



Interoperability Task in EUChinaGrid [-I & -II] Projects

Marco Pappalardo

INFN Catania – Consorzio COMETA

**EGEE '07 Conference –
Interoperability Meeting**

Budapest, Oct 5, 2007





Agenda

- ***EUChinaGRID: work overview***
- ***Gateway-based interoperability used in the project***
 - ***Role of Gateway***
 - ***Gateway design principles***
 - ***Core components of gateway***
 - ***Batch job level interoperability process***
 - ***submit batch job from GOS to gLite***
 - ***submit batch job from gLite to GOS***
 - ***How to deal with Data transfer***
 - ***Manner to implement data transfer in EUChinaGrid project***
 - ***Security issues***
- ***EUChinaGRID-II: a new Architecture for Interoperability***
- ***Common issues in interoperability to be addressed***



EUChinaGRID: work overview

- ***The work done mainly covers the following three aspects:***
 - ***Design of a flexible gateway and proposal of a generic design for similar scenarios***
 - ***Usage of SEDA model as task process tool***
 - ***Usage of IoC model as configuration and assembly tool***
 - ***Extension of CNGrid GOS JobManager Framework***
 - ***Extension of gLite LCG-CE JobManager Framework***
- ***Goals achieved***
 - ***Finished and deployed first implementation in testbeds setup in IHEP (CAS) and in Catania (INFN)***
 - ***Up to now these two testbeds have run stably for nearly three months***
 - ***Process more than 1,500 batch jobs in total [including both GOS to gLite and gLite to GOS]***
 - ***Passed first EU project review held in February in Madrid***



Agenda

- ***EUChinaGRID: work overview***
- ***Gateway-based interoperability used in the project***
 - ***Role of Gateway***
 - ***Gateway design principles***
 - ***Core components of gateway***
 - ***Testbed***
 - ***Batch job level interoperability process***
 - ***submit batch job from GOS to gLite***
 - ***submit batch job from gLite to GOS***
 - ***How to deal with Data transfer***
 - ***Manner to implement data transfer in EUChinaGrid project***
 - ***Security issues***
- ***EUChinaGRID-II: a new Architecture for Interoperability***
- ***Common issues in interoperability to be addressed***



Role of Gateway

- ***Gateway is just a logical component, it can be treated as a “facade” for underlying grid infrastructure:***
 - ***Interface conversion.***
 - ***Function mapping, etc.***
- ***Gateway should support the following features:***
 - ***Transparent to end users of different grid infrastructures***
 - ***Easy to extend***
 - ***Support massive concurrency and high throughout***
 - ***Support standalone deployment or integrated underlying grid middleware etc***



Gateway design principle

- **Gateway design depends heavily on SEDA model and IoC model**
- **Reasons for choosing SEDA and IoC models:**
 - **SEDA is short for “Staged Event Driven Architecture”**

see: “SEDA: An Architecture for Well-Conditioned, Scalable Internet Services”,
M. Welsh, D. Culler, and E. Brewer, Univ. of California, Berkeley.

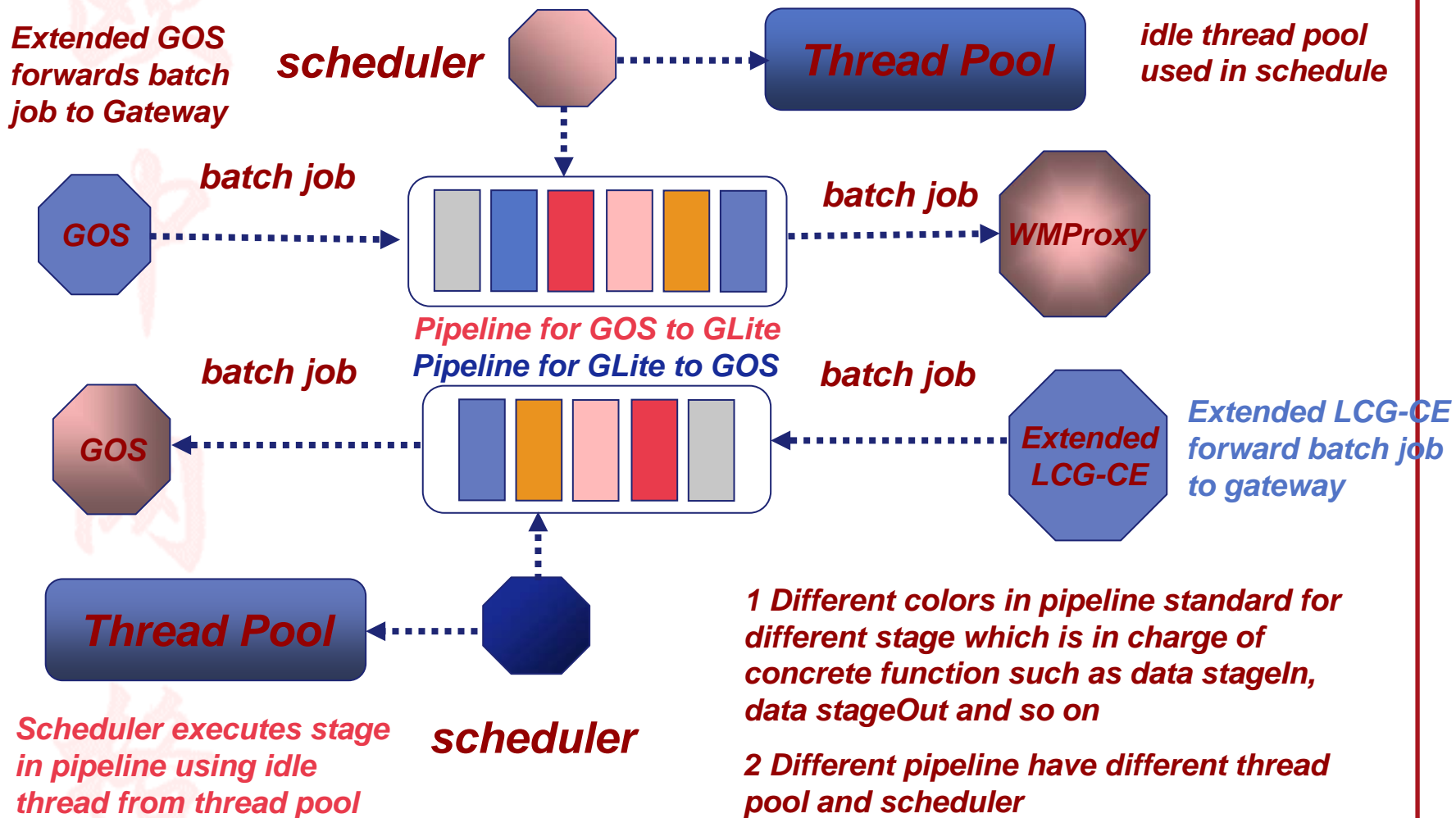
 - ◆ **Support massive concurrency, high throughput**
 - ◆ **Simplify the construction of well-conditioned Internet services**
 - **In our design, we firstly divide the whole process into several independent basic stages and then compose basic stages into different pipelines for different purpose such as gLite-to-GOS batch job forwarding and so on**
 - **IoC is short for “Inversion of Control”**
 - ◆ **Provides loose coupling among different modules and easy-to-reuse basic modules**
 - ◆ **Assembling new modules is easy and quick**
 - **HiveMind 1.1 is used as IoC container released under LGPL license.**



Core components of Gateway

- **Core components of Gateway:**
 - **Pipelines built for different purposes**
 - **Consisting of different basic processing stages**
 - **Used for different purposes such as forwarding batch job from GOS to gLite and vice versa**
 - **Scheduler**
 - **Execute processing stages at fixed rate**
 - **1-to-1 mapping between Pipeline and scheduler**
 - **Thread pool**
 - **Improves performance**
 - **1-to-1 mapping between Thread pool and scheduler**
 - **Different processing stages in same pipeline usually in charge of different concrete functions such as StageIn, StageOut and so on.**

Detailed description of gateway components

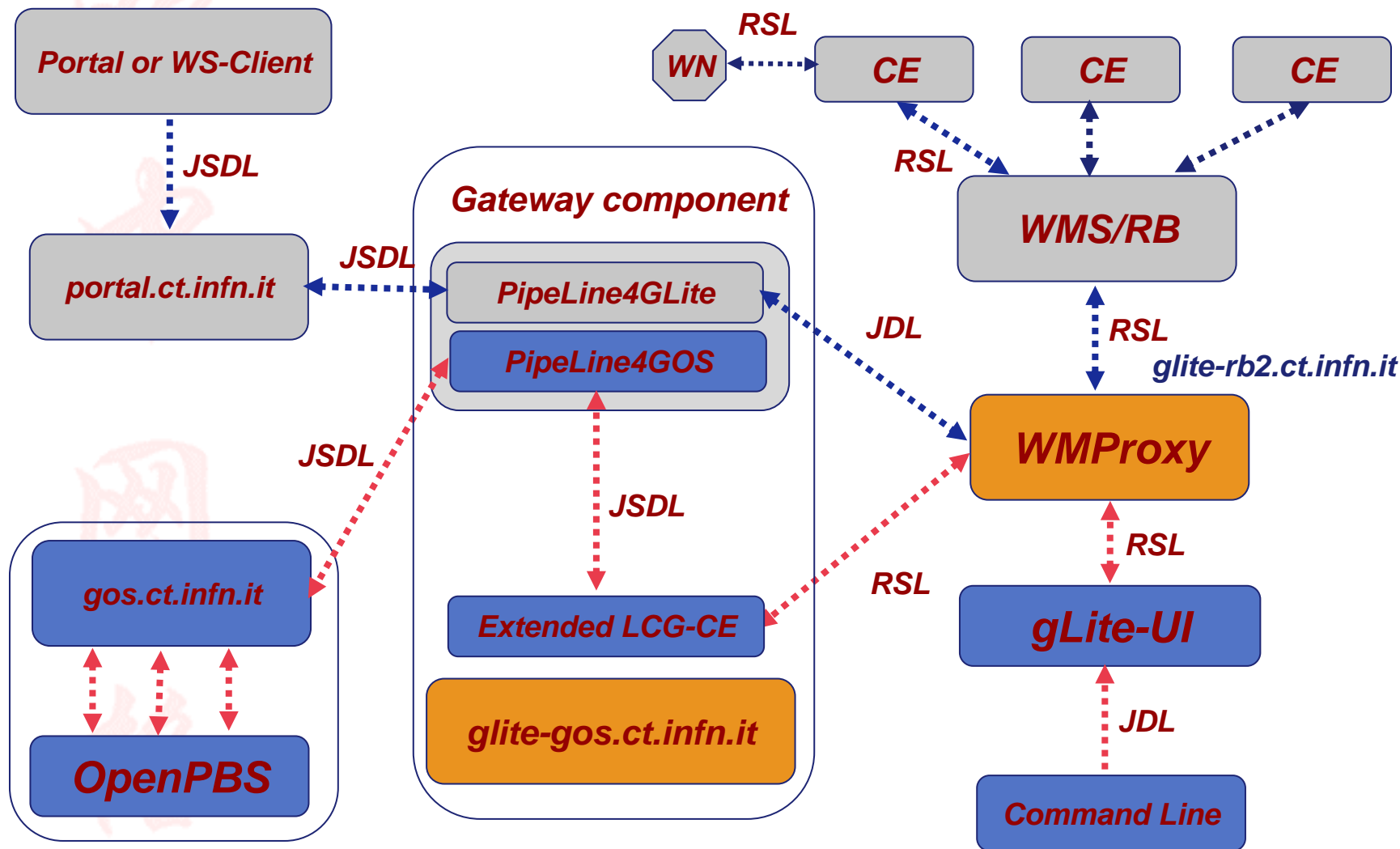




Batch job level interoperability process

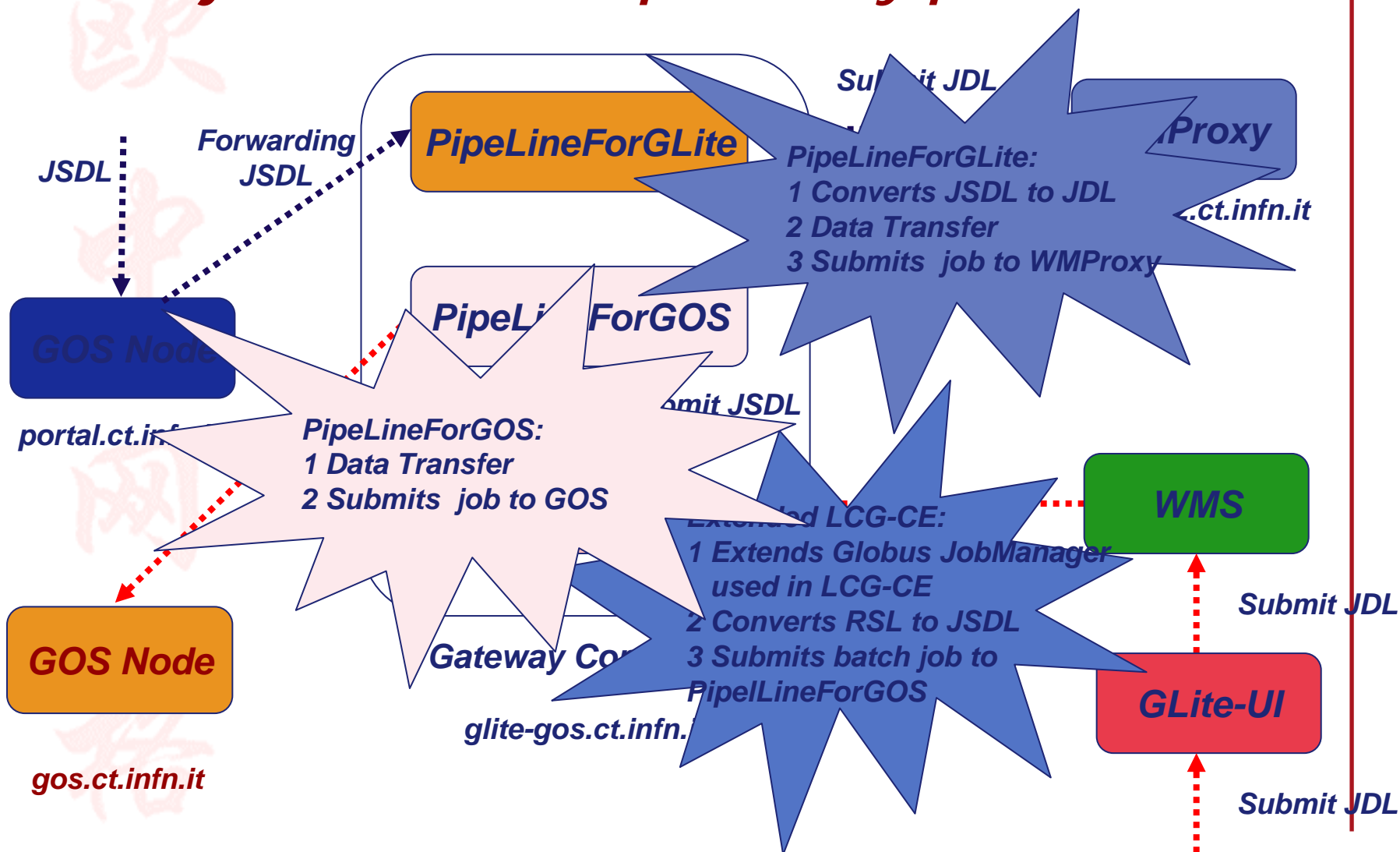
- ***Batch job level interoperability required:***
 - ***Extended JobManager in both gLite and GOS***
 - ***Extended gLite LCG-CE JobManager Framework***
 - ◆ ***LCG-CE JobManager Framework has couple relationship with resource schedule mechanism of gLite***
 - ***Provided Broker plugin for GOS JobManager framework***
 - ***Sandbox mode data transfer***
 - ***A fast approach for cross-domain security scenario***

Testbed in Catania, INFN





Batch job level interoperability process

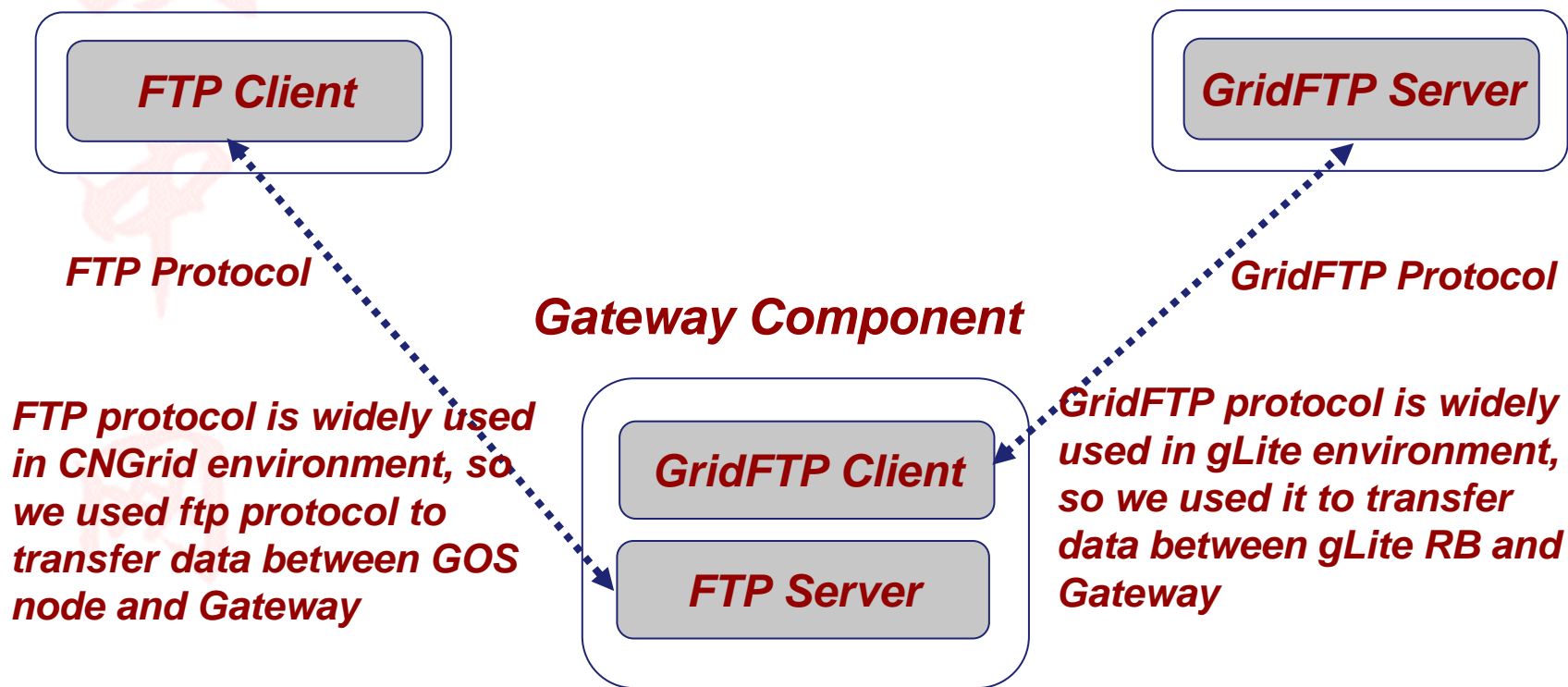




Data Transfer

- ***Data transfer operations between CNGrid and EGEE use sandbox mode***
 - ***All data transfers through Gateway***
 - ***Suitable for small scale data transfer scenario***
 - ***Gateway acts as data transfer center and have two different roles at the same time:***
 - ***GridFTP client***
 - ◆ ***Gateway upload/download necessary data to/from gLite WMS***
 - ***FTP server***
 - ◆ ***GOS upload/download data to/from Gateway component***

Role of Gateway in Data Transfer



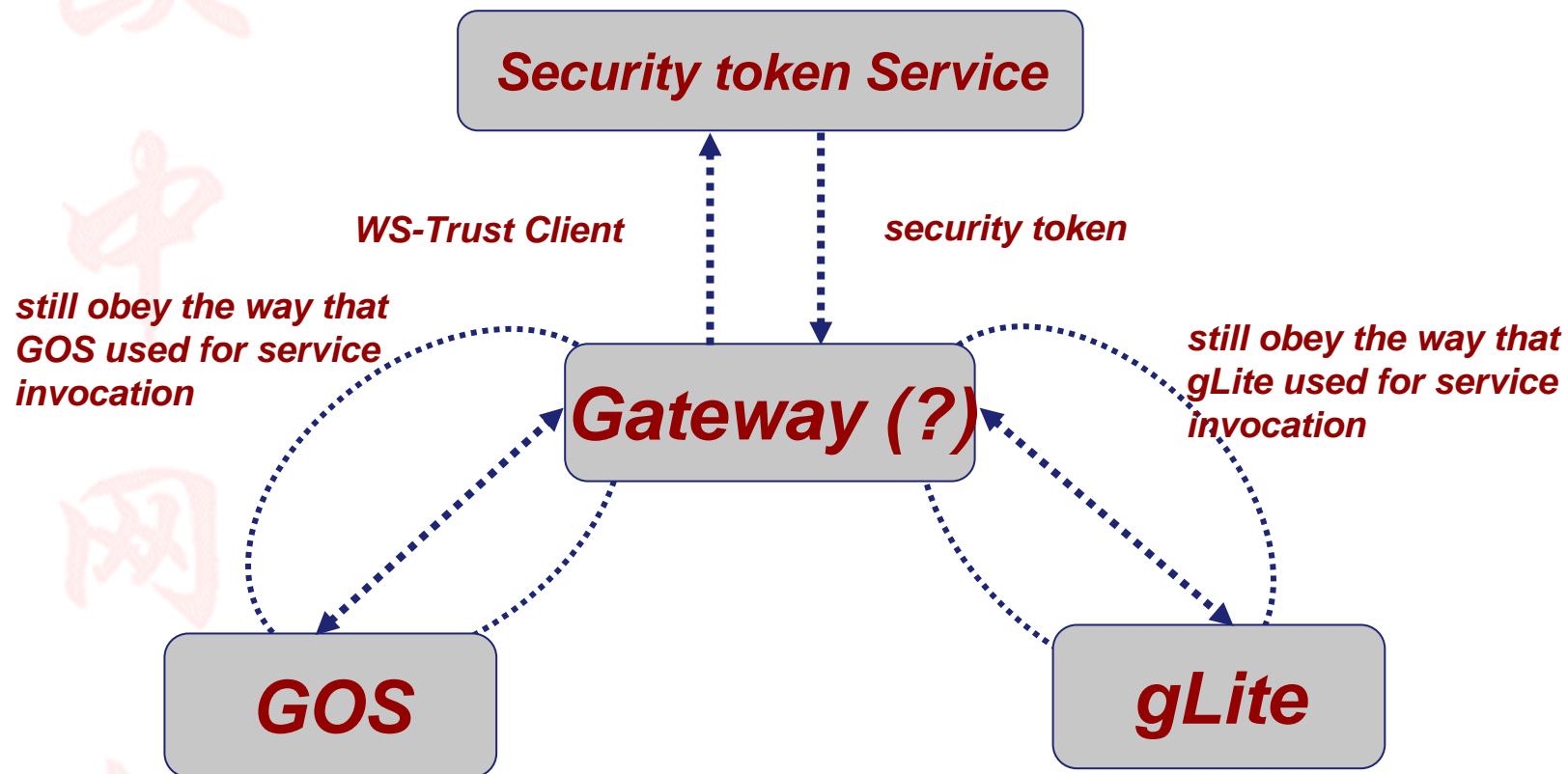
Role of gateway in data transfer scenario



Security issues

- **Security module (just a fast approach) for cross-domain security**
 - **Predefined users in both GOS and gLite. Requests:**
 - from GOS are submitted to gLite using predefined voms proxies
 - from gLite are submitted to GOS using predefined names
 - **User Management module designed to maintain mappings**
- **Security token service in EUChinaGRID-II.**
 - **Used to keep, distribute, exchange and verify security token between GOS and gLite and provide dynamical approach**
 - **IdentityMapping and Security Token Services should be used to provide such a functionality.**
 - **IdentityMapping service should be used to map identity between heterogeneous authentication management infrastructure, such as PKI and Kerberos.**
 - **Security Token Service should be used to store security token centrally allowing user from different domains to retrieve the corresponding token when necessary, as defined in OGSA-BES specification.**

Role of Security Token Service



Role of security token service in cross-domain security scenario

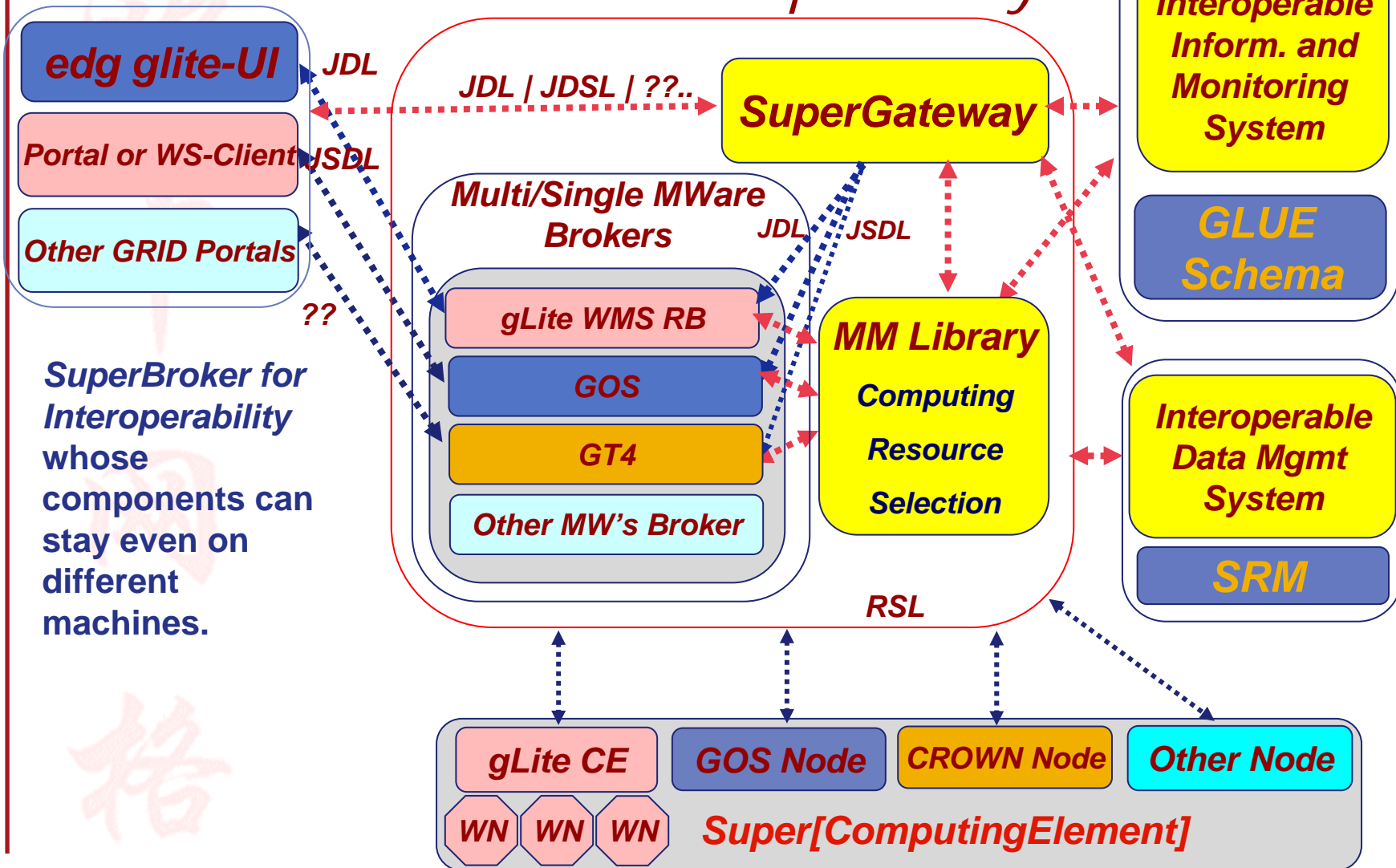


Agenda

- ***EUChinaGRID: work overview***
- ***Gateway-based interoperability used in the Project***
 - ***Role of Gateway***
 - ***Gateway design principles***
 - ***Core components of gateway***
 - ***Testbed***
 - ***Batch job level interoperability process***
 - ***submit batch job from GOS to GLite***
 - ***submit batch job from GLite to GOS***
 - ***How to deal with Data transfer***
 - ***Manner to implement data transfer in EUChinaGrid project***
 - ***Security issues***
- ***EUChinaGRID-II: a new Architecture for Interoperability***
- ***Common issues in interoperability to be addressed***



New Architecture for Interoperability





Future Tasks (1/4)

- ***Integrated Middleware execution environment***
 - ***SuperGateway (SGW)***
 - *transparent interfaces giving ability to submit jobs to the integrated middleware with no respect to the individual Grids architectures.*
 - ***Resource selection & ranking***
 - *based on pieces of info stored into an unified I&M system simultaneously providing data coming from different grid environments.*
 - *job description file and VO Management System*
 - ***transparently integrated w/ all Grid infrastructures.***
 - *developing respective interfaces to all Grids technologies used, pretending the SGW is an ordinary resource broker/server used by the respective Grid. OGSA-BES compliance.*



Future Tasks (2/4)

- **Integrated Virtual Organization**

- **FiVO**

- *evolve already developed Framework for intelligent Virtual Organization (called FiVO) as serving a provider of a unified vision of the heterogeneous grid environment. In turn, the information from FiVO can be processed by all tools and application required to deal at the global scale in EUChinaGRID-2 including Super Gateway.*

- **Major issues addressed by FiVO:**

- *Provision of a unified semantic interface (at least at the service level) for discovery and management of all aspects of a Virtual Organization (including its members, computer resources, etc).*
- *Allowing both static (manual) and dynamic (semi-automatic) creation and deployment of Virtual Organizations aiming to pursue some goal.*



Future Tasks (3/4)

- **Network Availability Measurement Services**
 - **network quality estimation.**
 - *NAMS, quality measurement service provides continuous overview of the network available bandwidth between all sites connected to the grid the current available bandwidth without need of temporary flooding the network.*
 - *95% of probability to estimate the current available throughput between two points in the network.*
 - *Such a technique does not flood the network and requires only a simple installation of monitoring service at every site which has to be monitored*
 - *estivolve already developed Framework for intelligent Virtual Organization (called FiVO) as serving a provider of a unified vision of the heterogeneous grid environment. In turn, the information from FiVO can be processed by all tools and application required to deal at the global scale in EUChinaGRID-2 including Super Gateway.*
 - ▶ **IPv6 compliance.**
 - **verify compliance of new and existing middleware services with the IPv6 rules.**
 - *the objective would be to identify the needed changes and to verify them afterwards.*



Future Tasks (4/4)

● The SuperCE

● *Middleware Co-existence*

Open Grid Forum's standards for complete interoperability is slow and limited, because of the big impact on architectures and features of middleware.

- *When a grid infrastructure is deployed, it can be used only by clients supporting its specific middleware.*
- *If different grids plan to merge, in order to increase the amount of resources shared, all of them should deploy the same middleware.*
- *A different approach to the interoperability is based on the so called middleware coexistence.*
- *Different middleware do not need to communicate to each other in order to have two grid infrastructures based on them to be able to merge.*
 - *Computing resources are all made available to all the users independently of the particular middleware they want to use.*
 - *Integration of different grid infrastructures is much easier and all users can exploit their previous knowledge base.*
 - *One side effect of the application of this approach will be the resource multiplication of resources available all over the world for everyone of the participating middleware.*



Agenda

- ***EUChinaGRID: work overview***
- ***Gateway-based interoperability used in the Project***
 - ***Role of Gateway***
 - ***Gateway design principles***
 - ***Core components of gateway***
 - ***Testbed***
 - ***Batch job level interoperability process***
 - ***submit batch job from GOS to gLite***
 - ***submit batch job from gLite to GOS***
 - ***How to deal with Data transfer***
 - ***Manner to implement data transfer in EUChinaGrid project***
 - ***Security issues***
- ***EUChinaGRID-II: a new Architecture for Interoperability***
- ***Common issues on interoperability to be addressed***



Common issues in interoperability

- **Full compliance to OGSA-BES standard.**
- **Resource Discovery.**
Adoption of **Glue Schema**. Should use the same schema or do some necessary conversion. Builds Super InformationIndex.
- **Resource Selection Mechanism.**
Global/Particular **MatchMaking algorithm**. Requires Super InformationIndex.
- **Data Management Mechanism**
Focusing on a point-to-point data transfer solution (doable with limited effort).
Development of a standard **SRM-compliant interface**.
- **Security. Unified Login session.**
A **unified login session** to the Interoperable Grid system will be handled so that the user will have no need to re-login again when his/her jobs are submitted to a different Grid infrastructure.
The price is a registration policy/procedure.
Information for automatic login are maintained by SGW(s).
Login on a specific middleware will be done only if necessary.



Thanks to

- *Yongjian Wang, Beihang University, Beijing*
- *Diego Scardaci, INFN Catania*

for their contributions.



欧
中
网
格

Thanks for your attention.

Any Questions?