

PI Data Sharing Infrastructure

Abstract:

Keywords: data sharing, data spaces, Physical Internet, federation, open and neutral data sharing infrastructure.

Physical Internet Roadmap:

1 Introduction

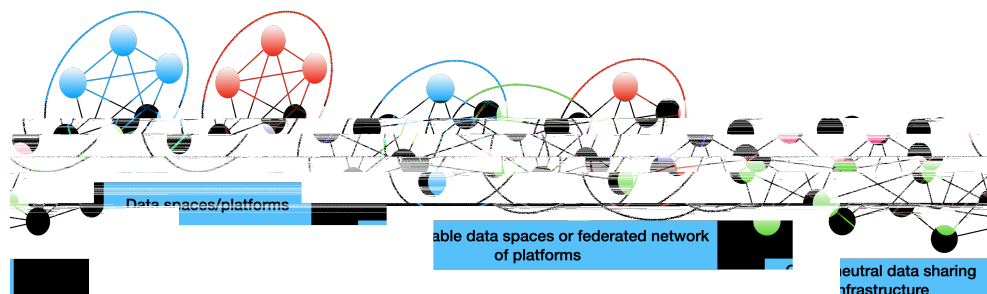


Figure 1 – From data spaces/platforms towards an open, neutral data sharing infrastructure

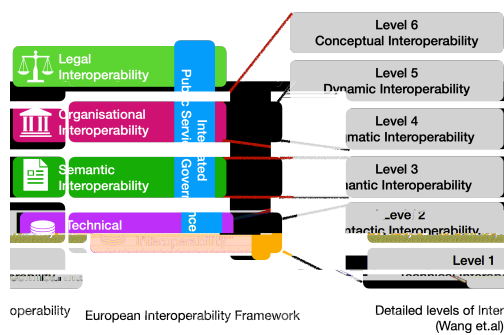


Figure 2 – Interoperability models

2 Protocol stack

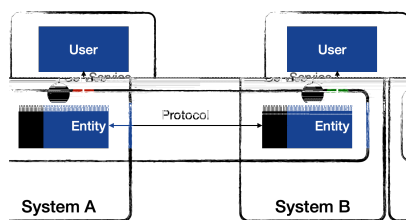


Figure 3 protocol, service, and interface

2.1 Protocol, service, interface

interface

protocol

service

2.2 Protocol stack

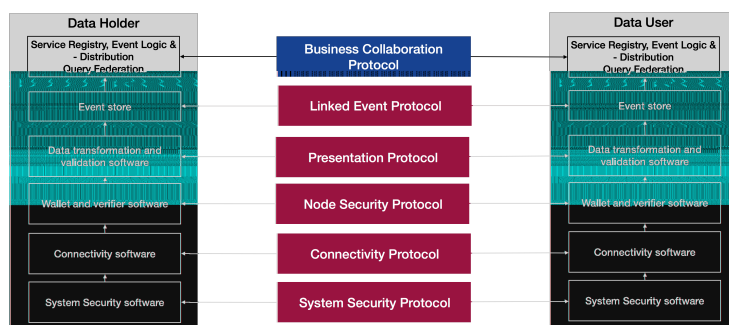


Figure 4 PI protocol stack

- **Business collaboration protocol**
- **Linked Event protocol (pull)**
- **Presentation protocol(s)**
- **Node Security protocol**
- **Connectivity protocol(s)**

- **System Security protocol(s)**

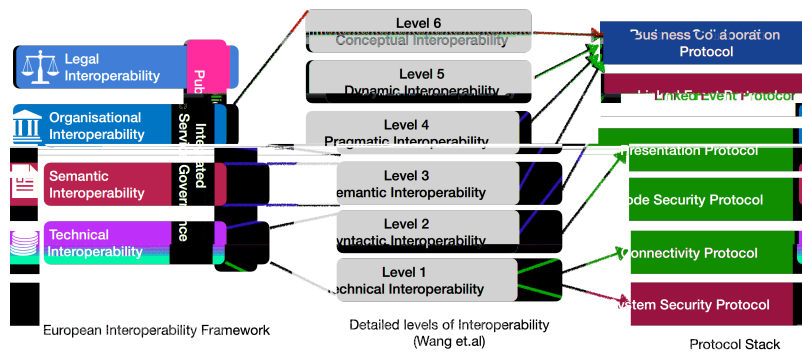


Figure 5 protocol stack and interoperability layers

2.3 Business collaboration protocol

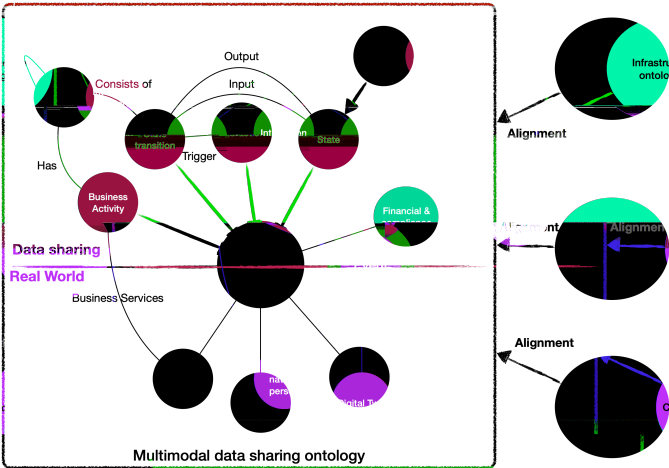


Figure 6 – the multimodal ontology with details of business data sharing concepts

2.4 Configuring the business collaboration protocol – Service Registry

-
-
- Design
- Configuration
 -

○

2.5 Index functionality

-
-
-
-
-
-

2.6 Identity, Authentication, and Authorization (IAA)

¹

- **Organizational trust**
- **Inter-organizational trust**
-
-
-

¹ There is also trust at business level, i.e. the trust in properly executing business activities for customers according to agreements made with them. This trust is outside scope of IAA.

3 Governance and legal aspects

3.1 Governance

- **Multimodal data sharing ontology**
- **Interaction patterns**
- **Linked Event Protocol**

3.2 Legal aspects

- **Organizational trust**

- **Behavior**
- **(Continuous) monitoring**
- **Change management**

4 Conclusions and future work

Acknowledgements

References

- Digital Transport and Logistics Forum (DTLF) Subgroup 2: Corridor Information Systems. (2018, June). *Enabling organizations to reap the benefits of data sharing in logistics and supply chains - executive summary*. Retrieved from Digital transport and logistics forum: <https://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupMeeting&meetingId=4855>
- Berners-Lee, T. (2006). *Artificial Intelligence and the Semantic Web: AAAI 2006 Keynote*. Retrieved from World Wide Web consortium: www.w3.org/2006/talks/0718-aaai-tbl/overview.html
- Object Management Group. (2011). *Business Process Model and Notation Specification 2.0*. Retrieved from <https://www.omg.org/spec/BPMN/2.0/>
- Tanenbaum, A. S. (1996). *Computer Networks (Third Edition)*. Prentice Hall.
- Alice. (2022, 01 17). *Roadmap to the Physical Internet*. Retrieved from [etp-alice.eu: https://www.etp-logistics.eu/alice-physical-internet-roadmap-released/](https://www.etp-logistics.eu/alice-physical-internet-roadmap-released/)
- De Juncker, M. (2023). Optimising Routing in an Agent-Centric Synchromodal Network with Shared Information. In *Optimisation in Synchromodal Logistics* (pp. 171-185). Springer.
- Eckartz, S., Hofman, W., & Veenstra, A. F. (2014). A Decision Model for Data Sharing. *eGov conference*.
- Dalmolen, S., Bastiaansen, H., Somers, E., Djafary, S., Kollenstart, M., & Punter, M. (2019). Maintaining control over sensitive data in the Physical Internet: towards an open, service oriented, network-model for infrastructural data sovereignty. *International Physical Internet Conference (IPIC2019)*. Londen.
- The Digital Transport and Logistics Forum (DTLF). (2017). *An outline for a generic concept for an innovative approach to interoperability in supply and logistics chains*. Discussion Paper, EC DG Move, Brussels.
- Nagel, L., & Lycklama, D. (. (April 2021). *Design Principles for Data Spaces - position paper*. Open DEI.
- Wang, W., Tolk, A., & Wang, W. (2009). The levels of conceptual interoperability model: applying systems engineering principles to M&S. *Spring Simulation Multiconference*. Society for Computer Simulation International.
- European Commission. (Belgium). *New European Interoperability Framework - promoting seamless services and data flows for European Public administrations*. 2017: European Union.
- International Data Spaces Association. (April 2019). *Reference Architecture Model - version 3.0*. Berlin, Germany: International Data Spaces Association.
- Euzenat, J., & Shvaiko, P. (2010). *Ontology Matching*. Heidelberg: Springer-Verlag.
- Hee, K. (1994). *Information Systems Engineering - a Formal Approach*. Cambridge University Press.