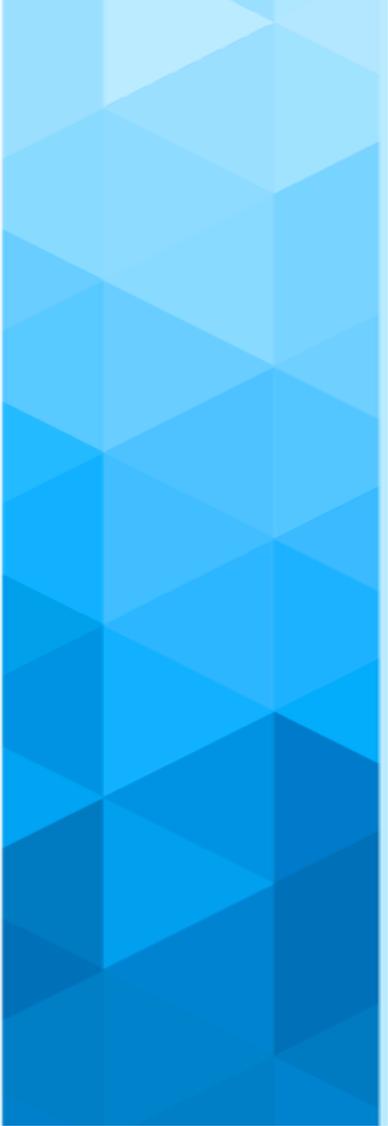




Rancher

Kubernetes as a service for the masses



Overview

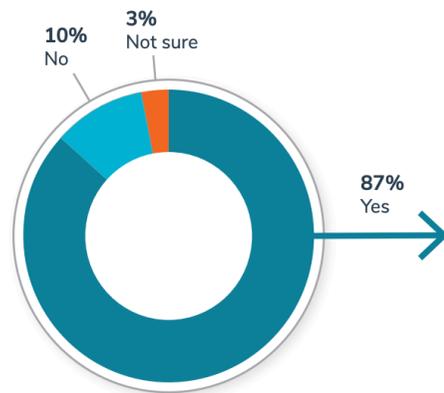
- Container adoption: state of the art
- Users perspective and expectations
- Rancher 101
- IaaS integration
- Conclusions

Containers adoption

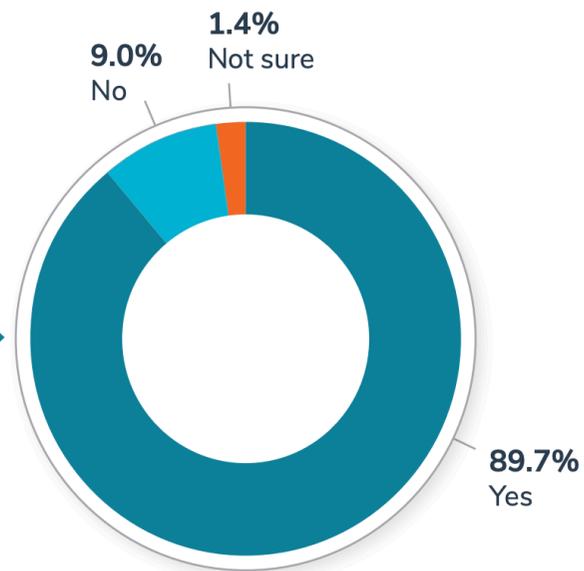


Containers adoption

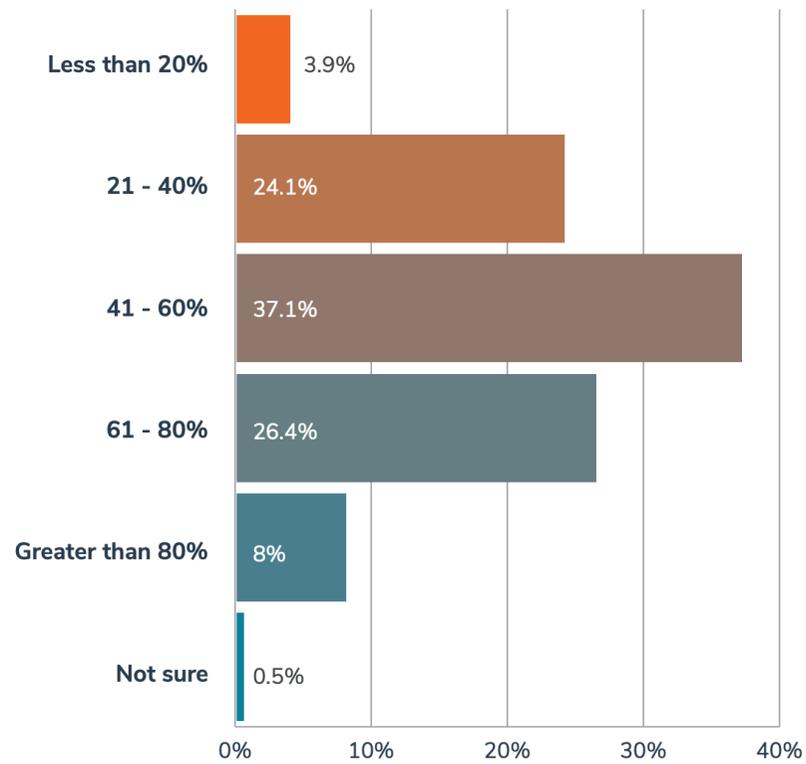
Does your organization run container technologies?



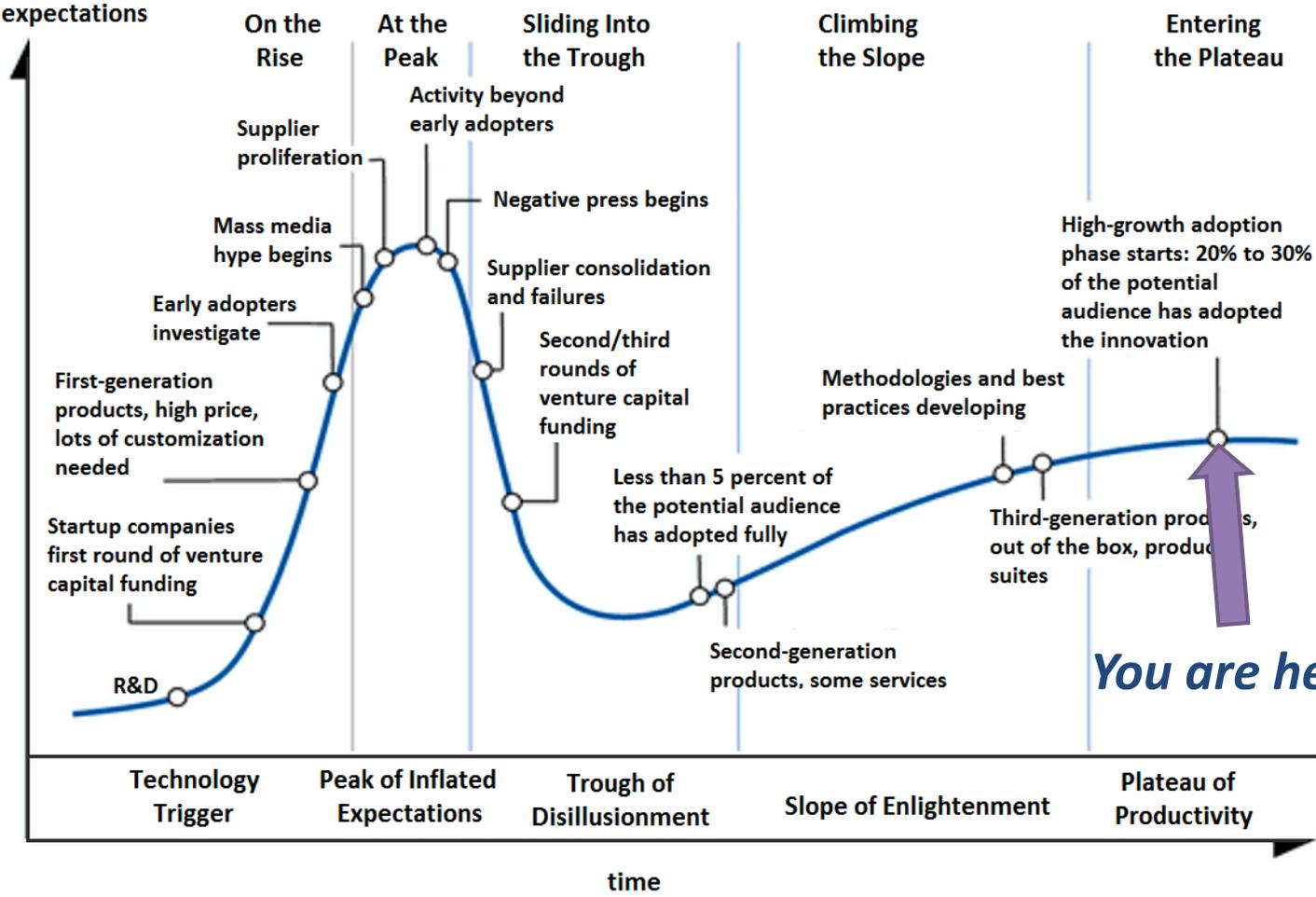
Does your organization run container technologies in **production**?



What percentage of your apps are running in containers?



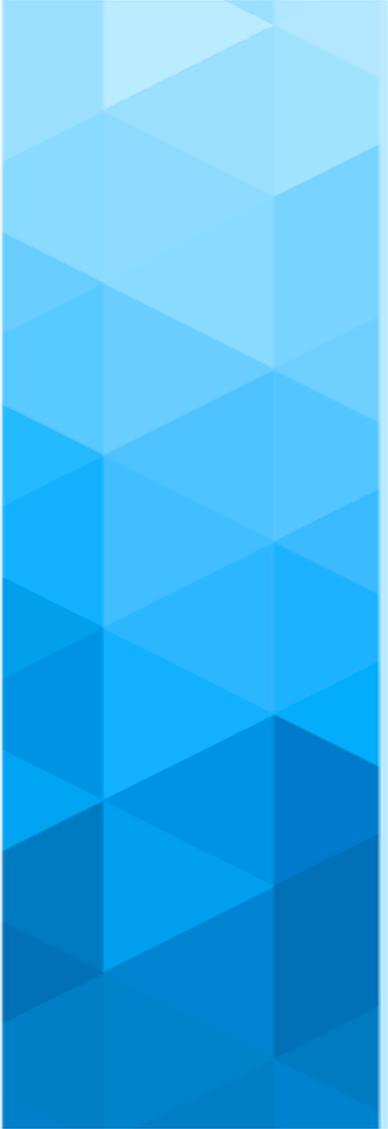
Hype cycle





State of the art: users perspective

- To run containers in production **an orchestrator is mandatory**
- **K8s** is the **de facto standard**
- Cloud users **expect their "clouds" to provide them with K8s "as-a-service"**
- Building an highly available k8s cluster is **not a piece of cake**

A vertical decorative bar on the left side of the slide, featuring a complex geometric pattern of overlapping triangles and polygons in various shades of blue, ranging from light sky blue to deep navy blue.

Users expectations

- As-a-service model
- Kubernetes managed engine
- Simple and effective web interface
- Reliable
- Replicable (*infrastructure as code*)

Users expectations



IBM Cloud
Kubernetes Service



Amazon
EKS



AZURE KUBERNETES
SERVICE



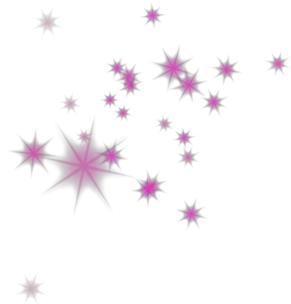


Some context...

*"**INFN Corporate Cloud (INFN-CC)** is INFN's geographically distributed private Cloud infrastructure.*

*It provides services starting from the **laaS** level and it is **based on OpenStack.**"*

What we were looking for...



Done!

(magic)



***Big
Red
Button***



User



Use cases

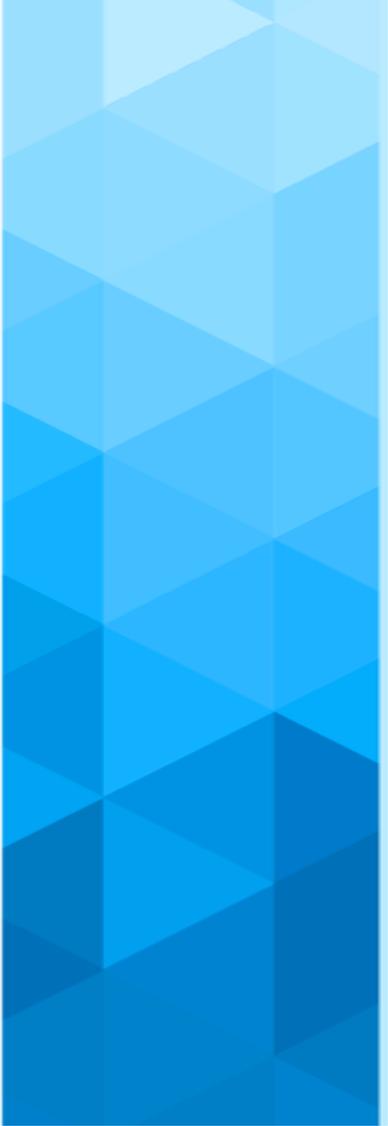
- User exploits IaaS cloud API and will be **autonomous in creating/destroying its own clusters** using a web interface
- User will be provided with a **running k8s cluster managed by INFN Cloud staff**
- User will be provided with a simple web interface for **provisioning preconfigured applications packaged in Helm charts** (*PaaS paradigm*)



Rancher, anyone ?

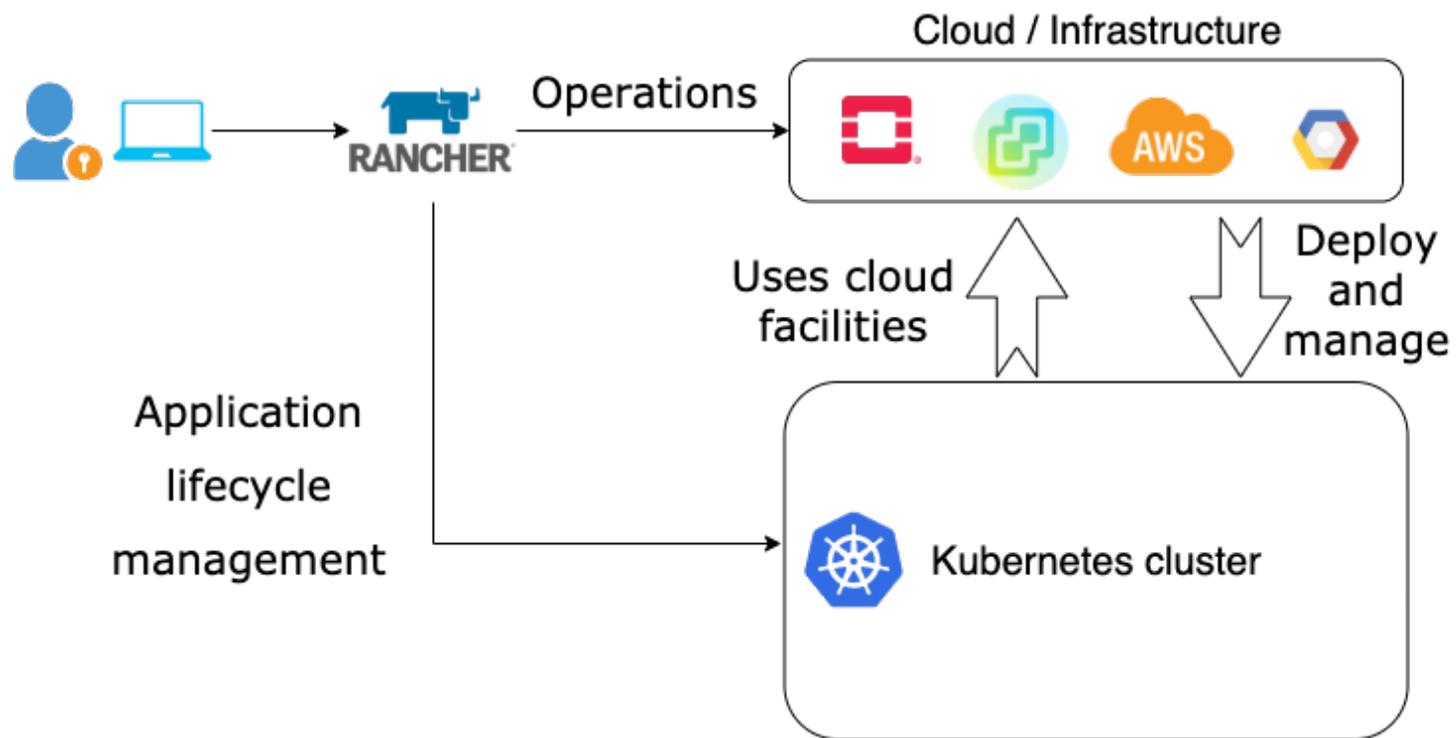
Rancher is a **complete software stack for teams adopting containers.**

It addresses the **operational and security challenges** of managing multiple Kubernetes clusters.

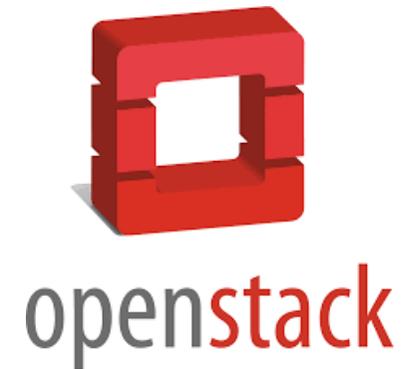
A vertical decorative bar on the left side of the slide, featuring a blue geometric pattern of overlapping triangles and polygons in various shades of blue, ranging from light to dark.

In a nutshell

- Runs in a docker container
- Keeps cluster info and status...
- ...but clusters run even with rancher offline
- Exploit cloud / infrastructure api to deploy needed components
- Use K8s api to manage user's applications deployment and lifecycle



Supported cloud / infrastructures

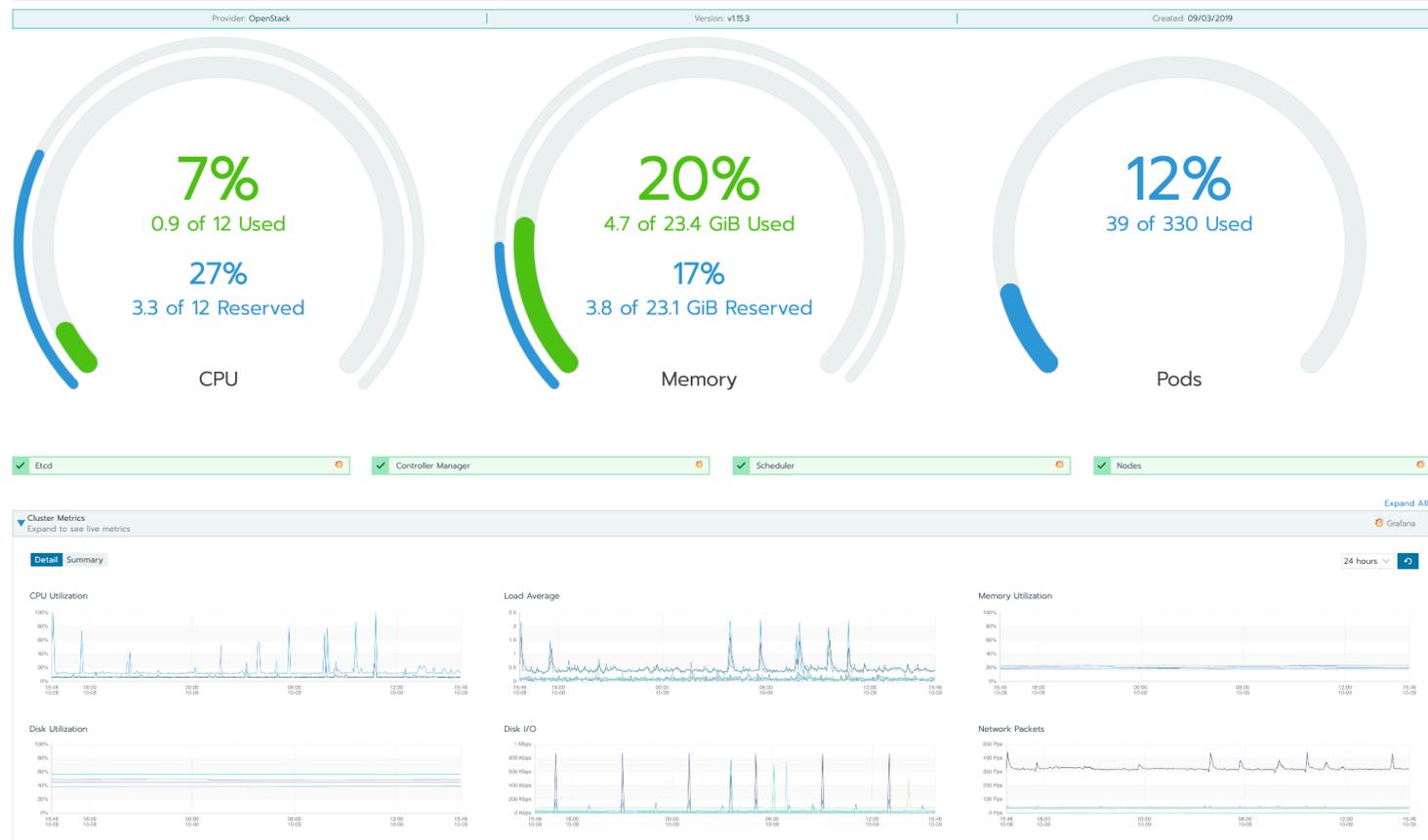


A vertical decorative bar on the left side of the slide, featuring a complex geometric pattern of overlapping triangles and polygons in various shades of blue, ranging from light sky blue to deep navy blue.

Bonus features

- Simple and effective web UI
- Ease the kubernetes learning curve
- Multi cluster/multi cloud management
- Manages all ops related tasks :
 - Kubernetes version upgrade
 - Cluster state backup/restore
 - Cluster scaling out/in
 - Managed cluster metrics/logs/alerts
 - [...]

Cluster monitoring



Fine grained access control

Grant Resources

Grant access to specific operations on Kubernetes resources

Create	Delete	Get	List	Patch	Update	Watch	Resource
--------	--------	-----	------	-------	--------	-------	----------



Catalogs



Apps



Projects



ProjectAlerts



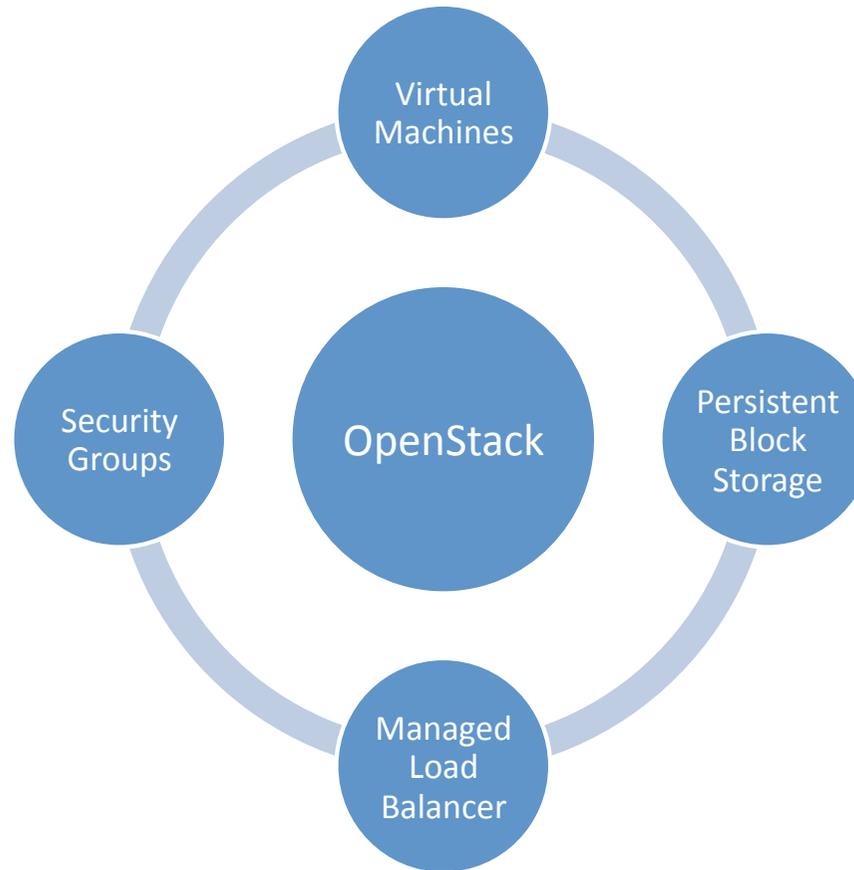
Add Resource

A vertical decorative bar on the left side of the slide, composed of a pattern of overlapping triangles in various shades of blue, ranging from light to dark.

Fine grained access control

- ✓ Per cluster
 - ✓ Per project
 - ✓ Per resource
 - ✓ Per verb

Exploited IaaS components





Workflow: cluster creation

User asks for new cluster using web interface

Rancher uses openstack api to deploy Virtual Machines

Rancher assigns floating ips/security groups to vms

Rancher ssh in the vms and installs Kubernetes

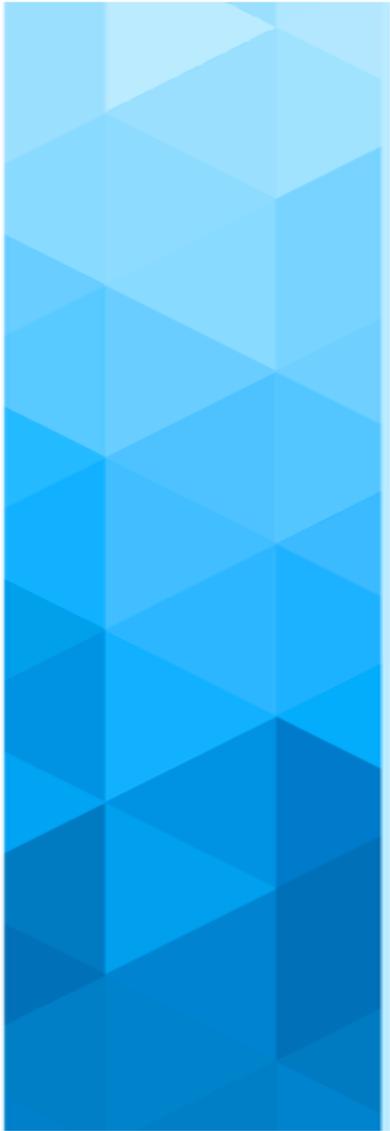
Workflow: App deployment

User picks an app from marketplace or deploy k8s yaml

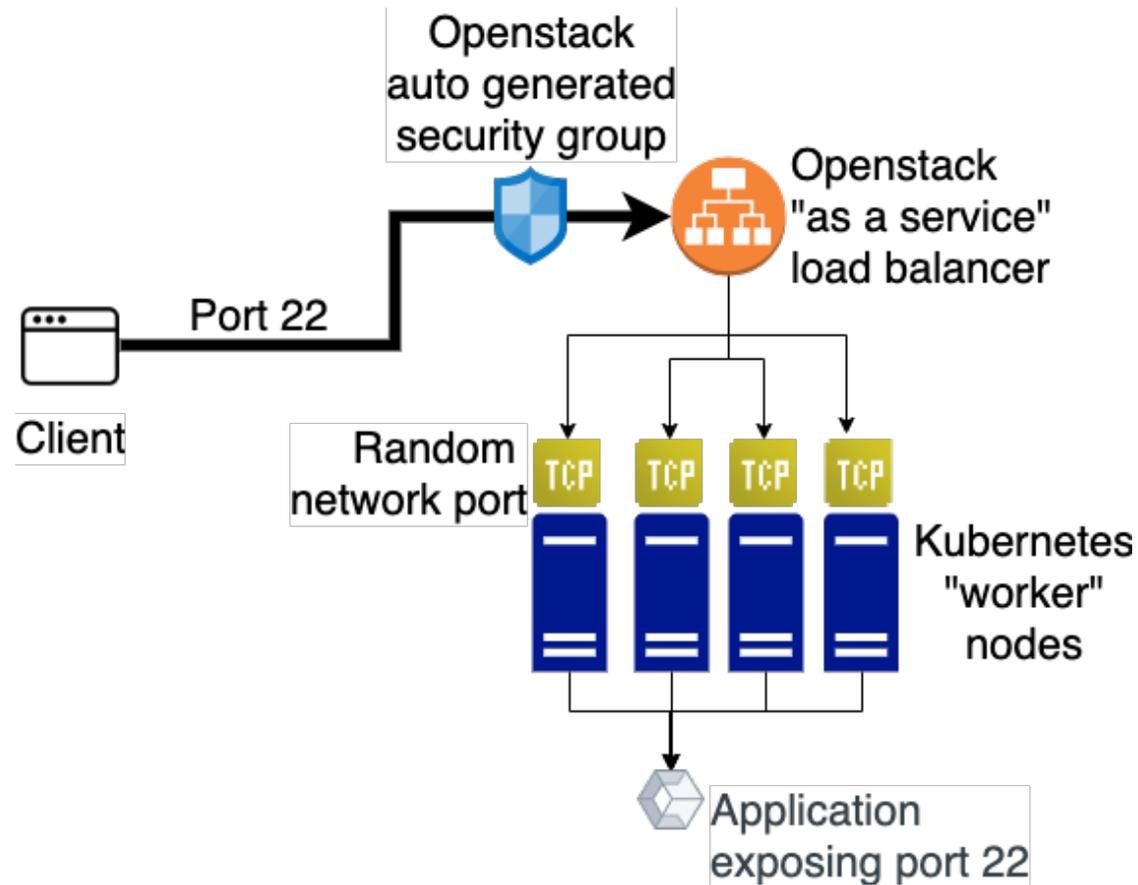
Rancher uses openstack api to request cinder block storage volumes

Rancher uses openstack LBaaS api to request a new load balancer

Rancher deploy app components in k8s



Exposing traffic: Layer 4





Exposing http(s) traffic

Two approaches, both based on virtual host

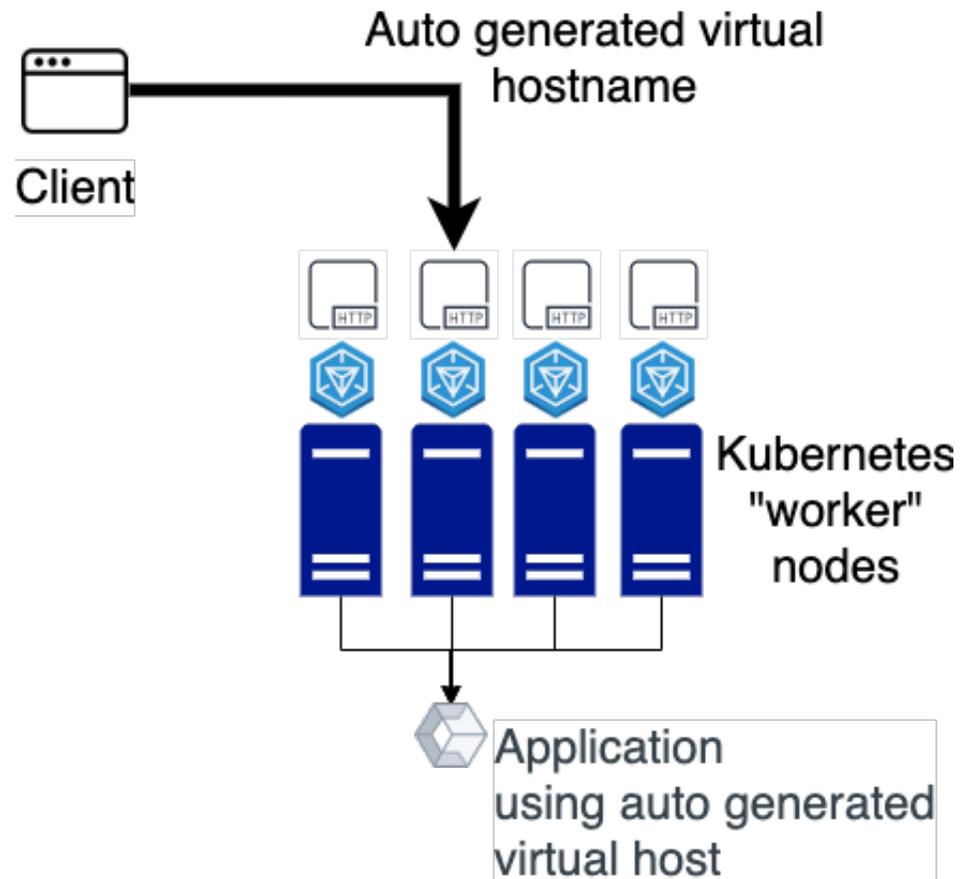
Auto generated virtual hostname

- No external DNS configuration needed
 - Perfect for quick app deployment
 - 'Free' TLS termination
- Ingress traffic is bound to a single worker node
- Long (LONG!) url to remember

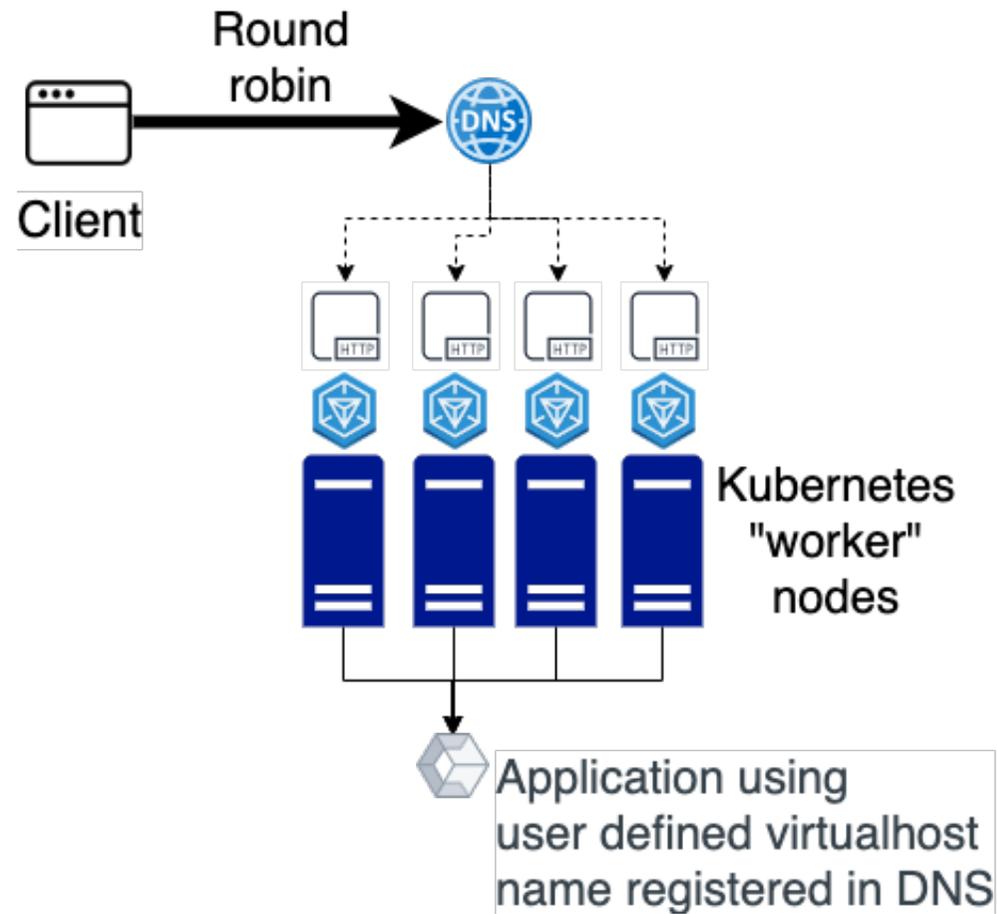
User defined virtual hostname

- Incoming traffic might be distributed
- Expose app with user friendly url
- External DNS configuration required

Ingress traffic with auto generated virtualhost



Ingress traffic with user defined virtualhost





xip.io magic domain name

What is xip.io?

xip.io is a magic domain name that provides wildcard DNS for any IP address.

Say your LAN IP address is **10.0.0.1**.

Using xip.io,

10.0.0.1.xip.io resolves to **10.0.0.1 www.**

10.0.0.1.xip.io resolves to **10.0.0.1 mysite.**

10.0.0.1.xip.io resolves to **10.0.0.1 foo.bar.**

10.0.0.1.xip.io resolves to **10.0.0.1**

Exposing traffic: self hosted xip.io

Registered web.cloud.infn.it zone in our dns



Deployed modified xip.io code in our powerdns



Configured rancher to use web.cloud.infn.it for autogenerated virtual hostname



Apps are reachable at
`https://<app>.<project>.<worker ip>.web.cloud.infn.it`



Geant4 environment

Remote web virtual desktop

Expand All

Configuration Options

Name *

Add a Description

Hostname *

Automatically generate a `.web.cloud.infn.it` hostname

Specify a hostname to use

Virtual hostname to reach your application

App: MyGeant4App

Active



Version 1.0.0

Namespace mca-rr65s-p-pxtxb

Created Last Monday at 12:02 PM

Expand All

Status

Status of current application

Workloads

Workloads created for this application.

Redeploy ↻

Pause Orchestration ||

Download YAML ↓

Delete 🗑️

Search

<input type="checkbox"/>	State	Name	Image	Scale
<input type="checkbox"/>	Active	mca-rr65s-p-pxtxb-python-shell 80/http, 80/tcp	virtuallabs/psiabox:latest 1 Pod / Created 2 days ago / Pod Restarts: 1	1

Endpoint

Protocol

https://mygeant4app.mca-rr65s-p-pxtxb.<worker ip>.web.cloud.infn.it

HTTP



Trash



File System



Home



Chromium
Web Browser



Firefox Web
Browser

```
Terminal
File Edit View Terminal Tabs Help
USER_ID: 0, GROUP_ID: 0
root@myroot-p-pxtxb-root-virtual-desk-766fb9c45b-zj5g6:~# root
-----
| Welcome to ROOT 6.12/06                               http://root.cern.ch |
|                                                         (c) 1995-2017, The ROOT Team |
| Built for linuxx8664gcc                               |
| From tag v6-12-06, 9 February 2018                    |
| Try '.help', '.demo', '.license', '.credits', '.quit'/.q' |
|-----
root [0] █
```



Conclusions

- ✓ Paradigm shifted from **'Why should I use container for my app'** to **'why shouldn't I'**
- ✓ Users are used to public cloud, we should try to get close to that level of **user experience**
- ✓ Keep **innovating...**
- ✓ ...and **DRIVE** innovation!



Thanks!

- GARR
- Simone Ferretti – ex borsista GARR
 - INFN Corporate Cloud team