

This thesis is focused on the SLUB memory allocator and its debugging functionalities. The SLUB allocator implementation included several tests, but nobody was running them. It was because no automated kernel testing infrastructure existed for them. This project added one of the kernel testing frameworks, the KUnit testing, for SLUB. Existing tests were integrated into this framework with some minor changes. Also, new regression tests were added based on a systematic review of commits associated with SLUB. Another part of the thesis extends the SLUB debug options for tracking allocation events, including more efficient stack trace storage. The last part improves the virtual file system debugfs that provide information about kernel components to userspace by including stack traces in SLUB's virtual files. Also, this project helps to track the efficiency of the SLUB cache usage in terms of object size. All of these changes to the Linux kernel should help with SLUB debugging. Some of the changes were also submitted and even accepted by the community, they were added into Linux version 5.14.