1.2 Introduction to RTOS

GPOS

The types of OS we often use (Windows, Linux, Mac, Android, iOS) can be classified as GPOS, which, as the name suggests, are designed for general purposes and typically utilize a GUI or CLI as the human interaction interface.

GPOS systems are designed to run multiple processes simultaneously, generally supported by multitasking and multi-threading, allowing the user to run several tasks at once. In general, timing deadlines for tasks in a GPOS are not crucial, and delays in tasks can be tolerated as long as they are not noticeable to the user[1]. For example, when a user opens a PDF document while listening to music on Spotify, both applications can run concurrently. If the system experiences a slight delay, such as the PDF page rendering taking longer or the audio buffering for a moment, this is still tolerable and does not significantly disrupt the user experience.

GPOS is non-deterministic, meaning the OS does not guarantee that a task will be fully completed within its allocated time (non-strict deadlines) [2]. This is not an issue for everyday GPOS applications that do not require strict timing certainty.

RTOS

Unlike GPOS, an RTOS plays a critical role in certain real-world applications. Imagine you are designing a car's airbag system, where the system must process sensor data with extreme speed and accuracy during a collision, then immediately deploy the airbag within microseconds. Even a slight delay could be fatal, thus requiring an operating system capable of guaranteeing real-time responses and consistently meeting strict deadlines.

Generally, an RTOS is designed to run on a microcontroller that does not have a user interface (GUI / CLI). The main advantage of an RTOS is its deterministic scheduling method, meaning the start time of a task can be known before it begins [1]. This ensures the timeliness of task execution, allowing the system to respond to events consistently, which is often crucial in IoT or embedded systems applications.

Revision #2
Created 2025-08-29 13:24:15 UTC by NS
Updated 2025-08-29 13:33:20 UTC by NS