Software Project Management

Chapter Six

Activity planning

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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

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

Activity networks

These help us to:

- Ensure that the appropriate resources will be available precisely when required.
- Avoid different activities competing for the same resources at the same time.
- Calculate when costs will be incurred.
- Produce a timed cash flow forecast.
- Produce a detailed schedule showing which staff carry out each activity.
- Produce a detailed plan against which actual achievement may be measured.
- Plan the project during its life to correct drift from the target.

Also

Activity plan will provide a target start and completion date for each activity.

The start and completion of activities must be clearly visible and ensure each activity to produce some tangible product or ‘deliverable’.

The project will progress according to the plan.

In case of deviation, identify the cause and plan to mitigate its effects.

Activity plan provides a means of evaluating the consequences of not meeting the activity target dates and guide to bring the project back to target.

Defining activities

Activity networks are based on some assumptions:

- 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

Defining activities -continued

An activity

- Must have clearly defined start and end-points
- Must have resource requirements that can be forecast: these are assumed to be constant throughout the project
- Must have a duration that can be forecast
- May be dependent on other activities being completed first (precedence networks)

Identifying activities

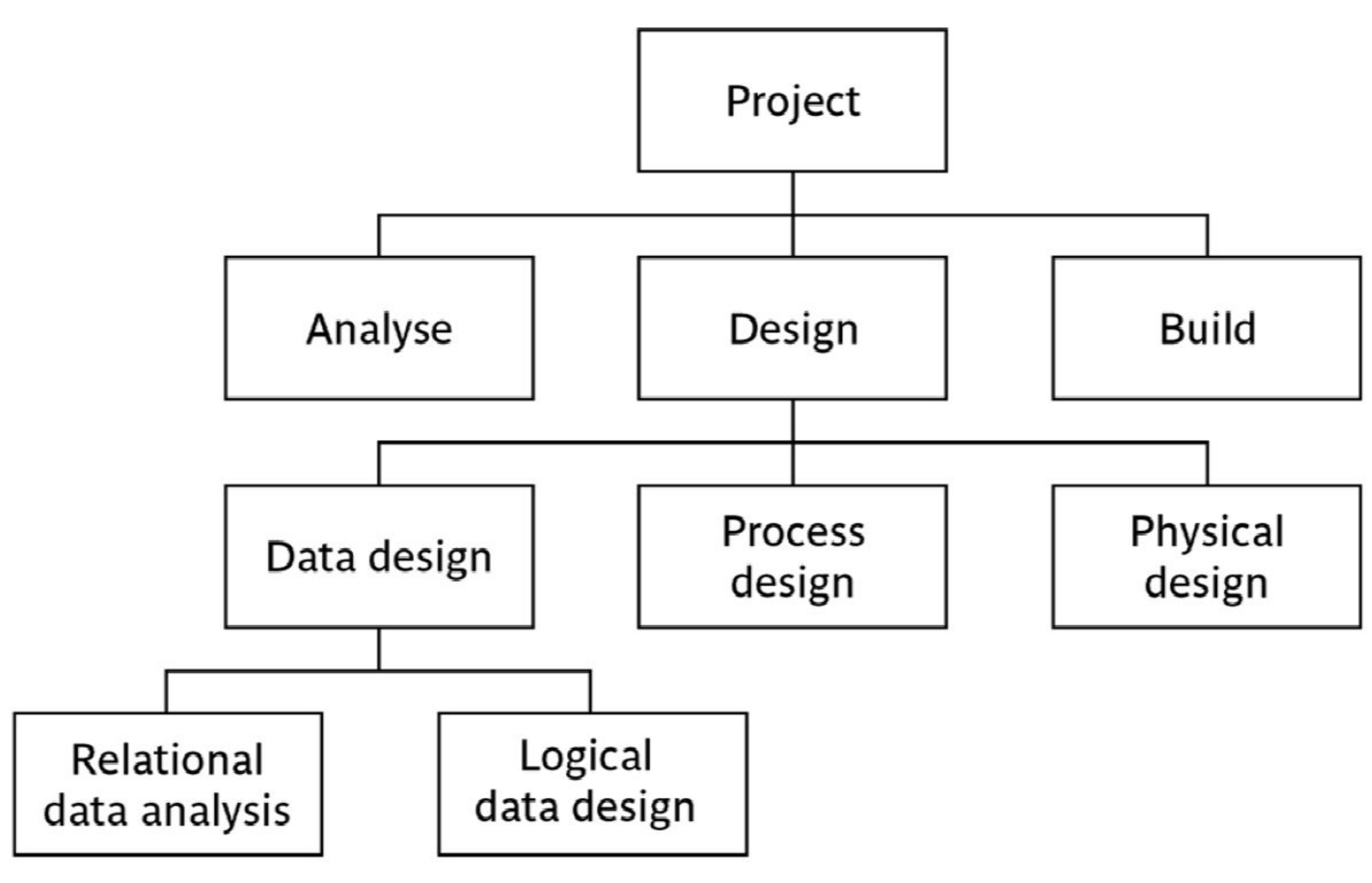
Work-based approach:

draw-up a Work Breakdown Structure listing the work items needed

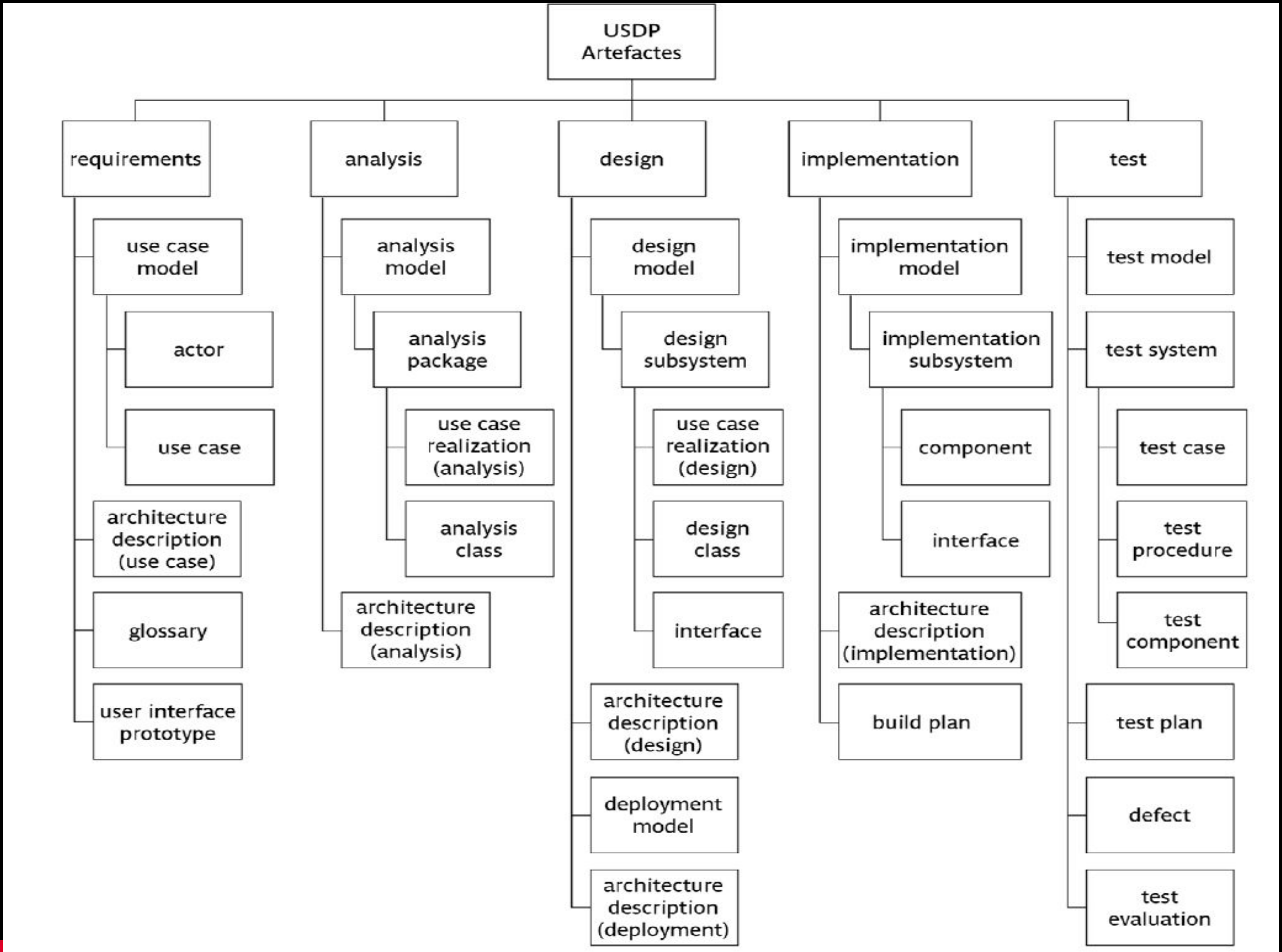
Product-based approach:

- 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

Activity based work-breakdown structure



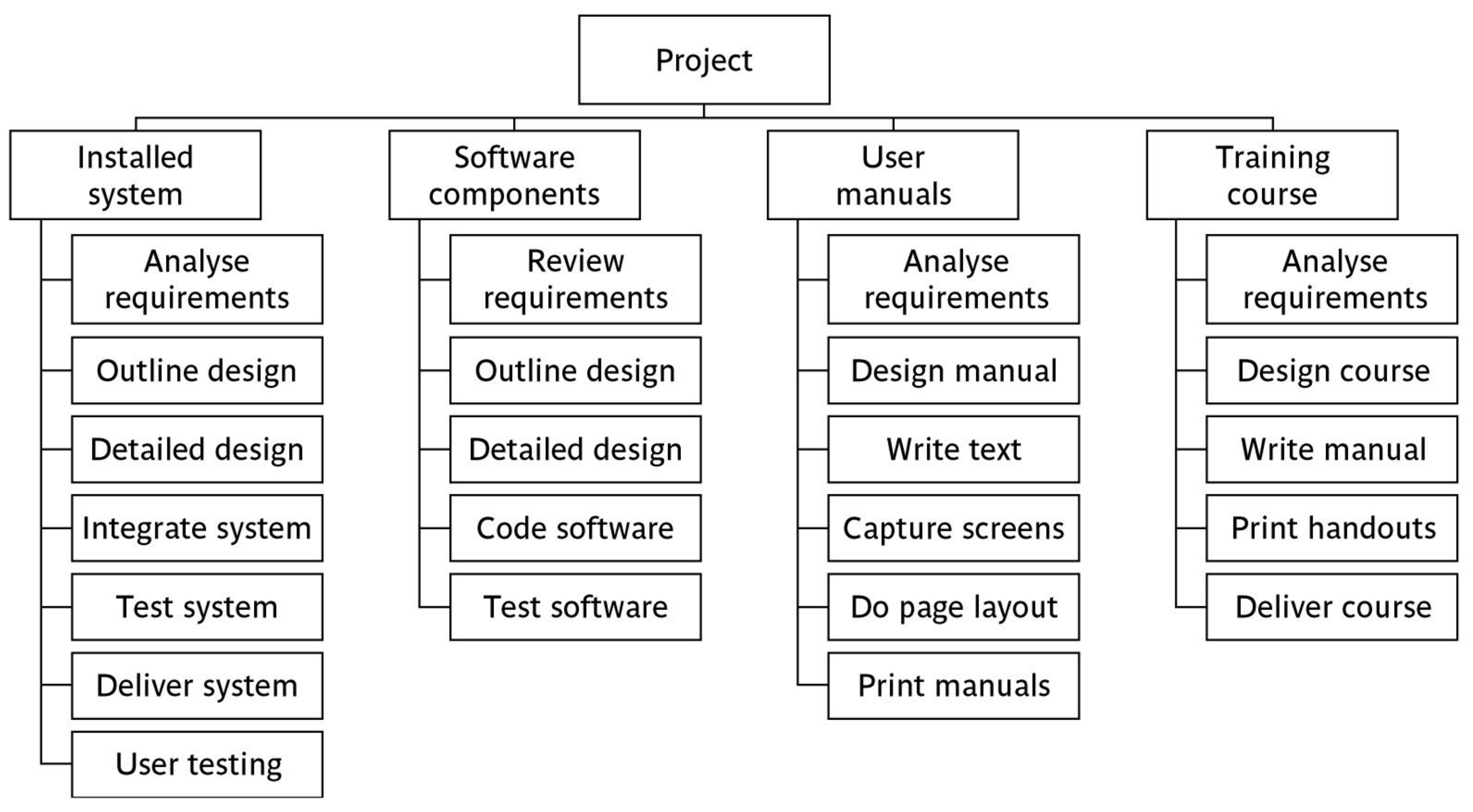
USDP product breakdown structure



- USDP Artefactes
  - requirements
    - use case model
      - actor
      - use case
    - architecture description (use case)
    - glossary
    - user interface prototype
  - analysis
    - analysis model
      - analysis package
        - use case realization (analysis)
        - analysis class
    - architecture description (analysis)
  - design
    - design model
      - design subsystem
        - use case realization (design)
        - design class
        - interface
    - architecture description (design)
    - deployment model
    - architecture description (deployment)
  - implementation
    - implementation model
      - implementation subsystem
        - component
        - interface
    - architecture description (implementation)
    - build plan
  - test
    - test model
    - test system
      - test case
      - test procedure
      - test component
    - test plan
    - defect
    - test evaluation

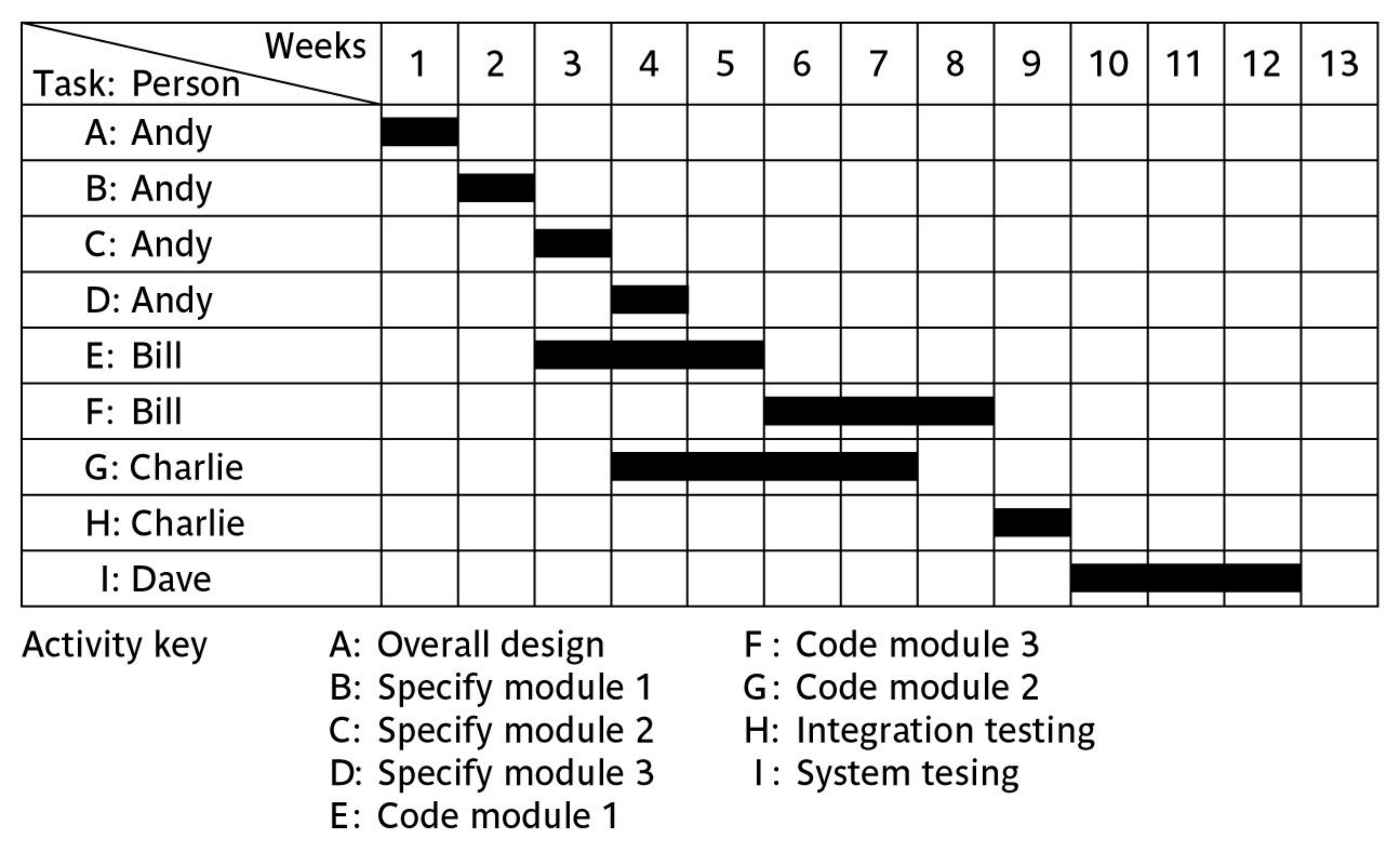
USDP – Unified Software Development Process – Jacobson, Booch, Rambaugh

Hybrid approach



The final outcome of the planning process

A project plan as a bar chart



Task: Person \ Weeks	1	2	3	4	5	6	7	8	9	10	11	12	13
A: Andy	■												
B: Andy		■											
C: Andy			■										
D: Andy				■									
E: Bill			■	■	■								
F: Bill						■	■	■					
G: Charlie				■	■	■	■						
H: Charlie									■				
I: Dave										■	■	■	

Activity key

A: Overall design
B: Specify module 1
C: Specify module 2
D: Specify module 3
E: Code module 1
F : Code module 3
G: Code module 2
H: Integration testing
I : System tesing

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Network Planning Model

Project scheduling techniques model the project activities and their relationships as a network

In the network time flows from left to right.

Developed in 1950s.

Uses activity-on-arrow to visualize network.

Circles and arrows are used.

Technique is called precedence network.

PERT (program evaluation review technique)

CPM (critical path analysis)

Constructing Precedence Network

A project network should have only one **start** node.

A project network should have only one **end** node.

A node has a **duration**.

Links normally have **no duration**.

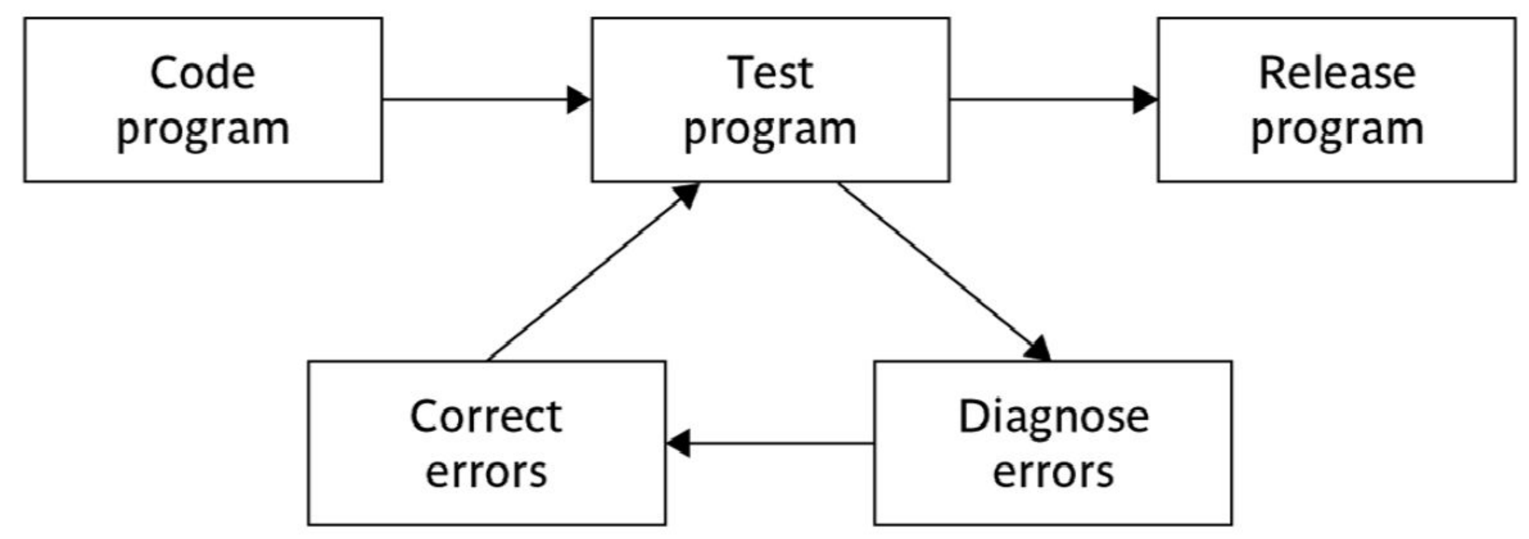
Precedents are the immediate preceding activities.

Time moves from left to right.

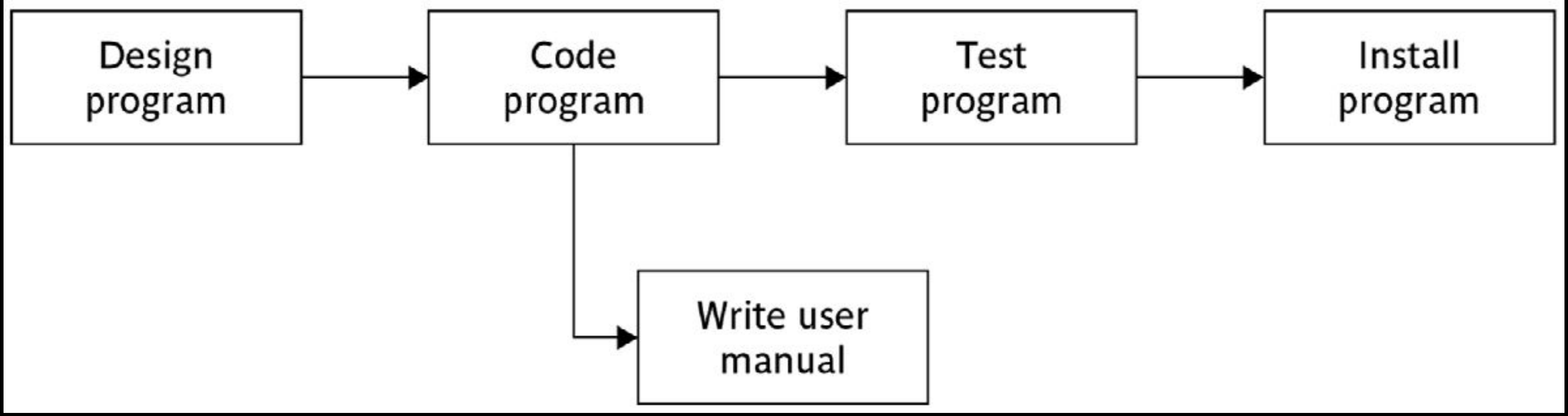
A network may not contain **loop**.

A network should not contain **dangles**.

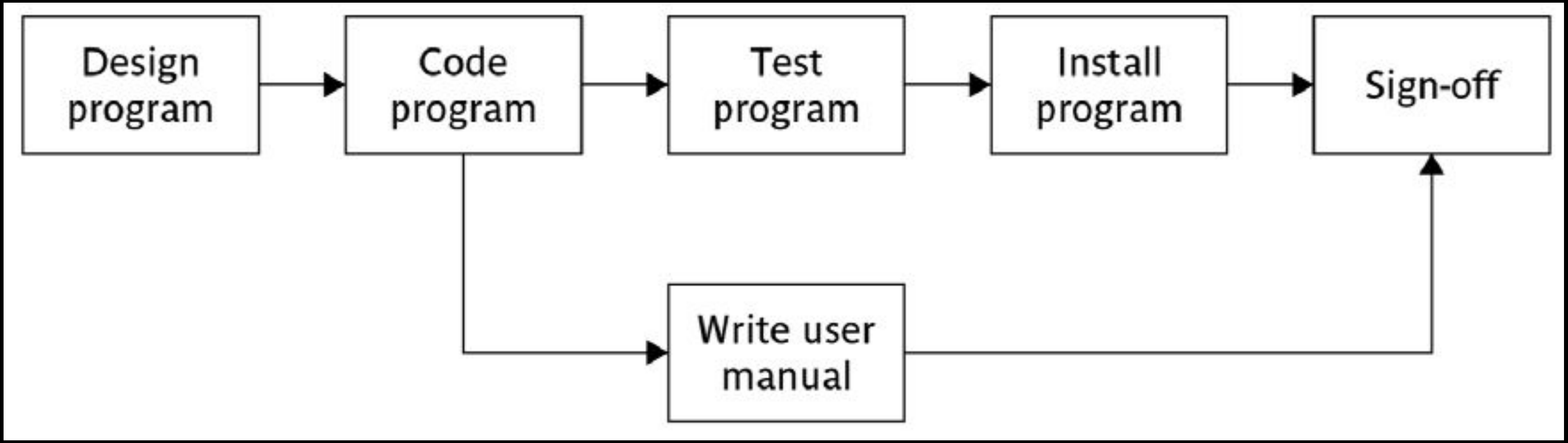
A loop represents an impossible sequence



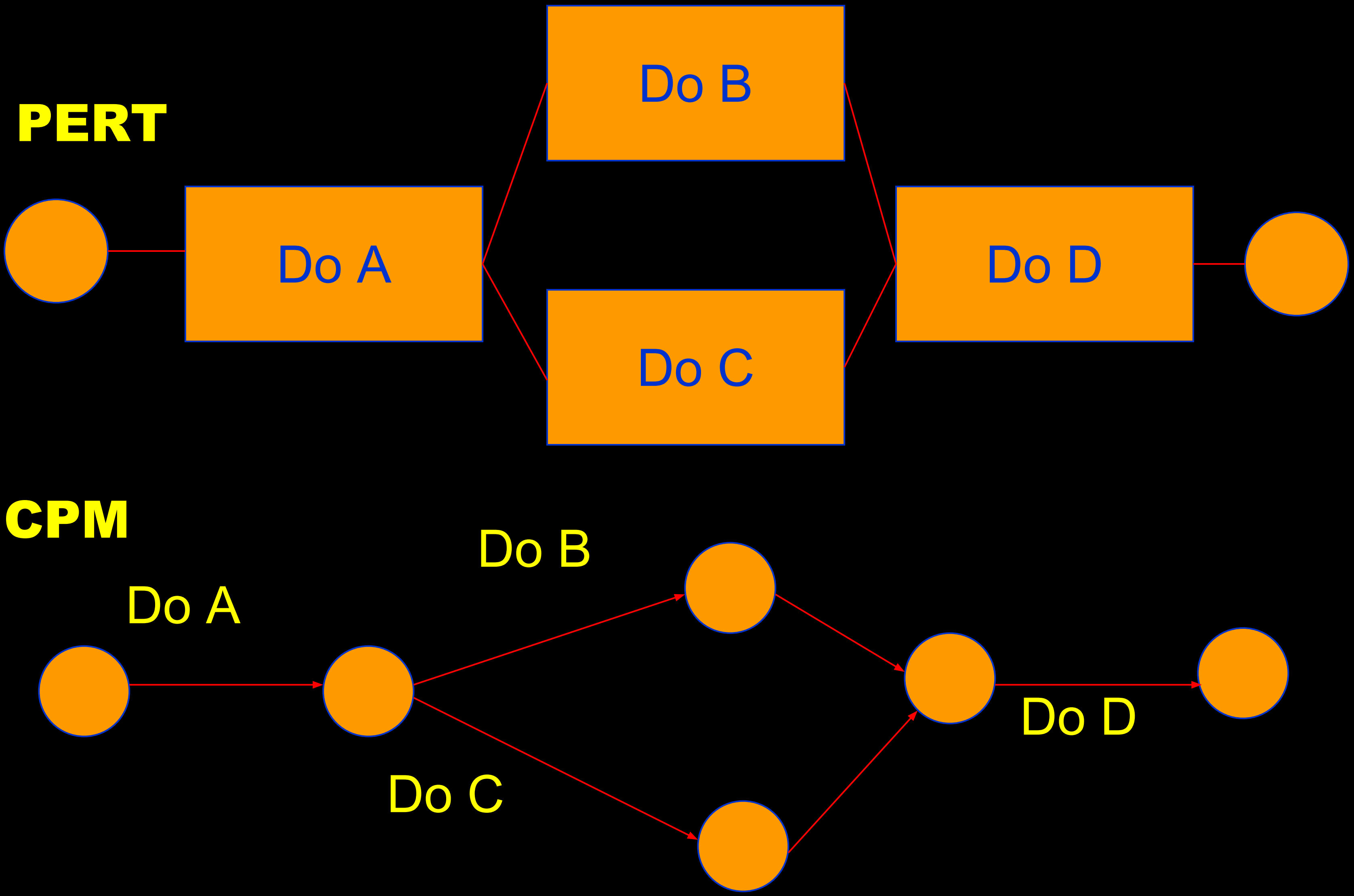
A dangle



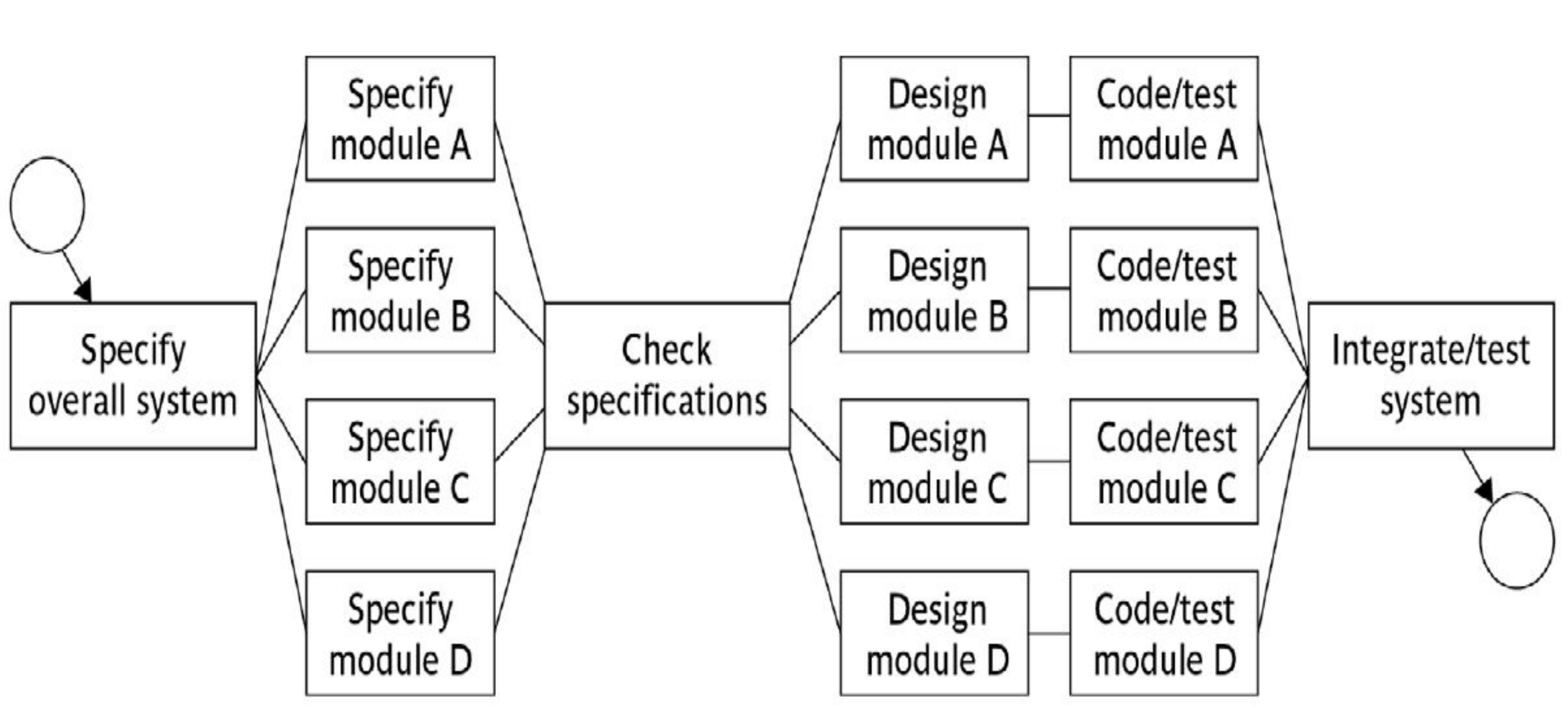
Resolving a dangle



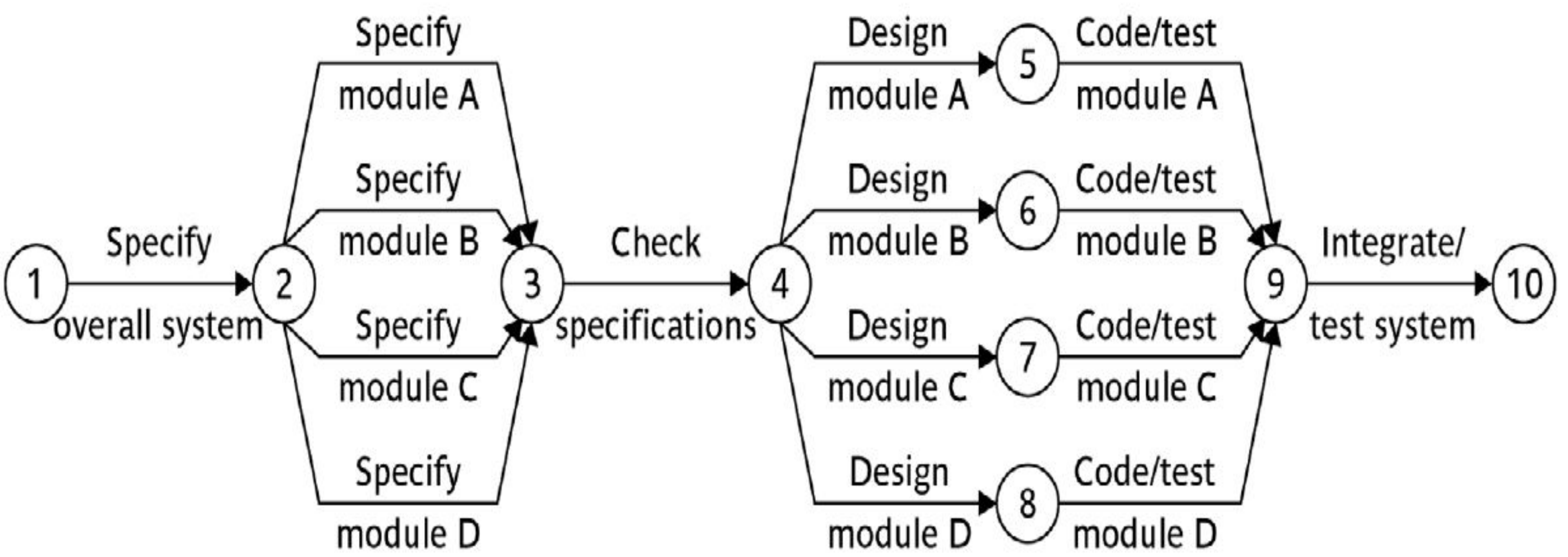
PERT vs CPM



Annual maintenance contract project – Event based network



Annual maintenance contract project activity network - CPM



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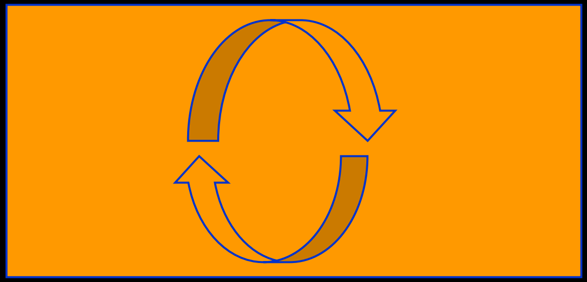
Drawing up a PERT diagram

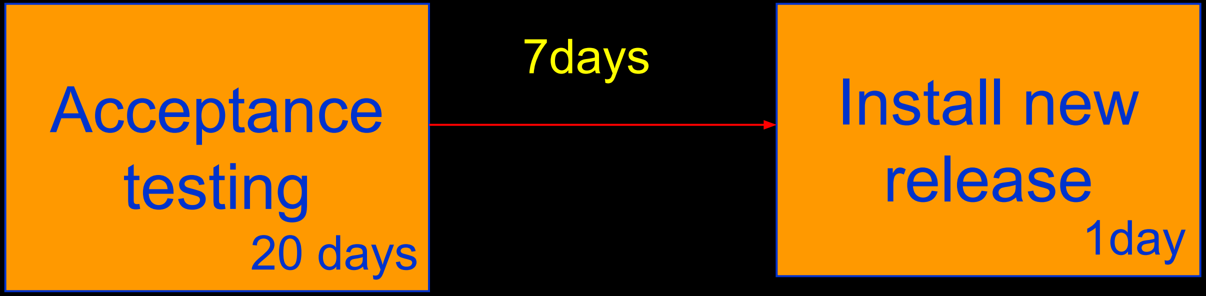
No looping back is allowed – deal with iterations by hiding them within single activities



milestones – ‘activities’, such as the start and end of the project, which indicate transition points. They have zero duration.

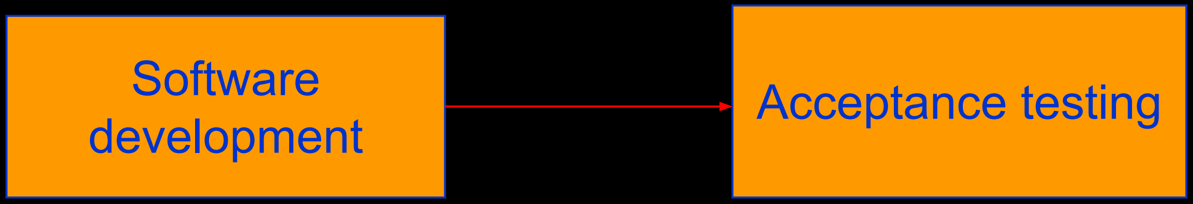
Lagged activities

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

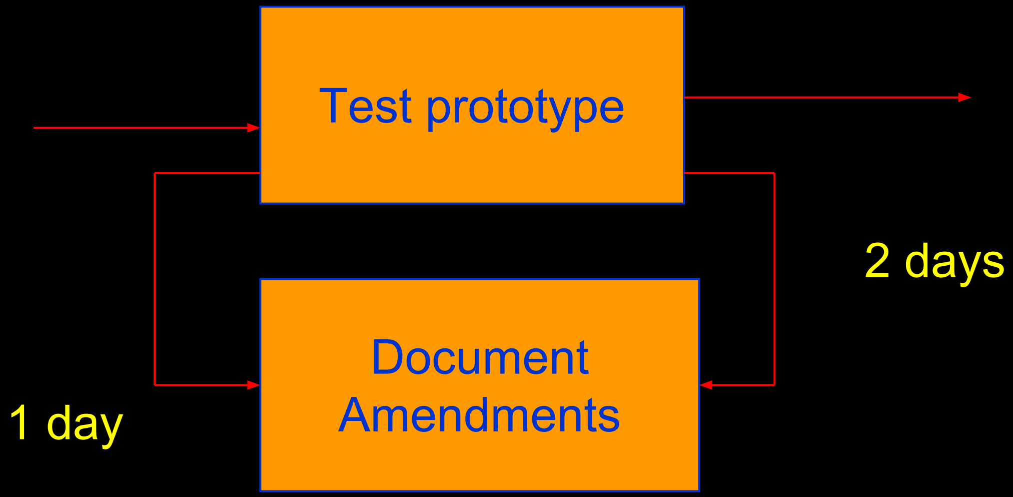
Finish to start



Software development

Acceptance testing

Start to start/ Finish to finish



Test prototype

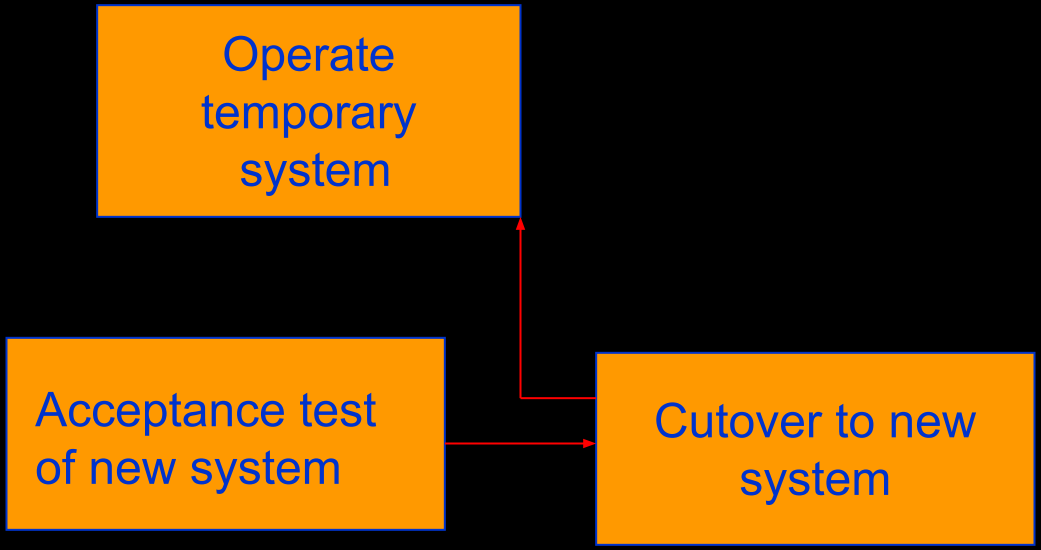
Document Amendments

2 days

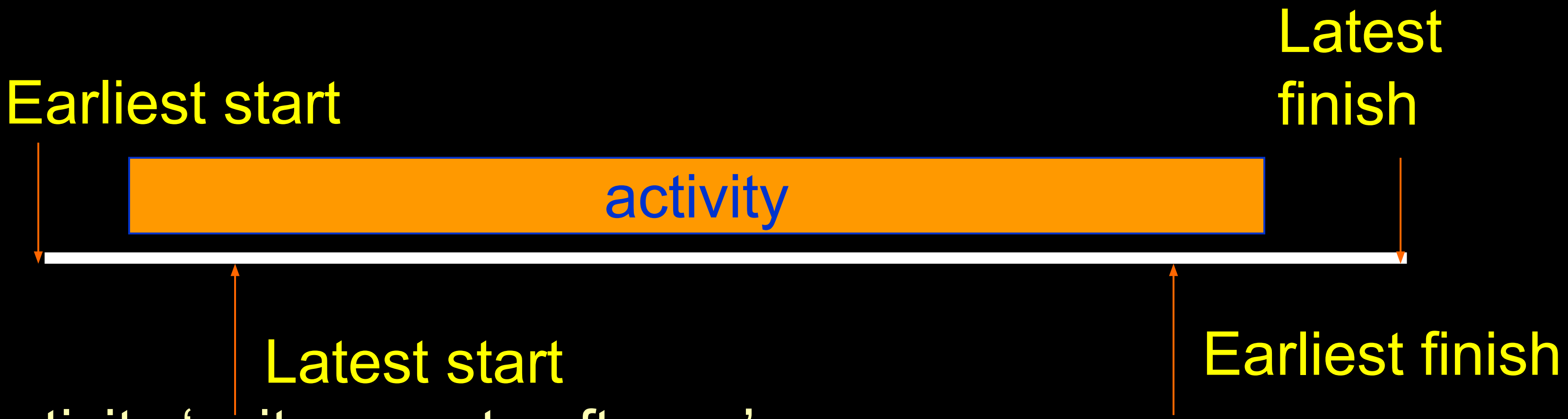
1 day

Types of links between activities

Start to finish



Start and finish times



Earliest start

Latest finish

activity

Latest start

Earliest finish

Activity ‘write report software’

Earliest start (ES)

Earliest finish (EF) = ES + duration

Latest start(LS) = latest task can be completed without affecting project end Latest start = LF - duration

Example

earliest start = day 5

latest finish = day 30

duration = 10 days

earliest finish = ?

latest start = ?

Float = ES – EF – duration

What is it in this case?

‘Day 0’

Note that in the last example, day numbers used rather than actual dates

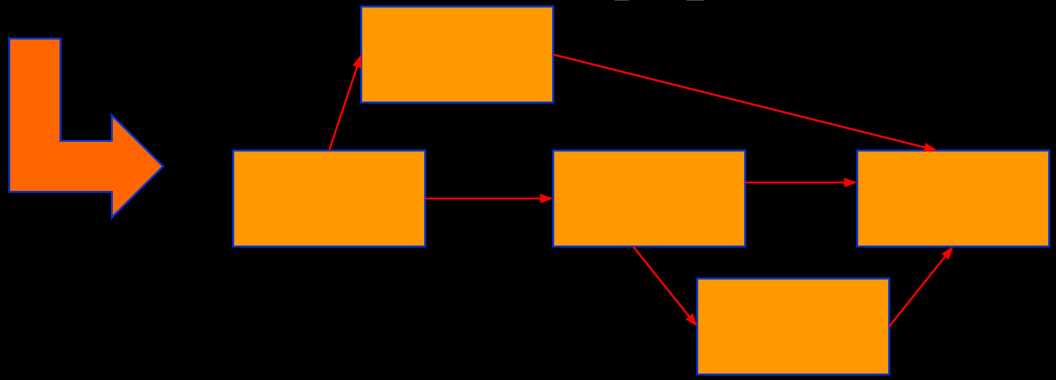
Makes initial calculations easier – not concerned with week-ends and public holidays

For **finish** date/times Day 1 means at the END of Day 1.

For a **start** date/time Day 1 also means at the END of Day 1.

The first activity therefore begin at Day 0 i.e. the end of Day 0 i.e. the start of Day 1

T_E	t	T_E+t
Earliest start (ES)	Duration	Earliest finish (EF)
Activity label, activity description		
Latest Start (LS)	Float	Latest finish (LF)
T_L-t	$T_L - T_E$	T_L



Complete for the previous example

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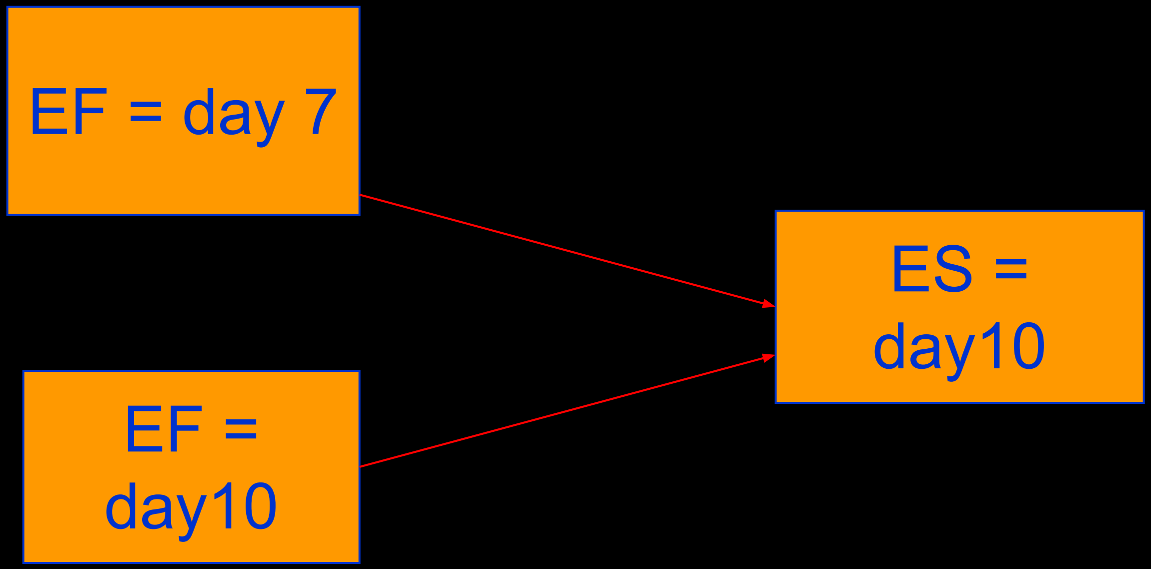
Forward pass

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

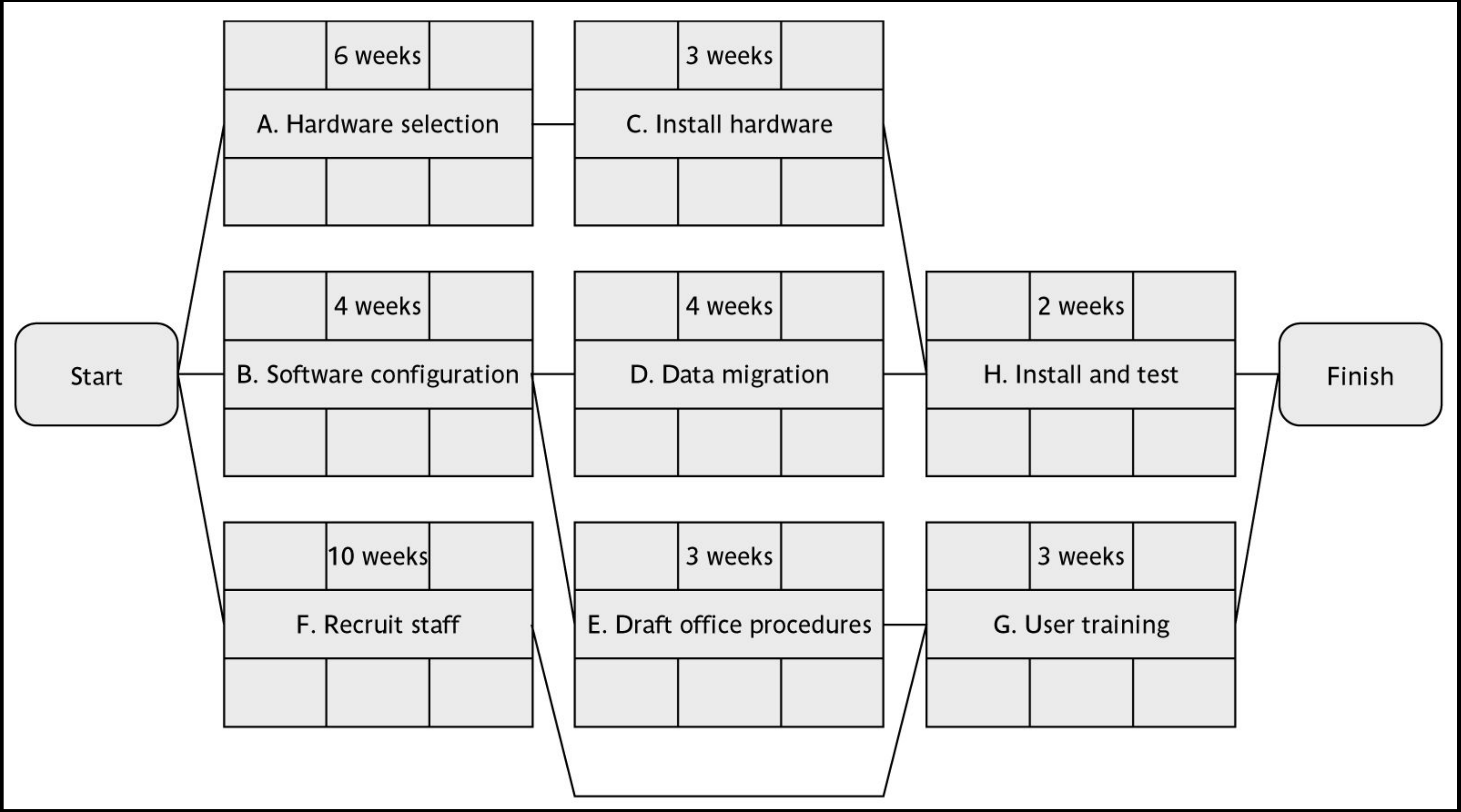


EF = day 7

EF = day10

ES = day10

Example of an activity network



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Complete the table

Activity	ES	duration	EF
A			
B			
C			
D			
E			
F			
G			
H			

Backward pass

Start from the *last* activity

Latest finish (LF) for last activity = earliest finish (EF)

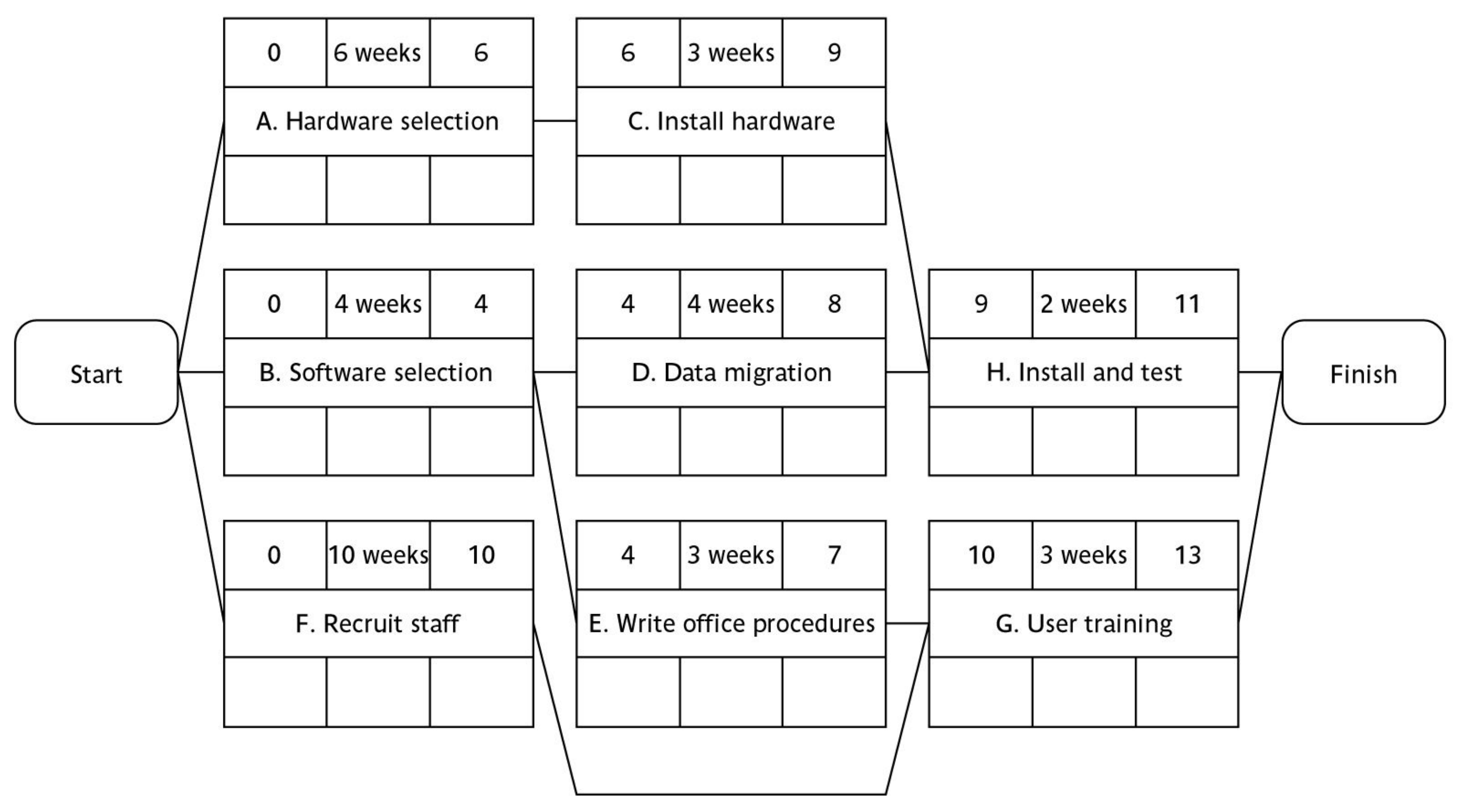
work backwards

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

Example: LS for all activities?

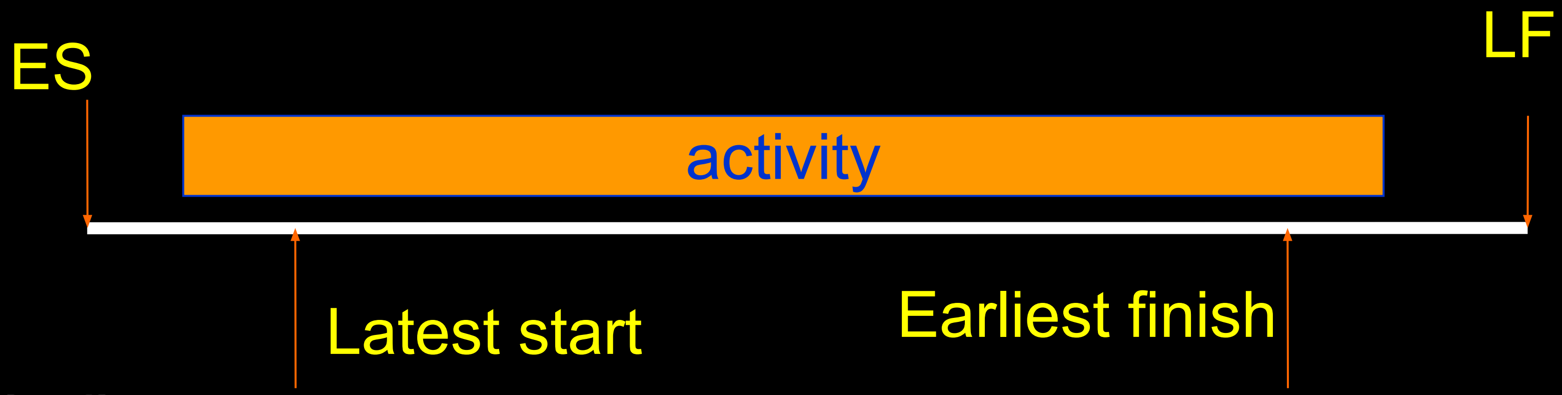


Complete the table

Activity	ES	Dur	EF	LS	LF
A					
B					
C					
D					
E					
F					
G					
H					

Float

Float = Latest finish - Earliest start - Duration



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Complete the table

Activity	ES	Dur	EF	LS	LF	Float
A						
B						
C						
D						
E						
F						
G						

Critical path

Note the path through network with zero floats

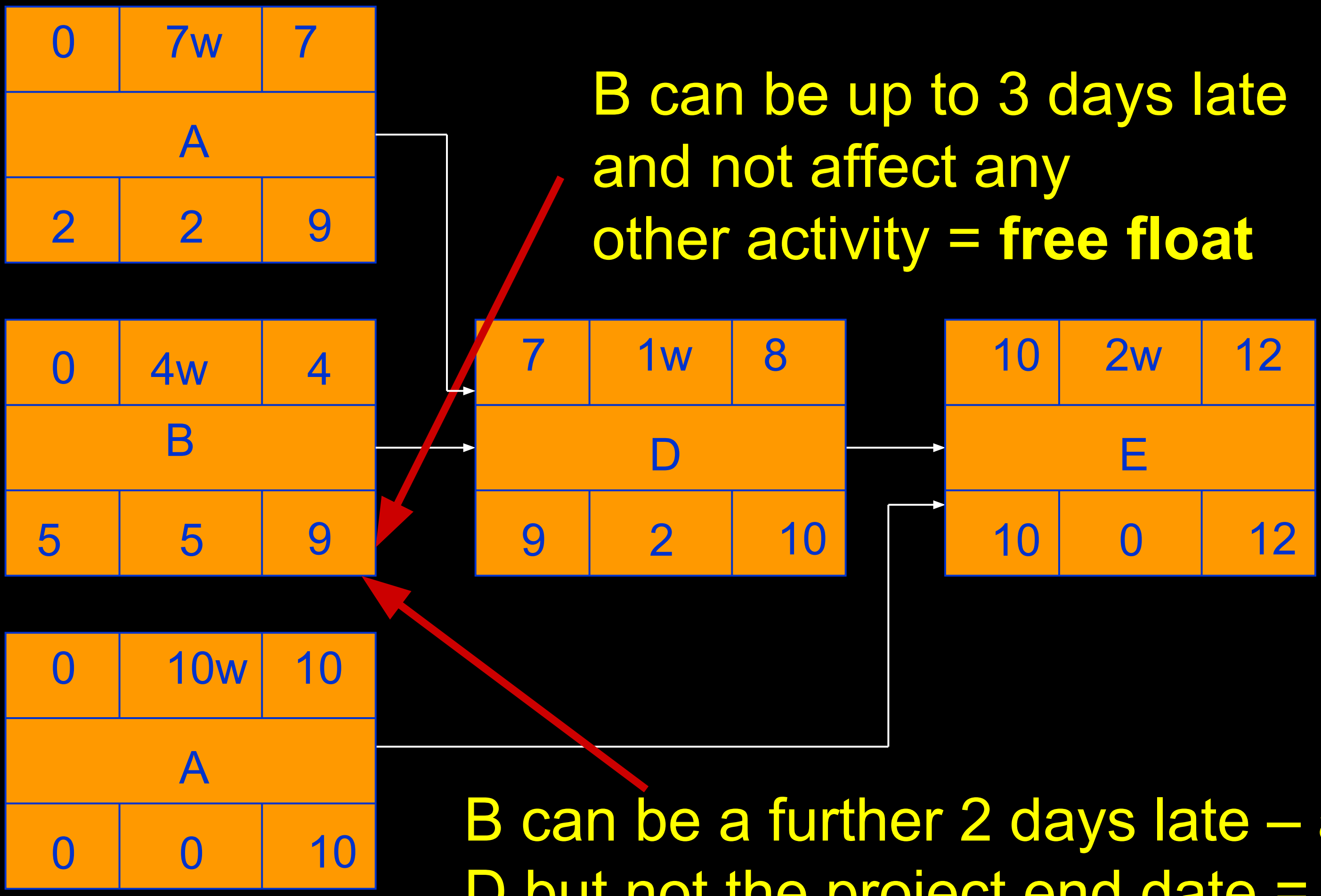
Critical path: any delay in an activity on this path will delay whole project

Can there be more than one critical path?

Can there be no critical path?

Sub-critical paths

Free and interfering float



B can be up to 3 days late and not affect any other activity = **free float**

B can be a further 2 days late – affects D but not the project end date = **interfering float**