Repo

Service Overview

Issue 01

Date 2024-07-01

HUAWEI CLOUD COMPUTING TECHNOLOGIES CO., LTD.

Trademarks and Permissions


and other Huawei trademarks are the property of Huawei Technologies Co., Ltd.
All other trademarks and trade names mentioned in this document are the property of their respective holders.

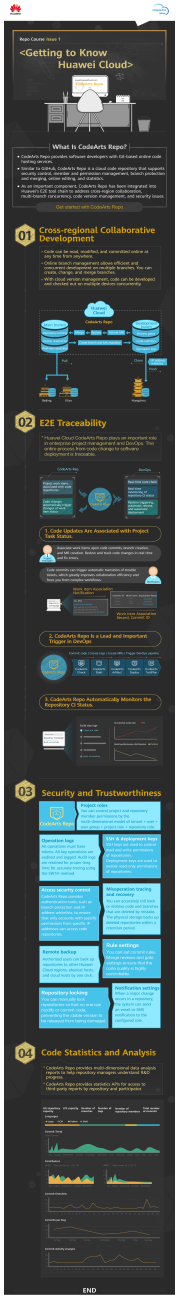
Notice

The purchased products, services and features are stipulated by the contract made between Huawei Cloud and the customer. All or part of the products, services and features described in this document may not be within the purchase scope or the usage scope. Unless otherwise specified in the contract, all statements, information, and recommendations in this document are provided "AS IS" without warranties, guarantees or representations of any kind, either express or implied.

The information in this document is subject to change without notice. Every effort has been made in the preparation of this document to ensure accuracy of the contents, but all statements, information, and recommendations in this document do not constitute a warranty of any kind, express or implied.

Contents

1 CodeArts Repo


Repo Course: Issue 1
<Getting to Know Huawei Cloud>
What Is CodeArts Repo?
Get started with CodeArts Repo
01 Cross-regional Collaborative Development
02 E2E Traceability
1. Code Updates Are Associated with Project Task Status.
2. CodeArts Repo Is a Lead and Important Trigger in DevOps
3. CodeArts Repo Automatically Monitors the Repository CI Status.
03 Security and Trustworthiness
Project roles
Branch rules
SSH & deployment keys
Operation tracing
Access security control
Risk settings
Remote backup
Repository backing
Notification settings
04 Code Statistics and Analysis
END

2 What Is CodeArts Repo?

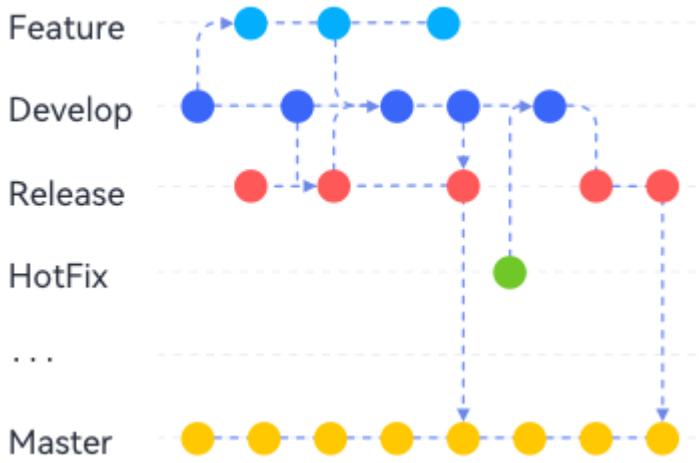
Overview

CodeArts Repo provides software developers with **Git**-based online code hosting services. It is a cloud code repository that supports security control, member and permission management, branch protection and merging, online editing, and statistics. The service aims to address cross-region collaboration, multi-branch concurrency, code version management, and security issues.

- Code can be read, modified, and committed online at any time from anywhere.
- Online branch management allows efficient concurrent development on multiple branches. You can create, change, and merge branches.
- Protected branches prevent pushes to the branches and prevent the branches from being incorrectly deleted.
- The Domain-level IP address whitelist and data transmissions via HTTPS block unauthorized code downloads to secure data.
- Passwords can be reset.

CodeArts Repo Working Mode

- CodeArts Repo uses GitFlow as the basic working mode.
- Following the rules suggested by GitFlow, small and medium-sized development teams can better manage their development.
  - **Concurrent development:** Features and patches are developed concurrently.
  - **Teamwork:** Developers are aware of the current work of other team members during collaboration.
  - **Flexibility:** Emergency fixes are developed on the hotfix branch.



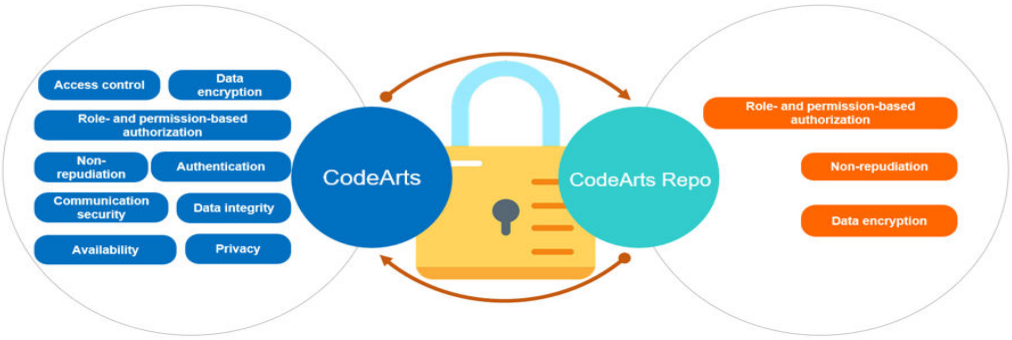
- **Master branch:** the most stable branch with complete features and code that can be released at any time.
- **Develop branch:** a permanent branch with the latest and most complete features. It contains all the code ready for the next release and is used to merge other branches.
- **Feature branch:** a branch for developing a new feature. Once the development is complete, the feature branch is merged into the develop branch for the next release after passing tests.
- **Release branch:** a dedicated branch for release preparation.
- **Hotfix branch:** a branch for fixing bugs in a live production version.

  NOTE

  - 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 to the master branch must be merged to 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.

3 Advantages

Security Advantages of CodeArts and CodeArts Repo



CodeArts security features:

- **Access control**: The unified model "tenant + user + user group + role" is used to control permissions.
- **Authentication**: The Identity and Access Management (IAM) service is used. When a user accesses the code repository through HTTPS or SSH, the SSH key or repository username and password are used for access authentication.
- **Role- and permission-based authorization**: Permissions vary with roles, resources, and services. Permissions can be customized.
- **Non-repudiation**: The IAM token mechanism is used. All operations in CodeArts must have tokens, and all key operations must be audited and recorded. Audit logs are retained for a reasonable period for accurate tracing.
- **Data encryption**: Sensitive information is encrypted before storage.
- **Communication security**: Security protocol: HTTPS and SSH.
- **Data integrity**: Key information in CodeArts is stored in the internal database, and data is consistent through various mechanisms such as transactions.
- **Availability**: All CodeArts services are deployed in clusters to ensure high availability.
- **Privacy**: Privacy of accounts and users is protected.

CodeArts Repo security features:

- **Role- and permission-based authorization**: A fine-granular authorization model is used for code access.
- **Non-repudiation**: Complete access logs of the code repositories are provided for users to audit.
- **Data encryption**: Code stored in CodeArts Repo is encrypted.

Cross-regional Collaborative Development

- Code can be read, modified, and committed online at any time from anywhere.
- Online branch management allows efficient concurrent development on multiple branches. You can create, change, and merge branches.
- Git Large File Storage (LFS) can be used for large files.
- Online code review is provided for team collaboration.

Statistical Analysis

- Code commit statistics
- Contributor statistics
- Programming language statistics

4 Use Cases

Remote Collaborative Development

- Targets: small- and medium-sized enterprises, and incubators
- Requirements and challenges: Software developers call for higher development efficiency and agility. To respond, more efficient collaboration management is required. Enterprises also expect lower development costs. However, inefficient development collaboration and frequent merge conflicts are two significant hinders.
- Benefits: Cloud-based code hosting makes collaborative development easier. Multi-branch management and merge requests are effective solutions to merge conflicts.

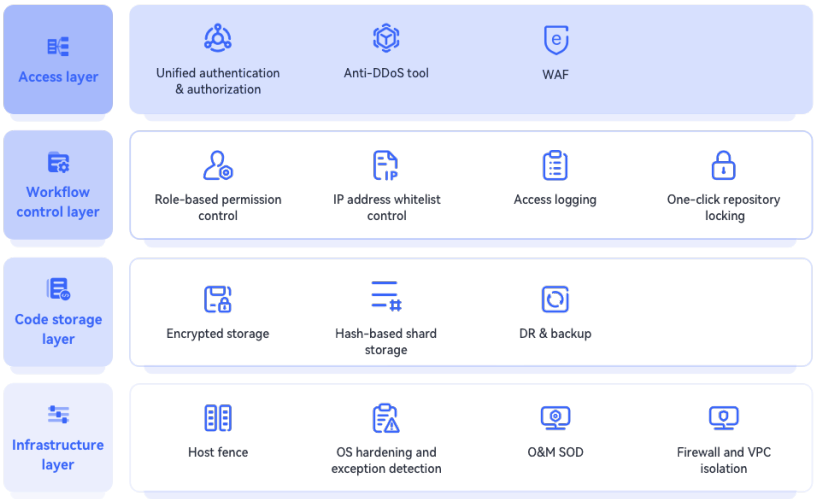
University Education

- Targets: university teachers and students
- Requirements and challenges: University teachers and students lack a comprehensive development toolchain, and struggle with time-consuming development environment setup and maintenance. Existing development tools also have a high learning threshold.
- Benefits: CodeArts Repo provides complete code hosting services and abundant repository templates, enabling students to quickly get started.

5 Features

5.1 Security & Resilience

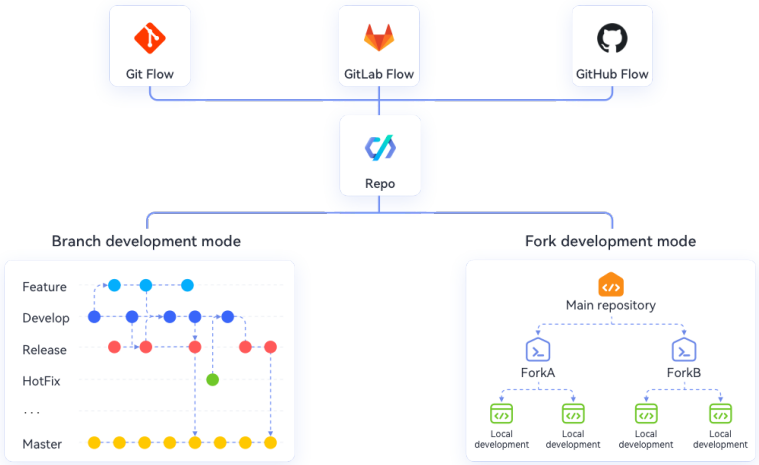
Based on the full-stack cloud native architecture and Huawei years of practices, CodeArts Repo provides resilient and secure code hosting. It overs collaborative development of ultra-large products such as cloud, pipe, device, vehicle and IT, billions of code management, tens of thousands of online concurrent operations, high-concurrency code download, and ultra-large storage.



5.2 Multiple Git Workflows

Multiple Collaboration Modes of Job Development

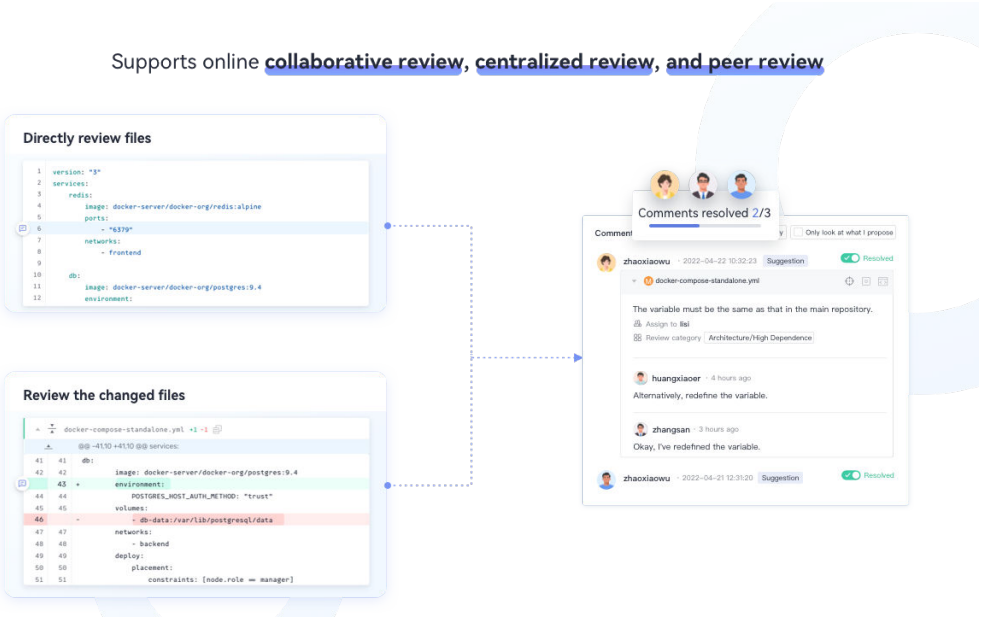
Git-based collaboration modes apply to flexible modes of small- and medium-sized enterprises and complex modes of medium- and large-sized enterprises.



5.3 Multi-form Code Reviews

Multi-form Code Reviews

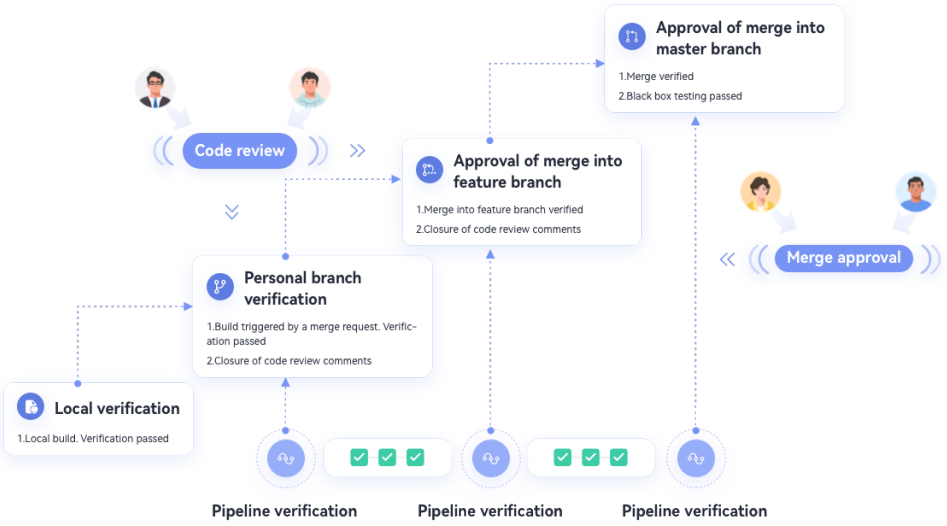
File-based peer reviews, code reviews of MRs, centralized reviews, distributed collaborative reviews, review templates, automatic reviewer assignment, and review task notification settings are supported. Reviews can be tracked and closed. For details, see **Managing MRs**.



5.4 Quality Gates for Code Merge

Multi-level and Fine-grained Quality Gates for Code Merge

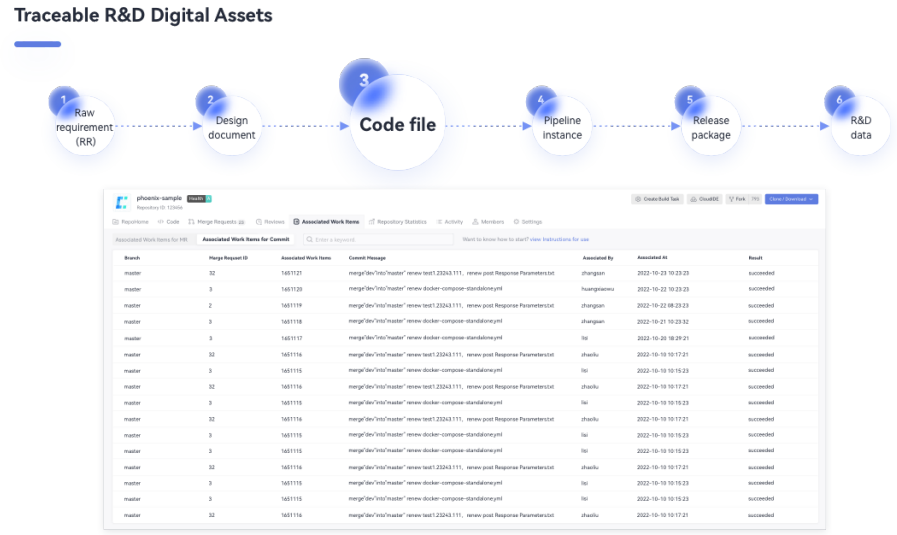
Code can be controlled by manual reviews and automatic pipeline integration. Only code that meets quality requirements can be merged. Manual reviews support SOD (separation of duties), automatic check, and branch-level control. For details, see **Managing MRs**.



5.5 Code-based R&D Asset Tracing

Code-based R&D Asset Tracing

Trace requirements, tasks, designs, bugs, codes, and versions to master the origin of each line of code, facilitating network problem locating and auditing. For details, see **E2E Settings**.



5.6 Embedded Repository Specifications and Templates

Diverse Templates and Standard Development Activities

CodeArts Repo provides templates for repositories, code review, and merge request. Mandatory and optional fields can be configured. This ensures unified development behavior of the team and facilitates efficiency analysis and improvement based on R&D data. For details, see **Template Management**.

6 Security

6.1 Shared Responsibilities

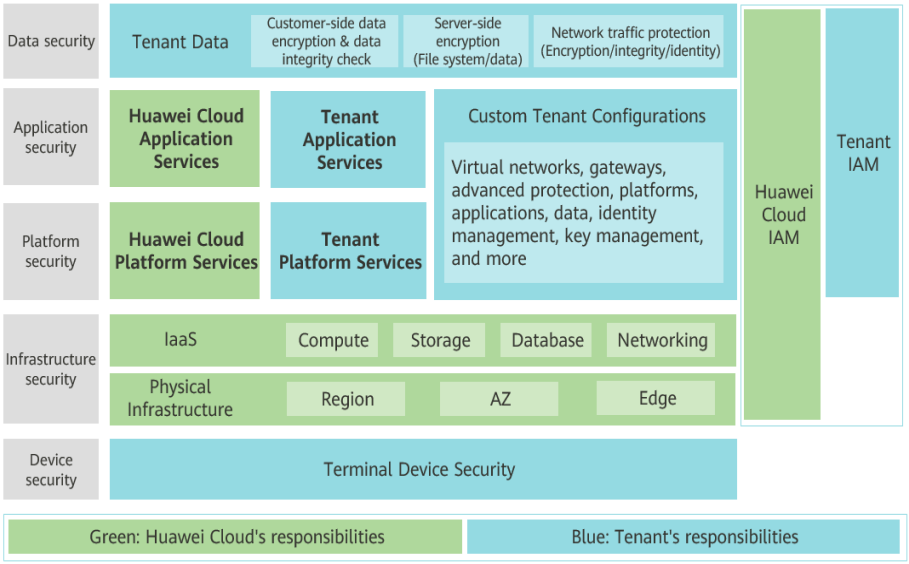
Huawei guarantees that its commitment to cyber security will never be outweighed by the consideration of commercial interests. To cope with emerging cloud security challenges and pervasive cloud security threats and attacks, Huawei Cloud builds a comprehensive cloud service security assurance system for different regions and industries based on Huawei's unique software and hardware advantages, laws, regulations, industry standards, and security ecosystem.

Figure 6-1 illustrates the responsibilities shared by Huawei Cloud and users.

- **Huawei Cloud**: Ensure the security of cloud services and provide secure clouds. Huawei Cloud's security responsibilities include ensuring the security of our IaaS, PaaS, and SaaS services, as well as the physical environments of the Huawei Cloud data centers where our IaaS, PaaS, and SaaS services operate. Huawei Cloud is responsible for not only the security functions and performance of our infrastructure, cloud services, and technologies, but also for the overall cloud O&M security and, in the broader sense, the security and compliance of our infrastructure and services.
- **Tenant**: Use the cloud securely. Tenants of Huawei Cloud are responsible for the secure and effective management of the tenant-customized configurations of cloud services including IaaS, PaaS, and SaaS. This includes but is not limited to virtual networks, the OS of virtual machine hosts and guests, virtual firewalls, API Gateway, advanced security services, all types of cloud services, tenant data, identity accounts, and key management.

Huawei Cloud Security White Paper elaborates on the ideas and measures for building Huawei Cloud security, including cloud security strategies, the shared responsibility model, compliance and privacy, security organizations and personnel, infrastructure security, tenant service and security, engineering security, O&M security, and ecosystem security.

Figure 6-1 Huawei Cloud shared security responsibility model



6.2 Authentication and Access Control

Authentication

Regardless of whether you access CodeArts Repo through the management console or APIs, CodeArts Repo uses Identity and Access Management (IAM) for authentication.

CodeArts Repo supports two authentication modes:

- **Token authentication**: Requests are authenticated using a token.
- **AK and SK authentication**: Requests are encrypted using an Access Key ID (AK) / Secret Access Key (SK). This method is recommended because it provides higher security than token-based authentication.

For more authentication details, see **Authentication**.

Access Control

1. **IAM Permission Management**

   Permission management is a fine-grained authorization based on roles and permissions. Different operation permissions are assigned to different roles based on their work requirements. Users can access only authorized resources.

   Roles in CodeArts Repo include the repository administrator, creator, committer, developer, and viewer.

   - The repository administrator, creator, or committer can manage repository members, update code, and configure repositories.
   - Developers can update repository code and browse the repository member list.
   - Viewers can view and comment on repositories.

2. **IP Address Whitelist Control**

- IP address whitelists enhance repository security by restricting access to repositories by IP address.
- You can access repositories only from whitelisted IP addresses. Access requests from other IP addresses are rejected.
- IP address whitelists include tenant-level IP address whitelists and repository-level IP address whitelists, and their priorities can be configured.

For details about how to configure the IP address whitelist, see **IP Address Whitelist**.

3. **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.

   For details about how to lock a repository, see **Repository Locking**.

4. **Protected Branch Management**

   Protected branches prevent pushes to the branches and prevent the branches from being incorrectly deleted.

   - Secure branches and allow developers to use merge requests to merge code.
   - Prevent non-administrators from pushing code.
   - Prevent all forcibly push to this branch.
   - Prevent anyone from deleting this branch.

   For details about how to configure branch protection, see **Protected Branches**.

5. **O&M SOD**

   The purpose is to standardize O&M scripts throughout the development, test, and release process (including script development, code review, manual test, integration acceptance, release review, script rollout, and version management). Promote and strengthen standardized operation management to ensure process, security, and quality compliance.

6. **Isolation Between Firewalls and VPCs**

   CodeArts Repo uses firewalls and VPCs to isolate networks and resources between tenants.

6.3 Data Protection Technologies

CodeArts Repo uses multiple methods to secure data.

Method	Description	Reference
Transmission encryption (HTTPS)	A code repository hosted in CodeArts Repo is flushed to disks on the cloud to prevent people other than the data owner from accessing users' plaintext data and prevent data leakage on the cloud. The code encryption process is transparent to users. Users can use any official Git client to access the code repository on CodeArts Repo.	-
Key management	Deployment key and SSH key management ensures that the request is initiated by the request initiator so that users can only browse authorized data, securing data.	For details about the SSH key pair and how to obtain it, see **SSH Key**.
git-crypt encrypted transmission and storage	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. For details about encrypted transmission and storage using git-crypt and how to obtain git-crypt, see **About git-crypt**.
Sensitive data anonymization and high-value data encryption	CodeArts Repo uses unified and accurate data to support applications and services for data security and privacy.	Logs and databases contain sensitive data, including but not limited to keys and account information. To prevent security issues caused by sensitive data leakage, the data is anonymized or encrypted. The principle is a hash function, which generates a digest for a piece of information to prevent tampering.

Method	Description	Reference
Anti-DDoS tool	Advanced Anti-DDoS (AAD) is a tool for defending against DDoS attacks. AAD can protect your servers against large volumetric DDoS attacks so your Internet services can keep being available.	AAD supports two traffic diversion modes: DNS resolution and IP address directing to protect website domain names and service ports. Based on the forwarding rules you configure for your services in AAD, AAD directs the DNS domain name resolution or service IP address to the AAD instance IP address or CNAME address for traffic diversion. Access traffic from the public network preferentially passes through an AAD equipment room. Malicious attack traffic is cleaned and filtered in the AAD traffic cleaning center. Normal access traffic is returned to the origin server through port protocol forwarding, ensuring stable access to the origin server.
Traffic limiting	Traffic limiting can be used to limit the number of HTTP requests sent by a user within a specified period of time. Traffic limiting is used to protect upstream application servers from being overwhelmed by too many concurrent user requests.	CodeArts Repo mainly uses Nginx and APIGW flow controls. Nginx uses the leaky bucket algorithm to limit traffic. This algorithm is widely used in communication and packet switched computer networks to handle bursts when bandwidth is limited. APIGW flow control limits the number of times an API is called within a specified period to protect backend services and provide continuous and stable services.
Backup & DR	Backup and DR not only prevent data loss, but also ensure that services on the server are taken over after the server breaks down to ensure service continuity. This feature ensures that users can continuously use application services, service requests of users can run continuously, and services provided by the information system are complete, reliable, and consistent.	-

Method	Description	Reference
Hash-based shard storage	Hash-based sharded storage improves confidentiality and privacy. Data sets are divided into independent and orthogonal data subsets based on certain rules. Then, the data is randomly distributed to multiple nodes. No node can access the complete data. They contain only a part of the data.	-
Watermark	To prevent unauthorized photos, screenshots, or other means from spreading core assets, you can enable watermark settings.	For details about how to set watermarks, see **Watermarks**.
Backup	The repository backup operation secures code and prevents others from deleting code by mistake. There are two backup modes: • Back up the repository to another region of Huawei Cloud. • Back up the repository to your local computer.	For details about how to back up the repository, see **Repository Backup**.

6.4 Auditing and Logging

Auditing

Cloud Trace Service (CTS) is a professional log audit service in Huawei Cloud security solutions. It can record, store and search operation records on the cloud resources in your account to perform security analysis, audit compliance, track resource, and locate faults.

After you enable CTS and configure a tracker, CTS can record management and data traces of CodeArts Repo for auditing.

For details about how to enable and configure CTS, see **Enabling CTS**.

Logs

- **Log Tank Service (LTS)**

Log Tank Service (LTS) provides one-stop log collection, log search in seconds, massive log storage, log structuring and transfer. Graphical application O&M, visual analysis of network logs, and operation analysis make organization tracking easier.

For analysis, CodeArts Repo records system running logs to LTS in real time and stores the logs for three days

LTS monitors logs of servers and databases, and generates alarms by messages or emails for logs that trigger monitoring rules. This ensures that faults and potential risks on the live network can be detected and handled in time, ensures normal service running, and reduces the impact on user services.

- **Operation Logs**

Operation logs are used to record all behavior activities, related operators, and time points of the code repository, helping administrators and repository owners monitor and trace behavior activities of code repositories.

For details about how to view operation logs, see **Audit Logs**.

6.5 Security Risk Monitoring

WAF Application Protection System

CodeArts Repo interconnects with the Web Application Firewall (WAF) protection system. WAF is also called website application-level intrusion prevention system.

WAF keeps web services stable and secure. It examines all HTTP and HTTPS requests to detect and block the following attacks: Structured Query Language (SQL) injection, cross-site scripting (XSS), web shells, command and code injections, file inclusion, sensitive file access, third-party vulnerability exploits, Challenge Collapsar (CC) attacks, malicious crawlers, and cross-site request forgery (CSRF).

WAF can be deployed in cloud, dedicated, or ELB mode.

Host Fence

You can set the security fence for the PC device access setting, IP address list, and PC device ID list.

OS Hardening and Exception Detection

The OS standardization script consists of two parts: **osstdchk.py** (for check) and **osstdfix.py** (for fix). OS hardening must be performed based on Huawei Cloud OS hardening standards.

6.6 Security O&M

Change Operation Process

Use scripts to change the live network on the platform to avoid network faults caused by direct operations on the server console. In addition, operations on the platform must comply with the 1+1 check process. One person performs the operations, and the other monitors and checks the operations to ensure process, security, and quality compliance.

Control of Privilege Escalation Operations

Control the rights and authorization process based on the hierarchical risk classification and SOD principle. When a common service alarm is generated, the system must comply with the high-risk and blacklist command control. When a change operation is performed, the system can monitor commands in real time and classify command risk levels based on configured rules. If a high-risk or blacklist command is detected, the system provides a real-time alarm notification, this prevents service interruption caused by unauthorized operations. When an emergency service alarm is generated, privilege escalation must comply with regulations to balance security and efficiency.

Review of Change Operations

Before implementing a change, you need to apply for a change, review risks, and evaluate the change by the related expert team.

During change implementation, you must check, verify, and monitor services in each step. The check scope includes changed services, peripheral services, global monitoring alarms, dialing tests, and traffic changes to prevent live network faults caused by manual changes.

6.7 Certificates

Compliance Certificates

Huawei Cloud services and platforms have obtained various security and compliance certifications from authoritative organizations, such as International Organization for Standardization (ISO), System and Organization Controls (SOC), and Payment Card Industry (PCI). You can **download** them from the console.

Resource Center

Huawei Cloud also provides resources to help users meet compliance requirements. For details, see **Resource Center**.

7 Constraints

This section describes the constraints on CodeArts Repo.

Table 7-1 Constraints

Category	Item	Free Edition	Basic Edition	Professional Edition	Enterprise Edition
Single repository	Size of a single repository (excluding LFS)	≤ 1 GB	≤ 10 GB	≤ 20 GB	≤ 30 GB
	Size of a single file that can be uploaded (page)	≤ 50 MB	≤ 50 MB	≤ 50 MB	≤ 50 MB
	Size of a single file that can be pushed (local)	≤ 200 MB	≤ 200 MB	≤ 300 MB	≤ 300 MB
	Size of a single LFS file	≤ 1 GB	≤ 1 GB	≤ 2 GB	≤ 2 GB
	Number of lines of code that can be saved online at a time	≤ 5,000	≤ 5,000	≤ 5,000	≤ 5,000
Total repository capacity	Repository capacity including LFS (Once this capacity is exceeded, some repository functions such as code upload will be unavailable.)	≤ 10 GB	≤ 50 GB	≤ 100 GB	≤ 500 GB
Repository quantity	Repository quantity	Unlimited	Unlimited	Unlimited	Unlimited

Category	Item	Free Edition	Basic Edition	Professional Edition	Enterprise Edition
Browser	Type	Currently, the following mainstream browsers are supported: • Chrome (recommended) • Internet Explorer 10 or later • Microsoft Edge (recommended) • Firefox • Safari			
Resolution	Resolution	The recommended resolution is 1920 x 1080 or higher.			

When the repository capacity exceeds the limit, or the repository is frozen due to arrears or security reasons, some functions will be unavailable. For details, see **Table 7-2**.

If your repository is frozen due to security reasons or incomplete real-name authentication, you have only the view permission but do not have the operation permission. For details, see **Table 7-2**.

Table 7-2 Constraints

Tab Page	Function	Capacity Limit Reached, Account Frozen Due to Arrears or Security Reasons	Frozen Due to Security Reasons or Incomplete Real-Name Authentication
Homepage	Create a repository	×	×
Home	• Associate a work item • Managing a member • Delete a repository	√	×

Tab Page	Function	Capacity Limit Reached, Account Frozen Due to Arrears or Security Reasons	Frozen Due to Security Reasons or Incomplete Real-Name Authentication
Code	• Create, edit, delete, rename, and upload a file • Create and delete a directory • Create and delete a submodule • Cherry-Pick and revert a file	×	×
Code	Add, delete, edit, reply, and resolve a review and comment	√	×
Branch & Tag	• Create a branch • Merge branches • Create a tag	×	×
Branch & Tag	• Edit and delete a branch • Set a protected branch • Delete a tag	√	×
Merge Requests	• Create, edit, close, re-open, and merge a merge request • Cherry-Pick and revert a merge request • Merge requests to resolve code conflicts.	×	×
Merge Requests	Add, delete, edit, reply, and resolve a review	√	×
Members	Add, delete, edit, and approve a member	√	×
Repository	Fork a repository	×	×

Tab Page	Function	Capacity Limit Reached, Account Frozen Due to Arrears or Security Reasons	Frozen Due to Security Reasons or Incomplete Real-Name Authentication
Settings	• Set a repository • Set a submodule • Sync a deploy key • Free space • Set policies (All) • Integrate services (All) • Set synchronization • Synchronize a repository	√	×
Settings	• Repository information • Notifications • Free space • Repository backup • MR templates • Review templates • Deploy key • Tenant- and repository-level IP address whitelist • Risky operations • Watermark • Repository locking • Audit logs • Tenant-Level usage management	√	× **NOTE** All configuration items except repository backup and tenant-level usage management can only be viewed and cannot be modified.

NOTE

CodeArts Repo closed: You cannot access the repository. The system prompts you to subscribe to the service. After CodeArts Repo is re-subscribed, the repository status is restored. If CodeArts Repo has been closed for more than 30 days, the system automatically deletes all repositories, which cannot be restored.

8 Glossary

Project Administrator

Generally, the project creator is the project administrator by default.

The project administrator has all permissions in the project and the permissions cannot be removed or modified. The DevUC controls which members in a project can manage permissions of other members in other projects. Based on the current function, the project creator (also the project administrator) can grant permissions to other project members to manage permissions. (This feature is provided by DevUC and is not perceived to subservices.)

Repository Owner (Creator)

When project members with permissions to create a repository created a repository, they become the repository owner and has the full permission on the repository.

Repository Administrator

The repository owner, parent repository group owner, and project administrator are repository administrators.

Repository Group Administrator

The repository group owner, project administrator, and parent repository group owner are repository group administrators.

