



# **BBGrid – Technical Session**

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# Agenda

- **Globus Basics**
- PCG experience
- Next steps in BBGrid
- Technical details for Globus installation

# Grid Infrastructures

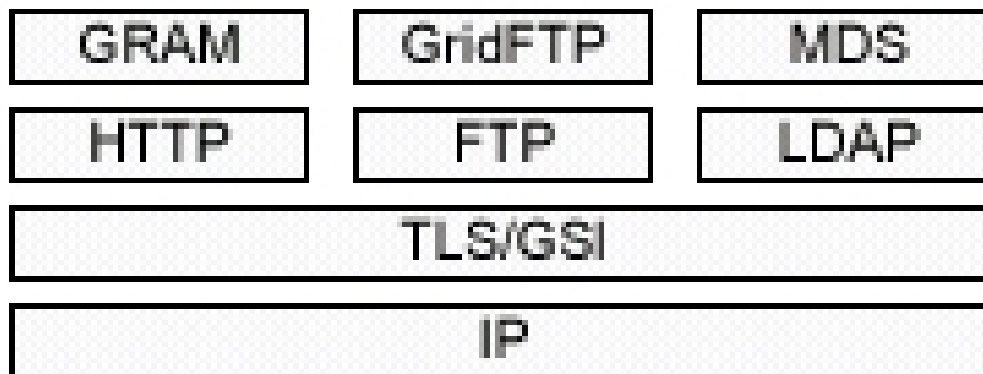
- Authentication
  - Data access and movement
  - Resource monitoring
  - Resource usage
  - Scheduling
  - Intra-/Inter-Node communication
- simplifies development of distributed applications for **existing** heterogeneous execution environments

# The Globus Toolkit

- Globus Project (Argonne National Laboratory)
- Open source, integrates several third-party projects (OpenSSL, RSA, Axis, OpenLDAP, wuFTP)
- de-facto standard for grid infrastructures, reference implementation for GGF standards
- offers building blocks and tools for developers and integrators
- All major Unix platforms, Windows as client
- C, Perl, Java, Python API's
- Version 2 (1997) : proprietary grid architecture
- Version 3 (2003) : OGSI-based architecture
- Version 4 (fall 2004) : WSRF-based architecture

# Globus Toolkit Version 2 (GT2)

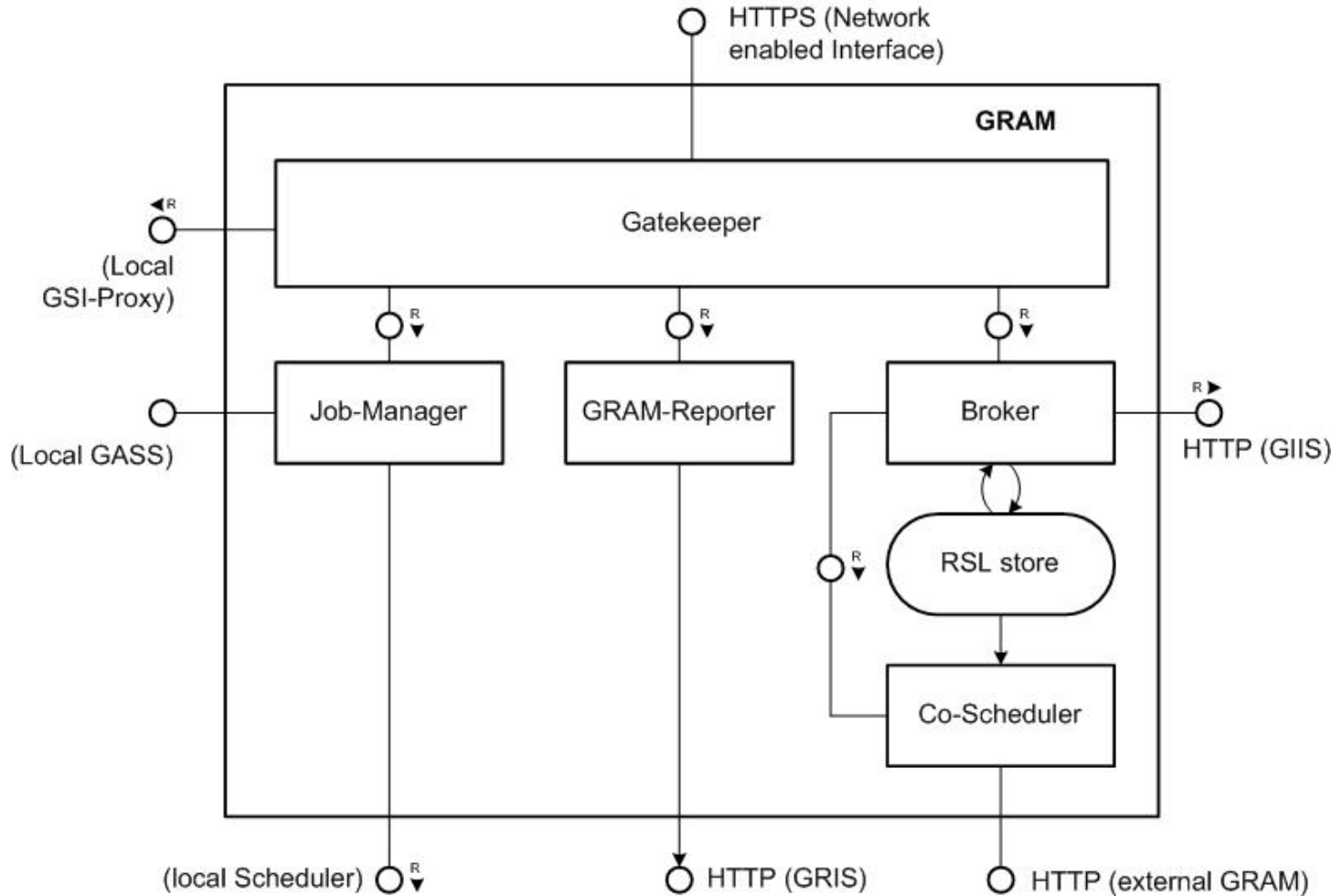
- Globus Resource Allocation Management (GRAM, RSL)
- Metacomputing Directory Service (MDS)
- Globus Security Infrastructure (GSI)
- Heartbeat Monitor (HBM)
- Globus Access to Secondary Storage (GASS, GridFTP)
- Communication (Nexus, MPICH-G2)



# GRAM

- Translates generic resource request (RSL) into explicit commands for a set of resources (cluster, single machine)
- Gatekeeper:
  - Frontend for all GT2 machines
  - Security check, proxy validation
- Job Manager:
  - Monitors and controls jobs on the resource (single machine, cluster)
  - Interacts with multiple local schedulers (Condor, LSF)
- GRAM reporter:
  - Collects and manages system-specific resource information
  - Forwards information to other nodes (GIS)

# GRAM



# MDS

- Hierarchical directory information tree
- Globus Resource Information Service (GRIS)
  - Installed on a grid node
  - Supplies information about a specific resource
  - Local information providers
- Globus Institution Indexing Server (GIIS)
  - Collects information from GRIS instances
  - Allows information queries with RSL over HTTP
- Globus Resource Information Protocol (GRIP), based on LDAP

# GridFTP

- Based on standard FTP protocol (RFC 2228)
- Striped, partial and parallel file transfer
- Restartable file transfer
- Security protocols on connectivity layer (GSI)
- Backend's for heterogeneous file systems
- Replica management extension
  - Selection
  - Location
  - Mirroring
- GGF Working Group

# **Globus Security Infrastructure (GSI)**

- **Secure communication**

- Authenticated
- Perhaps confidential

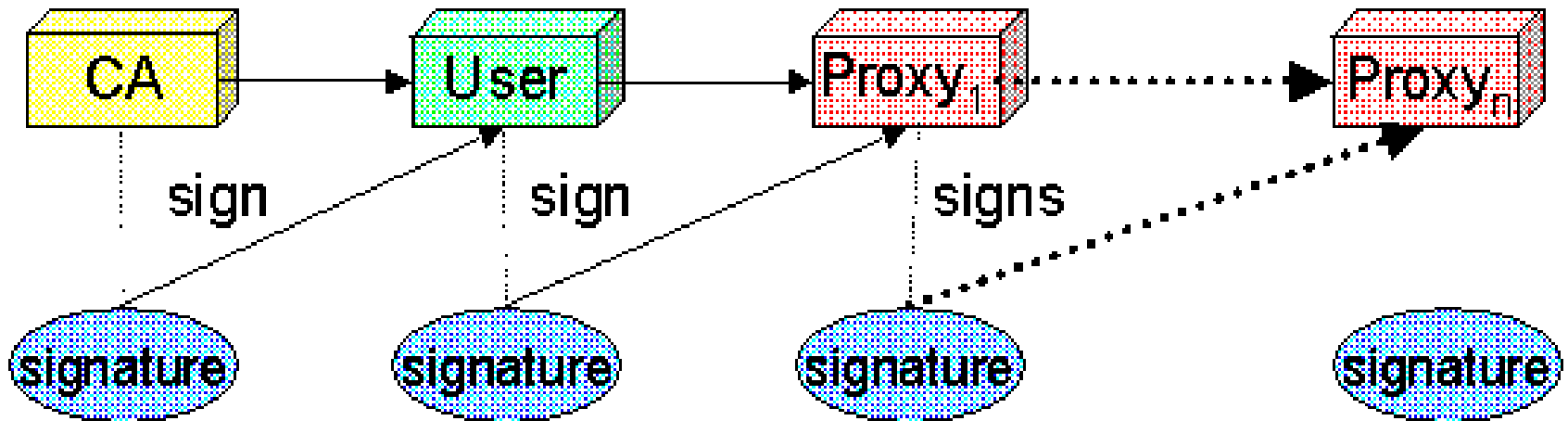
- **Security across organizational boundaries**

- Prohibition of central management

- **Single sign-on**

- Credential delegation

# Delegation and Single Sign-On

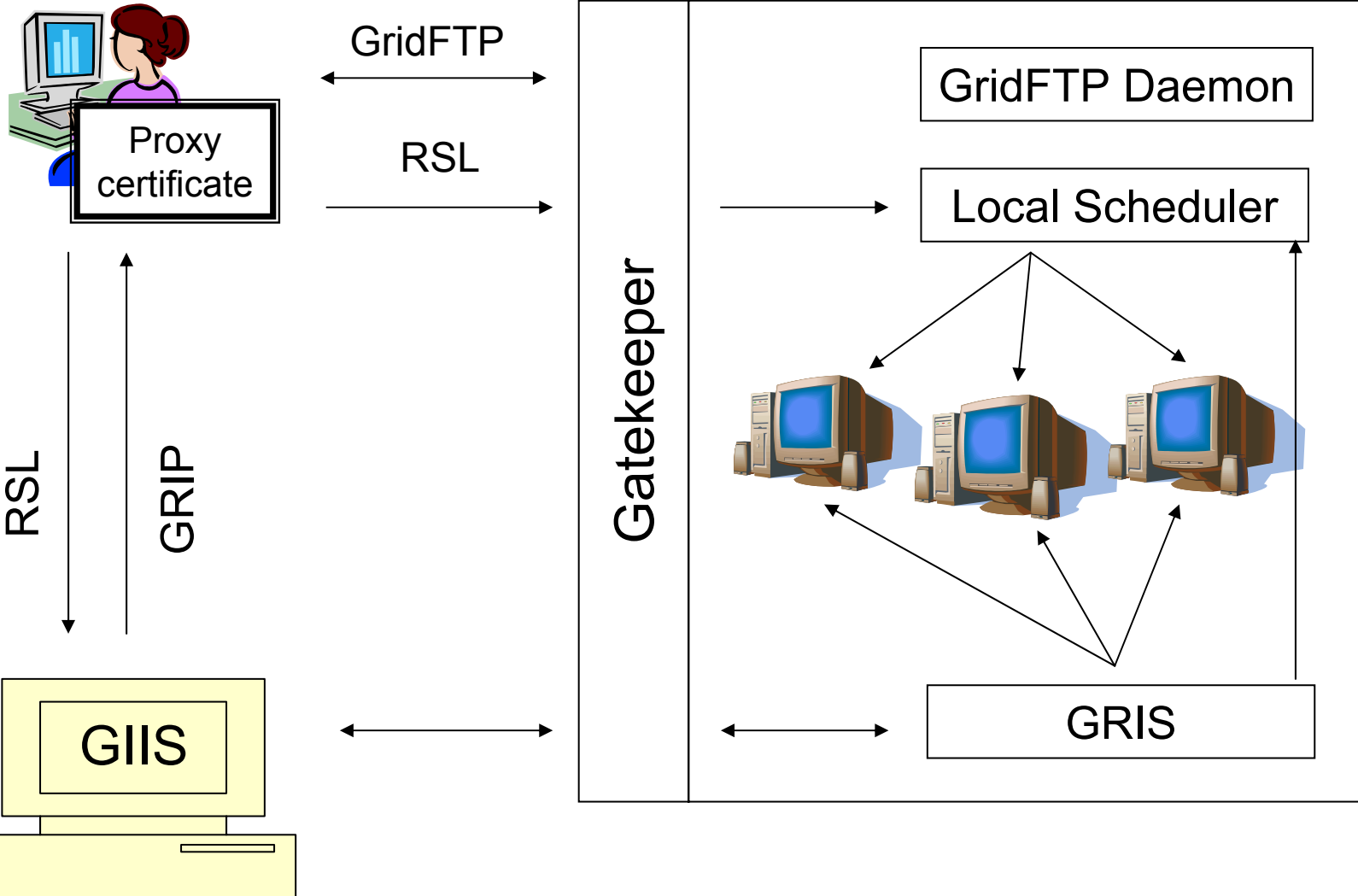


- SSL Extension
- Proxies have limited lifetime
- Mutual authentication considers whole *chain of trust*

# Communication with Nexus

- Nexus library for abstraction from underlying transport protocol
- Pluggable backend's
- Implementation for TCP/IP

# GT2 usage scenario

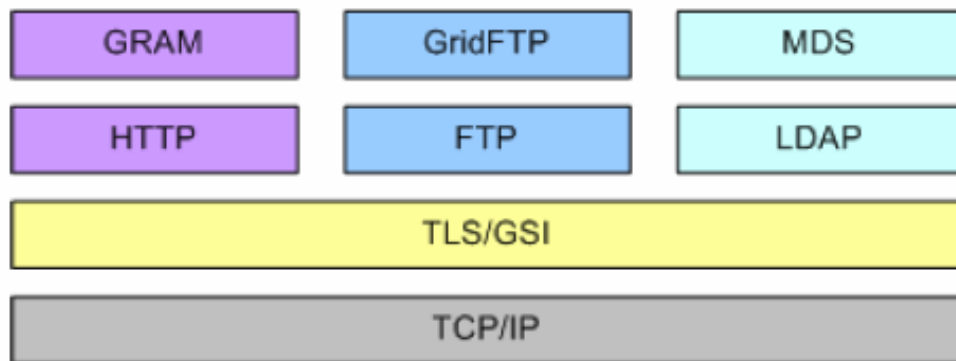


# Why GT3 ?

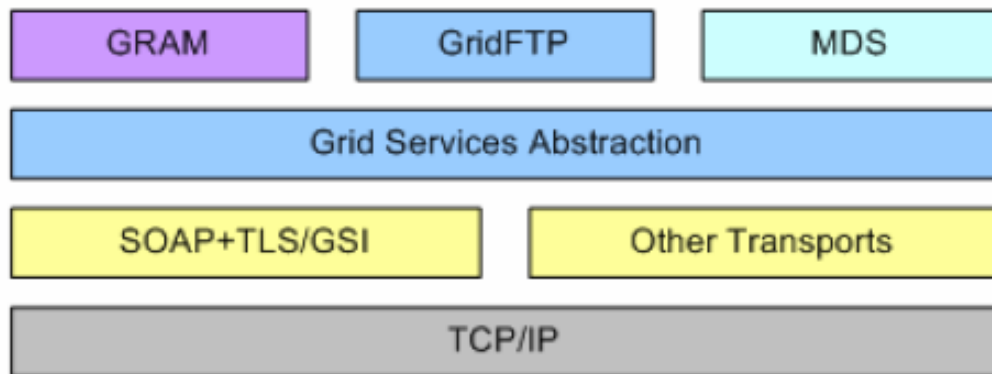
- Core protocols (GRAM, LDAP, GridFTP) with overlapping but different functionality
- Service orientation
  - Decouple service from concrete resource (not relevant for the client)
  - Late binding and transport protocol independence
- Web service as foundation for heterogeneous environments, WSDL as IDL
- Service = abstract interface + semantics
- Web Services:  
discovery & invocation of persistent services
- Grid Services:  
additional need for stateful service instances
  - Definition of interfaces
  - Management of service instances (lifetime management)

# GT2 → GT3 transition

Globus 2.4



OGSA based Globus



# GT3 Architecture

## ■ OGSI interfaces implementation

- Service data discovery
- Factory services
- Handle resolving  
→ Reference implementation

## ■ Security infrastructure

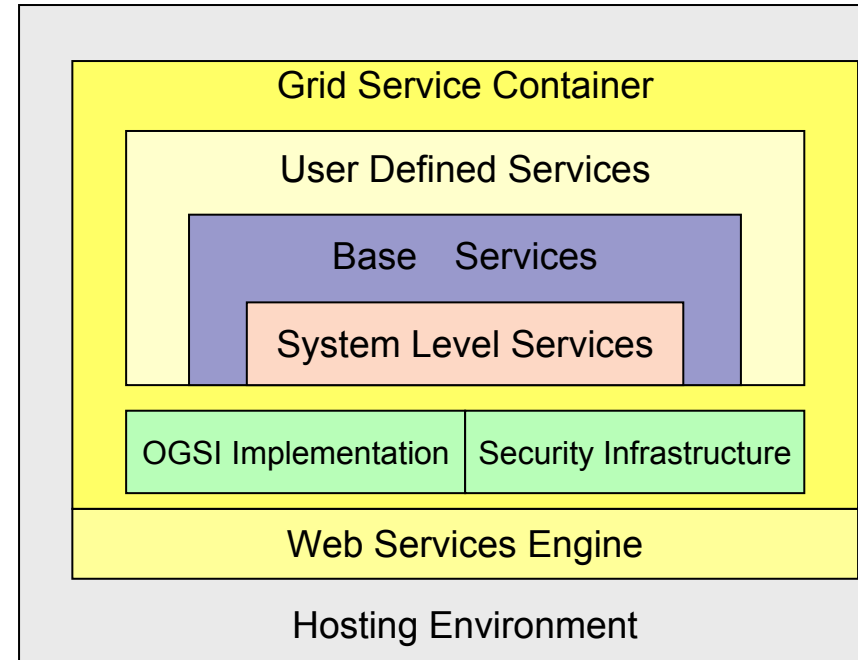
- GT2 GSI and PKI
- Message level security for SOAP (WS-Security, XML Signature)
- Transport level security (TSL/SSL)

## ■ System Level Services

- Hosting environment ping service
- Logging management service
- Container management service

## ■ Base Services as inherited GT2 functionality

- Resource Management (GRAM → MMJFS / MJS)
- Information Services (GRIS → OGSI FindServiceData interface / Index service)
- File Transfer (GridFTP → RFT service)



# GT3 Client Interfaces

## ■ Core libraries

- Java & C stubs
- PyGlobus

## ■ High-level abstraction

- GridLab project (GAT, Cactus)
- Condor-G
- Web portals
- Maybe Grid-Occam ?!?

# Agenda

- Globus Basics
- Next steps in BBGrid
- Technical details for Globus installation

# Next Steps for BB-Grid

## ■ Today

- Identification of GIS machine
  - [tb1.asg-platform.org](http://tb1.asg-platform.org)
- Clarification of CA procedures
  - each site maintains own CA
  - new entries for the grid-mapfile exchanged per e-mail
- Do we want a web-based portal ? Who runs it (web server, myProxy installation) ?
- BBGrid Wiki
  - set up by BTU

# Your next steps (suggestion)

- CA installation, distribution of CA certificate
- Firewall configuration, pair-wise creation of SSH accounts; connectivity tests
- Start Globus installation, ensure an externally resolvable DNS entry; base dir: /usr/local/globus; Version 3.2.1
- Create certificate requests for your Globus machine and the first users, sign them with you CA
- Install signed certificates
- Test locally
- Pair wise job submission

# Agenda

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- **Technical details for Globus installation**

# Mandatory Ports in Globus

- Client (>1024) → Globus machine
  - 22 / tcp (SSH, GSI SSH)
  - 2119 / tcp (Gatekeeper)
  - 2135 / tcp, 2135 / udp (MDS GIS)
  - 2811 / tcp (GridFTP)
  - 40000 / tcp – 40010 / tcp (GridFTP, job management)
- Globus machine (>1024) → BB-Grid GIIS machine
  - 2135 / tcp, 2135 / udp
- No NAT (client compares the reverse lookup of the server IP with the certificate machine name)

# Optional Globus Ports

- BB-Grid Portal machine (>1024) → BB-Grid MyProxy machine
  - 7512 / tcp
- Globus machine (>1024) → BB-Grid RLS server
  - 39281 / tcp
- Open port range on client side
  - Needed for
    - Optional Job output redirection to client
    - Optional File staging with globusrun
  - Needs open port range for incoming connections on the client side
  - GLOBUS\_TCP\_PORT\_RANGE environment variable on client and server

# Globus Installation

- More details here:

<http://www.dcl.hpi.uni-potsdam.de/research/grid/testbed/>

- Download for Globus pre-WS package:

<http://www-unix.globus.org/ftppub/gt3/3.2/3.2.1/installers/src/gt3.2.1-preogsi-source-installer.tar.gz>

- Preparation

- Create */usr/local/globus* and change owner to *globus.globus*
- Create */etc/grid-security*
- *su – globus*

# Globus Installation

## ■ Source installation:

[http://www-unix.globus.org/toolkit/docs/3.2/installation/install\\_installing.html](http://www-unix.globus.org/toolkit/docs/3.2/installation/install_installing.html)

- Ignore MMJFS installation
- Don't ignore compiler error messages

## ■ Security setup:

[http://www-unix.globus.org/toolkit/docs/3.2/installation/install\\_config\\_req.html](http://www-unix.globus.org/toolkit/docs/3.2/installation/install_config_req.html)

- Don't forget to run `$GLOBUS_LOCATION/bin/setperms.sh` as root
- Prof. Schnor's group recommends *TinyCA* for CA management

# Globus Installation

## ■ Request and install certificates:

- *grid-cert-request -host FQDN* for the machine job manager
- *grid-cert-request -service ldap -host FQDN* for the machine GIS
- *grid-cert-request* for users
- Sign with your CA
- Copy signed host certificate to */etc/grid-security/hostcert.pem*
- Copy signed LDAP certificate to */etc/grid-security/ldap/ldapcert.pem*
- Copy signed user certificate(s) to *~/.globus/usercert.pem*
- Create */etc/grid-security/grid-mapfile* as user root  
(*grid-cert-info -subject* is your friend)
- Try *grid-proxy-init* for a given user

# Globus Installation

## ■ MDS / GRAM installation:

[http://www-unix.globus.org/toolkit/docs/3.2/installation/install\\_config\\_prews.html](http://www-unix.globus.org/toolkit/docs/3.2/installation/install_config_prews.html)

- Look in the Globus *sbin* directory for prepared startup scripts (*/etc/init.d*)
- *grid-proxy-init* and *globus-job-run localhost /bin/date* should work now
- Try also *grid-info-search*

## ■ GridFTP installation:

[http://www-unix.globus.org/toolkit/docs/3.2/installation/install\\_config\\_gridftp.html](http://www-unix.globus.org/toolkit/docs/3.2/installation/install_config_gridftp.html)

- Remove */etc/grid-security/gsi-authz.conf* and */etc/grid-security/gsi-gaa.conf*
- Try *globus-url-copy gsiftp://[FQDN]/tmp/foo file:///tmp/bar*