LOGISTIKUM
CHALLENGE ACCEPTED

Workshop 3.1
“Synchromodality”

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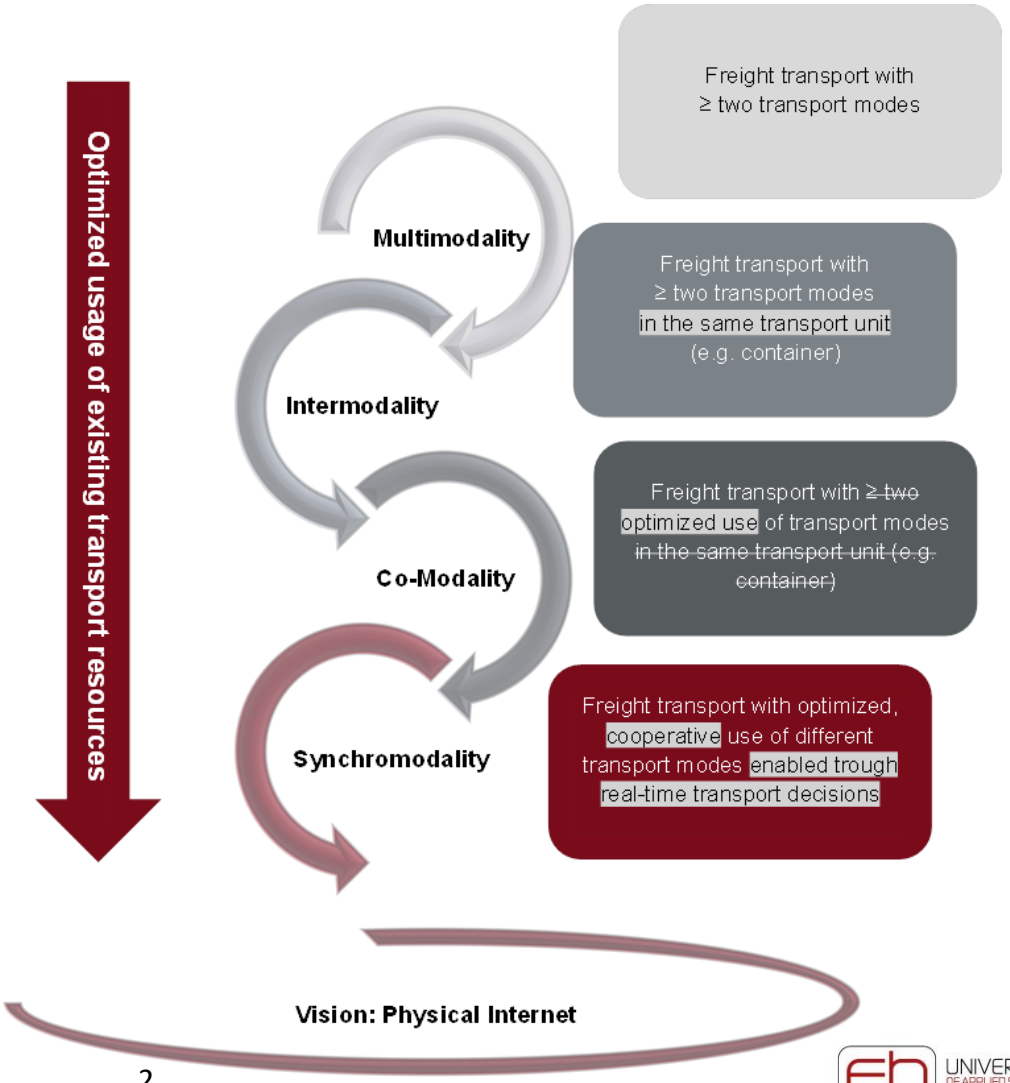
UNIVERSITY OF APPLIED SCIENCES UPPER AUSTRIA

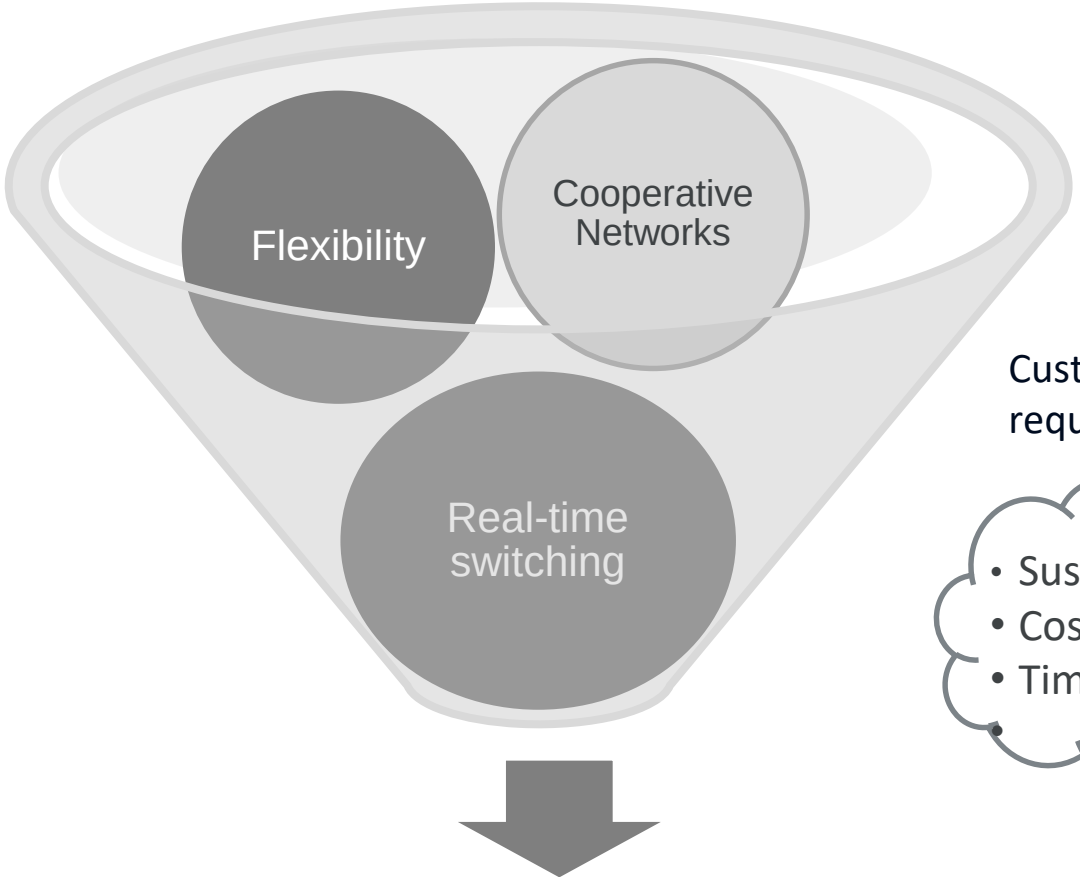
This work has been funded by the State of Upper Austria as part of the research program ‘FTI Struktur Land Oberösterreich’

Introduction: Synchromodality

- Promising concept to foster modal shift
- Based on „amodal booking“
- Network orchestrator plans and optimizes flows of goods
- Real-time switching of transport modes
- Resilience through back-up function



Introduction: Synchromodality



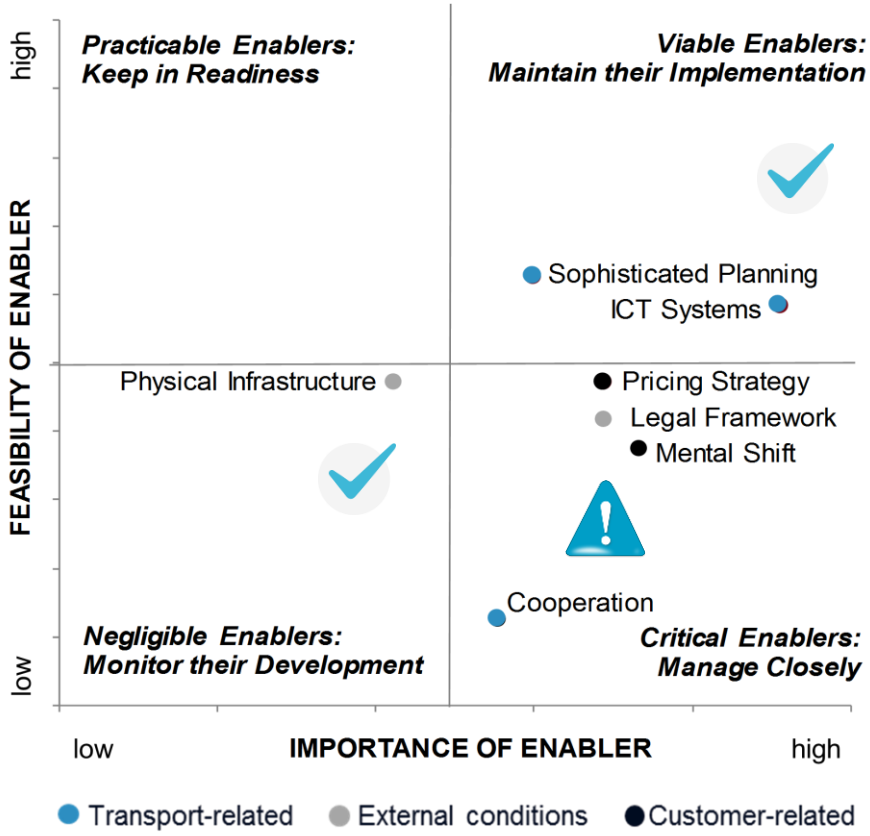
Customers determine only basic requirements in terms of ….

- Sustainability
- Costs
- Time

Bundling of transports, optimized and sustainable use of resources to support the PI vision

Conclusion and outlook

- Impressive modal shift achieved within pilot (2011) → Nevertheless still quite unknown in the rest of Europe
- Technical requirements are realizable
- Existing solutions demonstrated practical feasibility
- „Soft factors“ rather more critical for implementation



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15 Jahre innofreight

Railway transport

Material handling

Optimized and flexible railway logistic solutions from Innofreight for industries with high raw material consumption IPIC 2017

The Company

We specialise in systems for the innovative transport of goods and logistics on rails.

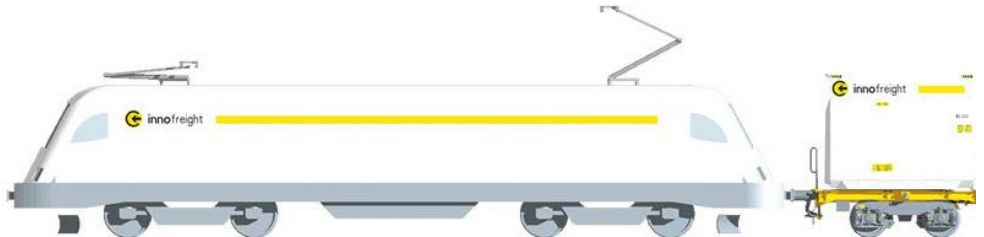
From the very idea to a concept, through its implementation and last but not least the service – we are the perfect business partner for you.

SHARE YOUR **LOGISTICS CHALLENGES** WITH US –
TOGETHER WE WILL ACHIEVE THE **OPTIMAL SOLUTION!**

The Company

- As many as 100 Innofreight block trains run daily for our customers all across Europe.
- We are transporting ca. 15 Mio.t mass goods per year (= ca. 1 Mio unloadings of containers with our machines).
- Ca. 10.000 containers and more than 50 unloading forklift trucks and 6 stationary unloading systems in 14 countries guarantee a smooth and reliable operation at our customer’s locations.
- Members of our staff offer you assistance on the spot and in your own language!

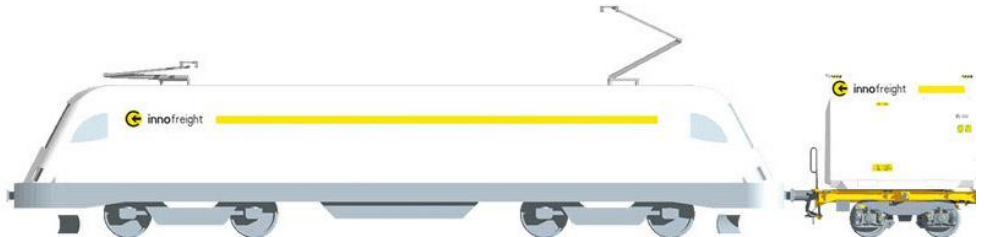
Innofreight delivers logistic solutions



Business model railway/IF/end-customer

- Innofreight is investing in containers, loading and unloading technology.
- Railway company buys or rents InnoWaggons (from Innofreight) and rents our containers.
- The staff of the end-customer takes care of the material handling on site.

InnoWaggons – the best container wagons



InnoWaggon Sggrrs 2014

LIGHT WEIGHT CONTAINER WAGON, START IN JULI 2014 FOR COMPANY KNAUF:

ERC GmbH
NOTIFIED BODY INTEROPERABILITY
[2329]

EG-Bauartprüfbescheinigung

EC Type Examination Certificate

Entsprechend der Richtlinie 2008/57/EG des europäischen Parlaments und des Rates vom 17. Juni 2008 über die Interoperabilität des Eisenbahnsystems in der Gemeinschaft
In accordance with Directive 2008/57/EC of the European parliament and Council of June 17th 2008 on the interoperability of the rail system within the community

wird für das im angefügten Technischen Dossier detailliert beschriebene Teilsystem
the following, in the attached Technical File detailed described subsystem,

InnoWaggon Sggrrs 4854

des Herstellers/Antragstellers : of the manufacturer/applicant

InnoWaggon GmbH
Grazer Straße 18
A – 8600 Bruck an der Mur

durch die / has been approved by

Benannte Stelle für Interoperabilität im Eisenbahnverkehr
Identifikations-Nr. der Europäischen Kommission: 2329
Identification number of the European Commission

ERC GmbH
Waagner-Biro-Strasse 125
A – 8020 Graz

die Konformität mit den Anforderungen der oben genannten Richtlinie und der zutreffenden TSI ('n) mit der vorliegenden Bescheinigung bestätigt.
The conformity with the requirements of the above Directive and the relevant TSI ('s) is confirmed with the certificate in hand.

2329/1/SB/15/RST/DEEN/0117

Das Konformitätsbewertungsverfahren wurde gemäß Richtlinie, nach Modul SB der anzuwendenden TSI ('n) durchgeführt.
The conformity assessment has been performed by application of Module SB of the relevant decisions adopted pursuant to the Directive.

Diese EG-Bauartprüfbescheinigung ist unter den im angefügten Technischen Dossier genannten Einschränkungen gültig.
This EC Type Examination Certificate is valid under the conditions listed in the Technical File.

Dieses EG-Zertifikat ersetzt die EG-Bauartprüfbescheinigung Nr.: 2329/1/SB/14/RST/DE EN/0117 vom 18.06.2014
This EC-Certificate replaces the Type Examination Certificate number 2329/1/SB/14/RST/DE EN/0117 from 18.06.2014

Graz, den 03.11.2015

ERC GmbH 2329 Notified Body Interoperability

Dr. Fabian Schmid

InnoWaggon Sggrrs 2017

LIGHT WEIGHT CONTAINER WAGON:

- Till end 2017 ca. **800 InnoWaggons** will be in servive.
- Äquivalent: 1.600 single wagons, first traffics: Start was in Juli 2014.
- Main users: Steel industry, power plants and construction companies.
- Owners: 400 wagons Innofreight, 400 wagons railway companies.

InnoWaggon Sggrrs 2017

RAILWAY COMPANIES BELIEVE IN MODULAR CONCEPT AND INNOFREIGHT TECHNOLOGIES:

InnoWaggon Sggrrs for wide gauge

LIGHT WEIGHT CONSTRUCTION WAGON FOR WIDE GAUGE FOR **VR CARGO:**

- Prototype in service in Q4/2017!

MODULAR

- Modular = the InnoWaggon + a special container + the unloading technology.
- Higher load than in special waggons.
- The container and unloading technology is optimized depending on the type of load and the customer's specific needs.
- All components may be combined with one another.
- Great availability and flexibility due to easy maintenance and a swift exchange of components.

MODULAR = **FIT FOR THE FUTURE!**

Cooperation railway - Innofreight

ADVANTAGES FOR THE RAILWAY COMPANY BECAUSE OF SPLITTING CHASSIS FROM CAR BODY:

- Compared to special wagons low investment costs and risks, speed to renew the fleet can be accelerated significantly.
- Innofreight offers high availabilty and flexibility according to the needs of the market.
- Different life cycles of container wagons and containers are improving the competitiveness (e.g. higher payload by using high-tensile-steels).
- Standardization of the fleet is possible, reduction of variety of railcars.
- Reduction of maintenance and infrastructure costs.

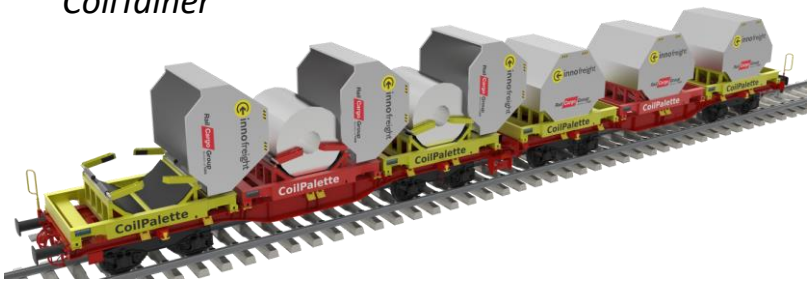
- **There are no limits for possible combinations!**

Many applications – one universal wagon:

ADVANTAGES FOR THE RAILWAY COMPANY BECAUSE OF SPLITTING CHASSIS FROM CAR BODY:

…to be continued…

CoilTainer

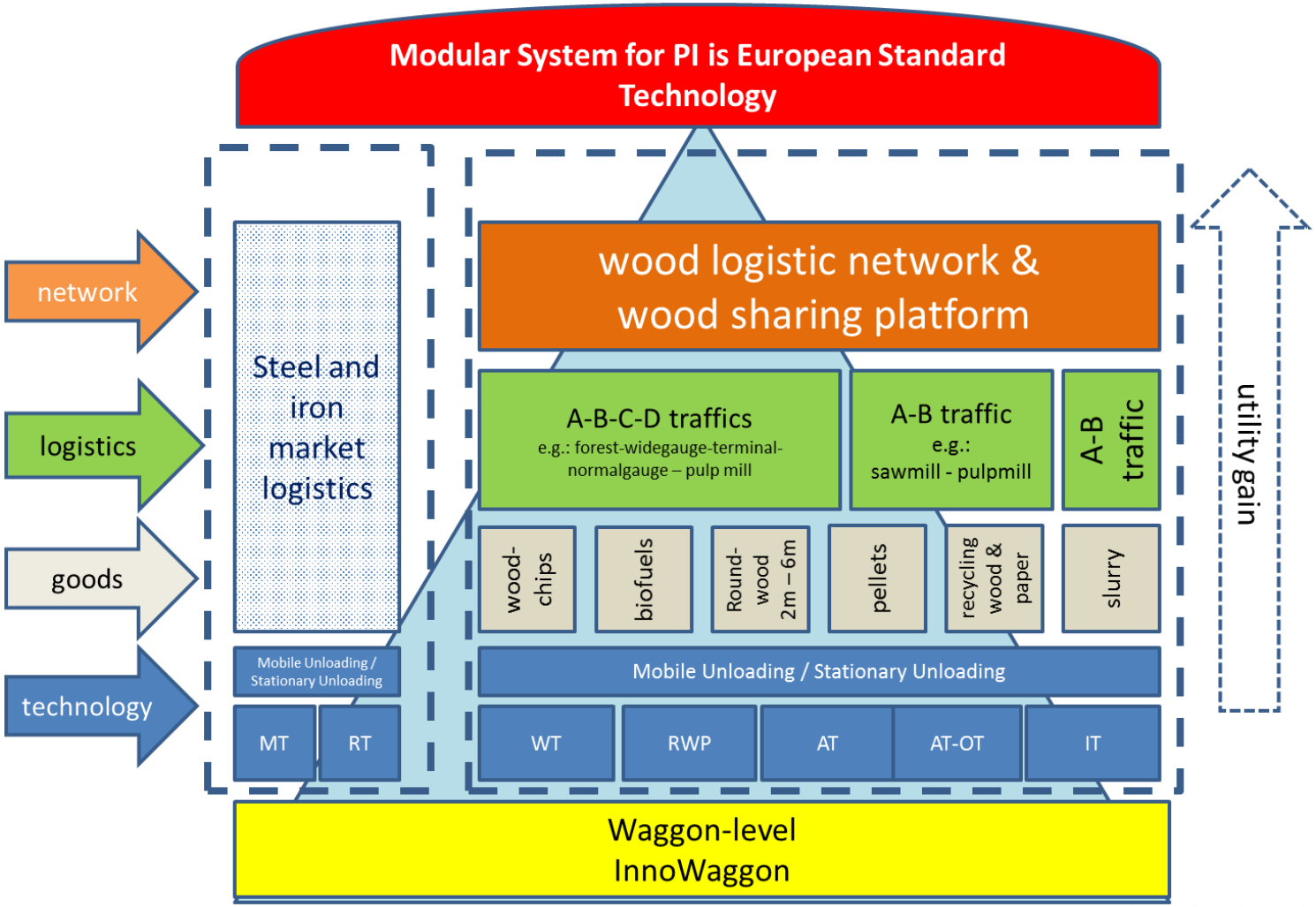


RockTainer-SAND

BoxInBox

WireTainer

Utility pyramid:



Railway logistics of the future

- Modularization of logistic components and containers
- Unification of waggon materials
- Technical limits (axle load, profiles, train lenghts, etc.) adjusted to nowadays technical standards
- Modernization and clearing of railway law and regulation
- Modern infrastructure and terminals as hubs and service centers with multiple functions
- Modularization bases for digitalization and PI

Benefits of modularity

FOR THE **CUSTOMERS** (E.G. STEEL INDUSTRY):

It is the model of a platform wagon (= the InnoWaggon) and the load-optimised containers that render it possible to transport goods more efficiently than ever before. We offer you higher loads along with a more efficient and reliable unloading.

FOR THE **RAILWAY COMPANY:**

A perfect opportunity to standardise and modernise the wagon fleet as well as optimise its maintenance process.

FOR **INNOFREIGHT:**

An expansion of the logistics services (our current primary focus is on the paper and chemical pulp industry). In the future: also building materials, steel and power stations. Short life cycles – as a result we meet our customers' needs to an optimal extent.

Contact

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Tel: +4338628989-234
http://www.innofreight.com

INNOFREIGHT – YOUR PARTNER FOR OPTIMISING YOUR LOGISTICS!

01 INNOVATIVE

02 EUROPEAN

03 PROFESSIONAL

04 ECOLOGICAL

05 MODULAR

Inducing a new paradigm shift: *A different take on synchromodal transport modelling*

Tomas Ambra

4th International Physical Internet Conference

Graz, Austria

04/07/2017

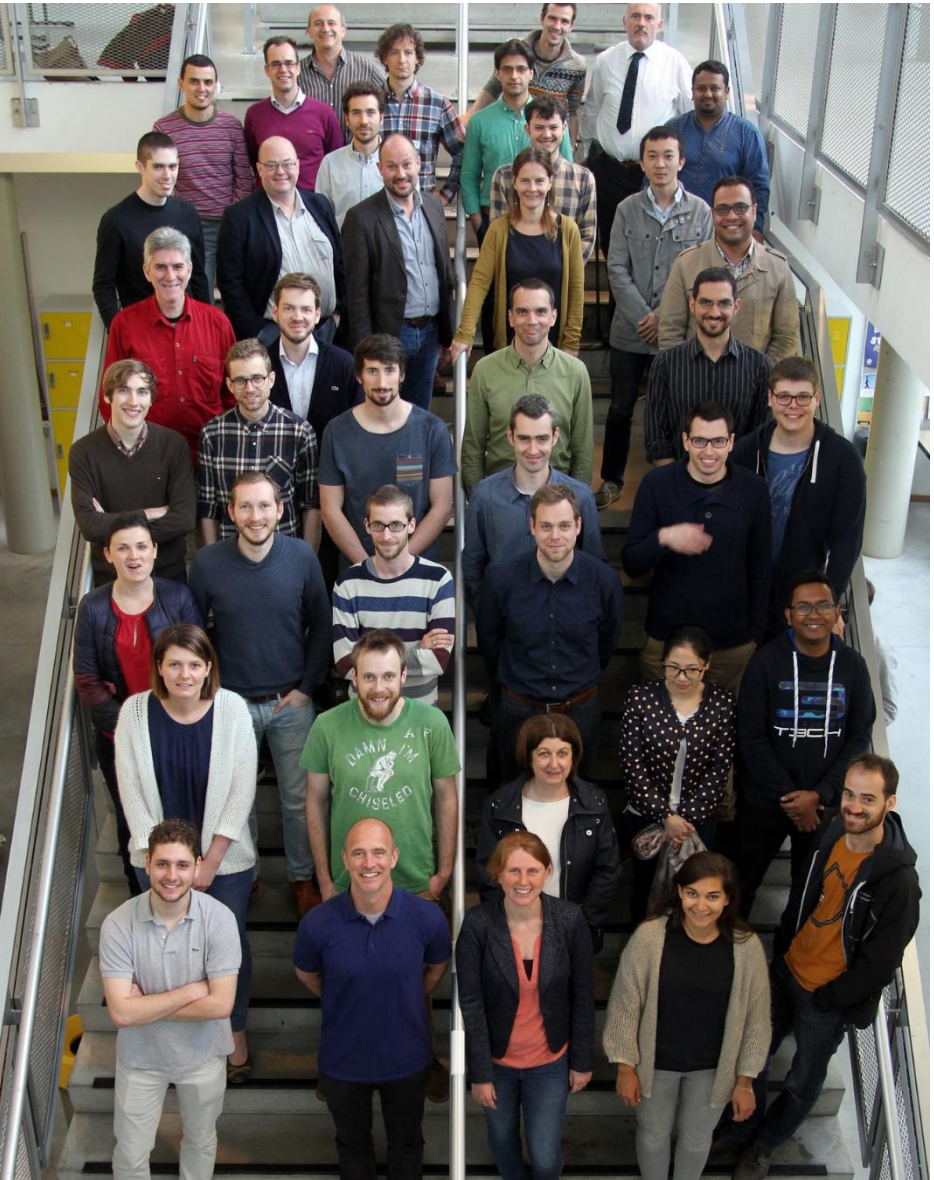
VUB VRIJE UNIVERSITEIT BRUSSEL

mobi

fwo Research Foundation Flanders
Opening new horizons

MOBI

Mission statement



supporting and studying the transition towards a more sustainable mobility & logistics system

Key assets

Sustainable logistics

Battery Innovation Centre

Electric and hybrid vehicles

Urban mobility

Key data

40
years of expertise

140 projects
over last 5 years

12
current EU Projects

3.6 M€
turnover 2016

70 +
team members

18
nationalities

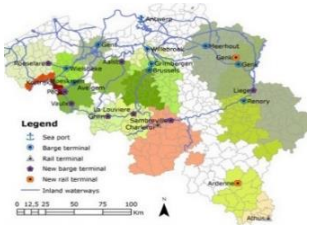
MOBI

Expert tools

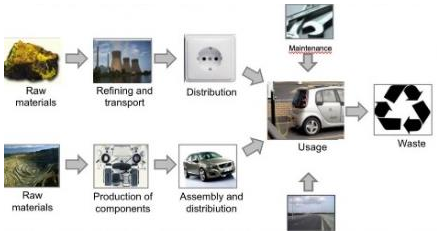
MAMCA ©

Business Modelling

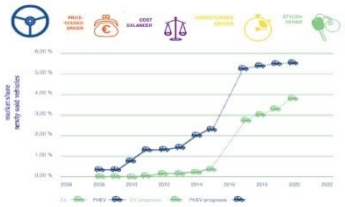
Battery Models



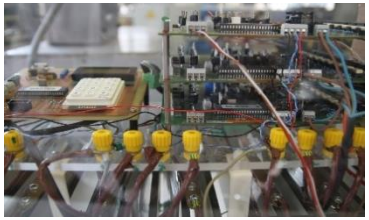
LAMBIT



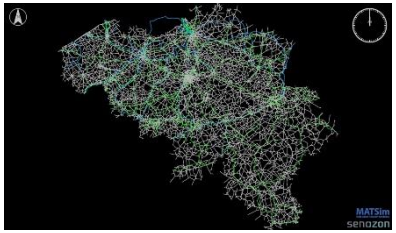
LCA



Consumer Behaviour



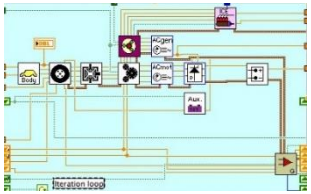
Power Electronics



TRABAM

ECC

Big Data



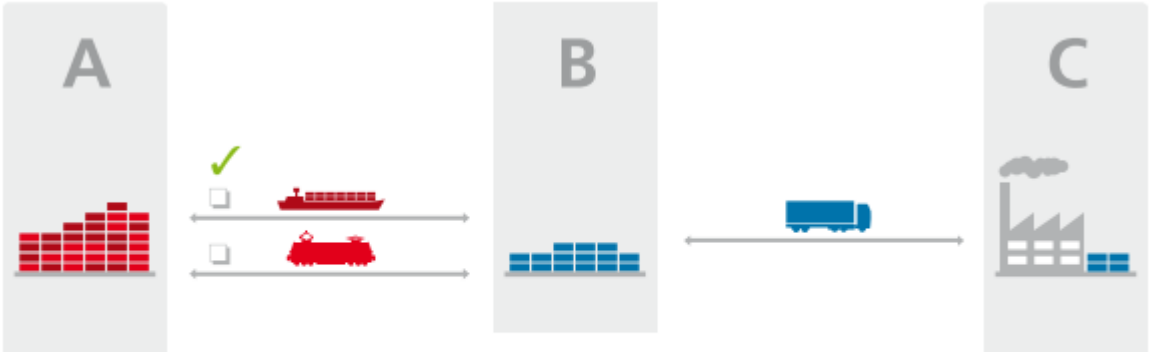
VSP

Location Analysis

2) Synchromodality

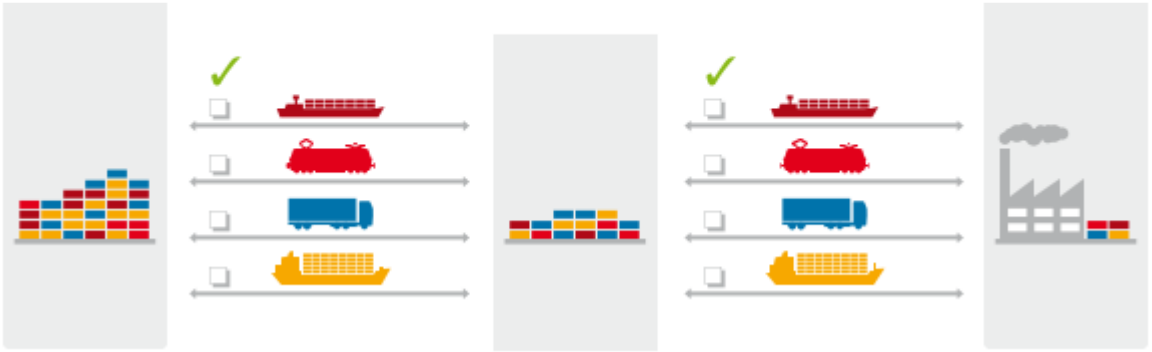
Intermodal

From A to B using barge or train and from B to C (the 'last mile') by truck



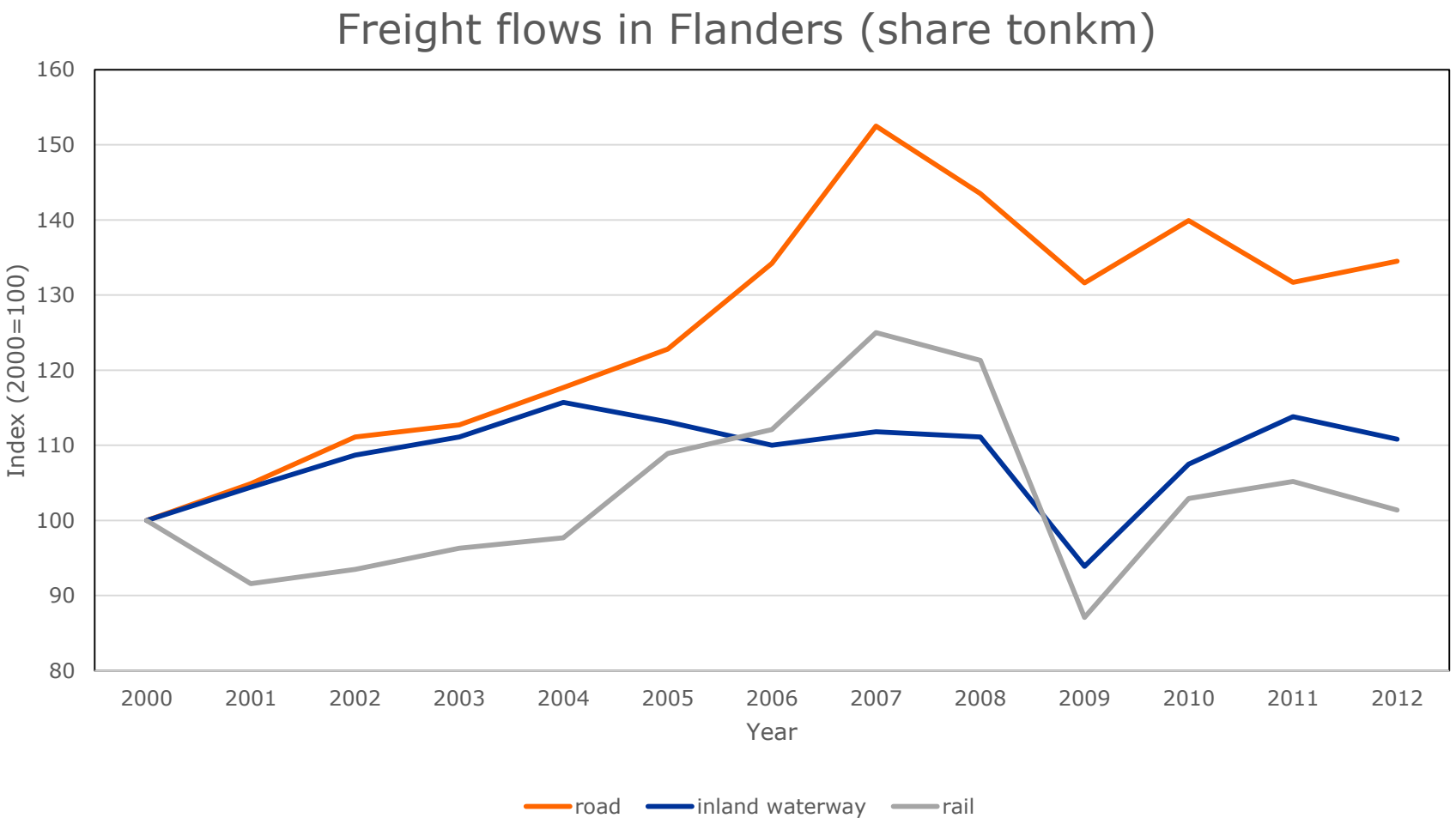
Synchromodal

Maximum flexibility and sustainable system: in A one can chose among different modal options, but also in B and in C for the return



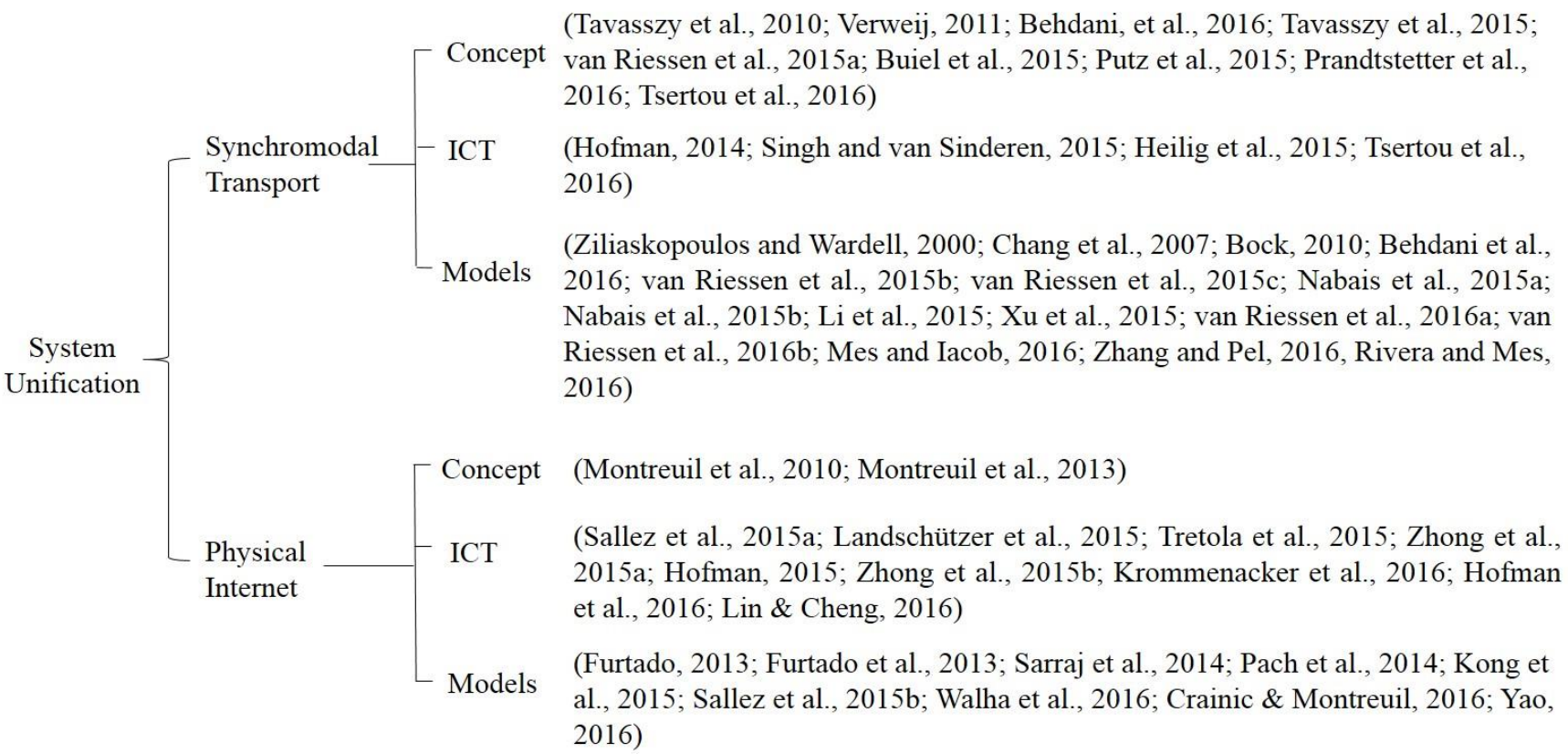
Source: ECT, 2011

2) Problem statement



Source: www.milieurapport.be, based on numbers of Eurostat, FOD MV, NMBS, NV De Scheepvaart, PBV, VMM, W&Z

2) Review of state-of-the-art



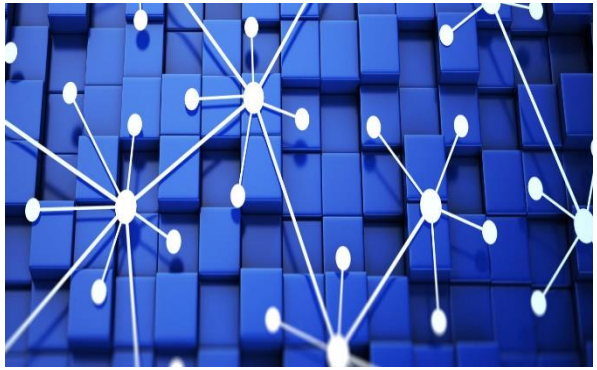
2) Synchromodal characteristics

Real-time

Re-routing

Re-scheduling

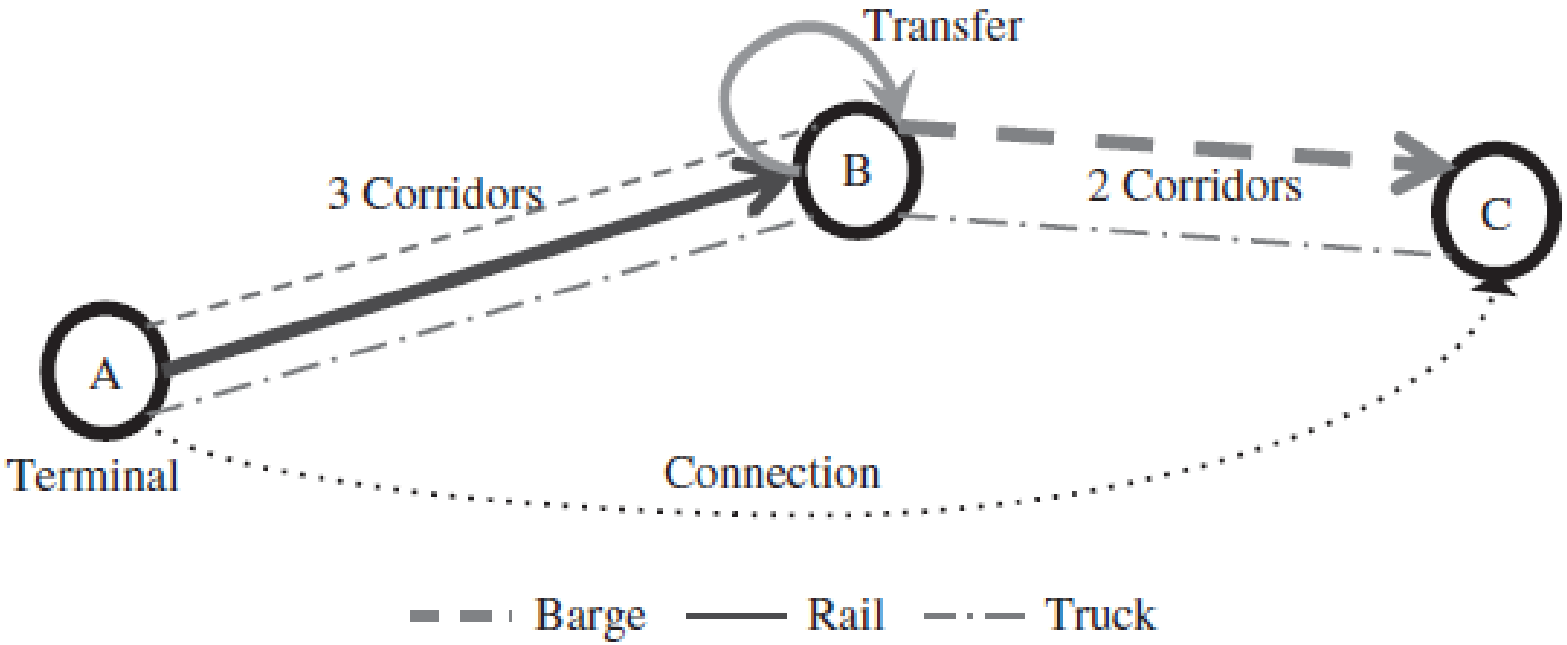
A-modal



Asset planning to Network planning

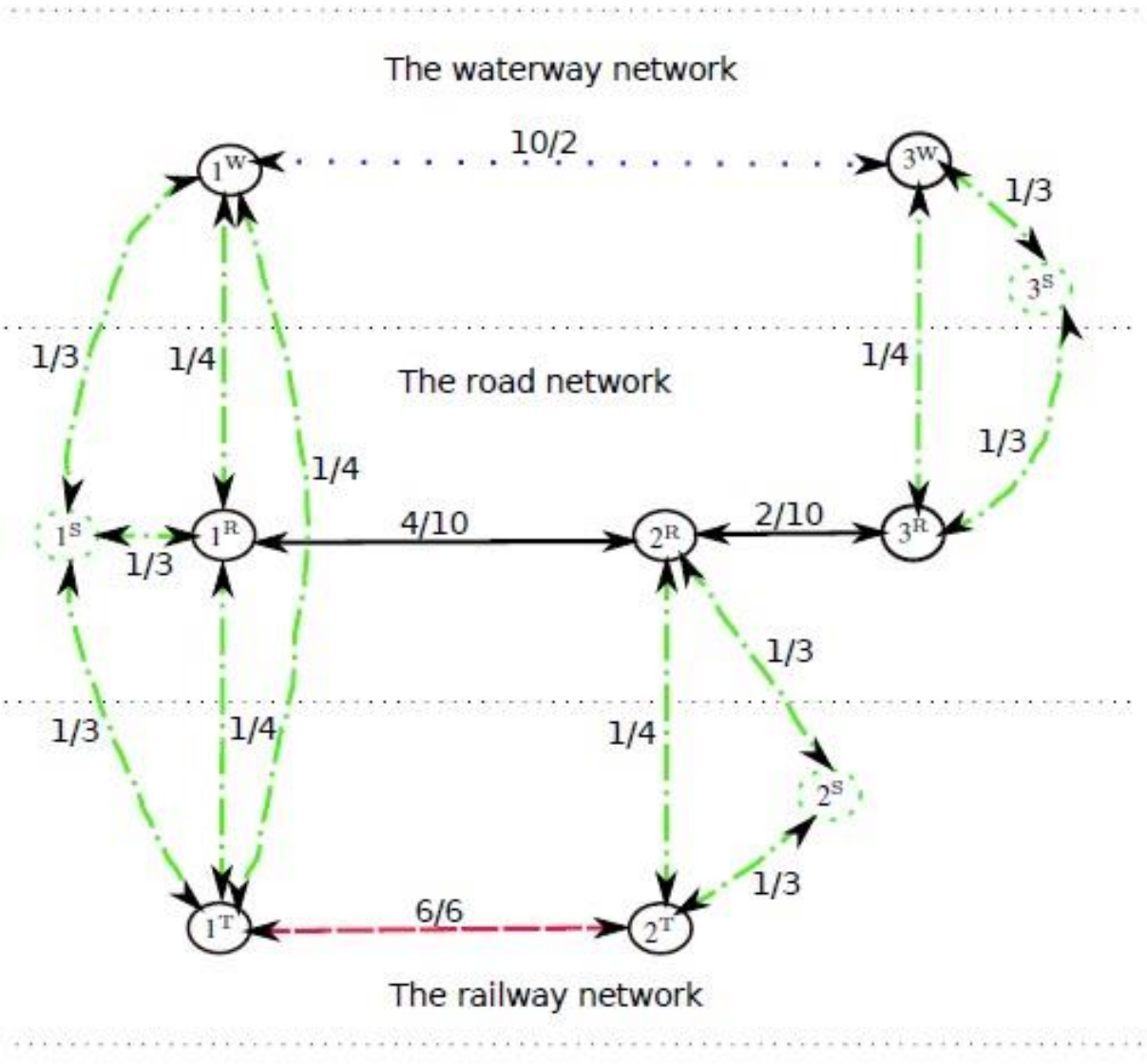
Predict & Prepare to Sense & Respond

2) Current modelling environments



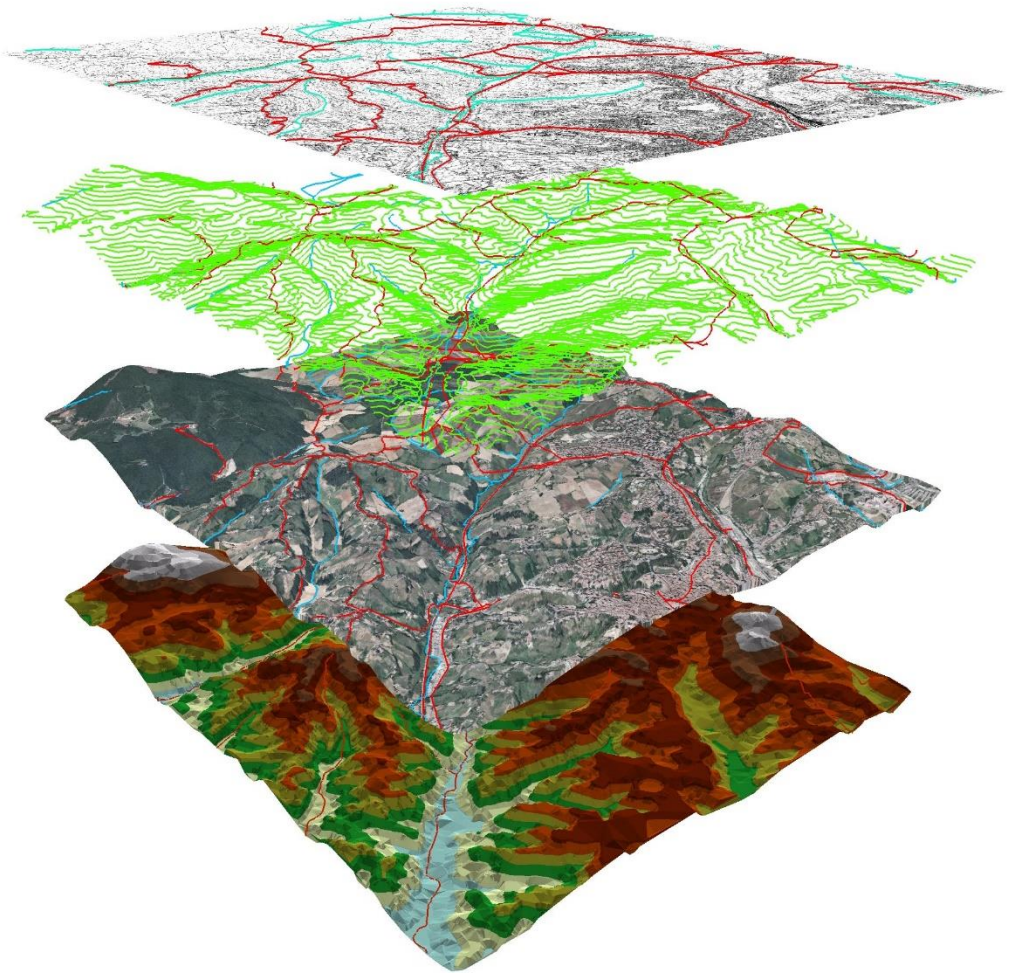
Source: (Van Riessen et al., 2014)

2) Current modelling environments



Source: (Negenborn and De Schutter, 2013)

2) The role of GIS



Source: Smart Max Geosystems

- Capture, store, check and display data
- Analyze patterns and relationships
- Record and represent temporal change and states of agents over time
- GIS spatial queries allow ‘where’ to be physical location, ‘in’ to be enclosure and ‘from’ to be directional

2) Why now?

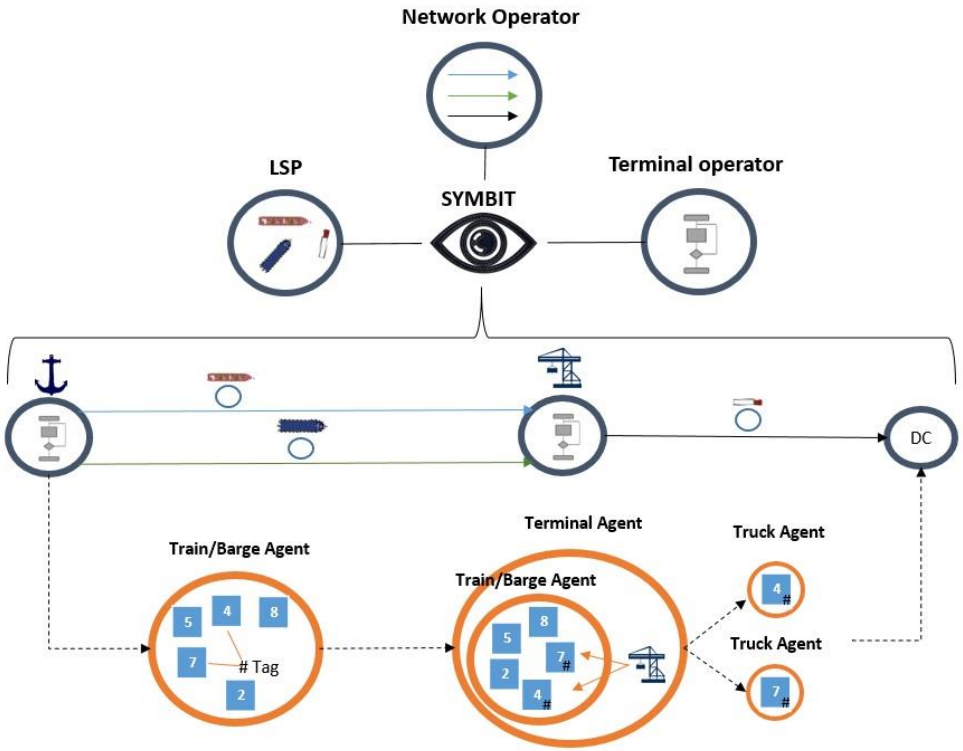
The future evolution of GIS as a DSS is dependent upon improvements in technology since the lack of integrated spatial model management subsystems keep GIS at the thresholds below true DSS (Murphy, **1995**).

ESRI's ArcMacro, AML or Avanue-ArcView

Java, C++, Visual Basic, Python, VBscript, Jscript

Integration of GIS libraries (OpenMap, ArcGIS, GeoTools)

3) Our approach



SYMBIT

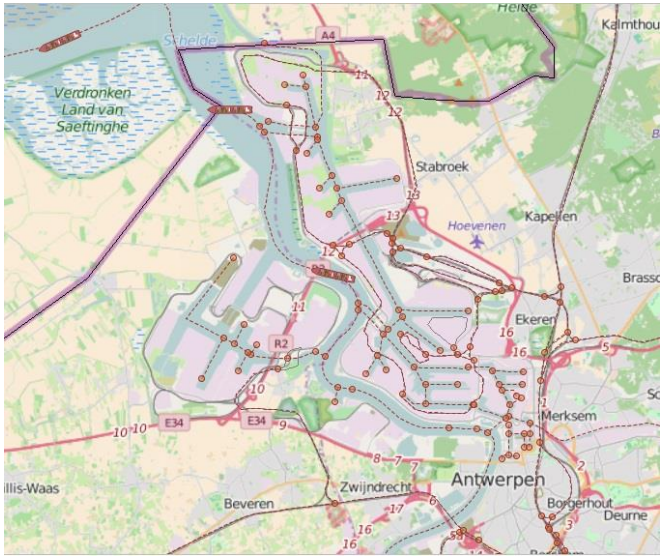
A multimethod model:

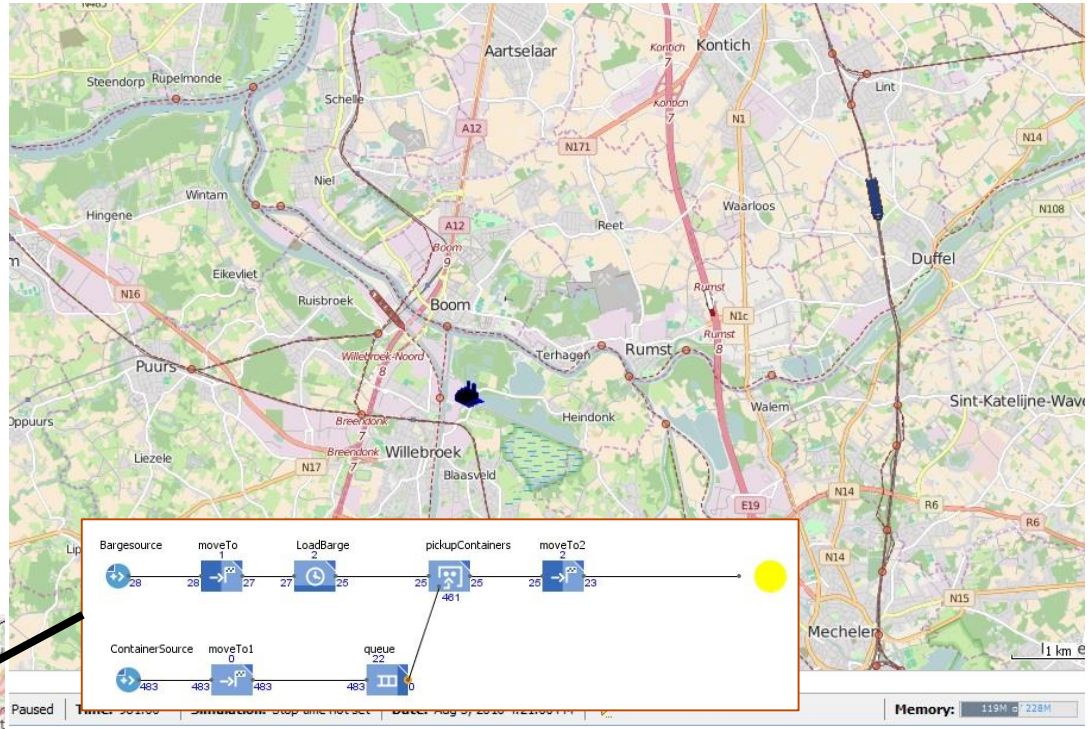
- Agent-based modelling
- Discrete event simulation
- Geographic Information System

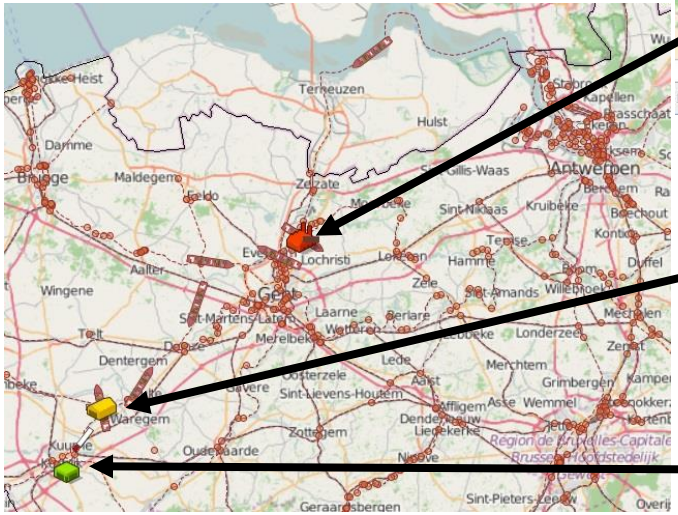
Simulates:

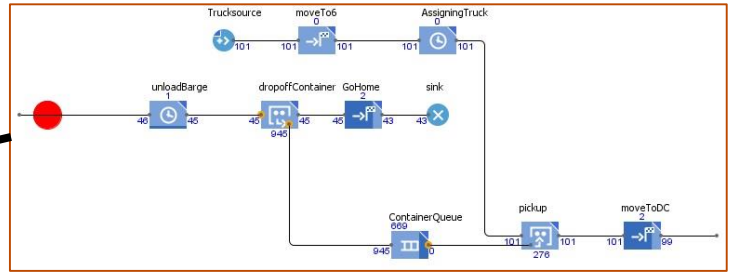
- Bundling and business logic
- Physical flows
- Information flows

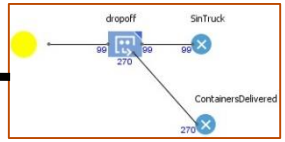
3) SYMBIT (regional)





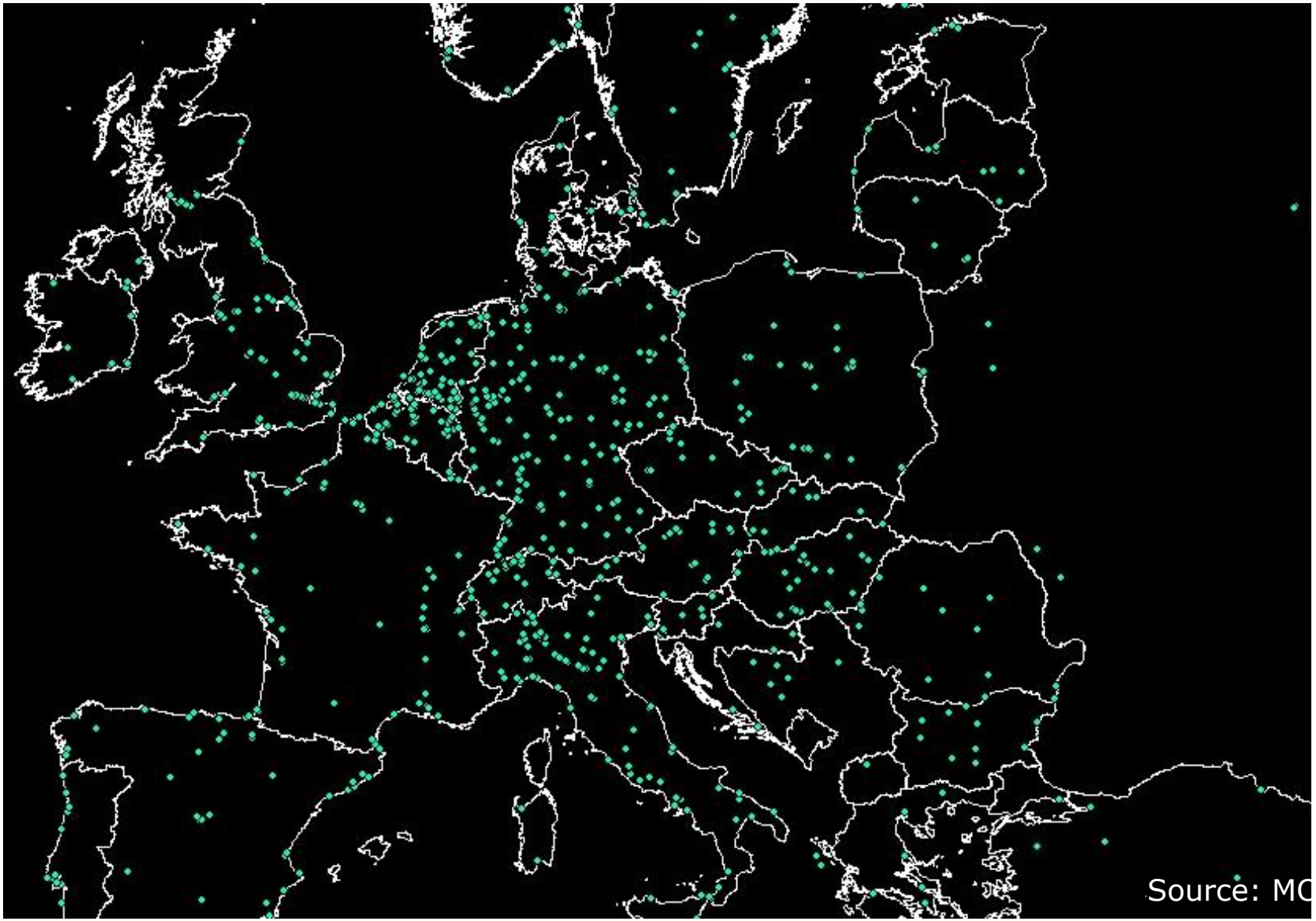






Source: MOBI

3) SYMBIT (EU)



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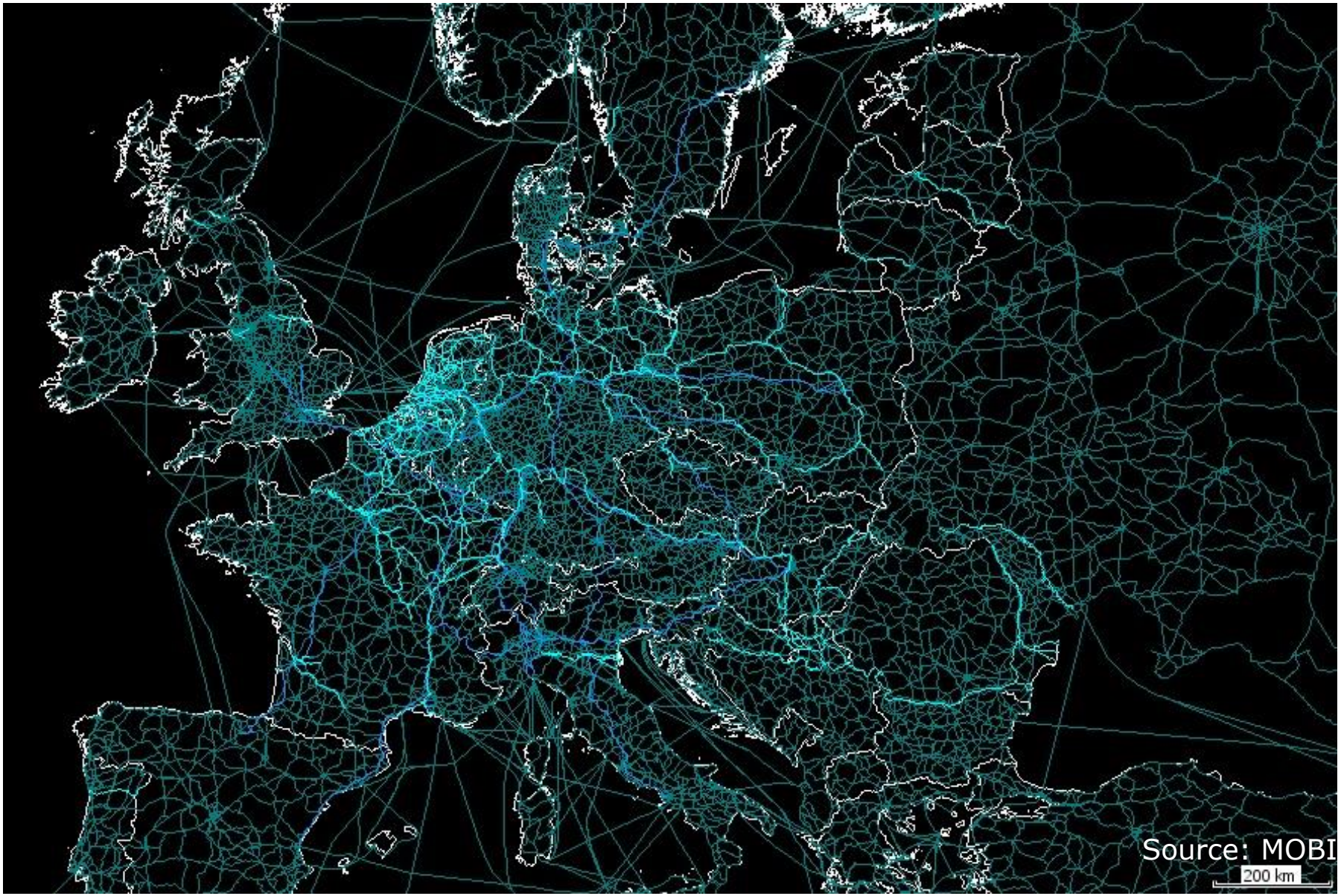

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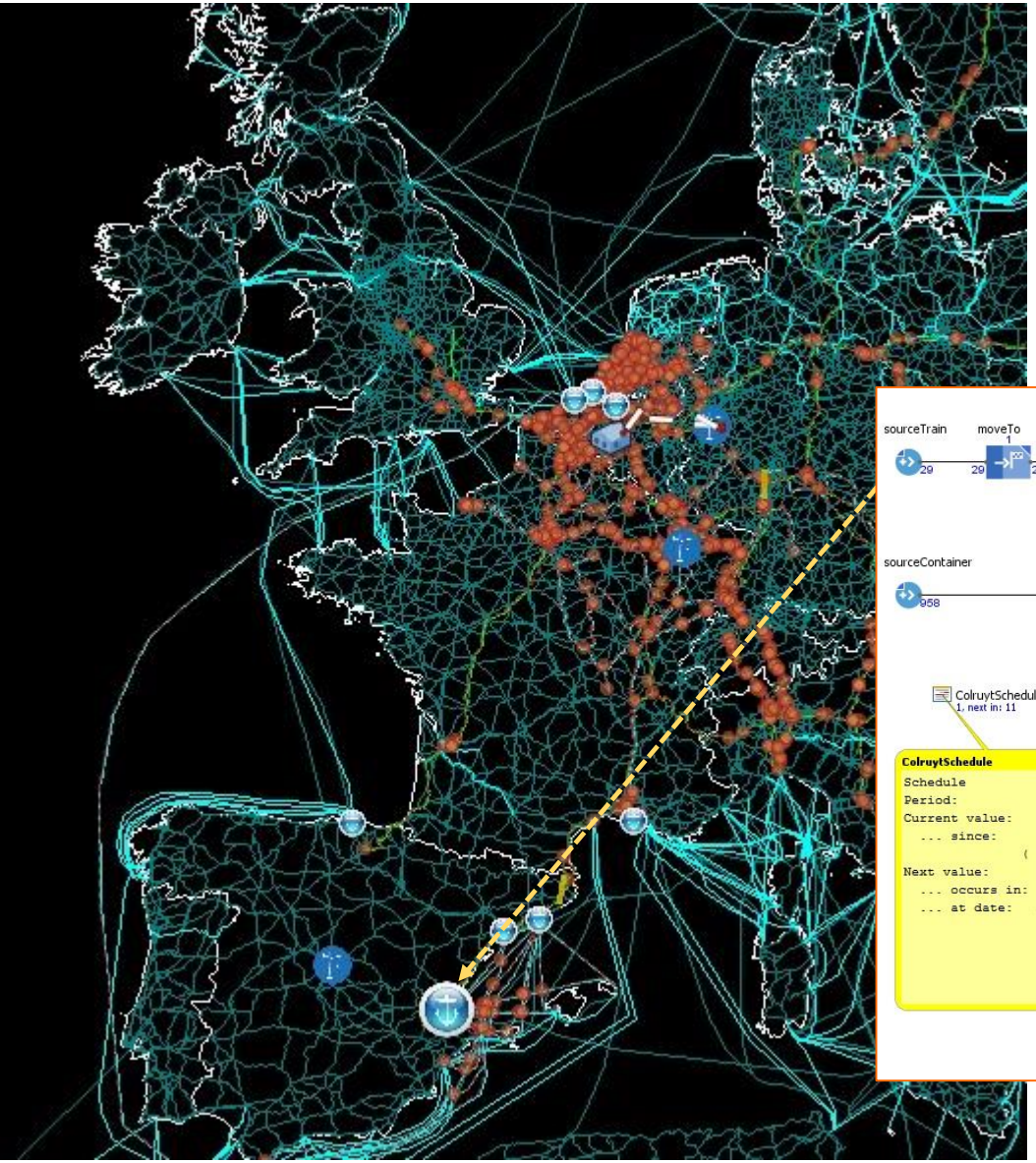
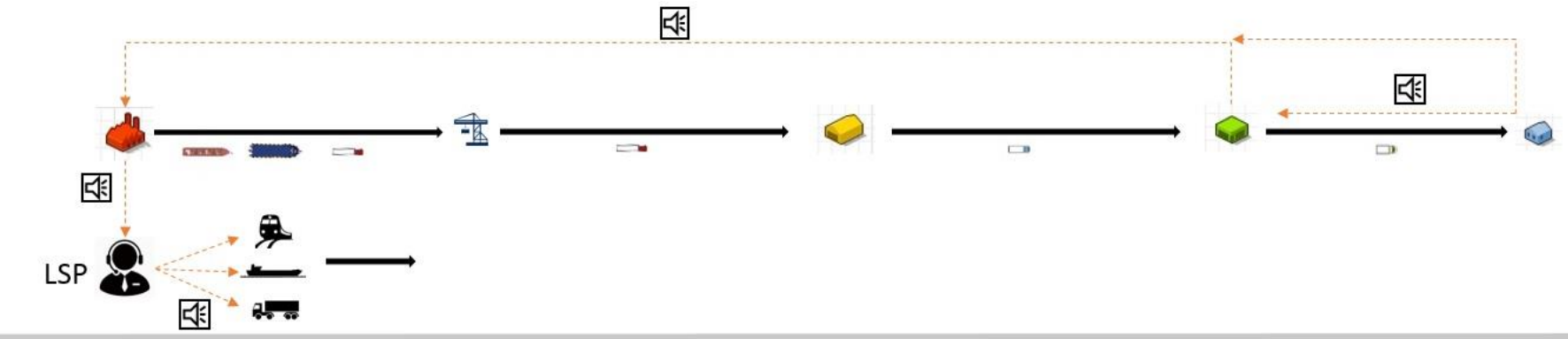
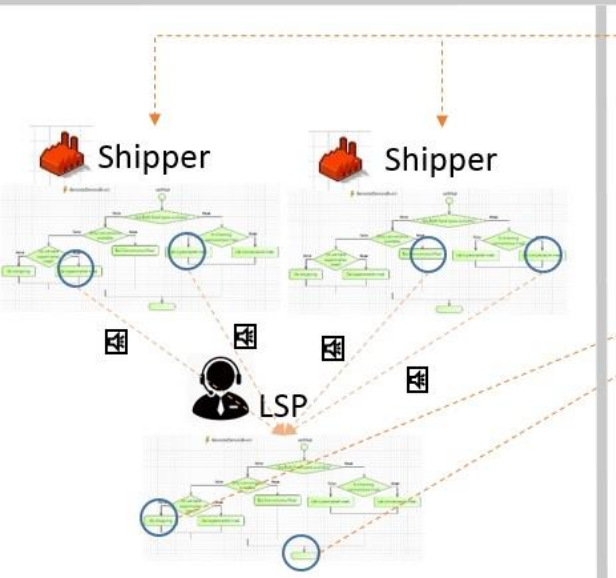


Assesses values per each node or an entity under study

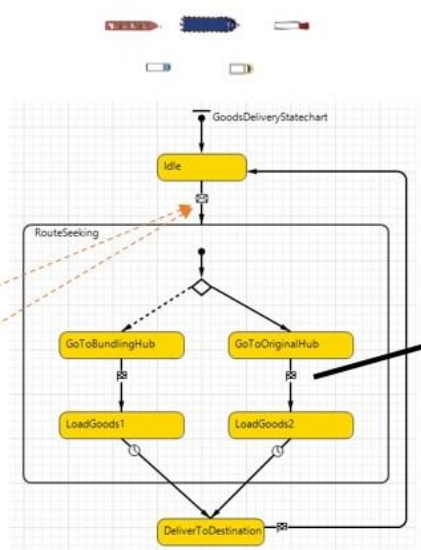
Source: MOBI

3) SYMBIT – under the hood

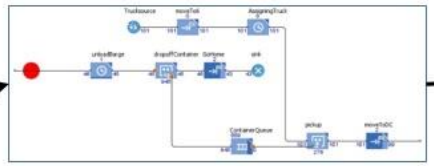




Decision algorithms
Actioncharts



Routing calculations and fill rates
Statecharts



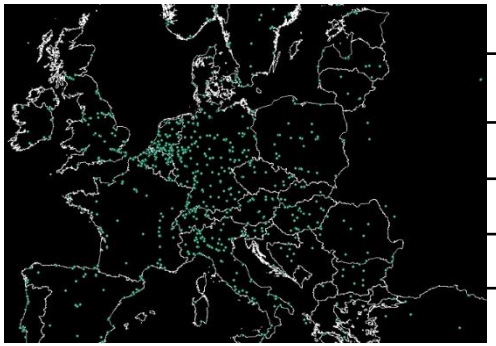
Terminal bundling, crossdocking
Discrete event simulation

Decision algorithms
Actioncharts

Source: MOBI

3) SYMBIT - Architecture summary

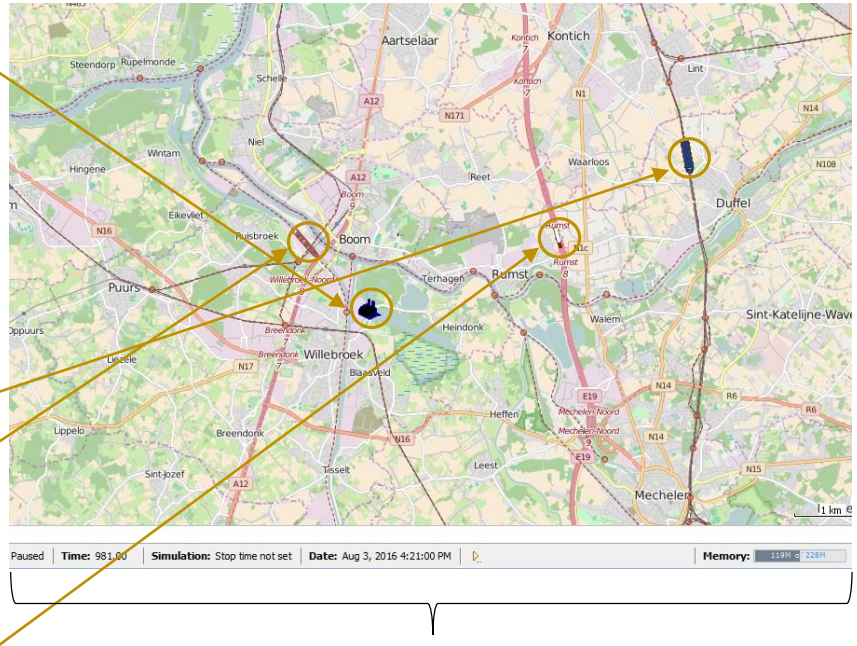
Geo locations of:



- Shippers
- Terminals
- DCs
- Retailers
- Consumers

Routes followed by:

- Trains
- Barges
- Trucks and Lorries

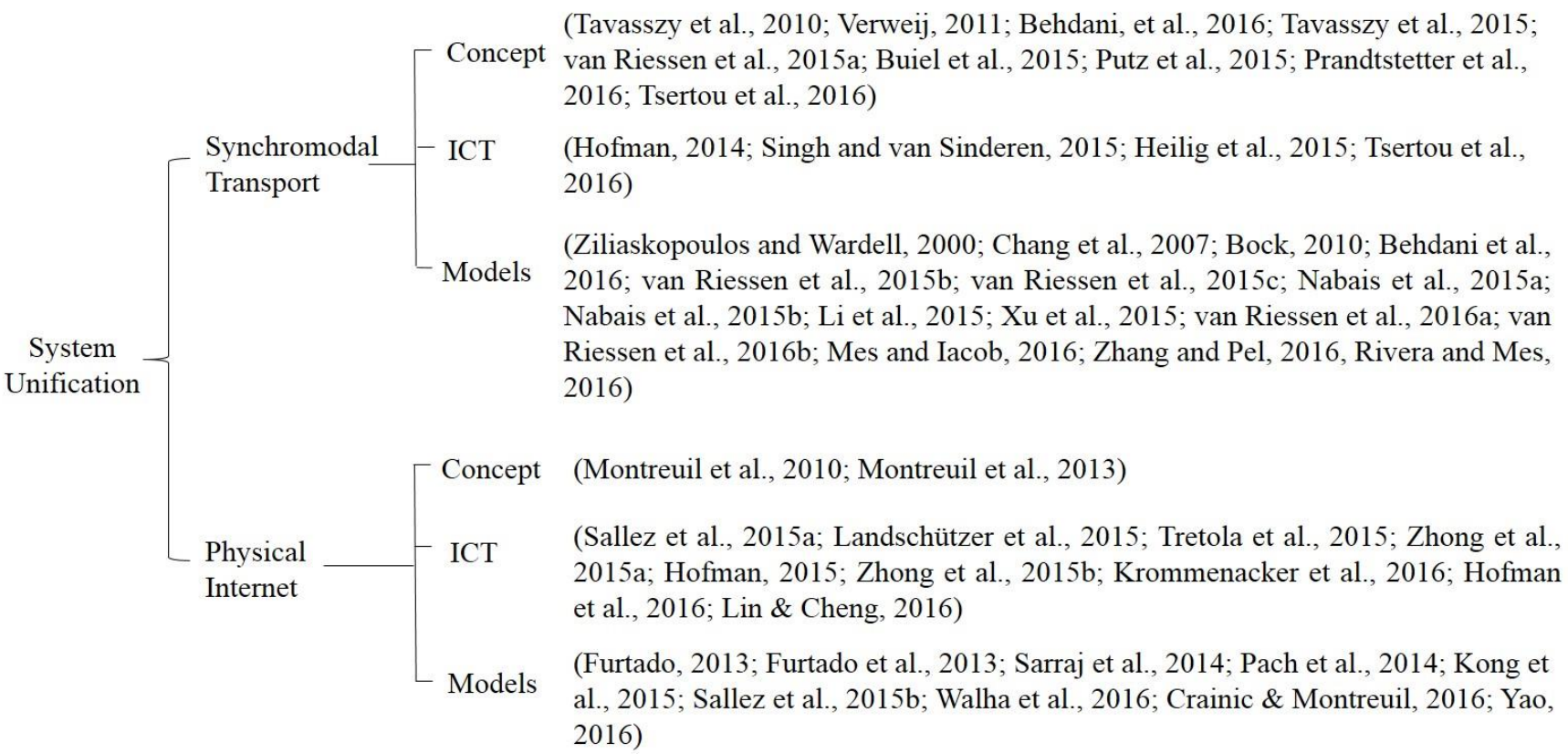


Output:

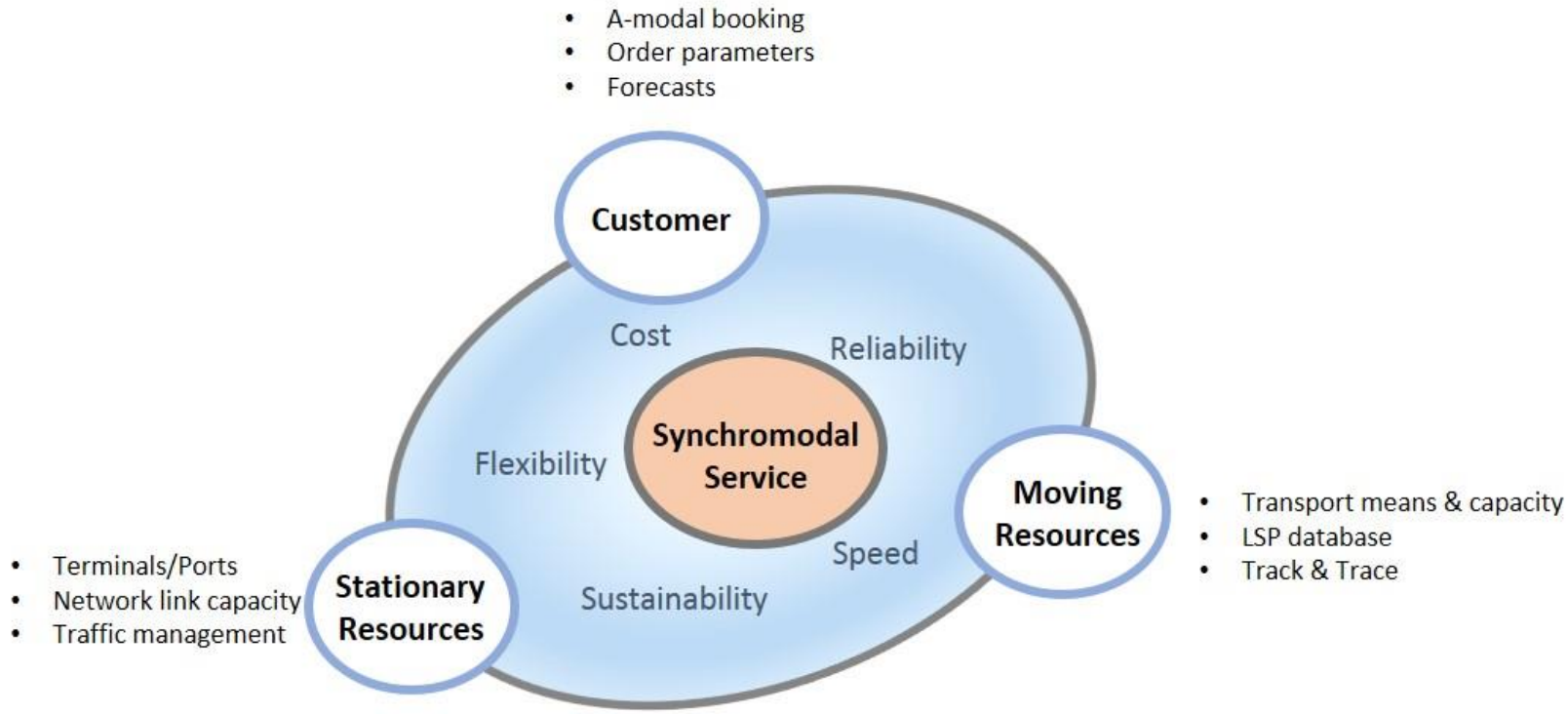
Distances covered, Delivery duration, Fill rates, Emissions, Cost (fixed, variable, handling)

Source: MOBI

4) Unifying synchromodality and physical internet

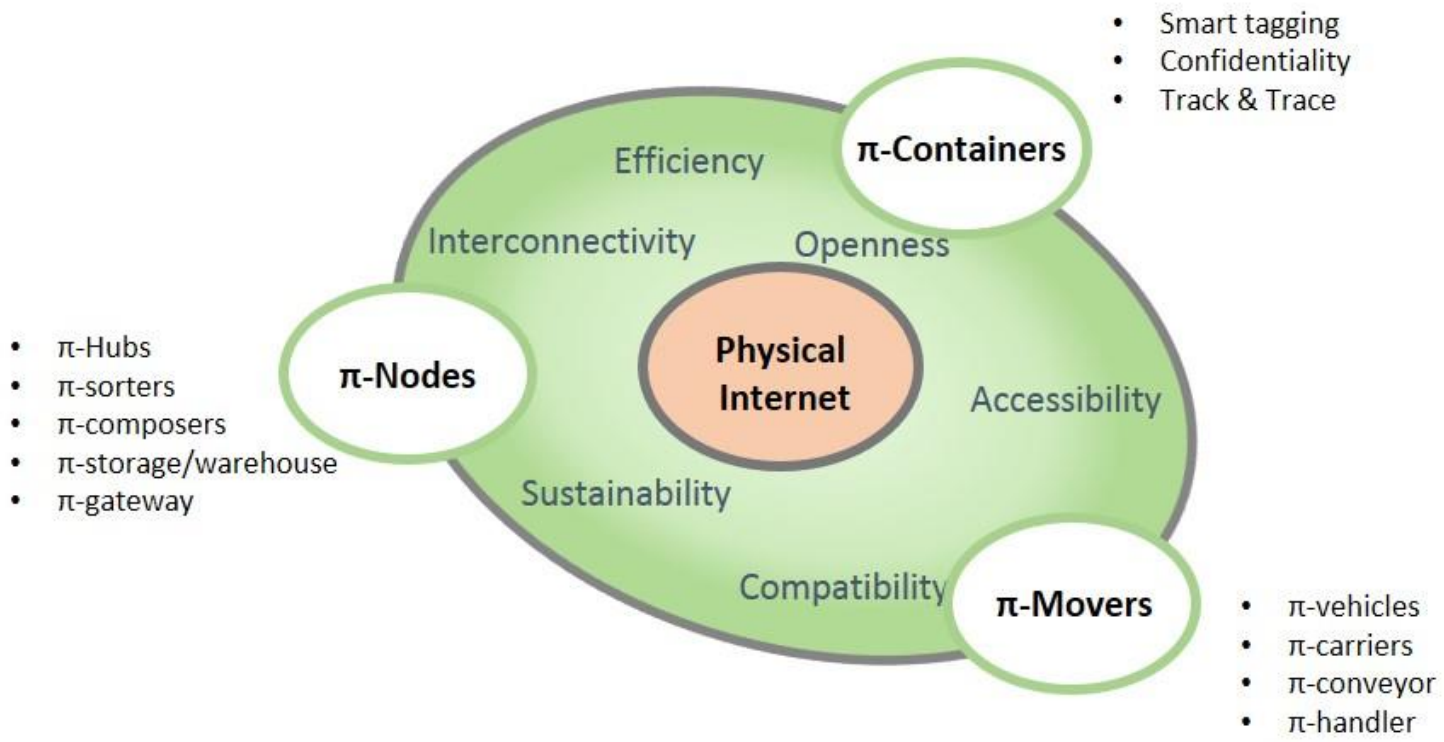


4) Unifying synchromodality and physical internet



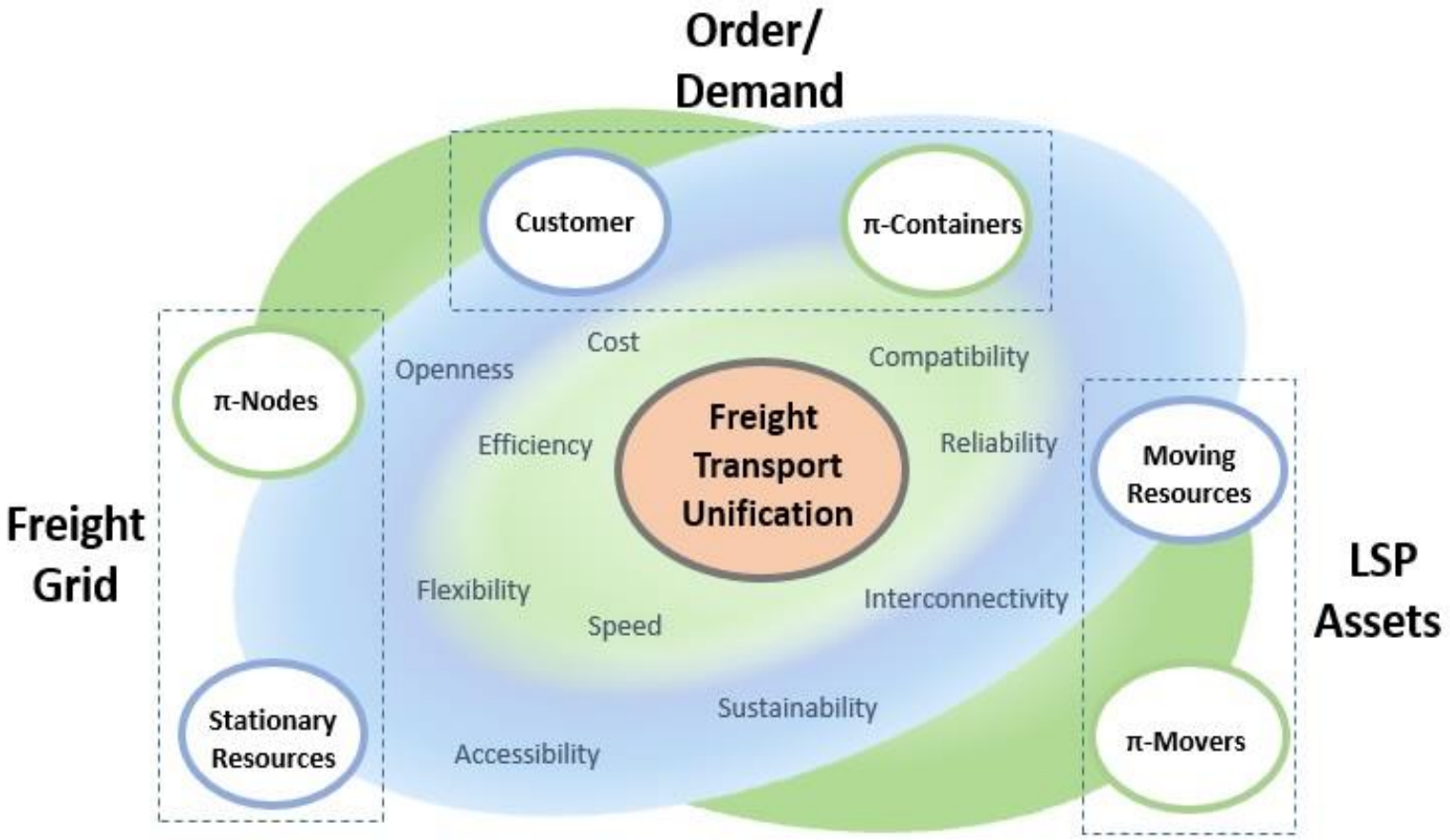
Integrated view of the elements necessary to achieve synchromodal service design. (Source: own setup, based on Behdani et al. (2016))

4) Unifying synchromodality and physical internet



Integrated view of the elements constituting the Physical Internet (Source: own setup, based on Montreuil et al. (2010))

4) Unifying synchromodality and physical internet

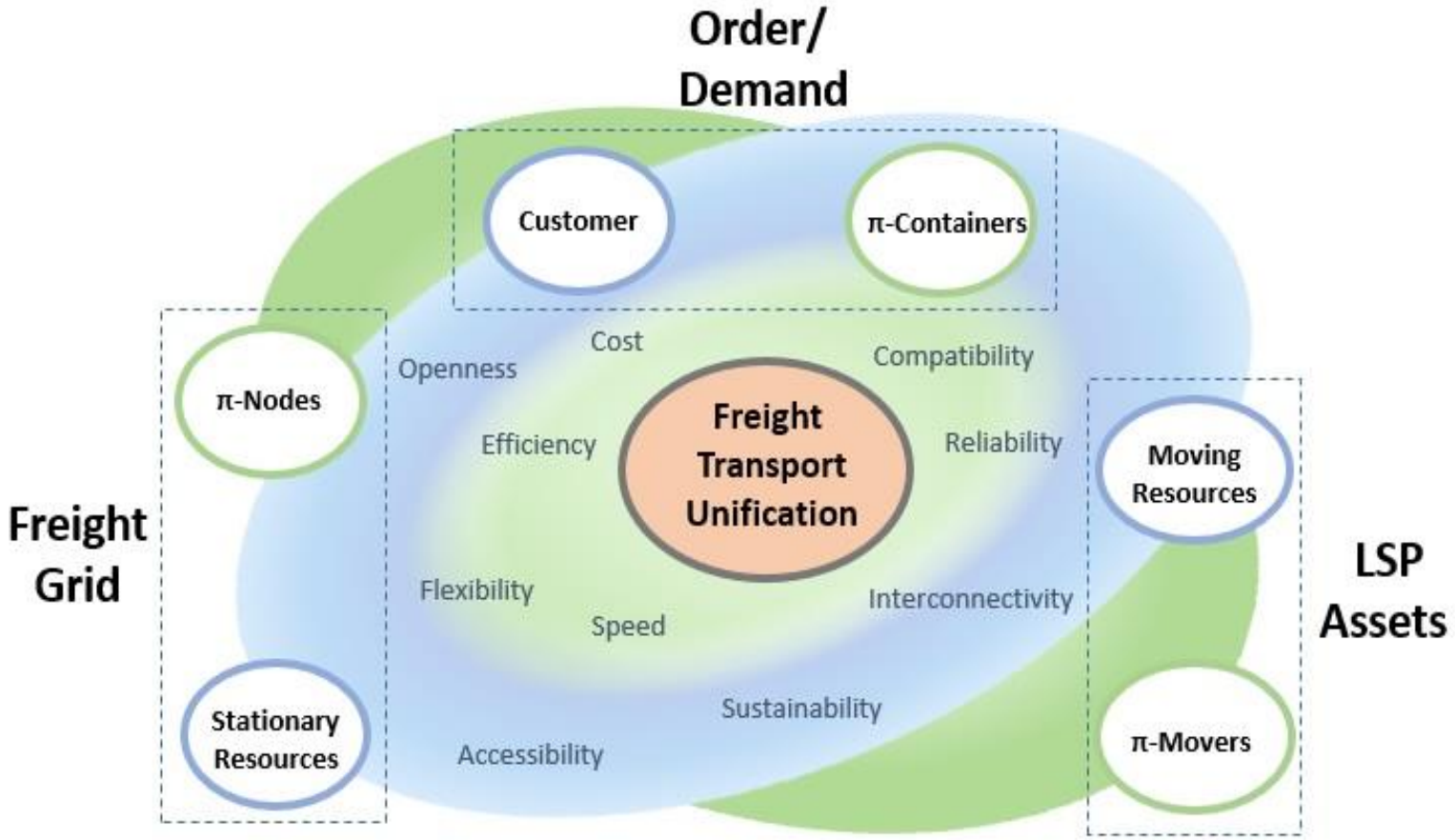


4) Unifying synchromodality and physical internet

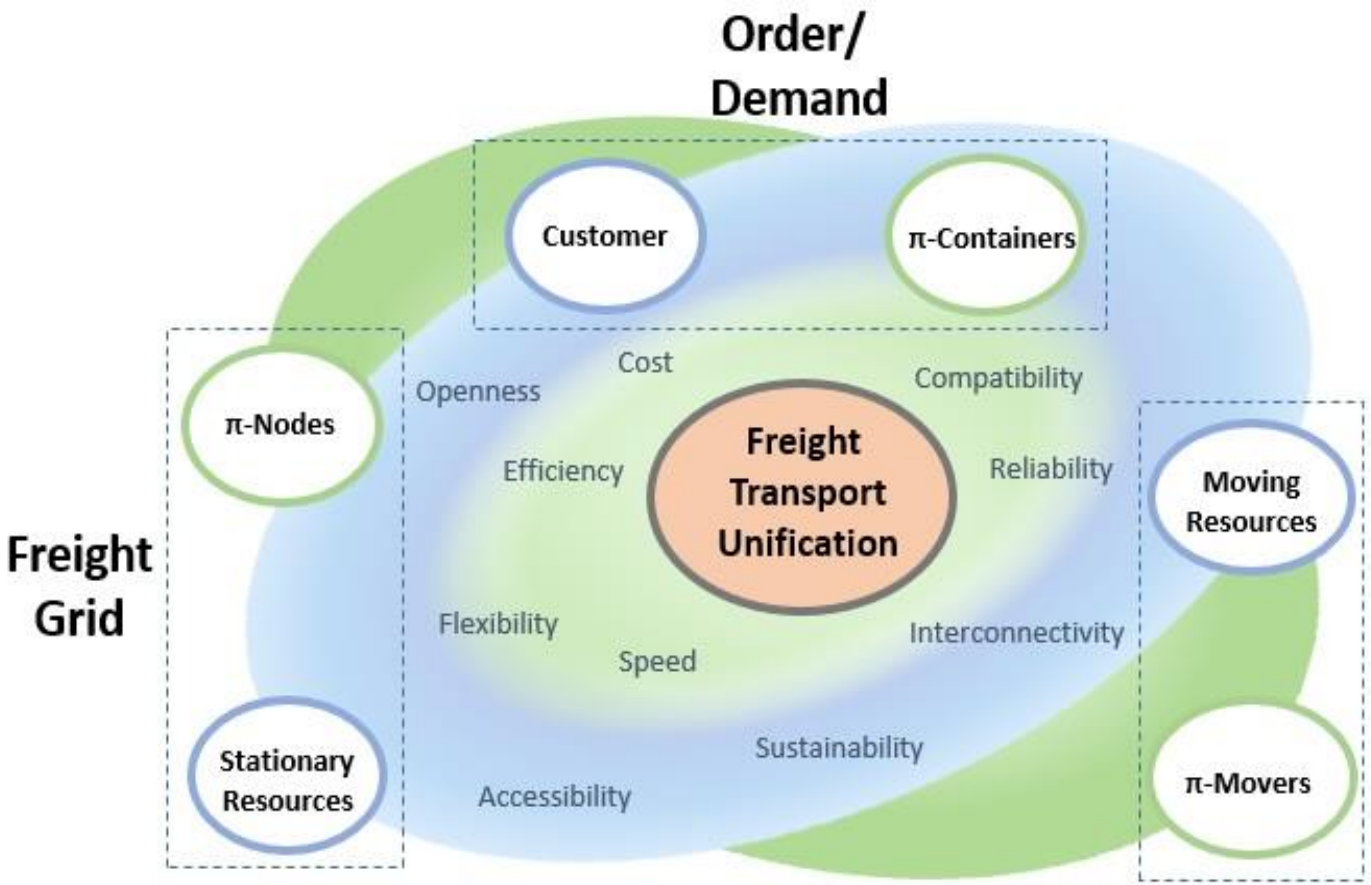
PI box - trust

p- and h-containers/
warehouse level

t-containers/
Interregional management



4) Unifying synchromodality and physical internet



Automation/compatibility

PI community

Event handling

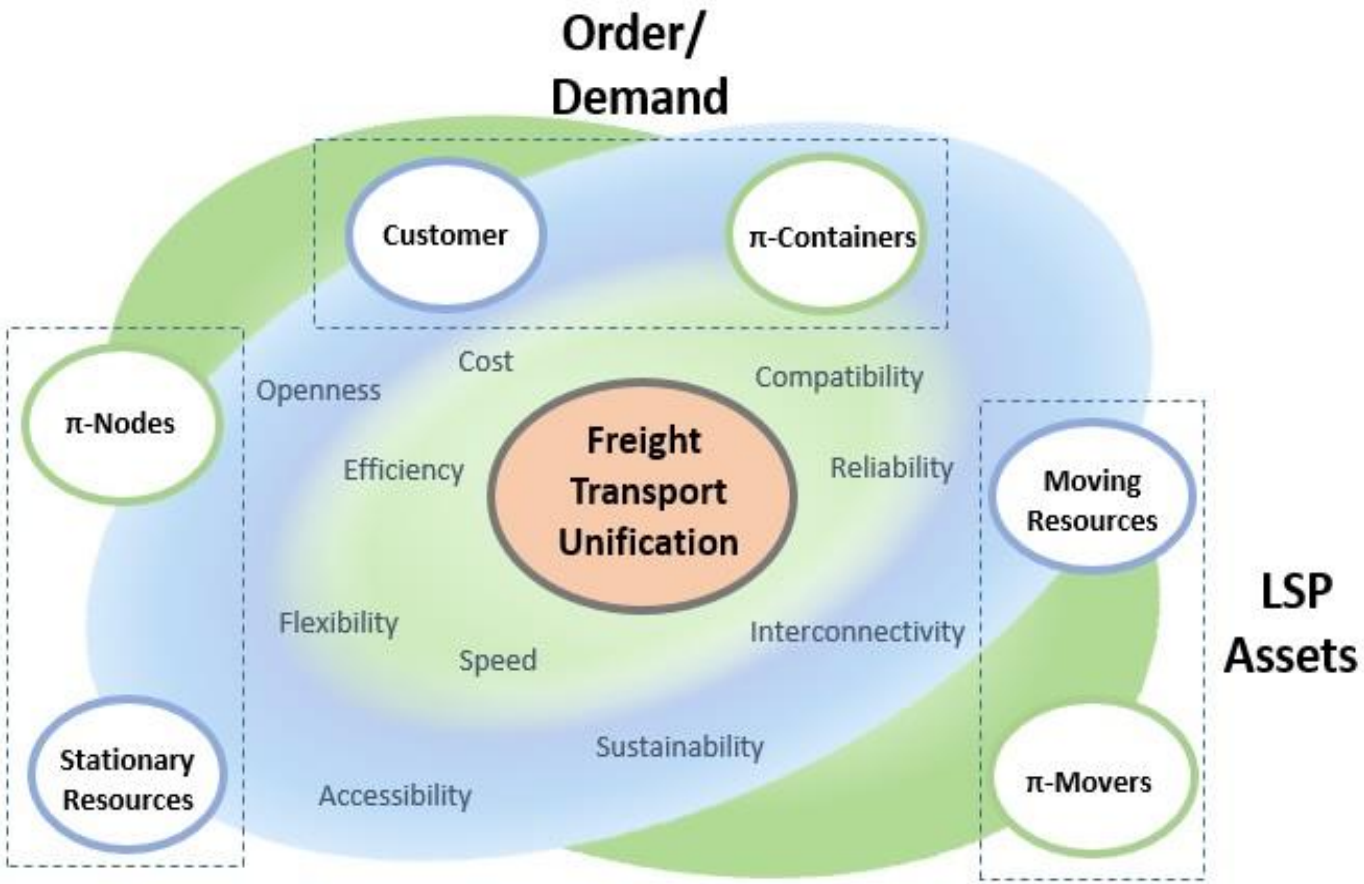
Disturbance management

4) Unifying synchromodality and physical internet

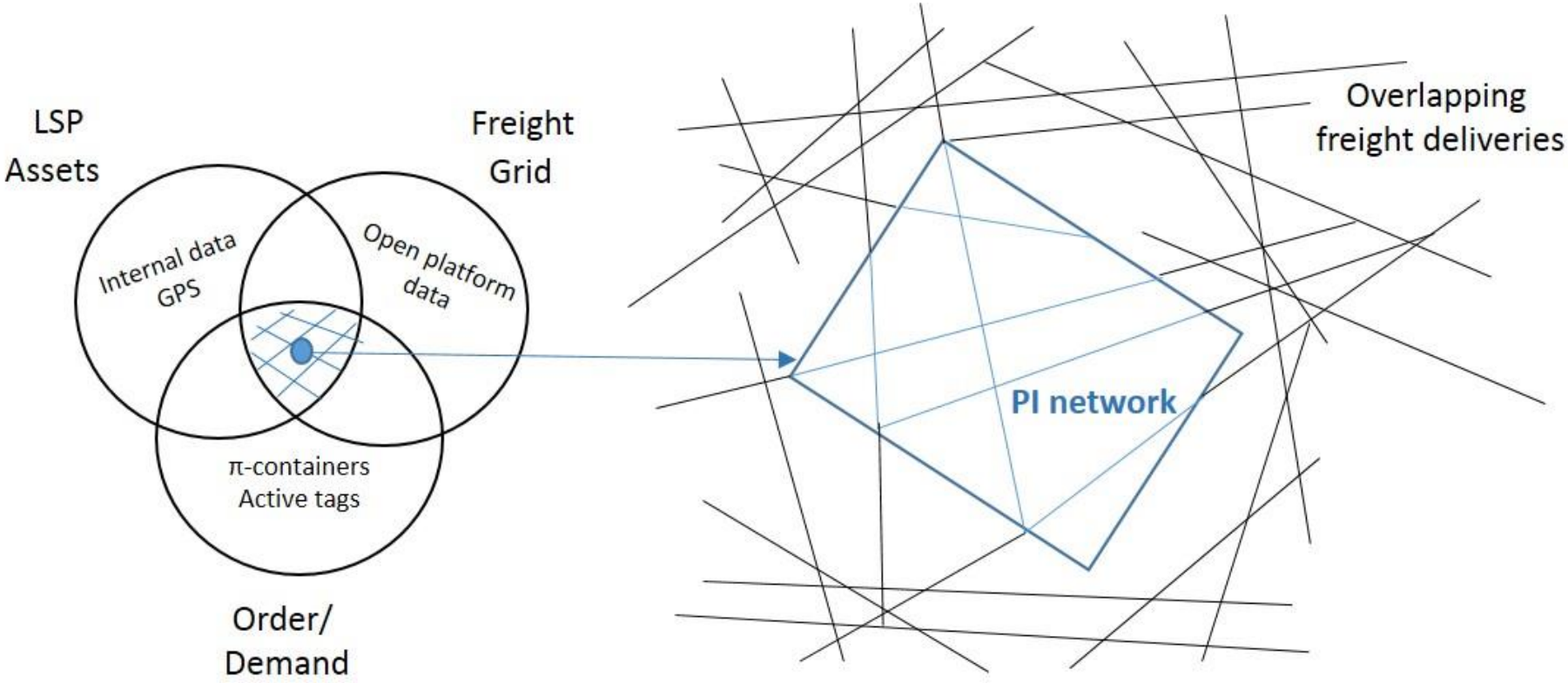
External + Internal developments

Network flow/ Cost structure

ETAs/ Predictive control



5) Where do we stand?



Conceptual illustration of a transparent and resilient freight network

Thank you for your attention!

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Business Models in Physical Internet Systems - Findings from the ATROPINE project

Brandtner Patrick, Plasch Michael, Simmer Laura, Schauer Oliver

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UNIVERSITY OF APPLIED SCIENCES UPPER AUSTRIA

Research Background

- By seamlessly integrating locating technologies, sensors, mobile data transmission, cloud computing, data analytics and other technologies, the **physical internet (PI) seeks** to **create open, global logistic systems, which**
  - significantly **increase capacity utilization** of transport routes by generating and taking advantage of synergies through **bundling effects** along the entire supply chain,
  - open up several **new opportunities** but also **challenge existing routines & business models**.

- In order to realize PI systems and to benefit from their effects, several **innovations and advancements in different areas are inevitable,** one of these being **business model innovation**:
  - Innovative strategies and business models and the consideration of their effects on existing processes and routines represent the basis for **progressing from traditional SCs to collaborative PI systems**.

- This presentation discusses current findings (WIP!) in the area of **business model innovation in PI systems** gained in the **research project ATROPINE**.

ATROPINE – The Project

The project ATROPINE (Fast Track to the Physical Internet) aims to **demonstrate a PI region in Upper Austria and to bring regional businesses** and especially all **participating logistics partners** on **a 'Fast Track to the Physical Internet'**.

Project goals

- promoting the vision of the Physical Internet in Upper Austria
- establishing a PI model region
- bringing key elements of the Physical Internet to life in real business environments
- triggering the innovation chain along industry, education and research

Funded by

- Upper Austrian Government
- Industry partners

Project volume

- € 1.400.000,- (including industry contributions of € 410.000,-)

ATROPINE - Research Team

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ATROPINE – Company Partners

Application partners from business:

Best-in-class partner from industry & trade

- ALDI/HOFER, Lenze, Vetropack, delfortgroup…

Integrators, IT & Logistic Technology Provider

- SAP, SHI, Knapp, barcotec...

Logistics service providers

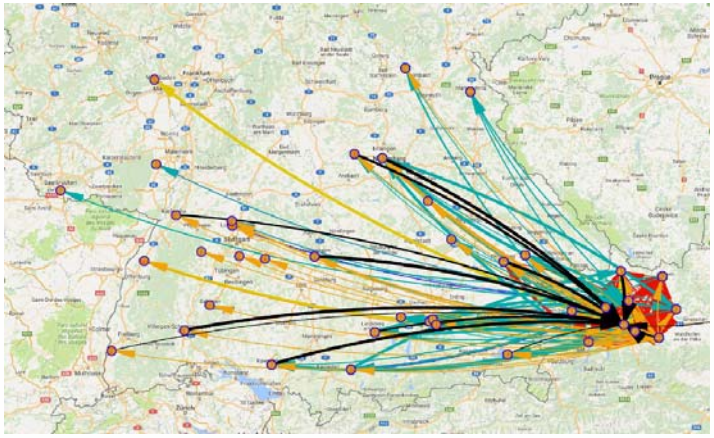
- Quehenberger, Eurotrans, Schneckenreither, …

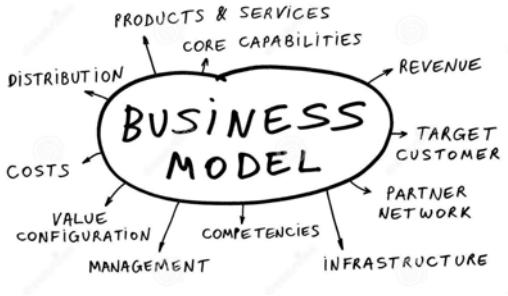
Representations of interest

- Chamber of Commerce, Industrial Association

Project Setting: ATROPINE “Peer Groups”

- **Project team of about 30 researchers and industry partners**
- **Work in 3 different ‘peer groups’:**
  - Modeling, interaction, simulation and optimization
  - Legal Framework
  - Business Model





Peer Group - Business Model Objectives and Outputs

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- Analyze the **framework conditions for collaborative business models and operational structures** which allow and promote cross-industry, synergetic use of existing infrastructures and transport resources.
  - Data?, Legal Aspects?, Coopetion-Readiness?, Value Creation?, etc.

- Understand the **shape and levels of an ATROPINE-like / PI-ready business model** including the platform user's, operator's and investor's point of view and motivation / drivers (in theory and practice).

- Develop **concrete business model concept** for potential **platform operators and investors.**

Starting with a vision.

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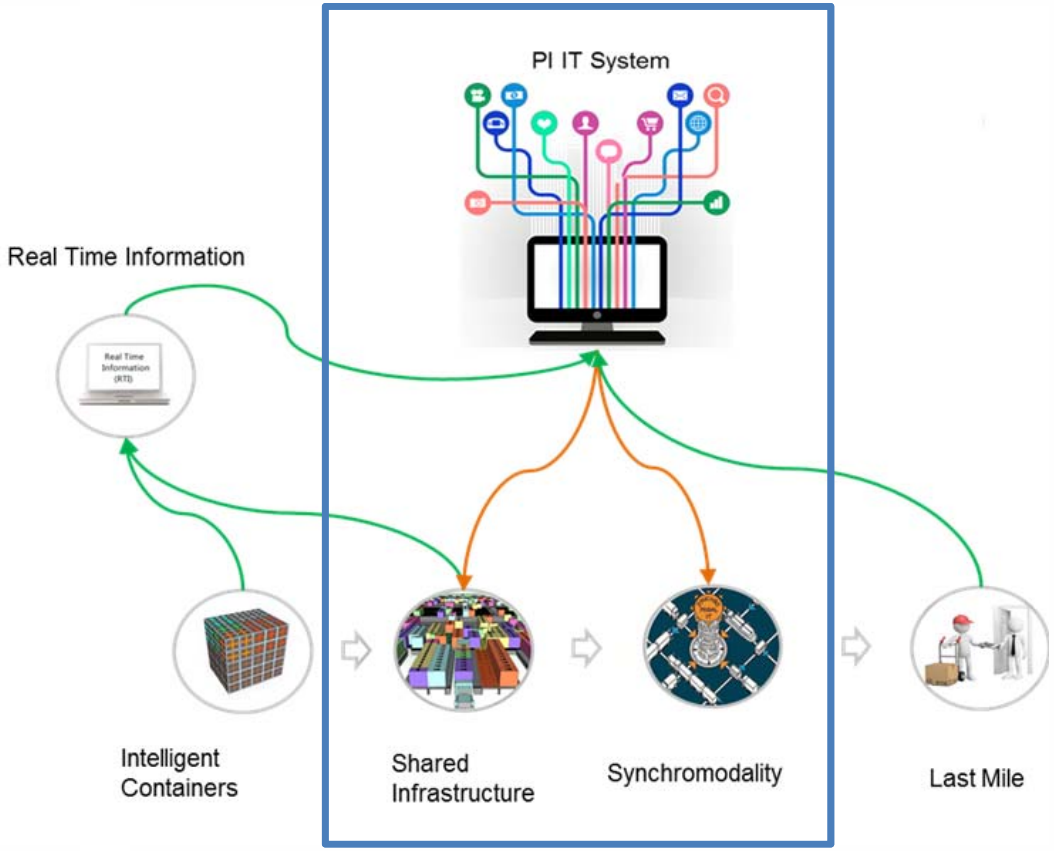
ATROPINE Vision

Creation of an IT-based **PI-Platform** that:

- **Connects** LSPs, Shippers and third parties
- Allows for more efficient capacity **utilization** by identifying and recommending **bundling effects** between platform members
- Enables the **creation** of new / adapted business models



Elaborating the framework conditions for a PI platform.

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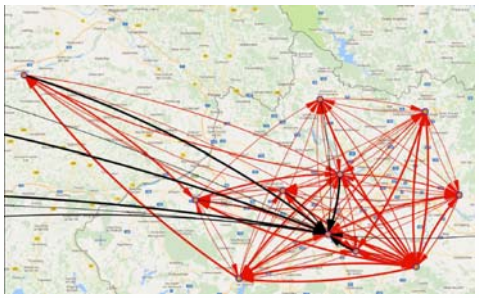
ATROPINE Vision

Technological Framework

Legal Framework

Software…



Hardware…

Atropine Transport- und Lagerbedingungen (ATLB)

1. Einleitende Bestimmungen:

1.1. Diese Allgemeinen Geschäftsbedingungen für Transport- und Lagerleistungen, nachfolgend „ATLB", gelten für alle Verkehrsverträge, also Speditions-, Fracht- (auch Lohnfuhrverträge) und Lagerverträge oder sonstige üblicherweise zum Speditionsgewerbe gehörende Geschäfte und in diesem Zusammenhang stehende logistische Leistungen (zB Zollabwicklung, Sendungsverfolgung, Umschlag, Kommissionieren, Bildung von Ladeeinheiten, Etikettieren und Verwiegen von Gütern und Retourenabwicklung) über die PI-Plattform Atropine durch den Dienstleister, nachfolgend „DL".

1.2. Die Anwendbarkeit Allgemeiner Vertragsbedingungen des DL, insbesondere lokaler Spediteurbedingungen wie zum Beispiel AÖSp, ADSp oder Fenex gelten – soweit anwendbar - nur in Ergänzung der ATLB. Die ATLB gehen diesen Bestimmungen vor.

1.3. Sollten einzelne Bestimmungen oder Teilbestimmungen der ATLB nichtig, unwirksam oder undurchführbar sein, wird die entsprechende Bestimmung

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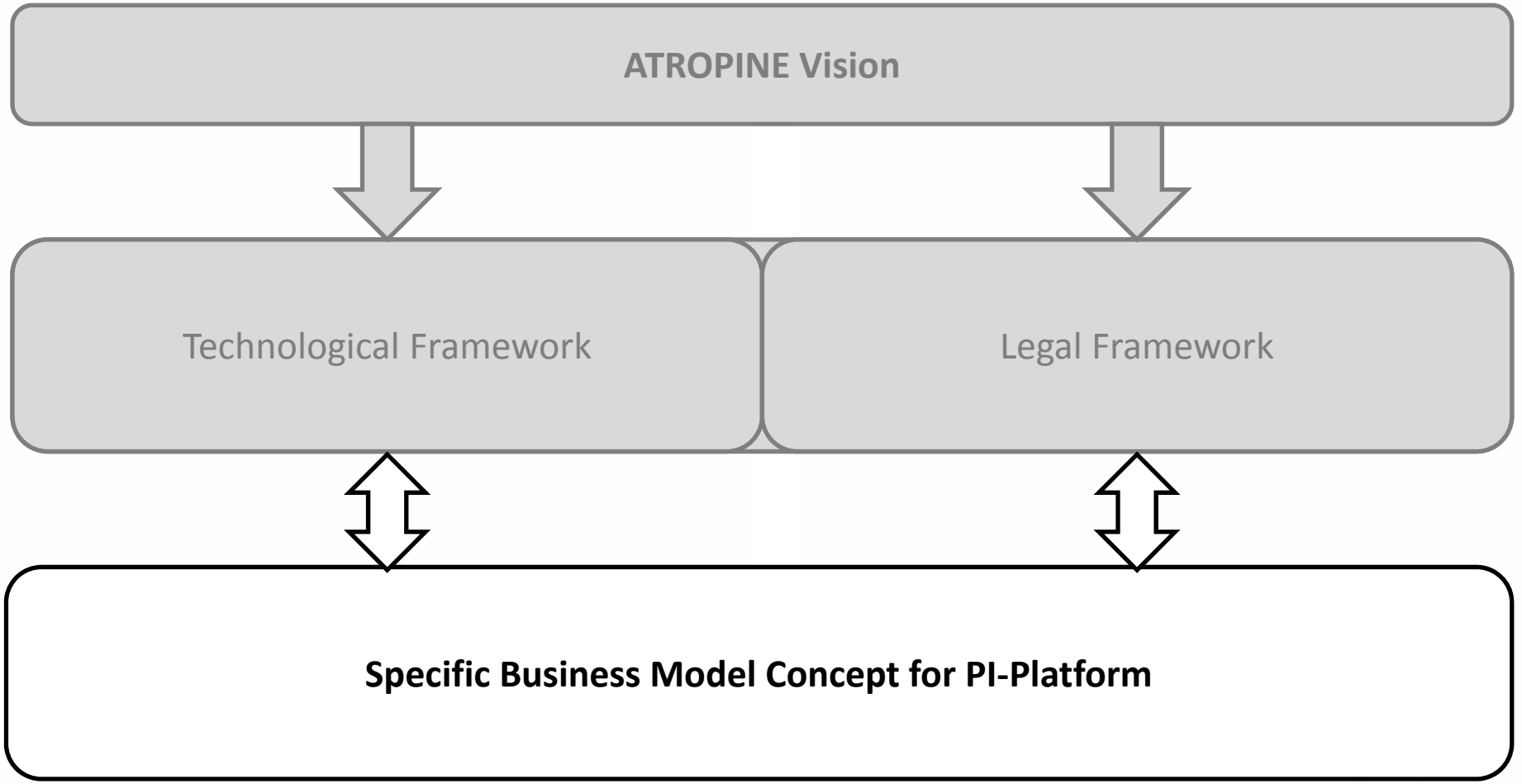
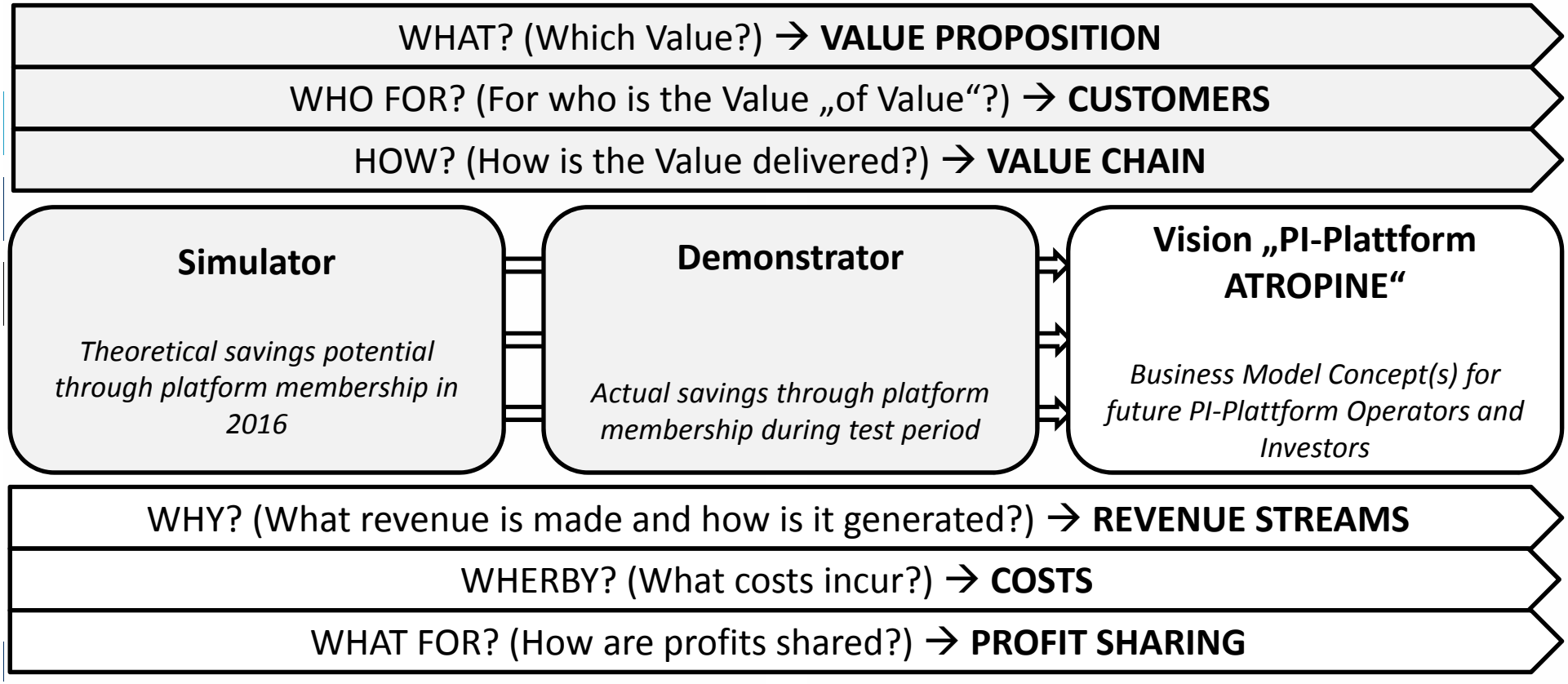
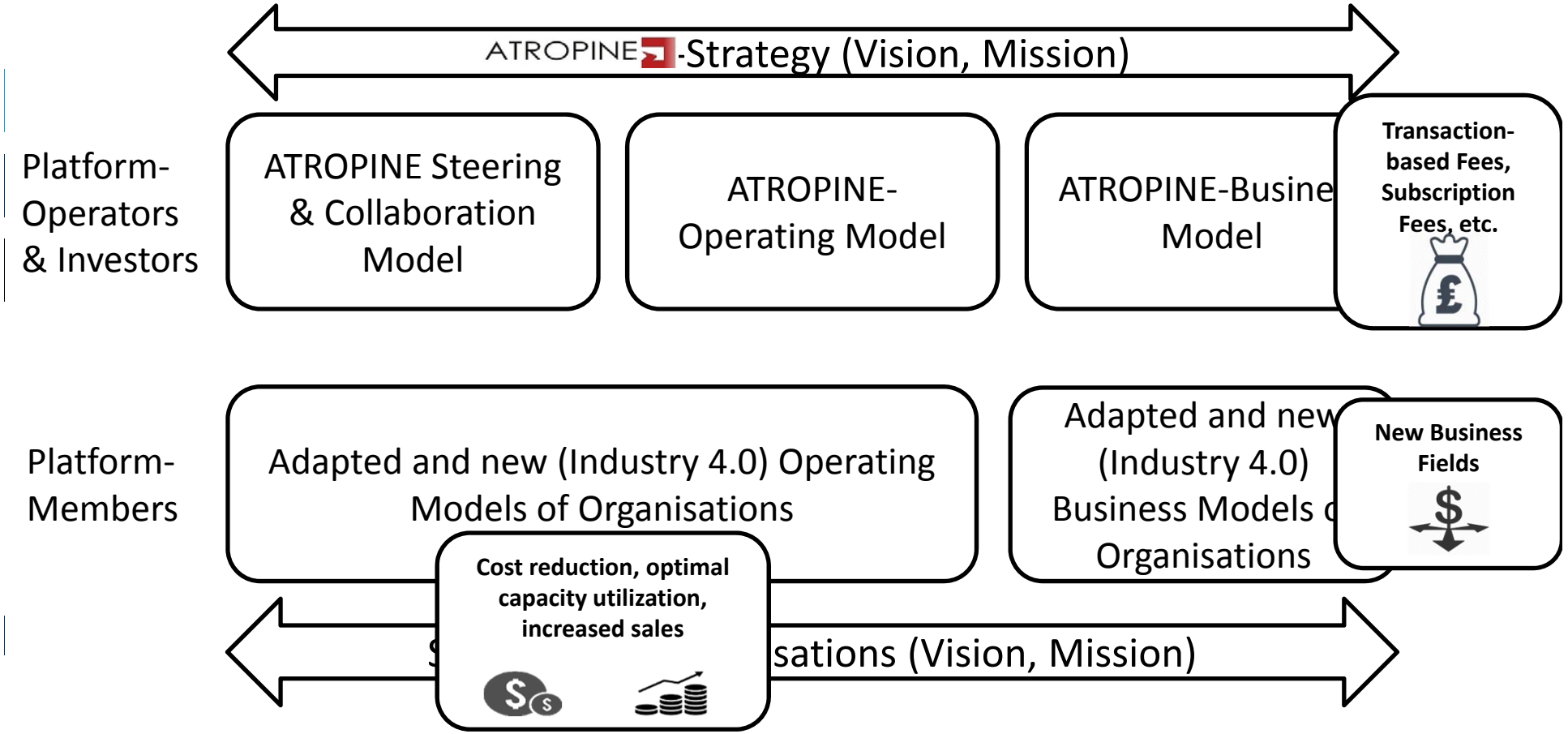
Developing specific business model(s) for PI Platform.



Peer Group Business Model: Elements of a Business Model



Peer Group Business Model: Creating and Influencing BMs



ATROPINE – Status Quo & Next Steps

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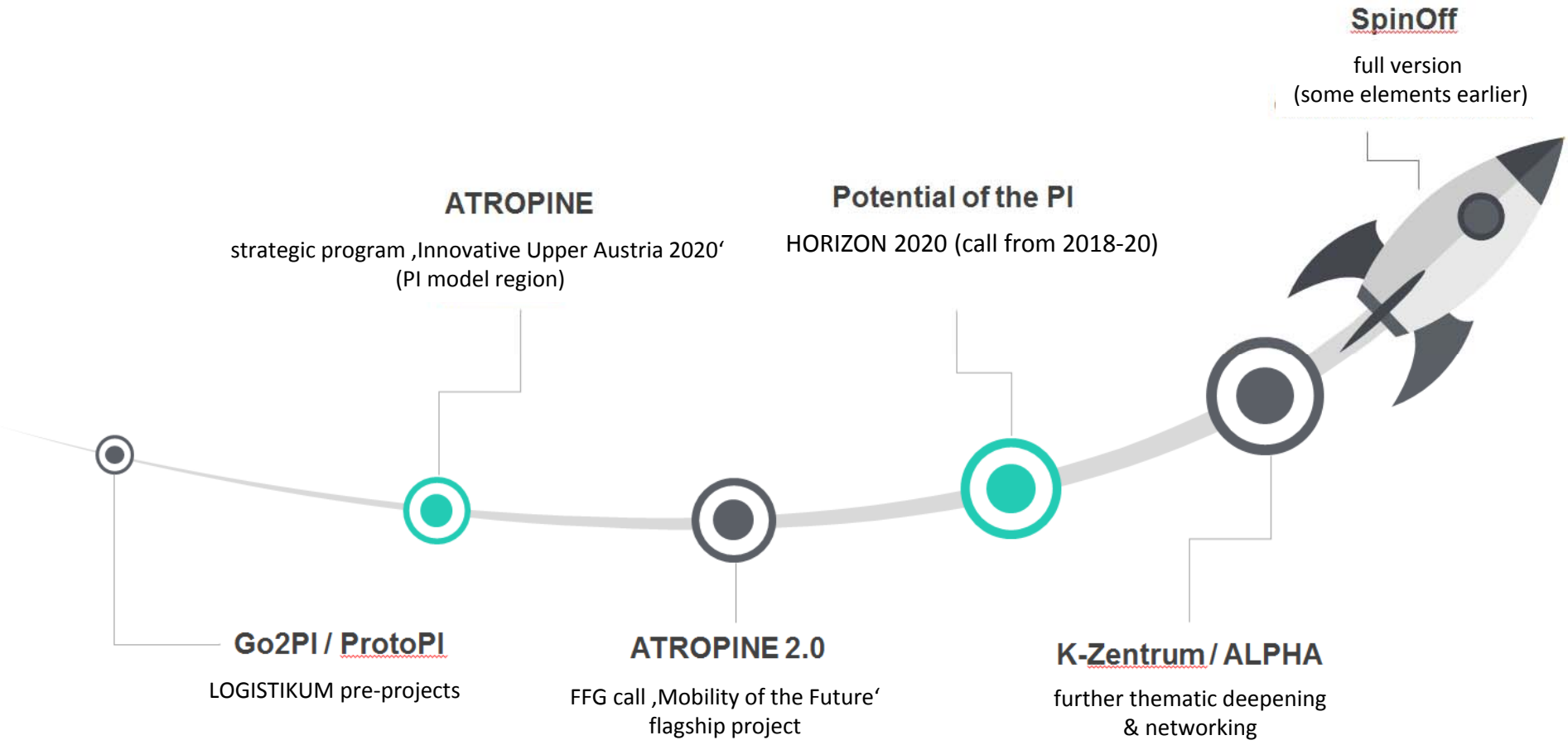
- Simulation-Phase currently running
  - Identify hypothetical savings in 2016
  - → PoC for actual value delivered by platform in terms of monetary benefits

- Demonstrator-Phase to start in 2018
  - "real-life" test in defined environment and time-frame
  - → PoC for platform in terms of practical applicability of underlying algorithms and optimization recommendations

- Further develop and adapt Business Model(s) for PI Platform based on simulation and demonstration results

ATROPINE – Future Work



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QUESTIONS?

Thanks for your attention.

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