

REAL TIME OPERATING SYSTEMS

Lesson-10:

Real Time Operating System

1. Real Time Operating System

Real time operating system (RTOS)

- Required when the system requires several jobs to be done at the same time and in real time space
- Used when a complex application consists of multiple tasks and tasks are programmed to execute in real time

Definitions of Real time and ROTS

- Real time is time which is continuously incrementing from the system's start and the different actions takes place in a system at different instances of this time
- A real time operating system (RTOS) is an operating system (OS) that has system-software required to synchronise and schedule the tasks in a multitasking system environment in real time and takes care of the real-time constraints in the system

RTOS Definition

- A real time operating system (RTOS) is multitasking operation system for the applications with hard or soft real time constraints.
- RTOS is an OS for system having the constraint on latencies permitted for interrupt service threads, ISRs and tasks

Hard and soft real time operability

- Hard real-time and soft real-time operations

1. Real Time Operating System Services

Basic OS Functions

- Process Management,
- Resources Management,
- Device Management,
- I/O Devices subsystems
- Network Devices and subsystems management

Process Priorities Allocation

- User level priorities allocation, called static priority allocation or real-time priority allocation
- Real time priorities higher than the dynamically allocated priorities to the OS functions.

Process Predictability

- A predictable timing behavior of the system
- A predictable task-synchronization
- Minimum jitter (difference between best case latency and worst case latency)

Process Management by Preemption

- RTOS kernel preempts a lower priority process when a message or event for that was waiting is obtained for the higher priority process.

Memory Management and Protection

- RTOS threads can run in kernel space.
- The real time performance becomes high

Memory Management: Disabling MMU

- Either disabling use of MMU and virtual memory or using memory locks.
- Memory locking stops page swapping between physical memory and disk disabled
- RTOS task latencies predictable

Memory Allocation

- In RTOS, the memory allocation is fast and there are , fixed length memory block allocation and system takes predictable time for allocation

Scheduling and Interrupt-latency control functions

- Real time Task-Scheduling and Interrupt-latency control and uses of the timers and system clocks

Timer Functions and Time Management

- Provides for timer functions
- Time allocation and de-allocation to tasks

Asynchronous IO Functions

- Permits asynchronous IOs, which means IOs without blocking a task

IPC Synchronization

- Synchronization of tasks with IPCs
(Semaphores, mailboxes, message queues, pipes, sockets and RPCs)

Time Slicing

- Time-slicing of the processes execution of those processes which have equal priority

Summary

Real time

- Means the time, which is continuously incrementing from the system's start and different actions takes place in the system at different instances of this time
- A real time operating system (RTOS) is an operating system (OS) that has system-software required to synchronise and schedule the tasks in a multitasking system in real time and takes care of the real-time constraints in the system

We learnt

- An RTOS is an OS for the systems having the hard or soft real timing constraints and predictable latencies of the tasks, ISTs and ISRs
- Higher Priority allocation to real time tasks

End of Lesson 10 of Chapter 10
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RTOS Introduction