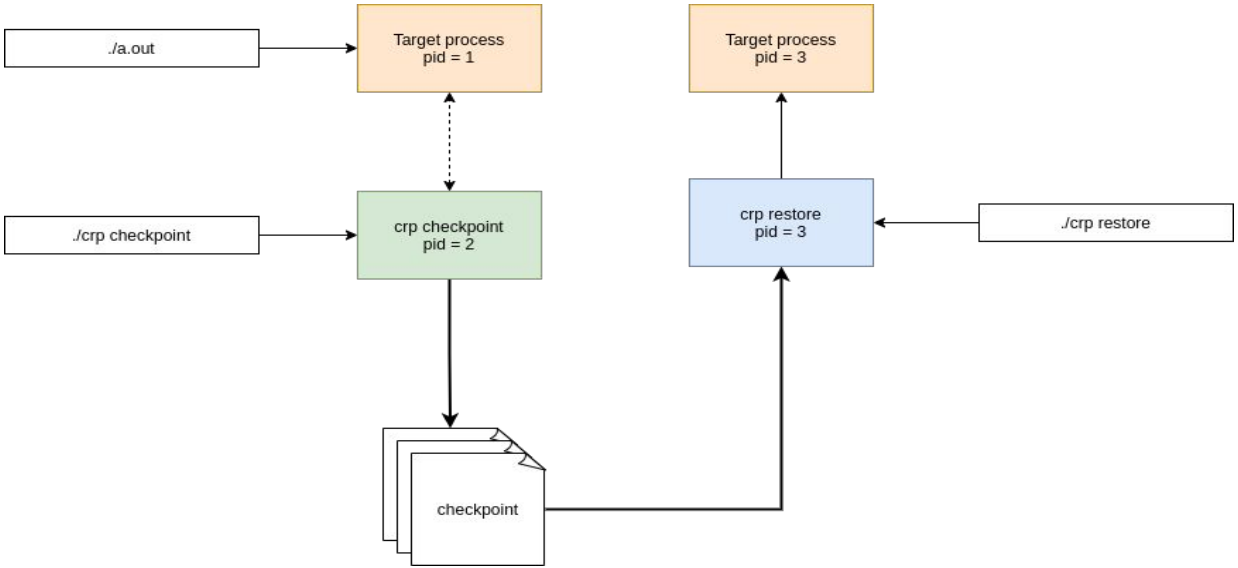
Checkpoint and Restore of a single process

Project Group and Contributions

- Dev Chauhan (180205)
  - Ideation
  - CPU state restore, mm restore (e.g. kallsyms for dup_mm)
  - user facing library and base driver
  - reports and presentations, testing other methods for restore
- Paras Mittal (180501)
  - Ideation
  - VMA restore (along with red-black tree)
  - Process kernel state inspection(virtual memory)
  - reports and presentations, testing other methods for restore
- Somu Prajapati (180772)
  - Reading about POSIX kernel structures important for checkpoint/restore similar to Aurora

Approach

- Restore: Transform existing process instead of creating a new one



Transforming restore process

- CPU State -
  - General purpose registers and segment registers are overwritten.
- Memory State -
  - mm_struct overwritten using dup_mm on checkpointed process' mm_struct (Assuming it is present in memory)
  - Overwrite memory pages using copy_to_user
  - For read only pages, write flag is added in vm_flags before making a call to copy_to_user then reverted back.
- Other states -
  - Similar to Memory state, these objects (for example, File descriptors) are also part of linked list, and has locks
  - Point of the project was to successfully store such complicated structures into persistent storage such that it can be restored successfully
  - Inspecting and storing structures correctly was taking too much time
  - Fast forwarded it by using dup_mm for mm_struct so that we can think about other structures and fast checkpointing

Demo

Thank You