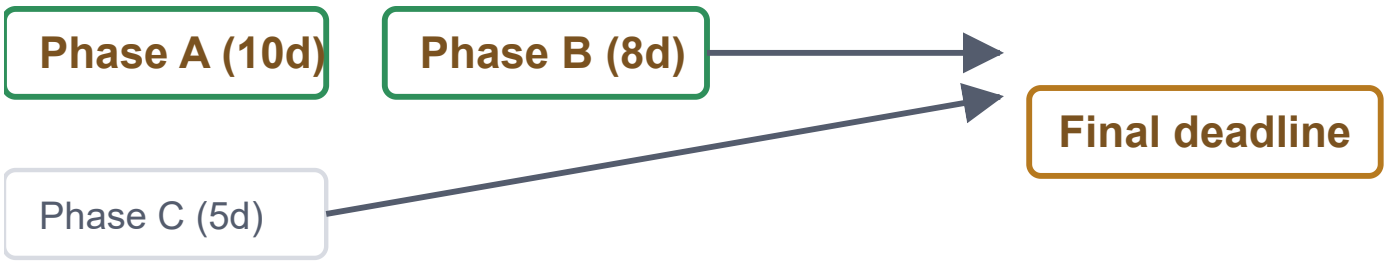
Critical Path Basics: Why Some Delays Slip the Deadline and Others Do Not

> On a multi-phase plan, a delay in one phase might push the final deadline back by exactly that amount, or might have no effect at all, depending on whether that phase has any schedule slack.

When a project has multiple phases with dependencies between them (some phases can run in parallel, others must wait for an earlier phase to finish), not every phase's timing affects the final completion date equally. The critical path is the specific sequence of dependent phases with zero slack, meaning any delay in one of those phases delays the final deadline by the same amount. A phase not on the critical path has some slack (float): it can run late, up to a point, without moving the final deadline at all.



A -> B (18 days) is the critical path; Phase C has 13 days of slack before it could de

The longer dependency chain (A then B) has zero slack and sets the deadline; the shorter parallel chain (C) has slack to absorb delay.

How slack is computed

For each phase, a forward pass through the dependency graph computes the earliest it could start and finish given its predecessors, and a backward pass from the final deadline computes the latest it could start and finish without delaying that deadline. The difference between those two windows for a given phase is its slack. A phase with zero slack is on the critical path, and a phase with positive slack has that much room to run late before it starts affecting the deadline.

Why this matters more than a simple total-duration sum

Simply adding up every phase's duration overstates the real minimum project length whenever any phases can run in parallel, and it gives no information about which specific phase to watch most closely for delay risk. Knowing the actual critical path tells you exactly which phases have zero margin for error and which ones can absorb some slippage without any consequence to the final date.

What changes when a critical-path phase is delayed vs. accelerated

Delaying a critical-path phase pushes the final deadline back by the same amount, with no absorption. Accelerating a critical-path phase can pull the deadline forward, but only up to the point where a different phase (previously non-critical) becomes the new critical path with its own zero slack. WhenMath's Phase Dependency Planner and Schedule Slack Calculator both compute this directly from a stated dependency graph rather than requiring a manual slack calculation.

Key takeaway. Only phases on the critical path (zero slack) directly delay the final deadline when they run late. A phase with slack can absorb some delay with no effect on the deadline, up to the size of its slack.

Frequently asked

Can a project have more than one critical path?

Yes, if two or more dependency chains happen to have exactly the same total duration to the final deadline, they are all critical simultaneously, and a delay in any one of them delays the deadline.

Does adding more people to a delayed phase always help?

Only if that phase is actually on the critical path. Speeding up a phase with slack has no effect on the final deadline at all, which is why identifying the critical path before reallocating effort matters.

How does this relate to a deadline buffer?

A buffer (covered in its own resource above) is deliberately reserved slack added to protect a deadline, while critical-path slack is the naturally occurring slack that already exists in a dependency graph before any buffer is added on top of it.

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