Media and entertainment companies are realizing that they not only have to consolidate their IT into a common infrastructure, manage storage more effectively, and better utilize computing assets, but they also have to reduce the number of different technologies that are deployed to simplify operational challenges and reduce costs. The foundation of this transformation is a high-speed switched networking infrastructure that allows many different end point systems to be connected reliably, efficiently, and at scale.

**Requirements Overview**

Higher resolution imaging standards evolving from HD to 2K, 4K, and future 6K / 8K video quality are creating exponential growth in file size. 3D technology adds fuel to the fire by effectively doubling storage requirements. Today, raw video capture for a full-length feature film may require between one-half and two petabytes of storage, while high-resolution Digital Intermediates may require multiple terabytes. Different departments and functional units no longer have completely isolated workflows, as proxies must be linked to master assets in the vault. All of this is further complicated as global partners must collaborate to seamlessly produce a final result, moving massive numbers of assets around the planet in ever-shortening timeframes. Once completed, an asset may need to be localized, watermarked, transcoded, and otherwise processed, creating hundreds or thousands of versions of the same title. Version control and content rights must be managed, while policy dictates what must be archived and how assets are stored. No wonder there are such strong efforts to develop an Interoperable Master Format to allow for dynamic creation of distribution derivatives instead of saving all of these separate versions.

Further, audiences today have a huge appetite for graphic imagery and realistic CGI. The cost of producing a modern blockbuster has skyrocketed to more than $100M. To avoid producing a movie flop studios are deploying video game and modeling tools and simulating an entire movie well ahead of incurring these large production costs. These tools model camera angles and storylines, check visuals, and model much of the animation, all without shooting a single frame of live video or paying for big name actors. The up-front costs to verify creative work and fine-tune aesthetics are thus reduced from hundreds of millions of dollars to just several million.

These innovations are driving the need for high-speed data center infrastructures made up of commodity servers, a fast and efficient common network, and file-based storage that easily scales as the petabytes of content grow. No longer do we rely on individual workstations, loosely coupled storage, and ad-hoc content management.
This new world of digital production has forever changed the Computer Generated Imagery (CGI) landscape. In order to produce realistic-looking high resolution VFX and animation, modern day CGI shops must increasingly look towards parallel computing, with hundreds or even thousands of connected servers. These HPC clusters include centralized storage systems, Intel-based X86 multi-core servers, and file caching accelerators, all interconnected through high-speed, ultra reliable, low-latency switching.

Whether working on feature-length films, episodic TV, or live broadcast, all of these requirements are placing extreme demands on technology. But they’re also creating new opportunities for innovative, specialized teams to be part of an industry that was once closed to everyone but the biggest players. The people who can leverage these new digital technologies, in the shortest timeframes, with the best creative contributions, are the people who win and prosper.

And while high performance computing was once only affordable by elite research and development communities, the cost of this technology has dropped significantly, to where parallel computing infrastructures are now extremely cost effective in many commercial markets. These industries include automotive safety testing, oil and gas exploration, drug exploration (bioscience research), and financial trading. Media and entertainment companies are rapidly being added to this list.

**DIGITAL MEDIA TECHNOLOGY SHIFTS**

Smaller digital studios and post-production facilities that are leveraging technology advances are competing aggressively with larger organizations. These smaller studios are producing movies, ads, and special effects with higher quality imaging, smaller budgets, and many different streaming and playback formats — all in less time. Plus, they are environmentally green because less waste is generated by live action scenes going into landfills. Further, some smaller studios are leveraging cloud outsourcers. These outsourcers offer the software, compute, network, and storage resources on a pay-as-you-use basis (for rent), built around high performance computing technologies.

Today, the playing field is being leveled by an evolution away from very expensive, fully proprietary systems to more open and commodity-based tools, thereby dramatically changing the costs of implementing and operating technology. In the sphere of networking, for example, maintaining a separate Fibre Channel network for storage just doesn’t make sense any longer when you can get the same or better performance on a converged 10Gb or 40Gb Ethernet media backbone.
Larger studios see the long-term benefits of these technologies and are deploying clusters within many of their data centers. Below, we outline five of the top technology requirements:

- A central storage repository with media libraries for content repurposing and more structured management of their assets. The most common storage deployed is file based, with either 10 or 40Gbps Ethernet interfaces in support of large infrastructure and network fan in designs.

- Rendering applications for post-production, sophisticated 3D, visual effects (VFX), animation, and finishing. These rendering applications use interconnected servers with high performance Ethernet switching platforms, requiring hosting within the data center based upon a set of power, cooling, cabling, and operational requirements.

- Fast movement of large files (master frames) between artist’s workstations and centralized storage repositories for digital editing. This requires high-speed Ethernet switching using cost-effective twisted pair cabling and large switch buffers to handle network speed changes between office workstations and data center server / storage nodes. Office switches are not built for these types of file transfers.

- Fast transcoding to multiple formats concurrently, as studios see the blurring of content delivery across many media types. This requires a lot of parallel server processing as offered by data center clustering. In the future, distribution derivatives may be dynamically created in real-time.

- 7x24 uptime for all of these use cases (centralized storage, rendering, digital production, transcoding) as studios work around the clock to get their final products delivered to many different types of global markets. Studios are moving many of their CGI technologies into the data center as a result, because data centers are designed around zero downtime. Workstations connected with office/workgroup switches cannot guarantee the same level of service. Clearly there is an increased job dependency on the availability of CGI technologies.

**CLOUD HOSTING PROVIDERS**

- Leverages cloud providers’ IT expertise in place of building a dedicated in-house organization
- Lowers barriers to entry for smaller entertainment companies
- Offers access to high performance infrastructures, including high speed data center switching
- Concerns about security represent one of the biggest barriers to wider adoption outside of educational markets

**DIGITAL MEDIA CONSOLIDATION DRIVERS**

**HIGH-SPEED NETWORKING FOR COMPUTER ANIMATION**

Images created by movie animators, scene designers, and lighting artists require large data sets that must be composited and rendered to create a movie. To shave hundreds of hours of postproduction time, computers running in parallel that are interconnected by high-speed, high bandwidth Ethernet switches, are fast becoming the technology of choice.

The animation is represented digitally via data sets. The data sets include what is in each frame, and the linking together of each frame represents a full-length digitized movie. Computers are...
used to alter each data set (what is inside the frame) and the movement between the frames. A 2K frame’s pixel count is, on average, four times the size of an HD video image and eight times the size used for 3D rendering. For a single frame (1/24 of a second of animation), with four bytes of data per pixel, each frame is hundreds of megabytes in size.

The large number and size of these frames, combined with the need to animate these as a full motion movie (utilizing rendering) drives the need for high performance computing. Hundreds of computers that are connected together are used to split the processing and rendering up into smaller chunks, so that information can be processed in parallel. This saves days, weeks, and often months’ worth of production time.

A full-length feature film with an average length of 90-120 minutes can fill multiple terabytes of storage. For this reason, animated movie productions rely heavily on many multi-core Intel based X86 servers, large file-based storage systems, storage performance scaling with active data caching on flash and solid state disks (SSD), and high performance wire speed networks that scale from a small number of server, storage, and caching nodes, to thousands.

THE NEED FOR SPEED WITH NEXT-GENERATION X86 BASED WORKSTATIONS AND SERVERS

For customers looking to swap out their high-end CGI workstation and/or build a high performance computing cluster, there will be a significant transition in 2012 in which a majority of these servers and workstations will ship with 10Gbps network interfaces embedded directly on the motherboard. Server and high-end workstation manufacturers have realized that the processors within these servers can easily oversubscribe 1Gbps interfaces, thus creating an I/O bottleneck that impacts the performance of their applications.

High-speed 10Gbps Ethernet server and storage networking technologies have matured in the last five years based upon advancements in chip technologies, where the cost and power consumption per port have clear economic advantages over 1Gbps technologies. For approximately twice the price of 1Gbps interfaces, customers receive over five times the performance benefits from deploying 10Gbps networks. And third-generation chip technologies support 10Gbps interfaces that are now compatible with RJ-45 connected Category 5 and Category 6 copper cabling, including auto speed negotiation with 1Gbps legacy ports.

When added together, 10Gbps server interfaces and 1/10/40Gbps switching platforms are rapidly becoming the technology of choice. These offerings have reached industry maturity and deliver backwards compatibility with much better price/performance than legacy 1Gbps networking technologies.

A TIME OF EXPONENTIAL GROWTH IN DIGITAL MEDIA
ARISTA NETWORKS: THE RIGHT CHOICE

Arista switches have many highly beneficial features for studios looking to migrate their CGI and distribution applications to the data center. The most demanding portions of your infrastructure that support applications such as rendering, transcoding, streaming, and centralized asset storage can all benefit from being upgraded to Arista 10Gbps Ethernet switching without having to forklift your entire network.

ARISTA NETWORKS AS THE PREFERRED CHOICE BY PRODUCTION STUDIOS

Arista Networks is the leader in data center networking within the high performance computing market, with hundreds of customers who have deployed Arista data center-class switches for their mission critical applications. Many of these applications require hundreds or thousands of server and compute nodes for crunching data to process millions of messaging streams within nanoseconds, stream hundreds of real time broadcast, video, and movie streams across the Internet, or reliably move large data files between data centers at wire speed. The one thing that all of these applications have in common is the requirement to accelerate time to market for the finished product. This means getting the work done faster with no downtime or network outage. Moreover, getting the work done more efficiently with less administrative overhead. And finally, being able to scale as more demands are placed on the network.

Arista offers a complete line of high-speed, ultra fast 1/10/40Gbps Ethernet switches. These switches are setting a new standard for data center networking, including a broad portfolio of fixed and modular chassis with an Extensible Operating System (EOS) that is common across all platforms. This operating system is both modular and open, allowing fast time to market for the most sophisticated data center switching features. EOS is also customer centric, whereby administrators can create their own scripts and utilities for customizing network configuration and operation. Customers can even download a version of EOS as a virtual machine, to run and test on an X86 server. This offers a low-cost prototyping environment that eliminates many of the traditional impediments to customization.

Arista switches offer many features that are highly beneficial to studios that are looking to migrate their CGI and computer animation applications to the data center. Moreover, customers can integrate Arista switches with 1Gbps switching infrastructures and RJ-45 connected copper cabling, allowing the most demanding portions of their production environment to be upgraded to 10Gbps Ethernet switching without having to rip out and replace the entire network. Arista offers leading technologies in speed buffering when connecting between 1Gbps servers, workstations, and storage devices and newer generation 10 and 40Gbps data center equipment. This buffering is extremely important for ensuring the best possible throughput, as well as for providing investment protection in helping customers gracefully migrate to higher performance networks. Increasingly, customers are requiring a migration strategy to 10Gbps, as newer storage devices such as multi-core, multi-CPU servers will ship with 10Gbps interface cards as part of their base offerings.

Customers can scale their high performance network seamlessly as demand grows by starting with a single tier top-of-rack design using a single RU, high port density fixed switch, and moving to a very efficient and scalable two tier architecture with a leaf/spine design as the number of nodes and racks expand. Arista offers a full line of switches that support both of these architectures. For larger studios, Arista offers the modular 7500 series switching chassis with up to 384 ports of fully non-blocking 10Gbps Ethernet and 1.25 terabits of switching throughput per slot. Moreover, this chassis offers Virtual Output Queuing that ensures low latency traffic flow without congestion. This is very important when rendering between hundreds of servers, and also when moving large content files from storage. The 7500 series modular chassis also offers future proofing for customers who will ultimately require 40 and 100Gbps spine topologies.
ARISTA SOLUTIONS FOR MEDIA AND ENTERTAINMENT

- Modular 7500 platform for large digital rendering farms with an ability to deploy a 2-tier network architecture supporting 50+ server racks
- 384 line rate 1/10G ports at Layer 2 and Layer 3 with load balancing across redundant links
- Virtual Output Queuing and ultra deep buffers for uncongested low latency performance between compute and storage nodes
- N+1 redundancy for all system components
- High density 40G and 100G ready for massive digital content creation and storage consolidation

- Top of rack 7050 switch for high density 10G server and storage rack build outs
- Flexible platform portfolio for both low latency 10G Fiber or lower cost 10GBase-T copper wiring
- Non-blocking wire rate L2/L3 performance for meeting time-to-market pressures
- Low power, efficient cooling, and Zero Touch Provisioning for reduced operational costs

- Top of rack 7048T for connecting CGI workstations to central data center resources
- Deep switch buffers for handling 1Gbps to 10Gbps speed transitions
- Common Extensible Operating System (EOS) across all Arista platforms

ABOUT ARISTA NETWORKS

Arista Networks was founded to deliver networking solutions for large data center and high-performance computing environments. Arista delivers a portfolio of Gigabit and 10/40 Gigabit Ethernet switches that redefine network architectures, bring extensibility to networking, and dramatically change the price/performance of data center networks.

At the core of Arista’s platform is the Extensible Operating System (EOS), a groundbreaking network operating system with single-image consistency across all hardware platforms, and a modern core architecture enabling in-service upgrades and application extensibility.

Arista’s team is comprised of experienced management and engineering talent from leading networking companies. Arista designs revolutionary products in California and delivers them worldwide through distribution partners, systems integrators, and resellers with a strong dedication to partner and customer success.
MEDIA AND ENTERTAINMENT SOLUTION

ACCELERATE YOUR MEDIA PRODUCTION WORKFLOWS

Media and entertainment organizations are constantly looking for ways to increase the business value of their media assets by merging creative talent with technological breakthroughs. Storage infrastructure plays a critical role in the ability to manage, store, and access vast and rapidly growing libraries of media production and programming content for multiple distribution channels, media formats, and consumption models.

Media companies across the globe rely on the EMC Isilon scale-out NAS platform to maximize the value of their assets. EMC Isilon storage solutions, built on the sixth-generation OneFS operating system, can store over 15.5 petabytes of data in a single volume and generate over 85 gigabytes per second (Gbps) of aggregate throughput, with up to 1.6 million IOPS in a single storage system.

EMC Isilon scale-out NAS is extremely flexible to adapt to your organization’s business growth and take advantage of new revenue opportunities, while providing uncompromising protection and availability to ensure business continuity. With EMC Isilon, you can:

- Easily and non-disruptively scale a single file system/single volume on a “pay-as-you-grow” basis from 10 terabytes to over 15 petabytes.
- Generate hundreds of SD, HD, and 2K streams concurrently for ingest, edit, rendering, and play-out access to the same pool.
- Edit in-place: Access single copy during and immediately after ingest.
- Provide simplicity and ease-of-use that extend productivity of one FTE to a multi-petabyte scale.
- Accommodate a wide range of file types and access patterns.
- Enable raw storage utilization rates to over 80 percent.
- Reduce technology “lock-in” risk with multi-protocol access options.
- Facilitate massive concurrent read/write access.
- Gain wide-area content delivery by taking advantage of Isilon’s integrated solution with Aspera software for fast and reliable media transfers over wide-area-networks.

EMC Isilon scale-out NAS solutions, designed specifically to meet the challenges typical of media and entertainment organizations, offer the only “pay-as-you-grow” model for adding storage capacity quickly and easily. EMC Isilon’s range of capabilities for accessing online, nearline, and long-term data helps you to configure just the right solution for your needs, and cost-effectively adapt as your needs change. When it comes to achieving exceptional productivity for media and entertainment workflows, EMC Isilon’s award-winning solutions deliver.

CONCLUSION

Arista switches lead the industry with best-in-class load sharing across redundant links, best-in-class traffic failover when a link fails, highly innovative monitoring and event-driven capabilities, and best-in-class operating system architecture for applying patches or upgrades without disrupting switching. These capabilities are offered irrespective of the platform deployed from Arista because the same binary version of EOS runs across the entire product line, both fixed and modular. Further, Arista is leading the industry with zero touch provisioning capabilities, where newly installed switches can literally auto-configure based on neighboring switch and topology information learned when the switch is first powered up. This auto learning and auto configuration is done securely because no traffic is forwarded until the auto provisioning is complete.

These features are vital as customers increasingly run their mission-critical applications across Arista networks. Arista understands the productivity losses associated with even minutes of downtime. Highly paid artists, designers, and producers have little patience for outages as time-to-market pressures increase.