

1) *Where does Julia Cartwright work?*

She is working at National Instruments

2) *What is PREEMPT_RT?*

Linux itself is not real time capable. With the additional PREEMPT_RT patch it gains real-time capabilities. When embedded projects call for a real-time operating system, Linux users often turn to PREEMPT_RT, the real-time kernel patch, to get it done.

3) *What is mixed criticality?*

Most complexed embedded systems might run two different types of tasks. You need to run some tasks in real-time. Requirements and bounded latency requirements. Then you also might run some non time critical stuff, doing basic monitoring, disk or I/O. Those two need to run together, maybe need to communicate with another. Then there is mixed criticality in the sense that there are two different degrees of time sensitiveness.

4) *How can drivers misbehave?*

If your drivers are involved as part of interrupt dispatches or you are actually involved in the process of delivering an interrupt, than you can't be threaded.

5) *What is Δ in Figure 1?*

Delta is latency for real-time guarantee. You have a thread that has been told to the scheduler, execute this real-time thread and from now on their counting the time spent from that before point to the thread actually being Scheduled in as the scheduling latency.

6) *What is Cyclicttest?*

Cyclicttest accurately and repeatedly measures the difference between a thread's intended wake-up time and the time at which it actually wakes up in order to provide statistics about the system's latencies. It can measure latencies in real-time systems caused by the hardware, the firmware, and the operating system. It takes a timestamp and it sleeps for a fixed duration (like 10 milliseconds). Then it takes a timestamp, when that threat wakes up. If you take the difference between these two timestamps this is the amount of time that the thread actually slept. When you subtract that out, that difference is Delta.

7) *What is plotted in Figure 2?*

You can see the distribution has a long tail. This is not a real-time operating system. That has a 342 microseconds spike. This is the config PREEMPT setting in a mainline kernel. The green is on the same HW-System. This is a preempt tarty patch. You can see that it has in that some duration. This has a max bound of 16 microseconds much better behaved for real-time use cases.

8) What is dispatch latency? Scheduling latency?

Dispatch: This is the amount time, it takes between the HW and the actually firing to the interrupt. That latency is a part of the Delta. *"The term dispatch latency describes the amount of time a system takes to respond to a request for a process to begin operation. With a scheduler that is written specifically to honor application priorities, real-time applications can be developed with a bounded dispatch latency."*

Scheduling latency: The scheduler has been made aware that this high priority task need to be run. The time it takes from that moment to the CPU, being given that task, to actually execute it is scheduled.

9) What is mainline?

The mainline shows long running interrupts. Interrupt handlers are executed in hard IRQ context they are implicitly executed with interrupts disabled.

10) What is keeping the External event in Figure 3 from starting?

The non critical IRQ, which is executed. The external event can start, when the critical IRQ is finish, but not sooner.

11) Why can the External event in Figure 4 start sooner?

A little code is executed in heart interrupt context. The non critical IRQ is interrupted and external event can begin. After the external event is finished, critical IRQ can continue working.