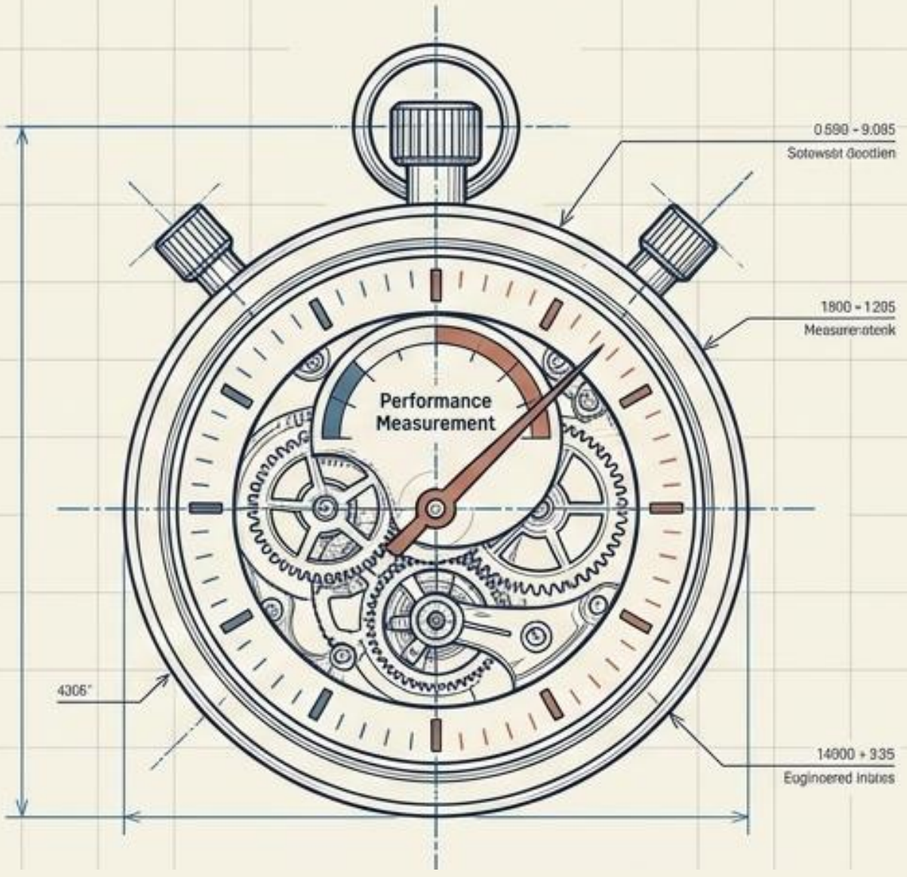
Mastering Project Time Management: The Complete Architecture

A definitive visual guide to engineering, scheduling, and controlling project timelines.



7204201 Project Management in Information Technology

Paranya Palwisut

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The Architectural Blueprint: (The 6-Step Master Process)

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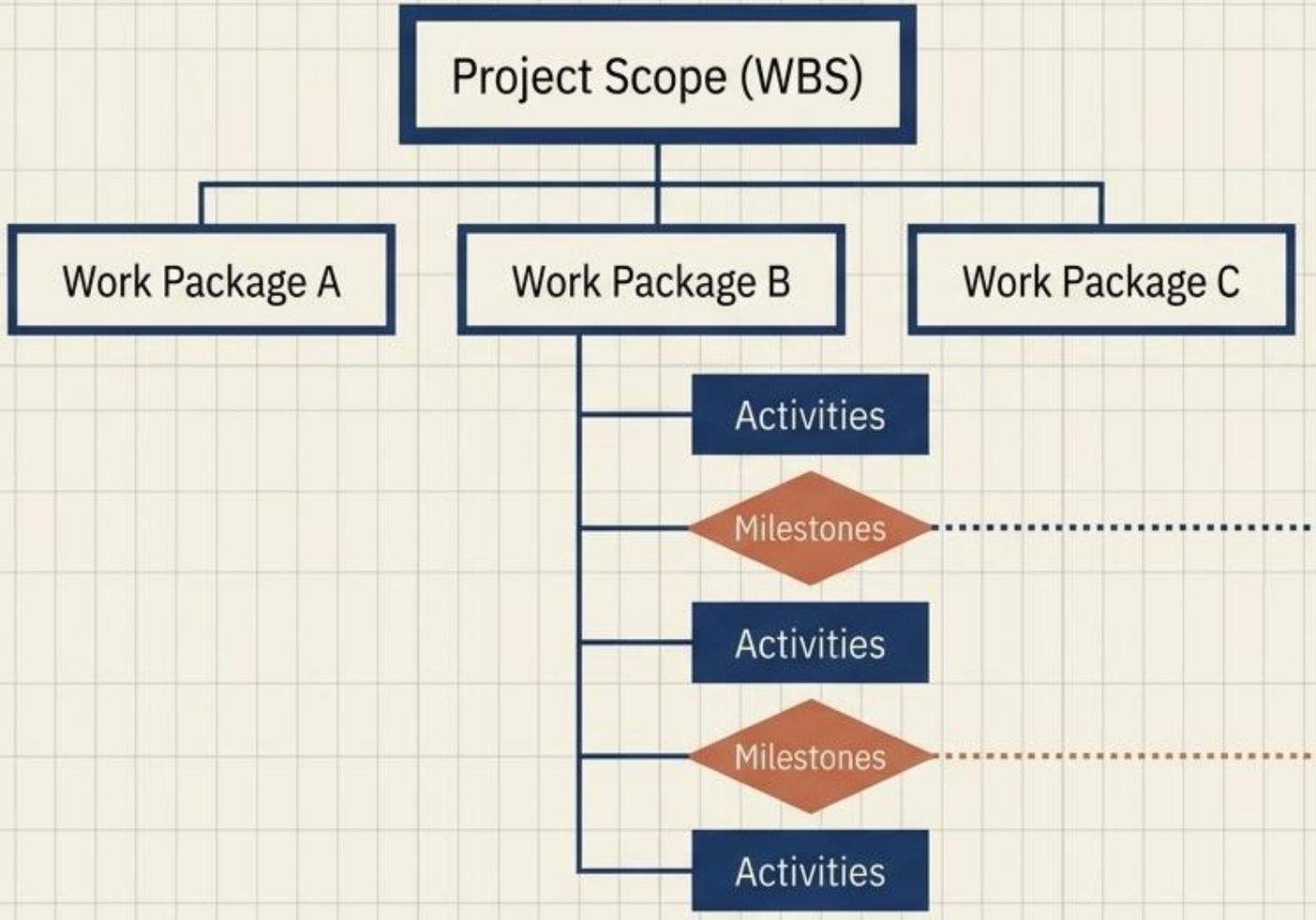
Step 1: Activity Definition – From Scope to Tasks

Transforming the conceptual Work Breakdown Structure (WBS) into actionable, trackable deliverables.



1. Activity List

The comprehensive registry of schedule-driven work, tied to costs and resources.

2. Attributes

The detailed descriptions, logical predecessors, and success metrics for each activity.

3. Milestones

Zero-duration checkpoints signifying major events or critical phase completions.

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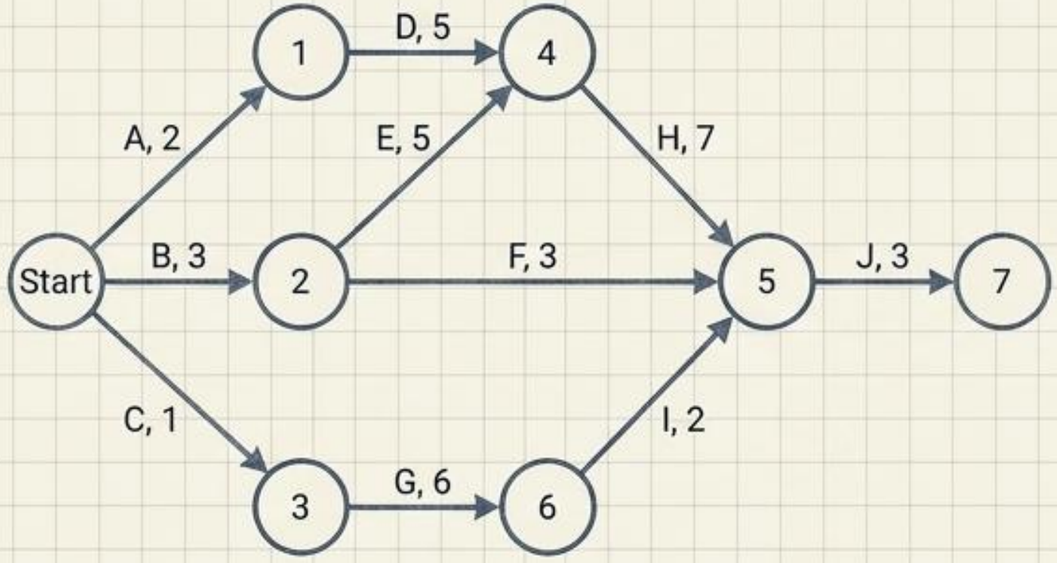
Step 2: Activity Sequencing – Network Architecture

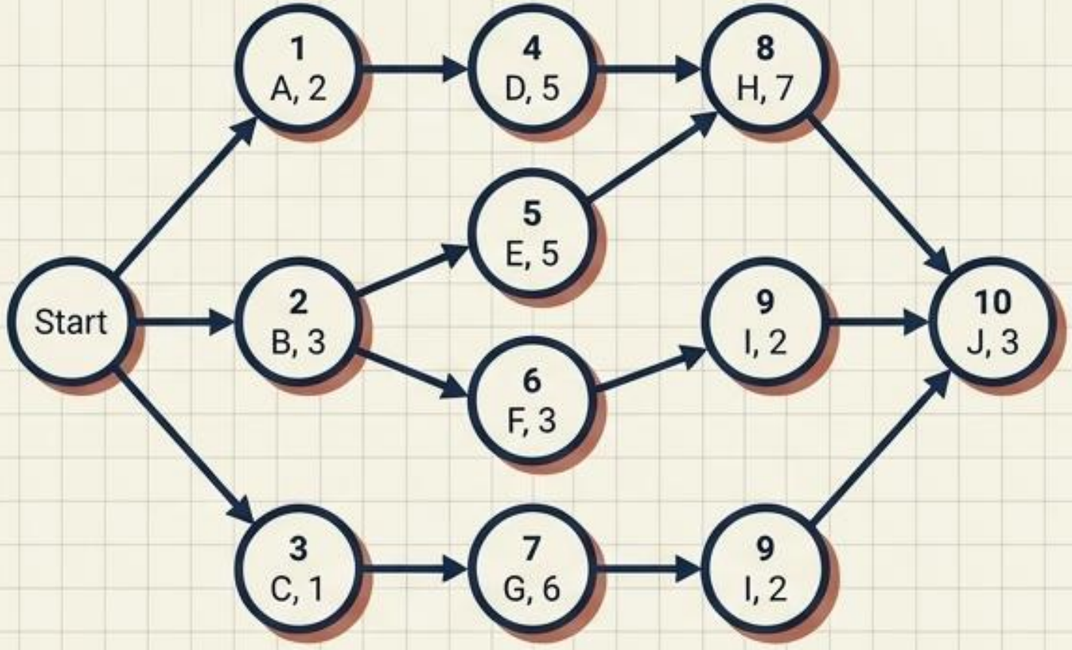
Activity-on-Arrow (AOA)



Structure: Arrows = Activities, Nodes = Connection points.

Limitation: Exclusively supports basic Finish-to-Start relationships.

Activity-on-Node (AON / PDM)



Structure: Nodes = Activities, Arrows = Dependencies.

Advantage: The modern standard. Supports all four complex relationship types (Precedence Diagramming Method).

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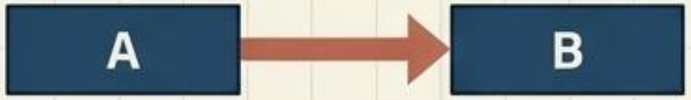
Step 2: PDM Dependencies – The Logic of Execution

1. Finish-to-Start (FS)



A must finish before B begins.

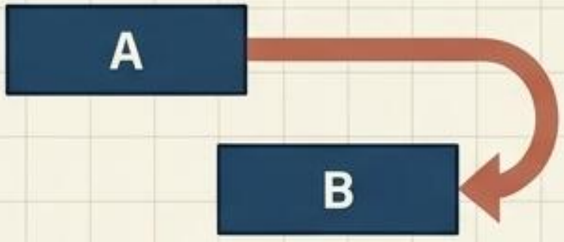
Ex: Finish writing code -> Start testing system.

2. Start-to-Start (SS)

A must start before B can start.

Ex: Start UI design -> Start Backend structuring.

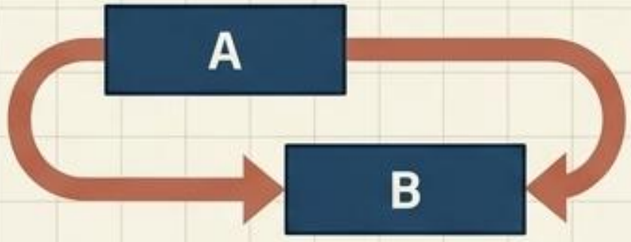
3. Finish-to-Finish (FF)



A must finish before B can completely finish.

Ex: Finish bug fixes -> Finish User Acceptance Testing.

4. Start-to-Finish (SF)



A must start before B can finish.

(Rare in practice)

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Steps 3 & 4: Aligning Needs & Time

Resource Estimating

People: Personnel and expertise.

Tools: Software and equipment.

Materials: Physical assets and servers.

Duration Estimating

Total Duration = Actual Work Time + Elapsed Time

a

Optimistic (Best-case scenario)

m / b

Most Likely (Normal conditions)

c

Pessimistic (Worst-case scenario / Delays)

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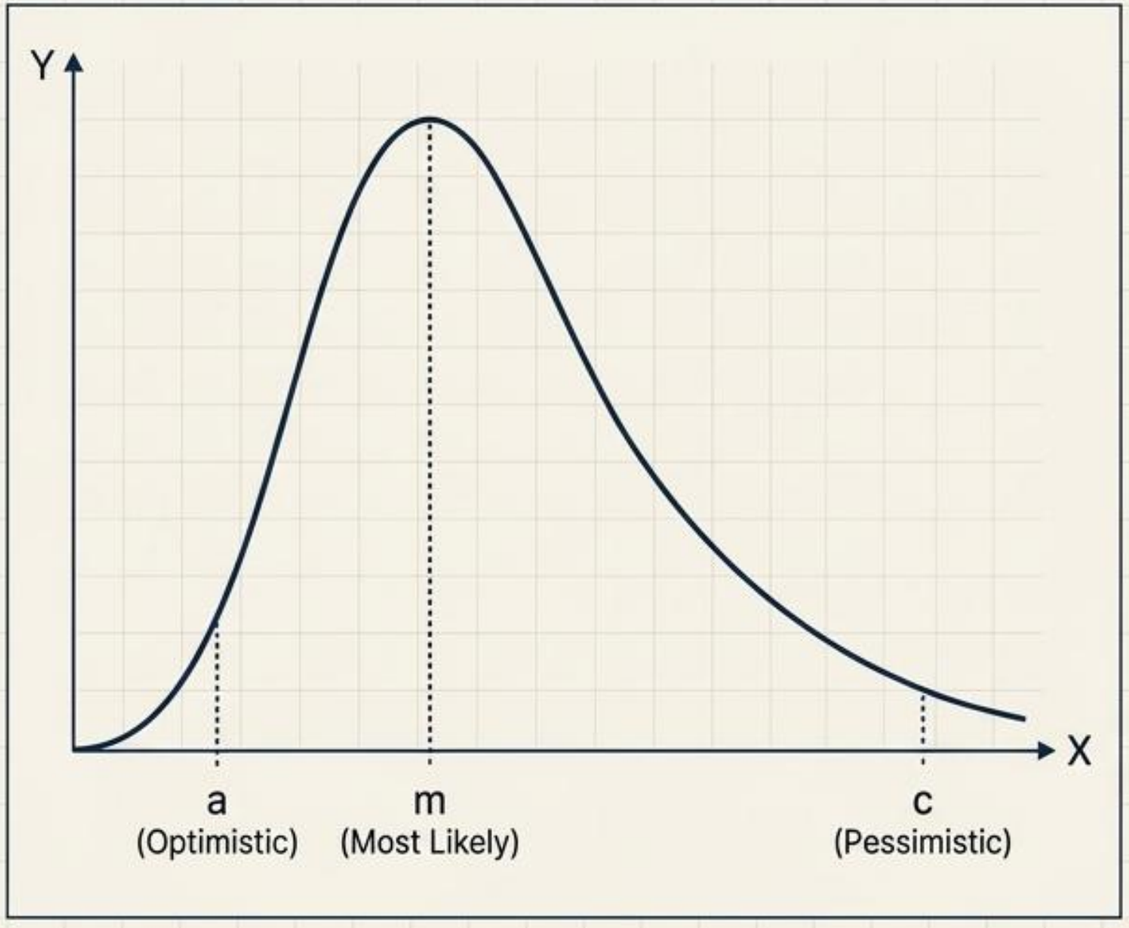
Advanced Duration Estimating: The PERT Technique

Program Evaluation and Review Technique—designed for high-uncertainty (R&D) environments.



Expected Time (t_e)

$$t_e = \frac{a + 4b + c}{6}$$

(A weighted average prioritizing the most likely outcome)

Variance (v)

$$v = \left(\frac{c - a}{6}\right)^2$$

	a	b	c	t_e	v
Activity G	3	4	11	5.00	1.78

A wide gap between Optimistic **(a)** and Pessimistic **(c)** yields high variance.

Example: Activity G (a=3, c=11) has a variance of 1.78—identifying it as the primary risk node in the network.

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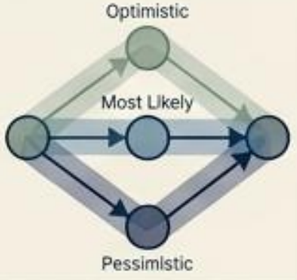
Methodology Comparison: CPM vs. PERT

Diagnostic Dimensions	CPM	PERT
Dimension 1: Time Estimate	**Deterministic** (Single fixed value).	**Probabilistic** (3-point weighted average). 
Dimension 2: Project Nature	Routine, predictable, historical data exists.	Novel, R&D, high uncertainty.
Dimension 3: Primary Focus	Cost/Time trade-offs and resource optimization.	Risk management and probability of on-time completion.

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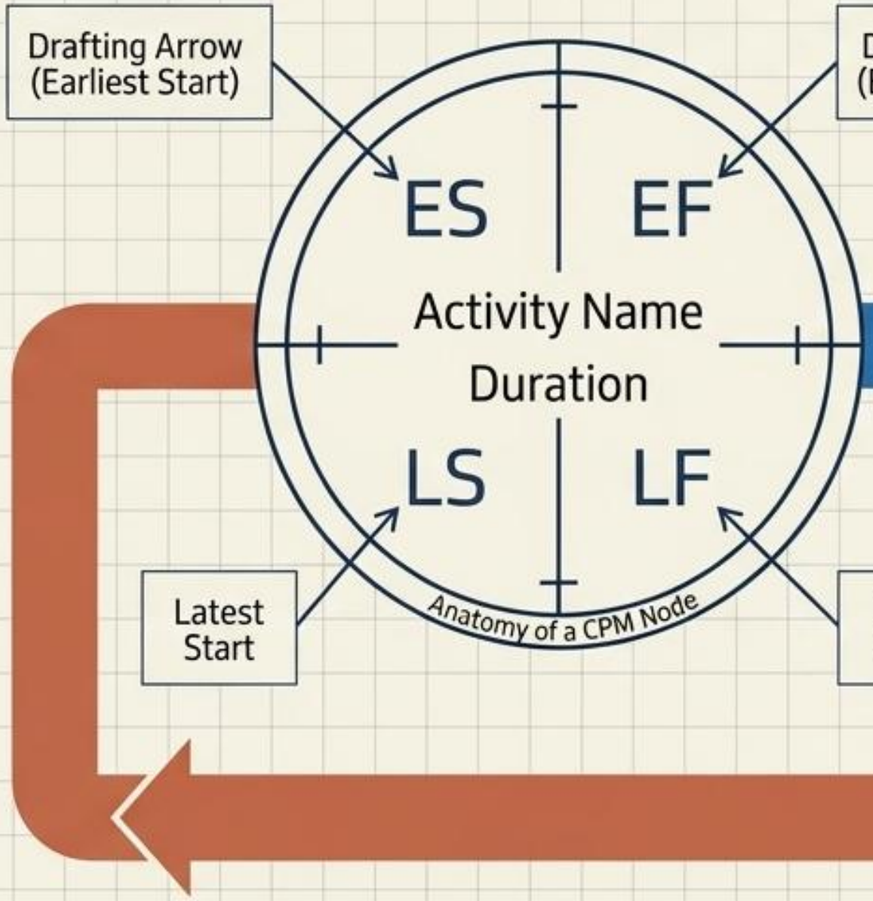
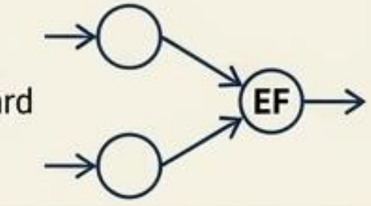
Step 5: Schedule Development – Anatomy & Algorithm



Forward Pass Logic
(Finding Earliest Times)

Formula: EF = ES + Duration.

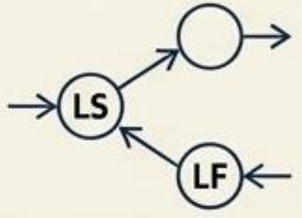
The Merge Rule:
When multiple paths converge, carry forward the HIGHEST EF to become the next ES.



Backward Pass Logic
(Finding Latest Times)

Formula: LS = LF - Duration.

The Burst Rule:
When moving backwards through converging paths, carry back the LOWEST LS to become the preceding LF.



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Step 5: Critical Path Analysis & Slack

Definition: Slack (Float) is the amount of time a task can be delayed without delaying the entire project.

The Formula:

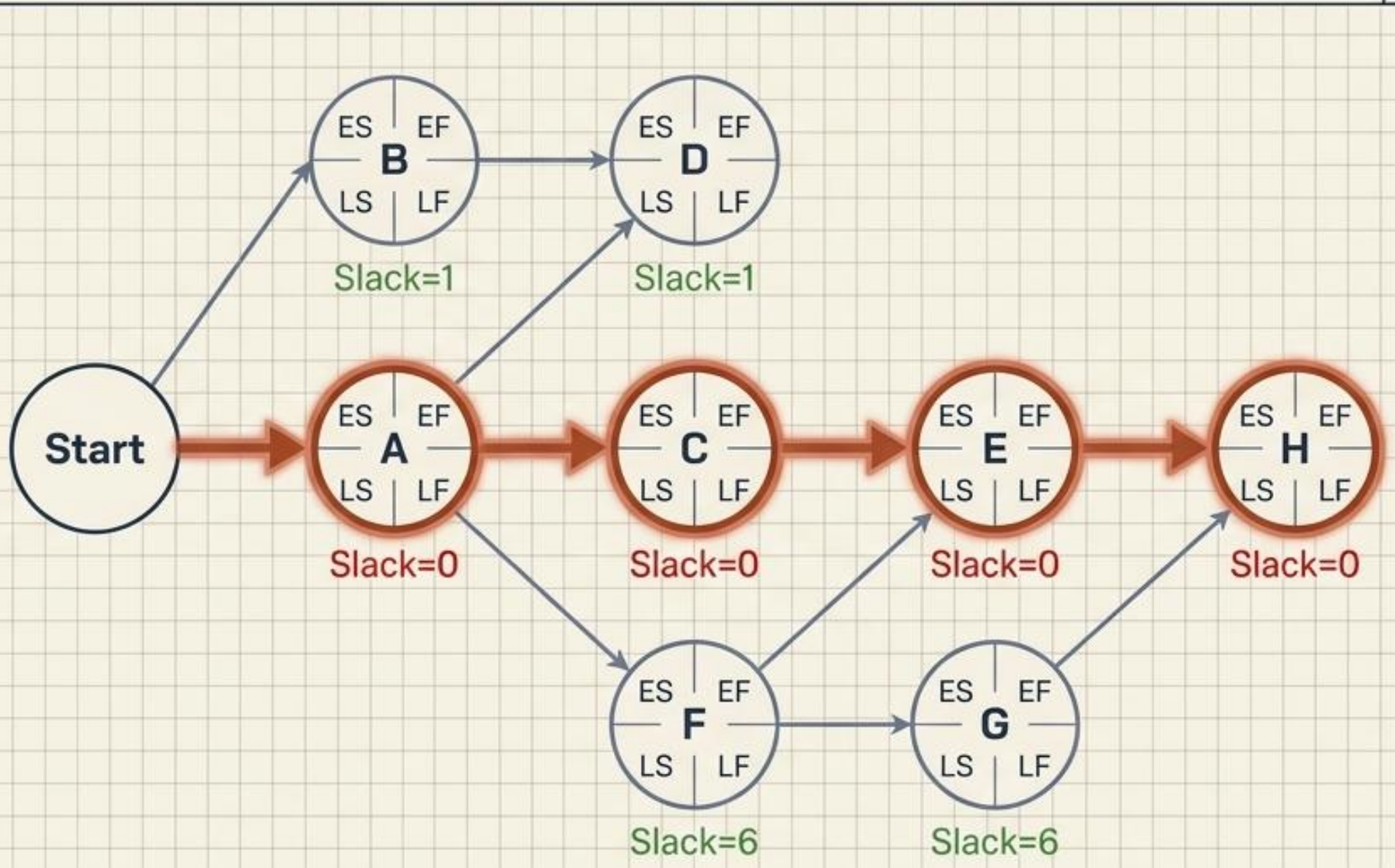
Slack = LS - ES (or LF - EF).

The Golden Rule:

Any activity where Slack = 0 is a Critical Activity.

Visual Callout:

The highlighted path (Start -> A -> C -> E -> H) has exactly 0 slack. This forms the Critical Path, dictating the absolute minimum project duration (15 weeks).



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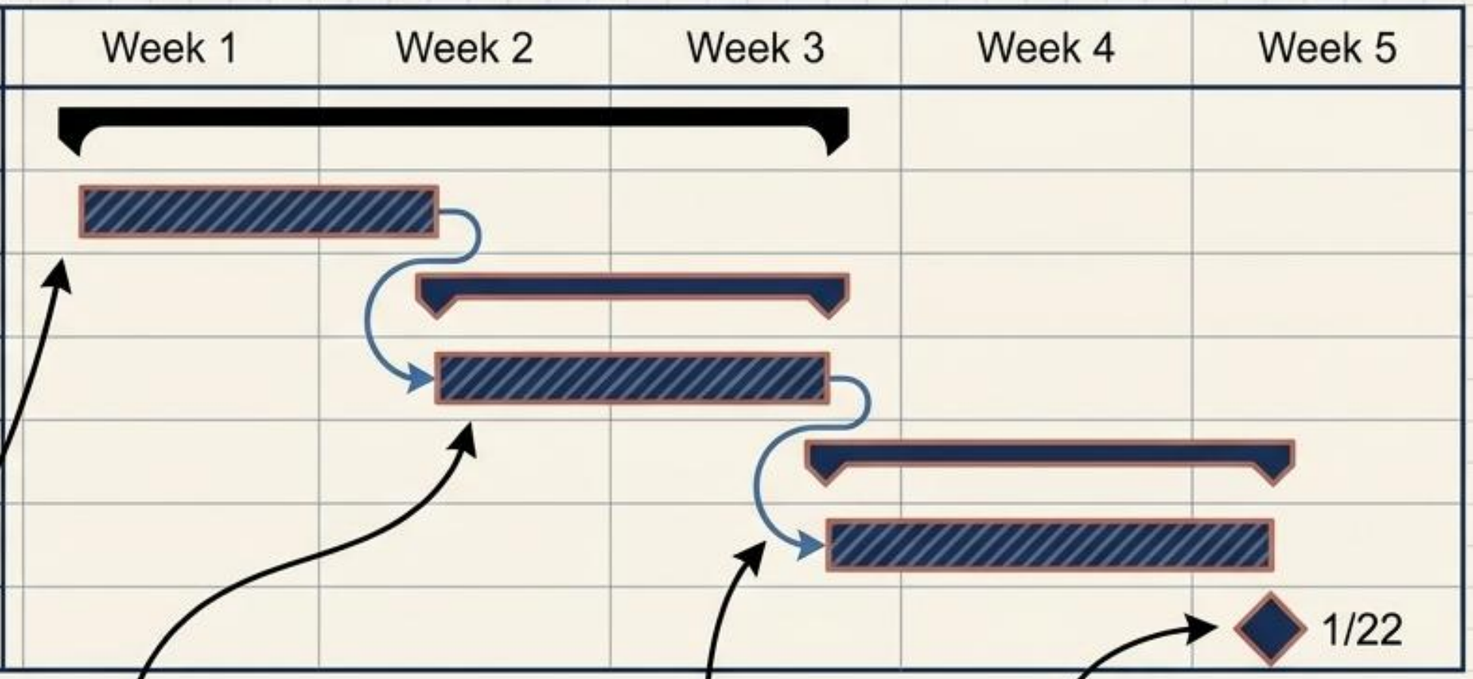
Step 5: The Gantt Chart – The Ultimate Communication Tool

Translating complex network mathematics into an accessible calendar interface.

WBS	Task Name
1.	**1. Scope**
1.1	Define boundaries
2.	**2. Analysis**
2.1	Process analysis
3.	**3. Design**
3.1	System design
3.2	UI design



1. **Summary Tasks (Brackets)**
   Shows the overarching timeline of grouped activities.
2. **Task Bars**
   The visual representation of an individual activity's duration.
3. **Dependencies (Arrows)**
   The physical Finish-to-Start (FS) links enforcing order.
4. **Milestones (Diamonds)**
   Critical zero-duration delivery checkpoints.

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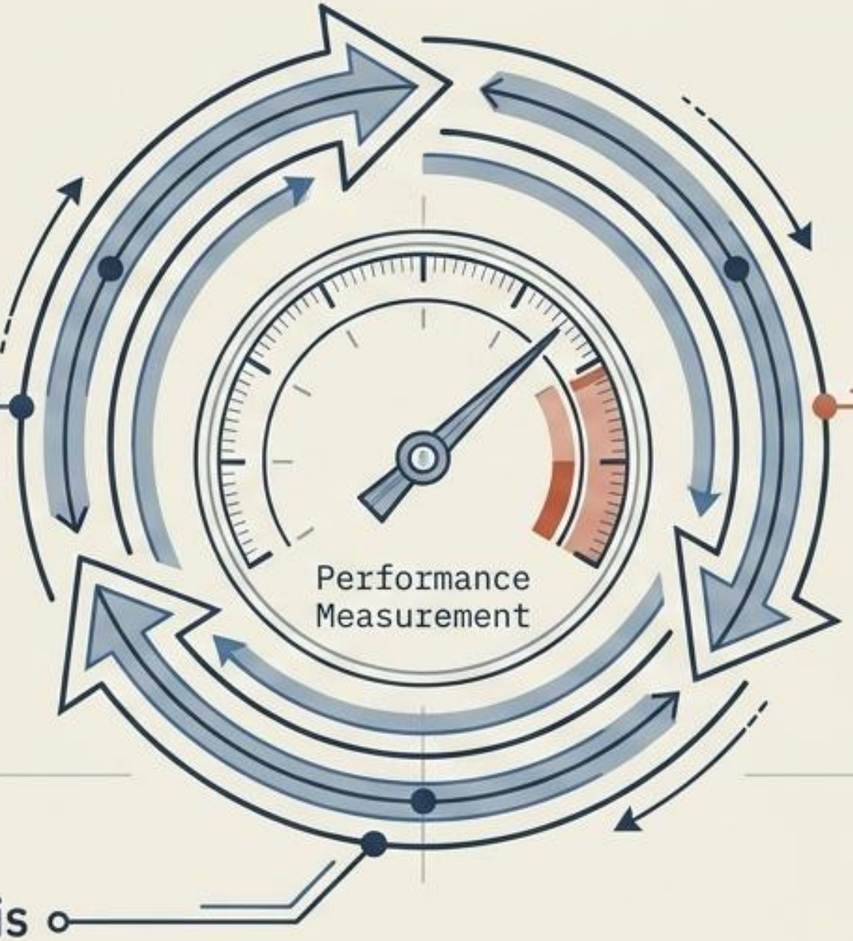
Step 6: Managing the Baseline – Schedule Control

Inputs:
Actual performance data and change requests enter the system.



Outputs:
Deploying corrective actions (crashing, fast-tracking) and updating the master schedule baseline to maintain delivery assurance.

Analysis
Measuring real-world deviations against the planned baseline, specifically assessing the impact on the Critical Path.

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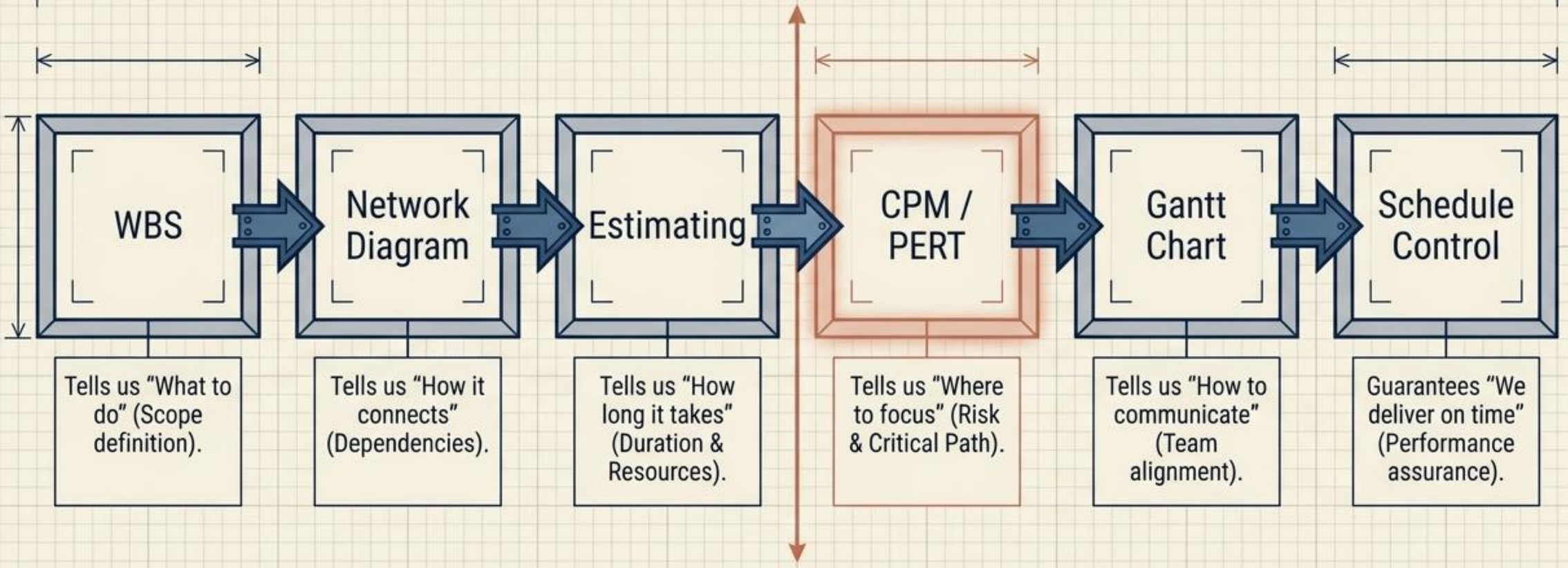
Synthesis: The Complete Integrated Architecture



Effective time management is the seamless integration of precise mathematics, continuous communication, and team adaptability.

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