



National Aeronautics
and Space Administration

Introduction to Isilon

Jacqueline Biggio-Barrientos

Federal Civilian Manager



Sujal Patel
Founder and Chief Technology Officer

Sujal Patel is the founder and chief technology officer of Isilon Systems and is the chief architect of the company's network storage system. Prior to founding Isilon, Sujal spent five years at RealNetworks, in part as chief architect behind the company's second-generation core media delivery system, which is still in use today by leading streaming content providers. At RealNetworks he also managed the engineering teams for the company's primary infrastructure products. Sujal has been an active member of the open-source software development community, including working as a developer on the FreeBSD operating system. Sujal holds a number of patents and pending patents, including those for the Isilon OneFS™ distributed file system and for the RealNetworks network adaptive SureStream™ technology. Sujal holds a bachelor's degree in computer science from the University of Maryland at College Park.

Clustered Revolution

- Fundamental change in thinking
- Activity or movement designed to effect change
- A change of paradigm



Isilon is
the only company
delivering today on the promise
of clustered storage



National Aeronautics
and Space Administration

Current Mission at NASA



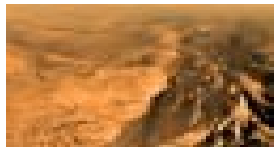
Expedition 13

Mission to the International Space Station.



Preparations Continue for Next Shuttle Mission

The STS-121 mission is targeted for launch no earlier than July.



New Views of Titan



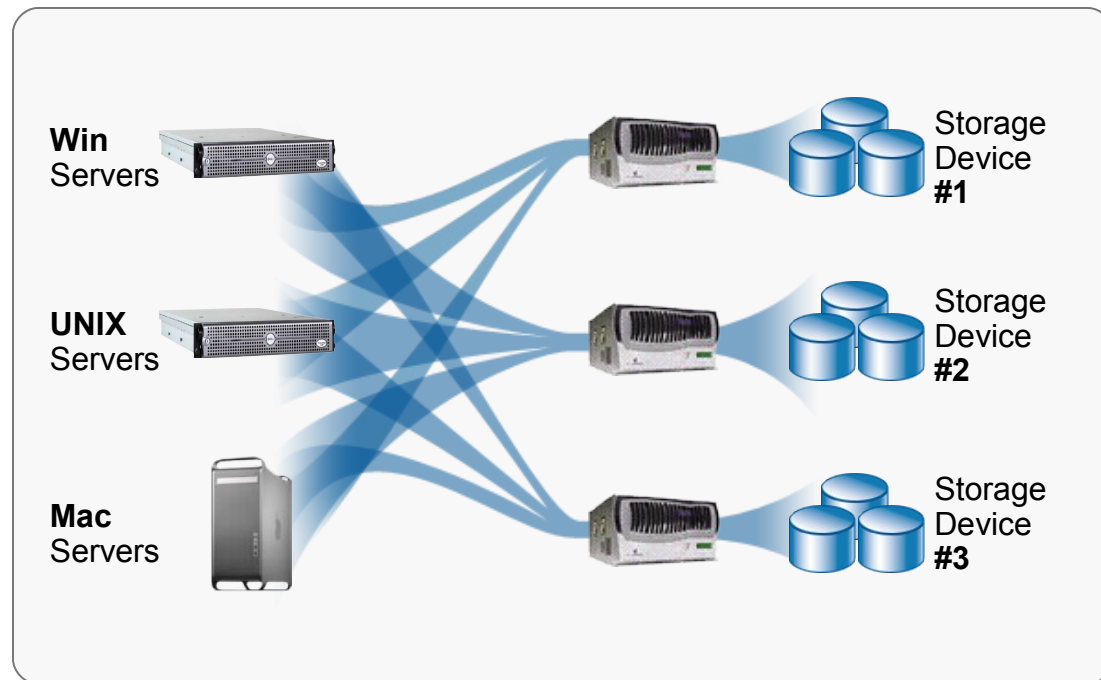
GOES-N

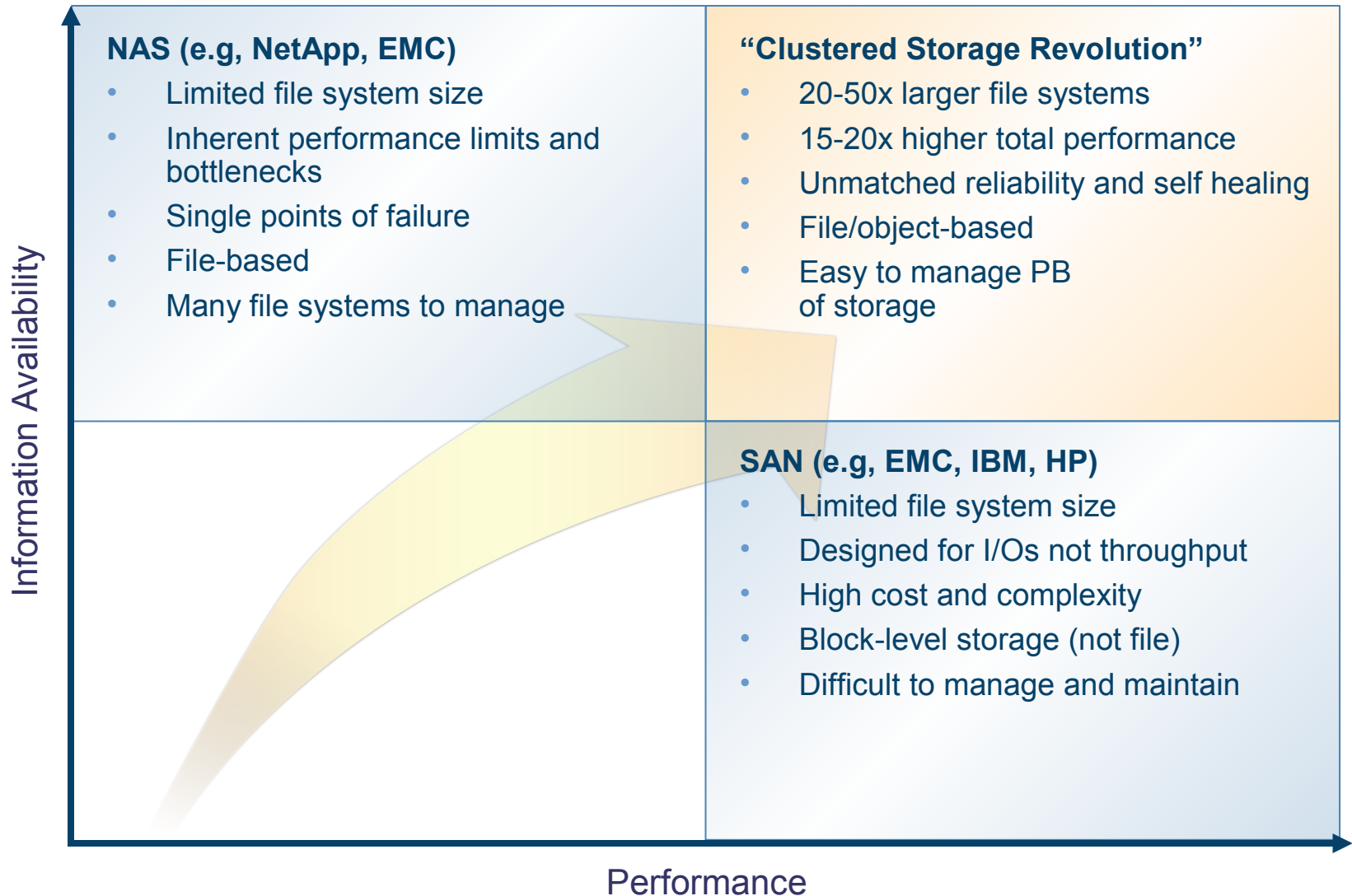
GOES-N is the latest in a series of Earth-observing satellites.



Traditional Storage: Great for Traditional Data; NOT the Best Tool for Unstructured Data

- Islands of storage
- Not scalable
- Performance bottlenecks
- Not highly available
- Overly complex
- Cost prohibitive





Isilon Customers and Leadership

Select Customers

Kodak EasyShare
Gallery



LexisNexis™

Sports Illustrated

GlobeXplorer

sony pictures
imageworks



Pratt & Whitney

A United Technologies Company



UCSB LIBRARIES

myspace.com
a place for friends



TECHNICOLOR
VIDEO • CD • DVD SERVICES

Recognition



“Isilon IQ is one of the most compelling next generation clustered NAS systems in the market today and ESG considers it the easiest storage system we have ever worked with.”

- Tony Asaro, Enterprise Strategy Group

Background

- Store and share more than 1 billion digital images for 23+ million online users

Challenge

- Need easy way to allow customers to “point, shoot and *share*” photos 24x7x365
- Storage needs increasing ~300% per year

Solution

- Started with 10TB Isilon IQ cluster – added 1.8PB of TBs with no additional IT staff
 - » >\$600K per year in operating savings
- Eliminated over 360 different file systems
- Reduced scaling from 4+ weeks to <1 day
- Major reduction in capital costs

“The simplicity and performance Isilon IQ offers is fantastic... we have added hundreds and hundreds of terabytes of capacity while only adding one junior level admin which would not have been possible with our legacy systems.”

-Sonja Erickson
VP Technical Operations, Kodak
EasyShare Gallery



Digital Images



Core Value: OneFS™ Distributed File System

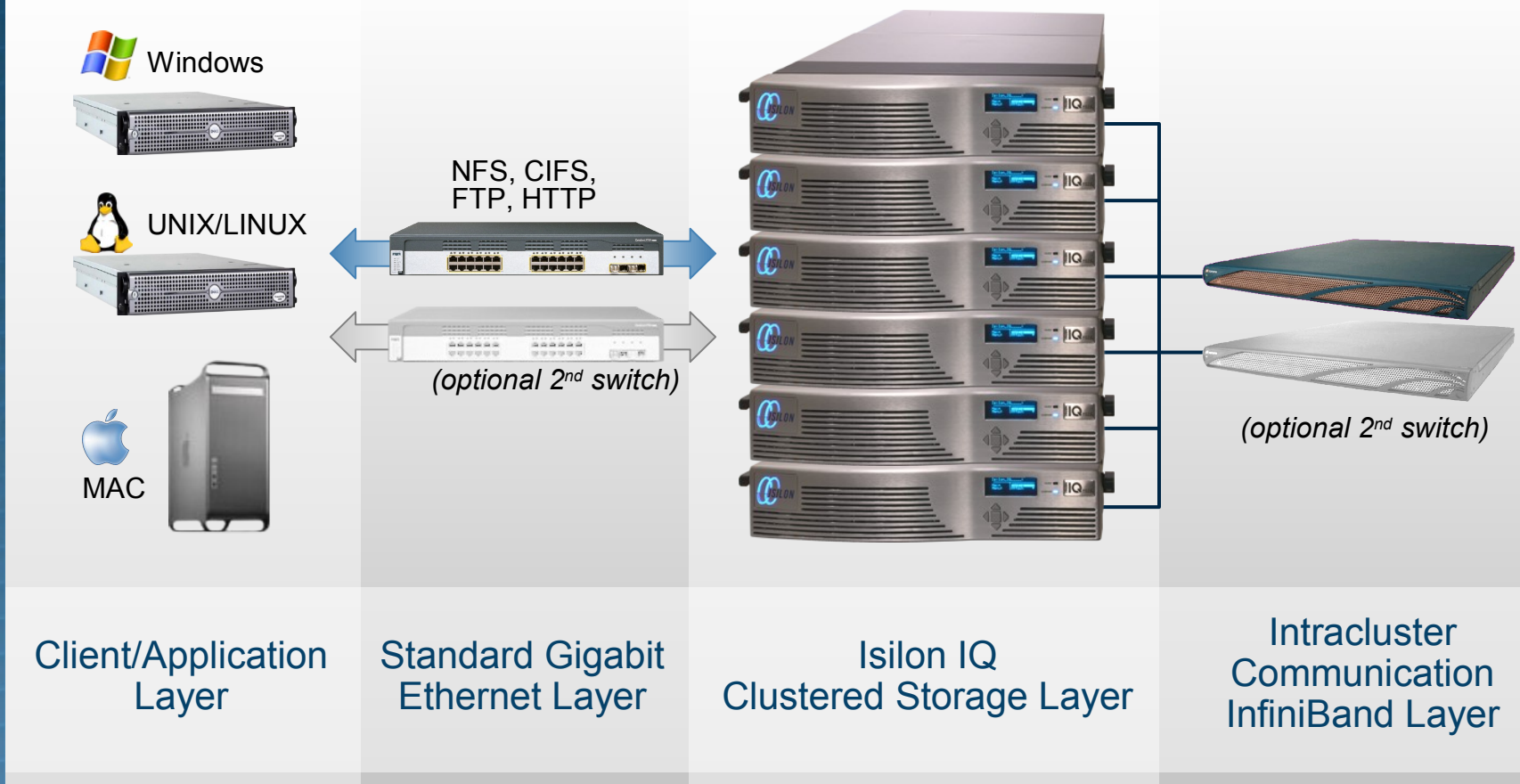
OneFS™ combines three traditional storage layers into **one**



- Creates one single file system
- Files are striped across all nodes
- High performance, fully symmetric cluster
- Automated software eliminates complexity

The world's most advanced
Distributed File System

Isilon IQ Network Architecture



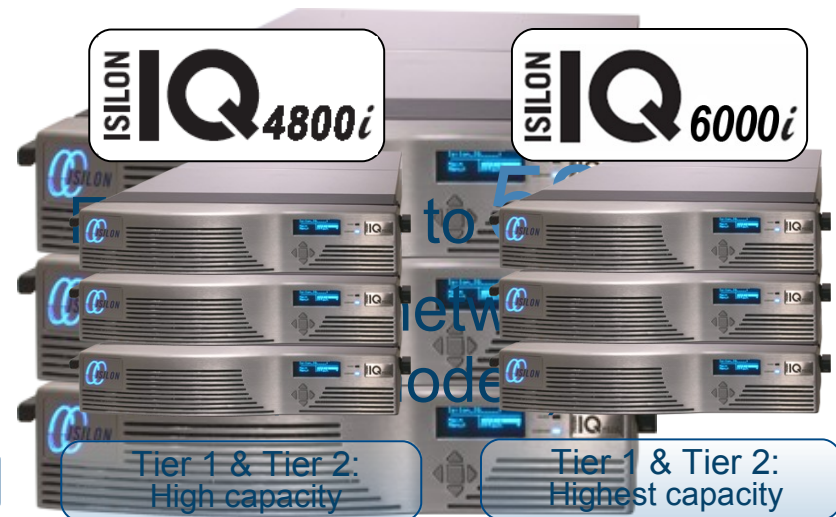
Isilon is the Leader in Clustered Storage

- 3.2 GHz Intel Xeon,
- 4GB Cache per node,
- 12 Spindles per node (EX6000 24),
- Hard Drives Hot-swappable SATA-2,
- 512 MB non-volatile RAM,
- AC Input/Power consumption 100-240VAC
- Dual redundant Power supply



Tier 1:
Highest performance

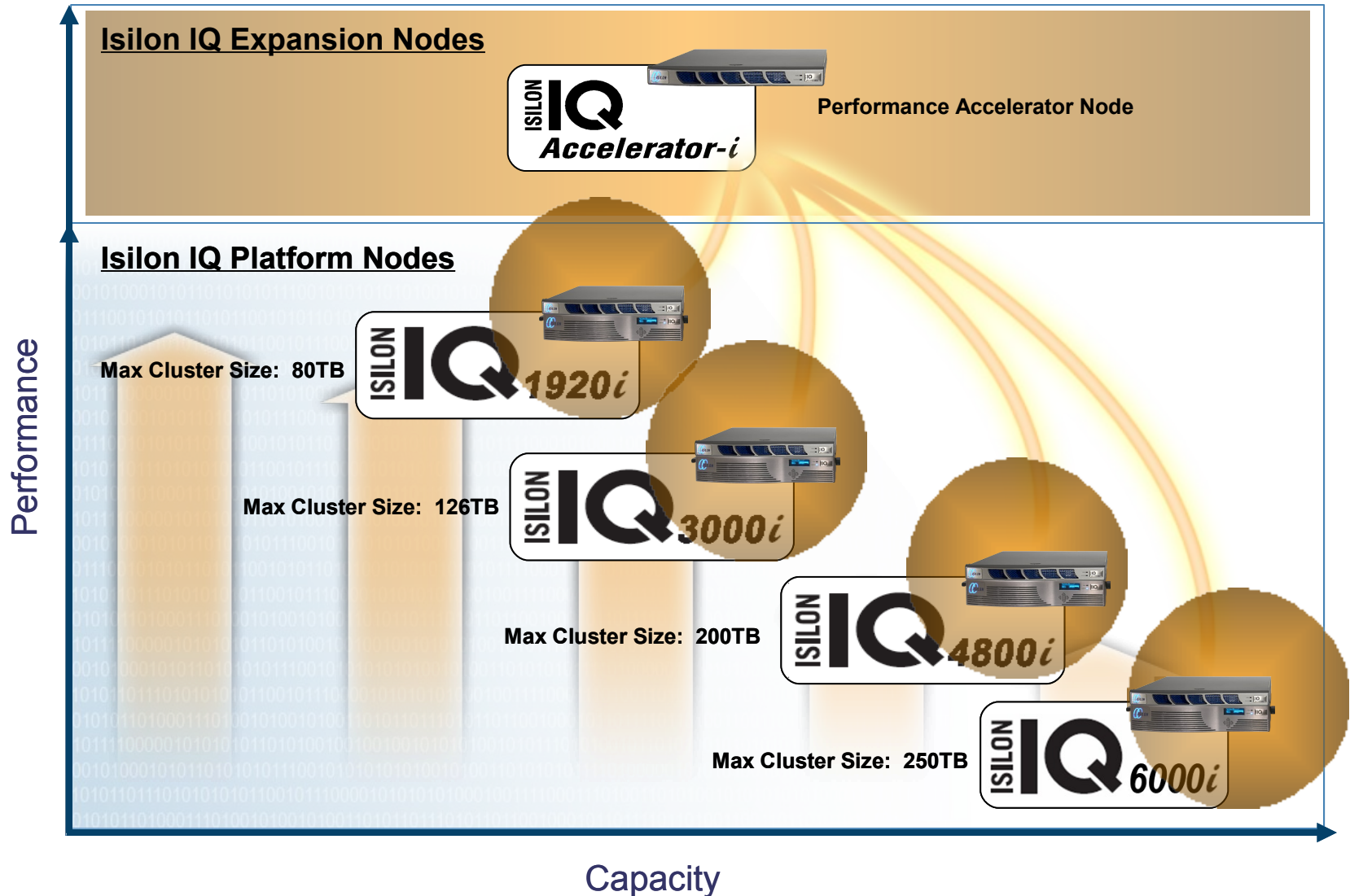
Tier 1 & Tier 2:
Performance & capacity



Tier 1 & Tier 2:
High capacity

Tier 1 & Tier 2:
Highest capacity

Isilon IQ Product Family: Designed to Meet a Wide Range of Performance and Capacity Needs





Isilon EX 6000

Capacity Extension Node



EX 6000 Feature

What is the benefit?

1. Independent scaling of capacity with TrueScale

1. Cost-effectively scale for archive applications (\$4100/TB)

1. 100's of TB's in a single cluster and single file system

1. Simplified management for near line archive and backup apps

1. Serial Attached SCSI (SAS)

1. Future proof platform

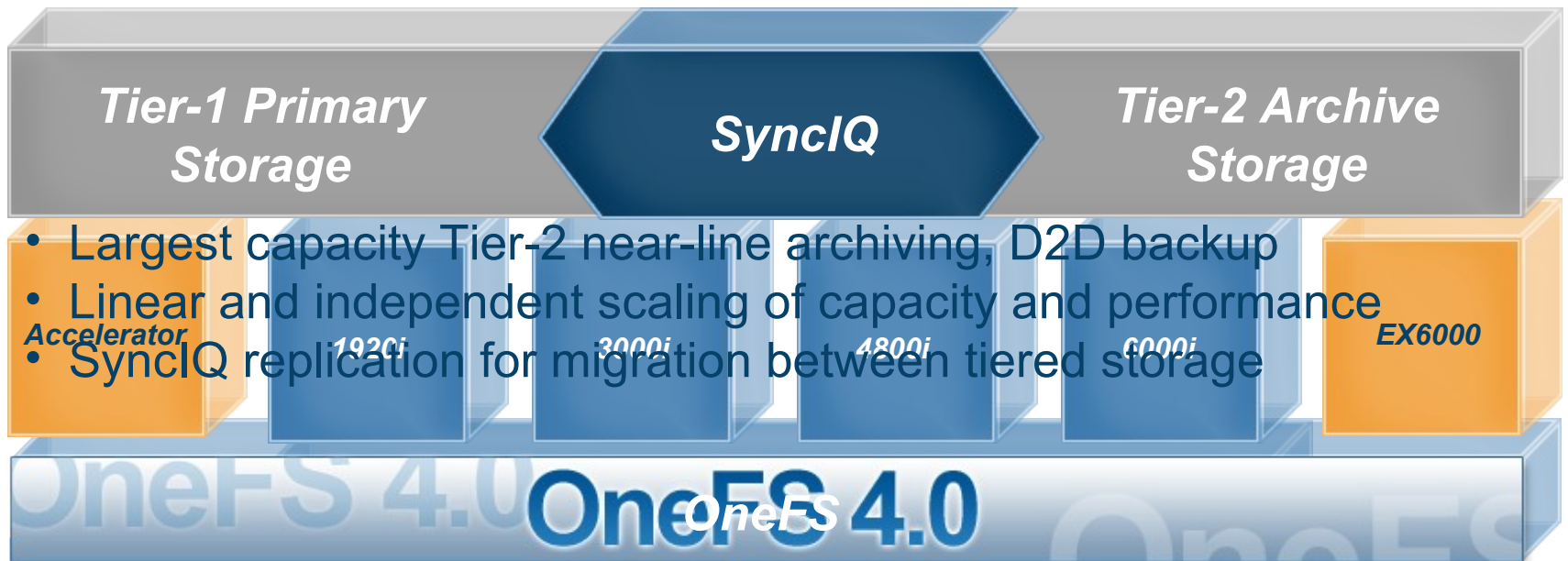
1. High density 12TB is just 4RU

1. Maximum datacenter efficiency

1. Tiered storage with Isilon SyncIQ replication software

1. Ensures data is on appropriate price/performance storage tier

First “End-to-End” Clustered Storage Solution



- Largest capacity Tier-2 near-line archiving, D2D backup
- Linear and independent scaling of capacity and performance
- SyncIQ replication for migration between tiered storage

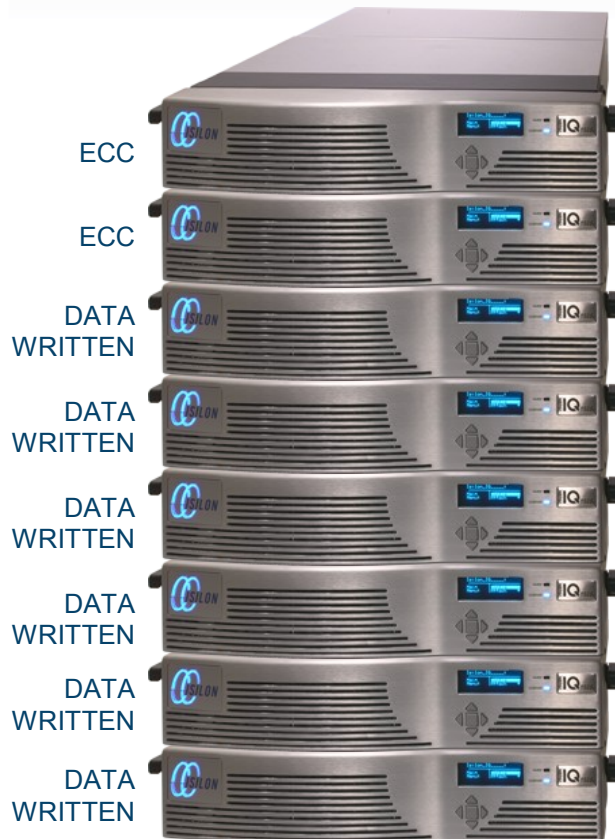


*Technical Feature
Discussion*

The Most Available Storage System

IQ

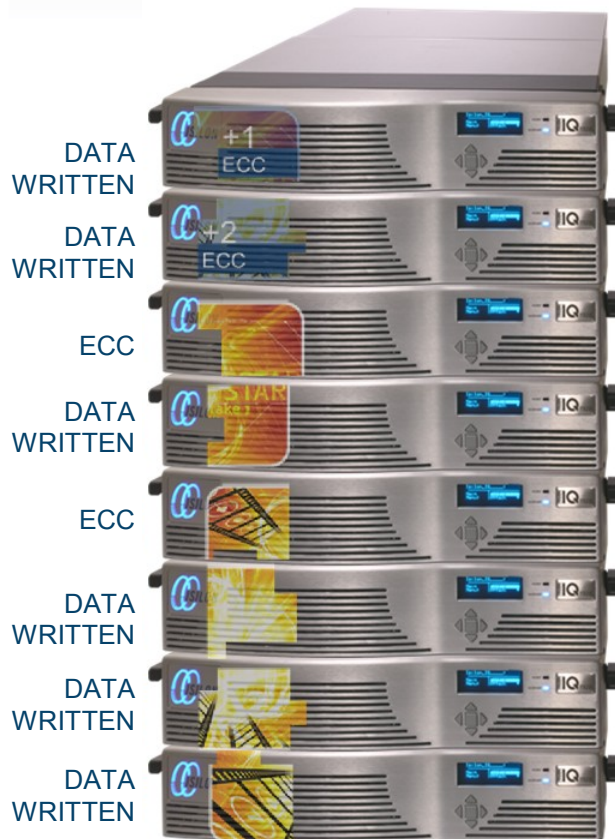
Built-in high availability clustered architecture



The Most Available Storage System

IQ

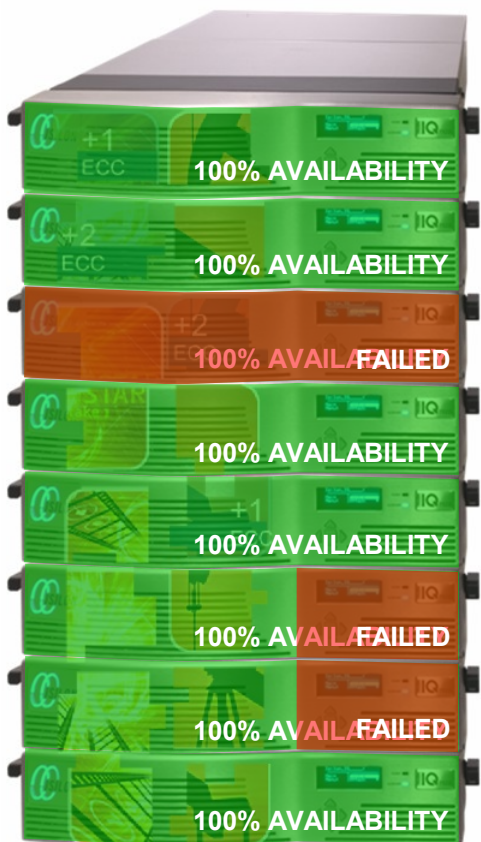
Built-in high availability clustered architecture



The Most Available Storage System

IQ

Built-in high availability clustered architecture



With N+2 protection, data is 100% available if multiple drives or nodes fail

With N+1 protection, data is 100% available even if a single drive or node fails

And... Isilon IQ offers the industry's **fastest drive rebuild** times: a 250 GB disk can be rebuilt in as little as an hour

The Most Available Storage System

IQ Built-in high availability clustered architecture

» EMC and NetApp require costly, redundant heads and software

IQ Replicate data with SyncIQ™ software

» The fastest and most flexible asynchronous file-based replication



Largest and Most Scalable File System

IQ

AutoBalance: Automated data balancing across nodes

» Reduces costs, complexity and risks for scaling storage



- AutoBalance migrates content to new storage nodes while system is online and in production
- Requires NO manual intervention, NO reconfiguration, NO server or client mount point or application changes

Isilon IQ Software Architecture

Software Application Layer

SyncIQ™ Replication Software

Intelligent, Policy-Based File Replication

OneFS™ Distributed File System 4.0

AutoBalance

Automatic Content
Balancing

FlexProtect-AP

Advanced
Data Protection

SmartConnect

Client
Load Balancing

SmartCache

Globally Coherent

WebAdmin


Simple, Web-Based
Management

- File striping, data layout across nodes within a cluster
- Data protection at cluster, directory, and file level
- Metadata management
- Clustered communication



Powerful and Simple Web-based Management Tool

Single-level of Management Manage 4-526TB single file system from one intuitive console



Cluster Management (Live)

Cluster **joe**
Logged in as **Root** to node 1.

Cluster Management
View List of Local Clusters
Remove Node
Add Node

Node Management
1: 172.16.8.180
2: 172.16.8.181
3: 172.16.8.182
4: 172.16.8.183
5: 172.16.8.184
6: 172.16.8.185
7: 172.16.8.186
8: 172.16.8.187
9: 172.16.8.188
10: 172.16.8.189
11: 172.16.8.228
12: 172.16.8.229
13: 172.16.8.230

File System Management
File Sharing
Alerts
Logs
Tools

Powered by Isilon OneFS v2.5
For product support, contact Isilon Systems at:
<http://support.isilon.com>
support@isilon.com
1-877-2-ISILON (1-877-247-4566)
1-206-316-7600
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Cluster Configuration

Static | **Live**

Cluster
Name: joe
Add Node Setting: Manual
Cluster Time: 14:31:31 Mar 18 2005 GMT
Cluster Uptime: 10:36:28

Networking
1st DNS Resolver: 172.16.8.3
2nd DNS Resolver: not configured
Domain setting: isilon.com
Gateway: 172.16.8.1
Wins configuration: not configured
NIS domain: not configured
Configured Networks:
Primary: 172.16.8.180/22
External-1: not configured
Internal-B: not configured
External-2: not configured

Access
NFS Service: Active
FTP Service: disabled
HTTP Service: WebUI only
DAV Service: disabled
Domain: Anonymous Mode

Cluster Capacity

99% used - 1% free

13.8 TB used of 14.3 TB

last sample: 6:38:45 AM PST

Cluster Throughput

Bits per Second

in/out (Mbps): 0.0 / 0.0

Time (5.0 sec intvl)

last sample: 6:38:37 AM PST

Legend
Inbound
Outbound

Node Status

ID	IP	Health	Throughput per sec In/Out/Total	Node Capacity	Space Used
1	172.16.8.180	●	0.0b / 0.0b / 0.0b	1.4TB	0.6MB (< 1%)
2	172.16.8.181	●	0.0b / 0.0b / 0.0b	1.4TB	0.6MB (< 1%)
3	172.16.8.182	●	0.0b / 0.0b / 0.0b	1.4TB	0.6MB (< 1%)
4	172.16.8.183	●	0.0b / 0.0b / 0.0b	1.4TB	0.6MB (< 1%)
5	172.16.8.184	●	0.0b / 0.0b / 0.0b	1.4TB	0.7MB (< 1%)
6	172.16.8.185	●	0.0b / 0.0b / 0.0b	1.4TB	0.5MB (< 1%)
7	172.16.8.186	●	0.0b / 0.0b / 0.0b	1.4TB	0.5MB (< 1%)
8	172.16.8.187	●	0.0b / 0.0b / 0.0b	1.4TB	0.5MB (< 1%)

devices: 10

last sample: 6:38:45 AM PST

World-Class Global Manufacturing and Fulfillment

- **Isilon has partnered with Sanmina-SCI for worldwide manufacturing and fulfillment**
 - » \$12 billion, publicly traded (NASDAQ: SANM)
 - » 40+ years of operating history
 - » Contract manufacturer for top-tier vendors such as (Sun, EMC, Cisco, etc.)
 - » 35,000 employees globally
 - » 100 locations worldwide
 - » Leader in the EMS Industry

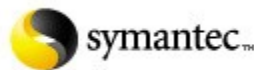
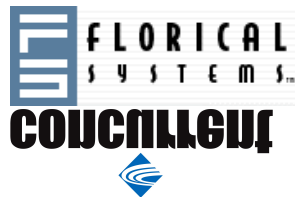


World-Class, Global Customer Service

- **Isilon Support:**
 - » 24x7x365 worldwide product support
 - » 4 hour on-site response time guaranteed
 - » Automatic cluster monitoring and remote diagnostics
 - » Onsite professional training and custom services
- **Isilon Onsite Partner: IBM Global Services**
 - » Worlds largest service company
 - » Global capabilities: 150,000 employees in 160 countries
 - » Highest customer/end-user customer satisfaction in the industry 97.7%



Isilon Technology Partners



Investor Comments

- Sequoia Capital

"Isilon embodies many of the same characteristics of our franchise companies that have grown into major players - the company is focused on a large and growing market opportunity, has built a product driven entirely by customer needs, and the team has proven it can execute by meeting all of its key milestones," said Greg McAdoo at Sequoia Capital, which was an initial investor in companies such as Network Appliance, Cisco Systems Inc., and Oracle Corp. "The growth in digital content is enormous, and it is clear that businesses need a completely new solution to effectively store and manage it. We are confident that Isilon will become a significant player in the network storage arena over the next several years."

Isilon Systems Federal Advisory Board



William W. Crouch, General, U.S. Army
(Ret.)

- Richard D. Hearney, General U.S. Marine Corps (Ret.)



- Leslie F. Kenne, Lt. General, US Air Force (Ret.)



- George R. Sterner, Vice Admiral, U.S. Navy (Ret.)



Background

- Cancer research that combines data from many different sources, including clinical mass spectroscopy and genomic data

Challenge

- Collect more than 60 gigabytes per drop of blood for proteomic studies
- Correlate clinical observations with research data
- Securely maintain comprehensive patient files

Solution

- 10 node Isilon IQ cluster, 22+TB
- Helping to better diagnose/treat cancer
- Allows Cedars-Sinai to easily and continually expand their data sets
- Easy to setup, administer and expand

“Isilon IQ clustered storage is very easy to manage and its scalability enables us to continually add new data points to our studies.”

- Dr. David Agus, Research Director,
Cedars-Sinai Prostate Cancer Center
& Clinical Outcomes Project



Life Sciences



Background

- World's leading sports publisher

Challenge

- Transition to 100% digital workflow
- Process huge volumes in short timeframes
- High profile, mission critical remote events (Olympics, Super Bowl, Orange Bowl, Final Four, etc.)

Solution

- An Isilon IQ cluster capable of storing more than 500,000 digital images
- Reduced picture editing time by 80%
- Accelerated capture, editing, & publishing
- Saved >\$4M in film & processing costs

"By going 100 percent digital for the first time in Olympic history, we are seeing phenomenal increases in the quality of our photos and at the same time saving millions of dollars.

-Phil Jache

Deputy Director of Technology,
Sports Illustrated



Digital Images



Background

- World's #1 social networking/lifestyle site with 44 million users (and growing)
- Division of News Corp and ranked 3rd most viewed site by comScore

Challenge

- Exponential growth of users and uploaded content
- Legacy storage systems not able to keep up
- 24x7x365 world-wide operations

Solution

- Initial deployment of more than 40 TB of Isilon IQ clustered storage
- Isilon IQ enables myspace to seamlessly scale
- Key engineering resources redeployed to more critical business initiatives

“Our streaming and storage needs are tripling every year and this presented a challenge for our traditional storage systems. Isilon IQ is a critical part of our infrastructure – the performance, scalability and cost savings we realize with Isilon IQ will help fuel the next wave of our growth.”

*-Aber Whitcomb,
Chief Technical Officer, MySpace*



Online Service Providers



Background

- Clustered storage for Athens Olympics

Challenge

- Produce 5x more broadcast programming than previous Olympic with same size staff
- Digitize all Olympic video for editing
- Record and playback all track & field and gymnastics slow-motion video

Solution

- 10 Isilon IQ nodes at 3 locations (>26+TBs)
- Replaced tape video review systems
- Immediate online access to all event footage
- Five times more broadcast hours = 5 times more advertising revenue

"Isilon IQ delivers the combination of performance, reliability, ease of use and economics that will enable us to deliver the best Olympics broadcast to date."

-Matt Adams,
-Director of Technology, NBC
Olympics



Broadcasting



Background

- Tens of millions of legal documents & images online

Challenge

- Scaling capacity with zero downtime
- Highest reliability of critical online service
- Scaling performance as millions of documents and users are added

Solution

- Two Isilon IQ clusters at separate locations achieve what they call “judicial-grade” reliability & performance
- SyncIQ replication software in use between multiple locations
- More than 14 million files
- >50,000 files added daily

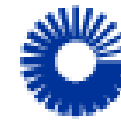
“With its combination of modular building-block scalability and extremely simple management, Isilon IQ performed well from the start and is an ideal storage system for our mission-critical revenue generating applications.”

-EvansRoth, VP of Operations
Emerging Markets, LexisNexis



Document Imaging





Background

- Pratt & Whitney engines power nearly half the world's commercial and military fleets

Challenge

- Replace legacy engine testing storage infrastructure with 100% online and file-based network attached clustered storage system

Solution

- 32+ Terabytes of Isilon IQ clustered storage used for jet engine tests
- Enabled reduction in test time from 6 months to 6 weeks
- Isilon IQ used to test military and civilian engines for Airbus A380, A318, F135 (Joint Strike Fighter), Boeing 737, F15
- Data critical for government compliance



Manufacturing



Clustered Revolution is Here!

- Isilon is the leader
- Started in the market space
- Made specifically to handle unstructured data
- On version 4.02
- Shipping 4.5 in July
- 5.0 to be release in September
- Key accounts like USGS, IRIS, University of California Santa Barbara (LOC),