

Towards realistic core-failure-resilient scheduling and analysis

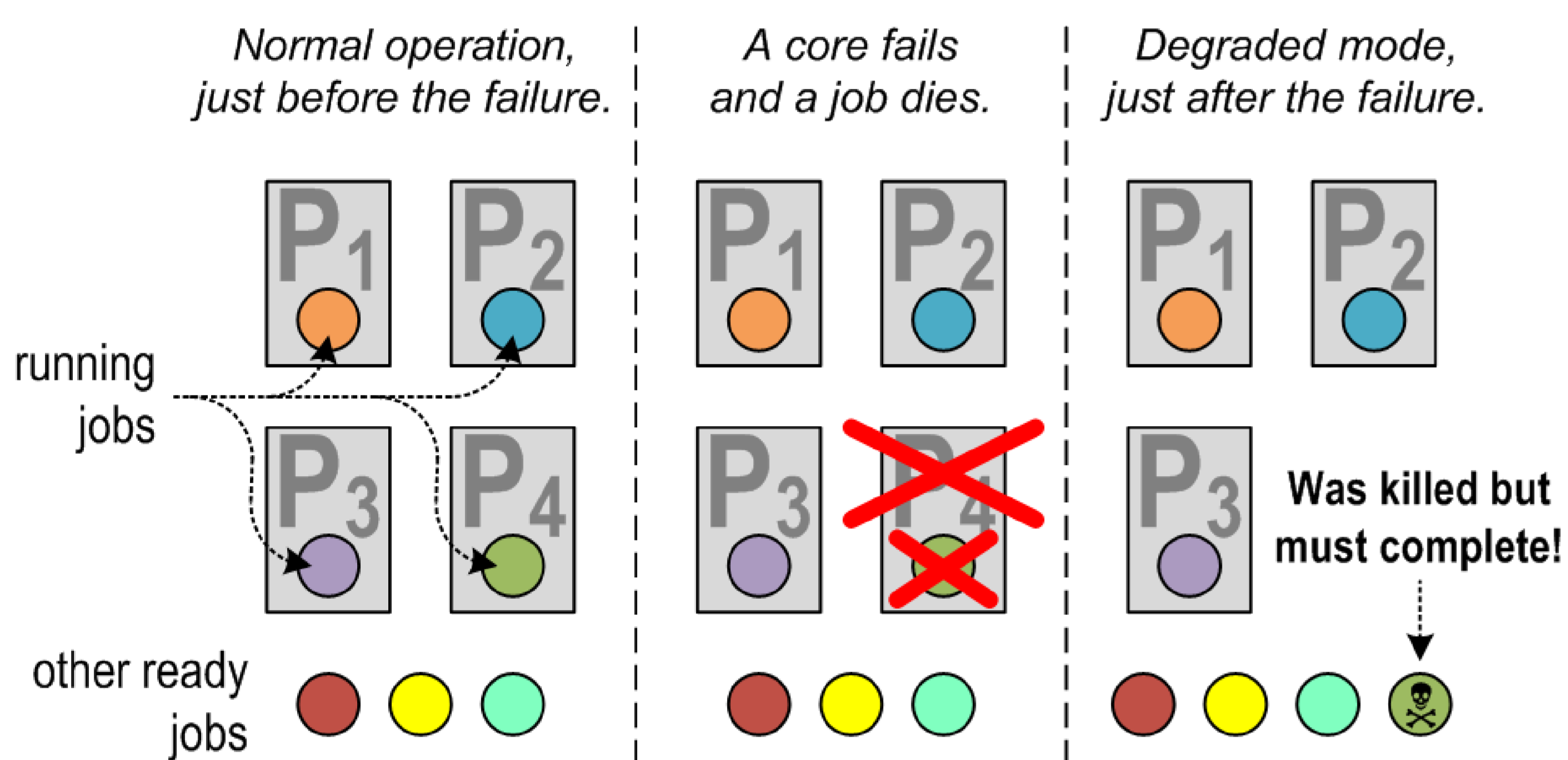


CISTER - Research Center in
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(1) The scheduling problem

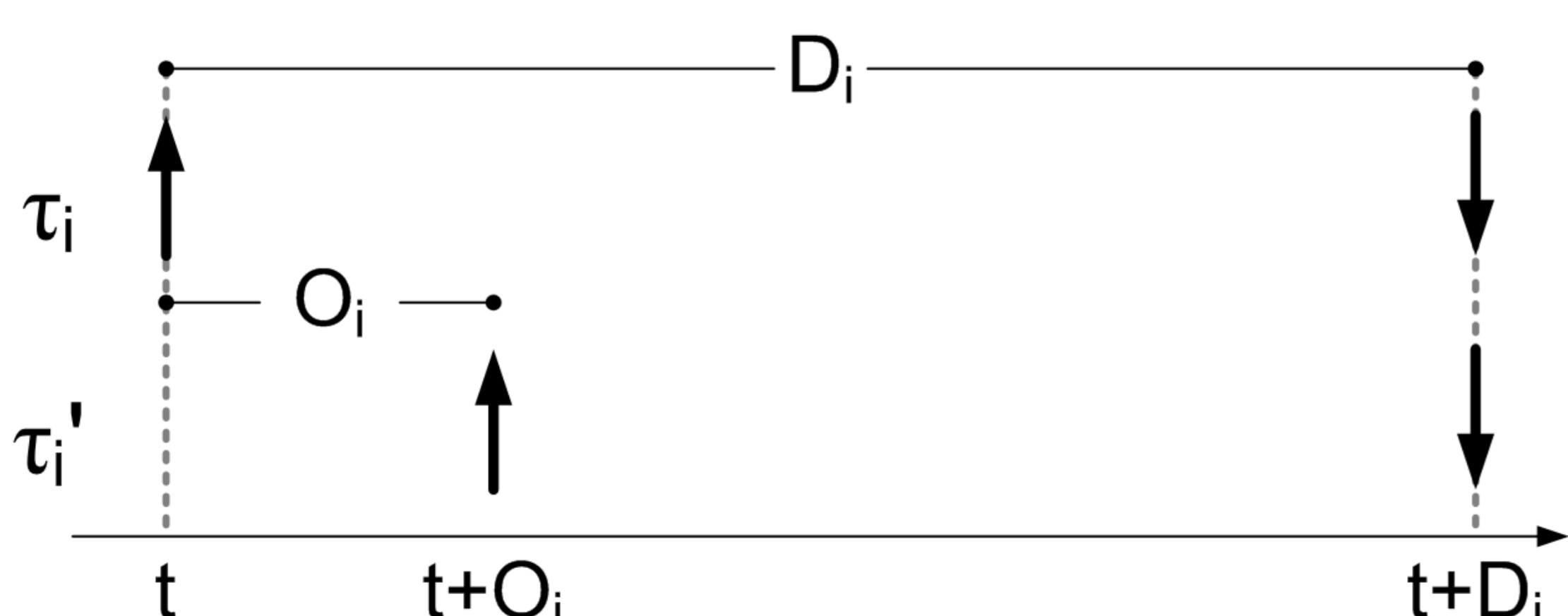
- **Goal:** Meeting all task deadlines on a multicore platform even when a core suddenly fails and is rendered unusable.
- **Model:** When a core fails, whichever task was running there is killed but its deadline **must still be met**.



- Our basic scheduling arrangement and analysis for this problem (RTCSA 2015) makes many simplifying assumptions. We want to make it more realistic.

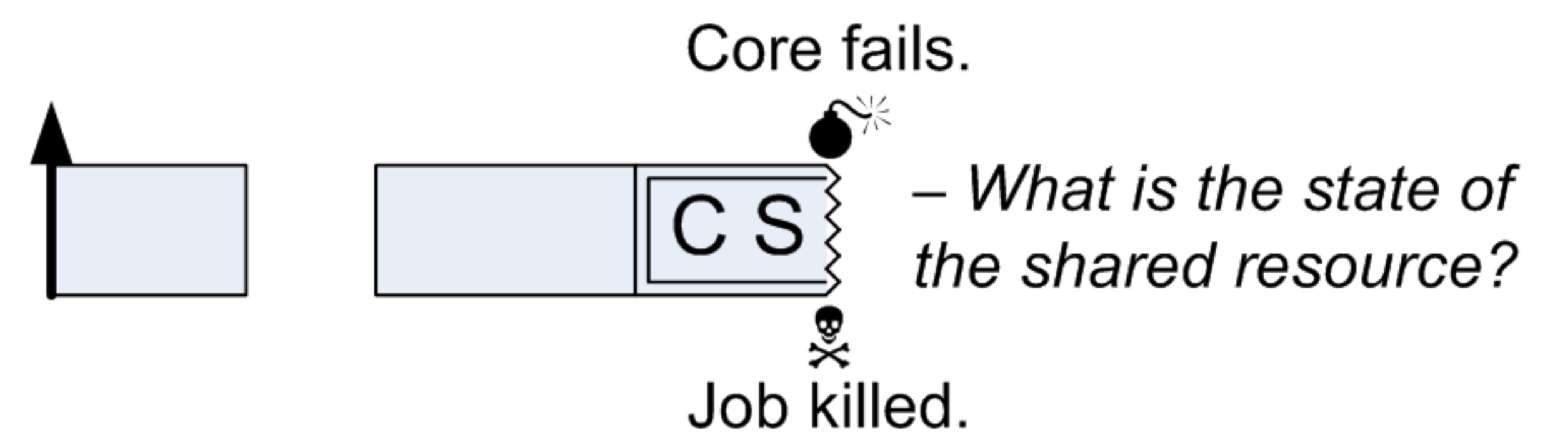
(2) The baseline approach

- Global fixed-priority scheduling.
- Generalisation of two simple but "faulty" ideas:
 - Full task replication (Resource-inefficient!)
 - Restart task upon failure (May be too late!)
- For each job by task τ_i , release a **copy job** after a time offset O_i , relative to the main job.
 - smaller O_i : more redundant execution.
 - bigger O_i : harder to meet deadline.
 - Optimal O_i : the biggest value that allows provably meeting deadlines in every case.



(3) Critical sections

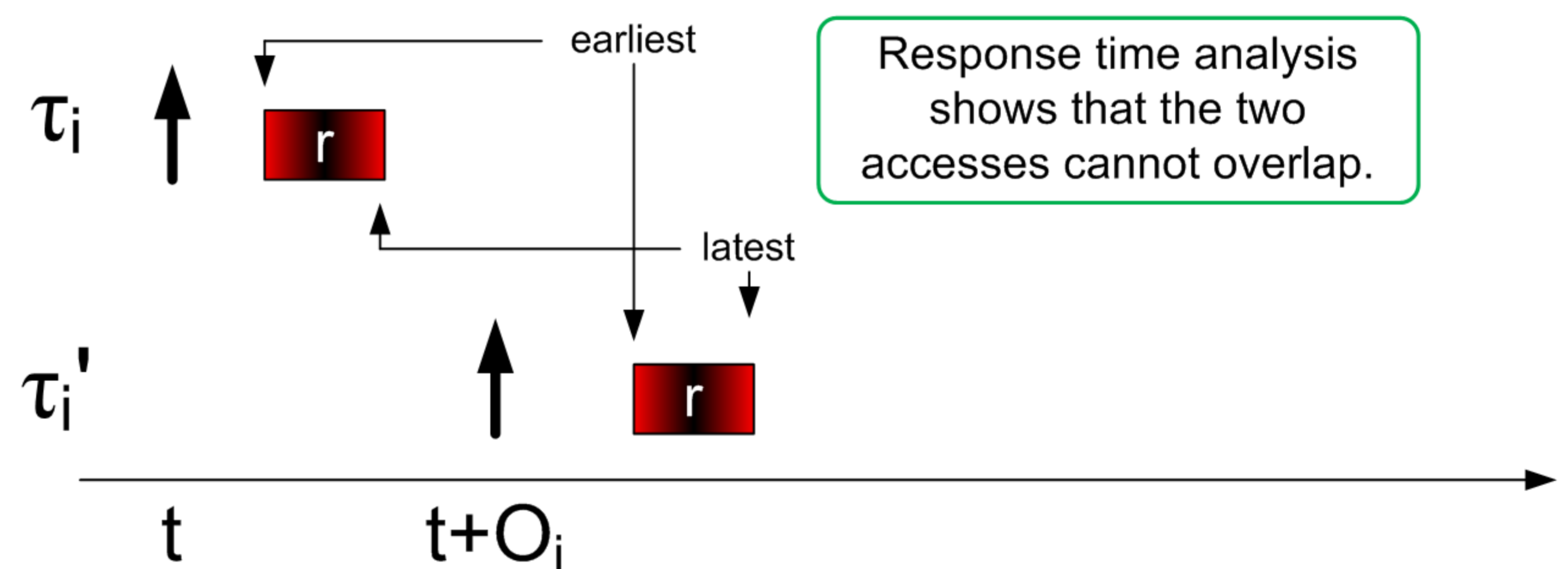
- Provisions for resource sharing under some adaptation of an existing protocol are needed.
- But what happens if a task dies while executing a critical section?



- Transaction semantics (with COMMIT and ROLLBACK) appear as an appropriate solution.

(4) Indirect resource sharing

- With job copies, *all* resources suddenly become shared (between the main job and its copy)!
- Possible solutions:
 - Critical sections everywhere (inefficient).
 - Code-level analysis also considering O_i , in order to rule out some access hazards.



(5) Implementation aspects

- Facility for detecting/handling core failures.
- Facility for launching, tracking and terminating jobs early.
- Incorporation of overheads into the analysis, taking into account the actual implementation.

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