CodeArts Repo

Best Practices

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1 CodeArts Repo Best Practices

Table 1-1 Common best practices

Practice	Description
Migrating GitLab Intranet Repositories to CodeArts Repo in Batches	Currently, CodeArts Repo only allows for repository migrations between public networks. There is no quick solution for migrating repositories from a platform built on the customer's intranet to CodeArts Repo. Therefore, we provide a script for migrating repositories from an intranet platform to CodeArts Repo in batches.
Importing External Repositories to CodeArts Repo in Batches	Currently, CodeArts Repo only allows for repository migrations between public networks. There is no quick solution for migrating repositories from a platform built on the customer's intranet to CodeArts Repo. Therefore, we provide a script for migrating repositories from an intranet platform to CodeArts Repo in batches.

2 Migrating GitLab Intranet Repositories to CodeArts Repo in Batches

Background

Currently, CodeArts Repo only allows for repository migrations between public networks. There is no quick solution for migrating repositories from a platform built on the customer's intranet to CodeArts Repo. Therefore, we provide a script for migrating repositories from an intranet platform to CodeArts Repo in batches.

Configuring the SSH Public Key for Accessing CodeArts Repo

To migrate GitLab code repositories to CodeArts Repo in batches, you must install the Git Bash client and configure the locally generated SSH public key to CodeArts Repo. The procedure is as follows:

Step 1 Run Git Bash to check whether an SSH key has been generated locally.

If you select the RSA algorithm, run the following command in Git Bash:

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

If you select the ED255219 algorithm, run the following command in Git Bash:

```
cat ~/.ssh/id_ed25519.pub
```

- If **No such file or directory** is displayed, no SSH key has been generated on your computer. Go to **Step 2**.
- If a character string starting with **ssh-rsa** or **ssh-ed25519** is returned, an SSH key has been generated on your computer. If you want to use the generated key, go to **Step 3**. If you want to generate a new key, go to **Step 2**.

Step 2 Generate an SSH key. If you select the RSA algorithm, run the following command to generate a key in Git Bash:

```
ssh-keygen -t rsa -b 4096 -C your_email@example.com
```

In the preceding command, **-t rsa** indicates that an RSA key is generated, **-b 4096** indicates the key length (which is more secure), and **-C your_email@example.com** indicates that comments are added to the generated public key file to help identify the purpose of the key pair.

If you select the ED25519 algorithm, run the following command to generate a key in Git Bash:


```
ssh-keygen -t ed25519 -b 521 -C your_email@example.com
```

In the preceding command, **-t ed25519** indicates that an ED25519 key is generated, **-b 521** indicates the key length (which is more secure), and **-C your_email@example.com** indicates that comments are added to the generated public key file to help identify the purpose of the key pair.

Press **Enter**. The key is stored in **~/.ssh/id_rsa** or **~/.ssh/id_ed25519** by default, the corresponding public key file is **~/.ssh/id_rsa.pub** or **~/.ssh/id_ed25519.pub**.

Step 3 Copy the SSH public key to the clipboard. Run the corresponding command based on your operating system to copy the SSH public key to your clipboard.

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

Step 4 Log in to Repo and go to the code repository list page. Click the alias in the upper right corner and choose **This Account Settings** > **Repo** > **SSH Keys**. The **SSH Keys** page is displayed.

You can also click **Set SSH Keys** in the upper right corner of the code repository list page. The **SSH Keys** page is displayed.

Step 5 In **Key Name**, enter a name for your new key. Paste the SSH public key copied in **Step 3** to **Key** and click **OK**. The message "The key has been set successfully. Click Return immediately, automatically jump after 3s without operation" is displayed, indicating that the key is set successfully.

----End

Migrating GitLab Intranet Repositories to CodeArts Repo in Batches

Step 1 Go to **Python official website** to download and install Python3.

Step 2 Log in to GitLab and obtain private_token. In **User settings**, choose **Access Tokens** > **Add new token**.

Step 3 You need to generate an SSH public key locally and configure it in GitLab and CodeArts Repo. For details about how to configure it in CodeArts Repo, see **Configuring the SSH Public Key for Accessing CodeArts Repo**.

Step 4 Call the API for **obtaining a user token (using a password)**. Use the password of your account to obtain a user token. Click the request example button on the right of the API debugging page, set parameters, click the debug button, and copy and save the obtained user token to the local host.

Step 5 Use the obtained user token to configure the **config.json** file. **source_host_url** indicates the GitLab API address on your intranet, and **repo_api_prefix** indicates the open API address of CodeArts Repo.

```
{
    "source_host_url": "http://{source_host}/api/v4/projects?simple=true",
    "private_token": "private_token obtained from GitLab",
    "repo_api_prefix": "https://${open_api}",
    "x_auth_token": " User Token"
}
```


Step 6 Log in to the **CodeArts console**, click , select a region, and click **Access Service**.

Step 7 On the CodeArts homepage, click **Create Project**, and select **Scrum**. If there is no project on the homepage, click **Select** on the **Scrum** card. After creating a project, save the project ID.

Step 8 Use the obtained project ID to configure the **plan.json** file. The following example shows the migration configuration of two code repositories. You can configure the file as required. **g1/g2/g3** indicates the repository group path. If the path is not pre-created, it will be automatically generated according to the configuration.

```
[
   ["path_with_namespace", "Project ID", "g1/g2/g3/Target repository name 1"],
      ["path_with_namespace", "Project ID", "g1/g2/g3/Target repository name 2"]
]
```

NOTE

- To create a repository group, go to the CodeArts Repo homepage, click the drop-down list box next to **New Repository**, and select **New Repository Group**.
- Repository name: Start with a letter, digit, or underscore (_), and use letters, digits, hyphens (-), underscores (_), and periods (.). Do not end with .git, .atom, or periods (.).

Step 9 On the local Python console, create a **migrate_to_repo.py** file.

```
#!/usr/bin/python
# -*- coding: UTF-8 -*-
import json
import logging
import os
import subprocess
import time
import urllib.parse
import urllib.request
from logging import handlers

# Skip creating a repository with the same name.
SKIP_SAME_NAME_REPO = True

STATUS_OK = 200
STATUS_CREATED = 201
STATUS_INTERNAL_SERVER_ERROR = 500
STATUS_NOT_FOUND = 404
HTTP_METHOD_POST = "POST"
CODE_UTF8 = 'utf-8'
FILE_SOURCE_REPO_INFO = 'source_repos.json'
FILE_TARGET_REPO_INFO = 'target_repos.json'
FILE_CONFIG = 'config.json'
FILE_PLAN = 'plan.json'
FILE_LOG = 'migrate.log'
X_AUTH_TOKEN = 'x-auth-token'


class Logger(object):
    def __init__(self, filename):
        format_str = logging.Formatter('%(asctime)s - %(pathname)s[line:%(lineno)d] - %(levelname)s: %
(message)s')
        self.logger = logging.getLogger(filename)
        self.logger.setLevel(logging.INFO)
        sh = logging.StreamHandler()
        sh.setFormatter(format_str)
        th = handlers.TimedRotatingFileHandler(filename=filename, when='D', backupCount=3,
encoding=CODE_UTF8)
        th.setFormatter(format_str)
        self.logger.addHandler(sh)
        self.logger.addHandler(th)
```



```
log = Logger(FILE_LOG)


def make_request(url, data={}, headers={}, method='GET'):
    headers["Content-Type"] = 'application/json'
    headers['Accept-Charset'] = CODE_UTF8
    params = json.dumps(data)
    params = bytes(params, 'utf8')
    try:
        import ssl
        ssl._create_default_https_context = ssl._create_unverified_context
        request = urllib.request.Request(url, data=params, headers=headers, method=method)
        r = urllib.request.urlopen(request)
        if r.status != STATUS_OK and r.status != STATUS_CREATED:
            log.logger.error('request error: ' + str(r.status))
            return r.status, ""
    except urllib.request.HTTPError as e:
        log.logger.error('request with code: ' + str(e.code))
        msg = str(e.read().decode(CODE_UTF8))
        log.logger.error('request error: ' + msg)
        return STATUS_INTERNAL_SERVER_ERROR, msg
    content = r.read().decode(CODE_UTF8)
    return STATUS_OK, content


def read_migrate_plan():
    log.logger.info('read_migrate_plan start')
    with open(FILE_PLAN, 'r') as f:
        migrate_plans = json.load(f)
    plans = []
    for m_plan in migrate_plans:
        if len(m_plan) != 3:
            log.logger.error("line format not match \"source_path_with_namespace\",\"project_id
\",\"target_namespace\"")
            return STATUS_INTERNAL_SERVER_ERROR, []
        namespace = m_plan[2].split("/")
        if len(namespace) < 1 or len(namespace) > 4:
            log.logger.error("group level support 0 to 3")
            return STATUS_INTERNAL_SERVER_ERROR, []
        l = len(namespace)
        plan = {
            "path_with_namespace": m_plan[0],
            "project_id": m_plan[1],
            "groups": namespace[0:l - 1],
            "repo_name": namespace[l - 1]
        }
        plans.append(plan)
    return STATUS_OK, plans


def get_repo_by_plan(namespace, repos):
    if namespace not in repos:
        log.logger.info("%s not found in gitlab, skip" % namespace)
        return STATUS_NOT_FOUND, {}

    repo = repos[namespace]
    return STATUS_OK, repo


def repo_info_from_source(config):
    if os.path.exists(FILE_SOURCE_REPO_INFO):
        log.logger.info('get_repos skip: %s already exist' % FILE_SOURCE_REPO_INFO)
        return STATUS_OK

    log.logger.info('get_repos start')
    headers = {'PRIVATE-TOKEN': config['private_token']}
    url = config['source_host_url']
    per_page = 100
    page = 1
```



```
    data = {}

    while True:
        url_with_page = "%s&page=%s&per_page=%s" % (url, page, per_page)
        status, content = make_request(url_with_page, headers=headers)
        if status != STATUS_OK:
            return status
        repos = json.loads(content)
        for repo in repos:
            namespace = repo['path_with_namespace']
            repo_info = {'name': repo['name'], 'id': repo['id'], 'path_with_namespace': namespace,
                         'ssh_url': repo['ssh_url_to_repo']}
            data[namespace] = repo_info
        if len(repos) < per_page:
            break
        page = page + 1

    with open(FILE_SOURCE_REPO_INFO, 'w') as f:
        json.dump(data, f, indent=4)
    log.logger.info('get_repos end with %s' % len(data))
    return STATUS_OK


def get_repo_dir(repo):
    return "repo_%s" % repo['id']


def exec_cmd(cmd, ssh_url, dir_name):
    log.logger.info("will exec %s %s" % (cmd, ssh_url))
    pr = subprocess.Popen(cmd + " " + ssh_url, cwd=dir_name, shell=True, stdout=subprocess.PIPE,
stderr=subprocess.PIPE)
    (out, error) = pr.communicate()
    log.logger.info("stdout of %s is:%s" % (cmd, str(out)))
    log.logger.info("stderr of %s is:%s" % (cmd, str(error)))
    if "Error" in str(error) or "err" in str(error) or "failed" in str(error):
        log.logger.error("%s failed" % cmd)
        return STATUS_INTERNAL_SERVER_ERROR
    return STATUS_OK


def clone_from_source(config, plans):
    log.logger.info('clone_repos start')
    with open(FILE_SOURCE_REPO_INFO, 'r') as f:
        repos = json.load(f)
    for plan in plans:
        status, repo = get_repo_by_plan(plan["path_with_namespace"], repos)
        if status == STATUS_NOT_FOUND:
            return status

        name = repo["name"]
        dir_name = get_repo_dir(repo)
        folder = os.path.exists(dir_name)
        if folder:
            log.logger.info("skip clone " + name)
            continue
        os.makedirs(dir_name)
        status = exec_cmd("git clone --mirror", repo['ssh_url'], dir_name)
        if status != STATUS_OK:
            return status
    log.logger.info('clone_repos end')
    return STATUS_OK


def get_groups(config, project_id):
    log.logger.info('get_groups start')
    headers = {X_AUTH_TOKEN: config['x_auth_token']}
    api_prefix = config['repo_api_prefix']
    limit = 100
    offset = 0
```



```
    data = {}
    while True:
        url_with_page = "%s/v4/%s/manageable-groups?offset=%s&limit=%s" % (api_prefix, project_id, offset,
limit)
        status, content = make_request(url_with_page, headers=headers)
        if status != STATUS_OK:
            return status, dict()
        rows = json.loads(content)
        for row in rows:
            full_name = row['full_name']
            data[full_name] = row
        if len(rows) < limit:
            break
        offset = offset + len(rows)
    log.logger.info('get_groups end with %s' % len(data))
    return STATUS_OK, data


def create_group(config, project_id, name, parent, has_parent):
    log.logger.info('create_group start')
    headers = {X_AUTH_TOKEN: config['x_auth_token']}
    api_prefix = config['repo_api_prefix']
    data = {
        'name': name,
        'visibility': 'private',
        'description': ''
    }
    if has_parent:
        data['parent_id'] = parent['id']

    url = "%s/v4/%s/groups" % (api_prefix, project_id)
    status, content = make_request(url, data=data, headers=headers, method='POST')
    if status != STATUS_OK:
        log.logger.error('create_group error: %s', str(status))
        return status
    return STATUS_OK


# Specify a repository group to create a repository.
def create_repo(config, project_id, name, parent, has_parent):
    log.logger.info('create_repo start')
    headers = {X_AUTH_TOKEN: config['x_auth_token']}
    api_prefix = config['repo_api_prefix']
    data = {
        'name': name,
        'project_uuid': project_id,
        'enable_readme': 0
    }
    if has_parent:
        data['group_id'] = parent['id']
    url = "%s/v1/repositories" % api_prefix
    status, content = make_request(url, data=data, headers=headers, method='POST')
    if "repository or repository group with the same name" in content:
        log.logger.info("repo %s already exist. %s" % (name, content))
        log.logger.info("skip same name repo %s: %s" % (name, SKIP_SAME_NAME_REPO))
        return check_repo_conflict(config, project_id, parent, name)
    elif status != STATUS_OK:
        log.logger.error('create_repo error: %s', str(status))
        return status, ""
    response = json.loads(content)
    repo_uuid = response["result"]["repository_uuid"]

    # Check after the creation.
    for retry in range(1, 4):
        status, ssh_url = get_repo_detail(config, repo_uuid)
        if status != STATUS_OK:
            if retry == 3:
                return status, ""
            time.sleep(retry * 2)
```



```
            continue
        break

    return STATUS_OK, ssh_url


def check_repo_conflict(config, project_id, group, name):
    if not SKIP_SAME_NAME_REPO:
        return STATUS_INTERNAL_SERVER_ERROR, ""

    log.logger.info('check_repo_conflict start')
    headers = {X_AUTH_TOKEN: config['x_auth_token']}
    api_prefix = config['repo_api_prefix']
    url_with_page = "%s/v2/projects/%s/repositories?search=%s" % (api_prefix, project_id, name)
    status, content = make_request(url_with_page, headers=headers)
    if status != STATUS_OK:
        return status, ""
    rows = json.loads(content)
    for row in rows["result"]["repositories"]:
        if "full_name" in group and "group_name" in row:
            g = group["full_name"].replace(" ", "")
            if row["group_name"].endswith(g):
                return STATUS_OK, row["ssh_url"]
        elif "full_name" not in group and name == row['repository_name']:
            # For scenarios with no repository group.
            return STATUS_OK, row["ssh_url"]

    log.logger.info('check_repo_conflict end, failed to find: %s' % name)
    return STATUS_INTERNAL_SERVER_ERROR, ""


def get_repo_detail(config, repo_uuid):
    log.logger.info('get_repo_detail start')
    headers = {X_AUTH_TOKEN: config['x_auth_token']}
    api_prefix = config['repo_api_prefix']
    url_with_page = "%s/v2/repositories/%s" % (api_prefix, repo_uuid)
    status, content = make_request(url_with_page, headers=headers)
    if status != STATUS_OK:
        return status, ""
    rows = json.loads(content)
    log.logger.info('get_repo_detail end')
    return STATUS_OK, rows["result"]["ssh_url"]


def process_plan(config, plan):
    # Obtain the repository group list of a project.
    project_id = plan["project_id"]
    status, group_dict = get_groups(config, project_id)
    if status != STATUS_OK:
        return status, ""
    group = ""
    last_group = {}
    has_group = False
    for g in plan["groups"]:
        # Check the target repository group. If the target repository group exists, check the next layer.
        if group == "":
            group = " %s" % g
        else:
            group = "%s / %s" % (group, g)
        if group in group_dict:
            last_group = group_dict[group]
            has_group = True
            continue
        # If the file does not exist, create one and update it.
        status = create_group(config, project_id, g, last_group, has_group)
        if status != STATUS_OK:
            return status, ""
        status, group_dict = get_groups(config, project_id)
        if status != STATUS_OK:
```



```
            return status, ""
        last_group = group_dict[group]
        has_group = True

    status, ssh_url = create_repo(config, project_id, plan["repo_name"], last_group, has_group)
    if status != STATUS_OK:
        return status, ""

    return status, ssh_url


def create_group_and_repos(config, plans):
    if os.path.exists(FILE_TARGET_REPO_INFO):
        log.logger.info('create_group_and_repos skip: %s already exist' % FILE_TARGET_REPO_INFO)
        return STATUS_OK

    log.logger.info('create_group_and_repos start')
    with open(FILE_SOURCE_REPO_INFO, 'r') as f:
        repos = json.load(f)
        target_repo_info = {}
    for plan in plans:
        status, ssh_url = process_plan(config, plan)
        if status != STATUS_OK:
            return status

        status, repo = get_repo_by_plan(plan["path_with_namespace"], repos)
        if status == STATUS_NOT_FOUND:
            return
        repo['codehub_sshUrl'] = ssh_url
        target_repo_info[repo['path_with_namespace']] = repo

    with open(FILE_TARGET_REPO_INFO, 'w') as f:
        json.dump(target_repo_info, f, indent=4)
    log.logger.info('create_group_and_repos end')
    return STATUS_OK


def push_to_target(config, plans):
    log.logger.info('push_repos start')
    with open(FILE_TARGET_REPO_INFO, 'r') as f:
        repos = json.load(f)
    for r in repos:
        repo = repos[r]
        name = repo["name"]
        dir_name = get_repo_dir(repo)

        status = exec_cmd("git config remote.origin.url", repo['codehub_sshUrl'], dir_name + "/" + name +
".git")
        if status != STATUS_OK:
            log.logger.error("%s git config failed" % name)
            return

        status = exec_cmd("git push --mirror -f", "", dir_name + "/" + name + ".git")
        if status != STATUS_OK:
            log.logger.error("%s git push failed" % name)
            return
    log.logger.info('push_repos end')


def main():
    with open(FILE_CONFIG, 'r') as f:
        config = json.load(f)
    # read plan
    status, plans = read_migrate_plan()
    if status != STATUS_OK:
        return
    # Obtain the list of self-built GitLab repositories and export the result to the FILE_SOURCE_REPO_INFO
file.
    if repo_info_from_source(config) != STATUS_OK:
```



```
        return
    # Clone the repository to your local host.
    status = clone_from_source(config, plans)
    if status != STATUS_OK:
        return

    # Call the CodeArts API to create a repository and record its address in the FILE_SOURCE_REPO_INFO file.
    if create_group_and_repos(config, plans) != STATUS_OK:
        return

    # Push code using SSH. Configure the SSH key in CodeArts Repo first.
    push_to_target(config, plans)


if __name__ == '__main__':
    main()
```

Step 10 Run the following command to start the script and migrate code repositories in batches:

```
python migrate_to_repo.py
```

----End

3 Importing Local Repositories to CodeArts Repo in Batches

Overview

Currently, CodeArts Repo only support a single repo import from the public network. There is no quick solution for migrating local repositories to CodeArts Repo. Therefore, we provide a script for migrating local repositories to CodeArts Repo in batches.

Preparations

Step 1 Go to **Python official website** to download and install Python3.

Step 2 Call the API for **obtaining a user token (using a password)**. Use the password of your account to obtain a user token. Click the request example button on the right of the API debugging page, set parameters, click the debug button, and copy and save the obtained user token to the local host.

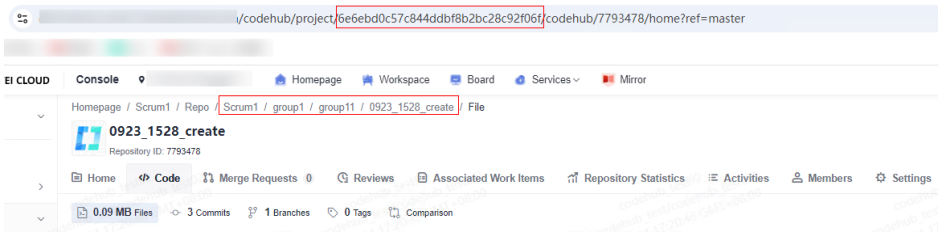
Step 3 Use the obtained user token to configure the **config.json** file. **repo_api_prefix** indicates the open API address of CodeArts Repo.

```
{
   "repo_api_prefix": "https://${open_api}",
   "x_auth_token": " User Token"
}
```

Step 4 Log in to the **CodeArts console**, click , select a region, and click **Access Service**.

Step 5 On the CodeArts homepage, click **Create Project**, and select **Scrum**. If there is no project on the homepage, click **Select** on the **Scrum** card. After creating a project, save the project ID.

Step 6 Configure the **plan.json** file using the obtained project ID. The following example shows the migration configurations of the two code repositories. You can configure them as required. In the following figure, g1/g2 indicates the repo group path. For details about how to create a path, see **NOTE**. This figure shows how to obtain the project ID and *project name/g1/g2/target repo name 1* on the CodeArts Repo page.



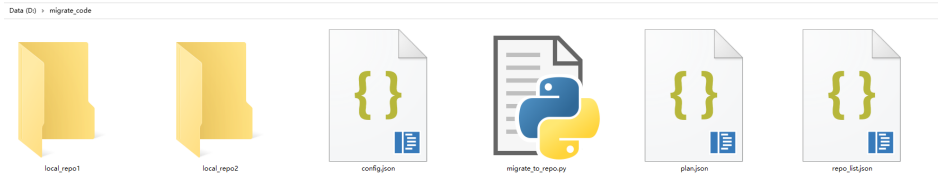

```
[
   ["Project name/g1/g2/Target repo name 1," "Project ID," "Project name/g1/g2/Target repo name 1"],
      ["Project name/g1/g2/Target repo name 2," "Project ID," "Project name/g1/g2/Target repo name 2"]
]
```

NOTE

- To create a repository group, go to the CodeArts Repo homepage, click the drop-down list box next to **New Repository**, and select **New Repository Group**.
- Repository name: Start with a letter, digit, or underscore (_), and use letters, digits, hyphens (-), underscores (_), and periods (.). Do not end with .git, .atom, or periods (.).

Step 7 Add a configuration file named **repo_list.json**.

In this file, **local_dir** indicates the path of the target repository to which the code file in a local directory is uploaded. You must upload a complete Git repository and it must be in the same directory as **migrate_to_repo.py**. As shown in the following figure, **local_repo1** and **local_repo2** indicate the local Git repositories to be uploaded. That is, the values of **local_dir** and **local_dir** are **local_repo1** and **local_repo2**, respectively.



In the following code example, **g1/g2** indicates the repo group path. For details about how to obtain the project ID, see **Obtaining a Project ID**.

```
[
   {
      "id": "Project ID",
      "namespace":"Project name/g1/g2/target repo name 1"
      "local_dir": "Local path 1 of Git repository"
   },
   {
      "id": "Project ID",
      "namespace":"Project name/g1/g2/target repo name 2"
      "local_dir": "Local path 2 of Git repository"
   }
]
```

Step 8 On the local Python console, create a **migrate_to_repo.py** file.

```
#!/usr/bin/python
# -*- coding: UTF-8 -*-
import json
import logging
import os
import subprocess
import time
import urllib.parse
import urllib.request
import argparse
```



```
from logging import handlers


# Skip creating a repository with the same name.
SKIP_SAME_NAME_REPO = True
STATUS_OK = 200
STATUS_CREATED = 201
STATUS_INTERNAL_SERVER_ERROR = 500
STATUS_NOT_FOUND = 404
HTTP_METHOD_POST = "POST"
CODE_UTF8 = 'utf-8'
FILE_SOURCE_REPO_INFO = 'source_repos.json'
FILE_SOURCE_REPO_INFO_TXT = 'source_repos.txt'
FILE_TARGET_REPO_INFO = 'target_repos.json'
FILE_CONFIG = 'config.json'
FILE_PLAN = 'plan.json'
FILE_LOG = 'migrate.log'
FILE_REPO_LIST = 'repo_list.json'
X_AUTH_TOKEN = 'x-auth-token'
LOG_FORMAT = '%(asctime)s - %(pathname)s[line:%(lineno)d] - %(levelname)s: %(message)s'


class Logger(object):
    def __init__(self, filename):
        format_str = logging.Formatter(LOG_FORMAT)
        self.logger = logging.getLogger(filename)
        self.logger.setLevel(logging.INFO)
        sh = logging.StreamHandler()
        sh.setFormatter(format_str)
        th = handlers.TimedRotatingFileHandler(
            filename=filename,
            when='D',
            backupCount=3,
            encoding=CODE_UTF8
        )
        th.setFormatter(format_str)
        self.logger.addHandler(sh)
        self.logger.addHandler(th)
log = Logger(FILE_LOG)


def make_request(url, data={}, headers={}, method='GET'):
    headers["Content-Type"] = 'application/json'
    headers['Accept-Charset'] = CODE_UTF8
    params = json.dumps(data)
    params = bytes(params, 'utf8')
    try:
        import ssl
        ssl._create_default_https_context = ssl._create_unverified_context
        request = urllib.request.Request(
            url,
            data=params,
            headers=headers,
            method=method
        )
        r = urllib.request.urlopen(request)
        if r.status != STATUS_OK and r.status != STATUS_CREATED:
            log.logger.error('request error: ' + str(r.status))
            return r.status, ""
    except urllib.request.HTTPError as e:
        log.logger.error('request with code: ' + str(e.code))
        msg = str(e.read().decode(CODE_UTF8))
        log.logger.error('request error: ' + msg)
        return STATUS_INTERNAL_SERVER_ERROR, msg
    except Exception as e:
        log.logger.info("request failed, e is %s", e)
        return STATUS_INTERNAL_SERVER_ERROR, "request failed"
    content = r.read().decode(CODE_UTF8)
    return STATUS_OK, content
```



```
def read_migrate_plan():
    log.logger.info('read_migrate_plan start')
    try:
        with open(FILE_PLAN, 'r') as f:
            migrate_plans = json.load(f)
    except Exception as e:
        log.logger.info("load plan.json, e is %s", e)
        return STATUS_INTERNAL_SERVER_ERROR, []
    plans = []
    for m_plan in migrate_plans:
        if len(m_plan) != 3:
            log.logger.error(
                "please check plan.json file"
            )
            return STATUS_INTERNAL_SERVER_ERROR, []
        namespace = m_plan[2].split("/")
        namespace_len = len(namespace)
        if namespace_len < 1 or namespace_len > 4:
            log.logger.error("group level support 0 to 3")
            return STATUS_INTERNAL_SERVER_ERROR, []
        plan = {
            "path_with_namespace": m_plan[0],
            "project_id": m_plan[1],
            "groups": namespace[0:namespace_len - 1],
            "repo_name": namespace[namespace_len - 1]
        }
        plans.append(plan)
    return STATUS_OK, plans


def get_repo_by_plan(namespace, repos):
    if namespace not in repos:
        log.logger.info("%s not found in gitlab, skip" % namespace)
        return STATUS_NOT_FOUND, {}
    repo = repos[namespace]
    return STATUS_OK, repo


def repo_info_from_source(source_host_url, private_token, protocol):
    log.logger.info('get repos by api start')
    headers = {'PRIVATE-TOKEN': private_token}
    url = source_host_url
    per_page = 100
    page = 1
    data = {}
    while True:
        url_with_page = "%s&page=%s&per_page=%s" % (url, page, per_page)
        status, content = make_request(url_with_page, headers=headers)
        if status != STATUS_OK:
            return status
        repos = json.loads(content)
        for repo in repos:
            namespace = repo['path_with_namespace']
            repo_info = {
                'id': repo['id'],
                'name': repo['name'],
                'path_with_namespace': namespace
            }
            if protocol == "ssh":
                repo_info["clone_url"] = repo["ssh_url_to_repo"]
            else:
                repo_info["clone_url"] = repo["http_url_to_repo"]
            data[namespace] = repo_info
        if len(repos) < per_page:
            break
        page = page + 1
    try:
```



```
        with open(FILE_SOURCE_REPO_INFO, 'w') as f:
            json.dump(data, f, indent=4)
    except Exception as e:
        log.logger.info("load source_repos.json, e is %s", e)
        return STATUS_INTERNAL_SERVER_ERROR
    log.logger.info('get_repos end with %s' % len(data))
    return STATUS_OK


def repo_info_from_file():
    log.logger.info('get repos by file start')
    data = {}
    try:
        with open(FILE_REPO_LIST, 'r') as f:
            repos = json.load(f)
    except Exception as e:
        log.logger.info("load repo_list.json, e is %s", e)
        return STATUS_INTERNAL_SERVER_ERROR
    for index, repo in enumerate(repos):
        if repo.get("id") is None:
            log.logger.error("line format not match id")
        if repo.get("namespace") is None:
            log.logger.error("line format not match namespace")
            return STATUS_INTERNAL_SERVER_ERROR
        if repo.get("local_dir") is None:
            log.logger.error("line format not match local_dir ")
            return STATUS_INTERNAL_SERVER_ERROR
        if not os.path.exists(repo.get("local_dir")):
            log.logger.warning("local dir %s non-existent" % repo.get("local_dir"))
            continue
        namespace = repo.get("namespace")
        repo_info = {
            'id': repo.get("id"),
            'name': namespace.split("/")[-1],
            'path_with_namespace': namespace,
            'clone_url': "",
            'local_dir': repo.get("local_dir")
        }
        data[namespace] = repo_info
    try:
        with open(FILE_SOURCE_REPO_INFO, 'w') as f:
            json.dump(data, f, indent=4)
    except Exception as e:
        log.logger.info("load source_repos.json, e is %s", e)
        return STATUS_INTERNAL_SERVER_ERROR
    log.logger.info('get_repos end with %s' % len(data))
    return STATUS_OK


def get_repo_dir(repo):
    return "repo_%s" % repo['id']


def exec_cmd(cmd, ssh_url, dir_name):
    log.logger.info("will exec %s %s" % (cmd, ssh_url))
    pr = subprocess.Popen(
        cmd + " " + ssh_url,
        cwd=dir_name,
        shell=True,
        stdout=subprocess.PIPE,
        stderr=subprocess.PIPE
    )
    (out, error) = pr.communicate()
    log.logger.info("stdout of %s is:%s" % (cmd, str(out)))
    log.logger.info("stderr of %s is:%s" % (cmd, str(error)))
    if "Error" in str(error) or "err" in str(error) or "failed" in str(error):
        log.logger.error("%s failed" % cmd)
        return STATUS_INTERNAL_SERVER_ERROR
    return STATUS_OK
```



```
def clone_from_source(plans):
    log.logger.info('clone_repos start')
    with open(FILE_SOURCE_REPO_INFO, 'r') as f:
        repos = json.load(f)
    for plan in plans:
        status, repo = get_repo_by_plan(plan["path_with_namespace"], repos)
        if status == STATUS_NOT_FOUND:
            return status
        name = repo["name"]
        dir_name = get_repo_dir(repo)
        folder = os.path.exists(dir_name)
        if folder:
            log.logger.info("skip clone " + name)
            continue
        os.makedirs(dir_name)
        status = exec_cmd("git clone --mirror", repo['clone_url'], dir_name)
        if status != STATUS_OK:
            return status
    log.logger.info('clone_repos end')
    return STATUS_OK


def get_groups(config, project_id):
    log.logger.info('get_groups start')
    headers = {X_AUTH_TOKEN: config['x_auth_token']}
    api_prefix = config['repo_api_prefix']
    limit = 100
    offset = 0
    data = {}
    while True:
        url_with_page = "%s/v4/%s/manageable-groups?offset=%s&limit=%s" % (
            api_prefix,
            project_id,
            offset,
            limit
        )
        status, content = make_request(url_with_page, headers=headers)
        print(url_with_page, status, content)
        if status != STATUS_OK:
            return status, dict()
        rows = json.loads(content)
        for row in rows:
            full_name = row['full_name']
            data[full_name] = row
        if len(rows) < limit:
            break
        offset = offset + len(rows)
    log.logger.info('get_groups end with %s' % len(data))
    return STATUS_OK, data


def create_group(config, project_id, name, parent, has_parent):
    log.logger.info('create_group start')
    headers = {X_AUTH_TOKEN: config['x_auth_token']}
    api_prefix = config['repo_api_prefix']
    data = {
        'name': name,
        'visibility': 'private',
        'description': ''
    }
    if has_parent:
        data['parent_id'] = parent['id']
    url = "%s/v4/%s/groups" % (api_prefix, project_id)
    status, content = make_request(
        url,
        data=data,
        headers=headers,
```



```
        method='POST'
    )
    if status != STATUS_OK:
        log.logger.error('create_group error: %s', str(status))
        return status
    return STATUS_OK


# Specify a repository group to create a repository.
def create_repo(config, project_id, name, parent, has_parent):
    log.logger.info('create_repo start')
    headers = {X_AUTH_TOKEN: config['x_auth_token']}
    api_prefix = config['repo_api_prefix']
    data = {
        'name': name,
        'project_uuid': project_id,
        'enable_readme': 0
    }
    if has_parent:
        data['group_id'] = parent['id']
    url = "%s/v1/repositories" % api_prefix
    status, content = make_request(
        url,
        data=data,
        headers=headers,
        method='POST'
    )
    if "repository or repository group with the same name" in content:
        log.logger.info("repo %s already exist. %s" % (name, content))
        log.logger.info("skip same name repo %s: %s" % (
            name,
            SKIP_SAME_NAME_REPO
            )
        )
        return check_repo_conflict(config, project_id, parent, name)
    elif status != STATUS_OK:
        log.logger.error('create_repo error: %s', str(status))
        return status, ""
    response = json.loads(content)
    repo_uuid = response["result"]["repository_uuid"]
    # Check after the creation.
    for retry in range(1, 4):
        status, ssh_url = get_repo_detail(config, repo_uuid)
        if status != STATUS_OK:
            if retry == 3:
                return status, ""
            time.sleep(retry * 2)
            continue
        break
    return STATUS_OK, ssh_url


def check_repo_conflict(config, project_id, group, name):
    if not SKIP_SAME_NAME_REPO:
        return STATUS_INTERNAL_SERVER_ERROR, ""
    log.logger.info('check_repo_conflict start')
    headers = {X_AUTH_TOKEN: config['x_auth_token']}
    api_prefix = config['repo_api_prefix']
    url_with_page = "%s/v2/projects/%s/repositories?search=%s" % (
        api_prefix,
        project_id,
        name
    )
    status, content = make_request(url_with_page, headers=headers)
    if status != STATUS_OK:
        return status, ""
    rows = json.loads(content)
    for row in rows["result"]["repositories"]:
        if "full_name" in group and "group_name" in row:
```



```
            g = group["full_name"].replace(" ", "")
            if row["group_name"].endswith(g):
                return STATUS_OK, row["ssh_url"]
        elif "full_name" not in group and name == row['repository_name']:
            # For scenarios with no repository group.
            return STATUS_OK, row["ssh_url"]
    log.logger.info('check_repo_conflict end, failed to find: %s' % name)
    return STATUS_INTERNAL_SERVER_ERROR, ""


def get_repo_detail(config, repo_uuid):
    log.logger.info('get_repo_detail start')
    headers = {X_AUTH_TOKEN: config['x_auth_token']}
    api_prefix = config['repo_api_prefix']
    url_with_page = "%s/v2/repositories/%s" % (api_prefix, repo_uuid)
    status, content = make_request(url_with_page, headers=headers)
    if status != STATUS_OK:
        return status, ""
    rows = json.loads(content)
    log.logger.info('get_repo_detail end')
    return STATUS_OK, rows["result"]["ssh_url"]


def process_plan(config, plan):
    # Obtain the repository group list of a project.
    project_id = plan["project_id"]
    status, group_dict = get_groups(config, project_id)
    if status != STATUS_OK:
        return status, ""
    group = ""
    last_group = {}
    has_group = False
    for g in plan["groups"]:
        # Check the target repository group. If the target repository group exists, check the next layer.
        if group == "":
            group = " %s" % g
        else:
            group = "%s / %s" % (group, g)
        if group in group_dict:
            last_group = group_dict[group]
            has_group = True
            continue
        # If the file does not exist, create one and update it.
        status = create_group(config, project_id, g, last_group, has_group)
        if status != STATUS_OK:
            return status, ""
        status, group_dict = get_groups(config, project_id)
        if status != STATUS_OK:
            return status, ""
        last_group = group_dict[group]
        has_group = True
    status, ssh_url = create_repo(
        config,
        project_id,
        plan["repo_name"],
        last_group,
        has_group
    )
    if status != STATUS_OK:
        return status, ""
    return status, ssh_url


def create_group_and_repos(config, plans):
    if os.path.exists(FILE_TARGET_REPO_INFO):
        log.logger.info(
            '%s skip: %s already exist' % (
                "create_group_and_repos",
                FILE_TARGET_REPO_INFO
```



```
            )
        )
        return STATUS_OK
    log.logger.info('create_group_and_repos start')
    with open(FILE_SOURCE_REPO_INFO, 'r') as f:
        repos = json.load(f)
        target_repo_info = {}
    for plan in plans:
        status, ssh_url = process_plan(config, plan)
        if status != STATUS_OK:
            return status
        status, repo = get_repo_by_plan(plan["path_with_namespace"], repos)
        if status == STATUS_NOT_FOUND:
            return
        repo['codehub_sshUrl'] = ssh_url
        target_repo_info[repo['path_with_namespace']] = repo
    with open(FILE_TARGET_REPO_INFO, 'w') as f:
        json.dump(target_repo_info, f, indent=4)
    log.logger.info('create_group_and_repos end')
    return STATUS_OK


def push_to_target():
    log.logger.info('push_repos start')
    with open(FILE_TARGET_REPO_INFO, 'r') as f:
        repos = json.load(f)
    for r in repos:
        repo = repos[r]
        name = repo["name"]
        dir_name = get_repo_dir(repo)
        status = exec_cmd(
            "git config remote.origin.url",
            repo['codehub_sshUrl'],
            dir_name + "/" + name + ".git"
        )
        if status != STATUS_OK:
            log.logger.error("%s git config failed" % name)
            return
        status = exec_cmd("git push --mirror -f", "", dir_name + "/" + name + ".git")
        if status != STATUS_OK:
            log.logger.error("%s git push failed" % name)
            return
    log.logger.info('push_repos end')


def push_to_target_with_local():
    log.logger.info('push_repos start')
    with open(FILE_TARGET_REPO_INFO, 'r') as f:
        repos = json.load(f)
    for r in repos:
        repo = repos[r]
        dir_name = repo["local_dir"]
        status = exec_cmd(
            "git config remote.origin.url",
            repo['codehub_sshUrl'],
            dir_name
        )
        if status != STATUS_OK:
            log.logger.error("%s git config failed" % dir_name)
            return
        status = exec_cmd("git push --all -f", "", dir_name)
        if status != STATUS_OK:
            log.logger.error("%s git push failed" % dir_name)
            return
    log.logger.info('push_repos end')


def get_args_from_command_line(args_list):
    # Parse CLI parameters.
```



```
    parser = argparse.ArgumentParser()
    parser.add_argument(
        '-p',
        '--protocol',
        dest='protocol',
        default="SSH",
        choices=['SSH', 'HTTP', "ssh", "http"],
        required=False,
        help='protocol specified for clone or push'
    )
    parser.add_argument(
        '-m',
        '--mode',
        dest='mode',
        default="FILE",
        choices=['FILE', "file"],
        required=False,
        help='import mode'
    )
    return parser.parse_args(args_list)


if __name__ == '__main__':
    if not os.path.exists(FILE_CONFIG):
        log.logger.info("config.json must be present")
        exit(1)
    if not os.path.exists(FILE_PLAN):
        log.logger.info("plan.json must be present")
        exit(1)

    # Obtain the mapping, repo information, and namespace.
    status, plans = read_migrate_plan()
    if status != STATUS_OK:
        log.logger.info("load plan.json failed")
        exit(1)

    # Load the configuration file.
    try:
        with open(FILE_CONFIG, 'r') as f:
            config = json.load(f)
    except Exception as e:
        log.logger.info("load config.json, e is %s", e)
        exit(1)
    if config.get("repo_api_prefix") is None:
        log.logger.error("config.json not match repo_api_prefix")
        exit(1)
    if config.get("x_auth_token") is None:
        log.logger.error("config.json not match x_auth_token")
        exit(1)

    args = get_args_from_command_line(None)
    protocol = args.protocol
    mode = args.mode
    if mode.lower() == "api":
        log.logger.error("not allow mode is api")
        exit(1)
        if config.get("source_host_url") is None:
            log.logger.error("config.json not match source_host_url")
            exit(1)
        if config.get("private_token") is None:
            log.logger.error("config.json not match private_token")
            exit(1)
        if repo_info_from_source(
            config["source_host_url"],
            config["private_token"],
            protocol.lower()
        ) != STATUS_OK:
            exit(1)
        try:
```



```
        # Clone the repository to your local host.
        status = clone_from_source(plans)
        if status != STATUS_OK:
            exit(1)
    except Exception as e:
        log.logger.info("clone_from_source fail, e is %s", e)
        exit(1)
else:
    if repo_info_from_file() != STATUS_OK:
        exit(1)

try:
    if create_group_and_repos(config, plans) != STATUS_OK:
        exit(1)
except Exception as e:
    log.logger.info("create_group_and_repos fail, e is %s", e)
    exit(1)

try:
    if mode.lower() == "api":
        push_to_target()
    else:
        push_to_target_with_local()
except Exception as e:
    log.logger.info("push_to_target fail, e is %s", e)
    exit(1)
```

----End

Configuring the SSH Public Key for Accessing CodeArts Repo

Step 1 Run Git Bash to check whether an SSH key has been generated locally.

If you select the RSA algorithm, run the following command in Git Bash:

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

If you select the ED255219 algorithm, run the following command in Git Bash:

```
cat ~/.ssh/id_ed25519.pub
```

- If **No such file or directory** is displayed, no SSH key has been generated on your computer. Go to **step 2**.
- If a character string starting with **ssh-rsa** or **ssh-ed25519** is returned, an SSH key has already been generated on your computer. If you want to use this key, go to **step 3**. If you want to generate a new key, go to **step 2**.

Step 2 Generate an SSH key. If you select the RSA algorithm, run the following command to generate a key in Git Bash:

```
ssh-keygen -t rsa -b 4096 -C your_email@example.com
```

In the preceding command, **-t rsa** indicates that an RSA key is generated, **-b 4096** indicates the key length (which is more secure), and **-C your_email@example.com** indicates that comments are added to the generated public key file to help identify the purpose of the key pair.

If you select the ED25519 algorithm, run the following command to generate a key in Git Bash:

```
ssh-keygen -t ed25519 -b 521 -C your_email@example.com
```

In the preceding command, **-t ed25519** indicates that an ED25519 key is generated, **-b 521** indicates the key length (which is more secure), and **-C your_email@example.com** indicates that comments are added to the generated public key file to help identify the purpose of the key pair.

Press **Enter**. The key is stored in **~/.ssh/id_rsa** or **~/.ssh/id_ed25519** by default, the corresponding public key file is **~/.ssh/id_rsa.pub** or **~/.ssh/id_ed25519.pub**.

Step 3 Copy the SSH public key to the clipboard. Run the corresponding command based on your operating system to copy the SSH public key to your clipboard.

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

Step 4 Log in to Repo and go to the code repository list page. Click the alias in the upper right corner and choose **This Account Settings** > **Repo** > **SSH Keys**. The **SSH Keys** page is displayed.

You can also click **Set SSH Keys** in the upper right corner of the code repository list page. The **SSH Keys** page is displayed.

Step 5 In **Key Name**, enter a name for your new key. Paste the SSH public key copied in **Step 3** to **Key** and click **OK**. The message "The key has been set successfully. Click Return immediately, automatically jump after 3s without operation" is displayed, indicating that the key is set successfully.

----End

Starting Migration in Batch

Step 1 Run the following commands to view the script parameters:

```
python migrate_to_repo.py -h

usage: migrate_to_repo.py [-h] [-p {SSH,HTTP,ssh,http}]
                          [-m {API,FILE,api,file}]

optional arguments:
  -h, --help            show this help message and exit
  -p {SSH,HTTP,ssh,http}, --protocol {SSH,HTTP,ssh,http}
                        protocol specified for clone or push
  -m {API,FILE,api,file}, --mode {API,FILE,api,file}
                        import mode

# Parameter description
# -p: Protocol. SSH by default. SSH, ssh, HTTP, and http are also supported.
```

----End

