Towards Zero emissions via *Physical internet*

Opportunities challenges & perspective

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Bottom-up rather top-down approach to securing country commitments
Intended Nationally Determined Contributions (INDCs)

Global carbon budget

2°C and 1.5°C scenarios for 2100
Expectation
Logistic & Supply Chain Vision in 2008

Vision for a collaborative supply chain

(“2016: The Future Supply Chain” published by the Global Commerce Initiative (CGI) and Cap Gemini, May 2008)
Base for T&L was 2.8 Billions (ITF base is 3.7)

1.4 Billions potential of which:

0.5 billions from PI like intervention (arrow)

<table>
<thead>
<tr>
<th>Supply Chain Decarbonization Opportunities</th>
<th>Potential Abatement Mt CO$_2$e</th>
<th>Assessed Index of Feasibility</th>
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<tbody>
<tr>
<td>Clean Vehicle Technologies</td>
<td>175</td>
<td>High</td>
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<tr>
<td>Despeeding the Supply Chain</td>
<td>171</td>
<td>High</td>
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<tr>
<td>Enabling Low Carbon Sourcing: Agriculture</td>
<td>178</td>
<td>Medium</td>
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<tr>
<td>Optimised Networks</td>
<td>124</td>
<td>High</td>
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<tr>
<td>Energy Efficient Buildings</td>
<td>93</td>
<td>High</td>
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<tr>
<td>Packaging Design Initiatives</td>
<td>132</td>
<td>High</td>
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<tr>
<td>Enabling Low Carbon Sourcing: Manufacturing</td>
<td>152</td>
<td>Medium</td>
</tr>
<tr>
<td>Training and Communication</td>
<td>117</td>
<td>Medium</td>
</tr>
<tr>
<td>Modal Switches</td>
<td>115</td>
<td>Medium</td>
</tr>
<tr>
<td>Reverse Logistics / Recycling</td>
<td>84</td>
<td>Medium</td>
</tr>
<tr>
<td>Nearshoring</td>
<td>5</td>
<td>Medium</td>
</tr>
<tr>
<td>Increased Home Delivery</td>
<td>17</td>
<td>Medium</td>
</tr>
<tr>
<td>Reducing Congestion</td>
<td>26</td>
<td>Low</td>
</tr>
</tbody>
</table>
WEF (effectiveness assessment)

- 1 - Clean Vehicle Technologies
- 2 - Despeeding the Supply Chain
- 3 - Enabling Low Carbon Sourcing: Agriculture
- 4 - Optimised Networks
- 5 - Energy Efficient Buildings
- 6 - Packaging Design Initiatives
- 7 - Enabling Low Carbon Sourcing: Manufacturing
- 8 - Training and Communication
- 9 - Modal Switches
- 10 - Reverse Logistics / Recycling
- 11 - Nearshoring
- 12 - Increased Home Delivery
- 13 - Reducing Congestion
Challenge
10 YEARS: ZERO IMPROVEMENT ON LOAD FACTORS

(CO3 Project, FP7)
Load efficiency is tough if you stay alone.

Full, but only 25% of weight limit

60% empty, but at weight limit

This is bad for both profitability and environment.
“Cube-Fill” Concept

- Potato Chips
  - Volume 90%
  - Weight 20%

- Diapers
  - Volume 90%
  - Weight 20%

- Laundry and/or Shampoo
  - Volume 57%
  - Weight 100%

Container limit: 87m³ & 24 tonnes

Overall efficiency: 80% weight & 80% volume
“Cube-Fill” Concept

Container Limit = 87m³ & 24 tonnes
Overall efficiency = 80% weight & 80% volume
Dream
Physical Internet
ALICE Roadmaps

http://www.etp-logistics.eu/?page_id=292
Bottom-up rather top-down approach to securing country commitments

Intended Nationally Determined Contributions (INDCs)

Global carbon budget

$2^\circ C$ and $1.5^\circ C$ scenarios for 2100
OECD PROJECTIONS (ITF 2017)

Total Freight Transport
OECD PROJECTIONS (ITF 2017)

Surface Transport Only
What PI does to the projections?

Let’s assume that with PI assets utilization moves from 43% to 85%
2050 Freight Transport Scenarios

Footprint (in Billions Tons of CO2)

- Base (no change)
- Base with Pi (-49%)
- 2C target (-69%)
- 1.5 target (-89%)
Physical Internet will bring efficiency and sustainability to Logistics. It cannot fully solve, but it will make it less onerous to meet the Decarbonization Challenge.

We therefore advanced PI realization to 2030 and declared Zero Emissions by 2050 as the new Vision for ALICE.
Where is the solution?

Digital

Physical
“Cube-Fill” Concept
But it’s not really easy…
The key to an open network approach: modules
A generalization of containerization
Modulushca Concept

Today

Tomorrow
Basic requirements for a new RPC standard

**HARD**

RPCs have to be ISO-MODULAR.

RPCs have to have straight walls.

RPCs have to be Stackable up to 2.40 meters. When they stack, the top of one RPC connects with the bottom of another to prevent the stack from slipping.

RPCs have to have flat inside surfaces.

RPCs must have the capability to have a lid.

**SOFT**

RPCs can be foldable as a way to favour reverse logistics. However rigid walls are an option.

RPCs Lid "ability" We don't need to have every RPC with lid BUT RPCs must have the ability to install a lid in case of specific requirements [e.g. Dangerous Goods].

Protection can be realized through one RPC on top at the other and at the top either we put an empty RPC (if we store them in column) or we put a layer lid that will seal the top layer of the pallet (when we created a pallet of RPCs).

RPCs wall thickness reduction is highly desirable in order to increase the inner dimensions.

RPCs should preferably be hermetic. However, in certain applications could have holes in the walls allowing manual handling.

RPCs should preferably be fully interlockable. Interlockability in all dimensions would be desirable.

RPCs should be suitable for direct use as a retail merchandising unit.

**NO**

RPCs must not be nestable.
<table>
<thead>
<tr>
<th>EDEKA</th>
<th>Müller</th>
<th>Rossmann</th>
<th>dm</th>
<th>GS1</th>
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<tbody>
<tr>
<td>Stauchrucktest 3-er Stapel *</td>
<td>1.100 daN</td>
<td>1.000 daN</td>
<td>1.400 daN</td>
<td>FEM-Berechnung</td>
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<tr>
<td>1.200 daN</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Bodendurchbiegung * *</td>
<td>7,5kg – 12mm</td>
<td>20kg – 11,3mm</td>
<td>30kg – 1,7mm</td>
<td>Gewicht: 2,7 Kg</td>
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<tr>
<td>30Kg- 5mm</td>
<td>Gewicht: 2,3 Kg</td>
<td>Gewicht: 2,8 Kg</td>
<td>Gewicht: 3,2 Kg</td>
<td>FEM-Berechnung, Wert zu</td>
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<tr>
<td>Gewicht:3,2 Kg LKR-Boden,10mm</td>
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<td>Einfacher Boden</td>
<td>Doppelboden</td>
<td>definieren Doppelboden</td>
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</table>

![Images of different containers](image-url)
MODAL SHIFT

Transport costs per unit vs. Distance

- Road
- Rail
- Maritime

Comparative costs for different modalities.
Modal shift: 40% maximum

Inland Road Transport – Extreme Scenario
100% mode shift to non-road

ROAD
1.78 Trillion Tn·Km (81.53%)

Long Road
983 Billion Tn·Km (45.1%)
(Above 300km)
55.33% of Road Tn.km

Short Road
793 Billion Tn·Km (36.43%)
(0 to 299km)
44.67% of Road Tn.km

NON-ROAD
1.283 Trillion Tn·Km (58.94%)

potential shift
492.43 Bn Tn·Km (22.6%)

Short Road
1.283 Trillion Tn·Km (58.94%)
(0 to 299km)
100% of Road Tn.km

Non-Road
895 Bn Tn·Km (41.05%)

ROAD
1.283 Trillion Tn·Km (58.94%)

potential shift
492.43 Bn Tn·Km (22.6%)

Inland Waterway
150.89 Bn Tn·Km (6.9%)

Rail
251.65 Bn Tn·Km (11.55%)

SOURCE: Eurostat (rail.go.typeall) (iww.go.atygo) and (road.go.ca.c) – 2014 EU-28 Data. For (road.go.ta.dctg) - Averaged Data from the year 2008 to 2014 and SNIC calculations
Assumption: Modal shift does not cause increase in the total Tn-km of a journey
WHY DO WE NEED A CHANGE IN THE INTERMODALITY APPROACH?

CONGESTION HAS A HUGE SOCIAL AND ECONOMIC IMPACT

CONGESTION

IMPACT OF CONGESTION

<table>
<thead>
<tr>
<th>Year</th>
<th>Costs (BN)</th>
<th>CO₂ (Kt)</th>
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<tr>
<td></td>
<td>DIRECT</td>
<td>INDIRECT</td>
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<tr>
<td>2013</td>
<td>47.3</td>
<td>29.3</td>
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<td>2020</td>
<td>54.9</td>
<td>33.4</td>
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<td>2025</td>
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<tr>
<td>2030</td>
<td>65.8</td>
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</table>

% Change: +39% +43% +39% +11%

* Costs in £ BN
** CO₂ in Kiloton Equivalent

Source: CEBR - Cost of Congestion Report
WHY DO WE NEED A CHANGE IN THE INTERMODALITY APPROACH?

A DRIVER SHORTAGE IS EXPECTED

250,000 truck drivers, representing 40 percent of Germany’s professional truckers are due to retire by 2027, according to a study by ZF Friedrichshafen AG.

Source: Bloomberg, August 2013
Source: WUL, November 2012

The US industry is short about 35,000 truck drivers, according to industry lobby group the American Trucking Associations (ATA). The shortfall could grow to around 240,000 drivers by 2020 if it is not addressed, the ATA said.

Source: Reuters, October 2014

HGV driver shortage is ‘a ticking time bomb’ for UK logistics sector, say MPs

13/01/2015

The problems of recruiting younger people into the haulage industry, as a way of solving the driver shortage crisis, was revealed by a new report released by a UK Parliamentary group yesterday.

The all-party Parliamentary group for freight transport yesterday published Barriers to Youth Employment in the Freight Transport Sector, its final report before the country votes in a general election in May, after which the group could comprise different personnel.
WHY DO WE NEED A CHANGE IN THE INTERMODALITY APPROACH?

WHILE RAIL INFRASTRUCTURE IS UNDERUTILIZED

<table>
<thead>
<tr>
<th>Year</th>
<th>Road Network</th>
<th>Road Volume</th>
<th>Road Intensity</th>
<th>Rail Network</th>
<th>Rail Volume</th>
<th>Rail Intensity</th>
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<tr>
<td>1995</td>
<td>47970</td>
<td>1289</td>
<td>26.9</td>
<td>227139</td>
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<td>2000</td>
<td>54719</td>
<td>1519</td>
<td>27.8</td>
<td>217857</td>
<td>404</td>
<td>1.9</td>
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<tr>
<td>2005</td>
<td>62218</td>
<td>1794</td>
<td>28.8</td>
<td>212584</td>
<td>413</td>
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<td>2009</td>
<td>66814</td>
<td>1690</td>
<td>25.3</td>
<td>212693</td>
<td>361</td>
<td>1.7</td>
</tr>
</tbody>
</table>

% CHANGE
- +39%
- +31%
- -6%
- -5%
- -5%
- 0%

(1) Length of EU-27 Motorway Network in Kilometer
(2) Freight volume shipped in EU-27 in Ton-Kilometer
(3) Length of EU-27 Railway Network in use in Kilometer
(4) Million Ton-kilometer per Network Kilometer

Source: EU Commission - Transportation Booklet
WHY DO WE NEED A CHANGE IN THE INTERMODALITY APPROACH?

WE ARE NOT ABLE TO SET UP AND SUSTAIN INTERMODAL CONNECTIONS

- NOT ENOUGH CONNECTIVITY
- NOT ENOUGH VOLUME
- NOT ENOUGH FREQUENCY

HIGH COSTS

LONG LEAD TIMES
Making collaboration easy

Clusters 2.0

Data sharing platform

- Shippers
- Logistics service providers
- Intermodal operators
  Terminals and rail, barge or shortsea operators
- Value added Service providers
  Optimizers, 4pl
Redesigning Trucks-Trailers for efficiency
TRANSFORMERS Innovation Areas

- Whole Vehicle Combination Aerodynamics
- Trailer Mounted Electric Driveline "Hybrid on Demand"
- Load Capacity Optimisation
Demonstrator test results

Hybrid-on-Demand:
3 to 5%

Aerodynamic features:
approx. 8%

Loading efficiency:
**Up to 40%**

Motorway:
2 to 4% fuel consumption (FC) reduction
Urban heavy traffic: 6 to 7%

90 km/h constant speed:
Up to 14% drag reduction,
Up to approx. 8% FC reduction

1 additional pallet on floor (3%);
Double floor: additional floor space;
+10 pallets = +30% = +16 minutes
THE ALPHA ALPHA CASE

ZARAGOZA REGION
THE BEST
ALPHA ALPHA GRASS

THE NETHERLANDS
THE BEST
MILK COWS
HOW DO WE GET THE GRASS TO THE COWS?

ALPHA ALPHA LOADS ARE NOT URGENT AND USED AS A FILLER

ALPHA ALPHA GRASS LOAD

REGULAR LOAD
## SYNCHROMODALITY
FROM A ONE LEAD TIME MODEL WITH PLANT STOCK

### CURRENT SUPPLY CHAIN SET-UP

<table>
<thead>
<tr>
<th></th>
<th>PERIOD N</th>
<th>PERIOD N+1</th>
<th>PERIOD N+2</th>
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<tbody>
<tr>
<td>PRODUCTION</td>
<td></td>
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<tr>
<td>PLANT INVENTORY</td>
<td><img src="triangle.png" alt="" /></td>
<td><img src="triangle.png" alt="" /></td>
<td><img src="triangle.png" alt="" /></td>
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<tr>
<td>FAST AND AGILE TRANSPORTATION MODE</td>
<td><img src="truck.png" alt="" /></td>
<td><img src="train.png" alt="" /></td>
<td><img src="ship.png" alt="" /></td>
</tr>
</tbody>
</table>

## TO A MULTIPLE LEADTIME MODEL WITH PIPELINE STOCK

### SYNCHROMODAL SUPPLY CHAIN SET-UP

<table>
<thead>
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<th></th>
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<th>PERIOD N+1</th>
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<td><img src="train.png" alt="" /></td>
<td><img src="ship.png" alt="" /></td>
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<tr>
<td>FAST AND STABLE TRANSPORTATION MODE</td>
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<tr>
<td>SLOW AND STABLE TRANSPORTATION MODE</td>
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<td><img src="ship.png" alt="" /></td>
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</tr>
</tbody>
</table>
**BENEFITS OF SYNCHROMODALITY.**

- Reduction in transportation cost if slow mode is used for non-urgent volume (40% of total volume).
- Reduction in warehousing cost due to the shift from warehouse inventory to pipeline inventory.

**PREREQUISITES FOR SYNCHROMODALITY.**

- Supply chain visibility at tactical level through a tactical control tower to design lanes.
- Supply chain visibility at operational level for the PSCs.
- Multiple leadtimes set-up in SAP APO DRP system versus one leadtime today.
Current best industry practice

- Ship the stable demand via reliable slow mode
- About 20-30% of freight volume


With synchromodality a breakthrough modal shift

Total logistics costs (transportation and inventory) optimization allows to increase slow mode shift from 20-30% to 60-70%
The key to an open network approach: modules
A generalization of containerization

Barriers:
- Too many regulations
- Market dynamics
- Lack of trust on sharing information
- Lack of transhipment and modularization technology
- Lack of IT/ICT Systems interoperability
- Lack of industry well recognized business and operational models
- Market dynamics
The key to an open network approach: modules
A generalization of containerization

Enablers

Autonomous Transport

Robotic

Stakeholders Support

IT/ICT Systems interoperability

Leadership and entrepreneurship

IoT, Big Data, 5G, ...
Use your capacity, share your assets
Through the “Alibaba economy,” we hope to enable consumers and businesses to buy globally, sell globally, pay globally, deliver globally and travel globally.

Jack Ma...letter to shareholders 2017
Thank you
Contact

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