



Omneon MediaGrid™

Active Storage for Post Production

Omneon MediaGrid delivers unparalleled scalability, performance, availability and manageability and is backed by a company known for its expertise in digital media. Omneon has imbued MediaGrid with “media intelligence” by designing into the product differentiated functionality tailored to media workflow applications: performance optimization for leading edit platforms to enable “edit-in-place,” the ability to access and modify content while it is being transferred onto the platform (e.g. during server ingest) or the ability to transcode or quality check content with the processing power in the MediaGrid system. With these attributes, MediaGrid delivers more than just static content storage; it plays an active role in the production workflow, and is fast becoming the leading central storage for content editing, staging, repurposing and news and sports highlights.

System Architecture

The MediaGrid system architecture takes the concept of clustered storage to a whole new level, with a design that harnesses the collective storage, bandwidth and processing power of multiple interconnected nodes all working together as a single cohesive pool. This multinode performance is enhanced with a highly distributed, virtualized file system that presents the collective capacity of all nodes as a single unified namespace.

MediaGrid is based on a distributed design that effectively eliminates bottlenecks by allowing different functions to be performed by different components of the system. By separating major functions of a storage system into distinct components, each optimized for a specific function, MediaGrid is able to deliver levels of performance, resiliency and manageability that far surpass traditional storage systems. MediaGrid is based on the following core components:

- **ContentDirectors** – file system controllers that manage all file system information and present a single global namespace.
- **ContentServers** – individual servers containing storage capacity, network access bandwidth and processing power.
- **File System Driver** – a software agent available for individual client workstations or servers to allow optimized file system operations. The File System Driver extends the MediaGrid to clients and eliminates the need for any NAS-head-type bottleneck.

Each of the above components are designed to perform a specific task with respect to storage system activities, and yet all work together to deliver the highest levels of performance. This distribution of work ensures that no single component can become overloaded with tasks, especially as the number of clients increases.

BENEFITS

Massive Scalability

Aggregating the performance of multiple nodes delivers multiple petabytes of storage capacity combined with multiple gigabytes per second of bandwidth.

High Availability

Dynamic Data Redundancy ensures multiple active copies of content at all times and delivers unprecedented data recovery speeds.

Ease of Management

The highly distributed and virtualized file system enables simple expansion and eliminates the need for file system reconfiguration when new capacity is added or disks are replaced.

Media Intelligence

Leveraging a decade of media industry expertise from Omneon, MediaGrid has been designed to deliver optimal performance for today’s highly demanding digital media workflows.

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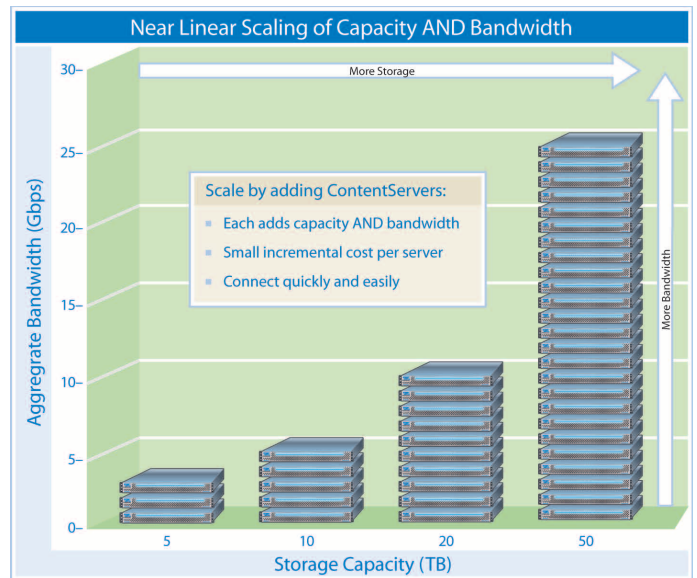
www.omneon.com/MediaGrid

PRODUCT OVERVIEW

Scalability

The MediaGrid architecture delivers tremendous storage capacity as a result of its modular, grid-based approach. By aggregating the capacity of many individual ContentServer storage units all connected over a standard network infrastructure, MediaGrid total system capacity can scale from a few terabytes to multiple petabytes within a single file system.

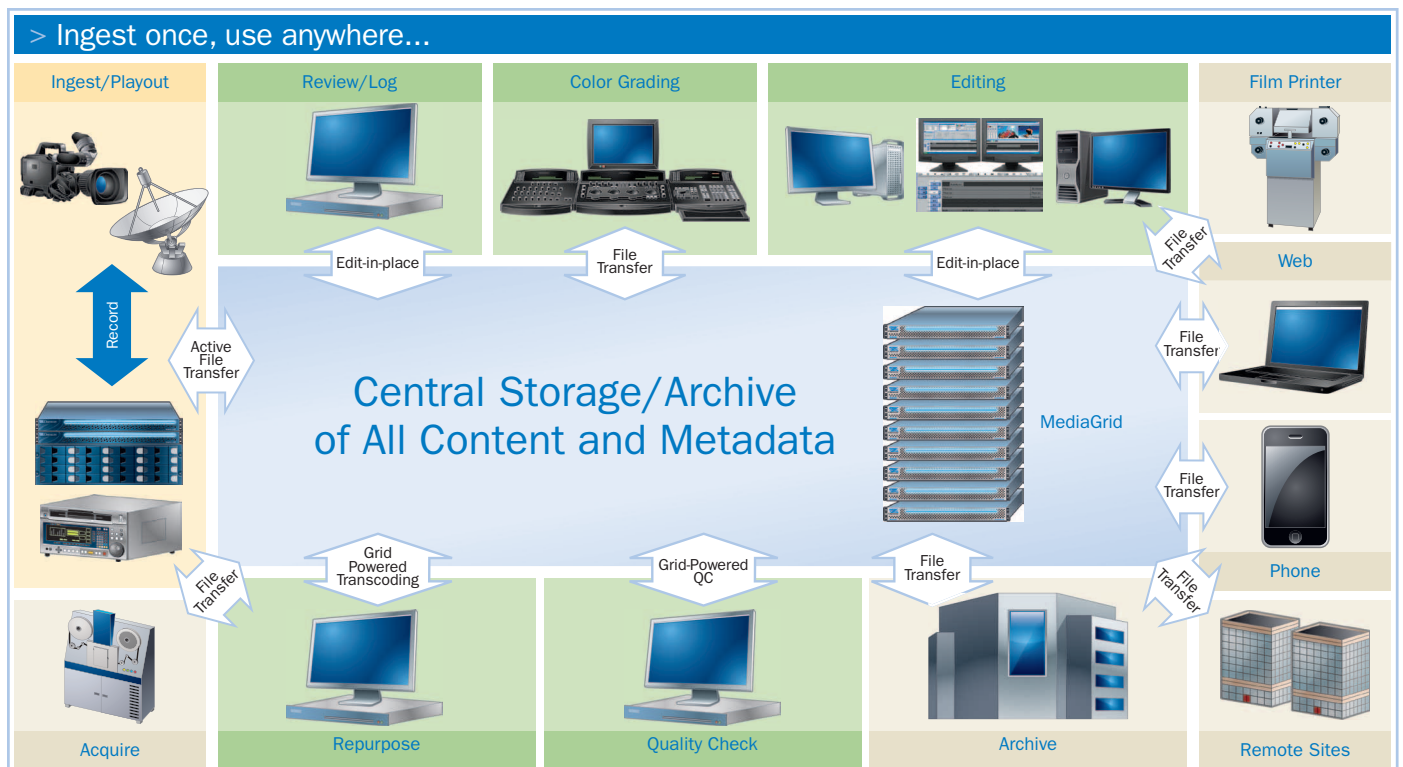
An entry-level system starts with six ContentServers providing 12 TB of usable capacity and 600 megabytes per second of client access bandwidth – from there bandwidth scales in 100 MB/s increments. Simply add more ContentServers to the system and bandwidth, capacity and processing power will grow linearly in the desired increments. ContentServers come with either four, 12 or 24 disk drives per enclosure, with a range of disk drive sizes available. As higher capacity drives are introduced in the future at a more attractive price/GB, higher capacity ContentServers or even higher capacity replacement disks can be added to an existing MediaGrid system without interrupting operations.



Performance

MediaGrid is specifically designed to deliver high bandwidth to multiple clients who need fast access to material for production or repurposing activities. MediaGrid enables clients to communicate directly with ContentServers instead of forcing access through NAS heads that might limit available bandwidth. Even with clustered NAS architectures, aggregate bandwidth is limited to the bus speed of the backend communications network. MediaGrid eliminates such bottlenecks by allowing clients to pull content, in the form of slices, directly from multiple ContentServers.

In addition, MediaGrid makes available all copies of each slice stored on the system (the specific number set by the user-configurable redundancy factor), so clients have multiple sources for data and can avoid contention with other clients. Built-in load balancing ensures that slices are evenly distributed throughout the system to avoid any bottlenecks.



MediaGrid at the core of an active media workflow

Reliability and Availability

The storage industry has continued to push RAID or variations of RAID as the primary mechanism to deliver system reliability and data protection. While RAID has delivered data protection, the performance penalty during recovery procedures has become a key issue.

To address this challenge, MediaGrid uses the concept of Dynamic Data Redundancy (DDR): once content is written to the system, it is immediately replicated one or more times depending on the DDR factor specified. DDR places multiple active copies of the content in multiple locations, which correspondingly increases accessibility and availability to every file. Multiple copies ensure complete redundancy and speed data recovery in the event of a disk or ContentServer failure.

For comparison, the content on a failed 500 GB drive will typically be replicated within MediaGrid in minutes. Traditional RAID systems might take many hours to rebuild lost data, and even enhanced RAID-based systems take multiple hours under comparable configurations. During this rebuild time, performance on RAID systems suffers.

Ease of Use and Management

The MediaGrid design simplifies operation and management, using its highly distributed and virtualized file system to present a single global namespace to all clients. Administrators never have to restripe or reconfigure the file system when new storage capacity and bandwidth is added; they simply add new ContentServers and the new capacity and bandwidth is automatically incorporated. Connectivity is offered over a single common Ethernet network, which eliminates the need to manage more than one network as required with other storage platforms (e.g. backend network for intra-cluster communication). Omneon system configuration and management tools provide intuitive GUIs for administrators to use when setting policies and monitoring system performance. This includes setting directory- and user-based quotas, replication factors, security policies and more.

Grid-PoweredSM Performance

MediaGrid adds even further value by acting as a distributed computing platform for media processing applications that can run directly within the system. MediaGrid enables this functionality with the MediaGrid Processing Framework, a software interface that makes use of the processing power within ContentServers. In addition to its own ProXchangeTM transcode application,

Omneon is engaged with third parties that are developing applications in areas such as transcoding, up/down/cross conversion, graphics rendering and quality control. MediaGrid customers who deploy such applications realize several benefits:

- *Acceleration in application performance given their ability to use tens to hundreds of ContentServer processors per system*
- *Elimination of separate digital islands of processing and storage that would otherwise have to be qualified, networked, managed and maintained*
- *Simplification of the workflow by minimizing file transfers that need to be managed between the storage system and any external processing systems*

With all these capabilities, MediaGrid delivers more than just content storage—it plays an active role in the post production workflow.

High-Performance Format Transcoding

Omneon ProXchangeTM is a high-performance transcoding system specifically designed for high-volume multi-format media environments. As the first application to take advantage of the combined storage and processing architecture of Omneon MediaGrid, ProXchange delivers grid-based transcoding of media files stored within MediaGrid. ProXchange can transcode media files between a wide range of DV and MPEG-2 formats, including both SD and HD, as well as additional low-bit-rate distribution formats such as H.264. The scalable architecture of MediaGrid enables ProXchange to bring new levels of performance by distributing jobs across multiple processors in a MediaGrid active storage system.



MediaGrid Components: ContentDirectors

ContentDirectors manage and direct the overall operation of Omneon MediaGrid by creating, managing and presenting a single virtual file system and providing the information needed by clients to interact with the system. During write operations, ContentDirectors provide clients with pointers to target ContentServers using a heuristic algorithm weighing dynamic usage factors, including ContentServer load and capacity. This approach actively load balances the available storage and bandwidth of the system, and eliminates bandwidth bottlenecks commonly found in traditional NAS or clustered NAS storage systems. During read operations, ContentDirectors follow a similar algorithm to supply a performance-optimized list of target ContentServers containing the required data. In all cases, clients are able to interact directly with multiple storage elements to avoid performance bottlenecks.

MediaGrid Components: ContentServers

ContentServers are the actual storage devices within MediaGrid and provide high-bandwidth access to content. Each ContentServer contributes storage capacity, network bandwidth and processing power for file serving and the MediaGrid Processing Framework. Different types of ContentServers, optimized for either bandwidth or capacity, are available to meet the facility's bandwidth vs. storage capacity requirements. Additional design flexibility is enabled by support for multiple disk-drive sizes on each ContentServer model and the ability to create systems with a mix of these models.

Model Name	Model Number	Unit Size/Capacity	Processor	Memory	Network Connectivity
High Bandwidth ContentServer	CSS 1024	1RU height 4 disk drives	1 x Intel Pentium 4	2 GB	2 x 1GbE ports
Hybrid ContentServer	CSS 2122	2RU height 12 disk drives	1 x Quad-core Xeon	4 GB	2 x 1GbE ports
High Capacity ContentServer	CSS 1242	4RU height 24 disk drives	1 x Intel Pentium 4	2 GB	2 x 1GbE ports

SystemManager and ContentManager

Omneon SystemManager handles system management functions for all Omneon hardware platforms and application servers, including MediaGrid. This includes configuration, connectivity, security, fault and performance management. Configuration management deals with network topology, the "state" of the network, device names, end-to-end connections, bandwidth and other related network configuration tasks. Fault management handles detection and correction of network problems through error detection processes and diagnostic testing.

ContentManager is an easy-to-use Windows-based application for setting, reviewing and changing attributes on files, directories and user permissions within MediaGrid. Administrators can set file or directory level "replication factors" for data protection and to increase client-access bandwidth to content. User and group permissions are established by creating Access Control Lists (ACLs) that can be applied both to human users and automated systems. ContentManager also provides a comprehensive logging feature for troubleshooting system issues. Activity logs record all information related to file and user operations. Log level severity can be set to record all minor or major events within a file system to facilitate quick identification of errors and issues.



U.S. Headquarters:
1237 E. Arques Ave.
Sunnyvale, CA 94085
ph +1 866.861.5690
ph +1 408.585.5000
fx +1 408.585.5099

Europe:
5 Lindenwood
Chineham, Basingstoke
RG24 8QY United Kingdom
ph +44 1256.347.400
fx +44 1256.347.410

Japan:
Ginza 3-Chome Bldg. 8F
3-14-1 Ginza, Chuo-ku
Tokyo 104-0061 Japan
ph +81 03.5565.6735
fx +81 03.5565.6736

Asia/Pacific:
20 Loyang Crescent
Singapore 508984
ph +65 6548.0500
fx +65 6548.0504