MIKELANGELO

A CONTINUOUS RESEARCH PLATFORM TO ADVANCE FULL-STACK VIRTUAL INFRASTRUCTURES

Problem

MIKELANGELO works on crucial components throughout the whole virtual infrastructure stack. Since components influence each other, complex patterns emerge at the system level.
Thus, the system needs to be tested regularly. The system complexity however makes it impossible to do this by hand.

Approach

We introduce a platform for continuous integration of full-stack virtual deployments.
The platform builds on a development pipeline scheduler and a resilient resources pool.
Holistic monitoring extends the platform to provide immediate feedback on non-functional properties to developers.

Result

Gerrit organizes the source code and collects the results from the pipeline management tool Zuul. This tool is able to run automated builds, tests and benchmarks in a widespread resource pool. Immediate feedback on the quality, functionality and system wide impact of the code in an up-to-date environment is provided by Snap, a comprehensive monitoring application.

OSv designed for the cloud · OpenFOAM · KVM · sKVM · Spark

Zuul

- Listens to Gerrit, triggers and schedules code changes from MIKELANGELO components into pipelines
- Schedules system test for MIKELANGELO components
- Manages benchmarks for MIKELANGELO use cases, depending on resources and MIKELANGELO components
- Independent pipeline – runs isolated jobs, for example component tests
- Dependent pipeline – used for benchmarking and integration tests

Resource pool

- Set of physical and virtual systems (Bare metal / OpenStack / HPC / Linux Container)
- Parallel testing on different resources
- Load tests
- Automated test environment provisioning
- Exclusive resource reservation for benchmarks

Gerrit

- Web-based code management
- Central code repository
- Code evaluation feedback

Jenkins

- Cross-platform continuous integration and delivery tool
- Builds and tests software through predefined jobs
- Jobs created with Jenkins Job Builder (JJB) – automated job configuration

Monitoring

- Holistic monitoring with Snap
- Covering metrics from bare metal to the application layer
- Performance data export for developers
- Non-functional requirements
- Feedback by Grafana

Gerrit

Gerrit SSH stream ↓   ↑ Actions on Gerrit internal SSH

Zuul

| Scheduler | Gearman Server | Merger |

↕ Gearman protocol

Gearman Plugin

Jenkins

Snap → Influx → Grafana

Monitoring

Managed Hosts

- Build and test modified host kernels
- Use a modified hypervisor
- Install any user-space software

Virtualized Hosts

- Container-based virtualization
- Linux Containers (LXC), Docker
- Full virtualization
- KVM, MIKELANGELO's sKVM

Cloud

- Production-like OpenStack deployment capable of running realistic performance tests
- DevStack environment for functional tests

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