

More material:  
<http://gonium.net/md>

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What is Grid  
Computing?

6

Virtualization

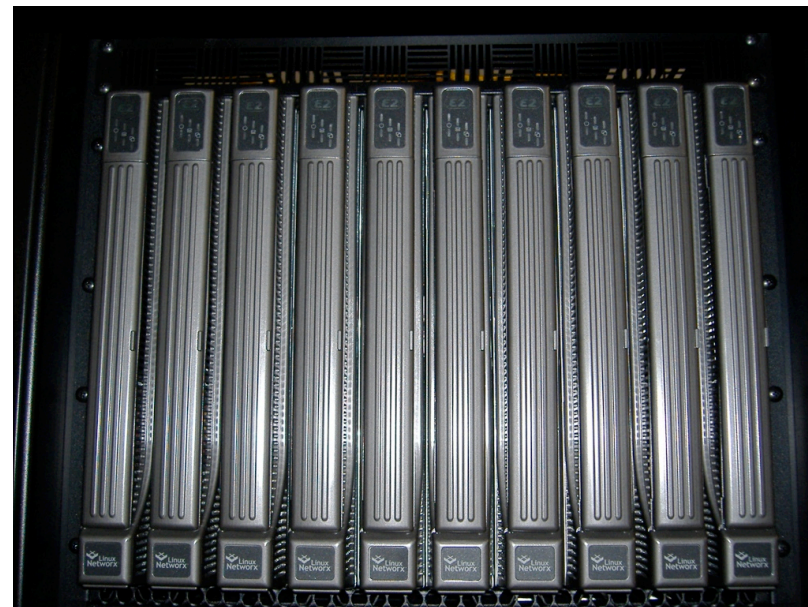
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Grid problem:  
coordinated resource  
sharing and problem  
solving in dynamic,  
multi-institutional  
virtual organizations.

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# coordinated resource sharing and problem solving

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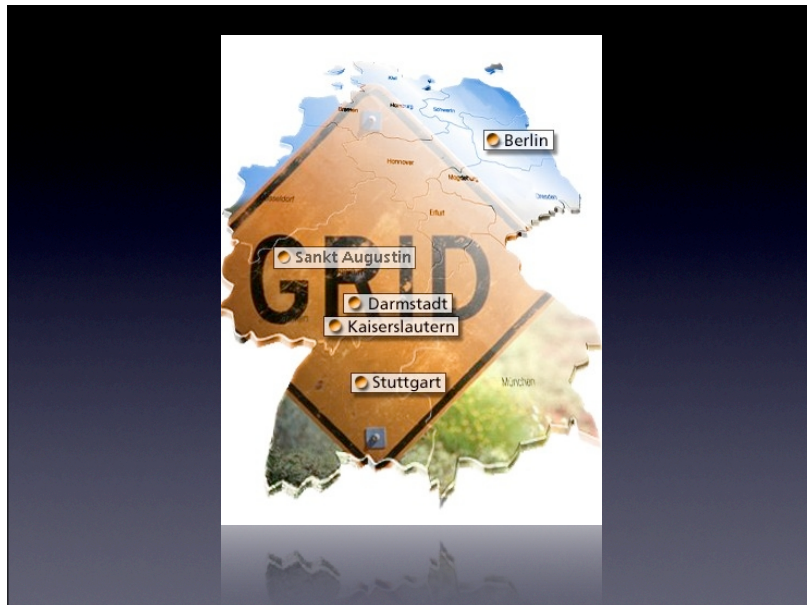
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coordinated resource  
sharing and problem  
solving

13

in dynamic, multi-  
institutional virtual  
organizations

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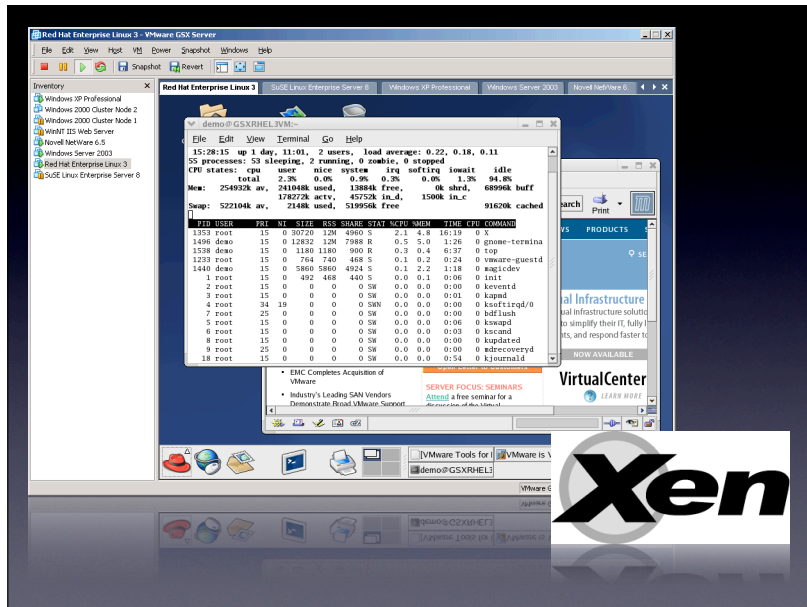
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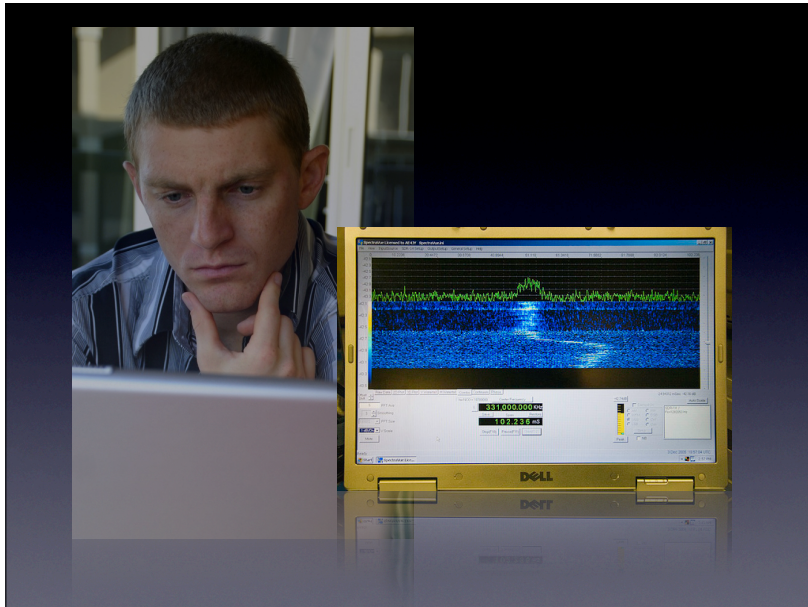
in dynamic, multi-institutional virtual organizations

Virtualization?



The screenshot shows the Merriam-Webster OnLine website. The main navigation bar includes links for Merriam-Webster ONLINE, Merriam-Webster COLLEGIATE, and Merriam-Webster UNABRIDGED. Below the navigation bar, there is a search bar and a list of products. The definition of 'virtual' is displayed:

vir-tu-al:  
 1: being such in essence or effect though not formally recognized or admitted <a virtual dictator>  
 2: ...



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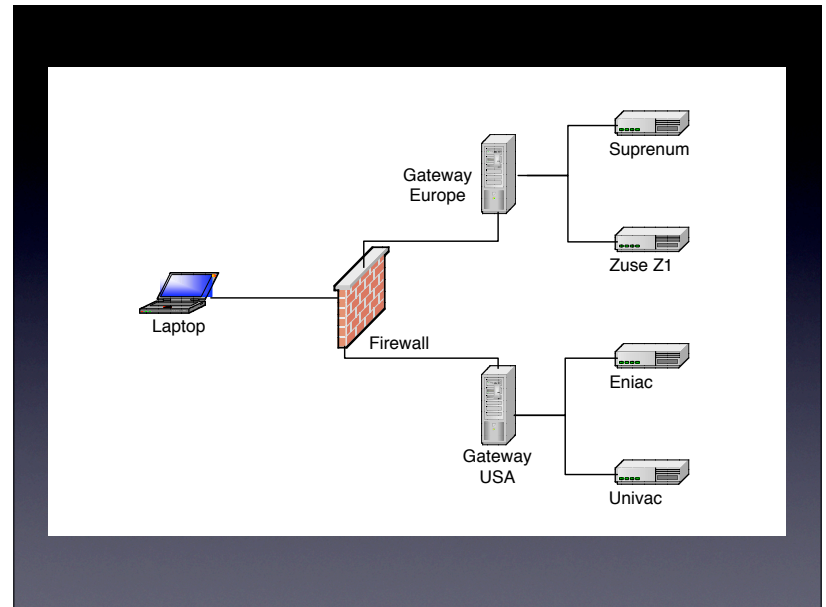
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# Grid Characteristics

- Distributed Systems
- Site Autonomy
- But also: High security
- Virtual resources in a pool

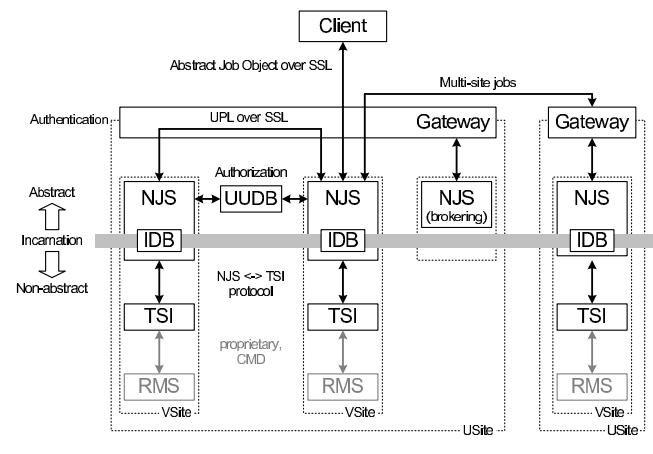
 A map of Germany is shown with a grid overlay. The word "GRID" is written in large, bold letters across the map. Several locations are marked with dots and labels: Berlin, Sankt Augustin, Darmstadt, Kaiserslautern, and Stuttgart.

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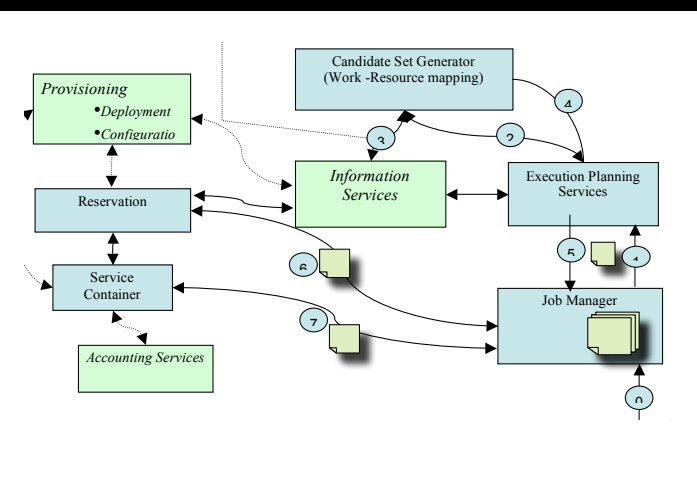
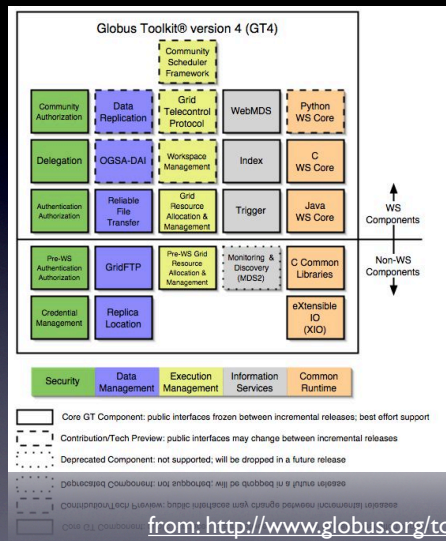


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# Demo



Streit et al.: Unicore - From Project Results to Production Grids



GGF OGSA-WG: Open Grid Services Architecture Draft V1.5

# Key problems

- Security
- Resource Management
- Data Management
- Information Services

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# Grid Security

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Security = Encryption  
+ Authentication  
+ Authorization  
+ etc.

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# Encryption

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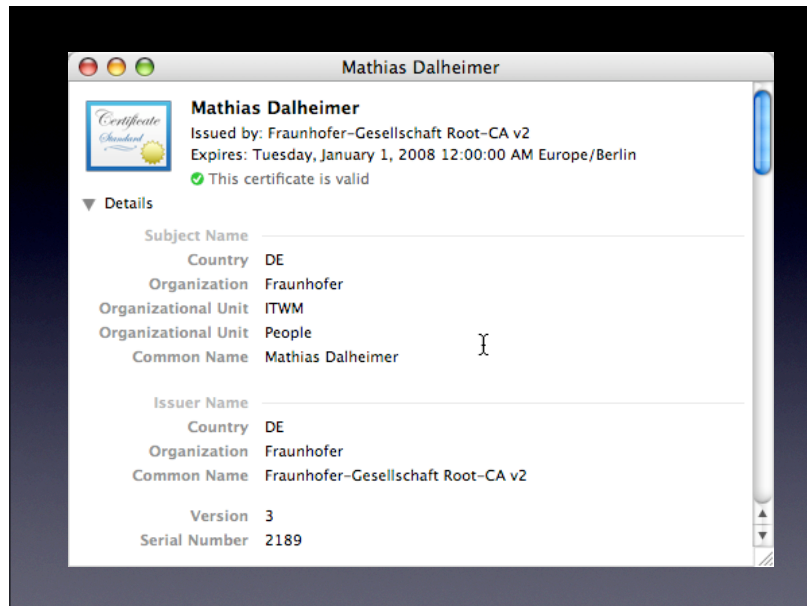


# Authentication

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# Passport: X.509

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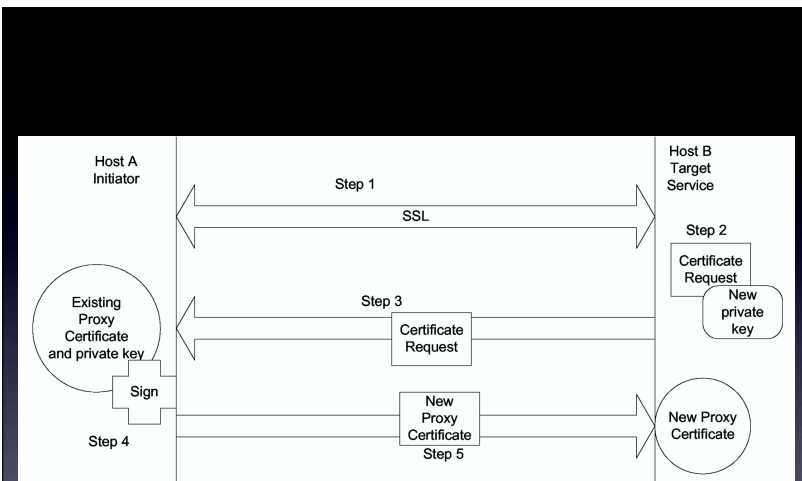


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# X.509 is not enough

- Dynamic delegation of rights to a service
- Delegation to dynamically generated services
- Solution:
  - Different signatures (Unicore)
  - Proxy certificates (Globus)

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Welch et al: X.509 Proxy Certificates for Dynamic Delegation

Security = Encryption  
+ Authentication  
+ Authorization  
+ etc.

Authorization

DN -> Privilege  
mapping

Security = Encryption  
+ Authentication  
+ Authorization  
+ etc.

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Grid Resource  
Management

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What is a grid  
resource?

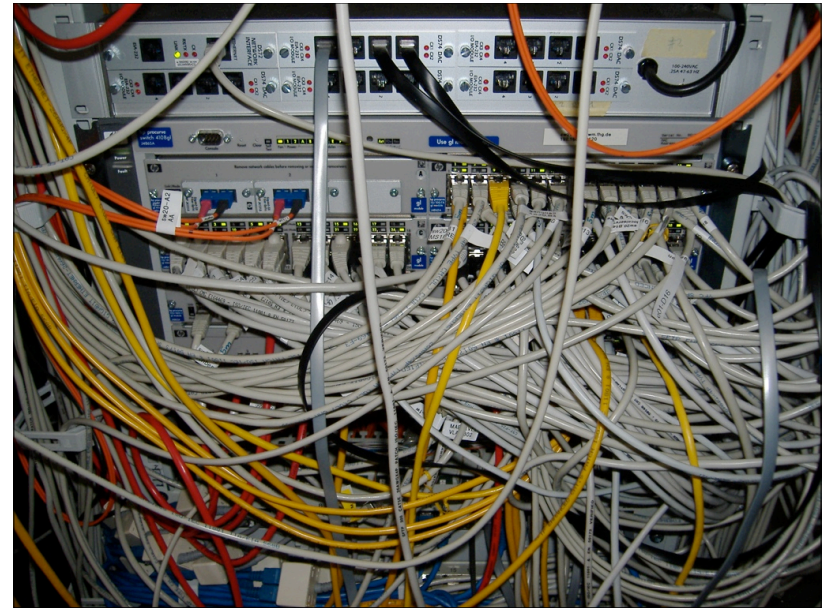
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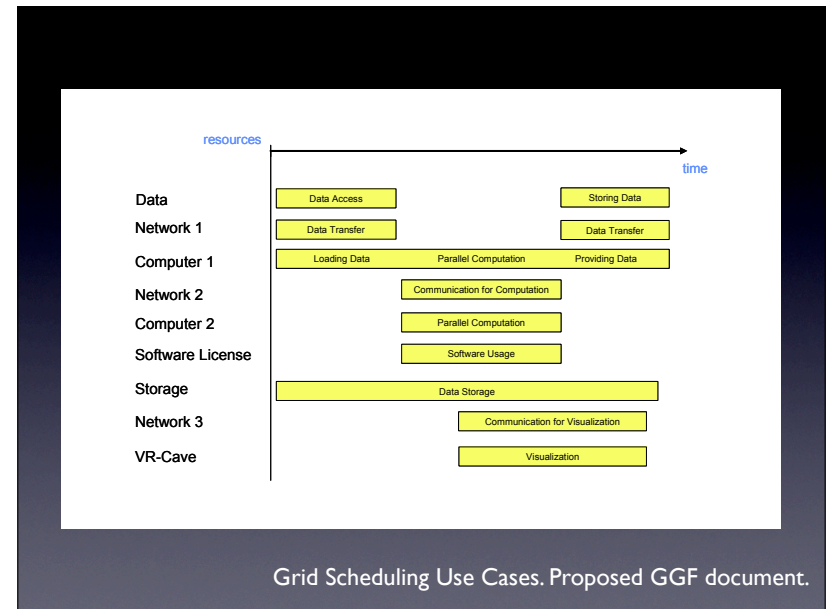
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# Resource Management

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# Grid Resource Management

- Resource Discovery
- Information Gathering
- Job Execution

Schopf: Ten Actions when Grid Scheduling

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# Resource Discovery

- Authorization filtering
- Application requirement definition
- Minimal requirement filtering

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# Information Gathering

- Dynamic information gathering
- System selection

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# Job Execution

- Advance reservation
- Job submission
- Preparation tasks
- Monitor progress
- Cleanup tasks

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# Different architectures

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# Centralized Scheduling

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# Hierarchical Scheduling

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# Decentralized Scheduler

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# Negotiation

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# Data Management

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- 80 GB/sec. continuously
- Data is streamed to computing centers across Europe
- Experiments are run on the stored data



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# Data management challenges

- Manage huge amounts of data
- Provide data where it is needed
- Determine where it is needed
- Help to find specific datasets

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# GridFTP

- Add-on to FTP:
  - Uses GSI to authenticate users
  - All data transfers are encrypted
  - Allows third-party transfers
  - Striped File transfer
  - Partial transfers

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# But: Not sufficient

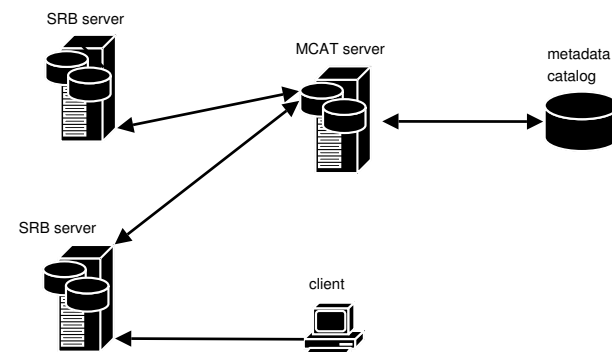
- Doesn't abstract from the resource
- No search mechanisms for specific datasets
- Doesn't integrate different storage technologies
- No support or replicas and caches

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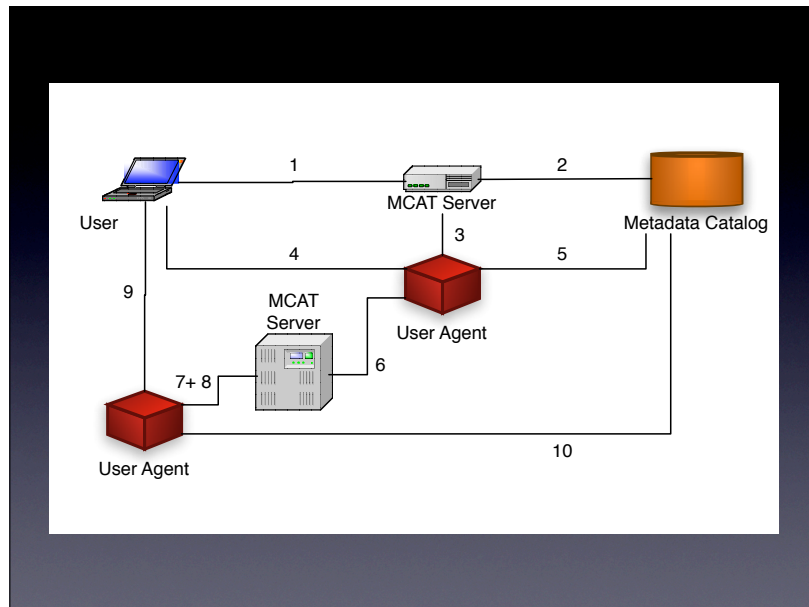
*realizing cyber-infrastructure*



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## Additional concepts

- Fine-grained access control
- Ticket mechanism allows temporary access delegation
- Automatic or manual replication of datasets
- Caching on fast media while archiving on slow media

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