EMBALAJE ISO-MODULAR EN LA REVOLUCIONARIA RED LOGÍSTICA PHYSICAL INTERNET

-A NEW CONCEPT FOR LOGISTICS: A PHYSICAL INTERNET -

MODULUSHCA

Modular Logistics Units in Shared Co-modal Networks

SEVENTH FRAMEWORK PROGRAMME

Hispack 2015

Barcelona, 23 April 2015

Martinez Avila, Maximo

P&G *Supply Network Innovation Center*

AGENDA

Why a Physical Internet ?

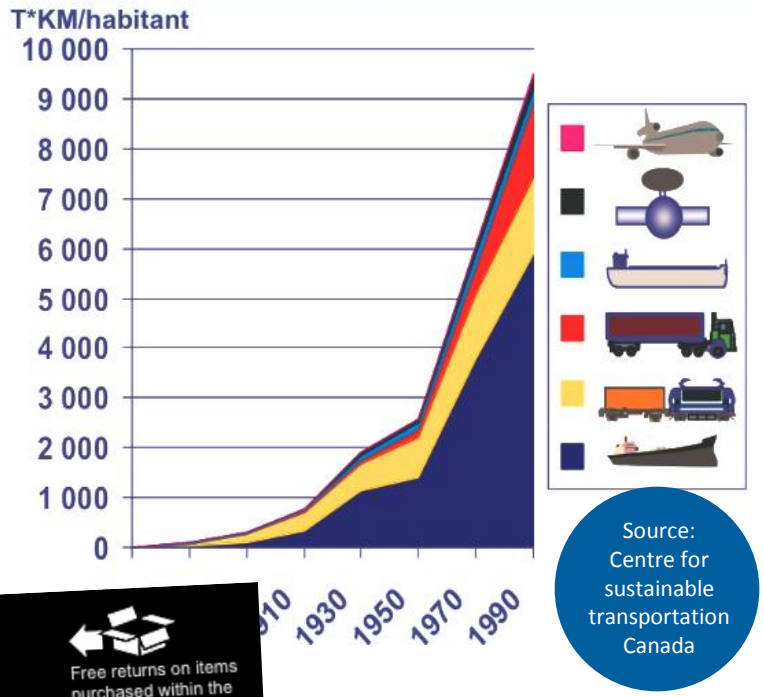
- Supply chain challenges and inefficiencies

The Physical Internet concept

- Definition of logistics network interconnection
- Build interconnection with full collaboration
- Build interconnection with new IT systems
- Build interconnection with modular boxes: The MODULUSHCA project
- The MODULUSHCA prototype

Current Supply Chain Challenges

- Efficiency, trends and innovations
  - Trends…
    - Flow exponential growth (even if they will not reach the sky)
  - Shipments fragmentation
    - Shipment median weight divided by 4,5 from 160 kg in 1988 to 30 kg in 2004
      Source IFSTTAR 2013
  - A no cost illusion for the consumers



Source: Centre for sustainable transportation Canada

- **Expectations: better services and economic support to growth**

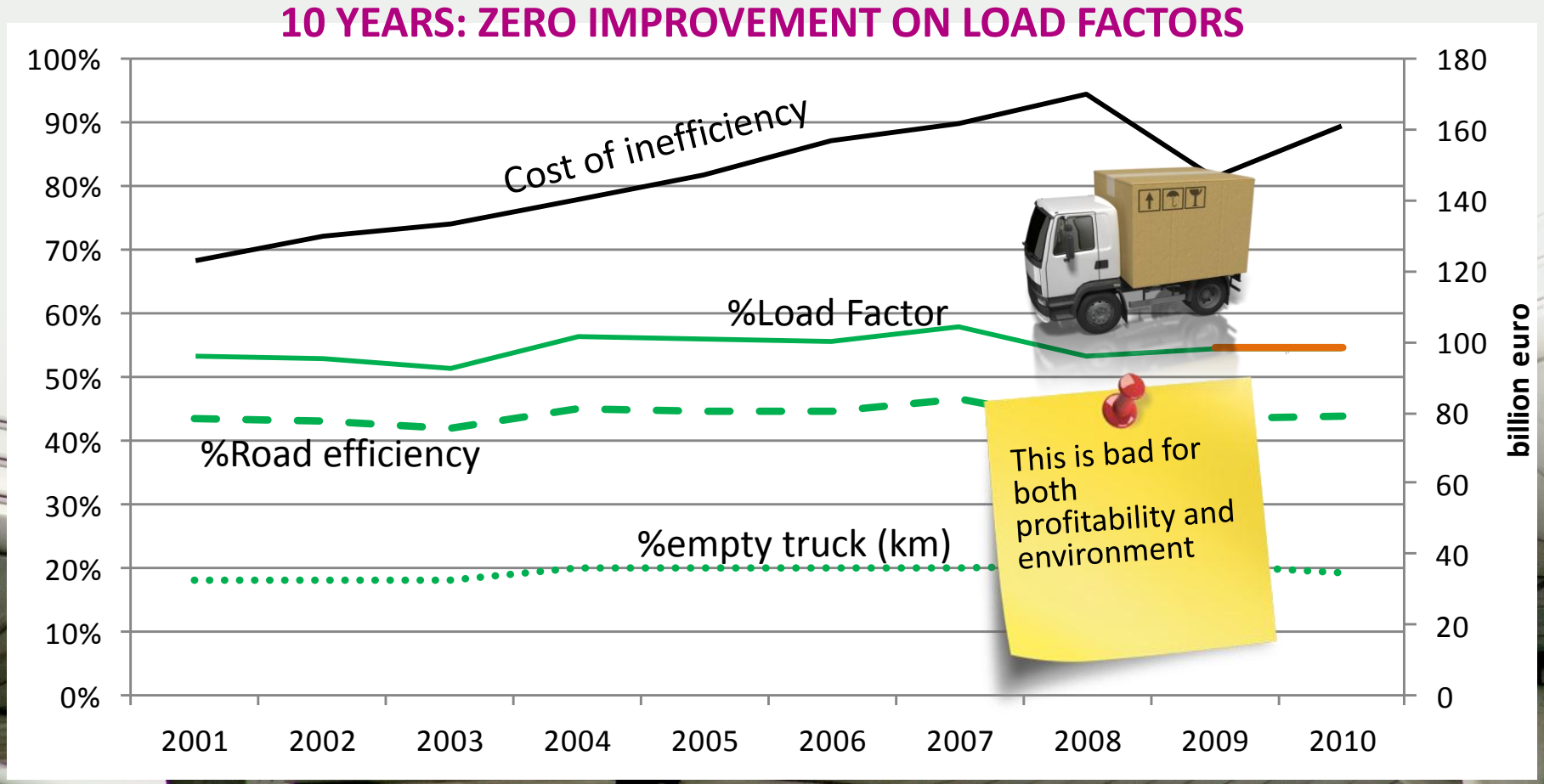
How to take advantage of economy of scale when each shipment are going smaller?

How to mitigate the environmental effects? Decoupling / economic activity?

How to cope with the demand and without a new physical infrastructure?

Current Supply Chain Challenges

Transport inefficiency is a €160 Billions loss
and 1.3% of EU27 CO2 footprint!!!



Current Supply Chain Challenges

Whilst logistics is the backbone sustaining our life, global logistics are inefficient and unsustainable

- *Economically, environmentally & socially*

Current Status – *inefficient & unsustainable supply chains*

This is bad for both profitability and environment

MODULUSHCA
Modular Logistics Units in Shared Co-modal Networks

SEVENTH FRAMEWORK PROGRAMME

Current Supply Chain Challenges

In addition ……..

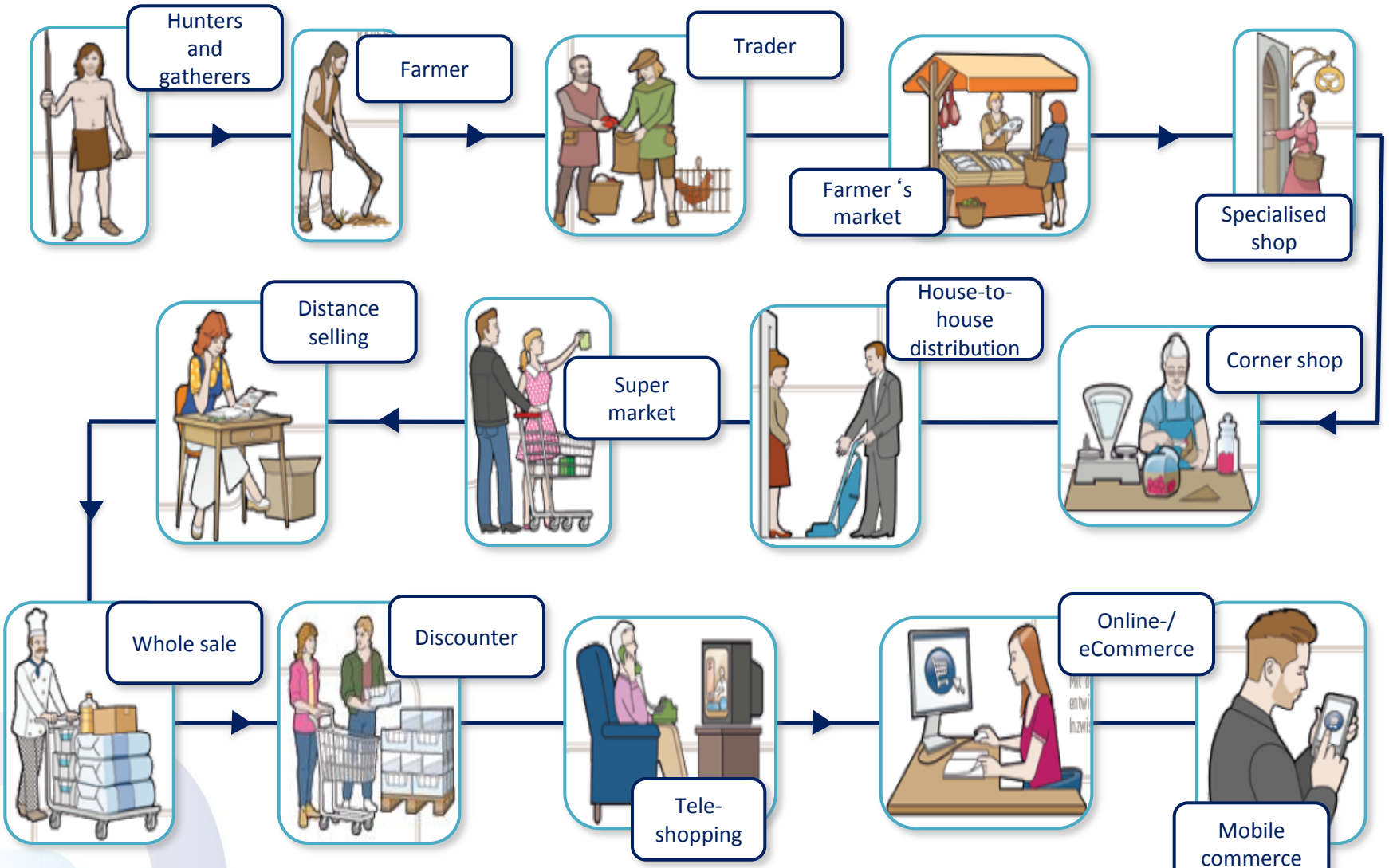
Poorly used storage facilities

25% wastage of retail produce

- Fast & reliable multimodal transport remains an aspiration
- Networks are neither secure nor robust
- Innovation is constrained

This is bad for both profitability and environment

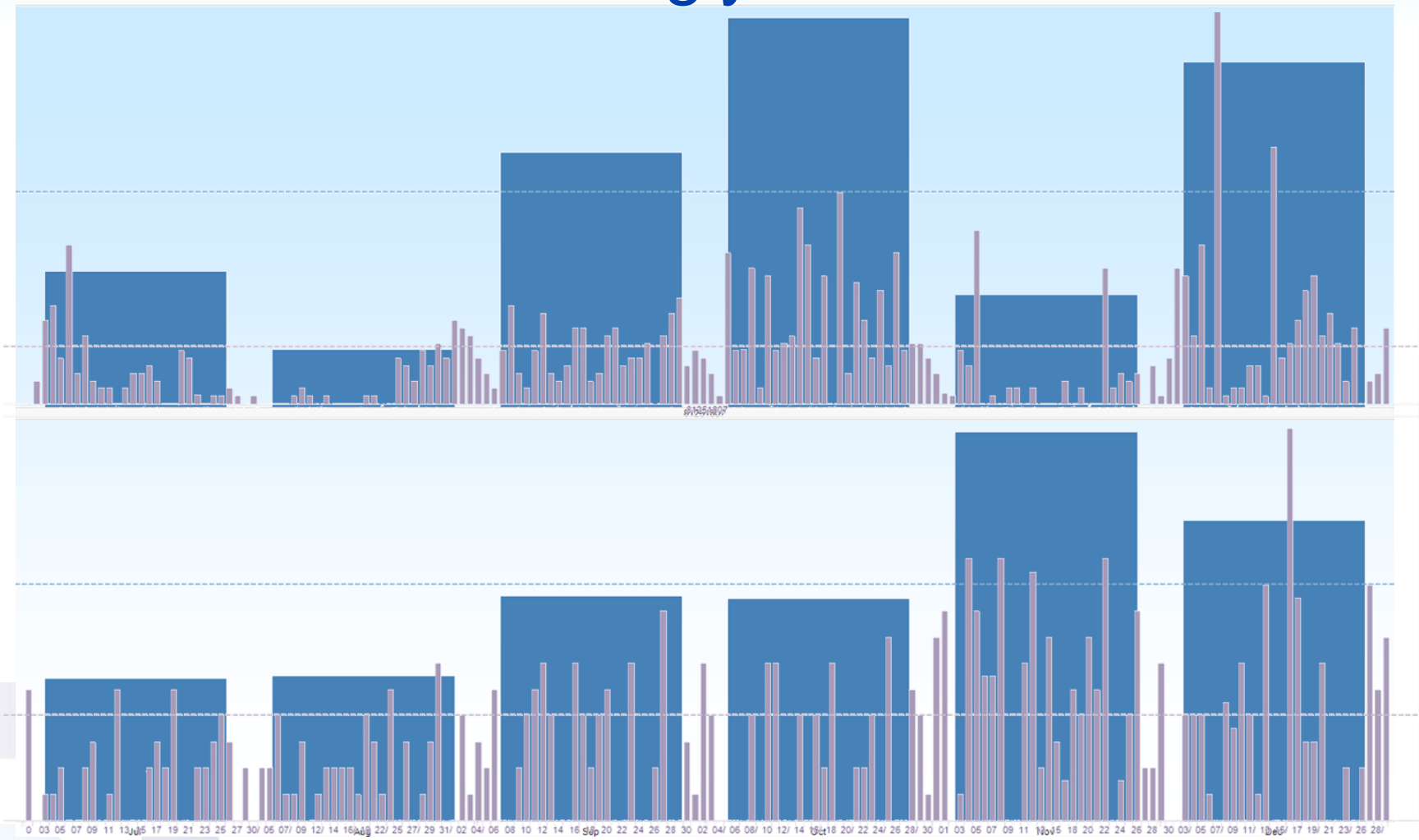
Current Supply Chain Challenges



Source: Metro AG (2012).

Current Supply Chain Challenges

We face an increasingly volatile market…



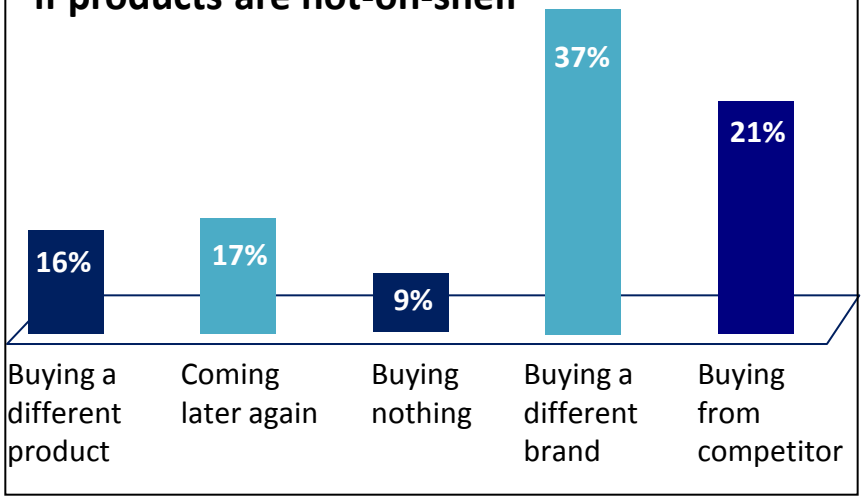
MODULUSHCA
Modular Logistics Units in Shared Co-modal Networks

SEVENTH FRAMEWORK PROGRAMME

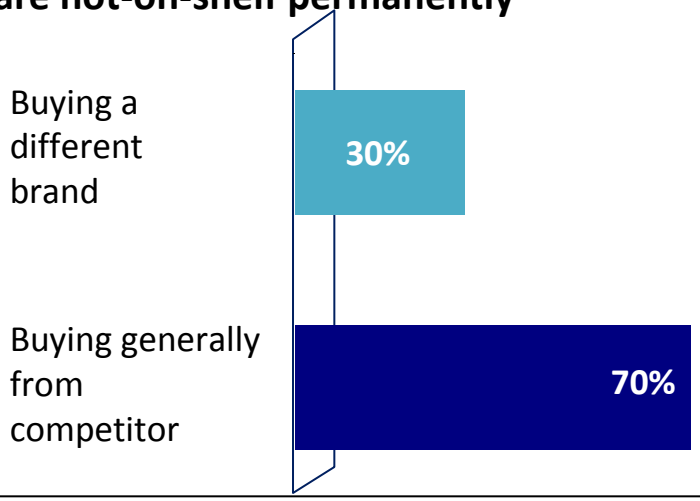
Current Supply Chain Challenges

In the average supermarket, 8.2% of all goods are not available (6.5% of sales volume)

Average reaction of customers, if products are not-on-shelf



Reaction of the customers, if products are not-on-shelf permanently



- If preferred products are not available permanently, consumers are drifting to competitive products for a long-lasting period
- Decreasing sales and market shares
- Despite all efforts made in the supply chains still a major subject

Source: Accenture (2009). ECR Europe (2009).

MODULUSHCA
Modular Logistics Units in Shared Co-modal Networks

SEVENTH FRAMEWORK PROGRAMME

Current Supply Chain Challenges

Safety

- In France in 2009, workers in a warehouse or a distribution center have:
  - 89 accidents per year (1/11workers)!
  - 2.7 gravity index
- More than twice of the average of all sectors
- Half of them are caused by manual handling

- Cost
  - 20 million €
  - 277 699 working days lost

A major improvement is required!

Source: Institut national de recherche et de sécurité pour la prévention des accidents du travail et des maladies professionnelles (INRS) (2009).

The Physical Internet definition

An open global logistics system
based on
the physical, digital and operational interconnectivity
enabled by
smart modular containers, interfaces and protocols
for increased efficiency and sustainability

B. Montreuil, R. D. Meller & E. Ballot

In other words: a universal interconnection of logistics services

www.physicalinternetinitiative.org

MODULUSHCA
Modular Logistics Units in Shared Co-modal Networks

SEVENTH FRAMEWORK PROGRAMME

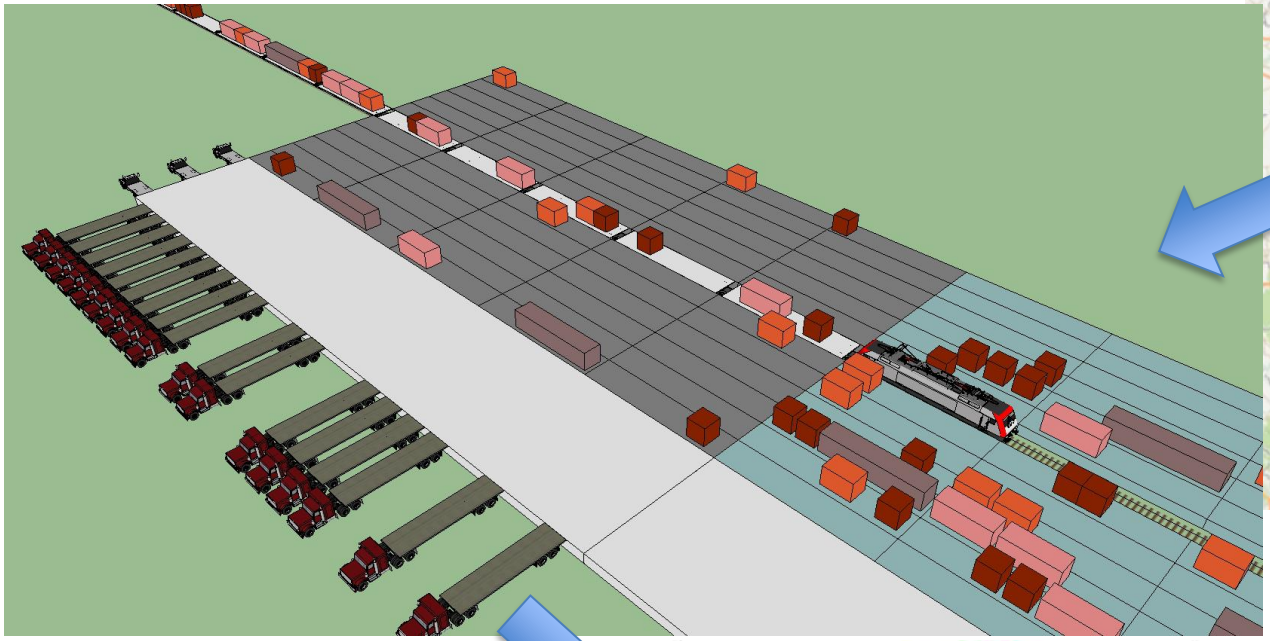
Build interconnection with full collaboration

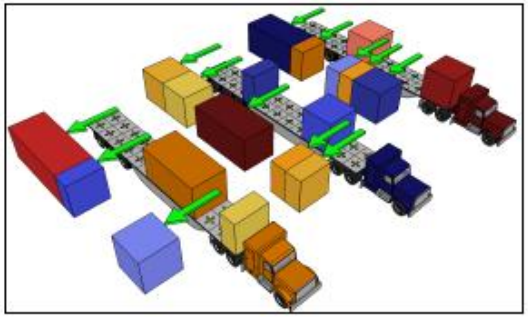
MODULUSHCA
Modular Logistics Units in Shared Co-modal Networks

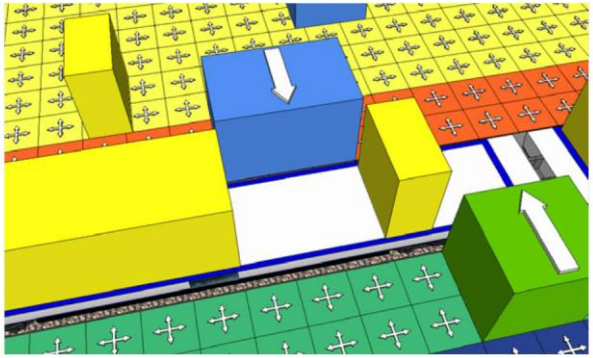
SEVENTH FRAMEWORK PROGRAMME

Build interconnection with new hubs

- Containers' routing.
- A call for more efficient transshipments.







MODULUSHCA
Modular Logistics Units in Shared Co-modal Networks

SEVENTH FRAMEWORK PROGRAMME

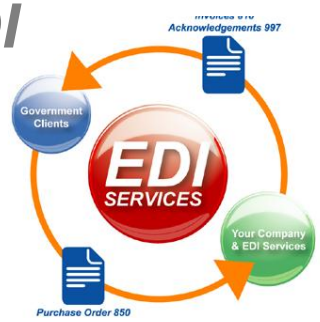
PONY EXPRESS

Source: Celebrating 155th Anniversary of the Pony Express – https://www.google.com/doodles/155th-anniversary-of-the-pony-express

Build interconnection with new IT systems

- ***Enterprise Resources Planning***

- ***EDI***



- ***Passive objects***

- Software As A Service

- IoT

- Smart objects

MODULUSHCA
Modular Logistics Units in Shared Co-modal Networks

SEVENTH FRAMEWORK PROGRAMME

Build interconnection with modular boxes

MODULUSHCA: A Practical Approach

Objectives

To enable more efficient flows of fast-moving consumer goods (FMCG)

- operate with developed iso-modular logistics units of adequate size
- provide a basis for a fully interconnected logistics system by 2030.
- identify and address the necessary changes to the logistics system
- exploit progress in digital, physical and operational interconnectivity
- build on current assets & infrastructure.

Consortium

MODULUSHCA
Modular Logistics Units in Shared Co-modal Networks

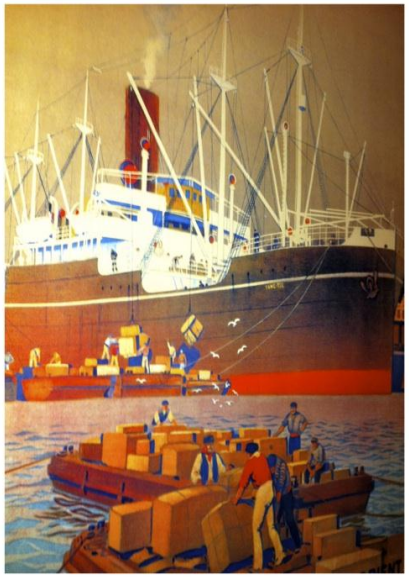
SEVENTH FRAMEWORK PROGRAMME

Physical expected impact

- A generalization of containerization

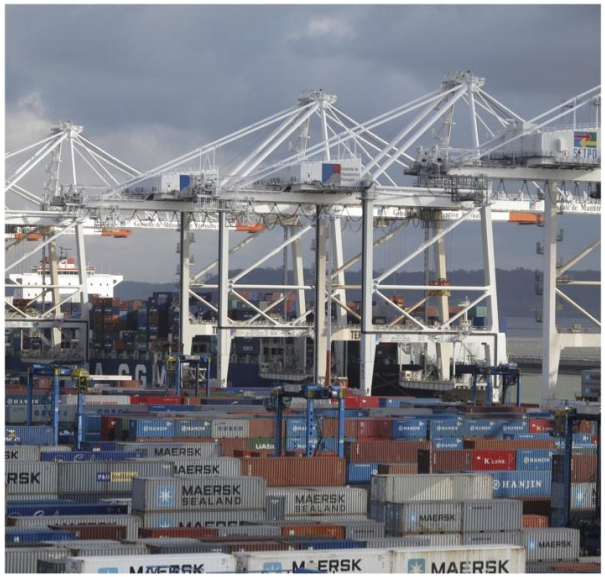
The Box (2006) Marc Levinson, Princeton Press

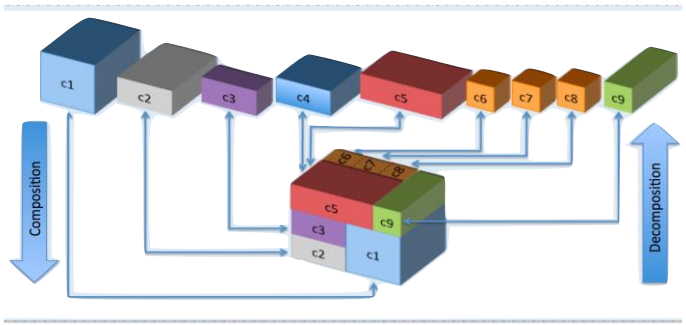
Cost Port = 2xOcean shipping=2xInland



>>

Cost Port = 0.4xOcean =0.8xInland





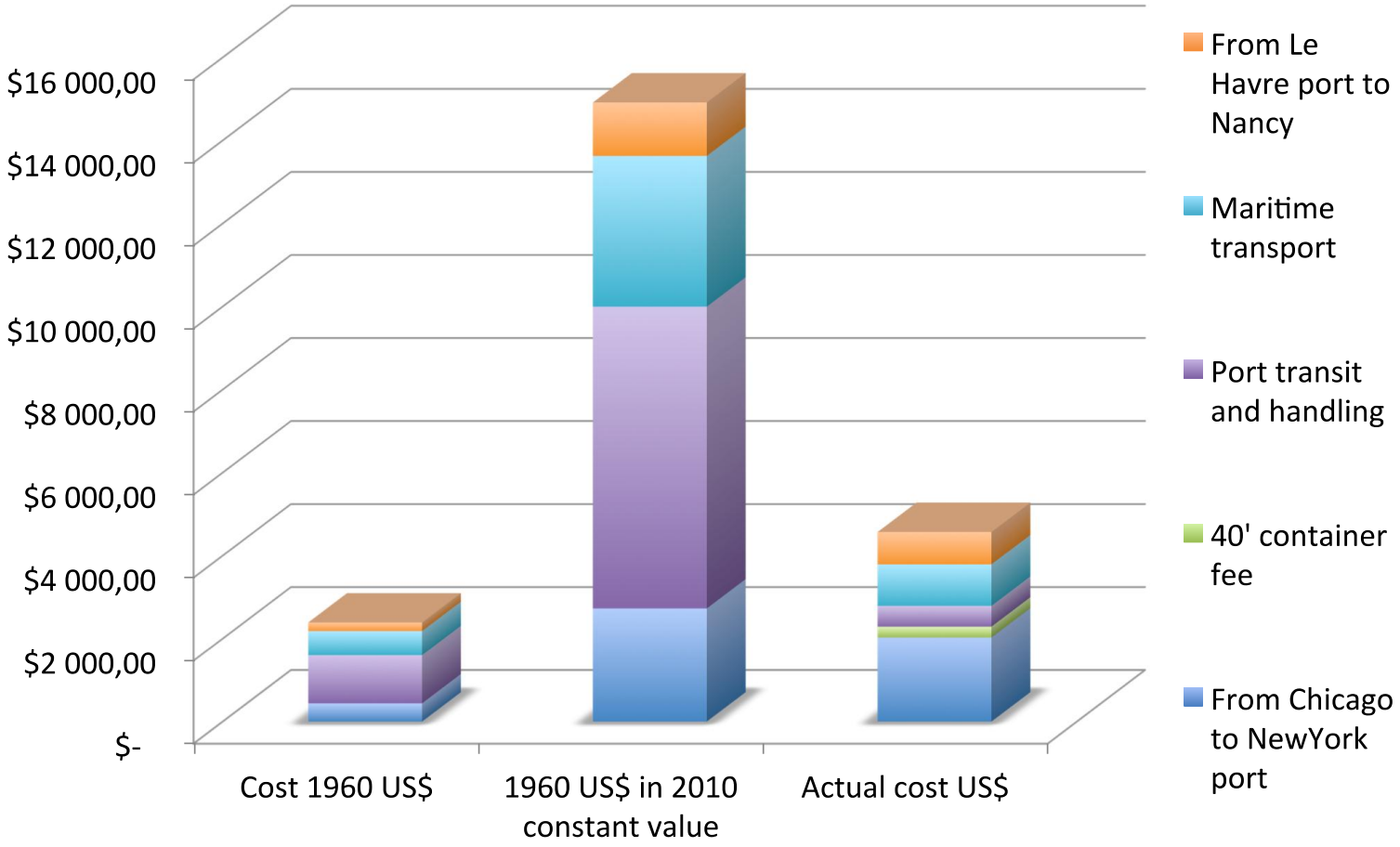
Montreuil, B., Meller, R. D. and Ballot, E. (2010). Towards a Physical Internet : the impact on logistics facilities and material handling systems design and innovation. *In: AL., K. G. E. (ed.) Progress in Material Handling Research. Material Handling Industry of America*

MODULUSHCA
Modular Logistics Units in Shared Co-modal Networks

SEVENTH FRAMEWORK PROGRAMME

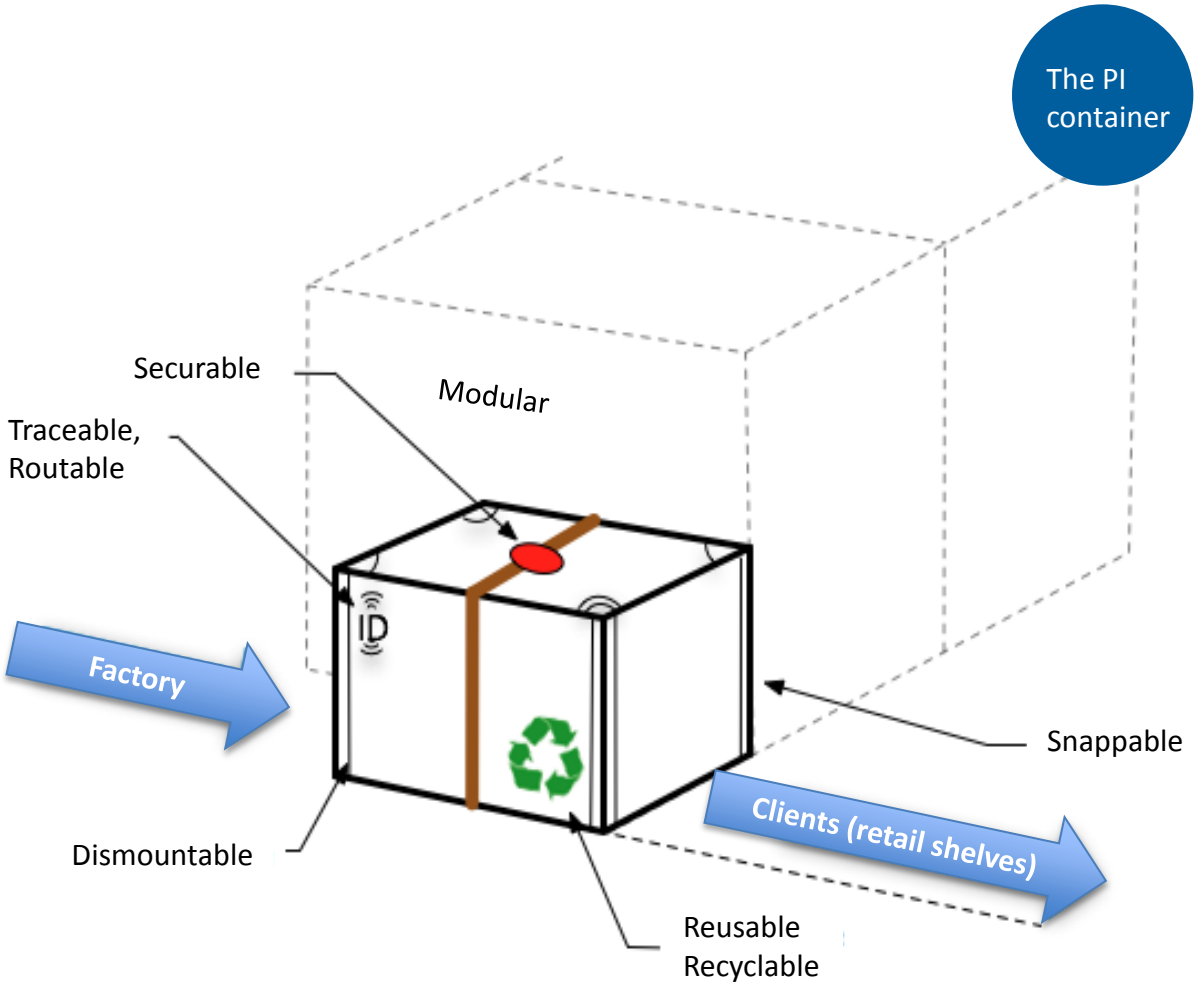
Physical expected impact

- The benefit of standard: the maritime container example



Build interconnection with modular boxes

- Why containers?
- A set of modular, connected, secured, reusable and recyclable containers
- A private space in an shared environment
- From production line to shelves or homes



MODULUSHCA
Modular Logistics Units in Shared Co-modal Networks

SEVENTH FRAMEWORK PROGRAMME

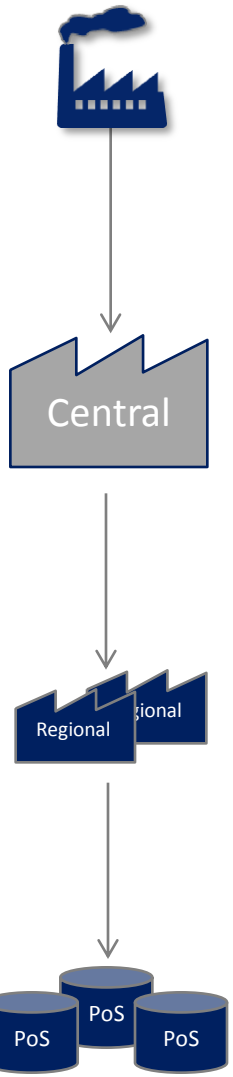
Build interconnection with modular boxes

Centre de Gestion Scientifique

Foreseeable impacts on packing and handling

Why modularity?

- Boxes sizes are not an issue when leaving the plant



- Boxes sizes are a big issue downstream of the supply chain

MODULUSHCA
Modular Logistics Units in Shared Co-modal Networks

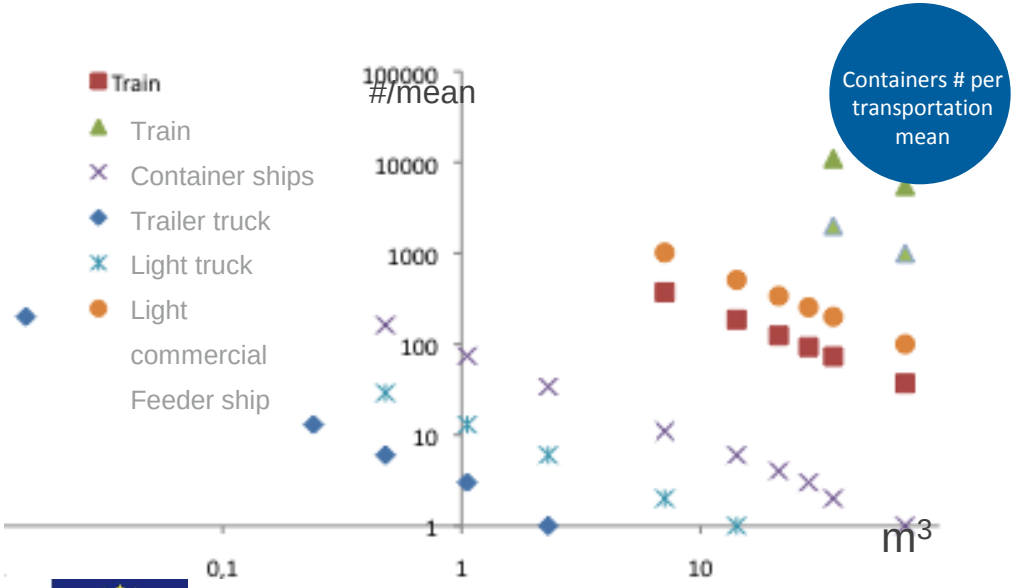
SEVENTH FRAMEWORK PROGRAMME

Build interconnection with modular boxes

Foreseeable impacts on packing and handling

Replacement of quasi infinite sizes by modular dimensions to avoid the never match syndrome

- Three classes of modular sizes
  - Transportation containers 2.4x2.4 section from $\pm 7 m^3$ to $70 m^2$
  - Blocks around the cubic meter made from boxes clipped together
  - Boxes $\pm 10^{-2} m^3$ to $10^{-1} m^3$



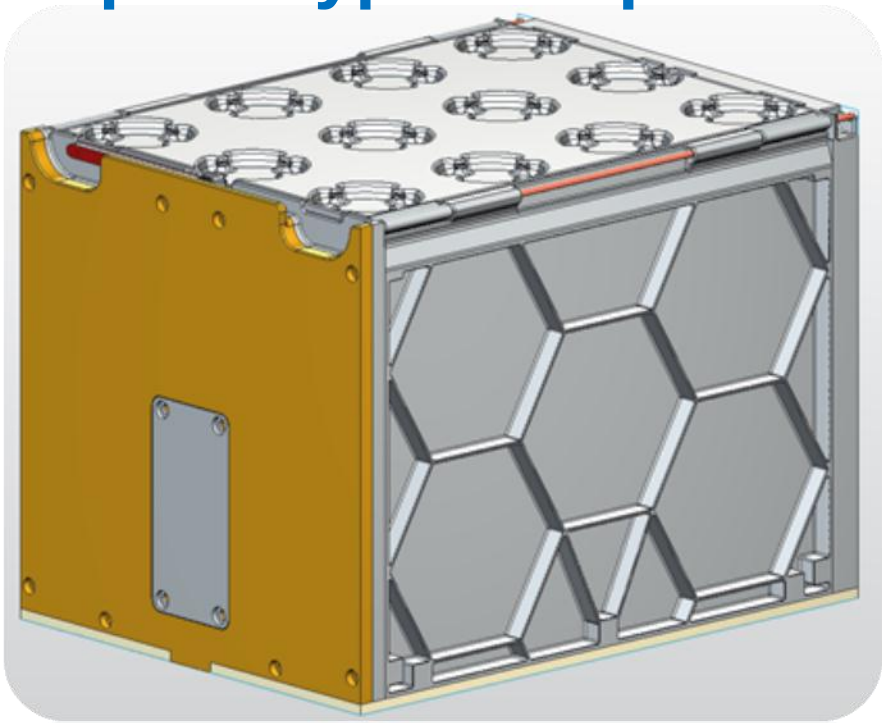
MODULUSHCA
Modular Logistics Units in Shared Co-modal Networks

SEVENTH FRAMEWORK PROGRAMME

Build interconnection with modular boxes

MODULUSHCA New Modular Concept

the prototype box presented

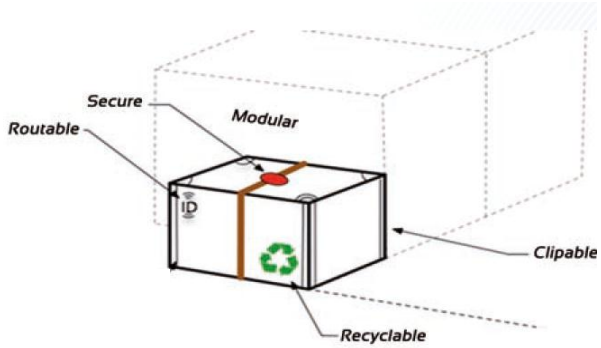


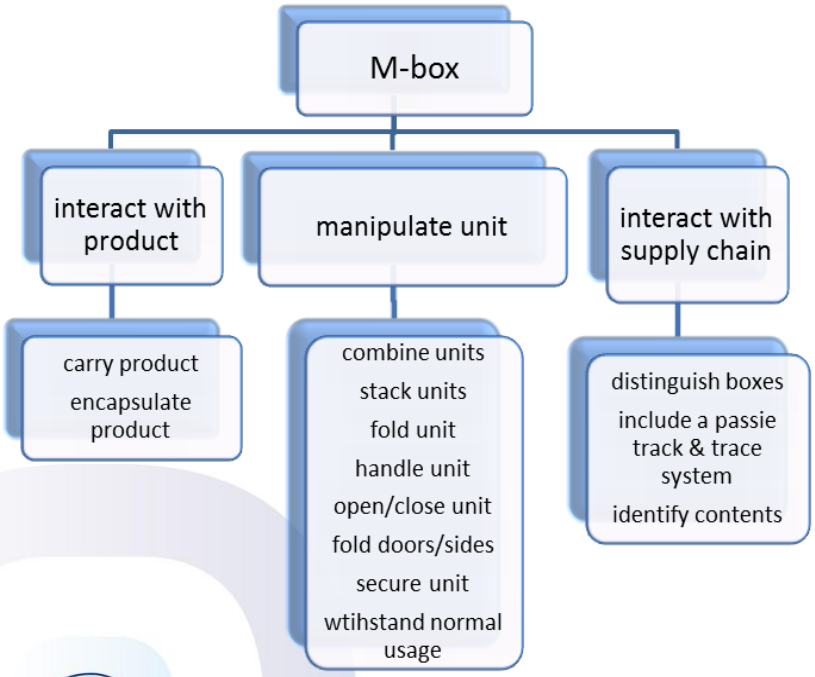
- Modular dimensions from cargo containers down to tiny sizes
- Easy to handle, store, transport, interlock, load, unload, construct, dismantle, compose and decompose
- Smart tag enabled, with sensors

MODULUSHCA
Modular Logistics Units in Shared Co-modal Networks

SEVENTH FRAMEWORK PROGRAMME

Build interconnection with modular boxes





the overall requirements for the box

M-box development with/without modular detachable panels

Functions and requirements

- storybook
- Surveys
- List of “must have”, “nice to have” and “not required” features
- List of functions, requirements for the design and requirements out of the production perspective

Build interconnection with modular boxes

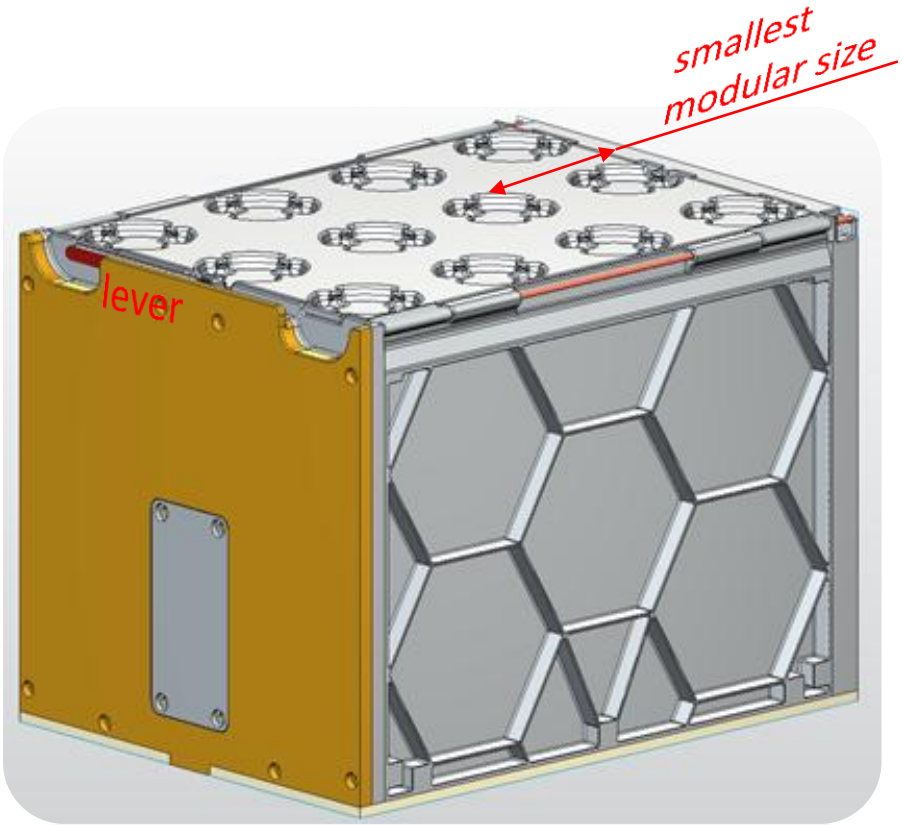
interlocking mechanism - cutaway view

Prototype #1: Interlocking mechanism

- Interlocking the boxes via top and bottom!
- Inside the box there is a double floor
- with a sliding sheet in the middle
- Turning the leaver on top of the side panel
- moves the sliding plate
- via a push and pull mechanism
- The movement of the sliding plate rotates small discs inside the bottom panel
- to interlock
- with the counterpart in the top panel of the box below in the unit load

Build interconnection with modular boxes

the prototype box presented



Unibody design

M-Box functions	fulfilled now	fulfilled at 2nd gener.
fold unit	x	x
encapsulate product	✓	✓
carry product	✓	✓
Fold doors/sides	x	x
combine units	✓	✓
stack units	✓	✓
Distinguish boxes	x	✓
Open/close box	✓	✓
include a passive track & trace system	x	x
Identify contents	x	✓
Handle units	x	✓
withstand normal usage	✓	✓
Secure box	x	✓

KPI - M-box (new prototype design)	
Outer dimensions [in mm]	300x400x300
Inner dimensions [in mm]	270x360x275
Volume usage	74.25%
Weight	4.5kg

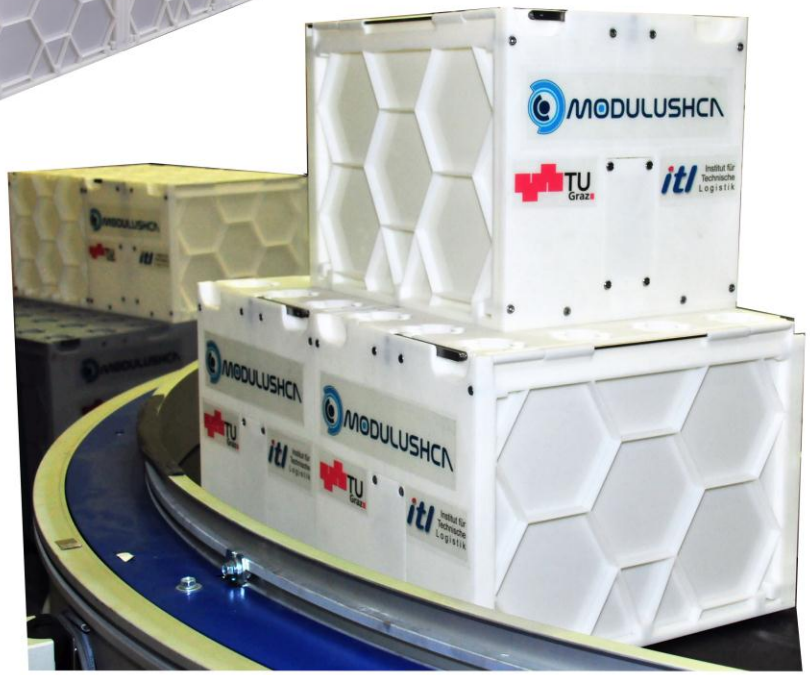
Panels: further development till 2015

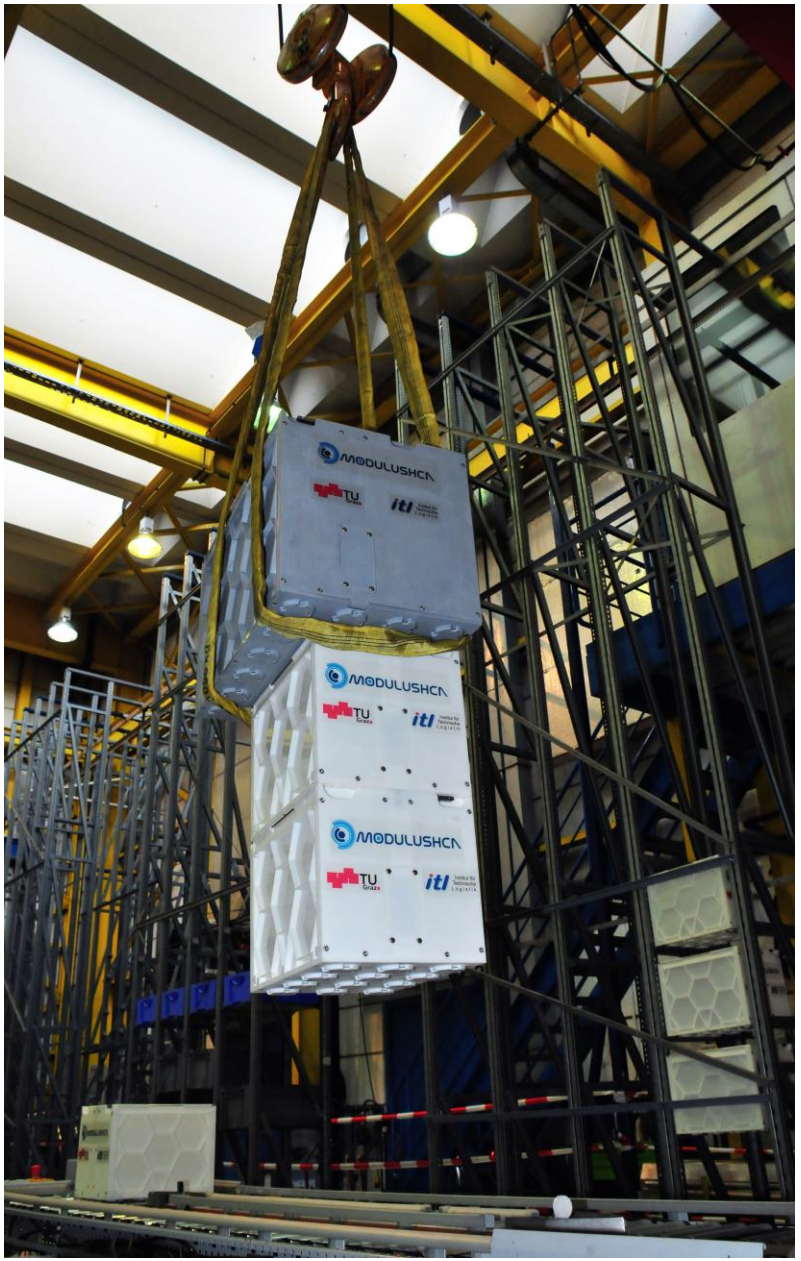
MODULUSHCA
Modular Logistics Units in Shared Co-modal Networks

SEVENTH FRAMEWORK PROGRAMME

Build interconnection with modular boxes

Prototype #2: Interlocking mechanism



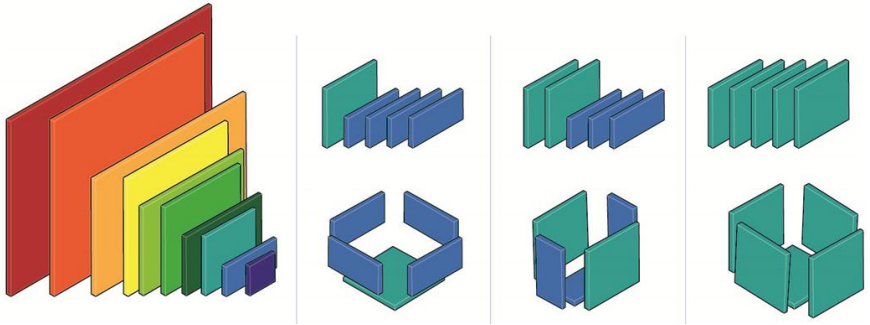


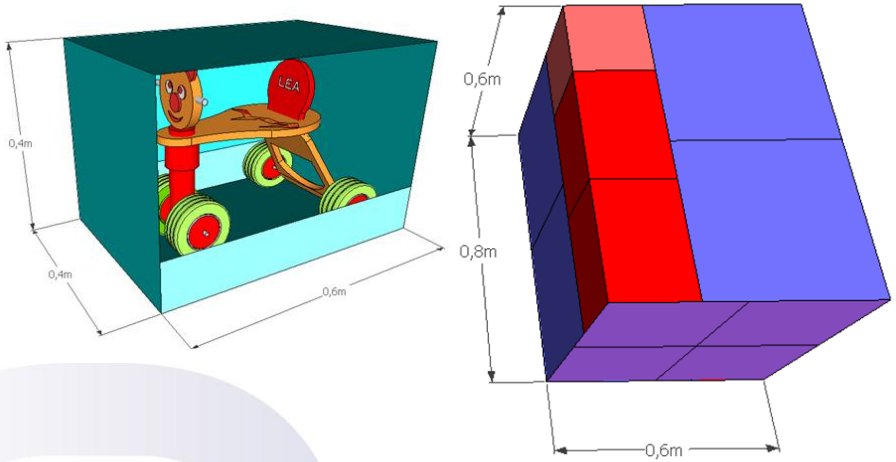
MODULUSHCA
Modular Logistics Units in Shared Co-modal Networks

SEVENTH FRAMEWORK PROGRAMME

Build interconnection with modular boxes

Design with panels – ongoing work





PI-Boxes built out of PI-panels (PI/Montreuil and Meller)

Problems to overcome in order to realize panel-based vision/concept:

- Evolve the concept to a technical design
- Combine panels to a box
- Interlocking boxes out of panels
- Using panels in every position
- Combine different panels to a larger one

How to Engage?

1. Be open minded to move toward an Industry Standard
2. Be ready to share assets (e.g. pooling) for higher efficiency
3. Identify suitable pilots

Contact

Maximo Martinez Avila

MODULUSHCA Technical Coordination Team

martinezavila.m@pg.com

http:// www.modulushca.eu

http:// www.cgs-mines-paristech.fr/ipic2015

http://www.physicalinternetinitiative.org/

MODULUSHCA
Modular Logistics Units in Shared Co-modal Networks

SEVENTH FRAMEWORK PROGRAMME

www.modulushca.eu