

# Opportunistic Use of Storage in the Open Science Grid

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# Types of Storage in the OSG Context



User's Storage



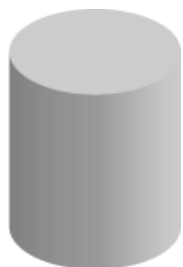
Worker Storage



Storage Element



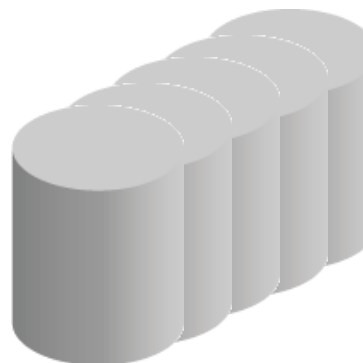
Repository



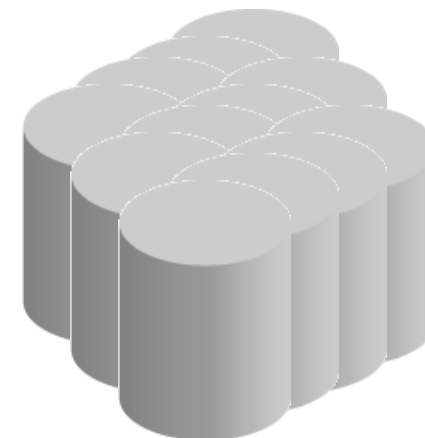
-Desktop  
-NFS



-/tmp  
-Software  
-NFS



-Owned  
-Leased  
-Public



To stage data

# When to use Opportunistic Storage

- The same data is used many times by different jobs.
- Data amount is so large that WAN gridftp is not efficient.
  - Transferring data separate process from computing.
- VO's application software is large and cannot be loaded efficiently per-job.
- Worker node temporary storage is not sufficient for the files to be accessed.
- VO does not have the resources to keep the data in an accessible form.
- VO moving from a custom architecture to one more broadly supported

# Components of Opportunistic Storage

- ✓ Compute Elements with Storage Elements
- ✓ Proxies for authentication
- ✓ Authorization
- ✓ Storage Management
  - Space Reservation (SRM v2.2)
    - Size
    - Lifetime
    - File Attributes
    - Storage Area Attributes

# Site Options

## A) Leased space reservation made by site administrator

- How is request made from VO to site?
- Implied Service Level Agreement

## B) Public space reservation made by site administrator

- All transfers to use the same space token
- Difficult to recycle space

## C) Storage area made by site administrator

- Users authorized to make space reservations in it
- May recycle space in expired reservations

## The User's Viewpoint, Case A

1. Discover which sites offer leased space. (How?)
2. Request storage space of a size, lifetime. (How?)
  - Implies adherence to site policy
3. Receive acknowledgment.
4. Discover space token (information service)
5. Use space token to write files
6. Relocate needed files before expiration of space reservation

## The User's Viewpoint, Case C

1. Discover which sites offer public space.
2. Request storage space of a size, lifetime. (SRM client)
  - Implies adherence to site policy
3. Receive space token.
4. Use space token to write files
5. Relocate needed files before expiration of space reservation

# Profiles - Matching Job Attributes to Storage Attributes

## Basic: matching is implicit

<i>Basic Job Storage Profile</i>
Total Input File Sizes
Total Input File Lifetime
Total Intermediate File Sizes
Total Intermediate File Lifetime
Total Output File Sizes
Total Output File Lifetime
Job Running Time
Available Control Protocols
Available Access Protocols
VO Membership



<i>Basic SE Profile</i>
Information Service SE Element
Space Reservation
Space Reservation Discovery
Storage Area Free Size
Storage Area Reservation Lifetime
Supported Control Protocol
Supported Access Protocols
Authorized VOs

<i>Basic CE Storage Profile</i>
Local Storage Size
Local Storage Lifetime

# Standard: explicitly matched

<i>Standard Job Storage Profile = Basic plus ...</i>
Input Number of Files
Intermediate Number of Files
Output Number of Files
Number of New Files
Number of Modified Files
Rate of File Opens
Number of Simultaneous Open Files
Number of Streams per File
Total Size In per Protocol
Total Size Out Total per Protocol
Requires Site Status Monitoring
Requires Transfer Status Monitoring
Requires Transfer Progress Monitoring
Min Service Level Profile

Basic match  
plus



<i>Standard SE Profile = Basic plus ...</i>
Max Number of New Files
Max Number of Modified Files
Max File Access Lifetime
Max Rate of File Opens
Max Number of Simultaneous Open Files
Max Number of Streams per File
Max In Size Total per Protocol
Max Out Size Total per Protocol
Supports Site Status Monitoring
Supports Transfer Status Monitoring
Supports Transfer Progress Monitoring
Service Level Profile

# Advanced: Optimized

## Include more job and SE attributes, additional profiles

<i>File Access Profile</i>	
Size	Access Latency
Version Frequency	Retention Policy
Lifetime	Quality of Service
Useful Portion	Disposition
Aggregate Access Pattern	Shared by Multiple Jobs
Aggregate Access Frequency, or Popularity	Shared by Multiple Users
Aggregate Access Types, or Topology	Shared by Multiple VOs
File Lifetime for Multiple Job Access	

<i>SE Host Profile</i>
Number of Doors
Number of Pools
Clock Rate
Memory
Internal Bandwidth
External Bandwidth
System Load
Bottleneck Load
Network Topology

## Conclusion

- Space Reservation is a start.
- May need tools for handling larger reservations
- May need software for Job/SE matching
- Bandwidth reservation?