IT Project Management

CIS 8000

Session 6: Schedule & Budget

How Do You Develop The Schedule and Budget For the Project?

"You Can't Manage Something that You Don't Know What It is!"

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Learning Objectives

Project Schedule Development Techniques

- Develop a GANTT chart.
- Develop a project network diagram using a technique called activity on the node (AON).
- Identify a project's critical path and explain why it must be controlled and managed.
- Develop a PERT diagram.
- Describe the concept of precedence diagramming and identify finish-to-start, start-to-start, finish-to-finish, and start-to-finish activity relationships.
- Describe the concept of critical chain project management (CCPM).

Cost Types

- Describe the various types of costs that make up the project's budget.

Baseline

- Define what is meant by the baseline project plan.

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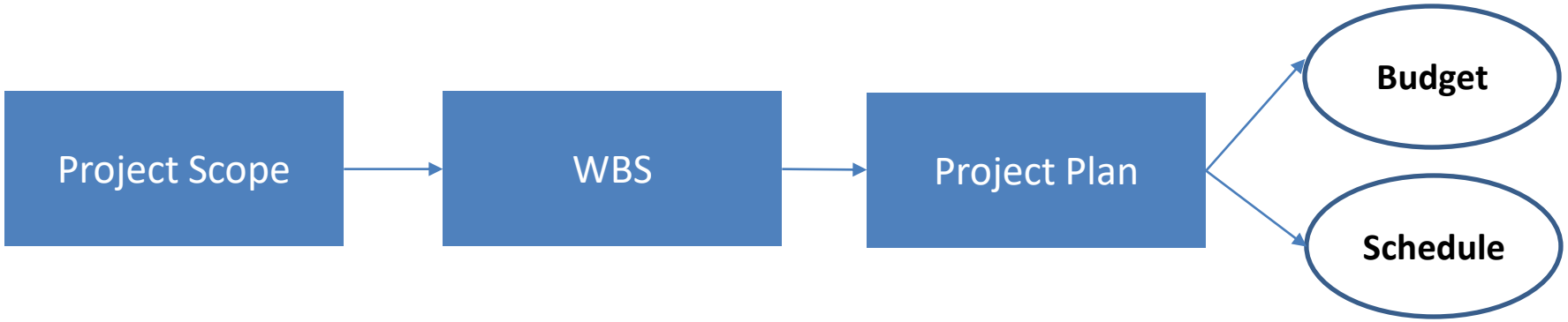
Work Breakdown Structure (WBS)

- The PMBOK® Guide states that the WBS represents a logical decomposition of the work to be performed and focuses on how the product, service, or result is naturally subdivided. It is an outline of what work is to be performed.



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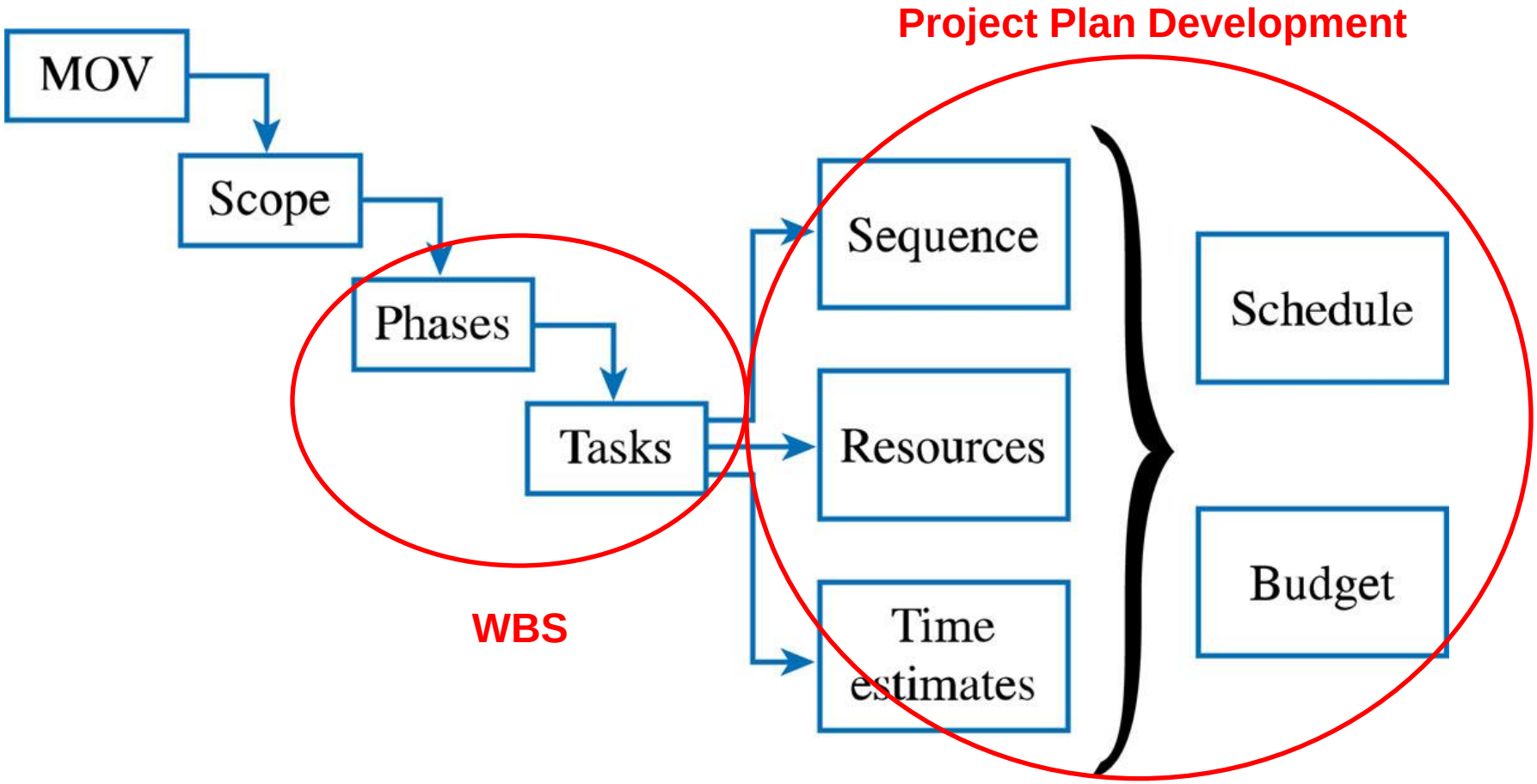
The Project Planning Framework



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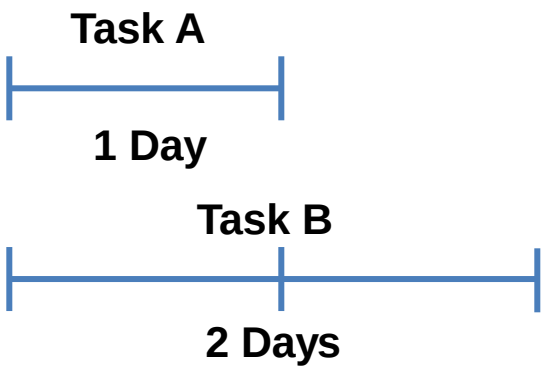
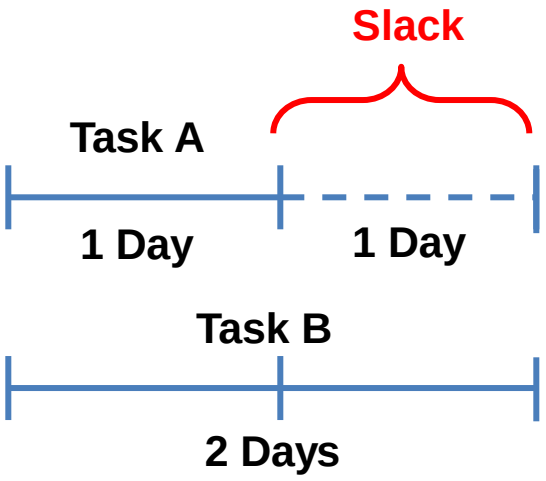
First Way of Doing This Project - Parallel



How Many Days Will It Take To Complete Project?

2 Days

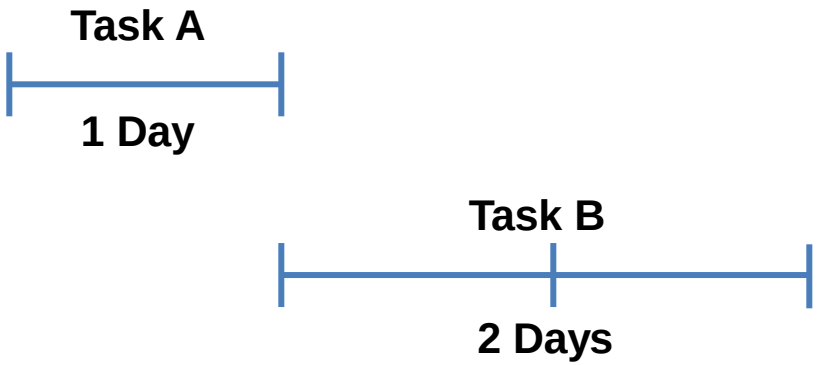


How Many Days Will It Take To Complete Project? 2 Days

What is the longest time to complete the project? 2 Days

What is the minimal amount of time to complete the project? 2 Days

Second Way of Doing This Project - Sequence



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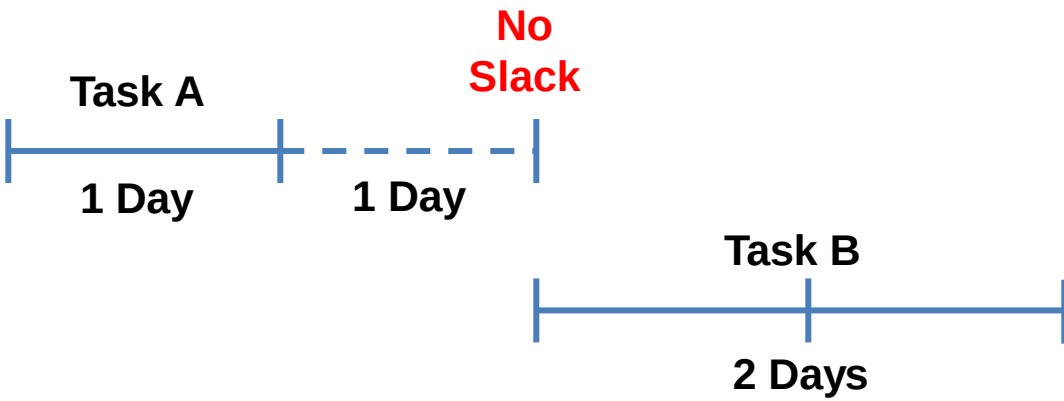
3 Days



How Many Days Will It Take To Complete Project? 4 Days

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What is the minimal amount of time to complete the project? 4 Days

Schedule and Budget Development

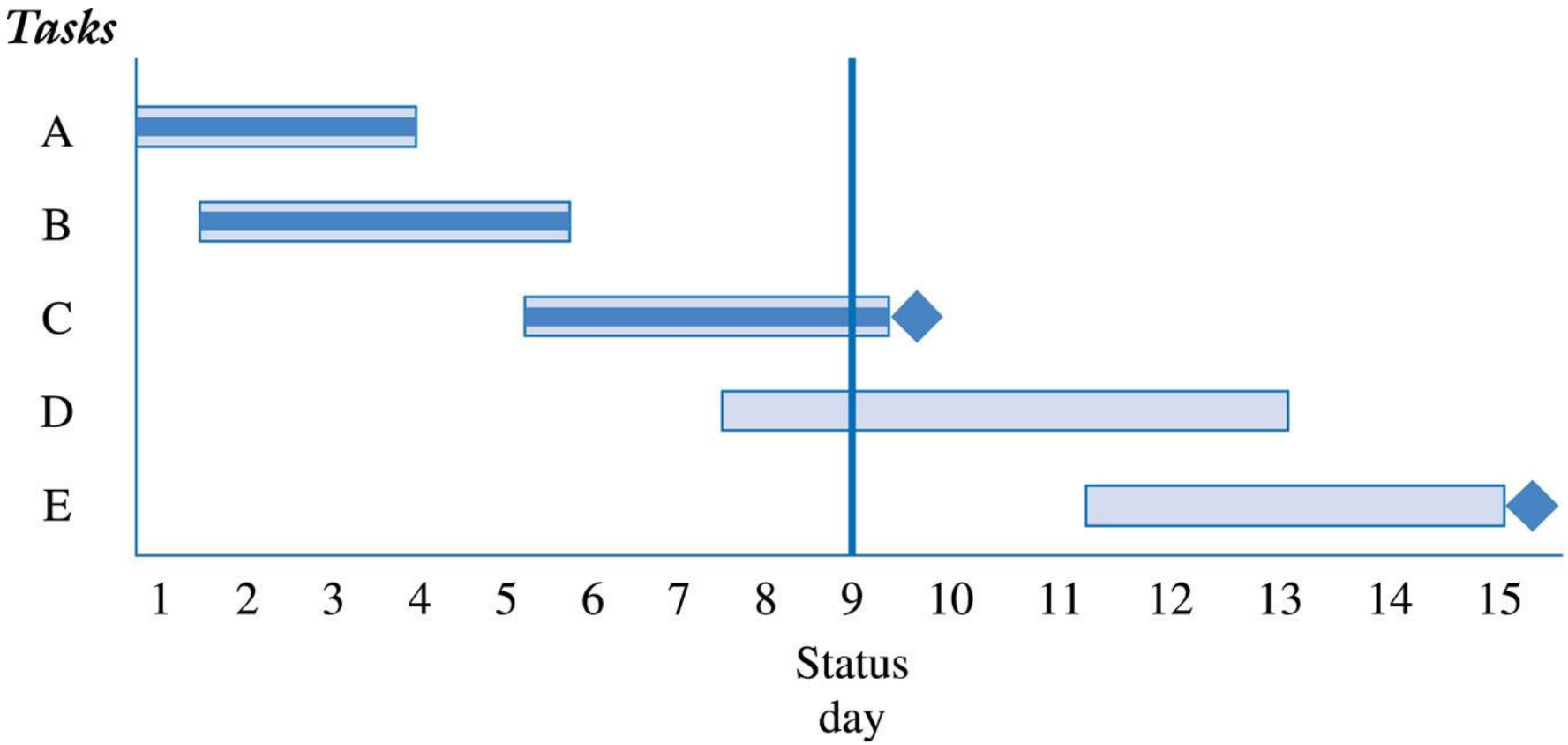
- WBS – Defines the phases, deliverables, tasks, milestones
- Duration Estimation – Considers –
  - Tasks
  - Resources (labor and support needed - facility, hardware, software, etc..)
- Project Networks – Supports Project Schedule Development
  - Identify Dependencies and Sequencing
  - Monitoring and Controlling
- Iterations may still be necessary
- The objective is to create a realistic project schedule and budget!

Components Needed To Develop Project Schedule and Budget

Developing the Project Schedule

- Project Management Tools
  - Gantt Charts
  - Project Network Diagrams
    - Activity on the Node (AON)
    - Critical Path Analysis
    - Program Evaluation and Review Technique (PERT)
    - Precedence Diagramming Method (PDM)
    - Critical Chain Project Management (CCPM)

Gantt Chart



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Activity Analysis for AON

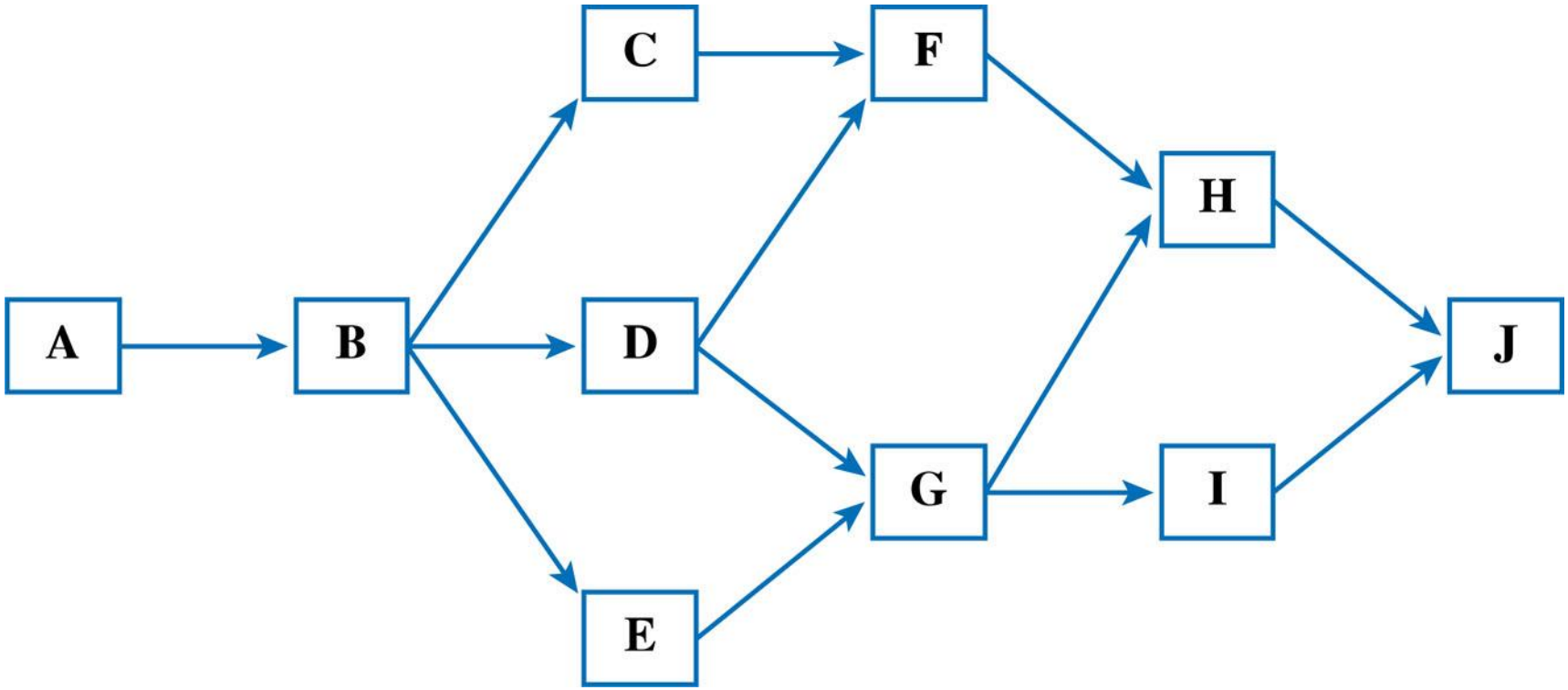
Example: Develop an intranet site

(Most Likely Scenario)

(What Task(s) Must Be Completed Before This Task Can Begin)

Activity	Description	Estimated Duration (Days)	Predecessor
A	Evaluate current technology platform	2	None
B	Define user requirements	5	A
C	Design Web page layouts	4	B
D	Set-up Server	3	B
E	Estimate Web traffic	1	B
F	Test Web pages and links	4	C,D
G	Move web pages to production environment	3	D,E
H	Write announcement of intranet for corp. newsletter	2	F,G
I	Train users	5	G
J	Write report to management	1	H,I

Activity on the Node (AON) Network Diagram



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Activity Analysis for AON

Example: Develop an intranet site *(Most Likely Scenario)*

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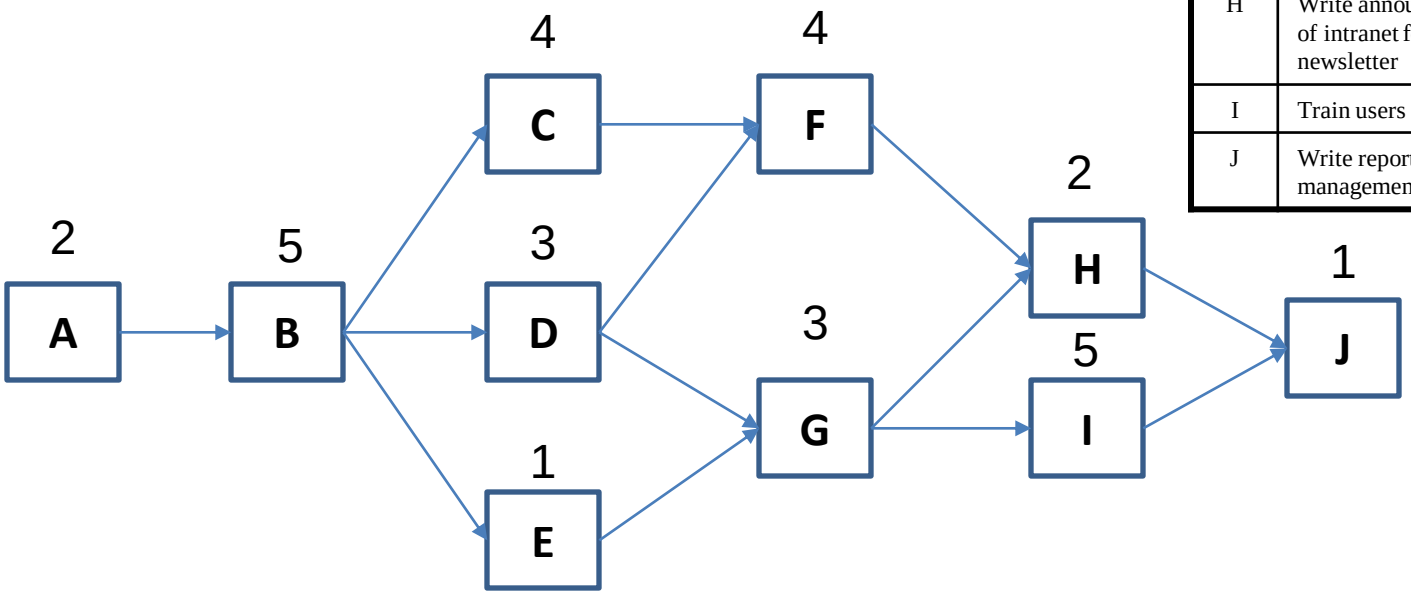

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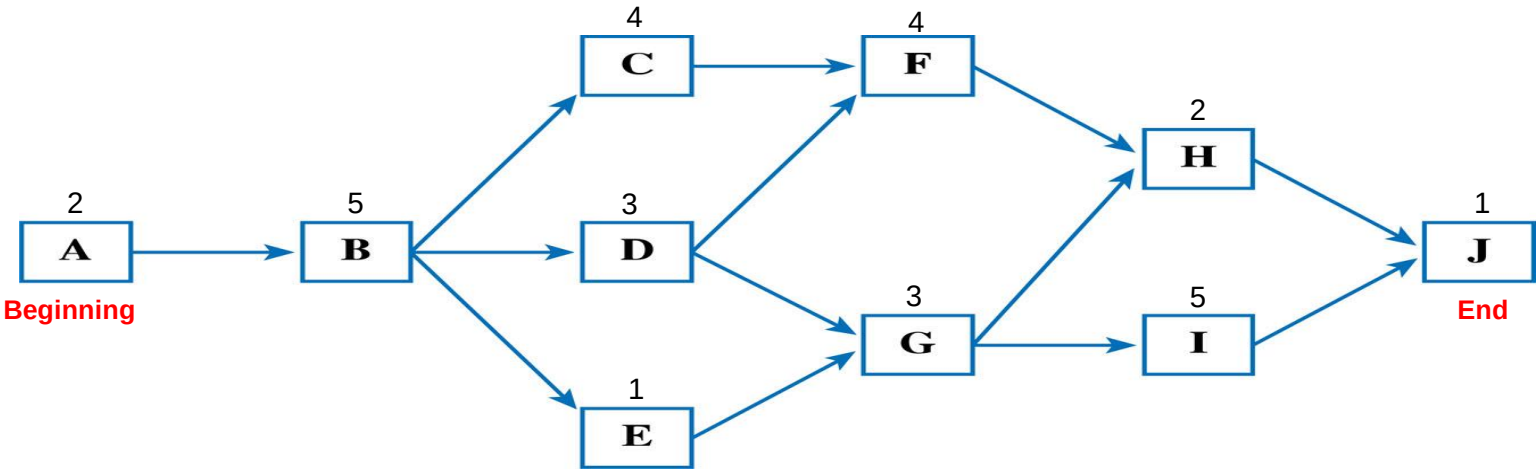
Activity on the Node (AON) Network Diagram



Path 1: A + B + C + F + H + J

Path 2: A + B + D + F + H + J

Path 3: A + B + D + G + H + J

Path 4: A + B + D + G + I + J

Path 5: A + B + E + G + I + J

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Possible Activity Paths

Possible Paths	Path	Total
Path 1	A+B+C+F+H+J	18
	2+5+4+4+2+1	
Path 2	A+B+D+F+H+J	17
	2+5+3+4+2+1	
Path 3	A+B+D+G+H+J	16
	2+5+3+3+2+1	
Path 4	A+B+D+G+I+J	19
	2+5+3+3+5+1	
Path 5	A+B+E+G+I+J	17
	2+5+1+3+5+1	

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What is a "Slack"?

PM – The amount of time that an activity can go beyond its estimated duration without impacting the overall project schedule.

What is Critical Path?

"The longest path in the project and the shortest time in which the project can be completed." (Zero Slack)

Possible Activity Paths

Possible Paths	Path	Total
Path 1	A+B+C+F+H+J	18
	2+5+4+4+2+1	
Path 2	A+B+D+F+H+J	17
	2+5+3+4+2+1	
Path 3	A+B+D+G+H+J	16
	2+5+3+3+2+1	
Path 4	A+B+D+G+I+J	19*
	2+5+3+3+5+1	
Path 5	A+B+E+G+I+J	17
	2+5+1+3+5+1	

* The Critical Path

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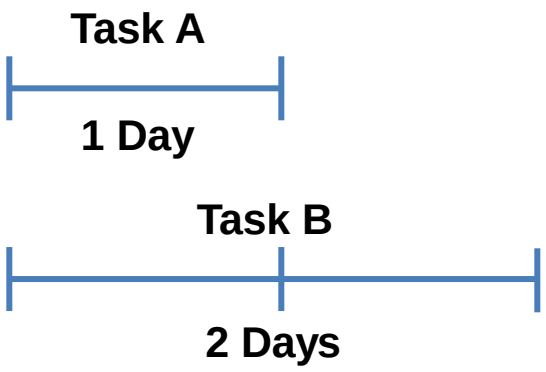
First Way of Doing This Project - Parallel



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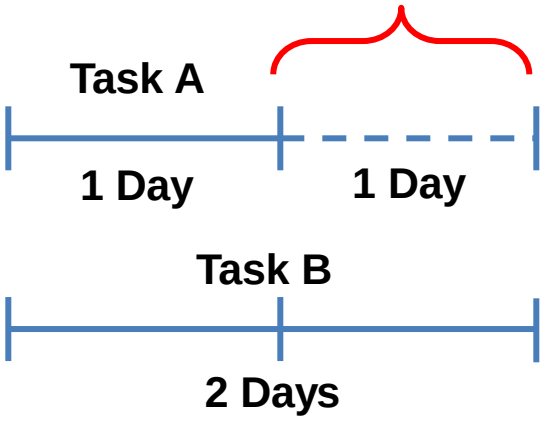
2 Days

Slack



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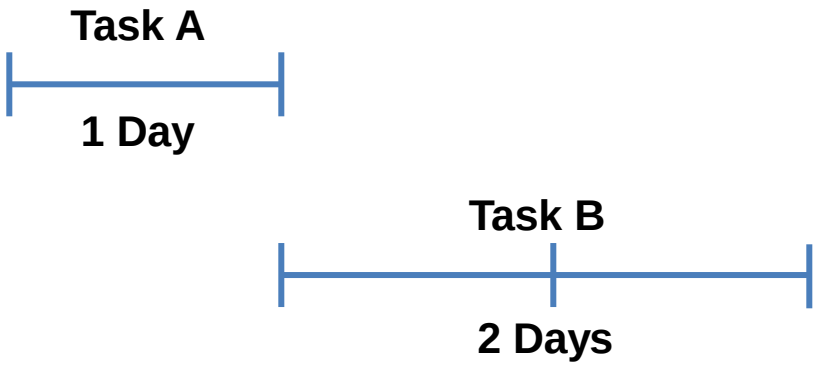
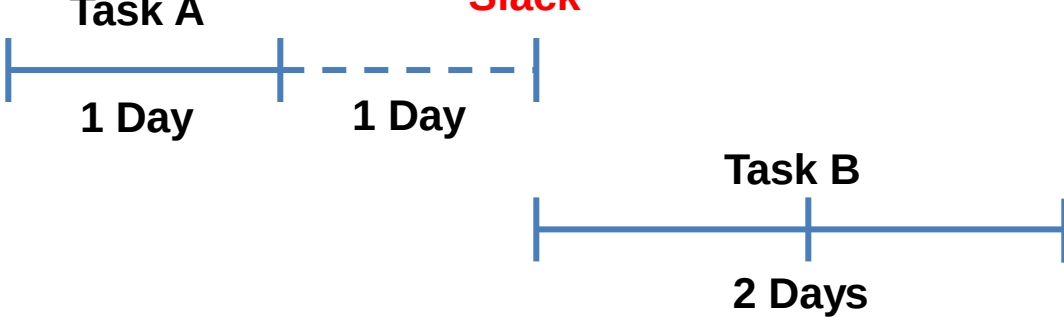
Second Way of Doing This Project - Sequence



How Many Days Will It Take To Complete Project?

3 Days

No Slack



How Many Days Will It Take To Complete Project? 4 Days

What is the longest time to complete the project? 4 Days

What is the minimal amount of time to complete the project? 4 Days

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Critical Path

- Longest path
- Shortest time project can be completed (without any slack or buffer)
  - Slack (or float)
    - The amount of time an activity can be delayed before it delays the project (for critical path, there is NO slack)
- Must be monitored and managed!
  - Project manager can expedite or crash by adding resources
  - Fast tracking – running activities in parallel which were originally planned as sequential
  - The CP can change
  - Can have multiple CPs

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Team Assignment 4 – AON & Critical Path (Complete in Class)

- 20 Minutes
- Use the AON table provided
- Develop the following: (2 Parts – Write on Paper)
  - Part 1 - AON Network Diagram
  - Part 2 –
    - Possible Activity Paths and Total Time Estimates for Each Path
    - Identify Critical Path and Duration
- Only List Team Members Present That Contributed To This Assignment
- Turn in assignment in Team Assignment 4 dropbox before midnight tonight.

PERT

- Uses Project Network Diagraming for visual of sequence & relationships.
- Well suited for developing simulations for sensitivity analysis for schedule planning and risk analysis
- Probabilistic estimates
  - Optimistic estimate – best case scenario
  - Most likely estimate – expected under normal circumstances
  - Pessimistic estimate – worst case scenario

Activity Estimate = $\frac{\text{Optimistic Time + (4 x Most Likely) + Pessimistic}}{6}$

Activity Analysis for PERT

AON

Activity	Predecessor	Optimistic Estimates (Days)	Most Likely Estimates (Days)	Pessimistic Estimates (Days)	Expected Duration $\frac{(a+4b+c)}{6}$
A	None	1	2	4	2.2
B	A	3	5	8	5.2
C	B	2	4	5	3.8
D	B	2	3	6	3.3
E	B	1	1	1	1.0
F	C,D	2	4	6	4.0
G	D,E	2	3	4	3.0
H	F,G	1	2	5	2.3
I	G	4	5	9	5.5
J	H,I	.5	1	3	1.3

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Activity Analysis for PERT

Activity Estimate = $\frac{\text{Optimistic Time + (4 x Most Likely) + Pessimistic}}{6}$

TASK A Estimate = (**1** + (4 x **2**) + **4**) / 6 = 2.2

TASK B Estimate = (**3** + (4 x **5**) + **8**) / 6 = 5.2

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Possible PERT Activity Paths

Possible Paths	Path	Total
Path 1	A+B+C+F+H+J	18.8
	2.2+5.2+3.8+4.0+2.3+1.3	
Path 2	A+B+D+F+H+J	18.3
	2.2+5.2+3.3+4.0+2.3+1.3	
Path 3	A+B+D+G+H+J	18.6
	2.2+5.2+3.3+3.0+2.3+1.3	
Path 4	A+B+D+G+I+J	20.5*
	2.2+5.2+3.3+3.0+5.5+1.3	
Path 5	A+B+E+G+I+J	18.2
	2.2+5.2+1.0+3.0+5.5+1.3	

* The Critical Path

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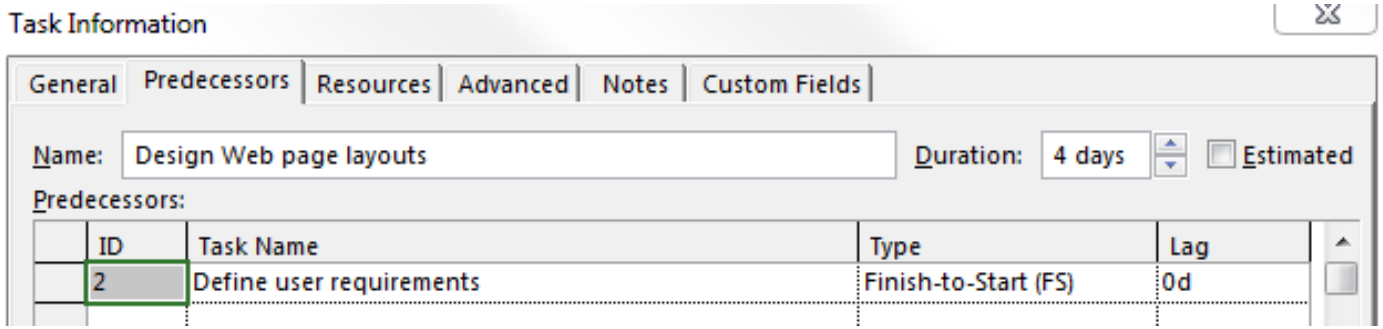
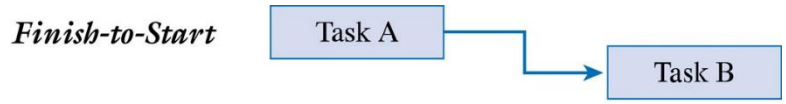
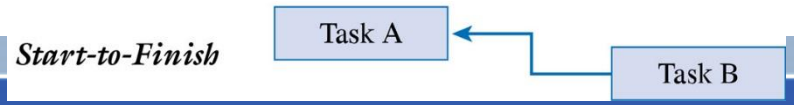
Precedence Diagram Method (PDM)



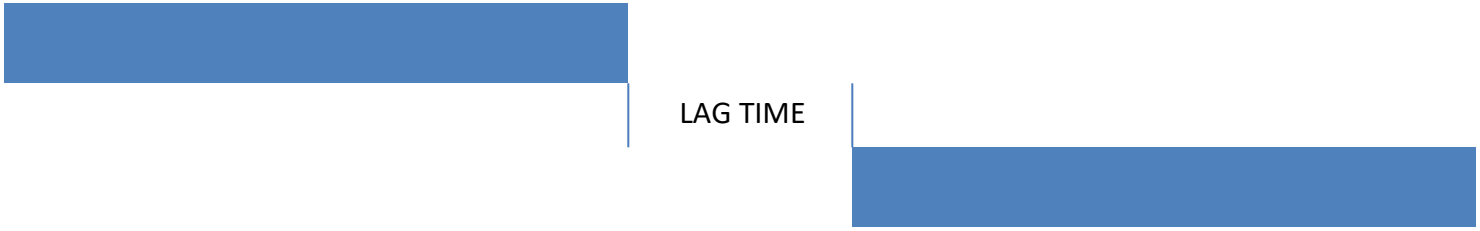




Lead and Lag times

- Lead is starting the next task before the first task is complete
  - Example: Begin installing the operating systems when half of the PCs are set up

- Lag (or negative lead) is the adding of a buffer of time before the next task begins
  - Example: Once the walls have been painted, wait one day before laying the carpet so that the walls have had a chance to dry



Critical Chain Project Management (CCPM)

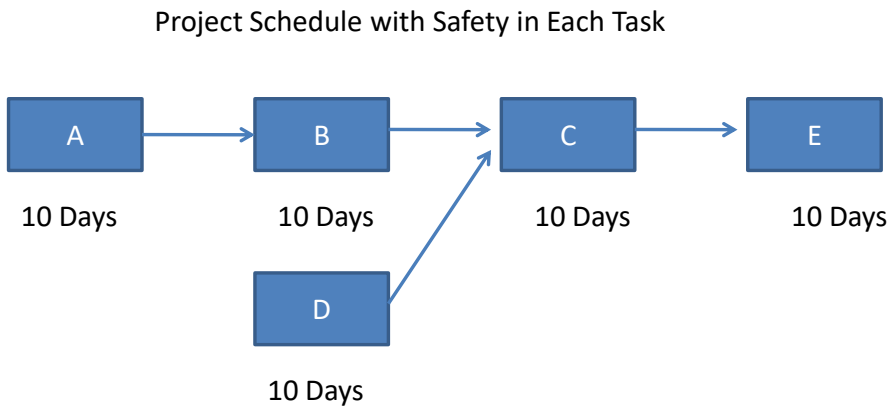
- *CCPM is based on the idea that people often inflate or add cushioning to their estimates to create a form of "safety"...*
  - *Your work is dependent upon the work of someone else*
  - *Previous experience where things did not go as planned*
  - *Project sponsor or customer may cut your project schedule or budget*

If build in safety, why would project could still be late?

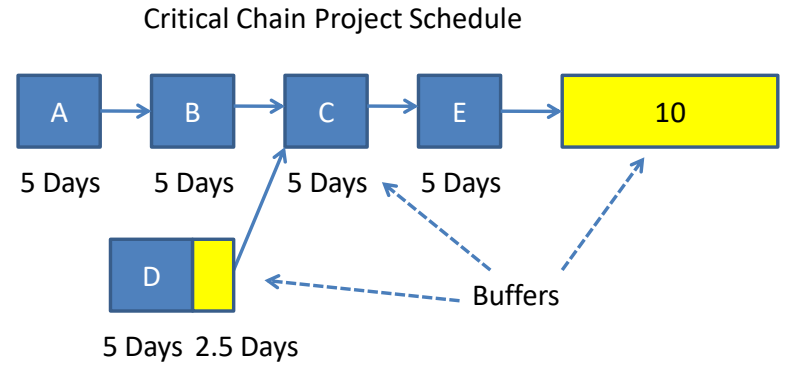
- Student's syndrome
- Parkinson's Law
- Resource Contention

CCPM

- Begin by asking each person or team working on a task to provide a time estimate that would have a 50% chance of being completed as scheduled



- Buffers instead of slack
  - End-of-Project buffer
  - Feeding buffer
  - Resource buffer



Critical Chain Project Management

- And the critical path are similar
  - The difference is the CCPM takes into account resource contention
- Takes a more project portfolio view
  - Other projects should be scheduled so that a resource can be dedicated to a particular task
- Requires that everyone understand that each project task has a 50% chance of being completed as scheduled, so about half of the tasks will be late.
  - This is the reason for having the project buffer.
  - Instead of tracking each task individually, we become more concerned with the project buffer –i.e., the project will be late only if it uses more than the allotted project buffer.
- Instead of penalties for being late, bonuses or other incentives for completing tasks early may be needed (e.g., fixing the I-85 bridge collapse)

Developing the Project Budget

1. Define what resources will be needed to perform the work
2. Determine the quantity of resources that are needed
3. Define the cost of using each resource
4. Calculate the cost of the task or activity
5. Ensure that the resources are leveled, that is, not over allocated. An example of over allocation is assigning a project team member to two tasks scheduled at the same time. (Resource Allocation or Resource Leveling)

Costs

- Direct Costs
  - The direct cost of labor (salary plus benefits) and other resources
- Indirect Costs
  - Rent, utilities, insurance, administrative costs, etc…
- Sunk Costs
  - Costs incurred prior to the project, such as a project that has been restarted after a failed attempt
- Learning Curve
  - Often have to "Build one and throw it away" to understand a problem or a new technology
- Prorated Costs
  - The idea that there is a cost associated with using a resource
- Reserves
  - Contingency funds to be used at the discretion of the project manager

Finalizing the Project Schedule and Budget

- The project schedule and budget may require several iterations before it is acceptable to the sponsor, the project manager, and the project team.
- ***Resource Allocation*** – PM reviews project to make sure resources are properly allocated – leveled – not over allocated
- Once the project schedule and project plan are accepted, the project plan becomes the ***baseline plan***.
- Once accepted, the project manager and project team have the authority to execute or carry out the plan and can have a ***Kickoff Meeting***.