Description

The below table gives the dependencies, the duration and the number of Analysts that requires the analysis phase of an ICT project.

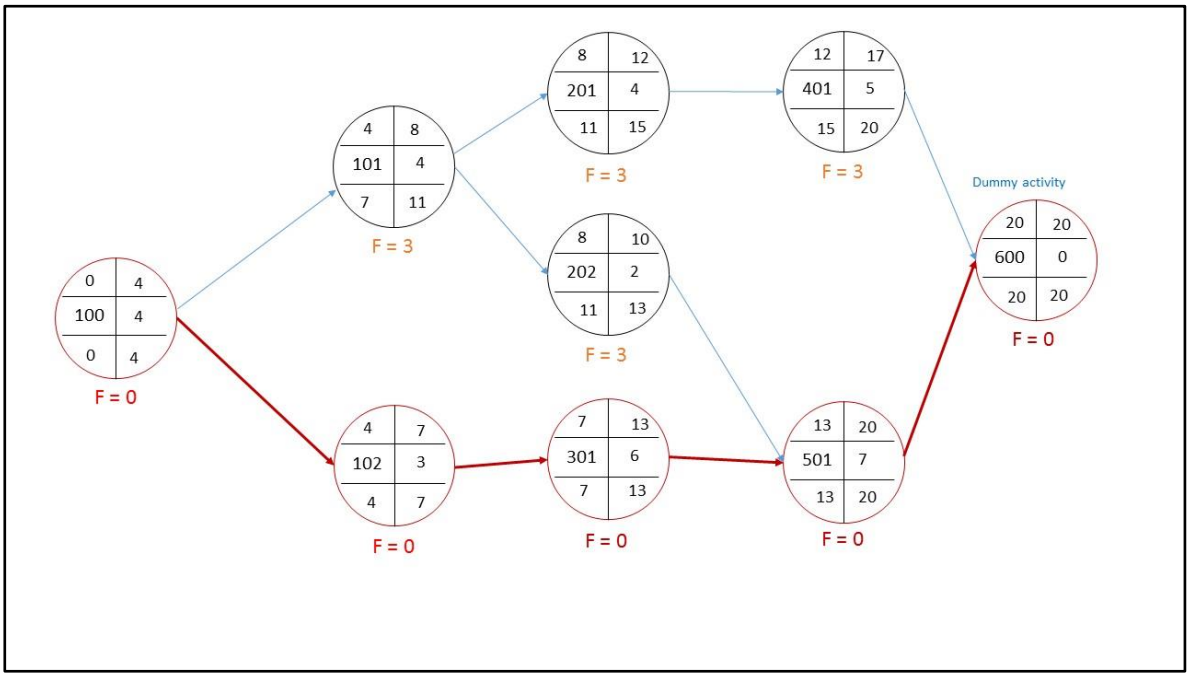
Activity	Predecessors	Duration (in months)	Required Analysts (per month)
100	-	4	6
101	100	4	8
102	100	3	4
201	101	4	5
202	101	2	6
301	102	6	2
401	201	5	3
501	202, 301	7	3

Suppose that there are **8 Full-time Analysts** available, answer the following questions:

1. Create the activities log based on earliest and latest start times.
2. Can the project be completed within the timeframes that set by the critical path?
3. If no, how long should the project be extended to be implemented using the available Analysts? Proceed with the resource allocation using the serial method.

Solution

1) The network diagram is depicted below:



We notice that the **critical activities** are the **100, 102, 301, 501** and total project completion time is **20 months**.

The activities logs are presented below.

A. Activities log based on earliest start times

		Months																			
Activity	**Duration**	**Analysts**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
100	4	6																				
101	4	8																				
102	3	4																				
201	4	5																				
202	2	6																				
301	6	2																				
401	5	3																				
501	7	3																				
Required Resources: 146			6	6	6	6	12	12	12	10	13	13	7	7	5	6	6	6	6	3	3	3

B. Activities log based on latest start times

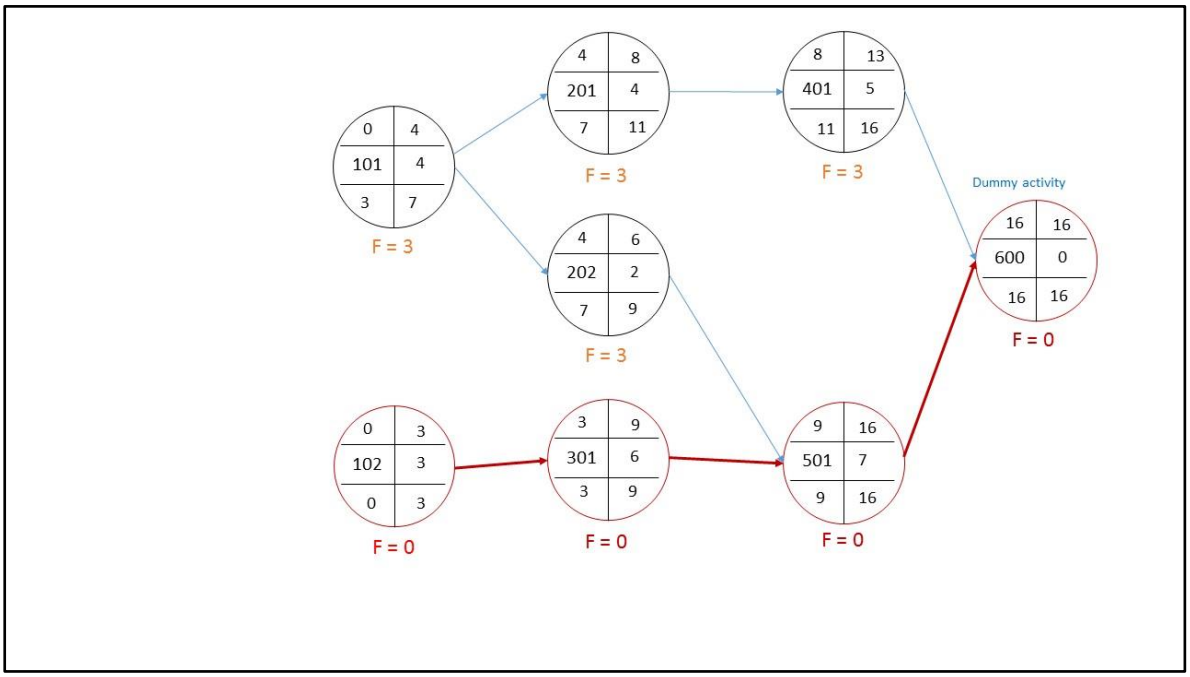
		Months																			
Activity	**Duration**	**Analysts**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
100	4	6	■	■	■	■																
101	4	8								■	■	■	■									
102	3	4					■	■	■													
201	4	5												■	■	■	■					
202	2	6												■	■							
301	6	2								■	■	■	■	■	■							
401	5	3																■	■	■	■	■
501	7	3														■	■	■	■	■	■	■
Required Resources: 148			6	6	6	6	4	4	4	10	10	10	10	13	13	8	8	6	6	6	6	6

2) According to the above logs the project cannot be implemented within 20 months due to lack of resources.

3) The resource allocation based on the serial method is stated below:

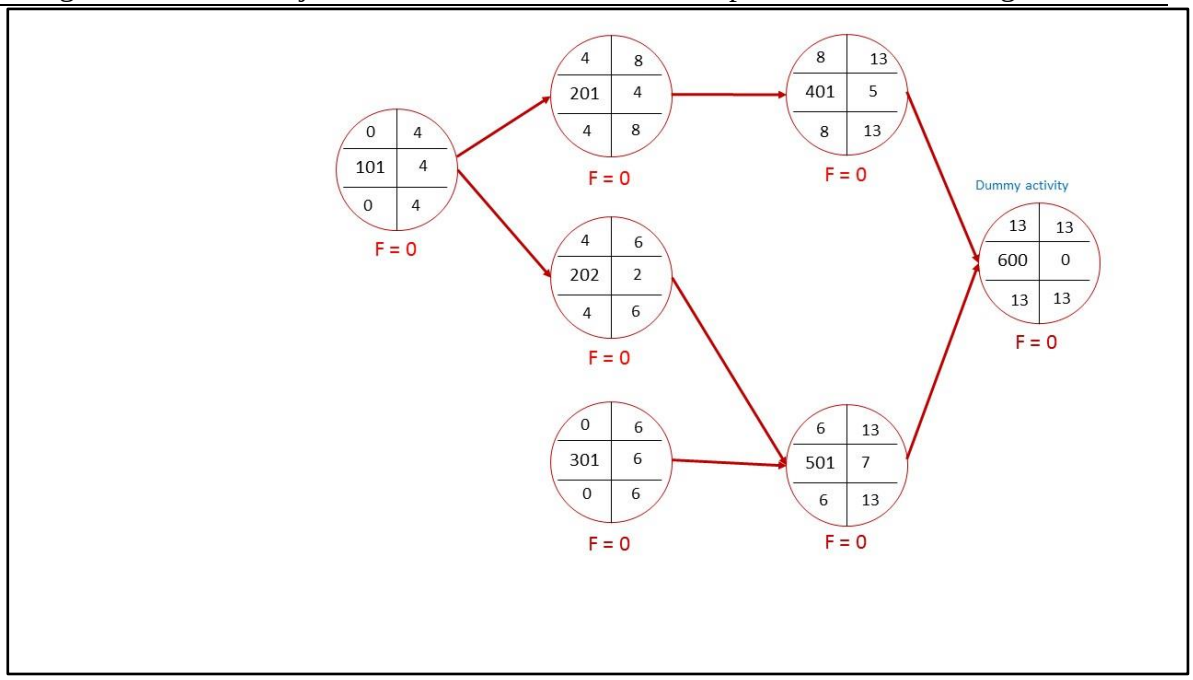
➔ T1 = 0 (beginning of the first critical activity) – beginning of 1st month
AtbAS = {100} = AtbAOS
Assign to 100 → 6 Analysts for 4 months / available Analysts: 2

➔ T2 = 4 – beginning of 5th month
The 100 activity is completed.
Available Analysts: 8
The network diagram is re-calculated setting 100 as completed.



AtbAS = {101, 102}, AtbAOS = {102, 101} as the slack for 102 is 0 and the slack for 101 is 3.
Assign to 102 → 4 Analysts for 3 months / available Analysts: 4
The assignment of 101 is postponed as there are no adequate resources.

➔ T3 = 7 – beginning of 8th month
The 102 activity is completed.
Available Analysts: 8
The network diagram is re-calculated setting 102 as completed.

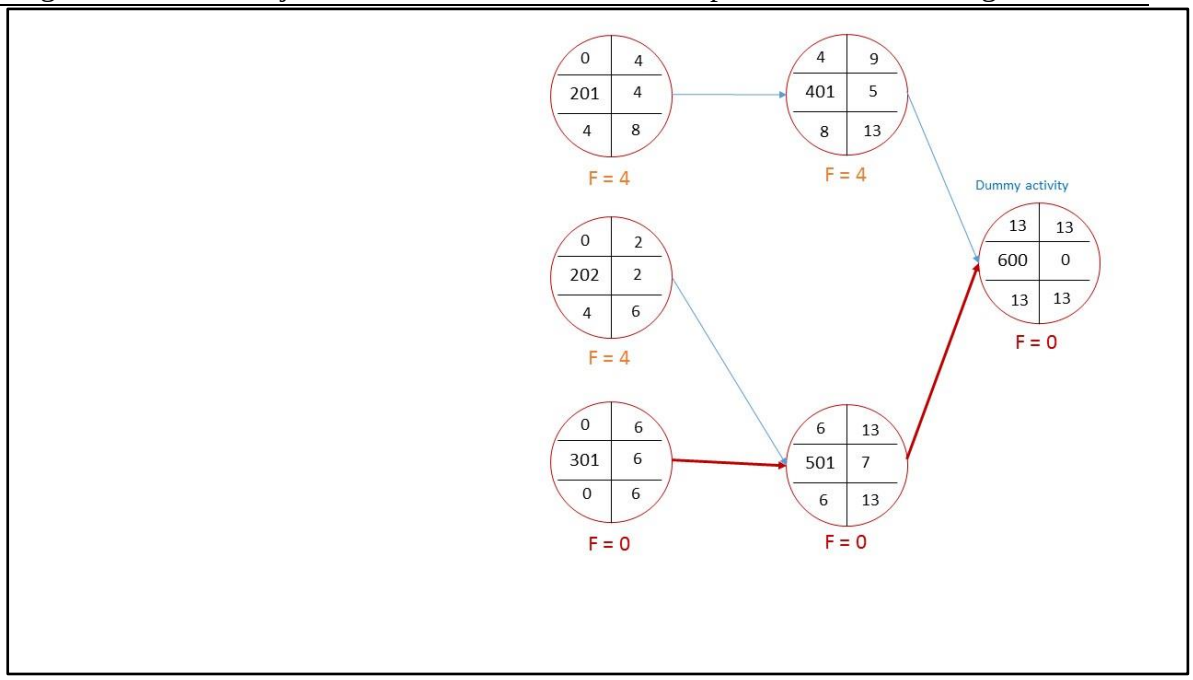


AtbAS = {101,301}
Both activities, 101 and 301, are critical (their slack is 0). So, in order to determine the AtbAOS we need to calculate the product (duration x resources).

AtbAOS = {101,301} as
$(\text{duration x resources})_{101} = 4 \times 8 = 32$
$(\text{duration x resources})_{301} = 6 \times 2 = 12$

Assign to 101 → 8 Analysts for 4 months / available Analysts: 0
The assignment of 301 is postponed as there are no adequate resources.

➔ T4 = 11 – beginning of 12th month
The 101 is completed.
Available Analysts: 8
The network diagram is re-calculated setting 101 as completed.



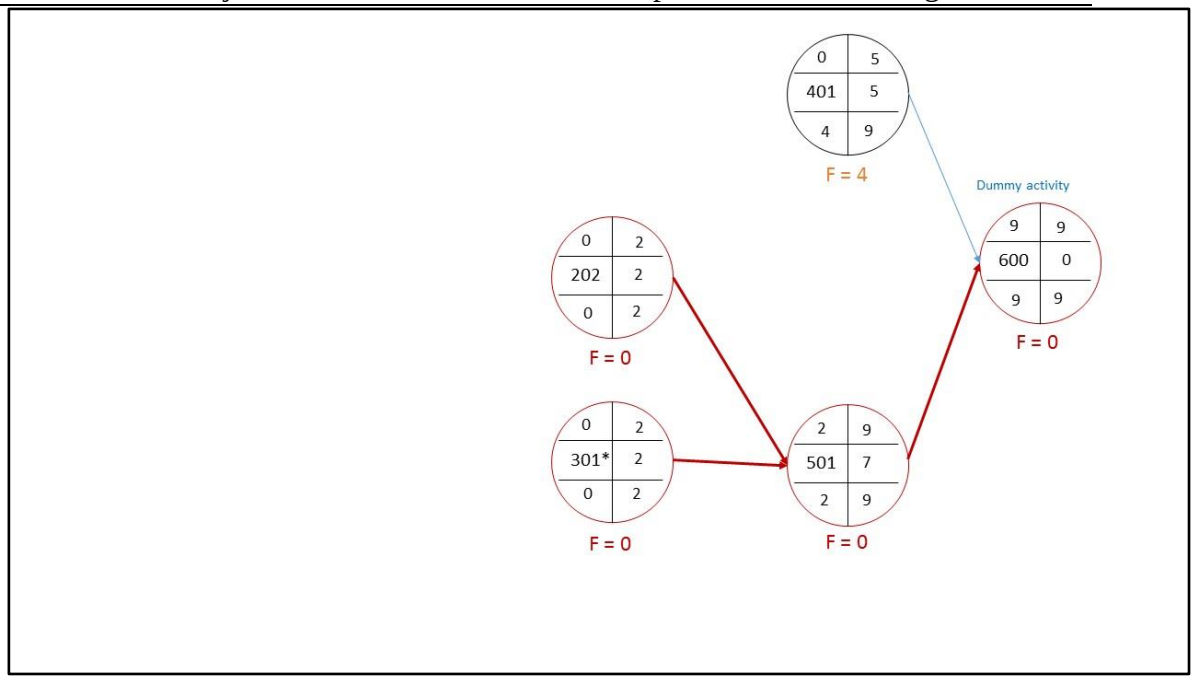
AtbAS = {201,202,301}, AtbAOS = {301,201,202} as the slack for 301 is 0 and the slack for 201 and 202 is 4 and

(duration x resources)$_{201}$ = 4 x 5 = 20
(duration x resources)$_{202}$ = 2 x 6 = 12

Assign to 301 → 2 Analysts for 6 months/ available Analysts: 6
Assign to 201 → 5 Analysts for 4 months/ available Analysts: 1

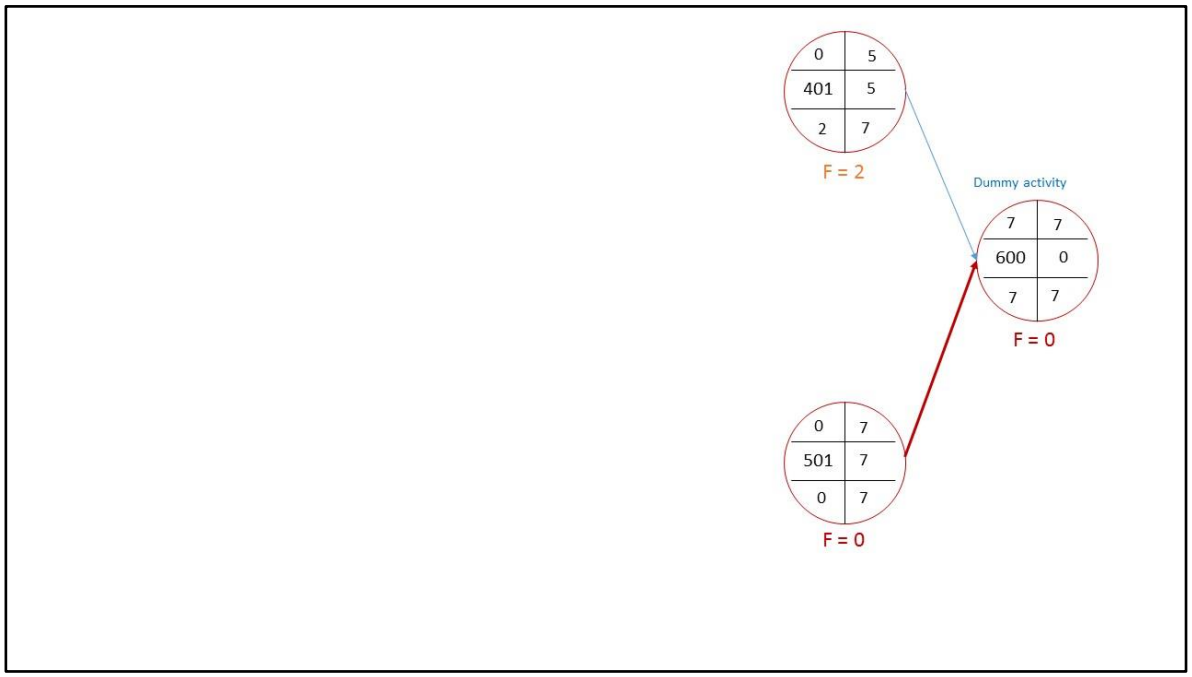
The assignment of 202 is postponed as there are no adequate resources

➔ T5 = T4 + min{6,4} = 15 – beginning of 16th month
The 201 activity is completed while 301 is under execution (two more months are required).
Available Analysts: 6
The network diagram is re-calculated setting 201 as completed and 301 under execution.



AtbAS = {202,401} = AtbAOS as the slack for 202 is 0 and the slack for 401 is 4.
Assign to 202 → 6 Analysts for 2 months/ available Analysts: 0
The assignment of 401 is postponed as there are no adequate resources

➔ T6 = T5 + min{2,2} = 17 – beginning of 18th month
The activities 301 and 202 are completed.
Available Analysts: 8
The network diagram is re-calculated setting 301 & 202 as completed.



AtbAS = {401, 501}, AtbAOS = {501, 401} as the slack for 501 is 0 and the slack for 401 is 2.

Assign to 501 → 3 Analysts for 7 months/ available Analysts: 5
Assign to 401 → 3 Analysts for 5 months

So the project will end after the completion of 501 activity. Thus, the new duration of the project is 24 months i.e. the project duration is extended by 4 months in order to be implemented using the available resources.