

Programming embedded systems

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A program that execute. The process is controlled and scheduled by the operating system.

Def. Operating System (OS)

Software that control program execution and access to common rescurces (E.g. Memory and IO). Schedule which process that shall execute.

Def. “Multi tasking”

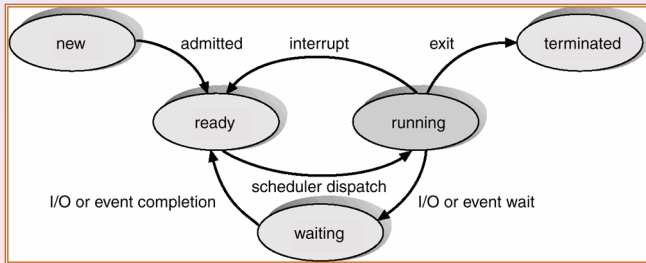
The ability to perform two ore more tasks, virtually, at the same time by time-sharing.

Def. “Task” /Process/Thread

A “task” is similar to a process. The “Task” has its own copy of register and stack (like a process), but shares memory with other tasks (a process has private memory). “Threads” and “tasks” has same properties.

Task states

- Running - currently executing on processor/processes
- Ready - ready to run at available CPU
- Blocked - due to (shared resources, time, synchronization).



” Context Switch”

When the currently running (“Running”) process is exchanged by a different task (either “Ready” or “Blocked”) its called a “Context Switch”. The decision on which process shall have priority is governed by the “scheduler”.

"Context Switch" (forts.)

"Save context" from a running task by:

- turn off interrupt
- processors state (register, stack pointer) saved (in the associated TCB)
- interrupts turned on

"Context Switch" (forts.)

- "Running" possibly exchanged to a different task.
- load context from the new task by: turn off interrupts, restore register from the TCB and turn on interrupts.

- Communication between tasks called *inter process communication (IPC)*.
- Pass results or other information between tasks.
- Used for "task synchronization". I.e. control the execution order by aligning computations in tasks.
- messages can be synchronous or asynchronous.

Scheduling and priorities, EDF

- Scheduler decided which task that will run on the processor on next "time slice".
- Priorities are common in OS.
- "Earliest deadline first" (EDF) best choice when scheduling on time.

Def. Realtime-system

A *Real-time system* is an (embedded) computer system with special requirement on “Timing”. Thus, the computer system shall perform its task within the predefined point in time, the so called “deadline”.

Some example of OS for embedded systems

- ENEA OSE
- Free RTOS
- uOS