

# Transportation in SC

- Refers to the movement of product from one location to another
- Important SC driver because rarely goods are produced & consumed in the same location
- Transportation costs form a significant part of the SC costs
- Much more significant in global SCs

# Modes of transportation

- Rail transportation
- Road transportation
- Air transportation
- Water transportation
- Pipeline movement
- Ropeways
- Inter modal/multimodal transportation

# Rail transportation







# Rail transportation

## Relative Advantages

1. Low cost
2. Reliability (weather conditions)
3. Bulky goods

## Relative disadvantages

1. Not economical for small shipments/ shorter distances
2. Inflexibility of terminals
3. Handling systems
4. Time schedules

# Road transportation

- Least physical constraints
- Flexible
- Apt for rapid movements in small batches
- India – more than 3 mln kms of road network; 1 of the largest in the world
- Farm produces, dairy products, medical facilities, primary education
- Road freight index (RFI) – similar to stock index; displays past & present freight rate trends







# Forms of road transport

- Common carriers

A **common carrier** is a person or company that transports goods or people for any person or company and that is responsible for any possible loss of the goods during transport.

on hire basis

responsibility for safe transit & for loss/damage

pre-paid, post pay or to be billed later

FTL (10 tonnes) or LTL

# Forms of road transport

- Local cartage  
Transporting goods for short distances, such as within a commercial area or town.  
Also called drayage or haulage  
varying size from plant or warehouse to local customers  
interlinking with other mode
- Private fleet

# Road transport

## Advantages

1. Continuity in movement
2. Flexibility
3. Less capital costs
4. Detachable units
5. Immunity from strikes etc.
6. Adaptability in inter modal operations

## Disadvantages

1. Susceptibility to weather conditions
2. Not suitable for heavy loads
3. Not apt for long distances





# Air transportation

- Many constraints – physical & weather
- High value freight
- Perishable products
- Emergency products
- Live animals
- Fashion items

# Air transportation

## Advantages

1. Faster
2. Low inventory costs
3. Broad service range

## Disadvantages

1. High cost
2. Effect of weather conditions
3. Extremely heavy consignments

# Water transportation

- Maritime routes - oceans, coasts, seas, lakes, rivers & channels
- Atlantic ocean accounts for 78% of global trade
- High port building & maintenance costs
- Heavy industries such as steel & petrochemicals

# Water transportation

- Types - Inland (rivers, canals, great lakes), Domestic coast ways & Seaways
- High bulk, low value commodities
- Iron ore, coal, chemicals, petroleum products, cement, etc.



# Water transportation

## Advantages

1. Mass movement of bulk goods
2. Lower cost
3. Large capabilities
4. Suitable for long distances
5. Apt for low value items

## Disadvantages

1. Slow
2. Suitable only for few types of products
3. In transit inventory

# Pipeline movement

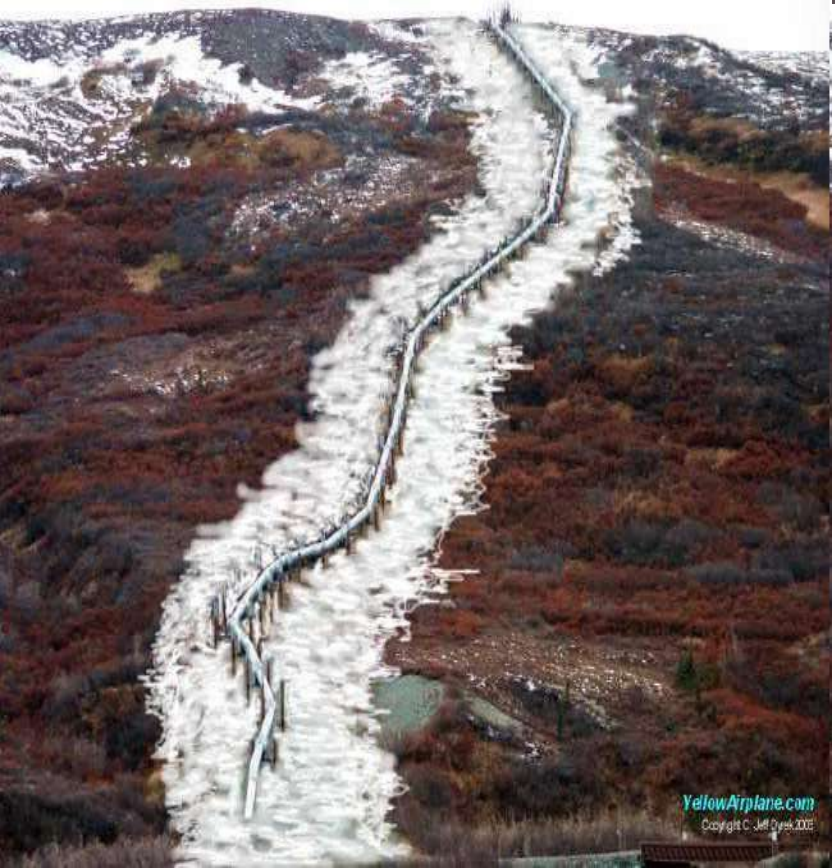
## Liquids & gases over long distances

### Advantages

1. Least energy consumption
2. Low cost
3. Environmental friendly
4. Safety
5. Carrier stationary – saves energy
6. Quantity variation easy
7. Apt for difficult terrain where laying roads/railways is not possible

### Disadvantages

1. Not suitable for all types of products
2. High initial costs
3. Prone to sabotage in disturbed areas



YellowAirplane.com  
Copyright © Jeff Dyrek 2005

# Ropeways

- Connects two places of large altitude differential
- Environmental safety
- Bulk material over short distances
- Horticultural products
- Hilly areas
- No other means of transportation
- Shorter distances
- Heavy initial investment
- Size & quantity limitations





# Inter modal/ multi modal transportation

- Use of more than one mode of transport to move a shipment to its destination
- Truck/rail – most common
- Key issue – information exchange to facilitate shipment transfers between different modes

# Inter modal/ multi modal transportation

## Advantages

- Reduction in time, loss/damage incidental to segmented transportation
- Timely arrival – lower inventory
- Single point responsibility

# Activities in Transportation

- Scheduling
- Load planning
- Mode selection
- Routing
- Transportation provider selection
- Transportation of hazardous material



# Design options for a Transportation network

# Transportation network design

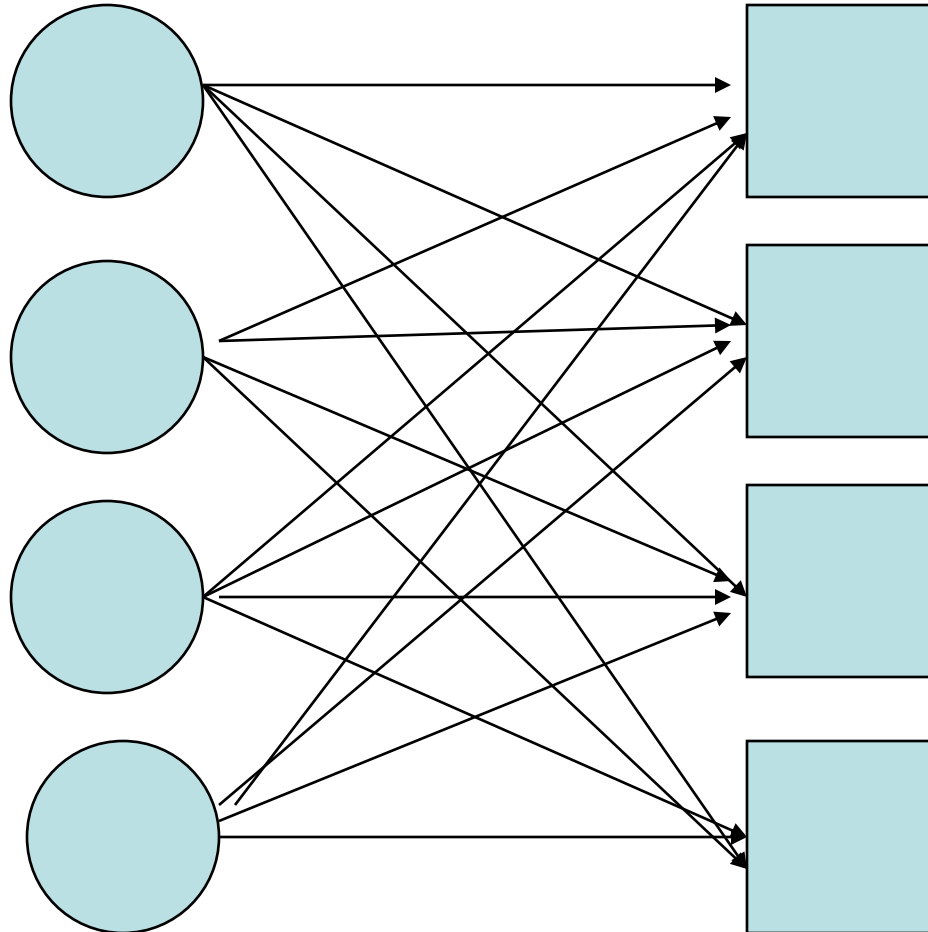
## 1. Direct shipment network

- all shipments come directly from each supplier to each buyer location
- SC manager only needs to decide on the quantity to ship & the mode of transportation
- trade off between transportation & inventory costs

# Direct shipment network

**Suppliers**

**Buyer locations**



# Direct shipment network

- +elimination of warehouses
- + simple to operate & coordinate
- + short time due to direct shipment
- ✓ Large demand at buyer locations
- ✓ Lot size close to TL from each supplier
- ✓ TL vs LTL

# Transportation network design

## 2. Direct shipping with milk runs

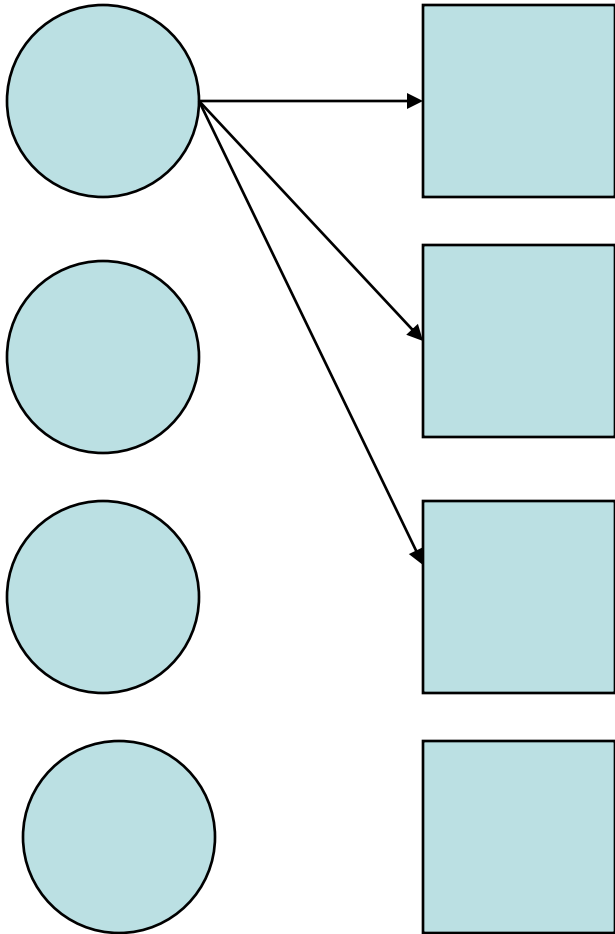
“A milk run is a route on which a truck either delivers product from

- (i) single supplier to multiple buyers or
- (ii) multiple suppliers to a single buyer”

# Direct shipping with milk runs

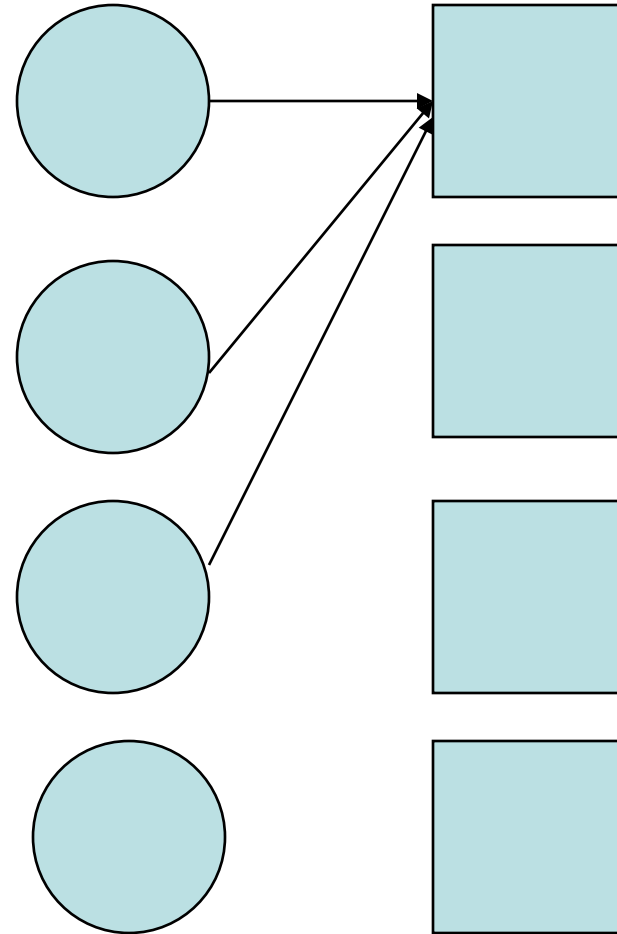
**Suppliers**

**Buyer locations**



**Suppliers**

**Buyer locations**





# Direct shipping with milk runs

+ lower transportation costs due to consolidation

- ✓ Frequent small deliveries
- ✓ Set of suppliers/buyers in close proximity
- ✓ Toyota – Japan : single supplier to many assembly plants & US : many suppliers to each assembly plant

# Transportation network design

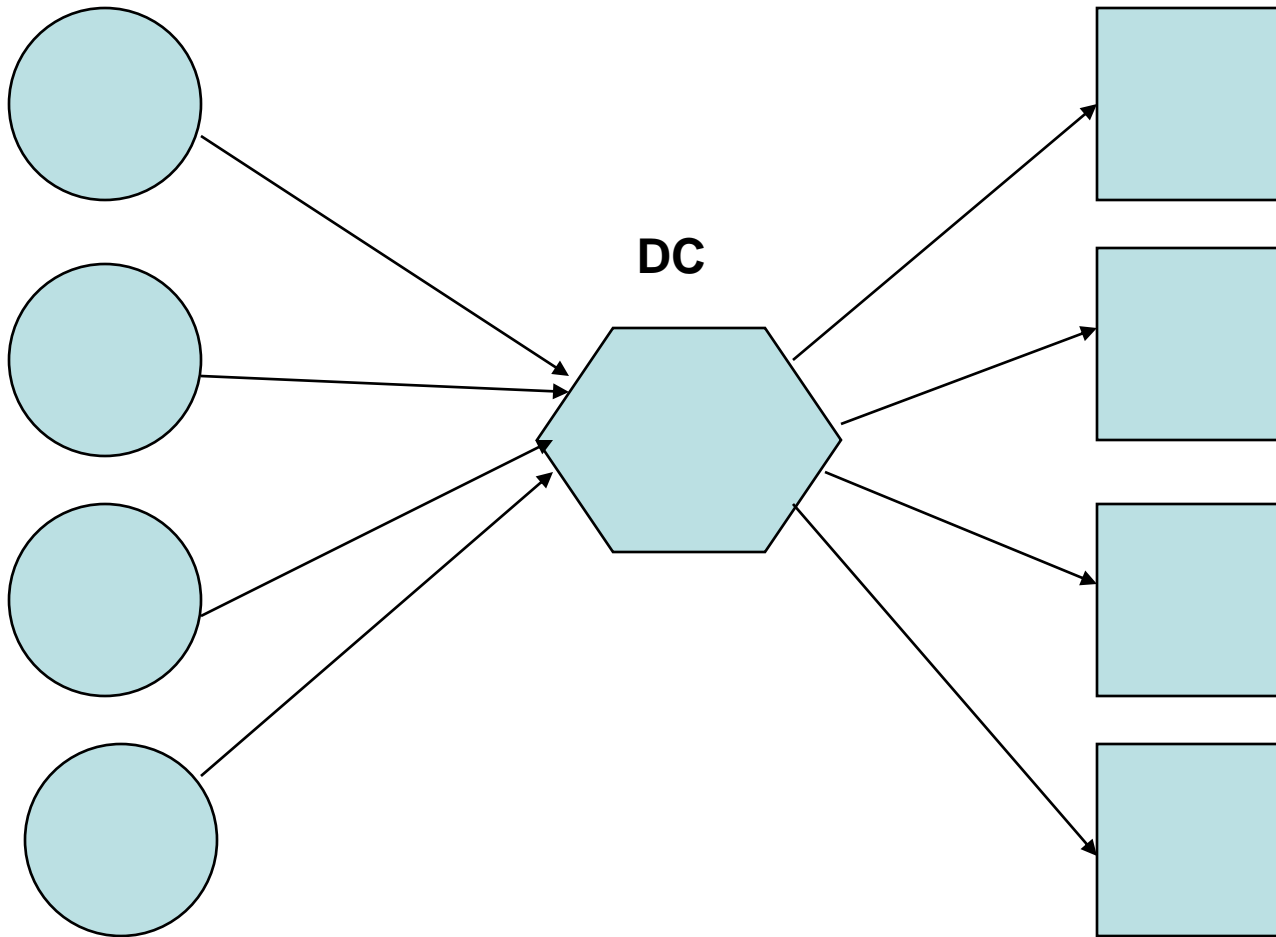
## 3. All shipments via central DC with inventory storage

- buyer divides locations by geographic region
- a DC is built for each region
- suppliers send their shipments to the DC
- DC forwards appropriate shipments to each buyer location

# All shipments via central DC with inventory storage

**Suppliers**

**Buyer locations**



# All shipments via central DC with inventory storage

- DC – 2 roles
- Stores inventory
- Serves as transfer location
- Wal-Mart sources from overseas suppliers – product held at DC – DC serves the stores
- ✓ Lower SC costs when suppliers are far from the buyers
- ✓ DC - EOS in inbound transportation
- ✓ DC – lower outbound transportation costs due to location advantage

# Transportation network design

## 4. All shipments via central DC with cross docking

- if lots to be served by DCs are larger then DC does not need to hold inventory
- Cross docks products arriving from various suppliers

# All shipments via central DC with cross docking

- breaks each inbound shipment into smaller shipments, then loads into trucks going to each buyer location
- each inbound truck contains product from a supplier to several buyer locations
- each outbound truck contains product for a buyer location from several suppliers



# All shipments via central DC with cross docking

- + little inventory needs to be held
- + faster product flows
- + saves handling costs (no moving into & out of storage)
- ✓ Synchronization between incoming & outgoing shipments
- ✓ Products with large, predictable demands
- ✓ Wal-Mart has used this successfully

# Transportation network design

## 5. Shipping via DC using Milk runs

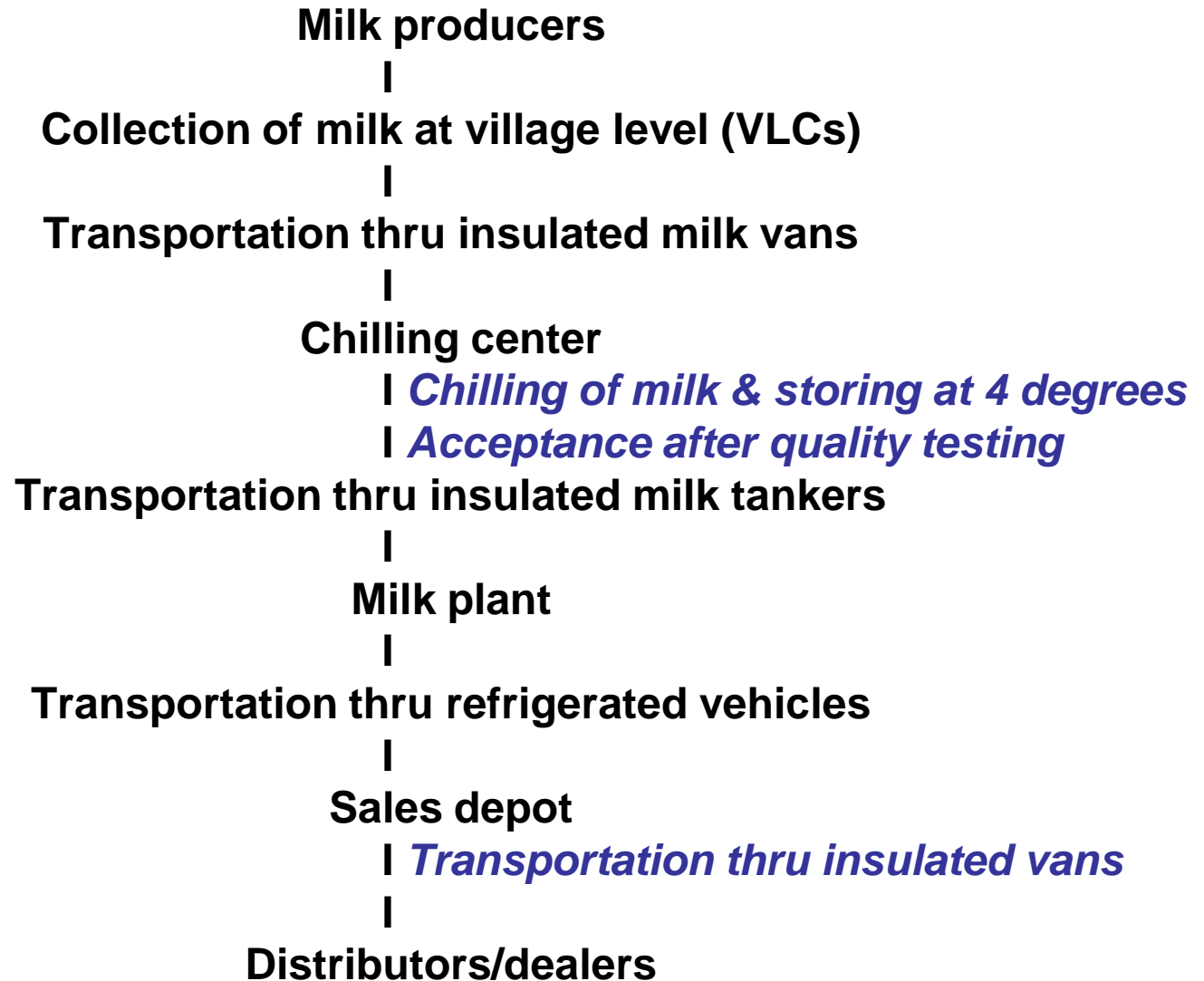
- if lot sizes to be delivered to each buyer location are small
- milk runs consolidate small shipments resulting in lower costs

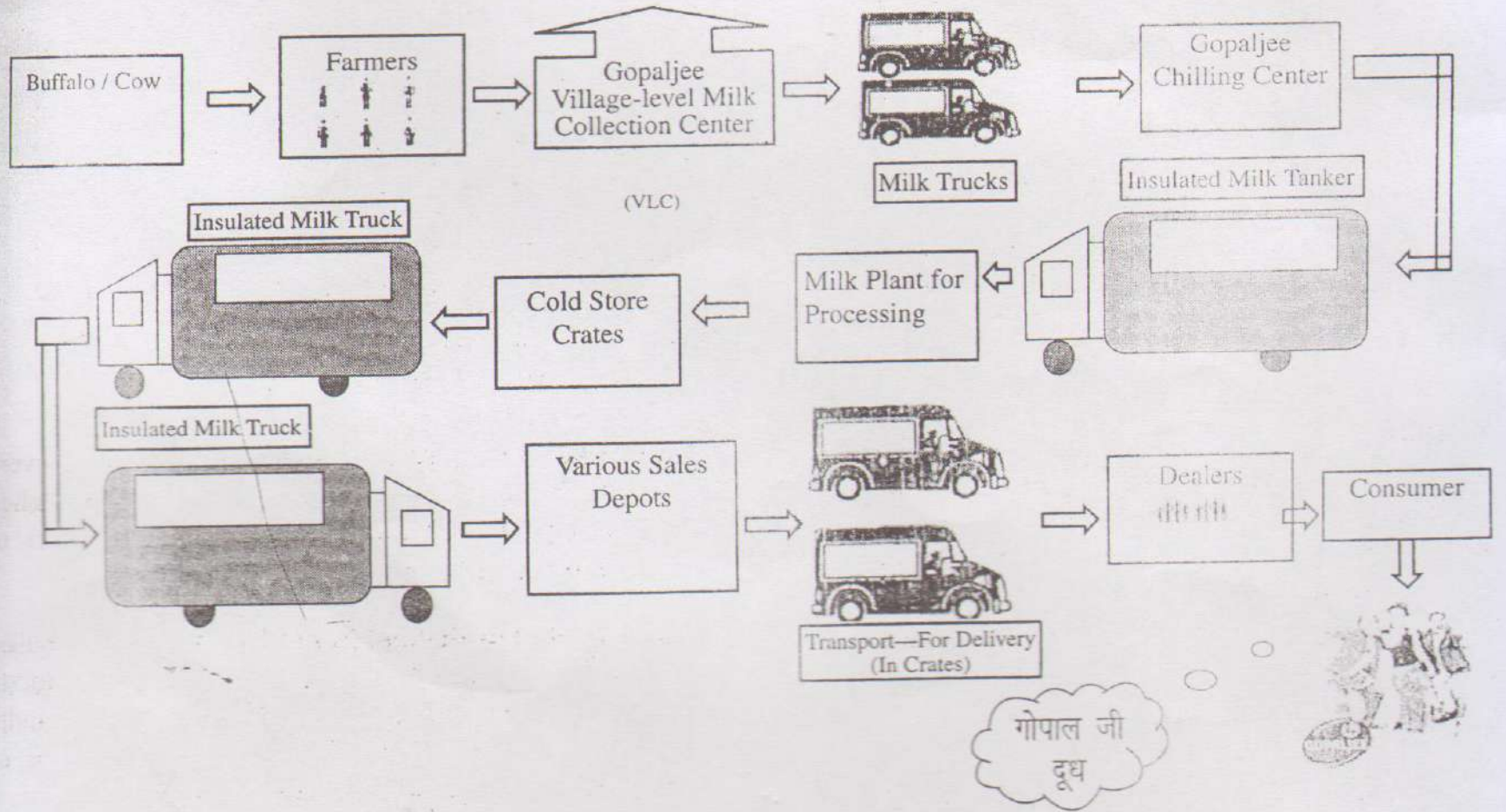
## 6. Tailored network

- combination of options that reduces the cost & improves SC responsiveness

Direct shipping	Supplier to buyer location
Direct shipping with milk runs	Consolidation of small shipments
Shipments via DC with inventory storage	Supplier to DC-storage-buyer location
Shipments via DC with cross docking	Supplier to DC –cross docking-buyer location
Shipping via DC using milk runs	Supplier to DC - consolidation of small shipments-buyer location
Tailored network	Combination of the options used simultaneously

# Gopaljee Milk run for Milk





A Journey of **GOPALJEE** Milk from Farmer to Consumer

# Fleet management

- Fleet management includes a range of functions such as vehicle financing, vehicle maintenance, vehicle tracking, driver management, speed management, fuel management & health & safety management
- By in house fleet management department or outsourced fleet management provider



# Fleet management deals with

- removing/minimizing the risks associated with vehicle investment
- improving efficiency & productivity
- reducing overall transportation & staff costs
- 100% compliance with government legislation

# Aspects of fleet management

- Identifying needs
- Acquisition process
- Insurance
- Vehicle leasing (internal & External)
- Vehicle management-Fleet management systems
  - Vehicle maintenance & upkeep
- Vehicle usage
  - Vehicle disposal
- Health, safety & security
  - Complying with Legislature
  - Complying with security requirements
  - Drivers

# Identifying needs

- Nature of emergency & operations
- Size & area of operation
- Local fuel availability
- Availability of local dealers
- Spare parts availability
- Acquisition costs
- Warranties
- Availability of competent mechanics

# Acquisition process

- Standard recommended vehicles
- Tender process
- Outsourcing a few fleet management functions
- Leasing

# Insurance

- Form of insurance for the vehicles
- 3<sup>rd</sup> party insurance cover
- Fully conversant with accident & incident reporting procedures for vehicles & personal injury
- Insurance cover for personnel
- 3<sup>rd</sup> party, 3<sup>rd</sup> party theft & fire, comprehensive or liability insurance
- rent/outsource – negotiations with service provider

# Vehicle leasing (internal & External)

- External leasing : The ownership could
  - (i) remain with the leasing company or entity, but the rights for use are passed on to the lessee for the period of the lease
  - (ii) at the expiry of the lease, the ownership is transferred to the lessee
  - (iii) the ownership remains with the lessee, but some aspects remain with the leasing company
- Internal leasing : The organization itself owns the vehicles which are centrally managed and issued to on a cost recovery basis.



# Vehicle management

- May lie with admin/transport/independent fleet manager
- Vehicles are expensive but critical
- Proper management requires
  - (i) entry in log book & monitoring the same
  - (ii) fuel costs
  - (iii) vehicle keys
  - (iv) drivers

# Vehicle management

- Fleet management systems
  - designed in house for internal use to provide analysis of vehicle & driver performance
  - Structured to capture information on fleet usage, maintenance & operations
  - Weekly, monthly, bi-monthly reports & summaries by vehicles

# Vehicle management

- Vehicle maintenance & upkeep
  - Selection of garage
  - Qualified technical staff
  - Minimum equipment
  - Basic spare parts in a workshop
  - Maintenance documentation

# Vehicle usage

- Light vehicles – office operations & within urban settings
- Heavy vehicles – field bases operations
- Drivers / authorized staff
- Vehicle disposal
- Running old vehicles – uneconomical
- Stipulated policies on when & how to replace/dispose old vehicles

# Health, safety & security

- Vehicle safety → staff safety → road safety
- Complying with legislature & security requirements that are country specific
  - reg. driving authorization documents,
  - type & size of vehicles allowed,
  - communication systems in the vehicles,
  - duties & taxes, etc

# Containerization

# Containerization

- It is a system of freight transport based on a range of steel inter modal containers
- Containers are built to standardized dimensions, and can be loaded and unloaded, stacked, transported efficiently over long distances, and transferred from one mode of transport to another without being opened.
- The system, developed after World War II, led to greatly reduced transport costs, and supported a vast increase in international trade.











**ITAL FLORIDA  
TRIESTE**

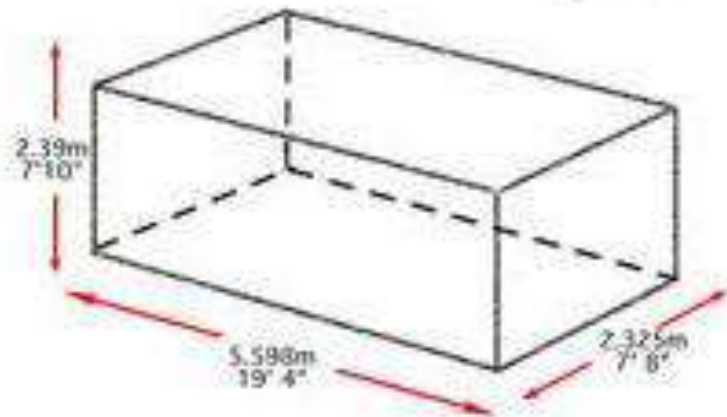
IMO 9308038

22.06.2007

# Containerization

- Twenty foot equivalents TEU – 6.10m length \* 2.44m width \* 2.059m height = 30.5 m<sup>3</sup>
- General purpose dry van for boxes, cartons, sacks, bales, drums in standard height
- Temperature controlled reefer
- Open top bulk containers

20 Ft Container  
Internal Dimensions



Cubic Capacity

33.2 Cubic Metres  
1173 Cubic Feet



# Containerization

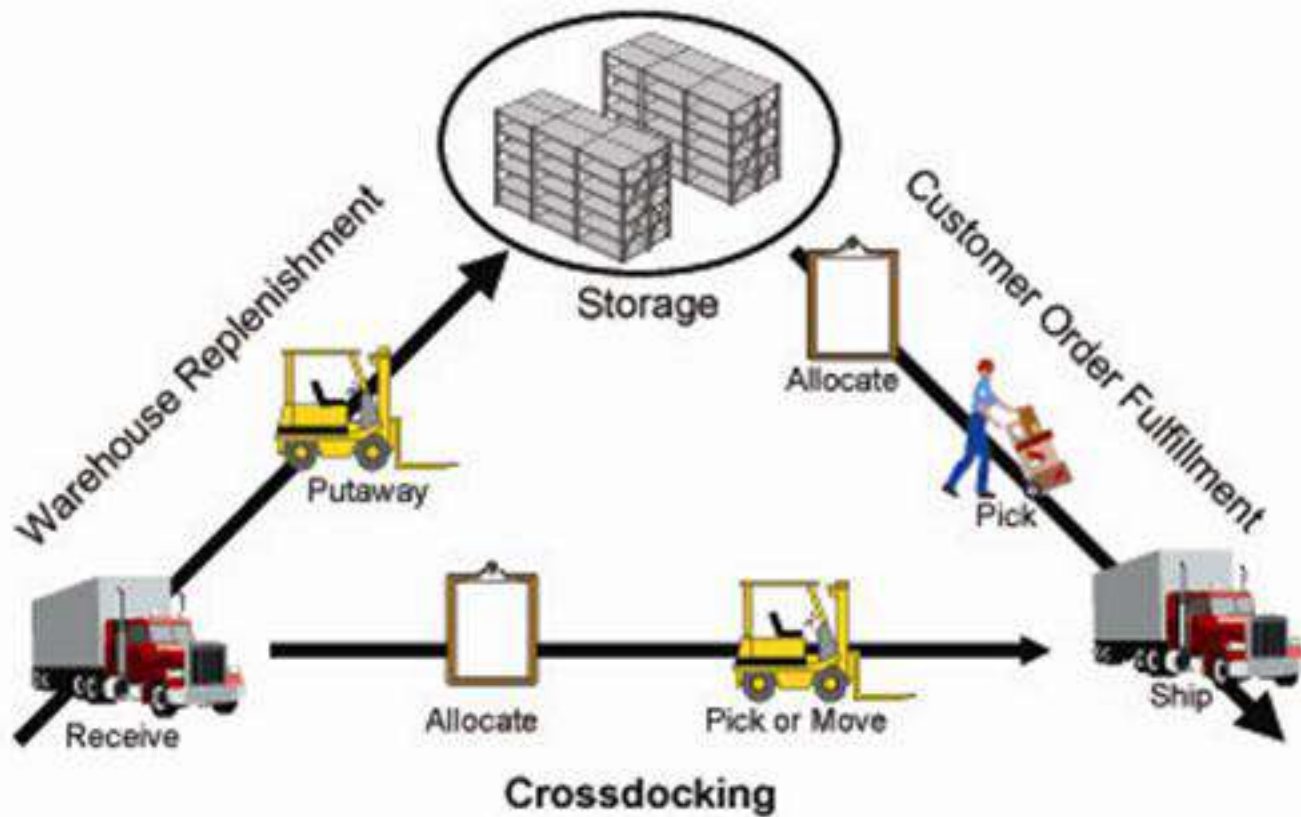
- + time saving
- + less handling
- + no theft / pilferage / damage
- + flexibility
- + labor saving
- high cost of specialized ships
- Not suitable for small shipments
- Improperly secured cargo

# Cross docking

- **Cross-docking** is a practice in logistics of unloading materials from an incoming trailer/truck/rail car and loading these materials directly into outbound trucks, trailers, or rail cars, with little or no storage in between.
- Moving cargo from one transport vehicle directly into another, with minimal/no warehousing
- Staging areas



# Cross docking





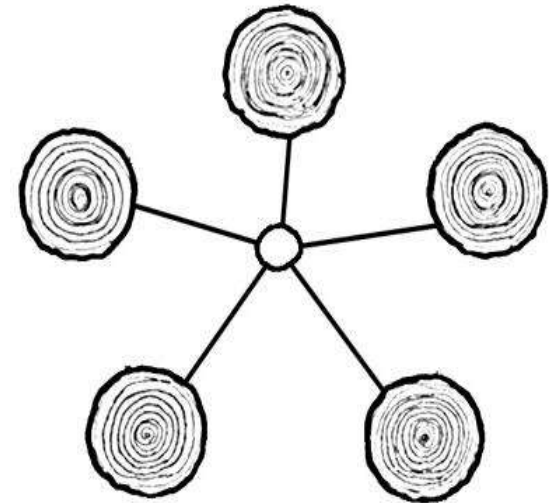
# Cross docking

This may be done

- (i) to change type of conveyance
- (ii) to sort material intended for different destinations
- (iii) to combine material from different origins into transport vehicles (or containers) with the same destination.

# Cross docking

- Hub & Spoke arrangements
- Consolidation arrangements
- Deconsolidation arrangements



# Cross docking

- Adequate transportation system
- Adequate IT support
- Storage/staging area