Contribution ID: **125** Type: **not specified**

How to introduce KUnit to physical device drivers?

Monday, September 12, 2022 5:40 PM (20 minutes)

Unit testing is a great way to ensure code reliability, leading to organic improvements, as it's often possible to integrate it with developers' workflows. It is also of great help when refactoring, which should be a primordial task in large code bases. When it comes to the Linux kernel, the KUnit framework looks very promising, as it works natively from inside the kernel, and provides an infrastructure for running tests easily.

We are seeing a growing interest in unit testing on the DRM subsystem, with amazing initiatives to add KUnit tests to the DRM API. Moreover, three GSoC projects under the X.Org Foundation umbrella target unit tests for AMDGPU display drivers, as it is currently the largest one in the kernel. It is, thus, of great importance to discuss problems and possible solutions regarding the implementation of KUnit tests, especially for hardware drivers.

Bearing this in mind, and as part of our GSoC projects [1], we introduce unit testing to the AMDGPU driver departing from the Display Mode Library (DML), which is a library focused on mathematical calculations for DCN (Display Core Next); we also explore the addition of new tests to DCE (Display Controller Engine). Since AMD's CI already relies on IGT GPU Tools (a test suite for DRM drivers) we also propose an integration between it and KUnit which allows for DRM KUnit tests to be run through IGT as well.

In this talk, we present the tests' development process and the current state of KUnit in GPU drivers. We discuss the obstacles we faced during the project, such as generating coverage reports, mocking a physical device, and especially in regards to the implementation of tests for the AMDGPU driver stack, with the additional difficulties associated with making them IGT compatible. Finally, we want to discuss with the community lessons learned using KUnit in GPU drivers and how to reuse these strategies for other GPU drivers and also drivers in other subsystems.

[1] https://summerofcode.withgoogle.com/programs/2022/organizations/xorg-foundation

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Session Classification: Kernel Testing & Dependability MC

Track Classification: LPC Microconference: Kernel Testing & Dependability MC