mogul

whitepaper
/
storage

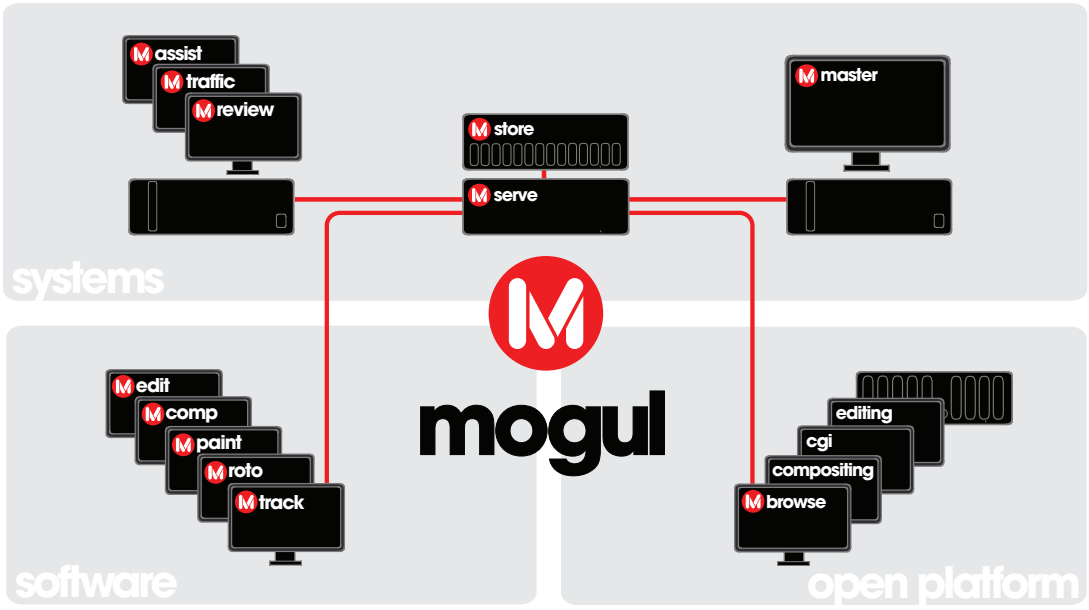
Introduction

This whitepaper discusses strategies for acquiring storage for mogul, as well as pros and cons of local storage and shared storage in relation to mogul systems. Finally some guideline bandwidth requirements are outlined.

About mogul

mogul is the industry's first collaborative VFX architecture to provide an open platform that unites common design facility talents, such as editing, compositing, 3D design and modelling, and empowers designers in a new VFX workflow that more closely fits the way artists work.

Additionally, mogul enables powerful new collaboration capabilities critical in today's deadline-intensive, and fiscally demanding business climate and offers an innovative new subscription-based pricing model, ensuring mogul is accessible, viable and affordable for facilities of any size or budget.



mogul is comprised of a powerful combination of system-level and desktop application-level components, tightly integrated to optimize the creative collaborative workflow experience. Key systems components will include: a collaborative shared storage management system; a powerful file browser application designed for working with media and metadata; a disk-based playback and review system that includes tools for quality control and annotation; a highly interactive finishing system with I/O, 3D compositing, editing, and grading tools; and a dedicated I/O system, with capture, layback, encoding and job duplication, all on a dedicated workstation.

Modular, integrated cross-platform VFX desktop applications that seamlessly plug into the mogul architecture will include rotoscoping, 2D and 3D tracking, paint, and node-based compositing – all built on mogul's powerful new 3D engine.

mogul is an open architecture, and provides a path for all users – of Imagineer Systems current products, as well as those from discreet, Avid, Quantel, and many others – to embrace a tightly integrated, collaborative, inclusive and highly effective visual effects workflow.

Choosing the right storage solution is key to unlocking mogul's potential.

Acquiring storage

A number of vendors offer a variety of local and shared storage solutions. Traditionally these solutions are purchased outright, as storage is a fundamental part of a facility's infrastructure. Consequently, this approach remains valid in many cases.

The decision making process for purchasing storage solutions is often difficult, as one has to predict future requirements to ensure that the system is not scaled too big (higher cost) but at the same time will meet the requirements of the facility 2 or 3 years from now (high replacement cost).

Local vs shared storage

When planning the infrastructure for a facility, careful thought need to be given to the type of storage to which you will be connecting the individual workstations and servers. Let's start with the question of local vs shared storage.

Local storage

Local storage are usually attached via Serial Attached SCSI (SAS) or Fibre Channel.

Pros of local storage	Cons of local storage
Easy to guarantee that the storage will deliver the necessary throughput	Difficult to achieve seamless workflow as files will have to be copied onto local storage device before playback
Lower cost than shared storage	Copied media occupies extra disk space leading to an overall increase in disk capacity required in the facility

Local storage options include mogul/store modules, which are JBODs connected over SAS to a mogul system. These are fully certified and can be subscribed for along with other mogul components

Shared storage

Shared storage is usually attached via Fibre Channel.

Pros of shared storage	Cons of shared storage
Easier to achieve a seamless workflow as new media is immediately visible to all workstations	More expensive than local storage
Avoids time and disk capacity spent on copied media	Cost of scaling the system to provide the bandwidth required can be high
	Reserving bandwidth for particular systems may not be possible

Planning your mogul storage solution

As the mogul platform is very flexible and used in a variety of scenarios, there is not a single ideal solution that fits every facility.

Aspects to consider

Key considerations when choosing a storage solution should include:

- Connectivity
- Scalability
- Bandwidth
- Workflow
- Archiving
- Planning for transition

As part of the planning process, many questions do arise, such as:

Does the solution have the connectivity options required?

Typically we connect to storage devices using Fibre Channel or Serial Attached SCSI (SAS).

How scaleable does the storage solution need to be?

This is mainly a concern with shared storage solutions, as requirements tend to change as a facility grows (or shrinks!)

What bandwidth is required?

For single workstation setups with fixed bandwidth requirements, there are straightforward solutions in terms of local storage. For workgroups with a mix of systems requiring a minimum bandwidth and workstations with more flexible bandwidth requirements, careful thought is due.

Can the solution allocate bandwidth to a specific system?

Can that bandwidth be freed up when the system is not in use?

How will a particular choice of storage impact the workflow in the facility?

With shared storage solutions a more seamless workflow can be achieved, but if not scaled sufficiently or not reliable enough it can decrease productivity.

Too often the storage question is considered dealt with when we have decided on an on-line storage solution that serves the system or workgroup with media relating to current projects. Archiving, however, is an important aspect of the storage question as we need to efficiently backup and restore inactive projects. This also applies to the scenario where use of a storage solution is discontinued.

Example - mogul/review

We can use mogul/review as an example of a system that has a specific bandwidth requirement.

mogul/review requirements	
Connectivity	mogul/review systems offer two connection options: a) Fibre Channel - ideal solution when connecting a mogul system to an existing SAN or RAID device b) SAS - a lower-cost solution when connecting a mogul system to a JBOD or mogul/store device
Bandwidth	The following are guideline data rate requirements: 2K RGB 8-bit TGA: 220 MB/s 2K RGB 10-bit DPX: 300 MB/s 2K RGB 16-bit OpenEXR: 440 MB/s 2K RGB 32-bit OpenEXR: 880 MB/s For 4K, multiply the above numbers with 4.
Filesystem	mogul components are filesystem independent, but for optimum performance we recommend StorNext or XFS.

Now let's examine the options in the context of the needs of mogul/review.

local storage	shared storage
Easy to scale to deliver the necessary bandwidth and capacity	Easier to achieve a seamless workflow as new media is immediately is visible to the review system
Lower cost than shared storage	Avoids time and disk capacity spent on copied media
Difficult to achieve seamless workflow as files will have to be copied onto local storage device before playback	Cost of scaling the system to provide the bandwidth required can be high
Copied media occupies extra disk space leading to an overall increase in disk capacity required in the facility	Reserving bandwidth for particular systems may not be possible
In a scenario where the system modifies the media, we may need to copy the files back and may end up with another system that requires to be backed-up	

Example - mogul/serve

We can use mogul/serve as an example of a system that can either have local storage attached and act as the meta data server of this local storage to turn it into shared storage, or participate as a client in a dedicated shared storage solution.

mogul/serve requirements	
Connectivity	mogul/serve systems offer two connection options: a) Fibre Channel - ideal solution when connecting a mogul system to an existing SAN or RAID device b) SAS - a lower-cost solution when connecting a mogul system to a JBOD or mogul/store device
Bandwidth	Heavily dependent on number of users and requirements of specific systems attached
Filesystem	mogul components are filesystem independent, but for optimum performance we recommend StorNext or XFS.

Now let's examine the options in the context of the needs of mogul/serve.

local storage	shared storage
Lower cost than shared storage	Scales better to larger workgroups than locally attached storage as media is transferred directly between the client and the shared storage
In this scenario, mogul/serve acts as the meta data server and SAN/NAS head unit of the filesystem, therefore bandwidth will be restricted by the bus speed of the server (approximately 900MB/s)	Higher cost than attaching local storage to mogul/serve Cost of scaling the system to provide the bandwidth required can be high Reserving bandwidth for particular systems may not be possible

Conclusions

Choosing the correct storage requires careful consideration, and often the choice is only the correct one for a limited period of time as requirements are likely to change. This makes the decision to invest large sums of capital in a particular solution a truly daunting task.

mogul offers an alternative approach, which is to acquire storage by subscription, in the same way as other mogul components. This offers a lower entry cost than purchasing the storage and adds flexibility in that storage can be scaled up, down and even replaced as required[1], within the terms of the subscription agreement.

mogul/store modules can be used as locally attached storage for standalone system installation scenarios, such as installing a single mogul/review system in a desktop compositing or 3D graphics workgroup.

When connected to mogul/serve, mogul/store modules can be shared as mogul/serve will act as a SAN/NAS head unit. This offers a realistically priced shared storage solution for small to medium sized workgroups using mogul/serve.

For larger workgroups, dedicated SAN solutions from vendors such as Isilon, Bright Systems, Maximum Throughput, Data Direct and DVS are worth investigating and will work with all mogul components.

[1] mogul projects and meta data is stored on the storage device in industry standard formats, such that if you decide to scale down the storage you have subscribed for, data can be archived elsewhere before the storage device is returned, whilst the data is still accessible with standard tools.