

PROJECT MANAGEMENT

Implementation Planning

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Why Project Management

- To accomplish
 - Unique outcomes
 - With limited resources
 - Under time constraints
- Examples:
 - Advertising campaigns
 - Event management
 - Construction projects
 - Even a family's annual vacation

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History

- The United States Polaris missile programme
 - Time was the focus
 - Program Evaluation and Review Technique (PERT)
- U.S. Chemical firm of Du Pont
 - Money was the focus
 - Critical Path Method (CPM)
- Network Techniques – Time + Money

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Agenda

- Implementation planning – Case: Plastics Inc.
 - Activities, Events, and Predecessor Relationship, Network Development
- Time Analysis
 - Identifying Critical Path and Managing Time
- Managing Time Uncertainty (PERT)
- Resource Analysis
 - Identification of Critical Resources, Resource Profile, Resource Leveling

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Content

- MS Project
 - Hands-on with MS Project
 - Fund Analysis: Managing Overhead Costs, Indirect Costs, Managing Cash Flows
- Time Cost trade-off
 - Optimal Project Duration, Managing Time Slippages, Crashing the Network
- Critical Chain

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Implementation Planning - Activity

- Project – sub-project – sub-sub-project ...
- Building a House:
 - Site preparation
 - Masonry Work
 - Electrical Work
 - Carpentry
 - Plumbing
 - Finishing
- The smallest work component is called activity

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What is a Project

- **Project**: A set of interrelated activities that are performed in an order, requiring some resources
 - When all activities are completed, the project is done
- **Project Management**: planning, scheduling, and controlling the activities of the project meeting the constraints

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Network Analysis

- Activity Listing
- Sequencing (Network Logic)
- Estimation of Time
- Time Analysis
- Resource Analysis
- Funds Analysis
- Monitoring and Information System
- Updating and Monitoring


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Components

- **Activity:** A time consumable Task; consumes resources; directed arc; length need not be proportional to duration
- Example
 - Procure Material
 - Arrange for Labour
 - Equipment Installation
- Represented by 

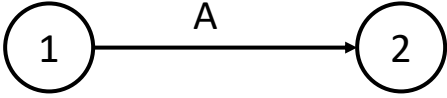
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Components

- **Event:** specific point in time indicating Beginning or Ending of one or more activities
- Do not consume Time
- Do not consume Resources
- Represented by 

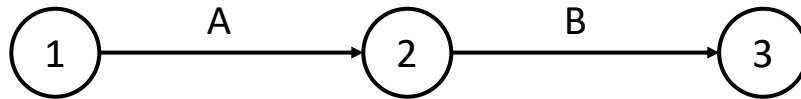
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Network Models



- Activities originating from a certain event cannot start until all the activities terminating at the same event have been completed
- An event shows the logical relationship between activities

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Network Models

- A and B are concurrent activities; C depends on A; D depends on both A and B

Activity	<u>IP</u>
A	-
B	-
C	A
D	A, B

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Network Models

- A, B, and E are concurrent activities; C depends on A; D depends on both A and B; F depends on A, B, and E

Activity	IP
A	-
B	-
C	A
D	A, B
E	-
F	A, B, E

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Network Models

- A, B, and E are concurrent activities; C depends on A; D depends on both A and B; F depends on B, and E

Activity	IP
A	-
B	-
C	A
D	A, B
E	-
F	B, E

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Network Models

- Dummy Activity: to maintain the logical relationship, and do not consume any resources
- Predecessor Activity: must be completed immediately before the start of another activity
- Successor Activity: cannot be started until one or more of other activities are completed, but immediately succeed them
- Concurrent Activity: can be accomplished simultaneously

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Network Models

RULES

- Each activity is represented by one and only one arrow i.e. no single activity can be represented twice in the network
- Flow of the diagram should be from left to right
- No two activities can have the same head and tail events – dummies can be used
- Dangling, looping, redundancy

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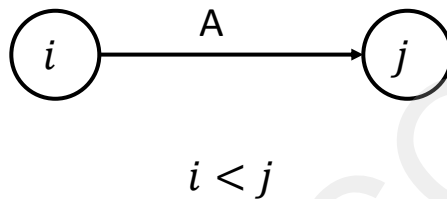
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Network Models

Fulkerson's Rule – Numbering Nodes

- For an activity, the ending event must have higher number compared to the starting event



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Activity listing and network logic

Activity Name	Activity Description	IP
A	Prepare Project Report	-
B	Clear Plans	A
C	Arrange own finance	A
D	Arrange loan finance	B
E	Get an industrial shed	B
F	Order and receive equipment	C, D
G	Estimate power and utilities required	A
H	Obtain water and power sanction	G
I	Arrange for raw material	C, D
J	Erect substation	H
K	Prepare for installation	E, C, D
L	Install equipment	K, F
M	Recruit personnel	C, D
N	Train personnel	M
O	Test run	I, J, L, N

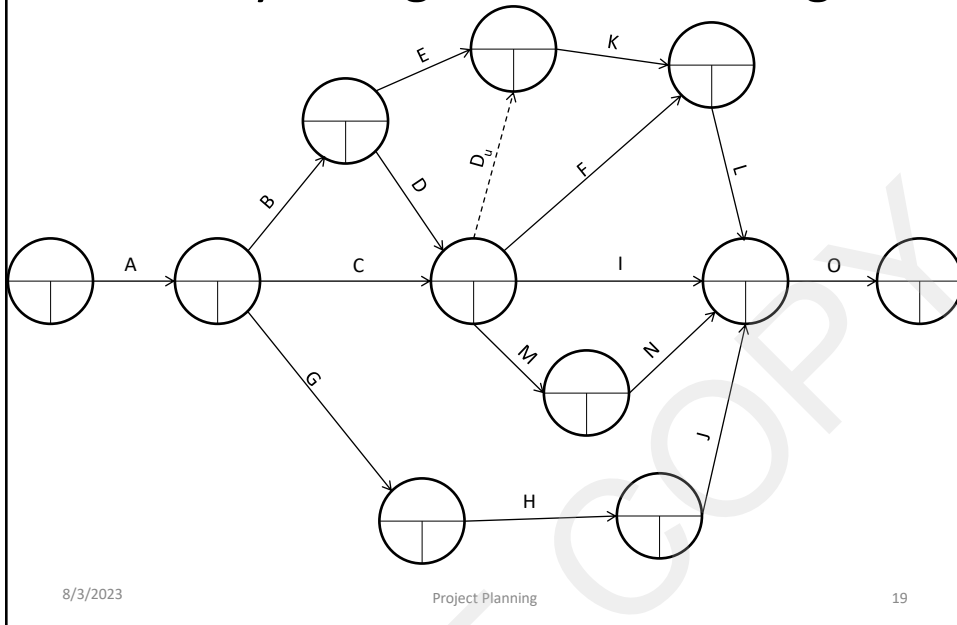
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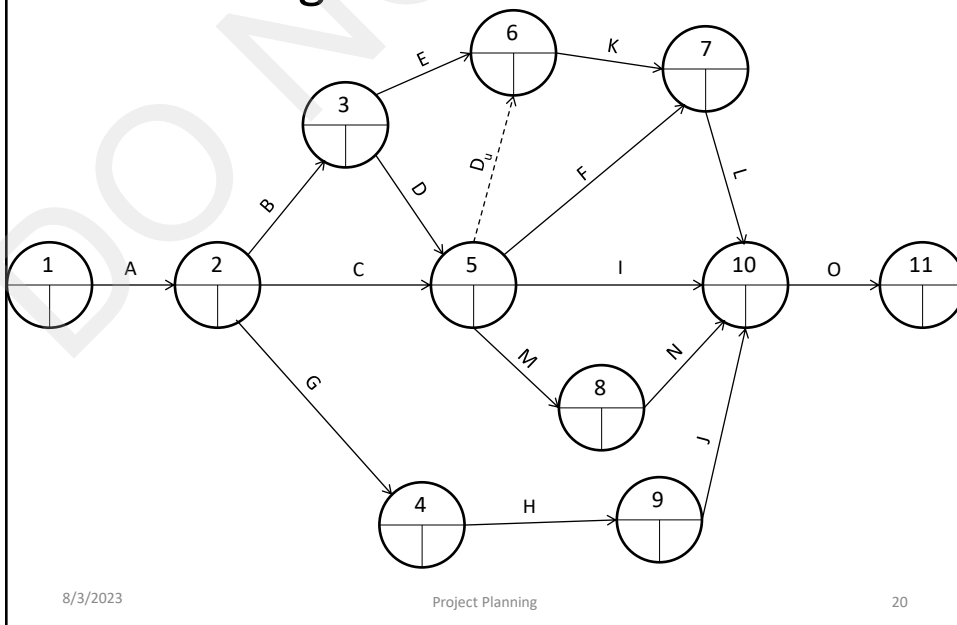
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Activity listing and network logic

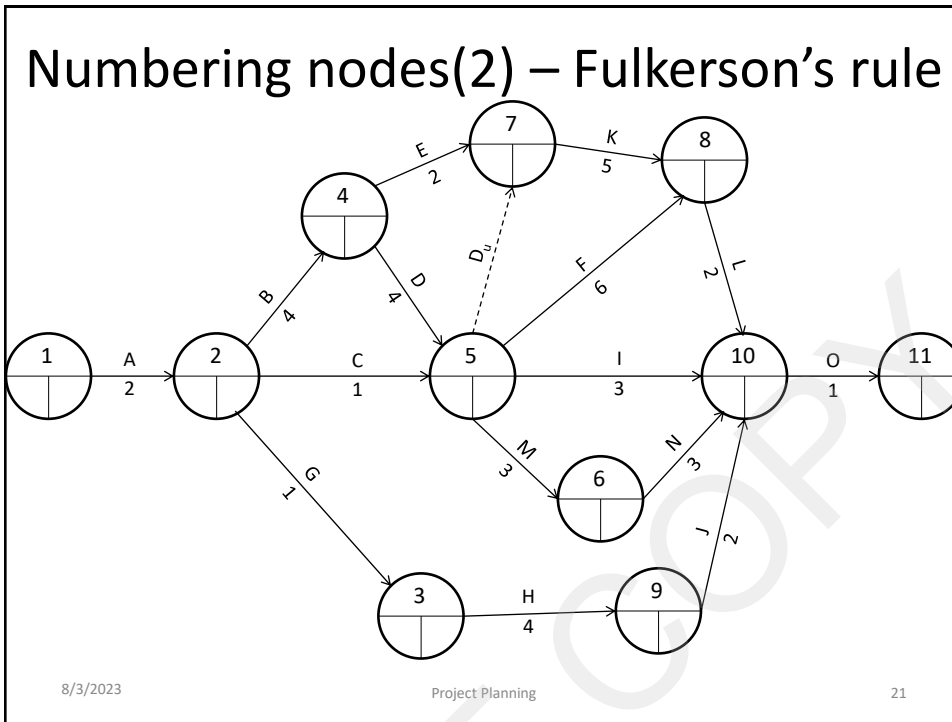


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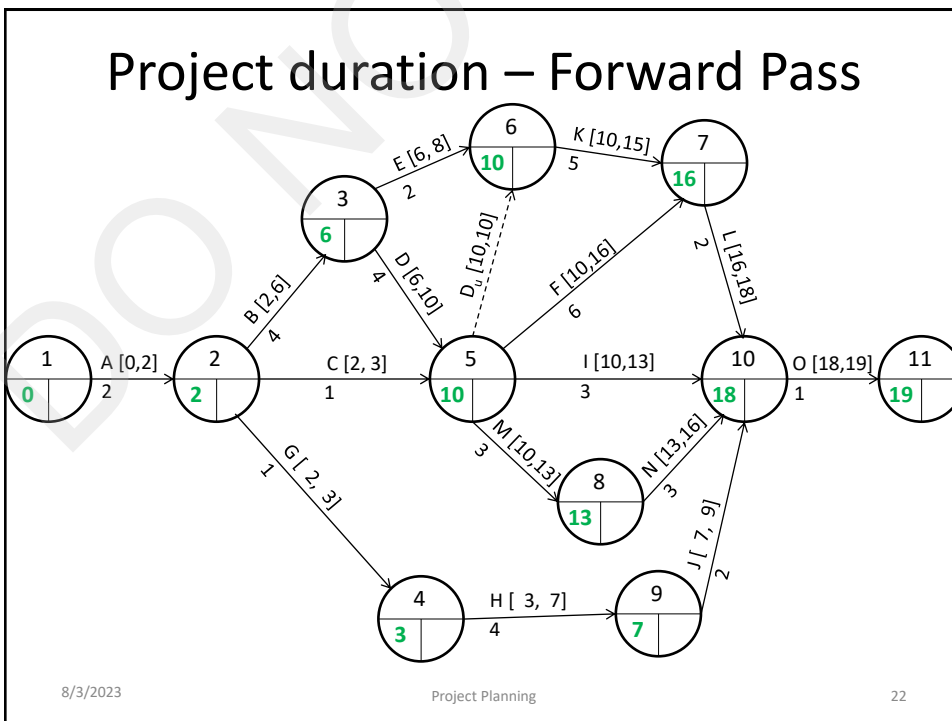
Numbering nodes – Fulkerson's rule



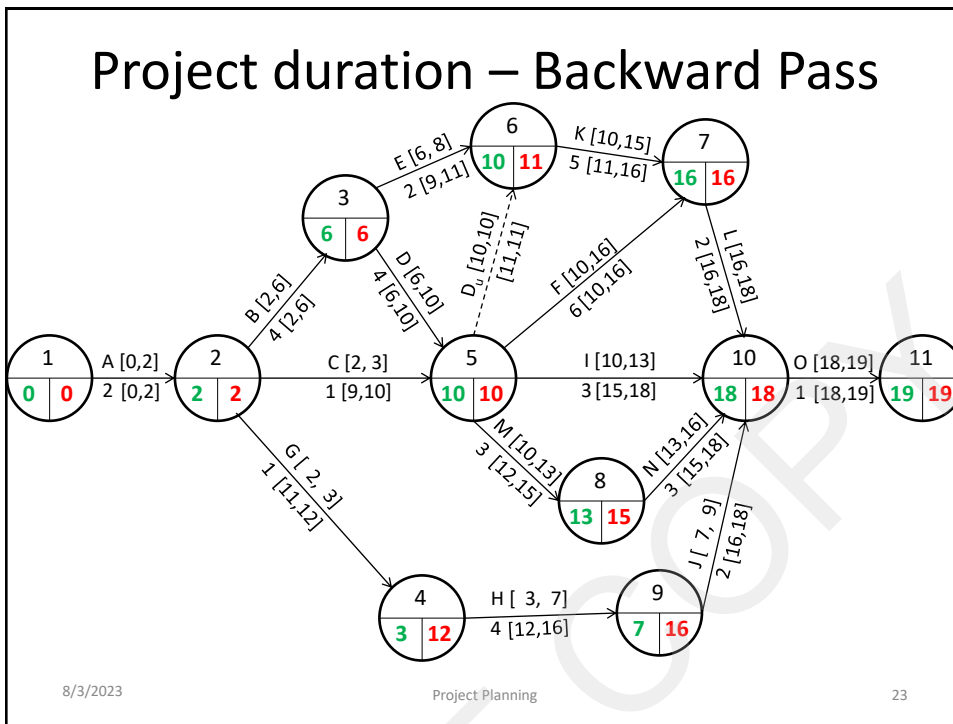
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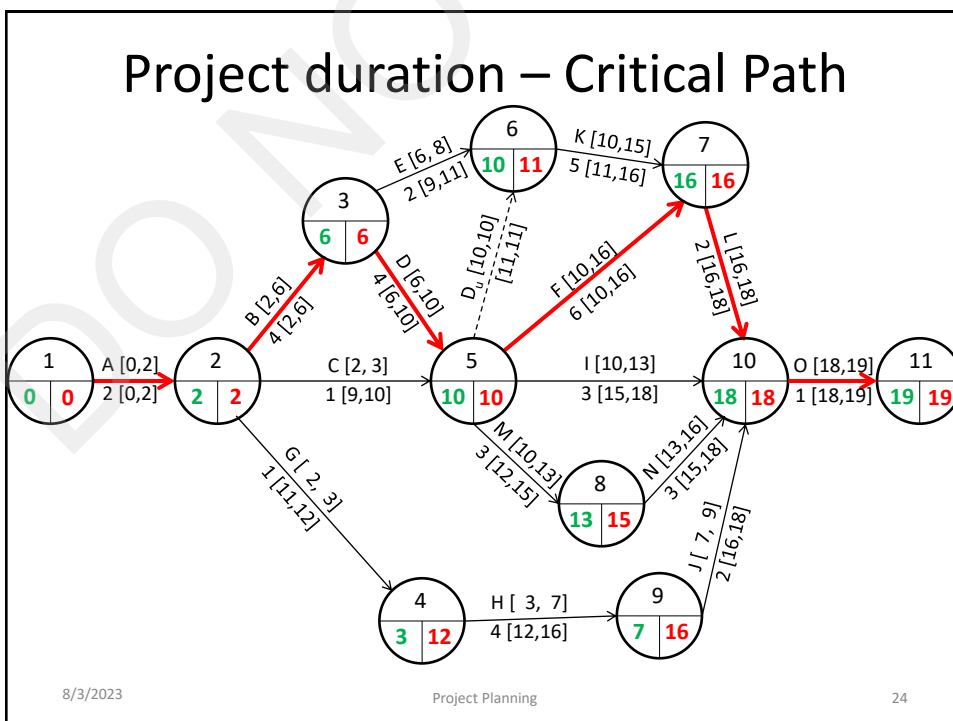
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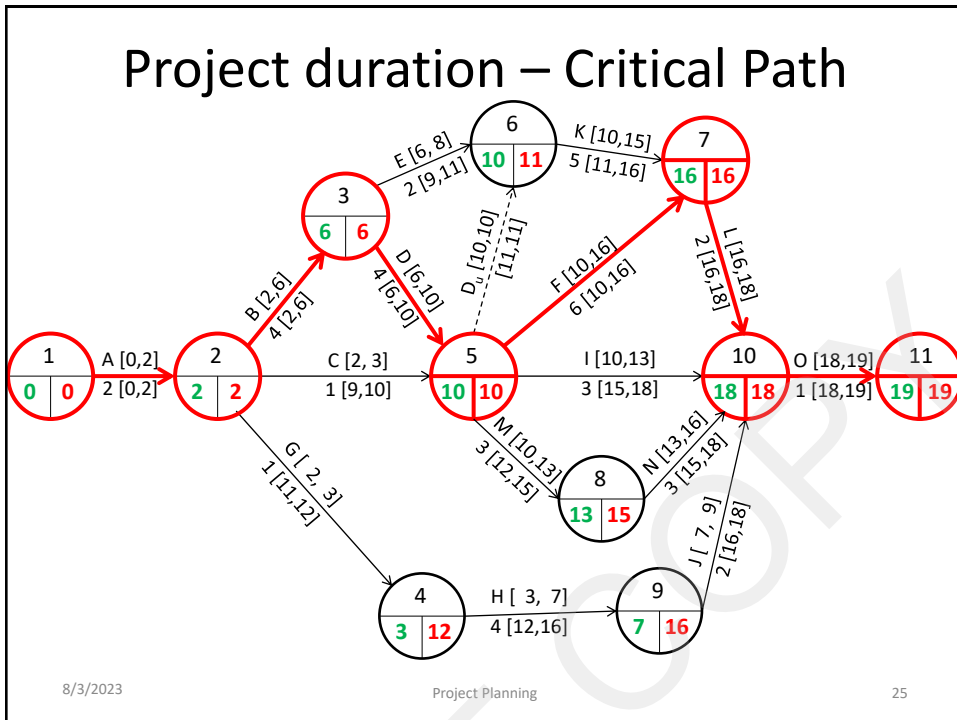
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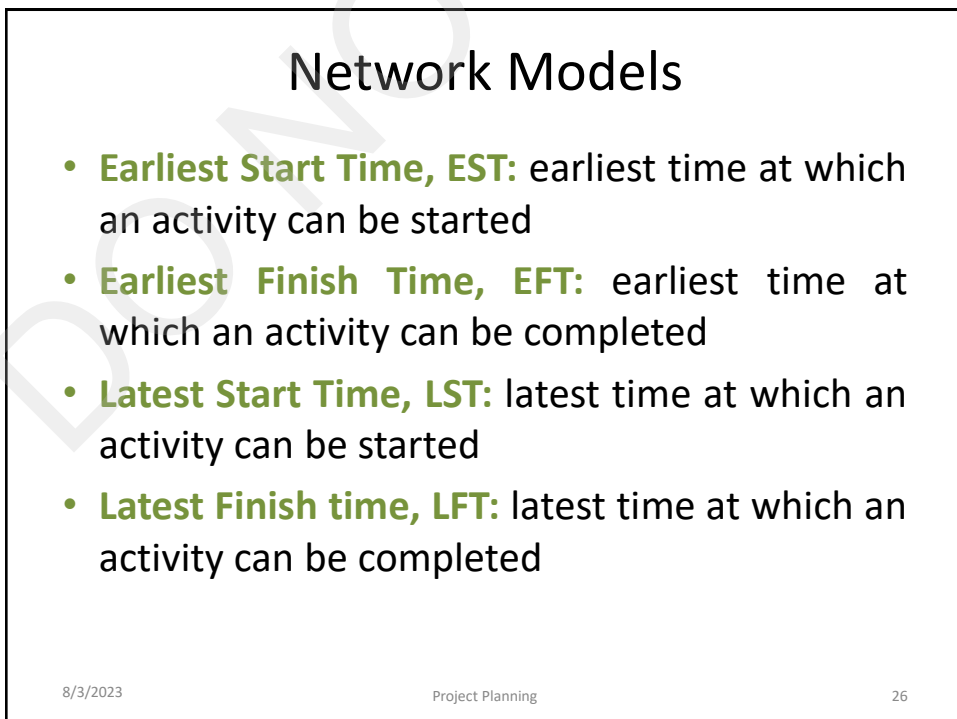
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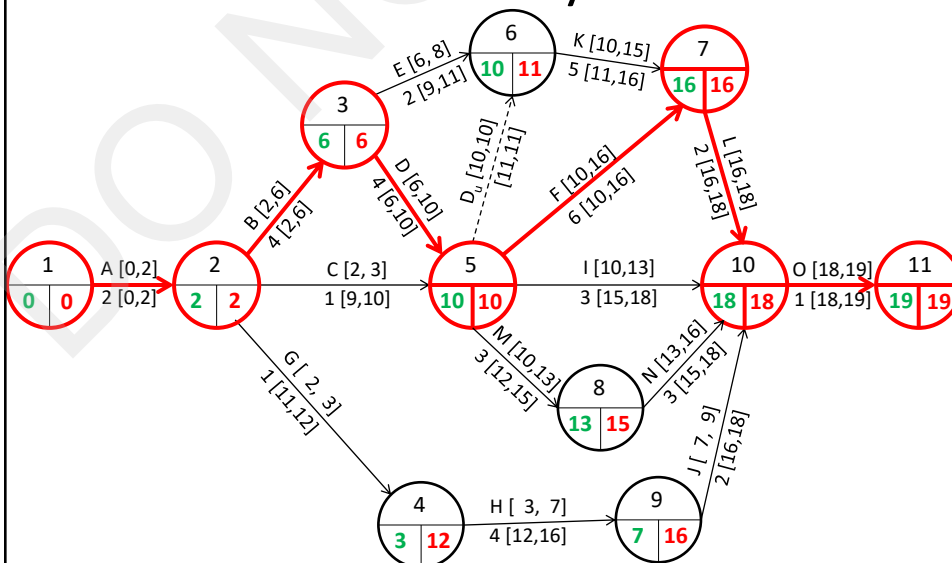
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Network Models

- Critical Path: the longest path in terms of time
- All activities on the critical path are critical activities, other activities are non-critical
- Delaying any critical activity, delays the entire project

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Time Analysis



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Slack

My Activity		
Predecessor	Successor	Slack
Early	Late	Total Slack

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Slack

My Activity		
Predecessor	Successor	Slack
Early	Late	Total Slack
Early	Early	Free Slack

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Slack

$E(i) = \max_i \{EFT(-, i)\} = EST(i, -)$
 $L(i) = \min_i \{LST(i, -)\} = LFT(-, i)$
 $E(j) = \max_j \{EFT(-, j)\} = EST(j, -)$
 $L(j) = \min_j \{LST(j, -)\} = LFT(-, j)$

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Total Slack

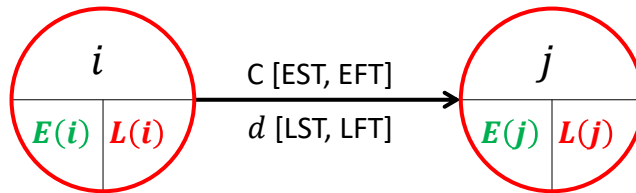
- Amount of time by which an activity can be delayed beyond the EST without affecting the project duration

$$TS = LST - EST = LFT - EFT = L(j) - EFT$$

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Free Slack



- Amount of time by which an activity can be delayed beyond the EST without affecting the earliest start of succeeding activities

$$FS = E(j) - EFT$$

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Slack

My Activity		
Predecessor	Successor	Slack
Early	Late	Total Slack
Early	Early	Free Slack
Late	Early	Independent
Late	Late	Critical

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Time Analysis

- Critical activities – 75% monitoring time
- Sub-critical activities – 20%
- Other activities – 5%

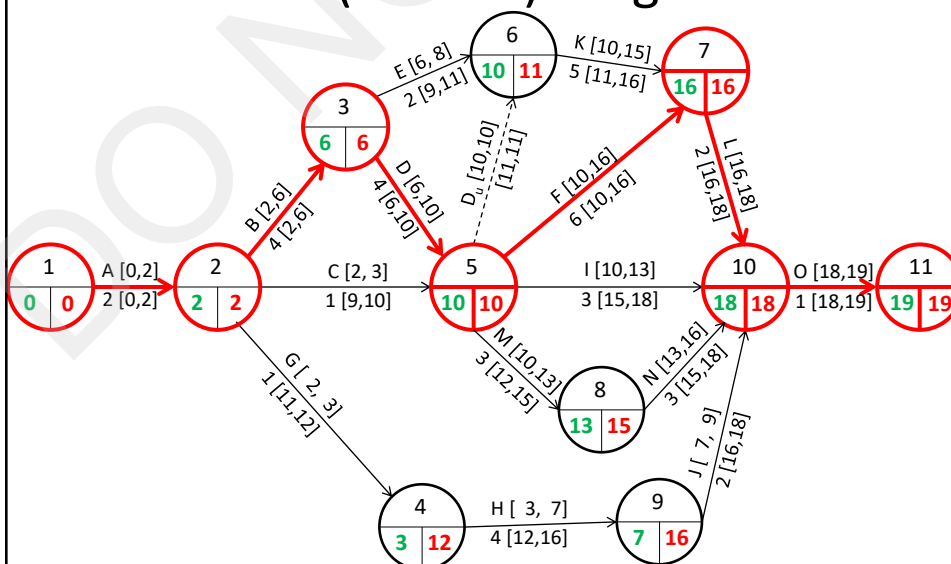
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EON (or AOA) Diagram

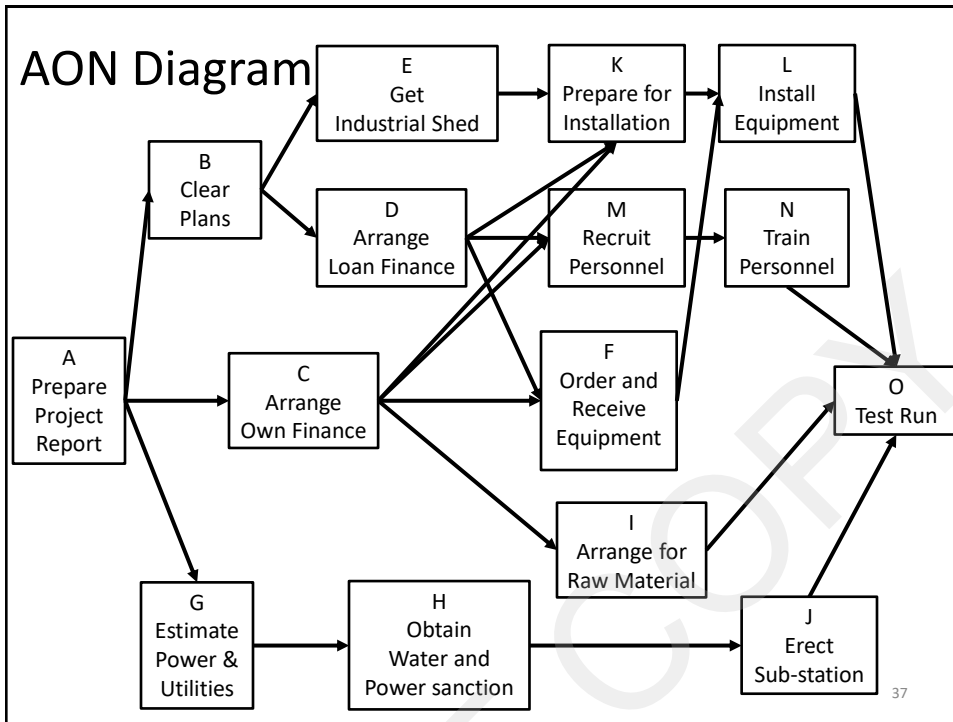


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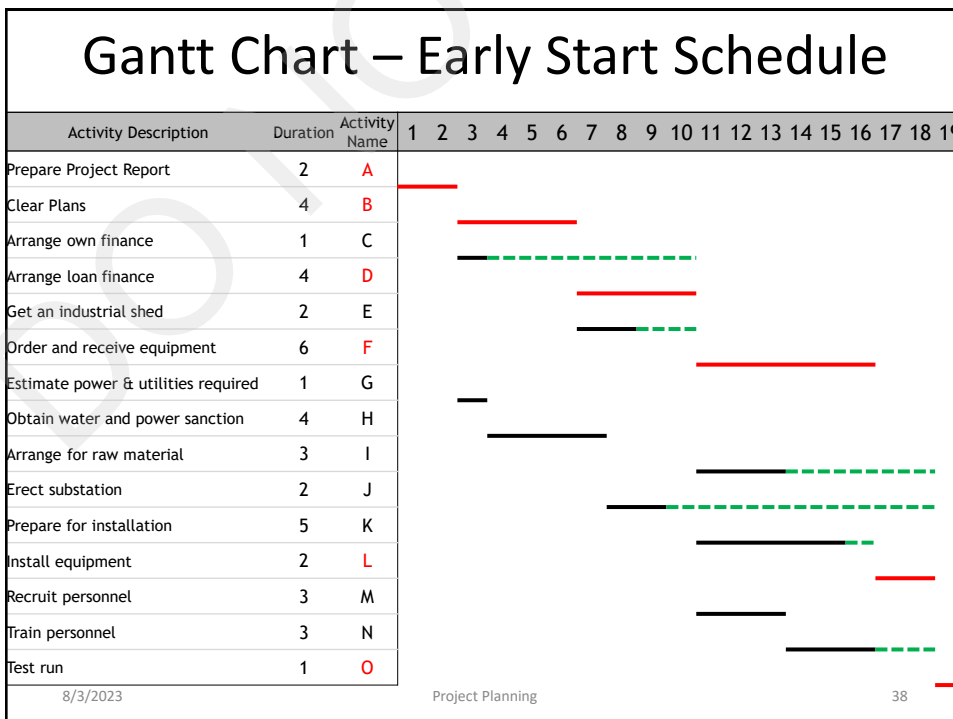
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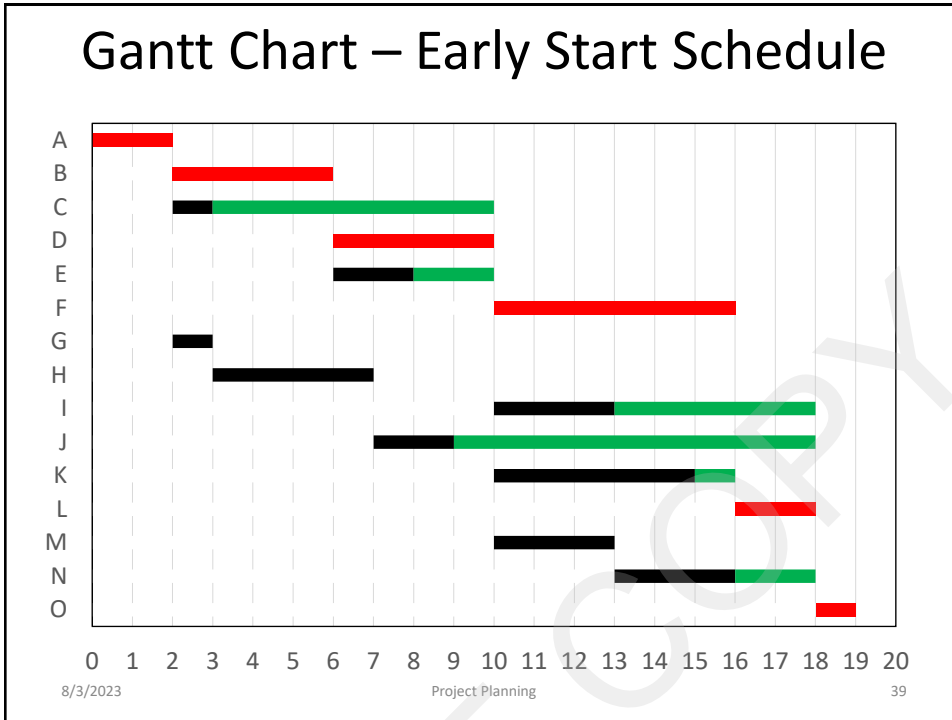


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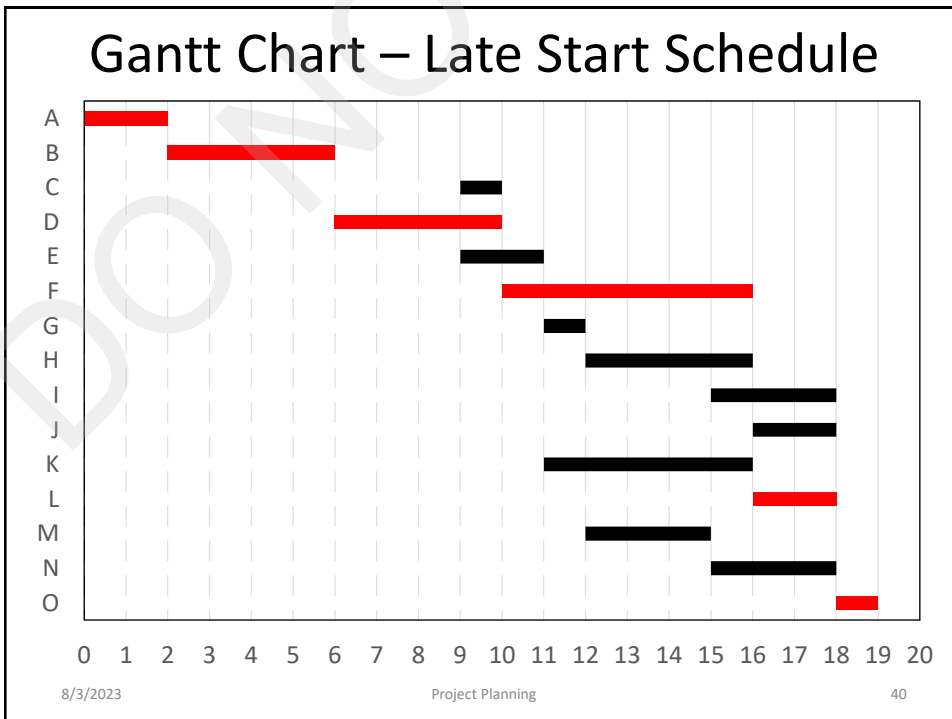
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Gantt Chart – Early Start Schedule



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Gantt Chart – Late Start Schedule



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Laddering and Lags

- Laddering is a **technique where we break down certain tasks into smaller units and try to fit them into the Project Plan.**
- Laddering is possible if an activity can be broken down into two or more sub-activities and a succeeding activity is similarly broken down into the same number of sub-activities as its predecessor

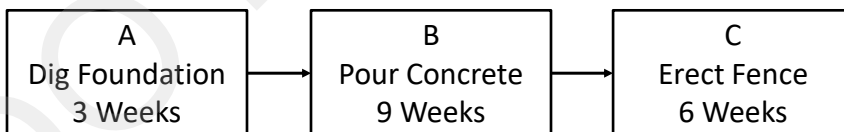
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Laddering: Fencing the Campus



- Total Duration: $3 + 9 + 6 = 18$ Weeks (No Slack)
- Break each activity into 3 segments

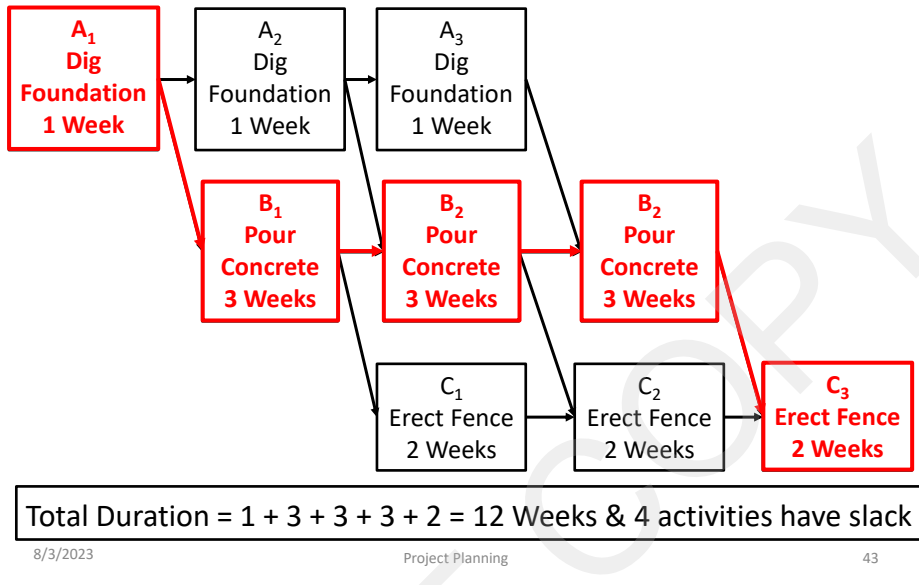
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Laddering: Fencing the Campus



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Laddering and Lags

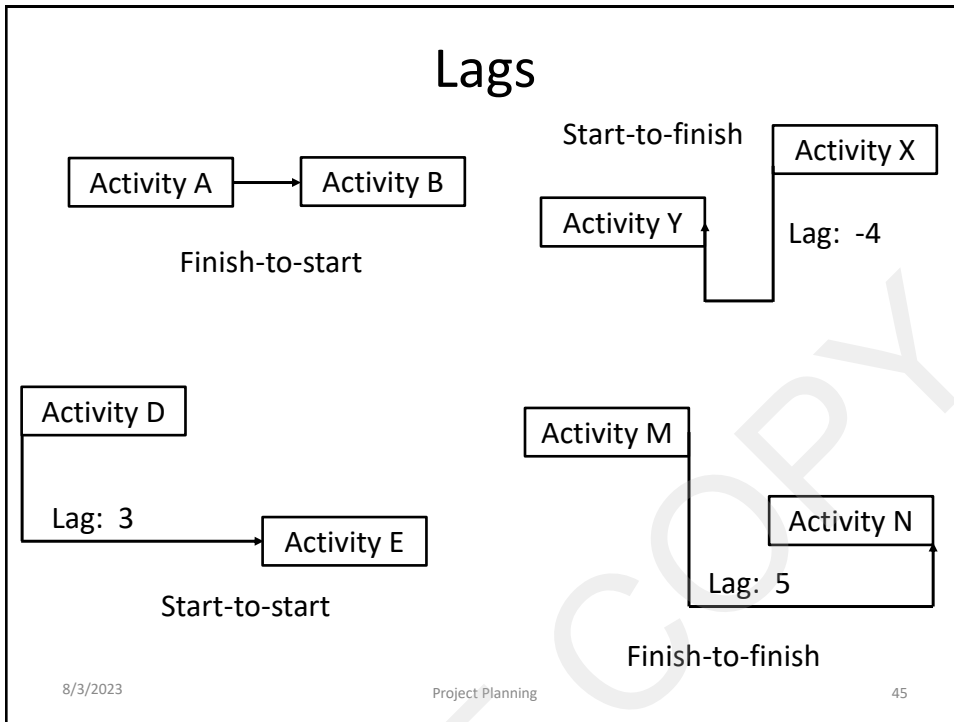
- Lags: The minimum amount of time a dependent activity must be delayed to begin or end
- Break down the activities so that the following activity can start sooner
- Finish-to-start, start-to-start, finish-to-finish, start-to-finish, or a combination.

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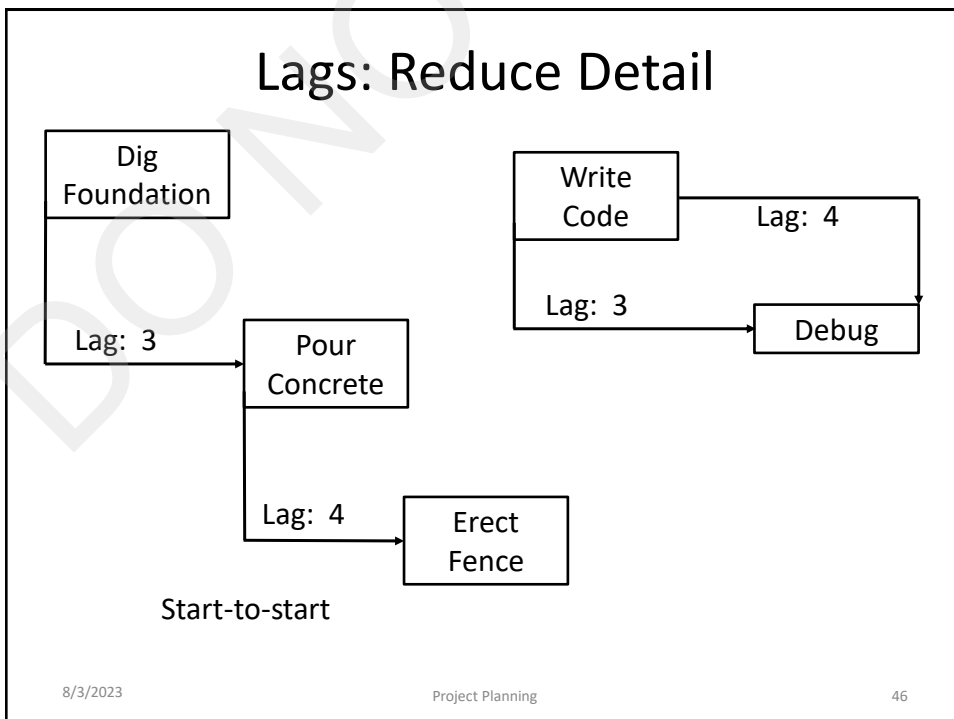
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