# A Note on Some Open Problems in Mixed-Criticality Scheduling

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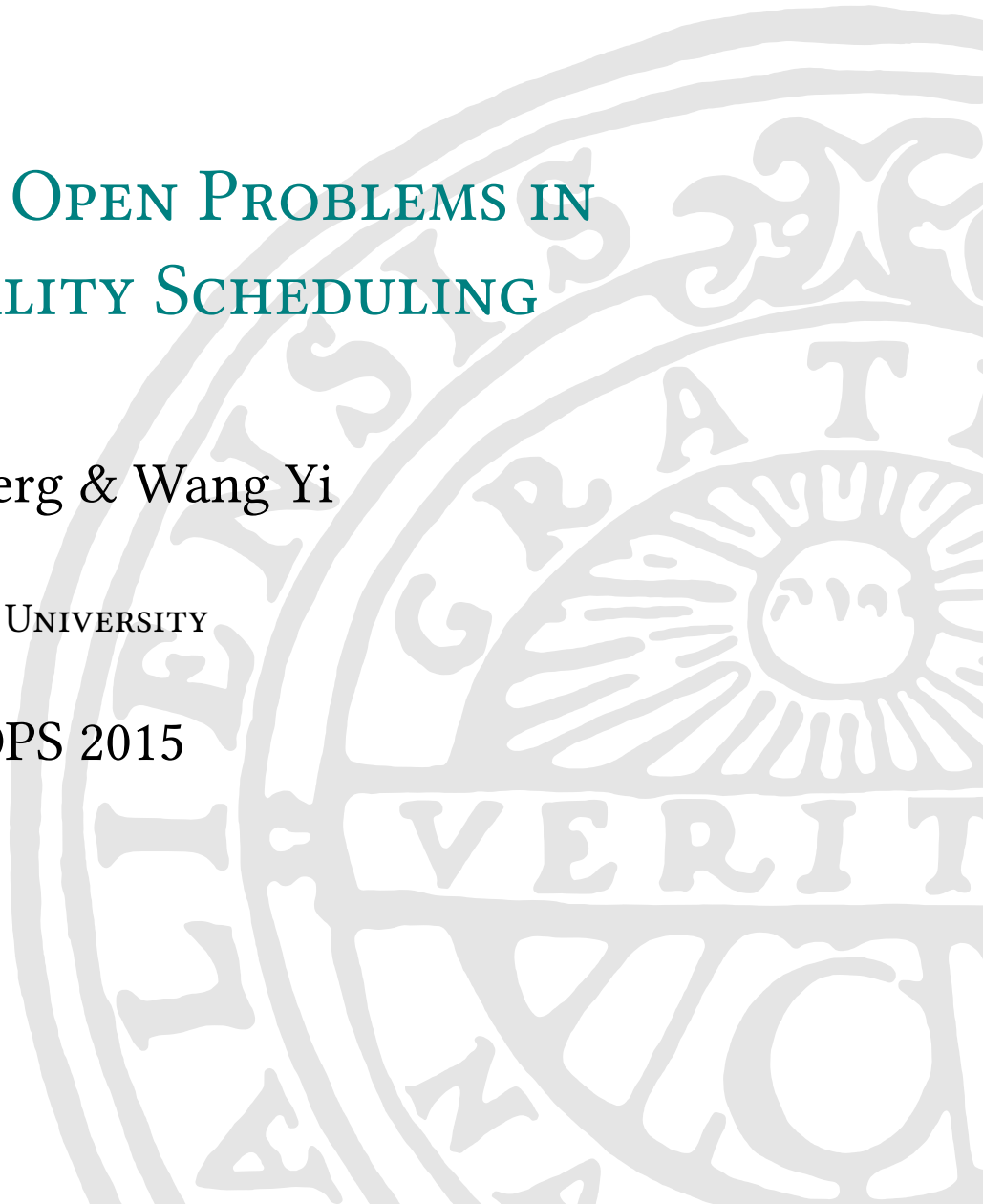

# The setting

- "Vestal-type" mixed-criticality sporadic tasks.
- Two criticality levels (LO/HI).
- A preemptive uniprocessor.

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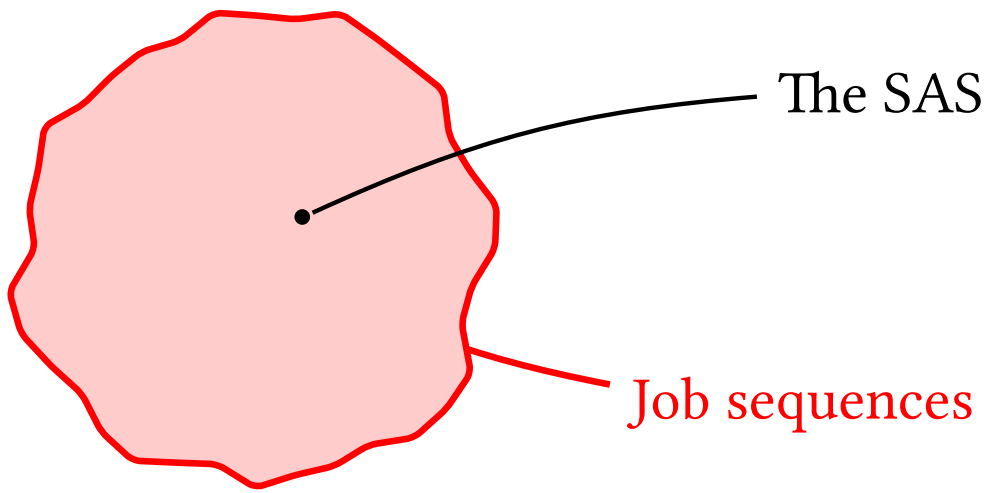


# Job sequences

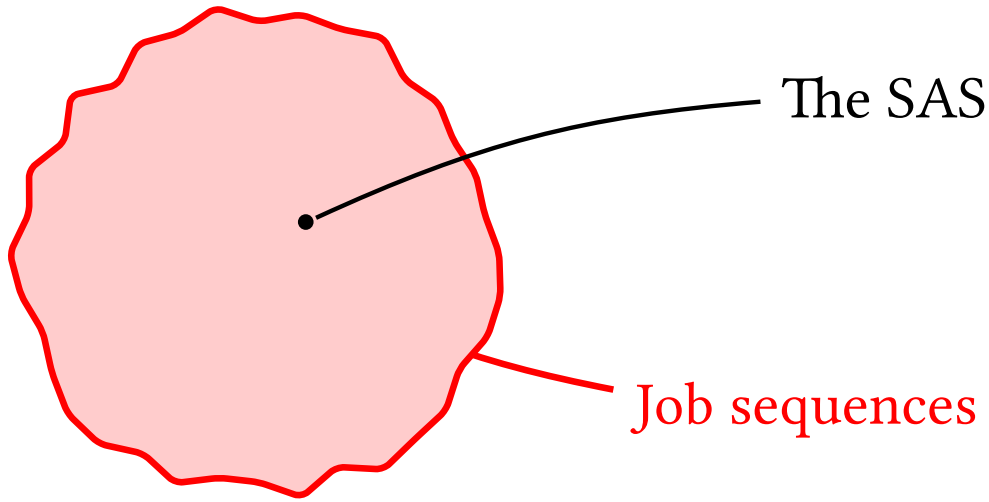
## MC job sequences

- Fixed sequences specifying *release times* of all jobs in a given runtime scenario.
- Execution times still unknown.

# Claim 1

The synchronous arrival sequence is *not* a guaranteed worst case for sporadic MC tasks.

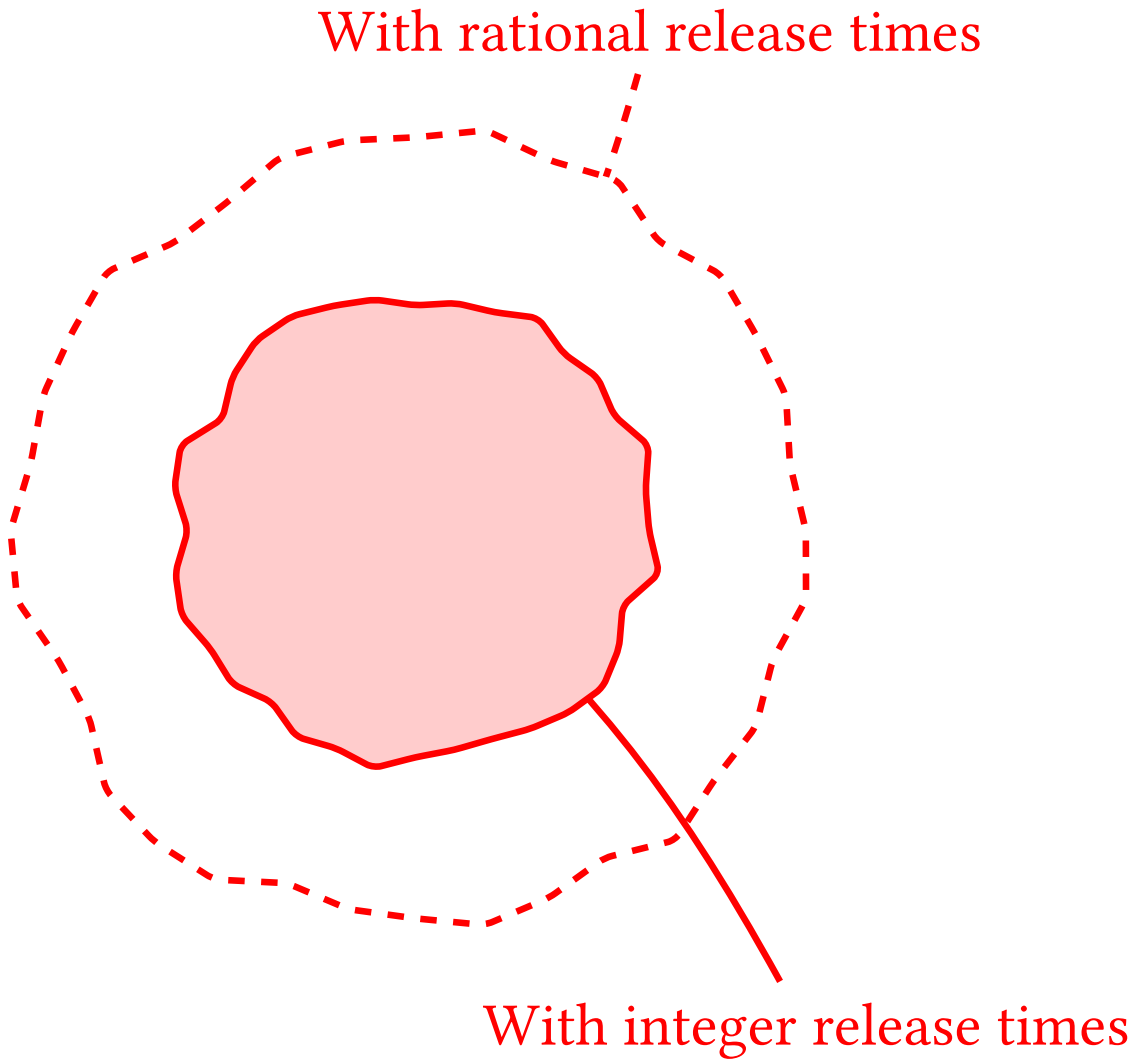
# Claim 1



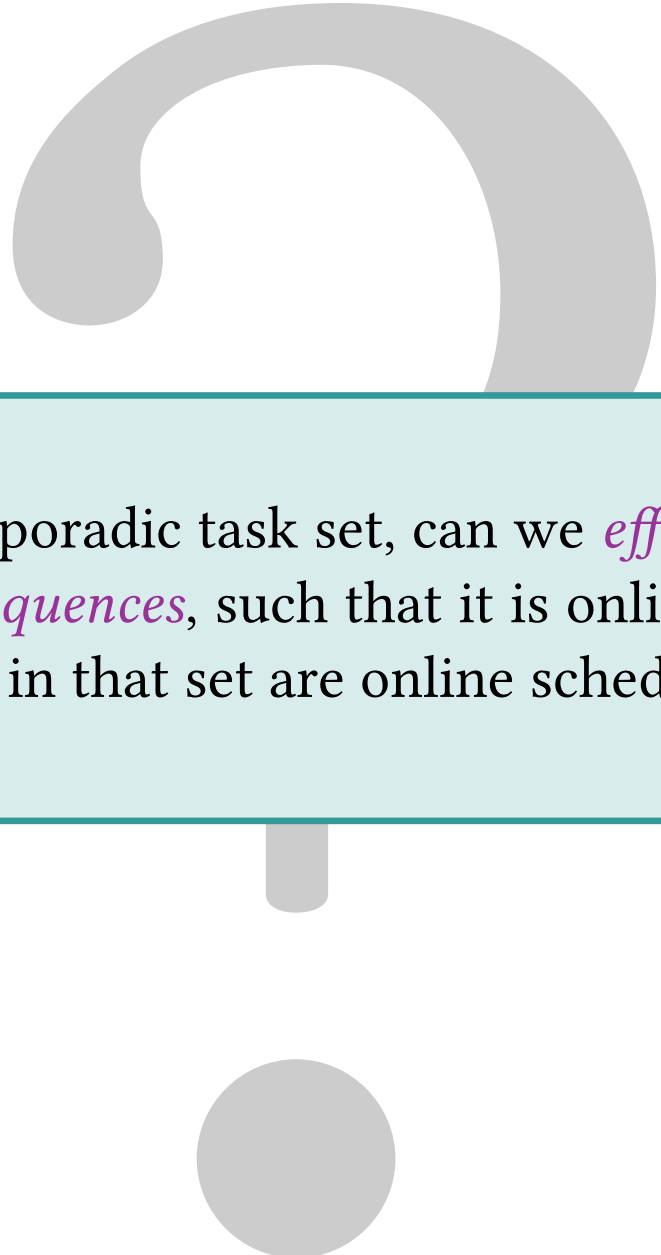
# Claim 2

In general, it is not enough to consider integer-valued release times when analyzing sporadic MC tasks.

# Claim 2

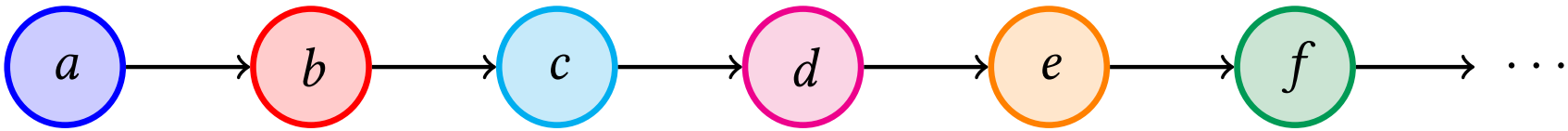


# Question 1



For a given MC sporadic task set, can we *efficiently find* some *small set of job sequences*, such that it is online schedulable iff all job sequences in that set are online schedulable?

# Are job sequences the right abstraction?



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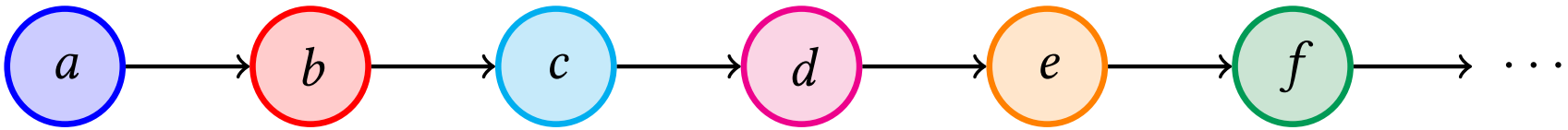


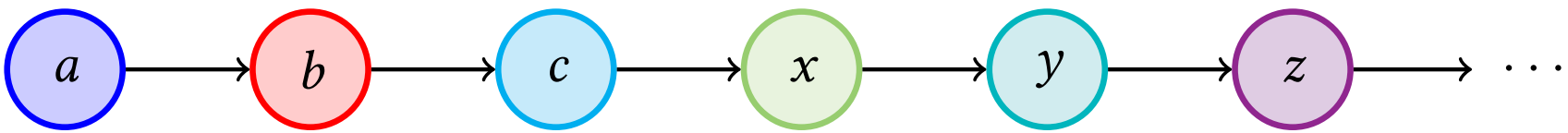

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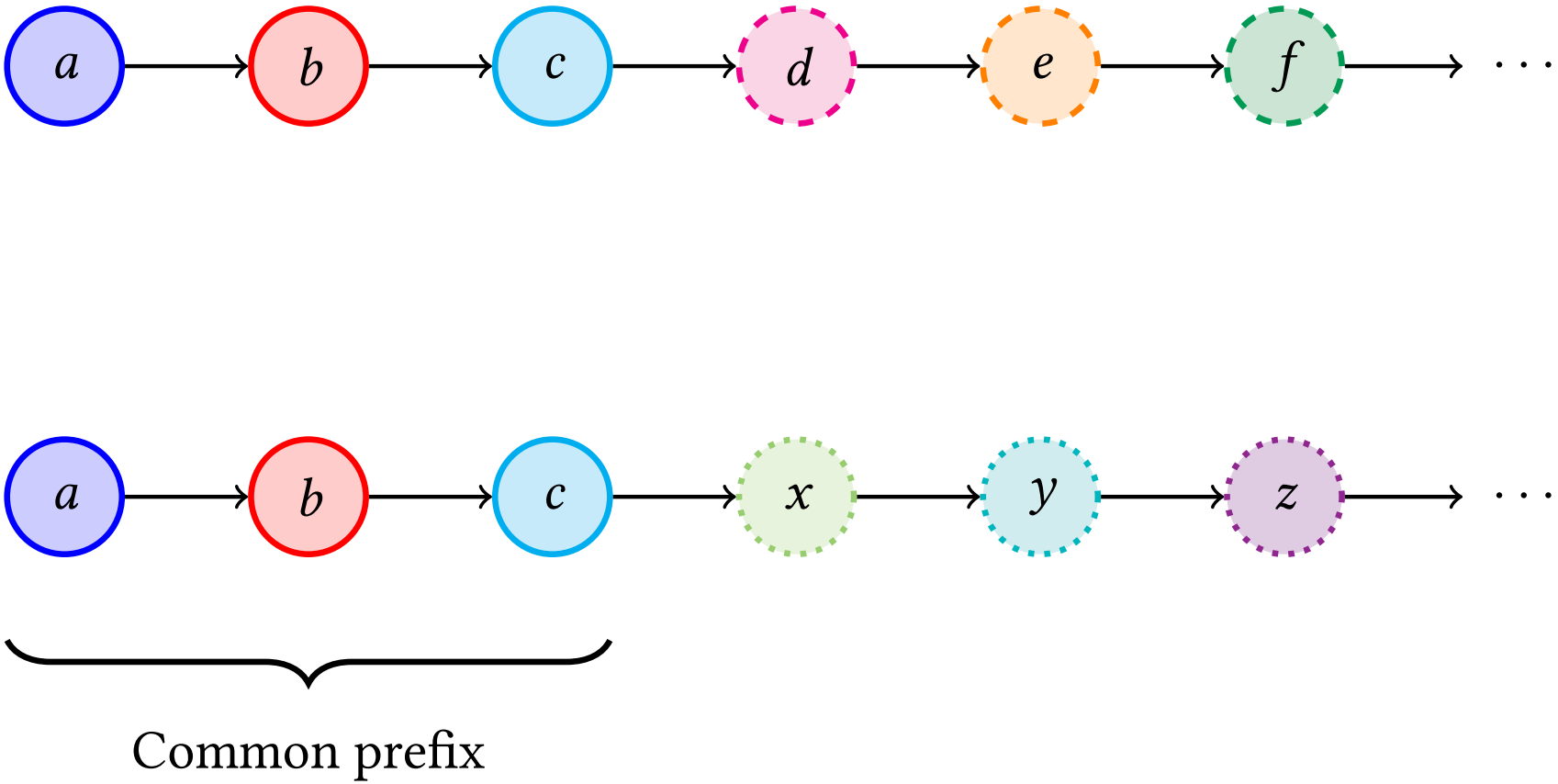

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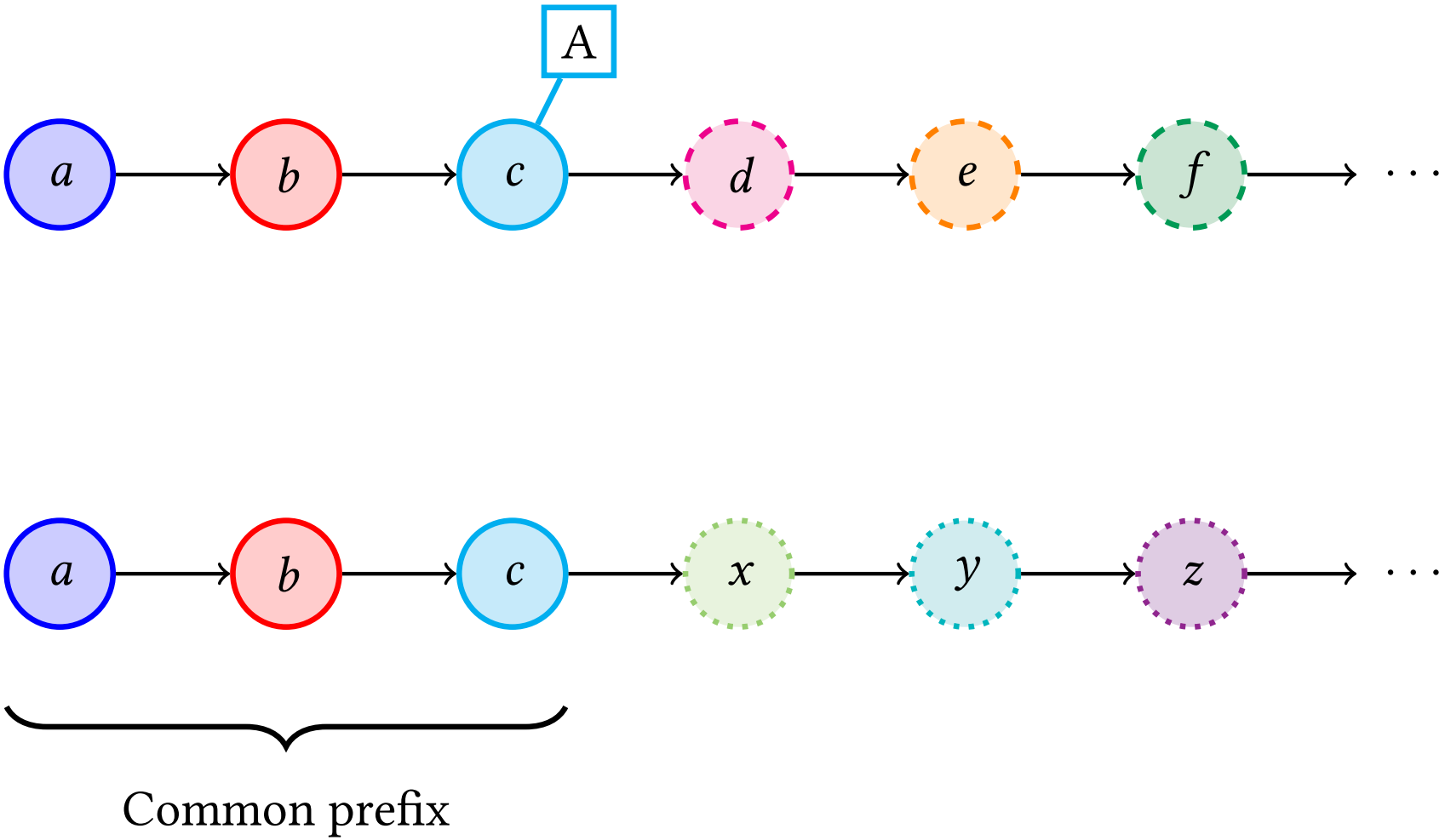

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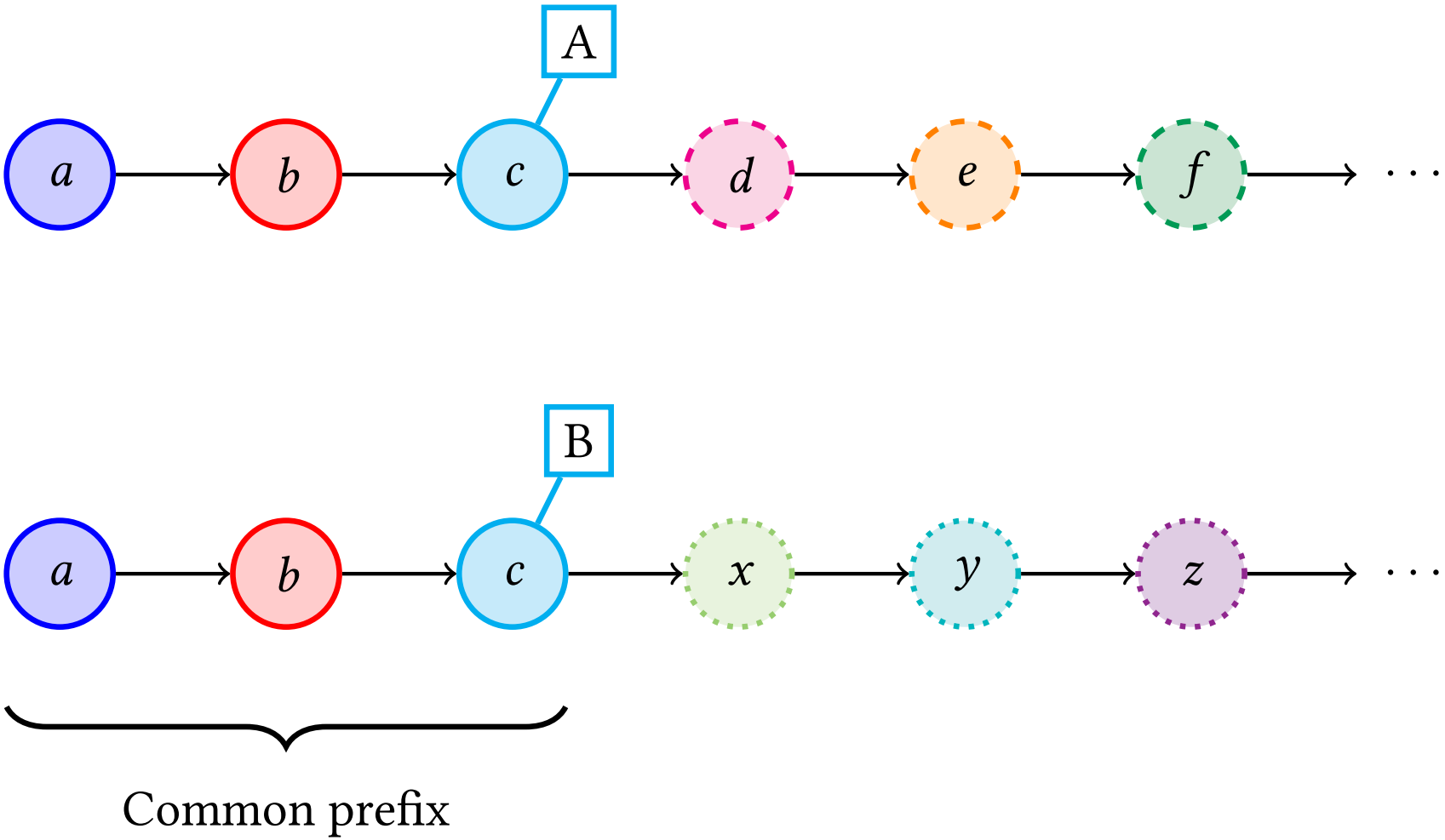

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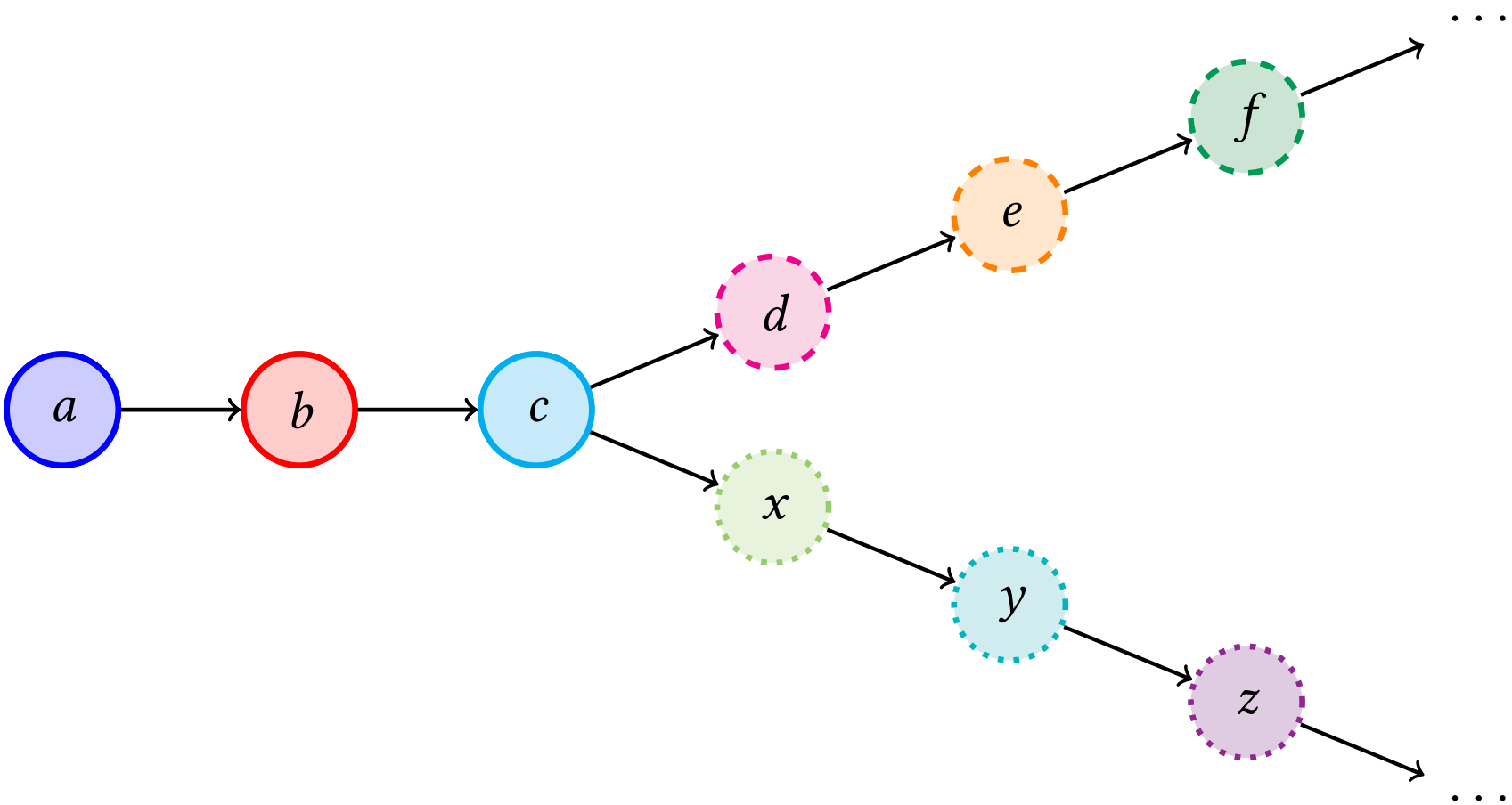

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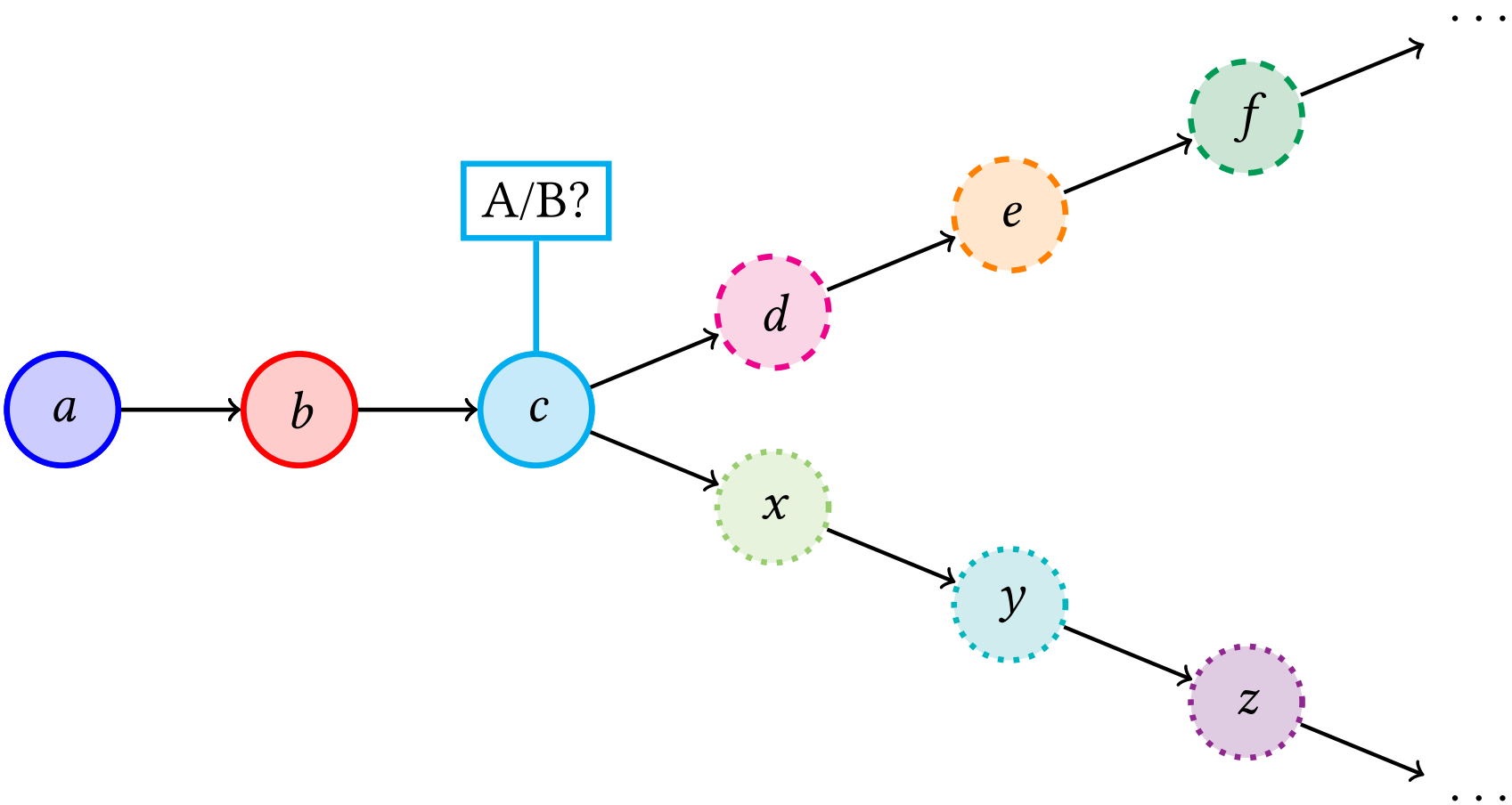
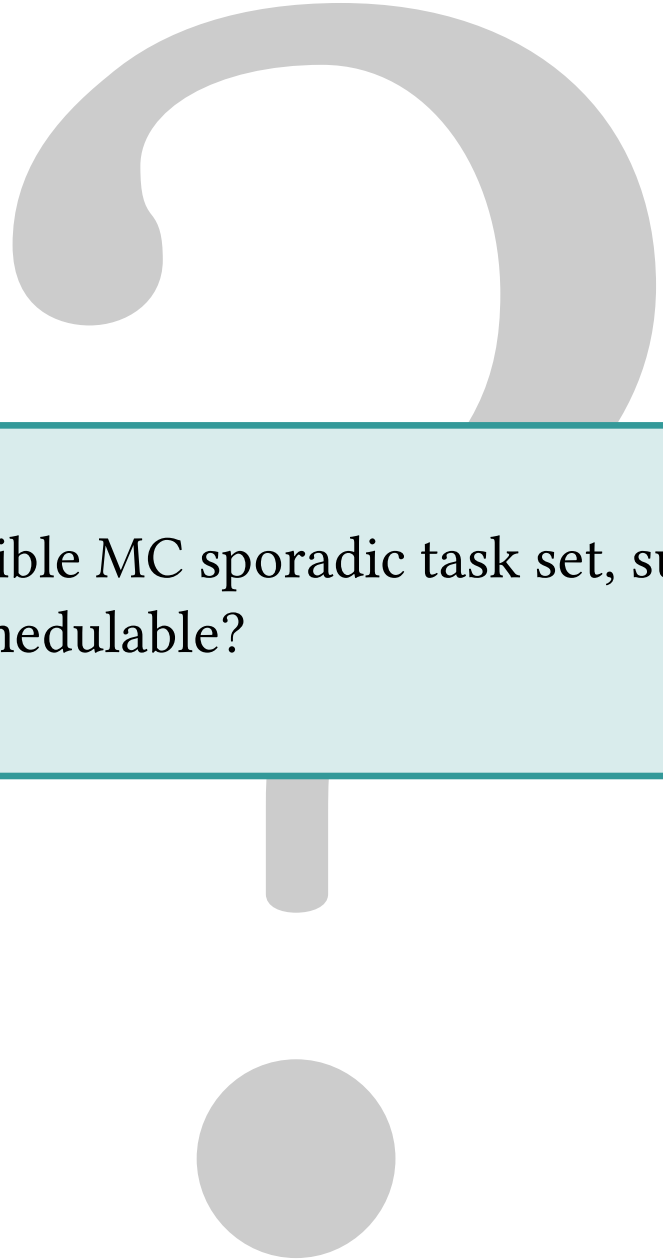


# Question 2



Is there an infeasible MC sporadic task set, such that all its job sequences are schedulable?

# Reevaluating the choice of task model?

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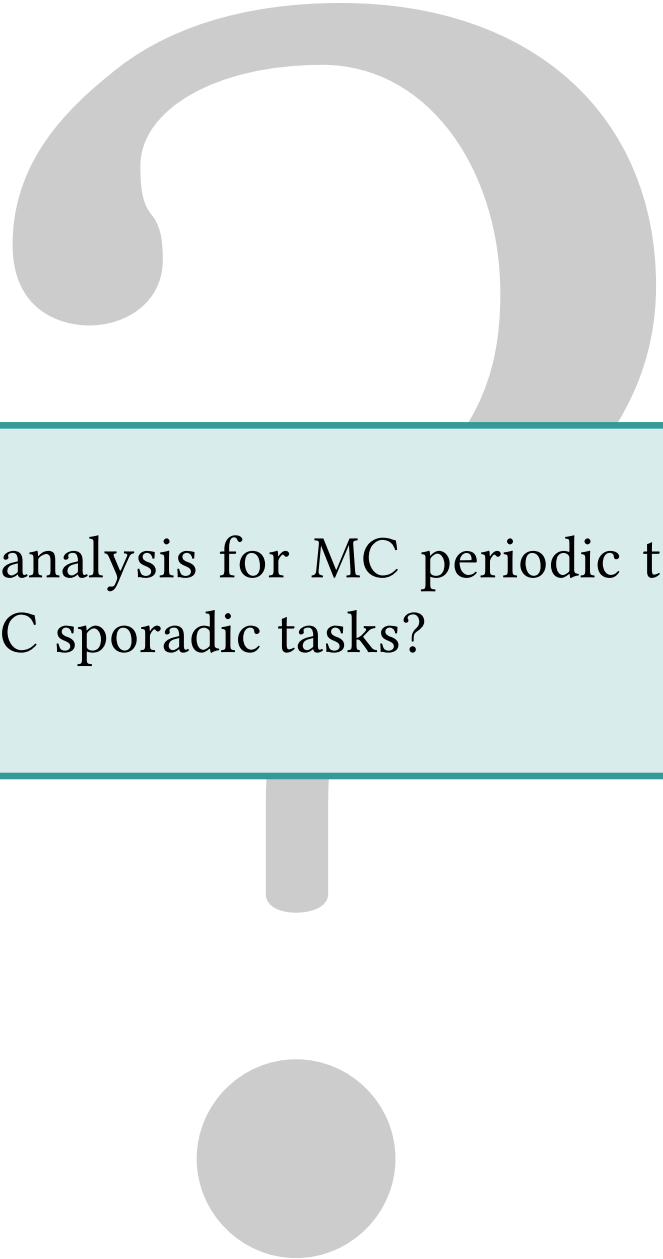
## MC periodic tasks

- Direct MC extension of ordinary (strictly) periodic tasks.
- Synchronous or asynchronous.
- Each task set can generate only a single job sequence!

# Question 3



Is scheduling or analysis for MC periodic tasks significantly easier than for MC sporadic tasks?

# Summary

Claim 1: The SAS is not a worst-case job sequence.

Claim 2: Rational release times can be worse than integer release times.

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Claim 1: The SAS is not a worst-case job sequence.

Claim 2: Rational release times can be worse than integer release times.

Question 1: Is there a (reasonable) replacement for the SAS?

Question 2: Is it enough to look at job sequences?

Question 3: Is it easier to analyze and/or to schedule MC periodic tasks than MC sporadic tasks?