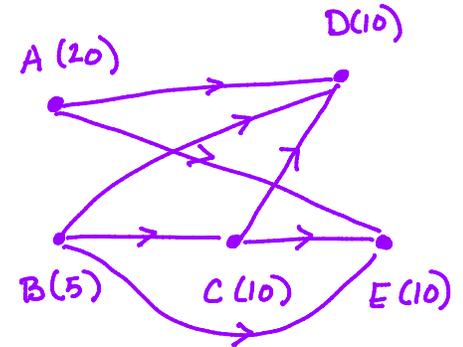


Goal: Learn about the following terminology: schedule, digraph, processors, finishing time, optimal finishing time, optimal schedule, idle time, critical path, critical time.

Real World Example: Carnegie Mellon Road Construction Plan

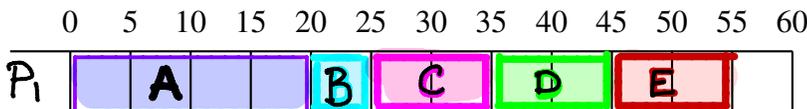
1. **Example** Fixing a Flat Bike Tire

label	task	time	dependence
A	buy a new tube and patch kit	20 minutes	
B	find tools	5 minutes	
C	remove tire and old tube	10 minutes	B
D	replace tire and new tube	10 minutes	A, B, C
E	repair old tube	10 minutes	A, B, C



(a) Schedule with one processor

total time: 55

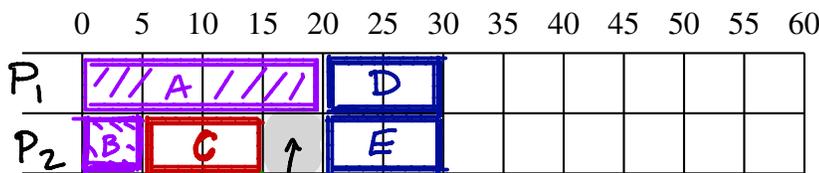


(b) Schedule with two processors

total time: 30 min

← With 2 processors, project finishes 25 minutes faster.

time	0	5	15	20	30
done		B	C	A	D, E
ready	A, B	C	-	D, E	



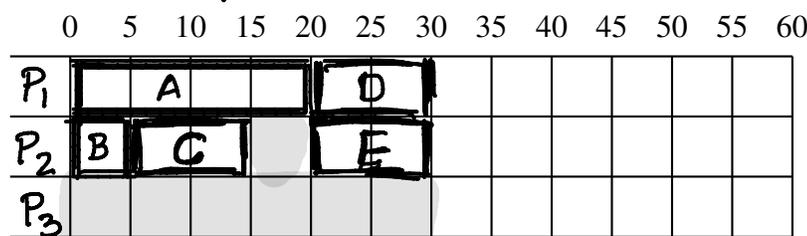
called "idle time"

(c) Schedule with three processors

total time: 30

← No benefit of another processor. More is not always better.

time	0	5	15	20	30
done		B	C	A	D, E
ready	A, B	C	-	D, E	



↑ idle time₁

2. Terminology

(a) **schedule** - the ordering of all the tasks, accounting for dependencies.

(b) **digraph** - Model of the schedule.
 vertices = tasks w/ time
 edges from v to w if task w needs task v to be finished

(c) **processors**
 people/machines/teams completing the tasks.

(d) **finishing time**
 how long it takes to complete the project/all tasks.

(e) **optimal finishing time and optimal schedule**
 SHORTEST time/schedule to complete all tasks. *What is this for our bike example?*

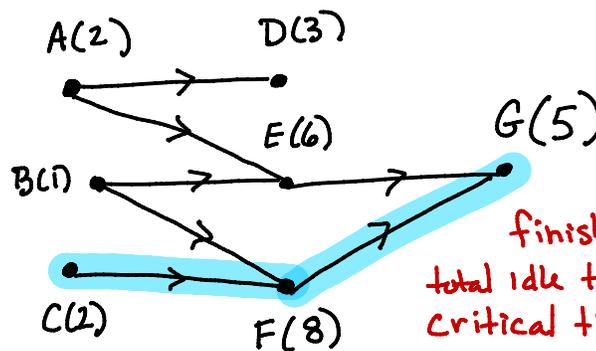
(f) **idle time**
 time when a processor(s) are not completing tasks

(g) **critical path**
 the longest path where length is the sum of vertex weights *← why would we care about this?*

(h) **critical time**
 the length of the critical path.

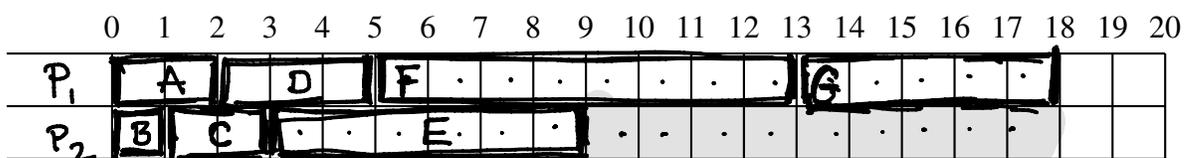
3. **General Example:** Create a digraph. Make a valid schedule with TWO processors. Determine values of finishing time, idle time and critical time.

label/task	time	dependence
A	2	
B	1	
C	2	
D	3	A
E	6	A, B
F	8	B, C
G	5	E, F



finishing time: 18
total idle time: 9
critical time: 15

time	0	1	2	3	5	9	13	18	finish.
done		B	A	C	D	E	F	G	.
ready	A, B, C	C	D, E	E, F	F	F	G		



9 units idle time.