e-Infrastructures: future directions

The European grid: **EGI**
The Italian national grid: **IGI**
The European Middleware: **gLite** and **EMI**

International Round Table Italy - Russia@Dubna
December 18 – 19, 2009,
International Conference Hall, JINR, Dubna,

Mirco Mazzucato
Italian Grid Infrastricture Coordinator
Director of CNAF

FROM EGEE TO EGI

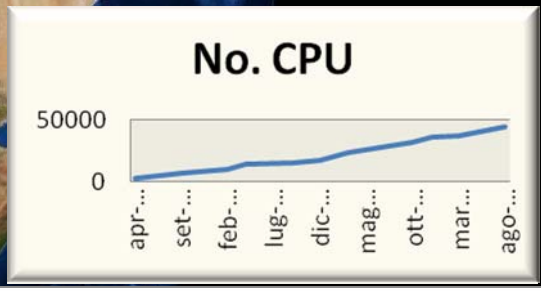
EGEE III: ~100 Istitutions
Continuously growing

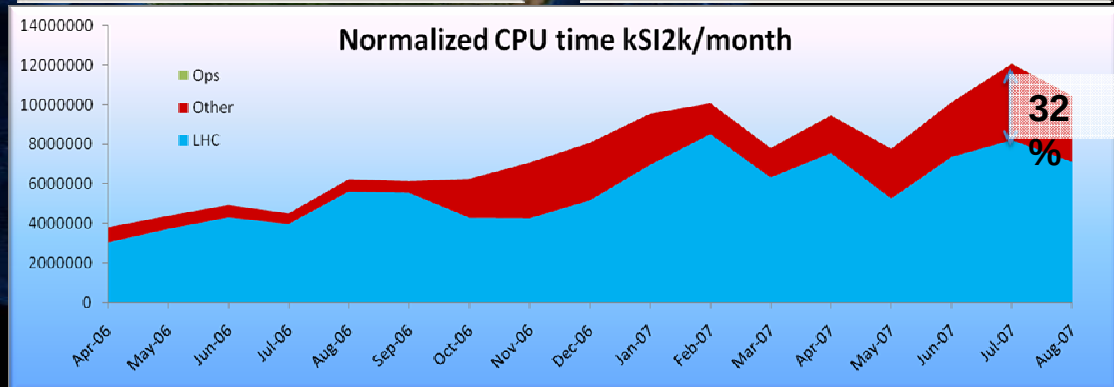
EGI new model:
sustainable + general

EGEE Operate the world largest grid infrastructure with production quality for e-Science

250 sites
45 countries
100,000 CPUs
25 PetaBytes
>5000 users
>100 VOs
>100,000 jobs/day

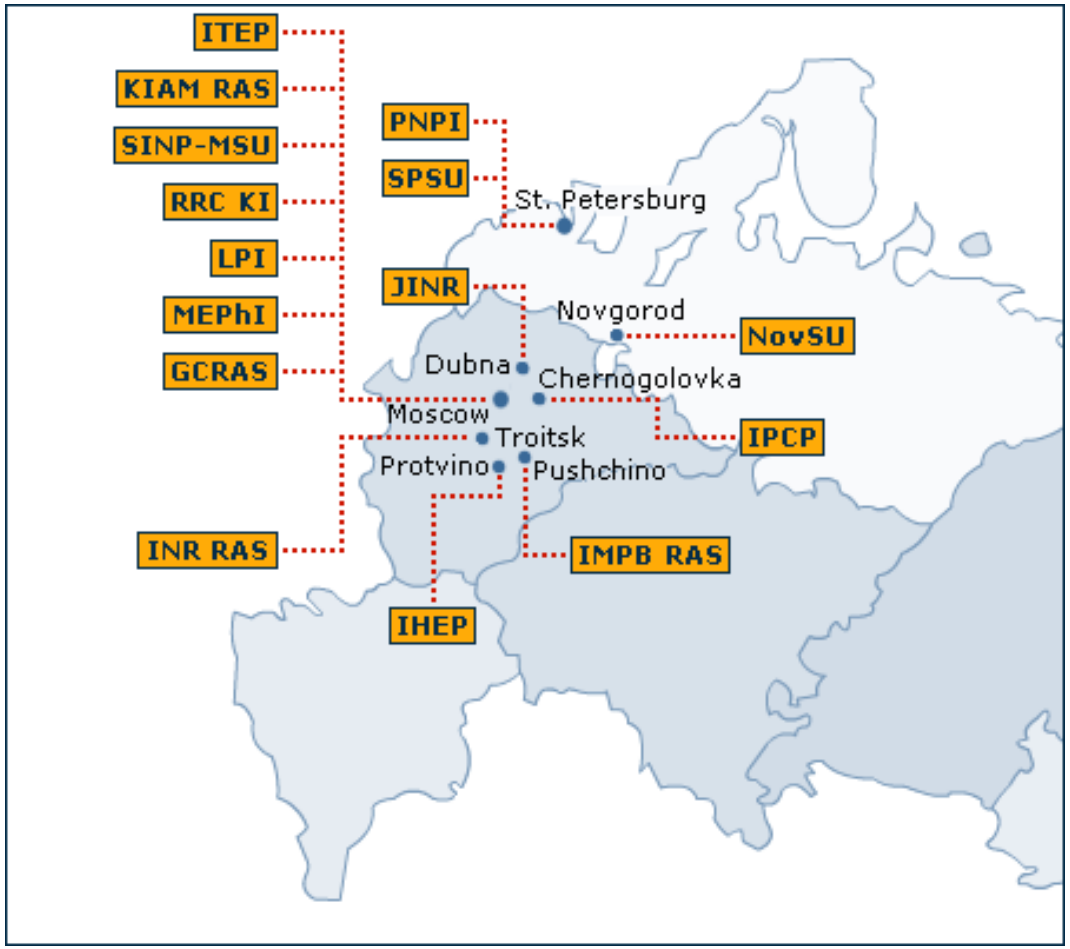
Many Applications:
Archeology
Astronomy
Astrophysics
Civil Protection
Comp. Chemistry
Earth Sciences
Finance
Fusion
Geophysics
High Energy Physics
Life Sciences
Multimedia
Material Sciences
...





EGEE and Russia

- **The Russian consortium RDIG (Russian Data Intensive Grid) has been and is a key partner of the EGEE series acting as a regional federation providing Russia's full-scale participation**



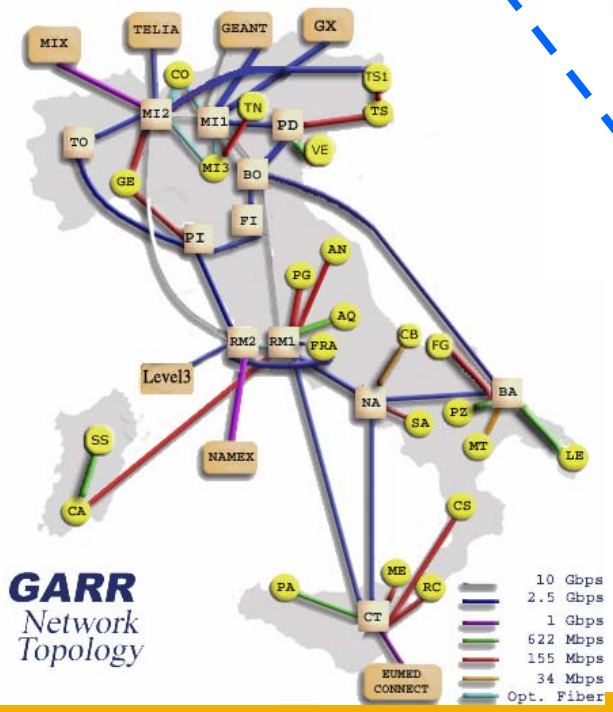
The Italian Grid Infrastructure

+Several Universities

+ Compute Centers

INFN production GRID

GARR Network



IGI in EGEE

FESR

PON

POR

Progetto SCOPE Università degli

SPACI

CRESCO

CYBERSAR

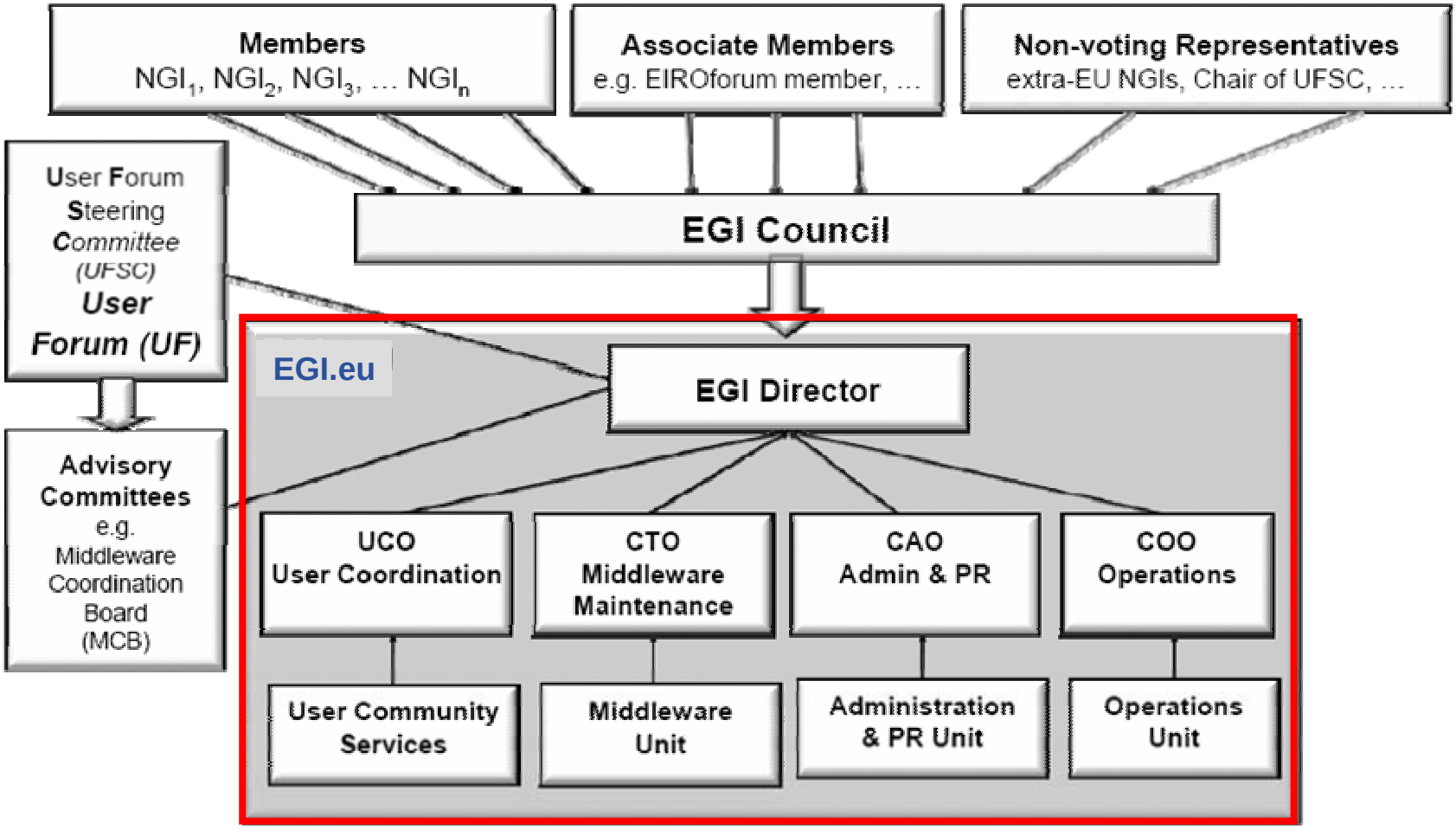
Trinacria Grid Virtual Laboratory

PI2S2

The European Grid Initiative

- EGI = EGI.eu + National Grid Initiatives (NGI) +
  European Research International Organizations (EIRO)
- EGI.eu -> New coordinating legal organisation (March 2010)
- 36 National Grid initiatives (NGIs) with CERN and EMBL (Molecular Biology) have signed the EGI MoU
- Ongoing process in all countries to transform NGIs in legal organisations managing the national e-Infrastructure and representing the country
- A new EGI **I**ntegrated **S**ustainable **P**an-European **I**nfrastructure for **R**esearchers in **E**urope (INSPIRE) project submitted to EC
- 4 year project €25M EC contribution
- Project cost €70M
- European Grid Effort Cost ~ €335M

Structure of EGI



Status of EGI.eu

- **The EGI.eu statute that defines the new European organisation is taking shape**
  - V6 sent to the member countries' legal offices
  - To be signed by March 2010 to assure coordination of the EU project
- **No-profit Foundation under Dutch law designated**
- **"Stichting" European Grid Initiative**
- **In V6 a Council formed by the member countries' representatives acts as a supervisory and controlling Authority**
- **An Executive Board composed of members elected by the Council manages all activities**
  - These are the Founders of the Foundation under Dutch law

RUSSIA IN EGI

- **From S. Ilyin presentation at EGI Council 4Dec in Stockholm**

- **e-Arena (*National association of research and educational e-Infrastructures «e-ARENA»*)** *is the NREN and NGI representative body in Russia, recognized by Federal Ministry of Communication and Ministry of Education and Science, with Vice-Minister of Communication A. Soldatov as a Chair of the e-Arena Council.*

- **e-Arena** *has been established in September 2009 as a legal body for coordinating efforts of different organizations in Russian Federation in creating and developing the e-infrastructures, including networking and grids, to serve science and higher education.*

- **e-Arena** is Russian NGI partner in the EGI-InSPIRE proposal.

The Italian NGI: IGI

- **The Italian Grid Infrastructure (IGI)**
  - Is currently an EU Joint Research Unit
  - Established with an MoU signed by all the partners in december 2007
    - Open to new partners
  - Recognised and supported with a letter by MIUR
  - Recognised by the European Commission
  - Single Interface to the EU at the Italian level
  - Common Governance of the Italian e-Infrastructure
- **Is becoming a legal entity to be able to sign the EGI.eu statute**
- **Must stabilise the available grid know-how**

- Natural partner for collaboration with e-Arena (*National association of research and educational e-Infrastructures «e-ARENA»*) *which is the NREN and NGI representative body in Russia,*

The challenge: Grid and “Clouds”

- “Cloud ” **is an offer via WEB of IT services as computing and storage, but not only, in a virtual environment tailored to the users’ needs within a single administrative domain**
- **Amazon, Google, IBM…. already offer this service with proprietary software**
- **Cloud:** Has simplified access to hardware, software and storage thanks to the new simple WEB interface, the creation on demand of virtual environments and expanded the offer to all sort of services required by the users
- **GRID Infrastructure = Has enabled the sharing of services for ICT resources (even virtual ones) and/or tools located in different administrative domains (typical European case) . Currently supports collaborative distributed e-Science activities (WLCG)**
- **Grid services based on General, Standard, Open Source Protocols:**
- **GRID, Cloud and Virtualization together can extend use of the infrastructure from the domain of Research to potentially any user (PA and Enterprise)**

Cloud Functionality

- **The functionality of Cloud services can be described in many ways, depending on the type of abstraction**
- **Typically these are:**
  - *Hardware as a Service* (HaaS), focusing on making hardware available to customers.
  - *Software as a Service* (SaaS), focusing on providing ready-to-use software services.
  - *Data as a Service* (DaaS), focusing on the provisioning of access to data, available from various sources
- **These abstractions can be viewed collectively as the offer of a *Platform as a Service* (Paas), or, more in general, of an Infrastructure as a Service (IaaS)**
- **The infrastructure itself (such as e-Arena or IGI) becomes a service that can be easily procured via the WEB**

Grids, clouds, supercomputers..

Grids
- Collaborative environment
- Distributed resources (political/sociological)
- Commodity hardware (also supercomputers)
- (HEP) data management
- Complex interfaces (bug

Supercomputers
- Expensive
- Low latency interconnects
- Applications peer reviewed
- Parallel/coupled applications
- Traditional interfaces (login)
- Also SC grids (DEISA, Teragrid)

Many different problems:
Amenable to different solutions

No right answer

Clouds
- Proprietary (implementation)
- Economies of scale in management
- Commodity hardware
- Virtualisation for service provision and encapsulating application environment
- Deta
- Simp

omputing
- Simple mechanism to access millions CPUs
- Difficult if (much) data involved
- Control of environment ➔ check
- Community building – people involved

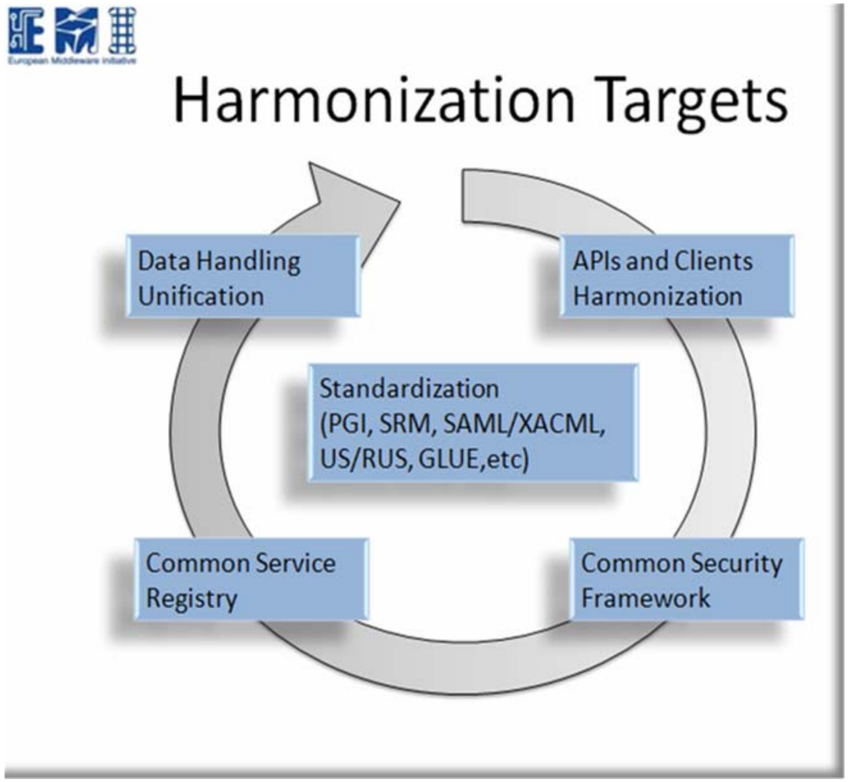
real work

The challenge: consider ALL as a combined *e-Infrastructure ecosystem*

Aim for interoperability and combine the resources into a consistent whole

Middleware in EGI->EMI

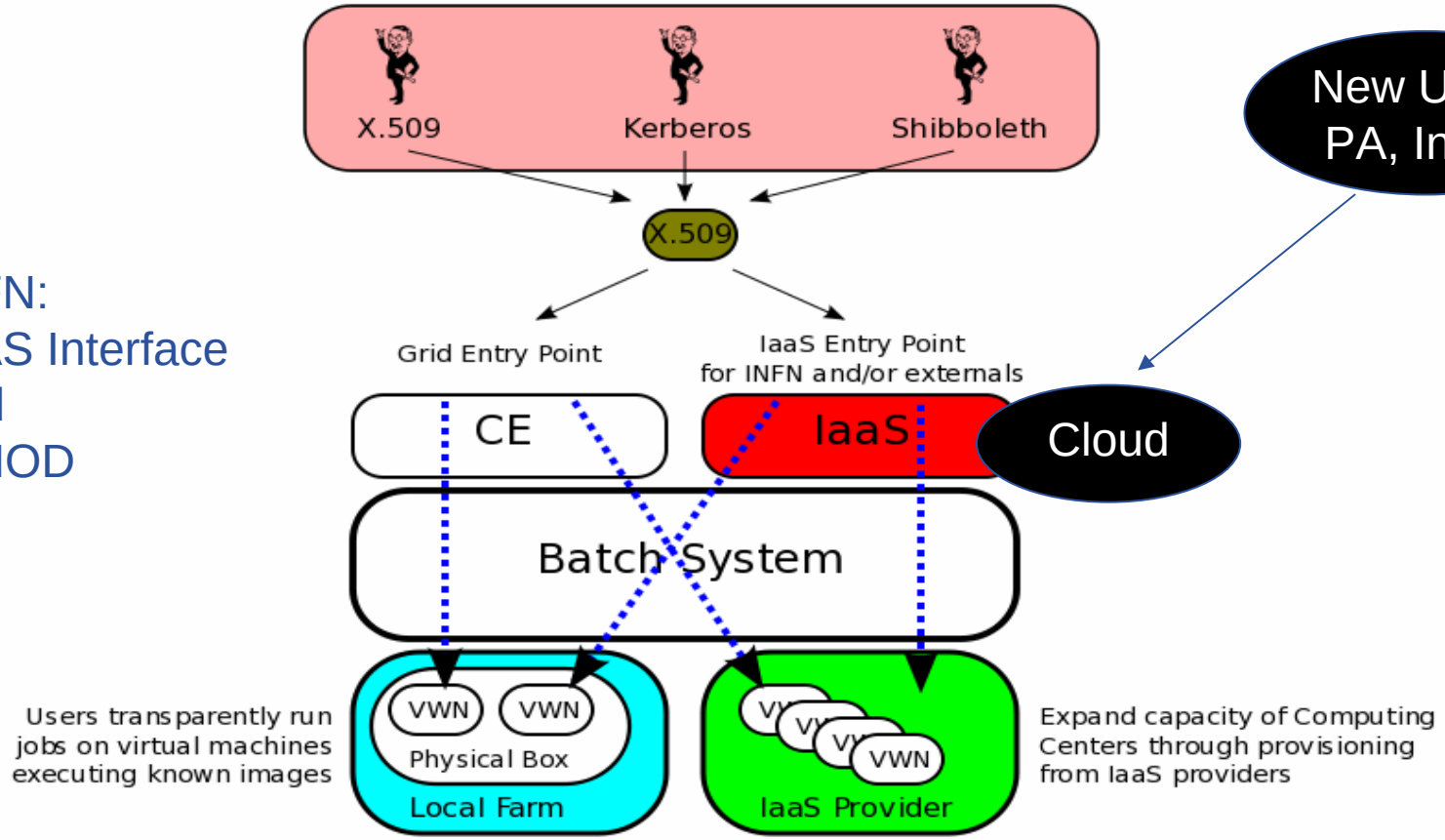
- **gLite Open Collaboration now in place**
  - 15 partners forming a new framework for the maintenance and future evolution of the gLite middleware beyond the end of EGEE project
- **Product teams combining integration & development/support staff in place**



CLOUDS IN INFN and IGI

Convergence of Grid and Cloud Services on Dynamically Provisioned Resources

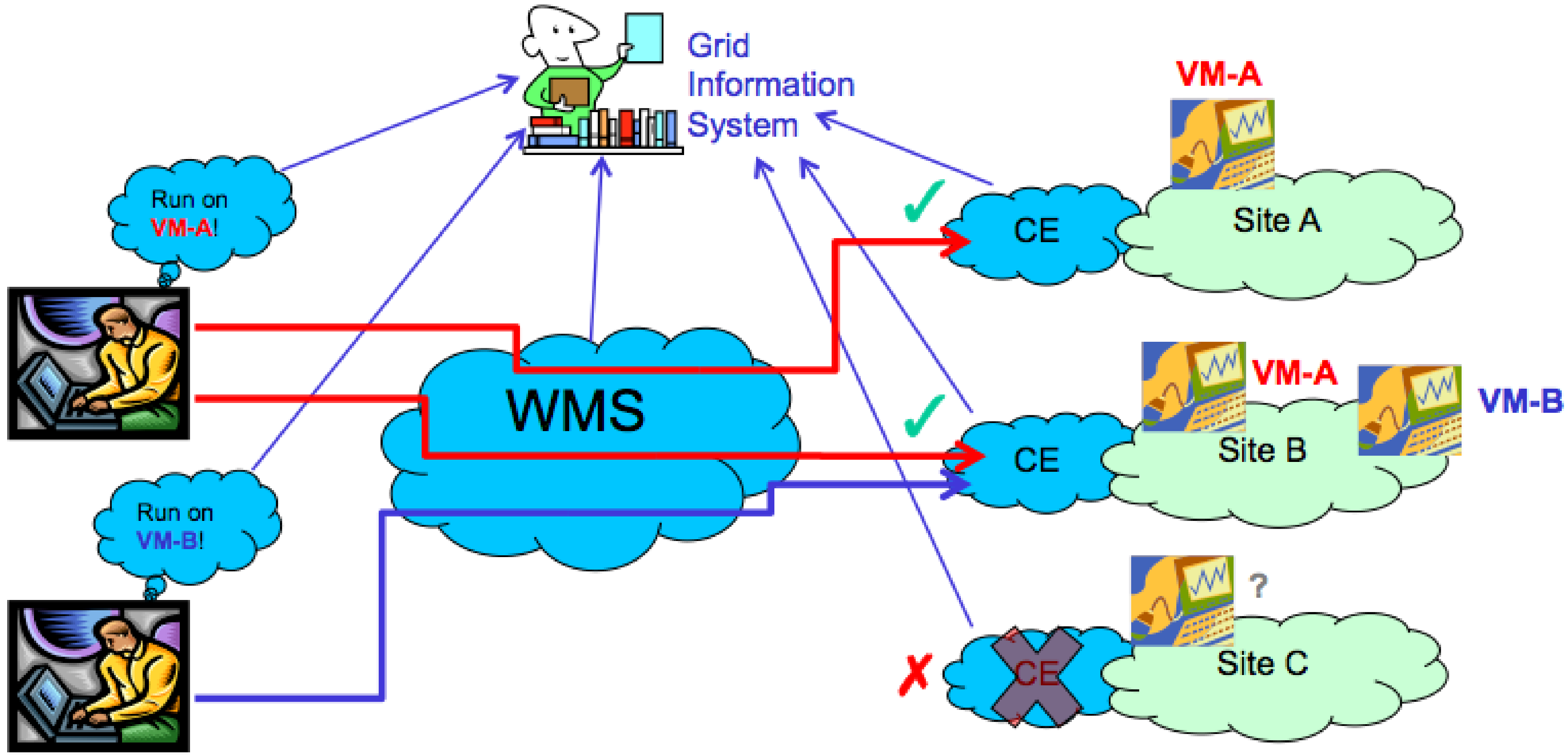
INFN:
IAAS Interface
and
WNOD



IGI become a IaaS provider

INFN WNOD is in production

Worker Node on Demand (WNOD)
WNOD: Dynamic selection of virtual resources via grid Jobs

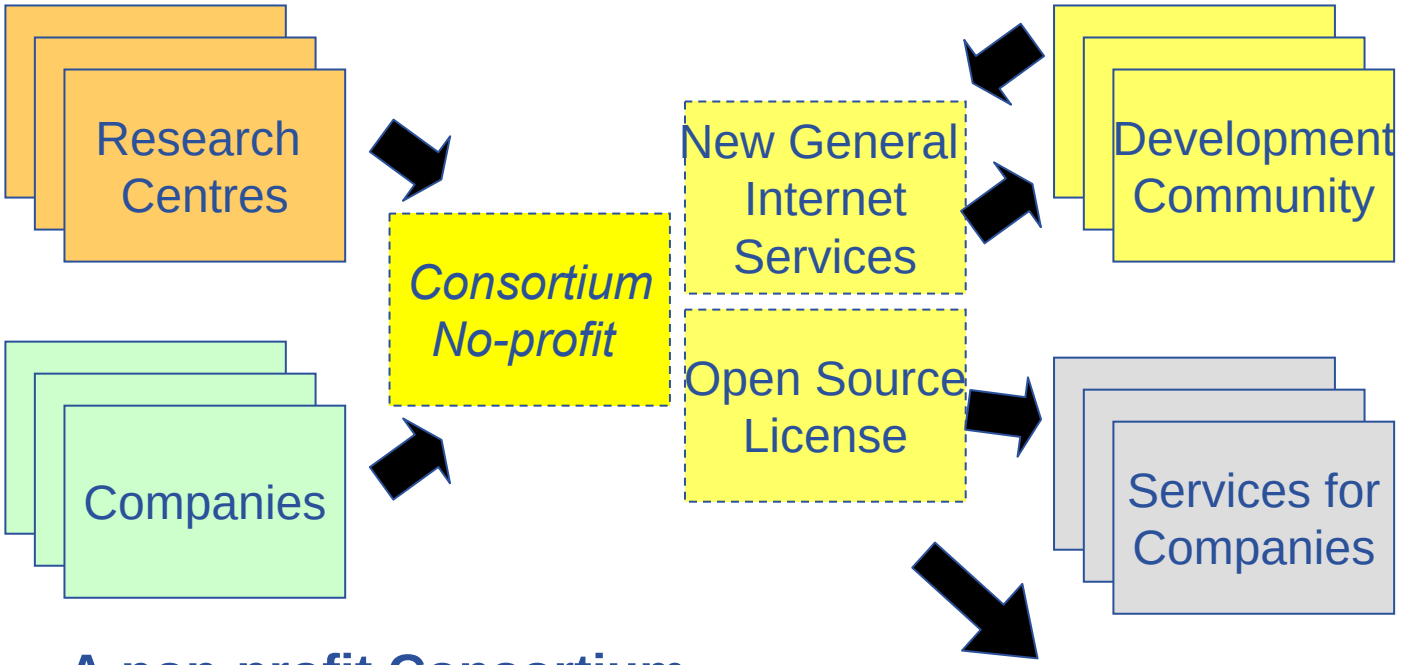


Users can choose their virtual envirobment

The New “gLite” Collaboration

An opportunity for Research and Enterprise in Europe

The Reference Model



- **A non-profit Consortium**
  - With partners for-Profit and/or non-profit
- **Some common development activities**
- **An open source license**

gLite EFFORT

PARTY	TOTAL CONTRIBUTED FTEs
CERN	7.6
INFN/IT	6.6
(Authorization Framework, VOMS and VOMSadmin, CE: CREAM, CEMon, BLAH, Workload: WMS, Data: StoRM, Accounting: DGAS; CLOUD: WNOD, ETICS	
CESNET/CZ	1.5
SWITCH/CH	0.7
NIKHEF/NL	1.2
UH-HIP/FI	1.2
STFC-RAL	1.0
PNPI/RU	0.5
CESGA + CSIC/SP	0.4
ASGC/TW,	0.8
TCD/IE,	0.7
GRNET/GR,	0.6
KISTI/K	1.0
UCY/Cyprus	0.2
UAB/SP	0.2

Conclusions

- **Europa is building a single ecosystem which will include resources from HTC-EGI, HPC-DEISA/PRACE and Data Archives and will provide a general e-Infrastructure for the world of research and beyond, under a sustainable governance**
- **For Italy and Russia with IGI and e-Arena many topics for a bilateral collaboration exist: e-Infrastucture**
  - Grid service provision (Monitoring, Accounting, Testing.....)
  - New clouds and IaaS services
  - User Communities support (e-Science Portals..)
- **Middleware: EMI and the gLite Collaboration are producing an harmonized integrated solution**
  - Again many topics for bilateral collaborations can be identified