DIAMANTI

Container Infrastructure in 15 Minutes

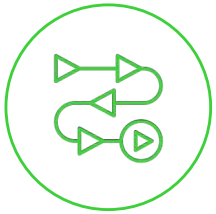
SHAWN KINNEAR, VICE PRESIDENT OF SALES

Diamanti Solves Major Container Challenges

Day 1 (Hard)

Deploy infrastructure in minutes

- Open-source, no vendor lock-in
- Plug-n-play network, storage
- Software-defined container policies



Day 2 (Harder)

Manage containers in production

- Guaranteed real-time SLAs
- Infrastructure services
- 24x7 full stack support

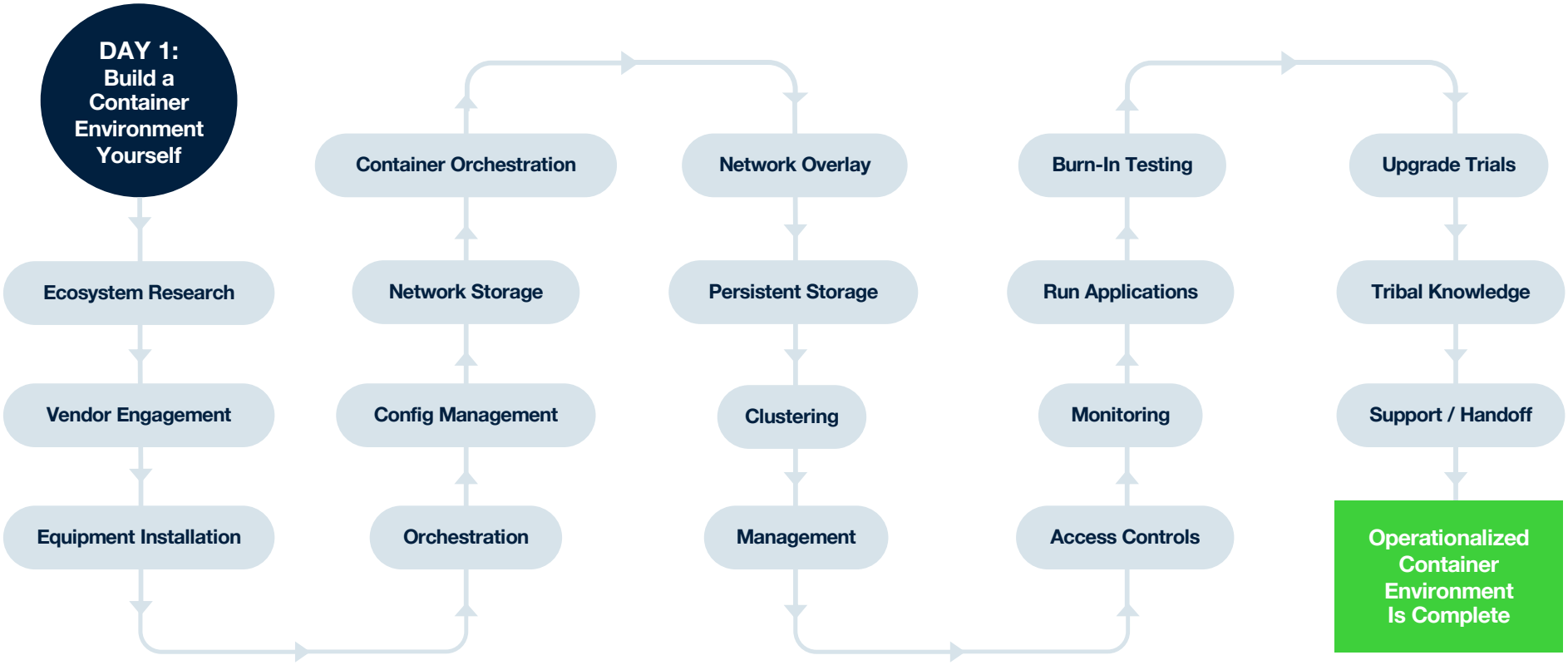
Day 3 (Hardest)

Expand with multi-cloud

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

Diamanti Enhances Simplicity, Efficiency, and Scaling, and Eliminates Virtualization Overhead

Do-It-Yourself Approach to Container Infrastructure

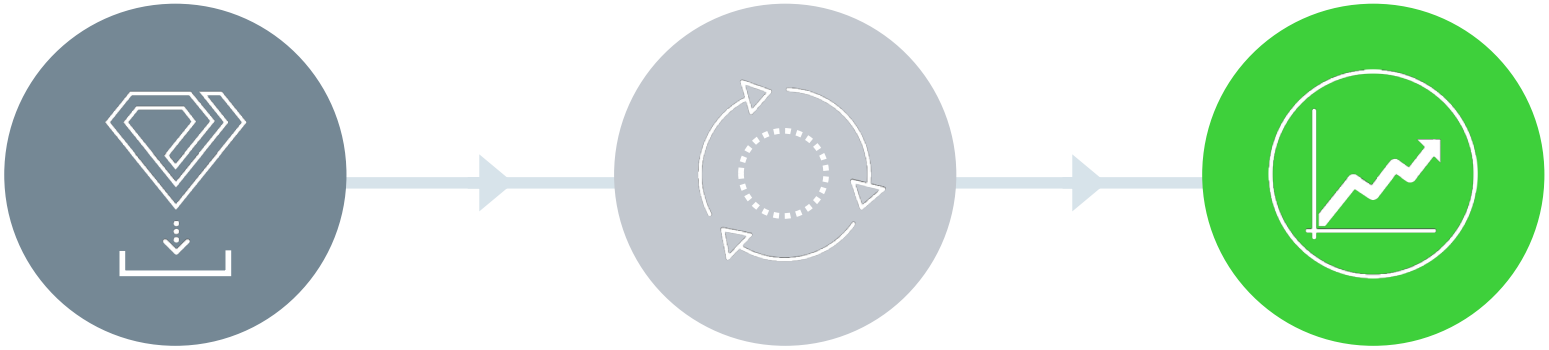


Infrastructure Remains a Top Container Adoption Challenge

"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 Cohn, Executive Director

Deploy Containers in 15 Minutes With Diamanti



Install Diamanti

Rack and stack, then load IPs and Docker images

Run Applications

Run your Docker images and K8s pod templates

Drive Business Forward

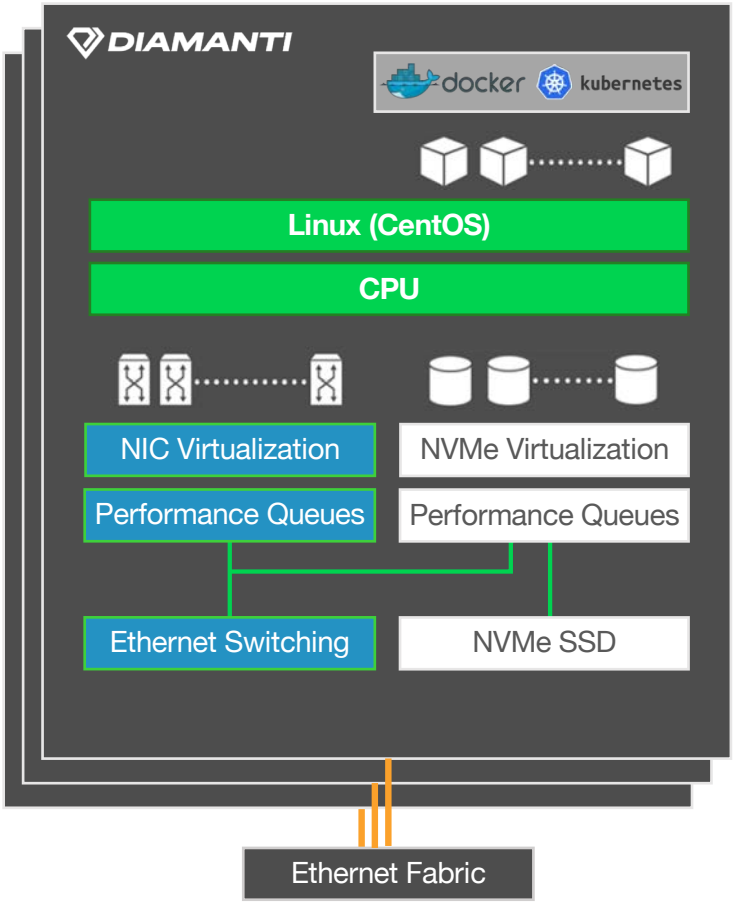
You and your customers can now focus on applications and business needs

```
$ dctl cluster create my-cluster [args]
$ dctl network create my-network [args]
$ dctl volume create my-volume [args]
$ kubectl create -f my-deployment.yaml
```

The Diamanti Bare-Metal Container Platform

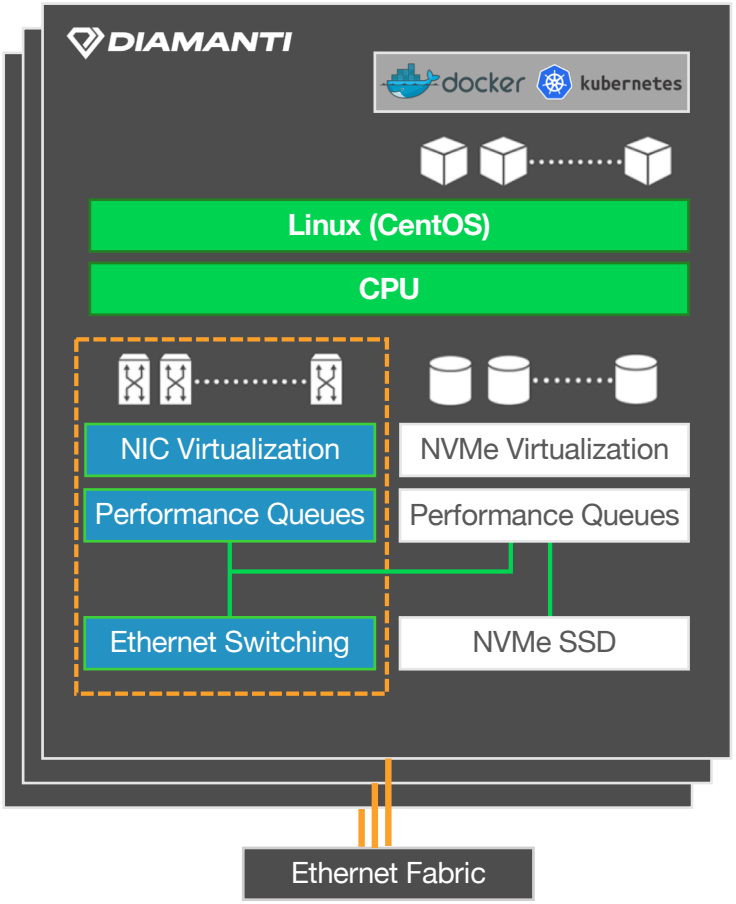
- Bare-metal hardware
- Low-latency NVME flash storage
- Plug-and-play networking
- Open-source Docker and Kubernetes
- Full-stack support

Under The Hood: Diamanti Bare-Metal Platform



- Unmodified Docker 1.12 and Kubernetes 1.8 (certified) pre-installed on top of CentOS
- Intel x86 architecture
- Custom network and storage controllers
  - Dedicated processors offload overhead from CPU
  - SR-IOV / CNI networking for overlay-less L2 network interfaces
  - High availability persistent storage via NVMoE
  - Enables granular control of throughput and high utilization
- ~~Hypervisor~~

Under The Hood: Diamanti Bare-Metal Platform Networking



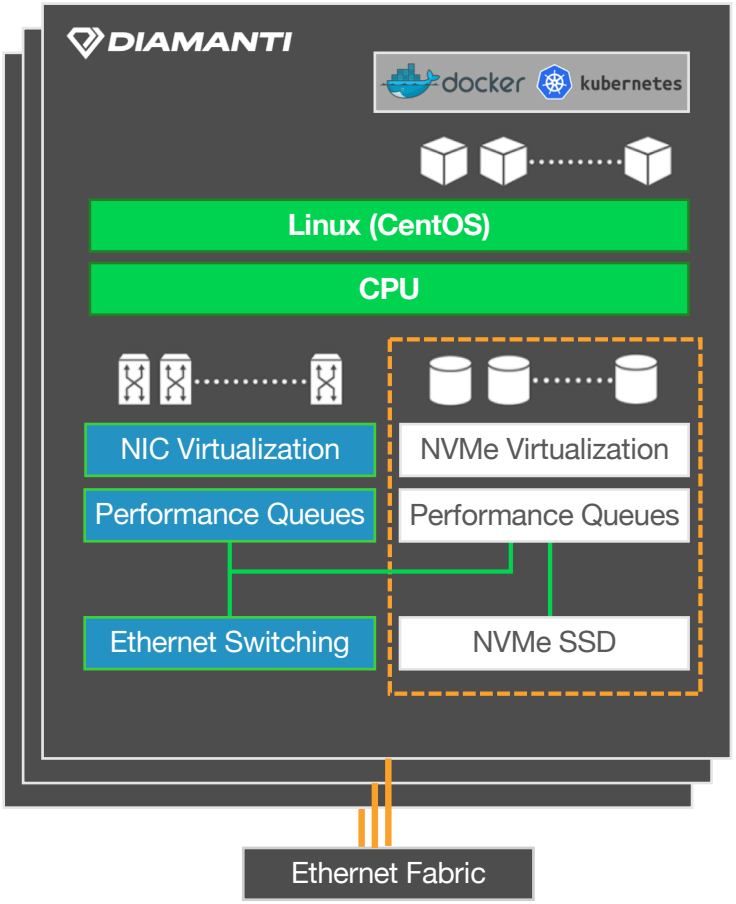
Dedicated layer-2 interfaces are available to all containers

- SR-IOV / CNI enabled networking for overlay-less Layer 2 network interfaces
- Provides NVMoE storage transport for cluster-wide replication
- High performance QSFP/SFP+ interconnects
- 2 x SFP+ for containers
- 2 x SFP+ for storage (L2)

Benefits

- Seamless integration with your existing data center network
- No overlays, NATs, or proxies required
- Highly granular control over throughput
- Have containers *appear* like VMs on the network-- with unique MAC and IP addresses

Under The Hood: Diamanti Bare-Metal Platform Storage



Persistent sub-millisecond NVMe is distributed throughout the cluster

- Persistent storage with FlexVols
- High availability clustered storage via NVMoE
  - 500K IOPs per node
  - 100-300µs max latency
  - Up to 24TB per node
- iSCSI connectivity to the container network for additional storage

Benefits

- Eliminates complexity, challenges around storage for stateful containers
- Granular control of IOPs
- Multi-tenancy possible without risk of noisy neighbors

Gain Performance, Simplicity, Efficiency and Control

	DIAMANTI	DIY and Traditional Systems	Hyperconverged Systems
Set up container infrastructure	15 minutes	Months	Hours, Days (with guest network overlays)
Integrated with open source tools	Yes	Yes	No
Performance tuning	Automatic	Manual	Manual
Performance guarantees	Yes	DIY	Partial
Bare-metal containers	Yes	Yes	No
Container networking	Existing Network	Customization, Complexity	Customization, Complexity
Storage performance	100-300 µs	1 ms	10 ms
Utilization	90%	10-15%	10-15%
Migration strategy	Standard Docker and Kubernetes components	Yes	Difficult
Open-source platform support	Diamanti 24/7 Support	You own it. Ops must read/write/debug in Go.	N/A

Diamanti Benefits

Speed

- 15-minute container infrastructure deployment
- 2,400,000+ IOPS
- 100µs latency across cluster

Simplicity

- Easy to buy
- Easy to deploy
- Easy to manage
- Easy to scale

Efficiency

- 50% less infrastructure
- 70% lower TCO
- Integrates with modern workflows

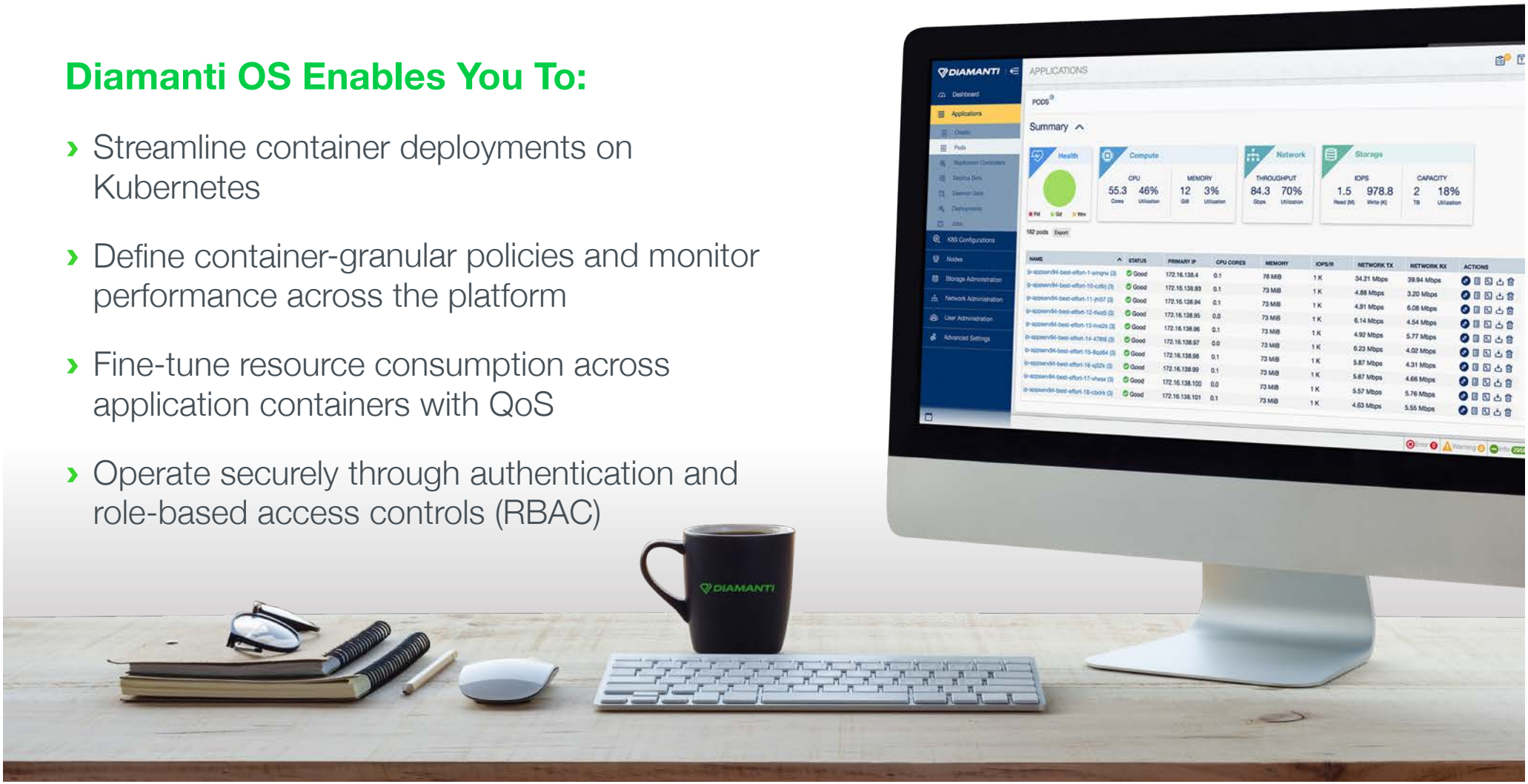
Control

- Container-granular policies and monitoring
- Predictable performance
- Guaranteed SLAs
- No vendor lock-in

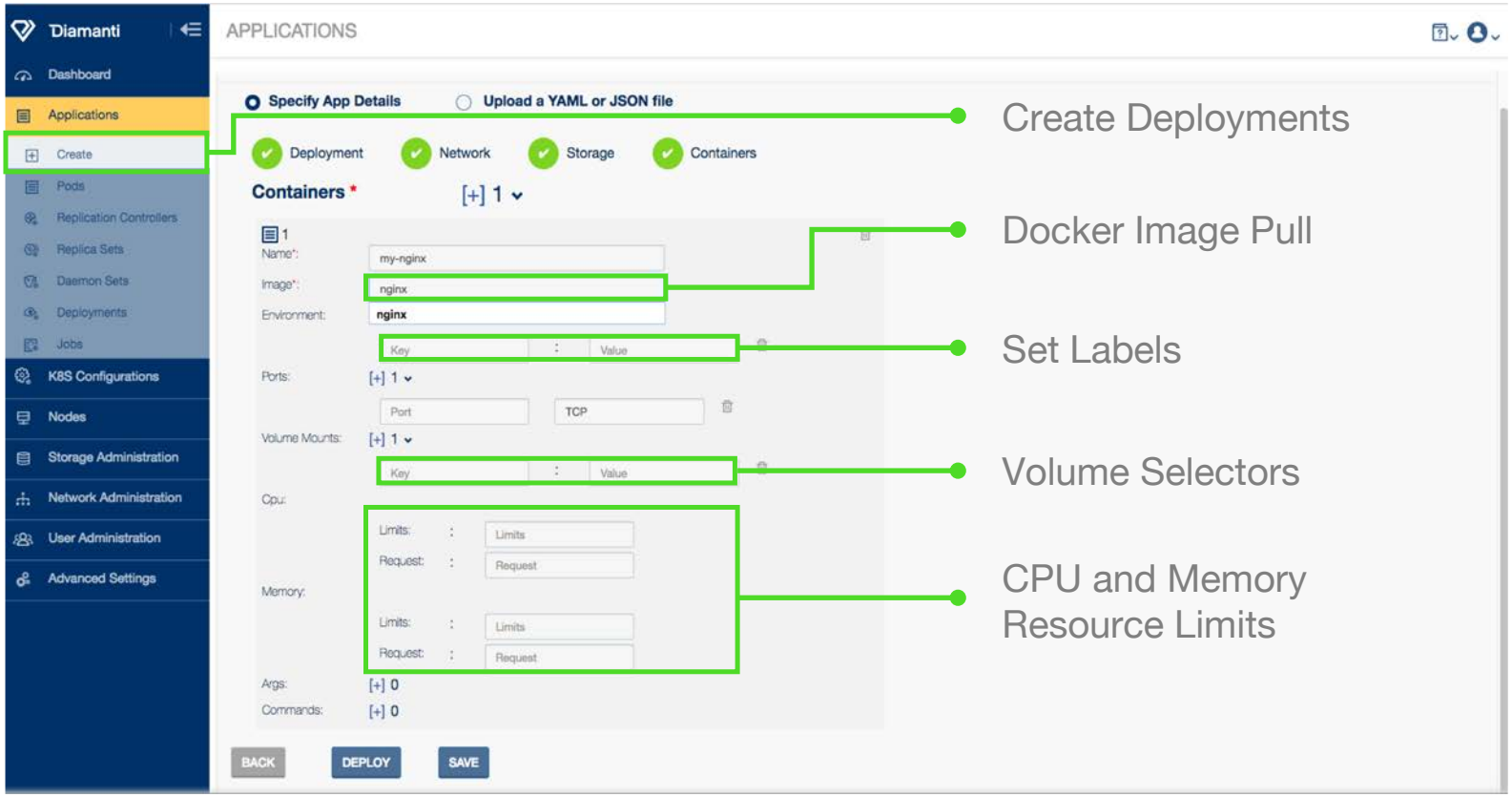
Diamanti OS: End-to-End Control of Your Infrastructure

Diamanti OS Enables You To:

- Streamline container deployments on Kubernetes
- Define container-granular policies and monitor performance across the platform
- Fine-tune resource consumption across application containers with QoS
- Operate securely through authentication and role-based access controls (RBAC)



Simplify and Accelerate Container Deployment



Diamanti OS Podspec Wizard enables you to:

- Simplify creation of Kubernetes deployment templates with easy-to-use front-end for creation of K8s Podspecs
- Build once
- Save and import into other clusters

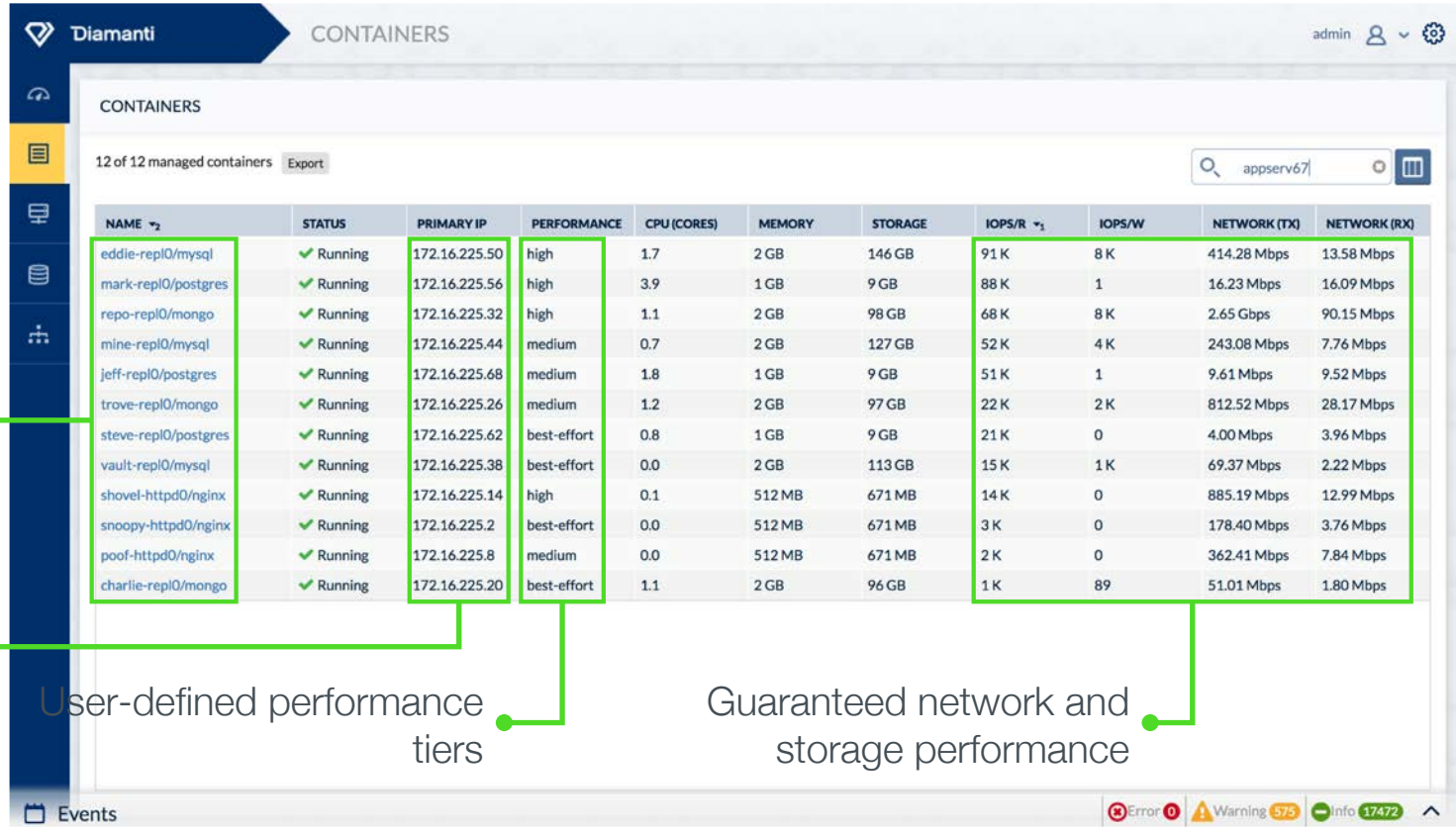
Get Operational Insight Into Your Container Environment

Standard Docker images

Unique IP address and subnet per container

User-defined performance tiers

Guaranteed network and storage performance

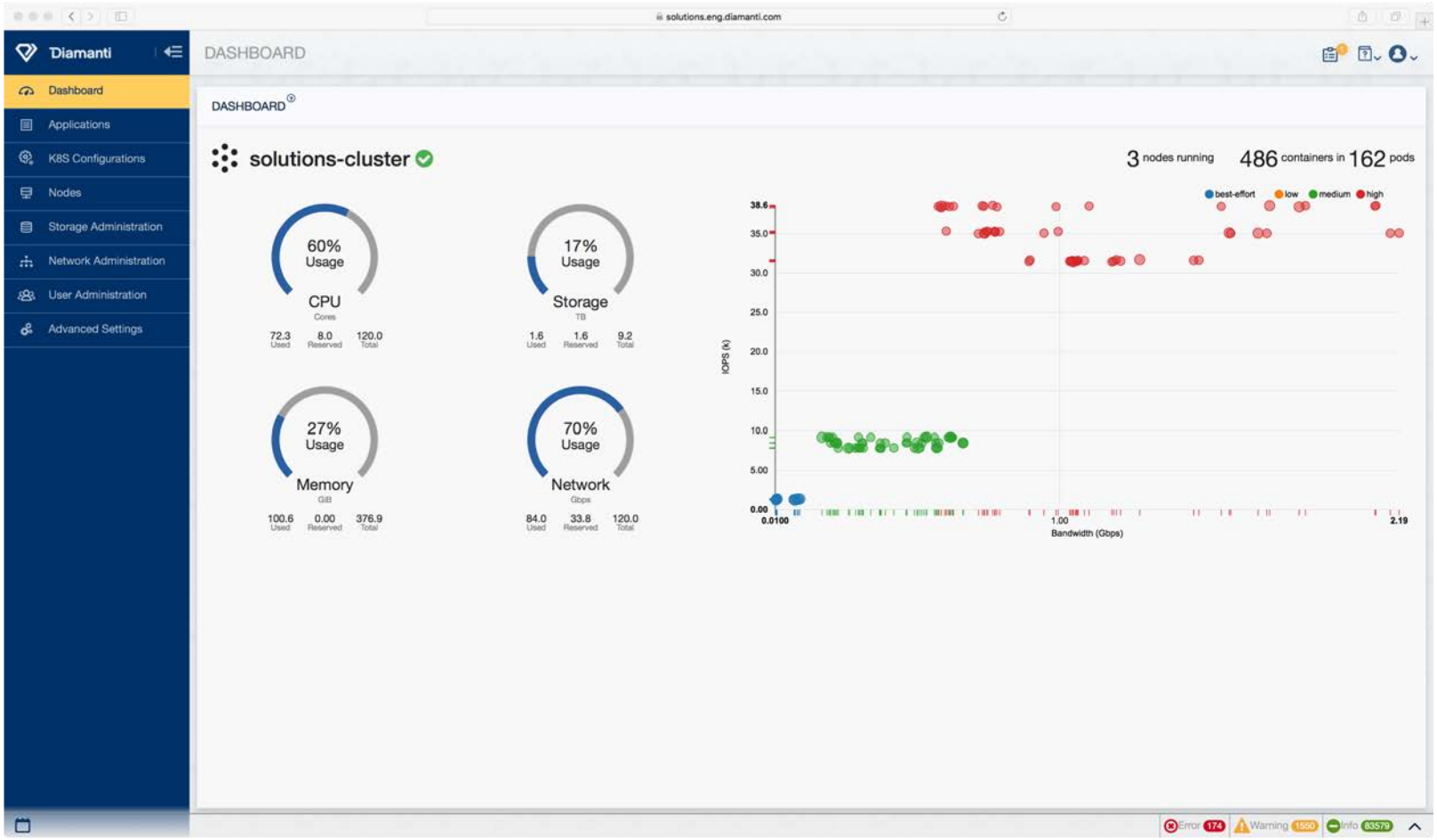


NAME	STATUS	PRIMARY IP	PERFORMANCE	CPU (CORES)	MEMORY	STORAGE	IOPS/R	IOPS/W	NETWORK (TX)	NETWORK (RX)
eddie-repl0/mysql	Running	172.16.225.50	high	1.7	2 GB	146 GB	91 K	8 K	414.28 Mbps	13.58 Mbps
mark-repl0/postgres	Running	172.16.225.56	high	3.9	1 GB	9 GB	88 K	1	16.23 Mbps	16.09 Mbps
repo-repl0/mongo	Running	172.16.225.32	high	1.1	2 GB	98 GB	68 K	8 K	2.65 Gbps	90.15 Mbps
mine-repl0/mysql	Running	172.16.225.44	medium	0.7	2 GB	127 GB	52 K	4 K	243.08 Mbps	7.76 Mbps
jeff-repl0/postgres	Running	172.16.225.68	medium	1.8	1 GB	9 GB	51 K	1	9.61 Mbps	9.52 Mbps
trove-repl0/mongo	Running	172.16.225.26	medium	1.2	2 GB	97 GB	22 K	2 K	812.52 Mbps	28.17 Mbps
steve-repl0/postgres	Running	172.16.225.62	best-effort	0.8	1 GB	9 GB	21 K	0	4.00 Mbps	3.96 Mbps
vault-repl0/mysql	Running	172.16.225.38	best-effort	0.0	2 GB	113 GB	15 K	1 K	69.37 Mbps	2.22 Mbps
shovel-httpd0/nginx	Running	172.16.225.14	high	0.1	512 MB	671 MB	14 K	0	885.19 Mbps	12.99 Mbps
snoopy-httpd0/nginx	Running	172.16.225.2	best-effort	0.0	512 MB	671 MB	3 K	0	178.40 Mbps	3.76 Mbps
poof-httpd0/nginx	Running	172.16.225.8	medium	0.0	512 MB	671 MB	2 K	0	362.41 Mbps	7.84 Mbps
charlie-repl0/mongo	Running	172.16.225.20	best-effort	1.1	2 GB	96 GB	1 K	89	51.01 Mbps	1.80 Mbps

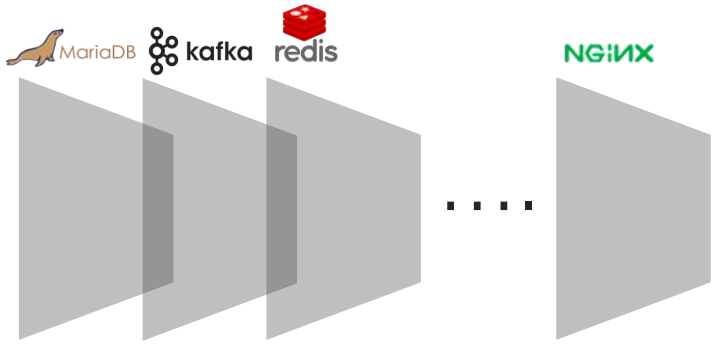
Monitor Performance and QoS

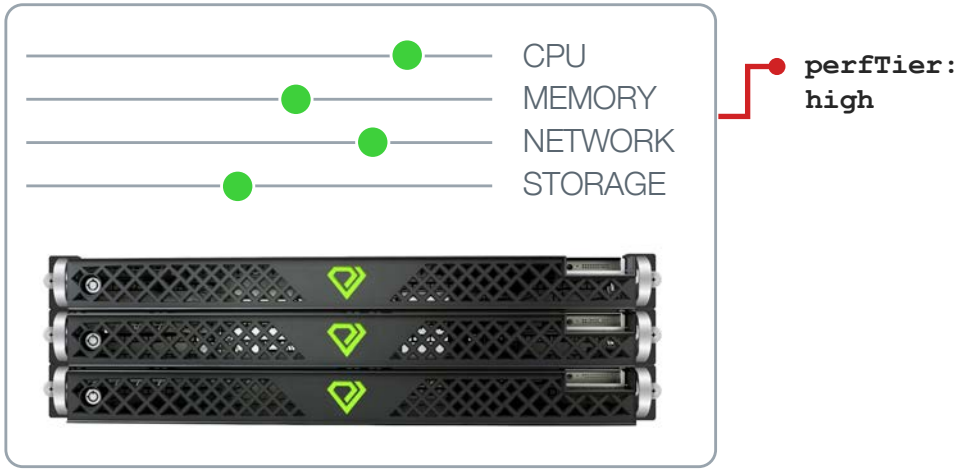
Diamanti OS Performance Dashboard enables you to:

- Easily track overall resource consumption
- Monitor application containers by performance tier
- Rapidly identify noisy neighbors



Container-Granular Performance Tuning





KUBERNETES POD SPEC

```
apiVersion: v1
kind: Pod
metadata:
  name: nginx
  annotations:
    diamanti.com/endpoint0: '{"network":"blue","perfTier":"high"}'
spec:
  containers:
  - image: nginx
    name: nginx
    resources:
      limits:
        cpu: "2"
        memory: 4Gi
      requests:
        cpu: 500m
        memory: 1Gi
    volumeMounts:
    - mountPath: /var/www/nginx-default
      name: nginx-data
  volumes:
  - name: nginx-data
    flexVolume:
      driver: diamanti.com/volume
      fsType: xfs
      options:
        name: nginx-data
        perfTier: high
```

Secure Platform Operation

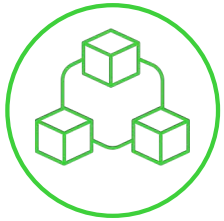
Secure Access

Diamanti OS leverages secure communication via TLS certificates

Users can also authenticate via LDAP and Active Directory

RBAC

Diamanti OS enables role-based access control (RBAC) to regulate access to resources within the environment.



Third-party Solutions

Compatible with container-native security solutions designed for Docker and Kubernetes

Customer Success: Fortune 50 Bank

Profile:

- Large global bank serving 16M Canadian, American, and international customers
- 81,000 employees, worldwide

Challenge:

- Migration away from Oracle for cost, agility
- Paid $6K per CPU
- 3 weeks to deploy new clusters

Initial approach:

- DIY infrastructure to support containerized DBaaS
- $1.2M HW/SW investment
- 48 nodes & 4 dedicated FTEs

Zero Downtime

16x
Footprint reduction

23x
Faster deployment

$14M
TCO savings over 3 years

Solution:

- Installed and configured 3-node Diamanti D10 cluster
- Deployed PostgreSQL, MongoDB, SQL Server and MariaDB on Diamanti in minutes, vs. weeks
- Saved $1.2M in Oracle license costs
- Added D10 nodes dynamically with zero service disruption

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Case Study: Containers for Database-as-a-Service

Profile:

- Fortune 50 Financial Institution
- Sybase legacy app, ecosystem diminishing
- VM infrastructure takes months to deploy new instance
- Costly DB and VM licensing, overprovisioning, $10K per node + 84 Rus

Challenge:

- Move to Postgres + DBaaS
- Looked at building it
- 6 FTE, 12 month development
- 4 FTE support
- 42 RUs

7 Days
Start to finish

10x
Footprint reduction

10x
Faster deployment

$4M
TCO savings over 3 years

Solution:

- Solution up and running in a week
- Minutes to deploy new instance
- Nodes added dynamically without disruption
- $1.2M upfront savings
- $4M+ TCO savings over 3 years
- 4 FTE -> ½ FTE
- 23x faster than legacy
- 84 RUs down to 4 RUs
- Quality of service without overprovisioning
- High availability based on Kubernetes
- 24x7 support

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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

openstack

SUSE CaaS Platform

RED HAT OPENSHIFT Container Platform

Pivotal Cloud Foundry

GridOS

IBM WebSphere

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

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Company Overview

Diamanti has developed the industry's first bare-metal container platform purpose-built for enterprise cloud-native environments.

Background

Founded in 2013

Headquarters:
San Jose, CA

42 Employees

Customers:
Global 2000 Enterprises in Finance, Media, and Energy sectors

Team

Founding Team of Infrastructure Experts

Jeff Chou
Co-founder, CEO

Gopal Sharma
Co-founder, CTO

Amitava Guha
Co-founder, VP of Engineering

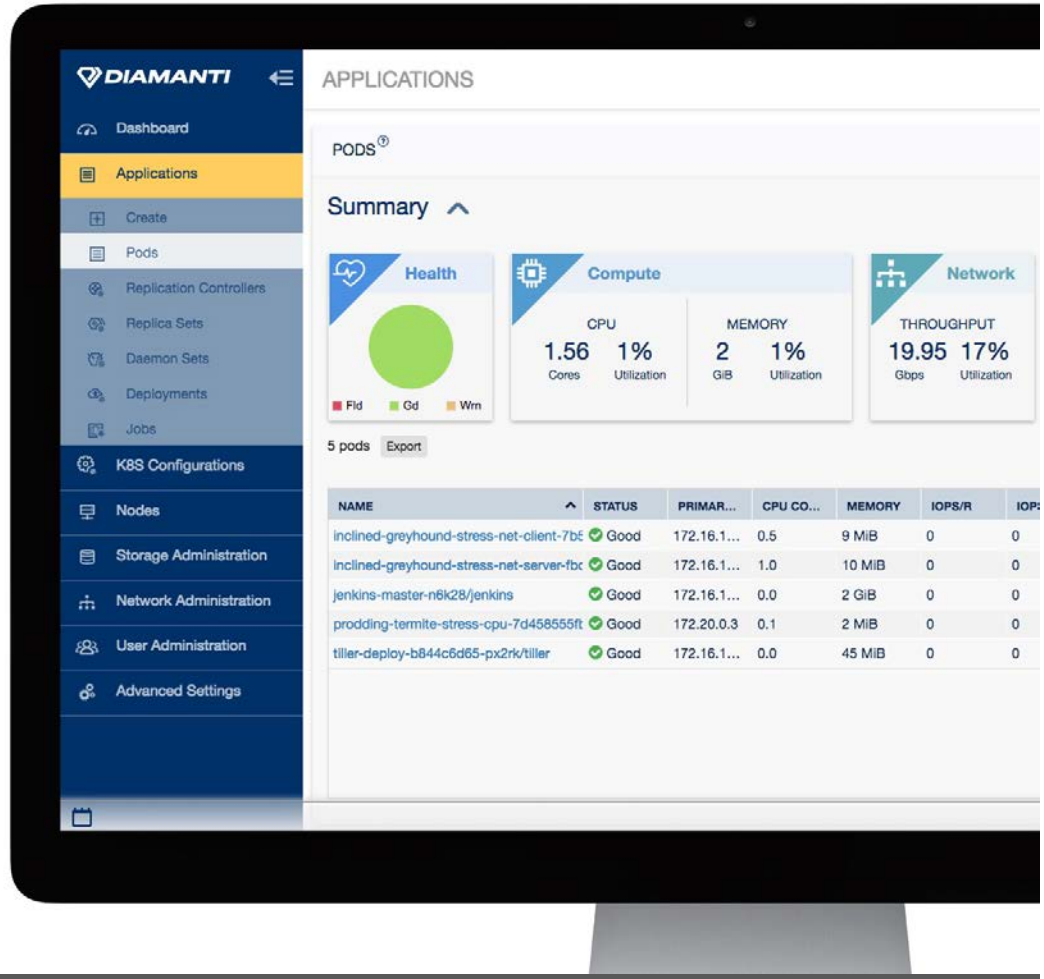
Funding

$43M in funding from top-tier venture firms

金沙江创业投资 GSR Ventures
TRANSLINK CAPITAL
NORTHGATE
crv
Goldman Sachs
DFJ
Engineering Capital
venture capital for engineers

Resources

- **Visit www.diamanti.com**
  - Whitepapers, webinars, tutorials, blogs
- **https://landscape.cncf.io/**

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Thank you!

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Appendix

The Diamanti Story

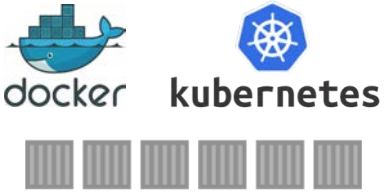
Founding team has decades of infrastructure expertise from top global enterprise IT companies

2005

Joined together to design Cisco UCS and grew install base to 36K+ customers in 5 years

2013

Diamanti is founded on an idea for a new type of infrastructure for cloud-native applications



2014

Containers gain traction in the enterprise; Google open-sources Kubernetes

2016

Diamanti contributes FlexVolume plugin and Kubernetes storage and network scheduler extensions to the open-source community

2017

Diamanti introduces the industry's first hyperconverged bare-metal container platform

DAY 1: Diamanti Bare-Metal Container Platform VS. DIY

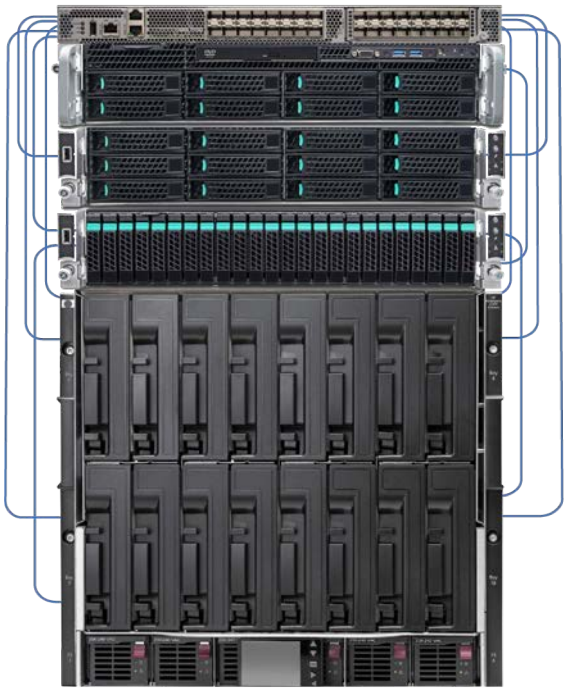
1. Purchase servers, network switching and storage

2. For each node:
   - Install VMware ESX and Linux VMs
   - Download Docker 1.5
   - Download Kubernetes 1.8
   - Install/configure Kubernetes networking SDN and plugins
   - Install/configure Kubernetes storage and plugins
   - Install/configure Enterprise Storage for HA
   - Configure the entire stack for compatibility

3. Purchase support for Docker, Kubernetes, Vmware, and enterprise storage

6-9 MONTHS

docker kubernetes CNI CONTAINER STORAGE INTERFACE



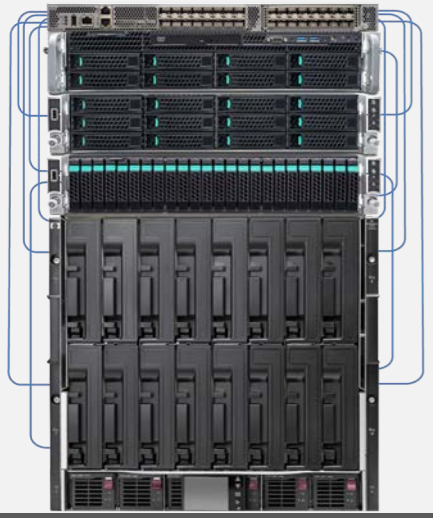
1. Rack Diamanti D10 Appliance and connect to layer-2 network switch

2. Run the following commands:
   - `$ dctl cluster create my-cluster [args]`
   - `$ dctl network create my-network [args]`
   - `$ dctl volume create my-volume [args]`
   - `$ kubectl create -f my-deployment.yaml`

3. Deploy containers

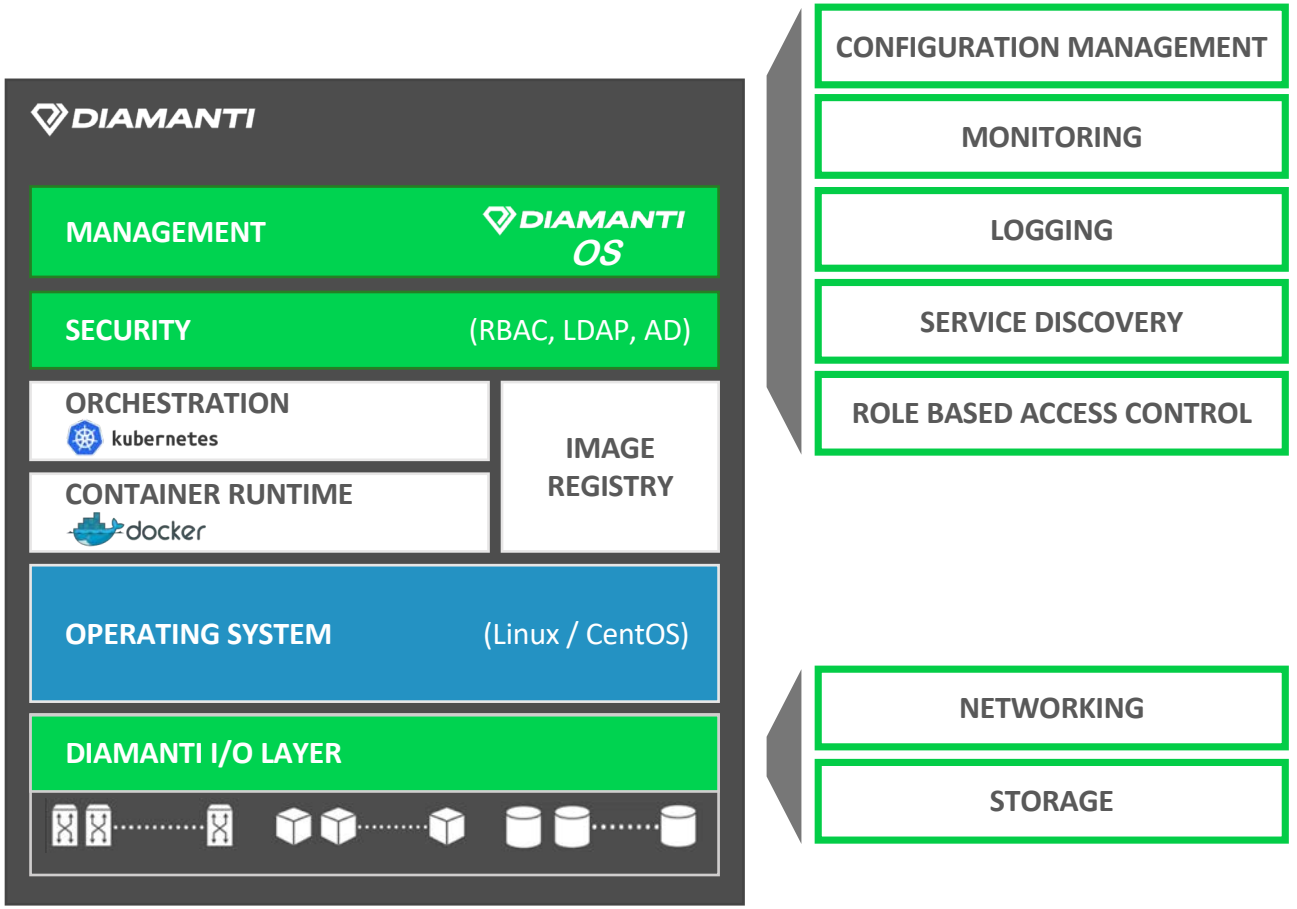
LESS THAN 1 DAY

Diamanti VS. DIY Infrastructure: Cost Analysis

MANAGEMENT	CUSTOMIZED KUBERNETES · OPENSHIFT · docker ENTERPRISE EDITION	Orchestrator and runtime licensing & support	$ $
+ **NETWORK**	weaveworks · flannel	SDN / CNI licensing & support	$ $
+ **STORAGE**	portworx · GLUSTER	SDS / CSI licensing & support	$ $
+ **HYPERVISOR**	vmware	Hypervisor licensing	$ $ $
+ **LEGACY HARDWARE**		x86 20-core servers	$ $
		Storage arrays	$ $ $
		Network switches	$ $
		TOTAL COST	**16x $**

MANAGEMENT	FULLY-INTEGRATED · docker FULLY-INTEGRATED	**All-inclusive management** › Container-granular QoS across storage, network, CPU › Multi-zone clustering for HA › Real-time performance and health monitoring › Secure management with authentication and RBAC	
+ **NETWORK**			
+ **STORAGE**			
+ ~~**HYPERVISOR**~~			
+ **BARE-METAL APPLIANCE**		**1U bare-metal appliance with best-in-class I/O** › Built-in container networking and fast NVMe flash storage for stateful containers	Diamanti D10 Appliance $ $ Diamanti support $
			**TOTAL COST** **3x $**

Diamanti Bare-Metal Container Stack



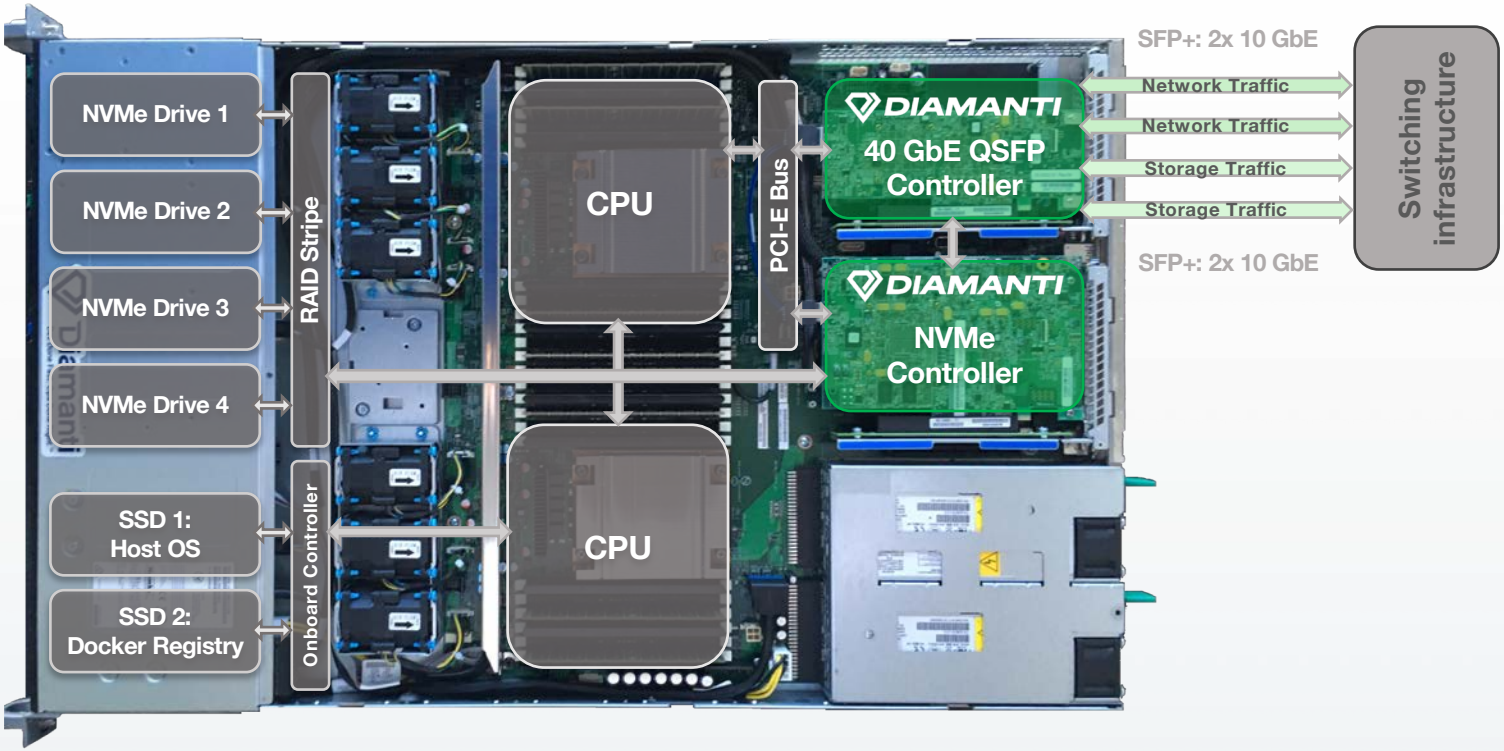
Diamanti D10: Under The Hood

Diamanti Platform Networking

› Layer-2 interfaces made available to all containers

Diamanti Platform Storage

› Persistent, high-speed, sub-ms NVMe flash is distributed throughout the cluster



Diamanti manages the I/O pathways to provide QoS and advanced monitoring for containers

Diamanti Product Specifications

PLATFORM MANAGEMENT	
USER INTERFACE	Diamanti OS ▪ Detailed monitoring and reporting ▪ Tunable storage and network performance tiering ▪ Automatic IP address assignment per interface ▪ Synchronous volume mirroring and fail-over ▪ Role-based access control (RBAC) ▪ Authenticated GUI, CLI, and REST API ▪ User authentication with LDAP, Active Directory ▪ Audit log ▪ SNMP monitoring
CONTAINER STACK (PRE-INSTALLED)	
ORCHESTRATION	Kubernetes (Kubernetes 1.8 Certified)
CONTAINER RUNTIME	Docker Community Edition
HARDWARE SPECIFICATIONS	
NETWORK	4x 10 GbE VNIC (Virtual Network Controllers)
STORAGE	DATA STORAGE 3.2 TB configuration: 4x 800 GB NVMe SSD 6.4 TB configuration: 4x 1600 GB NVMe SSD HOST OS AND DOCKER REGISTRY STORAGE 960 GB (2x 480 GB SATA SSD)
COMPUTE	CPU: 2x E5-2630V4 2.2 GHz Intel® Xeon® Processors RAM: 128 GB

PHYSICAL SPECIFICATIONS	
Rack space	1U
Dimensions	17.25”W x 28”D x 1.72”H
Power	Dual redundant 110/220V power supplies
Environmental	Operating temperature: 50°F to 95°F (10°C to 35°C)

AVAILABLE CONFIGURATIONS	
Basic	20 CPU cores / 128GB RAM / 3.2TB Storage
Enhanced	32 CPU cores / 256GB RAM / 6.4TB Storage
Fully-loaded	40 CPU cores / 512GB RAM / 32TB Storage

Technology Partnerships and Integrations

Orchestration and Management

Service Management

CI/CD and Registries

Databases

Monitoring and Security