Programming a Mixed Criticality scheduler for FreeRTOS

Introduction:

Embedded systems are in high numbers around us today. They range from smart watches to flight control systems. In safety-critical domains such as avionics and automotive systems, embedded software has to pass a strict certification process. This is usually regulated according to different criticality levels which are specified for the particular domains. A mixed-criticality system is an integration of hardware and application software, operating system and middleware services to support the performance of safety-critical, mission-critical, and non-critical software within a single, secure computing platform.

Content:

Mixed-criticality system is a set of low-criticality (LO) and high-criticality (HI) tasks share one processor and are scheduled under EDF-VD algorithm. To this end, an MC task set is partitioned into disjoint subsets, each of which is assigned a portion of the total processor utilization. EDF-VD is then applied to each such subset or partition independently. Clearly, partitions need to follow some functional criteria. The objective of this work is to develop a scheduling technique in the real-time operating system (RTOS) for mixed-criticality workloads. The main focus of this work is on programming a Mixed Criticality scheduler on a real time Operation System by using FreeRTOS. As a result, in particular, there is a need for methods and techniques that allow designing such mixed-criticality (MC) systems and, at the same time, complying with safety and certification requirements.

Requirements:

- Knowledge in MATLAB and C for programming
- Self-reliance

Contact:

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