Quand la logistique s’inspire du numérique. Vers un Internet Physique

Palaiseau– 23 Feb. 2017
Agenda

- How supply chains shapes the logistics demand
  - Moving from mass to focused
  - Moving from few to many channels
  - Faster and faster!

- A new approach of logistics networks to cope with new needs
  - The concept
  - Impacts on several dimensions
  - Potentials

- It becomes real
  - ALICE
  - Start-up
  - Opportunities

- IT challenges…
Moving to a focused global supply

- Smart phone simplified supply map
  - Just-in-Time, global and specialized plants
Moving an omni-channel demand

- Much more fragmented flows!

- Shipment median weight divided by 4,5 in 16 years, next 16?

  160 kg in 1988 - 30 kg in 2004
  Source IFSTTAR 2013 – freight network

- A no cost illusion for most consumers
Faster and faster deliveries!

- Consequence on transport

  - An increase of delivery frequency

  - A reduction of delivery lead time
Two major concerns

- An incredible performance but with contradictions

- Asset utilization


- Sustainability

How to rebuild economy of scale?
How to mitigate the environmental effects?
How to cope with the demand?
Future vision: we need a paradigm shift

- Technology? Sustainability? Collaboration?

Diagram:

- Economies of scale
  - Emissions reduction
  - Efficient logistics
  - Improved service level
  - Shipments’ fragmentation
The Physical Internet concept

Definition

The Physical Internet is an interconnected global logistics system enabling seamless asset sharing and flow consolidation.

The Physical Internet is founded on universal physical, digital, operational, business and legal interconnectivity achieved through standard open protocols, “encapsulation”, certification, performance assessment and monitoring.

B. Montreuil, R. D. Meller & E. Ballot, June 9th, 2015
The Physical Internet concept

Illustration

Classic SC

Plant → Warehouse → Distribution center → PoS

Supplier span of control

Distributor span of control

Interconnected SC

Plant → HUB → Sub-network A:

Supplier span of control

Distributor span of control

Consumer

PoS
Impact on logistics networks design

- Actual supply networks design

A supplier with 3 factories distributes via a central warehouse 10 regional distribution centers of two customers

Another supplier with 3 factories distributes via 2 warehouses to 10 regional distribution centers of two customers

- DC of retail chain 1
- DC of retail chain 2
- Plant of retailer 1
- WH of retailer 1
- Plant of retailer 2
- WH of retailer 2

Two dedicated supply chains: overlapping each other
Expected impact on logistics networks

- Interconnected networks

A supplier with 3 factories distributes via a central warehouse to 10 regional distribution centers of two customers.

Another supplier with 3 factories distributes via 2 warehouses to 10 regional distribution centers of two customers.

- DC of retail chain 1
- DC of retail chain 2
- Plant of manufacturer 1
- WH of manufacturer 1
- Plant of manufacturer 2
- WH of manufacturer 2

An interconnected network
Physical aspect

- A generalization of containerization: transport and handling containers small and modular boxes, pallets footprint free

Handling cost / 10 in 50 years

How to achieve the same improvement?
Information aspect

- Logistics information structure and communication could be more independent of operators

- Enterprise Resources Planning
- Capture
- Objects
- Software As A Service
- IoT
- Smart objects
What is needed: a new market place

How to give an incentive to dynamic collaboration?

- When a hub becomes a marketplace for independent operators!

<table>
<thead>
<tr>
<th>Request</th>
<th>Destination</th>
<th>Load units</th>
<th>Current carrier</th>
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<td>r1</td>
<td>h1</td>
<td>5</td>
<td></td>
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<td>r2</td>
<td>h3</td>
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<td>h5</td>
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<td>h5</td>
<td>3</td>
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S. Pan, X. Xu, S. Xiu Xu, Eric Ballot, GQ Huang, Submitted to IJPE, revision in second round

E. Ballot

Palaiseau – 23 février 2017
What is needed: a new type of marketplace

- How to give an incentive to dynamic collaboration?

  - When a hub becomes a marketplace for independent operators!

Assuming that $t_1, t_2, t_3, t_4$ have descending cost efficiency, the allocation decision is:

- $\{r_1, r_2\} \rightarrow t_3$;
- $\{r_3, r_5\} \rightarrow t_2$;
- $\{r_4, r_6, r_7\} \rightarrow t_1$.

Truck fill rate: +30%
Distance traveled: -28%
A significant gain to share
Many aspects

<table>
<thead>
<tr>
<th>Function</th>
<th>Current logistics</th>
<th>Physical Internet</th>
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<tbody>
<tr>
<td>Shipping</td>
<td>Goods</td>
<td>Containers</td>
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<tr>
<td>Network</td>
<td>Specific services</td>
<td>Network of open and shared networks</td>
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<tr>
<td>Trip</td>
<td>Logistics service</td>
<td>Dynamic routing</td>
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<tr>
<td>Information system</td>
<td>Proprietary</td>
<td>Internet of Things</td>
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<tr>
<td></td>
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<td>Platform of services on the Cloud</td>
</tr>
<tr>
<td>Standard</td>
<td>Proliferation of standards</td>
<td>Market movement to agreement on interfaces, identification and protocols</td>
</tr>
<tr>
<td>Storage</td>
<td>Time-intensive (centralized)</td>
<td>Deployment logic</td>
</tr>
<tr>
<td>Capacity management</td>
<td>Private</td>
<td>Market-based</td>
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</table>
Development timeline

- A worldwide initiative

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tbody>
<tr>
<td>2005</td>
<td>SCs collaborations</td>
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<tr>
<td>2007</td>
<td>The name is found...</td>
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<tr>
<td>2009</td>
<td>Projects in Fr &amp; USA</td>
</tr>
<tr>
<td>2011</td>
<td>Dissemination, industry and awards</td>
</tr>
<tr>
<td>2013</td>
<td>European dimension</td>
</tr>
<tr>
<td>2015</td>
<td>Academic recognition 1st IPIC</td>
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<tr>
<td></td>
<td>Start-ups</td>
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<td></td>
<td>Chaire</td>
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Potential: transportation efficiency

- What if we are able to dynamically consolidate freight?

- Interconnection of logistics services potential is:
  - 15% in distance, +35% in transport mean fill rate, up to -60% CO₂ (modal-shift)

- More resilient supply chain

Potential: supply chain inventory

- What if push inventory gradually towards consumers?

- Up to 42% of inventory reduction (same service level)

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Decentralized inventory models

What if we are able to open hubs for storage?

A case study with fast moving consumer goods in France

- In FMCG decentralized storage could make sense
  - New vendor managed inventory model
  - One virtual inventory with different access cost and time

Up to -30%
What is needed: structured information

- Be part of the Internet of Things

- All logistics assets could be connected soon… thanks to the IoT

- We need
  - communications technologies

- Standard to structure the data
Sharing information

- 3 levels to share information

Master Data
with GDSN
GTIN, GLN, Brand Owner, Product Classification

Transaction Data
with EDI
Order, Invoice, Payment, Delivery

Physical Event Data
with EPCIS
What, Where, When, Why

Identify
Capture
Share
What is needed: trusted transactions

What do we need?

- Interconnection of logistics services comes with much more:
  - Transshipments
  - Parties involved

- Traditional approach:
  - Certification, ISO or a new UN agency

- But we look for a decentralized, low cost, fast and secure solution to run operations…
Supply chain applications

- Certification
  - Product traceability (passport)
  - SC asset and journey record
  - Service completed

- EPC global in blocks
  - Proof of delivery
  - A way to implement (or protect) EPCIS?
  - ...

- A way to implement transactions and payment
  - Carrier tender
  - A proof of delivery
  - A smart contract release the money
  - ...

- A collaboration booster
A full history of all transactions: M2M and...

Physical Internet and collaborative logistics based on IoT

Vectors of disruption

Unlock excess capacity of physical assets
Create liquid, transparent marketplaces
Enable radical re-pricing of credit and risk
Improve operational efficiency
Digitally integrate value chains

Liquification of the physical world

Instantly search, use and pay for available physical assets
Real-time matching of supply and demand for physical goods and services
Digitally manage risk and assess credit, virtually repossess and reduce moral hazard
Allow unsupervised usage of systems and devices, reduce transaction and marketing costs
Enable business partners to optimize in real-time, crowdsource and collaborate

Device democracy Saving the future of the Internet of Things IBM

Ballot É., B. Montreuil, R. Meller (2015), The Physical Internet: The Network of Logistics Networks

Roadmap and workgroups: EU, USA, China...

- More than 100 European companies and universities involved

- A research roadmap

- Dissemination actions

- Based on: collaborative development of the vision of the future and competition in the search for solution

http://www.etp-logistics.eu/?page_id=292
Opening of logistics networks starts now

- Online platforms
  - More and more IT solutions implemented
    - Freight market places
  
- Readiness level of the sector is increasing
  - Transport
  - Warehouse
  - Control towers
  - Marketplaces
  - ...

- A call for a new level of optimization!
A first pilot in 2015 and a start-up: CRC®

- Flow routing centers
  - Proof of concept in South East of France
  - Open to all FMCG suppliers and retailers
  - Doesn’t change current supply networks
  - Each participant is still able to manage its supply chain “independently”

Confirmed by actual operations: CRC® achieves 87% tuck fill rate in average since the beginning of 2016
A vision of a gradual but drastic change!

• An innovation framework
  • A physical internet access provider for all
    It groups my deliveries, my shipments and knows me!

• The consumer is part of the SC!
  A bonus when I announce my car journey
  Invent your app!

• A major change for shippers and all logistics operators
  – New advantages: better asset utilization, less stock-outs, Lower environmental impact…
  – Some fears: losing control, losing competitive advantages…
  – A new approach of operations and business models

• An alternative to integration

A NEW WAY TO DO OLD ACTIVITIES
If you want to know more and participate

- A supply chain research chair dedicated to logistics services interconnection

- Research program 2016 - 2020
  1. Theory of interconnection and components design
  2. Performance assessment and transition phase
  3. Intermediation and decentralized governance

- Method
  - Workshops
  - Collaboration with start-ups
  - Projects application
  - Dissemination
  - Annual conference

- New members welcome!
Thank you

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