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Globus Toolkit® 4:
from common Grid protocols to virtualization

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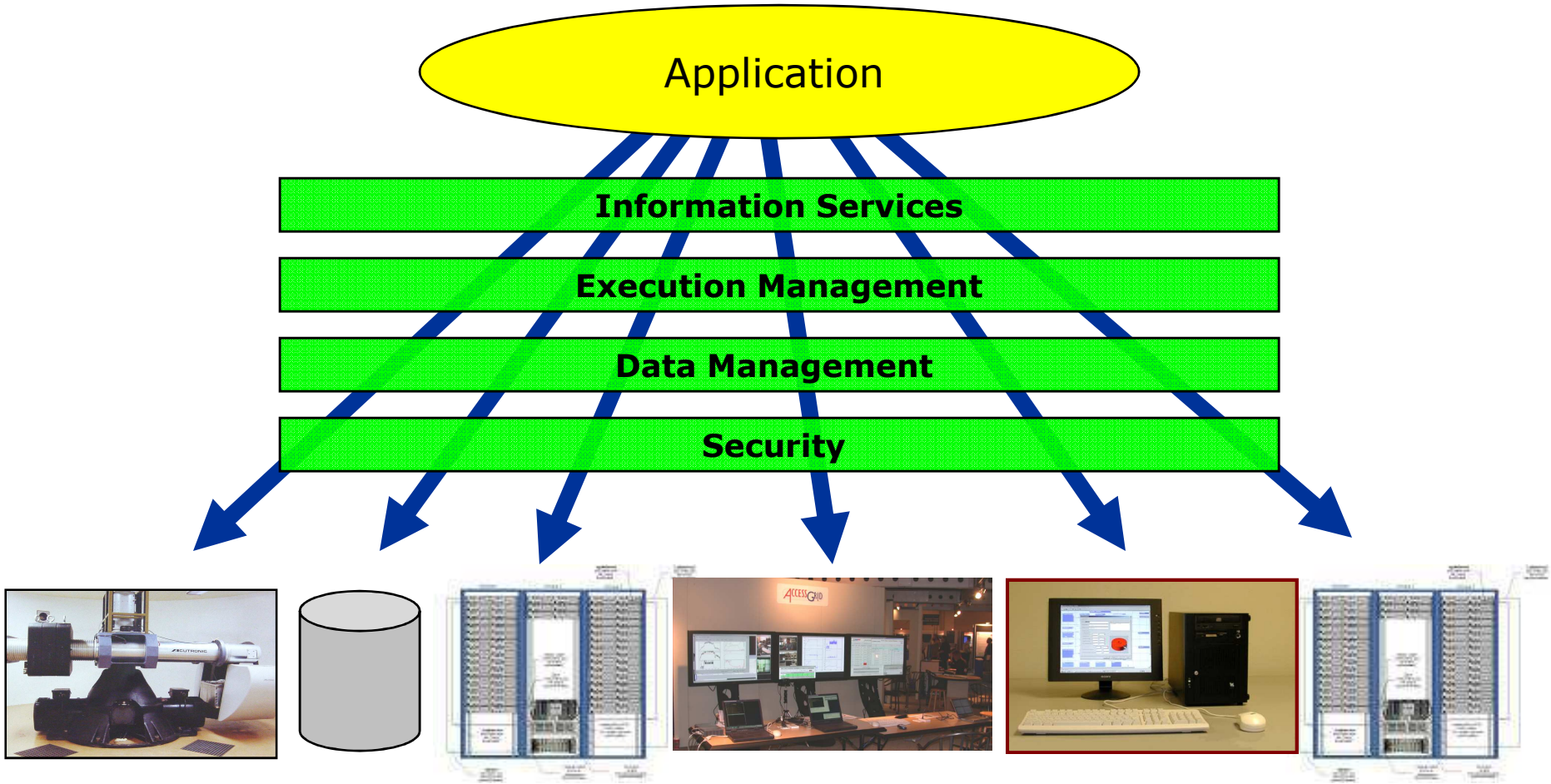
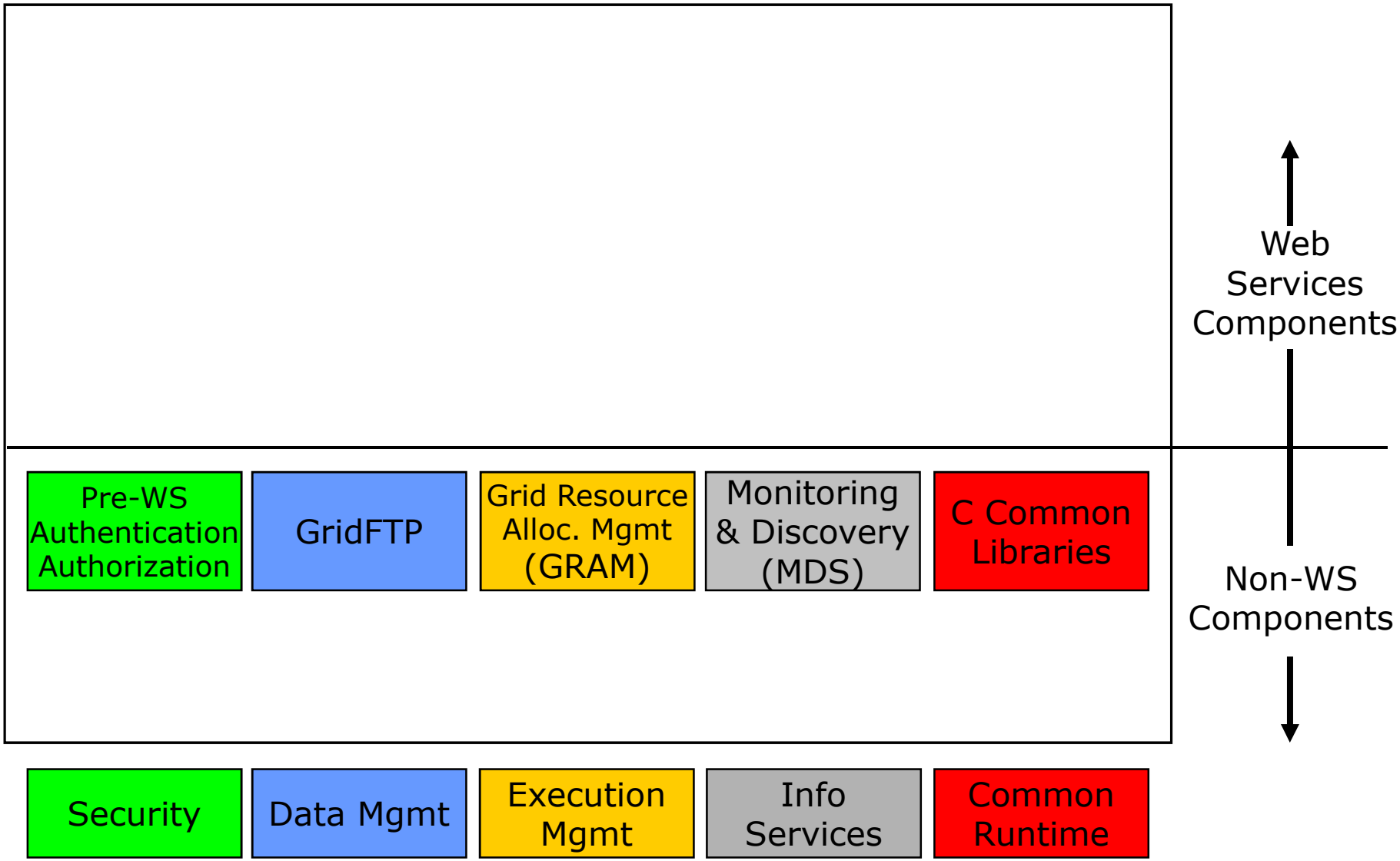
Grid Infrastructure



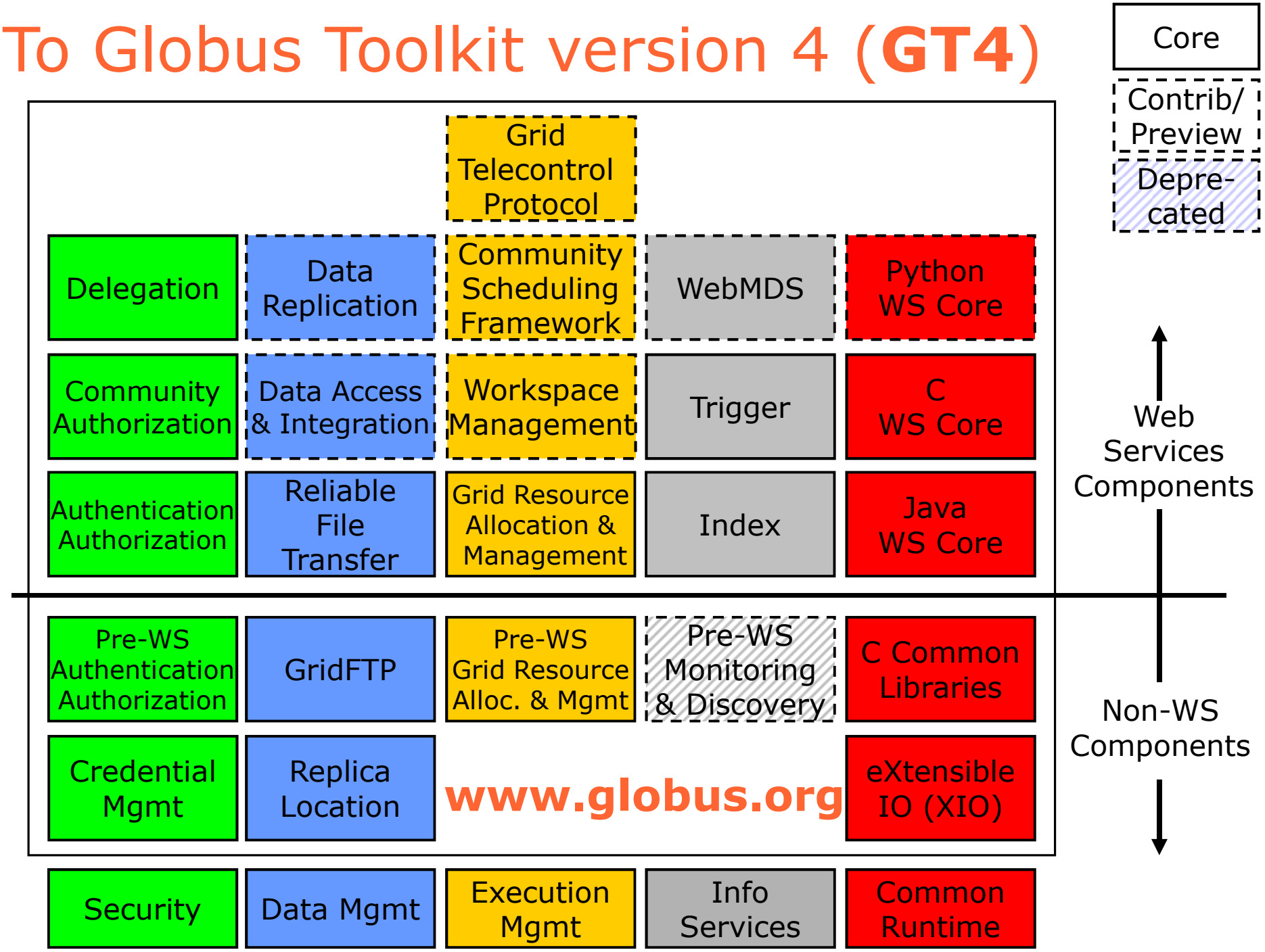
Globus Toolkit: Basic Grid Services

- Globus Toolkit Core
  - Infrastructure for building Grid services
  - Uniform, standard, WS-based protocols
  - Implementations in Java, C, Python, WSRF.NET
- Information Services
  - Discover & monitor dynamic services
- Execution Management
  - Provision environments, execute jobs, manage instruments
- Data management
  - Discover, transfer, & access large data
- Security
  - Authentication & Authorization
  - Credential management tools

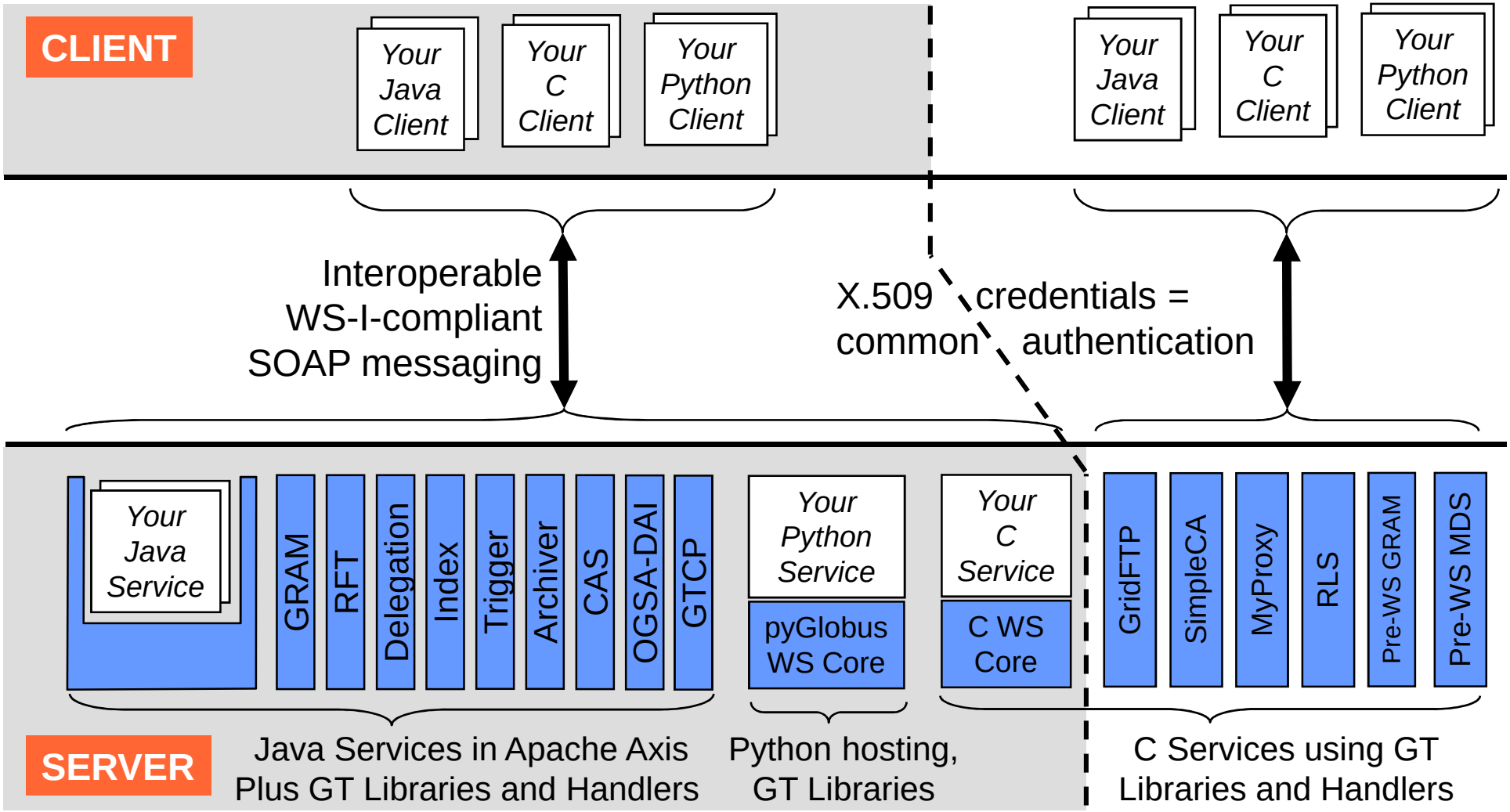
From Globus Toolkit version 2 (**GT2**)



To Globus Toolkit version 4 (**GT4**)



GT4 Components



Globus Toolkit 4

- Standard protocol base
  - Consistent with latest WS standards (WS-*, WSRF, WS-N, etc.) and Apache platform
- New components
  - Such as Reliable File Transfer, Delegation, Community Authorization, Workspace Service..
- Significant improvements in usability, reliability & scalability
  - Web service components have quality equal or superior to pre-WS components
  - Documentation is very significantly improved
- New platforms & languages
  - And links to larger Globus ecosystem
- Final release available since April 29, 2005

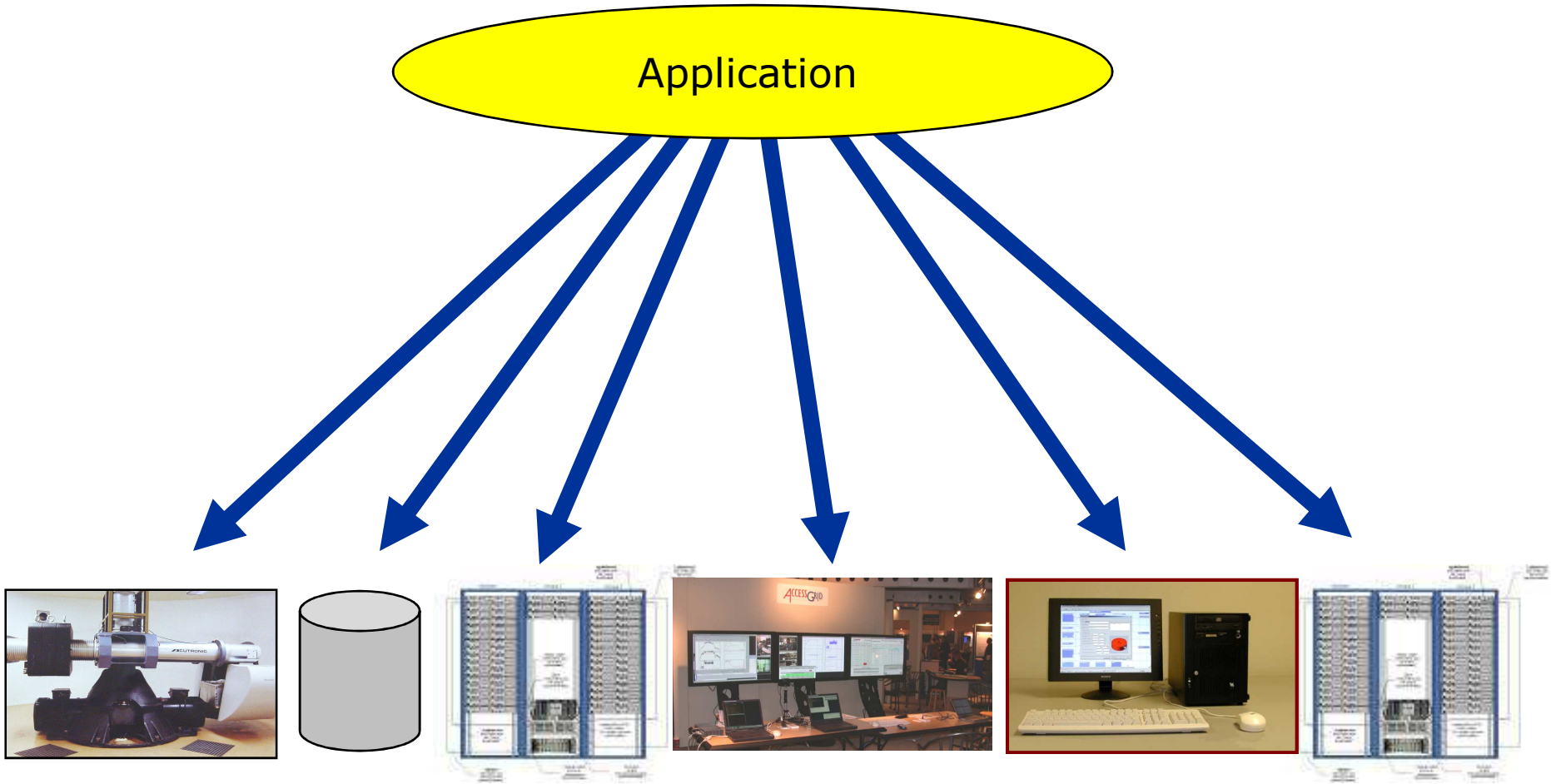
Working with GT4

- Download and use the software, and provide feedback
  - Join **gt4friends@globus.org** mail list
- Review, critique, add to documentation
  - Globus Doc Project: **http://gdp.globus.org**
- Tell us about your GT4-related tool, service, or application
  - Email **info@globus.org**

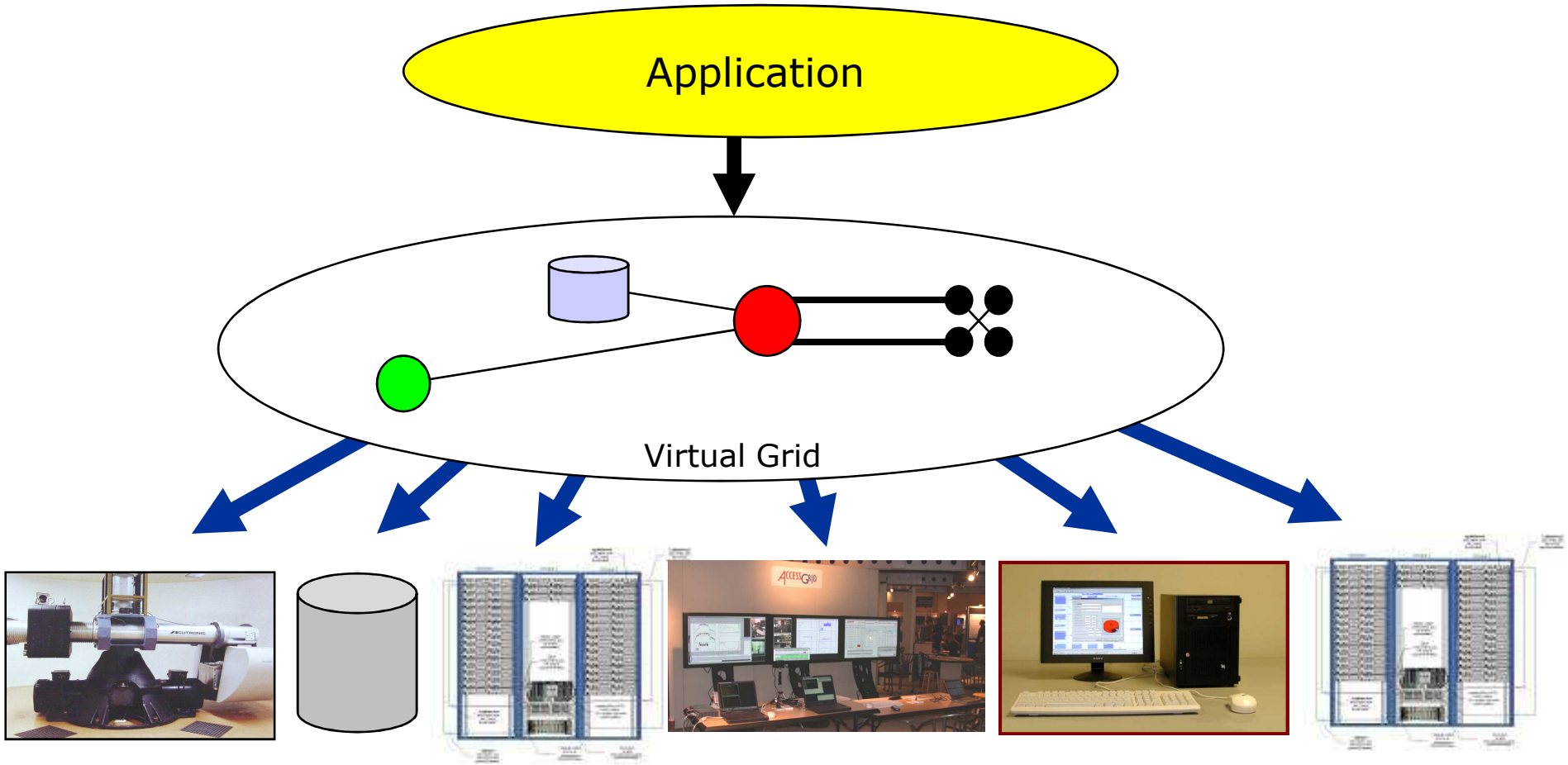
Globus Future

- Building on the powerful WS base
- What to look out for:
  - Security: attribute assertions and authorization framework
    - Gridshib, VOMS, SAML, etc.
  - Managed services
    - Common policies: persistence, throttling
  - Advance reservations
  - Replication service and policy support in data services
- Moving towards virtualization and policy-driven resource management

Working in the Grid Today

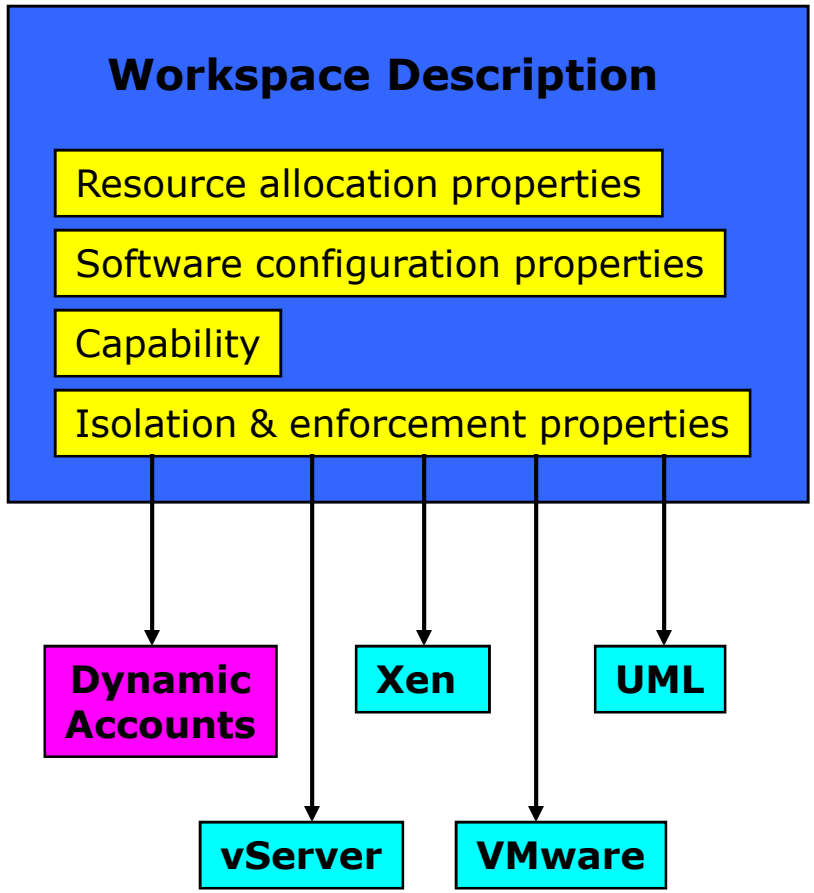


Virtualization in the Grid



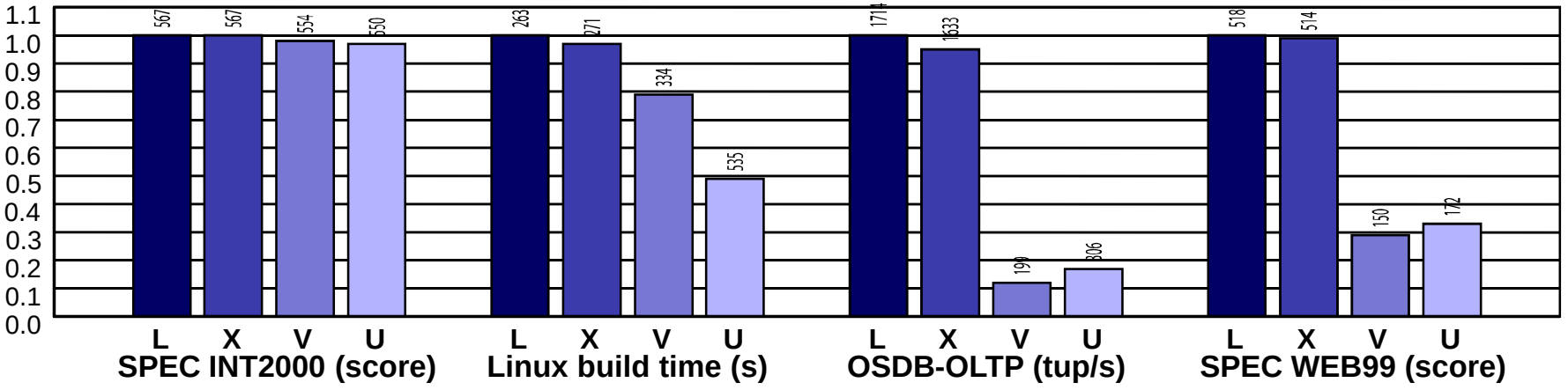
Building Blocks: Virtual Workspaces

- A description of a Grid environment
- Many implementations
  - Dynamic accounts
  - Virtual machines
- Workspaces can be deployed on resources
- Workspaces can be managed & refined
- Jobs can be deployed in workspaces

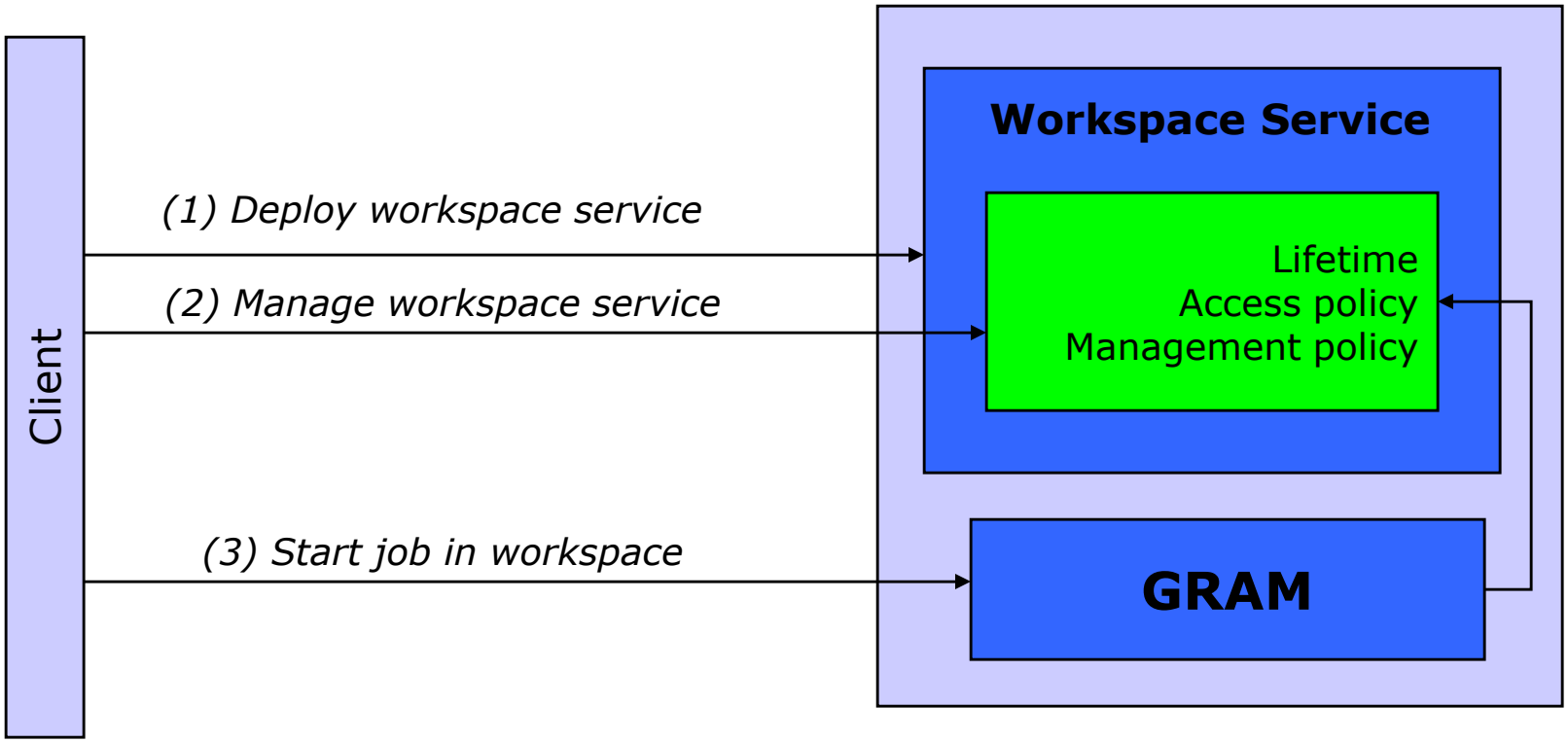


Workspace Implementations

- Dynamic accounts
  - Dynamically created or account pools
  - Weak enforcement & isolation properties: quota, limits, etc.
  - Software configuration via Pacman, SoftEnv, etc.
  - Low acceptance barrier, familiar concept
- Virtual Machines
  - Excellent isolation & enforcement capabilities
  - Highly customizable software configuration
  - Pausing, serialization, migration
  - New concept
  - Performance:



Using Workspaces

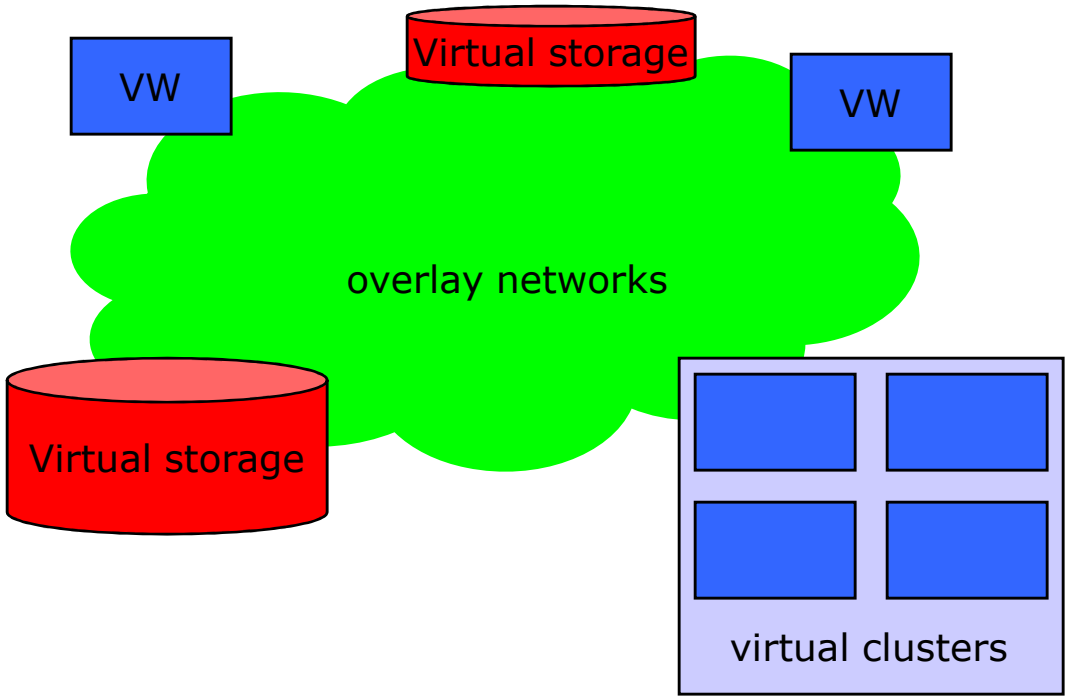


- Moving towards controlled use of resources: advance reservations and enforcement

Workspace Service Status

- Workspace service
  - Dynamic account implementation
    - Released as GT4 technology preview, deployed by EGEE
    - Creates a Unix account and provides management for it
    - Two backend implementations: adduser & account pools
    - Uses VOMS credentials for authorization and customization
    - www.mcs.anl.gov/workspace
  - Virtual Machine implementation
    - Prototype implementation based on the Xen VM
    - Pilot projects with OSG, TeraGrid and other communities
    - Limited functionality tech preview expected within a few months
    - Much research is being done on security, networking, enforcement

Grid as a "Virtual Playground"



Parting Thoughts

- GT4: significant progress
  - Web Service protocol base
  - But also significant improvements in usability, reliability & scalability
  - Provides a stable base on which to build higher-level services
- We are moving towards a more seamless Grid model
  - Virtual workspaces and virtual Grids
  - Promising solution to providing Quality of Service in the Grids
    - Descriptions and protocols
    - Enforcement capabilities
  - Also promising with respect to providing Quality of Life in the Grids!
  - Improving usability, utilization, and generally more flexible ways of using the Grid
- For questions mail keahey@mcs.anl.gov