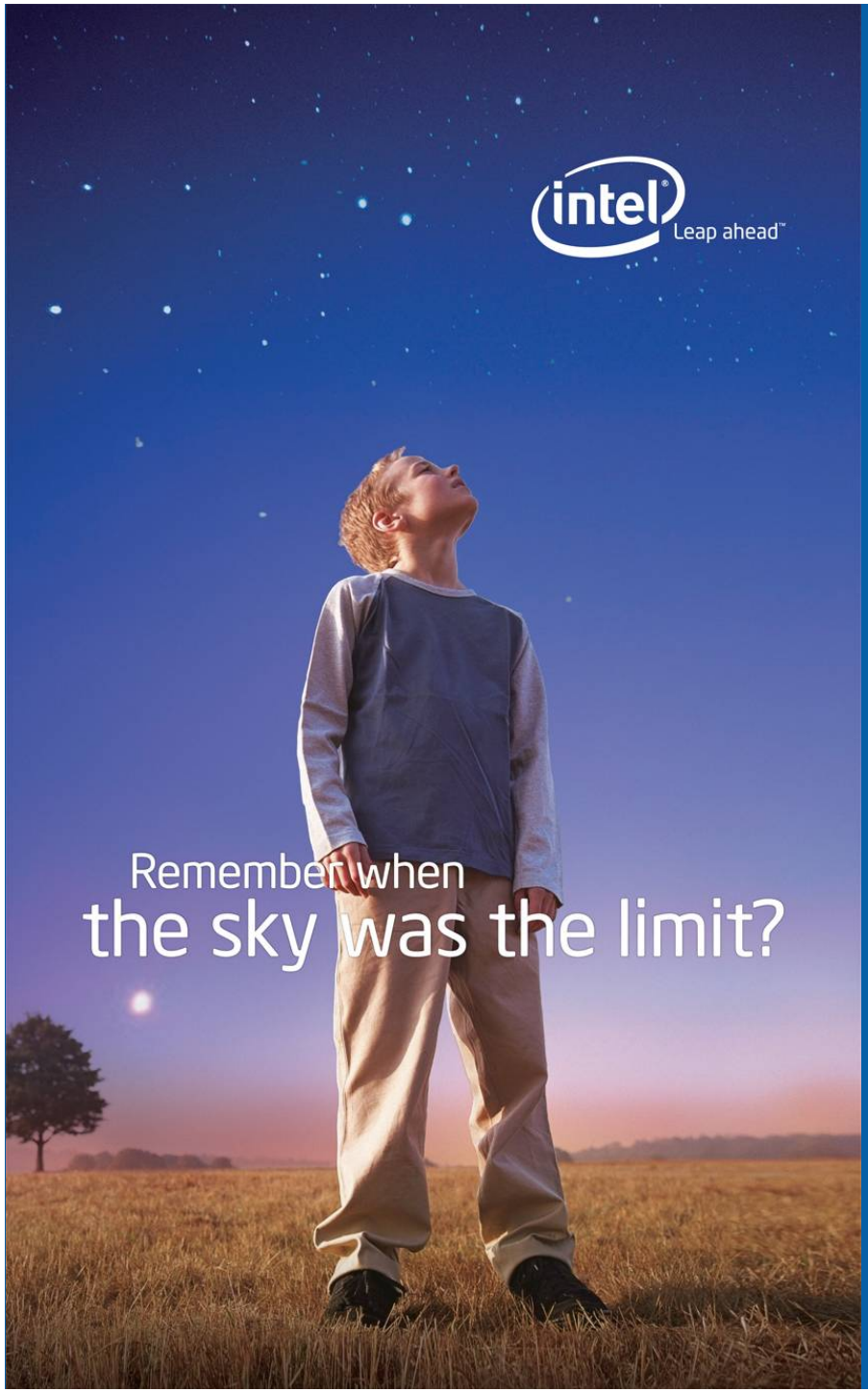


Intel and the Grid

Hans–Christian Hoppe
Intel Software&Solutions Group

EGEE'06 – Capitalizing on e–Infrastructures

Software

Intel's Relation to the Grid

Our view of the Grid:

- A key infrastructure technology
  - virtualizing and federating distributed data centers
- An important extension of the SOA model
  - dynamic, policy–based execution of services on suitable resources
- An opportunity to drive broad adoption with commodity platforms

We work with the Grid community in several ways:

- Enable software developers of today's Grid solutions
  - Industrial/corporate developers, academic/research developers, *and* foster ISVs too!
- Create new, exciting Grid showcases
- Participation at Grid standards bodies

Grid Business Drivers – Break Resource Silos

Conventional Cluster/Data Center

App 1 | App 2 | App 3

Resource
- Compute
- Network
- Data

Resource
- Compute
- Network
- Data

Resource
- Compute
- Network
- Data

Dedicated Silos of Statically Allocated Resources

Grid

App 1 | App 2 | App 3

Virtualized Pool of Dynamic Resources

Intel Developer Products Division (DPD) Grid Activities

Develop prototype Grid components

- Grid Programming Environment (GPE)
- Simplify creation of Grid–enabled applications
- Historical focus on HPTC, shifting towards SOA
- Leverage emerging technology (e.g. VT, Multi-core, IAMT)

Engage with Grid experts and users

- Work in European–union funded R&D projects
- Focus on Government (HPC), Manufacturing, Life Sciences, FSI
- Bring in GPE or general Grid experience, create showcases

Interact with ecosystem, standards bodies

- Focus on Open Grid Forum (OGF)

Grid Programming Environment (GPE)

GPE turns a collection of geographically distributed computer systems into a Grid
- Resource provisioning
- On–demand use of computing resources and distributed computation
- Data staging and sharing

GPE implements higher–level Grid capabilities
- Graphical user interfaces
- Programming APIs and libraries
- Dynamic resource and service registry, (simple) resource broker

GPE leverages existing Grid middleware and furthers interoperability
- Interact with OGSA–compliant Grid systems through atomic services interface

GPE is being used as a technology demonstrator by Intel
- Available as Open Source
- Enable customers and ISVs interested in Grid software
- Implement and influence standards
- Drive new technologies into market

GPE Components

Applications

Graphical User Interfaces

GridBean SDK

Services

Service Registry

BPEL Workflow Service

Resource Broker

OS Repository Service

Utility

Atomic Services

TSI

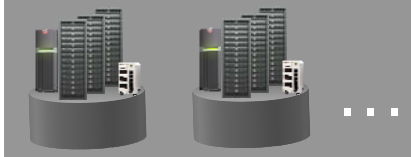
TSI

...

Grid 1

Atomic Services

PBS, Platform LSF, etc.



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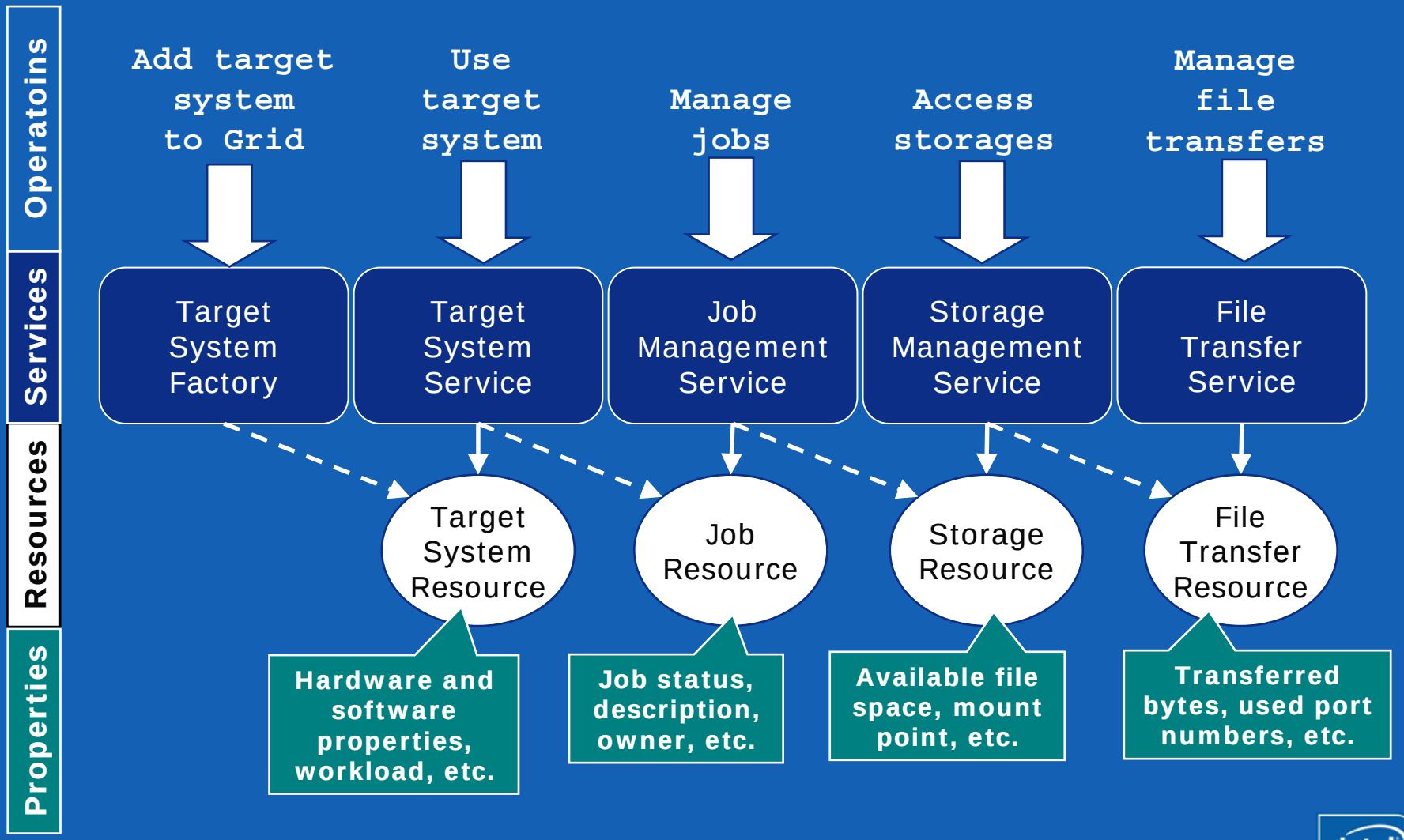
Grid 2

Interface to OGSA Grid systems

Atomic Services using the Web Service Resource Framework (WSRF)



Motivation for Virtual Machine Technology GPE

Security
- Protect sensitive user data in VM instance

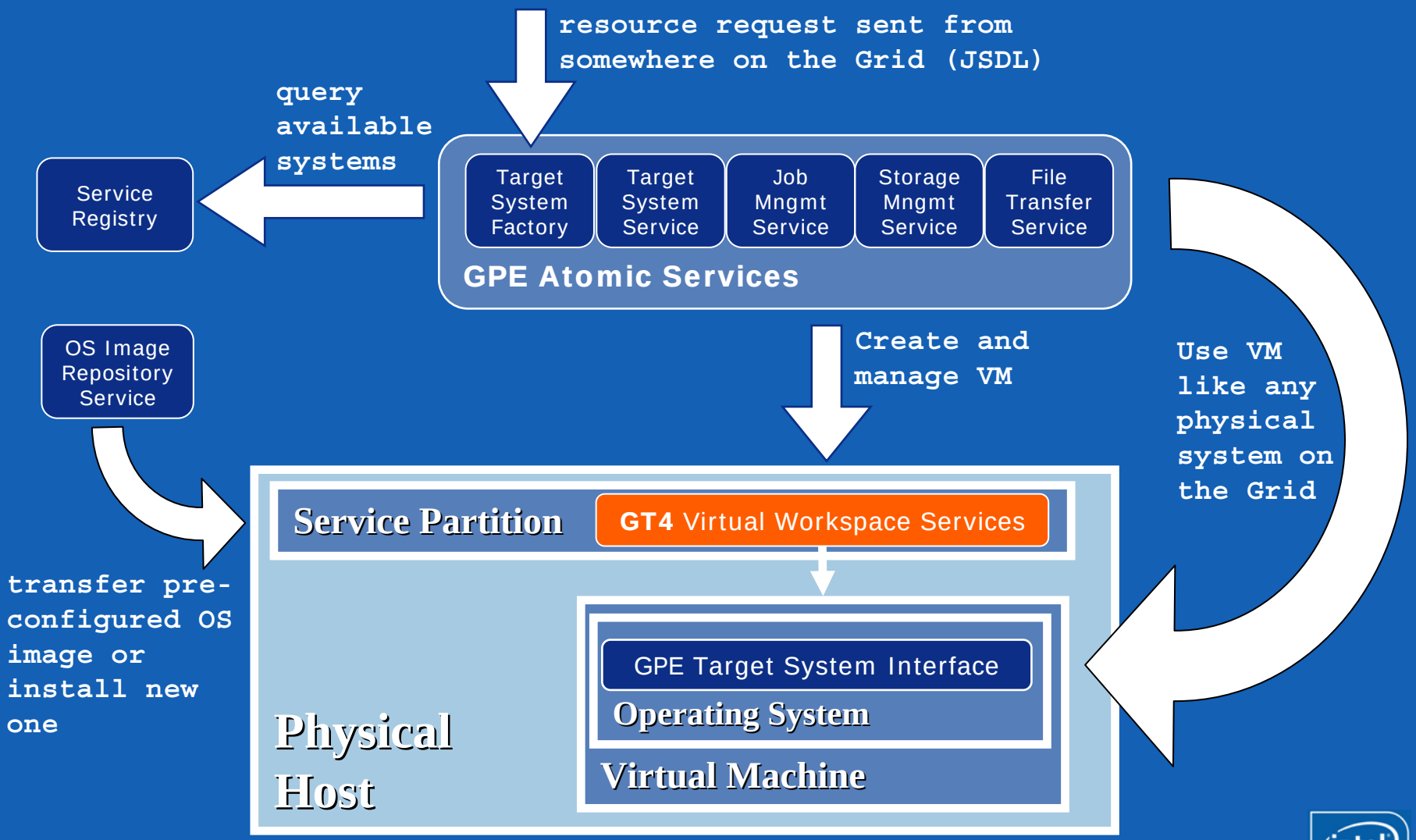
Reliability
- A partition remains unaffected if other partitions crash

Flexibility
- VMs can checkpoint and migrate during run-time
  - *I want to move to a faster system, when it becomes available*
  - *My job has high priority, please free the fastest machine for me*

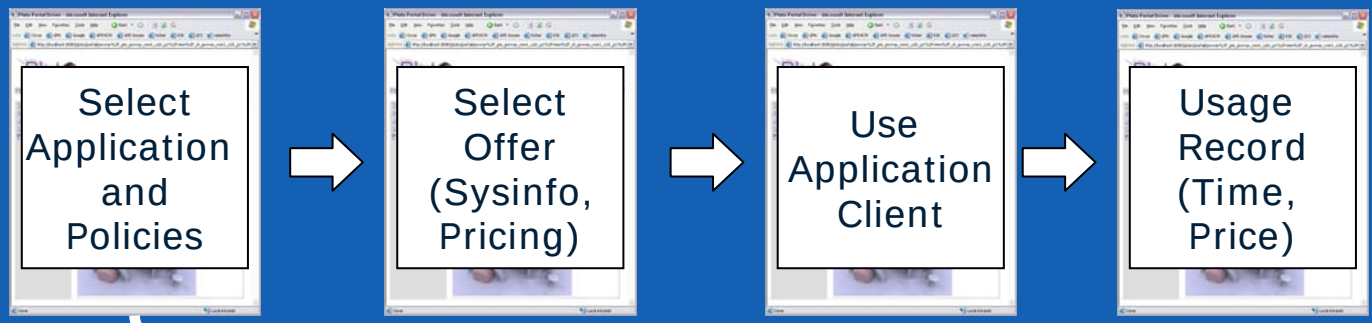
Configurability
- Dynamically deployed OS images and applications on user request
  - *I need two cores on a fast CPU with 1Gb of memory and RedHat Linux 9*

Manageability
- Maintenance of systems, software and users in centralized services

GPE and Globus Toolkit: Virtualization now!



Outlook: Automatic VM Deployment



Broker

System Monitor

Target System Factory

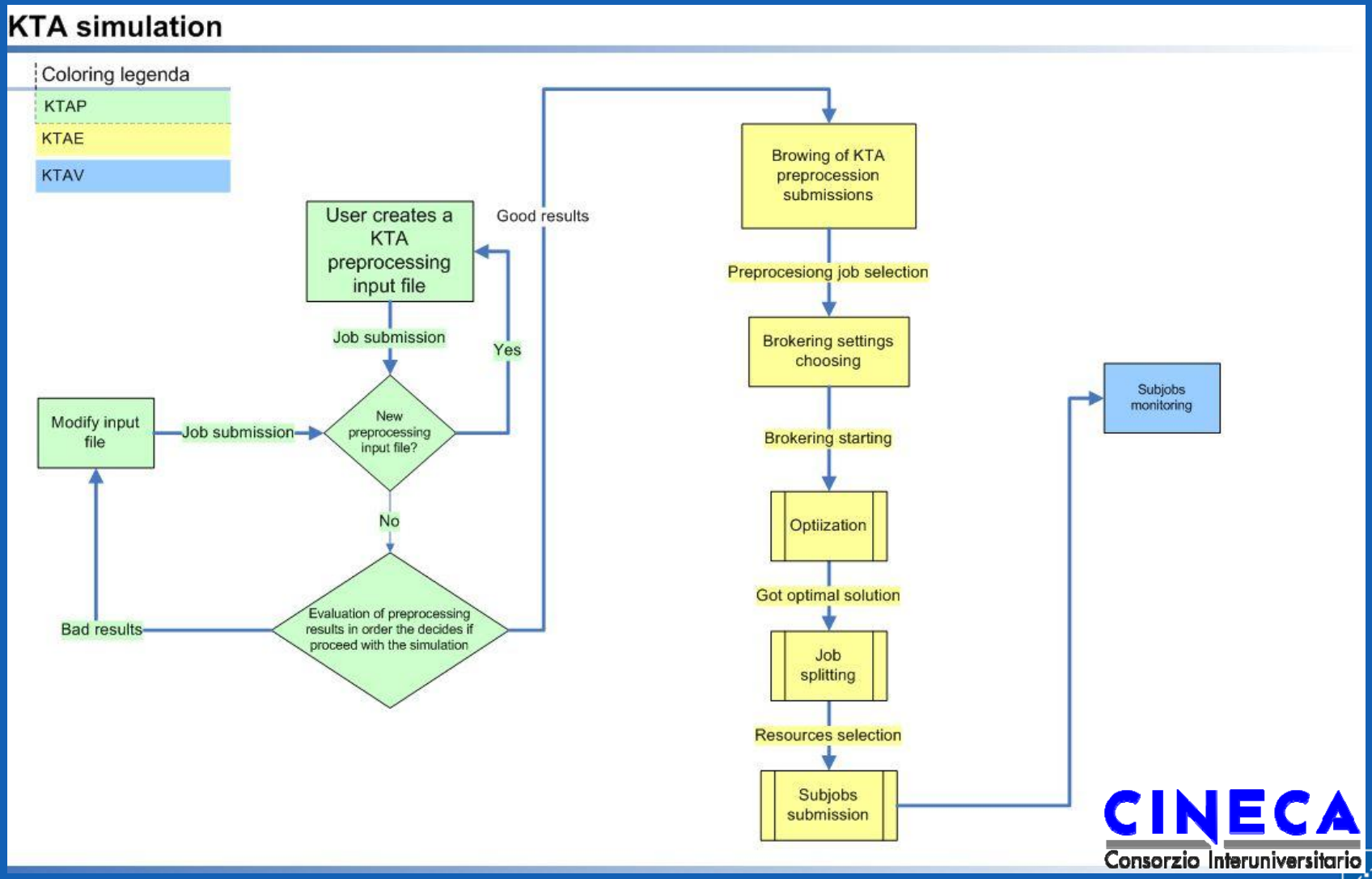
OS Image Repository

AS VM AS VM Physical System

DB VM Physical System

AS VM BI VM AS VM Physical System

UniGrids Oil&Gas Show Case: GridBean Suite for Kirchhoff True Amplitude Simulation (KTA)



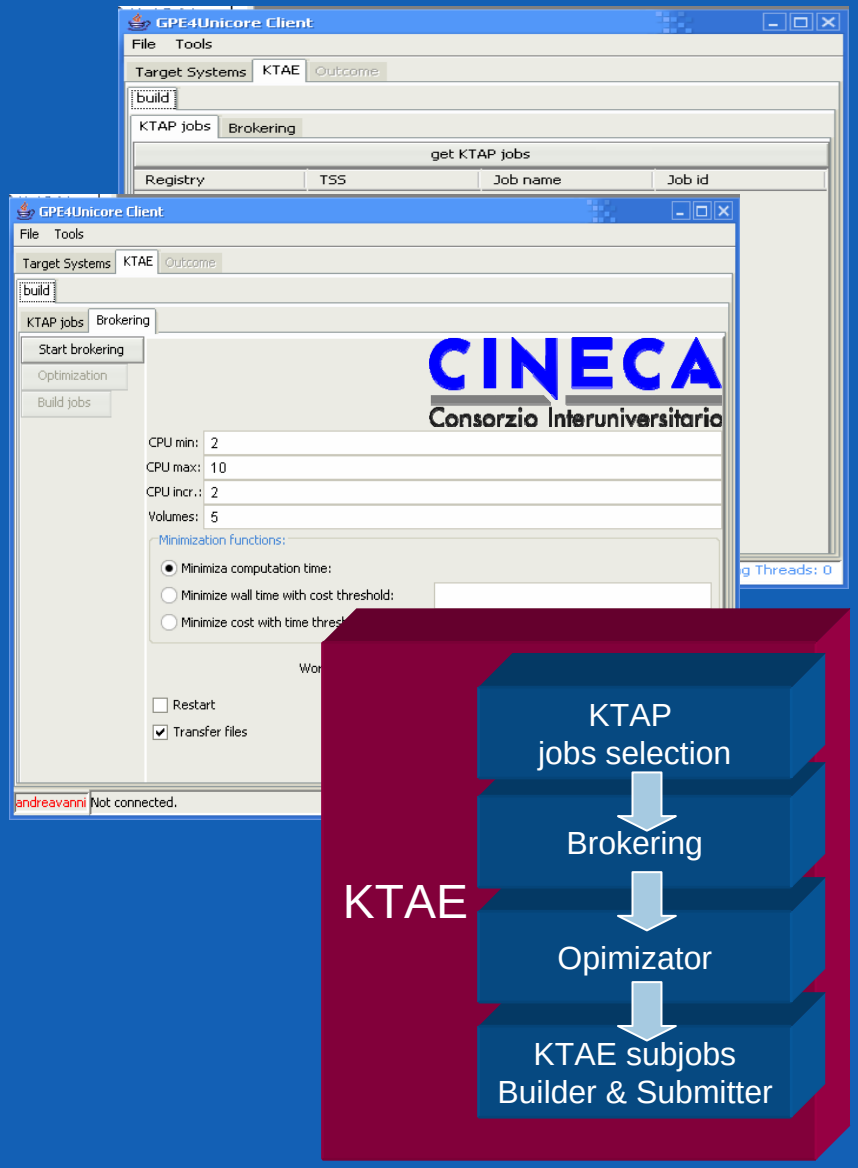
CINECA
Consorzio Interuniversitario

intel Software

UniGrids EU–Funded Project

- Intel provides GPE as client and development framework for UNICORE
  - GPE4Unicore released at Unicore SourceForge project
- GridBean development by FZ Juelich, CINECA and ICM Warsaw
- UNICORE will support GPE atomic service interfaces
  - Intel is member of Unicore Forum and Technical Board
  - GPE clients part of UNICORE 6 roadmap
- UniGrids project ended in July 06
  - GPE available for next generation of UNICORE-based research projects (Chemomentum, A-Ware, D-Grid, Deisa, etc.)

UniGrids: KTA Execution GridBean (KTAE)



KTAE GridsBean allows to:

- KTAP job discovery and selection
  - search all KTAP jobs
  - select a KTAP job
  - export the input file
- Brokering
  - KTAE request based on application domain parameters and not on resources specification
- Optimization
  - Optimize the job splitting using an optimization function
- Job splitting
  - Build sub jobs and submit them

GPE: Based on Standards

Open Grid Forum (OGF)

- JSDL (Job Submission Description Language)
- OGSA (Open Grid Services Architecture)
  - Different profiles
- BES (Basic Execution Services)
- ByteIO (File Transfer and Streaming)

OASIS

- WSRF and WSN (Web Services Resource Framework)
  - Migration to WS-RT
- WSS (Web Service Security)
- WSBPEL (WS-Business Process Execution Language)

DMTF

- CIM (Common Information Model)

W3C

- WS-Addressing, SOAP, WSDL, UDDI, XML, etc.

GPE Current State

- Release 1.1 available as Open Source
  - based on Globus Toolkit 4 container (WS-Core)
  - Unicore-based version available at unicore.sourceforge.net
- Installation packages
  - All components written in Java 5
  - Out-of-the-box installation including Globus WS-Core
- Source Code available from CVS