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Introduction to Project Management

This course provides good understanding of the fundamentals of project management

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Module 6

Lesson 6: Planning 2 Schedule

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Course Overview

- Plan Project Schedules
- Develop Project Schedules
- Develop Sprint Plans
- Describe Agile Ceremonies

Key Concepts for Project Schedule Management

- Project scheduling provides how and when the delivery happens and acts as communication tool.
- Project management team selects the scheduling method, such as critical path or Agile approach.

- For small projects, the planning processes can be combined as one process.
- When possible, the detailed project schedule should remain flexible throughout the project to adjust for knowledge gained, increased understanding of risk, and value-added activities.

Project Schedule

- Project schedule assigns a duration to the project activities, and the activities are sequenced in a logical order.
- Project schedule defines the start and end dates of the project and its activities.
- Each task is assigned a resource, duration, and, when appropriate, a predecessor task.
- Scheduling software is used to develop the project schedule. Microsoft Project is the most popular tool used for project schedule development.

A project management plan is not a project schedule. It is more comprehensive and contains various project related plans such as risk management plan, cost management plan, etc. It may also include a schedule.

Trends and Emerging Practices in Project Schedule Management

Iterative Scheduling with a Backlog

It is a form of Rolling Wave Planning technique that is based on adaptive life cycles. Benefit of this approach is it welcomes changes throughout the development life cycle.

On-demand Scheduling

This does not rely on a schedule that was developed previously for development of the product but rather pulls work from backlog as resources become available. This approach, typically used in a Kanban system, is based on the theory-of-constraints and pull-based scheduling concepts.

Module 6 Section1

Lesson 6: Schedule Management

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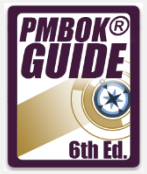
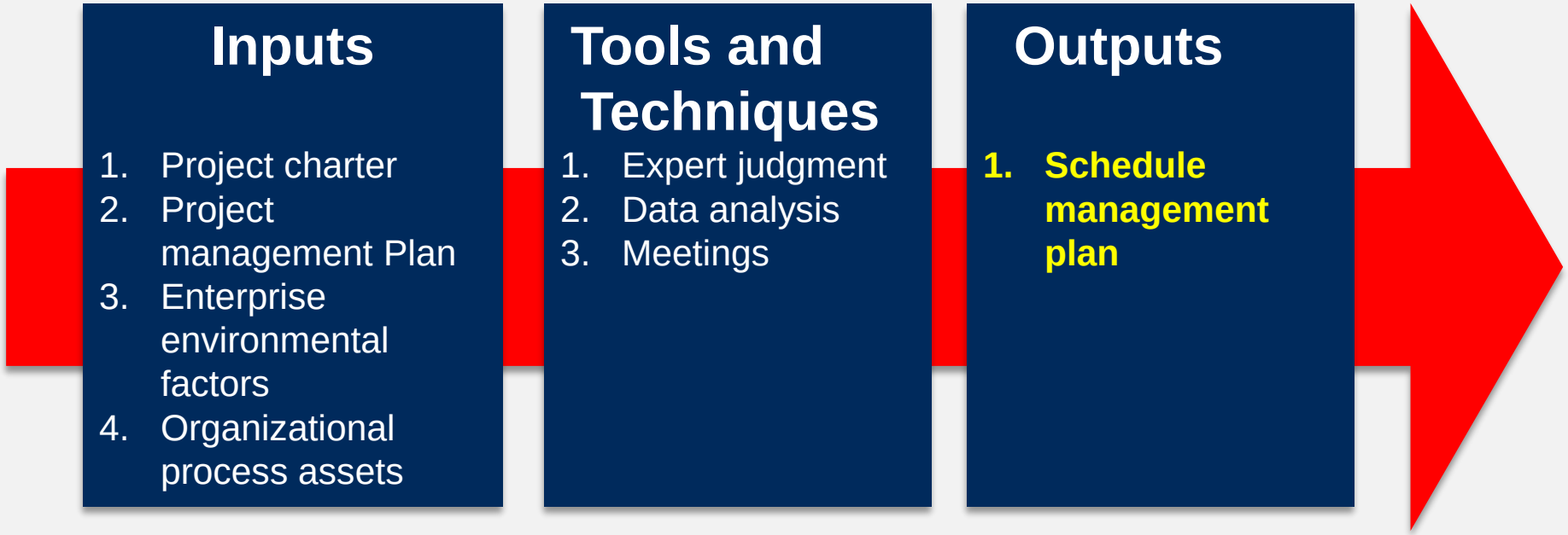
Project Schedule Management

	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Integration					
Scope		Plan Schedule Mgmt Define Activities Sequence Activities Estimate Activity Durations Develop Schedule			
Schedule					
Cost					
Quality					
Resource					
Communications					
Risk					
Procurement					
Stakeholder					



Plan Schedule Management

Process of establishing the policies, procedures, and documentation for planning, developing, managing, and controlling the project schedule



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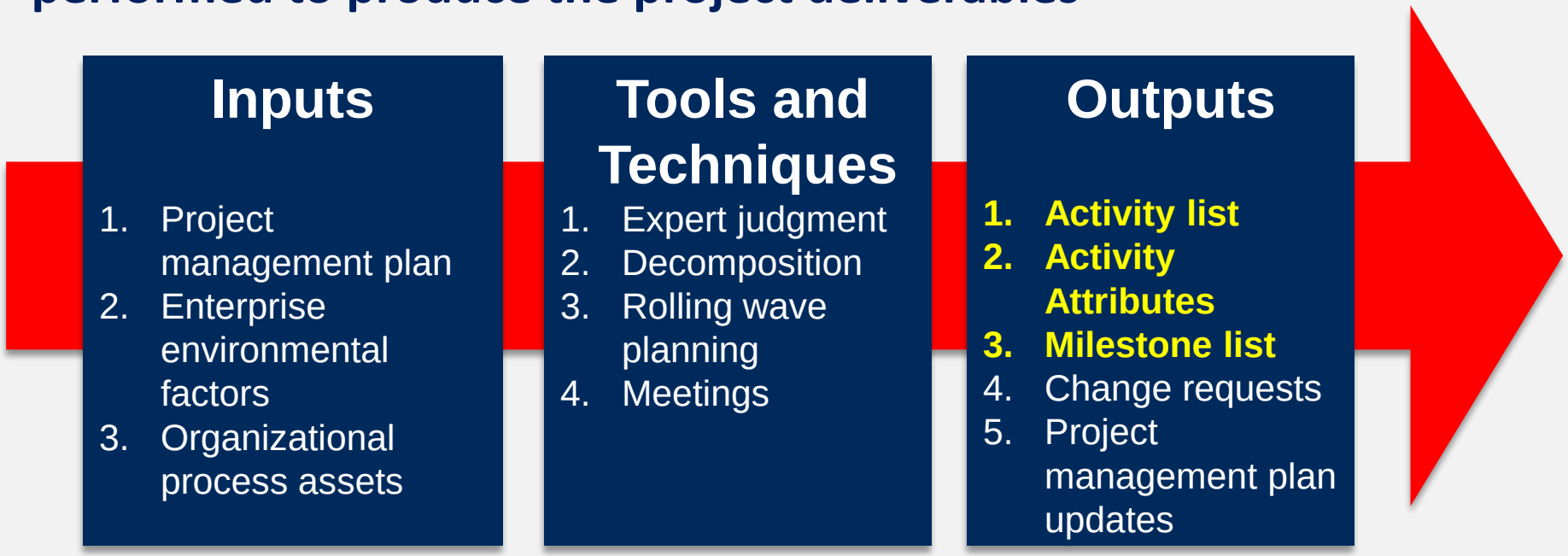
6.1

Schedule Management Plan

- **Includes:**
  - Determination on the scheduling methodology used on the project
  - Release and iteration length (e.g. time-boxed periods, rolling waves)
  - Level of schedule accuracy required
  - Units of measure (e.g. hours, days, weeks)
  - Control thresholds for monitoring schedule (number of days, weeks ahead/behind for determining status)
  - Performance measurement (e.g. Earned Value Management (EVM))
  - Formats and frequency of schedule reports
  - Description of the schedule management process

Define Activities

Process of identifying and documenting the specific actions to be performed to produce the project deliverables



WBS identifies the deliverables at lowest level called "Work Packages".
"Work Packages" are further decomposed into "Activities"

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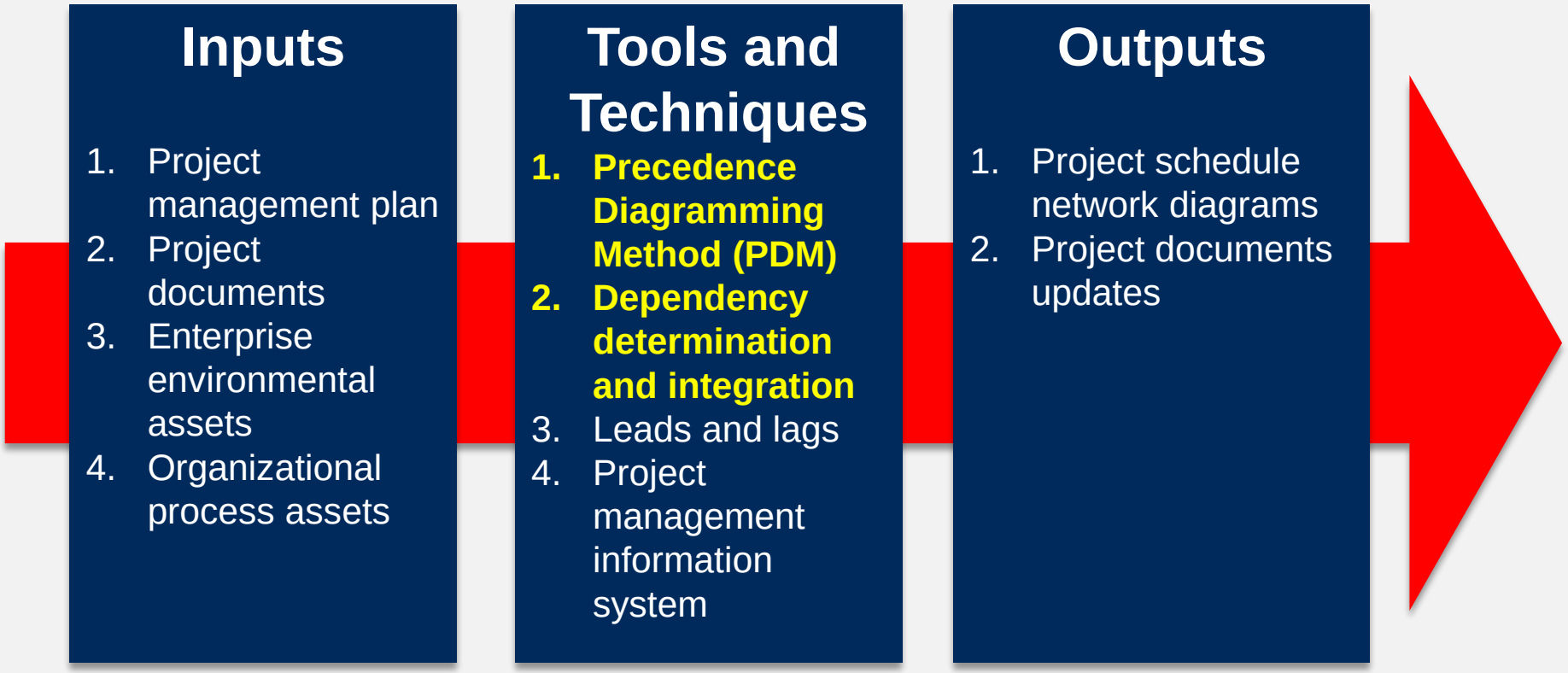
Define Activities – Outputs

- **Activity list**
  - Tabulation of activities to be included on project schedule
  - Includes the activity name and a brief description
- **Activity attributes**
  - Provides schedule-related information about each activity
  - Has a unique identifier (ID), WBS ID, and activity label or name
  - Includes predecessors, successors, logical relationships, leads and lags, resource, performance measurement
- **Milestone list**
  - A significant event that has zero duration attached to it, but does have a date
  - Useful tool set up to track schedule goals and monitor progress
- **Change requests**
- **Project management plan updated**

Sequence Activities

Process of identifying and documenting relationships among the project activities



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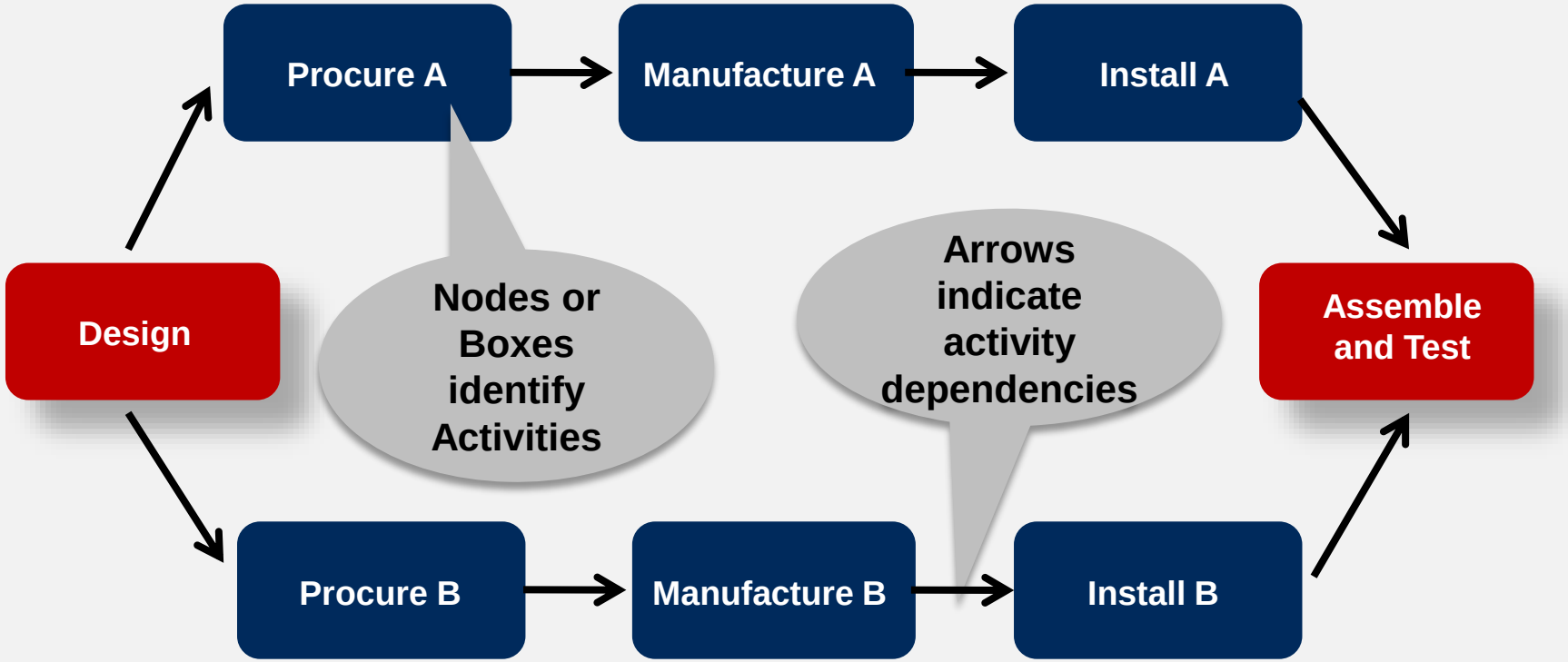
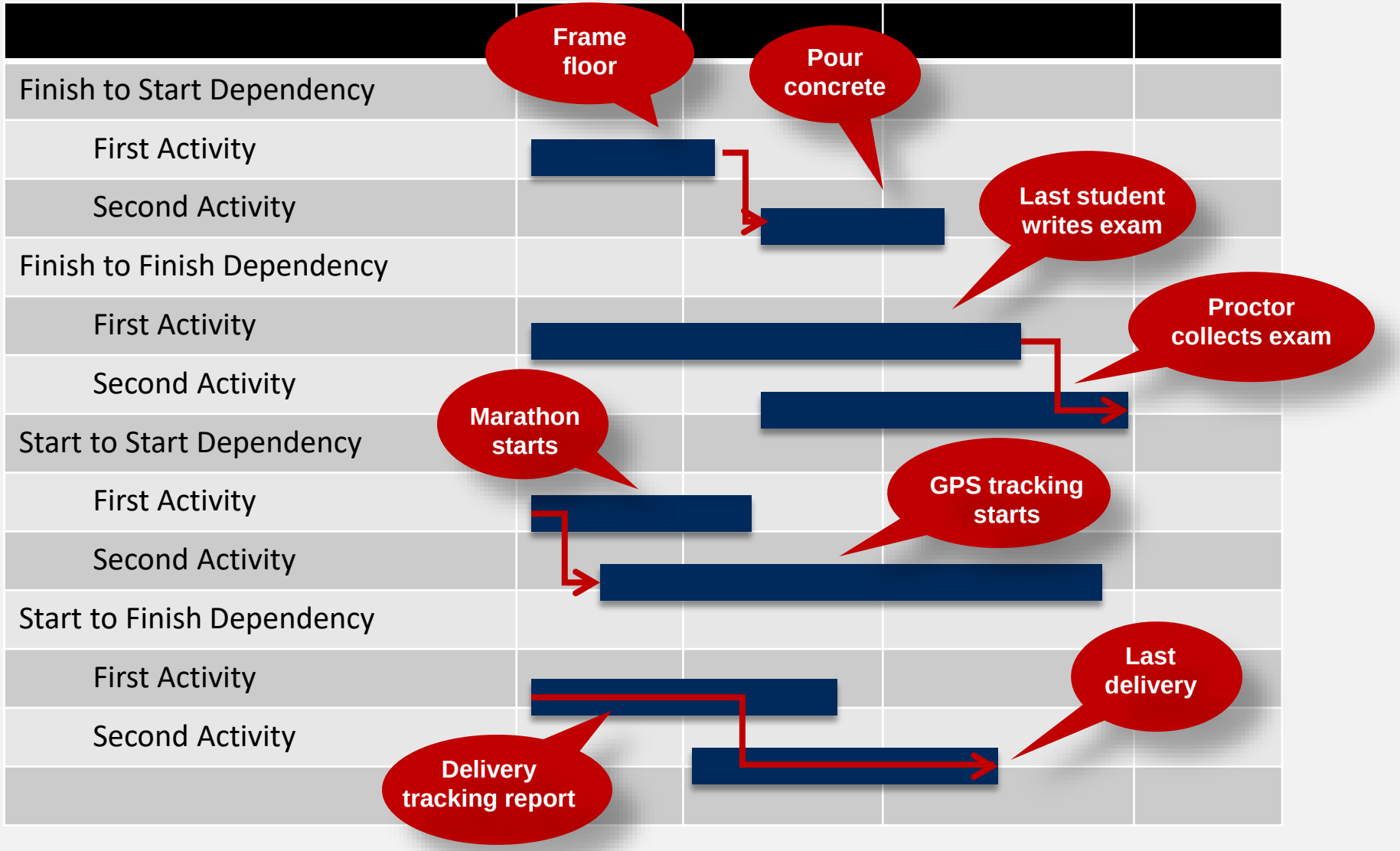
Precedence Diagramming Method (PDM)

- PDM is the most commonly used diagramming method
- Also known as Activity on Node (AoN)
- PDM is the basis for Gantt Charts and most software



Activity Dependencies Types

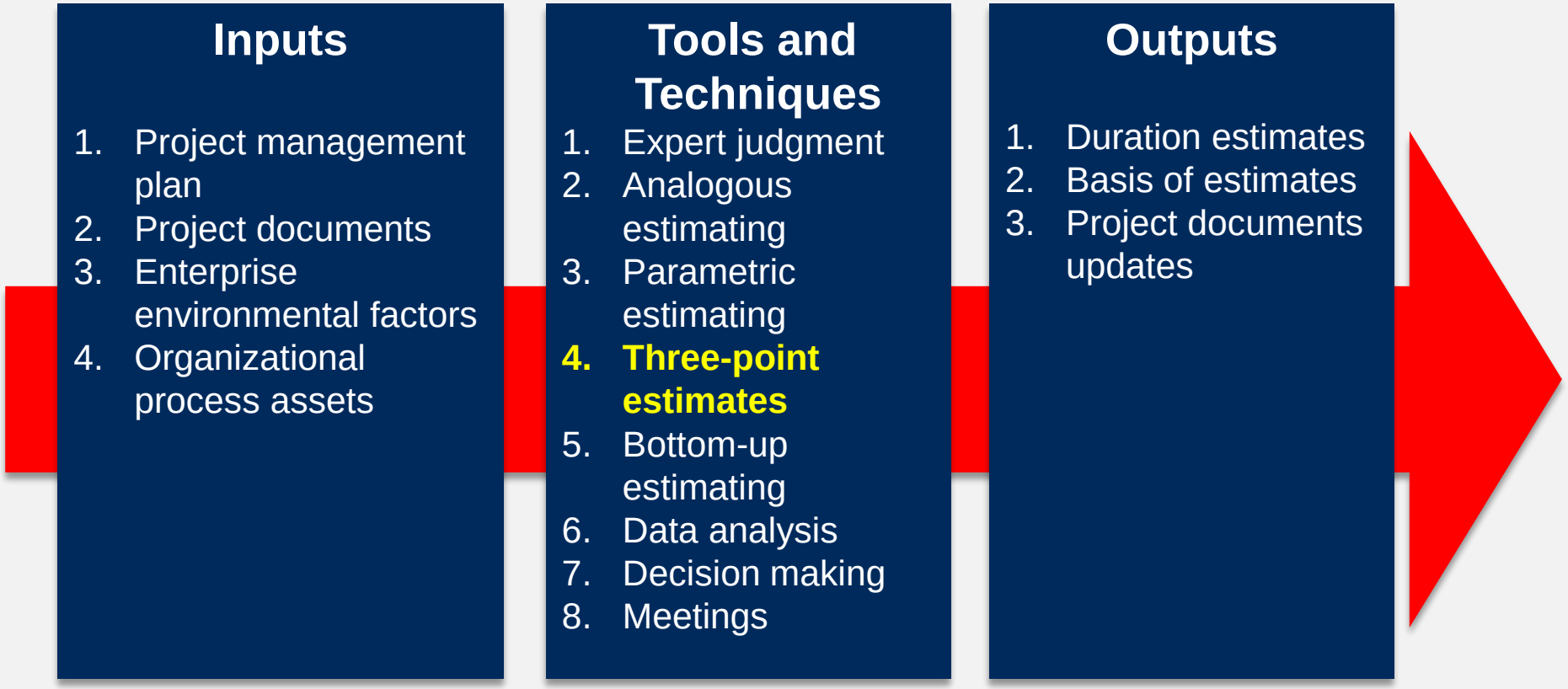


Dependency Determination

- A dependency or relationship relates to the sequencing of project activities or tasks
- Mandatory dependencies
  - Are inherent in the nature of work
  - They are also referred to as “hard logic”
- Discretionary dependencies
  - Defined by the project team, as per good practice
  - Also referred to as “soft logic”
- External dependencies
  - Relationships between project and non-project activities
- Internal dependencies
  - Predecessor relationships within project team’s control

Estimate Activity Durations

Process of estimating the number or work periods needed to complete individual activities with estimated resources



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Estimate Activity Duration – Tools

Three Point Estimation – Beta (or PERT_

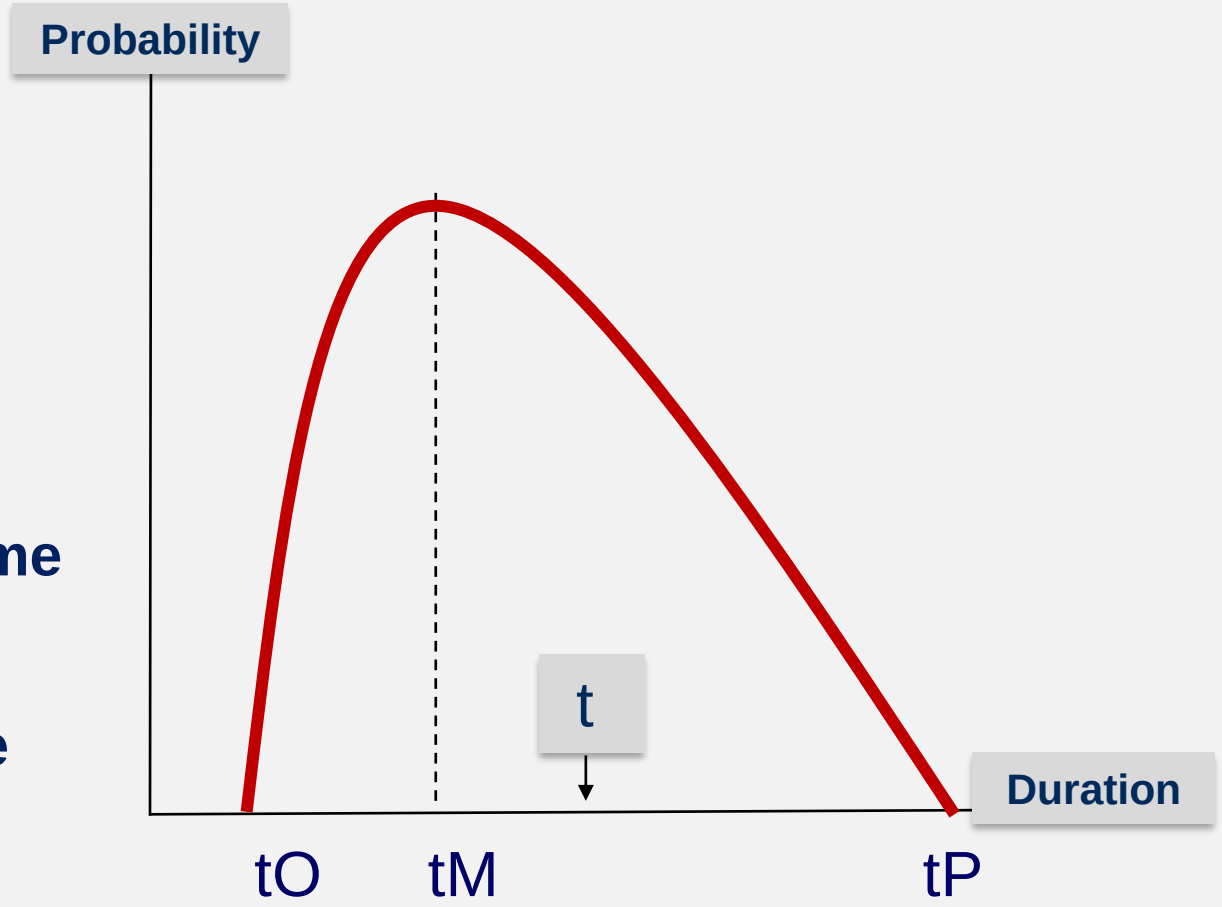
Triangular distribution

tE = (tO + tM + tP) / 3

Beta distribution

tE = (tO + 4tM + tP) / 6

t = the estimated time
tO = optimistic time
tM = most likely time
tP = pessimistic time



Schedule Management – Questions

1. **Which of the following is a difference between an activity list and an activity attribute?**
   a. Unlike an activity list, an activity attribute provides resource requirements and constraints related to activities.
   b. An activity list is a more concrete list of milestones for a project than an activity attribute.
   c. An activity attribute is a tabulation of activities to be included on a project schedule, whereas an activity list is not.
   d. An activity attribute provides more schedule-related information about each activity than an activity list.
2. **_____ dependencies are sometimes referred to as soft logic and should be used with care because they may limit later scheduling options.**
   a. Mandatory
   b. Discretionary
   c. External
   d. Internal
3. **After working with key stakeholders to define activities, the next process in project schedule management is to_____.**
   a. Develop Schedule
   b. Control Schedule
   c. Sequence Activities
   d. Align Resources

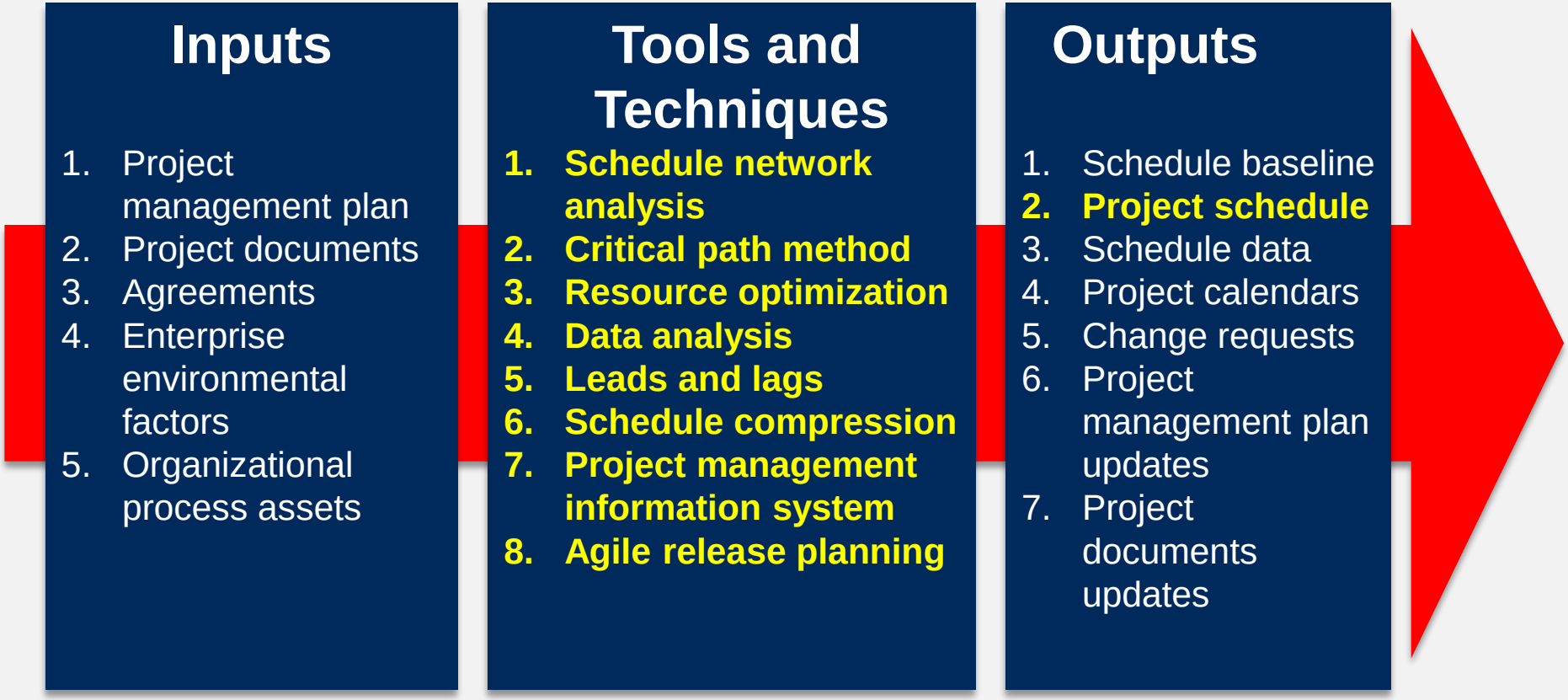
1. A
2. B
3. C

Module 6 Section2

Lesson 6: Develop Schedule

Develop Schedule

Process of analyzing activity sequences, durations, resource requirements, and schedule constraints to create a schedule model for project execution and monitoring and controlling



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Develop Schedule – Tools

- **Schedule network analysis**
  - Assessing need to aggregate schedule reserves
  - Reviewing high-risk activities to reduce risk
- **Resource optimization**
  - Resource Leveling is used when shared/critical resources are only available at certain times. May change the critical path
  - Resource Smoothing adjusts so resource requirements do not exceed predefined limits. Does not change the critical path
- **Data analysis**
  - What-if scenarios are used to evaluate situations to predict their effect, positive or negative, on the schedule
  - Simulations involve using multiple work packages with different durations and calculating impact on the schedule

Develop Schedule – Tools (cont'd)

- **Schedule Compression**
  - **If the Project must be complete by a fixed date, the CPM must be revisited to:**
    - **Review all original duration calculations**
    - **Review original Network Logic**
    - **Consider increasing resource allocation to shorten activity durations (Crashing)**
    - **Increase work effort with existing resources**
    - **Look at possible Activity Overlaps (Fast Tracking)**

Develop Schedule – Tools (cont'd)

Normal Activity Dependencies

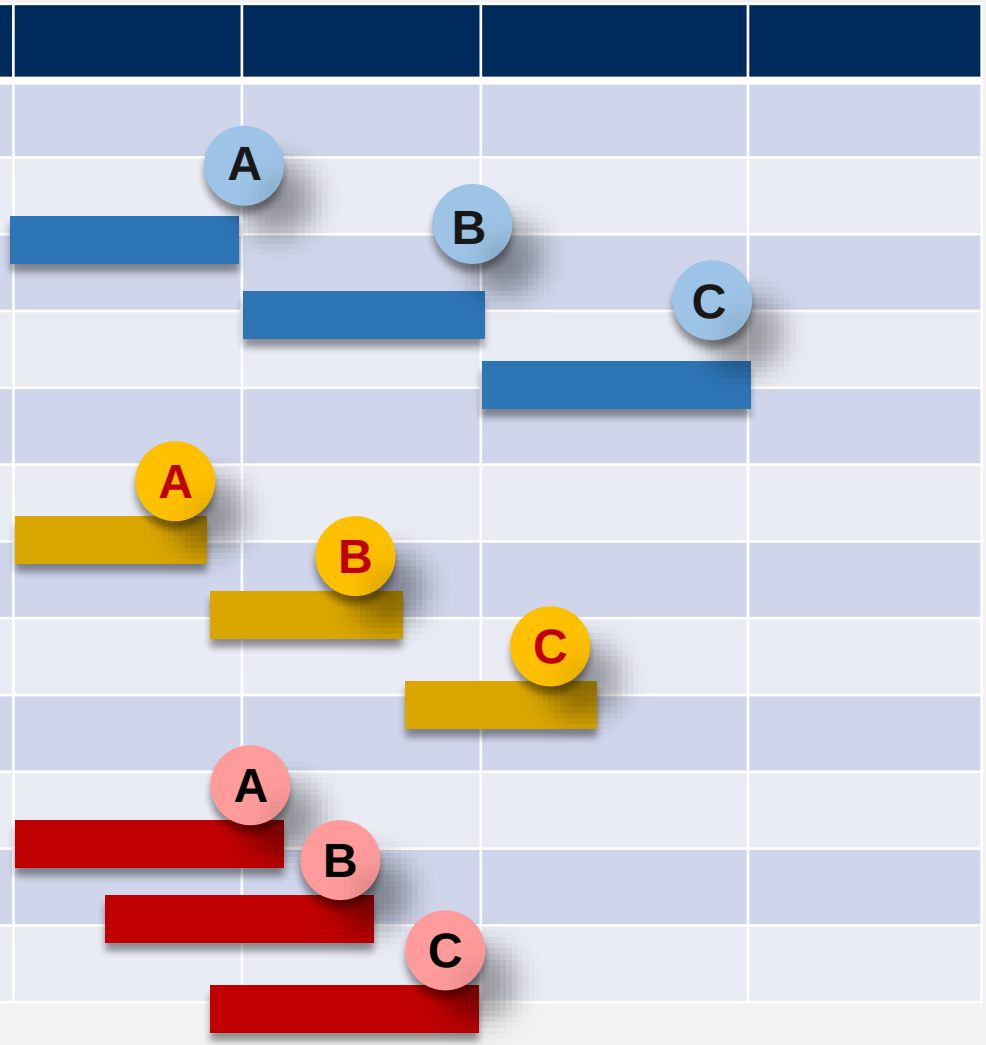
Activities are initially sequenced using relevant dependencies

Crashing

Tasks are compressed by providing additional resources

Fast Tracking

Tasks are overlapped if "soft" dependencies allow for the overlap



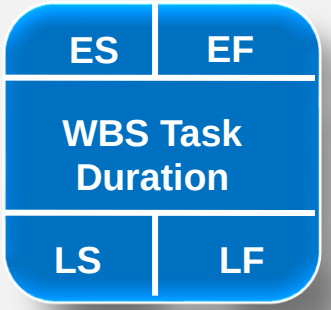
Develop Schedule – Tools (cont'd)

- **Critical Path Method (CPM)**
  - Process of analyzing activity sequences, durations, resource requirements, and schedule constraints to create the project schedule model
    - Also called "critical path analysis"
    - Usually involves the use of Precedence Diagramming Method (PDM)
    - Uses a single duration estimate from a SME, historical data, or based on the three-point estimate
    - Calculates earliest or latest possible start date for each activity
    - Determines the "shortest" time a project can be completed
    - Helps identify schedule Trade-offs (Free Slack or Free Float, Total Slack or Total Float)

Develop Schedule – Tools (cont'd)

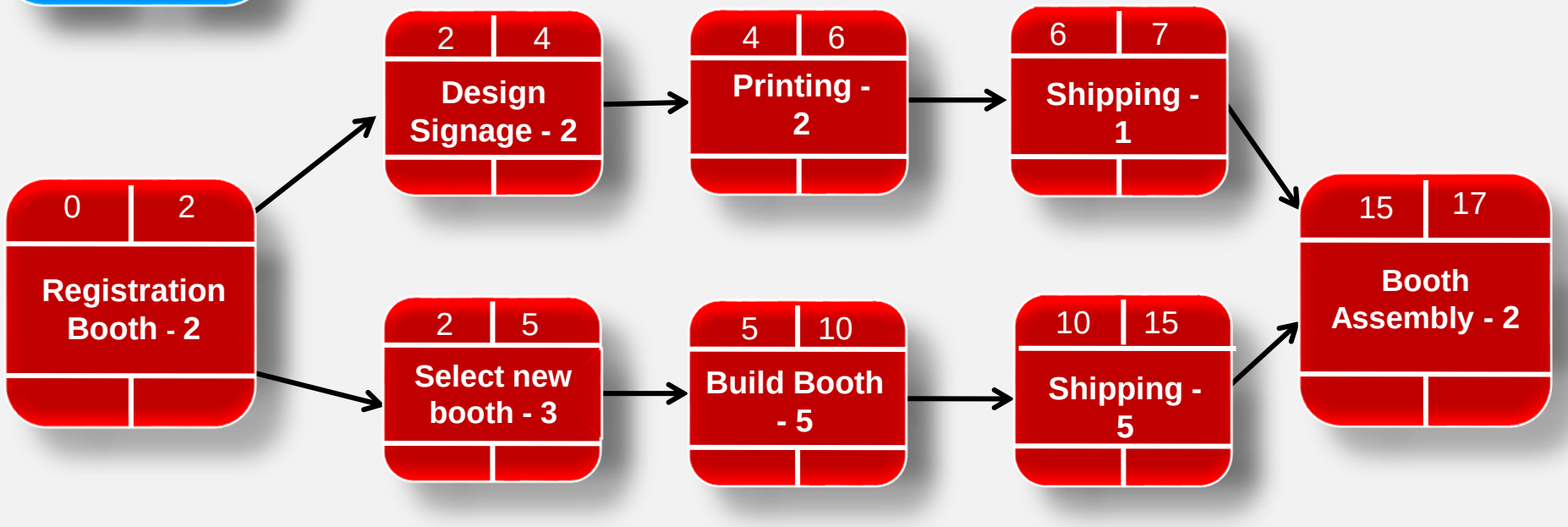
- Leads and lags
  - A lead is the amount of time a successor activity can be advanced
  - A lag is the amount of time a successor activity can be delayed

CPM: The Network Diagram: Forward Pass



Project Management Expo Example

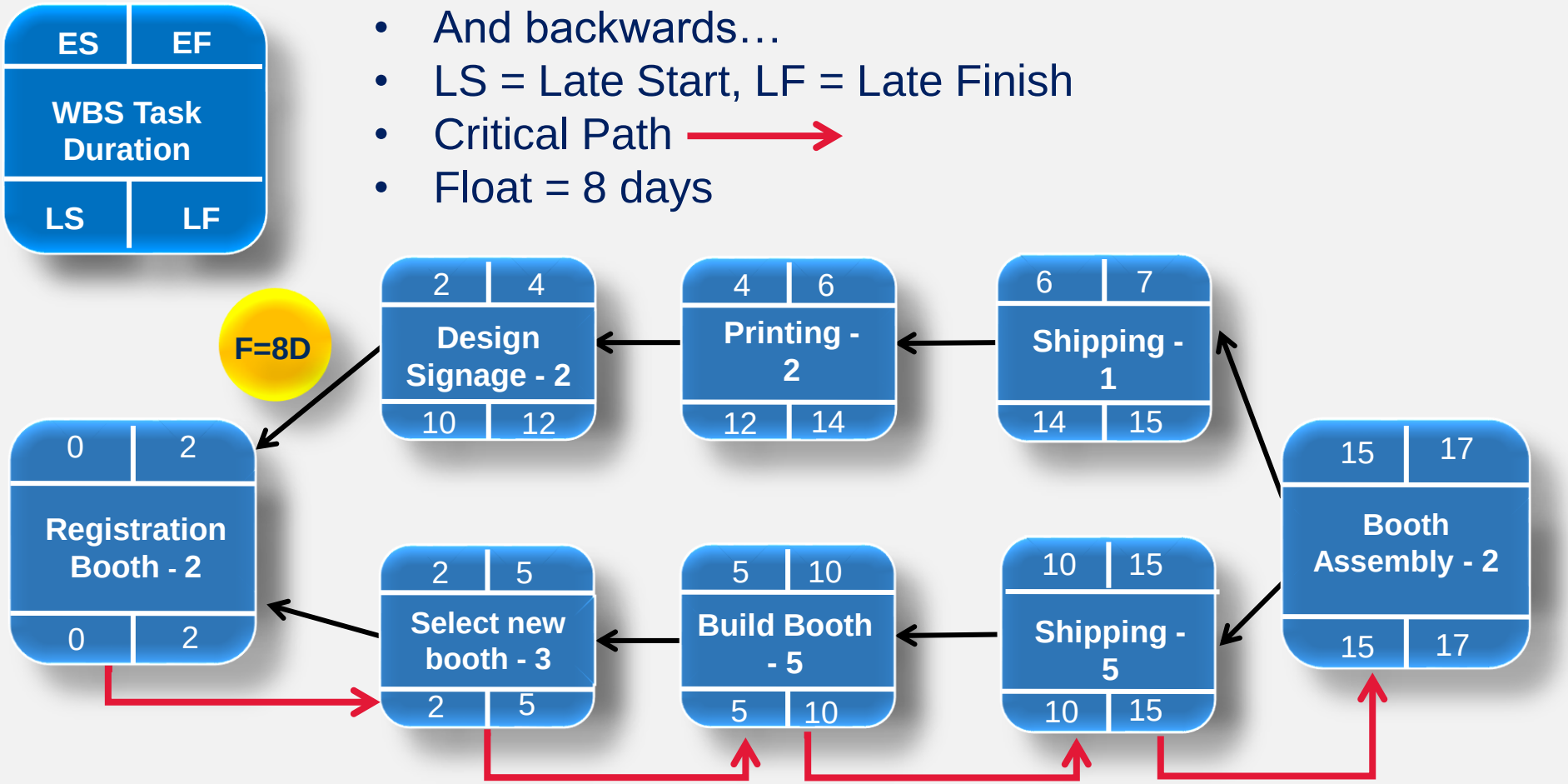
- Two sets of activities required for completing a Registration Booth work package
- Activities are estimated in days
- ES = Early Start, EF = Early Finish



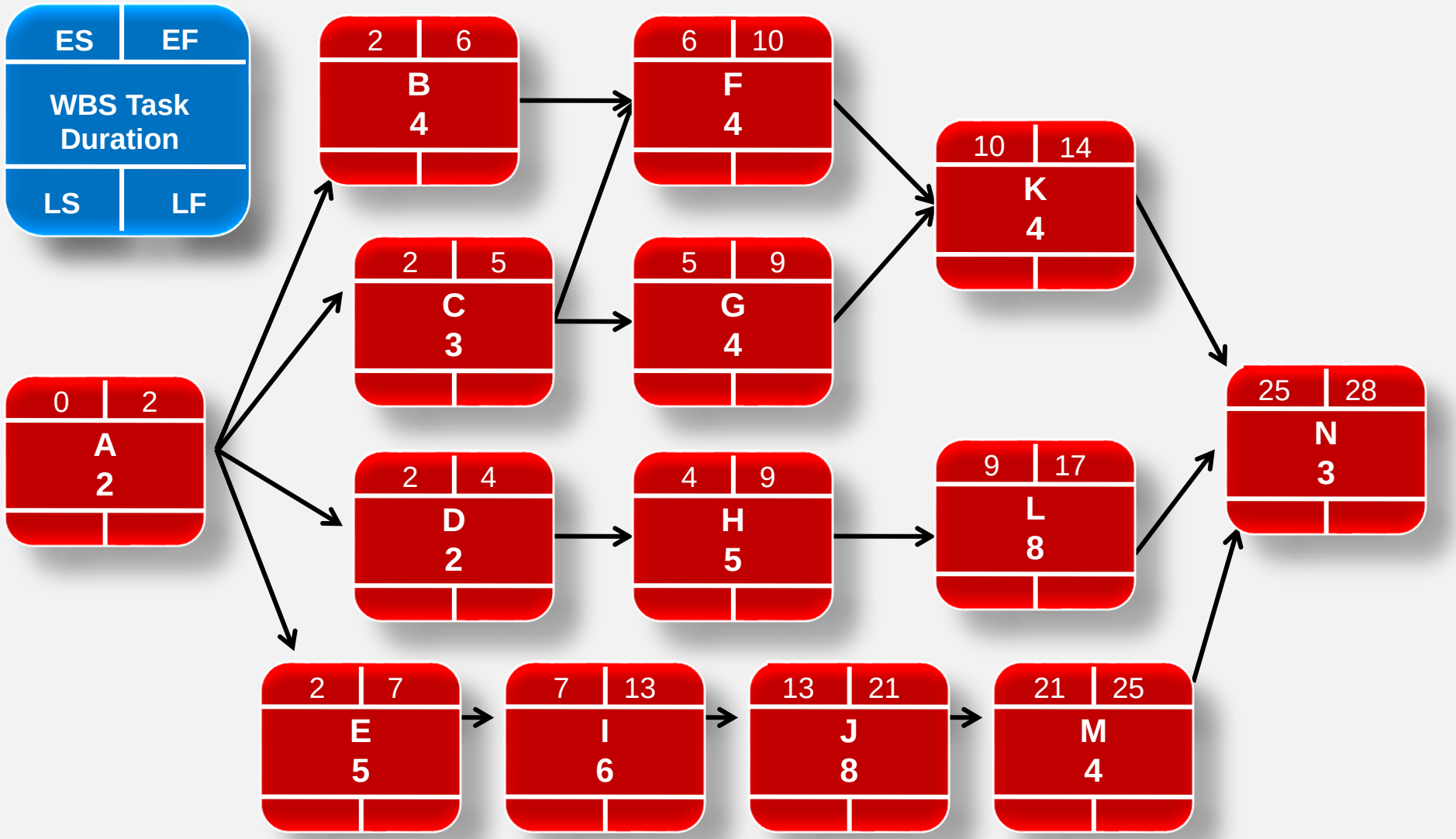
CPM: The Network Diagram: Backward Pass

Project Management Expo Example

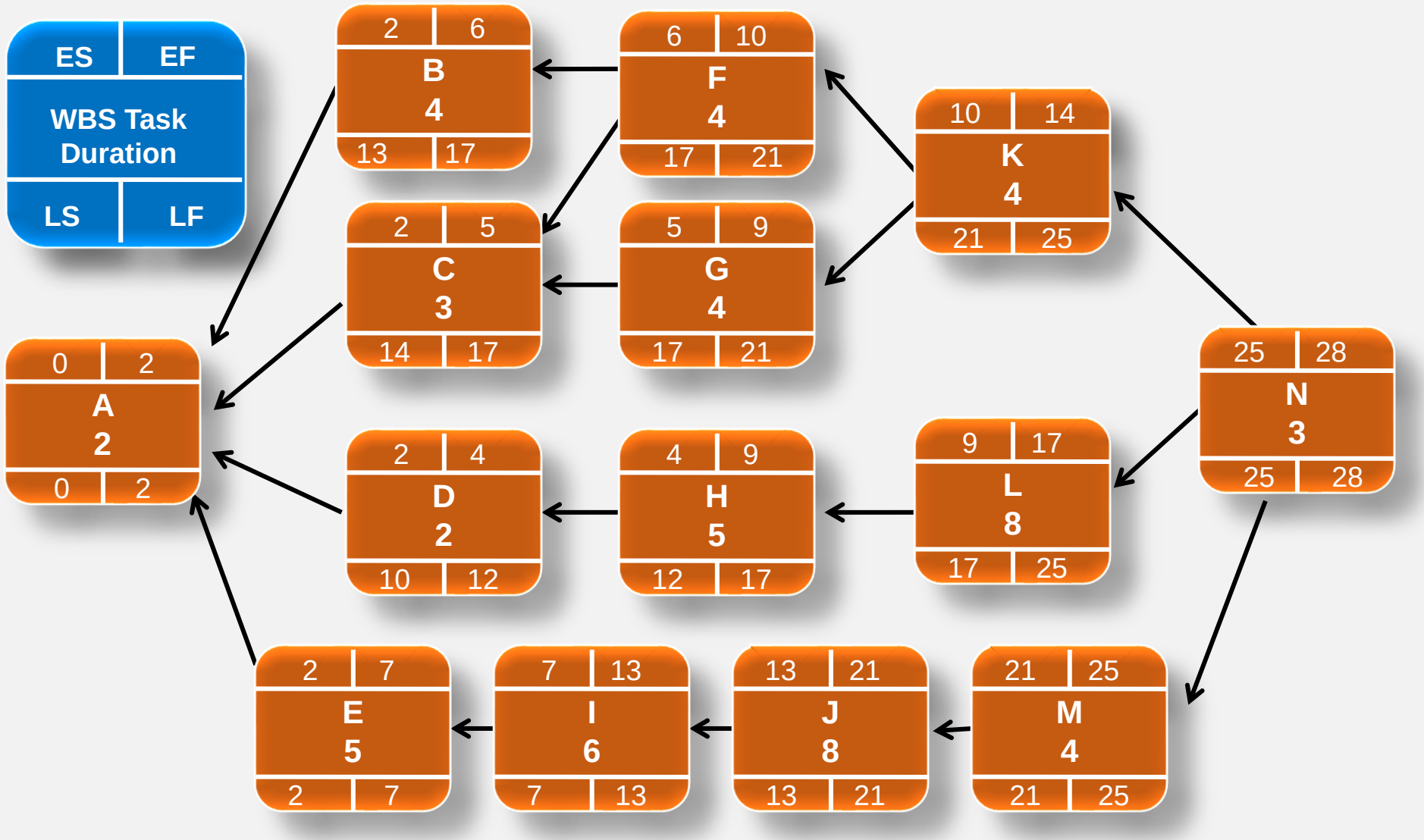
- And backwards…
- LS = Late Start, LF = Late Finish
- Critical Path ⟶
- Float = 8 days



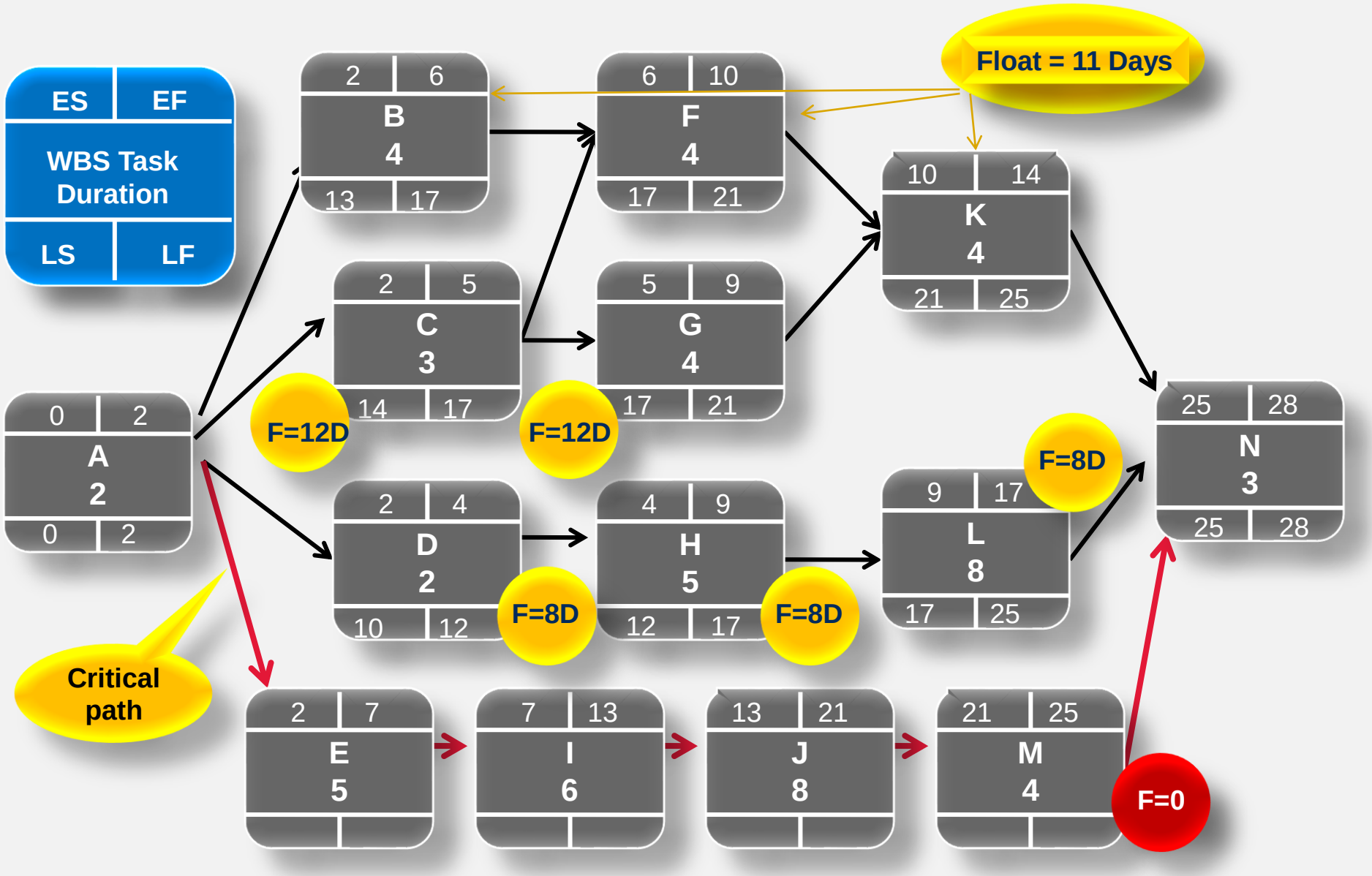
CPM: The Network Diagram: Forward Pass



CPM: The Network Diagram: Backward Pass



CPM: Critical Path

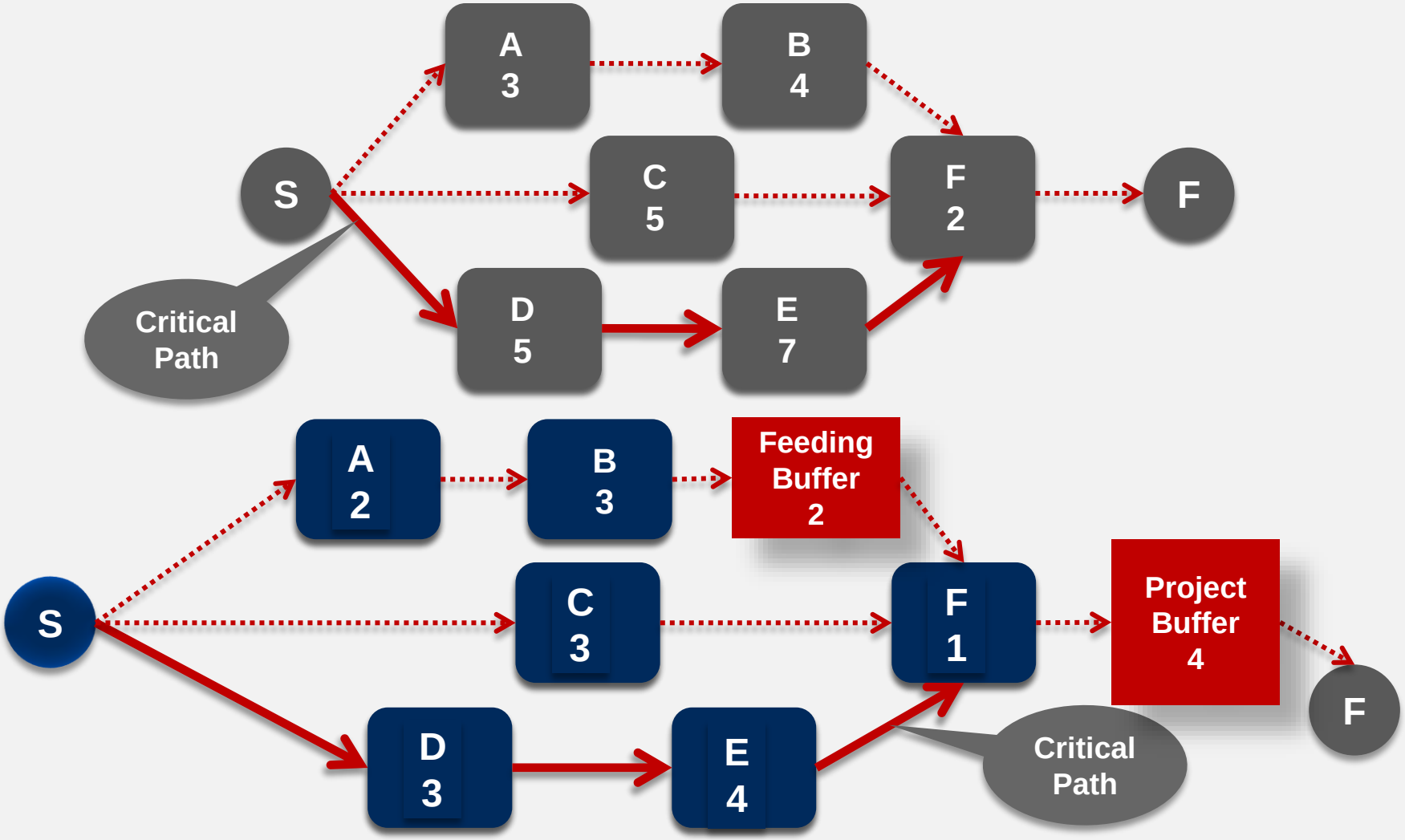


Develop Schedule – Tools (cont'd)

- **Critical Chain Method**
  - Resource allocation must be checked to ensure that the projected resources are available when needed
  - If the fully developed schedule indicates that two or more activities require scarce resources simultaneously, a "leveling" of resources is required
  - "Critical Chain" scheduling involves:
    - Reviewing original network logic and duration calculations
    - Identifying possible activity overlaps
    - Using "Float" times to "balance" resources
    - Working additional hours with available resources
    - Extending a project's duration

Develop Schedule – Tools (cont'd)

- **Critical Chain Buffers**



Develop Schedule – Outputs

- Project schedule
  - Bar charts
    - Also known as Gantt charts
    - Graphically represent dates with horizontal bars
  - Milestone list
    - Text based and include the date for important events
      - Start of a phase of a project
      - Completion of a phase of a project
      - Hand over of part of a Project
      - Delivery of an important item of equipment
      - Receipt of a permit
    - Possible to show baseline vs. actual dates
    - Suitable for executive presentations or gate reviews

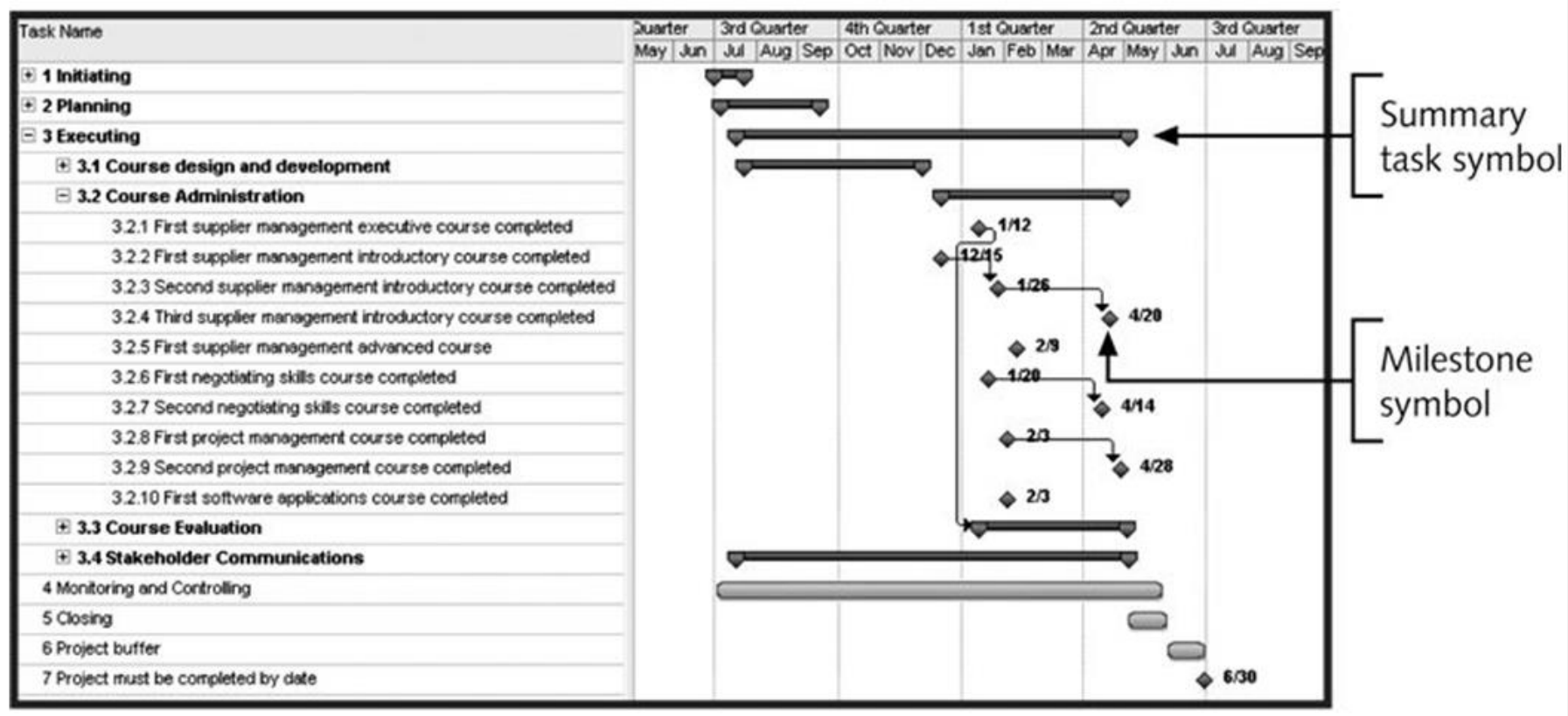
Develop Schedule – Tools (cont'd)

- **Project schedule**
  - **Milestone list**

Milestone List			
Project Name: **Project Management Expo**		Date: **August 1**	
ID	Milestone	Estimated Completion Date	Actual Completion Date
	Project Team selected	March Year 1	
	Venue confirmed	January Year 2	
	Hotel booked	January Year 3	
	Attendee rooms blocked	March Year 3	
	Registration/credit card set up	July Year 3	
	Registration opened	Sept. Year 3	
	Speakers confirmed	Nov. Year 3	
	Program finalized	January Year 4	
	Sponsor spots booked	February Year 4	
	Volunteers trained	March Year 4	
	Event held	Sept. Year 4	

Develop Schedule - Outputs

- **Project schedule**
  - **Bar or Gantt chart**



Adapted from Figure Figure 5-17, Kathy Schwalbe, Information to Project Management, 6th Edition, 2017. Page 174.

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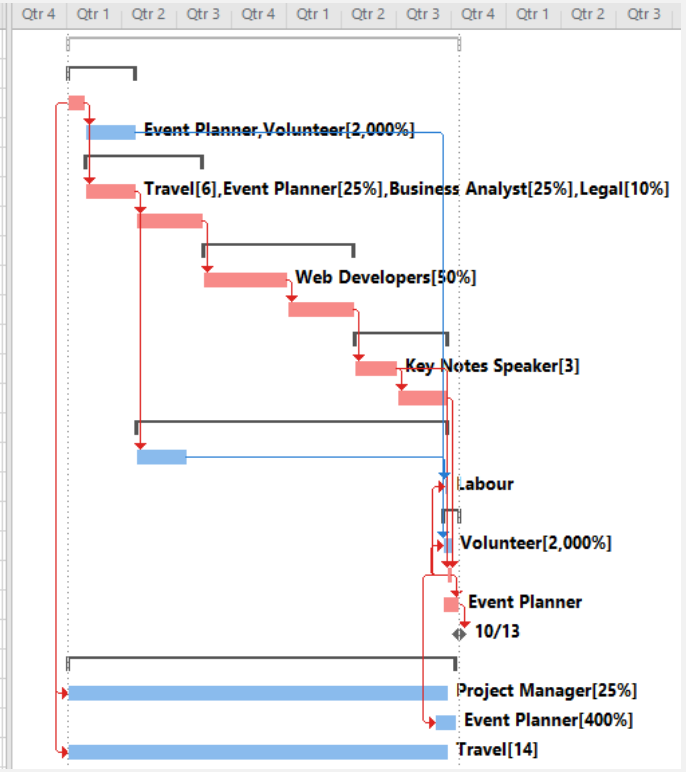
Gantt Chart

	WBS	Task Name	Duration	Start	Finish	Predecess	Resource Names	Cost
0	**0**	**Project Management Expo**	**93 wks**	**Mon 1/3/2**	**Fri 10/13/23**			**$400,000.00**
1	**1**	**Staff**	**16 wks**	**Mon 1/3/22**	**Fri 4/22/22**			**$24,000.00**
2	1.1	Project Team Selected	4 wks	Mon 1/3/22	Fri 1/28/22			$0.00
3	1.2	Volunteers Assigned	12 wks	Mon 1/31/22	Fri 4/22/22	2	Event Planner,Volunte	$24,000.00
4	**2**	**Venue**	**28 wks**	**Mon 1/31/2**	**Fri 8/12/22**			**$45,500.00**
5	2.1	Venue Confirmed	12 wks	Mon 1/31/22	Fri 4/22/22	2	Travel[6],Event Planne	$35,500.00
6	2.2	Hotel Booked	16 wks	Mon 4/25/22	Fri 8/12/22	5		$10,000.00
7	**3**	**Registration**	**36 wks**	**Mon 8/15/2**	**Fri 4/21/23**			**$55,000.00**
8	3.1	Website Developed	20 wks	Mon 8/15/22	Fri 12/30/22	6	Web Developers[50%]	$50,000.00
9	3.2	Member Packages Sent	16 wks	Mon 1/2/23	Fri 4/21/23	8		$5,000.00
10	**4**	**Program**	**22 wks**	**Mon 4/24/2**	**Fri 9/22/23**			**$15,000.00**
11	4.1	Speakers Confirmed	10 wks	Mon 4/24/23	Fri 6/30/23	9	Key Notes Speaker[3]	$12,000.00
12	4.2	Social/Entertainment Confirmed	12 wks	Mon 7/3/23	Fri 9/22/23	11		$3,000.00
13	**5**	**Sponsorship**	**74 wks**	**Mon 4/25/2**	**Fri 9/22/23**			**$7,000.00**
14	5.1	Sponsor Packages Completed	12 wks	Mon 4/25/22	Fri 7/15/22	5		$5,000.00
15	5.2	Sponsor Layout Completed	4 days	Tue 9/19/23	Fri 9/22/23	14,18SS-4 d	Labour	$2,000.00
16	**6**	**Event**	**4 wks**	**Mon 9/18/2**	**Fri 10/13/23**			**$87,000.00**
17	6.1	Volunteers Travel Completed	2 wks	Mon 9/18/23	Fri 9/29/23	18SS-1 wk,3	Volunteer[2,000%]	$30,000.00
18	6.2	Event Held	1 wk	Mon 9/25/23	Fri 9/29/23	11,12		$49,000.00
19	6.3	Survey Completed	4 wks	Mon 9/18/23	Fri 10/13/23	18FS-2 wks	Event Planner	$8,000.00
20	6.4	Event Completed	0 wks	Fri 10/13/23	Fri 10/13/23	19		$0.00
21	**7**	**Project Management**	**92 wks**	**Mon 1/3/22**	**Fri 10/6/23**			**$166,500.00**
22	7.1	Project Management Completed	90 wks	Mon 1/3/22	Fri 9/22/23	2SS	Project Manager[25%]	$112,500.00
23	7.2	Event Planners Selected	5 wks	Mon 9/4/23	Fri 10/6/23	18SS-3 wks	Event Planner[400%]	$40,000.00
24	7.3	Travel Completed	90 wks	Mon 1/3/22	Fri 9/22/23	2SS	Travel[14]	$14,000.00



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Develop Schedule – Questions

1. **By using the Three Point Estimation – Beta (PERT) analysis tool, determine the estimated activity duration for a task in days if the optimistic time is 20 days, the pessimistic time is 35 days and the most likely time is 26 days.**
   a. 27.5
   b. 27
   c. 26.5
   d. 26
2. **_____ is the amount of time an activity can be delayed from its early start without delaying the planned project finish date.**
   a. Total slack
   b. Free slack
   c. Backward pass
   d. Forward pass
3. **The technique for making cost and schedule trade-offs to obtain the greatest amount of schedule compression for the least incremental cost is known as _____.**
   a. dependency
   b. crashing
   c. critical chain scheduling
   d. feeding buffers

1. C tE = (tO + 4tM + tP) / 6… (20+ 4x26+35)=27
2. A
3. B

Module 6 Section3

Lesson 6: Sprint Planning

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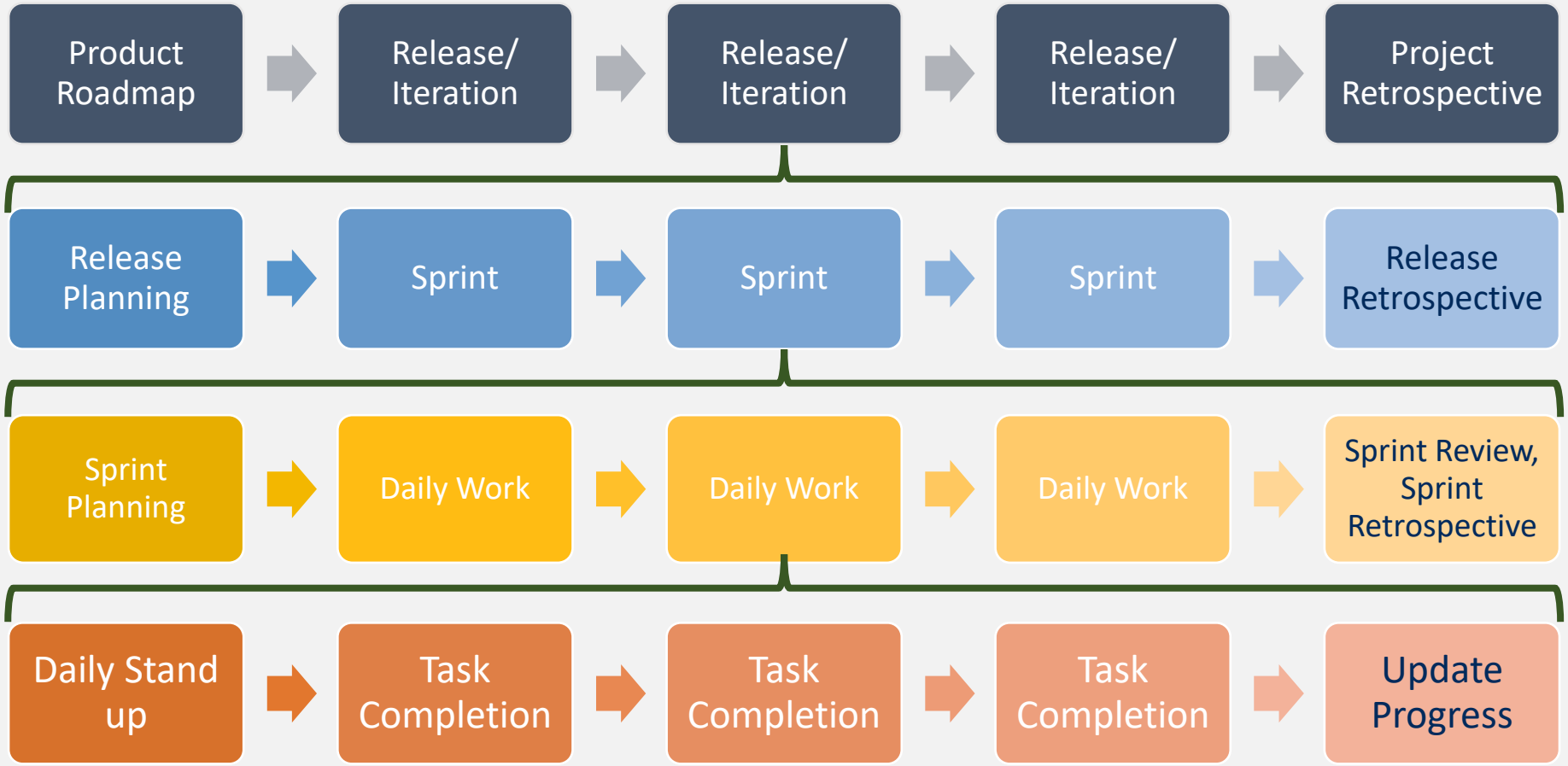
The Agile Project Lifecycle



What is Scrum

- A framework within which people can address complex adaptive problems, while productively and creatively delivering products of the highest possible value
- Scrum is:
  - Lightweight
  - Transformational for organization
  - Simple to understand
  - Difficult to master

Scrum Values

- These values are embodied and lived by the Scrum team
- The Scrum pillars of transparency, inspection, and adaptation come to life and build trust for everyone
- Successful use of Scrum depends on people becoming more proficient in living these five values

The Sprint

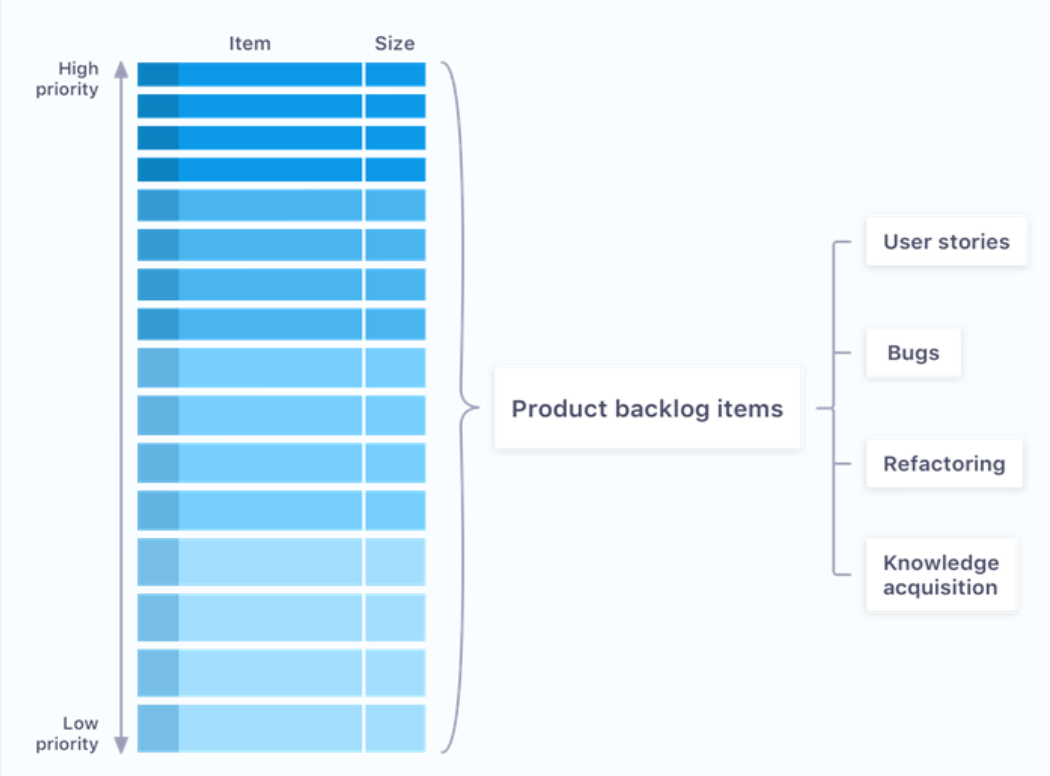
- A Sprint is the heart of Scrum, a time-box of one month or less during which a product increment is created
- Sprints have consistent durations throughout a development effort
- A new Sprint starts immediately after the conclusion of the previous Sprint
- Sprints contain and consist of the:
  - Sprint planning
  - Daily scrums
  - The development work
  - The sprint review
  - The sprint retrospective

The Sprint Backlog

- The Sprint backlog is the set of product backlog items selected for the Sprint
- The Sprint backlog is a forecast by the development team about what functionality will be in the next increment and the work needed to deliver that functionality
- Only the development team modifies the Sprint backlog throughout the Sprint
- The Sprint backlog is a highly visible, real-time picture of the work that the development team plans to accomplish during the Sprint

Sprint Backlog (cont'd)

- A subset of the Product Backlog
- Prioritized based on the objective of the sprint and capability of the team to deliver something of value during the sprint

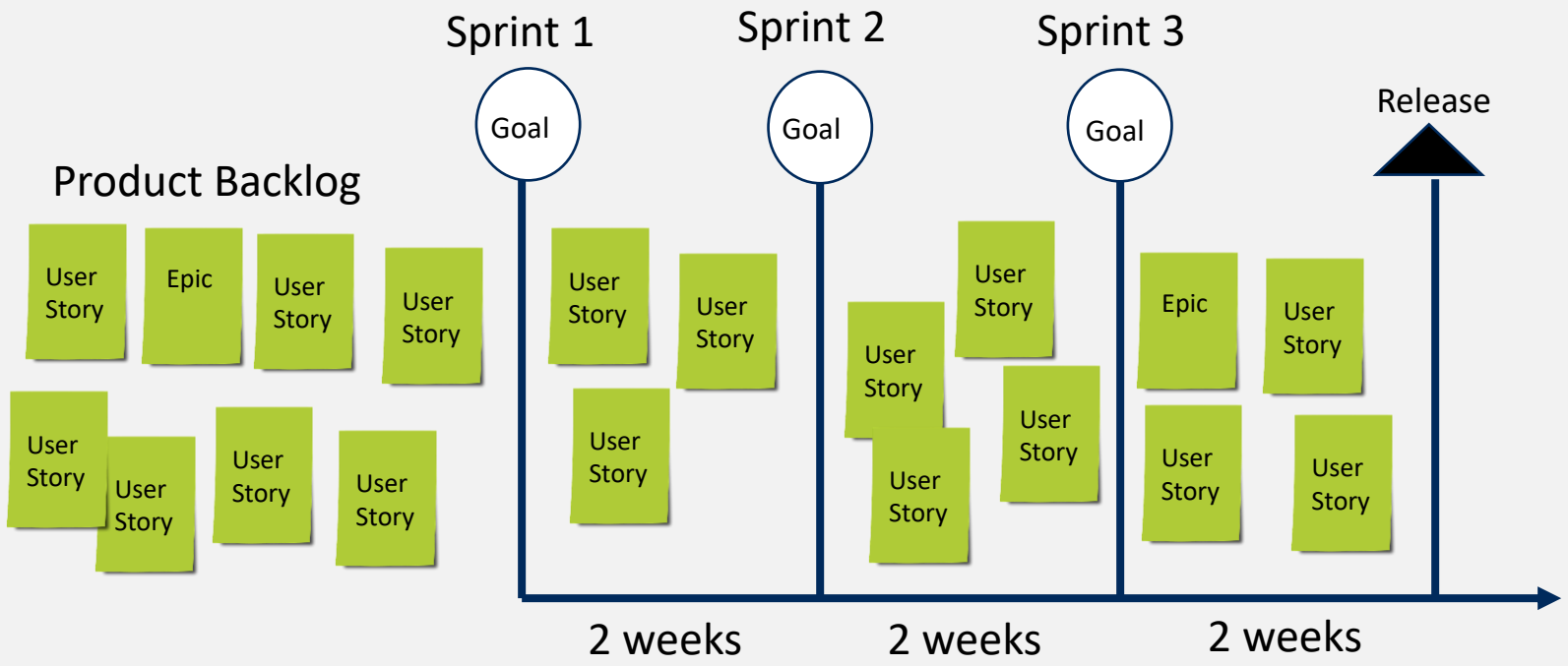


Agile Release Planning

- Release backlog is a subset of the product backlog and includes features to be done in the release
- Sprint backlog is a subset of the release backlog and are the user story and task level
- Sprints are of fixed duration, usually 2 to 4 weeks and end with product demos or retrospectives

Simple Release Plan

- During the release planning session, the team will review the backlog and define the goal of each sprint and the minimum features that will need to be delivered



The Product Increment

- The increment is the sum of all the product backlog items completed during a Sprint and the value of the increments of all previous Sprints
- The increment is a step toward a vision or goal
- The new increment must be “Done,” which means it must be in useable condition and meet the Scrum team’s definition of “Done”
- Everyone must understand what “Done” means
- Although this may vary significantly per Scrum team, members must have a shared understanding of what it means for work to be complete, to ensure transparency

Schedule Management – Questions

1. **Who can modify a sprint backlog during the sprint?**
   a. Scrum master
   b. Product owner
   c. Development team
   d. Project sponsor
2. **What will the team define for a particular sprint during each release planning?**
   a. Dates
   b. Budget
   c. Scope
   d. Goal

1. C
2. D

Module 6 Section4

Lesson 6: Agile Ceremonies

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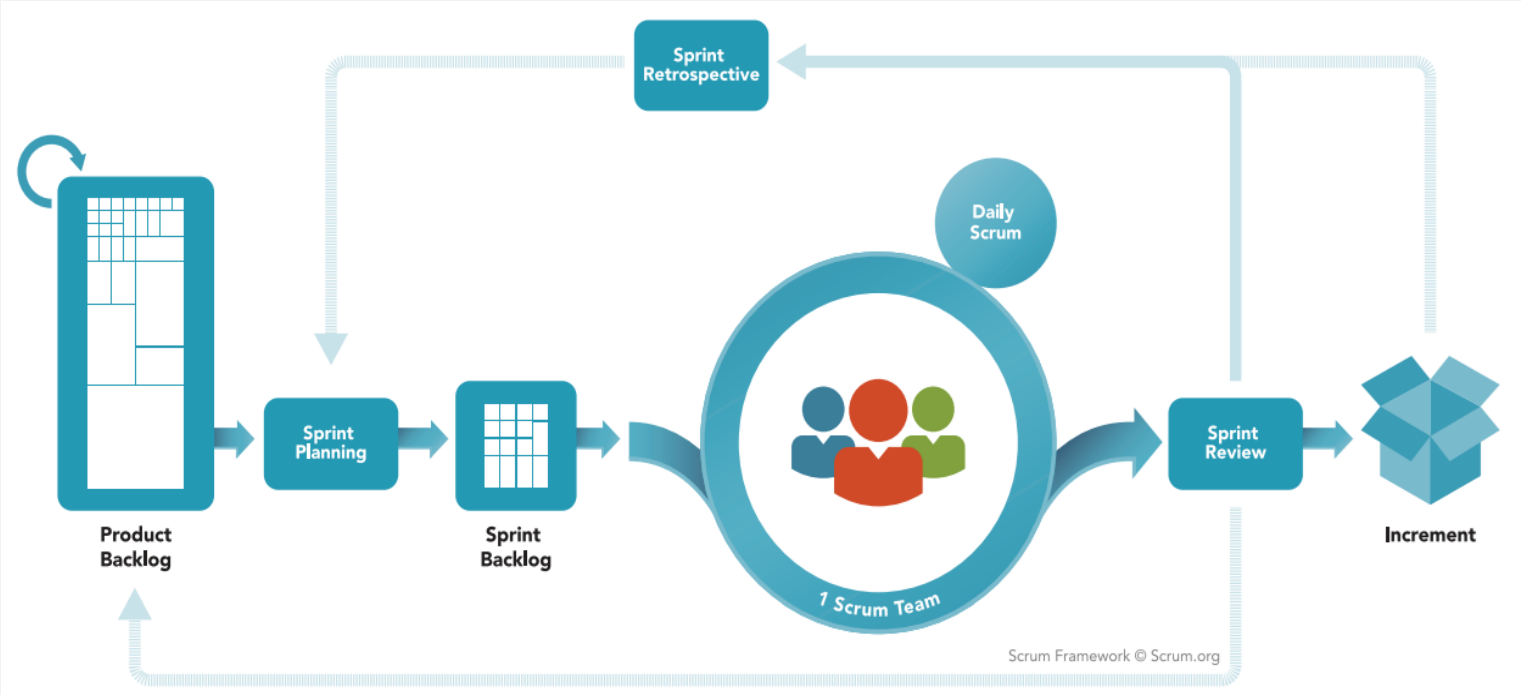
Scrum Events At A Glance

- Scrum's events represent ceremonies that provide:
  - Transparency
  - Minimize the need for meetings
  - Opportunities for inspection and adaptation



Scrum Ceremonies or Events

- Prescribed events are used in Scrum to create regularity and to minimize the need for meetings not defined in Scrum
- All events are time-boxed events, such that every event has a maximum duration
- Once a Sprint begins, its duration is fixed and cannot be changed

Sprint Planning

- The work to be performed in the Sprint is planned at the Sprint planning
- This plan is created by the collaborative work of the entire Scrum team
- Sprint planning is time-boxed to a maximum of eight hours for a one-month Sprint
- Sprint planning answers the following questions:
  - What can be delivered in the next increment?
  - How will the work needed to deliver the increment be achieved?

The Daily Scrum

- *The daily scrum is a 15-minute time-boxed event for the development team*
- The development team plans work for the next 24 hours
- Held at the same time and place each day of the Sprint to reduce complexity
- Topics addressed during the daily scrum by each participants in a round-robin fashion:
  - What did I do yesterday?
  - What will I do today?
  - Do I see any impediment?

The Sprint Review

- A four-hour meeting for one-month Sprints
- Held at the end of the Sprint to inspect the increment and adapt the product backlog
- The Scrum team and stakeholders collaborate about what was done in the Sprint
- Attendees collaborate on the next things that could be done to optimize value
- The result of the Sprint review is a revised product backlog that defines the probable product backlog items for the next Sprint
- The product backlog may also be adjusted overall to meet new opportunities

The Sprint Retrospective

- It is at most a three-hour meeting for one-month Sprints
- The purpose of the Sprint retrospective is to:
  - Inspect how the last Sprint went with regards to people, relationships, process, and tools
  - Identify and order the major items that went well and potential improvements
  - Create a plan for implementing improvements to the way the Scrum team works
- The Sprint retrospective provides the team a formal opportunity to focus on inspection and adaptation

Kanban Ceremonies

- No defined ceremonies for Kanban
- Kanban encourages continuous improvement at all the levels of the organization
- Kanban says that leadership acts don’t have to originate from senior managers only
- People at all levels can provide ideas and show leadership to implement changes to continually improve the way they deliver their products and services
- Feedback loops are incorporated on an ongoing basis

Schedule Management – Questions

1. **Sprints have consistent durations and start immediately after the previous Sprint. During the Sprint:**
   a. A project phase is completed
   b. A product increment is created
   c. A product backlog is defined
   d. A product backlog is completed
2. **The daily scrum is a time-boxed meeting that takes approximately _____.**
   a. 15 minutes
   b. 30 minutes
   c. 1 hour
   d. 2 hours

1. B
2. A

Quiz

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Quiz

1. In Scrum, sprints have consistent durations throughout a development effort. When does a new sprint start?

   A. The week after the previous sprint

   B. Immediately after the previous sprint

   C. The team decides when to start a new sprint

   D. The agile coach decides when to start a new sprint

Correct Answer is : **B**
Immediately after the previous sprint.

Quiz

1. The project team scheduled a three-hour retrospective meeting at the end of Sprint 2. The discussion goes well, and the team first focuses on the things that went well in the sprint. What else should they discuss?
   A. Potential improvements
   B. Customer needs
   C. Product backlogs
   D. b. Sprint planning

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Correct Answer is : **A**
Identify and order the major items that went well and potential improvements

Quiz

3. “The project team has started the work on Sprint 2 and the work is underway. One of the stakeholders discusses a change with the product owner and the product owner discusses the change with the development team. Who can modify the sprint backlog in the middle of the sprint?

A. The product owner

B. The development team

C. The project manager

D. The project stakeholder

Correct Answer is: **B**

Quiz

4. Your customer wants your project to be completed 10 days earlier than planned. You believe that you can meet the target by overlapping the project activities. What is the approach that you plan to use?

   A. Concurrent Engineering

   B. Crashing

   C. Resource Leveling

   D. Fast Tracking

Correct Answer is: **D**
Overlapping of activities implies taking activities that would otherwise be executed sequentially and executing them by introducing parallelism. This is referred to as fast tracking

Quiz

5. You are managing a project to build a multi-storey complex in your city. You are waiting for the clearance to start construction of the building. A dependency that originates outside of the project is called _____.

A. External Dependency

B. Mandatory Dependency

C. Discretionary dependency

D. Internal Dependency

Correct Answer is: **A**
This is an example of an external dependency that involves relationships between the project and non-project activities that are outside the control of a project manager

Quiz

6. Which of the following is the best action to take to complete a project one week ahead of schedule?

A. Inform customer that critical path does not allow early completion

B. Motivate the team to work hard and check the status next month

C. Meet the team and look for options for crashing or fast tracking the critical path

D. Consult project sponsor

Correct Answer is: **C**
You should first seek to understand what the best course of action is. Also, when it comes to schedule compression, crashing and fast tracking are the two main options. The project sponsor would approve the actions after your team develops them.

Quiz

7. A sequence of tasks within a project schedule that has zero slack is called _____.

A. Critical Chain

B. Critical Path

C. Zero Slack Track

D. Network Dependency Diagram

Correct Answer is: **B**
The Critical Path in a project has zero slack, and any delays on tasks on the critical path will delay the end date of the project.

Takeaways

- Project Schedule Management includes the processes required to manage the timely completion of the project.
- A project schedule defines the start and end dates of the project and the project activities. These activities are assigned a duration and sequenced in a logical order.
- Gantt charts and network diagrams are used to identify project activities and determine the relationships and dependencies between them.
- Plan Schedule Management, Define Activities, Sequence Activities, Estimate Activity Durations and Develop Schedule,
- Gantt chart displays the start and end dates of project activities, the overall project schedule, and the logical task relationships, while network diagram is used to plot the activity dependencies.
- Schedule network analysis technique generates project schedule based on the estimates of time and resource requirements.


Questions