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Introduction in Physical Internet

IPIC 2018
Agenda

• Physical Internet

• The goals: efficiency, services, reliability and sustainability

• What is needed to make it work?

• First applications
Physical Internet

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, 2011
More and more fragmented deliveries

- Logistics works! But several trends are against its sustainability

- Fragmented shipments in space and time
From mass transport to…

- Logistics works! But several trends are against its sustainability

- Shipment median weight divided by 4.5 in 16 years in France.

  160 kg in 1988 - 30 kg in 2004

  Source IFSTTAR 2013 – freight network

- In 2020? 6.6 kg ?

- In 2030? 1.5 kg?
Impact on transport means

- Economies of scale are more and more difficult to obtain

A strong contradiction with sustainability

- Sustainability is out of reach with business as usual

-60% /1990 with the growth of traffic implies
-95% in 2050 of individual emissions!
The goals of physical internet

- **Main properties of a meshed network of networks vs. overlapped dedicated networks**

  - **Flow concentration**
    - Competition on services: best services to attract more flows
    - Utilization of less means and less infrastructure for the same t.km

  - **Reliability and resilience**
    - Alternate routes
    - Decentralized inventory

  - **Sustainability**
    - -60% of CO₂
    - More direct routes -15% of t.km
    - No sizing at the peak of activity

  - **New services**
    - Warehouse as a service
    - IP service provider

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From dedicated networks

Change networks organization

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.

Two dedicated supply chains: overlapping each other.

- 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
To interconnected networks

- Change networks organization

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An interconnected network
A simulation model with 2 main retailers

- If we have a reconfigured network it works…

Loss of capacity: \( \div 2 \)

Inventory: \( \div 3 \)

Handling cost: \( \div 3 \)

CO\(_2\): -60%

Tkm: -15%

Delivery failures: - x%

Availability on shelves: +y%

Empty trips: - z%
Infrastructure

- 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?

Nodes: an example

Inspired by container terminals in ports

Physical Internet Road-Rail Hub
Containerization: transport level

- A set of modular and multi modal containers for the trans European network and local services
- For fast movers: a full container from the suppliers to the users

Clusters 2.0
Containerization: handling level

- A set of modular boxes for inland transportation
  - A set of modular boxes for all products
    - Handling productivity
    - Better space utilization
    - Proved lifetime > 10 years
    - Improved security: anonymization of the content, mixed goods and blocks sealed
    - Savings > 20% of logistics cost
Real time monitoring of containers

- Part of the **Internet of Things**

- All logistics assets could be connected soon… thanks to the IoT
- With access limited to authorized stakeholders
Routing through the Physical Internet

• How to build offers in an interconnected world?
  – A problem already known by several sectors
  – Dynamic pricing as a proxy for the remaining capacity
  – Based on will and interest of each company

• Interconnection platforms attract flows as ports

• Each hub becomes a marketplace for independent operators

• Transport requests allocation or reallocation

• Transshipment only if it improves current solution

• Contract standardization between trusted partners
Interconnection vs. other solutions

Fragmentation
“Silo effect”

International treaty
“UN bureaucracy”

Dominant position
“The winner takes all”

Interconnection
“Decentralization commitments & trust”
An example: a routing center start-up

- How to connect industrials to retailers?

**Supplier control**
Distance > 250km

**Retailer control**
Distance < 125km

**Flow routing**

- Full truck or full container for several retailers
- Full truck from several suppliers

87% fill-rate, 99% service level
One service provider for all my deliveries

All online orders are redirected to my local delivery provider

- I can have all deliveries at once or not
- A provider who knows me and my preferences

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Design and future governance

○ How to build coordination and trust in a new system?

• Collaborative design of 5 roadmaps towards physical internet components and guidelines

• At European level

**Update:**
- 2030 PI
- 2050 carbon neutral supply chains
Thank you

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