

XtreemOS Grid Checkpointing Architecture

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Job Manager

0

job unit B1

grid node

Job Manager

Job Unit CP

Kernel CP

job unit A2

Restart and Resource Management

Job Manager

job unit B2

grid node

No Resource Isolation:

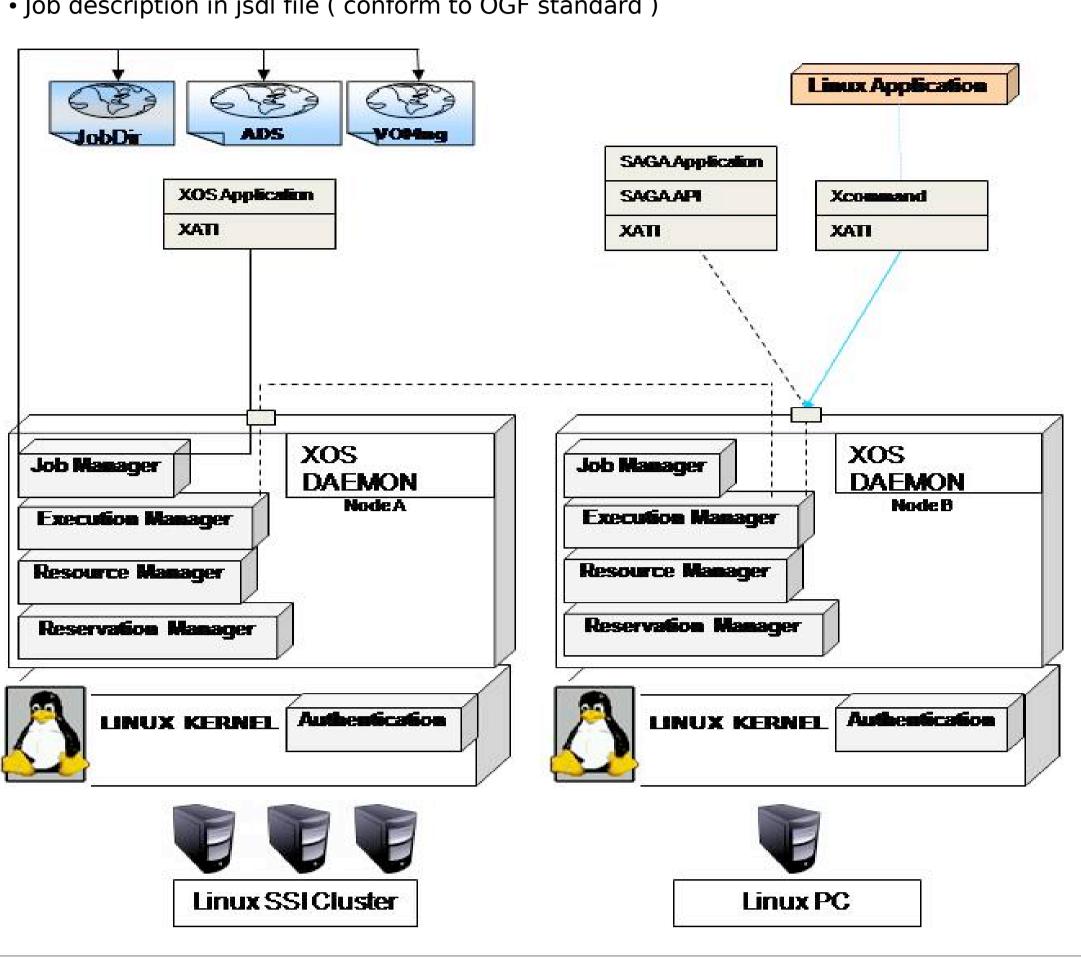
jobA running ... process_99200

checkpoint jobA process_99200

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Application Execution Management (AEM)

- Distributed job management and resource management
- One XtreemOS daemon on each grid node (single PC, SSI cluster, mobile device)
- One job consists of one or more job units spread over grid nodes
- Job description in jsdl file (conform to OGF standard)

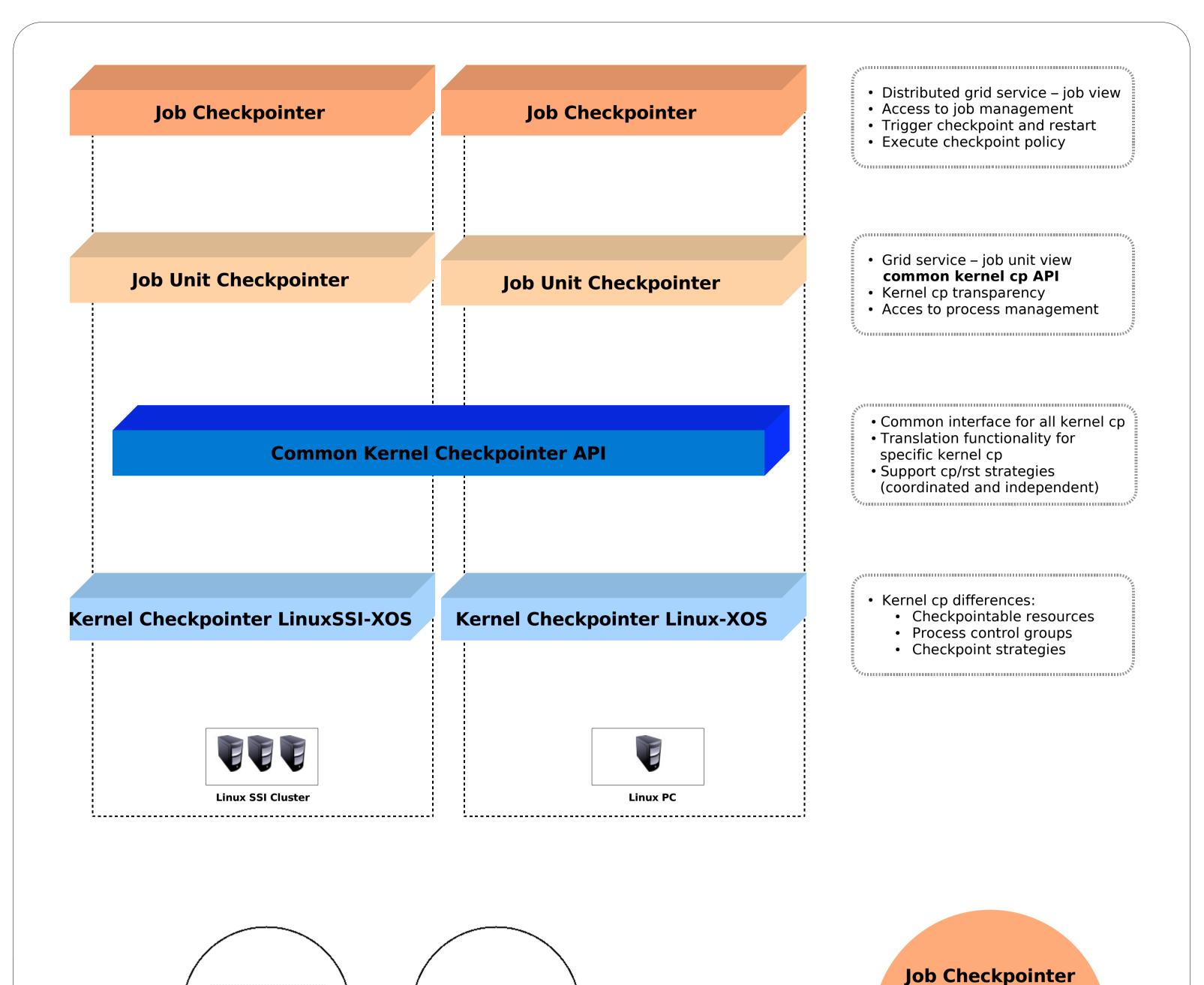


Grid Checkpointing Goals

- Reliable job execution
- Load balancing (based on migration)

Grid Checkpointing Features

- Checkpoint and restart a grid job consisting out of more than one job unit
- Identify a kernel checkpointer that can checkpoint/restart relevant resources
- Isolation of multiple job units per grid node using Linux containers
- Secure restart from checkpoint images
- Adaptive grid checkpointing



Checkpoint/Restart Job A

Checkpoint/Restart Job Unit Al

Kernel Checkpointer

Kerrighed (LinuxSSI) BLCR (Linux PC)

checkpoint and restart job

consisting of one or multiple

job units spread over one or multiple grid

nodes

Job Unit Checkpointer

AEM world interfaces

underlying Linux world

Resource isolation needed

 Multiple jobs may share a grid node Resource conflicts are likely to occur,

especially at restart

Job Manager

Job Checkpointer

grid node

Job Manager

Job Unit CP

Kernel CP

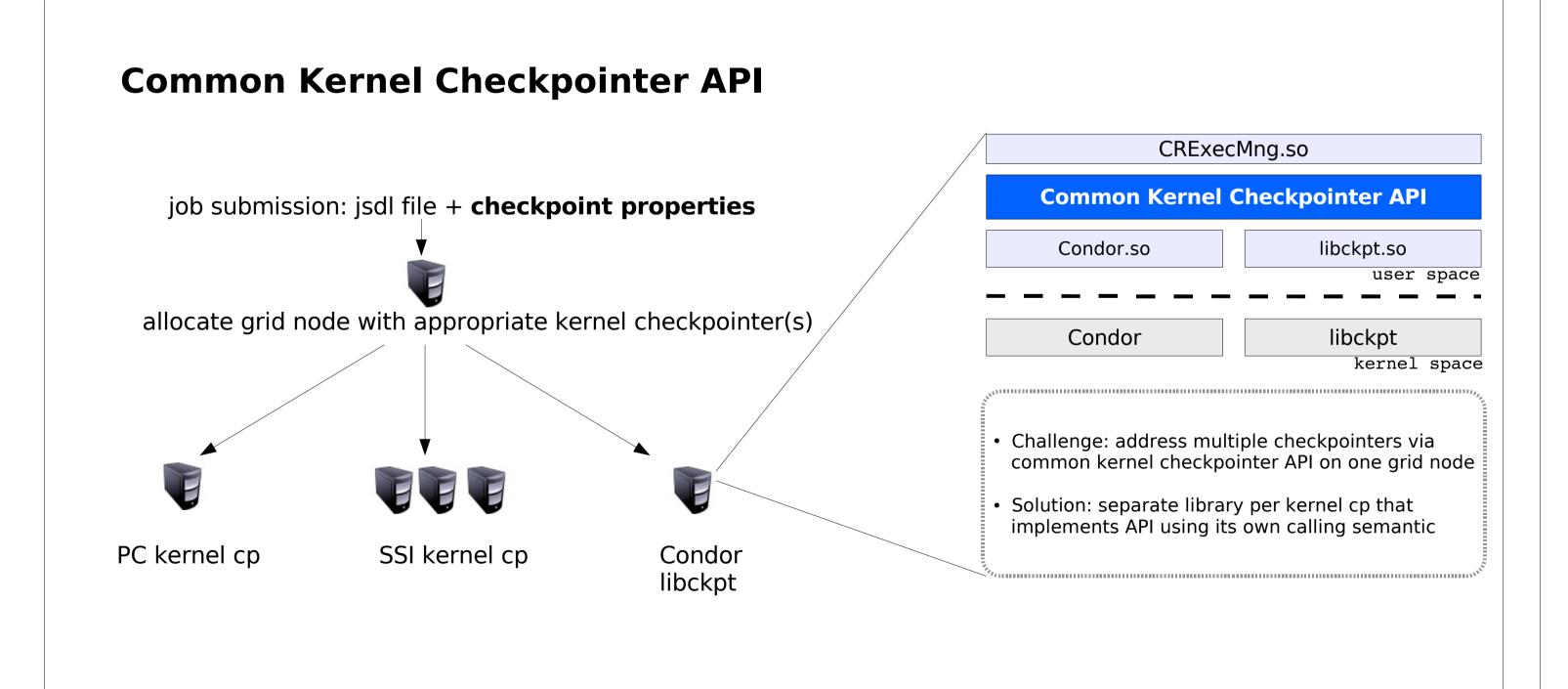
grid node

Checkpoint/Restart Job Unit A2

jobB running ... process_99200

jobB running ...

process_99200



Checkpoint File Management

- 1) The checkpoints are used by the AEM
- For fault tolerance For scheduling optimization (migration, suspend)

For the working of the system: node shutdown (migration)

- → The user should not pay for resources used by the system
- The disk space needed for the checkpoint must be managed by the AEM By default checkpoints files are deleted when the job is finished
- 2) The user has special needs

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- He wants to keep several checkpoints of a job He does not want the checkpoints to be deleted at the end of the job
- → The user has to provide the disk space The user describes this disk space at job submission

XtreemOS Checkpointing Partners:





