

Logistics

Logistics

The process of planning, implementing, and controlling the efficient, cost effective flow and storage of raw materials, in-process inventory, finished goods and related information from point of origin to point of consumption for the purpose of meeting customer requirements.

Logistics

Get the
right amount of
right material
to the right place
at the right time

Why Logistics?

CASE study: Shoes From China

- As a manufacturer, how should I ship my shoes from Shenzhen (China) to Kansas City (USA)
 - ✦ Shoes are manufactured, labeled, and packed at a plant
 - ✦ ~4.5M shoes shipped per year from this plant
 - ✦ 6000-6500 shoes shipped per container
 - ✦ Value of pair of shoes ~\$35

Inland Transport @ Origin



◆ 3 Port Options

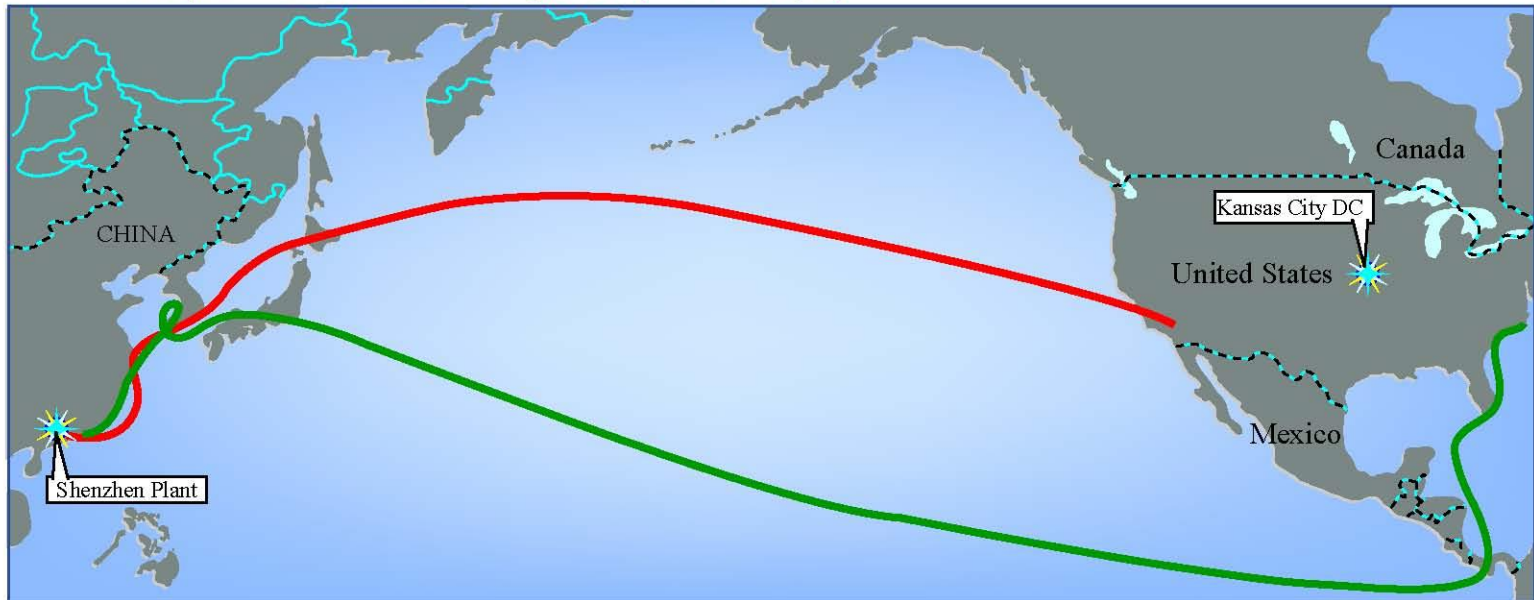
- Shekou
 - ◆ Truck
- Yantian
 - ◆ Rail
 - ◆ Truck
- Hong Kong
 - ◆ Rail
 - ◆ Truck

◆ In Hong Kong

- 9 container terminals

Ocean Shipping Options

- ◆ 40 shipping lines visit these ports each w/ many options
- ◆ Examples:
 - **APL – APX-Atlantic Pacific Express Service**
 - ◆ Origins: Hong Kong (Sat) -> Kaohsiung, Pusan, Kobe, Tokyo
 - ◆ Stops: Miami (25 days), Savannah (27), Charleston (28), New York (30)
 - **CSCL – American Asia Southloop**
 - ◆ Origins: Yantian (Sat) -> Hong Kong, Pusan
 - ◆ Stops: Port of Los Angeles (16.5 days)



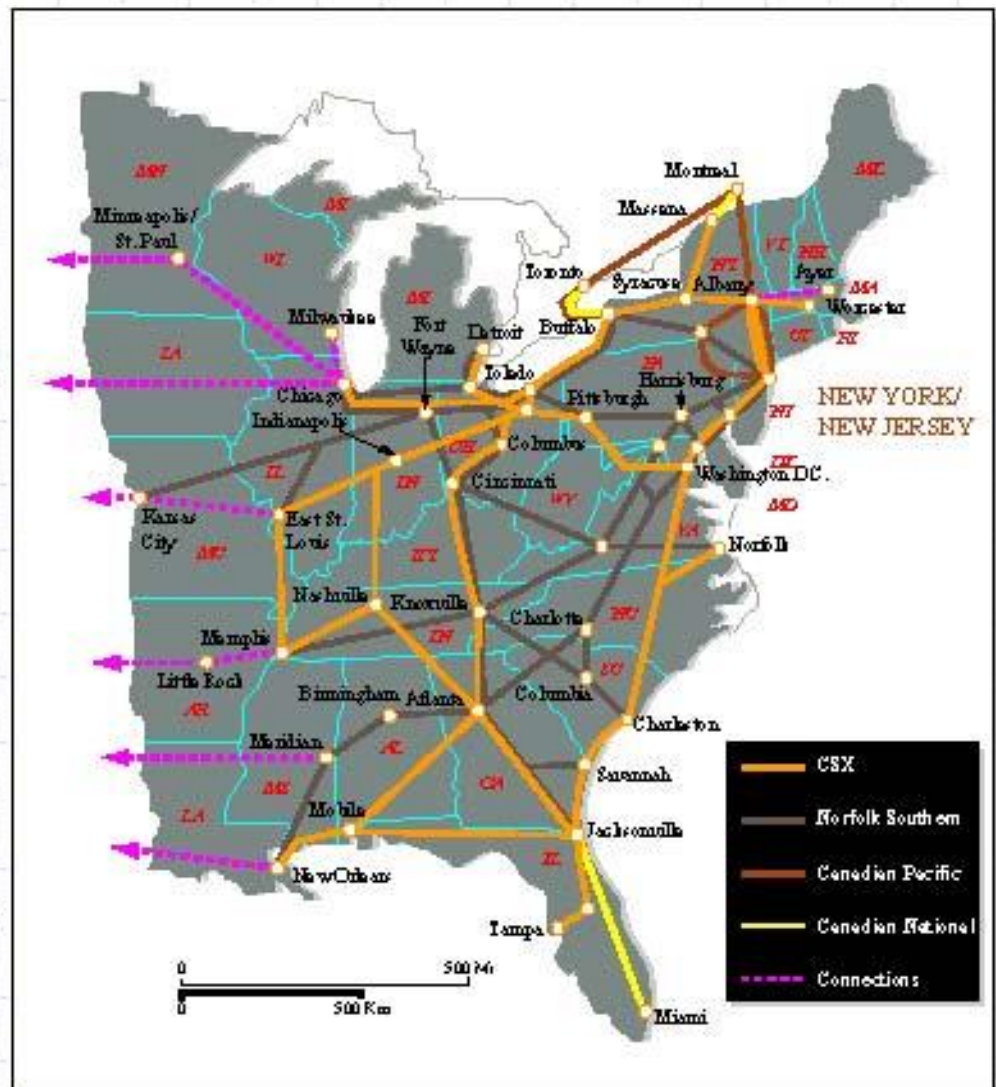
Inland Transportation in US



Port of New York / New Jersey

◆ Maher Terminal

- Express Rail II NS RR
 - ◆ Double stack thru:
 - ◆ Harrisburg, Pittsburgh, Cleveland, Ft. Wayne, to Kansas City
- CSX RR (5-10 days)
 - ◆ Double stack thru:
 - ◆ Philadelphia, Baltimore, Washington, Pittsburgh, Stark, Indianapolis, to Kansas City
- Truckload (2.5 – 3 days)
 - ◆ NJ Turnpike to I-78W, I-81S, I-76/70 to Kansas City



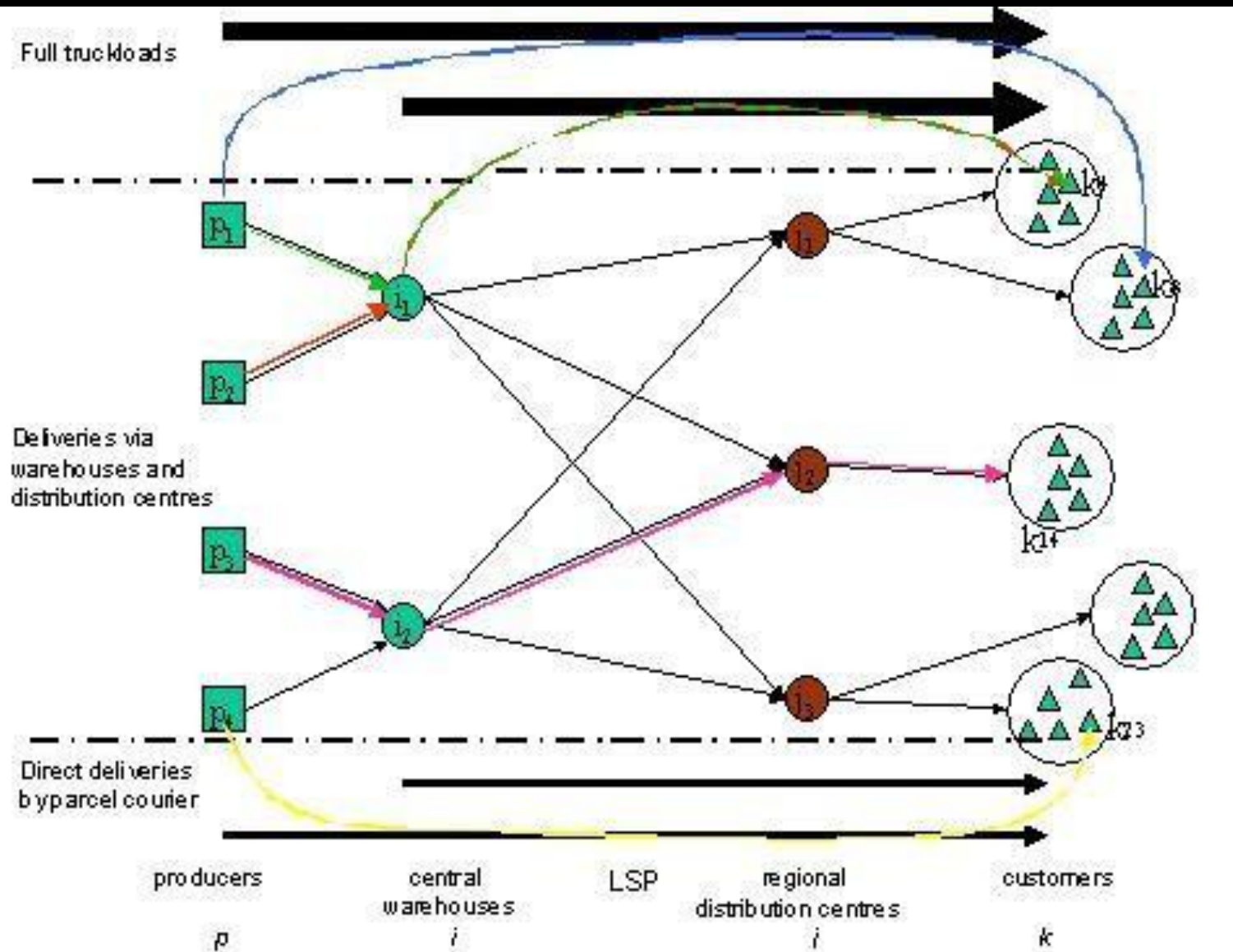
Transport Options

- ◆ So how do I ship shoes from Shenzhen to Kansas City?
- ◆ What factors influence my decision?

Logistics systems

- Composed of facilities linked by transportation services
- Facilities include
 - Sites of manufacturing, storing, sorting, selling, consuming etc...
 - Warehouses, distribution centers (DCs), transportation terminals, dump sites, etc...

Logistics Systems (Supply Chains)



Logistic System Characteristics

- *Push* versus *Pull* Systems
 - make-to-order, make-to-stock, make-to-assembly
- Vertical integration vs. third-party logistics (3PL)
 - transaction based relationships, strategic alliances

Third Party Logistics(3PL)

- Use of an outside company
 - ✦ Perform all or part of a company's product distribution
- Three different levels:
 - ✦ Basic service providers
 - Physical distribution services (warehousing, transportation)
 - ✦ Value added service providers
 - Basic service + services such as specialized pick/pack, labeling
 - ✦ Logistics integrators
 - Full responsibility for managing key supply chain operations on a daily basis.

Outsourcing: Pros and Cons

- Pros:
 - Improve company focus
 - Access to new technology
 - Free-up resources
 - Reduce operation costs
- Cons:
 - Coordination costs
 - Loss of internal logistics management capability
 - Reduced contact with final customer

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- Retailer managed vs. vendor managed inventory
- Product and information flows

Logistics systems

- Can categorize in three main activities:
 - ✦ Order processing
 - Links information flow with product flows
 - ✦ Inventory management
 - Controls inventories that are waiting to be manufactured, assembled, sold or salvaged
 - ✦ Freight transportation
 - Allows production and consumption to be far apart

Order processing

- Links information flows with product flows
 - Customers request products (EDI, fax, telephone,...)
 - Availability of requested items is checked (PPS, SAP,...)
 - Required items are produced (if necessary) or retrieved from the warehouse
 - Items are shipped to customers
 - Customers are kept informed about order status

Inventory management

- Inventories are stocked
 - Raw materials
 - Semi-finished products and components
 - finished products (in warehouse or en-route)
- waiting to be manufactured, assembled, sold or salvaged

Inventory management

- Reasons for holding inventories
 - Demand seasonality
 - Improving customer service level
 - Price seasonality
 - Exploit economies of scale in freight transportation
 - Cope with demand and lead-time randomness
 - Cover inefficiencies in managing the logistics system

Inventory management

- A good inventory policy takes into account
 - the economic significance of stored products
 - transportation policies
 - production process characteristics
 - competitors' policies

Freight transportation

- allows production and consumption to be far apart
 - global availability of certain products
 - economic benefits from production at low wage countries
 - improved availability of perishable goods

Freight Transportation

- Types:
 - ✦ Private transportation
 - (owned or leased vehicles)
 - ✦ Contract transportation
 - (dedicated carrier)
 - ✦ Common transportation
 - (general carrier)

Freight Transportation

■ Main features:

★ Distribution channels:

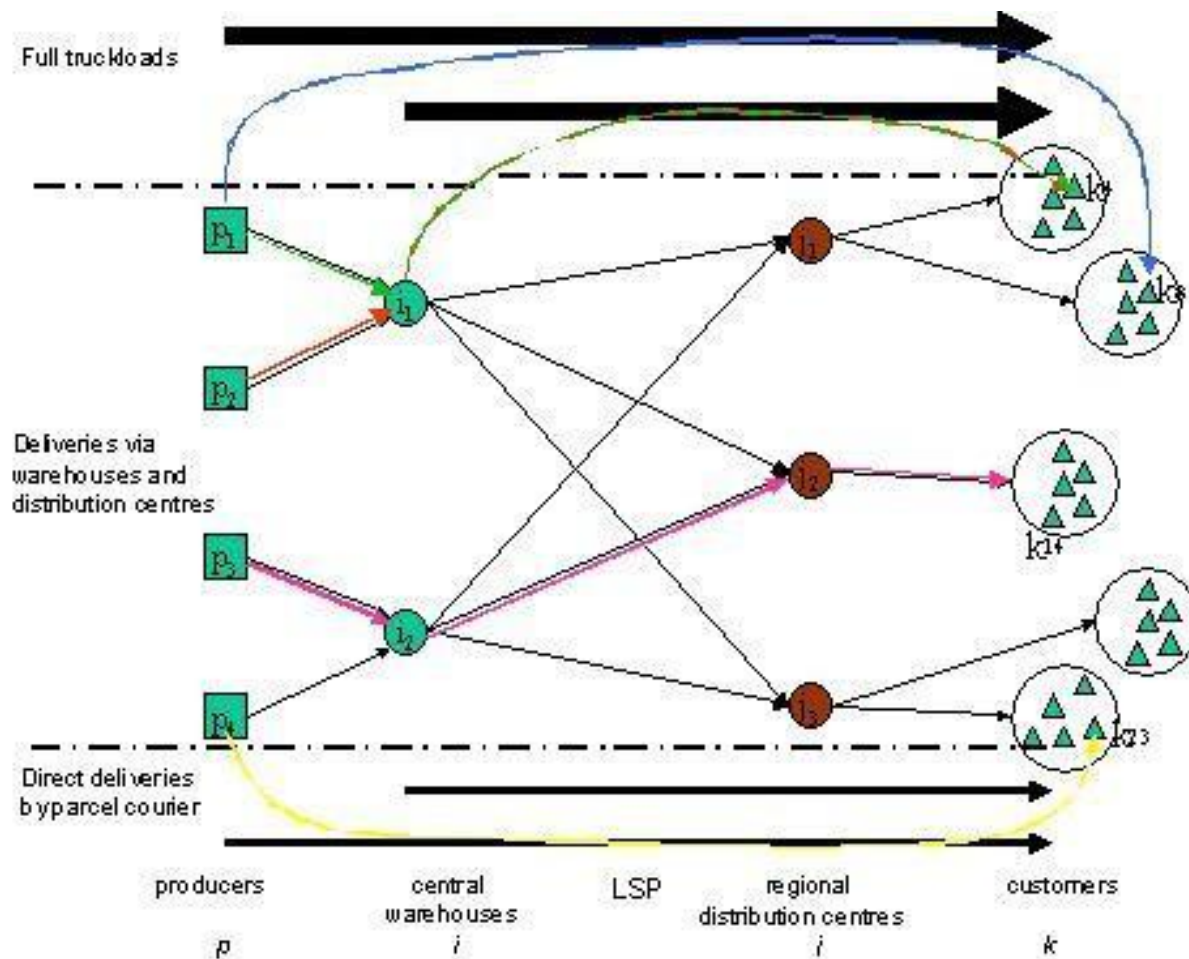
- warehouses, DCs, direct...

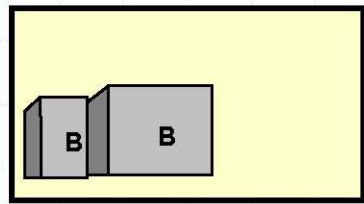
★ Freight consolidation:

- Facility consolidation : (e.g. hubs) individual shipments are consolidated at hubs .
- multi-stop: serving some customers together
- Temporal: adjusting schedules to ship larger quantities

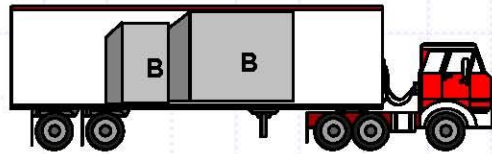
★ Modes of transportation

Distribution channels

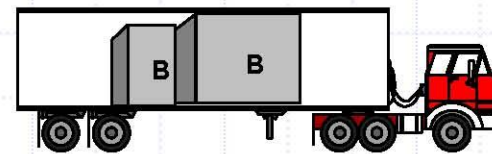




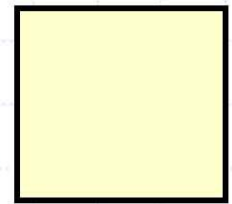
Plant A



Loading



Linehaul



Customer B

Unloading

◆ Loading/Unloading

- Key drivers:
 - ◆ Number of items
 - ◆ Time
 - ◆ Stowability (Packaging)
- Not always symmetric

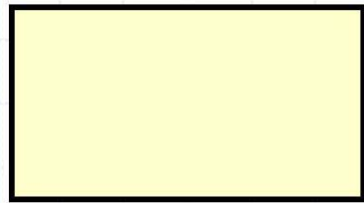
◆ Linehaul

- Key drivers:
 - ◆ Distance
 - ◆ Balance / Backhaul

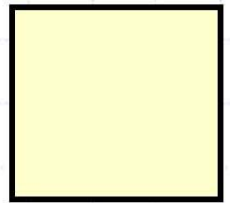
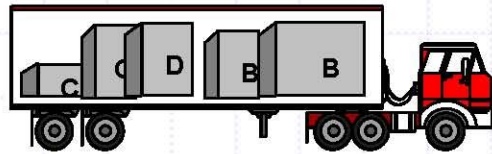
Freight consolidation

- *Facility consolidation*
 - e.g. UPS consolidates individual shipments at hubs for joint transportation between hubs
- *Multi-stop consolidation*
 - e.g. Fedex delivers individual shipments to their final destination on routes serving several customers
- *Temporal consolidation*
 - e.g. shipments schedules may be adjusted forward or backward to ship large quantities periodically

Multi-stop consolidation



Plant A



Customer B

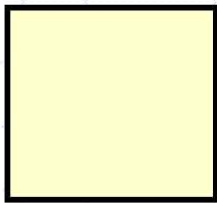
◆ Vehicle Routing

■ Key drivers:

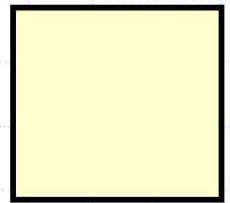
- ◆ Number/Density of stops
- ◆ Vehicle Capacity
- ◆ Time

■ Origin or Destination

- ◆ One to Many
- ◆ Many to One

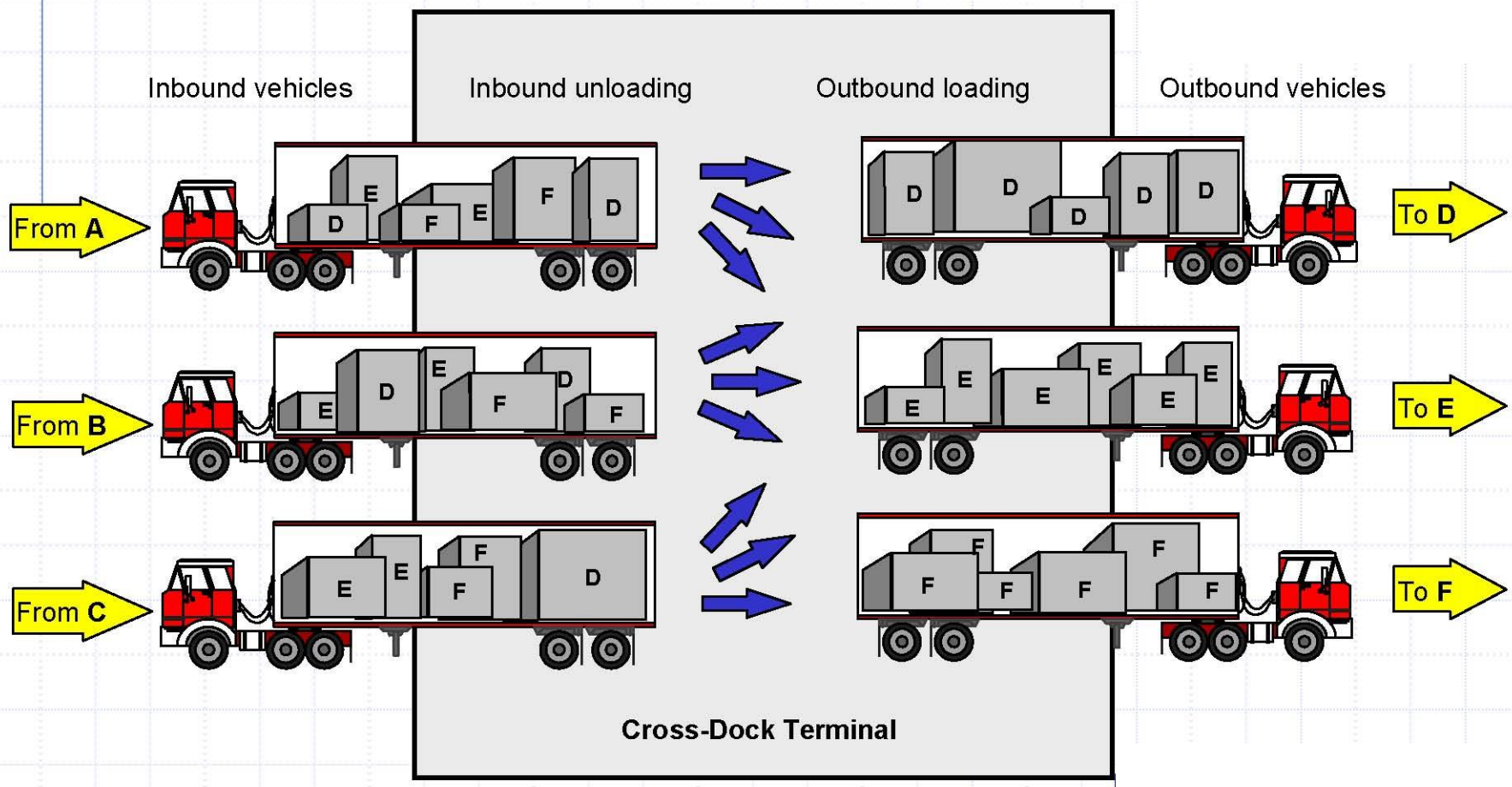


Customer D



Customer C

Facility consolidation



Freight Transportation

■ Modes of transportation:

- ✦ Air

- ✦ Truck

- ✦ Train

- ✦ Ship

- ✦ Pipeline

- ✦ intermodal

Freight Transportation

- Mode Choice Decisions:
- Air:
 - ✦ Fastest, handling slows down the process
 - ✦ Long distance high value goods
- Truck
 - ✦ Truck load vs Less-Than-Truck load
- Rail
 - ✦ Inexpensive, relatively slow

Freight Transportation

- Mode Choice Decisions:

- Intermodal

 - ✦ Air-Truck

 - Birdyback

 - ✦ Train-Truck

 - Piggyback

 - ✦ Ship-Truck

 - Fishyback

Mode Comparison Matrix

	Truck	Rail	Air	Water
Operational Cost	Moderate	Low	High	Low
Market Coverage	Pt to Pt	Terminal to Terminal	Terminal to Terminal	Terminal to Terminal
Degree of competition	Many	Few	Moderate	Few
Traffic Type	All Types	Low to Mod Value, Mod to High density	High value, Low density	Low value, High density
Length of haul	Short – Long	Medium – Long	Long	Med - Long
Capacity (tons)	10 – 25	50 – 12,000	5 – 12	1,000 – 6,000

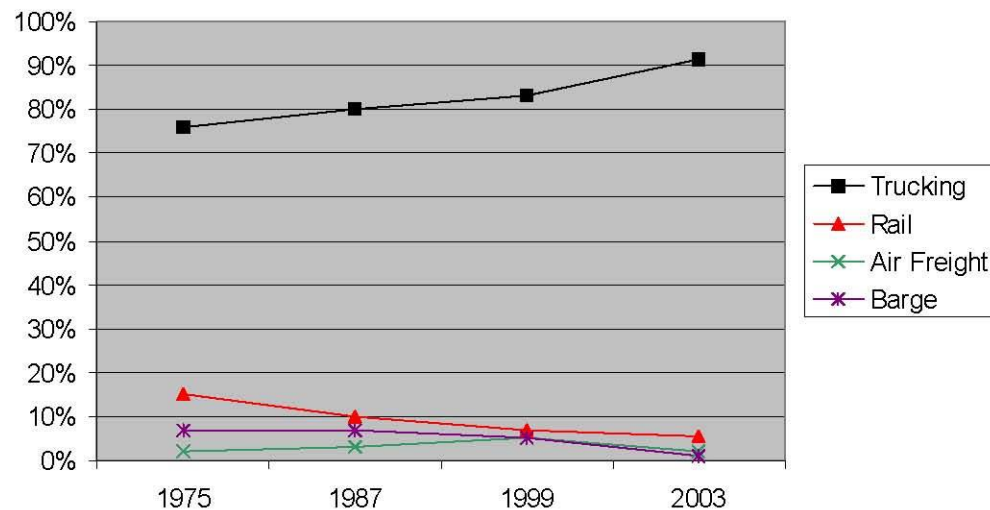
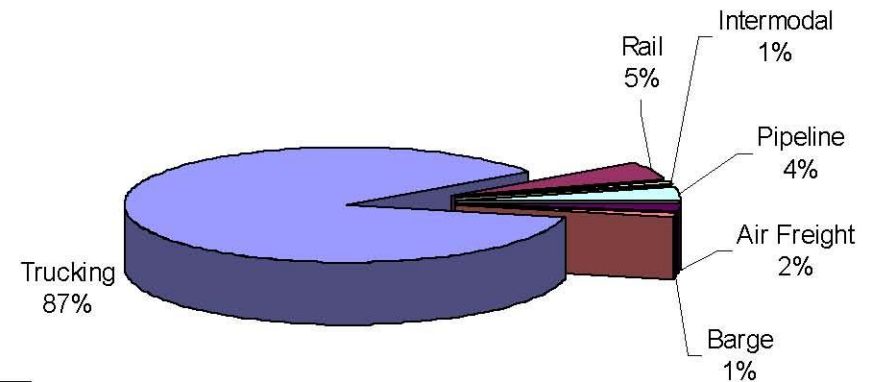
Mode Comparison Matrix

	Truck	Rail	Air	Water
Speed	Moderate	Slow	Fast	Slow
Availability	High	Moderate	Moderate	Low
Consistency (delivery time)	High	Moderate	Moderate	Low
Loss & Damage	Low	High	Low	Moderate
Flexibility	High	Low	Moderate	Low

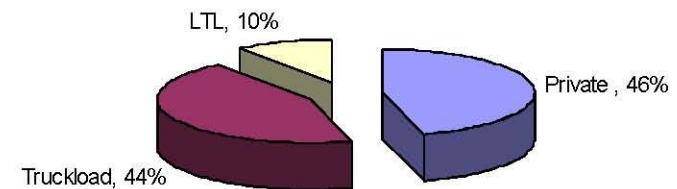
Traditional Transport Modes (US)

Mode	2003 revenue (\$B)	
Trucking	610	87%
Rail	36	5%
Intermodal	8	1%
Pipeline	27	4%
Air Freight	13	2%
Barge	8	1%
	702	100%

US Transportation By Mode 2003 (702 \$B)



Trucking By Sub-Mode



Logistics Managerial Issues

- Capital reduction vs. Operating cost reduction
- Service level improvement
- Cost vs. Level of service trade-off
- Sales vs. Level of service trade-off

Logistics Decisions

	Planning Horizon	Data	Decision maker	E.g.
Strategic	Up to several years	Very imprecise and incomplete	Top management	Facility location, layout
Tactical	Up to a year	Disaggregated data available	Middle management	Resource allocation, production and distribution planning
Operational	Days	Precise data available	Lower management	Order picking, vehicle dispatching

KAHOOT Quiz

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