- DevOps is a trending topic in recent years. DevOps has a profound meaning and involves a wide range of technologies, which pose big challenges to enterprises. Therefore, being a master hand at DevOps is not an easy task.

Foreword

- This chapter describes the implementation of DevOps on HUAWEI CLOUD platforms.

Objectives

- After this course, you will be able to:
  - Describe the DevOps process.
  - Understand DevOps platforms on HUAWEI CLOUD and their functions.

Contents

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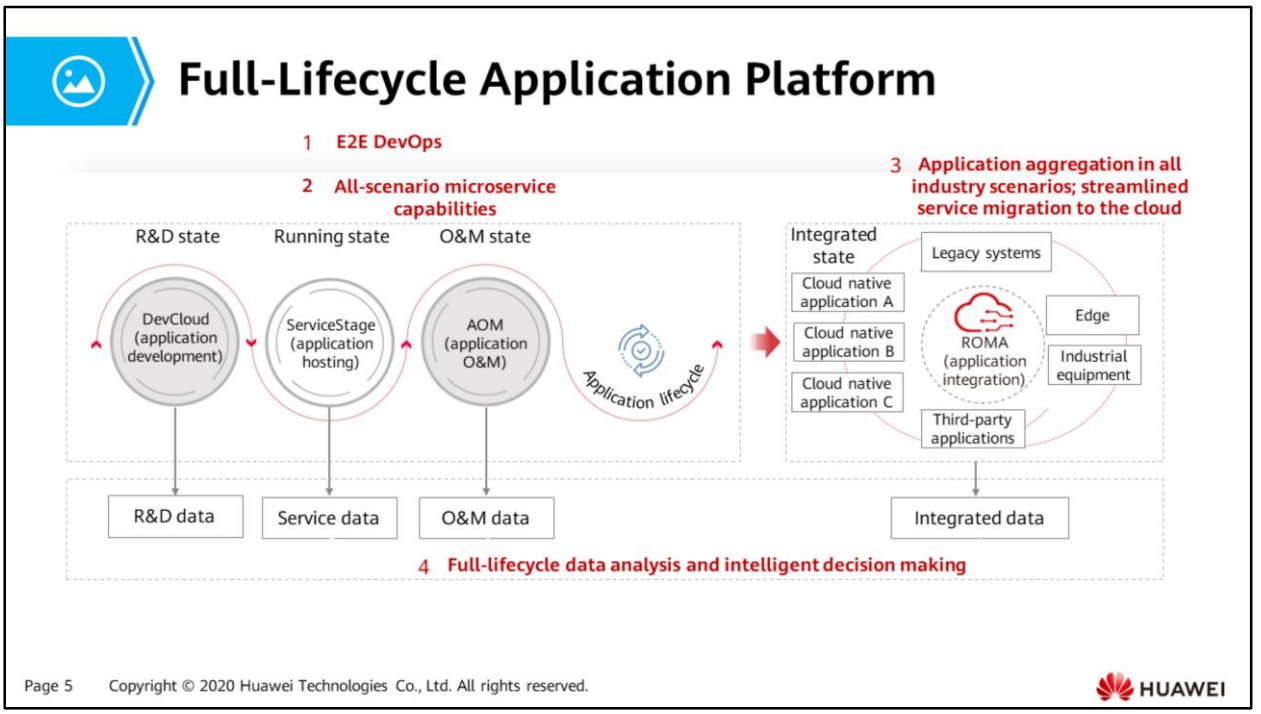
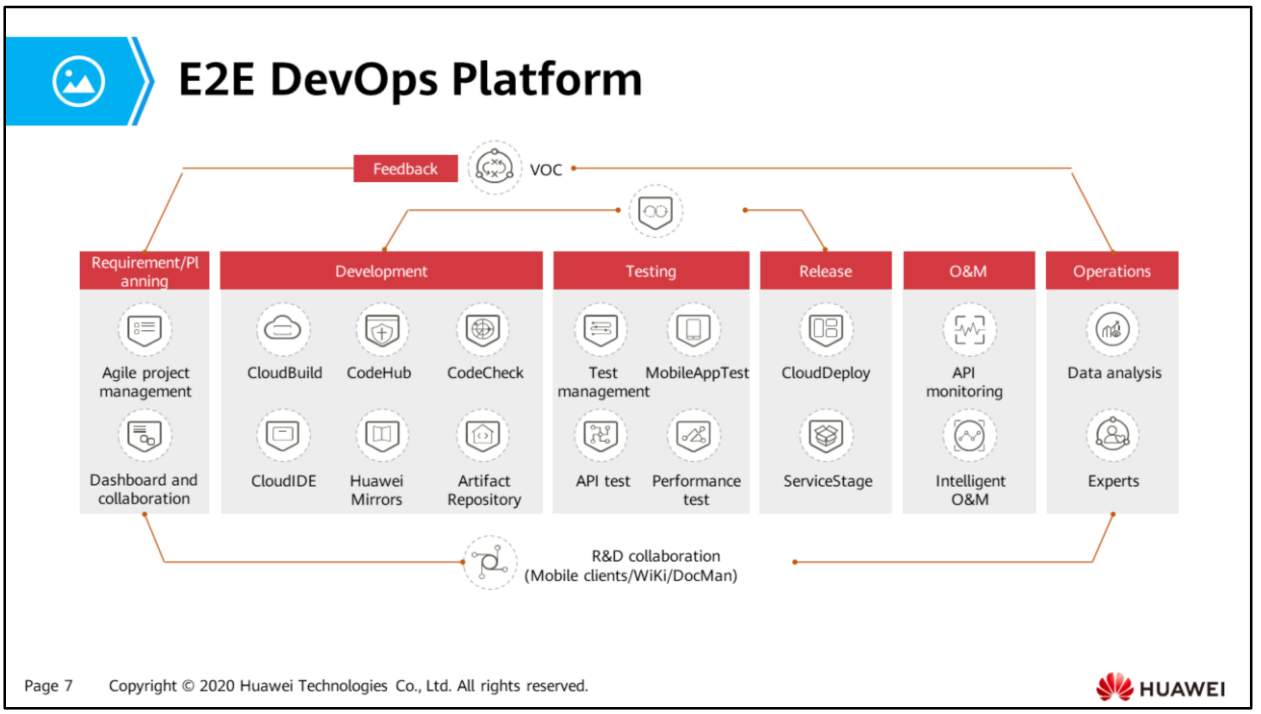
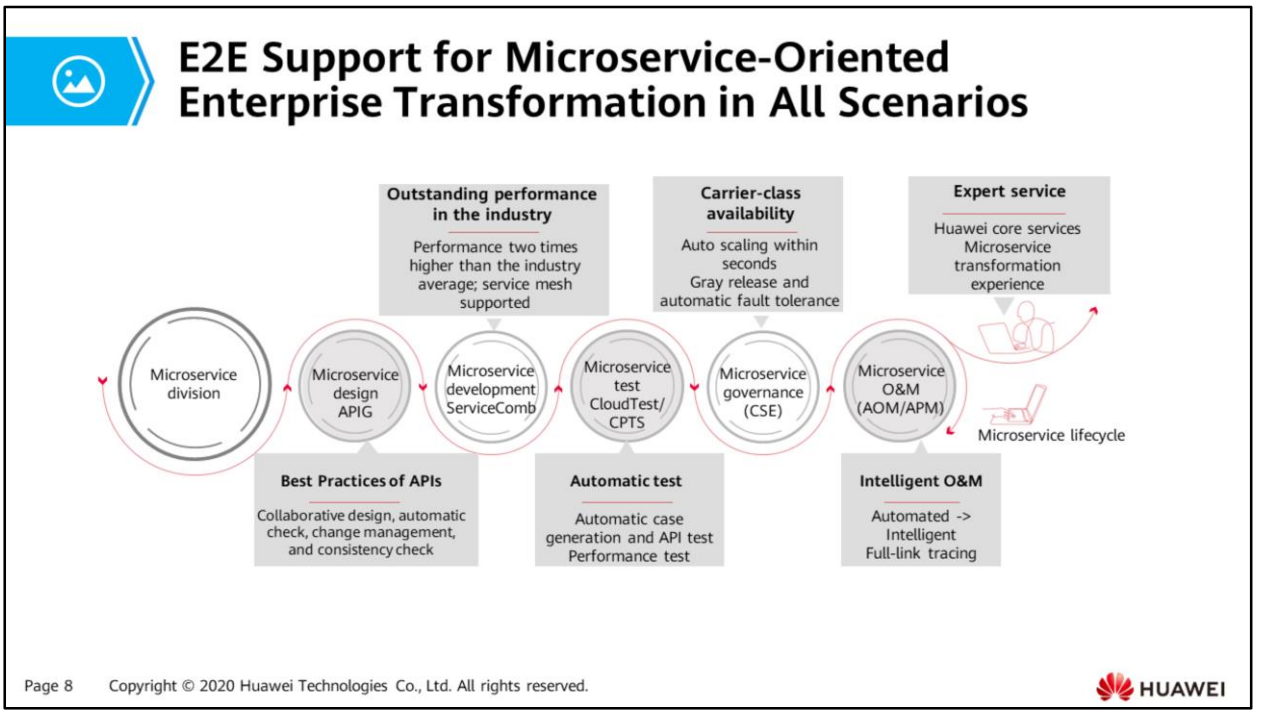


- First, let's have a brief introduction to the HUAWEI CLOUD capabilities involved in this platform.
    - To address the challenges in enterprise and industry digital transformation, HUAWEI CLOUD launched the first full-lifecycle application platform that covers the entire lifecycle of applications.
    - The full-lifecycle application platform consists of four states from left to right as shown in the diagram.
    - Since 2016, HUAWEI CLOUD has launched services such as the application development platform DevCloud, application running platform ServiceStage, and application O&M platform AOM. These services used to be independent from each other in the past.
    - This time, we deeply integrate application models, service scenarios, operation processes, and APIs to adapt the services to enterprise scenarios and enhance scenario-specific support and experience.
    - The full-lifecycle application platform is built through seamless integration of DevCloud, ServiceStage, and ROMA, focusing on application development, hosting, O&M, and integration.
    - The core measure of enterprise digital transformation is reforming the application development, running, O&M, integration, operation model, and business model with cloud being the foundation.

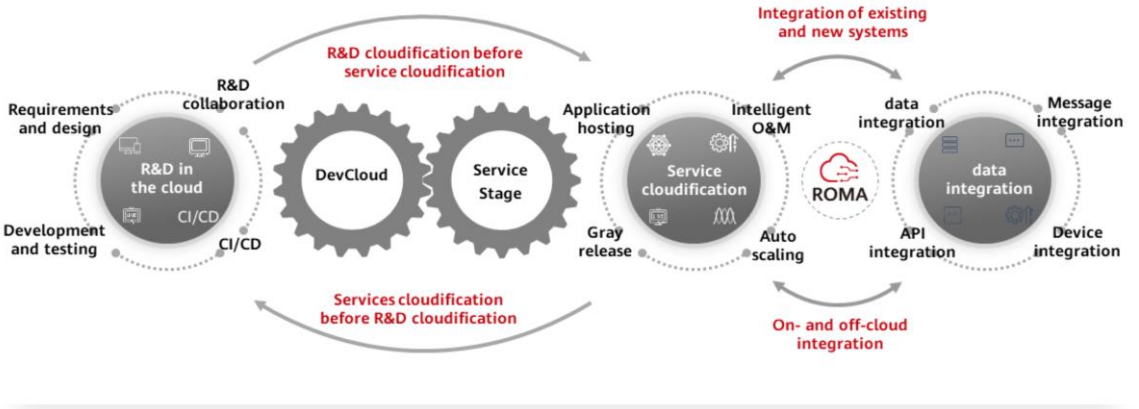


- In 2015, three services were launched for the first time. During 2016 and 2017, eight services have been rolled out. By now, more than 15 services have been rolled out.
- The entire application development process is covered.
- Industry standards: leading the development of DevOps standards in the industry; covering all major DevOps standard capability domains.
- Market progress: adopted by 30+ city campuses, 24 universities in Project 985, 300,000 professional developers, and 400,000 projects.
- Domains covered:
  - Requirements, development, test, release, O&M, and operations
  - Leading the development of DevOps standards in the industry; covering all major DevOps standard capability domains.
  - Adopted by 30+ city campuses, 24 universities in Project 985, 300,000 professional developers, and 400,000 projects.

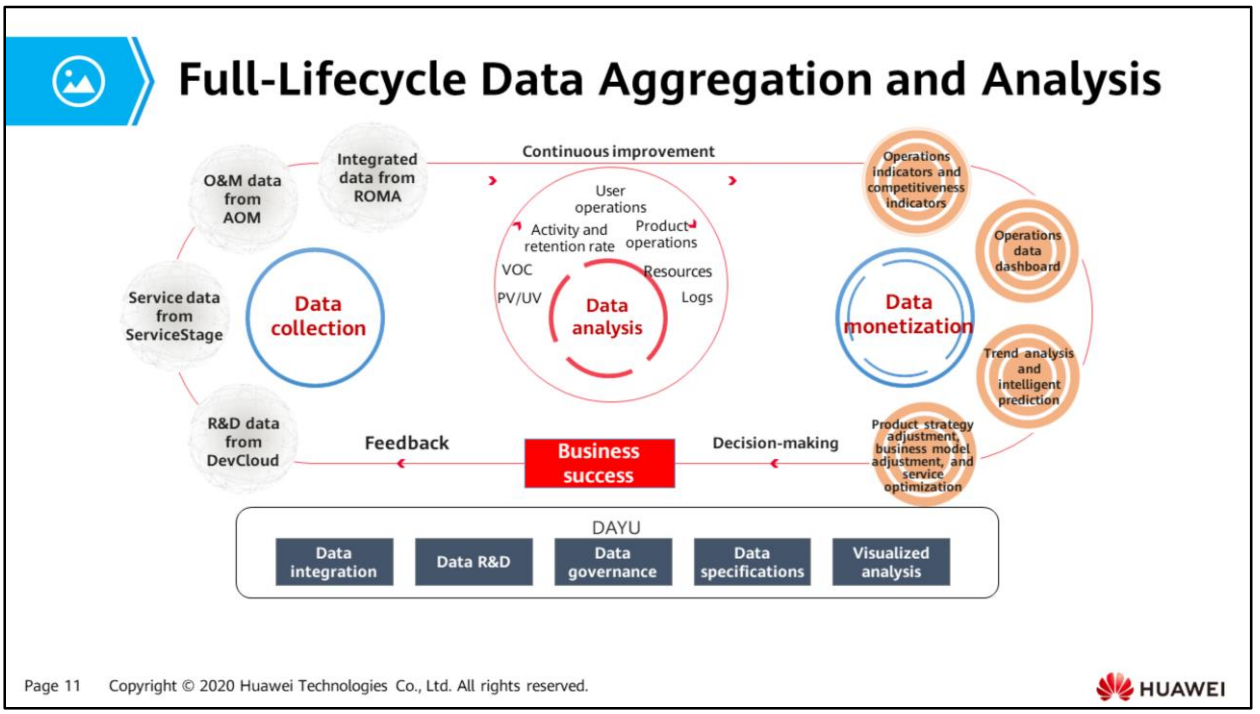


- Providing capabilities such as microservice design, Huawei microservice development framework, registration and discovery, microservice test, governance, and O&M.
- Expert service:
  - Introduce microservice services, design, ServiceComb, test, CSE, and O&M one by one.
  - Cloud Performance Test Service (CPTS) is a cloud service that provides API and E2E performance tests of applications, which are built based on HTTP, HTTPS, TCP, UDP, WebSocket, RTMP, or HLS. The rich capability of test model definition can be used to restore scenarios of large-scale concurrent service access, helping users identify application performance problems in advance.
  - CloudTest is a one-stop test platform that allows developers to conduct API and performance tests and manage these tests in the cloud. Developed on the basis of the DevOps agile testing concept, CloudTest helps developers improve management efficiency and deliver high-quality products.

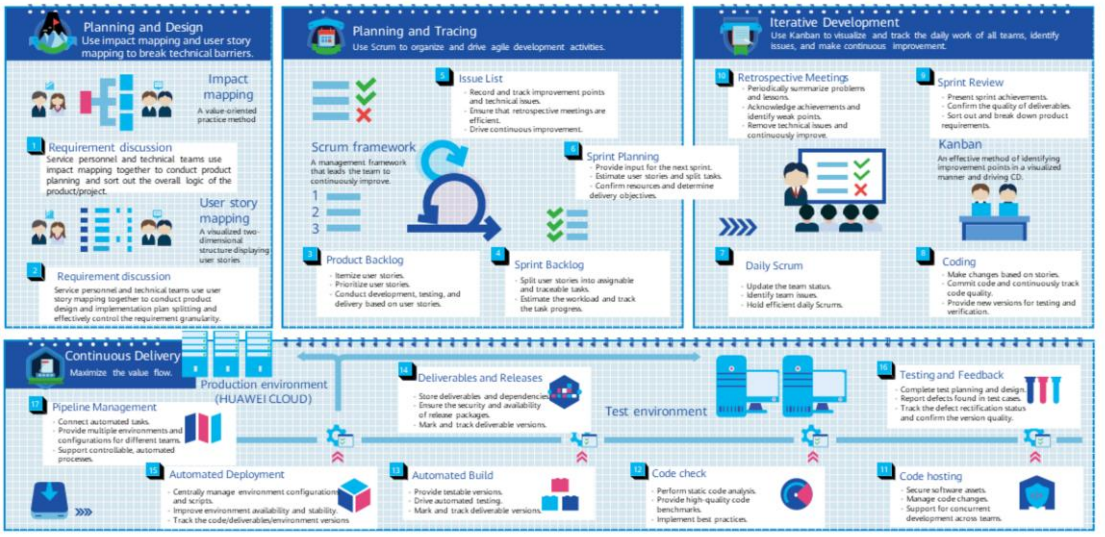
Smooth Digital Transformation for Enterprises



- Enterprise digital transformation is a complex systematic project, involving changes in the R&D process, R&D model, business model, organization, and culture.
- The transformation cannot be accomplished overnight. It should be smoothly implemented step by step through continuous sprint and improvement.
- Mature and stable approaches are provided as follows:
  - DevCloud: stories of R&D cloudification
  - ServiceStage: stories of service cloudification
  - ROMA: an integration platform



- The ultimate goal of enterprise digital transformation is business success.
- We hope to help enterprises continuously improve, gradually form a virtuous cycle, and implement operation data-driven improvement, and value-driven investment.
- Continuous aggregation of full-lifecycle data: various types of data
- Analysis of a massive amount of data: based on Huawei DAYU
- Cultivating data monetization capabilities: 4 points



- HE2E is Huawei E2E DevOps implementation framework. Based on industry-leading practices and 30 years of R&D experience, we have developed a practical Agile development methodology, which is supported by the DevCloud tool chain.
- The diagram shows the HE2E DevOps implementation framework.
- This framework integrates the industry methodologies and practices with Huawei's DevOps experience, which are then implemented in the tool chain of Huawei DevCloud.
- Steps 1 and 2 in the diagram represent the process of product planning between service personnel (even customers) and technicians to sort out the overall product logic, implementing product planning and design, and controlling the requirement granularity and splitting.
- The essence of software development is to solve problems and deliver user value, not simply providing functions. Therefore, we need to identify what user requirements and root causes are. This is where impact mapping comes in.
- User stories are carriers of objectives and requirements. We tell stories based on user scenarios to facilitate information exchange between customers, service personnel, and developers. In this process, it is easy to get lost when scattered requirement items pile up. User story mapping can help you solve this problem. Major phases and their detailed activities can be sorted and displayed in a tree structure according to user scenarios. In this way, you can intuitively see both the objectives and their detailed requirements items.

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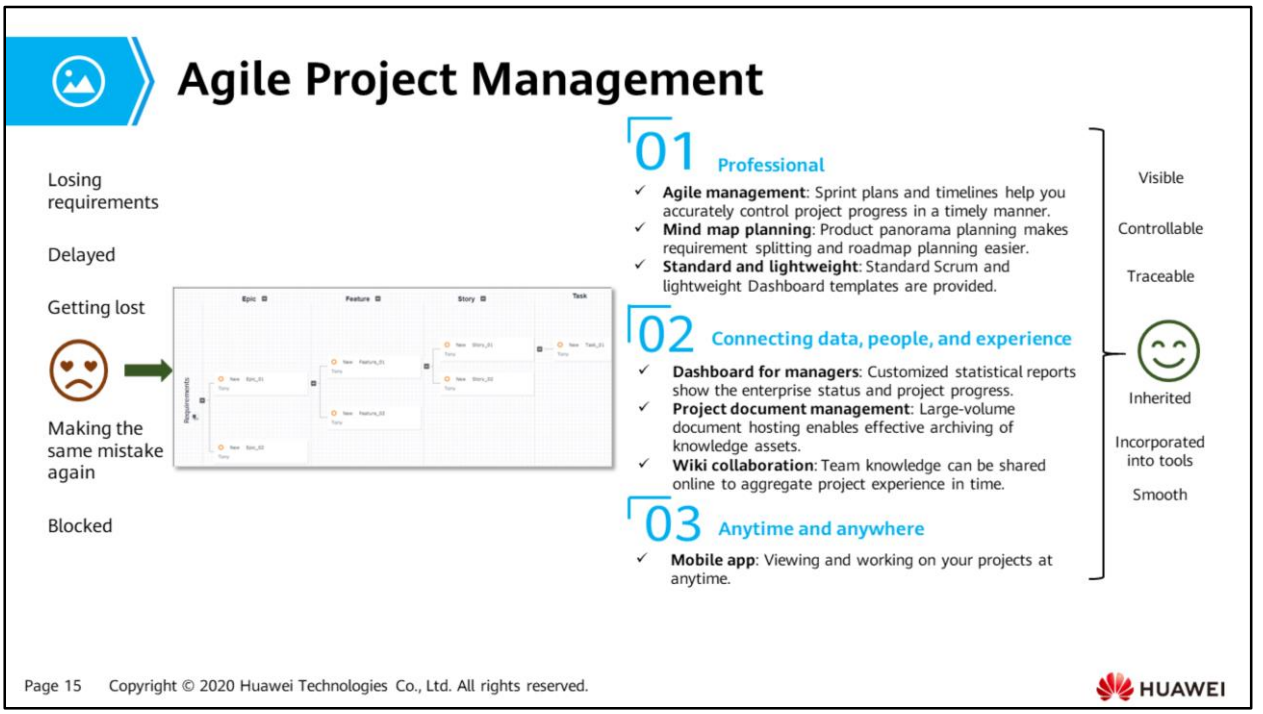
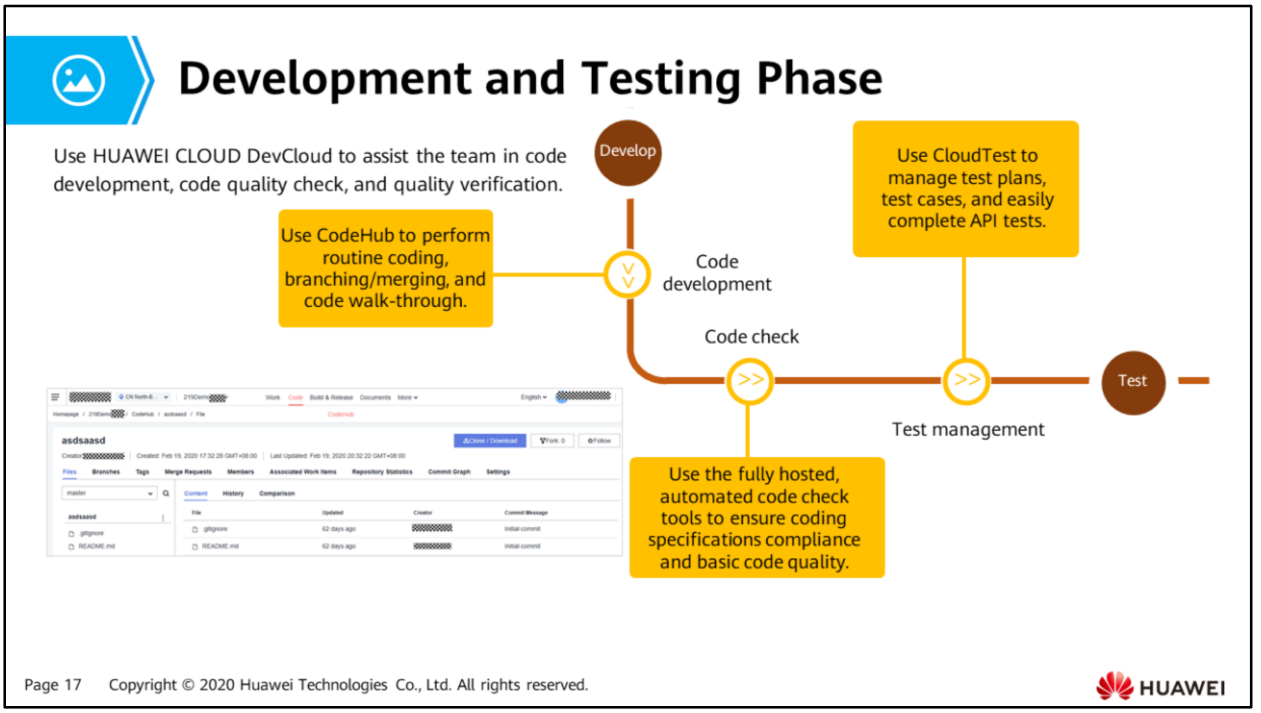
Design and Planning Phase

Use HUAWEI CLOUD DevCloud to conduct planning, design, and agile project management.

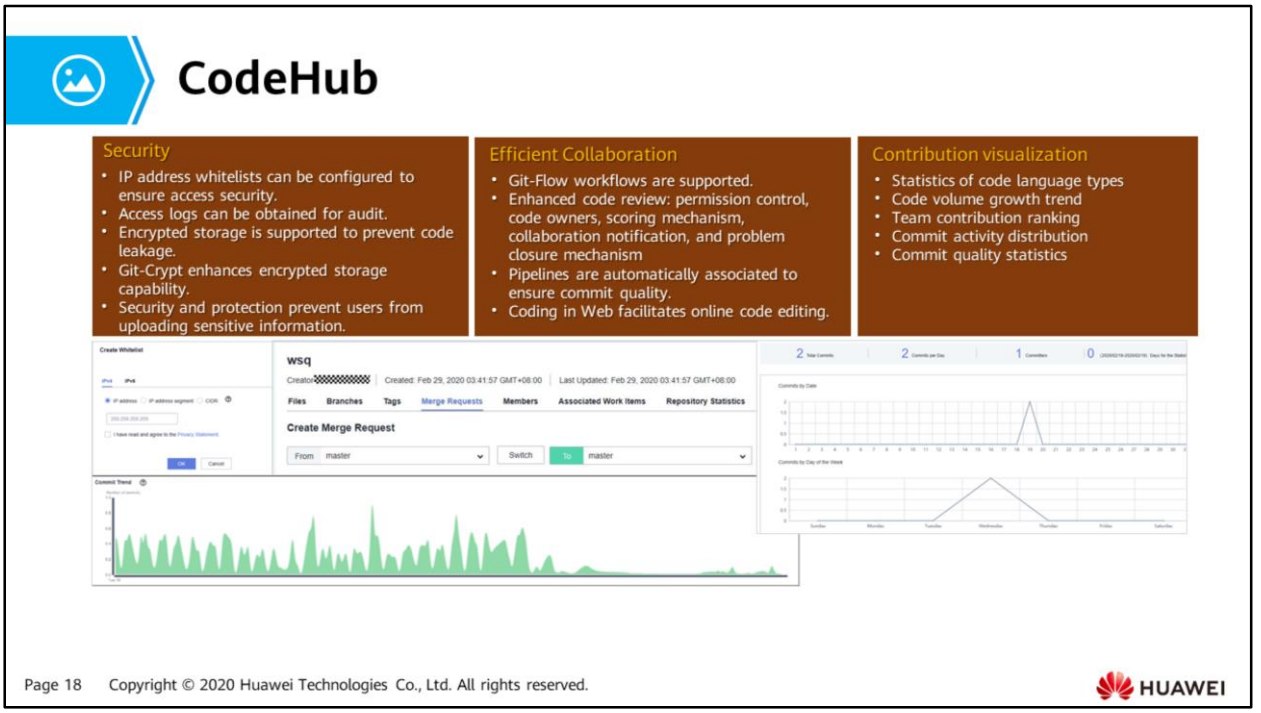
- HUAWEI CLOUD DevCloud supports product planning, design, and agile project management.
- In the product design phase, you can design product framework using mind maps.
- Requirements are associated with product design. The hierarchical structure of epic, feature, and backlog allows you to manage the details of a requirement.
- Use sprint and Kanban to track the project progress and work item completion status.



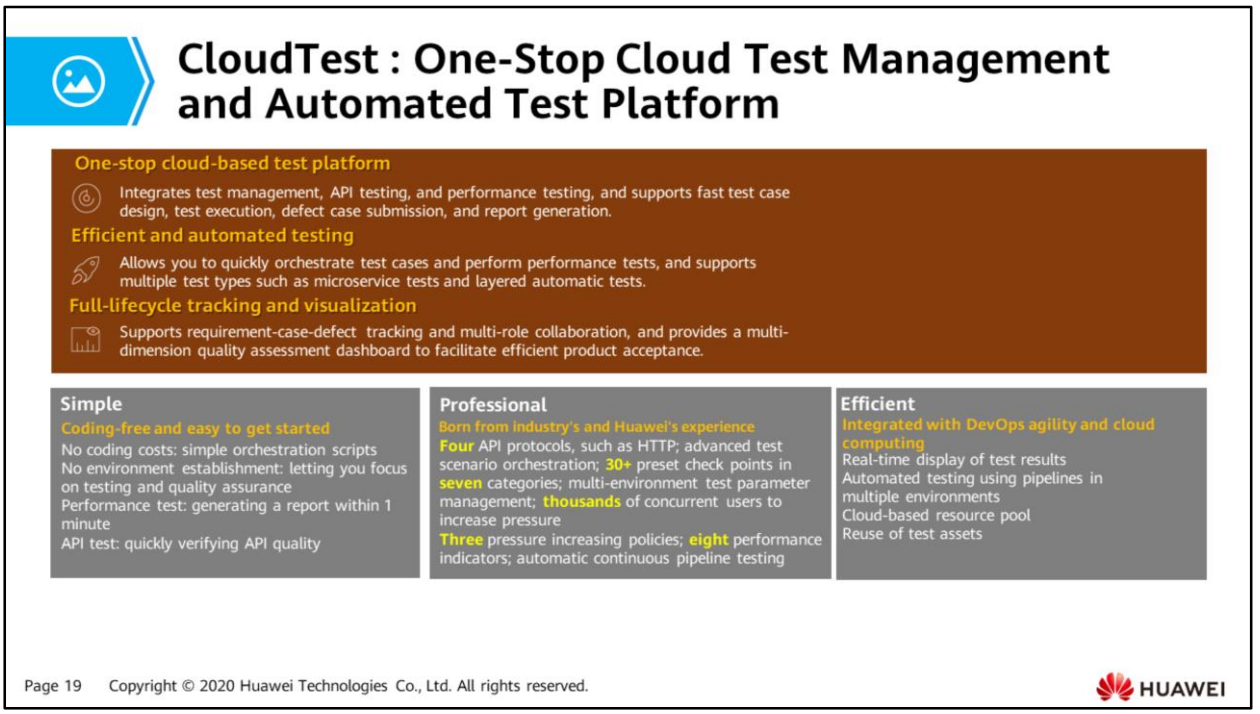
- ProjectMan is a cloud service that provides agile project management and collaboration for software development teams. It integrates Huawei's more than 30 years of advanced software R&D concepts and practices.
- Cloud-based deployment is based on the powerful infrastructure of HUAWEI CLOUD. It is out-of-the-box and allows team members to collaborate anywhere at anytime. In addition, it seamlessly integrates with other HUAWEI CLOUD DevCloud services to provide full-lifecycle management for applications and enable team collaboration for software development.
- Agile project management helps you solve problems listed on the left.
- There are two types of preset project templates: Scrum project template and Kanban project template.
    - Scrum projects follow the strict Agile Scrum methodologies and practices, which are suitable for agile software development teams.
    - Kanban projects use cards for interaction. It is suitable for lightweight and simple management of software development teams.
- Multiple basic features of software project management are provided. These features include project management, requirement planning and management, defect management, sprint plan management, customized workflow, progress tracking, statistics reports, dashboard, Wiki online collaboration, and project document hosting. ProjectMan enables E2E, efficient, transparent, and visible management.



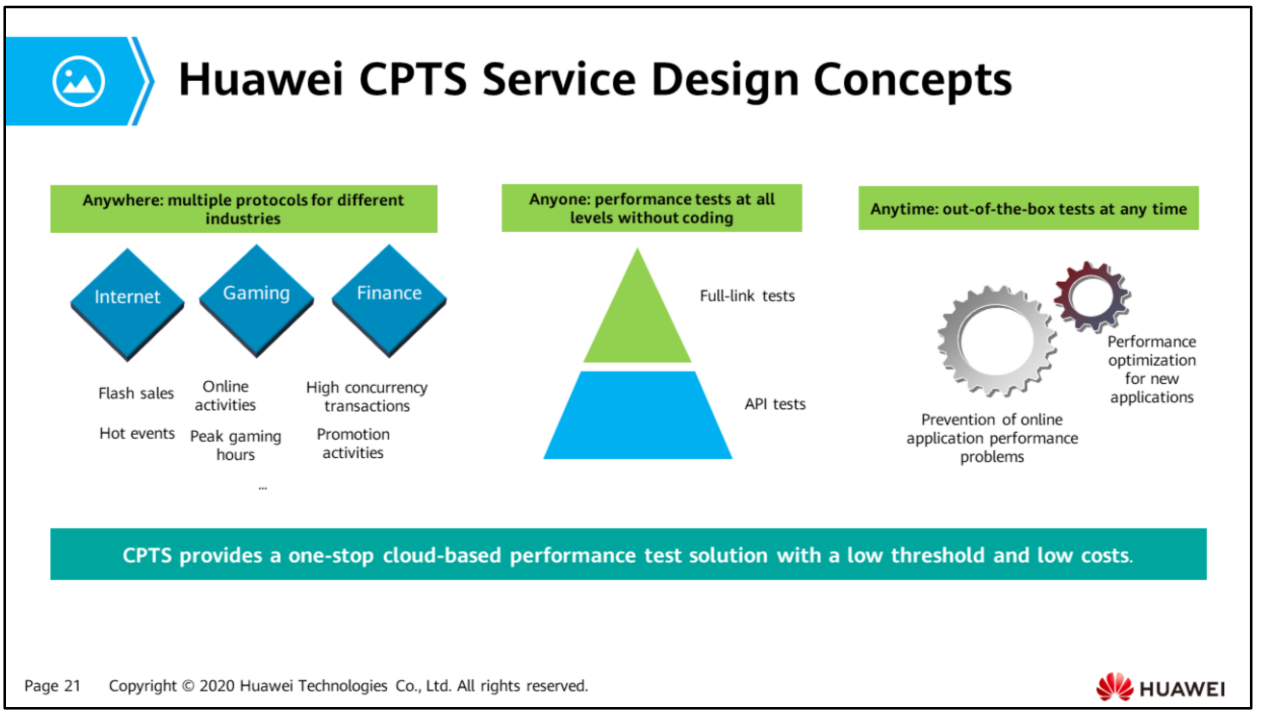
- In the development and testing phase, DevCloud provides support for code management and code quality control.
- CodeHub is a Git-based online code hosting service for software developers. It is a cloud code repository with functions such as security management, member and permission management, branch protection and merging, online editing, and statistics. The service aims to address issues such as cross-distance collaboration, multi-branch concurrent development, code version management, and security.
- CodeCheck is a cloud-based management service that checks code quality. Developers can easily perform static code and security checks in multiple programming languages and obtain comprehensive quality reports. CodeCheck also provides suggestions on correcting encoding bugs and analytical breakdowns to identify potential problems before the code is compiled to run, effectively controlling quality throughout the process.
- CloudTest is a one-stop test platform that allows developers to conduct API and performance tests and manage these tests in the cloud. Developed on the basis of the DevOps Agile testing concept, CloudTest helps developers improve management efficiency and deliver high-quality products.



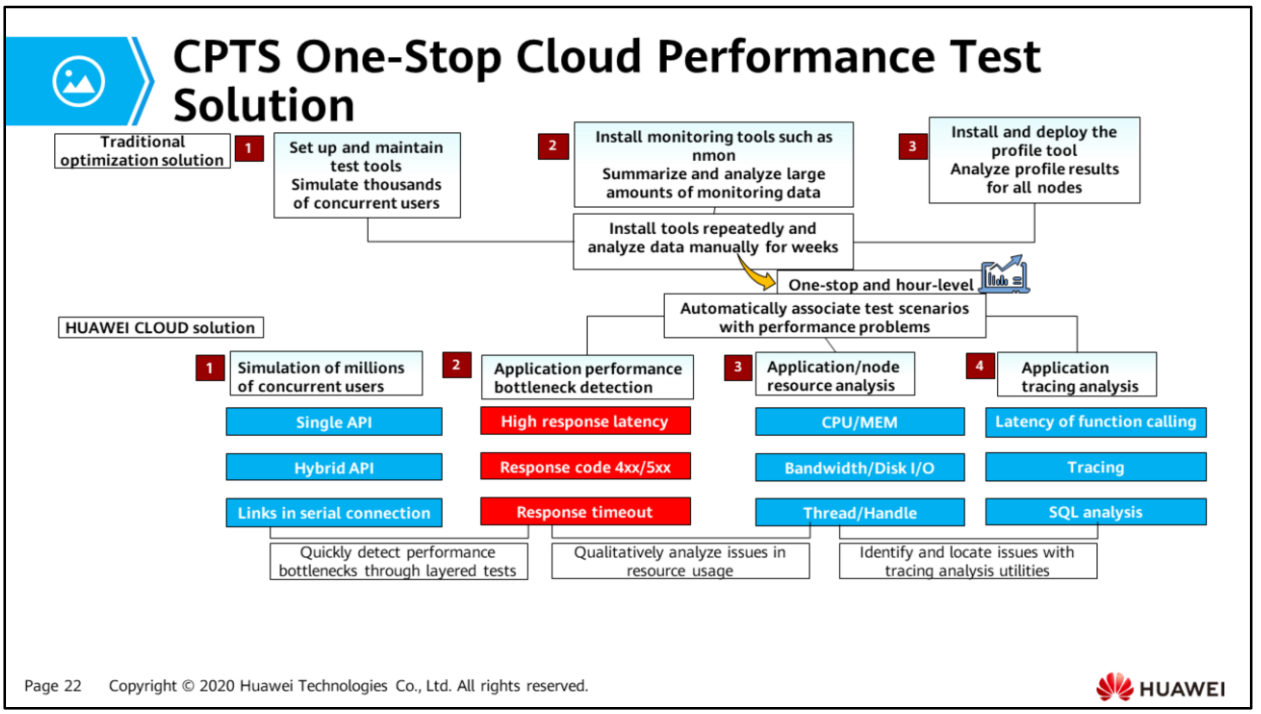
- CodeHub features:
  - You can read, modify, and commit code online. CodeHub enables you to develop code anywhere at anytime.
  - Online branch management, including branch creation, switchover, and merge. You can develop multiple branches concurrently and efficiently.
  - Branch protection prevents branches from being committed or deleted by others.
  - IP address whitelists allow you to perform region control. HTTPS is supported. In this way, unauthorized code pull is blocked to ensure data transmission security.
  - Password reset frees you from worrying about forgetting passwords.
- Security:
  - Security advantages of DevCloud and CodeHub



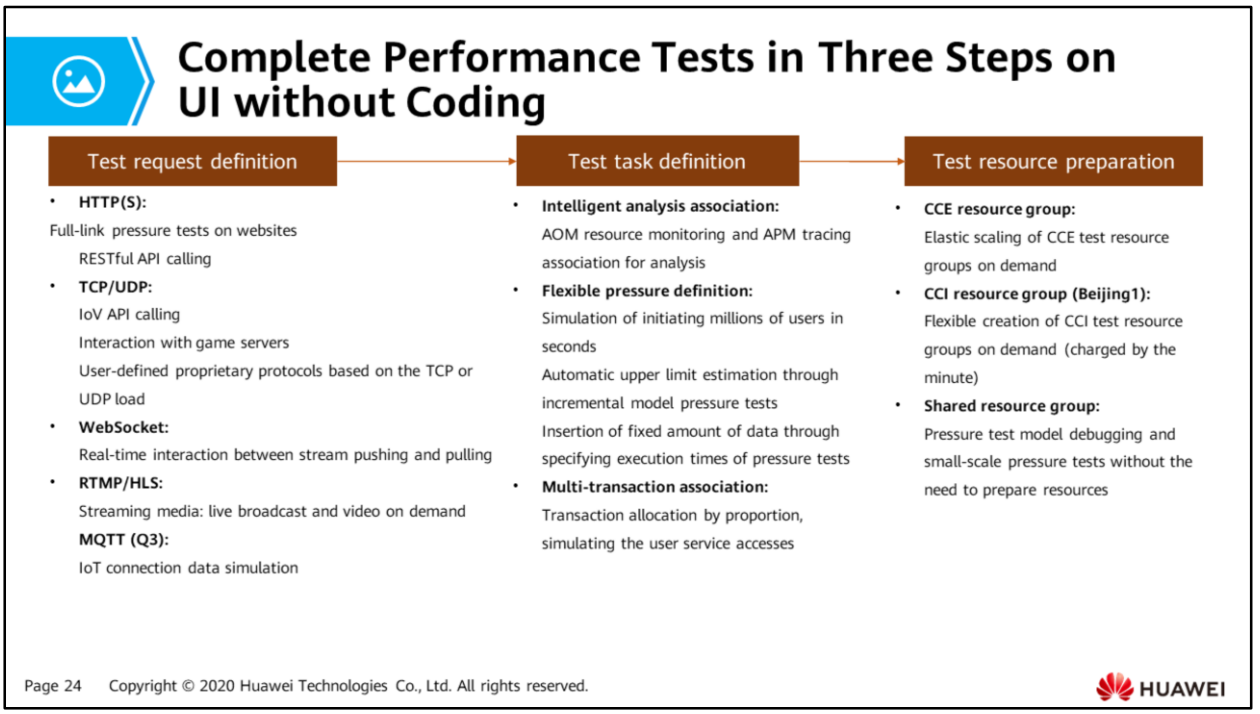
- What Is CloudTest?
  - CloudTest is a one-stop test platform that allows developers to conduct API and performance tests and manage these tests in the cloud. Developed on the basis of the DevOps agile testing concept, CloudTest helps developers improve management efficiency and deliver high-quality products.
  - Test management incorporates concepts such as full-lifecycle tracing, multi-role collaboration, agile test, and requirement-driven test, covering test requirement management, task assignment and execution, progress management, coverage management, result management, defect management, test reports and dashboard, and one-stop manual and automatic test management. Test management can be tailored for different teams and processes, supporting product quality evaluation from multiple perspectives, efficient test activity management, and quality product delivery.
- API test allows you to quickly orchestrate API test cases based on the API URL or Swagger files. It integrates pipelines, and supports microservice testing and layered automatic testing. No code compiling is required for test cases. The technical barrier is low. Therefore, these test cases can be used by different roles such as API developers, API consumers, test personnel, and service personnel. You can import the swagger API definition in a few clicks to automatically generate a script template, based on which you can orchestrate and manage automated test cases of APIs. HTTP and HTTPS supported; a visualized case editing interface; various preset check points and built-in variables; customized variables; parameter transfer; and continuous automated testing.



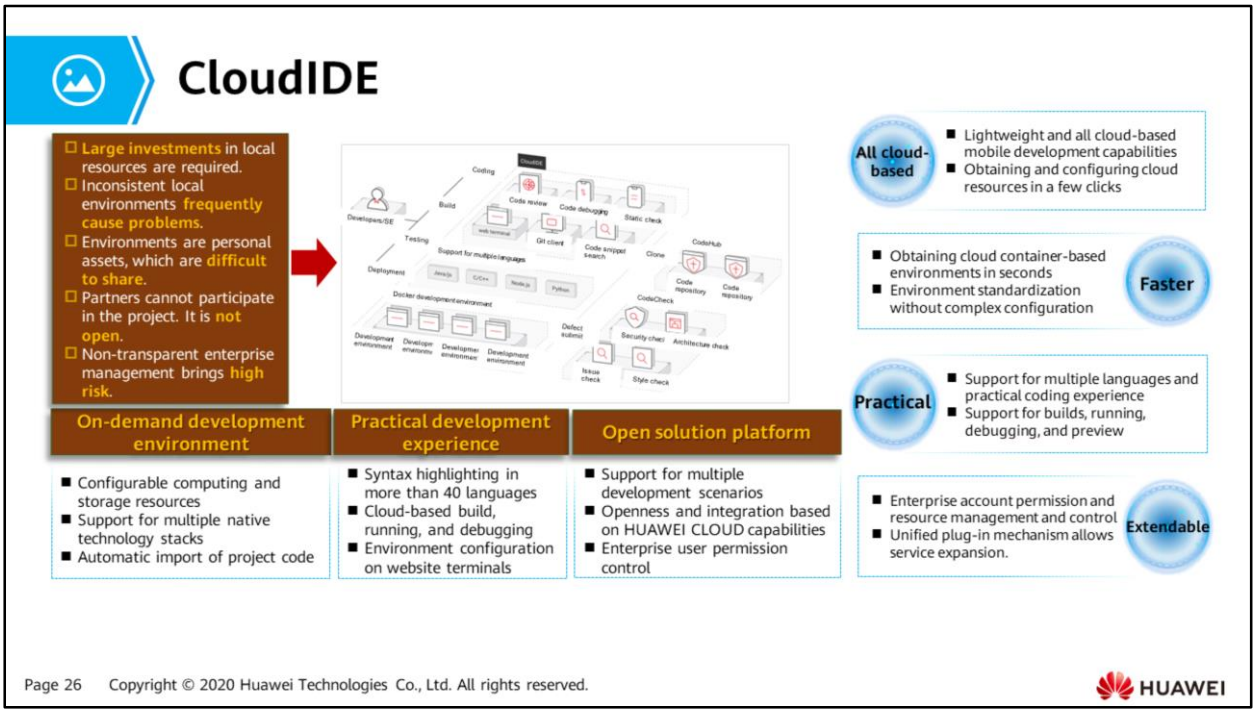
- Application scenarios: Internet, gaming, and finance
  - Cloud Performance Test Service (CPTS) is a cloud service that provides API and E2E performance tests of applications, which are built based on HTTP, HTTPS, TCP, UDP, WebSocket, RTMP or HLS. The rich capability of test model definition can be used to restore scenarios of large-scale concurrent service access, helping users identify application performance problems in advance.
  - CPTS provides distributed pressure tests and is widely used in various industries, such as the Internet, digital marketing, Internet of Vehicles (IoV), and finance.
- E-Commerce Flash Sale Tests
  - E-commerce flash sale is characterized by large-scale user concurrency, multiple burst requests, and repeated access attempts. Guaranteeing the availability of websites under heavy load is key.
- Advantages
  - Scenario simulation: CPTS simulates millions of instantaneous concurrent requests in seconds, and simulates a heavy-load website in a test model.
  - Professional test report: CPTS provides statistics collected based on the response latency range, reflecting user experiences.
  - Retry for failed users: User-defined comparison of results calculated by using expressions enables login retry.
  - Figure 1 E-commerce flash sale tests



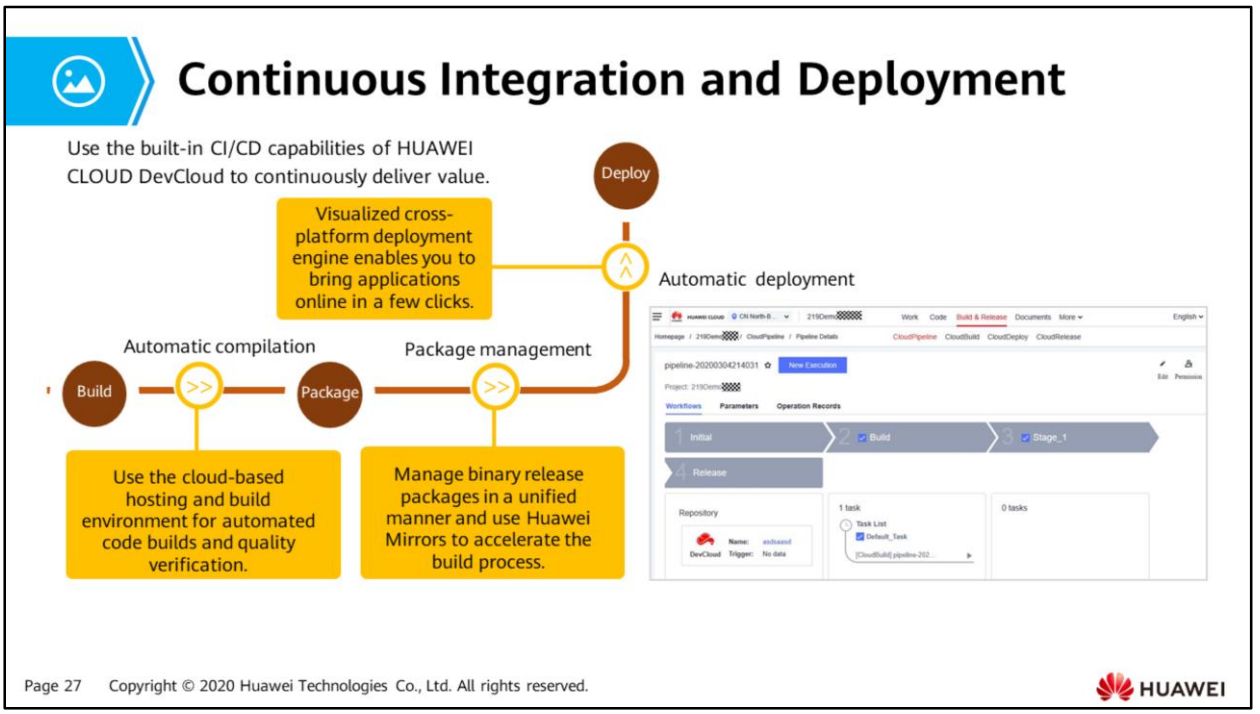
- Advantages:
  - CPTS provides a one-stop performance test solution, helping you identify the performance bottlenecks of applications in advance.
  - Cost-efficient simulation of ultra-high concurrency
  - CPTS provides private test clusters for you. In such a test cluster, a single execution node can simulate virtual users in the tens of thousands, and the entire test cluster can simulate virtual users in the millions.
  - CPTS simulates millions of instantaneous concurrent requests. In this way, enterprises can identify application performance bottlenecks in high concurrency scenarios and prevent system breakdown caused by a large number of access requests. CPTS is easy to operate and greatly shortens the test time.
  - CPTS supports execution of multiple concurrent tasks. It enables you to test the performance of multiple applications at the same time, greatly improving the test efficiency.
  - Flexible and fast performance test, achieving quick application rollout



- Features
  - CPTS provides tests for HTTP/HTTPS/TCP/UDP/WEBSOCKET/RTMP/HLS-based applications with high user concurrency. It allows you to flexibly define multi-protocol packet contents, transactions, and test task models. CPTS also allows you to view performance statistics, such as concurrency, transactions per second (TPS), and response latency in real time or in offline mode. Additionally, CPTS performs management of test resource groups based on the changes in required performance test scales. This management includes creating and scaling of private test resource groups.
- Multi-protocol and high-concurrency performance tests
  - Quickly define standard HTTP/HTTPS/TCP/UDP/WEBSOCKET/RTMP/HLS packet contents. You can send pressure test traffic to different tested applications through simple adjustment. Based on the service requirements of tested applications, CPTS allows you to define any fields in HTTP/HTTPS/TCP/UDP/WEBSOCKET/RTMP/HLS protocol packets, for example, configuring and editing the GET and POST methods of HTTP, as well as the uniform resource locator (URL), header, and body fields.
  - Defining the behavior of virtual users for different test scenarios. You can specify the interval for sending requests of the same user by setting the think time, or define multiple request packets in a transaction to set the number of requests initiated by each user per second.



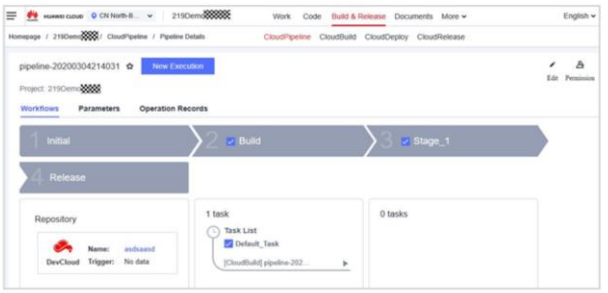
- A cloud-based development environment of DevCloud. It provides a workspace (including the editor and runtime environment) that can be configured as required and quickly obtained. It supports environment configuration, code reading, writing, building, running, debugging, and preview. It can connect to multiple code repositories.
- Application scenarios:
  - Application: service-oriented web application
  - Scenario characteristics: Developers cannot perform development due to the lack of local environment. Now developers can access CloudIDE on web page to develop anywhere at anytime.
  - Application: CloudIDE is suitable for container-based service-oriented web application development. It enables quick setup of a consistent development environment and online code developing at anytime.



- Continuous integration (CI) refers to the delivery of an individual's work to the entire software development. It uses frequent integration to quickly detect errors. Continuous integration originates from Extreme Programming (XP) and is one of the first 12 practices of XP.
- Requirements of CI: comprehensive automatic testing. This is the basis for continuous integration and continuous deployment. In addition, it is important to select proper automatic testing tools; flexible infrastructure. Containers and virtual machines free developers and QA personnel from heavy burdens; version control tools, such as Git, CVS, and SVN. Tools for automatic build and software release processes, such as Jenkins and flow.ci; feedback mechanism. For example, if a build or test fails, the owner can be quickly notified to solve the problem as soon as possible to ensure a more stable version.
- HUAWEI CLOUD DevCloud enables enterprises to build CI/CD capabilities through automatic compilation, build, deployment, release, and pipelines.

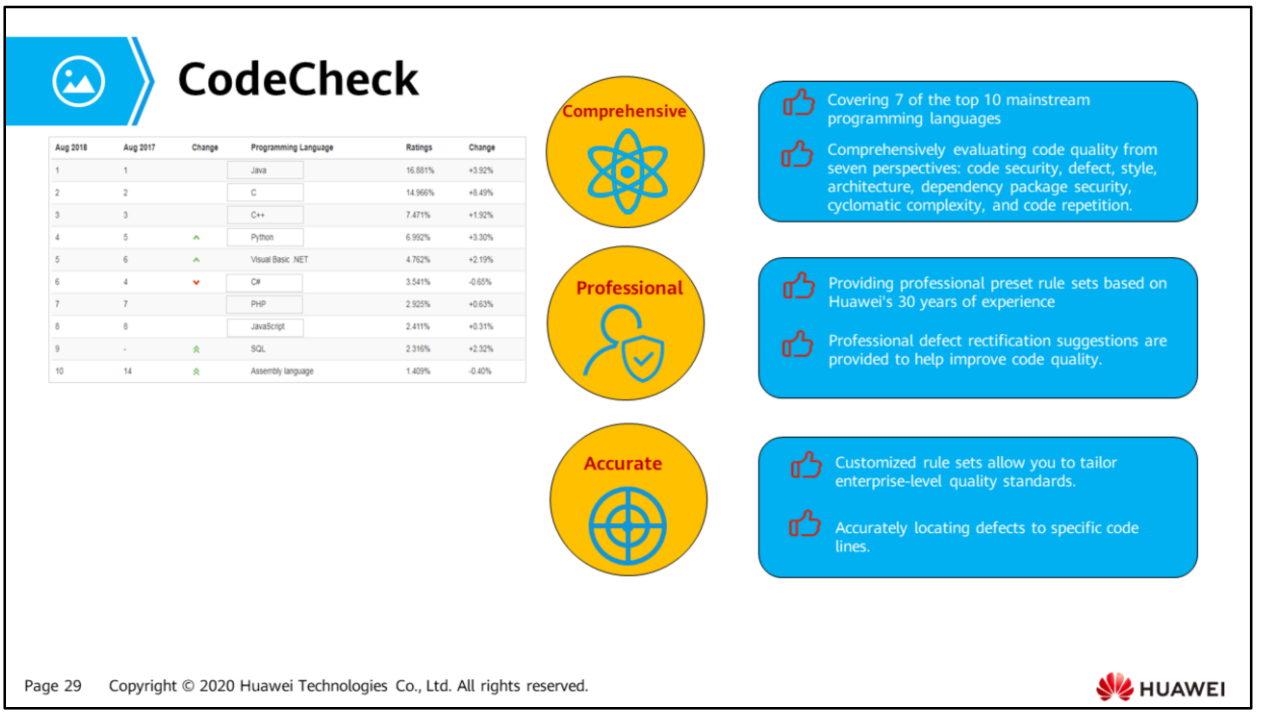
CloudPipeline : Build Fast , Reliable , and Repeatable Pipelines

Visualized orchestration	Management task	Triggering mode	Management and control mode	Accurate identification of bottlenecks	Mobility
Stages Jobs Parallel or serial Sub-pipelines	Code check Compilation and build API tests Deployment	Code commits Scheduling Manual triggering	Quality guard Manual intervention	Visualization Task health	Mobile apps

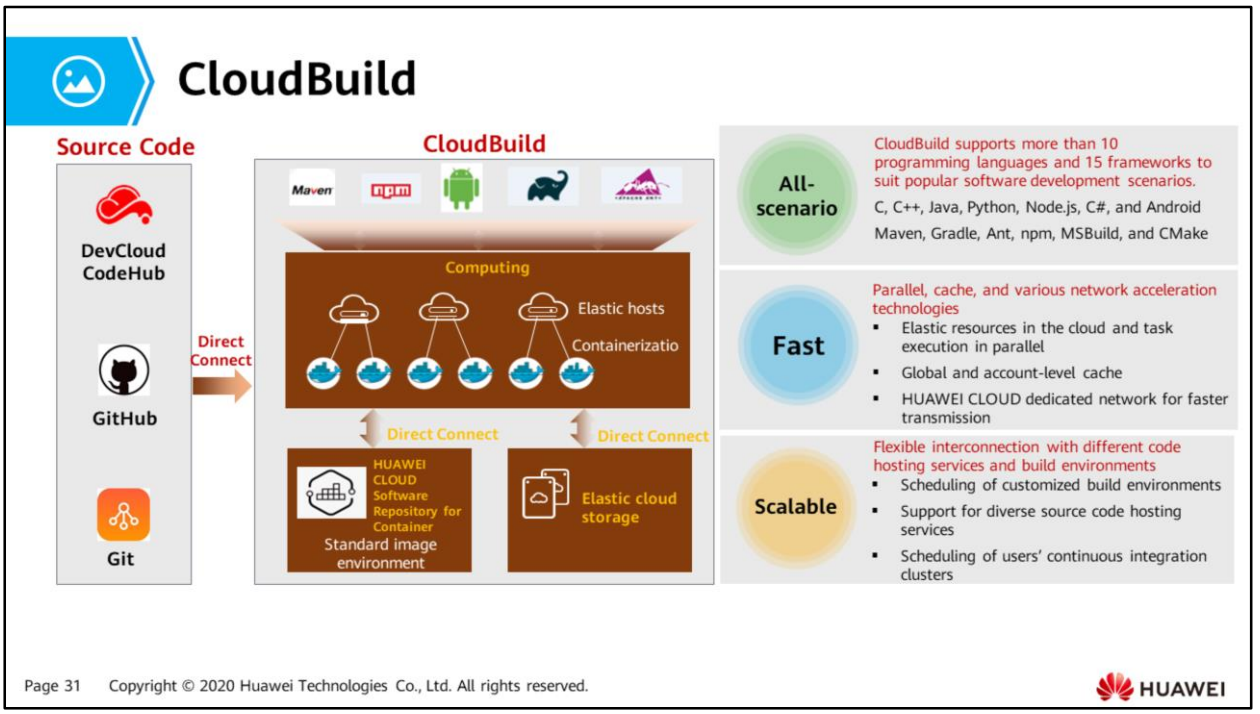


Ford Model T assembly line (source: Internet)

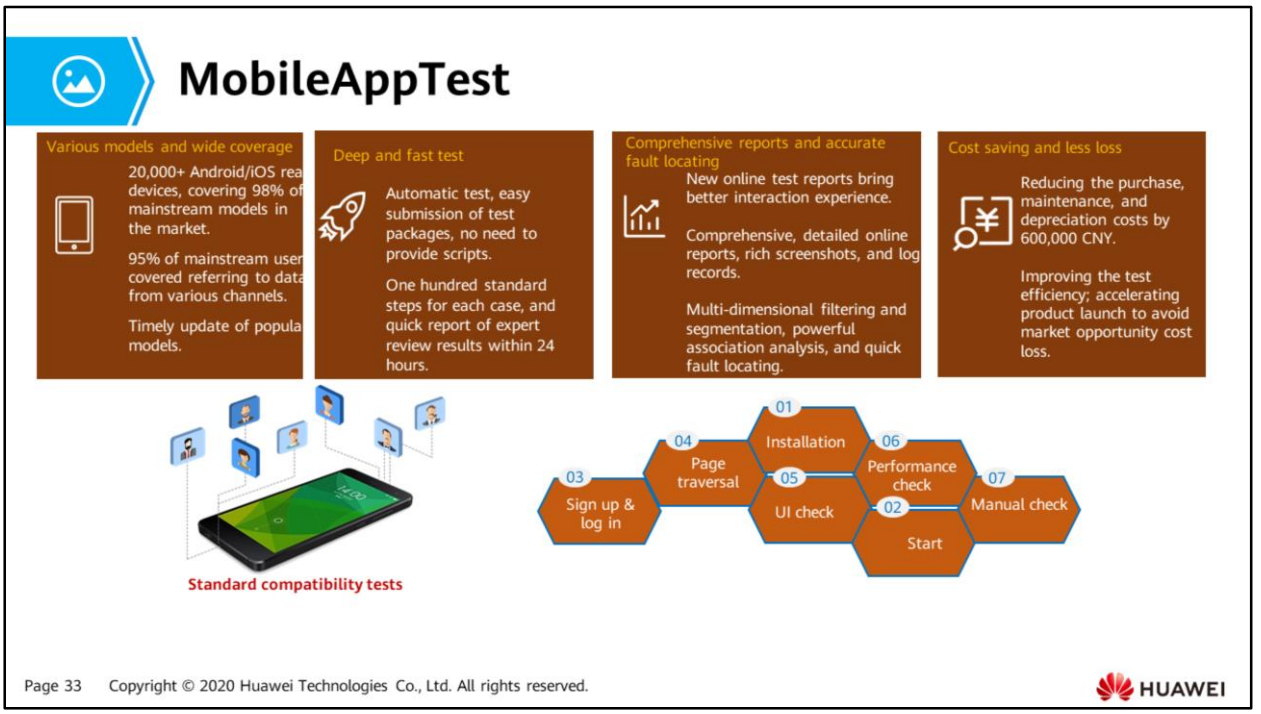
- CloudPipeline provides visualized and customizable automatic delivery pipelines to shorten the delivery period and improve delivery efficiency.
- CloudPipeline has the following features:
  - Five task types are supported: build, code check, sub-pipeline, deployment, and pipeline control.
  - Tasks in each pipeline stage can be executed in serial or parallel mode.
  - Execution status and execution logs can be reported.
  - Software packages can be downloaded.
  - Tasks can be executed independently.
  - Progress statistics is supported.
  - Parameter-based pipeline execution is supported.
  - Pipeline execution history is provided.
  - Subtasks can be queried.
  - Pipeline statistics is supported.
  - Pipelines can be executed periodically.



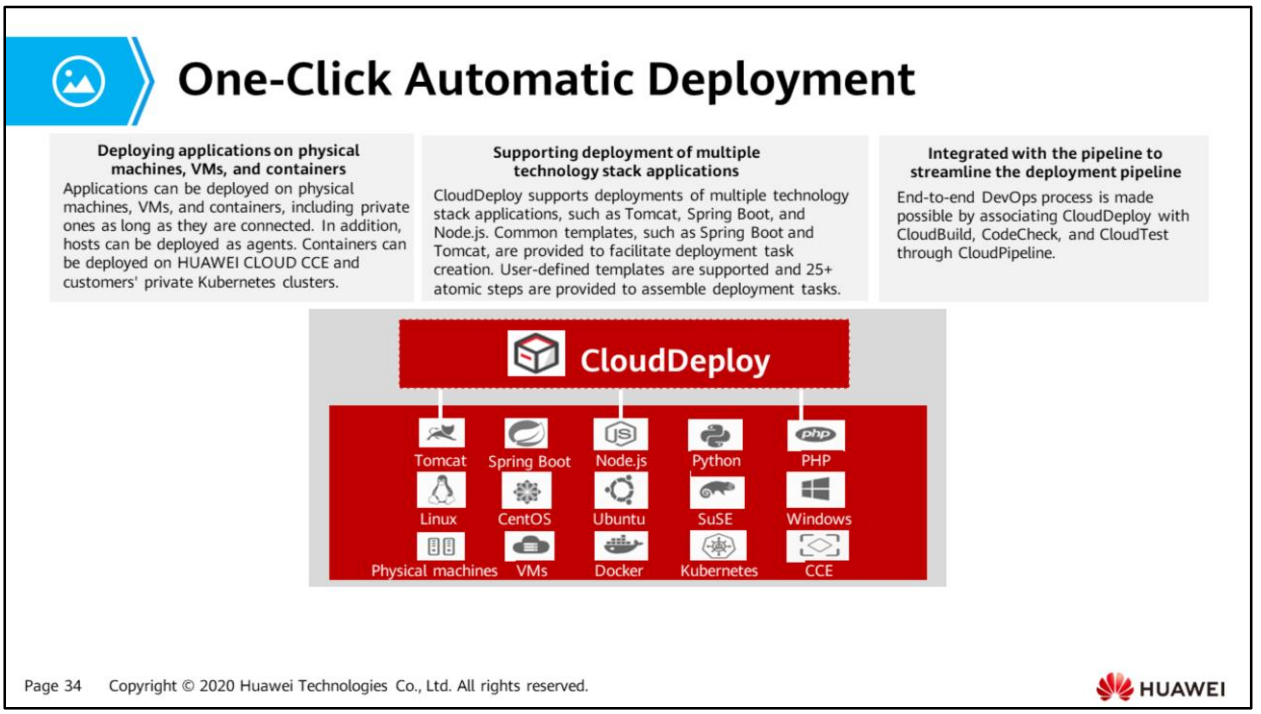
- CodeCheck is a cloud-based code quality management service for software developers. It supports mainstream development languages, such as Java, C/C++, Android (Gradle), PHP, Python, JavaScript, Web, and CSS. Code static check, architecture check, security check, issue check, quality scoring, and code defect rectification trend analysis can be performed online in multiple languages to facilitate code quality control.
- CodeCheck helps you quickly locate code defects and provides examples and rectification suggestions.
- You can switch to the code repository to perform online debugging in one click.
- Huawei typical check rule sets are provided, or you can customize your check rule sets to flexibly adapt to project requirements.
- Check the code in one click and fix defects in batches.
- CodeCheck has the following features:
    - Code check in multiple languages is supported.
    - Huawei's typical check rules are provided to support web security architecture and code check.
    - Check rule set customization
    - Code defects can be sorted by multiple dimensions to allow you prioritize your work.
    - Impact description, modification examples, and suggestions are provided for code defects.



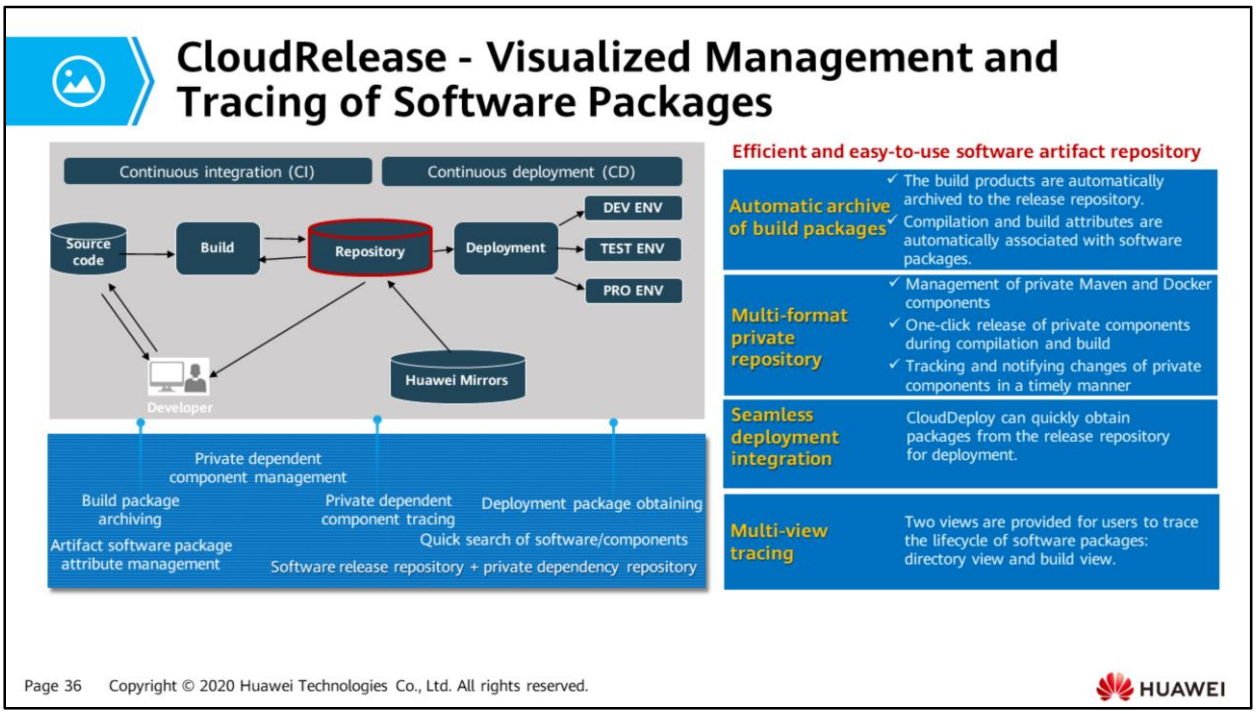
- CloudBuild provides an easy-to-use code compile and build platform that supports multiple programming languages in the cloud. It helps enterprises improve build efficiency.
- What Is CloudBuild?
- Build is the process of converting source code into a target file and packaging the configuration file and resource file.
- HUAWEI CLOUD DevCloud CloudBuild is an easy-to-use code compile and build platform in the cloud that supports multiple programming languages. It helps enterprises with more efficient and faster continuous delivery. CloudBuild enables you to easily create, configure, run, and monitor build jobs, and automates code obtaining, building, and packaging.
- CloudBuild Features
    - Container-based build
    - DevCloud supports two types of container images:
    - System image: supports the build and packaging using popular languages and tools.
    - Custom images: HUAWEI CLOUD Software Repository for Container (SWR) and Docker Hub are supported. You can customize application images for multi-language compilation.



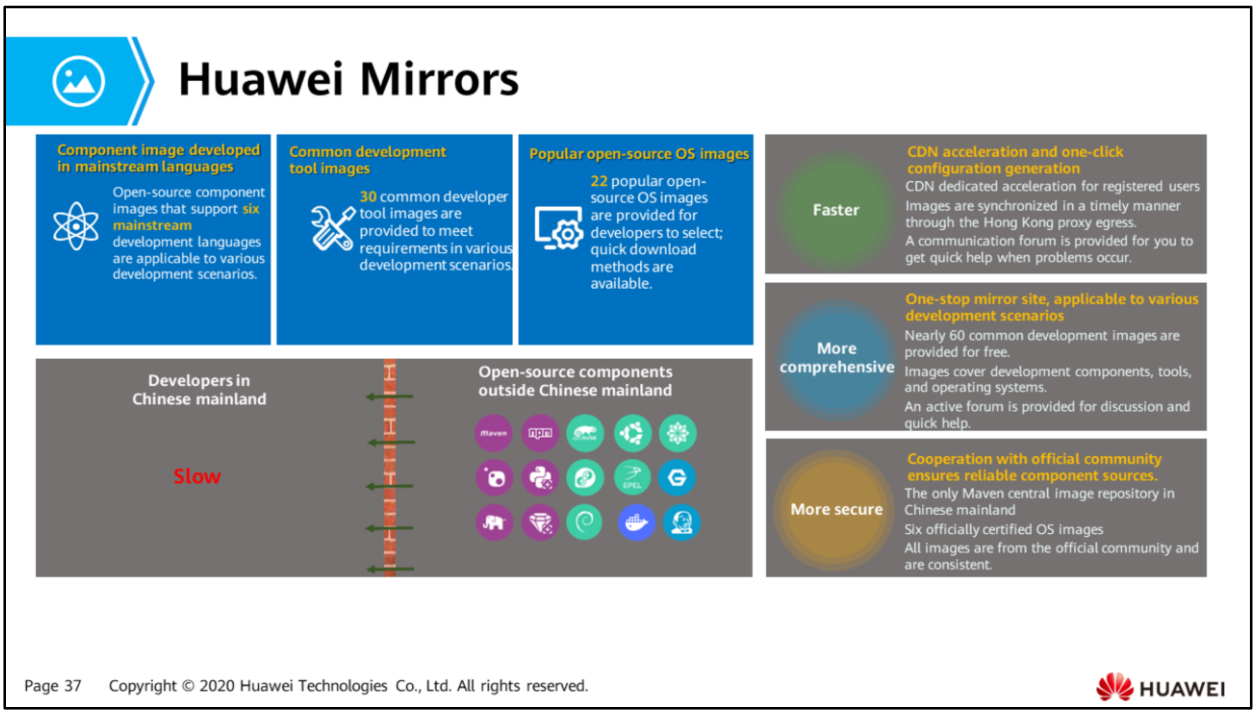
- MobileAppTest is a mobile compatibility test service provided by Huawei and TestBird. It provides top models and hundreds of test experts. Leveraging image recognition and app control recognition, the service generates compatibility test reports for apps. The test reports generated include system logs, screenshots, error causes, CPUs, and memory.
- The MobileAppTest has the following features:
  - Comprehensive models: Top models are provided, covering 98% of mainstream models; Quickly launching new mainstream models.
  - Automatic testing: No test script or manual case compilation is required. You only need to submit the Android and iOS application installation files and select the test package to generate a detailed test report.
  - Deep and fast tests: In-depth tests cover compatibility issues such as UI exceptions, crash, suspension, program exceptions, and black screen. You can quickly obtain a professional and complete test report by submitting a task.
  - Detailed online test reports can be downloaded by one click. Detailed test analysis, problem context, screenshots, and logs are provided.
  - It enables you to quickly locate and resolve problems. Detailed problem description is provided. It supports operation screenshots and log correlation analysis, impact ranking, and multi-dimensional problem filtering, such as terminal, to help accurately locate problems.



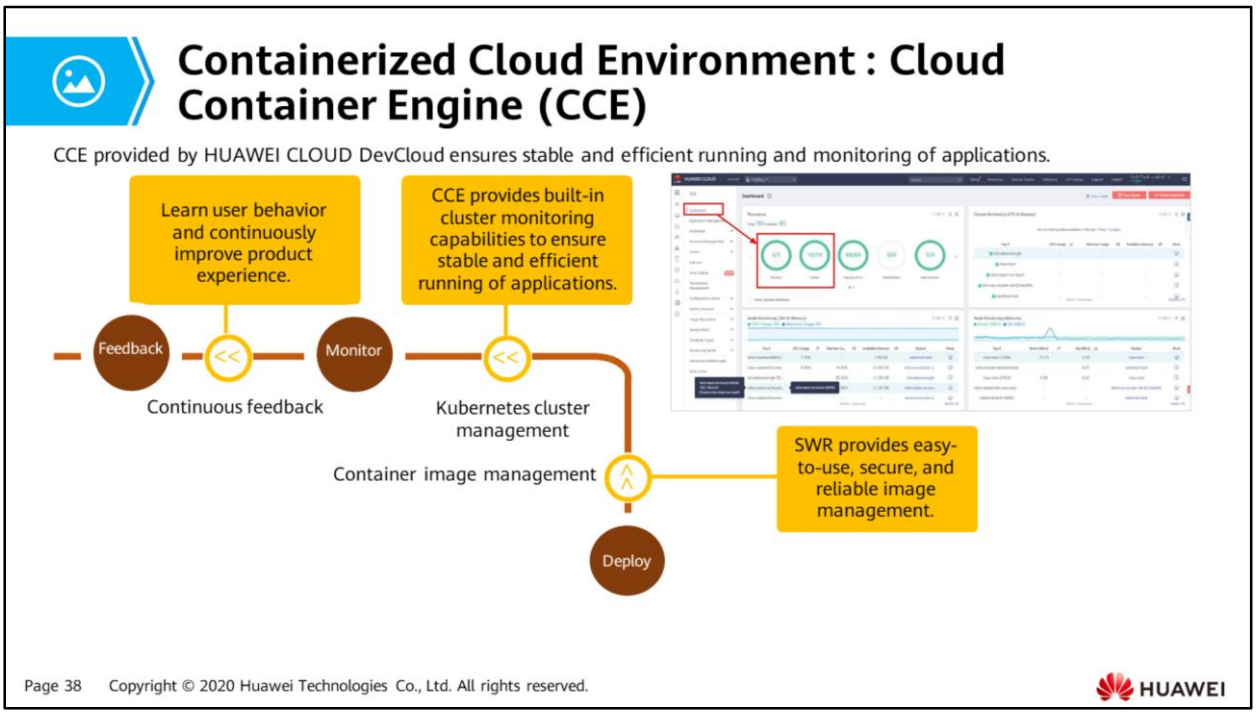
- CloudDeploy provides visualized, one-click deployment services. It supports deployment on VMs or containers by using Tomcat, Spring Boot, and other templates or flexibly orchestrated atomic actions. It also supports parallel deployment and seamless integration with CloudPipeline, providing standard deployment environments and implementing automatic deployment.
- What Is CloudDeploy?
- CloudDeploy provides visualized, one-click deployment services. It supports deployment on VMs or containers by using Tomcat, Spring Boot, and other templates or flexibly orchestrated atomic actions. It also supports parallel deployment and seamless integration with CloudPipeline, providing standard deployment environments and implementing automatic deployment.
- CloudDeploy has the following features:
    - Tomcat, Spring Boot, PHP, CCE, and other templates are predefined for fast task creation. More than 20 atomic actions are provided for flexible task orchestration.
    - A deployment task can be deployed on multiple hosts and host groups. Logs are generated for each atomic action, enabling quick fault locating and rectification in the case of deployment failure.
    - You can define and save your own templates.
    - Parameters can be set and dynamically executed.



- A cloud service for software release and management. Secure software repositories allow you to manage software packages and their metadata, download release packages, and release software, achieving continuous delivery.
- CloudRelease helps software development enterprises manage the software release process in a standardized, visualized, and traceable way.
- CloudRelease focuses on and manages the to-be-deployed software packages (usually built by or packed from the source code) and their lifecycle metadata. The metadata includes basic attributes such as name and size, source code, build time, tests conducted, and deployment environment.
- The management of software packages and their attributes is the basis of release management. The common software development process is shown below:
- CloudRelease provides two types of repositories:
    - Software release repository: It is used to manage all software packages generated by building or packing and their lifecycle attributes.
    - Private dependency repository: Unlike open-source central repositories such as Maven Central Repository, the private dependency repository is used to manage an enterprise's public components. It supports multiple languages and dependency package management tools such as Maven and npm.



- Mirrors is provided by DevCloud for quickly downloading a wide variety of trustworthy open-source components, operating systems (OSs), and DevOps tools.
- Mirrors is developed and maintained by the HUAWEI CLOUD DevCloud team. DevCloud is dedicated to building a cloud-based one-stop DevOps tool service that simplifies software development. Mirrors provides multiple types of software installation sources and ISO download services, covering seven languages including Maven, NPM, and PyPI, 20+ OS images including Ubuntu, CentOS, and Debian, and common tool images such as MySQL and Nginx. It is dedicated to providing users with comprehensive, high-speed, and trustworthy component download service.



- Cloud Container Engine (CCE) is a high-performance, high-reliability service through which enterprises can manage containerized applications. CCE supports native Kubernetes applications and tools, allowing you to easily set up a container runtime environment on the cloud.
- Easy to use
  - One-click creation of container clusters; one-stop deployment and O&M of containerized applications; Kubernetes and Docker out of the box; Deep integration of Istio
- High performance
  - Multiple types of heterogeneous infrastructures are supported, such as high-performance HUAWEI CLOUD VMs, BMSs, and GPUs. The bare-metal NUMA architecture and high-speed InfiniBand network cards yield three- to five-fold improvement in computing performance.
- Enterprise-grade functionality
  - High reliability through 3 masters on the cluster control plane; node and application deployment across AZs. High security as clusters are private to users and subject to role-based access control (RBAC).

Summary

- HUAWEI CLOUD provides software lifecycle management.
  - Requirements/Planning
  - Development
  - Testing
  - Release
  - O&M
  - Operations

Quiz

1. CloudDeploy of HUAWEI CLOUD DevCloud can be used to deploy application software packages only to HUAWEI CLOUD. In this way, customer loyalty can be enhanced. The pattern of promoting cloud with cloud can be established.
   A. True
   B. False
2. Apart from lightweight Dashboard templates, which of the following project management processes is provided by DevCloud?
   A. Scrum
   B. Agile
   C. CMMI
   D. IPD

- Answer for Q1:
  - B
- Answer for Q2:
  - A

More Information

- DevCloud
  - https://support.huaweicloud.com/intl/en-us/devcloud/index.html


Thank You
www.huawei.com