Improving the Linux/DRM GPU scheduler

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About me

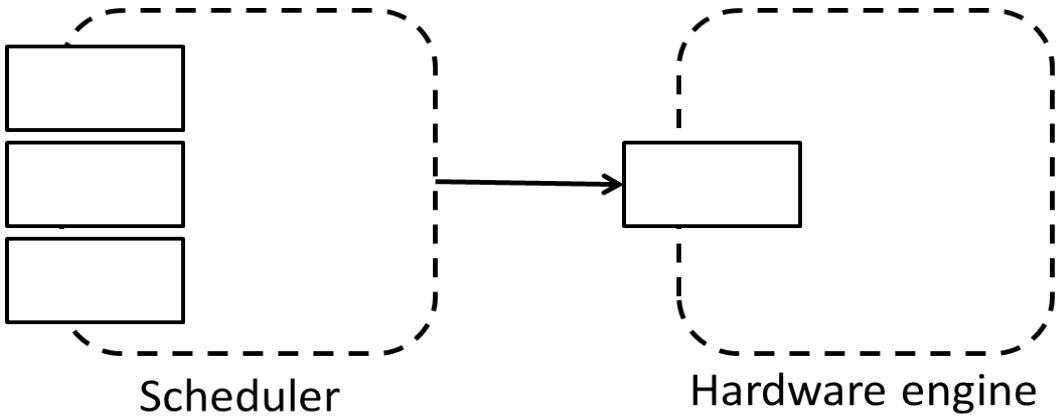
- Did GSoC this year
- Graduated from IIT Kanpur with a bachelors in computer science
- Recently joined Samsung
- GSoC project with dri-devel
- I have worked with Mesa community

DRM scheduler

- The amdgpu’s (AMD’s graphics driver) scheduler was shifted to a shared space (now called DRM GPU scheduler) so that the other drivers can reuse the code
- The DRM scheduler is now used by amdgpu, etnaviv (graphics driver for Vivante GPUs), and recently the Broadcom V3D driver.

DRM scheduler

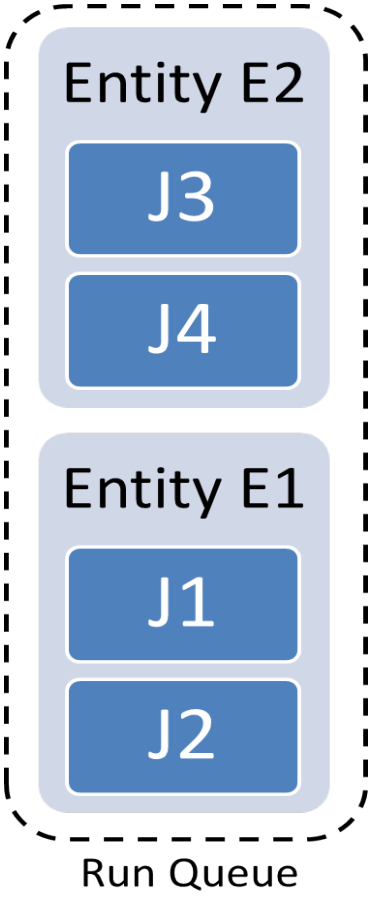
- Job is the basic unit which is executed by the hardware engine



- Scheduler can handle dependencies among jobs
- We can also specify priority among the jobs

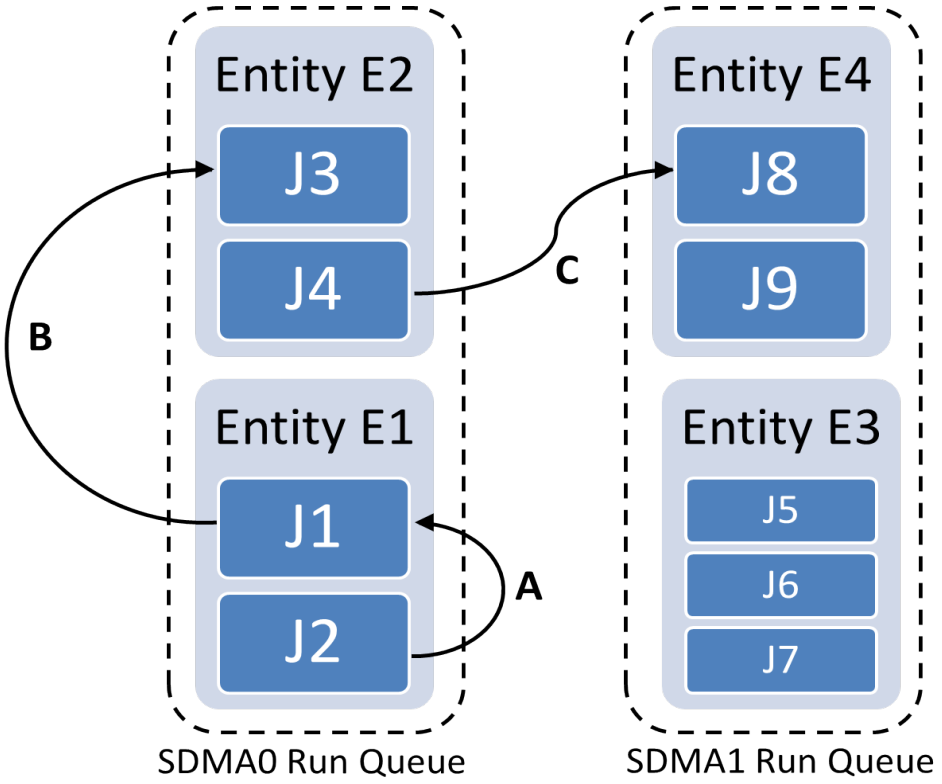
DRM scheduler

- Entity is a dynamic list of jobs
- The jobs in a entity are always scheduled in the order that they were pushed
- Entities are pushed to the run queues



DRM scheduler

- Job depend on other jobs
- We can do dependency optimization



DRM scheduler

- Each hardware engine has its own scheduler instance
- When an entity is created it is attached to a scheduler and will remain attached to it for the rest of its lifetime
- The jobs from an entity can be scheduled only on one hardware engine
- What if we have multiple copies of the same hardware engine? Can we do load balancing?

My Project

- Implemented shifting of entity from one scheduler to other
- Driver specifies the possible hardware engines during entity init
- We shift the entity when a new job is pushed to it
- Need to identify the cases where shifting is correct and beneficial

My Project

- Three phases
- First phase
  - Understanding the code
  - Added documentation, cleaned up the API
- Second phase
  - Discussed various ideas
  - Decided to go for a small but simple implementation
  - Started writing the code

My Project

- Third phase
  - Completed the code
  - Spent a good amount of time in debugging
  - Upstream the code
- After GSoC
  - Minor improvements to the code
- You can get more details of my project here: https://ndesh26.github.io/categories/#gsoc

Future work

- Have a better criteria for calculating load
- There are more cases where we can shift entities
- We only shift an entity when we push a job to it
- Analyse the performance benefits on real life workloads

Questions?

Thank you