CHAPTER 7 – TRANSPORTATION

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CONTENTS

- Roles of transportation
- Relationships between transportation and logistics
- Transportation modes
- Introduction to linear programming

ROLE OF TRANSPORTATION

The physical movement of materials between points in the supply chain

- Transport principles:
  - Economy of scale
  - Economy of distance
- Transportation members:
  - Shippers and Consignees
  - Carriers and Agents
  - Owners and operators of transportation infrastructure
  - Transportation policy makers

RELATIONSHIPS BETWEEN TRANSPORTATION AND LOGISTICS

- Transportation costs and facility locations
- Inventory requirements and transport mode
- Transport mode and packaging
- Type of carrier and material handling equipment
- Shipment consolidation and shipment size
- Customer service goals and type/quality/service of carrier

TRANSPORT RATE AND TARIFF

- Transport rate
- Tariff
- Minimum charge
- Surcharge
- Commodity
- Freight-All-Kind (FAK)
- Demurrage
- Detention

MODES OF TRANSPORT

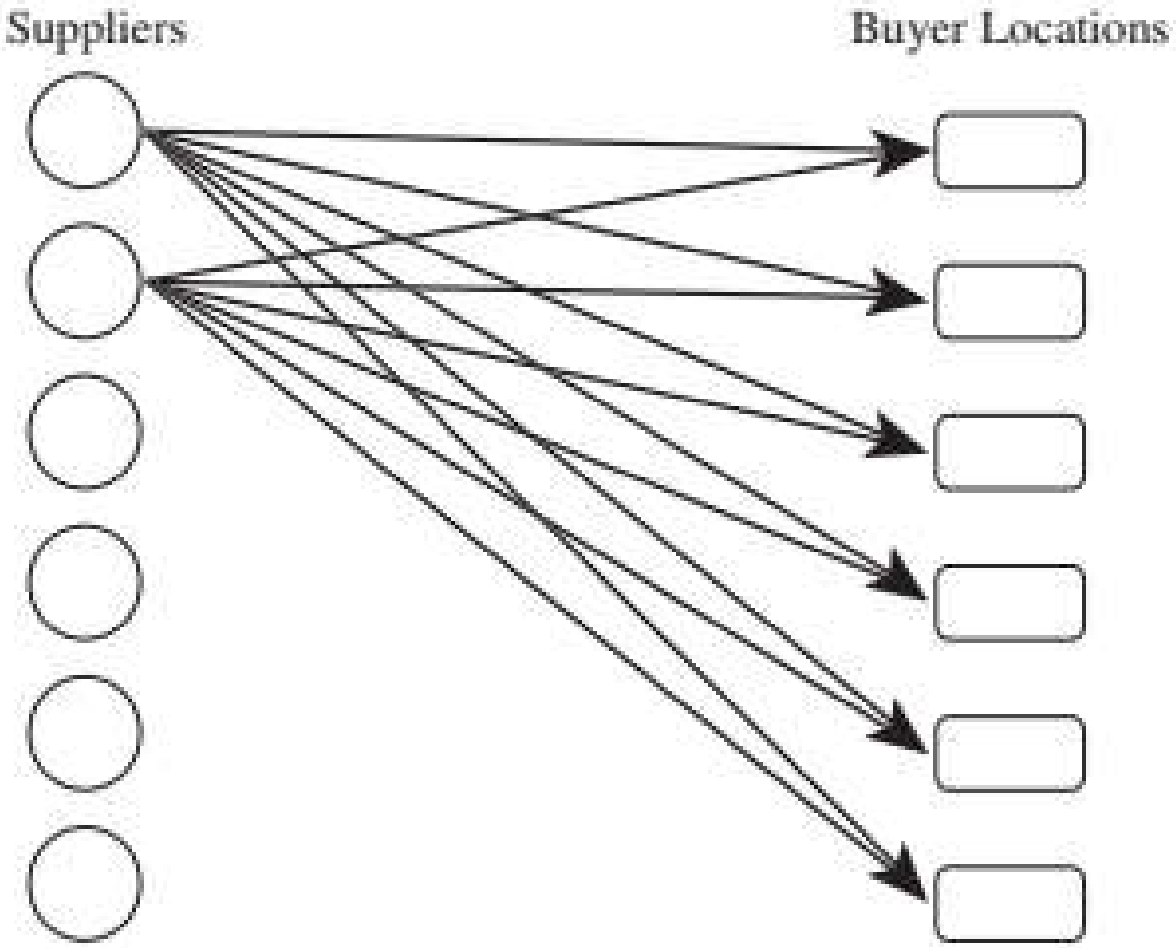
- Air
- Package carrier
- Road
- Rail
- Water
- Pipeline

INTERMODAL – MULTI-MODAL TRANSPORT

ATTRIBUTES AFFECTING THE CHOICE OF TRANSPORT MODE

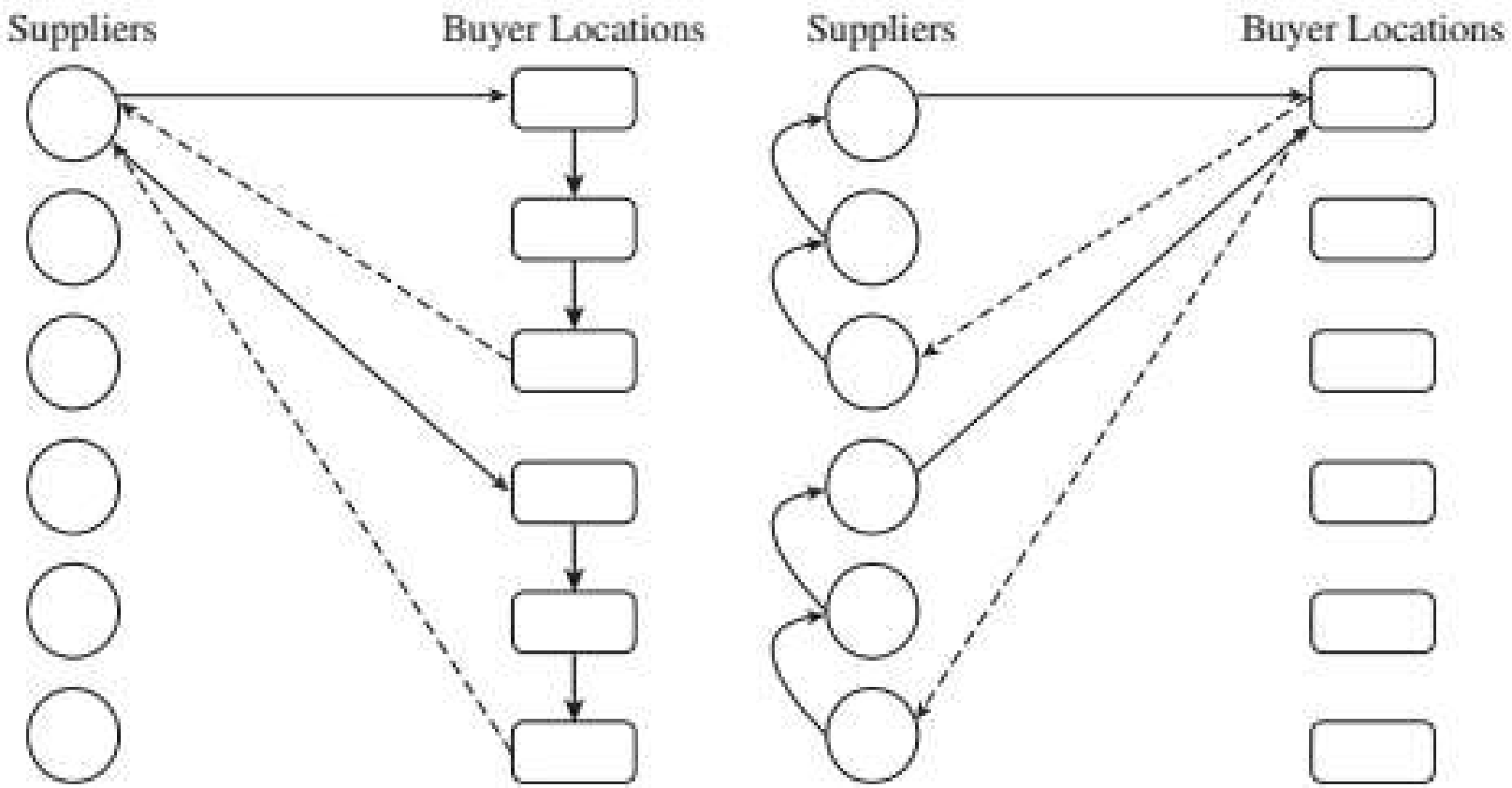
- Cost
- Speed
- Reliability
- Capability
- Capacity
- Flexibility
- Value of materials
- Importance
- Security
- Special facilities available

DIRECT SHIPMENT NETWORK TO A SINGLE DESTINATION



Source: Chopra and Meindl (2016)

DIRECT SHIPPING WITH MILK RUNS



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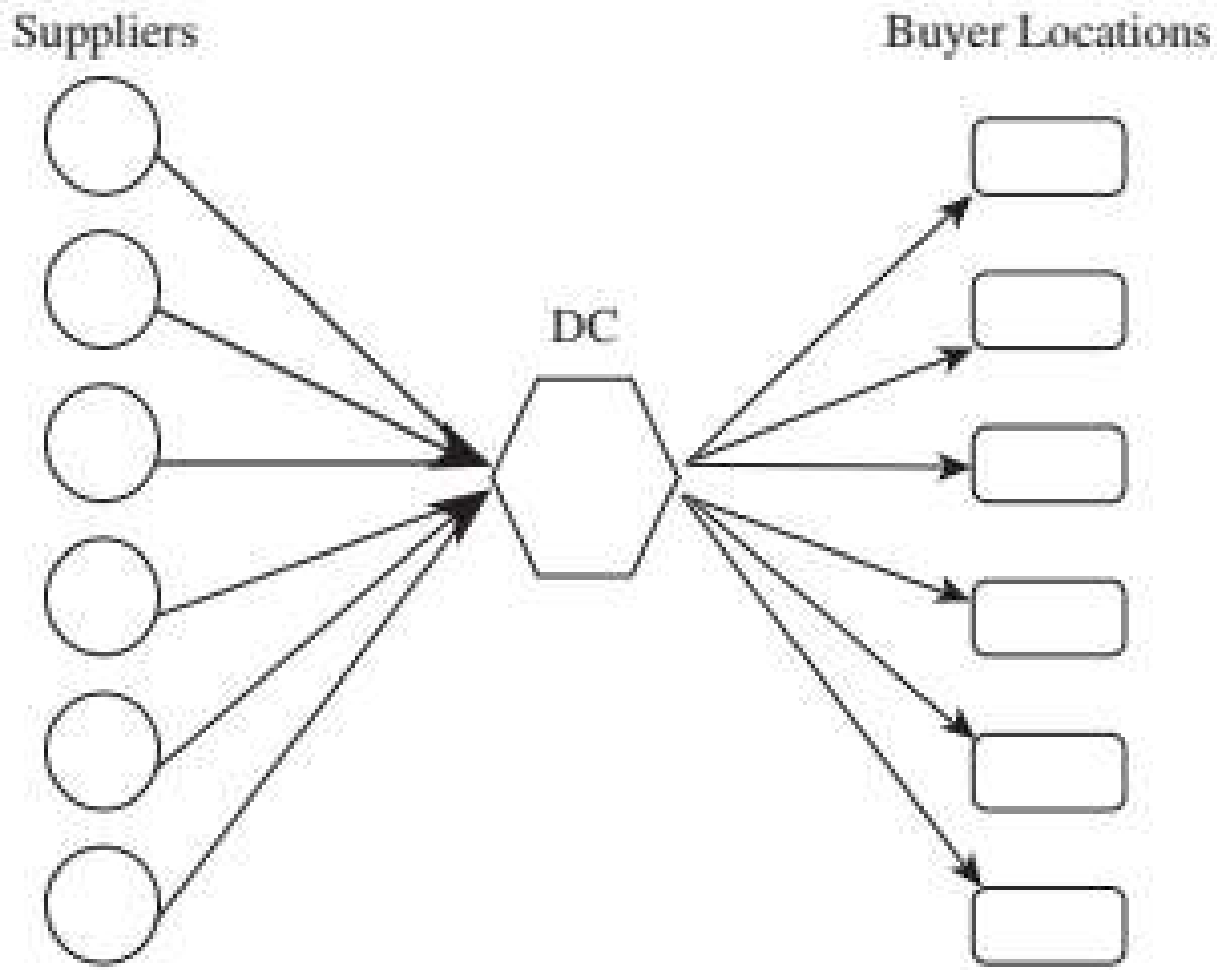
ALL SHIPMENTS VIA INTERMEDIATE CENTER WITH STORAGE/CROSS-DOCKING



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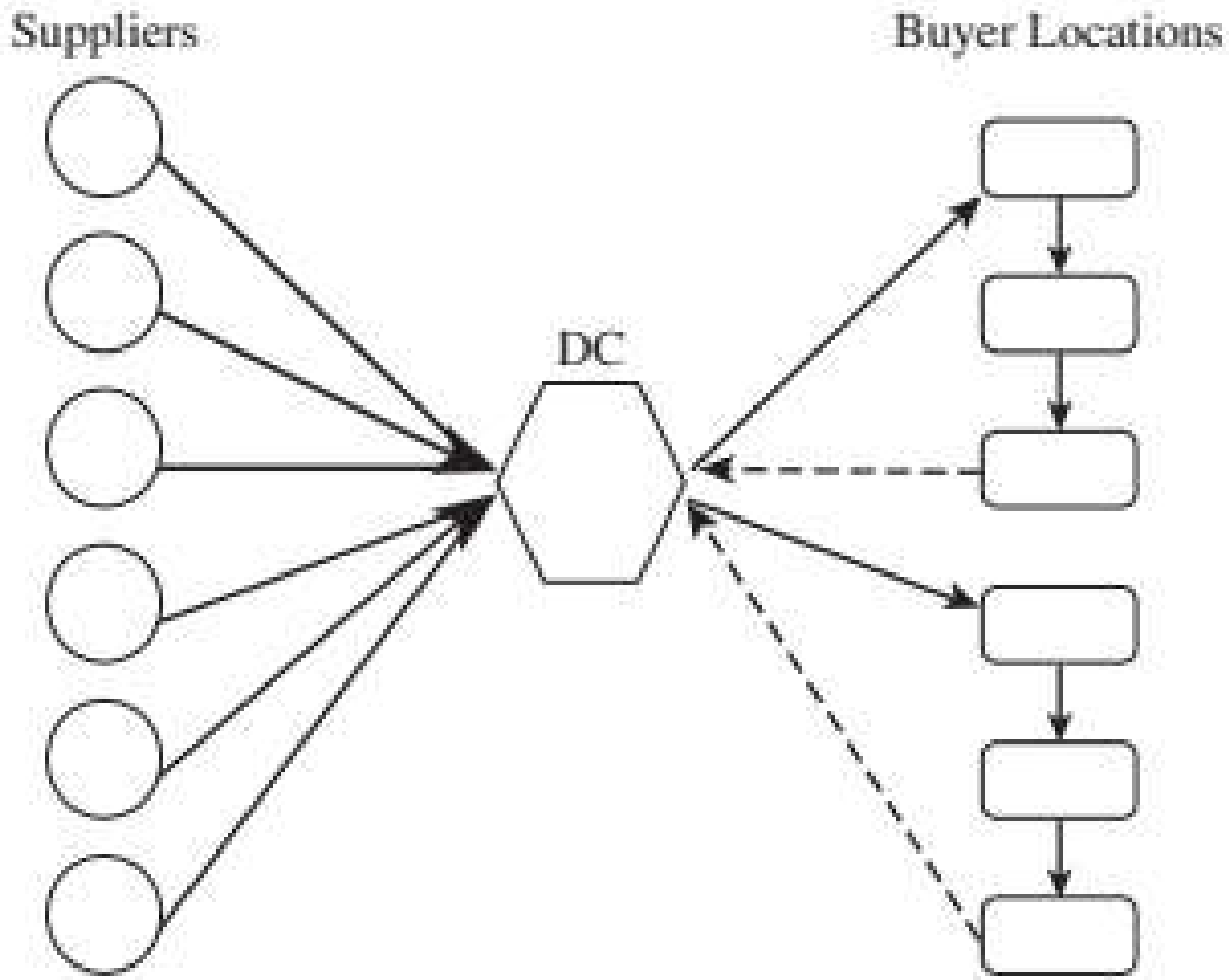
SHIPPING VIA DC USING MILK RUNS



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INTRODUCTION TO LINEAR PROGRAMING – EXERCISE 1

A model consists of linear relationships representing decisions, given an objective and resource constraints

	Resource Requirements		
	Labor	**Clay**	**Profit**
Product	**(hr./unit)**	**(kg/unit)**	**($/unit)**
Bowl	1	4	40
Mug	2	3	50

40 hrs of labor available per day
120 kgs of clay

MODEL (EXERCISE 1)

- Decision variables
- Objective function
- Constraints

$$maximize\ Z = 40x_1 + 50x_2$$

$$subject\ to$$

$$1x_1 + 2x_2 \leq 40$$

$$4x_1 + 3x_2 \leq 120$$

$$x_1, x_2 \geq 0$$

EXERCISE 2

A retailer ships smartphones from three warehouses to three stores on a monthly basis. Each warehouse has an amount of supply per month, and each store has a fixed demand per month. The retailer wants to know the number of smartphones to ship from ***each*** warehouse to ***each*** store in order to minimize the total cost of transportation.

Warehouse	Supply (units)
1	300
2	200
3	200

Store	Demand (units)
A	150
B	250
C	200

Unit transportation cost

	To store		
From warehouse	A	B	C
1	$16	$18	$11
2	$14	$12	$13
3	$13	$15	$17

EXERCISE 3

A retailer ships smartphones from three warehouses to three stores on a monthly basis. Each warehouse has a fixed supply per month, and each store has a fixed demand per month. However, each warehouse does not need to ship smartphones to all three stores per month. Please find the number of smartphones to be shipped from warehouses to stores in order to minimize the total cost of transportation.

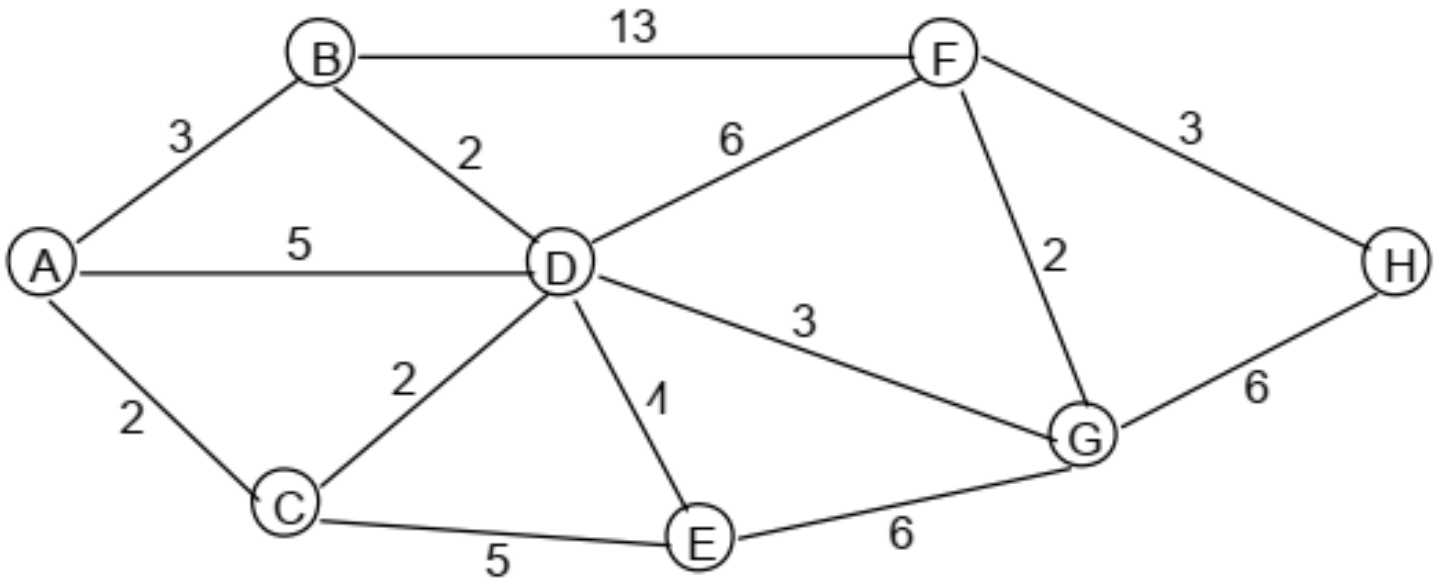
Warehouse	Supply (units)
1	150
2	175
3	275

Store	Demand (units)
A	200
B	100
C	300

Unit transportation cost

	To store		
From warehouse	A	B	C
1	$6	$8	$10
2	$7	$11	$11
3	$4	$5	$12

EXERCISE 4 (THE SHORTEST ROUTE PROBLEM)



Source: Chinneck (2000)

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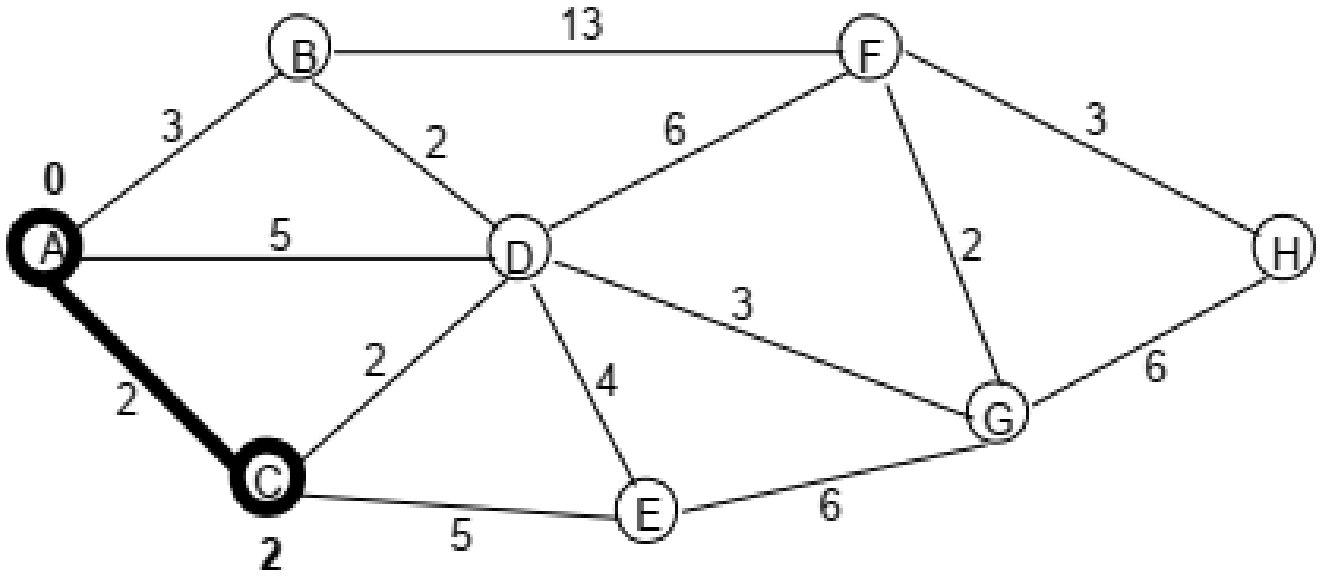

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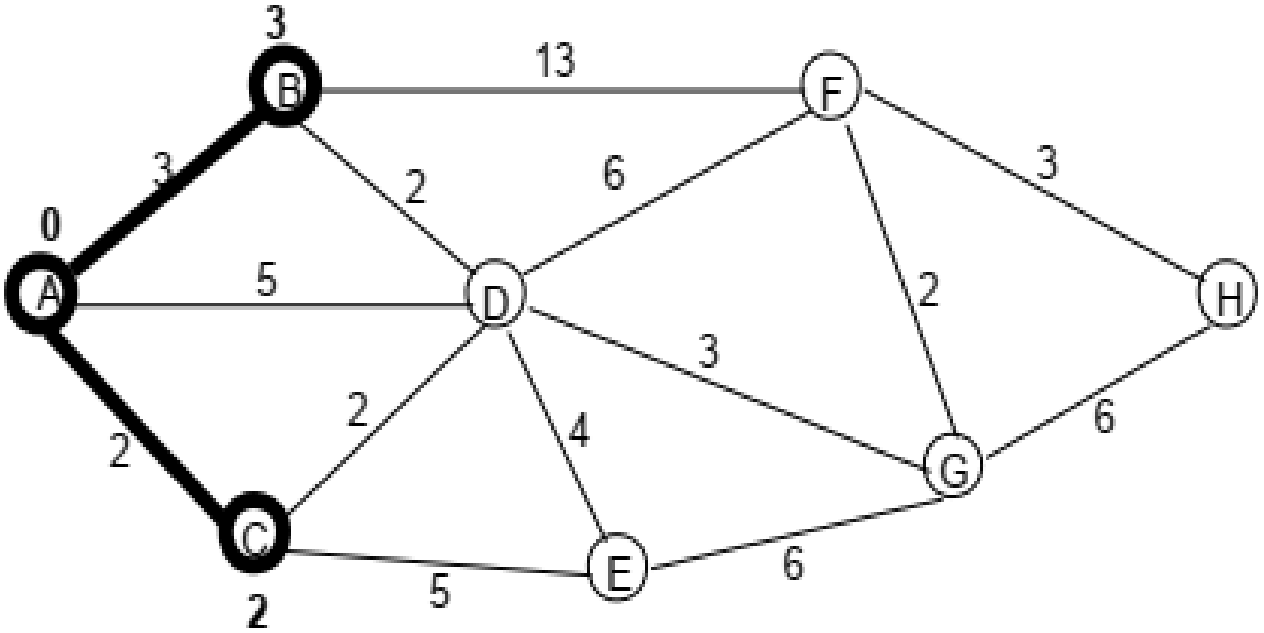

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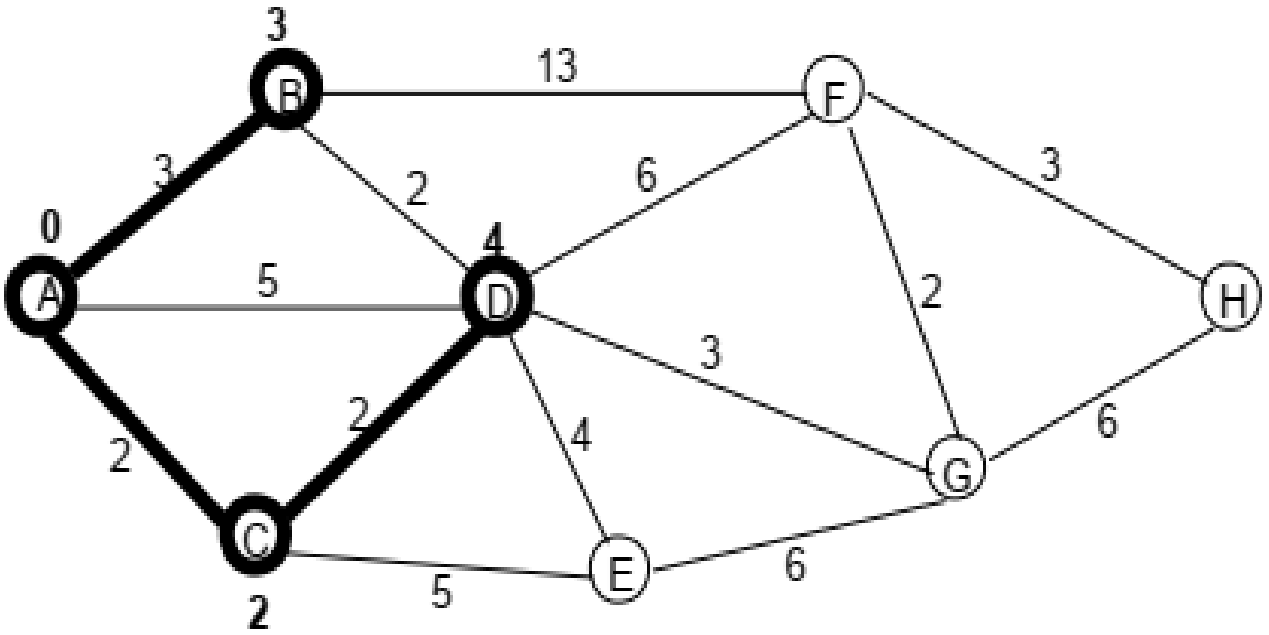

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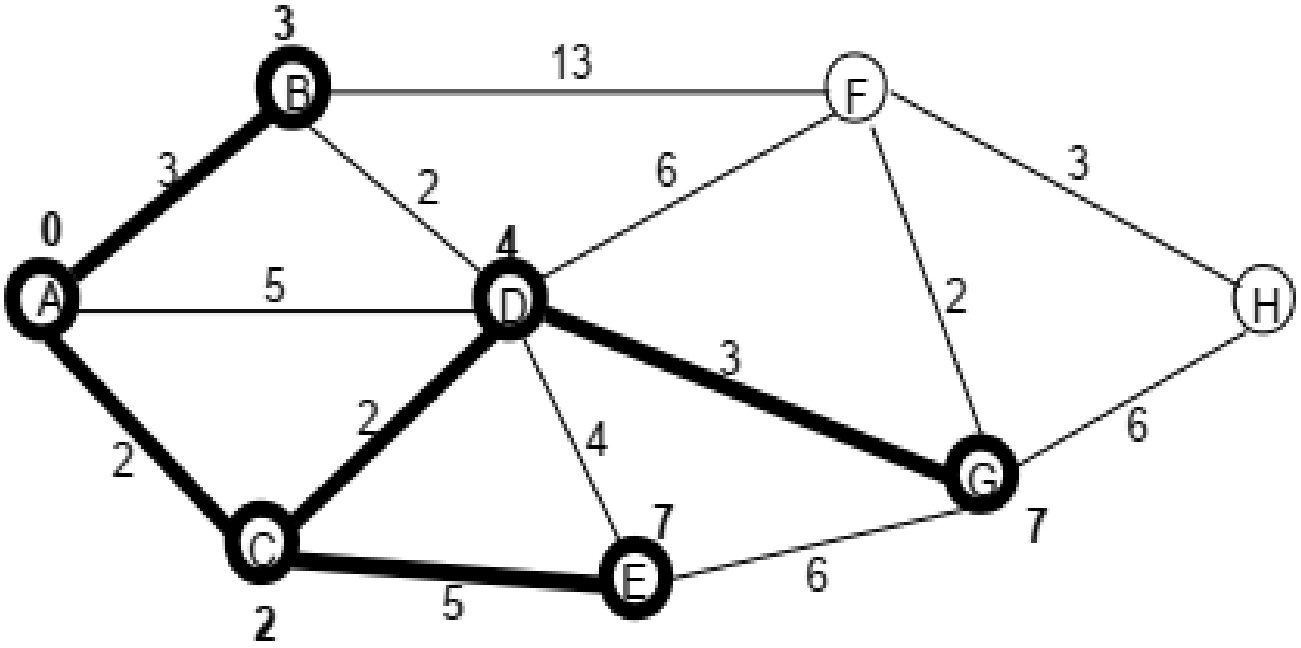

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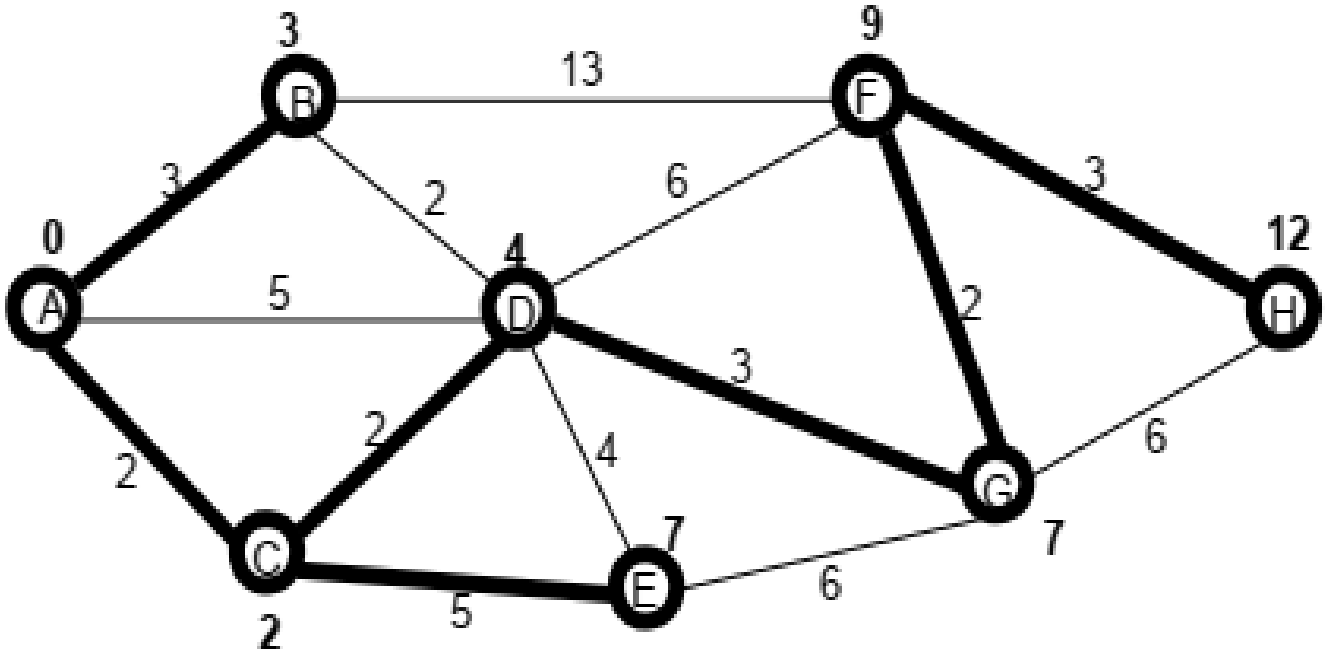

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THANK YOU!