CRIU - Checkpoint Restore in Userspace

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COPYING LINE OF CODE IN: XL
COPYING LINE OF CODE IN: VIM

Ooohh yeah! Can do!

How dare you!?
What's the best code editor?

VSCode  Sublime  VIM!!
Checkpoint

- While executing scientific applications, they must sometimes stop the process due to hardware problems or even job end-of-life.

- The checkpoint can be provided by the application or by an external tool.

- It is not an easy task to checkpoint software using an external tool.
CRIU

• While executing scientific applications, they must sometimes stop the process due to hardware problems or even job end-of-life.

• CRIU (Checkpoint Restore in Userspace, pronounced kree-oo) is a tool for checkpointing and restoring applications in GNU/Linux environment.

• https://criu.org
CRIU, OSG, and more

• The object is to check the features of CRIU:
  • Check the basic features.
  • How will CRIU behave on a batch system?
  • Check the networks and containers support.
Tests

• Simple C code: writing on the terminal. Using the same operational system and hardware
  • The test was successful, only requiring a few options on restore and dump.

• LAMMPS: read and write files. Using the same operational system and hardware
  • If CRIU detects any file or directory change location, the restoration fails. To restore, it is required to set the paths from before the CRIU dump.
Tests

• Simple C code: dump from Intel hardware to AMD hardware.

• Simple C code – dump from AMD hardware to Intel hardware.
  • If any processor code optimization is used, it will fail, and all the system libraries should be the same.

• Open files and dump the software
  • The file structure should be the same on dump and restore
Tests

• TCP and UDP Network connections:
  • One host: client and server stay on the same host.
  • Two hosts – need to stay on the same host.
Tests

• Nvidia GPUs are not supported at all.

• Singularity, Podman, and docker – Test to dump and restore inside the container

• Singularity – Test to dump and restore outside the container

• Podman – Test to dump and restore outside the container
  • Using podman/CRIU integration interface is possible to dump and check containers using the podman command.
Tests

• Dumping and restoring a POD using CVMFS

• Dumping and restoring a process with FORK

• Dumping and restoring a process with MPI
Conclusions

• CRIU can provide several options to stop and restore applications.

• It is possible to control applications with multiple threads and processes maintaining network connections.

• CRIU supports containers using docker and podman.
Conclusions

• It requires a “form” of root access: sudo, SUID Bit, or Kernel capabilities.

• To use Kernel capabilities requires a specific version of CRIU and Linux.

• Restoring a previously checkpointed process requires the same directory paths used during restoration as during checkpointing.

https://path-cc.io/GIL/criu_checkpoint_restore_userspace/
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