

*Integrated Tokamak Modelling – Task Force 2006 General Meeting
Cadarache (France) September 13-15 2006*

ENEA GRID resources and ITM-TF

G. Bracco, S.Migliori, S. Podda

**ENEA INFO, C.R. ENEA Frascati
V. E. Fermi 45 Frascati ROMA (Italy)
bracco@frascati.enea.it**

Outline

- ENEA-GRID architecture and resources
- EGEE/EGEEII
 - ENEA-INFO EGEE site implementation, access to SP4/SP5 IBM AIX
 - Fusion VO
- ITM-TF GRID questions

ENEA

[Italian National Agency for New Technologies, Energy and Environment]

12 Research sites and a **Central Computer and Network Service** (ENEA-INFO) with **6 computer centres** managing multi-platform resources for serial & parallel computation and graphical post processing.



ENEA GRID

INFO-ENEA computational resources:

- **Hardware**: ~100 hosts and ~650 cpu : IBM SP; SGI Altix & Onyx; Linux clusters 32/ia64/x86_64; Apple cluster; Windows servers. Most relevant resource: IBM SP5 192 cpu (12 nodes p575 1.5GHz, 16 cpu each)
- **software**: commercial codes (fluent, ansys, abaqus..); elaboration environments (Matlab, IDL,..)

ENEA GRID mission [started 1999]:

- provide a **unified user environment** and an homogeneous access method for all ENEA researchers, irrespective of their location.
- optimize the resource utilization

ENEA GRID architecture

GRID functionalities (unique authentication, authorization, resource access and resource discovery) are provided using “mature”, multi-platform components:

Distributed File System: **OpenAFS**

Resource Manager: **LSF Multicluster [www.platform.com]**

Unified user interface: **Java & Citrix Technologies**

These components constitute the **ENEA-GRID Middleware.**

OpenAFS

- user homes, software and data distribution
- integration with LSF
- user authentication/authorization [still kerberos 4]

EGEE/EGEE-II



<http://www.eu-egee.org>: “Expanding from originally two scientific fields, high energy physics and life sciences, EGEE now integrates applications from many other scientific fields, ranging from geology to computational chemistry”

EGEE is one of the two biggest EU GRID projects; [2+2 years] second phase EGEE-II started April 2006

- 90 institutions in over 30 countries, ~30000 cpu
- ENEA is a funded partner, [~100 cpu 20% of time, AIX]

EGEE architecture is based both on components (globus, condor,..) coming from previous GRID projects [VDT Virtual Data Toolkit, Datagrid, Datatag,....] and on new systems developed by the project itself and integrated in the **EGEE middleware**: **Glite 3.0** is now (5/06) available for x86 Scientific Linux 3.

Implementing EGEE site in ENEA

To provide access to a platform not supported by the GRID middle-ware requires a special effort which is a consequence of the fact that a general accepted multi-platform standard for GRID middle-ware does not exist at the moment.

The integration of different GRID infrastructures can nevertheless be attempted by implementing "gateways".

Resource sharing can be thus obtained, minimizing the invasiveness of a specific GRID middle-ware inside the hosting infrastructure and reducing the requirements concerning platform/OS and firewall security.

The EGEE site in ENEA has been implemented as a "almost" standard site, based on a "gateway" approach and allowing access to platform/OS still unsupported by Glite middle-ware.

Main ENEA GRID computational resources are made accessible from EGEE infrastructure.

ENEA EGEE site implementation (1)

Basic components of an EGEE site installation:

- ◆ User Interface [UI]
- ◆ Storage & Monitoring Element [SE]
- ◆ Computing Element [CE] (with support to LSF)
- ◆ Worker Nodes [WN]

ENEA implementation requirements:

- ◆ EGEE users => mapped to some standard ENEA-GRID AFS users
- ◆ Access to AIX platform => **NO Middleware on Worker Nodes**
- ◆ LSF resources must be used whenever possible
 - **Batch submission**: bsub
 - **Information**: lsload, bhosts, lshosts, bqueues,...
 - **Prompt job execution**: lsruntime
 - Batch queues dedicated to EGEE GRID users

ENEA EGEE site implementation (2)

Implementation architecture:

- ◆ UI & SE: Linux, Standard EGEE configuration
- ◆ CE: Linux, modified to become a “gateway”
- ◆ WN: any platform/OS with support for AFS/LSF
 - share user homes with CE using AFS
 - delegate all grid commands concerning file transfer to/from GRID to the CE by means of the LSF lsruncmd command.
 - the CE has the correct security context
 - AFS security and quota management guarantee reliability

ENEA EGEE site implementation (3)

How:

- ◆ Any WN middle-ware command concerning file transfer is wrapped with a lsrunc script.
- ◆ The wrapped WN middle-ware is located in AFS.
- ◆ The relevant PATHs in the environment of the EGEE job on the WN are modified so that the wrapped middle-ware is used
 - LSF wrapper configuration for the GRID dedicated queues
- ◆ The CE is installed with all the packages required by a WN
- ◆ EGEE GRID users require an AFS token (results on this activity will be presented at the next EGEE,06 conference in Geneva):
 - gssklogd modified to be compatible with EGEE middle-ware
 - EGEE middle-ware on the CE must properly call gssklog.

EGEE Standard site layout

User Interface

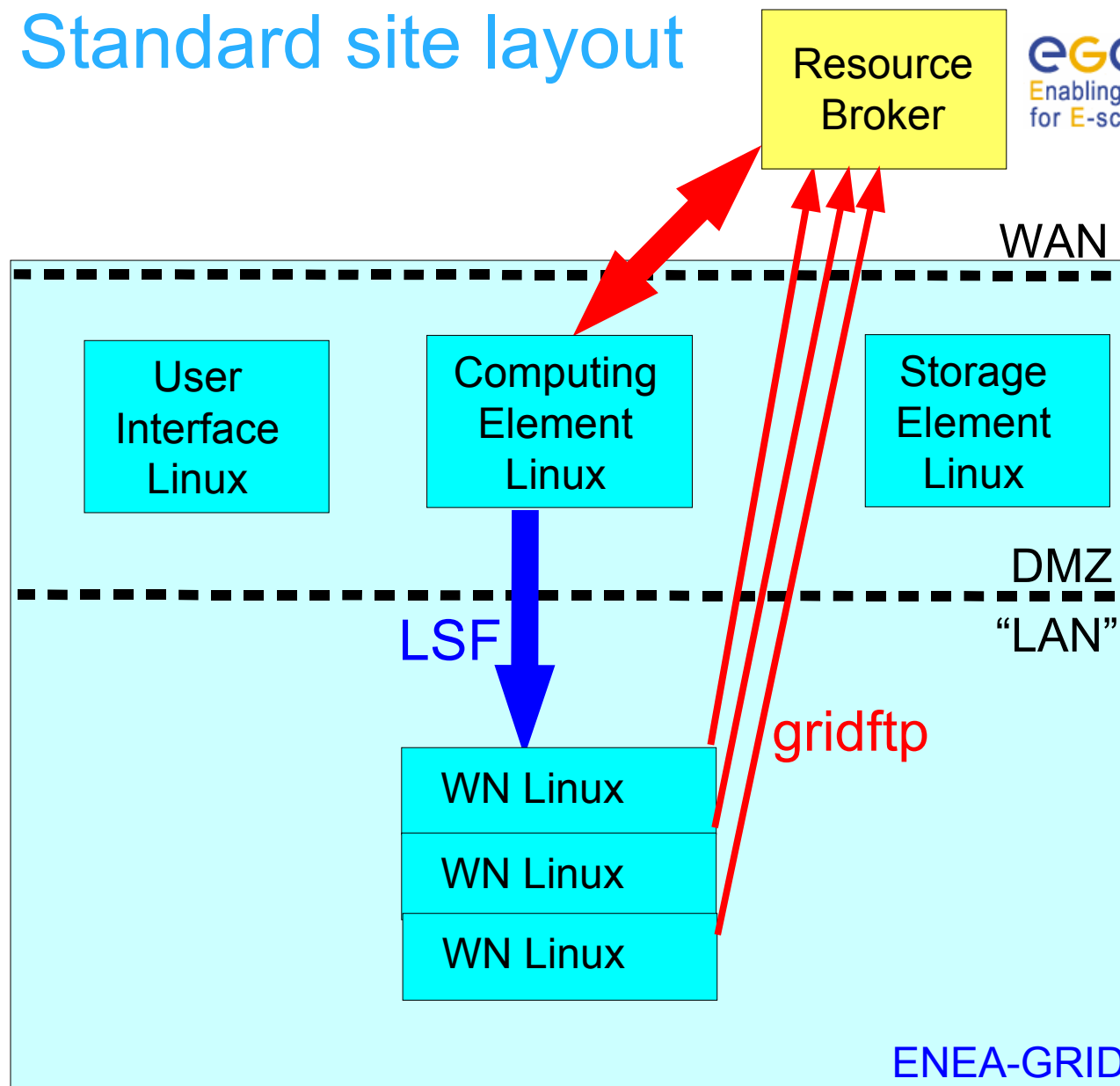
Storage Element

Computing

Element: accepts jobs sent by the RB and submits them to the local batch system (LSF)

Worker Nodes:

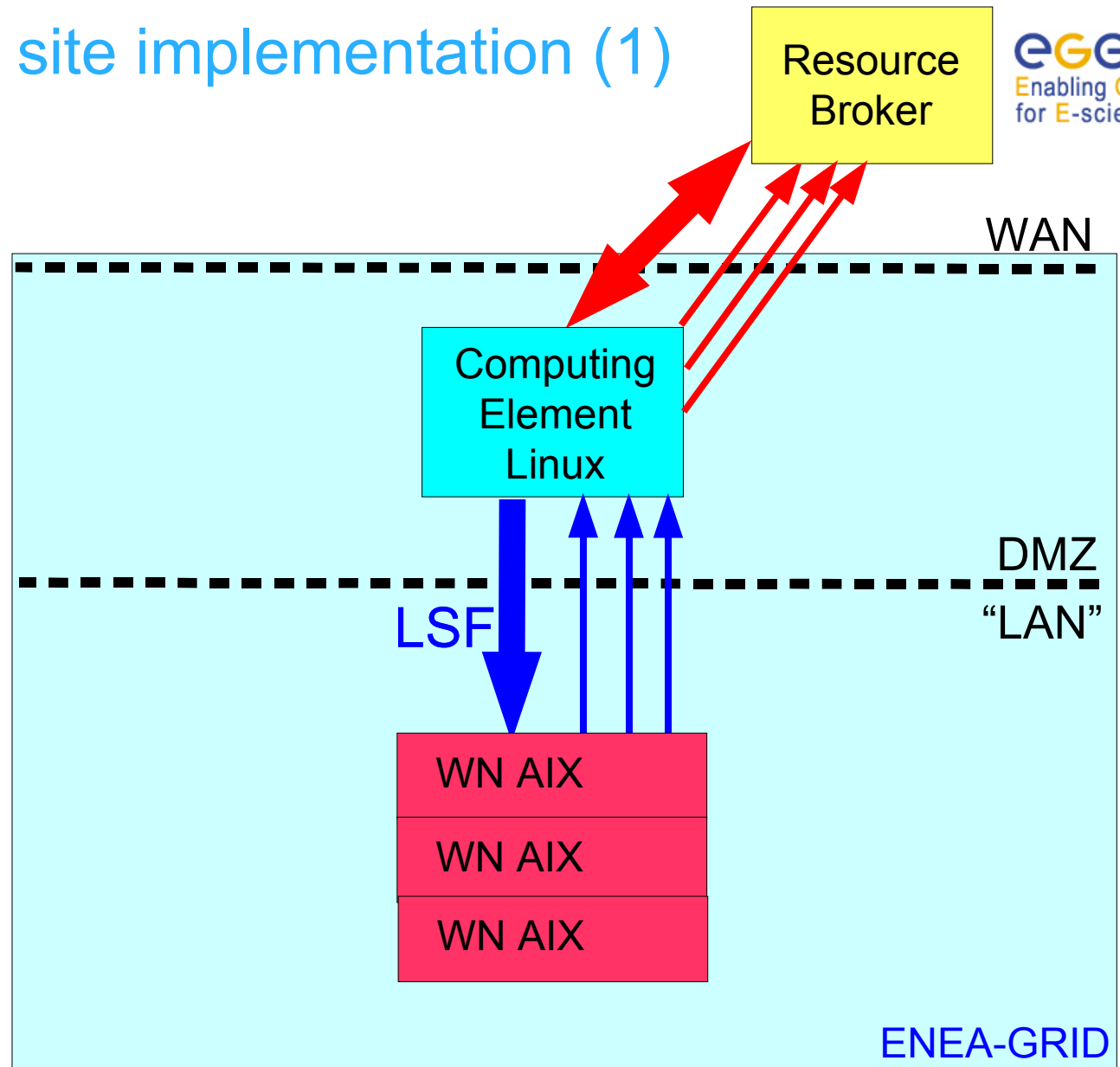
they perform the computation and the WN middleware sends back job results to RB



EGEE ENEA site implementation (1)

The Computing Element: a gateway system where all the grid commands are executed.

Worker Nodes: perform the computation and ask the CE to send back job results to RB.



ENEA-GRID

EGEE ENEA site implementation (2)

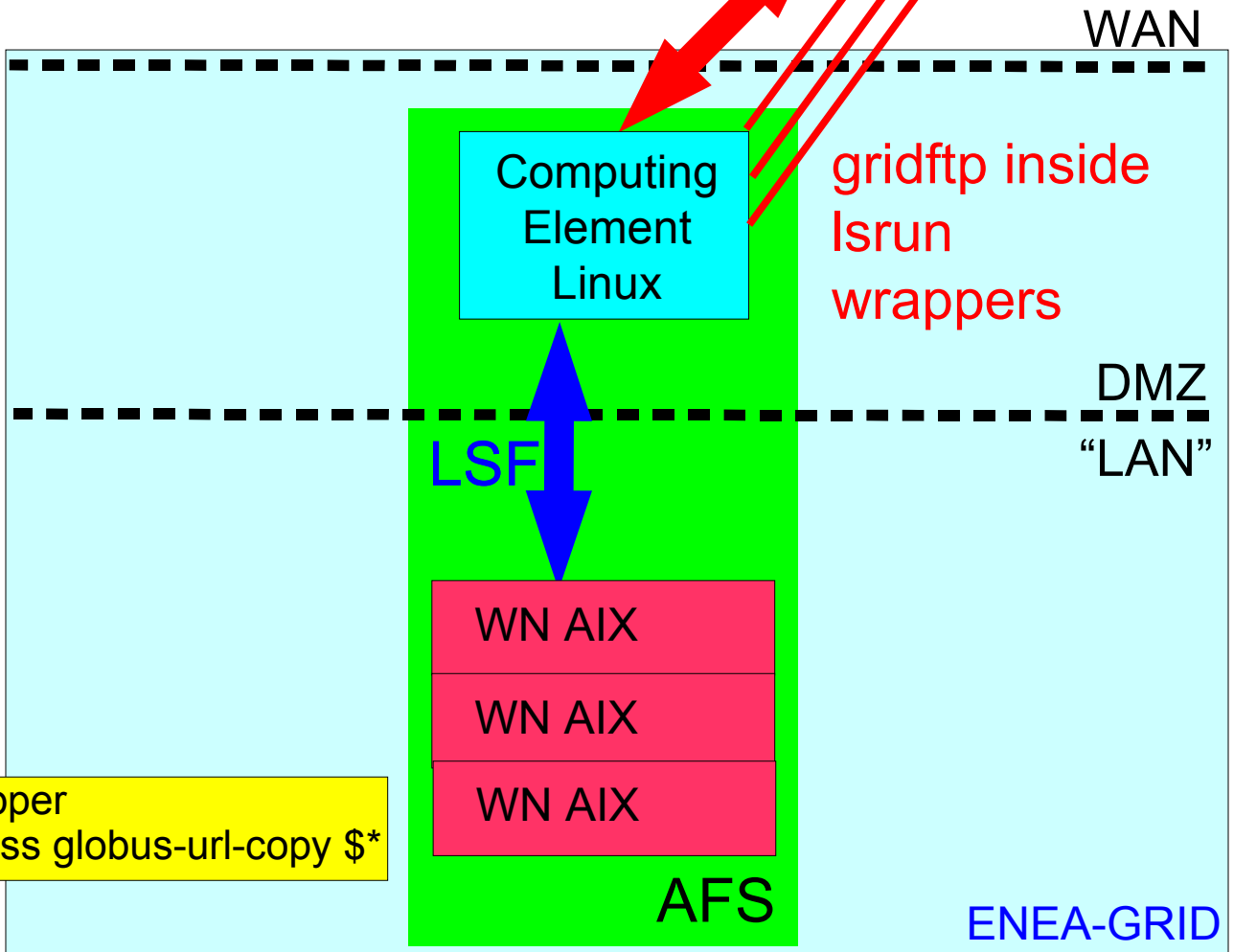
Resource Broker

CE and WN share user homes using AFS.

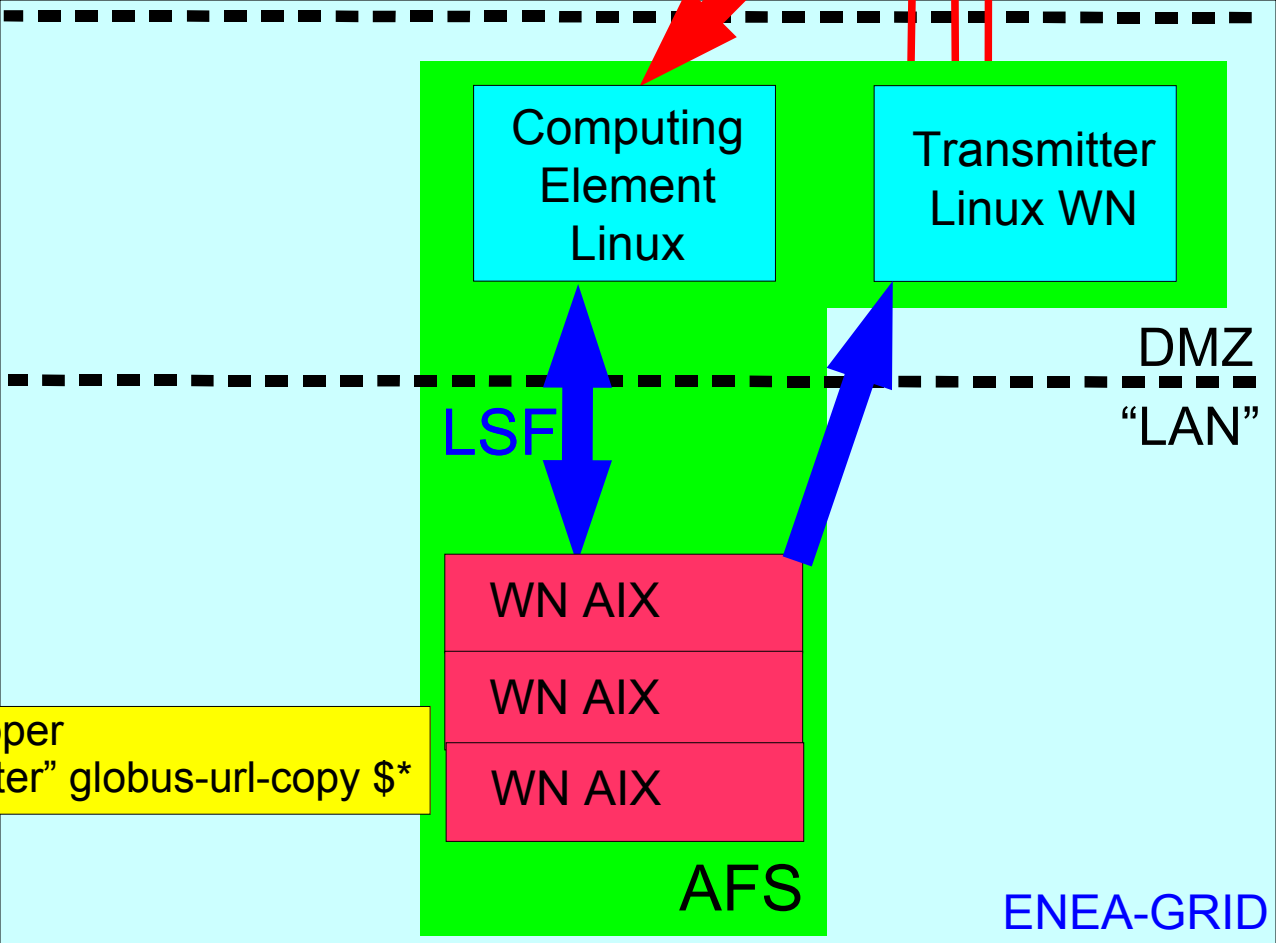
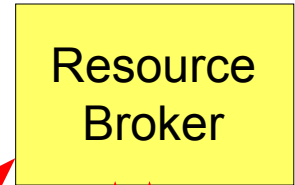
In the environment of the job on the WN the PATHs are defined so that grid data transfer commands are:

- 1) taken from AFS
- 2) wrapped with Isrun

e.g. globus-url-copy-> wrapper
wrapper: Isrun -m ce.address globus-url-copy \$*



EGEE ENEA site implementation (3)



To simplify the installation a "Transmitter" Linux WN has now been configured

Grid data transfer commands are:

- 1) taken from AFS
- 2) wrapped with lsrunc

e.g. globus-url-copy-> wrapper
wrapper: lsrunc -m "transmitter" globus-url-copy \$*

Status and limits

ENEA Linux site with “gateway” approach, Glite 3.0 certified

CE: egce.frascati.enea.it

SE: egse.frascati.enea.it

WN: 16 Linux P4, 1.8 Ghz, 1 GB

ENEA AIX site, Glite 3.0 certification in progress

CE: egceaix.frascati.enea.it

SE: egseaix.frascati.enea.it

WN: 32 cpu SP4, 1.5 Ghz, 32 GB

Successful tests also with SGI-IRIX, MacOSX, Altix.

LIMITS of the “gateway” approach

- **Not a completely standard site** [but EGEE Certification job runs well]
 - GRID-API & some WN monitoring components are unavailable
- **Scalability** : the number of transmitters machines can be increased

FUSION VO and ENEA-INFO site

“Fusion is the VO created to support the EGEE-II NA4 activity for nuclear fusion application inside EGEE”

<http://grid.bifi.unizar.es/egee/fusion-vo>

Supported by ~15 sites

- some LCG sites [CIEMAT, CGG, RAL, ...]
- fusion sites [JET]
- others [BIFI, GRIF, ScotGRID,..]

and now also **ENEA**

- ENEA-INFO site is now opening to fusion VO
- ENEA is very interested in receiving fusion applications, especially for AIX platform and MPI

GRID & ITM-TF: some questions

Do ITF-TF needs GRID?

- GRID is now available! Add and ask for features/requirements if you need: e.g. at present in EGEE MPI support can be tricky.

What GRID and what about GRID standards?

- EGEE, DEISA, no standards but “gateways” are possible.
- from user side: GRID is simple if the application is well designed.

What about a portal to hide GRID complexity?

- My experience: a portal is nice for beginners but for “production work” a portal often either is not enough flexible or grows to a too high complexity.

Dedicated ITM-TF VO in EGEE or use fusion VO?

- Fusion VO is available, why duplicate it?

Acknowledgements

ENEA GRID is operated with the support of many people in various ENEA sites:

S. Taglienti, R. Guadagni, P. D'Angelo, A. Perozziello, A. De Gaetano, F. Simoni, S. Pecoraro, D. Giammattei, G. Mencuccini., M. De Rosa, M. Caiazzo, A. Palumbo, G. Elmo, S. Pierattini, M. Impara, V.Lusani, G. Furini, C. Zini...

and people from various software companies:

Carlo Sciò, Alessandro Secco,