

The Critical-Path Algorithm

Lecture 37
Sections 8.5

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Hampden-Sydney College

Mon, Nov 27, 2017

1 The Critical-Path Algorithm

2 Example

3 Assignment

Outline

1 The Critical-Path Algorithm

2 Example

3 Assignment

The Critical-Path Algorithm

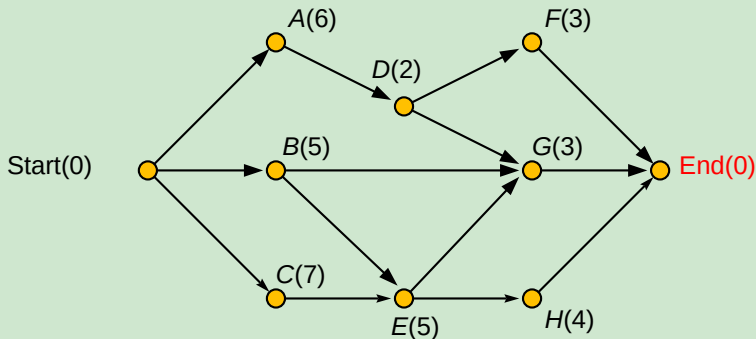
Definition (The Critical-Path Algorithm)

The **critical-path algorithm** creates a schedule by the following method.

- 1 Use the backflow algorithm to find the critical time of every task in the project.
- 2 Create a priority list with the tasks listed in order of **decreasing critical time**.
- 3 Use that priority list to create a schedule.

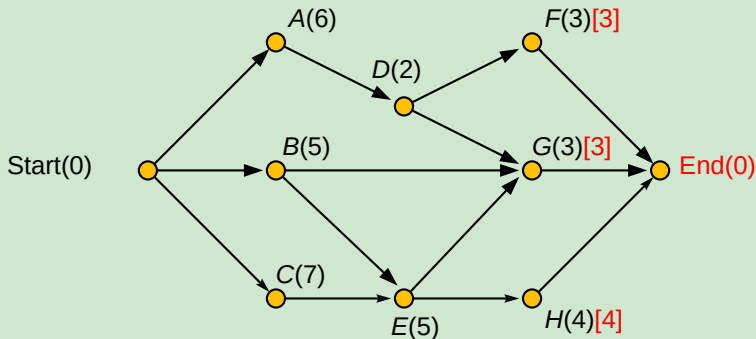
The Backflow Algorithm

Example (The Backflow Algorithm)



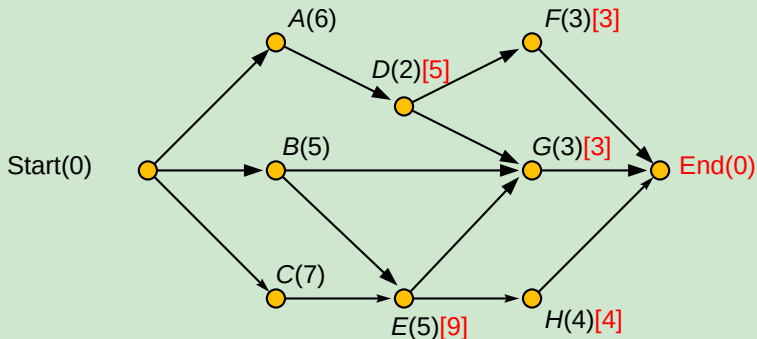
The Backflow Algorithm

Example (The Backflow Algorithm)



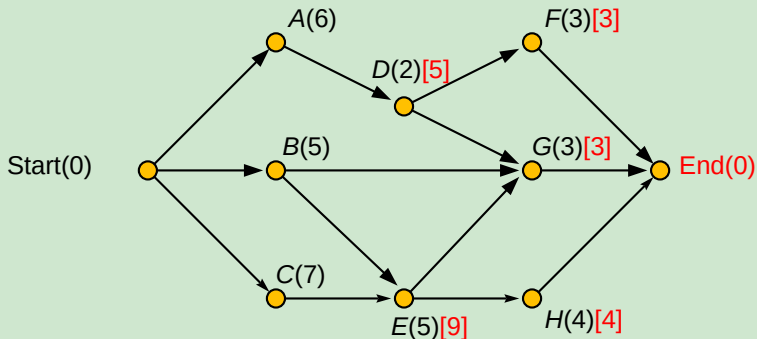
The Backflow Algorithm

Example (The Backflow Algorithm)



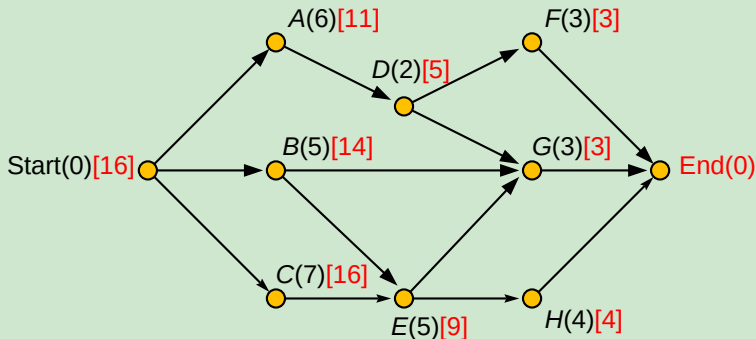
The Backflow Algorithm

Example (The Backflow Algorithm)



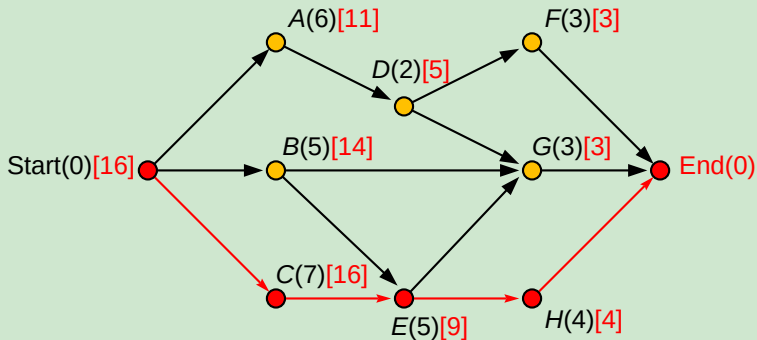
The Backflow Algorithm

Example (The Backflow Algorithm)



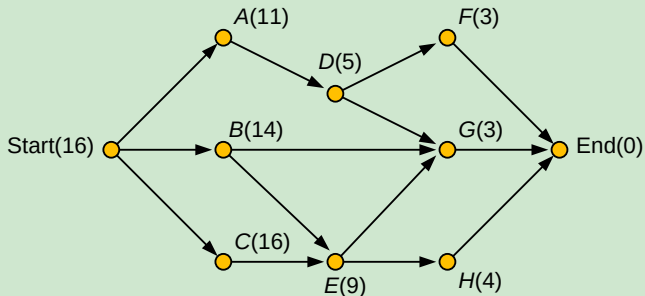
The Backflow Algorithm

Example (The Backflow Algorithm)



Example

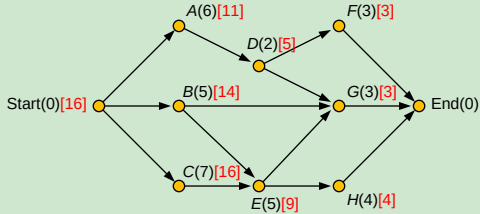
Example (The Critical-Path Algorithm)



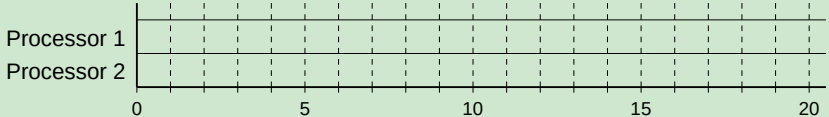
- The priority list is C, B, A, E, D, H, F, G .

Example

Example (The Critical-Path Algorithm)

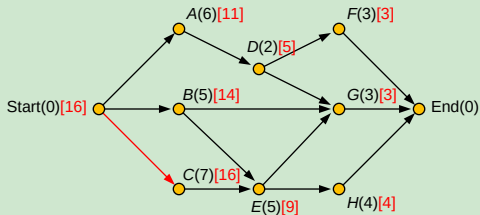


Priority list: *C, B, A, E, D, H, F, G*

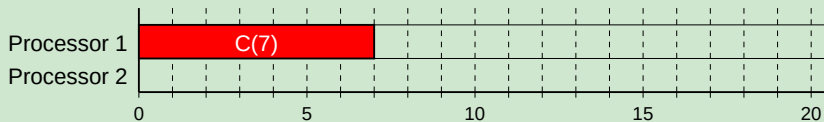


Example

Example (The Critical-Path Algorithm)

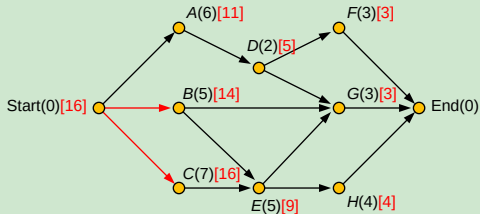


Priority list: **C**, B, A, E, D, H, F, G

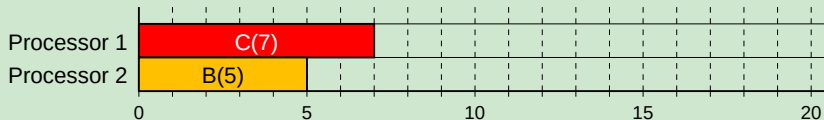


Example

Example (The Critical-Path Algorithm)

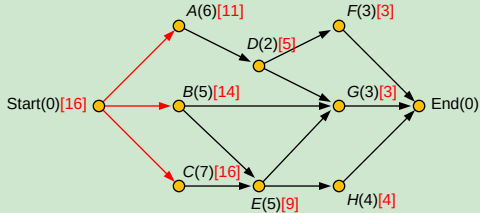


Priority list: **C**, **B**, A, E, D, H, F, G

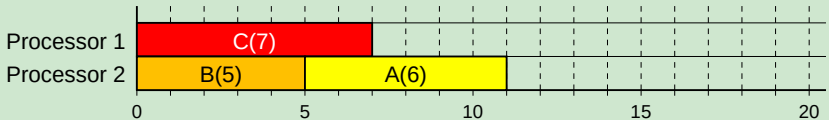


Example

Example (The Critical-Path Algorithm)

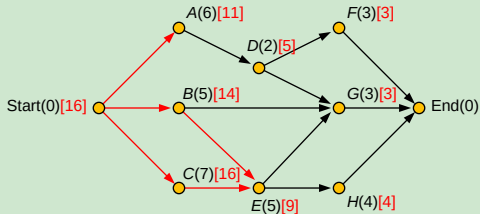


Priority list: **C**, **B**, **A**, E, D, H, F, G

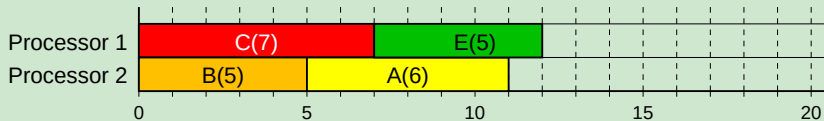


Example

Example (The Critical-Path Algorithm)

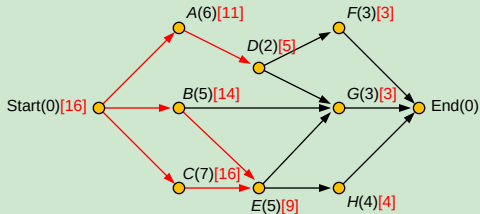


Priority list: **C**, **B**, **A**, **E**, **D**, **H**, **F**, **G**

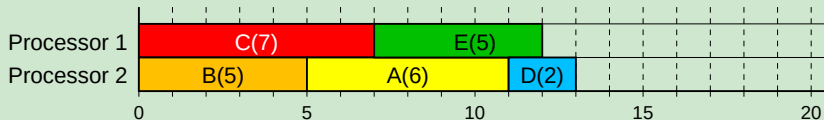


Example

Example (The Critical-Path Algorithm)

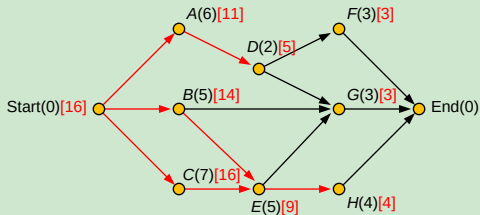


Priority list: **C**, **B**, **A**, **E**, **D**, **H**, **F**, **G**

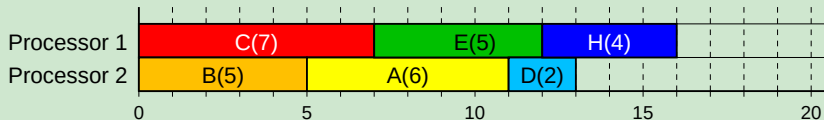


Example

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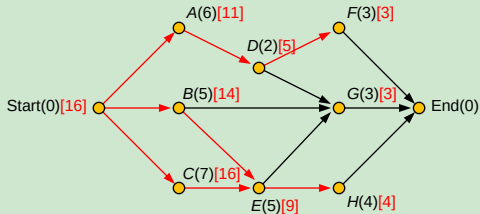


Priority list: **C**, **B**, **A**, **E**, **D**, **H**, **F**, **G**

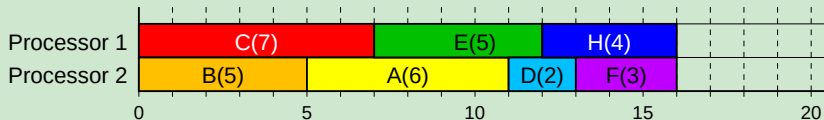


Example

Example (The Critical-Path Algorithm)

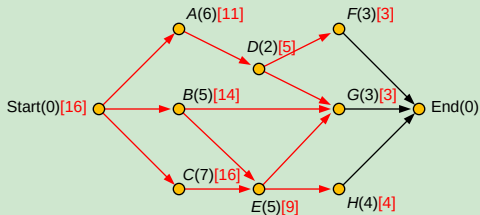


Priority list: *C, B, A, E, D, H, F, G*

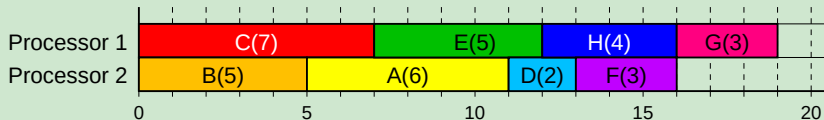


Example

Example (The Critical-Path Algorithm)

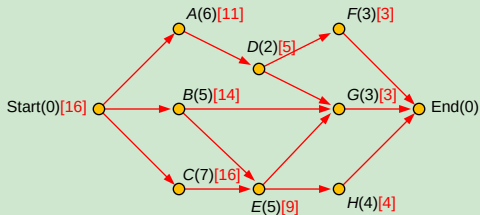


Priority list: *C, B, A, E, D, H, F, G*

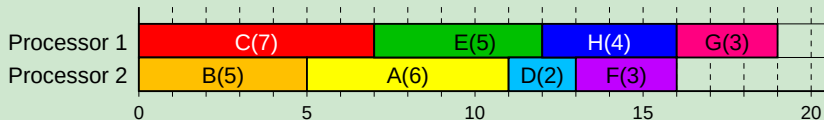


Example

Example (The Critical-Path Algorithm)



Priority list: *C, B, A, E, D, H, F, G*



Outline

1 The Critical-Path Algorithm

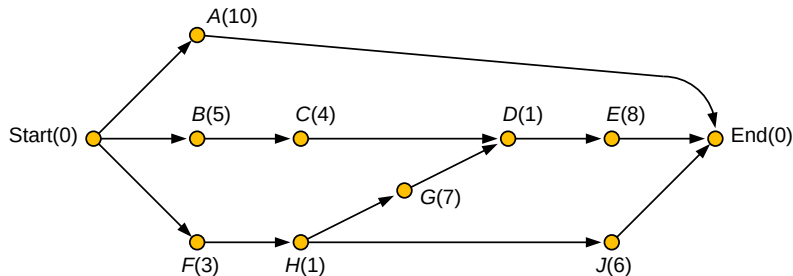
2 Example

3 Assignment

Example (Exercise 55)

Task	Precedent Tasks	Processing Time
<i>A</i>		10
<i>B</i>		5
<i>C</i>	<i>B</i>	4
<i>D</i>	<i>C, G</i>	1
<i>E</i>	<i>D</i>	8
<i>F</i>		3
<i>G</i>	<i>H</i>	7
<i>H</i>	<i>F</i>	1
<i>J</i>	<i>H</i>	6

Example (Exercise 55)



Schedule the tasks using 2 processors.

Example (Exercise 55)

Task	Precedent Tasks	Processing Time	Critical Time
<i>A</i>		10	
<i>B</i>		5	
<i>C</i>	<i>B</i>	4	
<i>D</i>	<i>C, G</i>	1	
<i>E</i>	<i>D</i>	8	
<i>F</i>		3	
<i>G</i>	<i>H</i>	7	
<i>H</i>	<i>F</i>	1	
<i>J</i>	<i>H</i>	6	

Example (Exercise 55)

Task	Precedent Tasks	Processing Time	Critical Time
<i>A</i>		10	10
<i>B</i>		5	
<i>C</i>	<i>B</i>	4	
<i>D</i>	<i>C, G</i>	1	
<i>E</i>	<i>D</i>	8	
<i>F</i>		3	
<i>G</i>	<i>H</i>	7	
<i>H</i>	<i>F</i>	1	
<i>J</i>	<i>H</i>	6	

Example (Exercise 55)

Task	Precedent Tasks	Processing Time	Critical Time
<i>A</i>		10	10
<i>B</i>		5	
<i>C</i>	<i>B</i>	4	
<i>D</i>	<i>C, G</i>	1	
<i>E</i>	<i>D</i>	8	8
<i>F</i>		3	
<i>G</i>	<i>H</i>	7	
<i>H</i>	<i>F</i>	1	
<i>J</i>	<i>H</i>	6	

Example (Exercise 55)

Task	Precedent Tasks	Processing Time	Critical Time
<i>A</i>		10	10
<i>B</i>		5	
<i>C</i>	<i>B</i>	4	
<i>D</i>	<i>C, G</i>	1	
<i>E</i>	<i>D</i>	8	8
<i>F</i>		3	
<i>G</i>	<i>H</i>	7	
<i>H</i>	<i>F</i>	1	
<i>J</i>	<i>H</i>	6	6

Example (Exercise 55)

Task	Precedent Tasks	Processing Time	Critical Time
<i>A</i>		10	10
<i>B</i>		5	
<i>C</i>	<i>B</i>	4	
<i>D</i>	<i>C, G</i>	1	9
<i>E</i>	<i>D</i>	8	8
<i>F</i>		3	
<i>G</i>	<i>H</i>	7	
<i>H</i>	<i>F</i>	1	
<i>J</i>	<i>H</i>	6	6

Example (Exercise 55)

Task	Precedent Tasks	Processing Time	Critical Time
<i>A</i>		10	10
<i>B</i>		5	
<i>C</i>	<i>B</i>	4	13
<i>D</i>	<i>C, G</i>	1	9
<i>E</i>	<i>D</i>	8	8
<i>F</i>		3	
<i>G</i>	<i>H</i>	7	
<i>H</i>	<i>F</i>	1	
<i>J</i>	<i>H</i>	6	6

Example (Exercise 55)

Task	Precedent Tasks	Processing Time	Critical Time
<i>A</i>		10	10
<i>B</i>		5	
<i>C</i>	<i>B</i>	4	13
<i>D</i>	<i>C, G</i>	1	9
<i>E</i>	<i>D</i>	8	8
<i>F</i>		3	
<i>G</i>	<i>H</i>	7	16
<i>H</i>	<i>F</i>	1	
<i>J</i>	<i>H</i>	6	6

Example (Exercise 55)

Task	Precedent Tasks	Processing Time	Critical Time
<i>A</i>		10	10
<i>B</i>		5	
<i>C</i>	<i>B</i>	4	13
<i>D</i>	<i>C, G</i>	1	9
<i>E</i>	<i>D</i>	8	8
<i>F</i>		3	
<i>G</i>	<i>H</i>	7	16
<i>H</i>	<i>F</i>	1	17
<i>J</i>	<i>H</i>	6	6

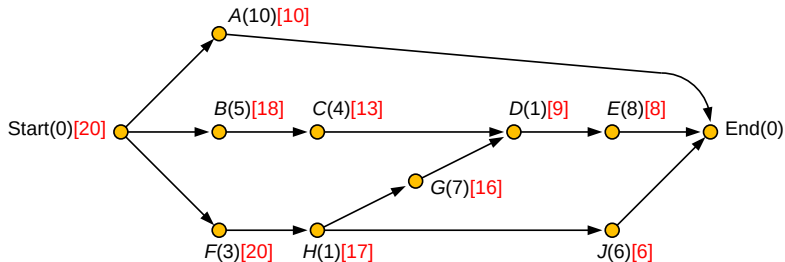
Example (Exercise 55)

Task	Precedent Tasks	Processing Time	Critical Time
<i>A</i>		10	10
<i>B</i>		5	18
<i>C</i>	<i>B</i>	4	13
<i>D</i>	<i>C, G</i>	1	9
<i>E</i>	<i>D</i>	8	8
<i>F</i>		3	
<i>G</i>	<i>H</i>	7	16
<i>H</i>	<i>F</i>	1	17
<i>J</i>	<i>H</i>	6	6

Example (Exercise 55)

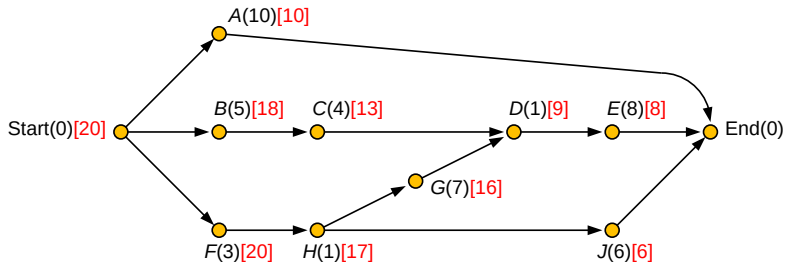
Task	Precedent Tasks	Processing Time	Critical Time
<i>A</i>		10	10
<i>B</i>		5	18
<i>C</i>	<i>B</i>	4	13
<i>D</i>	<i>C, G</i>	1	9
<i>E</i>	<i>D</i>	8	8
<i>F</i>		3	20
<i>G</i>	<i>H</i>	7	16
<i>H</i>	<i>F</i>	1	17
<i>J</i>	<i>H</i>	6	6

Example (Exercise 55)



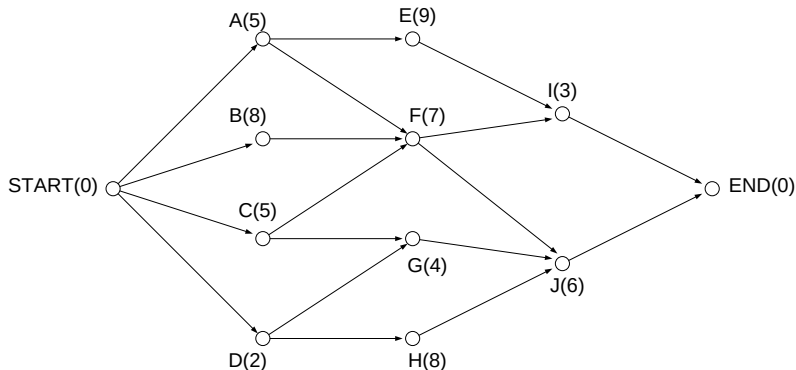
Schedule the tasks using 2 processors.

Example (Exercise 55)



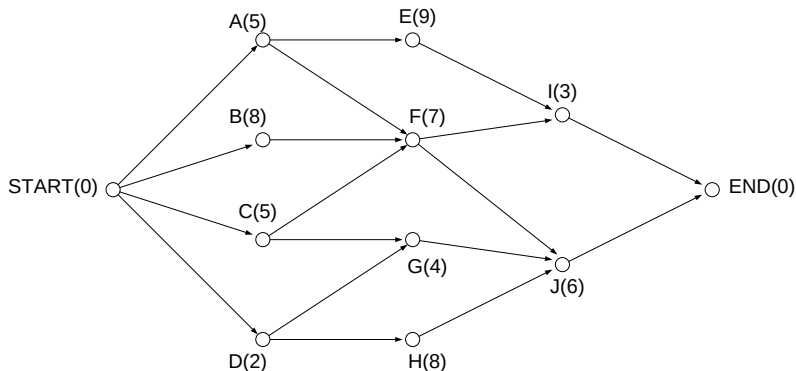
Schedule the tasks using 3 processors.

Example



Schedule the tasks using 2 processors.

Example



Compare to the Decreasing-Time Method.

Outline

1 The Critical-Path Algorithm

2 Example

3 Assignment

Assignment

Assignment

- Chapter 8: Exercises 49, 50, 51, 52, 56.