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BREAKING THE CPU BARRIER IN MEDIA TRANSCODING PERFORMANCE

Dell EMC Isilon and Elemental Server: Scalable solutions for on-demand video conversion and content delivery

ABSTRACT

Dell EMC Isilon and Elemental provide best-in-class, massively scalable solutions for IPTV transcoding and on-demand content delivery for broadcast media workflows. The world's top on-demand service providers rely on Dell EMC Isilon scale-out NAS and Elemental Server GPU-based video transcoding solutions to simplify and accelerate their workflows.

December, 2016

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EXECUTIVE SUMMARY

BUSINESS CASE

Elemental™ and Dell EMC® Isilon® solutions help top service providers to convert media content for on-demand viewing on PCs, tablets, and mobile devices. Solutions from Elemental employ the massively parallel architecture of graphics processing units (GPUs) to perform accelerated video processing and encoding. Elemental reduces the number of systems needed to support the transcoding of thousands of hours of content compared to CPU-only solutions.

Service providers are faced with a number of issues as the market shifts from broadcast media content consumption to a widening array of on-demand viewing options:

- Content must be available anywhere, at any time, for any device.
- Massive libraries of legacy feature films and broadcast content require conversion.
- Valuable content must be secured and managed.

Transcoding workflows must be highly parallelized in order to prepare fresh content for on-demand delivery in a timely manner. Service providers responsible for driving new revenue from broadcast content in on-demand markets must rely on efficiencies of scale. Above all, the solutions for on-demand content creation must be cost-effective.

SOLUTION OVERVIEW

Elemental Server is a scalable, GPU-based video processing system. Each node in an Elemental Server array is capable of converting up to 12 unique high definition or 32 mobile video files into hundreds of output files simultaneously, at data rates faster than real-time. Elemental delivers the highest quality encoding using codecs designed specifically for the GPU. Elemental Server is a Linux–based system featuring web-based administration, REST/XML APIs, and standardized SMB or NFS connectivity to high-performance Dell EMC Isilon scale-out NAS. Isilon and Elemental Server combine to provide a scalable, fault-tolerant infrastructure for media content conversion and delivery to your content delivery network.

KEY RESULTS/RECOMMENDATIONS

The world's top broadcast, streaming media, and production companies trust Isilon to store content and drive performance-hungry media workflows. Elemental and Dell EMC have partnered to provide a state-of-the art compute layer for on-demand transcoding workflows built on the Isilon family of scale-out NAS products. Like Isilon, Elemental Server is built on a modular appliance platform that easily scales to meet the demands of your business.

- Deploy high-density, multiformat video conversion
- Scale out network attached storage capacity and bandwidth through the simple addition of Isilon nodes
- Scale parallel GPU-based video processing power through the simple addition of Elemental Server systems

ELEMENTAL SERVER INTEGRATION WITH DELL EMC ISILON

CONFIGURATION

Elemental Server is typically deployed in a clustered configuration consisting of a management node and one or more worker nodes. The management node of the cluster acts as a gateway to balance new jobs from the REST/XML interface, watch folders, or web interface evenly across the cluster. The management node may also store an XML file to automate the configuration of new worker nodes as they are added to the Elemental Server cluster. Communication from the Elemental Server management node to the worker nodes is carried over a dedicated management network interface. The Elemental Server cluster connects to Isilon NAS over a dedicated interface on the "data network" as shown below in figure 1. For optimum performance, the data network should be a 10 gigabit network configured for jumbo frames.
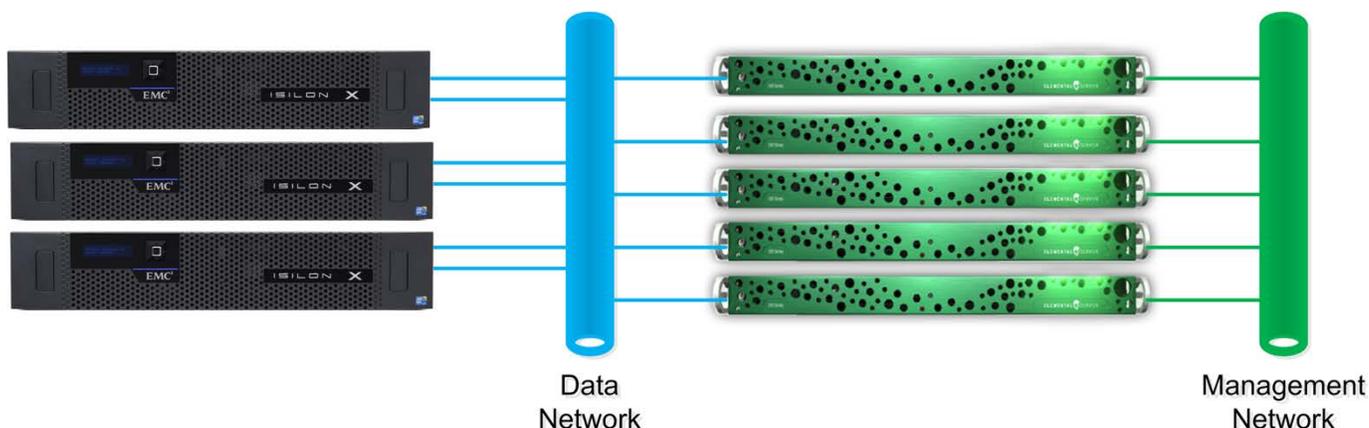

Figure 1. Elemental Server clustered network configuration

Elemental Server uses standard SMB v1 and NFS v3 mounts when connecting to Isilon NAS. To mount a share or NFS export on the Elemental Server cluster, simply enter the fully qualified domain name for the Isilon SmartConnect™ zone and share name into the "mount point settings" page of the Elemental Server web interface. The Isilon SmartConnect service automatically balances network connections from the Elemental Server cluster across to individual nodes in the Isilon storage cluster. For the best performance and reliability, mount the Isilon cluster from an NFS export using the SmartConnect Advanced application. SmartConnect Advanced allows for the dynamic allocation of IP addresses to different nodes in the NAS cluster. SmartConnect Advanced automatically initiates a failover of active NFS connections in the event of a hardware failure. SmartConnect Advanced also rebalances active NFS connections across the Isilon cluster to ensure an even distribution of active Elemental Server client connections on each node. This NFS client rebalancing is possible without disconnecting the active client connections.

The Dell EMC Isilon OneFS® operating system allows SMB shares to be mounted as NFS exports simultaneously, allowing seamless integration of Windows and UNIX/Linux applications in your workflow. Contact your local Dell EMC sales team to learn more about Isilon account identity mapping and authentication features that enable concurrent integration of UNIX POSIX permissions and Windows access control list permissions.

Those familiar with high-volume transcode workflows know that the storage requirements for content grow out of hand very quickly. Broadcasters taking on the challenge of converting entire libraries of content from an archival format such as JPEG2000 to a constantly growing array of output formats know the pain points surrounding traditional LUN-based SAN architectures. Isilon eliminates the need for teams of storage administrators and the time-consuming administrative tasks associated with traditional SAN or LUN-based NAS management. The Isilon OneFS operating system automatically balances data evenly across each node in the cluster for every file written and routinely rebalances the data for each file to ensure a constant symmetry of capacity on each node. The revolutionary OneFS filesystem has become a staple in the media-centric data center for this very reason. It is common for tens or even hundreds of terabytes worth of media to rotate in and out of a filesystem in a high-volume transcode workflow over the course of a single week. The amount of file system "churn" associated with the rapid creation and deletion of files in an automated media workflow can bring a traditional LUN-based infrastructure to its knees.

DESIGN CONSIDERATIONS

A single Elemental Server appliance with 1024 GPU cores can generate between 80–200 megabytes per second of combined read/write traffic when running the standard throughput benchmark test profile created by the default Elemental Server install. The read/write throughput generated by each Elemental Server appliance is highly variable. The read performance may peak up to 200 megabytes per second or higher on an Elemental Server that is equipped with the optional 10 Gigabit Ethernet network adapter while the source file is read into memory for decoding. The bandwidth requirements for the Elemental Server are highly variable and "bursty" as the appliance reads files into memory.

Due to the considerable storage requirements and moderate throughput demands of the Elemental Server appliance, the Isilon X200 storage node is an ideal match. Testing at the Isilon labs indicate that a single Isilon X200 node equipped with 10 Gigabit Ethernet can easily support 2 Elemental Server appliances equipped with 10 Gigabit Ethernet. This 2:1 ratio implies that the minimum Isilon cluster size, a 3-node X200 cluster, can easily support the bandwidth requirements of a 6-node Elemental Server installation. Individuals wishing to add additional video processing compute power to their Elemental Server installation simply add one more Isilon X200 node to their cluster for every 2 Elemental Severs appliances added. Adding additional bandwidth and capacity to an Isilon cluster is as simple as pushing a button. The OneFS operating system automatically balances data and new client connections to the new node as soon as it is added to the cluster. No administrative overhead or complicated management of the storage environment is required. For more information about the benefits of the Isilon OneFS operating system, please visit the Isilon website.
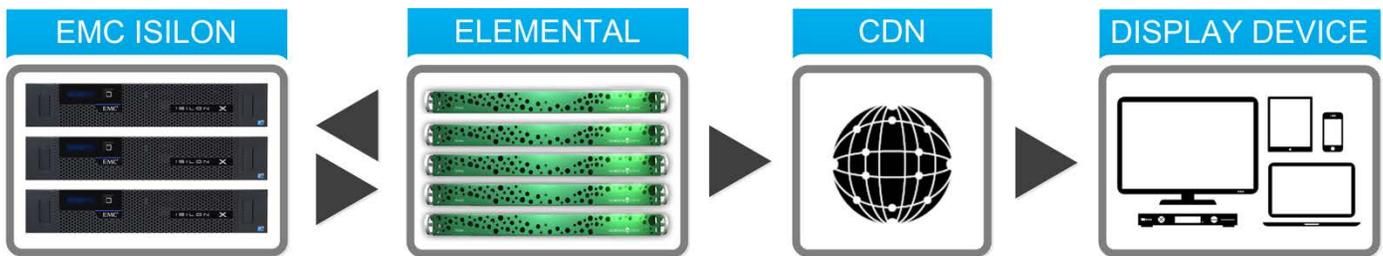

Figure 2. Elemental Server workflow

Benchmark results are highly dependent upon workload, specific application requirements, and system design and implementation. Relative system performance will vary as a result of these and other factors. Therefore, this workload should not be used as a substitute for a specific customer application benchmark when critical capacity planning and/or product evaluation decisions are contemplated. All performance data contained in this report was obtained in a rigorously controlled environment. Results obtained in other operating environments may vary significantly. Dell EMC does not warrant or represent that a user can or will achieve similar performance expressed in transactions per minute.