Repo

User Guide

Issue 01

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HUAWEI TECHNOLOGIES CO., LTD.

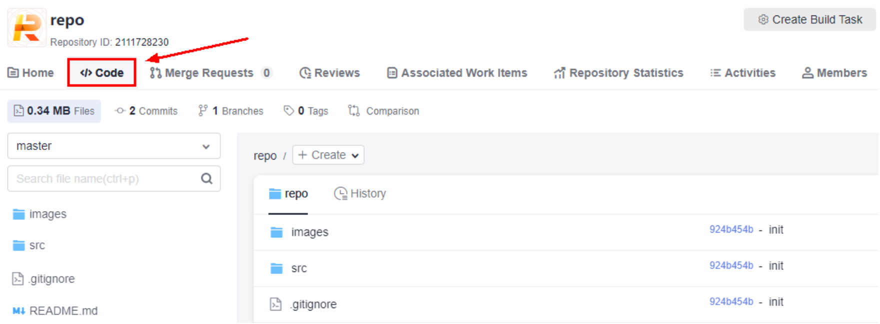
Contents

1 Before You Start

Huawei Cloud CodeArts Repo started a grayscale release from May 6, 2023. During the release, all user data is not affected. Grayscale users can perform repository operations by referring to the **new user guide**, and non-grayscale users can perform repository operations by referring to the **old user guide**.

How Do I Know Whether I'm a Grayscale User?

When a grayscale user accesses the CodeArts Repo repository details page, the **Code** tab page is displayed, indicating that you have entered the grayscale environment.



2 New Version (Recommended)

2.1 Overview

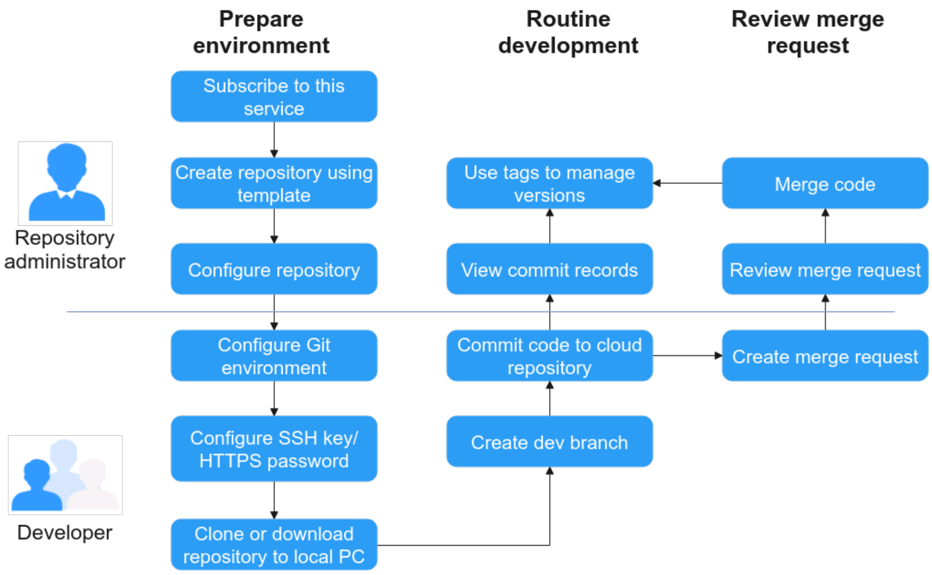
CodeArts Repo is a distributed version management platform that uses the Git workflow. It provides functions such as security management, member and permission management, branch protection and merge, online editing, and statistical analysis. The service aims to address issues such as cross-distance collaboration, multi-branch concurrent development, code version management, and security.

To start a new project, you can use CodeArts Repo built-in repository templates to create a repository for development. For details, see **Starting R&D Projects in CodeArts Repo**.

If you are developing a project locally and want to use CodeArts Repo to manage versions, you can migrate the project to CodeArts Repo. For details, see **Migrating a Local Project to CodeArts Repo**.

Starting R&D Projects in CodeArts Repo

You can use repository templates provided by CodeArts Repo to create a project and start development. The following figure shows the workflow.

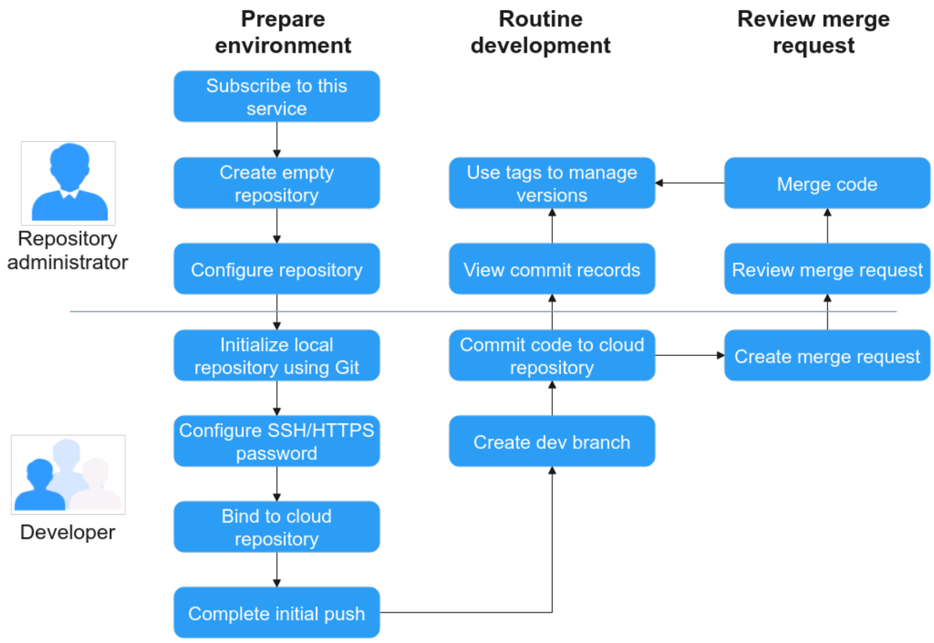


The operations involved are as follows:

- **Creating a Repository Using a Template**
- **Configuring Member Management**
- **Configuring CodeArts Repo**
- **Git Installation and Configuration**
- **Cloning or Downloading Code from CodeArts Repo to a Local PC**
- **Managing Branches**
- **Managing Tags**
- **Submitting Code to the CodeArts Repo**
- **Managing MRs**
- **Forking a Repository**

Migrating a Local Project to CodeArts Repo

To manage code versions of a locally developed project using CodeArts Repo, you can bind the local repository to CodeArts Repo and complete initial push. Then, you can continue developing your project in the distributed version management mode. The following figure shows the workflow.



The operations involved are as follows:

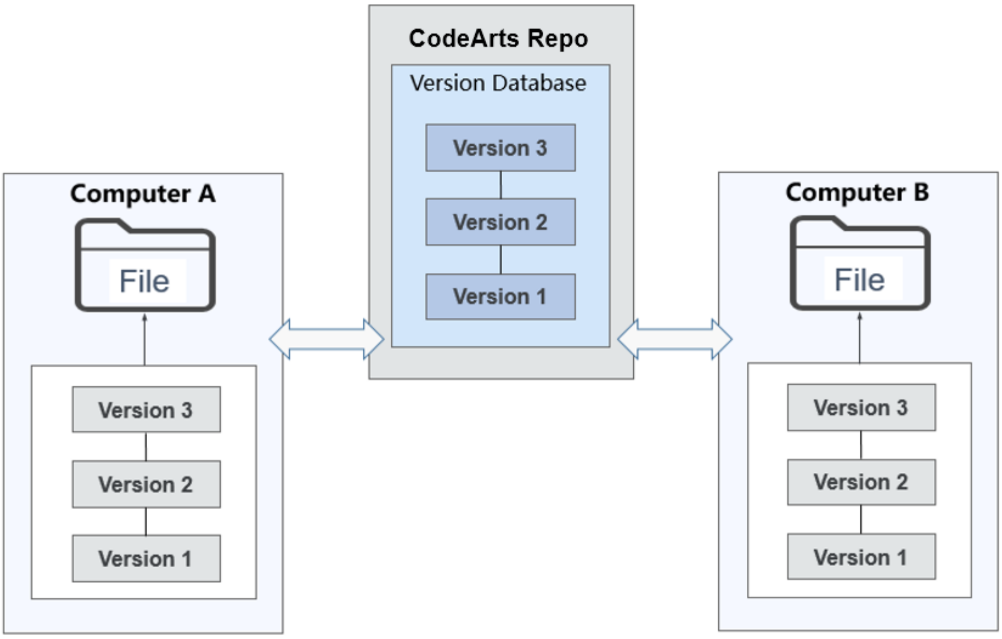
- **Creating an Empty Repository**
- **Configuring Member Management**
- **Configuring CodeArts Repo**
- **Git Installation and Configuration**
- **Associating the CodeArts Repo Repository**
- **Cloning or Downloading Code from CodeArts Repo to a Local PC**
- **Managing Branches**
- **Managing Tags**
- **Submitting Code to the CodeArts Repo**
- **Managing MRs**
- **Forking a Repository**

Distributed Version Management

There is a complete code repository on your local computer and in CodeArts Repo respectively.

All version information can be synchronized to the local computer for viewing.

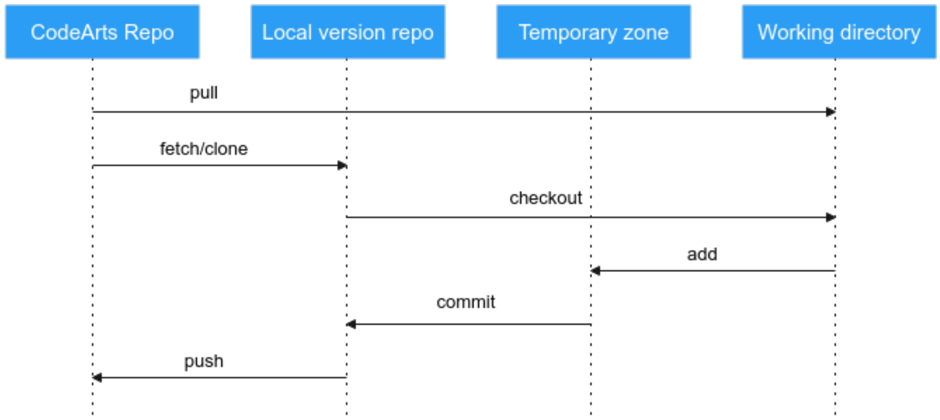
You can commit code offline on the local computer and push the code to the CodeArts Repo repository when the network is connected.



Basic Workflow

CodeArts Repo is a cloud repository service that uses the Git workflow.

- Data in a Git local repository can be in one of the three statuses: modified, staged, and committed. The file you modified in the repository is in the modified state. You can run the **add** command to add the changes to the local staging area. Then, the file is in the staged state. Run the **commit** command to commit the changes to the local repository for management. The corresponding version and version number are generated upon each commit. You can switch and roll back a version based on the version number. A version can have multiple branches and tags. Each branch, tag, or commit is an independent version that can be checked out using the **checkout** command.
- As a cloud repository service, CodeArts Repo not only has the basic features of local Git repositories, but also serves as the remote repository of each local repository and provides configurable security policies and authentication.
- A CodeArts Repo cloud repository interacts with a Git repository in the following scenarios:
  - **clone**: clones the branch in CodeArts Repo to the local computer as a local repository.
  - **push**: pushes changes in the local repository to CodeArts Repo.
  - **fetch**: fetches a version from CodeArts Repo to the working directory.
  - **pull**: fetches a version from CodeArts Repo to the working directory and tries to merge it into the current branch. If the operation fails, you need to manually resolve the file conflict.



2.2 Git Installation and Configuration

2.2.1 Installing and Configuring Git

CodeArts Repo is a Git-based service. Git clients such as Git Bash or TortoiseGit must be installed on local computers to connect to CodeArts Repo. The following sections describe how to install and configure Git Bash and TortoiseGit on Windows, Linux, and macOS.

If you have installed Git and configured the signature and email address, skip the following sections:

- **Installing Git Bash for Windows**
- **Installing TortoiseGit for Windows**
- **Installing Git for Linux**
- **Installing Git for macOS**

NOTE

GitHub Desktop is not supported in CodeArts Repo.

2.2.2 Installing Git Bash for Windows

Git Bash is a simple and efficient client on Windows for users who are familiar with Git commands. If you are unfamiliar with Git commands, you can use TortoiseGit by referring to **Installing TortoiseGit for Windows**.

1. Install the Git Bash client.
   a. Go to the **Git Bash website** and download the installation package for 32-bit or 64-bit Windows.
   b. Double-click the installation package. In the installation window displayed, click **Next** for several times and then click **Install**.
2. Open the Git Bash client.

   Click the Windows start icon, enter **Git Bash** in the search box, and press **Enter** to open Git Bash. You are advised to pin Git Bash to the Windows taskbar.

3. Configure the Git Bash client.

   Enter the following commands in Git Bash to configure your username and email address:

   ```
   git config --global user.name your_username
   git config  --global user.email your email address
   ```

   Run the following command to view the configurations:

   ```
   git config -l
   ```

   NOTE

   - A username can contain letters, digits, and special characters. You are advised to set the same username as that in CodeArts Repo.
   - The email address should be written in the standard format.
   - The **--global** parameter in the commands indicates that the configurations apply to all Git repositories on your computer. However, you can set a different username and email address for a specific repository.

2.2.3 Installing TortoiseGit for Windows

TortoiseGit is a better choice if you are not familiar with Git commands or you hope to migrate code from an SVN client such as TortoiseSVN. TortoiseGit is a Windows shell interface to Git as TortoiseSVN to SVN.

Prerequisites

1. Go to the **TortoiseGit website** and download the installation package for 32-bit or 64-bit Windows.
2. Double-click the installation package. In the window displayed, click **Next** for several times and then click **Install** to complete the installation. Click **Finish** to run the tool.
3. In the first start wizard displayed, select a language, enter a Git.exe path (the field is automatically filled with an available path if there is any), and configure a username and email address. Keep the default values and click **Next** till the settings are finished.

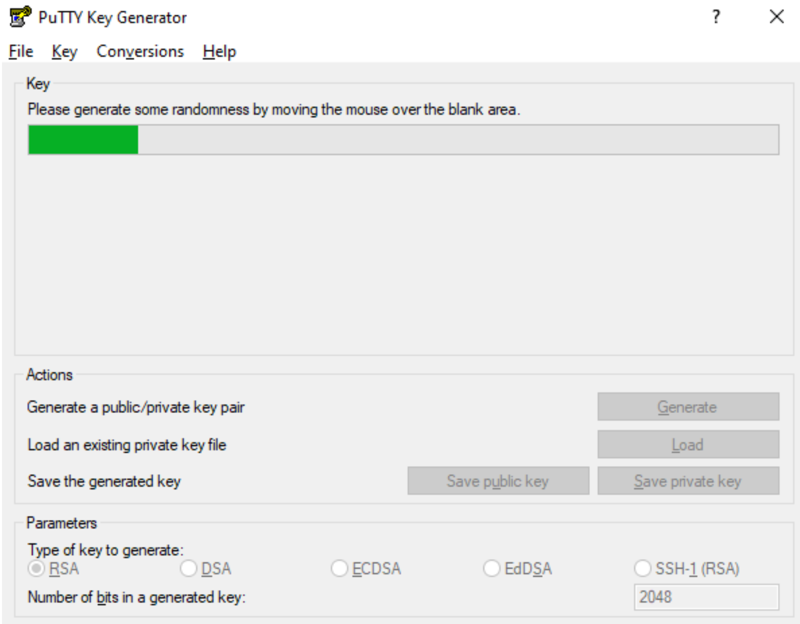
(Optional) Localization

TortoiseGit is installed in English by default. If you want to use a translated version of TortoiseGit, go to the **TortoiseGit website** to download your desired language pack.

Configurations

TortoiseGit also requires a key pair for authentication with the CodeArts Repo server. To generate a key pair, perform the following steps:

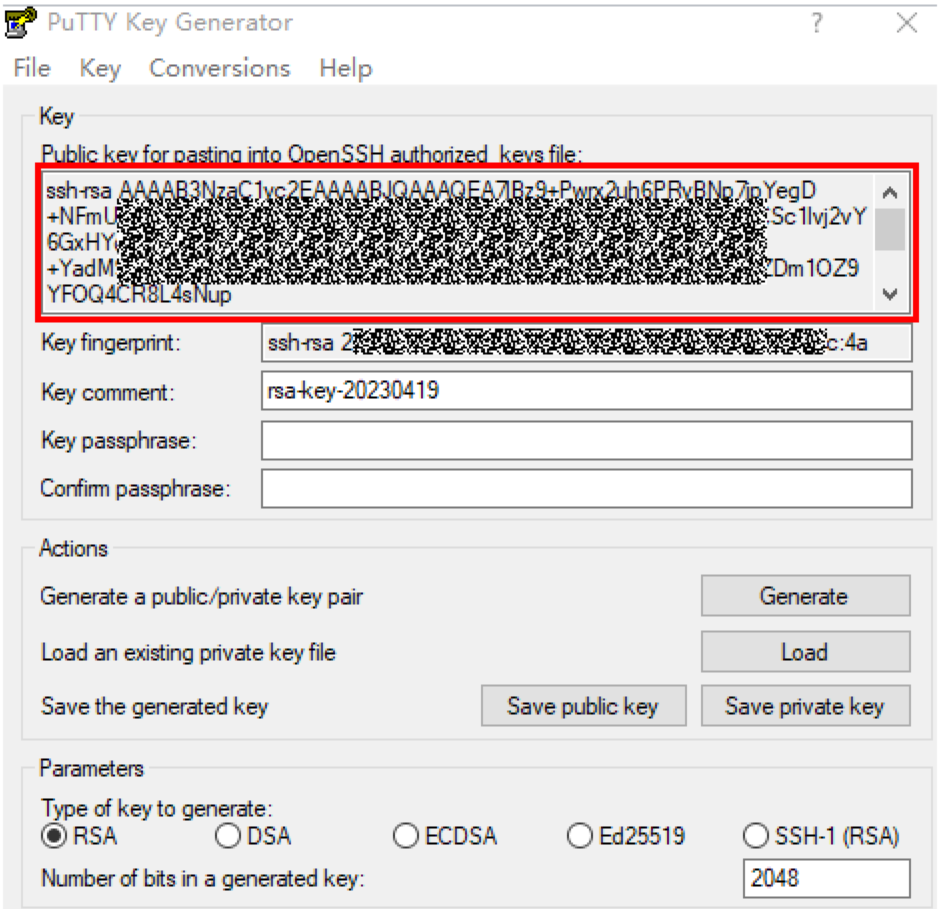
1. Search for PuTTYgen and open it. In the displayed window, click **Generate** to generate a key pair.



NOTE

PuTTYgen is a powerful, compact, and easy-to-use tool for generating pairs of public and private keys. It is installed along with the TortoiseGit installation and does not conflict with the one built in PuTTY.

2. After the key pair is generated, store the public and private keys.
   - Click **Save private key**. In the dialog box that is displayed, enter a file name and save the private key file.
   - Click **Save public key**. In the dialog box that is displayed, enter a file name and save the public key file.
3. Copy the public key in the red box in the following figure and **bind it to CodeArts Repo**.



4. Bind the private key to the local client.

   Search for Pageant and open it. In the displayed window, click **Add Key**, and select the generated private key file.

2.2.4 Installing Git for Linux

- Debian or Ubuntu

  Run the following command in the terminal:

```
apt-get install git
```

- Fedora, CentOS, or Red Hat

  Run the following command in the terminal:

```
yum install git
```

- For more OSs, see the Git Git website.

2.2.5 Installing Git for macOS

- You can quickly install Git on macOS by installing Xcode command line tools.
- On Mavericks 10.9 or a later version, run the **git** command on the Terminal. The system will prompt you to install the command line tools if you have not.
- If you want to install Git of a later version, go to the Git website and download the latest version for macOS.

2.3 Setting SSH Key or HTTPS Password for CodeArts Repo Repository

2.3.1 Overview

Introduction

When you push code to or pull code from CodeArts Repo repository, the repository needs to verify your identity and permissions. SSH and HTTPS are two authentication modes for remote access to CodeArts Repo.

- **SSH Keys**: An SSH key is used to establish a secure connection between your local computer and CodeArts Repo under your account.

  Before connecting to CodeArts Repo in SSH mode, generate an SSH key on your computer and configure it in CodeArts Repo.

  After you configure an SSH key on a local computer and add the public key to CodeArts Repo, you can use the SSH key to access all code repositories under your account from your computer.
- **HTTPS Password**: An HTTPS password is a user credential used for pulling and pushing code using the HTTPS protocol.

  The maximum size of a package that can be pushed at a time using HTTPS is 200 MB. If the size is greater than 200 MB, use the SSH mode.

  Federated users cannot be bound to email addresses and cannot use the HTTPS protocol.

NOTE

Either SSH or HTTPS can be used to push or pull code. Set SSH keys or HTTPS passwords as required.

2.3.2 SSH Keys

Introduction

When you push code to or pull code from CodeArts Repo, the repository needs to verify your identity and permissions. SSH is an authentication mode for remote access to CodeArts Repo.

- An SSH key is an encrypted network transmission protocol that establishes a secure connection between your computer and CodeArts Repo under your account.
- After you configure an SSH key on a local computer and add the public key to CodeArts Repo, you can use the SSH key to access all code repositories under your account from your computer.
- Before connecting to CodeArts Repo in SSH mode, generate an SSH key on your computer and configure it in CodeArts Repo.

Generating and Configuring an SSH Key

The following procedure describes how to generate a public key and bind it.

Step 1 Install the Git Bash client by referring to **Installing Git Bash for Windows**.

Step 2 Check whether your computer has generated a key.

Run the following command on the local Git client:

```
cat ~/.ssh/id_rsa.pub
```

- If **No such file or directory** is displayed, no SSH key has been generated on the computer. Go to **Step 3** to generate and configure an SSH key.

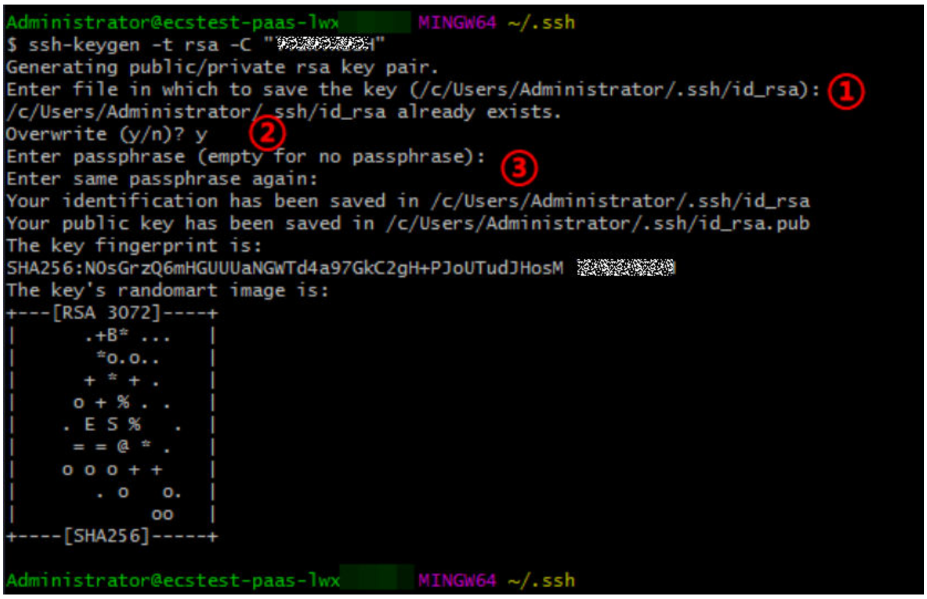
- If at least one group of keys is returned, an SSH key has been generated on your computer. To use the generated key, go to **Step 4** directly. To generate a new key, go to **Step 3**.

- If you want to manage multiple keys on one computer, see **How Can I Set Multiple SSH Keys on My Computer?**

Step 3 Generate an SSH private key.

Run the following command on the local Git client to generate a new SSH key:

```
ssh-keygen -t rsa -C "Your SSH key comment"
```



Perform the following operations. If information similar to the preceding figure is displayed, the key is generated.

1. The system prompts you to enter the storage path of the key. You can press **Enter** to use the default path.

2. If a key already exists in the local path, the system asks you whether to overwrite it. Enter **n** to cancel key generation, or enter **y** and press **Enter** to overwrite the existing key. In this example, the existing key is overwritten.

3. The system prompts you to set a password for the key and confirm the password. If you do not want to set a password, press **Enter**.

NOTICE

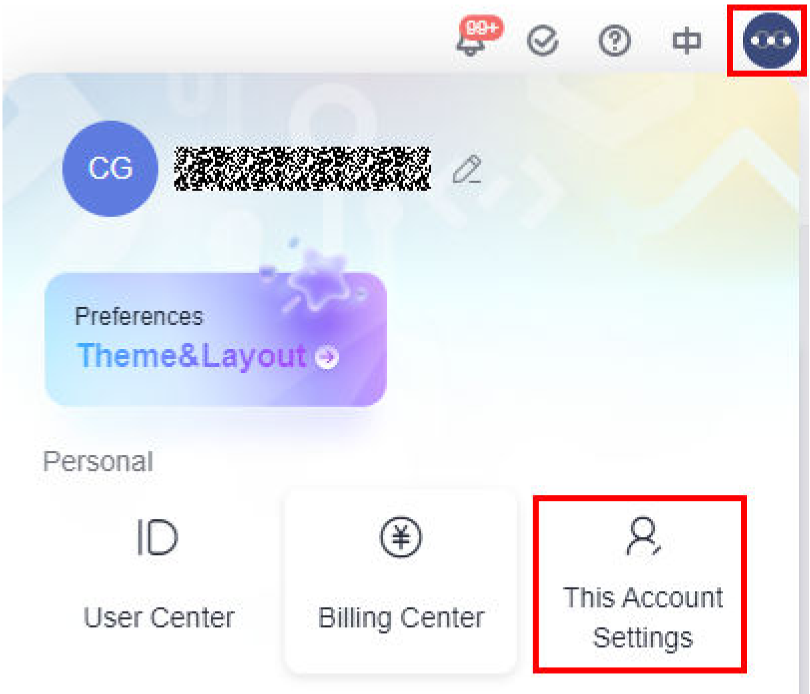
- If a password is set (recommended), the generated private key file is stored after being encrypted by AES-128-CBC.
- If you press **Enter** without entering the password, the generated private key file **id_rsa** is stored locally in plaintext. Keep it secure.

Step 4 Copy the SSH public key to the clipboard.

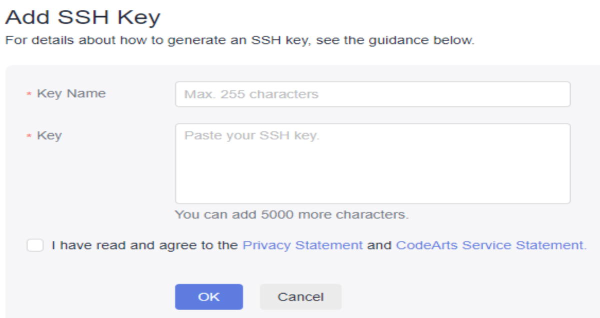
Run the following command based on your operating system to copy the SSH public key to your clipboard. Take Windows as an example. If no command output is displayed, the public key is copied.

- **Windows**
```
clip < ~/.ssh/id_rsa.pub
```
- **macOS**
```
pbcopy < ~/.ssh/id_rsa.pub
```
- **Linux (xclip required)**
```
xclip -sel clip < ~/.ssh/id_rsa.pub
```

Step 5 Log in to the CodeArts Repo service repository list page, click the alias in the upper right corner, and choose **This Account Settings > SSH Keys**.



Step 6 On the **SSH Keys** page, click **Add SSH Key**. The **Add SSH Key** page is displayed.



Step 7 Enter a key name, paste the SSH public key copied in **Step 4** to the **Key** text box, select **I have read and agree to the Privacy Statement and CodeArts Service Statement**, and click **OK**. A message is displayed, indicating that the operation is successful.

NOTE

- An SSH key cannot be added repeatedly. If an SSH key fails to be added, check whether it has already been added or whether there are redundant spaces in the key.
- After the key is added, you can view it on the **SSH Keys** page. If it is no longer used, you can delete it.
- The difference between an SSH key and repository deploy key is that the former is associated with a user/computer and the latter is associated with a repository. The SSH key has the read and write permissions on the repository, and the deploy key has the read-only permission on the repository.

----End

Verifying Whether an SSH Key Is Bound

When an SSH key is bound, you can perform **SSH-clone** on the repository that you have the access permission on the client. If the clone is successful, the key is bound.

NOTE

If you use SSH to clone a repository to the local computer for the first time, the message "The authenticity of host *.*.com can't be established. RSA key... (yes/no)?" is displayed. Enter **yes** to continue.

2.3.3 HTTPS Password

Introduction

When you push code to or pull code from CodeArts Repo, the repository needs to verify your identity and permissions. HTTPS is an authentication mode for remote access to CodeArts Repo.

- **HTTPS username**

  The value can be the tenant name or IAM username. Enter the complete username. If you want to add the username to the URL, escape '/' to ' %2F'.

  NOTE

  When setting the HTTPS password for the account (the account name is the same as the username), you can enter only the account name.

- **HTTPS password**
  - Enter a password containing 8 to 32 characters. The password must contain at least three types of digits, uppercase letters, lowercase letters, and special characters. It cannot be the same as the username or the username spelled backwards.
  - An HTTPS password is a user credential used for pulling or pushing code using the HTTPS protocol. Each developer needs to set a password only once and can use it for all repositories.
  - Keep your HTTPS password secure and change it periodically to avoid security risks. If you forget the password, set a new HTTPS password.

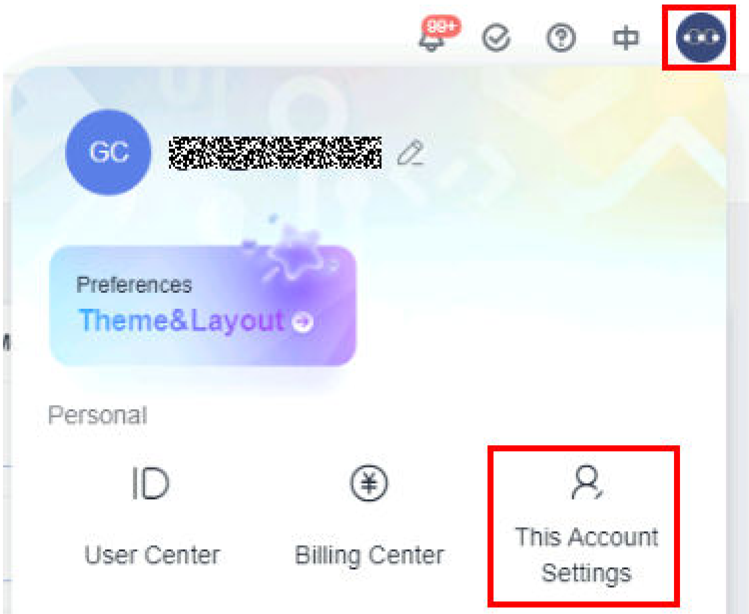
NOTE

By default, the HTTPS password is the Huawei Cloud login password. The password can be synchronized in real time. You can also select **Set new password** to change the password.

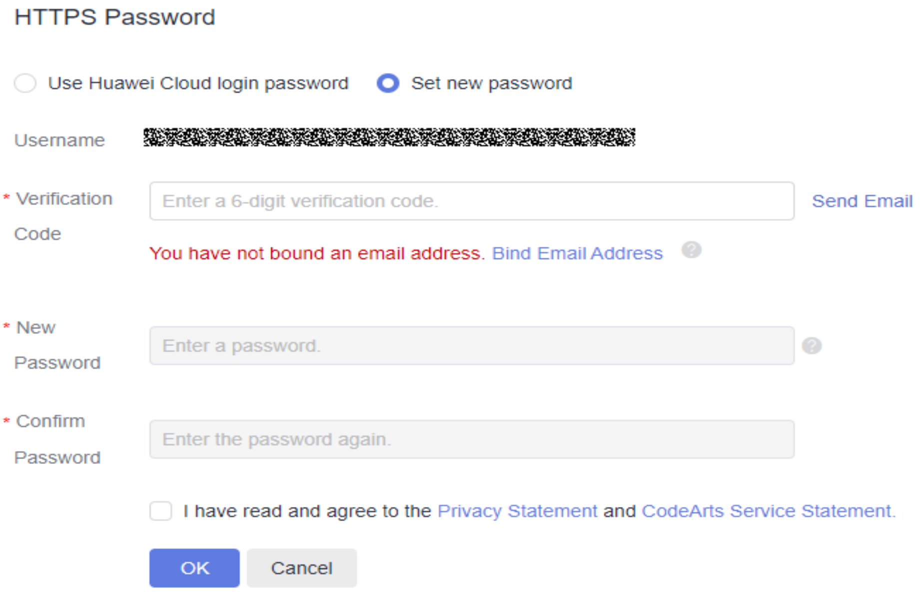
Changing the HTTPS Password

You need to set the initial password upon the first login. You can also change the HTTPS password at any time. The procedure is as follows:

Step 1 Log in to the CodeArts Repo service repository list page, click the alias in the upper right corner, and choose **This Account Settings > HTTPS Password**. The page is displayed.



Step 2 Choose **Set new password** to reset the password. (If you have set an HTTPS password and are using it, click **Change**.)



Step 3 Enter the new password and email verification code, select **I have read and agree to the Privacy Statement and CodeArts Service Statement**, and click **OK**. A message is displayed, indicating that the operation is successful.

Step 4 After the password is reset, you need to regenerate the repository credential locally and check the **IP address whitelist**. Otherwise, you cannot interact with the CodeArts Repo repository.

Delete the local credential (for example, on Windows, choose **Control Panel > User Accounts > Manage Windows Credentials > Generic Credentials**), use HTTPS to clone the cloud repository again, and enter the correct account and password in the dialog box that is displayed.

NOTE

If **SSL certificate problem** is displayed, run the following command on Git client:

```
git config --global http.sslVerify false
```

----End

NOTE

- You can click **Use Huawei Cloud Account Password** to reset the password and customize a password at any time.
- If the account is upgraded to a Huawei ID, the tenant-level function of **Use HUAWEI CLOUD Account Password** is no longer supported (the function is still valid for IAM users).
- The maximum size of a package that can be pushed at a time using HTTPS is 200 MB. If the size is greater than 200 MB, use the SSH mode.
- **Federated users** cannot be bound to email addresses and do not support the HTTPS protocol.

Verifying Whether an HTTPS Password Takes Effect

After setting an HTTPS password, you can perform **HTTPS-clone** on the repository that you have the access permission on the client. A dialog box is displayed, asking you to enter the account and password. If the clone is successful, the password is configured.

NOTE

You can also use the HTTPS protocol to set password-free code submission. For details, see **Setting Password-Free Access via HTTPS**

2.4 Migrating Data to CodeArts Repo

2.4.1 Overview

This section describes how to migrate your repository to CodeArts Repo. Select one of the following migration solutions based on your repository storage mode:

- **Migrating an SVN Repository to CodeArts Repo**
- **Importing a Remote Git Repository to CodeArts Repo**
- **Uploading Local Code to CodeArts Repo**

2.4.2 Migrating an SVN Repository to CodeArts Repo

This section uses a code repository with the standard SVN layout as an example to describe how to migrate an existing SVN repository to CodeArts Repo. The following figure shows the directory structure of the repository.

```
|-- .svn
|-- KotlinGallery
    |-- trunk           Main Development Directory
        |--app
        |--gradle
        |--..
    |-- branches        Branch Development Directory
        |--r1.1_hotfix
            |--app
            |--gradle
            |--...
    |-- tags            Tag Archive Directory(The modification is not allowed)
        |--r1.0
            |--app
            |--gradle
            |--...
        |--r1.1
```

There are two methods of migrating the existing SVN code. Both methods effectively migrate the SVN code and operation records. The differences of the two methods are as follows. In the first method, the branches and tags folders of the SVN repository are mapped to Git branches and tags during the migration. This facilitates subsequent development on CodeArts Repo, but the migration process is complex. The second method is simple because the branch and tag folders of the SVN repository are migrated without mapping, but it is inconvenient for subsequent development. You can select a method as required.

- **Migration Method 1: Import on the Git Bash Client**: applicable to the scenarios where only part of code is stored in the SVN during project development
- **Migration Method 2: Online Import Using HTTP**: applicable to the scenarios where the complete project code is stored in the SVN when the project is complete

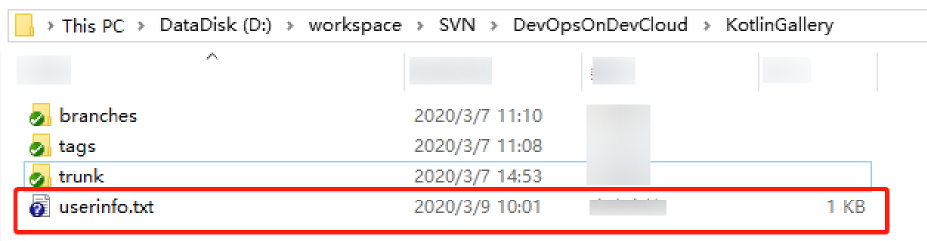
Migration Method 1: Import on the Git Bash Client

Step 1 Obtain committer information of the SVN repository.

1. Use TortoiseSVN to download the repository to be migrated to the local computer.
2. Go to the local SVN repository (**KotlinGallery** in this example) and run the following command on the Git Bash client:

```
svn log --xml | grep "^<author" | sort -u | \awk -F '<author>' '{print $2}' | awk -F '</author>' '{print $1}' > userinfo.txt
```

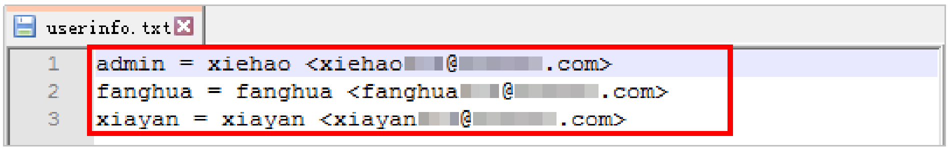
   The **userinfo.txt** file is generated in the directory.



3. Open the **userinfo.txt** file. You can view the information about all committers who have committed code to the repository in the file.

4. Git uses an email address to identify a committer. To better map the SVN repository information to a Git repository, create a mapping between the SVN and Git usernames.

   Modify the **userinfo.txt** file. Each line should be in the format of *svn_committer* = *git_committer_nickname* <*email_address*>.



Step 2 Create a local Git repository.

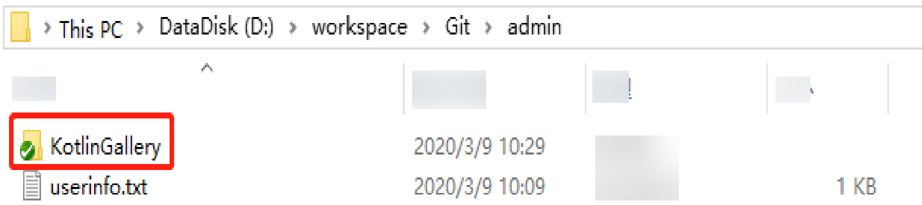
1. **Create an empty Git repository directory on the local computer**, and copy the **userinfo.txt** file obtained in **Step 1** to the directory.
2. Start the Git Bash client in the directory and run the following command to clone a Git repository:

```
git svn clone <svn_repository_address> --no-metadata --authors-file=userinfo.txt --trunk=trunk --tags=tags --branches=branches
```

   The following table lists parameters in the command. Set the parameters as required.

Parameter	Description
--no-metadata	Prevents the Git from exporting useless information contained in the SVN.
--authors-file	File that maps all SVN accounts to Git accounts
--trunk	Main development project
--branches	Branch projects
--tags	Tags

   After the command is executed, a Git repository is generated locally.



3. Run the following commands to go to the **KotlinGallery** folder and verify the current Git repository branch structure:

```
cd KotlinGallery
git branch -a
```

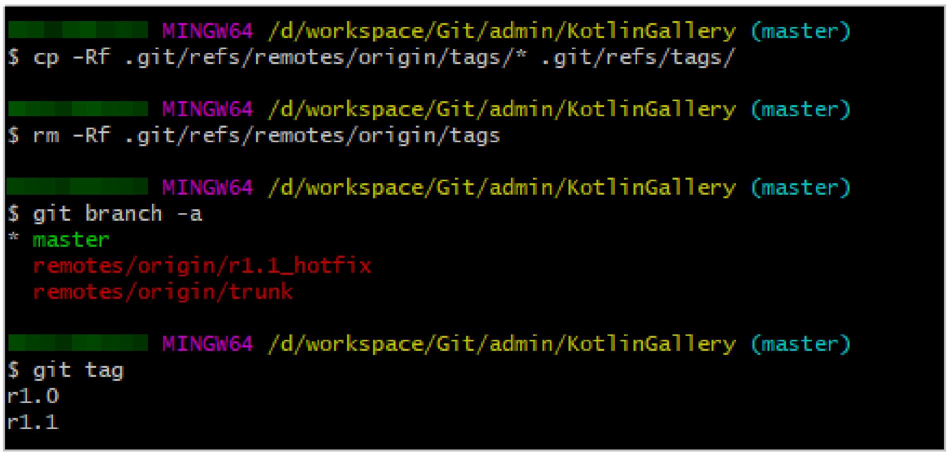
As shown in the preceding figure, all SVN directory structures are successfully migrated in the form of Git branches.

Step 3 Correct local branches.

In **Step 2**, the **git svn clone** command is used to save the **tags** folder in the SVN repository as a branch, which does not comply with the Git usage specifications. Therefore, before uploading tags to CodeArts Repo, adjust the local branches to comply with the Git usage specifications.

1. Go to the local Git repository and run the following commands on the Git Bash client to change the tags branch to appropriate Git tags:

```
cp -Rf .git/refs/remotes/origin/tags/* .git/refs/tags/
rm -Rf .git/refs/remotes/origin/tags
git branch -a
git tag
```



2. Run the following commands to change the remaining indexes under **refs/remotes** to local branches:

```
cp -Rf .git/refs/remotes/origin/* .git/refs/heads/
rm -Rf .git/refs/remotes/origin
git branch -a
git tag
```

3. Run the following commands to merge the trunk branch into the master branch and delete the trunk branch:

```
git merge trunk
git branch -d trunk
git branch -a
git tag
```

Step 4 Upload the local code.

1. Set the SSH key of the repository by referring to **Overview**.
2. Run the following commands to associate the local repository with the CodeArts Repo repository and push the master branch to CodeArts Repo:
   ```
   git remote add origin <CodeArts Repo_repository_address>
   git push --set-upstream origin master
   ```
   After the push is successful, log in to CodeArts Repo and view the master branch of the repository after clicking the **Code** and **Branches** tabs.
3. Run the following command to push other branches from the local computer to CodeArts Repo:
   ```
   git push origin --all
   ```
   After the push is successful, the r1.1_hotfix branch is added to the repository after clicking the **Code** and **Branches** tabs.
4. Run the following command to push tags from the local computer to CodeArts Repo:
   ```
   git push origin --tags
   ```
   After the push is successful, click the **Code** and **Branches** tabs and view tags **r1.0** and **r1.1** added to CodeArts Repo.

----End

Migration Method 2: Online Import Using HTTP

Ensure that your SVN server supports HTTP or HTTPS access. You can enter **http(s)://SVN server address/Name of the repository to be accessed** in any browser for verification.

Step 1 On the CodeArts Repo list page, click  next to **New Repository** and choose **Import Repository** from the drop-down list.

Step 2 Enter the source repository URL, enter the SVN username and password, select **I have read and agree to the *Privacy Statement* and *CodeArts Service Statement*,** and click **Next**.

Enter the name of the repository to be created, configure permissions, and click **OK**.

Step 3 After the repository is created, click the repository name to view details.

----End

2.4.3 Importing a Remote Git Repository to CodeArts Repo

Background

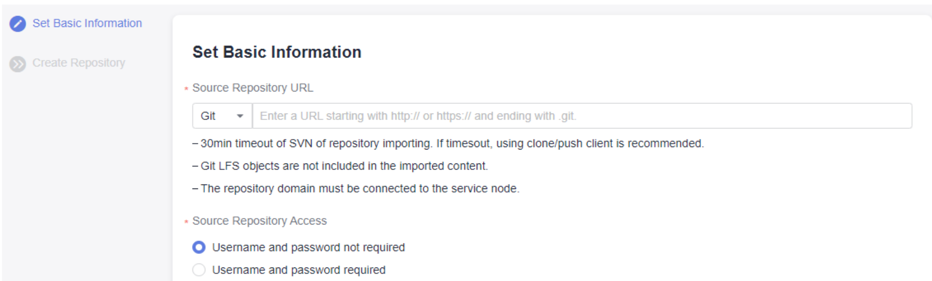
CodeArts Repo allows you to import Git-based remote repositories.

Git-based remote repositories are cloud repositories hosted in storage services such as GitHub.

Method 1: Online Import

You can directly import your remote repository to CodeArts Repo online. The import speed will be affected by network conditions of the source repository.

1. On the CodeArts Repo homepage, click next to **New Repository** and select **Import Repository** from the drop-down list. The **Import Repository** page is displayed.
2. Enter information in the **Source Repository URL** field. If the source repository is open-source (public repository), select **Username and password not required**. If the source repository is private, select **Username and password required**.
3. Click **Next**. On the **Create Repository** page, enter the basic information about the repository.
4. Click **OK** to import the repository. The repository list page is displayed.



For details, see **Importing an External Repository**.

Method 2: Cloning the Git Repository to the Local Computer and Associating and Pushing It to CodeArts Repo

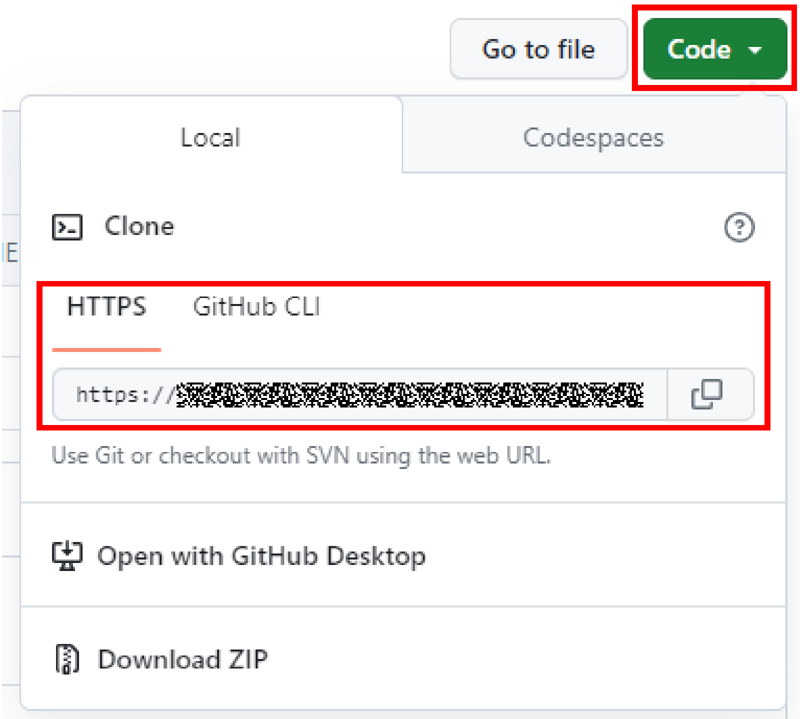
If you cannot **import a repository online** due to network issues, use this method. Using this method, you can clone a remote repository to the local computer, and then associate and push it to CodeArts Repo.

Step 1 **Install and configure the Git client**.

Step 2 Download a bare repository using the source repository address.

The following uses GitHub as an example:

1. Open a browser and enter the address of the GitHub code repository.
2. Click **Code** on the right, click the **HTTPS** tab, and click on the right.



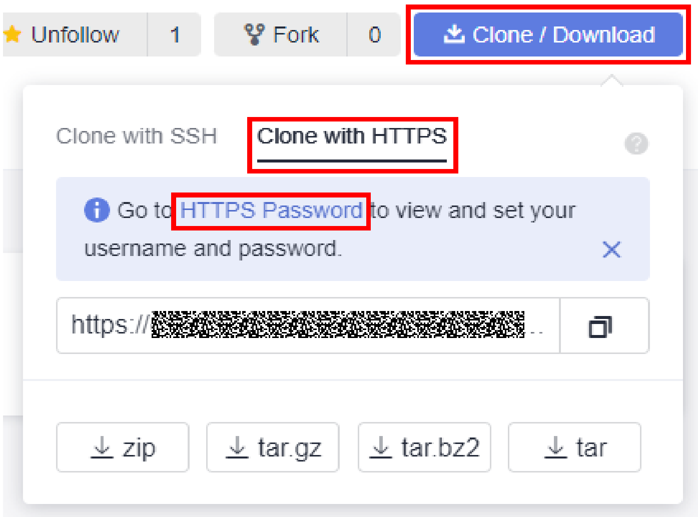
3. Open the Git Bash client on the local PC, run the following command to clone the repository to the local PC, and run the **cd** command to go to the repository directory:

```
git clone --bare <source_repository_address>
```

Step 3 Associate the local repository with CodeArts Repo and push it to CodeArts Repo.

1. On the CodeArts Repo homepage, click **New Repository**. In the **Permissions** area, do not select **Allow generation of a README file**.
2. Go to the repository details page created in **1**, click **Clone/Download**, click the **Clone with SSH** or **Clone with HTTPS** tab as required, and click to obtain the repository address.

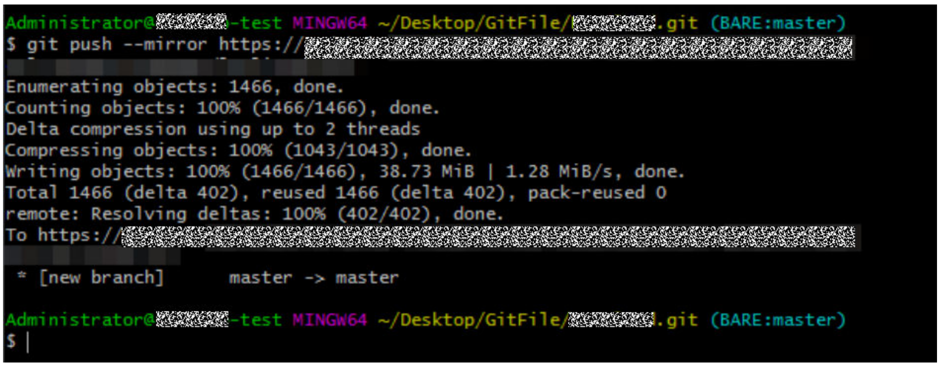
   In this example, the HTTPS address is used.



3. In the root directory of local source code, open the Git Bash client and run the following command to push the local repository to the new repository:

```
git push --mirror <new_repository_address>
```

When the command is executed, the system prompts you to enter the HTTPS account and password of the CodeArts Repo repository. Enter the correct account and password. (For details about how to obtain an HTTP account and password, see **Changing the HTTPS Password**.)



If your source repository has branches and tags, they will also be pushed to CodeArts Repo.

----End

After the push is successful, check whether the migration is complete in CodeArts Repo. (For details about how to view a CodeArts Repo repository, see **Viewing the Repository List**.)

2.4.4 Uploading Local Code to CodeArts Repo

Background

CodeArts Repo allows you to perform Git initialization on local code and upload the code to a CodeArts Repo repository.

Procedure

Step 1 **Create an empty repository** in CodeArts Repo.

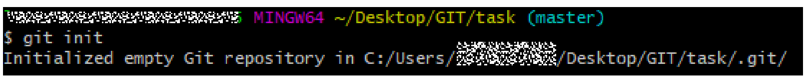
- Do not configure **Programming Language of .gitignore**.
- Deselect **Allow generation of a README file**.

Step 2 Prepare the source code to be uploaded on the local computer.

- If the source code is from the SVN server, refer to **Migrating an SVN Repository**.
- If the source code is not managed by any version control systems, run the following Git command in the root directory of the source code (Git Bash is used as an example):

  a. Initialize a Git repository on the local computer:

  ```
  git init
  ```

  b. Add the code files to the local repository:

  ```
  git add *
  ```

c. Create an initial commit:

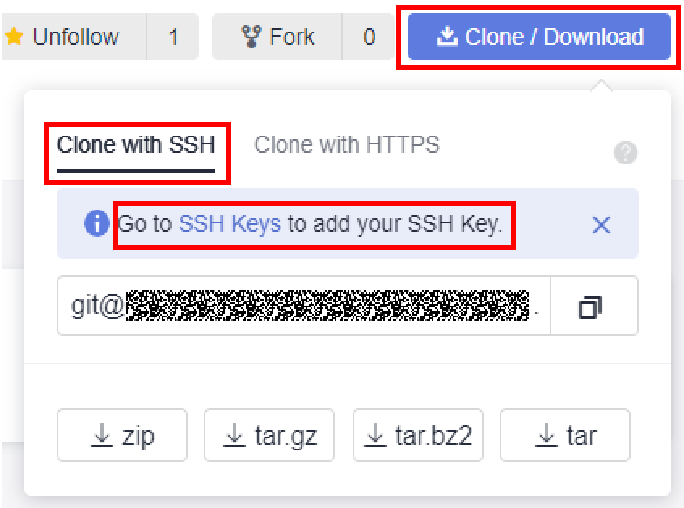
```
git commit -m "init commit"
```

Step 3 Set a remote server address for the local repository.

- If the Git repository is cloned from other systems, run the following command to add a new remote repository:

```
git remote add new git@***.***.com:testtransfer/Repo1.git     # (replace the part after new with the repository address)
```

The repository address is displayed on the repository details page. The following figure shows how to obtain the repository address.



- If the Git repository is just initialized, run the following command to add a remote repository named **origin**.

```
git remote add origin git@***.***.com:testtransfer/Repo1.git # (replace the part after origin with the repository address)
```

Step 4 Push all code to CodeArts Repo.

```
git push new master      # (when the Git repository is cloned from other systems)
git push origin master   # (when the Git repository is just initialized)
```

----End

NOTE

Basic Git knowledge is required for the preceding operations. If you have any questions during the operation, see **the Git website** or contact technical support.

2.5 Creating a CodeArts Repo Repository

2.5.1 Overview

Currently, CodeArts Repo provides the following ways to create a repository.

- **Creating an Empty Repository**: You can create a local repository and synchronize it to CodeArts Repo.
- **Creating a Repository Using a Template**: You can create a repository using a CodeArts Repo template when there is no local repository.
- **Importing an External Repository**: You can import a cloud repository to CodeArts Repo or import a CodeArts Repo repository from a region to another

region (see **Repository Backup**). The imported repository is independent of the source repository.

- Scenario 1: Migrate Gitee and GitHub repositories and projects to CodeArts Repo.
- Scenario 2: Migrate CodeArts projects from a region to other regions.

- **Forking a Repository**: You can fork a CodeArts Repo repository, make changes to the fork, and merge the changes to the source repository.
  - Scenario 1: Carry out new projects based on historical projects without damaging the repository structure of the historical projects.
  - Scenario 2: Share projects of your organization with others.

NOTICE

- The capacity of a single repository cannot exceed 2 GB (including LFS usage). If the capacity exceeds 2 GB, the repository cannot be used properly and cannot be expanded.
- When the capacity of a repository exceeds the upper limit, the repository is frozen. In this case, you are advised to delete the repository, control the capacity locally, and push the repository again.

Common Repository Settings

- **Repositories**
- **Commit Rules**
- **Merge Requests**
- **Protected Branches**
- **IP Address Whitelists**
- **More settings**

2.5.2 Creating an Empty Repository

You can create an empty repository and synchronize a local repository to CodeArts Repo. To create an empty repository on the CodeArts Repo console, perform the following steps:

Step 1 Access the repository list page.

Step 2 Click **New Repository**. On the page that is displayed, enter basic repository information.

Table 2-1 Parameters for creating an empty repository

Parameter	Mandatory	Remarks
Repository Name	Yes	The name must start with a letter, digit, or underscore (_) and can contain periods (.) and hyphens (-), but cannot end with .git, .atom, or period (.). The name can contain a maximum of 200 characters.
Project	Yes	• A repository must be associated with a project. • If there is no project under the account or you click **Create Project** in the **Project** drop-down list, the **Create Project** dialog box is displayed and you can create a basic project. (For a basic project, only CodeArts Repo and some services can be used. Other services are not enabled by default. You can change a project to a basic project on the project settings page.) **NOTE** If you create a repository in a project, the project is selected for **Project** by default, and the **Project** parameter is hidden on the repository creation page.
Description	No	Enter a description for your repository. The description can contain a maximum of 2,000 characters.
Programming Language of .gitignore	No	The .gitignore file is generated based on your selection. (For details about gitignore, see **gitignore Documentation**.)
Permissions	No	The options are as follows: • **Allow project members to access the repository** The project manager is automatically set as the repository administrator, and the developer is set as a common repository member. When the two roles are added to the project, they will be automatically synchronized to existing repositories. • **Allow generation of a README file** You can edit the README file to record information such as the project architecture and compilation purpose, which is similar to a comment on the entire repository.

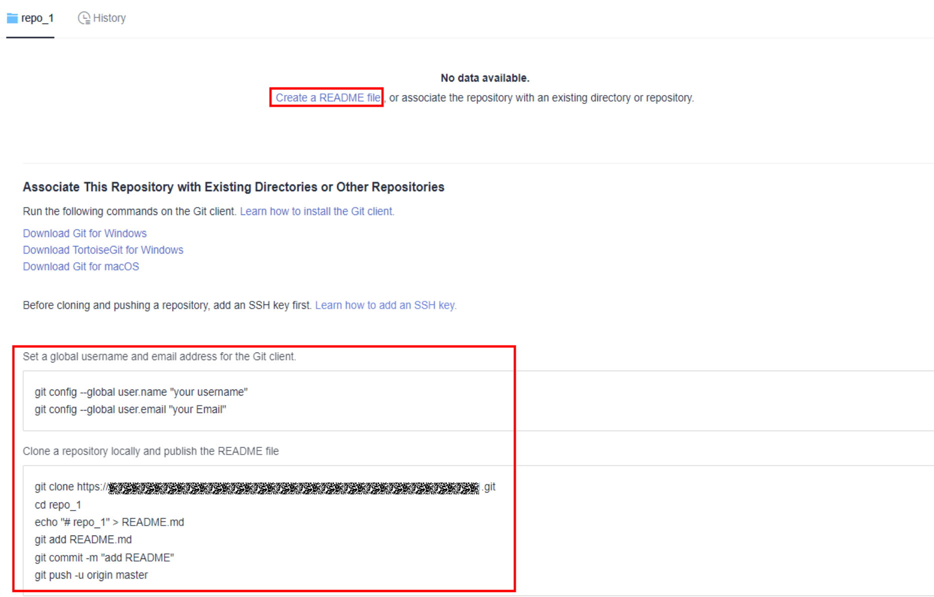
Parameter	Mandatory	Remarks
Visibility	Yes	The options are as follows: ● **Private** The repository is visible only to repository members. Repository members can access the repository or commit code. ● **Public read-only** The repository is open and read-only to all guests, but is not displayed in their repository list or search results. You can select an open-source license as the remarks.

Step 3 Click **OK** to create the repository. The repository list page is displayed.

----End

Associating with an Existing Directory or Repository

If you do not generate a README file when creating a common repository, you can click the **Code** tab, click **Create a README file** or associate the repository with an existing directory or repository. The procedure is as follows:



Prerequisites

- You need to run following commands on the Git client. Install the Git client and configure the Git global username and user email address. For details, see **Git Installation and Configuration**.
- Set the SSH key. For details, see **SSH Keys**.

Procedure

NOTE

The following commands have been automatically generated in the new repository. You can copy them on the **Code** tab page of the repository.

Step 1 Clone the repository on the local host and push the new README file.

```
git clone HTTP_download_address
cd taskecho "# Repository_name" > README.md
git add README.md
git commit -m "add README"
git push -u origin master
```

Step 2 Associate an existing code directory with the repository.

```
cd <Your directory path>
mv README.md README-backup.md
git init
git remote add origin  HTTP_download_address
git pull origin master
git add --all
git commit -m "Initial commit"
git push -u origin master
```

Step 3 Associate with an existing Git repository.

```
cd <Your Git repository path>
git remote remove origin > /dev/null 2>&1
git remote add origin  HTTP_download_address
git push -u origin --all -f
git push -u origin --tags -f
```

----End

2.5.3 Creating a Repository Using a Template

You can create a repository using a CodeArts Repo template on the CodeArts Repo console.

Prerequisites

This operation must be performed in the Scrum template project.

Procedure

Step 1 Access the repository list page.

Step 2 Click  next to **New Repository** and select **Template Repository** from the drop-down list. The **Select Template** page is displayed.

Step 3 On the **Select Template** page, enter a keyword for fuzzy search and select a template as required.

Step 4 Click **Next**. On the **Basic Information** page, enter basic repository information.

Table 2-2 Parameters for creating a repository using a template

Parameter	Mandatory	Remarks
Repository Name	Yes	The name must start with a letter, digit, or underscore (_) and can contain periods (.) and hyphens (-), but cannot end with .git, .atom, or period (.). The name can contain a maximum of 200 characters.
Project	Yes	• A repository must be associated with a project. • If there is no project under the account or you click **Create Project** in the **Project** drop-down list, the **Create Project** dialog box is displayed and you can create a basic project. (For a basic project, only CodeArts Repo and some services can be used. Other services are not enabled by default. You can change a project to a basic project on the project settings page.) **NOTE** If you create a repository in a project, the project is selected for **Project** by default, and the **Project** parameter is hidden on the repository creation page.
Description	No	Enter a description for your repository. The description can contain a maximum of 2,000 characters.
Permissions	No	• **Allow project members to access the repository** The project manager is automatically set as the repository administrator, and the developer is set as a common repository member. When members of the two roles are added to the project, they are added to the repository member list by automatic synchronization. You can view the list.
Visibility	Yes	The options are as follows: • **Private** The repository is visible only to repository members. Repository members can access the repository or commit code. • **Public** The repository is open and read-only to all guests, but is not displayed in their repository list or search results. You can select an open-source license as the remarks.

Step 5 Click **OK** to create the repository.

----End

NOTE

When you create a repository by template, the repository type of the selected template will be automatically configured for the repository.

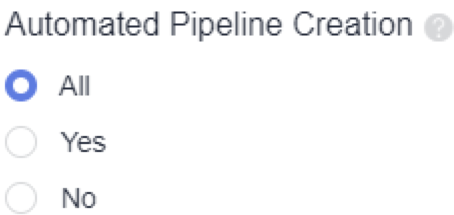
The repository created using the template contains the repository file structure preset in the template.

Automatically Creating a Pipeline

A pipeline can be automatically created when a repository is created using a template. Note that the host used in CodeArts Deploy must be changed to the actual environment so that the pipeline can be successfully executed.

Step 1 On CodeArts Repo, click next to **New Repository** and select **Template Repository**.

Step 2 On the **Select Template** page, set **Automated Pipeline Creation** to **Yes** in the navigation pane to display templates that can be used to automatically create a pipeline.



Step 3 Select a template as required, click **Next**, enter basic repository information, and click **OK**.

Step 4 After the repository is created, you can view the pipeline that is automatically created on the pipeline list page displayed.

----End

2.5.4 Importing an External Repository

You can import a cloud repository to CodeArts Repo or import a CodeArts Repo repository from a region to another region (see **Repository Backup**). The imported repository is independent of the source repository.

NOTE

Currently, this function is not supported at **AP-Singapore**. Check your access point (AP) in the upper left corner.

To import an external repository on the CodeArts Repo console, perform the following steps:

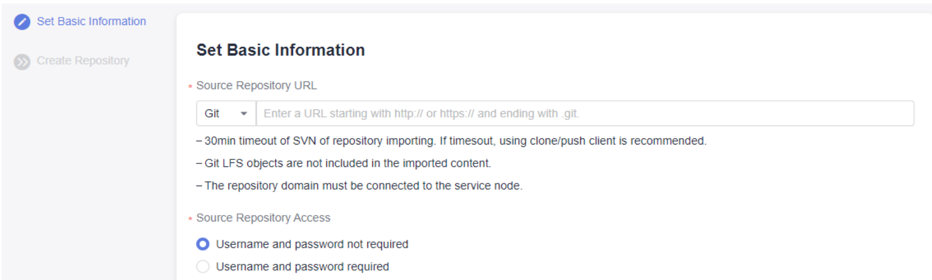
Step 1 Access the repository list page.

Step 2 Click next to **New Repository** and select **Import Repository** from the drop-down list.

NOTICE

- An external repository can be a Git remote repository (HTTPS) or SVN repository.
- The source repository port can be 80, 443, or greater than 1024.
- Currently, GitHub, Gitee, GitLab, and SVN source repositories are supported. If the import using other types of source repositories fails, contact technical support to check the source server whitelist.

Step 3 Enter the source repository path, and enter the username and password for accessing the source repository. (This parameter is not required for open-source repositories.)



Step 4 Click **Next**. On the **Create Repository** page, enter the basic information about the repository.

Table 2-3 Parameter description

Parameter	Mandatory	Remarks
Repository Name	Yes	The name must start with a letter, digit, or underscore (_) and can contain periods (.) and hyphens (-), but cannot end with .git, .atom. The name can contain a maximum of 200 characters.
Description	No	Enter a description for your repository. The description can contain a maximum of 2,000 characters.
Permissions	No	• **Allow project members to access the repository** The project manager is automatically set as the repository administrator, and the developer is set as a common repository member. When the two roles are added to the project, they will be automatically synchronized to existing repositories.

Parameter	Mandatory	Remarks
Visibility	Yes	The options are as follows: ● **Private** The repository is visible only to repository members. Repository members can access the repository or commit code. ● **Public read-only** The repository is open and read-only to all visitors. You can select an open-source license as the remarks.
Branch	Yes	You can choose to synchronize the **default branch** or **all branches** of the source repository.
Schedule	No	Select **Schedule sync into repo**. ● The default branch of the source repository is automatically imported to the default branch of the new repository every day. ● The repository becomes a read-only image repository and cannot be written. In addition, only the branches of the third-party repository corresponding to the default branch of the current repository are synchronized.

NOTE

You can synchronize branches manually. In addition, you can also schedule synchronization. This setting cannot be changed after you configure it. For details, see **Repository Synchronization**

Step 5 Click **OK** to import the repository. The repository list page is displayed.

----End

NOTE

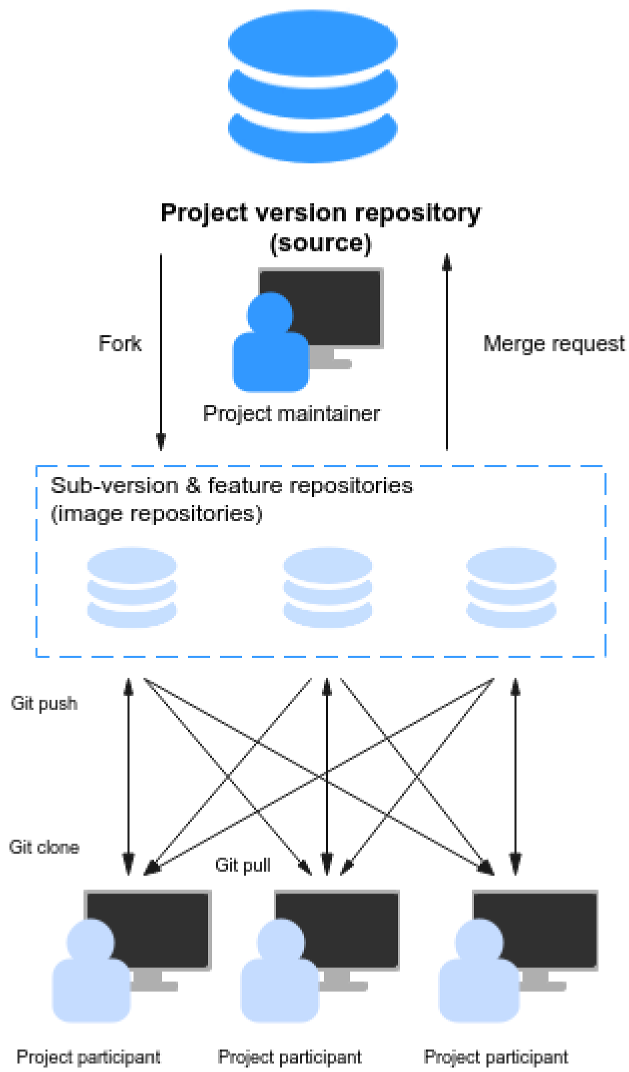
- The timeout interval for importing a repository is 30 minutes. If the import times out, use the clone/push function on the client.
- The **Git LFS** object is not imported.
- The repository domain must be connected to the service node.

2.5.5 Forking a Repository

Application Scenarios

You can fork a CodeArts Repo repository based on an image repository, make changes to the fork, and merge the changes to the source repository. Before changes are merged, the changes of the fork or the source repository will not affect each other.

As shown in the following figure, fork is applicable to the development scenario where a large-scale project contains multiple sub-projects. The complex development process occurs only in image repositories and the project repository (source repository) is not affected. Only new features that are completed can be merged to the project repository. Fork can be considered as a team collaboration mode.



Differences Between Forking a Repository and Importing an External Repository

The two modes are both repository replication. The main difference lies in the association between the source repository and the copied repository. The details are as follows:

- **Fork**
  – Forks are used to copy repositories on CodeArts Repo.
  – A fork generates a repository copy based on the current version of the source repository. You can apply for merging changes made on the fork to the source repository (cross-repository branch merge), but you cannot pull updates from the resource repository to the fork.
- **Import**

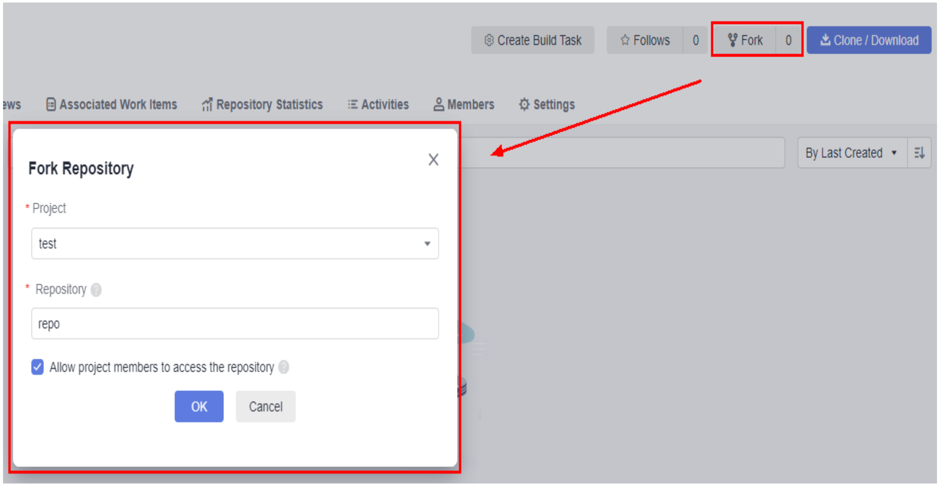
- You can import repositories of other version management platforms (mainly Git- and SVN-based hosting platforms) or your own repository to CodeArts Repo.
- An import also generates a repository copy based on the current version of the source repository. The difference is that you can pull the default branch of the source repository to the repository copy at any time to obtain the latest version, but you cannot apply for merging changes made on the repository copy to the source repository.

Forking a Repository

Step 1 Access the repository list page.

Step 2 Click a repository name to go to the target repository.

Step 3 Click **Fork** in the upper right corner of the page. In the **Fork Repository** dialog box that is displayed, select the target project, enter the repository name, and select **Allow project members to access the repository**.



Step 4 Click **OK** to fork the repository.

----End

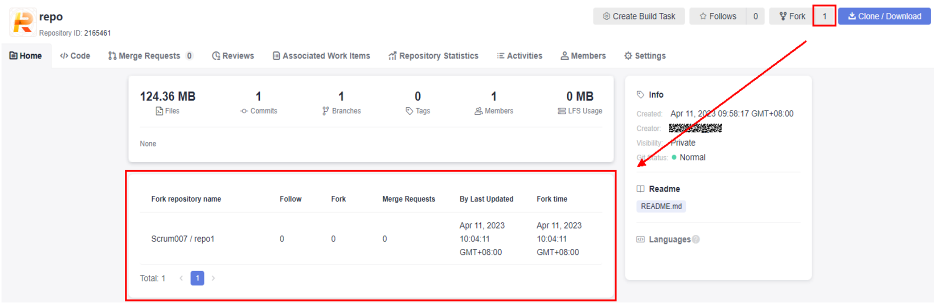
Viewing the List of Forked Repositories

Step 1 Access the repository list page.

Step 2 Click the source repository name.

Step 3 Click **Fork** in the upper right corner of the page to view the list of forked repositories, as shown in the following figure.

You can click the name of a forked repository to access the repository.



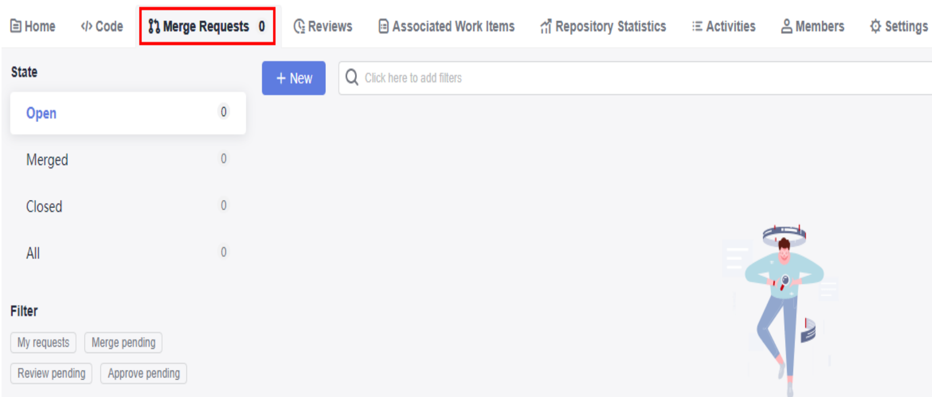
----End

Merging Changes of a Fork to the Source Repository

Step 1 Access the repository list page.

Step 2 Click the name of the forked repository.

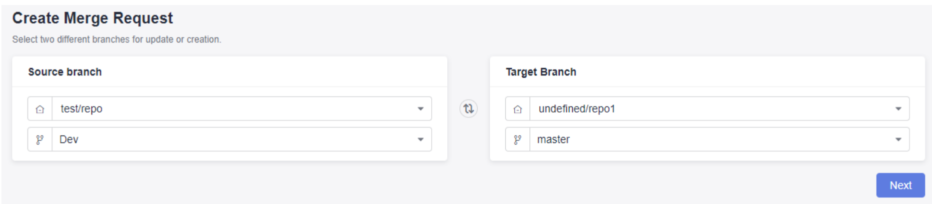
Step 3 Click the **Merge Requests** tab.



Step 4 Click **New**. The **Create Merge Request** page is displayed.

Source Branch is the one that requests merging.

Target Branch is the one that merges content.



Step 5 Click **Next**. The page for creating a merge request is displayed. The subsequent operation process is the same as that of creating a merge request in the repository. For details, see **Creating a Merge Request**.

----End

NOTE

A cross-repository MR belongs to the source repository and can be viewed only on the **Merge Requests** tab of the source repository. Therefore, reviewers, approvers, and mergers must be members of the source repository.

2.6 Associating the CodeArts Repo Repository

Before using CodeArts Repo, initialize the local project files to a Git repository and associate it with a CodeArts Repo repository.

Prerequisites

You have installed the **Git client** and **bound the SSH key of the Git client to CodeArts Repo**.

Procedure

Step 1 **Create a CodeArts Repo repository**.

If you select gitignore based on your local code library, some non-development files will be ignored and will not be managed in Git.

Step 2 Initialize the local repository to a Git repository.

Open the Git Bash client in your repository and run the following command:

```
git init
```

The following figure shows that the initialization is successful. The current folder is the local Git repository.

Step 3 Bind the CodeArts Repo repository.

1. Go to the CodeArts Repo repository and obtain the repository address.
2. Run the remote command to bind the local repository to the cloud repository.

   ```
   git remote add <repository_alias> <repository_address>
   ```

   Example:

   ```
   git remote add origin git@*****/java-remote.git  # Change the address to that of your repository.
   ```

   By default, **origin** is used as the repository alias when you clone a remote repository to the local computer. You can change the alias.

   If the system displays a message indicating that the repository alias already exists, use another one.

   If no command output is displayed, the binding is successful.

Step 4 Pull the master branch of the CodeArts Repo repository to the local repository.

This step is performed to avoid conflicts.

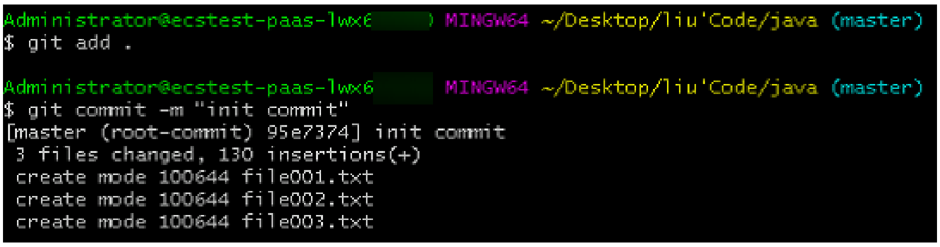
```
git fetch origin master  # Change origin to your repository alias.
```

Step 5 Commit local code files to the master branch.

Run the following commands:

```
git add .
git commit -m "<your_commit_message>"
```

The following figure shows a successful execution.



Step 6 Bind the local master branch to the master branch of CodeArts Repo repository.

```
git branch --set-upstream-to=origin/master master  # Change origin to your repository alias.
```

If the following information is displayed, the binding is successful.

Step 7 Merge the files in the CodeArts Repo repository and local repository and store them locally.

```
git pull --rebase origin master   # Change origin to your repository alias.
```

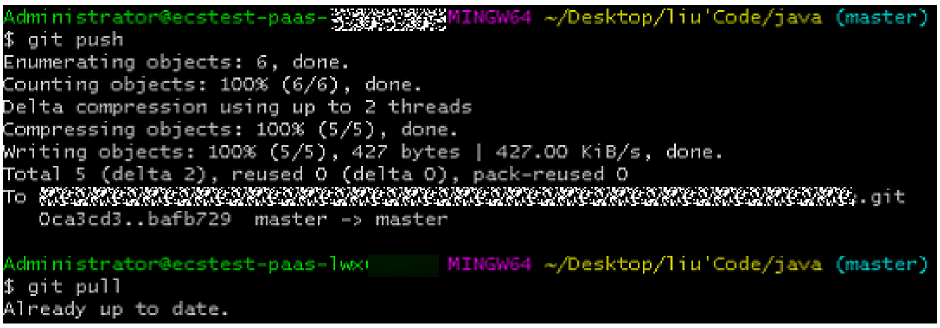
The following figure is displayed, indicating that the merged repository has been placed in the working directory and repository.

Step 8 Push the local repository to overwrite the CodeArts Repo repository.

Run the **push** command because the repositories have been bound:

```
git push
```

After the operation is successful, pull the repository to verify that the version of the CodeArts Repo repository is the same as that of the local repository.



----End

2.7 Cloning or Downloading Code from CodeArts Repo to a Local PC

2.7.1 Overview

In addition to **Managing Files**, the Git-based CodeArts Repo also allows you to download repository files to a local PC.

There are three methods of cloning or downloading a repository to a local PC for the first time:

- **Using SSH to Clone Code from CodeArts Repo to a Local PC**
- **Using HTTPS to Clone Code from CodeArts Repo to a Local Computer**
- **Downloading a Code Package on a Browser**

2.7.2 Using SSH to Clone Code from CodeArts Repo to a Local PC

Prerequisites

Your network can access CodeArts Repo. For details, see **Network Connectivity Verification**.

Cloning Code on the Git Bash Client Using SSH

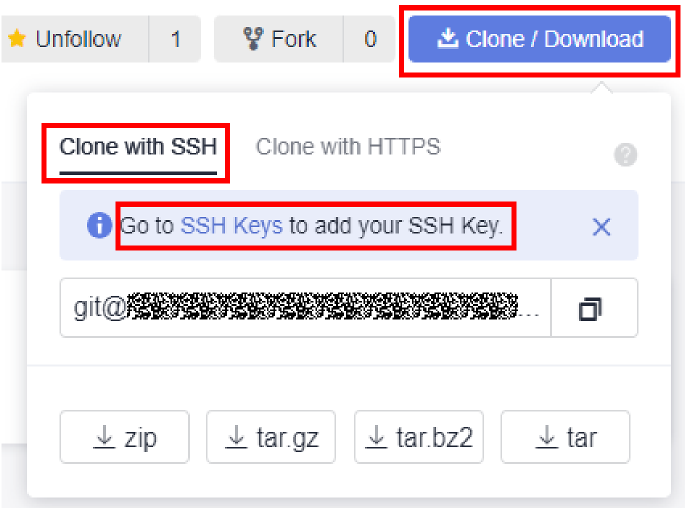
This section describes how to use the Git Bash client to clone a repository of CodeArts Repo to a local PC.

Step 1 **Download and install the Git Bash client**.

Step 2 **Configure an SSH key**.

Step 3 Obtain the repository address. (If there is no repository, **create one**.)

On the repository details page, click **Clone/Download** to obtain the SSH address. You can use this address to connect to CodeArts Repo from the local PC.



NOTE

If no SSH key is available, click **SSH Keys** to configure one. For details, see **SSH key**.

Step 4 Open the Git Bash client.

Create a folder on the local PC to store the code repository. Right-click the blank area in the folder and open the Git Bash client.

NOTE

The repository is automatically initialized during clone. You do not need to run the **init** command.

Step 5 Run the following command to clone code from CodeArts Repo:

```
git clone <repository_address>
```

repository_address in the command is the SSH address obtained in **Step 3**.

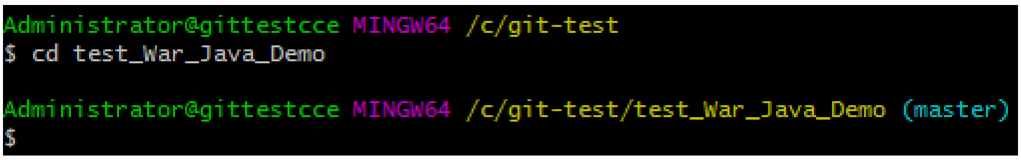
If you clone the repository for the first time, the system asks you whether to trust the remote repository. Enter **yes**.

After the command is executed, a folder with the same name as CodeArts Repo is displayed, and a hidden .git folder exists in the folder, indicating that the repository is cloned.

Step 6 Run the following command to go to the repository directory:

```
cd <repository_name>
```

You will be taken to the **master** branch by default.



----End

NOTE

If the **git clone** command fails to be executed, locate the fault as follows:

- Check whether your network can access CodeArts Repo.

  Run the following command on the Git client to test the network connectivity:

  ```
  ssh -vT git@**********.com
  ```

  If the returned information contains **Could not resolve hostname code**********.com: Name or service not known** as shown in the following figure, your network is restricted and you cannot access CodeArts Repo. In this case, contact your local network administrator.
- Check the SSH key. If necessary, **regenerate a key and configure it on the CodeArts Repo console**.
- Only PCs that **enabled the IP address whitelist** can be cloned on the Git client.

Cloning Code on the TortoiseGit Client Using SSH

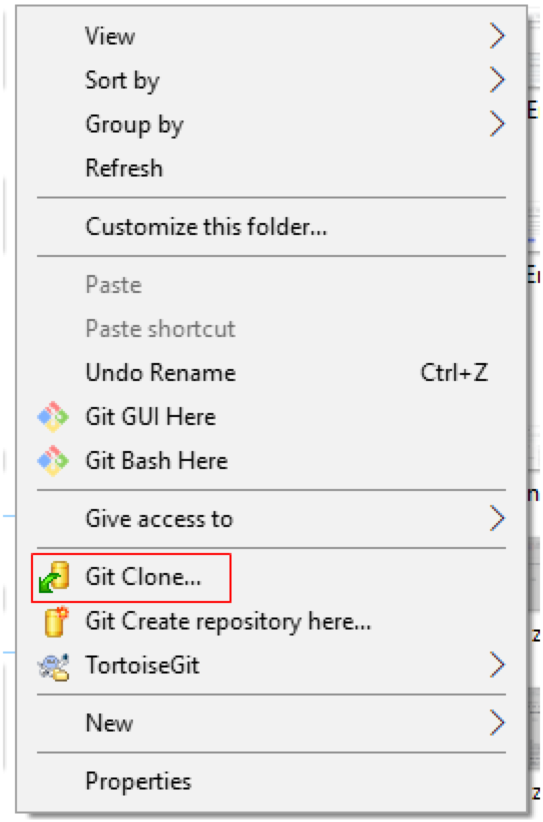
This section describes how to use the TortoiseGit client to clone a repository of CodeArts Repo to a local PC.

Step 1 **Download and install the TortoiseGit client**.

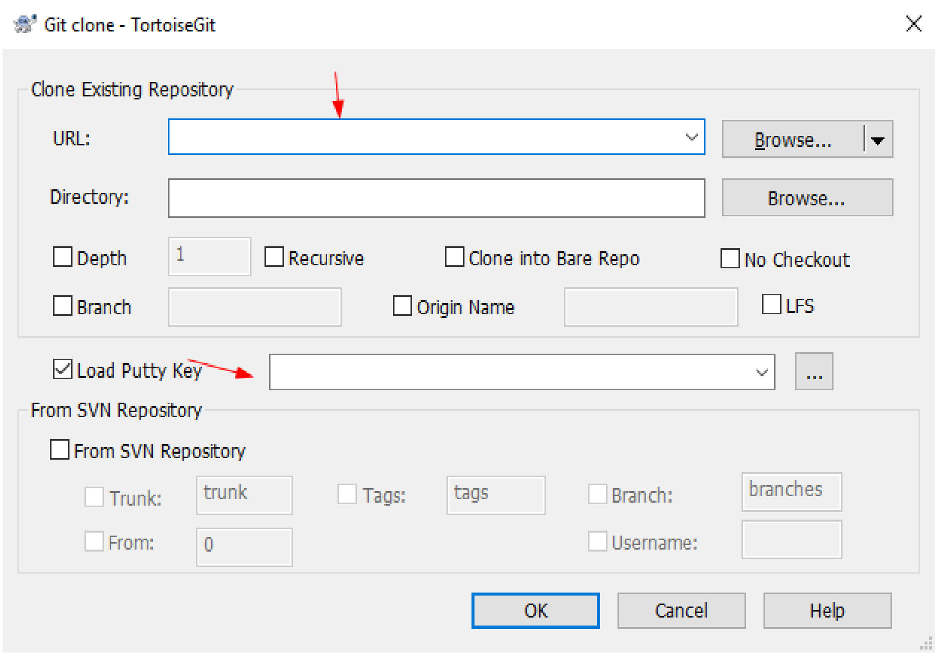
Step 2 Obtain the repository address. (If there is no repository, **create one**.)

On the repository details page, click **Clone/Download** to obtain the SSH address. You can use this address to connect to CodeArts Repo from the local PC.

Step 3 Go to the local directory where you want to clone the repository, and choose **Git Clone...** from the right-click menu.

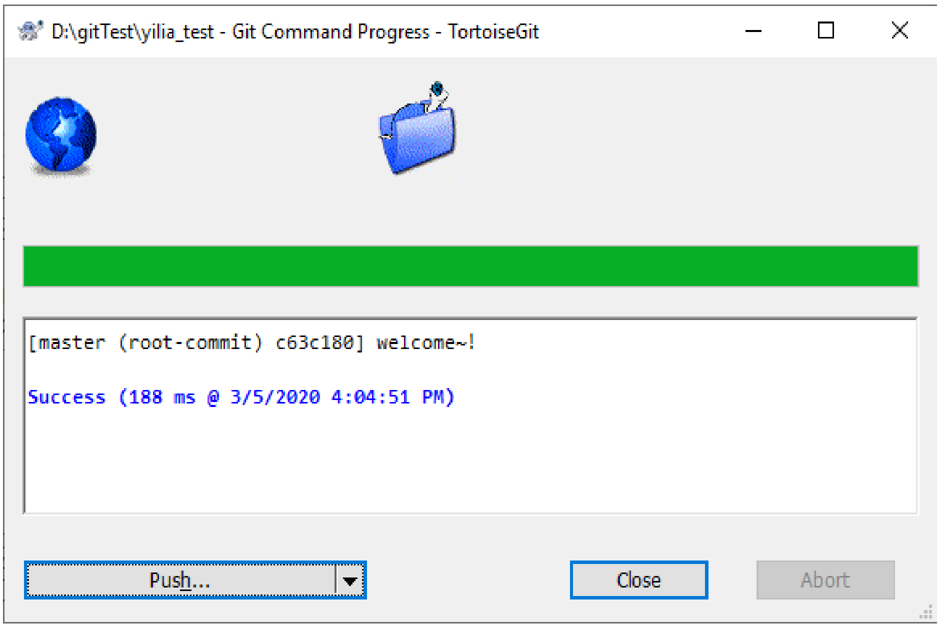


Step 4 In the dialog box displayed, paste the copied repository address to the **URL** field, select **Load Putty Key**, choose the **private key** file, and click **OK**.



Step 5 Click **OK** to start cloning the repository. If you clone the repository for the first time, the TortoiseGit client asks you whether to trust the remote repository. Click **Yes**.

Step 6 The cloning duration is affected by the repository size. The following figure shows the cloning process.



----End

Cloning a Repository on Linux or macOS Using SSH

After the environment is configured (see **Installing Git for Linux** or **Installing Git for macOS**), the clone operations of the Git client on Linux or macOS are the same as those in **Cloning Code on the Git Bash Client Using SSH**.

2.7.3 Using HTTPS to Clone Code from CodeArts Repo to a Local Computer

Cloning Code on the Git Bash Client Using HTTPS

This section describes how to use the Git Bash client to clone a repository of CodeArts Repo to a local PC.

NOTICE

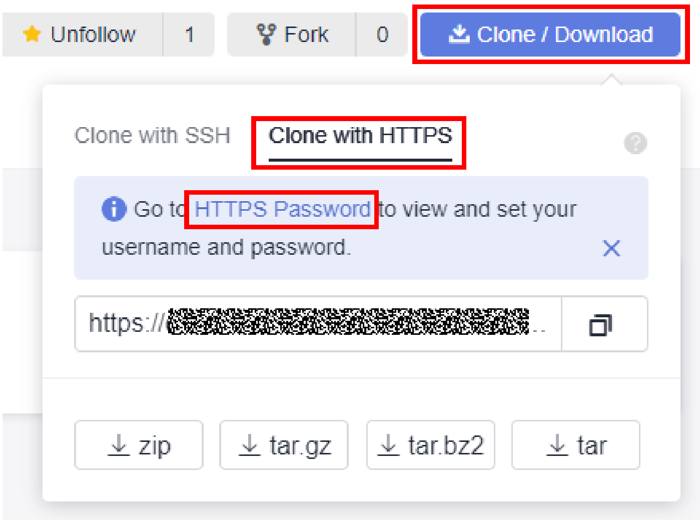
The maximum size of a package that can be pushed at a time using HTTPS is 200 MB. If the size is greater than 200 MB, use the SSH mode.

Federated users cannot be bound to email addresses and do not support the HTTPS protocol.

Step 1 **Download and install the Git Bash client**.

Step 2 Configure an HTTPS password.

Step 3 On the CodeArts Repo homepage, click the name of a repository. On the repository details page displayed, click **Clone/Download**, click **Clone with HTTPS**, and copy the repository address.



NOTE

If no HTTPS password is available, click **HTTPS Password** to configure one. For details, see **HTTPS Password**.

Step 4 Open Git Bash, navigate to the directory where you want to clone the repository, and run the following command. For the first clone, enter the username (account name) and HTTPS password.

```
git clone HTTP_download_address
```

Step 5 After the username (account name) and HTTPS password are entered, the repository is cloned.

Step 6 Run the following command to go to the repository directory:

```
cd <repository_name>
```

You will be taken to the **master** branch by default.

----End

NOTE

If the git clone command fails to be executed, locate the fault as follows:

- Check whether your network can access CodeArts Repo.

  Run the following command on the Git client to test the network connectivity:

  ```
  ssh -vT git@**********.com
  ```

  If the returned information contains **Could not resolve hostname code**********.com: Name or service not known** as shown in the following figure, your network is restricted and you cannot access CodeArts Repo. In this case, contact your local network administrator.
- Check the HTTPS password and **reset the password** if necessary.
- Only PCs that **enabled the IP address whitelist** can be cloned on the Git client.

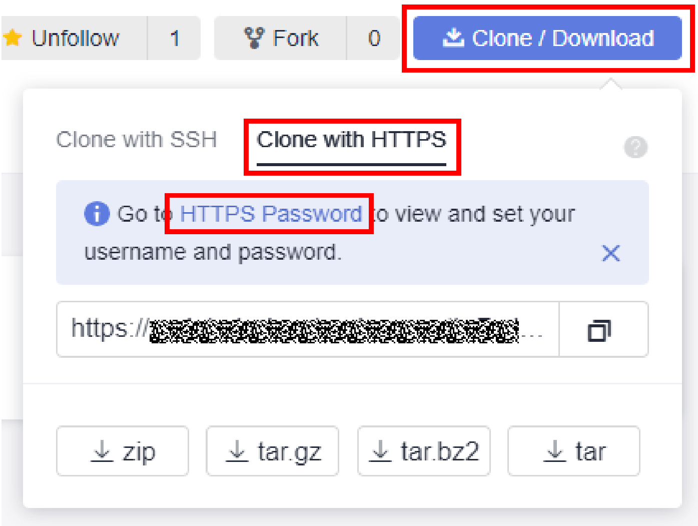
Cloning Code on the TortoiseGit Client Using HTTPS

This section describes how to use the TortoiseGit client to clone a repository of CodeArts Repo to a local PC.

Step 1 **Download and install the TortoiseGit client**.

Step 2 **Configure an HTTPS password**.

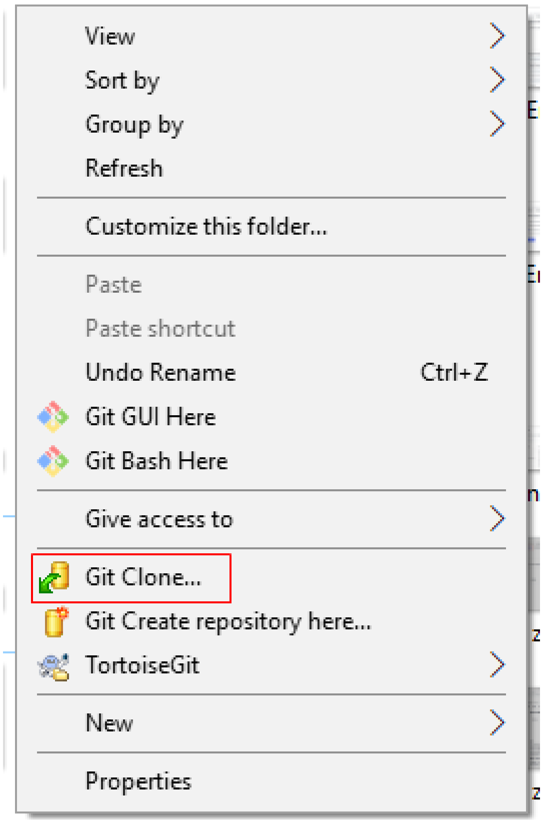
Step 3 On the CodeArts Repo homepage, click the name of a repository. On the repository details page displayed, click **Clone/Download**, click **Clone with HTTPS**, and copy the repository address.



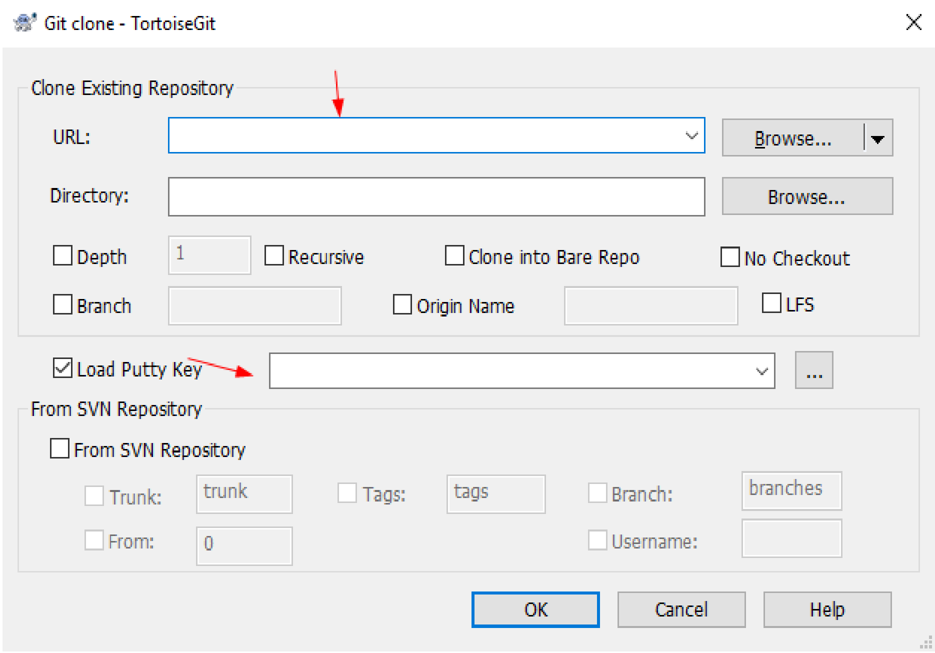
NOTE

If no HTTPS password is available, click **HTTPS Password** to configure one. For details, see **HTTPS Password**.

Step 4 Go to the directory where you want to clone the repository, and choose **Git Clone...** from the right-click menu.



Step 5 In the dialog box displayed, paste the copied repository address to the **URL** field and click **OK**.



Step 6 If you clone a repository on TortoiseGit for the first time, enter the username and HTTPS password as prompted.

Step 7 Wait until the clone is complete.

----End

Cloning a Repository on Linux or macOS Using HTTPS

After the environment is configured (see **Installing Git for Linux** or **Installing Git for macOS**), the clone operations of the Git client on Linux or macOS are the same as those in **Cloning Code on the Git Bash Client Using HTTPS**.

2.7.4 Downloading a Code Package on a Browser

In addition to clone, CodeArts Repo also allows you to package and download the code of a cloud repository to the local PC.

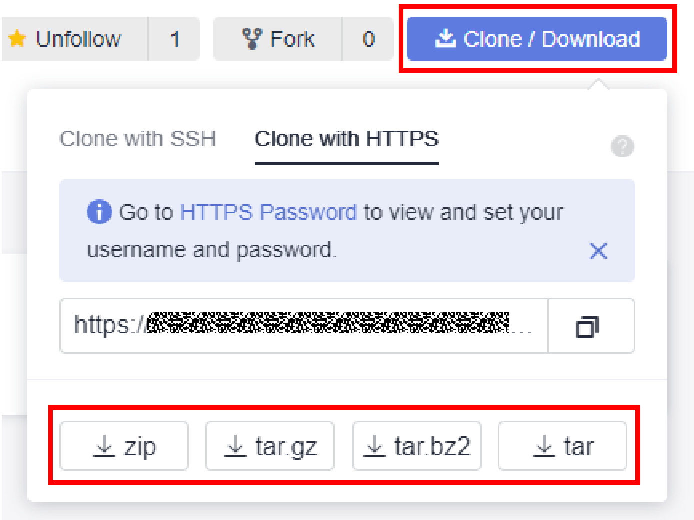
The downloaded code repository file is not associated with CodeArts Repo and cannot be pushed back to CodeArts Repo.

The procedure is as follows:

Step 1 Access the repository list page.

Step 2 Go to your repository. (If there is no repository, **create one**.)

Step 3 Click **Clone/Download**. In the dialog box that is displayed, click the required code package format.



----End

NOTE

- If an **IP address whitelist** is set for the repository, only hosts with whitelisted IP addresses can download the repository source code on the page. If no IP address whitelist is set for the repository, all hosts can download the repository source code.
- Currently, the zip, tar.gz, tar.bz2, and tar package formats are supported.
- The master branch of CodeArts Repo will be downloaded.

2.8 Using CodeArts Repo

2.8.1 Viewing the Repository List

The repository list is the entry to CodeArts Repo. You can access the repository list in either of the following ways:

- On the CodeArts homepage, click **Repo** under the 

icon. The repository list page is displayed.

  NOTE

  All code repositories of the **tenant** are displayed.

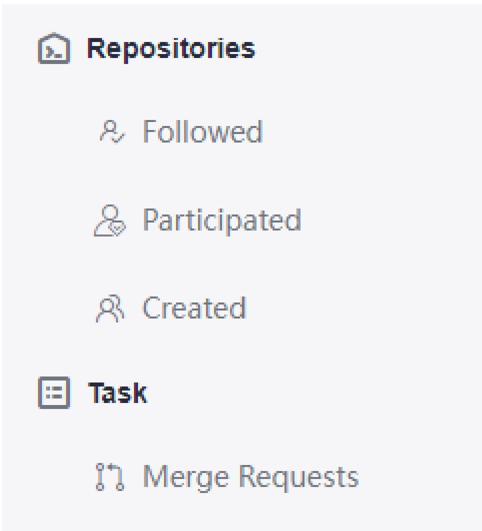
- On the CodeArts homepage, move the cursor to the card of the target project, and click **Code**. The repository list page is displayed.

  NOTE

  All code repositories of the **project** are displayed.

You can create a repository, configure a repository, and obtain the repository address.

- On your homepage, you can view repositories by category, such as **Followed**, **Participated**, and **Created**. You can click the name of a target repository to access the repository. You can view the combination requests of **Created by me, Merge pending**, **Review pending**, and **Approve pending**. You can click the name of a target merge request to access the combination request.



  NOTE

  If you access a project of CodeArts Repo, this function is hidden.

- You can **create a repository** by **New Repository**, **Template Repository** or **Import Repository**.
- Filter a Repository: You can select **All repositories**, **Unlocked repositories**, or **Locked repositories**. For details about how to lock a repository, see **Repository Locking**.
- You can **automatically synchronize project members to a Repository**.
- Click ☆ to follow a repository. After a repository is being followed, it is displayed on the top of the repository list.

- **Associated work Items** with CodeArts Req to improve efficiency.
- **Manage members** by synchronizing members from a project with one click or adjust the permission of a member separately.
- Delete a repository by entering a repository name.

NOTE

This operation cannot be canceled and deleted repositories cannot be restored. Please double-check.

2.8.2 Viewing Repository Details

In the repository list, click a repository name to go to the repository details page. CodeArts Repo provides abundant console operations.

Table 2-4 Description

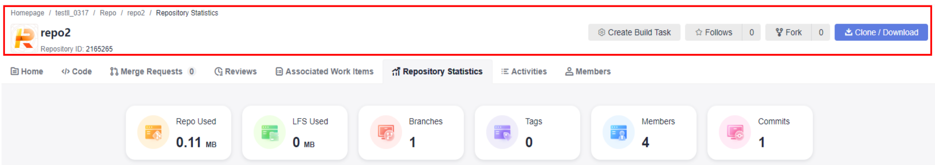
Page	Function Description
Repository Homepage	Displays the repository capacity, commits number , branches number , tags number , members number, LFS usage, creation time, creator, visible scope, repository status, README file, language, and percentage of each language.
Code	• File list: You can create files, directories, and submodules, upload files, modify files online, and view commit history. • Submit: You can view commit records and repository network diagrams. • Branch: Branches can be managed on the console. • Tag: Tags can be managed on the console. • Comparison: You can view code changes between branches or between tag versions by comparison.
Merge Requests	Merge requests of branches can be managed on the console.
Reviews	You can view the review records of MRs and commits.
Associated Work Items	List of associated work items. You can associate CodeArts Req work items with the repository code to improve efficiency.
Repository Statistics	Visualized charts of repository commits, such as code contribution.
Activity	You can view the dynamic information about the repository.
Members	You can manage repository members, for example, synchronizing members from the project by one click or changing the permissions of a member.
Settings	Repository settings. Only the repository administrator and the repository creator can view this tab page and configure settings.

In addition, the repository details page provides quick entries to the following functions:

- Configure builds: Create a build task.
- Follow: Click to follow the repository. The followed repositories are pinned on top.
- Fork: displays the number of forks of a repository. You can click this button to create a fork.
- Clone/Download: You can obtain the SSH address and HTTPS address of a repository or directly download the code package.

NOTE

The following figures show the **adaptation** function of CodeArts Repo. When the length of the repository page is greater than the window length, the repository tab page is moved to the top after you scroll down. The position in the red box in the following figure is collapsed so you can view repository information easily. After you scroll up, the page layout is restored.



2.8.3 Viewing Repository Homepage

The **Home** tab page displays the basic information about a repository.

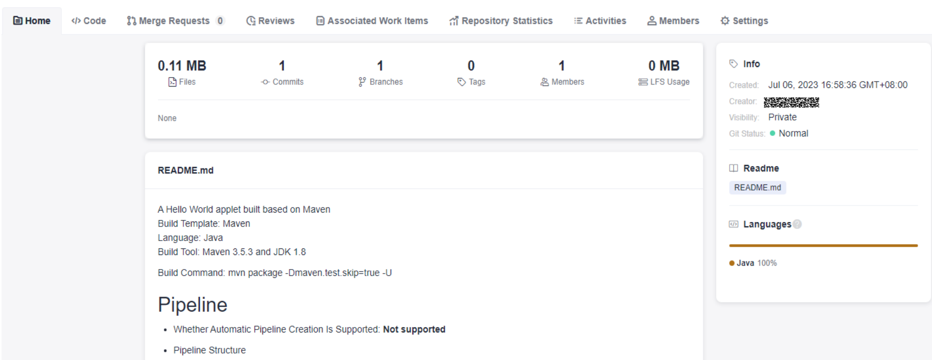
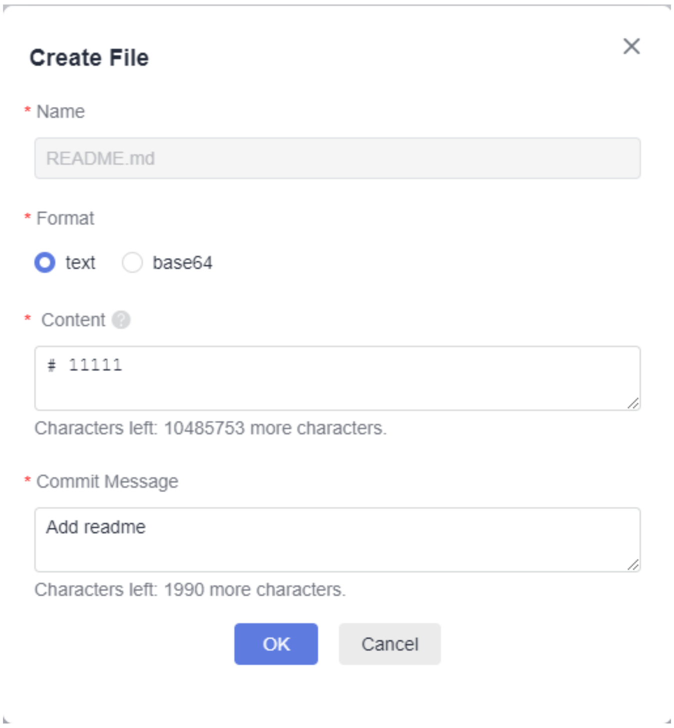


Table 2-5 Parameter description

Parameter	Description
Files	Capacity of the current repository **NOTE** • The capacity of a single repository cannot exceed 2 GB (including LFS usage). If the capacity exceeds 2 GB, the repository cannot be used properly and cannot be expanded. • When the capacity of a repository exceeds the upper limit, the repository is frozen. In this case, you are advised to delete the repository, control the capacity locally, and push the repository again.

Parameter	Description
Commits	Displays the number of commits in the current repository. You can click the icon to go to the **Code** tab page and view commit details.
Branches	Displays the number of branches in the current repository. You can click the icon to go to the **Code** tab page and manage branches.
Tags	Displays the number of tags in the current repository. You can click the icon to go to the **Code** tab page and manage tags.
Members	Displays the number of members in the current repository. You can click the icon to go to the **Members** tab page and manage members.
LFS Usage	Collect statistics on the LFS usage of the current repository.
Repository description	The description entered during repository creation.

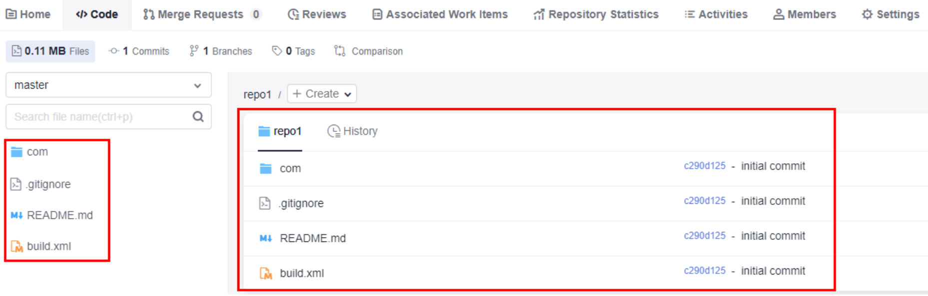
Parameter	Description
README.md	You can preview README files. If no Readme file exists in the repository, click **Create Readme** to create one. **Name**: The default file name is **README.md**. **Format**: The options are as follows: ● **text**: indicates text data or a text string. ● **base64**: Base64 is a method of representing binary data based on 64 printable characters. **Content**: The value can be customized. ● If the format is **text**, enter common text. ● If the format is **base64**, enter Base64-encoded content that can pass the encoding verification. **Commit Message**: Enter the commit information about the file or folder, which can be customized. 
Info	Displays the creation time, creator, visible scope, and status of a repository.
Readme	Displays the README file of the current repository. You can click the file name to go to the **Code** tab page and view the file content.
Languages	Displays the percentage of each language by file size in the current repository.

2.8.4 Managing Code Files

2.8.4.1 Managing Files

CodeArts Repo allows you to edit and compare files, and trace file changes.

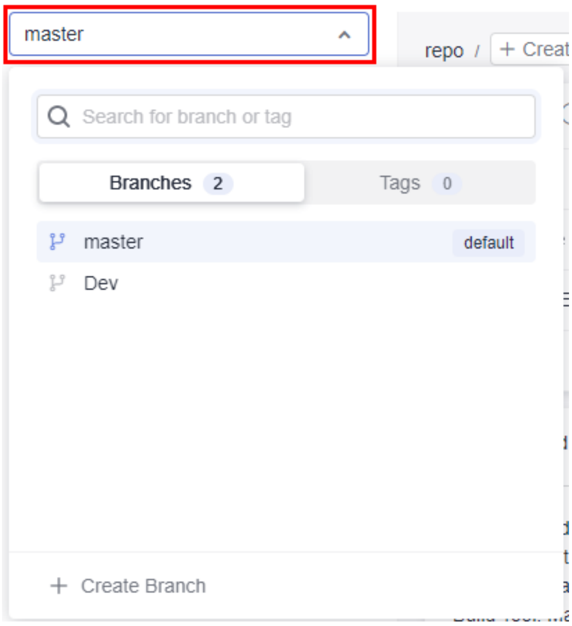
When you access **repository details console**, the system locates the **Files** subtab on the **Code** tab page. You can switch to different branches and tags to view the files in the corresponding version. As shown in the following figure, the file list under the main branch is displayed on the left, the **Repository name (file details of a branch or tag version)** and **History (branch or tag version)** tab pages are displayed on the right.



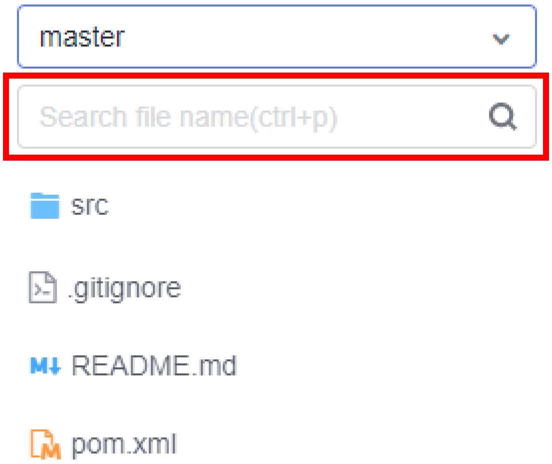
File List

The file list is on the left of the **Files** tab page of the repository. The file list provides the following functions:

1. Click a branch name to switch the branch and tag. After the branch and tag are switched, the file directory of the corresponding version is displayed.



2. Click to display the search box. You can search for files in the file list.



3. Click 

. The following functions can be extended:
   - **Creating a file**

     Creating a file on the CodeArts Repo console is to create a file and run the **add**, **commit**, and **push** commands. A commit record is generated.

     On the **Create File** page, enter the file name, select the target template type, select the encoding type, enter the file content and commit information, and click **OK**.

     NOTE

     The **Commit Message** field is equivalent to the **-m** message in git commit and can be used for **Viewing Associated Work Items**.

   - **Creating a directory**

     Creating a directory on the CodeArts Repo console is to create a folder structure, and run the **add**, **commit**, and **push** commands. A commit record is generated.

     A .gitkeep file is created at the bottom of the directory by default because Git does not allow a commit of an empty folder.

     On the **Create Directory** page, enter the catalog name and commit information, and click **OK**.

   - **Creating a submodule**
   - **Uploading a file**

     Uploading a file on the CodeArts Repo console is to create a file and run the **add**, **commit**, and **push** commands. A commit record is generated.

     On the **Upload File** page, select the target file to be uploaded, enter the commit information, and click **OK**.

   NOTE

   Move the cursor to the folder name and click  to perform the preceding operations in the folder.

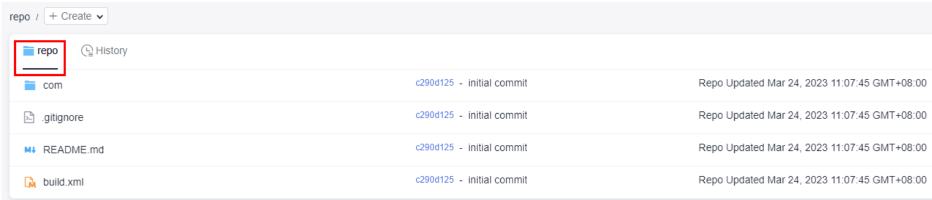
4. Move the cursor to the file name and click  to change the file name.

   Renaming a file on the CodeArts Repo console is to change a file name, and run the **add**, **commit**, and **push** commands. A commit record is generated.

5. You can click a file name to display the file content on the right of the page. You can modify the file content, trace file modification records, view historical records, and compare the file content.

Repository Name Tab Page: Viewing File Details of a Branch or Tag Version

By default, the **repository name** tab page displays file details of the master branch.



It displays the following information:

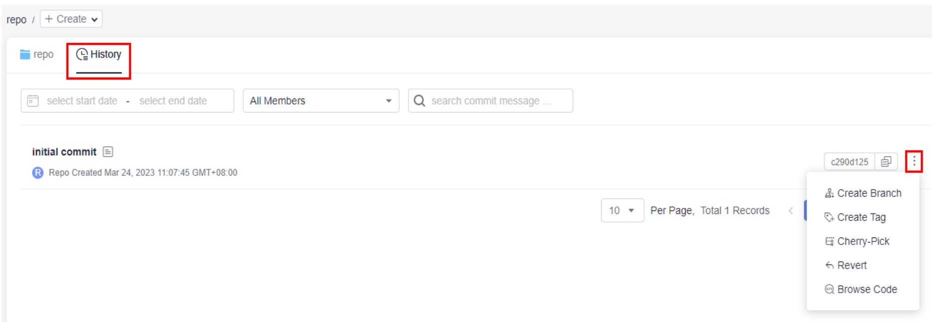
- *File*: name of a file or folder.
- *Commit message*: message of the last commit to the file or folder (**-m** in the **commit** command). You can click the message to display the commit record.
- *Creator*: creator of the last commit to the file or folder.
- *Update time*: last update time of the file or folder.

NOTE

Commit messages are required for the edit and delete operations. They are similar to **-m** in the **git commit** command and can be used for associating work items. For details, see **Viewing Associated Work Items**.

History Tab: Viewing the Commit History of a Branch or Tag Version

The **History** tab page displays the commit history of a branch or tag version.



On this page, you can perform the following operations on the commit history:

- Click a **commit name** to go to the commit details page.
- Click ⋮ to extend the following functions:
  - **Create Branch**.
  - **Create Tag**: You can create a tag for this commit. For details, see **What is a tag**.
  - **Cherry-Pick**: Use the commit as the latest commit to overwrite a branch. It is used to retrieve a version.

– **Revert**: undoing this commit
– **Browse Code**.

Managing Repository Files

You can click a file name to manage the file. The functions are as follows:

NOTE

When you maximize the browser window, the functions in the drop-down menu shown in the preceding figure are displayed in tile mode.

- *File name*: View the detailed content of the file.

Table 2-6 Screen description

Screen Function	Function Description
File Capacity	Indicates the capacity of the file.
Full Screen	Full screen to view the file content
Copy Code	Copy the file content to the clipboard.
Open Raw	You can view the original data of the file.
Edit	Edit the file online.
Download	Download the file to the local PC.
Delete	Delete a file
File content	The email content is displayed.
	Click this icon to add review comments.

- **Blame**: View the change history of a file and trace operations.
  On this tab page, a modifier corresponds to their modified content. You can a record to view the commit details.
- **History**: View the commit history of the file.
  On this page, you can perform the following operations on the commit history:
  – Click a **commit name** to go to the commit details page.
  – ⋮ provides the following functions:

- Create Branch.
- **Create Tag**: You can create a tag for this commit. (**Introduction**)
- **Cherry-Pick**: Use the commit as the latest commit to overwrite a branch. It is used to retrieve a version.
- **Revert**: undoing this commit
- **Browse Code**.

- **Comparison**: compares the committed differences.

  The differences compared on the CodeArts Repo console are displayed in a better way than those on the Git Bash client. You can select different commit batches on the GUI for difference comparison.

  NOTE

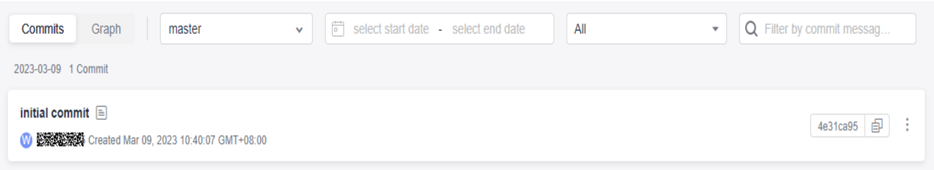
  The comparison result shows the impact of merging from the left repository version to the right repository version on the files in the right repository. If you want to know the differences between the two file versions, you can adjust the left and right positions, compare them again, and learn all the differences based on the two results.

2.8.4.2 Managing Commits

On the **Code** and **Commits** tab pages, view the commit records and graph of the repository.

Commits

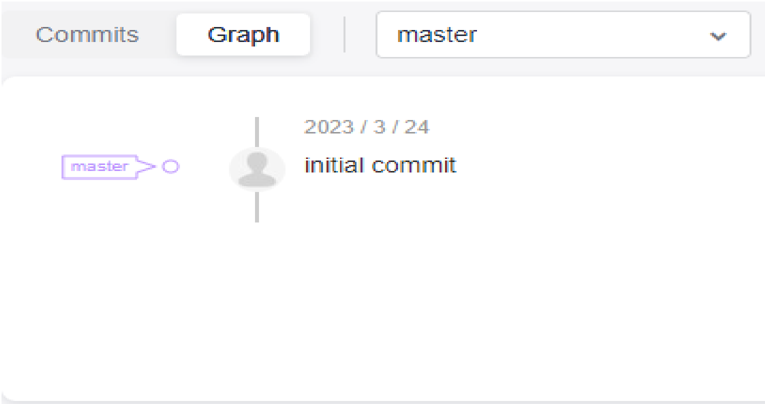
This tab displays the entire commit records of a branch or tag in the current repository. You can filter records by time segment, committer, commit message, or commit ID.



Graph

The commit graph of a repository displays the entire commit history (including the action, time, committer, commit message generated by the system or specified by the committer) of a branch or tag and the relationship between commits in flow chart.

You can switch between branches or tags. You can click a commit node or commit message to go to the corresponding commit record.



NOTE

Compared with the **History** tab page under the **Files** tab page, the commit graph can display the relationship between commits.

2.8.4.3 Managing Branches

Branching is the most commonly used method in version management. Branches isolate tasks in a project to prevent them from affecting each other, and can be **merged** for version release.

When you create a CodeArts Repo or Git repository, a master branch is generated by default and used as the branch of the latest version. You can create custom branches at any time for personalized scenarios.

GitFlow

As a branch-based code management workflow, **GitFlow** is highly recognized and widely used in the industry. It is recommended for you to start team-based development.

GitFlow provides a group of branch usage suggestions to help your team improve efficiency and reduce conflicts. It has the following features:

- **Concurrent development:** Multiple features and patches can be concurrently developed on different branches to prevent intervention during code writing.
- **Team collaboration:** In team-based development, the development content of each branch (or each sub-team) can be recorded separately and merged into the project version. An issue can be accurately detected and rectified separately without affecting other code in the main version.
- **Flexible adjustment**: Emergency fixes are developed on the hotfix branch without interrupting the main version and sub-projects of each team.

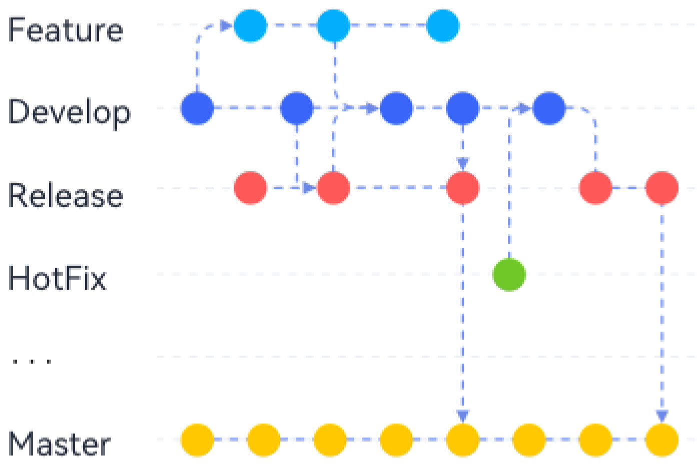


Table 2-7 Suggestions on using GitFlow branches

Branch	Master	Develop	Feature_1\2...	Release	HotFix_1\2...
Description	Core branch, which is used together with **tags** to archive historical versions. Ensure that all versions are available.	Main development branch, which is used for routine development and must always be the branch with the latest and most complete functions.	Feature development branch, which is used to develop new features. Multiple branches can exist concurrently. Each branch corresponds to a new feature or a group of new features.	Release branch, which is used to check out a version to be released.	Emergency fix branch, which is used to fix bugs in the current version.
Validity	Long-term	Long-term	Temporary	Long-term	Temporary

Branch	Master	Develop	Feature_1\2...	Release	HotFix_1\2...
When to Create	Created when the project repository is created	Created after the master branch is created.	• Created based on the develop branch when a new feature development task is received. • Created based on the parent feature branch when the current feature development task is split into sub-tasks.	Created based on the develop branch before the first release.	Created based on the corresponding version (usually the master branch) when issues are found in the master or bug version.
When to Develop This Branch	Never	Not recommended	Developed when being created.	Never	Developed when being created.

Branch	Master	Develop	Feature_1\2...	Release	HotFix_1\2...
When to Merge Other Branches into This Branch	• When the project version is frozen, the develop or release branch are merged into this branch. • After bugs found in the released version are fixed, hotfix branches are merged into this branch.	• After new features are developed, feature branches are merged into this branch. • When a new version starts to be developed, the last version (release or master branch) is merged into this branch.	After a child feature branch is developed and tested, it is merged into the parent feature branch.	When a version is to be released, the develop branch is merged into this branch.	-

Branch	Master	Develop	Feature_1\2...	Release	HotFix_1\2...
When to Merge This Branch to Other Branches	-	● When a version is to be released, this branch is merged into the release branch. ● When a version is to be archived, this branch is merged into the master branch.	After new features are developed and tested on this branch, it is merged into the develop branch.	● When a version is released and archived, this branch is merged into the master branch. ● When a new version is developed based on a released version, this branch is merged into the develop branch to initialize the version.	When the corresponding bug fixing task is complete, this branch is merged into the master and develop branches as a patch.
When to End	-	-	After the corresponding features are accepted (released and stable)	-	After the corresponding bugs are fixed and the version is accepted (released and stable)

NOTE

GitFlow has the following rules:

- All feature branches are pulled from the develop branch.
- All hotfix branches are pulled from the master branch.
- All commits to the master branch must have tags to facilitate rollback.
- Any changes that are merged into the master branch must be merged into the develop branch for synchronization.
- The master and develop branches are the main branches and they are unique. Other types of branches can have multiple derived branches.

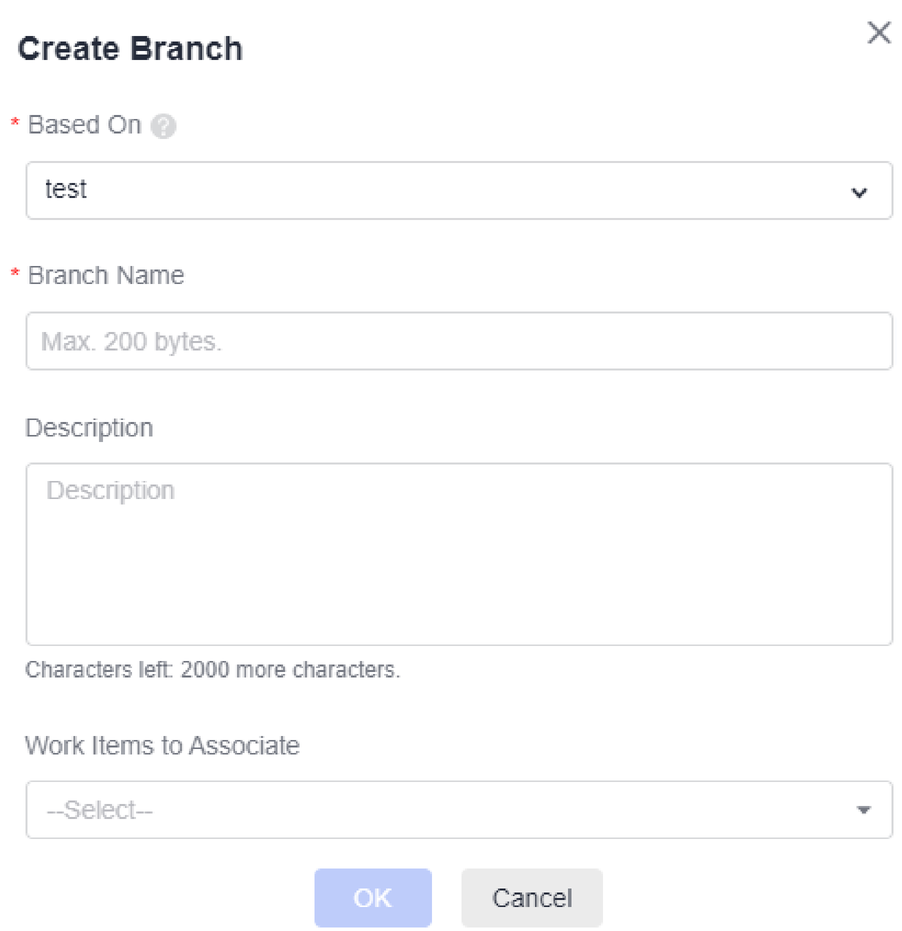
Creating a Branch on the Console

Step 1 Access the repository list.

Step 2 Click a repository to go to the details page.

Step 3 Click the **Code** and **Branches** tabs. The branch list page is displayed.

Step 4 Click **Create**. In the displayed dialog box, select a version (branch or tag) based on which you want to create a branch and enter the branch name. You can associate the branch with an existing work item.



Step 5 Click **OK**. The branch is created.

----End

Managing Branches on the Console

You can perform the following operations in the branch list:

- Filtering branches
  - **My**: displays all branches created by you. The branches are sorted by the latest commit time in descending order.
  - **Active**: displays the branches that have been developing in the past three months. Branches are sorted by the last commit time in descending order.
  - **Inactive**: displays the branches that have not been developed in the past three months. Branches are sorted by the last commit time in descending order.
  - **All**: displays all branches. The default branch is displayed on the top. Other branches are sorted by the last commit time in descending order.
- You can click a **branch name** to go to the **Files** tab page of the branch and view its content and history.
- You can click a commit ID to view the content latest committed on the details page.
- Select branches and click **Batch Delete** to delete branches in batches.
- You can click to associate work items with the branch.
- You can click to go to the **Comparison** tab page and compare the current branch with another branch.
- Click to download its compressed package.
- You can click to the **Merge Requests** tab page and create a **merge request**.
- Click to go to the repository settings page and set the branch as protected.
- You can click to delete a branch as prompted.

NOTICE

You can download the compressed package of source code on the page only for hosts that have **configured IP address whitelists**.

If you delete a branch by mistake, submit a service ticket to contact technical support.

In addition, you can configure branches on the console.

- **Merge Requests**
- **Default Branches**
- **Protected Branches**

Common Git Commands for Branches

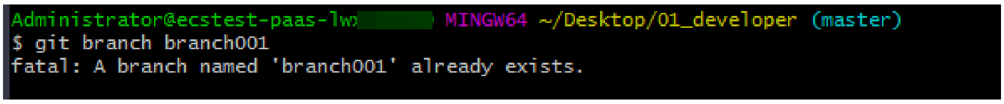
- **Creating a branch**

```
git branch <branch_name>        # Create a branch based on the current working directory in the local repository.
```

Example:

```
git branch branch001          # Create a branch named branch001 based on the current working directory in the local repository.
```

If no command output is displayed, the creation is successful. If the branch name already exists, as shown in the following figure, create a branch with another name.



- **Switching a branch**

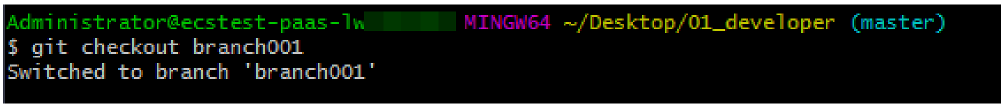
Switching a branch is to check out the branch file content to the current working directory.

```
git checkout <branch_name>       # Switch to a specified branch.
```

Example:

```
git checkout  branch002        # Switch to branch002.
```

The following information shows that the switch is successful.



- **Switching to a new branch**

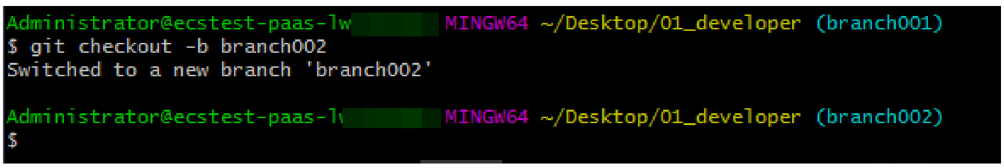
You can run the following command to create a branch and switch to the new branch directly.

```
git checkout -b <branch_name>     # Create a branch based on the current working directory in the local repository and directly switch to the branch.
```

Example:

```
git checkout -b branch002      # Create a branch named branch002 based on the current working directory in the local repository and directly switch to the branch.
```

The following information shows that the command is successfully executed.



- **Viewing a branch**

You can run the corresponding command to view the local repository branch, the remote repository branch, or all branches. These commands only list branch names. You can **switch to a branch** to view specific files in a branch.

```
git branch                    # View the local repository branch.
git branch -r                 # View the remote repository branch.
git branch -a                 # View the branches of the local and remote repositories.
```

The following figure shows the execution result of the three commands in sequence. Git displays the branches of the local and remote repositories in different formats. (Remote repository branches are displayed in the format of remote/*<remote_repository_alias>*/*<branch_name>*.)

```
Administrator@ecstest-paas-lw[redacted] MINGW64 ~/Desktop/01_developer (branch002)
$ git branch
  branch001
* branch002
  https1
  https2
  master
  no996

Administrator@ecstest-paas-lw[redacted] MINGW64 ~/Desktop/01_developer (branch002)
$ git branch -r
  HTTPSOrigin/branch001
  HTTPSOrigin/branch002
  HTTPSOrigin/branch007
  HTTPSOrigin/master

Administrator@ecstest-paas-lw[redacted] MINGW64 ~/Desktop/01_developer (branch002)
$ git branch -a
  branch001
* branch002
  https1
  https2
  master
  no996
  remotes/HTTPSOrigin/branch001
  remotes/HTTPSOrigin/branch002
  remotes/HTTPSOrigin/branch007
  remotes/HTTPSOrigin/master
```

- **Merging a branch**

  When a development task on a branch is complete, the branch needs to be merged into another branch to synchronize the latest changes.

  git merge *<name_of_the_branch_merged_to_the_current_branch>* # Merge a branch into the current branch.

  Before merging a branch, you need to switch to the target branch. The following describes how to merge **branch002** into the master branch.

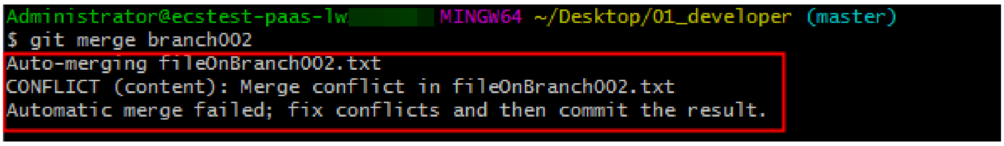
  git checkout master # Switch to the master branch.
  git merge branch002 # Merge **branch002** into the master branch.

  The following figure shows the execution result of the preceding command. The merge is successful, and three lines are added to a file.

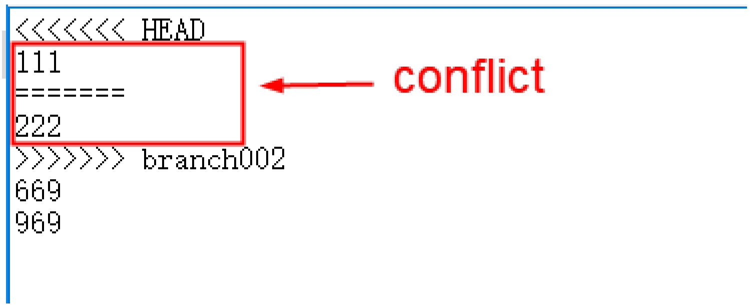
```
Administrator@ecstest-paas-lw[redacted] MINGW64 ~/Desktop/01_developer (branch001)
$ git checkout master
Switched to branch 'master'
Your branch is up to date with 'HTTPSOrigin/master'.

Administrator@ecstest-paas-lw[redacted] MINGW64 ~/Desktop/01_developer (master)
$ git merge branch002
Updating 6b40550..09fd1d4
Fast-forward
 fileOnBranch002.txt | 3 +++
 1 file changed, 3 insertions(+)
 create mode 100644 fileOnBranch002.txt
```

NOTE

The system may prompt that a merge conflict occurs. The following shows that a conflict occurs in the **fileOnBranch002.txt** file.



To resolve the conflict, open the conflicting file, manually edit the conflicting code (as shown in the following figure), and save the file. Then run the **add** and **commit** commands again to save the result to the local repository.



This is similar to resolving a conflict that occurs when you commit a file from the local repository to the remote repository. For details about the working principle, see **Resolving Code Conflicts in an MR**.

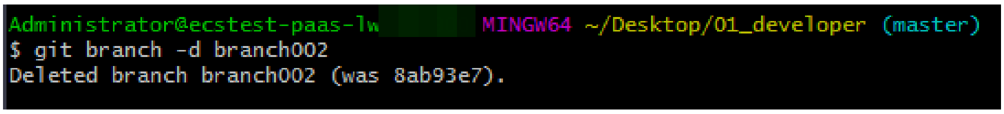
A proper collaboration mode can prevent conflicts.

- **Deleting a local branch**

  git branch -d *<branch_name>*

  Example:

  git branch -d branch002 # Delete **branch002** from the local repository. The following information shows that the operation is successful.



- **Deleting a branch from the remote repository**

  git push *<remote_repository_address_or_alias>* -d *<branch_name>*

  Example:

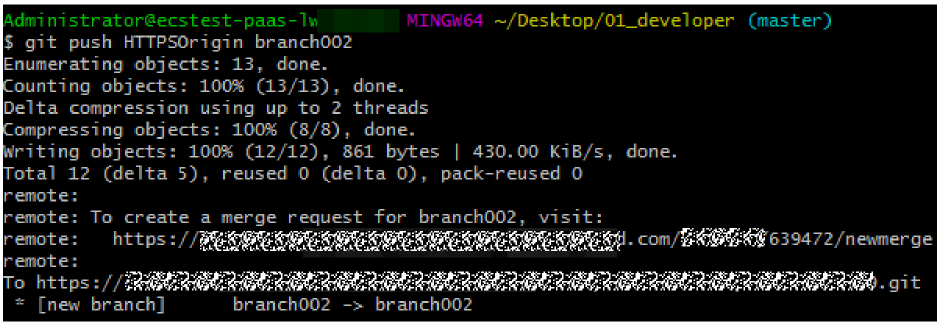
  git push HTTPSOrigin -d branch002 # Delete **branch002** from the remote repository whose alias is **HTTPSOrigin**. The following information shows that the deletion is successful.

- **Pushing a new local branch to the remote repository**

  git push *<remote_repository_address_or_alias>* *<branch_name>*

  Example:

  git push HTTPSOrigin branch002 # Push the local branch **branch002** to the remote repository whose alias is **HTTPSOrigin**. The following information shows that the push is successful.



📖 **NOTE**

If the push fails, check the connectivity.

- Check whether your network can access CodeArts Repo.

  Run the following command on the Git client to test the network connectivity:

  ```
  ssh -vT git@********.com
  ```

  If the returned information contains **connect to host **********.com port 22: Connection timed out**, your network is restricted and you cannot access CodeArts Repo. In this case, contact your local network administrator.

- Check the SSH key. If necessary, regenerate a key and configure it on the CodeArts Repo console. For details, see **SSH Keys**. Alternatively, check **whether the HTTPS password** is correctly configured.

2.8.4.4 Managing Tags

Git provides **tags** to help your team manage versions. You can use Git tags to mark commits to manage important versions in a project and search for historical versions.

A tag points to a commit like a reference. No matter how later versions change, the tag always points to the commit. It can be regarded as a version snapshot that is permanently saved (the version is removed from the repository only when being manually deleted).

When using Git to manage code, you can search for and trace historical versions based on commit IDs. A commit ID is a long string (as shown in the following figure) that is difficult to remember and not identifiable, compared with version numbers such as **V 1.0.0**. Therefore, you can tag and name important versions to easily remember and trace them. For example, tag a version as **myTag_V1.0.0** or **FirstCommercialVersion**.

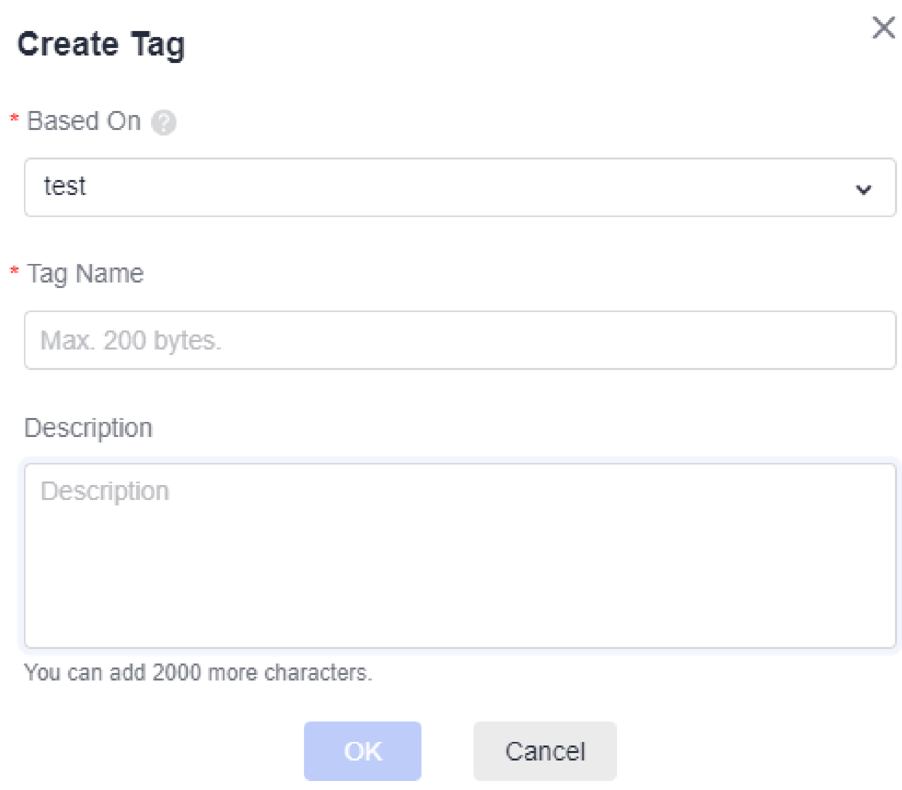
Creating a Tag for the Latest Commit on the Console

Step 1 Access the repository list.

Step 2 Click a repository to go to the details page.

Step 3 Click the **Code** and **Tags** tabs. The tag list is displayed.

Step 4 Click **Create**. In the following dialog box that is displayed, select a branch or tag.



NOTE

An annotated tag is generated if you enter a message (the content after **-m**). A lightweight tag is generated if you do not enter a message. For details about annotated tags, see **Tag Classification**.

Step 5 Click **OK**. A tag is generated based on the latest version of the branch. The tag list is displayed.

----End

Creating a Tag for a Historical Version on the Console

Step 1 Access the repository list.

Step 2 Click a repository to go to the details page. On the **Code** tab page, click the **Files** and **History** tabs.

Step 3 In the historical commit list, click ⋮ next to a commit record and select **Create Tag**. The dialog box for creating a tag for the historical version is displayed.

NOTE

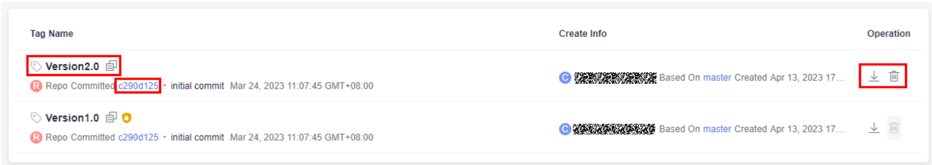
An annotated tag is generated if you enter a message (the content after **-m**). A lightweight tag is generated if you do not enter a message. For details about annotated tags, see **Tag Classification**.

Step 4 Click **OK**. A tag is generated based on the specified historical version of the branch. The tag list is displayed.

----End

Managing Tags on the Console

- All tags in the remote repository are displayed in the tag list. You can perform the following operations:

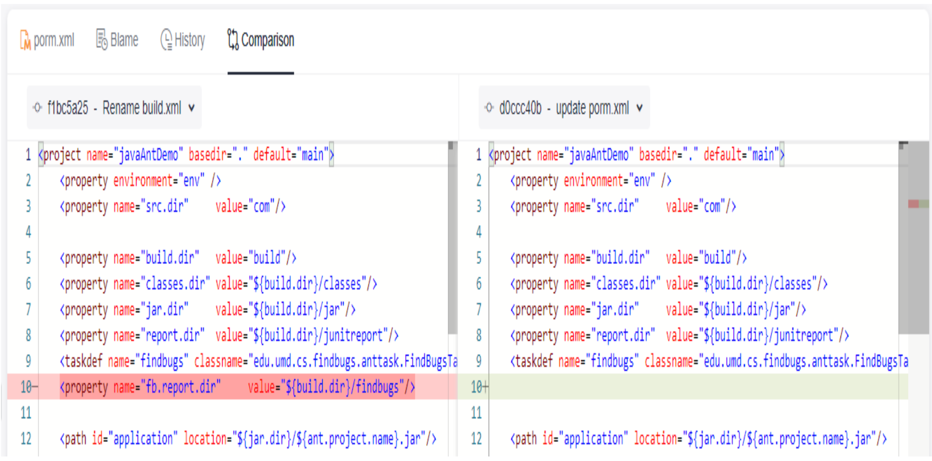


  – Click a tag in the **Tag Name** column to go to the file list of the tagged version.
  – Click a **commit ID** to go to the commit details page.
  – Click to download the file package of the labeled version in tar.gz or zip format.
  – Click to delete a tag from CodeArts Repo. (To delete the tag from the local repository, perform the **clone**, **pull**, or **-d** operation.)

NOTICE

If an **IP address whitelist** is set for the repository, only hosts with whitelisted IP addresses can download the repository source code on the page. If no IP address whitelist is set for the repository, all hosts can download the repository source code on the page.

- You can **create a branch** based on a tag.
- On the console, click the **Files** tab and click the file name of the target file. Click the **Comparison** tab to compare commit records of the file.



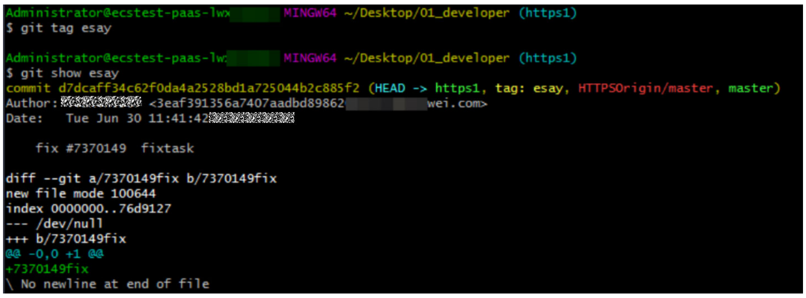
Tag Classification

Git provides two types of tags:

- **Lightweight tag**: is only a reference pointing to a specific commit. It can be considered as an alias for the commit.

  ```
  git tag <tag_name>
  ```

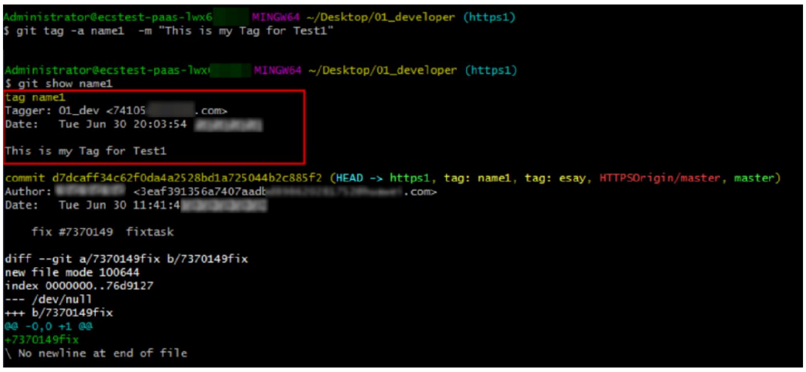
  The following figure shows the information of a lightweight tag. You can find that it is an alias of a commit.

- **Annotated tag**: points to a specific commit, but is stored as a complete object in Git. Compared with lightweight tags, annotated tags contain messages (similar to code comments). In addition to the tag name and message, the tag information includes the name and email address of the person who creates the tag, and tag creation time/date.

  ```
  git tag -a <tag_name> -m "<message>"
  ```

  The following figure shows the information of an annotated tag, which points to a commit and contains more information than that of a lightweight tag.

NOTE

Both types of tags can identify versions. **Annotated tags** contain more information and are stored in a more stable and secure structure in Git. They are more widely used in large enterprises and projects.

Common Git Commands for Tags

- **Creating a lightweight tag**

  ```
  git tag <tag_name>      # Add a lightweight tag to the latest commit.
  ```

  Example:

  ```
  git tag myTag1                # Add a lightweight tag myTag1 to the latest commit.
  ```

- **Creating an annotated tag**

  ```
  git tag -a <tag_name> -m "<message>"        # Add an annotated tag to the latest commit.
  ```

  Example:

  ```
  git tag -a myTag2 -m "This is a tag." # Add an annotated tag myTag2 to the latest commit, and the message is "This is a tag.".
  ```

- **Tagging a historical version**

You can also tag a historical version by running the **git log** command to obtain the commit ID of the historical version. The following uses an annotated tag as an example:

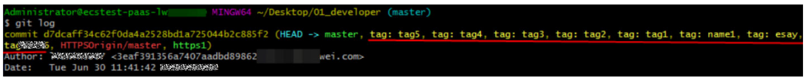
git log # The historical commit information is displayed. Obtain the commit ID (only the first several digits are required), as shown in the following figure. Press **q** to return.

git tag -a historyTag -m "Tag a historical version." 6a5b7c8db # Add tag **historyTag** to the historical version whose commit ID starts with **6a5b7c8db**, and the message is "Tag a historical version.".

NOTE

- If no command output is displayed, the tag is successfully created. If the command output is displayed, indicating that the tag name already exists (as shown in the following figure), change the tag name and perform the operation again.

- One commit can have multiple tags with unique names, as shown in the following figure.



- **Viewing tags in the local repository**

  You can list all tag names in the current repository and add parameters to filter tags when using them.

  git tag

- **Viewing details about a specified tag**

  git show *<name_of_the_desired_tag>*

  Example:

  Display the details about **myTag1** and the commit information. The following shows an example command output:

  git show myTag1

- **Pushing a local tag to the remote repository**
  - By default, tags are not pushed when you push files from the local repository to the remote one. Tags are automatically synchronized when you synchronize (clone or pull) content from the remote repository to the local one. Therefore, if you want to share local tags with others in the project, you need to run the following Git command separately.

git push *<remote_repository_address_or_alias> <name_of_the_tag_to_be_pushed>* # Push the specified tag to the remote repository.

Example:

Push the local tag **myTag1** to the remote repository whose alias is **origin**.

```
git push origin myTag1
```

– Run the following command to push all new local tags to the remote repository:

git push *<remote_repository_address_or_alias>* --tags

NOTE

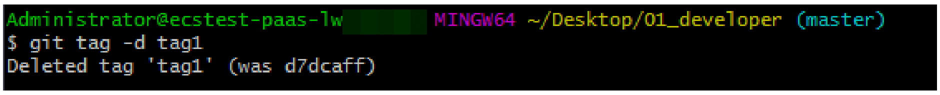
If you create a tag in the remote repository and a tag with the same name in the local repository, the tag will fail to be pushed due to the conflict. In this case, you need to delete one of the tags and push another tag again.

You can view all tags in the remote repository by referring to **Managing Tags on the Console**.

- **Deleting a local tag**

  git tag -d *<name_of_the_tag_to_be_deleted>*

  The following shows an example of deleting the local tag **tag1**.

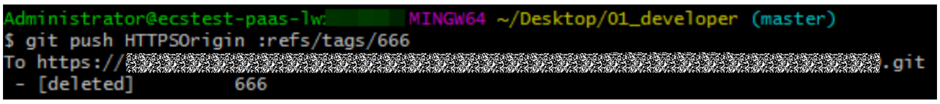
- **Deleting a tag from the remote repository**

  Similar to tag creation, tag deletion also needs to be manually pushed.

  git push *<remote_repository_address_or_alias>* :refs/tags/*<name_of_the_tag_to_be_deleted>*

  The following shows an example of deleting a tag.

  git push HTTPSOrigin :refs/tags/666 # Delete the tag **666** from the remote repository whose alias is **HTTPSOrigin**.

Obtaining a Historical Version Using Tags

If you want to view the code in a tagged version, you can check it out to the working directory. The code can be edited but cannot be added or committed because the checked-out version belongs only to a tag instead of a branch. You can create a branch based on the working directory, modify the code on the branch, and merge the branch into the master branch. The detailed steps are as follows:

1. Check out a historical version using a tag.

   git checkout V2.0.0 # Check out the version tagged with **V2.0.0** to the working directory.

2. Create a branch based on the current working directory and switch to it.

   git switch -c forFixV2.0.0 # Create a branch named **forFixV2.0.0** and switch to it.

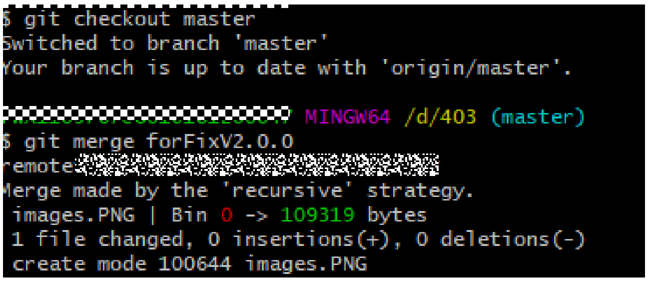
   

3. (Optional) If the new branch is modified, commit the changes to the repository of the branch.

```
git add .                        # Add the changes to the staging area of the new branch.
git commit -m "fix bug for V2.0.0"  # Save the changes to the repository of the branch.
```

4. Switch to the master branch and merge the new branch (**forFixV2.0.0** in this example) to the master branch.

```
git checkout master          # Switch to the master branch.
git merge forFixV2.0.0       # Merge the changes based on the historical version into the master
branch.
```

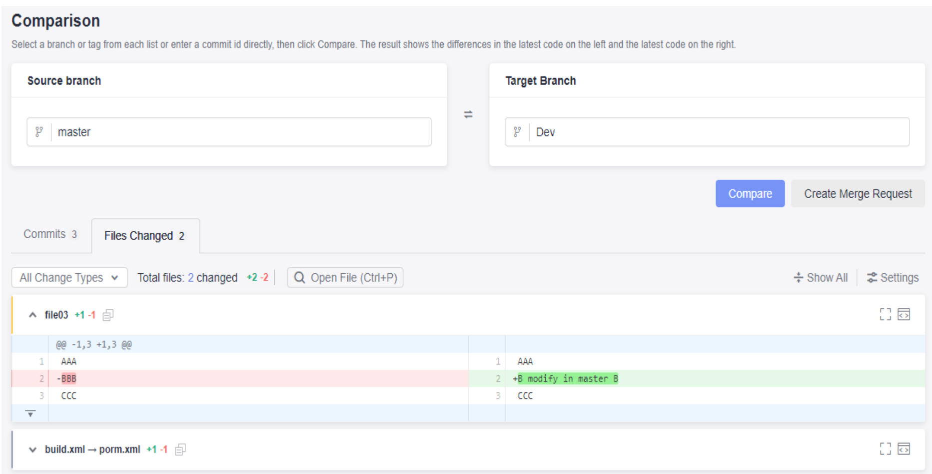


NOTE

The preceding commands are used to help you understand how to obtain a historical version using a tag. Omit or add Git commands as required.

2.8.4.5 Managing Comparison

Click the **Code** and **Comparison** tabs of the repository details page, you can view the code changes between branches or between tag versions through comparison.



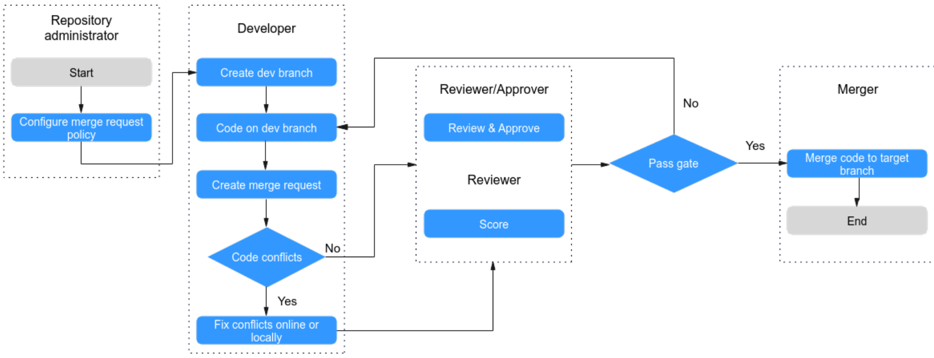
NOTE

After comparing branches, you can **create a merge request** as required.

2.8.5 Managing MRs

2.8.5.1 Managing MRs

CodeArts Repo supports development of multiple **branches** and establishes configurable review rules for branch merging. When a developer initiates an MR, some repository members can be selected to participate in code review to ensure the correctness of the merged code.



NOTE

When a merge request is created, reviewers, approvers, and mergers will be notified by emails and .

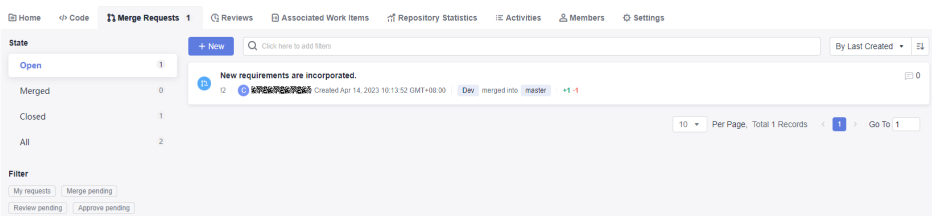
Based on the security of the code repository, you are advised to understand and configure the following functions before using merge requests:

- **Merge Requests**: You can set rules for merging branches.
- **Protected Branches** describes how to configure the merge permission on a protected branch.

Merge Request List

On the **Merge Requests** tab page, you can view merge requests list page.

- You can switch between tabs to view MRs in different states.
- You can click a request to go to the details page.
- You can view the brief information about the request, including the involved branch, creation time, and creator.
- You can search for a request based on different conditions.
- You can click **New** in the upper left corner to create a request.



NOTE

Open: The request has entered the review or merge phase, and branches have not been merged.

Merged: indicates that the request is approved and the branch is merged.

Closed: indicates that the request is canceled and the branch is not merged.

All: displays MRs in all states.

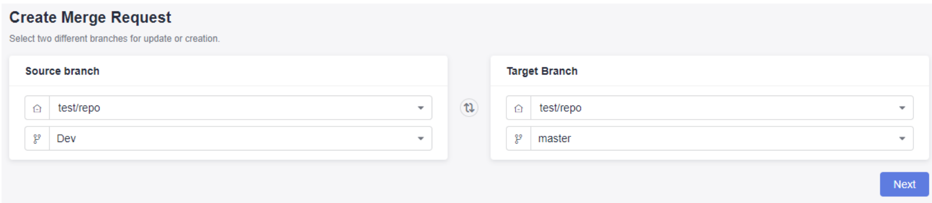
Creating a Merge Request

Assume that the administrator has set **branch merge rules**. To create an MR for a develop branch, perform the following steps:

Step 1 Go to the details page of a target repository.

Step 2 Switch to the **Merge Requests** tab page.

Step 3 Click **New** and select the branch to be merged.



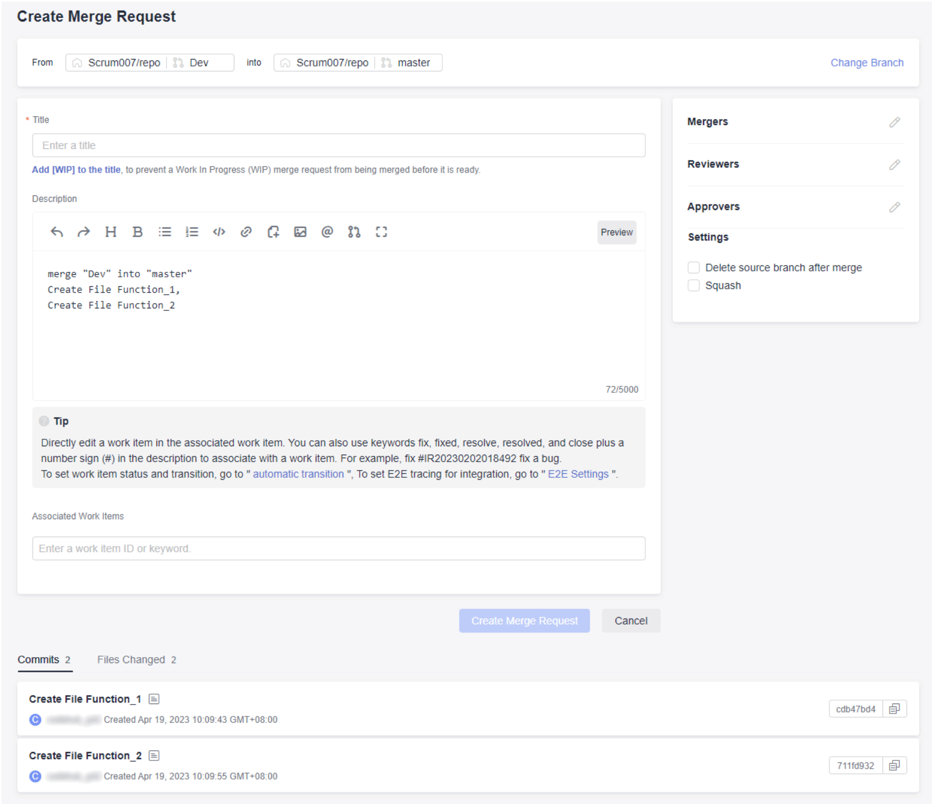
In the preceding figure, **Dev** (where the development task is completed) is merged into the **master** branch.

NOTE

The branch of a forked repository can be selected as the source branch.

Step 4 Click **Next**. The system checks whether the two branches are different.

- If there is no difference between the two, the system displays a message and the MR cannot be created.
- If the branches are different, the following **Create Merge Request** page is displayed.



The lower part of the **Create Merge Request** page displays the file differences of the two branches and the commit records of the source branch.

Step 5 Set the parameters according to the following table.

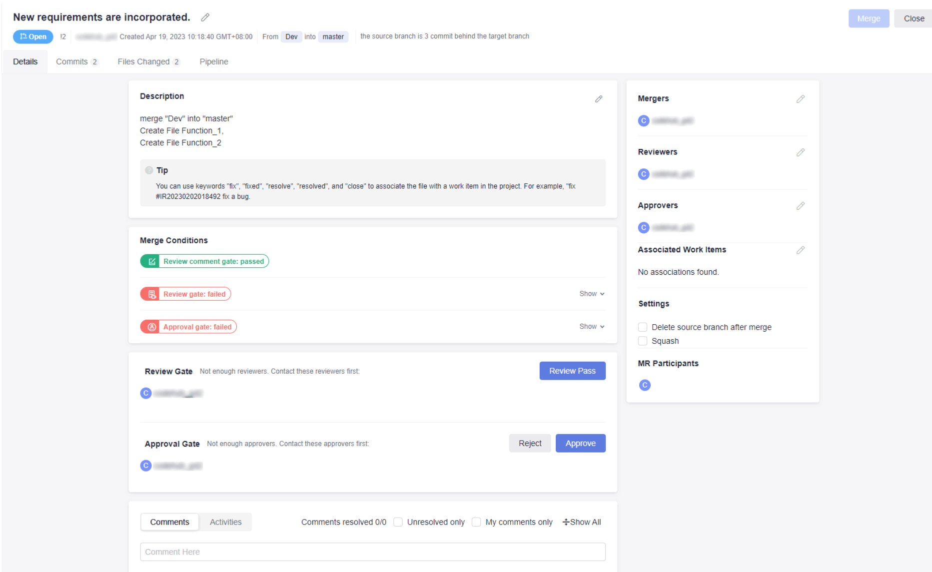
Table 2-8 Parameter description

Parameter	Description
Change Branch	Click to return to the previous step and change the branch to be merged.
Title	Enter the MR title.
Description	A default description is generated based on the merge and commit messages of the source branch. You can modify the description as required.
Associate Work Items	You can choose to associate a merge action with a work item to automatically change the status of the work item.
Mergers	Mergers have permissions to merge branches (by clicking the merge button) when all approvers approve MRs and all discussed issues are solved (or you can set the rule to allow merge with issues unsolved). They can also close the MR.
Reviewers	Specified to participate in the merge branch review and can raise questions to the initiator.

Parameter	Description
Approvers	Appointed to participate in the merge branch review. You can provide review comments (approved or rejected) or raise questions to the initiator.
Delete source branch after merge	You can choose whether to delete the source branch after merge. The preset status in the MR settings is initially used.
Squash	Enabling Squash merge keeps the history of the basic branch clean, with meaningful commit messages, and can be easily restored if necessary. For details, see **Squash**.

Step 6 Click **Create Merge Request** to submit the MR. The details page is displayed.

On the details page, merge rule statuses, mergers, reviewers, approvers, and associated work items are displayed. You can view review comments, mark a review comment as **Unsolved**, and view all activities related to the merge request.



- **Commits**: You can view commit records of the source branch.
- **Files Changed**: You can view the changed content in an MR and filter the change types such as addition, modification, deletion, and renaming.
- **Pipeline**: You can view the information about the pipeline.

----End

NOTE

- When an MR is created, related members (reviewers and mergers) will be notified by emails.
- If a single file contains 5000 different lines and there are over 100 different files, you are advised to merge the branch using the client and then push it to CodeArts Repo.

Reviewing, Approving, and Merging MRs

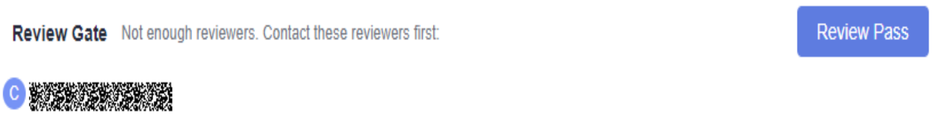
If you are notified of an MR as a reviewer, approver, or merger, perform the following steps:

Step 1 Go to the details page of a target repository.

Step 2 Switch to the **Merge Requests** tab and click the name of the target merge request to view details.

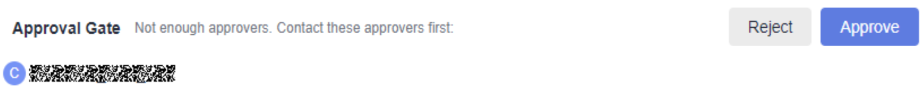
Step 3 Review the target merge request.

Both the reviewer and approver can review the merge request and provide review comments. If there is no comment, the reviewer can click **Review Pass** to complete the review.



Step 4 Approve the target merge request.

The reviewer can click **Reject** or **Approve**.



Step 5 Pass the gate.

Table 2-9 Merge conditions

Merge Condition	Description
Code merge conflicts	When the source branch code conflicts with the target branch code, you need to resolve the conflict before proceeding to the next step. For details about how to resolve the code conflict, see **Resolving Code Conflicts in an MR**.
Review comment gate	After the initiator resolves the reviews of all reviewers or approvers, the gate is passed. For details see **Detailed Description of Review Comments Gate**.
Pipeline gates	When the latest commit or pre-merged commit starts and successfully executes the pipeline, the gate is passed. For details see **Detailed Description of Pipeline Gate**.
E2E ticket number not associated	After the combination request is associated with a work item, the gate is passed. For details see **Detailed Description of E2E Ticket Number Association Gate**.
Review gate	When the number of reviewers reaches the minimum number, the gate is passed. For details see **Detailed Description of Review Gate**.

Merge Condition	Description
Approval gate	When the number of approvers reaches the minimum number, the gate is passed. For details see **Detailed Description of Approval Gate**.

Step 6 Merge the request.

After an initiator meets the preceding conditions, click **Merger** to merge the request. Otherwise, click **Close** to close the request.

----End

Squash

Squash is to merge all change commit information of an MR into one and keep a clean history. When you focus only on the current commit progress but not the commit information, you can use squash merge. To better understand this function, perform the following operations:

Step 1 **Create a repository.**

Name it **repo**.

Step 2 **Create a branch.**

Name it **Dev**.

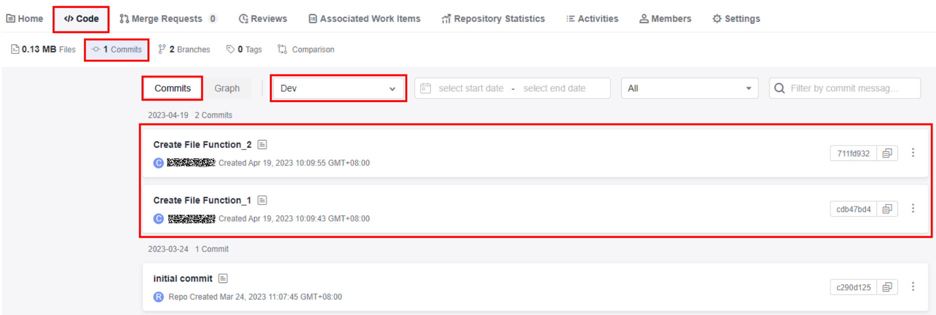
Step 3 Submit the creation.

Consider **creating a file** as a commit.

Dev branch: Create two files and name them **Function_1** and **Function_2**.

Step 4 Check the effect before Squash is enabled.

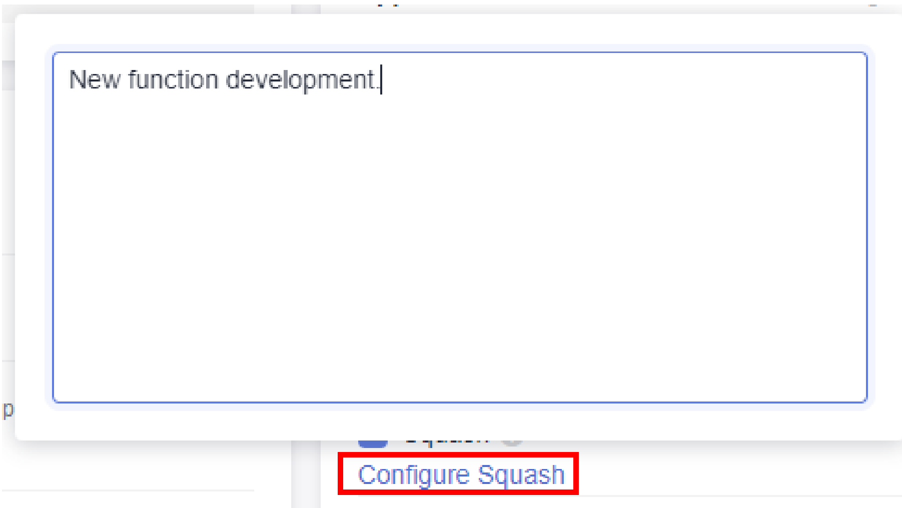
Find the **Dev** branch. Click the **Code**, **Commits**, and **Commits** tabs to view the commit information.



Step 5 Create and merge a request.

1. Set the source branch to **Dev** and target branch to **master**. **Create a merge request**.

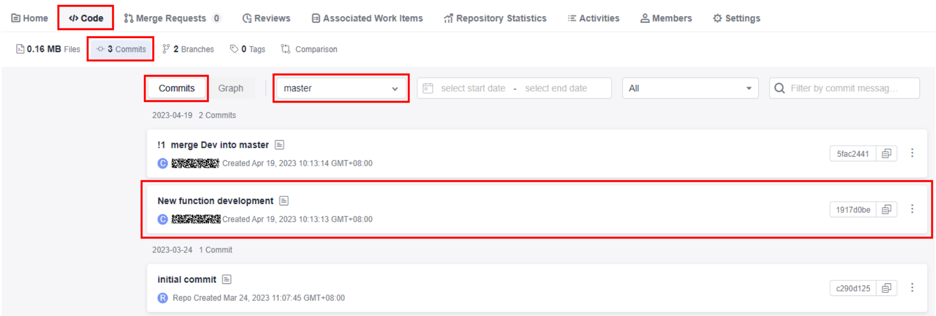
   Dev branch: Name the merge request as **Code Merge**, select **Squash**, and enter **Configure Squash**.



2. Complete **the review and approval**.

Step 6 Check the effect after **Squash** is enabled.

After the request is successfully merged, click the **Code**, **Commits**, and **Commits** tabs, select the **master** branch. Compared with **Step 4**, the committed content has been merged.



----End

2.8.5.2 Resolving Code Conflicts in an MR

When using CodeArts Repo, you may encounter the situation where two members in the same team modify a file at the same time. Code fails to be pushed to a CodeArts Repo repository due to the code commit conflict. The following figure shows a push failure caused by the file change conflict in the local and remote repositories.

NOTE

- The returned messages vary depending on Git versions and compilers but have the same meaning.
- The information similar to "push failure" and "another repository member" in the returned message indicates that there is a commit conflict.
- Git automatically merges changes in different lines of the same file. A conflict occurs only when the same line of the same file is modified (the current version of the local repository is different from that of the remote repository).
- Conflicts may occur during branch merge. The locating method and solution are basically the same as those for the conflict during the commit to the remote repository. The following figure shows that a conflict occurs when the local **branch1** is merged into the master branch (due to the changes in the **file01** file).

```
Administrator@ecstest-paas-[redacted] MINGW64 ~/Desktop/02_developer/[redacted] (master)
$ git merge branch1
Auto-merging file01
CONFLICT (content): Merge conflict in file01
Automatic merge failed; fix conflicts and then commit the result.
```

Resolving a Code Commit Conflict

To resolve a code commit conflict, pull the remote repository to the working directory in the local repository. Git will merge the changes and display the conflicting file content that cannot be merged. Then, modify the conflicting content and push it to the remote repository again (by running the **add**, **commit**, and **push** commands in sequence).

The following figure shows that there is a file merge conflict when you run the **pull** command.

```
Administrator@ecstest-paas-[redacted] MINGW64 ~/Desktop/02_developer/[redacted] (master)
$ git pull
remote: Enumerating objects: 5, done.
remote: Counting objects: 100% (5/5), done.
remote: Compressing objects: 100% (3/3), done.
remote: Total 3 (delta 1), reused 0 (delta 0)
Unpacking objects: 100% (3/3), 321 bytes | 14.00 KiB/s, done.
From [redacted].com:[redacted]
   9c5d50b..54848ef  master     -> origin/master
Auto-merging file01
CONFLICT (content): Merge conflict in file01
Automatic merge failed; fix conflicts and then commit the result.
```

Modify the conflicting file carefully. If necessary, negotiate with the other member to resolve the conflict and avoid overwriting the code of other members by mistake.

NOTE

git pull combines **git fetch** and **git merge**. The following describes the operations in detail.

```
git fetch origin master # Pull the latest content from the master branch of the remote host.
git merge FETCH_HEAD    # Merge the latest content into the current branch.
```

During merge, a message indicating that the merge fails due to a conflict is displayed.

Example: Conflict Generation and Resolution

The following shows an example to help you understand how a conflict is generated and resolved.

A company uses CodeArts Repo and Git to manage a project. A function (the **file01** file is modified) of the project is jointly developed by developer 1 (01_dev) and developer 2 (02_dev). The two developers encounter the following situation.

1. **file01** is stored in the remote repository. The following shows the file content.

file01

```
##file01AAAAAAAAAAAA
##file02BBBBBBBBBBBB
##file03CCCCCCCCCCCC
##file04DDDDDDDDDDDD

```

2. 01_dev modifies the second line of **file01** in the local repository and successfully pushes the file to the remote repository. The following shows the file content in the local and remote repositories of 01_dev.

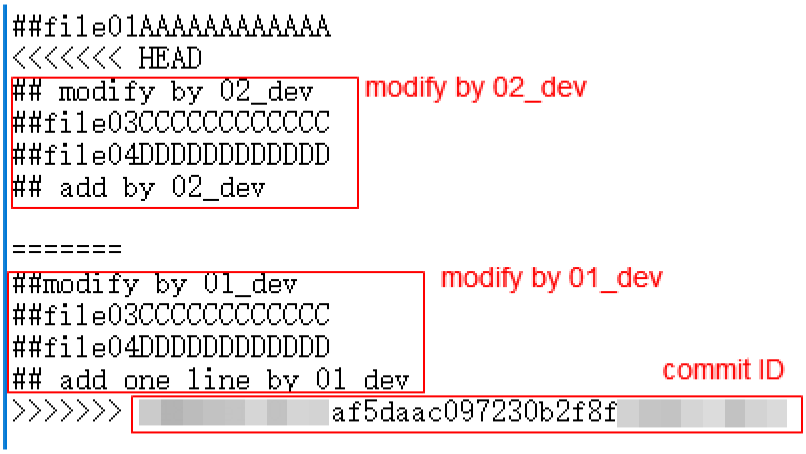
file01

```
##file01AAAAAAAAAAAA
##modify by 01_dev
##file03CCCCCCCCCCCC
##file04DDDDDDDDDDDD
## add one line by 01_dev
```

3. 02_dev also modifies the second line of **file01** in the local repository. When 02_dev pushes the file to the remote repository, a conflict message is displayed. The following shows the file content in the local repository of 02_dev, which is conflicting with that in the remote repository.

```
##file01AAAAAAAAAAAA
## modify by 02_dev
##file03CCCCCCCCCCCC
##file04DDDDDDDDDDDD
## add by 02_dev
```

4. 02_dev pulls the code in the remote repository to the local repository, detects the conflict starting from the second line of the file, and immediately contacts 01_dev to **resolve the conflict**.
5. We find that they both modified the second line and added content to the last line, as shown in the following figure. Git identifies the content starting from the second line as a conflict.



NOTE

Git displays the changes made by the two developers and separates them using =======.

- The content between **<<<<<<<HEAD** and **=======** indicates the changes of the local repository in the conflicting lines.
- The content between **=======** and **>>>>>>>** indicates the changes of the remote repository in the conflicting lines, that is, the pulled content.
- The content after **>>>>>>>** is the commit ID.
- Delete **<<<<<<<HEAD**, **=======**, **>>>>>>>**, and commit ID when resolving the conflict.

6. The two developers agree to retain all changes after discussion. After 02_dev modifies the content, the modified and added lines are saved in the local repository of 02_dev, as shown in the following figure.

```
##file01AAAAAAAAAAAA
## modify by 02_dev
##modify by 01_dev
##file03CCCCCCCCCCCC
##file04DDDDDDDDDDDD
## add by 02_dev
## add one line by 01_dev
```

7. 02_dev pushes the merged changes to the remote repository (by running **add**, **commit**, and **push** commands in sequence). The following shows the file content in the remote repository after a successful push. The conflict is resolved.

file01

```
1   ##file01AAAAAAAAAAAA
2   ## modify by 02_dev
3   ##modify by 01_dev
4   ##file03CCCCCCCCCCCC
5   ##file04DDDDDDDDDDDD
6   ## add by 02_dev
7   ## add one line by 01_dev
```

NOTE

In the preceding example, TXT files are used for demonstration. In the actual situation, the conflict display varies in different text editors and Git plug-ins of programming tools.

Preventing a Conflict

Repository preprocessing before code development can prevent commit and merge conflicts.

In **Example: Conflict Generation and Resolution**, 02_dev successfully resolves the conflict in the commit to the remote repository. For 02_dev, the latest code version of the local repository is the same as that of the remote repository. For 01_dev, version differences still exist between the local and remote repository. A conflict will occur when 01_dev pushes code to the local repository. The following describes methods to resolve the conflict.

Method 1 (recommended for beginners):

If your local repository is not frequently updated, clone the remote repository to the local repository to modify code locally, and commit the changes. This directly resolves the version differences. However, if the repository is large and there are a large number of update records, the clone process will be time-consuming.

Method 2:

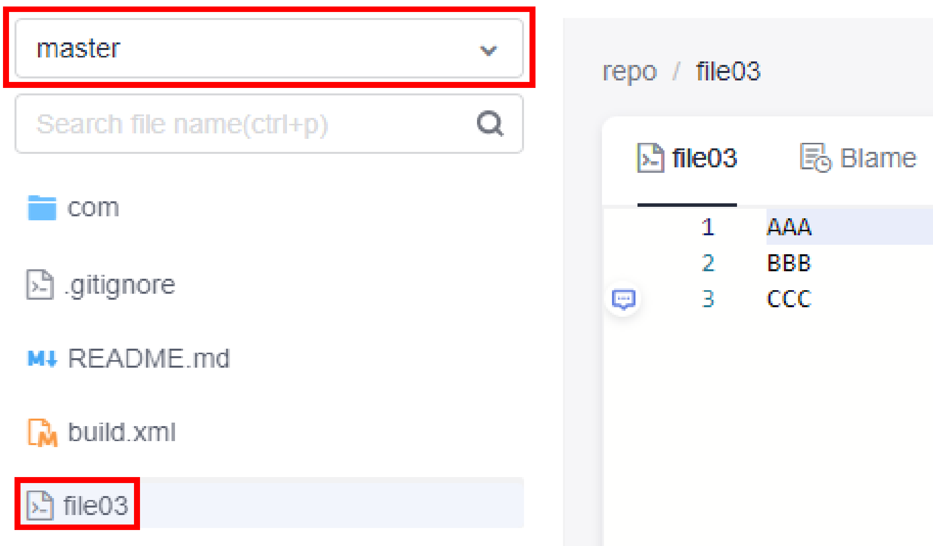
If you modify the local repository every day, create a develop branch in the local repository for code modification. When committing code to the remote repository, switch to the master branch, pull the latest content of the master branch in the remote repository to the local repository, merge the branches in the local repository, and resolve the conflict. After the content is successfully merged into the master branch, commit it to the remote repository.

Resolving a Merge Conflict on the Console

CodeArts Repo allows you to **manage branches**. The following simulates a conflicting MR and describes how to resolve it.

Step 1 **Create a repository**.

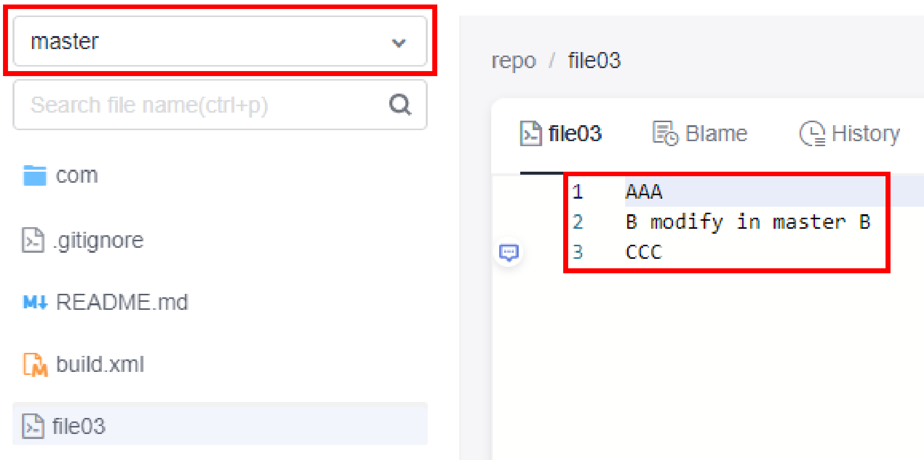
Step 2 **Create a file** named **file03** on the master branch in the repository. The initial content is as follows:



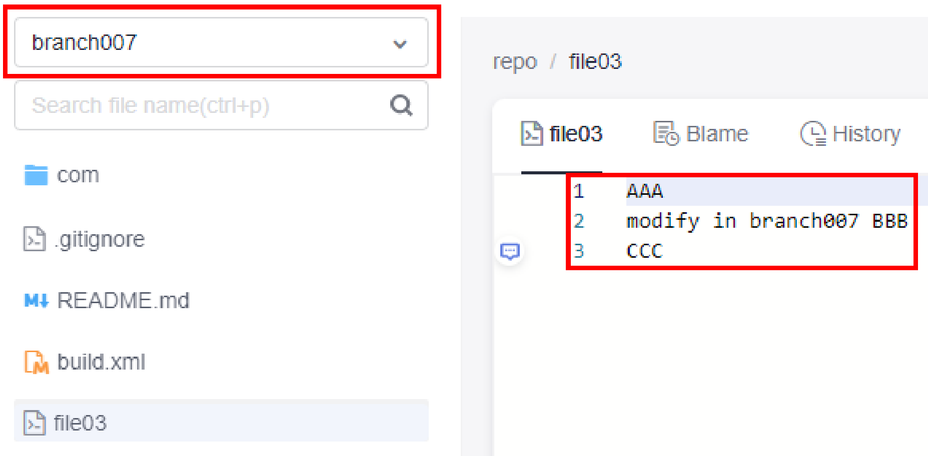
Step 3 **Create a branch** named **branch007** based on the master branch.

The content in the master branch is the same as that in **branch007**. The following describes how to make them different.

Step 4 In the master branch, modify **file03** as shown in the following figure, and enter the commit message **modify in master**.

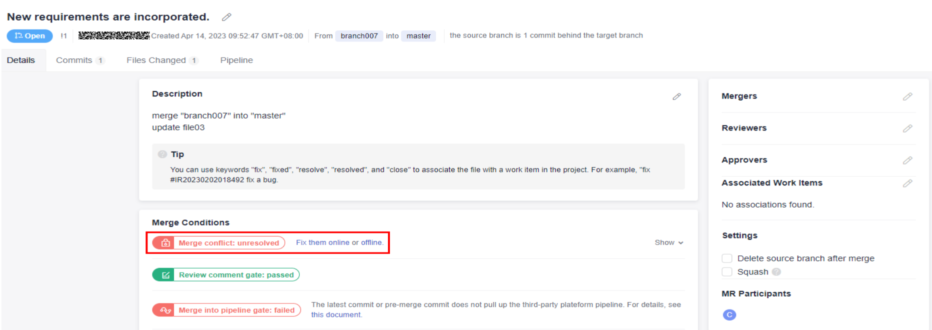


Step 5 Switch to **branch007**, modify **file03** as shown in the following figure, and enter the commit message **modify in branch007**. Then the two branches are different, that is, a conflict occurs.



Step 6 Create an **MR** to merge **branch007** to the master branch. Click **Create Merge Request** to submit the MR.

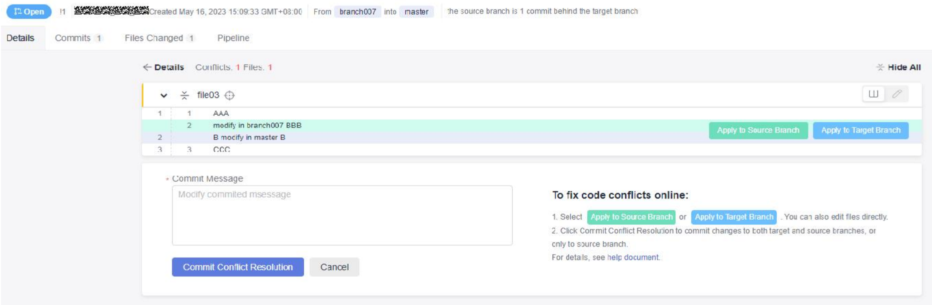
Merge request details page is displayed. You can also click the name of the merge request in the merged requests list to access this page. **Merge conflict: unsolved** displays on the details page. You are advised to **Fix them online or offline**.



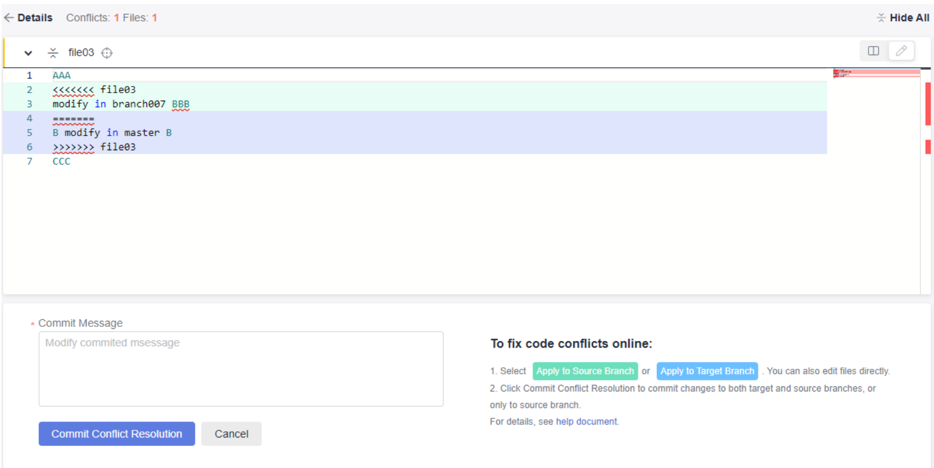
Step 7 Perform the following operation to resolve the conflict:

- **Fix them online** (recommended for small code volume)

a. Click **Fix them online**. The following page is displayed, showing the code conflict.



b. If the conflict cannot be resolved by overwriting the file, click to go to the **Manual Editing** page, as shown in the following figure. The conflict display format is similar to that in **Example: Conflict Generation and Resolution**.



c. Manually modify the code to resolve the conflict and commit the changes.

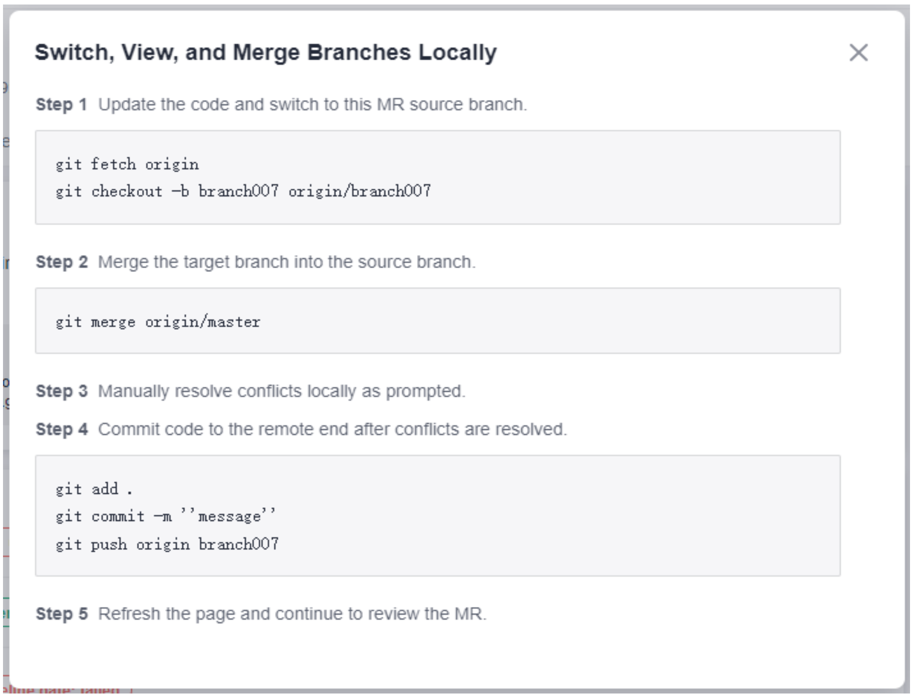
NOTE

Enter a commit message.

In the preceding figure, the following signs are used for conflict display and separation: <<<<, >>>>, and ====. Delete the lines where the signs are located when modifying code.

- **offline** (recommended for large-scale projects)

  Click **offline**. The following page is displayed. Perform the operations as prompted.



NOTE

CodeArts Repo automatically generates Git commands based on your branch name. You only need to copy the commands and run them in the local repository.

Step 8 After the conflict is resolved by using either of the preceding methods, you can click **Merge** to merge branches. The system displays a message indicating that the merge is successful.

You can also follow the instructions in **Managing MRs**.

Now, the content of the master and **branch007** branches is the same. You can switch between branches to check the content.

----End

2.8.5.3 Detailed Description of Review Comments Gate

Opening/Closing the Gate

Step 1 Go to the target repository and choose **Settings** > **Policy Settings** > **Merge Requests**.

Step 2 Configure the gate.

- Select **Merge after all reviews are resolved** and click **Submit** to save the settings. The access control is enabled.
- Deselect **Merge after all reviews are resolved** and click **Submit** to save the settings. The access control is closed.

----End

Effect of Gate Triggering

The reviewers or approvers can move the cursor to the code line in **Files Changed** of the **Merge Request** and click the icon to add review comments.

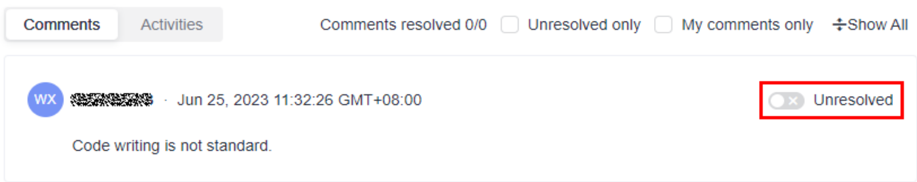
Alternatively, the reviewers or approvers can directly add review comments in **Details** > **Comments** of the **Merge Request**.

- **Review comment gate: passed**: It is displayed when there is no review comments in the merge request, or all review comments do not need to be resolved or have been resolved.

- **Review comment gate: failed**: It is displayed when the review comments in the Merge request are not resolved.

Passing of the Gate

After you have resolved the issue raised in the review comments, you can switch the status of the review comments from **Unresolved** to **Resolved** in **Details** > **Review Comments** of the **Merge Request**. In this case, the status of the review comments is displayed as **Review comment gate: passed**.



2.8.5.4 Detailed Description of Pipeline Gate

NOTE

Pipeline gate supports only merge requests whose merge mechanism is **Approval**.

Opening/Closing the Gate

Step 1 Go to the target repository and choose **Settings** > **Policy Settings** > **Merge Requests**.

Step 2 Click **Create** to set a branch policy for the target branch.

Step 3 Configure the gate.

- Select **Enable pipeline gate** under the policy and click **OK** to save the settings. The gate is enabled.
- Deselect **Enable pipeline gate** under the policy and click **OK** to save the settings. The gate is closed.

----End

Effect of Gate Triggering

- **Merge into pipeline gate: passed**: It is displayed when the pipeline is successfully started after the latest commit or pre-merge commit operation is performed.

- **Merge into pipeline gate: failed**: It is displayed when the repository has no associated pipeline task or the latest commit or pre-merge commit fails to start the pipeline.

Passing of the Gate

Step 1 Choose **CICD** > **Pipeline**.

Step 2 Click **Create Pipeline** and enter the following information:

- **Name**: Enter a custom name.
- **Pipeline Source**: Select **Repo**.
- **Repository**: Select the target code repository for which you want to create a merge request.
- **Default Branch**: Select the target branch of the merge request.

Step 3 Click **Next**, select the target template as required, and click **OK**.

Step 4 After the task is created, the system automatically switches to the **Task Orchestration** tab page in the task details and switches to the **Execution Plan** tab page.

Step 5 Enable **Merge Request Event Triggering** and select the following trigger events based on the site requirements:

- **Create**: triggered when an MR is created.
- **Update**: triggered when the content or setting of an MR is updated.
- **Merge**: triggered when an MR is merged. The code submission event will also be triggered.
- **Reopen**: triggered when an MR is reopened.

Step 6 Configure other information about the pipeline task and click **Save**.

Step 7 Return to the CodeArts Repo and trigger the event selected in **Execution Plan** to enable the repository to start the pipeline task.

----End

2.8.5.5 Detailed Description of E2E Ticket Number Association Gate

Opening/Closing the Gate

Step 1 Go to the target repository and choose **Settings** > **Policy Settings** > **Merge Requests**.

Step 2 Configure the Gate.

- Select **Must be associated with CodeArts Req** and click **Submit** to save the settings. The gate is enabled.

- Deselect **Must be associated with CodeArts Req** and click **Submit** to save the settings. The gate is closed.

----End

Effect of Gate Triggering

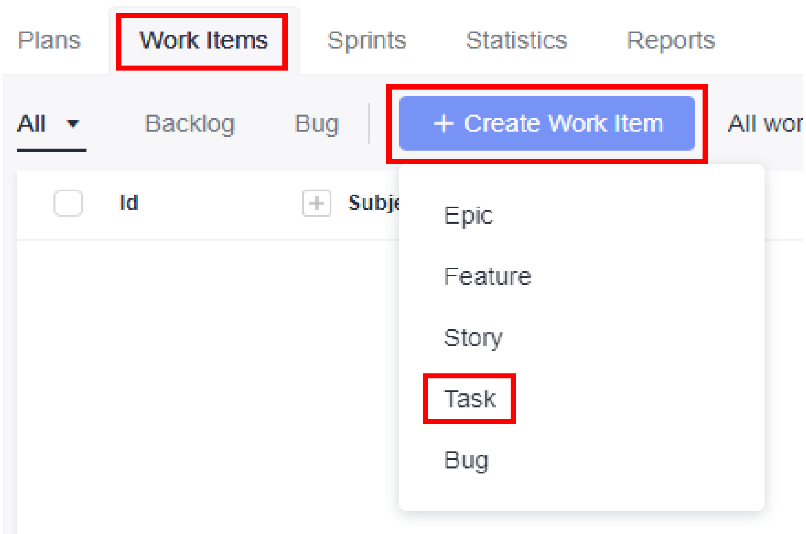
- **E2E ticket number: associated**: It is displayed when the merge request is successfully associated with the work item.

- **E2E ticket number: not associated**: It is displayed when the merge request has no associated work item.

Passing of the Gate

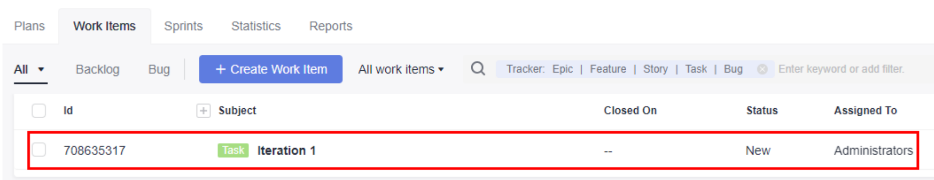
Step 1 Click the target project name to access the project.

Step 2 On the **Work Items** tab, click **Create Work Item** and choose **Task** from the drop-down list. The page for creating a work item is displayed.



Step 3 Enter a title, for example, Sprint 1.

Retain the default values for other parameters. Click **Save**.



Step 4 Choose **Code** > **CodeArts Repo**.

Step 5 Click a repository name to go to the target repository.

Step 6 Switch to the **Merge Requests** tab page and click the name of the target merge request to access the target merge request.

Step 7 On the **Details** page, click the icon next to **Associated Work Items** to search for and select the target work item.

Step 8 Click **OK**. The E2E ticket number is associated.

----End

2.8.5.6 Detailed Description of Review Gate

NOTE

The review gate supports only the merge requests whose merge mechanism is **Approval**.

Opening/Closing the Gate

Step 1 Go to the target repository and choose **Settings** > **Policy Settings** > **Merge Requests**.

Step 2 Click **Create** to configure a branch policy for the target branch.

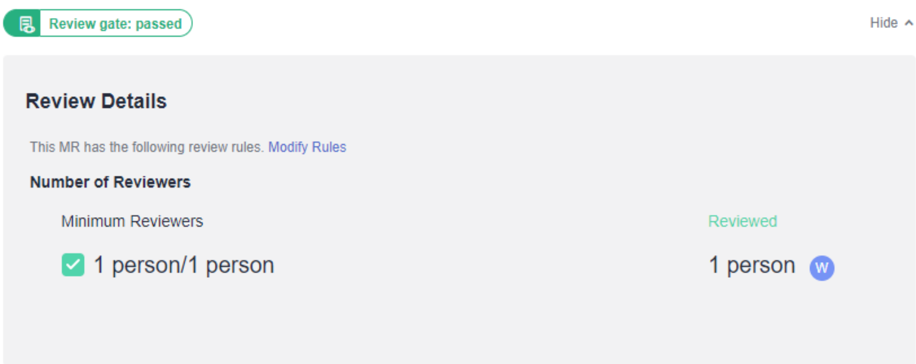
Step 3 Configure the Gate.

- Set **Reviewers Required** to a number except 0 and click **OK** to save the settings. The gate is enabled.
- Set **Reviewers Required** to 0 and click **OK** to save the settings. The gate is closed.

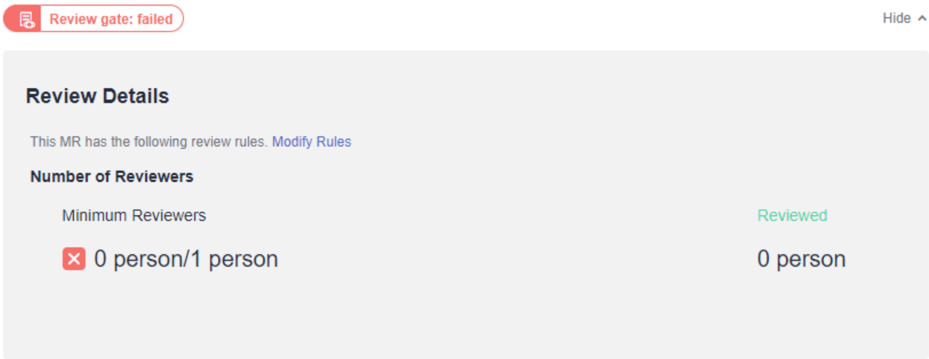
----End

Effect of Gate Triggering

- **Review gate: passed**: It is displayed when the number of reviewers who give pass reaches the **Reviewers Required**.



- **Review gate: failed**: It is displayed when the number of reviewers who give pass does not reach the **Reviewers Required**.



Passing of the Gate

After completing the review, the reviewer needs to choose **Details** > **Review Gate** and click **Pass**. The review is passed. For details, see **Setting Branch Policies**.

2.8.5.7 Detailed Description of Approval Gate

NOTE

The approve gate supports only the merge requests whose merge mechanism is **Approval**.

Opening/Closing the Gate

Step 1 Go to the target repository and choose **Settings** > **Policy Settings** > **Merge Requests**.

Step 2 Click **Create** to configure a branch policy for the target branch.

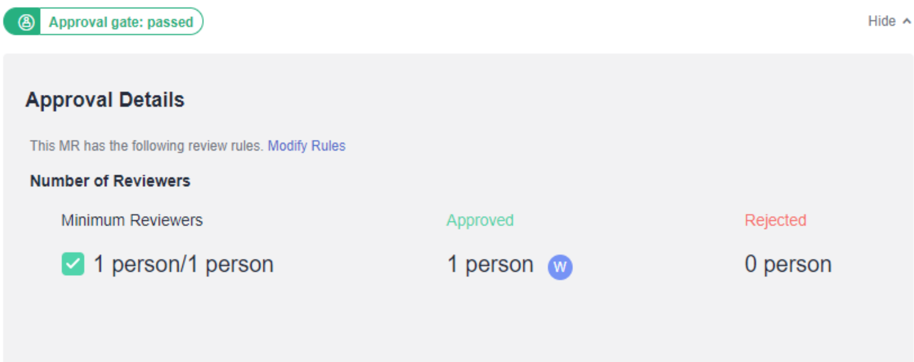
Step 3 Configure the Gate.

- Set **Approvals Required** to a number except 0 and click **OK** to save the settings. The gate is enabled.
- Set **Approvals Required** to 0 and click **OK** to save the settings. The gate is closed.

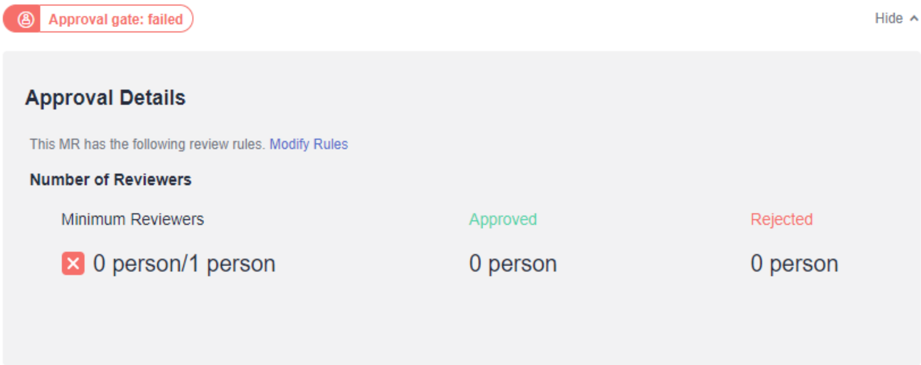
----End

Effect of Gate Triggering

- **Approval gate: passed**: It is displayed when the number of approvers who give pass reaches the **Approvals Required**.



- **Approal gate: failed**: It is displayed when the number of approvers who give pass does not reach the **Approvals Required**.



Passing of the Gate

After completing the approval, the approvers need to choose **Details** > **Approval Gate** and click **Pass**. The approval is passed. For details, see **Setting Branch Policies**.

2.8.6 Viewing Review Records of a Repository

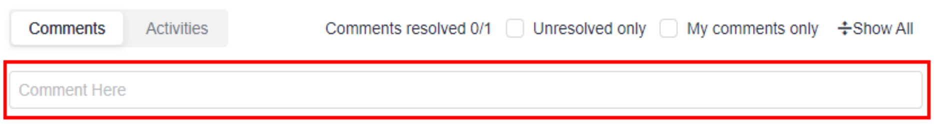
On the **Reviews** tab page of the repository details page, you can view the review information of the repository from MRs and commits. You can filter records based on the filter criteria.

Table 2-10 Review record parameters

Parameter	Description
Status	Review records are classified into three statuses: **Unresolved**, **Resolved**, and **Resolve Not Needed**.
Review comment	Comment provided by the reviewer
Approver	Reviewer who provides the review comment
Review date	Date when the reviewer submits the review comments
Assign to	Assign the task to the default or specified personnel.

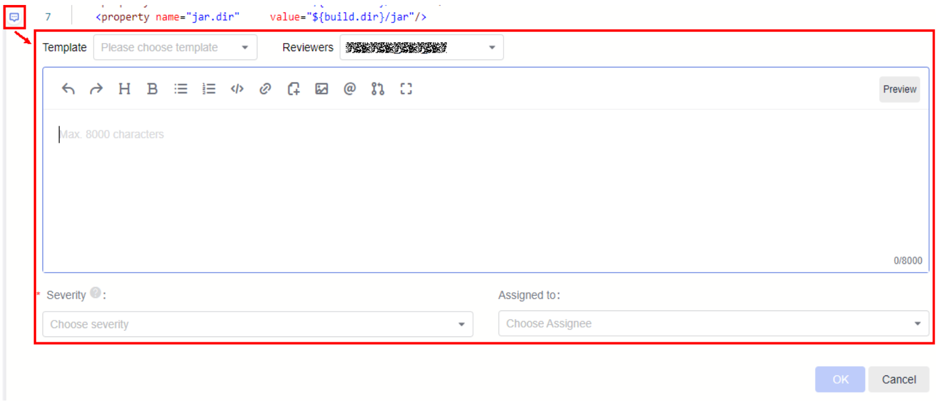
Adding Comments on the Reviews for MR Tab

Go to the details page of the target merge request and add review comments at the bottom of the page.

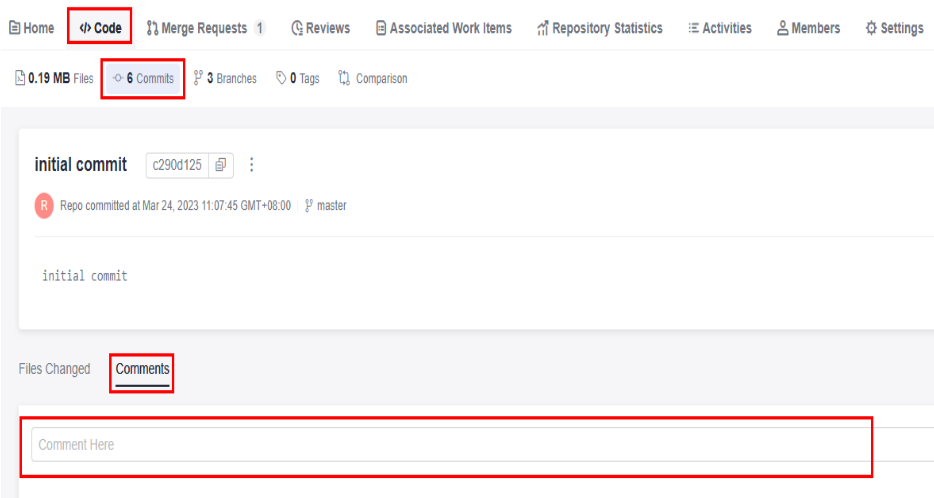


Adding Comments on the Reviews for Commit Tab

Method 1: In the code file, click  next to a line of code to add review comments.



Method 2: On the **Commits** tab, click a commit to switch to the comment page and add review comments.



2.8.7 Viewing Associated Work Items

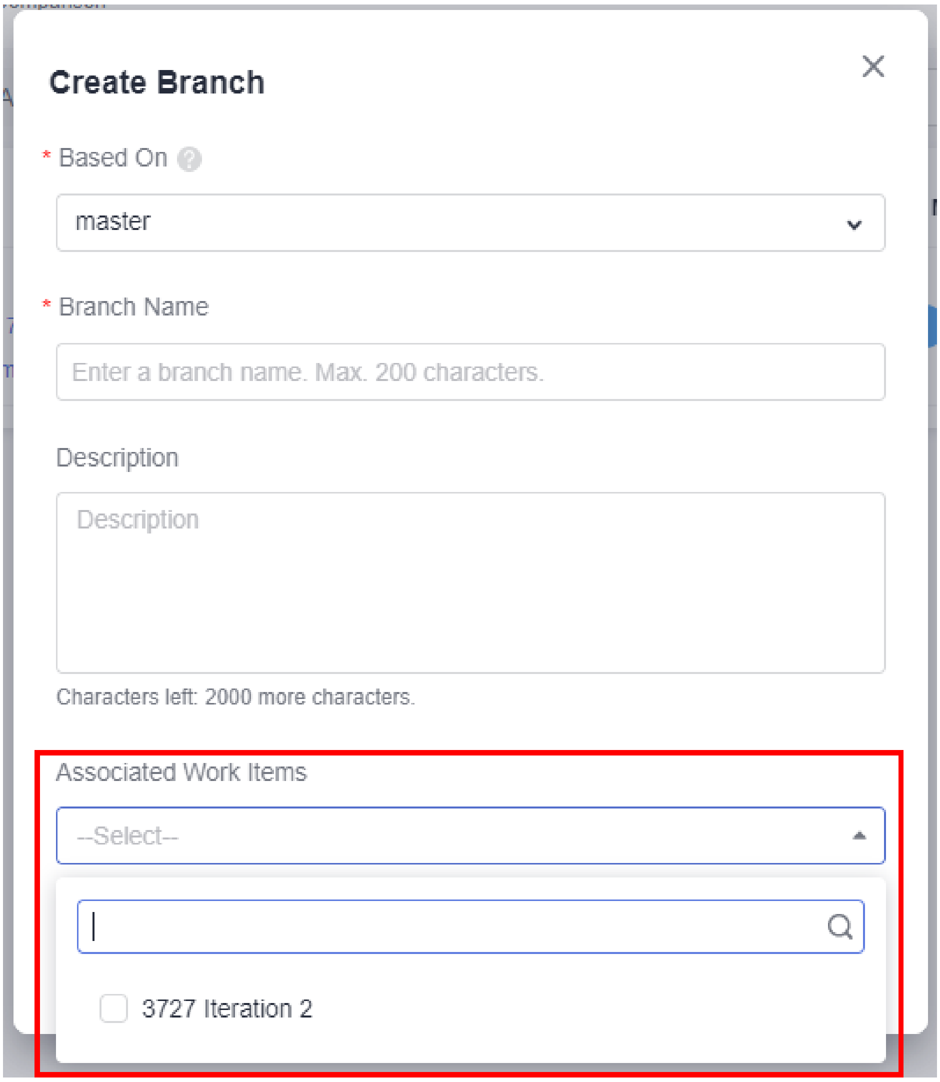
2.8.7.1 Introduction

Work item is used to track work content in CodeArts Req. A work item usually has a unique ID and a description. It can be a requirement, bug, or task. In CodeArts Req, work item is a work content list that supports GUI-based management.

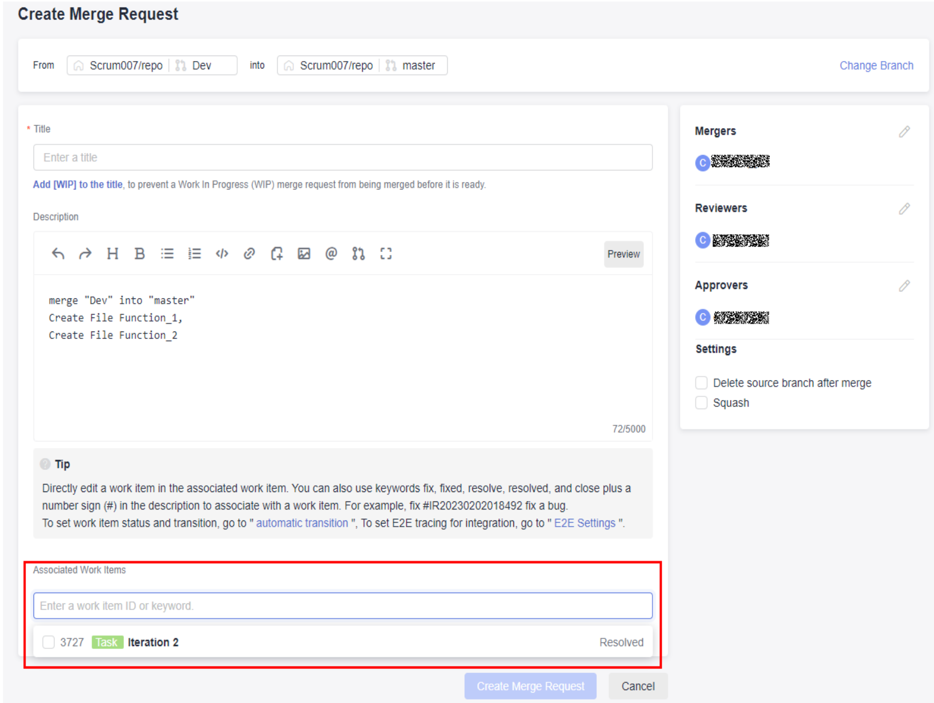
You can use the following associations and configure **E2E Tracing**.

- **Commit association**
- Create a branch association.

  You can select the target work item under **Associated Work Items** on the page for creating a branch.



- Merge request association
  You can select the target work item under **Associated Work Items** on the page for creating a merge request.



NOTE

CodeArts Req: a CodeArts service that provides R&D teams with efficient collaboration services. You can create multiple Agile Scrum and Lean Kanban projects to manage requirements, track bugs, create project Wiki, host documents in the cloud, analyze statistics, and manage person-hours.

Preparations

Step 1 (Optional) Configure the commit transition status.

NOTE

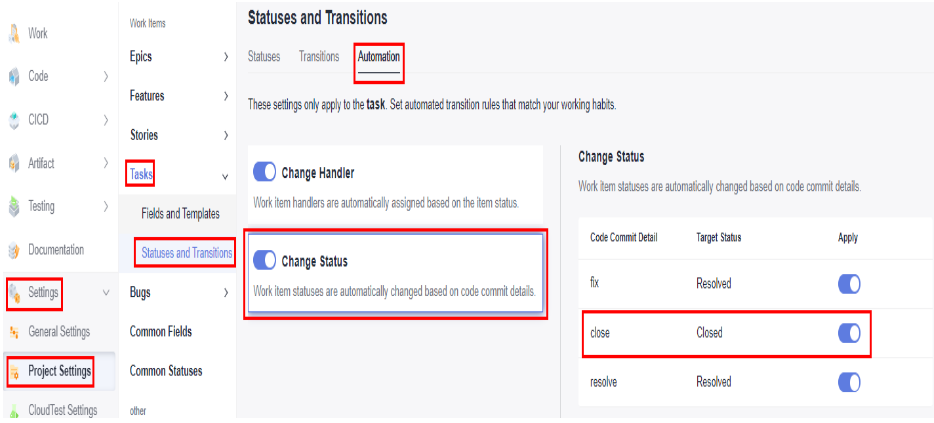
By default, the code commit status is configured as follows:

- The **fix** keyword is associated with the **Resolved** target state (enabled by default).
- The **close** keyword is associated with the **Closed** target state (disabled by default).
- The **resolve** keyword is associated with the **Resolved** target state (enabled by default).

In project settings, a project manager or another role with project setting permission can set three commit message keywords (such as **fix**, **close**, and **resolve**) for different work item types (**Epic**, **Feature**, **Story**, **Task**, and **Bug**). You can associate each keyword with a target status (for example, **Resolved** or **Closed**). The work item status can also be customized.

The following describes how to associate the **close** keyword to **Rejected** in a **Task** work item.

1. Click the target project name to access the project.
2. Find the code commit status corresponding to a task, as shown in the following figure.



3. Click the **Target Status** of **close**, set it to **Rejected**, and set **Apply** to . The settings are automatically saved.

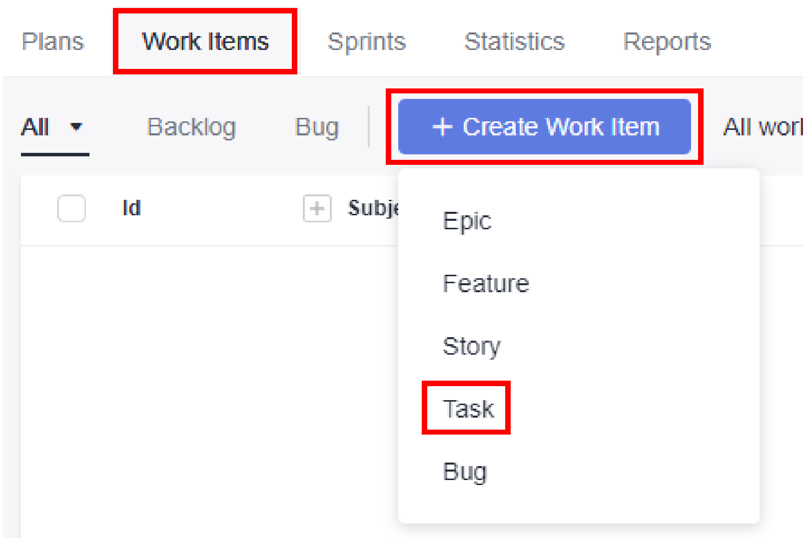
   Then, you can use the **close** keyword in the commit message to change the status of a **Task** work item to **Rejected** when committing local code.

   Example:

   git commit -m "close #*<task_work_item_id>* *<commit_message>*"

Step 2 Create a work item.

1. Click the target project name to access the project.
2. On the **Work Items** tab, click **Create Work Item** and choose **Task** from the drop-down list. The page for creating a work item is displayed.



3. Enter a title, for example, Sprint 1.

   Retain the default values for other parameters. Click **Save**.

NOTE

The work item management page is displayed. You can view the work item ID and the status is **New**.

In this example:

– The ID of **task01** is **708206208**.

– The ID of **task02** is **708206209**.

On the project homepage, choose **Work > Work Items** to obtain a work item ID.

----End

2.8.7.2 Commit Association

With CodeArts Repo, you can associate each code commit with a work item of CodeArts Req.

- Associated work items help developers accurately record tasks for fixing bugs and developing new features.
- Associated work items allow project managers to view information such as change committer and committed content involved in each requirement and bug fixing task.

NOTE

Commit: You can commit and save operations on files in the working directory, including creating, editing, and deleting files. The following shows the **commit** command, in which the **-m** parameter is mandatory and followed by the commit message.

```
git commit -m <commit_message>
```

On the CodeArts Repo console, a changed file can be saved only after you enter a commit message. Each saving operation on the console is a commit, and the mandatory message corresponds to the content after **-m** in the **commit** command.

CodeArts Repo automatically associates work items with code by capturing keywords from the commit message after **-m**. The most commonly used keyword is **fix**, which is the recommended keyword in the prompt. The keyword must meet the following format:

```
git commit -m "fix #<work_item_id> <commit_message>"
```

If a work item is successfully associated, the system automatically changes the work item status based on the **configured code commit status transition**. By default, the **fix** keyword sets the work item to the resolved state.

Example:

```
git commit -m "fix #123456 fixed this bug"
```

The work item **123456** is set to the resolved state after being pushed to CodeArts Repo.

CodeArts Repo allows you to associate work items with code on the local PC or on the console. The following describes the two methods.

NOTE

- Only members of the same project and repository can associate work items with code.
- For the work item creator, specified modifier, or account (such as the project manager) that has the permission to modify all work items in the project, their association operations can change the work item status (new or resolved) and generate comment records. In the association records, **Transition successful** is displayed in the **Result** column. When you use an unauthorized account to perform operations, only association records are generated. The work item status is not changed, no comment record is generated, and **Association successful** is displayed in the **Result** column.

Associating a Work Item with Locally Committed Code

Prepare the Git environment on the local PC. For details, see **Installing and Configuring Git**. If you can access the repository (**the corresponding remote repository has been associated**), perform the following operations:

Create a file on the local master branch and push the file to the remote repository. During the push, use the **fix** keyword in **-m** to associate the work item **task01** with code.

NOTE

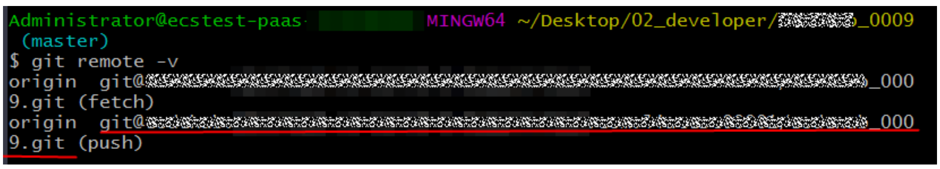
- In this example, the master branch is modified to simplify the process so that you can quickly understand how to associate a work item with code committed on the local PC.
- Do not modify the master branch in the actual situation. It is recommended that you create a branch for file operations, merge the changed file into the master branch, and push the master branch to the remote repository. (This is a default rule and good habit.)

Step 1 Right-click in the local repository folder to open the Git Bash client.

Step 2 Check whether the remote repository address is successfully associated.

```
git remote -v          # View the remote repository address associated with the local repository.
```

In the following figure, the underlined part indicates the remote repository address associated with the local repository, and the information before the address is the alias of the remote repository on the local PC.



If the associated repository is not the one you want or the repository is not associated, **clone the desired repository to the local PC**.

After the clone is successful, run the **git remote -v** command again to verify the association.

Step 3 Check the repository status and switch to the master branch. (Skip this step for a repository cloned in the previous step.)

```
git status             # Check the repository status. You can view the current branch and whether there are unsaved, uncommitted, and unpushed changes on the branch.
git checkout master    # Switch to the master branch. Run the command when the current branch is not the master branch.
```

Step 4 Create a file in the local repository folder and name the file **fileFor708206208**.

Step 5 Add the new file to the staging area using Git Bash.

```
git add fileFor708206208
```

Step 6 Commit the operation using Git Bash.

```
git commit -m "fix #708206208 Task01"    #/ Use the fix keyword to associate task 01 whose ID is 708206208.
```

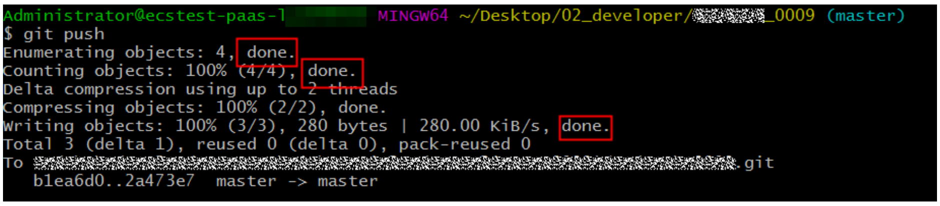
NOTE

708206208 is the ID of **task01**.

Step 7 Push the committed content to the associated CodeArts Repo repository using Git Bash.

```
git push
```

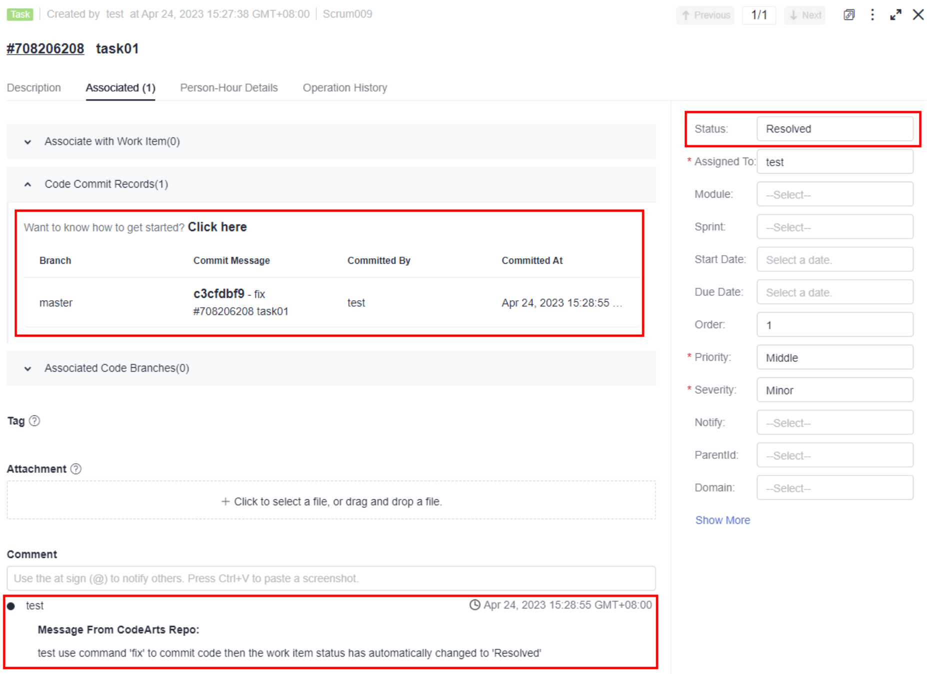
The command output varies depending on the repository structure. If **100%** or **done** is displayed for all steps, the push is successful. Push failures are usually caused by invalid **keys**.



Step 8 Verify the association result.

Go to the work item list and locate the work item whose ID is 708206208 to view its details.

- The status is **Resolved**.
- An associated code commit record is added. You can click the commit ID to view the details.
- A comment is automatically generated to describe the work item association.



----End

Associating Work Items with Code Committed on the Console

Step 1 Go to the repository details page.

Step 2 **Create a file**, enter a commit message starting with **fix #708206209**, and set other parameters as required. The following figure shows an example.

NOTE

708206209 is the ID of **task02**.

Step 3 Click **OK**. The system performs the following operations on the CodeArts Repo repository:

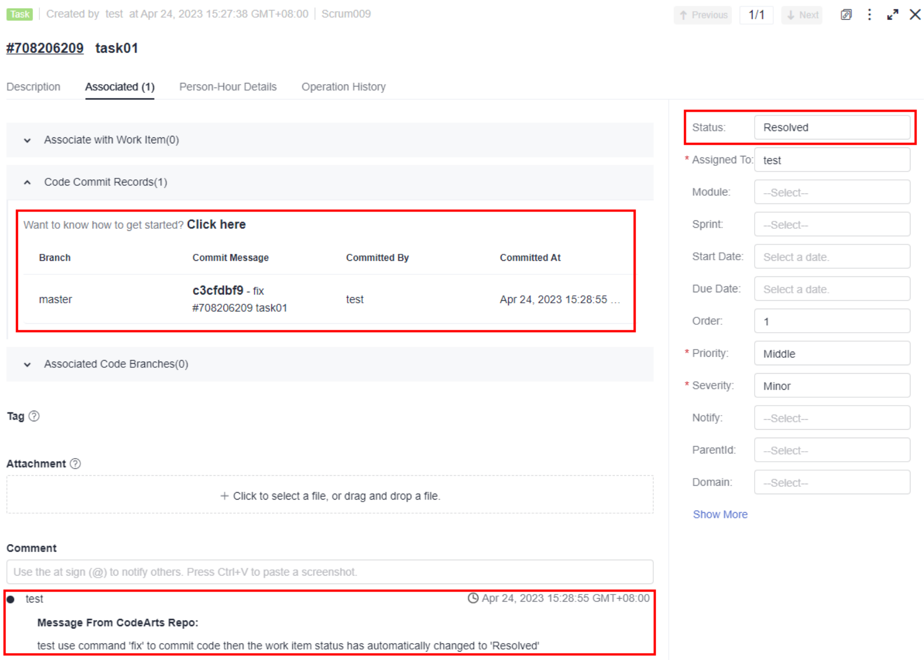
```
Writes content to the new file.
git add .
git commit -m "fix #708206209 Task02"
```

That is, the system commits the new file and associates it with the **task02** work item using the **fix** keyword in the **-m** parameter.

Step 4 Verify the association.

View the **task02** work item.

- The status is **Resolved**.
- An associated code commit record is added. You can click the commit ID to view the details.
- A comment is automatically generated to describe the work item association.



----End

2.8.8 Viewing Repository Statistics

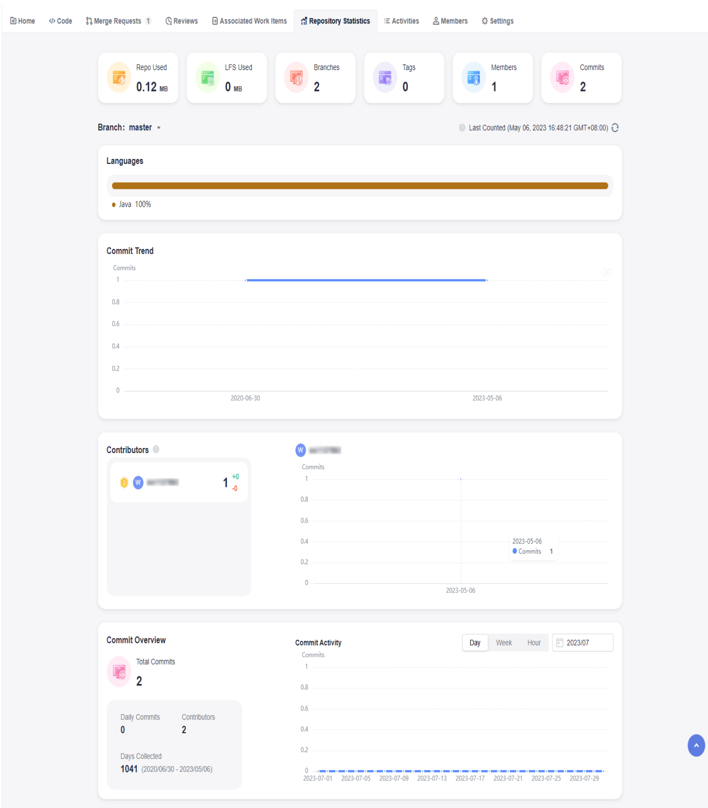
On the **Repository Statistics** tab page in the repository details, you can view the following repository statistics:

- Repository summary: Displays the Git repository capacity, **LFS** capacity, and the number of branches, tags, repository members, and commits. You can select a branch, and the statistical scope of commit trend, contributors, and commit overview will be changed, but the repository summary will not be affected.
- Languages: displays the distribution of each language in the current branch of the repository.
- Commit trend: displays the commit distribution of a branch in the repository.
- Contributors: collects statistics on the contribution of code committers in a branch (number of commits and number of code lines).

- Commit overview: collects statistics on code commits by different dimensions (weekly, daily, and hourly).

NOTE

- The repository administrator can trigger code contribution statistics and language ratio statistics.
- Due to resource restrictions, statistics can be collected for each repository three times a day.
- Each user can collect statistics for 500 times a day.
- After the statistics are complete, the number of added and deleted code lines of each user is displayed before the deadline.
- Commits (an operation that combines two or more historical development records) of the merge node are not counted.



2.8.9 Viewing Activities

Access a repository and click the **Activities** tab page to view all activities of the current repository.

- **All**: This tab displays all operation records of the repository.
- **Push**: displays all push operation records of the repository, such as code push and branch creation and deletion.
- **Merge Request**: displays the operation records of all merge requests in the repository. You can click the sequence number of a merge request to view details, such as creating, closing, re-opening, and merging a merge request.
- **Review**: This tab displays all review comments of the repository. You can click the commit nID to view details such as adding or deleting comments.

- **Member**: displays the management records of all members in the repository, for example, adding or removing members and editing member permissions.

NOTE

- The displayed information includes the operator, operation content, and operation time.
- You can specify search criteria, such as the time range and operator, to filter and query data.

2.8.10 Managing Repository Members

2.8.10.1 IAM Users, Project Members, and Repository Members

Repository members come from project members of the project to which the repository belongs. Project members mainly come from IAM users of tenants. In addition to the tenant to which the project creator belongs, IAM accounts of other tenants can be invited to join the project. The following figure shows the relationships between IAM users, project members, and repository members.

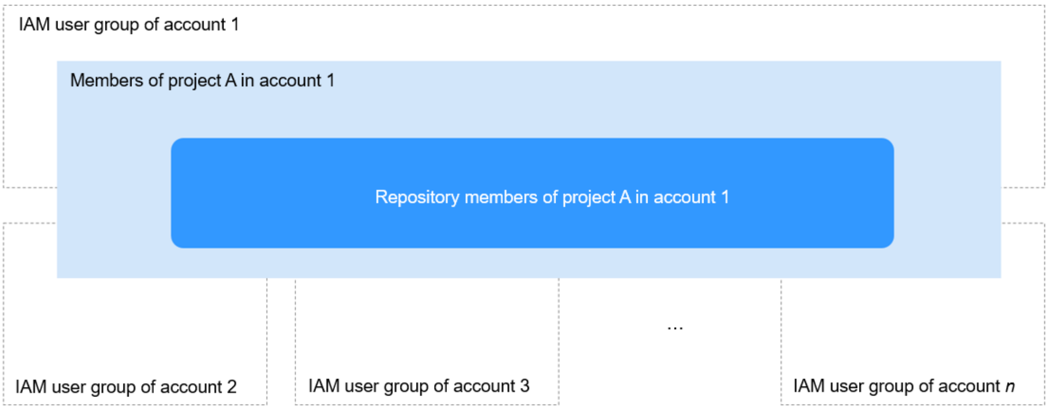


Table 2-11 Mapping between project roles and repository roles

Project Role	Repository Role
Project manager	Administrator
Developer	Developer
Test manager	Viewer
Tester	
Participant	
Viewer	
O&M manager	
Custom role	The repository role can be set as a committer, developer, or viewer by a project creator.

2.8.10.2 Configuring Member Management

You can manage repository members on the **Members** tab page. Only the repository creator (owner) and administrator can manage repository members. Other members can only view the repository member list. The following procedure shows how to configure member management.

NOTE

Currently, CodeArts Repo only allows you to import project members as repository members. For details about how to add project members or modify project member roles, see **Member Management**.

Automatically Synchronizing Project Members to the Repository

Configure **Member Role Synchronization** to synchronize project roles to the repository. For details about the synchronization policies, see **Table 2-12**.

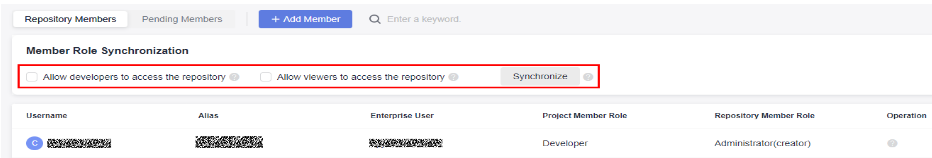


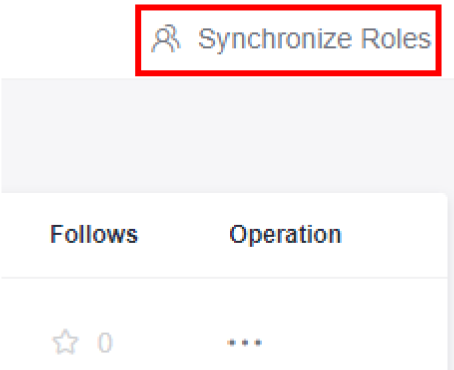
Table 2-12 Member role synchronization

Item	Project Role	Repository Role	Allowed Operation
——	Project manager	Administrator	——
Allow developers to access the repository	User-defined project role (Committer permission)	Committer	• Set the role as a committer. • Set the role as a developer • Set the role as a viewer. • Remove the member.
	Developer	Developer	• Set the role as an administrator. • Set the role as a committer. • Set the role as a viewer. • Remove the member.
	Custom role (developer permission)		• Set the role as a developer • Set the role as a viewer. • Remove the member.
Allow viewers to access the repository	Test manager	Viewer	Remove the member.
	Tester		

Item	Project Role	Repository Role	Allowed Operation
	Participant		
	Viewer		
	Custom role (viewer permission)		

NOTE

- By default, a project manager is the repository administrator. If you want to move the project manager out of the repository, you need to adjust the role of the project manager in the project settings.
- If you select a policy in **Member Role Synchronization**, related users added to the project are automatically synchronized to the repository.
- If you deselect policies in **Member Role Synchronization** and click **Synchronize**, related members will be removed immediately.
- On the repository list page, you can select **Synchronize Roles** to modify the repository role mapped from a custom project role as a project creator.



Manually Adding Project Members to the Repository

NOTICE

Manually configured repository members will be overwritten by **Automatically Synchronizing Project Members to the Repository**. You are advised to use either of the two functions.

Click **Add Member**. On the displayed dialog box, select a member from the member list of the corresponding project and add the member to the repository. A **default repository role** is assigned to the member based on the project role. For details about the role mapping, see the following table.

Table 2-13 Mapping between project roles and repository roles

Project Role	Repository Role	Allowed Operation
Project manager	Administrator (default)	• Set the role as a committer. • Set the role as a developer.
	Developer	• Set the role as an administrator. • Set the role as a committer. • Remove the member.
Developer	Administrator	• Set the role as a committer. • Set the role as a developer.
	Developer (default)	• Set the role as an administrator. • Set the role as a committer. • Set the role as a viewer. • Remove the member.
	Viewer	• Set the role as a committer. • Set the role as a developer. • Remove the member.
Test manager	Viewer (default)	Remove the member.
Tester		
Participant		
Viewer		
O&M manager		
Custom role	Committer	• Set the role as a committer. • Set the role as a developer. • Set the role as a viewer. • Remove the member.
	Developer	• Set the role as a developer. • Set the role as a viewer. • Remove the member.
	Viewer (default)	Remove the member.

NOTE

If the project-level member list is empty, the project does not have members other than the repository creator. Add project members.

2.8.10.3 Repository Member Permissions

Repository Creation Permission

Table 2-14 Repository creation permission of project roles

Operation	Project Manager	Developer	Others
Create repositories	√	√	-

Repository Operation and Viewing Permission

Type	Operation	Creator	Administrator	Committer	Developer	Viewer (Repository Member)	Remarks
Code	Access code online	√	√	√	√	√	-
	Edit code online	√	√	√	√	×	If a protected branch is set, permissions of this protected branch are used instead.
	Download code online	√	√	√	√	√	-
	Local code clone	√	√	√	√	√	-
	Local code push	√	√	√	√	×	If a protected branch is set, permissions of this protected branch are used instead.

Type	Operation	Creator	Administrator	Committer	Developer	Viewer (Repository Member)	Remarks
Fork	Fork a project	√	√	√	√	√	When you select a project for the Fork repository, only the projects for which you have the project-level developer permission or higher are displayed.
Members	Add a member	√	√	×	×	×	-
	Edit a member	√	√	×	×	×	-
	Remove a member	√	√	×	×	×	-
	Approve a member	√	√	×	×	×	-
	View a member	√	√	√	√	√	-
MR	Create an MR	√	√	√	√	×	-
	View an MR	√	√	√	√	√	-

Type	Operation	Creator	Administrator	Committer	Developer	Viewer (Repository Member)	Remarks
	Merge an MR	√	√	√	×	×	1. If a protected branch is set, permissions of this protected branch are used instead. 2. Developers cannot merge MRs by default. MRs can be merged by developers only when the target branch is set as a protected branch and developers have MR permissions.
	Edit an MR (Open)	√	√	√	×	×	1. The MR creator can perform this operation, but the MR creator must be a developer or role with higher permissions. 2. The √ role can operate all MRs, including MRs created by others and MRs created by yourself.
	Close an MR	√	√	√	×	×	
	Re-open an MR	√	√	√	×	×	
	Edit a merged MR (Merged)	×	×	×	×	×	-

Type	Operation	Creator	Administrator	Committer	Developer	Viewer (Repository Member)	Remarks
	Cherry-pick an MR (generate an MR)	√	√	√	√	×	A temporary branch containing **cherry-pick** is automatically generated. The cherry pick operation fails in the following scenarios: 1. If all branches are protected branches and the operator does not have the permission to create a branch (push), the operation fails. 2. If the branch policy is configured and the temporary branch does not meet the policy, the operation fails.
	Revert an MR (generate an MR)	√	√	√	√	×	A temporary branch containing **revert** is automatically generated. The revert operation fails in the following scenarios: 1. If all branches are protected branches and the operator does not have the permission to create a branch (push), the operation fails. 2. If the branch policy is configured and the temporary branch does not meet the policy, the operation fails.

Type	Operation	Creator	Administrator	Committer	Developer	Viewer (Repository Member)	Remarks
	Cherry-pick an MR (No MR is generated, and new code is directly merged into the related branch.)	√	√	√	√	×	If a protected branch is set, permissions of this protected branch are used instead.
	Revert MR (No MR is generated, and new code is directly merged into the related branch.)	√	√	√	√	×	

Type	Operation	Creator	Administrator	Committer	Developer	Viewer (Repository Member)	Remarks
	Delete the source branch	√	√	√	√	×	1. The source branch can be deleted only when MR is performed between repository branches and the source branch is not protected. 2. If the Fork repository has committed an MR to the source repository, the source branch of the source repository cannot be deleted. 3. A protected source branch cannot be deleted.
	Vote scoring in the scoring mechanism	√	√	√	√	√	1. All repository members can score the MR even if they are not configured as scorers of this MR. 2. By default, developers and roles with lower permissions can score from -1 to 1, and committers and roles with higher permissions can score from -2 to 2.
	Review in the approval mechanism	√	√	√	√	√	Only MR reviewers can review the MR.
	Approve in the approval mechanism	√	√	√	×	×	Only MR approvers and √ roles can review MRs.

Type	Operation	Creator	Administrator	Committer	Developer	Viewer (Repository Member)	Remarks
	Delete an MR	×	×	×	×	×	No one can delete an MR.
Score	Score	√	√	√	√	×	The repository configuration prevails: 1. If **Developers and above** is selected, developers or users with higher permissions can give a score. 2. If **Committers and above** is selected, committer or or users with higher permissions can give a score.
Reviews	Add a review	√	√	√	√	√	You can add a review for which you have permission to view MR.
	Edit a review	×	×	×	×	×	Only reviewers can edit their reviews.
	Delete a review	×	×	×	×	×	
	Reply a review	√	√	√	√	√	You can reply a review for which you have permission to view.
	View a review	√	√	√	√	√	You can view all reviews for which you have permission to view MR.

Type	Operation	Creator	Administrator	Committer	Developer	Viewer (Repository Member)	Remarks
	Resolve a review	√	√	√	×	×	1. When the severity of review is suggestion: MR creator, reviewer, committer, and roles with higher permission can operate. 2. When the severity of review is minor, major or fatal: Reviewer, committer, and roles with higher permission can operate, but the MR creator (Even if with supported roles) cannot operate.
Pipeline	Trigger an MR pipeline	√	√	√	√	×	The pipeline execution plan is enabled.
Branches	Create a branch	√	√	√	√	×	1. If **Developers cannot create branches** is selected, this operation cannot be performed. 2. If **Committers cannot create branches** is selected, this operation cannot be performed.
	Edit a branch	√	√	√	√	×	
	Delete a branch	√	√	√	√	×	A protected branch cannot be deleted by any user.
	View a branch	√	√	√	√	√	-
Tag	Create a tag	√	√	√	√	×	If **Developers cannot create tags** is selected, this operation cannot be performed.

Type	Operation	Creator	Administrator	Committer	Developer	Viewer (Repository Member)	Remarks
	Delete a tag	√	√	×	×	×	A protected tag cannot be deleted by any user.
	View a tag	√	√	√	√	√	-
Settings	View settings	√	√	×	×	×	-
	Edit settings	√	√	×	×	×	-
	Rename a repository	√	×	×	×	×	-
	Transfer repository ownership	√	×	×	×	×	-
Repository	Create a repository	√	√	√	√	×	-
	Delete a repository	√	√	×	×	×	-
	Display a repository	√	√	√	√	√	The repository is displayed for all repository members.
Activities	View updates	√	√	√	√	√	-

Type	Operation	Creator	Administrator	Committer	Developer	Viewer (Repository Member)	Remarks
Associated work items	View associated work items	√	√	√	√	√	-
Home	View home	√	√	√	√	√	-
Repository statistics	View the statistics	√	√	√	√	√	-
	Update the statistics	√	√	√	√	×	-
SSH and HTTP settings	View and edit	√	√	√	√	√	-
IP address whitelist	View and edit	×	×	×	×	×	The administrator can view and edit the information.

NOTE

For details about how to set a protected branch policy, see **Protected Branches**.

2.9 Configuring CodeArts Repo

2.9.1 General Settings

2.9.1.1 Repository Information

To view and modify the repository information, choose **Settings > General Settings > Repository Information** on the repository details page.

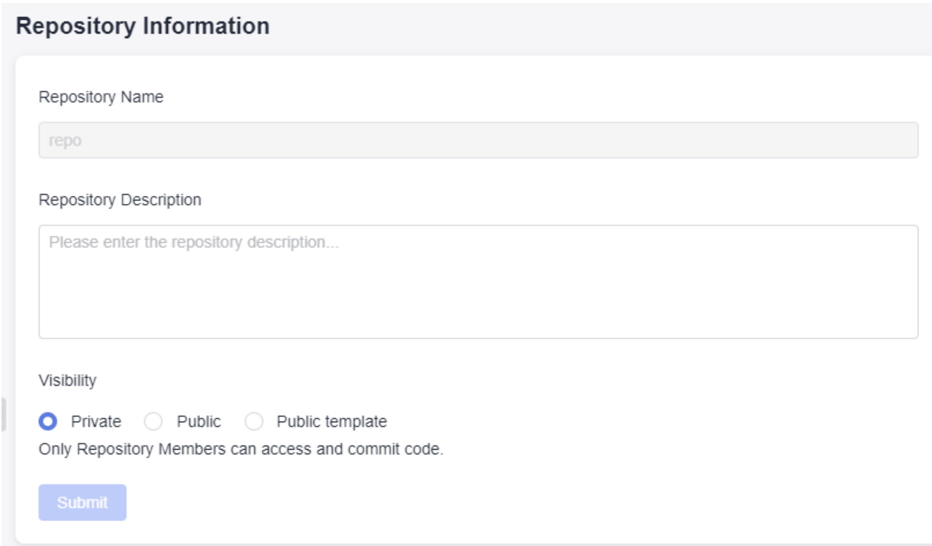
The settings take effect only for the repository configured.

Only repository administrators and owners can view this tab page and configure webhooks.

Repository Description: remarks field when the template is open-source (public example template). It is used to facilitate search.

Visibility

- **Private**: Only repository members can access and commit code.
- **Public**: Read-only for visitors and hidden from repo lists and search results.
- **Public template**: The repository will be shared as a template in the whole site. **Template Title** and **Author** are mandatory



2.9.1.2 Notifications

CodeArts Repo Notifications

To set notifications, choose **Settings > General Settings > Notifications** on the repository details page.

The settings take effect only for the repository configured.

Only the repository administrators and owners can view this tab page and configure notifications.

NOTE

If all notification types in the notification settings are disabled, the system sends an email notification to the creator or administrator by default when you perform the following operations:

- When a repository is created, an email notification is sent to the creator or administrator by default.
- When a non-repository member applies to join a repository, an email notification is sent to the creator by default.
- When a repository is frozen or closed, an email notification is sent to the creator or administrator by default.

- **Delete a repository**: You can manually configure the system to send email notifications to the repository owner, administrator, committer, developer, and viewer.
- **Capacity warning**: By default, this parameter is not enabled. You can manually set the capacity warning threshold as required. When the capacity of a single repository exceeds the threshold, the system emails the repository owner, administrators, committers, and developers. The warning email is sent only once unless you update the warning settings.
- **Open a merge request**: Pushed states of the merge request (including create and re-open) to specified roles by email. By default, email notification is disabled. You can enable it to send email notifications to scorers, approvers, reviewers, and mergers.
- **Update a merge request**: Pushes code updates of the branch associated with the merge request to specified roles by email. By default, the email notification is disabled. You can enable it to send email notifications to scorers, approvers, or reviewers.
- **Merge a request**: By default, an email notification is sent to the MR creator. You can determine whether to also send an email notification to the merger.
- **Review a merge request**: By default, an email notification is sent to the MR creator. You can also disable the notification.
- **Approve a merge request**: By default, an email notification is sent to the MR creator. You can manually set not to send the notification.
- **Create a review comment**: By default, an email notification is sent to the MR creator. You can also disable the notification.
- **Resolve a review comment**: By default, an email notification will be sent to the MR creator. You can manually set not to send the notification.

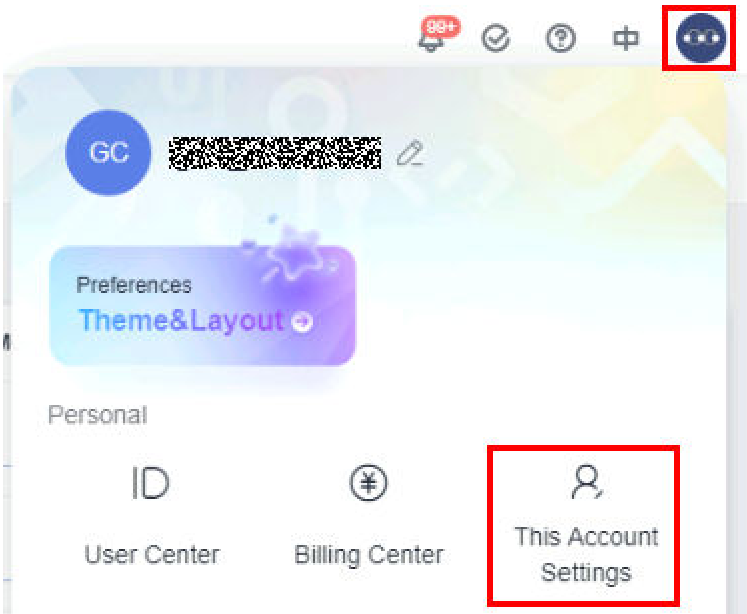
NOTE

If no email notification is received, go to **Notifications** to check whether the email and email notifications are enabled.

If you want to know repository changes in other ways than emails, you can choose **Service Integration** > **Webhooks** and customize notifications in your own system (third-party system).

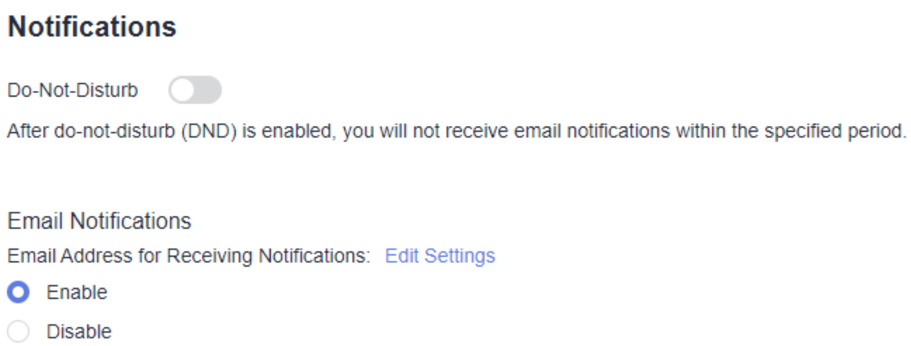
Configuring Messages for CodeArts

CodeArts provides configurable notifications. On the CodeArts homepage, click your username in the upper right corner. In the dialog box that is displayed, click **This Account Settings** to configure notifications.



Choose **General Settings> Notifications**. Enable or disable and email notifications, and change the email address for receiving notifications.

You can also set a Do-Not-Disturb (DND) period so that you will not receive email notifications within the specified period.



2.9.2 Repository Management

2.9.2.1 Repositories

To configure repository settings, you can choose **Settings > Repository Management > Repository Settings** on the repository details page.

The default branch is the branch selected by default when you enter the current repository and is also the default target branch when you create a merge request (MR). When a repository is created, the master branch is used as the default branch and can be manually adjusted at any time.

The settings take effect only for the repository configured.

Only the repository administrator and repository owner can view this page and have the setting permission. After the setting is complete, you can click **Commits** for the setting to take effect.

Table 2-15 Parameter description

<table>
<tr><th>Parameter</th><th>Description</th></tr>
<tr><td>Do not fork a repo.</td><td>This parameter is not selected by default. If this parameter is selected, all users cannot fork the repository.</td></tr>
<tr><td>Developers cannot create branches.</td><td>This parameter is not selected by default. If this parameter is selected, the developer role cannot create branches.
NOTE
A whitelist can be set to prevent developers who are not in the whitelist from creating branches.</td></tr>
<tr><td>Developers cannot create tags.</td><td>This parameter is not selected by default. If this parameter is selected, the developer role cannot create tags.</td></tr>
<tr><td>Committers cannot create branches</td><td>This parameter is not selected by default. If this parameter is selected, the committer role cannot create branches.</td></tr>
<tr><td>Pre-merge</td><td>By default, this option is not selected. After this option is selected, the server automatically generates MR pre-merging code. Compared with running commands on the client, this operation is more efficient and simple, and the build result is more accurate. This option applies to scenarios that have strict requirements on real-time build.</td></tr>
<tr><td>Branch name rule</td><td>● The value cannot exceed 200 bytes.
● The name cannot start with -, refs/heads/, or refs/remotes/, and cannot contain spaces or special characters such as brackets ([), backward slashes (\), angle brackets (<), tildes (~), circumflexes (^), colons (:), question marks (?), asterisks (*), exclamation marks (!), parentheses (()) , single quotation marks ('), quotation marks ("), and vertical bars (|). It cannot end with ./ or .lock.
● The name of a new branch cannot be the same as that of an existing branch or tag.</td></tr>
<tr><td>Tag name rule</td><td>● The value cannot exceed 200 bytes.
● The name cannot start with -, refs/heads/, or refs/remotes/, and cannot contain spaces or special characters such as brackets ([), backward slashes (\), angle brackets (<), tildes (~), circumflexes (^), colons (:), question marks (?), asterisks (*), exclamation marks (!), parentheses (()) , single quotation marks ('), quotation marks ("), and vertical bars (|). It cannot end with ./ or .lock.
● The name of a new tag cannot be the same as that of an existing branch or tag.</td></tr>
</table>

NOTE

- Byte: a group of adjacent binary digits. It is an important data unit of computers and is usually represented by B. 1 B = 8 bits.
- Character: a letter, digit, or another symbol that represents data and information.

Configuring MR Pre-combination

After an MR is created, you can customize the scripts for downloading plug-ins such as WebHook and CodeArts Pipeline. That is, you can control the downloaded code content.

- If you select **MR Pre-merge**, the server will generate a hidden branch, indicating that the MR code has been merged. You can directly download the code that already exists in the hidden branch.
- If **MR Pre-merge** is not selected, you need to perform pre-merge on the client. That is, download the code of the MR source branch and MR target branch and perform pre-merge on the build executor.

Command

The pre-merge command on the server is as follows:

```
git init
git remote add origin ${repo_url clone/download address}
git fetch origin +refs/merge-requests/${repo_MR_iid}/merge:refs/${repo_MR_iid}merge
```

If this option is not selected, you can perform the pre-merge operation on the client and create a clean working directory on the local host. The command is as follows:

```
git init
git remote add origin ${repo_url clone/download address}
git fetch origin +refs/heads/${repoTargetBranch}:refs/remotes/origin/${repoTargetBranch}
git checkout ${repoTargetBranch}
git fetch origin +refs/merge-requests/${repo_MR_iid}/head:refs/remotes/origin/${repo_MR_iid}/head
git merge refs/remotes/origin/${repo_MR_iid}/head --no-edit
```

Advantages

In scenarios that have high requirements on real-time build, for example, one MR may start the build of dozens or hundreds of servers, and the pre-merging result generated by the local or client may be inconsistent with that generated by the server. As a result, the build code cannot be obtained accurately and the build result is inaccurate. Pre-merging on the server can solve this problem in real time. In addition, the script building command is simpler, and developers or CIEs can better use it.

2.9.2.2 Space Freeing

To enable space freeing, you can choose **Settings > Repository Management > Space Freeing** on the repository details page.

With space freeing, you can free up storage space to increase the read and write speed for the current repository by running background clean-up tasks, including compressing files and removing unused objects. Space freeing is similar to the garbage collect (gc) function in Git.

Only the repository administrators and owners can view this tab page and configure space freeing.

NOTE

It is recommended that you perform this operation once every month.

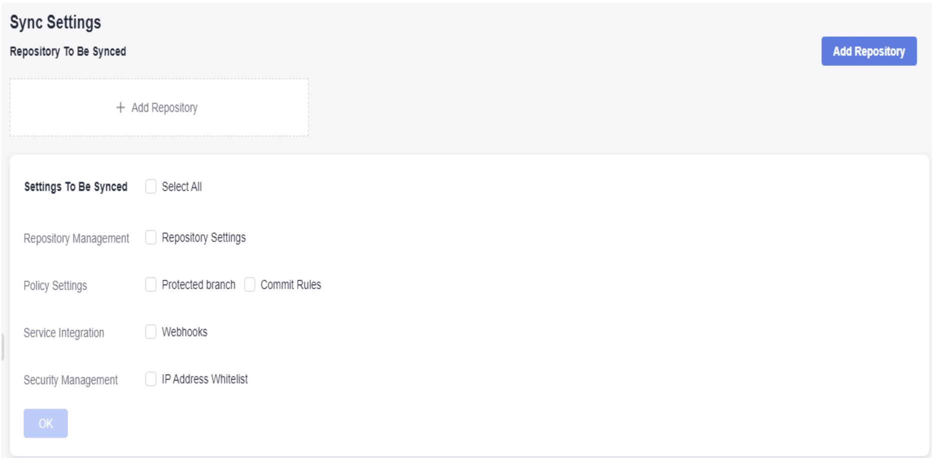
2.9.2.3 Synchronization

To configure repository settings, you can choose **Settings** > **Repository Management** > **Sync Settings** on the repository details page.

This function is used to synchronize the customized settings of the current repository to other repositories. This function supports cross-project synchronization but does not support cross-region synchronization.

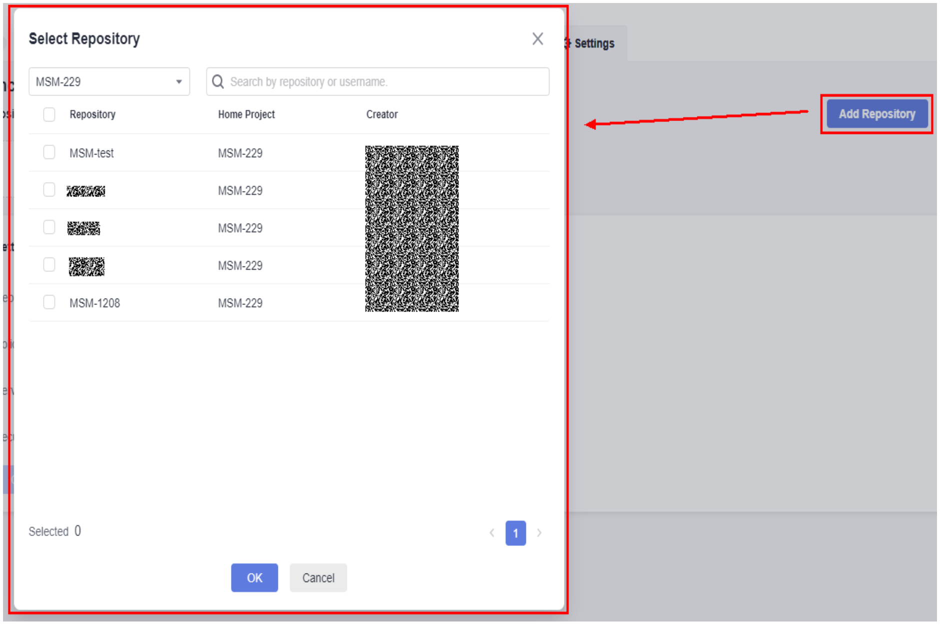
This function is used for a repository forked based on the repository because the settings are not automatically copied during forking. For details, see **Forking a Repository**

Only the repository administrators and owners can view this tab page and configure copy repository settings.



Adding a Synchronization Repository

Step 1 Click **Add Repository**. In the dialog box that is displayed, select the target repository.



Step 2 Click **OK**. The repository synchronization is complete.

----End

NOTE

Common Failure Causes

- Failed to synchronize **Commit Rules**: No commit rules are set for the source repository.
- Failed to synchronize protected branches: The branch names of the source repository and target repository are different.

2.9.2.4 Submodules

Background

A submodule is a Git tool used to manage shared repositories. It allows you to embed a shared repository as a subdirectory in a repository. You can isolate and reuse repositories, and pull latest changes from or push commits to shared repositories.

You may want to use project B (a third party repository, or a repository developed by yourself for multiple parent projects) in project A, and use them as two separate projects. Submodules allow you to clone a Git repository as a subdirectory into another Git repository while keeping commits separate.

The submodules are recorded in a file named **.gitmodules**, which records the information about the submodules.

```
[submodule "module_name"] # Submodule name
path = file_path # File path of the submodule in the current repository (parent repository).
url = repo_url # Remote repository IP address of the submodule (sub-repository).
```

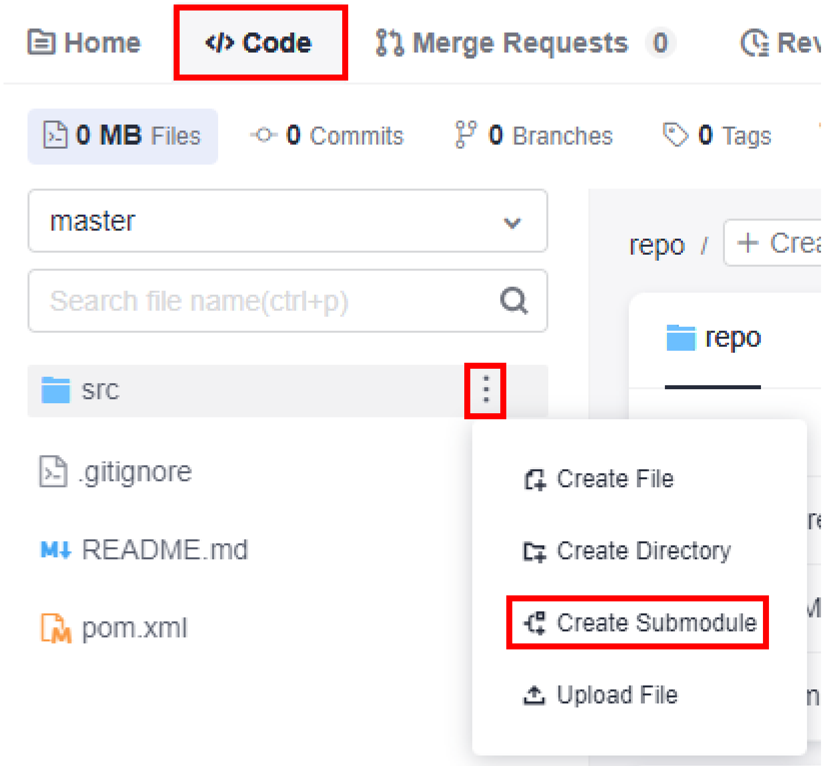
In this case, the source code in the **file_path** directory is obtained from **repo_url**.

Using the Console

- **Creating a submodule**
  - **Entry 1**:

    You can add a submodule to a folder in the repository file list.

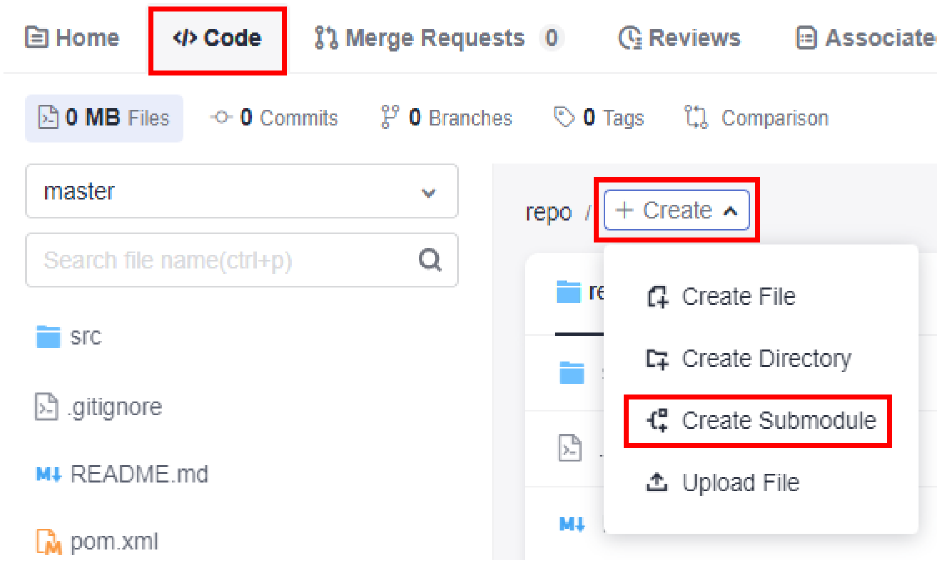
    Click and select **Create Submodule**, as shown in the following figure.

  - **Entry 2**

    You can create a submodule on the **Code** tab page

    Click  and select **Create Submodule**, as shown in the following figure.



– **Entry 3:**

You can create a submodule in the repository settings.

Choose **Settings** > **Repository Management** > **Submodules** > **Create Submodule**.

– **Remarks:**

You can use one of the preceding methods to **create a submodule**.

Configure the following parameters and click **OK**.

Table 2-16 Parameters of creating a sub-repository

Parameter	Description
Submodule	Select a repository as the submodule.
Submodule Branch	Select the target branch of the submodule to be synchronized to the parent repository.
Submodule Path	The storage path of the sub-repository in the parent repository. Use slashes (/) to separate levels.
Details	Remarks for creating a submodule. You can find the operation in the file history. The value contains a maximum of 2000 characters.

NOTE

After the creation is complete, you can find the submodule (sub-repository) in the corresponding directory of the repository file list. The icon on the left of the corresponding file is .

- **Viewing, synchronizing, and deleting a submodule**
  Choose **Settings > Repository Management > Submodules**. On the displayed page, repository administrators can view, synchronize, and delete submodules.
- **Synchronizing deploy keys**
  If a submodule is added on the Git client, the repository administrator needs to synchronize the deploy key of the parent repository to the submodule on the **Settings > Repository Management > Submodules** page. In this way, the submodule can also be pulled during the build of the parent repository.

Using the Git Client

Step 1 **Add a submodule**.

```
git submodule add <repo> [<dir>] [-b <branch>] [<path>]
```

Example:

```
git submodule add git@***.***.com:****/WEB-INF.git
```

Step 2 **Pulling a repository that contains a submodule**

```
git clone <repo> [<dir>] --recursive
```

Example:

```
git clone git@***.***.com:****/WEB-INF.git --recursive
```

Step 3 **Update a submodule based on the latest remote commit**

```
git submodule update --remote
```

Step 4 **Push updates to a submodule.**

```
git push --recurse-submodules=check
```

Step 5 **Delete a submodule**.

1. Delete the entry of a submodule from the **.gitsubmodule** file.
2. Delete the entry of a submodule from the **.git/config** file.
3. Run the following command to delete the folder of the submodule.

```
git rm --cached {submodule_path} # Replace {submodule_path} with your submodule path.
```

NOTE

Omit the slash (/) at the end of the path.

For example, if your submodule is stored in the **src/main/webapp/WEB-INF/** directory, run the following command:

```
git rm --cached src/main/webapp/WEB-INF
```

----End

2.9.2.5 Repository Backup

To configure remote backup, choose **Settings** > **Repository Management** > **Repository Backup** on the repository details page.

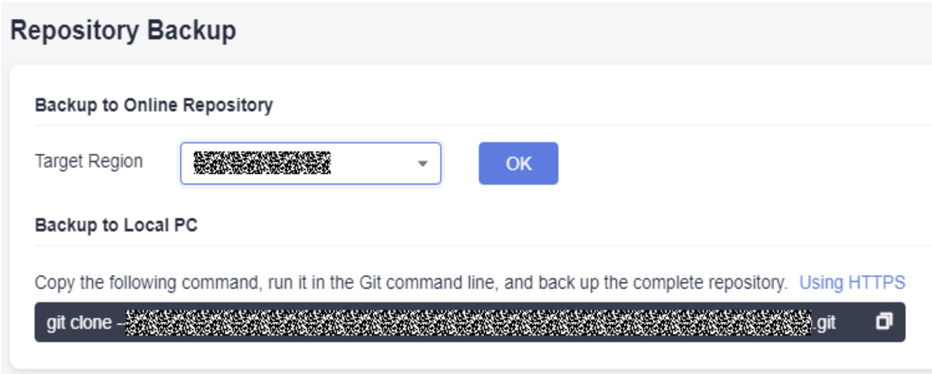
The repository can be backed up in either of the following modes:

- **Backup to Online Repository**: Back up the repository to another region.
  This mode imports a repository from a region to another region. For details, see **Importing an External Repository**.

- **Backup to Local PC**: Back up the repository to your local PC.

  You can use the HTTPS or SSH clone mode. The clone command is generated as shown in the following figure. You only need to paste the command to the local Git client and run it. (Ensure the repository connectivity.)

  Only the repository administrators and owners can view this tab page and have permissions.



2.9.2.6 Repository Synchronization

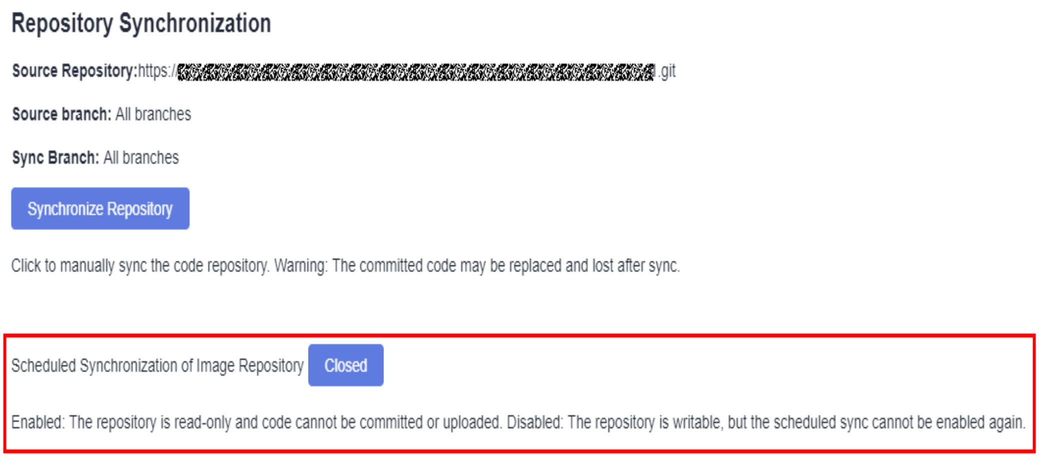
The **Repository Synchronization** option is available only for repositories created by **Importing an External Repository**.

To synchronize a repository, choose **Settings > Repository Management > Sync Settings** on the repository details page.

Only repository administrators and owners can view this tab page and configure the function.

You can click **Synchronize Repository** to resynchronize the default branch of the source repository. If you have selected **Schedule sync into repo** before importing external repositories, the **Synchronize Repository** switch is displayed on the **Repository Synchronization** tab page, as shown in the following figure.

- When the **Scheduled Synchronization of Image Repository** function is enabled, the image repository is read-only for you and code cannot be submitted or uploaded. The image repository refreshes content every hour to synchronize code generated 24 hours ago. For example, if you modify the default branch of the source repository at 10:00 today, the modified content will be synchronized to the image repository at 10:00 tomorrow.
- If you disable the **Scheduled Synchronization of Image Repository** function, you can edit the image repository. This function is removed from the page and cannot be restored.



NOTICE

- The image repository takes effect only on the default branch. To update code of other branches, manually change the default branch following instructions in **Repository Settings**.
- If the content of the source repository is synchronized to the current repository, the code submitted by the current repository may be overwritten. As a result, the code is lost.

2.9.3 Policy Settings

2.9.3.1 Protected Branches

To configure protected branches, you can choose **Settings** > **Policy Settings** > **Protected Branches** on the repository details page.

The settings take effect only for the repository configured.

Only the repository administrators and owners can view this tab page and configure protected branches.

Functions of Protected Branches

- Ensure branch security and allow developers to use MRs to merge code.
- Prevent non-administrators from pushing codes.
- Prevent all forcibly push to this branch.
- Prevent anyone from deleting this branch.

NOTE

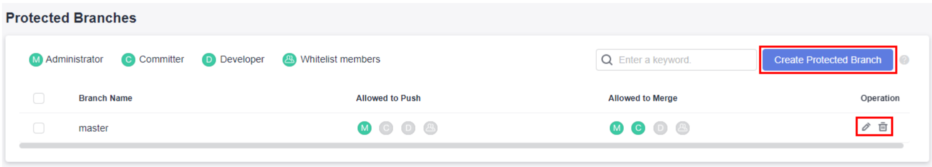
When you create a repository, the repository automatically sets the default branch (generally master) as the protection branch to ensure repository security.

After you set a protected branch, the protected branch cannot be used as the target branch for code merging.

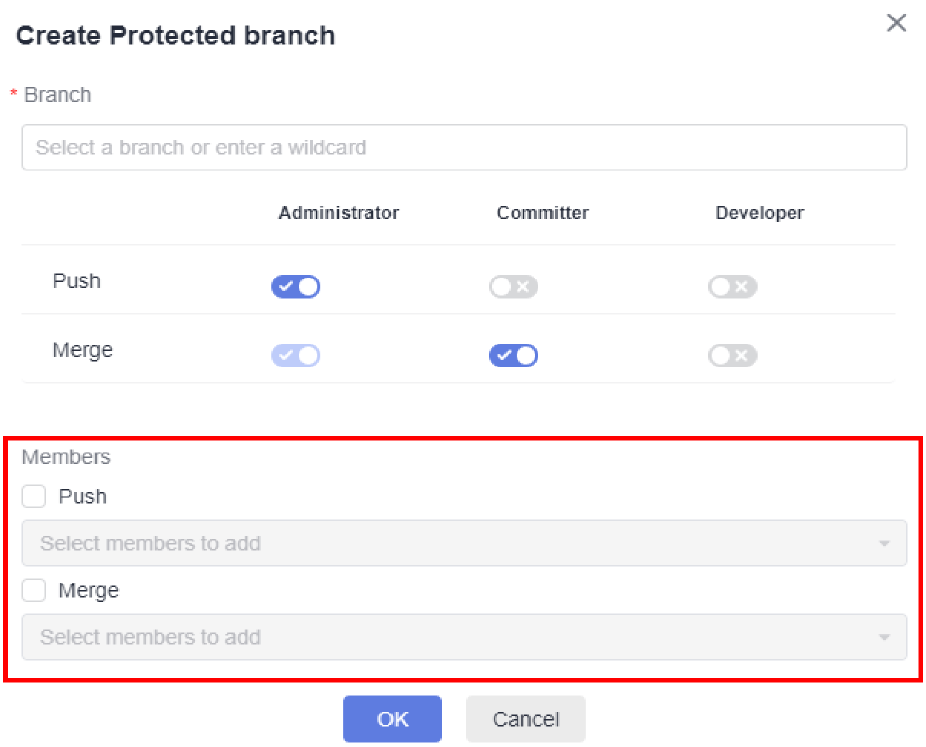
Editing Protected Branches

You can set a protected branch. The procedure is as follows:

- Click **Create Protected Branch**. In the **Added Protected Branch** dialog box, select a branch from the drop-down list or manually enter a branch name or wildcard character, select the corresponding permissions or assign permissions to users, and click **OK**.
- Click to modify the configuration of the protected branch.
- Click to delete the protected branch.



- Configure the whitelist: To assign permissions to one or more members of an unauthorized role, you can select **Push** and **Merge** under **Members** and click the drop-down list to add the members to the trustlist.



NOTE

- Only developers and users with permissions higher than developers have the **Can push** and **Can merge** permissions.
- If **Administrator**, **Committer**, and **Developer** are selected for **Can push**, all these roles have the permissions. In this case, you do not need to select **Can push** or **Can merge** under **Members**.
- You can create, edit, and delete protected branches in batches.

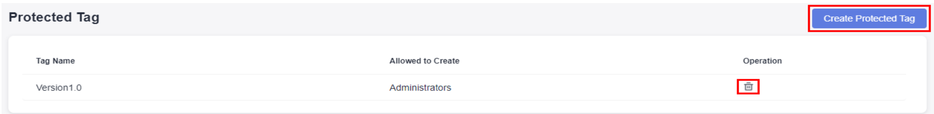
2.9.3.2 Protected Tags

To configure protected tags, you can choose **Settings** > **Policy Settings** > **Protected Tags** on the repository details page.

Only the repository administrators and owners can view this tab page and configure protected tags.

You can set protected tags to prevent production tags or important tags from being deleted. The procedure is as follows:

Click **Create Protected Tag**. In the **Added Protected Tags** dialog box, select a tag from the **To be protect tag** drop-down list or create a wildcard, select **No one**, **Developers + Committer + Maintainers**, or **Maintainers** from the **Allowed to create** drop-down list, and click **OK**.



NOTE

- When a developer, committer and administrator, or administrator is allowed to create protected tags, or other members cannot create or delete the tags. If no one can create protected tags, all members cannot create or delete the tags.
- Click to delete protected tags.

2.9.3.3 Commit Rules

To configure commit rules, you can choose **Settings** > **Policy Settings** > **Commit Rules** on the repository details page.

On the **Commit Rules** page, you can establish a series of code commit verification and restriction rules to ensure code quality. The settings take effect only for the configured repository.

Only the repository administrators and owners can view this tab page and configure code commit rules.

Table 2-17 Parameters on the Commit Rules page

Parameter	Description

Reject unsigned commits	Only signed commits can be pushed to the repository.
	CodeArts Repo signature mode:
	When performing online commit in CodeArts Repo, use the following format to compile and submit information:
	`commit message # Enter the customized submission information.`
	`# This is a blank line.`
	`Signed-off-by: User-defined signature # Enter the user-defined signature after Signed-off-by:`
	Git client signature mode:
	When running the commit command on the Git client, you need to add the -s parameter.
	git commit -s -m "<*your commit message*>"
	You need to **configure the signature and email address** on the client in advance.

Tags cannot be deleted	After this option is selected, tags cannot be deleted on the page or by running commands on the client.
Prevent committing secrets	Confidential files include **ssh_server_rsa**, **id_rsa**, and **id_dsa**. For details, see **Description of Confidential Files**.
Prevent **git push -f**	Indicates whether users can run the **git push -f** command on the client to push code. **git push -f** indicates that the current local code repository is pushed to and overwrites the code in CodeArts Repo. In general cases, you are not advised to use this command.

Creating a Commit Rule

The repository administrator and repository owner can create a commit rule for a branch of the repository. Only one commit rule can be set for each branch.

Table 2-18 Parameters

Parameter	Description
Rule Name	This parameter is mandatory. The value contains a maximum of 200 characters.
Branch	This parameter is mandatory. Select a branch from the drop-down list or create a regular expression. This field supports a maximum of 500 characters.

<table>
<tr><th>Parameter</th><th>Description</th></tr>
<tr><td>Commit rules</td><td>Parameters in this area are optional.

Commit Message: This parameter is left empty by default, indicating that the commit message is not verified, and any parameter can be committed. This field supports a maximum of 500 characters.
For example, you can set the format rule of the commit message as follows:
<code>TraceNo:((REQ[0-9]{1,9})|(DTS[0-9]{13}))(.|\n|.\n)Author:.*(.|\n|.\n)Description:.*</code>
The following is a commit message that complies with the rule:
<code>TraceNo:DTS20220801156688 Author:cwx1094057 Description:testpushfile</code>
The following is a commit message that does not comply with the rule:
<code>new files</code>
Negative Match: This parameter is left empty by default, indicating that the commit information is not verified, and any parameter can be committed. This field supports a maximum of 500 characters.
For example, you can set the format rule of the commit message as follows:
<code>TraceNo:((REQ[0-9]{1,9})|(DTS[0-9]{13}))(.|\n|.\n)Author:.*(.|\n|.\n)Description:.*</code>
Commit author: This parameter is left empty by default, indicating that the commit author is not verified, and any parameter can be committed. This field supports a maximum of 200 characters.
The commit author can run the git config -l command to view the value of user.name and run the git config --global user.name command to set the value of user.name.
Example:
<code>Rules for setting the commit author: ([a-z][A-Z]{3})([0-9]{1,9})</code>
Commit author's email: This parameter is left empty by default, indicating that the commit author email is not verified, and any parameter can be committed. This field supports a maximum of 200 characters.
The commit author can run the git config -l command to view the value of user.email and run the git config --global user.email command to set the email address.
Example:
<code>Rules for setting the email of the commit author: @huawei.com$</code>
</td></tr>
</table>

Parameter	Description
Basic Attributes	Parameters in this area are optional. ● **File Name That Cannot Be Committed**: This parameter is left empty by default, indicating that the file name is not verified, and any file can be committed. You are advised to use standard regular expressions to match the file name. By default, the file path is verified based on the file name rule. This field supports a maximum of 2000 characters. Example: `Set File Name That Cannot Be Committed: (\.jar|\.exe)$` ● **Each File Size (MB)**: The default value is **50**, indicating that the push is rejected if the size of the added or updated file exceeds 50 MB. The administrator can change the value from 0 to 200. **NOTE** When a repository is created, the maximum size of a single file in the default submission rule (default) is 200 MB. When a repository is created, the recommended maximum size of a single file in the default submission rule is 50 MB.
Binary Rules	Parameters in this area are optional. These parameters are not set by default, indicating that binary files can be uploaded. The size of a single file cannot exceed the upper limit. **Allow changes to binary files**, **Repo File Whitelist**, and **Privileged User** take effect only when **Do not allow new binary files** is selected. If you select **Allow changes to binary files**, binary files in modifiable state are not intercepted and can be directly uploaded. Binary files can be deleted without binary check. ● **Do not allow new binary files (privileged users excepted)** ● **Allow changes to binary files (privileged users excepted)** ● Binary file trustlist (files that can be directly imported to the database. This field supports a maximum of 2000 characters.) ● Privileged users (privileged users can directly push all binary files to the database. This field supports a maximum of 2000 characters.)
Effective Date	This parameter is optional. Before being pushed, all commitments created after the date specified by this parameter must match the hook settings. If this parameter is left empty, all commitments are checked regardless of the committing date.

NOTE

You are not advised to store binary files in CodeArts Repo. Otherwise, the performance and stability of the code repository will be affected.

2.9.3.4 Merge Requests

To configure MRs, you can choose **Settings** > **Policy Settings** > **Merge Requests** on the repository details page.

Merge Requests applies to merge MRs. MRs can be merged only when all configured MR conditions are met. You can select **Score** or **Approval** for **Merge Mechanism**.

The settings take effect only for the repository configured. Only the repository administrators and owners can view this tab page and configure MRs.

Merge Mechanism

- **Score**: Code review is included. Based on scoring, the minimum merging score can be set and the score ranges from 0 to 5. The code can be merged only when the score and mandatory review meet pass conditions. When selecting the scoring mechanism, you need to set the minimum score.
- **Approval**: Code review and merge approval are included. Code can be merged only after the number of reviewers reaches gate requirements. You are advised to configure branch policies when you select the approval mechanism.

NOTE

By default, **Approval** is used. You can manually switch to **Score**.

After the merge mechanism is switched, the workflows of the MRs are changed. However, the early created MRs retain the previous merge mechanism.

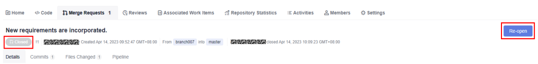
Merge Conditions

Table 2-19 Parameters

Parameter	Description
Merge after all reviews are resolved.	After this parameter is selected, if **Must resolve** is selected as the review comment, a message **Review comment gate: failed** is displayed and the **Merge** button is unavailable. If it is a common review comment, the **Resolved** button does not exist, the MR is not intercepted by the merge condition.
Must be associated with CodeArts Req	• **Associate only one ticket number**: If this parameter is selected, one MR can be associated with only one ticket number. • **All E2E ticket numbers pass verification**: If this parameter is selected, all associated E2E ticket numbers must pass the verification. • **Branches to configure the MR policy**: Multiple branches can be added. You can manually enter wildcard characters and press. Press **Enter**, for example, ***-stable or production/***.

MR Settings

Table 2-20 Parameters

Parameter	Description
Do not merge your own requests	After this parameter is selected, the **Merge** button is unavailable when you view the MRs created by yourself. You need to ask the person who has the permission to merge the MRs.
A repo administrator can forcibly merge code	The project creator and administrator roles have the permission to forcibly merge MRs. If the merging conditions are not met, these roles can click **Force Merge** to merge MRs.
Continue with code review and comment after requests are merged	After this parameter is selected, you can continue to review and comment on the code that has been merged the MR.
Mark the automatically merged MRs as Closed (If all commits in the B MR are included in the A MR, the B MR is automatically merged after the A MR is merged. By default, the B MR is marked as **merged**. You can use this parameter to mark the B MR as **closed**.)	• If this parameter is not selected, MRs that are automatically merged are marked as **merged**. • If this parameter is selected, MRs that are automatically merged are marked as **closed**.
Cannot re-open a Closed MR.	If this option is selected, the branch merge request cannot be set back to **Open** after it is closed. **Re-open** in the upper right corner is hidden.  This parameter is used for process control to prevent review history from being tampered with.
Delete source branch by default after the MR is merged	After the merging, the source branch is deleted. • A protected source branch cannot be deleted. • This setting does not take effect for historical MRs. Therefore, you do not need to worry about branch loss.
Do not Squash	After this parameter is selected, the **Squash** button is unavailable, and the entry for using this button is unavailable in the MR.

Parameter	Description
Enable Squash merge for new MRs	Squash merge means that when merging two branches, Git squashes all changes on the merged branch into one and appends them to the end of the current branch as merge commit, which simplifies the branch. The only difference between squash merge and common merge lies in the commitment history. For common merge, the merge commitment on the current branch usually has two commitment records, while squash merge has only one commitment record.

Merge Method

Table 2-21 Parameters

Parameter	Description
Merge commit	If this parameter is selected, a merge commit is created for every merge, and merging is allowed as long as there are no conflicts. That is, no matter whether the baseline node is the latest node, the baseline node can be merged if there is no conflict. ● **Do not generate Merge nodes during Squash merge**: If this parameter is selected, no merge node is generated during the squash merging. ● **Use MR merger to generate Merge Commit**: If this parameter is selected, the commit information is recorded. ● **Use MR creator to generate Merge Commit**: If this parameter is selected, the commit information is recorded.
Merge commit with semi-linear history	If this parameter is selected, a merge commit is recorded for each merge operation. However, different from **Merge commit**, the commitment must be performed based on the latest commit node of the target branch. Otherwise, the system prompts the developer to perform the rebase operation. In this merging mode, if the MR can be correctly constructed, the target branch can be correctly constructed after the merge is complete.
Fast-forward	If this parameter is selected, no merge commits are created and all merges are fast-forwarded, which means that merging is only allowed if the branch could be fast-forwarded. When fast-forward merge is not possible, the user is given the option to rebase.

Configure Branch Policy

Click **Create** to set a merge policy for a specified branch or all branches in the repository.

NOTE

Currently, branch policies can be set only for the Approval mechanism.

The following is an example of the branch policy priority:

- Assume that there are policies A and B in the repository and their branches are the same. The system uses the latest branch policy by default.
- Assume that there are policies A and B in the repository. Branch a and branch b are configured for policy A, and branch a is also configured for policy B. When a merge request whose target branch is branch a is committed, the system uses policy B by default.

If no branch policy is set in the approval mechanism, the default branch policy is used when a merge request is committed. The branch policy can be edited and viewed but cannot be deleted. The policy configuration is as follows:

- **Branches**: *. By default, all branches are used and cannot be modified.
- **Reviewers Required**: The default value is **0**.
- **Approvals Required**: The default value is **0**.
- **Reset approval gate**: This option is selected by default.
- **Reset review gate**: This option is selected by default.
- **Add approvers/reviewers only from the following ones**: This option is not selected by default.
- **Enable pipeline gate**: This option is not selected by default.
- **Mergers**: This parameter is left blank by default.
- **Approvers**: This parameter is left blank by default.
- **Reviewer**: This parameter is left blank by default.

Table 2-22 Parameters

Parameter	Description
Branches	Set policies for all branches or a branch.
Reviewers Required	Set **Reviewers Required**. When the number of reviewer who give pass meets the **Reviewers Required**, the gate is passed. **0** indicates that the review gate is optional. However, if an MR is rejected by a reviewer, it fails the gate.
Approvals Required	Set **Approvals Required**. When the number of approvals who give pass meets the **Approvals Required**, the gate is passed. **0** indicates that the approval gate is optional. However, if an MR is rejected by an approver, it fails the gate.
Reset approval gate	When code is re-pushed to the source branch of an MR
Reset review gate	When code is re-pushed to the source branch of an MR

Parameter	Description
Add approvers/reviewers only from the following ones	If this option is selected, you can configure the list of **New Approvers** and **New Reviewers**. If you want to add additional members, you can only add members from the lists.
Enable pipeline gate	If this option is selected, before the merge, you need to pass all pipeline gates. This rule integrates the CI into the code development process.
Mergers	The list of **mandatory mergers** can be configured. When a merger request is created, the list is automatically synchronized to the merger request.
Approvers	The list of **mandatory reviewers** can be configured. When a merge request is created, the list is automatically synchronized to the merge request.
Reviewer	The list of **mandatory reviewers** can be configured. When a merge request is created, the list is automatically synchronized to the merge request.

NOTE

Example of a mandatory reviewer list:

- The **Reviewers Required** is 2. If the list of **mandatory reviewers** is empty, the 2 approvers in the list of **New Reviewers** give pass and the gate is passed.
- The **Reviewers Required** is 2. If the list of **mandatory reviewers** is not empty, the gate can be approved only after at least one reviewer in the list give pass.

2.9.3.5 Review Comments

On the repository details page, choose **Settings > Policy Settings > Reviews**. The review comment setting is used to standardize the review comments and configure review comment templates, for details, see**Review Comment Templates**.

The settings take effect only for the repository configured.

Only repository administrators and owners can view this tab page and configure the function.

Setting Review Comments

Step 1 Select **Enable comment types and modules** as required.

Step 2 Configure review comment categories.

- Enable preset comment types

  If you select **Enable preset comment types**, you can directly use the preset review comment categories.
- Customized Categories

You can customize review comment categories. Enter a type name and press **Enter** to save the settings.

NOTE

The name can contain a maximum of 200 characters. A maximum of 20 names can be created.

Step 3 Enter a category name in the text box under **Comment Modules**.

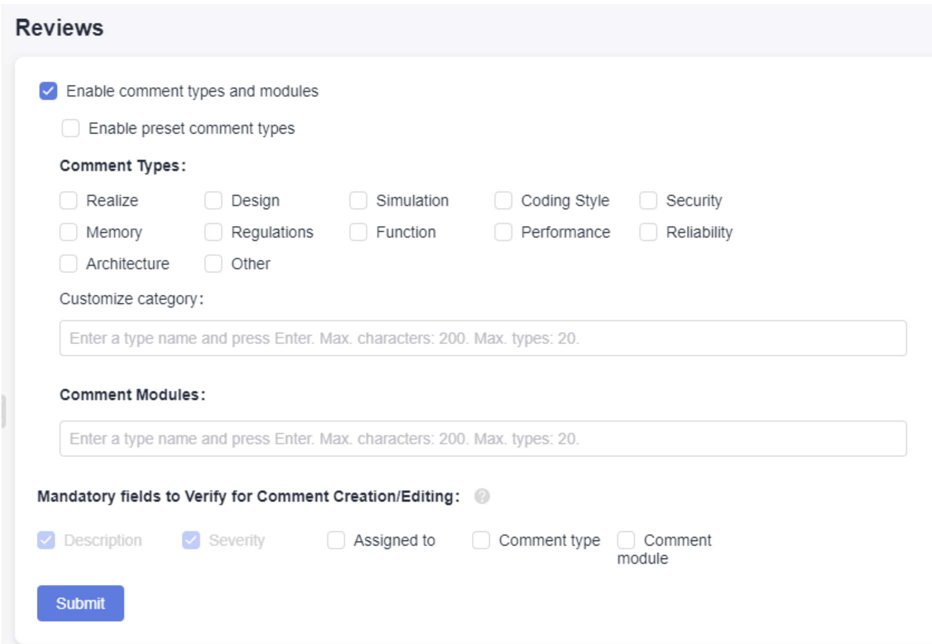
NOTE

The name can contain a maximum of 200 characters. A maximum of 20 names can be created.

Step 4 Set **Mandatory fields to Verify for Comment Creation/Editing** as required.

Step 5 Click **Submit**.

----End



2.9.3.6 MR Evaluation

This function is used to set MR evaluation dimensions. After the dimensions are set, you can evaluate the dimensions on the MR details page.

Setting MR Evaluation

Step 1 Select **Enable MR User-defined Evaluation Dimension Classification**. You can add evaluation dimensions.

Enter a dimension name and press **Enter** to save the settings. The name can contain a maximum of 200 characters. A maximum of 20 dimensions can be created.

NOTE

If **Enable MR User-defined Evaluation Dimension Classification** is not selected, the single-dimension MR evaluation is performed.

Step 2 Click **Submits**.

----End

2.9.4 Service Integration

2.9.4.1 E2E Settings

Repo uses this E2E tracing setting to log code merge reasons, such as implementing a requirement, fixing a bug, or completing a work item. Association is enabled by default.

Integrated Systems

It integrates with CodeArts Req and use work items in CodeArts Req to associate with code commits.

NOTE

The repositories of Kanban projects does not support E2E settings.

Integration Policies

(Optional) Specify available selection conditions when you associate with a work item.

Excluded States: States of work items that CANNOT be associated with.

Associable Types: Types of work items that can be associated with.

Applicable Branches: Branches to comply with preceding restrictions.

Automatic ID Rules Extraction

Automatic ID Rules Extraction (automatically extracting ticket numbers based on code commitment information) are as follows:

- **ID Prefix**: (Optional) A maximum of 10 prefixes are supported, for example, *[Trouble ticket number or Requirement ticket number]*.

NOTE

If **ID Prefix**, **Separator**, and **ID Suffix** are not empty, the automatic ticket number extraction function is enabled by default.

- **Separator**: (Optional) The default value is a semicolon (;).
- **ID Suffix**: (Optional) The default value is a newline character.

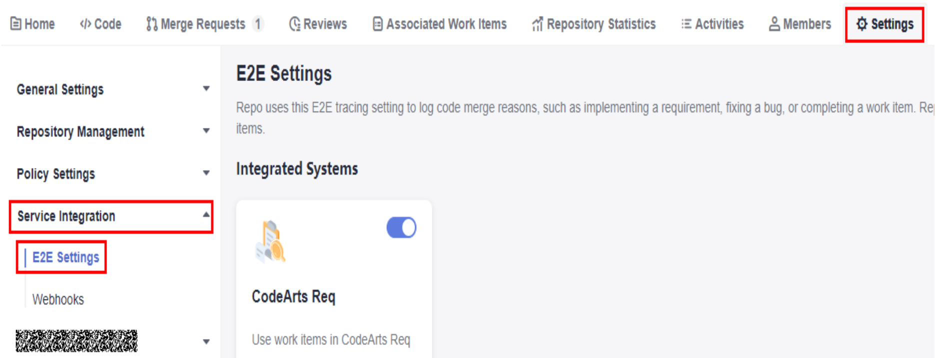
NOTE

- The values of **ID Prefix**, **Separator**, and **ID Suffix** cannot be the same.
- If **Separator** is left empty, the values of **ID Prefix** and **ID Suffix** cannot be two semicolons (;;).
- If **ID Suffix** is left empty, the values of **ID Prefix** and **Separator** cannot be **\n**.
- The values of **ID Prefix**, **Separator**, and **ID Suffix** are matched in full character mode. Regular expressions are not supported.

Examples

Step 1 Configure E2E settings.

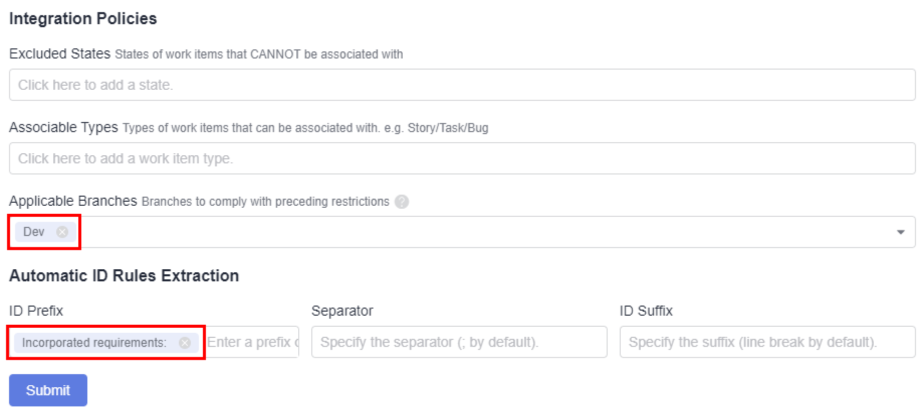
1. Go to the target repository.
2. Choose **Settings** > **Service Integration** > **E2E Settings**. The **E2E Settings** page is displayed.



3. Configure the following integration policies and click **Submit**.

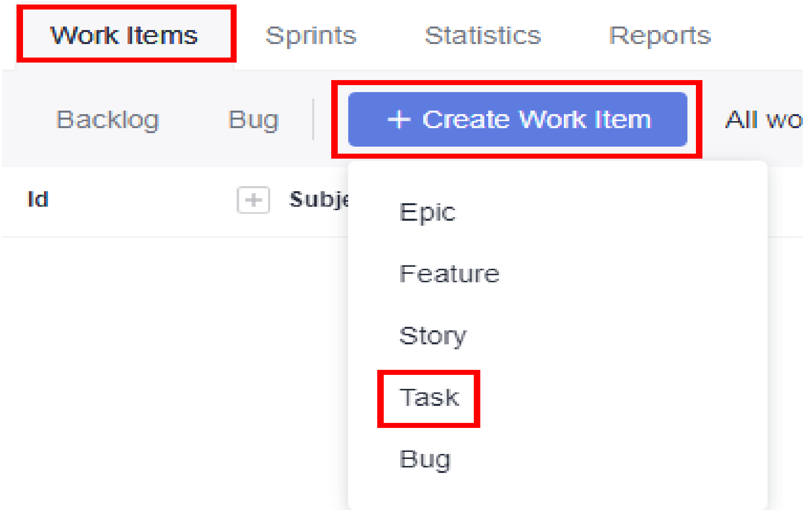
   Applicable Branches: Select the target branch, for example, **Dev**.

   ID Prefix: user-defined prefix, for example, **Incorporated requirements**.



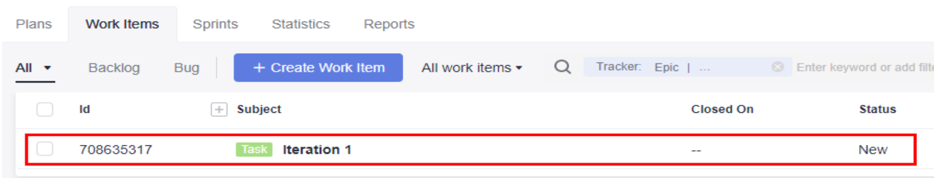
Step 2 Create a work item.

1. Click the target project name to access the project.
2. On the current **Work Items** tab, click **Create Work Item** and choose **Task** from the drop-down list box. The page for creating a work item is displayed.



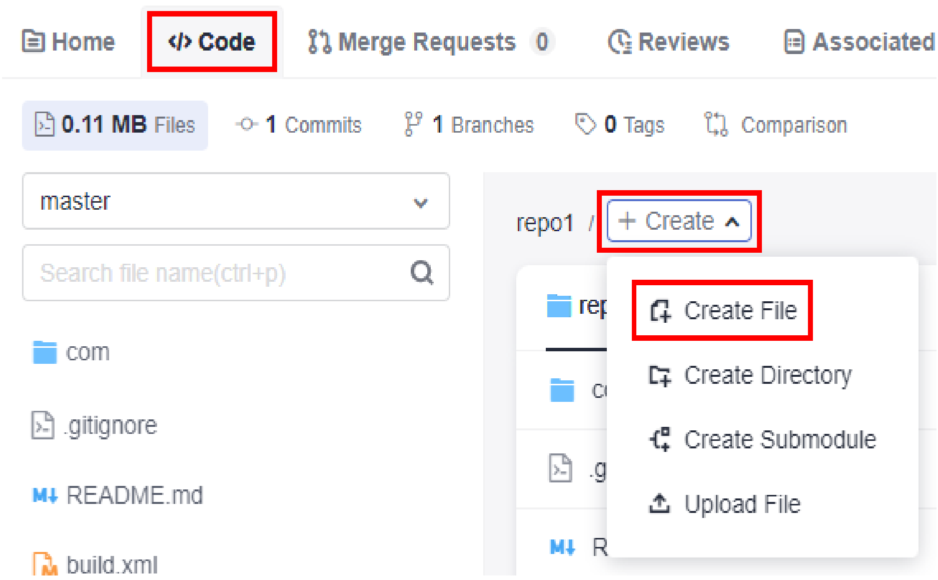
3. Enter a title, for example, Sprint 1.

   Retain the default values for other parameters. Click **Save**.



Step 3 Create a File.

1. Go to the repository list page and click the name of the target repository.
2. On the **Code** tab, click **Create** and choose **Create File** from the drop-down list box. The page for creating a file is displayed.

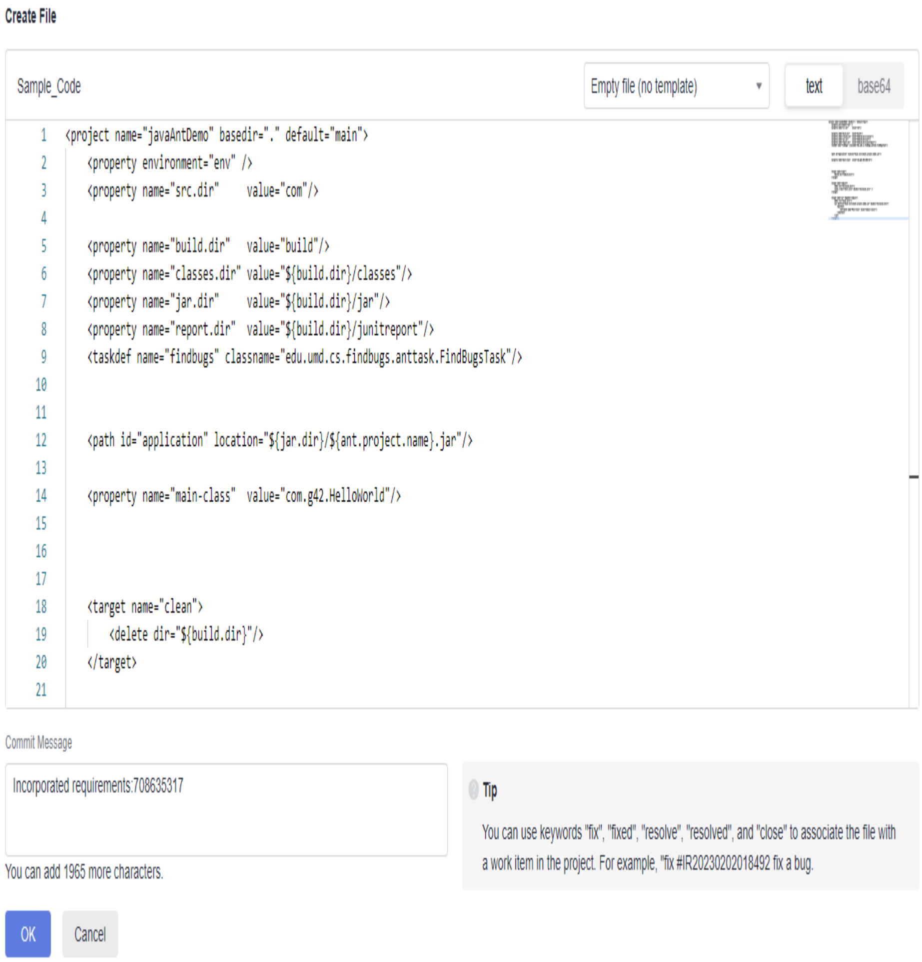


3. Enter the following information, retain the default values for other parameters, and click **OK**.

   File name: user-defined file name, for example, **Sample_Code**.

   File content: user-defined file content.

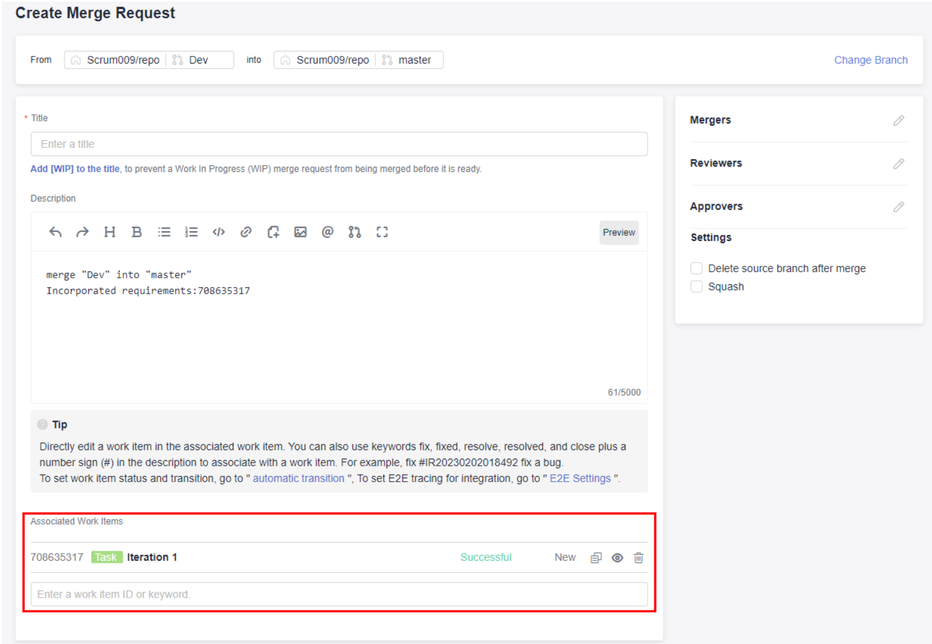
   Commit message: Enter the prefix and work item number in the E2E settings, for example, 708635317.



Step 4 Extract the ticket number when creating a merge request.

1. Switch to the **Merge Requests** tab and click **New**.
2. Select **Dev** as the source branch and **master** as the target branch, and click **Next**. The page for creating a merge request is displayed.

   At this point, the work item is automatically extracted to the merge request.



----End

2.9.4.2 Webhooks

Introduction to Webhook

Developers can configure URLs of third-party systems on the Webhook page and subscribe to events such as branch push and tag push of CodeArts Repo based on project requirements. When a subscription event occurs, you can use a webhook to send a POST request to the URL of a third-party system to trigger operations related to your system (third-party system), such as popping up a notification window, building or updating images, or performing deployment.

If you want to email repository change notifications, you can configure **Notifications** in **General Settings**.

Configuring Webhooks

To configure webhooks, you can choose **Settings > Service Integration > Webhooks** on the repository details page.

The settings take effect only for the repository configured.

Only repository administrators and owners can view this tab page and configure webhooks.

Table 2-23 Parameters for creating a webhook

Parameter	Description
Name	Custom name.

Parameter	Description
Description	Description of the webhook.
URL	(Mandatory) Provided by the third-party CI/CD system.
Token type	Used for webhook interface authentication of third-party services. The options are as follows: ● **X-Repo-Token** ● **X-Gitlab-Token** ● **X-Auth-Token**
Token	Used for third-party CI/CD system authentication. The authentication information is stored in the HTTP request header.
Event Type	The system can subscribe to the following events: ● **Push events** ● **Tag push events** ● **Merge request events** ● **Comments**

NOTE

- A maximum of 20 webhooks can be created for a repository.
- You can configure a token when setting up a webhook. The token will be associated with the webhook URL and sent to you in the X-Repo-Token header.

2.9.5 Template Management

2.9.5.1 MR Templates

To configure MR templates, you can choose **Settings > Template Manage > Merge Request Templates** on the repository details page. When creating an MR, you can select an MR template. The template content is automatically applied to the MR.

The settings take effect only for the repository configured.

Only the repository administrators and owners can view this tab page and configure MR templates.

Creating an MR Template

Table 2-24 Parameters

Parameter	Description
Template name	(Mandatory) Name of the template to be created.
Configure the template as the default template	(Optional) If this parameter is selected, this template is used by default during MR creation.
Auto extract MR title	(Optional) The options are as follows: ● **None** ● **Extract commit message** ● **Extract E2E title**
Title	(Optional) When **Auto extract MR title** is set to **None**, this parameter can be customized.
Description	This parameter is optional. Enter the description of the template. The value contains a maximum of 10,000 characters.

2.9.5.2 Review Comment Templates

To configure comment templates, you can choose **Settings > Template Management > MR Comment Templates** on the repository details page. You can create, edit, and delete a comment template, and customize template information such as Severity, Assign to, Review category, Module, and Description. When a repository member reviews a comment, you can select a review comment template. The template content is automatically applied to the merge request.

The settings take effect only for the repository configured.

Only the repository administrators and owners can view this tab page and configure review comment templates.

Creating a Review Comment Template

Table 2-25 Parameters

Parameter	Description
Template name	(Mandatory) Name of the template to be created.
Configure the template as the default template	(Optional) If this parameter is selected, this template is used by default during comment reviewing.

Parameter	Description
Severity	(Optional) Classified into the following types based on problem severity: **fatal**, **major**, **minor**, and **Suggestion**.
Assign To	This parameter is optional. ● If this parameter is set to **empty**: – When review comments are added to an MR, the comments are assigned to the MR creator by default. – When review comments are added to a file or Commit, the comments are assigned to nobody. ● If this parameter is set to the **MR creator** or **Commit author**. – When review comments are added to an MR, the comments are assigned to the MR creator by default. – When review comments are added to a file or Commit, the comments are assigned to the Commit author by default. ● Assign to **specific person**. – When review comments are added to an MR, the review comments are assigned to a specific person by default. – When review comments are added to a file or Commit, the review comments are assigned to a specific person by default.
Review category	This parameter is optional and is disabled by default. You need to **Enable review comment categories and modules** and configure the review comment category. For details, see **Review comments**.
Comment module	This parameter is optional and is disabled by default. You need to **Enable review comment categories and modules** and configure the review comment module. For details, see **Review comments**.
Description	This parameter is optional. Enter the description of the template. The description can be previewed.

2.9.6 Security Management

2.9.6.1 Deploy Keys

The deploy key is the public key of the SSH key generated locally. However, the deploy keys and SSH keys of a repository cannot be the same. Deploy keys allow you to clone repositories with read only access over SSH. They are mainly used in scenarios such as repository deployment and continuous integration.

NOTE

- Multiple repositories can use the same deploy key, and a maximum of 10 deploy keys can be added to a repository.
- The difference between an SSH key and repository deploy key is that the former is associated with a user and PC and the latter is associated with a repository. The SSH key has the read and write permissions on the repository, and the deploy key has the read-only permission on the repository.
- The settings take effect only for the repository configured.
- Only the repository administrators and owners can view this tab page and configure deploy keys.

To configure the deploy keys, choose **Settings > Security Management > Deploy Keys** on the repository details page. The deploy key is a key that has only the read-only permission on the repositories.

Click **Add Deploy Key** to create a deploy key. For details about how to generate a local key, see **Generating and Configuring an SSH Key**.

2.9.6.2 IP Address Whitelists

About IP Address Whitelists

- An IP address whitelist includes an IP address segment and several access control settings. The whitelist restricts users' access, upload, and download permissions to enhance repository security.
- The IP address whitelist can be configured only for repositories whose visibility is **Private**. Repositories whose visibility is **Public** or **Public template** are not supported.

IP Address Whitelist Formats

IPv4 and IPv6 are supported. The following table lists the three formats of IP address whitelists.

Table 2-26 IP address whitelist formats

Format	Description
Specified IP Address	This is the simplest IP address whitelist format. You can add the IP address of your PC to the whitelist, for example, 100.*.*.123.
IP address segment	If you have multiple servers and their IP addresses are consecutive or the IP address of your server dynamically changes in a network segment, you can add the IP address segment, for example, 100.*.*.0 to 100.*.*.255.
CIDR block	• When your server on a LAN uses the CIDR, you can specify a 32-bit egress IP address of the LAN and the number of bits for a specified network prefix. • Requests from the same IP address are accepted if the network prefix is the same as the specified one.

Configuring IP Address Whitelists

IP address whitelists can be created in the following levels:

NOTE

If the **Private** repository for which the IP address whitelist has been configured is switched to a **Public** repository, you can upload and download code on the CodeArts Repo page or Git client.

IP Address whitelists. The whitelists are set for all cloud services. IP addresses that are not in the whitelist are blocked upon login. For details, see **Access Control**

- **IP address whitelist for repository**. It allows access only from IP addresses in the whitelist to a specific repository. To set the whitelist, choose **Settings > Security Management >IP Address Whitelist** (IPv4 and IPv6 addresses are supported. For details, see **IP Address Whitelist Formats**).

  Allowed to access the repository: Only whitelisted IP addresses and the repository creator can access the repository.

  Allowed to download code : Only whitelisted IP addresses can download code online and clone code locally.

  Allowed to commit code: Only whitelisted IP addresses can modify and upload code online, or commit code locally. Code-based build project orchestration and YAML file synchronization are not affected.

  NOTE

  - **Commit code**: Create, edit, delete, upload and rename files, create and delete directories, submodules, branches, and tags, resolve code conflicts, create and merge MRs, cherry-pick, revert, use LFS storage, and rebase.
  - **Download code**: Download a single file and branches, tags, repositories and backup repositories.
  - **Local download**: Download code through SSH and HTTPS, and clone repository through deploying keys.
  - **Local commit**: Commit code through SSH and HTTPS.
  - Repository synchronization is not affected by the IP address whitelist.

- **Tenant-level IP address whitelist**: To set IP address whitelists for repositories of all accounts from a tenant, log in to the CodeArts Repo repository list page, click the alias in the upper right corner, and choose **All Account Settings > Repo > Whitelists for All Accounts**, as shown in the following figure. The configuration rules are the same as those of **repository-level IP address whitelists**.

  Only tenant accounts have permissions to configure **Whitelist for All Accounts**. Click next to **Add Address** and select **Prioritize this List**. For details about the logic of cloning the Git client or downloading the repository source code on the UI, see the following table.

Account-level Whitelist Prioritized (Prioritize This List)	Configure Tenant-level Whitelist	Configure Repository-Level Whitelist	Priority
Enabled	×	×	All IP addresses are allowed.
	×	√	The repository-level whitelist prevails.
	√	×	The tenant-level whitelist prevails.
	√	√	The intersection of the tenant-level whitelist and repository-level whitelist prevails.
Disabled	×	×	All IP addresses can pass.
	×	√	The repository-level whitelist prevails.
	√	×	The tenant-level whitelist prevails.
	√	√	The repository-level whitelist prevails.

2.9.6.3 Risky Operations

To configure risky operations, choose **Settings > Security Management > Risky Operations** on the repository details page.

Only the repository administrators and owners can view this tab page and configure risky operations.

Risky operations are as follows:

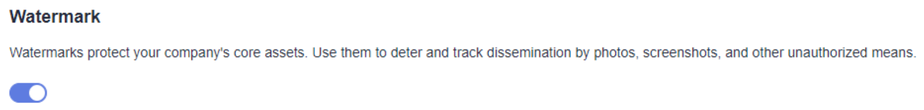
- **Transfer repository ownership**: The ownership of a repository can be transferred to another person in the repository but cannot be transferred to a viewer or custom role.
- **Delete repository**: The repository cannot be recovered after being deleted.
- **Rename repository**: After renaming a repository, check the configuration related to the repository name in a timely manner.

2.9.6.4 Watermarks

On the repository details page, choose **Settings > Security Management > Watermark**. The watermark content consists of your account name and current time.

Only repository administrators and owners can view this tab page and configure the watermark function.

Watermarks will be displayed on code repository pages to reduce the risk of code asset leakage.

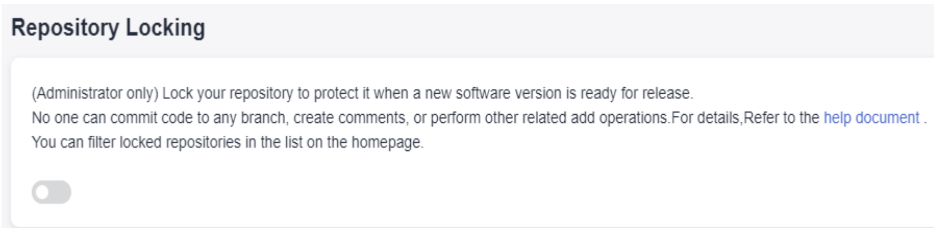


2.9.6.5 Repository Locking

When a new software version is ready for release, administrators can lock the repository to protect it from being compromised. After the repository is locked, no one (including the administrators) can commit code to any of its branches.

To lock a repository, choose **Settings** > **Security Management** > **Repository Locking** on the repository details page.

Only the repository administrators and owners can view this tab page and configure repository locking.



After the administrator locks the repository, no one can use the repository functions in **Table 2-27**.

Table 2-27 List of functions that cannot be executed

Tab Page	Function
Code	If the repository is locked, the following functions cannot be performed on the **Code** tab page: ● Create, edit, delete, rename, and upload a file ● Create and delete a directory ● Create and delete a submodule ● Cherry-Pick and revert a file ● Add, delete, edit, reply, and resolve a review and comment
Branch & Tag	If the repository is locked, the following functions cannot be performed on the **Branch** or **Tag** subtab of the **Code** tab page: ● Create, edit, and delete a branch ● Create and delete a Tag

Tab Page	Function
Merge Requests	If the repository is locked, the following functions cannot be performed on the **Merge Requests** details page: ● Create, edit, close, re-open, and merge a merge request ● Cherry-Pick and revert a merge request ● Resolve a code conflict ● Add, delete, edit, reply, and resolve a review comment
Repository & Members	If the repository is locked, the following functions cannot be performed: ● Fork a repository ● Add, delete, edit, and approve a member
Settings	If the repository is locked, the following functions cannot be performed on the **Settings** tab page: ● Repository settings ● Submodules ● Policy settings (All) ● Service integration (All)

NOTE

After the repository is locked, changes to project members will be synchronized to the repository, affecting repository members.

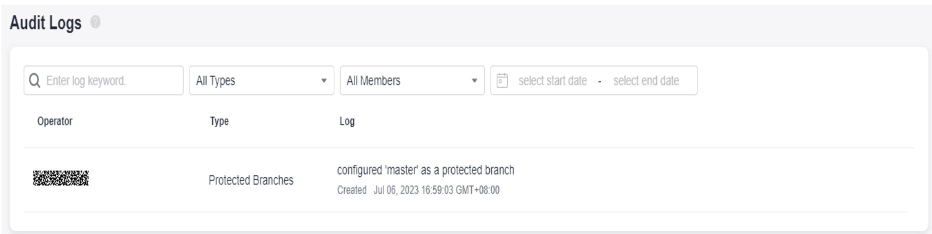
2.9.6.6 Audit Logs

To view audit logs, choose **Settings** > **Security Management** > **Audit Logs** on the repository details page.

Only the repository administrators and owners can view this tab page.

Audit logs record only changes to repository attributes. Check daily development activities such as MRs, reviews, and member changes from **repository dynamics**.

You can filter logs by time segment, operator, operation type, or log information. The operation types include repository information, submission rule, merge request, and merge request policy.



2.10 Submitting Code to the CodeArts Repo

2.10.1 Creating a Commit

Background

In code development, developers usually clone code from CodeArts Repo to the local PC to develop code locally, and the commit the code to CodeArts Repo after completing the phased development task. This section describes how to use the Git client to commit the modified code.

Prerequisites

1. Git Installation and Configuration.
2. You have created a repository in CodeArts Repo. For details, see **Overview**.
3. You have set the SSH keys or HTTPS password. For details, see **Setting SSH Key or HTTPS Password for CodeArts Repo Repository**
4. You have Cloned the CodeArts Repo Repository to the Local Host. For details, see **Overview**.

Procedure

Generally, developers do not directly develop code in the master branch. Instead, they create a feature branch based on the master or develop branch, and develop code in it. Then they commit the **feature** branch to CodeArts Repo, and merge it into the **master** or **develop** branch. The preceding operations are simulated as follows:

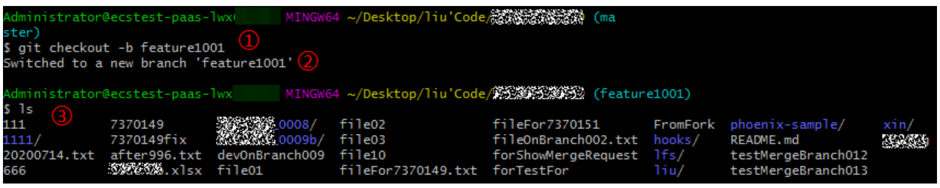
Step 1 Go to the local repository directory and open the Git client. Take Git Bash as an example. The principles and commands of other Git management tools are the same.

Step 2 Create a **feature1001** branch based on the **master** branch, switch to the created branch, and run the following command in the **master** branch:

```
git checkout -b feature1001 #Shown in 1 in the following figure.
```

This command creates a branch and then switches to the branch.

If the command is successfully executed, 2 in the following figure is shown. You can run the **ls** command to view the files of the branch (as shown in 3 in the following figure), which are the same as those of the **master** branch currently.



Step 3 Modify code in the **feature** branch (code development).

Git supports Linux commands. In this case, the **touch** command is used to create a file named **newFeature1001.html**, indicating that the developer has developed new features locally and a new file is added into the local code repository.

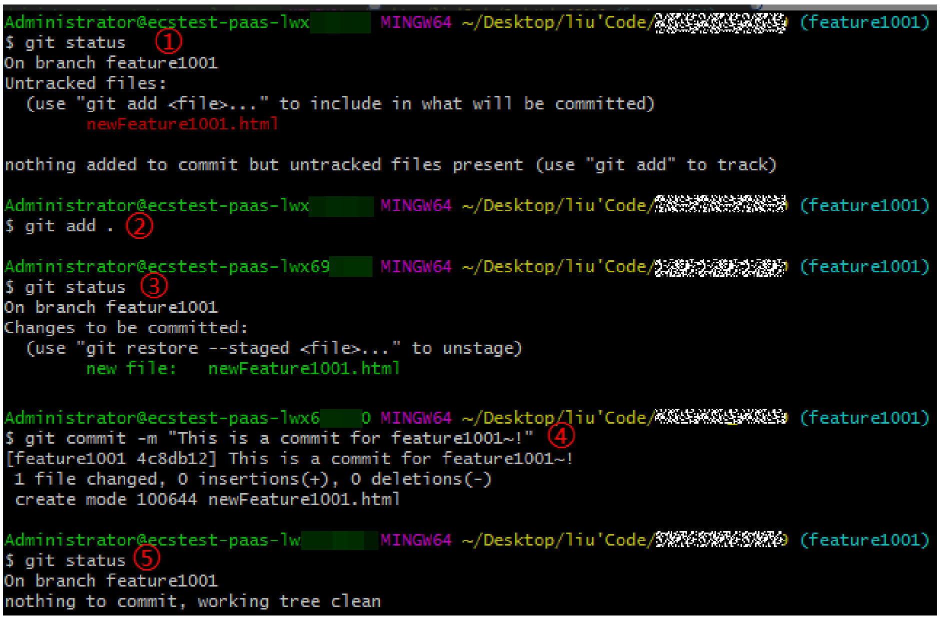
```
touch newFeature1001.html
```

Run the **ls** command again to view the created file.

Step 4 Run the **add** and **commit** commands to add the file from the working directory to the staging area, and then commit the file to the local repository. (For details, see **Overview**.)

You can also run the **status** command to check the file status.

1. Run the **status** command. The command output shows that a file in the working directory is not included in version management, as shown in 1 in the following figure.
2. Run the **add** command to add the file to the staging area, as shown in 2 in the following figure.
```
git add . # Period (.) means all files, including hidden files. You can also specify a file.
```
3. Run the **status** command. The command output shows that the file has been added to the staging area and is waiting to be committed, as shown in 3 in the following figure.
4. Run the **commit** command to commit the file to the local repository, as shown in 4 in the following figure.
```
git commit -m "<your_commit_message>"
```
5. Check the file status again. If no file to be committed exists, the commit is successful, as shown in 5 in the following figure.

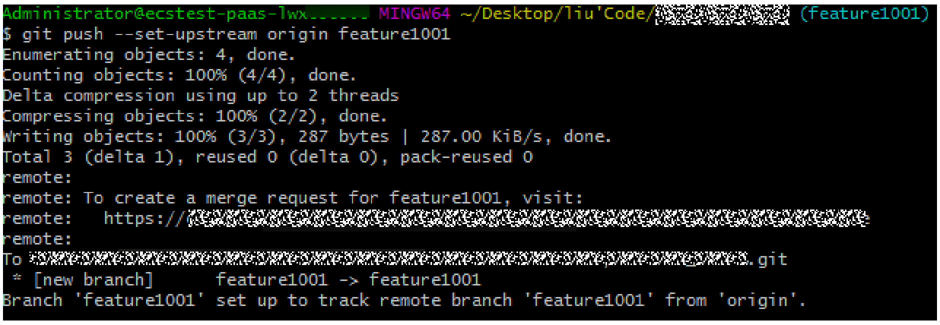


Step 5 Push a local branch to CodeArts Repo.

```
git push --set-upstream origin feature1001
```

Run the preceding command to create a branch that is the same as your local **feature1001** branch in CodeArts Repo, and associate them and synchronize the branch.

origin indicates the alias of your CodeArts Repo. The default alias of a directly controllable repository is **origin**. You can also use the repository address.



NOTE

If the push fails, check the connectivity.

- Check whether your network can access CodeArts Repo.

  Run the following command on the Git client to test the network connectivity:
  ```
  ssh -vT git@********.com
  ```
  If the command output contains **connect to host ********.com port 22: Connection timed out**, your network is restricted from accessing CodeArts Repo. Contact your network administrator.
- Check the SSH key. If necessary, regenerate a key and configure it on the CodeArts Repo console. For details, see **SSH Keys**. Alternatively, check **whether the HTTPS password** is correctly configured.
- Check the **IP address whitelist**. If no whitelist is configured, all IP addresses are allowed to access the repository. If a whitelist is configured, only IP addresses in the whitelist are allowed to access the repository.

Step 6 View the CodeArts Repo repository branch.

Log in to CodeArts Repo and go to your repository. In the **Files** tab page, you can switch to your branch in CodeArts Repo.

NOTE

If the branch you just committed is not displayed, your **origin** may be bound to another repository. Use the repository address to commit the branch again.

Step 7 Create a merge request. For details, see **Managing MRs**. Notify the approver to review the request and merge the new feature into the master or develop branch.

----End

2.10.2 Transmitting and Storing a File in Encryption Mode

CodeArts Repo uses git-crypt for encrypted storage and transmission of confidential and sensitive files.

About git-crypt

git-crypt is a third-party open-source software that can transparently encrypt and decrypt files in the Git repository. It can encrypt and store specified files and file types. Developers can store encrypted files (such as confidential information or sensitive data) and shared code in the same repository and pull and push them like in a common repository. Only the person who has the corresponding file key can view the content of the encrypted files, but others are not restricted to read and write unencrypted files.

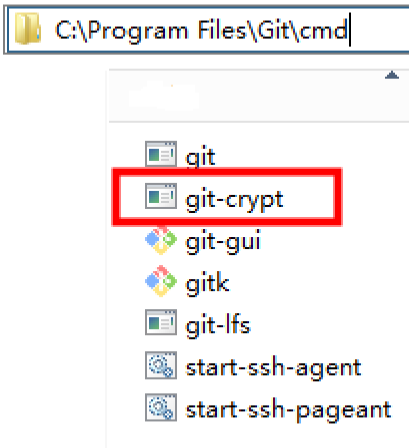
git-crypt allows you to encrypt only specific files without locking the entire repository, facilitating team cooperation and ensuring information security.

Using Key Pairs for Encryption and Decryption on Windows

Step 1 Install and initialize Git.

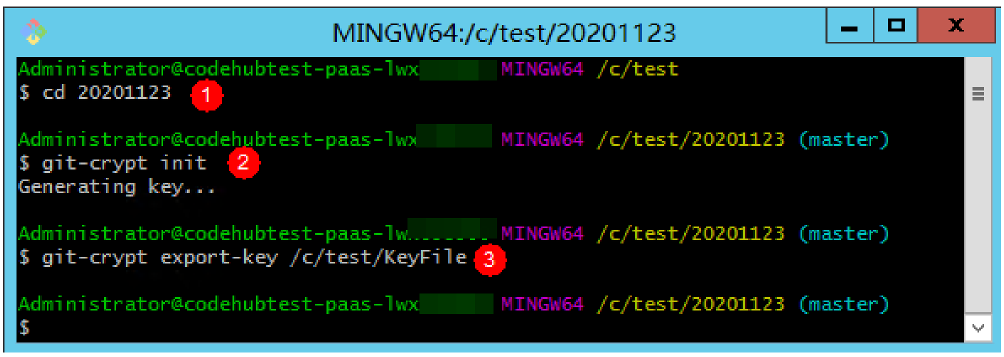
Step 2 Download the latest **Windows-based git-crypt** and save the downloaded .exe file to the **cmd** folder in the Git installation directory. The following figure uses the default Git Bash installation path of **Windows Server 2012 R2 Standard (64-bit)** as an example.

Put the .exe file in the folder. You do not need to run it.

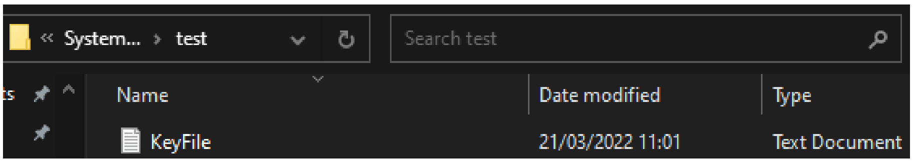


Step 3 **Generate a key pair.**

1. Open **Git Bash** and go to the local repository, as shown in 1 in the following figure.
2. Run the following command to generate a key pair, as shown in 2 in the following figure.
```
git-crypt init
```
3. Export the key file. In this example, the key file is exported to the **C:\test** directory and named **KeyFile**. Run the following command, as shown in 3 in the following figure.
```
git-crypt export-key /c/test/keyfile
```



4. Check whether the key is generated in the file path where the key is exported. In this example, check whether the **KeyFile** file exists in the **C:\test** directory, as shown in the following figure.



The computer containing the key file can decrypt the corresponding encrypted file.

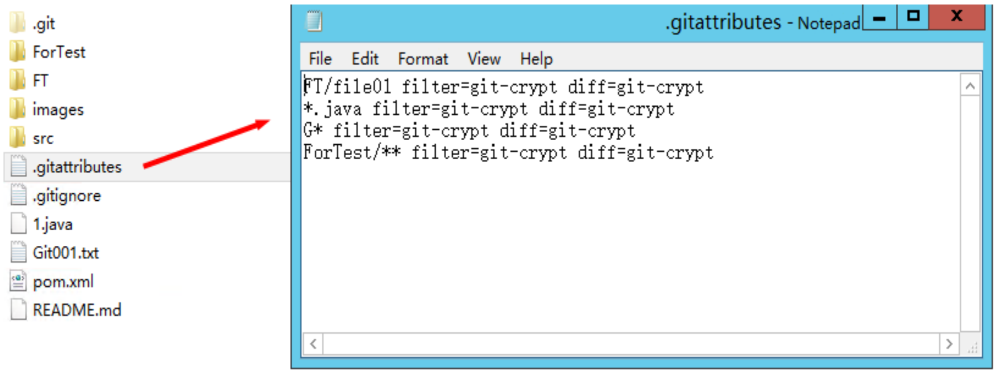
Step 4 **Configure the encryption scope for the repository.**

1. Create a file named **.gitattributes** in the root directory of the repository.
2. Open the **.gitattributes** file and run the following command to set the encryption range.

```
<file_name_or_file_range>: filter=git-crypt diff=git-crypt
```

Four examples are as follows:

```
FT/file01.txt filter=git-crypt diff=git-crypt  # Encrypt a specified file. In this example, the file01.txt file in the FT folder is encrypted.
*.java filter=git-crypt diff=git-crypt  # The .java file is encrypted.
G* filter=git-crypt diff=git-crypt   # Files which names start with G are encrypted.
ForTest/** filter=git-crypt diff=git-crypt   # Files in the ForTest folder are encrypted.
```



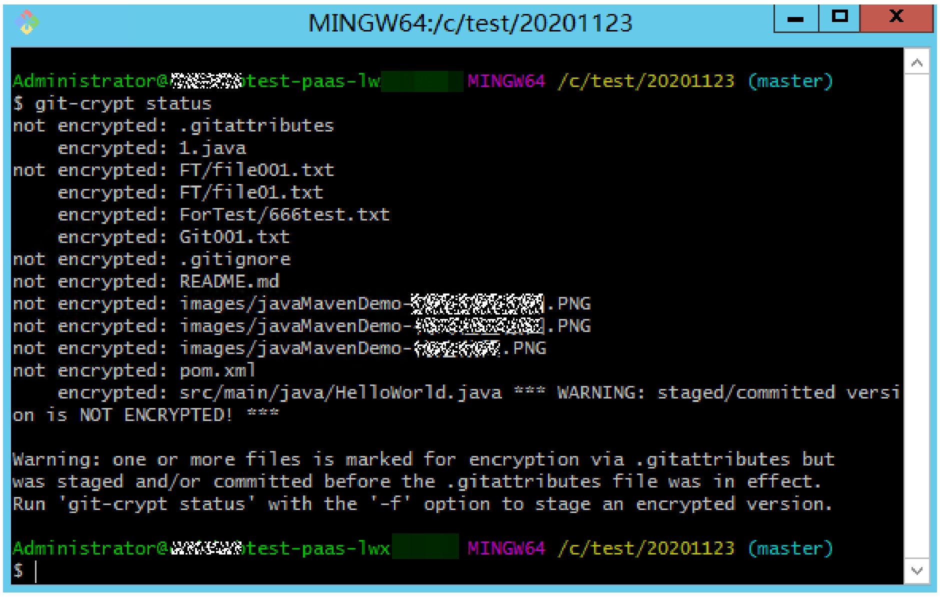
NOTE

- If the system prompts you to **enter the file name** when you create the **.gitattributes** file, you can enter **.gitattributes.** to create the file. If you run the Linux command to create the file, this problem does not occur.
- Do not save the **.gitattributes** file as a **.txt** file. Otherwise, the configuration does not take effect.

Step 5 **Encrypt the file.**

Open Git Bash in the root directory of the repository and run the following command to encrypt the file. The encryption status of the file is displayed.

```
git-crypt status
```



After the encryption, you can still open and edit the encrypted files in plaintext in your local repository because your local repository has a key.

You can run the **add**, **commit**, and **push** commands to push the repository to CodeArts Repo. In this case, the encrypted files are pushed together.

Encrypted files are stored in CodeArts Repo as encrypted binary files and cannot be viewed directly. If you do not have a key, you cannot decrypt it even if you download it to the local computer.

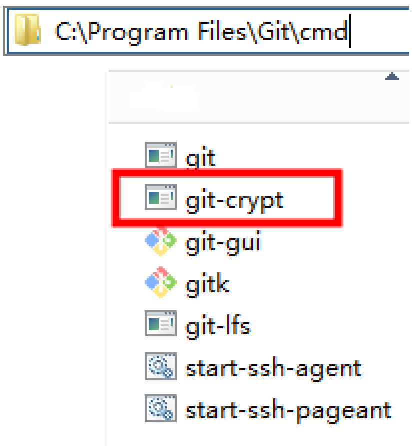
NOTE

git-crypt status encrypts only the files to be committed this time. It does not encrypt the historical files that are not modified this time. Git displays a message for the unencrypted files involved in this setting (see **Warning** in the preceding figure). If you want to encrypt all files of a specified type in the repository, run the **git-crypt status -f** command.

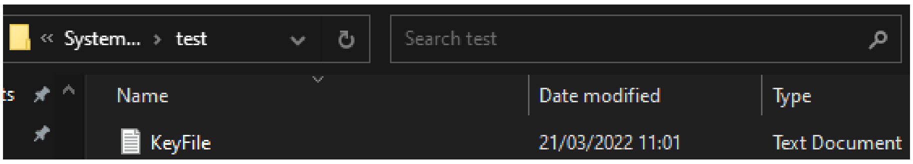
In team cooperation, **-f** (forcible execution) has certain risks and may cause the members' work output to remain unchanged. Exercise caution when using **-f**.

Step 6 Decrypt the file.

1. Ensure that the **git-crypt** file exists in the Git installation path on the local computer.



2. Clone the repository from CodeArts Repo to the local host.
3. Obtain the key file for encrypting the repository and store it on the local computer.



4. Go to the repository directory and right-click Git Bash.
5. Run the decryption command. If no command output is displayed, the command is successfully executed.

```
git-crypt unlock /C/test/KeyFile # Replace /C/test/KeyFile with the actual key storage path.
```

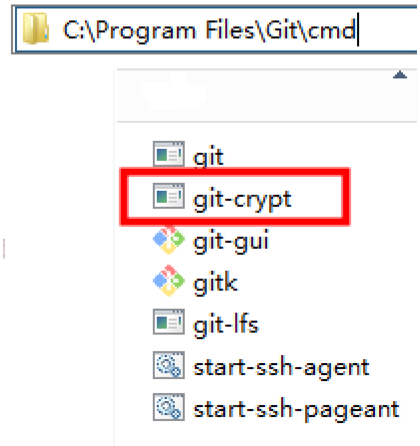
----End

Encrypting and Decrypting a File in GPG Mode on Windows

Step 1 Install and initialize Git.

Step 2 Download the latest **Windows-based git-crypt** and save the downloaded .exe file to the **cmd** folder in the Git installation directory. The following figure uses the default Git Bash installation path of **Windows Server 2012 R2 Standard (64-bit)** as an example.

Put the .exe file in the folder. You do not need to run it.



Step 3 **Download the GPG** of the latest version. When you are prompted to donate the open-source software, select **0** to skip the donation process.

OS	Where	Description
Windows	**Gpg4win**	Full featured Windows version of *GnuPG*
	download sig	Simple installer for the current *GnuPG*
	download sig	Simple installer for *GnuPG 1.4*
OS X	**Mac GPG**	Installer from the gpgtools project
	GnuPG for OS X	Installer for *GnuPG*
Debian	**Debian site**	GnuPG is part of Debian
RPM	**rpmfind**	RPM packages for different OS
Android	**Guardian project**	Provides a GnuPG framework
VMS	**antinode.info**	A port of GnuPG 1.4 to OpenVMS
RISC OS	**home page**	A port of GnuPG to RISC OS

Double-click to start the installation. Click **Next** to complete the installation.

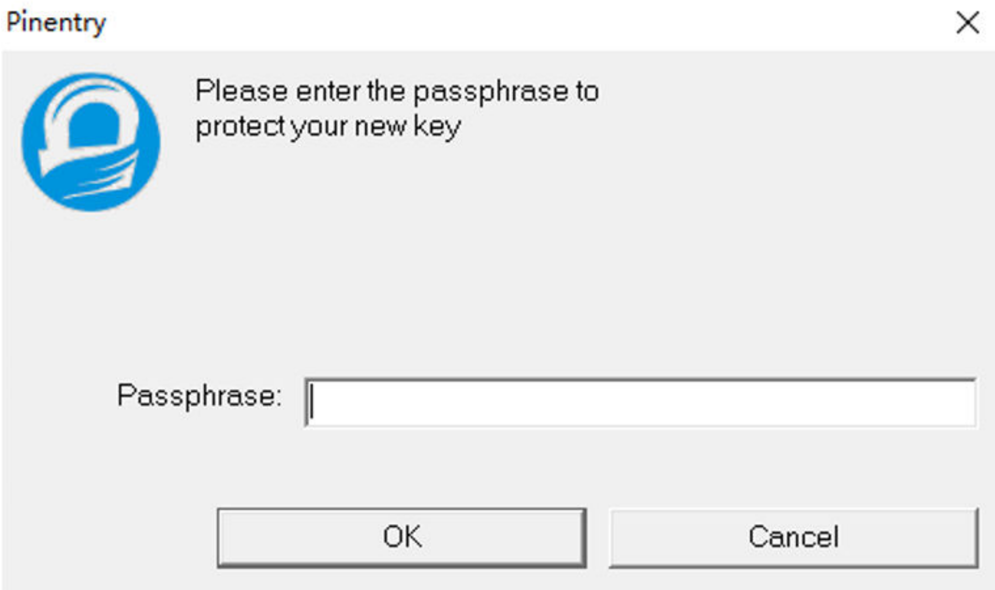
Step 4 **Generate a key pair in GPG mode.**

1. Open Git Bash and run the following command:

```
gpg --gen-key
```

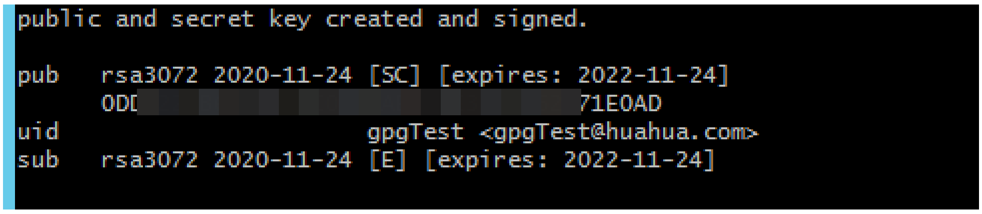
2. Enter the name and email address as prompted.

3. Enter **o** as prompted and press **Enter**. The dialog boxes for entering and confirming the password are displayed.



The password can be empty. To ensure information security, you are advised to enter a password that complies with the standard (this password is required for decryption).

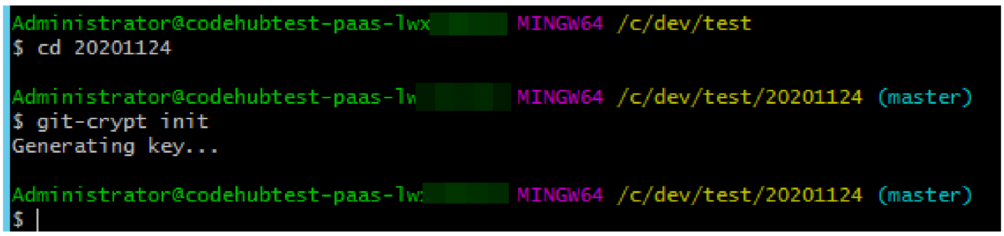
4. If the following information is displayed, the GPG key pair is generated successfully.



Step 5 Initialize the repository encryption.

1. Open Git bash in the root directory of the repository and run the following command to initialize the repository:

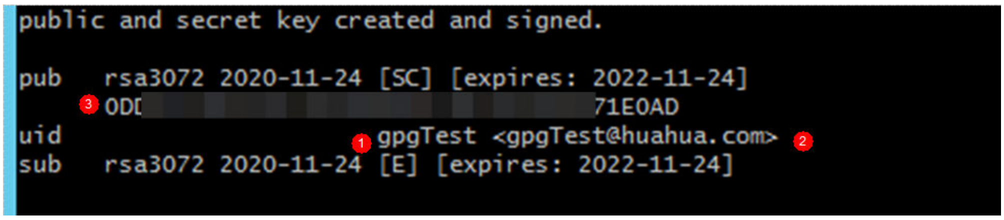
```
git-crypt init
```



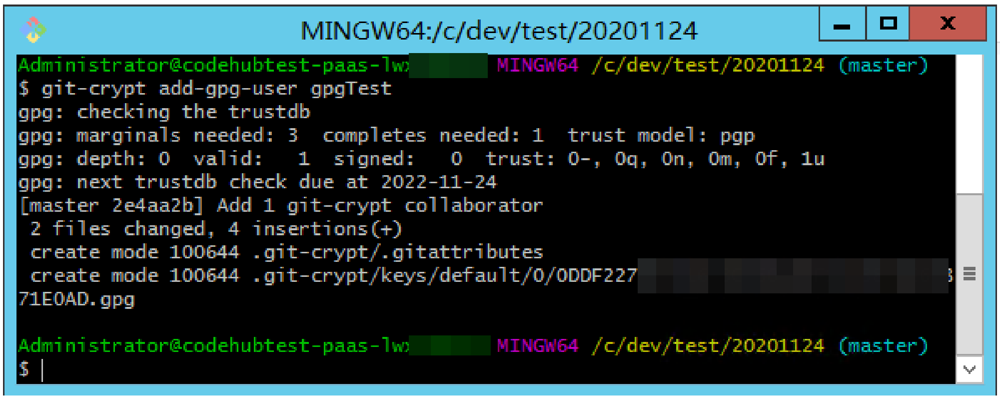
2. Run the following command to add a copy of the key to your repository. The copy has been encrypted using your public GPG key.

```
git-crypt add-gpg-user USER_ID
```

USER_ID can be the name, email address, or fingerprint that uniquely identifies the key, as shown in 1, 2, and 3 in the following figure in sequence.



After the command is executed, a message is displayed, indicating that the **.git-crypt** folder and two files in it are created.



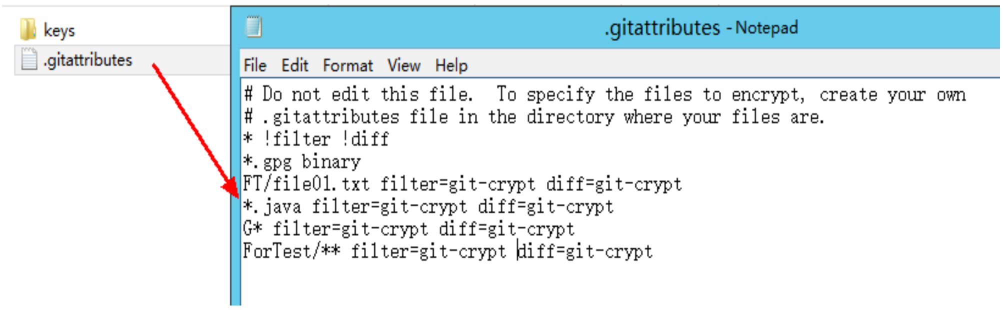
Step 6 **Configure the encryption scope for the repository.**

1. Go to the **.git-crypt** folder in the repository.
2. Open the **.gitattributes** file and run the following command to set the encryption range.

```
<file_name_or_file_range>: filter=git-crypt diff=git-crypt
```

Four examples are as follows:

```
FT/file01.txt filter=git-crypt diff=git-crypt  # Encrypt a specified file. In this example, the file01.txt file in the FT folder is encrypted.
*.java filter=git-crypt diff=git-crypt  # The .java file is encrypted.
G* filter=git-crypt diff=git-crypt   # Files which names start with G are encrypted.
ForTest/** filter=git-crypt diff=git-crypt   # Files in the ForTest folder are encrypted.
```

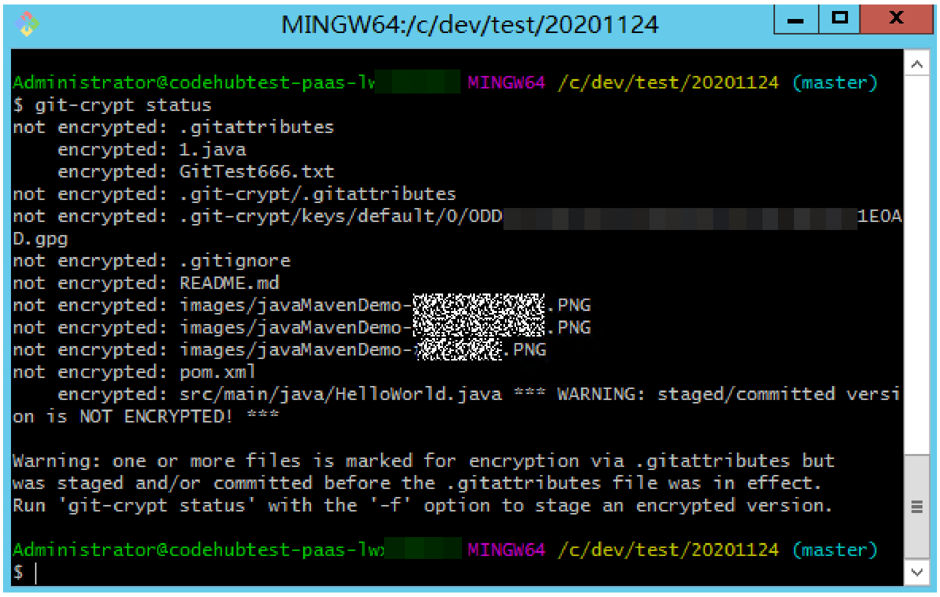


3. Copy the **.gitattributes** file to the root directory of the repository.

Step 7 **Encrypt the file.**

Open Git Bash in the root directory of the repository and run the following command to encrypt the file. The encryption status of the file is displayed.

```
git-crypt status
```



After the encryption, you can still open and edit the encrypted files in plaintext in your local repository because your local repository has a key.

You can run the **add**, **commit**, and **push** commands to push the repository to CodeArts Repo. In this case, the encrypted files are pushed together.

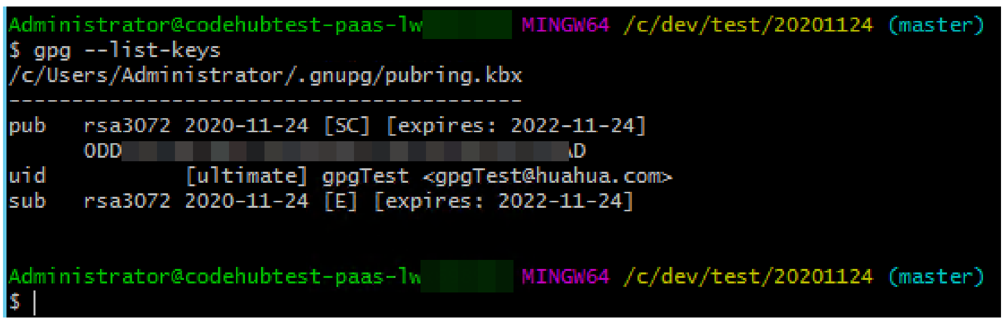
Encrypted files are stored in CodeArts Repo as encrypted binary files and cannot be viewed directly. If you do not have a key, you cannot decrypt it even if you download it to the local computer.

> NOTE
>
> **git-crypt status** encrypts only the files to be committed this time. It does not encrypt the historical files that are not modified this time. Git displays a message for the unencrypted files involved in this setting (see **Warning** in the preceding figure). If you want to encrypt all files of a specified type in the repository, run the **git-crypt status -f** command.
>
> In team cooperation, **-f** (forcible execution) has certain risks and may cause the members' work output to remain unchanged. Exercise caution when using **-f**.

Step 8 Export the key.

1. Lists the currently visible keys. You can view the name, email address, and fingerprint of each key.

```
gpg --list-keys
```



2. Run the **gpg --export-secret-key** command to export the keys. In this example, the **gpgTest** key is exported to **drive C** and named **Key**.

```
gpg --export-secret-key -a gpgTest > /c/key   # -a indicates that the key is displayed in text format.
```

During the execution, the system prompts you to enter the key password. Enter the correct password.

No command output is displayed. You can view the key file in the corresponding directory (**drive C** in this example).

3. Send the generated key to the team members to share the encrypted file.

Step 9 **Import the key and decrypt the file.**

1. To decrypt files on another computer, you need to download and install git-crypt and GPG based on Git. For details, see the previous steps in this section.
2. Clone the corresponding repository to the local host.
3. Obtain the key of the corresponding encrypted file. For details about how to export the key, see the previous step. In this example, the obtained key is stored in **drive C**.
4. Go to the repository, open Git Bash, and run the **import** command to import the key.

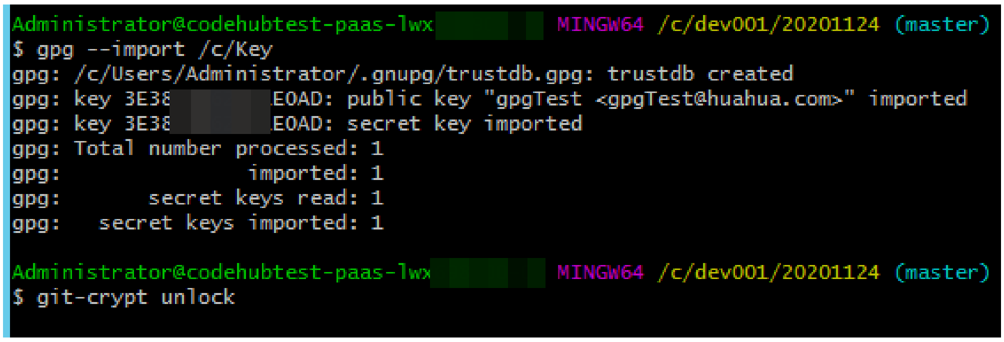
```
gpg --import  /c/key
# /c/Key is the key path and user-defined key name in this example. Replace them with the actual ones.
```

During the import, the system prompts you to enter the password of the key. If the import is successful, the following figure is displayed.

5. Run the **unlock** command to decrypt the file.

```
git-crypt unlock
```

During the decryption, a dialog box is displayed, prompting you to enter the password of the key. If no command output is displayed after you enter the correct password, the decryption is successful.



Step 10 View the file before and after decryption.

----End

Application of git-crypt Encryption in Teamwork

In most cases, a team needs to store files that have **restricted disclosure** in the code repository. It can use **CodeArts Repo**, **Git**, and **git-crypt** to encrypt some files in the distributed open-source repository.

Generally, **Key pair encryption** can meet the requirements of restricting the access to some files.

When a team needs to set different confidential levels for encrypted files, the **GPG encryption** can be used. This encryption mode allows you to use different keys to encrypt different files in the same repository and share the keys of different confidential levels with team members, restricting file access by level.

Installing git-crypt and gpg on Linux and macOS

Installing git-crypt and gpg on **Linux**

- Linux installation environment

Software	Debian/Ubuntu Package	RHEL/CentOS Package
Make	make	make
A C++11 compiler (e.g. gcc 4.9+)	g++	gcc-c++
OpenSSL development files	libssl-dev	openssl-devel

- In Linux, install git-crypt by compiling the source code.

  Download the source code.

  ```
  make
  make install
  ```

  Install git-crypt to a specified directory

  ```
  make install PREFIX=/usr/local
  ```

- In Linux, install GPG by compiling the source code.

  Download the source code.

  ```
  ./configure
  make
  make install
  ```

- Install git-crypt using the Debian package.

  You can **download the source code**.

  The Debian package can be found in the **debian** branch of the project Git repository.

  The software package is built using **git-buildpackage**, as shown in the following figure.

  ```
  git checkout debian
  git-buildpackage -uc -us
  ```

- Install GPG using the build package in Debian.

  ```
  sudo apt-get install gnupg
  ```

Install git-crypt and GPG on macOS.

- Install git-crypt on macOS.

  Run the following command to install git-crypt using the brew package manager.

  ```
  brew install git-crypt
  ```

- Install GPG on macOS.

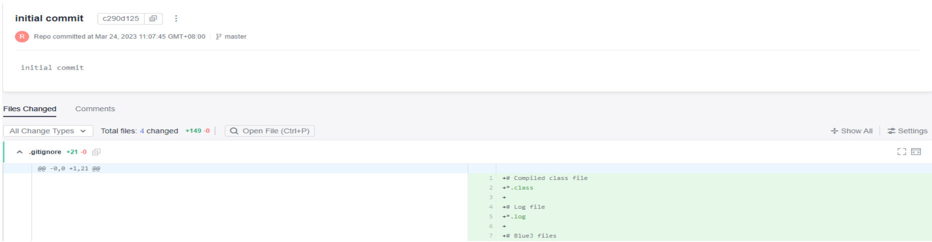
  Run the following command to install git-crypt using the brew package manager.

  ```
  brew install gpg
  ```

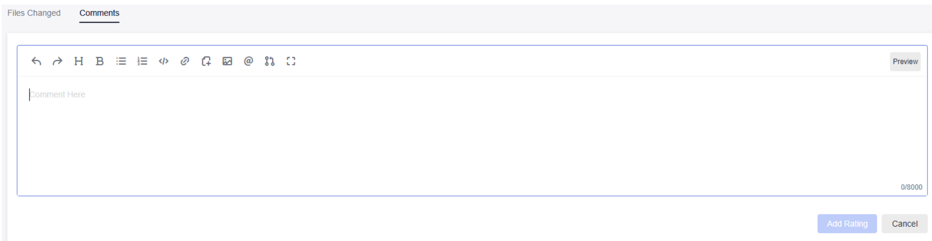

2.10.3 Viewing Commit History

CodeArts Repo allows you to view details about the commit history and related file changes.

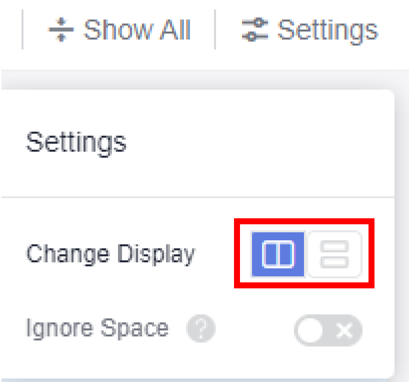
You can view the commit history on the **History** tab page of the **Files** or **repository dynamics**. You can click a commit record to view the committer, commit number, parent node, number of comments, and code change comparisons.



You can comment on a commit or reply a comment.



You can click the icon in the following figure to switch the horizontal or vertical display of code change comparison. You can click **Show All** to view the full text of the files involved in the commit.



2.10.4 Pushing Code to CodeArts Repo Using Eclipse

Background

You can install EGit on Eclipse so that Eclipse can be connected with CodeArts Repo and be used for operations such as committing code from a local Git repository to a remote one.

NOTE

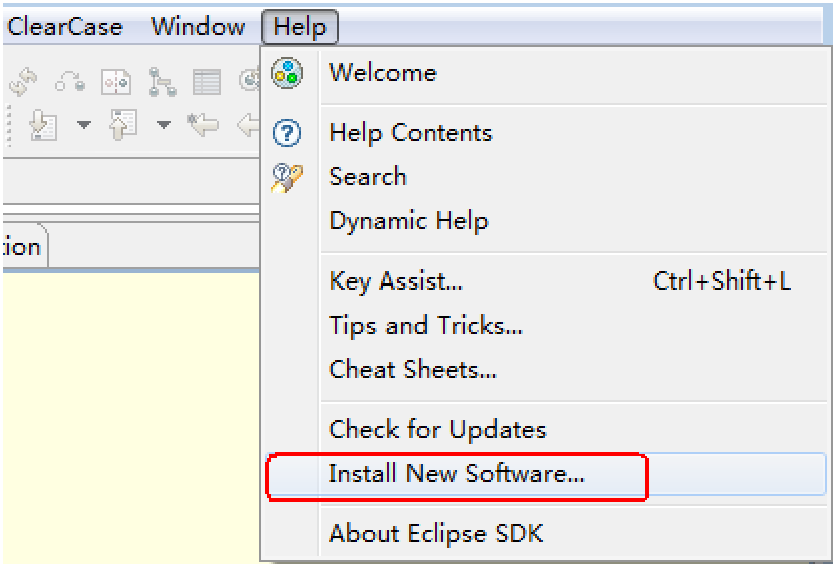
Only Eclipse 4.4 or later versions are supported.

- For the first push:
  1. Create a repository on the local computer, that is, the local repository.
  2. **Commit** the update to the local repository.
  3. Pull the code from the server to the local repository, merge the code, and push the repository to the server.
- If it is not the first push:
  1. Commit the modified code to the local repository.
  2. Pull the code from the server to the local repository, merge the code, and push the repository to the server.

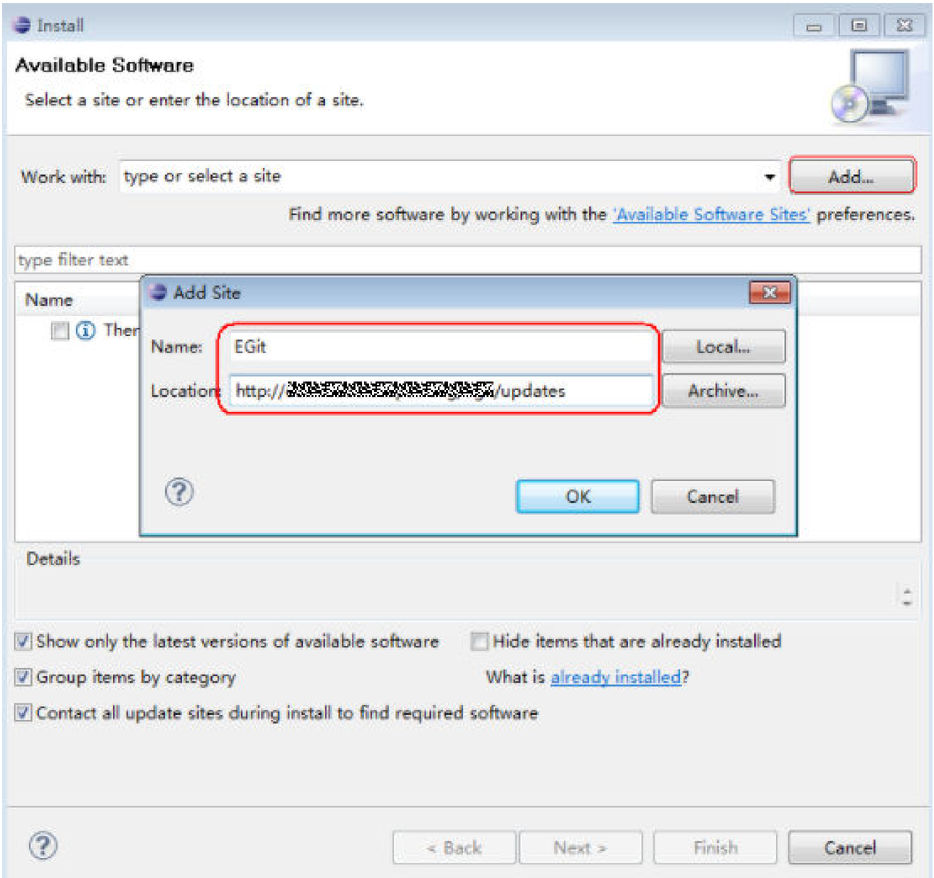
Step 1: Installing EGit on Eclipse

Eclipse 4.4 is used in the following procedure.

1. On the Eclipse toolbar, choose **Help** > **Install New Software...**.



2. In the **Install** window displayed, click **Add...**.
   Set **Location** to **https://download.eclipse.org/egit/updates**.



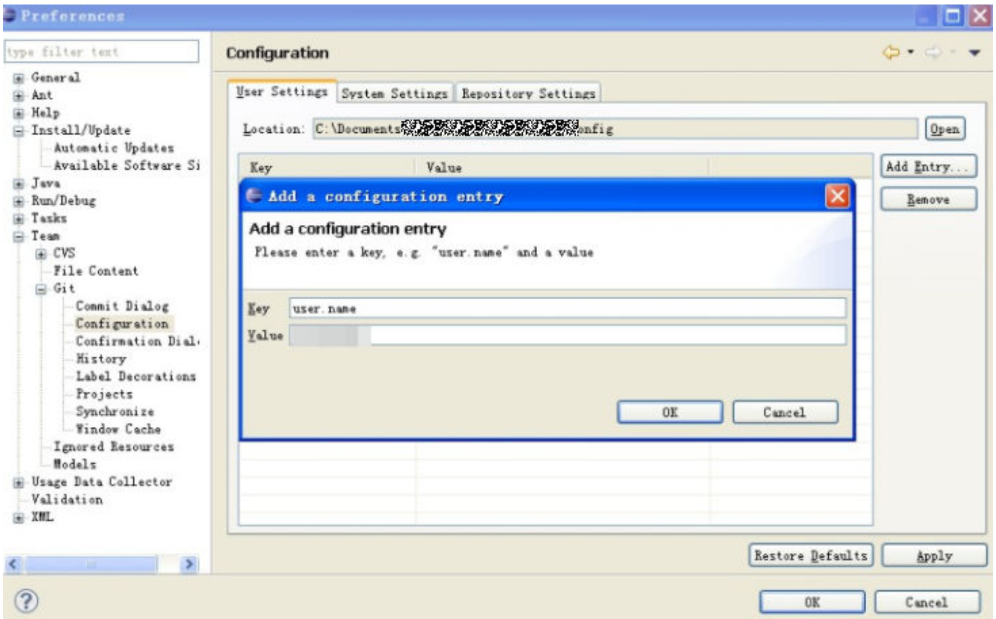
3. Click **OK**. Then, click **Next** until the installation is finished.

   Restart Eclipse after the installation.

Step 2: Configuring EGit on Eclipse

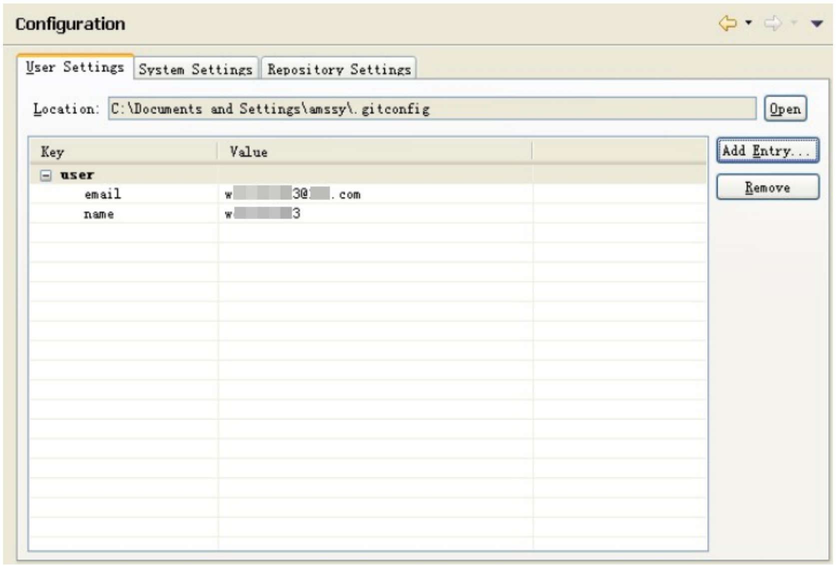
1. On the Eclipse toolbar, choose **Window** > **Preferences** > **Team** > **Git** > **Configuration**.

   Set **Key** to a registered username.



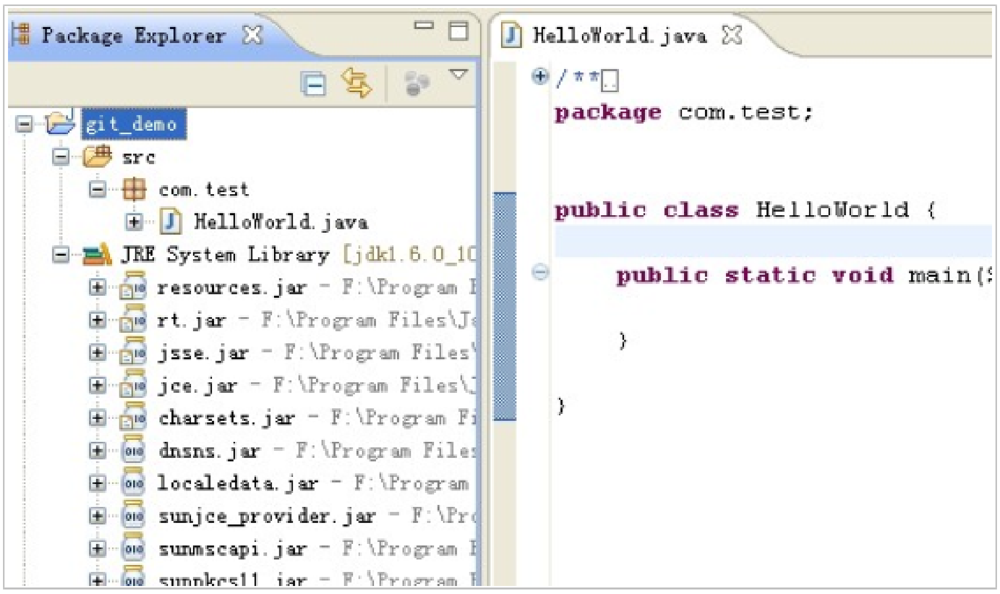
2. Click **OK**.

 email indicates the bound email address. If the username is not set previously, set it in this step.

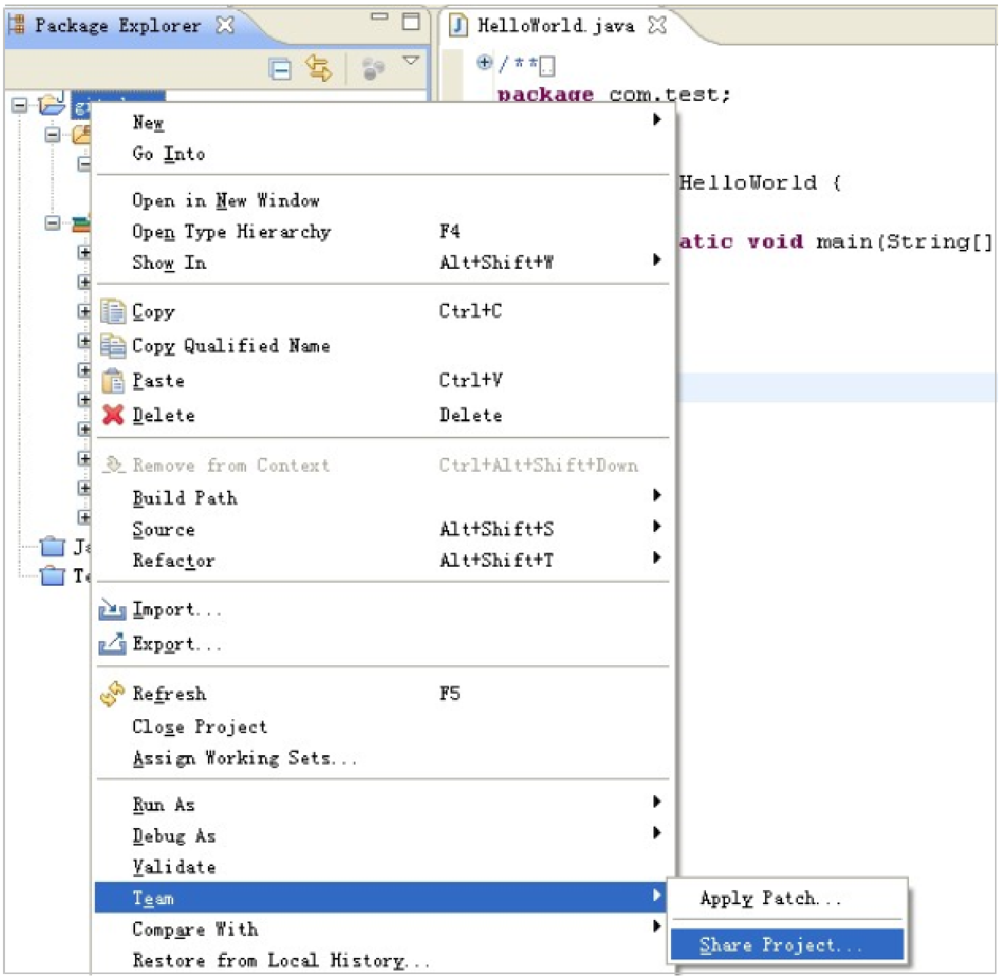


Step 3: Creating a Project and Committing Code to the Local Git Repository

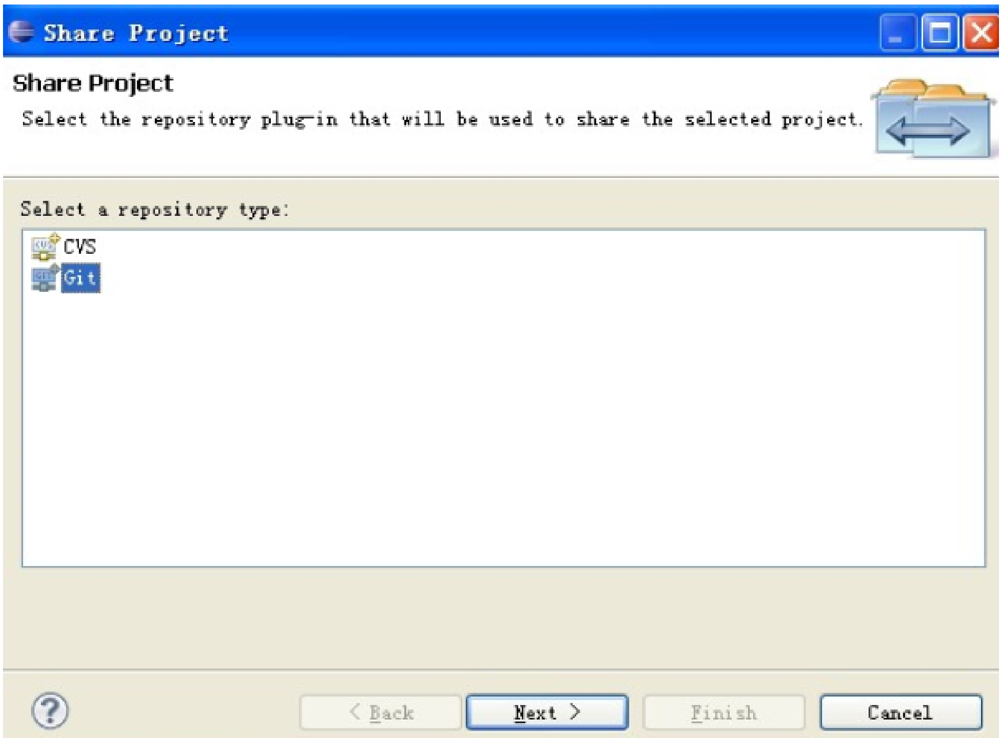
1. Create the **git_demo** project and the **HelloWorld.java** class.



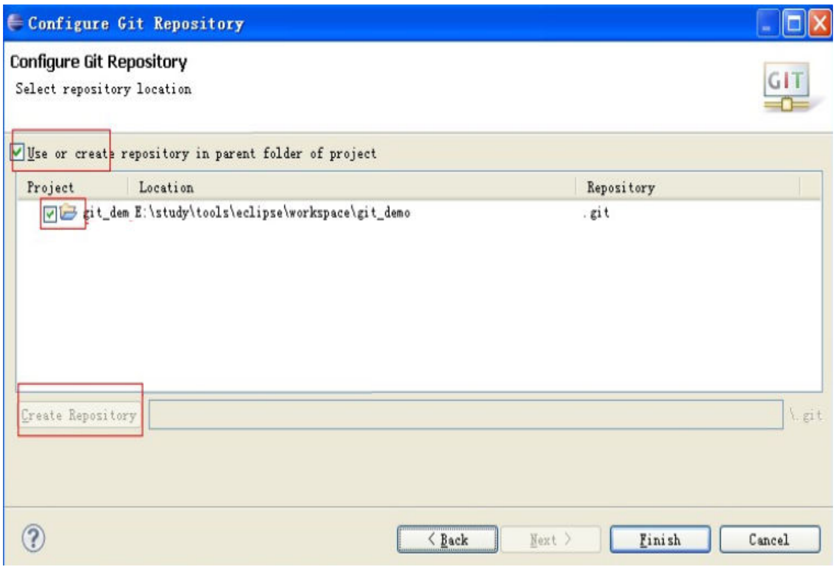
2. Share the **git_demo** project with the local repository.



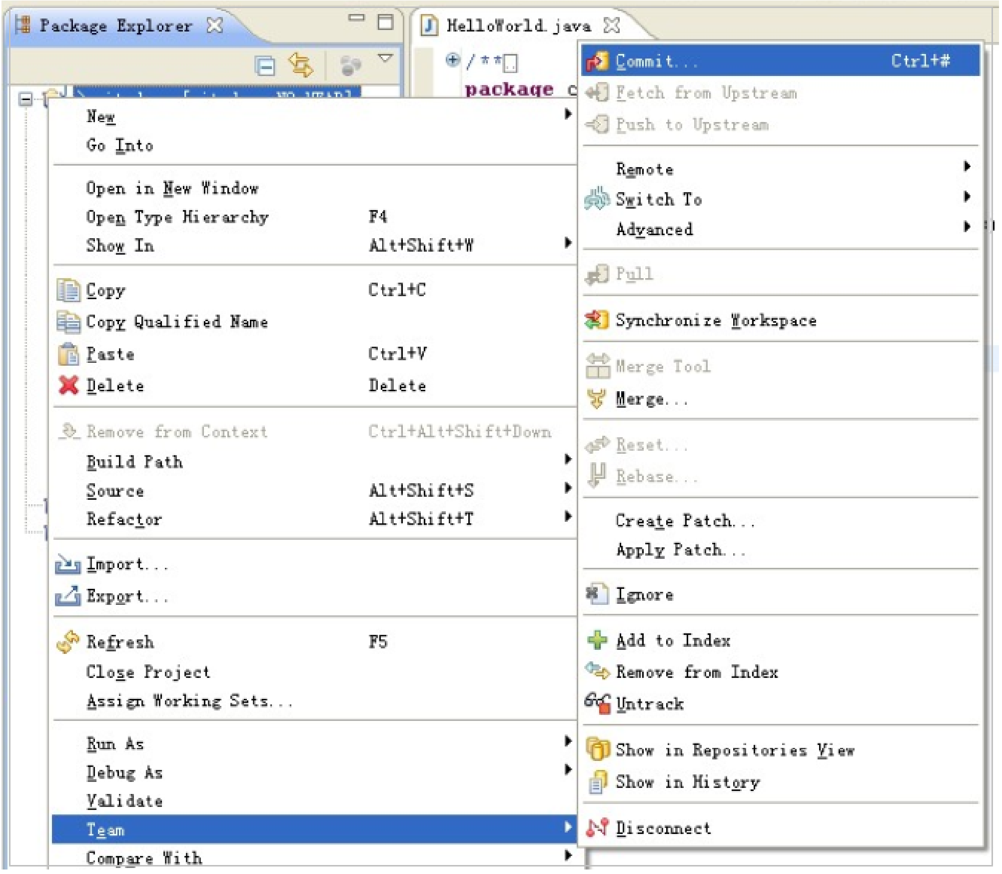
3. In the **Share Project** window displayed, select **Git**.



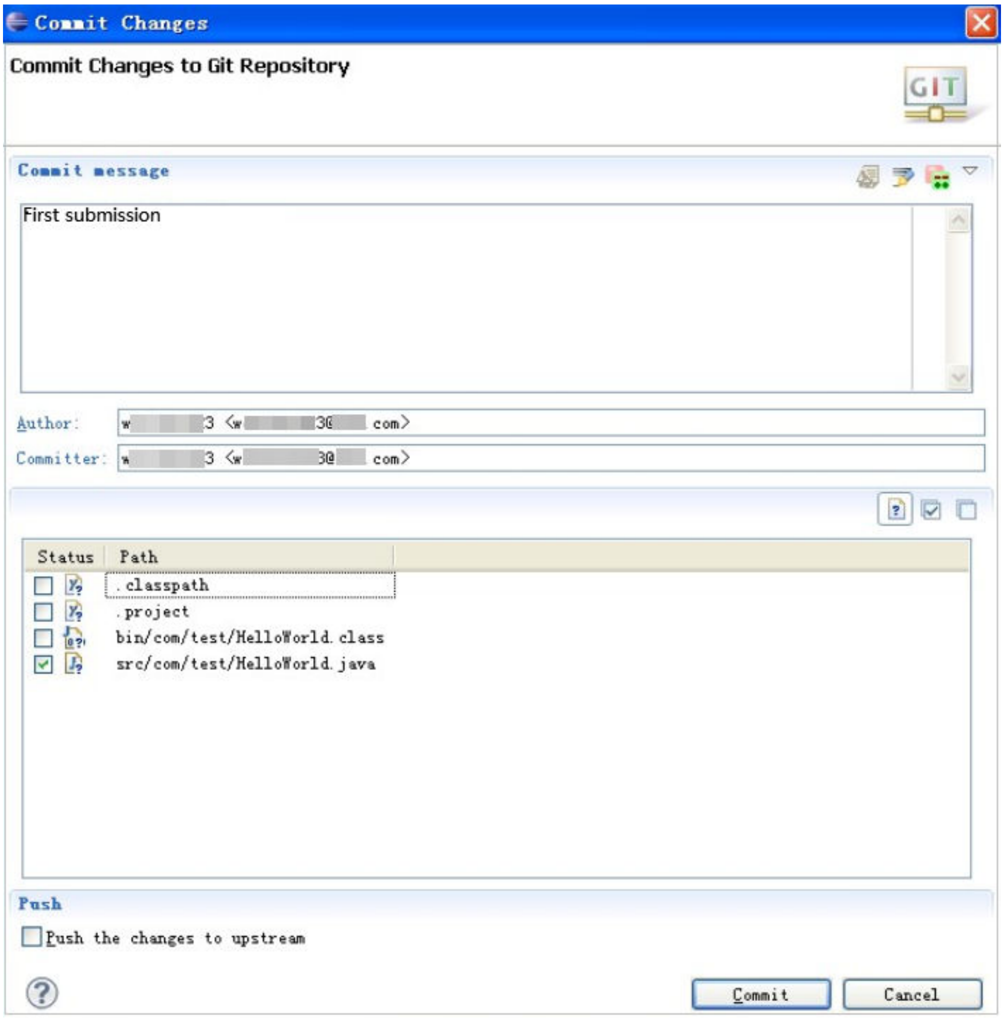
4. Click **Next**. The **Configure Git Repository** dialog box is displayed.



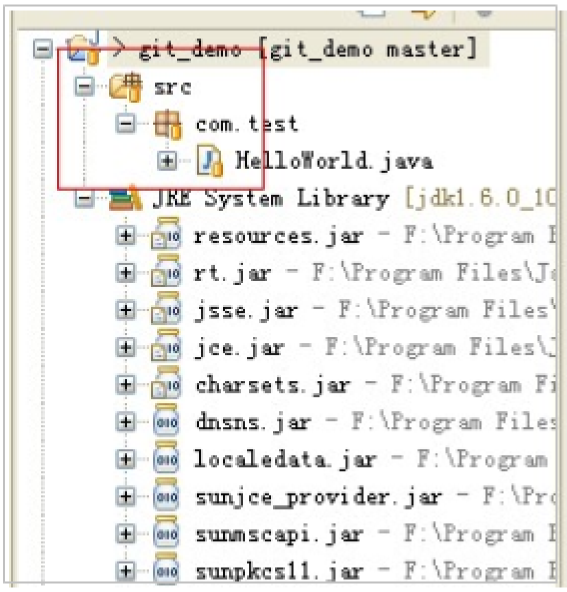
5. Click **Create Repository** to create a Git repository.
   The directory is in the **untracked** status, indicated by a question mark (**?**).
   Choose **Team** > **Commit...** to commit code to the local repository.



6. In the **Commit Changes** dialog box displayed, set the commit message.



7. Click **Commit** to commit the code to the local repository.

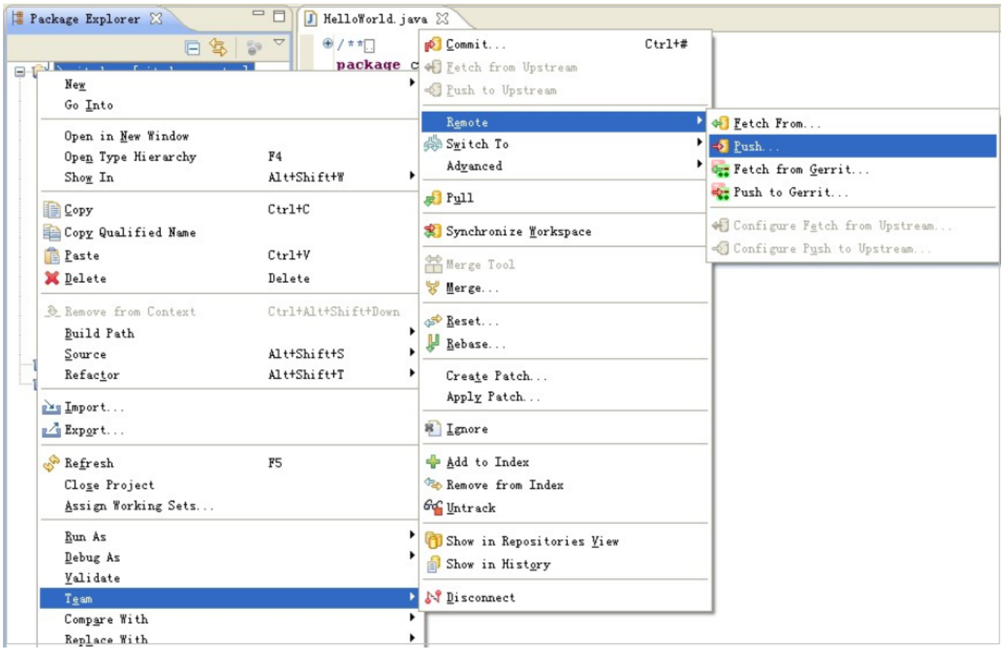


Step 4: Committing Code in the Local Repository to the Remote Git Repository

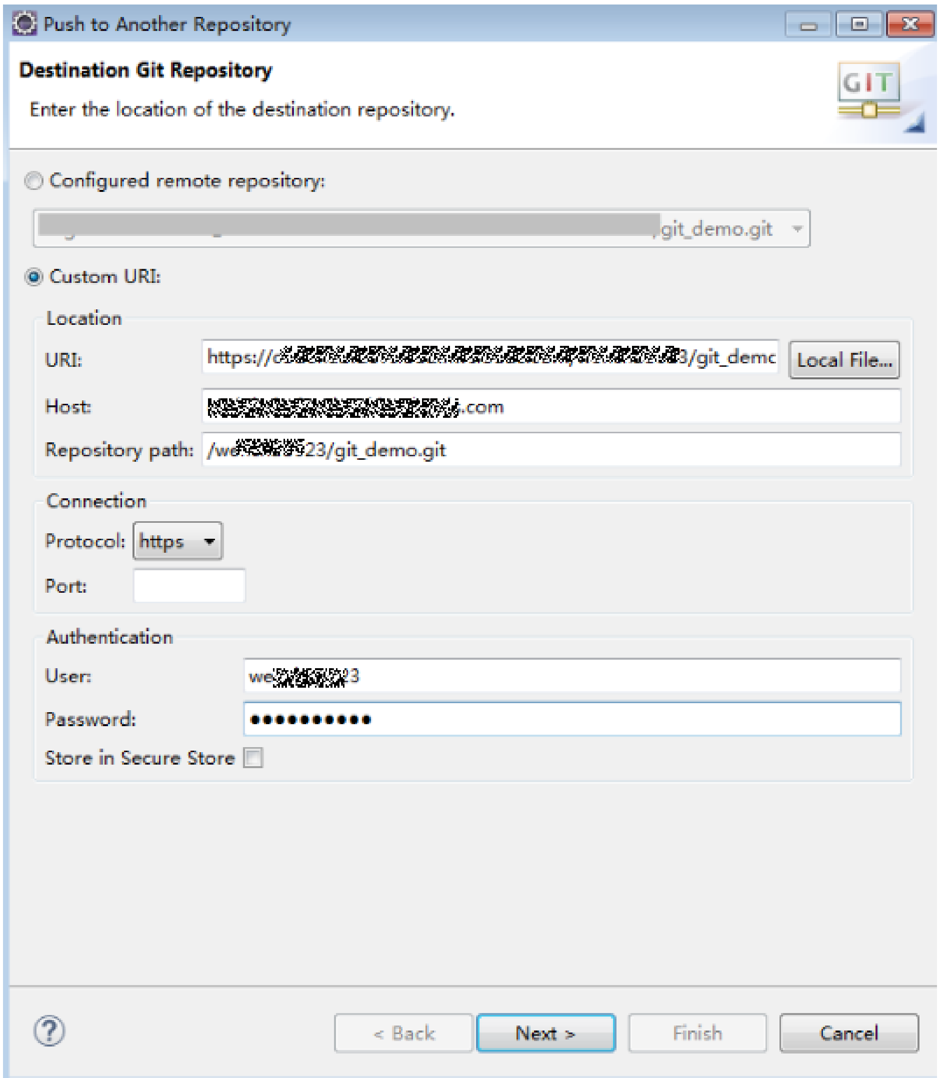
1. Create a repositor in CodeArts Repo. For details, see **Overview**.

   Go to the repository details page and copy the repository URL.

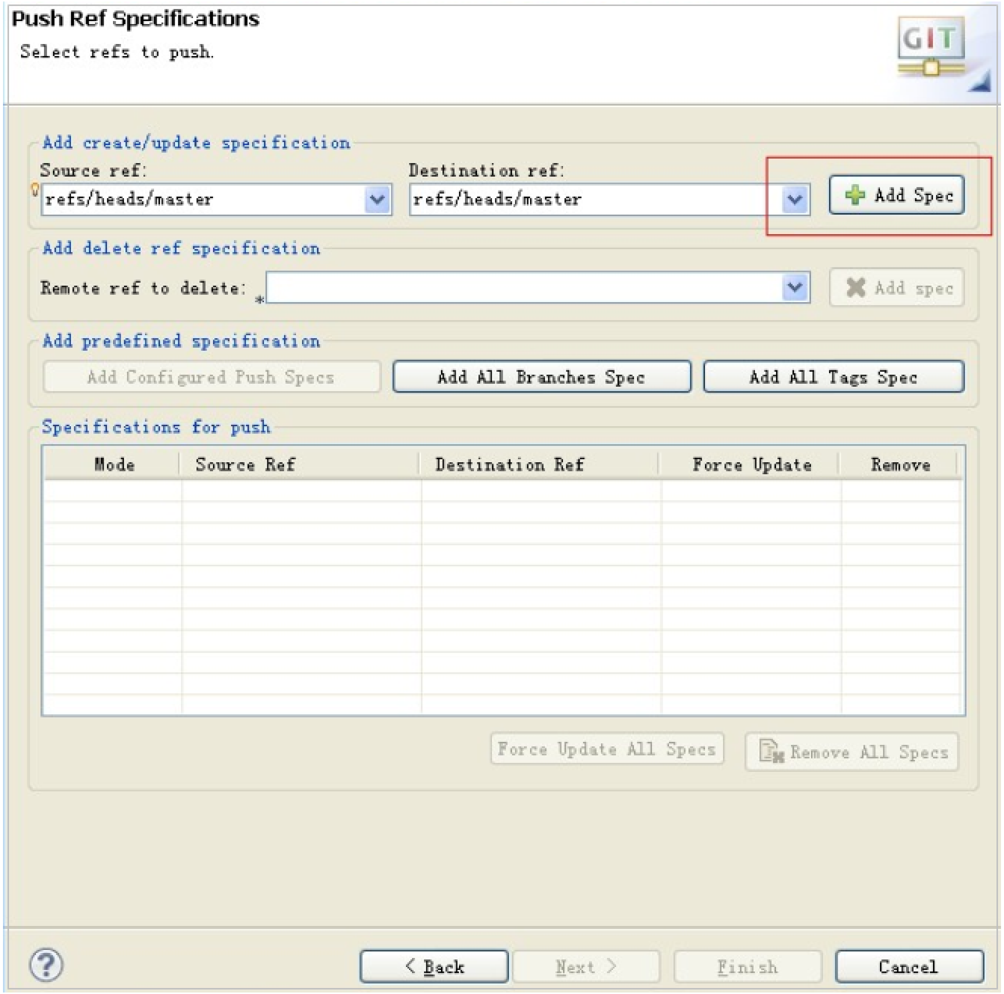
2. Choose **Team** > **Remote** > **Push...** to push the code to the remote repository.



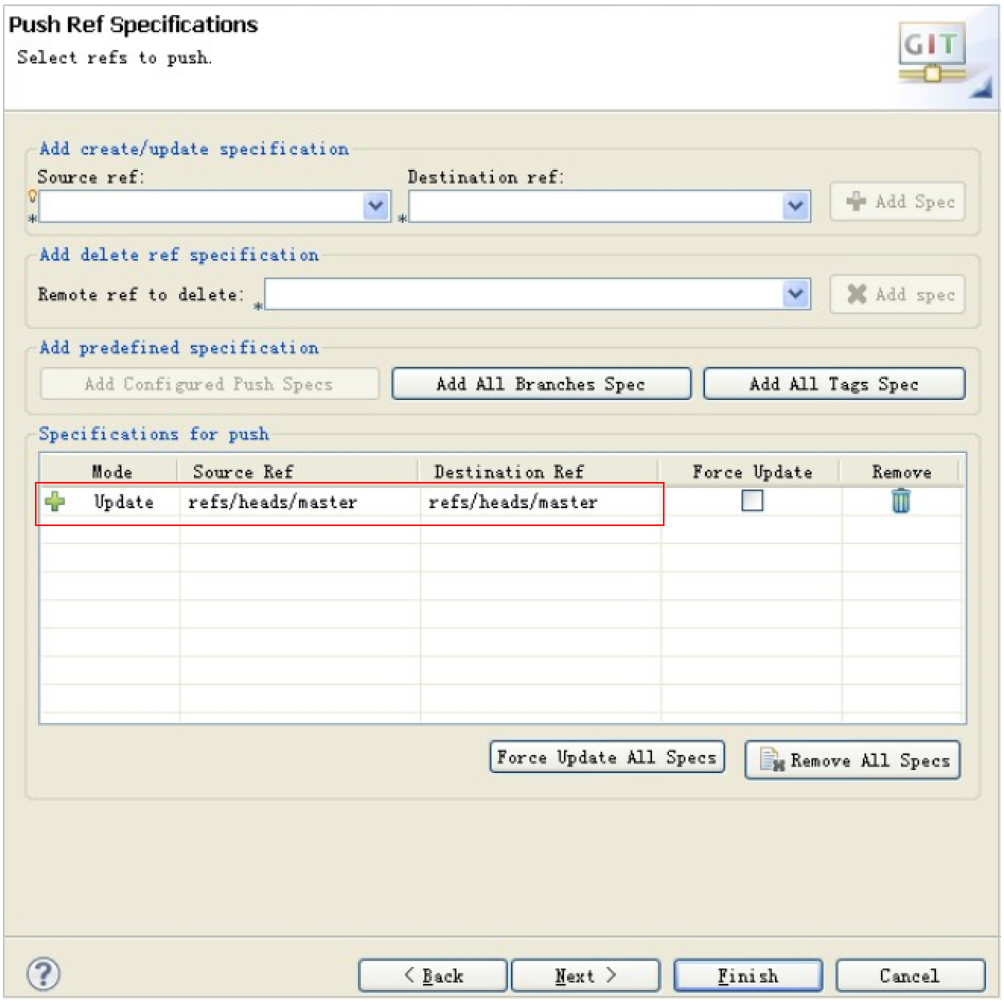
3. In the **Push to Another Repository** dialog box, set the parameters.



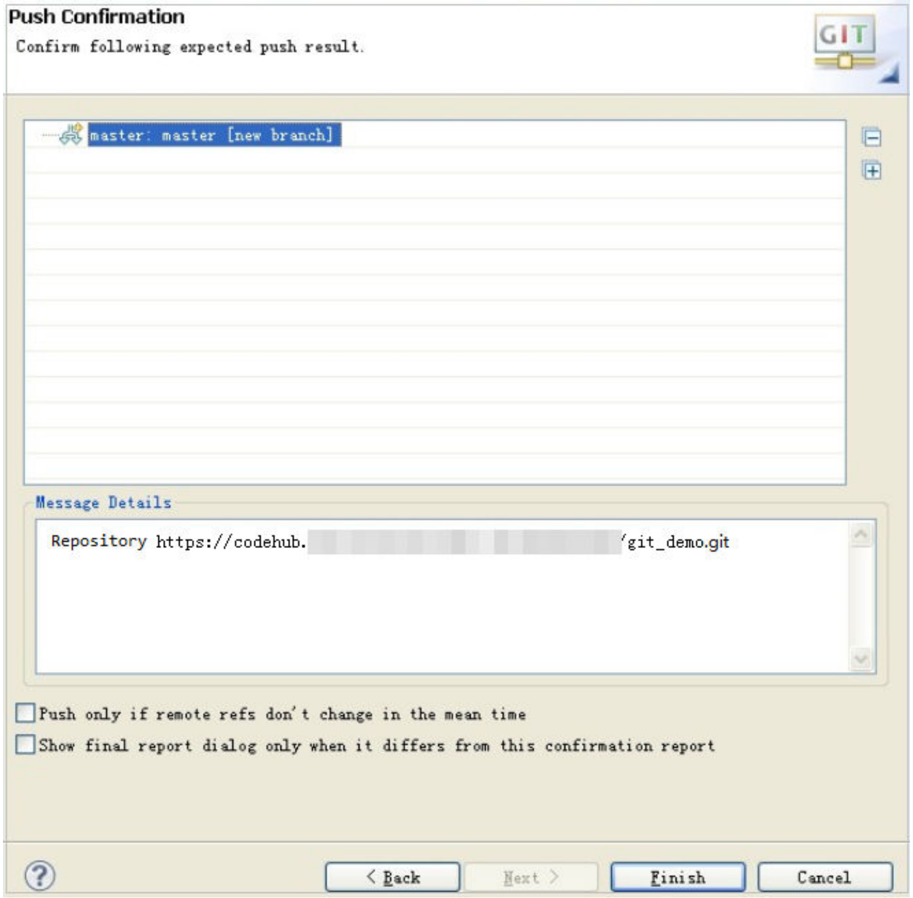
4. Click **Next**. The **Push Ref Specifications** dialog box is displayed.



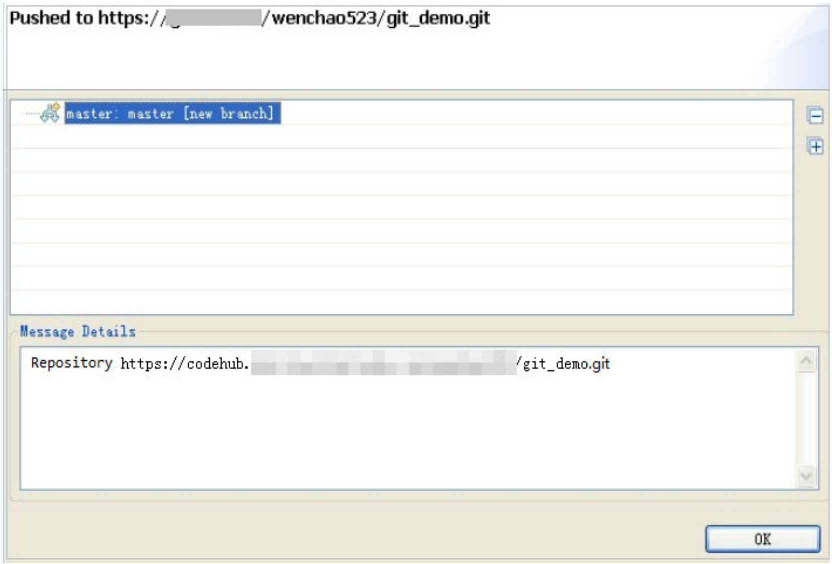
5. Click **Add Spec**.



6. Click **Next**. The **Push Confirmation** dialog box is displayed.



7. Click **Finish**.



8. Click **OK**.

   Log in to the remote repository and check the submitted code.

2.11 More About Git

2.11.1 Using the Git Client

Background

Before using the Git client, you need to understand the workflow and master basic operations, such as installing Git, creating and cloning repositories, adding, committing, and pushing changes, creating, updating, and merging branches, creating tags, and replacing local changes.

Prerequisites

The Git client has been installed.

Usage Process

The following figure shows the basic process of using the Git client.

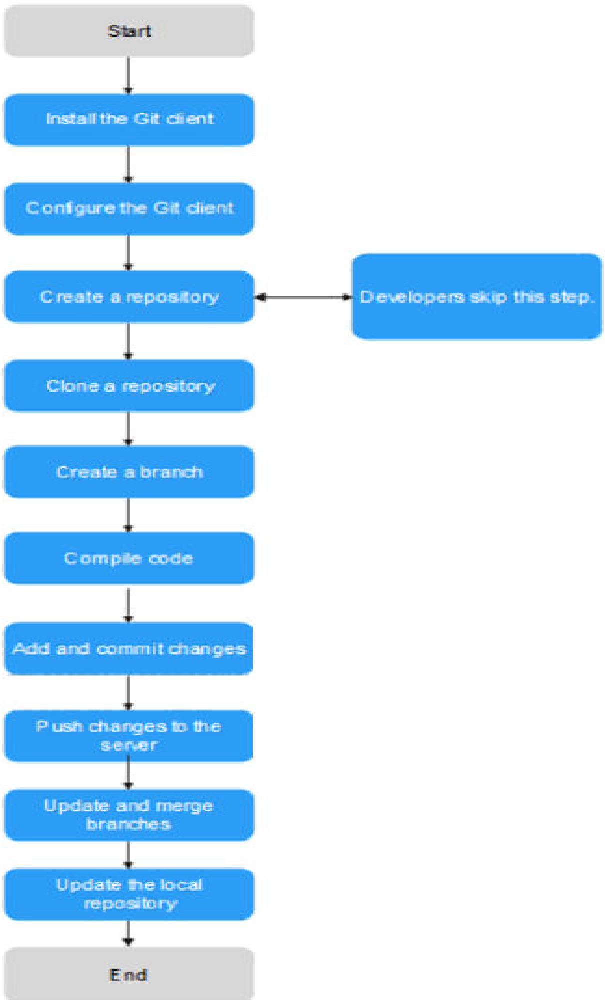


Table 2-28 Procedure

Procedure	Description
Install the Git client	Install the Git client for your operating system. ● Git for Windows ● Git for macOS X ● Git for Linux
Create a repository	Create and open a new folder, and run the following command: git init A Git repository is created.
Clone a repository	Run the following command to create a clone of a local repository: git clone /path/to/repository If the repository is on a remote server, run the following command: git clone username@host:/path/to/repository
Local repository structure	There are three components in a local repository: working directory, index, and HEAD. ● Working directory contains the files that you are working on. ● Index caches changes you have made. ● HEAD points to the latest commit.
Add and commit changes	Run the following command to add the changes to the index: git add <filename> git add * Run the following command to commit the changes: git commit -m "Code submission information" The changes are committed to the HEAD but not to the remote repository.
Push changes	The changes are in the HEAD of the local repository. Run the following command to push the changes to the remote repository: git push origin master You can replace master with any other branch to be pushed. If you have not cloned an existing repository, run the following command to connect the local repository to a remote server before the push: git remote add origin <server> Then push the changes to the added server.

Procedure	Description
Create a branch	Branches enable you to develop features separately. When a repository is created, the master branch is the main branch by default. Develop features on other branches and then merge them to the main branch after the development. 1. Create a branch named **feature_x** and check out the branch. git checkout -b feature_x 2. Check out the main branch. git checkout master 3. Push the main branch to the remote repository. (If the branch is not pushed, the branch can be seen only in your local repository.) git push origin <branch> 4. Delete the created branch. git branch -d feature_x
Update and merge branches	1. Run the following command to update the local repository to the latest remote commits: git pull The remote changes are fetched and merged to your working directory. 2. Run the following command to merge other branches to the current branch (for example, the master branch): git merge <branch> **NOTE** Automatic merges may fail and conflicts occur. In this case, you need to modify these files to manually merge the conflicts. 3. After the modification, run the following command to add your changes. git add <filename> 4. Before the modification, you can run the following command to compare the source and target branches. git diff <source_branch> <target_branch>
Create a tag	You are advised to create tags for releases. For example, run the following command to create a tag named **1.0.0**: git tag 1.0.0 1b2e1d63ff **1b2e1d63ff** is the first 10 characters of the commit ID to be tagged. Run the following command to obtain the commit ID: git log You can enter the first several characters of the commit ID as long as it can distinguish the commit from others.

Procedure	Description

Replace local changes	Run the following command to replace the unwanted local changes:
	`git checkout -- <filename>`
	The files in the working directory are replaced by the latest content in the HEAD. Changes added to the index and new files are not affected.
	To discard all local changes and commits, fetch the latest commit from the server and reset the local main branch to the commit.
	`git fetch origin`
	`git reset --hard origin/master`

2.11.2 Setting Password-Free Access via HTTPS

Background

The username and password are required each time you connect to CodeArts Repo using the HTTPS protocol. However, Git can help you implement password-free access with its credential storage. You are advised to install **Git 2.5** or a later version so that the function runs properly. The following describes the configuration methods on different OSs:

- **Setting Password-Free Access on Windows**
- **Setting Password-Free Access on macOS**
- **Setting Password-Free Access on Linux**

Prerequisites

- **The SSH keys and HTTPS password have been set.**
- You have to enter the username and password in CodeArts Repo each time you use the HTTPS protocol to perform operations such as git clone, git fetch, git pull, and git push.

Setting Password-Free Access on Windows

The following table describes how to set password-free access on Windows.

Table 2-29 Setting password-free access on Windows

Method	Description
Set the HTTPS password on the local computer	1. Set the Git authentication mode. Open the Git client and run **git config --global credential.helper store**. 2. Run the Git command to clone or push code for the first time, and enter the username and password as prompted. 3. Open the **.git-credentials** file. If the username and password have been stored locally, the following information is displayed: `https://username:password@***.***.***.com`

Setting Password-Free Access on macOS

Install the **osxkeychain** tool to implement password-free access.

1. Check whether the tool has been installed.
```
git credential -osxkeychain
# Test for the cred helper
Usage: git credential -osxkeychain < get|store|erase >
```
If the following information is displayed, the tool has not been installed.
```
git: 'credential -osxkeychain' is not a git command. See 'git --help'.
```
2. Obtain the installation package.
```
git credential -osxkeychain
# Test for the cred helper
git: 'credential -osxkeychain' is not a git command. See 'git --help'.
curl -s -o \
https://github-media-downloads.s3.amazonaws.com/osx/git-credential-osxkeychain
# Download the helper
chmod u+x git-credential-osxkeychain
# Fix the permissions on the file so it can be run
```
3. Install **osxkeychain** in the directory where Git is installed.
```
sudo mv git-credential-osxkeychain\
"$(dirname $(which git))/git-credential-osxkeychain"
# Move the helper to the path where git is installed
Password:[enter your password]
```
4. Use **osxkeychain** to set Git to the password-free mode.
```
git config --global credential.helper osxkeychain
#Set git to use the osxkeychain credential helper
```

NOTE

The password needs to be entered the first time you perform Git operations. After that, **osxkeychain** will manage the username and password, and you do not need to enter password subsequently.

Setting Password-Free Access on Linux

Linux provides two password-free access modes:

- **cache**:
  - Credentials are cached in memory and cleared after 15 minutes.
```
git config --global credential.helper cache
#Set git to use the credential memory cache
```

– Set the expiration time in **timeout**, in units of seconds.

```
git config --global credential.helper 'cache --timeout=3600'
# Set the cache to timeout after 1 hour (setting is in seconds)
```

- **store**:

  Credentials are stored in a plain-text file (**~/.git-credentials** by default) in the **home** directory on the disk. The credentials never expire unless you change the password on the Git server. The content of the **git-credentials** file is as follows:

  https://username:password@***********.com

  After saving the credentials in the preceding file, run the following command to implement pass-free access:

  ```
  git config --global credential.helper store
  ```

Troubleshooting

If the message **SSL certificate problem: self signed certificate** is displayed when you download code using HTTPS, run the following command on the client:

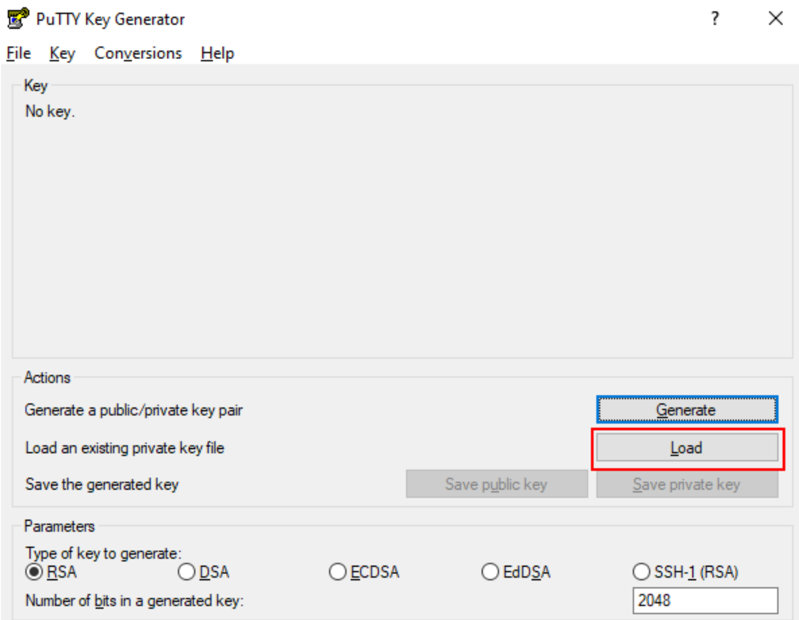
```
git config --global http.sslVerify false
```

2.11.3 Using the TortoiseGit Client

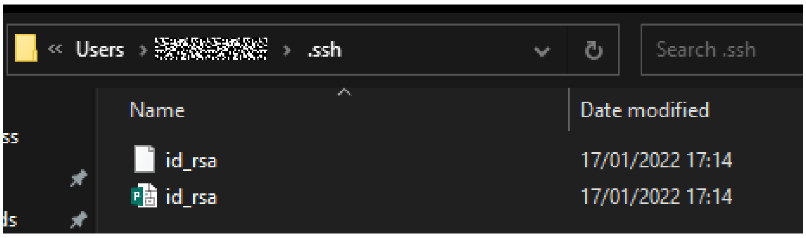
Generating a PPK File

A PPK file is required for downloading and committing code on the TortoiseGit client. Assuming that an SSH key pair has been generated on the Git client. The methods to generate a PPK file are different in the following two scenarios:

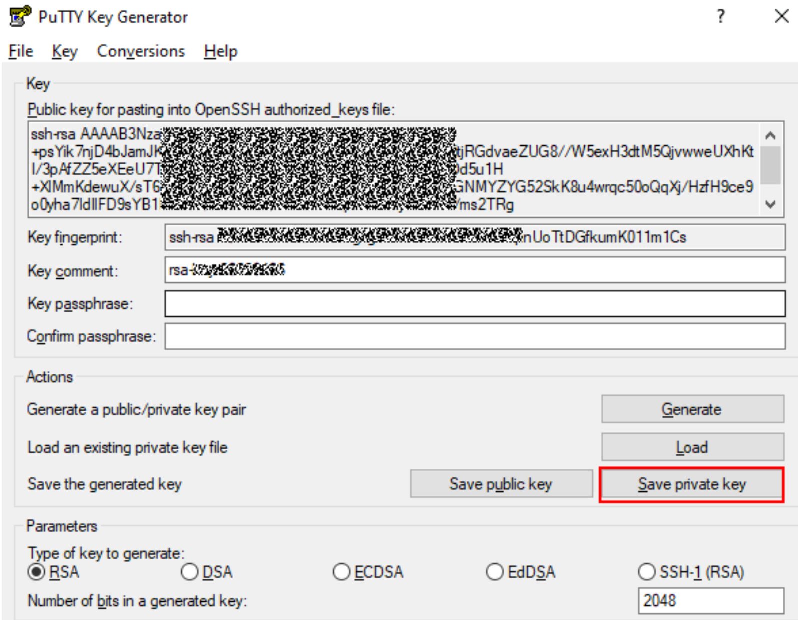
- **The Public Key Has Been Added to Ssh-key in CodeArts Repo**
  a. On theStart menu, search for and select **PuttyGen**.
  b. Click **Load**.



  c. Select the **id_rsa** file in the directory where the SSH key pair is stored and click **Open**.

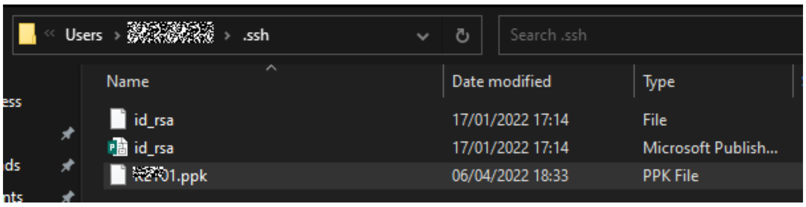


d. Click **OK** and select **Save private key**.



e. Click **Yes** to generate a PPK file.

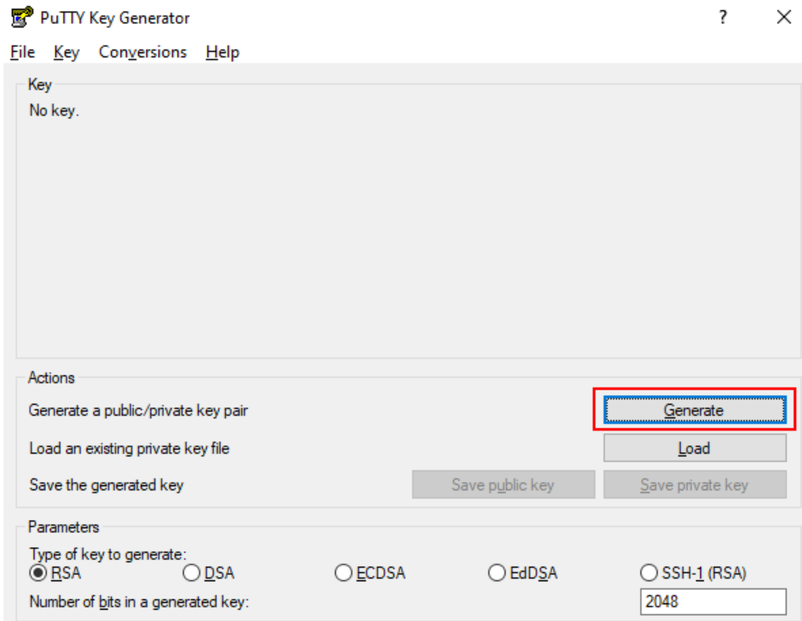
f. Save the file to the directory where the SSH key pair is stored.



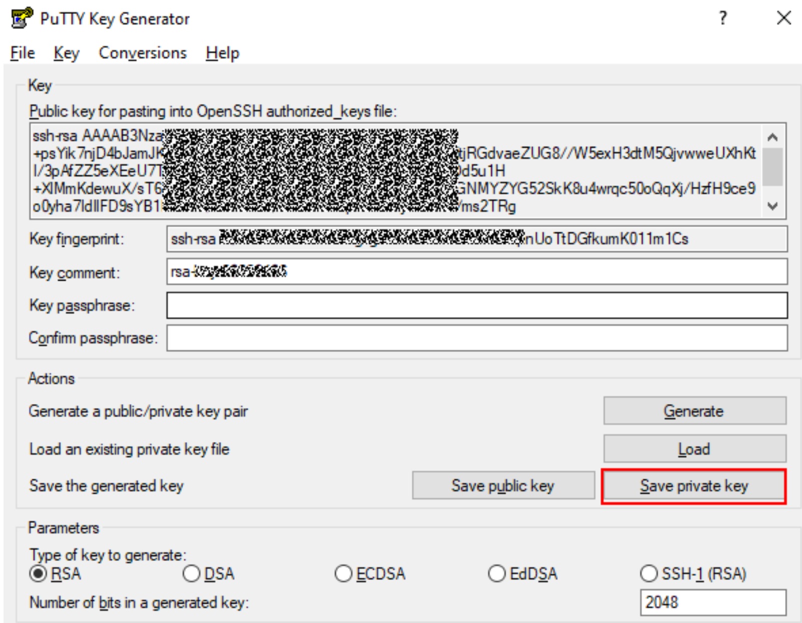
- **The Public Key Has Not Been Added to CodeArts Repo**

a. On theStart menu, search for and select **PuttyGen**.

b. Click **Generate** to generate a key, as shown in the following figure.

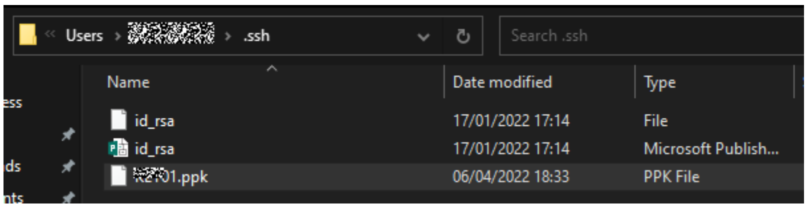


c. Click **Save private key** to save the generated key as a PPK file.



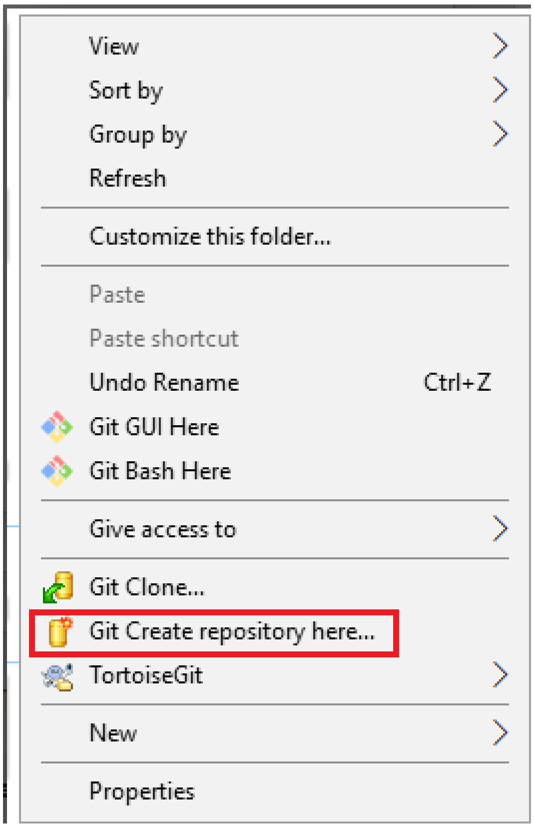
d. Click **Yes** to generate a PPK file.

e. Save the file to the directory where the SSH key pair is stored.



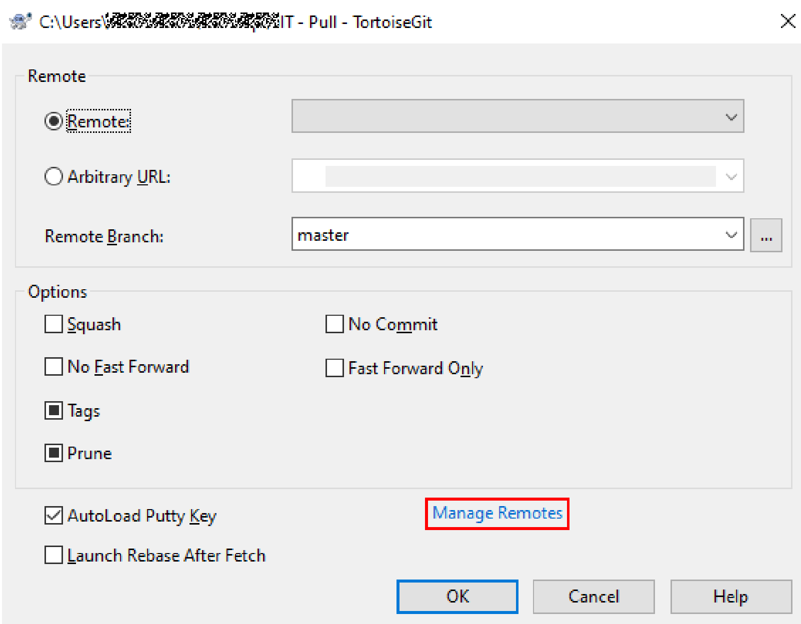
Creating a Git Version Repository

To create a repository for the first time, right-click in an empty directory on the local computer and choose **Git Create repository here...**.

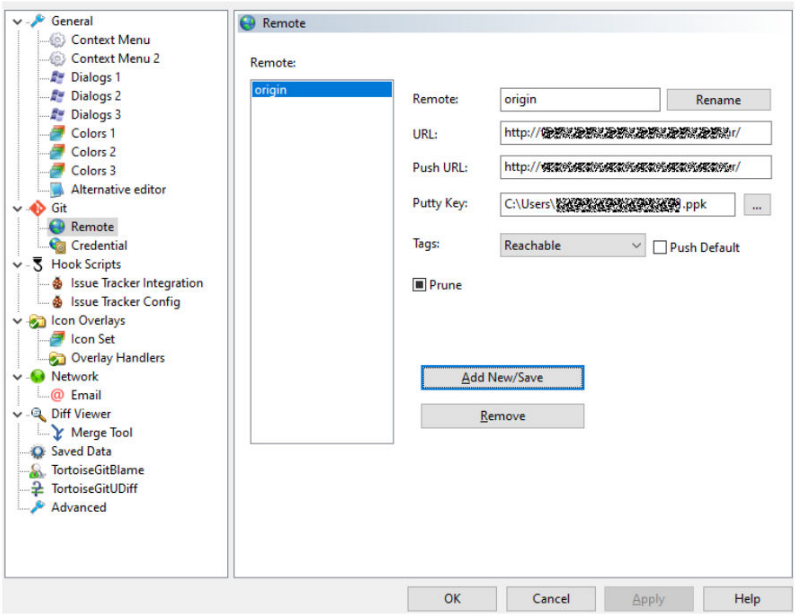


Cloning a Version Repository

1. Open the local Git repository directory (where **the repository is created**) and choose **TortoiseGit** > **Pull** on the right-click menu.
2. Click **Manage Remotes**.

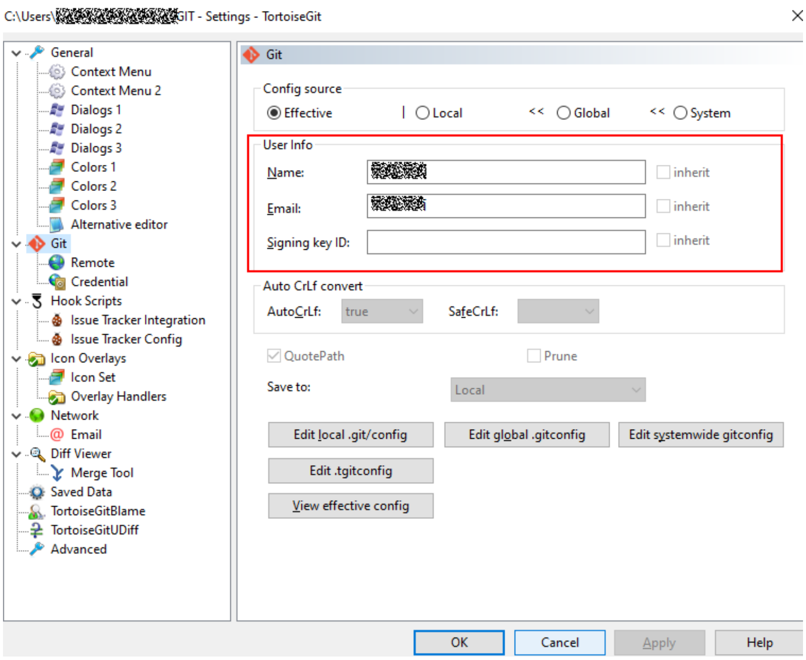


3. Specify the **URL**, select **the PPK file** for the **Putty** field, and click **OK**.



Push Version Repository

1. Configure the username, email address, and signature key ID (PPK file).
2. Right-click in the blank area and choose **TortoiseGit > setting**.
3. Select **Git**, and set **Name** and **Email**.



NOTE

If the push fails, run the following script to locate the fault and send the **git.log** file generated to the technical support:

```
#!/bin/bash
# this script will collect some logs for Coding.net
### how to use ###
# first enter your git reposiztory
# then execute this bash, please make sure you have correct rights
echo "## git version  #################" >> git.log
git version  >> git.log
echo "## ping ########################" >> git.log
ping code*************.com  >> git.log
echo "## curl *************.com ##########" >> git.log
curl -v https://code*************.com >> git.log 2>&1
echo "## ssh -vT git@*************.com #############" >> git.log
ssh -vT git@*************.com >> git.log 2>&1
echo "## git pull  #############" >> git.log
GIT_CURL_VERBOSE=1 GIT_TRACE=1 GIT_TRACE_PACKET=1 git pull  >> git.log  2>&1
```

2.11.4 Use Cases on the Git Client

2.11.4.1 Uploading and Downloading Code

1. Ensure that the network connection is up and running.

   Enter **telnet *************.com 22** on the client.

   If **command not found** is displayed, the network cannot access CodeArts Repo.

2. Check if the client is trusted by CodeArts Repo.

   If the system prompts you to enter a password when you **pull** or **push** code, check whether the public key has been added to CodeArts Repo.

   If the public key has been added, run **$ ssh -vT git@*************.com** to check whether the trust relationship is established.

   If the following information is displayed, the trust relationship is established.

```
debug1: channel 0: new [client-session]
debug1: Requesting no-more-sessions@openssh.com
debug1: Entering interactive session.
Welcome to GitLab, 100314597!
debug1: client_input_channel_req: channel 0 rtype exit-status reply 0
debug1: client_input_channel_req: channel 0 rtype eow@openssh.com reply 0
debug1: channel 0: free: client-session, nchannels 1
Transferred: sent 3536, received 3488 bytes, in 0.3 seconds
Bytes per second: sent 11491.6, received 11335.6
debug1: Exit status 0

[redacted] MINGW64 /d/Gitlab
$
```

3. If the fingerprints of both parties are changed after the trust relationship is established, a public key authentication error is reported during commit attempts. In this case, perform the following operations:

   a. Delete the lines related to **************.com** from the **~/.ssh/known_hosts** file.

   b. Enter **push**, **pull**, or **ssh -T git@*************.com**.

   c. Enter **yes** when asked whether to trust the public key of the server.

4. The code download is successful. If the target branch of the push is protected, the code fails to be pushed.

5. Contact the repository administrator to **unprotect the branch**. The code can be pushed after the protection is canceled.

2.11.4.2 Committing Letter Case Changes in File Names to the Server

Background

When changes are made to the case of a file name and pushed to the server, the server does not recognize the changes.

For example, a file named **AppTest.java** is renamed as **apptest.java** on the Git client. When the change is pushed to the server, the name of the file in the remote server is still **AppTest.java**.

Procedure

Run the following commands in sequence:

```
git mv --force AppTest.java apptest.java
git add apptest.java
git commit –m "rename"
git push origin XXX (branch name)
```

2.11.4.3 Setting the Line Ending Conversion

Background

Different operating systems may use different line endings. Therefore, if you open a file created in an operating system different from yours, the file may be displayed incorrectly. This problem may also occur when you use version control systems.

Procedure

1. (Optional) By default, **core.autocrlf** is set to **false** in Git. Perform the following operations to enable Git to identify and convert the line endings for text files:
   - On **Windows**

     Set **core.autocrlf** to **true**. All text files in the local repository use LF line endings whereas those checked out to the working directory use CRLF line endings.
   - On **Linux**

     Set **core.autocrlf** to **input**. When files are imported to the local repository, Git auto-converts line endings from CRLF to LF. No conversion is performed when files are checked out from the local repository to the working directory.
2. Set **core.autocrlf** to **true** to enable auto-conversion of line endings.
   ```
   git config --global core.autocrlf true
   ```

2.11.4.4 Committing Hidden Files

Run **git add**.

NOTE

- Do not use **git add ***, which instructs Git to ignore the hidden files.
- The file and directory names cannot contain special characters.

2.11.4.5 Pushing a File That Has Been Changed on the Server

Background

A file push on the Git client will fail if the file is modified on the server, and the following information is displayed.

```
git.exe push --progress "origin" master:master

To git@[redacted]
1.[redacted].com:fdae56335080433a8298a5c72aed2fe6/[redacted].git
! [rejected]        master -> master (fetch first)
error: failed to push some refs to 'git@[redacted]
1.[redacted].com:fdae56335080433a8298a5c72aed2fe6/[redacted].git'
hint: Updates were rejected because the remote contains work that you do
hint: not have locally. This is usually caused by another repository pushing
hint: to the same ref. You may want to first integrate the remote changes
hint: (e.g., 'git pull ...') before pushing again.
hint: See the 'Note about fast-forwards' in 'git push --help' for details.
```

Procedure

1. Pull the latest code from the server.
   ```
   git pull origin XXX (branch name)
   ```
2. Modify and push the code.
   ```
   git push origin XXX (branch name)
   ```

2.11.5 Common Git Commands

Background

- Git is a free and open-source distributed version control system. It can manage projects of any size in an agile and efficient manner.
- With Git, you can clone a complete Git repository (including code and version information) from a server to a local computer, create branches, modify and commit code, and merge branches.

Commonly Used Commands

The following table describes the functions, formats, parameters, and examples of common Git commands.

Table 2-30 Common Git commands

Command	Function	Format	Parameter	Example
ssh–keygen –t rsa	Generate a key	ssh–keygen –t rsa –C [email]	**email**: indicates an email address.	Obtain the key file **id_rsa.pub** from the .ssh folder in drive C. ssh–keygen –t rsa –C "devcloud_key01@XXX.com"
git branch	Create a branch	git branch [new branchname]	**new branchname**: indicates the name of the new branch.	Create a branch: git branch newbranch
git branch –D	Delete a branch	git branch –D [new branchname]	**new branchname**: indicates the name of the new branch.	Delete a local branch: git branch –D newbranch Delete a branch in the remote repository: git branch –rd origin/newbranch Remove branches that have been deleted in the remote repository: git remote prune origin

Command	Function	Format	Parameter	Example
git add	Add a file to the index	git add [filename]	**filename**: indicates the name of the file to be added.	Add a file to the index: git add filename Add all modified and new files to the index: git add .
git rm	Delete a local directory or file	git rm [filename]	**filename**: indicates the name of the file or directory to be deleted.	Delete a file or a directory: git rm filename

Command	Function	Format	Parameter	Example
git clone	Clone a remote repository	git clone [VersionAddress]	**Version Address**: indicates the URL of the remote repository.	Clone a **jQuery** repository git clone https://github.com/jquery/jquery.git A directory is generated on the local computer. The name of the directory is the same as that of the cloned repository.
git pull	Pull the branch in the remote repository to the local computer and merge it with a specified local branch	git pull [RemoteHostname] [RemoteBranchname]:[LocalBranchname]	-	Pull the **next** branch from the remote repository and merge it with the local **master** branch. git pull origin next:master

Command	Function	Format	Parameter	Example
git diff	Compares files, branches, directories, or versions	git diff	-	Compare the current branch with the **master** branch: git diff master
git commit	Commit files	git commit	-	Add a commit message: git commit –m "commit message"
git push	Push files to the remote repository	git push [RemoteHostname] [LocalBranchname] [RemoteBranchname]	-	If the remote branch name is not specified, the local branch is pushed to the remote branch that it tracked (The two branches usually share a name). Such a remote branch will be created if it does not exist. git push origin master The local master branch is pushed to the master branch in the remote repository. If the latter does not exist, it will be created.
git merge	Merge branches	git merge [branch]	**branch**: indicates the name of the source branch	Assuming that the current branch is the develop branch. The latest commit to the master branch is merged to the develop branch. git merge master

Command	Function	Format	Parameter	Example
git checkout	Check out a branch	git checkout [branchname]	branchname: indicates the name of the branch to be switched to.	Check out the master branch: git checkout master
git log	List the log	git log	-	List all logs: git log --all
git status	Check the status	git status	-	git status
git grep	Search for a character string	git grep	-	Check whether there is any character string containing **hello**: git grep "hello"
git show	Display objects or revisions	git show	-	• git show v1 The revisions attached with the **v1** tag are displayed. • git show HEAD Display the last commit of the current branch. • git show HEAD^ Display the first parent of the last commit of the current branch. • git show HEAD~4 Display the ancestor four generations prior to the last commit of the current branch.

Command	Function	Format	Parameter	Example
git stash	Commands related to stashes	git stash	-	• git stash Saves and restores the work progress. • git stash list Lists all stashes. • git stash pop Restore the latest stash and remove it from the stash list. • git stash apply Restore the latest stash but not remove it from the stash list. • git stash clear Clear all stashes.
git ls-files	View files	git ls-files	-	• git ls-files –d View deleted files • git ls-files –d |xargs git checkout Restore deleted files
git remote	Perform operations on the remote repository	git remote	-	• git push origin master:newbranch Create the master branch in the remote repository and push changes to it. • git remote add newbranch Create the master branch in the remote repository and push changes to it. • git remote show List the number of remote repositories • git remote rm newbranch Delete a new branch from the remote repository • git remote update Update branches of all remote repositories

2.11.6 Using Git LFS

Background

- Git Large File Storage (LFS) is supported on CodeArts Repo. It stores large file such as music, images, and videos outside a Git repository while users can still easily perform operations on these files as if they were within the repository.

The Git extension allows more repository space and faster repository cloning, and reduces the impact of large files on the Git performance.

- If the size of a file to be uploaded exceeds 200 MB, use Git LFS.
- Get started with Git LFS:
  - Installing Git LFS
  - Configuring File Tracking
  - Committing Large Files
  - Cloning a Remote Repository Containing Git LFS Files
  - More About Git LFS

Installing Git LFS

The following table describes the installation on different operating systems.

Table 2-31 Installing Git LFS

Operating System	Installation Method
Windows	Download and install Git 1.8.5 or a later version. Run the following command in the CLI: `git lfs install`

Linux	Run the following commands in the CLI:
	`$ curl -s https://packagecloud.io/install/repositories/github/git-lfs/script.deb.sh | sudo bash`
	`$ sudo apt-get install git-lfs`
	`$ git lfs install`

macOS	Install the Homebrew software package management tool, and run the following commands:
	`$ /usr/bin/ruby -e "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/master/install)"`
	`$ brew install git-lfs`
	`$ git lfs install`

Configuring File Tracking

This section describes how to configure file tracking.

Table 2-32 Configuring file tracking

Scenarios	Method
Track all **.psd** files	Run the following command: `git lfs track "*.psd"`
Track a file	Run the following command: `git lfs track "logo.png"`

Scenarios	Method

View tracked files	Run **git lfs track** or view the **.gitattributes** file.
	`$ git lfs track`
	`Listing tracked patterns`
	`    *.png (.gitattributes)`
	`    *.pptx (.gitattributes)`
	`$ cat .gitattributes`
	`*.png filter=lfs diff=lfs merge=lfs -text`
	`*.pptx filter=lfs diff=lfs merge=lfs -text`

Pushing Large Files

The **.gitattributes** file should be pushed to the repository along with the large files. After the push, run **git lfs ls-files** to view the list of track files.

```
$ git push origin master
Git LFS:  (2 of 2 files) 12.58 MB / 12.58 MB
Counting objects: 2, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (5/5), done.
Writing objects: 100% (5/5), 548 bytes | 0 bytes/s, done.
Total 5 (delta 1), reused 0 (delta 0)
To <URL>
<SHA_ID1>..<SHA_ID2>  master -> master
$ git lfs ls-files
61758d79c4 * <FILE_NAME_1>
a227019fde * <FILE_NAME_2>
```

Cloning a Remote Repository Containing Git LFS Files

Run **git lfs clone** to clone a remote repository that contains **Git LFS** files to the local computer.

```
$ git lfs clone <URL>
Cloning into '<dirname>'
remote: Counting objects: 16,done.
remote: Compressing objects: 100% (12/12),done.
remote: Total 16 (delta 3), reused 9 (delta 1)
Receiving objects: 100% (16/16),done.
Resolving deltas: 100% (3/3),done.
Checking connectively...done.
Git LFS: (4 of 4 files) 0 B / 100 B
```

More Operations

For details, see the **https://git-lfs.github.com**.

2.11.7 Git Workflows

2.11.7.1 Overview

Create a Git workflow or branching policy that works best on your development scenarios for effective version control, project process management, and team collaboration.

There are four common Git workflows. The following sections describe their processes, advantages, disadvantages, and some usage tips.

- Centralized workflow
- Feature branch workflow
- GitFlow (recommended)
- Forking workflow

Development teams can integrate CodeArts Repo and the workflow that suits them best to efficiently manage code and secure code. This enables them to focus more on service development to achieve continuous integration and delivery, and fast iteration.

2.11.7.2 Centralized Workflow

The centralized workflow is suited to a development team that comprises around 5 members or has just migrated from SVN to Git. There is only one main branch called master by default (trunk in SVN), which is the single entry point of changes. However, this workflow is not recommended for teams who want to enjoy the benefits of Git and team collaboration.

Process

Developers clone the master branch from the central repository to their local computers, make changes to the code, and push changes to the remote master branch.

Advantages

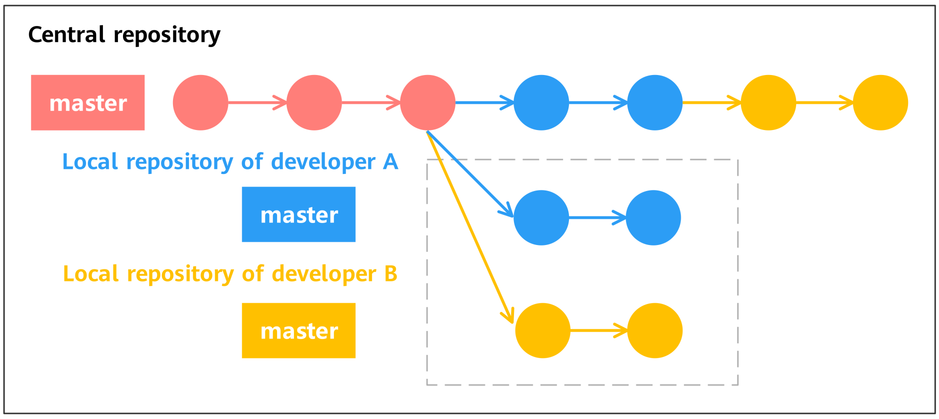
No branch interaction is involved.

Disadvantages

- Merge conflicts are frequent when the size of a development team is more than 10 members. Much time is spent on conflict resolution.
- The master branch is unstable due to frequent pushes to it, making it difficult to conduct integration tests.

Tips: Avoiding Conflicts and Unreadable Commit History

Before developing a new feature, developers must synchronize the local repository to the central one so that they can work on the latest version. After the development is complete, fetch updates from the central repository before rebasing their own commits. In this way, the commits are applied on top of changes that have been made and pushed to the central repository by other developers. The commit history is linear and clear. The following figure shows an example of the workflow.



1. Developers A and B pull code from the central repository at the same time.
2. Developer A completes the work and pushes it to the central repository.
3. When ready to push commits, developer B needs to first run **git pull –rebase** to apply commits on top of the changes made by developer A.
4. Developer B pushes the code to the central repository.

2.11.7.3 Branch Development Workflow

The core of the feature branch workflow is that every feature should be developed on a separate branch pulled off the master branch. This creates a work silo for every developer, ensures a stable master branch, and encourages team collaboration.

Process

Before developing a new feature, each developer should pull a new branch from the master branch and give it a descriptive name, for example, **video-output** or **issue-#1061**, to clearly state its purpose. By pushing local feature branches to the central repository, developers can share their code with each other without merging code into the master branch.

Advantages

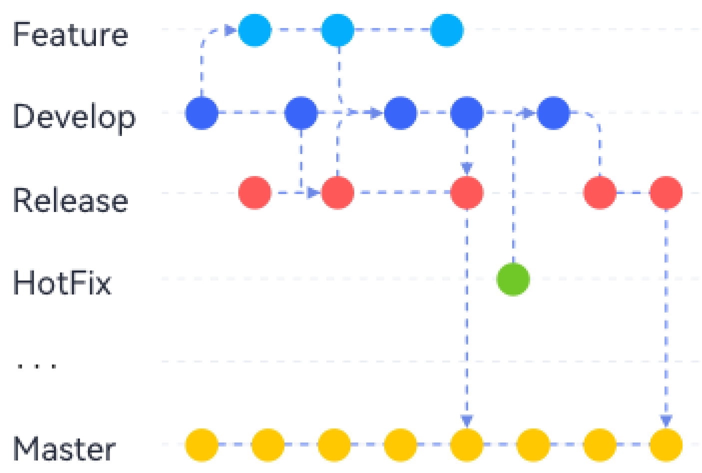
- Developers can create merge requests to have their code reviewed before merge.
- Pushes to the master branch are less frequent.

Disadvantages

Only the master branch is used to incorporate changes. The instability of the branch is further increased in large-scale development projects.

2.11.7.4 GitFlow

GitFlow is commonly seen in large-scale development projects. Each branch is dedicated to a specific purpose and policies are made to regulate the interaction between branches. The following figure shows the process of GitFlow.



Process

- **Master branch**

  The master branch is the production branch where code is ready to deploy. It is the most stable branch because changes cannot be directly pushed to it. Developers can only merge other branches to the master branch. It is often set as a protected branch by default, on which only the project maintainer can operate.

- **Hotfix branch**

  It is a temporary branch created off the master branch for fixing urgent bugs in a live production version. After the bug is fixed, the hotfix branch gets merged into the master branch and tagged with a version number. The bug fix also needs to be merged to the develop branch.

- **Develop branch**

  A develop branch is pulled from the master branch and used to merge features. It contains all the code ready to release for integration and system testing.

- **Release branch**

  When a new release is coming up, developers create a release branch from the develop branch for release preparations, such as fixing minor bugs and producing documents. Adding new features is not allowed. They should be merged into the develop branch and wait for the next release. When the preparation is complete, the release branch is merged into the master branch and the commit is tagged with a version number. The changes made in the release branch also need to be merged to the develop branch.

- **Feature branch**

  Feature branches are pulled from the develop branch for feature development. When the development is complete, they are merged into the develop branch. Feature branches do not interact with the master branch.

Developers add new features in either of the following ways:

- Integrate features after reviewed by a dedicated approver.

a. Developers push feature branches to the central repository in CodeArts Repo.
b. Developers then create merge requests for merging the feature branches into the develop branch, and assign the requests to the reviewer.

NOTE

CodeArts Repo supports MRs. You can choose source branches and target branches. Only repository administrators (project managers, repository creators, and developers granted with repository management permissions) can accept MRs.

c. The approver reviews the merge requests. If the requests are approved, the feature branches are merged into the develop branch and deleted. Otherwise, the approver should explain the reasons of rejections.

- Integrate features after self-reviews.
  a. Developers merge feature branches to the develop branch in the local repository and delete the feature branches.
  b. The local develop branch is then pushed to the central repository in CodeArts Repo.

Advantages

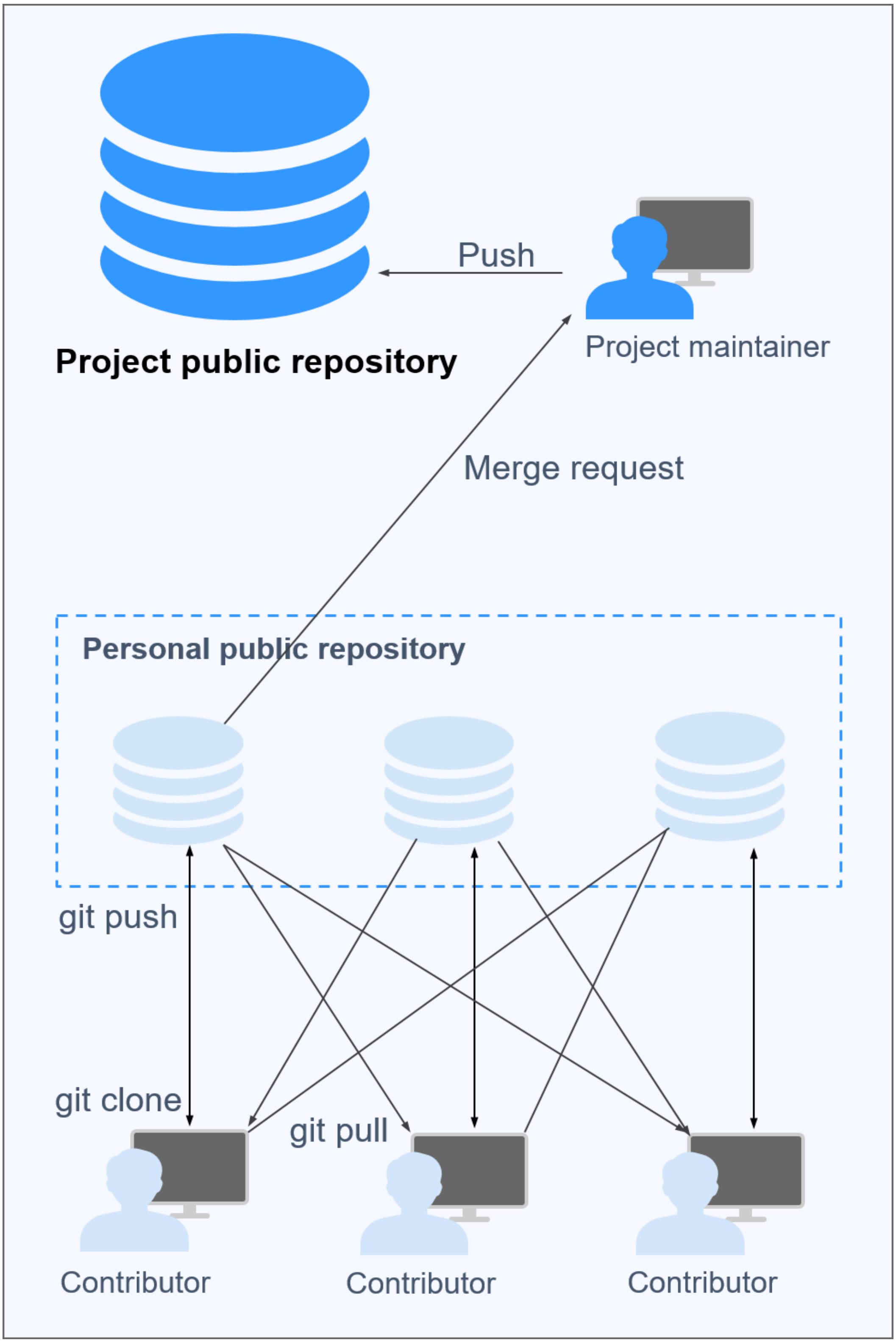
- With a branch dedicated for release preparation, a development team can develop new features for a future release on the develop branch while improving the version for the upcoming release. Release is visualized, which means team members can have a clear view of the release status in commit graphs.
- Hotfix branches, which can be seen as temporary release branches created off the master branch, enable development teams to fix urgent bugs without interrupting other works. You do not have to wait until next release but can quickly deploy fixes to the production version.
- Effective multi-branch mechanism allows for organized development process especially for large-scale projects.
- This workflow is more in line with the DevOps philosophies.

Disadvantages

- High learning thresholds.
- Impact will be greater if development teams do not comply with their specified workflow policies.

2.11.7.5 Forking Workflow

The forking workflow is suitable for outsourcing, crowdsourcing, crowdfunding, and open source projects. One of the features that distinguish this workflow is that every contracting developer has a personal public repository, which is forked from the project public repository. Developers can perform operations on the forks without the need of being authorized by the project maintainer. The following figure shows the process of the forking workflow.



Process

1. Developers fork the project public repository to create personal public ones.

2. The personal public repositories are cloned to their local computers for development.
3. After the development is complete, developers push changes to their personal public repositories.
4. Developers file merge requests to the project maintainer for merge to the project public repository.
5. The project maintainer pulls changes to the local computer and reviews the code. If the code is approved, it is pushed to the project public repository.

NOTE

If the code written by a developer is not approved and therefore, not merged to the project public repository, other developers can still pull the code from the personal public repository of the developer for references.

Advantages

- Code collaboration is easier. Developers can share their code by pushing it to their personal public repositories for others to pull, unlike some workflows where developers cannot see others' work until it is merged into the project repository.
- Project maintainers do not have to grant permissions on project public repositories to every contributor.
- Merge requests serve as an important guard for code security.
- The three workflows introduced previously can be incorporated into the forking workflow based on project requirements.

Disadvantages

It takes more steps and time before the code of developers gets merged into the project repository.

3 Old Version

3.1 Overview

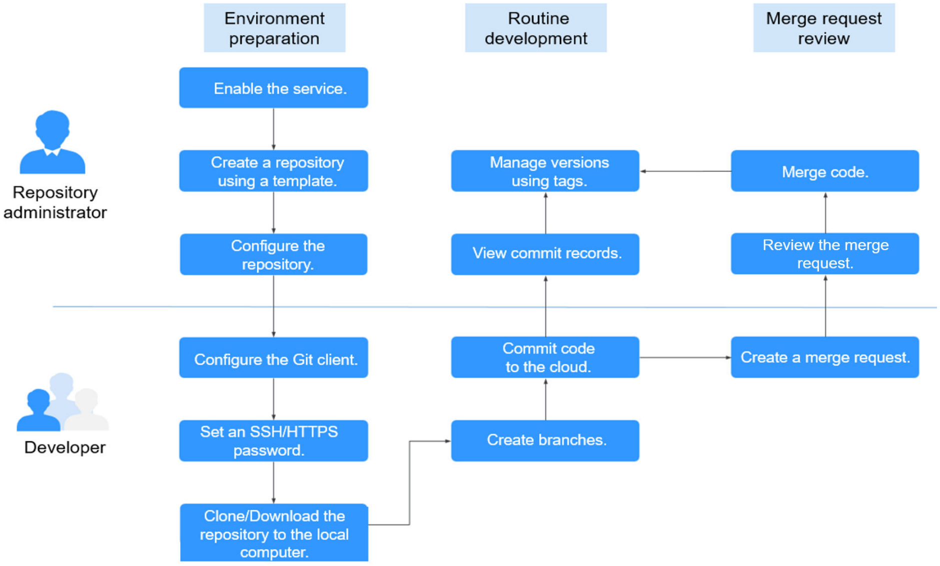
CodeHub is a distributed version management platform that uses the Git workflow. It provides functions such as security management, member and permission management, branch protection and merge, online editing, and statistical analysis. The service aims to address issues such as cross-distance collaboration, multi-branch concurrent development, code version management, and security.

To start a new project, you can use CodeHub built-in repository templates to create a repository for development. For details, see **Starting an R&D Project in the Cloud**.

If you are developing a project locally and want to use CodeHub to manage versions, you can migrate the project to the cloud. For details, see **Migrating a Local Project to the Cloud**.

Starting an R&D Project in the Cloud

You can use repository templates provided by CodeHub to create a project and start development. The following figure shows the workflow.

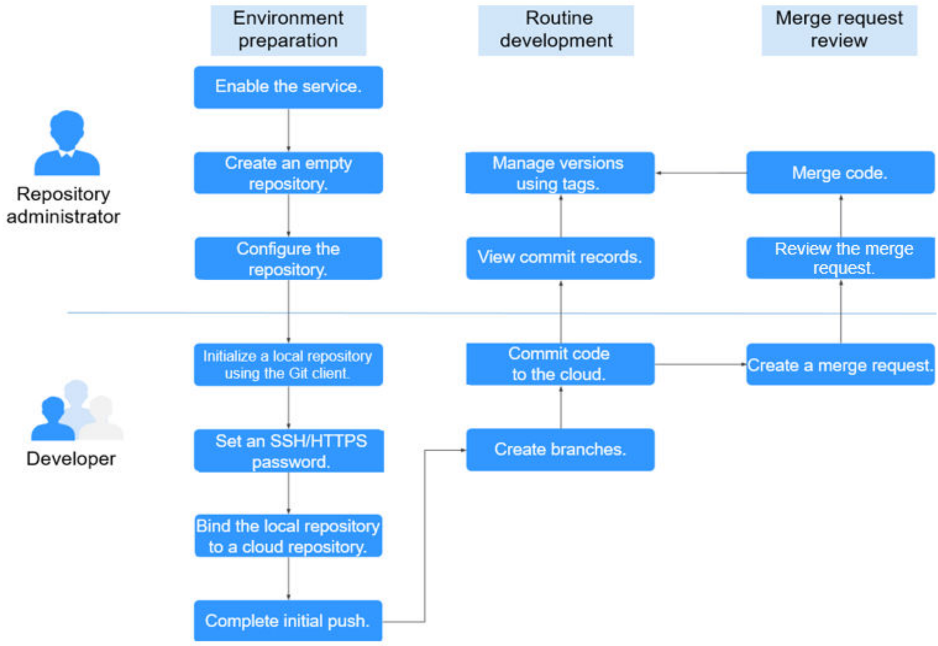


The operations involved are as follows:

- **Creating a Repository Using a Template**
- **Managing Repository Members**
- **Cloud Repository Management**
- **Git Installation and Configuration**
- **Cloud Repository Clone/Download to a Local Computer**
- **Managing Branches**
- **Managing Tags**
- **Committing Code to the Cloud**
- **Merge Request Approval**
- **Forking a Repository**

Migrating a Local Project to the Cloud

To manage code versions of a locally developed project using CodeHub, you can bind the local repository to a cloud repository and complete initial push. Then, you can continue developing your project in the distributed version management mode. The following figure shows the workflow.



The operations involved are as follows:

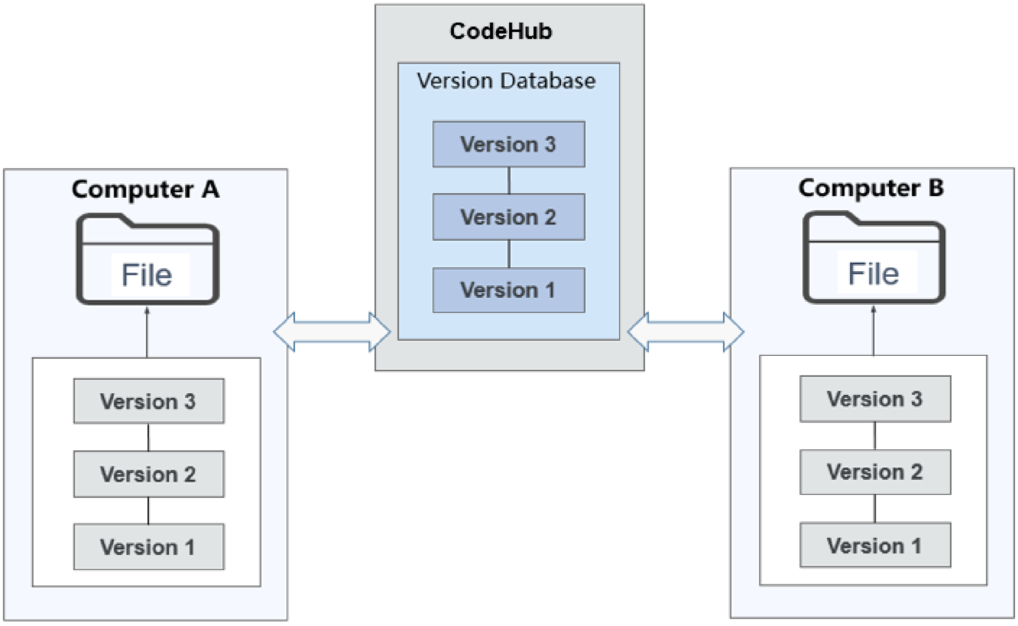
- **Creating an Empty Repository**
- **Managing Repository Members**
- **Cloud Repository Management**
- **Git Installation and Configuration**
- **Associating Cloud Repositories**
- **Cloud Repository Clone/Download to a Local Computer**
- **Managing Branches**
- **Managing Tags**
- **Committing Code to the Cloud**
- **Merge Request Approval**
- **Forking a Repository**

Distributed Version Management

There is a complete code repository on your local computer and in CodeHub respectively.

All version information can be synchronized to the local computer for viewing.

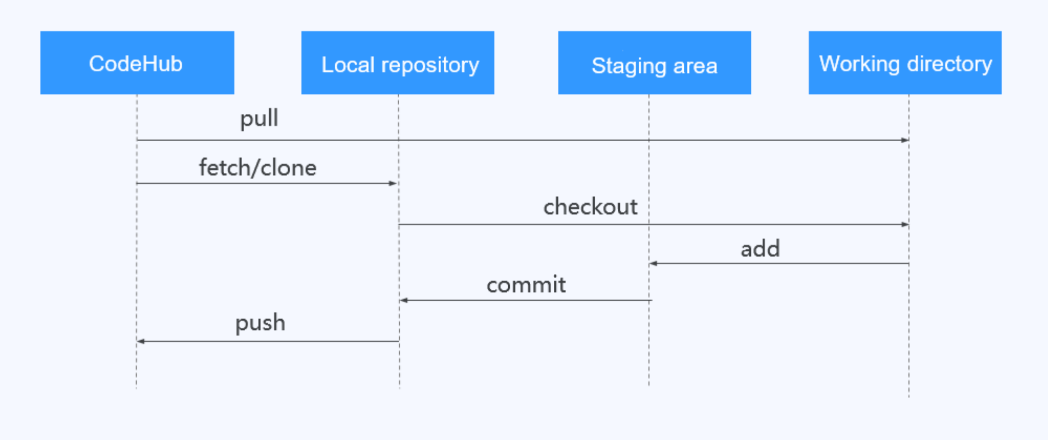
You can commit code offline on the local computer and push the code to the CodeHub repository when the network is connected.



Basic Workflow

CodeHub is a cloud repository service that uses the Git workflow.

- Data in a Git local repository can be in one of the three statuses: **modified**, **staged**, and **committed**. The file you modified in the repository is in the **modified** state. You can run the **add** command to add the changes to the local staging area. Then, the file is in the **staged** state. Run the **commit** command to commit the changes to the local repository for management. The corresponding version and version number are generated upon each commit. You can switch and roll back a version based on the version number. A version can have multiple branches and tags. Each branch, tag, or commit is an independent version that can be checked out using the **checkout** command.
- As a cloud repository service, CodeHub not only has the basic features of local Git repositories, but also serves as the remote repository of each local repository and provides configurable security policies and authentication.
- A CodeHub cloud repository interacts with a local Git repository in the following scenarios:
  - **Clone**: clones the branch in the remote repository to the local computer as a local repository.
  - **Push**: pushes changes in the local repository to the cloud repository.
  - **Fetch**: fetches a version from the cloud repository to the working directory.
  - **Pull**: fetches a version from the cloud repository to the working directory and tries to merge it into the current branch. If the operation fails, you need to manually resolve the file conflict.



3.2 Git Installation and Configuration

3.2.1 Overview

CodeHub is a Git-based service. Git clients such as Git Bash or TortoiseGit must be installed on local computers to connect to CodeHub. The following sections describe how to install and configure Git Bash and TortoiseGit. Git for Windows, Linux, and macOS are available.

If you have installed Git and configured the signature and email address, skip the following sections:

- **Installing Git Bash for Windows**
- **Installing TortoiseGit for Windows**
- **Installing Git for Linux**
- **Installing Git for macOS**

NOTE

GitHub Desktop is not supported in CodeHub.

3.2.2 Installing Git Bash for Windows

Git Bash is a simple and efficient client on Windows for users who are familiar with Git commands. If you are unfamiliar with Git commands, you can use TortoiseGit by referring to **Installing TortoiseGit for Windows**.

1. Install the Git Bash client.
   a. Go to the Git Bash website and download the installation package for 32-bit or 64-bit Windows.
   b. Double-click the installation package. In the installation window displayed, click **Next** for several times and then click **Install**.
2. Open the Git Bash client.

   Click the Windows **Start** icon, enter **Git Bash** in the search box, and press **Enter** to open Git Bash. You are advised to pin Git Bash to the Windows taskbar.

3. Configure the Git Bash client.

   Enter the following commands in Git Bash to configure your username and email address:

   ```
   git config --global user.name "your username"
   git config  --global user.email "your email address"
   ```

   Run the following command to view the configurations.

   ```
   git config -l
   ```

   NOTE

   - A username can contain letters, digits, and special characters. You are advised to set the same username as that in CodeHub.
   - The email address should be written in the standard format.
   - The **–global** parameter in the commands indicates that the configurations apply to all Git repositories on your computer. You can also set a different username and email address for a specific repository.

3.2.3 Installing TortoiseGit for Windows

Tortoise is a better choice if you are not familiar with Git commands or you hope to migrate code from an SVN client such as TortoiseSVN. TortoiseGit is a Windows shell interface to Git as TortoiseSVN to SVN.

Prerequisite

1. Go to the TortoiseGit website and download the installation package for 32-bit or 64-bit Windows.
2. Double-click the installation package. In the window displayed, click **Next** for several times and then click **Install** to complete the installation. Click **Finish** to run the tool.
3. In the first start wizard displayed, select a language, enter a Git.exe path (the field is automatically filled with an available path if there is any), and configure a username and email address. Keep the default values and click **Next** till the settings are finished.

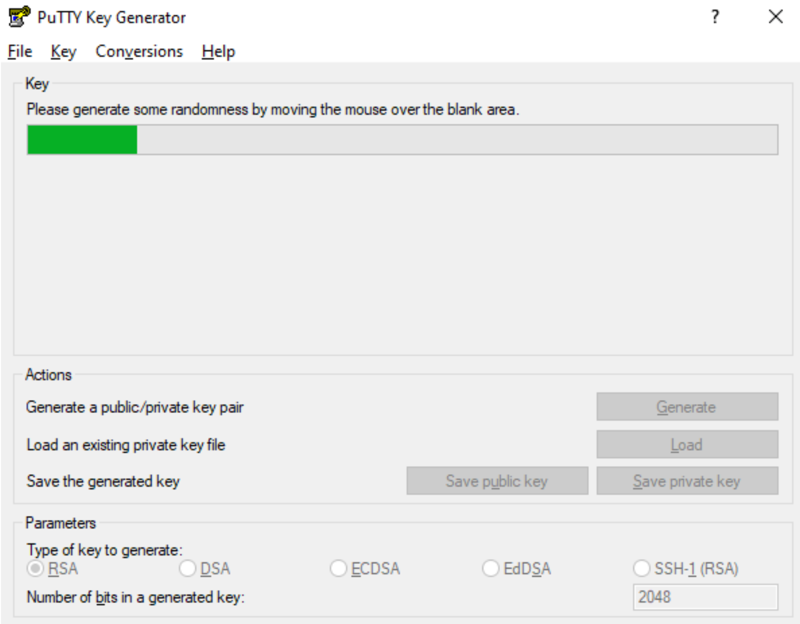
(Optional) Language Packs

TortoiseGit is installed in English by default. If you want to use a translated version of TortoiseGit, go to the TortoiseGit website to download your desired language packs.

Configuration

TortoiseGit also requires a key pair for authentication with the CodeHub server. To generate a key pair, perform the following steps:

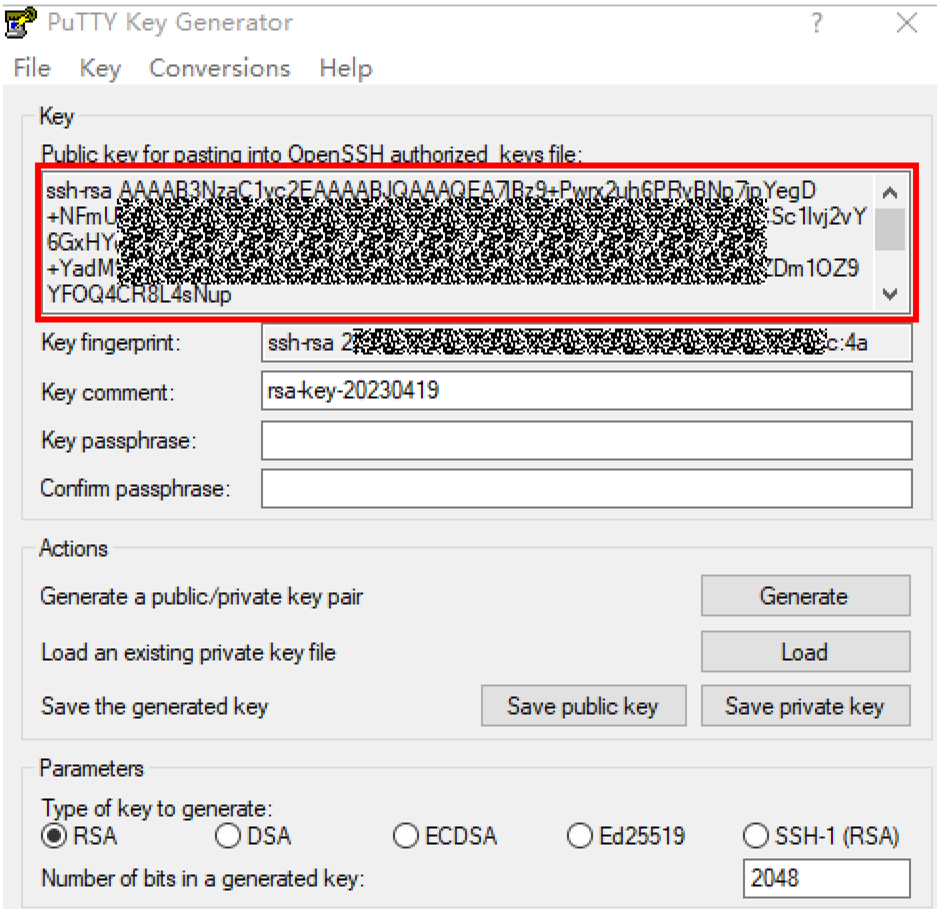
1. Click the Windows **Start** icon and search for PuTTYgen and open it. In the displayed window, click **Generate** to generate a key pair.



NOTE

PuTTYgen is a powerful, compact, and easy-to-use tool for generating pairs of public and private keys. It is installed along with the TortoiseGit installation. PuTTY has its own PuTTYgen in-built. No conflicts occur if you install and use both TortoiseGit and PuTTY.

2. After the key pair is generated, store the public and private keys.
   – Click **Save private key**. In the dialog box that is displayed, enter a file name and save the private key file.
   – Click **Save public key**. In the dialog box that is displayed, enter a file name and save the public key file.
3. Copy the public key in the red box in the following figure and **bind it to a CodeHub repository**.



4. Bind the private key to the local client.

   Click the Windows **Start** icon and search for Pageant and open it. In the displayed window, click **Add Key**, and select the generated private key file.

3.2.4 Installing Git for Linux

- For Debian or Ubuntu

  Run the following command in the terminal:

  ```
  apt-get install git
  ```

- For Fedora, CentOS, or Red Hat

  Run the following command in the terminal:

  ```
  yum install git
  ```

- For more OSs, see the Git official website.

3.2.5 Installing Git for macOS

- You can quickly install Git on macOS by installing Xcode command line tools.
- On Mavericks 10.9 or a later version, run the **git** command on the Terminal. The system will prompt you to install the command line tools if you have not.
- If you want to install Git of a later version, go to the Git website and download the latest version for macOS.

3.3 SSH Keys and HTTPS Passwords

3.3.1 Overview

Introduction

When you push code to or pull code from a cloud repository, the cloud repository needs to verify your identity and permissions. SSH and HTTPS are two authentication modes for remote access to CodeHub.

- **SSH Keys**: An SSH key is used to establish a secure connection between your local computer and CodeHub under your account.

  After you configure an SSH key on a local computer and add the public key to CodeHub, you can use the SSH key to access all code repositories under your account from your computer.

  Before connecting to CodeHub in SSH mode, generate an SSH key on your computer and configure it in CodeHub.

- **HTTPS Passwords**: An HTTPS password is a user credential used for pulling and pushing code using the HTTPS protocol.

  Each developer needs to set a password only once, and the password takes effect for all repositories in the project.

  The maximum size of a package that can be pushed at a time using HTTPS is 500 MB. If the size is greater than 500 MB, use the SSH mode.

NOTE

Either SSH or HTTPS can be used to push or pull code. Set SSH keys or HTTPS passwords as required.

3.3.2 SSH Keys

Introduction

When you push code to or pull code from a cloud repository, the cloud repository needs to verify your identity and permissions. SSH is an authentication mode for remote access to CodeHub.

- An SSH key is an encrypted network transmission protocol that establishes a secure connection between your computer and CodeHub under your account.
- After you configure an SSH key on a local computer and add the public key to CodeHub, you can use the SSH key to access all code repositories under your account from your computer.
- Before connecting to CodeHub in SSH mode, generate an SSH key on your computer and configure it in CodeHub.

Generating and Configuring an SSH Key

The following procedure describes how to generate a public key and bind it.

Step 1 Install the Git Bash client by referring to **Installing Git Bash for Windows**.

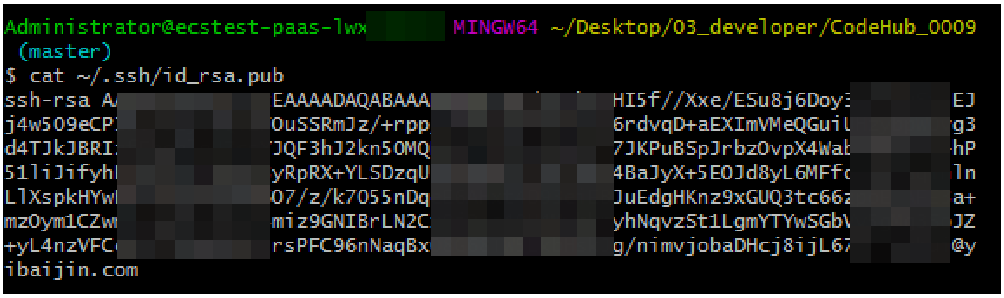
Step 2 Check whether your computer has generated a key.

Run the following command on the local Git client:

```
cat ~/.ssh/id_rsa.pub
```

- If **No such file or directory** is displayed, no SSH key has been generated on the computer. Go to **Step 3** to generate and configure an SSH key.

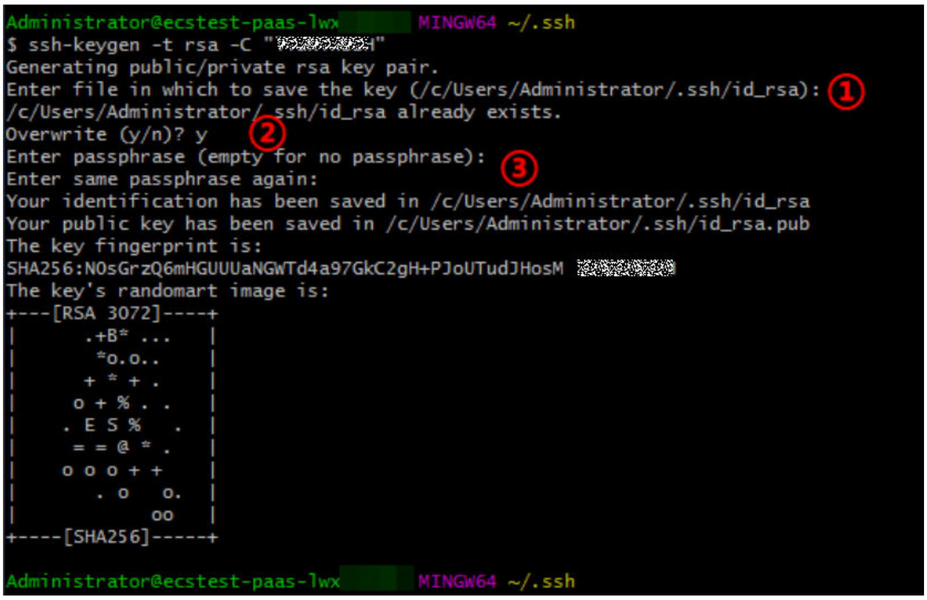
- If at least one group of keys is returned, an SSH key has been generated on your computer. To use the generated key, go to **Step 4** directly. To generate a new key, go to **Step 3**.



Step 3 Generate an SSH private key.

Run the following command on the local Git client to generate a new SSH key:

```
ssh-keygen -t rsa -C "Your SSH key comment"
```



Perform the following operations. If information similar to the preceding figure is displayed, the key is generated.

1. The system prompts you to enter the storage path of the key. You can press **Enter** to use the default path.

2. If a key already exists in the local path, the system asks you whether to overwrite it. Enter **n** to cancel key generation, or enter **y** and press **Enter** to overwrite the existing key. In this example, the existing key is overwritten.

3. The system prompts you to set a password for the key and confirm the password. If you do not want to set a password, press **Enter**.

CAUTION

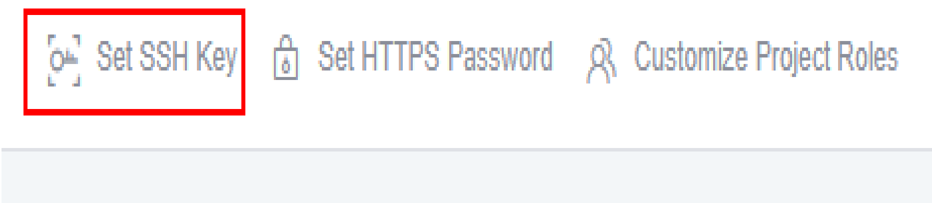
- If a password is set (recommended), the generated private key file is stored after being encrypted by AES-128-CBC.
- If you press **Enter** without entering the password, the generated private key file **id_rsa** is stored locally in plaintext. Keep it secure.

Step 4 Copy the SSH public key to the clipboard.

Run the following command locally based on your operating system to copy the SSH public key to your clipboard. Take Windows as an example. If no command output is displayed, the public key is copied.

- **Windows**:
```
clip < ~/.ssh/id_rsa.pub
```
- **macOS**:
```
pbcopy < ~/.ssh/id_rsa.pub
```
- **Linux (xclip required)**:
```
xclip -sel clip < ~/.ssh/id_rsa.pub
```

Step 5 Log in to the CodeHub repository list, switch to your region, and click **Set SSH Key**. The **SSH Keys** page is displayed.



Step 6 On the **SSH Keys** page, click **Add SSH Key**. The **Add SSH Key** page is displayed.

Step 7 In **Title**, enter a name for the new key, paste the SSH public key copied in **Step 4** to the **Key** field, and click **OK**. A message is displayed, indicating that the operation is successful.

NOTE

- An SSH key cannot be added repeatedly. If an SSH key fails to be added, check whether it has already been added or whether there are redundant spaces in the key.
- After the key is added, you can view it on the **SSH Keys** page. If it is no longer used, you can delete it.
- The difference between an SSH key and repository deployment key is that the former is associated with a user/computer and the latter is associated with a repository. The SSH key has the read and write permissions on the repository, and the deploy key has the read-only permission on the repository.

----End

Verifying Whether an SSH Key Is Bound

When an SSH key is bound, you can perform **SSH-clone** on the repository that you have the access permission on the client. If the clone is successful, the key is bound.

NOTE

If you use SSH to clone a repository to the local computer for the first time, the message "The authenticity of host *.*.com can't be established. RSA key... (yes/no)" is displayed. Enter **Yes** to continue.

3.3.3 HTTPS Passwords

Introduction

When you push code to or pull code from a cloud repository, the cloud repository needs to verify your identity and permissions. HTTPS is an authentication mode for remote access to CodeHub.

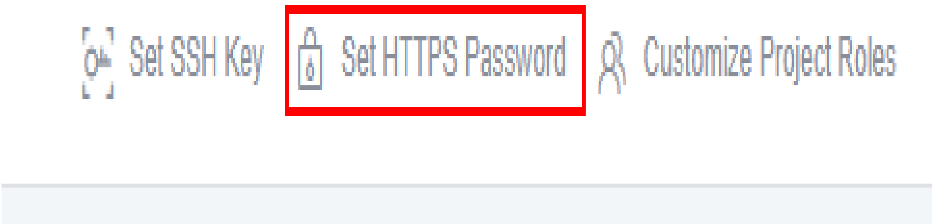
- An HTTPS password is a user credential used for pulling and pushing code using the HTTPS protocol. Each developer needs to set a password only once and can use it for all repositories.
- Keep your HTTPS password secure and change it periodically to avoid security risks.

Obtaining an HTTPS Password

Set the initial password upon the first login.

You can perform the following steps to change the HTTPS password at any time:

Step 1 Log in to the CodeHub repository list, switch to your region, and click **Set HTTPS Password**. The **HTTPS Password** page is displayed.



Step 2 Click **Change**, reset the password, and save the settings.

----End

NOTE

After the password is reset, **regenerate a repository credential**. Otherwise, you cannot interact with the cloud repository.

Verifying Whether an HTTPS Password Takes Effect

After setting an HTTPS password, you can perform **HTTPS-clone** on the repository that you have the access permission on the client. A dialog box is displayed, asking you to enter the account and password. If the clone is successful, the password is configured.

Related Information

Regenerating a repository credential:

If a clone fails and the message **The project you were looking for could not be found** is displayed, regenerate a credential and check the whitelist.

- If the password is incorrect, delete the local credential (for example, on Windows, choose **Control Panel > User Accounts > Manage Windows Credentials > Generic Credentials**), use HTTPS to clone the cloud repository again, and enter the correct account and password in the dialog box that is displayed.
- Check the **IP address whitelist**. If no whitelist is configured, all IP addresses are allowed to access the repository. If a whitelist is configured, only IP addresses in the whitelist are allowed to access the repository.

NOTE

If "**SSL certificate problem**" is displayed, run the following command:

```
git config --global http.sslVerify false
```

3.4 Cloud Repository Creation

3.4.1 Overview

The total capacity of a single repository and LFS storage is 2 GB. Currently, CodeHub provides the following repository creation methods:

- **Creating an Empty Repository**: You can create an empty repository in the cloud and synchronize a local repository to that repository.
- **Creating a Repository Using a Template**: You can create a repository using a CodeHub template when there is no local repository.
- **Forking a Repository**: You can fork a CodeHub repository, make changes to the fork, and merge the changes to the source repository.
  - Scenario 1: Carry out new projects based on historical projects without damaging the repository structure of the historical projects.
  - Scenario 2: Share projects of your organization with others.

NOTICE

The capacity of a repository cannot exceed 2 GB. If the capacity exceeds 2 GB, the repository cannot be used normally. The capacity cannot be expanded.

When the capacity of a repository exceeds the upper limit, the repository is frozen. In this case, delete the repository, control the capacity locally, and push the repository again.

Common Repository Settings

- Default Branch
- Commit Rules
- Merge Requests
- Protected Branches
- Configuring IP Address Whitelist
- More settings

3.4.2 Creating an Empty Repository

You can create an empty repository in the cloud and synchronize a local repository to that repository. To create an empty repository on the CodeHub console, perform the following steps:

Step 1 Access the repository list page.

Step 2 Click **Create Directly**. On the page that is displayed, enter basic repository information.

Table 3-1 Parameters for creating an empty repository

Parameter	Mandatory	Remarks
Repository name	Yes	A name contains letters, digits, underscores (_), periods (.), and hyphens (-) and must start with a letter, digit, or underscore (_).
Project	Yes	• A repository must be in a project. • If you create a repository in a project, the project is selected for **Project** by default, and the **Project** parameter is hidden on the repository creation page.
Description	No	Enter the description of your repository.

Parameter	Mandatory	Remarks
Programming Language of .gitignore	No	The .gitignore file is generated based on your selection.
Type	No	Select a type for your repository content.
Permissions	No	The options are as follows: ● **Allow project members to access the repository.** The project manager is automatically set as the repository administrator, and the developer is set as a common repository member. When the two roles are added to the project, they will be automatically synchronized to existing repositories. ● **Allow generation of a README file.** You can edit the README file to record information such as the project architecture and compilation purpose, which is similar to a comment on the entire repository. ● **Allow automated creation of a code check task.** After the repository is created, you can view the code check task of the repository in the CodeCheck task list after switching to the region where the repository is located.
Visibility	Yes	The options are as follows: ● **Private** The repository is visible only to repository members. Repository members can access the repository or commit code. ● **Public read-only** The repository is open and read-only to all guests, but is not displayed in their repository list or search results. You can select an open-source license as the remarks.

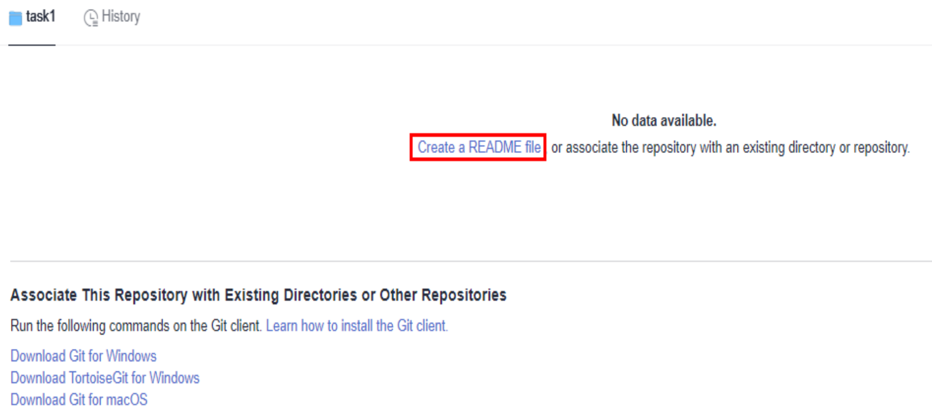
Step 3 Click **OK** to create the repository. The repository list page is displayed.

----End

Associating with an Existing Directory or Repository

If you do not generate a **README File** when creating a common repository, you can click the **Files** tab and click **Create a README file** to generate a README file or associate the repository with an existing directory or repository. The procedure is as follows:

Figure 3-1 Associating with an existing directory or repository



Prerequisite

- You need to run following commands on the Git client. Install the Git client and configure the Git global username and user email address. For details, see **Git Installation and Configuration**.
- Set the SSH key. For details, see **SSH Keys**.

Procedure

NOTE

The following commands have been automatically generated in the new repository. You can copy them on the **Files** tab page of the repository.

Step 1 Clone the repository on the local host and push the new README file.

```
git clone HTTP_download_address
cd taskecho "# Repository_name" > README.md.
git add README.md
git commit -m "add README"
git push -u origin master
```

Step 2 Associate an existing code directory with the repository.

```
cd <Your directory path>
mv README.md README-backup.md
git init
git remote add origin  HTTP_download_address
git pull origin master
git add --all
git commit -m "Initial commit"
git push -u origin master
```

Step 3 Associate with an existing Git repository.

```
cd <Your Git repository path>
git remote remove origin > /dev/null 2>&1
git remote add origin  HTTP_download_address
git push -u origin --all -f
git push -u origin --tags -f
```

----End

3.4.3 Creating a Repository Using a Template

You can create a repository using a CodeHub template on the CodeHub console.

Prerequisites

This operation must be performed in the Scrum template project.

Procedure

Step 1 Access the repository list page.

Step 2 Click  next to **Create Directly** and select **Use Template** from the drop-down list. The **Template Repository** page is displayed.

Step 3 On the **Template Repository** page, enter a keyword for fuzzy search and select a template as required.

Step 4 Click **Next**. On the **Create Repository** page, enter basic repository information.

Table 3-2 Parameters for creating a repository using a template

Parameter	Mandatory	Remarks
Repository Name	Yes	A name contains letters, digits, underscores (_), periods (.), and hyphens (-) and must start with a letter, digit, or underscore (_).
Project	Yes	• A repository must be in a project. • If you create a repository in a project, the project is selected for **Project** by default, and the **Project** parameter is hidden on the repository creation page.
Description	No	Enter the description of your repository.
Permissions	No	The options are as follows: • **Allow project members to access the repository.** The project manager is automatically set as the repository administrator, and the developer is set as a common repository member. When members of the two roles are added to the project, they are added to the repository member list by automatic synchronization. You can view the list. • **Allow automated creation of a code check task.** After the repository is created, you can view the code check task of the repository in the CodeCheck task list after switching to the region where the repository is located.

Parameter	Mandatory	Remarks
Visibility	Yes	The options are as follows: • **Private** The repository is visible only to repository members. Repository members can access the repository or commit code. • **Public read-only** The repository is open and read-only to all guests, but is not displayed in their repository list or search results. You can select an open-source license as the remarks.

Step 5 Click **OK** to create the repository.

Step 6 After the repository is created, the repository list page is displayed.

----End

NOTE

When you create a repository by template, the repository type of the selected template will be automatically configured for the repository.

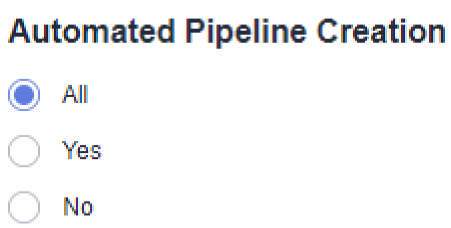
The repository created using the template contains the repository file structure preset in the template.

Automatically Creating a Pipeline

A pipeline can be automatically created when a repository is created using a template. Note that the host used in CloudDeploy must be changed to the actual environment so that the pipeline can be successfully executed.

Step 1 On CodeHub, click next to **Create Directly** and select **Use Template**.

Step 2 On the **Use Template** page, set **Automated Pipeline Creation** to **Yes** in the navigation pane to display templates that can be used to automatically create a pipeline.



Step 3 Select a template as required, click **Next**, enter basic repository information, and click **OK**.

Step 4 After the repository is created, you can view the pipeline that is automatically created on the pipeline list page displayed.

----End

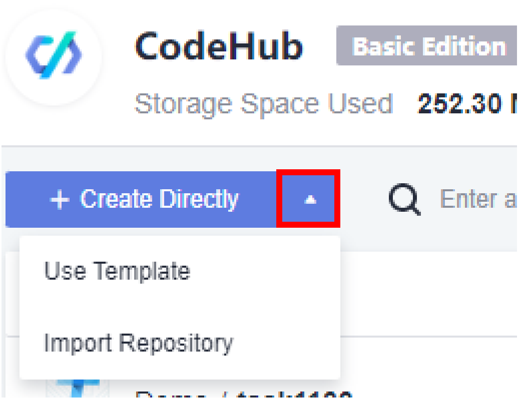
3.4.4 Importing an External Repository

You can import a cloud repository to CodeHub or import a CodeHub repository from a region to another region (see **Backup**). The imported repository is independent of the source repository.

To import an external repository on the CodeHub console, perform the following steps:

Step 1 Access the repository list page.

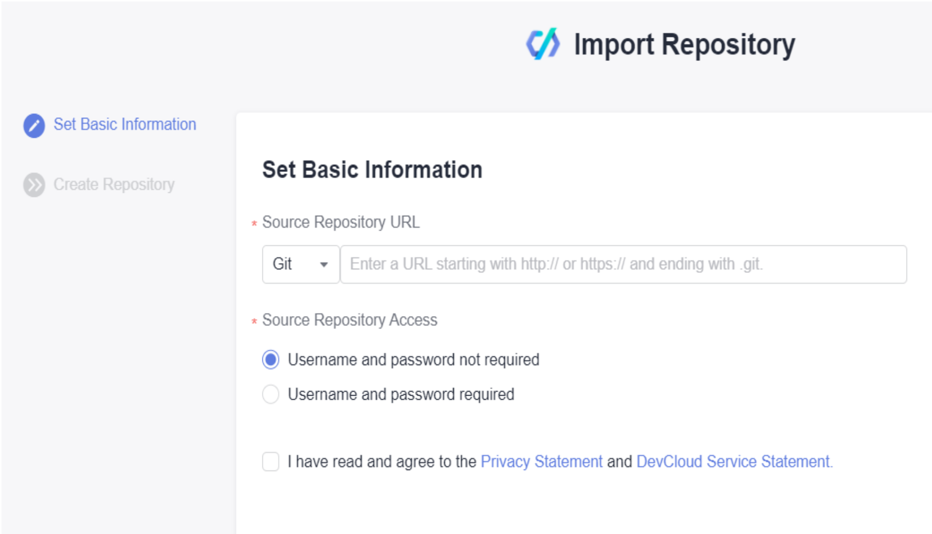
Step 2 Click  next to **Create Directly** and select **Import Repository** from the drop-down list. The **Import Repository** page is displayed.



NOTICE

- An external repository can be a Git remote repository (HTTPS) or SVN repository.
- The source repository port can be 80, 443, or greater than 1024.
- Currently, GitHub, Gitee, GitLab, and SVN China source repositories are supported. If the import using other types of source repositories fails, contact technical support to check the source server whitelist.

Step 3 Enter the source repository path, and enter the username and password for accessing the source repository. (This parameter is not required for open-source repositories.)



Step 4 Click **Next**. On the **Create Repository** page, enter the basic information about the repository.

Parameter	Mandatory	Remarks
Repository Name	Yes	A name contains letters, digits, underscores (_), periods (.), and hyphens (-) and must start with a letter, digit, or underscore (_).
Description	No	Enter the description of your repository.
Permissions	No	The options are as follows: ● **Allow project members to access the repository** The project manager is automatically set as the repository administrator, and the developer is set as a common repository member. When the two roles are added to the project, they will be automatically synchronized to existing repositories.
Visibility	Yes	The options are as follows: ● **Private** Onl members of the repository can access the repository or commit code. ● **Public read-only** The repository is read-only to all visitors. You can select an open source license as the remarks.
Branch	Yes	You can choose to synchronize the default branch or all branches of the source repository.

Parameter	Mandatory	Remarks
Schedule	No	Select **Schedule sync into repo**. ● The default branch of the source repository is automatically imported to the default branch of the new repository every day. ● The repository becomes a read-only image repository and cannot be written. In addition, only the branches of the third-party repository corresponding to the default branch of the current repository are synchronized.

NOTE

You can synchronize branches manually. In addition, you can also schedule synchronization. This setting cannot be changed after you configure it.

Step 5 Click **OK** to import the repository. The repository list page is displayed.

----End

NOTE

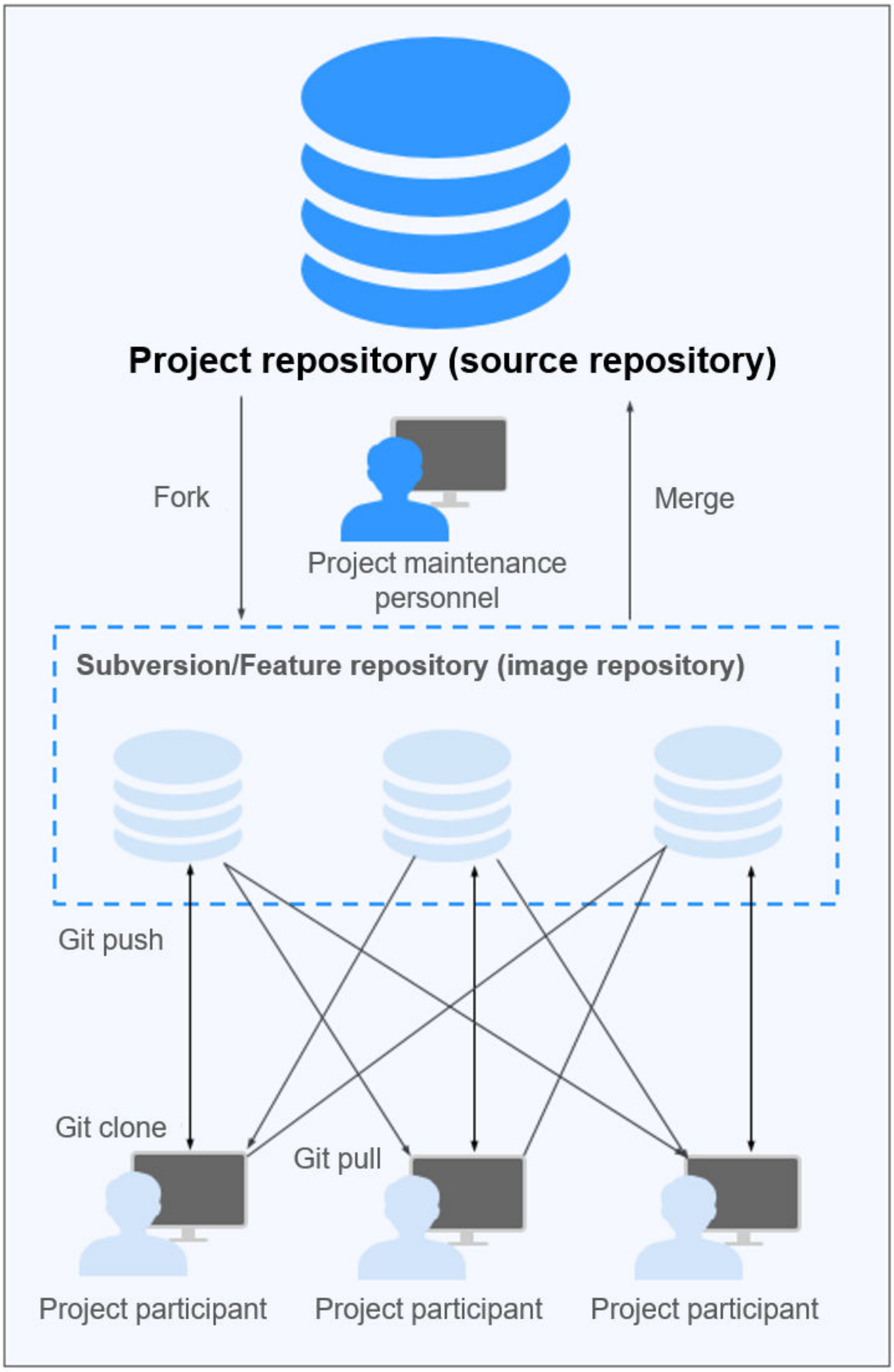
- The timeout interval for importing a repository is 30 minutes. If the import times out, use the clone/push function on the client.
- The **Git LFS** object is not imported.

3.4.5 Forking a Repository

Application Scenarios

You can fork a CodeHub repository based on an image repository, make changes to the fork, and merge the changes to the source repository. Before changes are merged, the changes of the fork or the source repository will not affect each other.

As shown in the following figure, fork is applicable to the development scenario where a large-scale project contains multiple sub-projects. The complex development process occurs only in image repositories and the project repository (source repository) is not affected. Only new features that are completed can be merged to the project repository. Therefore, forks can be considered as a team collaboration mode.



Forking a Repository

Step 1 Access the repository list page.

Step 2 Find the target repository in the repository list, click the repository name to access the repository, and click **Fork**.

Step 3 In the **Fork Repository** dialog box, select the project to which the fork belongs, and enter the fork name.

If **Allow project members to access the repository** is selected, the project manager and developers of the project are added to the repository as the administrator and common members of the repository, respectively.

Step 4 Click **OK** to fork the repository. The repository list page is displayed.

----End

Merging Changes of a Fork to the Source Repository

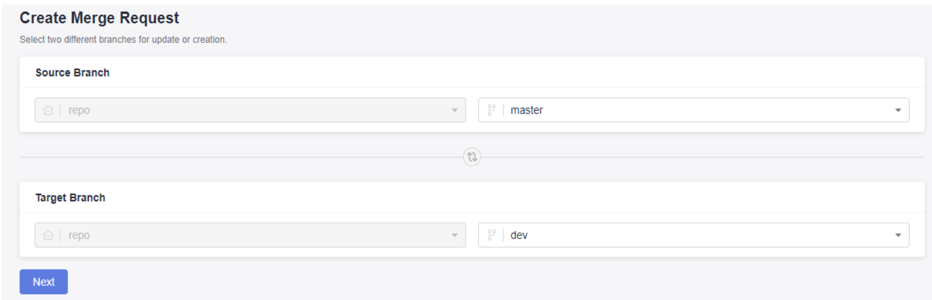
Step 1 Access the repository list page.

Step 2 Click a forked repository.

Step 3 On the **Files** tab page of the repository, click + next to the branch, select **Create File** from the expanded items, edit the file name and content, and click **Save**.

Step 4 Switch to the **Merge Requests** tab page.

Step 5 Click **Create Merge Request**. The **Create Merge Request** page is displayed.



Step 6 **Source Branch** is the one that requests merging.

Target Branch is the one that merges content.

Step 7 Click **Next**. The page for creating a merge request is displayed. The subsequent operation process is the same as that of **branch merge review** in the repository.

----End

NOTE

A cross-repository merge request belongs to the source repository and can be viewed only on the **Merge Requests** tab page of the source repository. Therefore, mergers and reviewers must be members of the source repository.

3.5 Cloud Repository Clone/Download to a Local Computer

3.5.1 Overview

In addition to **Managing Repository Files in Console**, the Git-based code hosting service CodeHub also allows you to download repository files to a local computer.

There are three methods of cloning or downloading a repository to a local computer for the first time:

- **Using SSH to Clone a Cloud Repository to a Local Computer**
- **Using HTTPS to Clone a Cloud Repository to a Local Computer**
- **Downloading a Code Package on a Browser**

3.5.2 Using SSH to Clone a Cloud Repository to a Local Computer

Prerequisite

Your network can access CodeHub. For details, see **Network Connectivity Verification**.

Cloning Code on the Git Bash Client Using SSH

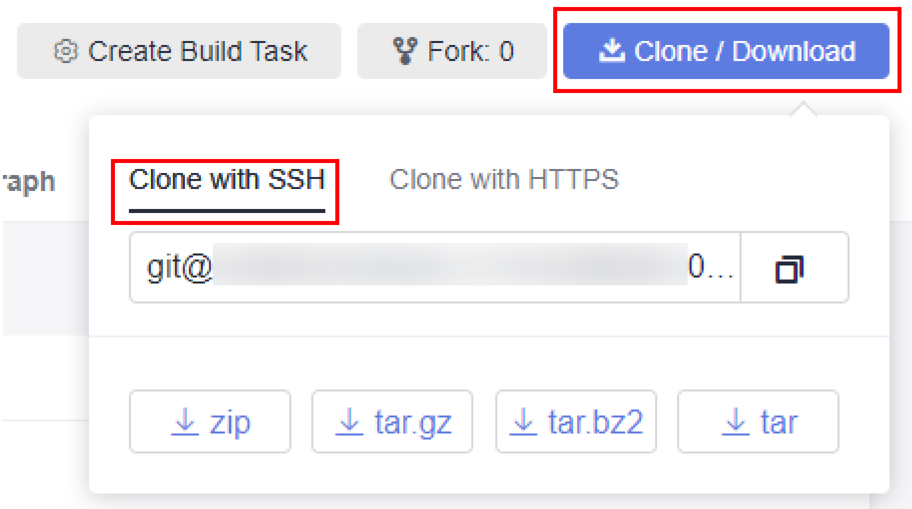
This section describes how to use the Git Bash client to clone a cloud repository of CodeHub to a local computer.

Step 1 **Download and install the Git Bash client**.

Step 2 **Configure an SSH key**.

Step 3 Obtain the repository address. (If there is no repository, **create one**.)

On the repository details page, click **Clone/Download** to obtain the SSH address. You can use this address to connect to the cloud repository from the local computer.



Step 4 Open the Git Bash client.

Create a folder on the local computer to store the code repository. Right-click the blank area in the folder and open the Git Bash client.

NOTE

The repository is automatically initialized during clone. You do not need to run the **init** command.

Step 5 Run the following command to clone the cloud repository:

```
git clone <repository_address>
```

repository_address in the command is the SSH address obtained in **Step 3**.

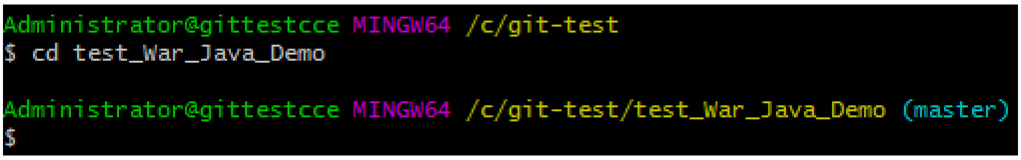
If you clone the repository for the first time, the system asks you whether to trust the remote repository. Enter **yes**.

After the command is executed, a folder with the same name as the cloud repository is displayed, and a hidden .git folder exists in the folder, indicating that the repository is cloned.

Step 6 Run the following command to go to the repository directory:

```
cd <repository_name>
```

You will be taken to the master branch by default.



----End

NOTE

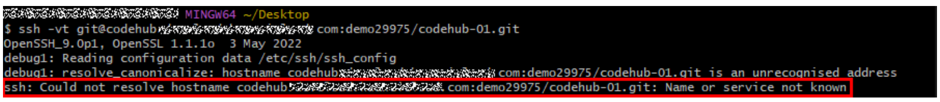
If the **git clone** command fails to be executed, locate the fault as follows:

- Check whether your network can access CodeHub.

  Run the following command on the Git client to test the network connectivity:

  ```
  ssh -vT git@code**********.com
  ```

  The command output contains **Could not resolve hostname code**********.com: Name or service not known**, as shown in the following figure.

- Check the SSH key. If necessary, **regenerate a key and configure it on the CodeHub console**.
- Only PCs that **enabled the IP address whitelist** can be cloned on the Git client.

Cloning Code on the TortoiseGit Client Using SSH

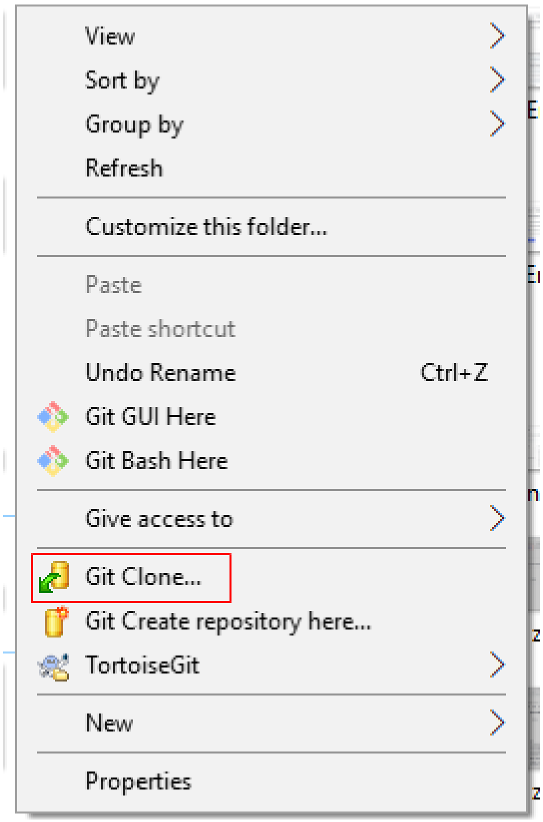
This section describes how to use the TortoiseGit client to clone a cloud repository of CodeHub to a local computer.

Step 1 **Download and install the TortoiseGit client**.

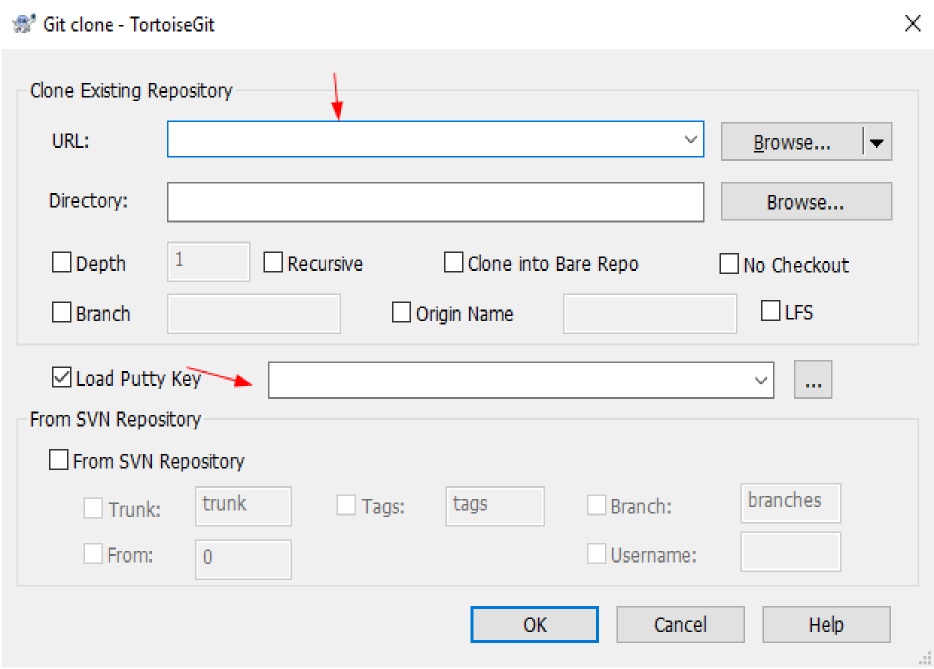
Step 2 Obtain the repository address. (If there is no repository, **create one**.)

On the repository details page, click **Clone/Download** to obtain the SSH address. You can use this address to connect to the cloud repository from the local computer.

Step 3 Go to the local directory where you want to clone the repository, and choose **Git Clone...** from the right-click menu.

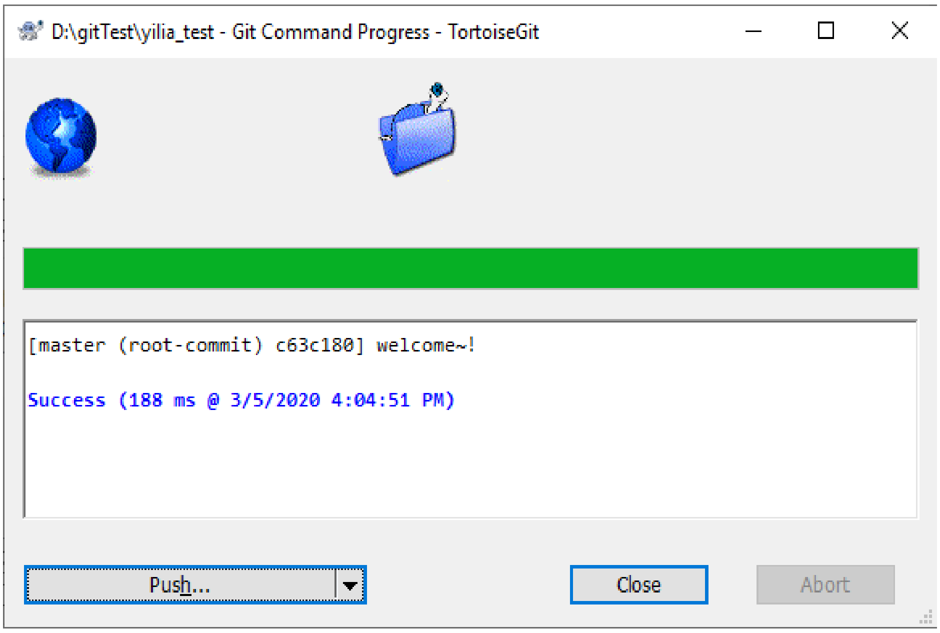


Step 4 In the dialog box displayed, paste the copied repository address to the **URL** field, select **Load Putty Key**, choose the **private key** file, and click **OK**.



Step 5 Click **OK** to start cloning the repository. If you clone the repository for the first time, the TortoiseGit client asks you whether to trust the remote repository. Click **Yes**.

Step 6 The cloning duration is affected by the repository size. The following figure shows the cloning process.



----End

Cloning a Repository on Linux or macOS Using SSH

After the environment is configured (see **Installing Git for Linux** or **Installing Git for macOS**), the clone operations of the Git client on Linux or macOS are the same as those in **Cloning Code on the Git Bash Client Using SSH**.

3.5.3 Using HTTPS to Clone a Cloud Repository to a Local Computer

Cloning Code on the Git Bash Client Using HTTPS

This section describes how to use the Git Bash client to clone a cloud repository of CodeHub to a local computer.

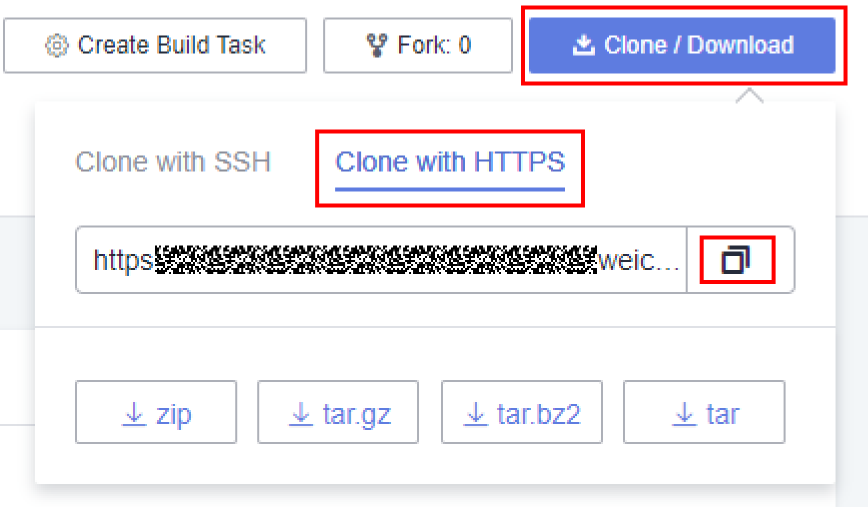
NOTICE

The maximum size of a package that can be pushed at a time using HTTPS is 500 MB. If the size is greater than 500 MB, use the SSH mode.

Step 1 **Download and install the Git Bash client**.

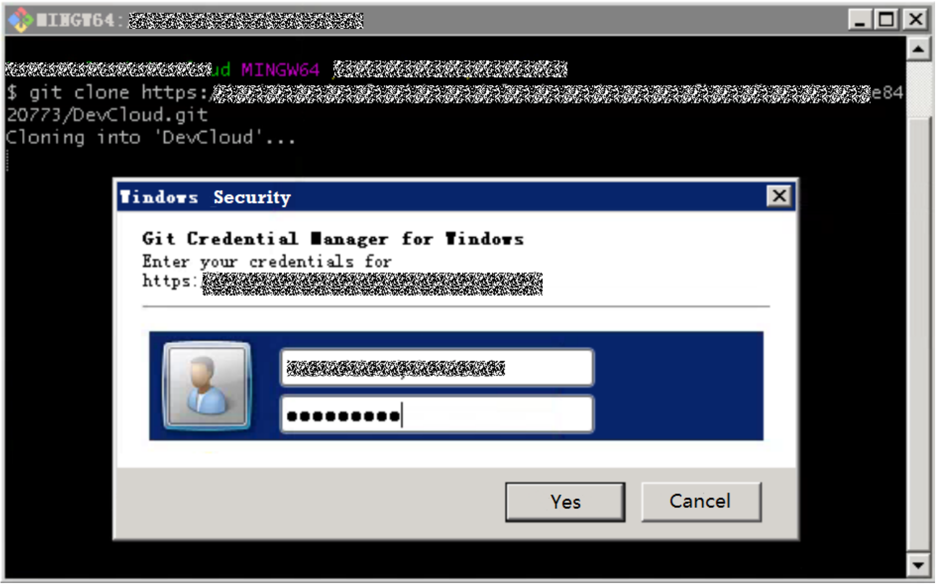
Step 2 **Configure an HTTPS password**.

Step 3 On the CodeHub homepage, click the name of a repository in the repository list. On the repository details page displayed, click **Clone/Download**, click **Clone with HTTPS**, and copy the repository address.



Step 4 Open Git Bash, navigate to the directory where you want to clone the repository, and run the following command. For the first clone, enter the username (account name/username) and HTTPS password.

```
git clone HTTP_download_address
```

NOTICE

If the clone fails and the message **SSL certificate problem** is displayed, run the following command:

```
git config --global http.sslVerify false
```

Step 5 After the username (account name/username) and HTTPS password are entered, the repository is cloned.

Step 6 Run the following command to go to the repository directory:

```
cd <repository_name>
```

You will be taken to the **master** branch by default.

----End

NOTE

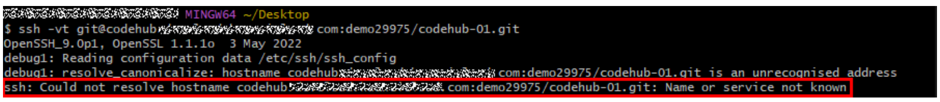
If the **git clone** command fails to be executed, locate the fault as follows:

- Check whether your network can access CodeHub.

  Run the following command on the Git client to test the network connectivity:

  ```
  ssh -vT git@code**********.com
  ```

  The command output contains **Could not resolve hostname code**********.com: Name or service not known**, as shown in the following figure.

- Check the SSH key. If necessary, **regenerate a key and configure it on the CodeHub console**.
- Only PCs that **enabled the IP address whitelist** can be cloned on the Git client.

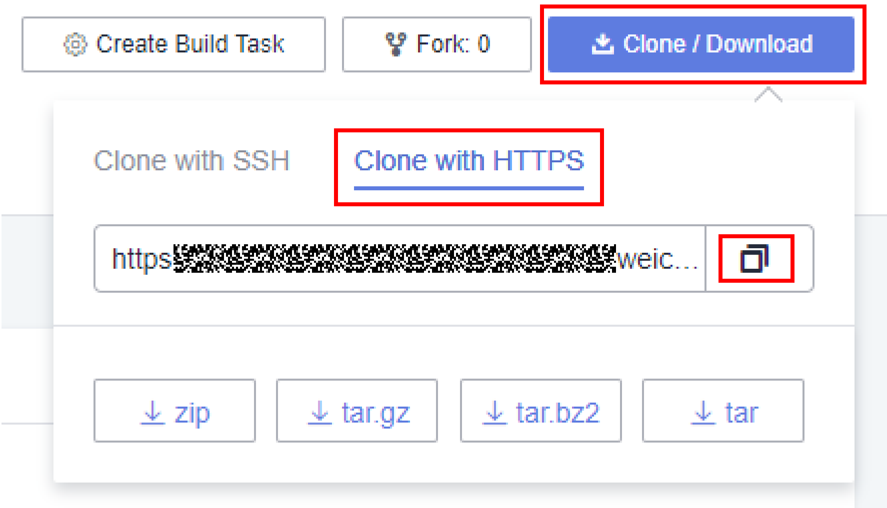
Cloning Code on the TortoiseGit Client Using HTTPS

This section describes how to use the TortoiseGit client to clone a cloud repository of CodeHub to a local computer.

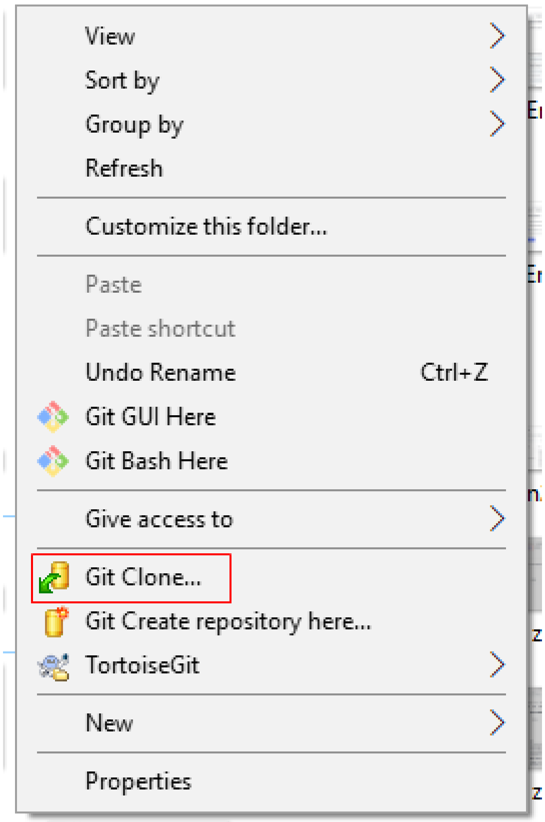
Step 1 [Download and install the TortoiseGit client](#).

Step 2 [Configure an HTTPS password](#).

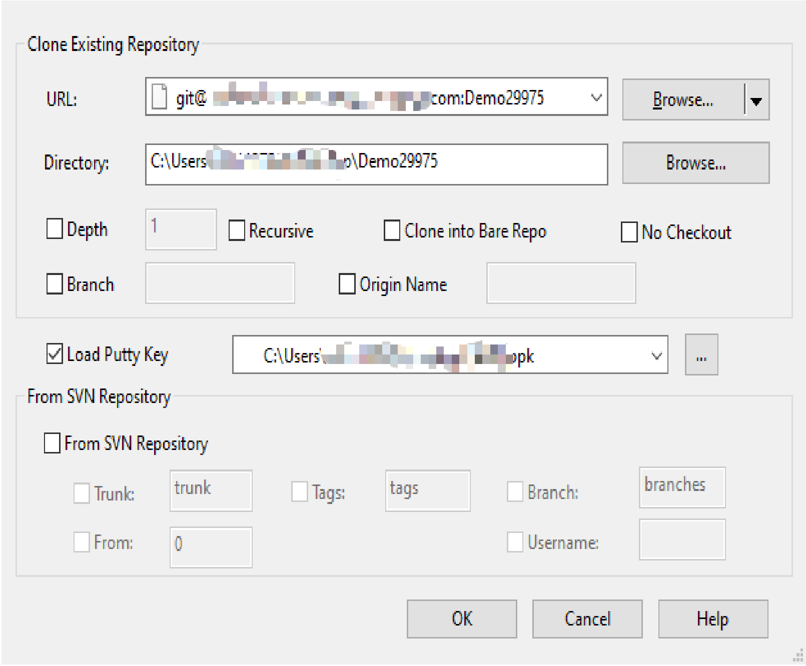
Step 3 On the CodeHub homepage, click the name of a repository in the repository list. On the repository details page displayed, click **Clone/Download**, click **Clone with HTTPS**, and copy the repository address.



Step 4 Go to the directory where you want to clone the repository, and choose **Git Clone...** from the right-click menu.



Step 5 In the dialog box displayed, paste the copied repository address to the **URL** field and click **OK**.



Step 6 If you clone a repository on TortoiseGit for the first time, enter the username and HTTPS password as prompted.

Step 7 Wait until the clone is complete.

----End

Cloning a Repository on Linux or macOS Using HTTPS

After the environment is configured (see **Installing Git for Linux** or **Installing Git for macOS**), the clone operations of the Git client on Linux or macOS are the same as those in **Cloning Code on the Git Bash Client Using HTTPS**.

3.5.4 Downloading a Code Package on a Browser

In addition to clone, CodeHub also allows you to package and download the code of a cloud repository to the local computer.

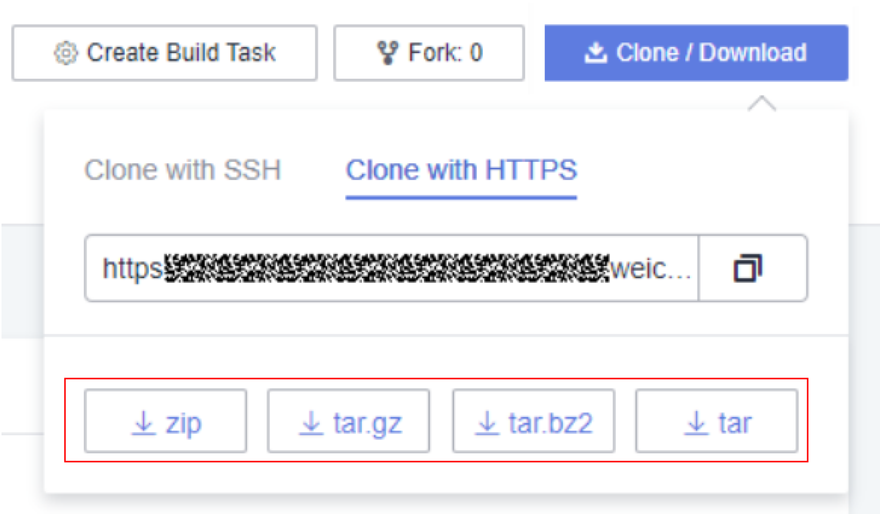
The downloaded code repository file is not associated with the cloud repository and cannot be pushed back to the cloud repository.

The procedure is as follows:

Step 1 Access the repository list page.

Step 2 Go to your repository. (**create one**.)

Step 3 Click **Clone/Download**. In the dialog box that is displayed, click the required code package format.



----End

NOTE

- If an **IP address whitelist** is set for the repository, only hosts with whitelisted IP addresses can download the repository source code on the page. If no IP address whitelist is set for the repository, all hosts can download the repository source code on the page.
- Currently, the zip, tar.gz, tar.bz2, and tar package formats are supported.
- The master branch of the cloud repository will be downloaded.

3.6 Repository Migration

3.6.1 Overview

This section describes how to migrate your repository to CodeHub. Select one of the following migration solutions based on your repository storage mode:

Migrating an SVN Repository to CodeHub

Importing a Remote Git Repository to CodeHub

Uploading Local Code to CodeHub

3.6.2 Migrating an SVN Repository to CodeHub

Migration Method: Import on the Git Bash Client

Step 1 Obtain committer information of the SVN repository.

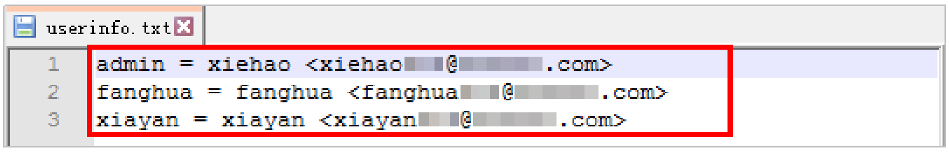
1. Use TortoiseSVN to download the repository to be migrated to the local host.
2. Go to the local SVN repository (**KotlinGallery** in this example) and run the following command on the Git Bash client:

```
svn log --xml | grep "^<author" | sort -u | \awk -F '<author>' '{print $2}' | awk -F '</author>' '{print $1}' > userinfo.txt
```

The **userinfo.txt** file is generated in the directory.

3. Open the **userinfo.txt** file. You can view the information about all committers who have committed code to the repository.
4. Git uses an email address to identify a committer. To better map the SVN repository information to a Git repository, create a mapping between the SVN and Git usernames.

   Modify the **userinfo.txt** file. Each line should be in the format of *svn_author = git_author_nickname <email_address>*.



Step 2 Create a local Git repository.

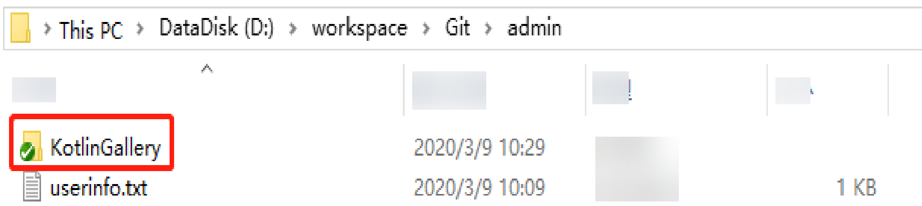
1. **Create an empty Git repository directory on the local host**, and copy the **userinfo.txt** file obtained in **Step 1** to the directory.
2. Start the Git Bash client in the directory and run the following command to clone a Git repository:

```
git svn clone <svn_repository_address> --no-metadata --authors-file=userinfo.txt --trunk=trunk --tags=tags --branches=branches
```

   The following table lists parameters in the command. Set the parameters as required.

Parameter	Description
--no-metadata	Prevents the Git from exporting useless information contained in the SVN.
--authors-file	File that maps all SVN accounts to Git accounts
--trunk	Main development project
--branches	Branch projects
--tags	Tags

   After the command is executed, a Git repository is generated locally.



3. Run the following commands to go to the **KotlinGallery** folder and verify the current Git repository branch structure:

```
cd KotlinGallery
git branch -a
```

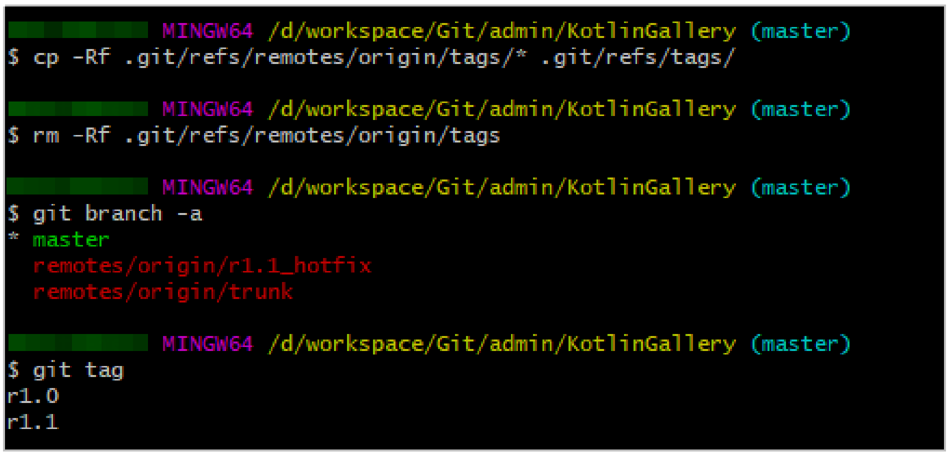
As shown in the preceding figure, all SVN directory structures are successfully migrated in the form of Git branches.

Step 3 Correct local branches.

In **Step 2**, the **git svn clone** command is used to save the **tags** folder in the SVN repository as a branch, which does not comply with the Git usage guidelines. Therefore, before uploading tags to the remote repository, adjust the local branches to comply with the Git usage guidelines.

1. Go to the local Git repository and run the following commands on the Git Bash client to change the tags branch to appropriate Git tags:

```
cp -Rf .git/refs/remotes/origin/tags/* .git/refs/tags/
rm -Rf .git/refs/remotes/origin/tags
git branch -a
git tag
```



2. Run the following commands to change the remaining indexes under **refs/remotes** to local branches:

```
cp -Rf .git/refs/remotes/origin/* .git/refs/heads/
rm -Rf .git/refs/remotes/origin
git branch -a
git tag
```

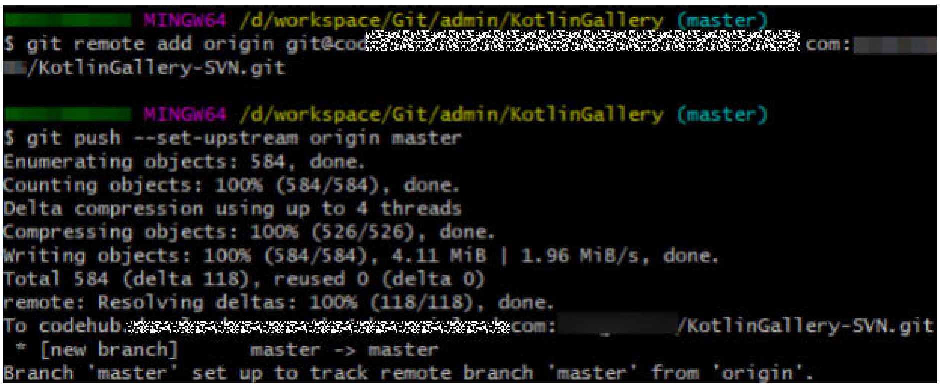
3. Run the following commands to merge the trunk branch into the master branch, and delete the trunk branch:

```
git merge trunk
git branch -d trunk
git branch -a
git tag
```

Step 4 Upload the local code.

1. Set the SSH key of the repository by referring to **Overview**.
2. Run the following commands to associate the local repository with the CodeHub repository and push the master branch to the CodeHub repository:

```
git remote add origin <Codehub_repository_address>
git push --set-upstream origin master
```



After the push is successful, log in to CodeHub and view the master branch of the repository on the **Branches** tab page.

3. Run the following command to push other branches from the local computer to CodeHub:

```
git push origin --all
```

After the push is successful, the r1.1_hotfix branch is added to the repository, as displayed on the **Branches** tab page.

4. Run the following command to push tags from the local host to CodeHub:

```
git push origin --tags
```

After the push is successful, the tags **r1.0** and **r1.1** are added to the repository, as displayed on the **Tags** tab page of CodeHub.

----End

3.6.3 Importing a Remote Git Repository to CodeHub

Background

CodeHub allows you to import Git-based remote repositories.

Git-based remote repositories are cloud repositories hosted in storage services such as GitHub.

Cloning the Git Repository to the Local host and Associating and Pushing It to CodeHub

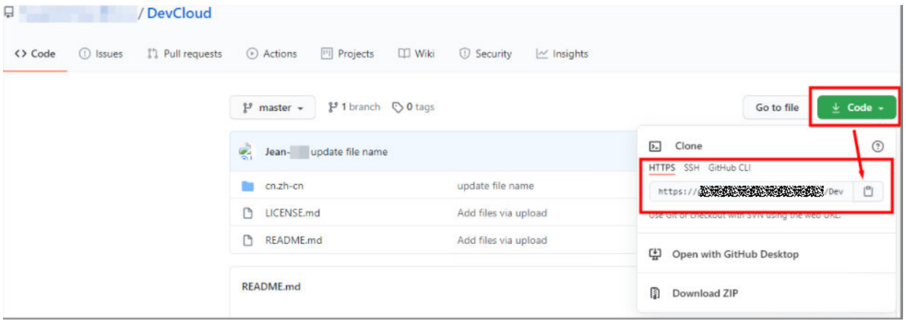
Clone the remote repository to the local host, and then associate and push the repository to the cloud code hosting.

Step 1 **Install and configure the Git client**.

Step 2 Download a bare repository using the source repository address.

The following uses GitHub as an example:

1. Open and enter the address of the GitHub code repository in a browser.
2. Click **Code** on the right, choose the **HTTPS** tab, and click the **Copy Icon** on the right.

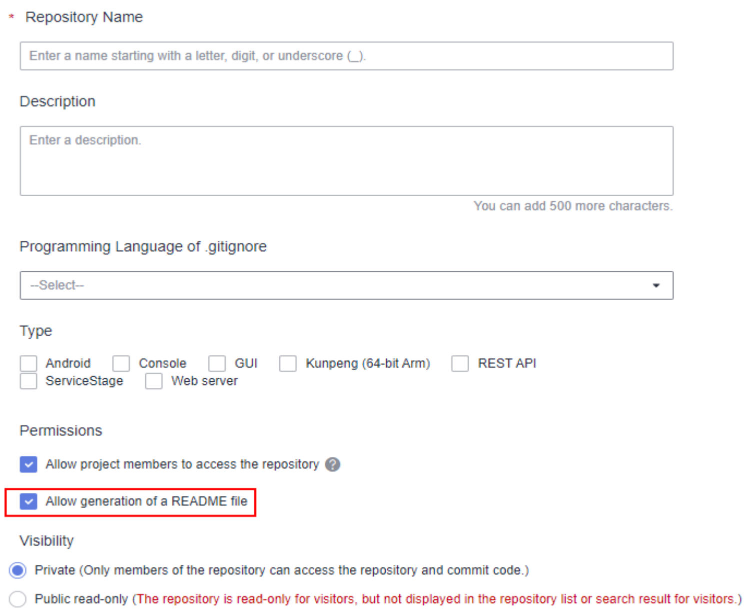


3. Open the Git Bash client on the local host, run the following command to clone the repository to the local computer, and run the **cd** command to go to the repository directory:

```
git clone --bare <source_repository_address>
```

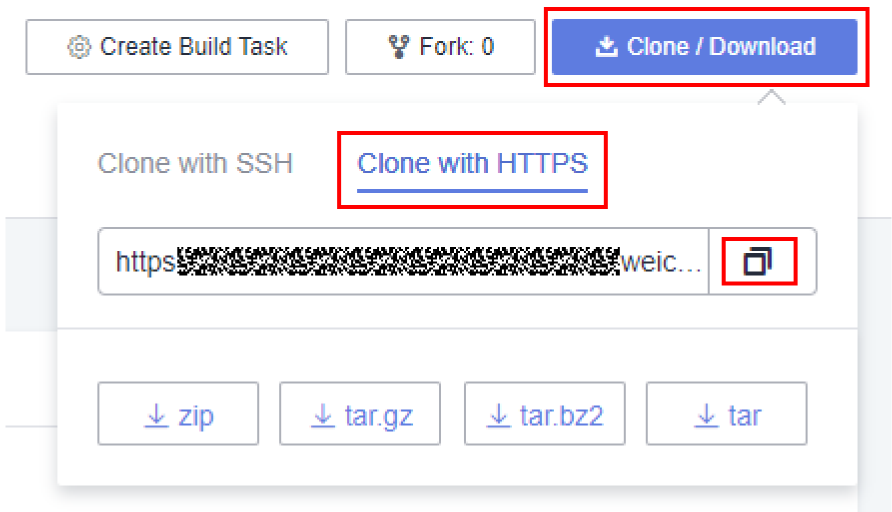
Step 3 Associate the local repository with CodeHub and push it to CodeHub.

1. On the CodeHub homepage, click **Create Directly**. In the **Permissions** area, do not select **Allow generation of a README file**.



2. Go to the repository details page created in **1**, click **Clone/Download**, and click the **Clone with SSH** or **Clone with HTTPS** as required. Then, click to obtain the repository address.

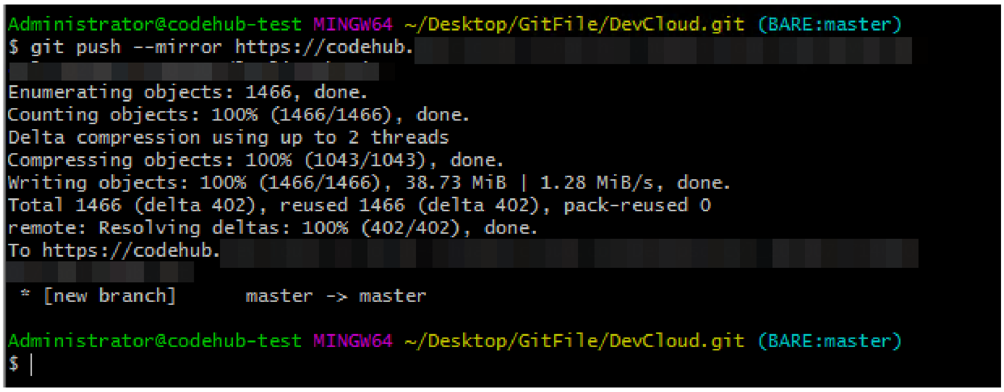
   In this example, the HTTPS address is used.



3. In the root directory of local source code, open the Git Bash client and run the following command to push the local repository to the new repository:

   git push --mirror *<new_codehub_repository_address>*

   When the command is executed, the system prompts you to enter the HTTPS account and password of the CodeHub repository. Enter the correct account and password. (For details, see **Obtaining an HTTPS Password**.)



If your source repository has branches and tags, they will also be pushed to the CodeHub cloud repository.

----End

After the push is successful, check whether the migration is complete in the code hosting cloud repository. (For details, see **Repository List**.)

3.6.4 Uploading Local Code to CodeHub

Background

CodeHub allows you to perform Git initialization on local code and upload the code to a CodeHub repository.

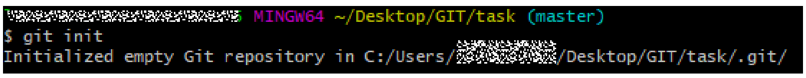
Procedure

Step 1 **Create an empty repository** in CodeHub.

- Do not configure **Programming Language of .gitignore**.
- Deselect **Allow generation of a README file**.

Step 2 Prepare the source code to be uploaded on the local host.

- If the source code is from the SVN server, refer to **Migrating an SVN Repository to CodeHub**.
- If the source code is not managed by any version control systems, run the following Git command in the root directory of the source code (Git Bash is used as an example):

  a. Initialize a Git repository:
```
git init
```


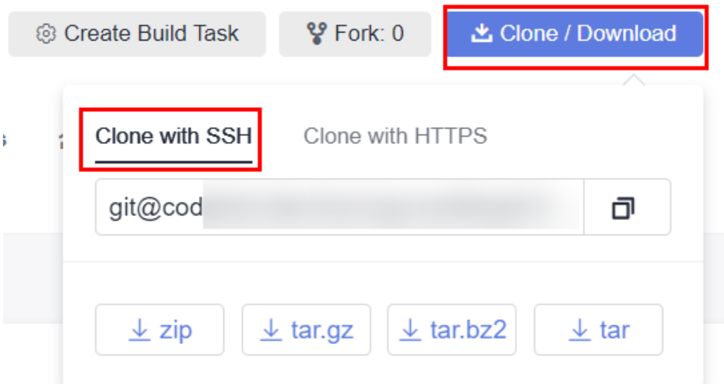
  b. Add the code files to the local repository:
```
git add *
```
  c. Create an initial commit:
```
git commit -m "init commit"
```

Step 3 Set a remote server address for the local repository.

- If the Git repository is cloned from other systems, run the following command to add a new remote repository:

```
git remote add new git@***.***.com:testtransfer/Repo1.git     # (replace the part after new with the repository address)
```

The repository address is displayed on the repository details page. The following figure shows how to obtain the repository address.



- If the Git repository is just initialized, run the following command to add a remote repository named **origin**.

```
git remote add origin git@***.***.com:testtransfer/Repo1.git # (replace the part after origin with the repository address)
```

Step 4 Push all code to the remote repository.

```
git push new master      # (when the Git repository is cloned from other systems)
git push origin master   # (when the Git repository is just initialized)
```

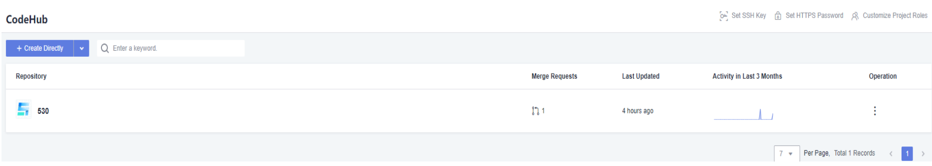
----End

3.7 Cloud Repositories

3.7.1 Repository List

The repository list is the entry to CodeHub.

You can create a repository, configure your SSH key or HTTPS password, and obtain a repository address.



- **Create a repository.** You can create a repository by **Create Directly** or **Use Template**.
- **Set an SSH key**.
- **Set an HTTPS password**.
- **Configure an IP address whitelist**.
- Click ☆ to follow a repository and the repository will be displayed on the top of the list.

3.7.2 Viewing Repository Details

In the repository list, click a repository name to go to the repository details page. CodeHub provides abundant console operations.

On the top of the repository page, you can view the **Creator**, **Created**, **Last Updated**, and **Fork Relationship** (**Fork repository**) of the repository.

The repository details page provides the following tab pages:

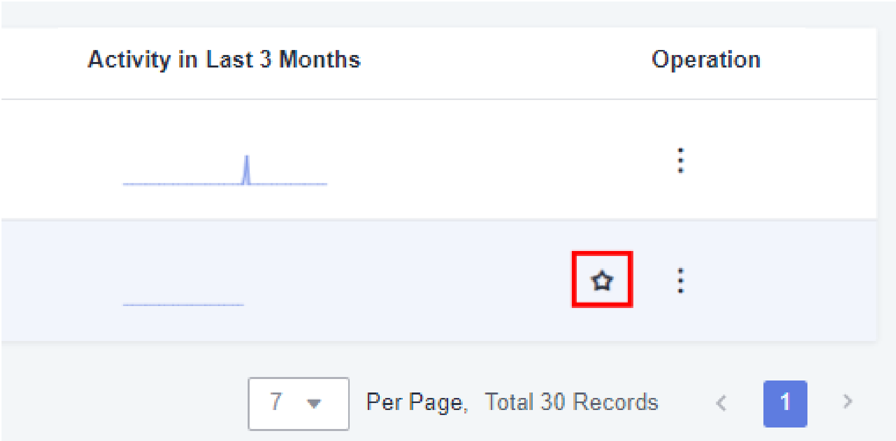
Table 3-3 Description

Page	Function Description
Files	File list of the repository. You can modify files online and view the commit history.
Branches	Branch list of the repository. You can manage branches on the console.
Tags	Tag list of the repository. You can manage tags on the console.
Merge Requests	Manage branch merge requests.
Reviews	Check review records of merge and commit requests.
Activity	View the dynamic information about the repository.
Members	Manage repository members, for example, synchronizing members from the project by one click or changing the permissions of a member.
Associated Work Items	List of associated work items. You can set the association with work items in ProjectMan to improve efficiency.
Repository Statistics	Visualized charts of repository commits, such as code contribution.
Commit Graph	By viewing the graph of the repository commit history, you can clearly understand the code change history, including the merge relationship between branches and committers.
Settings	Repository settings. Only the repository administrator and the repository owner can view this tab page and configure settings.

In addition, the repository details page provides quick entries to the following functions:

- **Clone/Download**: Obtain the SSH address and HTTPS address of the repository or directly download the code compressed package.
- **Fork**: Display the number of forks of the repository. You can click this button to create a fork.

- **Follow/Unfollow**: Follow or unfollow the repository. Followed repositories are displayed on the top of the repository list.

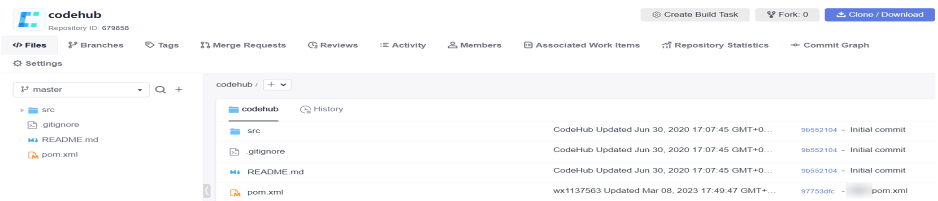


3.7.3 Managing Repository Files in Console

Introduction

CodeHub allows you to edit, trace, and compare file.

When you access the **repository details page**, the **Files** tab page is displayed by default. You can switch to different branches and tags to view the files in the corresponding version. The file list is displayed on the left, and the ***repository name*** (the tab name is the name of the displayed file), **History** tabs are displayed on the right.



File List

The file list is displayed on the left of the **Files** tab of the repository details page.

The file list provides the following functions:

- Switching branches and tags to display the file directory of the corresponding version

- Click 🔍 to display the search box. You can search for files in the file list.
- Click + provides the following functions:
  - **Create File**
  - **Create Directory**

- Create Submodule
- Upload File

- Point to the name of a file. The button for **renaming the file** is displayed.
- Click a file name to display the file content on the *repository name* tab page on the right. On this tab page, you can modify the file content and trace file changes.

NOTE

: file

: folder

: **Git submodule**

Creating a File

Creating a file on the CodeHub console is to **create a file** and run the **add**, **commit**, and **push** commands. A commit record is generated.

The created file is added to the **file list** of the corresponding branch. You can view the commit remarks and details on the ***repository name*** tab page.

Procedure:

Step 1 Access the repository list page.

Step 2 Go to your repository. (If there is no repository, **create one**.)

Step 3 Click + next to the branch and choose **Create File**. The **Create File** area is displayed. (Note that this step is to create a file under the branch.)

Click ⋮ next to the folder and choose **Create File**. The **Create File** area is displayed. (Note that this step is to create a file in a folder under the branch.)

Step 4 On the **Create File** page, enter related information as prompted.

Commit Message is equivalent to the **-m** message in the **git commit** command and can be used for associating work items. For details, see **Associating Work Items**.

Step 5 Click **OK** to save the new file.

----End

Creating a Directory

Creating a directory on the CodeHub console is to **create a folder structure**, and run the **add**, **commit**, and **push** commands. A commit record is generated.

The created directory structure (folder structure) is added to the **file list** of the corresponding branch. You can view the commit remarks and details of each layer on the ***repository name*** tab page.

A .gitkeep file is created at the bottom of the directory by default because Git does not allow a commit of an empty folder.

Procedure:

Step 1 Access the repository list page.

Step 2 Go to your repository. (If there is no repository, **create one**.)

Step 3 Click + next to the branch and choose **Create Directory**. The **Create Directory** area is displayed. (Note that this step is to create a directory under the branch.)

Click ⋮ next to the folder and choose **Create Directory**. The **Create Directory** area is displayed. (Note that this step is to create a directory in a folder under the branch.)

Step 4 In the **Create Directory** dialog box, enter related information as prompted.

- Directories are divided into different levels by slashes (/).
- **Commit Message** is equivalent to the **-m** message in the **git commit** command and can be used for associating work items. For details, see **Associating Work Items**.

Step 5 Click **OK** to save the new directory structure.

----End

Uploading a File

Uploading a file on the CodeHub console is to **create a file** and run the **add**, **commit**, and **push** commands. A commit record is generated.

Procedure:

Step 1 Access the repository list page.

Step 2 Go to your repository. (If there is no repository, **create one**.)

Step 3 Click + next to the branch and choose **Upload File**. The **Upload File** area is displayed. (Note that this step is to upload a file under the branch.)

Click ⋮ next to the folder and choose **Upload File**. The **Upload File** area is displayed. (Note that this step is to upload a file in a folder under the branch.)

Step 4 In the **Upload File** dialog box, enter related information as prompted.

- All file formats are supported. Only one file can be uploaded at a time. The size of a file cannot exceed 10 MB. If the file size exceeds 10 MB, use the Git client to push the file.
- **Commit Message** is equivalent to the **-m** message in the **git commit** command and can be used for associating work items. For details, see **Associating Work Items**.

Step 5 Click **OK** to upload the file.

----End

The uploaded file is added to the **file list** of the corresponding branch. You can view the commit remarks and details of each layer on the ***repository name*** tab page.

Renaming a File

Renaming a file on the CodeHub console is to **change a file name**, and run the **add**, **commit**, and **push** commands. A commit record is generated.

Procedure:

Step 1 Access the repository list page.

Step 2 Go to your repository. (If there is no repository, **create one**.)

Step 3 Point to a file in the file list on the left and click . The **Rename File** dialog box is displayed.

Step 4 In the **Rename File** dialog box, change the file name and enter the commit message.

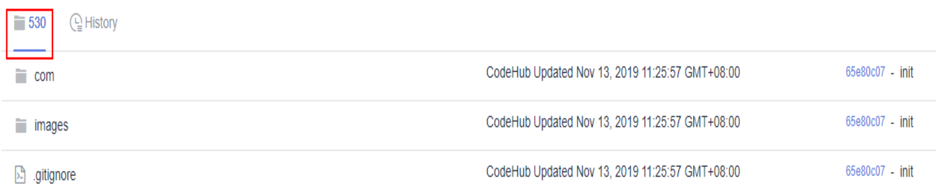
Commit Message is equivalent to the **-m** message in the **git commit** command and can be used for associating work items. For details, see **Associating Work Items**.

Step 5 Click **OK** to change the file name.

----End

Viewing Repository Details on the Repository Name Tab Page

By default, the *repository name* tab page displays repository details.



It displays the following information:

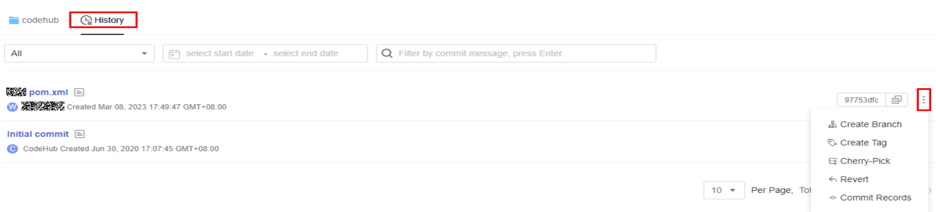
- *File*: name of a file or folder.
- *Update time*: last update time of the file or folder.
- *Creator*: creator of the last commit to the file or folder.
- *Commit message*: message of the last commit to the file or folder (**-m** in the **commit** command). You can click the message to display the commit record.

NOTE

Commit messages are required for the edit and delete operations. They are similar to **-m** in the **git commit** command and can be used for associating work items. For details, see **Associating Work Items**.

Viewing Commit History of a Repository on the History Tab Page

The **History** tab page displays the commit history of a repository.



On this page, you can perform the following operations on the commit history:

- Click a **Commit Name** to go to the commit details page.
- Click to display the following extended functions:
  - **Create Branch**.
  - **Create Tag**:Tag this commit. (**What is tag?**).
  - **Cherry-Pick**: Use the commit as the latest commit to overwrite a branch. It is used to retrieve a version.
  - **Revert**: undoing this commit
  - **Commit Records**: View commit records.

Viewing File Details on the File Name Tab Page

By default, the *file name* tab page displays file details.

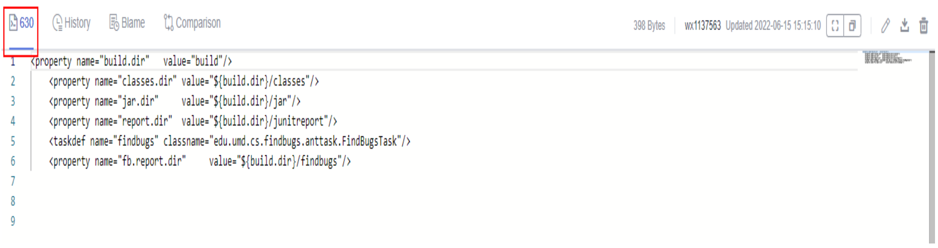
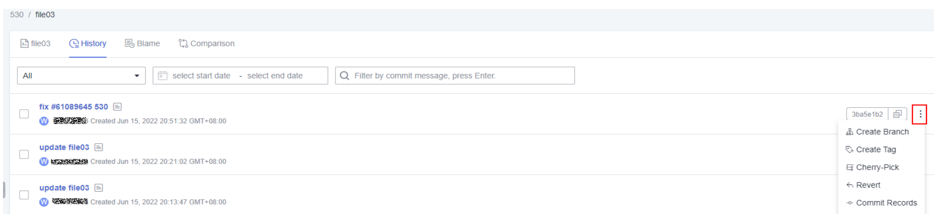


Table 3-4 Screen description

Screen Function	Function Description
File	Name of the file.
Updated	Last update time of the file.
Creator	Creator of the last commit to the file.
Full-Screen	Full screen to view the file content.
Copy Code	Copy the file content to the clipboard.
Download	Download the file to the local computer.
Edit	Edit the file online.
Delete	Delete the file.

Viewing Commit History of a File on the History Tab Page

The **History** tab page displays the commit history of a file.



On this page, you can perform the following operations on the commit history:

- Click a **Commit Name** to go to the commit details page.
- Click ⋮ to display the following extended functions:
  - **Create Branch**.
  - **Create Tag**: Tag this commit. (**What is Tag?**).
  - **Cherry-Pick**: Use the commit as the latest commit to overwrite a branch. It is used to retrieve a version.
  - **Revert**: undoing this commit.
  - **Commit Records**: View commit records.

Viewing and Tracing File Change History on the Blame Tab Page

The **Blame** tab page is located in the file details area. Click the target file. The following figure is displayed.

On this tab page, a modifier corresponds to their modified content. You can click the file name to view the commit details.

Comparison: Shows Commit Differences

The **Comparison** tab page is located in the file details area. Click the target file. The following figure is displayed. You can select different commits to compare differences.

CodeHub displays differences better than the Git Bash client.

NOTE

The comparison result shows the impact of merging from the left repository version to the right repository version on the files in the right repository. If you want to know the differences between the two file versions, you can adjust the left and right positions, compare them again, and learn all the differences based on the two results.

3.7.4 Viewing Activities

Access a repository and click the **Activities** tab page to view all activities of the current repository.

- **All**: This tab displays all operation records of the repository.
- **Push**: This tab displays all push operation records of the repository.
- **Merge Request**: This tab displays the operation records of all merge requests of the repository. You can click the sequence number of a merge request to view details.
- **Review**: This tab displays all review comments of the repository. You can click the commit number to view details.
- **Member**: This tab displays management records of all members of the repository.

NOTE

The displayed information includes the operator, operation content, and operation time.

3.7.5 Viewing Review Records of a Repository

Access a repository and click the **Reviews** tab page to view the review information about the repository.

Merge Requests

This tab displays all review records of merge requests. You can select a reviewer to filter records.

Table 3-5 Parameter description

Parameter	Description
Reviewer	Reviews merge requests or comments on the merge requests.
Merge Requests	Merge request to which the review record belongs. You can click the merge request name to view the merge request details.
Comments	Review comments of the reviewer.
Time	The date when the reviewer submits the review comments.
Requester	Author of the review comment.

Commits

This tab displays all records submitted for review. You can select a reviewer to filter records.

Table 3-6 Parameter description

Parameter	Description
Reviewer	Reviews commits.

Parameter	Description
Commit ID	Sequence number of commits. You can click an ID to view commit details.
Comments	Review comments of the reviewer.
Time	The date when the reviewer submits the review comments.
Requester	Author who commits code.

3.7.6 Viewing Repository Statistics

On the **Repository Statistics** tab page in the repository details, you can view the following repository statistics:

- Repository Summary: Displays the **Repository Storage Used**, **LFS Used**, **Branches** (cloud repository), **Tags** (cloud repository), **Members**, and **Commits**.

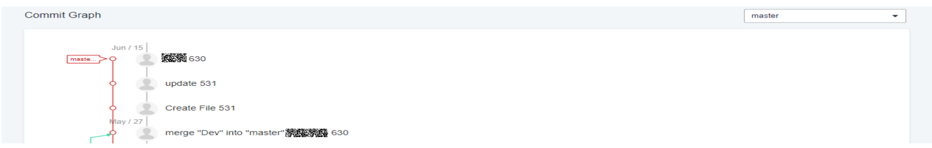
  You can select a branch, and the statistical scope of **Commit Trend**, **Contributors**, and **Commit Overview** will be changed. But the repository summary will not be affected.
- **Commit Trend**: Displays the submission distribution of the current branch of the repository.
- **Contributors**: Collects statistics on the contribution (number of submissions and number of code lines) of code committers in the current branch.
- **Commit Overview**: Collects statistics on code submission activeness by different dimensions (weekly, daily, and hourly).

3.7.7 Viewing the Commit Graph of a Repository

The commit graph of a repository displays the entire commit history (including the action, time, committer, commit message generated by the system or specified by the committer) of a branch or a tag and the relationship between commits in the form of a flow chart.

You can click the drop-down list in the upper right corner to switch to another branch.

You can click a commit node or a commit message to go to the details page of the corresponding commit record.



NOTE

Compared with the **History** tab page under the **Files** tab page, the commit graph can display the relationship between commits.

3.8 Associating Cloud Repositories

If you have stored project files on the local computer, you need to initialize the local project files as a Git repository and associate them with a cloud repository provided by CodeHub before using CodeHub.

Prerequisites

You have installed the **Git client** and **bound the SSH key of the Git client to CodeHub**.

Procedure

Step 1 **Create a remote repository**.

If you select gitignore based on your local code library, some non-development files will be ignored and will not be managed in Git.

Step 2 Initialize the local repository to a Git repository.

Open the Git Bash client in your repository and run the following command:

```
git init
```

The following figure shows that the initialization is successful. The current folder is the local Git repository.

Step 3 Bind the local repository to the cloud repository.

1. Go to the cloud repository and obtain the repository address.
2. Run the **remote** command to bind the local repository to the cloud repository:

```
git remote add <repository_alias> <repository_address>
```

Example:

```
git remote add origin git@*****/java-remote.git  # Change the address to that of your repository.
```

By default, **origin** is used as the repository alias when you clone a remote repository to the local computer. You can change the alias.

If the system displays a message indicating that the repository alias already exists, use another one.

If no command output is displayed, the binding is successful.

Step 4 Pull the master branch of the cloud repository to the local repository.

This step is performed to avoid conflicts.

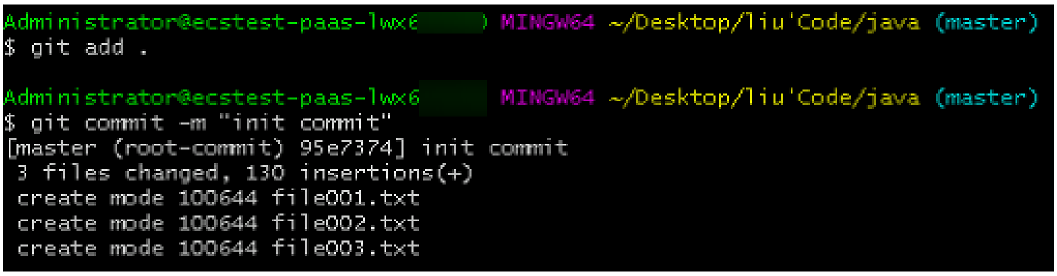
```
git fetch origin master  # Change origin to your repository alias.
```

Step 5 Commit local code files to the master branch.

Run the following commands:

```
git add .
git commit -m "<your_commit_message>"
```

The following figure shows a successful execution.



Step 6 Bind the local master branch to the cloud master branch.

```
git branch --set-upstream-to=origin/master master  # Change origin to your repository alias.
```

If the following information is displayed, the binding is successful.

Step 7 Merge the files in the cloud repository and local repository and store them locally.

```
git pull --rebase origin master   # Change origin to your repository alias.
```

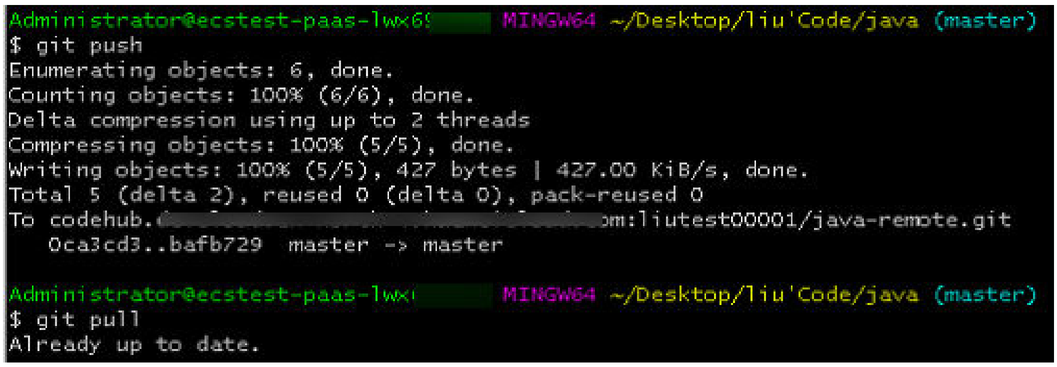
The following figure is displayed, indicating that the merged repository has been placed in the working directory and repository.

Step 8 Push the local repository to overwrite the cloud repository.

Run the **push** command directly because the repositories have been bound:

```
git push
```

After the operation is successful, pull the repository to verify that the version of the cloud repository is the same as that of the local repository.



----End

3.9 Cloud Repository Management

3.9.1 General Settings

3.9.1.1 Repository Information

To view and modify the repository information, choose **Settings > General Settings > Repository Information** on the repository details page.

The repository description, language, and type are remarks fields when the template is open-source (public), facilitating search.

NOTE

Modifying **Language** does not affect the .gitignore setting of the repository.

Visibility

- **Private**: Only repository members can access the repository.
- **Public read-only**: The repository is read-only to all visitors. Visitors can access the repository only through link sharing.
- **Public**: Set this parameter to a public sample template. The repository is read-only and can be used as a template when users create a template repository. You need to enter the title and author of the shared template.

3.9.1.2 Merge Requests

To configure merge requests, choose **Settings > General Settings > Merge Requests** on the repository details page. The settings take effect only for the repository configured. Only the repository administrators and owners can view this tab page and configure merge requests.

Rules you set take effect in **Merge Request Approval**. The parameters are described as follows:

Table 3-7 Configuration description

Item	Description
Creators cannot merge requests.	If this option is selected, creators cannot merge their own branches.
Closed merge requests cannot be re-opened.	If this option is selected, the branch merge request cannot be set back to the **enabled** status after it is closed. This option is used for project process control to prevent review history from being tampered with.
Merge after complete resolution	If this option is enabled, code cannot be merged until all review comments marked as '**Must resolve**' are addressed.

Item	Description
Delete source branch after merge	After the merge is successful, the source branch is deleted. ● The source branch set as a protection branch will not be deleted. ● This setting does not take effect for historical merge requests. Therefore, you do not need to worry about branch loss.
Merge Method	Currently, **Merge commit**, **Merge commit with semi-linear history**, and **Fast-forward** are supported. For details, see the description on the **Merge Requests** page.
Merge Mechanism	There are two types of mechanisms: **Approval** and **Score**. **NOTICE** By default, the **Approval** is used. You can manually switch to **Score**.

Merge Mechanism

1. **Score**: Code review is included. The minimum score can be set. The score ranges from 0 to 5. Score and code review are gates that must be passed before a merge can be accepted.
2. **Approval**: The Approval method consists of code review and merge approval. Code can be merged only after the number of reviewers reaches gate requirements. Click **Create Policy** to set a merge policy for a specified branch or all branches in the repository.

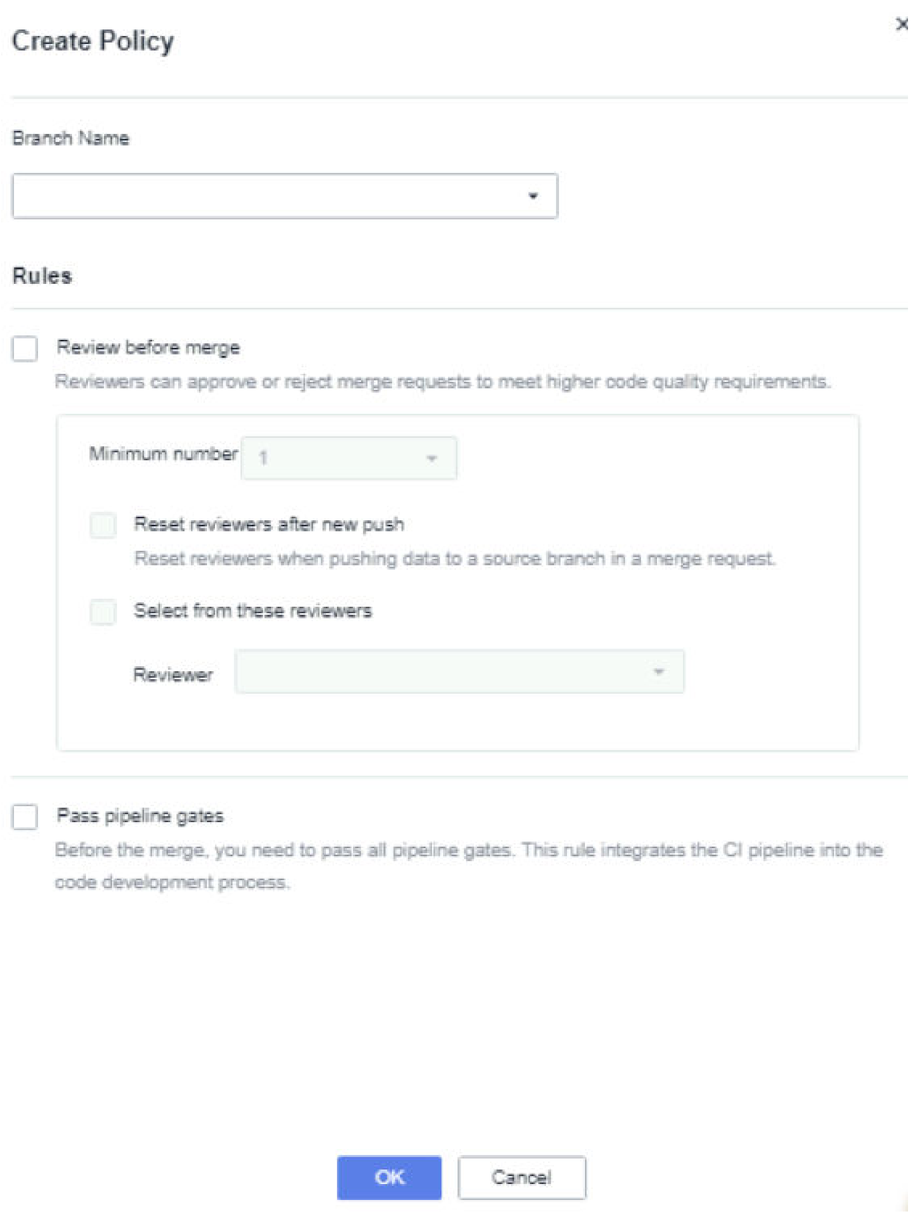


Table 3-8 Parameter description

Parameter	Description
Branch Name	You can select a specified branch or all branches of the repository.
Review before merge	If this option is selected, the adapted branches can be merged only after meeting all review rules.
Minimum number	The value ranges from 1 to 5.
Reset reviewers after new push	Reset reviewers when pushing data to a source branch in a merge request.

Parameter	Description
Select from these reviewers	The range of reviewers can be specified.

NOTE

If the branch policy is not set, the approval information is not displayed in the merge condition after a merge request is initiated.

- **Rules**: If you select **Review before merging**, reviewers can approve or reject merge requests to meet higher code quality requirements.
- **Rules**: Select **Pass pipeline gates**. Before the merge, you need to pass all pipeline gates. This rule integrates the pipeline into the code development process.

3.9.1.3 Commit Rules

Code commit rules can be set in **CodeHub** to ensure code quality.

To set code commit rules, choose **Settings** > **General Settings** > **Commit Rules** on the repository details page.

The settings take effect only for the repository configured.

Only the repository administrators and owners can view this tab page and configure code commit rules.

Table 3-9 Code commit rules description

Parameter	Description
Reject unsigned commits	Only signed commits can be pushed to the repository. **Signature mode**: Add the **-s** parameter when performing the commit operation on the client. `git commit -s -m "<your_commit_message>"` You need to **configure the signature and email address** on the client in advance.
Prevent tag removal by git push command to delete tags on the Git client, but can delete tags on the web UI.	Tags cannot be deleted by the **git push** command. However, tags can still be deleted on the web UI.
Prevent committing secrets	For details, see Rejecting Encrypted Files.

Parameter	Description
Prevent git push -f	Indicates whether users can run the **git push -f** command on the client to push code. **git push -f** indicates that the current local code repository is pushed to and overwrite the cloud repository. In general cases, you are not advised using this command.
Developers cannot create branches.	A whitelist can be set to prevent developers not in the whitelist from creating branches.
Developers cannot create tags.	Indicates whether developers are forbidden to create tags.
Allowed Commit Submission Information	Only commit messages that match the defined regular expression rules, for example, ^fix #[0-9]+, are allowed to be pushed. If this field is left blank, any commit message is allowed. It is equivalent to a whitelist for committing messages.
Prohibited Commit Submission Information	Commit messages that match the defined regular expression rules, for example, ^test.+, are not allowed to be pushed. If this field is left blank, any commit message is allowed. It is equivalent to a blacklist for committing messages.
Allowed Branch Names	Only branch names that match the defined regular expression rules, for example, ^feature-[0-9a-zA-Z]+, are allowed to be pushed. If this field is left blank, any branch name is allowed.
Prohibited File Names	File names that match the defined regular expression rules, for example, ^*\.exe, are not allowed to be pushed.

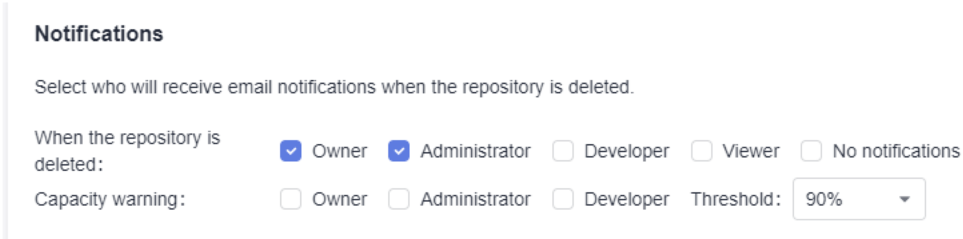
3.9.1.4 Notifications

CodeHub Notifications

To set merge requests, choose **Settings > General Settings > Notifications** on the repository details page.

The settings take effect only for the repository configured.

Only the repository administrators and owners can view this tab page and configure notifications.



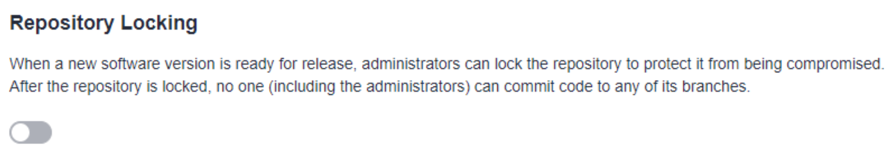
- **When the repository is deleted**: You can manually configure whether notification emails will be sent to the repository owners, administrators, developers, and viewers when a repository is deleted.
- **Capacity warning**: By default, this parameter is not enabled. You can manually set the capacity warning threshold as required. When the capacity of a single repository exceeds the threshold, the system emails the repository owner, the administrator, and developers. The warning email is sent only once unless the user updates the warning settings.

3.9.1.5 Repository Locking

When a new software version is ready for release, administrators can lock the repository to protect it from being compromised. After the repository is locked, no one (including the administrators) can commit code to any of its branches.

To lock a repository, choose **Settings > General Settings > Repository Locking** on the repository details page.

Only the repository administrators and owners can view this tab page and configure repository locking.



3.9.1.6 Repository Synchronization

The **Repository Synchronization** option is available only for repositories created by **Importing an External Repository**.

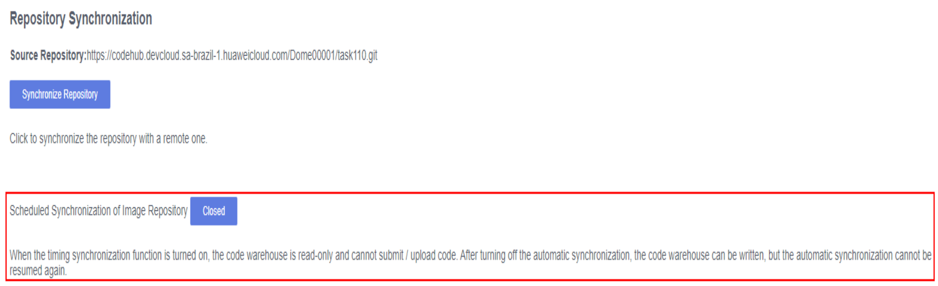
To synchronize a repository, choose **Settings > General Settings > Repository Synchronization** on the repository details page.

Only repository administrators and owners can view this tab page and configure the function.

You can click **Synchronize Repository** to resynchronize the default branch of the source repository. If you have selected **Periodically synchronize the default branch of the source repository** before importing external repositories, the **Scheduled Synchronization of Image Repository** switch is displayed on the **Repository Synchronization** tab page, as shown in the following figure.

- When the **Scheduled Synchronization of Image Repository** function is enabled, the image repository is read-only for you and code cannot be submitted or uploaded. The image repository refreshes content every hour to synchronize code generated 24 hours ago. For example, if a user modifies the default branch of the source repository at 10:00 today, the modified content will be synchronized to the image repository at 10:00 tomorrow.

- If you disable the **Scheduled Synchronization of Image Repository** function, you can edit the image repository. This function is removed from the page and cannot be restored.



CAUTION

- The image repository takes effect only on the default branch. To update code of other branches, manually change the default branch following instructions in **Default Branch**.
- If the content of the source repository is synchronized to the current repository, the code submitted by the current repository may be overwritten. As a result, the code is lost.

3.9.2 Repository Management

3.9.2.1 Default Branch

The default branch is the branch selected by default when you enter the current repository and is also the default target branch when you create a merge request.

To manage the default branch, choose **Settings** > **Repository Management** > **Default Branch** on the repository details page.

When a repository is created, the master branch is used as the default branch and can be manually adjusted at any time.

The settings take effect only for the repository configured.

Only the repository administrators and owners can view this tab page and set a default branch.

3.9.2.2 Protected Branches

Protected branches have the following functions:

- Ensure branch security and allow developers to use merge requests to merge code.
- Prevent non-administrators from pushing codes.

- Prevent all forcibly push to this branch.
- Prevent anyone from deleting this branch.

On the **Protected Branches** page, you can configure a specified branch to limit it using any of the following rules:

- Whether an administrator has the commit permission.
- Whether a developer has the commit permission.
- Whether an administrator has the merge permission.
- Whether a developer has the merge permission.

To configure protected branches, choose **Settings > Repository Management > Protected Branches** in the repository details.

The settings take effect only for the repository configured.

Only the repository administrators and owners can view this tab page and configure protected branches.

3.9.2.3 Submodules

Background

A submodule is a Git tool used to manage shared repositories. It allows you to embed a shared repository as a subdirectory in a repository. You can isolate and reuse repositories, and pull latest changes from or push commits to shared repositories.

You may want to use project B (a third party repository, or a repository developed by yourself for multiple parent projects) in project A, and use them as two separate projects. Submodules allow you to clone a Git repository as a subdirectory into another Git repository while keeping commits separate.

The submodules are recorded in a file named **.gitmodules**, which records the information about the submodules.

```
[submodule "module_name"]      # Submodule name
path = file_path               # File path of the submodule in the current repository (parent repository).
url = repo_url                 # Remote repository IP address of the submodule (sub-repository).
```

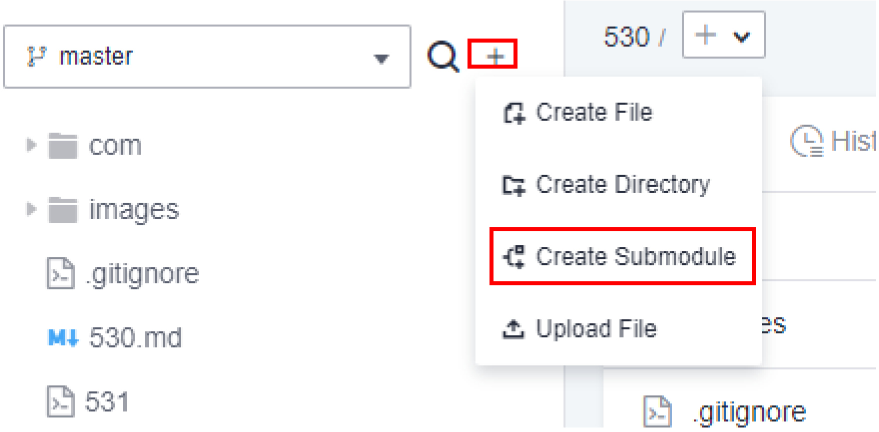
In this case, the source code in the **file_path** directory is obtained from **repo_url**.

Using the Console

- **Creating a submodule**
  - **Entry 1**:

    You can create a submodule on the **Files** tab page.

    Click + and select **Create Submodule**, as shown in the following figure.



– **Entry 2**

  You can create a submodule in the repository settings.

  Choose **Settings** > **Repository Management** > **Submodules** > **Create Submodule**.

– **Remarks:**

  You can use either of the preceding methods to **Create submodule**.

  Configure the following parameters and click **OK**.

Table 3-10 Parameters of creating a sub-repository

Parameter	Description
Submodule	Select a repository as the submodule.
Submodule Branch	Select the target branch of the submodule to be synchronized to the parent repository.
Submodule Path	The storage path of the submodule in the parent repository. Use slashes (/) to separate levels, as shown in the following figure.
Commit Message	Remarks for creating a submodule. You can find the operation in the file history.

NOTE

After the creation is complete, you can find the submodule (sub-repository) in the corresponding directory of the repository file list. The icon on the left of the corresponding file is .

- **Viewing, synchronizing, and deleting a submodule**

  Choose **Settings** > **Repository Management** > **Submodules**. On the displayed page, repository administrators can view, synchronize, and delete submodules.

- **Synchronizing deploy keys**
  If a submodule is added on the Git client, the repository administrator needs to synchronize the deploy key of the parent repository to the submodule on the **Settings > Repository Management > Submodules** page. In this way, the submodule can also be pulled during the build of the parent repository.

Using the Git Client

Creating a submodule

```
git submodule add <repo> [<dir>] [-b <branch>] [<path>]
```

Example:

```
git submodule add git@***.***.com:****/WEB-INF.git
```

Pulling a repository that contains a submodule

```
git clone <repo> [<dir>] --recursive
```

Example:

```
git clone git@***.***.com:****/WEB-INF.git --recursive
```

Updating a submodule based on the latest remote commit

```
git submodule update --remote
```

Pushing changes to a submodule

```
git push --recurse-submodules=check
```

Deleting a submodule

1. Delete the entry of a submodule from the **.gitsubmodule** file.
2. Delete the entry of a submodule from the **.git/config** file.
3. Run the following command to delete the folder of the submodule.
   ```
   git rm --cached {submodule_path} # Replace {submodule_path} with your submodule path.
   ```

   NOTE

   Omit the slash (/) at the end of the path.

   For example, if the submodule is stored in **src/main/webapp/WEB-INF/**, run **git rm --cached src/main/webapp/WEB-INF**.

3.9.2.4 Webhook

Introduction to Webhook

Developers can configure URLs of third-party systems on the webhook page and subscribe to events such as branch push and tag push of CodeHub based on project requirements. When a subscription event occurs, you can use a webhook to send a POST request to the URL of a third-party system to trigger operations related to your system (third-party system), such as popping up a notification window, building or updating images, or performing deployment.

If you want to email repository change notifications, you can configure **Notifications** in **General Settings**.

Setting Webhooks

To configure the webhook, choose **Settings > Repository Management > Webhooks** on the repository details page.

The settings take effect only for the repository configured.

Only repository administrators and owners can view this tab page and configure the function.

NOTE

- A maximum of 20 webhooks can be created for a repository.
- You can configure a token when setting up a webhook. The token will be associated with the webhook URL and sent to you in the X-Devcloud-Token header of a POST request.

Events for Subscription

- You can select which events to listen to. CodeHub will send you POST requests only when subscribed events occur. You can also change the subscribed events on the **Webhooks** page.
- The following events can be selected:
  - Push events
  - Tag push events
  - Merge request events
  - Comment events
- **Example**: If you have subscribed to merge request events, CodeHub will send a POST request to the configured webhook URL when a merge request is created, closed, or reopened in the repository. You can then perform actions based on the received information.

  POST Requests

  A POST request sent by CodeHub includes the following information:

```
headers:
  Content-Length: 2294
  Connection: keep-alive
  Host: your.host.com
  X-Devcloud-Event: Push Hook
  Content-Type: application/json
X-Devcloud-Token: xxxxxxx (if configured)
body: (event details)
  {
    "object_kind": "push",
    "event_name": "push",                    // Event type: push event in this example.
    "before": "0101010101010101010101010101010101010101",    // before and after fields record
the commit IDs before and after the action respectively.
    "after": "0123456789012345678901234567890123456789",
    "ref": "refs/heads/master",                    // Triggered branch
    "checkout_sha": "0123456789012345678901234567890123456789",  // Version that is checked out
when an event is triggered.
    "message": "",
    "user_id": 1234,                    // Operator information
    "user_name": "example_user",
    "user_username": "example_user",
    "user_email": "example@huawei.com",
    "user_avatar": null,
    "user_id": 1234,                    // Project information of the triggered event
    "project": {
```

```
      "id": 123456,
      "name": "ExampleRepository",
      "description": "This is an example repository",
      "web_url": "https://codehub.devcloud.huaweicloud.com/ExampleNamespace/ExampleRepository",
      "avatar_url": null,
      "git_ssh_url": "git@codehub.devcloud.huaweicloud.com:ExampleNamespace/
ExampleRepository.git",
      "git_http_url": "https://codehub.devcloud.huaweicloud.com/ExampleNamespace/
ExampleRepository.git",
      "namespace": "ExampleNamespace",
      "visibility_level": 0,
      "path_with_namespace": "ExampleNamespace/ExampleRepository",
      "default_branch": "master",
      "ci_config_path": null,
      "homepage": "https://codehub.devcloud.huaweicloud.com/ExampleNamespace/
ExampleRepository",
      "url": "git@codehub.devcloud.huaweicloud.com:ExampleNamespace/ExampleRepository.git",
      "ssh_url": "git@codehub.devcloud.huaweicloud.com:ExampleNamespace/ExampleRepository.git",
      "http_url": "https://codehub.devcloud.huaweicloud.com/ExampleNamespace/
ExampleRepository.git"
   },
  "commits": {                                        // Commit information of the triggered event
    "id": "0123456789012345678901234567890123456789",
    "message": "This is an example message",
    "timestamp": "2019-05-30T08:50:37Z",
    "url": "https://codehub.devcloud.huaweicloud.com/ExampleNamespace/ExampleRepository/commit/
0123456789012345678901234567890123456789",
    "author": {
      "name": "example_user",
      "email": "example@huawei.com"
    }"added": [
      "src/main/java/HelloWorld.java"
    ],
    "modified": [],
    "removed": []
  },
  "total_commits_count": 1,
  "repository": {                                     // Repository information
    "name": "ExampleRepository",
    "url": "git@codehub.devcloud.huaweicloud.com:ExampleNamespace/ExampleRepository.git",
    "description": "This is an example repository",
    "homepage": "https://codehub.devcloud.huaweicloud.com/ExampleNamespace/ExampleRepository",
    "git_http_url": "https://codehub.devcloud.huaweicloud.com/ExampleNamespace/
ExampleRepository.git",
    "git_ssh_url": "git@codehub.devcloud.huaweicloud.com:ExampleNamespace/ExampleRepository.git",
    "visibility_level": 0
  }
}
```


3.9.2.5 Space Freeing

With space freeing, you can free up storage space to increase the read and write speed for the current repository by running background clean-up tasks, including compressing files and removing unused objects. Space freeing is similar to the garbage collect (gc) function in Git.

To enable space freeing, choose **Settings > Repository Management > Space Freeing** on the repository details page.

Only the repository administrators and owners can view this tab page and configure space freeing.

NOTE

It is recommended that you perform this operation once every month.

3.9.2.6 Backup

Repository backup has two modes:

- a: Back up the repository to another DevCloud region.

  This mode imports a repository from a region to another region. For details, see **Importing an External Repository**.

  NOTE

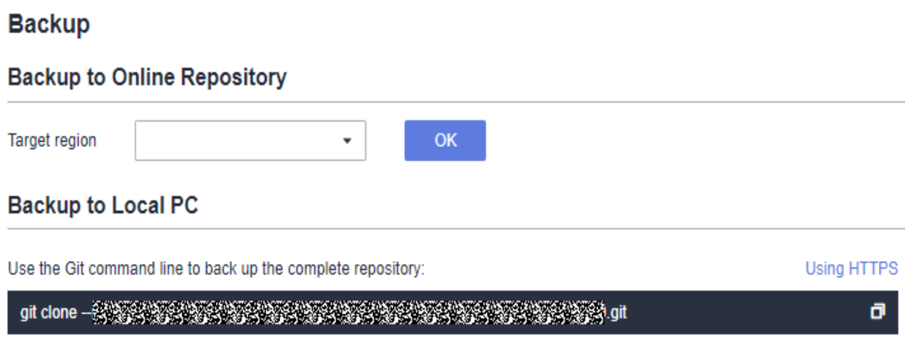
  On the Huawei Cloud International Website, the networks of each site are isolated from each other. Therefore, remote backup cannot be performed. Therefore, this function is unavailable now.

- b: Back up the repository to your local computer.

  You can use the HTTPS or SSH clone mode. The clone command is generated as shown in **b** in the following figure. You only need to paste the command to the local Git client and run it. (Ensure the repository connectivity.)

  To configure remote backup, choose **Settings** > **Repository Management** > **Backup** on the repository details page.

  Only the repository administrators and owners can view this tab page and have permissions.



3.9.2.7 Copy Repository Settings

You can copy the settings of a repository to another repository in the same project.

This function is used for a repository forked based on the repository because the settings are not automatically copied during forking. For details, see **Forking a Repository**

To configure copy repository settings, choose **Settings** > **Repository Management** > **Copy Repository Settings** on the repository details page.

Only the repository administrators and owners can view this tab page and configure copy repository settings.

Common Failure Causes

- Failed to copy commit rules: No commit rules are set for the source repository.
- Failed to copy default and protected branches: The branch names of the source repository and target repository are different.

3.9.3 Security Management

3.9.3.1 Deploy Keys

Deploy keys allow you to clone repositories with read only access over SSH. They are mainly used in scenarios such as repository deployment and continuous integration.

The deploy key is the public key of the SSH key generated locally. However, the deploy keys and SSH keys of a repository cannot be the same.

NOTE

- Multiple repositories can use the same deploy key, and a maximum of 10 deploy keys can be added to a repository.
- The settings take effect only for the repository configured.
- Only the repository administrators and owners can view this tab page and can configure deploy keys.

To configure the deploy keys, choose **Settings** > **Security Management** > **Deploy Keys** on the repository details page. The deploy key is a key that has only the read-only permission on the repositories.

The settings take effect only for the repository configured.

Click **Add Deploy Key** to create a deploy key.

To generate an SSH key, perform the following operations:

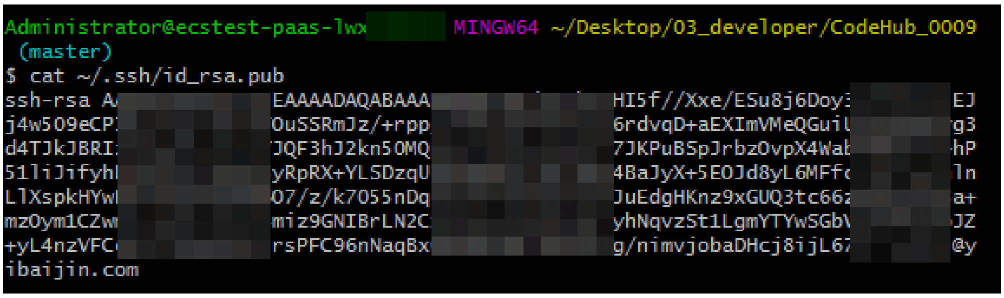
Step 1 **Check whether your computer has generated a key**.

Run the following command on the local Git client to display the SSH key:

```
cat ~/.ssh/id_rsa.pub
```

- If a message indicating that **No such file or directory** is displayed as shown in the following figure, no SSH key has been generated on your computer. Go to **Step 2** to generate and configure an SSH key.

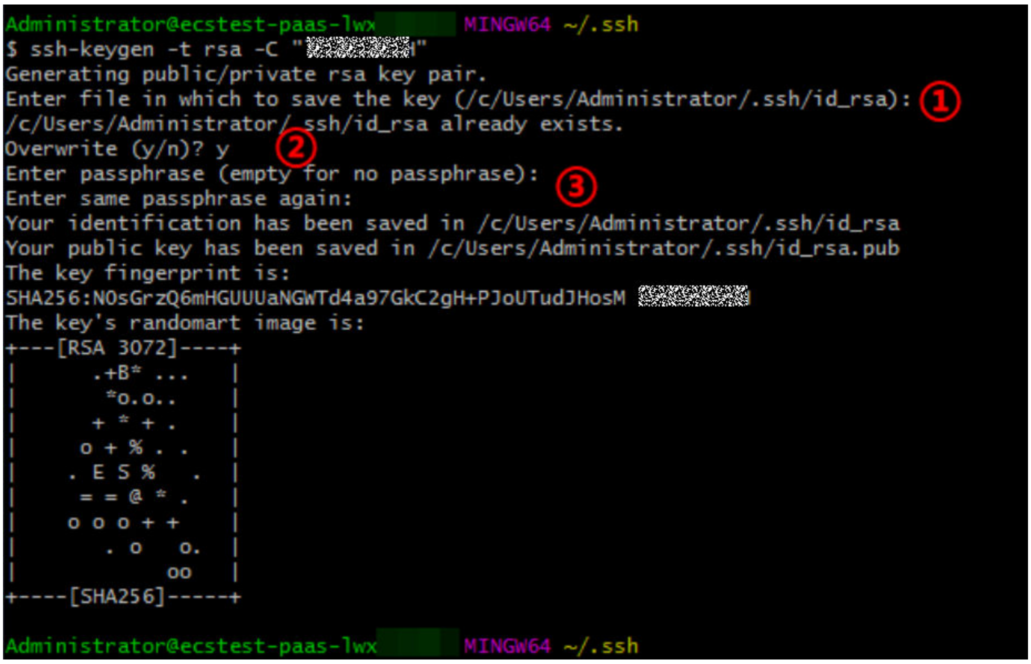
- If at least one group of keys is returned, an SSH key has been generated on your computer. To use the generated key, go to **Step 3** directly. To generate a new key, go to **Step 2**.



Step 2 **Generate an SSH private key.**

Run the following command on the local Git client to generate an SSH key:

```
ssh-keygen -t rsa -C "Your SSH key comment"
```



Perform the following operations. If information similar to the preceding figure is displayed, the key is generated.

- 1. The system prompts you to enter the storage path of the key. You can press **Enter** to use the default path.
- 2. If a key already exists in the local path, the system asks you whether to overwrite it. Enter **n** to cancel key generation, or enter **y** and press **Enter** to overwrite the existing key. In this example, the existing key is overwritten.
- 3. The system prompts you to set a password for the key and confirm the password. If you do not want to set a password, press **Enter**.

> ⚠ CAUTION
>
> – If you press **Enter** without entering the password, the generated private key file **id_rsa** is stored locally in plaintext. Keep it secure.
>
> – If **passphrase** is set, the generated private key file is stored after being encrypted by AES-128-CBC. (Recommended)

Step 3 **Copy the SSH public key to the clipboard.**

Run the following command locally based on your operating system to copy the SSH public key to your clipboard. Take Windows as an example. If no command output is displayed, the public key is copied.

- **Windows**
```
clip < ~/.ssh/id_rsa.pub
```
- **macOS**
```
pbcopy < ~/.ssh/id_rsa.pub
```
- **Linux (xclip required)**

```
xclip -sel clip < ~/.ssh/id_rsa.pub
```

----End

3.9.3.2 Configuring IP Address Whitelist

About IP Address Whitelist

- IP address whitelists enhance repository security by restricting access to repositories by IP address.
- Only access from whitelisted IP addresses is allowed.

IP address Whitelist Formats

IPv4 and IPv6 are supported. The following table lists the three formats of IP address whitelists.

Table 3-11 IP address whitelist formats

Format	Description
Single IP address	This is the simplest IP address whitelist format. You can add the IP address of your computer to the whitelist, for example, 100.*.*.123.
IP address segment	If you have multiple servers and their IP addresses are consecutive or the IP address of your server dynamically changes in a network segment, you can add the IP address segment, for example, 100.*.*.0 to 100.*.*.255.
CIDR block	• When your server on a LAN uses the CIDR, you can specify a 32-bit egress IP address of the LAN and the number of bits for a specified network prefix. • Requests from the same IP address are accepted if the network prefix is the same as the specified one. • In contrast, access from servers of other users in the same IP LAN are intercepted because the network prefix is not the specified one. For example: 100.*.*.11/12.

Configuring IP Address Whitelist

IP address whitelists can be created in the following levels:

NOTE

The IP address whitelist can be configured only for repositories whose visibility is **Private**. Repositories whose visibility is **Public read-only** or **Public** are not supported.

- **IP Address Whitelist for Repository**. It allows access only from IP addresses in the whitelist to a specific repository. To set the whitelist, choose **Settings > Security Management > IP Address Whitelist for Repository**. IPv4 and IPv6 addresses are supported. For details, see **IP address Whitelist Formats**.
- Personnel in the IP address whitelist are allowed to clone the Git client or download the repository source code on the UI.

NOTE

If no IP address whitelist is configured, all IP addresses are allowed.

3.9.3.3 Risky Operations

To configure risky operations, choose **Settings > Security Management > Risky Operations** on the repository details page.

Only the repository administrators and owners can view this tab page and configure risky operations.

Risky operations are as follows:

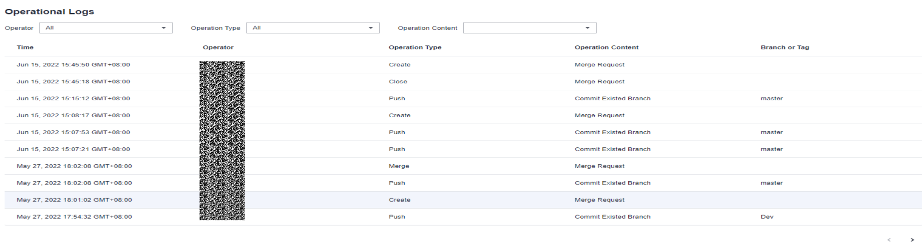
- **Transfer repository ownership**: The ownership of a repository can be transferred to another person in the repository but cannot be transferred to a viewer or custom role.
- **Delete repository**: The repository cannot be recovered after being deleted.
- **Rename repository**: After renaming a repository, check the configuration related to the repository name in a timely manner.

3.9.3.4 Operational Logs

To view operational logs, choose **Settings > Security Management > Operational Logs** on the repository details page.

Only the repository administrators and owners can view this tab page.

You can query logs by operator, operation content, branch, or tag.



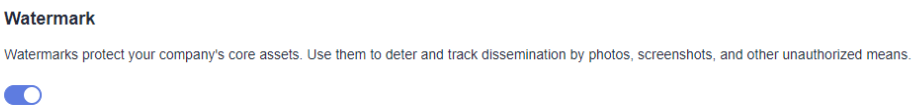
To view the impact of specific operations on files, see **Commit Graph** or **Commit History**.

3.9.3.5 Watermarks

On the repository details page, choose **Settings > Security Management > Watermark**. The watermark content consists of your account name and current time.

Only repository administrators and owners can view this tab page and configure the watermark function.

Watermarks will be displayed on code repository pages to reduce the risk of code asset leakage.



3.10 Committing Code to the Cloud

3.10.1 Creating a Commit

Background

In code development, developers usually clone the cloud repository to the local computer to develop code locally, and the commit the code to the cloud repository after completing the phased development task. This section describes how to use the Git client to commit the modified code.

Prerequisites

1. You have installed and configured the Git client. For details, see **Git Installation and Configuration**.
2. You have created a repository in CodeHub. For details, see **Overview**.
3. You have set the SSH keys or HTTPS password. For details, see **SSH Keys and HTTPS Passwords**.
4. You have cloned the cloud repository to the local host. For details, see **Overview**.

Procedure

Generally, developers do not directly develop code in the master branch. Instead, they create a feature branch based on the master or develop branch, and develop code in it. Then they commit the **feature** branch to the cloud repository, and merge it into the **master** or **develop** branch. The preceding operations are simulated as follows:

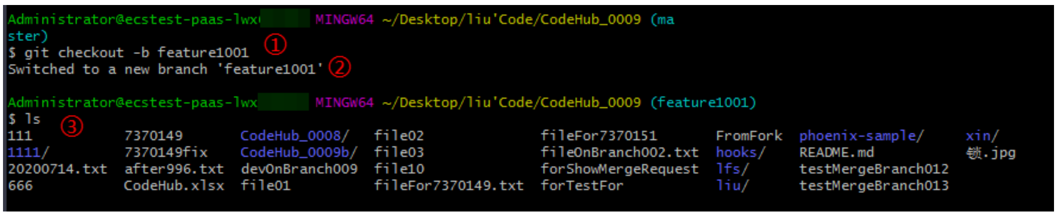
Step 1 Go to the local repository directory and open the Git client. Take Git Bash as an example. The principles and commands of other Git management tools are the same.

Step 2 Create a **feature1001** branch based on the **master** branch, switch to the created branch, and run the following command in the **master** branch:

```
git checkout -b feature1001 #Shown in 1 in the following figure.
```

This command creates a branch and then switches to the branch.

If the command is successfully executed, 2 in the following figure is shown. You can run the **ls** command to view the files of the branch (as shown in 3 in the following figure), which are the same as those of the **master** branch currently.



Step 3 Modify code in the **feature** branch (code development).

Git supports Linux commands. In this case, the **touch** command is used to create a file named **newFeature1001.html**, indicating that the developer has developed new features locally and a new file is added into the local code repository.

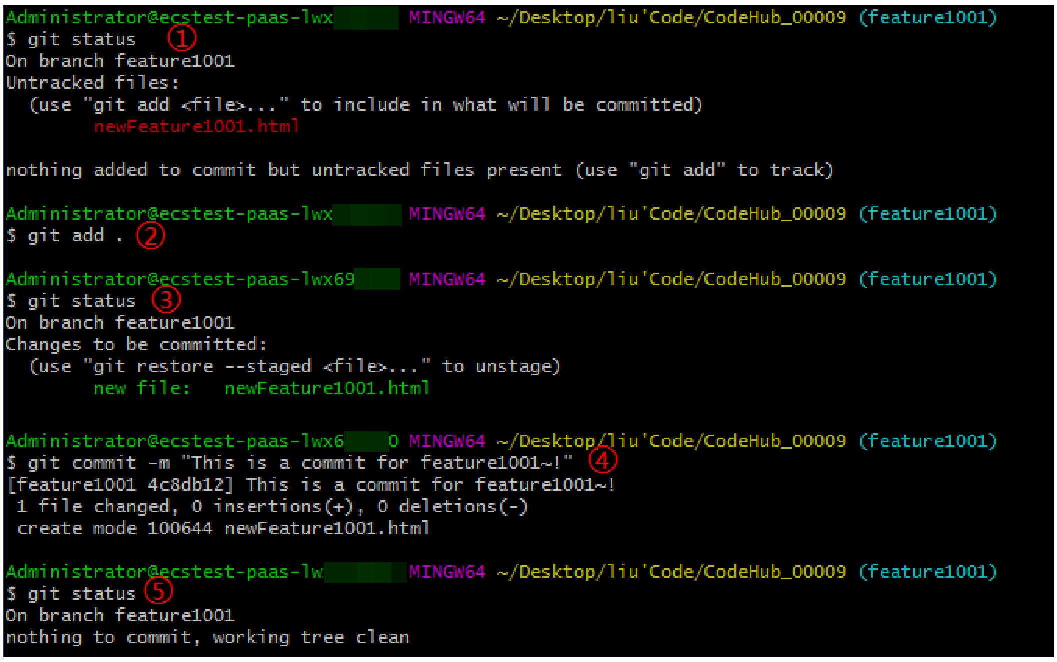
```
touch newFeature1001.html
```

Run the **ls** command again to view the created file.

Step 4 Run the **add** and **commit** commands to add the file from the working directory to the staging area, and then commit the file to the local repository. (For details, see **Overview**.)

You can also run the **status** command to check the file status.

1. Run the **status** command. The command output shows that a file in the working directory is not included in version management, as shown in 1 in the following figure.
2. Run the **add** command to add the file to the staging area, as shown in 2 in the following figure.
```
git add . # Period (.) means all files, including hidden files. You can also specify a file.
```
3. Run the **status** command. The command output shows that the file has been added to the staging area and is waiting to be committed, as shown in 3 in the following figure.
4. Run the **commit** command to commit the file to the local repository, as shown in 4 in the following figure.
```
git commit -m "<your_commit_message>"
```
5. Check the file status again. If no file to be committed exists, the commit is successful, as shown in 5 in the following figure.

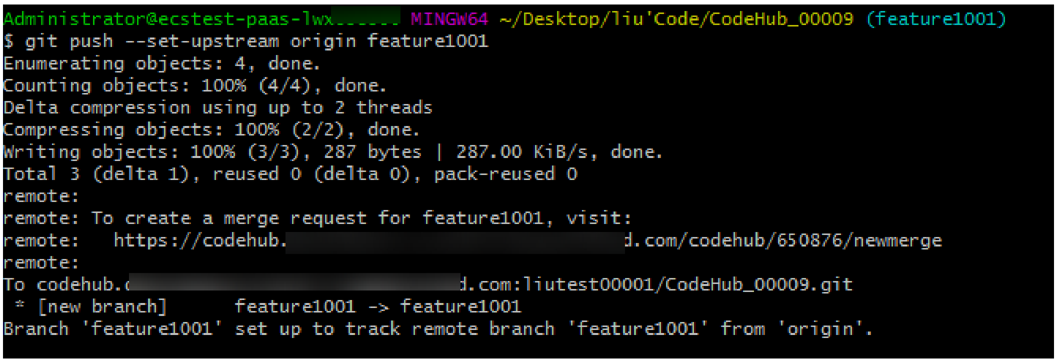


Step 5 Push a local branch to the remote repository.

```
git push --set-upstream origin feature1001
```

Run the preceding command to create a branch that is the same as your local **feature1001** branch in the cloud repository, and associate them and synchronize the branch.

origin indicates the alias of your remote repository. The default alias of a directly controllable repository is **origin**. You can also use the repository address.



```
Administrator@ecstest-paas-lwx[redacted] MINGW64 ~/Desktop/liu'Code/CodeHub_00009 (feature1001)
$ git push --set-upstream origin feature1001
Enumerating objects: 4, done.
Counting objects: 100% (4/4), done.
Delta compression using up to 2 threads
Compressing objects: 100% (2/2), done.
Writing objects: 100% (3/3), 287 bytes | 287.00 KiB/s, done.
Total 3 (delta 1), reused 0 (delta 0), pack-reused 0
remote:
remote: To create a merge request for feature1001, visit:
remote:   https://codehub.[redacted]d.com/codehub/650876/newmerge
remote:
To codehub.[redacted]d.com:liutest00001/CodeHub_00009.git
 * [new branch]      feature1001 -> feature1001
Branch 'feature1001' set up to track remote branch 'feature1001' from 'origin'.
```

NOTE

If the push fails, check the connectivity.

- Check the established SSH key pair. If necessary, regenerate a key and configure it on the CodeHub console. For details, see **SSH Keys**.
- Check the **IP address whitelist**. If no whitelist is configured, all IP addresses are allowed to access the repository. If a whitelist is configured, only IP addresses in the whitelist are allowed to access the repository.

Step 6 View the branch on the cloud.

Log in to CodeHub and go to your repository. In the **Files** tab page, you can switch to your branch on the cloud.

NOTE

If the branch you just committed is not displayed, your **origin** may be bound to another repository. Use the repository address to commit the branch again.

Step 7 Create a merge request. For details, see **Merge Request Approval**. Notify the reviewer to review the request and merge the new feature into the master or develop branch.

----End

3.10.2 Transmitting and Storing a File in Encryption Mode

CodeHub uses git-crypt for encrypted storage and transmission of confidential and sensitive files.

About git-crypt

git-crypt is a third-party open-source software that can transparently encrypt and decrypt files in the Git repository. It can encrypt and store specified files and file types. Developers can store encrypted files (such as confidential information or sensitive data) and shared code in the same repository and pull and push them like in a common repository. Only the person who has the corresponding file key can view the content of the encrypted files, but others are not restricted to read and write unencrypted files.

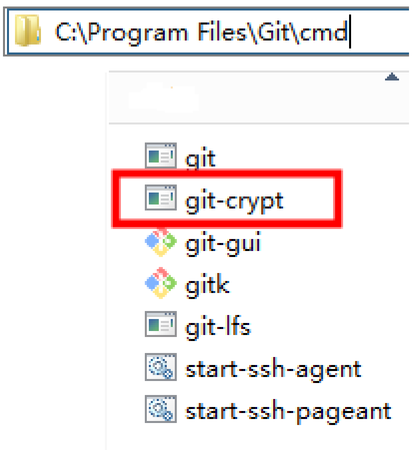
git-crypt allows you to encrypt only specific files without locking the entire repository, facilitating team cooperation and ensuring information security.

Using Key Pairs for Encryption and Decryption on Windows

Step 1 Install and initialize Git.

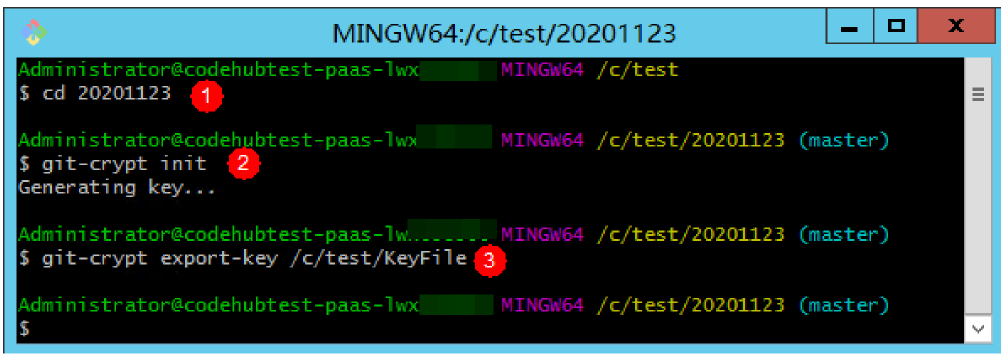
Step 2 Download the latest **Windows-based git-crypt** and save the downloaded .exe file to the **cmd** folder in the Git installation directory. The following figure uses the default Git Bash installation path of **Windows Server 2012 R2 Standard (64-bit)** as an example.

Put the .exe file in the folder. You do not need to run it.

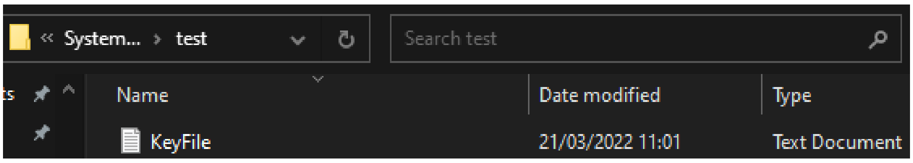


Step 3 **Generate a key pair.**

1. Open **Git Bash** and go to the local repository, as shown in 1 in the following figure.
2. Run the following command to generate a key pair, as shown in 2 in the following figure.
```
git-crypt init
```
3. Export the key file. In this example, the key file is exported to the **C:\test** directory and named **KeyFile**. Run the following command, as shown in 3 in the following figure.
```
git-crypt export-key /c/test/keyfile
```



4. Check whether the key is generated in the file path where the key is exported. In this example, check whether the **KeyFile** file exists in the **C:\test** directory, as shown in the following figure.



The computer containing the key file can decrypt the corresponding encrypted file.

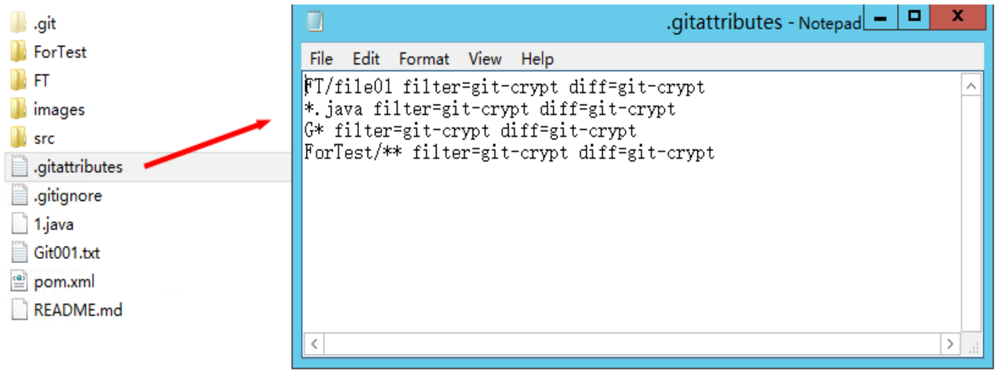
Step 4 Configure the encryption scope for the repository.

1. Create a file named **.gitattributes** in the root directory of the repository.
2. Open the **.gitattributes** file and run the following command to set the encryption range.

```
<file_name_or_file_range>: filter=git-crypt diff=git-crypt
```

Four examples are as follows:

```
FT/file01.txt filter=git-crypt diff=git-crypt  # Encrypt a specified file. In this example, the file01.txt file in the FT folder is encrypted.
*.java filter=git-crypt diff=git-crypt  # The .java file is encrypted.
G* filter=git-crypt diff=git-crypt   # Files which names start with G are encrypted.
ForTest/** filter=git-crypt diff=git-crypt   # Files in the ForTest folder are encrypted.
```



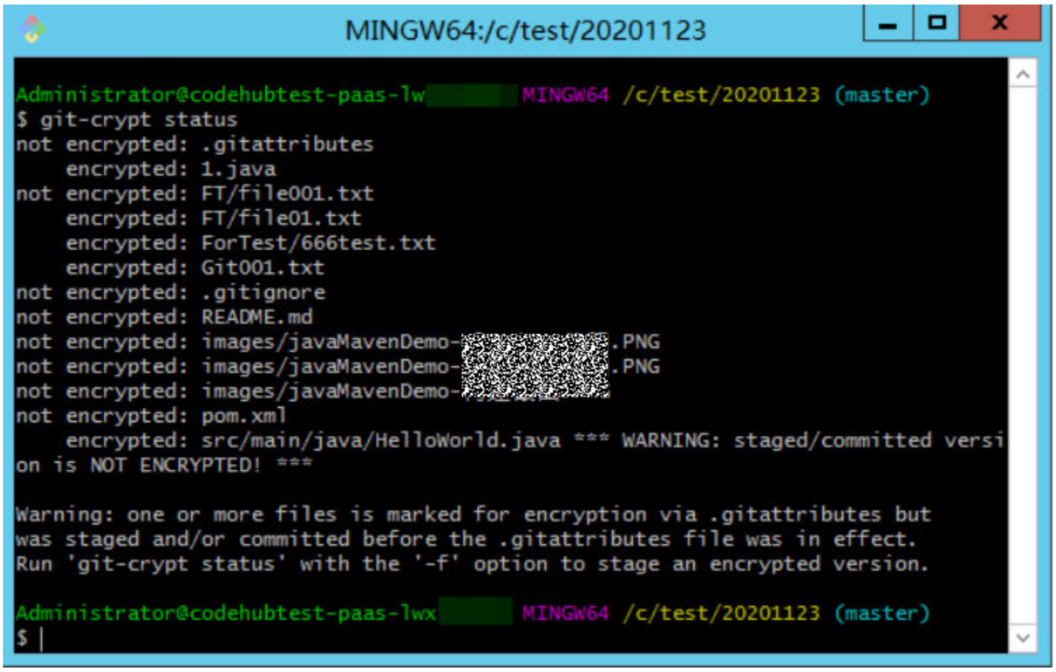
NOTE

- If the system prompts you to **enter the file name** when you create the **.gitattributes** file, you can enter **.gitattributes.** to create the file. If you run the Linux command to create the file, this problem does not occur.
- Do not save the **.gitattributes** file as a **.txt** file. Otherwise, the configuration does not take effect.

Step 5 Encrypt the file.

Open Git Bash in the root directory of the repository and run the following command to encrypt the file. The encryption status of the file is displayed.

```
git-crypt status
```



After the encryption, you can still open and edit the encrypted files in plaintext in your local repository because your local repository has a key.

You can run the **add**, **commit**, and **push** commands to push the repository to the cloud. In this case, the encrypted files are pushed together.

Encrypted files are stored in the cloud repository as encrypted binary files and cannot be viewed directly. If you do not have a key, you cannot decrypt it even if you download it to the local computer.

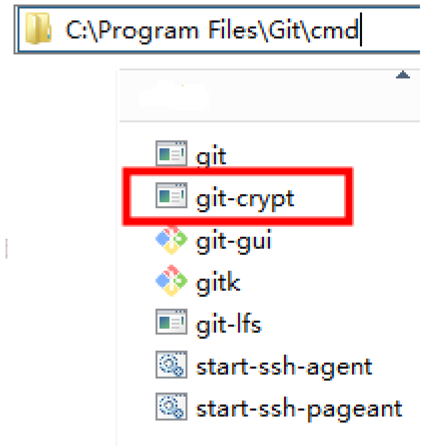
NOTE

git-crypt status encrypts only the files to be committed this time. It does not encrypt the historical files that are not modified this time. Git displays a message for the unencrypted files involved in this setting (see **Warning** in the preceding figure). If you want to encrypt all files of a specified type in the repository, run the **git-crypt status -f** command.

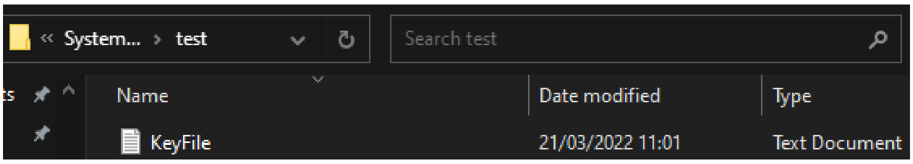
In team cooperation, **-f** (forcible execution) has certain risks and may cause the members' work output to remain unchanged. Exercise caution when using **-f**.

Step 6 Decrypt the file.

1. Ensure that the **git-crypt** file exists in the Git installation path on the local computer.



2. Clone the repository from the cloud to the local computer.
3. Obtain the key file for encrypting the repository and store it on the local computer.



4. Go to the repository directory and right-click Git Bash.
5. Run the decryption command. If no command output is displayed, the command is successfully executed.

```
git-crypt unlock /C/test/KeyFile # Replace /C/test/KeyFile with the actual key storage path.
```

The encrypted **Git001.txt** file is used as an example. The following figures show the file before and after decryption.

Figure 3-2 Before decryption

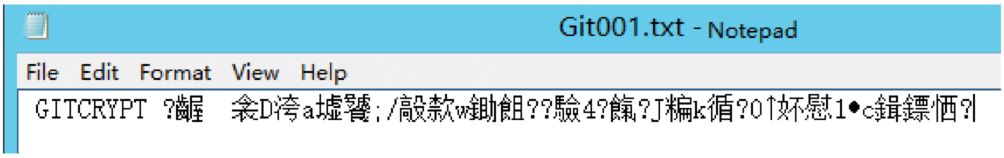
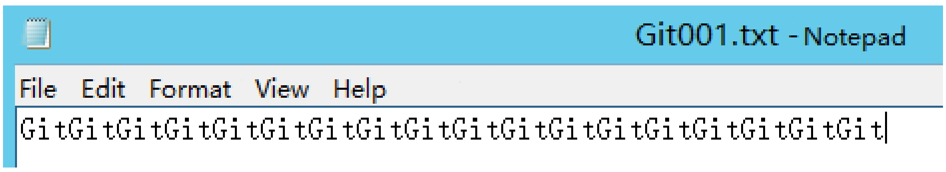


Figure 3-3 After decryption



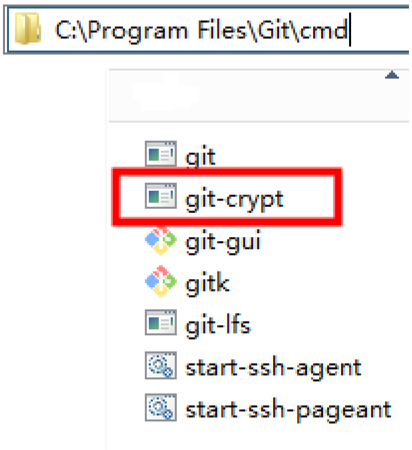
----End

Encrypting and Decrypting a File in GPG Mode on Windows

Step 1 Install and initialize Git.

Step 2 Download the latest **Windows-based git-crypt** and save the downloaded .exe file to the **cmd** folder in the Git installation directory. The following figure uses the default Git Bash installation path of **Windows Server 2012 R2 Standard (64-bit)** as an example.

Put the .exe file in the folder. You do not need to run it.



Step 3 **Download the GPG** of the latest version. When you are prompted to donate the open-source software, select **0** to skip the donation process.

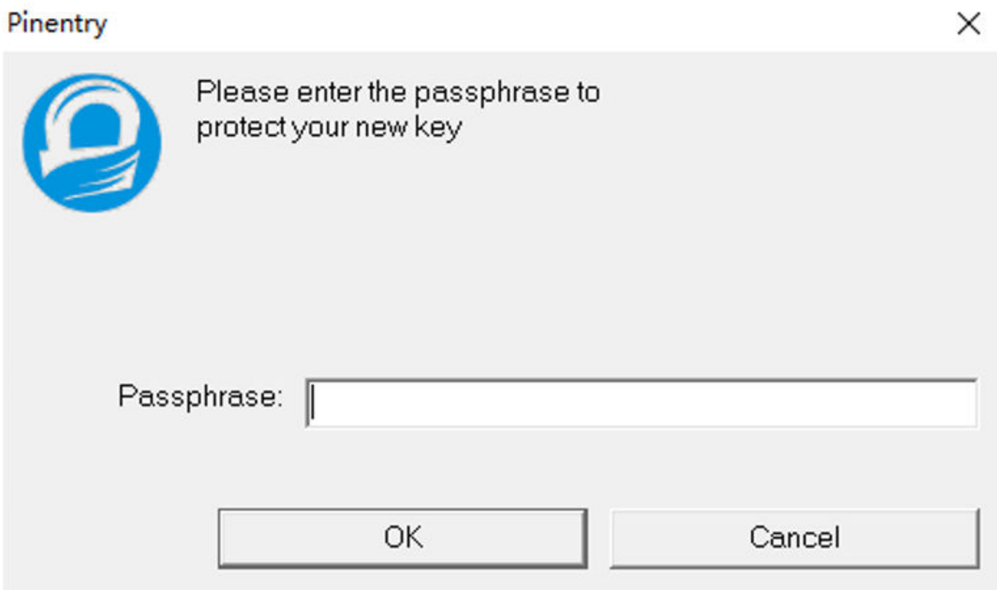
OS	Where	Description
Windows	**Gpg4win**	Full featured Windows version of *GnuPG*
	download sig	Simple installer for the current *GnuPG*
	download sig	Simple installer for *GnuPG 1.4*
OS X	**Mac GPG**	Installer from the gpgtools project
	GnuPG for OS X	Installer for *GnuPG*
Debian	**Debian site**	GnuPG is part of Debian
RPM	**rpmfind**	RPM packages for different OS
Android	**Guardian project**	Provides a GnuPG framework
VMS	**antinode.info**	A port of GnuPG 1.4 to OpenVMS
RISC OS	**home page**	A port of GnuPG to RISC OS

Double-click to start the installation. Click **Next** to complete the installation.

Step 4 **Generate a key pair in GPG mode.**

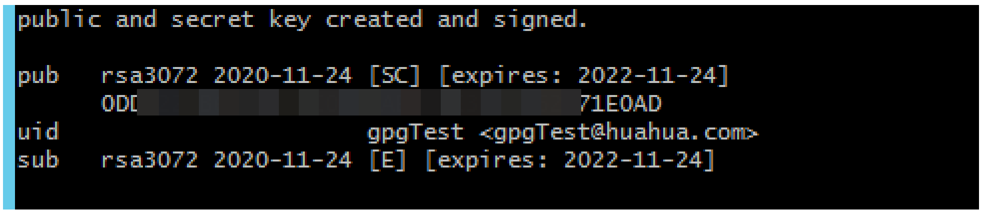
1. Open Git Bash and run the following command:
```
gpg --gen-key
```
2. Enter the name and email address as prompted.

3. Enter **o** as prompted and press **Enter**. The dialog boxes for entering and confirming the password are displayed.



The password can be empty. To ensure information security, you are advised to enter a password that complies with the standard (this password is required for decryption).

4. If the following information is displayed, the GPG key pair is generated successfully.



Step 5 Initialize the repository encryption.

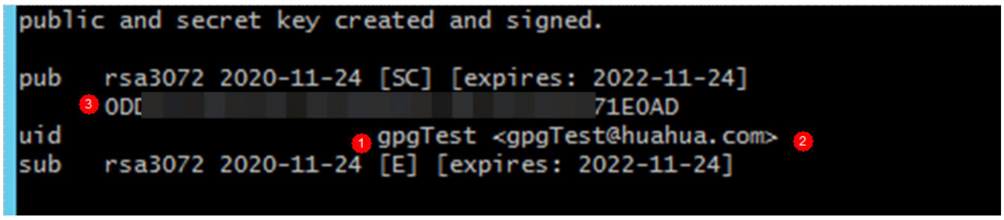
1. Open Git bash in the root directory of the repository and run the following command to initialize the repository:

```
git-crypt init
```

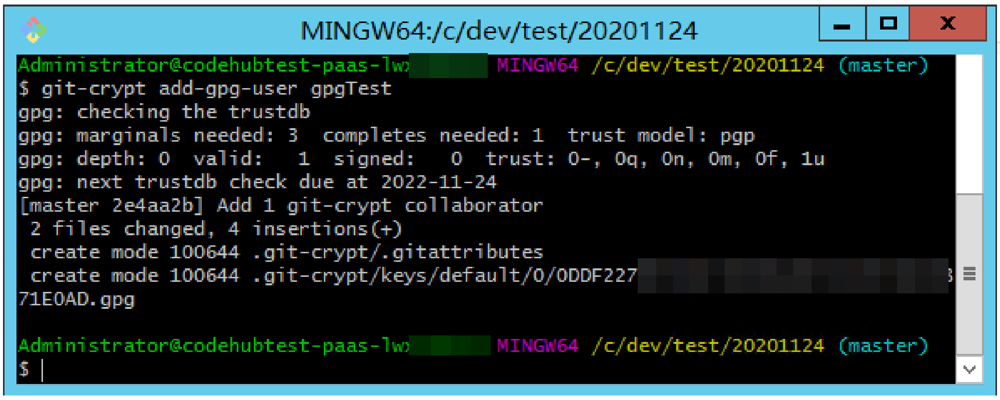
2. Run the following command to add a copy of the key to your repository. The copy has been encrypted using your public GPG key.

```
git-crypt add-gpg-user USER_ID
```

USER_ID can be the name, email address, or fingerprint that uniquely identifies the key, as shown in 1, 2, and 3 in the following figure in sequence.



After the command is executed, a message is displayed, indicating that the **.git-crypt** folder and two files in it are created.



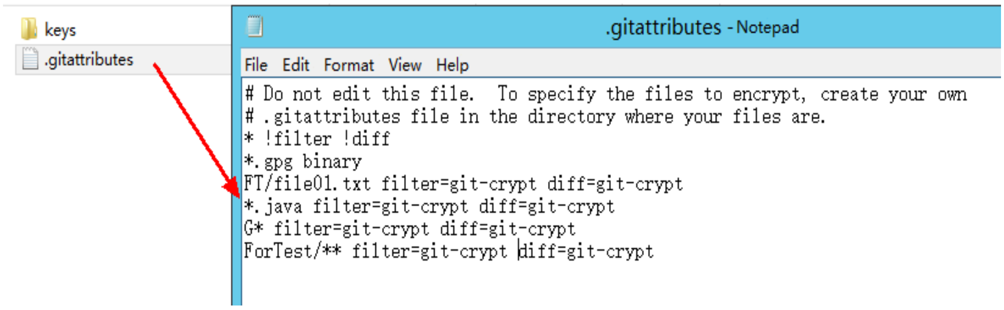
Step 6 **Configure the encryption scope for the repository.**

1. Go to the **.git-crypt** folder in the repository.
2. Open the **.gitattributes** file and run the following command to set the encryption range.

```
<file_name_or_file_range>: filter=git-crypt diff=git-crypt
```

Four examples are as follows:

```
FT/file01.txt filter=git-crypt diff=git-crypt  # Encrypt a specified file. In this example, the file01.txt file in the FT folder is encrypted.
*.java filter=git-crypt diff=git-crypt  # The .java file is encrypted.
G* filter=git-crypt diff=git-crypt   # Files which names start with G are encrypted.
ForTest/** filter=git-crypt diff=git-crypt   # Files in the ForTest folder are encrypted.
```



3. Copy the **.gitattributes** file to the root directory of the repository.

Step 7 **Encrypt the file.**

Open Git Bash in the root directory of the repository and run the following command to encrypt the file. The encryption status of the file is displayed.

```
git-crypt status
```

After the encryption, you can still open and edit the encrypted files in plaintext in your local repository because your local repository has a key.

You can run the **add**, **commit**, and **push** commands to push the repository to the cloud. In this case, the encrypted files are pushed together.

Encrypted files are stored in the cloud repository as encrypted binary files and cannot be viewed directly. If you do not have a key, you cannot decrypt it even if you download it to the local computer.

NOTE

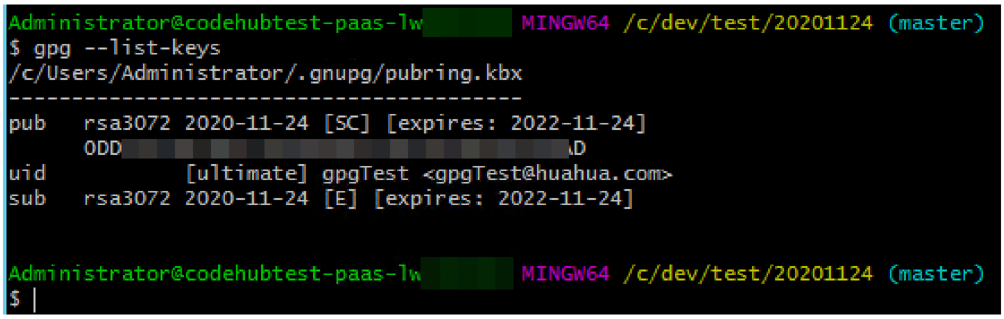
git-crypt status encrypts only the files to be committed this time. It does not encrypt the historical files that are not modified this time. Git displays a message for the unencrypted files involved in this setting (see **Warning** in the preceding figure). If you want to encrypt all files of a specified type in the repository, run the **git-crypt status -f** command.

In team cooperation, **-f** (forcible execution) has certain risks and may cause the members' work output to remain unchanged. Exercise caution when using **-f**.

Step 8 **Export the key.**

1. Lists the currently visible keys. You can view the name, email address, and fingerprint of each key.

```
gpg --list-keys
```



2. Run the **gpg --export-secret-key** command to export the keys. In this example, the **gpgTest** key is exported to **drive C** and named **Key**.

```
gpg --export-secret-key -a gpgTest > /c/key   # -a indicates that the key is displayed in text format.
```

   During the execution, the system prompts you to enter the key password. Enter the correct password.

   No command output is displayed. You can view the key file in the corresponding directory (**drive C** in this example).

3. Send the generated key to the team members to share the encrypted file.

Step 9 **Import the key and decrypt the file.**

1. To decrypt files on another computer, you need to download and install git-crypt and GPG based on Git. For details, see the previous steps in this section.
2. Clone the corresponding repository to the local host.
3. Obtain the key of the corresponding encrypted file. For details about how to export the key, see the previous step. In this example, the obtained key is stored in **drive C**.
4. Go to the repository, open Git Bash, and run the **import** command to import the key.

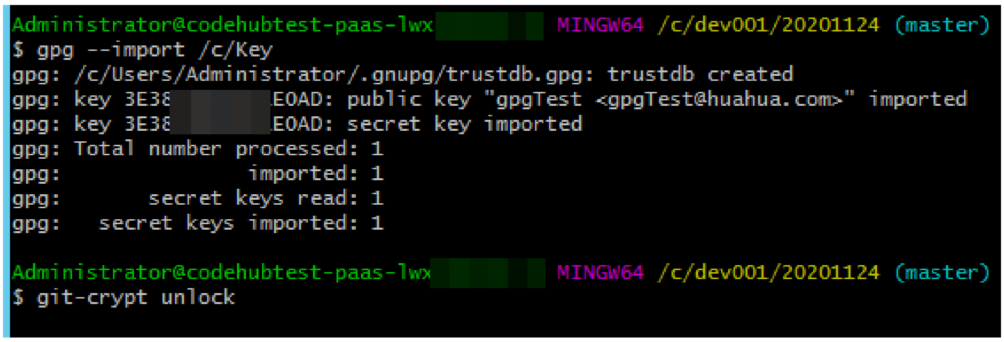
```
gpg --import  /c/key
# /c/Key is the key path and user-defined key name in this example. Replace them with the actual ones.
```

   During the import, the system prompts you to enter the password of the key. If the import is successful, the following figure is displayed.

5. Run the **unlock** command to decrypt the file.

```
git-crypt unlock
```

   During the decryption, a dialog box is displayed, prompting you to enter the password of the key. If no command output is displayed after you enter the correct password, the decryption is successful.



Step 10 View the file before and after decryption.

Figure 3-4 Before decryption

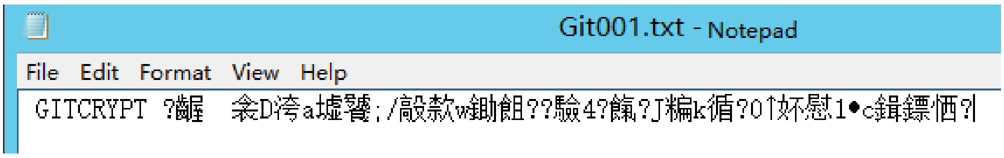
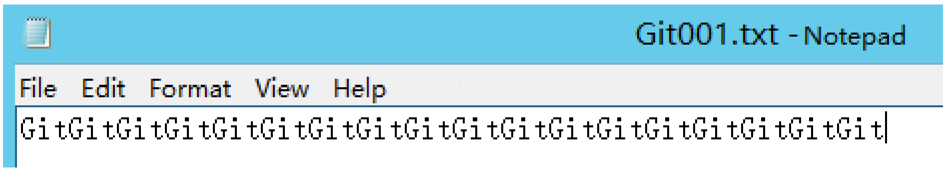


Figure 3-5 After decryption



----End

Application of git-crypt Encryption in Teamwork

In most cases, a team needs to store files that have **restricted disclosure** in the code repository. It can use **CodeHub**, **Git**, and **git-crypt** to encrypt some files in the distributed open-source repository.

Generally, **Key pair encryption** can meet the requirements of restricting the access to some files.

When a team needs to set different confidential levels for encrypted files, the **GPG encryption** can be used. This encryption mode allows users to use different keys to encrypt different files in the same repository and share the keys of different confidential levels with team members, restricting file access by level.

Installing git-crypt and gpg on Linux and macOS

Installing git-crypt and gpg on **Linux**

- Linux installation environment

Software	Debian/Ubuntu Package	RHEL/CentOS Package
Make	make	make
A C++11 compiler (e.g. gcc 4.9+)	g++	gcc-c++
OpenSSL development files	libssl-dev	openssl-devel

- In Linux, install git-crypt by compiling the source code.

  Download the source code.

```
make
make install
```

  Install git-crypt to a specified directory


```
make install PREFIX=/usr/local
```

- In Linux, install GPG by compiling the source code.

  Download the source code.

  ```
  ./configure
  make
  make install
  ```

- Install git-crypt using the Debian package.

  You can **download the source code**.

  The Debian package can be found in the **debian** branch of the project Git repository.

  The software package is built using **git-buildpackage**, as shown in the following figure.

  ```
  git checkout debian
  git-buildpackage -uc -us
  ```

- Install GPG using the build package in Debian.

  ```
  sudo apt-get install gnupg
  ```

Install git-crypt and GPG on macOS.

- Install git-crypt on macOS.

  Run the following command to install git-crypt using the brew package manager.

  ```
  brew install git-crypt
  ```

- Install GPG on macOS.

  Run the following command to install git-crypt using the brew package manager.

  ```
  brew install gpg
  ```

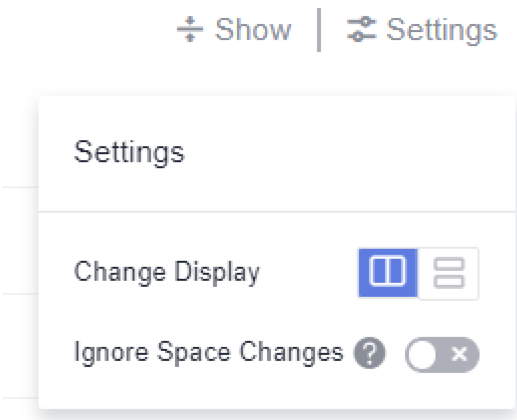
3.10.3 Viewing Commit History

CodeHub allows you to view details about the commit history and related file changes.

You can view the commit history on the **History** tab page of the **Files** or **Commit Graph of a repository**. You can click a commit record to view the committer, commit number, parent node, number of comments, and code change comparisons.

You can comment on a commit or reply a comment.

You can click the icon in the following figure to switch between horizontal and vertical display of code change comparison.



Click **Show** to view the full text of the documents involved in this submission.

3.10.4 Pushing Code to CodeHub Using Eclipse

Background

You can install EGit on Eclipse so that Eclipse can be connected with CodeHub and be used for operations such as committing code from a local Git repository to a remote one.

NOTE

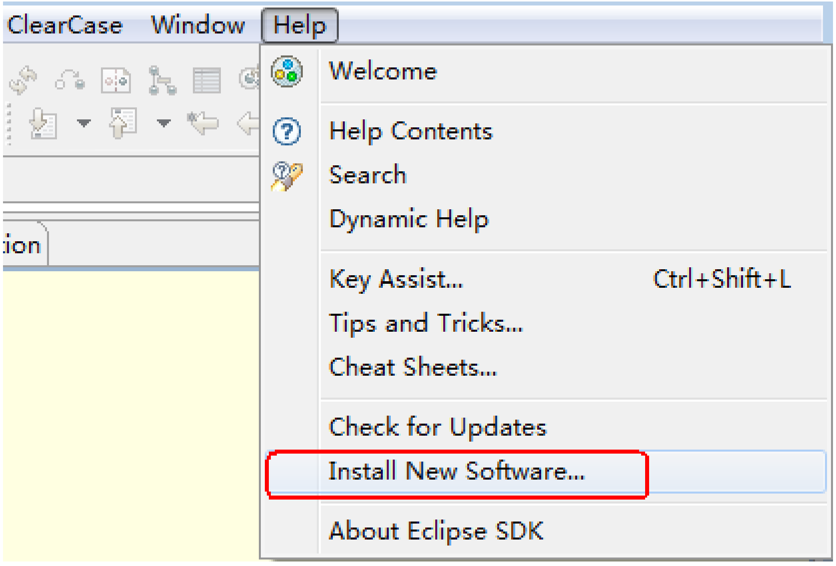
Only Eclipse 4.4 or later versions are supported.

- For the first push:
  1. Create a repository on the local computer, that is, the local repository.
  2. **Commit** the update to the local repository.
  3. Pull the code from the server to the local repository, merge the code, and push the repository to the server.
- If it is not the first push:
  1. Commit the modified code to the local repository.
  2. Pull the code from the server to the local repository, merge the code, and push the repository to the server.

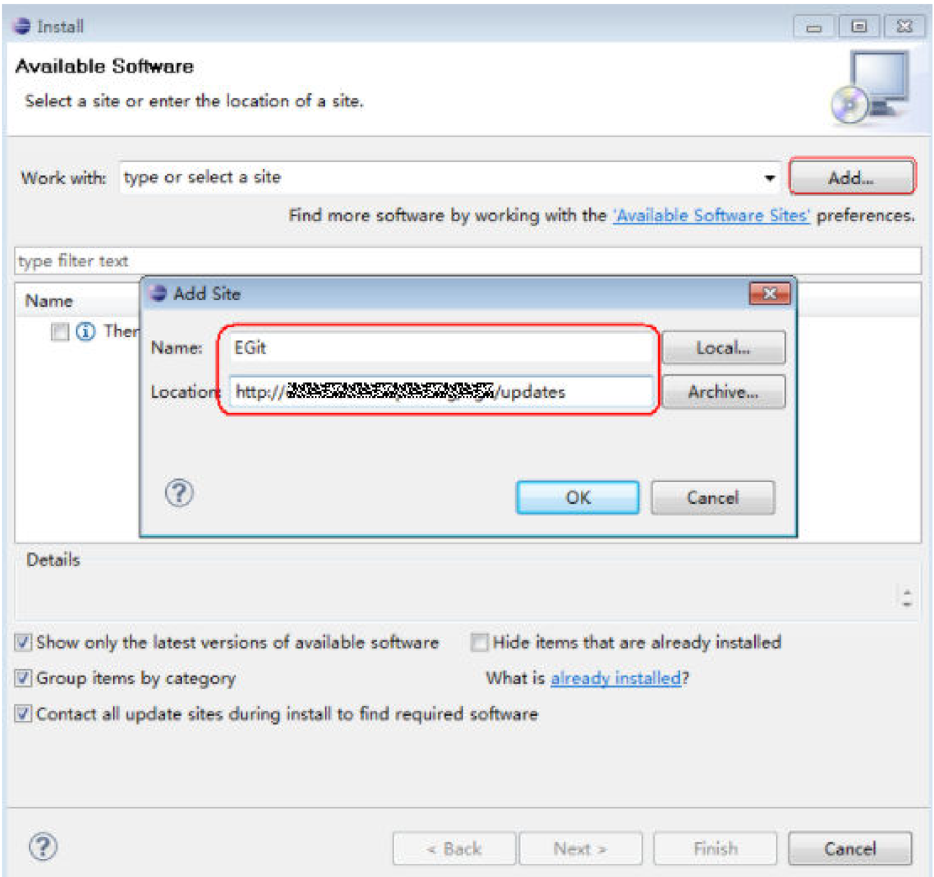
Step 1: Installing EGit on Eclipse

Eclipse 4.4 is used in the following procedure.

1. On the Eclipse toolbar, choose **Help > Install New Software...**.



2. In the **Install** window displayed, click **Add...**.

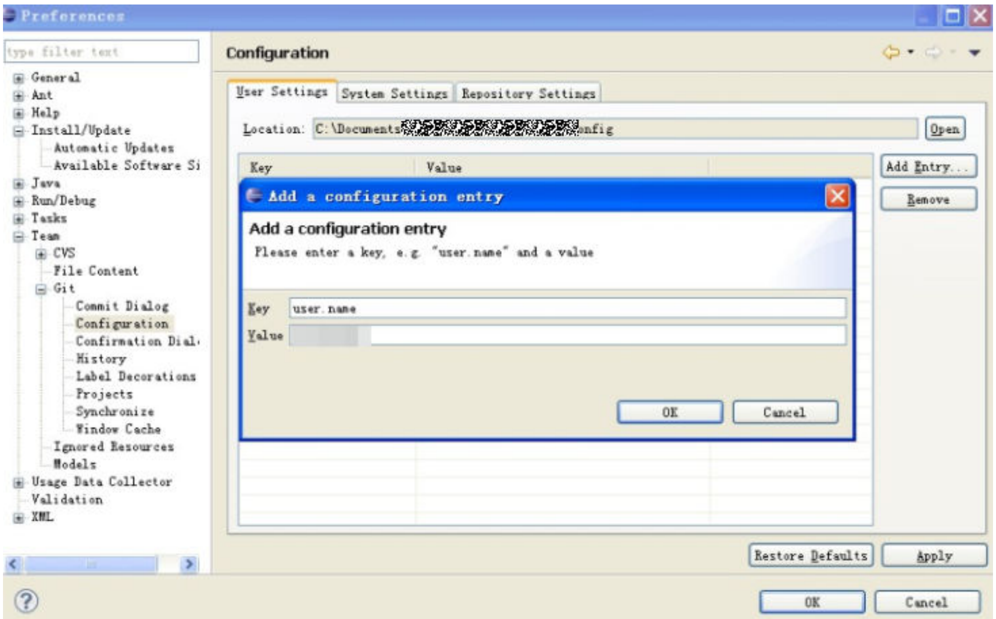


3. Click **OK**. Then, click **Next** until the installation is finished.
Restart Eclipse after the installation.

Step 2: Configuring EGit on Eclipse

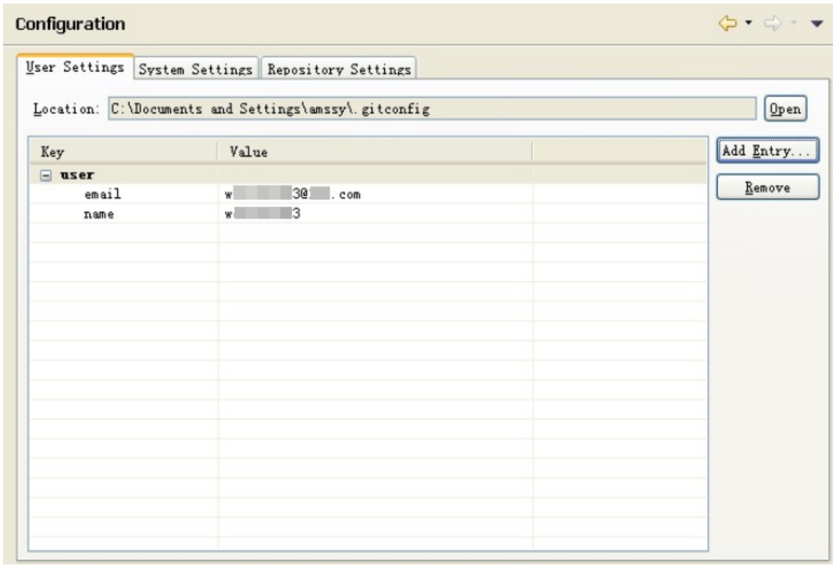
1. On the Eclipse toolbar, choose **Window** > **Preferences** > **Team** > **Git** > **Configuration**.

Set **Key** to a registered username.



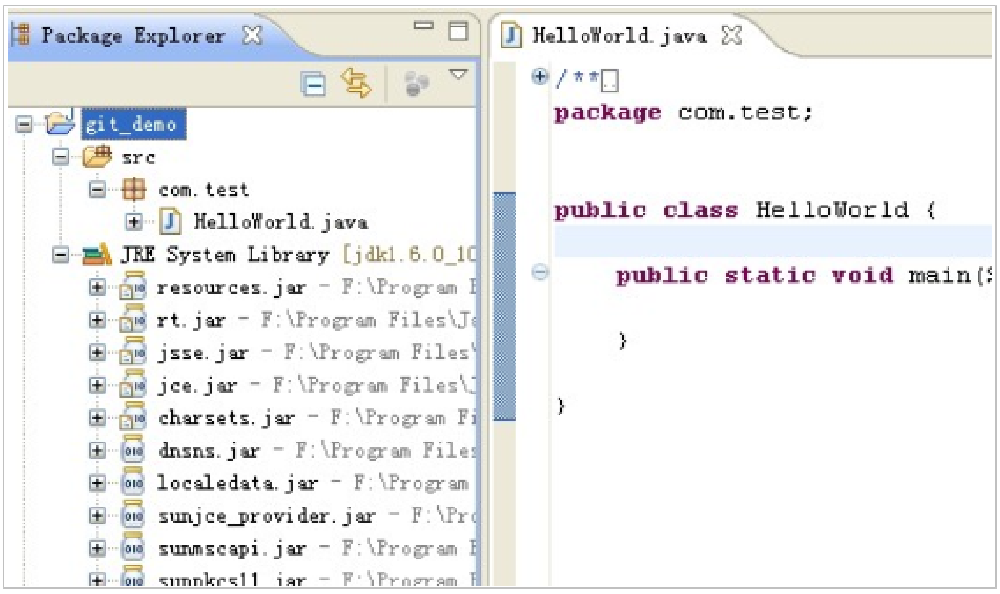
2. Click **OK**.

   user.email indicates the bound email address. If the **user.name** is not set previously, set it in this step.

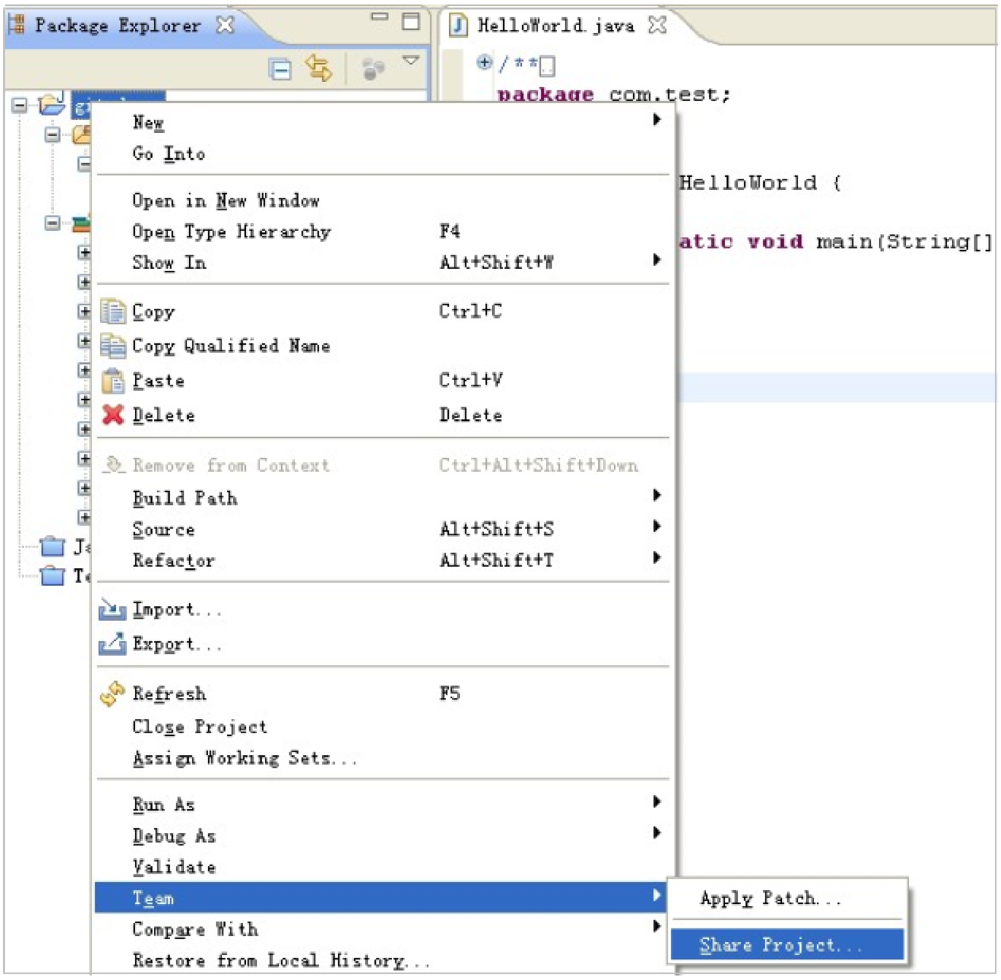


Step 3: Creating a Project and Committing Code to the Local Git Repository

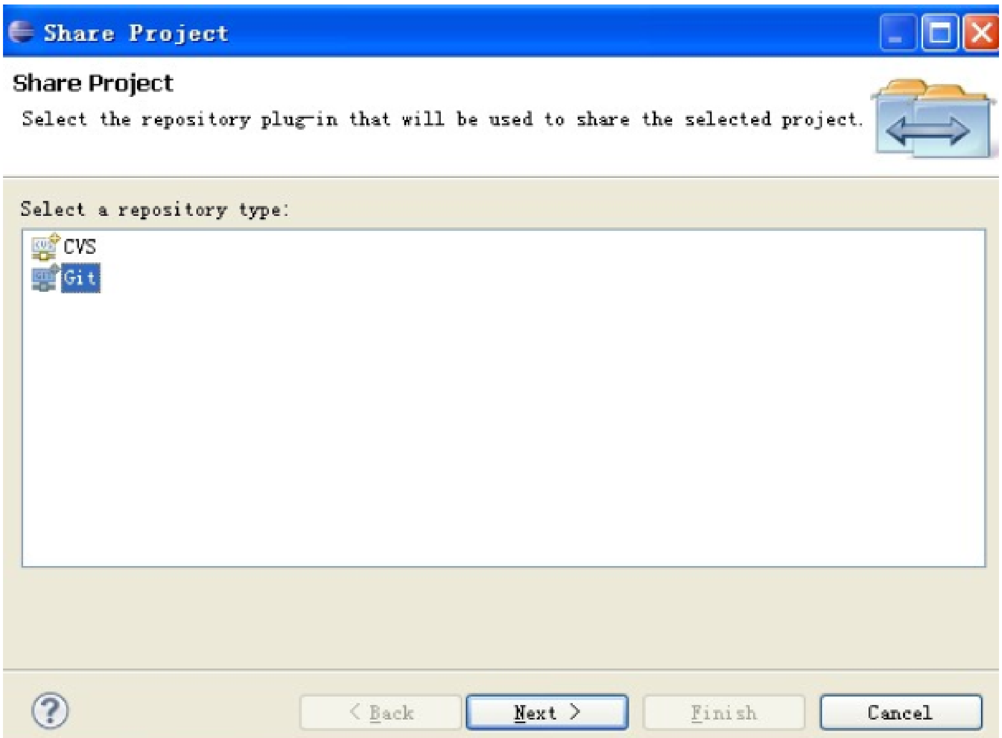
1. Create the **git_demo** project and the **HelloWorld.java** class.



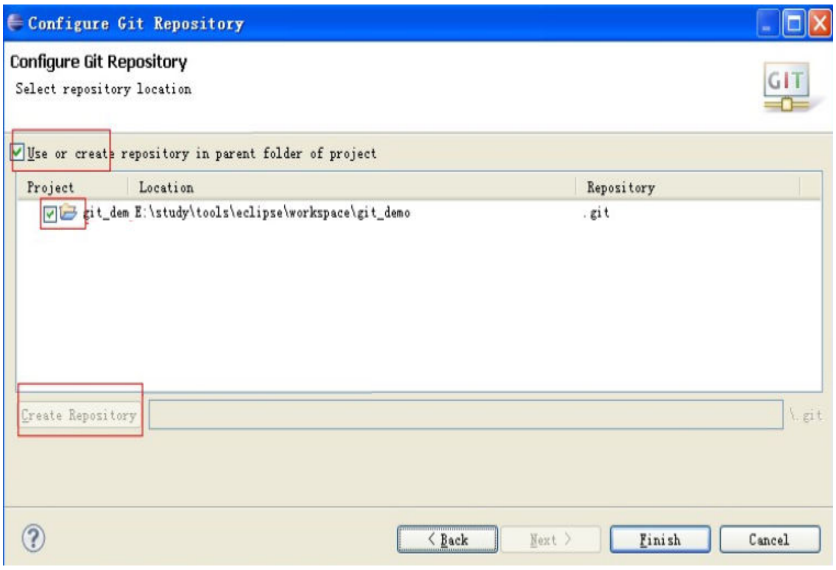
2. Share the **git_demo** project with the local repository.



3. In the **Share Project** window displayed, select **Git**.



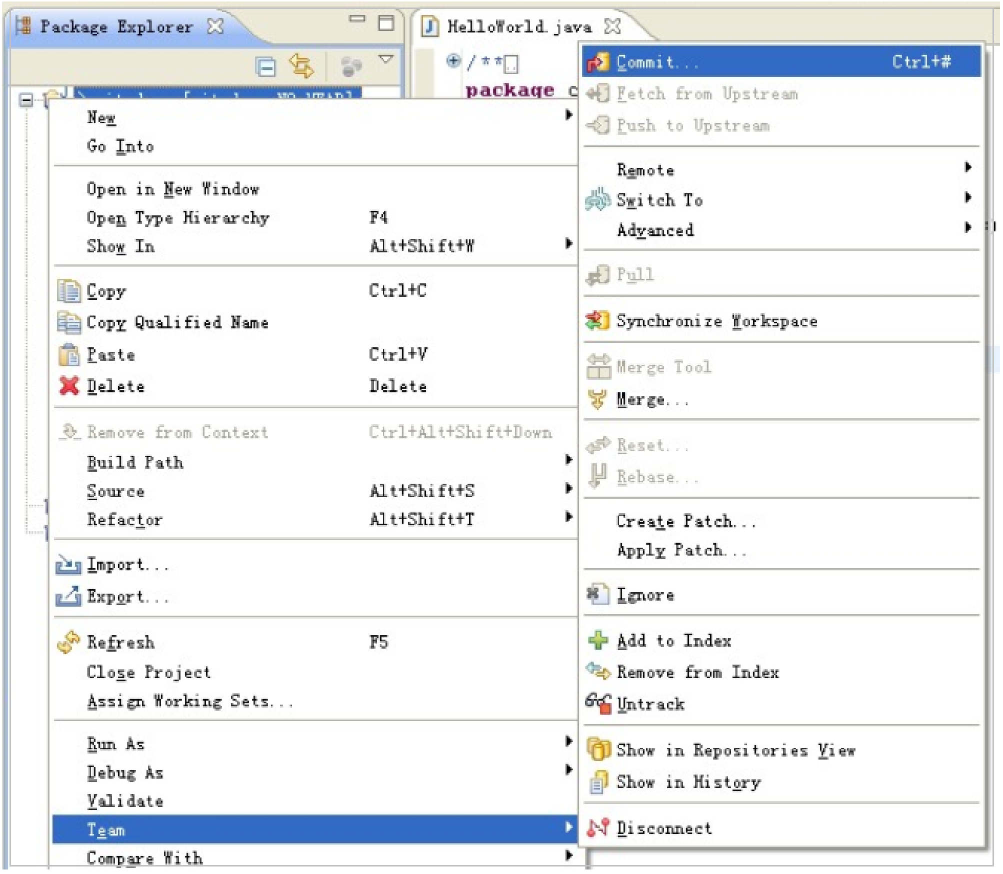
4. Click **Next**. The **Configure Git Repository** dialog box is displayed.



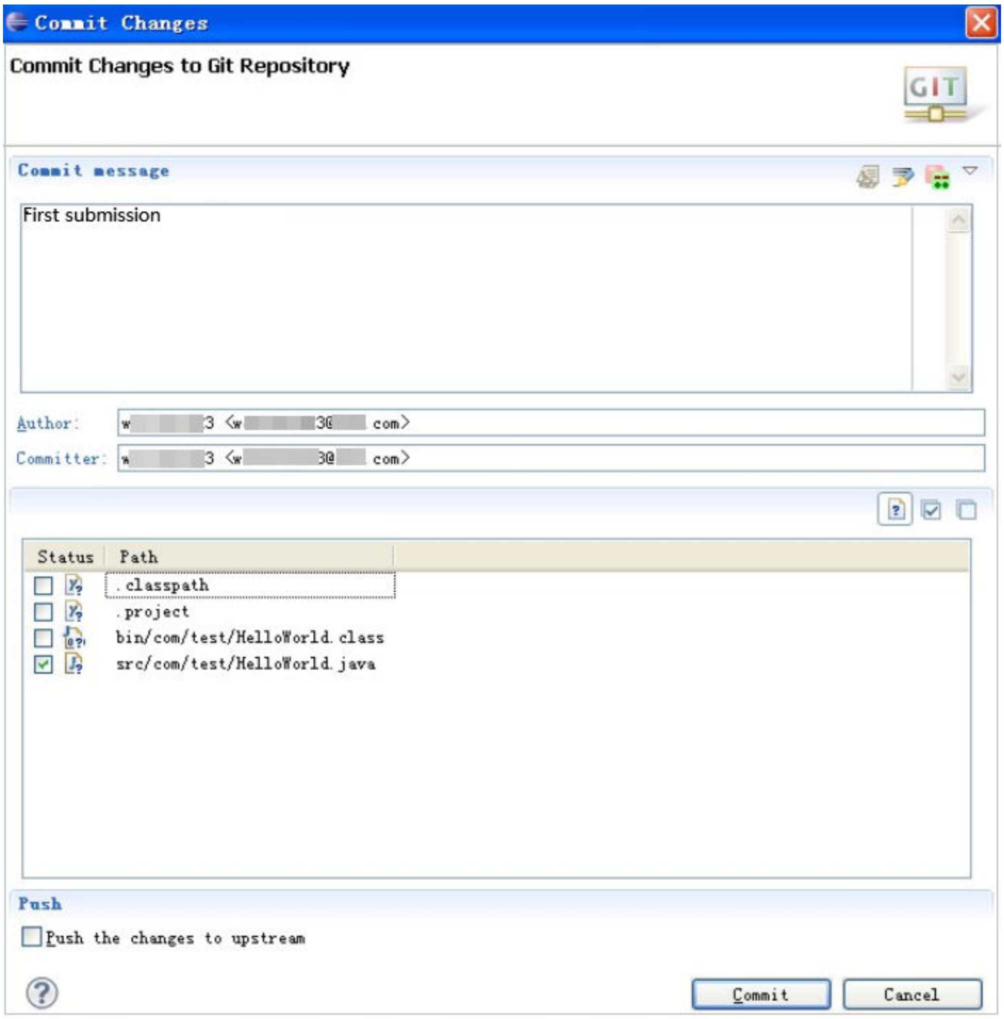
5. Click **Create Repository** to create a Git repository.

   The directory is in the **untracked** status, indicated by a question mark (**?**).

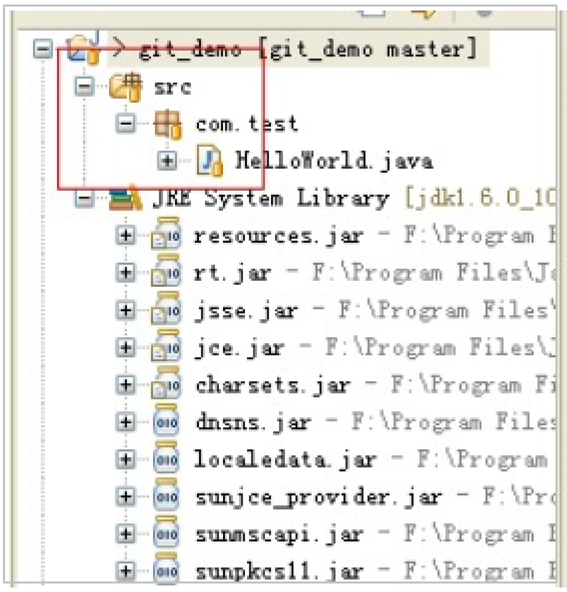
   Choose **Team** > **Commit...** to commit code to the local repository.



6. In the **Commit Changes** dialog box displayed, set the commit message.



7. Click **Commit** to commit the code to the local repository.

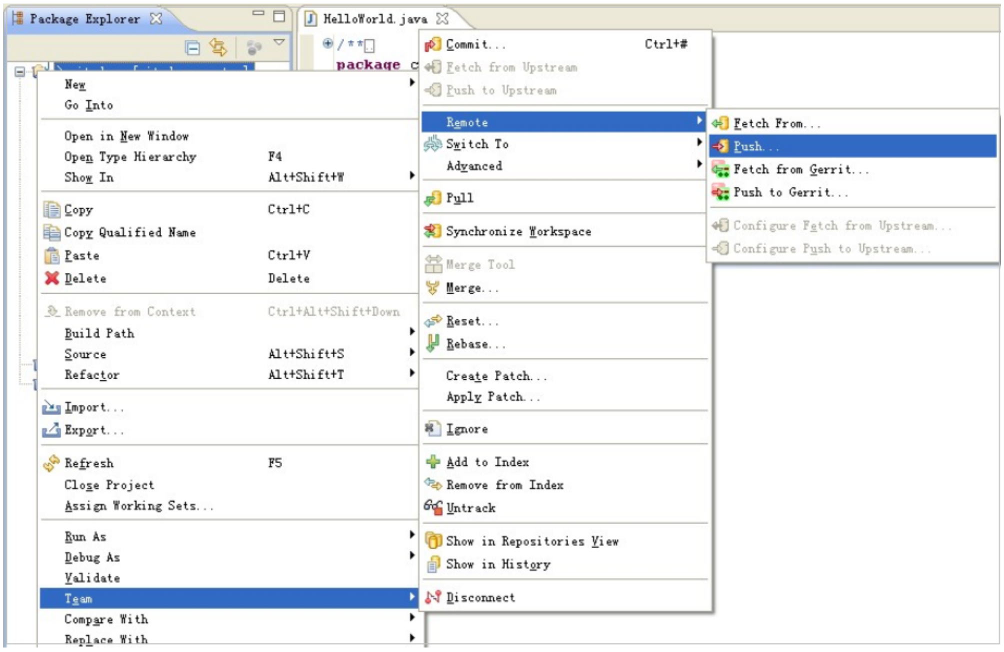


Step 4: Committing Code in the Local Repository to the Remote Git Repository

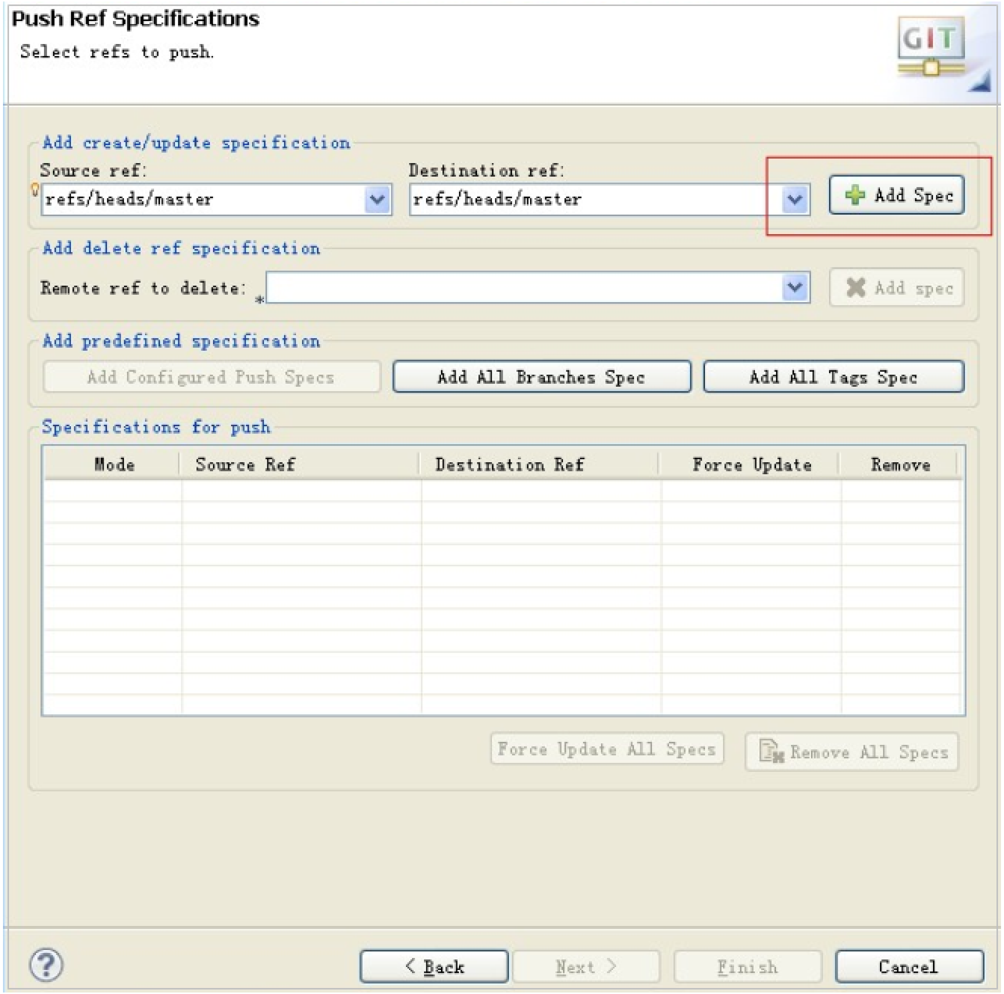
1. **Create a repository** in CodeHub.

   Go to the repository details page and copy the repository URL.

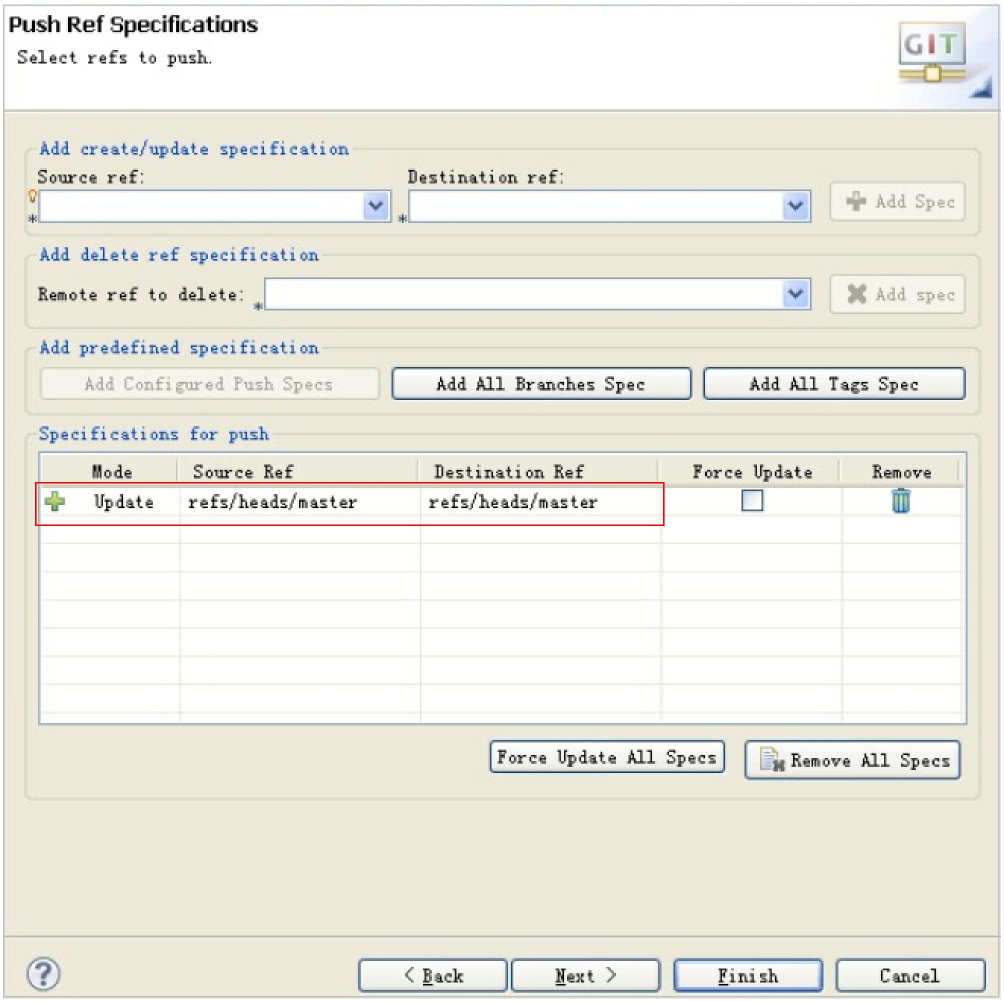
2. Choose **Team** > **Remote** > **Push...** to push the code to the remote repository.



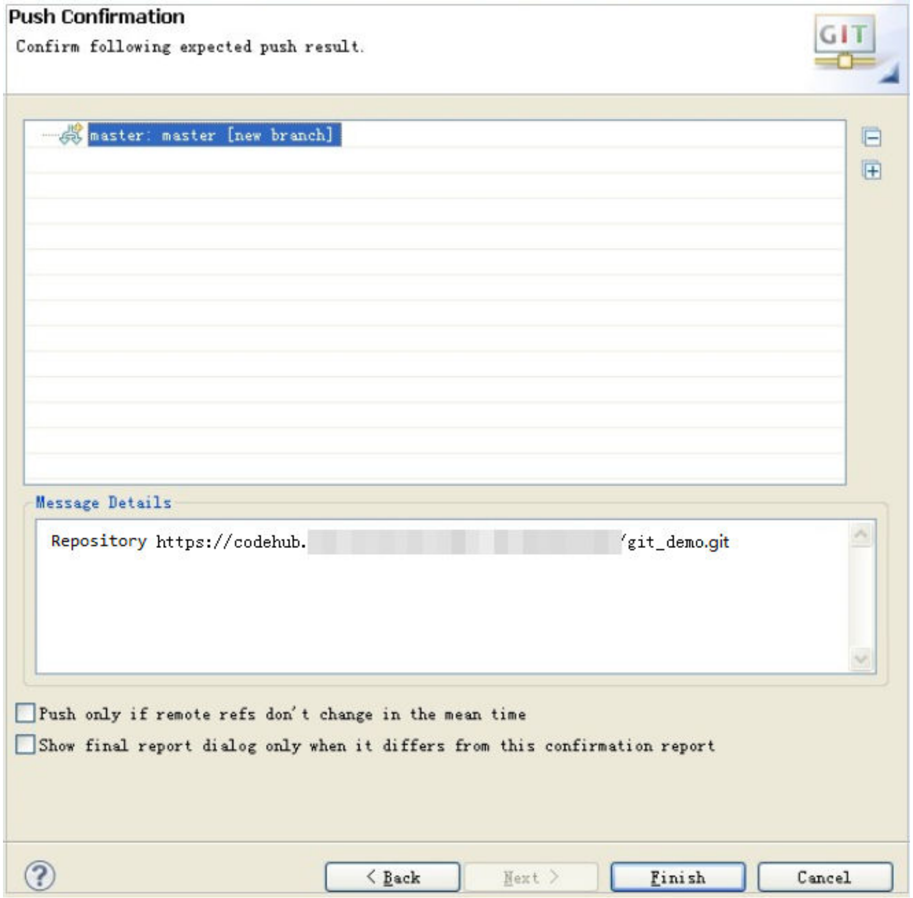
3. Set related parameters in the **Push to Another Repository** window.
4. Click **Next**. The **Push Ref Specifications** dialog box is displayed.



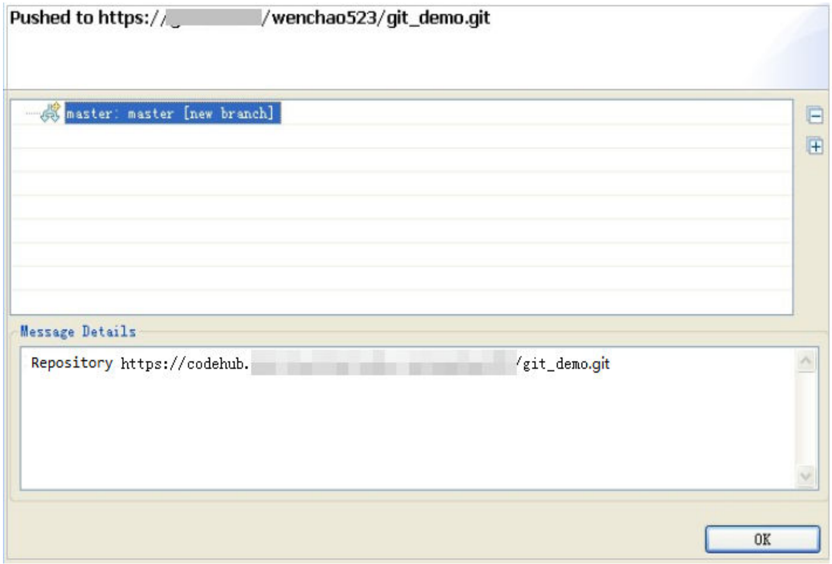
5. Click **Add Spec**.



6. Click **Next**. The **Push Confirmation** dialog box is displayed.



7. Click **Finish**.



8. Click **OK**.

   Log in to the remote repository and check the submitted code.

3.11 Team-based Development on CodeHub

3.11.1 Managing Branches

Introduction

Branch is the most commonly used management method in the version management tool. Branches can be used to isolate tasks in project development from each other so that they do not affect each other. Before releasing a version, you can use the **Branch Merging** to integrate the tasks.

When you create a CodeHub or Git repository, a master branch is generated by default and used as the branch of the latest version. You can create custom branches at any time for personalized scenarios.

GitFlow

As a branch-based code management workflow, GitFlow is highly recognized and widely used in the industry. It is recommended for you to start team-based development.

GitFlow provides a group of branch usage suggestions to help your team improve efficiency and reduce code conflicts. It has the following features:

- **Concurrent development:** Multiple features and patches can be concurrently developed on different branches to prevent intervention during code writing.
- **Team collaboration:** In team-based development, the development content of each branch (or each sub-team) can be recorded separately and merged into the project version. An issue can be accurately detected and rectified separately without affecting other code in the main version.
- **Flexible adjustment**: Emergency bug fixes are developed on hotfix branches without interrupting the main version and sub-projects of each team.

Table 3-12 Suggestions on using GitFlow branches

Branch	Description	Validity	When to Create	When to Develop This Branch	When to Merge Other Branches into This Branch	When to Merge This Branch to Other Branches	When to End
master	Core branch, which is used together with **tags** to archive historical versions. Ensure that all versions are available.	Long-term	Created when the project repository is created	Never	• When the project version is frozen, the develop or release branch are merged into this branch. • After bugs found in the released version are fixed, hotfix branches are merged into this branch.	–	–

Branch	Description	Validity	When to Create	When to Develop This Branch	When to Merge Other Branches into This Branch	When to Merge This Branch to Other Branches	When to End
develop	Main development branch, which is used for routine development and must always be the branch with the latest and most complete functions.	Long-term	Created after the master branch is created.	Not recommended	• After new features are developed, feature branches are merged into this branch. • When a new version starts to be developed, the last version (release or master branch) is merged into this branch.	• When a version is to be released, this branch is merged into the release branch. • When a version is to be archived, this branch is me	_

Branch	Description	Validity	When to Create	When to Develop This Branch	When to Merge Other Branches into This Branch	When to Merge This Branch to Other Branches	When to End
						rged into the master branch.	

Branch	Description	Validity	When to Create	When to Develop This Branch	When to Merge Other Branches into This Branch	When to Merge This Branch to Other Branches	When to End
feature_1\2\3...	Feature development branch, which is used to develop new features. Multiple branches can exist concurrently. Each branch corresponds to a new feature or a group of new features.	Temporary	• Created based on the develop branch when a new feature development task is received. • Created based on the parent feature branch when the current feature development task	Developed when being created.	After a child feature branch is developed and tested, it is merged into the parent feature branch.	After new features are developed and tested on this branch, it is merged into the develop branch.	After the corresponding features are accepted (released and stable)

Branch	Description	Validity	When to Create	When to Develop This Branch	When to Merge Other Branches into This Branch	When to Merge This Branch to Other Branches	When to End
			is split into sub-tasks.				

Branch	Description	Validity	When to Create	When to Develop This Branch	When to Merge Other Branches into This Branch	When to Merge This Branch to Other Branches	When to End
release	Release branch, which is used to check out a version to be released.	Long-term	Created based on the develop branch before the first release.	Never	When a version is to be released, the develop branch is merged into this branch.	• When a version is released and archived, this branch is merged into the master branch. • When a new version is developed based on	_

Branch	Description	Validity	When to Create	When to Develop This Branch	When to Merge Other Branches into This Branch	When to Merge This Branch to Other Branches	When to End
						a released version, this branch is merged into the develop branch to initialize the version.	

Branch	Description	Validity	When to Create	When to Develop This Branch	When to Merge Other Branches into This Branch	When to Merge This Branch to Other Branches	When to End
hotfix_ bug1\bug2...	Emergency fix branch, which is used to fix bugs in the current version.	Temporary	Created based on the corresponding version (usually the master branch) when issues are found in the master or bug version.	Developed when being created.	_	When the corresponding bug fixing task is complete, this branch is merged into the master and develop branches as a patch.	After the corresponding bugs are fixed and the version is accepted (released and stable)

NOTE

GitFlow has the following rules:

- All feature branches are pulled from the develop branch.
- All hotfix branches are pulled from the master branch.
- All commits to the master branch must have tags to facilitate rollback.
- Any changes that are merged into the master branch must be merged into the develop branch for synchronization.
- The master and develop branches are the main branches and they are unique. Other types of branches can have multiple derived branches.

Creating a Branch on the Console

Step 1 Access the repository list.

Step 2 Click a repository to go to the details page.

Step 3 Switch to the **Branches** tab page. **Branches** in the remote repository are displayed.

Step 4 Click **Create Branch**. In the displayed dialog box, select a version (branch or tag) based on which you want to create a branch and enter the branch name. You can associate the branch with an existing work item.

Step 5 Click **OK**. The branch list is displayed.

----End

Managing Branches on the Console

You can perform the following operations in the branch list:

- Filtering branches
  - **All**: displays all branches. The default branch is displayed on the top. Other branches are sorted by the last commit time in descending order.
  - **Active**: displays the branches that have been developing in the past three months. Branches are sorted by the last commit time in descending order.
  - **Inactive**: displays the branches that have not been developed in the past three months. Branches are sorted by the last commit time in descending order.
- You can click a branch to go to the **Files** tab page of the branch and view its content and history.
- You can click a latest commit to view the content committed on the details page.
- You can click to go to the **Comparison** tab page and compare the current branch with another branch.
- Click to download its compressed package.
- You can click to **create a merge request** for a branch on the **Merge Requests** tab page.
- You can click to delete a branch as prompted.

In addition, you can configure branches as follows on the console:

- **Merge Requests**
- **Default Branch**
- **Protected Branches**

Common Git Commands for Branches

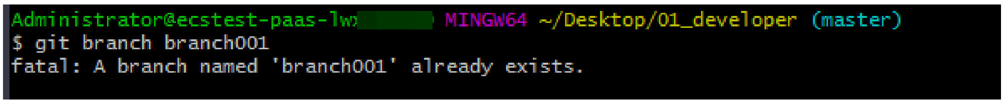
- **Creating a branch**

```
git branch <branch_name>        # Create a branch based on the current working directory in the local repository.
```

Example:

```
git branch branch001        # Create a branch named branch001 based on the current working directory in the local repository.
```

If no command output is displayed, the creation is successful. If the branch name already exists, as shown in the following figure, create a branch with another name.



- **Switching a branch**

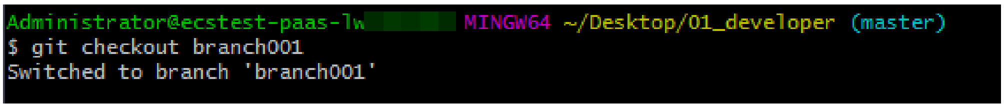
  Switching a branch is to check out the branch file content to the current working directory.

  ```
  git checkout <branch_name>        # Switch to a specified branch.
  ```

  Example:

  ```
  git checkout  branch002        # Switch to branch002.
  ```

  The following information shows that the switch is successful.



- **Switching to a new branch**

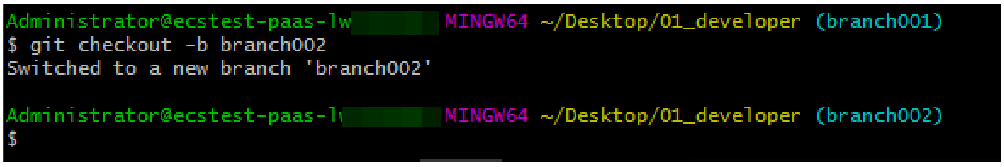
  You can run the following command to create a branch and switch to the new branch directly.

  ```
  git checkout -b <branch_name>     # Create a branch based on the current working directory in the local repository and directly switch to the branch.
  ```

  Example:

  ```
  git checkout -b branch002      # Create a branch named branch002 based on the current working directory in the local repository and directly switch to the branch.
  ```

  The following information shows that the command is successfully executed.



- **Viewing a branch**

  Run the following commands to view the branches of the local repository, remote repository, or all. These commands list only the branch names. To view the specific files in a branch, run the command in **Switching a branch**.

  ```
  git branch                        # View the local repository branch.
  git branch -r                     # View the remote repository branch.
  git branch -a                     # View the branches of the local and remote repositories.
  ```

  The following figure shows the execution result of the three commands in sequence. Git displays the branches of the local and remote repositories in different formats. (Remote repository branches are displayed in the format of remote/*<remote_repository_alias>*/*<branch_name>*.)

- **Merging a branch**

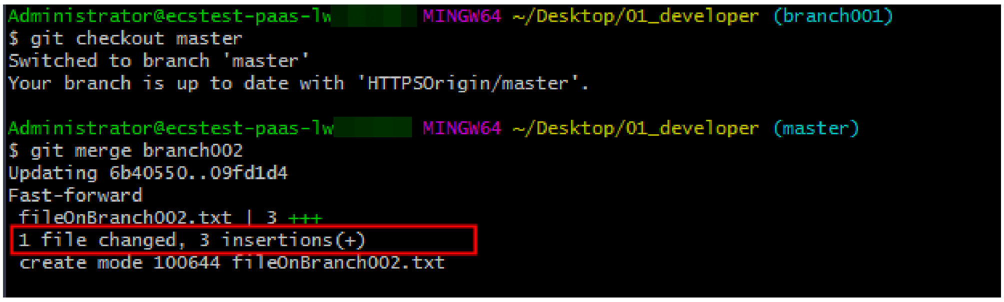
  When a development task on a branch is complete, the branch needs to be merged into another branch to synchronize the latest changes.

  ```
  git merge <name_of_the_branch_merged_to_the_current_branch>       # Merge a branch into the current branch.
  ```

  Before merging a branch, you need to switch to the target branch. The following describes how to merge **branch002** into the master branch.

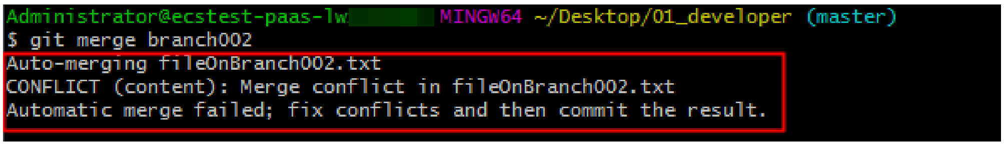
  ```
  git checkout master                    # Switch to the master branch.
  git merge branch002                     # Merge branch002 into the master branch.
  ```

  The following figure shows the execution result of the preceding command. The merge is successful, and three lines are added to a file.

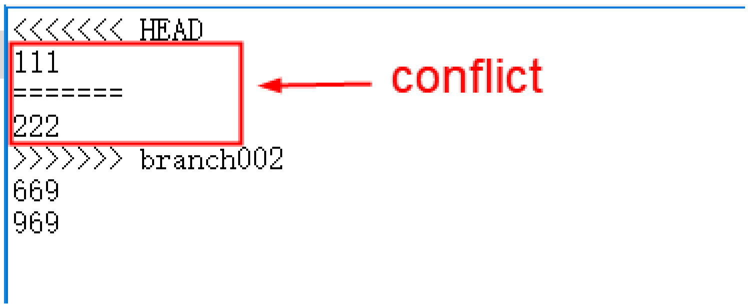


NOTE

The system may prompt that a merge conflict occurs. The following shows that a conflict occurs in the **fileOnBranch002.txt** file.



To resolve the conflict, open the conflicting file, manually edit the conflicting code (as shown in the following figure), and save the file. Then run the **add** and **commit** commands again to save the result to the local repository.



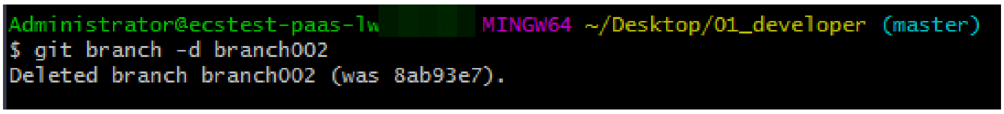
This is similar to resolving a conflict that occurs when you commit a file from the local repository to the remote repository. For details about the working principle, see **Resolving Code Commit Conflicts**.

A proper collaboration mode can prevent conflicts.

- **Deleting a local branch**
  git branch -d *<branch_name>*

  Example:

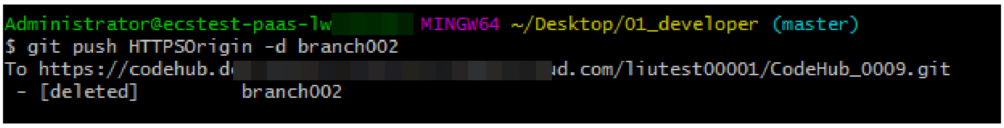
  git branch -d branch002 # Delete **branch002** from the local repository. The following information shows that the operation is successful.



- **Deleting a branch from the remote repository**
  git push *<remote_repository_address_or_alias>* -d *<branch_name>*

  Example:

  git push HTTPSOrigin -d branch002 # Delete **branch002** from the remote repository whose alias is **HTTPSOrigin**. The following information shows that the deletion is successful.



- **Pushing a new local branch to the remote repository**
  git push *<remote_repository_address_or_alias> <branch_name>*

  Example:

  git push HTTPSOrigin branch002 # Push the local branch **branch002** to the remote repository whose alias is **HTTPSOrigin**. The following information shows that the push is successful.

```
Administrator@ecstest-paas-lw[redacted] MINGW64 ~/Desktop/01_developer (master)
$ git push HTTPSOrigin branch002
Enumerating objects: 13, done.
Counting objects: 100% (13/13), done.
Delta compression using up to 2 threads
Compressing objects: 100% (8/8), done.
Writing objects: 100% (12/12), 861 bytes | 430.00 KiB/s, done.
Total 12 (delta 5), reused 0 (delta 0), pack-reused 0
remote:
remote: To create a merge request for branch002, visit:
remote:   https://codehub.de[redacted]d.com/codehub/639472/newmerge
remote:
To https://codehub.c[redacted]ud.com/liutest00001/CodeHub_0009.git
 * [new branch]      branch002 -> branch002
```

NOTE

If the push fails, check the connectivity.

Check the established SSH key pair. If necessary, regenerate a key and configure it on the CodeHub console. For details, see **SSH Keys**.

3.11.2 Managing Tags

Introduction

Git provides tags to help your team manage versions. You can use Git tags to mark commits to manage important versions in a project and search for historical versions.

A tag points to a commit like a reference. No matter how later versions change, the tag always points to the commit. It can be regarded as a version snapshot that is permanently saved (the version is removed from the repository only when being manually deleted).

When using Git to manage code, you can search for and trace historical versions based on commit IDs. A commit ID is a long string (as shown in the following figure) that is difficult to remember and not identifiable, compared with version numbers such as **V1.0.0**. Therefore, you can tag and name important versions to easily remember and trace them. For example, tag a version as **myTag_V1.0.0** or **FirstCommercialVersion**.

```
commit 53538093c56de4df204b12ca4841926eef630bbd (tag: myTag_V1.0.0)
Author: 02_dev <[redacted].com>
Date:   Sun Jun 28 17:40:09 [redacted]

    fix #7369022 fix a bug
```

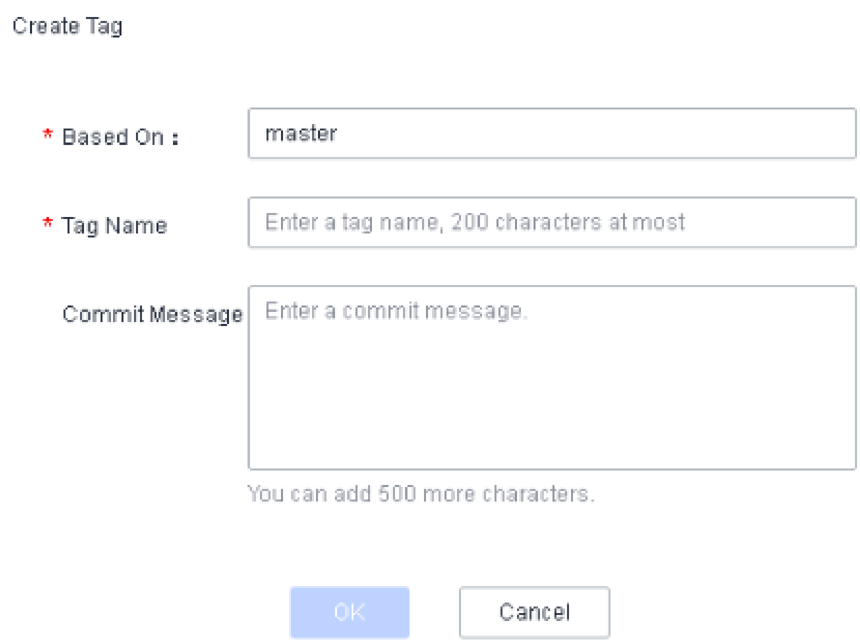
Creating a Tag for the Latest Commit on the Console

Step 1 Access the repository list.

Step 2 Click a repository to go to the details page.

Step 3 Click the **Tags** tab to view tags.

Step 4 Click **Create Tag**. In the following dialog box that is displayed, select a branch or tag.



NOTE

An annotated tag is generated if you enter a message (the content after **-m**). A lightweight tag is generated if you do not enter a message. For details about annotated tags, see **Tag Classification**.

Step 5 Click **OK**. A tag is generated based on the latest version of the branch. The tag list is displayed.

----End

Creating a Tag for a Historical Version on the Console

Step 1 Access the repository list.

Step 2 Click a repository to go to the details page. On the **Files** tab page, click **History**.

Step 3 In the historical commit list, click next to a commit record and select **Create Tag**. The dialog box for creating a tag for the historical version is displayed.

NOTE

An annotated tag is generated if you enter a message (the content after **-m**). A lightweight tag is generated if you do not enter a message. For details about annotated tags, see **Tag Classification**.

Step 4 Click **OK**. A tag is generated based on the specified historical version of the branch. The tag list is displayed.

----End

Managing Tags on the Console

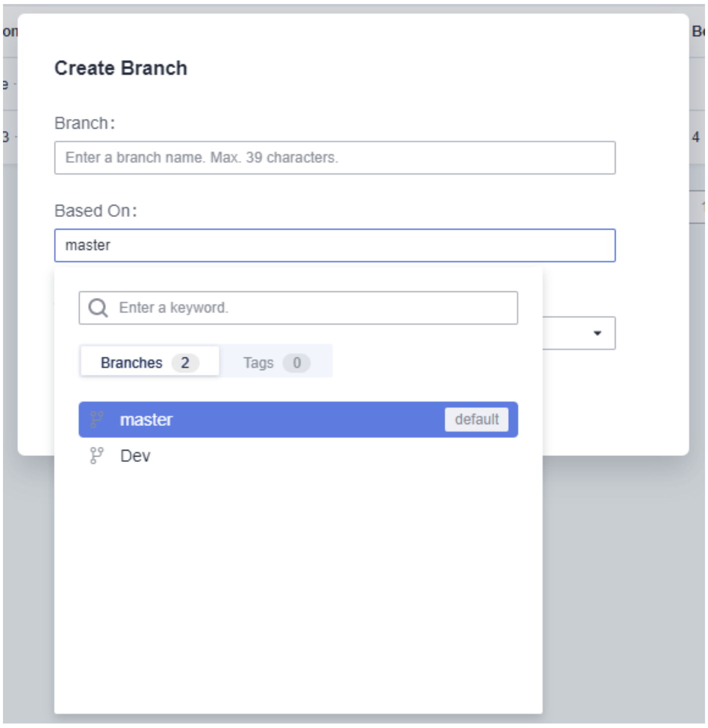
- All tags in the remote repository are displayed in the tag list. You can perform the following operations:

- Click a tag in the **Tag Name** column to go to the file list of the tagged version.
- Click the commit ID in the **Latest Commit** column to go to the commit details page.
- Click **zip** or **tar.gz** in the **Download** column to download the package of the tagged version in the corresponding format.
- Click to delete a tag from CodeHub. (To delete the tag from the local repository, perform the **clone**, **pull**, or **-d** operation.)

NOTICE

If an **IP address whitelist** is set for the repository, only hosts with whitelisted IP addresses can download the repository source code on the page. If no IP address whitelist is set for the repository, all hosts can download the repository source code on the page.

- You can **create a branch** based on a tag.



- On the console, click the **Files** tab and click the file name of the target file. Click the **Comparison** tab to compare commit records of the file.

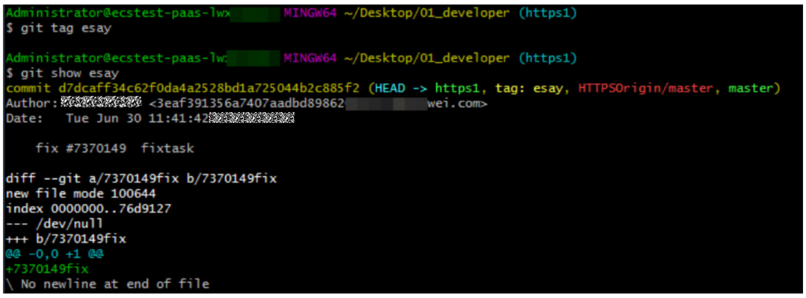
Tag Classification

Git provides two types of tags:

- **Lightweight tag**: is only a reference pointing to a specific commit. It can be considered as an alias for the commit.

  ```
  git tag <tag_name>
  ```

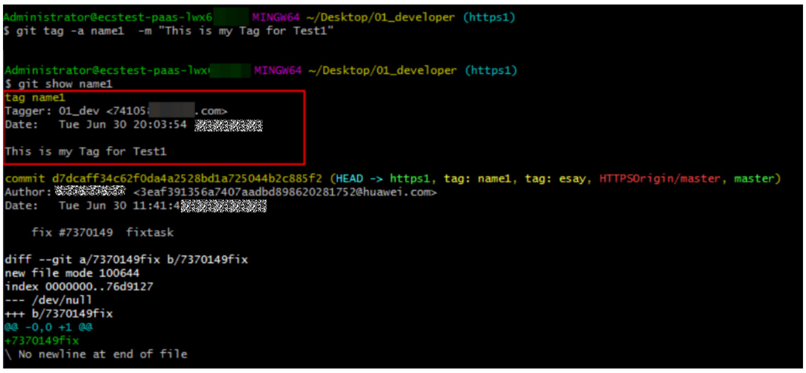
  The following figure shows the information of a lightweight tag. You can find that it is an alias of a commit.



- **Annotated tag**: points to a specific commit, but is stored as a complete object in Git. Compared with lightweight tags, annotated tags contain messages (similar to code comments). In addition to the tag name and message, the tag information includes the name and email address of the person who creates the tag, and tag creation time/date.

  ```
  git tag -a  <tag_name> -m "<message>"
  ```

  The following figure shows the information of an annotated tag, which points to a commit and contains more information than that of a lightweight tag.



NOTE

Both types of tags can identify versions. Annotated tags contain more information and are stored in a more stable and secure structure in Git. They are more widely used in large enterprises and projects.

Common Git Commands for Tags

- **Creating a lightweight tag**

  ```
  git tag <tag_name>        # Add a lightweight tag to the latest commit.
  ```

  Example:

  git tag myTag1   # Add a lightweight tag **myTag1** to the latest commit.

- **Creating an annotated tag**

  ```
  git tag -a  <tag_name> -m "<message>"         # Add an annotated tag to the latest commit.
  ```

  Example:

  git tag -a myTag2 -m "This is a tag." # Add an annotated tag **myTag2** to the latest commit, and the message is "This is a tag.".

- **Tagging a historical version**

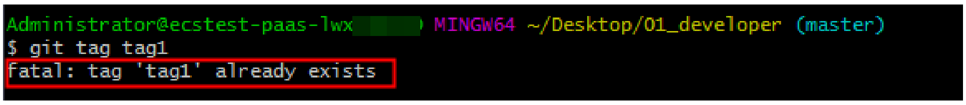
  You can also tag a historical version by running the **git log** command to obtain the commit ID of the historical version. The following uses an annotated tag as an example:

  git log   # The historical commit information is displayed. Obtain the commit ID (only the first several digits are required), as shown in the following figure. Press **q** to return.

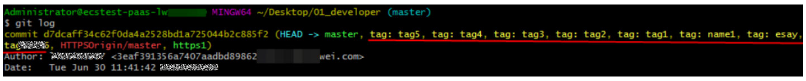

```
git tag -a historyTag -m "Tag a historical version." 6a5b7c8db    # Add tag historyTag to the historical version whose commit ID starts with 6a5b7c8db, and the message is "Tag a historical version.".
```

NOTE

- If no command output is displayed, the tag is successfully created. If the command output is displayed, indicating that the tag name already exists (as shown in the following figure), change the tag name and perform the operation again.



- One commit can have multiple tags with unique names, as shown in the following figure.



- **Viewing tags in the local repository**

  You can list all tag names in the current repository and add parameters to filter tags when using them.

```
git tag
```

- **Viewing details about a specified tag**

git show *<name_of_the_desired_tag>*

Example:

Display the details about **myTag1** and the commit information. The following shows an example command output:

```
git show myTag1
```

- **Pushing a local tag to the remote repository**
  - By default, tags are not pushed when you push files from the local repository to the remote one. Tags are automatically synchronized when you synchronize (clone or pull) content from the remote repository to the local one. Therefore, if you want to share local tags with others in the project, you need to run the following Git command separately.

git push *<remote_repository_address_or_alias> <name_of_the_tag_to_be_pushed>*   # Push the specified tag to the remote repository.

Example:

Push the local tag **myTag1** to the remote repository whose alias is **origin**.

```
git push origin myTag1
```

– Run the following command to push all new local tags to the remote repository:

```
git push  <remote_repository_address_or_alias> --tags
```

NOTE

If you create a tag in the remote repository and a tag with the same name in the local repository, the tag will fail to be pushed due to the conflict, as shown in the following figure. In this case, you need to delete one of the tags and push another tag again.

You can view all tags in the remote repository by referring to **Managing Tags on the Console**.

- **Deleting a local tag**

```
git tag -d <name_of_the_tag_to_be_deleted>
```

The following shows an example of deleting the local tag **tag1**.

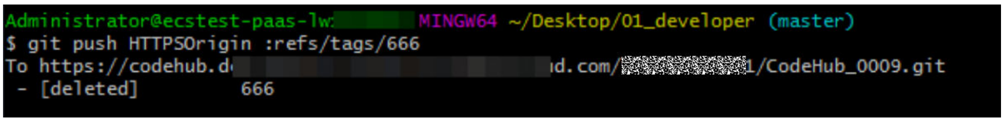
- **Deleting a tag from the remote repository**

Similar to tag creation, tag deletion also needs to be manually pushed.

```
git push <remote_repository_address_or_alias> :refs/tags/<name_of_the_tag_to_be_deleted>
```

The following shows an example of deleting a tag.

git push HTTPSOrigin :refs/tags/666   # Delete the tag **666** from the remote repository whose alias is **HTTPSOrigin**.



Obtaining a Historical Version Using Tags

If you want to view the code in a tagged version, you can check it out to the working directory. The code can be edited but cannot be added or committed because the checked-out version belongs only to a tag instead of a branch. You can create a branch based on the working directory, modify the code on the branch, and merge the branch into the master branch. The detailed steps are as follows:

1. Check out a historical version using a tag.

   git checkout V2.0.0   # Check out the version tagged with **V2.0.0** to the working directory.

2. Create a branch based on the current working directory and switch to it.

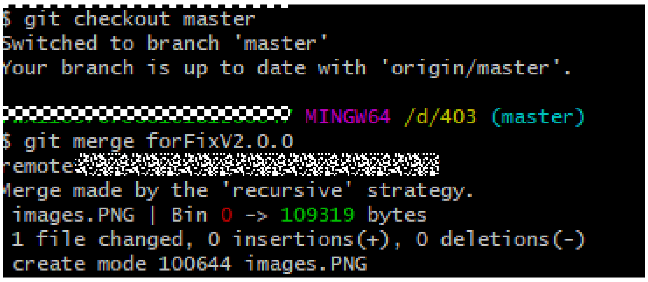
   git switch -c forFixV2.0.0   # Create a branch named **forFixV2.0.0** and switch to it.

3. (Optional) If the new branch is modified, commit the changes to the repository of the branch.

```
git add .                        # Add the changes to the staging area of the new branch.
git commit -m "fix bug for V2.0.0"  # Save the changes to the repository of the branch.
```

4. Switch to the master branch and merge the new branch (**forFixV2.0.0** in this example) to the master branch.

```
git checkout master          # Switch to the master branch.
git merge forFixV2.0.0       # Merge the changes based on the historical version into the master 
branch.
```



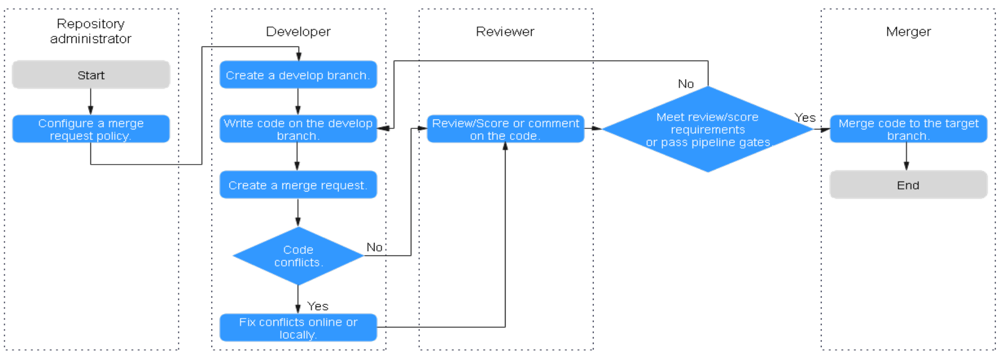
NOTE

The preceding commands are used to help you understand how to obtain a historical version using a tag. Omit or add Git commands as required.

3.11.3 Merge Request Approval

Introduction

CodeHub supports multi-**branch** development and provides configurable review rules for branch merge requests. When a merge request is created, all repository members can review the branch to ensure the quality of the code to be merged.



Merge Request Settings

There will be no restriction on merge requests if you do not set any rules. You are advised to understand related rules before using this function.

Merge Requests: You can set rules for merging branches.

Protected Branches describes how to configure the merge permission on a protected branch.

Merge Request List

On the **Merge Requests** tab page, you can view merge requests.

- You can switch between tabs to view requests in different states.
- You can click a request to go to the **details page**.
- You can view the brief information about the request, including the involved branch, creation time, and creator.
- You can search for a request based on different conditions.
- You can click **Create Merge Request** in the upper right corner to create a request.

NOTE

Closed: indicates that the request is canceled and the branch is not merged.

Merged: indicates that the request is approved and the branch is merged.

Merge Request Details

- On the **Details** tab page, merge rule statuses, mergers, reviewers, and associated work items are displayed. You can view review comments, mark a review comment as **Unsolved**, and view all activities related to the merge request.
- On the **Commit Records** tab page, you can view the commit records of the source branch.
- On the **Files Changed** tab page, you can view the changes to be merged and filter changes by type (such as adding, updating, deleting, and renaming).
- On the **CloudPipeline** tab page, you can view the information about the pipeline gate.

Creating a Merge Request

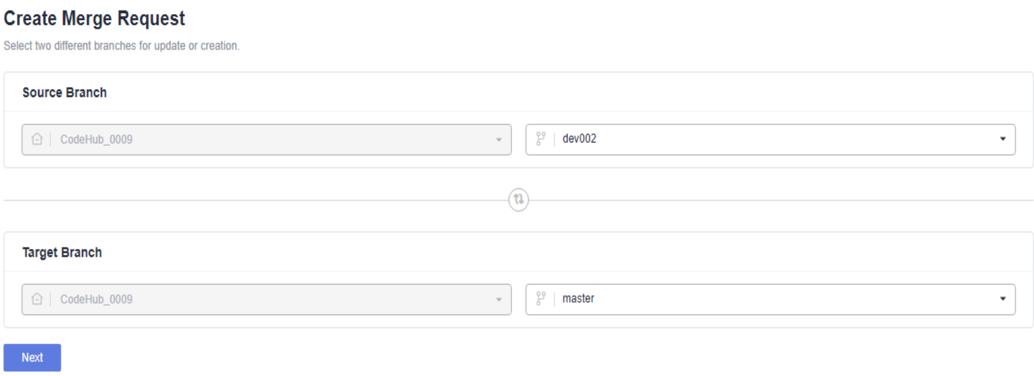
Assume that the administrator has set **merge rules**. To create a merge request for a develop branch, perform the following steps:

Step 1 Access the repository list.

Step 2 Click a repository to go to the details page.

Step 3 Switch to the **Merge Requests** tab page.

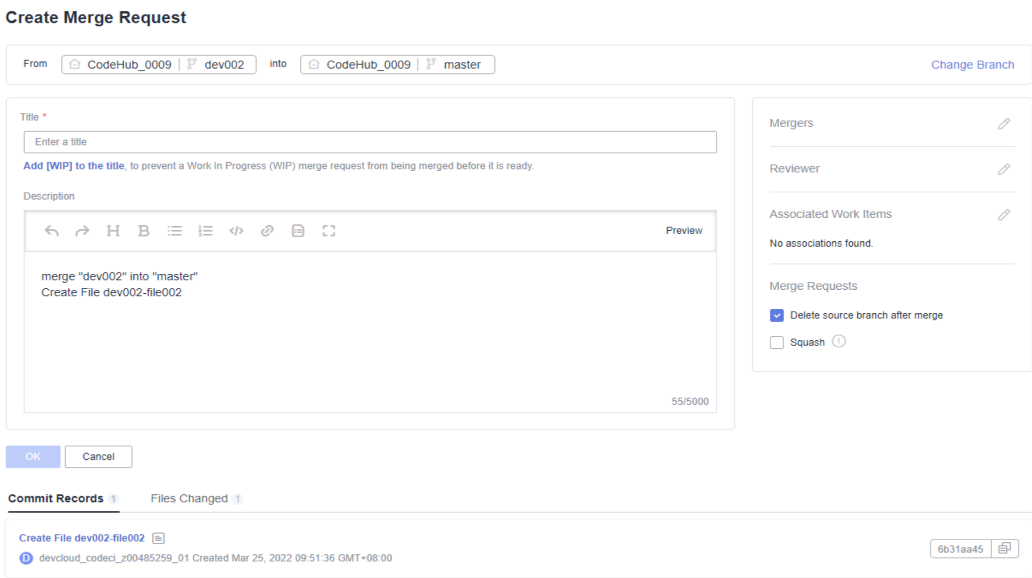
Step 4 Click **Create Merge Request** and select the source and target branches for merge.



In the preceding figure, **dev002** (where the development task is completed) is merged into the **master** branch.

Step 5 Click **Next**. The system checks whether the two branches are different.

- If there is no difference, the system displays a message and the merge request cannot be created.
- If the branches are different, the following **Create Merge Request** page is displayed.



The lower part of the **Create Merge Request** page displays the file differences of the two branches and the commit records of the source branch.

Step 6 Enter the **title** and **description**.

A default description is generated based on the merge and commit messages of the source branch. You can modify the description as required.

Step 7 Set **Mergers**, **Reviewers**, and other rules.

- **Mergers**: Mergers have permissions to merge branches (by clicking the merge button) when all reviewers approve MRs and all discussed issues are solved (or you can set the rule to allow merge with issues unsolved). They can also close the MR.
- **Reviewers**: members assigned to review the merge request. Reviewers can approve or reject the merge request, or raise questions to the requester.

- **Associated Work Items**: You can associate a merge with a work item so that the work item status can change automatically.
- **Delete source branch after merge**: You can choose whether to delete the source branch after merge. The preset rule is used as the initial setting.
- **Squash**: You can choose whether to merge all commits of the merge request into one and keep a clean history.

Step 8 Click **OK** to submit the merge request. The **Details** page is displayed.

If the requester is also a reviewer, they can directly **review the merge request** on the **Details** page.

----End

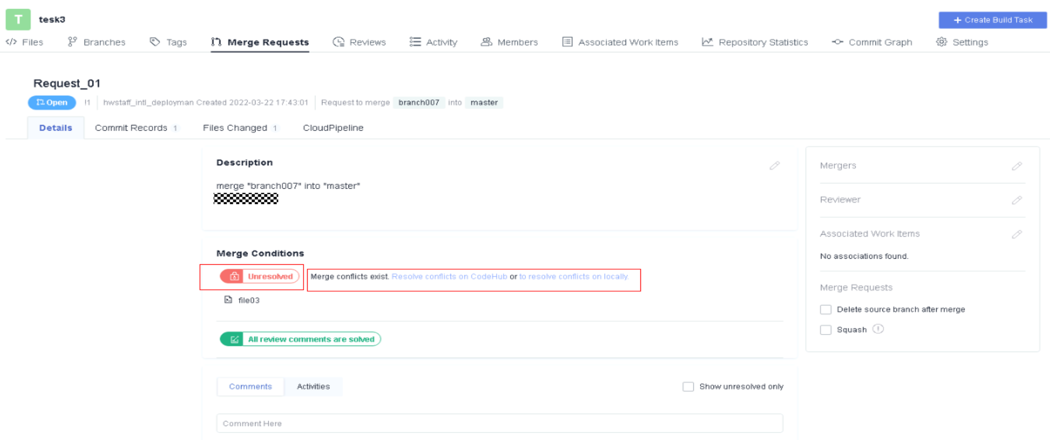
Reviewing a Merge Request and Performing Merge

Step 1 Access the repository list.

Step 2 Click a repository to go to the details page.

Step 3 Switch to the **Merge Requests** tab page.

Step 4 (If you are not a reviewer, skip this step.) Review the merge request.



Step 5 (Optional) Comment on the submitted content and wait for the initiator to reply.

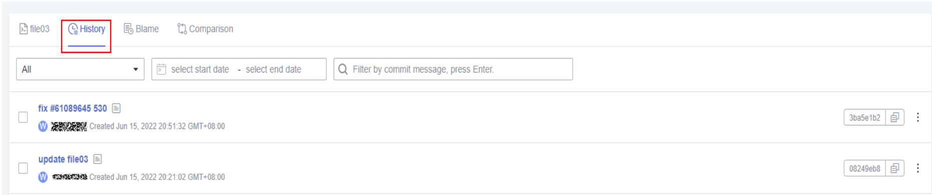
Step 6 If the score is higher than the access control score, you can choose whether to delete the source branch. After the operation, the request status changes to **Merged** (only the merger can perform the merge operation).

If all reviewers approve the merge request, you can click **Merge** to merge the branch or click the extension icon on the right of the **Merge** button to close the request.

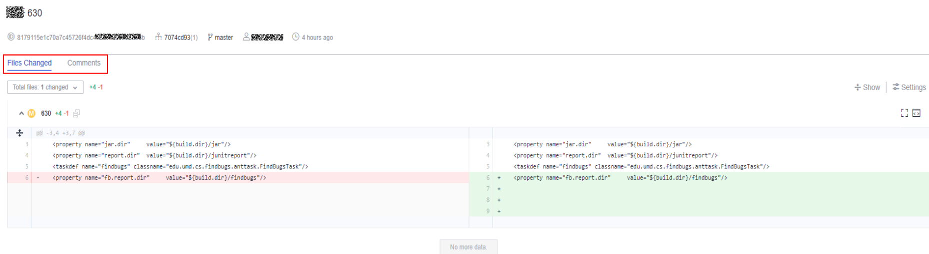
----End

Viewing Merge Request Records

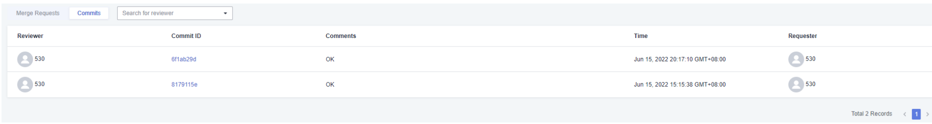
Step 1 After a project team member submits a file, you can view the record on the **History** tab.



Step 2 Click a record to view details, compare the file content before and after the modification, view comments, and click **OK**.



Step 3 Click the **Reviews** tab to view records on the **Merge Requests** tab.



----End

3.11.4 Associating Work Items

With CodeHub, you can associate each code commit with a work item of ProjectMan.

- Associated work items help developers accurately record tasks for fixing bugs and developing new features.
- Associated work items allow project managers to view information such as change committer and committed content involved in each requirement and bug fixing task.

NOTE

Work item: It is one of the methods of tracing work contents in ProjectMan. Generally, a work item has a unique number and description. A work item can be a requirement, defect, or task. In the ProjectMan service, a work item is a list of work contents that can be visualized management.

Commit: You can commit and save operations on files in the working directory, including creating, editing, and deleting files. The following shows the **commit** command, in which the **-m** parameter is mandatory and followed by the commit message.

```
git commit -m <commit_message>
```

On the CodeHub console, a changed file can be saved only after you enter a commit message. Each saving operation on the console is a commit, and the mandatory message corresponds to the content after **-m** in the **commit** command.

CodeHub automatically associates work items with code by capturing keywords from the commit message after **-m**. The most commonly used keyword is **fix**, which is the recommended keyword in the prompt. The keyword must meet the following format:

```
git commit -m "fix #<work_item_id> <commit_message>"
```

If a work item is successfully associated, the system automatically changes the work item status based on the **configured code commit status transition**. By default, the **fix** keyword sets the work item to the **resolved** state.

Example:

```
git commit -m "fix #123456 fixed this bug"
```

The work item **123456** is set to the **resolved** state after being pushed to CodeHub.

CodeHub allows you to associate work items with code on the local host or on the console. The following describes the two methods.

Assume that a project has been created. If no project has been created, create a project by referring to "Creating a Project in ProjectMan". In this case, you need to perform operations in **(Optional) Configuring the Code Submission Status**, **Creating a Work Item**, and **Create a code repository** under the project.

CAUTION

- Only members of the same project and repository can associate work items with code.
- For the work item creator, specified modifier, or account (such as **Project Manager**) that has the permission to modify all work items in the project, their association operations can change the work item status (new or resolved) and generate comment records. In the association records, **Transition successful** is displayed in the **Result** column, as shown in the following figure. For other members, only association records are generated. The work item status is not changed, no comment record is generated, and **Association successful** is displayed in the **Result** column.

(Optional) Configuring the Code Commit Status Transition

By default, you can use the **fix** keyword in the commit message to change the work item to the resolved state.

The following describes the working principle and advanced settings of associating work items with code commits. If you only need **default settings**, skip this section.

In project settings, you can set three commit message keywords (such as **fix**, **close**, and **resolve**) for different work item types (**Epic**, **Feature**, **Story**, **Task**, and **Bug**). You can associate each keyword with a target status (for example, **Resolved** or **Closed**). The work item status can also be customized.

NOTE

The default settings of code commit status transition are as follows:

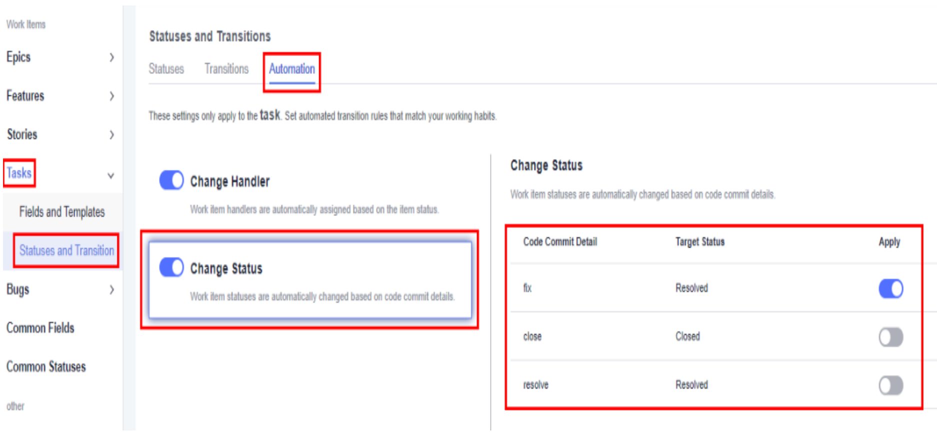
- The **fix** keyword is associated with the **Resolved** target state (enabled by default).
- The **close** keyword is associated with the **Closed** target state (disabled by default).
- The **resolve** keyword is associated with the **Resolved** target state (enabled by default).

Only the project manager or other roles with the project setting permission can modify the settings.

The following describes how to associate the **close** keyword to **Rejected** in a **Task** work item.

Step 1 Access the project.

Step 2 Choose **Settings** > **Project Settings** and find the code commit status corresponding to the **Task** work item type, as shown in the following figure.



Step 3 Click the target status of **close**, set it to **Rejected**, and set **Apply** to  .

The settings are automatically saved.

----End

Then, you can use the **close** keyword in the commit message to change the status of a **Task** work item to **Rejected** when committing code.

Example:

```
git commit -m "close #<task_work_item_id> <commit_message>"
```

Creating a Work Item

To compare **Associating a Work Item with Locally Committed Code** and **Associating Work Items with Code Committed on the Console**, repeat the following steps to create two **Task** work items.

Step 1 Accessing the Project

Step 2 Choose **Work** > **Work Items**.

Step 3 Click **Create Work Item** and select **Task** from the drop-down list. The page for creating a work item is displayed.

Step 4 Enter a title and click **Save**.

----End

The work item management page is displayed. You can view the work item ID and the status is **New**.

In this example:

- The ID of **task01** is **7370149**.
- The ID of **task02** is **7370151**.

On the project homepage, choose **Work** > **Work Items** to obtain a work item ID.

Associating a Work Item with Locally Committed Code

Prepare the Git environment on the local host. For details, see **Overview**. If you can access the repository (**the corresponding remote repository has been associated**), perform the following operations:

Create a file in the local master branch and push the file to the remote repository. During the push, use the keyword **fix** in **-m** to associate the file with the work item task01.

CAUTION

- In this example, the master branch is modified to simplify the process so that you can quickly understand how to associate a work item with code committed on the local host.
- Do not modify the master branch in the actual situation. It is recommended that you create a branch for file operations, merge the changed file into the master branch, and push the master branch to the remote repository.

Step 1 Right-click the local repository folder and open Git Bash.

Step 2 Check whether the remote repository address is successfully associated.

```
git remote -v        # View the remote repository address associated with the local repository.
```

In the following figure, the underlined part indicates the remote repository address associated with the local repository, and the information before the address is the alias of the remote repository on the local computer.

If the associated repository is not the one you want or the repository is not associated, **clone the desired repository to the local computer**.

After the clone is successful, run the **git remote -v** command again to verify the association.

Step 3 Check the repository status and switch to the master branch. (Skip this step for a repository cloned in the previous step.)

```
git status            # Check the repository status. You can view the current branch and whether there are unsaved, uncommitted, and unpushed changes on the branch.
git checkout master    # Switch to the master branch. Run the command when the current branch is not the master branch.
```

Step 4 Create a file in the local repository folder. In this example, the file is named **fileFor7370149**.

Step 5 Add the new file to the staging area using Git Bash.

```
git add fileFor7370149
```

Step 6 Commit the operation using Git Bash.

```
The git commit -m "fix #7370149 Task01" #/ uses the fix keyword to associate task01 whose ID is 7370149.
```

NOTE

61081924 is the ID of **tesk-01** created in **Creating a Work Item**.

Step 7 Push the committed content to the associated CodeHub repository using Git Bash.

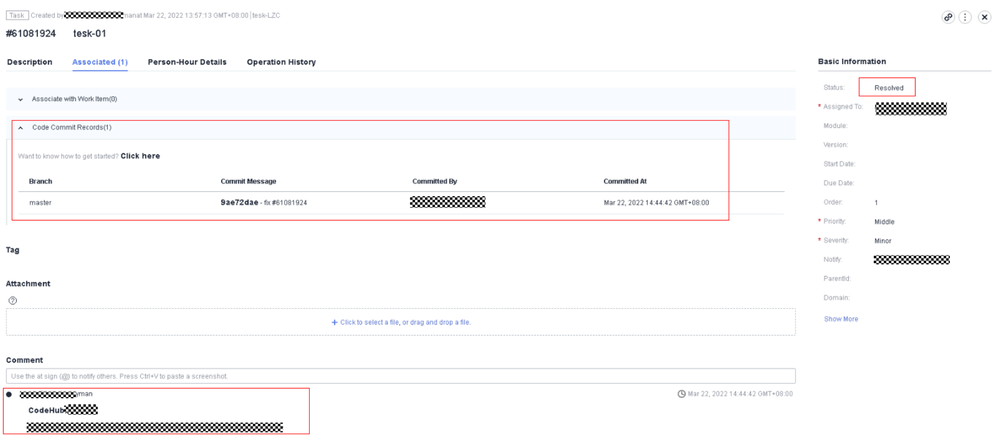
```
git push
```

If the push is successful, the return value varies depending on the repository structure. If all steps are 100% and done, the push is successful. If the push fails, the key is incorrect.

Step 8 Verify the association result.

After the preceding operations are complete, go to the work item list, find the work item whose ID is **7370149**, and view its details, as shown in the following figure.

- The status is **Resolved**.
- An associated code commit record is added. You can click the commit ID to view the details.
- A comment is automatically generated to describe the work item association.

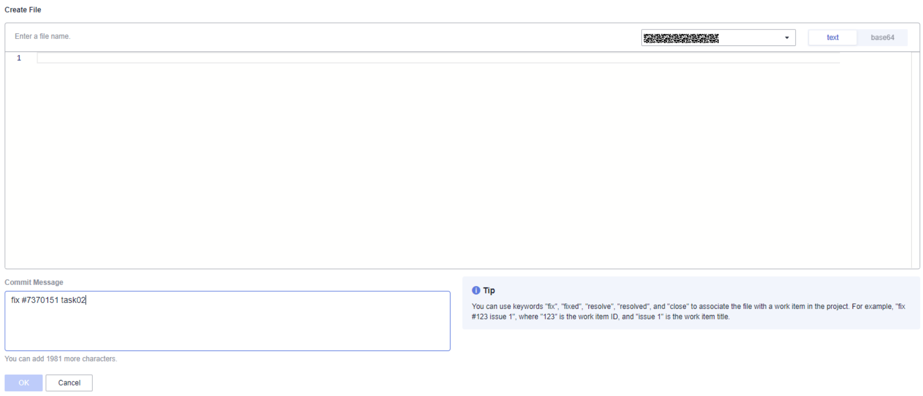


----End

Associating Work Items with Code Committed on the Console

Step 1 Go to the repository details page.

Step 2 **Create a file**, as shown in the following figure. When filling in the **remarks**, start with fix #7370151. Set other information to any value.



NOTE

7370151 is the ID of **task02** created in **Creating a Work Item**.

Step 3 Click **OK**. The system performs the following operations on the CodeHub repository:

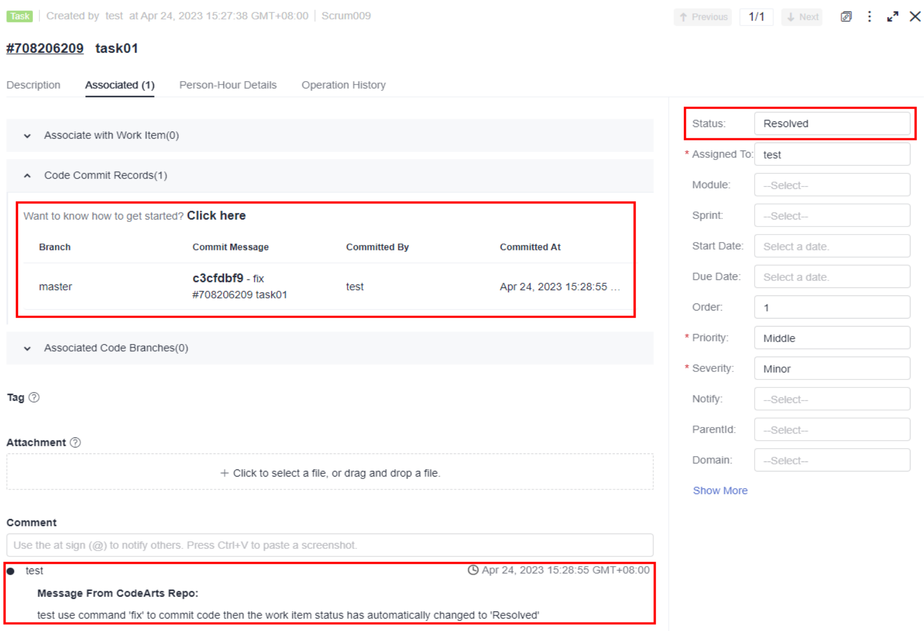
```
Writes content to the new file.
git add .
git commit -m "fix #7370151 Task02"
```

That is, the system commits the new file and associates it with the **task02** work item using the **fix** keyword in the **-m** parameter.

Step 4 Verify the association.

View the **task02** work item.

- The status is **Resolved**.
- An associated code commit record is added. You can click the commit ID to view the details.
- A comment is automatically generated to describe the work item association.



----End

Viewing the Association Between Commits and Work Items

The following table describes how to view the association between commits and work items.

Table 3-13 Viewing the association between commits and work items

Scenario	Operation
On the **ProjectMan** console, locate the committed code based on the work item.	Locate the target project in ProjectMan and go to the work item details page. Click **Associated** > **Code Commit Records**. The associated code commit record is displayed. Click the repository node link (the string before the commit message) in the record. Then the code page is displayed.
On the **CodeHub** console, view the work item based on the association record.	Go to the target repository details page, click the **Associated Work Items** tab to view the work items associated with code commits. Click a work item ID to go to the details page.

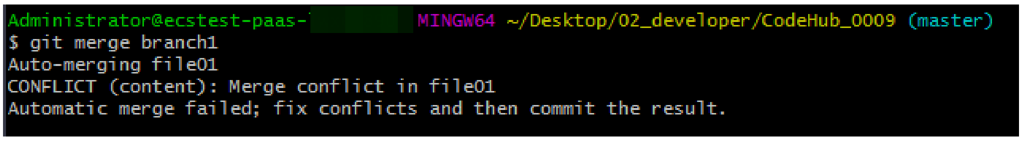
3.11.5 Resolving Code Commit Conflicts

Introduction

When using CodeHub, you may encounter the situation where two members in the same team modify a file at the same time. Code fails to be pushed to a CodeHub repository due to the code commit conflict. The following figure shows a push failure caused by the file change conflict in the local and remote repositories.

NOTE

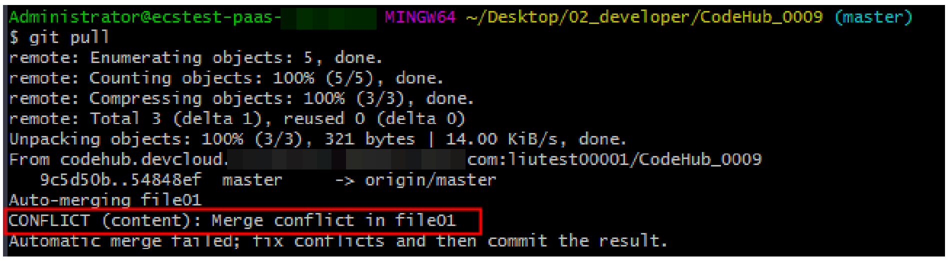
- The returned messages vary depending on Git versions and compilers but have the same meaning.
- The information similar to "push failure" and "another repository member" in the returned message indicates that there is a commit conflict.
- Git automatically merges changes in different lines of the same file. A conflict occurs only when the same line of the same file is modified (the current version of the local repository is different from that of the remote repository).
- Conflicts may occur during branch merge. The locating method and solution are basically the same as those for the conflict during the commit to the remote repository. The following figure shows that a conflict occurs when the local **branch1** is merged into the master branch (due to the changes in the **file01** file).



Resolving a Code Commit Conflict

To resolve a code commit conflict, pull the remote repository to the working directory in the local repository. Git will merge the changes and display the conflicting file content that cannot be merged. Then, modify the conflicting content and push it to the remote repository again (by running the **add**, **commit**, and **push** commands in sequence).

The following figure shows that there is a file merge conflict when you run the **pull** command.



Modify the conflicting file carefully. If necessary, negotiate with the other member to resolve the conflict and avoid overwriting the code of other members by mistake.

NOTE

git pull combines **git fetch** and **git merge**. The following describes the operations in detail.

```
git fetch origin master # Pull the latest content from the master branch of the remote host.
git merge FETCH_HEAD    # Merge the latest content into the current branch.
```

During merge, a message indicating that the merge fails due to a conflict is displayed.

Example: Conflict Generation and Resolution

The following shows an example to help you understand how a conflict is generated and resolved.

A company uses CodeHub and Git to manage a project. A function (the **file01** file is modified) of the project is jointly developed by developer 1 (01_dev) and developer 2 (02_dev). The two developers encounter the following situation.

1. **file01** is stored in the remote repository. The following shows the file content.

   file01

   ```
   ##file01AAAAAAAAAAAA
   ##file02BBBBBBBBBBB
   ##file03CCCCCCCCCCCC
   ##file04DDDDDDDDDDDD

   ```

2. 01_dev modifies the second line of **file01** in the local repository and successfully pushes the file to the remote repository. The following shows the file content in the local and remote repositories of 01_dev.

   file01

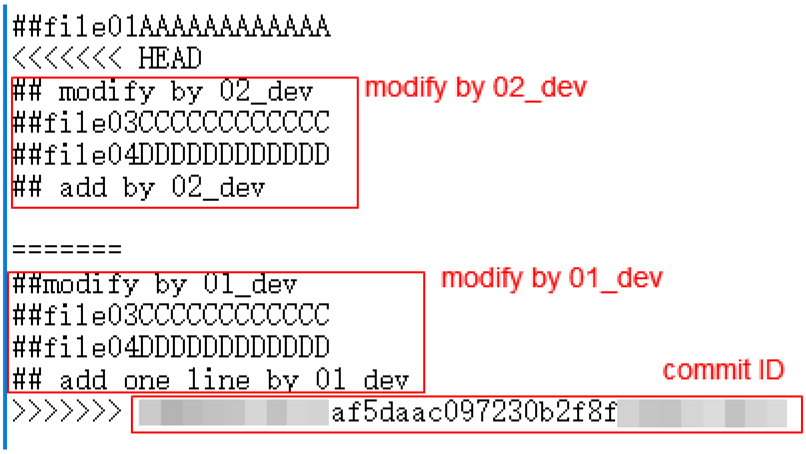
   ```
   ##file01AAAAAAAAAAAA
   ##modify by 01_dev
   ##file03CCCCCCCCCCCC
   ##file04DDDDDDDDDDDD
   ## add one line by 01_dev
   ```

3. 02_dev also modifies the second line of **file01** in the local repository. When 02_dev pushes the file to the remote repository, a **conflict** message is displayed. The following shows the file content in the local repository of 02_dev, which is conflicting with that in the remote repository.

   ```
   ##file01AAAAAAAAAAAA
   ## modify by 02_dev
   ##file03CCCCCCCCCCCC
   ##file04DDDDDDDDDDDD
   ## add by 02_dev
   ```

4. 02_dev pulls the code in the remote repository to the local repository, detects the conflict starting from the second line of the file, and immediately contacts 01_dev to **resolve the conflict**.

5. We find that they both modified the second line and added content to the last line, as shown in the following figure. Git identifies the content starting from the second line as a conflict.



NOTE

Git displays the changes made by the two developers and separates them using =======.

- The content between **<<<<<<<HEAD** and **=======** indicates the changes of the local repository in the conflicting lines.
- The content between **=======** and **>>>>>>>** indicates the changes of the remote repository in the conflicting lines, that is, the pulled content.
- The content after **>>>>>>>** is the commit ID.
- Delete **<<<<<<<HEAD**, **=======**, **>>>>>>>**, and commit ID when resolving the conflict.

6. The two developers agree to retain all changes after discussion. After 02_dev modifies the content, the modified and added lines are saved in the local repository of 02_dev, as shown in the following figure.

```
##file01AAAAAAAAAAAA
## modify by 02_dev
##modify by 01_dev
##file03CCCCCCCCCCCC
##file04DDDDDDDDDDDD
## add by 02_dev
## add one line by 01_dev
```

7. 02_dev pushes the merged changes to the remote repository (by running **add**, **commit**, and **push** commands in sequence). The following shows the file content in the remote repository after a successful push. The conflict is resolved.

file01

```
1   ##file01AAAAAAAAAAAA
2   ## modify by 02_dev
3   ##modify by 01_dev
4   ##file03CCCCCCCCCCCC
5   ##file04DDDDDDDDDDDD
6   ## add by 02_dev
7   ## add one line by 01_dev
```

NOTE

In the preceding example, TXT files are used for demonstration. In the actual situation, the conflict display varies in different text editors and Git plug-ins of programming tools.

Preventing a Conflict

Repository preprocessing before code development can prevent committing and merge conflicts.

In **Example: Conflict Generation and Resolution**, 02_dev successfully resolves the conflict in the commit to the remote repository. For 02_dev, the latest code version of the local repository is the same as that of the remote repository. For 01_dev, version differences still exist between the local and remote repository. A conflict will occur when 01_dev pushes code to the local repository. The following describes methods to resolve the conflict.

Method 1 (recommended for beginners):

If your local repository is not frequently updated, clone the remote repository to the local repository to modify code locally, and commit the changes. This directly resolves the version differences. However, if the repository is large and there are a large number of update records, the clone process will be time-consuming.

Method 2:

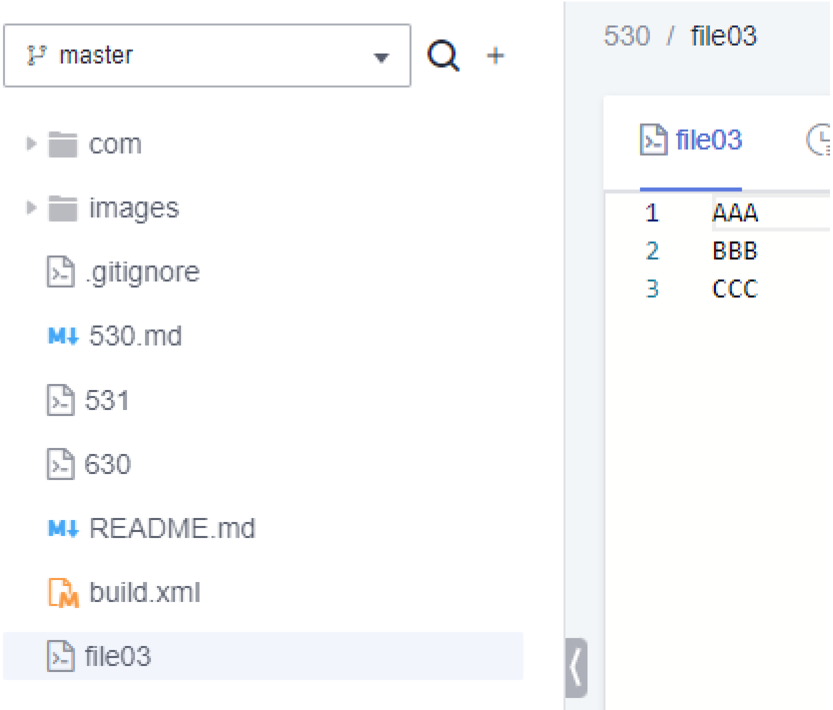
If you modify the local repository every day, create a develop branch in the local repository for code modification. When committing code to the remote repository, switch to the master branch, pull the latest content of the master branch in the remote repository to the local repository, merge the branches in the local repository, and resolve the conflict. After the content is successfully merged into the master branch, commit it to the remote repository.

Resolving a Merge Conflict on the Console

CodeHub allows you to **manage branches** in the cloud. The following simulates a conflicting merge request and describes how to resolve it.

Step 1 **Create a repository.**

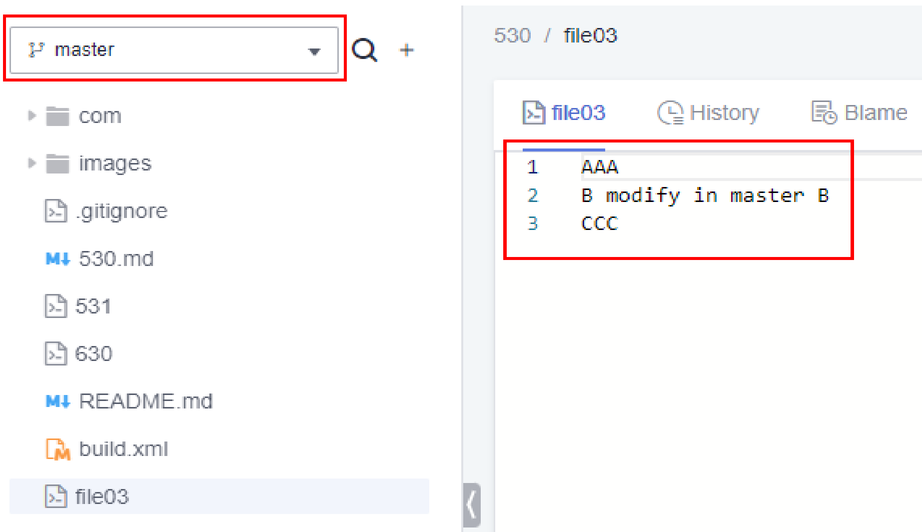
Step 2 **Create a file** named **file03** on the master branch in the repository. The initial content is as follows:



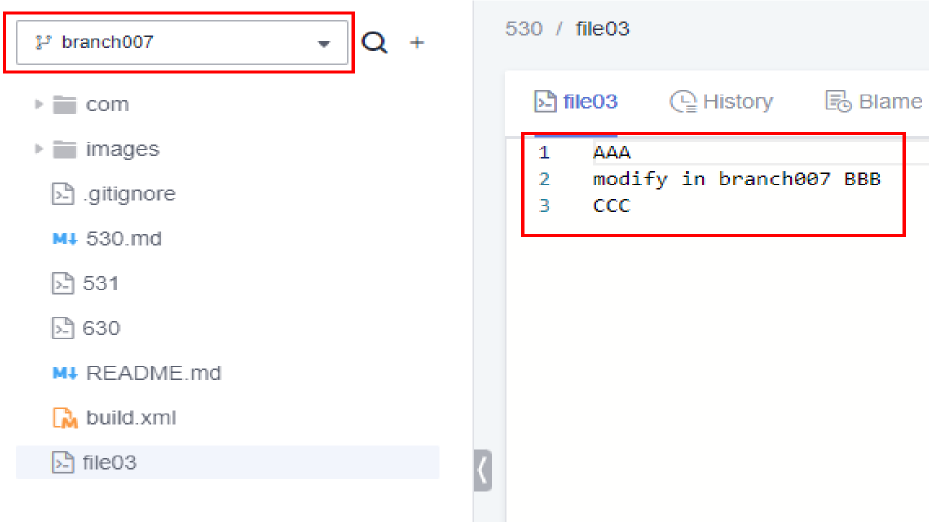
Step 3 **Create a branch** named **branch007** based on the master branch.

The content in the master branch is the same as that in **branch007**. The following describes how to make them different.

Step 4 In the master branch, **modify** **file03** as shown in the following figure, and enter the commit message **modify in master**.

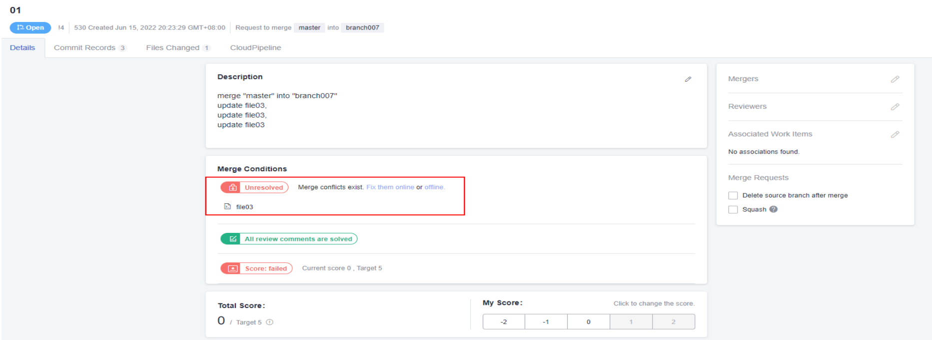


Step 5 Switch to **branch007**, modify **file03** as shown in the following figure, and enter the commit message **modify in branch007**. Then the two branches are different, that is, a conflict occurs.



Step 6 Create a **merge request** to merge **branch007** to the master branch. Click **OK** to submit the merge request.

The **merge request details** page displays a message indicating that a **merge conflict** exists and suggests you resolve the conflict **on CodeHub** or **locally**.

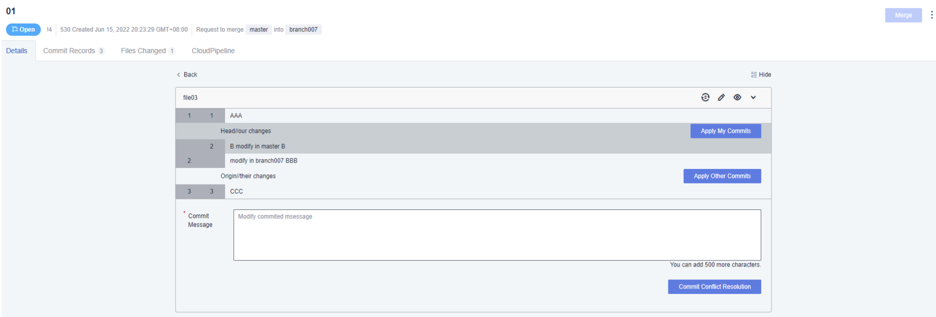


Step 7 Perform the prompted operation to resolve the conflict:

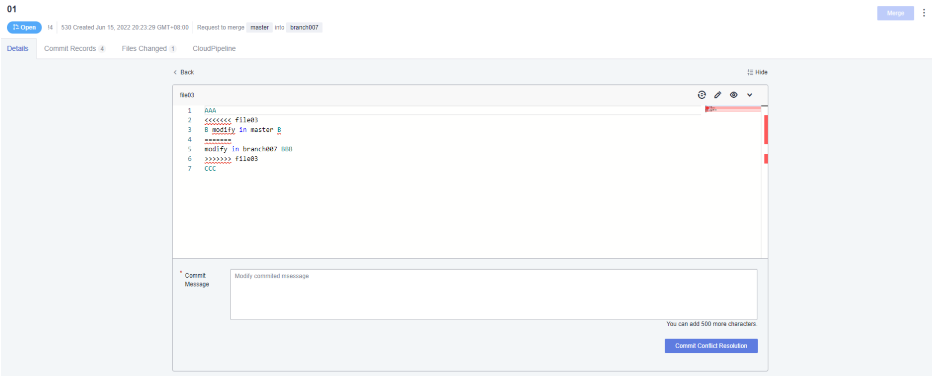
- **Resolving a conflict on CodeHub** (recommended for small code volume)

  a. Click **Resolve conflicts on CodeHub**. The following page is displayed, showing the code conflict.

  Click **Apply My Commits** or **Apply Other Commits** to select a final version.

  b. If the conflict cannot be resolved by overwriting the file, click  to go to the **manual editing** page, as shown in the following figure. The conflict display format is similar to that in **Example: Conflict Generation and Resolution**.



c. Manually modify the code to resolve the conflict and commit the changes.

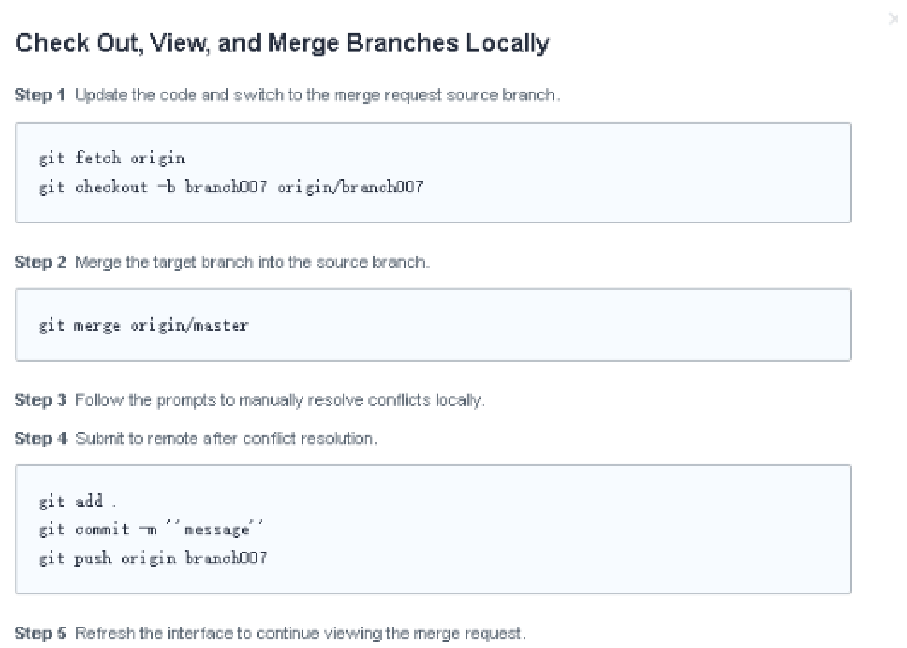
CAUTION

Enter a commit message.

In the preceding figure, the following signs are used for conflict display and separation: **<<<<**, **>>>>**, and **====**. Delete the lines where the signs are located when modifying code.

- **Resolving conflict locally** (recommended for large-scale projects)

  Click **resolve conflicts on locally**. The following page is displayed. Perform the operations as prompted.



NOTE

CodeHub automatically generates Git commands based on your branch name. You only need to copy the commands and run them in the local repository.

Step 8 After the conflict is resolved by using either of the preceding methods, the merge request status changes to **Open**. Click **Merge** to merge branches. The system displays a message indicating that the merge is successful.

You can also follow the instructions in **Merge Request Approval**.

Now, the content of the master and **branch007** branches is the same. You can switch between branches to check the content.

----End

3.12 Member and Permission Management

3.12.1 IAM Users, Project Members, and Repository Members

Repository members are members of the project to which the repository belongs.

Table 3-14 Mapping between project roles and repository roles

Project Role	Repository Role
Project manager	Repository administrator
Developer	Common repository member
Test manager	Repository viewer
Tester	
Participant	
Viewer	
O&M manager	
Custom role	A project creator can be set as a common repository member or viewer.

3.12.2 Managing Repository Members

You can manage repository members on the **Members** tab page.

Only the repository creator (owner) and repository administrator can manage repository members. Other members can only view the repository member list, as shown in **Figure 3-7**.

Figure 3-6 Member list

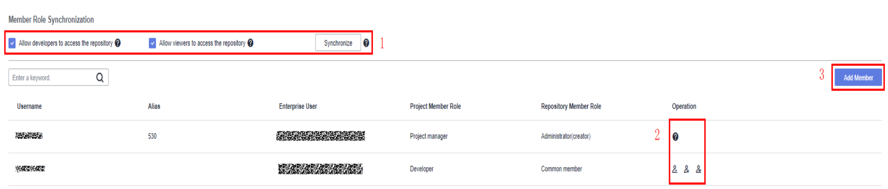
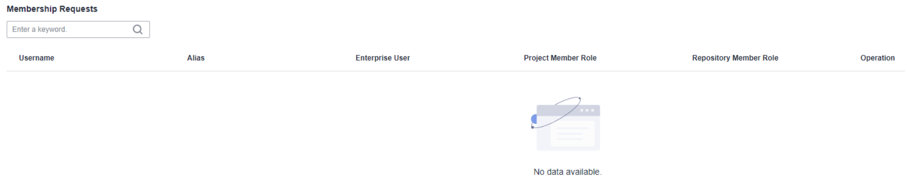


Figure 3-7 Member list for those who do not have operation permissions



Automatically Synchronizing Project Members to the Repository

Configure **Member Role Synchronization** (① in the **Figure 3-6**) to synchronize project roles to the repository. For details about the synchronization policies, see **Table 3-15**.

Table 3-15 Member role synchronization

Item	Project Role	Repository Role	Allowed Operation(② in the Figure 3-6)
——	Project manager	Repository administrator	——
Allow developers to access the repository	Developer Custom role (developer permission)	Common repository member	• Setting the member as a repository administrator • Setting the role as a common repository member • Removing the member
Allow viewers to access the repository	Test manager	Repository viewer	Removing the member
	Tester		
	Participant		
	Viewer		
	Custom role (viewer permission)		

NOTE

- A project manager is a repository administrator by default.
- To remove a project manager from the repository, change their role in the project settings.
- If you select a policy in **Member Role Synchronization**, users added to the project are automatically synchronized to the repository.
- If you deselect policies in **Member Role Synchronization** and click **Synchronize**, related members will be removed immediately.

Manually Adding a Repository Member

Manually added repository members will be overwritten by the synchronization function in **Automatically Synchronizing Project Members to the Repository**. You are advised to use either of the two functions.

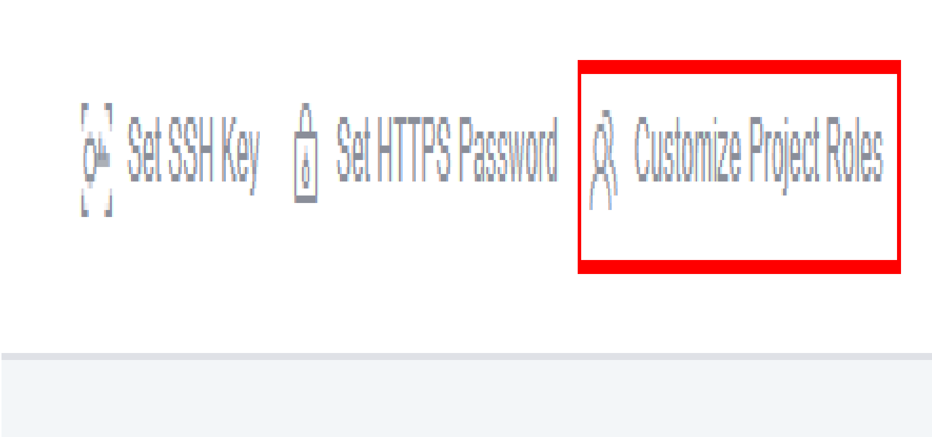
Click **Add Member** (③ in the **Figure 3-6**). On the displayed dialog box, select a member from the member list of the corresponding project and add the member to the repository. A default repository role is assigned to the member based on the project role. For details about the role mapping, see **Table 3-16**.

Table 3-16 Mapping between project roles and repository roles

Project Role	Repository Role	Allowed Operation (② in the Figure 3-6)
Project manager	Repository administrator (default)	• Downgrading the role to a common repository member
	Common repository member	• Escalating the role to a repository administrator • Removing the member
Developer	Repository administrator	• Downgrading the role to a common repository member
	Common repository member (default)	• Escalating the role to a repository administrator • Downgrading the role to a repository viewer • Removing the member
	Repository viewer	• Escalating the role to a common repository member • Removing the member
Test manager	Repository viewer (default)	Removing the member
Tester		
Participant		
Viewer		
O&M manager		
Custom role		

NOTE

- If the list is empty, the project has no members except the repository creator. You need to add members to the project.
- On the repository list page, you can select **Customize Project Roles** to modify the repository role mapped from a custom project role as a project creator.



3.12.3 Repository Member Permissions

Repository Creation

Table 3-17 Repository creation permission of project roles

Operation	Project Manager	Developer	Others
Create repositories	√	√	-

Operations and Viewing in the Repository

Operation	Repository Administrator/ Creator	Common Member	Repository Viewer
Viewing			
View repository files	√	√	√
View work items associated with code	√	√	√

Operation	Repository Administrator/ Creator	Common Member	Repository Viewer
View the member list	√	√	√
View the branch list	√	√	√
View the tag list	√	√	√
View commit history	√	√	√
Follow or unfollow repositories	√	√	√
View merge requests	√	√	√
View repository statistics	√	√	√
View commit graphs	√	√	√
Development			
Fork repositories	√	√	√
Pull code	√	√	√
Download code packages	√	√	√
Set SSH keys and HTTPS passwords	√	√	√
Push code to unprotected branches	√	√	-
Force push code to unprotected branches	√	√	-
Push code to protected branches	Determined by the branch protection policy	Determined by the branch protection policy	-
Add directories, commit messages, copyright description, and build guide	√	√	-

Operation	Repository Administrator/ Creator	Common Member	Repository Viewer
Upload, edit, and delete files	√	√	-
Create branches	√	Configured by commit rules	-
Delete unprotected branches	√	√	-
Create tags	√	Configured by commit rules	-
Delete tags	√	-	-
Create merge requests	√	√	-
Assign merge requests to reviewers (the target branch is protected)	Determined by the branch protection policy	Determined by the branch protection policy	-
Assign merge requests to reviewers (the target branch is protected)	Determined by the branch protection policy	Determined by the branch protection policy	-
Accept merge requests as a reviewer (the target branch is protected)	Determined by the branch protection policy	Determined by the branch protection policy	√
Accept merge requests as a reviewer (the target branch is protected)	Determined by the branch protection policy	Determined by the branch protection policy	-
Assign merge requests to reviewer (the target branch is not protected)	√	√	-

Operation	Repository Administrator/ Creator	Common Member	Repository Viewer
Assign merge requests to reviewers (the target branch is not protected)	√	√	-
Accept merge requests as a reviewer (the target branch is not protected)	√	√	√
Accept merge requests as a reviewer (the target branch is not protected)	√	√	-
Score merge requests	√	√	√
Comment on merge requests	√	√	√
Management			
Access the console	√	-	-
Add repository members	√	-	-
Delete repository members	√	-	-
Edit permissions of repository members	√	-	-
Trigger actions to generate repository statistics	√	√	-
Delete repositories	√	-	-
Share repositories as templates	√	-	-

Operation	Repository Administrator/ Creator	Common Member	Repository Viewer
General settings: Configure repository information	√	-	-
General settings: Configure merge requests	√	-	-
General settings: Configure commit rules	√	-	-
General settings: Lock repositories	√	-	-
Repository management: Manage the default branch	√	-	-
Repository management: Manage protected branches	√	-	-
Repository management: Manage submodules	√	-	-
Repository management: Free up repository space	√	-	-
Repository management: Copy repository settings	√	-	-
Security management: Manage deploy keys	√	-	-
Security management: Manage IP address whitelists	√	-	-

Operation	Repository Administrator/ Creator	Common Member	Repository Viewer
Security management: Manage risky operations	√	-	-
Security management: Manage operation logs	√	-	-

NOTE

For details about how to set a branch protection policy, see **Protected Branches**.

3.13 More About Git

3.13.1 Using the Git Client

Background

Before using the Git client, you need to understand the workflow and master basic operations, such as installing Git, creating and cloning repositories, adding, committing, and pushing changes, creating, updating, and merging branches, creating tags, and replacing local changes.

Prerequisites

You have installed the Git client.

Usage Process

The following figure shows the basic process of using the Git client.

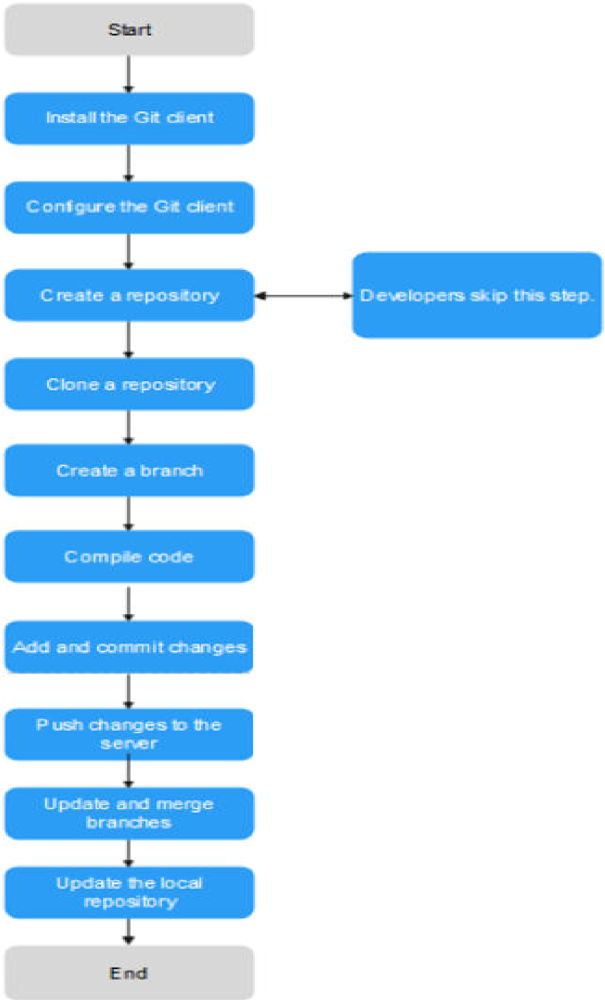


Table 3-18 Procedure

Procedure	Description
Install the Git client	Install the Git client for your operating system. ● Git for Windows ● Git for macOS X ● Git for Linux
Create a repository	Create and open a new folder, and run the following command: `git init` A Git repository is created.

Clone a repository	Run the following command to create a clone of a local repository:
	`git clone /path/to/repository`
	If the repository is on a remote server, run the following command:
	`git clone username@host:/path/to/repository`

Procedure	Description
Local repository structure	There are three components in a local repository: working directory, index, and HEAD. ● Working directory contains the files that you are working on. ● Index caches changes you have made. ● HEAD points to the latest commit.
Add and commit changes	Run the following command to add the changes to the index: git add <filename> git add * Run the following command to commit the changes: git commit -m "*<commit_message>*" The changes are committed to the HEAD but not to the remote repository.
Push changes	The changes are in the HEAD of the local repository. Run the following command to push the changes to the remote repository: git push origin master You can replace master with any other branch to be pushed. If you have not cloned an existing repository, run the following command to connect the local repository to a remote server before the push: git remote add origin <server> Then push the changes to the added server.
Create a branch	Branches enable you to develop features separately. When a repository is created, the master branch is the main branch by default. Develop features on other branches and then merge them to the main branch after the development. 1. Create a branch named **feature_x** and check out the branch. git checkout -b feature_x 2. Check out the main branch. git checkout master 3. Push the main branch to the remote repository. (If the branch is not pushed, the branch can be seen only in your local repository.) git push origin <branch> 4. Delete the created branch. git branch -d feature_x

Procedure	Description

Update and merge branches	1. Run the following command to update the local repository to the latest remote commits:
	`git pull`
	The remote changes are fetched and merged to your working directory.
	2. Run the following command to merge other branches to the current branch (for example, the master branch):
	`git merge <branch>`
	NOTE
	Automatic merges may fail and may induce conflicts. In this case, you need to modify these files to manually merge the conflicts.
	3. After the modification, run the following command to add your changes.
	`git add <filename>`
	4. Before the modification, you can run the following command to compare the source and target branches.
	`git diff <source_branch> <target_branch>`

Create a tag	You are advised to create tags for releases. For example, run the following command to create a tag named **1.0.0**:
	`git tag 1.0.0 1b2e1d63ff`
	1b2e1d63ff is the first 10 characters of the commit ID to be tagged. Run the following command to obtain the commit ID:
	`git log`
	You can enter the first several characters of the commit ID as long as it can distinguish the commit from others.

Replace local changes	Run the following command to replace the unwanted local changes:
	`git checkout -- <filename>`
	The files in the working directory are replaced by the latest content in the HEAD. Changes added to the index and new files are not affected.
	To discard all local changes and commits, fetch the latest commit from the server and reset the local main branch to the commit.
	`git fetch origin`
	`git reset --hard origin/master`

3.13.2 Setting Password-Free Access via HTTPS

Background

The username and password are required each time you connect to CodeHub using the HTTPS protocol. However, Git can help you implement password-free access with its credential storage. You are advised to install **Git 2.5** or a later version so that the function runs properly. The following describes the configuration methods on different OSs:

- Setting Password-Free Access on Windows
- Setting Password-Free Access on macOS
- Setting Password-Free Access on Linux

Prerequisites

- The SSH keys and HTTPS password have been set.
- You have to enter the username and password in CodeHub each time you use the HTTPS protocol to perform operations such as git clone, git fetch, git pull, and git push.

Setting Password-Free Access on Windows

The following table describes how to set password-free access on Windows.

Table 3-19 Setting password-free access on Windows

Method	Description
Set the HTTPS password on the local computer	1. Set the Git authentication mode. Open the Git client and run **git config --global credential.helper store**. 2. Run the Git command to clone or push code for the first time, and enter the username and password as prompted. 3. Open the **.git-credentials** file. If the username and password have been stored locally, the following information is displayed: `https://username:password@***.***.***.com`

Setting Password-Free Access on macOS

Install the **osxkeychain** tool to implement password-free access.

1. Check whether the tool has been installed.
```
git credential -osxkeychain
# Test for the cred helper
Usage: git credential -osxkeychain < get|store|erase >
```
If the following information is displayed, the tool has not been installed.
```
git: 'credential -osxkeychain' is not a git command. See 'git --help'.
```
2. Obtain the installation package.
```
git credential -osxkeychain
# Test for the cred helper
git: 'credential -osxkeychain' is not a git command. See 'git --help'.
curl -s -o \
https://github-media-downloads.s3.amazonaws.com/osx/git-credential-osxkeychain
# Download the helper
chmod u+x git-credential-osxkeychain
# Fix the permissions on the file so it can be run
```
3. Install **osxkeychain** in the directory where Git is installed.
```
sudo mv git-credential-osxkeychain\
"$(dirname $(which git))/git-credential-osxkeychain"
# Move the helper to the path where git is installed
Password:[enter your password]
```

4. Use **osxkeychain** to set Git to the password-free mode.
```
git config --global credential.helper osxkeychain
#Set git to use the osxkeychain credential helper
```

NOTE

The password needs to be entered the first time you perform Git operations. After that, **osxkeychain** will manage the username and password, and you do not need to enter password subsequently.

Setting Password-Free Access on Linux

Linux provides two password-free access modes:

- **cache**:
  - Credentials are cached in memory and cleared after 15 minutes.
    ```
    git config --global credential.helper cache
    #Set git to use the credential memory cache
    ```
  - Set the expiration time in **timeout**, in units of seconds.
    ```
    git config --global credential.helper 'cache --timeout=3600'
    # Set the cache to timeout after 1 hour (setting is in seconds)
    ```
- **store**:

  Credentials are stored in a plain-text file (**~/.git-credentials** by default) in the **home** directory on the disk. The credentials never expire unless you change the password on the Git server. The content of the **git-credentials** file is as follows:

  https://username:password@***********.com

  After saving the credentials in the preceding file, run the following command to implement pass-free access:
  ```
  git config --global credential.helper store
  ```

Troubleshooting

If the message **SSL certificate problem: self signed certificate** is displayed when you download code using HTTPS, run the following command on the client:

```
git config --global http.sslVerify false
```

3.13.3 Using the TortoiseGit Client

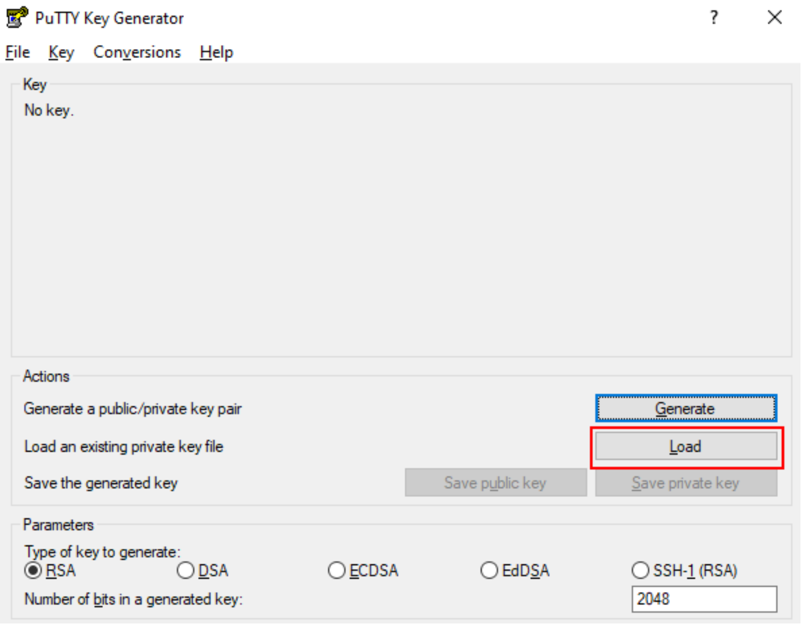
3.13.3.1 Generating a PPK File

A PPK file is required for downloading and committing code on the TortoiseGit client. Assuming that an SSH key pair has been generated on the Git client. The methods to generate a PPK file are different in the following two scenarios:

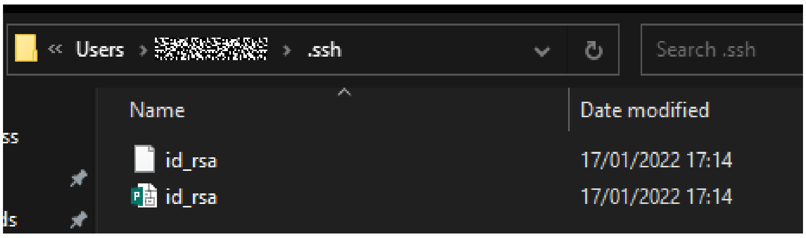
- **The public key has been added to CodeHub.**
- **The public key has not been added to CodeHub.**

The Public Key Has Been Added to CodeHub

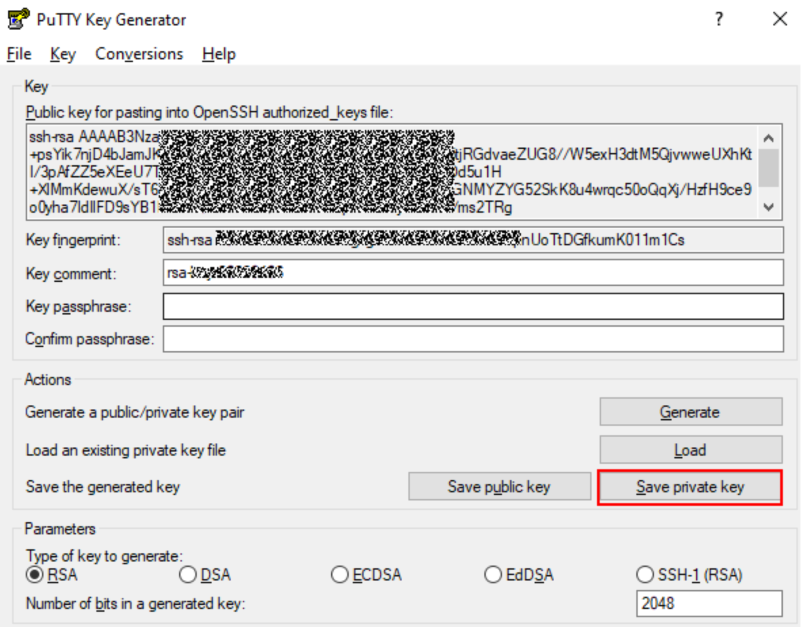
1. On the**Start** menu, search for and select **PuttyGen**.
2. Click **Load**.



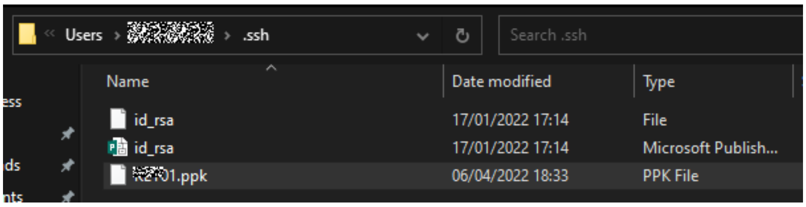
3. Select the **id_rsa** file in the directory where the SSH key pair is stored and click **Open**.



4. Click **OK** and select **Save private key**.

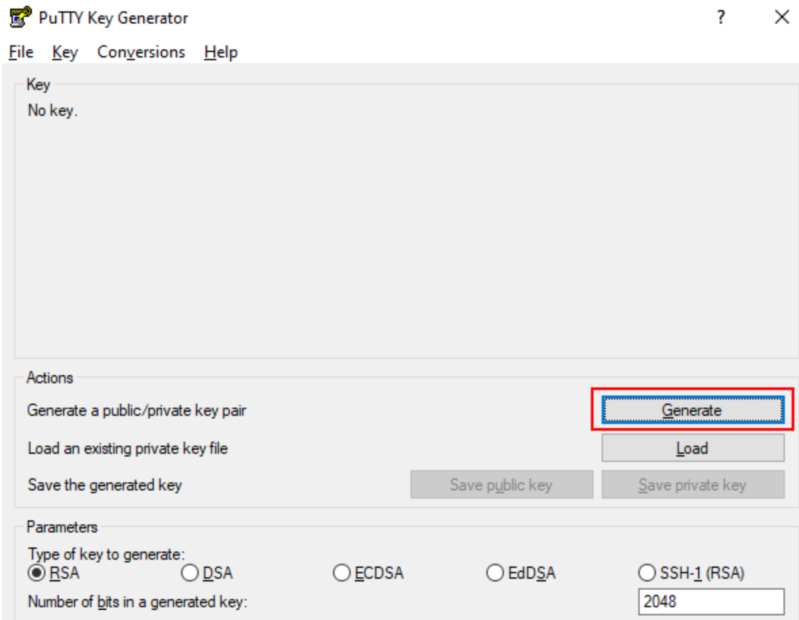


5. Click **Yes** to generate a PPK file.
6. Save the file to the directory where the SSH key pair is stored.

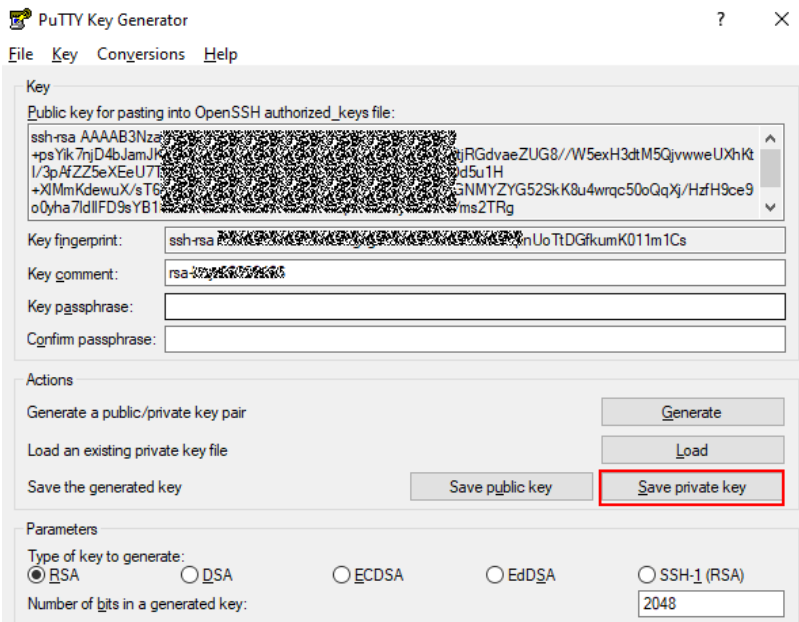


The Public Key Has Not Been Added to CodeHub

1. On the **Start** menu, search for and select **PuttyGen**.
2. Click **Generate** to generate a key, as shown in the following figure.

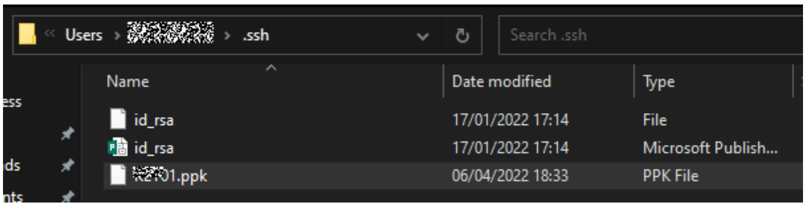


3. Click **Save private key** to save the generated key as a PPK file.



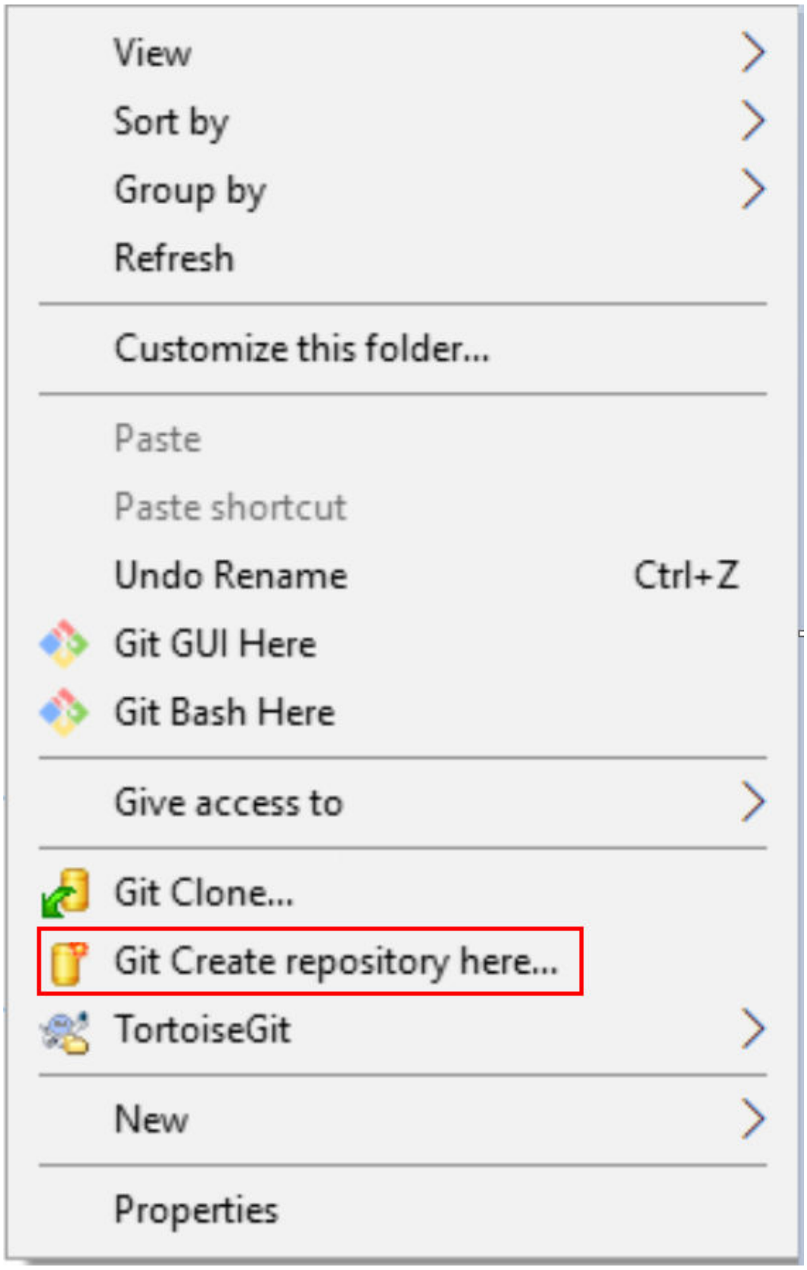
4. Click **Yes** to generate a PPK file.

5. Save the file to the directory where the SSH key pair is stored.



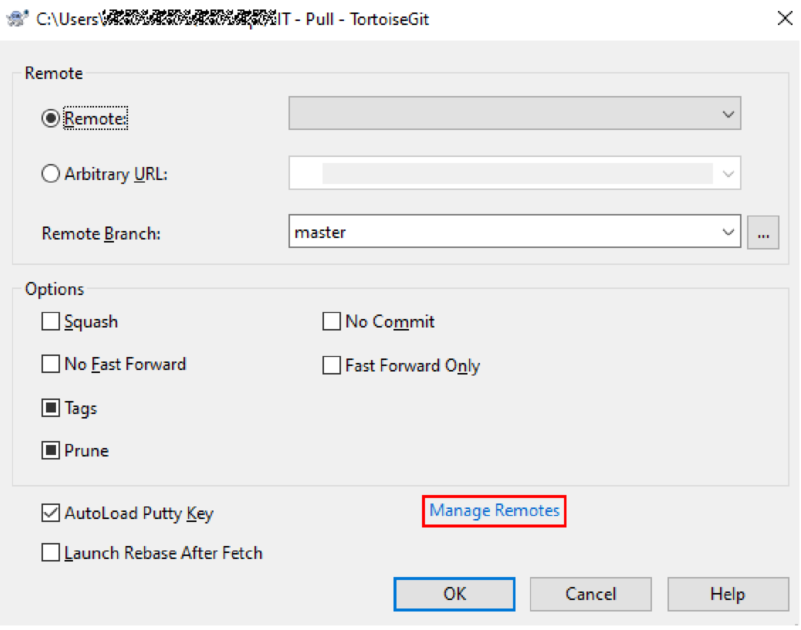
3.13.3.2 Creating a Git Repository

To create a repository for the first time, right-click in an empty directory on the local computer and choose **Git Create repository here**.

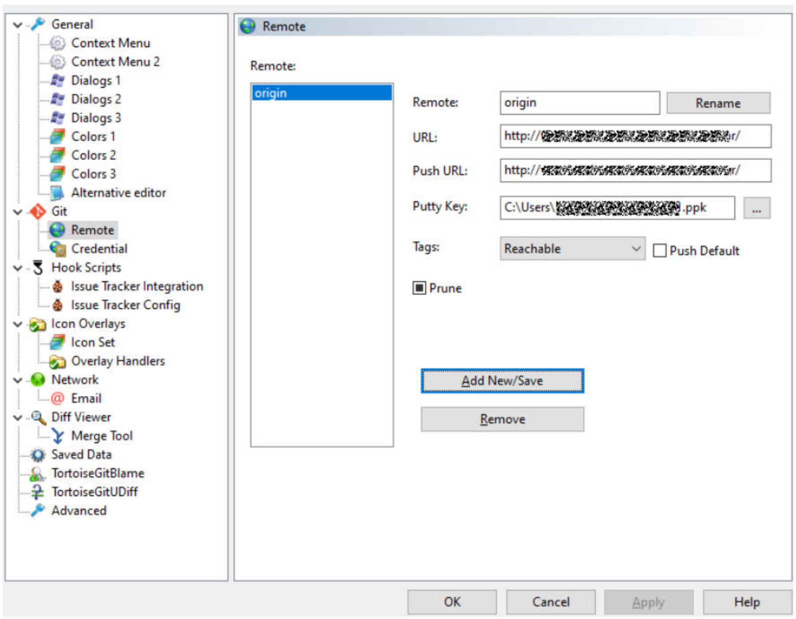


3.13.3.3 Cloning a Repository

1. Open the local Git repository directory (the directory where **the repository is created**) and choose **TortoiseGit** > **Pull** on the right-click menu.
2. Click **Manage Remotes**.

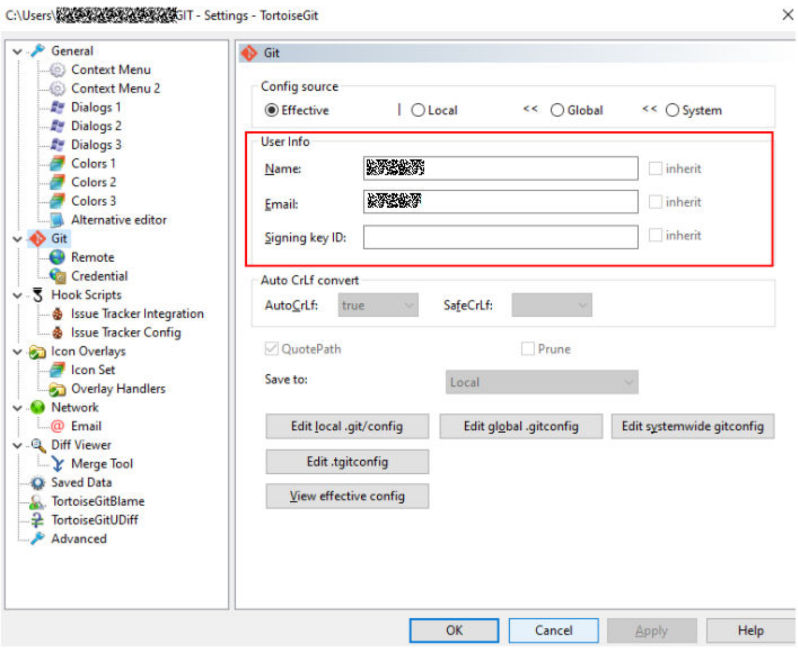


3. Specify the **URL**, select **the PPK file** for the **Putty** field, and click **OK**.



3.13.3.4 Pushing a Repository

1. Configure the username, email address, and signature key (PPK file).
2. Right-click in the blank area and choose **TortoiseGit** > **Settings**.
3. Select **Git**, and set **Name** and **Email**.



NOTE

If the push fails, run the following script to locate the fault and send the **git.log** file generated to the technical support:

```
#!/bin/bash
# this script will collect some logs for Coding.net
### how to use ###
# first enter your git repository
# then execute this bash, please make sure you have correct rights
echo "## git version  #################" >> git.log
git version  >> git.log
echo "## ping ########################" >> git.log
ping code*************.com  >> git.log
echo "## curl code*************.com ##########" >> git.log
curl -v https://code*************.com >> git.log 2>&1
echo "## ssh -vT git@code*************.com #############" >> git.log
ssh -vT git@code*************.com >> git.log 2>&1
echo "## git pull  #############" >> git.log
GIT_CURL_VERBOSE=1 GIT_TRACE=1 GIT_TRACE_PACKET=1 git pull  >> git.log  2>&1
```

3.13.4 Use Cases on the Git Client

3.13.4.1 Uploading and Downloading Code

1. Ensure that the network connection is up and running.

   Enter **telnet code*************.com 22** on the client.

   If **command not found** is displayed, the network cannot access CodeHub.

2. Check if the client is trusted by CodeHub.

   If the system prompts you to enter a password when you pull or push code, check whether the public key has been added to CodeHub.

   If the public key has been added, run **$ ssh -vT git@code*************.com** to check whether the trust relationship is established.

   If the following information is displayed, the trust relationship is established.

```
debug1: channel 0: new [client-session]
debug1: Requesting no-more-sessions@openssh.com
debug1: Entering interactive session.
Welcome to GitLab, 100314597!
debug1: client_input_channel_req: channel 0 rtype exit-status reply 0
debug1: client_input_channel_req: channel 0 rtype eow@openssh.com reply 0
debug1: channel 0: free: client-session, nchannels 1
Transferred: sent 3536, received 3488 bytes, in 0.3 seconds
Bytes per second: sent 11491.6, received 11335.6
debug1: Exit status 0

[redacted] MINGW64 /d/Gitlab
$
```

3. If the fingerprints of both parties are changed after the trust relationship is established, a public key authentication error is reported during commit attempts. In this case, perform the following operations:
   a. Delete the lines related to **code*************.com** from the **~/.ssh/known_hosts** file.
   b. Enter **push**, **pull**, or **ssh -T git@code*************.com**.
   c. Enter **yes** when asked whether to trust the public key of the server.
4. The code download is successful. If the target branch of the push is protected, the code fails to be pushed.

```
$ git push DevCloud_V100R001C00_InfoListV1.0.xlsx
warning: push.default is unset; its implicit value has changed in
Git 2.0 from 'matching' to 'simple'. To squelch this message
and maintain the traditional behavior, use:

  git config --global push.default matching

To squelch this message and adopt the new behavior now, use:

  git config --global push.default simple

When push.default is set to 'matching', git will push local branches
to the remote branches that already exist with the same name.

Since Git 2.0, Git defaults to the more conservative 'simple'
behavior, which only pushes the current branch to the corresponding
remote branch that 'git pull' uses to update the current branch.

See 'git help config' and search for 'push.default' for further information.
(the 'simple' mode was introduced in Git 1.7.11. Use the similar mode
'current' instead of 'simple' if you sometimes use older versions of Git)

fatal: 'DevCloud_V100R001C00_InfoListV1.0.xlsx' does not appear to be a git repo
sitory
fatal: Could not read from remote repository.

Please make sure you have the correct access rights
and the repository exists.
```

5. Contact the repository administrator to **unprotect the branch**. The code can be pushed after the protection is canceled.

3.13.4.2 Committing Letter Case Changes in File Names to the Server

Background

When changes are made to the case of a file name and pushed to the server, the server does not recognize the changes.

For example, a file named **AppTest.java** is renamed as **apptest.java** on the Git client. When the change is pushed to the server, the name of the file in the remote server is still **AppTest.java**.

Procedure

Run the following commands in sequence:

```
git mv --force AppTest.java apptest.java
git add apptest.java
git commit –m "rename"
git push origin XXX (branch name)
```

3.13.4.3 Setting the Line Ending Conversion

Background

Different operating systems may use different line endings. Therefore, if you open a file created in an operating system different from yours, the file may be displayed incorrectly. This problem may also occur when you use version control systems.

Procedure

1. (Optional) By default, **core.autocrlf** is set to **false** in Git. Perform the following operations to enable Git to identify and convert the line endings for text files:
   – On **Windows**
     Set **core.autocrlf** to **true**. All text files in the local repository use LF line endings whereas those checked out to the working directory use CRLF line endings.
   – On **Linux**
     Set **core.autocrlf** to **input**. When files are imported to the local repository, Git auto-converts line endings from CRLF to LF. No conversion is performed when files are checked out from the local repository to the working directory.
2. Set **core.autocrlf** to **true** to enable auto-conversion of line endings.
```
git config --global core.autocrlf true
```

3.13.4.4 Committing Hidden Files

Run **git add**.

NOTE

- Do not use **git add ***, which instructs Git to ignore the hidden files.
- The file and directory names cannot contain special characters.

3.13.4.5 Pushing a File That Has Been Changed on the Server

Background

A file push on the Git client will fail if the file is modified on the server, and the following information is displayed.

```
git.exe push --progress "origin" master:master

To git@codehub-cn-northeast-
1.[redacted].com:fdae56335080433a8298a5c72aed2fe6/____.________.git
! [rejected]        master -> master (fetch first)
error: failed to push some refs to 'git@codehub-cn-northeast-
1.[redacted].com:fdae56335080433a8298a5c72aed2fe6/____.________.git'
hint: Updates were rejected because the remote contains work that you do
hint: not have locally. This is usually caused by another repository pushing
hint: to the same ref. You may want to first integrate the remote changes
hint: (e.g., 'git pull ...') before pushing again.
hint: See the 'Note about fast-forwards' in 'git push --help' for details.
```

Procedure

1. Pull the latest code from the server.
   ```
   git pull origin XXX (branch name)
   ```
2. Modify and push the code.
   ```
   git push origin XXX (branch name)
   ```

3.13.5 Common Git commands

Background

- Git is a free and open-source distributed version control system. It can manage projects of any size in an agile and efficient manner.
- With Git, you can clone a complete Git repository (including code and version information) from a server to a local computer, create branches, modify and commit code, and merge branches.

Commonly Used Commands

The following table describes the functions, formats, parameters, and examples of common Git commands.

Table 3-20 Common Git commands

Command	Function	Format	Parameter	Example
ssh-keygen -t rsa	Generate a key	ssh-keygen -t rsa -C [email]	**email**: indicates an email address.	Obtain the key file **id_rsa.pub** from the .ssh folder in drive C. ssh-keygen -t rsa -C "devcloud_key01@XXX.com"
git branch	Create a branch	git branch [new branchname]	**new branchname**: indicates the name of the new branch.	Create a branch: git branch newbranch

Command	Function	Format	Parameter	Example
git branch –D	Delete a branch	git branch –D [new branchname]	**new branchname**: indicates the name of the new branch.	Delete a local branch: git branch –D newbranch Delete a branch in the remote repository: git branch –rd origin/newbranch Remove branches that have been deleted in the remote repository: git remote prune origin
git add	Add a file to the index	git add [filename]	**filename**: indicates the name of the file to be added.	Add a file to the index: git add filename Add all modified and new files to the index: git add .
git rm	Delete a local directory or file	git rm [filename]	**filename**: indicates the name of the file or directory to be deleted.	Delete a file or a directory: git rm filename
git clone	Clone a remote repository	git clone [VersionAddress]	**VersionAddress**: indicates the URL of the remote repository.	Clone a **jQuery** repository git clone https://github.com/jquery/jquery.git A directory is generated on the local computer. The name of the directory is the same as that of the cloned repository.

Command	Function	Format	Parameter	Example
git pull	Pull the branch in the remote repository to the local computer and merge it with a specified local branch	git pull [RemoteHostname] [RemoteBranchname]:[LocalBranchname]	-	Pull the **next** branch from the **origin** host, and merge it with the local **master** branch. git pull origin next:master
git diff	Compares files, branches, directories, or versions	git diff	-	Compare the current branch with the **master** branch: git diff master
git commit	Commit files	git commit	-	Add a commit message: git commit –m "commit message"

Command	Function	Format	Parameter	Example
git push	Push files to the remote repository	git push [RemoteHostname] [LocalBranchname] [RemoteBranchname]	-	If the remote branch name is not specified, the local branch is pushed to the remote branch that it tracked (The two branches usually share a name). Such a remote branch will be created if it does not exist. git push origin master The local master branch is pushed to the master branch in the remote repository. If the latter does not exist, it will be created.
git merge	Merge branches	git merge [branch]	**branch**: indicates the name of the source branch	Assuming that the current branch is the **develop** branch. The latest commit to the master branch is merged to the **develop** branch. git merge master
git checkout	Check out a branch	git checkout [branchname]	branchname: indicates the name of the branch to be switched to.	Check out the master branch: git checkout master
git log	List the log	git log	-	List all logs: git log --all
git status	Check the status	git status	-	git status
git grep	Search for a character string	git grep	-	Check whether there is any character string containing **hello**: git grep "hello"

Command	Function	Format	Parameter	Example
git show	Display objects or revisions	git show	-	• git show v1 The revisions attached with the **v1** tag are displayed. • git show HEAD Display the last commit of the current branch. • git show HEAD^ Display the first parent of the last commit of the current branch. • git show HEAD~4 Display the ancestor four generations prior to the last commit of the current branch.
git stash	Commands related to stashes	git stash	-	• git stash Saves and restores the work progress. • git stash list Lists all stashes. • git stash pop Restore the latest stash and remove it from the stash list. • git stash apply Restore the latest stash but not remove it from the stash list. • git stash clear Clear all stashes.
git ls-files	View files	git ls-files	-	• git ls-files –d View deleted files • git ls-files –d |xargs git checkout Restore deleted files

Command	Function	Format	Parameter	Example
git remote	Perform operations on the remote repository	git remote	-	• git push origin master:newbranch Create the master branch in the remote repository and push changes to it. • git remote add newbranch Create the master branch in the remote repository and push changes to it. • git remote show List the number of remote repositories • git remote rm newbranch Delete a new branch from the remote repository • git remote update Update branches of all remote repositories

3.13.6 Using Git LFS

Background

- Git Large File Storage (LFS) is supported on CodeHub. It stores large file such as music, images, and videos outside a Git repository while users can still easily perform operations on these files as if they were within the repository. The Git extension allows more repository space and faster repository cloning, and reduces the impact of large files on the Git performance.
- If the size of a file to be uploaded exceeds 100 MB, use Git LFS.
- Get started with Git LFS:
  - **Installing Git LFS**
  - **Configuring File Tracking**
  - **Committing Large Files**
  - **Cloning a Remote Repository Containing Git LFS Files**

Installing Git LFS

The following table describes the installation on different operating systems.

Table 3-21 Installing Git LFS

Operating System	Installation Method
Windows	Download and install Git 1.8.5 or a later version. Run the following command in the CLI: `git lfs install`

Linux	Run the following commands in the CLI:
	`$ curl -s https://packagecloud.io/install/repositories/github/git-lfs/script.deb.sh | sudo bash`
	`$ sudo apt-get install git-lfs`
	`$ git lfs install`

macOS	Install the Homebrew software package management tool, and run the following commands:
	`$ /usr/bin/ruby -e "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/master/install)"`
	`$ brew install git-lfs`
	`$ git lfs install`

Configuring File Tracking

The following figure shows how to configure the file tracking.

Table 3-22 Configuring file tracking

Scenarios	Method
Track all **.psd** files	Run the following command: `git lfs track "*.psd"`
Track a file	Run the following command: `git lfs track "logo.png"`

View tracked files	Run **git lfs track** or view the **.gitattributes** file.
	`$ git lfs track`
	`Listing tracked patterns`
	`    *.png (.gitattributes)`
	`    *.pptx (.gitattributes)`
	`$ cat .gitattributes`
	`*.png filter=lfs diff=lfs merge=lfs -text`
	`*.pptx filter=lfs diff=lfs merge=lfs -text`

Pushing Large Files

The **.gitattributes** file should be pushed to the repository along with the large files. After the push, run **git lfs ls-files** to view the list of track files.

```
$ git push origin master
Git LFS:  (2 of 2 files) 12.58 MB / 12.58 MB
Counting objects: 2, done.
Delta compression using up to 8 threads.
Compressing objects: 100% (5/5), done.
Writing objects: 100% (5/5), 548 bytes | 0 bytes/s, done.
```



```
Total 5 (delta 1), reused 0 (delta 0)
To <URL>
<SHA_ID1>..<SHA_ID2>  master -> master
$ git lfs ls-files
61758d79c4 * <FILE_NAME_1>
a227019fde * <FILE_NAME_2>
```

Cloning a Remote Repository Containing Git LFS Files

Run **git lfs clone** to clone a remote repository that contains Git LFS files to the local computer.

```
$ git lfs clone <URL>
Cloning into '<dirname>'
remote: Counting objects: 16,done.
remote: Compressing objects: 100% (12/12),done.
remote: Total 16 (delta 3), reused 9 (delta 1)
Receiving objects: 100% (16/16),done.
Resolving deltas: 100% (3/3),done.
Checking connectively...done.
Git LFS: (4 of 4 files) 0 B / 100 B
```

3.13.7 Git Workflows

3.13.7.1 Overview

Create a Git workflow or branching policy that works best on your development scenarios for effective version control, project process management, and team collaboration.

There are four common Git workflows. The following sections describe their processes, advantages, disadvantages, and some usage tips.

- Centralized workflow
- Feature branch workflow
- GitFlow (recommended)
- Forking workflow

Development teams can integrate CodeHub and the workflow that suits them best to efficiently manage code and ensure code security. This enables them to focus more on service development to achieve continuous integration and delivery, and fast iteration.

3.13.7.2 Centralized Workflow

The centralized workflow is suited to a development team that comprises around 5 members or has just migrated from SVN to Git. There is only one main branch called master by default (trunk in SVN), which is the single entry point of changes. However, this workflow is not recommended for teams who want to enjoy the benefits of Git and team collaboration.

Process

Developers clone the master branch from the central repository to their local computers, make changes to the code, and push changes to the remote master branch.

Advantages

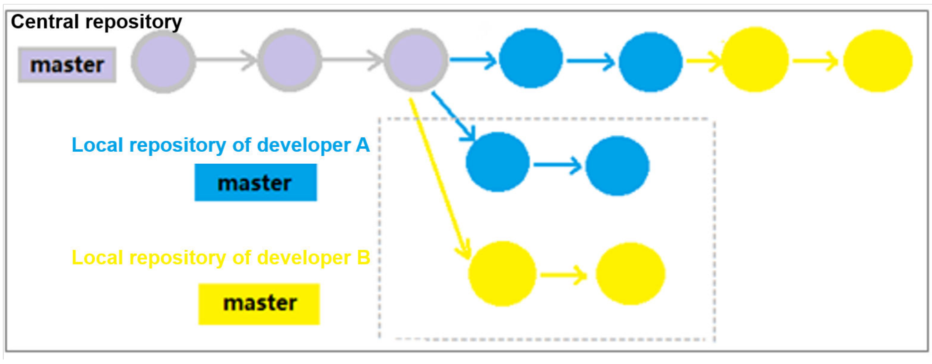
No branch interaction is involved.

Disadvantages

- Merge conflicts are frequent when the size of a development team is more than 10 members. Much time is spent on conflict resolution.
- The master branch is unstable due to frequent pushes to it, making it difficult to conduct integration tests.

Tips: Avoiding Conflicts and Unreadable Commit History

Before developing a new feature, developers must synchronize the local repository to the central one so that they can work on the latest version. After the development is complete, fetch updates from the central repository before rebasing their own commits. In this way, the commits are applied on top of changes that have been made and pushed to the central repository by other developers. The commit history is linear and clear. The following figure shows an example of the workflow.



1. Developers A and B pull code from the central repository at the same time.
2. Developer A completes the work and pushes it to the central repository.
3. When ready to push commits, developer B needs to first run **git pull –rebase** to apply commits on top of the changes made by developer A.
4. Developer B pushes the code to the central repository.

3.13.7.3 Feature Branch Workflow

The core of the feature branch workflow is that every feature should be developed on a separate branch pulled off the master branch. This creates a work silo for every developer, ensures a stable master branch, and encourages team collaboration.

Process

Before developing a new feature, each developer should pull a new branch from the master branch and give it a descriptive name, for example, **video-output** or **issue-#1061**, to clearly state its purpose. By pushing local feature branches to the central repository, developers can share their code with each other without merging code into the master branch.

Advantages

- Developers can create merge requests to have their code reviewed before merge.
- Pushes to the master branch are less frequent.

Disadvantages

Only the master branch is used to incorporate changes. The instability of the branch is further increased in large-scale development projects.

3.13.7.4 GitFlow

GitFlow is commonly seen in large-scale development projects. Each branch is dedicated to a specific purpose and policies are made to regulate the interaction between branches. The following figure shows the process of GitFlow.

Process

- **Master branch**

  The master branch is the production branch where code is ready to deploy. It is the most stable branch because changes cannot be directly pushed to it. Developers can only merge other branches to the master branch. It is often set as a protected branch by default, on which only the project maintainer can operate.

- **Hotfix branch**

  It is a temporary branch created off the master branch for fixing urgent bugs in a live production version. After the bug is fixed, the hotfix branch gets merged into the master branch and tagged with a version number. The bug fix also needs to be merged to the develop branch.

- **Develop branch**

A develop branch is pulled from the master branch and used to merge features. It contains all the code ready to release for integration and system testing.

- **Release branch**

  When a new release is coming up, developers create a release branch from the develop branch for release preparations, such as fixing minor bugs and producing documents. Adding new features is not allowed. They should be merged into the develop branch and wait for the next release. When the preparation is complete, the release branch is merged into the master branch and the commit is tagged with a version number. The changes made in the release branch also need to be merged to the develop branch.

- **Feature branch**

  Feature branches are pulled from the develop branch for feature development. When the development is complete, they are merged into the develop branch. Feature branches do not interact with the master branch.

Developers add new features in either of the following ways:

- Incorporate features after the features are reviewed by a dedicated reviewer.
  a. Developers push feature branches to the central repository in CodeHub.
  b. Developers then create merge requests for merging the feature branches into the develop branch, and assign the requests to the reviewer.

     NOTE

     CodeHub supports merge requests. Only repository administrators (project managers, repository creators, and developers granted with repository management permissions) can accept merge requests.

  c. Reviewers review the merge requests. If the requests are approved, the feature branches are merged into the develop branch and deleted. Otherwise, the reviewer should explain the reasons of rejections.
- Integrate features after self-reviews.
  a. Developers merge feature branches to the develop branch in the local repository and delete the feature branches.
  b. The local develop branch is then pushed to the central repository in CodeHub.

Advantages

- With a branch dedicated for release preparation, a development team can develop new features for a future release on the develop branch while improving the version for the upcoming release. Release is visualized, which means team members can have a clear view of the release status in commit graphs.
- Hotfix branches, which can be seen as temporary release branches created off the master branch, enable development teams to fix urgent bugs without interrupting other works. Bug fixes do not have to wait until next release but can be quickly deployed to the production version.
- Effective multi-branch mechanism allows for organized development process especially for large-scale projects.

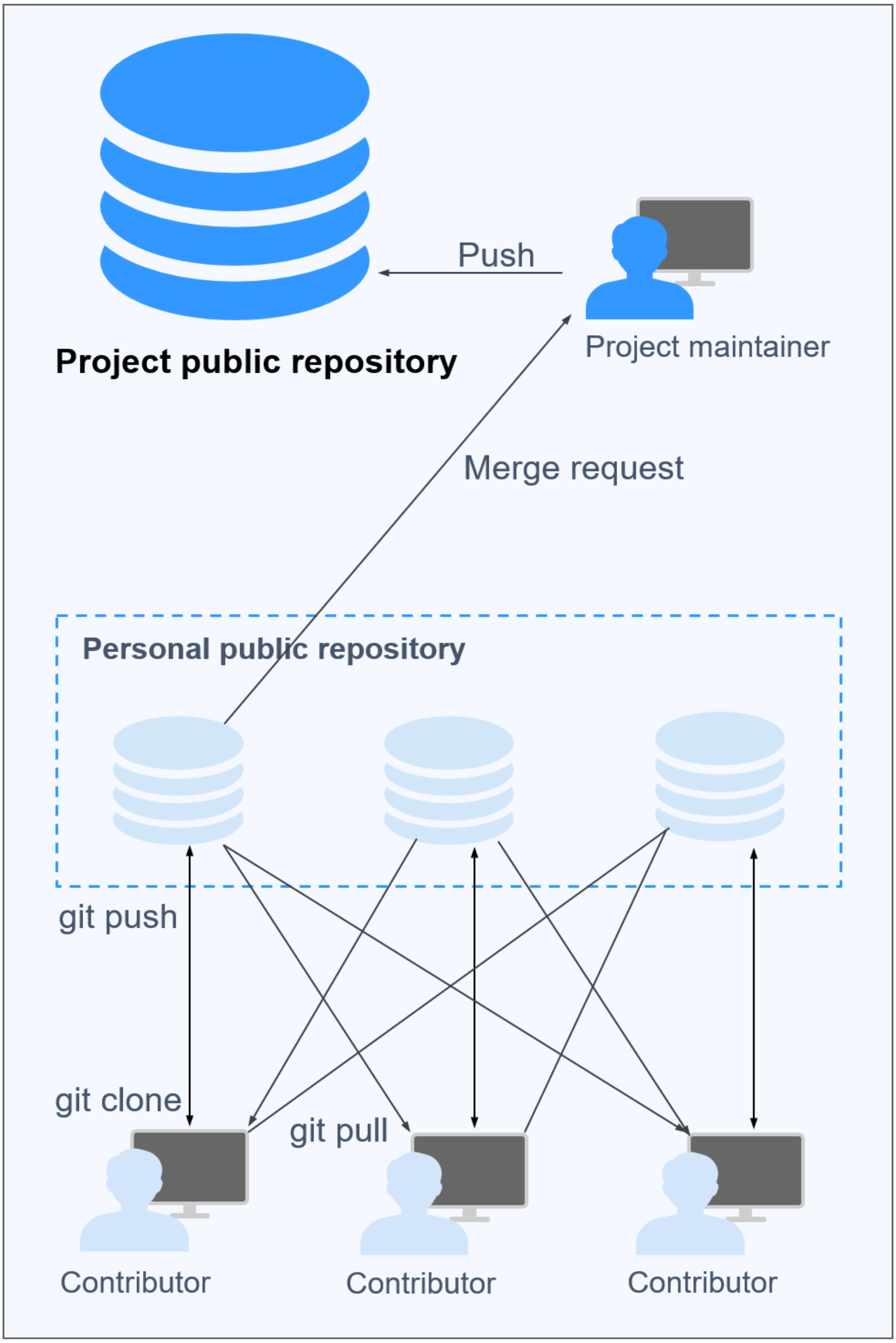
- This workflow is more in line with the DevOps philosophies.

Disadvantages

- High learning thresholds.
- Impact will be greater if development teams do not comply with their specified workflow policies.

3.13.7.5 Forking Workflow

The forking workflow is suitable for outsourcing, crowdsourcing, crowdfunding, and open source projects. One of the features that distinguish this workflow is that every contracting developer has a personal public repository, which is forked from the project public repository. Developers can perform operations on the forks without the need of being authorized by the project maintainer. The following figure shows the process of the forking workflow.



Process

1. Developers fork the project public repository to create personal public ones.

2. The personal public repositories are cloned to their local computers for development.
3. After the development is complete, developers push changes to their personal public repositories.
4. Developers file merge requests to the project maintainer for merge to the project public repository.
5. The project maintainer pulls changes to the local computer and reviews the code. If the code is approved, it is pushed to the project public repository.

NOTE

If the code written by a developer is not approved and therefore, not merged to the project public repository, other developers can still pull the code from the personal public repository of the developer for references.

Advantages

- Code collaboration is easier. Developers can share their code by pushing it to their personal public repositories for others to pull, unlike some workflows where developers cannot see others' work until it is merged into the project repository.
- Project maintainers do not have to grant permissions on project public repositories to every contributor.
- Merge requests serve as an important guard for code security.
- The three workflows introduced previously can be incorporated into the forking workflow based on project requirements.

Disadvantages

It takes more steps and time before the code of developers gets merged into the project repository.

