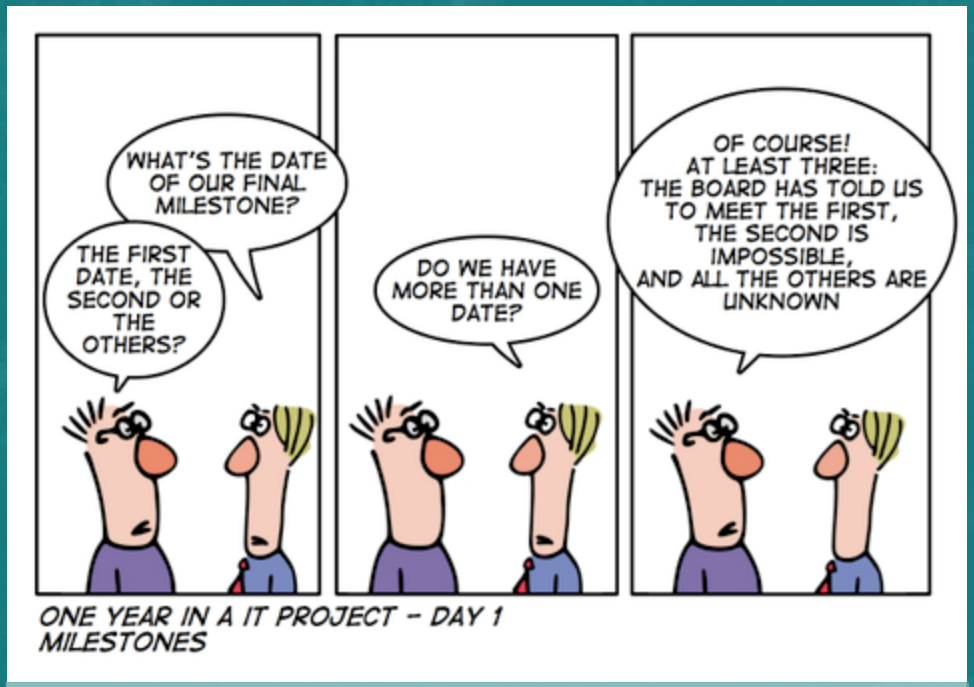
Project Plan & Scheduling

Production and Project Management


WHAT'S THE DATE OF OUR FINAL MILESTONE?
THE FIRST DATE, THE SECOND OR THE OTHERS?
DO WE HAVE MORE THAN ONE DATE?
OF COURSE! AT LEAST THREE: THE BOARD HAS TOLD US TO MEET THE FIRST, THE SECOND IS IMPOSSIBLE, AND ALL THE OTHERS ARE UNKNOWN
ONE YEAR IN A IT PROJECT – DAY 1
MILESTONES

Adding manpower to a late software project makes it later.

Brooks' Law:

Do you agree?

Please discuss with your team

http://www.gamasutra.com/view/feature/130509/the_secrets_in_the_schedule_.php?print=1

"The first 90% of the code accounts for the first 90% of the development time. The remaining 10% of the code accounts for the other 90% of the development time."

Tom Cargill's Ninety-Ninety Rule

Why?????

- Final 10% takes very much longer than anticipated.
  - Project seem to be ‘90% complete' for 90% of the time! seem to be on schedule
  - Then sudden, they over-run radically.

“The only constant in life is change.”

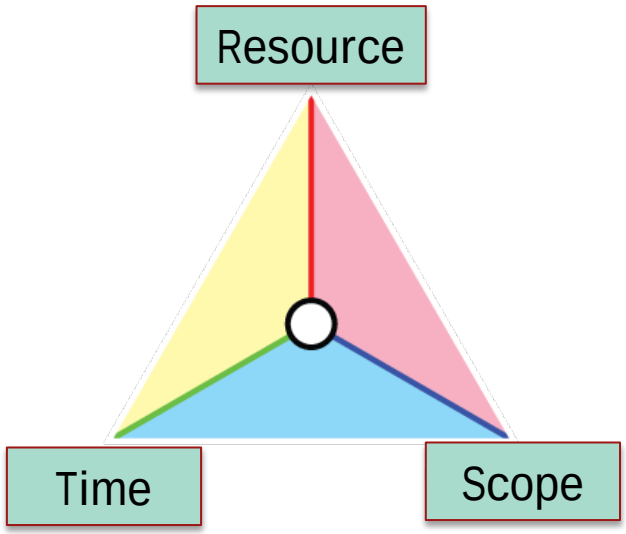
Heraclitus

Remember? A Project

- Has a beginning and an end
- Meet pre-established goals/quality objectives
- Meet schedule
- Within budget

Time, Quality and Cost Triangle

- The triangle works on the principle that as more emphasis is placed on one element, less is placed on the others.



Why Project is Delivered Late

- Too ambitions, too many features
- *Prioritising tasks/features*
- Scoping – poorly defined requirement
- *Past Experience/Expert Advice*
- Designers vs Programmers
- *Lack contingency planning – risk?*
- *Lack testing*
- Poor project management across team

Remember Lesson 1?

Planning for Success

What is Scheduling?

Walk (20 min)

Bus (12 min)

MRT (23 min)

Car/Taxi (6 min)

Resource

Time

Scope

Scheduling is about…

- … predicting the future
- … considering uncertainties and making assumptions.
- … understanding your resources, your constraints (time, budget, scope), and your risks (impediments, obstacles…).
- … finding ways to end the project efficiently.

Scheduling helps to

- … identifies and organises project tasks into a sequence of events that create the project management plan.
  - establish predictability
  - What was accomplished? What lies ahead? ← *remember?*
  - Which finished components (or increment) are delivered at the end of each stage (or iteration).
- … monitor and control activities
  - Track progress
  - Measure progress

Schedule Provides a Basis

- … help us to anticipate the needs and maximise our chance of success and meet project goals
  - Which features or deliverables can be packed into a limited time frame
  - How best to allocate resources, number of hours and other tangible and intangible costs
- … identify problems early on, and rectified them before they seriously threaten the project schedule

Review Schedule Regularly…

- Review and check schedule regularly
  - Scrum Meetings (Daily etc)
  - Updated as required
  - Members of the team should be familiar with the details

However, most people don't…

- Why are we not referring to Schedule?
- Managers (Product Owner/Scrum Master) know best
- Hot at first
  - In the beginning, everyone is tuned into the planning schedule as a whole.
  - Members start failing to update tasks
    - Too Busy *(?)*. Delayed or forgotten
    - Too many tasks to monitor

Getting out of Sync…

- Coordination deteriorates over time
  - Later, when everyone gets down to business and begin working on their own individual tasks
- Out of sync for big project
  - Dependencies across different teams/tasks getting too complex
  - When resources are available?
  - Harder to predict…

36 hrs a day?

How to Schedule?

Considerations when Scheduling

- Activities and Resources
  - Assigning appropriate resources to activities
- Resource leveling
  - No excessive demand on resources at any point in time
  - Time the activities so that the most critical activities have enough resources
- Risk Management
  - “What if” analysis

Scheduling: Step 1

Identify the Work and Relationships between Tasks

Review the Scope (Goals)

- Epic
  - "As a game player, I want to be able to feed the princess so that she is too heavy to lift and be rescued."
- A user story
  - "As a newbie game player, I want to know who goes first so that we can start the game."

Review Scope & Objectives

- Identify milestones and specific activities.
- Identify deliverables and tasks
  - Do not worry about duplication
  - Add more items if needed
- We can remove irrelevant tasks later

Example: Deliverables (BBQ)

- Event Date (milestone: 2 months before)
- Event Venue (2 months before)
- Invitations (4 weeks before)
- Confirmed Guest List (1 weeks before)
- Snacks (4 hrs)
- Drinks (4 hrs)
- Menu (2 hrs)
- Party Supplies (1 week)
- etc

Example: Activities (BBQ)

- Invitations
  - Prepare Invitation List
  - Send Invitation
    - Make calls
    - Send invitation via email
  - Update Confirmation
- Confirmed Guest List
  - Check confirmation
  - Finalise Guest List

A Task

- Element of Work (Activities)
  - Brief Description
- Resources required
- Task Time (or Effort)

Prepare Invitation List	
Resources Spread sheet/Computer ***Assigned to*** Tan Ah Kow	***Duration*** 2 hrs ***Completed by*** Day 1

Who is Responsible

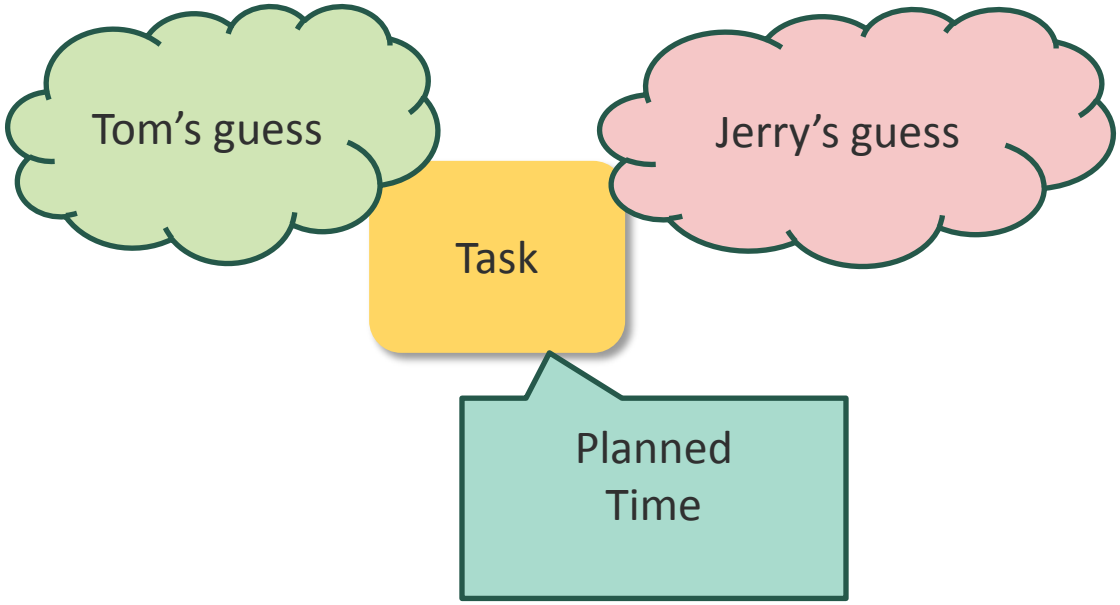
What is a Task?

- Find an appropriate level of detail
  - In Agile Scrum, can this be completed within 4-16 hrs.
- Identify resources required and responsibilities
  - Who is responsible for the tasks.
- Decide time needed
  - Break large tasks into smaller, more manageable ones.
  - Estimates based on similar tasks or past experience. (Planning Poker)
  - Task time and Lapsed Time
    - E.g. We may have to call back (Missing person-days)

Estimate Time/Effort (Planning Poker)

- Estimating how long a particular deliverable will take is a challenge

expert opinion, similar deliverables, and educated guesswork



Tasks List (e.g. Sprint Backlog)

- Group and arrange activities according to
  - Deliverables: Hierarchy, subgroups
  - Tasks: Sequence, grouping according to responsibilities (individual or department)
  - Remove Irrelevant Tasks

Scheduling: Step 2

Work Breakdown Structure and Network Diagram

Work Breakdown Structure

ID	Task Name	Duration	
1	**Business Modeling**	**13 days**	
2	**Describe Current Business**	**5 days**	
3	Create Business Use Case Model	5 days	B
4	**Develop a Domain Model**	**13 days**	
5	Maintain Business Rules	13 days	B
6	Create Domain Model	5 days	B
7	**Requirements**	**13 days**	
8	**Analyze the Problem**	**4 days**	
9	Develop Project Vision	4 days	V
10	Collate Features	4 days	F
11	Capture a Common Vocabulary	4 days	G
12	Develop Requirements Management Plan	4 days	R
13	**Define the System**	**4 days**	
14	Find Actors & Structure Use Case Diagrams	4 days	U
15	Collate Functional Requirements	4 days	U
16	Collate Non-functional Requirements	4 days	S
17	Capture a Common Vocabulary	4 days	G
18	**Manage the Scope of the System**	**2 days**	
19	Prioritize Use Cases	2 days	U
20	Determine Architecturally Significant Use Cases	2 days	S
21	**Refine the System Definition**	**9 days**	
22	Describe Architecturally Significant Use Cases	4 days	[S
23	Detail the Software Requirements	4 days	S
24	Model the User Interface	9 days	U
25	Prototype the User Interface	9 days	U
26	**Review Scope**	**9 days**	
27	Review Scope Definition	9 days	S

Tasks Dependencies

- Identify dependencies
  - Dependency based on
    - Logical
    - Resource
- Type of dependencies (A –predecessor, B –successor)
  - **Finish-Start: B cannot start until A finishes.**
  - Start-Start: B cannot start until A starts.
  - Finish-Finish: B cannot finish until A finishes.
  - Start-Finish: B cannot finish until A starts.

Tasks Dependencies Tables

Task	Predecessor	Time estimates			Expected time
		Opt. (O)	Normal (M)	Pess. (P)	
A	—	2	4	6	4
B	—	3	5	9	5.33
C	A	4	5	7	5.17
D	A	4	6	10	6.33
E	B, C	4	5	7	5.17
F	D	3	4	8	4.5
G	E	3	5	8	5.17

http://en.wikipedia.org/wiki/Program_Evaluation_and_Review_Technique

Tasks Chart (Backlog)

VBS	Task	Lead	Predecessors	Start	End	Work Days	% Complete
1	**Apply For Permits**	Bob		Fri 4/01/11	Thu 4/14/11	10	0%
1.1	Framing permit			Fri 4/01/11	Thu 4/14/11	10	0%
1.2	Electrical permit			Fri 4/01/11	Thu 4/14/11	10	0%
1.3	Plumbing permit			Fri 4/01/11	Thu 4/14/11	10	0%
1.4	HVAC permit			Fri 4/01/11	Thu 4/14/11	10	0%
1.5	*[Insert Rows above this one, then Hide or Delete this row]*						
2	**Site Work**	Bob		Fri 4/15/11	Thu 5/12/11	20	0%
2.1	Level lot		1	Fri 4/15/11	Thu 4/28/11	10	0%
2.2	Install underground utilities		2.1	Fri 4/29/11	Thu 5/12/11	10	0%
2.3	*[Insert Rows above this one, then Hide or Delete this row]*						
3	**Foundation**	Bob		Fri 5/13/11	Mon 6/20/11	27	0%
3.1	Footings - Excavate and Form		2	Fri 5/13/11	Fri 5/13/11	1	0%
3.2	Footings - Poor Concrete		3.1	Mon 5/16/11	Mon 5/16/11	1	0%
3.3	Footings - Cure Concrete		3.2	Tue 5/17/11	Wed 5/25/11	7	0%
3.4	Foundation - Build Forms		3.3	Thu 5/26/11	Tue 5/31/11	3	0%
3.5	Foundation- Poor Concrete		3.4	Wed 6/01/11	Fri 6/03/11	3	0%
3.6	Foundation- Cure Concrete		3.5	Mon 6/06/11	Thu 6/16/11	9	0%
3.7	Foundation- Inspection		3.6	Fri 6/17/11	Mon 6/20/11	2	0%
3.8	*[Insert Rows above this one, then Hide or Delete this row]*						
4	**Framing**	Jim		Tue 6/21/11	Wed 8/03/11	32	0%
4.1	Frame 1st Floor Walls		3	Tue 6/21/11	Tue 6/28/11	6	0%
4.2	Install 2nd Floor Joists		4.1	Wed 6/29/11	Fri 7/01/11	3	0%
4.3	Install 2nd Floor Decking		4.2	Tue 7/05/11	Wed 7/06/11	2	0%
4.4	Frame 2nd Floor Walls		4.3	Thu 7/07/11	Fri 7/15/11	7	0%
4.5	Install attice Joists		4.4	Mon 7/18/11	Wed 7/20/11	3	0%
4.6	Frame roof structures		4.5	Thu 7/21/11	Fri 7/29/11	7	0%
4.7	Framing Inspection		4.6	Mon 8/01/11	Wed 8/03/11	3	0%

Scheduling Tool

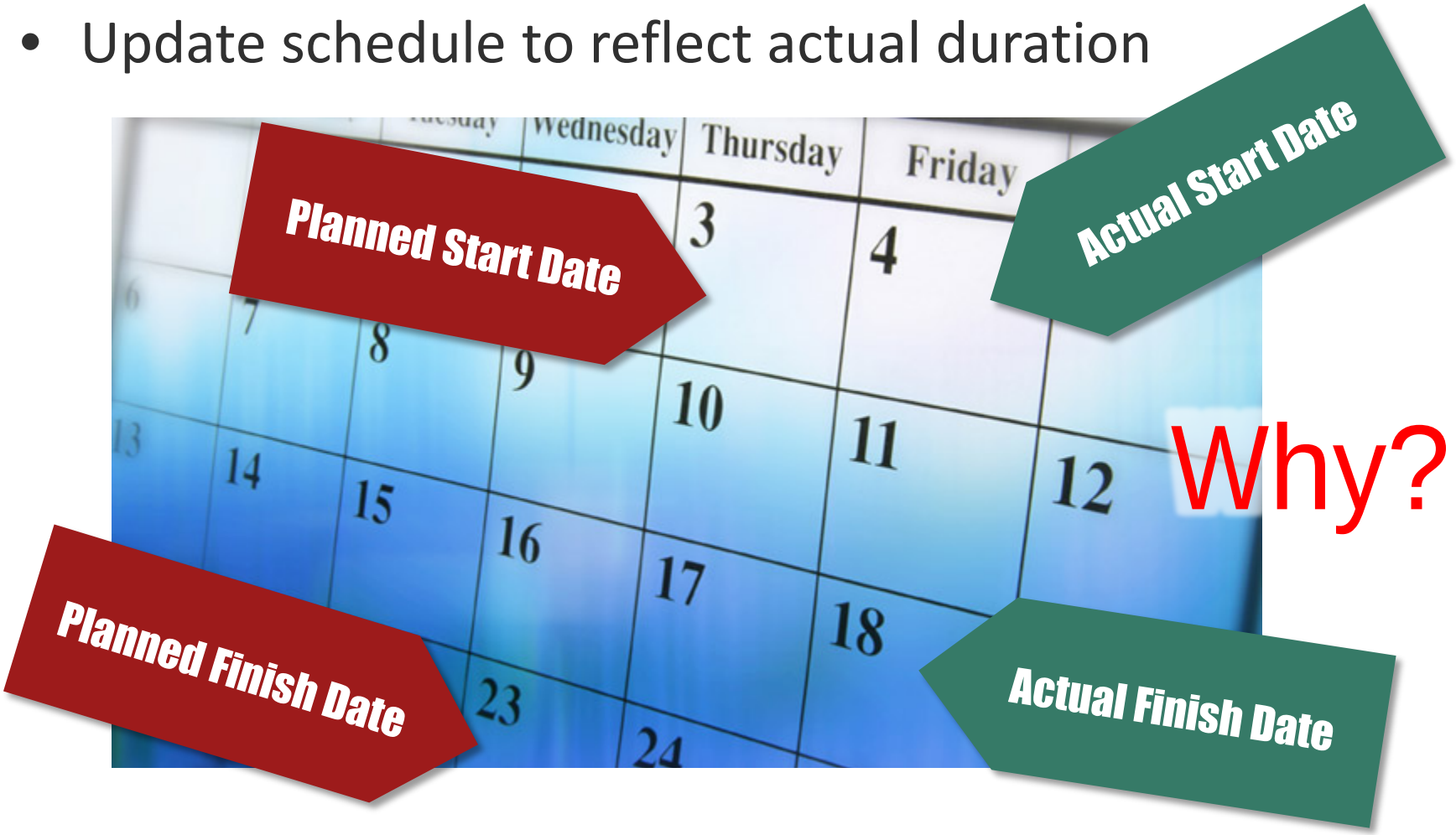
Gantt Chart

Gantt Chart

- Shows the duration of tasks within the timescale of the entire project.
- Advantages
  - Broad phases of the project are immediately obvious
  - Real time date for every event
  - Easy to monitor progress against original plan

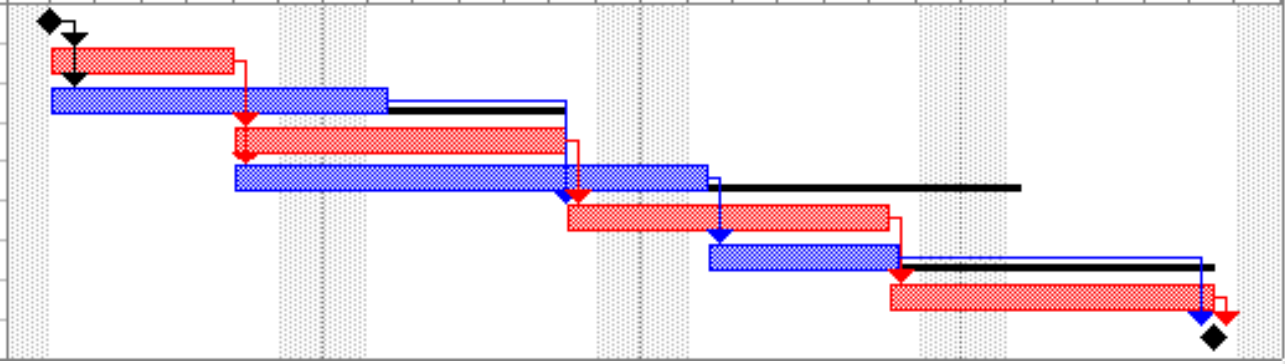
Remember: Planned and Actual

- Update schedule to reflect actual duration



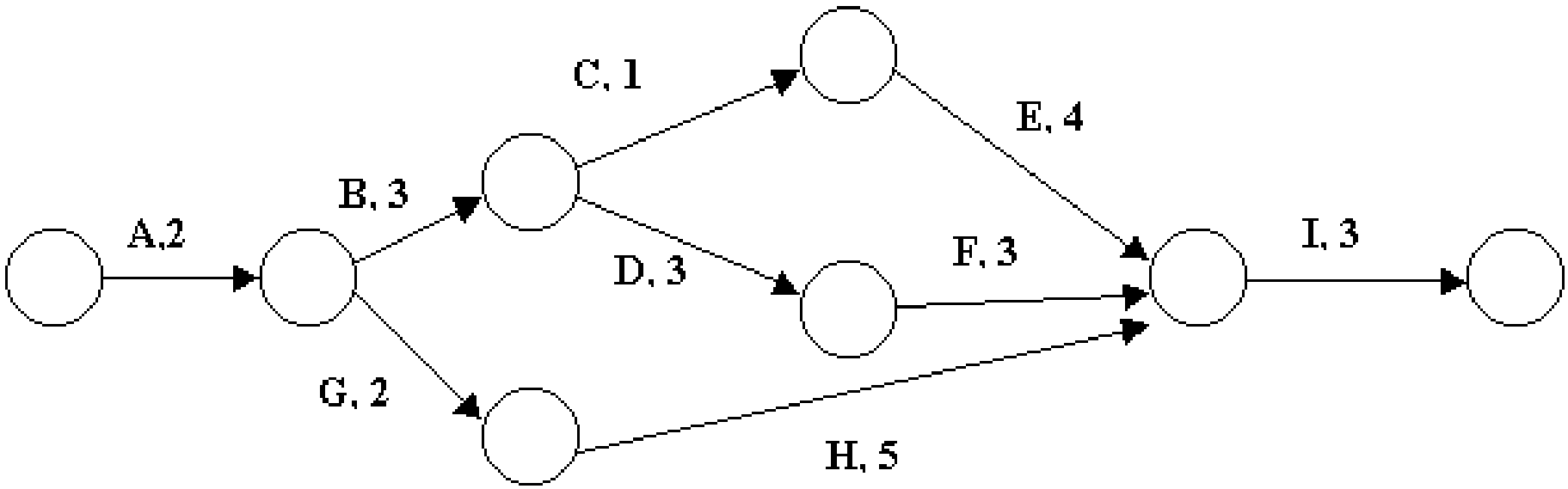
Gantt Chart

ID	Task Name	Predecessors	Duration
1	Start		0 days
2	a	1	4 days
3	b	1	5.33 days
4	c	2	5.17 days
5	d	2	6.33 days
6	e	3,4	5.17 days
7	f	5	4.5 days
8	g	6	5.17 days
9	Finish	7,8	0 days



Issues with Gantt Chart

- Does not allow flexibility in planning
- Difficult to plan as future is unknown
  - Rely on approximation based on less than complete information
- Dependencies are hard to verify
- Chart does not effectively address the dependencies



Scheduling Tool

PERT Chart

PERT Chart

- Sometimes refer to as Network Diagram
- Represent the task times and dependencies for the entire project.
- Show links between tasks.
- It shows the sequence of tasks, and branches occurs where tasks can be carried out independently.

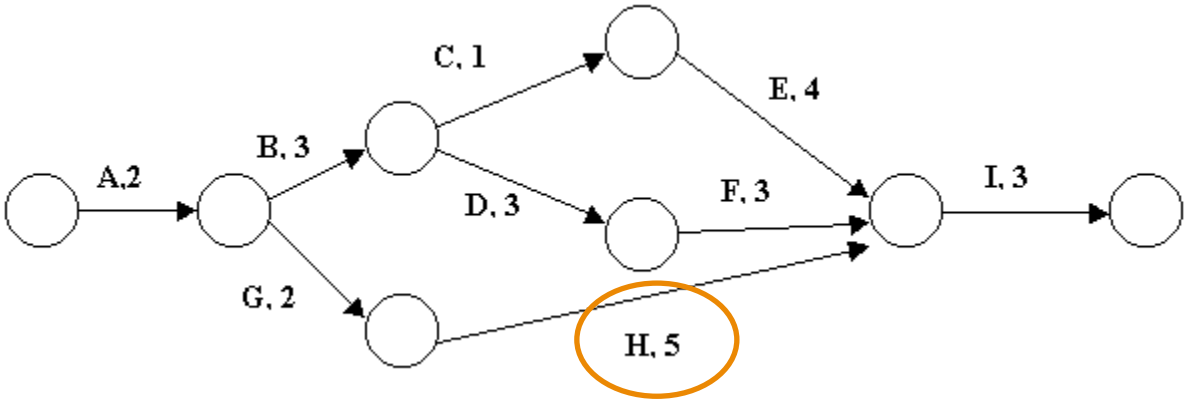
PERT

- PERT (or program evaluation review technique) is a method to analyze the involved tasks in completing a given project
  - Required time to complete each task
  - identify the minimum time needed to complete the total project.

PERT

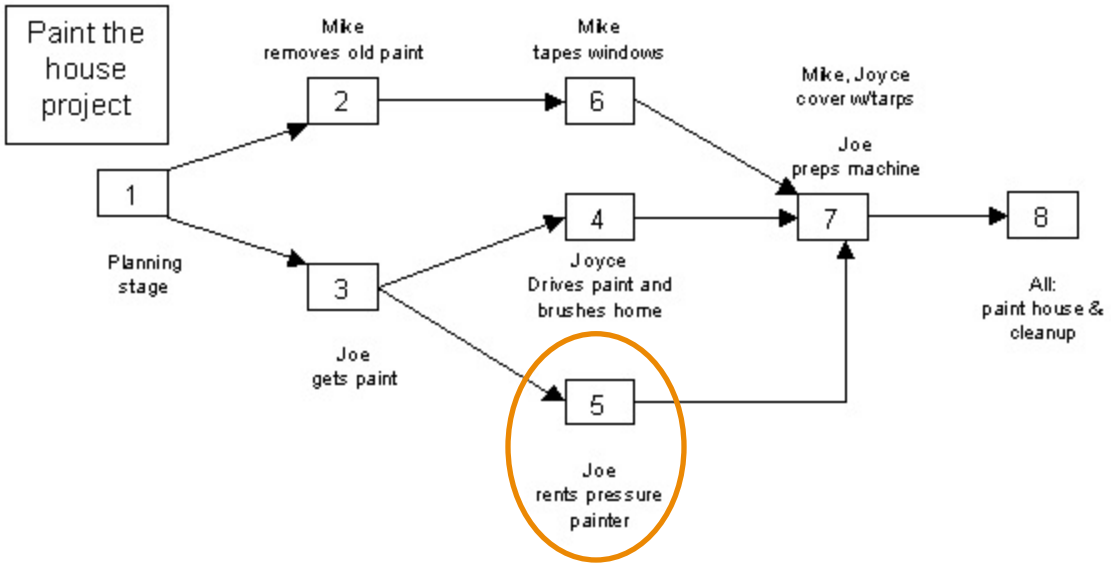
- PERT helps to determine the tasks that the project requires and the order in which they must be completed.
  - The order is important!
    - Buy your furniture first or buy your house first?
  - Assume the time estimates are normal, non-rushed time.
    - Time reduced for additional costs or a reduction in the quality.

PERT Chart – Activity on Line



Activity on Line

PERT Chart – Activity on Node



Activity on Node

PERT Chart

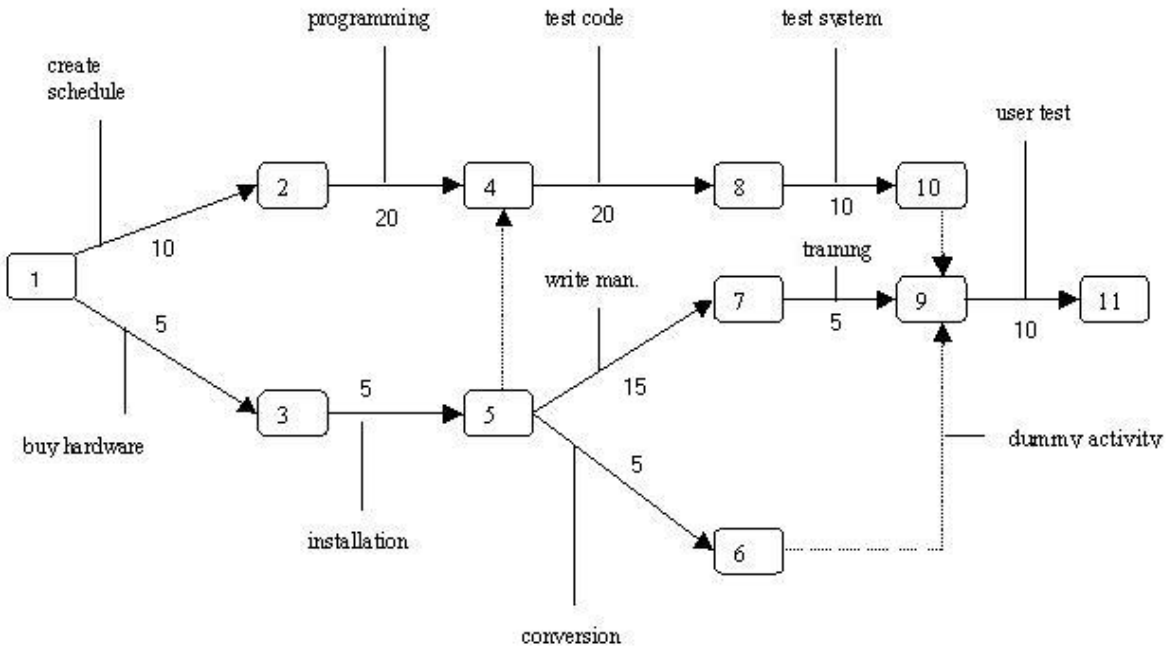


Fig. 1:
PERT Chart

* Numbered rectangles are nodes and represent events or milestones.
* Directional arrows represent dependent tasks that must be completed sequentially.
* Diverging arrow directions (e.g. 1-2 & 1-3) indicate possibly concurrent tasks
* Dotted lines indicate dependent tasks that do not require resources.

Source: http://searchsoftwarequality.techtarget.com/definition/PERT-chart

PERT: Advantages

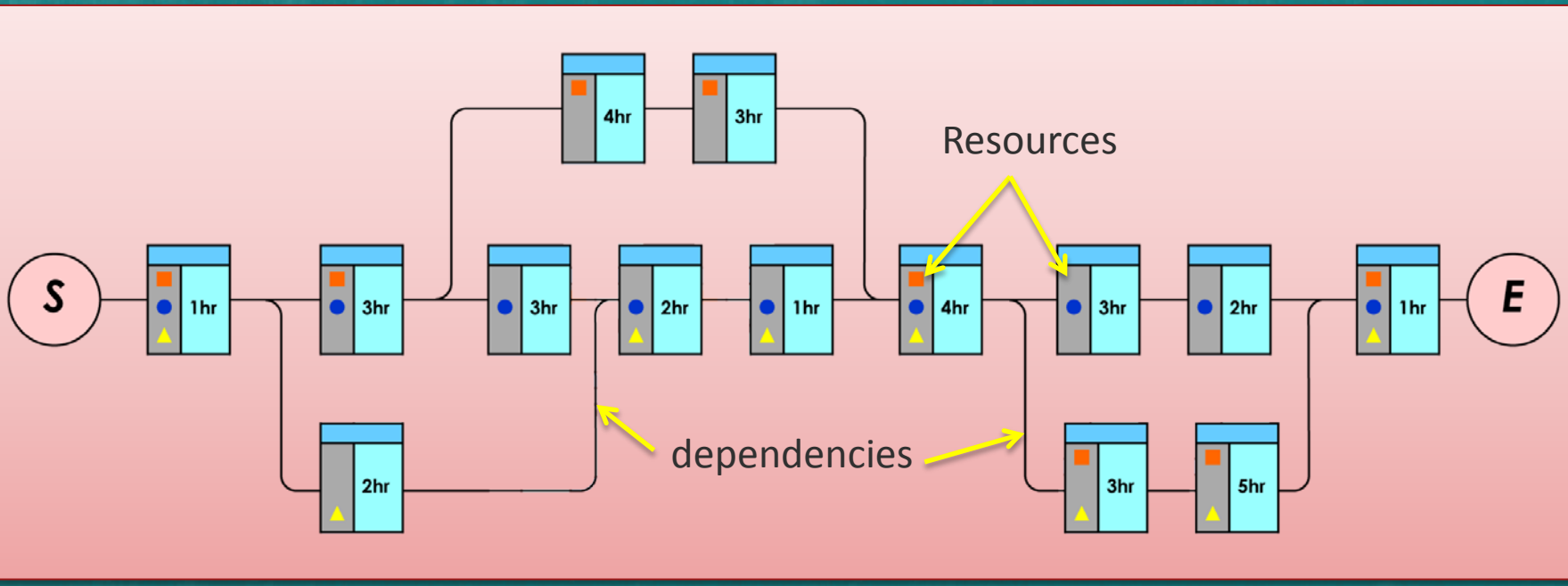
- dependencies between activities clearer
- Helps to identify critical path easily
- Helps to identify early start, late start, and slack for each activity
- May help to reduce project duration
  - Due to better understanding of dependencies leading to improved overlapping of activities and tasks where feasible.
- Organised & presented in diagram for use in decision making.

PERT: Disadvantages

- Hundreds or thousands of activities and individual dependency relationships
- The network charts tend to be large
- PERT Chart does not show timeframe
- When the charts become unwieldy, they are not used to manage the project.
- Uncertainty

Practical 5

Construct a PERT Chart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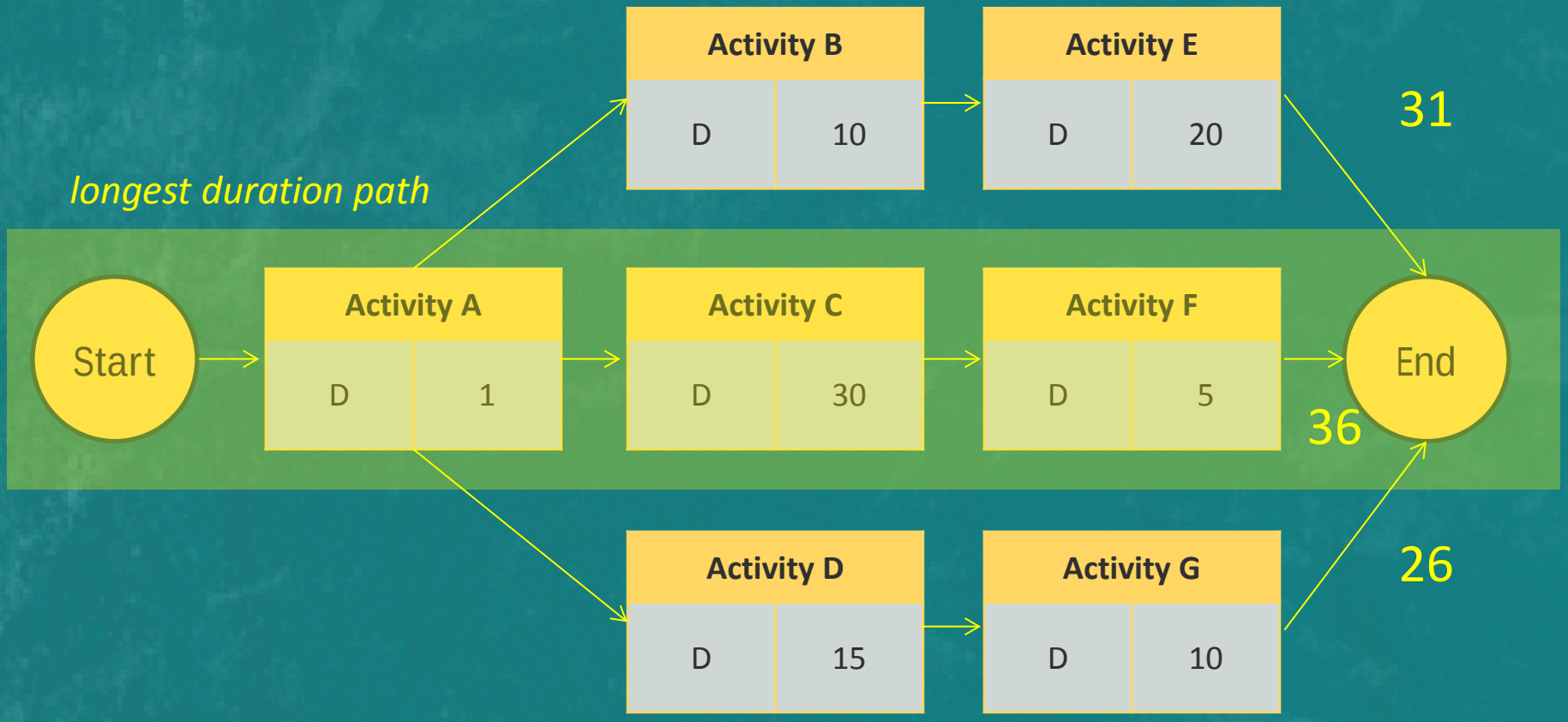
Resources
dependencies

Scheduling: Step 3

Critical Path: Finding the Shortest Time

What is the Shortest Time?

- The shortest time to complete a project
  - Depends on a sequence of activities that must be completed on schedule for the entire project to be completed on schedule.
  - This is the longest duration path through the work plan.


Activity B
D
10
Activity E
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20
31
longest duration path
Start
Activity A
D
1
Activity C
D
30
Activity F
D
5
End
36
Activity D
D
15
Activity G
D
10
26

Why Shortest Time?

- If any activity on this path is delayed by one day, then entire project will be delayed by one day (unless another activity on the path can be accelerated by one day).
- This path is refer to as the critical path

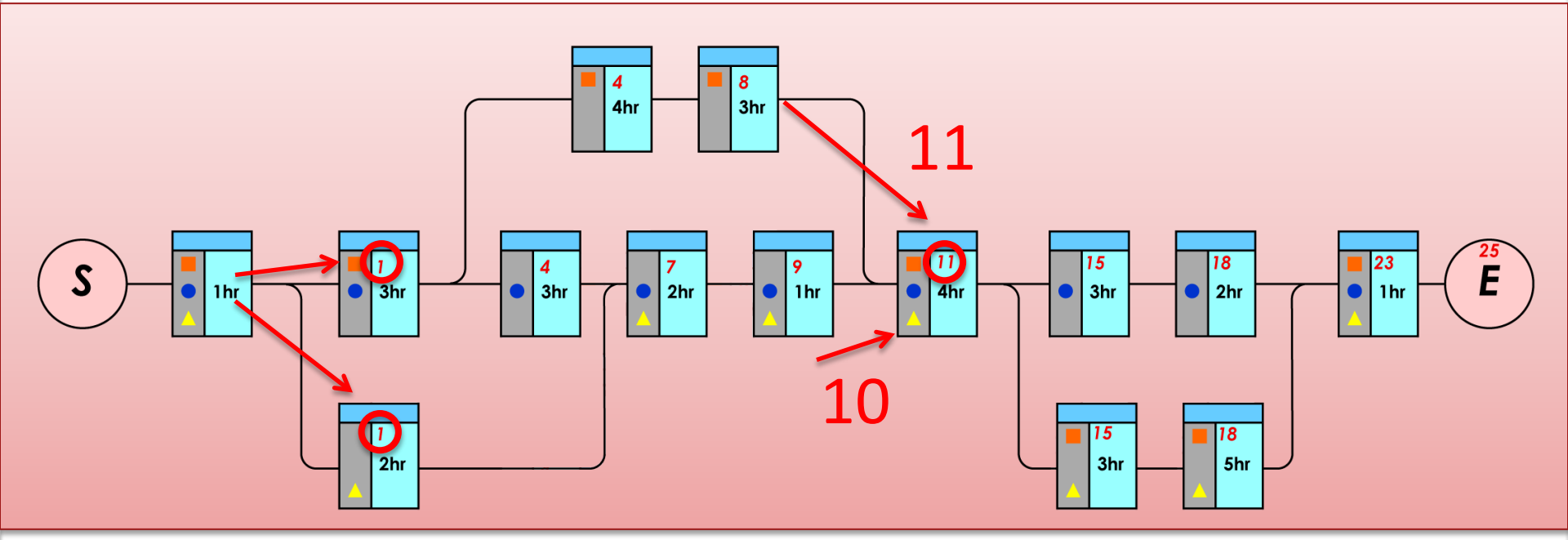
Critical Path Method

- Critical Path Method calculates
  - the longest path of planned activities to the end of the project
  - the earliest and latest that each activity can start to complete the project without making it longer.

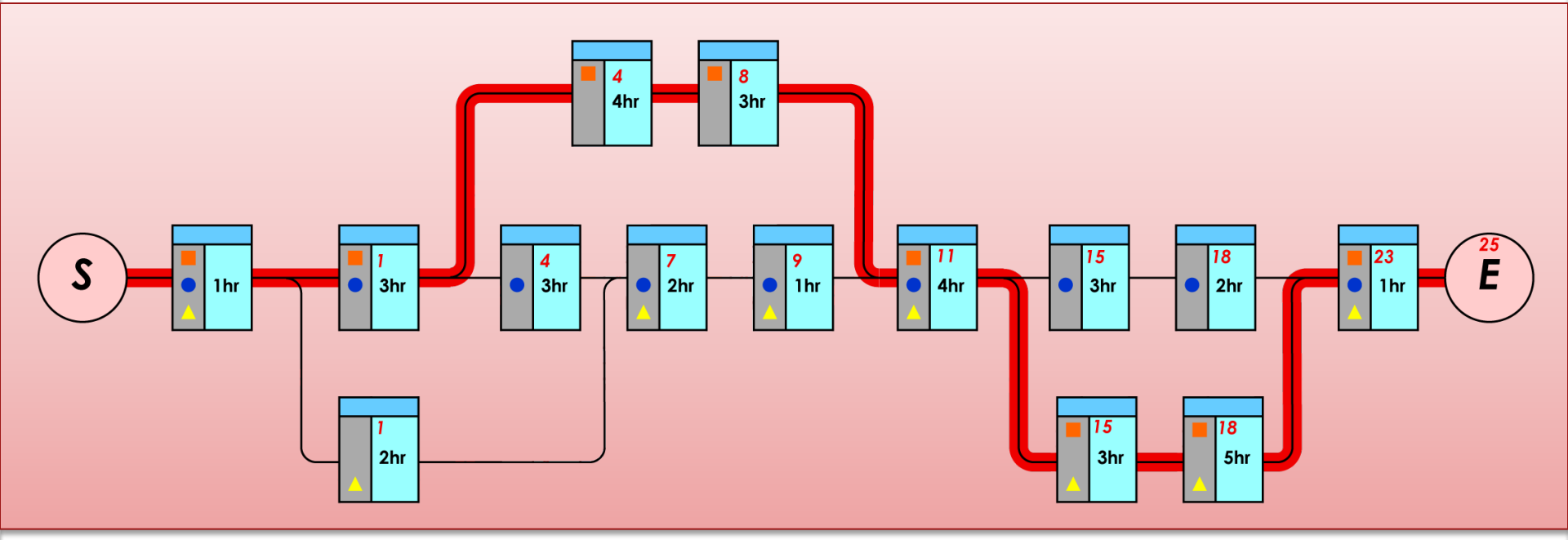
http://en.wikipedia.org/wiki/Program_Evaluation_and_Review_Technique

Critical Path Method

- Finding the earliest time by which a task can start
  - Forward pass

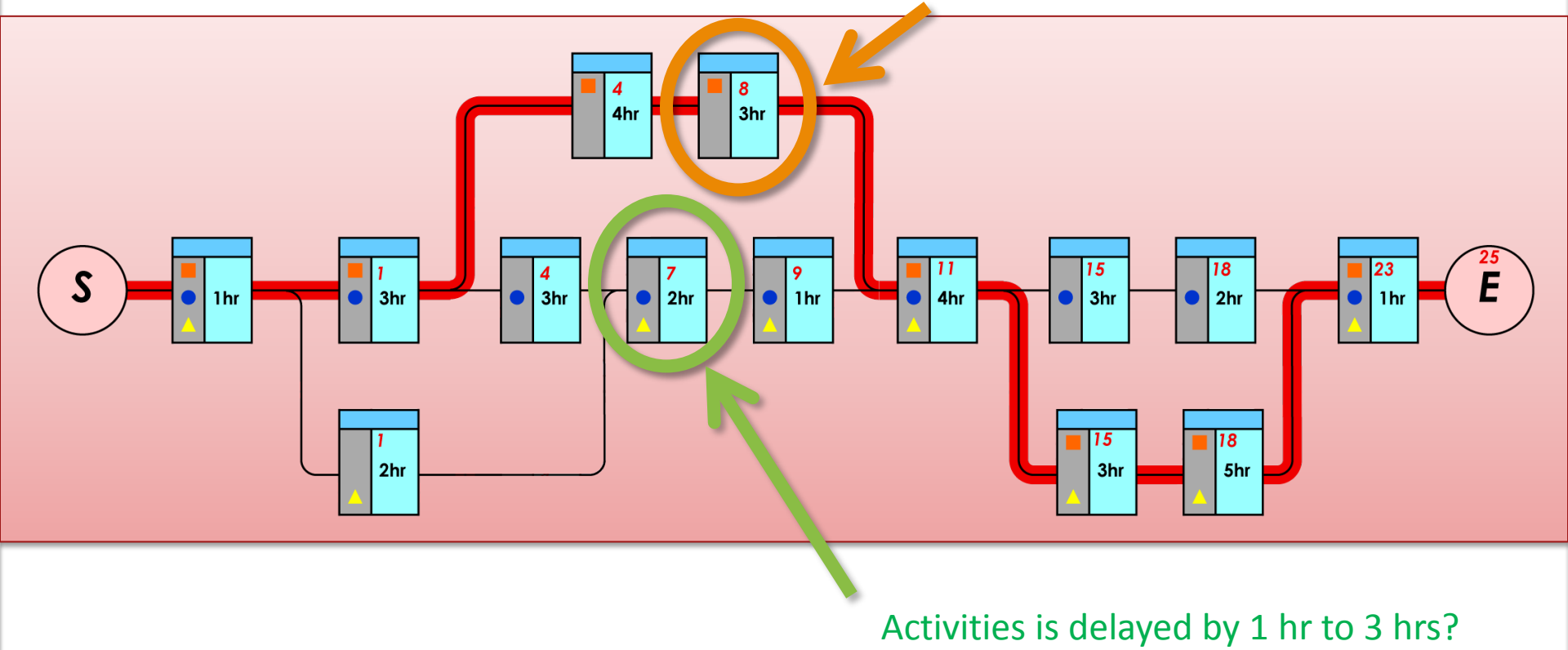


The Critical Path



When an Activity is Delayed

- If any activity on this path is delayed, then entire project will be delayed

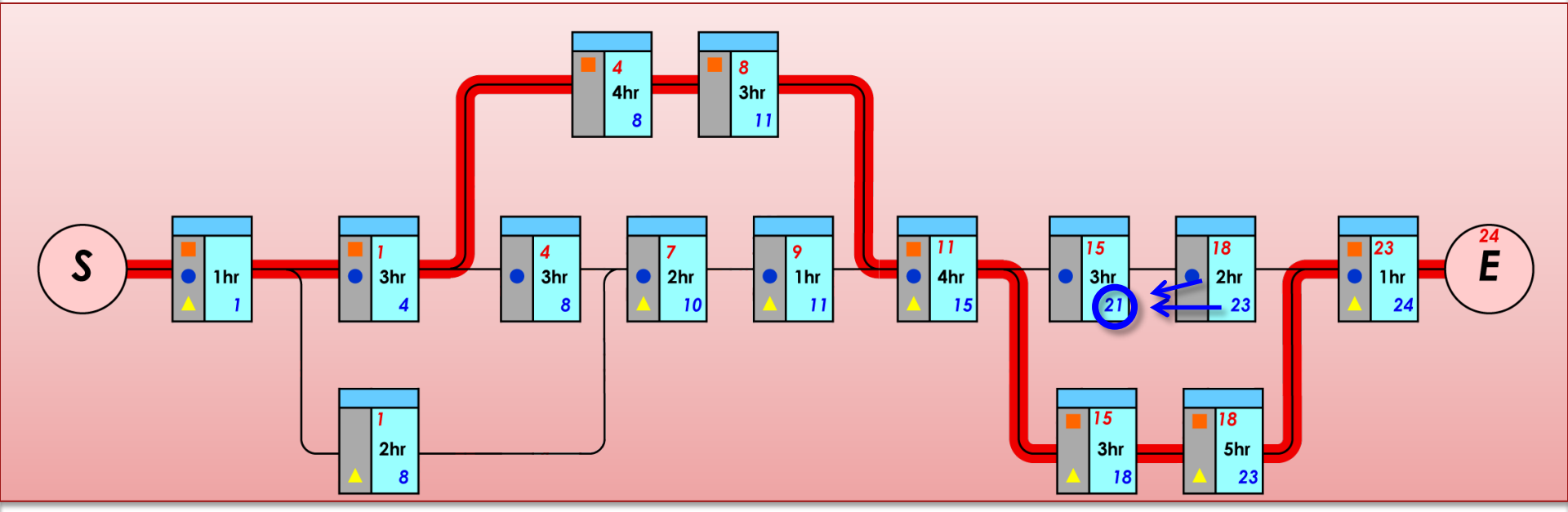


Scheduling: Step 4

Critical Path: Finding the Slack Time

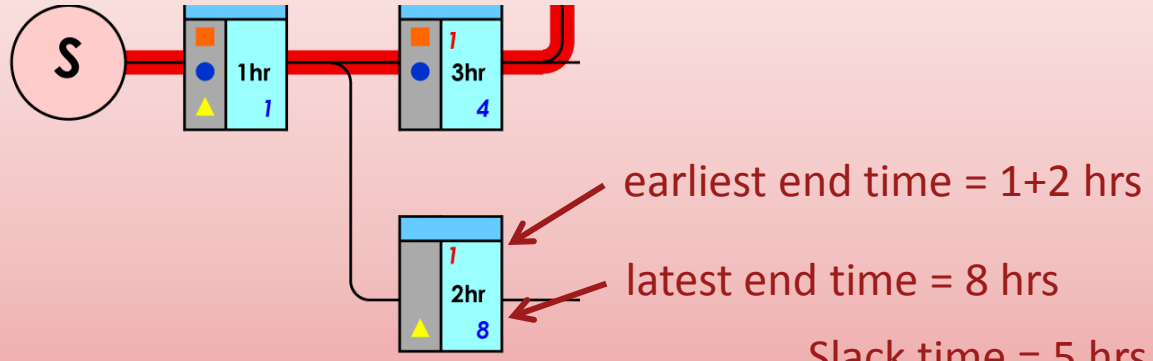
The Critical Path

- Finding the latest time by which the task must complete. (when it ends)
  - Backward pass



The Slack (Float) Time

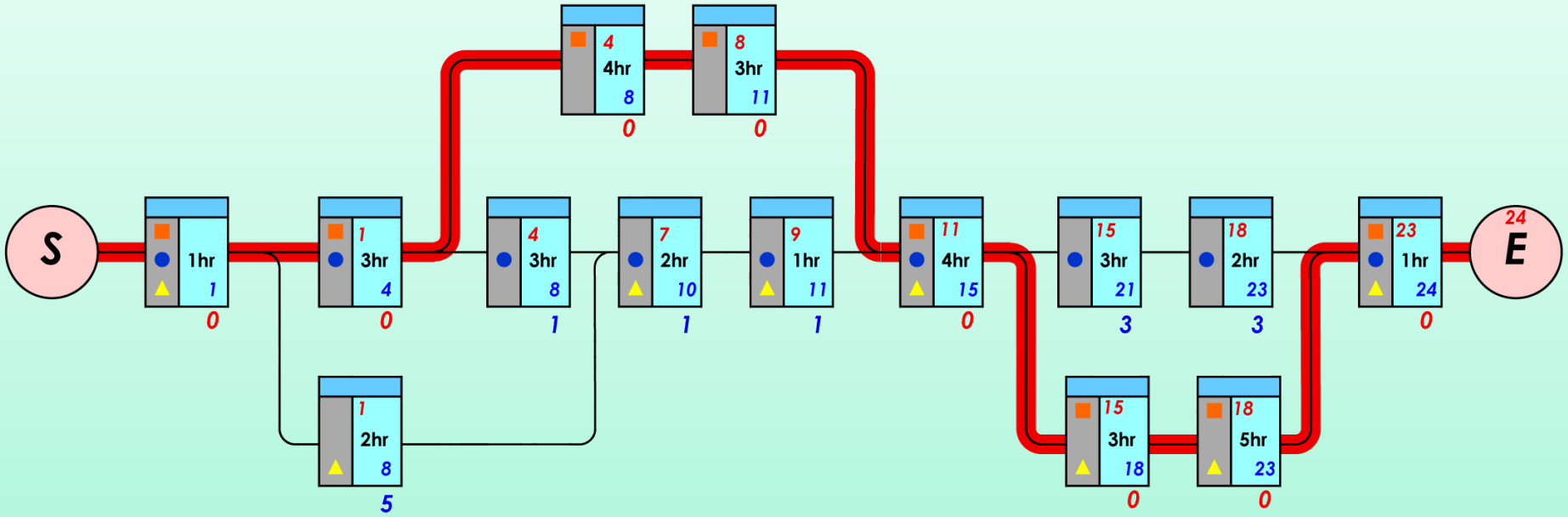
- The different between earliest end time and latest end time for completion of the task is the slack time.
- It show how long can you delay the task without affecting the overall length of the project.



The Slack (Float) Time

- Calculate the slack time for tasks that are not on the critical path.

- Why don't calculate for tasks on the critical path????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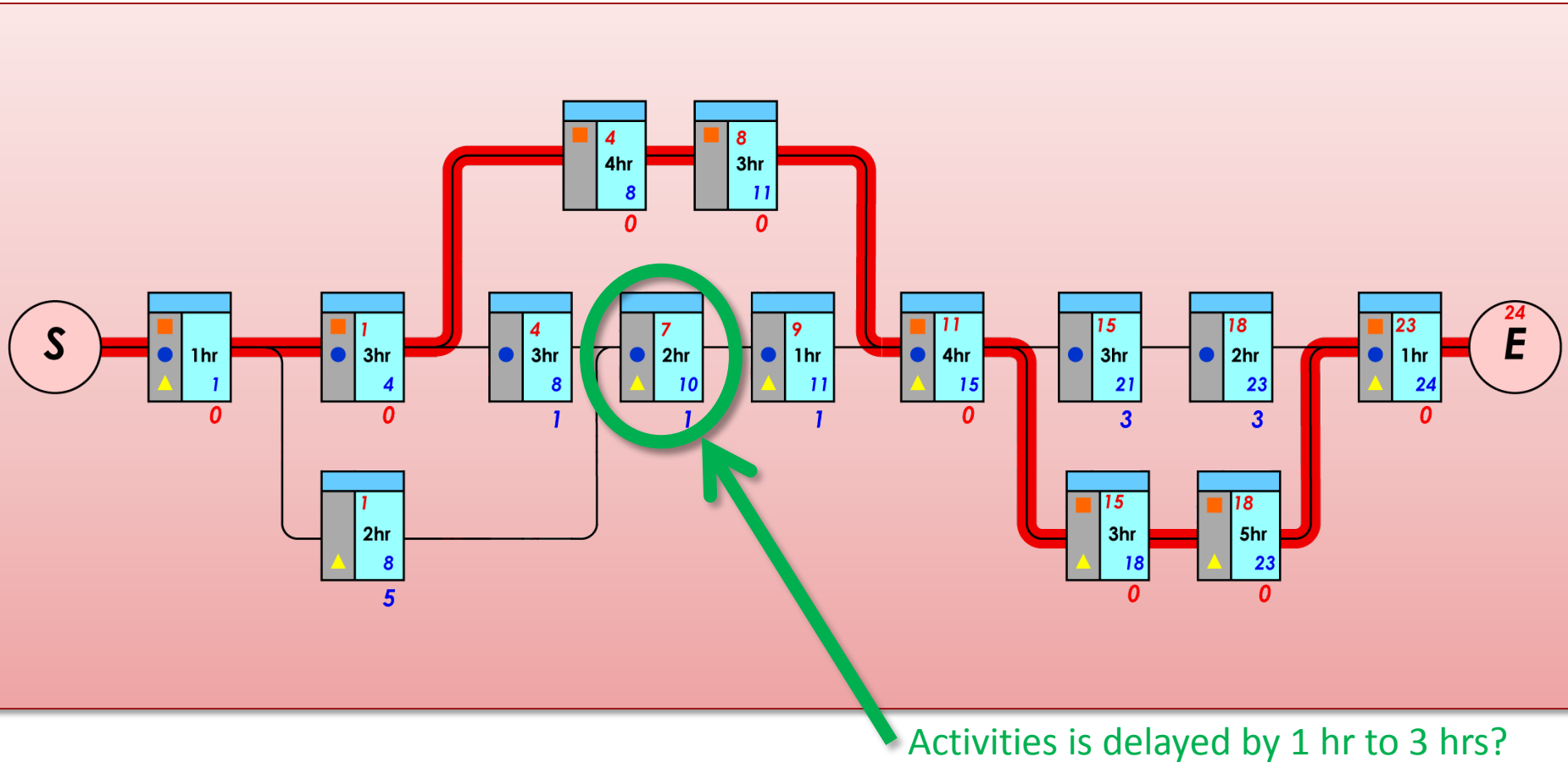
Using the Critical Path

- Assign tasks on critical path or those with little slack time to most competent and committed people (most of the time).
- Tasks with slack time can be used as opportunities to coach or self-development

Reviewing Tasks

- Tasks on critical path will need to be reviewed more often than less critical tasks.
  - Earliest warning
- Check progress against the critical path periodically
  - Critical path can change
- Do not forget about other tasks.

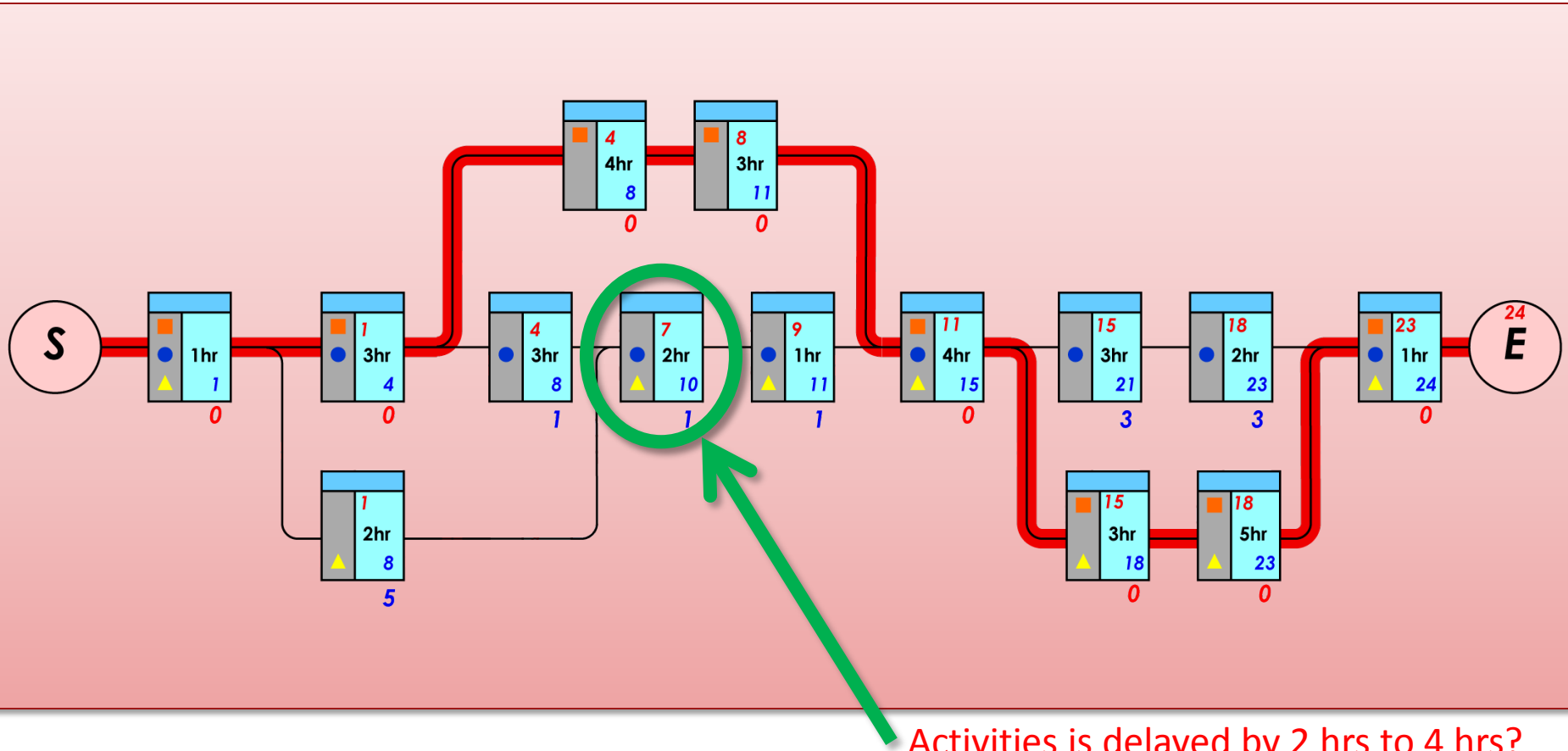
What if? Scenario 1



What if?

- In Scenario 1, the activity has a slack time of 1 hr. If the activity is delayed by an hour, there is no change in the completion time.

What if? Scenario 2



What if?

- In Scenario 2, the delay of 2 hours for activity (which is greater than the slack time) affect the completion time since it cannot end on time. In this case, the critical path changes.

Scheduling: Step 4

Schedule Compression

Schedule Compression (Risks?)

- Shorten the total duration of a project by reducing the original scope of the project. Customer?
- Shorten the total duration of a project by decreasing the time allotted for certain activities; and still keep the original scope of the project. Increase Risks?
  - Method 1: Crashing – assign more resources/Outsource. Time save offset resource costs.
  - Method 2: Fast-Tracking – More concurrent activities. More time is required to monitor activities.

Mistakes by Students and *some* Professionals

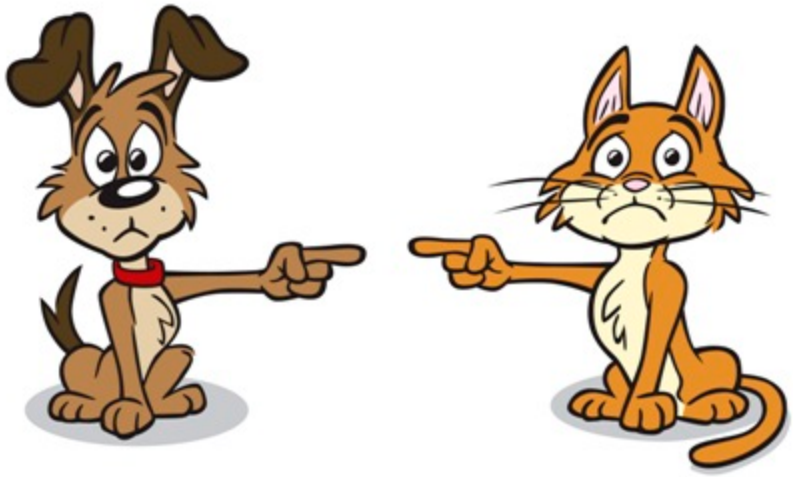
Issues about Scheduling

Misconception

- Misconception that a plan, once formulated, must be followed slavishly through to its completion.

Common Mistakes!

- Activities are not broken down to manageable tasks
  - Based on Scrum, each iteration should take 1-4 weeks, each task 4-16 hours
- Multiple owners to a task
  - Who is accountable?
  - Who has the right?



Common Mistakes!!

- Not leveraging on past experience
  - We are better prepared if we have encountered it before!

Common Mistakes!!!

- Not setting the project calendar to reflect reality

January						
S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

February						
S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28					

March						
S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

April						
S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

May						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

June						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

Common Mistakes!!!!

- Not using historical data

Ang Peng Siong said: "It usually takes us about 20 to 30 minutes to reach the Dr S.P. Mukherjee Swimming Complex. Today, it took us about an hour."

Ang left at 2:45pm local time for the 3pm deadline but ended up arriving at the SP Mukherjee complex 45 minutes late.

Common Mistakes!!!!

- Insufficient time for proper review/analysis
  - Implementation ASAP due to fear of slipping schedule
  - Meetings? Did you plan for it?

Common Mistakes!!!!!

- Underrating the risks!
  - Warning signs…
  - “Don’t worry, we have time!”