

Towards a GRID Operating System: from GLinux to a Pervasive GVM

Domenico TALIA



DEIS

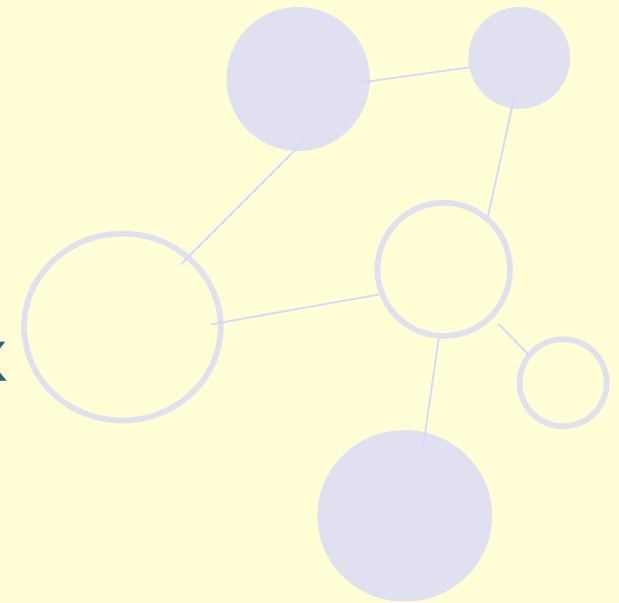
University of Calabria

ITALY

talia@deis.unical.it

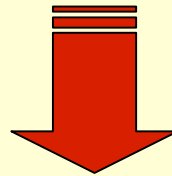
OUTLINE

- **Basic Issues**
- **Basic Features**
- **A Two-step Strategy**
- **A GVM for Implementing GLinux**
- **Towards a Pervasive GVM**
- **Conclusions**

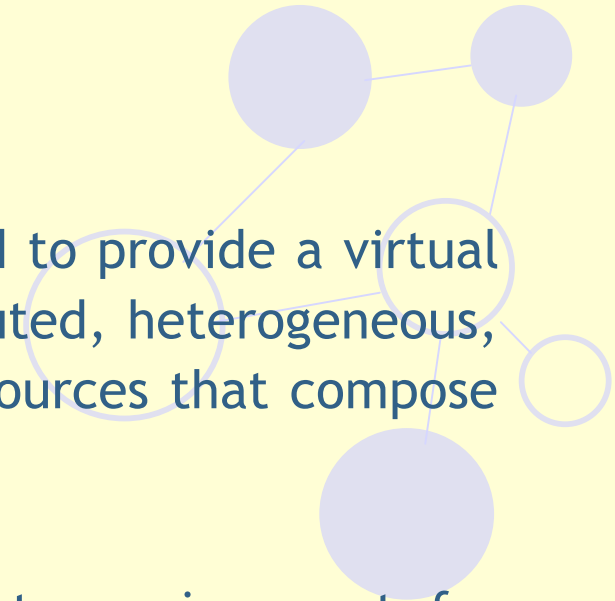


BASIC ISSUES

- A conventional operating system provides an abstraction layer on top of the underlying physical resources of a computer

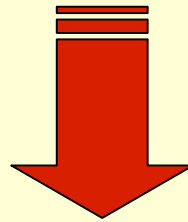


- A **GRID operating system** must be designed to provide a virtual machine interface layered over the distributed, heterogeneous, autonomous, and dynamically available resources that compose a GRID.
- An operating system is a more appropriate environment for providing GRID users access to resource sharing facilities.



BASIC ISSUES

- Internetworking facilities in desktop computers were initially implemented as a middleware on top of the existing operating systems and successively were embodied in the new releases of operating systems.



- According to the same approach, facilities for integrating computers in GRIDs should move from the middleware layer (toolkits) to the operating system layer.

BASIC FEATURES

- A developer and an end-user would like to connect her/his machine to the GRID and access the GRID facilities as today a computer/PDA/mobile phone connects to the Intranet/Internet and accesses their services.
- A GRID OS should
 - provide simple connection to the GRID
 - handle knowledge about GRID resources
 - offer access to GRID resources/services
 - define policies for providing local resource/services to a GRID and negotiate policies for accessing remote resources/services.



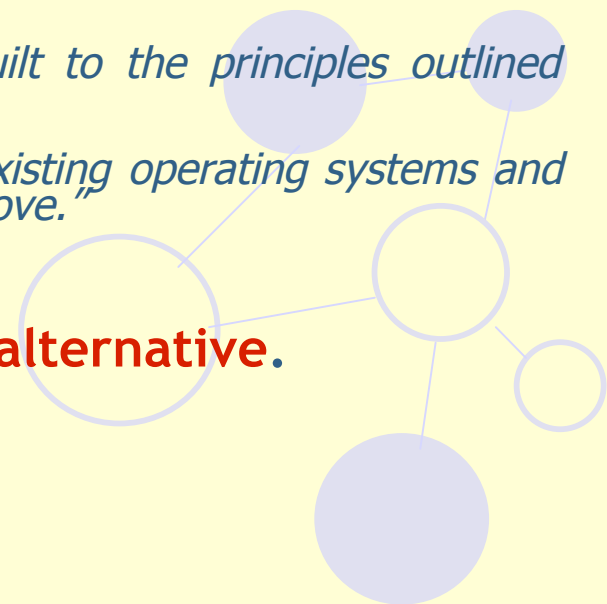
A TWO-STEPS STRATEGY

- From the Workshop Call:


"Two approach lines were and will be discussed:

- (a) the creation of an entirely new operating system built to the principles outlined above;*
- (b) the creation of foundationware to interface between existing operating systems and GRIDs middleware to support the principles outlined above."*

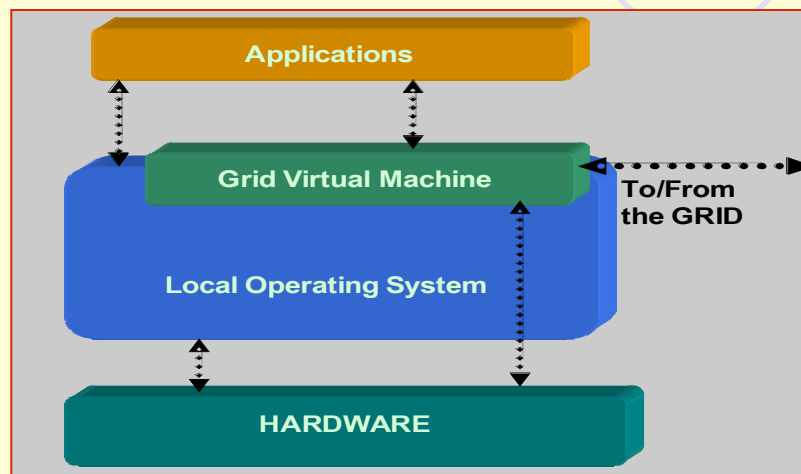
- I believe that the **two approaches are not alternative**.
- A **Two-steps roadmap** is possible.




A TWO-STEP STRATEGY

 The **first step** should integrate existing operating systems with GRIDs through an interface based on a **Grid Virtual Machine (GVM)** that extends the local OS.

- The GVM must be defined as a layered set of components that implement the services needed to access and use GRID resources.
- A very interesting use case to implement this phase could be the integration of a GVM as a *kernel Grid OS* into Linux (**GLinux as a Gridified Linux**).



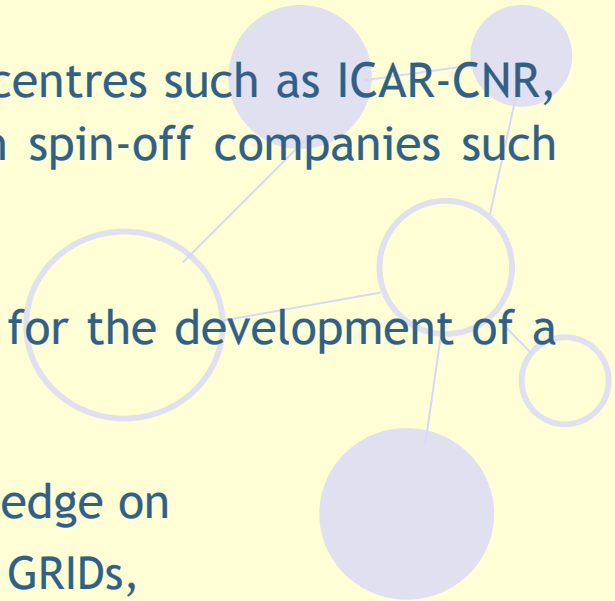
A TWO-STEPS STRATEGY

 The second step should provide **an operating system for a pervasive GRID** composed of **different grained computing nodes**.

- The modular design of the GVM will support its **total/partial implementation on different grained GRID nodes**, from cluster computers, to PDA and sensor devices resulting in different version of the GVM.
- Different instantiations of the GVM result in different GRID OS kernels depending on the hardware available.
- A minimal kernel should be configurable on every GRID node.
- It will provide different implementations of a **GRID file system (GFS)**, of a knowledge-based **global naming system**, and defines a *GRID horizon* composed of all the GRID environments accessible from a machine are represented and accessed through publication and **P2P discovery mechanisms**.

INTERESTS AND CONCLUSIONS

- The research team of University of Calabria is actively involved in several projects related to GRIDs and is active in research activities in the Grid computing area.
- We have strong partnerships with other research centres such as ICAR-CNR, ISTI-CNR, University of Pisa, and SPACI, and with spin-off companies such Exeura.
- We are interested to study the basic mechanisms for the development of a Grid Virtual Machine.
- We can supply our research background and knowledge on
 - P2P techniques, models and services for scalable GRIDs,
 - metadata management techniques and models,
 - architectures for GRID-based PSE toolkits,
 - scalable resource discovery and GRID information systems.





THANKS

