



# GT4 Installation

## GT4 Installation

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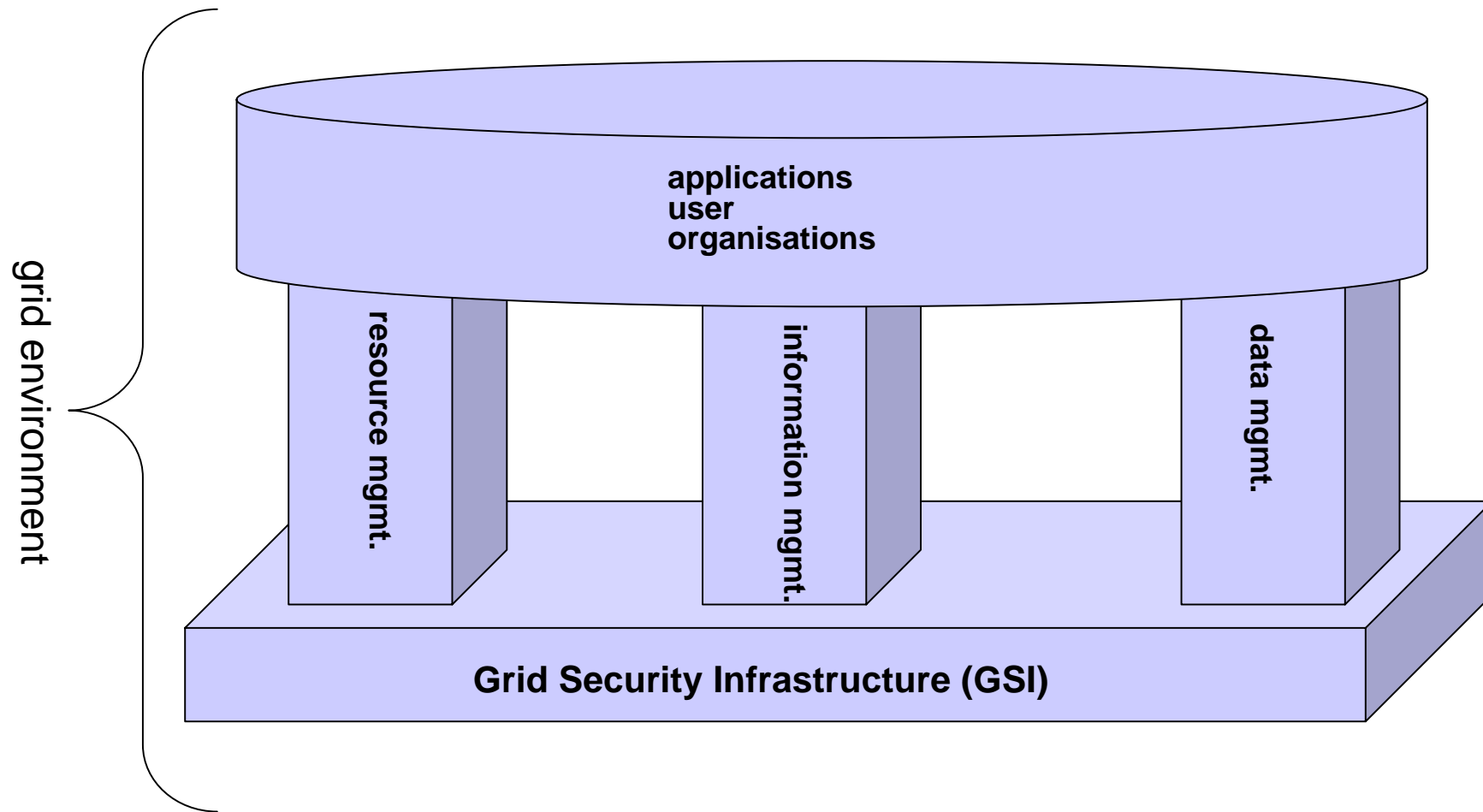


# Contents



- roles and predefinitions**
- grid security**
  - **host, user und container certificate**
- installation**
  - **Grid Packaging Tool (GPT) & Globus Toolkit (GT4)**
- authentication and authorization**
- grid services**
  - **GRAM and WS-GRAM**
  - **GridFTP and RFT**
  - **MDS and MDS4**
- GT4 usage utatistics collection**

# Grid Environment with Globus



# Roles

---



- ❑ system administrator
  - user **root**
- ❑ globus administrator
  - user **globus**
- ❑ postgresql administrator
  - user **postgres**
- ❑ grid user
  - user **steffi**



# Tasks of Roles (1)

---

- ❑ **system administrator (root)**
  - server configuration
  - host certificate
  - authorisation
  
- ❑ **globus administrator (globus)**
  - container certificate
  - globus installation
  - configuration of the services
  - start/stop service container



## Tasks of Roles (2)

---

- ❑ postgresql administrator (**postgres**)
  - database create, manage, ...
  
- ❑ grid user (**steffi**)
  - resource usage
    - job submission, job status, ...
  - informations
    - monitoring, indexing
  - data transfer, data storage
  - security
    - user certificates, proxy certificates

# Predefinitions (1)

---



- ❑ installation and configuration
  - example: Suse Linux 10.1
  - with bash shell
  
- ❑ execution mode
  - root: # **command**
  - globus : > **command**
  - steffi: \$ **command**
  - postgres: % **command**

# Predefinitions (2)



- ❑ installation directories for
  - Globus Toolkit (GT4)
  - Grid Packaging Tool (GPT)
- ❑ local for all readable files repository
  - # `chmod -R a+rX /tmp/LrzGlobusWorkshop`
- ❑ environment variables
  - # `cp /tmp/LrzGlobusWorkshop/globus-env-setup.sh \`  
`/usr/local/bin/`
  - and/or
  - # `cp /tmp/LrzGlobusWorkshop/globus-env-setup.csh \`  
`/usr/local/bin/`



# Preparation

---

## ❑ create user globus

```
# groupadd globus  
# useradd -m -g globus -d /home/globus globus  
# passwd globus
```

## ❑ create grid user (steffi)

```
# useradd -m -d /home/steffi steffi  
# passwd steffi
```

## ❑ create GPT installation directory

```
# mkdir /usr/local/gpt-3.2  
# chown globus.globus /usr/local/gpt-3.2
```

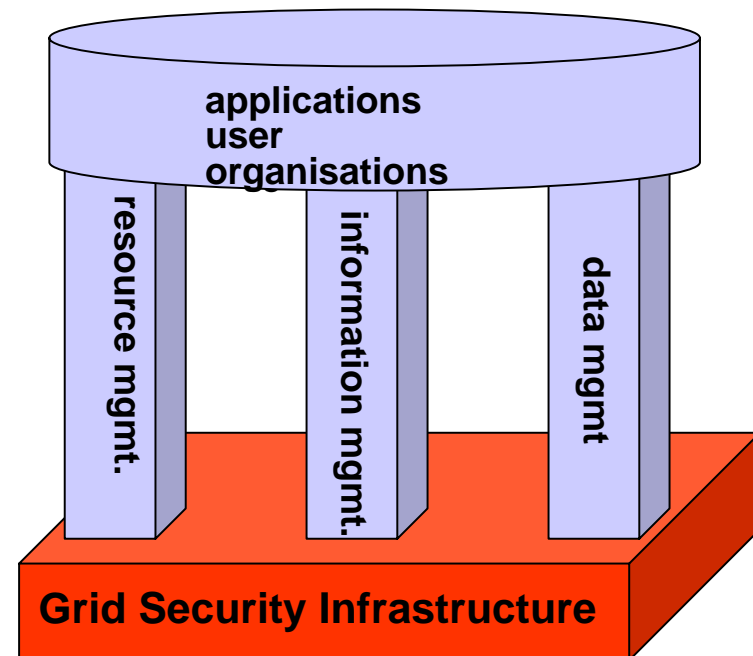
## ❑ create GT4 installation directory

```
# mkdir /usr/local/globus-4.0.1  
# chown globus.globus /usr/local/globus-4.0.1
```

# Grid Security Infrastructure - GSI (1)



- public key infrastructure
  - private key
  - public key
    - digital certificate
- authentication
  - user
  - host
- authorisation
  - user
- delegation
  - proxy certificate



# Grid Security Infrastructure - GSI (2)



- mutual authentication
  - Is it the one who it say it is
  - trust the CA of the other party
- uses X.509 certificate format (IETF)
- global name space (DN)
- information provided
  - subject
  - public key
  - identity of CA
  - digital signature of the CA
- grid-mapfile
  - mapping certificate to local user

# Grid Security Infrastructure - GSI (3)

---



- proxy
  - avoid re-entering password
  - signed by owner
  - less secure
  - new certificate and private key
  - uses X.509 certificate format (IETF)
- single sign-on
- myproxy
  - credential repository
  - global access
  - renewing proxy credentials by servers

# Host Certificates



## ❑ host certificates

```
# mkdir /etc/grid-security
# cd /etc/grid-security
# cp yourhostkey.pem hostkey.pem
# cp yourhostcert.pem hostcert.pem
# cp hostkey.pem containerkey.pem
# cp hostcert.pem containercert.pem
# chown globus.globus containerkey.pem \
  containercert.pem
```

## ❑ access rights

```
# chmod 400 *key.pem
# chmod 644 *cert.pem
# ls -al /etc/grid-security
-rw-r--r-- 1 globus globus 2130 2006-06-28 containercert.pem
-r----- 1 globus globus 1675 2006-06-28 containerkey.pem
-rw-r--r-- 1 root   root   2130 2006-06-28 hostcert.pem
-r----- 1 root   root   1675 2006-06-28 hostkey.pem
```

# User Certificate



- ❑ **user certificate (steffi)**

```
$ mkdir ~/.globus  
$ cd ~/.globus  
$ cp youruserkey.pem userkey.pem  
$ cp yourusercert.pem usercert.pem
```

- ❑ **access rights**

```
$ chmod 400 *key.pem  
$ chmod 644 *cert.pem  
$ ls -al ~/.globus
```

```
-rw-r--r-- 1 steffi users 2049 2006-07-06 15:09 usercert.pem  
-r----- 1 steffi users 1743 2006-07-06 15:09 userkey.pem
```

# CA certificates



- ❑ **unpacking of the Certification Authority (CA) certificates**
  - # `cd /etc/grid-security/`
  - # `tar xvf /tmp/LrzGlobusWorkshop/certificates.tar`
  
- ❑ **contained CA Certificates**
  - **in D-Grid accepted certificates:**
    - **DFN-Verein (Root CA, Server CA, User CA)**
    - **GridKA**
  - **for this Summer School:**
    - **LRZ Simple CA**

# Adjust Setup Script



## □ ant

- define path

```
# which ant
```

- adjust ANT\_HOME variable in setup file

```
# vi /usr/local/bin/globus-env-setup.*
```

## □ java

- define path

```
# ls -al `which javac`
```

- follow links, until no link is present anymore

- adjust JAVA\_HOME variable (without /bin/...) in setup file

```
# vi /usr/local/bin/globus-env-setup.*
```



# Installation GPT

---

- ❑ execute setup script as user globus

```
> . /usr/local/bin/globus-env-setup.sh
```

error message is OK here !

- ❑ GPT installation

```
> cd /tmp/LrzGlobusWorkshop
```

```
> tar zxvf gpt-3.2-src.tar.gz
```

```
> cd gpt-3.2
```

```
> ./build_gpt
```

# Installation Globus Toolkit 4



---

- ❑ Suse binaries (provided by LRZ)

- Suse 10.x

```
> $GPT_LOCATION/sbin/gpt-install \  
    <Lrz_GT4_binary.tar.gz>
```

```
> $GPT_LOCATION/sbin/gpt-postinstall
```

# Authorisation (1)



- ❑ execute setup script as grid user (steffi)  
\$ . /usr/local/bin/globus-env-setup.sh
- ❑ extraction of Distinguished Name (DN)  
\$ grid-cert-info -subject  
output, e.g.:  
/C=DE/O=GridGermany/OU=Leibniz-Rechenzentrum/CN=steffi
- ❑ execute setup script as root  
# . /usr/local/bin/globus-env-setup.sh
- ❑ user authorisation in /etc/grid-security/grid-mapfile  
# grid-mapfile-add-entry -dn "<DN>" -ln <login>  
# grid-mapfile-check-consistency (without output)



## Authorisation (2)

---

- ❑ insert user in `/etc/sudoers`

```
# cat /tmp/LrzGlobusWorkshop/sudoers >>  
/etc/sudoers
```

```
# vi /etc/sudoers
```

```
globus ALL=(steffi,...) ... /...job-manager-script...
```

```
globus ALL=(steffi,...) ... /...gram-local-proxy...
```

- ❑ insert complete host name (FQDN) in `/etc/hosts`

- extract FQDN

```
# cd /etc/grid-security
```

```
# grid-cert-info -file hostcert.pem -subject
```

- extract IP address

```
# host <FQDN>
```

```
# vi /etc/hosts
```

```
entry: <IP-Address> <FQDN>
```

# Testing the Globus-Installation (1)



- ❑ test of the service container without security

```
> globus-start-container -nosec
```

```
Result: 51 Grid Web Services on port 8080
```

- ❑ test example

```
$ counter-client -s \
```

```
http://<FQDN>:8080/wsrf/services/CounterService
```

- ❑ stop the started container

```
> Ctrl+c
```



## Testing the Globus-Installation (2)

---

- ❑ test of the service container with security

```
> globus-start-container
```

```
Result: 51 Grid Web Services on port 8443
```

- ❑ test of the Grid Security Infrastructure (GSI)

```
$ grid-proxy-init -verify -debug
```

- ❑ test Grid Service example

```
$ counter-client -s \  
\  

```

```
https://<FQDN>:8443/wsrp/services/CounterService \  
\  

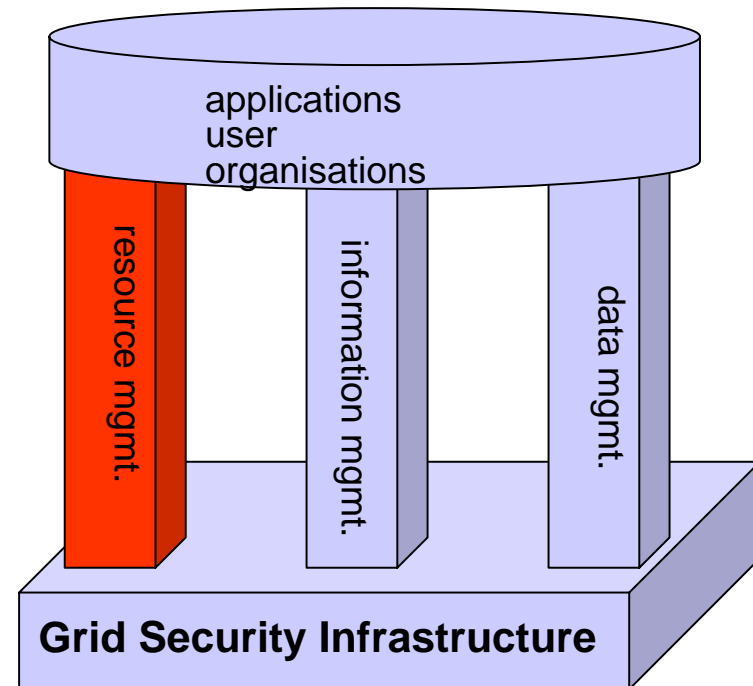
```

```
-z none
```

# Grid Resource Allocation Manager (GRAM)



- job submission
  - submit remote jobs
  - query status
  - fetch results
- gatekeeper
- jobmanager
- scheduler
  - Fork (default)
  - PBS
  - Condor
  - LSF





# GRAM: Configuration

---

- ❑ assigning port 2119

```
# echo gsigatekeeper 2119/tcp >> /etc/services
```

- ❑ copy configuration file

```
# cp /tmp/workshop/gsigatekeeper \  
/etc/xinetd.d/gsigatekeeper
```

- ❑ restart super daemon

```
# /etc/init.d/xinetd restart
```

- ❑ please note: machine time must be up to date!

- ❑ insert in /etc/hosts.allow (tcp wrapper):

- **ALL:ALL:rfc931:ALLOW !!!**



# WS-GRAM: Test (1)

---

- ❑ test of the gatekeeper

```
$ globus-personal-gatekeeper -start
```

output: GRAM contact: <FQDN>:<PORT>:<DN>

```
$ globus-job-run "<contact>" /bin/hostname
```

```
$ globus-personal-gatekeeper -killall
```

- ❑ pre-WS-GRAM command (GT2):

```
$ globus-job-run localhost /bin/hostname
```



## WS-GRAM: Test (2)

---

### ❑ WS-GRAM command (interactive):

- `globusrun-ws -submit -F JobFactoryURL \  
-Ft FactoryType -s -c command`

Test:

```
$ globusrun-ws -submit -c /bin/hostname
```

### ❑ WS-GRAM command (batch):

- `globusrun-ws -submit -batch -F JobFactoryURL \  
-Ft FactoryType -o EPRfile -c command`

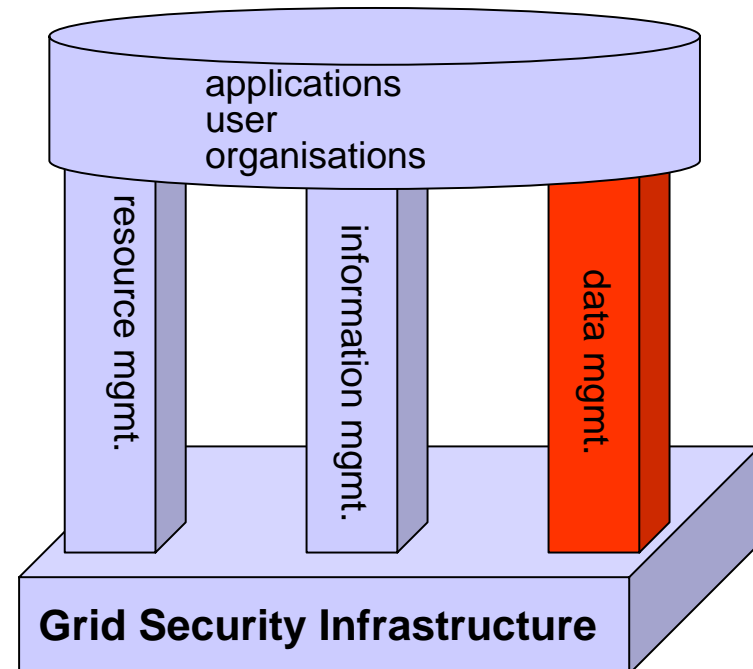
### ❑ job status

```
$ globusrun-ws -status -job-epr-file EPRfile
```

# Grid File Transfer Protocol - GridFTP (1)



- support GSI security
- based on File Transfer Protocol (FTP)
- a base for RFT
  - TCP buffer sizes
- transfer efficiency
  - Multiple TCP streams
  - TCP buffer sizes
- striping functionality



# Grid File Transfer Protocol - GridFTP (2)



- ❑ **command line tool**
  - \$ globus-url-copy**
  - **parameter:**
    - [ -tcp-bs buffersize] [-p parallelism] source dest**
  
- ❑ **source - dest format**
  - **protocol://host:port/path**
  
- ❑ **supported protocols**
  - **https, http, gsiftp, ftp, and file**

# GridFTP: Configuration

---



- ❑ assigning port 2811

```
# echo gsiftp 2811/tcp >> /etc/services
```

- ❑ copy configuration file

```
# cp /tmp/LrzGlobusWorkshop/gsiftp  
/etc/xinetd.d/gsiftp
```

- ❑ restart super daemon

```
# /etc/init.d/xinetd restart
```



# GridFTP: Test

---

## ❑ copy: local → local

```
$ globus-url-copy gsiftp://localhost/etc/hosts \  
file:///tmp/hosts_copy
```

## ❑ copy: remote → local

```
$ globus-url-copy \  
gsiftp://<Hostname>/etc/hosts \  
file:///tmp/hosts_copy_<YourLogin>
```

## ❑ copy: local → remote

```
$ globus-url-copy \  
file:///tmp/hosts_copy_<YourName> \  
gsiftp://<Hostname>/tmp
```

# Reliable File Transfer (RFT)

---



- using database information
  - postgresql as a default database
  - check pointing transfer state
  - to recover from failures
  - control and supervision
- retrying transfers
  - using checkpoints
- recursive directory transfer
- transfer all or none



# Postgresql: Configuration (1)

---

- ❑ initialise database (DB)

```
% initdb -D /var/lib/pgsql/data
```

- ❑ access restriction to globus user

```
% vi /var/lib/pgsql/data/pg_hba.conf
```

insert at end of file:

```
host[TAB]rftDatabase[TAB]globus[TAB]<Ihre-IP>\  
[TAB]255.255.255.255[TAB]trust
```

- ❑ enable TCP/IP connections

```
# vi /etc/sysconfig/postgresql
```

addition: `POSTGRES_OPTIONS="-i"`

- ❑ start Postgresql database

```
# /etc/init.d/postgresql start
```

# Postgresql: Configuration (2)



- ❑ create DB account for user globus

```
% createuser globus
```

answer following question with "yes"

- ❑ execute setup script as user postgres

```
% . /usr/local/bin/globus-env-setup.sh
```

- ❑ create DB and initialise DB schema

```
% createdb rftDatabase
```

```
% psql -d rftDatabase -f $GLOBUS_LOCATION/\  
share/globus_wsrft_rft/rft_schema.sql
```

# Postgresql: Configuration (3)



- ❑ **configure Postgresql for Globus**

- > `vi $GLOBUS_LOCATION/etc/globus_wsrft/\`  
`jndi-config.xml`

- use empty string as password

- ❑ **stop container**

- > `globus-stop-container`

- ❑ **start container**

- > `globus-start-container`

**Here no error message must appear!**



# Reliable File Transfer (RFT): Test

---

- ❑ copy test file

```
$ cp /tmp/LrzGlobusWorkshop/transfer.xfr /tmp
```

- ❑ in /tmp/transfer.xfr replace "localhost" by FQDN

- ❑ create test file

```
$ touch /tmp/rftTest.tmp
```

- ❑ RFT test

```
$ rft -h <FQDN> -f /tmp/transfer.xfr
```

result: [...]

**All transfers are completed**

# Monitoring and Discovery Service - MDS (1)

---

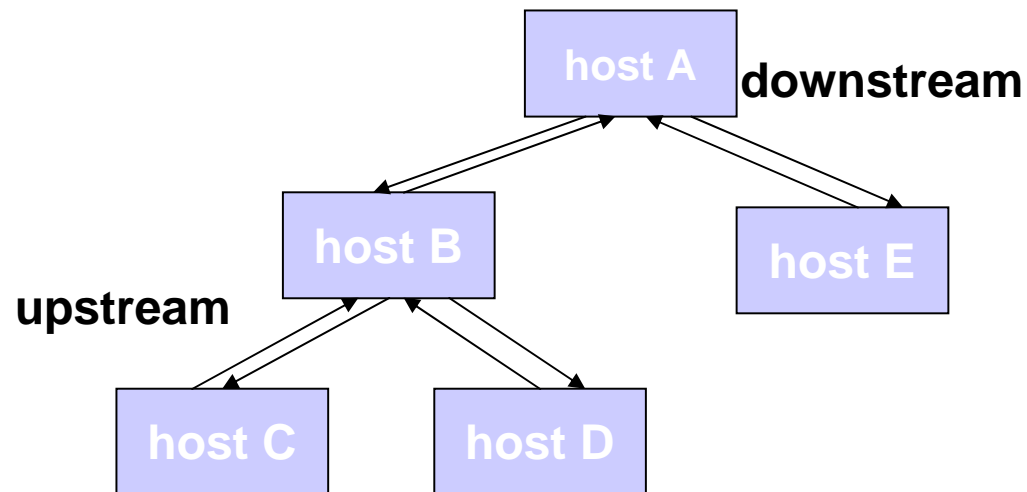


- ❑ **monitor and discover information about**
  - **application**
  - **resources**
  - **services**
  
- ❑ **WSRF-based services**
  - **index service**
    - **collects data**
    - **query/subscription**
  - **trigger service**
    - **triggering actions**

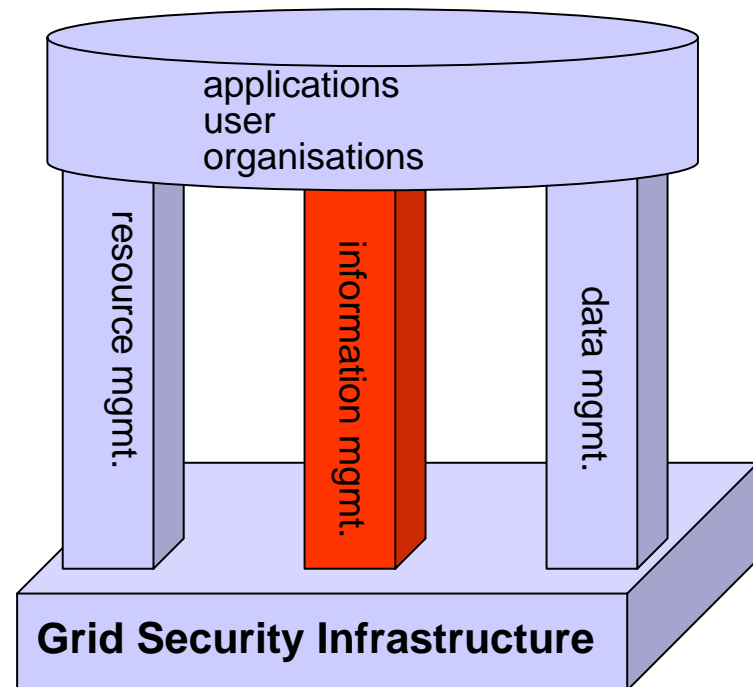
# Monitoring and Discovery Service - MDS (2)



- hierarchy based structures



- archive service
- web browser
  - WebMDS



# MDS4: configuration



- ❑ **construct monitoring hierarchy**

```
> vi $GLOBUS_LOCATION/etc/globus_wsrp_mds_index/\
  hierarchy.xml
```

```
<upstream>
```

```
  https://<parent-host>:8443/wsrp/services/DefaultIndexService
```

```
</upstream>
```

```
<downstream>
```

```
  https://<child-host>:8443/wsrp/services/DefaultIndexService
```

```
</downstream>
```

- ❑ **restart container**

```
> globus-stop-container; globus-start-container
```

# Summary

---



- ❑ **Globus installation**
  - **Grid Security Infrastructure (GSI)**
  - **Grid Resource Allocation Management (GRAM)**
  - **Data Management (GridFTP, RFT)**
  - **Monitoring and Discovery Service (MDS4)**

# GT4 Usage Statistics Collection



- ❑ **GT4 components send data for usage statistics collected by the Globus Alliance**
  
- ❑ **Transmission**
  - UDP packets to usage-stats.globus.org:4810
  - Data is sent by server, not by client
  
- ❑ **Affected Components:**
  - Java/C WS Core, GRAM, GridFTP, RFT, RLS
- ❑ **Transferred data (ia)**
  - all: component/data format identifiers, source IP/hostname, time stamps
  - GRAM: scheduler type, job type, some flags, success/failure, etc.
  - GridFTP: transfer type/size, transfer start/end, block/TCP buffer size, etc.
  
- ❑ **Further Information**
  - [http://www.globus.org/toolkit/docs/4.0/Usage\\_Stats.html](http://www.globus.org/toolkit/docs/4.0/Usage_Stats.html)

# Usage Stats: Motivation and Difficulty



## □ Motivation

- Globus Alliance
  - receives support from US government funding agencies
  - has to demonstrate that the scientific community is benefiting from their investment

## □ Difficulty

- Data privacy protection law in Germany / Europe
  - Transmission of person related data to the US is not permitted without explicit allowance by the user
  - IP addresses are regarded as person related data
  - Providing software which contains such functionality is only permitted after demonstrably informing the user

# Usage Stats: Opt Out



## □ How to disable the data transfer

- for Java Components:

in `$GLOBUS_LOCATION/etc/globus_wsrp_core/`  
change in file `server-config.wsdd`:

```
<globalConfiguration>  
    <parameter name="usageStatisticsTargets"  
                value=" [delete] "/>  
</globalConfiguration>
```

or remove the parameter

- for C Components:

change environment variable:

```
export GLOBUS_USAGE_OPTOUT=1 (for sh/bash)
```

```
setenv GLOBUS_USAGE_OPTOUT 1 (for csh/tcsh)
```



Vielen Dank für Ihre Aufmerksamkeit

Vielen Dank für Ihre Aufmerksamkeit

