



Enabling Grids for E-science

Interoperability

Markus Schulz

For EGEE-II SA3

IT Department, CERN

Final EU Review of EGEE-II

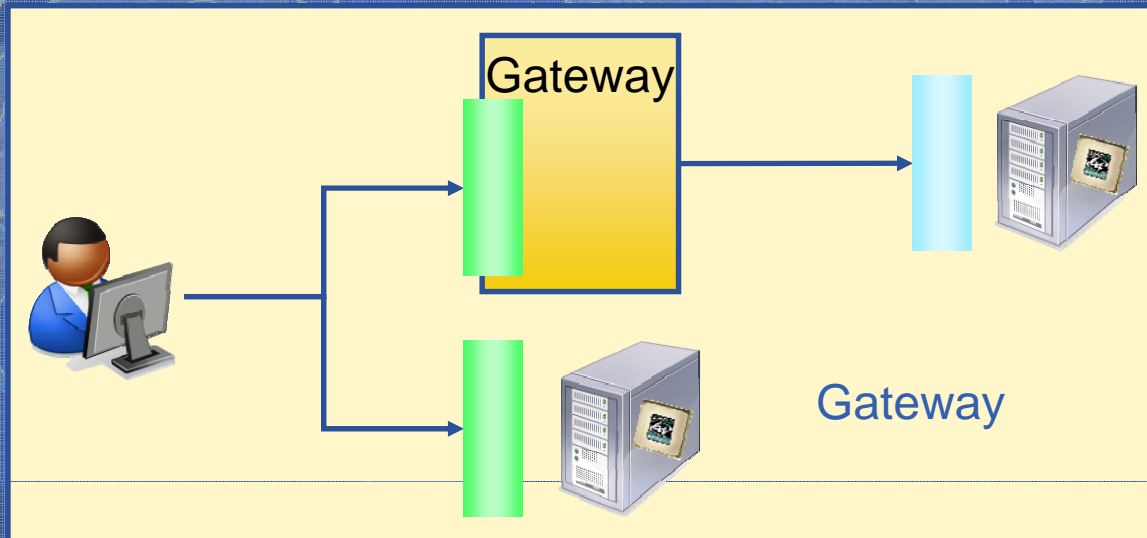
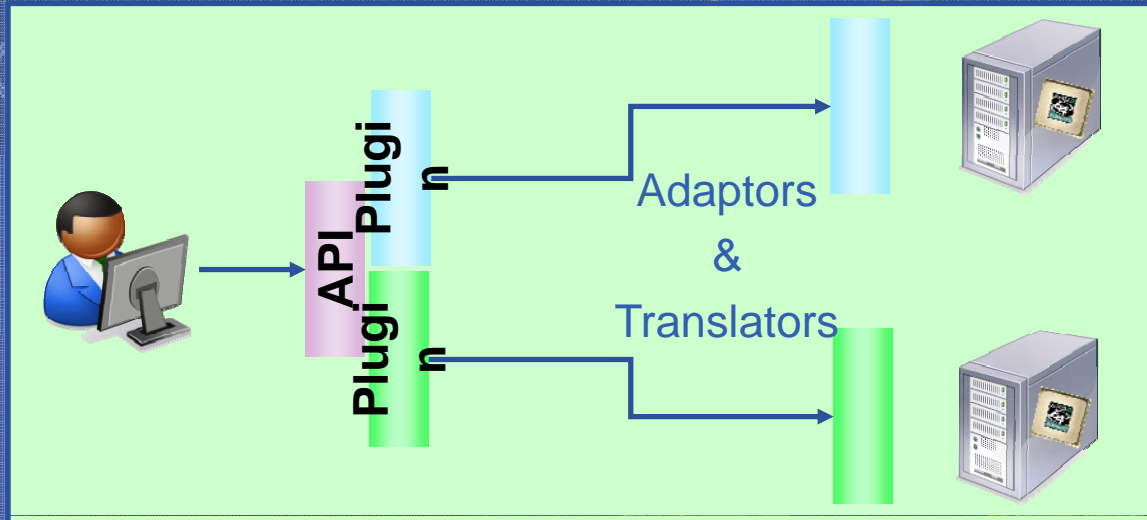
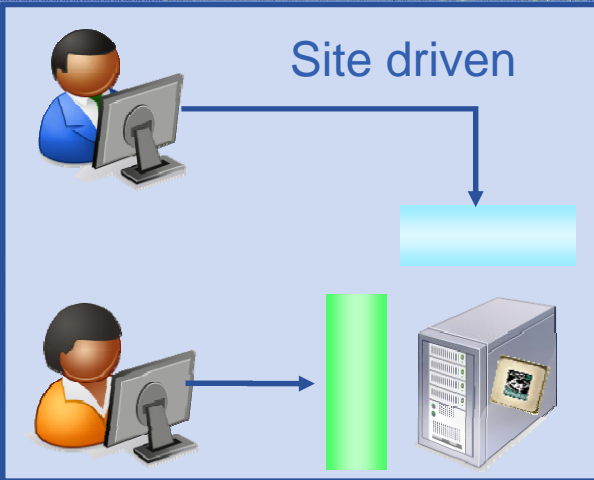
CERN, July 2008

www.eu-egee.org
www.glite.org



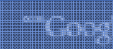
Why Interoperation?

- Over the last 6 years several large scale production grids emerged
 - Initially there were no (usable) standards
 - Standards take time to mature
 - We need to build the infrastructures now!
 - As a result, infrastructures are based on different middleware
 - User communities span several infrastructures
 - This drives the need for interoperability and interoperation
 - Several approaches to achieve interoperability are used
 - All have drawbacks
 - Maintaining interoperability is inherently difficult
 - Common standards are the future
 - EGEE has pioneered interoperability from the beginning
- 
- A blue-bordered box on the left side of the slide contains a list of infrastructure names: EGEE, OSC, Naregi, Teragrid, Pragma, and Nordugrid.



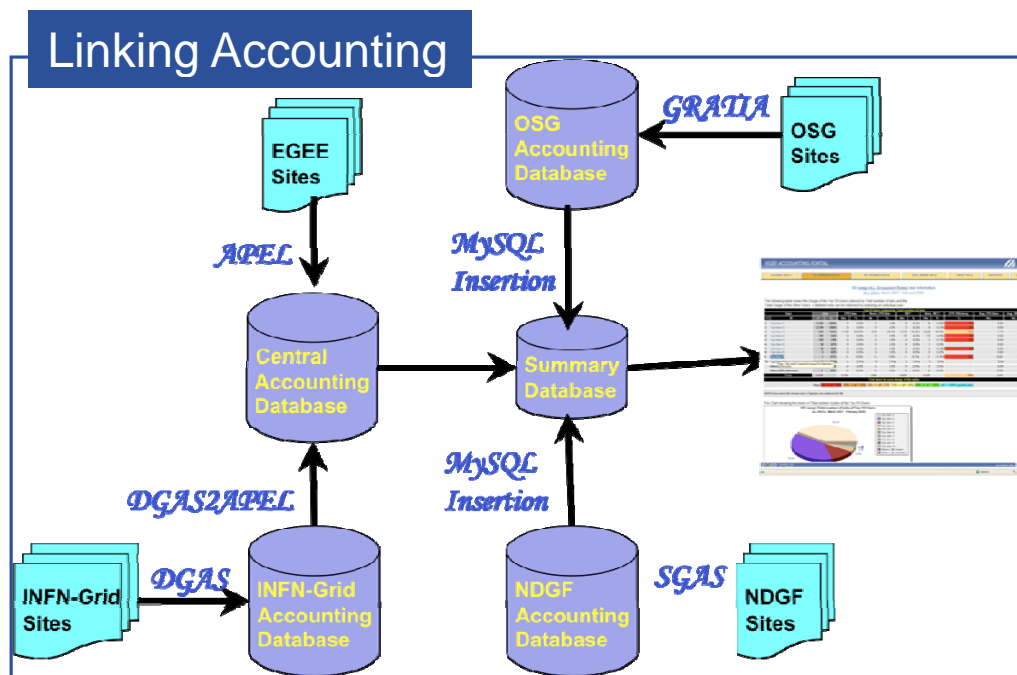
- OSG
- Naregi
- Teragrid
- Pragma
- Nordugrid

www.eggee.org
 Enabling Grids for E-science
 Project #25552, funded by the
 European Union



- **Interoperability:**
 - “The ability to exchange information and to use what has been exchanged”
 - (software)

- **Interoperation:**
 - “The use of interoperable systems“
 - (Infrastructures)



- **ARC (used by NDGF)**
 - Nordic Data Grid Facility
- **UNICORE (used by DEISA)**
 - Mainly on supercomputers
- **See next presentations**

- **OSG**
 - In production since 2 years (extensive use by CMS)
 - Interoperability testbed as part of the PPS
 - Accounting has been interfaced
 - Monitoring is currently underway
 - Grid specific tests have been compared and adapted
 - Trouble ticketing has been interfaced
 - OSG is participating in the weekly operations meetings



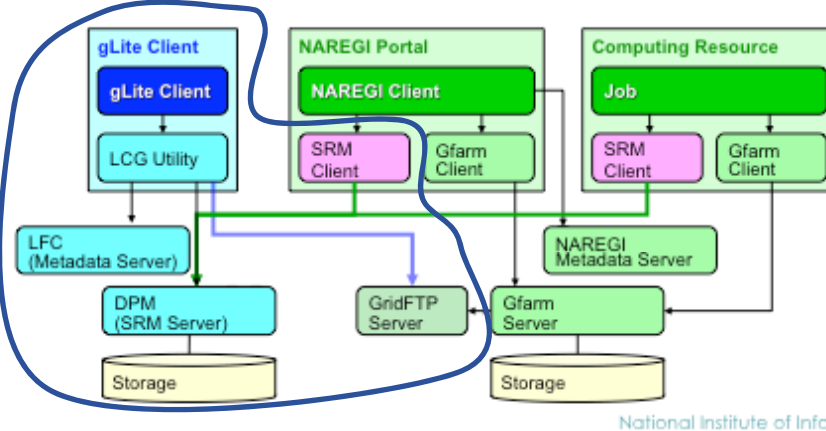
- **Close contact since 2006**
- **In 2007 30 NAREGI members visited CERN and Lyon**
 - Focus was on learning from EGEE grid operation
- **NAREGI demonstrated first set of interoperability tools**
 - Job submission gateway
 - Info system translator
 - Data management link
- **Starting up the infrastructure**
 - 5 sites December 2008
- **Building their operations team**
 - Communication channel has been opened





Data Exchange: Architecture in β Release

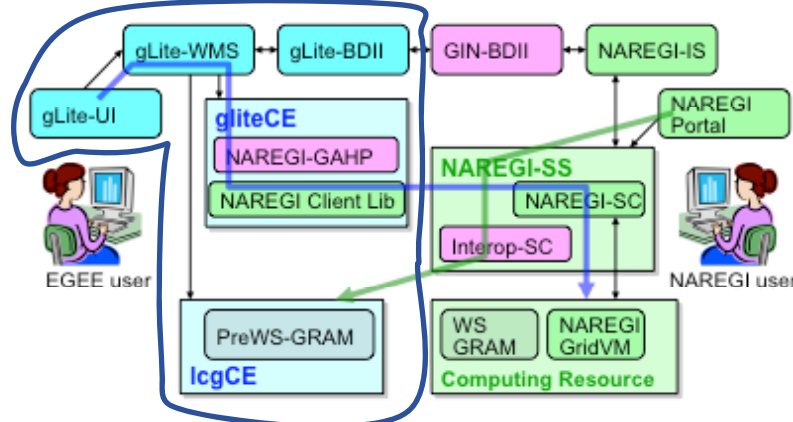
- NAREGI and EGEE gLite clients can access to both data resources (e.g., bi-directional file copy) using SRM interface.
- GridFTP is used as its underlying file transfer protocol.
- File catalog (metadata) exchange is planned.



National Institute of Info

Job Submission: Architecture in $\beta 2$

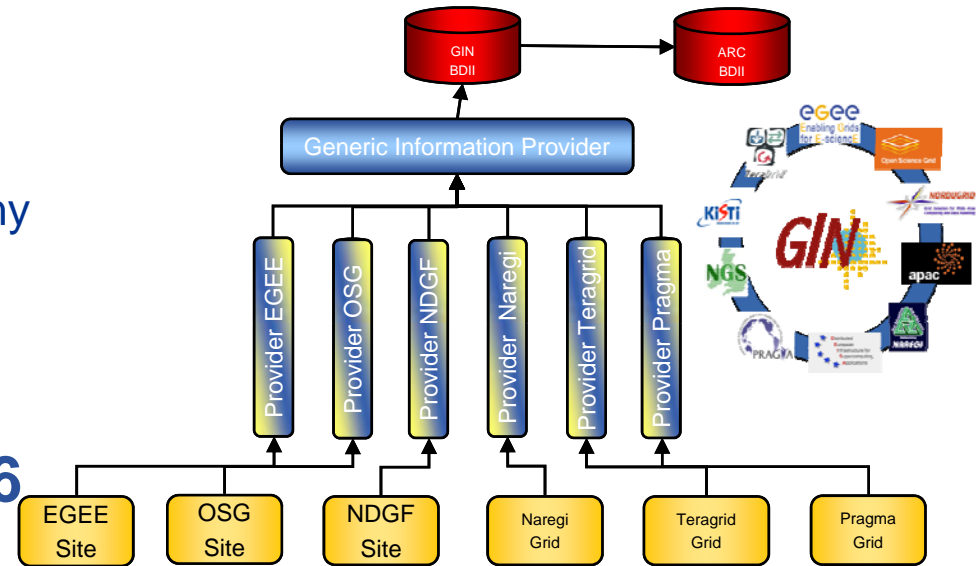
Architecture



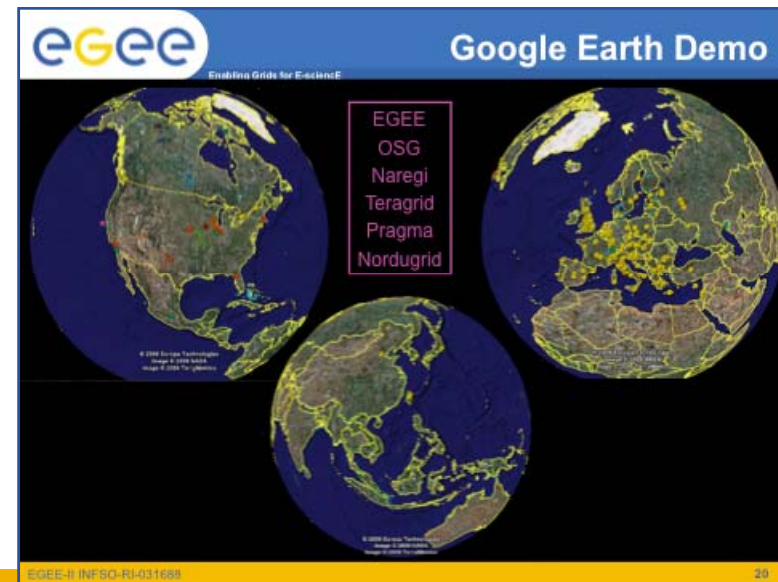
- NAREGI → EGEE: using NAREGI Workflow
- EGEE → NAREGI: using glite WMS commands

National Institute of Informatics

- **GIN info**
 - Part of the **OGF GIN** activity
 - Links information systems of many grid infrastructures
 - SA3 developed the concept and helped with translators
- **Translator up since SC 2006**
 - Interfaced to google earth



- **GIN is a main channel for exchanging experience**

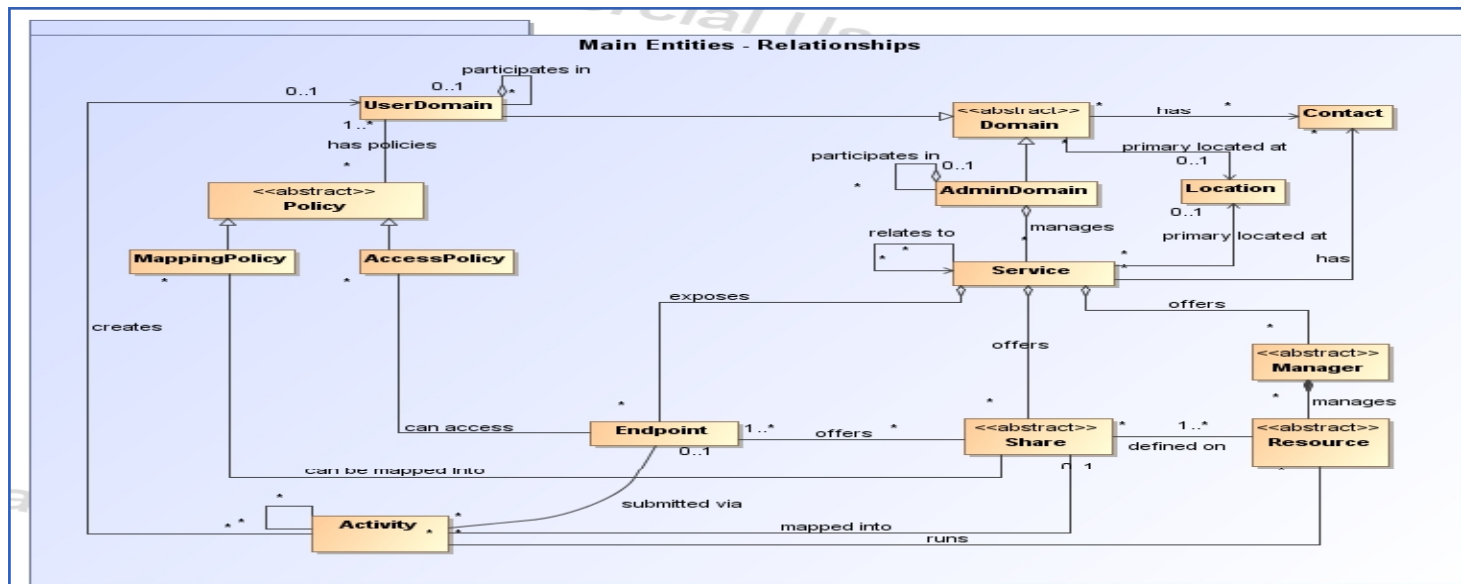


- **Interoperability requires communication**
- **We are in contact with:**
 - EUChina Grid (GOS)
 - EUIndia Grid (Garuda)
 - PRAGMA
 - a community in Asia, not a middleware stack
 - GIN
 - OSG
 - Teragrid
 - NGI
 - DEISA
 - KnowARC/ARC/NDGF/Nordugrid
 - Naregi
 - EUAsiaGrid
 - EUAsiaGrid
 - CrownGrid
 - APAC
 - OurGrid (Brazil)
 - Grid IT
 - EUMedgrid
 - EELA
 - Baltic Grid
 - SEE Grid

- EGEE has been very active in bringing together different groups to get results.
 - This has been motivated by the large user community that is behind EGEE

- **Problems faced when working on interoperability**
 - Security infrastructure
 - Different concepts and priorities
 - Site network policies
 - “VPN” approach to grids, private network
 - Data management
 - Different concepts, technologies
 - gridFTP can be used as glue
 - Job management
 - Every infrastructure has a different CE
 - *Batch Systems x CEs*
 - Standards
 - Only emerging, still room for interpretation
 - Standards have to follow experience to be useful
 -

- EGEE is driving GLUE standardization
- GLUE is the information schema used by several grids
 - It describes services and allows resource discovery
 - It is at the centre of the information system
 - It influences the architecture
 - If it can't be described via GLUE it is invisible on the grid



- **GLUE standardization is now part of OGF**
 - An EGEE member co-chairs the group
 - NDGF, ARC, OMII, NGS, NAREGI, DEISA, UNICORE contribute to the standard
 - More are interested to adopt it
 - Addresses many shortcomings of the current schema
- **The GLUE-2.0 standard is now passing through the “Draft Recommendation” state**
 - Finalized within 2 months
 - Adoption is planned
 - Migration from 1.3 to 2.0 will start within 6 months

- **CIM deals with another layer of infrastructures**
 - CIM.core contains network, memory etc.
- **GLUE-2 extends the CIM data model**
 - To describe grid services
 - OGF has a liaison with the DMTF
 - Over time grid entities will move into CIM
- **Why not use the CIM implementation WBEM?**
 - We looked into it
 - It is not clear how WBEM can scale to the EGEE size

- **Security**
 - Use X.509 certificates and VOMS Attribute Certificates
 - In future SAML and XACML for attribute and policy management

- **Information system, monitoring and accounting**
 - GLUE schema (1.3 now 2.0 in future) via LDAP
 - In future use a SAGA compliant interface for access
 - UR for description of accounting usage records
 - In future will adopt the RUS interface

- **Job Management**
 - Adopt BES interface in CREAM
 - but currently not descriptive enough
 - JSDL (with extensions) used to describe jobs
 - Is widely available

- **Data Management**
 - SRM 2.2 interface for data access and GridFTP for file transfers
- **Use a Web Service Interface wherever possible**
 - When performance allows



Enabling Grids for E-science

EGEE-II Review Interoperability: ARC

Michael Grønager, PhD

Project Director, NDGF

Representing EGEE-II partner: UKBH

CERN, *July 8th 2008*

• www.eu-egee.org

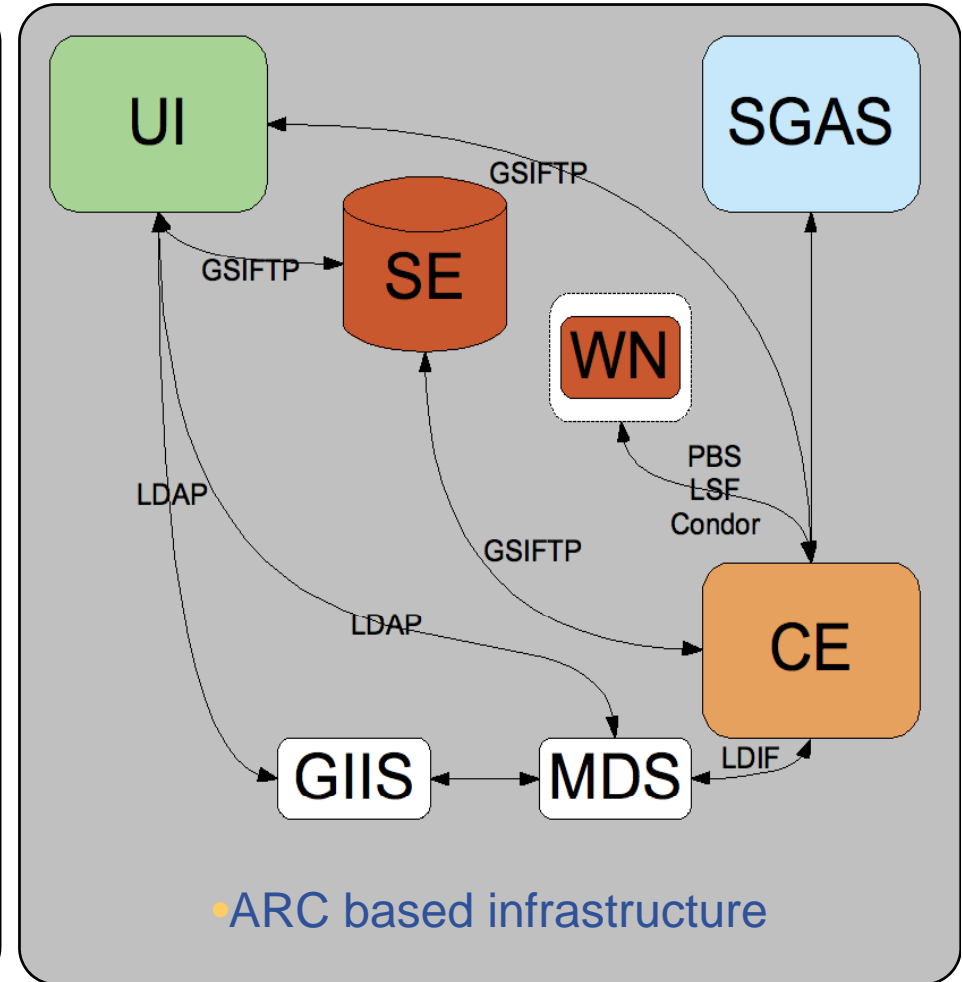
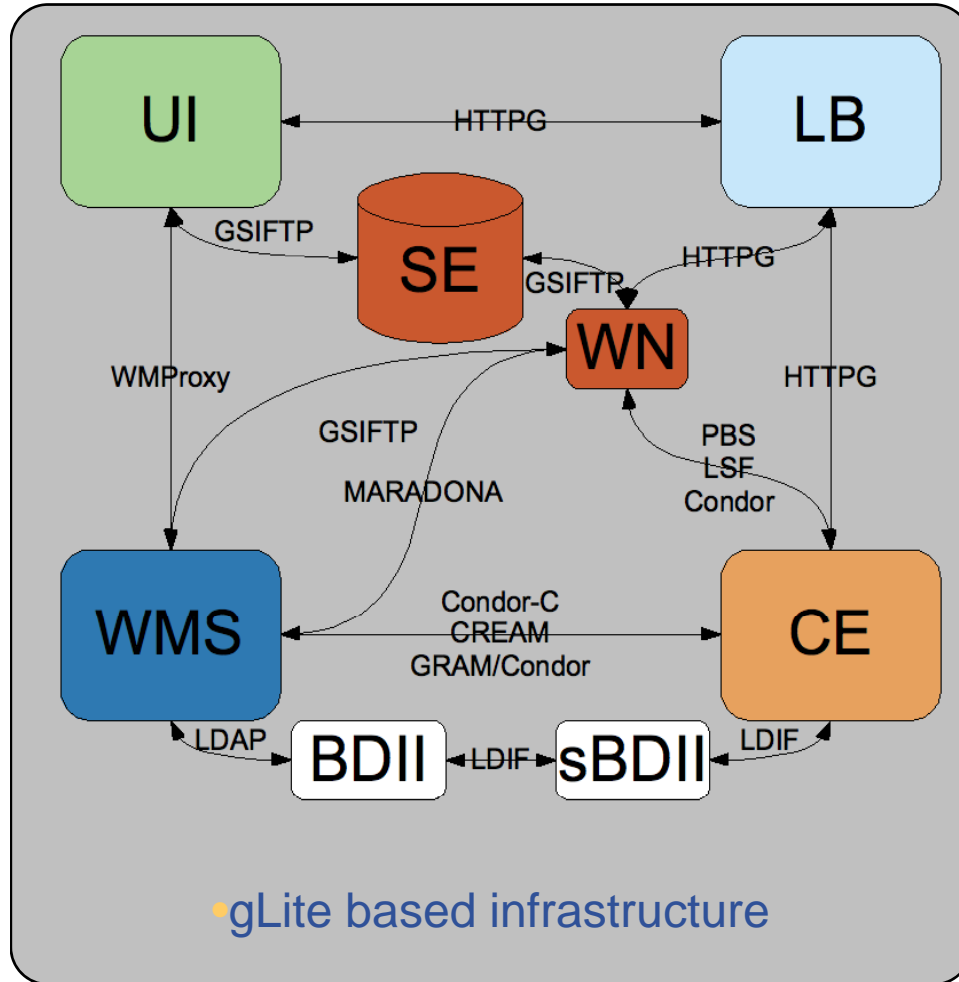


Information Society
and Media



- **Motivation and goal**
- **ARC/gLite comparison**
- **Interoperability**
- **Interoperation**
- **Status and results**
- **The future and sustainability**

- **Integration of ARC sites into the emerging European Grid Infrastructure**
- **Allow non-linux and multi OS sites to be part of the Grid**
- **A way for better resource usage 12-15%...**
- **Ensure a single interface for the smaller VOs**

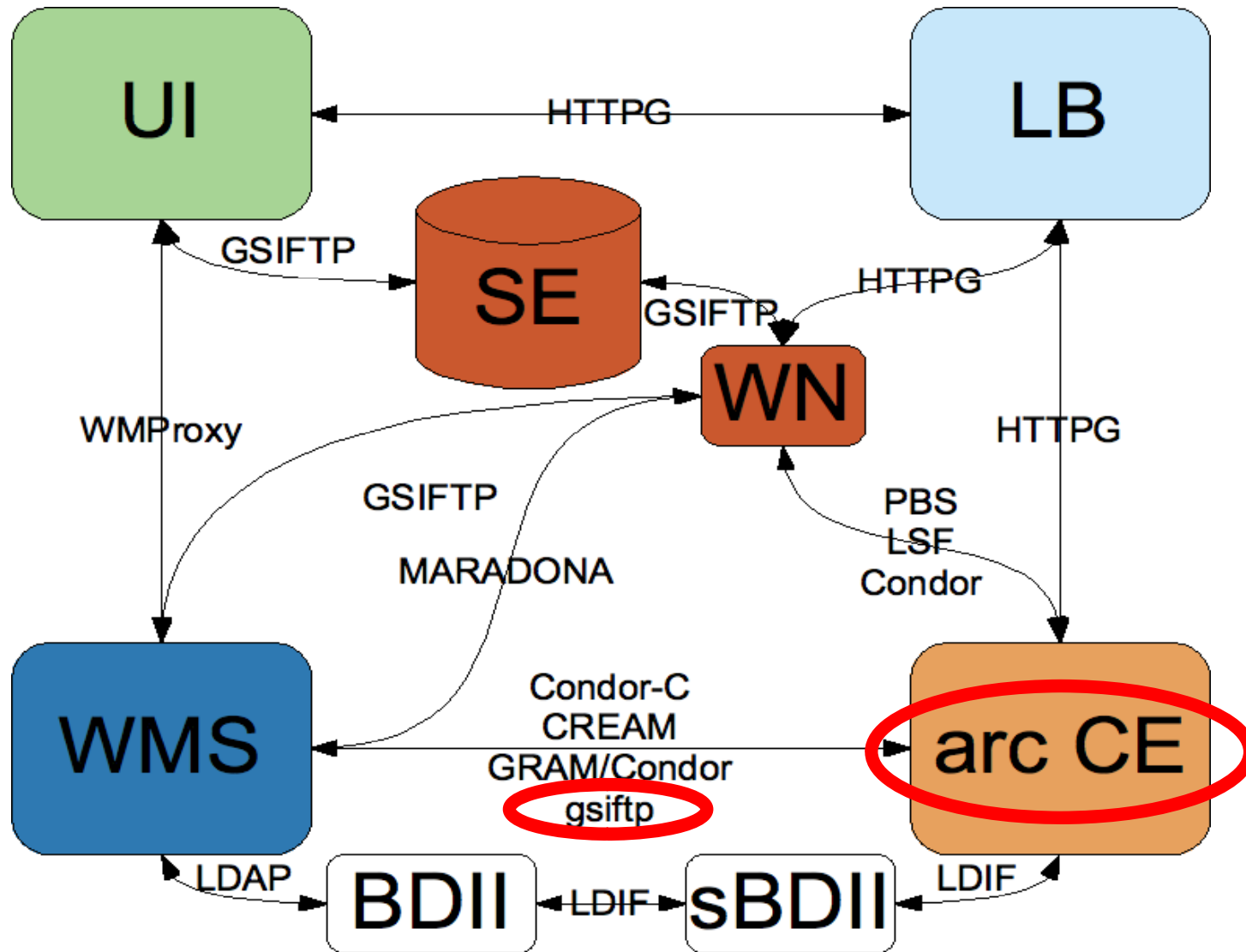


- **Protocol**
 - Unify protocols
- **WMS**
 - Implement ARC submission in gLite-WMS
- **Gateway**
 - Introduce a gateway between gLite and ARC
- **Co-installation**
 - deploy ARC and gLite at the same site
- ***All exploited within SA3***

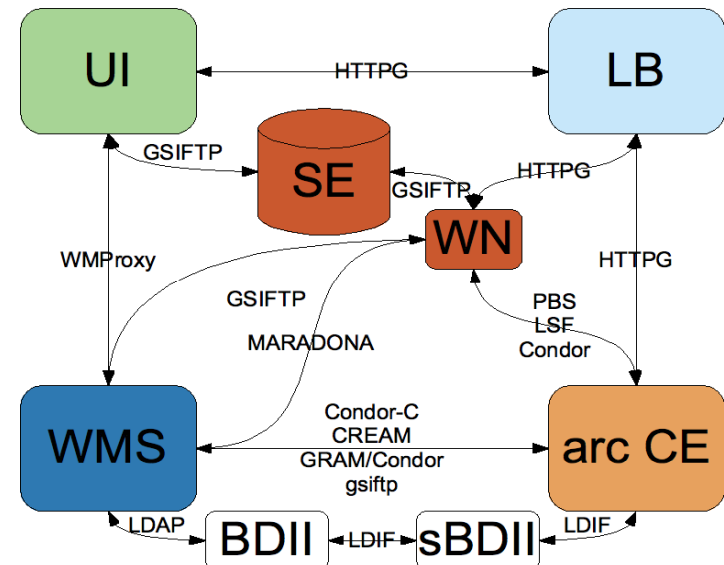
- **Current candidate: OGSA BES**
 - Implemented by EGEE for CREAM CE v.1
 - Implemented by KnowARC for ARC v.1

- **However:**
 - handles only small part of the job cycle
 - no unification of data handling
 - works only for “hello world” kind of jobs
 - a lot more work needed

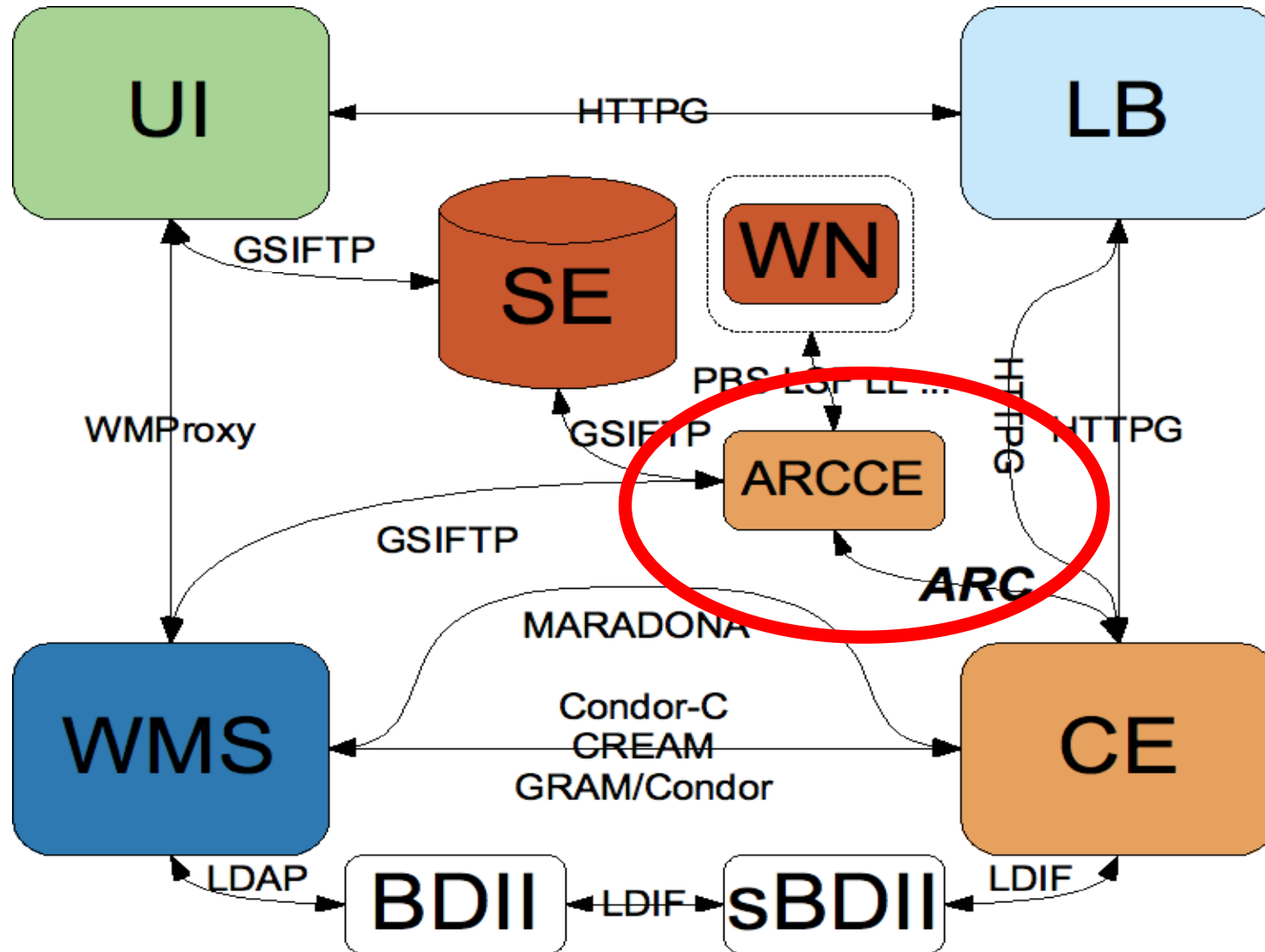
- ***This is our long term goal, though there is still a long way to go***



- Initiated in 2006
- Problems encountered in building the gLite-WMS
- Uses Condor-G ability to submit to ARC
- Functional today
- Requires:
 - Spezial gLite-WN
 - Runtime environment on the ARC-CE (proxies on WNs)
 - Outbound connections open



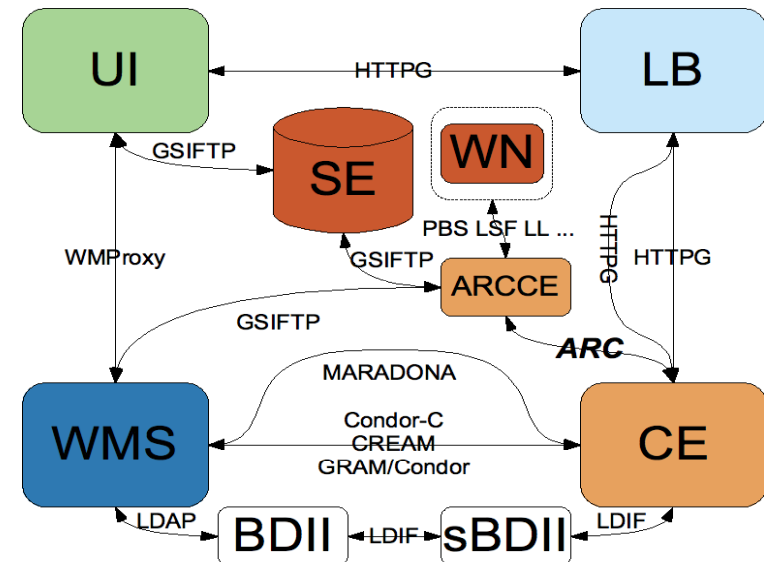
Gateway from gLite to ARC



- **Initiated in fall 2007**
 - due to slow progress of the WMS solution
 - finished in April 2008

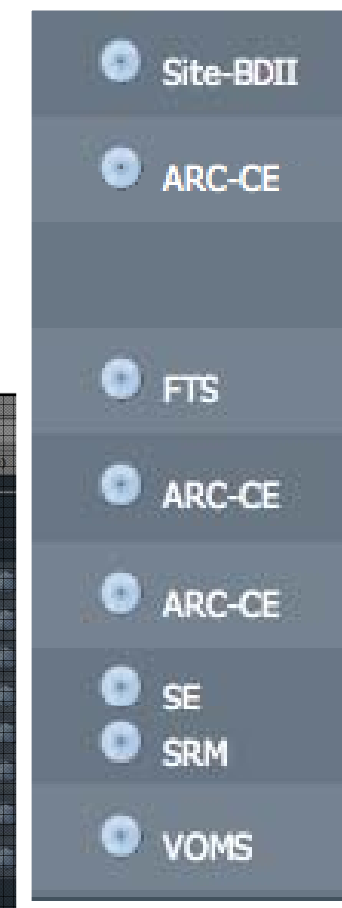
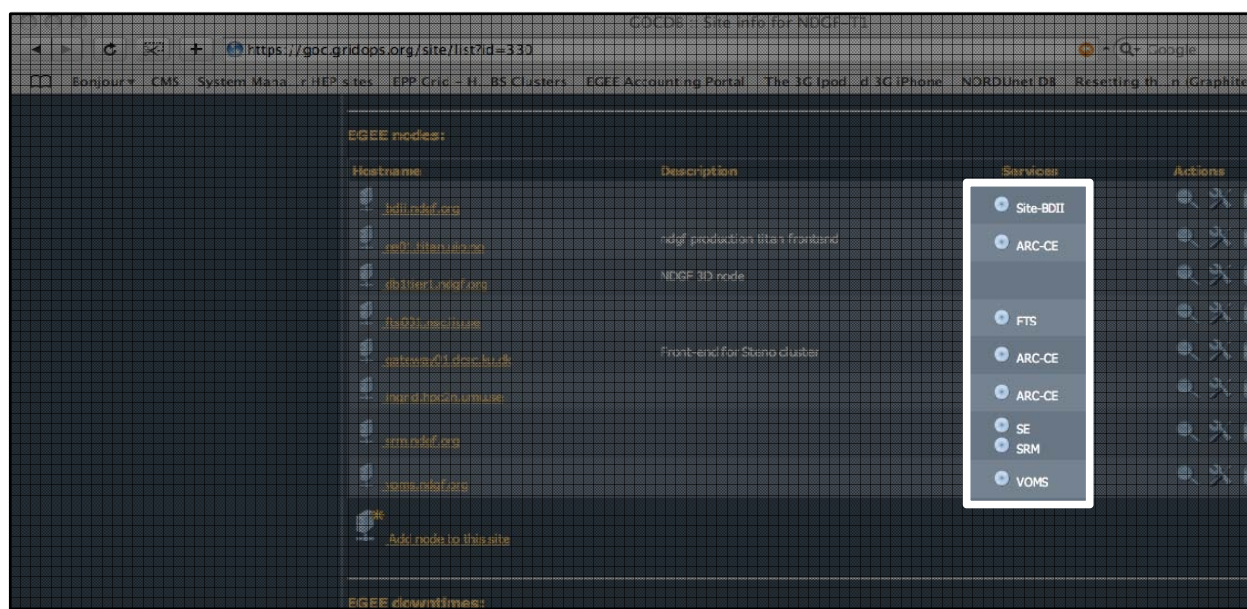
- **Modified gLite-CE to submit to ARC**
 - Add ARC as another LRMS to BLAH
 - *Adapts* gLite job to run on ARC
 - No data handling by WN
 - No need for proxy on WN
 - No need for “outbound” Wns
 - 12-15% performance gain

- **Functional today, but:**
 - gLite-CE (deprecated)
 - CREAM-CE on its way

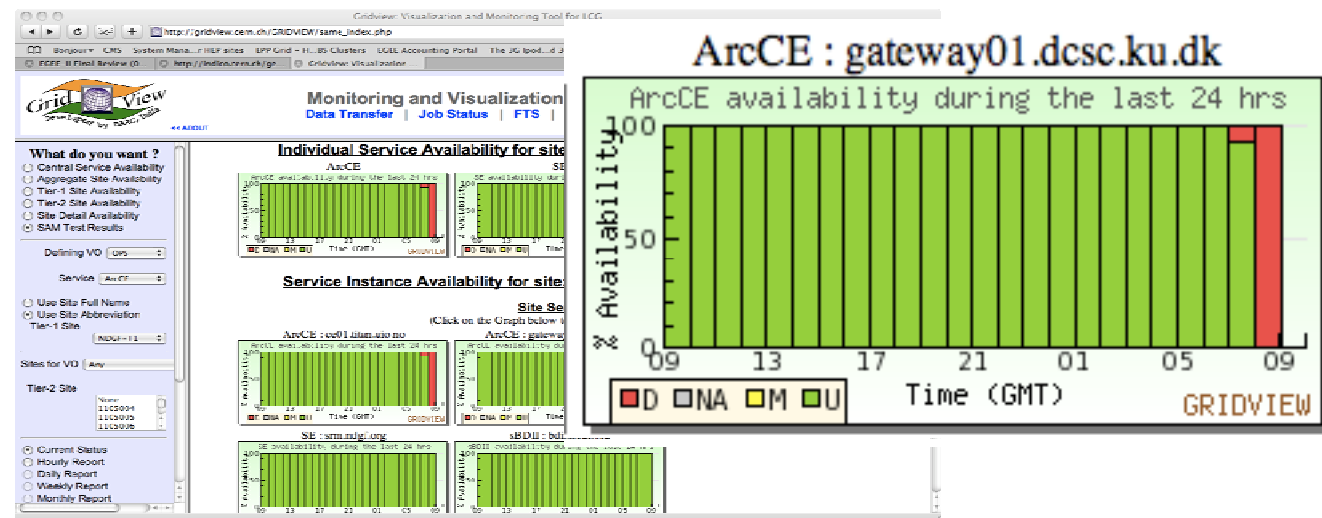


- **Between: “the Nordic Grid (now NDGF)” and “EGEE” - goal is:**
- **To integrate NDGF fully into the EGEE infrastructure**

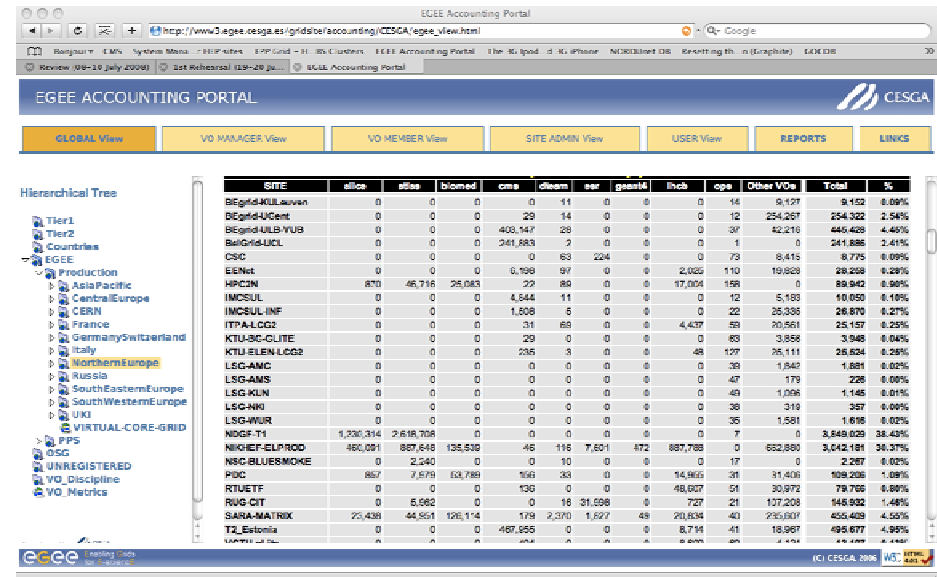
- Between: “the Nordic Grid (now NDGF)” and “EGEE” - goal is:
- To integrate NDGF fully into the EGEE infrastructure
- Registered ARC-CEs in the GOCDB



- Between: “the Nordic Grid (now NDGF)” and “EGEE” - goal is:
- To integrate NDGF fully into the EGEE infrastructure
- Registered ARC-CEs in the GOCDB
- Enabled SAM tests for ARC-CEs



- Between: “the Nordic Grid (now NDGF)” and “EGEE” - goal is:
- To integrate NDGF fully into the EGEE infrastructure
- Registered ARC-CEs in the GOCDB
- Enabled SAM tests for ARC-CEs
- Enabled Accounting for NDGF



EGEE ACCOUNTING PORTAL

GLOBAL View | VO MANAGER View | VO MEMBER View | SITE ADMIN View | USER View | REPORTS | LINKS

Hierarchical Tree

- Tier1
 - Tier2
 - Countries
 - EGEE
 - Production
 - Asia Pacific
 - CentralEurope
 - CERN
 - France
 - GermanySwitzerland
 - Italy
 - NorthernEurope
 - Russia
 - SouthEasternEurope
 - SouthWesternEurope
 - UKI
 - VIRTUAL-CORE-GRID
 - PPS
 - OSC
 - UNREGISTERED
 - VO_Discipline
 - VO_Metrics

SITE	alice	atlas	blomed	cms	cleann	esr	genit4	lhc_b	ops	Other VO's	Total	%
BEGrid-KULLeuven	0	0	0	0	11	0	0	0	16	0.127	9.152	0.09%
BEGrid-UCent	0	0	0	29	14	0	0	0	12	254.267	254.322	2.54%
BEGrid-ULB-VUB	0	0	0	403,147	28	0	0	0	30	42.216	445.428	4.45%
BEGrid-UDEL	0	0	0	241,883	7	0	0	0	1	0	241.886	2.41%
OSG	0	0	0	0	83	224	0	0	73	8.415	8.775	0.09%
EE-Net	0	0	0	0,198	97	0	0	2,022	110	19,983	20,258	0.2%
HPC-Net	870	45,716	25,083	22	86	0	0	17,004	158	0	89,942	0.9%
IMCSUL	0	0	0	4,544	11	0	0	0	12	5,183	10,050	0.1%
IMCSUL-INF	0	0	0	1,508	5	0	0	0	22	25,335	26,870	0.27%
ITPA-LCG2	0	0	0	31	65	0	0	4,437	59	20,551	25,157	0.25%
KTU-SG-GLITE	0	0	0	23	0	0	0	0	83	3,958	3,948	0.04%
KTU-SG-GLITE	0	0	0	235	3	0	0	48	127	25,111	26,524	0.26%
LSG-AMC	0	0	0	0	0	0	0	0	39	1,842	1,881	0.02%
LSG-AMS	0	0	0	0	0	0	0	0	47	179	228	0.00%
LSG-KLN	0	0	0	0	0	0	0	0	49	1,096	1,145	0.01%
LSG-NRI	0	0	0	0	0	0	0	0	38	319	357	0.00%
LSG-WUR	0	0	0	0	0	0	0	0	35	1,581	1,616	0.02%
NDGF-T1	1,230,314	2,618,708	0	0	0	0	0	0	7	0	3,849,029	38.43%
NIJOF-ELN/PROD	480,291	807,548	135,258	45	116	7,501	472	687,788	0	682,850	3,042,181	30.37%
NSG-BLUESMOKE	0	2,240	0	0	0	10	0	0	17	0	2,267	0.02%
PDIC	857	7,679	534,789	166	33	0	0	14,866	31	11,408	108,206	1.08%
RTUETF	0	0	0	130	0	0	0	48,007	21	30,972	79,705	0.8%
RUG-CIT	0	5,082	0	0	18	31,598	0	727	51	107,208	148,932	1.48%
SARA-MATRIX	25,438	44,551	126,114	179	2,370	1,627	49	20,834	43	295,007	455,409	4.55%
TL-Estonia	0	0	0	467,555	0	0	0	8,714	-61	18,987	495,677	4.95%

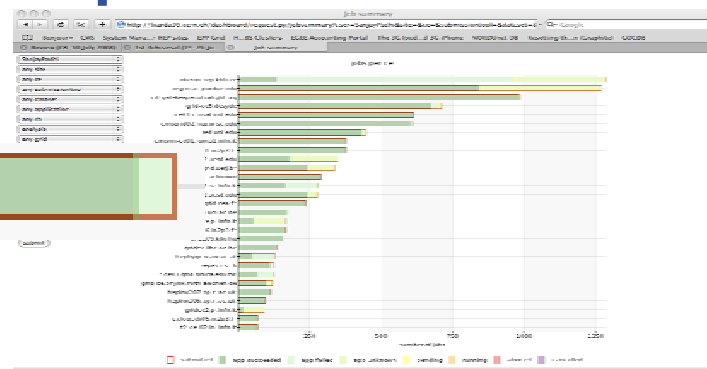
- **Between: “the Nordic Grid (now NDGF)” and “EGEE” - goal is:**
- **To integrate NDGF fully into the EGEE infrastructure**
- **Registered ARC-CEs in the GOCDB**
- **Enabled SAM tests for ARC-CEs**
- **Enabled Accounting for NDGF**
- **The ARC-CE Based NDGF infrastructure is the biggest NE site and contributed (2007) with 4% of all EGEE Computation!**

NDGF-T1	1,230,314	2,618,708	0	0	0	0	0	0	7	0	3,849,029	38.43%
---------	-----------	-----------	---	---	---	---	---	---	---	---	-----------	--------

- **The ARC-CE is now fully compatible with the gLite tools**
- **Sites running the ARC-CE integrate seamlessly into the EGEE infrastructure**
- **All infrastructure components are there:**
 - WMS, GOCDB, SAM, APEL
- **NDGF participates in the EGEE Operation to ensure support of ARC and generally in the CIC-on-Duty**

- The ARC-CE is now fully compatible with the gLite tools
- Sites running the ARC-CE integrate seamlessly into the EGEE infrastructure
- All infrastructure components are there:
 - WMS, GOCDB, SAM, APEL
- NDGF participates in the EGEE Operation to ensure support of ARC and generally in the CIC-on-Duty
- The WMS solution was used in production for CMS for Finnish ARC sites

sepeli.csc.fi



- **EGEE-III and onwards:**
 - The maintenance and support of the ARC interoperability effort is guaranteed by NDGF
 - Enables integration non-linux sites and sites running other OS'es than CERN Scientific Linux
 - The interoperability effort is a fine example of the feasibility of interoperability between infrastructures



Enabling Grids for E-science

gLite – UNICORE interoperability

*Daniel Mallmann
Forschungszentrum Jülich GmbH*

EGEE Final Review, CERN 8th July 2008

www.eu-egee.org

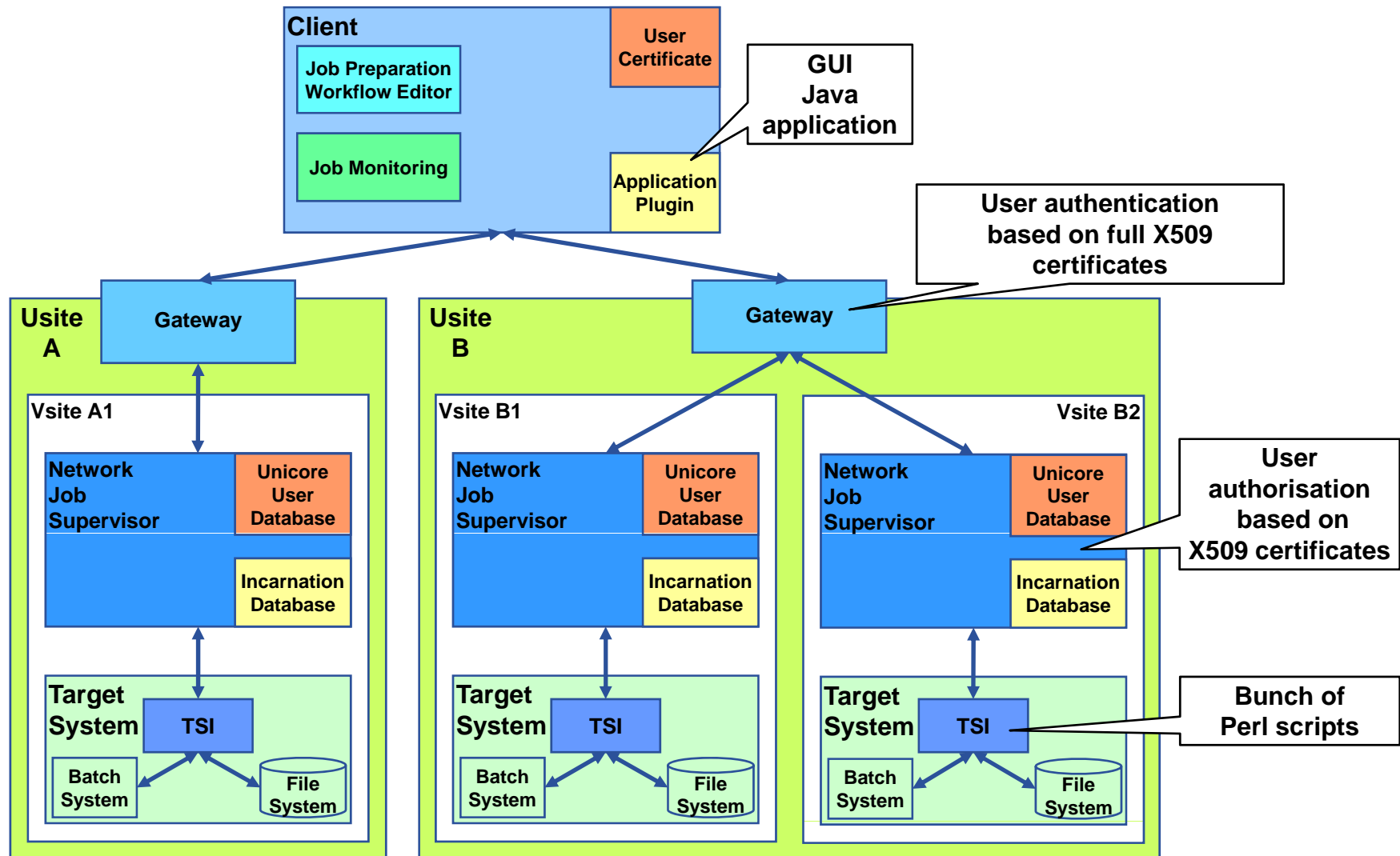


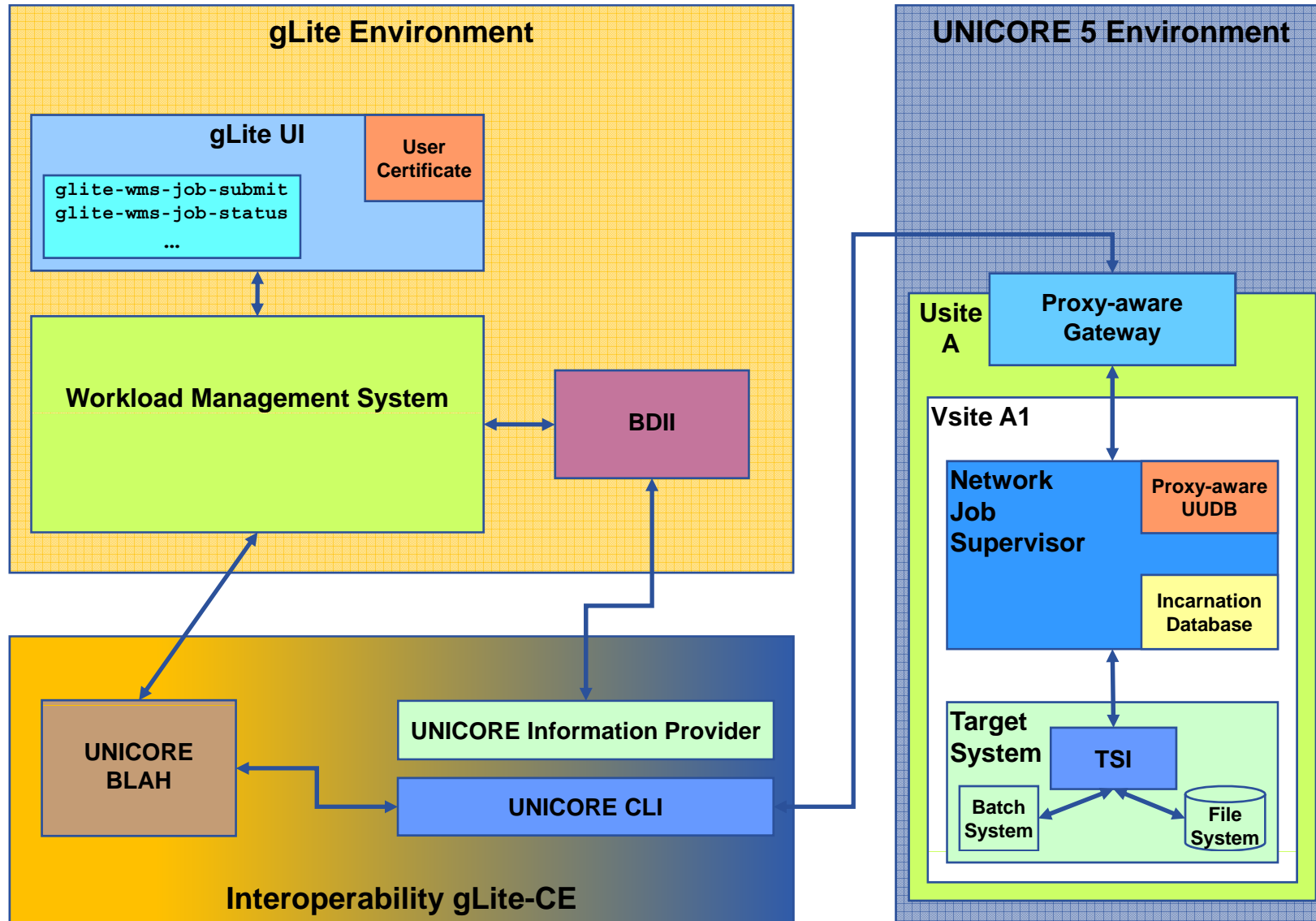
Information Society
and Media

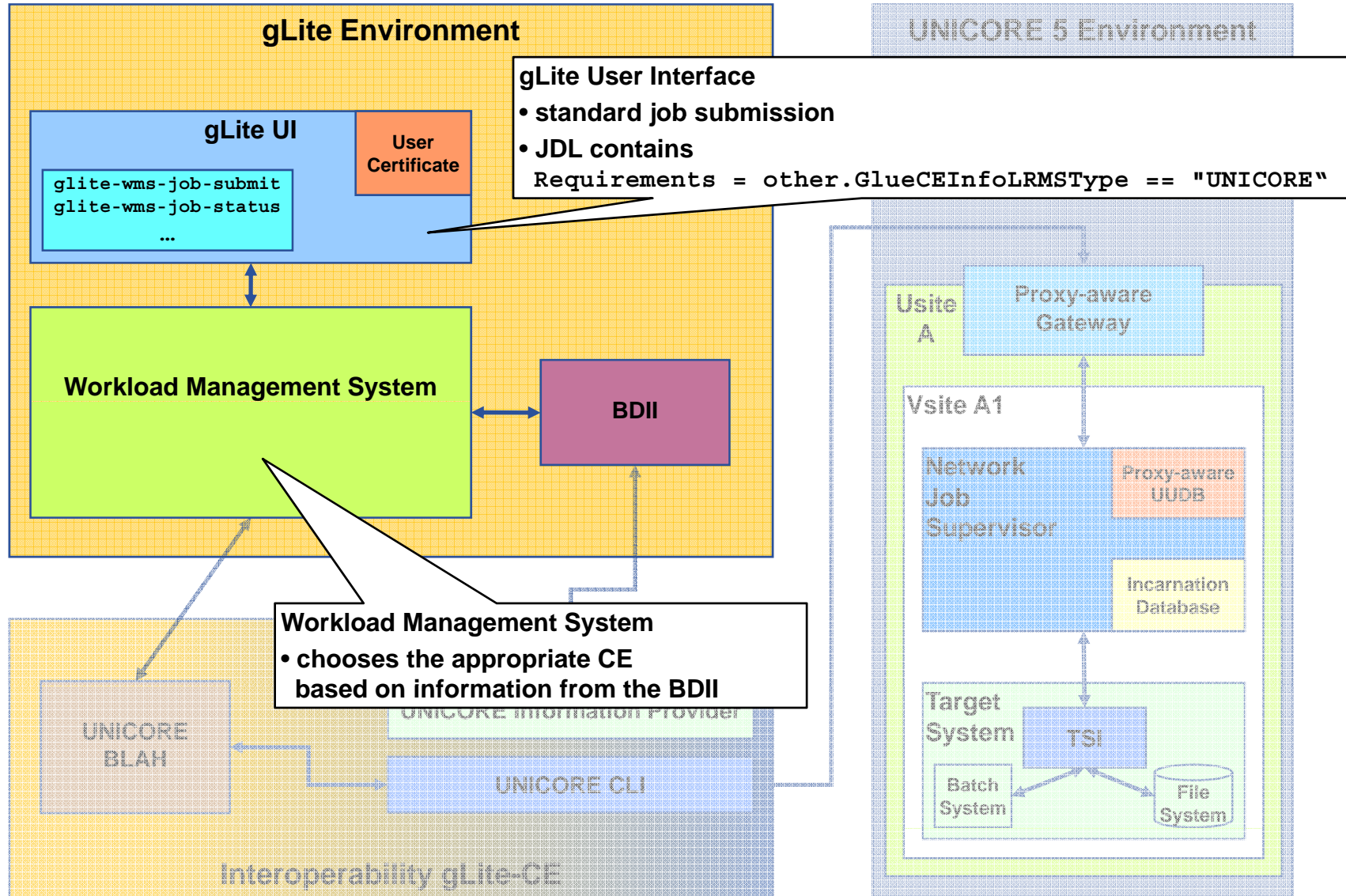


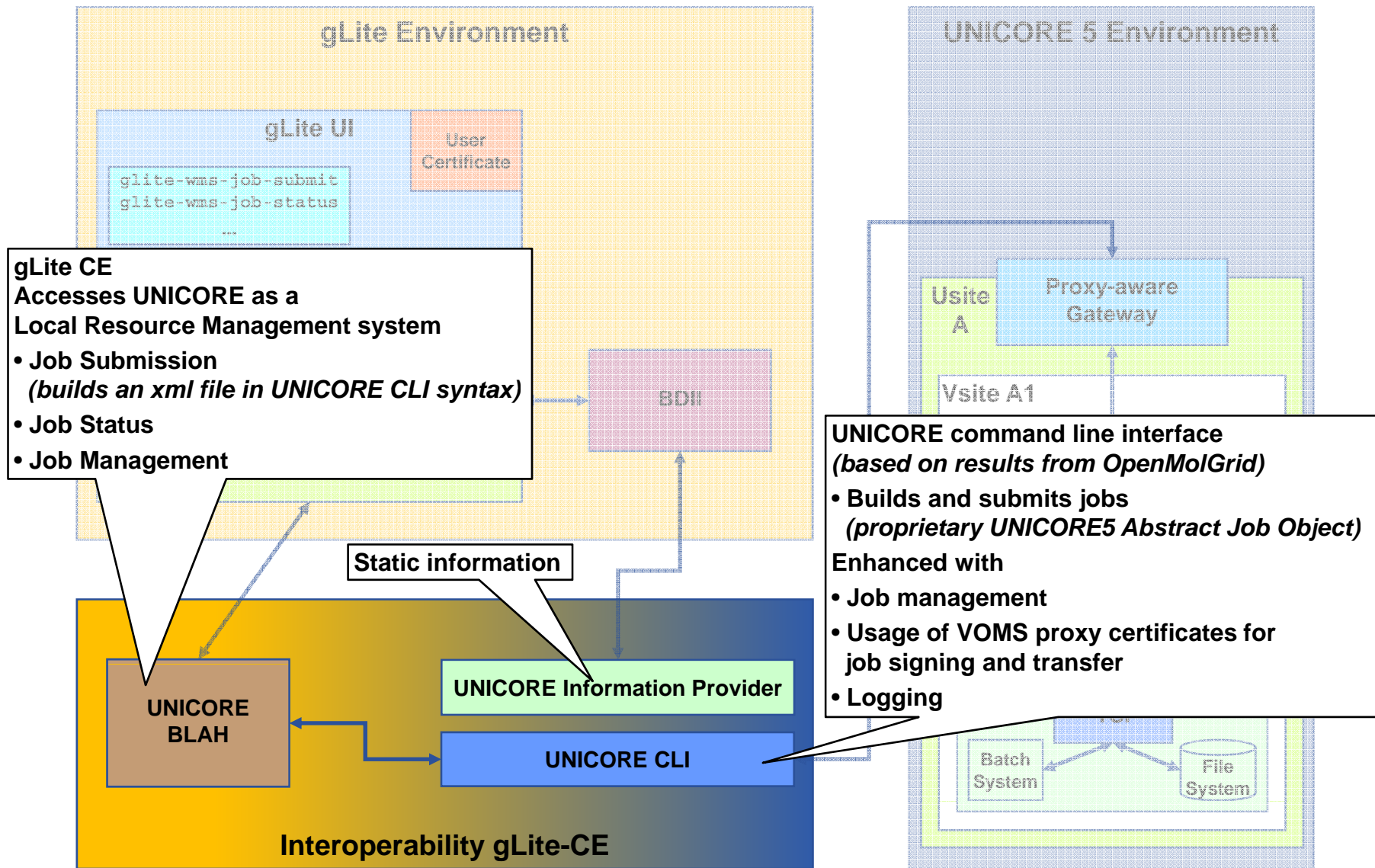
- **Overview**
 - Motivation
 - Short introduction to UNICORE
 - Overview of interoperability environment
 - Outlook

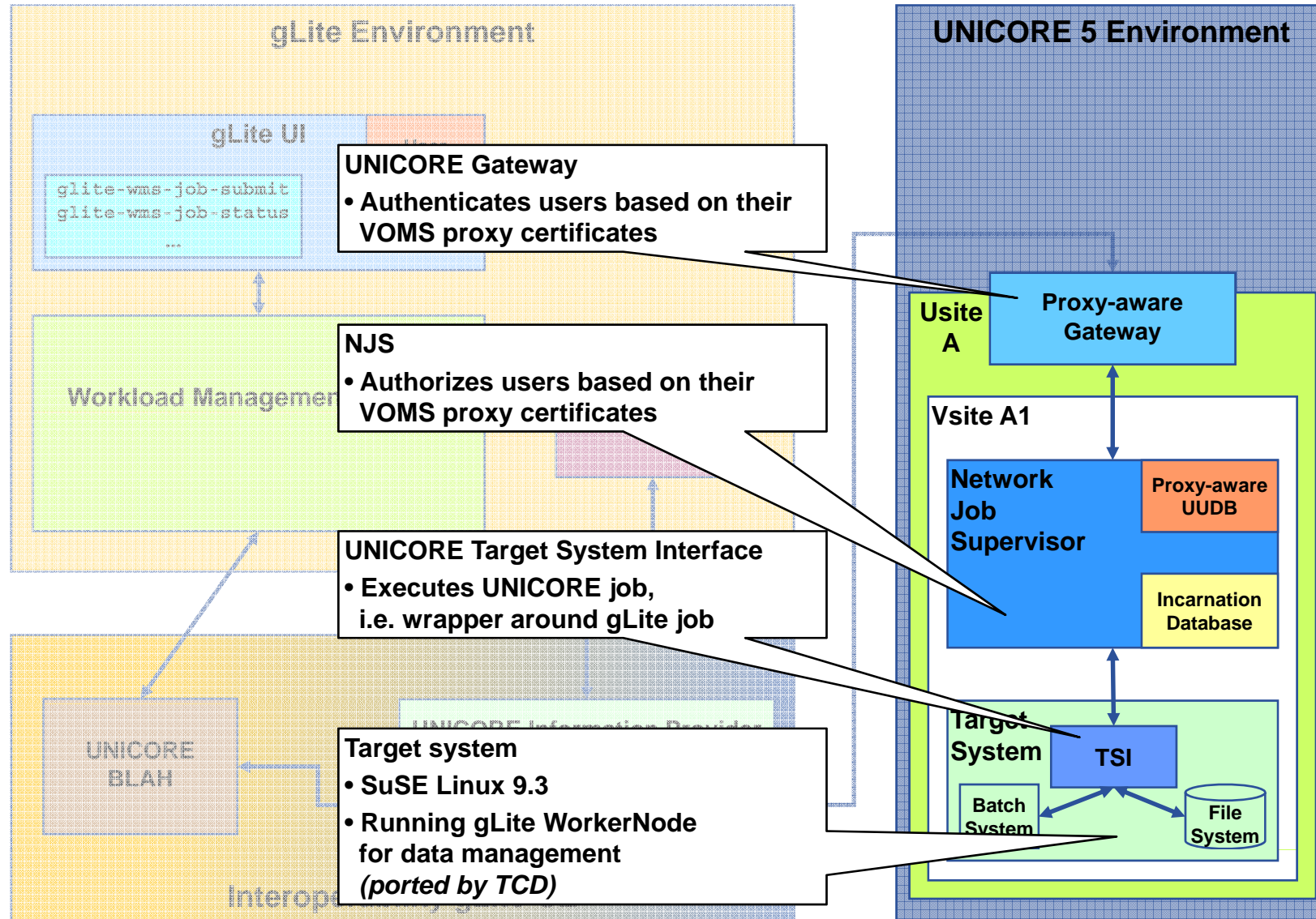
- **Motivation**
 - UNICORE offers access to supercomputers, e.g. DEISA infrastructure
 - User communities demand access to EGEE infrastructure as well as supercomputers
 - Fusion community
 - Biomed community











- **Switching to gLite CREAM CE**
 - BLAH scripts need to be adapted (minor changes)
- **Switching to UNICORE 6**
 - UNICORE 6 command line client
 - Input: JSON (JavaScript Object Notation) syntax
 - Output: JSDL (Job Submission Description Language)
 - BLAH scripts need to be adapted
 - UNICORE 6 Gateway user authentication based on VOMS proxy certificates (*implemented by OMII-Europe*)
 - UNICORE 6 XNJS user authorization based on VOMS proxy certificates (*implementation ongoing*)
- **Switching to AIX based IBM systems**
 - Porting of gLite WorkerNode ongoing

- **Cooperation**

- OGF Grid Interoperation Now Community Group (GIN-CG)
- DEISA-EGEE interoperability task force

- **Users**

- Wide In Silico Docking On Malaria (WISDOM) initiative
 - Molecule docking using Autodock or Flexx on EGEE
 - Refinement of best compounds using MD code Amber on DEISA
 - EU Fusion for ITER Applications (EUFORIA) project
 - Serial, loosely-coupled and parallel codes will be integrated in a work flow environment
- More work on data management