All-Flash Storage and OpenStack Drive Innovation
FICO's Next Generation Data Center

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SolidFire/NetApp

What Is Fico?

- FICO Score
- Intelligent analytics software and tools
  - Debt Management
  - Decision Management
  - Fraud & Security Analytics
  - Customer Engagement
  - Big Data Analytics
  - Predictive Analytics

- ~98% of credit related decisions are made using FICO
- 2.5B credit cards globally are protected by FICO Fraud Systems
- Founded 1956 with more than 50+ years of data and analytics experience
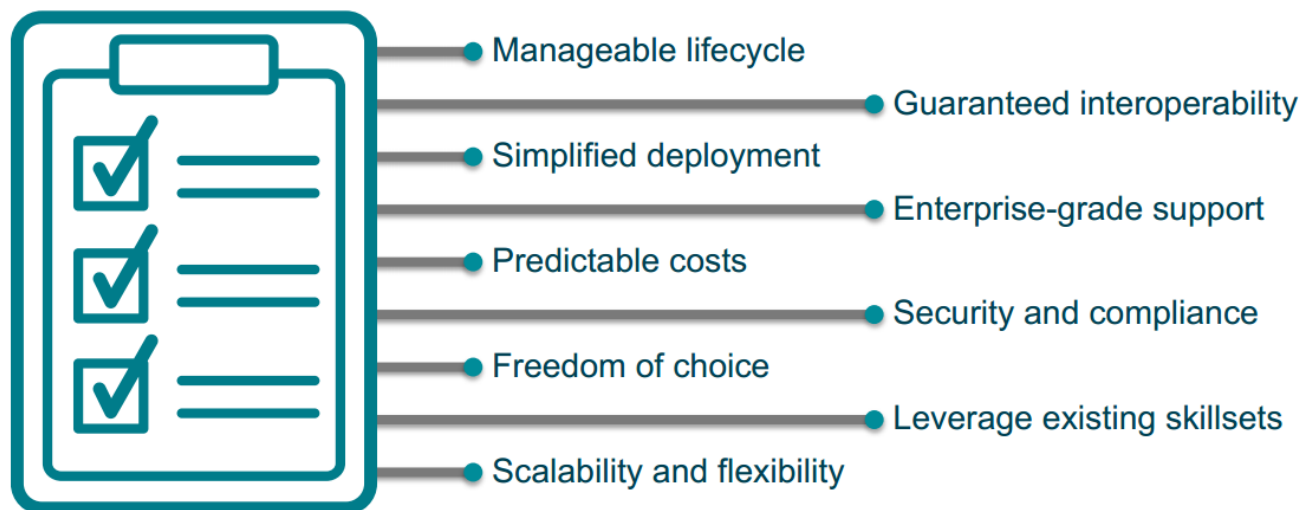
Why Move To The "Cloud"?

- Expand infrastructure to grow in to new markets
- Expose FICO forms & rules engines so customers can build their own apps based on FICO
- Move away from traditional on premise technologies that are cumbersome
- Simplify Support - Move to Software as a Service model and betteri end user experience
- Get to business outcomes faster with OpenSource Software
  - Increasing global presence
  - Lowering time to market
- Lower cost enables emergence into markets and geographic regions we otherwise wouldn't be able to penetrate

"The FICO Analytic Cloud provides Platform-as-a-Service (PaaS) access to the FICO Decision Management Platform, allowing customers to use FICO tools and technology to create and deploy applications and services."
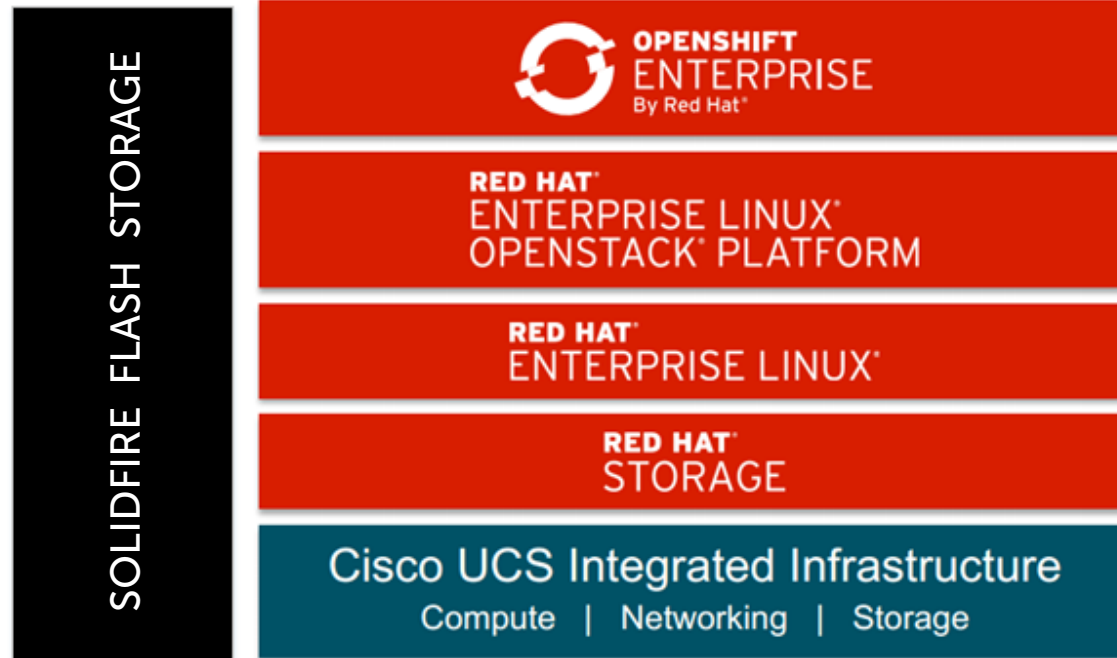
Why Did FICO Choose OpenStack?

- Manageable lifecycle
- Guaranteed interoperability
- Simplified deployment
- Enterprise-grade support
- Predictable costs
- Security and compliance
- Freedom of choice
- Leverage existing skillsets
- Scalability and flexibility

- F5 to load balance between APIs
- UCS C240 rack servers dedicated to compute and storage (hyper-converged)
  - Simplifies number of servers needed for small deployments and can scale out as necessary
- UCS C220 rack servers for the controller layer
- cgroups used to limit, and isolates resource usage (CPU, memory, disk I/O, network, etc.)
- Tiered Storage
- Ceph is used for all non- SLA driven workloads
- SolidFire storage is used when applications demand low latency and extreme performance
  - SolidFire for high performance SLA driven workloads

- Ceph storage selected as its scalable, Open Source, software-defined storage
  - Provides general purpose block storage
  - Provides File System storage; not using cephfs currently
  - Provides object oriented storage; also evaluating Swift
- Can be optimized for small and large deployments with OpenStack/ CEPH hyper-converged nodes or dedicated nodes
- Developers familiar with Amazon S3
- Tight integration with OpenStack
- Ceph cannot meet demand of all application requirements currently ☹
- SolidFire for high performance workloads!
  - Scalable, clustered all-flash storage array that has in line deduplication, compression and replication natively that is also easy to use

SOLIDFIRE

All-Flash Storage for the
Next Generation Data Center

FICO - Current Use Cases For SolidFire:

- Server Virtualization
- OpenStack - Cinder Tiered Storage
- VMware - ISCSI
- Virtual Desktop Infrastructure
- High Performance computing
- DR - replication

Why did FICO Choose SolidFire?

- All-Flash Scale-Out Platform
- Maximum Flexibility
- Deployment Speed
- Cost Reduction
- OpenStack Cinder
- VMware Integration – Storage I/O Control
- Workload Consolidation
- VDI backed by high performance storage array
- Guarantees
  - Performance
  - Capacity
- Internal SLA Capabilities

	Disk	Flash	
Read Characteristics	• Awful Random Reads • Good Sequential Reads	• Awesome Random Reads • Good Sequential Reads	Without Control, How Can QoS Help?
Random Reads (IOPs) Latency (us) Active / Standby Power (w)	• 150 • 5,000 – 20,000 • 15 / 10	• 10,000 + • 200 – 500 • 5 – 0.05	

Struggled with: Cost – Reliability – Density

Raw Flash Performance

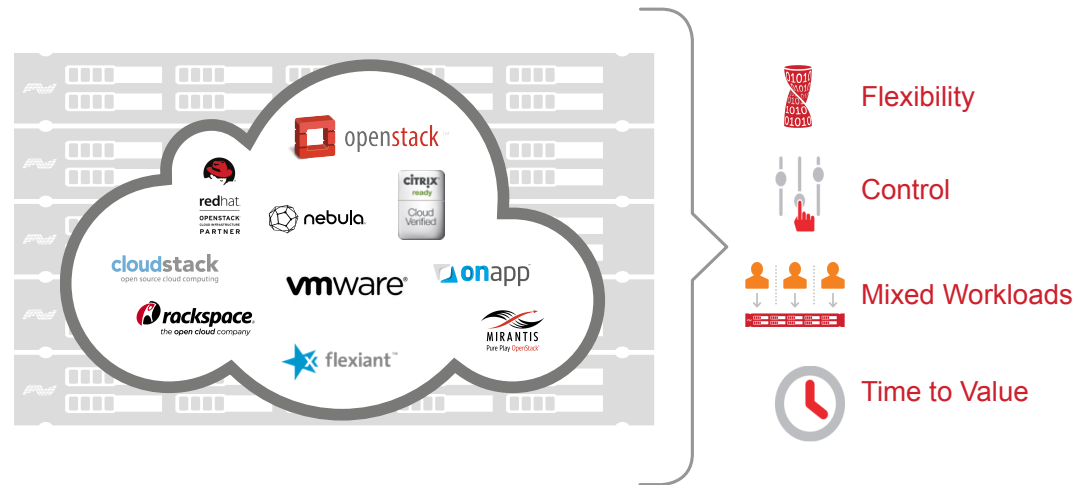Scarce resource only for select workloads

→

Flash Performance + (QoS) Control

Enabling technology of the Next Generation Data Center

Native multi-tenant architecture, best-in-class integrations

Flexibility

Control

Mixed Workloads

Time to Value

Orchestration

Native multi-tenant architecture, best-in-class orchestration integrations

Flexibility
- Dynamic resource pools
- Seamless scaling

Workload Consolidation
- Native multi-tenant design
- Application / tenant isolation

Control
- Control performance
- ## Control cost

Time to Value
- Rapid deployment
- Automated management

Configuring SolidFire Cinder Driver

Edit the cinder.conf file:

volume_driver=cinder.volume.solidfire.SolidFire
san_ip=172.17.1.182
san_login=openstack-admin
san_password=superduperpassword

OpenStack Supports Multiple Back Ends
Configured in under a minute
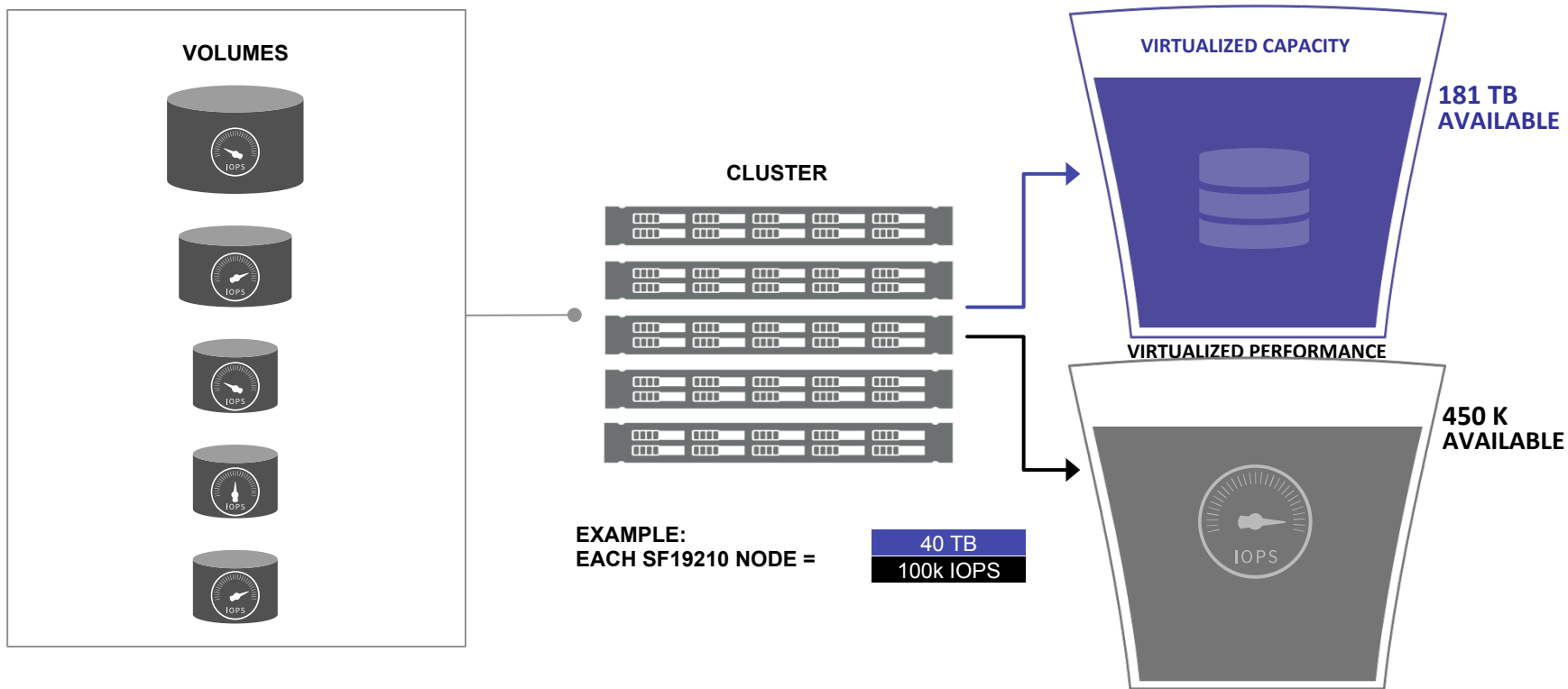
Configure QoS in OpenStack

Create volume type qos:

cinder --os-username admin --os-password secrete type-create qos
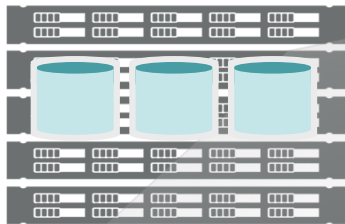
Set extra specs QoS values for the volume type:

cinder --os-username admin\ - -os-password secrete type-key 6fd967a7-c69e-46a6-aa84-b23e0e625ddd set qos:minIOPS=100 qos:maxIOPS=15000 qos:burstIOPS=15000

```
ID                                      Name    extra specs

6fd967a7-c69e-46a6-aa84-b23e0e625ddd    qos     {u'qos:burstIOPS': u'15000',

                                                u'qos:minIOPS': u'100',

                                                u'qos:maxIOPS': u'15000'}
```
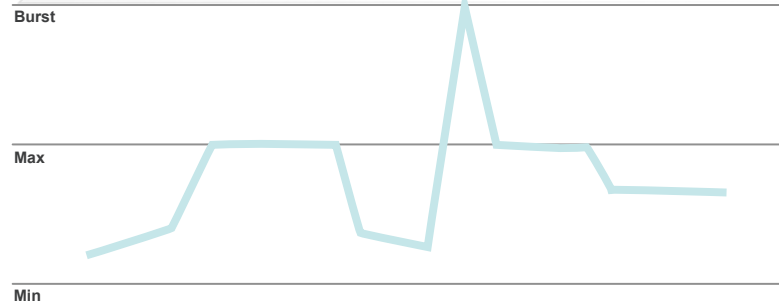
Capacity & Performance

VOLUMES

CLUSTER

VIRTUALIZED CAPACITY

181 TB AVAILABLE

VIRTUALIZED PERFORMANCE

450 K AVAILABLE

EXAMPLE:
EACH SF19210 NODE =

40 TB
100k IOPS

Element OS | Guaranteed Performance

NetApp

How QoS Works

SOLIDFIRE CLUSTER

APP BEHAVIOR

Burst

Max

Min

Create New Volume

Volume Name : Volume-1

Account : account1

Total Size : 1000   GB ▾

☑ Enable 512 Byte Emulation

Quality of Service Settings

IO Size	Min	Max	Burst
4 KB	10000 IOPS	11000 IOPS	13000 IOPS
8 KB	6250 IOPS	6875 IOPS	8125 IOPS
16 KB	3704 IOPS	4074 IOPS	4815 IOPS
256 KB	256 IOPS	282 IOPS	333 IOPS
Effective Max Bandwidth		76.9 MB / sec	90.88 MB / sec

Cancel Creation   **Create Volume**

Element OS | Guaranteed Performance

NetApp

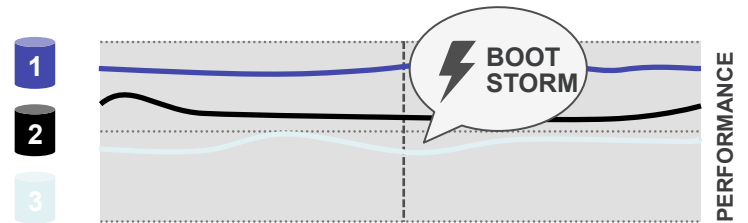# QoS in Practice
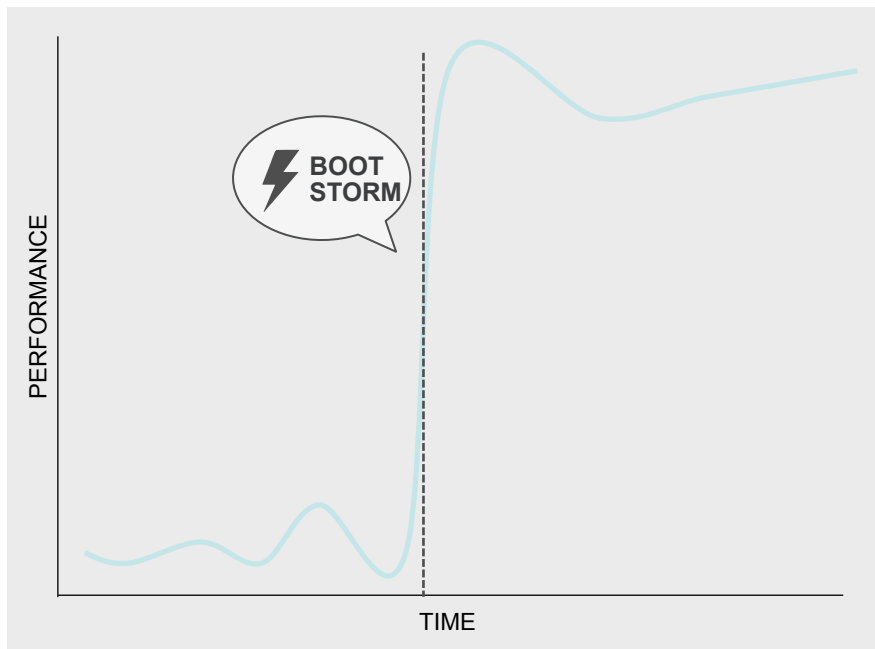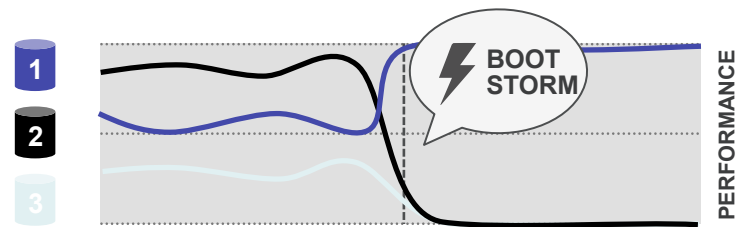
Block Storage Built for OpenStack

Deep OpenStack Integration

- Driver integrated into OpenStack
  - no additional features / licenses required
- Cinder driver enables all OpenStack block storage features
- Run OpenStack instances on a SolidFire volume
- Set and maintain true QoS levels on a per-volume basis thru OpenStack
- Create, snap, clone and manage SolidFire volumes directly
- Eliminate management layers between OpenStack and the storage system

Validated Interoperability

redhat.
OPENSTACK
CLOUD INFRASTRUCTURE
PARTNER

nebula.

MIRANTIS
Pure Play OpenStack

POWERED BY
rackspace
the open cloud company

Customer Success

ebay

PayPal

INTERNAP

iweb

BRINKSTER

QuoVadis

FICO