In this paper, a hard real-time execution environment extension is proposed for an open source real-time operating system, FreeRTOS, in order to support a special case of hard real-time tasks, called ModXs. The goal is to obtain a real-time system which has both the capabilities offered by a dynamic, preemptive, priority-based scheduling and execution environment and the determinism and predictability of a hard real time execution environment. This paper also presents an implementation of the system which was tested and validated on a hardware platform EFM32-G8900-STK.