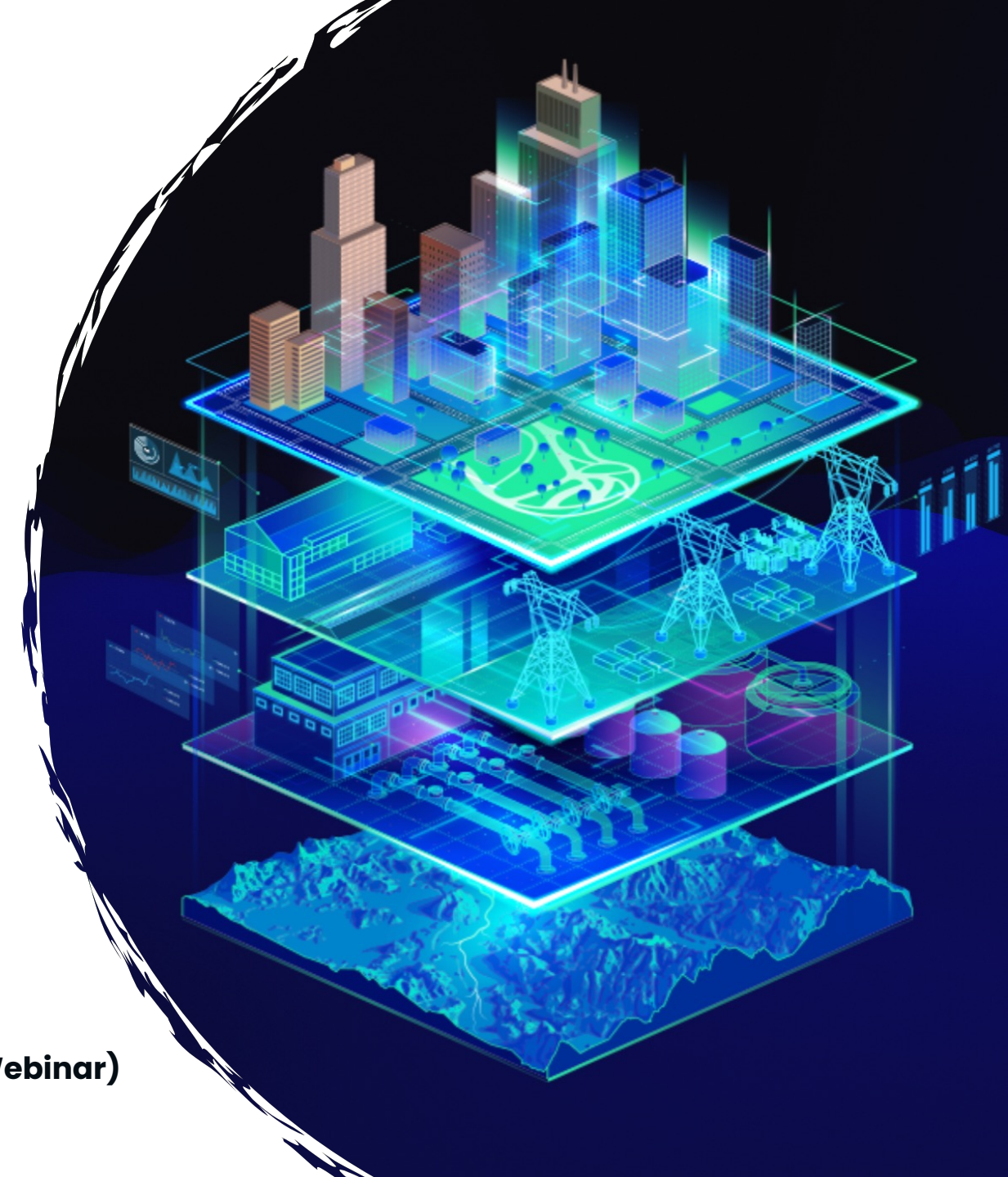
Digital Twins Standardisation at ETSI and oneM2M Follow Up



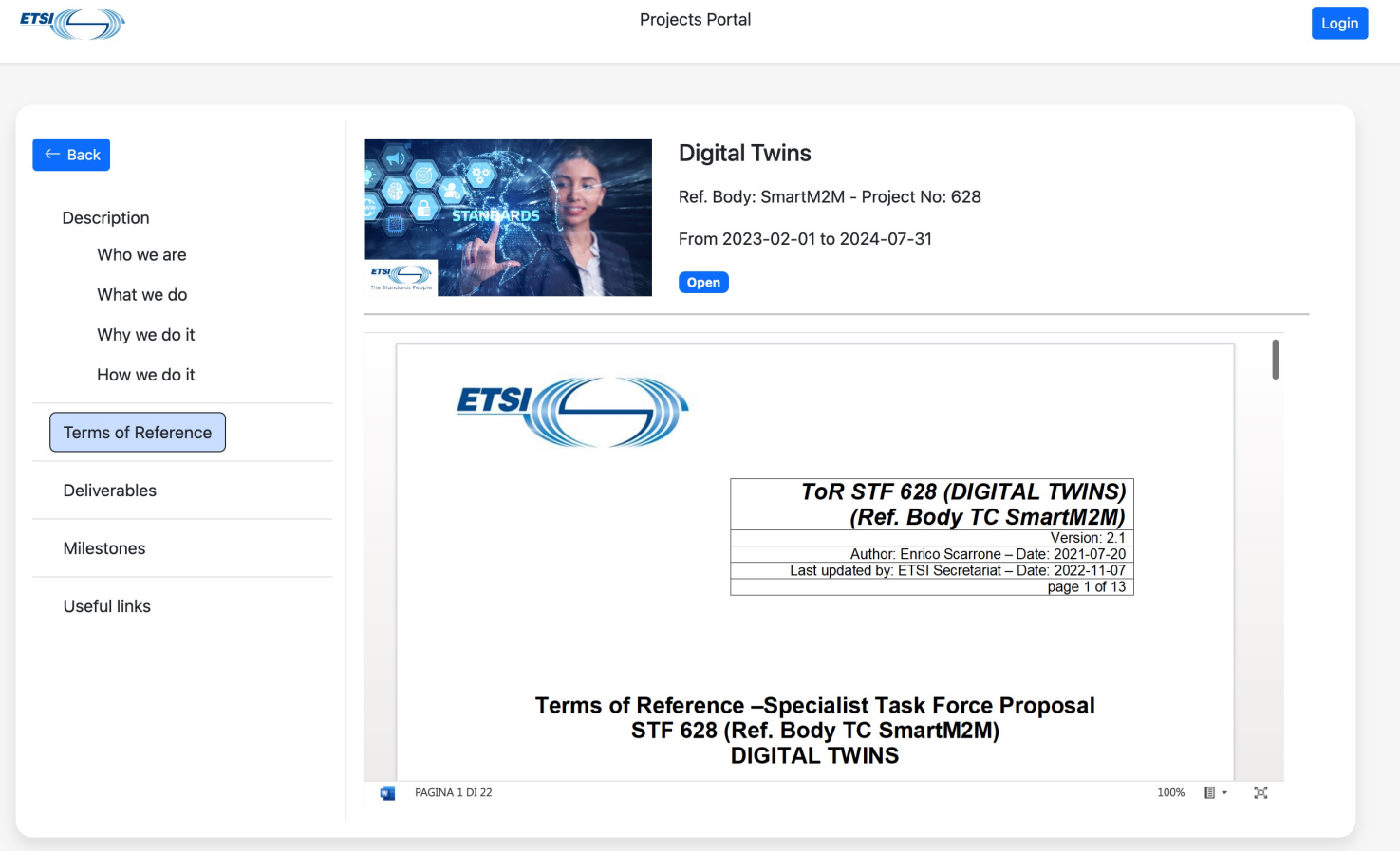
Presented by:
Marco Picone – University of Modena and Reggio Emilia
Massimo Vanetti - European DIGITAL SME Alliance

IEC-Webinar - Digital Twin – Standardization (JTC1/SC41/WG6 Webinar)
June 19th, 2024

Outline

- ETSI Digital Twin Specifications
  - **TR 103844:** Digital Twins and standardization opportunities in ETSI
  - **TS 103845:** Digital Twins communication requirements
  - **TS 103846:** Digital Twins: Functionalities and communication Reference Architecture
  - **TR 103847:** Digital Twins communication support in oneM2M
- Digital Twins Enablement in oneM2M
- SAREF Ontology for Digital Twins
  - **TR 103827 SAREF:** Digital Twins Opportunities for the Ontology Context
  - **TS 103828 SAREF:** Ontology Support for Urban Digital Twins and usage guidelines

ETSI Special Task Force (STF) 628 - at a Glance



https://portal.etsi.org/XTFs/#/xTF/628

ETSI Members Support

#	ETSI Member	Supporting delegate
1	TELECOM ITALIA S.p.A.	Enrico Scarrone
2	HUAWEI Technologies Sweden AB	Francisco da Silva
3	Facultad de Informatica	Raul Garcia Castro (UPM)
4	Futurewei	John Strassner
5	FBK	Mauro Dragoni (Fondazione Bruno Kessler)
6	SBS aisbl	Massimo Vanetti
7	INRIA	Luigi Liquori
8	Deutsche Telekom AG	Thomas Kessler
9	CNRS	Samir Medjiah
10	JK Consulting and Projects	Joachim Koss (ETSI Applicant member)
11	FBConsulting S.A.R.L.	Michelle Wetterwald

Experts Team

AI4 People
European DIGITAL SME Alliance
Exacta GlobalSMart Solution
University of Modena and Reggio Emilia

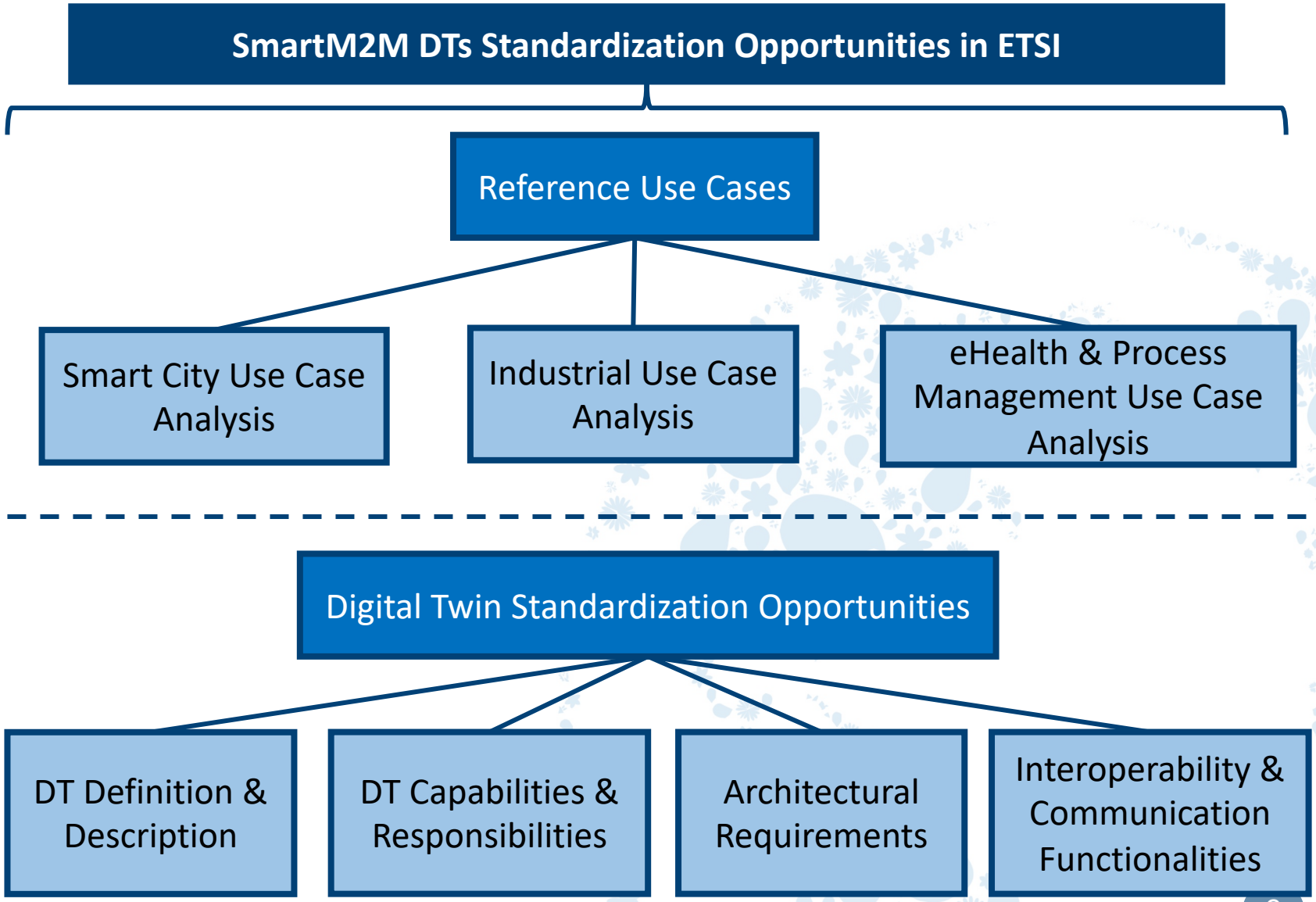
ETSI Special Task Force (STF) 628

- **Objective:** Develop standardized and interoperable IoT Digital Twins and their communication blueprint architecture.
- **Approach**:
  - Identify key elements and use cases for IoT Digital Twins to establish requirements and functionalities.
  - Create guidelines for horizontal cross-domain interoperability and standards, ensuring usability for both professional and general public IoT services.
  - Map IoT Digital Twins within the oneM2M framework based on derived use cases and guidelines.
  - Avoid siloed solutions by supporting cross-domain and cross-vendor DT interoperability, preventing a proliferation of incompatible DT implementations.
  - Leverage oneM2M and SAREF standards, with additional work to complete the interoperability framework.
  - Explore DT interoperability to achieve seamless integration of data and services in heterogeneous IoT edge deployments, simplifying interaction and cooperation with upper layers.
- **Goals**:
  - Analyze use cases and requirements for Digital Twins in IoT.
  - Standardize functionalities and communication reference architecture for Digital Twins.
  - Instantiation of the general solution in the oneM2M context.
  - Promote the technical solution to oneM2M and other relevant associations/fora representing potential stakeholders.

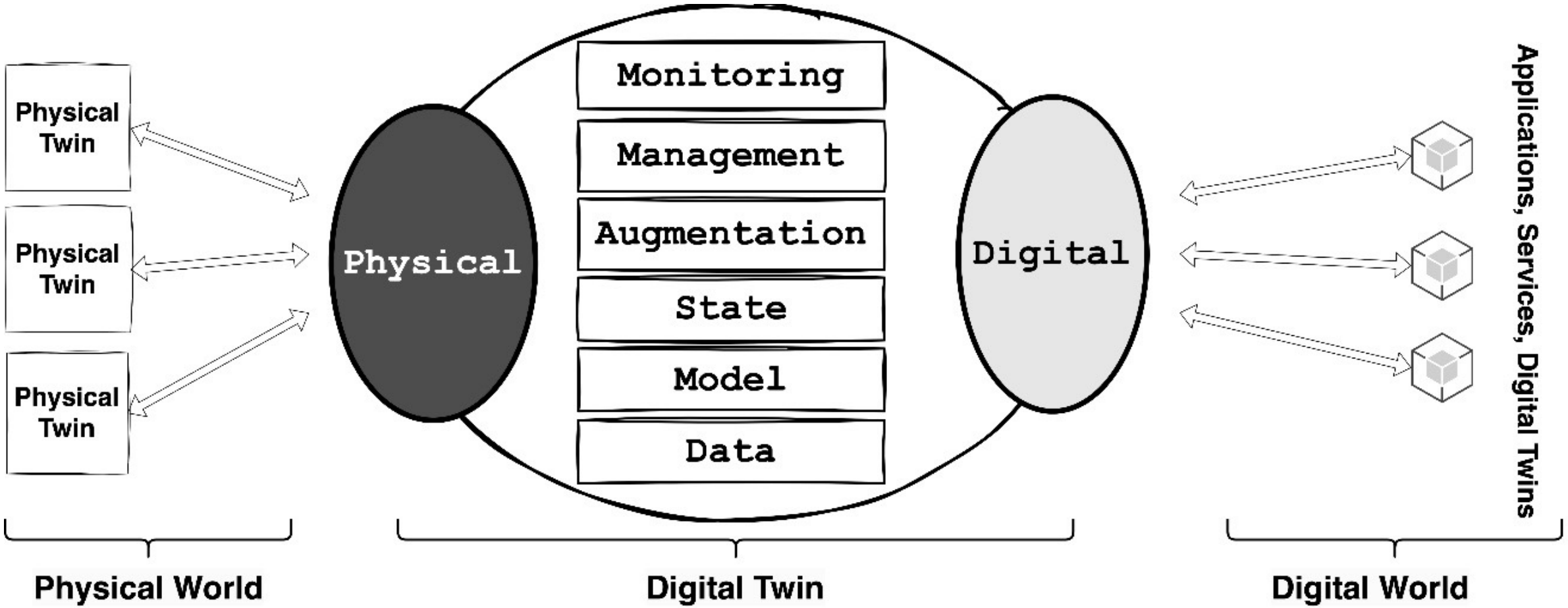
ETSI STF 628 – Timeframe

- Work Started on **2023-02-01**
- 7 Milestones defined
- Work completion scheduled for **2024-07-31**
- **Close to completion now**

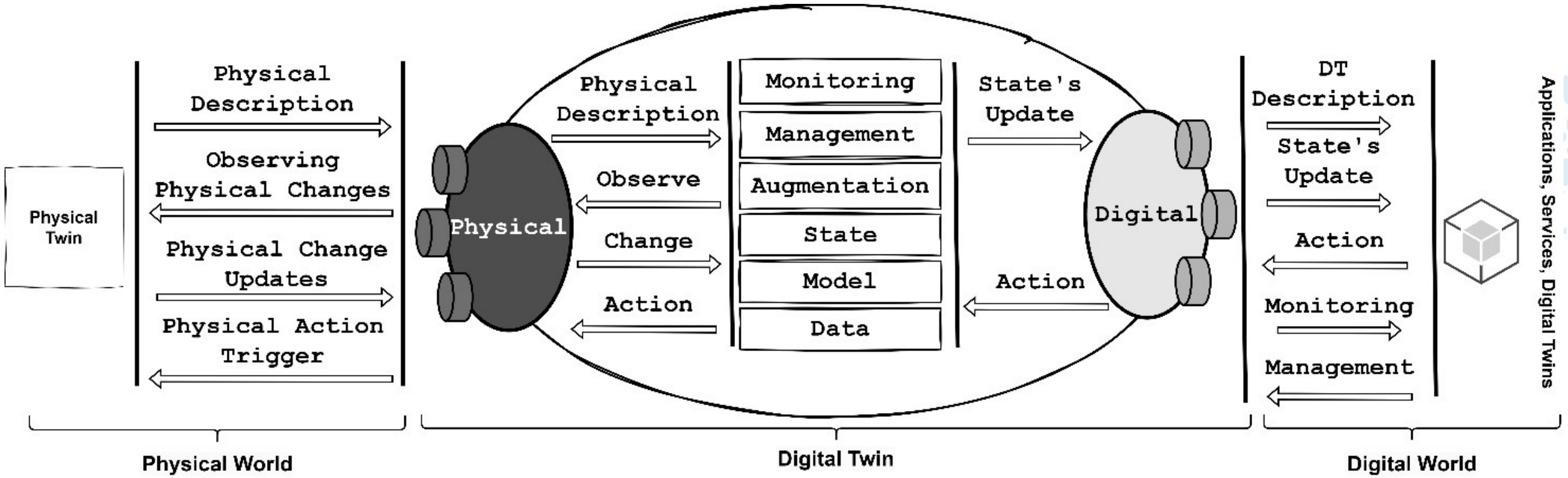
DTs Standardization Opportunities in ETSI



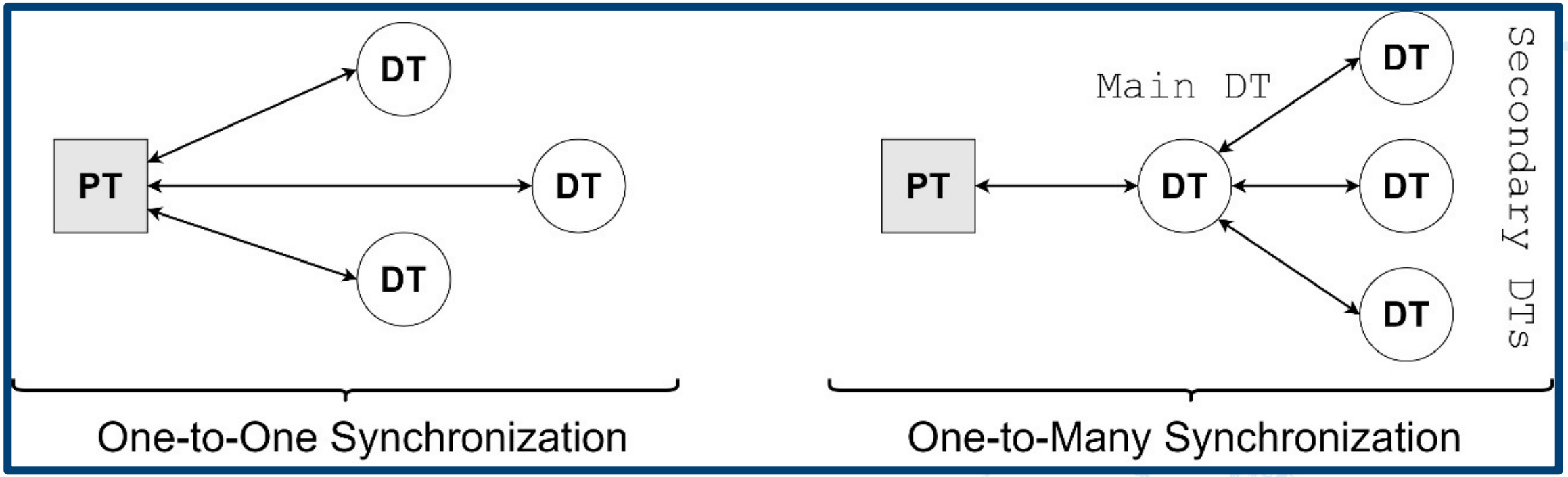
Digital Twins Communication Requirements



Digital Twins Communication Requirements



Digital Twins Communication Requirements - Replication



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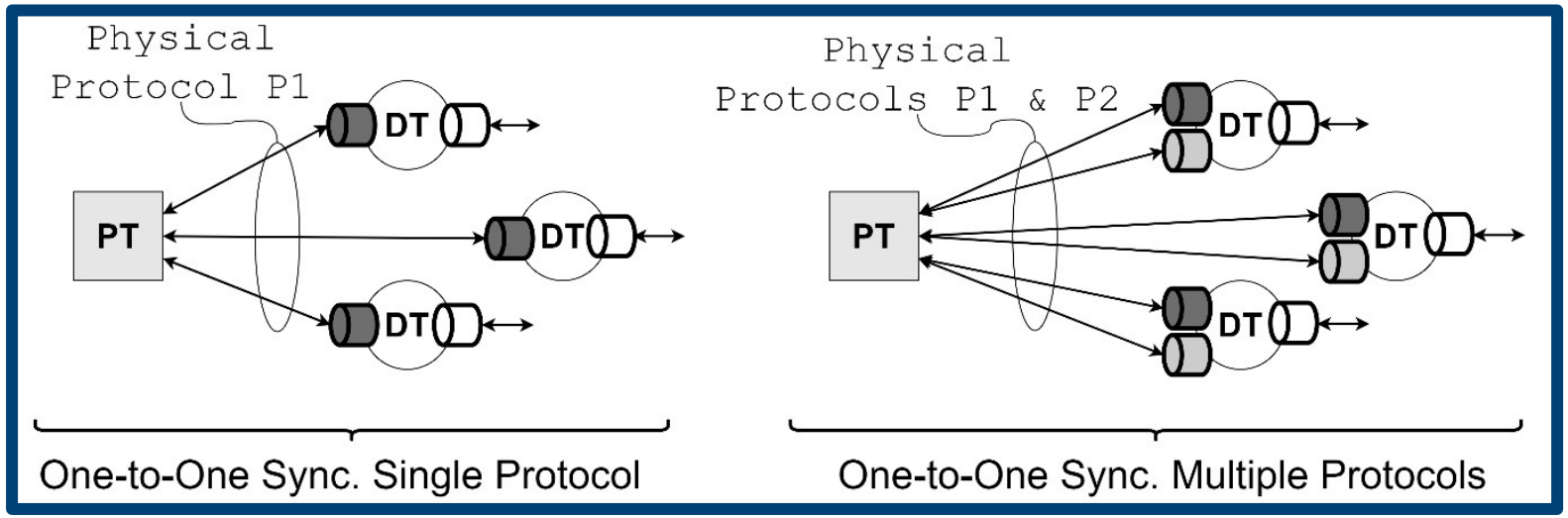
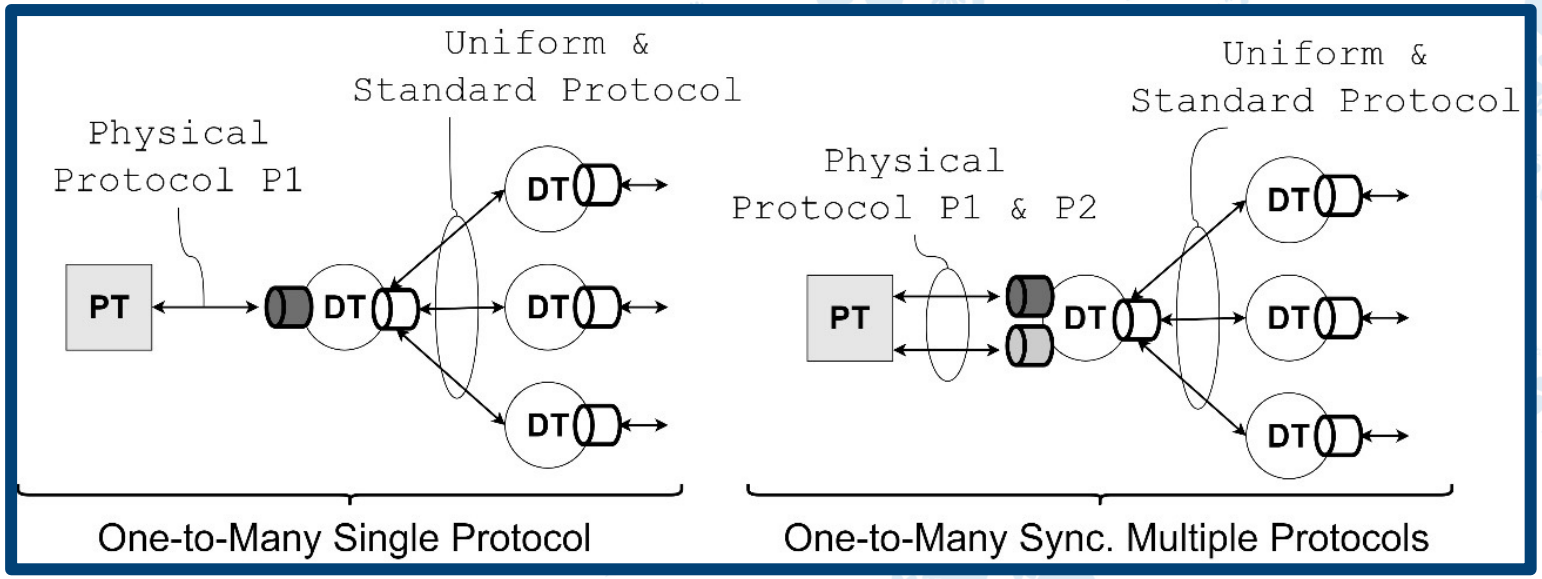
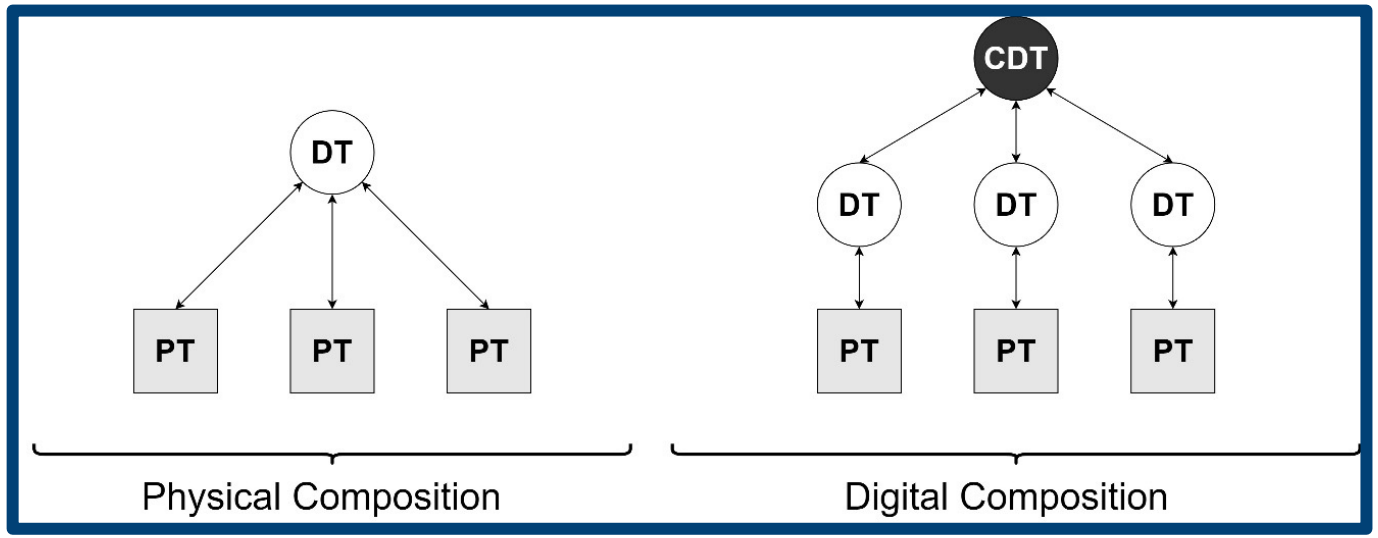
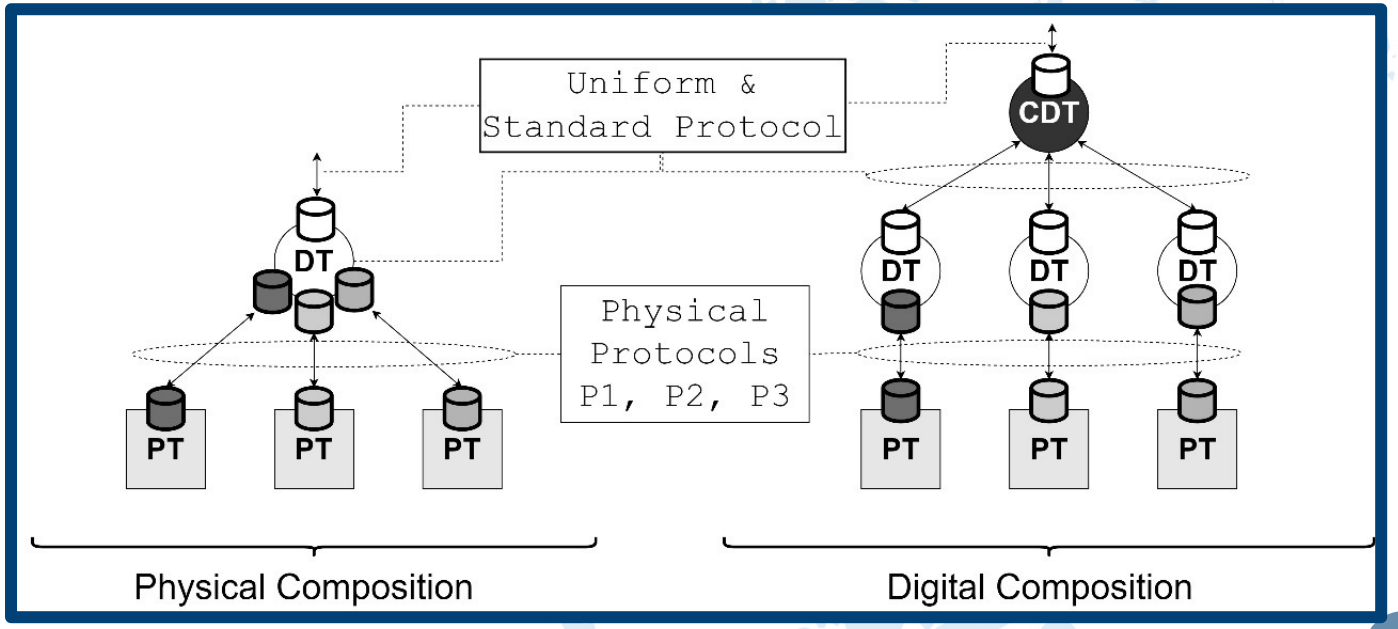




Digital Twins Communication Requirements - Composition





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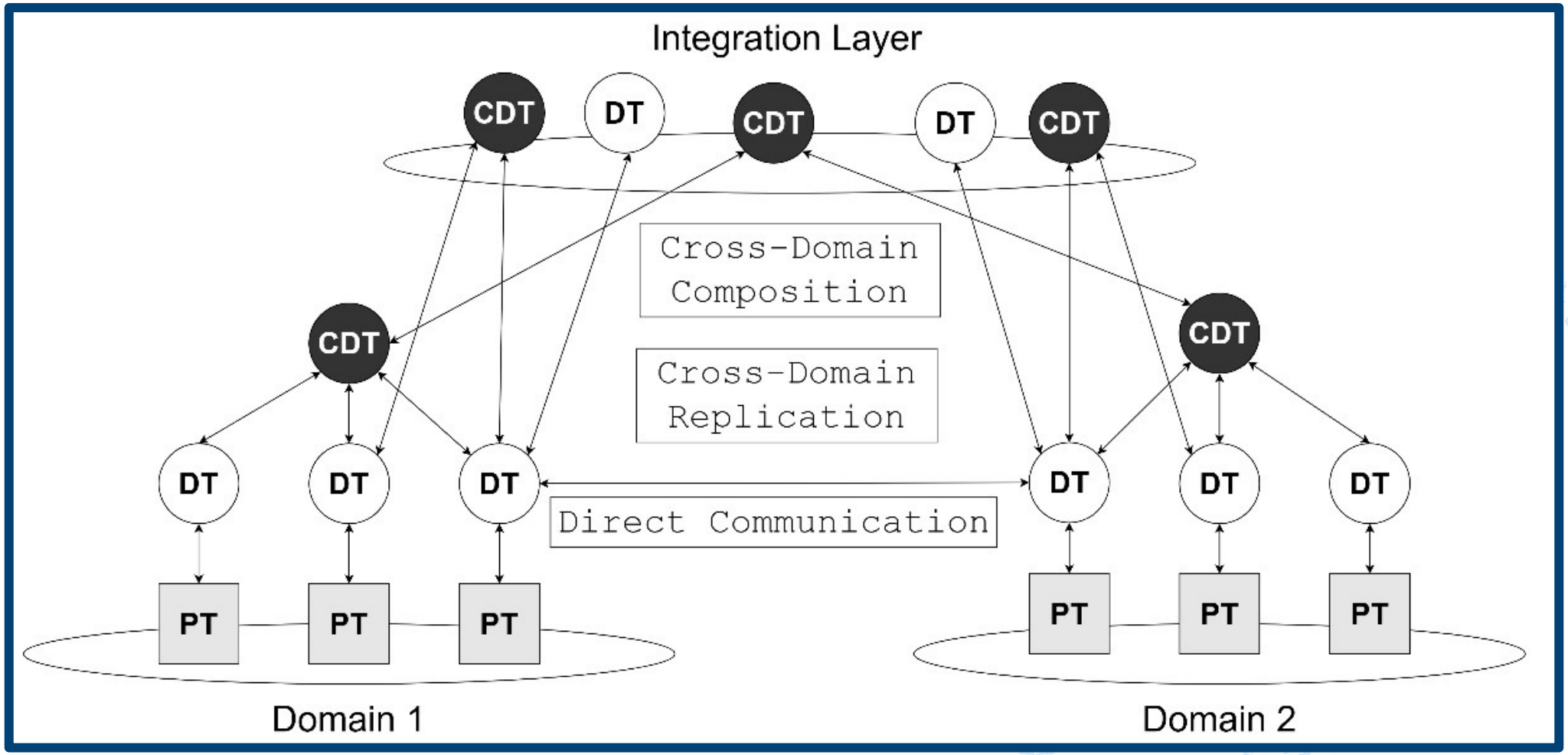
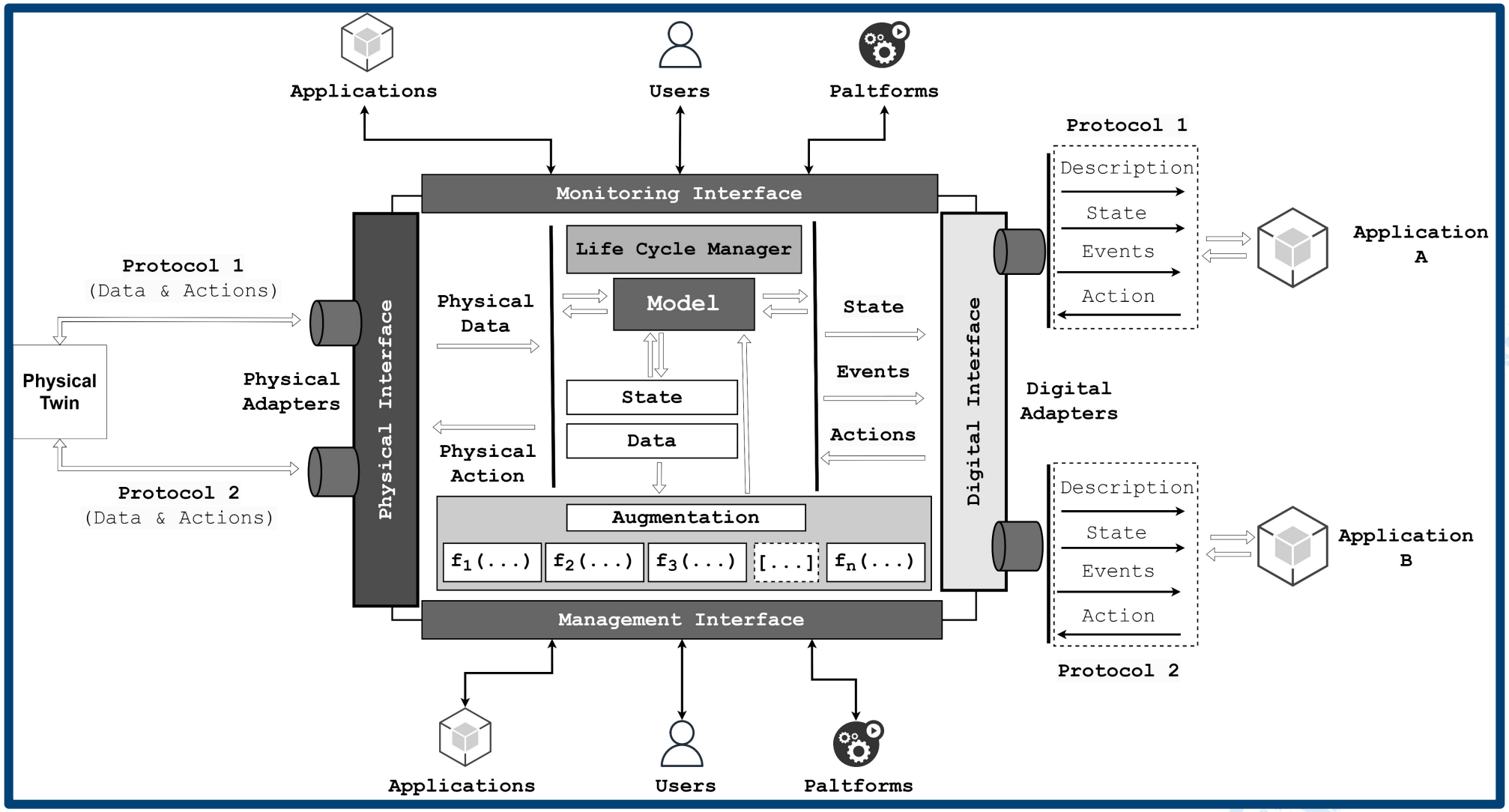
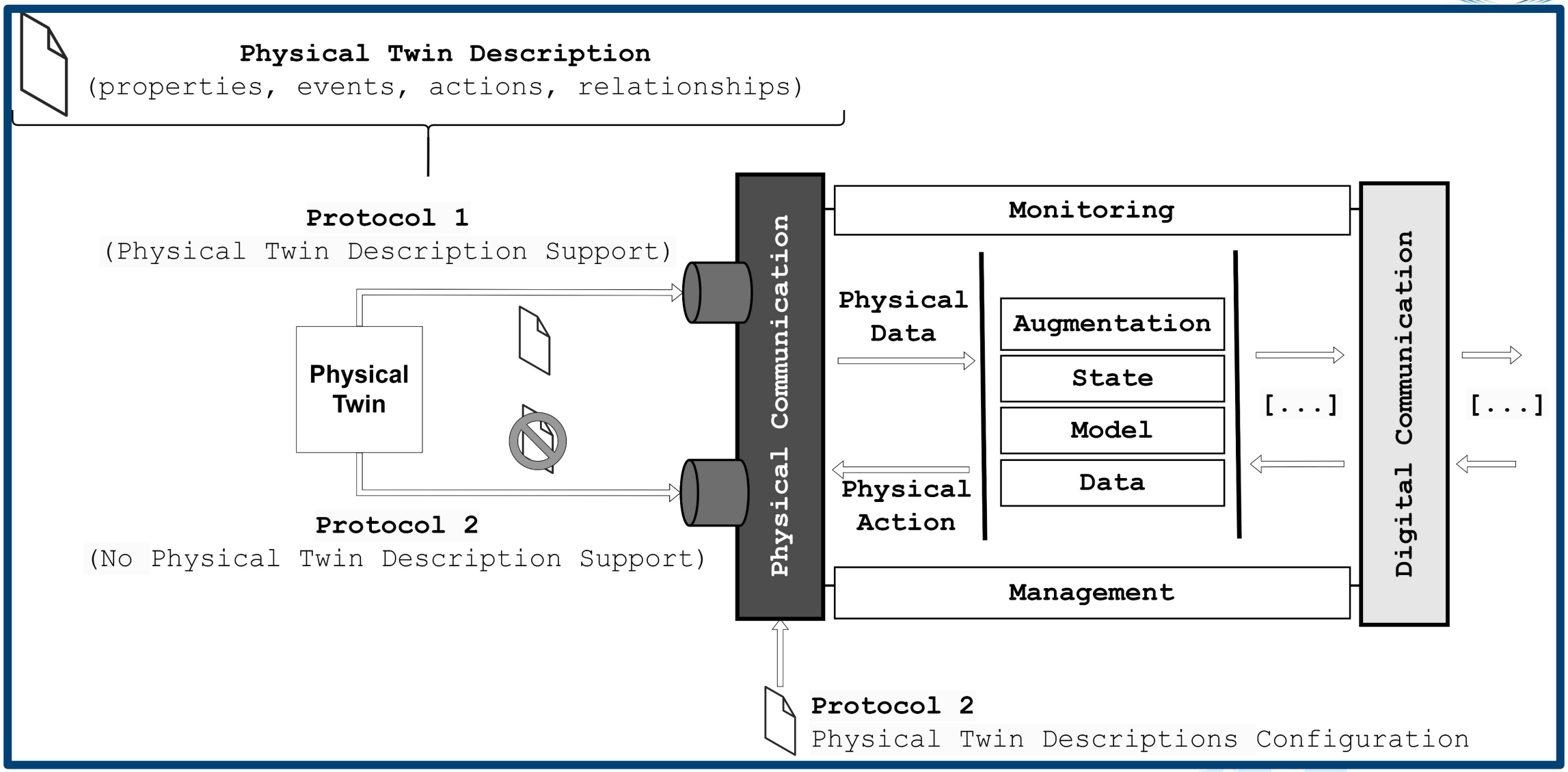


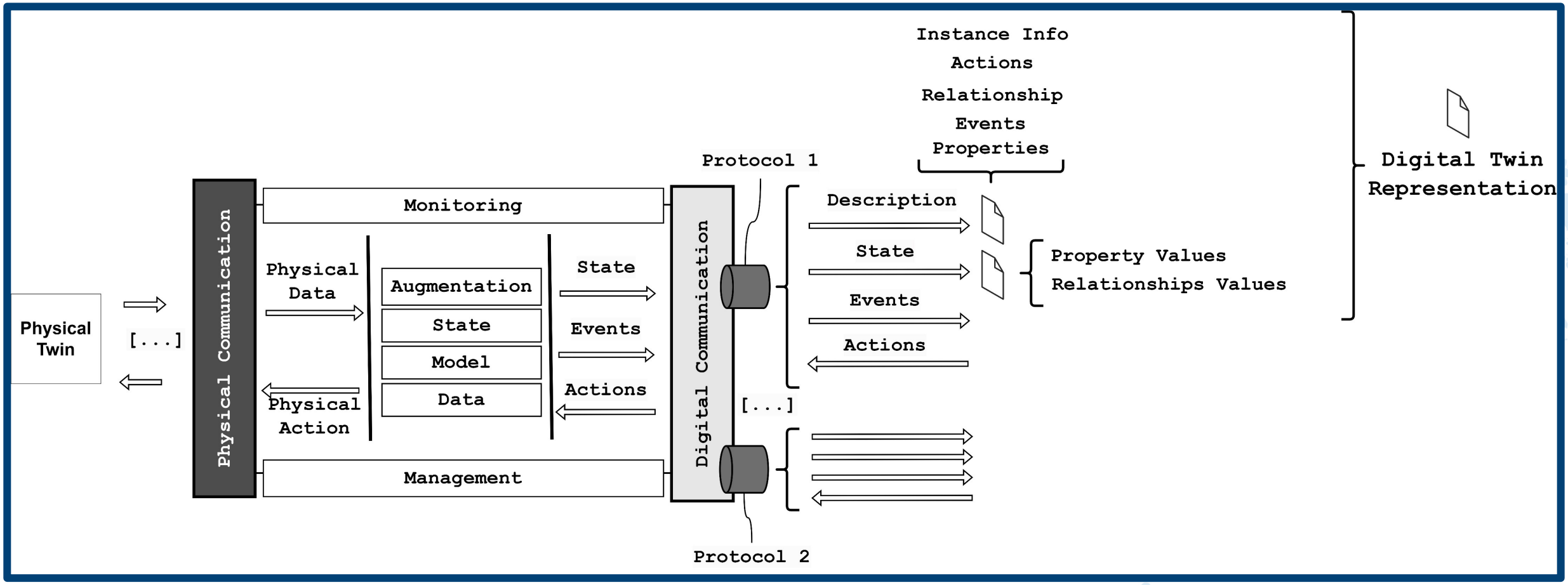
Functionalities and Comm. Reference Architecture



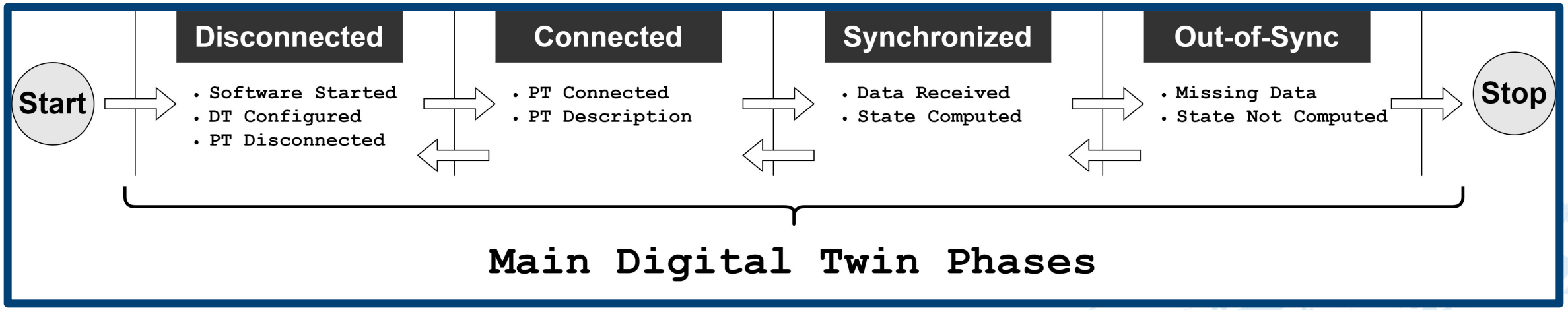
Physical World Discovery & Interaction

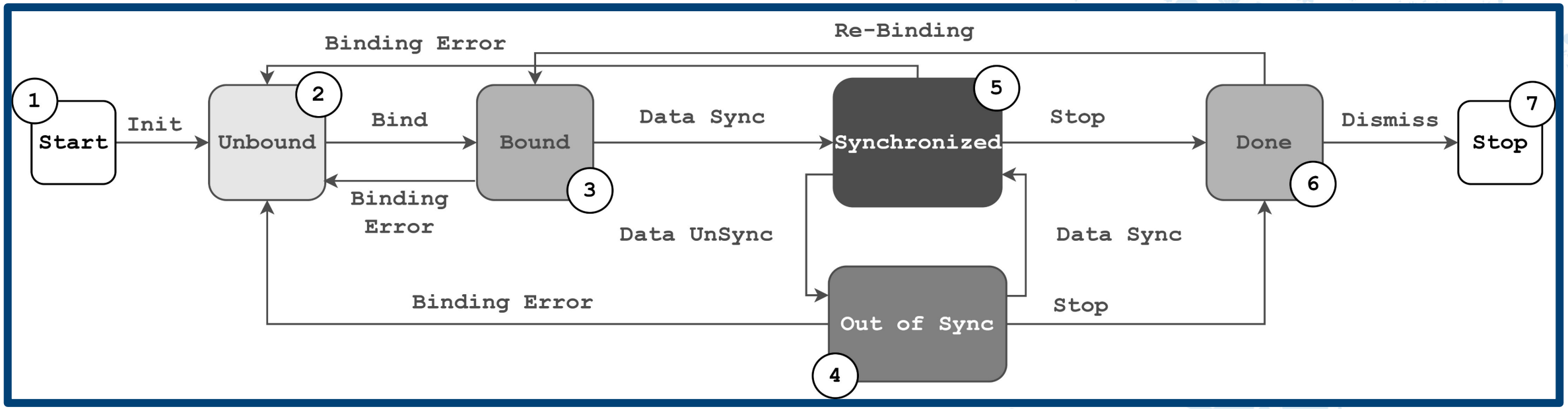


Digital Twin Representation

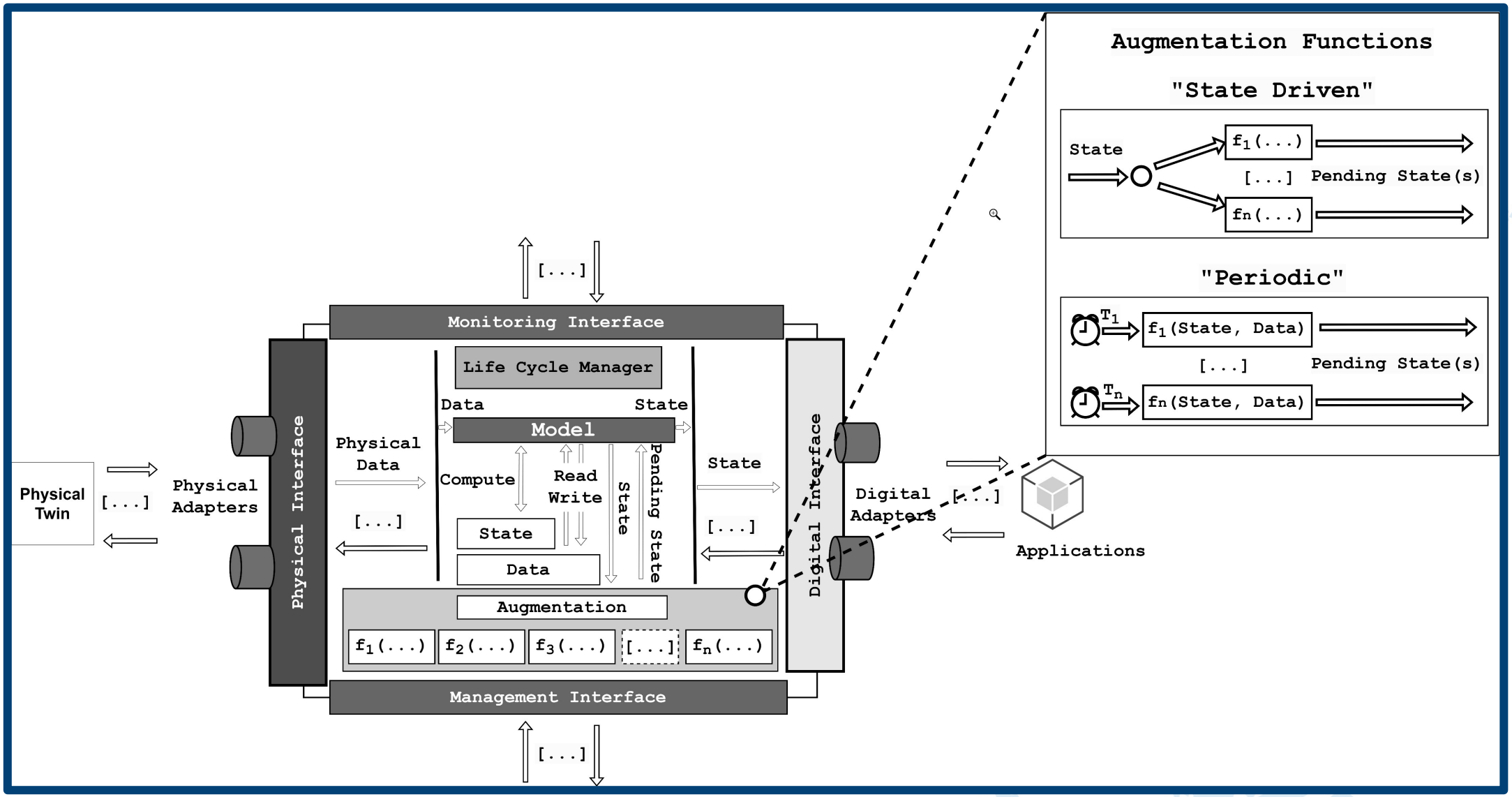


Digital Twin Phases & Life Cycle

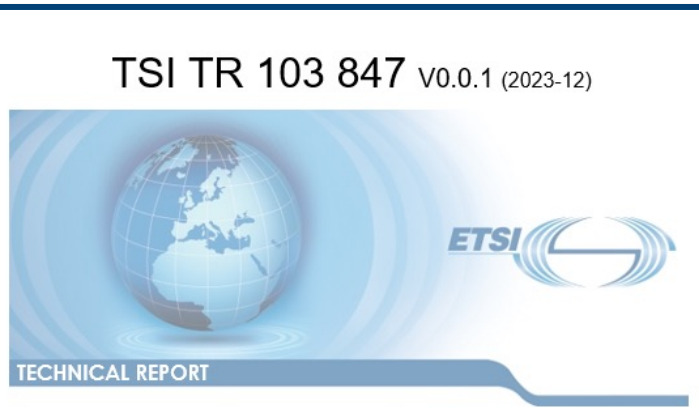


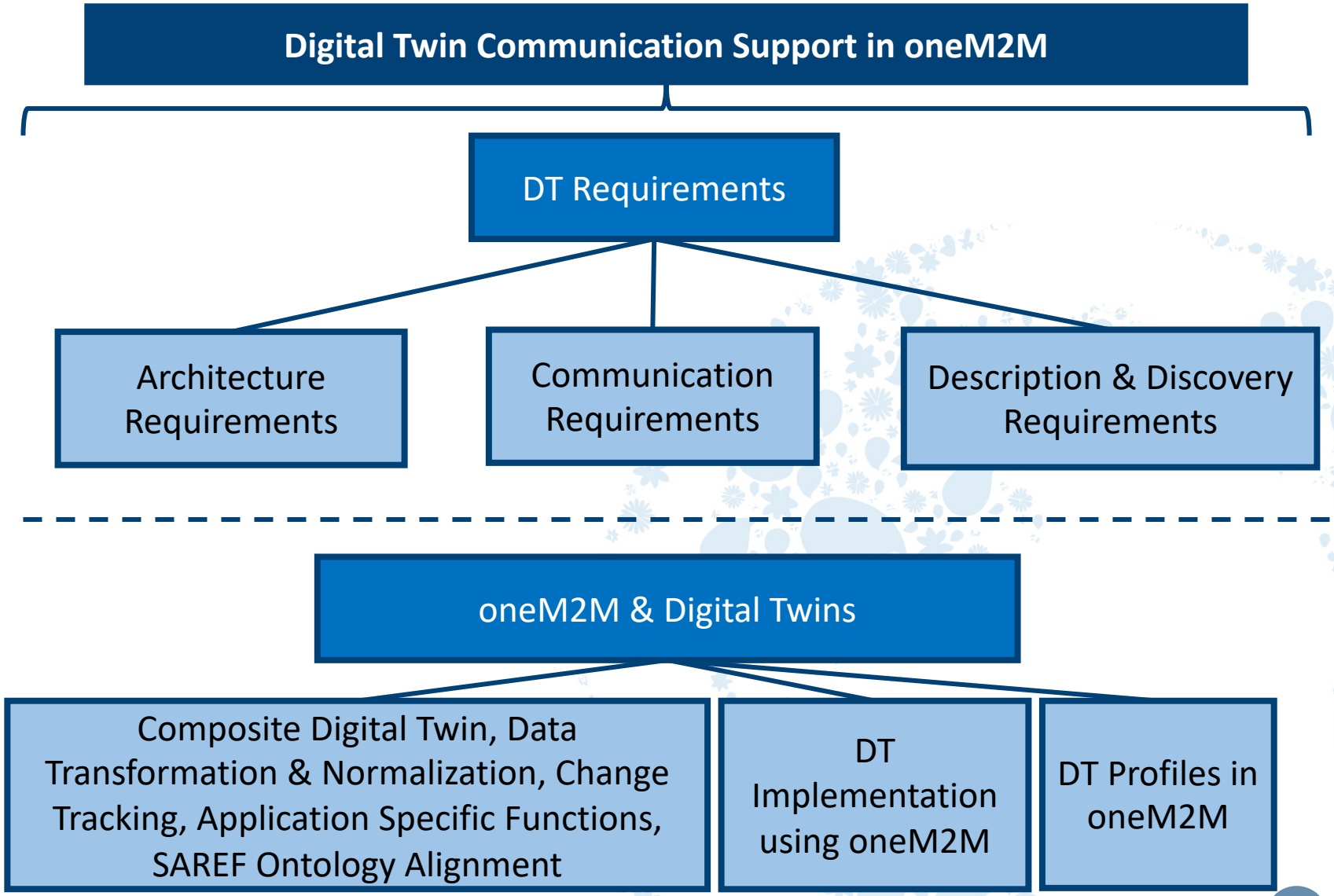


Digital Twin Augmentation



Digital Twin Communication Support in oneM2M





oneM2M WI-0118
“Digital Twins Enablement in oneM2M”

The activities under this Work Item consist of:

- Sharing the outcomes and results of STF 628 to oneM2M technical plenary
- Soliciting feedback from the oneM2M community to further augment and refine the findings from STF 628
- Involving the wider oneM2M community with the intent of developing contributions to augment and refine the findings from STF 628, including development of requirements in oneM2M and solutions.

The scope of this work item is to capture new requirements that are needed to support Digital Twins in oneM2M and, where needed, define appropriate mappings and/or extensions to existing specifications to satisfy said requirements.

oneM2M WI-0118
Timetable

Started	at TP#63, December 2023
Change Control	at TP#65, June 2024
Freeze	at TP#68, Q1 2025
Approval	at TP#69, Q2 2025

oneM2M WI-0118 - Deliverables

New Specifications:

- **TR-NNNN (Number not assigned yet)**
  - Support of Digital Twins in oneM2M

CRs to existing specifications:

- **TS-0002**
  - Suggest requirements for supporting Digital Twins
- **TS-0001**
  - Suggest architecture enhancements for supporting Digital Twins

ETSI Specialist Task Force 641 Digital Twins

STF641 develops **consolidated revisions of 7 SAREF domain extensions, a SAREF European Norm, 2 new Technical Reports (TR) and a new Technical Specification (TS)**

TR 103827 SAREF: Digital Twins Opportunities for the Ontology Context

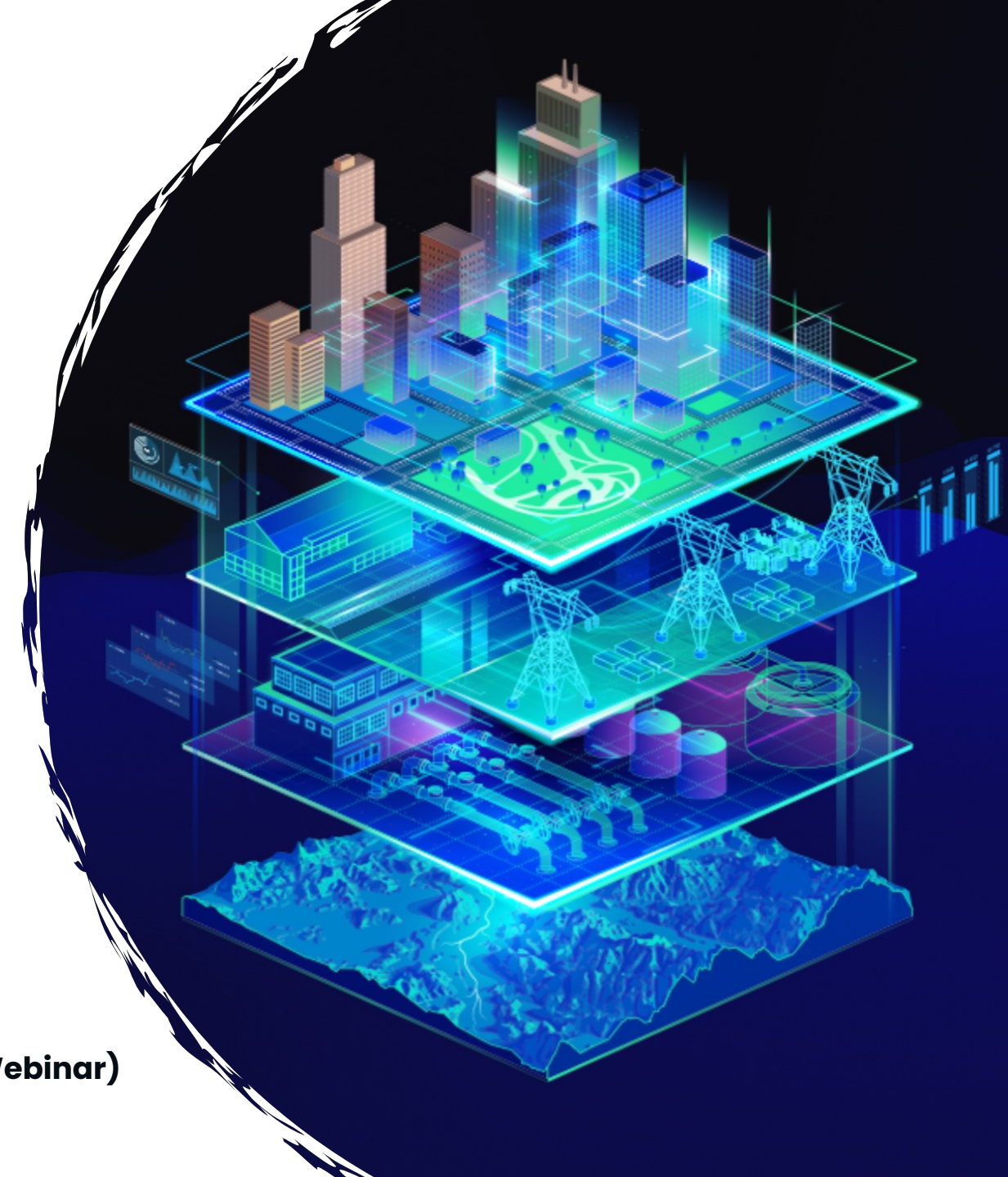
- Provides an overview of the Digital Twins landscape for the urban domain
- Aims to assist practitioners in gaining a comprehensive understanding of the latest trends in Digital Twins technical standards
- Provides valuable insights for companies seeking to implement Digital Twins applications by explaining the standards from five different perspectives: physical entity, virtual entity, data management, connections, and services
- Provides preliminary insights about how the SAREF Core ontology and its extensions can be exploited to support interoperability aspects within the Digital Twins domain
- Lists a set of use cases in order to depict concrete implementation of Digital Twins to use as a starting point for an interoperability analysis
- Analyses how the SAREF suite can be employed to model complex urban Digital Twins given the absence of standards
- Discovers that to fill the gaps between the current version of the SAREF suite and the definition of complex urban Digital Twins, further concepts aiming to model device services and time series are required

ETSI Specialist Task Force 641 Digital Twins

TS 103828 SAREF: Ontology Support for Urban Digital Twins and usage guidelines

- Provides a recap of the priority gaps identified in ETSI TR 103 827 concerning the modelling of complex Digital Twins by exclusively using the SAREF suite of ontologies
- Provides a comprehensive set of guidelines about
  - how the SAREF suite may fill those gaps
  - how the SAREF suite may be extended in two different directions, i.e. the modelling of semantic services and the integration of time series
  - how the SAREF suite may be applied concerning the modelling of complex Digital Twins
- Such potential enhancement is validated through the instantiation of two use cases which show, how complex Digital Twins may be instantiated through the proposed guidelines
- The guidelines represent important insights that the engineers should follow to make Digital Twins-based systems more useful from the data perspective and to avoid the gathering of data that are useless with respect to the purpose of specific scenarios
- The content of the Technical Specification works as a perfect basis towards the definition of a standard about the modelling of complex Digital Twins

Digital Twins Standardisation at ETSI and oneM2M Follow Up



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