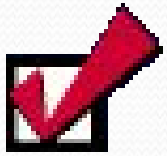
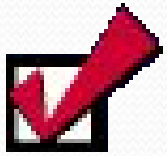
Project Planning

Where are we?

- Analysis and design
  - Have ideas about
    - Requirements
    - Resources
    - Tasks
- Early development
  - Beginning the DO-IT phase
- Perhaps some overlapping here

Early Phase Meetings

- Project Kickoff Meeting 
- Project Brainstorming Meeting
  - Clarify goals, scope, assumptions 
  - Refine estimates
- WBS Meeting

Analysis & Design

- How will we build the product?

- Inputs:
  - Requirements Document

- Outputs:
  - Functional Specification
  - Detailed Design Document
  - User Interface Specification
  - Project Plan

Planning

- How much will it **cost**?
- How much **time** will it take?
- How many **people** will it take?
- What might go wrong?

Planning

- Scoping
- Estimation
- Risk
- Schedule
- Control Strategy

Process Issues

- Projects are often larger than they first appear
- Easier to loosen too much process than add later

Communications Management Plan

- Often a section of SPMP
- Describes information flow to all parties
  - Gathering and distributing information
- Status meetings
  - Monthly, Weekly, Daily?
  - Status reports are vital

Project Terminology

- **Deliverables**
  - Units that are delivered
- **Activities**
  - Major units of work
- **Tasks**
  - Small units of work
  - Part of activities

Activity

- Set of tasks
- Major grouping of tasks
- Culminates in a ***milestone***
  - a scheduled event used to measure progress

Examples of Activities

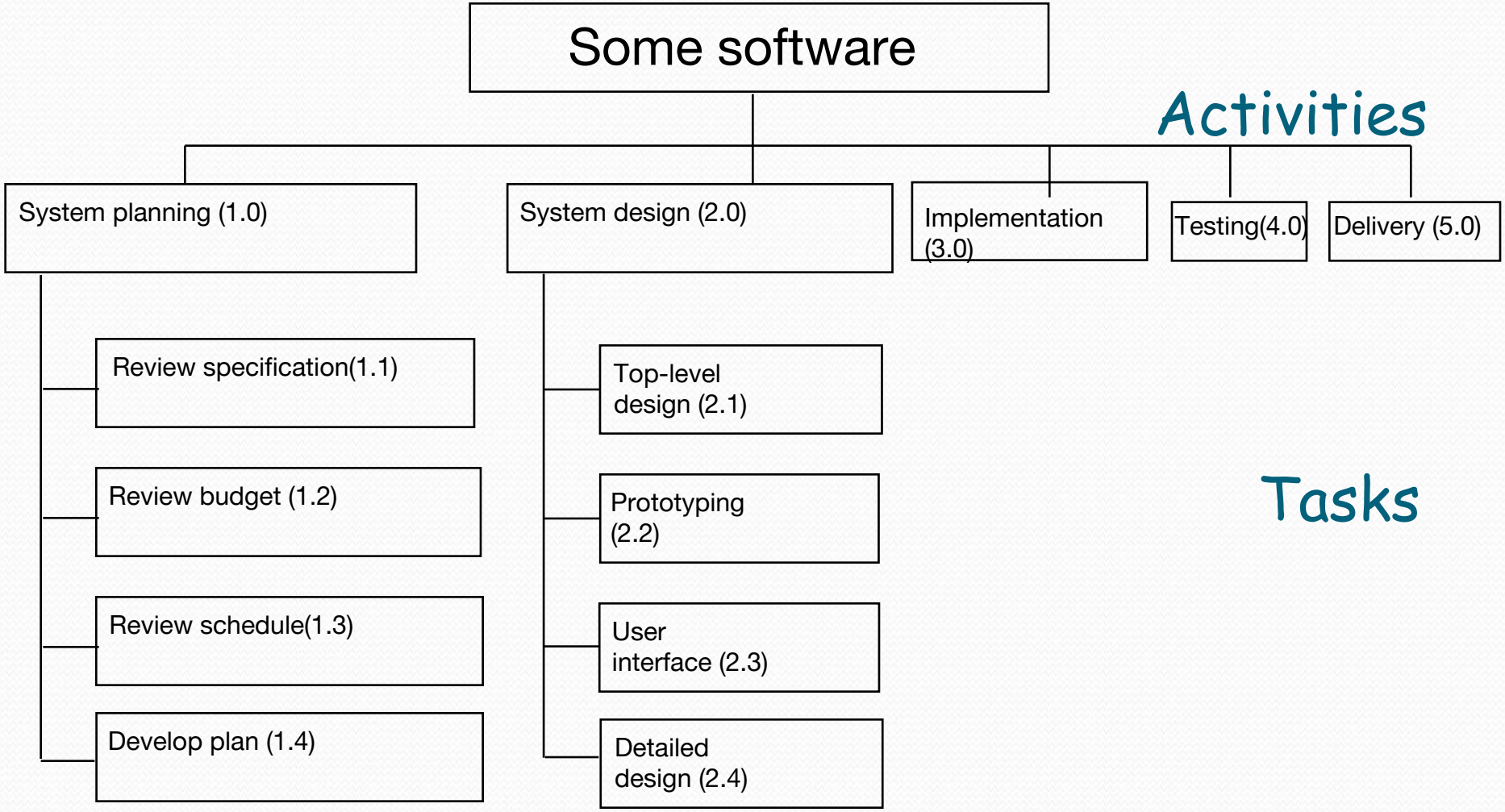
- Major Activities:
  - Planning
  - Requirements Elicitation
  - Requirements Analysis
  - System Design
  - Object Design
  - Implementation
  - System Testing
  - Delivery
- Sub-activities during requirements analysis:
  - Define scenarios
  - Define use-case model
  - Define object model
  - Define dynamic model
  - Design user interface

Planning documents/diagrams

Work Breakdown Structure (WBS)

- Break up project into
  - Activities
  - Sub-activities
  - Tasks

Work Breakdown Structure (WBS) Diagram



Work Breakdown Structure

Online Dating (Project)

1 Requirements (Activity)

1.1 Profiles (Task)

1.1.1 Self profile (subtask)

1.1.1 Partner profile

.....

2 Planning

2.1 Communication

How far shall we break it down?

- Rule of thumb:
  - Until you can give accurate estimates of cost and resource requirements
- Lowest level task can be performed in a *reasonable* time (case dependent)
- All tasks are assigned to someone

WBS Tradeoffs

- Easy overview
- Quick estimation of costs/time required by "rolling up" quantities.
- WBS that is too general/high level
  - difficult to assign tasks
  - utilize resources

WBS: Ordering Problems

- WBS does not show
  - Precedence ordering
  - Dependencies
- Can not determine how to order the tasks

Deliverables

- Many tasks have deliverables
- The list of deliverables is part of the plan
- Also used in tracking

Example

Deliverable	Due	Delivered	Author
Requirement Spec	28/3/2012	31/3/2012	Semih Tokat
Design Spec	16/4/2012		Galip Demir, Hayriye Temel

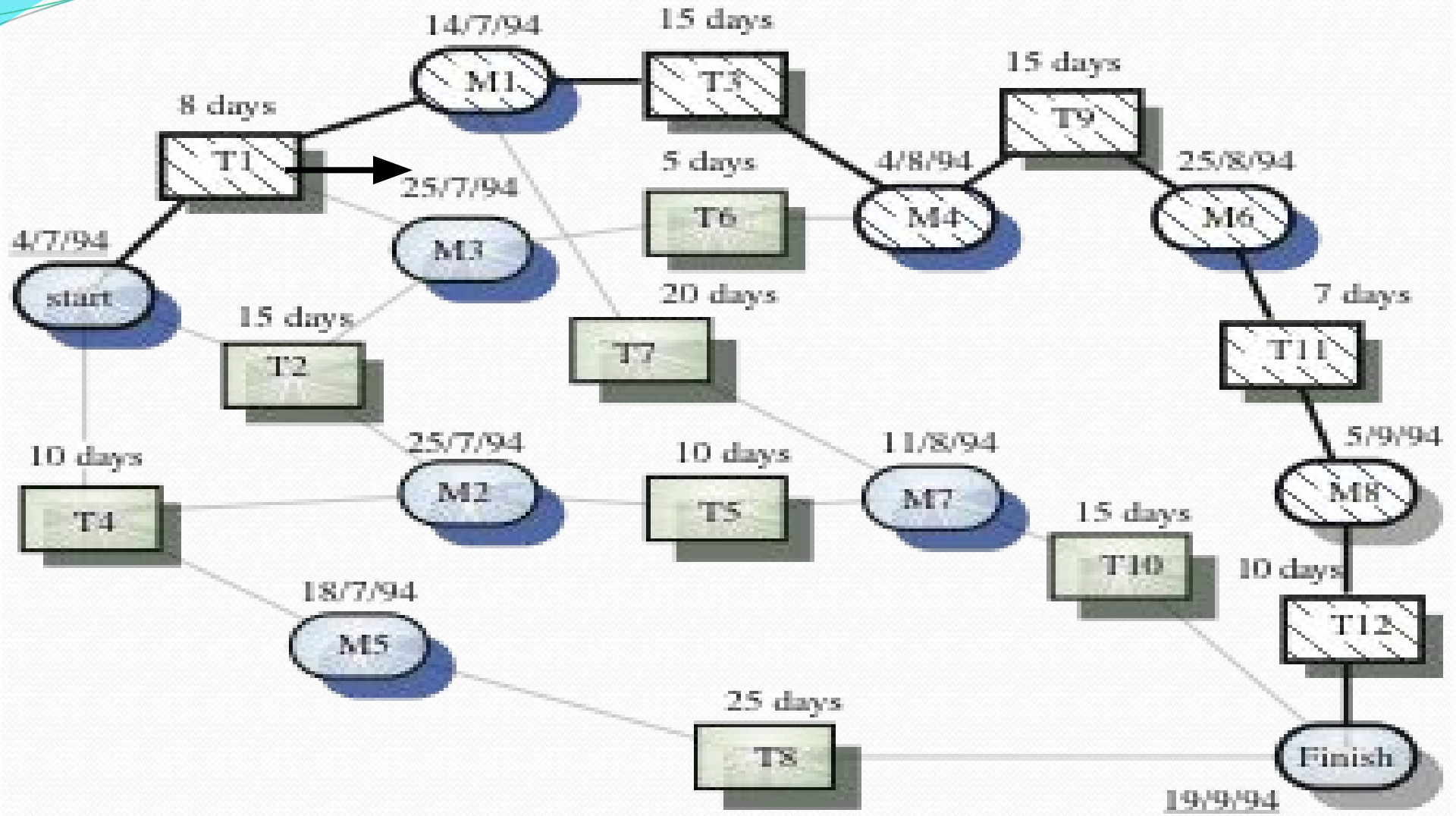
PERT/CPM chart

- Program Evaluation and Review Technique
- Developed in the 50s Polaris submarine missile program
- Same time Critical Path Method for PM in private sector
- Technique for managing tasks
  - Organizing
  - Scheduling
  - Coordinating

Ordering is Visible

- Dependent or sequential tasks
  - One must complete before other can start
  - In example tasks between 1, 2, 4, 8, 10 must be done in sequence
- Independent or parallel tasks
  - No dependency
  - In example, tasks between 1-2 and 1-3 are independent

Precedence Chart with Milestones



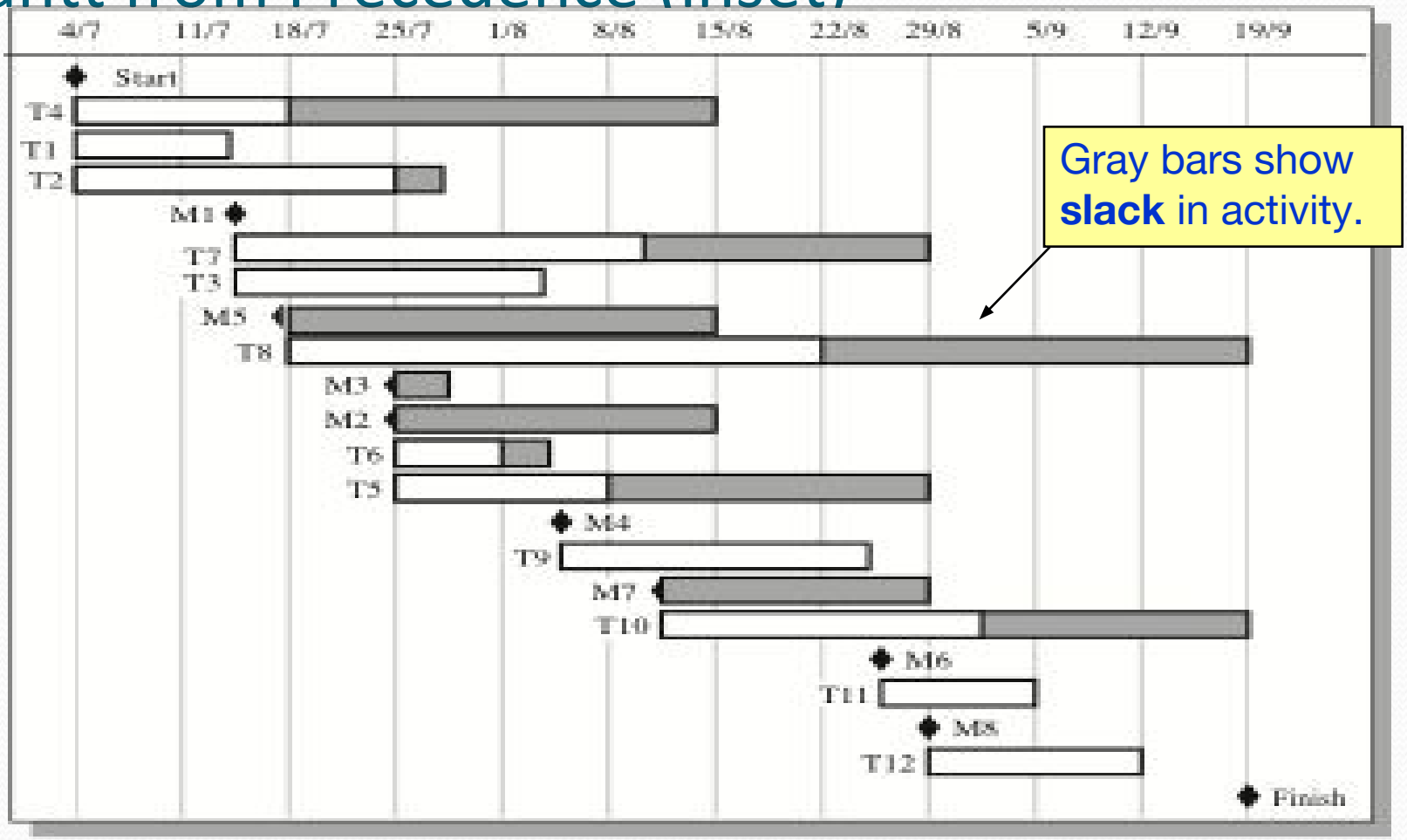
source: Ian Sommerville, Software Engineering, 5th Ed.

Precedence (rightward implied)

Gantt chart (schedule)

- **Schedule** (or Gantt chart)
- Shows a **particular scheduling**
- Maps tasks to time lines
- Based on **all** of the constraints (not just precedence)

Gantt from Precedence (inset)



source: Ian Sommerville, Software Engineering, 5th Ed.

Troubles Shown by Gantt Chart

- Long bars not **in parallel** with each other:
  - Is the **whole team** really doing that one task?
  - Or are a couple doing it while the others are idle?
  - Is it really not possible to describe in any finer detail?

Troubles Shown by Gantt Chart

- Long chains of short bars with one person assigned to each bar
  - Not enough parallelism among tasks
  - Solution: Reduce dependence between bars as much as possible.

Shortcomings of Gantt Chart

- Mostly long bars
- Difficult to track project status
- Rule of thumb:
  - the longer the bar, the more likely there is error in the estimate
  - Suggestion:
    - Break long bars into to smaller ones
    - Reassign resources

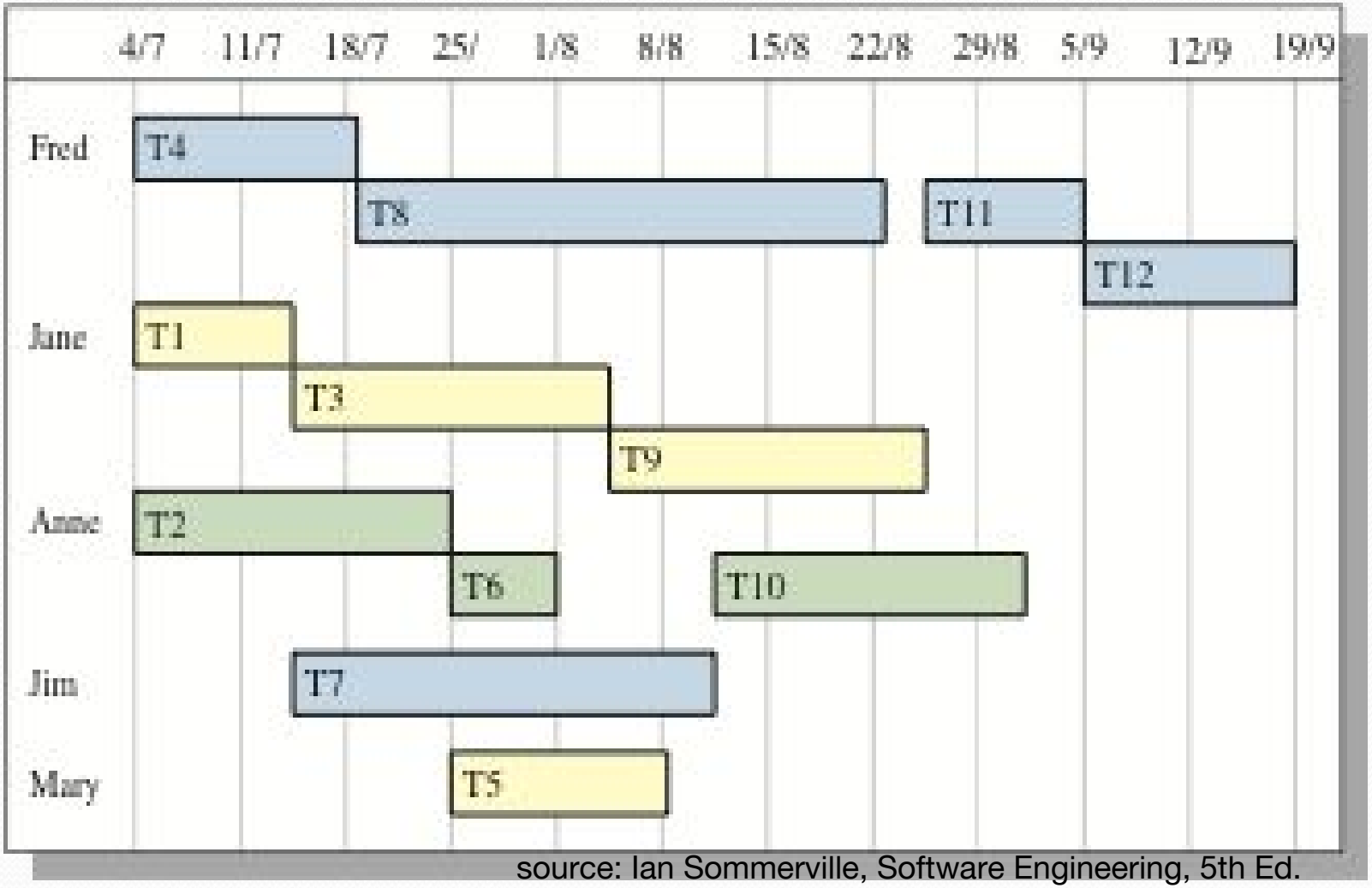
Shortcomings of Gantt Chart

- No specific staff assignment to bars
  - Difficult to know who on the team is actually doing the work
  - How do you know who to ask for status?

Staff Assignments

- Idle staff now may mean that everyone pays later to make up for the lost resource
- Idle staff often creates tension among non-idle staff

Staff Loading



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Critical Path

- A “critical path” on a Precedence chart

  sum of durations of the tasks path = the **shortest** project-completion time

- Each task has
  - a duration
  - possible constraints

Identifies critical path

- Shortest time project can be completed
- Any delay on critical path activities delays project
- Critical path activities have 0 (zero) slack

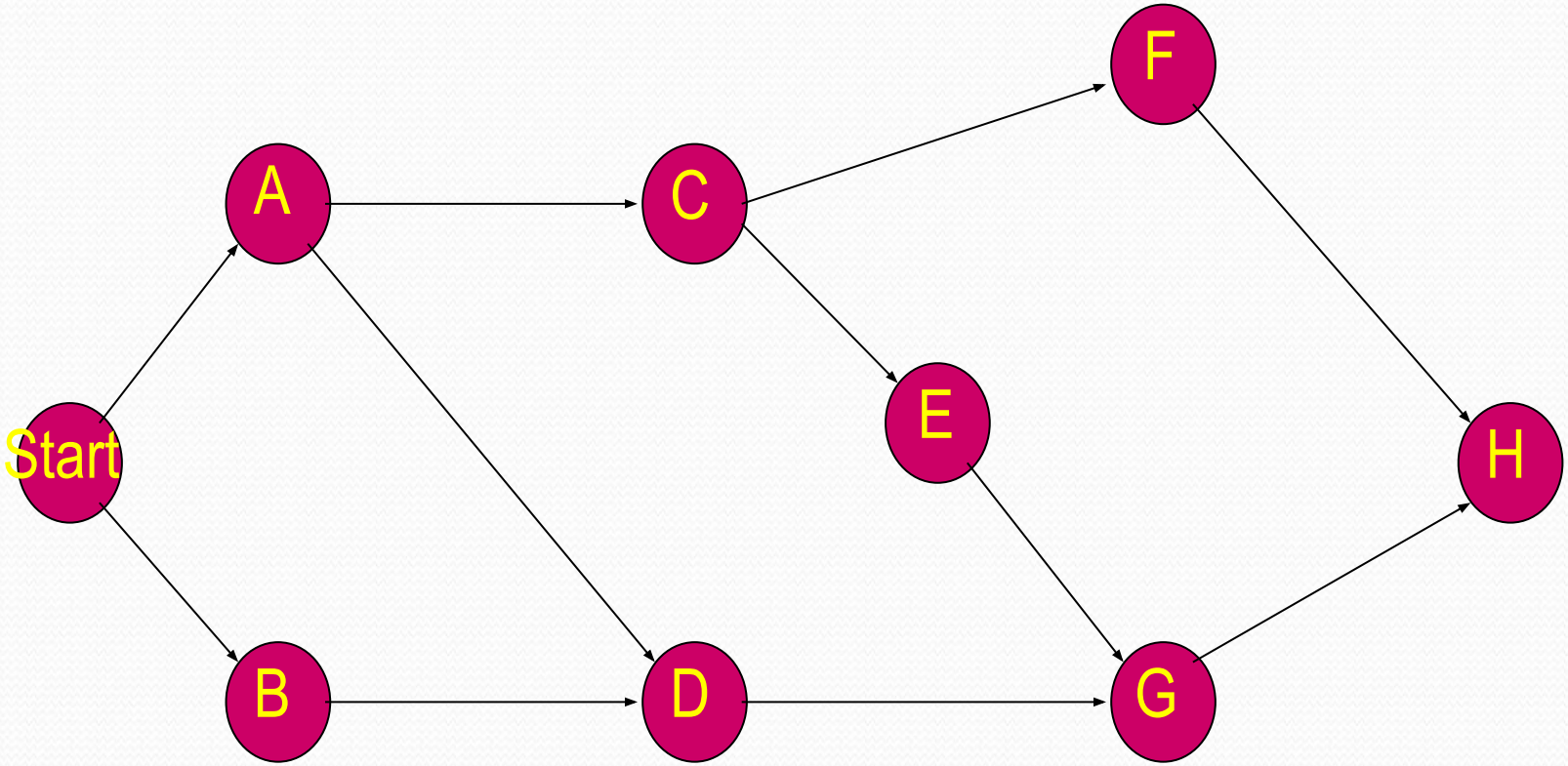
Critical Path Analysis

- Provides activity information
  - Earliest (ES) & latest (LS) start
  - Earliest (EF) & latest (LF) finish
  - Slack (S): Allowable delay

Example: Activities Information

ID	Network Node	Immediate Predecessor	Duration (days)
1	A	-	2
2	B	-	8
3	C	1	3
4	D	3	2
5	E	3	10
6	F	2,3	4
7	G	4	4
8	H	5,6	1
9	I	5,7	3
10	J	8,9	2

Activities on Nodes (AON)



Critical Path Method: Term definitions

Item	Symbol	Definition
Activity duration	***t***	The expected duration of an activity
Early start	***ES***	The earliest time an activity can begin
Early finish	***EF***	The earliest time an activity can be completed
Late start	***LS***	The latest time an activity can begin without delaying the completion of the project
Late finish	***LF***	The latest time an activity can be completed
Total slack	***TS***	The amount of time an activity can be delayed without delaying the completion of the project

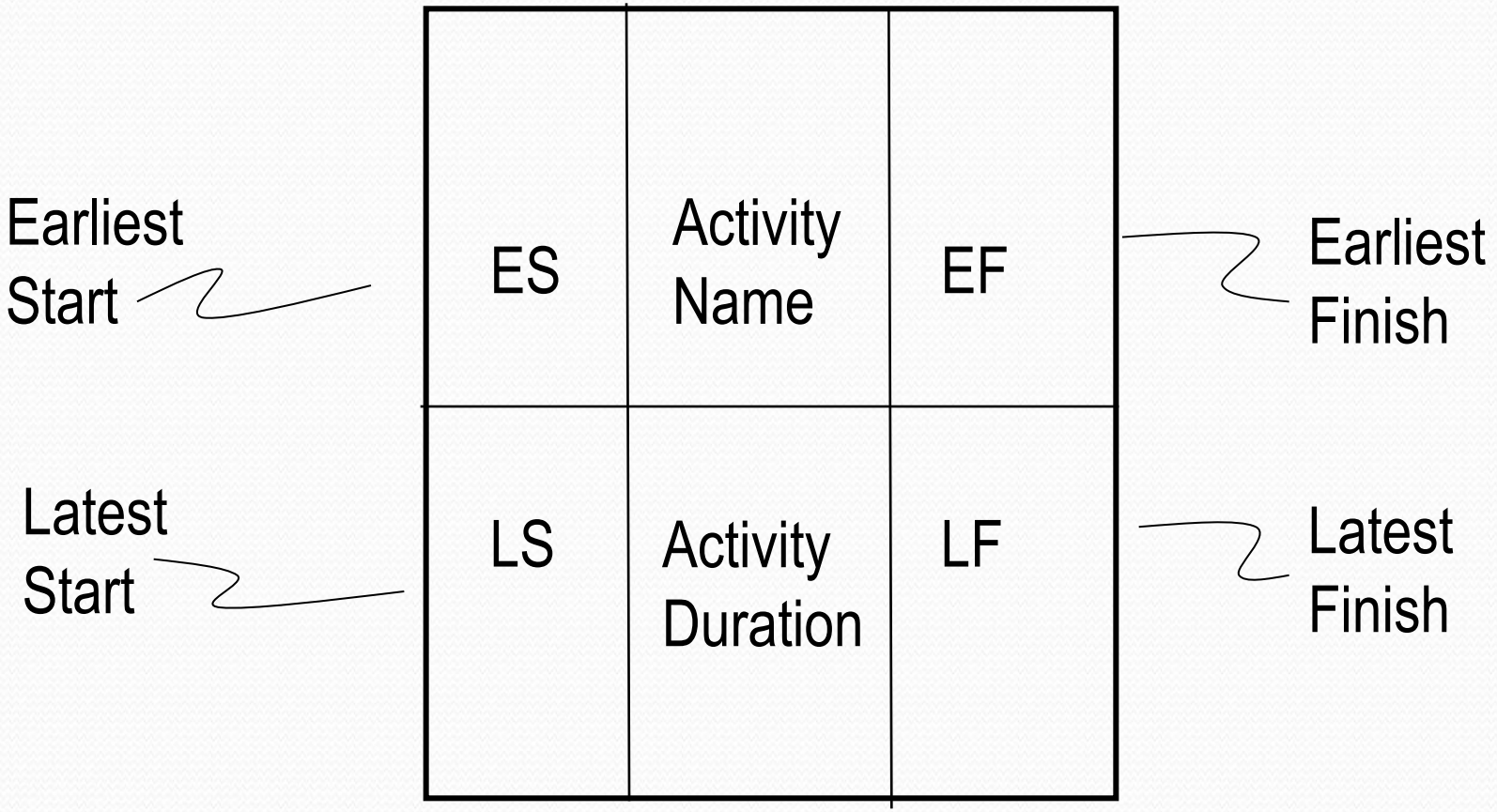
Earliest Start and Finish Steps

- Begin at starting event and work forward
- ES (earliest start)
  - 0 (zero) for starting activities
  - Maximum EF of all predecessors for non-starting activities
- EF (earliest finish)
  - ES + Activity time

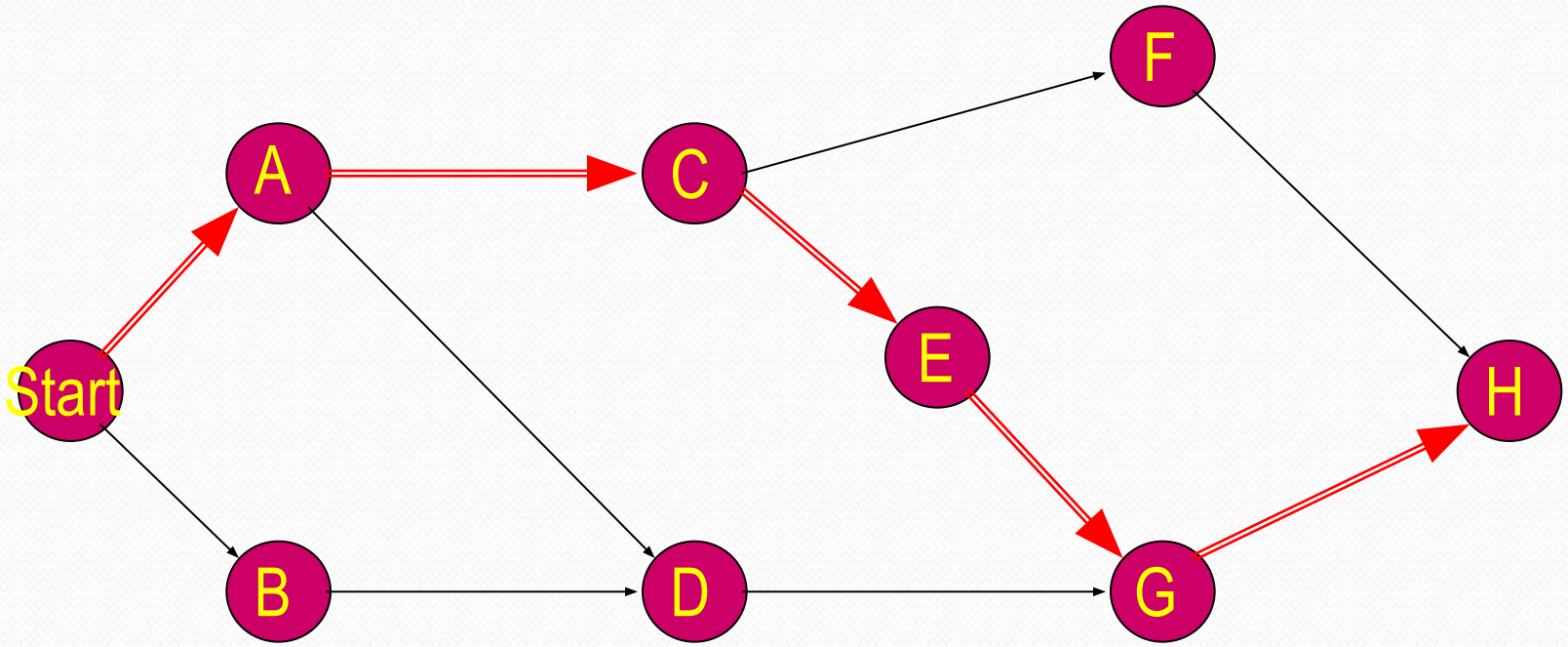
Latest Start and Finish Steps

- Begin at ending event and work backward
- LF (latest finish)
  - Maximum EF for ending activities
- LS (latest start)
  - LS = LF - Activity time
  - LF = Minimum LS of all successors for non-ending activities

Latest Start and Finish Steps



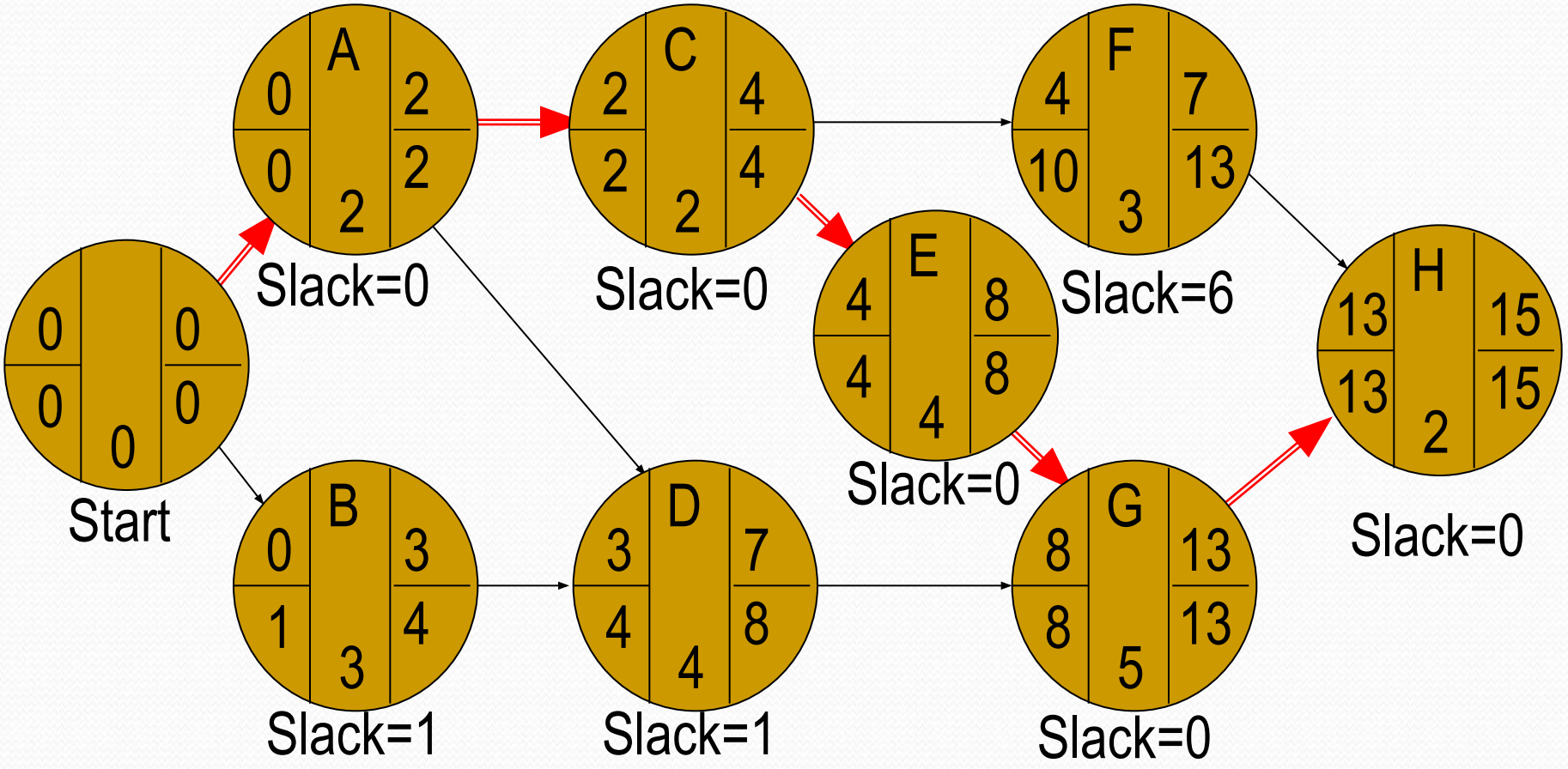
Critical Path



Example - Critical Path

Activity	Duration	Immediate Predecessors
A	2	-
B	3	-
C	2	A
D	4	A, B
E	4	C
F	3	C
G	5	D, E
H	2	F, G

AON Network


Start
0 0 0 0
A
0 0 2 2
2
Slack=0
B
0 1 3 3
4
Slack=1
C
2 2 4 4
2
Slack=0
D
3 4 7 8
4
Slack=1
E
4 4 8 8
4
Slack=0
F
4 10 7 13
3
Slack=6
G
8 8 13 13
5
Slack=0
H
13 13 15 15
2
Slack=0

Scheduling Formulas

$ES = EF_{predecessor}\ (max)$ (1)

$EF = ES + t$ (2)

$LF = LS_{successor}\ (min)$ (3)

$LS = LF - t$ (4)

$TS = LF - EF$ (5)

or

$TS = LS - ES$ (6)

What we learned

- Project Plan essentials
- Time estimation
- Milestones and tracking
- Project duration estimation
- Resource allocation