RTES theory and analysis:

Rate Monotonic Theory - Optimal Priority Policy

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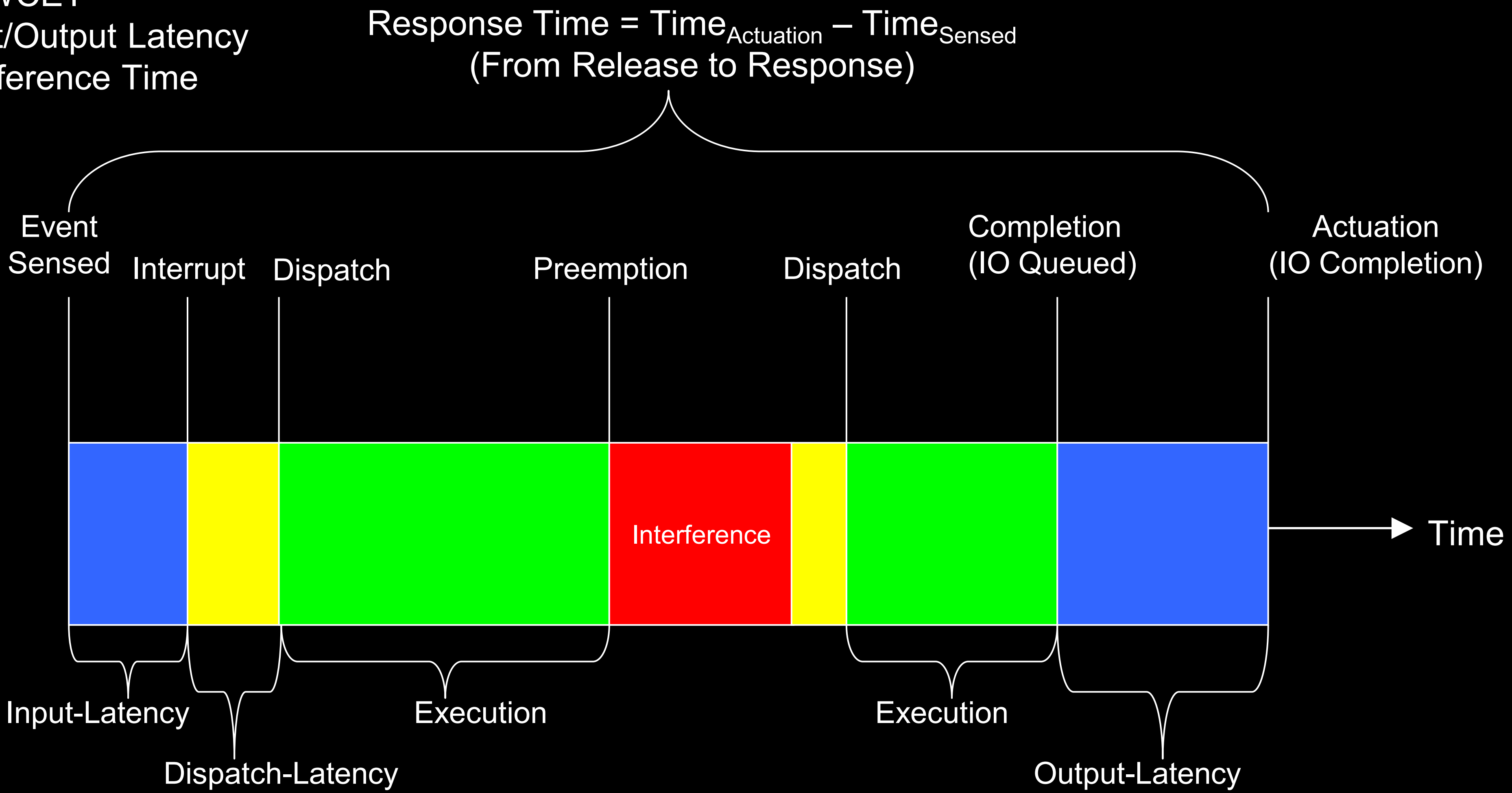
Segment Outline

- The Real-Time Service Response Timeline
- Argument for Optimality of RM Priority Assignment Policy

- Policy - Highest Frequency (Shortest Period) Services is assigned highest priority
- Same Frequency given same priority, dispatched in FIFO order from ready queue
- Adjust priority up by assuming higher frequency than actual (period transform)

A Service Release and Response

- C_i , WCET
- Input/Output Latency
- Interference Time



RM Assumptions and Constraints

- A1: Periodic Service Requests, the Period is Constant
- A2: Completion-Time < Period
- A3: Service Requests are Independent (No Known Phasing)
- A4: Run-time is Known and Deterministic (WCET may be Used)
- C1: Deadline = Period by Definition
- C2: Fixed Priority, Preemptive, Run-to-Completion Scheduling
- Critical Instant: longest response time for a service occurs when all system services are requested simultaneously (maximum interference case for lowest priority service)
- No Other Shared Resources – Not in Paper, but key assumption – e.g. shared memory

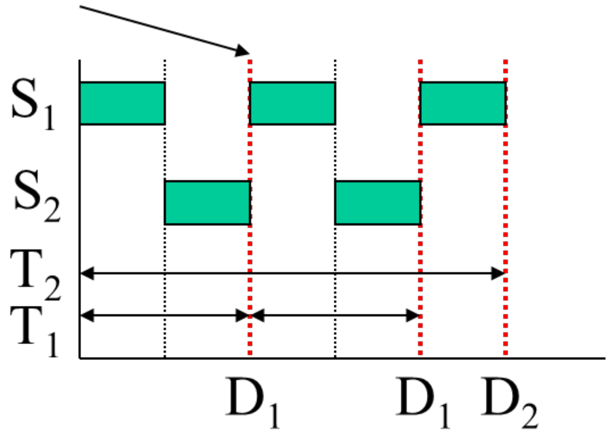
RM Priority Assignment Policy

<u>RM Policy</u>:

Given: services S_1, S_2 with periods T_1 and T_2 and C_1 and C_2 with $T_2 > T_1$

E.g. $T_1=2$, $T_2=5$, $C_1=1$, $C_2=2$, then if **prio(S_1) > prio(S_2)**, note that:

S_1 Makes Deadline if prio(S_1) > prio(S_2)

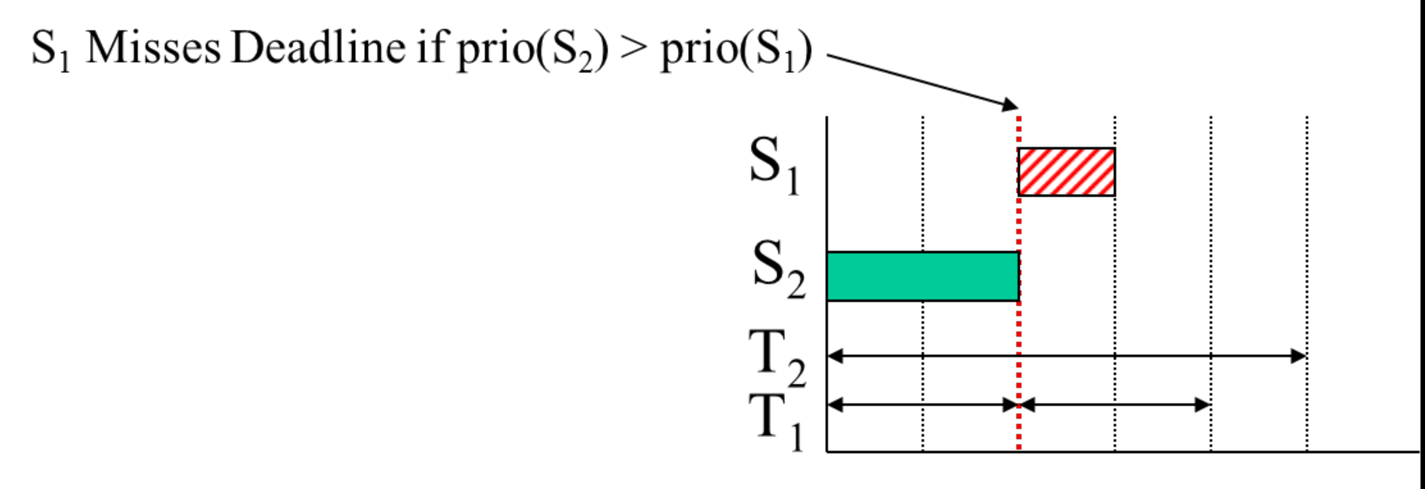


RM Priority Assignment Policy

Consider Alternative Policy:

Given: services S1, S2 with periods T1 and T2 and C1 and C2 with T2 > T1

E.g. T1=2, T2=5, C1=1, C2=2, then if prio(S2) > prio(S1), note that:



Conclusion:

If {Sn} feasible with prio(S2) > prio(S1), then {Sn} is also always feasible given prio(S1) > prio(S2), but converse is not necessarily TRUE!!

Therefore, prio(S1) > prio(S2) is OPTIMAL

Summary

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