

RTS Week 3

**Different types of RTOS
systems**

A real-time system means that the system is subjected to real-time, i.e., the response should be guaranteed within a specified timing constraint or the system should meet the specified deadline.

For example flight control systems, real-time monitors

Hard Real Time

- Strict deadlines :
 - task must start executing on the specified scheduled time
 - Task must be completed within assigned time duration

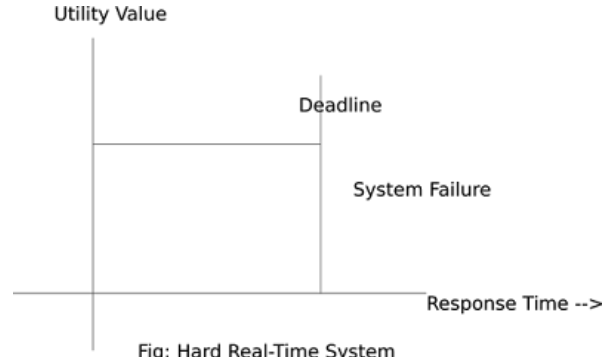
Firm Real Time

- Needs to follow deadlines:
 - but missing a deadline does not have a big impact
 - can cause undesired effects eg. huge reduction in product quality

Soft Real Time

- Accepts some delays by the Operating System:
 - There is deadline for specific tasks
 - Delay for a small amount of time is acceptable
 - Hence deadline is handled softly

Hard Real Time



- This type of system can never miss its deadline
 - Missing the deadline may have disastrous consequences.
- The usefulness of results produced by a hard real-time system decreases abruptly and may become negative if **tardiness** increases.
 - **Tardiness** means how late a real-time system completes its task with respect to its deadline.
- **Example:** Flight controller system (a single flight error might be fatal), medical critical care system (Patient's life is at risk)

Firm Real Time

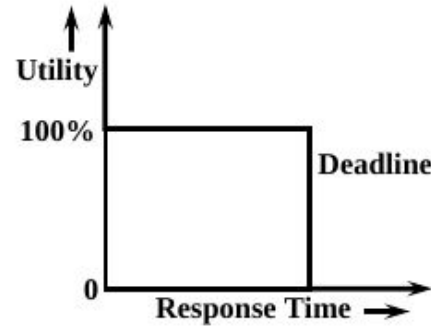
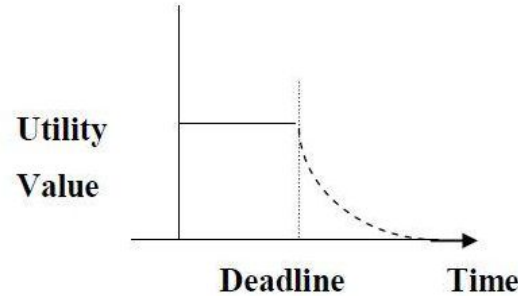


Fig. 28.14 Utility of Result of a Firm Real-Time Task with Time

- A firm real-time system is one in which a few missed deadlines will not lead to total failure
 - in hard real-time once deadline is crossed and task is not completed, system fails but in case of firm real-time task even after the passing of deadline, system does not fail.
- **Example:**
 - Video conferencing: When a certain frame is being played, if some preceding frame arrives at the receiver, then this frame is of no use and is discarded.
 - Satellite based tracking: When the ground computer is being overloaded, an new image may be received even before an older image is taken up for processing. In this case, the older image is of not much use.

Soft Real Time



- This type of system can miss its deadline occasionally with some acceptably low probability.
 - Missing the deadline have no disastrous consequences.
- The usefulness of results produced by a soft real-time system decreases gradually with an increase in tardiness.
- **Example:**
 - ATM: As long as the ATM is executing timely even though it miss deadline frequently it's output will still have value