

# Software Project Time Management

Meeting 14

# Project Scheduling

- Scheduling is an approximate process in that it tries to predict the future
- it is not possible to know with certainty how long a project will take
  - There are techniques that can increase the likelihood of being close
    - If you are close in your planning and estimation, you can manage the project to achieve the schedule by accelerating some efforts or modifying approaches to meet required deadlines

# Creating a Good Estimate

- There are techniques for estimating the duration and effort of an Activity like:
  - Similar activities
  - Historical data
  - Expert advice
  - Delphi technique
  - Three-point technique
  - Wide-band Delphi technique

# Creating a Good Estimate

- Similar Activities
  - This just means estimate an activity based on similar activities in the past
    - If you've developed lots of web pages, you can safely estimate how long it'll take to develop similar pages
- Historic Data
  - If you can find data from similar projects developed by your organization, they can form the basis for a good estimate
    - This assumes the project uses similar technology as previous projects
- Expert Advise
  - If you don't know anything about the task, ask someone who does!
    - Could find experts within your organization, outside consultants, vendors, academia, etc.
- Notice all three estimation methods depend on someone having experience doing the task before

# Creating a Good Estimate

- Delphi technique
  - The Delphi technique is a formal way to get group consensus on a wild guess for the estimate
    1. Get a group of people together
    2. Tell them about the project and its tasks
    3. Get them to all estimate the duration of each task
    4. Tabulate the guesses in a histogram called First Pass
    5. For estimates in the outer quartile (<25% and >75%), ask them for their rationale
    6. Have everyone guess again, and retabulate the results: Second Pass
    7. Have the outer quartile defend their choices again
    8. Make a third set of guesses, and use the average value for the task's estimate
- “Though it sounds a bit goofy, this method actually works pretty well”

# Creating a Good Estimate

- Three Point Estimate
  - The actual duration of a task could vary, depending on many factors
  - Hence there could be a distribution of possible values for the duration
  - Based on best judgment, determine the
    - **O**ptimistic, **M**ost likely, and **P**essimistic values for the duration, then use
      - Estimate =  $(O + 4 * M + P) / 6$

# PERT For Dealing With Uncertainty

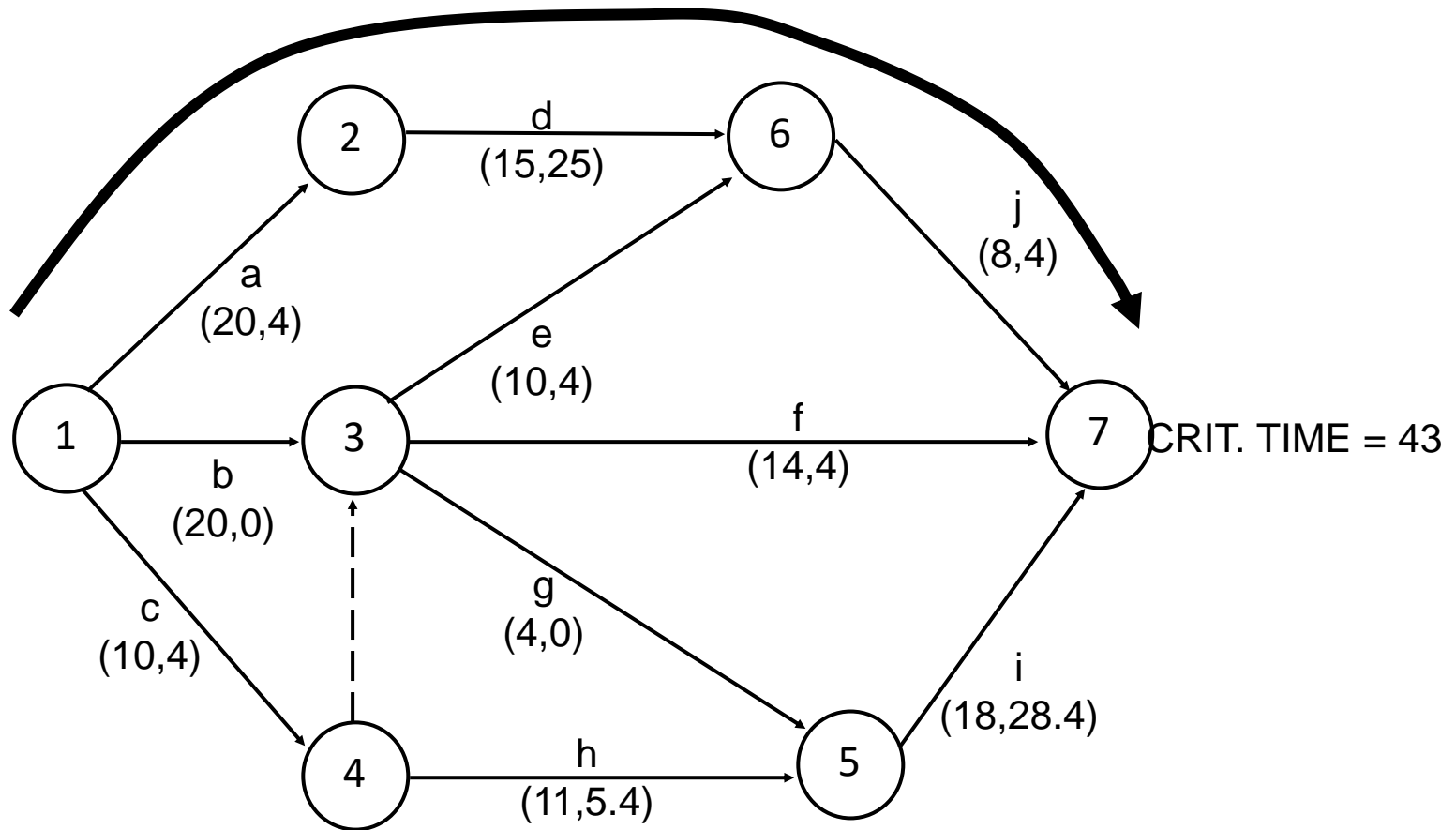
- Times can be estimated with relative certainty, confidence but for many situations this is not possible, e.g Research, development, new products and projects etc.
- Use 3 time estimates
  - $m$  = most likely time estimate,
  - $a$  = optimistic time estimate,
  - $b$  = pessimistic time estimate, and
  - Expected Value (TE) =  $(a + 4m + b) / 6$
  - Variance (V) =  $((b - a) / 6)^2$
  - Std Deviation ( $\delta$ ) =  $\text{SQRT}(V)$

## Precedence And Project Activity Times

Activity	Predecessor	Optimistic Time	Most likely Time	Pessimistic Time	EXP TE	Var V	S.Dev $\sigma$
A	-	10	22	22			
B	-	20	20	20	20	4	2
C	-	4	10	16	20	0	0
D	A	2	14	32	10	4	2
E	B,C	8	8	20	15	25	5
F	B,C	8	14	20	10	4	2
G	B,C	4	4	4	14	4	2
H	C	2	12	16	4	0	0
I	G,H	6	16	38	11	5.4	2.32
J	D,E	2	8	14	18	28.4	5.33
					8	4	2



# The complete network



# A PERT Activity time estimate

## Exercise

Activity	Optimistic (a)	Most Likely (m)	Pessimistic (b)
A	5	6	8
B	3	4	5
C	2	3	3
D	3.5	4	5
E	1	3	4
F	8	10	15
G	2	3	4
H	2	2	2.5

**Calculate:**

**T(E) =?**

**V =?**

**S =?**

# A PERT Activity time estimate

Activity	(a)	(m)	(b)	Te	v	(s)
A	5	6	8	6.17	0.25	0.50
B	3	4	5	4.00	0.108	0.33
C	2	3	3	2.83	0.028	0.17
D	3.5	4	5	4.08	0.062	0.25
E	1	3	4	2.83	0.25	0.50
F	8	10	15	10.50	1.36	1.17
G	2	3	4	3.00	0.108	0.33
H	2	2	2.5	2.08	0.006	0.08

$$Te = a + 4m + b/6$$

$$V = (b - a/6)^2$$

$$S = \text{sqrt}(v)$$

**Draw the PERT Diagram**

# NETWORK TECHNIQUES

PERT

-Program Evaluation and Review Technique  
- developed by the US Navy - on the Polaris Missile/Submarine program 1958

CPM

Critical Path Method  
Developed for Chemical Plant Shutdown Project- about same time as PERT

- ✓ Both use same calculations, almost similar
- ✓ Main difference is probabilistic and deterministic in time estimation
- ✓ Gantt Chart also used in scheduling

**P**rogram **E**valuation and **R**eview **T**echnique, Based on idea that estimates are uncertain. **Therefore:**

- uses duration **ranges**, And the **probability** of falling to a given range
- Uses an “expected value” (or weighted average) to determine durations