



Hack the Stack: Fast-track Kubernetes to Production with the Right Infrastructure Strategy

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Diamanti



Agenda

- What Actually Defines ‘Cloud Native’?
- Options For Deploying Cloud Native Applications
- The DIY Kubernetes Stack Approach In Depth
- A Look At Container Persistent Storage And Container Networking
- Running Containers On Bare Metal Versus VMs
- Diamanti’s Approach To Kubernetes Infrastructure

What is 'Cloud Native'? Here Are 10 Key Attributes

1. Packaged as lightweight containers
2. Developed with best-of-breed languages and frameworks
3. Designed as loosely coupled microservices
4. Centered around APIs for interaction and collaboration
5. Architected with a clean separation of stateless and stateful services
6. Isolated from server and operating system dependencies
7. Deployed on self-service, elastic, cloud infrastructure
8. Managed through agile DevOps processes
9. Automated capabilities
10. Defined, policy-driven resource allocation

Source: <https://thenewstack.io/10-key-attributes-of-cloud-native-applications/>

Enterprises are Going ‘Cloud Native’: A Look Back At 2018

80 BILLION

Docker downloads to date



More than 50%
of new workloads will be deployed
in containers in 2018

Gartner

>70% of enterprises
plan to deploy containers in
production in 2018*

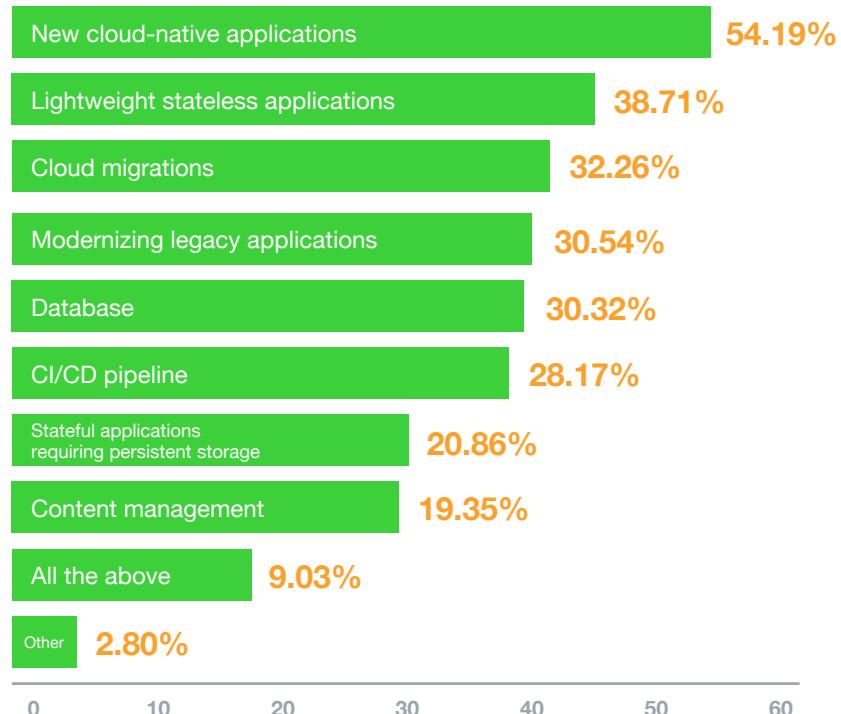


31% are modernizing
legacy apps with containers*



Diamanti Survey

How are containers being used?



Infrastructure Remains a Top Container Adoption Challenge

“Enterprise interest in Kubernetes to build and deploy new applications is off the charts. **Security, storage, networking and monitoring are the top challenges** that our user community have highlighted on the Kubernetes adoption path.”

-- Dan Kohn, Executive Director



What Options Do I Have for Cloud Native App Deployments?

Public Cloud

PROS:

- 100% OPEX means lowest cost at small scale
- Proven, resilient infrastructure as a service

CONS:

- Highest costs at large scale
- Difficult to optimize efficiency
- Security and compliance concerns
- No bare metal support yet

On-Prem: DIY with Hypervisor

PROS:

- Low complexity at small scale
- Experience with traditional technology components

CONS:

- Longer time-to-value
- With a VM layer, resource efficiency is reduced and complexity increases
- High complexity and cost at scale
- Difficult to manage at scale

On-Prem: DIY with Bare Metal

PROS:

- Flexible, seamlessly scalable infrastructure
- Better overall performance at scale
- TCO advantages are realized

CONS:

- Specialized skill sets required at different areas of the stack

Major Container Adoption Challenges



Day 1 (Hard)

Deploy infrastructure

- Build the container stack
- Configure network, storage
- Install container runtime and orchestration



Day 2 (Harder)

Manage containers in production

- Guarantee real-time SLAs
- Infrastructure services
- 24x7 support



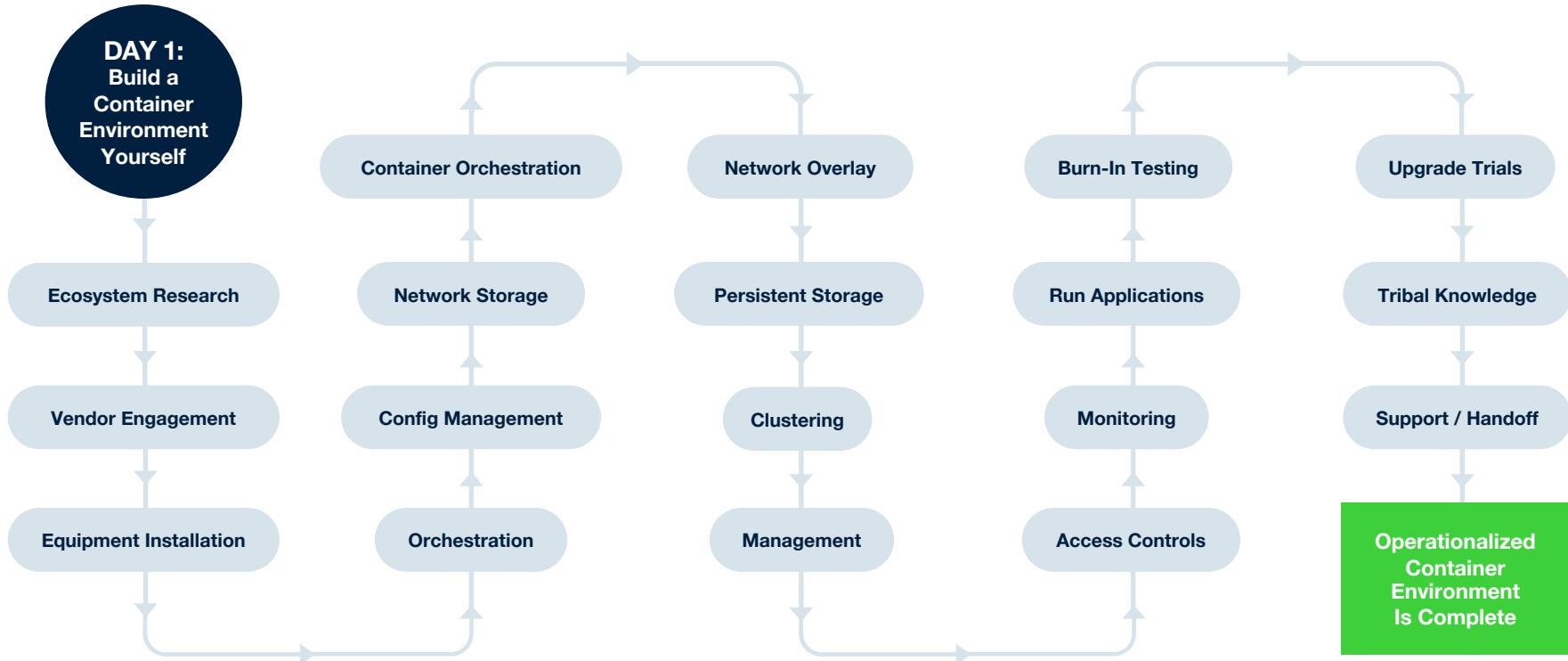
Day 3 (Hardest)

Expand with multi-cloud

- Quick movement of containers across cloud environments
- Seamless scalability
- Policy-driven

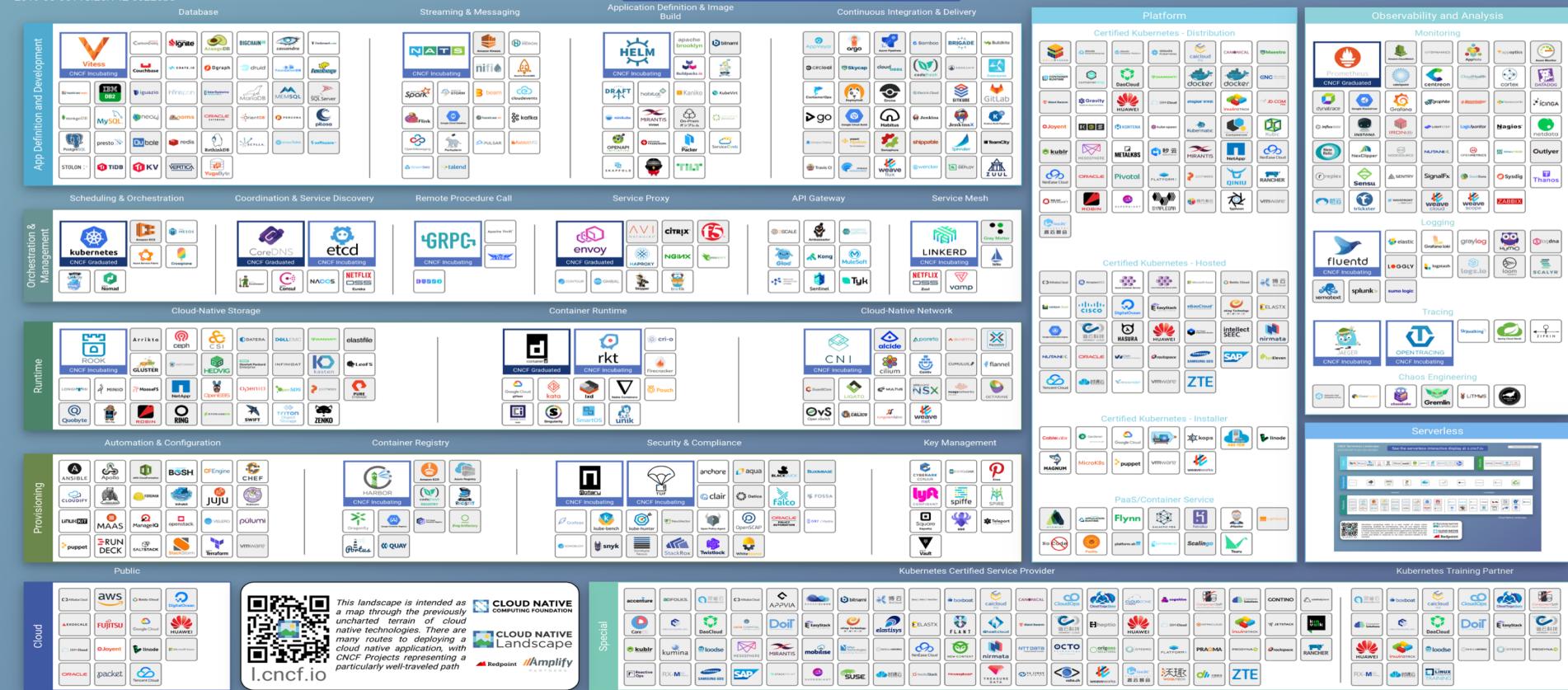
**Choose your cloud native infrastructure wisely;
it matters at every step.**

Do-It-Yourself Approach to Container Infrastructure



CNCF Landscape

See the interactive landscape at l.cncf.io



How Containers Use Compute Resources

- Kubernetes podspecs offers a declarative model for carving out CPU and memory on a per-container basis
 - Limits = maximums
 - Requests = guaranteed minimum
 - K8S prevents oversubscription of requests

```
apiVersion: v1
kind: Pod
metadata:
  name: qos-demo
  namespace: qos-example
spec:
  containers:
    - name: qos-demo-ctr
      image: nginx
  resources:
    limits:
      memory: "200Mi"
      cpu: "700m"
    requests:
      memory: "200Mi"
      cpu: "700m"
```

Drilling Down: Storage For Stateful Containers

Local Storage

- Host paths can be mounted to containers in Docker and Kubernetes

CHALLENGES

- High Availability
- Who is managing it?

Kubernetes Native Storage Drivers

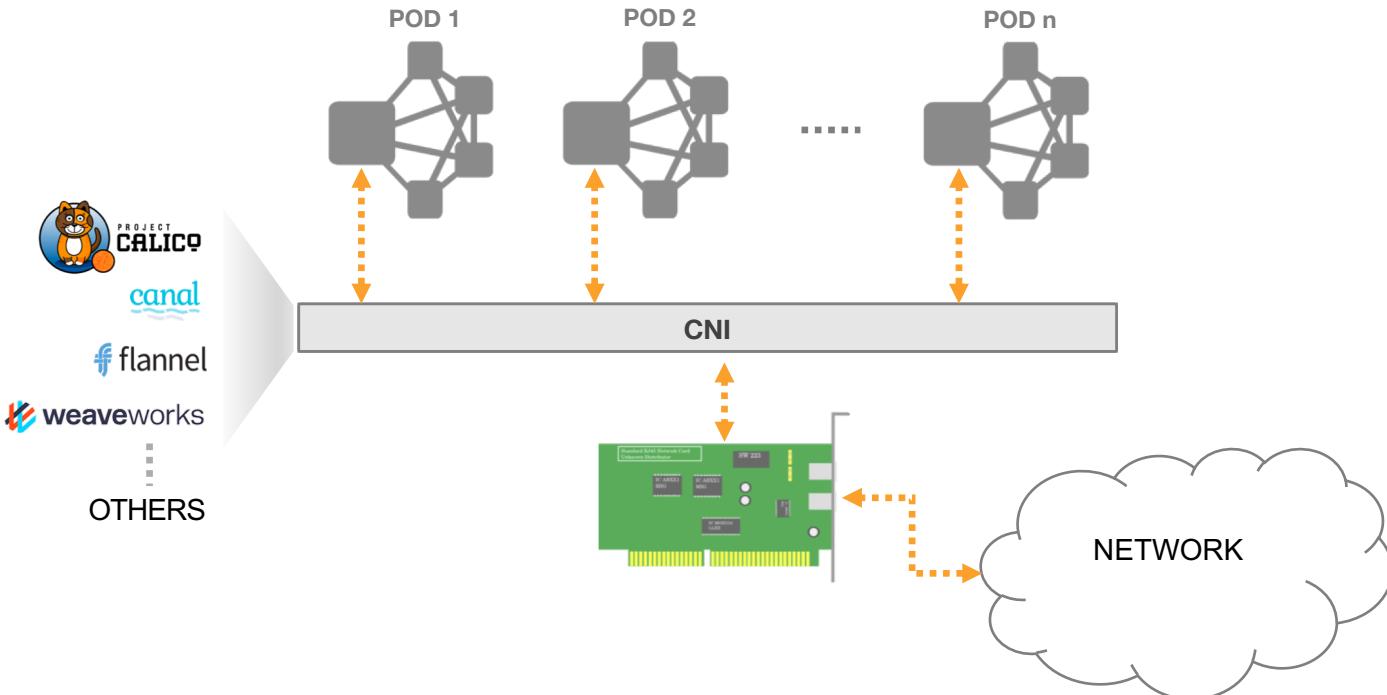
- K8S community integrated several popular filesystems and storage drivers:
 - iSCSI, NFS, GlusterFS, CEPH, GCEpersistent, AzureFile, etc.

Kubernetes FlexVolume / CSI

- Single way to integrate 3rd party storage
 - replaces the need to maintain several different storage drivers as part of the mainline Kubernetes code

Kubernetes Networking Model

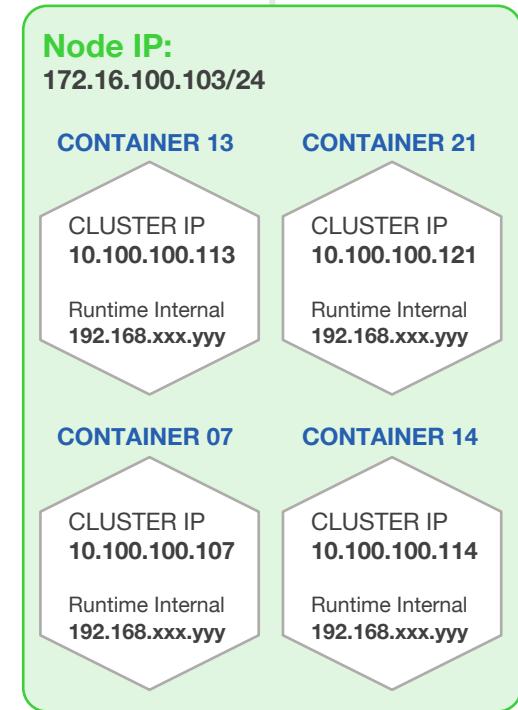
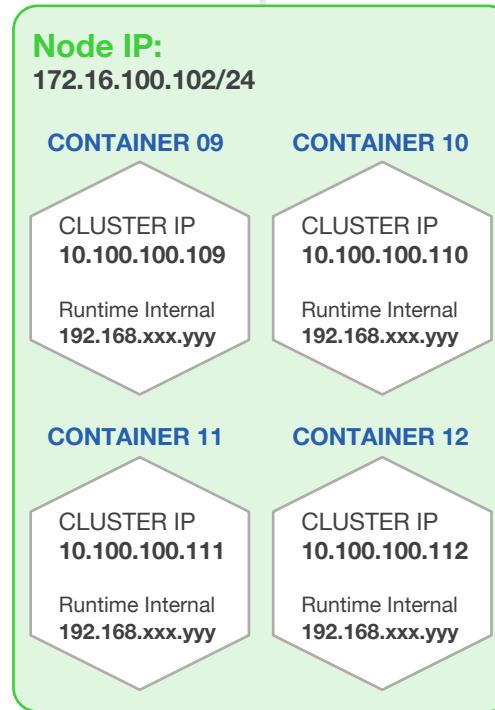
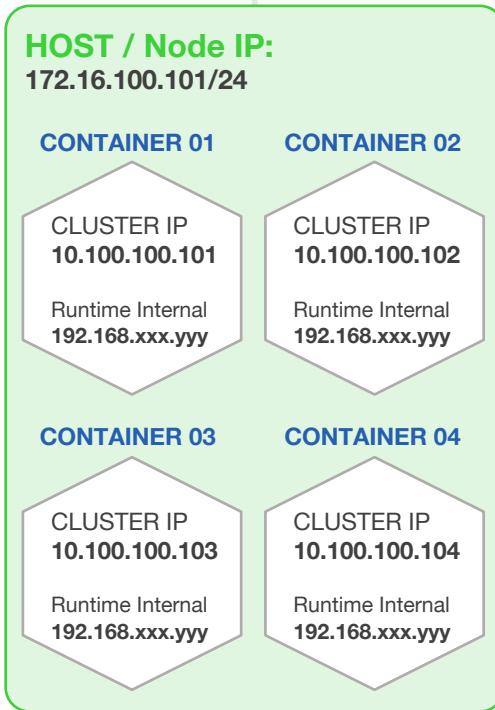
Kubernetes accepts only ONE container network interface (CNI)



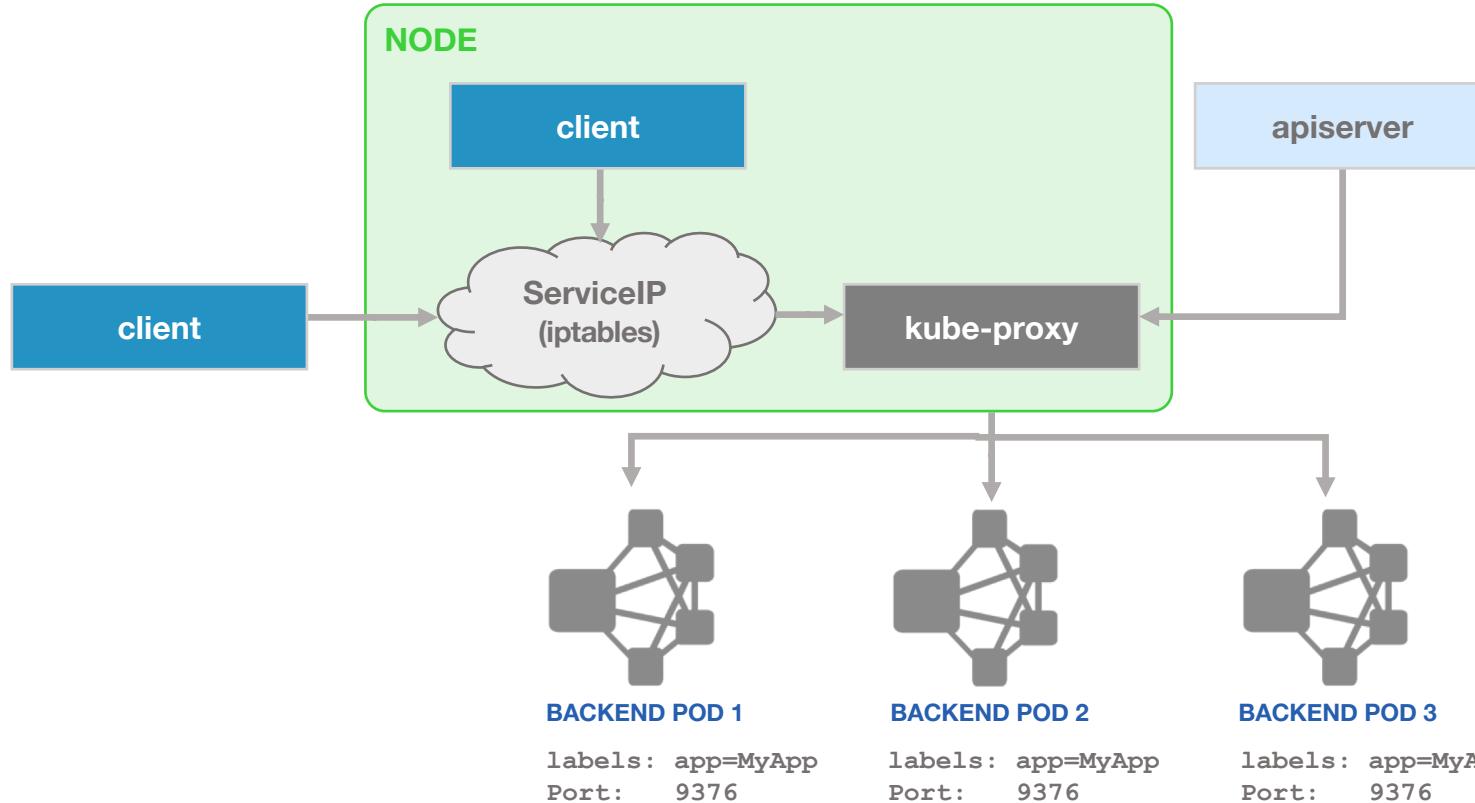
Container Networking Model: IP Layers and Port Mapping

It's not NAT, but it sort of acts like it:

Outside World



Drilling Down: Kubernetes Networking Model



Source: <https://kubernetes.io/docs/concepts/services-networking/service/>

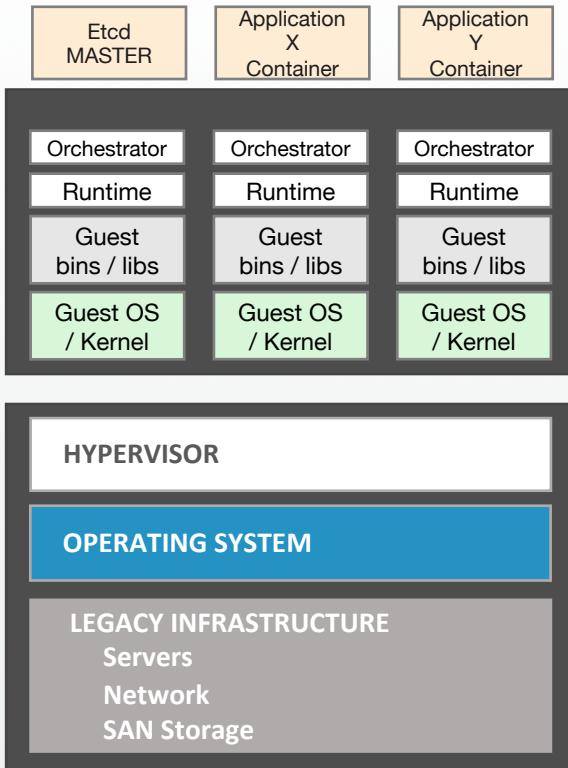
Truth?



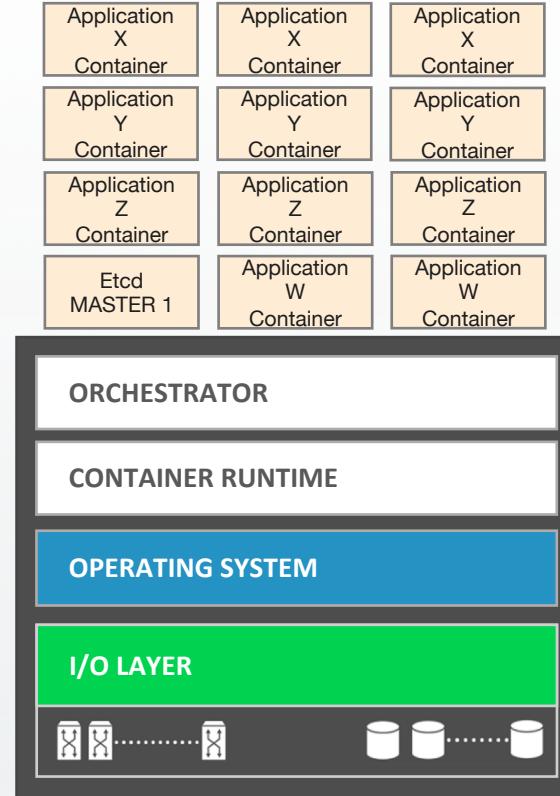
“And the one thing I want to make clear is, the best way to run a container environment is on a virtual machine.”

--VMware CEO Pat Gelsinger
The NewStack.io (August, 2018)

Infrastructure: VMs VS. Bare Metal Hyperconverged



- Complex management
- Inefficient resource utilization
- Low container density
- Limited performance
- High TCO



- Simpler management
- Efficient resource utilization
- High container density
- Enhanced performance
- Lower TCO

Diamanti Enterprise Kubernetes Platform

Complete turnkey Kubernetes stack

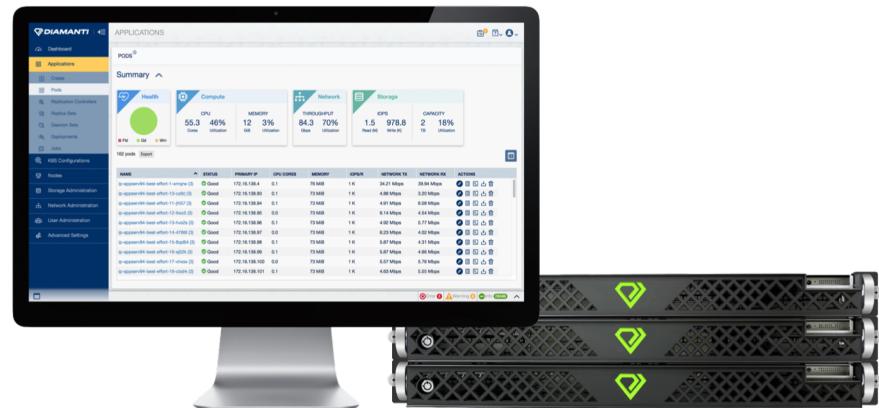
- Hyperconverged 1U appliance built on x86 architecture
- Features container-optimized networking and storage models
- Storage and network plug-ins address the lack of K8s declarative guarantees for performance
- 24/7 full-stack support

Built for public cloud experience, on-prem

- Manage multiple on-prem clusters and private-cloud deployments through single UI
- Per container network and storage QoS
- Enterprise DP/DR features: mirroring/synchronous replication, snapshots/asynchronous replication
- Burst production workloads to the cloud

Benefits:

- High performance
- Efficient
- Secure
- Installs in minutes
- Low TCO



Case Study: Containers for Multi-cloud

Profile:

- Fortune 50 energy institution
- Internal legacy energy grid mapping app EOL
- Moving to GridOS (containerized)
- Distributed energy grid management and analytics
- Container infrastructure challenge (architect, support, operations)
- Gross geography (40 miles)
- Multi-cloud

Challenge:

- Tried several alternatives:



APPRENDA



Pivotal Cloud Foundry

3 Days
Start to finish

10x
Footprint reduction

9x
Faster

\$6-9M
TCO savings over 5 years

Solution:

- Solution up and running 3 days
- Purpose-built
- Cross geography integration
- \$6-9M+ TCO savings over 5 years
- Removal of IBM Websphere license
- 9x faster than legacy
- > 50% reduction

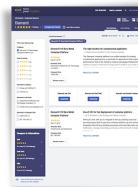


Next Steps

Visit www.diamanti.com

Resources

- Datasheet: Diamanti D10 Appliance
- Analyst report: ESG Review of Diamanti D10
- White paper: Five Reasons To Run Containers on Bare Metal, Not VMs





Thank You