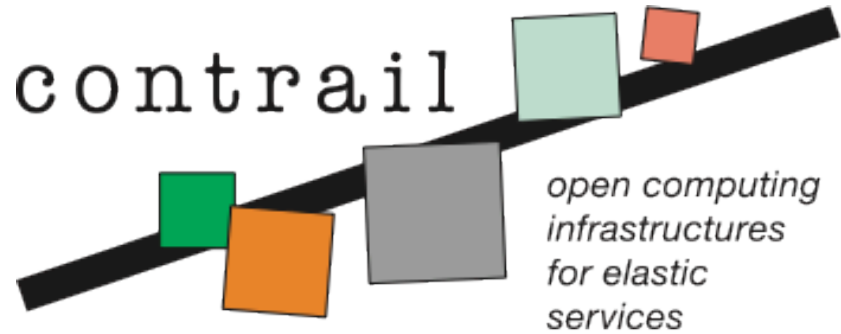


XtreemOS

*Enabling Linux
for the Grid*



contrail



From XtreemOS Grids to Contrail Clouds

Christine Morin

Myriads team, INRIA Rennes – Bretagne Atlantique
Scientific coordinator of XtreemOS European project
Coordinator of Contrail European project



Context

- Distributed operating system for Grids and Cloud federations
 - XtremOS Grid operating system (2006-...)
 - Contrail system for cloud federations (2010-...)
- Large scale distributed systems
 - Wide area computing infrastructure spanning multiple administrative domains
 - Dynamic nature & uncertainty
 - Huge amount of resources & users

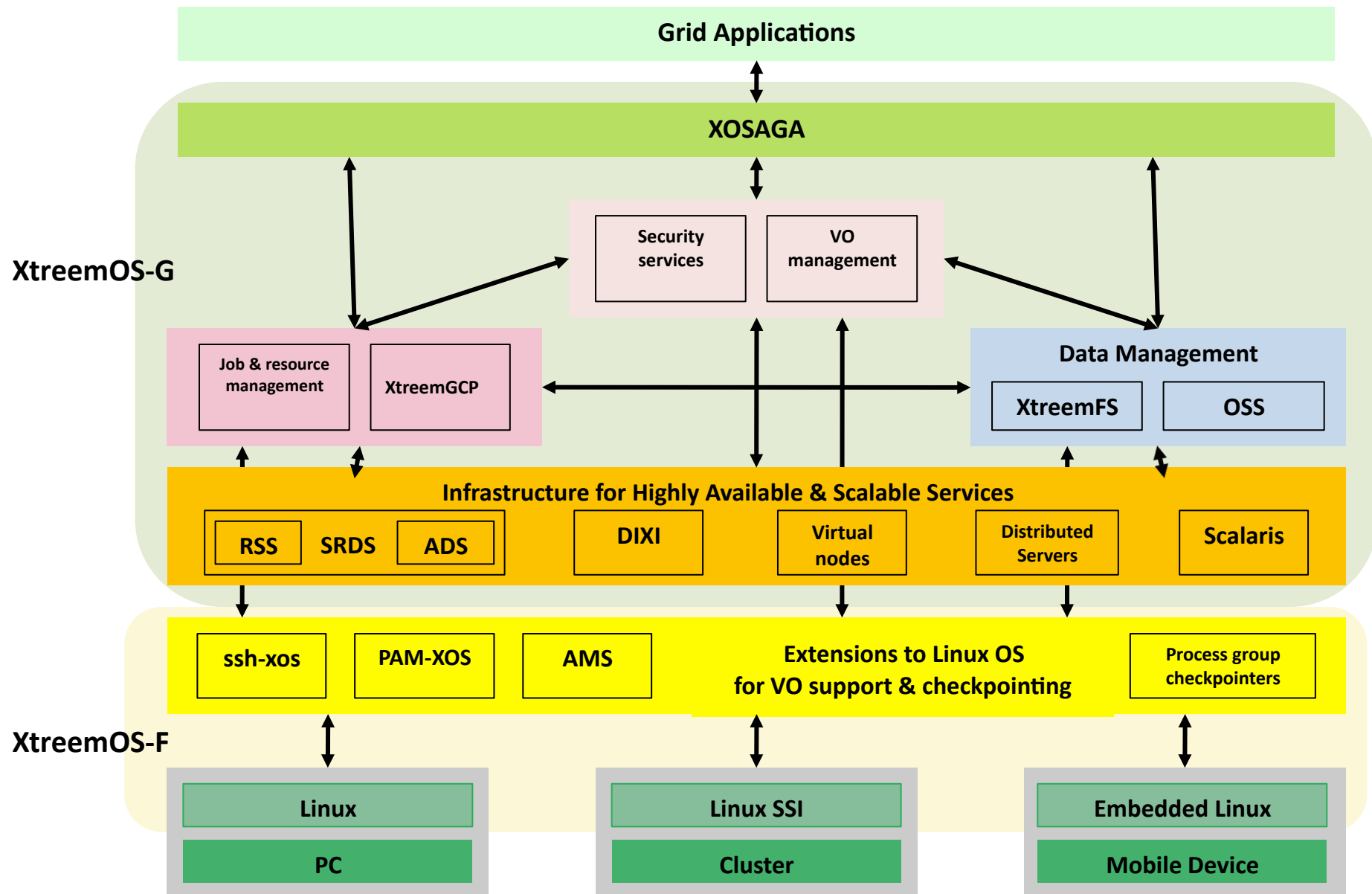
Outline

- XtreamOS Grid operating system
- XtreamOS: from Grid to Cloud computing
- Overview of Contrail European project

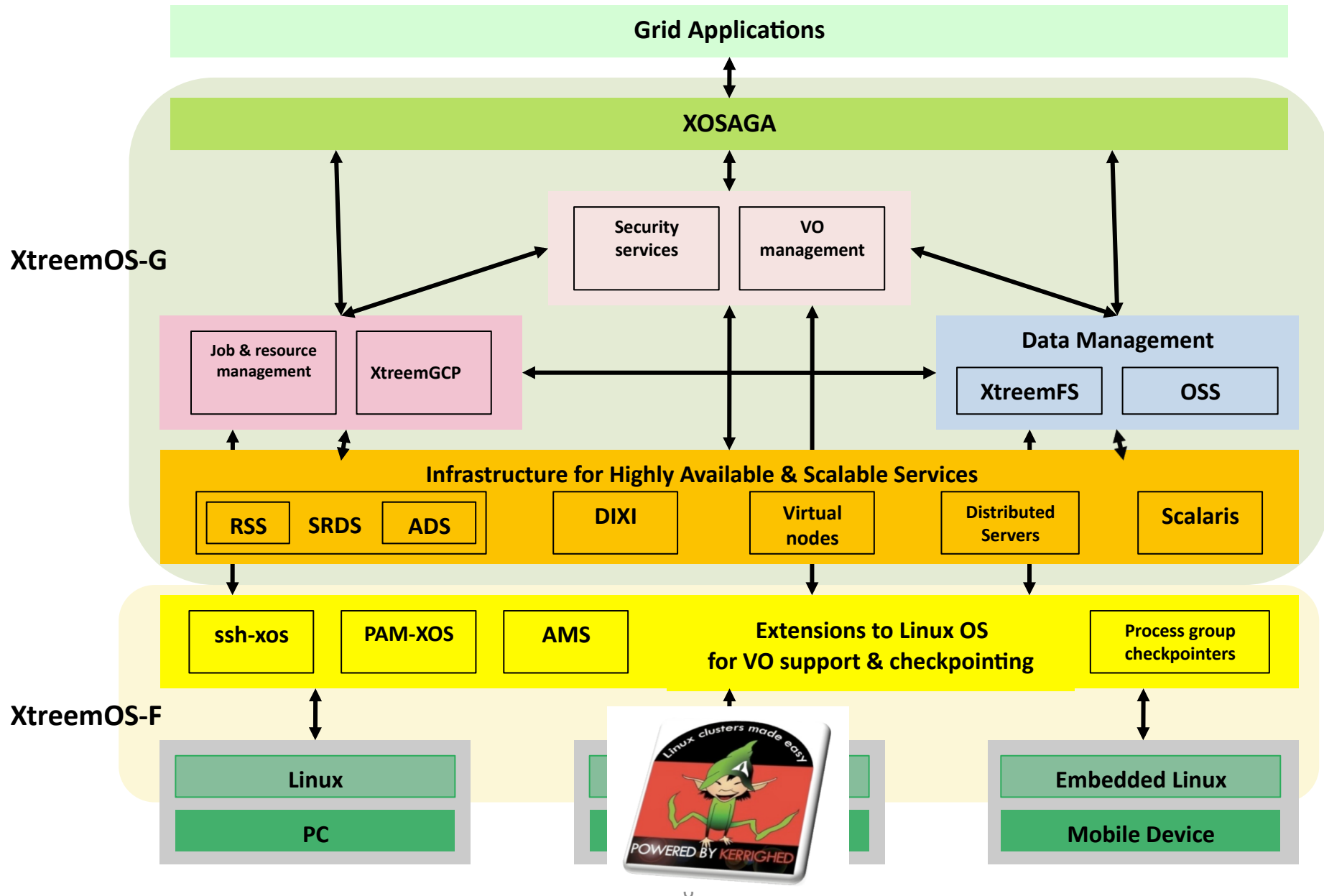
XtreemOS in a Nutshell

- Distributed operating system for large scale dynamic Grids
 - “**Operating system**” approach
 - Comprehensive set of cooperating system services
 - Ease of use
 - “**Bring the Grid to standard users**”
 - Unix system interface
 - SAGA programming interface
 - **Scalability**
 - Dependable system

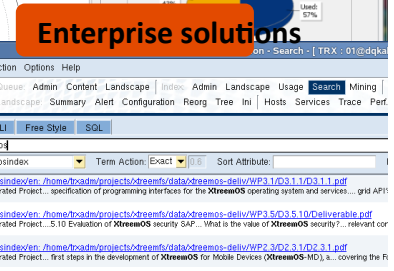
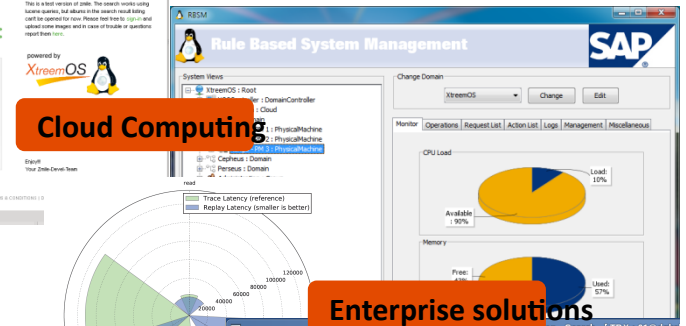
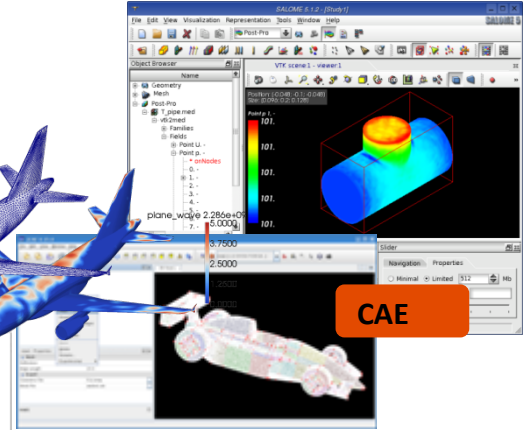
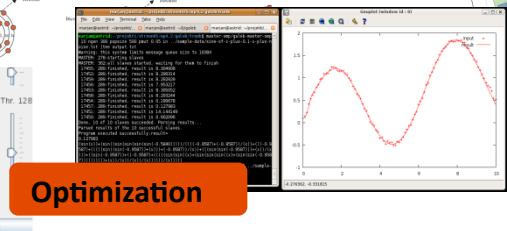
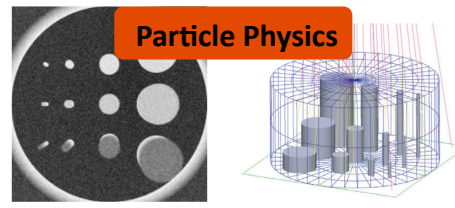
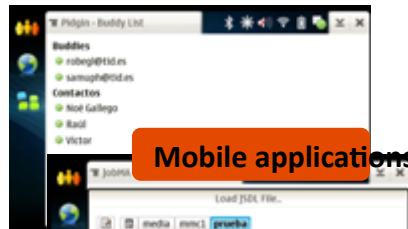
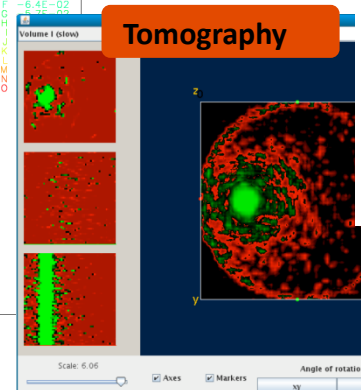
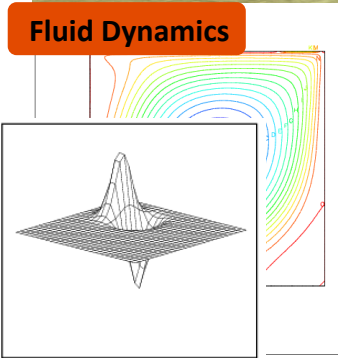
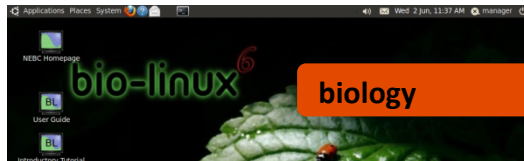
XtreemOS Software Architecture



XtreemOS Software Architecture

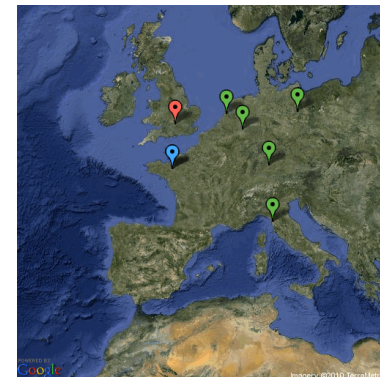


Applications

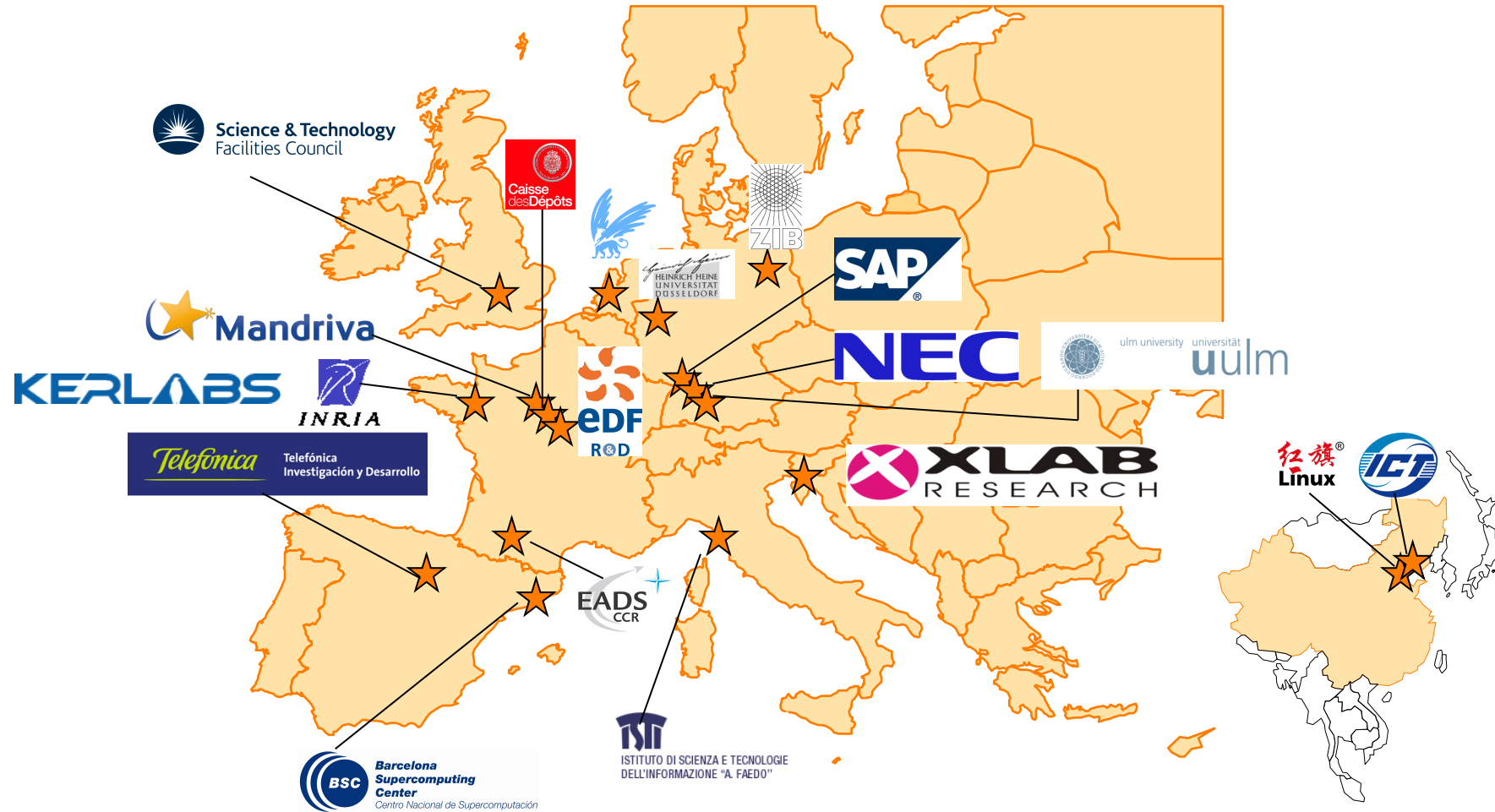


XtreemOS Software

- XtreemOS 2.1.2 open source Grid operating system
 - PC, clusters, netbooks, PDA, smart phones
- Packaged for Linux distributions
 - Mandriva, Debian, Asianux
- Ready to use VM for KVM & Virtual Box
- Tool for automatic deployment of XtreemOS on Grid'5000
- XtreemOS open permanent testbed



XtremOS Consortium



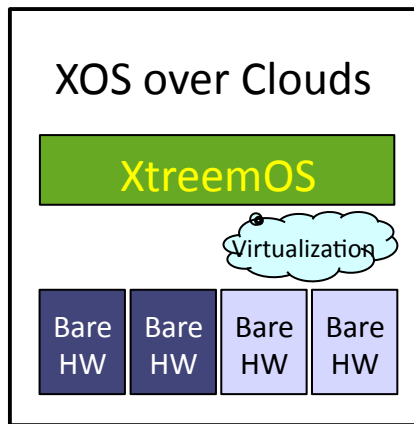
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XtreemOS and Cloud Computing

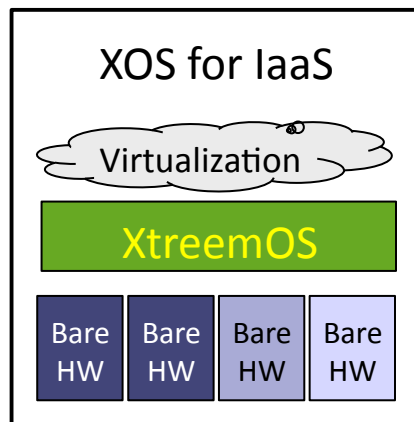
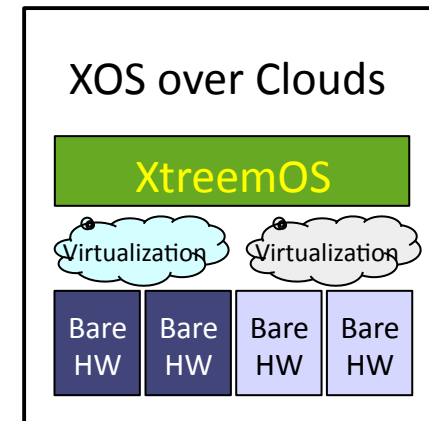
- XtreemOS: a distributed operating system designed for Grids
 - Project started in June 2006
- Cloud computing new era started in late 2007
 - Lots of media attention, new products announced every day, etc.
- Question
 - How relevant is XtreemOS in this new context?

XtreemOS & Cloud Computing



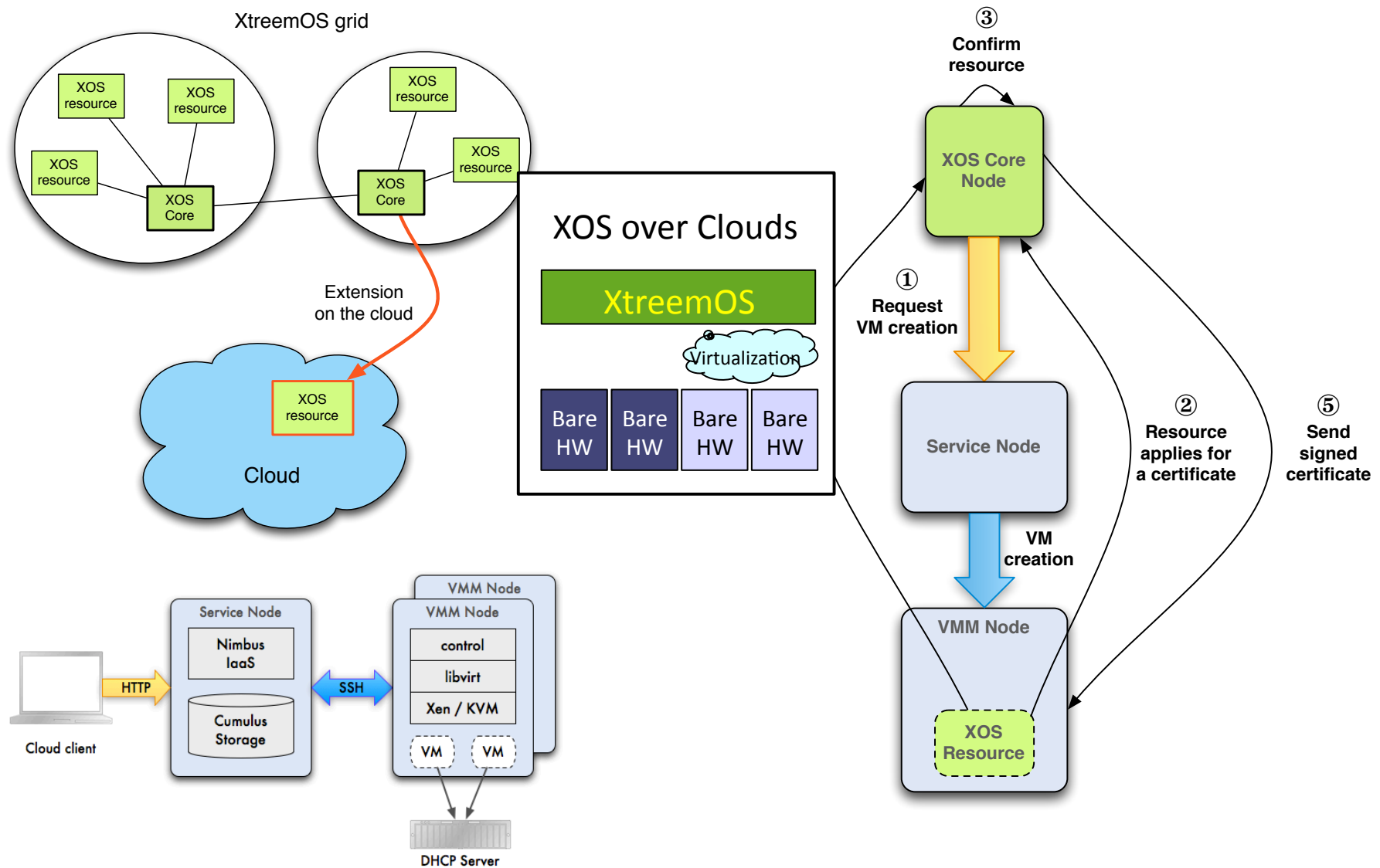
Extending an XtreemOS Grid
with dynamically provisioned resources

Cooperation over federated clouds
using XtreemOS Grid system

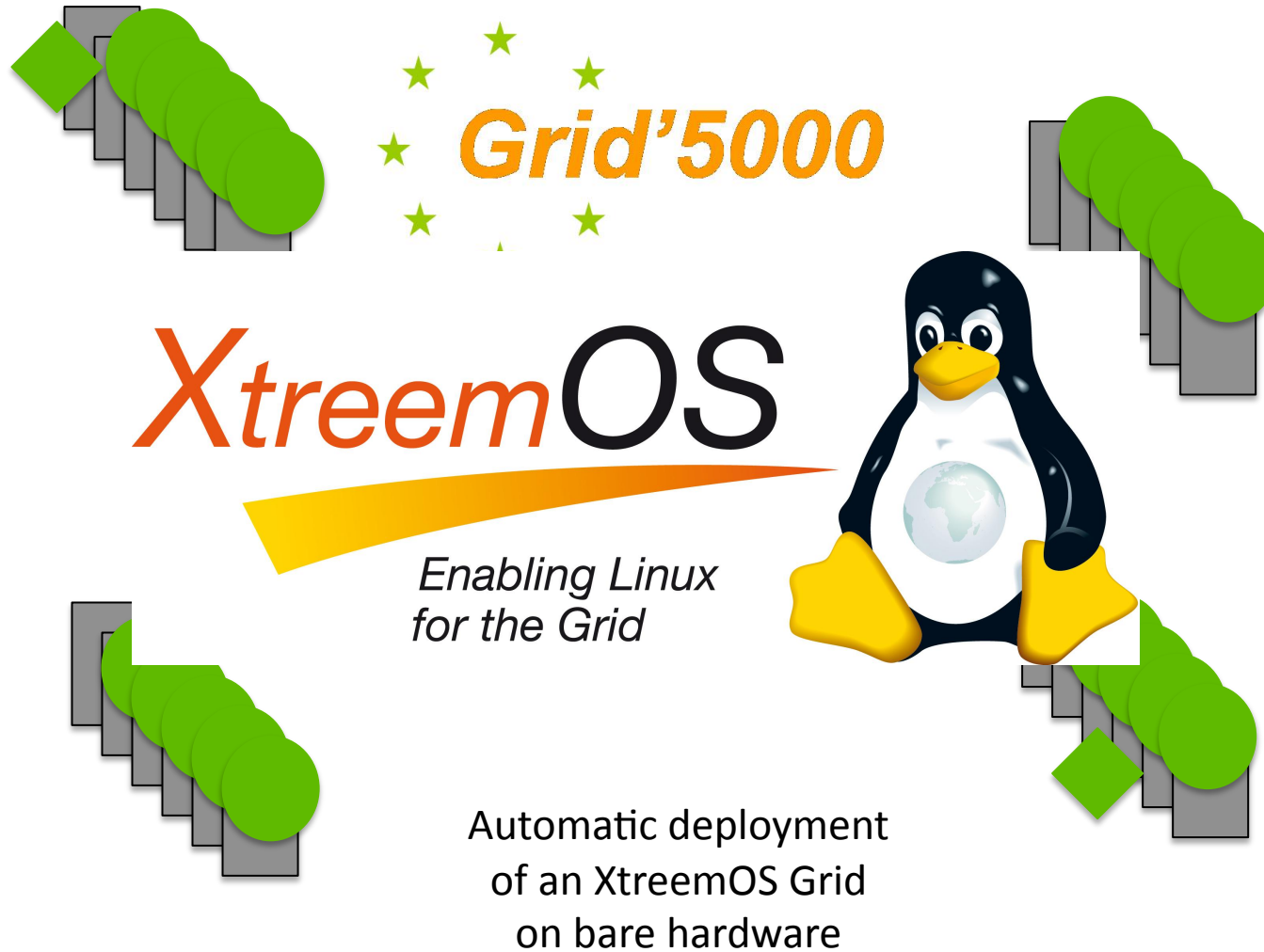


XtreemOS as an OS for IaaS clouds
over hardware resources in different sites
or provisioned by different suppliers

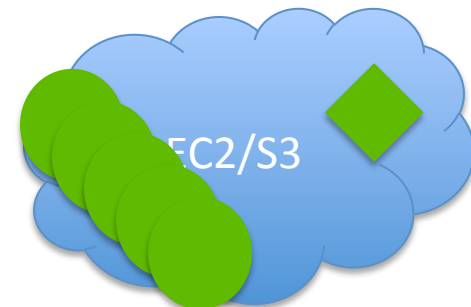
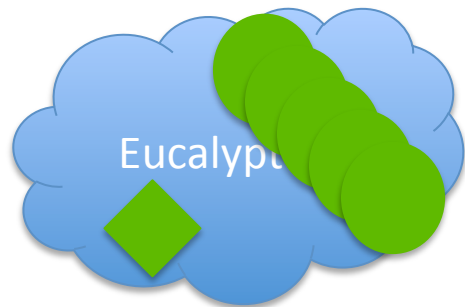
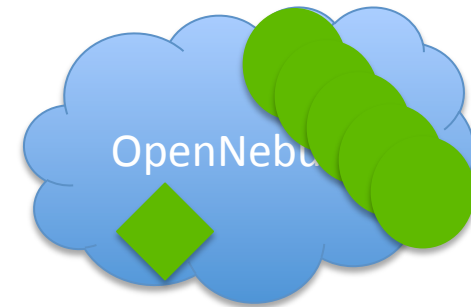
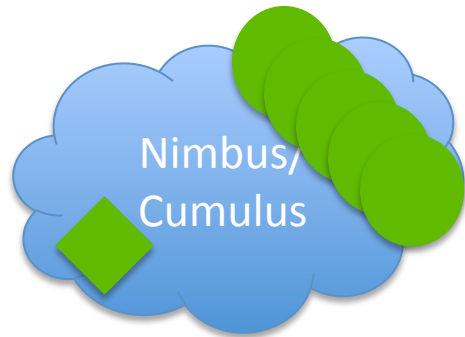
Provisioning Resources from Clouds



XtreemOS Appliances for Clouds



XtremOS Appliances for Clouds

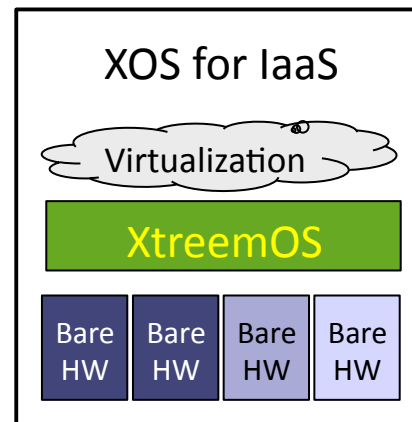


XtreemOS Appliances for Clouds



Cooperation over federated virtualized infrastructures

XtreemOS as an IaaS Cloud OS



XtreemOS as an IaaS Cloud Operating System

- Virtualization used in XtreemOS for isolation
 - Linux cgroups, containers, VM used to execute jobs
- XtreemOS could manage VM instead of jobs
 - EC2 interface
- XtreemFS could be used as a cloud storage system
 - VM images storage
 - S3 interface
- XtreemOS as a system to provide an IaaS cloud service on top of hardware resources supplied by different providers
 - Management of resources in different sites and administrative domains
 - VO infrastructure to manage resource usage policies
 - Customer classes
 - Bare hardware suppliers

Outline

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Contrail Objectives

- Design, implement, validate and promote an **open source software stack for cloud computing**
- Outcome
 - A tightly integrated open source software stack including a comprehensive set of system, runtime and high level services providing standardized interfaces for **cooperation and resource sharing in Cloud federations**



Contrail Vision

- *Federation of resources provided by public and private clouds*
 - Resources offered by different operators will be integrated into *a single homogeneous Federated Cloud* that users can access seamlessly
 - *Any organization* should be able to be *both a Cloud provider* when its IT infrastructure is not used at its maximal capacity, *and a Cloud customer* in periods of peak activity



Contrail Challenges

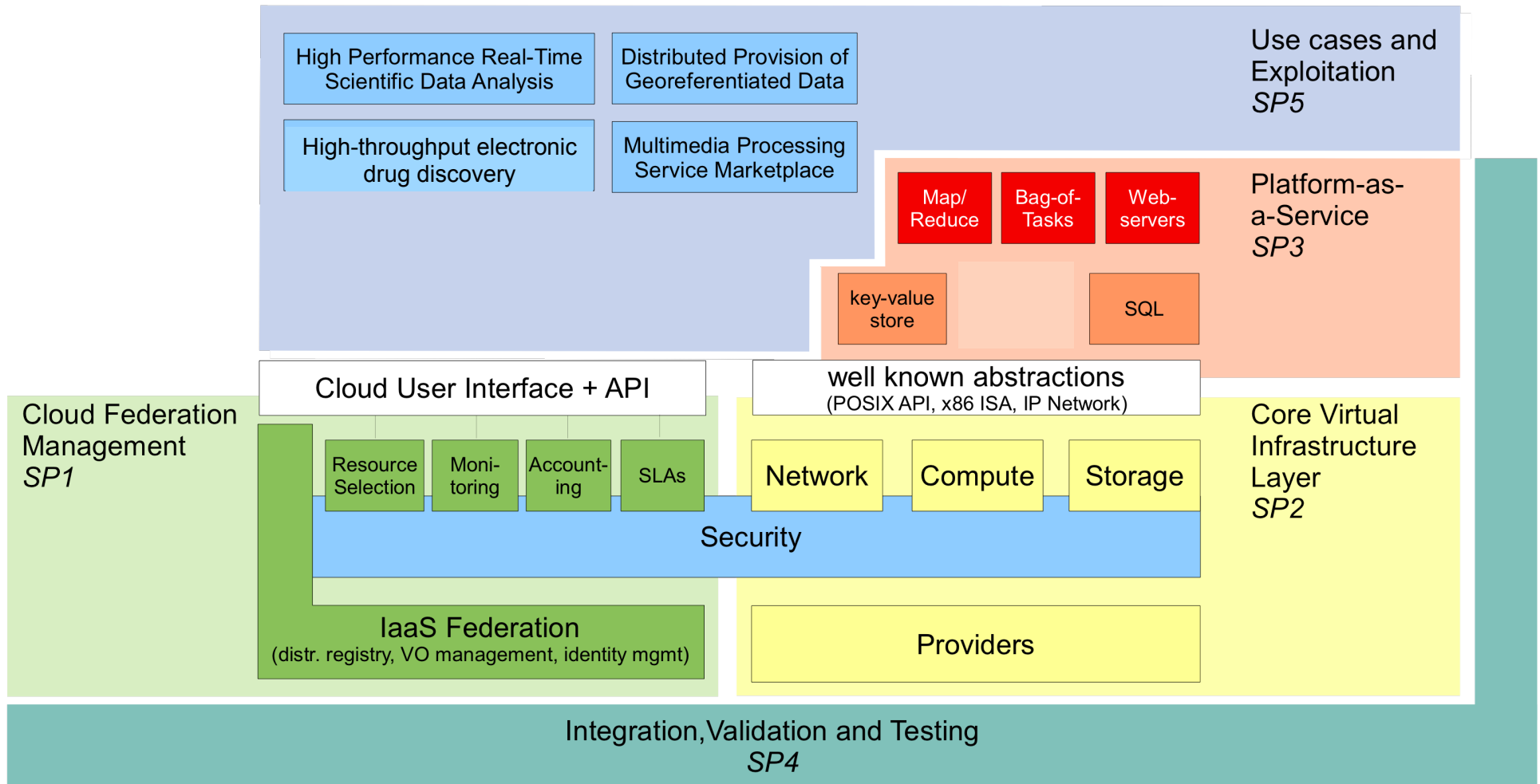
- Vertical integration of IaaS and PaaS in an comprehensive open source cloud computing software
- SLA enforcement through QoS & QoP management in all layers
- Sub-rent resources and federate clouds
- Avoidance of cloud user lock-in providing a live migration service for cloud federations

Contrail Approach

- Leverage and extend the results from the *XtreemOS FP6 IP* project
- Cooperate with other open source cloud computing projects
 - Standardize cloud API
 - Re-use existing software relevant for Contrail
 - Make sky computing real
 - Build a strong European community promoting open source cloud computing software



Contrail in a Nutshell



Contrail Consortium

The image features a map of Europe with several logos and stars indicating the locations of consortium members. A green callout box on the right contains project details. The logos include:

- Constellation Technologies The SuperCloud
- Science & Technology Facilities Council
- GENIAS Benelux bv
- ZIB
- hp
- INRIA
- XLAB RESEARCH
- tiscali.
- ISI ISTITUTO DI SCIENZA E TECNOLOGIE DELL'INFORMAZIONE "A. FAEDO"

Project Details:

- Starting date: October 2010
- Duration: 3 years
- Budget: 11,4 M€
- EC funding: 8,3 M€

Concluding Remarks

- XtreamOS: a sustainable technology
 - Free software in open source development
 - XtreamOS open testbed available for the community
 - Support provided
- Contrail project just starting
 - Leveraging XtreamOS results
 - Open source software for cloud federations
- External contributions welcome

More information

XtreemOS



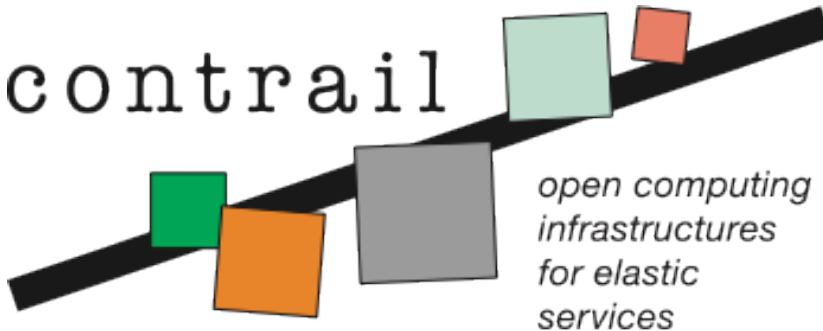
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IST-FP6-033576

<http://www.xtreemos.eu>

contrail



ICT-FP7-257438

<http://www.contrail-project.eu>