Needs and Plans Concerning Kerrighed in the XtreemOS Project

Christine MORIN

IRISA/INRIA

PARIS project-team

XtreemOS Scientific Coordinator

XtreemOS-contact@irisa.fr

XtreemOS Objectives

❑ **Design & implement** a **reference open source Grid operating system** based on **Linux**

    – Native support for virtual organizations

❑ **Validate** the XtreemOS Grid OS with a set of **real use cases** on a **large Grid testbed**

❑ **Promote** XtreemOS software in the **Linux community** and **create communities of users and developers**

XtreemOS Architecture

Business Applications

Scientific Applications

XtreemOS API

VO & Security

Data Management

Application Management

Infrastructure for Highly Available and Scalable Services

Linux-XOS: Grid-enabled Linux Operating System

Linux-XOS for PC

Linux-XOS for Cluster

Linux-XOS for Mobile Devices
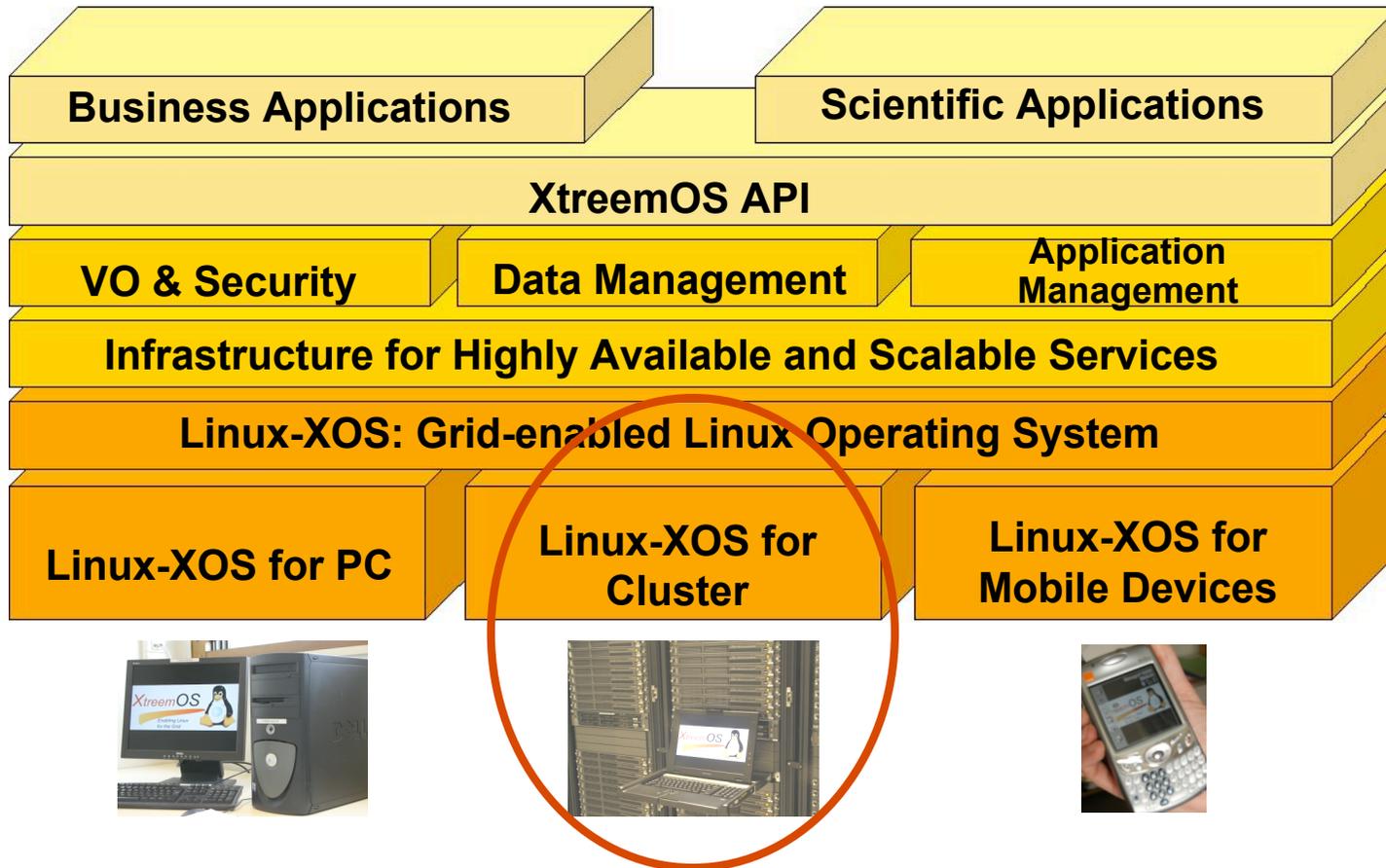
LinuxSSI leveraging Kerrighed

LinuxSSI in XtreemOS

❑ **LinuxSSI is one component of XtreemOS Grid OS**

– XtreemOS foundation for clusters

• **LinuxSSI aggregates** cluster resources into powerful grid nodes by **integrating single system image mechanisms in Linux**

– Used to run cluster-oriented and Grid-oriented applications

❑ **Kerrighed is used to experiment use cases during the first half of the project (XtreemOS software being under implementation)**

Needs for LinuxSSI

❑ **Support of up-to-date hardware**

- – SMP nodes
- – 64 bit processors
- – Large clusters

❑ **Based on the latest version of Linux**

- – Key for acceptance of the system
- – Necessary to push kernel patches

❑ **High stability**

- – To allow experiments with XtreemOS use cases
- – To start the development of new features on a sound basis

❑ **Java Virtual Machine support**

- – Required by some XtreemOS use cases

❑ **Test of LinuxSSI on virtual machines**

- – Highly convenient for testing & debugging
  - • VMware, QEMU

Short Term Plans

❑ **Contribute to improve Kerrighed technology**

1. Testing & debugging
    - Development of testing modules and applications
    - Running LTP suite on Kerrighed
2. Port to the most recent version of Linux
3. Work on supporting SMP nodes
4. Port to 64 bit processor

❑ **Timeline**

  – Testing & debugging in progress
  – As soon as possible for other items 2 and 3

Work Plan

❑ **Scalability**

– Identify and remove limitations to the scalability of Kerrighed

• Scalability benchmarks

❑ **Reconfiguration**

– Leverage HotPlug to tolerate node addition, shutdown, reboot and failure

❑ **Distributed parallel file system exploiting cluster nodes (LinuxSSI-FS)**

– Leverage KerFS

– LinuxSSI-FS used as root file system

– High performance as a primary target

• Striping policies (transparent, customizable)

• I/O scheduling

– Fault tolerance and reconfiguration

Work Plan

❑ **Checkpointing parallel tasks running on LinuxSSI**
  – Shared memory and message-passing communication paradigms
  – Interaction with the Grid level checkpointer
  – Open issue: exploiting BLRC checkpoints in Kerrighed (when an application is migrated from a XtreemOS PC to a XtreemOS cluster)

❑ **Customizable scheduler**
  – Hot-plug interface for dynamic loading of probes and analyzers
  – Basic probes, analyzers and load balancing strategy based on the monitored information
  – Event triggering mechanisms to support publish/subscribe mechanisms
  – Basic long-term scheduler for LinuxSSI interfaced with a standard Grid API (DRMAA/SAGA)

Work Plan

❑ **Packaging LinuxSSI for multiple Linux distributions**

- Mandriva Linux
- Red Flag Linux
- Debian

❑ **Integration in OSCAR**

❑ **Timeline**

– First version of Kerrighed packages by end of February

- A first version of RPM, Debian and OSCAR packages already available
  - NEC and INRIA work

– Improvement of RPM packages from now on

Feed-back from XtreemOS Participants

❑ **Installation process**
  - Difficult on real machines
  - Need to be better documented

❑ **Need to experiment Kerrighed on virtual machines**

❑ **Most of XtreemOS cluster-oriented use cases could not be run successfully on Kerrighed (before Nov. 2006)**
  - Stability needs to be increased
  - Missing functionalities
    - JVM support

  • NB: A technical report about LinuxSSI specification to be made available soon on XtreemOS website
    - http://www.xtreemos.eu

Partners Deeply Involved in LinuxSSI Development and Testing

❑ **Partners involved in LinuxSSI development**

  – NEC, INRIA, XLAB, University of Düsseldorf (design & implementation)

  – SAP, ICT (design)

❑ **Partners involved in XtreemOS packaging**

  – Mandriva, RedFlag, INRIA, EDF, NEC

❑ **Partners involved in cluster oriented use cases experiments on Kerrighed**

  – BSC, EDF, EADS, SAP, XLAB, University of Düsseldorf

XtreemOS Partners
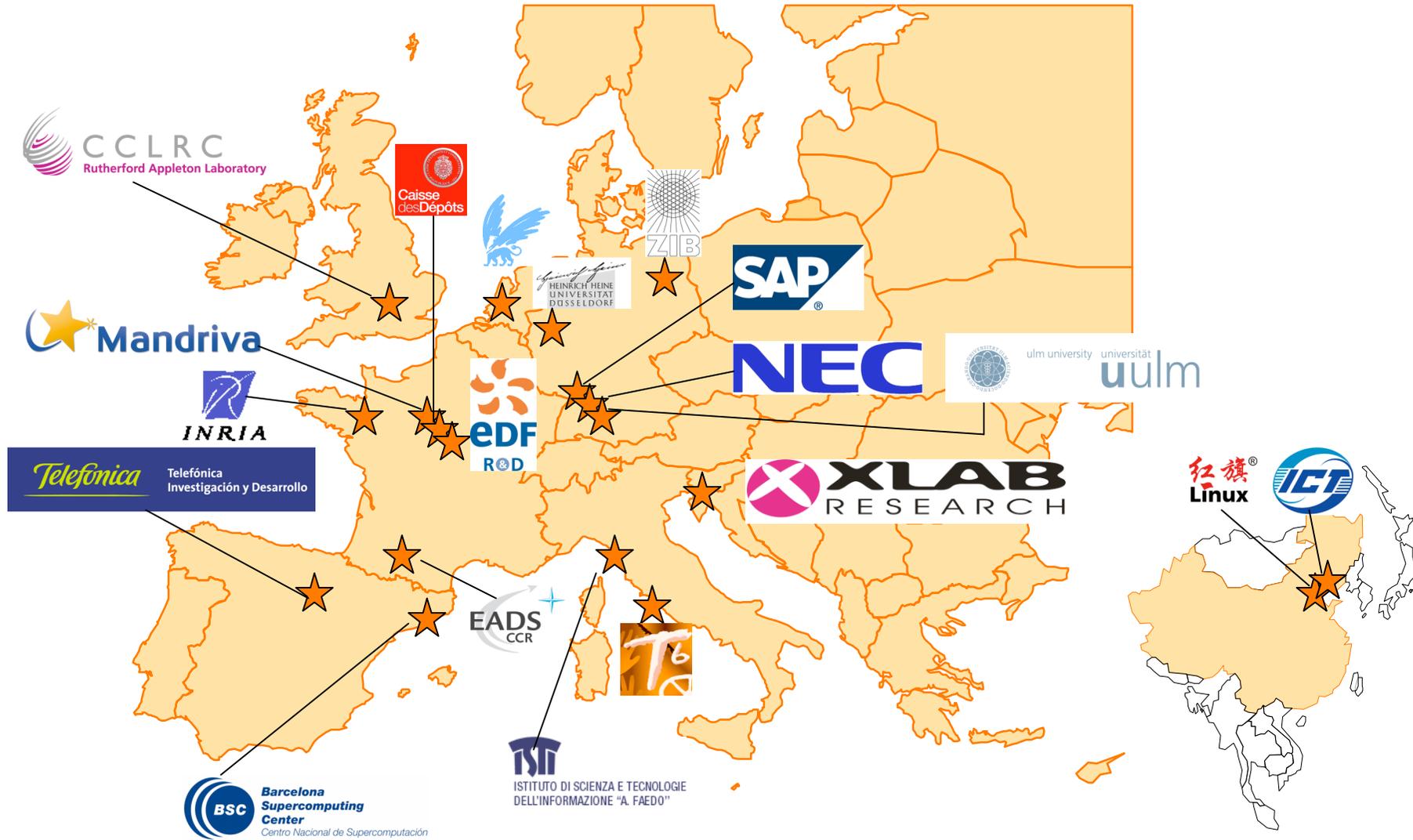
Fact Sheet

❑ **Start date**
– **June 1st, 2006**

❑ **Duration**
– **4 years**

❑ **Budget**
– **Approx. 30 Meuros**
– **EC funding 14.2 Meuros**

❑ **Website**
– **http://www.xtreemos.eu**

❑ **Administrative and financial coordinator**
– **CDC, Jean-Noël Forget**

❑ **Scientific and technical staff**
– **100 persons (part or full time)**