

Jenkins & Rancher
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INFN – CNAF

April 27th 2021, Bologna

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Software Delivery – by Martin Fowler

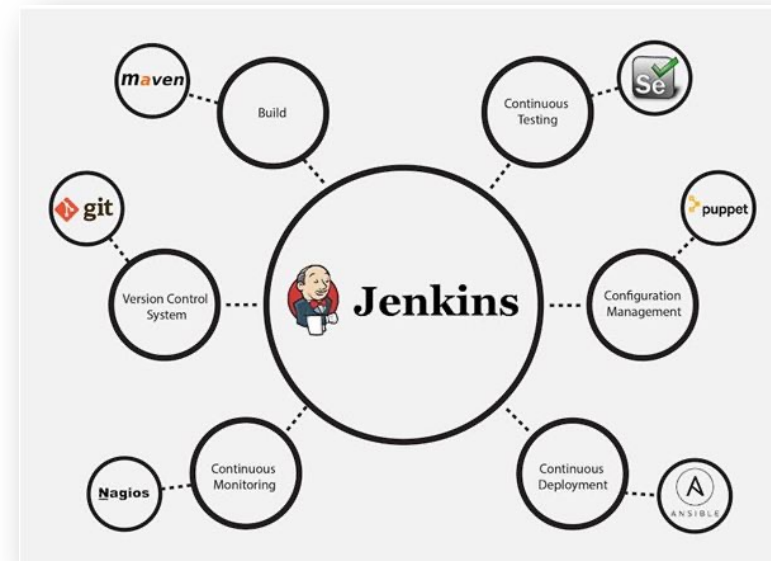


- “Software Delivery”
 - indicate the steps from a developer finishing work on a **new feature**, to that feature being used in **production**.
- Agile software development, introduced **short cycle times and fast feedback**.
- Continuous Integration
 - encourages all members of a dev-team to integrate their work daily, instead of developing features in isolation for days or weeks.
- Devops
 - encourages software devs, ops staff, and everyone else involved in delivery to work together - avoiding hand-offs that add delays and brittleness.
- Infrastructure-As-Code
 - takes advantage of our cloud age ability to rapidly deploy and provision new servers.
- Continuous Delivery:
 - Putting all the above together => always **keeps the software product in a releasable state**, allowing fast release of features and rapid response to any failures.

Jenkins

- Jenkins

- **leading open-source automation server.**
- manages and controls software delivery processes throughout the entire lifecycle, including *build, document, test, package, stage, deployment, static code analysis* and much more.
- watch for **any code changes** in places like
 - *GitHub, Bitbucket or GitLab*
- **automatically do a build** a with tools
 - *Maven and Gradle*
- Various platforms supported
 - Docker, Kubernetes, Linux, macOS, WAR files, Windows



History

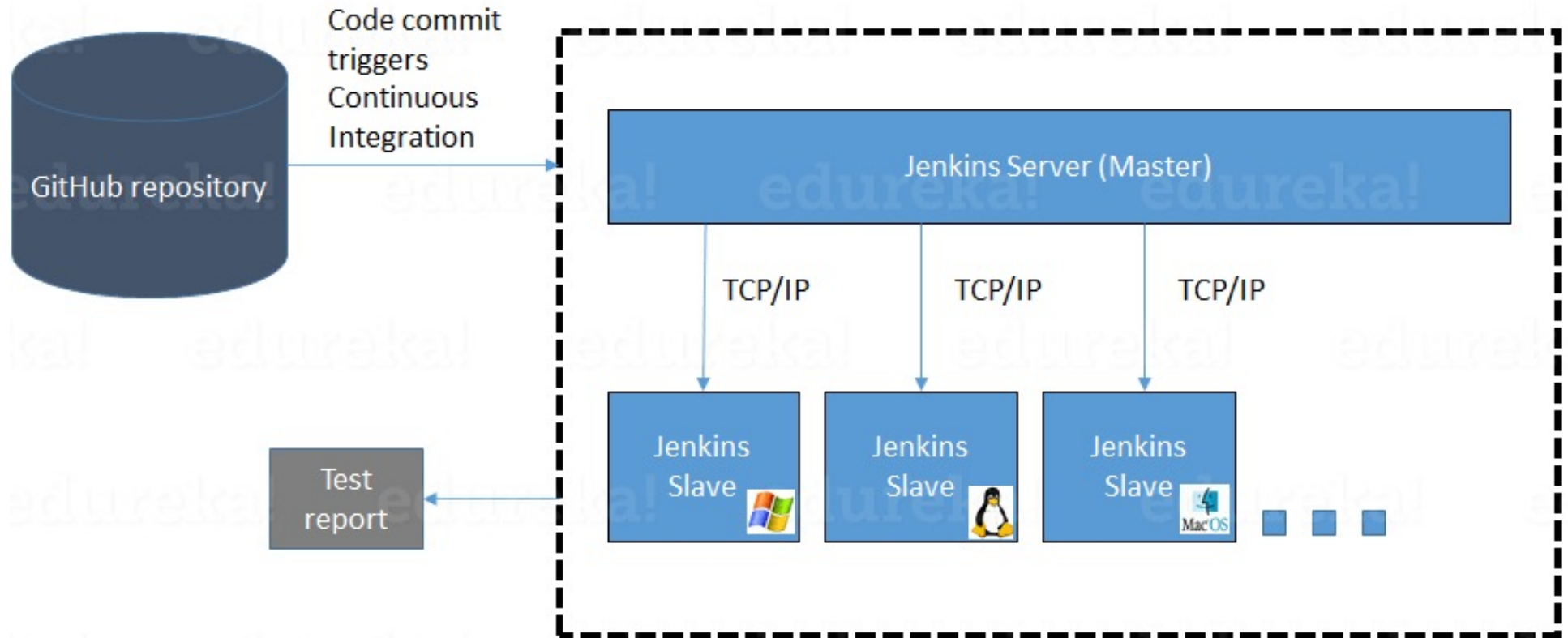
- In the beginning there was **Hudson**
 - Developed since 2004 (Sun Microsystems),
- 2010 - 2011 – dispute between Oracle (which had acquired Sun) and the independent Hudson open source community led to a fork with a name change, **Jenkins**
 - Kohsuke Kawaguchi received an O'Reilly Open Source Award for his work on the Hudson/Jenkins project.
- 2014 - Kawaguchi became CTO of CloudBees, which offers Jenkins-based continuous delivery products
- 2019 - the Continuous Delivery Foundation (CDF) was launched operating under the umbrella of the Linux Foundation
 - *developing, nurturing and promoting open source projects, best practices and industry specifications related to continuous delivery*
 - Jenkins is one of the supported projects
- 2020 - Kawaguchi announced he was moving to his new startup, Launchable.
 - officially stepping back from Jenkins, although staying on the Technical Oversight Committee of the Continuous Delivery Foundation
 - switching his role at CloudBees to an advisor.

Jenkins today

- Started as Continuous Integration tool
 - today it orchestrates the entire software delivery pipeline = Continuous Delivery
- The Jenkins community **offers more than 1,700 plugins** that enable Jenkins to integrate with virtually any tool,
- Jenkins continues to grow as the dominant solution for software process automation, continuous integration and continuous delivery and, as of **February 2018**, there are **more than 165,000 active installations** and an estimated **1.65 million users** around the world.



How it works



Architecture - master

• Master

- Scheduling build jobs.
- Dispatching builds to the slaves for the execution.
- Monitor the slaves.
- Recording and presenting the build results.
- Can also execute build jobs directly
- Easy configuration of all components and aspects

System Configuration



Configure System
Configure global settings and paths.



Global Tool Configuration
Configure tools, their locations and automatic installers.



Manage Plugins
Add, remove, disable or enable plugins that can extend the functionality of Jenkins.
▲ There are updates available



Manage Nodes and Clouds
Add, remove, control and monitor the various nodes that Jenkins runs jobs on.

Security



Configure Global Security
Secure Jenkins; define who is allowed to access/use the system.



Manage Credentials
Configure credentials



Configure Credential Providers
Configure the credential providers and types



Manage and Assign Roles
Handle permissions by creating roles and assigning them to users/groups



In-process Script Approval
Allows a Jenkins administrator to review proposed scripts (written e.g. in Groovy) which run inside the Jenkins process and so could bypass security restrictions. **2 dangerous signatures previously approved which ought not have been.**

Status Information



System Information
Displays various environmental information to assist trouble-shooting.



System Log
System log captures output from `java.util.Logging` output related to Jenkins.



Load Statistics
Check your resource utilization and see if you need more computers for your builds.



About Jenkins
See the version and license information.

Troubleshooting



Manage Old Data
Scrub configuration files to remove remnants from old plugins and earlier versions.

Tools and Actions



Reload Configuration from Disk
Discard all the loaded data in memory and reload everything from file system. Useful when you modified config files directly on disk.



Jenkins CLI
Access/manage Jenkins from your shell, or from your script.



Script Console
Executes arbitrary script for administration/trouble-shooting /diagnostics.



Prepare for Shutdown
Stops executing new builds, so that the system can be eventually shut down safely.

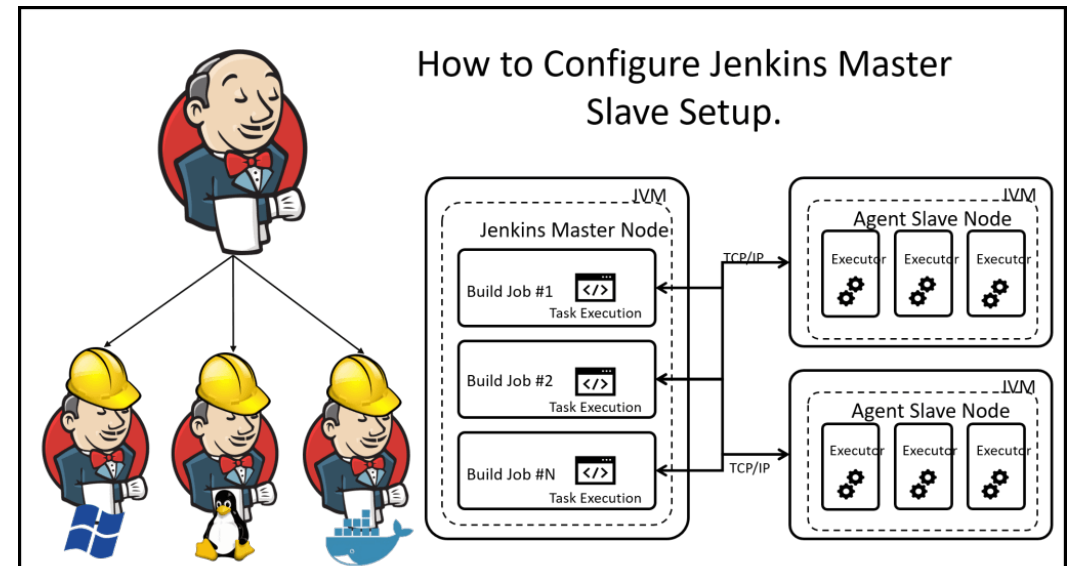
Uncategorized



Docker
Plugin for launching build Agents as Docker containers








Architecture - slaves

- Slaves
 - take requests from the Jenkins Master instance.
 - Slaves can run on a variety of operating systems.
 - The job of a Slave is to do as they are told to, which involves executing build jobs dispatched by the Master.
 - One can configure a project to always run on a particular Slave machine or a particular type of Slave machine, or simply let Jenkins pick the next available Slave.

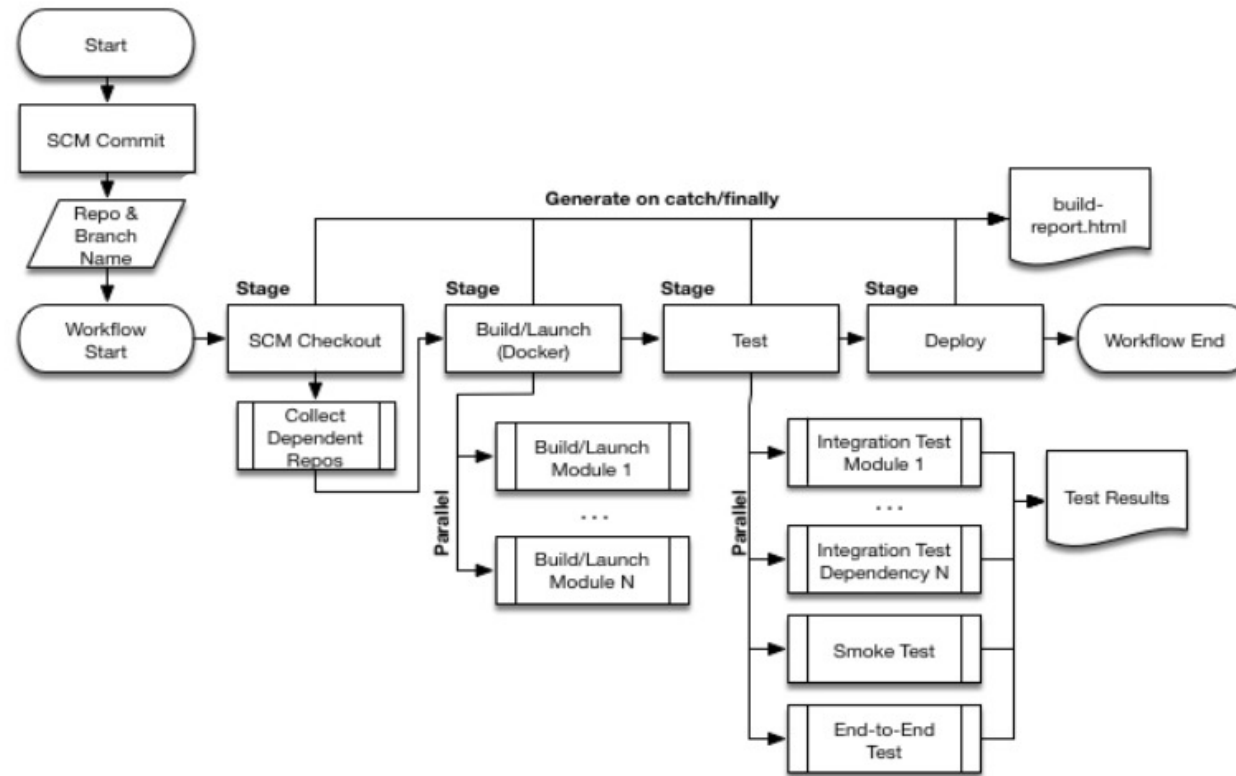
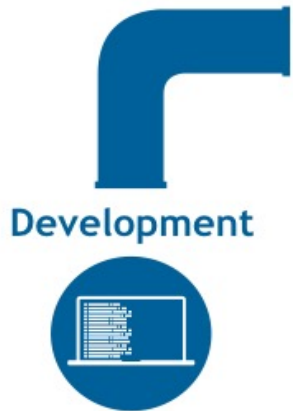


Jenkins jobs

- Jobs are the heart of *Jenkins's build* process.
- A job can be considered as a **particular task to achieve a required objective** in *Jenkins*

	<p>Freestyle project</p> <p>This is the central feature of Jenkins. Jenkins will build your project, combining any SCM with any build system, and this can be even used for something other than software build.</p>
	<p>Maven project</p> <p>Build a maven project. Jenkins takes advantage of your POM files and drastically reduces the configuration.</p>
	<p>Pipeline</p> <p>Orchestrates long-running activities that can span multiple build agents. Suitable for building pipelines (formerly known as workflows) and/or organizing complex activities that do not easily fit in free-style job type.</p>
	<p>Multi-configuration project</p> <p>Suitable for projects that need a large number of different configurations, such as testing on multiple environments, platform-specific builds, etc.</p>
	<p>Folder</p> <p>Creates a container that stores nested items in it. Useful for grouping things together. Unlike view, which is just a filter, a folder creates a separate namespace, so you can have multiple things of the same name as long as they are in different folders.</p>
	<p>GitHub Organization</p> <p>Scans a GitHub organization (or user account) for all repositories matching some defined markers.</p>
	<p>Multibranch Pipeline</p> <p>Creates a set of Pipeline projects according to detected branches in one SCM repository.</p>

CD workflow



- CD scenario easily modeled *in Jenkins Pipeline*

Pipeline

- “Jenkins Pipeline (or simply "**Pipeline**" with a capital "P") is a **suite of plugins** which supports implementing and integrating *continuous delivery workflows* into Jenkins”
 - Pipeline provides an extensible set of tools for modeling simple-to-complex delivery pipelines "as code" via the [Pipeline domain-specific language \(DSL\) syntax](#)

Jenkinsfile (Declarative Pipeline)

```

pipeline { ❶
  agent any ❷
  stages {
    stage('Build') { ❸
      steps { ❹
        sh 'make' ❺
      }
    }
    stage('Test'){
      steps {
        sh 'make check'
        junit 'reports/**/*.xml' ❻
      }
    }
    stage('Deploy') {
      steps {
        sh 'make publish'
      }
    }
  }
}

```

Declarative specific:

- pipeline
- agent
- steps

Scripted specific:

- node

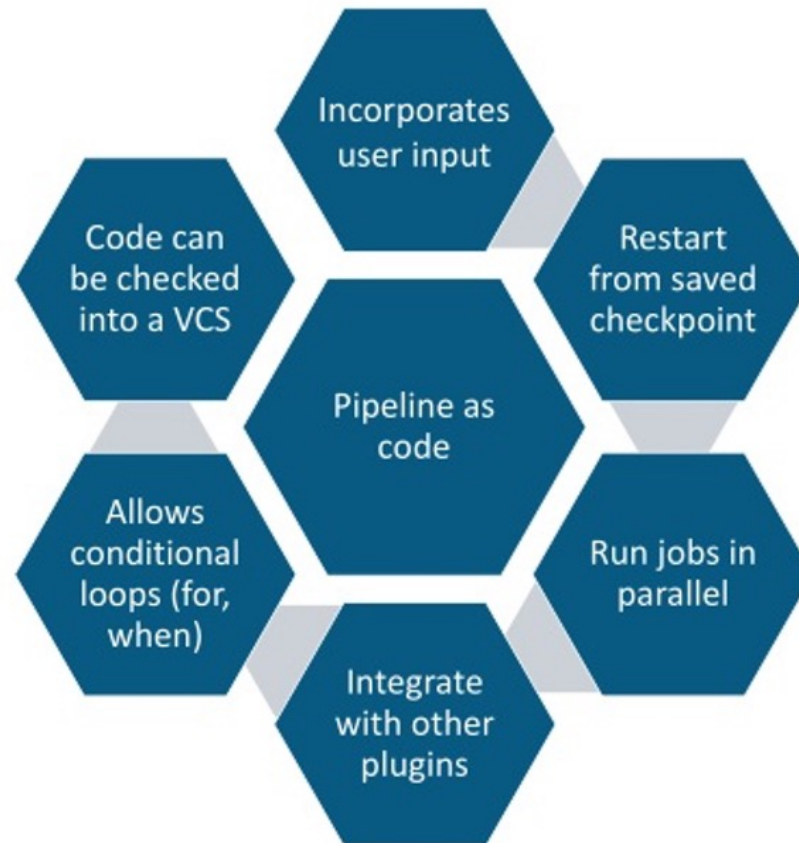
Jenkinsfile (Scripted Pipeline)

```

node { ❷
  stage('Build') { ❸
    sh 'make' ❺
  }
  stage('Test') {
    sh 'make check'
    junit 'reports/**/*.xml' ❻
  }
  stage('Deploy') {
    sh 'make publish'
  }
}

```

Key features of Kenkins Pipeline



Shared Libraries

- Useful to share parts of Pipelines between various projects to reduce redundancies and keep code "DRY"

```

17  stages {
18
19      stage('Code fetching') {
20          steps {
21              checkout scm
22              dir("$WORKSPACE/spring-social-oidc") {
23                  checkout([$class: 'GitSCM', branches: [[name: 'master']],
24                      ]
25              }
26              dir("$WORKSPACE/alien4cloud") {
27                  checkout([$class: 'GitSCM', branches: [[name: 'deep-dev']],
28                      ]
29              }
30          }
31      }
32
33      stage('Build Spring OIDC') {
34          steps {
35              dir("$WORKSPACE/spring-social-oidc") {
36                  MavenRun('-U clean install')
37              }
38          }
39      }
40
41      stage('Build local A4C (DEEP flavour)') {
42          steps {
43              dir("$WORKSPACE/alien4cloud") {
44                  MavenRun('-U clean install -Dmaven.wagon.http.ssl.insecure=true')
45              }
46          }
47      }
48
49      stage('Build plugin') {
50          steps {
51              dir("$WORKSPACE/indigodc-orchestrator-plugin") {
52                  MavenRun('-U clean package')
53              }
54          }
55      }
56  }

```

1.3.6 - jenkins-pipeline-library / vars / MavenRun.groovy

orviz Second stage of groovydoc adoption

1 contributor

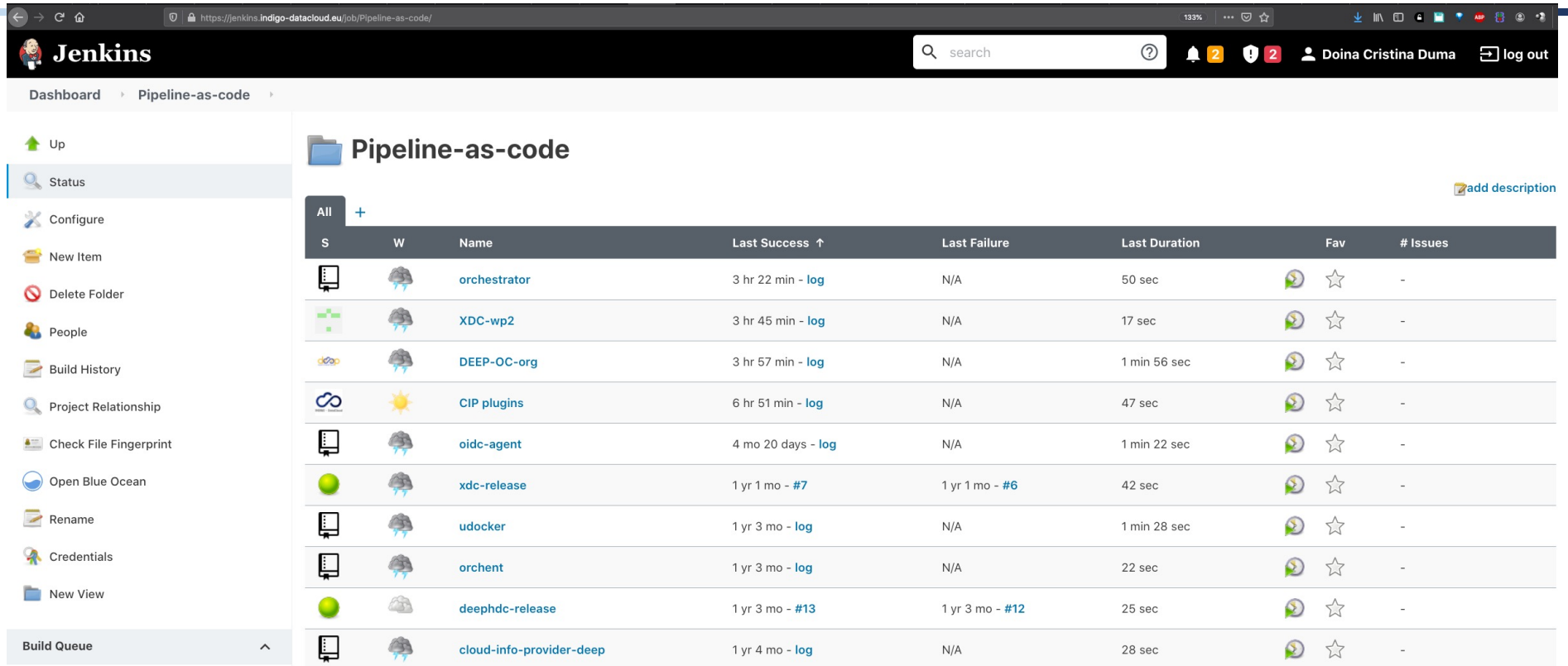
29 lines (28 sloc) 786 Bytes

```

1  #!/usr/bin/groovy
2
3  /**
4   * Runs either Checkstyle or Cobertura maven goals.
5   *
6   * @param report Report location [default]
7   * @see https://plugins.jenkins.io/cobertura
8   */
9  def call(String goal) {
10     options = []
11     if (goal.startsWith('checkstyle')) {
12         options = [
13             '-Dcheckstyle.failOnViolation=true',
14             '-Dcheckstyle.console=true',
15             '-Dcheckstyle.violationSeverity=warning',
16             '-Dcheckstyle.config.location=google_checks.xml',
17         ]
18         goal = 'checkstyle:check'
19     }
20     else if (goal.startsWith('cobertura')) {
21         options = [
22             '-Dcobertura.report.format=xml'
23         ]
24         goal = 'cobertura:cobertura'
25     }
26     l_cmd = ['mvn ', options.join(' '), goal]
27     cmd = l_cmd.join(' ')
28     sh(script: cmd)
29 }

```

Jenkins - Main page

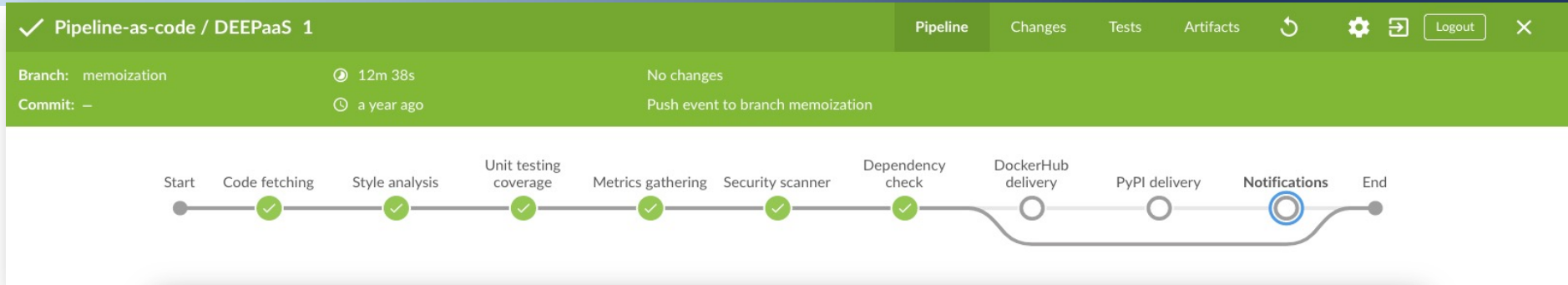


The screenshot shows the Jenkins Pipeline-as-code main page. The left sidebar contains navigation options: Up, Status, Configure, New Item, Delete Folder, People, Build History, Project Relationship, Check File Fingerprint, Open Blue Ocean, Rename, Credentials, and New View. The main content area displays a table of pipeline builds under the heading 'Pipeline-as-code'. The table has columns for Status (S), Weather (W), Name, Last Success, Last Failure, Last Duration, Fav, and # Issues. The builds listed are: orchestrator, XDC-wp2, DEEP-OC-org, CIP plugins, oidc-agent, xdc-release, udocker, orchent, deephdc-release, and cloud-info-provider-deep.

S	W	Name	Last Success ↑	Last Failure	Last Duration	Fav	# Issues
		orchestrator	3 hr 22 min - log	N/A	50 sec		-
		XDC-wp2	3 hr 45 min - log	N/A	17 sec		-
		DEEP-OC-org	3 hr 57 min - log	N/A	1 min 56 sec		-
		CIP plugins	6 hr 51 min - log	N/A	47 sec		-
		oidc-agent	4 mo 20 days - log	N/A	1 min 22 sec		-
		xdc-release	1 yr 1 mo - #7	1 yr 1 mo - #6	42 sec		-
		udocker	1 yr 3 mo - log	N/A	1 min 28 sec		-
		orchent	1 yr 3 mo - log	N/A	22 sec		-
		deephdc-release	1 yr 3 mo - #13	1 yr 3 mo - #12	25 sec		-
		cloud-info-provider-deep	1 yr 4 mo - log	N/A	28 sec		-

- Quick overview of builds
- “Weather” notification system
- Everything can be managed through this page

Examples



Jenkins Dashboard > Pipeline-as-code > CIP plugins > cip-plugin-aws-provider > master

Branch master

Full project name: Pipeline-as-code/CIP plugins/cip-plugin-aws-provider/master

Stage View

	Declarative: Checkout SCM	Code fetching	Style analysis	Metrics gathering	Security scanner
Average stage times: (Average full run time: ~2min 58s)	12s	3s	44s	37s	31s
#7 May 11 12:42 2 commits	11s	2s	34s	1min 7s	24s
#6 May 05 17:13 1 commit	13s	3s	51s	41s	28s
#5 May 04 16:13 1 commit	13s	4s	39s	33s	29s

SLOccount Trend

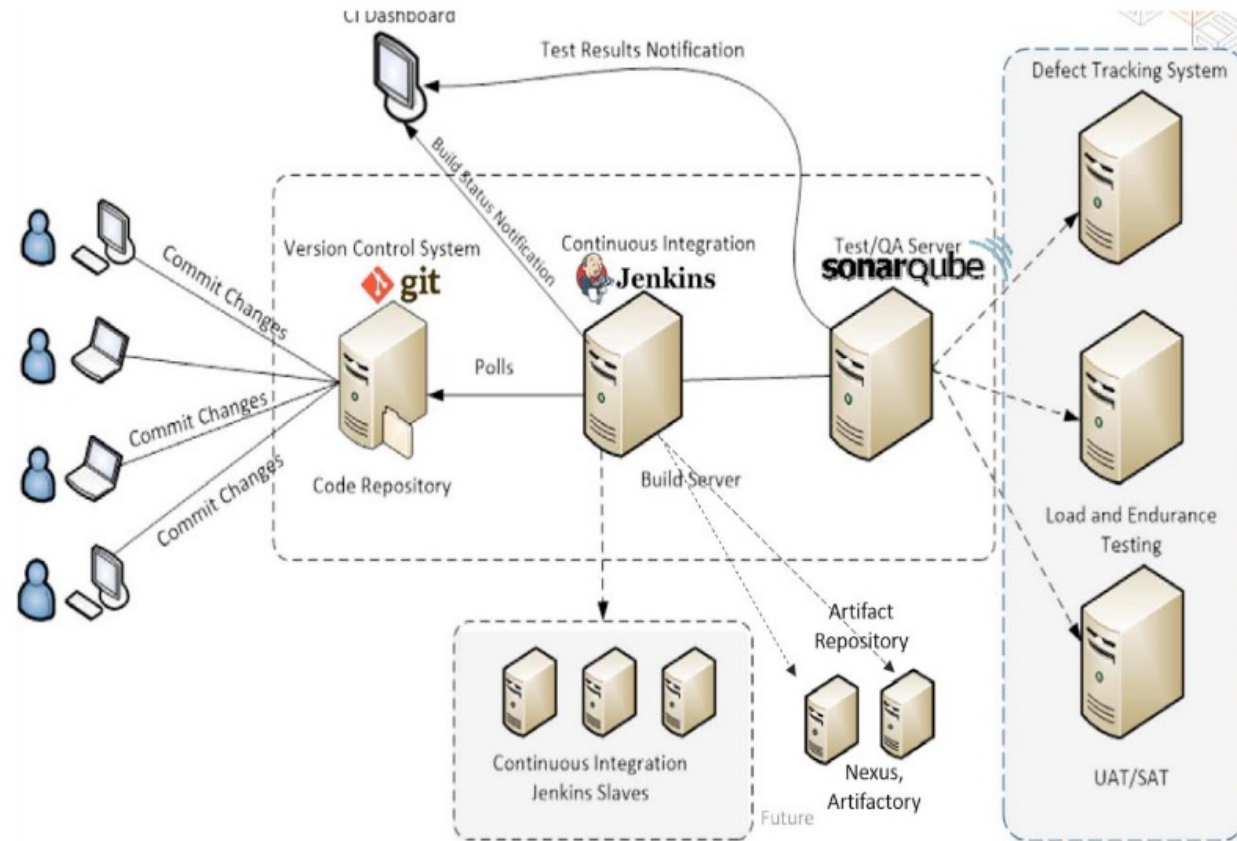
Servizio nazionale ci.infn.it



The screenshot shows the Jenkins dashboard for the ci.infn.it service. The main content is a table of build jobs with columns for status, weather icon, name, last success, last failure, and last duration. The left sidebar contains navigation options like 'New Item', 'People', 'Build History', and 'Build Queue'. The 'Build Queue' section shows 'No builds in the queue'. The 'Build Executor Status' section shows several executors, with two marked as 'offline'.

S	W	Name ↓	Last Success	Last Failure	Last Duration
		ASTERICS	N/A	N/A	N/A
		boost_161_c++11	4 yr 11 mo - #3	4 yr 11 mo - #1	29 min
		build_ubuntu_base_voms_image	N/A	N/A	N/A
		CHAOS	N/A	N/A	N/A
		CHAOS_TEST_RG	5 yr 8 mo - #111	5 yr 8 mo - #106	11 hr
		ciao	N/A	N/A	N/A
		Cosmic Muon Tomography	N/A	N/A	N/A
		CREAM	N/A	N/A	N/A
		DOCKER_TEST	N/A	N/A	N/A
		DPU	N/A	4 yr 12 mo - #1	14 sec
		DPU_ASW	N/A	N/A	N/A

CI/CD environment & Jenkins



Rancher

Open Source Container Management Platform

Running containers in production still isn't easy

↑ number tools + ↑ change =
↑ **complexity**

App Catalog	Helm, ...
Orchestration	Compose, Kubernetes, Marathon,
Scheduling	Swarm, Kubernetes, Mesos, ...
Monitoring	cAdvisor, Sysdig, Datadog, ...
Access Control	LDAP, AD, GitHub, ...
Registry	DockerHub, Quay.io, ...
Engine	Docker, Rkt, ...
Security	Notary, Vault, ...
Network	VXLAN, IPSEC, HAProxy, ...
Storage	Ceph, Gluster, Swift, ...
Distributed DB	Etcd, Consul, MongoDB, ...

Do you want to manage all this?...

or this? 

App Catalog	Helm, ...
Orchestration	Compose, Kubernetes, Marathon,
Scheduling	Swarm, Kubernetes, Mesos, ...
Monitoring	cAdvisor, Prometheus, Datadog, ...
Access Control	LDAP, AD, GitHub, ...
Registry	Nexus, Artifactory, DTR...
Engine	Docker, runC, Rocket ...
Security	Notary, Vault, ...
Network	VXLAN, IPSEC, HAProxy, ...
Storage	Ceph, Gluster, Swift, ...
Distributed DB	Etcd, Consul, MongoDB, ...



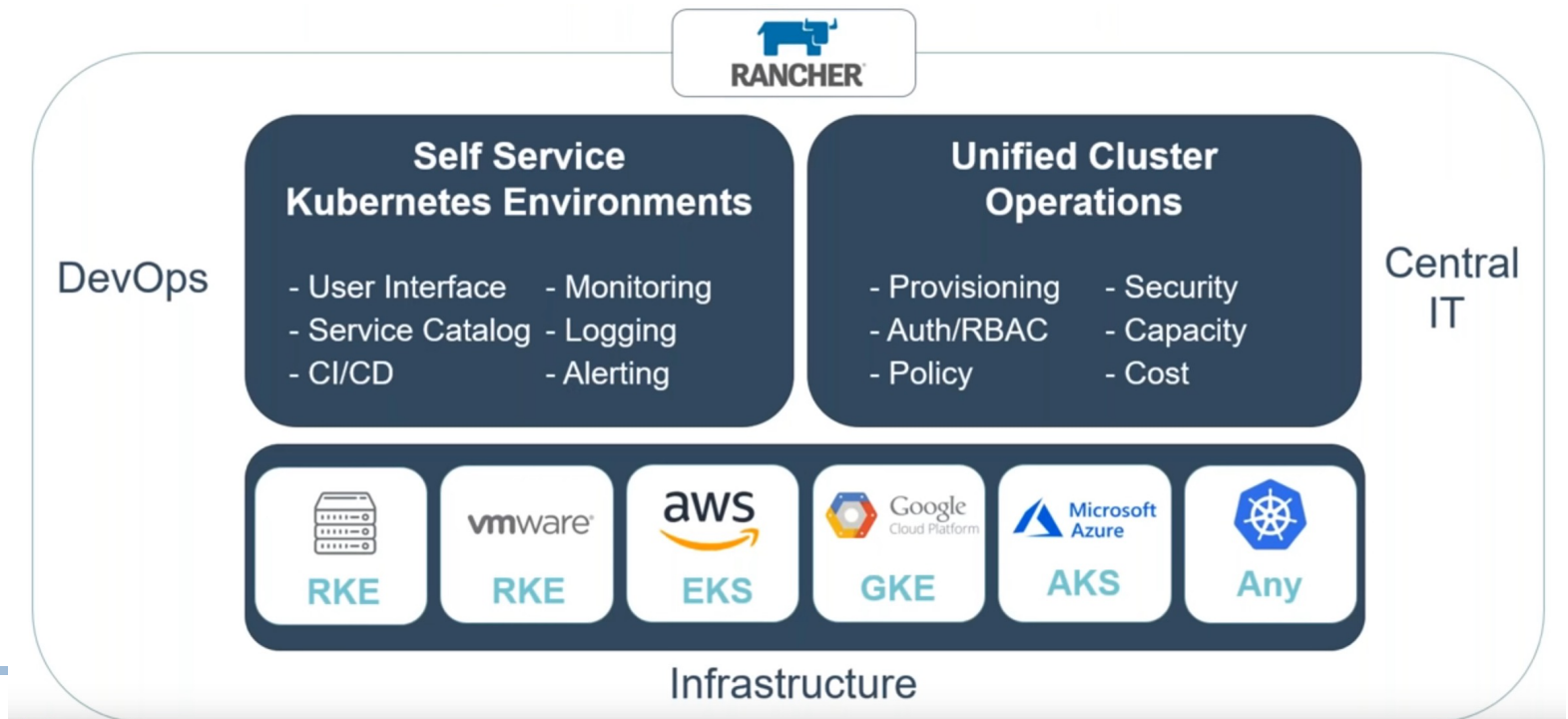
Open Source
Container Management platform

Rancher – Rancher Labs

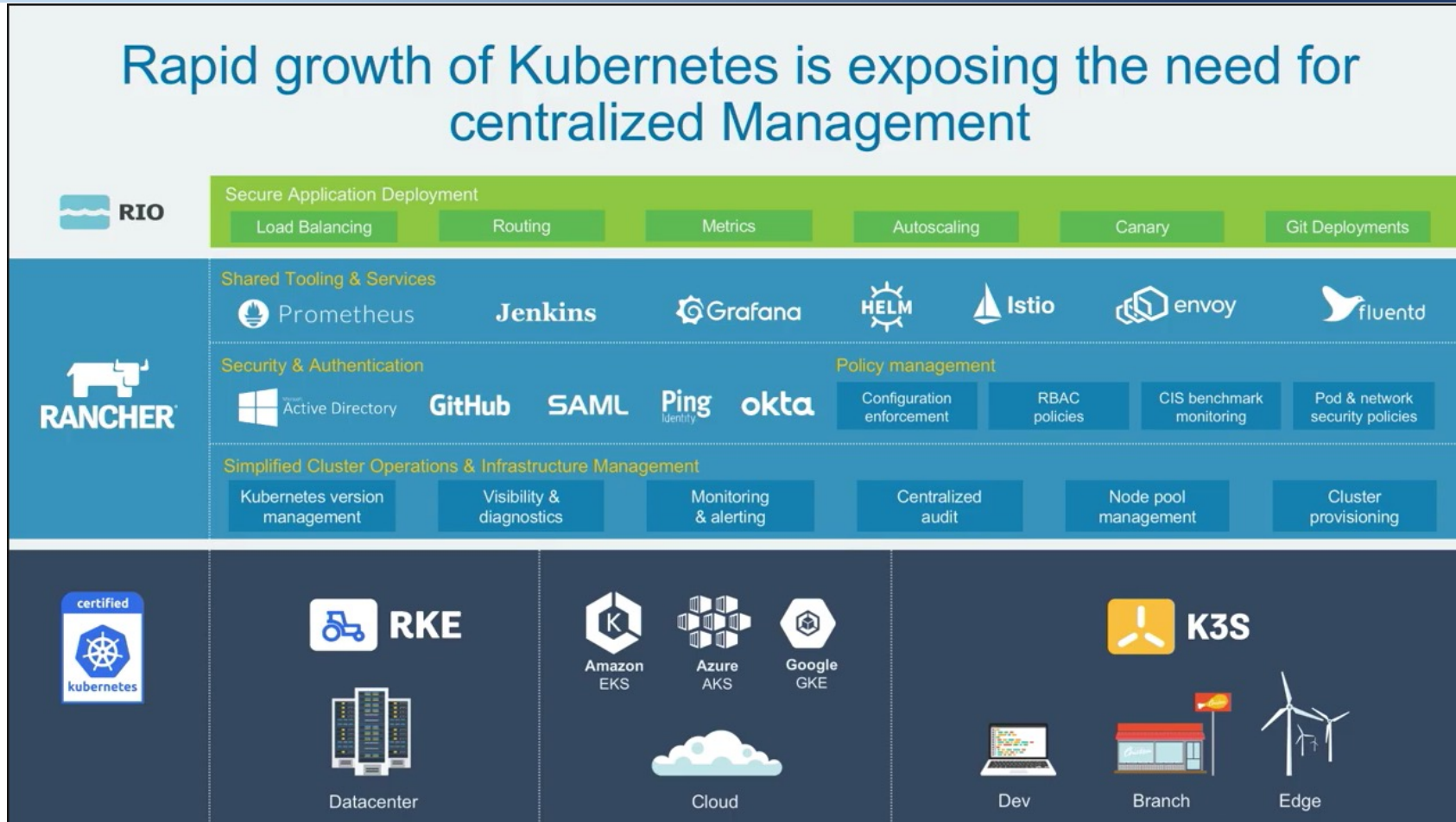
- Founded in 2014
- Dic 2020 - **Rancher Labs is a part of SUSE**
- **#1 choice** for enterprises looking to run containers and Kubernetes in production
 - “the **only product** that enables you to deliver Kubernetes-as-a-Service across any infrastructure”
- delivers open source software that enables organizations to
 - **deploy and manage** Kubernetes at scale
 - on **any infrastructure** across the data center, cloud, branch offices and the network edge
- +35,000 active users
- +100 million downloads

Rancher, the product

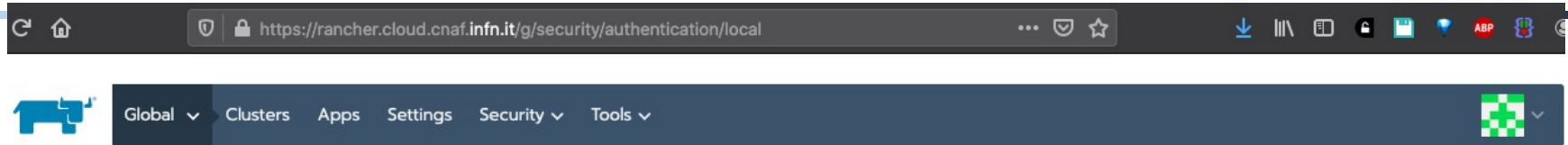
- Open source container management platform
- Main goals:
 - Managing and deploying K8S anywhere (ability to build cluster on bare metal, VM wherever is possible)
 - Ability to manage clusters in in hosted clusters like RKE or EKS and cloud, Amazon , Azure, or imported clusters
- Oriented to address different requests



Need of Centralized Management



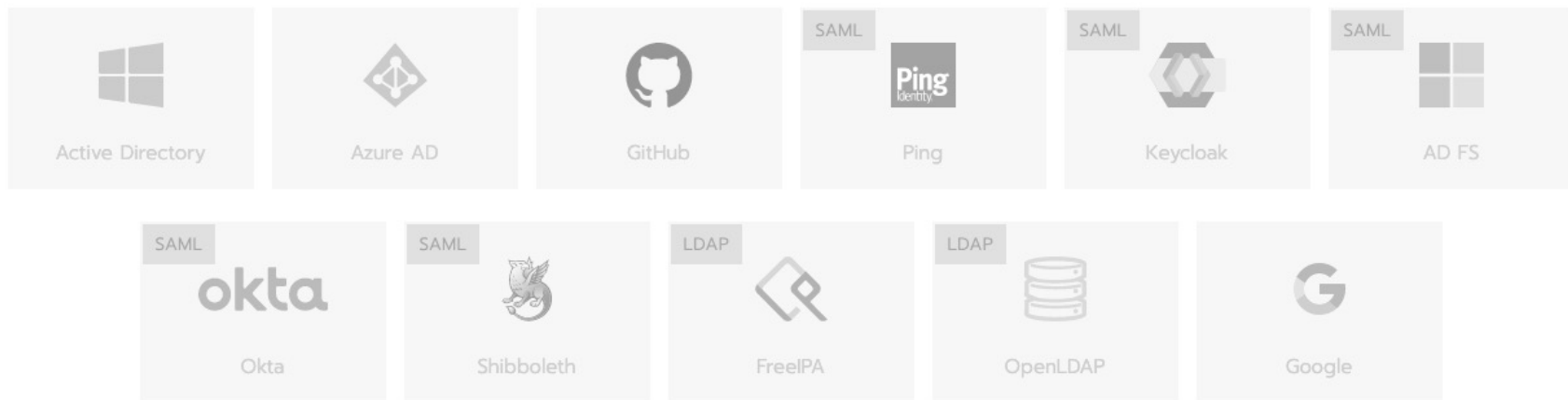
Authentication



Authentication

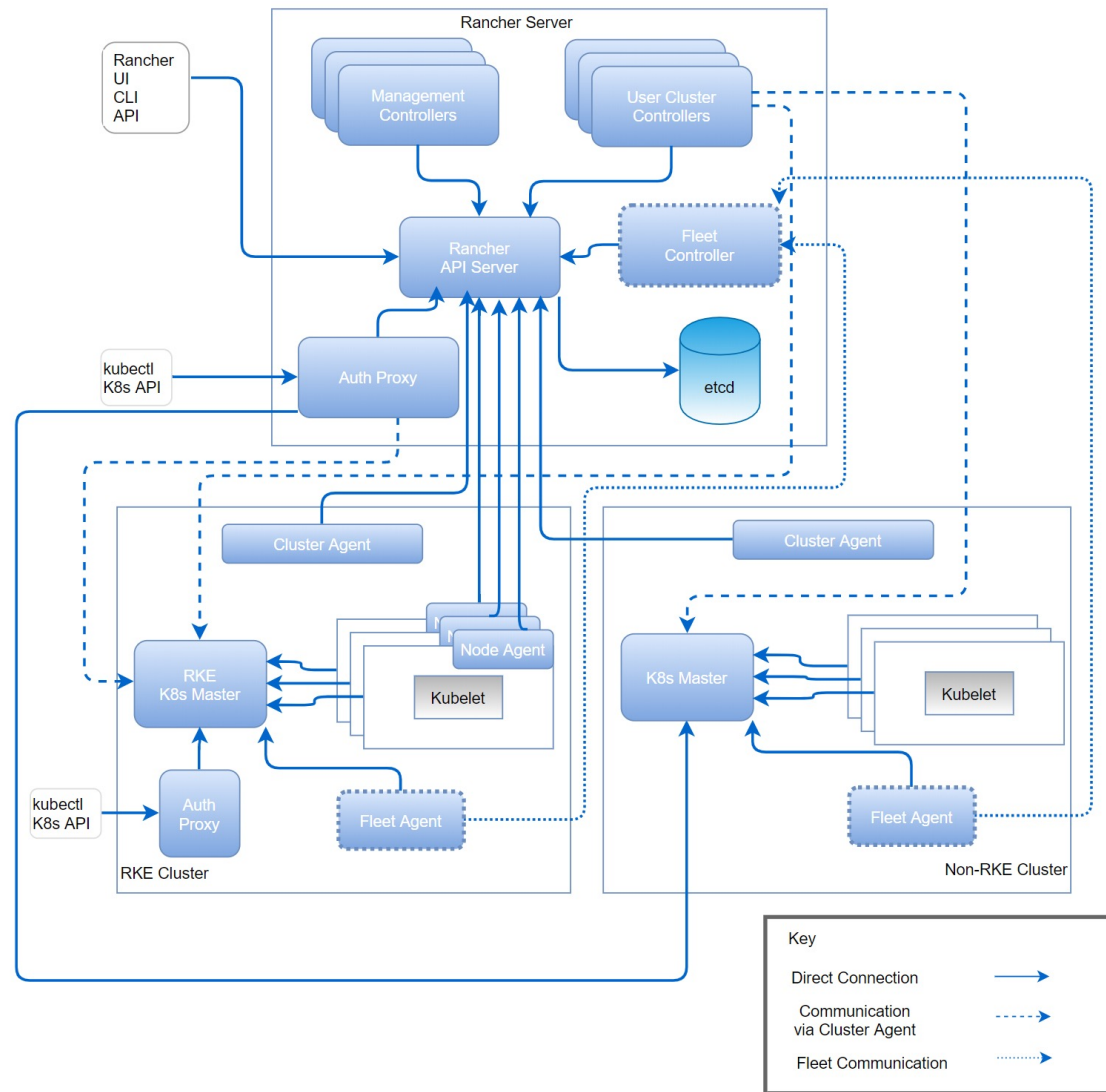


When enabling external authentication, will associate the external principal with the current user's local identity. The associated principal will receive all global permissions, as well as the project and cluster roles bindings of the current user.



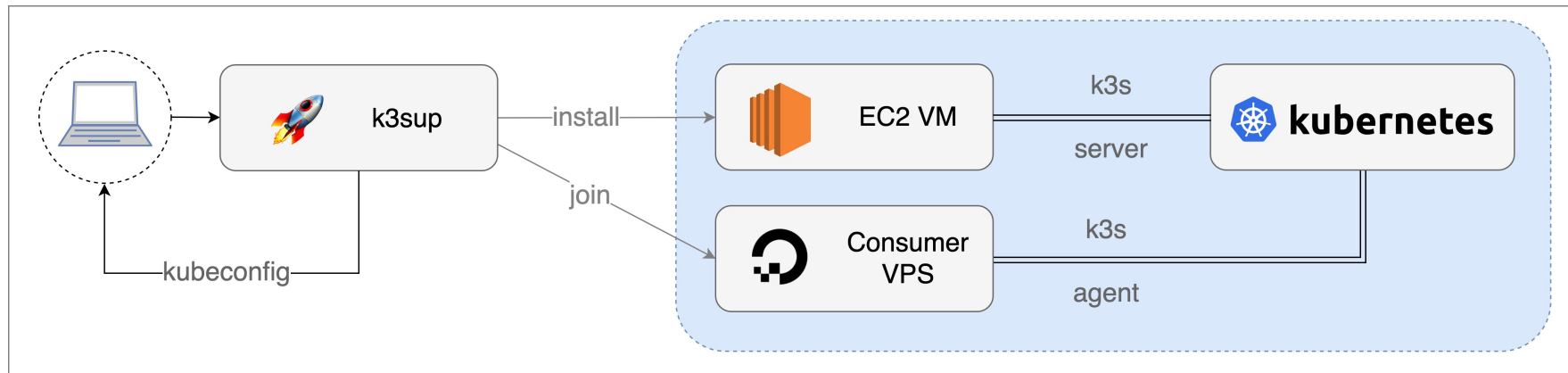
Rancher is configured to allow access to accounts in its local database. [Manage Accounts](#)
Local Authentication will always be enabled but you may select another authentication scheme to use in addition to local.

Architettura



K3S

- Super-lightweight CNCF-certified K8s distribution
- Different from non-production solutions like minikube/microk8s/kind
- Small binary / Uses 512MB of RAM for all of Kubernetes
- Easily installed with k3sup from Alex Ellis

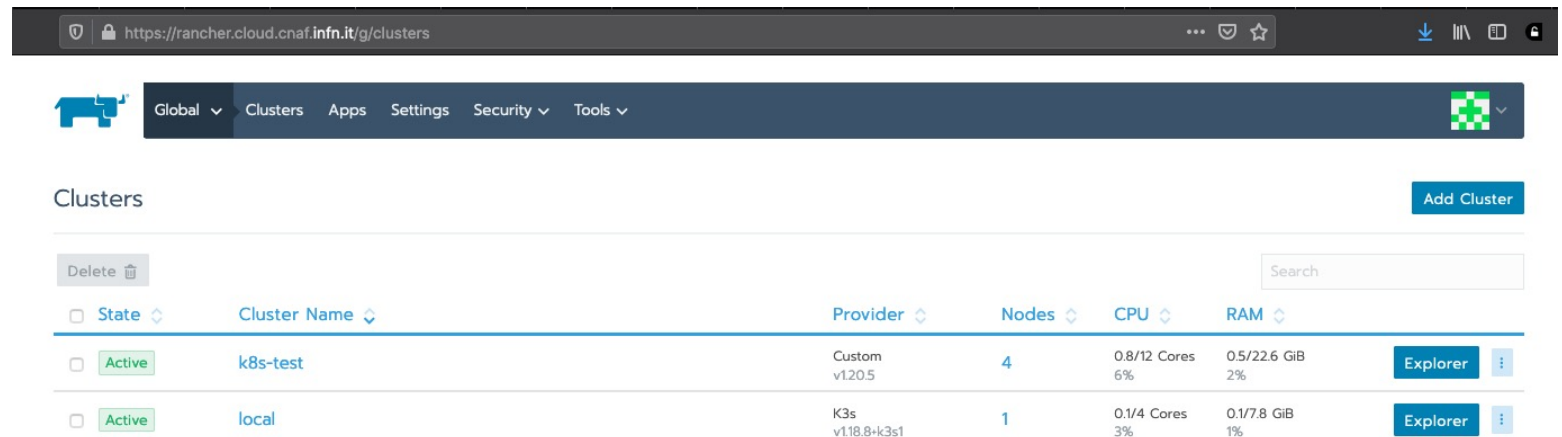
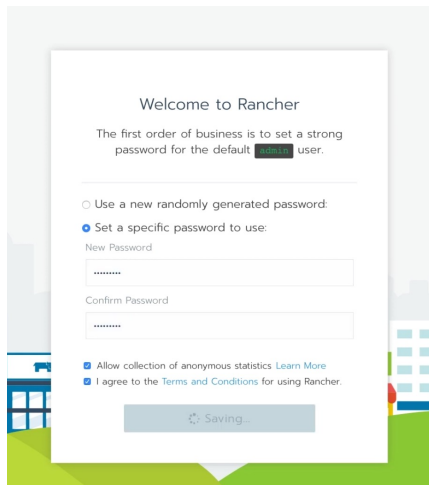


Architecture - k3sup running locally against any VM such as AWS EC2 or a VPS such as DigitalOcean

How it works


- <https://rancher.com/docs/>
 - 2 types of deployment: with HA and single instance
 - Demo - the single node:

```
[centos@devops13 ~]$ docker run -d --privileged --restart=unless-stopped -p 80:80 -p 443:443 -v /opt/rancher:/var/lib/rancher rancher/rancher:v2.5.4
```



Test Cluster

Browser address bar: <https://rancher.cloud.cnaf.infn.it/c/c-x6g8j/nodes>

Navigation: k8s-test ▾ Cluster Nodes Storage ▾ Projects/Namespaces Members Tools ▾ Cluster Explorer 

Nodes [Edit Cluster](#)

Cordon Drain Delete

<input type="checkbox"/> State	Name	Roles	Version	CPU	RAM	Pods
<input type="checkbox"/> Active	k8s-master 131.154.97.237 / 192.168.1.6	etcd Control Plane	v1.20.5 20.10.6	0.2/4 Cores	0.1/7.5 GiB	9/110
node-role.kubernetes.io/controlplane=true:NoSchedule node-role.kubernetes.io/etcd=true:NoExecute						
<input type="checkbox"/> Active	k8s-worker-1 192.168.1.13	Worker	v1.20.5 20.10.6	0.5/4 Cores	0.4/7.5 GiB	12/110
<input type="checkbox"/> Active	k8s-worker-2 192.168.1.7	Worker	v1.20.5 20.10.6	0.5/4 Cores	0.3/7.5 GiB	10/110
<input type="checkbox"/> Active	k8s-worker-3 192.168.1.10	Worker	v1.20.5 20.10.6	1.5/4 Cores	1.2/7.5 GiB	10/110

One click install applications

The screenshot displays the Rancher Cluster Explorer interface. The main dashboard shows the following cluster details:

- Cluster:** RKE
- Provider:** v1.20.5 (Kubernetes Version)
- Total Nodes:** 4
- Created:** 3.9 days ago

Workload summary:

- Total Resources: 66
- Namespaces: 12
- Ingress: 1
- PersistentVolumes: 0
- Deployments: 14
- StatefulSets: 2
- Jobs: 4
- DaemonSets: 9
- Services: 24

Resource usage summary:

- Pods Used: 10%
- Cores Reserved: 21%
- Memory Reserved: 8%

The terminal window at the bottom shows the installation of the 'rancher-monitoring' system:

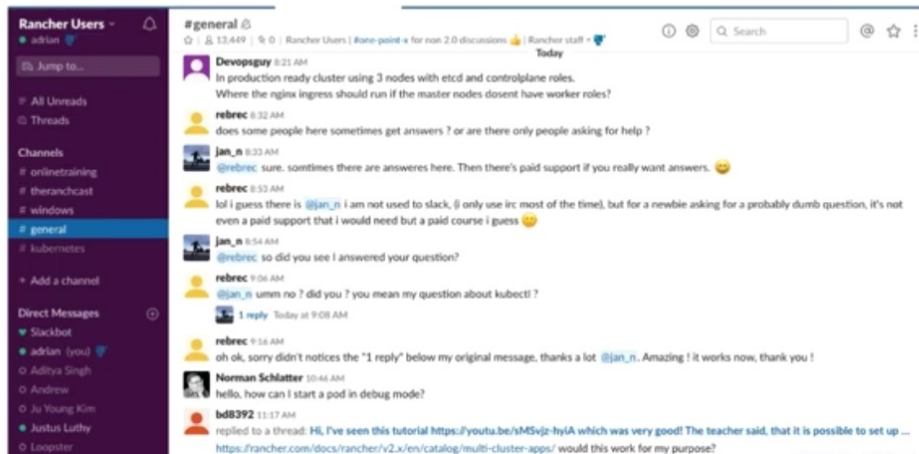
```

Thu, Apr 29 2021 3:45:37 am Starting delete for "rancher-monitoring-admission" RoleBinding
Thu, Apr 29 2021 3:45:37 am Starting delete for "rancher-monitoring-admission-patch" Job
Thu, Apr 29 2021 3:45:37 am Starting delete for "rancher-monitoring-patch-sa" Job
Thu, Apr 29 2021 3:45:38 am NAME: rancher-monitoring
Thu, Apr 29 2021 3:45:38 am LAST DEPLOYED: Thu Apr 29 01:42:53 2021
Thu, Apr 29 2021 3:45:38 am NAMESPACE: cattle-monitoring-system
Thu, Apr 29 2021 3:45:38 am STATUS: deployed
Thu, Apr 29 2021 3:45:38 am REVISION: 1
Thu, Apr 29 2021 3:45:38 am NOTES:
Thu, Apr 29 2021 3:45:38 am rancher-monitoring has been installed. Check its status by running:
Thu, Apr 29 2021 3:45:38 am kubectl --namespace cattle-monitoring-system get pods -l "release=rancher-monitoring"
Thu, Apr 29 2021 3:45:38 am Visit https://github.com/prometheus-operator/kube-prometheus for instructions on how to create & configure Alertmanager and Prometheus instances using
the Operator.
Thu, Apr 29 2021 3:45:38 am
Thu, Apr 29 2021 3:45:38 am SUCCESS: helm upgrade --install=true --namespace=cattle-monitoring-system --timeout=10m0s --values=/home/shell/helm/values-rancher-monitoring-
9.4.203.yaml --version=9.4.203 --wait=true rancher-monitoring /home/shell/helm/rancher-monitoring-9.4.203.tgz
Thu, Apr 29 2021 3:45:38 am
  
```

At the bottom of the terminal, there are buttons for 'Follow', 'Clear', and 'Download', along with a 'Filter' input field and a 'Disconnected' status indicator.

Resources – Community Support

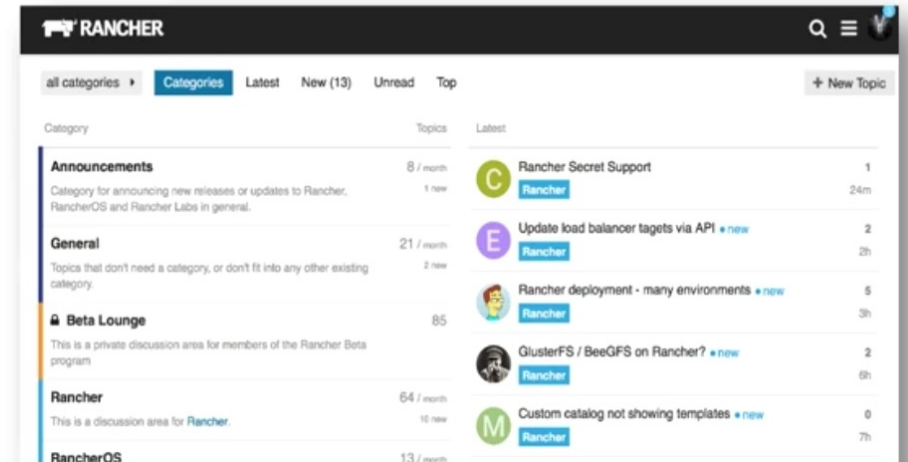
<http://slack.rancher.io>



The screenshot shows a Slack conversation in the #general channel. The channel has 13,449 members. The conversation includes the following messages:

- Devopsguy** (8:21 AM): In production ready cluster using 3 nodes with etcd and controlplane roles. Where the nginx ingress should run if the master nodes dosent have worker roles?
- rebrec** (8:32 AM): does some people here sometimes get answers ? or are there only people asking for help ?
- jan_n** (8:33 AM): @rebrec sure, sometimes there are answers here. Then there's paid support if you really want answers. 😊
- rebrec** (8:33 AM): lol i guess there is @jan_n i am not used to slack, (i only use irc most of the time), but for a newbie asking for a probably dumb question, it's not even a paid support that i would need but a paid course i guess 😊
- jan_n** (8:54 AM): @rebrec so did you see i answered your question?
- rebrec** (9:06 AM): @jan_n umm no ? did you ? you mean my question about kubernetes?
- jan_n** (9:08 AM): 1 reply Today at 9:08 AM
- rebrec** (9:16 AM): oh ok, sorry didn't notices the "1 reply" below my original message, thanks a lot @jan_n. Amazing ! it works now, thank you !
- Norman Schlatter** (10:44 AM): hello, how can i start a pod in debug mode?
- bd8392** (11:17 AM): replied to a thread: HI, I've seen this tutorial <https://youtu.be/sMSvje-hyIA> which was very good! The teacher said, that it is possible to set up ... <https://rancher.com/docs/rancher/v2.x/en/catalog/multi-cluster-apps/> would this work for my purpose?

<http://forums.rancher.com>



The screenshot shows the Rancher forums website. The page title is "RANCHER". The navigation bar includes "all categories", "Categories", "Latest", "New (13)", "Unread", and "Top". There is a "New Topic" button. The main content area displays a list of categories and topics:

Category	Topics	Latest
Announcements Category for announcing new releases or updates to Rancher, RancherOS and Rancher Labs in general.	8 / month 1 new	Rancher Secret Support Rancher 24m
General Topics that don't need a category, or don't fit into any other existing category.	21 / month 2 new	Update load balancer targets via API • new Rancher 2h
Beta Lounge This is a private discussion area for members of the Rancher Beta program.	85	Rancher deployment - many environments • new Rancher 3h
Rancher This is a discussion area for Rancher.	64 / month 10 new	GlusterFS / BeeGFS on Rancher? • new Rancher 6h
RancherOS	13 / month	Custom catalog not showing templates • new Rancher 7h