ALICE/SENSE PI Roadmap Workshop

IPIC 2019 | 6th International Physical Internet Conference | London

Accelerating the Path Towards Physical Internet

General (short) introduction to SENSE project. Fernando Liesa. Secretary General, ALICE.

Physical Internet Roadmap: Main streams and generations. Andreas Nettsträter. Fraunhofer IML & Sergio Barbarino, ALICE Chair and P&G

Getting the Physical Internet Community Feedback on the roadmap (all attendees)

End of workshop

Activities performed in the frame of SENSE Project: Accelerating the Path Towards Physical Internet. SENSE project has received funding from the European Union´s Horizon 2020 res Programme under grant agreements No. 769967

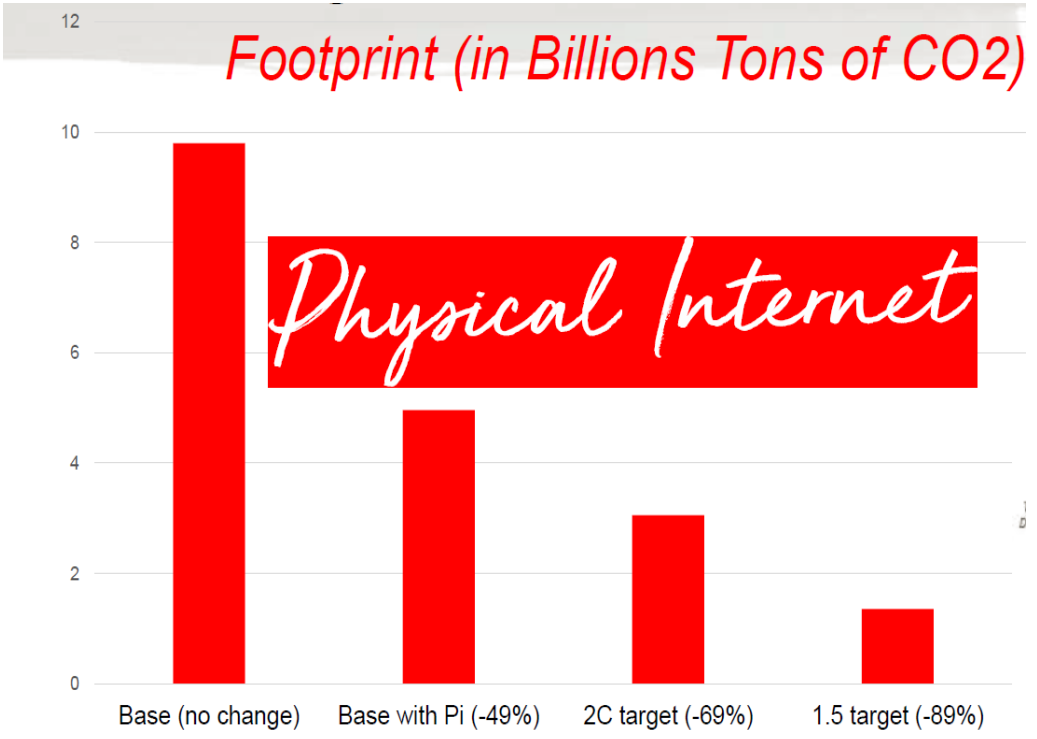
IPIC 2019

SENSE Strategic Objectives:

Accelerate the path towards the Physical Internet,

Pilot implementations of the Physical Internet concept are well functioning and extended in industry practice **by 2030**,

and hence contributing to a **30 % reduction in congestion, emissions and energy consumption**



Scenarios for Freight Transport Emissions including Physical Internet (PI)

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SENSE Project Overview: Work Packages, Tasks and Expected Outcomes

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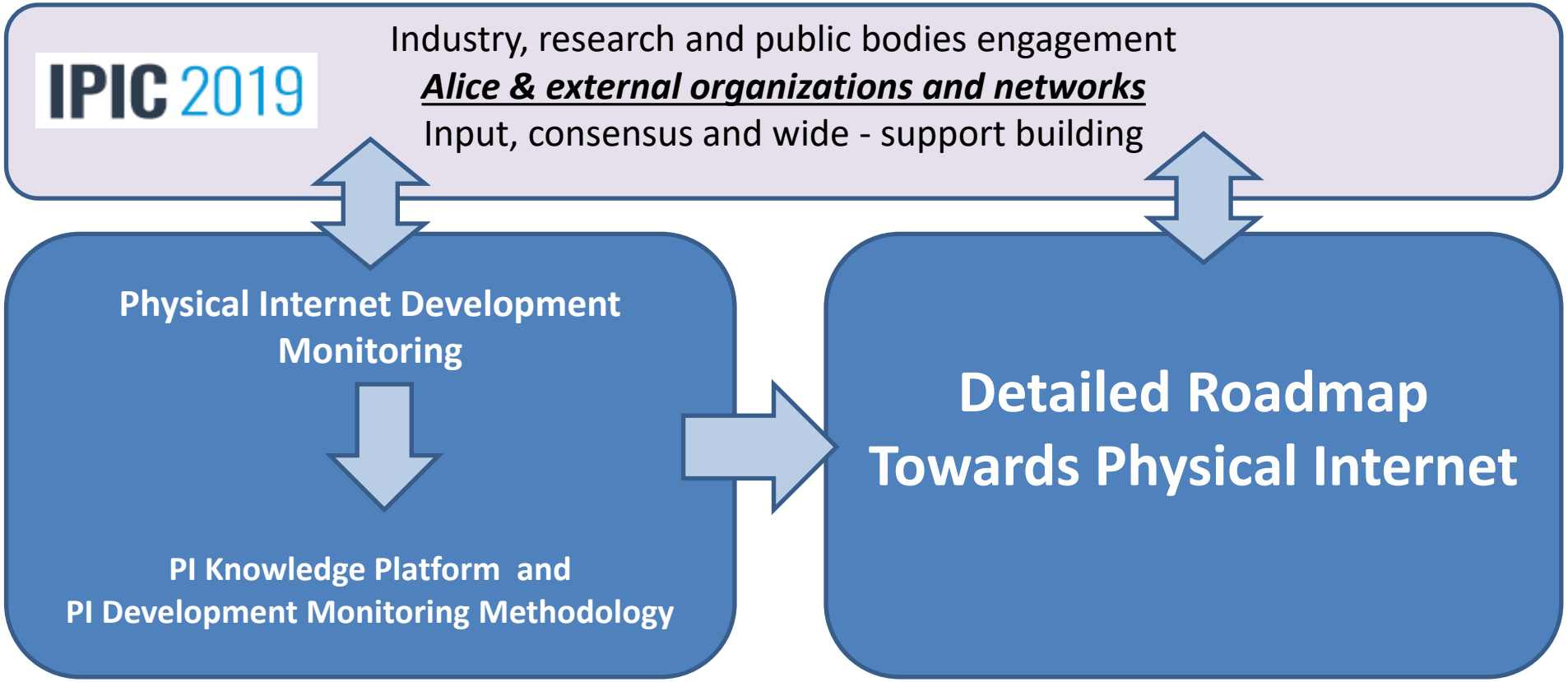

SENSE Major Outcomes:

- Wide Industry and public bodies consensus and support on Physical Internet vision and roadmap
- Strong methodology to monitor, assess and review Physical Internet implementation Status
- Reference Knowledge Platform on Physical Internet: Market, Projects and Programs
- Better alignment on regional, member states and EU Programs supporting Physical Internet
- Reinforced International Physical Internet Community.

Activities perform… …ch and innovation Programme under grant agreements No. 769967

Knowledge Platform

Platform link

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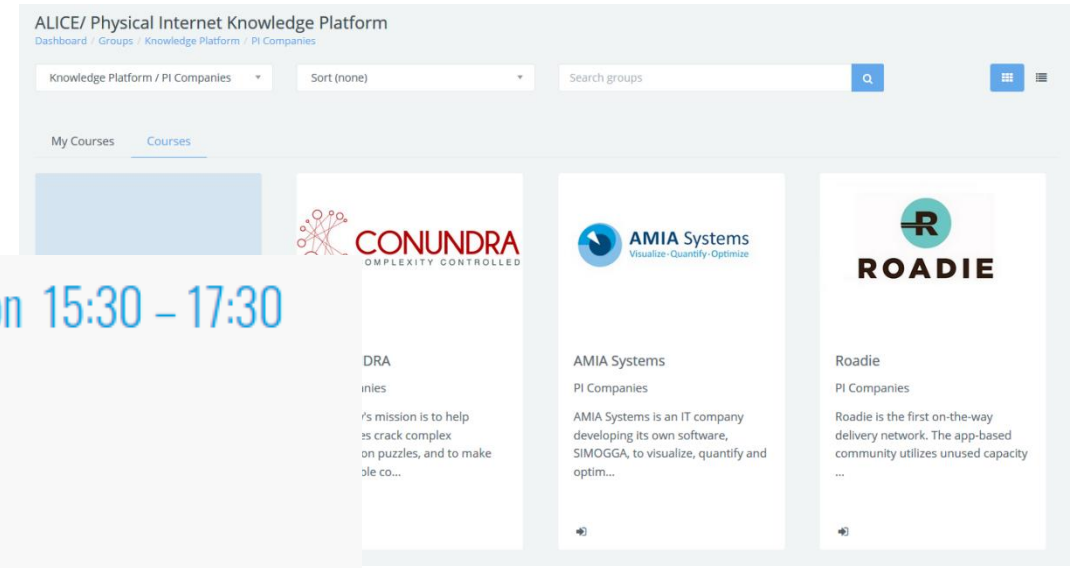
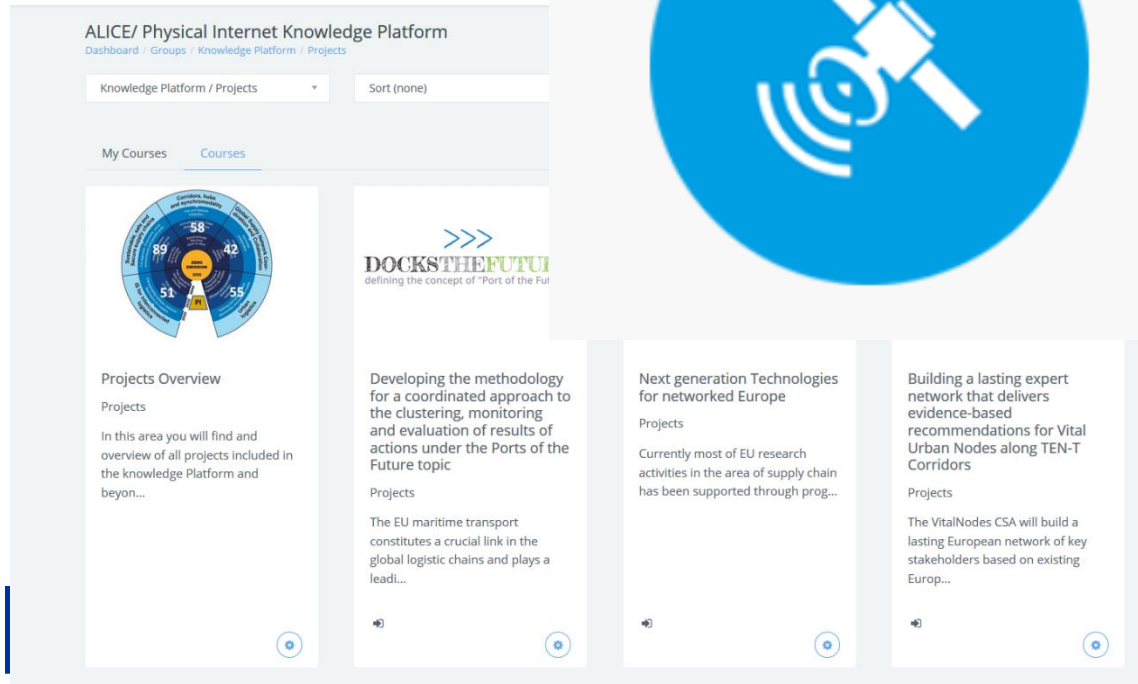
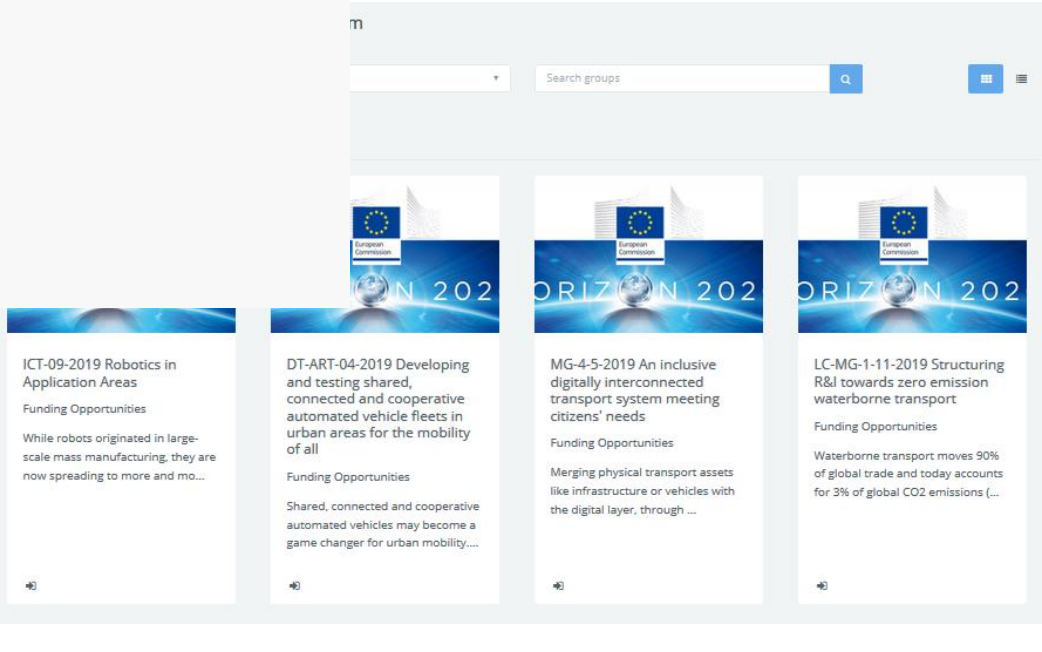


Physical Internet Access & Adoption 15:30 – 17:30





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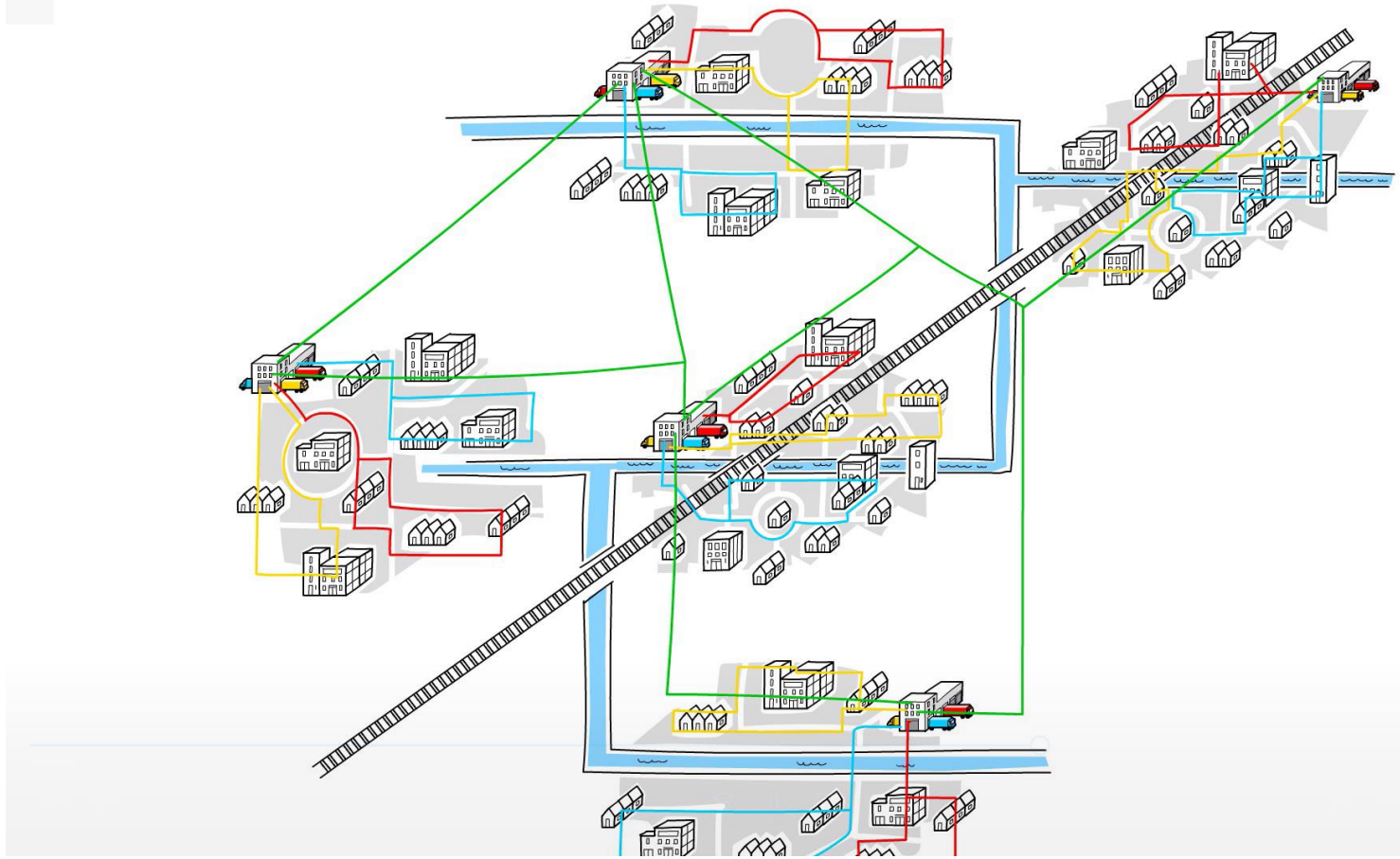
Physical Internet & City Logistics

Physical Internet Access & Adoption 15:30 – 17:30



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"Moving from an academic vision to an industry roadmap towards the Physical Internet"

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The Physical Internet Vision

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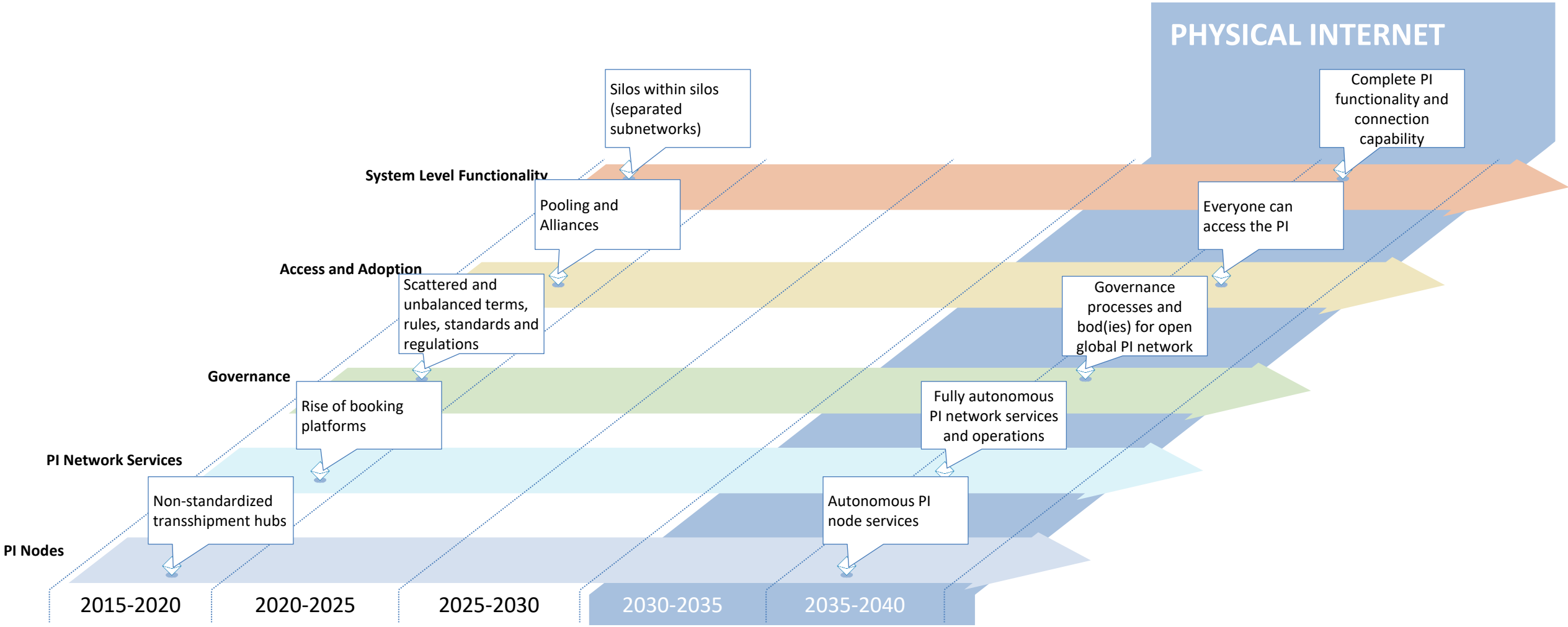

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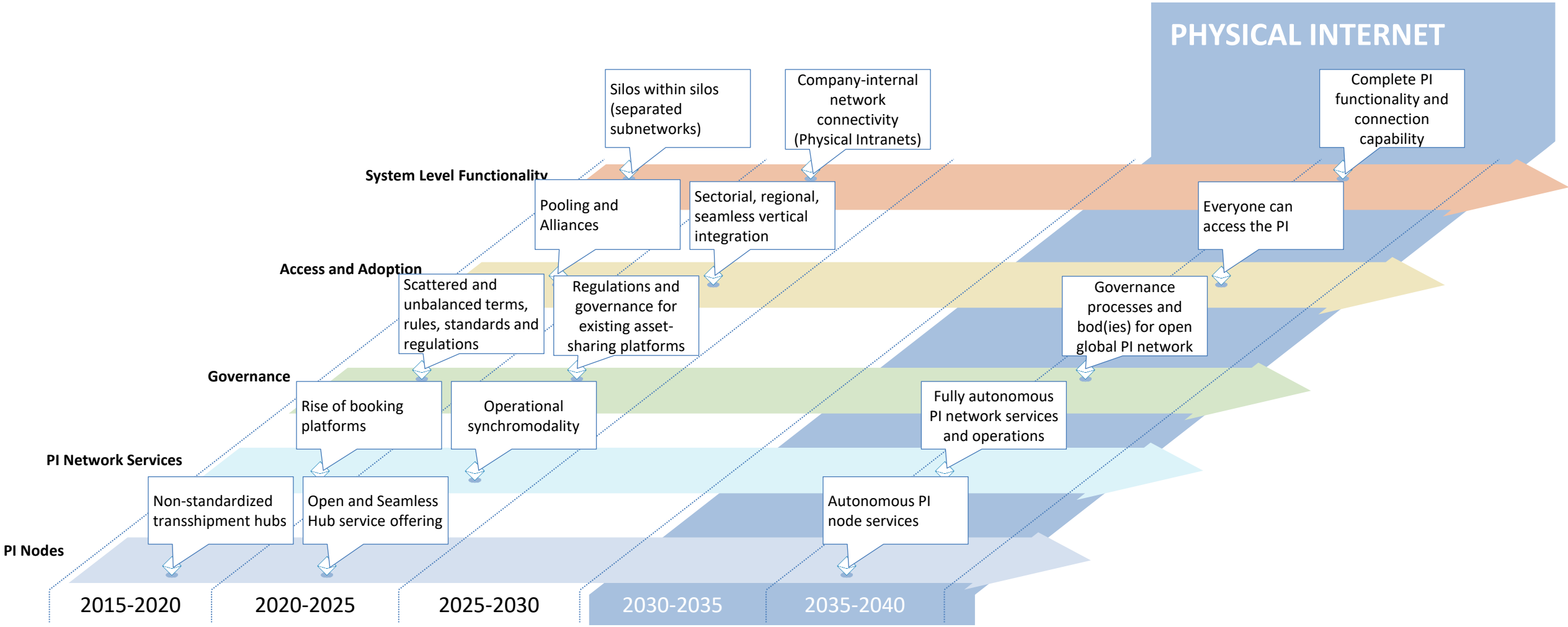
The next step from now to PI



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Roadmap to the Physical Internet

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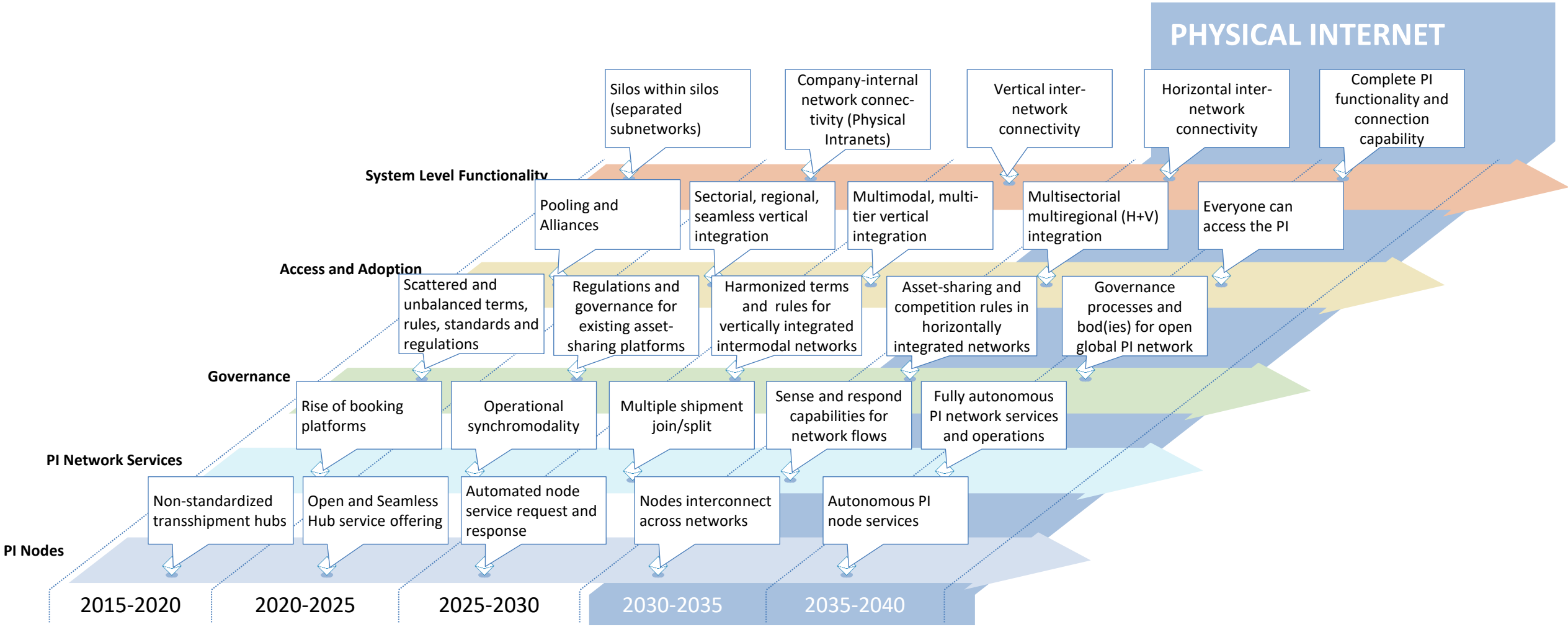

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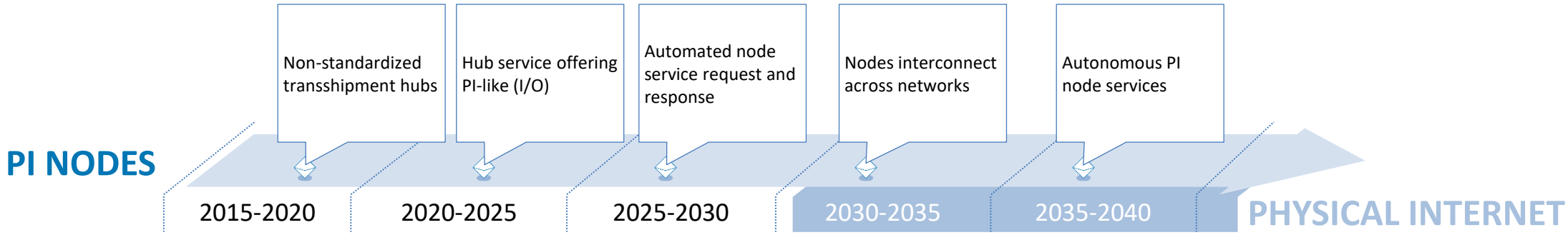
PI Nodes

Roles of and operational model for physical nodes



- Collaboration within nodes
  - Shared assets, warehouses, vehicles and infrastructures, and data
- Collaboration between nodes
  - Bundling flows between different nodes
  - Common Communication infrastructure
- Harmonising transport modes
  - Standard containers to handle
  - Modularization and seamless transhipment
  - Cargo Flow visibility
- Different node types and operational modes
- Value added services of Nodes
- Digital marketplace and platforms
- Autonomous operation of nodes
  - Autonomous handling of goods
  - Automated Material handling
  - Autonomous hubs
  - Autonomous goods / loading units

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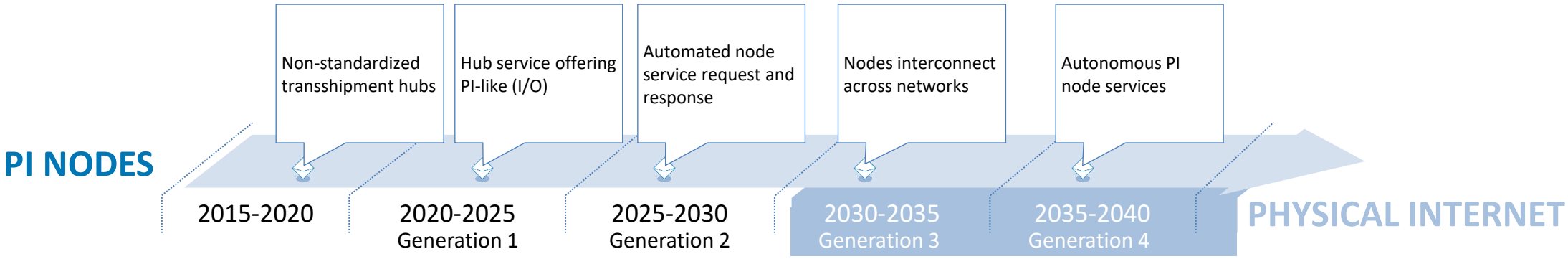
PI Nodes

Generations and next steps



Steps for G1:

- Definition of nodes characteristics (like different type of nodes, collaboration community services, capabilities and requirements)
- Creation of a PI Nodes Registry
- Definition of IT solutions to connect LSPs with a PI Node and PI Nodes with PI system
- Definition of infrastructural requirements (storage area characteristics) and PI cargo handling procedures that can be used as reference (or standards) by a PI Node
- Definition and publication of services (nodes will publish and allocate capacity to PI)

Steps for G2:

- Harmonizing and connecting different PI Nodes and related services and networks
- Dedicated facilities PI Nodes standards compliant for managing PI cargo
- Definition of standard procedures for PI cargo handling such as harmonization of transport modes exchange
- Modularization and seamless transshipment between modes
- Collaboration between modes and nodes

Steps for G3 and G4:

- Business models for Collaboration between networks
- Integration of different networks (of networks) via PI system
- Automated material handling and Autonomous handling of cargo

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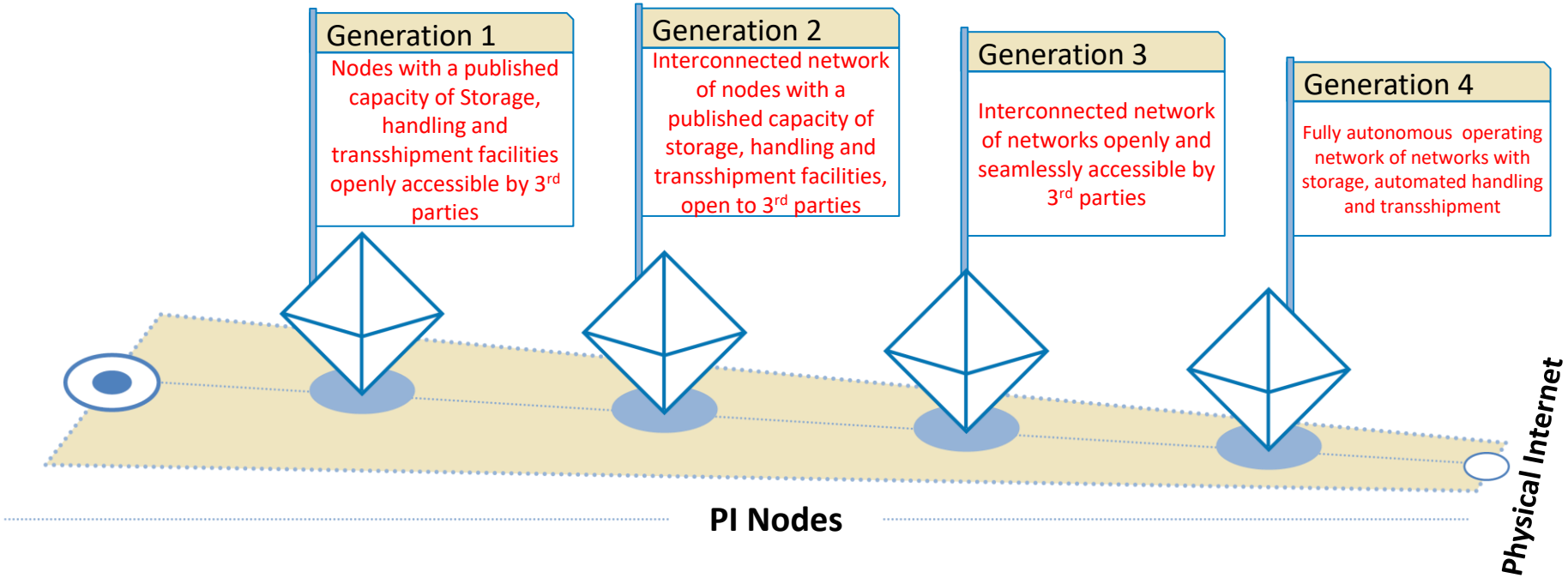
PI Nodes Generations

Roles of and operational model for physical nodes



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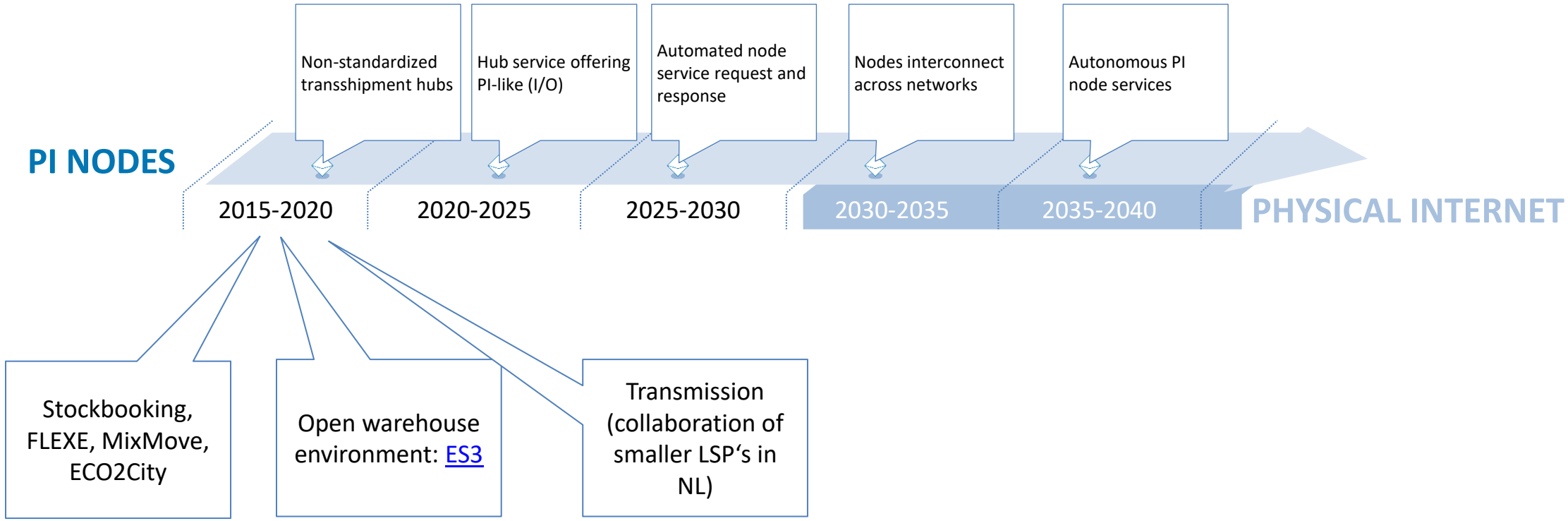
PI Nodes

Existing examples



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PI Nodes

Different types of nodes

- **PI Node – Type 1**: Warehouse/Depot
  - Main characteristics:
    - storage capacity,
    - cargo disruption (consolidation/deconsolidation)
- **PI Node – Type 2**: Intermodal Terminal
  - Main characteristics:
    - cargo disruption (consolidation/deconsolidation),
    - change of transport mode
- **PI Node – Type 3**: Intermodal/Multimodal Logistics Hub
  - Main characteristics:
    - storage capacity,
    - cargo disruption (consolidation/deconsolidation),
    - change of transport mode

→**There is a need to create a PI Nodes Taxonomy!**

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PI Nodes Network

PAN (Personal Area Network)	→	**Level 1**: Warehouse/Depot
LAN (Local Area Network)	→	**Level 2**: Logistics center/ Intermodal Terminal
MAN (Metropolitan Area Network)	→	**Level 3**: Proximity Terminal Network
WAN (Wide Area Network)	→	**Level 4**: Extended Terminal Network
GAN (Global Area Network)	→	**Level 5**: PI Nodes Network

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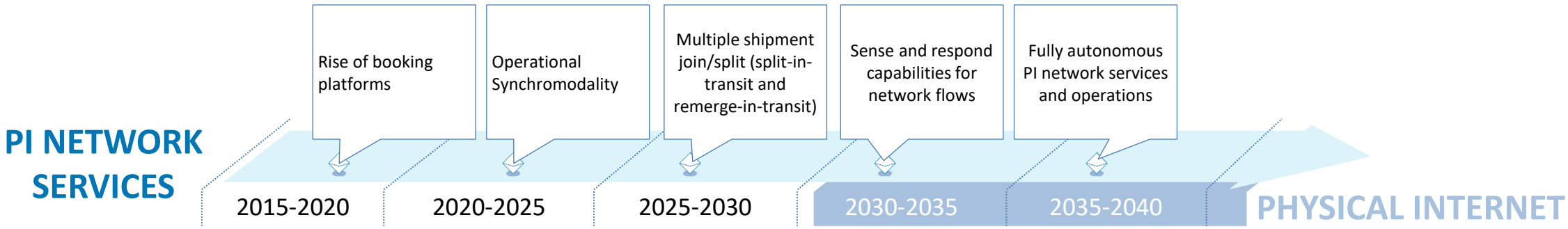
PI Network Services

PI protocol stack and network management



- Open Network / living network
  - Standard operational protocols
  - Operational protocol stack
  - E-transport documents
- Information and data: Supply Chain Visibility / network visibility
  - Visibility of mode capacity available
  - Shipment needs known at system level
  - Load and mode data decoupled
- Routing algorithms
  - Dynamic routing based on different parameters (time, money, emissions etc.)
  - Synchromodality
- Network management services
  - Track and trace
  - Prediction
  - Load/capacity monitoring
  - Reporting

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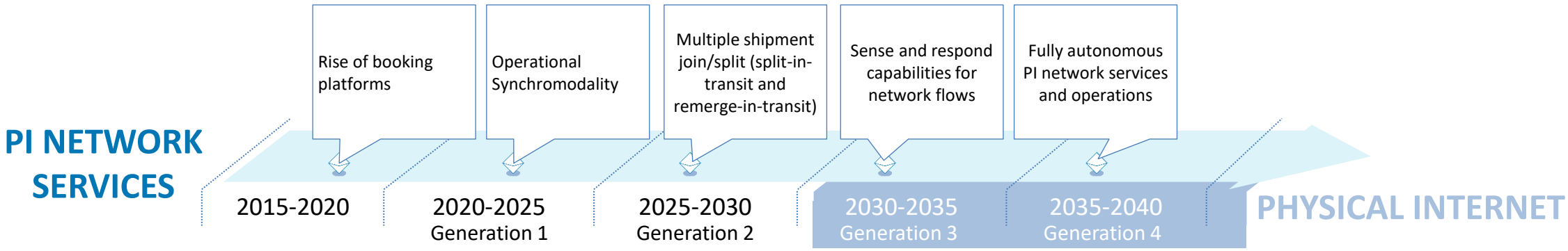
PI Network Services

Generations and next steps



Steps for G1:

- Definition of rules, services (and protocols)
- Routing algorithms to search for “best” route
- Schedule linkage and synchronization processes

Steps for G2:

- Shipment tracking and integration services
- Network management protocol development
- Capacity forecasting and assignment algorithms

Steps for G3:

- Dynamic plan/replan algorithm development
- Network recovery protocols for outages, capacity constraints, etc.
- Congestion control protocols

Steps for G4:

- Border routing protocol development
- Autonomous fail over and recovery protocol development
- Dynamic reconfiguration and updating protocol development

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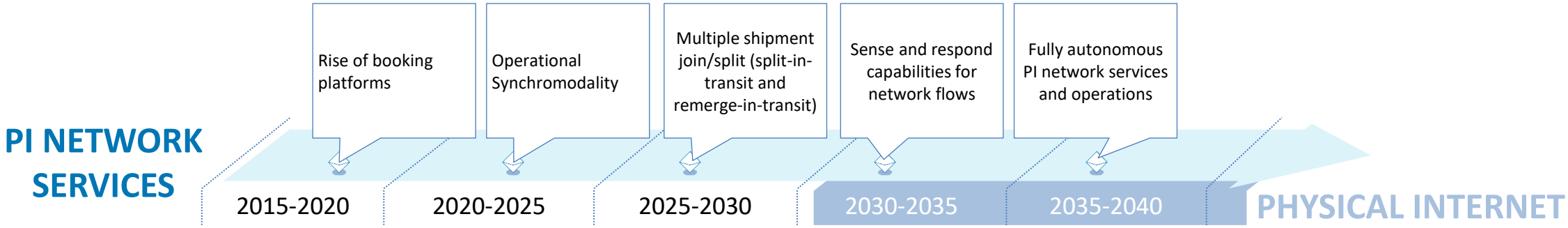
PI Network Services

Existing examples



Synchromodal Services in Port Hinterland
EGS

Cargo bundling in open environments: Mix Move
Smartbox

Matching Transport demand with Idle Capacity:
Roadie

Transport Collaboration Platforms and routing (CHEP, COllaborative Routage Center)

Multi-fulfilment last mile delivery platforms
https://www.bringg.com &
https://www.lastmile.team/

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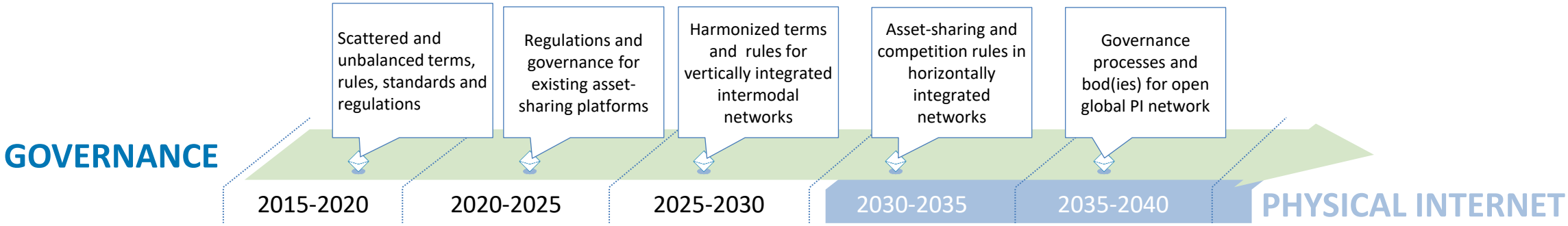
Governance

Governance concept, bodies, regulations and trust building measures



- Sustainability
- Standardisation and harmonisation
- Regulation/Legislation
- Security: access and rights mgt, enforcement, escalation, incident mgt
- Including multiple layers (institutions, arrangements, contracts)
- Build trust among users,
  - Clear rules on accountability, Liability
  - Business model and security standards
- Clear governance
  - Rights and Responsibilities
  - Define the common interests and goals of stakeholders
  - New Competition Rules & principles
- Cooperation / Business model of PI
  - Roles (PI-Sender, Receiver, Forwarder, …)
  - Clear definition of tasks and responsibilities
  - Gain-sharing among partners
  - Identification and definition of risks and rewards

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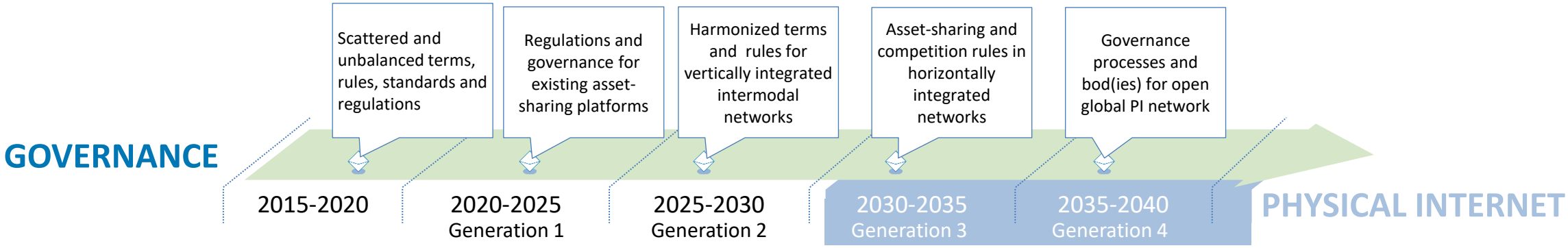
Governance

Generations and next steps



Steps for G1:

- Mapping and analysis of current asset-sharing networks, their forms and business models
- Consensus on core rules for individual platforms' administration, expansion, liability, …

Steps for G2:

- Next generation Incoterms, Rotterdam rules ratification, …

Steps for G3:

- Organizational models and rules for asset-sharing in horizontal networks (unexclusive participation, mutual liability, fair competition, antitrust, ..)

Steps for G4:

- Governance processes for different layers/areas (system, data, operations, ..), centralised vs. federated governance models

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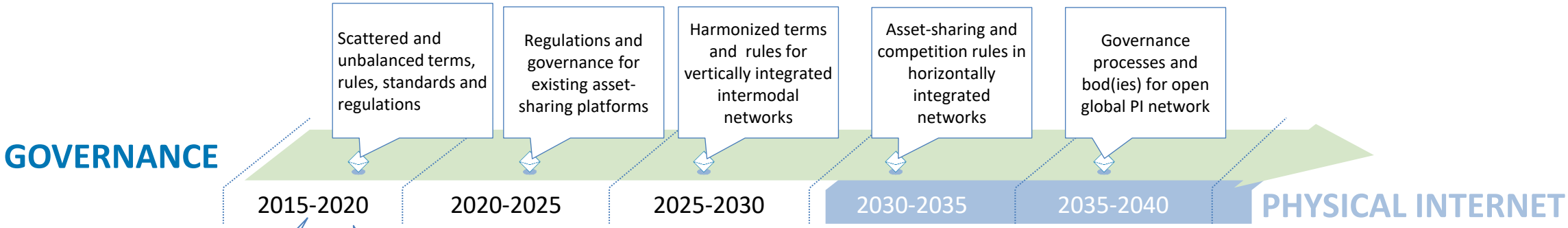
Governance

Existing examples



Pallet Networks Governance: https://www.palletways.com/about-us/

Groupage Networks: http://www.dgs-transports.fr/en/domestic-and-international-network/

Open warehouse networks (space): https://www.flexe.com/

Two governance models found in state-of-the-art:

- Platform Model (Flexe)
- Stakeholders Network with a Governance body (Pallet & Groupage Networks)

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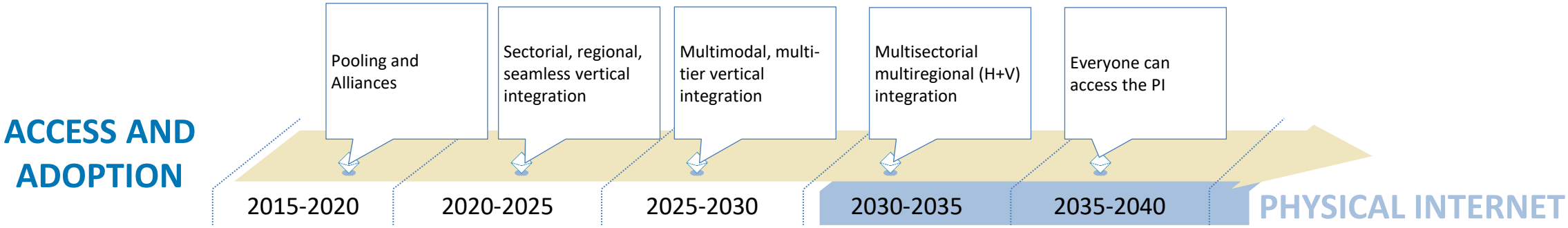
Access and Adoption

Benefits of PI and mental shift towards PI



- Show benefits for different stakeholders of PI
  - Shared assets, shared warehouse, shared vehicles and infrastructure
- New and changed roles of companies and stakeholders in PI:
  - New role of LSPs in value chains
  - Advanced role of ports and hubs in value chains
  - User perspective
- Modelling and visualization of PI
- Humans education and mind shift skills

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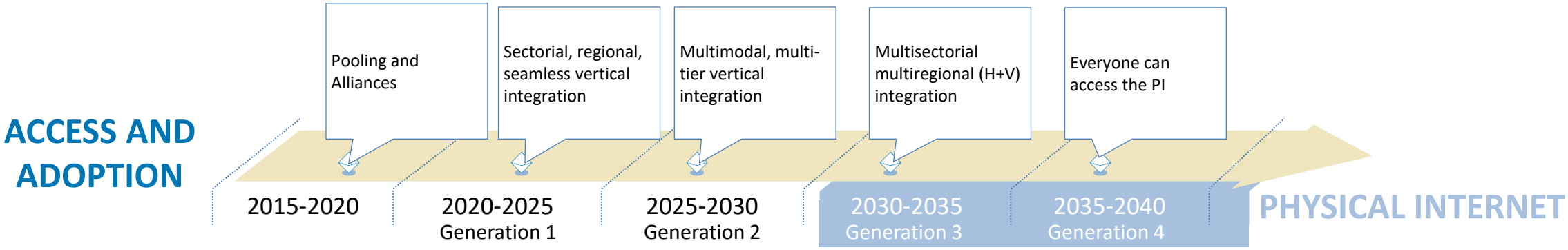
Access and Adoption

Generations and next steps



Steps for G1:

- Description of convincing business case including revenue models, gain sharing and description of different stakeholders
- Mapping of existing European hubs and networks (for simulation on existing infrastructure)
- Simulation model to understand the practicality of PI

Steps for G2:

- Successful Regional Demonstration (i.e. two connected networks)

Steps for G3:

- Successful European demonstration (i.e. various connected networks in an scalable way)

Parallel activity:

- Prepare people for PI (e.g. using gamification for education)

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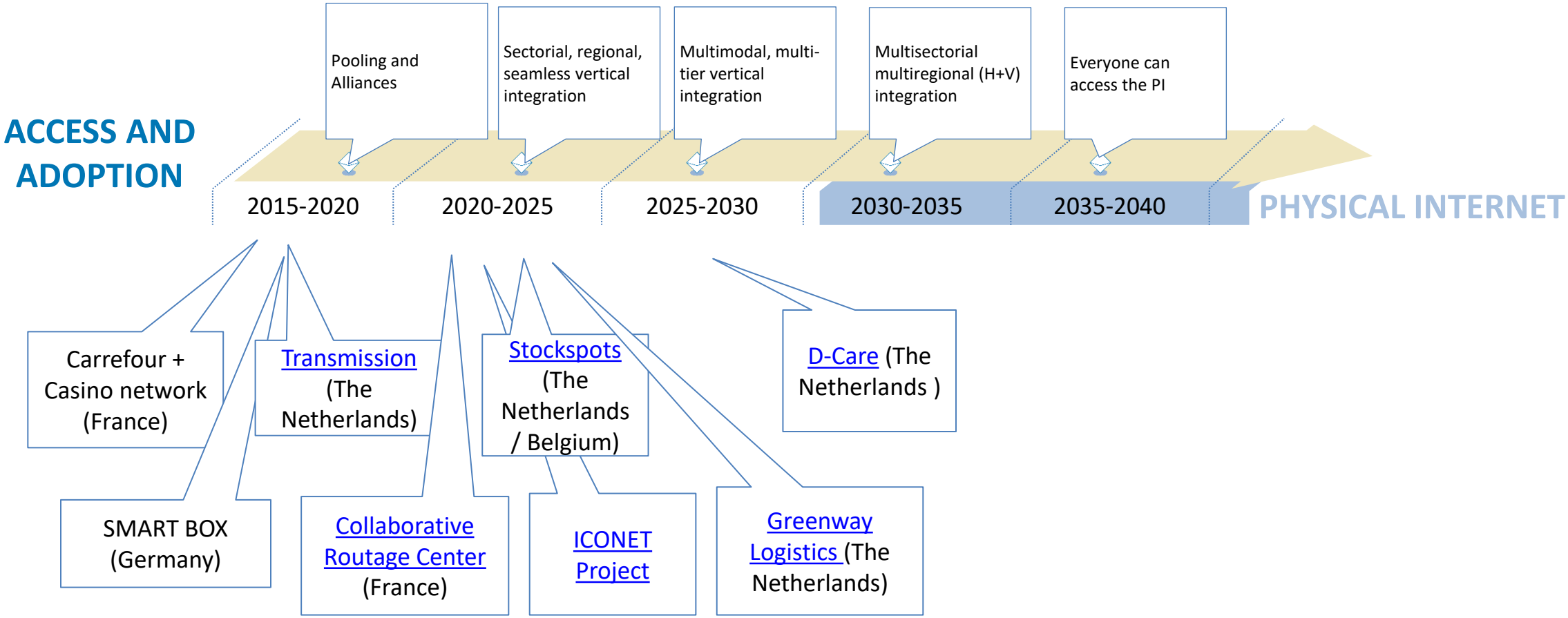
Access and Adoption

Existing examples



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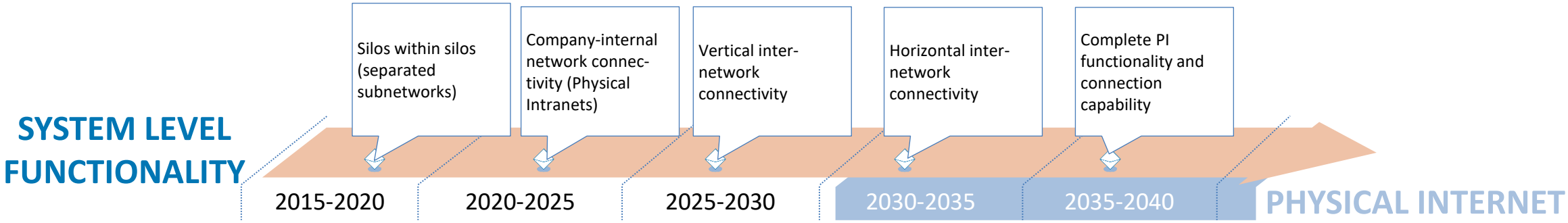
System Level Functionality

PI architecture, building blocks and information exchange



- PI Operating System
  - Functional building blocks of PI including basic functionalities and services of PI
  - General tasks of nodes and links (e.g., routing responsibility, etc.)
  - Federative platform for documents and data sharing
  - PI ISO/OSI model
- Systems design should have good flexibility to adapt (layered structure)
- Digitalisation/Virtualization of supply chains
- Visualization of PI
- Multimodal Logistics Networks interconnectivity protocols covering communications, load sizes, track and trace, reporting, etc.
- Smart and automated contracting

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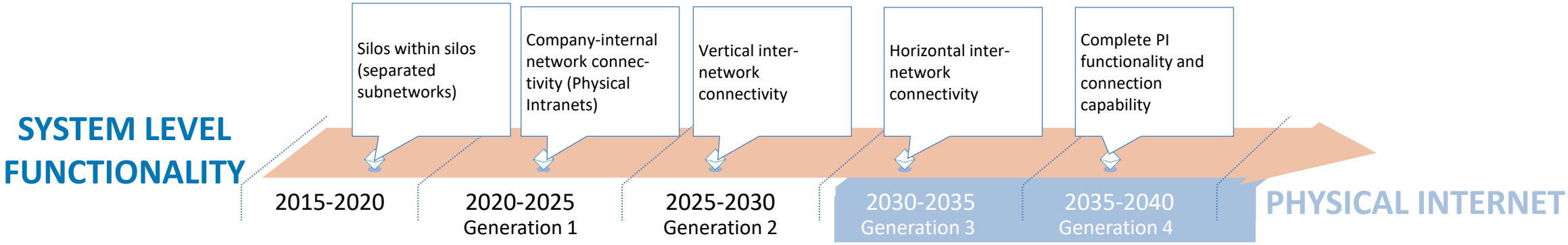
System Level Functionality

Generations and next steps



Steps for G1:

- Definition of PI building blocks, functions and processes
- Definition of PI Reference Architecture
- Definition of PI Protocol Stack
- Definition of PI data requirements, security processes, and reporting requirements

Steps for G2:

- Definition of inter-company communications protocols
- Definition of inter-company routing processes
- Definition of node/router responsibilities

Steps for G3:

- Definition of inter-network collaboration mechanisms
- Definition of network financial tracking and clearing processes
- Definition of forward planning processes and protocols
- Definition of QoS protocols

Steps for G4:

- Definition of dynamic access processes
- Definition of failure and recovery processes
- Definition of management protocols

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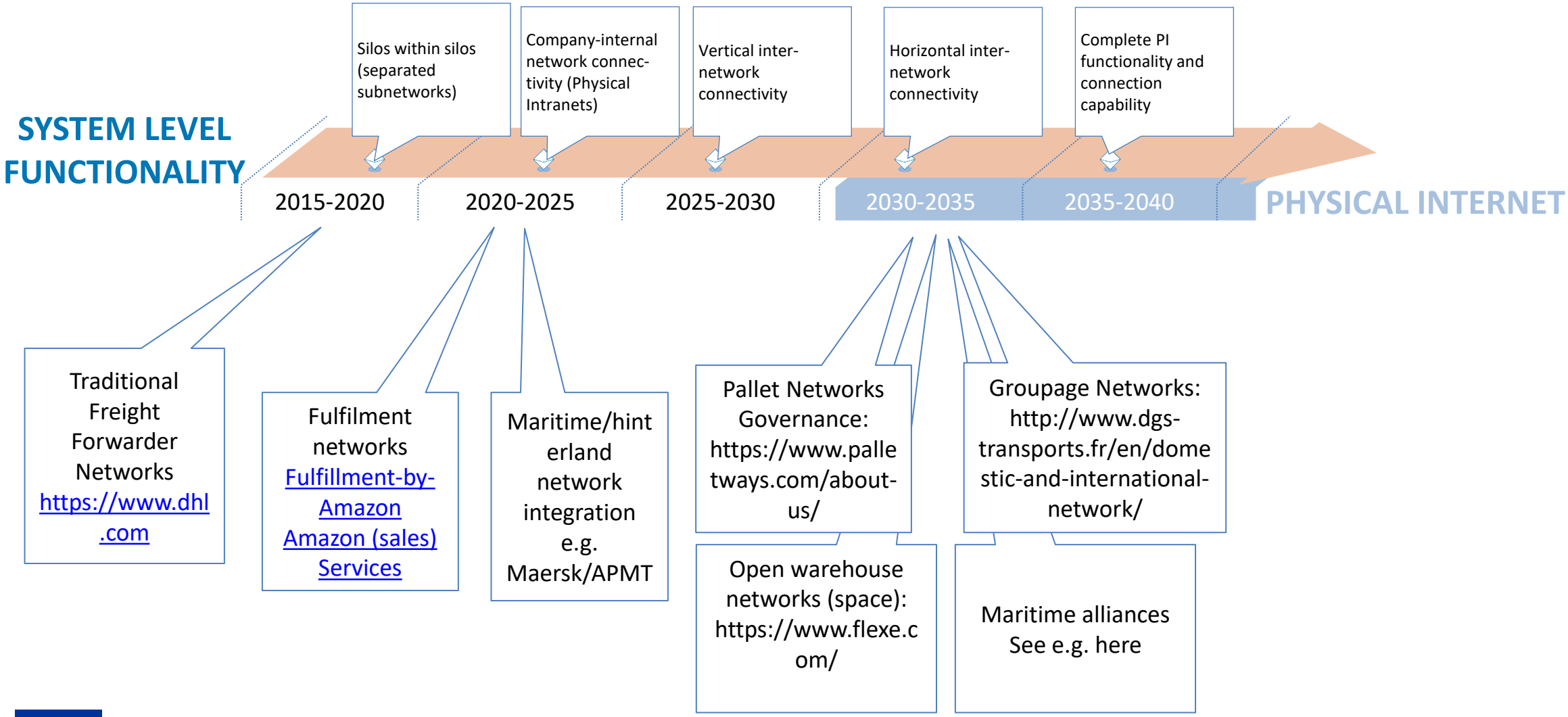
System Level Functionality

Existing examples



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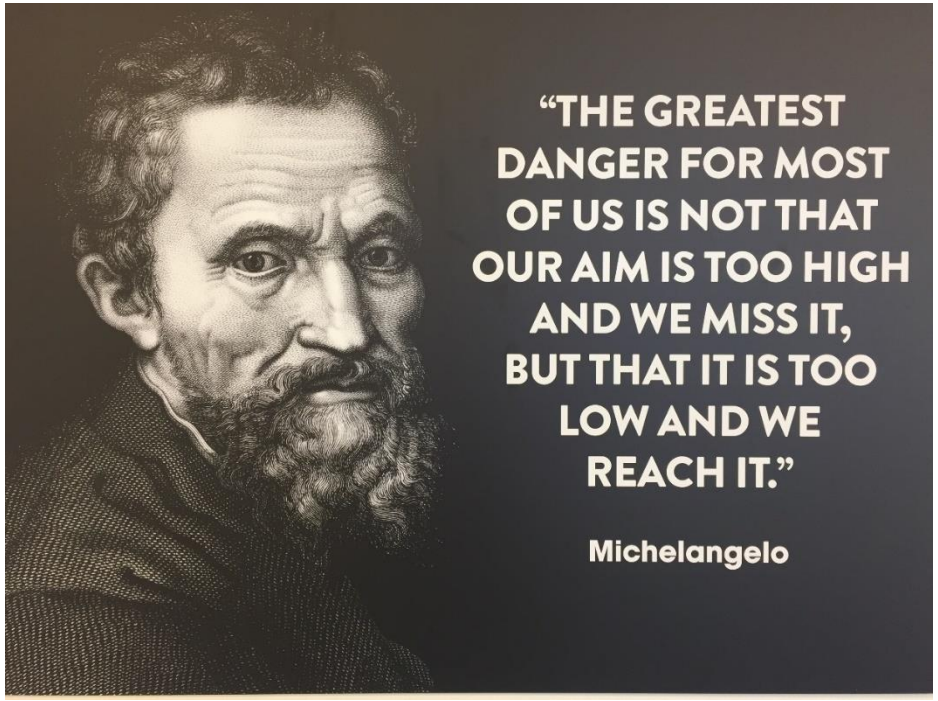

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Logistics innovation for a more competitive and sustainable industry

Thank you!

The Best Way To Predict The Future Is To Create It!

Source: President Abraham Lincoln

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