

VIETTEL

# The way we build the largest Public & Private Cloud infrastructure in Vietnam

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Speakers:  
Duc, Nguyen Cong  
Vinh, Nguyen Trong (Tovin)



# About us



## Duc, Nguyen Cong (DucNC) - @ducncvn

Head of Cloud Infrastructure Services

Ex-Organizer of Vietnam OpenInfra Community



## Vinh, Nguyen Trong (Tovin) - @tovin07

Head of Cloud Platform Services

Organizer of Vietnam OpenInfra Community

# CONTENT



1

About Viettel

2

The Journey

3

Our lessons learned

4

Conclusions



# About Viettel

1.0

Viettel Data Center

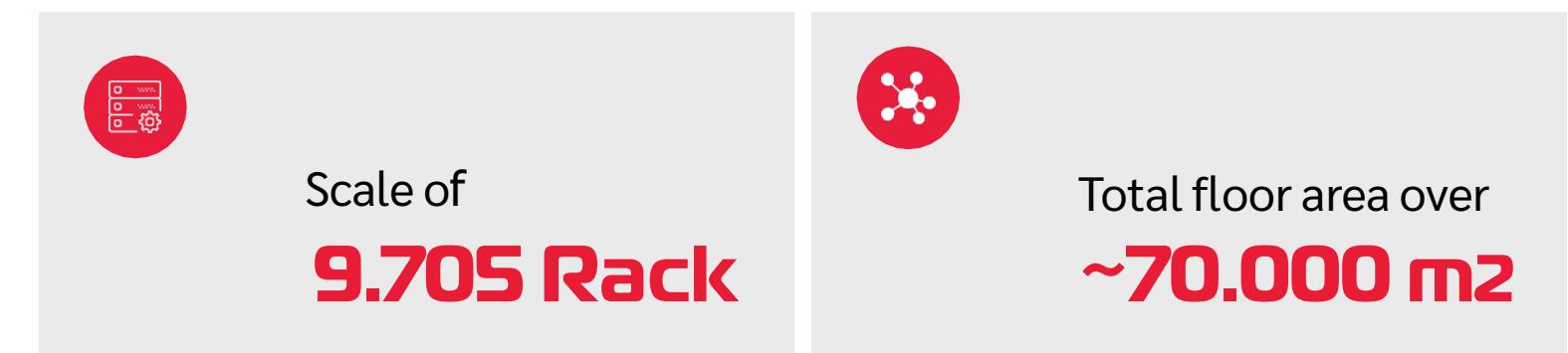
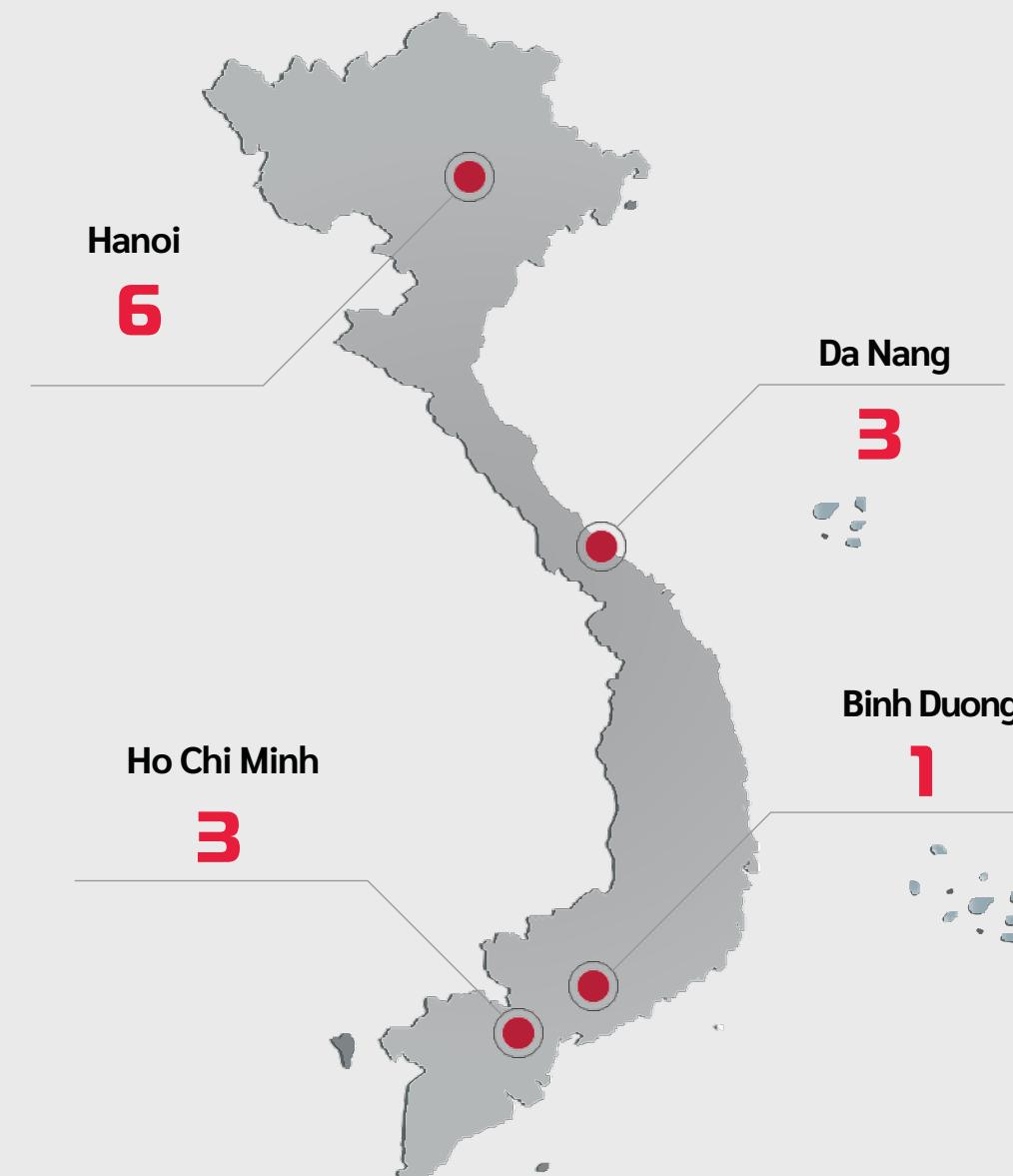
2.0

Viettel Cloud Ecosystem

# VIETTEL DATA CENTER

The largest Data Center infrastructure in Vietnam

13 Data Centers across North - Central - South Regions in Vietnam

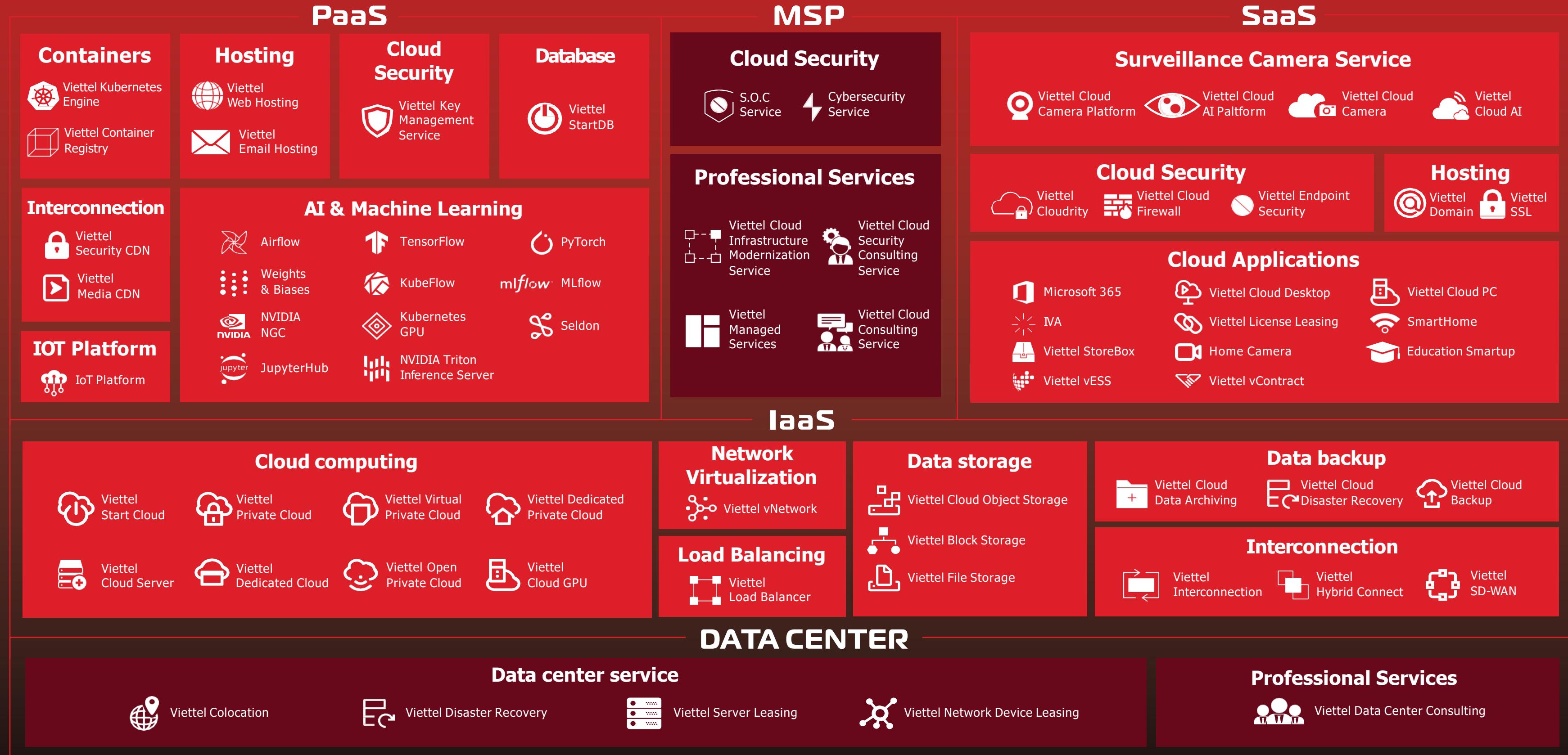


## Investment plan

2025	13 Data Center	Total floor area <b>100,000 m<sup>2</sup></b>	Total racks reach <b>17,000 Rack</b>	Total new investment <b>~10,000 Billion VND</b>
2030	22 Data Center	Total floor area <b>324,000 m<sup>2</sup></b>	Total racks reach <b>34,000 Rack</b>	Total new investment <b>~40,000 Billion VND</b>



# VIETTEL CLOUD ECOSYSTEM



# 2

# The Journey

1.0

Before "Go Cloud"

2.0

Decisions

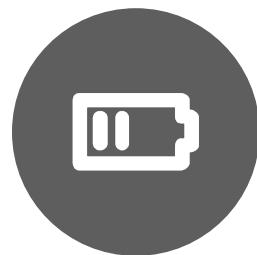
3.0

Progress

## PROBLEMS ENCOUNTERED BY VIETTEL BEFORE THE CLOUD



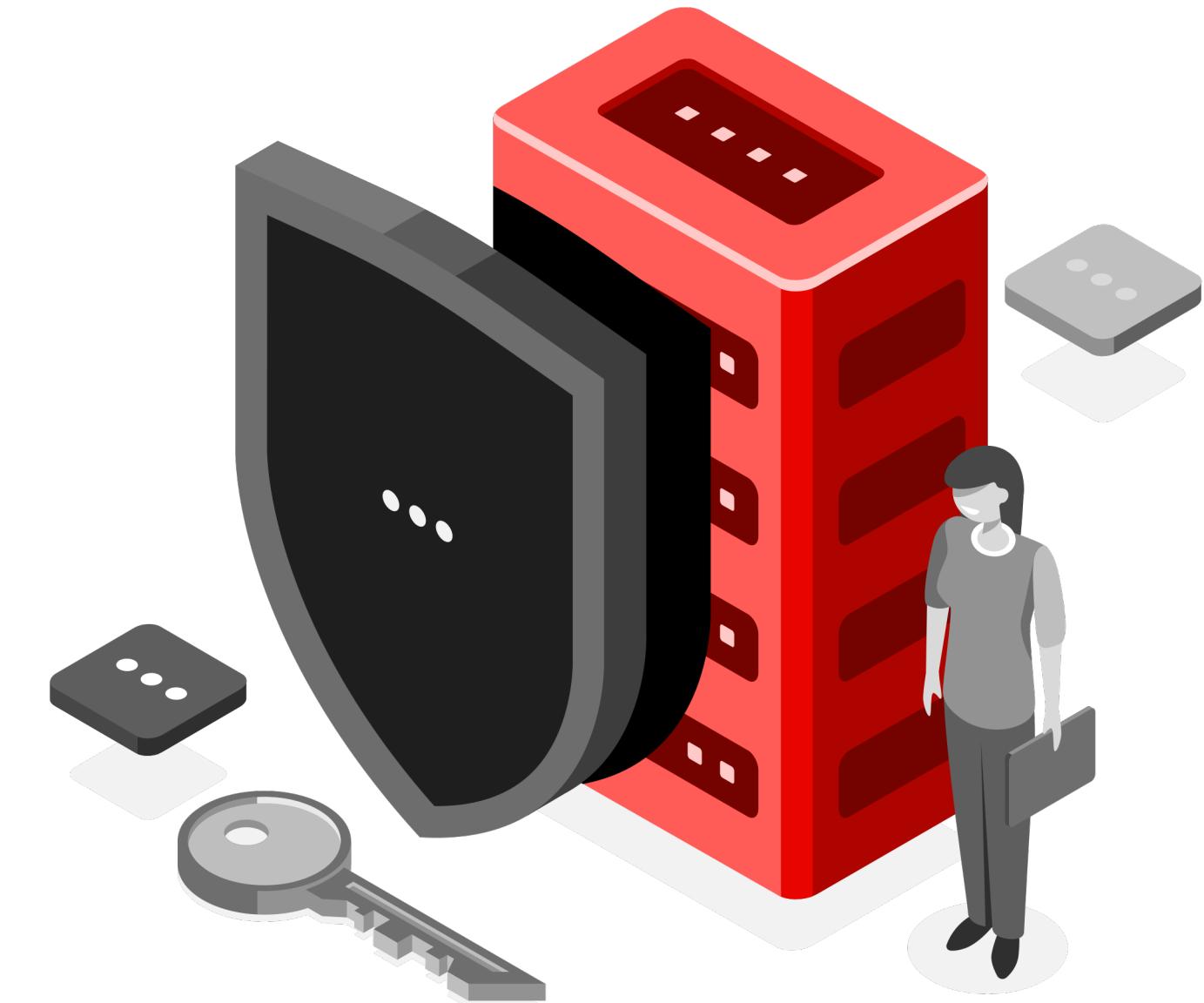
**Fragmented** infrastructure,  
**distributed** data



Large **CAPEX/OPEX**, low resource  
**utilization** efficiency



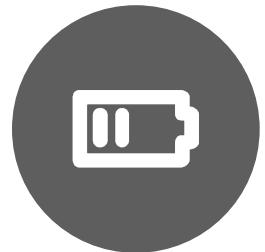
Difficulties in implementing and  
**applying new technology**



## CHALLENGES & DECISIONS



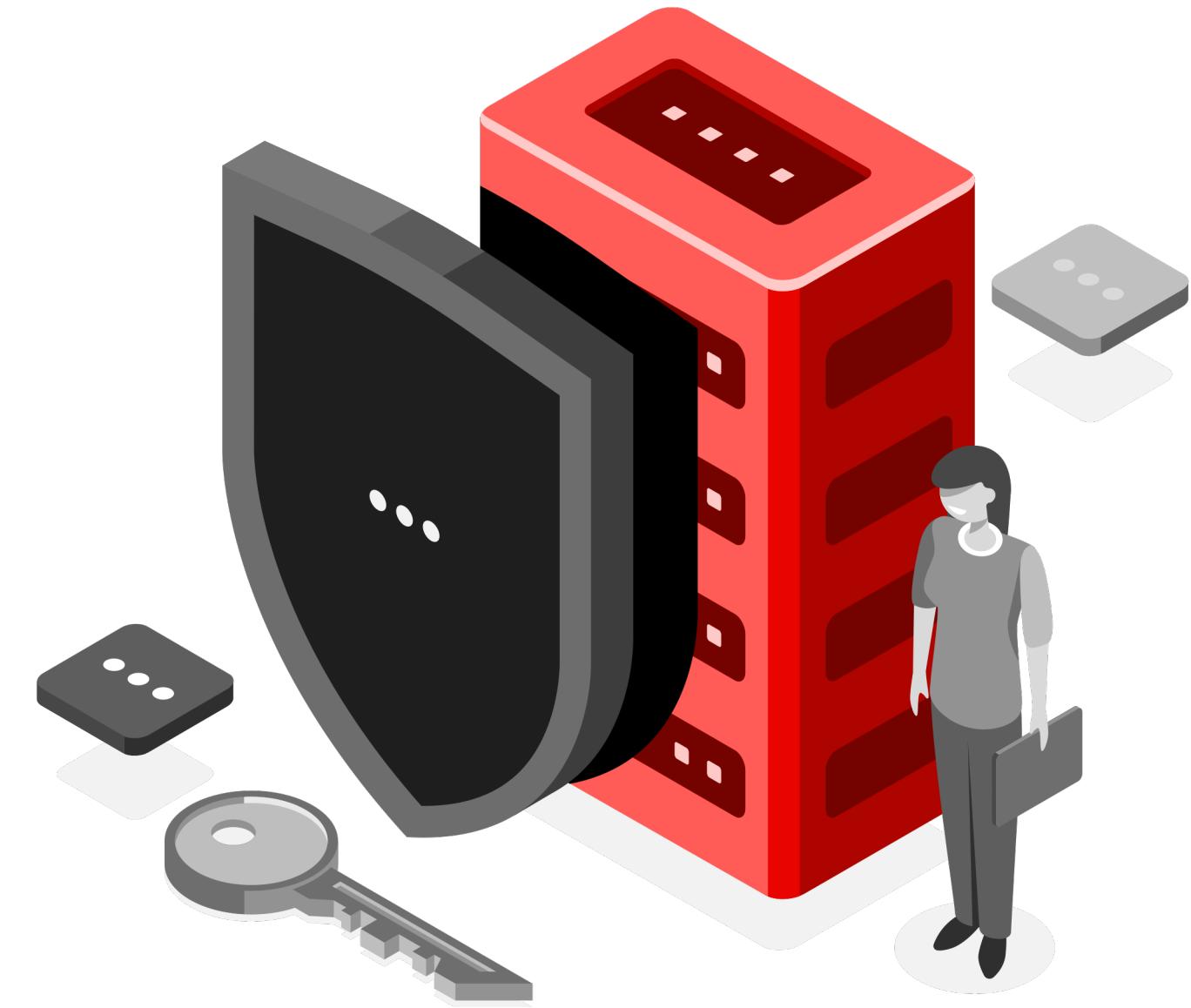
Cloud Architecture?

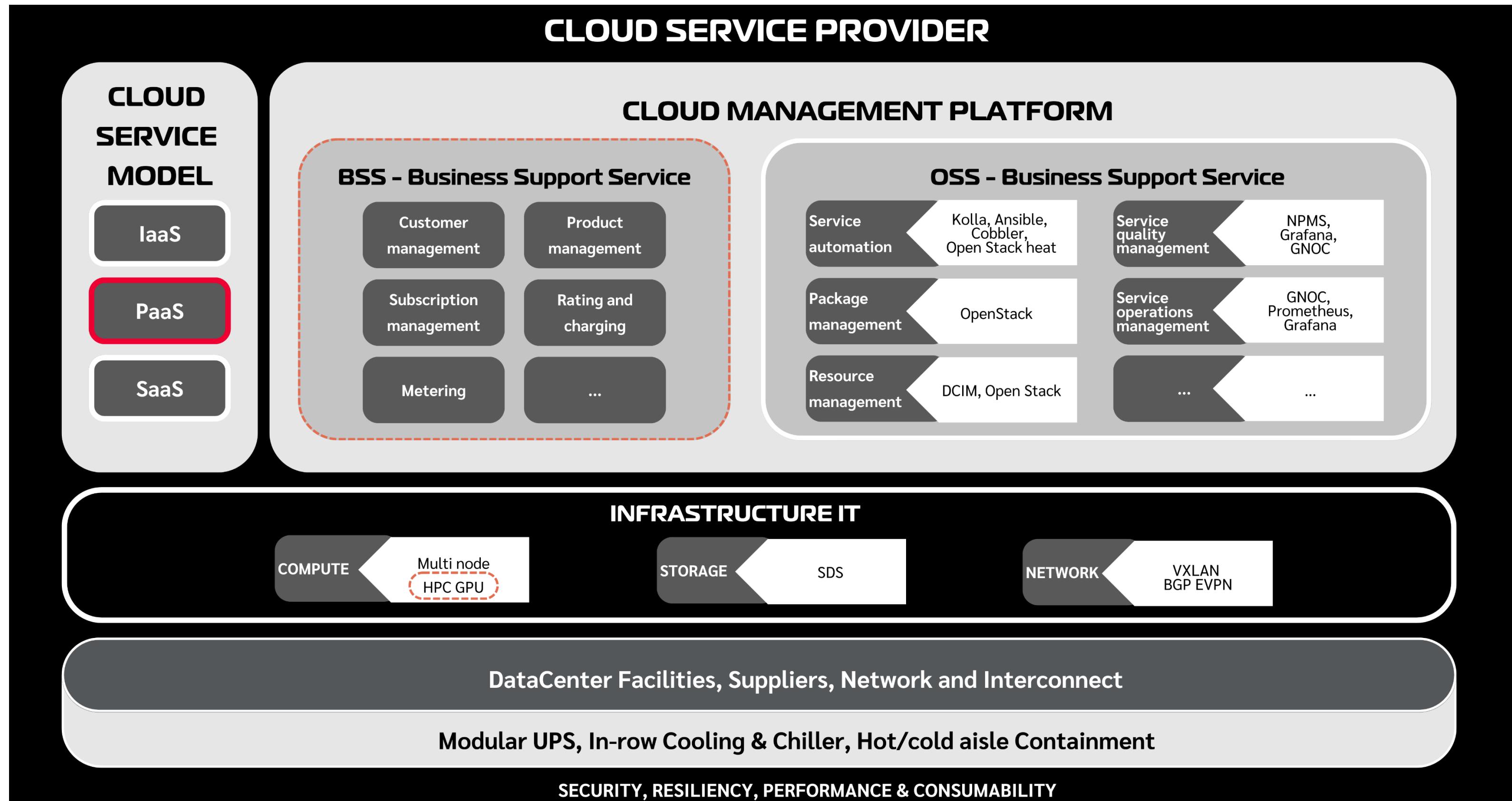


Core Technologies?



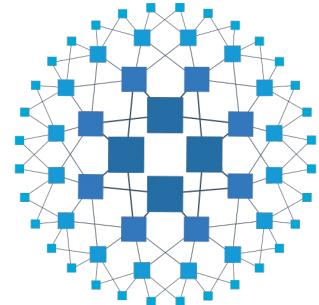
Human Resources?



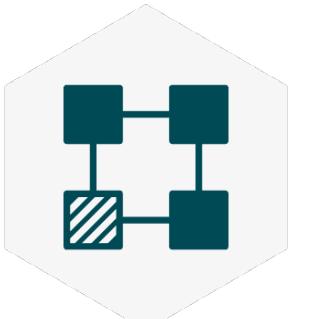
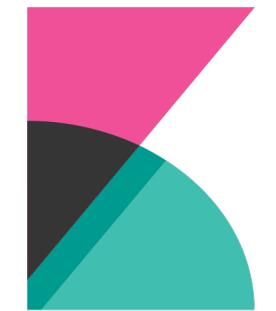


# Open Technology

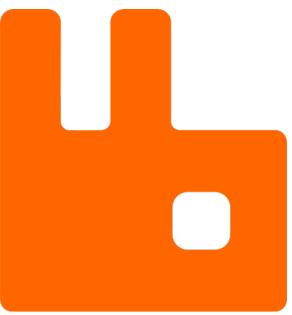
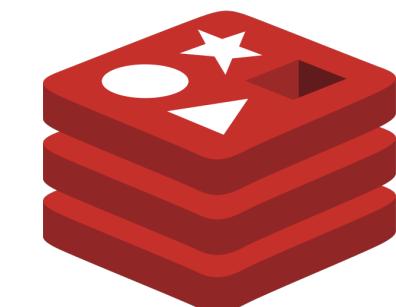
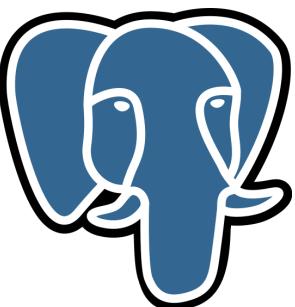
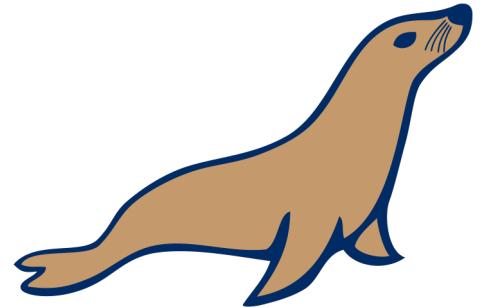
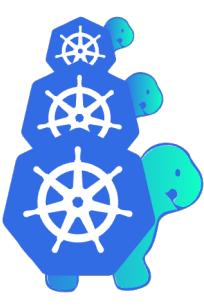
**django**



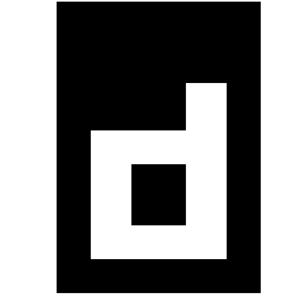
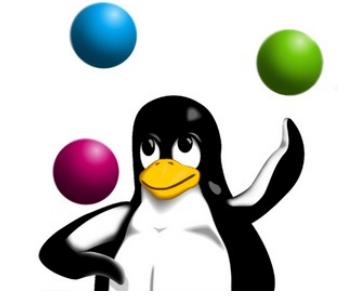
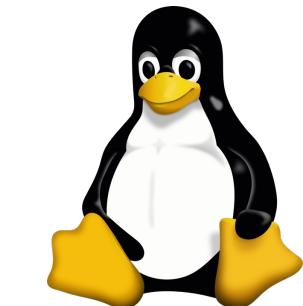
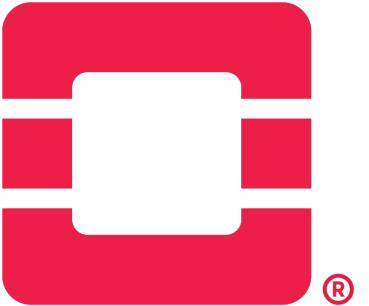
Framework & Tools



Monitoring Observability



Platform & Database



Infrastructure

# Open Technology

100	Microsoft	937
101	Deutsche Telekom	913
102	Viettel	900
103	China Mobile	889
104	Ansible	835
105	inwinSTACK	818
106	T1 Cloud	748

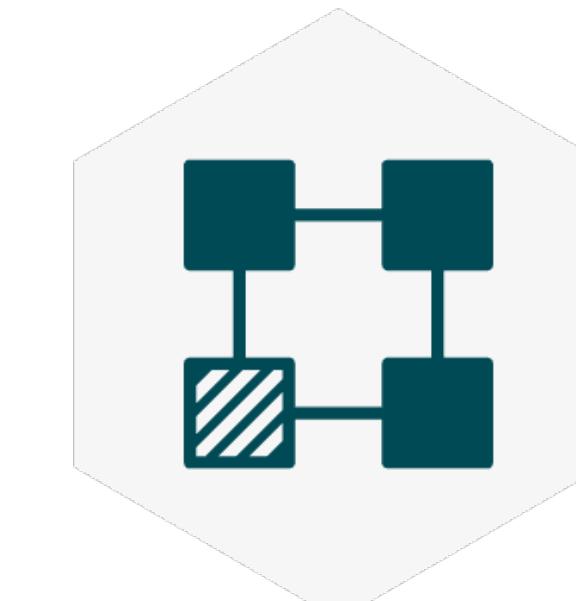
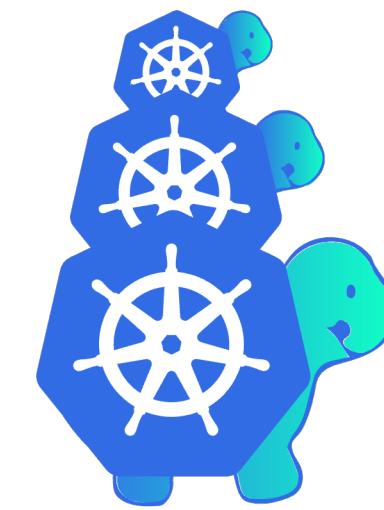
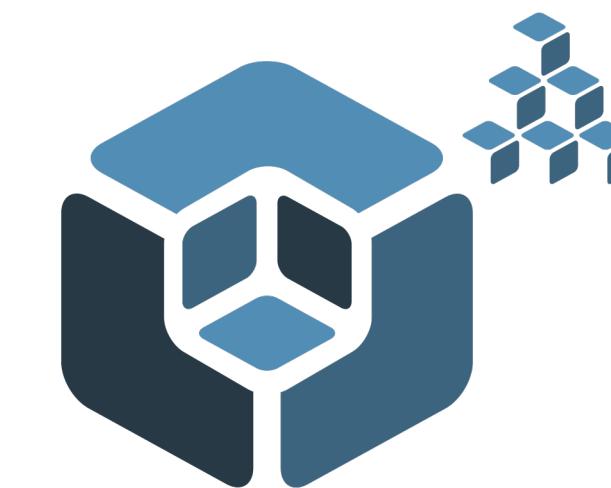
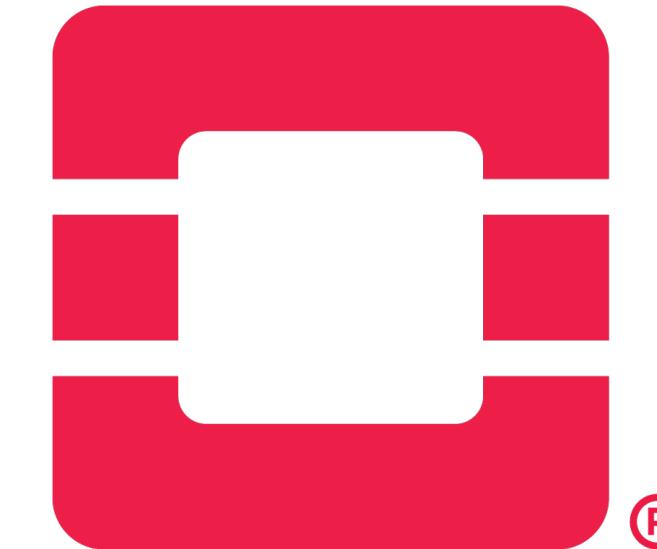
## #102: OpenStack ecosystems - Reviews

135	A10 Networks	131
136	University of Chicago	130
137	Cray	126
138	Viettel	126
139	Datera	122
140	Cloudin	120
141	NetEase	118

## #138: OpenStack ecosystem - Commits

<https://www.stackalytics.io/?release=all&metric=commits>

<https://www.stackalytics.io/?release=all&metric=marks>



vCloud-DFTBA / [san\\_exporter](#) Public

Code Issues 1 Pull requests

main 1 branch 2 tags

<https://github.com/vcloud-DFTBA>

# Viettel's Journey

2018

2019

2020

2021

2022

- 1<sup>st</sup> Cloud cluster (Hanoi)
- 30% legacy IT infrastructure migrated
- Pilot with microservices architecture

- 3<sup>rd</sup> Cloud cluster (HCM)
- 85% legacy IT infrastructure migrated
- New VM? On Cloud only
- Expand to other countries

- First touch to Cloud
- OpenStack
- Ceph
- Prometheus

- 2<sup>nd</sup> Cloud cluster (Hanoi)
- 70% legacy IT infrastructure migrated
- 03 countries (Laos, Cambodia, Myanmar)

- 08 Cloud clusters
- 90% legacy IT infrastructure migrated
- Become a Public Cloud player
- BFSI, Gov, Logistics, Manufacturing



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solutions

# 3

## Our lessons learned

1.0

Infrastructure

2.0

Cloud Management Platform

3.0

Cloud Services

# Network Architech - Big Picture

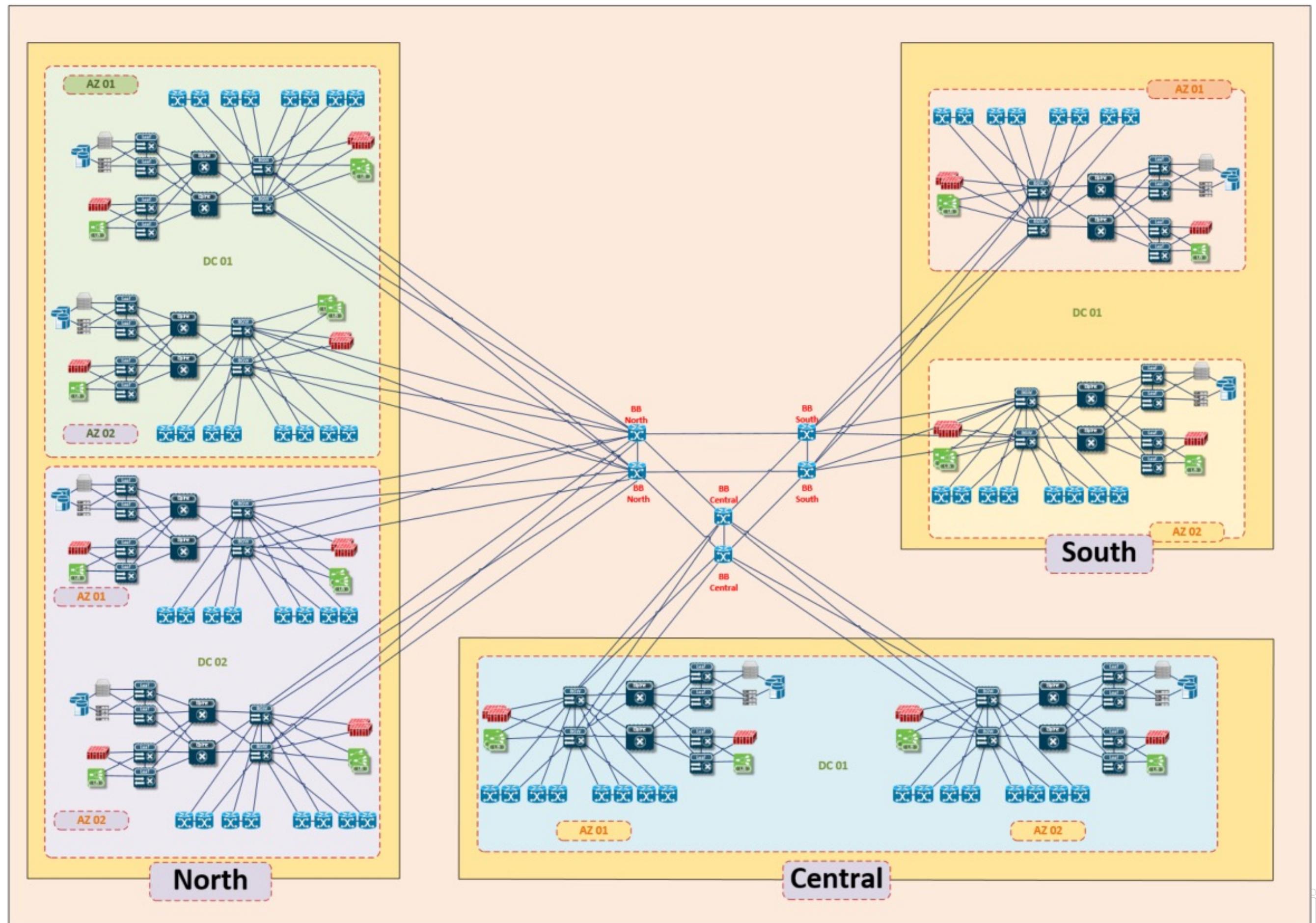


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### OpenStack

- Do not deploy too many compute nodes on an openstack cluster, if there are more, **separate** them into **different clusters**.
- Pay attention to the **response time** of OpenStack APIs, DB Query as your infrastructure grows. It will affect the experience.
- Monitor is good, but **consider monitoring metrics**. Too much or too frequently can increase the load on your system.
- **Unify CPU Model** for Compute nodes
- **Clustering compute node**: by CPU model, by storage,...
- Config to **slow down CPU** during live migration
- Pay attention to the default configuration, the bigger your system gets, the bigger it can kill you
- **Periodically running tasks** of nova, neutron,...
- Haproxy **maxconn** in backend

### Ceph

- ❑ Pay attention to **failure domain** from design:  
OSD level, host level, rack level or TOR,  
depending on the importance of your data.
- ❑ Ceph depends heavily on **network infrastructure**. Make sure you have a stable  
network infrastructure, ping latency is  
guaranteed to be below 60 us.

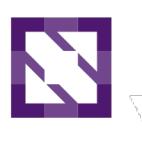


### VMs

- ❑ Port security: Only allow the packet  
with **IP/MAC address pair** known to  
OpenStack by default
- ❑ **Entropy** is very important, especially  
for scale out system running on OPS  
Cloud platform
- ❑ Enable **multiple queue** for VM



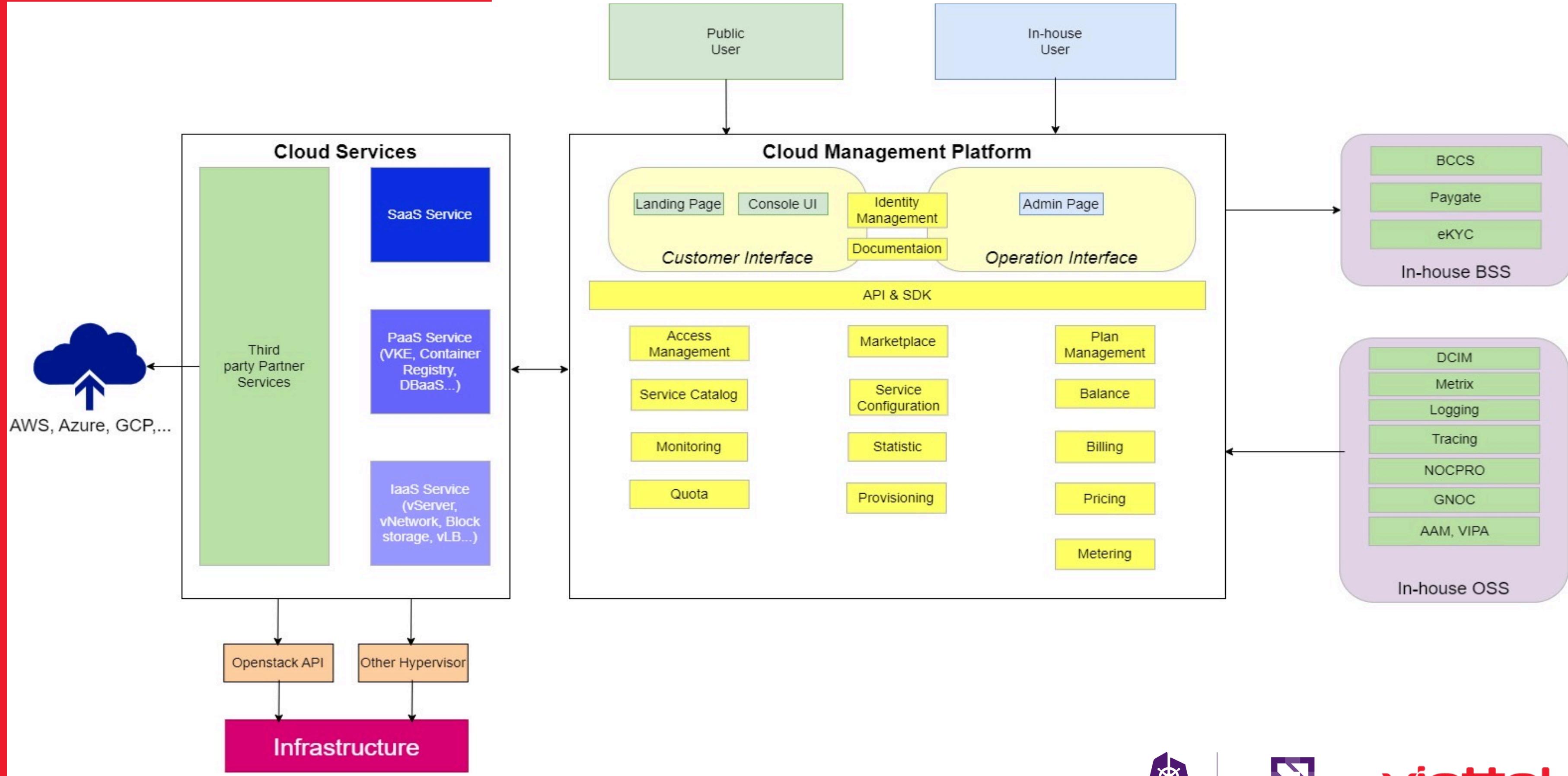
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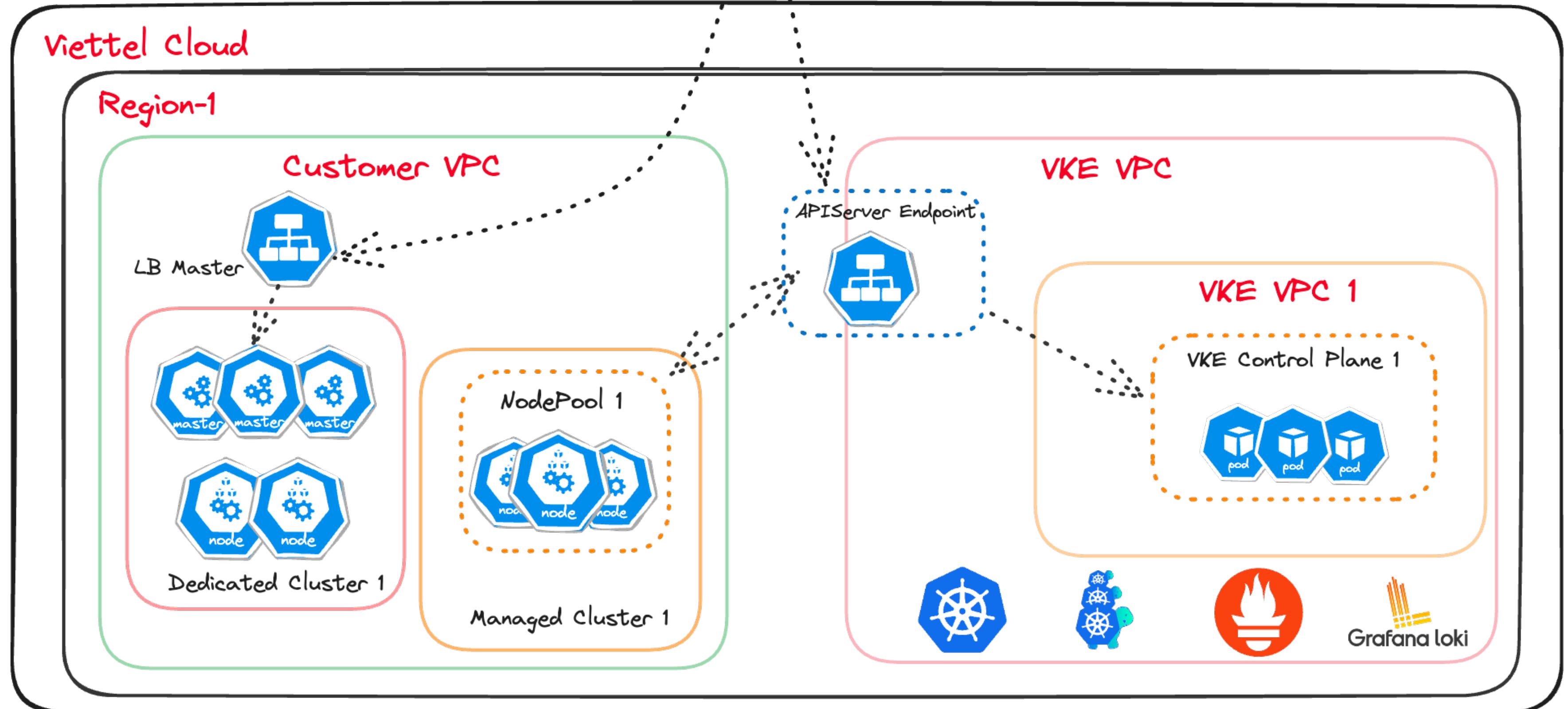


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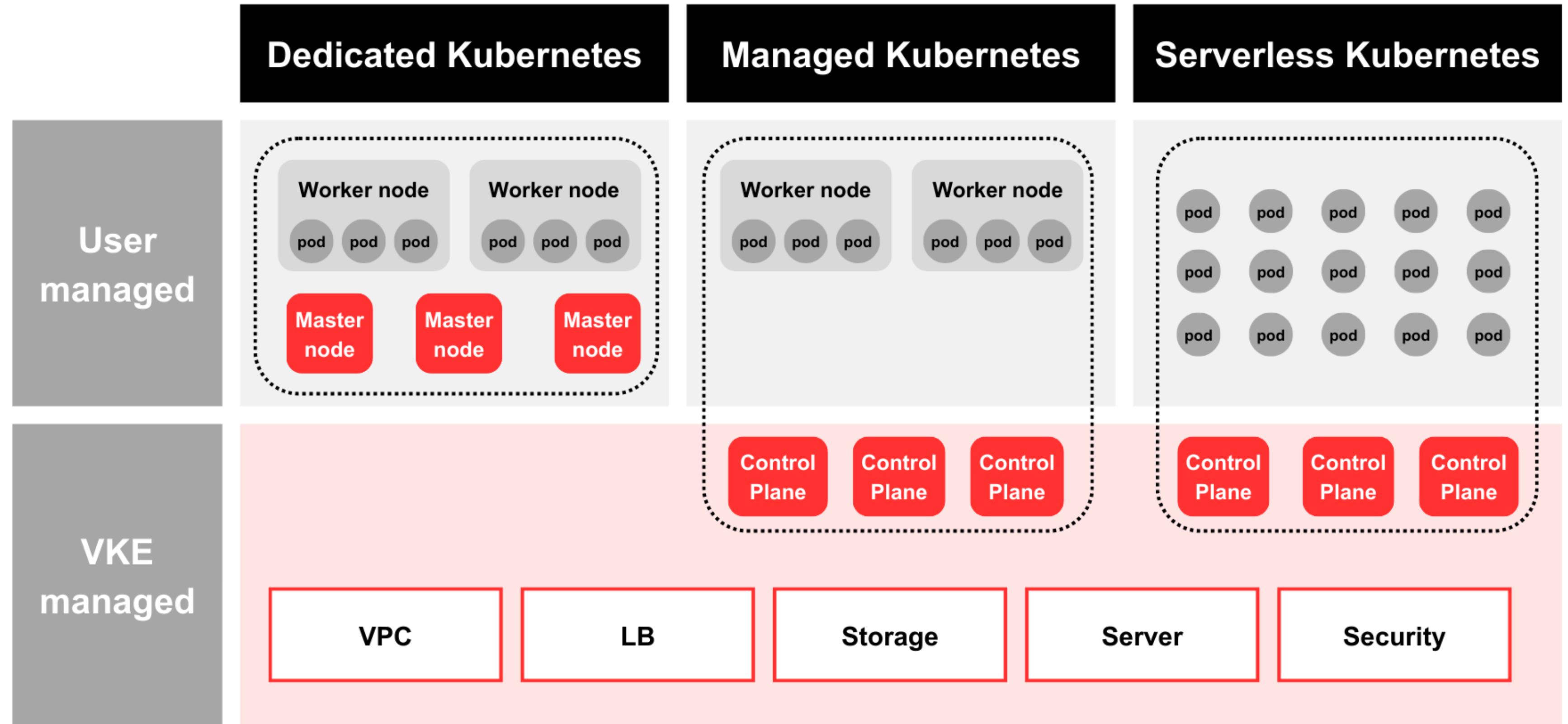
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# Kubernetes Service



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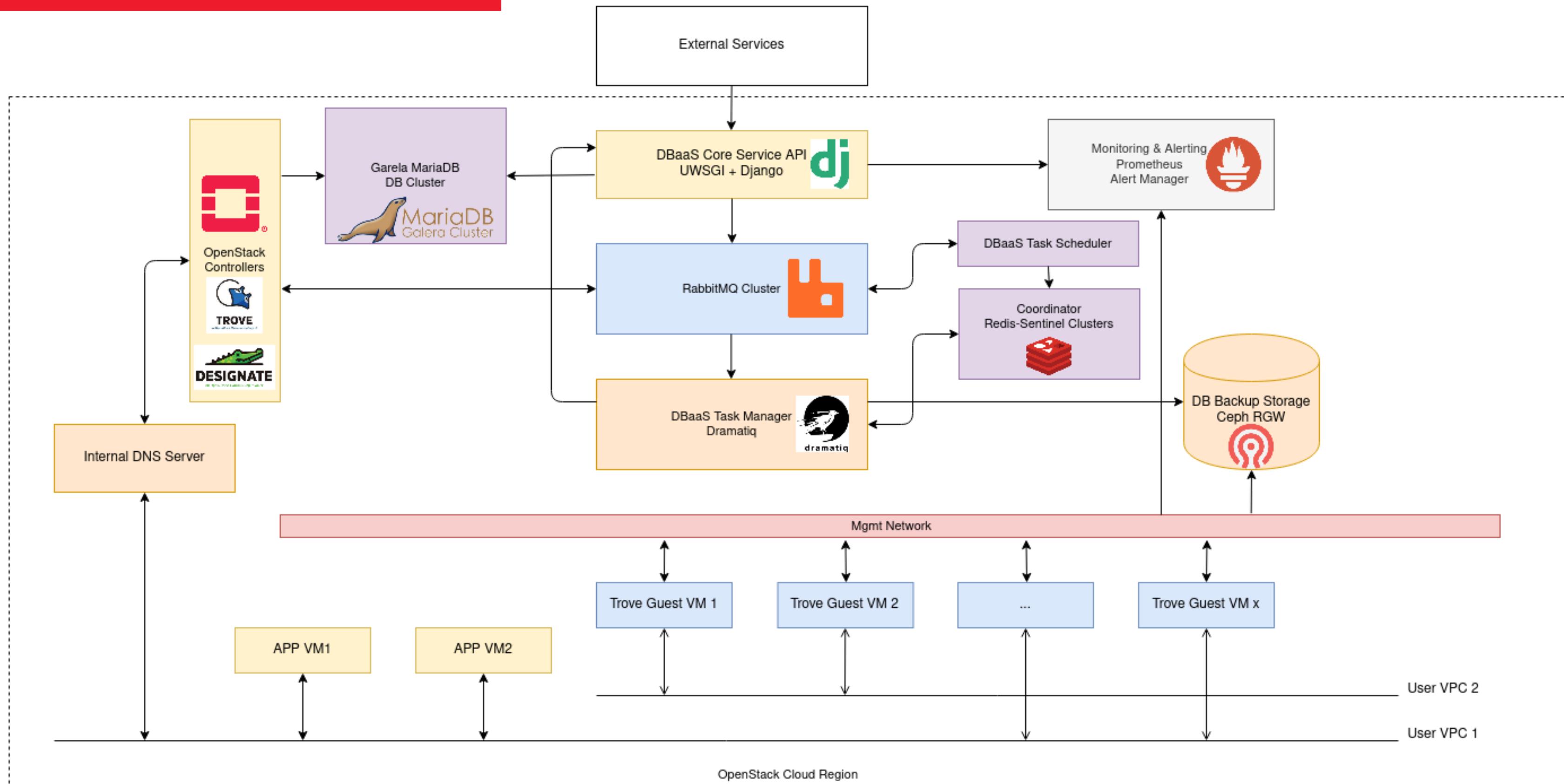
### Cluster API is the core

And:

- ❑ Cluster API Provider, Cloud Controller (on OpenStack)
- ❑ Custom Block Storage CSI
- ❑ Custom Cloud Ingress Controller
- ❑ etcd p99 duration should be less than 10ms
- ❑ Pay attention to **authentication, authorization:**
  - Connection from customer's cluster to Cloud Provider
- ❑ **Monitoring, Alerting, Logging, Audit log** for control plane
- ❑ Checklist for Kubernetes Deployment



# Database Services



# OpenStack Trove is great

And:

- Automatic health-check
- Automatic failover
- Automatic backup
- Automatic resize volume
- SSL support**
- Checklist for DB deployments (MySQL, MariaDB, PostgreSQL)



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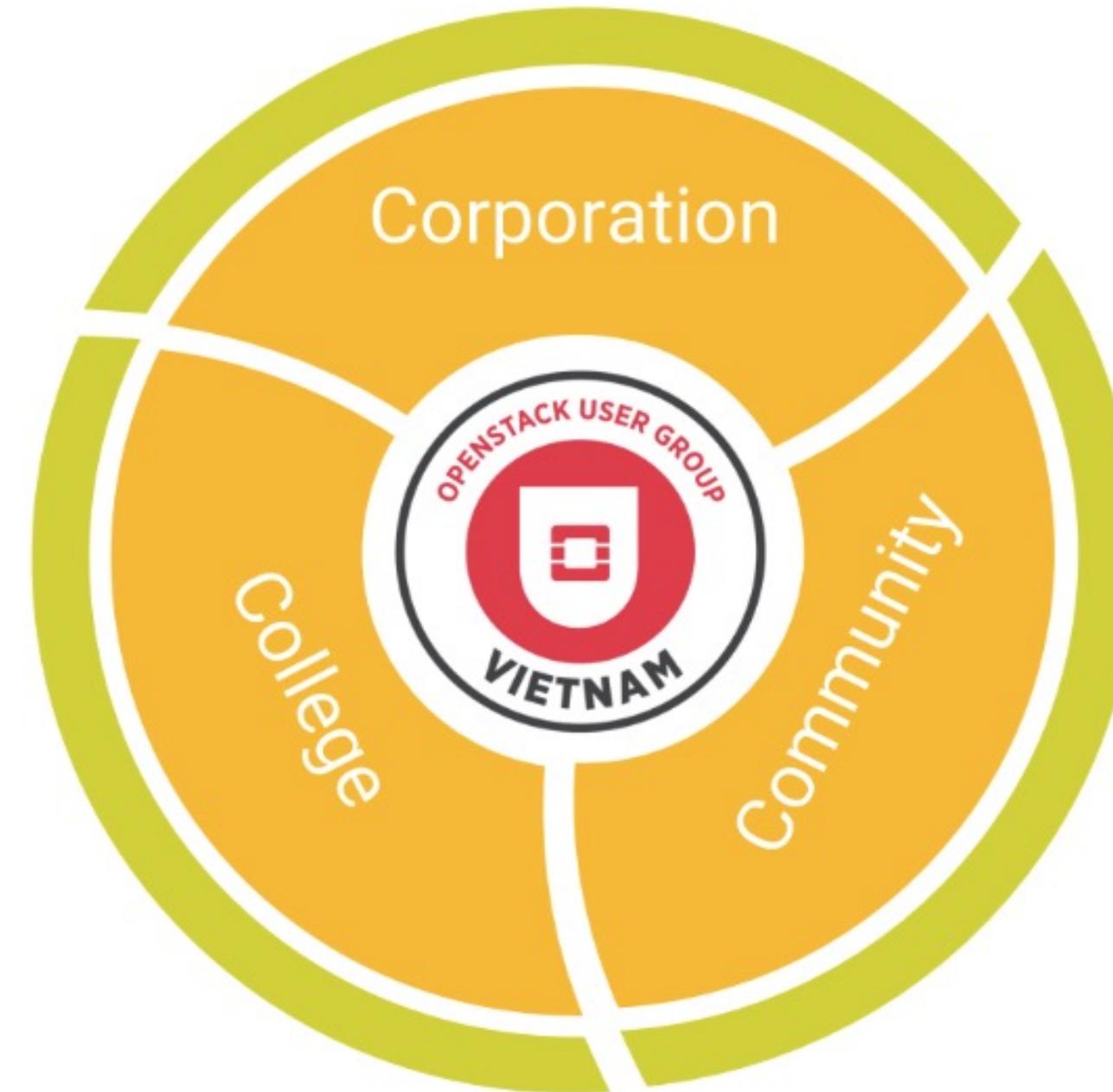


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# 4 Conclusion



# Key takeaway

## Infrastructure

- Too much compute nodes → new clusters instead
- Unify CPU Model** for compute nodes
- Clustering compute node: by CPU model, by storage,...
- Pay attention to the **response time** when scale your cluster
- Monitor is **good**, but **not too much**, it can be noisy
- Default configuration?** The bigger your system gets, the bigger it can kill you
  - Periodically running tasks
  - Tuning HAProxy maxconn
- Ceph** depends heavily on network, should be  $< 60 \mu\text{s}$

## Virtual Machines

- Port security
- Entropy is very important
- Enable multiple queue for VM

## Kubernetes Service

- Cluster API Provider, Cloud Controller (on OpenStack)
- Custom Block Storage CSI
- Custom Cloud Ingress Controller
- etcd p99 duration should be less than 10ms
- Pay attention to authentication, authorization
- Monitoring, Alerting, Logging, Audit log for control plane
- Checklist

## DB Service with OpenStack Trove

- Automatic health-check, failover, backup, resize volume
- SSL support
- Checklist



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# THANK YOU!



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