

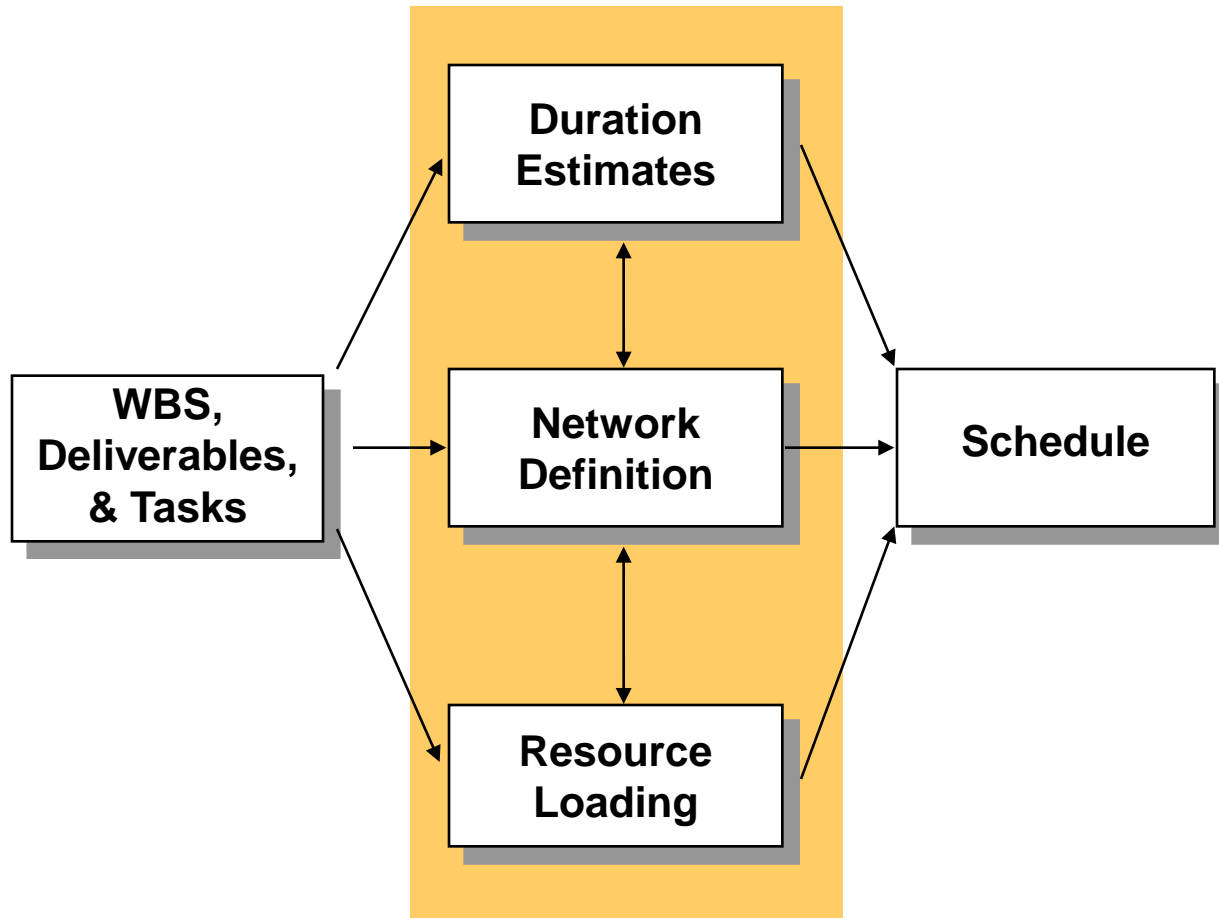
Software Project Management

Lecture 21

Words of Wisdom

- Know the truth that you were created as the best creation, with Allah (SWT) Himself breathing into you His spirit.
- *And (remember) when your Lord said to the angles: "I am going to create a man (Adam) from dried (sounding) clay of altered mud. So, when I have fashioned him completely and breath into him (Adam) the soul which I have created for him, then fall (you) down prostrating yourselves to him"*

Scheduling



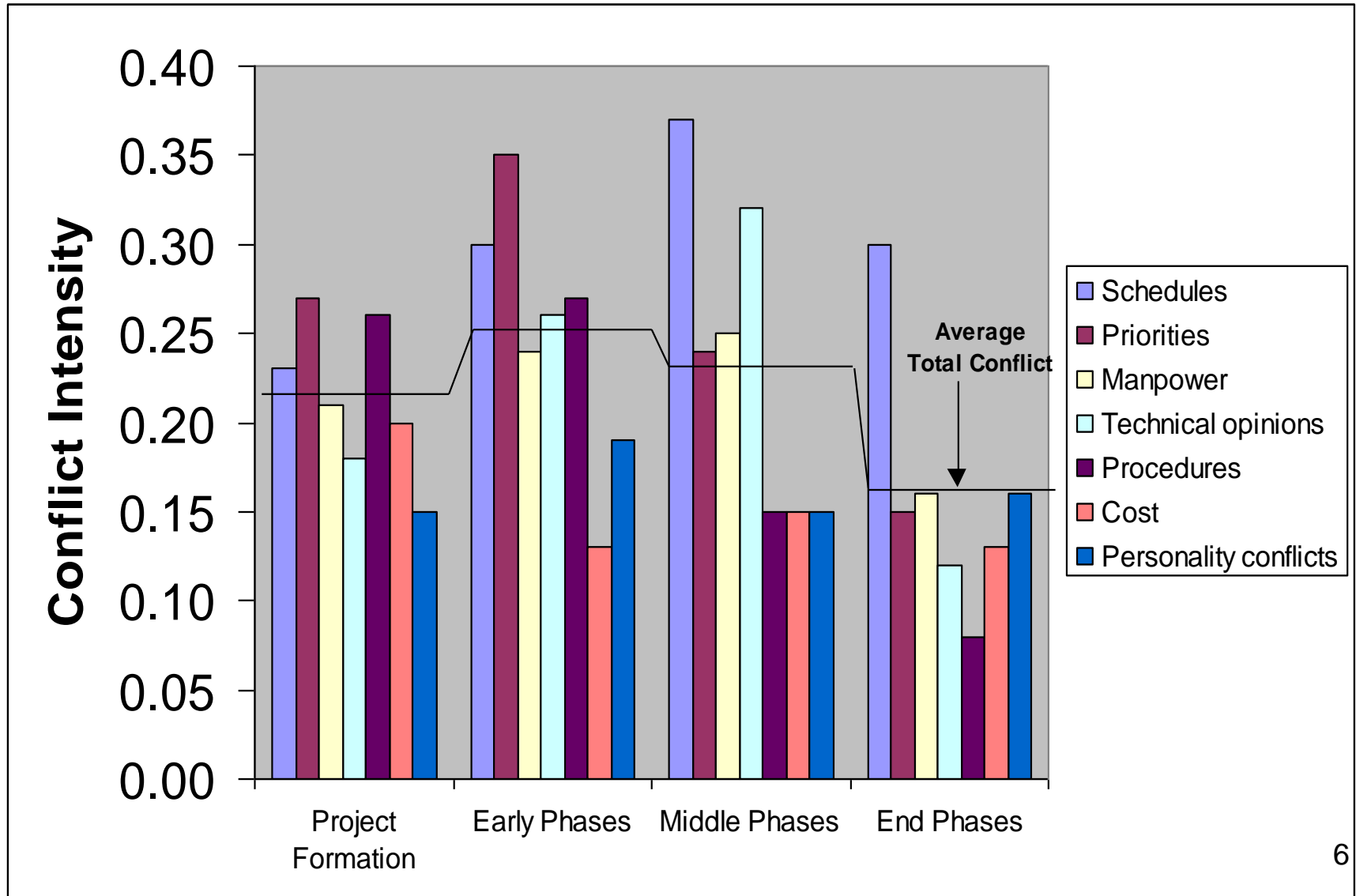
Scheduling

- The WBS provides an “is-part-of” organizational hierarchy of work activities
- A “Schedule Network” provides an “is-preceded-by” and “is-followed-by” time sequencing of work activities
- Validating when the work tasks need to be done.
- A schedule is the conversion of a project action plan into an operating timetable.
- Details the time allowed for the project and each activity, the main tasks to be accomplished, the people and skills required, the important issues and risks and when the projects are to be started and finished.
- It serves as a fundamental basis for monitoring and controlling project activity and, taken together with the plan and budget.

Importance of Project Schedules

- Managers often cite delivering projects on time as one of their biggest challenges
- Average time overrun from 1995 CHAOS report was 222%; improved to 63% in 2001 study
- Time has the least amount of flexibility; it passes no matter what
- Schedule issues are the main reason for conflicts on projects, especially during the second half of projects

Conflict Intensity Over the Life of a Project



Scheduling Steps

- Identify work activities and estimate resource needs for each work activity
- Identify predecessor and successor activities for each work activity – tie them to your milestones
- Develop an activity network and determine the schedule
- Develop resource loading profiles for each type of resource needed
- Iterate steps 1 through 4 to achieve a balance among a) work to be done, b) the schedule to do it, and c) the resources needed

PMI's Project Time Management Processes

- Project time management involves the processes required to ensure timely completion of a project. Processes include:
 - Activity definition
 - Activity sequencing
 - Activity duration estimating
 - Schedule development
 - Schedule control

Where Do Schedules Come From?

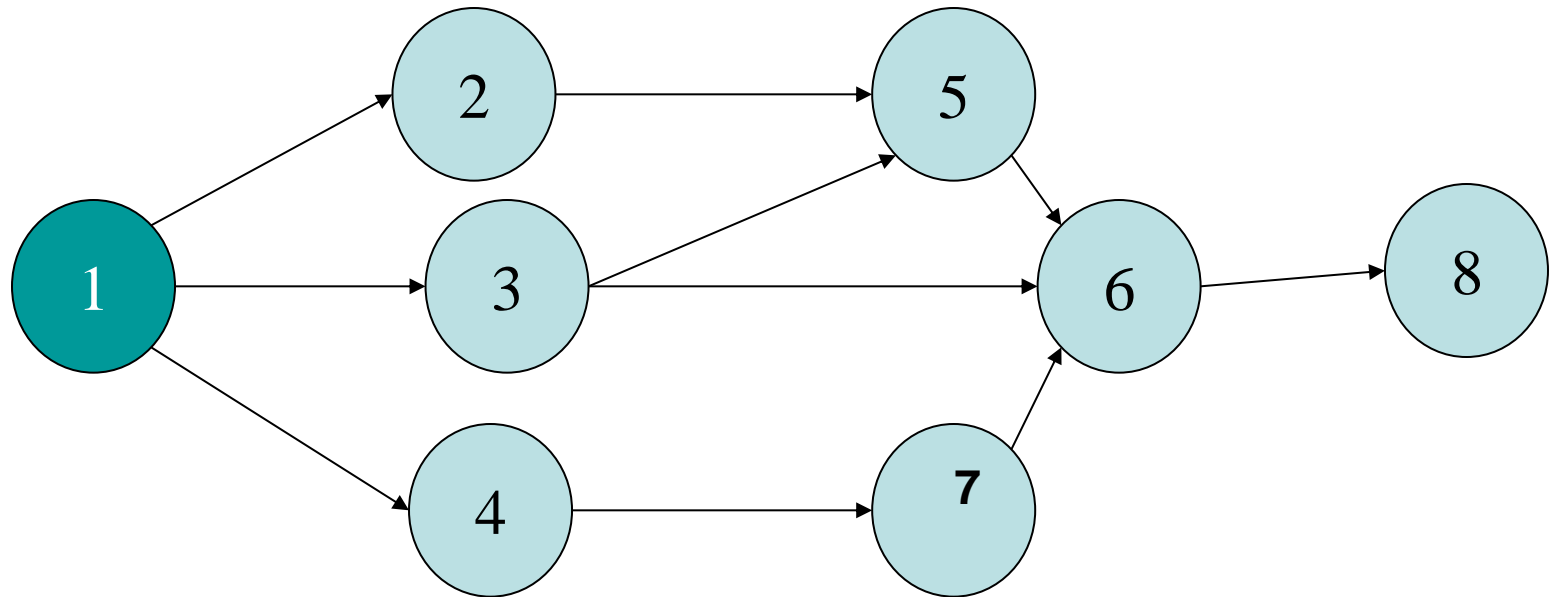
Defining Activities

- Project schedules grow out of the basic document that initiate a project
 - Project charter includes start and end dates and budget information
 - Scope statement and WBS help define what will be done
- Activity definition involves developing a more detailed WBS and supporting explanations to understand all the work to be done

Activity Sequencing

- Involves reviewing activities and determining dependencies
 - Mandatory dependencies: inherent in the nature of the work; hard logic
 - Discretionary dependencies: defined by the project team; soft logic
 - External dependencies: involve relationships between project and non-project activities
- You must determine dependencies in order to use critical path analysis

Project Network Diagrams



- Project network diagrams are the preferred technique for showing activity sequencing
- A project network diagram is a schematic display of the logical relationships among, or sequencing of, project activities

Arrow Diagramming Method (ADM)

- Also called activity-on-arrow (AOA) project network diagrams
- Activities are represented by arrows
- Nodes or circles are the starting and ending points of activities
- Can only show finish-to-start dependencies

Process for Creating AOA Diagrams

- 1. Find all of the activities that start at node 1. Draw their finish nodes and draw arrows between node 1 and those finish nodes. Put the activity letter or name and duration estimate on the associated arrow
- 2. Continuing drawing the network diagram, working from left to right. Look for bursts and merges.
 - Bursts occur when a single node is followed by two or more activities.
 - A merge occurs when two or more nodes precede a single node
- 3. Continue drawing the project network diagram until all activities are included on the diagram that have dependencies

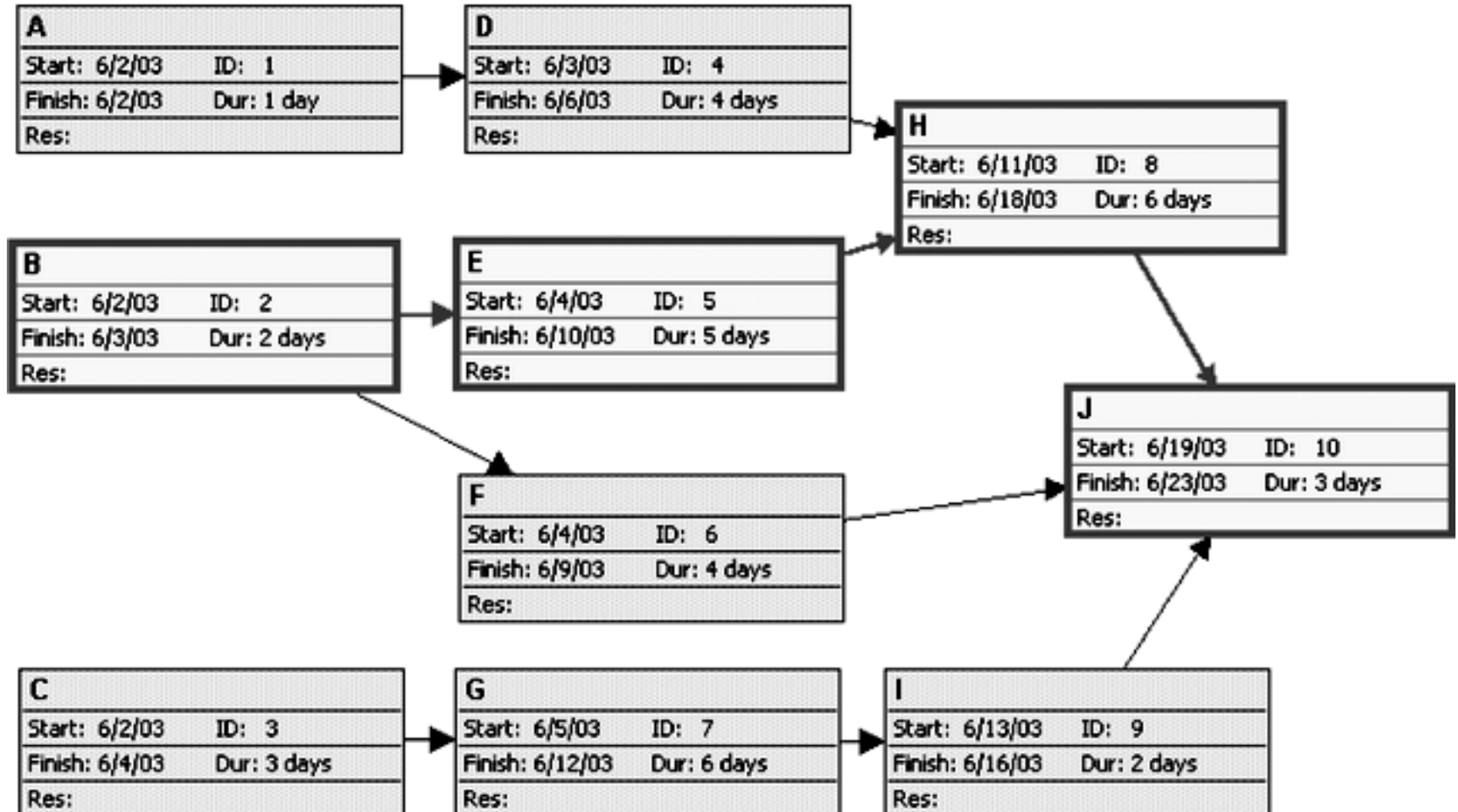
Precedence Diagramming Method (PDM)

- Activities are represented by boxes
- Arrows show relationships between activities
- More popular than ADM method and used by project management software
- Better at showing different types of dependencies

Task Dependency Types

- Task are linked by defining a dependency between their finish and start dates
- Finish-to-Start
 - Task (B) can not start until task (A) finishes
- Start-to-Start
 - Task (B) can not start until task (A) starts
- Finish-to-Finish
 - Task (B) can not finish until task (A) finishes
- Start-to-Finish
 - Task (B) can not finish until task (A) starts

Sample Precedence Diagramming Method (PDM) Network Diagram



Activity Duration Estimating

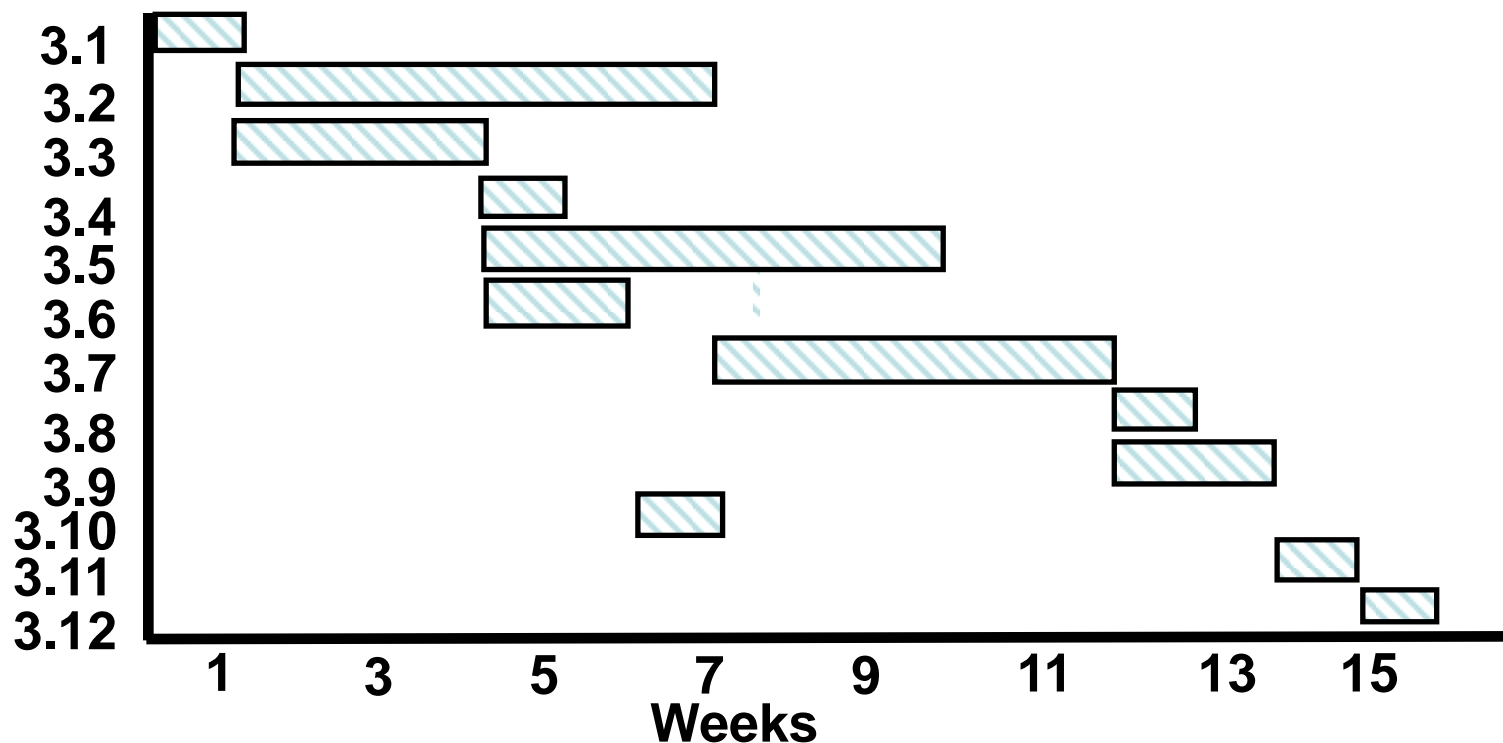
- After defining activities and determining their sequence, the next step is duration estimating
- Duration includes the actual amount of time worked on an activity plus elapsed time
- People doing the work should help create estimates, and an expert should review them

Schedule Development

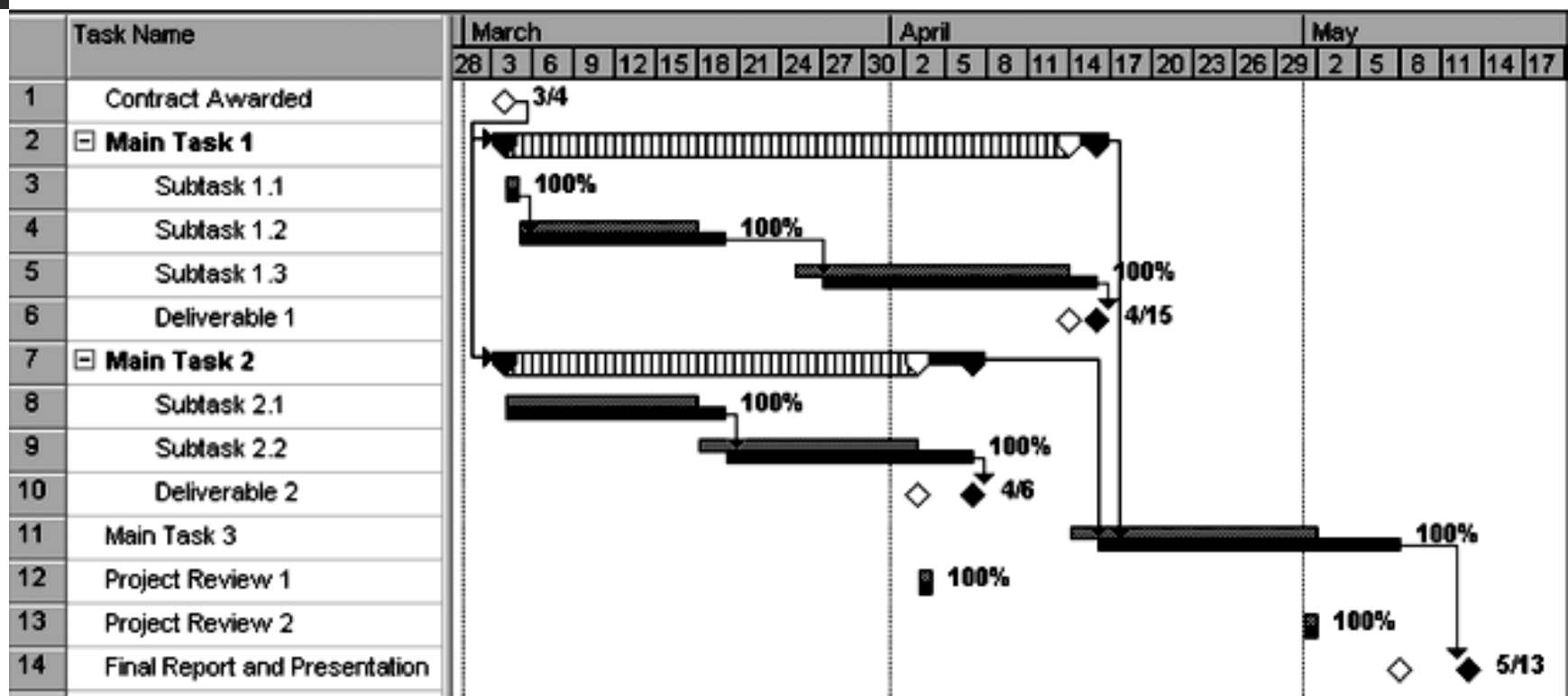
- Schedule development uses results of the other time management processes to determine the start and end date of the project and its activities
- Ultimate goal is to create a realistic project schedule that provides a basis for monitoring project progress for the time dimension of the project
- Important tools and techniques include
 - Gantt charts
 - PERT analysis
 - Critical path analysis, and
 - Critical chain scheduling

Gantt Charts

- Gantt charts provide a standard format for displaying project schedule information by listing project activities and their corresponding start and finish dates in a calendar format



Sample Tracking Gantt Chart



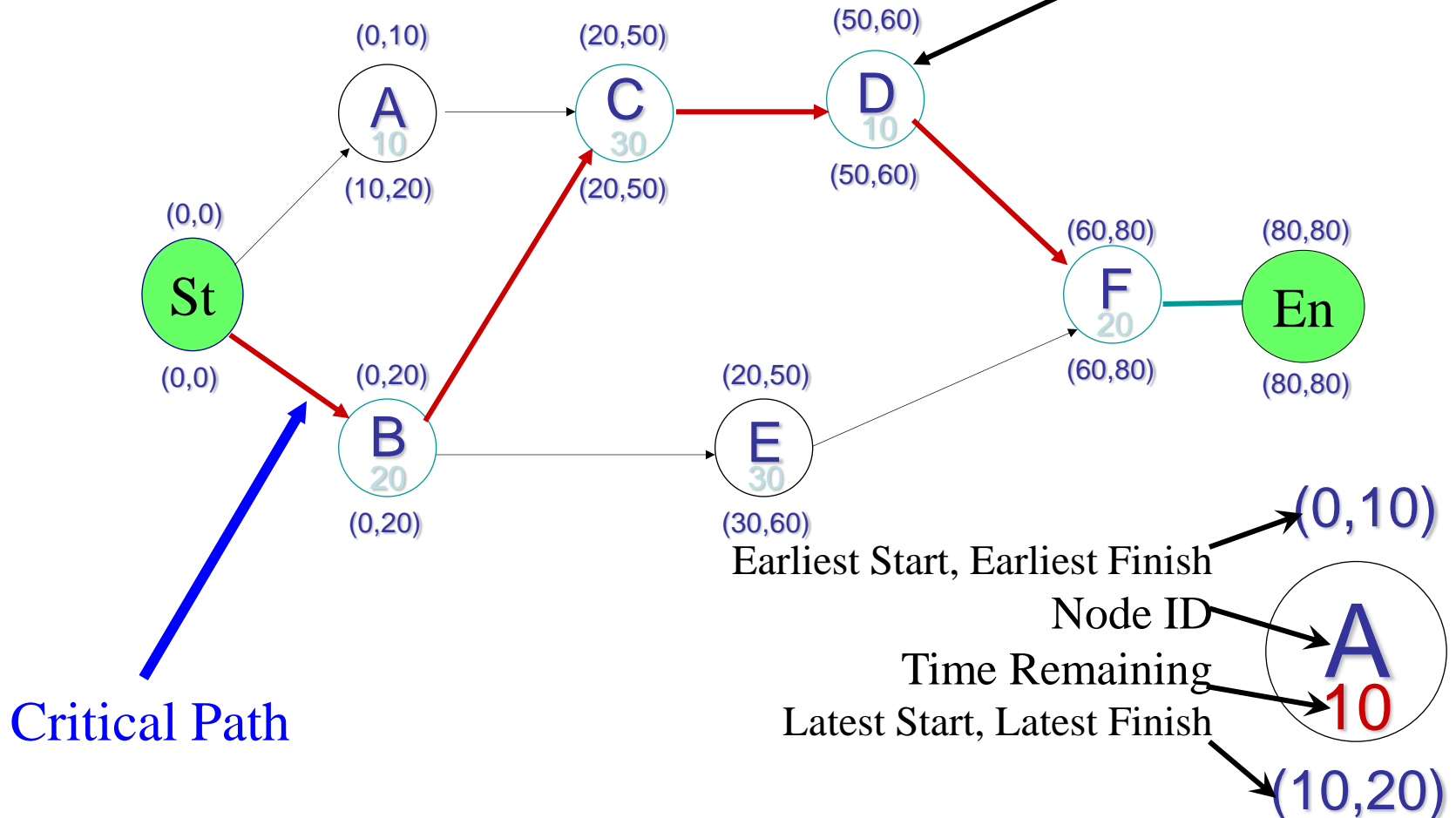
- A black diamond: milestones or significant events on a project with zero duration
- Thick bars: summary tasks
- Lighter horizontal bars: planned tasks
- Black horizontal bars: actual tasks
- Arrows: dependencies between tasks

Critical Path Method (CPM)

- CPM is a project network analysis technique used to predict total project duration
- A critical path for a project is the series of activities that determines the earliest time by which the project can be completed
- The critical path is the longest path through the network diagram and has the least amount of slack or float

CPM

Node/Activity

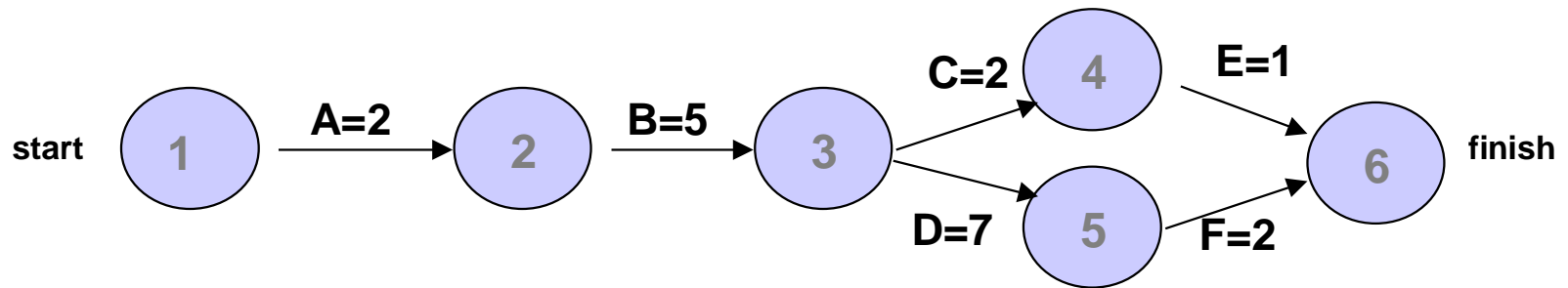


Finding the Critical Path

- First develop a good project network diagram
- Add the durations for all activities on each path through the project network diagram
- The longest path is the critical path

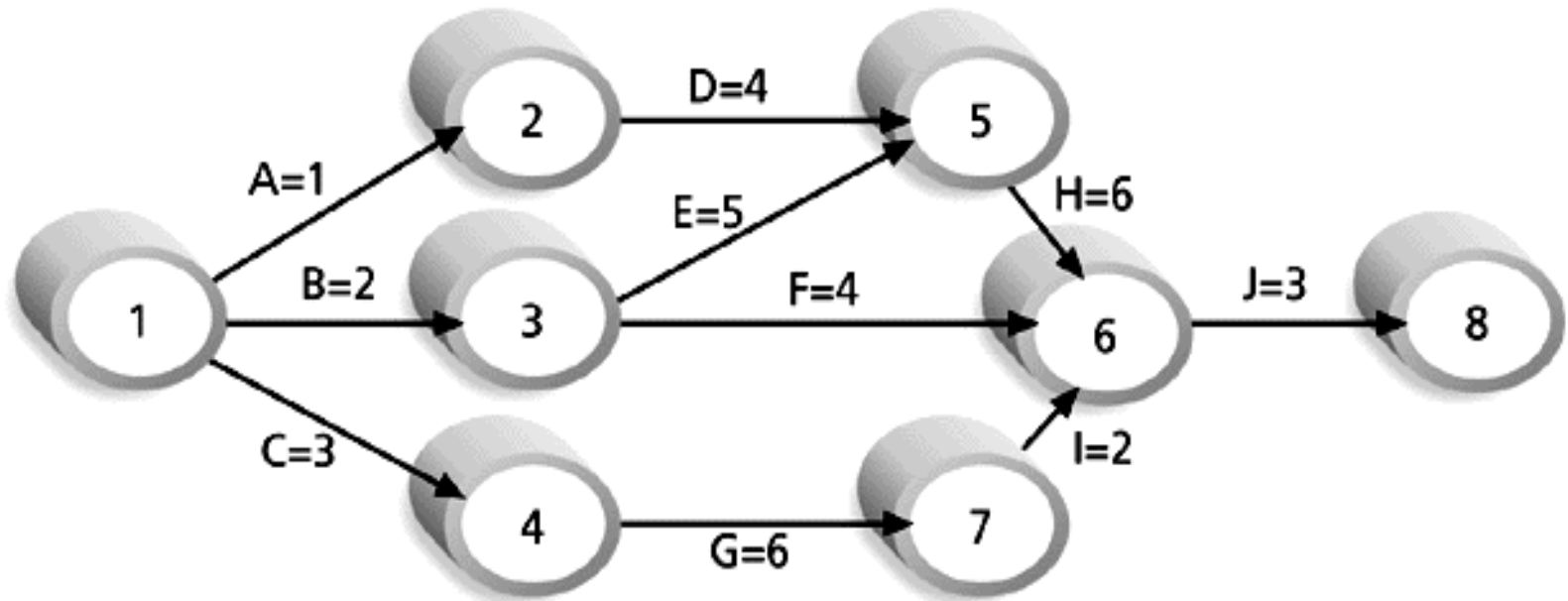
Simple Example of Determining the Critical Path

- Consider the following project network diagram. Assume all times are in days.



- How many paths are on this network diagram?
- How long is each path?
- Which is the critical path?
- What is the shortest amount of time needed to complete this project?

Determining the Critical Path



Note: Assume all durations are in days.

Path 1:	A-D-H-J	Length = $1+4+6+3 = 14$ days
Path 2:	B-E-H-J	Length = $2+5+6+3 = 16$ days
Path 3:	B-F-J	Length = $2+4+3 = 9$ days
Path 4:	C-G-I-J	Length = $3+6+2+3 = 14$ days

Since the critical path is the longest path through the network diagram, Path 2, B-E-H-J, is the critical path for Project X.

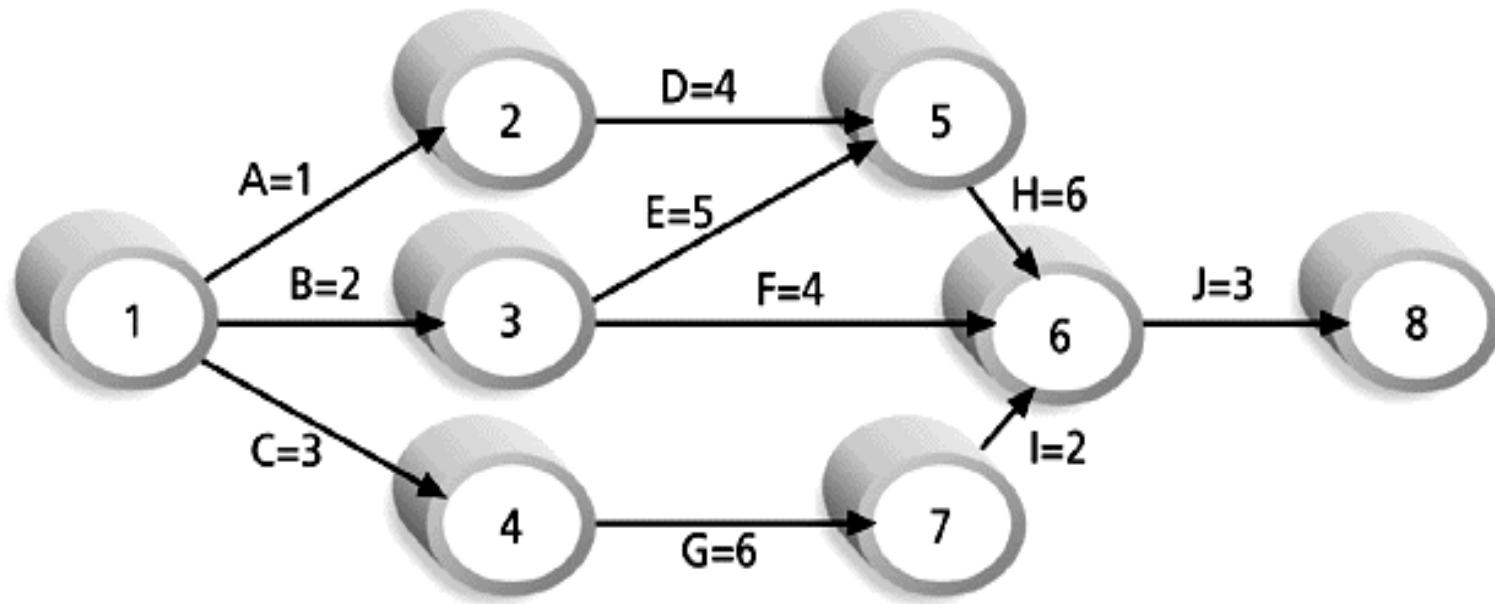
More on the Critical Path

- If one of more activities on the critical path takes longer than planned, the whole project schedule will slip unless corrective action is taken
- Remember:
 - The critical path is not the one with all the critical activities; it only accounts for time
 - There can be more than one critical path if the lengths of two or more paths are the same
 - The critical path can change as the project progresses

Using Critical Path Analysis to Make Schedule Trade-offs

- Knowing the critical path helps you make schedule trade-offs
- **Free slack or free float** is the amount of time an activity can be delayed without delaying the early start of any immediately following activities
- **Total slack or total float** is the amount of time an activity may be delayed from its early start without delaying the planned project finish date

Determining the Critical Path



Note: Assume all durations are in days.

Path 1: A-D-H-J Length = $1+4+6+3 = 14$ days

Path 2: B-E-H-J Length = $2+5+6+3 = 16$ days

Path 3: B-F-J Length = $2+4+3 = 9$ days

Path 4: C-G-I-J Length = $3+6+2+3 = 14$ days

Since the critical path is the longest path through the network diagram, Path 2, B-E-H-J, is the critical path for Project X.

Q&A