



***THE ECONOMIC BENEFITS OF
INTELLIGENT CLUSTERED STORAGE***

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THE DIGITAL CONTENT STORAGE CHALLENGE

Digital content such as audio, video, images, PDFs, research data sets, graphics and other large digital files are driving storage capacity needs to staggering heights across a range of industries. A company that creates or distributes digital content values those assets throughout the company's life. Not only is content valuable intellectual property, but existing assets often can be used in derivative products, repurposed into new formats, or repackaged and delivered through new distribution channels to create additional revenue. For businesses whose success depends upon digital content, the pressure is on to raise productivity and improve profitability by finding new ways to create, analyze and distribute content in digital form.

Digital content has several fundamental characteristics that make it unique from traditional text-based or transactional database files, as shown in the table below.

Traditional Data	Digital Content
Smaller files	Larger files (> 500 kb)
Steady capacity growth	Explosive capacity growth
Modest data stores	Very large data stores
Write and I/O intensive	Read and throughput intensive
Random access	Sequential access
Many small transactions	High concurrent access to content

Traditional storage systems were not designed for the unique requirements of digital content.

For lack of better alternatives, many companies have attempted to meet their digital content storage needs by extending storage systems that were designed for traditional data. Even the newest Network Attached Storage (NAS) and Storage Area Network (SAN) systems employ architectures that have inherent limitations, leading to enormous management complexity, high costs and performance limitations for storing digital content.

THE NEED TO DO MORE WITH LESS

The current economic climate has created challenges for organizations trying to increase revenues and service offerings while containing costs. The Meta Group estimates that storage capacity continues to grow at around 90 percent annually. The world of digital content has grown more complex than that of traditional data environments, with many more content formats and distribution channels to distribute that content. This has led to an explosion in the amount of digital media that content-centric businesses must create and manage, despite flat or declining capital budgets and administrative resources. From executives to systems administrators, today everyone is under pressure to do more with less.

Storage capacity is skyrocketing yet everyone from business unit executives to system administrators is under pressure to do more with less.

In digital content environments around the world, companies are struggling with storage systems that were not designed for digital content. This presents a challenge both to companies trying to effectively digitize and generate new revenues from their content assets and to system administrators tasked with managing their organization's complex infrastructure for digital content.

ISILON IQ: DESIGNED FOR DIGITAL CONTENT

To sustain digital content growth with fewer resources, organizations must change their approach to storage. Isilon® helps companies get more value per megabyte out of their storage than any other system. How does Isilon do this? Isilon has designed a storage system from the ground up to support the unique requirements of digital content and to ensure that businesses can easily manage their digital assets for the long term. For organizations that create, produce, archive, or deliver digital content, Isilon has designed the right tool for the job.

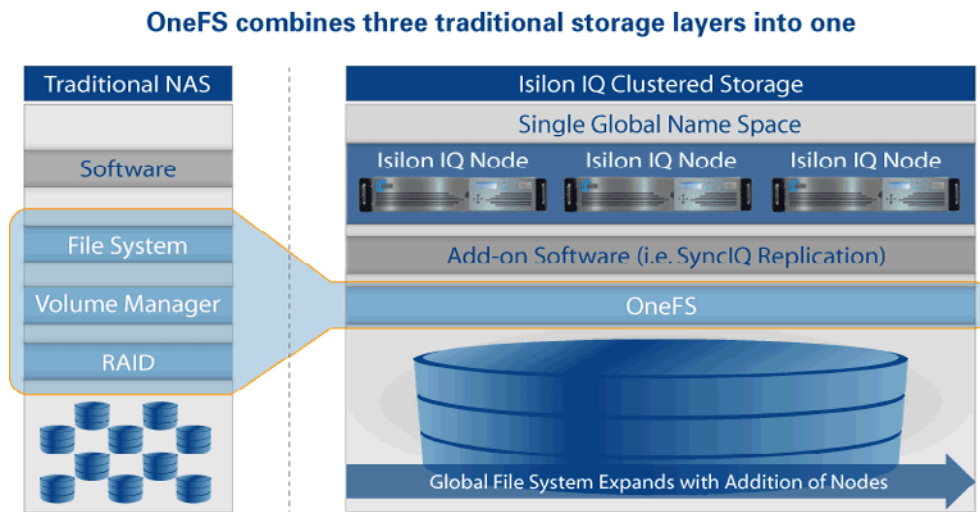
INTRODUCING ISILON IQ

Isilon IQ is based on a unique modular design that combines a powerful server and 1.44 or 2.25 terabytes of disk capacity in dense, self-contained storage nodes that work together in a single cluster. This modular design combines intelligent software and smart hardware, that sets bar for digital content storage. By intelligently distributing content across the nodes in a cluster, Isilon IQ creates a shared pool of storage that can be viewed, managed and accessed from a single point. The smart software in Isilon IQ automates many previously manual tasks and provides flexible and incremental scaling, eliminating barriers for new projects. Isilon IQ is content aware in architecture and approach, making it easier to manage digital content based on differing needs for availability and performance.

POWERED BY ONEFS: ISILON'S DISTRIBUTED FILE SYSTEM

OneFS™, Isilon's patent-pending distributed file system, provides the intelligence behind Isilon IQ. Now in its third generation, OneFS combines the four layers of traditional storage architectures - file system, volume management, data protection, and high availability - into one unified software layer, creating a single file system that spans all nodes within a cluster. The architecture of OneFS eliminates the volume size and file system limitations that face existing network storage products and enables scaling to tens of gigabits per second of throughput and hundreds of terabytes of capacity. OneFS also provides inherent high availability, unprecedented control over content and the ability to scale both performance and capacity in less than 30 seconds. For more information about OneFS and Isilon IQ's architecture, please visit: <http://www.isilon.com/products/onefs.html>.

The intelligent software and modular design of Isilon IQ fundamentally change the economics of storage for digital content, enabling organizations to slash acquisition costs, significantly reduce operating expenditures, increase productivity of users and unlock new revenue opportunities.



ACCELERATING RETURN ON INVESTMENT WITH ISILON IQ

Measuring storage return on investment (ROI) is necessary in that it can help companies assess the complete cost of a project and justify outlays for enhancing current infrastructure. The following sections show how Isilon IQ decreases costs, raises productivity and increases revenue.

DECREASES CAPITAL ACQUISITION COSTS

Isilon IQ is designed specifically for the requirements of digital content, delivering more value per megabyte for digital content compared to traditional storage systems in the following ways:

- **Comprehensive storage system.** Isilon IQ is a complete network storage system that includes all of the software and hardware necessary to store, serve and manage digital content across heterogeneous platforms. It eliminates the need to purchase and integrate separate volume management software, management tools and NFS/CIFS servers/licenses to communicate with clients or application servers. The table below compares what must be purchased for Isilon IQ versus a traditional high-end network storage system.

The components that must be purchased for a network storage system for digital content.

Isilon IQ	High-End Traditional Storage System
Hardware	
<ul style="list-style-type: none"> • Isilon IQ nodes • Gigabit Ethernet switch 	<ul style="list-style-type: none"> • Storage enclosure and controller • Disk arrays • Costly Fibre Channel switch • Host bus adapters (2 per server) • Servers to provide users with NFS/CIFS access to storage array • Gigabit Ethernet switch for application server access to the storage
Software	
<ul style="list-style-type: none"> • Included in each Isilon IQ node 	<ul style="list-style-type: none"> • Server clustering • Storage array management • Failover
Initial Setup	
<ul style="list-style-type: none"> • No professional services • Installation in under 30 minutes 	<ul style="list-style-type: none"> • System architecture, design and configuration • Installation (weeks)
Training	
<ul style="list-style-type: none"> • 1 hour, included with installation 	<ul style="list-style-type: none"> • 3-4 weeks, extra fees
Adding Capacity	
<ul style="list-style-type: none"> • Capacity can be added in less than 30 seconds • No professional services required • OneFS automates content balancing 	<ul style="list-style-type: none"> • Days or weeks of planning • Professional services often required • Tedious content migration required

- **Enables just-in-time capacity purchasing.** Isilon IQ's unique modular design enables companies to buy the amount of storage capacity needed and to easily and quickly add more when necessary. Isilon IQ creates a single pool of storage, eliminating the inefficiencies caused by the file system or volume size limits of traditional storage systems, where one volume might be 90

Isilon IQ provides the most economical solution for adding digital content storage capacity.

percent full and another only 10 percent full. Prior to Isilon IQ, companies avoided these inefficiencies by over-buying capacity and then spending a significant amount of time later to manually reallocate resources, load-balance data and remount servers to balance the demands placed on the storage system.

- **Inherent high-availability architecture.** Isilon IQ's inherent high-availability architecture design eliminates the need for expensive, redundant failover designs. With traditional NAS and SAN systems, high-availability means adding expensive failover software and redundant hardware components such as servers, switches and host bus adapters.
- **Enables better utilization of storage capacity.** Isilon IQ's exclusive FlexProtect-AP feature empowers users to set protection levels at the cluster, directory, or file level, giving users the flexibility to manage storage utilization based on business policies. Traditional RAID systems have static configurations that cannot be easily changed, so companies must set up multiple RAID systems to accommodate content workflow. Isilon IQ empowers customers to let their digital content needs dictate their storage utilization, not the other way around.
- **Investment protection.** Isilon IQ's unique architecture coupled with its intelligent software provides investment protection for the future. Isilon IQ's design harnesses advancements in industry-standard CPU, memory and disk drives, to deliver the best price/performance solution for customers.
- **No hidden costs.** One customer stated that the transparency in Isilon's costs were a huge benefit because he could linearly predict storage expenses. He said, "Large vendors spend a lot of effort

“There are never hidden costs with an Isilon IQ system.”
-- **Isilon customer**

to confuse you on what you will actually pay for. With my other system, three months down the road if I need to add capacity I might have to pay for another piece of software I thought was included. There are never hidden costs with an Isilon IQ system.”

REDUCES MANAGEMENT AND OPERATING COSTS

Gartner Group estimates that each dollar spent on storage hardware creates another three or more dollars in operating costs. Isilon IQ increases the efficiency of the people who must design, install, configure, update and manage the storage infrastructure in the following ways:

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

-- Tony Asaro,
Enterprise Strategy Group

- **Lowers storage infrastructure design costs.** Isilon IQ fits into existing Ethernet networks, eliminating the need for specialized storage administrators, integrators, or vendors to design a complex and costly Fibre Channel-based SAN. This process often takes weeks of organizing data, architecting, planning and reviewing configurations.

- **Faster to install and configure.** Isilon IQ’s “plug and store” design automates many tasks that must be performed

manually with other high-end systems. It takes minutes to install and configure an initial Isilon IQ cluster, rather than the weeks required to install and configure a SAN. Also, Isilon eliminates the need to buy Fibre Channel switches, host bus adapters and other required hardware and software, reducing the number of components to install, configure and manage. Adding capacity is even easier. As one customer says, “With Isilon, it’s very easy to add new nodes. Adding capacity to my SAN is a whole different deal - it’s a much more complex and time-intensive task.”

Isilon IQ takes minutes to install and configure versus several weeks for a SAN.

Task: Installation and configuration	
Isilon IQ	SAN
<ul style="list-style-type: none"> • Rack nodes • Plug in power and Ethernet • Turn on units • Configure IP address range, gateway and DNS server in one node • Wait a few minutes while the other nodes automatically join and configure themselves • Mount servers to any node in the cluster 	<ul style="list-style-type: none"> • Plan and schedule installation of refrigerator-sized rack in data center, including necessary power and cabling • Install and configure the hardware <ul style="list-style-type: none"> – Disk array: configure RAID, create RAID volume, assign LUN to the volume, select and map volume to storage controller port, create and update the storage volume – Install the Fibre Channel switch: set up the SAN fabric ports, link the switch to the host, set up multiple paths from hosts to servers, select storage port – Install and configure the servers: set up the HBA, select HBA ports, assign HBA and server hosts to storage networking fabric and zones, map the volumes to the HBAs, create and update the volumes on the hosts • Install and configure the software <ul style="list-style-type: none"> – Install management software – Install load balancing, clustering and failover software – Map the HBA LUNs to server OS and file system – Initialize and update the file system and volume manager – Adjust the back-up application to accommodate the new volume – Set up mirroring
Elapsed time: < 30 minutes	Elapsed time: 2-3 weeks

“ We had 6.5 Terabytes of Isilon storage up and running in under 30 minutes - my best guess is it would take 2-3 days to get our SAN up and running. ”
 -- **Isilon customer**

- **Automates tasks.** Isilon IQ eliminates nearly all of the manual work associated with adding capacity, load balancing content, changing file protection or RAID levels and re-mounting application servers as digital content stores grow. New capacity can be added in less than 30 seconds without manual reconfiguration of application servers and while the content is available to users. Isilon IQ's exclusive and pre-bundled AutoBalance feature automatically migrates and automatically load-balances content across the cluster in the background after new capacity is added. This unique capability eliminates costly downtime, prevents users from losing connections to their content and frees up days of work for the administrator to complete other tasks.

Isilon IQ's intelligent software automates and speeds the task of adding storage to a cluster.

Isilon IQ	Traditional NAS System
<ul style="list-style-type: none"> • Rack Isilon IQ node • Plug in power and Ethernet • From the front panel LCD, select the Join command, select the node to be added and press Accept Selection • In < 30 seconds, the new node joins the cluster and configures itself • Load-balancing of content starts automatically, in the background, while content remains available to user 	<ul style="list-style-type: none"> • Install and configure the new hardware <ul style="list-style-type: none"> – NAS head(s) – Disk drives – Connect FC loop – Connect the head(s) to the Ethernet network • Configure the system <ul style="list-style-type: none"> – Plan, design and implement new RAID groups and volumes for the new drives – Configure user access and permissions to use the new volumes • Migrate content from the existing NAS system to the new system <ul style="list-style-type: none"> – Decide how to re-allocate content – Schedule downtime or time during night/weekend to perform the migration – Copy content from source to destination – Re-mount application servers to the new volumes – Update backup/restore policies • Notify users of the new shares and how to link to the content <p>Risks:</p> <ul style="list-style-type: none"> • Users may lose access to content • Links to content users have set up prior to the migration may stop working • Performance load may still be skewed
Elapsed time: < 1 hour	Elapsed time: days

- **Reduces ongoing IT management costs.** According to storage author, consultant and guru Jon Toigo, “The true cost of storage is not the hardware, it’s in the number of people required to keep it running.” Isilon IQ creates a single pool of storage, eliminating the costs associated with managing multiple “islands of storage” that serve different groups of users and applications. Because of the size limits of file systems or volumes in typical storage systems, system administrators must spend time to manage capacity utilization and balance performance demands across all of their storage systems. Isilon IQ’s smart software makes the system self-supporting, freeing storage administrators to spend their time on other projects. Isilon IQ connects to standard Ethernet networks, so it is exceptionally straightforward to install into an existing infrastructure and easy to manage with existing network management tools.

“There are no human points of failure with an Isilon IQ system because it is easy for anyone in the IT organization to step in and manage.”
-- **Isilon Customer**

“With Isilon IQ you can manage 1 terabyte as easily as 1000 terabytes.”
-- **Isilon Customer**

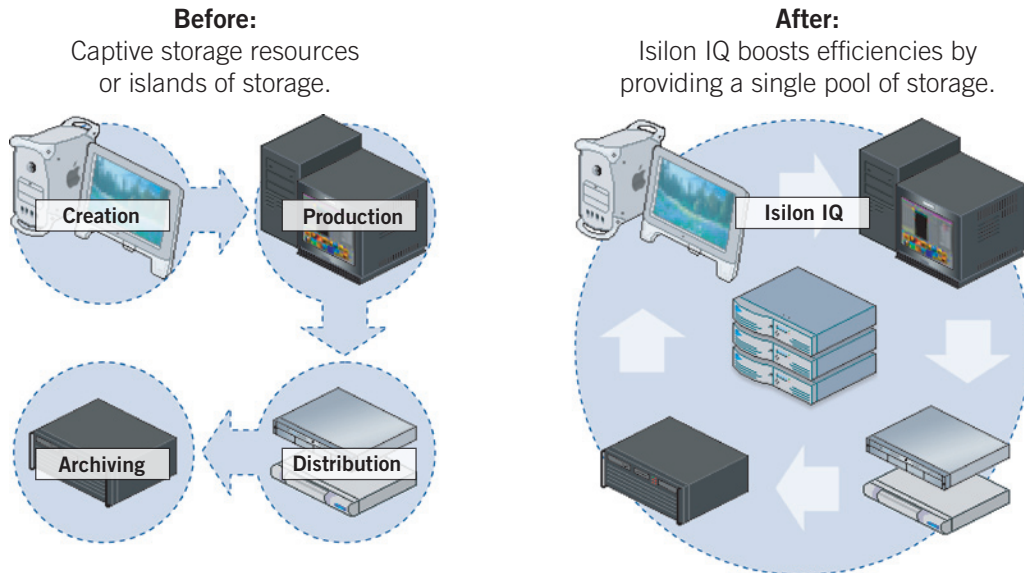
- **Eliminates training costs.** Isilon IQ’s overall ease of use eliminates the need to send administrators offsite to learn how to manage the system. According to one Isilon IQ customer, “With other vendors, there is a human single point of failure if our administrator is out of the office or gets hit by a bus. With Isilon there is a handful of people who could step in and manage the system without ever having touched it before.”
- **Dense design lowers data center costs.** Isilon IQ packs 1.44 or 2.25 terabytes of capacity into each 2U node, enabling dramatic savings on expensive data center space and environmental costs. A single rack filled with Isilon IQ nodes contains up to 45 terabytes.

RAISES USER AND APPLICATION PRODUCTIVITY

Companies today must better leverage their storage resources as their capacity continues to grow. The use of centralized storage brings greater efficiencies in the content workflow and takes advantages of investments already made in people and processes, by allowing these to be applied across more storage resources. Isilon IQ was designed to simplify the production, archiving and delivery of digital content. It combines the file-based communications and ease-of-use of managing a single NAS system with the performance and availability of a SAN. By creating a single, shared pool of storage that can be accessed by users throughout the digital content workflow, Isilon IQ increases the productivity of users who are creating, re-purposing, reviewing, moving and archiving digital content.

“ With Isilon IQ allowed our 6 photo editors to simultaneously review, access, and share the images they were working with over GigE and standard Windows file sharing - all while new images were being added to the cluster. ”
-- Isilon Customer

- **Shortens cycle time of content.** By creating one pool of storage that can be accessed by Windows, UNIX, Linux and Macintosh users alike, Isilon IQ eliminates the need to manually move content from one workstation to another. Further, Isilon IQ's SmartRead feature uses intelligent algorithms to pre-fetch content into a large global memory cache, speeding user access to content. Isilon IQ's scalable architecture ensures that all applications have the performance and capacity they need, so content can be produced faster.



Benefits

Creation

- Faster ingest, encoding, and transcoding

Archiving

- Active archive speeds content retrieval
- Content can be more easily repurposed

Production

- Enables better collaboration and decreases content cycle time

Distribution

- Faster delivery to end user
- Shared storage pool for servers

Isilon IQ eliminates cumbersome islands of storage and other inefficiencies resulting from captive or direct attached storage

- **Increases collaboration among users.** The shared pool of storage that Isilon IQ creates enables faster review of content as it is being produced. Isilon IQ reduces the need to add expensive and proprietary storage to specialized application servers, such as nonlinear edit systems, making it easier for multiple users to work on the same project directly from their own workstations.

- **Faster delivery of content.** High-performance delivery applications like streaming can have highly variable user access patterns. A piece of content may be wildly popular for a short period of time, with thousands of users trying to play or download the content; but that demand may suddenly shift and spread out over more pieces of content. Isilon IQ's SmartRead feature ensures that popular content is cached in memory for quicker delivery.
- **Better storage utilization.** The average utilization of Direct Attached Storage (DAS) is only 25 to 30 percent. Consolidating the storage infrastructure instead of buying captive storage for each server or workstation not only eases administration but results higher utilization rates for the storage that's purchased.
- **Enables "active archives" for quicker access to content.** It is estimated that disk-based recovery is up to 400 times faster than recovering content from tape. Digitizing content currently stored in a deep, tape-based archive and putting it into an "active" archive on disk speeds access and solves the "stranded asset" problem. This enables content creators to reuse existing content assets much more quickly and eliminates time-consuming searches through tape archives.
- **Enables fast restore or disaster recovery.** Using Isilon SyncIQ(TM) replication software, data can be easily replicated to another Isilon IQ cluster, for quick recovery in the event a primary content store becomes inaccessible. Because the content on the additional Isilon IQ cluster is always available, users can immediately access content on the secondary cluster while data on the primary cluster is restored, minimizing organizational disruption.

UNLOCKS NEW REVENUE OPPORTUNITIES

Isilon IQ creates a flexible, economical storage infrastructure that is designed to support a wide range of new business opportunities based on digital content. Isilon IQ enables customers to:

- **Create content in more formats.** Isilon IQ combines the right performance with the right price, empowering organizations to create, store and make content available in more formats on the same storage platform. Customers can store high-resolution originals and low-resolution thumbnails, video encoded at a variety of bit rates, and images transcoded into multiple formats and resolutions, all on the same system.
- **Economically add new distribution partners, channels and delivery points.** As content formats proliferate, being able to identify and repurpose content quickly through a cost-effective platform enables customers to gain new revenue from existing content. Users can distribute content to Internet sites, through other B2B channels, to digital cable, satellite and more, all directly from Isilon IQ, unlike other solutions that require additional investments in infrastructure.

The flexible storage infrastructure of Isilon IQ that supports new business opportunities.

- **Repurpose existing content for new products.** Isilon IQ provides a cost-effective storage infrastructure that allows organizations to digitize existing content assets that have been in deep archive storage and place it on disk. The content becomes more accessible and readily available for creating new or derivative products.
- **More quickly take on new projects.** The exclusive ability to add new nodes to an Isilon IQ cluster in seconds allows administrators to respond to new demands for capacity or performance instantaneously, enabling the organization to more quickly adapt to changing internal and external factors.

CONCLUSION

For digital content environments around the world, companies are struggling with storage systems that were not designed for the digital content era. While the amount of digital content that needs to be stored and accessed is growing, the budgets and IT resources to manage it are not. This presents a challenge both to companies trying to effectively digitize and generate new revenues from their content assets and to system administrators tasked with managing their organization's complex infrastructure for digital content.

Isilon Systems has fundamentally changed the economics of storage for digital content with its Isilon IQ clustered storage system. Adopting a storage solution that is optimized specifically for the unique requirements of digital content enables customers to store more content in more formats and make it instantly accessible to more people at a lower cost. It also enables businesses to use a common storage solution across multiple applications in the digital content lifecycle, including production, archiving and delivery.

With Isilon IQ, content-centric businesses will not just reduce costs, however. By connecting disparate applications and clients with a single shared pool of storage that can be instantly accessed by all users, Isilon IQ will help companies accelerate the return on their investment.

To see how Isilon can help you reduce storage costs and increase returns, contact your local Isilon sales representative at 877-2-ISILON (toll free) or +1 206-315-7602 (international), or email sales@isilon.com. Isilon will help you build a model specific to your business to demonstrate how Isilon IQ can help you unlock the potential of your digital content.

More information can be found at: <http://www.isilon.com>



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