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NOLI, A Proposal for an Open Logistics Interconnection Reference Model for a Physical Internet of poster for IPIC 2017 Conference

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Poster abstract

This poster presents a New Open Logistics Interconnection (NOLI) reference model for a Physical Internet (Table 1 and Table 2), inspired by the Open Systems Interconnection (OSI) reference model for data networks. This NOLI model is compared to the OSI model, and to the Transmission Control Protocol/Internet Protocol (TCP/IP) model of Internet. It is also compared to the OLI model for a Physical Internet proposed by Montreuil.

The main differences between the presented NOLI model and all the other models named above are in the appearance of definitions of physical objects in different layers and not just the lowest one. Also, the NOLI model we present locates the containerization and de-containerization operations in the topmost layer, and not in the layer below as does the OLI model.

Table 1. The "end-users" layers of the NOLI reference model:

Position in the NOLI model	Layer Name	Role of the Layer
7	Product Layer	Defines the possible products or goods that can be transported inside π -containers. It fills the π -containers with the products and establishes the related contracts.
6	Container Layer	Defines the physical characteristics of the π -containers allowed on the Logistics Network. It will check the physical integrity of the π -containers and combine them into "sets" according to their characteristics.
5	Order Layer	Receives sets of π -containers from the Container Layer. It will create the orders according to the specified constraints (deadlines, client wishes, starting and destination point, etc.), and assigns the π -containers to the orders.

Table 2. The "network layers" of the NOLI reference model:

Position in the NOLI model	Layer Name	Role of the Layer
4	Transport Layer	Receives orders made of π -containers from the Order Layer. The transport Layer creates "loads" from the received orders,

		and manages the end-to-end trip for each load.
3	Network Layer	Receives loads of π -containers from the Transport Layer and creates "blocks" from the loads. The Network Layer defines a path across the network for each block.
2	Link Layer	Manages the individual steps (point-to-point movement) of π -containers on π -means.
1	Physical Handling Layer	Physical characteristics description of the π -means used to move the containers.

The NOLI model is closer to the TCP/IP and OSI models than the OLI model, keeping the integrity of the Link Layer that the OLI model divides in two layers, and keeping separate the Session and Transport OSI Layers that the OLI model unites in just one layer.

Table 3. Comparison between the layers of the TCP/IP, OSI, OLI and NOLI models:

TCP/IP Layer Name	OSI Layer name	OLI Layer name	NOLI Layer name
Application	7. Application	7. Logistics Web	7. Product
	6. Presentation	6. Encapsulation	6. Container
	5. Session	5. Shipping	5. Order
Transport	4. Transport		4. Transport
Network	3. Network	4. Routing	3. Network
		3. Network	
Network Access	2. Data Link	2. Link	2. Link
Physical	1. Physical	1. Physical	1. Physical Handling

Finally, in Figure 1 an example of some functionalities of each Layer of the NOLI model is presented.

Figure 1. Example of NOLI layers functionalities:

