

SE 329 – Software Project Management

Time and Cost Planning – Part 3

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Recall - Questions

- How much does it cost to develop the system?
- How long does it take to develop the system?

Project goal: The goal of the project is to develop a low-cost fleet monitoring system. It includes a device installed in a bus collects data from their in-vehicle networks and sends them to a remote server along with the the locations.

Deliverables

1. Data collection component: A device that collects data from the car and sends it to a remote server along with the location of the vehicle
2. Data visualization: A web application that visualizes the position of each vehicles along with information collected from its network
3. Data analysis: A web application to run ad-hoc statistics using the data

Activities Sequencing

- We get the tasks using WBS
- We get the activity estimates

=> How long does the project take?

	Activity	Duration
1.0	Acquire hardware	5
2.0	Setup the development environment	3
3.0	Setup the libraries on the Arduino	4
4.0	Prepare the server with required libraries	1
5.0	Develop the acquisition component	
5.1	Send a request to the CAN and get the response	10
5.2	Format the response and send it to the server	2
6.0	Develop the server application	
6.1	Receive CAN data	5
6.2	Store data in database	2
7.0	Test the solution	10

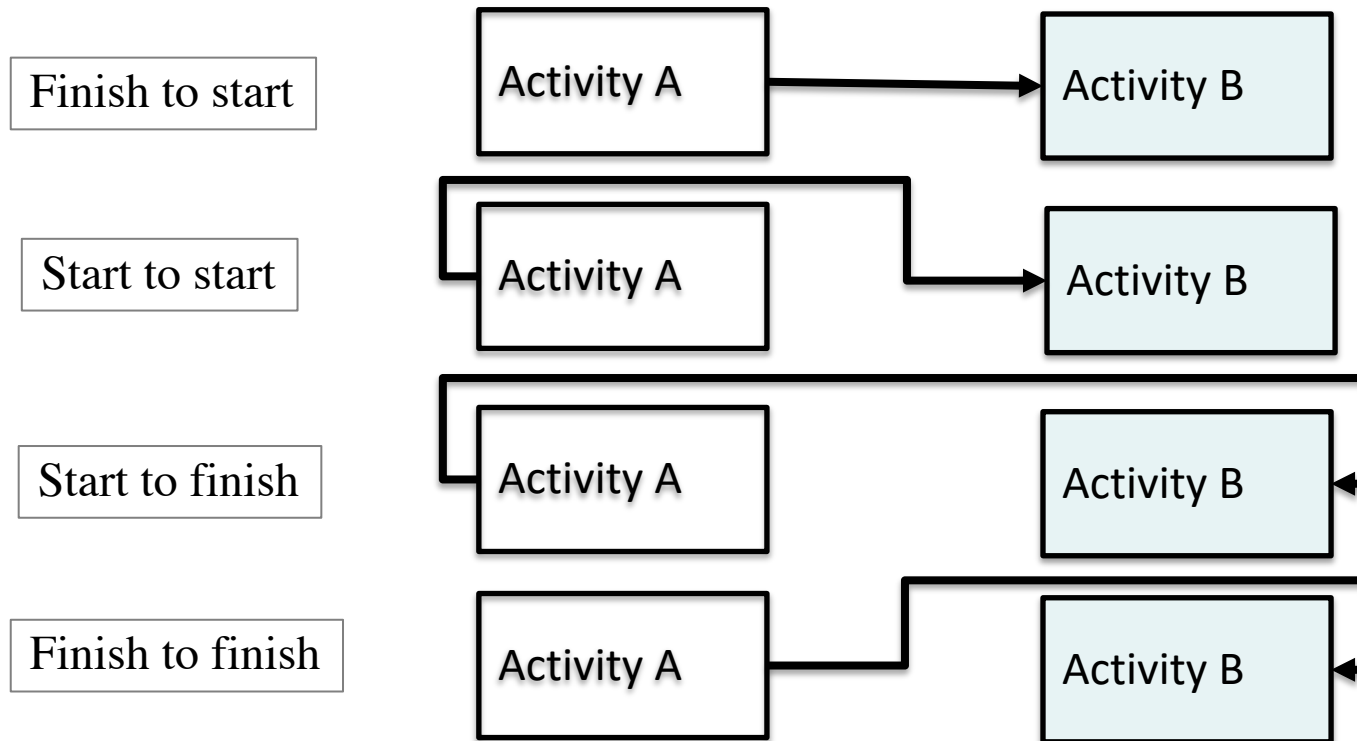
Lecture Plan

1. Identify project activities
2. Estimate activity resources
3. **Sequence activities**
4. Estimate project cost

Activity-Dependency Types

- Mandatory dependencies – inherent, contractual, or legally required
 - E.g., develop before you test
- Discretionary dependencies – preferred dependency based on e.g., based practices or logic.
- External dependencies -- relationships between the project activities and non-project activities
 - E.g., delivery of equipment
- Internal dependencies – precedence relationship in the project – they are under team control

Dependency-Precedence Types



Example - Dependency

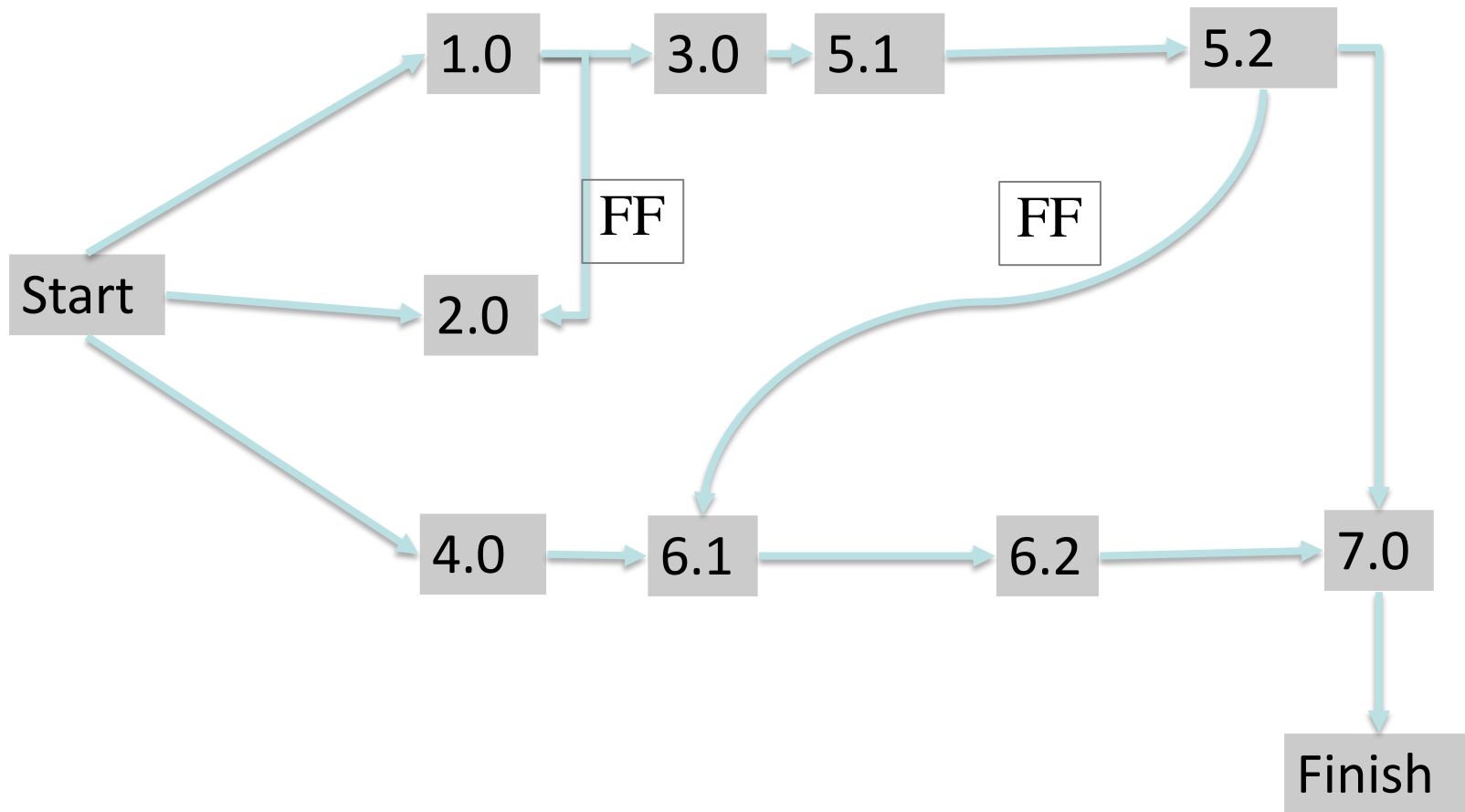
	Activity	Predecessors	Duration
1.0	Acquire hardware		5
2.0	Setup the development environment		3
3.0	Setup the libraries on the Arduino		4
4.0	Prepare the server with required libraries		1
5.0	Develop the acquisition component		
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Time for Project Completion

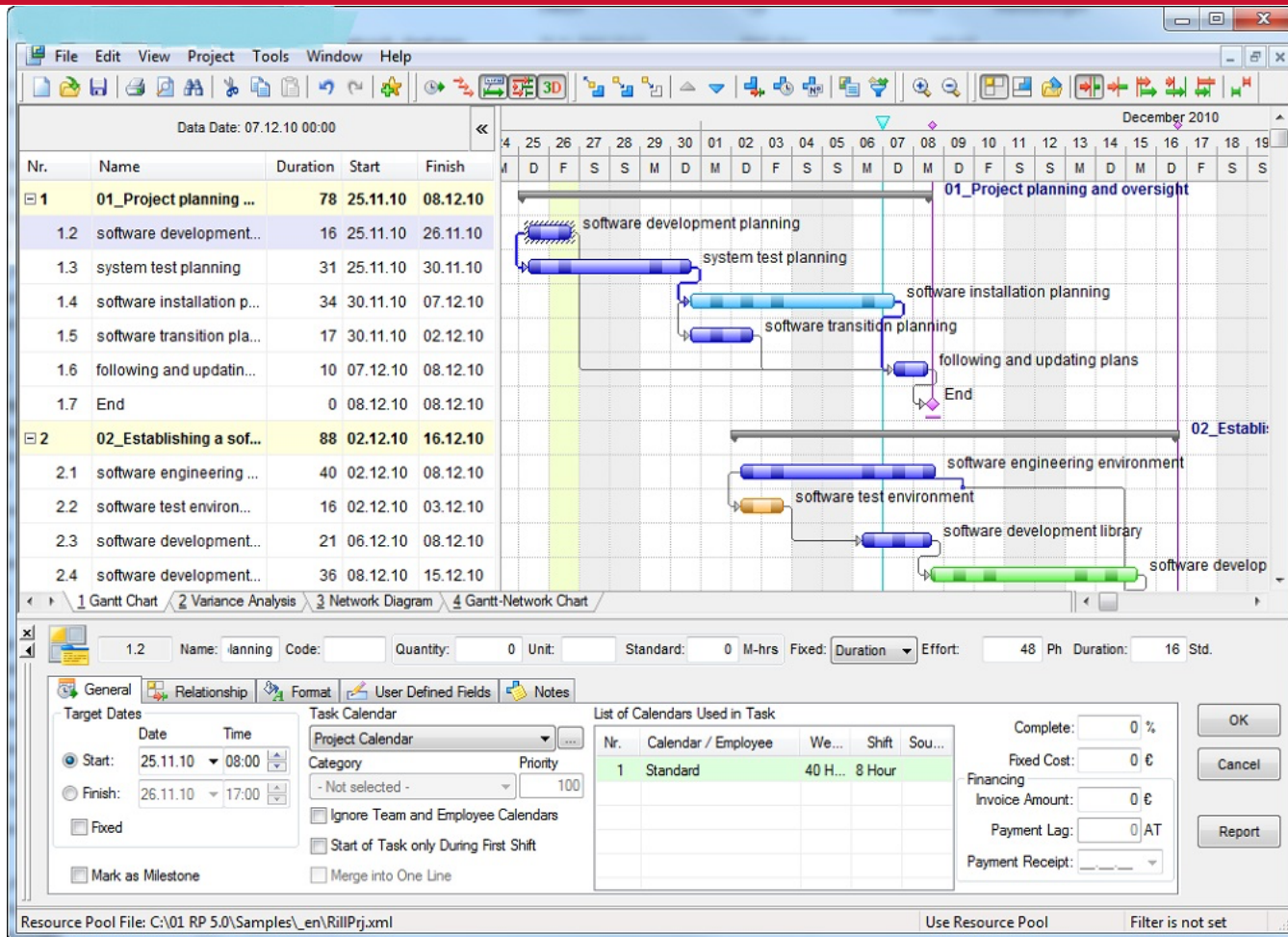
How long does the project take?

	Activity	Predecessors	Duration
1.0	Acquire hardware		5
2.0	Setup the development environment	1.0 FF	3
3.0	Setup the libraries on the Arduino	1.0	4
4.0	Prepare the server with required libraries		1
5.0	Develop the acquisition component	3.0	
5.1	Send a request to the CAN and get the response	3.0	10
5.2	Format the response and send it to the server	5.1	2
6.0	Develop the server application	4.0	
6.1	Receive CAN data	4.0 - 5.2 FF	5
6.2	Store data in database	6.1	2
7.0	Test the solution	5.2,6.2	10

Project Schedule Network Diagram



Project Schedule Network Diagram



(image copied from Internet)

Critical Path Method

- The **critical path** is the sequence of activities that compose the longest path for a project to complete.
- Determines the shortest possible project duration.

Identification of the Critical Path

1. Represent each task with a rectangle
2. Connect each task with immediate predecessors
3. For each task, mark the start time, duration, and finish time
4. Enumerate all the paths
5. Calculate the total time for each path
6. The critical path is the path with the maximum total time

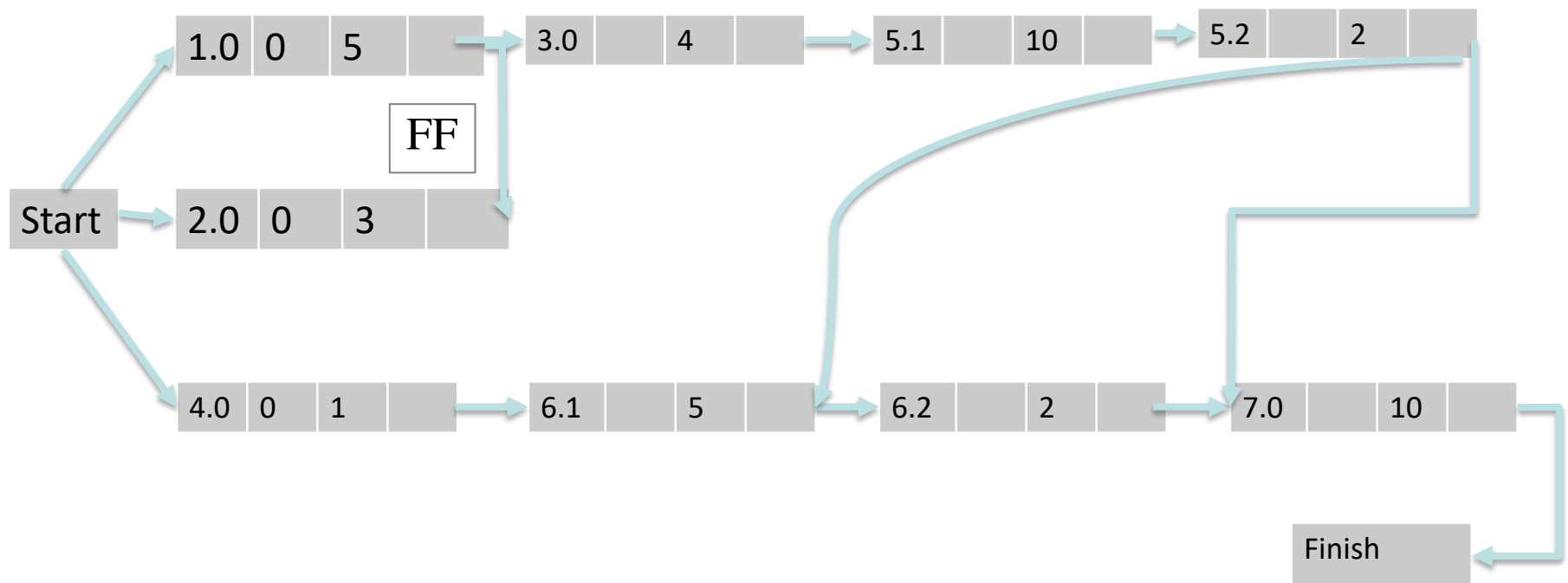
Example – Critical Path

	Activity	Predecessors	Duration
1.0	Acquire hardware		5
2.0	Setup the development environment		3
3.0	Setup the libraries on the Arduino	1.0	4
4.0	Prepare the server with required libraries		1
5.0	Develop the acquisition component	3.0	
5.1	Send a request to the CAN and get the response	3.0	10
5.2	Format the response and send it to the server	5.1	2
6.0	Develop the server application	4.0	
6.1	Receive CAN data	4.0	5
6.2	Store data in database	6.1	2
7.0	Test the solution	5.2,6.2	10

Example – Critical Path

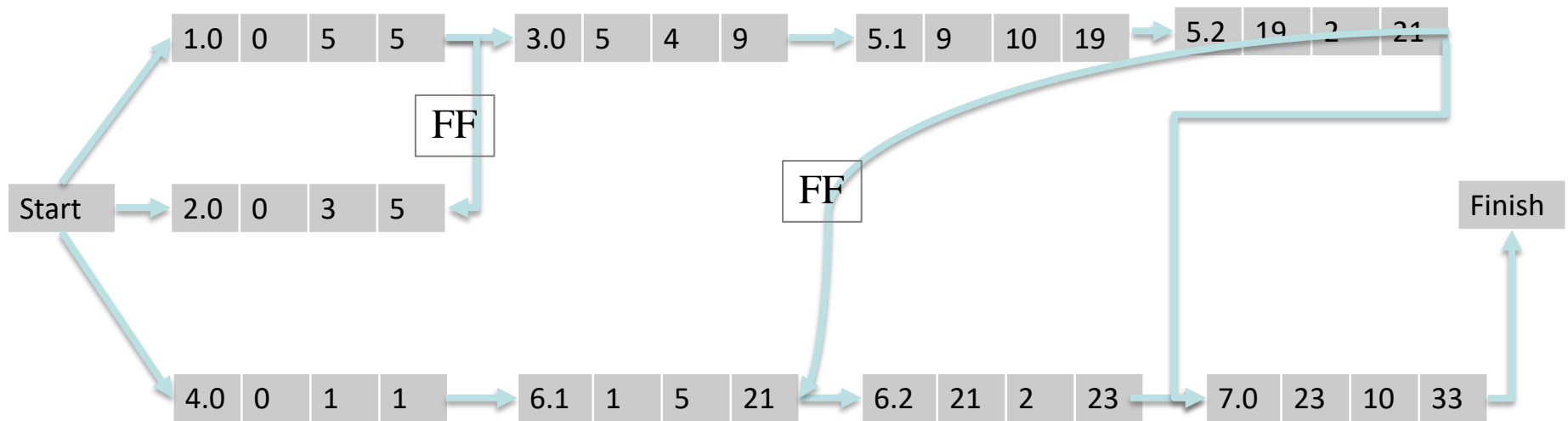
What are the unique paths in the diagram?

What is the length of each of these paths?



Solution – Critical Path

Activity ID: 1.0	Duration: 5
Start: 0	Finish: 5



Stack Time

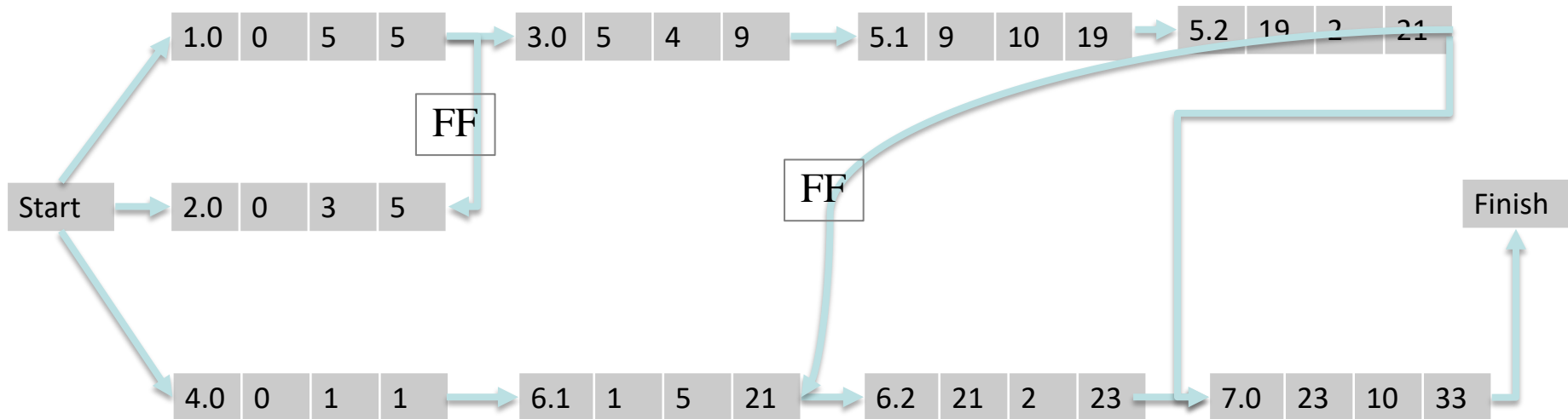
- **Slack time** is the maximum time a task may be delayed beyond its early start without delaying the project completion
- Tasks that are in the critical path have no slack time.

Schedule Compression

- Schedule compression techniques shorten the schedule duration without affecting the scope.
- Crashing is a technique to shorten the schedule by adding resources
 - Approve overtime, add resources, pay for expediate delivery, etc.
- Fast tracking is a technique for performing sequential activities in parallel

Example - Schedule Compression

Assume we want to reduce the project duration from 33 months to 27 months. What would you do?



Example - Schedule Compression

What would be the duration of the project if we start the testing when we start the development?

	Activity	Predecessors	Duration
1.0	Acquire hardware		5
2.0	Setup the development environment		3
3.0	Setup the libraries on the Arduino	1.0	4
4.0	Prepare the server with required libraries		1
5.0	Develop the acquisition component	3.0	
5.1	Send a request to the CAN and get the response	3.0	10
5.2	Format the response and send it to the server	5.1	2
6.0	Develop the server application	4.0	
6.1	Receive CAN data	4.0	5
6.2	Store data in database	6.1	2
7.0	Test the solution	5.2,6.2	10

Thank you