Application Execution Management (AEM)

- Distributed job management and resource management
- One Xtremos 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 job 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 checkpoint 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

Common Kernel Checkpointer API

- job submission: job file + checkpoint properties
- allocate grid node with appropriate kernel checkpointer(s)

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 are deleted when the job is finished
2. The user has special needs
   - He needs 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

Restart and Resource Management

- Resource isolation needed:
  - Multiple jobs share a grid node:
  - Resource isolation is being broken especially at restart

Resource Isolation:

- Isolation by resource virtualisation
  - Effective resource
  - Effective job
  - Non-deterministic container mechanism
  - Control group tool to manage resource isolation

XtremOS Grid Checkpointing Architecture

- Distributed grid service - job view
- Access to job management
- Trigger checkpoint and restart
- Execute checkpoint policy

- Grid service - job unit view
- Resource kernel-based API
- Kernel API functionality
- Access to IO management

- Common interface for all kernel cp
- Maximum functionality:
  - Support multiple strategies (distributed and independent)
  - Support different protocols
  - Support checkpoint strategy

XtremOS is a member of OGF

www.xtremos.eu

#PP6-633576 project