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Theoretical Approach and Proof of Concept Implementation of Adaptive Partition Scheduling Module for Linux

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Abstract : Linux operating system continues to gain popularity with every passed year. This is due to its open-source license and a great number of distributions, covering users' needs. At first glance it seems that Linux can be integrated in every type of systems – it is already present in personal computers, smartphones and even in some embedded systems like Raspberry Pi. However, Linux still does not meet the performance and security requirements to run effectively on a real-time system. Real-time systems are very time-restricted – their processes have to execute and finish at strict time intervals. The Completely Fair Scheduler present in Linux does not have such scheduling capabilities and it is not able to ensure that critical-time processes will execute on time. One of the ways to solve this problem is implementing an Adaptive Partition Scheduler solution similar to that present in QNX Neutrino operating system. This type of scheduling divides the CPU in multiple adaptive partitions where each partition holds a percentage of CPU usage called budget, which allows optimal usage of the CPU resources and also provides protection against cyber attacks such as Denial of Service. This approach will also benefit systems, where functional safety is highly demanded, such as the instrumental clusters in the Automotive industry. The purpose of this paper is to present a concept of Adaptive Partition Scheduler designed for Linux-based operating systems.

Keywords : adaptive partitions, Linux kernel modules, real-time systems, scheduling
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