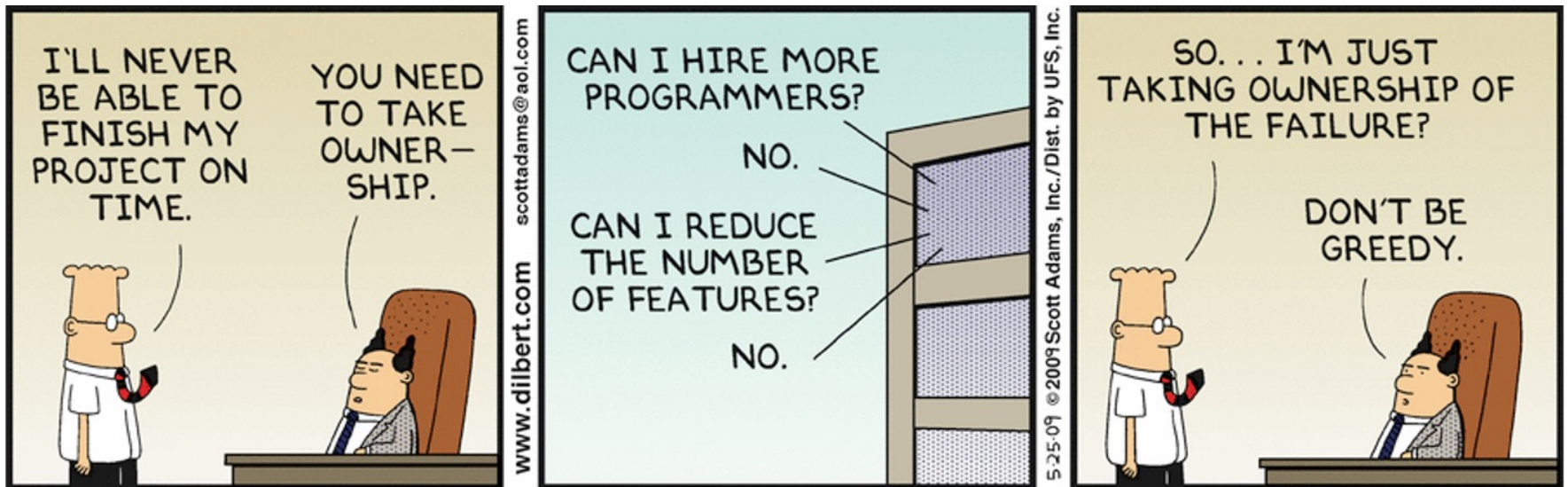# Lect. #7: Project Management
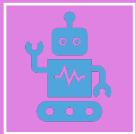## Project Scheduling 2

dilbert.com/strip/2009-05-25

Agenda for Today

1. My solution to PM1

2. Project Scheduling 2: Start and Finish Dates, Slack, and Critical Path
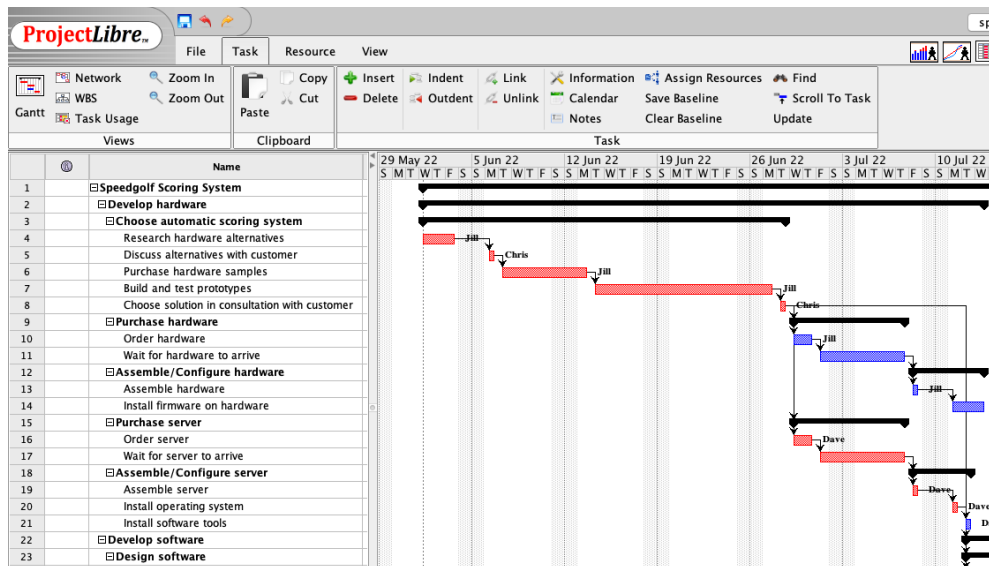
Announcements

- Teams due by 11:59 pm Thursday, 9.15.22; only 10 of 18 teams are complete

- Choose Project Manager/Team Captain asap!

- PM2 due by 11:59 pm Friday, 9.16.22

- A couple of comments on interviewing

- Questions?

Poll

Have you started PM2?

A. Yes

B. No

C. Other

PM: Project Scheduling 2

- In our Scheduling 1 lecture, we discussed resources and task durations

- Today we'll finish up scheduling with the following:

  - Start and finish times

  - Total slack

  - Critical path

PM: Project Scheduling
Start and Finish Times

After we've estimated the duration of each of the project tasks, we can determine whether the project can be completed on time by calculating the following

- Earliest dates on which each task can start and finish based on the date the project starts

- Latest dates by which each task *must* start and finish to complete the project on time
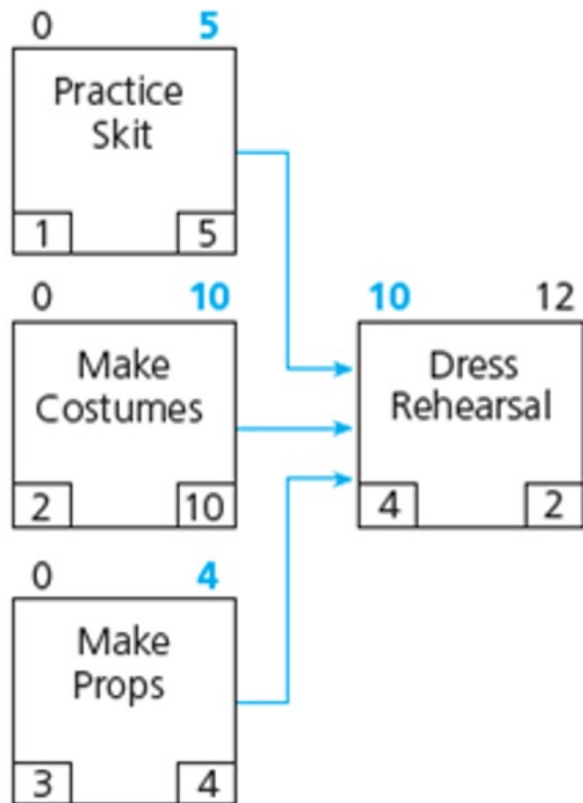
PM: Project Scheduling
Earliest Start and Finish Times

- Earliest Start (ES)
  - Earliest possible time a task can be started

- Earliest Finish (EF)
  - Earliest possible time a task can be completed
    - EF = ES + Estimated Duration

- Rule 1: Determine ES and EF by calculating forward, i.e., start at the beginning of the network diagram

- Rule 2: The ES time for a specific task must be the same as or later than the latest of all the earliest finish times of the tasks preceding it
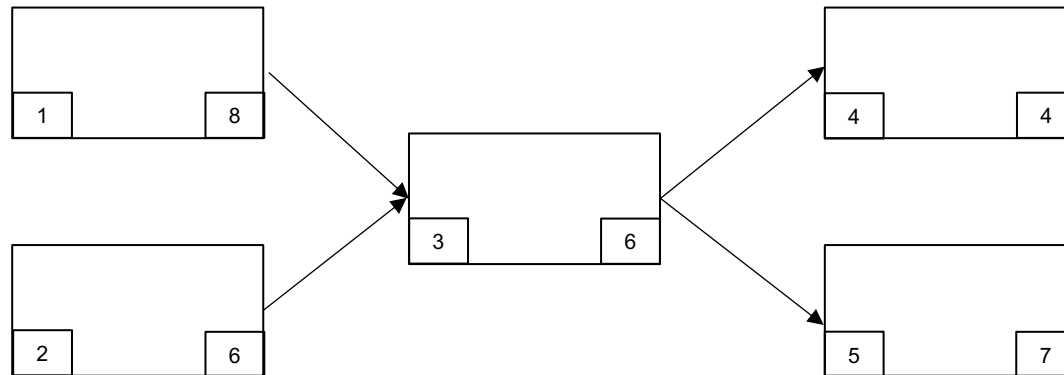
PM: Project Scheduling
ES and EF Times Example

Determine Earliest Start and Earliest Finish times for tasks 1-5.

Breakout Exercise Solution

```
   0          8                              14          18

          1          8            8         14        4          4
                            3          6

   0          6                              14          21

          2          6                      5          7
```
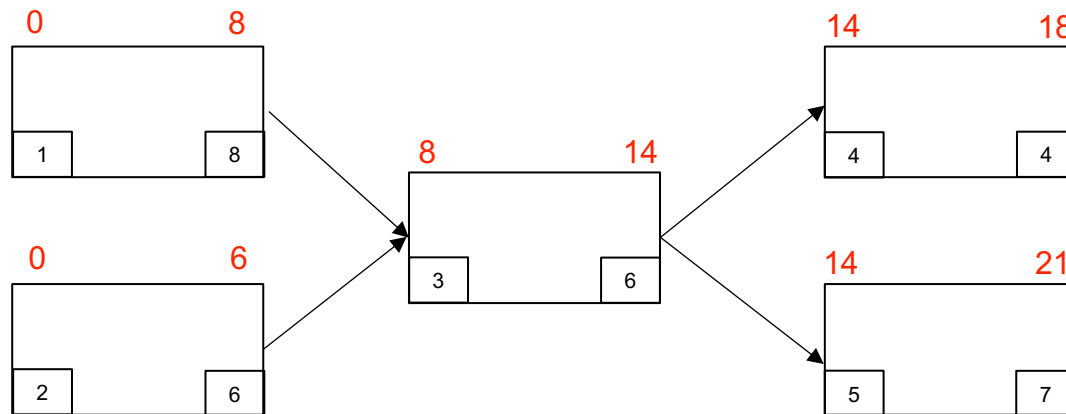
Determine Earliest Start and Earliest Finish times for tasks 1-5.

Poll

When will you probably graduate?

A. Dec 2022

B. May 2023

C. Dec 2023

D. May 2024

E. Other

PM: Project Scheduling
Latest Start and Finish Times

- ## Latest Finish (LF)

  - Latest possible time a task can be completed for project to be completed on time

- ## Latest Start (LS)

  - Latest possible time a task can be started
    - <mark>LS = LF - Estimated Duration</mark>

- ## Rule 1: Determine LF and LS by calculating backward, i.e., start at the end of the network diagram

- ## Rule 2: The LF time for a specific task must be the same as or earlier than the earliest of all the latest start times of the tasks following it

PM: Project Scheduling
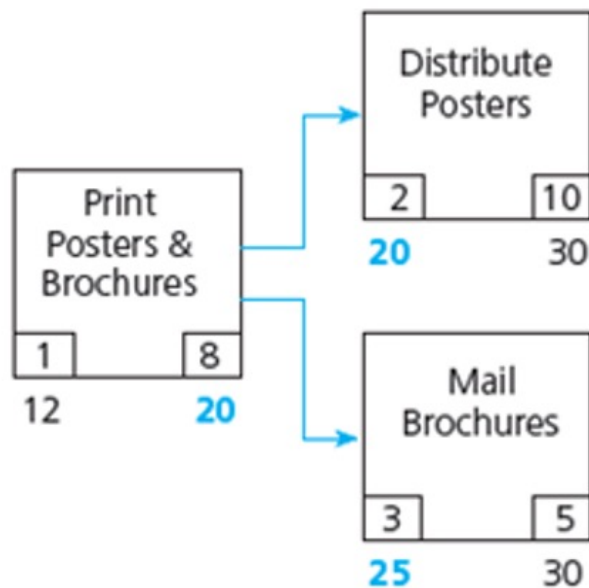# LS and LF Times Example

PM: Project Scheduling
Total Slack

Total Slack (TS)

- Total time between when you estimate you'll finish a project and the deadline for completion

- Two ways to calculate: TS = LF – EF or TS = LS – ES

- If TS > 0, tasks can be delayed by the TS

- If TS < 0, tasks must be accelerated by a total of |TS|

- If TS = 0, no slack so no task can be delayed

- TS is calculated for all tasks on a given path

- Aside: Free Slack (FS) is the amount of time a task can be delayed without delaying the ES of succeeding tasks

PM: Project Scheduling
Critical Path

Critical Path

- Longest path (most time-consuming) of tasks

- If delay occurs on critical path, and TS is 0, then project won't be completed on time

- Can calculate by finding the path with the smallest TS

- For tasks on critical path, EF of one task should be the same as ES of succeeding task

PM: Project Scheduling
Critical Path Example

	Consumer Market Study Project Activity	Respon.	Estim. Dur.	Earliest Start	Earliest Finish	Latest Start	Latest Finish	Total Slack	
1	Identify Target Consumers	Susan	3	0	3	–8	–5	–8	
2	Develop Draft Questionnaire	Susan	10	3	13	–5	5	–8	
3	Pilot-Test Questionnaire	Susan	20	13	33	5	25	–8	
4	Review Comments & Finalize Questionnaire	Susan	5	33	38	25	30	–8	
5	Prepare Mailing Labels	Steve	2	38	40	38	40	0	
6	Print Questionnaire	Steve	10	38	48	30	40	–8	
7	Develop Data Analysis Software	Andy	12	38	50	88	100	50	
8	Develop Software Test Data	Susan	2	38	40	98	100	60	
9	Mail Questionnaire & Get Responses	Steve	65	48	113	40	105	–8	
10	Test Software	Andy	5	50	55	100	105	50	
11	Input Response Data	Jim	7	113	120	105	112	–8	
12	Analyze Results	Jim	8	120	128	112	120	–8	
13	Prepare Report	Jim	10	128	138	120	130	–8	

Poll

Have you had any issues with Project Libre?

A. A few

B. Yes. It's been a headache to use.

C. Not really

D. I haven't tried using it yet.

E. Other