The Practice of CI/CD in Advancing the Ecosystem Development of photon Source Software

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What is CI/CD

CI/CD(Continuous Integration, Continuous Delivery/Deployment),which is a method of frequently delivering applications to customers by introducing automation during the development phase.Specifically, CI/CD enables continuous automation and monitoring throughout the entire lifecycle of an application, from integration and testing phases to delivery and deployment. These associated transactions are commonly referred to as "CI/CD pipelines".

Why is CI/CD

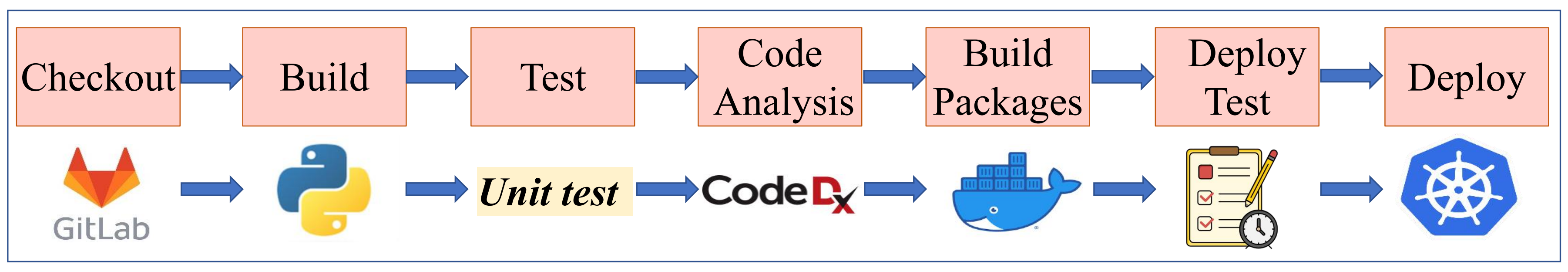
Problems in the software development process:

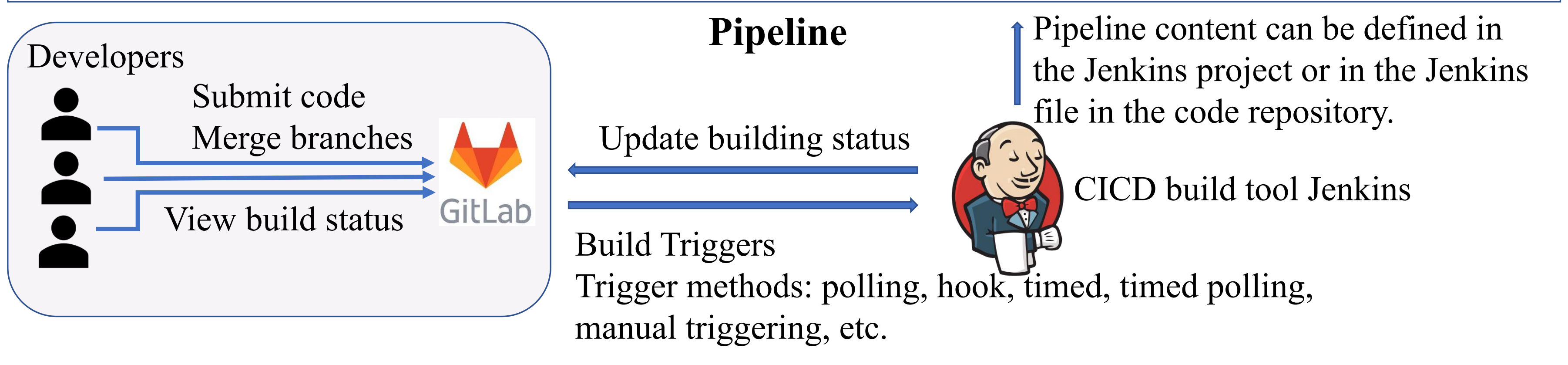
1. Deployment and integration issues in the development environment;New developers need to spend a long time familiarizing themselves with the environment and resolving issues such as version conflicts; A series of operations unrelated to algorithms cannot be completed in a short period of time.
2. BUGs lead to project rework and delays; Some of BUGS may not occur in the early stages of the project and often arise during release.
3. Lack of communication and coordination, long development cycle, often requiring long-term repeated communication between line station users and algorithm/software developers to understand each other's intentions, resulting in low efficiency.

How to solve these problems:

1. Containerization of development, testing, and deployment environments, with process automation. The development environment can use packaged containers or the CVMFS file system. Algorithm/software developers only need to submit code to the code repository, and the subsequent process is completed by the CI/CD system.
2. Timely code review and functional testing. Store the source code in a public repository; Whenever a new feature is merged into the main repository, a series of tests are required and the test results are reported to promptly identify and correct any bugs.
3. Simplify communication, frequently update, deliver, and maintain products.By viewing the Pipeline results between developers, they can understand the process and analyze problems, enhancing transparency and accountability. Line station users can see the product prototype as early as possible, communicate effectively, and continuously iterate and develop.

How to work

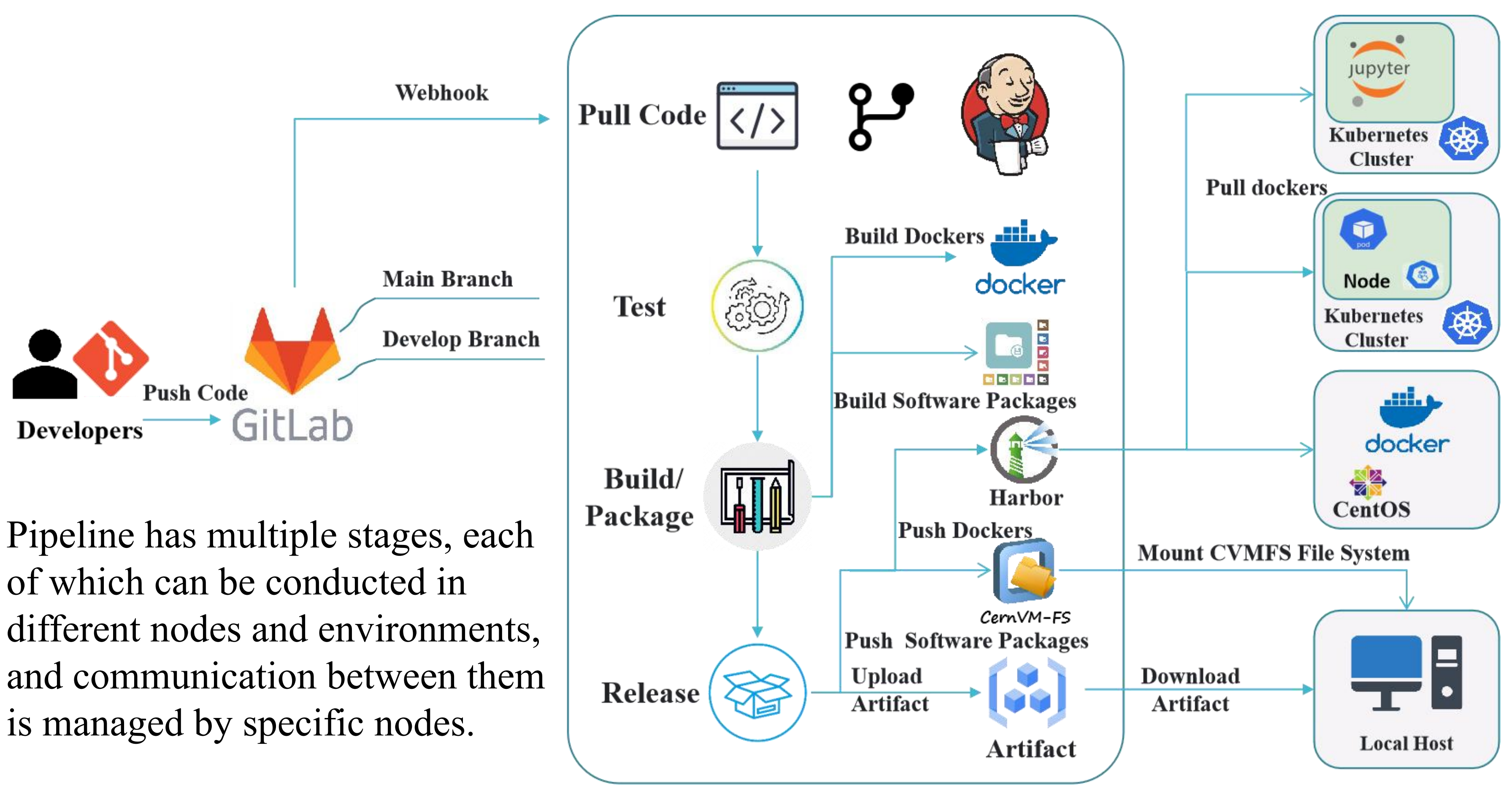




Pipeline content can be defined in the Jenkins project or in the Jenkins file in the code repository.

Trigger methods: polling, hook, timed, timed polling, manual triggering, etc.

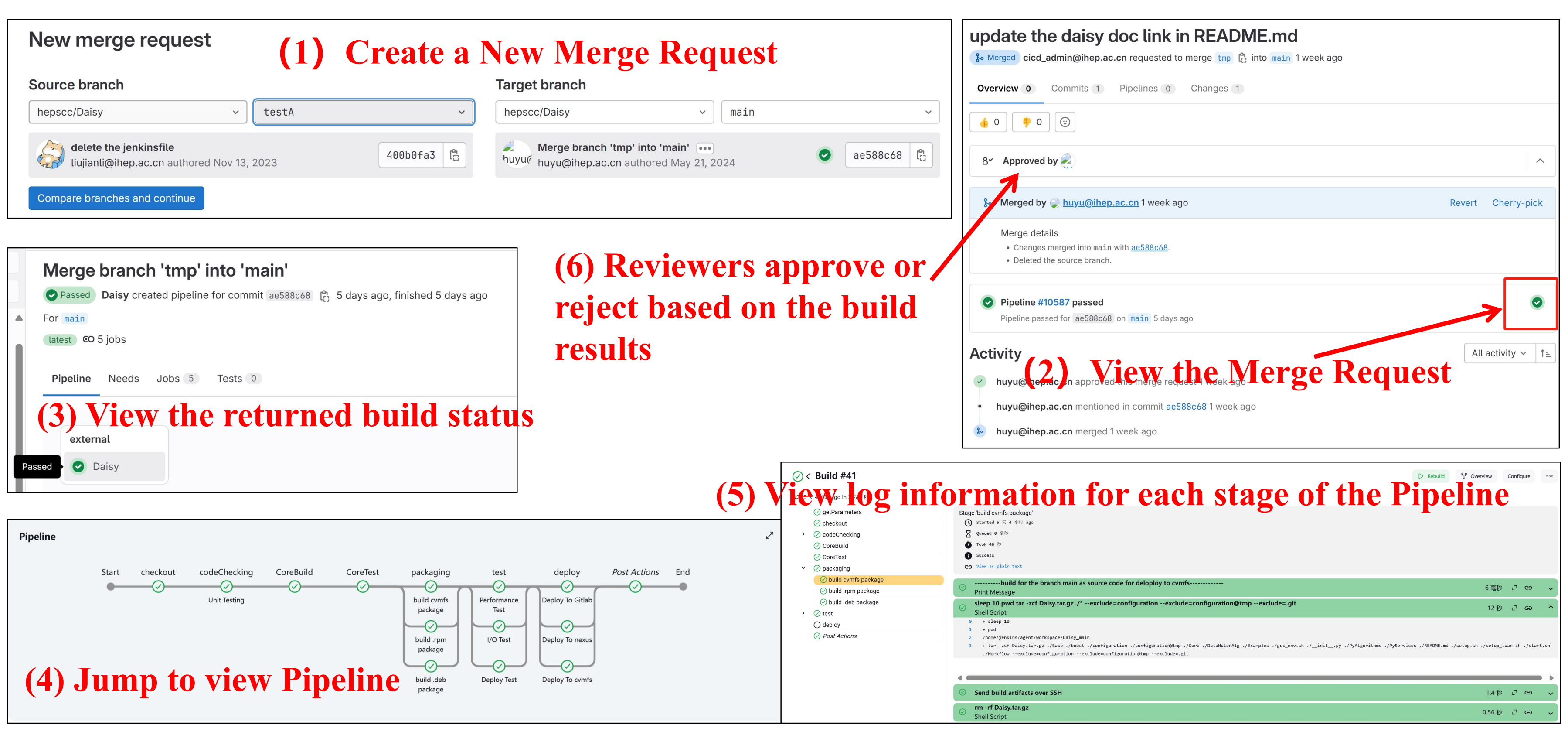
Developers only need to submit code to Gitlab, which will automatically trigger a build. Code reviewers will evaluate the build and test results, and merge the branches if they meet the criteria.



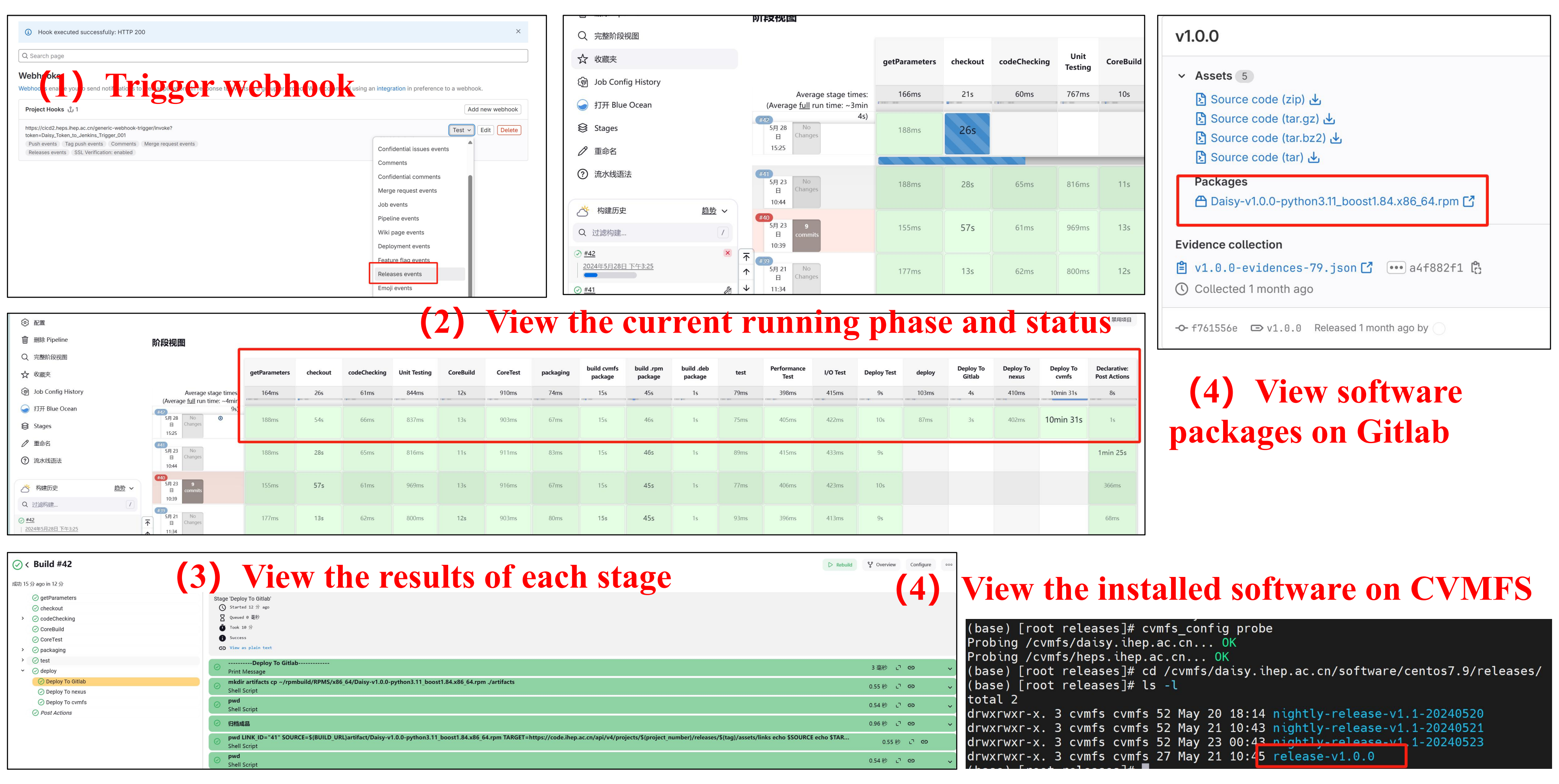
Pipeline has multiple stages, each of which can be conducted in different nodes and environments, and communication between them is managed by specific nodes.

Practices

Algorithm integration

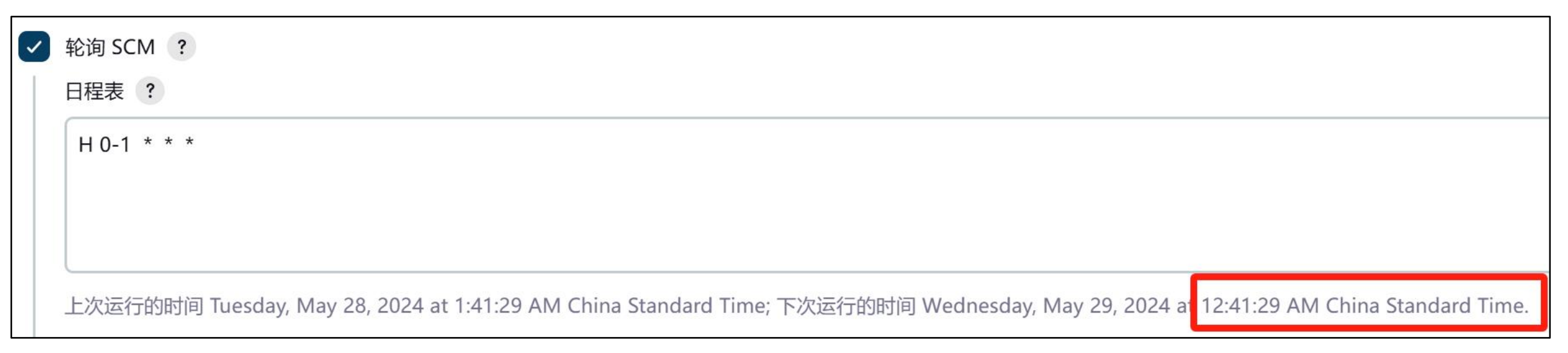

(1) Create a New Merge Request
(2) View the Merge Request
(3) View the returned build status
(4) Jump to view Pipeline
(5) View log information for each stage of the Pipeline
(6) Reviewers approve or reject based on the build results
New merge request
Source branch
Target branch
Merge branch 'tmp' into 'main'
update the daisy doc link in README.md

Releases


(1) Trigger webhook
(2) View the current running phase and status
(3) View the results of each stage
(4) View software packages on Gitlab
(4) View the installed software on CVMFS
v1.0.0
Assets
Packages

```
(base) [root releases]# cvmfs_config probe
Probing /cvmfs/daisy.ihep.ac.cn... OK
Probing /cvmfs/heps.ihep.ac.cn... OK
(base) [root releases]# cd /cvmfs/daisy.ihep.ac.cn/software/centos7.9/releases/
(base) [root releases]# ls -l
total 2
drwxrwxr-x. 3 cvmfs cvmfs 52 May 20 18:14 nightly-release-v1.1-20240520
drwxrwxr-x. 3 cvmfs cvmfs 52 May 21 10:43 nightly-release-v1.1-20240521
drwxrwxr-x. 3 cvmfs cvmfs 52 May 23 00:43 nightly-release-v1.1-20240523
drwxrwxr-x. 3 cvmfs cvmfs 27 May 21 10:45 release-v1.0.0
```

Nightly Build

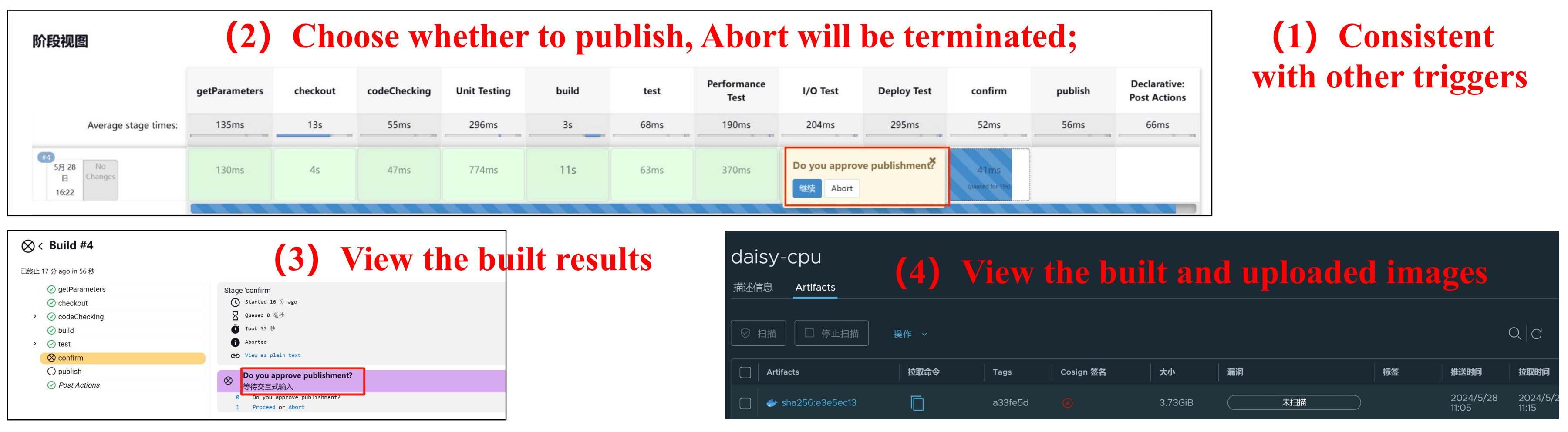


```
H 0-1 * * *
```

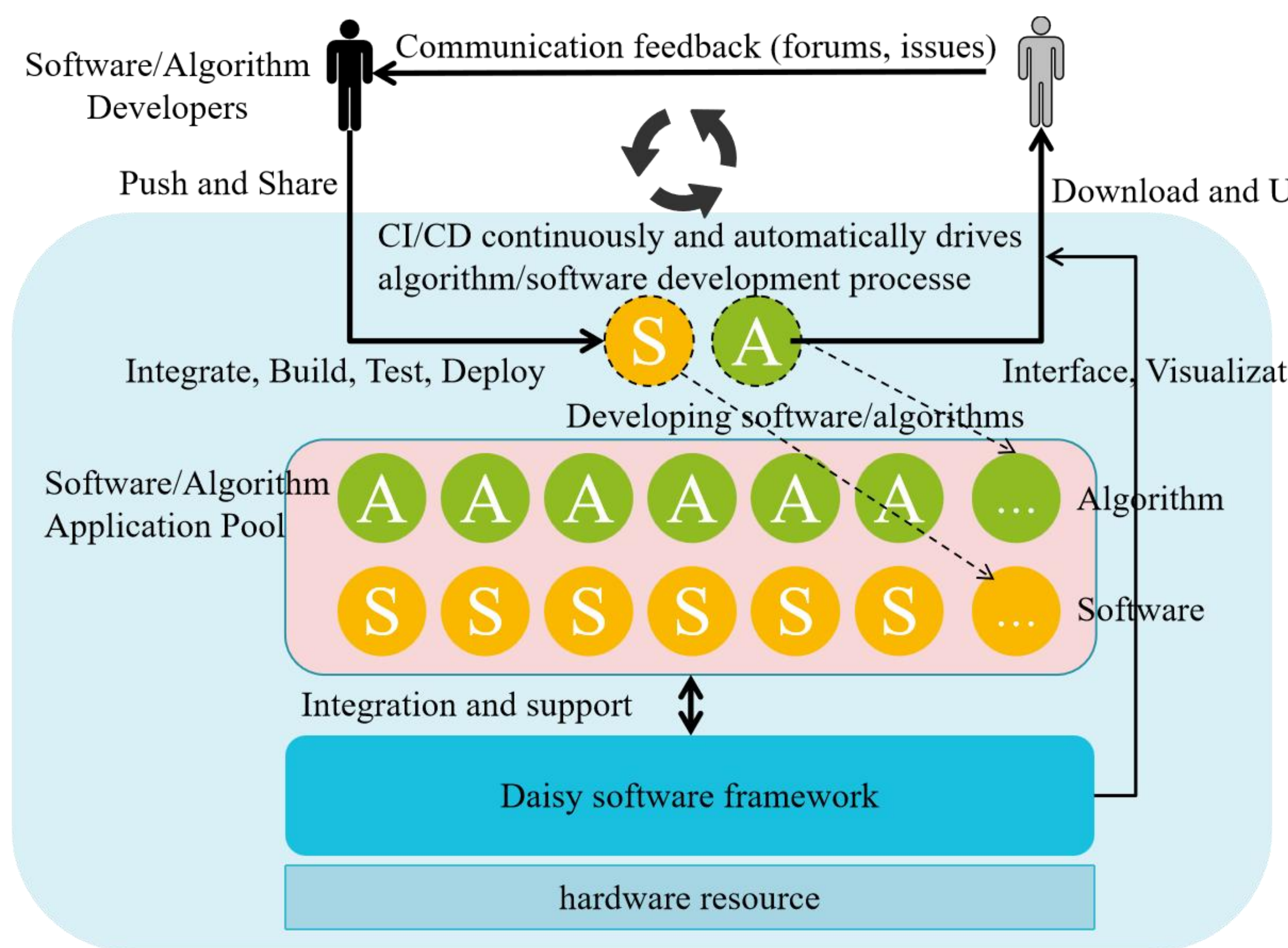
上次运行的时间 Tuesday, May 28, 2024 at 1:41:29 AM China Standard Time; 下次运行的时间 Wednesday, May 29, 2024 at 12:41:29 AM China Standard Time.

Daily polling from 0:00 to 1:00(Automatically select the idle time of the server during this period), triggering the build if there are code updates;

Build and push docker images


(1) Consistent with other triggers
(2) Choose whether to publish, Abort will be terminated;
(3) View the built results
(4) View the built and uploaded images
阶段视图
Do you approve publishment?
daisy-cpu
Artifacts

Building a software development ecosystem


Software/Algorithm Developers
Communication feedback (forums, issues)
Push and Share
Download and Use
CI/CD continuously and automatically drives algorithm/software development processe
Integrate, Build, Test, Deploy
Interface, Visualization
Developing software/algorithms
Software/Algorithm Application Pool
Algorithm
Software
Integration and support
Daisy software framework
hardware resource

DAISY(Data analysis integrated software system) is a software framework designed and developed for advanced light source online data processing. The goal is to design and implement a universal and scalable basic software architecture that integrates multiple methodological algorithms and tools, shields the complexity of computing architecture and the diversity of computing resources, provides a unified and simple calling interface for upper level application software and users, and develops common components such as data visualization and analysis desktop on this basis, in order to form a rich and prosperous software ecosystem.