**A simple guide to help understands the slide 47/48 – critical path (week 2)**

| **Activity** | **Immediate Predecessor(s)** | **Duration** |
| --- | --- | --- |
| 1 |  | 5 |
| 2 | 1 | 6 |
| 3 | 1 | 6 |
| 4 | 2,3 | 2 |
| 5 | 4 | 5.5 |
| 6 | 4 | 5 |
| 7 | 6 | 3 |
| 8 | 5,7 | 1 |

To calculate the Earliest Start (ES), **Earliest Finish (EF),** Latest Start (LS), and **Latest Finish** **(LF)** times for each activity, we can use the Critical Path Method (CPM). Here's the step-by-step process:

**Step 1: Forward Pass (Calculating ES and EF)**

1. **Activity 1**:
   * ES = 0
   * **EF** = ES + Duration = 0 + 5 = 5
2. **Activity 2**:
   * ES = EF of Activity 1 = 5
   * **EF** = ES + Duration = 5 + 6 = 11
3. **Activity 3**:
   * ES = EF of Activity 1 = 5
   * **EF** = ES + Duration = 5 + 6 = 11
4. **Activity 4**:
   * ES = Max(EF of Activity 2, EF of Activity 3) = Max(11, 11) = 11
   * **EF** = ES + Duration = 11 + 2 = 13
5. **Activity 5**:
   * ES = EF of Activity 4 = 13
   * **EF** = ES + Duration = 13 + 5.5 = 18.5
6. **Activity 6**:
   * ES = EF of Activity 4 = 13
   * **EF** = ES + Duration = 13 + 5 = 18
7. **Activity 7**:
   * ES = EF of Activity 6 = 18
   * **EF** = ES + Duration = 18 + 3 = 21
8. **Activity 8**:
   * ES = Max(EF of Activity 5, EF of Activity 7) = Max(18.5, 21) = 21
   * **EF** = ES + Duration = 21 + 1 = 22

**Step 2: Backward Pass (Calculating LF and LS)**

1. **Activity 8**:
   * **LF** = EF (since it's the last activity) = 22
   * LS = LF - Duration = 22 - 1 = 21
2. **Activity 7**:
   * **LF** = LS of Activity 8 = 21
   * LS = LF - Duration = 21 - 3 = 18
3. **Activity 6**:
   * **LF** = LS of Activity 7 = 18
   * LS = LF - Duration = 18 - 5 = 13
4. **Activity 5**:
   * **LF** = LS of Activity 8 = 21
   * LS = LF - Duration = 21 - 5.5 = 15.5
5. **Activity 4**:
   * **LF** = Min(LS of Activity 5, LS of Activity 6) = Min(15.5, 13) = 13
   * LS = LF - Duration = 13 - 2 = 11
6. **Activity 3**:
   * **LF** = LS of Activity 4 = 11
   * LS = LF - Duration = 11 - 6 = 5
7. **Activity 2**:
   * **LF** = LS of Activity 4 = 11
   * LS = LF - Duration = 11 - 6 = 5
8. **Activity 1**:
   * **LF** = Min(LS of Activity 2, LS of Activity 3) = Min(5, 5) = 5
   * LS = LF - Duration = 5 - 5 = 0

**Summary**

| **Activity** | **Duration** | **ES** | **EF** | **LS** | **LF** |
| --- | --- | --- | --- | --- | --- |
| 1 | 5 | 0 | 5 | 0 | 5 |
| 2 | 6 | 5 | 11 | 5 | 11 |
| 3 | 6 | 5 | 11 | 5 | 11 |
| 4 | 2 | 11 | 13 | 11 | 13 |
| 5 | 5.5 | 13 | 18.5 | 15.5 | 21 |
| 6 | 5 | 13 | 18 | 13 | 18 |
| 7 | 3 | 18 | 21 | 18 | 21 |
| 8 | 1 | 21 | 22 | 21 | 22 |

These calculations give the earliest and latest expected completion times for each activity, allowing for project scheduling and identifying the critical path. The critical path can be identified as the sequence of activities with zero float (LS = ES and LF = EF).

NOTE:

Earliest Finish (EF) here means the TE in slides.

Latest Finish (LF) here means the TL in slides.

If there is a difference between the earliest finish time and the latest finish time then it cant be a critical path as it means there is a slack time and critical path can not have any slack time.

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