Qumulo Overview

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NAS Generations

- **Scale-Up General Purpose NAS**
  - 1980s
- **Scale-Out Clustered NAS**
  - 1990s
- **Data Aware Scale-Out NAS**
  - 2000s
- **Qumulo**
  - 2010s
Storage architectures today are a lot like…
About Qumulo

- 3+ year-old storage company in Seattle, WA
- Founders invented Isilon OneFS and “Scale-out NAS” (55/62 patents)
- Over 10 PBs shipped after only a few months after GA!
- 600+ research interviews and ongoing active engagement feeding solution development
- Raised $67M in Series B funding from top venture firms
- Record number of new customers and bookings in 1H ‘15
“Sadly, capacity planning is a wild ass guess.”
Large US Insurance Company

“Data manageability is probably our greatest weakness.”
Major US Electric Utility

“We drop files into a folder and lose them forever.”
Hollywood Special Effects House

“We have a Pandora’s box of storage.”
Leading US Retailer
Qumulo’s mission is to be the company the world trusts to store, manage, and curate its data, forever.
Major Shift in Enterprise Storage

Shift in Enterprise Storage

- Hardware-Based → Software-Based
- Proprietary OS → Linux-Based OS
- Hard Drive → Flash-First Hybrid
- Petabytes of Data → Billions of Files/Objects
- Storage Management → Data Management
Managing Storage vs. Managing Data at Scale

Source: Qumulo Customer Development Research
Software-Only Storage System

Qumulo Core

QSFS: Software-Only

- Real-Time Analytics
- Scalable for All Data
- Flash-First Hybrid

Qumulo Appliances

Other Vendor Hardware

Virtualization

Cloud
Making Storage Invisible
Data-Aware Scale-Out

On-Premises

10/40GbE

Remote Management & Monitoring

RESTful API

Qumulo Scalable File System

Non-Proprietary OS

Deployment options

HDD for true hybrid and maximum density

SMB
NFS
REST

QSFS™

Linux OS

X86 Appliance, VM, or Software

SSD
HDD

Huge SSD tier for read and write optimization with alternate form factors

Linux OS

HDD for true hybrid and maximum density
Flash-First Hybrid Design

Client / Application Layer
- Genetic Analysis
- Transcoding
- Linear Editing
- Geo Processing

Standard Ethernet Layer
- NFS / SMB / REST
- 10 / 40 GbE

Qumulo Core Data-Aware Scale-Out NAS Layer
- SSD
- HDD

Qumulo Confidential
Scale Out - Rebalancing

Client / Application Layer
- Genetic Analysis
- Transcoding
- Linear Editing
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Standard Ethernet Layer
- NFS / SMB / REST
- 10 / 40 GbE

Qumulo Core Data-Aware Scale-Out NAS Layer
- SSD
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Qumulo Confidential
Data Management at Scale

Qumulo Cluster

```
/home/neal/proj1 11GB
/home/neal/proj2 20GB
/home/neal/proj3 1GB
/home/neal 30GB
/home/pete/proj1 22GB
/home/pete/proj2 101GB
/home/pete/proj3 1.4TB
/home/pete 1.53TB
/home/ 1.56TB
/ 1.56TB
```

Analytics Database
Qumulo Real-Time Analytics

- **Real-Time Analytics**
  - Built into QSFS
  - Instant metadata updates
  - Visual & programmable

- **Benefits**
  - Real time insight
  - No more tree walks
  - Eliminate labor time waste
Qumulo Real-Time Analytics

- More than just capacity
  - IOPS, access times, hotness
  - Fair sample tree by any metric

- Benefits
  - IOPS use by file type and user
  - Data utilization & storage utilization
Real-Time Analytics - 10 Billion Files

- Groot - 10.4 billion 1K files in ~1.2 million directories
- Real-time capacity, performance, and usage analytics
- Usable capacity is accurate. Accounts for overhead
- 5th node joined cluster in 90 seconds to expand
- 17 hours to rebuild a failed 6TB hard drive (load)
Qumulo Q-Series Hybrid Storage Appliances

QC24

QC208
Qumulo QC24 Hybrid Storage Appliance

Entry Cost-Optimized 1U Node

- QC24 (former Q0626) Data-Aware Scale-Out NAS:
  - Qumulo Core software
  - 1U form factor (4 nodes minimum)
    - Scales from 4 - 1,000+ nodes

- Specifications
  - NFS(v3), SMB(v2.1), REST
  - 2x10GbE/node
  - 24TB/node raw capacity (10.5TB Usable)
    - 2 x 800GB SSD
    - 4 x 6TB HDD
Qumulo QC208 Hybrid Storage Appliance
Capacity-Optimized 4U Node

- QC208 Data-Aware Scale-Out NAS:
  - Qumulo Core software
  - 4U form factor (4 nodes minimum)
    - Scales from 4 - 1,000+ nodes

- Specifications
  - NFSv3, SMBv2.1, REST
  - 4x40GbE/node
  - 208TB/node raw capacity (102 TB Usable)
    - 13 x 480GB SSD
    - 26 x 8TB HDD
HPC Life Sciences: Large Hadoop Map Reduce

Qumulo Real World Examples

- **Compute:**
  - Hadoop/Spark Cluster - 640 cores
  - HPC Forecasting Cluster - 16000 cores

- **Storage:**
  - 11 node QC24 used for HPC scratch space
    - Peak throughput just under 1GBps and Peak IOPs 140K, Sustained at 120K, average 100K (60 W/40 R)
  - 6 node QC208 in a HPC farm
    - Peak throughput just under 2GBps and Peak IOPs 80K
Customers

- SPORTVISION
  - CHANGING THE GAME

- Sinclair

- Blind
  - www.sci.utah.edu

- SCI

- 3 of Top 5 Film Animation Studios

- Supermajor Oil & Gas Company

- ANTFARM

- TELUS
  - Studios

- DENSHŌ

- FOTO KEM

- UCONN HEALTH

- IHME

- ZÖIC
Why Customers Choose Qumulo?

- Data-Aware Scale Out NAS Software – QSFS runs on top of Linux
- Flash-First Hybrid Design - *For maximum performance & capacity*
- No Compromise Storage - *Optimized for widest range of workloads & file sizes*
- Data Is What Matters - *Real-time analytics built into the file system*
- Cost Containment - *Scale-out on commodity hardware*
- Qumulo Care Customer Success – *MissionQ Cloud, Dedicated Support, Qston*
- Rapid Customer-Driven Innovation – *Agile Development 2-week release cycles*
- 100% Programmable - *Interactive REST-API browser built-in, Qumulo Community, github*