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# A simple SPAGO implementation enabling the connection of heterogeneous computational resources to a gLite based GRID

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# Motivations

- **Currently standard EGEE infrastructure offers only resources based on HW/OS platforms supported by gLite (IA32/x86\_64/SL).**
- **SPAGO (Shared Proxy Approach for GRID Objects) concept now provides access from EGEE to the ENEA AIX SP systems, belonging to ENEA-GRID.**
  - Implementation based on ENEA-GRID middleware, namely OpenAFS and LSF Multicluster.
- **This presentation: a simpler solution for any standard UNIX/Posix**
  - NFS and ssh can be adopted instead of OpenAFS and LSF Multicluster

# ENEA

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

12 Research sites and 6 computer centres with multi-platform resources integrated in ENEA-GRID, a GRID-oriented infrastructure based on LSF Multicluster and OpenAFS WAN file system. (4 Tflops now, mainly AIX, 25 Tflops Linux are coming)



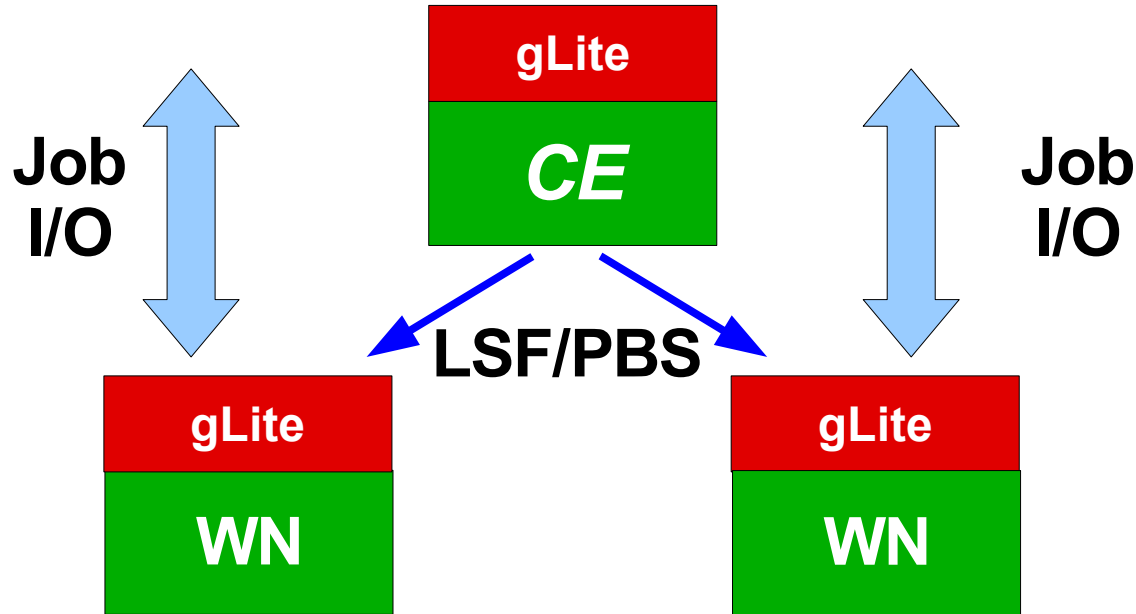
## ENEA GRID middleware:

- LSF Multicluster
- OpenAFS File System



# ENEA contribution to EGEE

- Research project focused on offering AIX resources to EGEE
  - Interoperability ENEA-GRID/EGEE
  
- ENEA-INFO EGEE site: three CEs with different resources
  - 1) Cluster of 14 Intel nodes running Linux
  - 2) Our role in EGEE/EGEE2: 105 G4 CPUs (4 SP4 frames) running AIX 5.2
    - ***Any VO interested in accessing these resource may contact us!***
  - 3) THIS PRESENTATION: cluster of 10 Intel nodes with Linux
    - Same interoperability technique in 2) using more common instruments (NFS/SSH)

# gLite Resource Restrictions

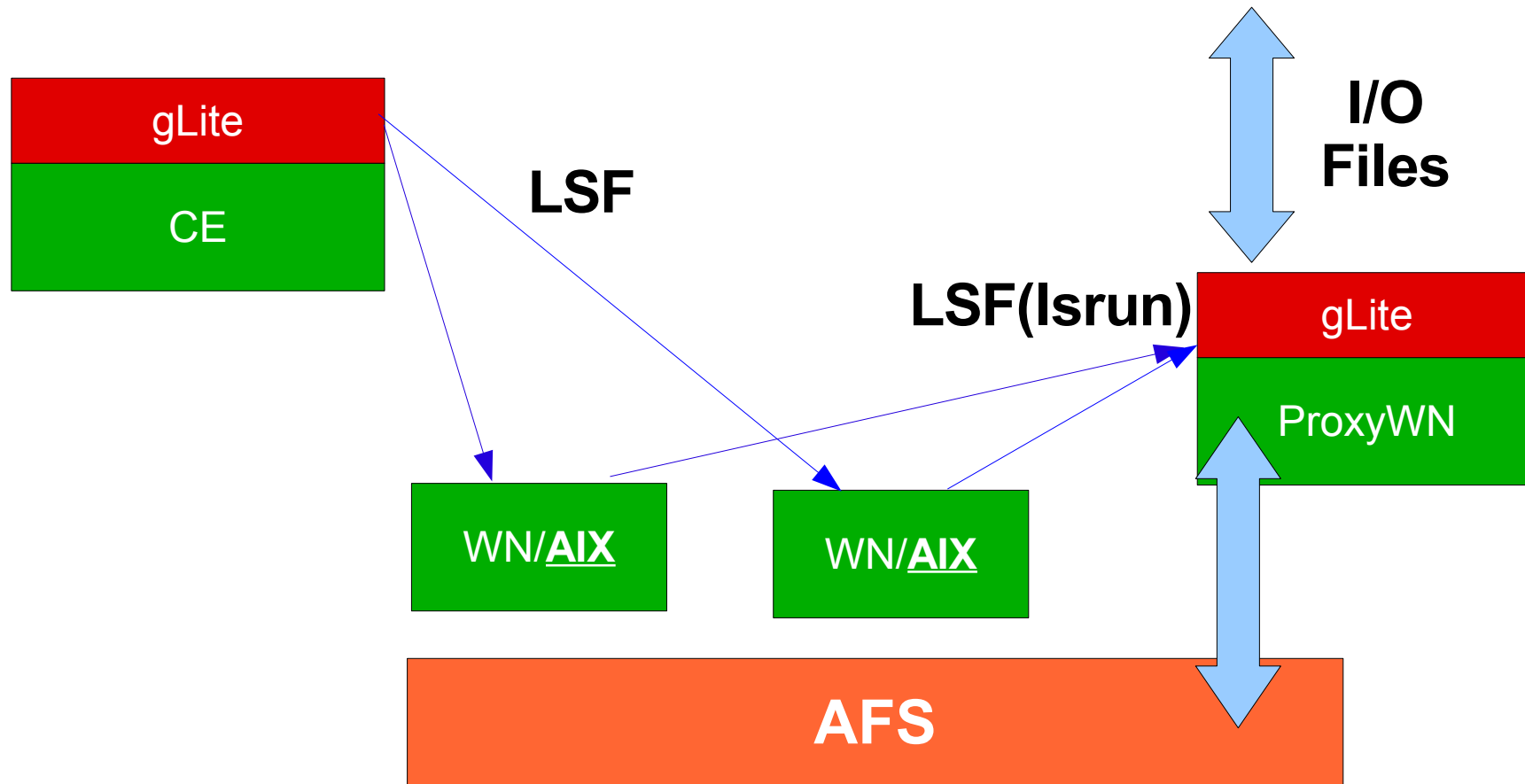


## Limitations:

- gLite must be installed on each WN  Only intel/SL machines participate to EGEE
- WNs must directly communicate with the RB  security/firewall management issues

**Serious restrictions on computational resources available!**

# Shared Proxy Approach for GRID Objects (SPAGO)



- Worker nodes do not mount gLite
- Required additional gLite machine (“proxy”)

# Redirection to ProxyWN through wrappers

## gLite Standard

- **WN: JOBSRIPT**

- Globus-url-copy input-file
- JOB
- Globus-url-copy output-file

## SPAGO

- **WN: JOBSRIPT**

- Globus-url-copy input-file
  - Isrun -m proxy Globus-url-copy input-file
- JOB
- Globus-url-copy output-file
  - Isrun -m proxy Globus-url-copy output-file

→ **Isrun: prompt job execution**

# Porting SPAGO outside ENEA-GRID?

## Requirements in ENEA-GRID:

- **AFS** (WAN Shared Filesystem)
  - Authentication interoperability problem (X509 vs AFS token):  
Solved
- **LSF** (Job dispatching mechanism)

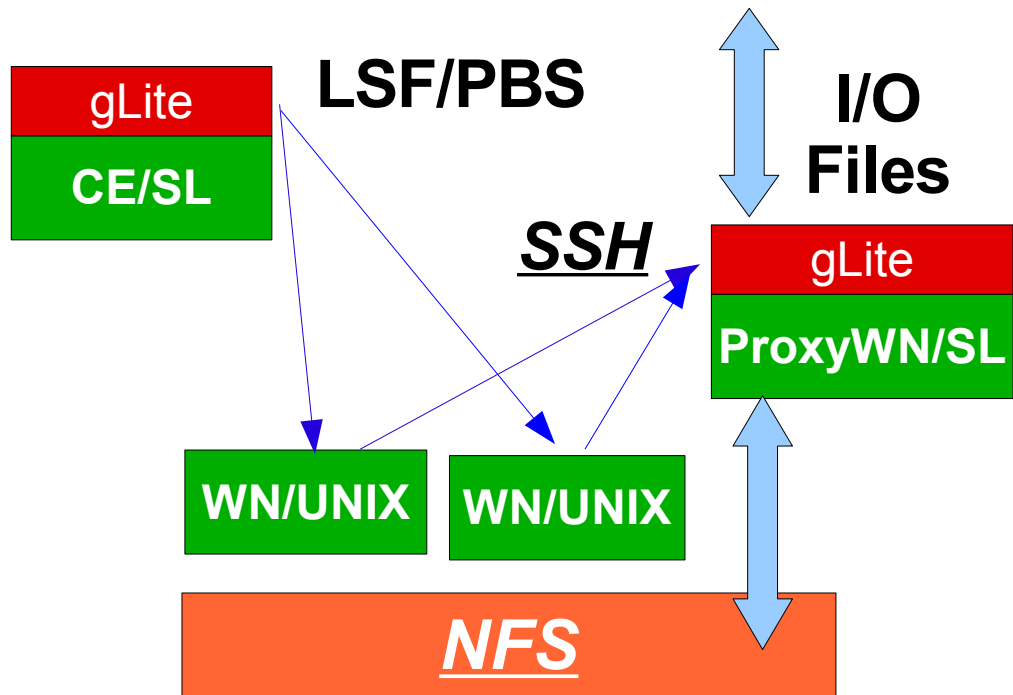
## Analogous tools available in common UNIX systems

- Shared filesystem: **NFS**
- Elementary job dispatching mechanism: **SSH** (*in place of Isrun*)

**This simplified version of SPAGO allows grid sites to share any kind of UNIX-based computational resource**



# SPAGO Approach for a typical UNIX system



## Real Case Implementation

- ENEA Fusion department
  - 10 CPUs with SPAGO
  - Employ SSH/NFS
  - Support VO “fusion”

Any typical Shared Filesystem (e.g. GPFS, LUSTRE) and remote execution mechanism (e.g. RSH) can be employed

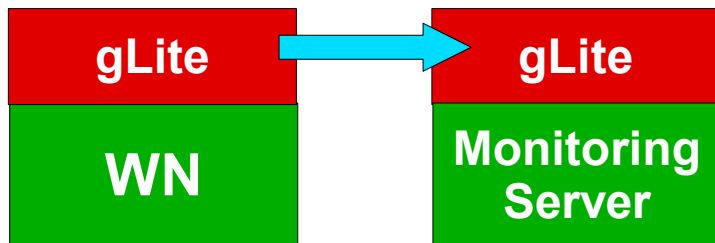
# What to do for a NFS/SSH SPAGO approach

- **Account management separated from Glite**
  - Grid and pool accounts home directories must be located on NFS
- **Wrapper generation**
  - We use a tool for SSH. It is possible to write plugins for other dispatchers
- **Cleanup-grid-accounts turned on only on ProxyWN or CE**
- **SSH configuration**
  - Server and Client configuration for host-based authentication
- **VO public certificates copied on shared file system**
- **Environment variables on WNs**
  - X509\_CERT\_DIR
  - LOCATION environment variables (e.g. GLOBUS\_LOCATION)
- **(optional) Dispatcher using SSH must be prepared.**
  - Required only in case of more than one proxy (to support scalability)

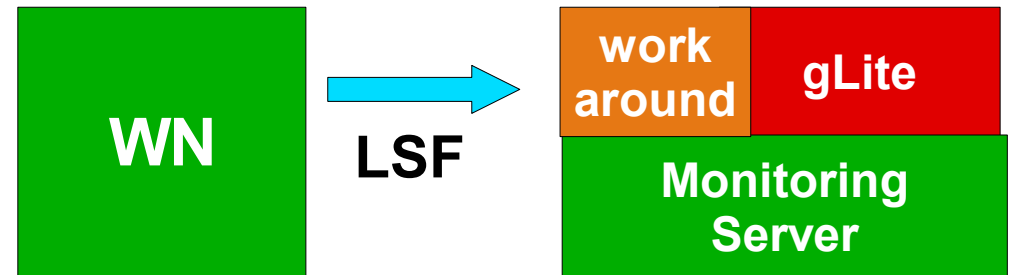
# SPAGO Limitation

- Sometimes EGEE requires additional services on WN
  - RGMA (information, monitoring, logging tool)
  - GridICE (monitoring system)
- It is often possible to find a work-around
  - eg: GridICE - Already in production in ENEA-INFO EGEE site

## Typical GridICE



## Modified GridICE



## ***Suggestions for a SPAGO-friendly development***

- **Architecture-dependent gLite modules on WNs require attention.**
  - Some modules (like GridICE and RGMA) have WN-resident modules.
  - Modules running on WN should explicitly state whether:
    - They are architecture dependent.
    - They must be run on WN or they can be moved on a Proxy.
  
- **Environment variables on CE and WN should be separated**
  - A few main environment variables of CE override environment variables of the WN.
  
- **A “SPAGO” tag in the Information System to identify SPAGO-based systems**

# References for ENEA-GRID implementation

## Technical Reports

- **EGEE Technical Note EGEE-TR-2007-001, "The gateway approach providing EGEE/gLite access to non-standard architectures" Bracco, G; Migliori, S; Sciò, C. ; Santoro , A.;**  
<http://doc.cern.ch//archive/electronic/egee/tr/egee-tr-2007-001.pdf>
- **EGEE Technical Note EGEE-TR-2006-006, "AFS Pool Account Users - GSSKLOG and LCMAPS extension to support AFS users as EGEE pool account users", Bracco, G; Giammarino, L; Migliori, S; Sciò, C.;**  
<http://doc.cern.ch//archive/electronic/egee/tr/egee-tr-2006-006.pdf>

## Recent Presentations

- **Grid Camp 2007, WLCG Tier 2 & EU-IndiaGrid Workshop, Taipei 28/10/2007-2/11/2007, "The ENEA gateway approach to provide EGEE/gLite access to non-standard architectures" Bracco, G; Migliori S.; Quintiliani A. ; S. Sciò, C. ; Santoro, A.; reported by G. Andronico in the "Interoperability in Asia" session.**
- **EGEE'07 Conference Budapest (Hungary) 1-5/10/2007, poster & demo session. "The ENEA gateway approach to provide EGEE/gLite access to non-standard architectures" Bracco, G; Migliori S.; Quintiliani A. ; S. Sciò, C. ; Santoro , A.; (abstract), poster id 135, stand #12.**

## Wrapping up...

- **For gLite Site Admins**
  - No need to offer only WN based on IA32/x86\_64/SL platform: any UNIX-like WN can be supported using SPAGO.
  - e.g. we plan to bring into EGEE a CE with 2500 x86\_64 cores based on RH 5.1 (CRESCO project, #180 in the top 500 supercomputer list).
  
- **For gLite users**
  - It is possible to run software not specifically designed for IA32/x86\_64/SL.
  
- **Feel free to contact us:**
  - if you have to support non-standard UNIX system in gLite.
  - if you have AIX code that should be run in EGEE infrastructure.
  - <http://www.afs.enea.it/project/eneaegee/>