IIT ROORKEE

NPTEL ONLINE CERTIFICATION COURSE

Project Management for Managers

Lec – 49

Crashing of Networks- II

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Example 1: Find optimum schedule by FF method?

Activity	Normal		Crash		Slope = (Crash cost – Normal cost) / (Normal time-Crash time)		
	Time	Cost	Time	Cost	Δt	Δc	$\Delta c/\Delta t$
1-2	5	200	2	260	3	60	20
1-3	6	220	3	310	3	90	30
2-4	4	310	2	390	2	80	40
2-6	7	250	4	400	3	150	50
3-5	5	350	3	390	2	40	20
4-5	4	150	2	230	2	80	40
4-6	6	300	3	420	3	120	40
5-6	7	200	4	290	3	90	30
		1980					

***Float:* We can define following for a given activity i-j.**

<u>Earliest start time</u> (Tei): This is the earliest occurrence time for the event from which the activity arrow originates.

<u>Earliest finish time</u> : Te i + t i-j

<u>Latest finish time:</u> The latest occurrence time for the node at which the activity arrow terminates, Tl j

<u>Latest start time :</u> Tl j - t I j

Maximum time available = Tlj – Tei

Total float: Total float for job i-j is the difference between maximum time available and the actual time it takes.

TF =Tlj – Tei – tij

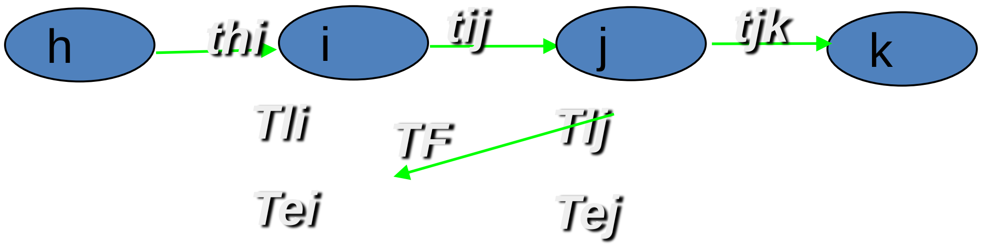
Free float: This is based on the possibility that all events occur at their earliest times, i.e. all activities start as early as possible. It is the difference between earliest finish time and earliest start time.

FF= Tej-Tei – tij

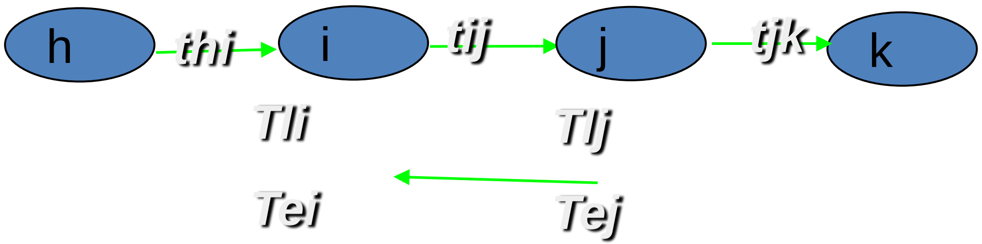
Independent float: Let the preceding job h-i finish at its latest possible time Tli and the succeeding job j-k start at its earliest possible time , which is Tej.

IF= Tej-Tli-tij.

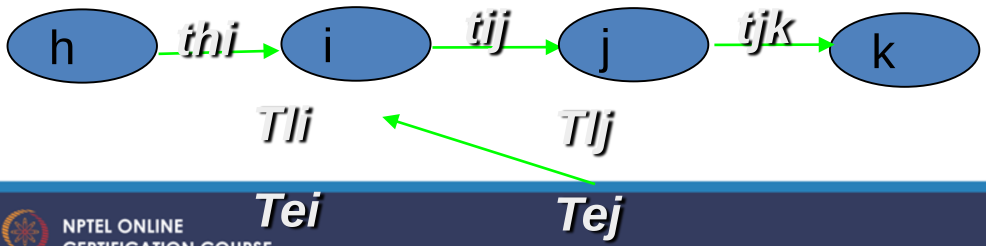
Total float



Free float

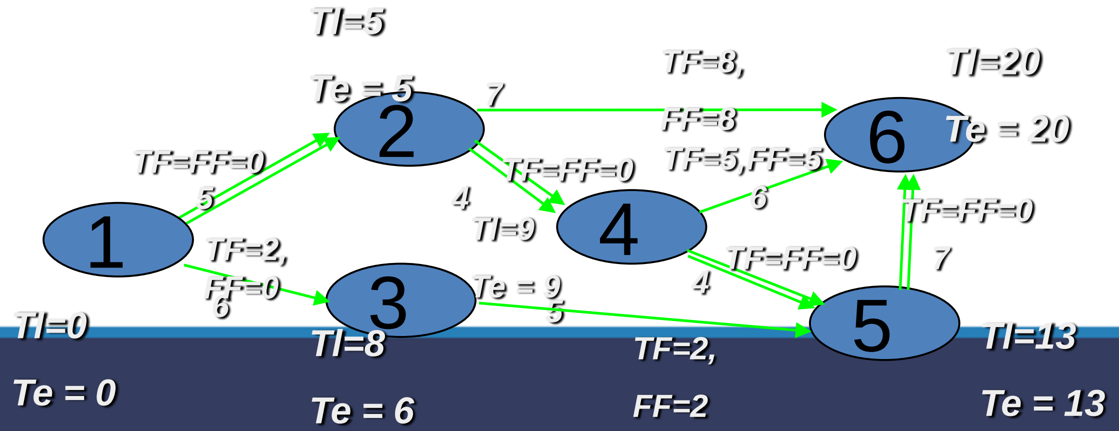


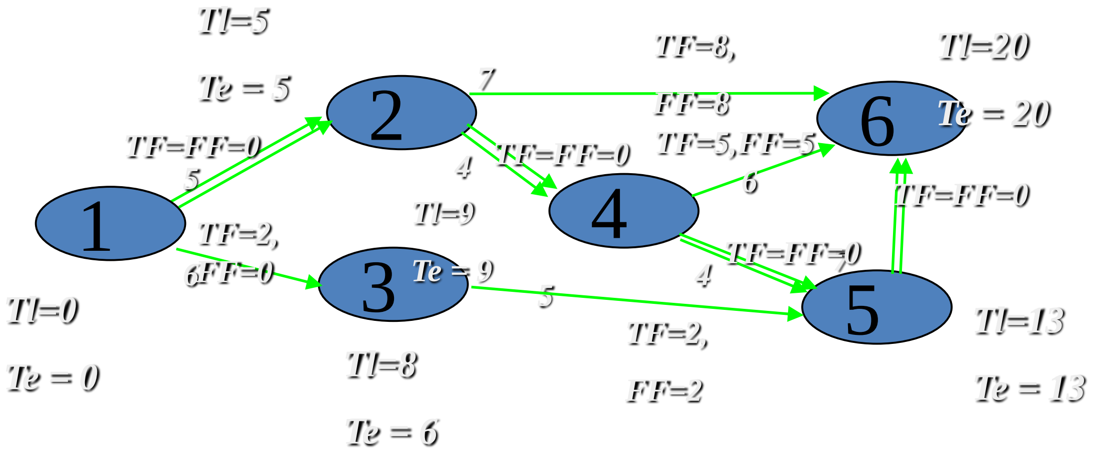
Independent float



Example 1: Find optimum schedule by FF method? If indirect cost is 40 per day

Activity	Normal		Crash		Slope = (Crash cost – Normal cost) / (Normal time-Crash time)		
	Time	Cost	Time	Cost	Δt	Δc	Δc/Δt
1-2	5	200	2	260	3	60	20
1-3	6	220	3	310	3	90	30
2-4	4	310	2	390	2	80	40
2-6	7	250	4	400	3	150	50
3-5	5	350	3	390	2	40	20
4-5	4	150	2	230	2	80	40
4-6	6	300	3	420	3	120	40
5-6	7	200	4	290	3	90	30
		1980					



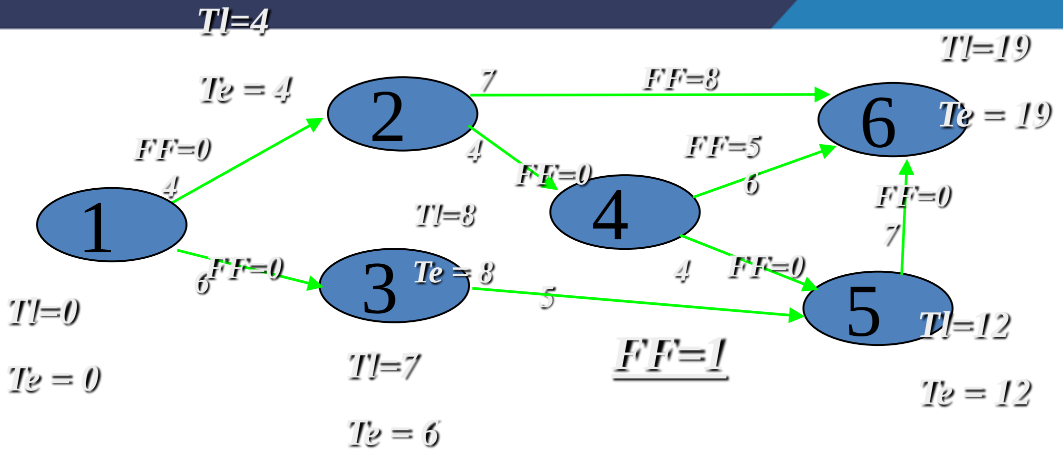


Critical path is a path having TF=0. Find FF for all the activities.

Critical path : 1 2 4 5 6
Slope : <u>20</u> 40 40 30
Crash limit : 3 2 2 3

The decision is to compress 1-2. Initially by one day and see the change in values of FF <u>of non critical</u> activities.

<u>Test step :</u> Which non critical activities are associated with activity 1-2.



*When we reduced activity 1-2 by one unit , **<u>FF of non critical activity 3-5 reduced from 2 to 1</u>**, if we reduce activity 1-2 by 2 units then **FF of 3-5 will become zero** and a new critical path may develop.*

*FF guards against a **non critical activity becoming critical**.*

It is better to find crash limit first .

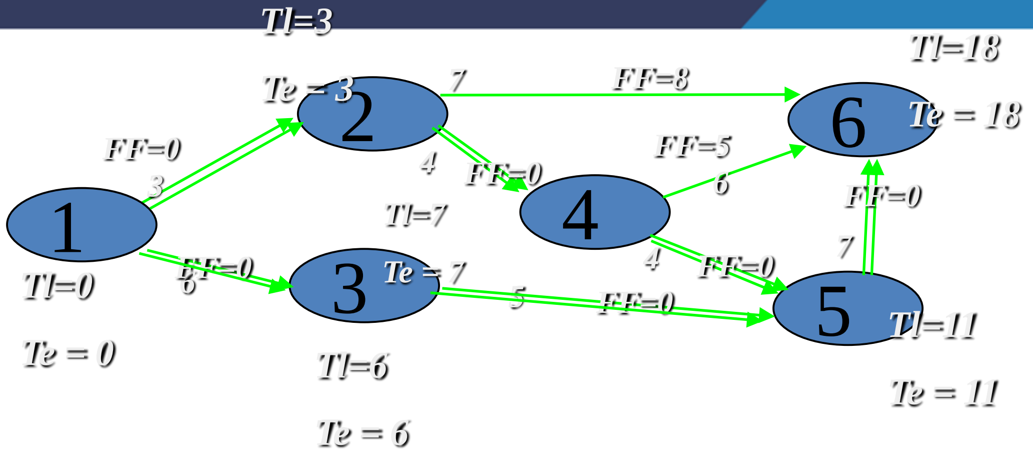
***FF limit** of the activity 1-2 = Min (FF 3-5) = Min (2) = 2*

*and the **crash limit** (CL) is 5 – 2 =3*

***Compression limit** is Min of FF and CL = Min (2,3)= 2.*

Take a decision to compress activity 1-2 by 2 days.

1-2	20
1-3	30
2-4	40
2-6	50
3-5	20
4-5	40
4-6	40
5-6	30



When we have reduced activity 1-2 by 2 days. A new critical path has developed 1-3-5-6.
Now to reduce total project duration reduce both the paths simultaneously.

Critical paths: 1 2 4 5 6 and 1 3 5 6

Slope : <u>20</u> 40 40 30 30 <u>20</u> 30

Crash limit 1 2 2 3 3 2 3

Either crash activities 1-2 and 3-5 simultaneously (Rs 40) or common activity 5-6 (Rs.30). <u>Take 5-6 common</u> activity for compression, its crash limit is 3 , we need a test step (reduce it by one day and see the FF of non critical activates).