Resource Provider Spotlight: Globus Storage & IT Services

GlobusWORLD 2012

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State of Affairs

• Working relationships in science divisions, Computation Institute
  • ATLAS
  • Ad hoc support to individual PIs

• “Research Storage”
  • In the wind (but not here yet): Institutional Archive
  • Enterprise NAS (EMC² Isilon)
  • Highly available, highly scalable, highly priced
  • Goal: make mid-scale, reliable storage available for critical data
Approach

• Globus Online plan
  • Globus Transfer opened 2011
  • Globus Storage in development

• Mutual interest in collaboration
  • Globus wish: a pattern of institutional/commercial provider cooperation
  • ITS wish: better integration with IT partners and resources
  • Shared technological experiences and interests
Approach

• Proposal
  • ITS provide Isilon for Globus Storage pilot & production
  • Upon launch, ITS becomes a campus provider of storage resources via Globus Online
  • Jointly develop “retail” model for access and growth

• Benefits
  • Globus: additional storage backend
  • Globus: foundation for developing service models
  • ITS: partnership with domain leaders
  • ITS: platform experience
Campus Provider Overview

- Incremental approach to service provisioning
- Simple deployment

- Pure infrastructure — who can say no?
Globus Storage Architecture
Globus Storage Architecture

- **Filesystem Emulation**
  - Access portal (UI) requests named files
  - Name Mapper maps named files to objects identified by UUID
  - Access Broker manages policy for requested object
Object Management
- Replication Manager may distribute multiple copies of object across disparate object stores
- May choose object store based on network proximity or other factors
- Replication and proximity policy selectable by user

Object stores may have differing policies
- User eligibility (institutional vs commercial)
- Backup policy
- Retention
- Etc.
Globus Storage Provider Architecture

Object Store (IT Services)

Transport VM
- GridFTP service
- NFS client

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VMware ESX platform

Isilon NAS
Globus Storage Provider Architecture

- Isilon Storage Array (EMC²)
  - A simple, file level, scalable NFS service
  - Node-based clustering: higher throughput using multiple pipelines
  - 10 TB space for Globus Storage pilot, exported to Transport VMs
  - Total platform capacity easily expanded
  - Easy to extend allocation to the Globus Storage project as needs change
Globus Storage Provider Architecture

- **Transport VMs**
  - Simple Linux servers; no variation from enterprise profile
  - RHEL 5.7, because no special needs
  - Uses GridFTP for transport to Globus Online
  - Multiple instances to meet pipelining expectation of Isilon cluster due to node based architecture
Globus Storage Provider Architecture

• Performance
  • Ideally, one transport VM per Isilon node
  • ESX hosts are Dell server blades
  • Blade chassis has 10G direct to data center core
  • Virtualization allows best match between Isilon node and I/O share in server chassis
Globus Storage Provider Architecture

- Globus components from EPEL
  - Fedora project, Extra Packages for Enterprise Linux
  - Standard software distribution point for our environment; no extra requirements
  - Straightforward GridFTP installation with single local user mapped by /etc/grid-security/grid-mapfile
  - Easy to set up, but does require a trusted certificate
Caveats

Certain responsibilities are delegated to Globus Online:

- Only GO has visibility into per-user resource utilization
  - Campus Provider has aggregate view
  - Affects chargeback — easiest for GO to proxy billing
- Only GO has control of object storage
  - Individual objects have no metadata properties at provider end
  - Affects access management and quotas/allocations
Campus Provider Benefits

- Lowers Provider’s cost for additional storage capacity
- Single relationship to manage
  - Provider works with Globus Online, not with users — even though they are our own users
- Single charge point
  - Globus Online pays Provider for aggregate use, rebills for individual use
Lessons Learned

• More testing needed
  • Sizing of transport servers is not tuned to workload
  • How many GridFTP servers are needed for optimum bandwidth?
  • How does resource consumption of VMs correspond to physical hosts under full workload?
  • Is virtualization the right approach?
  • Impact to enterprise workload: must scale these transport servers to have predictable maximum effect on the infrastructure as a whole
Future Plans

• Science DMZ placement
  • High throughput
  • Less restrictive access
  • Colocated with related applications, data

• Separate physical server infrastructure
  • Dedicated to science data flows
  • Easier management
  • Lower potential impact to enterprise

• Improved throughput to storage
  • Second Isilon array
  • Use Isilon replication for enhanced data protection
Future Plans

- Integration of Globus metadata with campus IDM
  - Automatic availability
  - Means of asserting metadata to Globus (allocation size, eligibility, groups)
- Closer proximity of Globus Storage software to array
  - Meeting with EMC\(^2\) at SC11
  - Build Globus Storage/Globus Transfer target embedded within Isilon shell
Suggested Enhancements (Wishlist)

• Capacity and Performance Planning, Insight, Reporting
  • Users choose where data goes at Globus Online; no mechanism to check whether provider is supplying adequate capacity and per-workload performance
  • Local analysis tools can only discern aggregate utilization
  ➢ Need a resource administrator interface to the metadata services behind Globus Storage

• Data Management
  • Legal restrictions, HIPAA, etc.
  • May have data that should not be backed up to our central systems
  • May have data that should not be stored extra-institutionally
  • Provider may have accountability to authorities for data provenance and residence
  ➢ Need provider interface to classify data and flag it for specific policies
Try This at Home

• IT: fulfill service mission without talking to users
  • IT departments are good at providing core service
  • IT departments are less good at matching service to need

• Globus: compelling product but limited resources
  • Globus Online depends on external resource providers
  • Providers with existing commitment to mutual customers are cheaper to work with
  • By lowering cost to provider, provider is easier to work with

• Research: single entity managing data
  • No IT required
Questions?