Project Planning & Control
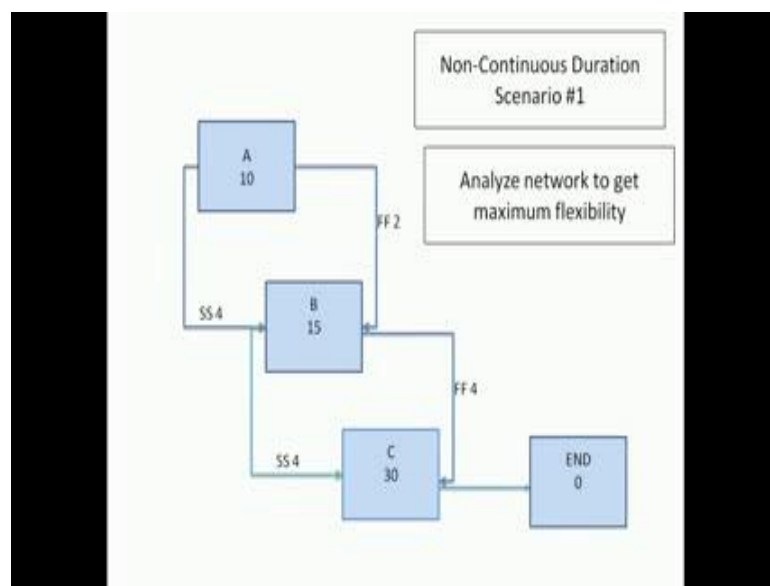
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Lecture – 44

Lesson - 05

PDM - Analysis with Non-continuous Duration, Floats

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We will see that, we do not need to keep the duration of the activity continuous. That is one of the powers of the precedence diagramming method. We should be able to take the duration and, or we should be able to take the start of an activity and finish of an activity and take it as a separate events and as I mentioned in the last lecture, this is what the AOA representation could do and we are trying to bring that into the PDM representation. So, this is here is where PDM starts differing from the AON, the typical AON.
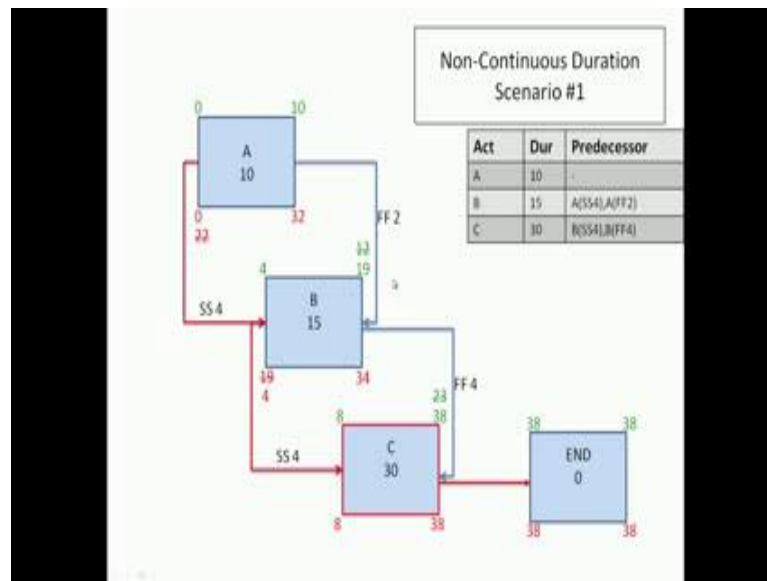
So, let us take this network, we have three activities A, B, C we have the durations are shown 10, 15 and 30 and we are now going to do the forward pass, which is 0, 10 and then, as we come back here we have the next activities. So, to 4 we have the early start of 4 and D goes to, so 4 plus 15 goes to 19 from 10 plus 2 we are going to 12, so 19 controls, so 4 and 19 that is good. And then, we go to C, now here we have 4 and lag of 4 that goes to 8 for the early start and here we had, we have 8 plus 30 give 38 as the early finish and here we have got to 19 and 4 as 23 and; obviously, 38 controls.

So, we go with end as 38, now on the backward pass you can see we get the 38 as the late finish, late start goes to 8 and when I take it back on to finish-finish relationship I get 34 that is 38 minus 4, 34 and if I went with 34 and 15, I would get 19, but if I go through this relationship for the start of B I would get 8 minus 4 which is 4. So, in the backward pass the minimum value controls, so this would be 4 and 34 and let me go back one more step, so we go back here, the 4 goes to 0 and 34 goes to 32.

So, we can see that this is the solved forward pass backward pass network and there are some interesting results we should discuss here. So, number one, we can see that if we are going to apply a rule for what is critical, you can see that of course, start of A is critical, start of D is critical, start of C is critical, but when you go to the end, the end of A activity ending on A or activity A ending is not critical; it has a difference between the early finish and the late finish. So, so my start is critical, but my ending is not critical.

So, this is where we are differing from the activity on node, there once an activity was

critical, the entire activity had to be critical. So, this gives more flexibility, but with the flexibility like we discussed last time comes more complexity. So, here we can see that the start of A is critical, the start of B is critical, the start of C is critical, start or finish of C is critical, but finish of A and finish of B are not critical.

Now, we will talk later as to , what does this mean in reality from an analytical sense all does it mean just I have to start B and move on or does it mean more than that, we will discuss that.

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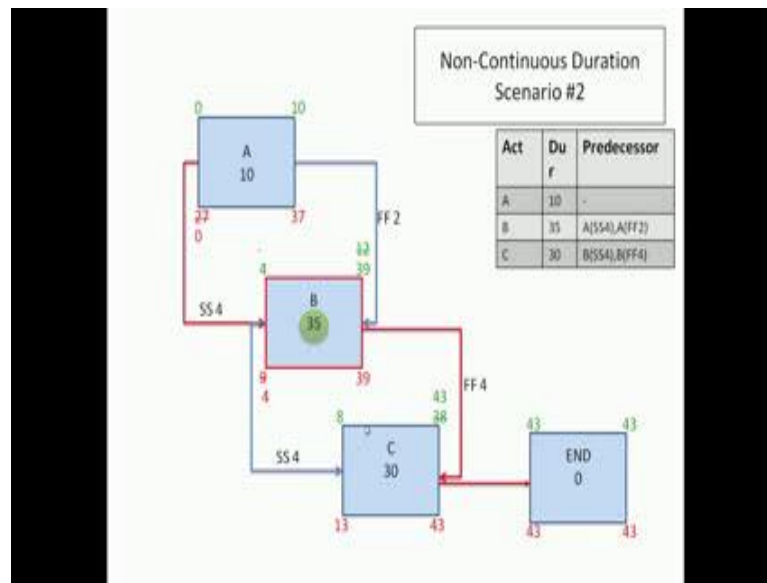
Now, we can see a second scenario, where what I have changed is actually the duration of B. If you compare the first one or the second one, almost all the relationships are the same, except that the duration of B is now increased to 35. With this scenario, now we are trying to see how does the analysis go, you can see, it is again 0, 10 and here because we have an increased duration, now it is 35 plus 4 that goes to 39 and we go to C we go to 8 and now instead of 38 controlling, because because the 39 with the finish-finish of 4 goes to 43; that is controlling the criticality of the project.

And based on this we get 43 as the project duration, we do the backward pass as earlier and now, because of this increased duration we find that the while start of A is critical, start of B is critical, start... end of B is critical and the start of C has stopped becoming critical, now the end of C has become critical, the start of C has float. So; obviously, I could start C on the 10th days, so my duration of 30 now need not be continuous. I could take, I could either stretch it or I could do intermittently what is required.

So, that is, what is the way this can be implemented, but if I do not finish at this particular junction I will certainly delay that project. So, similarly with A, while the start of A is critical, the end of A is not critical. So, this is a variation and it is something which we have to learn to manage.

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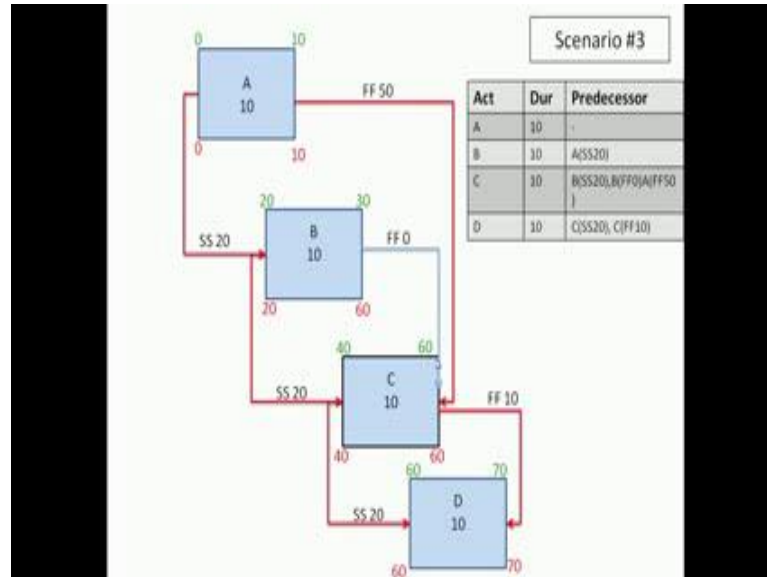
Now, we come to another scenario which is again quite different and interesting, it is added one more activity D. So, it is there are changes in the value from the last scenario, where we have, now four activities all the durations are 10. I have a start-start relationship here with all of them, so A to B start, start of 20, B to C starts, start of 20 and C to D start, start of 20 and we have, we do not have A to B finish, finish, but we have from A to C a finish, finish B to C a finish, finish and C to D a finish, finish as it can be seen here.
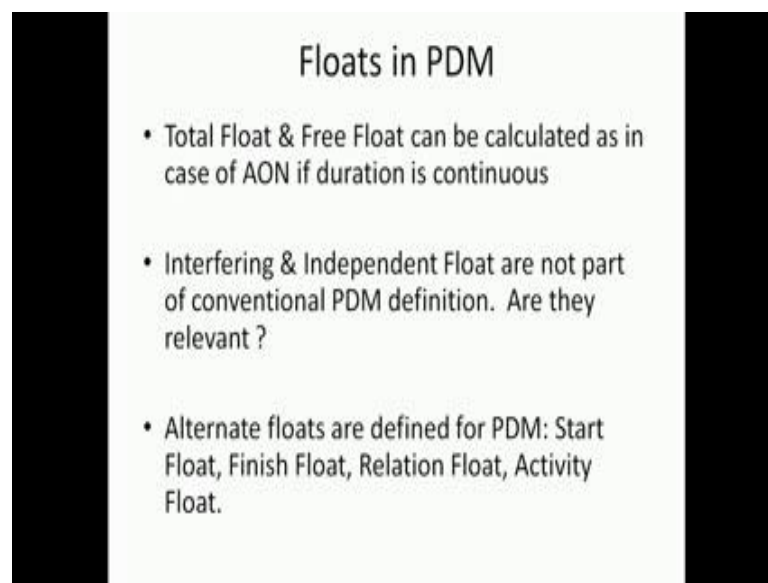
And if I go ahead and do the forward pass, it goes to 20, here we go to 20 plus 10 is 30 there and then, we are moving further on to C and then, on to D and you have got the early starts and then, the early finish of all the activities. So, we now start the backward pass, we got the 70 and 60 I am going to go through this, I think you should be able to follow it with they are working, so we go 60, 40, 60, 20 and 10, 0.

And now, if we look at what are the activities, how does a critical path go you will see that or what are the events that are critical you will see that it is events, which are the start of A is critical, end of A is critical, yes the whole of A is critical, we have start of B critical, end of B is not critical, start of C is critical, end of C is critical 40, 40, 60, 60 and

here again start and end of D is critical. But, if you look at C, while the start is critical and the end is critical you can see that the duration of C can as much as 20.

So, C as to start on 40 it cannot delay the start on 40 it has to finish on 60, but in between it has 20, 20 days to do what C needs to do, with C needs only 10 days to do. So, here is another scenario, where you are able to see that, able to show that the criticality is now not only, so not I mean in terms of start in terms of end also in the terms of the activity. So, when we now move on to float, so; obviously, this leads us to a discussion on float. Now, how do we define float with respect to a precedence diagramming method?

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Floats in PDM

- Total Float & Free Float can be calculated as in case of AON if duration is continuous

- Interfering & Independent Float are not part of conventional PDM definition. Are they relevant ?

- Alternate floats are defined for PDM: Start Float, Finish Float, Relation Float, Activity Float.

And while you will see many textbooks which define the standard total float and free float as in the case of AoN ((Refer Time: 09:06)) you can see that when you have behavior like this, in a network, some of this float the standard AoN floats are not so relevant. In fact, it is an open question where interfering and independent float; how are they relevant or do they actually, what do they mean in the context of DM.

But, more interesting when PDM was developed they define these floats here, what is called the start float, the finish float relation float and activity float. So, by seeing an earlier network you might have developed some intuitive sense on what, start float is and what a finish float is and there is something that we are calling like an activity float. But, also realize that each of this relationship also has floats defined in the context of PDM, so this is also something which we need to understand.

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So, if we come into the float definition in PDM getting into a little bit more of the formulae and formula, so if I take a total float. So, this is actually the activity float I would call it activity float or total float of a PDM activity basically it late finish minus early start minus the duration late finish minus early start minus the duration. And if you take the start float, which is the float that is coming or the start float it is our it is fairly easy to see it is late start minus early start to take a finish float is late finish minus early finish and you might have like a said earlier got an initiatives sense of this seeing the earlier scenario is which we develop.

So, the start float can be different from the finish float and the activity of total float can also be different like and the last case we did not have 0 start float 0 finish float, but we have some activity or total float.

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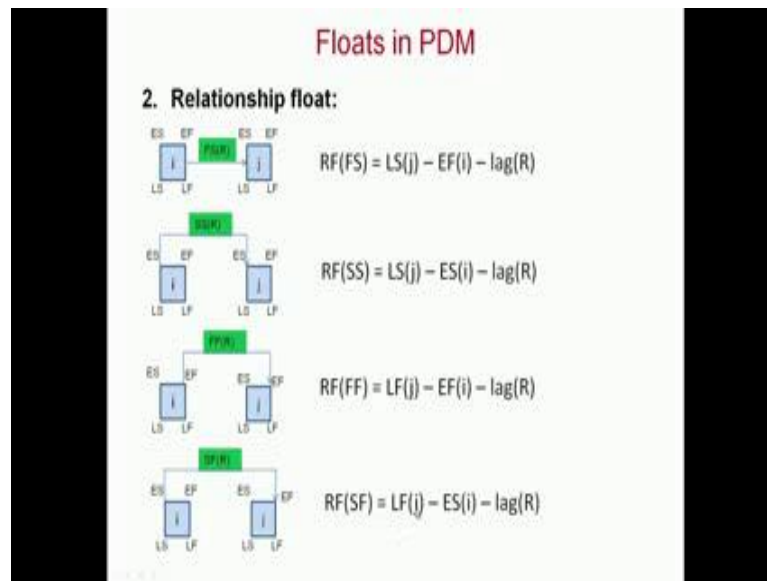
Now, we also now have relationship floats and these get quite interesting in the way they defined. So, if I have an activity i and j my relationship fit. So, I have a finish-start relationship here my relationship float will be for a finish start will be late start of j late start of j minus early finish of i minus early finish of i minus the lag R. So, this is for a finish-start relationship for a start, start relationship we would go with, we would go, so here is the start, start relationship I go with the late start of j minus the early start of i again minus the lag in the relationship.

So, this is the relationship float for start, start for a finish, finish relationship I go with late finish of j minus the early finish of I minus the lag and which we do not use too much the start finish relationship for definition say we are going to go with the start finish relationship it is late finish of j here minus early start of i minus again the lag. So, when you compute these in the precedence network, it will give you the relationship floats.
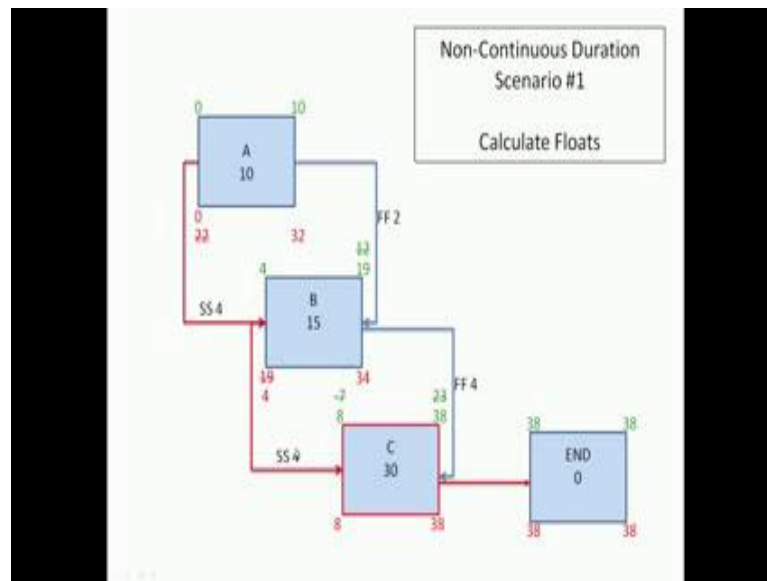
Now, let us take a look at how do we look at these floats in the context of the problems we have solved. So, we are we had this network which we had solved earlier, so here we can see 0, so there is no start float there is 22 days of finish float and if I do 32 minus 0 minus 10 there would be again 22 days of activity float or total float. So, that is something which we are which, so we have three kinds of basic float and then, we can also calculate the relationship floats for each case.

So, here we have a start, start and here we are going with, so if we take a start, start relationship I have to take the late start minus the early start here and there is 4 minus 0 minus 4 that will be there is no float on this and you can see that this is also on the critical it is one of the critical relationships. Similarly, here we would go 8 minus 4 minus 4 again no float on this relationship. If we take and other relationship, so were as it is., so now, we have if we take the start float of B again no start float of B, but finish float we have 34 minus 19 as the finish float. And activity float 34 minus 4 minus 15 is the activity float of these.

So, that is how we would calculate the floats again C has no start float no finish float, but let us look at the finish-finish float here. So, we have here 38 which is the late finish minus 19 minus 4, so that would be the way this is calculated for the finish, finish activity and we have seen all of these in the formulae here. So, we have going to do for a finish, finish activity it late finish of j minus early finish of i minus lag late finish of j minus early finish of the precedence minus a lag.

So, I would want you to calculate this values and we will put up these I mean you should do the calculation and we will put up these values with a part of the slides in the end of the slides the end of the lag. So, again I am giving this as an exercise you should be able to calculate the different floats for this scenario, which we calculated also and we should able to check your answers with what we have. Now, this is the scenario we discussed where we know we said C has start and end float C has C start float and end float is 0 let me go through putting the value likes we did last time.

So, C has no start float if 40, 40 no end float, but activity float is 60 minus 40 minus 10. So, it as activity float, so this is, so we have to learn how to interpreted this in what this mean in the practical context if you want to apply PDM that is one reason, why there is there is integrity when you apply the PDM on to a real project. If you look at, so you again through these activities and we have discussed the starts been critical or the end been critical and you can now, check whether the floats value match what we discussed earlier and you will be able to check the values with the results of the end of the grandmas.