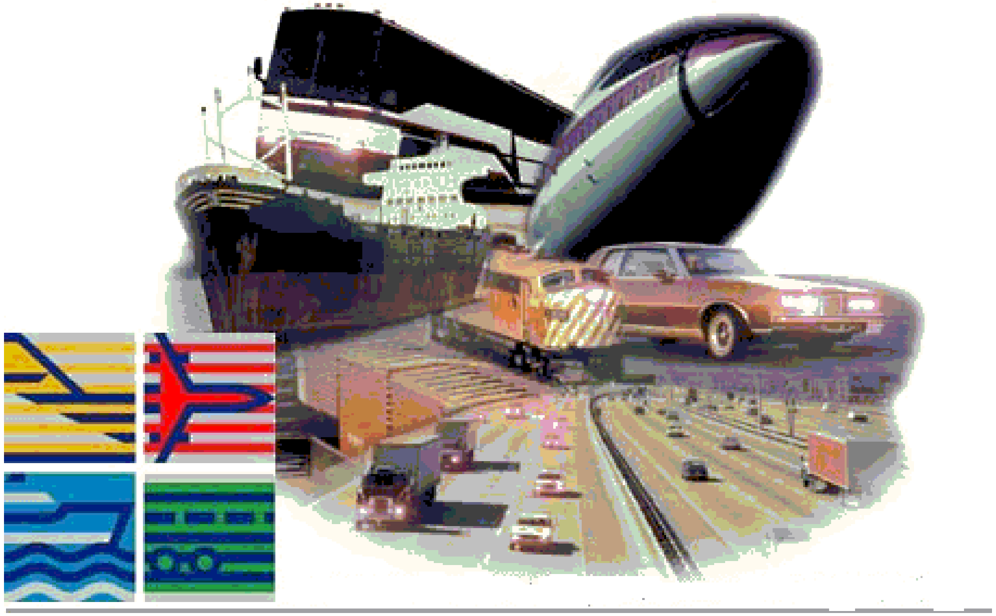


MULTIMODAL & INTERMODAL TRANSPORT

MT COURSE Frédéric Gauthier

Our learning objectives

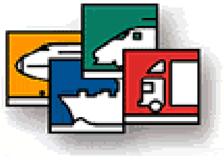
- To understand escalating importance of multi/intermodal transport as efficient answer to worldwide economic and environmental concerns through a sustainable development outlook

- To understand specificities in management, loading units and substructures

- To learn various categories of multi/intermodal transport depending on intercontinental or continental approach

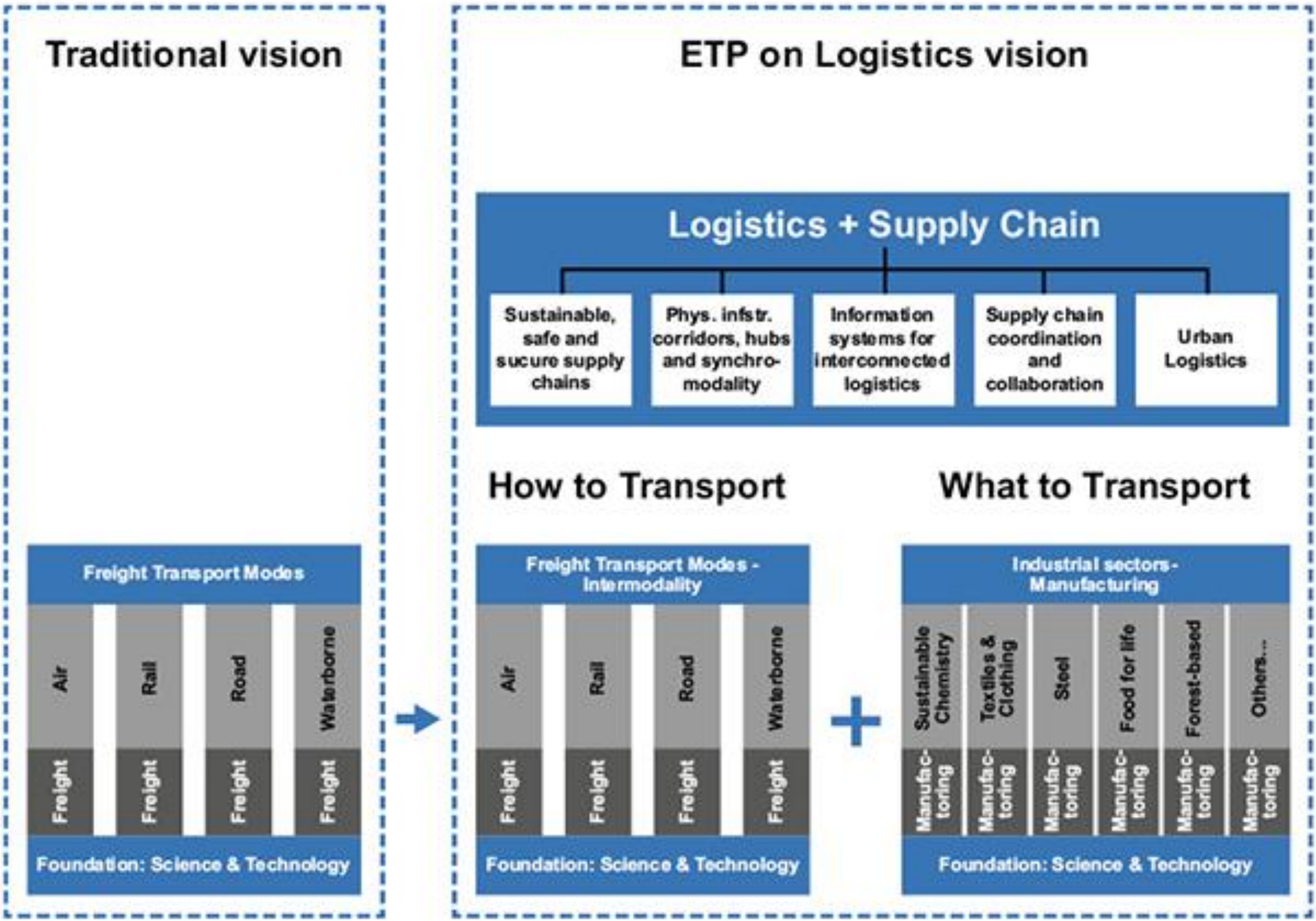
Our learning objectives

- To learn why multi/intermodal transport is changing quickly on a continuous basis
  - Information
  - Regulations
  - Political
  - Economical
- To see how multi/international transport is a key issue in EC economy today and tomorrow



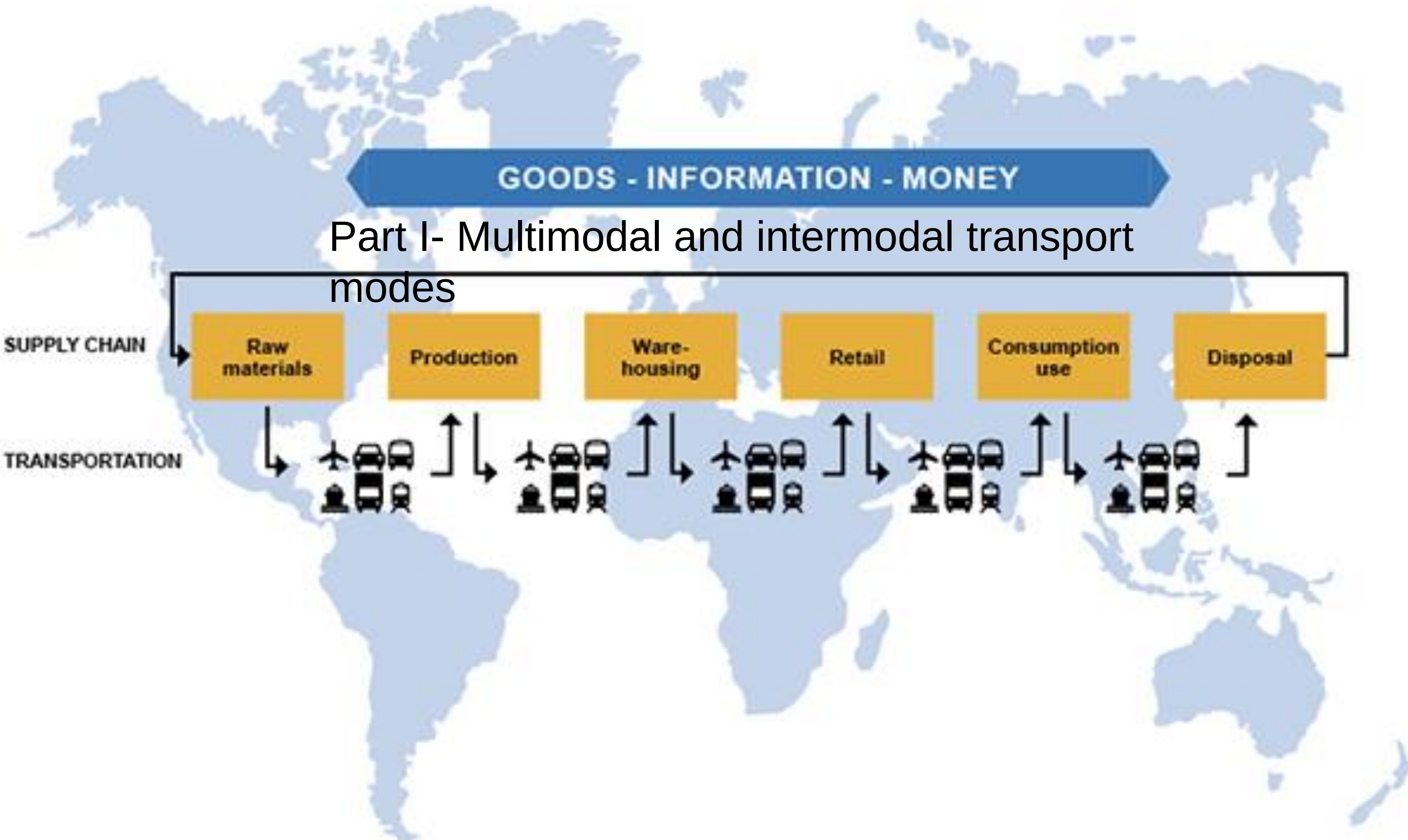
Programme

- Introduction
- I- Multimodal intermodal definitions & transshipments
- II- World flows
- III- Intercontinental distances
- IV- Continental distances
- V- The multimodal Transport Operator
- IV- Information and regulation



Traditional vision
ETP on Logistics vision
Logistics + Supply Chain
Sustainable, safe and sucure supply chains
Phys. infstr. corridors, hubs and synchro-modality
Information systems for interconnected logistics
Supply chain coordination and collaboration
Urban Logistics
How to Transport
What to Transport
Freight Transport Modes
Air
Rail
Road
Waterborne
Freight
Foundation: Science & Technology
Freight Transport Modes - Intermodality
Industrial sectors - Manufacturing
Sustainable Chemistry
Textiles & Clothing
Steel
Food for life
Forest-based
Others...
Manufac-toring

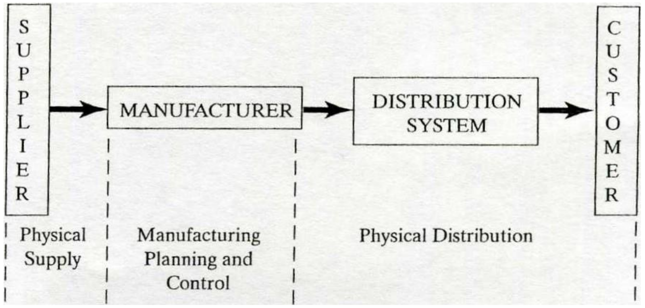
Part I- Multimodal and intermodal transport modes definitions

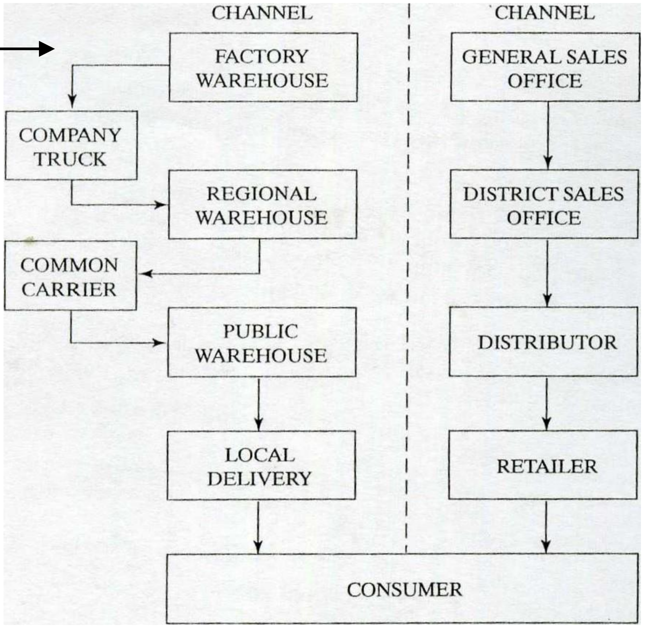


Part I- Multimodal and intermodal transport modes

Presentation

- Multimodal transport & Physical distribution
  - Physical supply
  - Distribution
    - Fragmented
    - Than concentration
  - **Channels of distribution**
    - Transaction channel of distribution centers separated from factories
    - Distribution channel as a display function of models
    - Identification of logistics problems
      - Deciding the location, size and time
    - **Multimodal approach needed**
      - To the channels of distribution
      - The types of markets
        - Geography, orders, goods
          - Weight, density, fragility, perishability
      - And type of transportation as available





- **Activities in distribution systems**
  - Transportation
    - The single highest cost of distribution
  - Distribution inventory
    - The second most important
  - Warehouses (distribution centers)
  - Materials handling : capital cost
  - Protective packaging
    - Contained, protected and identified
    - Fitting into transportation
  - Order processing and communication
    - Time element

Example
Transport rail cost $200
Transit time 10 days
Low value product
Inventory cost 10$ a day
Rail will be cheaper
Moved by air $1,000

- Total cost concept
  - Cost tradeoff
    - Transportation and carrying inventory
  - Interface
    - Supply/production/Distribution
  - Production
    - Cost of interrupting production
    - Availability of transportation
      - Raw material example and location

transportation

- Transportation
  - Modes to be connected
    - Road, rail, air, water, pipeline
  - Cost of carriage
    - Basic physical elements
      - Ways, terminals, vehicles
    - Fixed and variable cost
      - Purchase of the truck
      - Fuel, maintenance, ? driver's wage ?
  - Terminals
    - Connections performance
    - Maintenance, owned by carriers or publicly owned
  - Vehicles
    - All modes
      - Except pipelines

Intermodality

- Intermodality
  - Recent reduction of transport cost … or not
    - Containerization
    - Internationalization of standards
    - Rapid dissemination of information
    - Cure for land congestion but …
    - https://www.businessinsider.com/shipping-delays-china-supply-chain-record-ships-stuck-california-ports-2021-8
  - Information technology
    - Crossdocking
      - Immediately dispatched
      - Depends on IT tools
    - Warehouse management system
    - Vendor managed inventory system VMI

A record-breaking 44 container ships are stuck off the coast of California

Intermodality

- Intermodality
  - E-commerce
    - and Big Data : G.P.S., W.M.S….
    - Resulting in a strong competition among networks
    - To reconfigure traditional transport patterns
    - Reducing transaction costs …
    - By the way could affect number, size and location of physical points of sale such as … shops
  - Logistics and global production networks
    - Conforming to customer requirements
    - A detailed understanding of inefficiencies
      - Improvements through value stream mapping
    - 3PL firms carry out logistics functions
      - Instead of first and second party
      - Major freight forwarders
    - Self reinforcing fashion and decline in transport cost …

Intermodality

- Intermodality
  - Transport energy consuming
    - EU example 30% of energy used
    - Aviation sector
    - Solutions
      - Technology based
      - Infrastructure based
      - Flow based
    - Efficiencies
      - Energy
      - Loading
      - Intermodal transport systems and alternative modes
    - Bottlenecks to solve

SUM UP

- Why is Multimodal transport key to global flows
- Why sustainable to coming years

After this main picture,
let's go further …
Multimodal transport is a critical solution but what's ABOUT multimodal transport

1- common characteristics

2- multimodal transport

3- intermodalism

4- combined transport

5- terminal and cargo handling equipment

1- Common characteristics

- By at least two different modes of transport
  - Multimodal transport
  - Intermodal transfer and transportation
  - Intermodal freight transportation
  - A single freight bill
    - *CEMT*

Single contract of carriage

- Through freight rate – liability storage – handling

Maritime access and use

- A network – all types of transportation
- Access
- Geography
- Economies of scale
  - Per unit cost – consolidation and break bulk
  - Infrastructure factor

2- multimodal transport

- Carriage of goods
- Containerised and non containerised transport
- General cargo
- Bulk cargo
- Neo bulk

3- Intermodalism

Development of cellular containerships and relevant ports

Quick turn around

Increased productivity – efficient cost – effective transport network

Integration

- The same loading unit – eliminating to unpack and repack
- Containerised movement of cargo
  - Quicker transfer of cargo
  - Heavy capital investments

MT COURSE Frédéric Gauthier

3-

Transport and handling cost

- storage

Utilization of vehicles and facilities

- infrastructures

Paper work and time

Prevention from loss

Driver-accompanied / unaccompanied

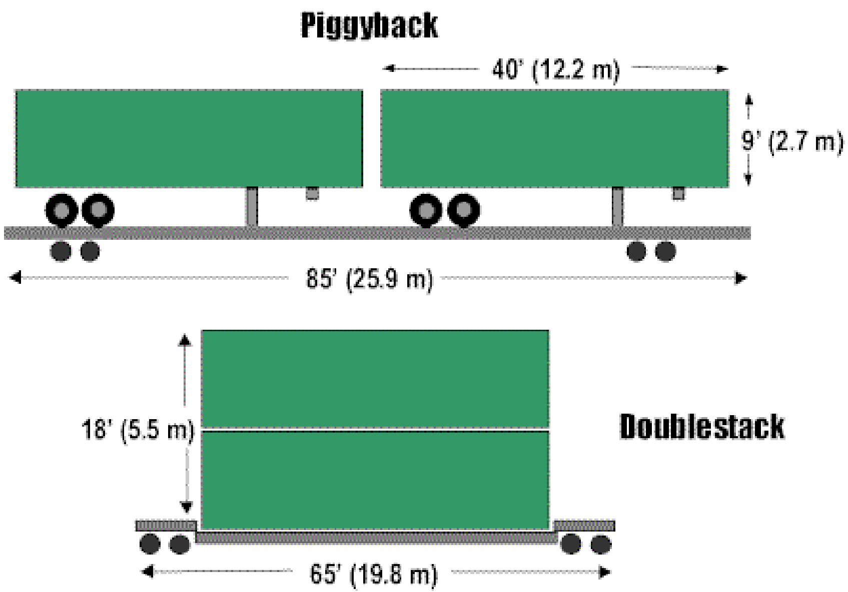
ISO containers

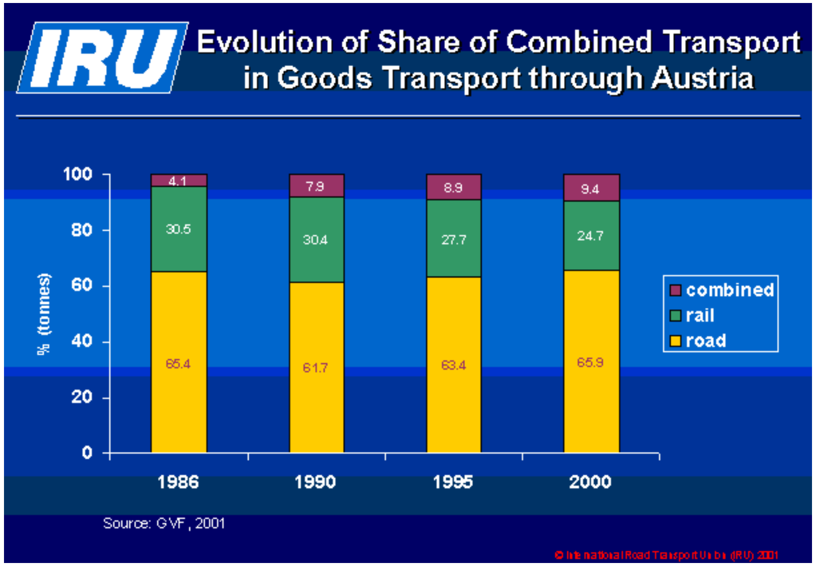
- Rail or road

Short sea - deep sea and barge

Intermodalism & container

4-Combined transport





4-

- Definition
  - Intermodal transport units ITU
  - Remain in their original packaging
  - Roll on Roll off
  - Rolling road
  - Lift on lift off

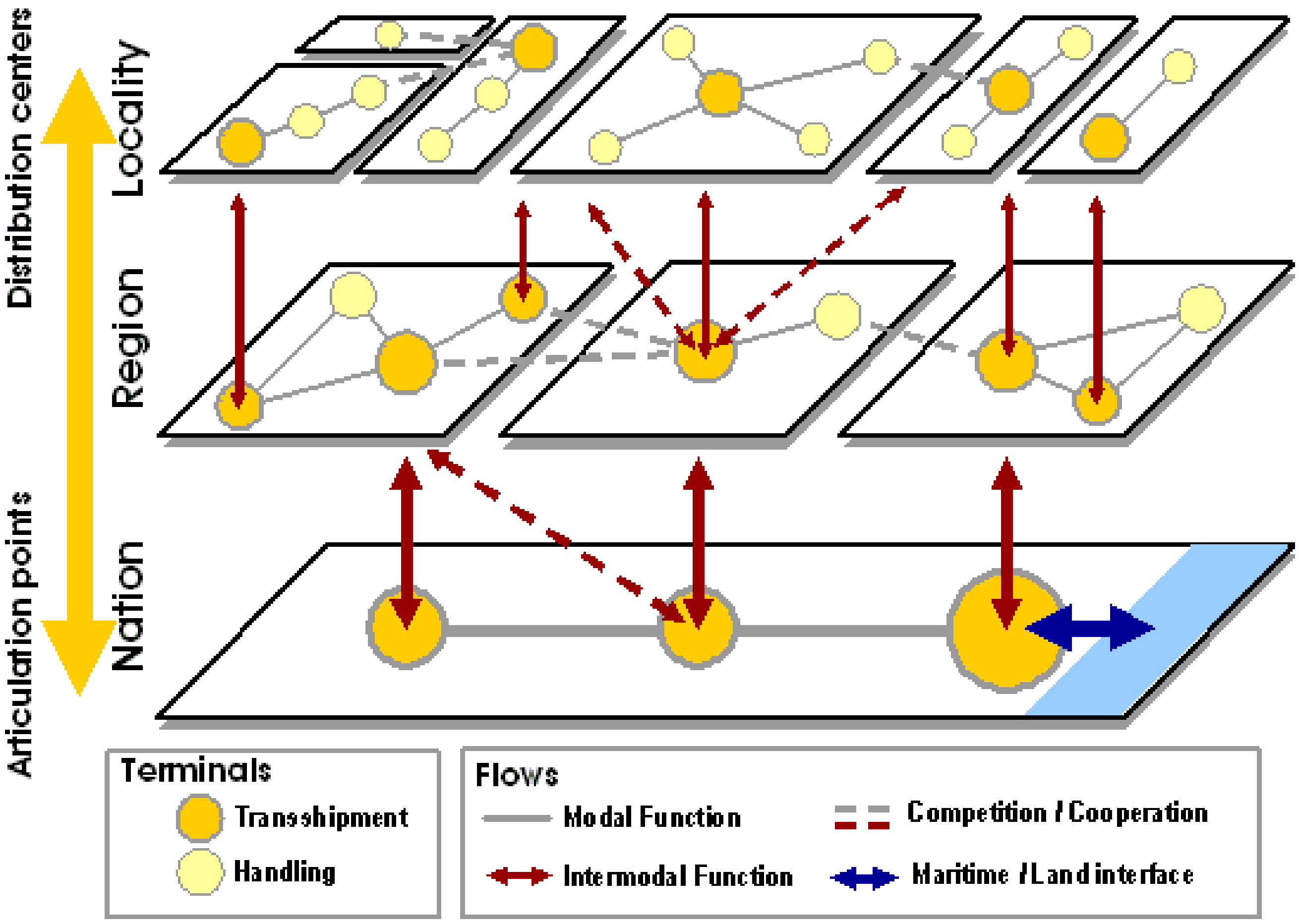
SUM UP

Definitions

- Multimodal
- Intermodal
- Combined

PREREQUISITE

5- Possible intermodal networks



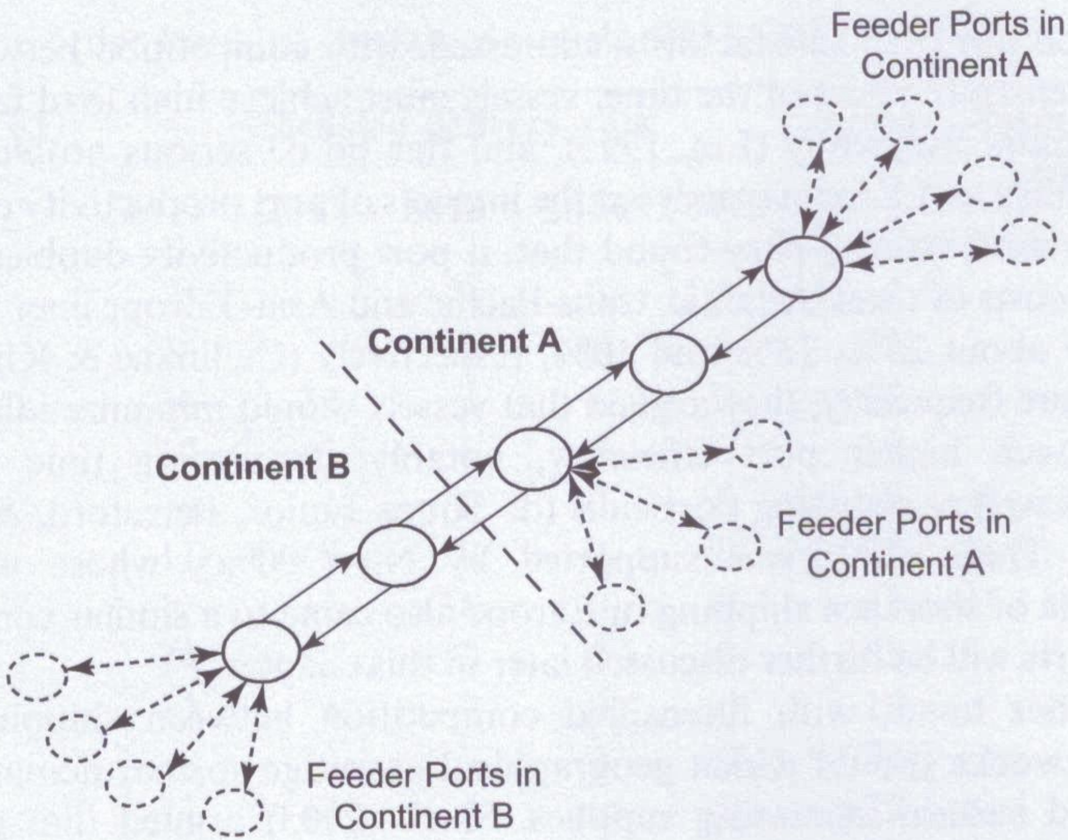
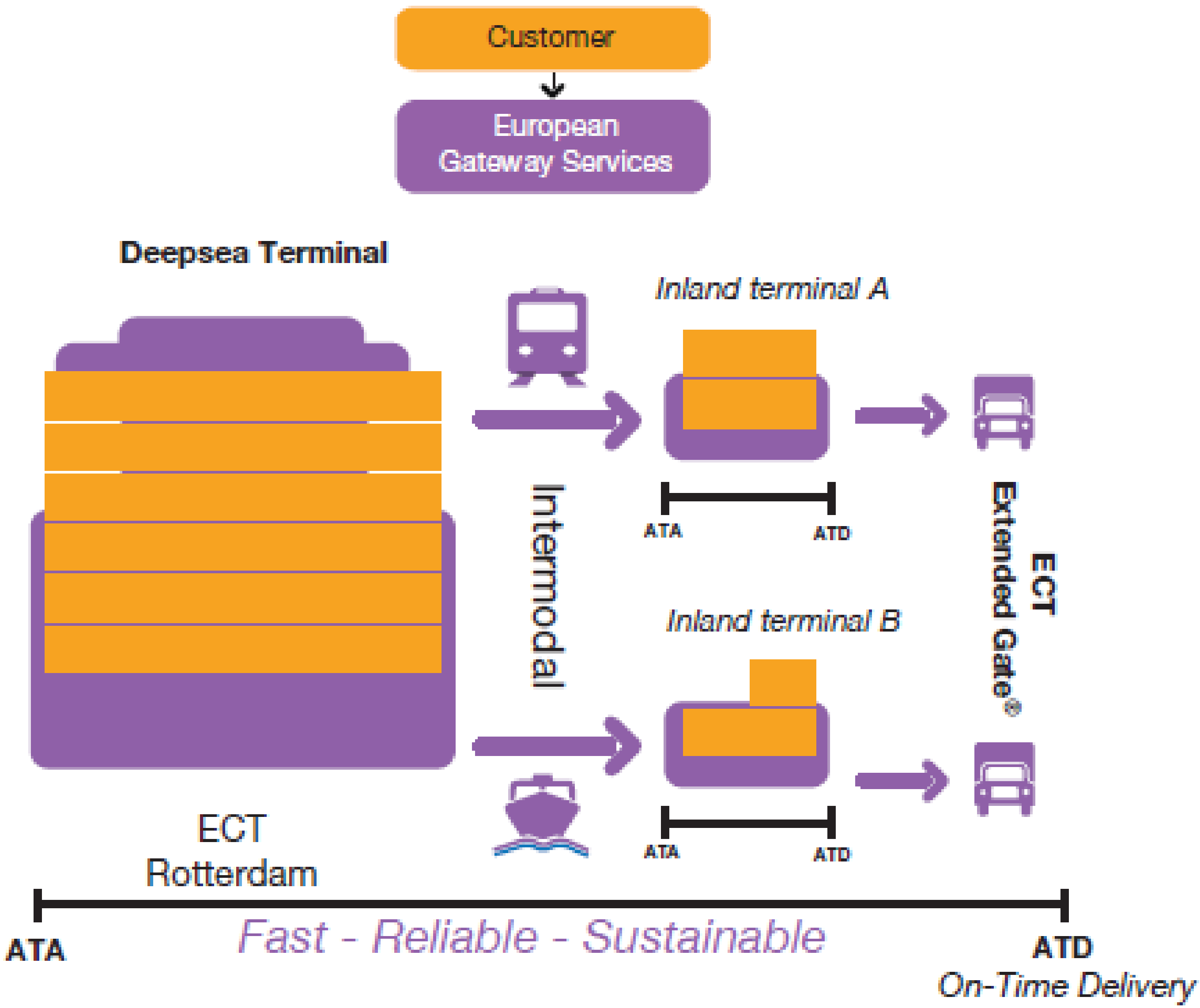
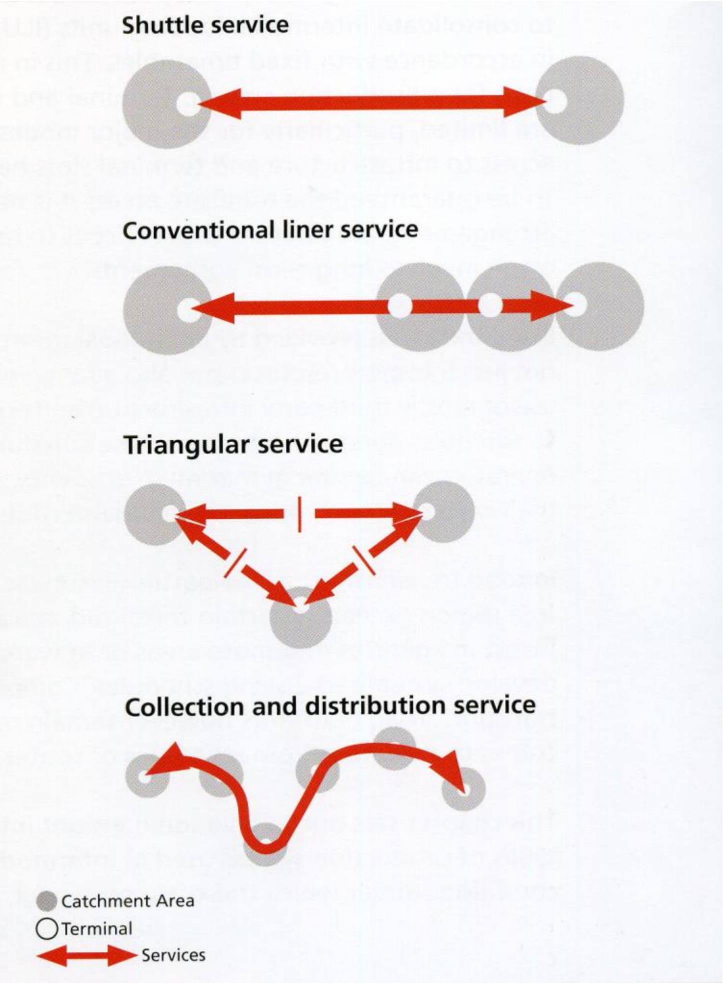


Figure 2.1: A diagram illustrating the trunk-and-feeder system in container liner shipping


Customer
European Gateway Services
Deepsea Terminal
Inland terminal A
Intermodal
ATA
ATD
Inland terminal B
ECT Extended Gate®
ATA
ATD
ECT Rotterdam
ATA
Fast - Reliable - Sustainable
ATD
On-Time Delivery

5-Liner production systems

High transport demand spread over the whole year



Additional stops, in the vicinity of the two end points

- Additional cargo
  - increases revenue

Additional stop costs time

- Extra call may add to
  - the trip distance

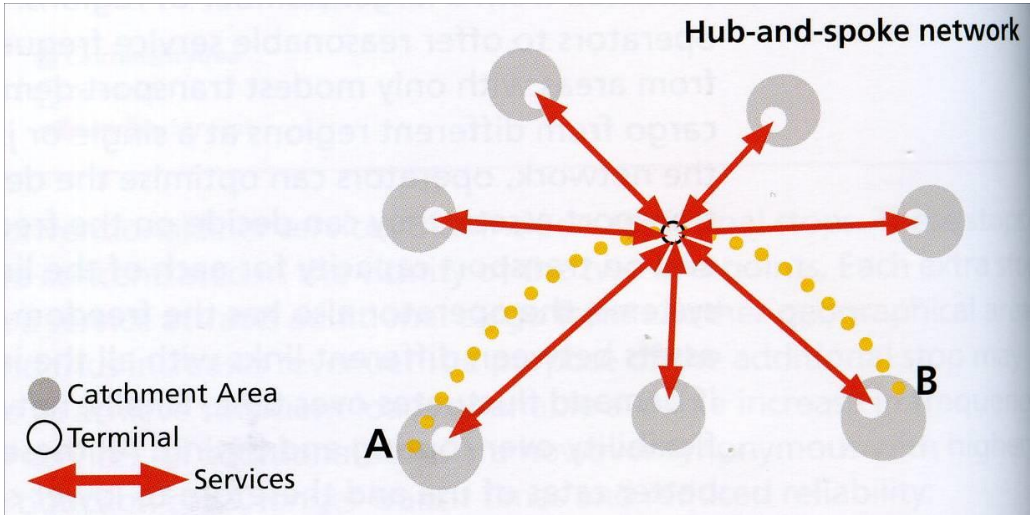
Triangular services

- Short sea shipping
- Regional distribution

5- Network production systems

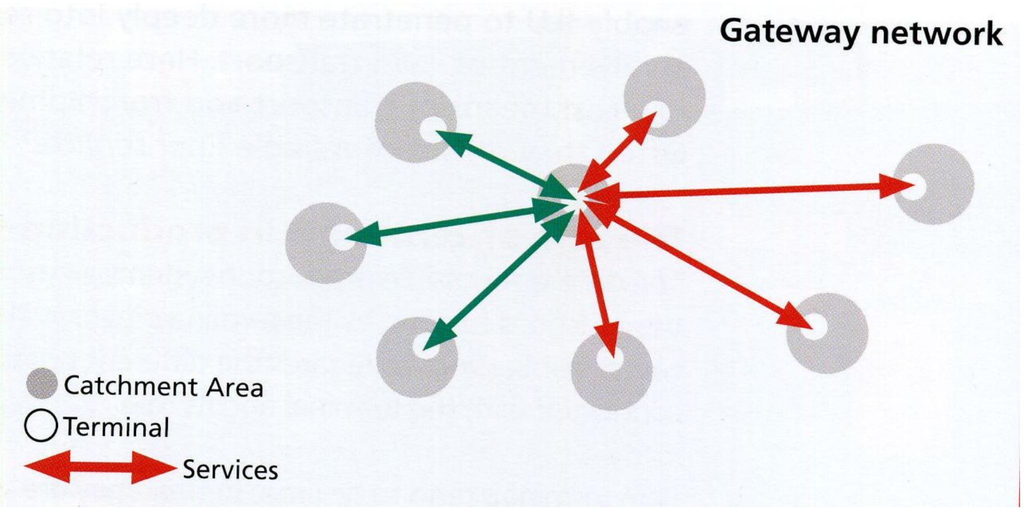
Interconnection points

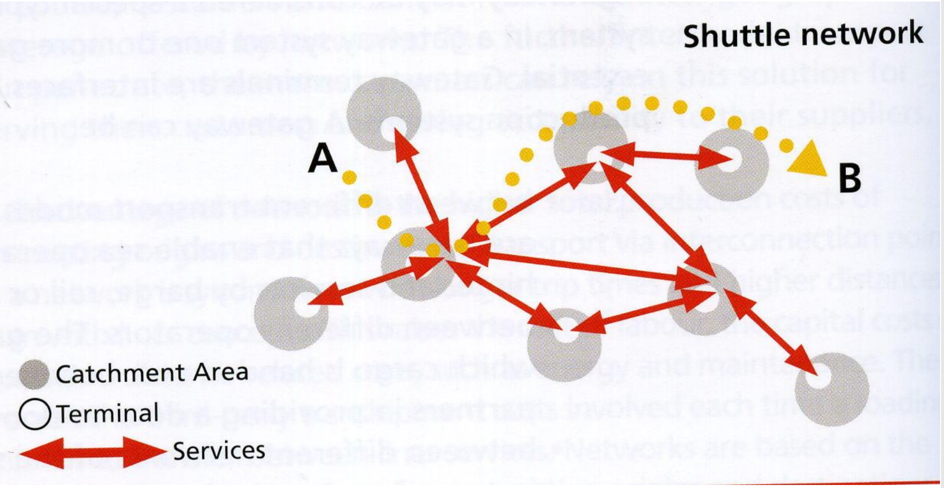
- A larger number of regions
- Deployment of transport assets
- Better geographical coverage



Interfaces between production systems

- Transport modes
- Operators
- Both





5- shuttle network

- Hub and Spoke
  - Large in size
  - Not necessarily linked to the close region
- Difference with gateway terminals
- Regional terminals

- PORT CONGESTION
- Optimization measures
  - Multi-pick lifting
  - Truck appointment system
    - Synchronised time slot
  - Extending gate opening hours
  - Electronic document transmission
    - Customs as well as payment documents
  - High speed gates
    - Optical character recognition
  - Automated yard marshalling
    - Rotterdam

Container terminal classification

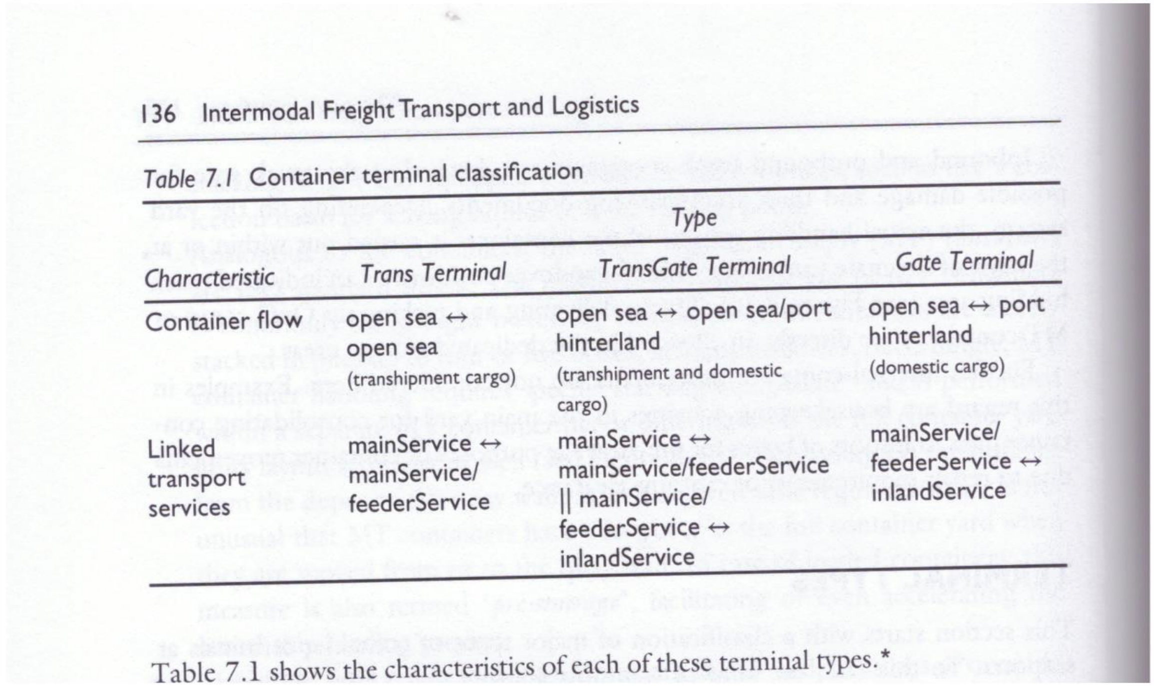


Table 7.1 Container terminal classification

Characteristic	*Type*: *Trans Terminal*	*TransGate Terminal*	*Gate Terminal*
Container flow	open sea ↔ open sea (transhipment cargo)	open sea ↔ open sea/port hinterland (transhipment and domestic cargo)	open sea ↔ port hinterland (domestic cargo)
Linked transport services	mainService ↔ mainService/ feederService	mainService ↔ mainService/feederService || mainService/ feederService ↔ inlandService	mainService/ feederService ↔ inlandService

Table 7.1 shows the characteristics of each of these terminal types.*

Available Port Data
Always
Channel & Berth Depth
Berth Length
Berths
Cranes & Types
Gross Acres
Port TEU
Avg. Vessel TEU
Vessel Calls
Sometimes
Avg. Crane Moves/hr
CY & Rail Acres
TEU Slots
Estimated
Max Vessel TEU
Confidential
Costs
Man-hours
Vessel Turn Time
Rates
Avg. Dwell Time
Working Crane Hours

Yield

Available Port Metrics	
Land Use	
TEU/Gross Acre	Gross/Net CY Acres
TEU Slots/CY Acre (Density)	Net/Gross Ratio
TEU Slots/Gross Acre	CY Utilization
TEU/Slot (Turns)	Moves/Container
TEU/CY Acre	Avg. Dwell Time
Crane Use	
Number of Cranes	Avg./Max Moves per hour
TEU/Crane	TEU/Available Crane Hour
Vessel Calls/Crane	TEU/Working Crane Hour
Crane Utilization	TEU/Man-Hour
Berth Use	
Number of Berths	Max Vessel DWT and TEU
Length of Berths	TEU/Vessel TEU
Depth of Berth & Channel	Vessel TEU/Max Vessel TEU
TEU/Berth	Berth Utilization - TEU
Vessels/Berth	Berth Utilization - Vessels
Balance & Tradeoffs	
Cranes/Berth	Net Acres/Berth
Gross Acres/Berth	Cost/TEU
CY Acres/Berth	Man-Hours/TEU
CY Acres/Crane	Man-Hours/Vessel


SCHELDE
SAFTINGENDOK
PSA - HNN
DEURGANCKDOK
ANTWERP GATEWAY

Key figures for selected container ports

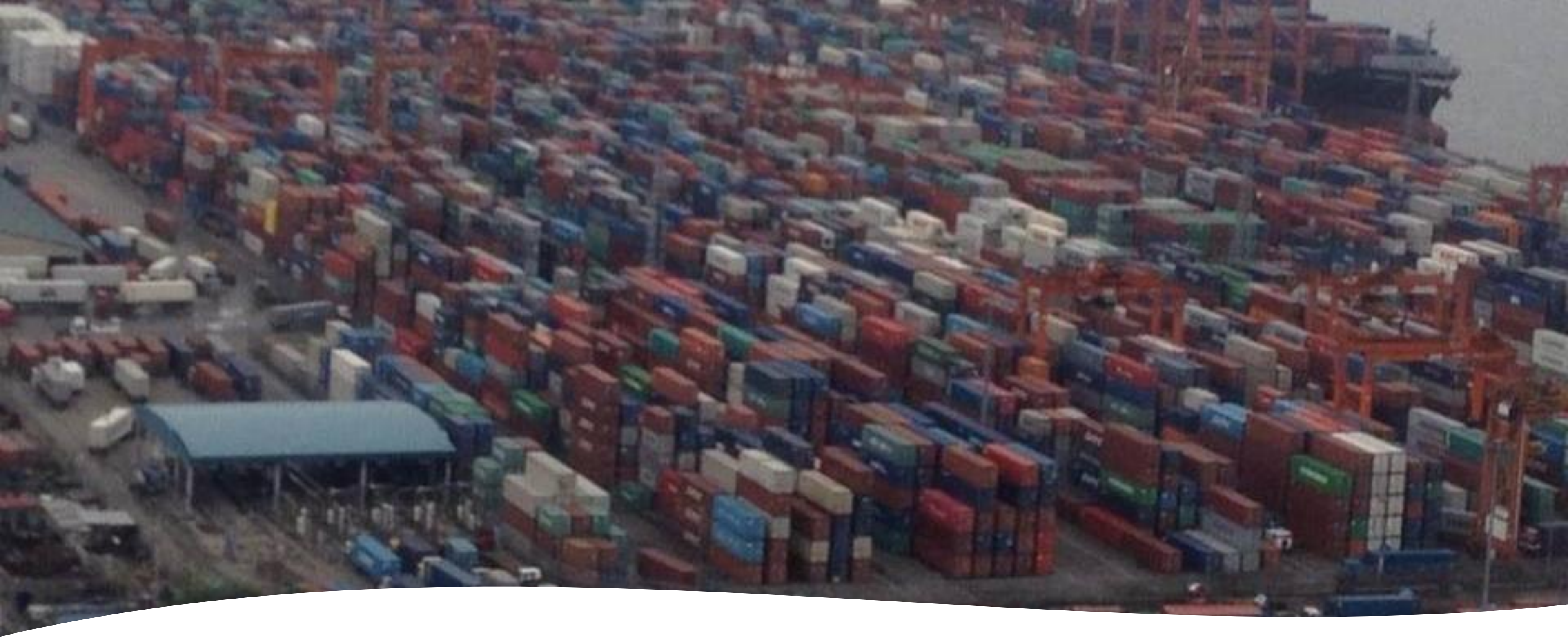
Table 7.2 Key figures for selected container ports

Characteristic	Port of Singapore[a]	Port of Shenzen[b]	Port of Hamburg[c]	Port of Los Angeles[d]	Port of Klaipeda[e]	Port of Riga[f]
# terminals	7	4	4	8	2	2
# berths[g]	57	58	25	31	6	2
quay length	17.350 m	17.505 m	7.570 m	9.336 m	1.908 m	645 m
# STS cranes	212	175	80	72	9[h]	7[i]
terminal area	700 ha	792 ha	440 ha	684 ha	54 ha	125 ha
mio TEU (2014)[j]	33,87	24,03	9,73	8,33	0,49	0,39
Transhipment share	85% (2013)[k]	50% (2013)[k]	36% (2015)[l]	<10% (to date)[m]	<10% (to date)[m]	<10% (to date)[m]

a PSA Singapore, 2016.
b Zheng and Park, 2016.
c Hamburg Port Authority, 2016.
d Port of Los Angeles, Container, https://www.portoflosangeles.org/, 2016.
e Drungilas, 2015.
f Freeport of Riga Authority, 2009.
g Berth length: about 300m
h Thereof 4 mobile cranes.
i Thereof 1 mobile crane.
j World Shipping Council, Top 50 world container ports, http://www.worldshipping.org/about-the-industry/global-trade/top-50-world-container-ports, 2016.
k Marine Information Service, 2015.
l Hafen Hamburg Marketing, 2016.
m Rodrigue, J.P., The geography of transport systems: Levels of transshipment incidence, https://people.hofstra.edu/geotrans/eng/ch4en/conc4en/transshipment_incidence.html, 2016.

Yard operations

- Reefer container requirement
- Containers with hazardous goods
- Empty containers stacking
- Landside operations
- Terminal types
  - Pure transhipment terminal
  - Combined transhipment and gateway terminal
  - Pure gateway terminal
  - Trans terminal



- PORT CONGESTION
- Optimization measures
  - Hinterland traffic diversion
  - Congestion pricing
  - Off-dock container yards
  - Fast rail shuttles
  - Expanded rail connections

Examples ….

Appendix A: Survey Country Reviews on Congestion

Table 4.A.1: Synthesis of survey country reviews on congestion.

Port	Measurement and data used	Current state of congestion	Expected development of congestion	Policy plans
Miami	No structural measurement	Problem landside: gate, location close to city	Increasing	Major port redevelopment, new gate system
Antwerp	Time registration for every vessel	Sometimes congestion, especially at terminals	Situation will improve: new quays, better rail, inland navigation and trucking system	Barge Traffic Services, new rail system, trucking assignment
Gdynia	No structural measurement	No congestion, at least not on maritime side	Worsening if no measures	Better hinterland connections
London	Every vessel is registered by the Port Authority	No structural congestion on maritime side	Probable worsening in hinterland	No structural plans
Rotterdam	No vessel registration	Only congestion on hinterland side	Pessimistic	No new infrastructure plans
Humber	Time measurement for every vessel	No congestion	No immediate worsening	No plans needed at this stage
Hamburg	No measurement	Congestion occurs, but not quantified	No worsening	No plans available
Long Beach	Some measurement, not structural	Road and rail increasingly congested, terminals equally congested	As traffic increases, problems may worsen	No immediate plans
Felixstowe	Shipping companies do measurements	No congestion	No worsening expected	No plans
Barcelona	Measurement of time that goods spend in port	Some inland congestion	No worsening expected	Discussion groups, no plans yet
Kotka	Data are collected for ships and at terminal	No real congestion	No worsening expected	No plans

SUM UP

- What are transport production systems ?
- What are nodes ?
- What has multimodal transport to manage ?

6- terminal and cargo handling equipment

Inter port competition has intensified

Less fidelity of shipping lines

Example of New York and Maersk

Efficient infrastructures

- Coopetition and regional port governance
- Busan and Rotterdam

Le Havre Hamburg ranges

The Pearl River Delta

Acronyms by sea

Free In	Free In FI : on board ship/ port of departure
Free in	Free in Stowed FIS : on board ship port of departure stowed
Free out	Free out FO : on board ship, port of destination
Free In	Free In / Liner Out FILO : on board ship port of loading (regular lines)
Board	Liner In / Free Out LIFO : on board ship port of arrival (regular lines)
Free In and Out	Free In and Out FIO : on board ship port of departure, on board ship port of arrival, stowed
Free In	Free In Out Stowed FIOS : On board port of departure, on board port of arrival , stowed
Free in	Free in Out Trimmed FIOT : idem FIO, marchandises en vrac nivelées

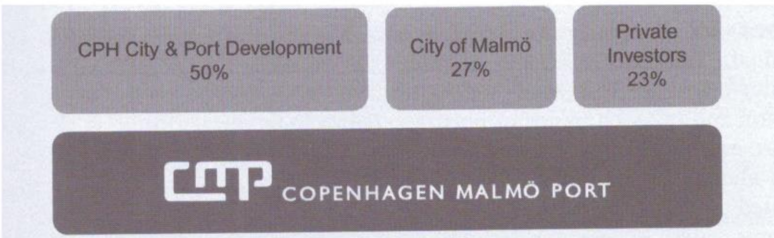


Figure 2.2: The ownership structure of Copenhagen Malmo Port
Source: Copenhagen Malmo Port (2011).

Synchronization between ports is needed :
Container transhipment traffic
+ 32% in Europe
+ 25% in Far East
+ 51% South East Asia
+ 31% Latin America
+ 33% in Africa

6- terminal and cargo handling equipment

- Some definitions
  - Terminal
    - Transshipment and storage of ITU's
  - Hub
    - Central distribution point
  - Crane
  - Gantry crane
  - Straddle carrier
    - Rubber tired overhead lifting vehicle
  - Reach stacker
  - Spreader
    - Adjustable fitting for containers

6- terminal and cargo handling equipment

- Efficient infrastructural facilities
- Bulk cargo transfer
- Containerized cargo transfer
  - Including pipelines to tank containers

6-

Inland port

- Railroads
- Water access
- road

- Inland container depots 6-

  also called dry ports
- A kind of warehouse area
  - To relieve congestion at the ports
  - To extend continuous movement of containers
  - Handling containers
  - Special containers
  - Receipt and delivery
    - Weighing, inspection of seals and damages, container information control
    - Consolidation and distribution
  - Depot function
  - Maintenance and repair
  - Customs clearance activities at inland terminals and not at port location
  - Under bond
  - Physical distribution services

- Dry port
  - An ICD with large logistics area

- Container freight stations
  - Stuffing / destuffing service
  - Consolidation points
  - Customs formalities
  - Customs service
  - LCL cargo / FCL shipments
  - CFS to ICD

6-

Conventional

Small terminal surface

Direct transshipment possible

Limited mechanization and automation

Improvisation in terminal operations

Container

Large terminal surface

Indirect transshipment (modal separation in time and space)

Advanced mechanization and automation

Organization and planning

6-

- Terminal characteristics
  - Intermodal interchange
    - Road rail / road barge
  - Location
    - Small package industry
    - Access
      - Airports as well as Ports
  - Productivity
    - Port hinterland operations
      - Adequate terminal access for various modes
      - Meet scheduling
      - Level of throughput and…
      - Of course profitability

Terminal flows

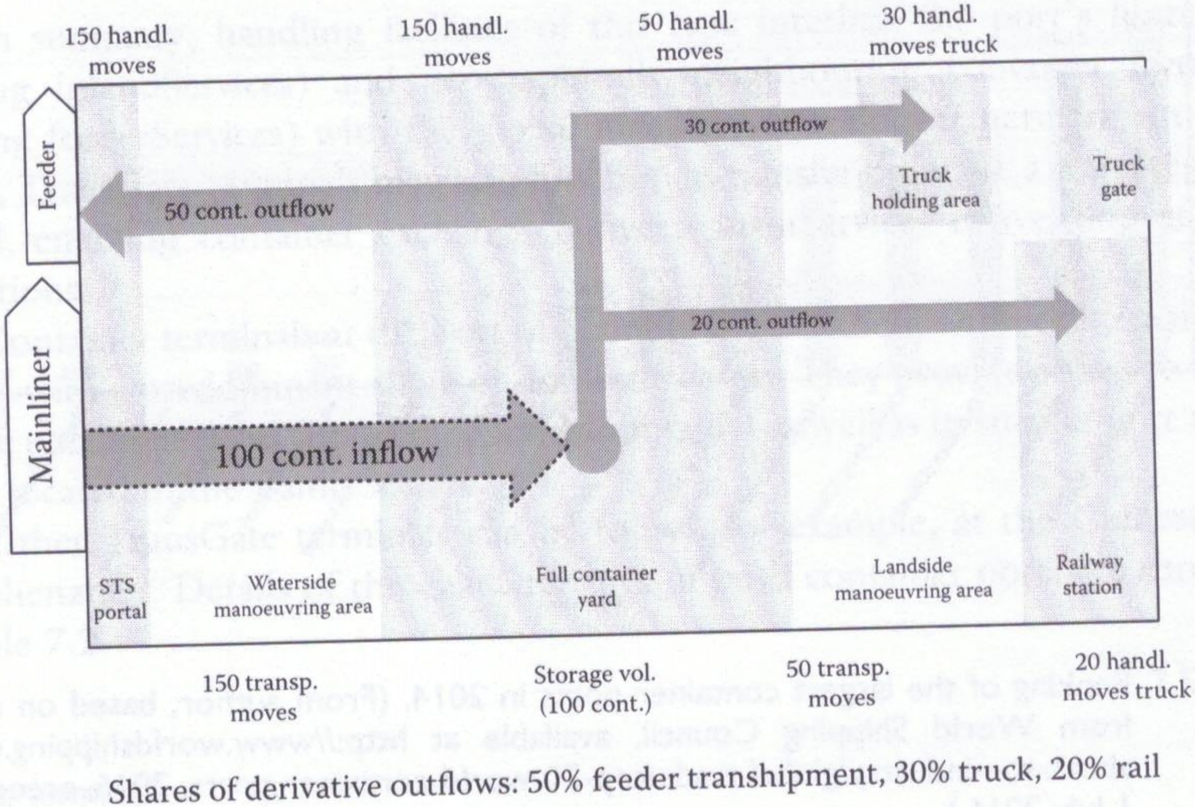
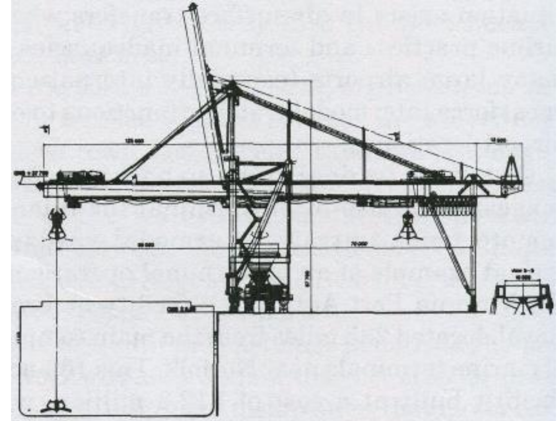


Figure 7.6 Original main service inflow of 100 containers and resulting derivative outf with associated logistical requirements (example).

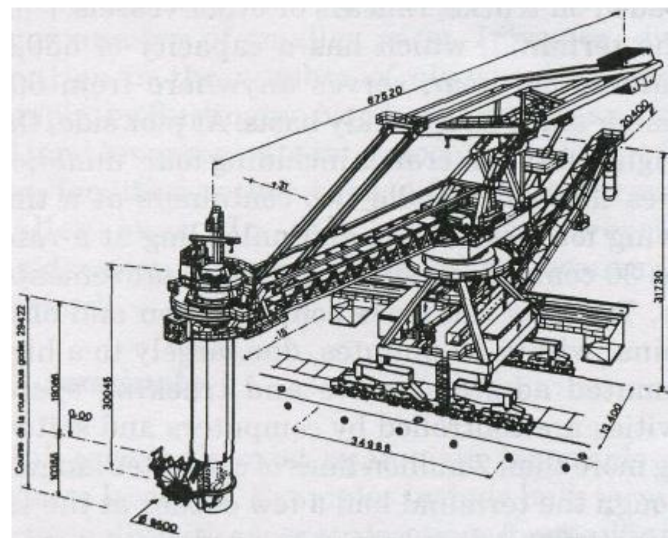
6-

- Terminal characteristics
  - Density of terminal placement
    - Greater density, smaller terminals
    - Large ocean terminals
    - Successful small package services
    - Sub-terminals
    - Direct vessel rail
      - Front Royal 235 miles from New-York
    - Advance marine terminals
      - HK terminal
      - Rotterdam Delta terminal

- Cargo transfer
  6-
  - Skilled staff and container equipment
  - All necessary documents
  - Maintain a status report
  - Preplan all loading / Unloading
  - Maintain security and … supervision
- Intermodal equipment for bulk freight transfer at ports
  - Continous vs discontinous bulk movement
  - Types of sea port bulk handling equipment
  - Environmental and political concerns



Grab bucket



6-

- Container ports and equipment

  - LCL infrastructure
  - Computation of moves
  - Cranes
    - Shore based
    - Rail mounted
    - Ahinged boom crane
  - Spreaders and frames
  - Straddle carriers
    - Bigger ships need biggercranes
  - Stacking cranes
  - Container handlers

Spreader

Straddle carrier

- Forklift trucks

Figure 2.9 Forklift handling an empty container. (From Michael Coghlan on Flickr. 'Handling a Container' is copyright (c) 2011 Michael Coghlan and made available under a Creative Commons Attribution-NoDerivs 2.0 Generic License.)

Comparative tasks

Trans terminal inbound to outbound feeder
Trans gate terminal : feeder to mainliner hub
Gate terminal feeder and mainliner hub : each is separated

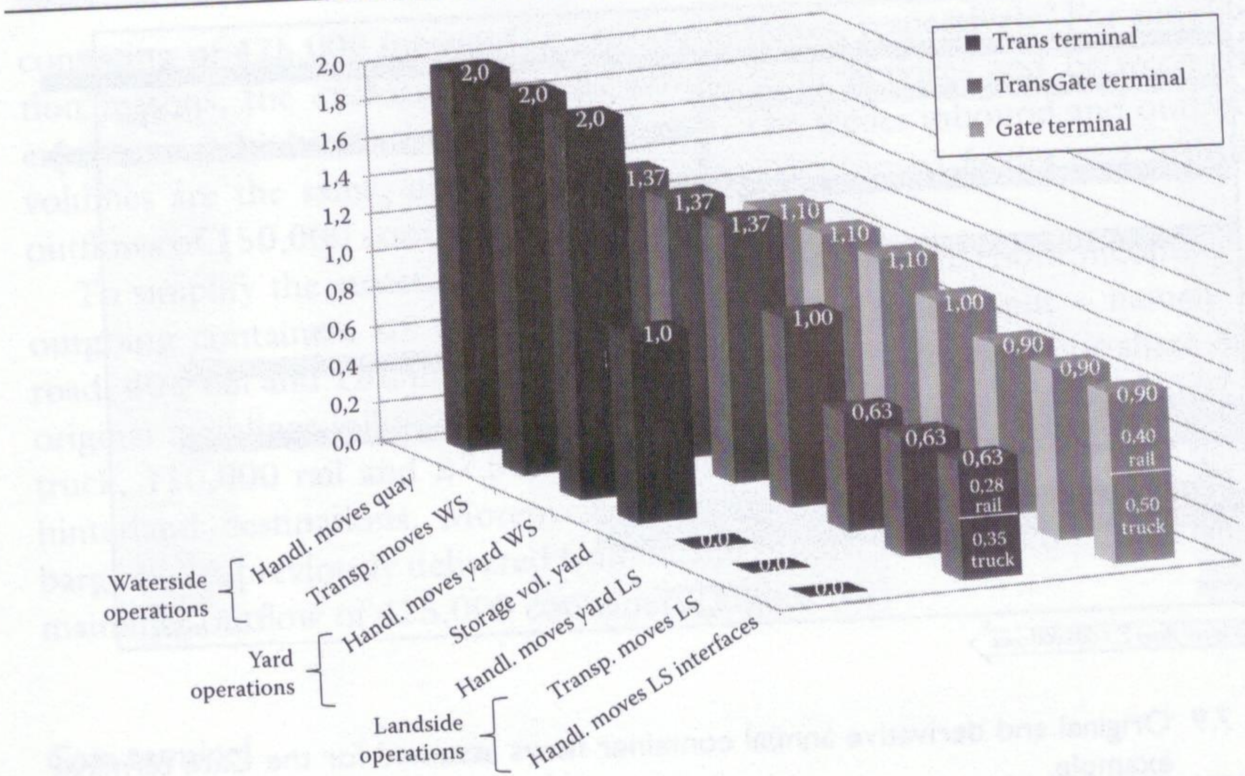


Figure 7.10. **Overview of logistics requirements* for all example terminals differentiated according to terminal operations areas.**

Land Intermodal terminal design example

- Location
- Marshalling
- Slopes and tracks availability
- Electrification of tracks and terminals
- Signalling systems connected to the terminal
- Paving
- Truck entry and exit capacity
- Lighting (security)
- Local road network
- Security
- A yard for wagons and containers
- Sufficient length

Figure 2.10 Reach stacker loading a container onto a train. (From Rickard Bergqvist and Jason Monios.)

Terminal costs

Table 6.1 World Bank toolkit

No.	*Section*
1	Introduction and basic conditions
2	Handover
3	Project control and finance
4	Extension works
5	Operations
6	Fees
7	Legal and insurance
8	Hand back
9	Legal and insurance
10	Performance
11	Legal and insurance

Source: Adapted from Monios, J., Bergqvist, R., *Research in Transportation Business & Management* (*RTBM*), 14 (March). 1–3, 2015.

Loading and unloading ships at an intermodal container terminal, we can manage, *average waiting time*

- Utilization of the system is less than 100%
  - no ship has to wait
- **U = p/m * a**   where p is the number of hours needed to load/unload a ship, **a** is number of hours that pass between arriving to be loaded/unloaded and **m** number of container cranes
  - U < 100 %
- But there is **existing variability** following a given probability distribution to be predicted with
  - Tq = p/m * (u (exp squareroot(2*m+1))-1) /(1-u) * (((CV*a exp2) +(CVp exp2))/2)
  - Cva and CVp represent the coefficients of variation of the probability distribution used to model variation in the processing and inter- arrival time.

$$T_q = \frac{p}{m} * \frac{u^{\sqrt{(2*(m+1))}-1}}{1-u} * \frac{CV_a^{\,2} + CV_p^{\,2}}{2}$$

Figure 2.11 Rubber-tyred gantry crane. (From Rickard Bergqvist and Jason Monios.)

Intermodal life cycle

Length	Planning, funding and development 3 to 10 years	Finding an operator 1 to 2 years	Operations and governance More than 10 years	Extension strategy More than 15 years
Main stake holders	Public infrastructures (authorities) Terminal operators Large shippers Ports Rail operators	Public infrastructure Terminal operator Terminal owner	Public infrastructure Terminal operator Terminal owner Rail operator	Public infrastructure Terminal operator
Main activities	Planning an design Funding construction	Business design Ownership model Contract development	Responding to changes in technology and demand	Renewed concessions Potential changes in ownership Potential expansion
Main influences Relevant policy and regulatory issues	Market demand Location of competitors Avaibility of innovation and technology Interface between transport administration and infrastructure owner Government policy	Public policy Market structure to terminals and rail operations Interface Rail regulations	Market structure (rapid change) Competition and technology Interface Rail regulations Government policy	Declining demand Changes in distribution strategies Competition Demand for land Gobernment policu (modal shift, economice development) Incentives

Figure 2.15 AGVs in operation at a port container terminal. (From © Henrik Jesser
BY 3.0] via Wikimedia Commons.)

6-

- Container ports and equipment
  - Side loaders
  - Yard hostels
  - Ocean land intermodal transfer point
  - Container chassis
  - Chassis flippers
  - Container handling standards

Side loader

Container chassis

- Equipment for intermodal transfer of breakbulk sea freight
  - Breakbulk cranes
  - Breakbulk forklift trucks
  - Winches and slings
- Equipment for intermodal transfer of RO/RO sea freight
  - Ro/ro forklift trucks

Breakbulk crane

Winches & slings

SUM UP

Discussion

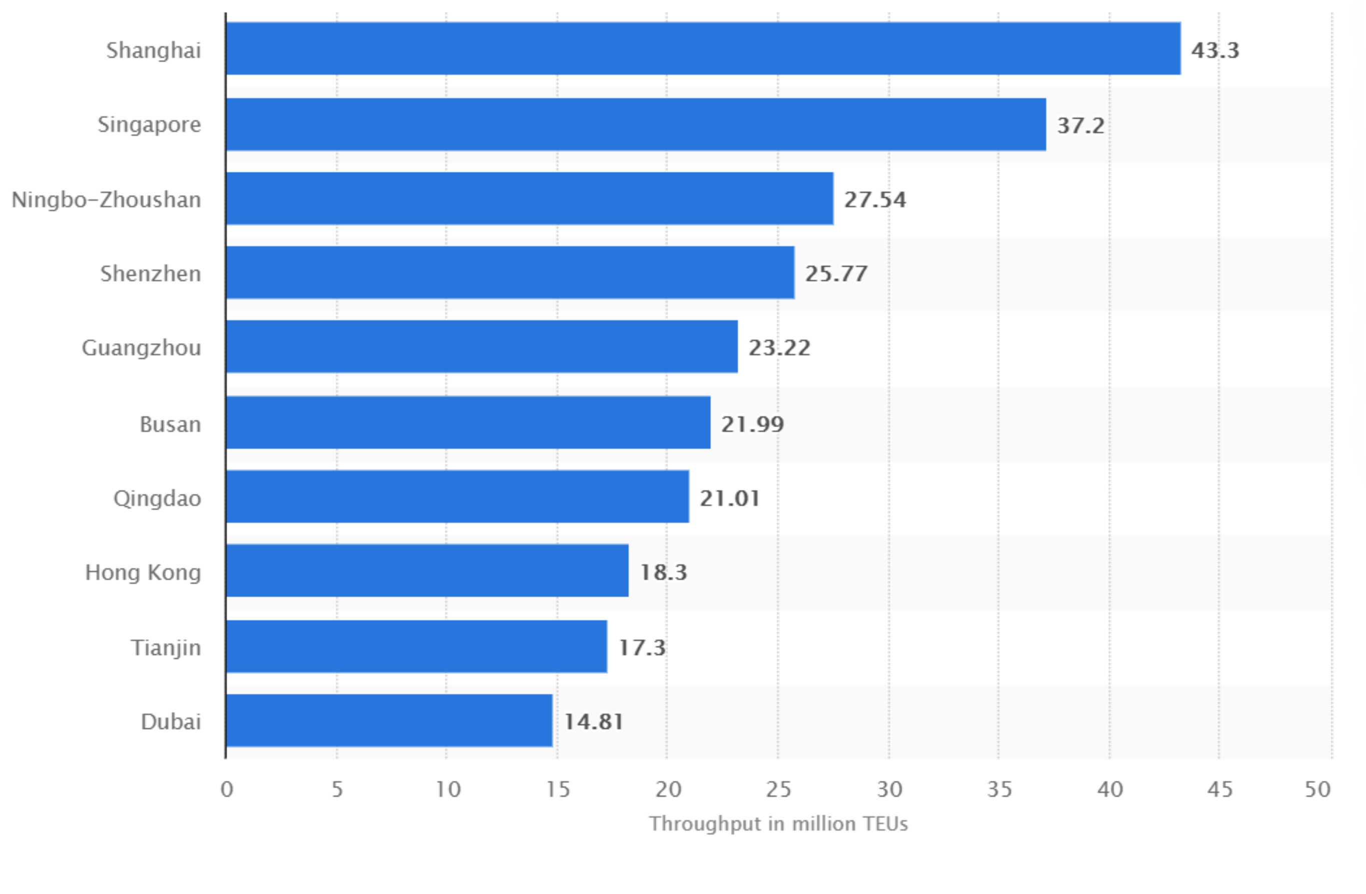
- Compare for and against
  - Bulk
  - Container
- What key indicator is looking for

	Ro-Ro operations	Lo-Lo operations
Number of TEU carried in 7x24 hours	2800	2100
Round trip time	84h	108h
Time in port per round trip	12h	36h
Transport time stack to stack	42-48h	54-72h
Transport cost stack-to-stack per unit (20 /40ft)	209 / 338	338 / 399

- Improvement in port performance
  - Ports and opening hours
  - Terminals
    - Indicators ISO
    - Global 40 €per TEU
    - Value example PSA Singapore purchased 20% of Hutchinson port Hong-Kong 4.4 billions $
  - World leading ports by productivity

Rank	Port	Volume 2018 (Million TEU)	Volume 2017 (Million TEU)	Volume 2016 (Million TEU)	Volume 2015 (Million TEU)	Volume 2014 (Million TEU)	Website
1	Shanghai, China	42.01	40.23	37.13	36.54	35.29	English Chinese
2	Singapore	36.60	33.67	30.90	30.92	33.87	English
3	Shenzhen, China	27.74	25.21	23.97	24.20	24.03	Chinese
4	Ningbo-Zhoushan, China	26.35	24.61	21.60	20.63	19.45	English Chinese
5	Guangzhou Harbor, China	21.87	20.37	18.85	17.22	16.16	English Chinese
6	Busan, South Korea	21.66	20.49	19.85	19.45	18.65	English Korean Chinese Japanese
7	Hong Kong, S.A.R, China	19.60	20.76	19.81	20.07	22.23	English Chinese
8	Qingdao, China	18.26	18.30	18.01	17.47	16.62	English Chinese
9	Tianjin, China	16.00	15.07	14.49	14.11	14.05	English China
10	Jebel Ali, Dubai, United Arab Emirates	14.95	15.37	15.73	15.60	15.25	English Arabic
11	Rotterdam, The Netherlands	14.51	13.73	12.38	12.23	12.30	English Dutch Deutsch Chinese

2019 figures



Porter's 'Diamond' Model Applied to the Analysis of Container Port Competitiveness

Determinant:	Components:	Important for container ports to create and sustain competitiveness by:
Factor conditions	• Factor Endowment • Factor Hierarchy	- Availability of skilled, specialised, competent and motivated human resources - Favourable maritime access - Strategic geographical location - Stable climate - High quality port infrastructure - Good transportation network to access hinterland - Modern communications infrastructure - Available and accessible sources of financial capital - Available and abundant stock of scientific, technical and market knowledge - Active participation in factor-creation - Advanced and specialised factors
Demand conditions (e.g. of local hinterland)	• Demand Composition • Demand Size and Growth Pattern • Demand Internationalisation	- Quality of demand important for perceiving, interpreting and responding to user needs - Segment structure of demand shapes the attention and priorities of terminal operator - Sophisticated and demanding users provide window to future user needs - Size of demand important especially for cases involving substantial R&D, scale economies, uncertainty and technological requirements - Presence of a number of independent users foster faster rate of innovation - Rapid demand growth encourages investment in new products and facilities - Early saturation of demand increases pressure to innovate and upgrade - Inculcate domestic user needs into foreign users to internationalise demand base - Mobile or multinational local users can provide loyal customer base
Related and supporting industries	• Supplier industries • Related industries	- Presence of internationally competitive supplier industries - Presence of internationally competitive related industries
Firm strategy, structure and rivalry	• Strategy and structure of firm • Goals • Domestic rivalry • New business formation	- Management practices and mode of organisation must concur with national circumstances - Succeed when goals and motivation stimulate unusual commitment and effort - Status of national priority and/or prestige attracts outstanding talent and resources - Importance of sustained commitment - Successful operators compete intensely for home market and pressure each other to improve and innovate - New business formation feeds the process of innovation
Chance	• Events beyond ability of firm and government to influence	- Capitalise on opportunities created from discontinuities that shift competitive advantage
Role of government	• National, regional and local	- Potential impact from government policies - Opportunity to work together with government to reinforce competitive advantage

Source: Adapted from Porter (1990: 69-130).

Endowment = dotation

Annualized Slot capacity

$$T_{xt}^{k} = 2G_{xt}^{k}F_{xt}^{k}\frac{\sum_{h=1}^{n} V_{xt}^{kh}}{n} = 2G_{xt}^{k}F_{xt}^{k}W_{xt}^{k} \qquad \ldots (7.1)$$

where: T denotes ASC, which is measured in TEUs, that called at port *X* for a particular service *k* for time period *t*;

G number of calls made at port *X* for the whole service loop;

F frequency of call in a year;

V_h capacity of vessel *h* for *n* vessels employed; and

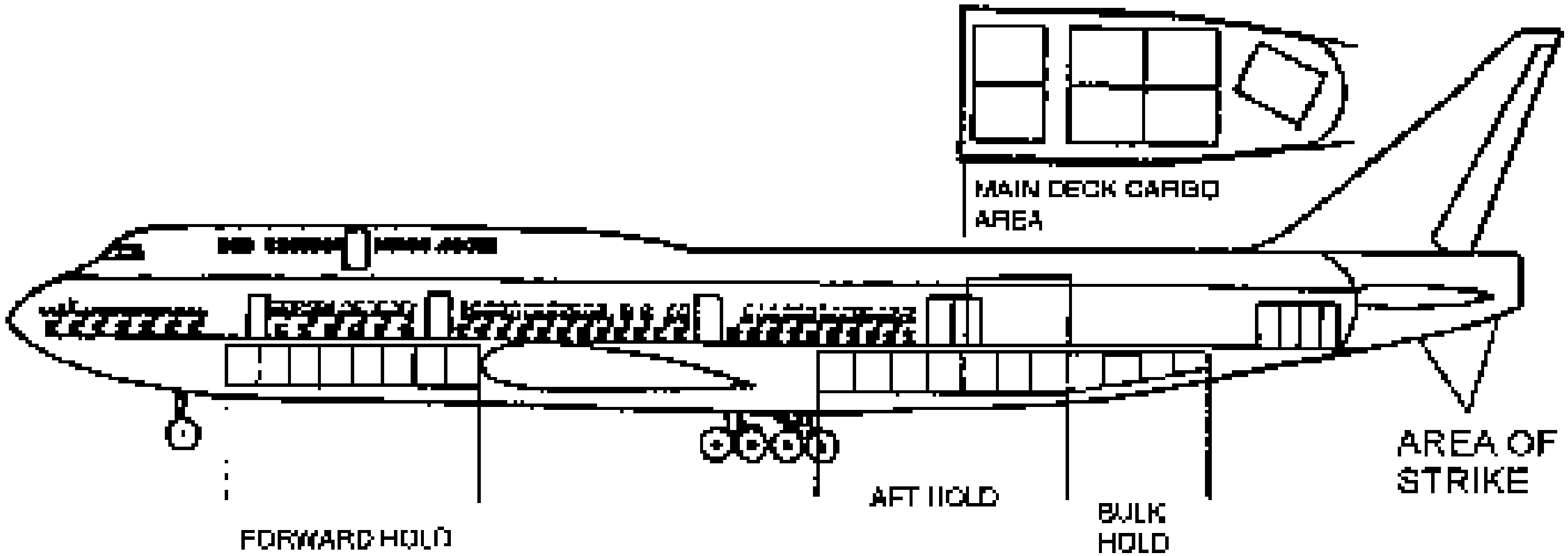
W average capacity of vessels employed for $W_{xt}^{k} = \frac{\sum_{h=1}^{n} V_{xt}^{kh}}{n}$.

ASC example

- Service AES2 of the CHKY alliance
  - Port of rotation
    - Hamburg-Le Havre-Singapore-Hong Kong-Kobe-Nagoya-Tokyo-Shenzhen-Hong Kong-Singapore-Port Said-Rotterdam-Felixstowe-Hamburg
  - Regions connected to : NW Europe, SE Asia, East Asia and Near East
  - Trade routes connected to : Europe – Far East
  - Service partner : COSCO, Hanjin, K Line, Yangming
  - Service frequency : weekly
  - Vessels employed : 8 (by K Line)
  - Total vessel capacity employed : 44,780 TEUs
  - 1x5500 TEU, 5x5600 TEU and 2x5640 TEU

- Other modes
  - RoRo forklift trucks
    - Very short mast
  - Inland transport development
    - Russian federation
      - More than 200 millions tons
    - Yangtze river
      - More than 1billion tonnes
    - Wuhan more than 300 000t 1000 kms from Shangai
    - Railway transport
      - EU
      - Russia
      - USA
        - More than 3 billion tonnekm
      - Corridors
        - Asia / Europe mainly China

6-



- Cargo handling at airports
  - Traditional airports
    - Primarly passenger traffic
  - Freight for domestic flights
    - Fequjent schedules
  - Freight for international flights
    - Stored at gateways
    - Seasonal fluctations
  - Terminals and equipment
    - More storage space
    - Handling equipement

6-

6-

- Cargo handling at airports
  - International shipment
    - Tracking and clearing systems
    - Taking priority import freight ?
  - Classification of handling equipment
    - Combi airplane
    - Scissorlift platform …
    - Nose : mechanical loading nose
  - Intermodal air surface containers
  - Small package express equipment
    - Door to door
    - Upper segments
  - Intermodal airports and equipment
    - Strategically located
    - And traditional carriers

SUM UP

Discussion

- Port and airport performance key indicators
- Port and airport according to transport flows

Part II- goods flows in the world

1- Global Production Networks

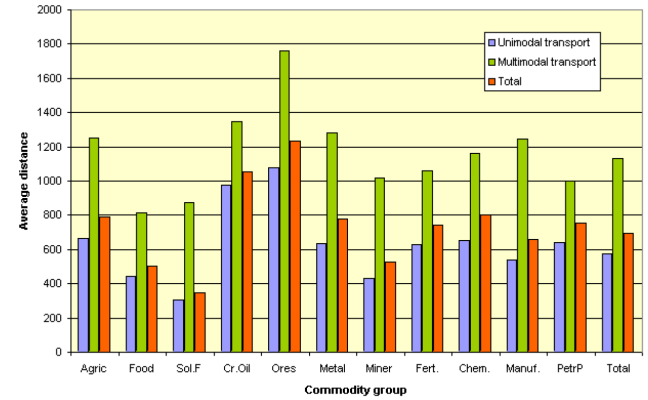
2- trends

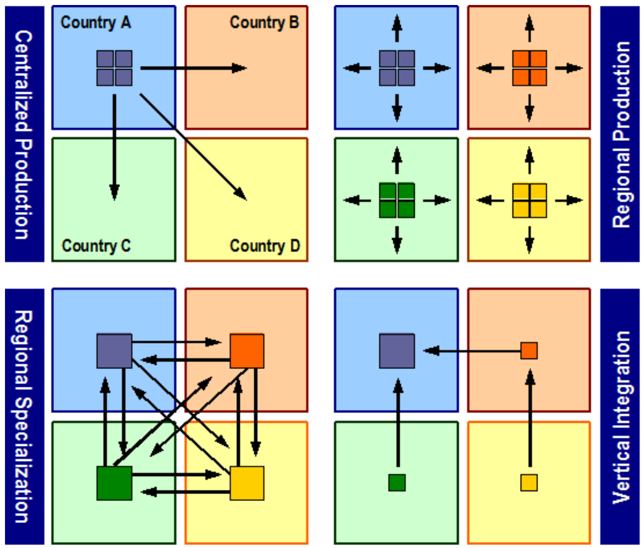
3- flow studies

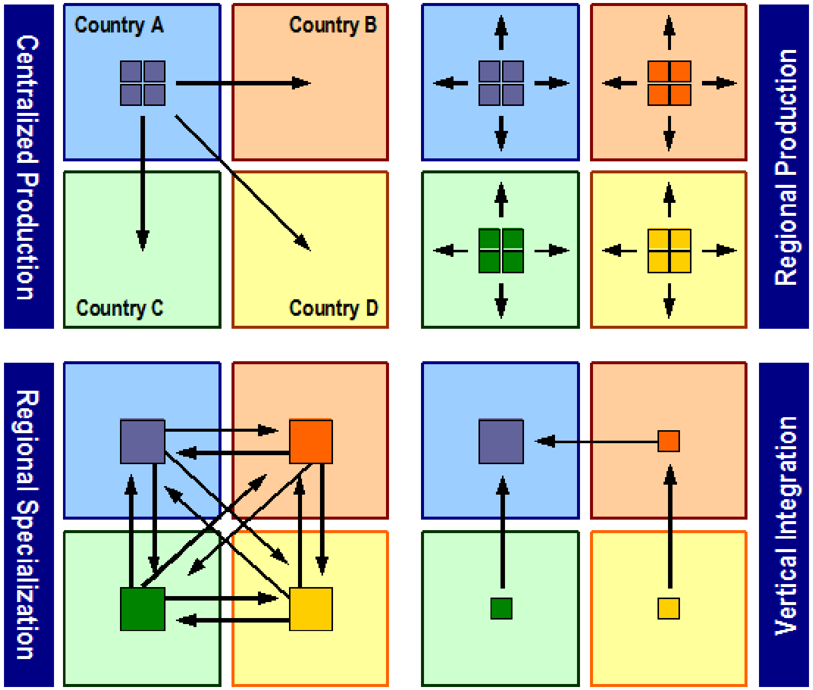
4- multimodal and intermodal transport, possible answer to congestions

1- Global Production networks

- Concept : a cross border arbitration
- GPN and Supply Chain Management
  - IT to globalization
  - Fragmented now and shifted toward periphery
  - Global and regional : close interrelationship
  - Horizontally integrated
    - Vertically disintegrated
    - Goal : a large number of products through a few processes
    - Maximum revenue through economies of scale





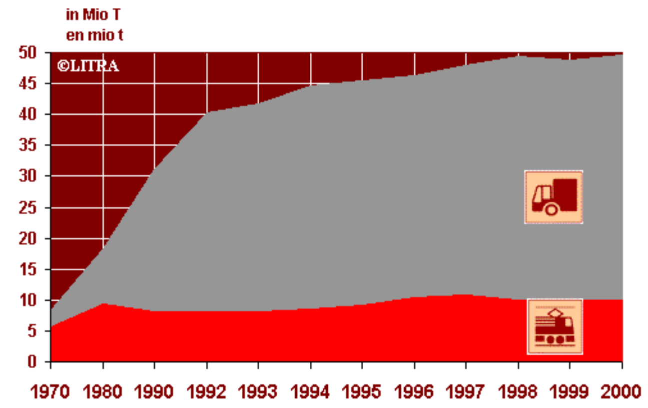


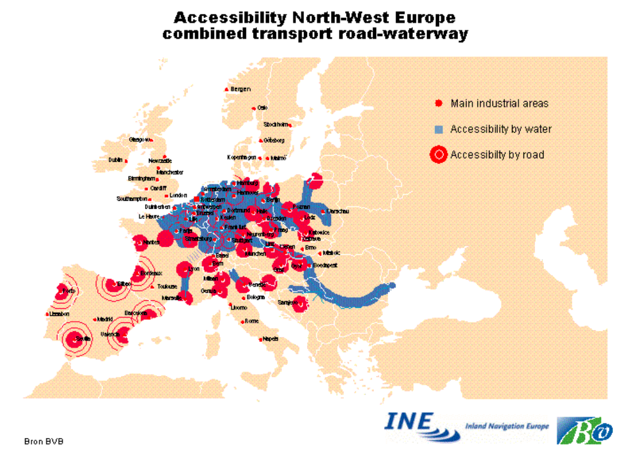
1- Global Production networks

- GPN and global Production /Distribution
  - Major transport modes have made new manufacturing locations
    - Combining labor cost, services, other ressources
  - Transnational corporations
    - More then 40% of US imports from overseas subsidiaries
  - Free trade agreements
  - Transport deregulation
  - Trade concentration

2- trends

- Drastic increase
  - Value of export sales
  - Development factors for intercontinental transport … and stopping it
  - Concentration
  - World fleet to a peak
  - Security difficulties in international flows and illegal trade
  - Express carriers
    - More than 40% of international airfreight





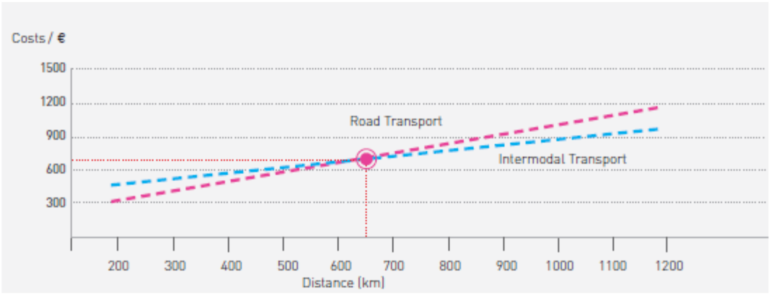
3 – Flow studies and comments

Location

- Regional flows increase
- Concentration of flows
- Share of developped countries
- The Triad
- World economic poles

Flows in world industry

Continental and intercontinental flows



4- Multimodal and intermodal transport possible answers to congestions

- Continental approach
  - Multimodal and inter continental leading
- Underutilization
  - In continental distances
- Transport cost by mode
  - More than 50 billions @ in EU in congestion

4- multimodal and intermodal transport possible answers to congestions

Shippers and consignees

- Supply chain : risk of stock-out, lost business
- Level of safety stock : delayed shipment, lngner transit time congestion over charges, higher inventories

Shipping lines

- Longer waiting time for berth
- Bypassing intended ports of call : higher fuel costs, lost business, higher feeder costs, reduced capacity

Container terminal operations

- Additional stack movements : longer cycle times, increasing handling cost, higher labor cost, reduced capacity
- Intermodal operators
  - Disruption to schedule, longer waiting times, missed connections, higher operating costs

Safety gantry for containers

- Evolution

Decade	Cost	Height	Reachable deck
1960	0.75 M $	19 m	Till 35 m
1970	2.4 M $	25 m	Till 39 m
1980	6 M $	30 m	Till 47 m
2000	8 M $	40 m	53 m and more

4- multimodal and intermodal transport possible answers to congestions

Traditional players and new ones

Horizontal and vertical integration

Better loyalty

(ERS carrier haulage, Merchant Haulage market)

Seaport terminal market (Hutchinson, P.SA.A, P&O, Eurogate…) vs specialization, railway operator, shortsea operator (ECT, DeCeTe)

Explosion in BRIC trade : Brazil, India, Russia … ? China

Asian ports more than 55% of container traffic and 50% export

Port ranking examples

Asia : Shanghai, Singapore, Hong-Kong

Middle East :Dubai, Salaha, Jeddah

Europe : Rotterdam, Antwerp, Hamburg

Africa : Port Said, Durban, Tangier Med

Part III- Intercontinental distances

1- International transportation

2- Loading units

3- Combination of modes

4- Case studies

1- International transportation

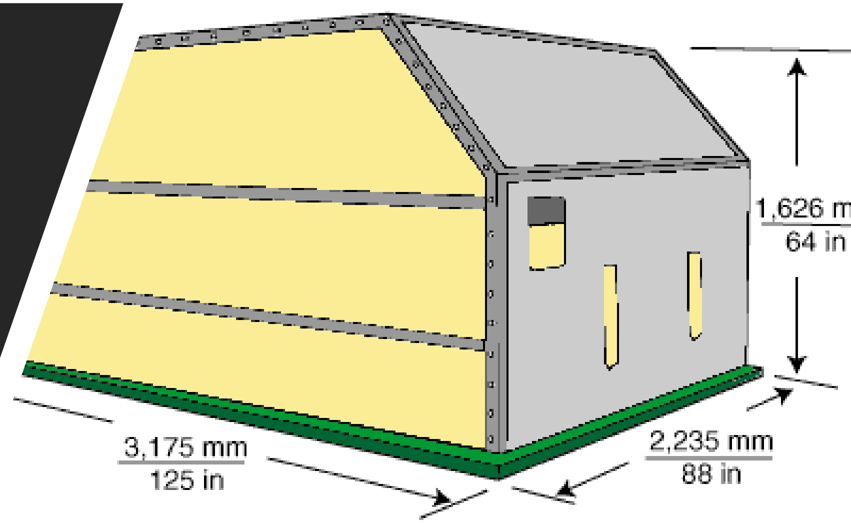
- Development of ships
  - Ship : vary considerably in size
  - Set routes
  - Sea containers
  - ISO standards
    - ISO 668:1995 classification, dimension and rating
    - ISO 6346:1995 Coding, identification and marking
    - ISO 1161:1984 Corner fittings- specification
  - Short sea shipping – semi trailers
- Development of relevant infrastructures

Equivalent to

- 1 mm = 0,03937 inch
- 1 cm = 0,3937 inch
- 1 m = 1,094 yards
- 1 km = 0,6214 mile
- 1 cm3 = 0,061 cubic inch
- 1 kg = 2,2046 pounds
- 1 m ton = 0,9842 ton

2- loading units

- Containers
- Air container
- Maritime container
    - Investments
    - 20’ 40’ containers
- Container service
    - Transit time – handling – reducing number of individual pieces of cargo
    - Substantial savings in packaging
    - No need for covered warehouse



- Container applications
  - One way shipping
  - Static ground storage
  - Economical way to add warehouse
  - Most common size of containers
    - Standard width
    - Non ISO overlength and over width containers
    - Regional pressures
    - To cohabit at interface points

ISO Containers

Also exist **45’ (2.40 m wide), 53’**

- ISO Norm 668 to **20’ and 40 ‘ dry containers**
- Minimum size

	Length	Width	Height
	mm	mm	mm
20 ‘	5 867	2 330	2 350
40 ‘	11 998	2 330	2 350

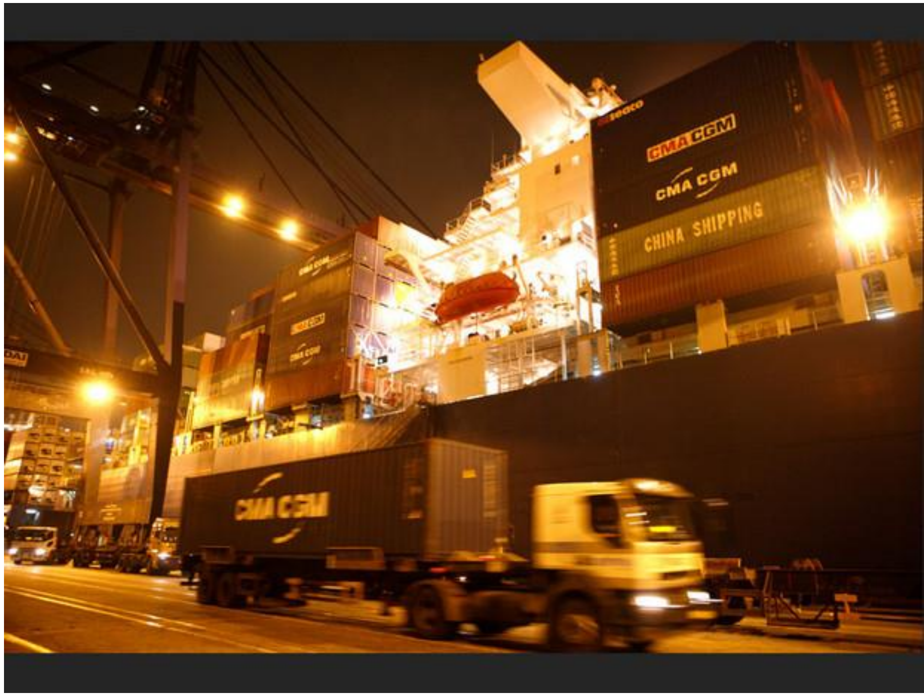
- Usual size : 2 350 wide and 2 390 mm high

	Width	Height
	mm	mm
20’	2 286	2 261
40’	2 286	2 261

Usual door opening : 2 340 en largeur et 2 280 mm en hauteur

2-

- Various containers
  - Standard
  - Hard top
  - Open top
  - Flat rack
  - Platform
  - Ventilated container
  - Refrigerated
  - Tank
- Density answer
  - Heavy goods – shorter container
  - Low density – larger containers



2-

- Standard container
  - General cargo – lashing devices

2-

Hard top container

- Removable steel roof
- Heavy loads
- loading

2-

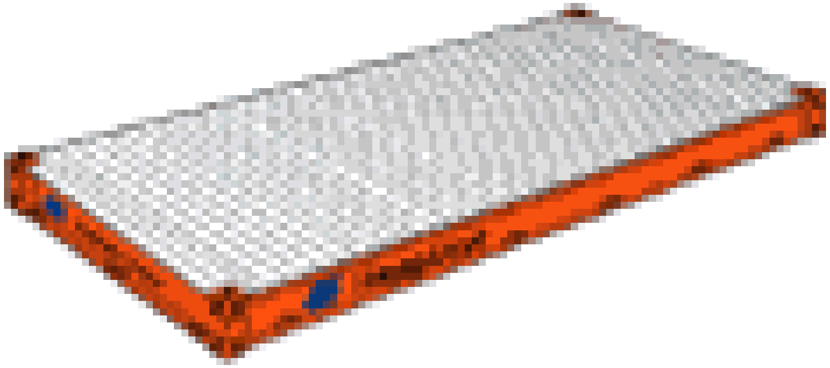
- Open top container
  - Removable tarpaulin, overheight cargo
  - loading

2-

- Flat rack
  - Heavy loads

2-

- Platform
  - Heavy loads – oversized cargo
  - Non domestic shipments



2-

- Ventilated
- Refrigerated container
  - Electrically operated unit

2-

- Tank container
  - Transport of liquid food

Discussion

- Container advantages and inconvenience

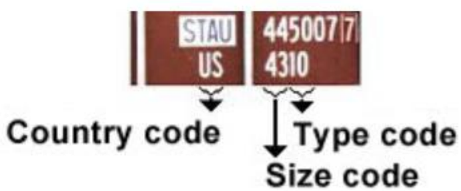
- Registration of containers
  - Interchange among carriers
  - Identification
  - Rolling stock registration
  - With a rail car

2-

- Container identification
  - Owner MSKU for Maersk example
  - U for freight container
  - Registration number (6)
  - Check digit

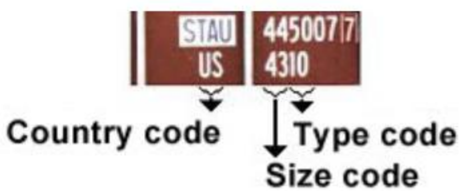
- Container type
  - Length
  - Width
  - Container type

Marking on Containers : Size and Type Code		ISO 6346	
1	2	3	4
Length	Height	Type	Features



1st digit	The digits have the following meanings...			
Length	1 = 10 '	2 = 20 '	3 = 30 '	4 = 40'

2nd digit	The digits have the following meanings...			
Height	0 = 8'	1 = 8' g.n.t	2 = 8' 6"	3 = 8' 6" g.n.t.
Height	4 = > 8'6"	5 = > 8' 6" g.n.t.	6 = > 4 ' 3 "	7 => 4' 3 "g.n.t.
Height	8 = > 4' 3 "< 8'	9 = < 4'		



Marking on Containers : Size and Type code		ISO 6346	
1	2	3	4
Length	Height	Type	Features

3. Ziffer = Type		4. Ziffer	
0	closed general purpose	0	end opening(s)
		1	end & full side opening(s)
		2	end & part side opening(s)
		3	end & roof opening
		4	end & roof & side openings
1	closed vented	0	smaller passive vents upper part
		1	bigger passive vents at upper part
		3, 4	passive vents at upper & lower part
		6	mechanical ventilation, located inside
		8	mechanical ventilation, located outside
2	thermal insulated heated named cargo	0	insulated
		1	insulated
		2	heated
		5	named cargo: livestock
		6	named cargo: cars
3	thermal refrigerated & heated	0	refrigerated, expendable refrigerant
		1	mechanically refrigerated
		2	refrigerated and heated
4	thermal refrigerated and/or heated removable equipment	0	refrigerated, expendable refrigerant
		1	mechanically refrigerated
		2	refrigerated and heated
5	open top	0	end opening(s)
		1	& removable top member in end frame
		2	& side opening(s)
		3	& removable top member in end frame
6	platform based	0	no endwalls
		1	complete fixed end walls
		2	fixed free-standing posts
		3	complete folding end walls
		4	folding free-standing posts
		5	with frame and roof
		6	with frame and open top
		7	skeletal, with open top and ends

Character	Container length			Character	Container length		
	mm	ft	in		mm	ft	in
1	2,991	10		D	7,450	24	6
2	6,058	20		E	7,820		
3	9,125	30		F	8,100		
4	12,192	40		G	12,500	41	
5	Spare			H	13,106	43	
6	Spare			K	13,600		
7	Spare			L	13,716	45	
8	Spare			M	14,630	48	
9	Spare			N	14,935	49	
A	7,150			P	16,154		
B	7,315	24		R	Spare		
C	7,430						

7	tank container	0	non-dangerous liquid, 0,45 bar
		1	non-dangerous liquid, 1.5 bar
		2	non-dangerous liquid, 2.65 bar
		3	dangerous liquid, 1.5 bar
		4	dangerous liquid, 2.65 bar
		5	dangerous liquid, 4.0 bar
		6	dangerous liquid, 6.0 bar
		7	dangerous liquid, 10.5 bar
		8	dangerous liquid, 22.0 bar
8	dry bulk	0-9	no specification
9	air/surface	0-9	no specification

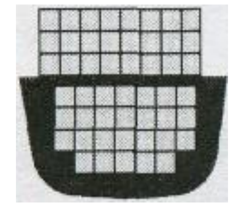

- 3 metre side height
- opening 3 sides
- 100 m³ go volume
- stackabl
TelliB x
DAF
Picture 31

- Sea container ships example
  - Fully cellular containerships
  - Breakbulk vessels
  - Container ship evolution
- Container leasing sector
  - Two major companies
  - Minor companies
  - Middle group
  - 38% of containers
- Ro/ro vessels

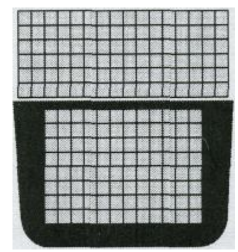
2-

1st generation

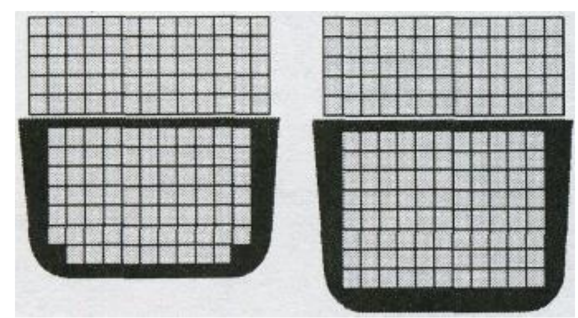
2nd generation



3rd generation



4th generation



5th generation

	TEU	Dead-weight (t)	Speed (kn)	Reefer	Length over all (m)	Breadth over all (m)	Gross Tonnage	Net Tonnage	Power (kW)	Delivery
Berlin Express	7506	100019	25.0	700	320.38	42.88	88493	36175	68640	2003
Hong Kong Express	7506	100016	25.0	700	320.38	42.88	88493	36175	68640	2002
Hamburg Express	7506	100006	25.0	700	320.38	42.88	88493	36175	68640	2001
Shanghai Express	7506	100003	25.0	700	320.38	42.88	88493	36175	68640	2002

MT COURSE Frédéric Gauthier

Containership choice

- Annualized slot capacity
  - Eastern/Western routes 75% world capacity
  - Transpacific 35%
  - Europe Far East 20%
  - Mediterranean / Far East 10%
  - Transatlantic 10%
  - Mediterranean / US : growing
- Secondary Routes
  - 25% North / South
  - East coast / South America 8%
  - Australasia 14%
  - West coast / South America 4%
  - South Africa 3%
  - West Africa 3%

Containership choice

- Factors of container service shipping lines
  - Type of capacity vs slot charter
  - Type of arrangement : independent, pooling…
  - Size of ship
  - Type of ship : cellular …or not
  - Number of ships : round trip and service level
  - Service frequency : daily …
  - Service speed
  - Service reliability
- Ports of calls
  - Depend on trade routes
    - Asian Europe 15
    - Transpacific 7

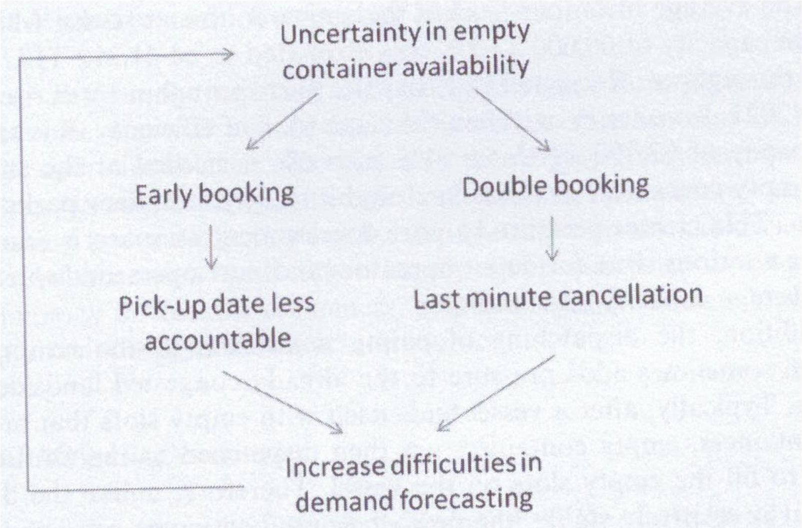


Figure 3.2: Container booking adverse cycle


EMMA MÆRSK

Container flows

Relocation of empty containers

Cost over 20 billions $ a year

Including

Inventory

Piggy back

Utilization of vessel space

Double booking and concellation


MAERSK LINE
© Jtashipphoto.dk

Discussion

Containership and after COVID 19 ?

3- combination of modes

- Airway
  - Air freight traffic
  - Intermodal air-surface containers
  - Improving aircraft turnaround
- Air / road
  - Road transport connected with long distances
  - Intermodal movements by air
    - The nature of air cargo
    - Growth in air freight cargo
    - Planned intermodality helps airfreight economics

3-

Sea-air intermodal operations

- Availability of aircrafts
- To maximize sea use
- Large industrialized centers

Sea air to China

Difficulty in tracking sea air shipments

- Smaller or bigger aircrafts
- Air-ground alternative

Convenient corridors

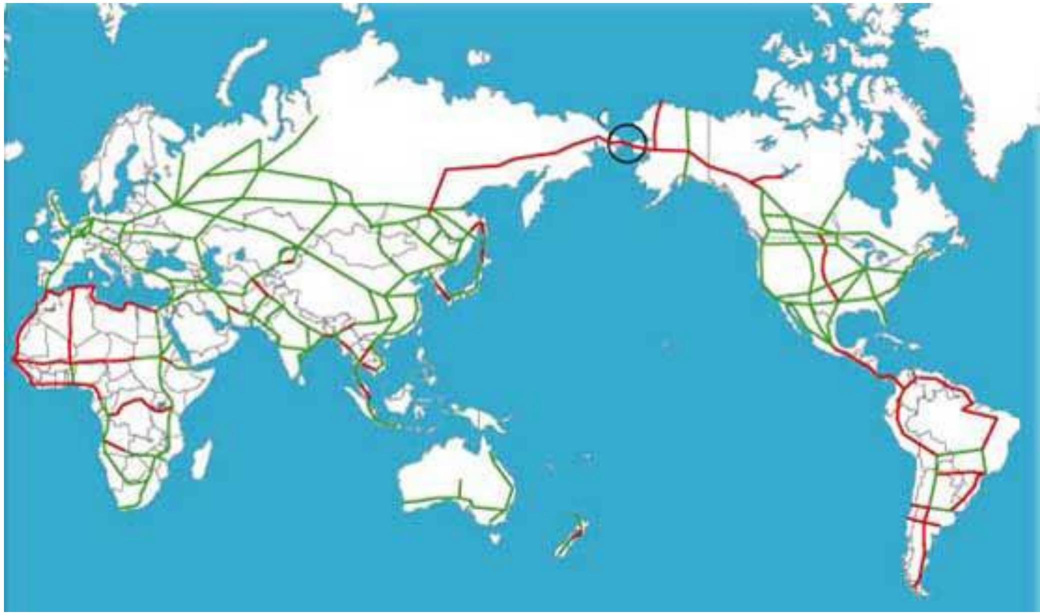
- Far East to Europe

Intermodal containers

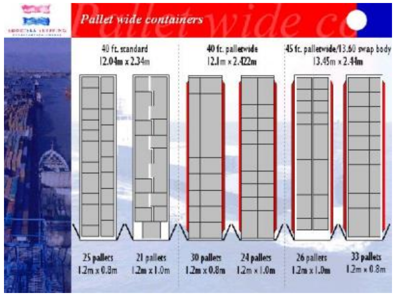
- Weight inconvenience

- Offer evolution
  - Longer distance, less energy
  - Container size to fit aircraft
  - Lower deck containers
  - Unit load device
- Thus smaller airplanes increasing presence
- Intermodal facilitators
  - NVOCC approach
  - The compulsory international air cargo agents
- Integrated carriers
  - Door to door service compared with airlines’ competitors

- Sea shipping services
  - Deep sea
  - Land bridges
    - Sea land or sea land sea route
    - Flat rate
    - Important international trade routes
  - Land bridge train



- Minibridges : through bill of lading
- Micro bridges
- Existing port adjacent intermodal facilities
  - Port terminal
    - Road sea and rail sea traffic
    - Ships – railway tracks
  - Transfer of containers
    - Container handling equipment
      - Fittings – handling – be stacked – eight high
      - Oval shaped holes – Inter Box Connectors
      - Oversized forklifts



STRADDLE CRANE

- Not transferred directly from a ship to a railcar
  - Rail intermodal terminal
  - Inland intermodal facilities
  - Straddle cranes
  - Smaller intermodal facilities : side loaders – oversized forklifts

- Sea/rail/road/inland waterways
  - By sea and one or more inland transport
  - Combination containership/LASH ocean vessels
  - A wide range of cargo
  - Rates are lower
  - Connections water / deep-sea
  - Hybrid vessels are in the minority
  - Combination vessels

Dunkirk example

Example

4-

Examples

Progrep2.doc

SSS SPI's – Second Interim Report – July 2001

	The Measure	***Management Responsibility***	***Performance measured by***	**The Standard**
	Terminal Handling & the Voyage			
7	The shipment will arrive at the destination port at the time agreed.	Shipping Line	Shipping Line	Percentage Measure of sailings that arrive outside of the agreed time at destination ports. Proposed target = 0%
8	Any revised arrival times will be reported to the shipper/consignee as soon as practicable after a firm revised time is set.	Shipping Line	Shipping Line	Time measure Revised arrival times to be reported to the shipper/consignee within one hour of firm time being set.
9	The shipment will be cleared for collection as soon as possible following the arrival of the vessel.	Inbound Stevedore	Inbound Stevedore	Time measure Shipments will normally be cleared for collection within eight hours of the arrival of the vessel.

Full Screen
Close Full Screen

Sum up

Rank modes combination in easy or not and why ?

Part IV- continental distances

- 1- continental loading units
- 2- Continental modes
- 3- India
- 4 – European Union
- 5 – multicontinental issues
- 6- case studies

Table 2.4 Comparison between the container and semi-trailer shipping segments

Factor	*Container*	*Semi-trailer*
Geographic transport market	Trans-ocean/deep sea/ short sea	Intra-European/short sea
Modal competition	Air for deep sea leg Rail and road for feeder leg	Rail and road + fixed connections
Business priority	Utilising economies of scale	Providing customer convenience
Port geography	Few large hub ports + feeder ports	Many ports – partly bridge substitute
Hinterland depth	Deep	Shallow
Transport time/speed	Fast	Fast
Precision	Day	Hour
Order time	Week	Day/minute
Frequency	Weekly	Daily/hourly
Transport service coordinator	Shipping line, line agent or sea forwarder	Shipper, road haulier or general forwarder
Cargo dwell time in port	Days	Accompanied – minutes or none Unaccompanied – hours
Empty unit dwell time	Days/weeks	Hours/days
Port work content	Substantial	Limited
Rail technology	Very simple – flat wagon/ twist-locks	Complicated – pocket wagon/ king-pin box
Road technology	Awkward at end points	Simple and accessible
Road-rail transhipment technology	Fairly simple – automation possible	Dimensioning factor in weight and handling

Source: Woxenius, J. and Bergqvist, R., *Journal of Transport Geography*. 19(4), 680–688, 2011.

1- continental loading units

Missing interoperability

- Unit load

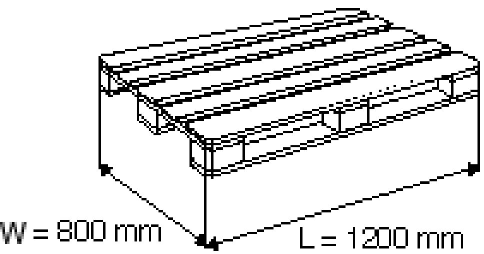
Pallets

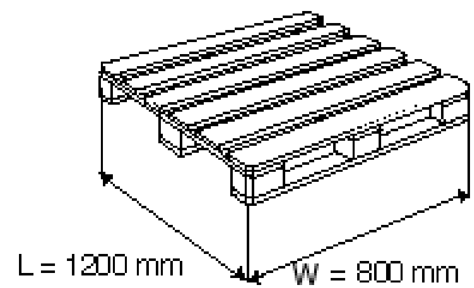
- From start to finish : efficient handling
- Stability
  - Might be shrink wrapped
  - Carton glue and corner boards
- Numerous materials
  - Wood, steel, aluminium, plastic, corrugated fibreboard
- Single trip …. Or not

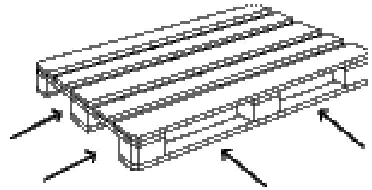
1-

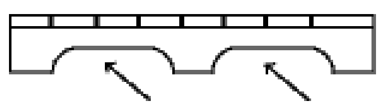
Pallet

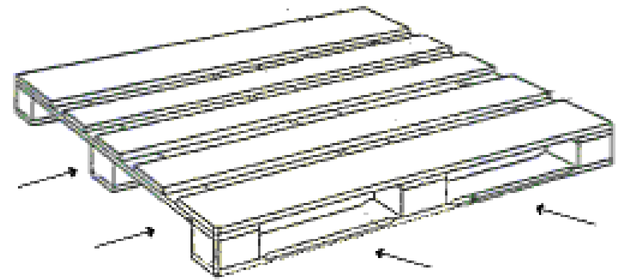
4 ways entry of 2 ways entry

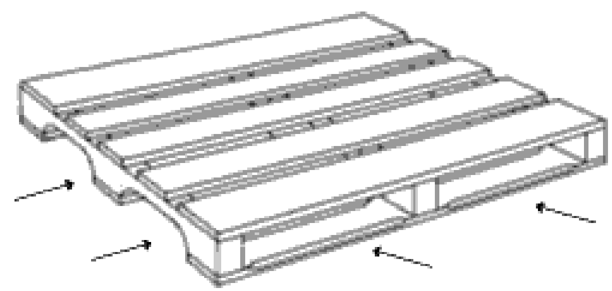












- Loading unit
  - Intermodal transport unit
  - European size containers
    - 45’
  - Swap body
    - To road vehicle dimension
  - Bi modal semi trailer
    - Less used
  - Low floor wagon
    - To carry ITUs
  - Pocket wagon
    - To accept axle/Wheel
  - Basket wagon
    - Demountable subframe
  - Rolling road wagon
    - Low floor wagon for rolling road

Swap body

Pocket wagon

Continental modes

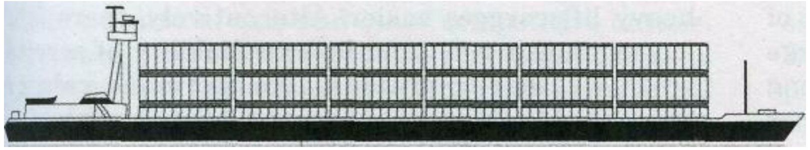
- Short sea shipping
  - Short distances
  - Advantages
    - Energy use
    - Extra capacity
  - Inconvenience
    - Long lead time
    - Low reliability
  - Feeder services
    - Liner services
    - With long distances traffic density decreases
  - RORO services
    - Including unaccompanied intermodal transport
  - Barge
    - Can moor to parallel tracks

Continental modes

- Inland waterway terminal
  - To offer trimodal terminals
- Waterways shipping
    - Intermodal movements by coastal and inland waterways
- European Inland waterway services
  - The Rhine key river
    - Hinterland terminals
    - Number of calls
    - Possible dwell time at sea port
- Rhine and … Danube
  - 2 millions containers estimation in Rotterdam
  - Roll on Roll off to avoid Switzerland for heavy trailers
  - Duisburg
    - From 110000 containers in 1990 to more than 2 500 000 containers today

2-

Different types of inland waterways service

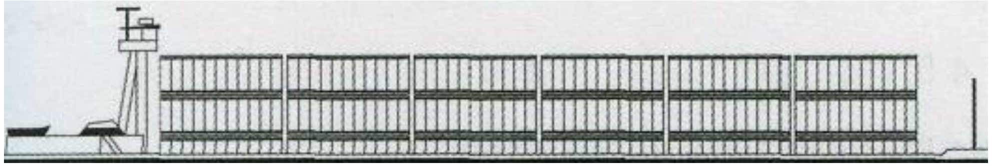


EUROPASCHIP

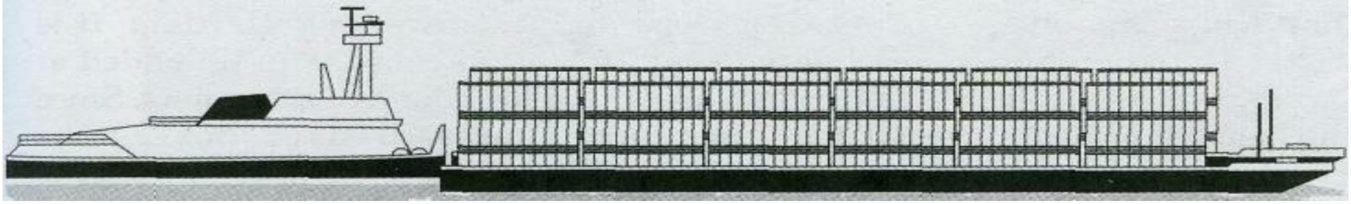
Typical container capacity per ECMT class.

Class		Typical TEU capacity	Typical TEU configuration (l x w x h)
II	Kampine barge	24	6x2x2
III	Dortmunder	54	9x3x2
IV	European class	90	10x3x3
Va	Rhine vessel	208	13x4x4
Vb	1x2 push barge	384	13x4x4 + 11x4x4
VIa	2x1 push barge	352	Twice 11x4x4
VIb	2x2 push barge/ largest motor vessel	450-500	

** no container traffic in Classes 0 and I



EUROPEBARGE



KOPPELVERBAND

- Infrastructure
  - Canal, locks and bridges
- River ports to challenge as Duisburg
- IWT Classification examples
- Connecting inland, coastal and ocean services at stake
- European coastal services
  - Developping in the U.S., to make fewer ship calls
  - Bremen to Hamburg and Scandinavian ports
    - 100 to 400 TEUS capacity, more than 16 knots speed
  - Short Sea Shipping Rotterdam
    - Oil, containers, fruits, coal, ore, scrap metal reach in 24 hours European ports
  - Amsterdam Portugal equivalent to 180 000 trucks a year
  - Black Sea: RoRo developping : Turkey, Russia, Eastern Europe
  - Baltic sea more than 400 ports with over 950 millions tonnes a year
- Market rules conditions are depending on ….
  - International Rhine
  - Rhône …
- Larger ocean containerships fewer port calls

Inland waterway network connected to Rotterdam

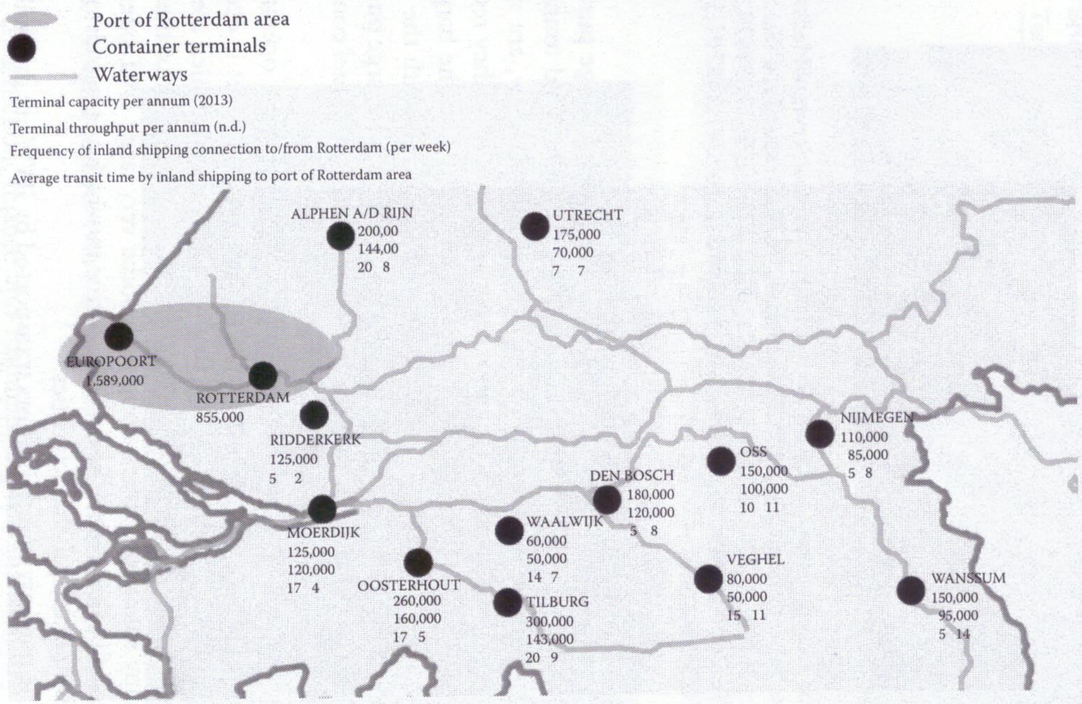


Figure 4.3 IWW network for the Port of Rotterdam. (From Fan, Y., The design of a synchromodal transport system: Applying synchromodality to improve the performance of current intermodal freight transport system, Master's thesis, Delft University of Technology, 2013.)

Table 4.2 Fleet statistics: Number of vessels

	W-Europe	*Europe Danube*	*United States*	*China*
Self-propelled				
Dry cargo	6.753	373	635	n.a.
Tank	1.992	37	2	n.a.
Total#	8.745	410	635	132.000
Push barges				
Dry cargo	3117	2559	23418	n.a.
Tank	155	233	3220	n.a.
Total#	3.272	2.792	26.638	33.000
Pushers	1039	422	3442	n.a.
Total	n.a.	n.a.	n.a.	165.000

Source: Adapted from Hekkenberg, R. and Liu, J., *Inland Waterway Transport: Challenges and Prospects*, Routledge, London, 2016.

IW fleet

4.4 A tugboat pushing barges up the Monongahela. (From https://rutheh.com/2010/03/10/tugboat-pushing-barges-up-the-monongahela.)

Saving load and fuel

Keep in mind global warming and tides as well as water levels

Table 4.4 Factor costs in inland waterway transport (reference date: 2008)

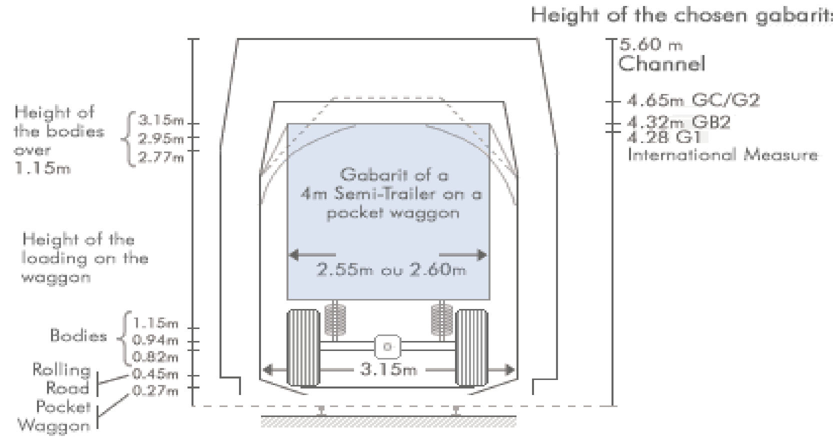
	Measure	*Rhine vessel (Class Va)*	*Rhine-Herne vessel (Class IV)*
Vessel characteristics			
Type of vessel		Motor dry freight vessel	Motor dry freight vessel
Capacity	TEU	208	90
Dimensions (L × W × D)	Metres	110 × 11.40 × 3.60	86 × 10.50 × 3.20
Tonnage	Tons	3.500	2.000
Fixed costs			
Capital costs	€/year	784.750	350.000
Labour costs			
Day operations	€/year	140.000	120.000
Semi-continuous operations	€/year	285.000	250.000
Continuous operations	€/year	660.000	510.000
Variable costs			
Fuel costs			
Loaded vessel	€/km	10	7.54
Empty vessel	€/km	4.78	3.62
Repair and maintenance costs	€/km	0.72	0.37
Overheads	€/year	n.a.	n.a.
Business hours			
Day operations	Hours/year	3.500	3.500
Semi-continuous operations	Hours/year	4.500	4.500
Continuous operations	Hours/year	7.800	7.800
Direct cost hour coefficient			
Day operations	€/hour	264	134
Semi-continuous operations	€/hour	238	133
Continuous operations	€/hour	185	110
Kilometre cost coefficient			
Loaded vessel	€/km	10.72	7.91
Empty vessel	€/km	5.50	3.99

Source: Adapted from NEA (2009).

Discussion

- What makes intercontinental vs continental moves different as far as transport modes are concerned ?

- Rail movement
  - Infrastructure design
    - Railway track gauge and clearance parameters
    - To 3000 t and 1,435 mm
  - The more wheels, the more traction
    - Two bogies : 2 driving axles
    - 20-25t per axle
  - Traffic safety and control systems
    - New infrastructures
    - New freight lines
  - The AGTC network
    - The UIC C Standard clearance gauge, height up to 4 m
    - UIC B to 2.9 m high, containers and swapbodies



GAUGE

PURPOSE BUILT CARS

Rail movement

- *Eight variables influencing capability for freight*
  - Track and route mileage
  - Electrified track miles
  - Permissible line speeds
  - Gauge capability
  - Route availability
  - Length capability
  - Gradients
  - Total tonnage capability

The table below shows some of the network parameters.

Infrastructure parameters for the network of major international combined transport lines	A: Existing lines which meet the infrastructure requirements and lines to be improved or reconstructed		B: New lines
	at present	target values	
1. Number of tracks	(not specified)	(not specified)	2
2. Vehicle loading gauge		UIC B 2/	UIC C 2/
3. Minimum distance between track centres 1/		4.0 m	4.2 m
4. Nominal minimum speed	100 km/h	120 km/h	120 km/h
5. Authorised axle-loads:			

Locomotives

- Old locomotives : up to 30-40 years
  - Power supply systems
    - With different electric systems
    - 4000 KW power (5400 Horse power)
    - Till 10000 KW
- But in intermodal …
  - 1000-2000 t payload in Europe and heavier in North America
  - The tailormade locomotive cost is 2-4 million € (leasing way)
  - Diesel locomotives are used for handling equipment

Table 2.5 UIC wagon codes

Class	*Wagon type*
E	Ordinary open high-sided wagon
F	Special open high-sided wagon
G	Ordinary covered wagon
H	Special covered wagon
I	Refrigerated van
K	Ordinary flat wagon with separate axles
L	Special flat wagon with separate axles
O	Open multipurpose wagon (composite open high-sided flat wagon)
R	Ordinary flat wagon with bogies
S	Special flat wagon with bogies
T	Goods wagon with opening roof
U	Special wagons
Z	Tank wagon

Figure 2.20 Open wagon with tarpaulin cover. (From Wascosa.)

Wagons

- Rail freight operators often lease wagons from manufacturers or leasing companies
- Locking pins are used depending on the loading unit (swapbody, container …)
- In UK conveyance of 9’6’’ is too constrainted (low floor or pocket wagons)
  - But existed 60’ long wagon : 1x20’ + 1x40’

Figure 2.21 Open wagon. (From © Phil Sangwell [CC BY 2.0] via Wikimedia Commons.)

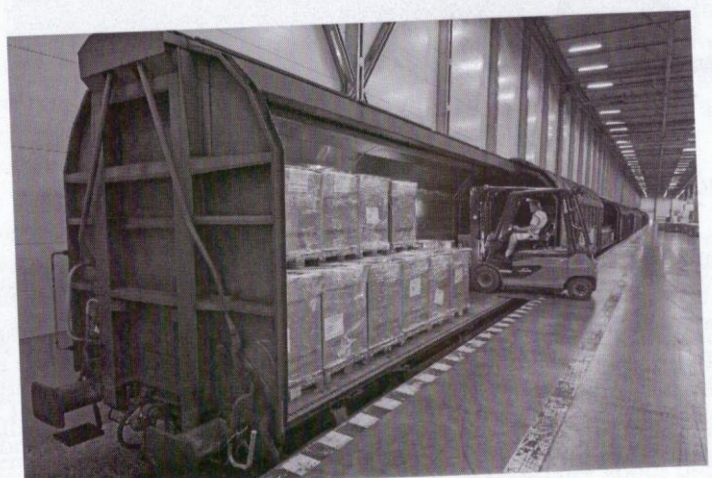


Figure 2.22 Covered wagon being unloaded by a forklift. (From Port of Gothenburg.)

Figure 2.23 Powder wagon. (From Wascosa.)

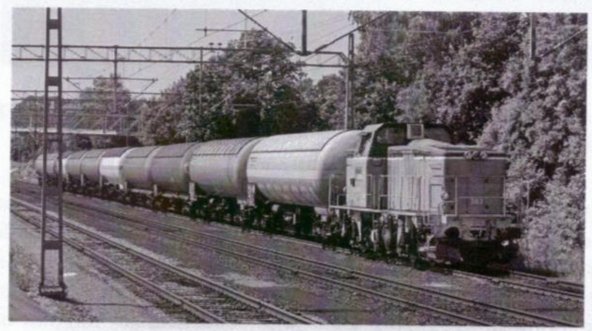
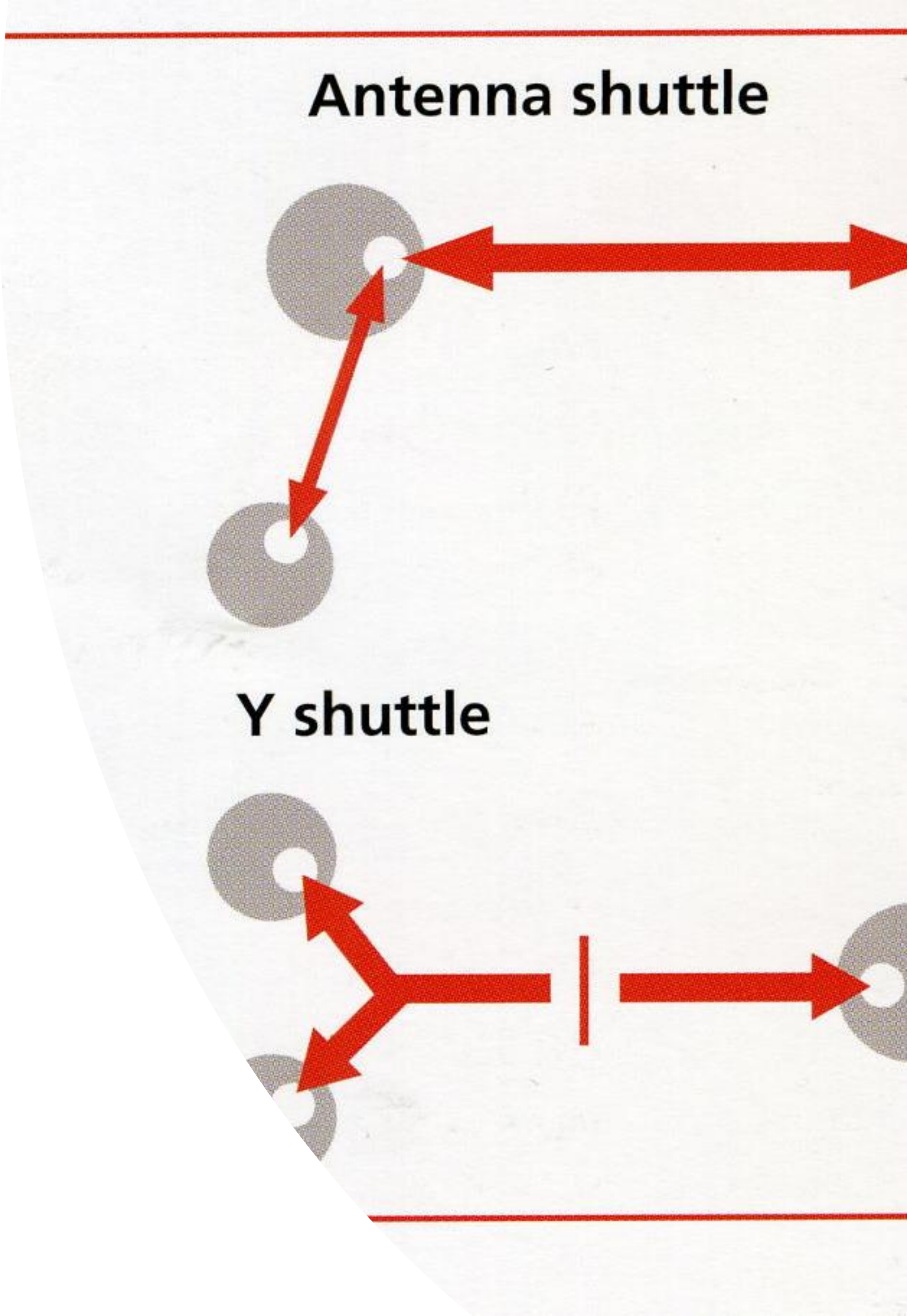


Figure 2.24 Tank wagons. (From Port of Gothenburg.)

Figure 2.25 Flat wagon with uprights for hauling general cargo such as steel pipes. (Fro
Port of Gothenburg.)

- Rail shuttles
- Block trains (not fixed)
- The antenna shuttle and Y shuttle
- The hub and spoke system …
- The gateway system
- Shuttle network
- Single wagon production
- Trimodal production systems
- Rail corridors
  - Rotterdam Genoa
  - compatibility



- Rail road
  - Swap bodies : minimal upper body – cannot be stacked
  - Piggyback : combination – speed and reliability – with tractors –trailer train
  - Rolling road : combined transport – without comitting to specific investment – mobile ramps
- Outlook
  - E.U. standard to 775m train length

COVID 19 vaccine example

- Pfizer forecast
  - Filling process in Kalamazoo plant in Michigan
  - Special shipping boxes = 0.40x0.40x0.56 m packed with dry ice
  - Each box contains 975 flasks containing each 5 vaccine doses
  - Six trucks daily to ship to Fedex, UPS, DHL
  - Delivery time : 1 to 2 days in the U.S. and 3 days worldwide
  - 20 dailys flights
  - Authorization f dry ice to Fedex in Boeing 767 and 777 (to avoid gas emission)
  - At destination : each box will be opened briefly twice a day
  - Dedicated to big vaccine centers
  - To be stored 2 weeks in the original refrigerated box
  - Production this very year : 50 millions doses
    - 20 to 30 millions delivered in the U.S. this year and 70 millions more in 2021
    - Europe : 200 millions ; 120 millions Japan, 30 millions U.K.
  - Then competitors as from first quarter 2021 will have their own on the market
    - Moderna, Astra Zeneca, Johnson & Johnson, Sanofi …

RESEARCH WORK

- WORKING GROUP FOR NEXT TIME
  - LET’S COMPARE MAIN INTERMODAL RAIL ROAD OPERATORS ON THE UK MARKET
    - IDENTIFICATION
    - WEAKNESS AND STRENTGH

- Landbridge train
  - European rail shuttle
  - Combine their management of the inland movement of container
  - East west trade in Europe
  - Door to door services
  - Russian railways joint venture : 2 Block trains a week
  - China and Russia developing agreement
  - Transport corridor Berlin-Warsaw-Minsk-Moscow
  - Transalpine traffic, Chunnel …
  - Malaysia a daily train to ICD
  - USA, double stock container service in South California

Belt and Road Initiative China/Europe

** CO2 : moyenne en grammes / tonne - kilomètre (source : OCDE 2008)*

Import China - Europe		
TC 40' (25T)	**SEA FREIGHT**	**RAIL FREIGHT**
Leg	Shanghaï - Hambourg	Shanghaï - Duisbourg
Distance	22 735 km	8 838 km (- 60%)
Carbonic gas emission*	12,5 g/t-km = 7,1 T	30 g/t-km = 6,63 T (- 6.6%)
Transtit time (days)	32	19 (- 40%)
ALL IN	1 950 USD	5 575 USD (x 2,85)
Fréquency (/week)	1	6

TYPE	LENGTH M	WIDTH M	HEIGHT M	VOLUME CBM	DEAD WEIGHT	LOAD T
box	7,15	2,55	2,30	39,3	NA	NA
tautliner	13,6	2,55	2,3to2,49	77	4to4,5	28,5
tarpaulin	13,6	2,55	2,35	77	3,4	NA
reefer	13,6	2,6	2,6	variable	5to5,5	28
Mega volume	13,6	2,55	2,95	100	5,85	28

Caisses mobiles fourgon 7,45 m

Caisse mobile 30'

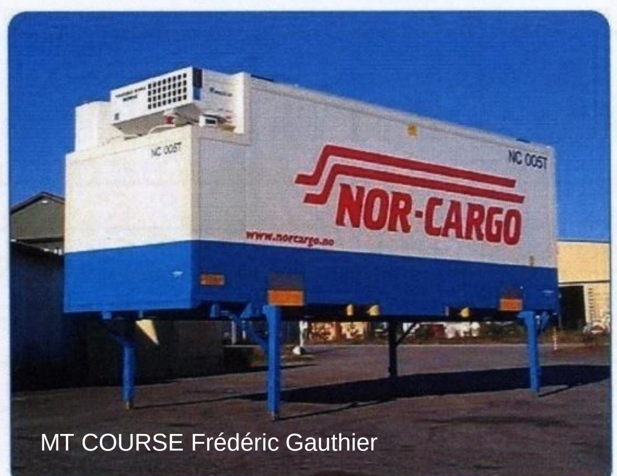
Caisse mobile tôlée

Caisse tautliner 13,6 m

Caisse mobile 7,45 m

Caisse frigo 13,6 m

Caisse frigo 7,45 m



Caisse Mega-Comb

Loading units comparison

	Number of pallets 80x120	Number of pallets 100x120	Load
Trucks Rail car SNCF	Till 33 44	Till 26 36	25.5 t 40t (average)
Container 20’ Container 40’ Swapbody TRAIN LENGTH	11 25 33 750 m to 850 m	9 22 26	28 28 29 1,800t
Unit type Combined container Swapbody CEMT Swapbody A1219 Swapbody A1360	External dimensions Wide x high x long 2.5x2.59x7.45 2.5x2.67x7.45 2.5x2.67x12.192 2.5x2.67x13.6	Euro pallet 18 18 30 33	UK pallet 14 14 24 26
Disruption to solve			
Bulk	Dedicated handling equipment	To move to containers	To transform raw material from close storage place
Pallets / big bags … Containers	Forklift Simple but dedicated	Handling equipment on barge with working operations Gantries, infrastructures	Storage / consolidation/ cross docking Close to consuming area Customs /ICDs availability
Heavy packages	Hight cost handling infrastructures	Disruption, horizontal handling RoRo	Useful inlandwaterway combined with road transport on short distances

Road transport systems

- Large scale to large operators
- Flexibility
- Production system with large customers
- Terminal cartage solutions
  - C passed on to the consignee
  - Extremely short, short, long distances
- Intermodal production and chain integration
  - Orgasitional and commercial ones
- Local distribution and flexibility

Efficiency model for road transport

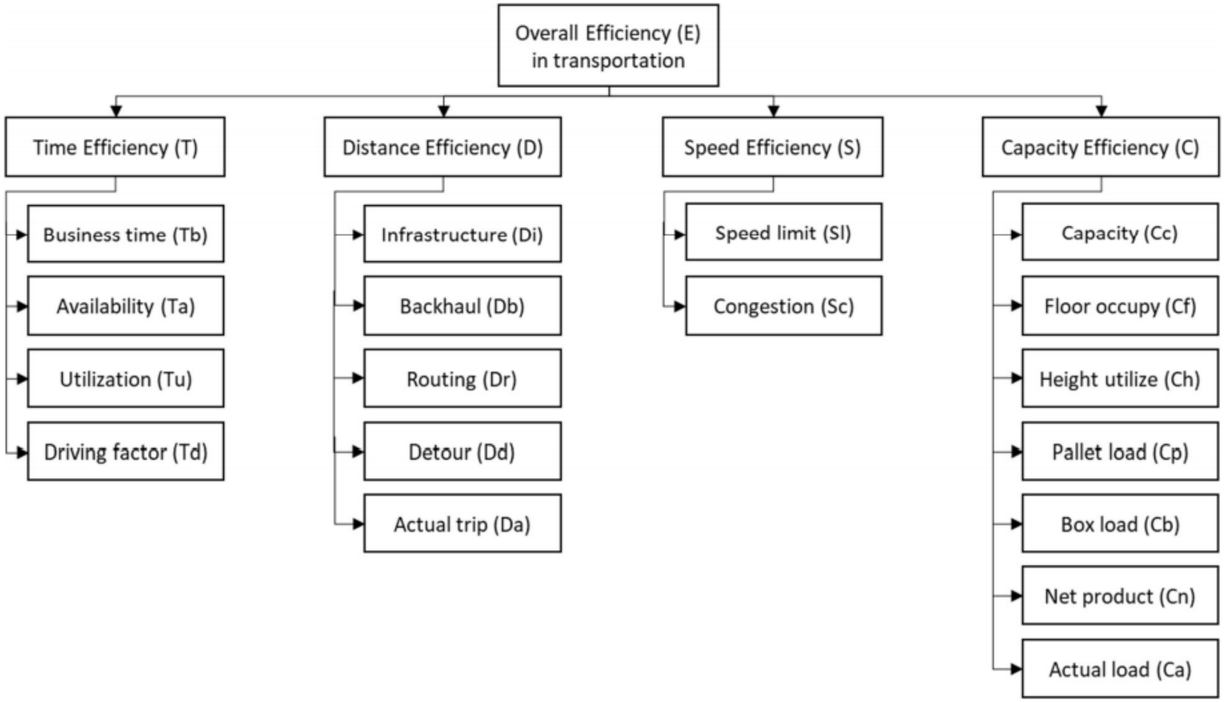


Figure 2. 1 Four-dimensional overall efficiency model for road transportation

Source: (Samuelsson and Tilanus, 1997)

Challenges to integrate pre and post Haulage

Road is 73% of inland E U freight

E U goal 30 % road freight shifted to other modes by 2030

Offer fragmented so Many empty trips

so pre post carriage can be primary source for long transit time and lead time unreliability

Urban distribution

Availability of infrastructures

Concentration of freight demand

Congested roads including with Cars

Road terminals are easily location changed which is not the case for rail terminals

Having closer terminals to shippers and receivers will decrease PPH (delay) cost and Congestion

But these networks are separated

MT COURSE Frédéric Gauthier

Road focus

Urban distribution

- European and North American cities, warehousing have been **decentralized**
- Rail centers remain **unfortunately in centers** which have to be moved to suburban areas
- A modal shift to lower gas emission will be possible that way

Table 5. 1 Example system design characteristics

	Intermodal terminal	Road haulage	Distribution centre
Capacity	• I reach stacker	• 2 trucks • 22 trailers (either 1*40 ft or 2*20 ft per trailer) • 5 lorry drivers	Between 1 2 and 24 gates • Staffing 2 shifts of 14 on average per shift
Opening/ operating hours	Mon-Fri 05.00-18.00	Mon—Fri 04.30-23.30	Mon-Thu 06.00-23.00 Fri 06.00-16.00 Sat 06.00-20.00
Activity and lead times	• Loading/unloading time: 2—5 min per trailer • Outside opening hours: • Time for marshalling of trailer including leaving/picking up trailer at the gate: 20-35 min	Transport time: 30-35 min (one-way).	Time for marshalling of trailer including leaving/picking up trailer at the gate: 20—35 min

Road focus

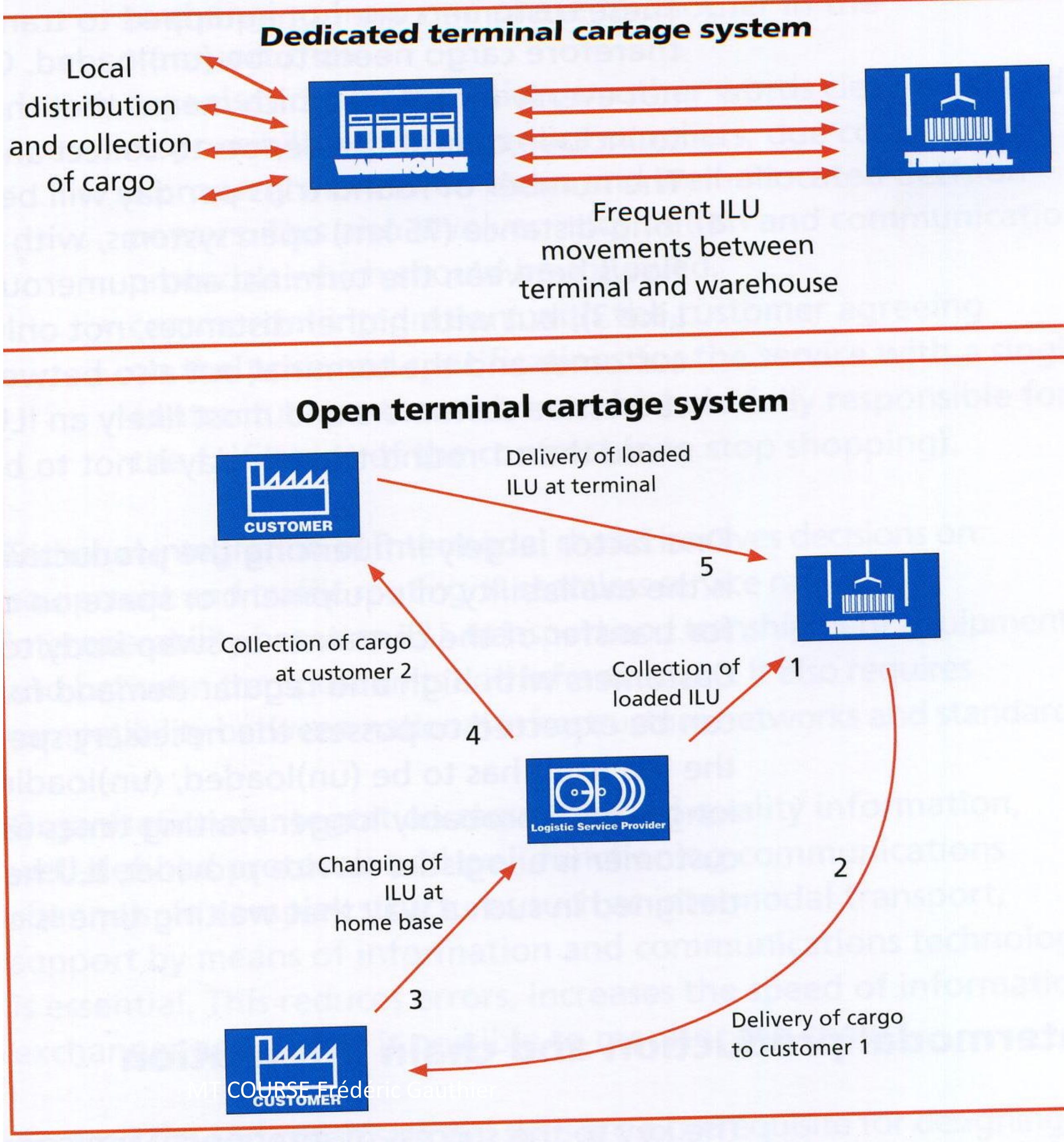
- **Last mile**
  - Looking for closer distance between terminal and operators
  - Extended terminal opening hours but extra cost ; Acquire more trailers
- **Final leg** is stripping / stuffing
- Empty repositioning of containers are depending on
  - Number of Containers stored at the terminal
  - Opening hours of the terminal
  - Number of trucks and working hours of drivers
  - Capacity of trucks
  - Number of trailers
  - Opening hours and manning of central warehouse
  - Difficulty is to take into account : fluctuations

Road focus

- Example in EU **inbound train than truck on delivery**
  - Truck returns the empty container
  - In the US, containers remain on the chassis

    Or
  - Truck coming with an empty container contacts the reach Stacker driver that he arrived and takes a full container at the yard
  - Then deliver to the D C he advised by radio
  - than DC can allocate discharge (and plan in advance)
  - And truck driver can take an empty container
  - Save significant round trip time

2-

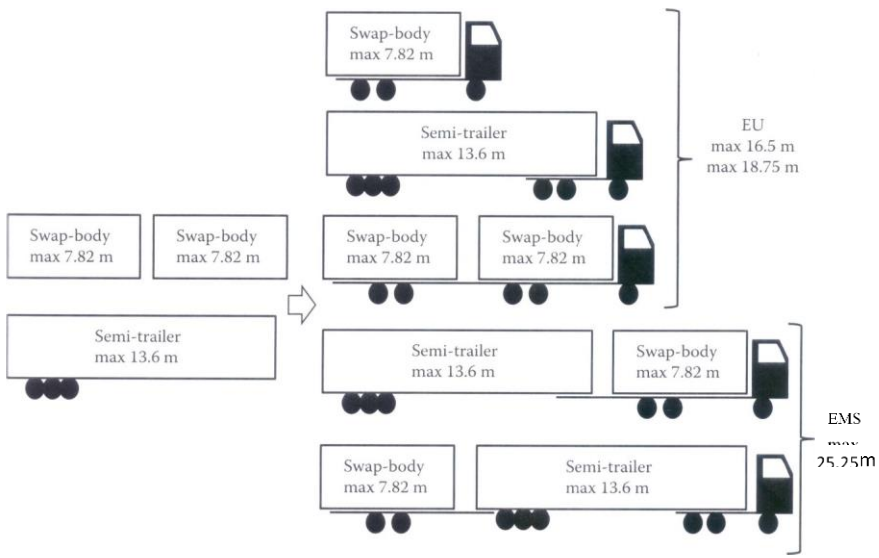

Dedicated terminal cartage system
Local distribution and collection of cargo
WAREHOUSE
TERMINAL
Frequent ILU movements between terminal and warehouse
Open terminal cartage system
CUSTOMER
Delivery of loaded ILU at terminal
5
TERMINAL
Collection of cargo at customer 2
Collection of loaded ILU
1
4
Logistic Service Provider
Changing of ILU at home base
2
3
Delivery of cargo to customer 1
CUSTOMER

Road focus

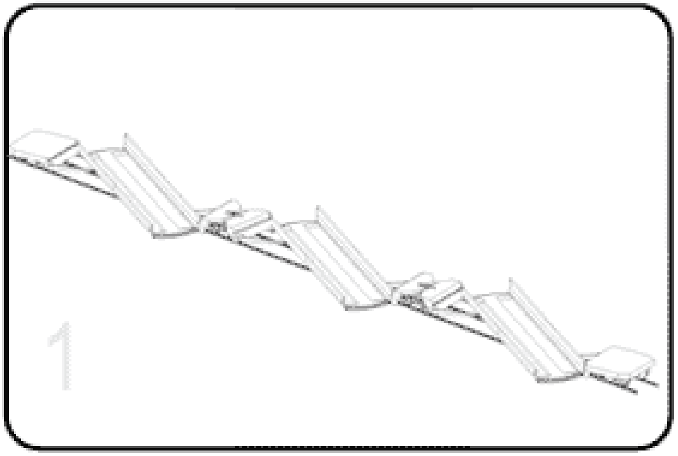
High capacity transport

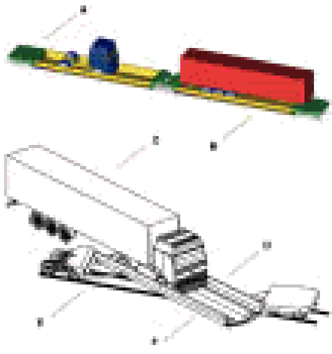
- Maximum length on cross border traffic = 16.50 m
- And 18.75m for articulated vehicles
- 44 t when transporting containers

- Will 25. 25 in Sweden , Finland , NL with weight restrictions
- Possible new regulation for 25.25m and 60 t

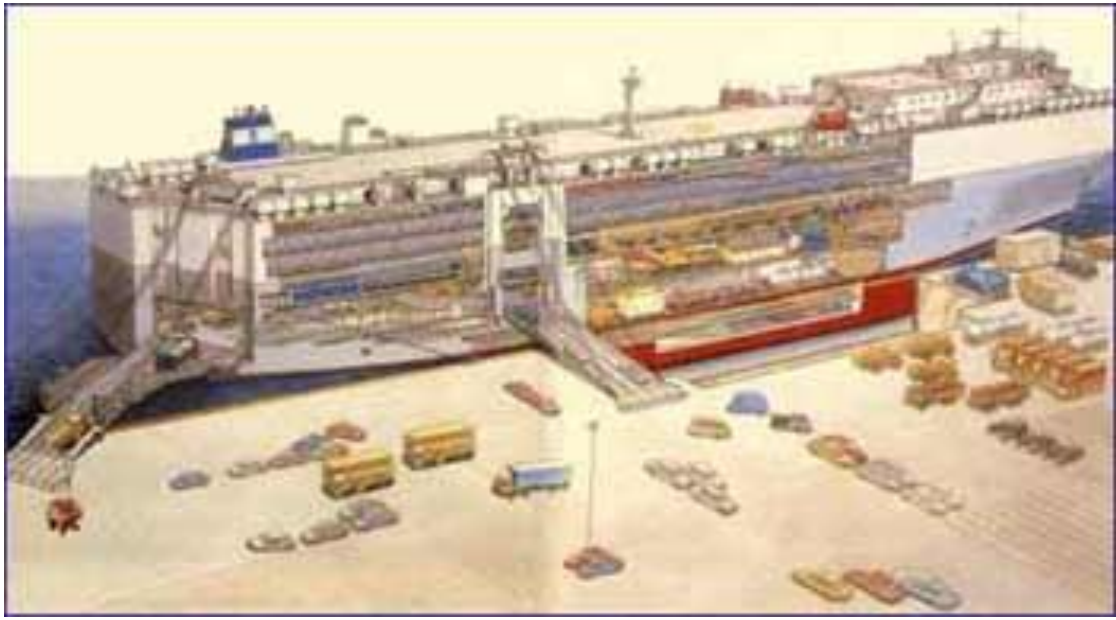


- Piggyback
  - Channel tunnel
    - Hazardous goods
    - Reefer trailers
  - Modalohr
    - Pivot on each wagon
    - Retractable ramp
    - Heavy goods vehicles
    - Where road traffic is saturated
    - As railway sidings do not exist – improved rail road combined transport
    - Multimodal platform





- Roll on roll off : short sea crossing
  - Roll on to water based
    - Tractors – buses – trucks
    - Safest and most inexpensive
    - No need for dismantling and reassembly
  - RoRo vessels
    - Outsized cargo
    - Multi-port operation

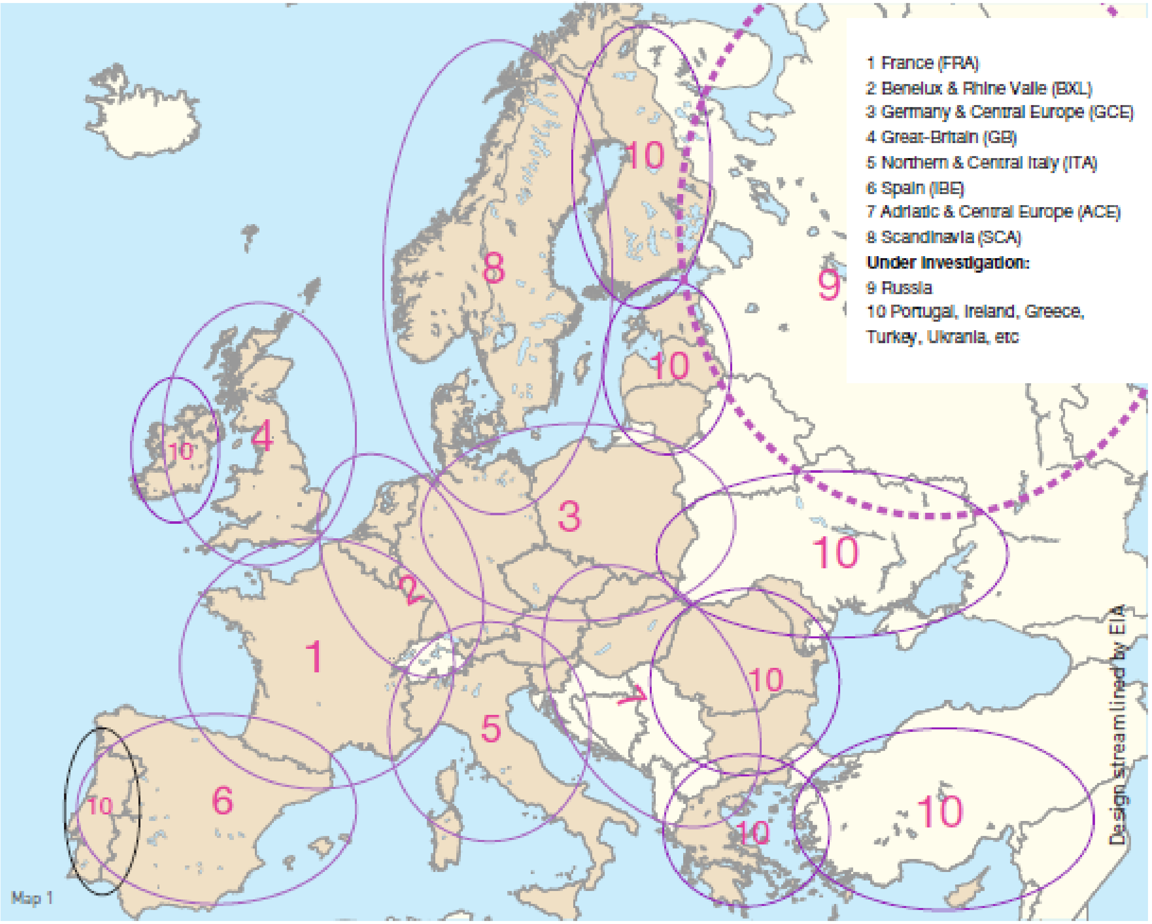


- Lift on lift off
  - Lifted into
  - Similar to RORO
  - Stored below the deck

3 – Continental approach

- Handling facilities
  - Adequation
  - Cost of moving
  - Inland movement of containers
- Container Corporation of India Case Study
  - Development of inland container handling facilities
  - Railway use
  - Traffic
  - ICD/CFS

CMA CGM case


1 France (FRA)
2 Benelux & Rhine Valle (BXL)
3 Germany & Central Europe (GCE)
4 Great-Britain (GB)
5 Northern & Central Italy (ITA)
6 Spain (IBE)
7 Adriatic & Central Europe (ACE)
8 Scandinavia (SCA)
Under investigation:
9 Russia
10 Portugal, Ireland, Greece, Turkey, Ukrania, etc
1
2
3
4
5
6
7
8
9
10
Map 1
Design streamlined by EIA

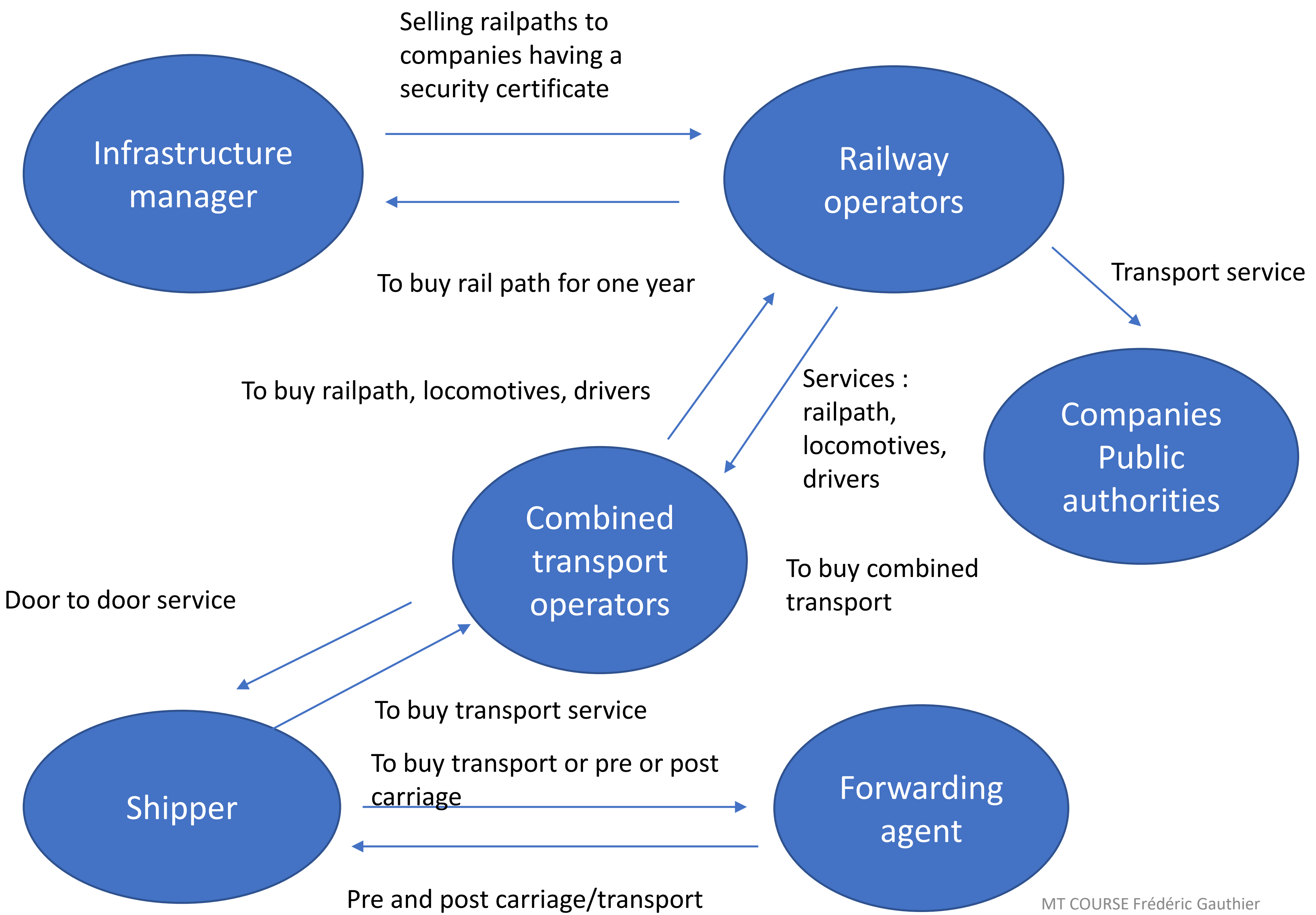
3-

- Short sea shipping in EU
  - Imo Fal
  - Marco Polo Programme
    - Programme
    - Structure
  - Loading units
  - Customs procedures for short sea shipping
  - A growth
  - Analysis per countries

Continental & Multimodal choice

About	Inlandwaterway	Railway
Full distance	From a short distance to 200 kms	More than 200 kms Some cases less than 200 kms
Pre/post carriage	From 0 km on short distance Till 150 km on a long distance	Less than 40 km Latest km might increase drastically total cost
Volumes	General cargo from 1 FCL Bulk : 250 t as a minimum (Freycinet barge) Heavy and over sized goods	22 to 24 rail cars 80 to 100 cbm Filling rate more than 85 %
Services	On request to bulk or operating cycle or liner shipping	Round trip or one way
Frequency	Just in time is possible	Can meet with rigidity (timetable, location which is compulsory Investment justified with flows (locomotive, raicars) highest productivity as a goal
Regular flows	Non specific constraint : taking care of mode disruption	Regular and sustainable flows
Goods	Heavy bulk or heavy general cargo, intermodal transport unit	Heavy goods (steel, construction material, drinks) and bulk sand, cereals, coal …)
Offer	10 to 15 brokers in France Several shipowners Direct chartering	One historical rail carrier in France 2 competitors Network RFF in France : to get train pathes

Road and rail



4-

- Intermodal freight transport in Europe
  - Main evolution
    - Increasing by free trade
    - Land use and different transport systems and .. infrastructures
  - European ports ranking
  - Trends in freight transport
    - Increasing number of terminals for all kinds of shifts
- 24% of freight vehicles in E.U. run empty
- The average loading of the rest is 57%
- There is an estimated recoverable loss for the E.U. of € 160 bn

V- Operators

1- Physical distribution

2- Network

3- Multimodal transport operator

4- Selection methods

1- Physical distribution

Legal types of carriage

For hire

- Common carrier

Or private

Service capability

- Market place under schedules and regulations

Other transportation agencies to remember

- Post office
- Freight forwarders

1- Physical distribution

- Transportation cost elements
  - Line-haul costs
    - Distance factor
    - Limitations to weight and cubic volume
  - Pick-up and delivery costs
    - And consolidation to reduce possibly the cost
  - Terminal handling
    - Number of times to load, handle and disload
    - consolidation factor is also critical
  - Billing and collecting
    - And paperwork
  - Total transportation costs management
    - So Decreasing costs
      - Line haul (by increasing weight),
      - Pick up (by reducing number),
      - Terminal, billing
  - Insurance
    - Value and density
    - Perishability
    - Packaging
    - Two rate structures LTL and FTL

1- Physical distribution

- Warehousing
  - Plant, regional, local and … wholesalers
  - Role of warehouses
    - General and distribution
    - Transportation reduced by using warehouses
    - Product mixing (different locations)
  - Market boundaries
    - Laid-down cost
    - Example Toronto / Boston
      - LTL cost 0.20 $ Product cost at Boston 70$ and 10$ in Toronto and 500 miles distance
  - Effect on transportation costs of adding more warehouses
    - Full truckload : cost increase and L.T.L. cost decrease
      - More distribution centers
      - Saving decrease with the first distribution centers
    - Package care
    - Unitization

1- Physical distribution

- Warehousing
  - Materials handling
    - Reducing handling
    - Fitting with dimensions
    - Handling equipement
      - Conveyors
      - Industrial trucks
      - Cranes and hoists

1-Physical distribution

- Costs
  - Transportation costs
  - Inventory carrying cost
  - By the way warehousing cost
    - More inventory places, more space needed and more costly
  - Materials handling
  - Packaging
  - Total system
    - Optimum point to identify
  - System service capability

2- network

Situation

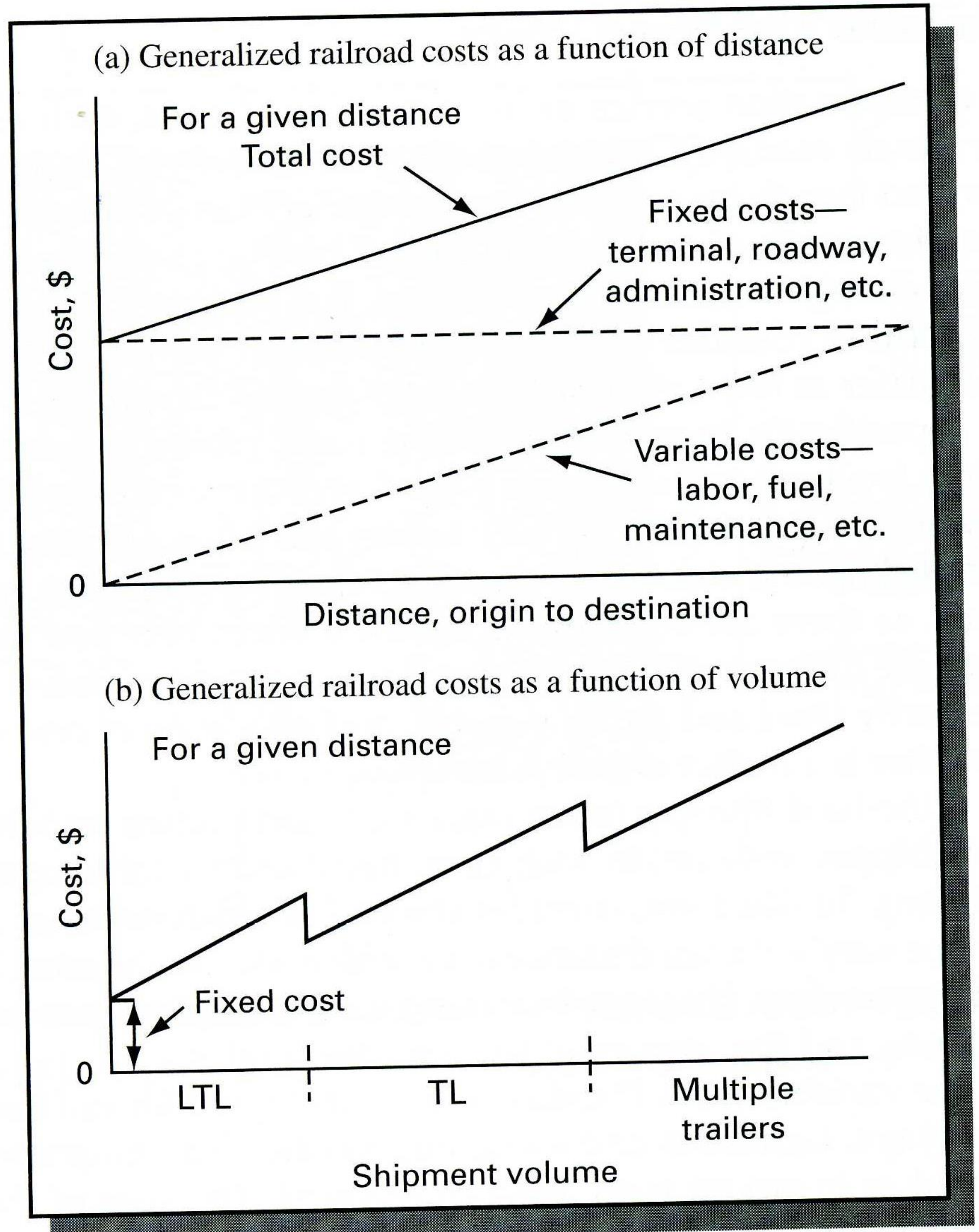
Types of transportation

Forwarding agent

- Cost
  - Variable and fixed costs
    - Line haul
    - Fixed costs depends on mode
  - Common or join costs
    - Arbitrary cost allocation
    - The back haul

Total cost

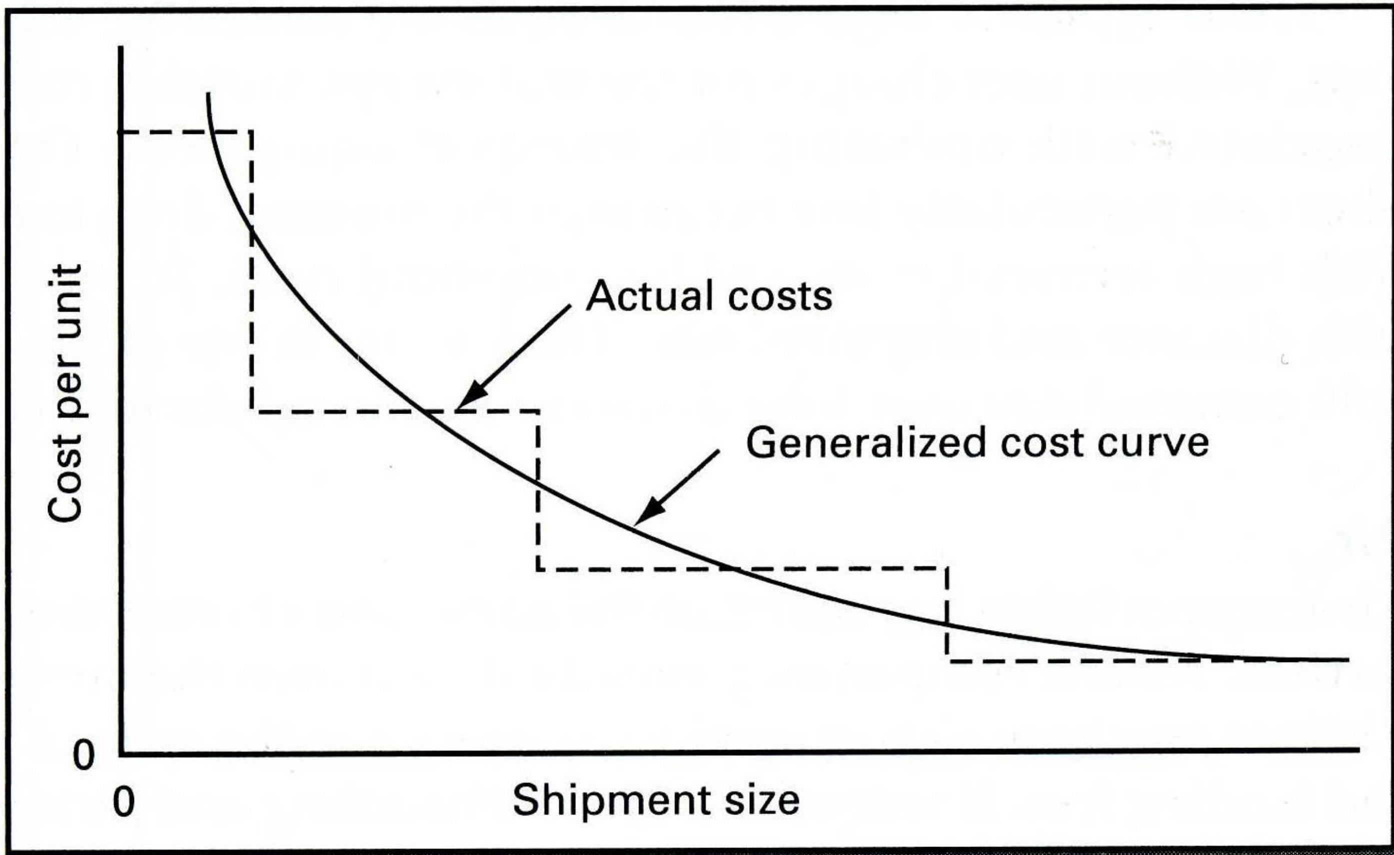
Figure 6-4
Generalized Railroad Costs (and Revenues) As Functions of Volume and Distance



- Cost characteristics by mode
  - Rail
    - Terminal cost
    - To add to fixed cost
    - Rail road
    - Economies of scale
    - To maximize time utilization

Shipment size

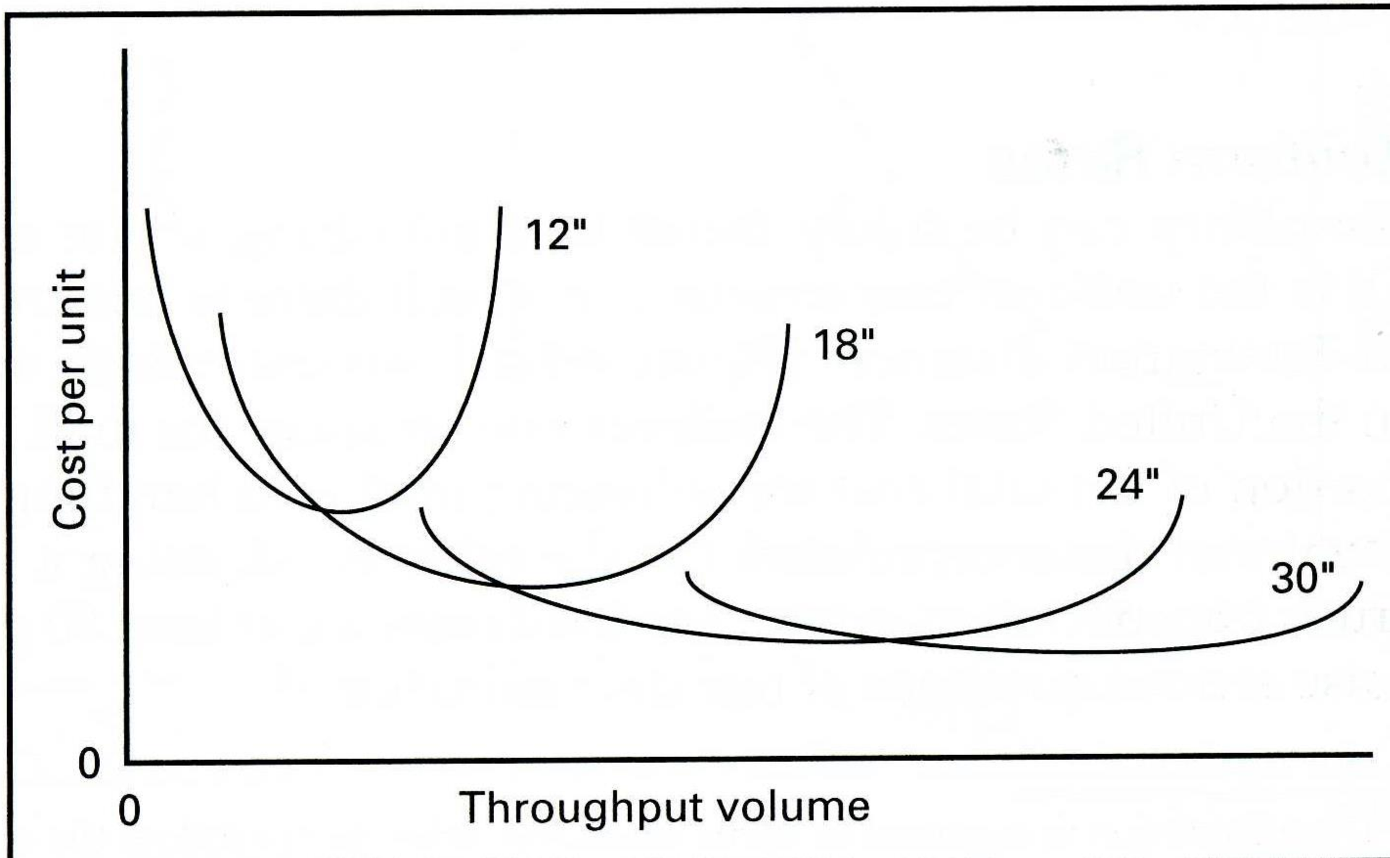
Figure 6-5
Generalized Surface Carrier Cost Structure Based on Shipment Size



- Costs and rates in Europe
  - Highway
    - Variable cost
  - Water
    - Equipment and terminal
    - Loading and unloading : slow and high
  - Air
    - Includes usually air space and terminal
    - Variable cost influenced by distance
  - Pipeline

Pipeline

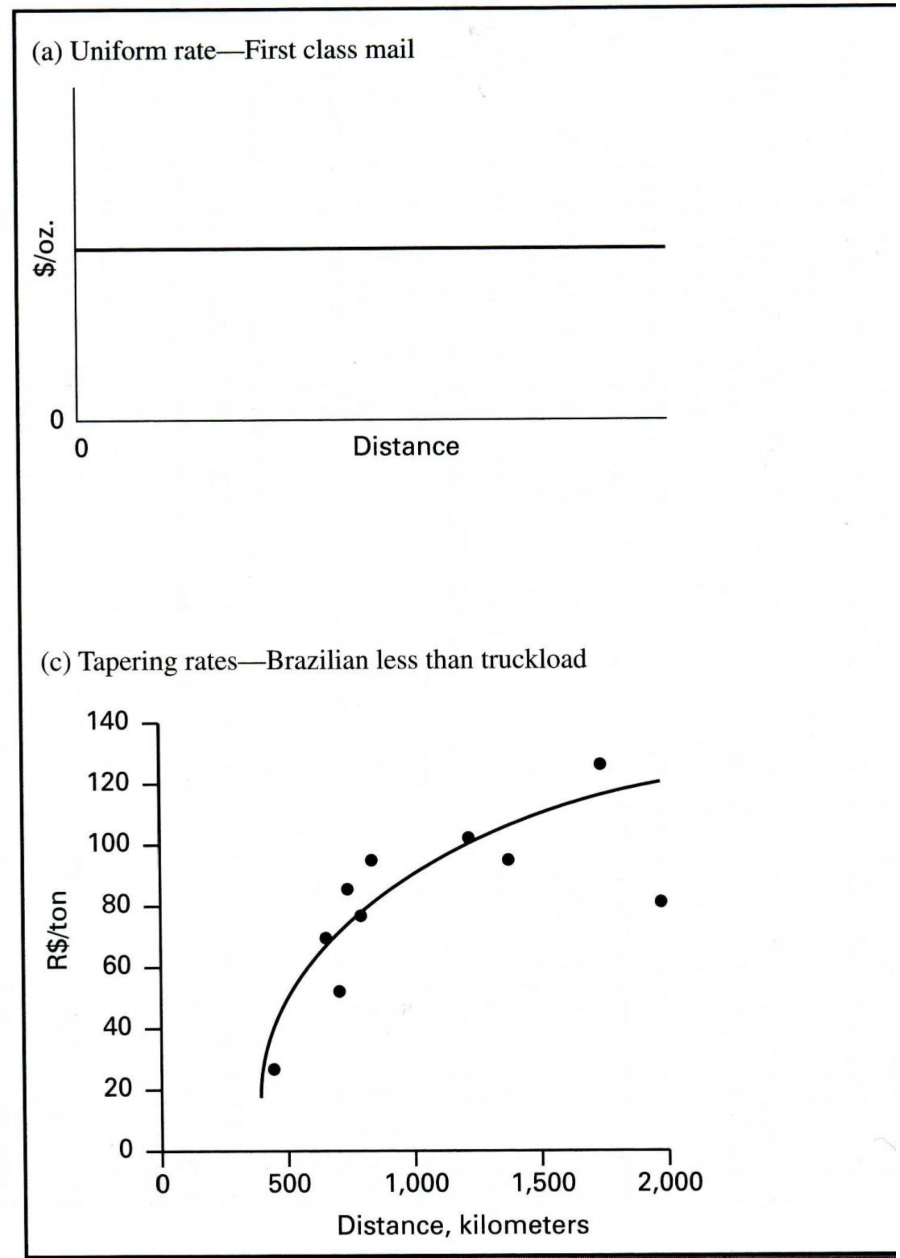
Figure 6-6
Generalized Pipeline Costs As Functions of Pipe Diameter and Throughput Volume



- Rate profiles
    - Volume related rates
        - Any quantity rate
    - Distance related rates
        - Uniform rates
            - Example Mail and handling

Uniform rates

Figure 6-7 Four Distance-Related Freight Rate Structures

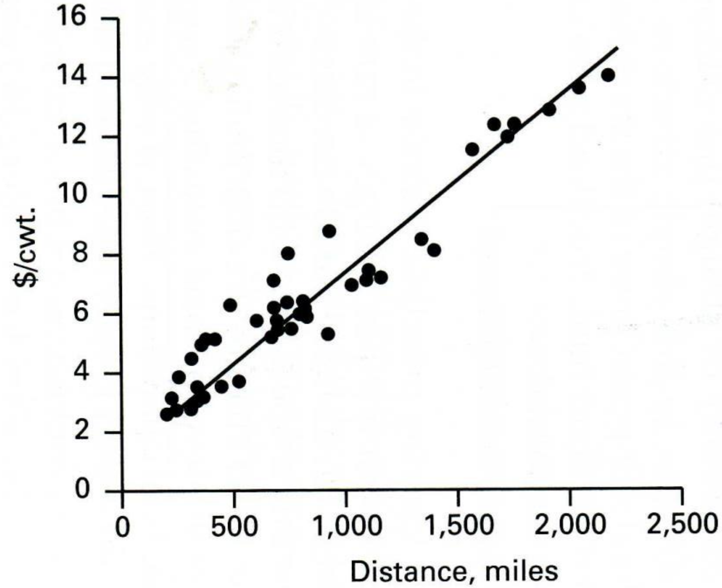


Tapering rates cost increasing with distance but at a decreasing rate

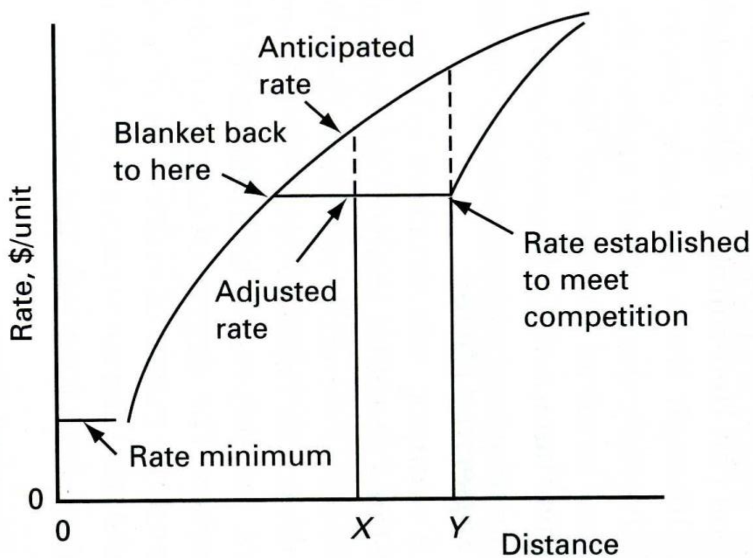
Blanket rates, area

Demand-related rates

(b) Proportional rates—Truckload

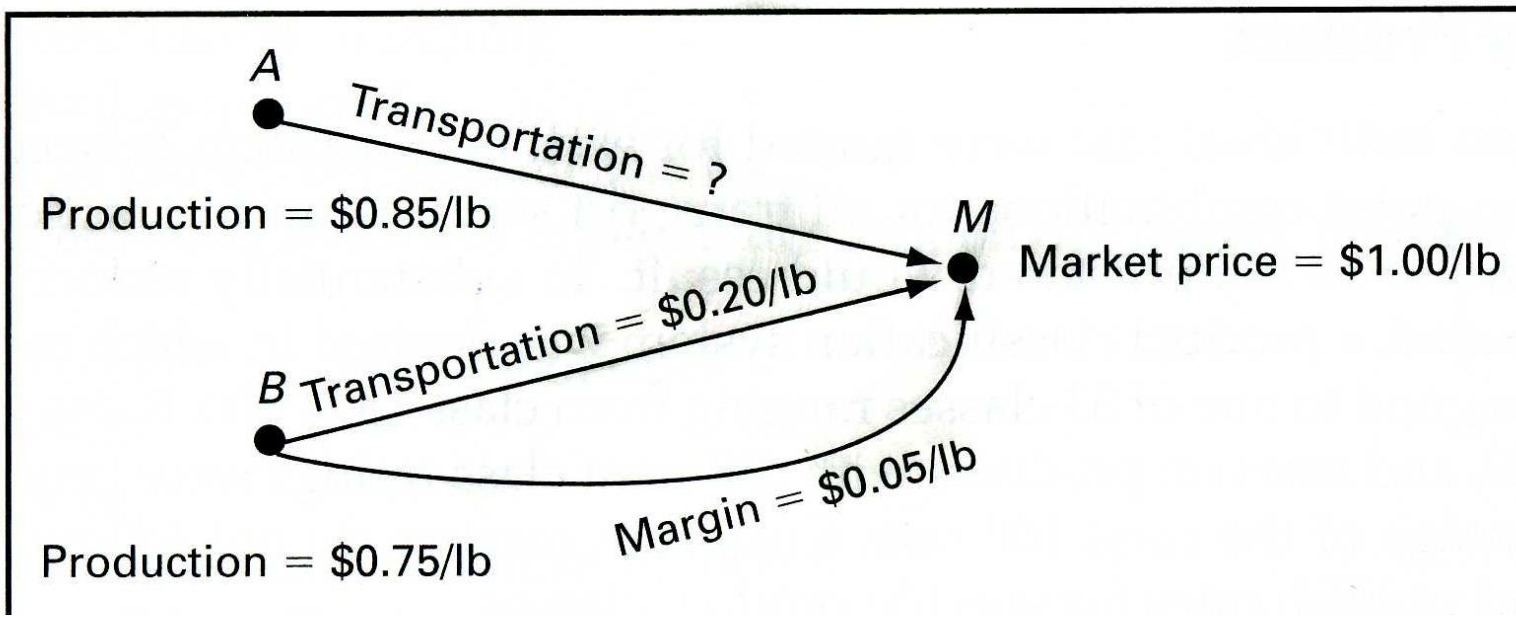


(d) Blanketing rates



Transport added value

Figure 6-8
Value of Transportation Service



By product

- Uniform freight classification
- Factors as density, stowability, ease of handling and liability
- Ratings of analogous articles
- Other factors

Class rates

- Break weight
- Next rate x next weight divided by current rate

Table 6-4 National Motor Freight Classification for Selected Products

Item Number	Description	Less-Than Truckload	Truckload	Minimum Weight, lb
	ABRASIVES GROUP:			
	Alundum, Corundum, Emery or other Natural or Synthetic Abrasive Material, consisting chiefly of aluminum oxide or silicon carbide:			
1070-00	Crude or lump, LTL, in bags, barrels or boxes: TL, loose or in packages	55	35	50,000
1090-00	Flour or grain, in packages	55	35	36,000
2010-00	Refuse, including broken wheels, wheel stubs or wheel grindings, in packages; also TL, loose	55	35	40,000
2030-00	Wheels, pulp grinding, on skids or in boxes or crates	55	40	30,000
2055-00	Cloth or Paper, abrasive, including Emery Cloth or Paper or Sandpaper, in packages	55	37.5	36,000
2070-00	Accessories or Furniture, cat or dog, in boxes and having a density on pounds per cubic foot of:			
2070-01	Less than 1	400	400	AQ[a]
2070-02	1 but less than 2	300	300	AQ[a]
2070-03	2 but less than 4	250	250	AQ[a]
2070-04	4 but less than 6	150	100	12,000
2070-05	6 but less than 8	125	85	15,000
2070-06	8 but less than 10	100	70	18,000
2070-07	10 but less than 12	92.5	65	20,000
2070-08	12 but less than 15	85	55	26,000
2070-09	15 or greater	70	40	36,000
	ADVERTISING GROUP:			
	Advertising Matter, NOI, prepaid, in packages			
4660-01	Cloth or oilcloth	85	55	24,000
4660-02	Paper or paperboard, other corrugated or fluted	70	40	30,000
4740-00	Almanacs, prepaid, in packages	77.5	55	24,000

Contract rates

- Special rates

Freight all-kinds

By shipment size

- Minimum quantity

Table 6-6 Selected Class Truck Rates in $ per cwt. by Classification Number and Weight-Break Quantity in lb for Shipments from Louisville, Kentucky, to Chicago, Illinois

MC[a] $75.40 Class	<500	≥ 500	≥ 1,000	≥ 2,000	≥ 5,000	≥ 10,000	≥ 20,000	≥ 30,000	≥ 40,000
500	165.39	132.31	99.26	82.70	59.51	54.44	28.67	28.67	28.67
400	139.03	111.22	83.43	69.51	50.03	45.76	24.10	24.10	24.10
300	110.26	88.21	66.17	55.13	39.68	36.68	19.11	19.11	19.11
250	95.88	76.70	57.54	39.55	34.50	31.56	16.62	16.62	16.62
200	79.10	63.28	47.47	39.55	28.46	26.04	13.71	13.71	13.71
175	69.51	55.61	41.72	34.76	25.01	22.88	12.05	12.05	12.05
150	62.32	49.86	37.40	31.16	22.43	20.51	10.80	10.80	10.80
125	52.73	42.19	31.65	26.37	18.98	17.36	9.14	9.14	9.14
110	52.34	40.27	30.21	25.17	18.11	16.57	8.73	8.73	8.73
100	47.94	38.35	28.77	23.97	17.25	15.78	8.31	5.69	4.37
92.5	45.54	36.43	27.33	22.77	16.39	14.99	7.89	5.41	4.15
85	42.19	33.75	25.32	21.09	15.18	13.89	7.31	5.01	3.85
77.5	39.79	31.83	23.88	19.90	14.32	13.10	6.90	4.72	3.63
70	37.39	29.91	22.44	18.70	13.46	12.31	6.48	4.44	3.41
65	35.48	28.38	21.29	17.74	12.77	11.68	6.15	4.21	3.23
60	34.04	27.23	20.43	17.02	12.25	11.20	5.90	4.04	3.10
55	32.60	26.08	19.56	16.30	11.73	10.73	5.65	3.87	2.97
50	31.16	24.93	18.70	15.58	11.21	10.26	5.40	3.70	2.84

[a] MC = minimum charge in $

Source: Southern Motor Carriers' CZAR-LITE software.

- Other incentive rates
  - In excess rates, quantity exceeding the vehicle minimum load
  - Unit trains example
    - Single commodity trains

Table 6-7 Examples of Transportation Charge Computations for Different Shipment Combinations of Class Ratings, Distances, and Shipment Weights

Example	Shipment Specifications	Calculation Rate, $/cwt.	Actual Freight of Charges	Charges	Comments
A	Item 2070-02; Louisville, KY, to Chicago, IL; Volume = 300 lb.	MC = $75.40, $110.26	$110.26 × 3 = $330.78	$330.78	Class = 300 from Table 6-4; Rate from Table 6-6
B	200 lb of paper calendars; Louisville, KY, to Chicago, IL	MC = $75.40, $37.39	37.39 × 2 = $74.78 Pay minimum charge	$75.40	Class = 70 for item 4800-02 in Table 6-4; Rate from Table 6-6
C	Cat furniture; New York, NY, to Portland, OR; Volume 15,000 lb at a density of 5 lb/cu. ft.	MC = $197.25, $58.19	$58.19 × 150 = $8,728.50 Break quantity is 17,680 lb[a]	$8,728.50	Class = 100 for item 2070-05 from Table 6-4; Rate from Table 6-5
D	150 lb of books printed on glossy paper; Louisville, KY, to Chicago, IL	MC = $75.40, $39.79	$39.79 × 1.5 = $59.69 Pay minimum charge	$75.40	Class = 77.5 for item 4860-02 from Table 6-4; Rate from Table 6-6
E	18,000 lb. of bags with advertising; Louisville, KY, to Chicago, IL	LTL: $15.78 @100 TL: $6.48 @70[b]	LTL: $15.78 × 180 = $2,840.40 TL: 6.48 × 200 = $1,296.00	$1,296.00 Ship TL at lower class and rate	Class = 100 LTL and 70 TL for item 4745-00 from Table 6-4; Rates from Table 6-6
F	Grain in packages; Louisville, KY, to Chicago, IL: Volume 27,000 lb	$5.65@20,000 $3.87 @30,000	$3.87 × 300 = $1,161.00 Break quantity is 20,549 lb	$1,161.00	Class = 55 for item 1090-00 from Table 6-4; Rates from Table 6-6
G	Class 100 item; New York, NY, to Little Rock, AR; Volume = 40,000 lb; 40% rate discount	$17.56 less 40% = $10.54	$10.54 × 400 = $4,216.00	$4,216.00	Rate from Table 6-5
H	40,000 lb of refuse; Louisville, KY, to Chicago, IL	TL Class = 35 Rate @35% of 4.37 = 1.52[c]	$1.52 × 400 = $608.00	$608.00	Class = 35 for item 2010-00 from Table 6-4; Base rate from Table 6-6
I	Class 100 item; New York, NY, to Dallas, TX; 45,000 lb; Minimum volume for truckload = 36,000 lb; in-excess rate offered = $15.00/cwt.[d]	TL: Rate = $20.52	TL: $20.52 × 360 = $7,387.20 EX: $15.00 × 90 = $1,350.00 Total $8,737.20	$8,737.20	Rate from Table 6-5

[a]Break quantity = (51.44 ÷ 58.19) × 20,000 = 17,680 lb
[b]Rate for class 70 and shipping weight of 20,000 lb
[c]Rate is approximate as a percent of class 100 rate. A truckload rate is likely to be quoted separately from the tabled rates.
[d]Rate applies to all weight in excess of the minimum volume. The minimum volume moves at the CL rate.

By route

Miscellaneous rates

- Cube rates
- Import/export rates
- Deferred rates : increasing delays
- Released value rates

Ocean rates

special service charges

- Diversion and reconsignement, waiting for the ultimate destination
- Special line Haul services
- Transit privileges

STOP OFF PRIVILEGE

Figure 6-9
Example of Stop-Off Privilege to Complete Loading

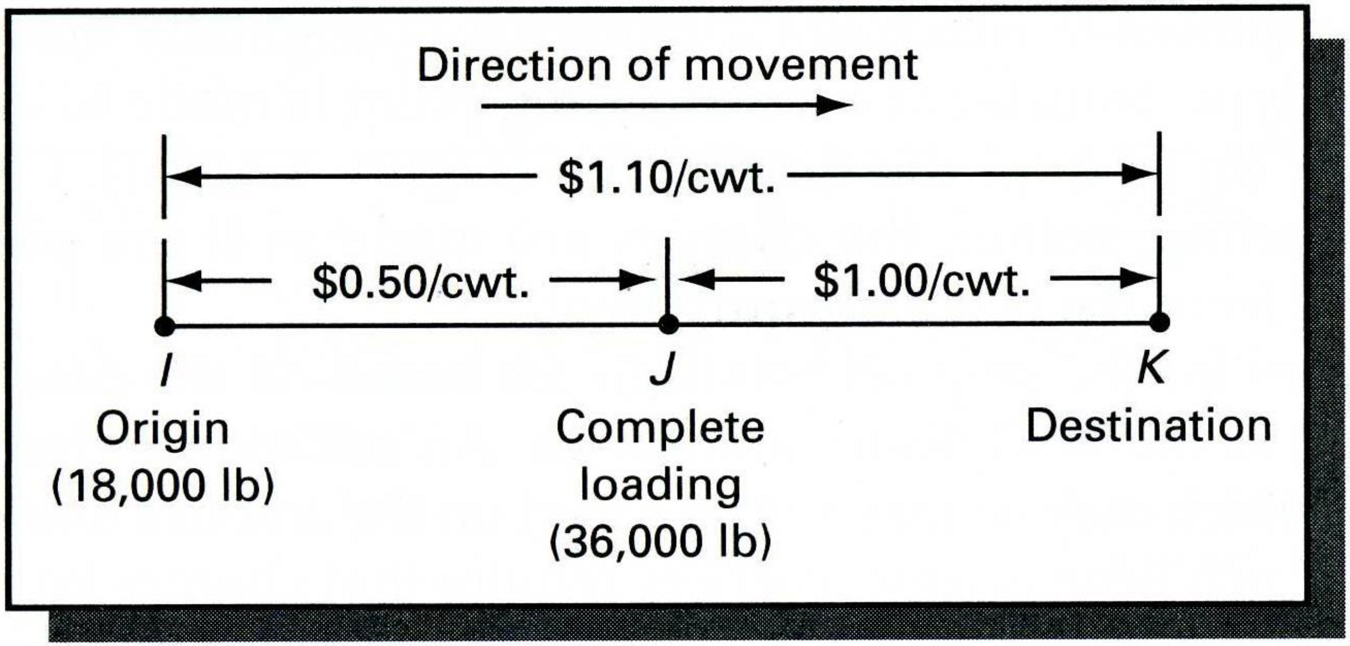


Table 6-8 Freight Charges for Example Problem with and Without a Stop-Off Privilege

LOADING	ROUTE	RATE	CHARGES WITHOUT STOP-OFF PRIVILEGE	RATE	CHARGES WITH STOP-OFF PRIVILEGE
18,000 lb at *I*	*I* to *J*	\$0.50/cwt.	\$ 90.00	—	—
additional	*I* and *J*	\$1.00/cwt.[a]	540.00	\$1.10/cwt.[b]	\$594.00
36,000 lb at *J*	to *K*	stop-off charge	—	stop-off charge	25.00
		Total charges	\$630.00	Total charges	\$619.00

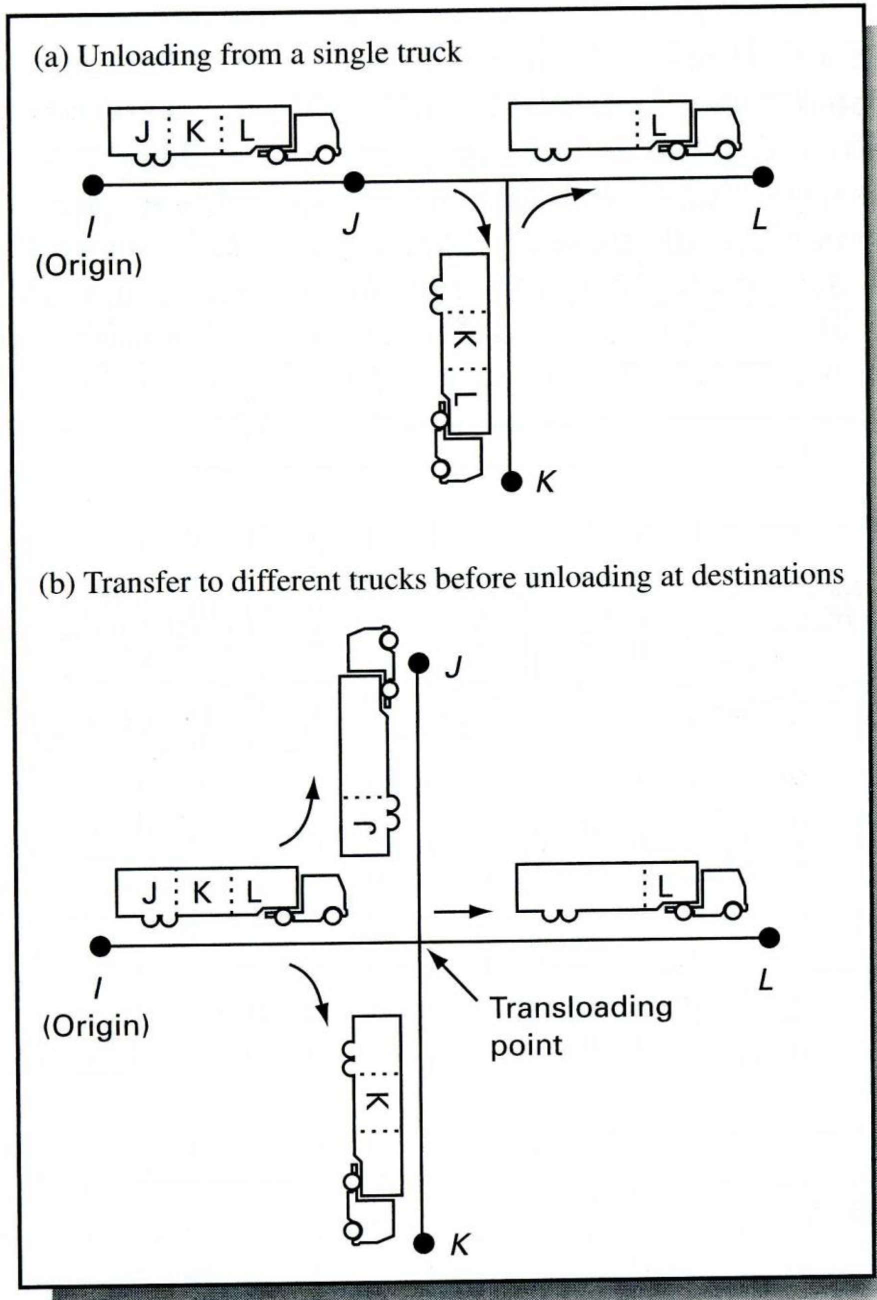
[a]Based on the combined weight of 54,000 lb.
[b]Rate applies from point *I* on complete load.

Table 6-9 A Comparison of Total Charges for Partial Unloading of Two Points With and Without a Stop-Off Privilege

	WITHOUT STOP-OFF PRIVILEGE				WITH STOP-OFF PRIVILEGE			
	LOAD, LB	POINTS	RATE, \$/CWT.	FREIGHT CHARGES	LOAD, LB	POINTS	RATE \$/CWT.	FREIGHT CHARGES
	8,000	*I* to *J*	3.05	\$ 244.00	30,000	*I* to *J*	3.00	\$900.00
	12,000	*I* to *K*	3.35	402.00			3 stops @ \$15/stop[a]	45.00
	10,000	*I* to *L*	3.60	360.00				
Total	30,000		Total charges	\$1,006.00			Total charges	\$945.00

[a]The endpoint *L* also incurs the stop-off charge.

Figure 6-10
Examples of Stop-Off Privilege for Partial Unloading



- Protection
- Interlining
- Terminal service
- Pick up and delivery
- Switching
- Demurrage and detention
- Private carrier costing

- Particular physical characteristics

4- Selection methods

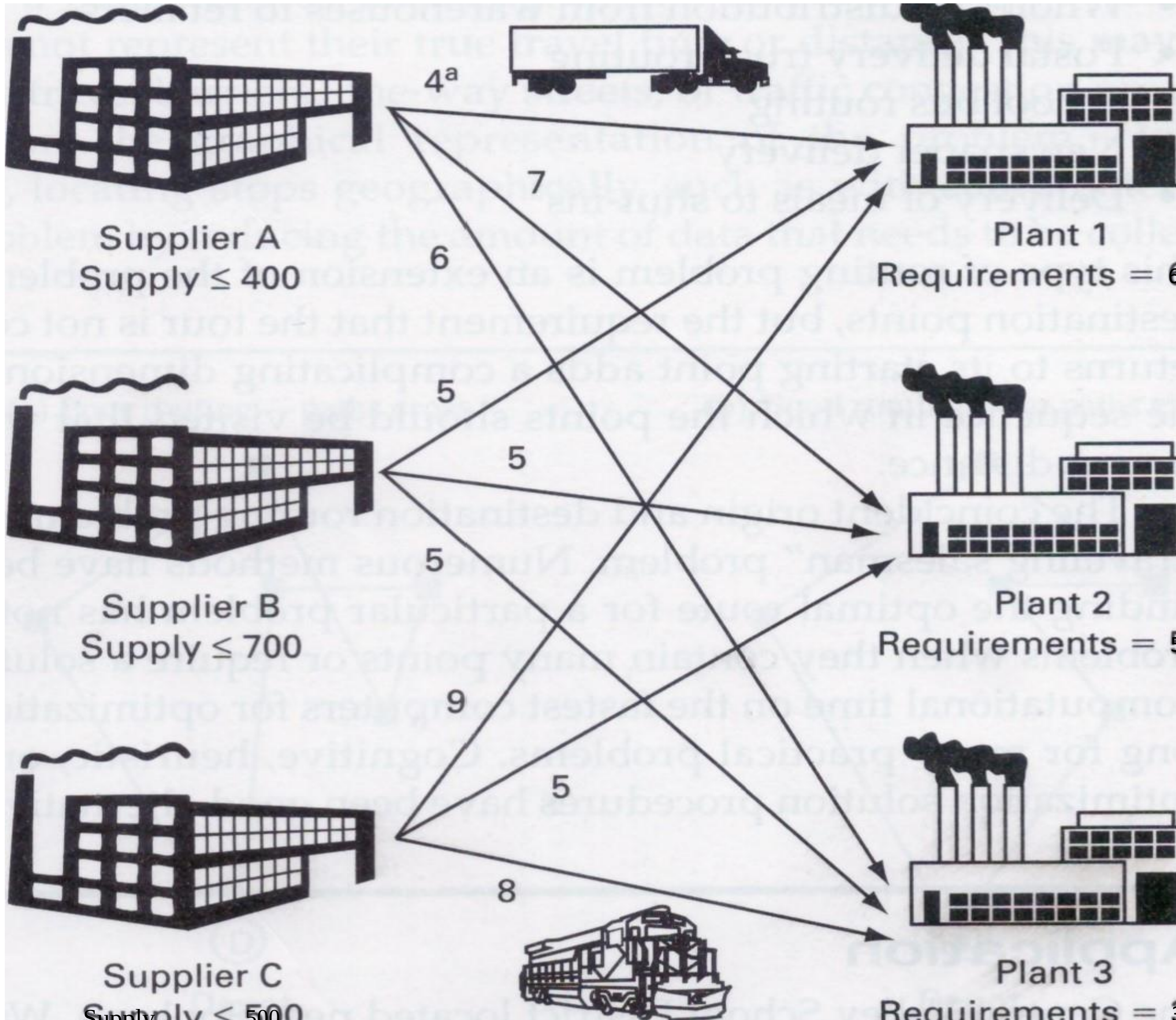
- Effective cooperation between supplier and buyer about price and service is doubful when separate entities are concerned
- A competing supplier in the distribution channel
- High quality service connected to … price
- Changes in conditions
- Inventories impact

Shortest way

- The shortest route method
- Comparing the total times to reach the unsolved nodes
- Than to identify the solved nodes and to use the solved one for next iterations and to compare it with unsolved nodes
- Minimum
  - Time
  - Distance

Multiple origin and destination points

- More than one vendor, plant, or warehouse to serve more than one customer for the same product
- When the source points are restricted to the amount of the total customer demand that can be supplied from each location
- A special class of the linear programming algorithm
- Familiar examples
  - Beverage delivery to bars and restaurants
  - Currency delivery and scheduling at ATM machines
  - Dynamic sourcing and transport of fuels
  - Home appliance repair, service, and delivery
  - Internet-based home grocery delivery
- Example
  - Three soda ash (used in glassmaking) suppliers at various locations to supply three manufacturing facilities



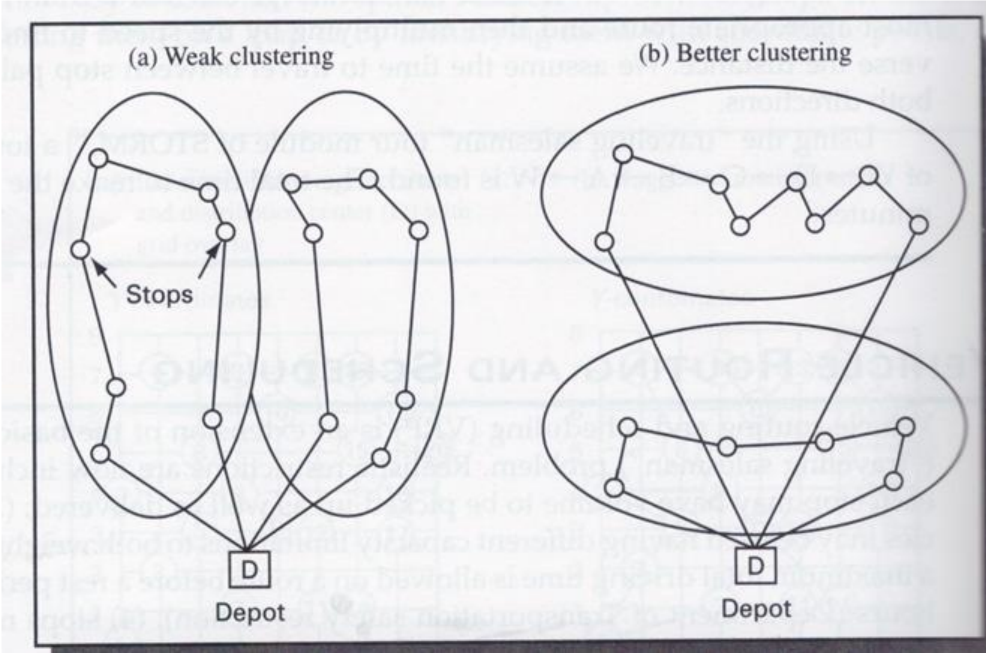
Supplier A
Supply ≤ 400
Supplier B
Supply ≤ 700
Supplier C
Supply ≤ 500
Plant 1
Requirements = 600
Plant 2
Requirements = 500
Plant 3
Requirements = 300
4a
7
6
5
5
5
9
5
8

Vehicle routing

- Points are spatially related
  - We know that good stop sequences are formed when the paths of the route do not cross
  - Clustering Stops by Day of the Week
    - When stops are to be served during different days of the week, the stops should be segmented into separate routing
  - Build routes beginning with the farthest stop from the depot.
  - Once the farthest stop is identified, selecting the volume from the tightest cluster of stops around this key stop

Principles for good routing and scheduling

- Load trucks with stop volumes that are in the closest proximity to each other
- The sequence of stops on a truck route should form a teardrop pattern
- Time window restrictions and the forcing of stop pickups after deliveries may cause route paths to cross



Principles for good routing and scheduling

The most efficient routes are built using the largest vehicles available

Pickups should be mixed into delivery routes rather than assigned to the end of routes

A stop that is greatly removed from a route cluster is a good candidate for an alternate means of delivery (stops isolated with low volume)

Time window restrictions on narrow stops have to be avoided, can force stop sequencing away

Example

The Case Casket Company manufactures and distributes a complete line of burial caskets to funeral homes

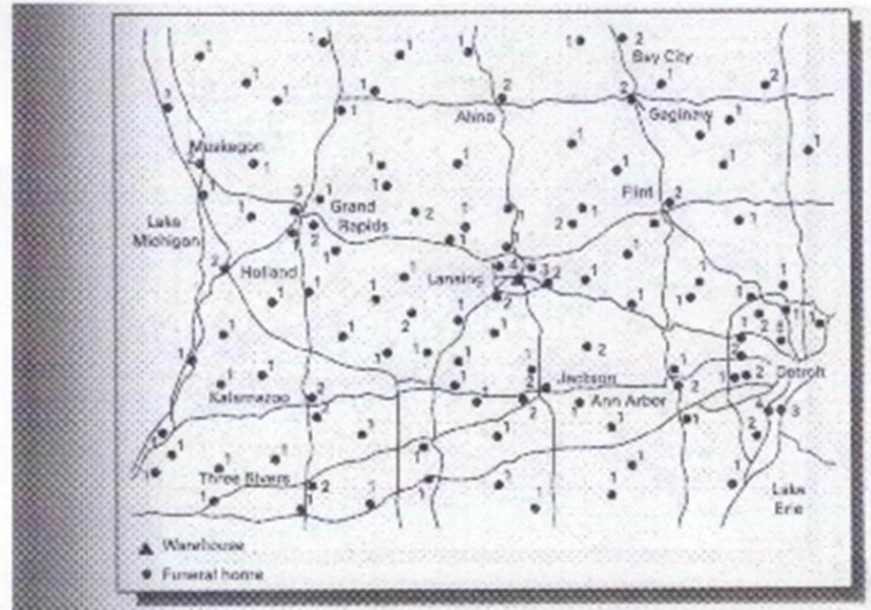
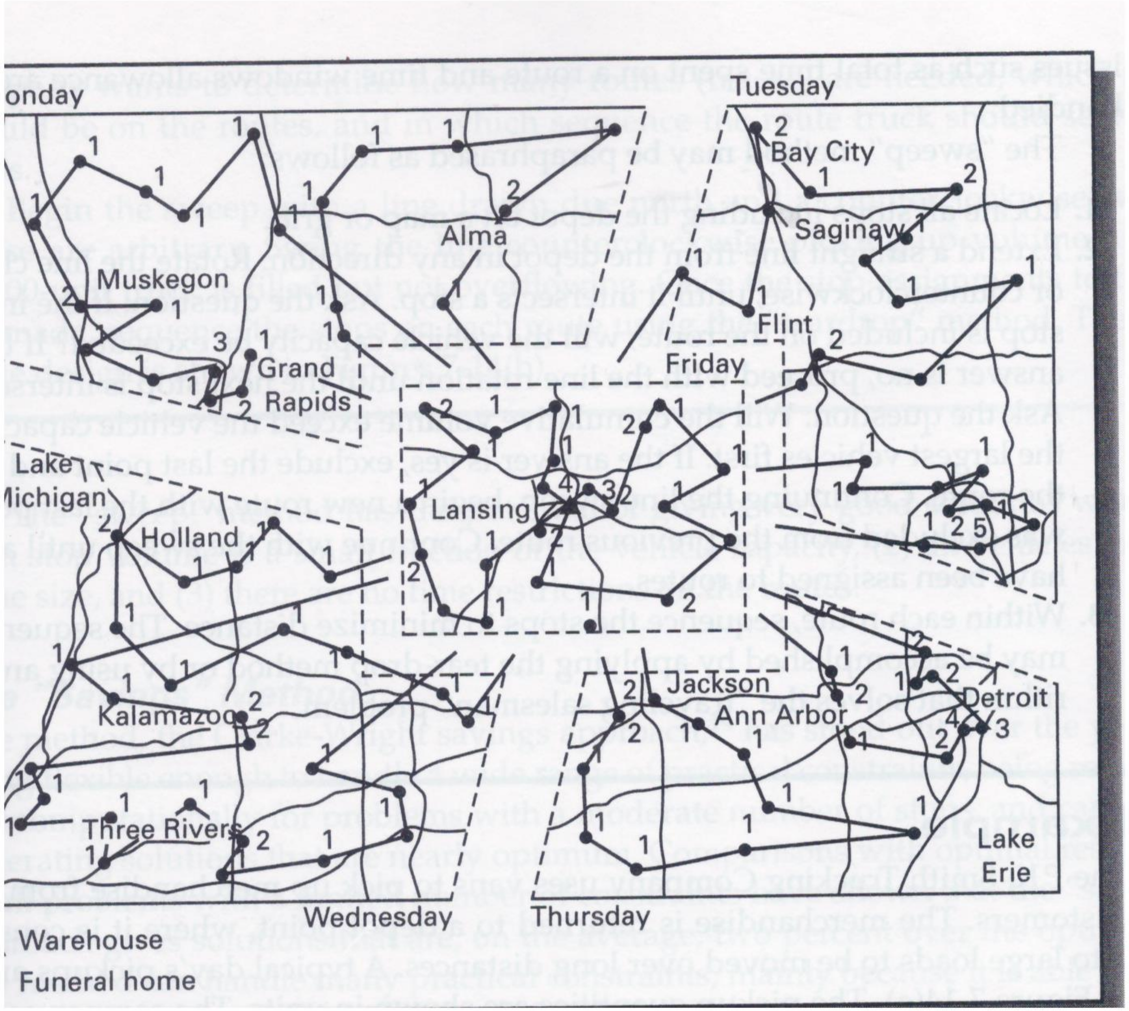


Figure 7-11 Funeral Home Locations and a Typical Week's Casket Orders from the Central Michigan Territory of the Case Casket Company

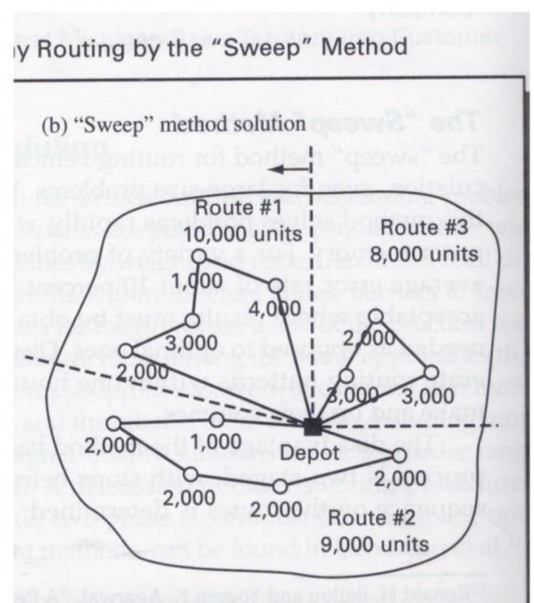
- Begin by segmenting the territory into five daily customer clusters based on five delivery days per week.
- Customers should be clustered starting with the farthest customer and then adding customers by progressively moving toward the warehouse
- Four customer groups for outlying stops for the first four days of the week, and one group for the fifth day that serves stops close to the warehouse

And the result …



The Sweep method

- Locate all stops including the depot on a map grid
- Extend a straight line from the depot in all directions
- Rotate the line until it intersects a stop
- If the inserted stop is on the route, check the truck capacity
  - Use the largest vehicle first
- Continue the line sweep, begin a new route with the last point excluded from the previous route
- Within each route, sequence stops to minimize distance (tear drop method)
- Constraints : total time spent on the route and time windows allowance



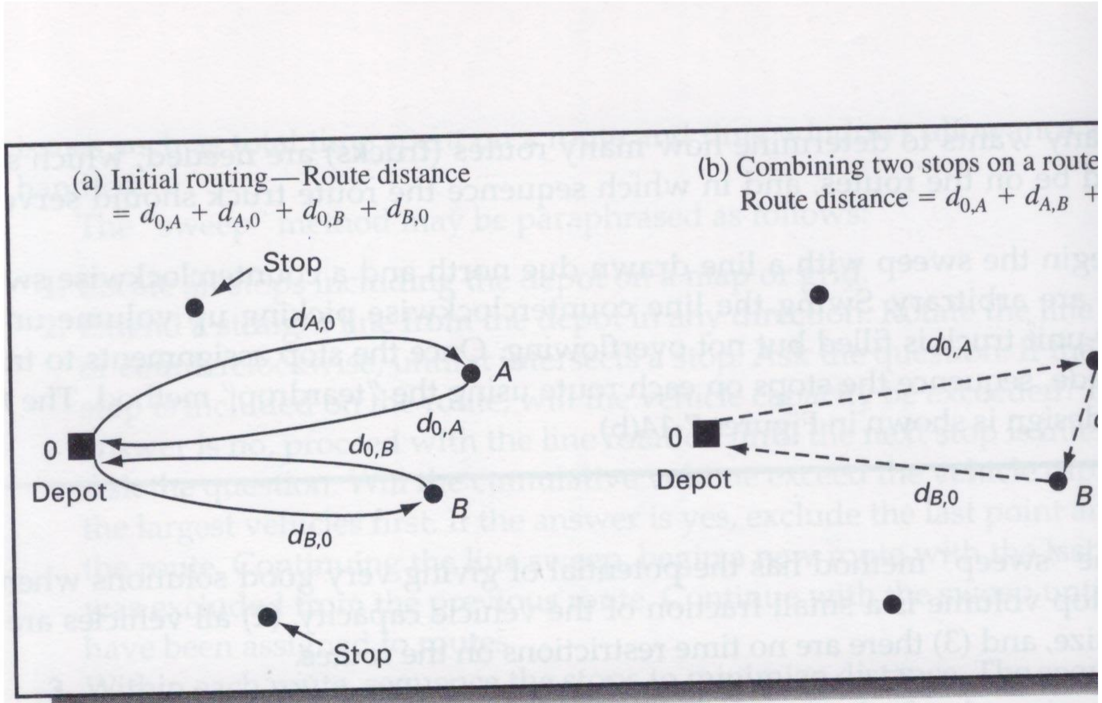


Figure 7-15 Reduced Travel Distance Through Stop Consolidation on a

The savings method

- More precise : to minimize the distance and minimize number of vehicles
- To begin with a dummy vehicle serving each stop and returning to the depot
  - Resulting in the maximum distance to be experienced
  - Next two stops are combined on the same route so that one vehicle can be eliminate et the distance reduced
- Example A and B
  - Saving result : doa+dbo-dab
  - This calculation is carried out for all stop pairs and we continue to combine
  - If a point is inserted on the same route, example :
    - S= doc +dco+dab-dac-dcb

Regalado in Toledo, Ohio, U.S.
x= 460 y= 720
5 trucks with a hauling capacity fo 40,000 lb each

Construction Site	X	Y	Order Size, lb
Milwaukee, WI	220	800	3,000
Chicago, IL	240	720	31,500
Detroit, MI	470	790	16,500
Buffalo, NY	670	860	6,000
Cleveland, OH	540	730	4,500
Pittsburgh, PA	630	680	6,750
Cincinnati, OH	420	570	3,750
Louisville, KY	370	490	6,000
St. Louis, MO	130	500	7,500
Memphis, TN	180	270	9,000
Knoxville, TN	480	360	5,250
Atlanta, GA	480	210	18,000
Columbia, SC	660	250	3,000
Raleigh, NC	760	390	6,750
Baltimore, MD	810	640	11,250
Total			138,750 lb

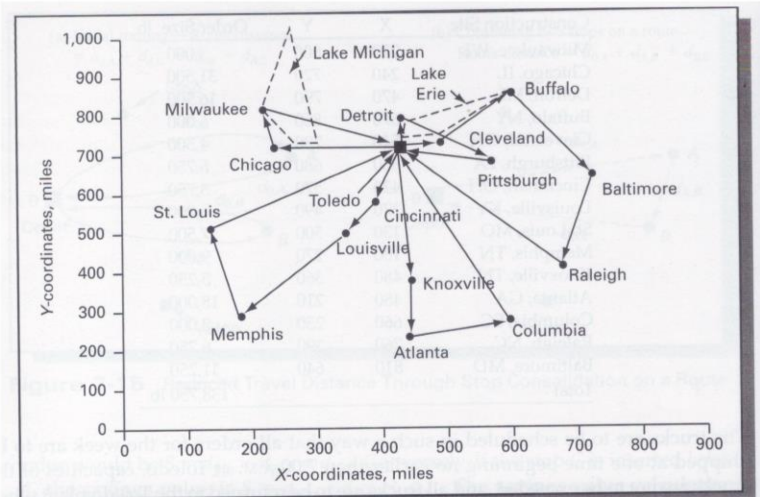


Figure 7-16 Routing Plan for Regal Metal's Deliveries As Generated by the "Savings" Method in ROUTER

Table 7-5 Arrival Time Summary for Regal Metals' Deliveries

Stop	Arrival Time	Day	Stop	Arrival Time	Day
Milwaukee	3:49 P.M.	1	St. Louis	5:16 P.M.	2
Chicago	1:19 P.M.	1	Memphis	9:28 A.M.	2
Detroit	8:47 A.M.	1	Knoxville	4:43 P.M.	1
Buffalo	3:17 P.M.	1	Atlanta	8:51 A.M.	2
Cleveland	8:57 A.M.	1	Columbia	2:49 P.M.	2
Pittsburgh	4:27 P.M.	1	Raleigh	5:46 P.M.	2
Cincinnati	10:45 A.M.	1	Baltimore	10:05 A.M.	2
Louisville	2:32 P.M.	1			

Result

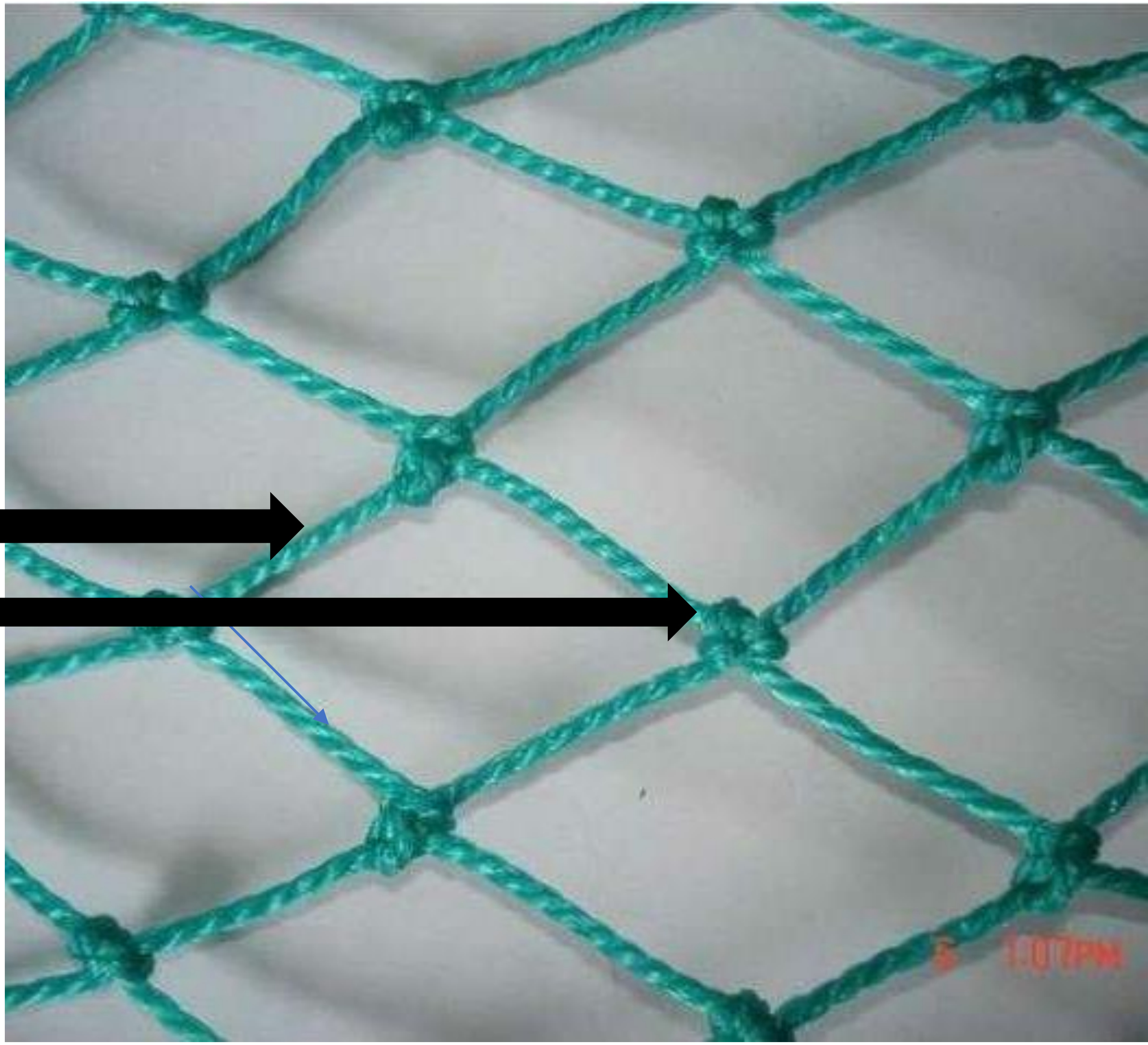
	Time				Route	Route	Route	Truck
Stops[a]	Start	Day	Return	Day	Distance, mi	Time, (hr)	Weight, (lb)	Size, lb
2,1	7:00 A.M.	1	1:44 P.M.	2	787	30.7	34,500	40,000
3,6	7:00 A.M.	1	9:11 A.M.	2	609	26.2	23,250	40,000
5,4,15,14	7:00 A.M.	1	5:03 P.M.	3	1,503	58.1	28,500	40,000
7,8,10,9	7:00 A.M.	1	3:22 P.M.	3	1,418	56.4	26,250	40,000
11,12,13	7:00 A.M.	1	3:40 P.M.	3	1,459	56.7	26,250	40,000
					5,776 mi.	228.1 hr.	138,750 lb	

s in sequence of their delivery.

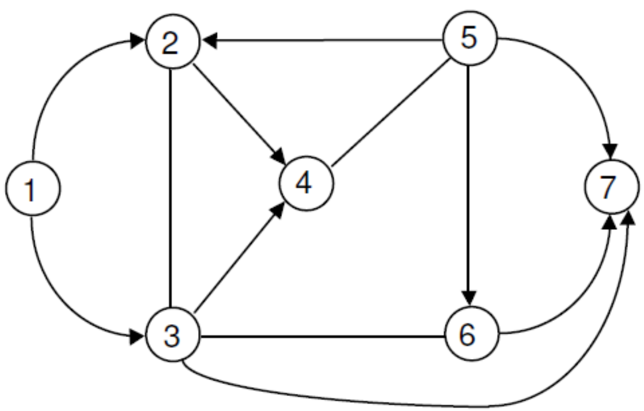
NETWORK FLOW

- A network
- The shortest way
- Minimum spanning tree
- Maximum flow

- From origin to destination, oriented or not
- Each edge is labelled
- Is able to connect nodes (i,j)
- A minimum spanning tree (MST) or minimum weight spanning tree is a subset of the edges of a connected, edge-weighted undirected graph



Definition



- Each edge might be
  - A length
  - A cost
  - A capacity
  - A duration …
- Resulting in possible algorithms

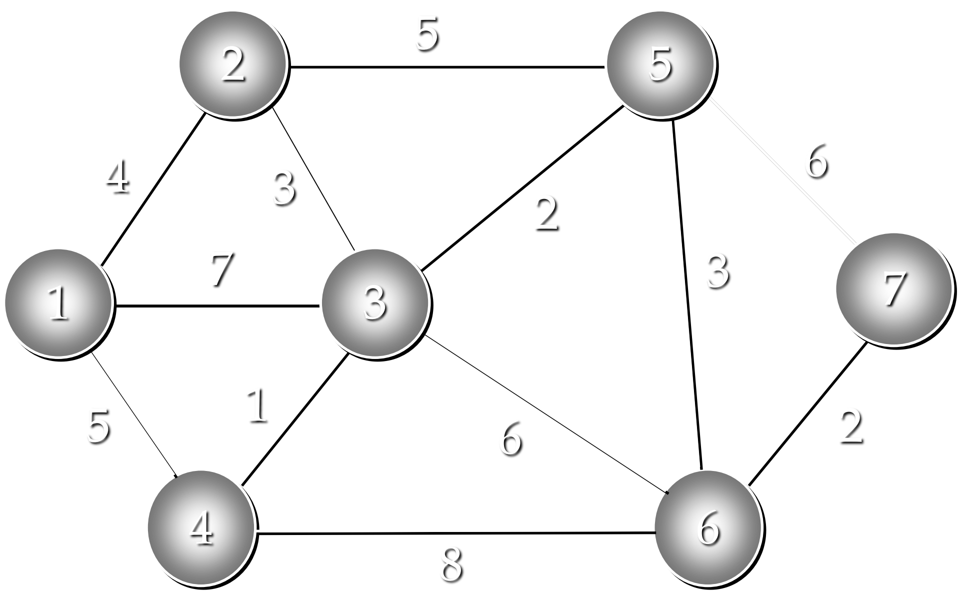
Shortest way

- The shortest route method
- Comparing the total times to reach the unsolved nodes
- Than to identify the solved nodes and to use the solved one for next iterations and to compare it with unsolved nodes
- Minimum
  - Time
  - Distance

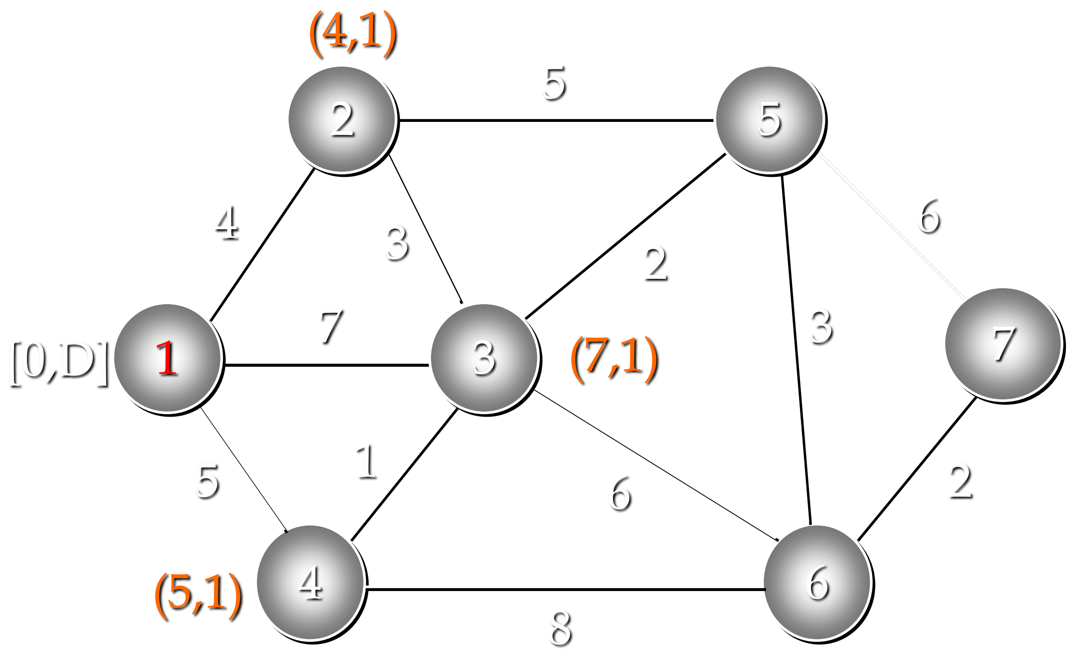
Method

- **Step 1** Identify Origin and destination points
- **Step 2** Comparing the total times to reach the unsolved nodes
- **Step 3** The third iteration finds the nearest unsolved nodes that are connected to the solved nodes
- **Step 4** The procedure continues in this manner until the destination node J is reached
- **Step 5** The route is found by linking the portions of the route starting with the destination working back to the origin
- *Do not account for time to traverse since the quality of the links is not taken into account*

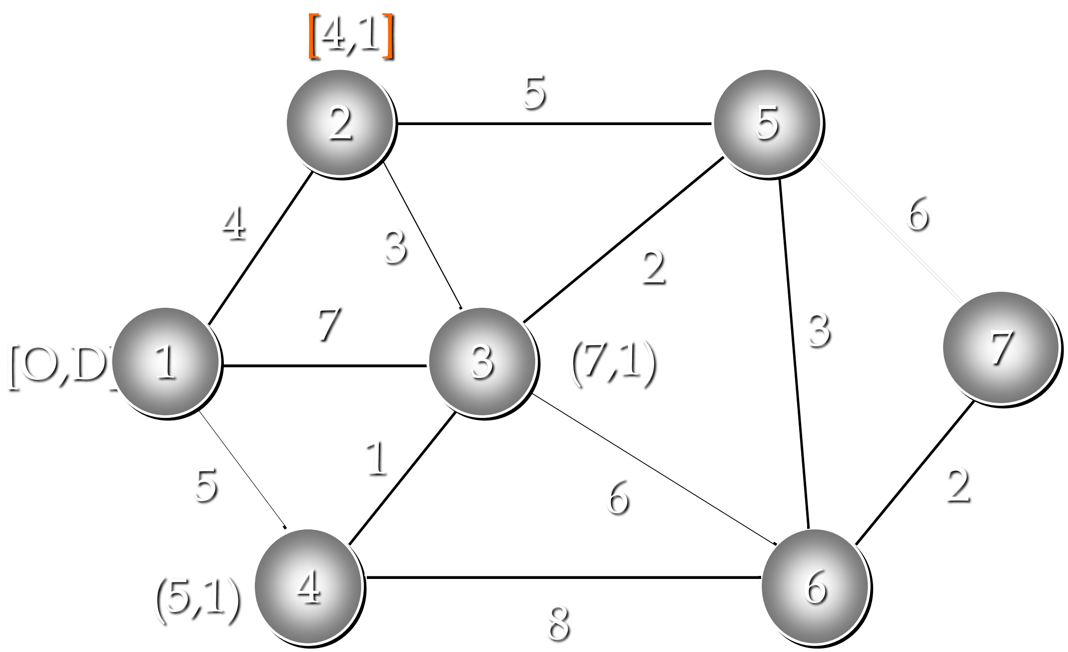
Example



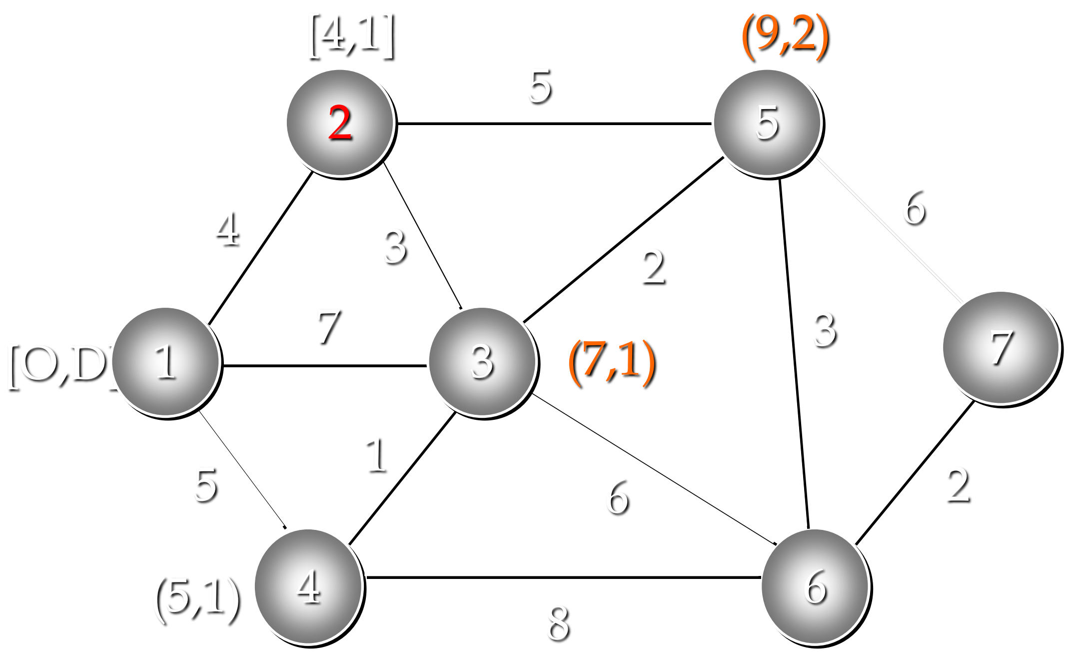
First iteration



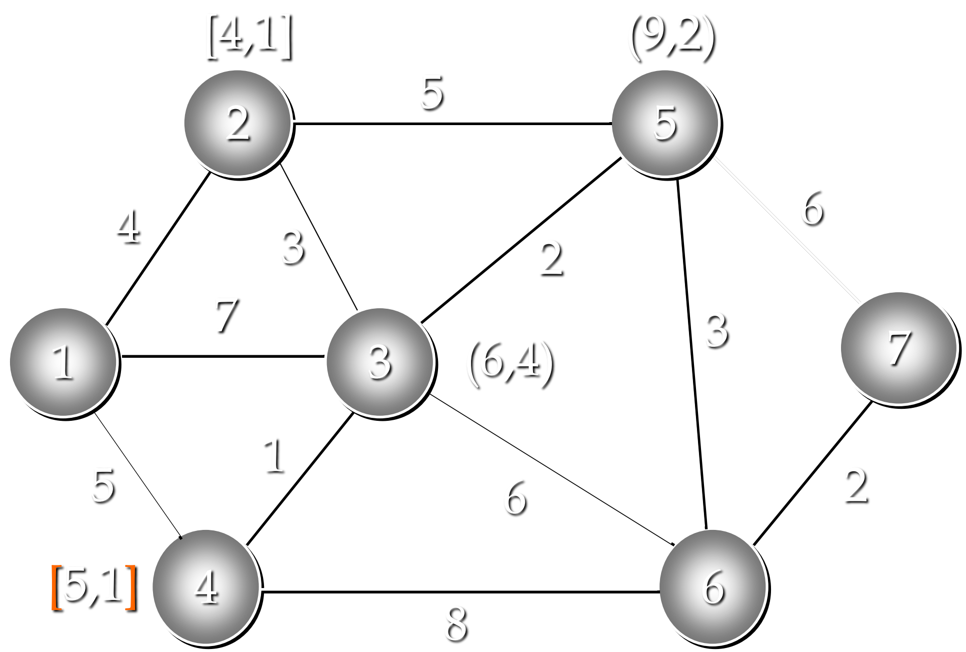
1st iteration



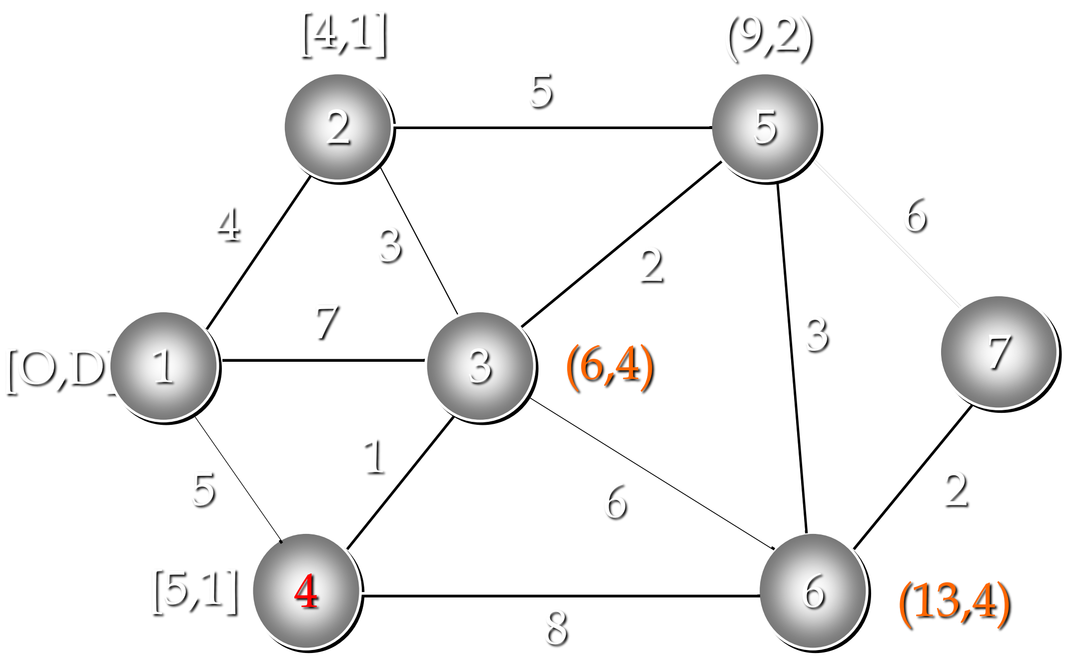
2nd Iteration



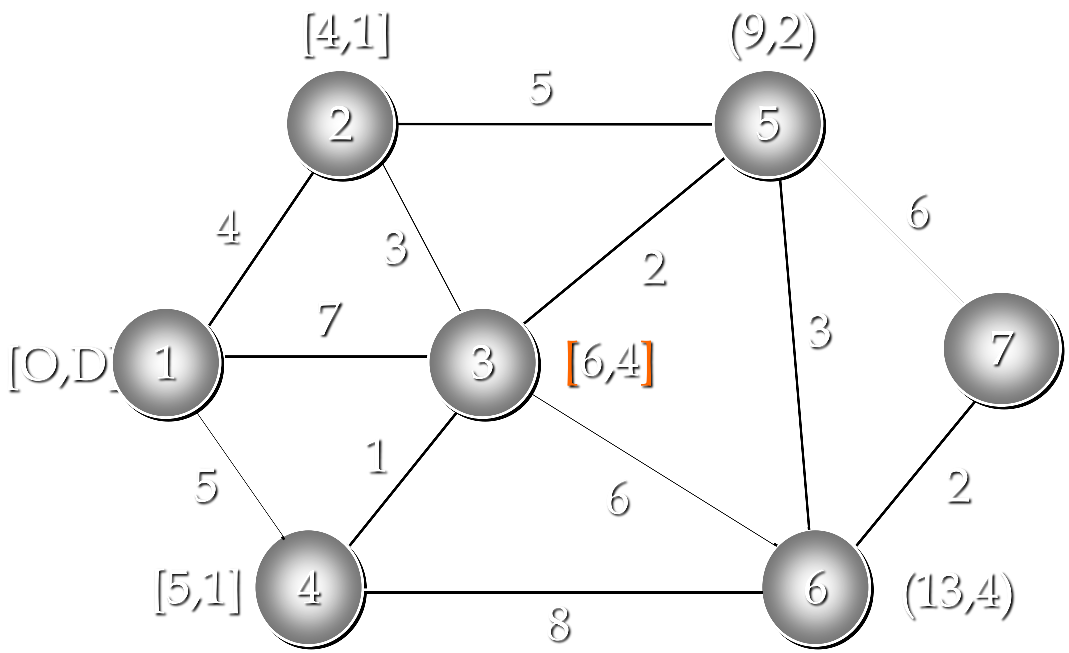
2nd iteration



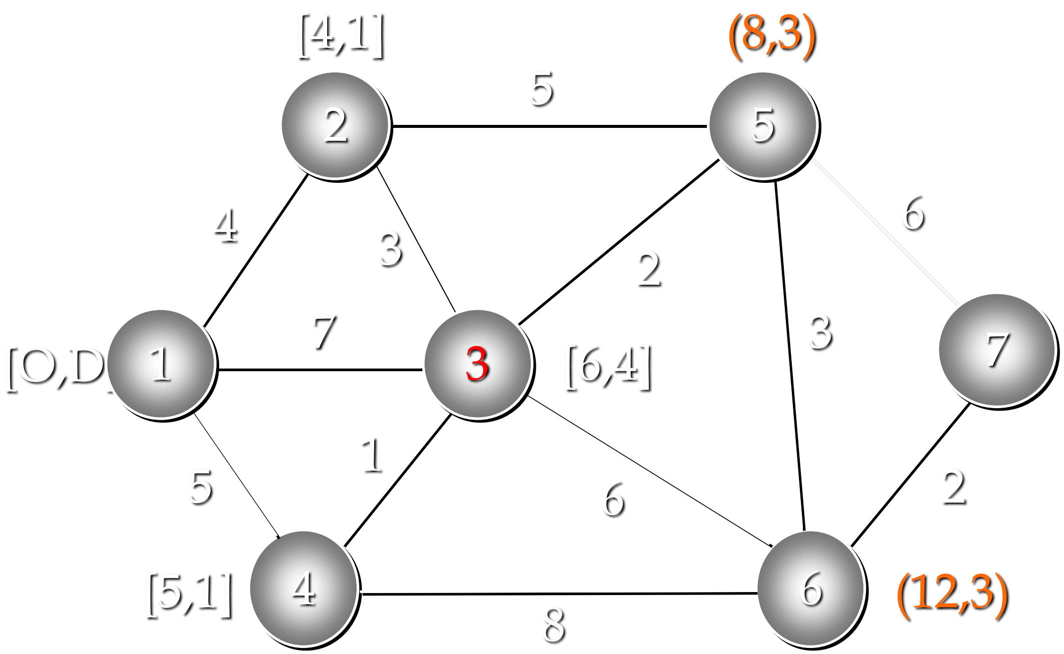
3th iteration



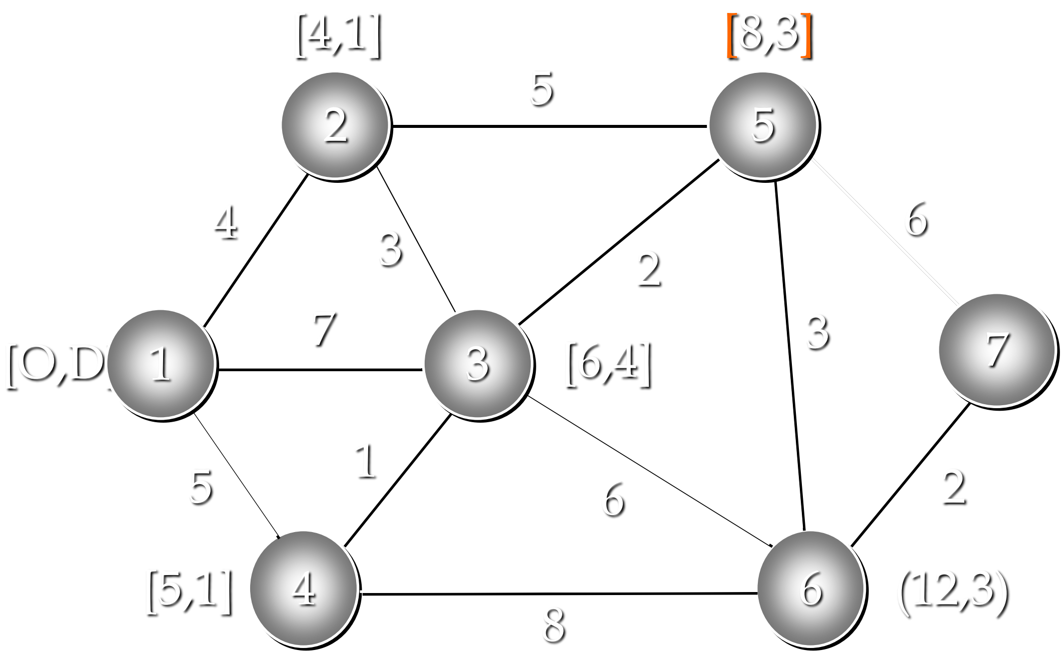
3th iteration



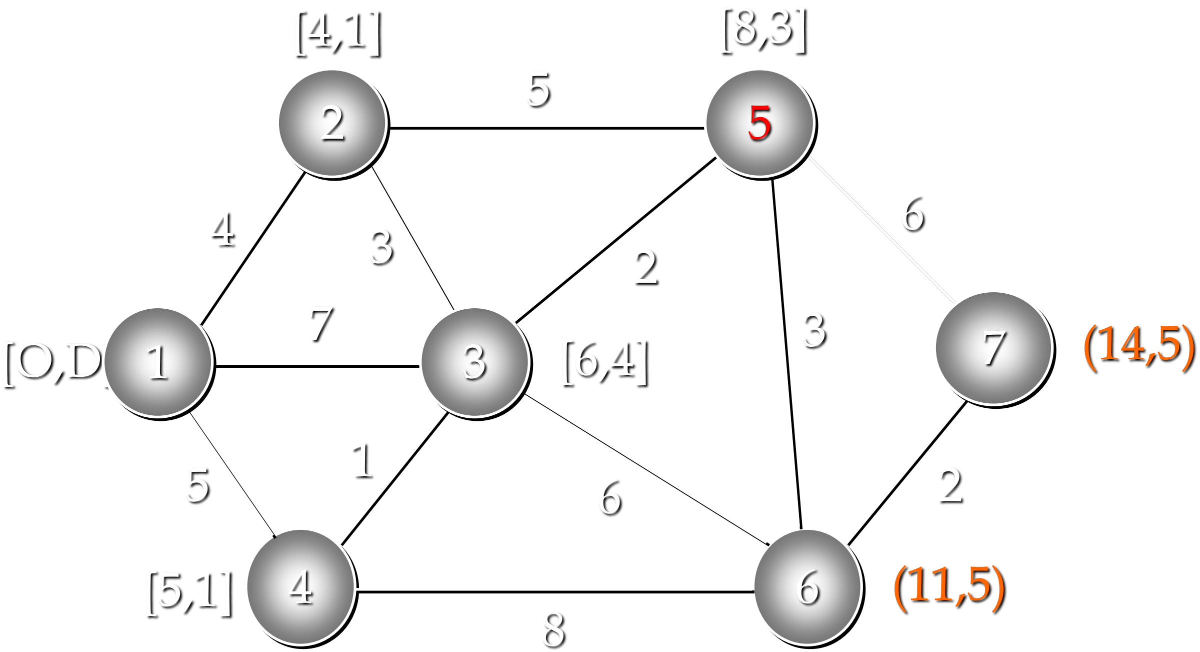
4th iteration



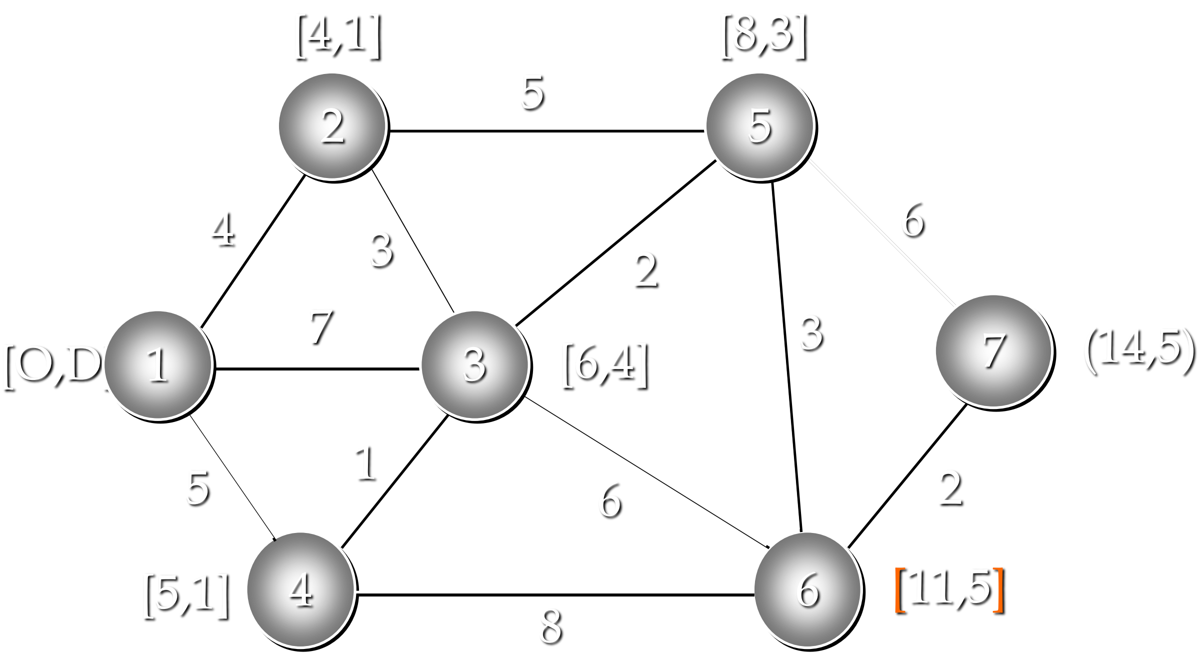
4th iteration



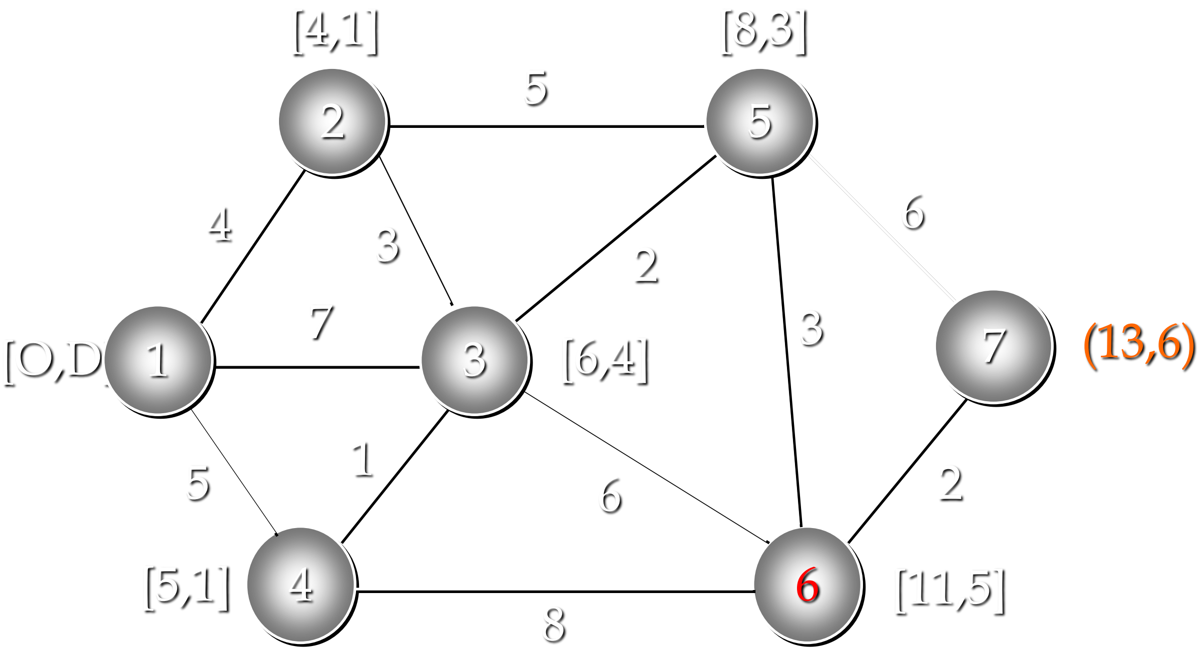
5th iteration

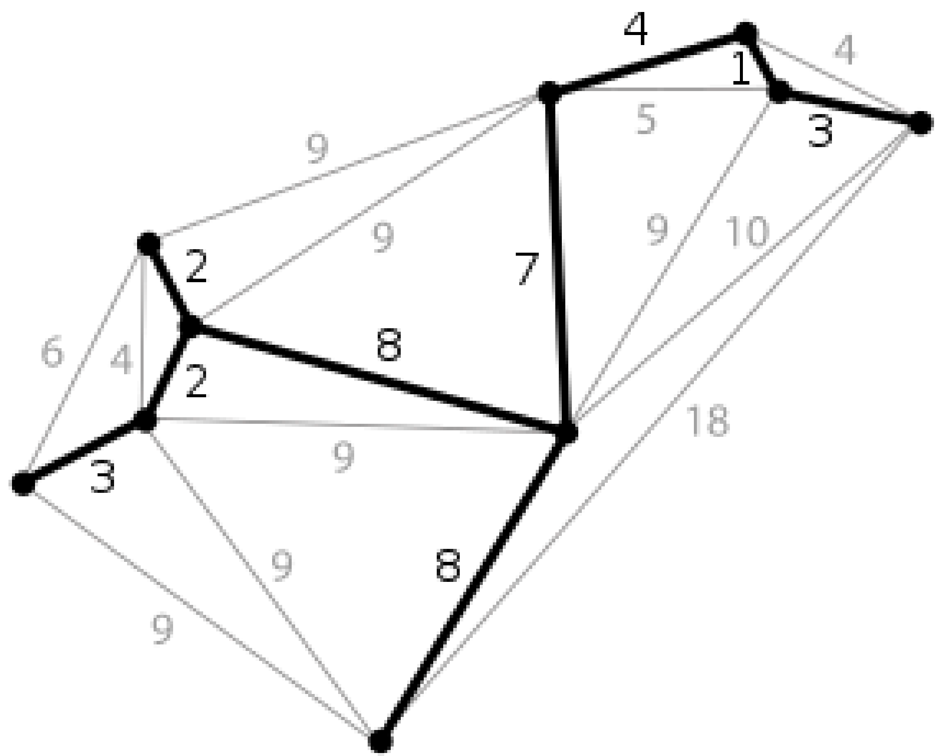


5th iteration



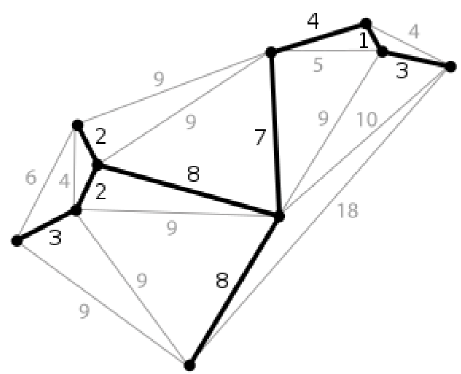
6 th iteration





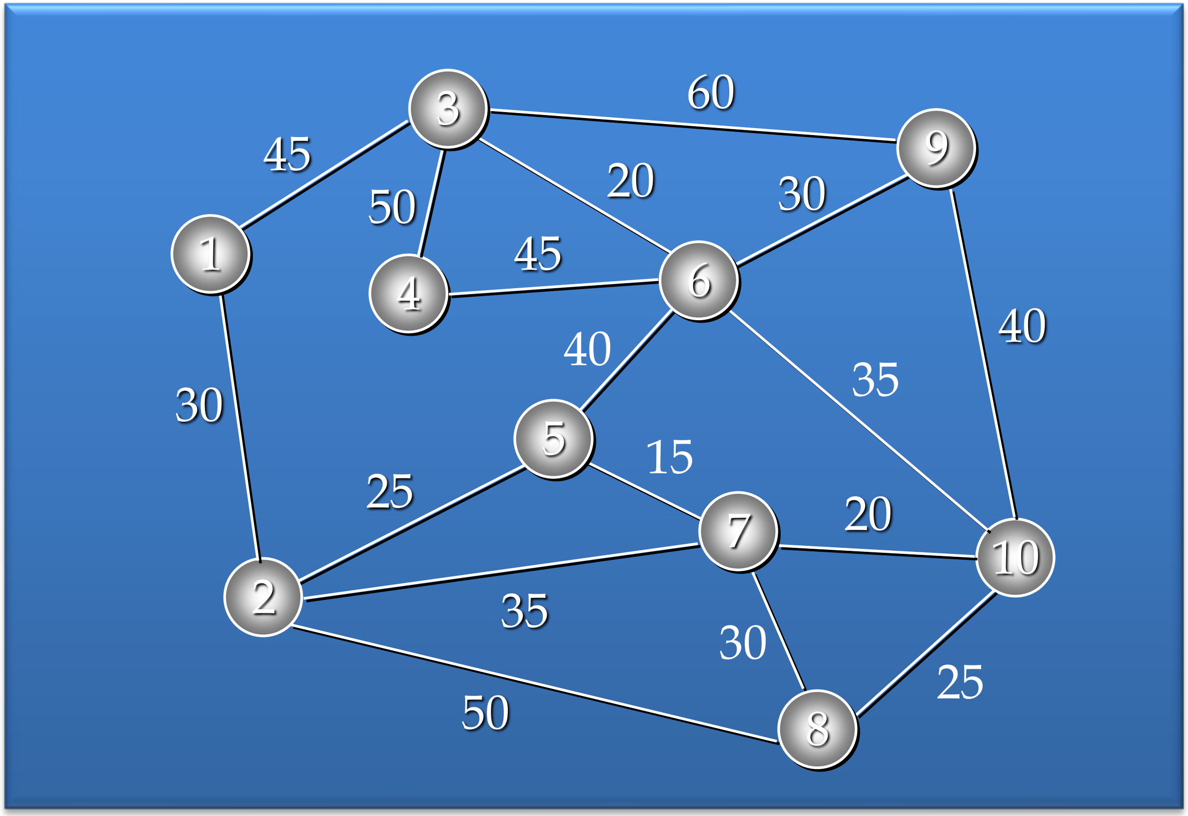
Minimum spanning tree

A network connection



- Examples would be a telecommunications company trying to lay cable in a new neighborhood. If it is constrained to bury the cable only along certain paths (e.g. roads),…
- Also gas or electric cables, computer, telecom, transportation, water …
- Is a minimum length of the linked network without any loop in a graph
- Starting point : anywhere as all points will be connected

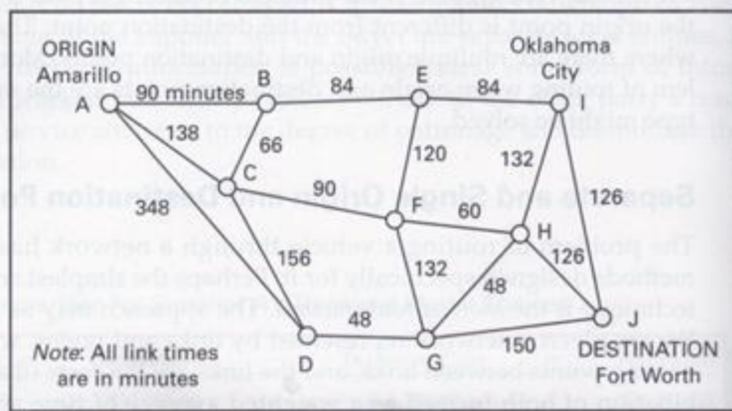
Let’s do it …



Let’s do it by yourself

Suppose that we have the problem shown in Figure 7-2. We seek a minimum-time route between Amarillo and Fort Worth, Texas. Each link has an associated driving time between nodes, and the nodes are road junctions.

Figure 7-2
A Schematic Representation of the Highway Network Between Amarillo and Fort Worth, Texas, with Driving Times

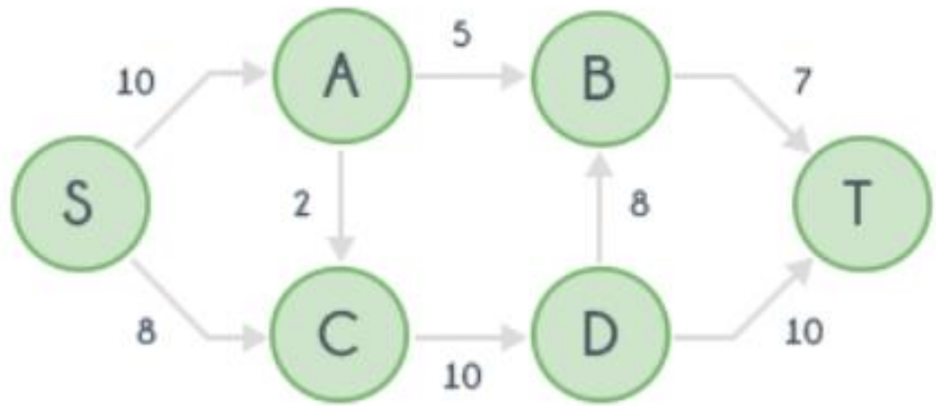


MAXIMUM FLOW

- A flow network is defined as a directed graph involving a source(S) and a sink(T) and several other nodes connected with edges. Each edge has an individual capacity which is the maximum limit of flow that edge could allow
- Conditions are
  - For any non-source and non-sink node, the input flow is equal to output flow.
  - For any edge(E_i) in the network, $0 \le flow(E_i) \le Capacity(E_i)$.
  - Total flow out of the source node is equal total to flow in to the sink node.
  - Net flow in the edges follows skew symmetry i.e. $F(u,v)=-F(v,u)$ where $F(u,v)$ is flow from node u to node v. This leads to a conclusion where you have to sum up all the flows between two nodes(either directions) to find net flow between the nodes initially.

MAXIMUM FLOW

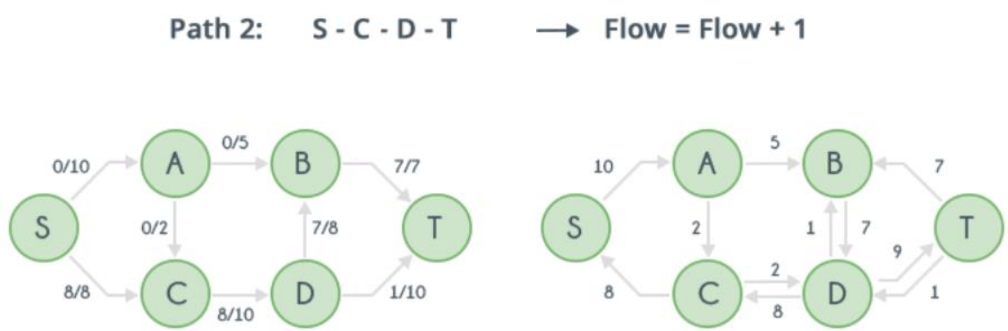
- The maximum amount of flow that the network would allow to flow from source to sink. Multiple algorithms exist in solving the maximum flow problem
- **Ford-Fulkerson Algorithm**
- An augmenting path is a simple path from source to sink which do not include any cycles and that pass only through positive weighted edges.
- A residual network graph indicates how much more flow is allowed in each edge in the network graph.
- If there are no augmenting paths possible from S to T, then the flow is maximum.
- The result i.e. the maximum flow will be the total flow out of source node which is also equal to total flow into the sink node.



10
5
7
A
B
S
2
8
T
C
D
8
10
10

Path 1: S - C - D - B - T → Flow = Flow + 7

Path1



Path 2: S - C - D - T → Flow = Flow + 1
S
A
B
C
D
T
0/10
0/5
7/7
0/2
7/8
8/8
8/10
1/10
10
5
7
2
1
7
9
8
2
8
1

Path 2

Path 3: S - A - B - T → Flow = Flow + 5

Path 3

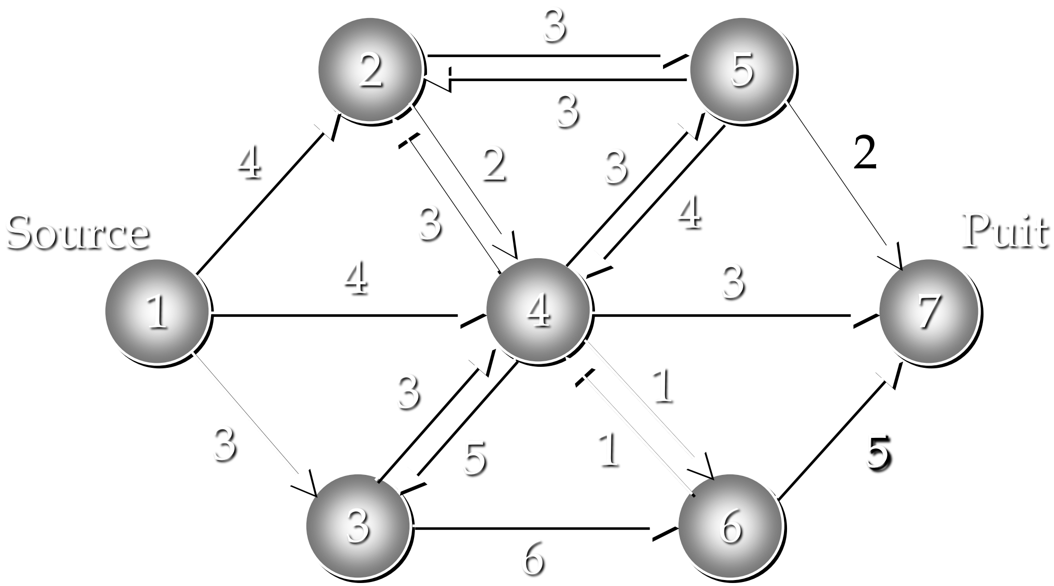
Path 4: S - A - C - D - T → Flow = Flow + 2

No More Paths Left

Max Flow = 15

Path 4

Let’s do it …. to avoid traffic jam



Linear programming to solve

- Variables are

  ie x_{ij} flow fromnnode *i* to node *j*

- Objective function

  $\text{Max } Z = x_{k1}$ (*k* = sink, 1 = source)

- Under :

  $\Sigma x_{ij} - \Sigma x_{ji} = 0$ (keep the flow) *i* *j*

  $x_{ij} \leq c_{ij}$ (cij is edge capacity ij)

  $x_{ij} \geq 0$ (non-négative)

Maximum flow example

- We have
  - 18 variables (17 edges + fictive edge from sink to source)
  - 24 constraints
    - 7 constraints to keep the flow capacity at each node (anything coming in has to go out)
    - 17 constraints of capacity on each edge

Writting it

- Goal

  Max x_{71}

- Constraints of keping flows

$x_{71} - x_{12} - x_{13} - x_{14} = 0$ (keeping flow of node 1)

$x_{12} + x_{42} + x_{52} - x_{24} - x_{25} = 0$ (node 2)

$x_{13} + x_{43} - x_{34} - x_{36} = 0$ (etc.)

$x_{14} + x_{24} + x_{34} + x_{54} + x_{64} - x_{42} - x_{43} - x_{45} - x_{46} - x_{47} = 0$

$x_{25} + x_{45} - x_{52} - x_{54} - x_{57} = 0$

$x_{36} + x_{46} - x_{64} - x_{67} = 0$

$x_{47} + x_{57} + x_{67} - x_{71} = 0$

Other constraints

- Constraints of edge maximum capacity

$x_{12} \leq 4 \quad x_{13} \leq 3 \quad x_{14} \leq 4$

$x_{24} \leq 2 \quad x_{25} \leq 3$

$x_{34} \leq 3 \quad x_{36} \leq 6$

$x_{42} \leq 3 \quad x_{43} \leq 5 \quad x_{45} \leq 3 \quad x_{46} \leq 1$

$x_{47} \leq 3$

$x_{52} \leq 5 \quad x_{54} \leq 5 \quad x_{57} \leq 5$

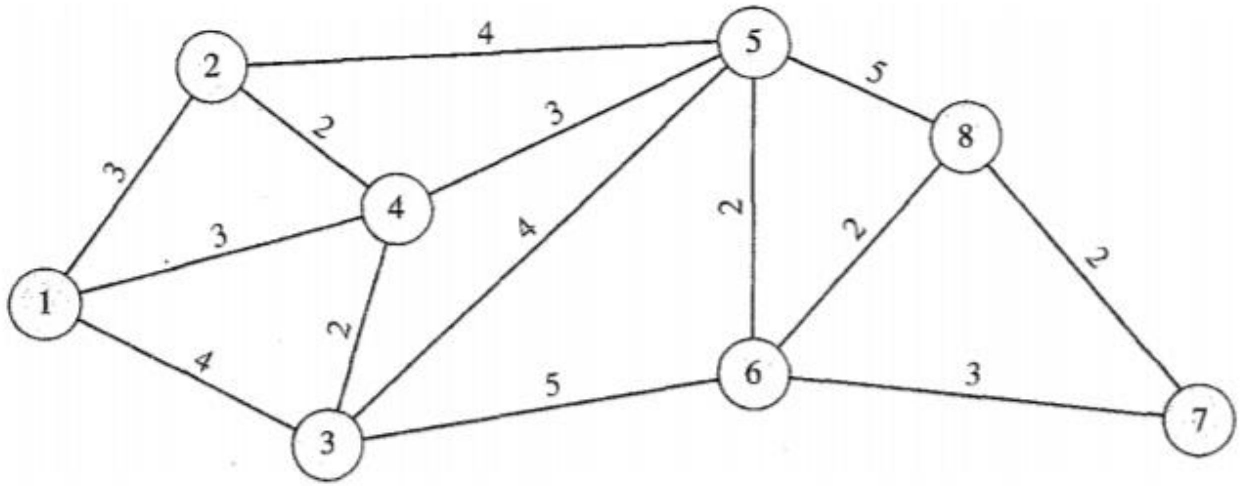
$x_{64} \leq 5 \quad x_{67} \leq 5$

- Non negative variables

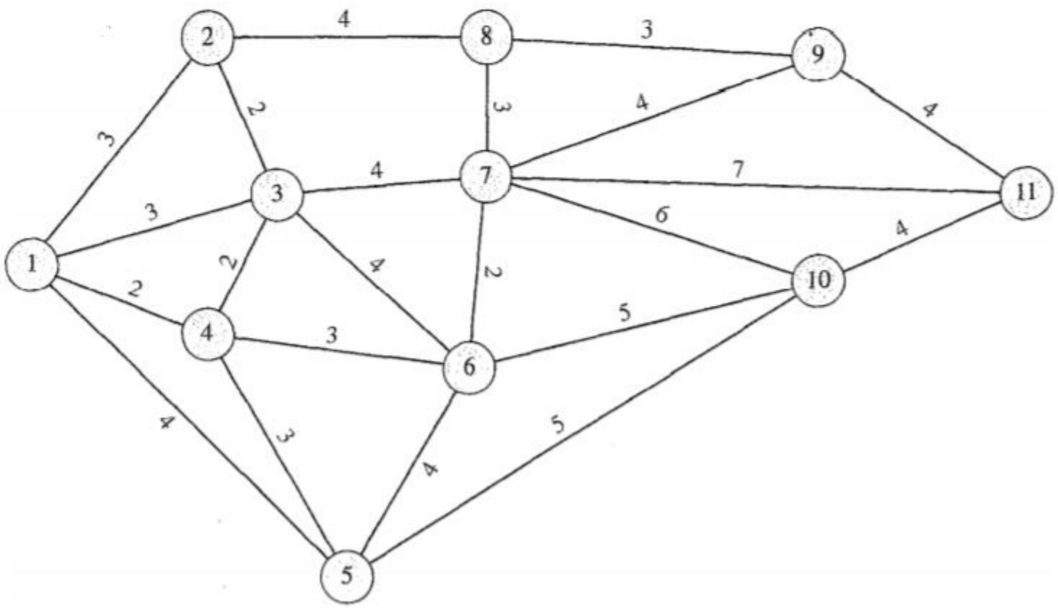
$x_{ij} \geq 0$

Solve it !

1. Find the shortest route between nodes 1 and 8 in the following network:

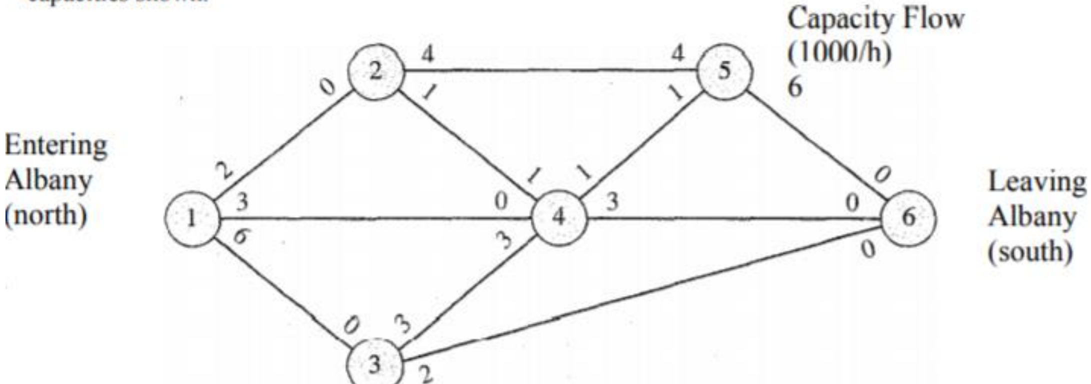


3. The Metrovision Cable Company has just received approval to begin providing cable television service to a suburb of Memphis, Tennessee. The nodes of the following network show the distribution points that must be reached by the company's primary cable lines. The arcs of the network show the number of miles between the distribution points. Determine the solution that will enable the company to reach all distribution points with the minimum length of primary cable line.



Spanning tree exercice

The north-south highway system passing through Albany, New York, can accommodate the capacities shown.



Can the highway system accommodate a north-south flow of 10,000 vehicles per hour?

Traffic

5- Asset based benchmarking

- *Vehicle fill:* - measured by payload weight, pallet numbers and average pallet height.

- *Empty running:* measured as the number of miles the vehicle travelled empty and the number of miles the vehicle travelled with only returnable items.

- *Time utilisation:* measured on an hourly basis as one of seven activities (running on the road; rest period; loading or unloading; preloaded and awaiting departure; delayed or otherwise inactive; maintenance and repair; and empty and stationary) over a 48-hour period.

- *Deviations from schedule:* measured as problem at collection point, problem at delivery point, own company actions, traffic congestion, equipment breakdown and lack of driver.

- *Fuel efficiency of tractor and trailer:* measured as km per litre, ml fuel required to move one standard industry pallet 1 km.

Infrastructure based benchmarking

Creation of an information system for electronic exchange and data transfer for combined freight transport.

Creation and implementation of UN/EDIFACT form.

Development of a decision support system for intensified utilization of combined transport.

Investigation of infrastructure conditions of combined and integrated transport from the standpoint of wider exploitation in transport and logistic systems.

Research into changes in the vehicles fleet-split needed for combined transport use.

Examples of government support

- Connection of the transport network between the area and adjacent countries.
- Co-ordination of the development of international transport corridors.
- Purchase of special railway wagons for combined transport for Railways (also for other railway operators in the future).
- Support of projects concerning new systems of combined transport and vehicles (*e.g.* swapbodies, semi-trailers).
- Modernisation of lifting mechanisms.
- Adaptation of vessels for combined transport.
- Modernisation of terminal and other buildings.
- Improving services in terminals.

Indicators to airfreight

- Delivery to the airline.
- Collection by/delivery to the agent.
- Flown as booked.
- Arrived as agreed.
- Aircraft arrival.
- Collection.

Indicators to shortsea shipping

- Time.
- Cargo care.
- Compliance.
- Customer service.

Logistics chain

- Performance indicators on logistics costs.
- Logistics-related social costs and charges.
- Benchmarking on road safety

Logistics cost and service

Transport cost.

Inventory cost.

Sorting and packing cost.

Packaging cost.

Quality indicators include the following:

Knowledge of goods and customer services.

Availability of goods.

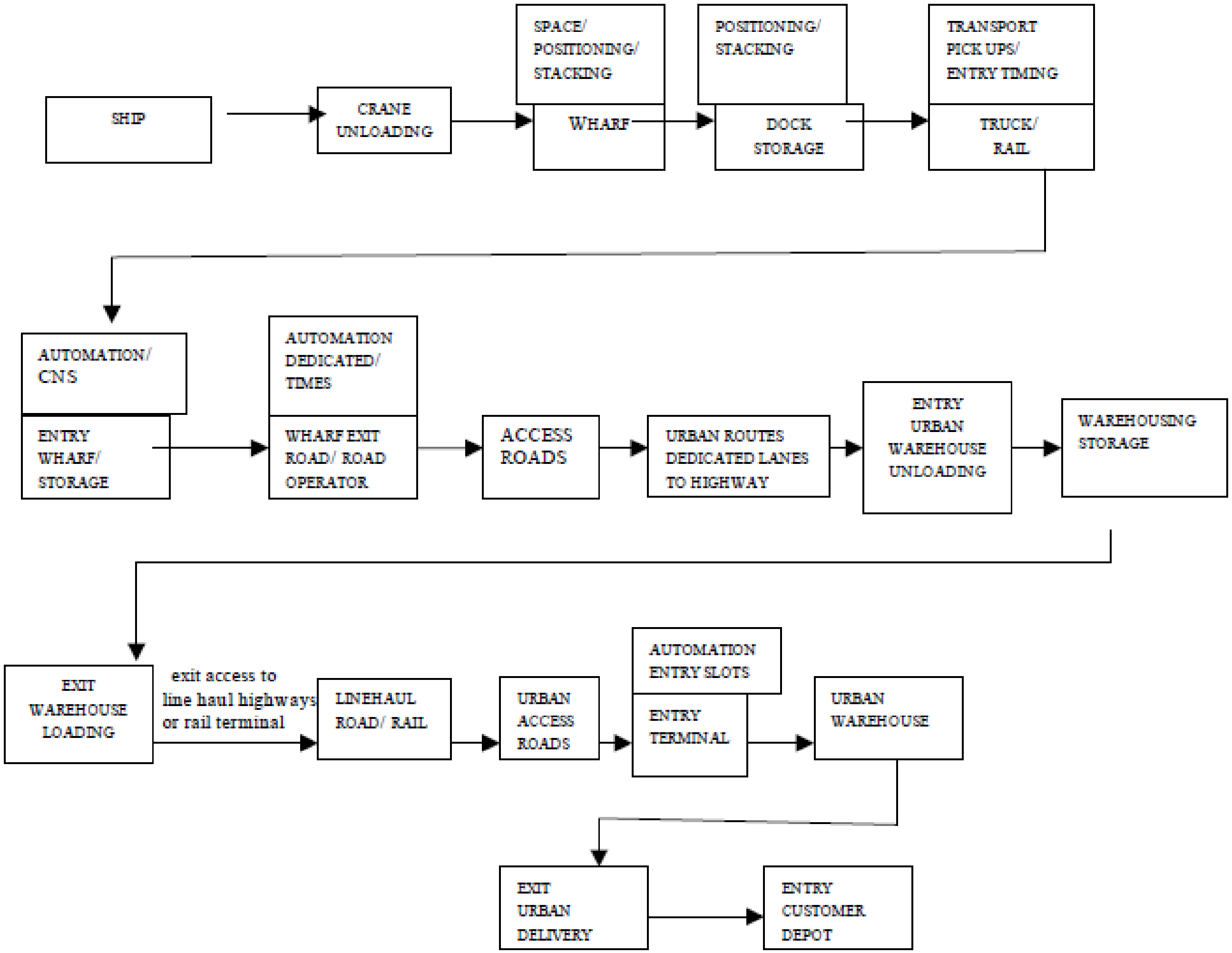
Lead-time from order to delivery, and its accuracy.

Flexibility: response time to special orders.

Ability to organise information: time, accuracy, and details of contents.

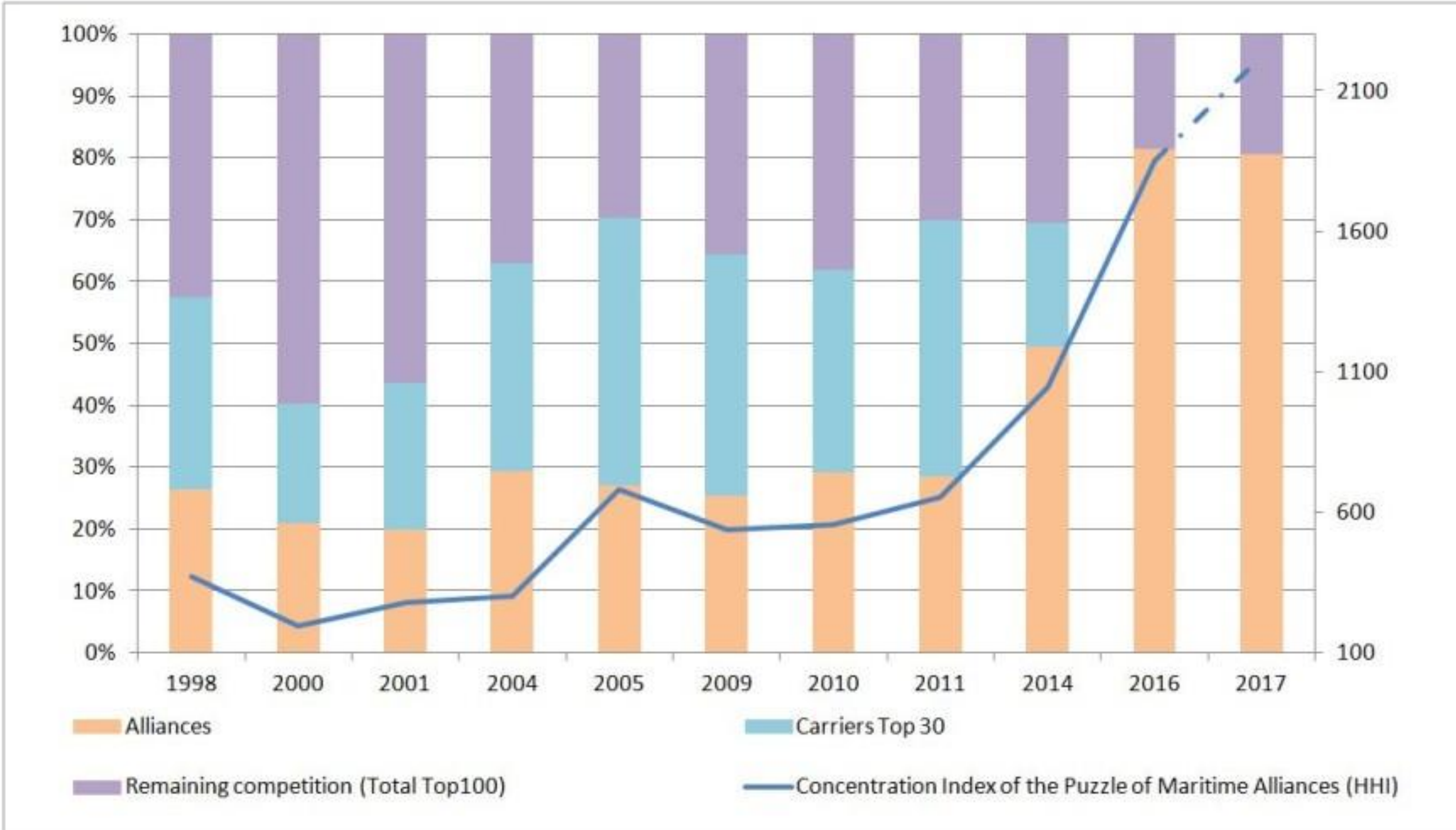
Response and restoration time when a mistake or problem occurs.

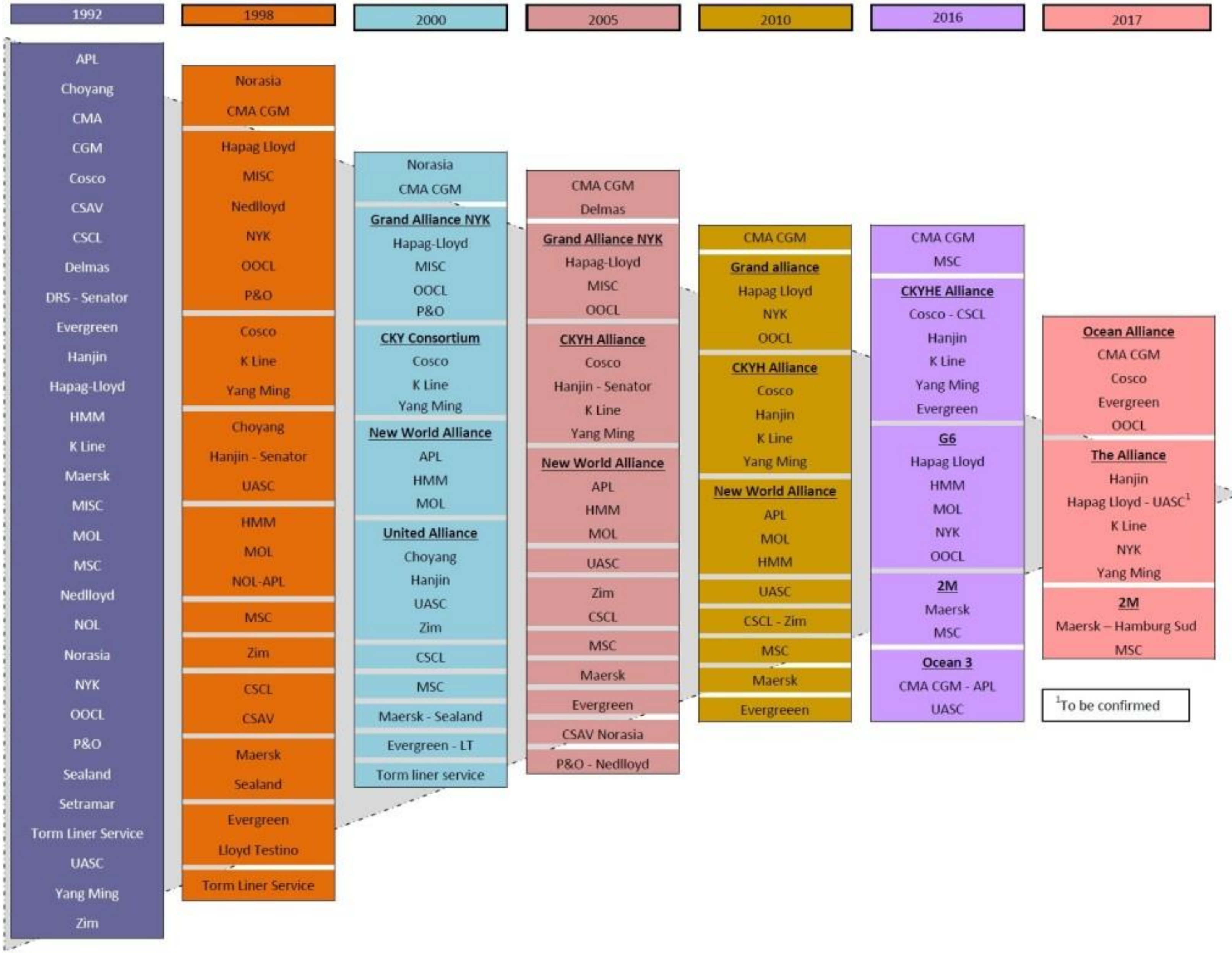
Importer intermodal supply chain example



6- multimodal transport operator

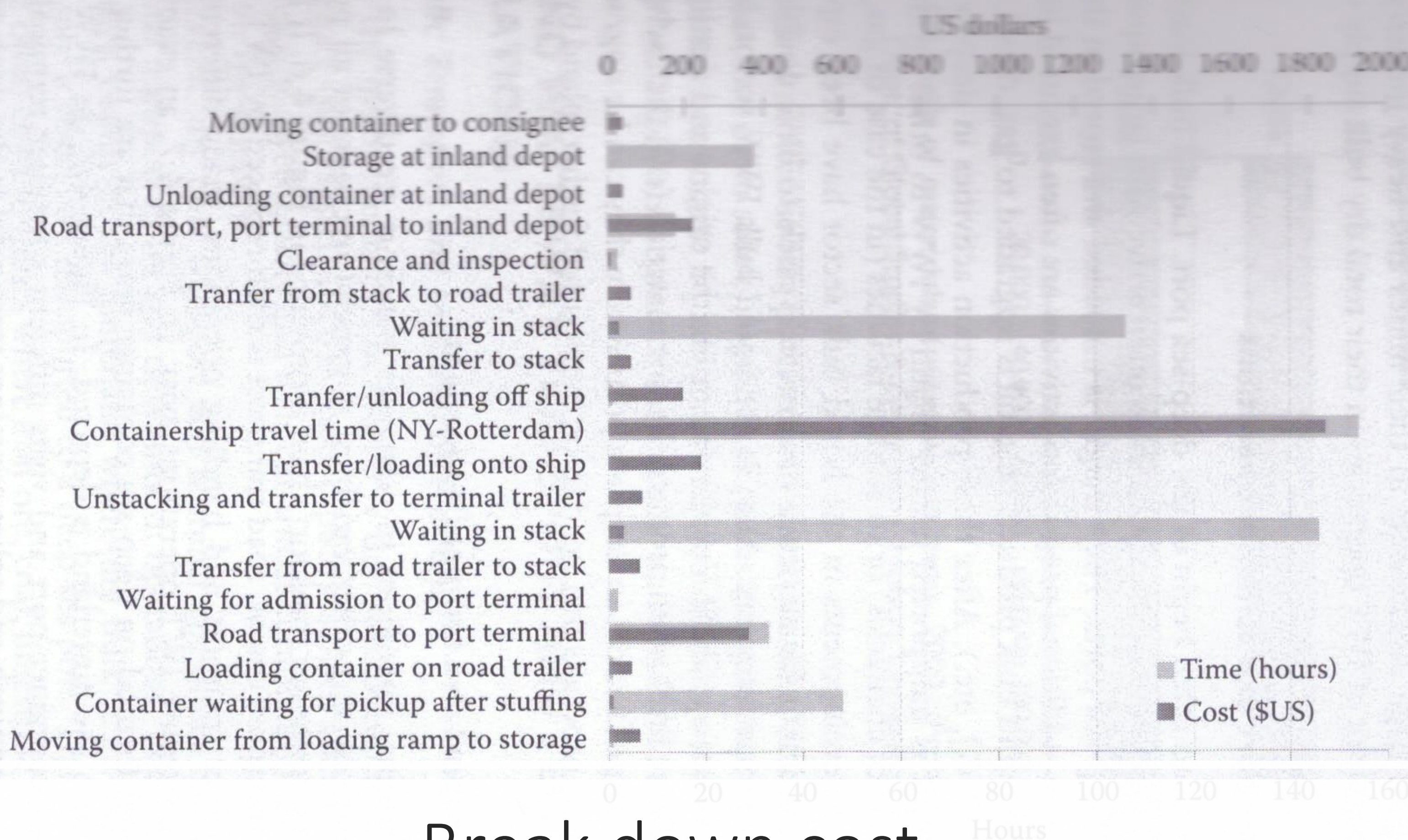
- Freight forwarder
- Integrator
- Non vessel operating common carriers


100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2100
1600
1100
600
100
1998
2000
2001
2004
2005
2009
2010
2011
2014
2016
2017
Alliances
Carriers Top 30
Remaining competition (Total Top100)
Concentration Index of the Puzzle of Maritime Alliances (HHI)


1992
APL
Choyang
CMA
CGM
Cosco
CSAV
CSCL
Delmas
DRS - Senator
Evergreen
Hanjin
Hapag-Lloyd
HMM
K Line
Maersk
MISC
MOL
MSC
Nedlloyd
NOL
Norasia
NYK
OOCL
P&O
Sealand
Setramar
Torm Liner Service
UASC
Yang Ming
Zim
1998
Norasia
CMA CGM
Hapag Lloyd
MISC
Nedlloyd
NYK
OOCL
P&O
Cosco
K Line
Yang Ming
Choyang
Hanjin - Senator
UASC
HMM
MOL
NOL-APL
MSC
Zim
CSCL
CSAV
Maersk
Sealand
Evergreen
Lloyd Testino
Torm Liner Service
2000
Norasia
CMA CGM
Grand Alliance NYK
Hapag-Lloyd
MISC
OOCL
P&O
CKY Consortium
Cosco
K Line
Yang Ming
New World Alliance
APL
HMM
MOL
United Alliance
Choyang
Hanjin
UASC
Zim
CSCL
MSC
Maersk - Sealand
Evergreen - LT
Torm liner service
2005
CMA CGM
Delmas
Grand Alliance NYK
Hapag-Lloyd
MISC
OOCL
CKYH Alliance
Cosco
Hanjin - Senator
K Line
Yang Ming
New World Alliance
APL
HMM
MOL
UASC
Zim
CSCL
MSC
Maersk
Evergreen
CSAV Norasia
P&O - Nedlloyd
2010
CMA CGM
Grand alliance
Hapag Lloyd
NYK
OOCL
CKYH Alliance
Cosco
Hanjin
K Line
Yang Ming
New World Alliance
APL
MOL
HMM
UASC
CSCL - Zim
MSC
Maersk
Evergreeen
2016
CMA CGM
MSC
CKYHE Alliance
Cosco - CSCL
Hanjin
K Line
Yang Ming
Evergreen
G6
Hapag Lloyd
HMM
MOL
NYK
OOCL
2M
Maersk
MSC
Ocean 3
CMA CGM - APL
UASC
2017
Ocean Alliance
CMA CGM
Cosco
Evergreen
OOCL
The Alliance
Hanjin
Hapag Lloyd - UASC[1]
K Line
NYK
Yang Ming
2M
Maersk – Hamburg Sud
MSC
[1]To be confirmed

Inland waterway market

- Freight flows
  - Dry bulk, regular transport flow
    - Ore , coal, limestone to deep sea
    - Then semi manufacture goods, steel products, construction material
    - Arcelor Mittal
  - Liquid bulk
    - Start in deep sea
    - Gas, diesel, liquefied gas
    - Shell, Vopak
  - Rising sector : containers
    - Connection and by the way collecting time is long : till one week
- USA
  - 5 majors 50% of the market
- Europe
  - Majority owns 1 to 3 vessels
- China
  - Both models



Break down cost

ure 4.6 Overview of freight transport operations. (From Jean-Paul Rodrigue, Dept. of Global Studies & Geography, Hofstra Univers

Part VI- information and regulations

1- information

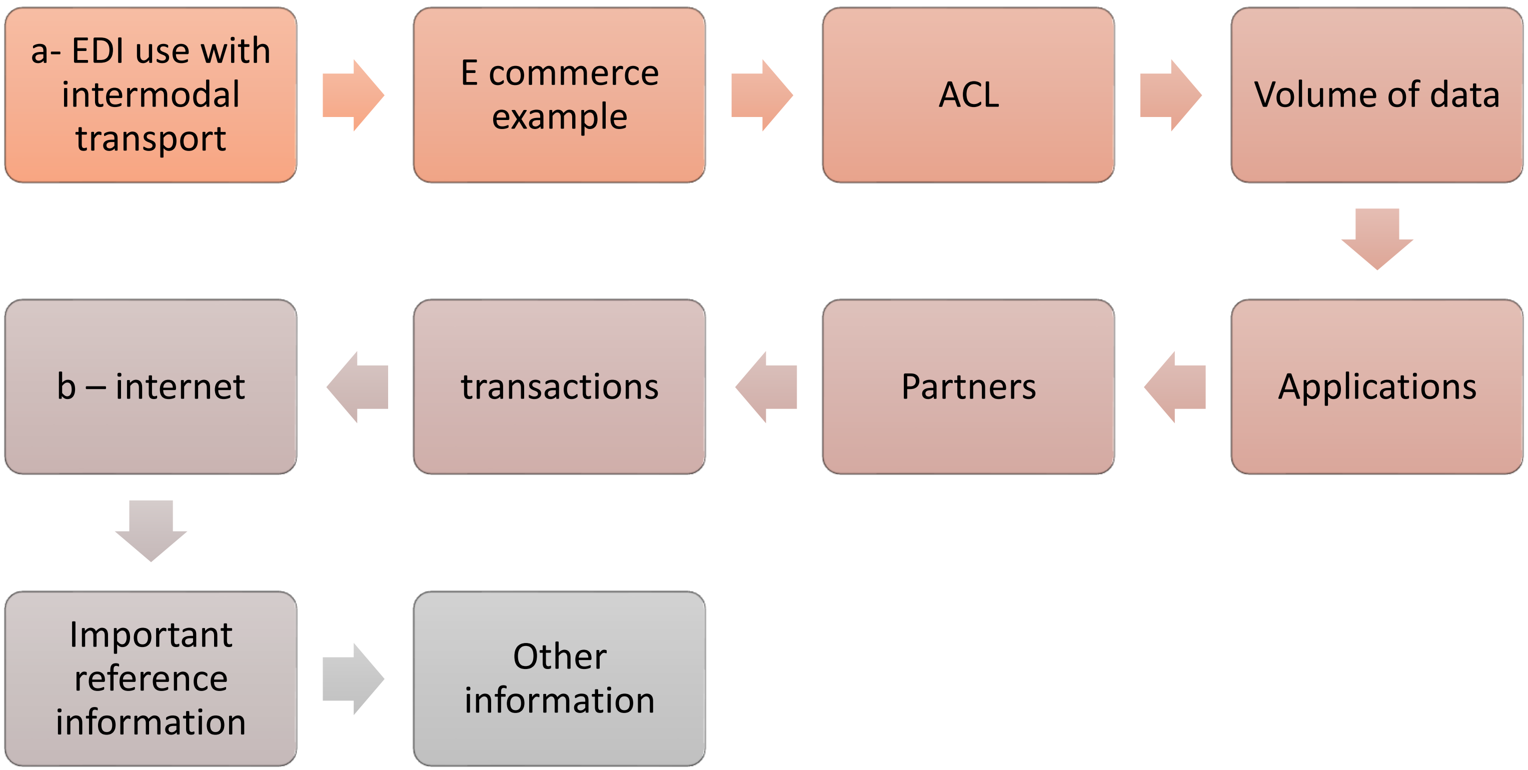
2- transport documents

3- multimodal transport of dangerous goods

4- political issue

5- case studies

1- information



1-

ANSI	X12	EDIFACT
Booking Request	300	IFTMBF
Booking Confirmation	301	IFTMBC
B/L Instructions	304	IFTMIN
Ocean Manifest	309	IFTMCS
Export B/L Invoice	310	INVOIC
Import Arrival Notice	312	IFTMAN
Shipment Status Updates	315	IFTSTA
Electronic Funds Transfer	820	

2- Transport documents

multimodal transportation act

carrier, consignee, consignement, consignor, delivery, endorsee, goods

mode of transport, multimodal transportation, multimodal transport contract, multimodal transport operator

multimodal transport document

responsabilities and liabilities of the multimodal transport operator

2- Multimodal transportation act

- Definitions : carrier, competent authority, consignee, consignment, consignor,
  - Delivery: disposal of the consignee
  - endorsee,
  - Endorsement : after adding a direction
  - goods, mode of transport, multimodal transportation,
  - multimodal transport operator : conclusion, principal
  - negotiable multimodal transport document: to order, transferable, to bearer

CODE NAME: "CONGENBILL". EDITION 1978

Shipper

⑩ Swiss Export Ltd.
Industriestrasse 200
CH-8050 Zürich-Oerlikon

BILL OF LADING ⑥

TO BE USED WITH CHARTER-PARTIES

B/L No. GGG/mzf 101

Reference No. 1150.01.23.

2-

Consignee ⑪

⑨ TO ORDER OF SHIPPER

SHIPCRAFT TRANSPORT INC.

General Agents:

SHIPCRAFT A/S
(Hovedgaden 16)
P O Box 142
DK-2970 Hoersholm, Denmark
Phone: 4 2-571033
Telex: 37584 Shpcr Dk
Fax: 4 2-571044

Notify address

⑫ 1st: ViaMAT (Far East)
1-10-7 Higashi Gotanda
Sinagawa-Ku, TOKYO 141
2nd: Suzuki K.K.
Saitama

Agent for Switzerland:

MAT TRANSPORT AG
Erlenstrasse 95
P.O. Box
CH-4002 Basel, Switzerland

Phone: 061 68 68 000
Fax: 061 68 68 001

Vessel ① M/V TIGER

Port of loading ② Cherbourg

Port of discharge ② Yokohama

Shipper's description of goods

⑬	⑭	⑮	Gross weight ⑯	
92HBFC0803T 1 - 240	240 packages	MACHINERY as per contract PQ 733 054 dated 12.10.19.. ⑱ Letter of credit No. MC986CH34 dated 4.12.19..	452'500 kg	1202 m3

ORIGINAL

(of which -0-(none) on deck at Shipper's risk; the Carrier not being responsible for loss or damage howsoever arising)

Freight payable as per CHARTER-PARTY dated ⑥ 7. March 19..

FREIGHT ADVANCE.
Received on account of freight:

⑰ PREPAID AS AGREED

Time used for loading 0 days 23 hours.

⑦ SHIPPED at the Port of Loading in apparent good order and condition on board the Vessel for carriage to the Port of Discharge or so near thereto as she may safely get the goods specified above.

Weight, measure, quality, quantity, condition, contents and value unknown.

IN WITNESS whereof the Master or Agent of the said Vessel has signed the number of Bills of Lading indicated below all of this tenor and date, any one of which being accomplished the others shall be void.

FOR CONDITIONS OF CARRIAGE SEE OVERLEAF

Freight payable at ⑰ Basel/Switzerland

Place and date of issue ③ Basel, - 6. Mai 19..

Number of original Bs/L ⑧ 3/3 (Three)

Signature ④ **MAT TRANSPORT AG**
as agent of the owner
i.e. Shipcraft Transport Inc.

ppa Gambon ⑤ Ulrich

Gauthier

Printed and sold by Carl Svanberg Tryckeri AB, Box 91, 35103 Växjö, by authority of The Baltic and International Maritime Conference, Copenhagen

THROUGH B/L

- Presentation
  - Succeeding transport
  - Single contract
  - Decreasing use

THROUGH B/L

mentions

- Place of receipt
- Place of delivery
- Pre carriage by

Double use

Final destination is critical

Port to port exception

THROUGH B/L

- Working rule
  - Owning title of the goods
  - Transshipment forbidden togetherwith letter of credit
    - Container, trailer, lash barges

Through bill of lading

- Non liability clause or liability limit
  - Responsible for the own leg
  - Carrier or forwarding agent
  - Non liability limit

COMBINED TRANSPORT DOCUMENT

- Main features of the document
  - Updated to container
  - A single law regulation
  - Document issuer

COMBINED TRANSPORT DOCUMENT

- Mentions
  - Bill of lading title
  - Kind of document
    - ICS and BIMCO
    - No standard
    - Door to door or mixed transport
  - Mentions
    - Place of receipt
    - Port of loading
    - Port of discharge
    - Place of delivery

COMBINED TRANSPORT DOCUMENT

- Issuer
  - Forwarding agent
  - Maersk case
  - Received the good

COMBINED TRANSPORT DOCUMENT

- Letter of credit use
  - Acceptance conditions
  - Transshipment

BIMCO LINER BILL OF LADING
CODE NAME: "CONLINEBILL 2000"

Amended January 1950; August 1952; January 1973; July 1974; August 1976; January 1978; November 2000.

Shipper (full style and address)	
Consignee (full style and address) or Order	B/L No. / Reference No.
	Vessel
Notify Party (full style and address)	Port of loading
	Port of discharge

PARTICULARS DECLARED BY THE SHIPPER BUT NOT ACKNOWLEDGED BY THE CARRIER

Container No./Seal No./Marks and Numbers	Number and kind of packages; description of cargo	Gross weight, kg	Measurement, m³

SHIPPED on board in apparent good order and condition (unless otherwise stated herein) the total number of Containers/Packages or Units indicated in the Box opposite entitled "Total number of Containers/Packages or Units received by the Carrier" and the cargo as specified above, weight, measure, marks, numbers, quality, contents and value unknown, for carriage to the Port of discharge or so near thereunto as the vessel may safely get and lie always afloat, to be delivered in the like good order and condition at the Port of discharge unto the lawful holder of the Bill of Lading, on payment of freight as indicated to the right plus other charges incurred in accordance with the provisions contained in this Bill of Lading. In accepting this Bill of Lading the Merchant* expressly accepts and agrees to all its stipulations on both Page 1 and Page 2, whether written, printed, stamped or otherwise incorporated, as fully as if they were all signed by the Merchant.
One original Bill of Lading must be surrendered duly endorsed in exchange for the cargo or delivery order, whereupon all other Bills of Lading to be void.
IN WITNESS whereof the Carrier, Master or their Agent has signed the number of original Bills of Lading stated below right, all of this tenor and date.

Total number of Containers/Packages or Units received by the Carrier	
Shipper's declared value	Declared value charge
Freight details and charges	
Date shipped on board	Place and date of issue
Number of original Bills of Lading	
Pre-carriage by**	
Place of receipt by pre-carrier**	
Place of delivery by on-carrier**	

Carrier's name/principal place of business

Signature

.... Carrier

or, for the Carrier

.... as Master

(Master's name/signature)

.... as Agents

(Agent's name/signature)

*As defined hereinafter (Cl. 1)

**Applicable only when pre-/on-carriage is arranged in accordance with Clause 8

Printed and sold by Fr. G. Knudtzons Bogtrykkeri A/S, Vallensbaekvej 61, DK-2625 Vallensbaek, Fax: +45 4366 0701
by authority of The Baltic and International Maritime Council (BIMCO), Copenhagen

BIMCO LINER BILL OF LADING

Code Name: "CONLINEBILL 2000"

1. Definition.
"Merchant" includes the shipper, the receiver, the consignor, the consignee, the holder of the Bill of Lading, the owner of the cargo and any person entitled to possession of the cargo.

2. Notification.
Any mention in this Bill of Lading of parties to be notified of the arrival of the cargo is solely for the information of the Carrier and failure to give such notification shall not involve the Carrier in any liability nor relieve the Merchant of any obligation hereunder.

3. Liability for Carriage Between Port of Loading and Port of Discharge.
(a) The International Convention for the Unification of Certain Rules of Law relating to Bills of Lading signed at Brussels on 25 August 1924 ("the Hague Rules") as amended by the Protocol signed at Brussels on 23 February 1968 ("the Hague-Visby Rules") and as enacted in the country of shipment shall apply to this Contract. When the Hague-Visby Rules are not enacted in the country of shipment, the corresponding legislation of the country of destination shall apply, irrespective of whether such legislation may only regulate outbound shipments.
When there is no enactment of the Hague-Visby Rules in either the country of shipment or in the country of destination, the Hague-Visby Rules shall apply to this Contract save where the Hague Rules as enacted in the country of shipment or, if no such enactment is in place, the Hague Rules as enacted in the country of destination apply compulsorily to this Contract.
The Protocol signed at Brussels on 21 December 1979 ("the SDR Protocol 1979") shall apply where the Hague-Visby Rules apply, whether mandatorily or by this Contract.
The Carrier shall in no case be responsible for loss of or damage to cargo arising prior to loading, after discharging, or with respect to deck cargo and live animals.
(b) If the Carrier is held liable in respect of delay, consequential loss or damage other than loss of or damage to the cargo, the liability of the Carrier shall be limited to the freight for the carriage covered by this Bill of Lading, or to the limitation amount as determined in sub-clause 3(a), whichever is the lesser.
(c) The aggregate liability of the Carrier and/or any of his servants, agents or independent contractors under this Contract shall, in no circumstances, exceed the limits of liability for the total loss of the cargo under sub-clause 3(a) or, if applicable, the Additional Clause.

4. Law and Jurisdiction.
Disputes arising out of or in connection with this Bill of Lading shall be exclusively determined by the courts and in accordance with the law of the place where the Carrier has his principal place of business, as stated on Page 1, except as provided elsewhere herein.

5. The Scope of Carriage.
The intended carriage shall not be limited to the direct route but shall be deemed to include any proceeding or returning to or stopping or slowing down at or off any ports or places for any reasonable purpose connected with the carriage including bunkering, loading, discharging, or other cargo operations and maintenance of Vessel and crew.

6. Substitution of Vessel.
The Carrier shall be at liberty to carry the cargo or part thereof to the Port of discharge by the said or other vessel or vessels either belonging to the Carrier or others, or by other means of transport, proceeding either directly or indirectly to such port.

7. Transhipment.
The Carrier shall be at liberty to tranship, lighter, land and store the cargo either on shore or afloat and reship and forward the same to the Port of discharge.

8. Liability for Pre- and On-Carriage.
When the Carrier arranges pre-carriage of the cargo from a place other than the Vessel's Port of loading or on-carriage of the cargo to a place other than the Vessel's Port of discharge, the Carrier shall contract as the Merchant's Agent only and the Carrier shall not be liable for any loss or damage arising during any part of the carriage other than between the Port of loading and the Port of discharge even though the freight for the whole carriage has been collected by him.

9. Loading and Discharging.
(a) Loading and discharging of the cargo shall be arranged by the Carrier or his Agent.
(b) The Merchant shall, at his risk and expense, handle and/or store the cargo before loading and after discharging.
(c) Loading and discharging may commence without prior notice.
(d) The Merchant or his Agent shall tender the cargo when the Vessel is ready to load and as fast as the Vessel can receive including, if required by the Carrier, outside ordinary working hours notwithstanding any custom of the port. If the Merchant or his Agent fails to tender the cargo when the Vessel is ready to load or fails to load as fast as the Vessel can receive the cargo, the Carrier shall be relieved of any obligation to load such cargo, the Vessel shall be entitled to leave the port without further notice and the Merchant shall be liable to the Carrier for deadfreight and/or any overtime charges, losses, costs and expenses incurred by the Carrier.
(e) The Merchant or his Agent shall take delivery of the cargo as fast as the Vessel can discharge including, if required by the Carrier, outside ordinary working hours notwithstanding any custom of the port. If the Merchant or his Agent fails to take delivery of the cargo the Carrier's discharging of the cargo shall be deemed fulfilment of the contract of carriage. Should the cargo not be applied for within a reasonable time, the Carrier may sell the same privately or by auction. If the Merchant or his Agent fails to take delivery of the cargo as fast as the Vessel can discharge, the Merchant shall be liable to the Carrier for any overtime charges, losses, costs and expenses incurred by the Carrier.
(f) The Merchant shall accept his reasonable proportion of unidentified loose cargo.

10. Freight, Charges, Costs, Expenses, Duties, Taxes and Fines.
(a) Freight, whether paid or not, shall be considered as fully earned upon loading and non-returnable in any event. Unless otherwise specified, freight and/or charges under this Contract are payable by the Merchant to the Carrier on demand. Interest at Libor (or its successor) plus 2 per cent. shall run from fourteen days after the date when freight and charges are payable.
(b) The Merchant shall be liable for all costs and expenses of fumigation, gathering and sorting loose cargo and weighing onboard, repairing damage to and replacing packing due to excepted causes, and any extra handling of the cargo for any of the aforementioned reasons.
(c) The Merchant shall be liable for any dues, duties, taxes and charges which under any denomination may be levied, *inter alia*, on the basis of freight, weight of cargo or tonnage of the Vessel.
(d) The Merchant shall be liable for all fines, penalties, costs, expenses and losses which the Carrier, Vessel or cargo may incur through non-observance of Customs House and/or import or export regulations.
(e) The Carrier is entitled in case of incorrect declaration of contents, weights, measurements or value of the cargo to claim double the amount of freight which would have been due if such declaration had been correctly given. For the purpose of ascertaining the actual facts, the Carrier shall have the right to obtain from the Merchant the original invoice and to have the cargo inspected and its contents, weight, measurement or value verified.

11. Lien.
The Carrier shall have a lien on all cargo for any amount due under this contract and the costs of recovering the same and shall be entitled to sell the cargo privately or by auction to satisfy any such claims.

12. General Average and Salvage.
General Average shall be adjusted, stated and settled in London according to the York-Antwerp Rules 1994, or any modification thereof, in respect of all cargo, whether carried on or under deck. In the event of accident, danger, damage or disaster before or after commencement of the voyage resulting from any cause whatsoever, whether due to negligence or not, for which or for the consequence of which the Carrier is not responsible by statute, contract or otherwise, the Merchant shall contribute with the Carrier in General Average to the payment of any sacrifice, losses or expenses of a General Average nature that may be made or incurred, and shall pay salvage and special charges incurred in respect of the cargo. If a salving vessel is owned or operated by the Carrier, salvage shall be paid for as fully as if the salving vessel or vessels belonged to strangers.

13. Both-to-Blame Collision Clause.
If the Vessel comes into collision with another vessel as a result of the negligence of the other vessel and any act, negligence or default of the Master, Mariner, Pilot or the servants of the Carrier in the navigation or in the management of the Vessel, the Merchant will indemnify the Carrier against all loss or liability to the other or non-carrying vessel or her Owner in so far as such loss or liability represents loss of or damage to or any claim whatsoever of the owner of the cargo paid or payable by the other or non-carrying vessel or her Owner to the owner of the cargo and set-off, recouped or recovered by the other or non-carrying vessel or her Owner as part of his claim against the carrying vessel or Carrier. The foregoing provisions shall also apply where the Owner, operator or those in charge of any vessel or vessels or objects other than, or in addition to, the colliding vessels or objects are at fault in respect of a collision or contact.

14. Government directions, War, Epidemics, Ice, Strikes, etc.
(a) The Master and the Carrier shall have liberty to comply with any order or directions or recommendations in connection with the carriage under this Contract given by any Government or Authority, or anybody acting or purporting to act on behalf of such Government or Authority, or having under the terms of the insurance on the Vessel the right to give such orders or directions or recommendations.
(b) Should it appear that the performance of the carriage would expose the Vessel or any cargo onboard to risk of seizure, damage or delay, in consequence of war, warlike operations, blockade, riots, civil commotions or piracy, or any person onboard to risk of loss of life or freedom, or that any such risk has increased, the Master may discharge the cargo at the Port of loading or any other safe and convenient port.
(c) Should it appear that epidemics; quarantine; ice; labour troubles, labour obstructions, strikes, lockouts (whether onboard or on shore); difficulties in loading or discharging would prevent the Vessel from leaving the Port of loading or reaching or entering the Port of discharge or there discharging in the usual manner and departing therefrom, all of which safely and without unreasonable delay, the Master may discharge the cargo at the Port of loading or any other safe and convenient port.
(d) The discharge, under the provisions of this Clause, of any cargo shall be deemed due fulfilment of the contract of carriage.
(e) If in connection with the exercise of any liberty under this Clause any extra expenses are incurred they shall be paid by the Merchant in addition to the freight, together with return freight, if any, and a reasonable compensation for any extra services rendered to the cargo.

15. Defences and Limits of Liability for the Carrier, Servants and Agents.
(a) It is hereby expressly agreed that no servant or agent of the Carrier (which for the purpose of this Clause includes every independent contractor from time to time employed by the Carrier) shall in any circumstances whatsoever be under any liability whatsoever to the Merchant under this Contract of carriage for any loss, damage or delay of whatsoever kind arising or resulting directly or indirectly from any act, neglect or default on his part while acting in the course of or in connection with his employment.
(b) Without prejudice to the generality of the foregoing provisions in this Clause, every exemption from liability, limitation, condition and liberty herein contained and every right, defence and immunity of whatsoever nature applicable to the Carrier or to which the Carrier is entitled, shall also be available and shall extend to protect every such servant and agent of the Carrier acting as aforesaid.
(c) The Merchant undertakes that no claim shall be made against any servant or agent of the Carrier and, if any claim should nevertheless be made, to indemnify the Carrier against all consequences thereof.
(d) For the purpose of all the foregoing provisions of this Clause the Carrier is or shall be deemed to be acting as agent or trustee on behalf of and for the benefit of all persons who might be his servants or agents from time to time and all such persons shall to this extent be or be deemed to be parties to this Contract of carriage.

16. Stowage.
(a) The Carrier shall have the right to stow cargo by means of containers, trailers, transportable tanks, flats, pallets, or similar articles of transport used to consolidate goods.
(b) The Carrier shall have the right to carry containers, trailers, transportable tanks and covered flats, whether stowed by the Carrier or received by him in a stowed condition from the Merchant, on or under deck without notice to the Merchant.

17. Shipper-Packed Containers, trailers, transportable tanks, flats and pallets.
(a) If a container has not been filled, packed or stowed by the Carrier, the Carrier shall not be liable for any loss of or damage to its contents and the Merchant shall cover any loss or expense incurred by the Carrier, if such loss, damage or expense has been caused by:
(i) negligent filling, packing or stowing of the container;
(ii) the contents being unsuitable for carriage in container; or
(iii) the unsuitability or defective condition of the container unless the container has been supplied by the Carrier and the unsuitability or defective condition would not have been apparent upon reasonable inspection at or prior to the time when the container was filled, packed or stowed.
(b) The provisions of sub-clause (i) of this Clause also apply with respect to trailers, transportable tanks, flats and pallets which have not been filled, packed or stowed by the Carrier.
(c) The Carrier does not accept liability for damage due to the unsuitability or defective condition of reefer equipment or trailers supplied by the Merchant.

18. Return of Containers.
(a) Containers, pallets or similar articles of transport supplied by or on behalf of the Carrier shall be returned to the Carrier in the same order and condition as handed over to the Merchant, normal wear and tear excepted, with interiors clean and within the time prescribed in the Carrier's tariff or elsewhere.
(b) The Merchant shall be liable to the Carrier for any loss, damage to, or delay, including demurrage and detention incurred by or sustained to containers, pallets or similar articles of transport during the period between handing over to the Merchant and return to the Carrier.

ADDITIONAL CLAUSE

U.S. Trade. Period of Responsibility.
(i) In case the Contract evidenced by this Bill of Lading is subject to the Carriage of Goods by Sea Act of the United States of America, 1936 (U.S. COGSA), then the provisions stated in said Act shall govern before loading and after discharge and throughout the entire time the cargo is in the Carrier's custody and in which event freight shall be payable on the cargo coming into the Carrier's custody.
(ii) If the U.S. COGSA applies, and unless the nature and value of the cargo has been declared by the shipper before the cargo has been handed over to the Carrier and inserted in this Bill of Lading, the Carrier shall in no event be or become liable for any loss or damage to the cargo in an amount exceeding USD 500 per package or customary freight unit.

Code Name: "COMBICONBILL"

B/L No.

Shipper

Reference No.

Negotiable

COMBINED TRANSPORT BILL OF LADING

Revised 1995

Consigned to order of

Notify party/address

	Place of receipt		
Ocean Vessel	Port of loading		
Port of discharge	Place of delivery	Freight payable at	Number of original Bills of Lading
Marks and Nos.	Quantity and description of goods		Gross weight, kg, Measurement, m³

Particulars above declared by Shipper

Freight and charges

RECEIVED the goods in apparent good order and condition and, as far as ascertained by reasonable means of checking, as specified above unless otherwise stated.
The Carrier, in accordance with and to the extent of the provisions contained in this Bill of Lading, and with liberty to sub-contract, undertakes to perform and/or in his own name to procure performance of the combined transport and the delivery of the goods, including all services related thereto, from the place and time of taking the goods in charge to the place and time of delivery and accepts responsibility for such transport and such services.
One of the Bills of Lading must be surrendered duly endorsed in exchange for the goods or delivery order.
IN WITNESS whereof TWO (2) original Bills of Lading have been signed, if not otherwise stated above, one of which being accomplished the other(s) to be void.

Shipper's declared value of ......

subject to payment of above extra charge.

Place and date of issue

Signed for

.... as Carrier

by ....

As agent(s) only to the Carrier

Note:
The Merchant's attention is called to the fact that according to Clauses 10 to 12 and Clause 24 of this Bill of Lading, the liability of the Carrier/s, in most cases, limited in respect of loss of or damage to the goods and delay.

Printed by the BIMCO Charter Party Editor

p.t.o.

COMBINED TRANSPORT BILL OF LADING

Adopted by The Baltic and International Maritime Council in January, 1971 (as revised 1995)

Code Name: "COMBICONBILL"

I. GENERAL PROVISIONS

1. Applicability.
Notwithstanding the heading "Combined Transport", the provisions set out and referred to in this Bill of Lading shall also apply, if the transport as described in this Bill of Lading is performed by one mode of transport only.

2. Definitions.
"Carrier" means the party on whose behalf this Bill of Lading has been signed.
"Merchant" includes the Shipper, the Receiver, the Consignor, the Consignee, the holder of this Bill of Lading and the owner of the goods.

3. Carrier's Tariff.
The terms of the Carrier's applicable Tariff at the date of shipment are incorporated herein. Copies of the relevant provisions of the applicable Tariff are available from the Carrier upon request. In the case of inconsistency between this Bill of Lading and the applicable Tariff, this Bill of Lading shall prevail.

4. Time Bar.
All liability whatsoever of the Carrier shall cease unless suit is brought within 9 months after delivery of the goods or the date when the goods should have been delivered.

5. Law and Jurisdiction.
Disputes arising under this Bill of Lading shall be determined by the courts and in accordance with the law at the place where the Carrier has his principal place of business.

II. PERFORMANCE OF THE CONTRACT

6. Methods and Routes of Transportation.
(1) The Carrier is entitled to perform the transport and all services related thereto in any reasonable manner and by any reasonable means, methods and routes.
(2) In accordance herewith, for instance, in the event of carriage by sea, vessels may sail with or without pilots, undergo repairs, adjust equipment, drydock and tow vessels in all situations.

7. Optional Stowage.
(1) Goods may be stowed by the Carrier by means of containers, trailers, transportable tanks, flats, pallets, or similar articles of transport used to consolidate goods.
(2) Containers, trailers, transportable tanks and covered flats, whether stowed by the Carrier or received by him in a stowed condition from the Merchant, may be carried on or under deck without notice to the Merchant.

8. Hindrances etc. Affecting Performance.
(1) The Carrier shall use reasonable endeavours to complete the transport and to deliver the goods at the place designated for delivery.
(2) If at any time the performance of the contract as evidenced by this Bill of Lading is or will be affected by any hindrance, risk, delay, difficulty or disadvantage of whatsoever kind, and if by virtue of sub-clause 8 (1) the Carrier has no duty to complete the performance of the contract, the Carrier (whether or not the transport is commenced) may elect to:
(a) treat the performance of this Contract as terminated and place the goods at the Merchant's disposal at any place which the Carrier shall deem safe and convenient;
or
(b) deliver the goods at the place designated for delivery.
(3) If the goods are not taken delivery of by the Merchant within a reasonable time after the Carrier has called upon him to take delivery, the Carrier shall be at liberty to put the goods in safe custody on behalf of the Merchant at the latter's risk and expense.
(4) In any event the Carrier shall be entitled to full freight for goods received for transportation and additional compensation for extra costs resulting from the circumstances referred to above.

III. CARRIER'S LIABILITY

9. Basic Liability.
(1) The Carrier shall be liable for loss of or damage to the goods occurring between the time when he receives the goods into his charge and the time of delivery.
(2) The Carrier shall be responsible for the acts and omissions of any person of whose services he makes use for the performance of the contract of carriage evidenced by this Bill of Lading.
(3) The Carrier shall, however, be relieved of liability for any loss or damage if such loss or damage arose or resulted from:
(a) The wrongful act or neglect of the Merchant.
(b) Compliance with the instructions of the person entitled to give them.
(c) The lack of, or defective conditions of packing in the case of goods which, by their nature, are liable to wastage or to be damaged when not packed or when not properly packed.
(d) Handling, loading, stowage or unloading of the goods by or on behalf of the Merchant.
(e) Inherent vice of the goods.
(f) Insufficiency or inadequacy of marks or numbers on the goods, covering, or unit loads.
(g) Strikes or lock-outs or stoppages or restraints of labour from whatever cause whether partial or general.
(h) Any cause or event which the Carrier could not avoid and the consequence whereof he could not prevent by the exercise of reasonable diligence.
(4) Where under sub-clause 9 (3) the Carrier is not under any liability in respect of some of the factors causing the loss or damage, he shall only be liable to the extent that those factors for which he is liable under this Clause have contributed to the loss or damage.
(5) The burden of proving that the loss or damage was due to one or more of the causes or events, specified in (a), (b) and (h) of sub-clause 9 (3) shall rest upon the Carrier.
(6) When the Carrier establishes that in the circumstances of the case, the loss or damage could be attributed to one or more of the causes or events, specified in (c) to (g) of sub-clause 9 (3), it shall be presumed that it was so caused. The Merchant shall, however, be entitled to prove that the loss or damage was not, in fact, caused either wholly or partly by one or more of the causes or events.

10. Amount of Compensation.
(1) When the Carrier is liable for compensation in respect of loss of or damage to the goods, such compensation shall be calculated by reference to the value of such goods at the place and time they are delivered to the Merchant in accordance with the contract or should have been so delivered.
(2) The value of the goods shall be fixed according to the commodity exchange price or, if there be no such price, according to the current market price or, if there be no commodity exchange price or current market price, by reference to the normal value of goods of the same kind and quality.
(3) Compensation shall not, however, exceed two Special Drawing Rights per kilogramme of gross weight of the goods lost or damaged.
(4) Higher compensation may be claimed only when, with the consent of the Carrier, the value for the goods declared by the Shipper which exceeds the limits laid down in this Clause has been stated on the face of this Bill of Lading at the place indicated. In that case the amount of the declared value shall be substituted for that limit.

11. Special Provisions for Liability and Compensation.
(1) Notwithstanding anything provided for in Clauses 9 and 10 of this Bill of Lading, if it can be proved where the loss or damage occurred, the Carrier and the Merchant shall, as to the liability of the Carrier, be entitled to require such liability to be determined by the provisions contained in any international convention or national law, which provisions:
(a) cannot be departed from by private contract, to the detriment of the claimant, and
(b) would have applied if the Merchant had made a separate and direct contract with the Carrier in respect of the particular stage of transport where the loss or damage occurred and received as evidence thereof any particular document which must be issued if such international convention or national law shall apply.
(2) Insofar as there is no mandatory law applying to carriage by sea by virtue of the provisions of sub-clause 11 (1), the liability of the Carrier in respect of any carriage by sea shall be determined by the International Brussels Convention 1924 as amended by the Protocol signed at Brussels on February 23rd 1968 - The Hague/Visby Rules. The Hague/Visby Rules shall also determine the liability of the Carrier in respect of carriage by inland waterways as if such carriage were carriage by sea. Furthermore, they shall apply to all goods, whether carried on deck or under deck.

12. Delay, Consequential Loss, etc.
If the Carrier is held liable in respect of delay, consequential loss or damage other than loss of or damage to the goods, the liability of the Carrier shall be limited to the freight for the transport covered by this Bill of Lading, or to the value of the goods as determined in Clause 10, whichever is the lesser.

13. Notice of Loss of or Damage to the Goods.
(1) Unless notice of loss of or damage to the goods, specifying the general nature of such loss or damage, is given in writing by the Merchant to the Carrier when the goods are handed over to the Merchant, such handing over is prima facie evidence of the Delivery by the Carrier of the goods as described in this Bill of Lading.
(2) Where the loss or damage is not apparent, the same prima facie effect shall apply if notice in writing is not given within three (3) consecutive days after the day when the goods were handed over to the Merchant.

14. Defences and Limits for the Carrier, Servants, etc.
(1) The defences and limits of liability provided for in this Bill of Lading shall apply in any action against the Carrier for loss or damage to the goods whether the action can be founded in contract or in tort.
(2) The Carrier shall not be entitled to the benefit of the limitation of liability provided for in sub-clause 10 (3), if it is proved that the loss or damage resulted from a personal act or omission of the Carrier done with intent to cause such loss or damage or recklessly and with knowledge that damage would probably result.
(3) The Merchant undertakes that no claim shall be made against any servant, agent or other persons whose services the Carrier has used in order to perform this Contract and if any claim should nevertheless be made, to indemnify the Carrier against all consequences thereof.
(4) However, the provisions of this Bill of Lading apply whenever claims relating to the performance of this Contract are made against any servant, agent or other person whose services the Carrier has used in order to perform this Contract, whether such claims are founded in contract or in tort. In entering into this Contract, the Carrier, to the extent of such provisions, does so not only on his own behalf but also as agent or trustee for such persons. The aggregate liability of the Carrier and such persons shall not exceed the limits in Clauses 10, 11 and 24, respectively.

IV. DESCRIPTION OF GOODS

15. Carrier's Responsibility.
The information in this Bill of Lading shall be *prima facie* evidence of the taking in charge by the Carrier of the goods as described by such information unless a contrary indication, such as "shipper's weight, load and count", "Shipper-packed container" or similar expressions, have been made in the printed text or superimposed on the Bill of Lading. Proof to the contrary shall not be admissible when the Bill of Lading has been transferred, or the equivalent electronic data interchange message has been transmitted to and acknowledged by the Consignee who in good faith has relied and acted thereon.

16. Shipper's Responsibility.
The Shipper shall be deemed to have guaranteed to the Carrier the accuracy, at the time the goods were taken in charge by the Carrier, of the description of the goods, marks, number, quantity and weight, as furnished by him, and the Shipper shall defend, indemnify and hold harmless the Carrier against all loss, damage and expenses arising or resulting from inaccuracies in or inadequacy of such particulars. The right of the Carrier to such indemnity shall in no way limit his responsibility and liability under this Bill of Lading to any person other than the Shipper. The Shipper shall remain liable even if the Bill of Lading has been transferred by him.

17. Shipper-packed Containers, etc.
(1) If a container has not been filled, packed or stowed by the Carrier, the Carrier shall not be liable for any loss of or damage to its contents and the Merchant shall cover any loss or expense incurred by the Carrier, if such loss, damage or expense has been caused by:
(a) negligent filling, packing or stowing of the container;
(b) the contents being unsuitable for carriage in container; or
(c) the unsuitability or defective condition of the container unless the container has been supplied by the Carrier and the unsuitability or defective condition would not have been apparent upon reasonable inspection at or prior to the time when the container was filled, packed or stowed.
(2) The provisions of sub-clause (1) of this Clause also apply with respect to trailers, transportable tanks, flats and pallets which have not been filled, packed or stowed by the Carrier.
(3) The Carrier does not accept liability for damage due to the unsuitability or defective condition of reefer equipment or trailers supplied by the Merchant.

18. Dangerous Goods.
(1) The Merchant shall comply with all internationally recognised requirements and all rules which apply according to national law or by reason of international Convention, relating to the carriage of goods of a dangerous nature, and shall in any event inform the Carrier in writing of the exact nature of the danger before goods of a dangerous nature are taken into charge by the Carrier and indicate to him, if need be, the precautions to be taken.
(2) Goods of a dangerous nature which the Carrier did not know were dangerous, may, at any time or place, be unloaded, destroyed, or rendered harmless, without compensation; further, the Merchant shall be liable for all expenses, loss or damage arising out of their handing over for carriage or of their carriage.
(3) If any goods shipped with the knowledge of the Carrier as to their dangerous nature shall become a danger to any person or property, they may in like manner be landed at any place or destroyed or rendered innocuous by the Carrier without liability on the part of the Carrier except to General Average, if any.

19. Return of Containers.
(1) For the purpose of this Clause the Consignor shall mean the Person who concludes this Contract with the Carrier and the Consignee shall mean the person entitled to receive the goods from the Carrier.
(2) Containers, pallets or similar articles of transport supplied by or on behalf of the Carrier shall be returned to the Carrier in the same order and condition as handed over to the Merchant, normal wear and tear excepted, with interiors clean and within the time prescribed in the Carrier's tariff or elsewhere.
(3)(a) The Consignor shall be liable for any loss of, damage to, or delay, including demurrage, of such articles, incurred during the period between handing over to the Consignor and return to the Carrier for carriage.
(b) The Consignor and the Consignee shall be jointly and severally liable for any loss of, damage to, or delay, including demurrage, of such articles, incurred during the period between handing over to the Consignee and return to the Carrier.

V. FREIGHT AND LIEN

20. Freight.
(1) Freight shall be deemed earned when the goods have been taken in charge by the Carrier and shall be paid in any event.
(2) The Merchant's attention is drawn to the stipulations concerning currency in which the freight and charges are to be paid, rate of exchange, devaluation and other contingencies relative to freight and charges in the relevant tariff conditions. If no such stipulation as to devaluation exists or is applicable the following shall apply:
If the currency in which freight and charges are quoted is devalued between the date of the freight agreement and the date when the freight and charges are paid, then all freight and charges shall be automatically and immediately increased in proportion to the extent of the devaluation of the said currency.
(3) For the purpose of verifying the freight basis, the Carrier reserves the right to have the contents of containers, trailers or similar articles of transport inspected in order to ascertain the weight, measurement, value, or nature of the goods.

21. Lien.
The Carrier shall have a lien on the goods for any amount due under this Contract and for the costs of recovering the same, and may enforce such lien in any reasonable manner, including sale or disposal of the goods.

VI. MISCELLANEOUS PROVISIONS

22. General Average.
(1) General Average shall be adjusted at any port or place at the Carrier's option, and to be settled according to the York-Antwerp Rules 1994, or any modification thereof, this covering all goods, whether carried on or under deck. The New Jason Clause as approved by BIMCO to be considered as incorporated herein.
(2) Such security including a cash deposit as the Carrier may deem sufficient to cover the estimated contribution of the goods and any salvage and special charges thereon, shall, if required, be submitted to the Carrier prior to delivery of the goods.

23. Both-to-Blame Collision Clause.
The Both-to-Blame Collision Clause as adopted by BIMCO shall be considered incorporated herein.

24. U.S. Trade.
(1) In case the contract evidenced by this Bill of Lading is subject to the Carriage of Goods by Sea Act of the United States of America, 1936 (U.S. COGSA), then the provisions stated in the said Act shall govern before loading and after discharge and throughout the entire time the goods are in the Carrier's custody.
(2) If the U.S. COGSA applies, and unless the nature and value of the goods have been declared by the shipper before the goods have been handed over to the Carrier and inserted in this Bill of Lading, the Carrier shall in no event be or become liable for any loss of or damage to the goods in an amount exceeding USD 500 per package or customary freight unit.

Other documents

- FIATA bill of lading
  - Forwarding agent
  - FIATA
  - Combined transport
  - Multimodal Transport Operator
  - CNUCED rules

ORIGINAL

Consignor

FBL 076827 FR

NEGOTIABLE FIATA MULTIMODAL TRANSPORT BILL OF LADING

Issued subject to UNCTAD/ICC Rules for Multimodal Transport Documents (ICC Publication 481).

Consigned to order of

Notify address

	Place of receipt
Ocean vessel	Port of loading
Port of discharge	Place of delivery

Marks and numbers	Number and kind of packages	Description of goods	Gross weight	Measurement

according to the declaration of the consignor

Declaration of interest of the consignor in timely delivery (Clause 6.2.)

Declared value for ad valorem rate according to the declaration of the consignor (Clauses 7 and 8).

The goods and instructions are accepted and dealt with subject to the Standard Conditions printed overleaf.

Taken in charge in apparent good order and condition, unless otherwise noted herein, at the place of receipt for transport and delivery as mentioned above.

One of these Multimodal Transport Bills of Lading must be surrendered duly endorsed in exchange for the goods. In Witness whereof the original Multimodal Transport Bills of Lading all of this tenor and date have been signed in the number stated below, one of which being accomplished the other(s) to be void.

Freight amount	Freight payable at	Place and date of issue
Cargo Insurance through the undersigned ☐ not covered ☐ Covered according to attached Policy	Number of Original FBL's	Stamp and signature
For delivery of goods please apply to:		"as carrier"

Standard Conditions (1992) governing the FIATA MULTIMODAL TRANSPORT BILL OF LADING

Definitions

- «Freight Forwarder» means the Multimodal Transport Operator who issues this FBL and is named on the face of it and assumes liability for the performance of the multimodal transport contract as a carrier.
- «Merchant» means and includes the Shipper, the Consignor, the Consignee, the Holder of this FBL, the Receiver and the Owner of the Goods.
- «Consignor» means the person who concludes the multimodal transport contract with the Freight Forwarder.
- «Consignee» means the person entitled to receive the goods from the Freight Forwarder.
- «Taken in charge» means that the goods have been handed over to and accepted for carriage by the Freight Forwarder at the place of receipt evidenced in this FBL.
- «Goods» means any property including live animals as well as containers, pallets or similar articles of transport or packaging not supplied by the Freight Forwarder, irrespective of whether such property is to be or is carried on or under deck.

1. Applicability
Notwithstanding the heading «FIATA Multimodal Transport Bill of Lading (FBL)» these conditions shall also apply if only one mode of transport is used.

2. Issuance of this FBL

2.1. By issuance of this FBL the Freight Forwarder
a) undertakes to perform and/or in his own name to procure the performance of the entire transport, from the place at which the goods are taken in charge (place of receipt evidenced in this FBL) to the place of delivery designated in this FBL;
b) assumes liability as set out in these conditions.

2.2. Subject to the conditions of this FBL the Freight Forwarder shall be responsible for the acts and omissions of his servants or agents acting within the scope of their employment, or any other person of whose services he makes use for the performance of the contract evidenced by this FBL, as if such acts and omissions were his own.

3. Negotiability and title to the goods

3.1. This FBL is issued in a negotiable form unless it is marked «non negotiable». It shall constitute title to the goods and the holder, by endorsement of this FBL, shall be entitled to receive or to transfer the goods herein mentioned.

3.2. The information in this FBL shall be prima facie evidence of the taking in charge by the Freight Forwarder of the goods as described by such information unless a contrary indication, such as «shipper's weight, load and count», «shipper-packed container» or similar expressions, has been made in the printed text or superimposed on this FBL. However, proof to the contrary shall not be admissible when the FBL has been transferred to the consignee for valuable consideration who in good faith has relied and acted thereon.

4. Dangerous Goods and Indemnity

4.1. The Merchant shall comply with rules which are mandatory according to the national law or by reason of International Convention, relating to the carriage of goods of a dangerous nature, and shall in any case inform the Freight Forwarder in writing of the exact nature of the danger, before goods of a dangerous nature are taken in charge by the Freight Forwarder and indicate to him, if need be, the precautions to be taken.

4.2. If the Merchant fails to provide such information and the Freight Forwarder is unaware of the dangerous nature of the goods and the necessary precautions to be taken and if, at any time, they are deemed to be a hazard to life or property, they may at any place be unloaded, destroyed or rendered harmless, as circumstances may require, without compensation. The Merchant shall indemnify the Freight Forwarder against all loss, damage, liability, or expense arising out of their being taken in charge, or their carriage, or of any service incidental thereto.
The burden of proving that the Freight Forwarder knew the exact nature of the danger constituted by the carriage of the said goods shall rest on the Merchant.

4.3. If any goods shall become a danger to life or property, they may in like manner be unloaded or landed at any place or destroyed or rendered harmless. If such danger was not caused by the fault and neglect of the Freight Forwarder he shall have no liability and the Merchant shall indemnify him against all loss, damage, liability and expense arising therefrom.

5. Description of Goods and Merchant's Packing and Inspection

5.1. The Consignor shall be deemed to have guaranteed to the Freight Forwarder the accuracy, at the time the goods were taken in charge by the Freight Forwarder, of all particulars relating to the general nature of the goods, their marks, number, weight, volume and quantity and, if applicable, to the dangerous character of the goods, as furnished by him or on his behalf for insertion on the FBL.
The Consignor shall indemnify the Freight Forwarder against all loss, damage and expense resulting from any inaccuracy or inadequacy of such particulars.
The Consignor shall remain liable even if the FBL has been transferred by him.
The right of the Freight Forwarder to such an indemnity shall in no way limit his liability under this FBL to any person other than the Consignor.

5.2. The Freight Forwarder shall not be liable for any loss, damage or expense caused by defective or insufficient packing of goods or by inadequate loading or packing within containers or other transport units when such loading or packing has been performed by the Merchant or on his behalf by a person other than the Freight Forwarder, or by the defect or unsuitability of the containers or other transport units supplied by the Merchant, or if supplied by the Freight Forwarder if a defect or unsuitability of the container or other transport unit would have been apparent upon reasonable inspection by the Merchant. The Merchant shall indemnify the Freight Forwarder against all loss, damage, liability and expense so caused.

6. Freight Forwarder's Liability

6.1. The responsibility of the Freight Forwarder for the goods under these conditions covers the period from the time the Freight Forwarder has taken the goods in his charge to the time of their delivery.

6.2. The Freight Forwarder shall be liable for loss of or damage to the goods as well as for delay in delivery if the occurrence which caused the loss, damage or delay in delivery took place while the goods were in his charge as defined in Clause 2.1.a, unless the Freight Forwarder proves that no fault or neglect of his own, his servants or agents or any other person referred to in Clause 2.2. has caused or contributed to such loss, damage or delay. However, the Freight Forwarder shall only be liable for loss following from delay in delivery if the Consignor has made a declaration of interest in timely delivery which has been accepted by the Freight Forwarder and stated in this FBL.

6.3. Arrival times are not guaranteed by the Freight Forwarder. However, delay in delivery occurs when the goods have not been delivered within the time expressly agreed upon or, in the absence of such agreement, within the time which would be reasonable to require of a diligent Freight Forwarder, having regard to the circumstances of the case.

6.4. If the goods have not been delivered within ninety consecutive days following such date of delivery as determined in Clause 6.3., the claimant may, in the absence of evidence to the contrary, treat the goods as lost.

6.5. When the Freight Forwarder establishes that, in the circumstances of the case, the loss or damage could be attributed to one or more causes or events, specified in a – e of the present clause, it shall be presumed that it was so caused, always provided, however, that the claimant shall be entitled to prove that the loss or damage was not, in fact, caused wholly or partly by one or more of such causes or events:
a) an act or omission of the Merchant, or person other than the Freight Forwarder acting on behalf of the Merchant or from whom the Freight Forwarder took the goods in charge;
b) insufficiency or defective condition of the packaging or marks and/or numbers;
c) handling, loading, stowage or unloading of the goods by the Merchant or any person acting on behalf of the Merchant;
d) inherent vice of the goods;
e) strike, lockout, stoppage or restraint of labour.

6.6. **Defences for carriage by sea or inland waterways**
Notwithstanding Clauses 6.2., 6.3. and 6.4. the Freight Forwarder shall not be liable for loss, damage or delay in delivery with respect to goods carried by sea or inland waterways when such loss, damage or delay during such carriage has been caused by:
a) act, neglect, or default of the master, mariner, pilot or the servants of the carrier in the navigation or in the management of the ship;
b) fire, unless caused by the actual fault or privity of the carrier, however, always provided that whenever loss or damage has resulted from unseaworthiness of the ship, the Freight Forwarder can prove that due diligence has been exercised to make the ship seaworthy at the commencement of the voyage.

7. Paramount Clauses

7.1. These conditions shall only take effect to the extent that they are not contrary to the mandatory provisions of International Conventions or national law applicable to the contract evidenced by this FBL.

7.2. The Hague Rules contained in the International Convention for the unification of certain rules relating to Bills of Lading, dated Brussels 25th August 1924, or in those countries where there are already in force the Hague-Visby Rules contained in the Protocol of Brussels, dated 23rd February 1968, as enacted in the Country of Shipment, shall apply to all carriage of goods by sea and also to the carriage of goods by inland waterways, and such provisions shall apply to all goods whether carried on deck or under deck.

7.3. The Carriage of Goods by Sea Act of the United States of America (COGSA) shall apply to the carriage of goods by sea, whether on deck or under deck, if compulsorily applicable to this FBL or would be applicable but for the goods being carried on deck in accordance with a statement on this FBL.

8. Limitation of Freight Forwarder's Liability

8.1. Assessment of compensation for loss of or damage to the goods shall be made by reference to the value of such goods at the place and time they are delivered to the consignee or at the place and time when, in accordance with this FBL, they should have been so delivered.

8.2. The value of the goods shall be determined according to the current commodity exchange price or, if there is no such price, according to the current market price or, if there are no such prices, by reference to the normal value of goods of the same nature and quality.

8.3. Subject to the provisions of subclauses 8.4. to 8.9. inclusive, the Freight Forwarder shall in no event be or become liable for any loss of or damage to the goods in an amount exceeding the equivalent of 666.67 SDR per package or unit or 2 SDR per kilogramme of gross weight of the goods lost or damaged, whichever is the higher, unless the nature and value of the goods shall have been declared by the Consignor and accepted by the Freight Forwarder before the goods have been taken in his charge, or the ad valorem freight rate paid, and such value is stated in the FBL by him, then such declared value shall be the limit.

8.4. Where a container, pallet or similar article of transport is loaded with more than one package or unit, the packages or other shipping units enumerated in the FBL as packed in such article of transport are deemed packages or shipping units. Except as aforesaid, such article of transport shall be considered the package or unit.

8.5. Notwithstanding the above mentioned provisions, if the multimodal transport does not, according to the contract, include carriage of goods by sea or by inland waterways, the liability of the Freight Forwarder shall be limited to an amount not exceeding 8.33 SDR per kilogramme of gross weight of the goods lost or damaged.

8.6. a) When the loss of or damage to the goods occurred during one particular stage of the multimodal transport, in respect of which an applicable international convention or mandatory national law would have provided another limit of liability if a separate contract of carriage had been made for that particular stage of transport, then the limit of the Freight Forwarder's liability for such loss or damage shall be determined by reference to the provisions of such convention or mandatory national law.
b) Unless the nature and value of the goods shall have been declared by the Merchant and inserted in this FBL, and the ad valorem freight rate paid, the liability of the Freight Forwarder under COGSA, where applicable, shall not exceed US$ 500 per package or, in the case of goods not shipped in packages, per customary freight unit.

8.7. If the Freight Forwarder is liable in respect of loss following from delay in delivery, or consequential loss or damage other than loss of or damage to the goods, the liability of the Freight Forwarder shall be limited to an amount not exceeding the equivalent of twice the freight under the multimodal contract for the multimodal transport under this FBL.

8.8. The aggregate liability of the Freight Forwarder shall not exceed the limits of liability for total loss of the goods.

8.9. The Freight Forwarder is not entitled to the benefit of the limitation of liability if it is proved that the loss, damage or delay in delivery resulted from a personal act or omission of the Freight Forwarder done with the intent to cause such loss, damage or delay, or recklessly and with knowledge that such loss, damage or delay would probably result.

9. Applicability to Actions in Tort
These conditions apply to all claims against the Freight Forwarder relating to the performance of the contract evidenced by this FBL, whether the claim be founded in contract or in tort.

10. Liability of Servants and other Persons

10.1. These conditions apply whenever claims relating to the performance of the contract evidenced by this FBL are made against any servant, agent or other person (including any independent contractor) whose services have been used in order to perform the contract, whether such claims are founded in contract or in tort, and the aggregate liability of the Freight Forwarder and of such servants, agents or other persons shall not exceed the limits in clause 8.

10.2. In entering into this contract as evidenced by this FBL, the Freight Forwarder, to the extent of these provisions, does not only act on his own behalf, but also as agent or trustee for such persons, and such persons shall to this extent be or be deemed to be parties to this contract.

10.3. However, if it is proved that the loss of or such loss or damage to the goods resulted from a personal act or omission of such a person referred to in Clause 10.1., done with intent to cause damage, or recklessly and with knowledge that damage would probably result, such person shall not be entitled to benefit of limitation of liability provided for in Clause 8.

10.4. The aggregate of the amounts recoverable from the Freight Forwarder and the persons referred to in Clauses 2.2. and 10.1. shall not exceed the limits provided for in these conditions.

11. Method and Route of Transportation
Without notice to the Merchant, the Freight Forwarder has the liberty to carry the goods on or under deck and to choose or substitute the means, route and procedure to be followed in the handling, stowage, storage and transportation of the goods.

12. Delivery

12.1. Goods shall be deemed to be delivered when they have been handed over or placed at the disposal of the Consignee or his agent in accordance with this FBL, or when the goods have been handed over to any authority or other party to whom, pursuant to the law or regulation applicable at the place of delivery, the goods must be handed over, or such other place at which the Freight Forwarder is entitled to call upon the Merchant to take delivery.

12.2. The Freight Forwarder shall also be entitled to store the goods at the sole risk of the Merchant, and the Freight Forwarder's liability shall cease, and the cost of such storage shall be paid, upon demand, by the Merchant to the Freight Forwarder.

12.3. If at any time the carriage under this FBL is or is likely to be affected by any hindrance or risk of any kind (including the condition of the goods) not arising from any fault or neglect of the Freight Forwarder or a person referred to in Clause 2.2. and which cannot be avoided by the exercise of reasonable endeavours the Freight Forwarder may:
abandon the carriage of the goods under this FBL and, where reasonably possible, place the goods or any part of them at the Merchant's disposal at any place which the Freight Forwarder may deem safe and convenient, whereupon delivery shall be deemed to have been made, and the responsibility of the Freight Forwarder in respect of such goods shall cease.
In any event, the Freight Forwarder shall be entitled to full freight under this FBL and the Merchant shall pay any additional costs resulting from the above mentioned circumstances.

13. Freight and Charges

13.1. Freight shall be paid in cash, without any reduction or deferment on account of any claim, counterclaim or set-off, whether prepaid or payable at destination.
Freight shall be considered as earned by the Freight Forwarder at the moment when the goods have been taken in his charge, and not to be returned in any event.

13.2. Freight and all other amounts mentioned in this FBL are to be paid in the currency named in this FBL or, at the Freight Forwarder's option, in the currency of the country of dispatch or destination at the highest rate of exchange for bankers sight bills current for prepaid freight on the day of dispatch and for freight payable at destination on the day when the Merchant is notified on arrival of the goods there or on the date of withdrawal of the delivery order, whichever rate is the higher, or at the option of the Freight Forwarder on the date of this FBL.

13.3. All dues, taxes and charges or other expenses in connection with the goods shall be paid by the Merchant.
Where equipment is supplied by the Freight Forwarder, the Merchant shall pay all demurrage and charges which are not due to a fault or neglect of the Freight Forwarder.

13.4. The Merchant shall reimburse the Freight Forwarder in proportion to the amount of freight for any costs for deviation or delay or any other increase of costs of whatever nature caused by war, warlike operations, epidemics, strikes, government directions or force majeure.

13.5. The Merchant warrants the correctness of the declaration of contents, insurance, weight, measurements or value of the goods but the Freight Forwarder has the liberty to have the contents inspected and the weight, measurements or value verified. If on such inspection it is found that the declaration is not correct it is agreed that a sum equal either to five times the difference between the correct figure and the freight charged, or to double the correct freight less the freight charged, whichever sum is the smaller, shall be payable as liquidated damages to the Freight Forwarder for his inspection costs and losses of freight on other goods notwithstanding any other sum having been stated on this FBL as freight payable.

13.6. Despite the acceptance by the Freight Forwarder of instructions to collect freight, charges or other expenses from any other person in respect of the transport under this FBL, the Merchant shall remain responsible for such monies on receipt of evidence of demand and the absence of payment for whatever reason.

14. Lien
The Freight Forwarder shall have a lien on the goods and any documents relating thereto for any amount due at any time to the Freight Forwarder from the Merchant including storage fees and the cost of recovering same, and may enforce such lien in any reasonable manner which he may think fit.

15. General Average
The Merchant shall indemnify the Freight Forwarder in respect of any claims of a General Average nature which may be made on him and shall provide such security as may be required by the Freight Forwarder in this connection.

16. Notice

16.1. Unless notice of loss of or damage to the goods, specifying the general nature of such loss or damage, is given in writing by the consignee to the Freight Forwarder when the goods are delivered to the consignee in accordance with clause 12, such handing over is prima facie evidence of the delivery by the Freight Forwarder of the goods as described in this FBL.

16.2. Where the loss or damage is not apparent, the same prima facie effect shall apply if notice in writing is not given within 6 consecutive days after the day when the goods were delivered to the consignee in accordance with clause 12.

17. Time bar
The Freight Forwarder shall, unless otherwise expressly agreed, be discharged of all liability under these conditions unless suit is brought within 9 months after the delivery of the goods, or the date when the goods should have been delivered, or the date when in accordance with clause 6.4. failure to deliver the goods would give the consignee the right to treat the goods as lost.

18. Partial invalidity
If any clause or a part thereof is held to be invalid, the validity of this FBL and the remaining clauses or a part thereof shall not be affected.

19. Jurisdiction and applicable law
Actions against the Freight Forwarder may be instituted only in the place where the Freight Forwarder has his place of business as stated on the reverse of this FBL and shall be decided according to the law of the country in which that place of business is situated.

FIATA and letter of credit

- FIATA and letter of credit
  - Acceptable
  - RUU 600 rules
  - conditions

Other documents

- NVOCC BILL OF LADING
  - Non Vessel Operating Common Carrier
  - House bill of lading
  - Master bill of lading
  - Receiver role
    - Double documentation level

Other documents

- NVOCC qualification
  - No legal definition
  - NVOCC sea carrier
  - Door to door forwarding agent
  - No carrier identification

Other documents

- NVOCC document and Letter of Credit
    - NVOCC ability
    - As carrier

Other documents

- NVOCC responsability and other players
  - Working process
    - Non compatible clauses
  - Actual carrier responsability
  - N.V.O.C.C. agent liability
  - Actual carrier and documents bearer
    - Consignee status

Other documents

- Seaway bill
  - And letter of credit
  - Short transit time
  - Increasing documents transmission time
  - Contract proof
  - Non negotiable document
  - Road waybill
  - Consignee advantage
  - Sea waybill use
  - Shipping receipt
  - Consignee key impact

Other sea documents

- Short forms
  - Utilisation
  - Visibilité des clauses et conditions du contrat

OTHER DOCUMENTS

- Electronic bill of lading
  - Paperless
  - seaway bill by electronic
  - Data Freight Receipt
  - Working rules
    - Registration of information related to goods
    - Confidential code
    - Rotterdam rules

BIMCO LINER BOOKING NOTE
CODE NAME: "CONLINEBOOKING 2000"

Agents (full style and address)	Place and date
	Vessel
Carrier (full style and address)	Time for shipment (about)
	Port of loading**
	Port of discharge
Merchant* (full style and address)	Merchant's representatives at loading port (full style and address)

Container No./Seal No./Marks and Numbers (if available)	Number and kind of packages; description of cargo	Gross weight, kg (if available)	Measurement, m³ (if available)

Freight details and charges	Special terms, if agreed
Freight (state prepayable or payable at destination)	

It is hereby agreed that this Contract shall be performed subject to the terms contained on Page 1 and 2 hereof which shall prevail over any previous arrangements and which shall in turn be superseded (except as to deadfreight) by the terms of the Bill of Lading.

Signature (Merchant)	Signature (Carrier)

*As defined hereinafter (Cl. 1)
**(or so near thereunto as the Vessel may safely get and lie always afloat)

Printed and sold by Fr. G. Knudtzons Bogtrykkeri A/S, Vallensbaekvej 61, DK-2625 Vallensbaek, Fax: +45 4366 0701 by authority of The Baltic and International Maritime Council (BIMCO), Copenhagen

FULL TERMS OF THE CARRIER'S BILL OF LADING FORM*

1. Definition.
"Merchant" includes the shipper, the receiver, the consignor, the consignee, the holder of the Bill of Lading, the owner of the cargo and any person entitled to possession of the cargo.

2. Notification.
Any mention in this Bill of Lading of parties to be notified of the arrival of the cargo is solely for the information of the Carrier and failure to give such notification shall not involve the Carrier in any liability nor relieve the Merchant of any obligation hereunder.

3. Liability for Carriage Between Port of Loading and Port of Discharge.
(a) The International Convention for the Unification of Certain Rules of Law relating to Bills of Lading signed at Brussels on 25 August 1924 ("the Hague Rules") as amended by the Protocol signed at Brussels on 23 February 1968 ("the Hague-Visby Rules") and as enacted in the country of shipment shall apply to this Contract. When the Hague-Visby Rules are not enacted in the country of shipment, the corresponding legislation of the country of destination shall apply, irrespective of whether such legislation may only regulate outbound shipments.
When there is no enactment of the Hague-Visby Rules in either the country of shipment or in the country of destination, the Hague-Visby Rules shall apply to this Contract save where the Hague Rules as enacted in the country of shipment or, if no such enactment is in place, the Hague Rules as enacted in the country of destination apply compulsorily to this Contract.
The Protocol signed at Brussels on 21 December 1979 ("the SDR Protocol 1979") shall apply where the Hague-Visby Rules apply, whether mandatorily or by this Contract.
The Carrier shall in no case be responsible for loss of or damage to cargo arising prior to loading, after discharging, or with respect to deck cargo and live animals.
(b) If the Carrier is held liable in respect of delay, consequential loss or damage other than loss of or damage to the cargo, the liability of the Carrier shall be limited to the freight for the carriage covered by this Bill of Lading, or to the limitation amount as determined in sub-clause 3(a), whichever is the lesser.
(c) The aggregate liability of the Carrier and/or any of his servants, agents or independent contractors under this Contract shall, in no circumstances, exceed the limits of liability for the total loss of the cargo under sub-clause 3(a) or, if applicable, the Additional Clause.

4. Law and Jurisdiction.
Disputes arising out of or in connection with this Bill of Lading shall be exclusively determined by the courts and in accordance with the law of the place where the Carrier has his principal place of business, as stated on Page 1, except as provided elsewhere herein.

5. The Scope of Carriage.
The intended carriage shall not be limited to the direct route but shall be deemed to include any proceeding or returning to or stopping or slowing down at or off any ports or places for any reasonable purpose connected with the carriage including bunkering, loading, discharging, or other cargo operations and maintenance of Vessel and crew.

6. Substitution of Vessel.
The Carrier shall be at liberty to carry the cargo or part thereof to the Port of discharge by the said or other vessel or vessels either belonging to the Carrier or others, or by other means of transport, proceeding either directly or indirectly to such port.

7. Transhipment.
The Carrier shall be at liberty to tranship, lighter, land and store the cargo either on shore or afloat and reship and forward the same to the Port of discharge.

8. Liability for Pre- and On-Carriage.
When the Carrier arranges pre-carriage of the cargo from a place other than the Vessel's Port of loading or on-carriage of the cargo to a place other than the Vessel's Port of discharge, the Carrier shall contract as the Merchant's Agent only and the Carrier shall not be liable for any loss or damage arising during any part of the carriage other than between the Port of loading and the Port of discharge even though the freight for the whole carriage has been collected by him.

9. Loading and Discharging.
(a) Loading and discharging of the cargo shall be arranged by the Carrier or his Agent.
(b) The Merchant shall, at his risk and expense, handle and/or store the cargo before loading and after discharging.
(c) Loading and discharging may commence without prior notice.
(d) The Merchant or his Agent shall tender the cargo when the Vessel is ready to load and as fast as the Vessel can receive including, if required by the Carrier, outside ordinary working hours notwithstanding any custom of the port. If the Merchant or his Agent fails to tender the cargo when the Vessel is ready to load or fails to load as fast as the Vessel can receive the cargo, the Carrier shall be relieved of any obligation to load such cargo, the Vessel shall be entitled to leave the port without further notice and the Merchant shall be liable to the Carrier for deadfreight and/or any overtime charges, losses, costs and expenses incurred by the Carrier.
(e) The Merchant or his Agent shall take delivery of the cargo as fast as the Vessel can discharge including, if required by the Carrier, outside ordinary working hours notwithstanding any custom of the port. If the Merchant or his Agent fails to take delivery of the cargo the Carrier's discharging of the cargo shall be deemed fulfilment of the contract of carriage. Should the cargo not be applied for within a reasonable time, the Carrier may sell the same privately or by auction. If the Merchant or his Agent fails to take delivery of the cargo as fast as the Vessel can discharge, the Merchant shall be liable to the Carrier for any overtime charges, losses, costs and expenses incurred by the Carrier.
(f) The Merchant shall accept his reasonable proportion of unidentified loose cargo.

10. Freight, Charges, Costs, Expenses, Duties, Taxes and Fines.
(a) Freight, whether paid or not, shall be considered as fully earned upon loading and non-returnable in any event. Unless otherwise specified, freight and/or charges under this Contract are payable by the Merchant to the Carrier on demand. Interest at Libor (or its successor) plus 2 per cent. shall run from fourteen days after the date when freight and charges are payable.
(b) The Merchant shall be liable for all costs and expenses of fumigation, gathering and sorting loose cargo and weighing onboard, repairing damage to and replacing packing due to excepted causes, and any extra handling of the cargo for any of the aforementioned reasons.
(c) The Merchant shall be liable for any dues, duties, taxes and charges which under any denomination may be levied, *inter alia*, on the basis of freight, weight of cargo or tonnage of the Vessel.
(d) The Merchant shall be liable for all fines, penalties, costs, expenses and losses which the Carrier, Vessel or cargo may incur through non-observance of Customs House and/or import or export regulations.
(e) The Carrier is entitled in case of incorrect declaration of contents, weights, measurements or value of the cargo to claim double the amount of freight which would have been due if such declaration had been correctly given. For the purpose of ascertaining the actual facts, the Carrier shall have the right to obtain from the Merchant the original invoice and to have the cargo inspected and its contents, weight, measurement or value verified.

11. Lien.
The Carrier shall have a lien on all cargo for any amount due under this contract and the costs of recovering the same and shall be entitled to sell the cargo privately or by auction to satisfy any such claims.

12. General Average and Salvage.
General Average shall be adjusted, stated and settled in London according to the York-Antwerp Rules 1994, or any modification thereof, in respect of all cargo, whether carried on or under deck. In the event of accident, danger, damage or disaster before or after commencement of the voyage resulting from any cause whatsoever, whether due to negligence or not, for which or for the consequence of which the Carrier is not responsible by statute, contract or otherwise, the Merchant shall contribute with the Carrier in General Average to the payment of any sacrifice, losses or expenses of a General Average nature that may be made or incurred, and shall pay salvage and special charges incurred in respect of the cargo. If a salving vessel is owned or operated by the Carrier, salvage shall be paid for as fully as if the salving vessel or vessels belonged to strangers.

13. Both-to-Blame Collision Clause.
If the Vessel comes into collision with another vessel as a result of the negligence of the other vessel and any act, negligence or default of the Master, Mariner, Pilot or the servants of the Carrier in the navigation or in the management of the Vessel, the Merchant will indemnify the Carrier against all loss or liability to the other or non-carrying vessel or her Owner in so far as such loss or liability represents loss of or damage to or any claim whatsoever of the owner of the cargo paid or payable by the other or non-carrying vessel or her Owner to the owner of the cargo and set-off, recouped or recovered by the other or non-carrying vessel or her Owner as part of his claim against the carrying vessel or Carrier. The foregoing provisions shall also apply where the Owner, operator or those in charge of any vessel or vessels or objects other than, or in addition to, the colliding vessels or objects are at fault in respect of a collision or contact.

14. Government directions, War, Epidemics, Ice, Strikes, etc.
(a) The Master and the Carrier shall have liberty to comply with any order or directions or recommendations in connection with the carriage under this Contract given by any Government or Authority, or anybody acting or purporting to act on behalf of such Government or Authority, or having under the terms of the insurance on the Vessel the right to give such orders or directions or recommendations.
(b) Should it appear that the performance of the carriage would expose the Vessel or any cargo onboard to risk of seizure, damage or delay, in consequence of war, warlike operations, blockade, riots, civil commotions or piracy, or any person onboard to risk of loss of life or freedom, or that any such risk has increased, the Master may discharge the cargo at the Port of loading or any other safe and convenient port.
(c) Should it appear that epidemics; quarantine; ice; labour troubles, labour obstructions, strikes, lockouts (whether onboard or on shore); difficulties in loading or discharging would prevent the Vessel from leaving the Port of loading or reaching or entering the Port of discharge or there discharging in the usual manner and departing therefrom, all of which safely and without unreasonable delay, the Master may discharge the cargo at the Port of loading or any other safe and convenient port.
(d) The discharge, under the provisions of this Clause, of any cargo shall be deemed due fulfilment of the contract of carriage.
(e) If in connection with the exercise of any liberty under this Clause any extra expenses are incurred they shall be paid by the Merchant in addition to the freight, together with return freight, if any, and a reasonable compensation for any extra services rendered to the cargo.

15. Defences and Limits of Liability for the Carrier, Servants and Agents.
(a) It is hereby expressly agreed that no servant or agent of the Carrier (which for the purpose of this Clause includes every independent contractor from time to time employed by the Carrier) shall in any circumstances whatsoever be under any liability whatsoever to the Merchant under this Contract of carriage for any loss, damage or delay of whatsoever kind arising or resulting directly or indirectly from any act, neglect or default on his part while acting in the course of or in connection with his employment.
(b) Without prejudice to the generality of the foregoing provisions in this Clause, every exemption from liability, limitation, condition and liberty herein contained and every right, defence and immunity of whatsoever nature applicable to the Carrier or to which the Carrier is entitled, shall also be available and shall extend to protect every such servant and agent of the Carrier acting as aforesaid.
(c) The Merchant undertakes that no claim shall be made against any servant or agent of the Carrier and, if any claim should nevertheless be made, to indemnify the Carrier against all consequences thereof.
(d) For the purpose of all the foregoing provisions of this Clause the Carrier is or shall be deemed to be acting as agent or trustee on behalf of and for the benefit of all persons who might be his servants or agents from time to time and all such persons shall to this extent be or be deemed to be parties to this Contract of carriage.

16. Stowage.
(a) The Carrier shall have the right to stow cargo by means of containers, trailers, transportable tanks, flats, pallets, or similar articles of transport used to consolidate goods.
(b) The Carrier shall have the right to carry containers, trailers, transportable tanks and covered flats, whether stowed by the Carrier or received by him in a stowed condition from the Merchant, on or under deck without notice to the Merchant.

17. Shipper-Packed Containers, trailers, transportable tanks, flats and pallets.
(a) If a container has not been filled, packed or stowed by the Carrier, the Carrier shall not be liable for any loss of or damage to its contents and the Merchant shall cover any loss or expense incurred by the Carrier, if such loss, damage or expense has been caused by:
(i) negligent filling, packing or stowing of the container;
(ii) the contents being unsuitable for carriage in container; or
(iii) the unsuitability or defective condition of the container unless the container has been supplied by the Carrier and the unsuitability or defective condition would not have been apparent upon reasonable inspection at or prior to the time when the container was filled, packed or stowed.
(b) The provisions of sub-clause (i) of this Clause also apply with respect to trailers, transportable tanks, flats and pallets which have not been filled, packed or stowed by the Carrier.
(c) The Carrier does not accept liability for damage due to the unsuitability or defective condition of reefer equipment or trailers supplied by the Merchant.

18. Return of Containers.
(a) Containers, pallets or similar articles of transport supplied by or on behalf of the Carrier shall be returned to the Carrier in the same order and condition as handed over to the Merchant, normal wear and tear excepted, with interiors clean and within the time prescribed in the Carrier's tariff or elsewhere.
(b) The Merchant shall be liable to the Carrier for any loss, damage to, or delay, including demurrage and detention incurred by or sustained to containers, pallets or similar articles of transport during the period between handing over to the Merchant and return to the Carrier.

ADDITIONAL CLAUSE
U.S. Trade. Period of Responsibility.
(i) In case the Contract evidenced by this Bill of Lading is subject to the Carriage of Goods by Sea Act of the United States of America, 1936 (U.S. COGSA), then the provisions stated in said Act shall govern before loading and after discharge and throughout the entire time the cargo is in the Carrier's custody and in which event freight shall be payable on the cargo coming into the Carrier's custody.
(ii) If the U.S. COGSA applies, and unless the nature and value of the cargo has been declared by the shipper before the cargo has been handed over to the Carrier and inserted in this Bill of Lading, the Carrier shall in no event be or become liable for any loss or damage to the cargo in an amount exceeding USD 500 per package or customary freight unit.

*BIMCO LINER BILL OF LADING
Code Name: "Conlinebill 2000"
Amended January 1950; August 1952; January 1973; July 1974; August 1976; January 1978; November 2000

Multimodal transportation act (2)

- Registration, period
- Shipping company, freight forwarding
- Two other countries
- Multimodal transport document
  - Issue, to enter into a contract, signed
  - Document of title : consignee or endorsee, rights and liabilities of the consignor
  - Contents : nature of goods, marks, packages, apparent condition, MTO, consignor, taking in charge, place of delivery, issue, freight payable, signature, intended journey route, terms of shipment


SCHENKER*ocean*

Non-Negotiable SEA WAYBILL
for Combined Transport

NON-NEGOTIABLE SEA WAYBILL

Non-Negotiable
SEA WAYBILL

NOT VALID FOR CARRIAGE

NON-NEGOTIABLE SEA WAYBILL

Multimodal transport act (3)

- Reservation in the multimodal transport document
  - Reservation specifying the inaccuracies
  - To have accepted the goods in apparent good condition
  - Evidentiary effect : taken in charge of goods
  - Responsibility of the consignor
  - The consignor shall indemnify
  - No way limit his liability
  - MTO liable for loss
  - Arising out of delay, declaration of interest

Multimodal transport act (4)

- Non delivery
- Limits of liability
- Compensation
- Sea /inland waterways and road
- Not declared at the stage of transport
- Mode of transport
- Delay / freight payable
- Assessment of compensation
- Current commodity exchange price
- Loss of right to limit liability
- Total loss of goods
- notice

Multimodal transport act (5)

- Special provision for dangerous goods
- The consignor shall inform him of the nature
- The goods mays be at any time destroyed
- A lien on the consignement and the documents
- General average
- To avert danger to property in common peril
- Limitation on action
- arbitration

3- multimodal transport bill

- Thailand case
  - CCC and COGSA
  - Damaged during their voyage by sea
  - Inland transportation / Thai CCC
  - Not party of Warsaw convention
  - Both domestic and international multimodal transport
  - Asean framework
  - Multimodal transport operator

Multimodal transport bill (2)

- Definition
  - Two different modes – one contract
  - Goods taken in charge by MTO
  - Against payment of freight
  - Evidence of multimodal transport contract
  - Principal
  - Carrier to perform the carriage
  - To hand over to and accept the carriage

Multimodal transport bill (6)

Delay	Liberties
	• Judgement of the ocean carrier • Unpack the container – at the risk and expense of the merchant • To cancel the contract of carriage • Awaiting trans shipment • Complete and final delivery • Merchant shall reimburse • War – hostilities - riot

Multimodal transport bill (6)

Goods

- Accuracy
- Use of container
- Ocean carrier container

Container packed by merchant

- Particulars of the contents
- The merchant warrants
- Suitable for handling and carriage
- The merchant shall inspect the container
- Seals intact

Multimodal transport bill (7)

- The right to open the container without notice
- Specific container unless special arrangements
- Special freights
- Not responsible for the function of special container
- Temperature – stow the content

Multimodal transport bill (8)

- Dangerous goods – contraband
  - Written application
  - Package – documents
  - Overboarded – discharged – the merchant is liable
- Stowage under deck and on deck
- Live animals and plant : the merchant
- Valuable goods under declaration
- Heavy lift : package exceeding 2240 lbs Gross marked outside
- Delivery by marks clearly stamped and marked
- Marks shown on BL

Multimodal transport bill (8)

- Delivery
  - At any time
  - Geographic limits of the port of discharge
  - Merchant’s request in writing
  - Seal of the container intact
  - Optional delivery
  - Notification
  - Transshipment
  - Discharge of the goods

Multimodal transport bill of lading (9)

Fire

- Unless caused by the actual fault

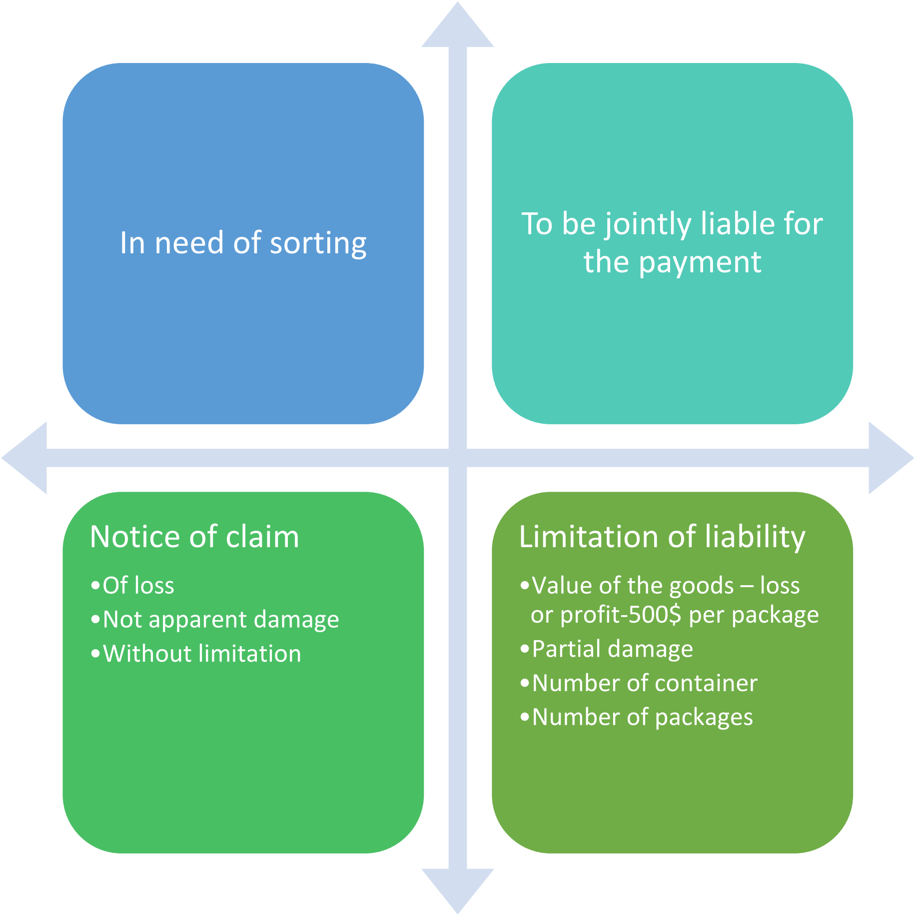
Lien

- On the goods
- Chargeable to the merchant
- Goods unclaimed

Freight and charges

- Accuracy of contents
- Balance of freight
- Full and in cash
- The goods are not available : failure of inland carrier

Multimodal transport bill (10)



Multimodal transport bill (11)

- General average
  - Average agreement
  - Before delivery of goods
  - Accident, damage, danger, disaster
  - Goods and merchant Jointly contribute
  - Payment of sacrifices
  - Blame collision
  - Carriage of metal products, lumber, cotton
    - Free of visible poisture
  - grain

Multimodal transport document (12)

- Intermodal transportation
  - Claims by the merchant against inland carrier
  - Oceans carrier tariff
  - Severability of terms

What bankers & traders should know about multimodal documents

- Documentary credit
  - Discrepencies, confusions
  - Multimodal BL
  - Freight forwarders and carriers
  - Difference between marine/multimodal information
  - Three functions of BL
  - Sea ocean BL, through ocean BL, combined BL, FIATA BL, MAWB and HAWB
  - clean

4- multimodal transport of hazardous goods

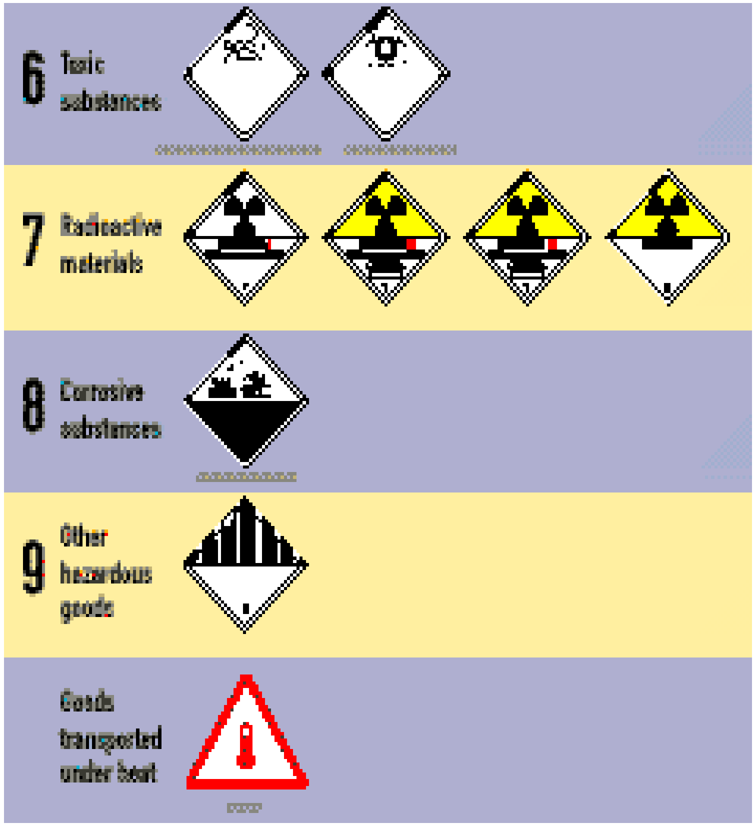
- UN packaging
  - Dangerous substances
  - Risk of accidents
  - Legislation and regulation
  - Association of america railroad

  www.aar.org
- Performance packagings for the transportation of dangerous goods

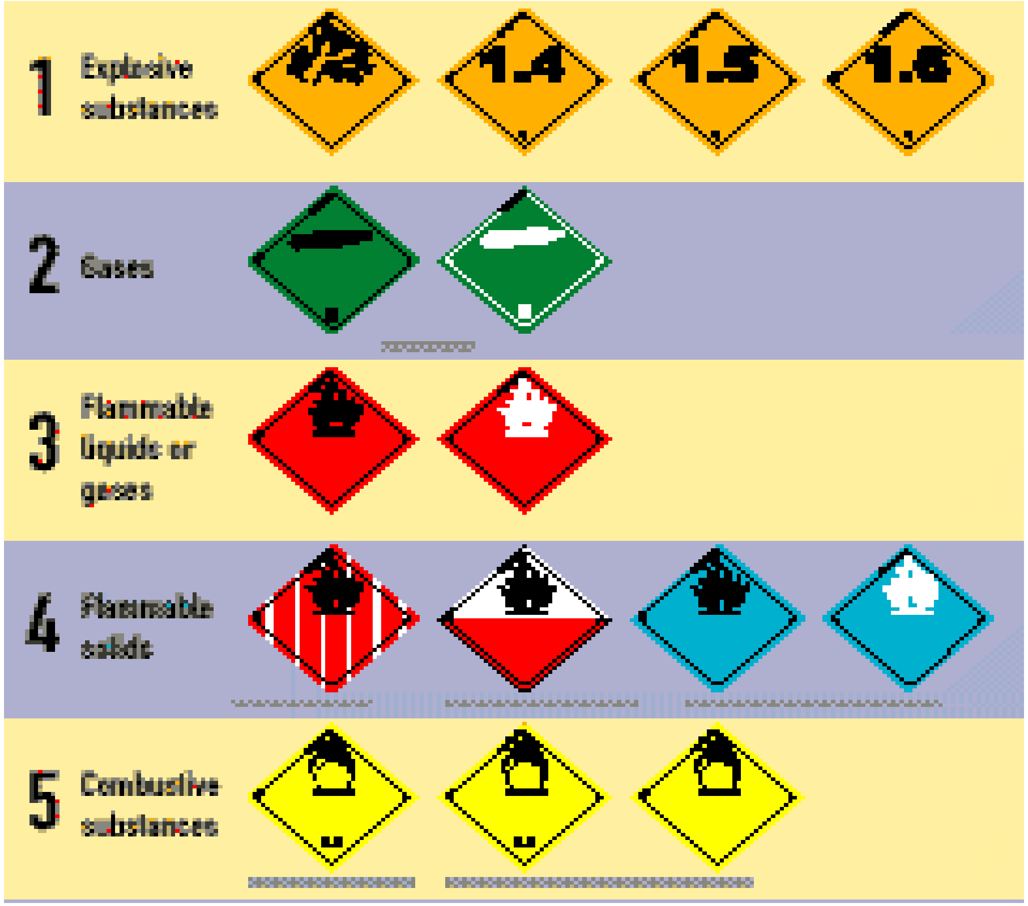
www.tc.gc.ca/tmd/info/moc/drum/appl126_f.htm

- Permits of equivalent level of safety
- **Depending on transport modes**

Carriage of dangerous goods



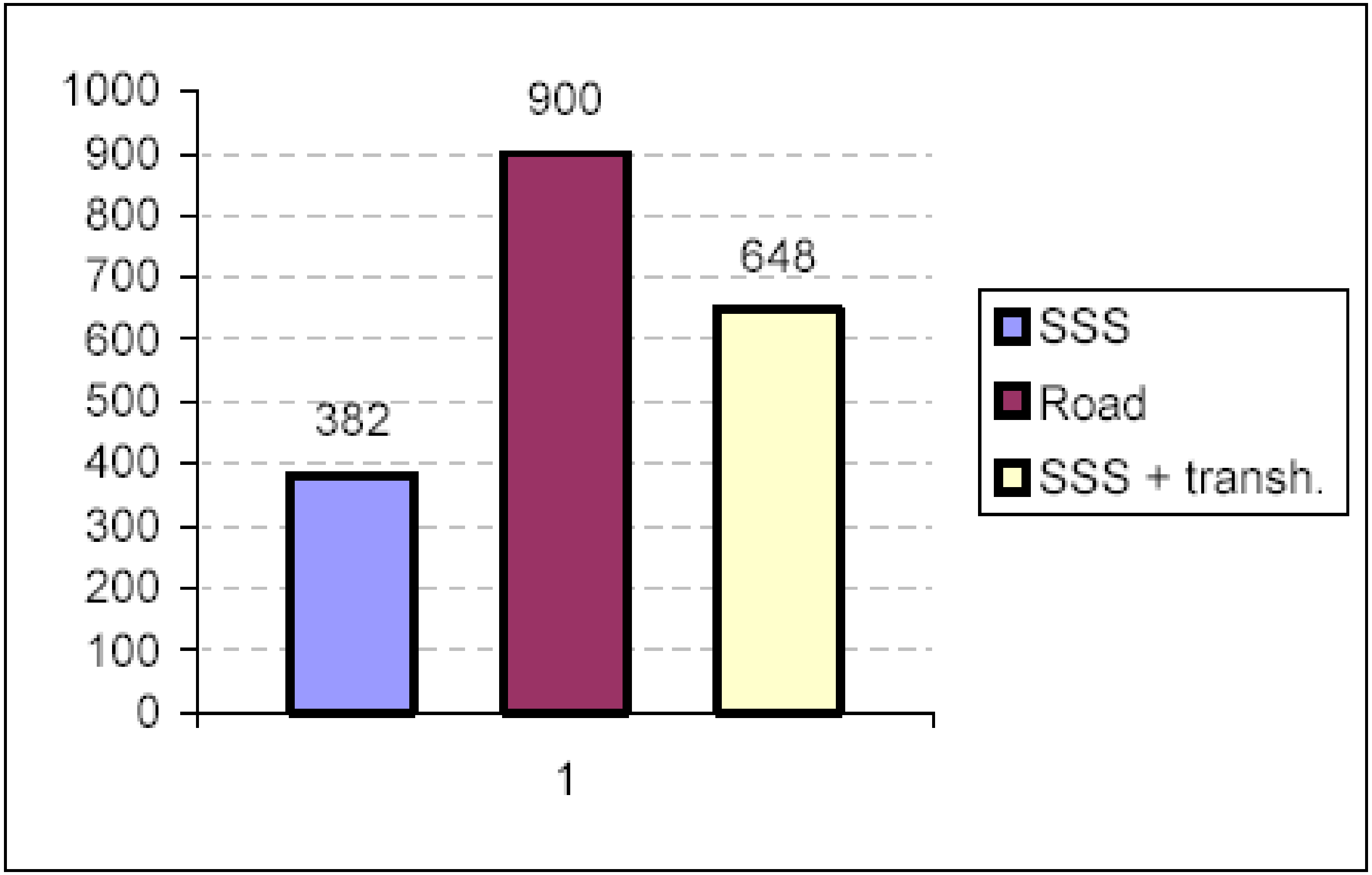
Carriage of dangerous goods



5- Political issue

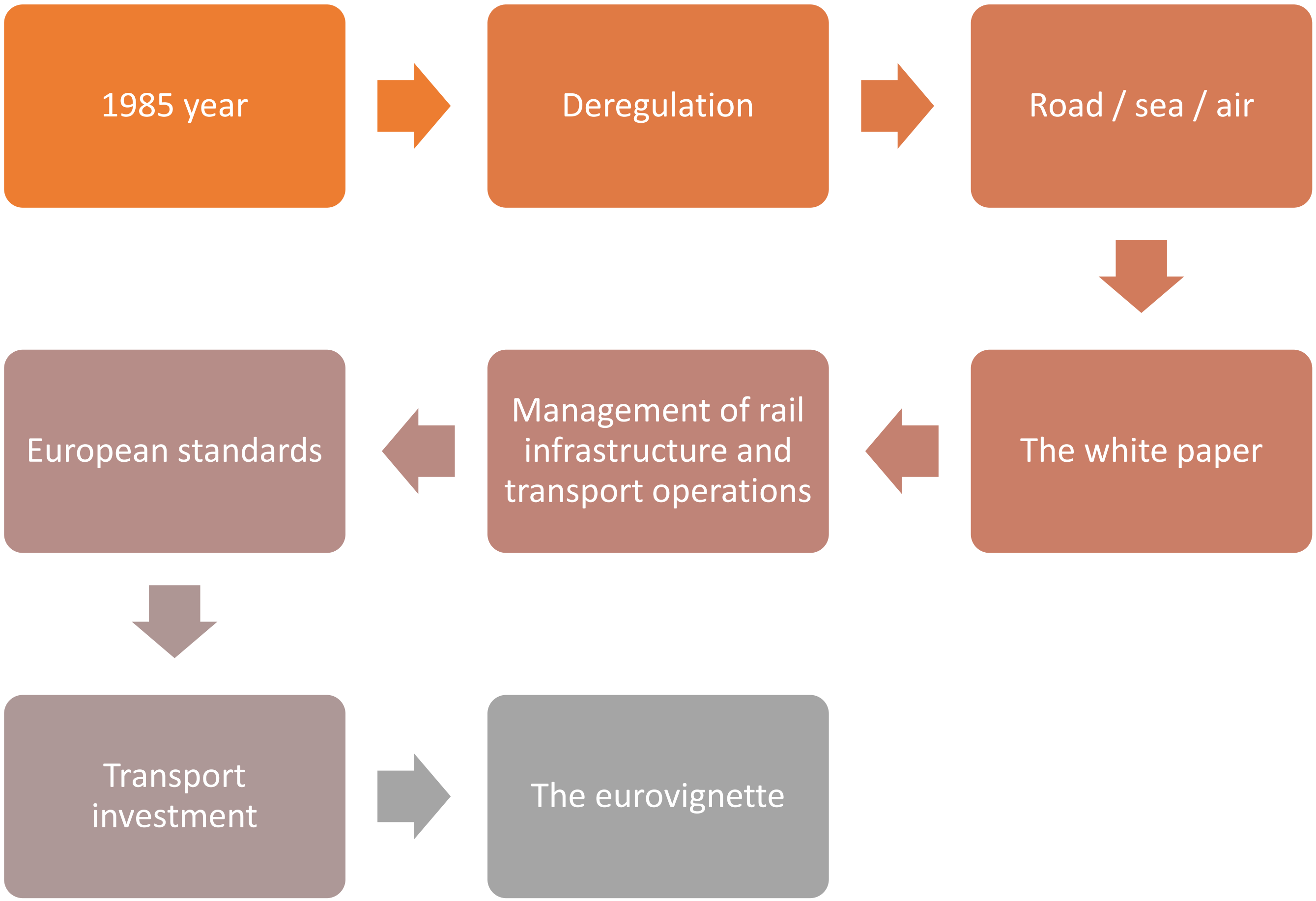
- CMI and multimodal transport
- Multimodal contracts reality
- Containerization
- Carriage by air
- Electronic commerce environment
- Multimodal COGSA
- Door to door scope – performing carrier
- Error in navigation defence

Price for 40 ft (2TEU)



Shipowner and cargo insurance	package definition - Container	Singapore conference then Rotterdam
		• Door to door • Inland segments • Liability network basis • Conflict of laws • Electronic commerce implications • A per kilo basis

The European transport policy



Physical internet and Multimodal transport

http://www.etp-logistics.eu/alice/en/news___events/video/

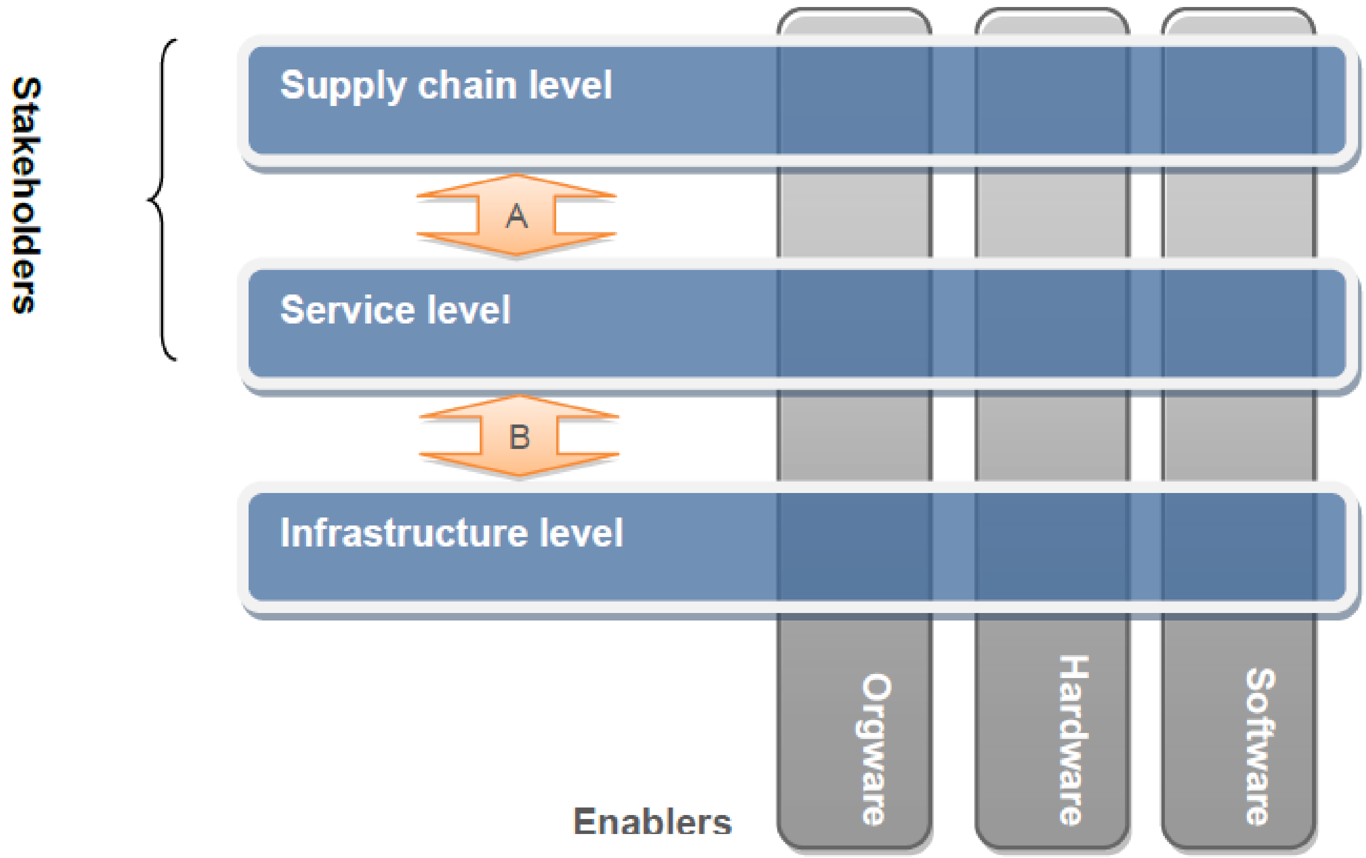


Figure S-1: Stakeholders levels and enablers

Pathway	Main innovations	Using Market	Expected Impact
1. Understanding the demand for synchromodal transport	Detailed demand mapping and forecasting tools. Big data used for demand prediction.	Transport service providers, SME networks	Load based, a-modal planning and booking possible due to demand intel.
2. Optimize alignment supply chains and synchromodal / multimodal services	Tactics for transport service and supply chain alignment (e.g. hybrid networks). Mind shift.	Supply chain managers, Logistics managers, Regulators	Tightly coupled production/ distribution/ transport systems.
3. New roles for hubs in the supply chain	New value added business models. Hubs taking role in supply chains for e.g. postponed manufacturing.	Real estate, cluster managers, transport service providers, port authorities, Regulators	Healthy and stable clusters, networks of clusters. Specialisation of hubs in TEN-T.
4. An integrative freight network strategy	European core freight network and access networks , multimodal network management, freight ITS	Network managers, corridor managers, hub managers	Connected and sustainable Pan-European freight TEN-T infrastructure
5. Transport chain design and operation for Synchromodality	Seamless and transparent freight service networks in Europe (gateway networks, hub/spoke, plus service levels)	Transport service providers, hub operators	Increased diversity and resilience of transport services, more Intermodality
6. Deploying ICT as integrating technology	Extended freight ITS towards Integrated and automated planning, booking, operation	ICT sector, Transport service providers	Automated and responsive synchromodal transport services

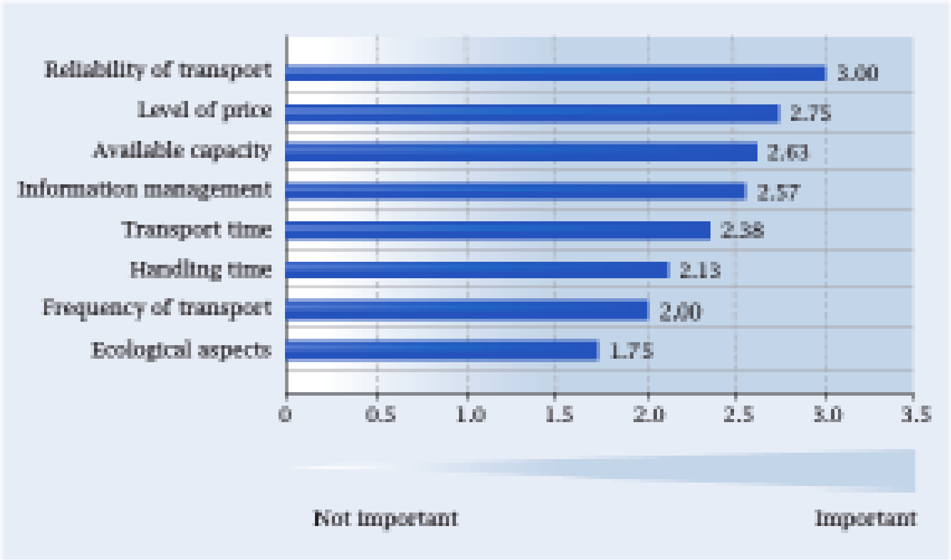


Figure 1.1: Freight customer requirements (CER, 2011)

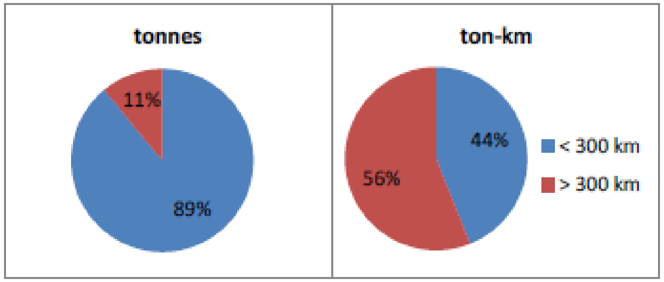
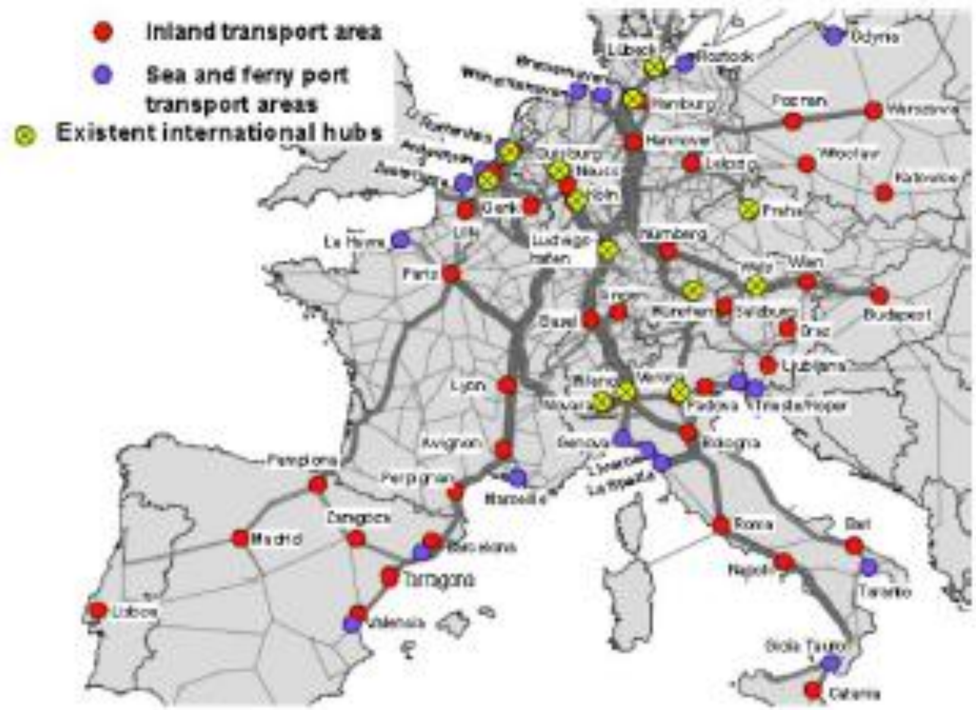


Figure 1.2: Spatial distribution of transport flows for road transport (2030; ACEA, 2011)



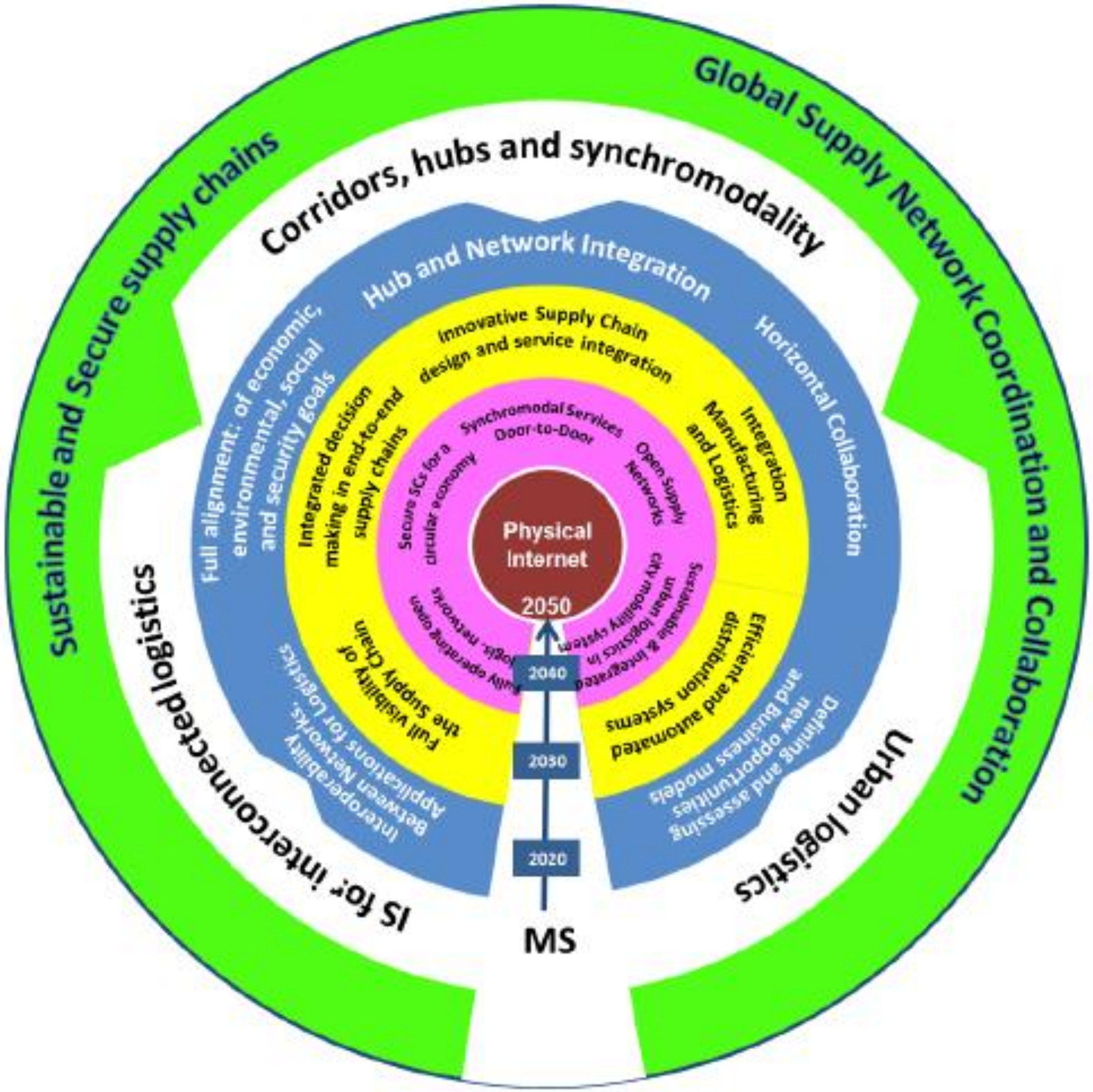


Figure 1: Interrelation between Roadmaps

Pathway	Innovations?	For whom?	Impact?
1. Understanding the demand for synchromodal transport	Detailed demand mapping and forecasting tools. Big data used for demand prediction.	Transport service providers, SME networks	Load based, a-modal planning and booking possible due to demand intel.
2. Optimize alignment supply chains and synchromodal / multimodal services	Tactics for transport service and supply chain alignment (e.g. hybrid networks). Mind shift.	Supply chain managers, Logistics managers, Regulators	Tightly coupled production/ distribution/ transport systems.
3. New roles for hubs in the supply chain	New value added business models. Hubs taking role in supply chains for e.g. postponed manufacturing.	Real estate, cluster managers, transport service providers, port authorities, Regulators	Healthy and stable clusters, networks of clusters. Specialisation of hubs in TEN-T.

Pathway	Innovations?	For whom?	Impact?
4. An integrative freight network strategy	European core freight network and access networks , multimodal network management, freight ITS	Network managers, corridor managers, hub managers	Connected and sustainable Pan-European freight TEN-T infrastructure
5. Transport chain design and operation for Synchromodality	Seamless and transparent freight service networks in Europe (gateway networks, hub/spoke, plus service levels). Aligned with modular loading and vehicle technology.	Transport service providers, hub operators. Vehicle and equipment manufacturers.	Increased diversity and resilience of transport services, more Intermodality
6. Deploy ICT as integrating technology	Extended freight ITS towards Integrated and automated planning, booking, operation	ICT sector, Transport service providers	Automated and responsive synchromodal transport services

Pathway	Overll innovation	Milestones (orange: R&D, green: products, red: market uptake)
1. Understanding the demand for synchromodal transport	Detailed demand mapping and forecasting tools. Big data used for demand prediction.	**Demand data analytics** **Synchromodal demand forecasting** **Integration with demand mapping tools**
2. Optimize alignment supply chains and synchromodal / multimodal services	Approaches for transport service and supply chain alignment (e.g. hybrid networks). Mind shift.	**Connect demand forecast/supply methods** **Production/transport optimization** **Supply chain/transport optimization best practices**

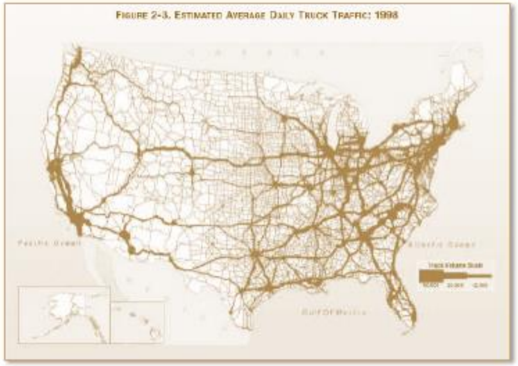
3. New roles for hubs in the supply chain	New value added business models. Hubs taking role in supply chains for e.g. postponed manufacturing.	**Define hub business model principles** **Hub and cluster business models** **Smart specialization for hubs**
4. An integrative freight network strategy	European core freight network and access networks , multimodal network management, freight ITS	**KPI's and design principles for EU freight network** **EU freight network design, TEN-T guidelines** **Develop multimodal freight network management**
5. Transport chain design and operation for Synchromodality	Seamless and transparent freight service networks in Europe (gateway networks, hub/spoke, plus service levels). Aligned with modular loading and vehicle technology.	**Synchromodal operation principles and technologies** **Performance based a-modal transport planning and booking** **Modular transport technolgy** **Synchromodal services widely available**
6. Deploying ICT as integrating technology	Extended freight ITS towards Integrated and automated planning, booking, operation	**ITS Logistics architecture for connected applications: operational (ITS), tactical (service design) and strategic (BI / business intelligence).** **Deploy connected ITS / MTMS (multimodal TMS) applications** **Synchro ICT adoption program**

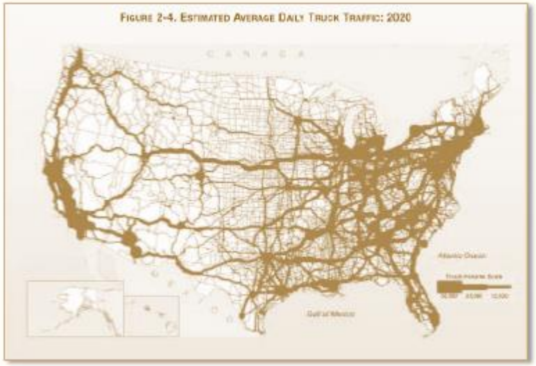
Legend for colours:
Orange: R&D
Green: Products
Red: Markets

Challenge	Impact
Identifying and assessing opportunities in urban freight	• Increase load factors. • Reduce freight vehicle movements. • Increase effectiveness • Reduce congestion
Towards a more efficient integration and management of urban freight in the transport system of the city	
Towards a more efficient integration of urban freight in the urban transport system	• Increase the number of available loading/unloading zones • Reduce the average number of kilometres per vehicle • Increase asset utilization
Better understanding of the impact of land use on urban logistics activities	• Increase the number of available loading/unloading zones • Reduce the average number of kilometres per vehicle • Create opportunities for the use of shorter-range, but more energy and emission efficient vehicles. • Increase the load factor of vehicles • Properly locate the available loading/unloading zones
Enabling a more efficient management of goods	• Reduce the number of km per vehicles • Increase the load factor of vehicles • Increase the rate of available loading zones
Improving the interaction between long distance freight transport and urban freight	• Reduce the average number of kilometres per vehicles • Optimise the network of consolidation/transhipment centres • Allow the use of electric vehicles for last mile deliveries
Better adapting the vehicles to innovative urban freight delivery systems	• Increase the load factor of vehicles • Reduce the number of km per vehicle • Increase the availability of loading and unloading areas

The need for change

Transportation systems supporting the supply chains are stretched to the limit



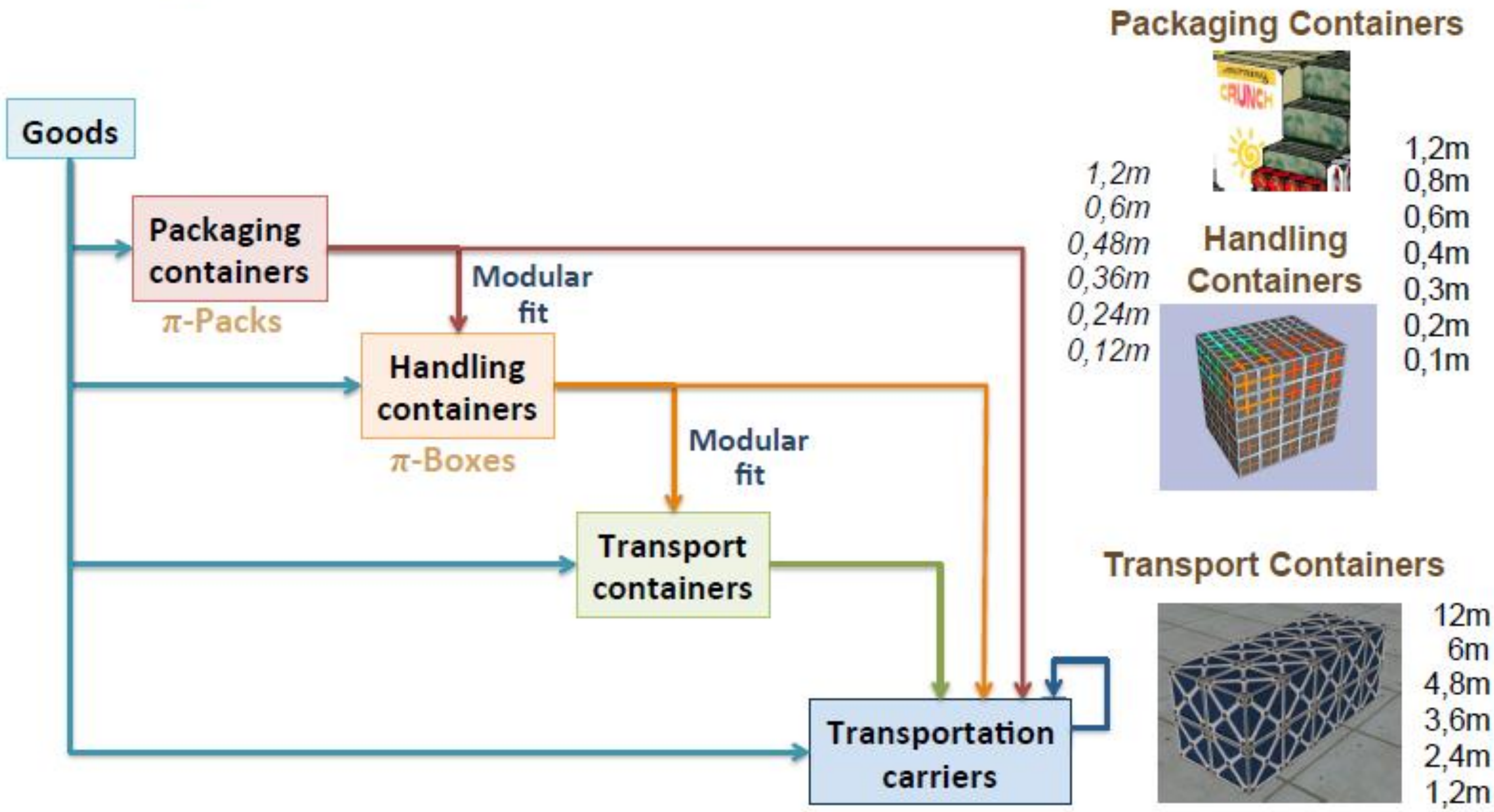


Growing traffic load from 1998 to 2020 on US highway infrastructure

Imagine 2030 and 2050

Business Models and Innovative Services	
Value creation logistics services and more efficient operations	• Increase load factors. • Increase asset/infrastructure utilization. • Reduce freight vehicle movements. • Increase first time delivery. • Increase customer satisfaction
e-commerce implications: Direct to consumer deliveries and functional logistics services	• Maintain/Increase load factors. • Reduce private vehicle movements. • New business opportunities increasing employment. • Increase first time delivery. • Increase customer (including ageing) satisfaction

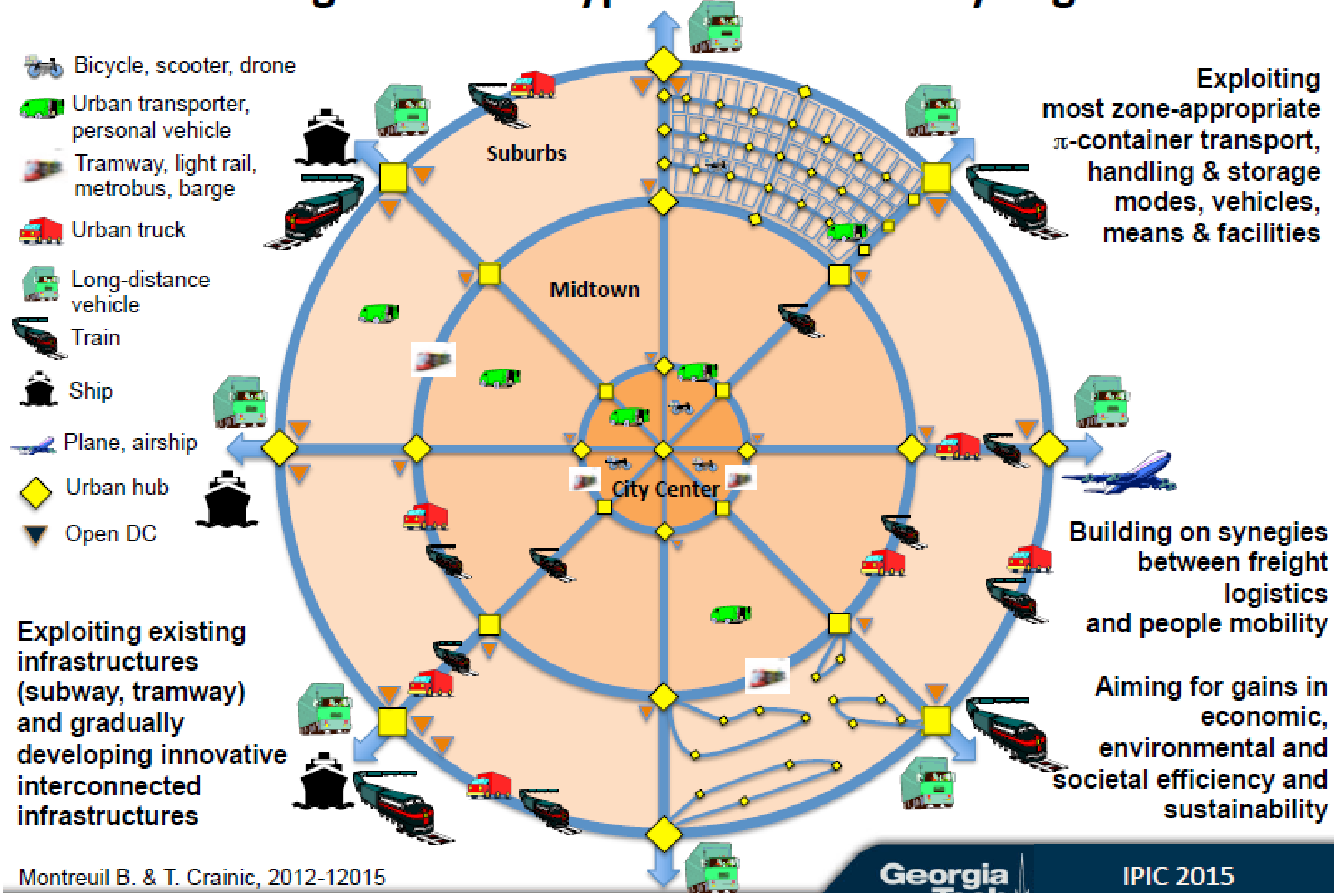
Encapsulation: Modular π-containers at all scales



TU Graz & N. Gazzard have lead the engineering and prototyping of the first generations of π-Boxes in the Modulushca project

Reverse logistics and transport of waste and recycling material	• Increase load factors. • Increase asset/infrastructure utilization. • Reduce freight vehicle movements. • Increase customer satisfaction. • New business opportunities increasing employment. • Improve urban transportation policies
Designing and operating urban freight delivery infrastructures	• Increase the load factor of vehicles • Reduce the average number of km per vehicles • Reduce the environmental impacts of logistics buildings
Safety and security in urban freight	• Reduce cargo lost. • Reduce accidents involving vulnerable road users
Cleaner and more efficient vehicles	• Reduce the emissions of pollutants from the vehicles • Increase the energy efficiency of the vehicles • Increase the availability of loading and unloading areas • Reduce the noise of urban freight • Enable night distribution

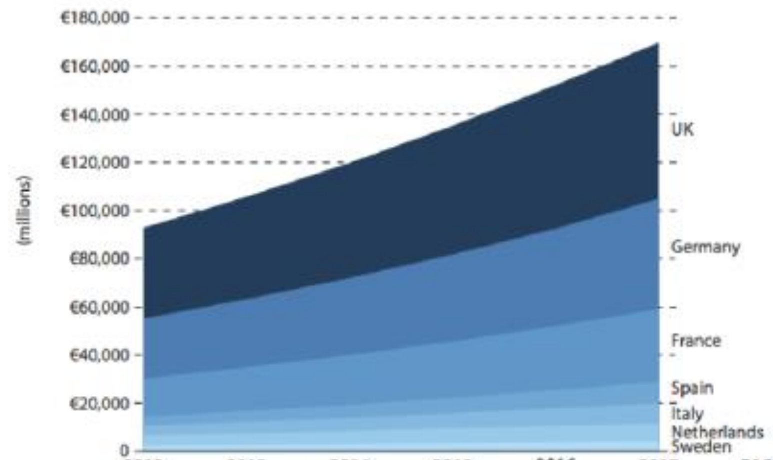
Evolving Towards Hyperconnected City Logistics



	Indicator	Guiding objective
Decarbonization	Energy efficiency: urban passenger transport	+80% (pkm/kWh) *
	Energy efficiency: long-distance freight transport	+40% (tkm/kWh) *
	Renewables in the energy pool	Biofuels: 25% Electricity: 5%
Reliability	Reliability of transport schedules	+50% *
	Urban accessibility	Preserve Improve where possible
Safety	Fatalities and severe injuries	-60% *
	Cargo lost to theft and damage	-70% *

* Versus 2010 baseline

Figure 1: Guiding objectives of the ERTRAC Strategic Research Agenda for 2030



	2012	2013	2014	2015	2016	2017	CAGR
Sweden	€2,500	€2,878	€3,234	€3,627	€3,970	€4,258	11%
Netherlands	€4,631	€5,106	€5,600	€6,147	€6,668	€7,125	9%
Italy	€3,993	€4,727	€5,485	€6,326	€7,276	€8,336	16%
Spain	€3,963	€4,776	€5,677	€6,708	€7,871	€9,108	18%
France	€17,989	€20,618	€23,221	€25,716	€28,180	€30,678	11%
Germany	€27,154	€30,874	€34,552	€38,451	€42,521	€46,356	11%
UK	€40,105	€45,020	€49,913	€54,840	€59,679	€64,104	10%

Source: Forrester Research Online Retail Forecast, 2012 To 2017 (Western Europe)

93341 Source: Forrester Research, Inc.

Figure 10: Forecast: European Online Retail Sales By Country, 2012 to 2017

Discussion

Your views, Global transport outlooks