Project Management

Network Scheduling Techniques –II (PERT)

PERT

Program Evaluation and Review Technique

Project completion time

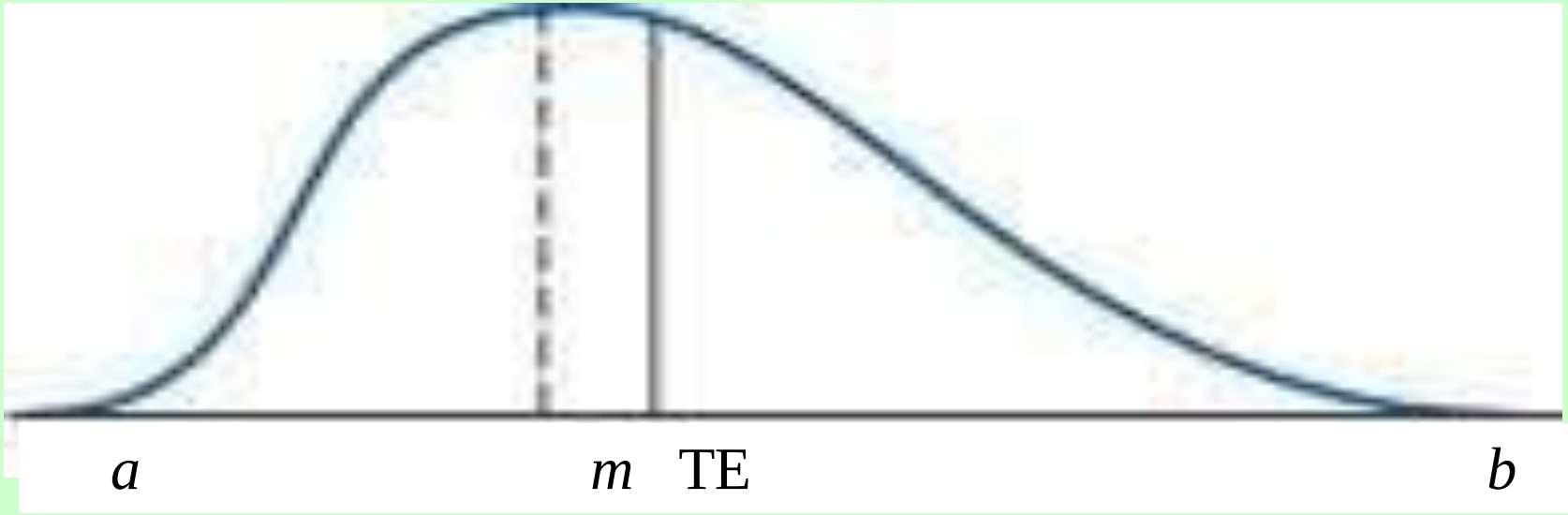
When analysing and negotiating the project completion time the PM should try to determine the probability that a project will be completed by the suggested time, OR find the completion time associated with a predetermined level of risk.

There are statistical methods for doing this, which are applicable if you know the risks for each activity.

Calculating times

- Completion time is found using three time estimates:
- Optimistic *(a),* Pessimistic *(b)*, and most likely *(m),* which are expressions of the risk associated with the time required for each activity
- On the distribution graph *m* is the mode, *a* is the estimation of actual time so that the the actual time will be a or greater about 99 percent of time, and b is estimated such that about 99% of the time the activity will have a duration of *b* or less
- Expected Time (TE) is found by: $TE=(a + 4m + b)/6$
- The method is based on BETA statistical distribution. TE is an estimate of the mean of the distribution, as a weighted average of *a,b,* and *m* with weight 1-4-1

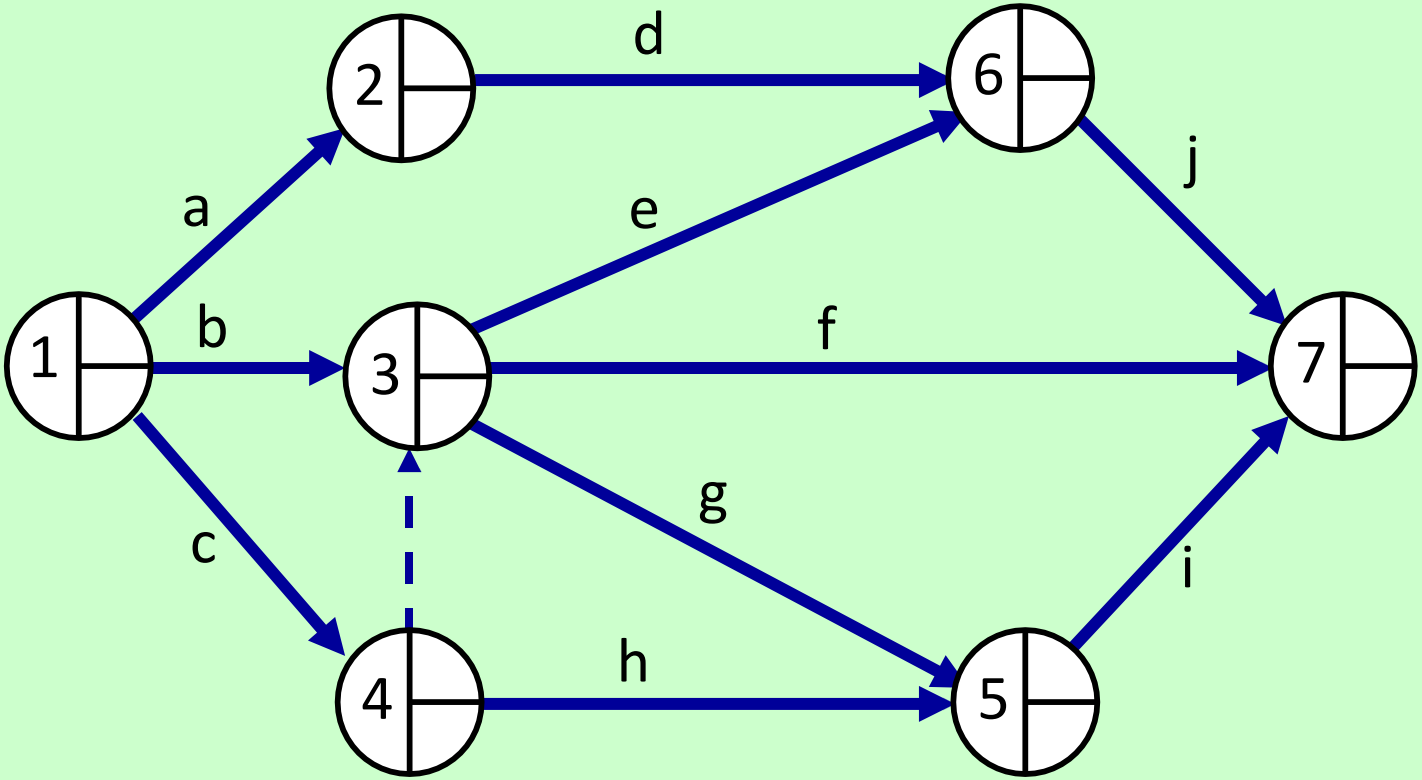
Expected time, TE



Project activity times and precedences

Activity	Optimistic time	Most likely time	Pessimistic time	Immediate predecessor activities
a	10	22	22	-
b	20	20	20	-
c	4	10	16	-
d	2	14	32	a
e	8	8	20	b, c
f	8	14	20	b, c
g	4	4	4	b, c
h	2	12	16	c
i	6	16	38	g, h
j	2	8	14	d, e

Activity on arrow (AOA) example



Expected time

TE=(a + 4m + b)/6

Activity	Optimistic time	Most likely time	Pessimistic time	Expected time (TE)	Immediate predecessor activities
a	10	22	22		-
b	20	20	20		-
c	4	10	16		-
d	2	14	32		a
e	8	8	20		b, c
f	8	14	20		b, c
g	4	4	4		b, c
h	2	12	16		c
i	6	16	38		g, h
j	2	8	14		d, e

Expected time

TE=(a + 4m + b)/6

Activity	Optimistic time	Most likely time	Pessimistic time	Expected time (TE)	Immediate predecessor activities
a	10	22	22	20	-
b	20	20	20	20	-
c	4	10	16	10	-
d	2	14	32	15	a
e	8	8	20	10	b, c
f	8	14	20	14	b, c
g	4	4	4	4	b, c
h	2	12	16	11	c
i	6	16	38	18	g, h
j	2	8	14	8	d, e

Terms: reminder

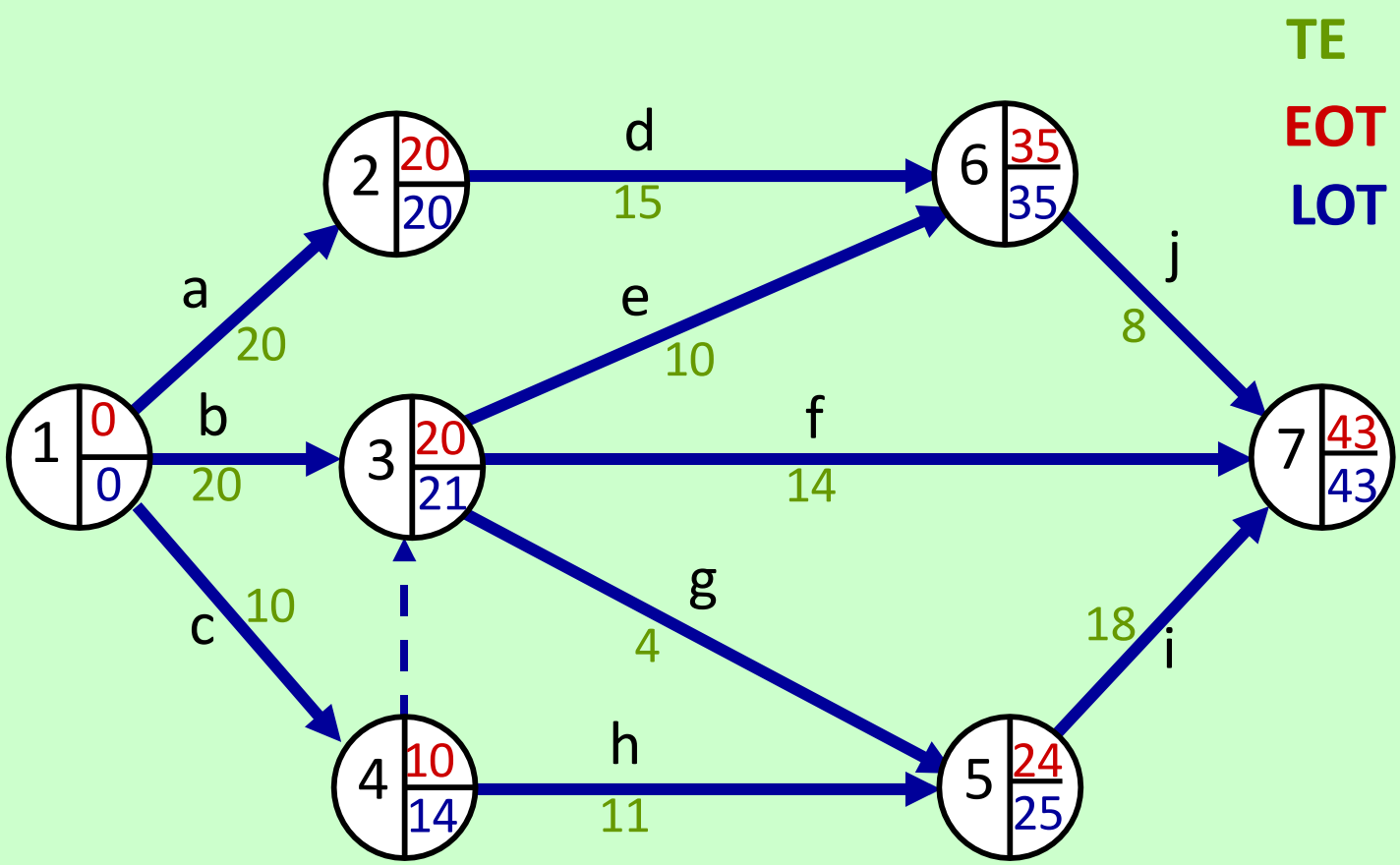
EOT or EET = Earliest Occurrence/Event Time (or EFT as earliest finish time)

EST = earliest starting time

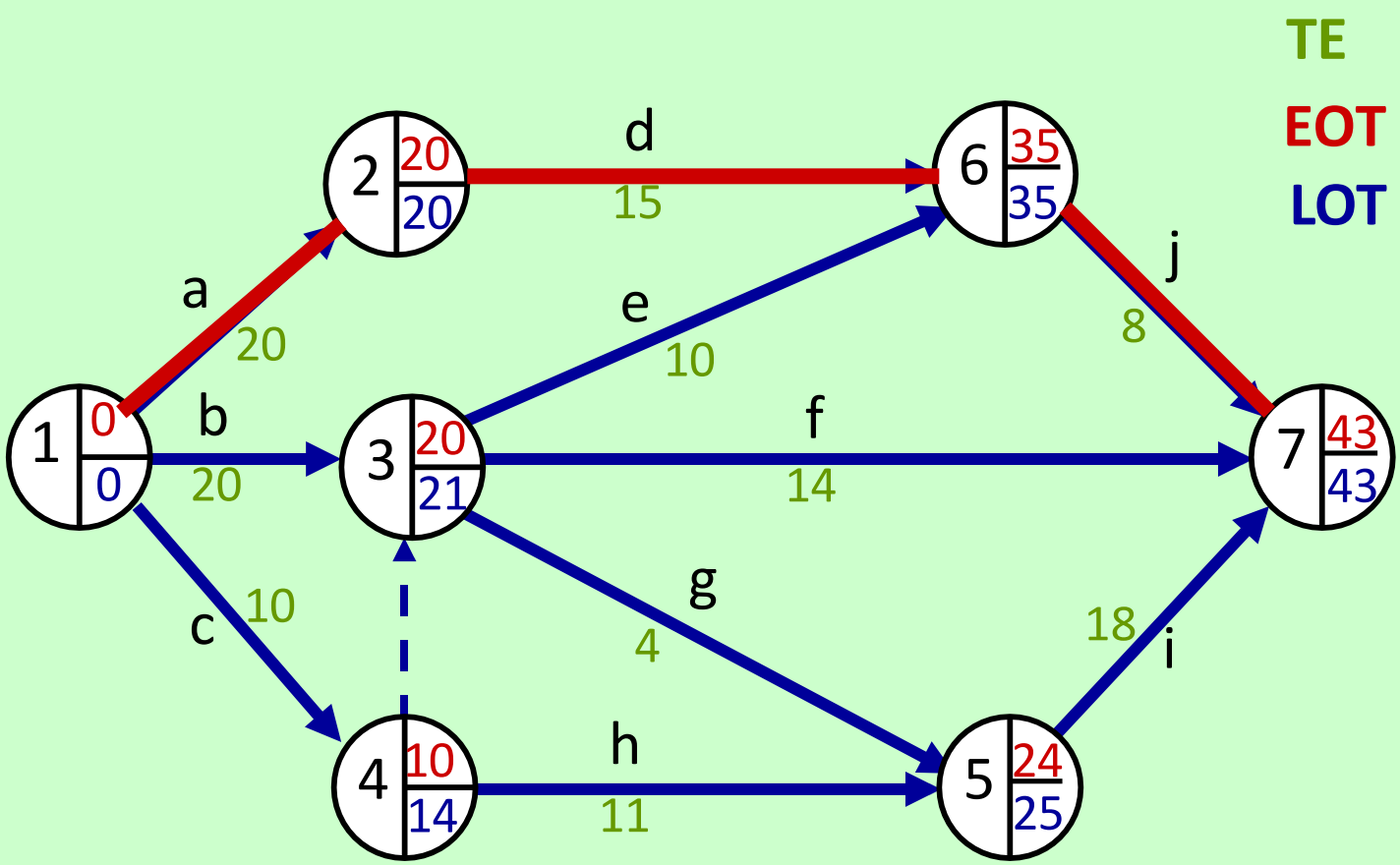
LST or LET or LOT = latest starting/event/occurrence time

- Critical Path = The LONGEST time in which the entire network can be completed
- Critical Time = The time of CP completion

Expected timings



Expected timings

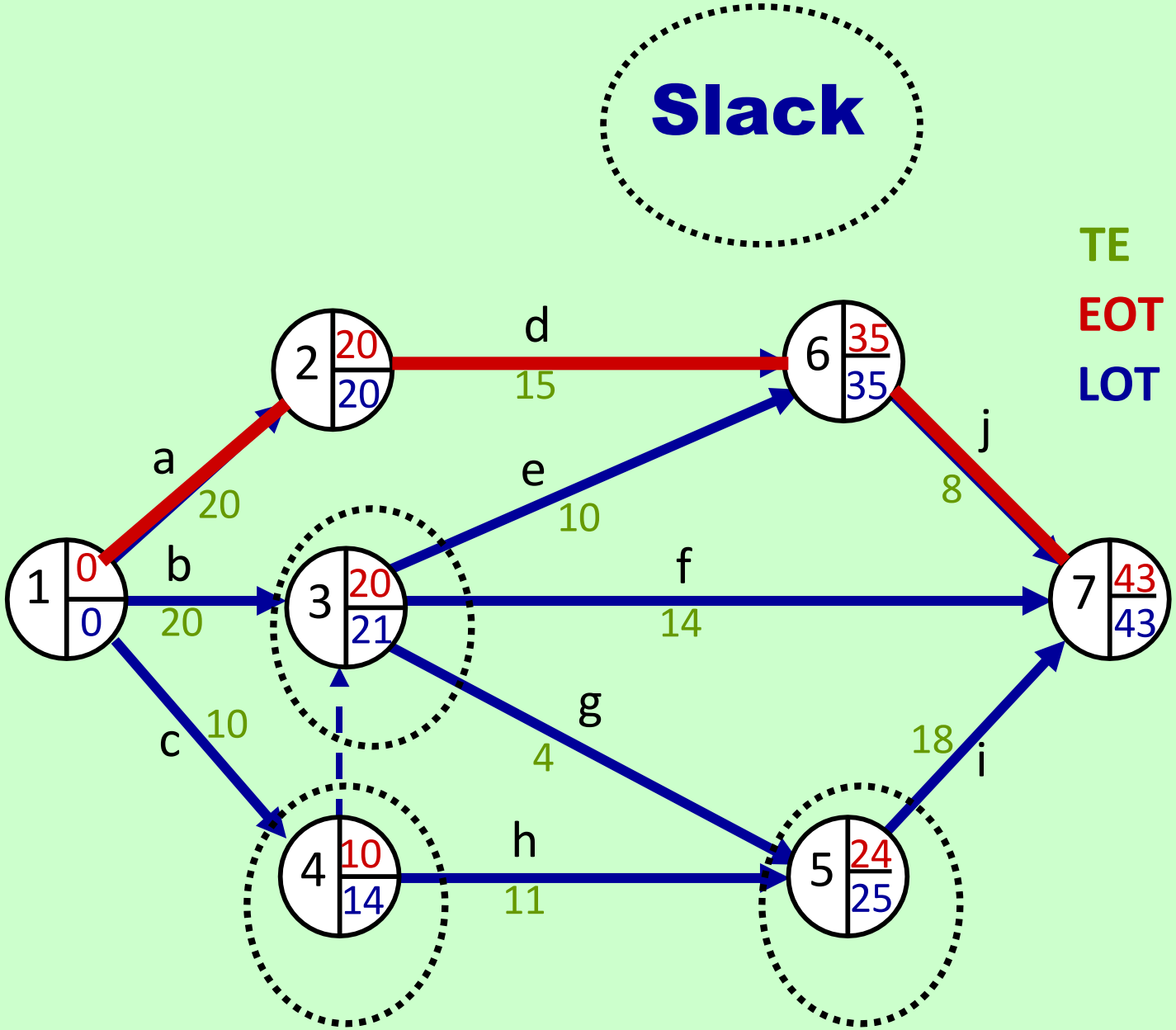


Slack

Slack = LOT – EOT: Time and slack for the network

Event	LOT	EOT	Slack
1	0	0	0
2	20	20	0
3	21	20	1
4	14	10	4
5	25	24	1
6	35	35	0
7	43	43	0

Slack


TE
EOT
LOT
1
0
0
2
20
20
3
20
21
4
10
14
5
24
25
6
35
35
7
43
43
a
20
b
20
c
10
d
15
e
10
f
14
g
4
h
11
i
18
j
8

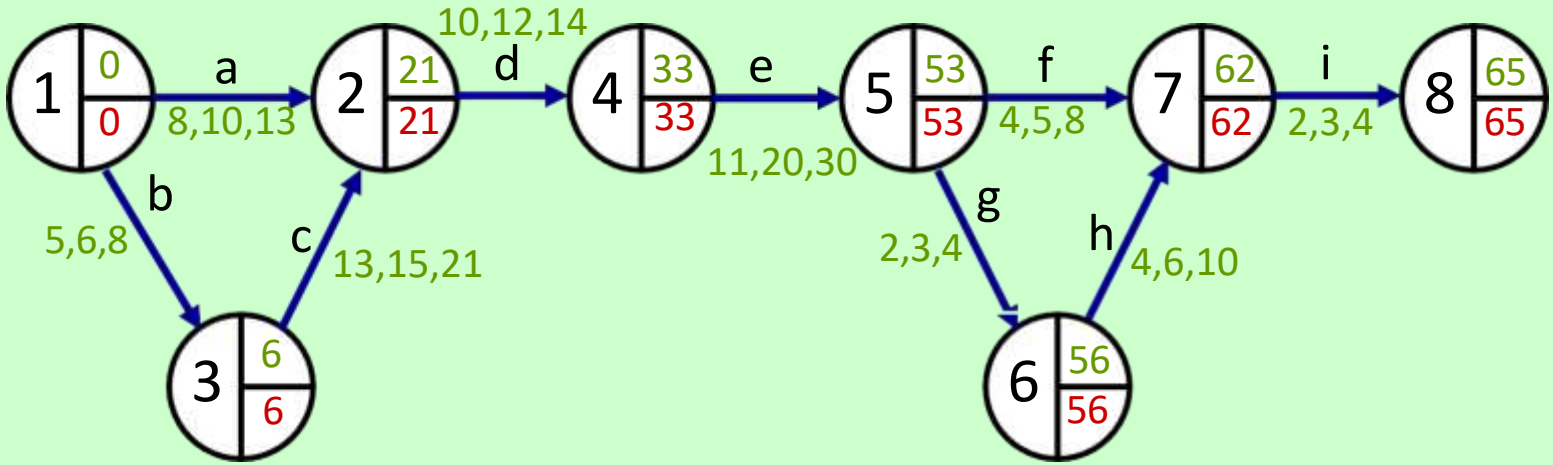
Critical Path Problem

	Activity	Optimistic	Most Like	Pessimistic	Precedents
a	Lay foundation	8	10	13	-
b	Dig hole for scale	5	6	8	-
c	Insert scale bases	13	15	21	b
d	Erect frame	10	12	14	a, c
e	Complete building	11	20	30	d
f	Install scales	4	5	8	e
g	Install display cases	2	3	4	e
h	Put in office equipment	4	6	10	g
i	Finishing touches	2	3	4	h, f

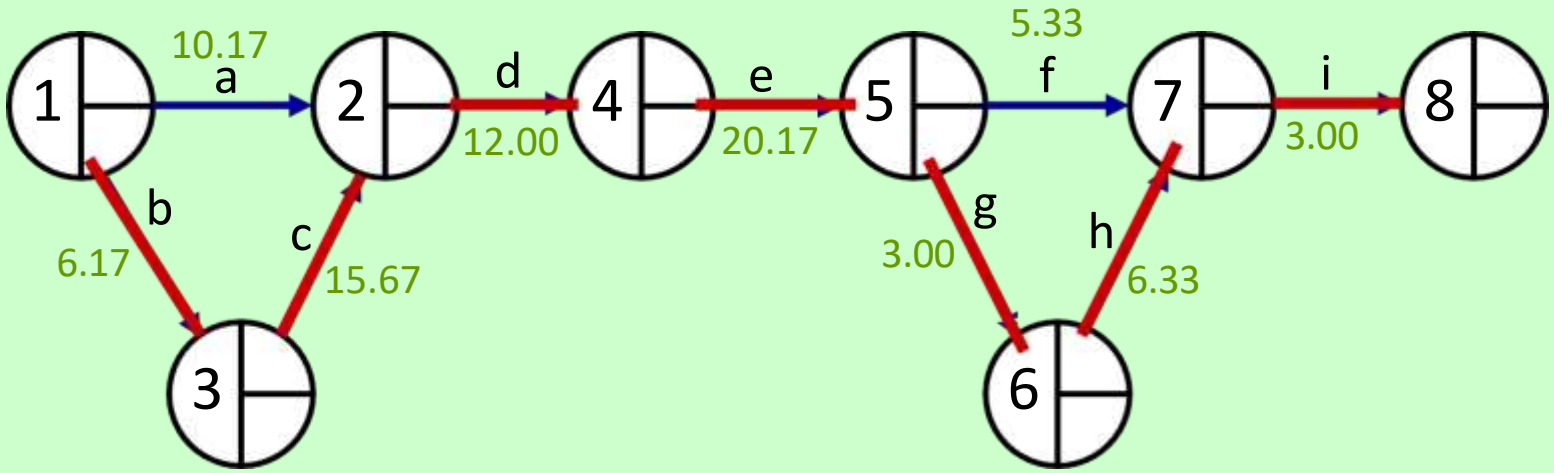
Critical path problem: calculate expected time

	Activity	Optimistic	Most Like	Pessimistic	Expected
a	Lay foundation	8	10	13	10.17
b	Dig hole for scale	5	6	8	6.17
c	Insert scale bases	13	15	21	15.67
d	Erect frame	10	12	14	12.00
e	Complete building	11	20	30	20.17
f	Install scales	4	5	8	5.33
g	Install display cases	2	3	4	3.00
h	Put in office equipment	4	6	10	6.33
i	Finishing touches	2	3	4	3.00

Network


1
0
0
a
8,10,13
2
21
21
d
10,12,14
4
33
33
e
11,20,30
5
53
53
f
4,5,8
7
62
62
i
2,3,4
8
65
65
b
5,6,8
3
6
6
c
13,15,21
g
2,3,4
6
56
56
h
4,6,10

ET and critical path



Critical path in red

Expected time = 6.17 + 15.67 + 12 + 20.17 + 3 + 6.33 + 3 = 66.34 days

- Thank you