CSIT214/CSCI814/HCSC814
IT Project Management

Project schedule management

Acknowledgement: Lecture slides are adapted from *Software Project Management by Bob Hughes and Mike Cotterell, 5th edition, McGraw-Hill, 2009, and Information Technology Project Management by Kathy Schwalbe, 8th edition (or later), Cengage Learning,*

Project management framework (review)

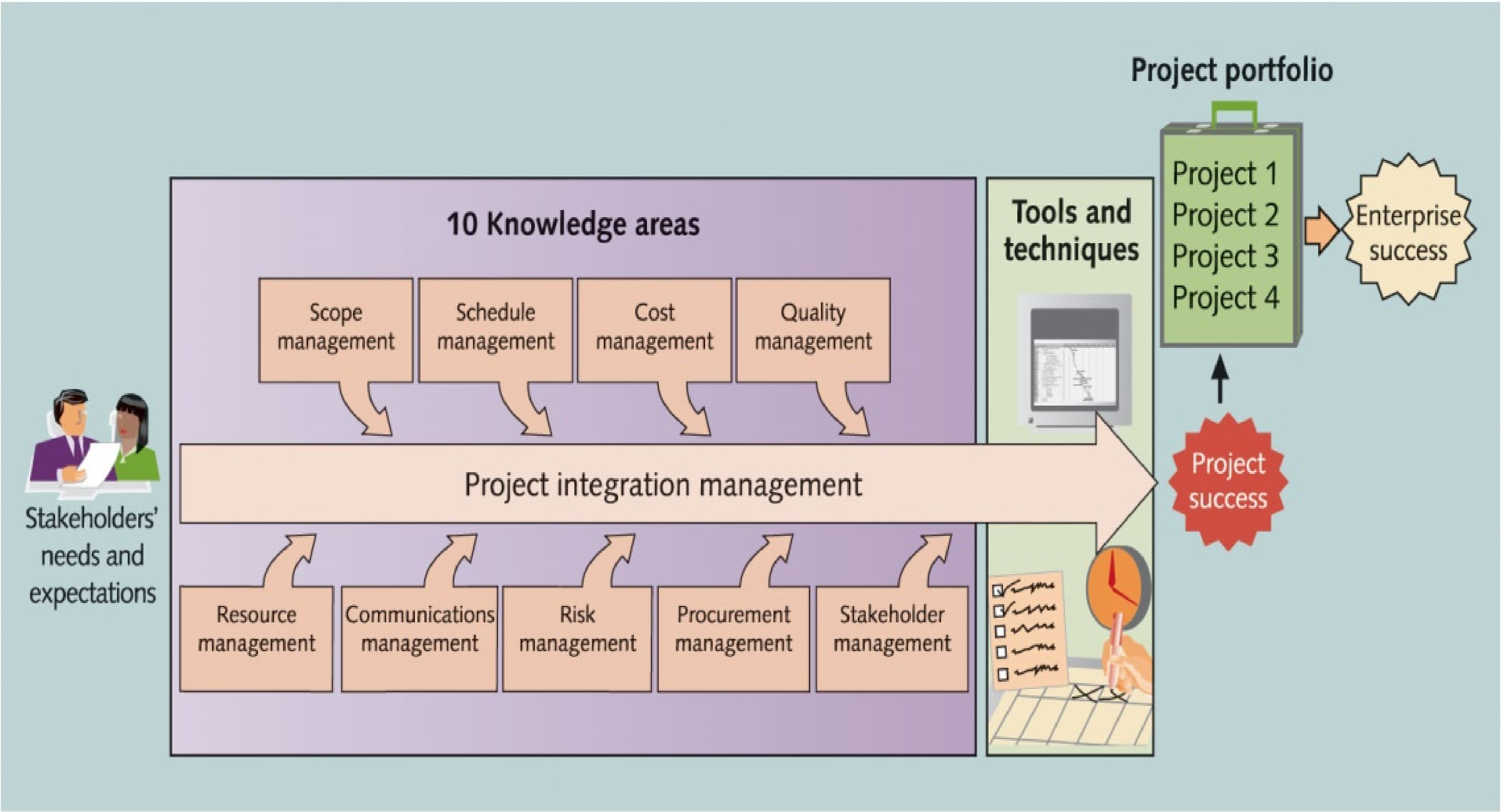


FIGURE 1-2 Project management framework

Scheduling

‘Time is nature’s way of stopping everything happening at once’

Having

- worked out a method of doing the project
- identified the tasks to be carried
- assessed the time needed to do each task

Now, need to allocate dates/times for the start and end of each activity/task

Defining activities

- A project is:
  - Composed of a number of **activities**
  - May start when at least one of its activities is ready to start
  - Completed when all its activities are completed

- A **milestone** is a significant event that normally has no duration
  - It often takes several activities and a lot of work to complete a milestone
  - They're useful tools for setting schedule goals and monitoring progress
    - Examples: obtaining customer sign-off on key documents or completion of specific products

Defining activities (cont.)

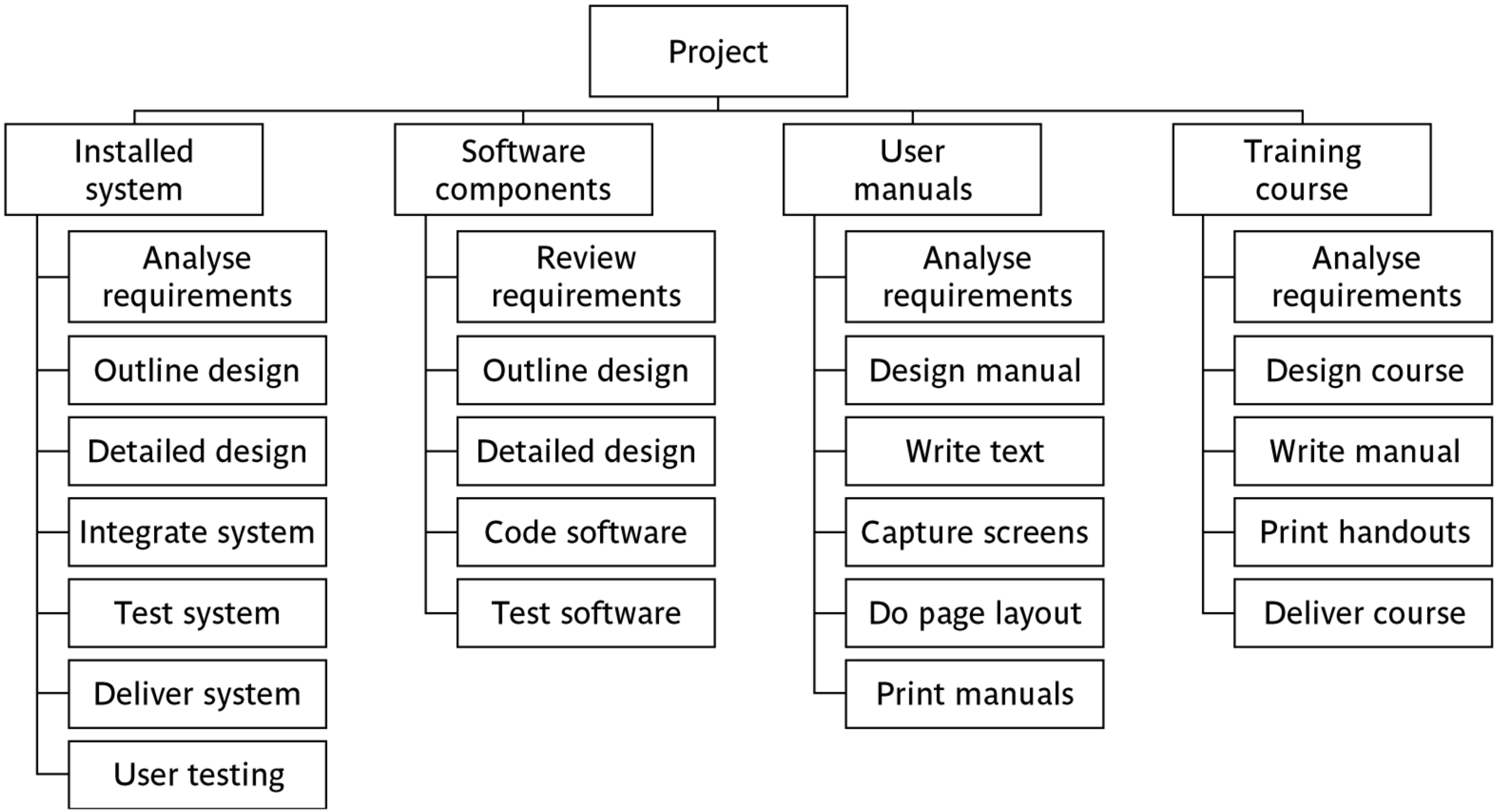
- An activity
  - Must have clearly defined start and end-points
  - Must have a duration that can be forecasted
  - May be dependent on other activities being completed first (precedence networks)

Identifying activities

- Activity-based approach:
  - list all activities, sub-activities (sub-sub-activities and so on) for the project (Work Breakdown Structure).

- Product-based approach
  - list the deliverable and intermediate products of project – product breakdown structure (PBS)
  - Identify the order in which products have to be created
  - work out the activities needed to create the products

Hybrid approach



Estimating Activity Durations

- Duration includes the actual amount of time worked on an activity plus elapsed time
- Effort is the number of workdays or work hours required to complete a task and does not normally equal duration
- People doing the work should help create estimates
  - An expert should review them

Activity networks

These help us to:

- Assess the **feasibility** of the planned project completion date
- Identify when **resources** will need to be deployed to activities
- Calculate when **costs** will be incurred

This helps the co-ordination and motivation of the project team

Activity networks (cont.)

- Developing an activity network involves evaluating the **reasons for dependencies** and the different types of dependencies
  - **Mandatory dependencies**: inherent in the nature of the work being performed on a project, sometimes referred to as hard logic
  - **Discretionary dependencies**: defined by the project team, sometimes referred to as soft logic. and should be used with care since they may limit later scheduling options
  - **External dependencies**: involve relationships between project and non-project activities

Activity networks (cont.)

- Network diagrams are the preferred technique for showing activity sequencing
  - Schematic display of the logical relationships among, or sequencing of, project activities
  - Two main formats are the arrow and precedence diagramming methods

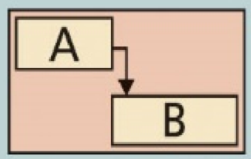
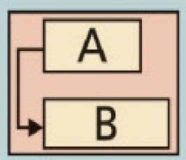
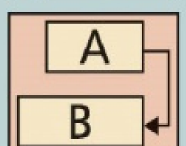
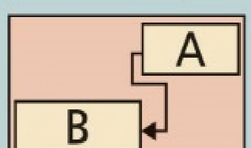
Activity networks (cont.)

- Arrow diagramming method (ADM) (i.e., activity-on-arrow network diagrams)
  - Activities are represented by arrows
  - Nodes or circles are the starting and ending points of activities
- **Precedence diagramming method (PDM)**
  - Network diagramming technique in which boxes represent activities
- Types of dependencies or relationships between activities
  - Finish-to-start
  - Start-to-start
  - Finish-to-finish
  - Start-to-finish

Activity networks (cont.)

Task dependencies

The nature of the relationship between two linked tasks. You link tasks by defining a dependency between their finish and start dates. For example, the "Contact caterers" task must finish before the start of the "Determine menus" task. There are four kinds of task dependencies in Microsoft Project.

Task dependency	Example	Description
Finish-to-start (FS)		Task (B) cannot start until task (A) finishes.
Start-to-start (SS)		Task (B) cannot start until task (A) starts.
Finish-to-finish (FF)		Task (B) cannot finish until task (A) finishes.
Start-to-finish (SF)		Task (B) cannot finish until task (A) starts.

Activity networks (cont.)

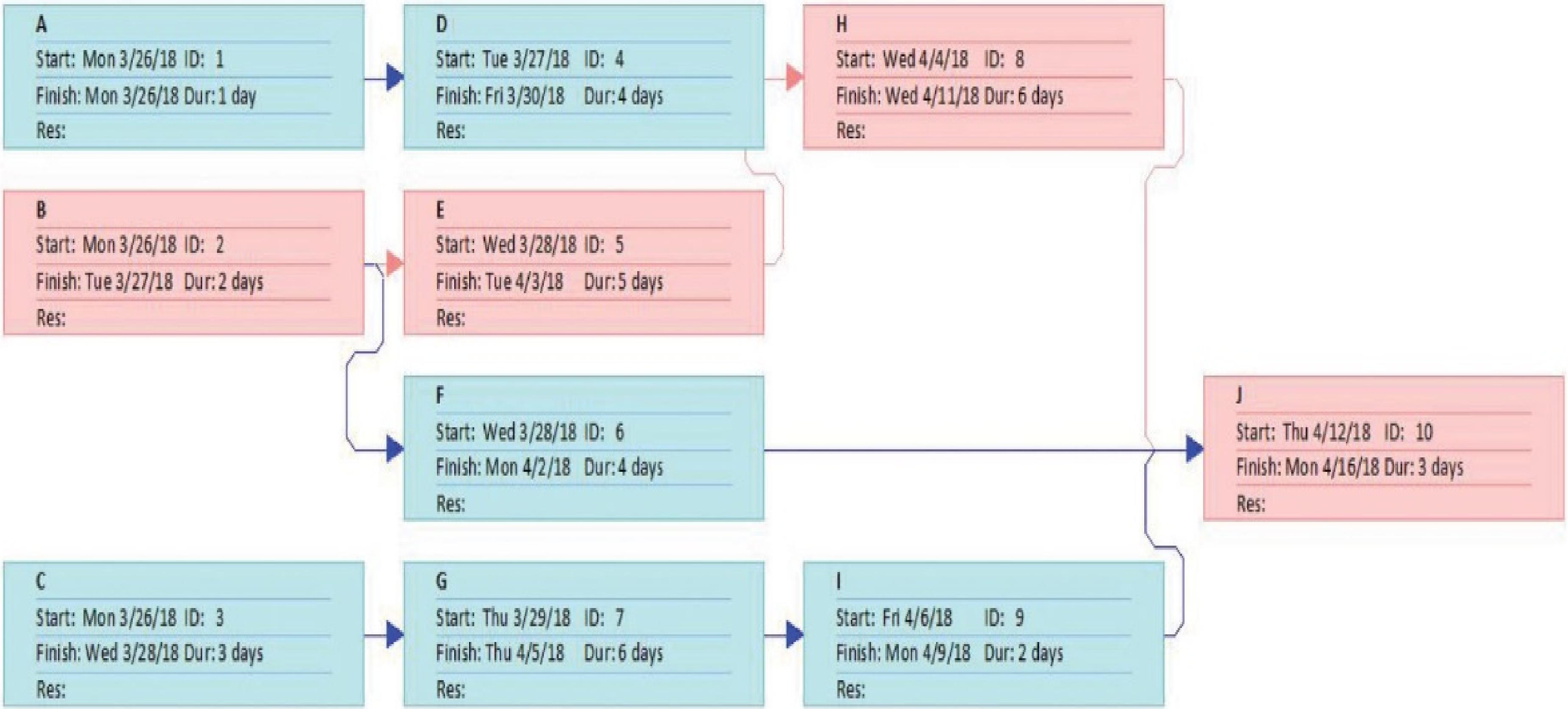
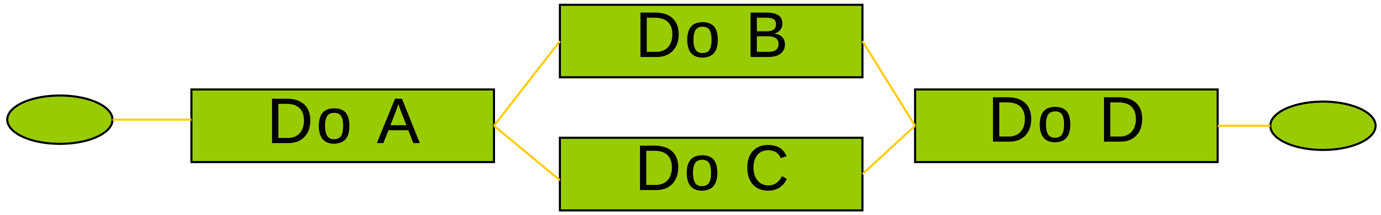
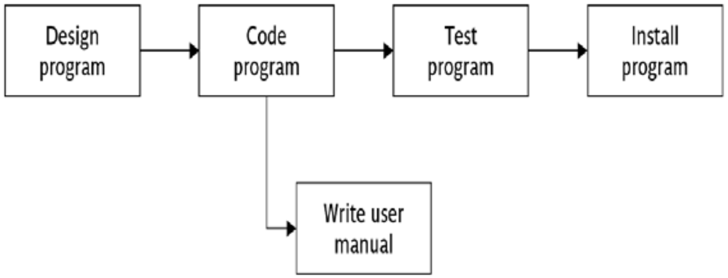


FIGURE 6-4 Precedence diagramming methods (PDM) network diagram for project X

Formulating a network planning model

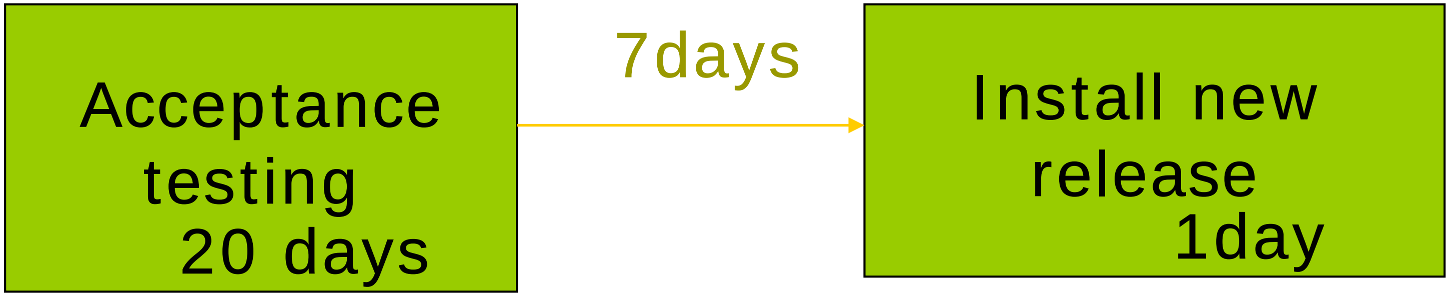


- An (activity-on-node) network planning model (i.e. **precedence network**) represents activities as nodes and their dependencies as edges:
  - Should have only 1 start node and 1 end node.
  - Each node has a duration.
  - Edges *normally* have no duration.
  - Times move from left to right.
  - Should not contain loops.
  - Should not contain dangles.



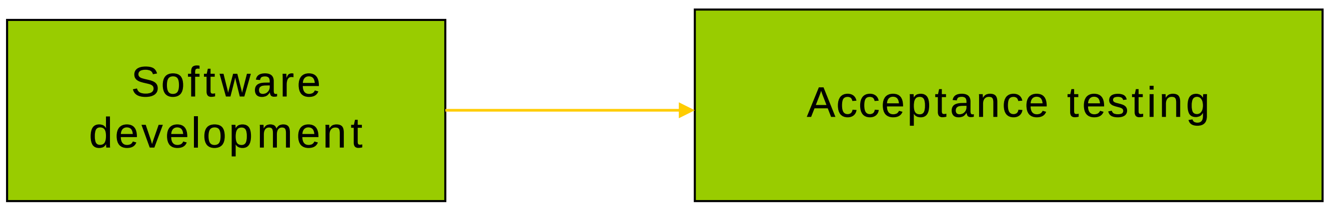
Lagged activities

- where there is a fixed delay between activities e.g. seven days notice has to be given to users that a new release has been signed off and is to be installed

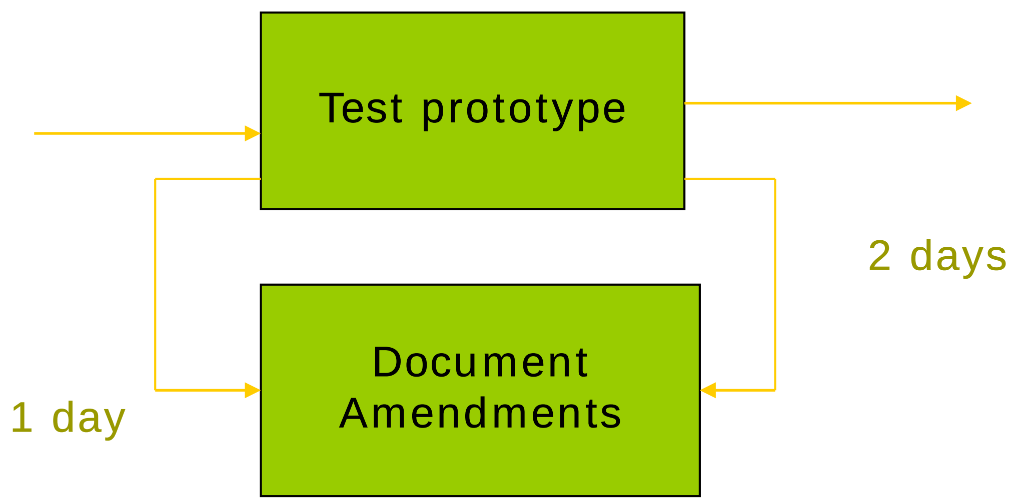


Types of links between activities

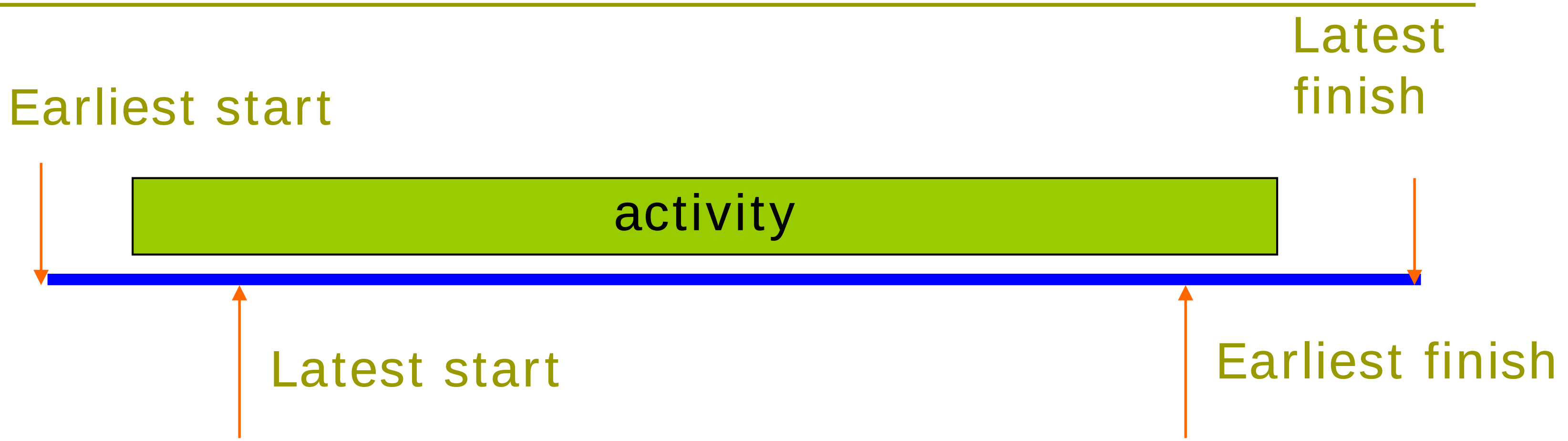
- Finish to start



- Start to start/ Finish to finish



Start and finish times



- Earliest start (ES)
- Earliest finish (EF) = ES + duration
- Latest finish (LF) = latest date when a task can be completed without affecting project end
- Latest start (LS) = LF - duration

Example

- earliest start = day 5
- latest finish = day 30
- duration = 10 days

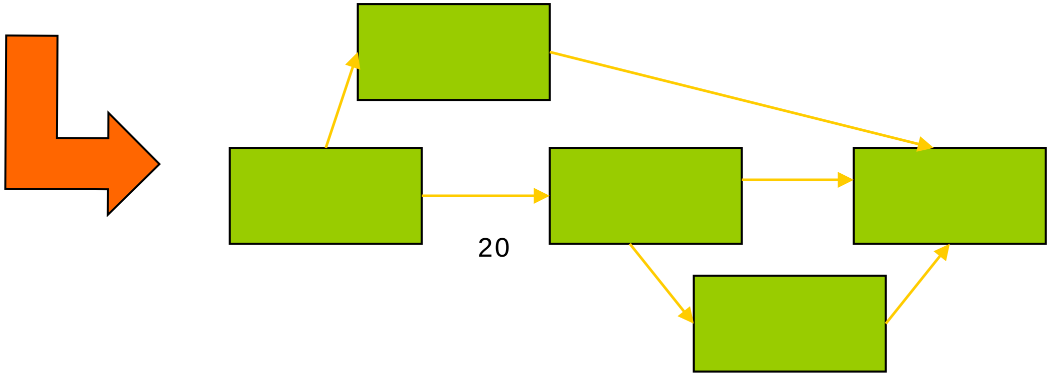
- earliest finish = ?
- latest start = ?

Float = LF - ES - duration

What is it in this case?

Notation

Earliest start	Duration	Earliest finish
Activity label, activity description		
Latest start	Float	Latest finish



Complete for the previous example

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Pen and paper exercise

Draw an activity network using precedence network conventions for the project specified as below.

Activity	Duration	Precedents
A	6	
B	4	
C	3	A
D	4	B
E	3	B
F	10	
G	3	E, F
H	2	C, D

Critical Path Method (CPM)

- Network diagramming technique used to predict total project duration
  - **Critical path**: series of activities that determine the earliest time by which the project can be completed
    - The longest path through the network diagram and has the least amount of slack or float; amount of time an activity may be delayed without delaying a succeeding activity or the project finish date

- Calculating the critical path
  - Develop a good network diagram and add the duration estimates for all activities on each path through the network diagram
    - Longest path is the critical path
  - If one or more of the activities on the critical path takes longer than planned, the whole project schedule will slip unless the project manager takes corrective action

Critical Path Method (cont.)

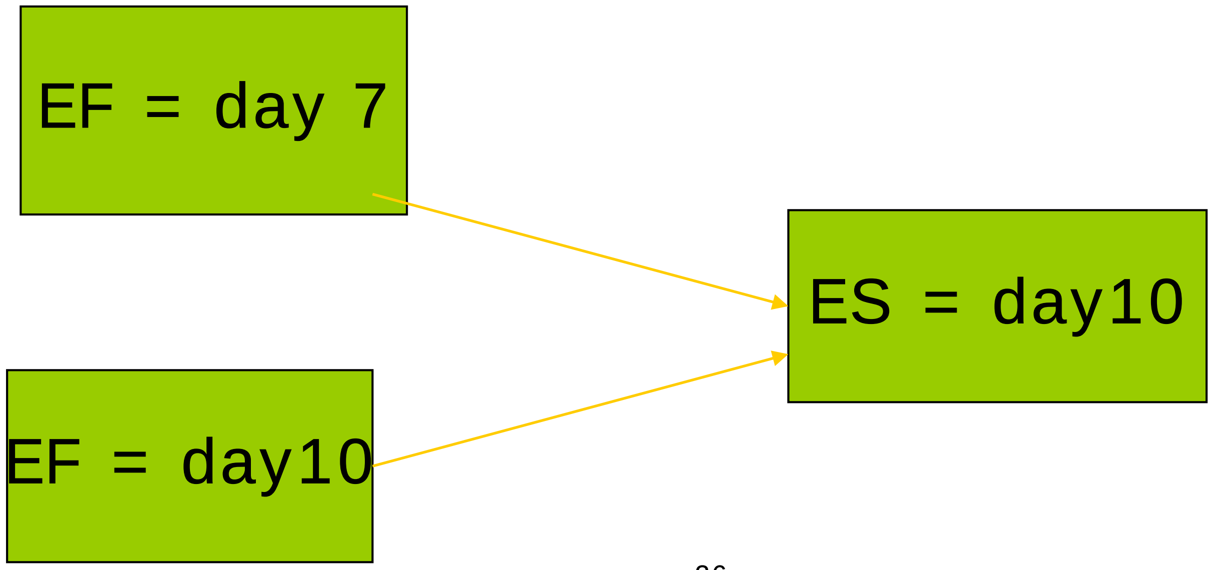
- There can be more than one critical path if the lengths of two or more paths are the same
  - Project managers should closely monitor performance of activities on the critical path to avoid late project completion
  - Critical path can change as the project progresses

Using Critical Path Analysis to Make Schedule Trade-Offs

- Free float
  - Amount of time an activity can be delayed without delaying the early start of any immediately following activities
- Total float
  - Amount of time an activity may be delayed from its early start without delaying the planned project finish date
- **Forward pass**
  - Determines the early start and finish dates
- **Backward pass**
  - Determines the late start and finish dates

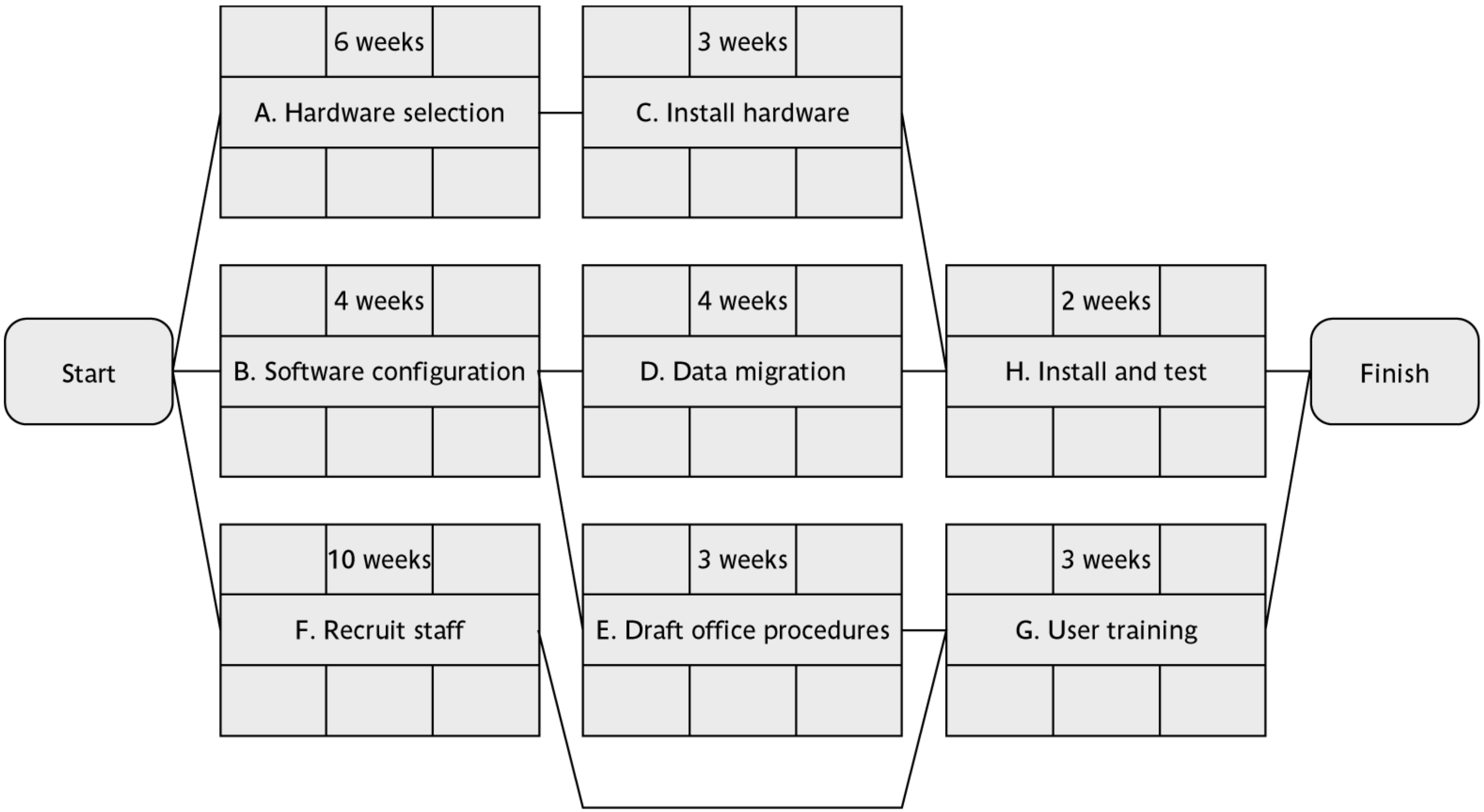
Forward pass

- Start at beginning (Day 0) and work forward following chains.
- Earliest start date for the *current* activity = earliest finish date for the *previous*
- When there is more than one previous activity, take the ***latest* earliest finish**

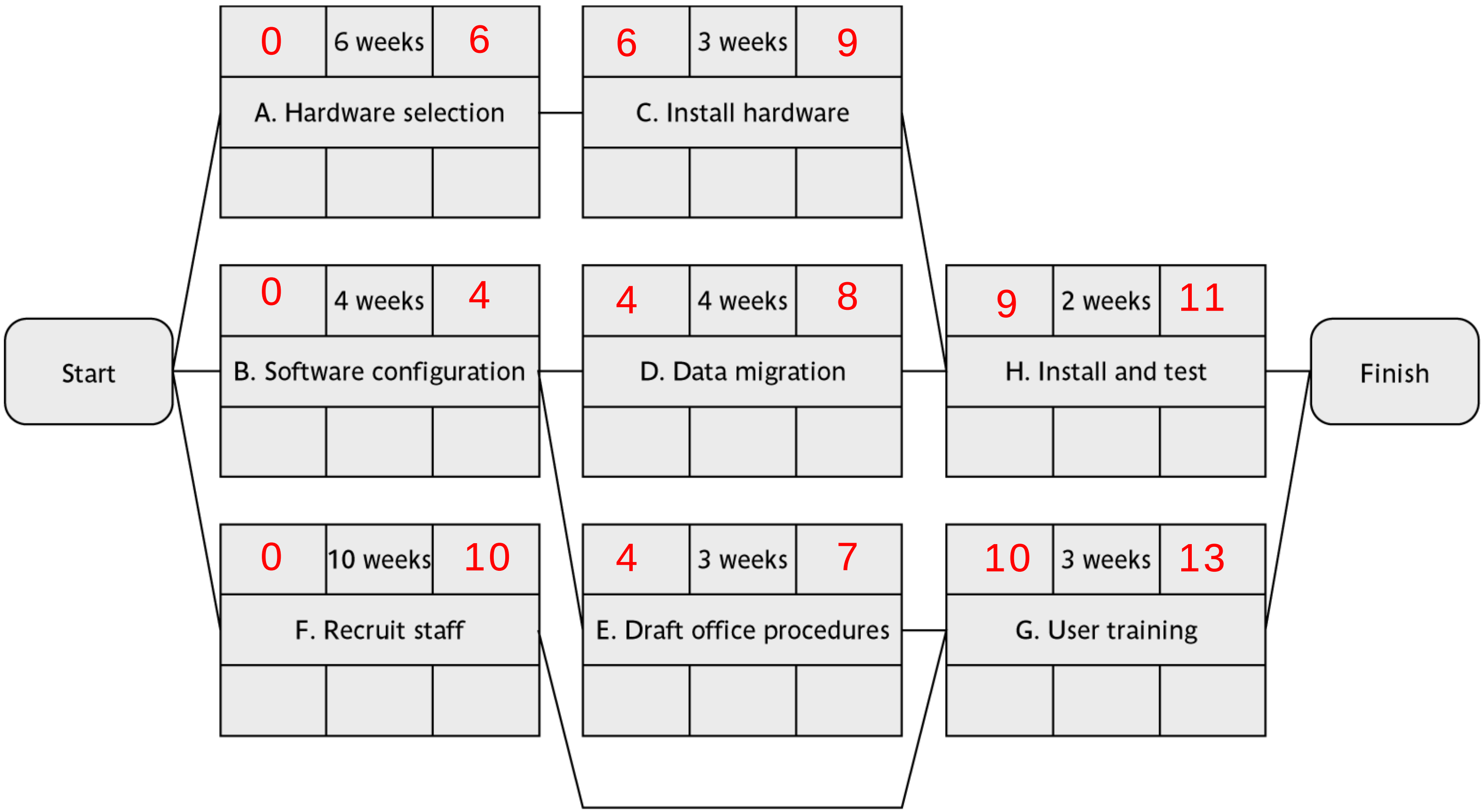


Pen and paper exercise

Fill in the earliest start and earliest finish dates for each activity



Forward pass Example

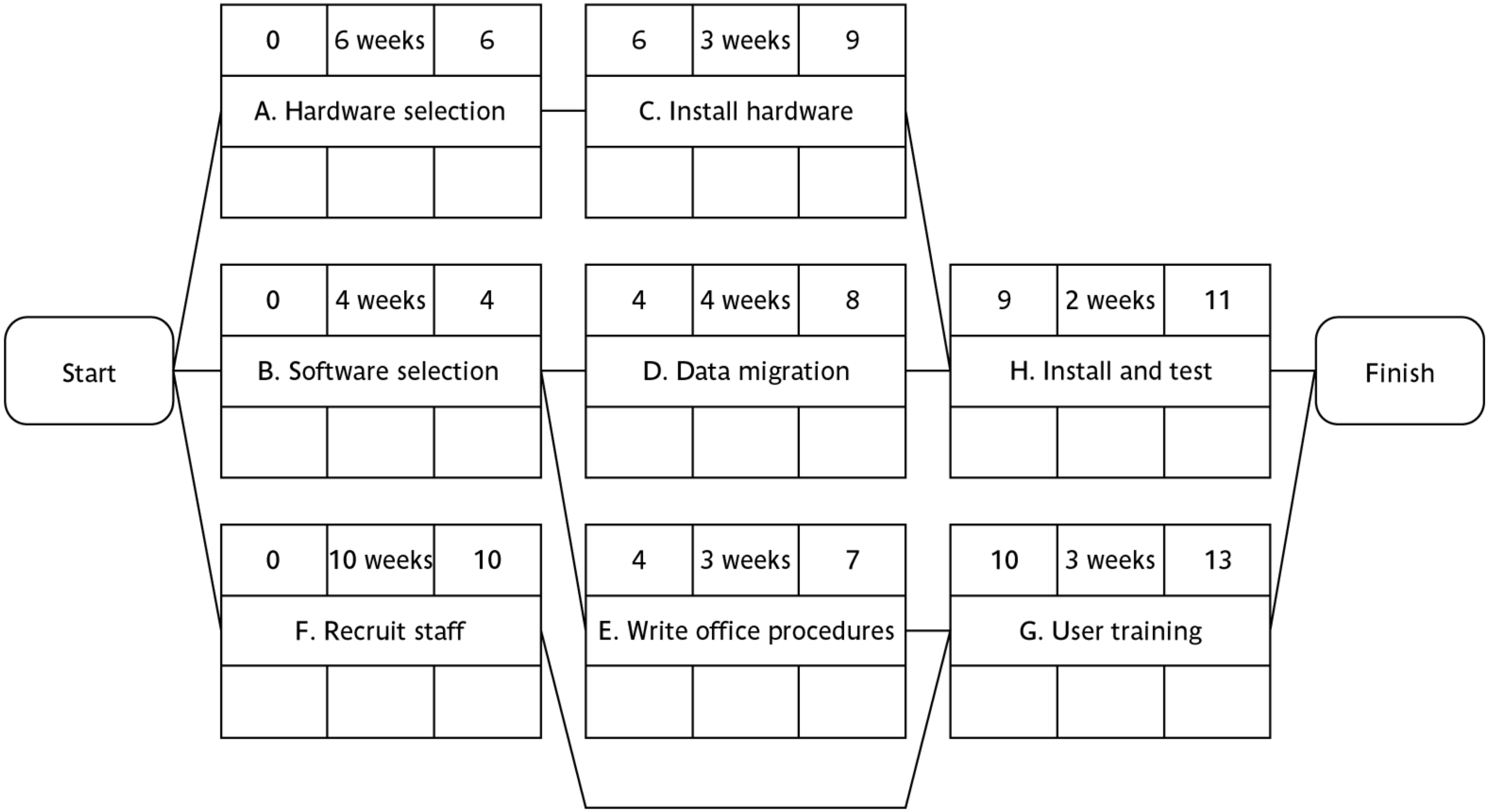


Backward pass

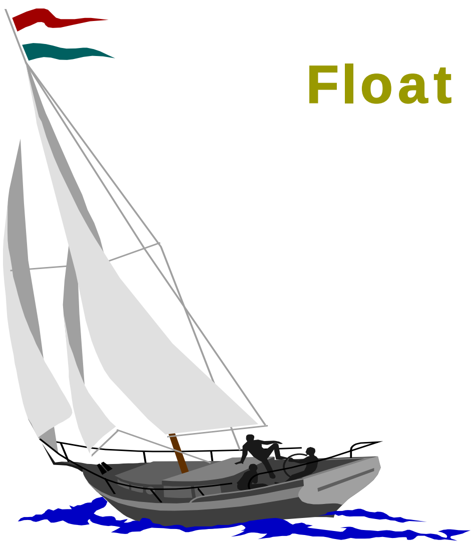
- Start from the *last* activity
- Latest finish (LF) for last activity = earliest finish (EF)
- Work backwards
- Latest finish for *current* activity = Latest start for the *following*
- More than one following activity - take the *earliest* LS
- Latest start (LS) = LF for activity - duration

Pen and paper exercise

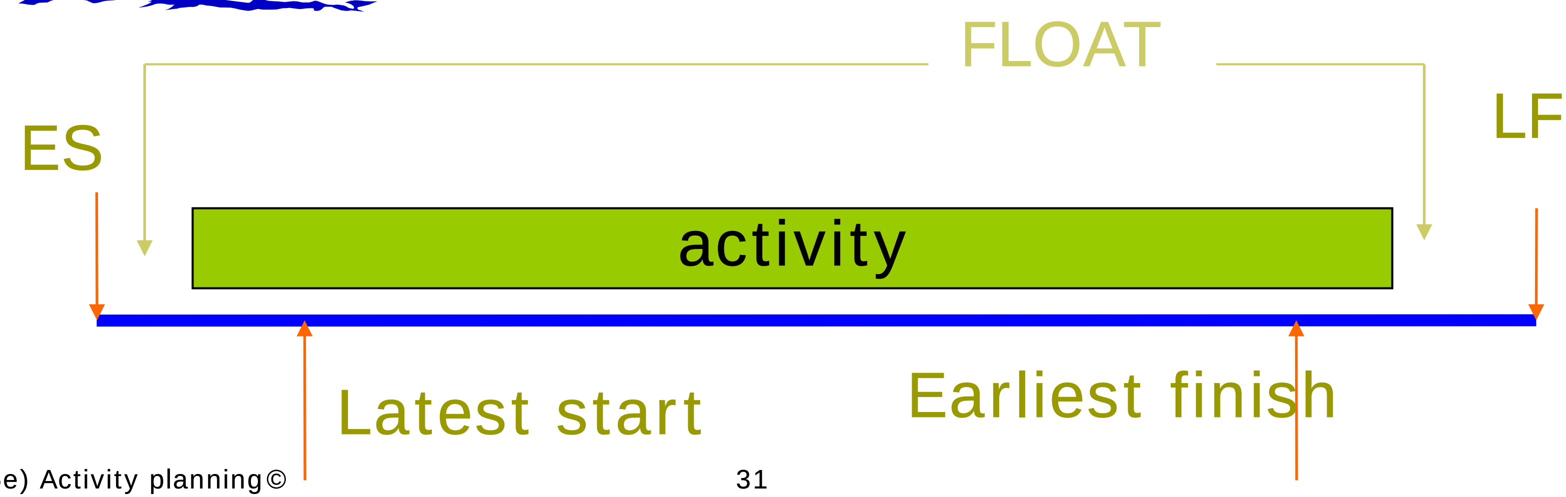
Fill in the latest start and latest finish dates for each activity



Float

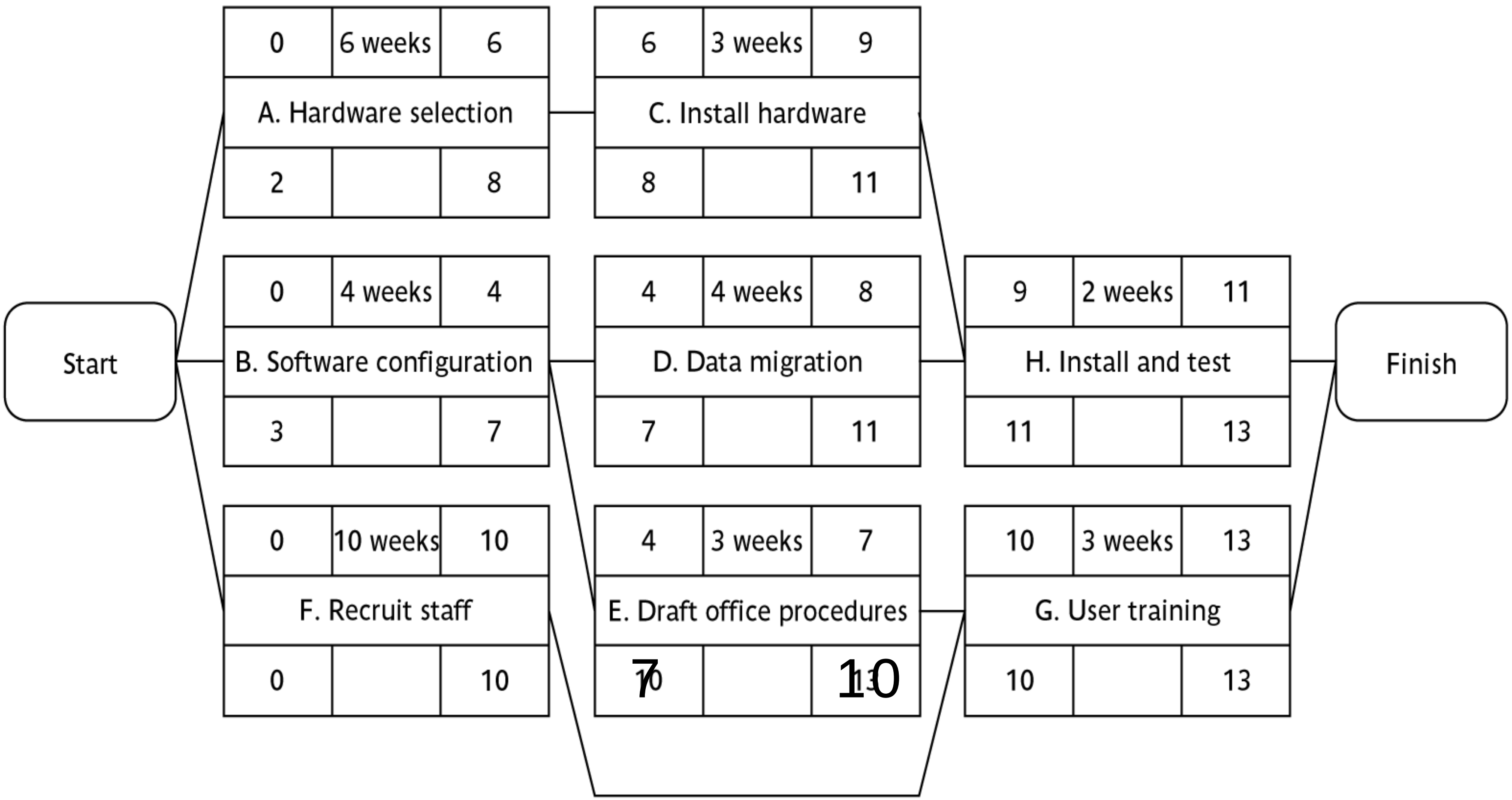


Float = Latest finish - Earliest start - Duration



Pen and paper exercise

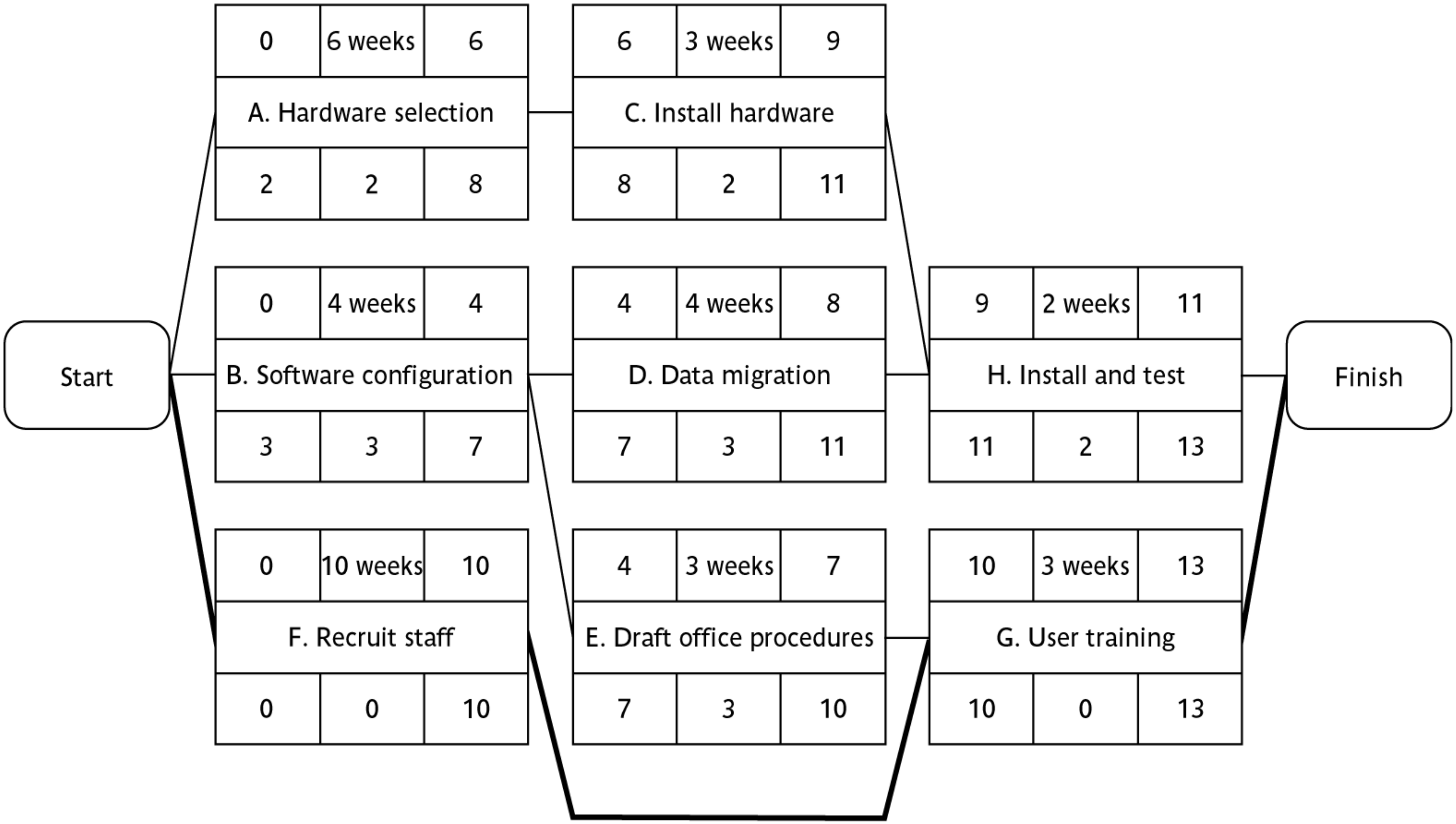
Fill in the float for each activity



Critical path

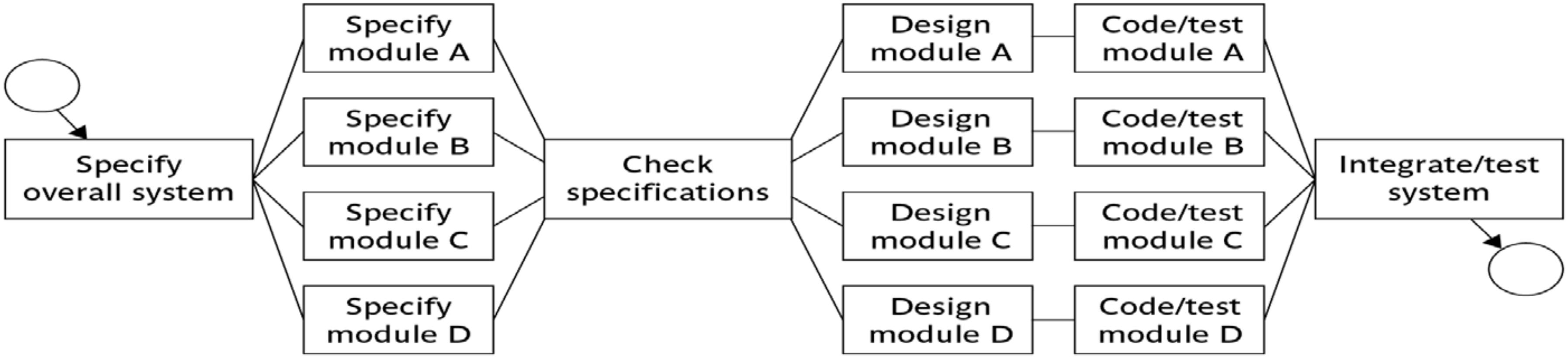
- Note the path through network with zero floats
- Critical path: any delay in an activity on this path will delay whole project
- Can there be more than one critical path?
- Can there be no critical path?
- Sub-critical paths

Critical path Example



Pen and paper exercise

- Identify the critical path of the following network



Activity	Estimated duration (days)	Activity	Estimated duration (days)
Specify overall system	34	Design module C	4
Specify module A	20	Design module D	4
Specify module B	15	Code/test module A	30
Specify module C	25	Code/test module B	28
Specify module D	15	Code/test module C	15
Check specification	2	Code/test module D	25
Design module A	7	System integration	6
Design module B	6		