

Virtual World of Energy - Digital Twins as building blocks Challenges

Antonio Kung
25 September 2024

An architecture and interoperability issue

Virtual word

AI, IoT, Digital twin

Safety, Security, Privacy, Resilience

Energy
domain

Other
domain

ISO/IEC JTC 1/SC 41 Internet of Things

- History (<https://jtc1info.org/sd-2-history/jtc1-subcommittees/sc-41/>)
 - November 2016
 - Creation of SC41: IoT and related technologies
 - November 2020
 - Adding Digital Twins in the scope
- Scope (https://www.iec.ch/dyn/www/f?p=103:7:16160045003496::::FSP_ORG_ID,FSP_LANG_ID:20486,25)
 - Standardization in the area of Internet of Things and Digital Twin, including their related technologies.
 - Serve as the focus and proponent for JTC 1's standardization programme on the Internet of Things and Digital Twin, including their related technologies.
 - Provide guidance to JTC 1, IEC, ISO and other entities developing Internet of Things and Digital Twin related applications.

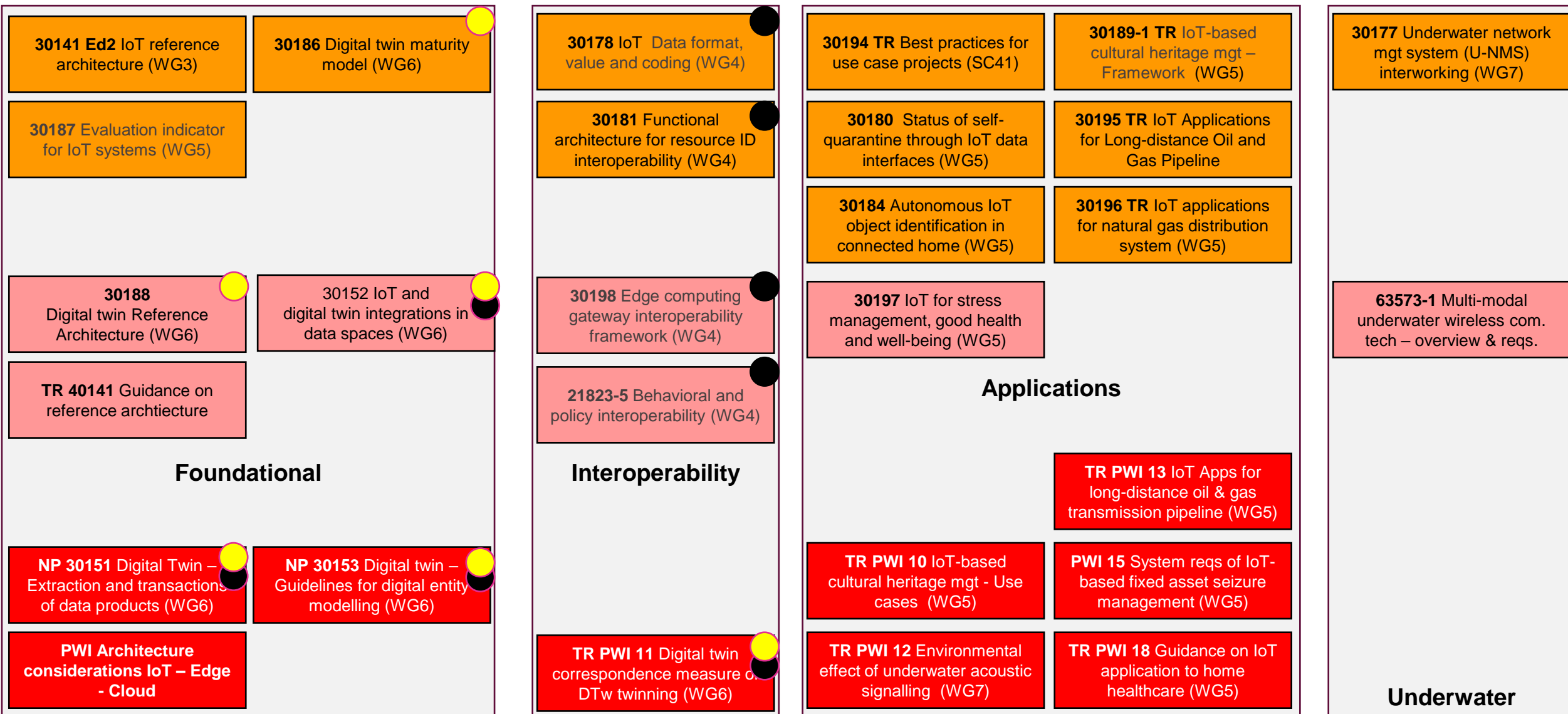
Published Standards (Yellow tags are Digital Twins Standards, black tags relate to Data)

(TR technical report – TS technical specification)

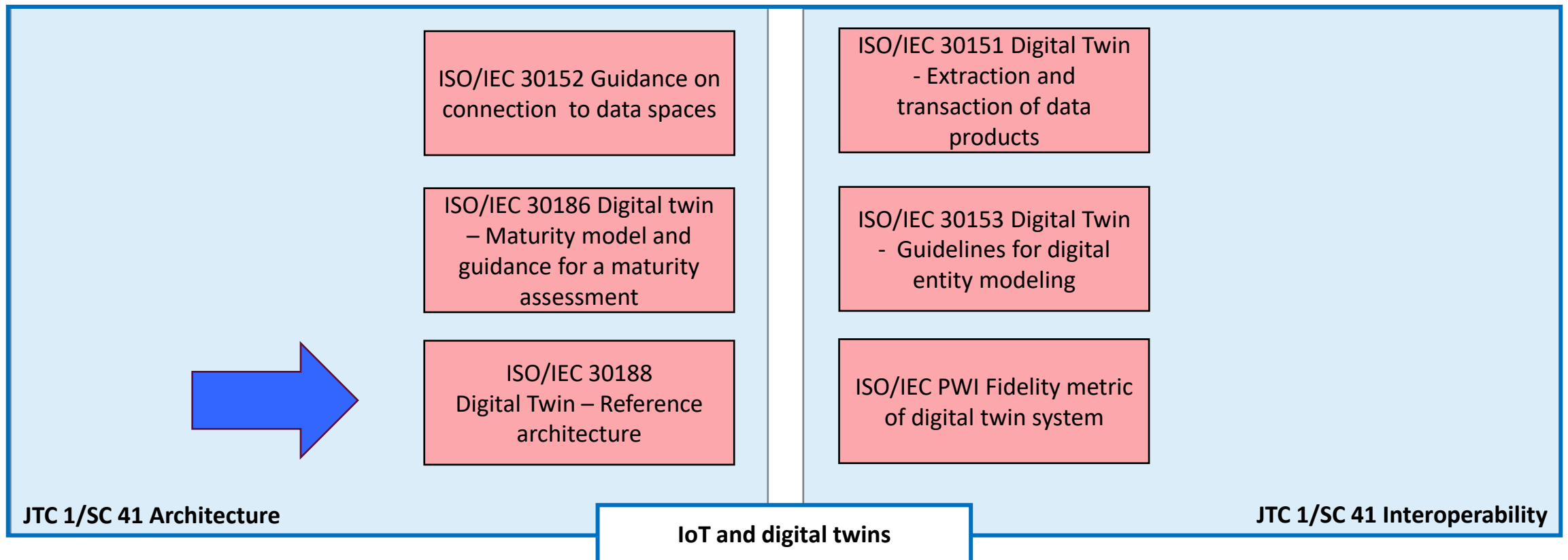
20924 Ed2 2024 IoT and digital twin – Vocabulary	21823-1 2020 IoT interoperability - framework	22417 TR 2017 IoT use cases	29182-1 2017 SNRA General overview and requirements	29182-7 2015 SNRA Interoperability guidelines	30140-1 2018 UWASN – Overview and requirements
30141 Ed2 2024 IoT reference architectures	21823-2 2020 IoT transport interoperability	30163 2021 SN-based integrated platform for chattel asset monitoring	29182-2 2013 SNRA Vocabulary and terminology	20005 2013 Collaborative information processing in intelligent SN	30140-2 2017 UWASN – Reference architecture
30147 2021 Integration of IoT trustworthiness in ISO/IEC/IEEE 15288	21823-3 2021 IoT semantic interoperability	30169 2022 IoT applications for electronic label systems (ELS)	29182-3 2014 SNRA Reference architecture views	30128 2014 Generic SN Application Interface	30140-3 2018 UWASN – Entities and interfaces
30164 2020 IoT Edge computing	21823-4 2022 IoT syntactic interoperability	30172 TR 2023 Digital twin use cases	29182-4 2013 SNRA Entity models	19637 2016 SN testing framework	30140-4 2018 UWASN – Interoperability
30165 2021 Real-time IoT	30161-1 2020 Data exchange platform for IoT - Requirements & architecture	30176 TR 2021 Integration of IoT and DLT/blockchain: use cases	29182-5 2013 SNRA Interface definitions	22560 TR 2017 SN - Aeronautics active air-flow control	30142 2020 UWASN – Network mgt system overview & requirements
30166 TR 2020 Industrial IoT	30161-2 2023 Data exchange platform for IoT – Transport interoperability	30179 2023 IoT system for ecological environment monitoring	29182-6 2014 SNRA Applications	30101:2014 SN and its interfaces for smart grid system	30142-2 2020 UWASN – Network management system u-MIB
30168:2024 TS Generic Trust Anchor API for Industrial IoT Devices	30162 2022 Compatibility requirements within industrial IoT systems				30143 2020 UWASN – Application profiles
30173:2023 Digital twin concepts and terminology					30171-1 2022 B-UWAN - Overview and requirements
30149 TS 2024 IoT trustworthiness principles					
Foundational	Interoperability	Application	Sensor network	Underwater acoustic network	

SC41 Standards under development

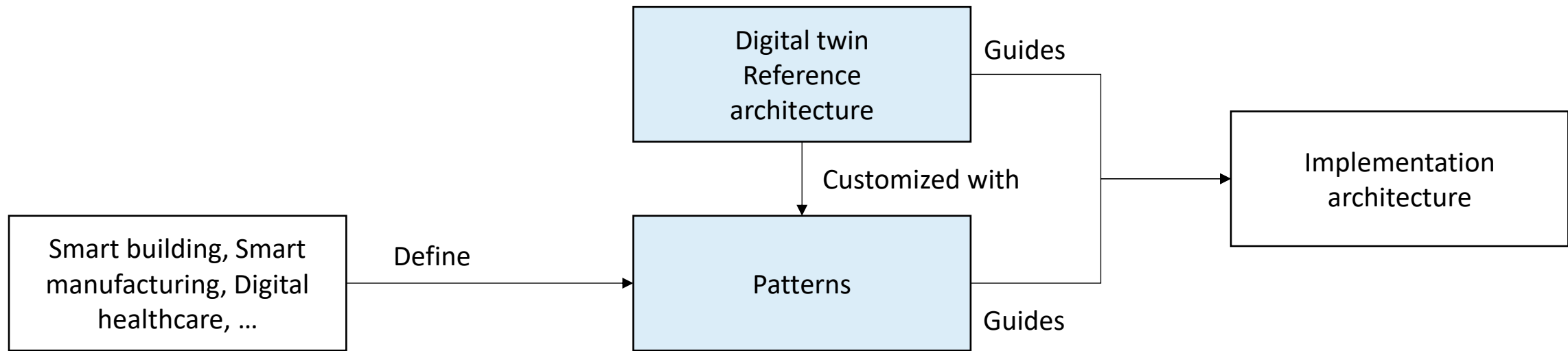
(Yellow tags are Digital Twins Standards, black tags relate to Data)



Standards under development

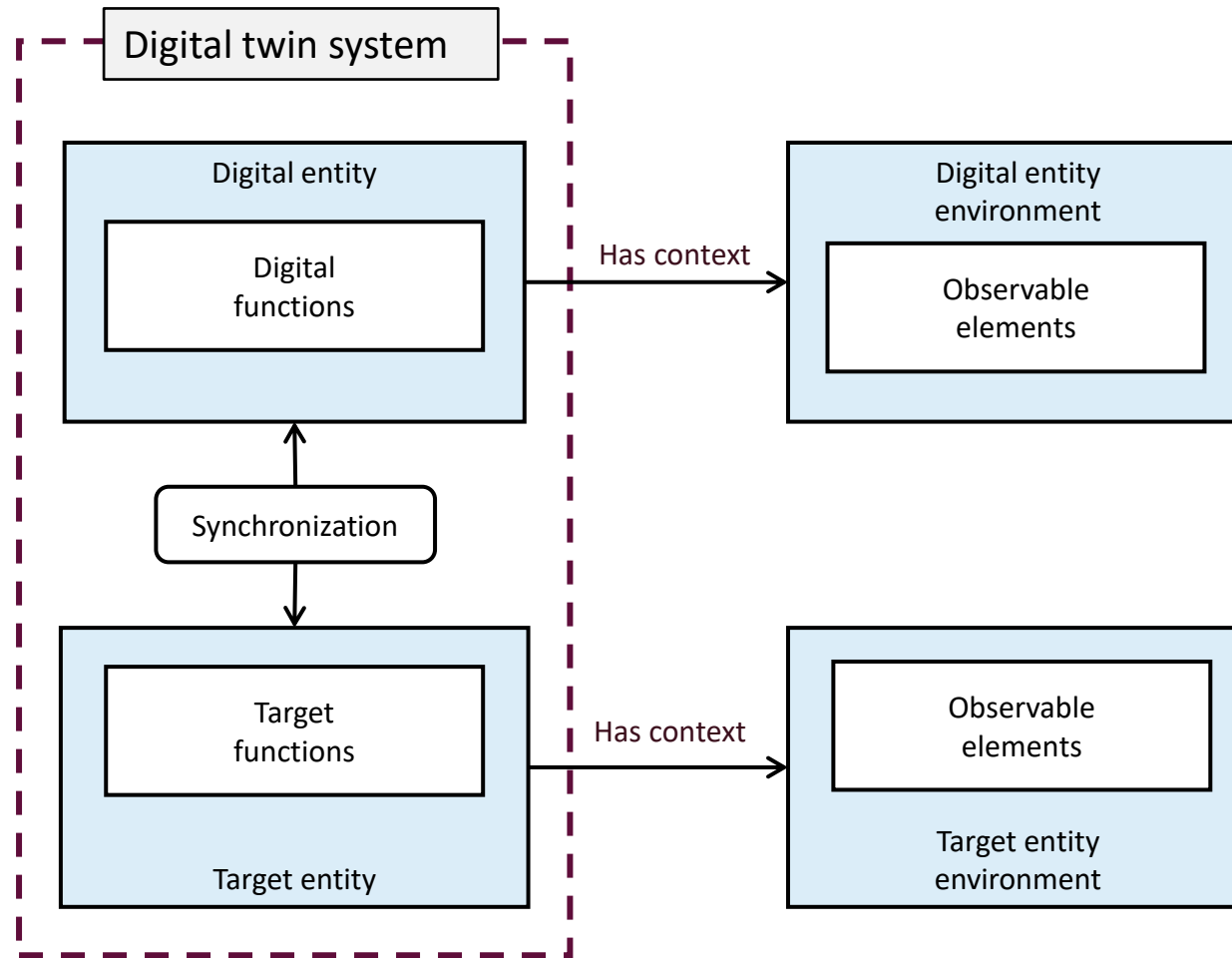


ISO/IEC 30188 Digital Twin Reference Architecture (Working Draft)



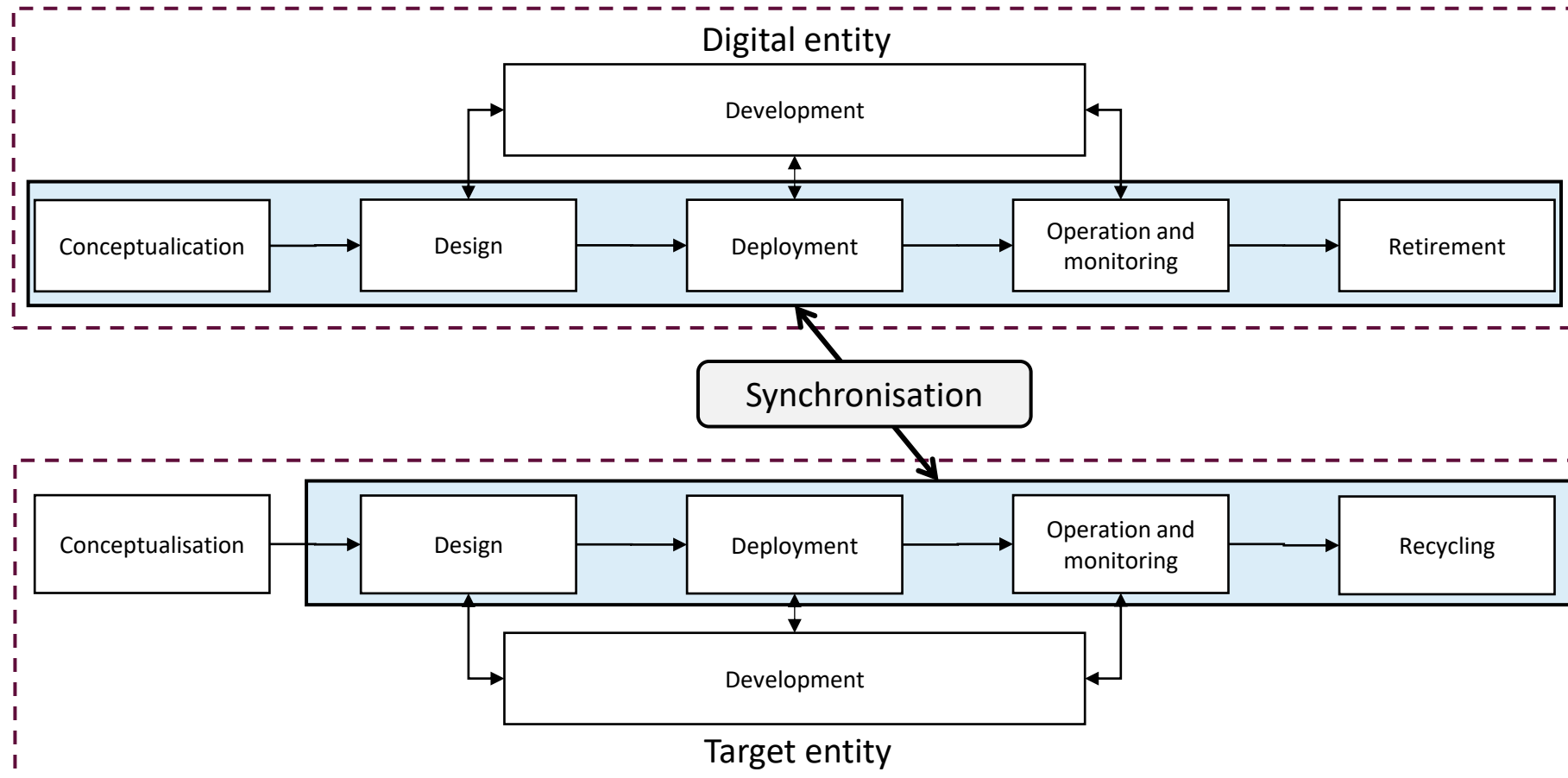
ISO/IEC 30188 Digital Twin Reference Architecture

Conceptual view



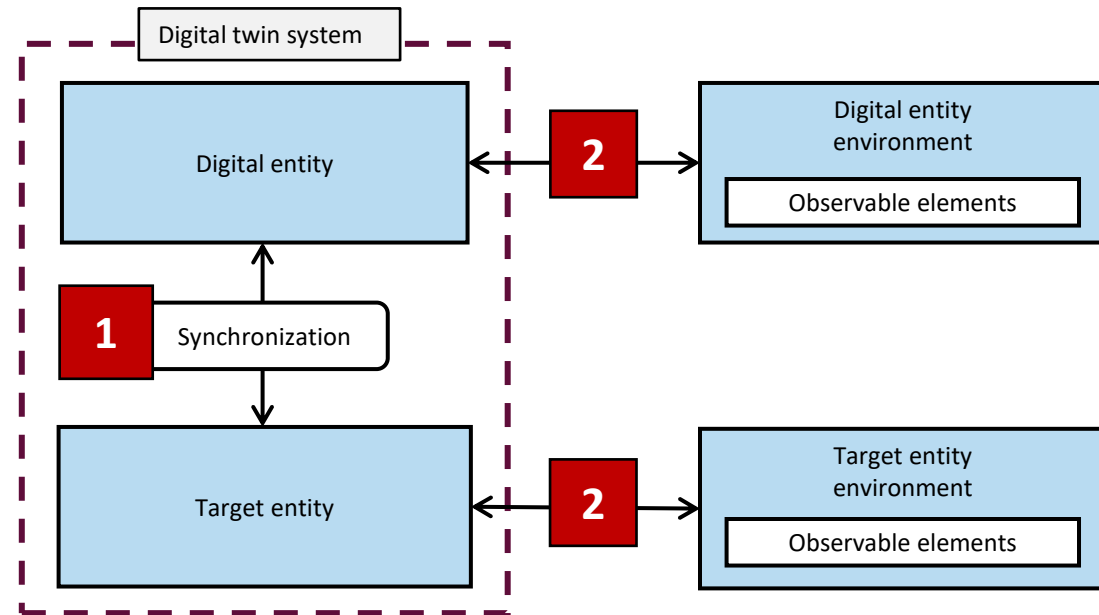
ISO/IEC 30188 Digital Twin Reference Architecture

Lifecycle view



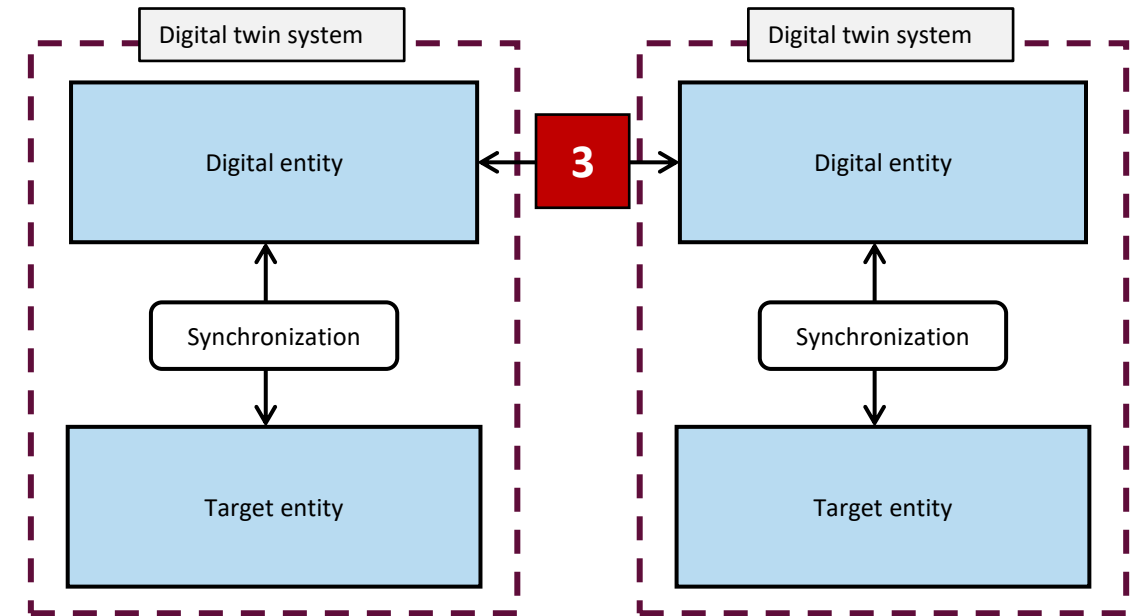
ISO/IEC 30188 Digital Twin Reference Architecture

Interoperability view





1 Inner interoperability

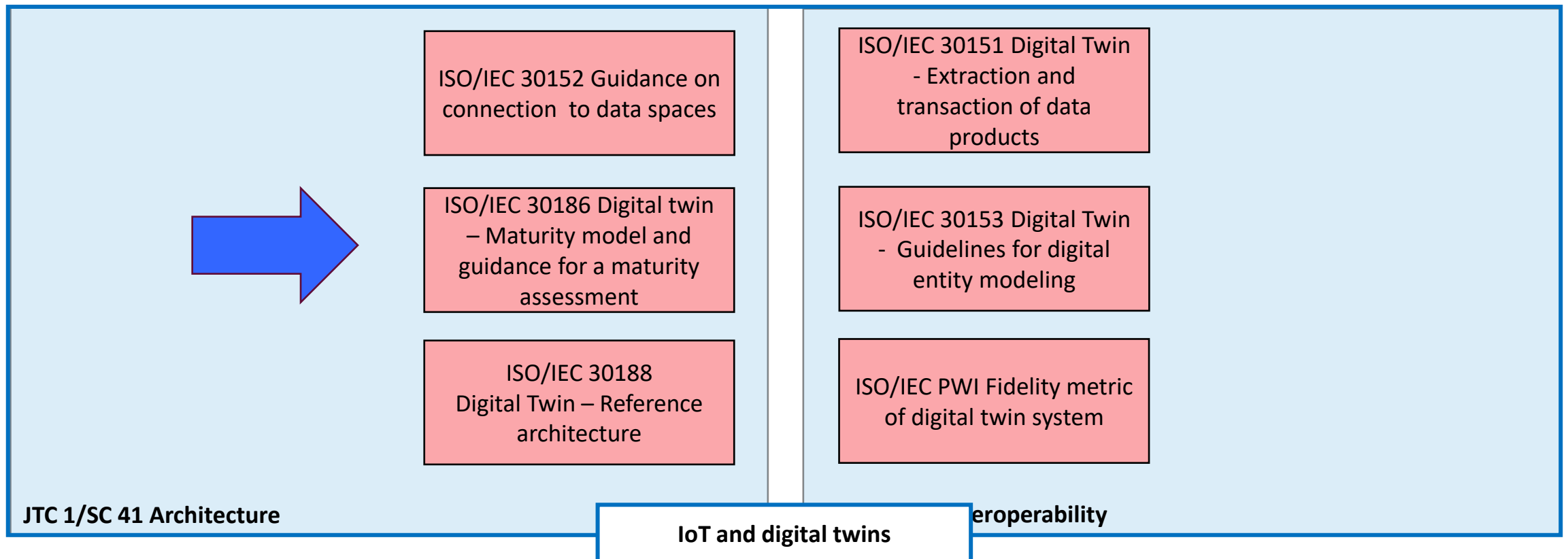
2 Outer interoperability



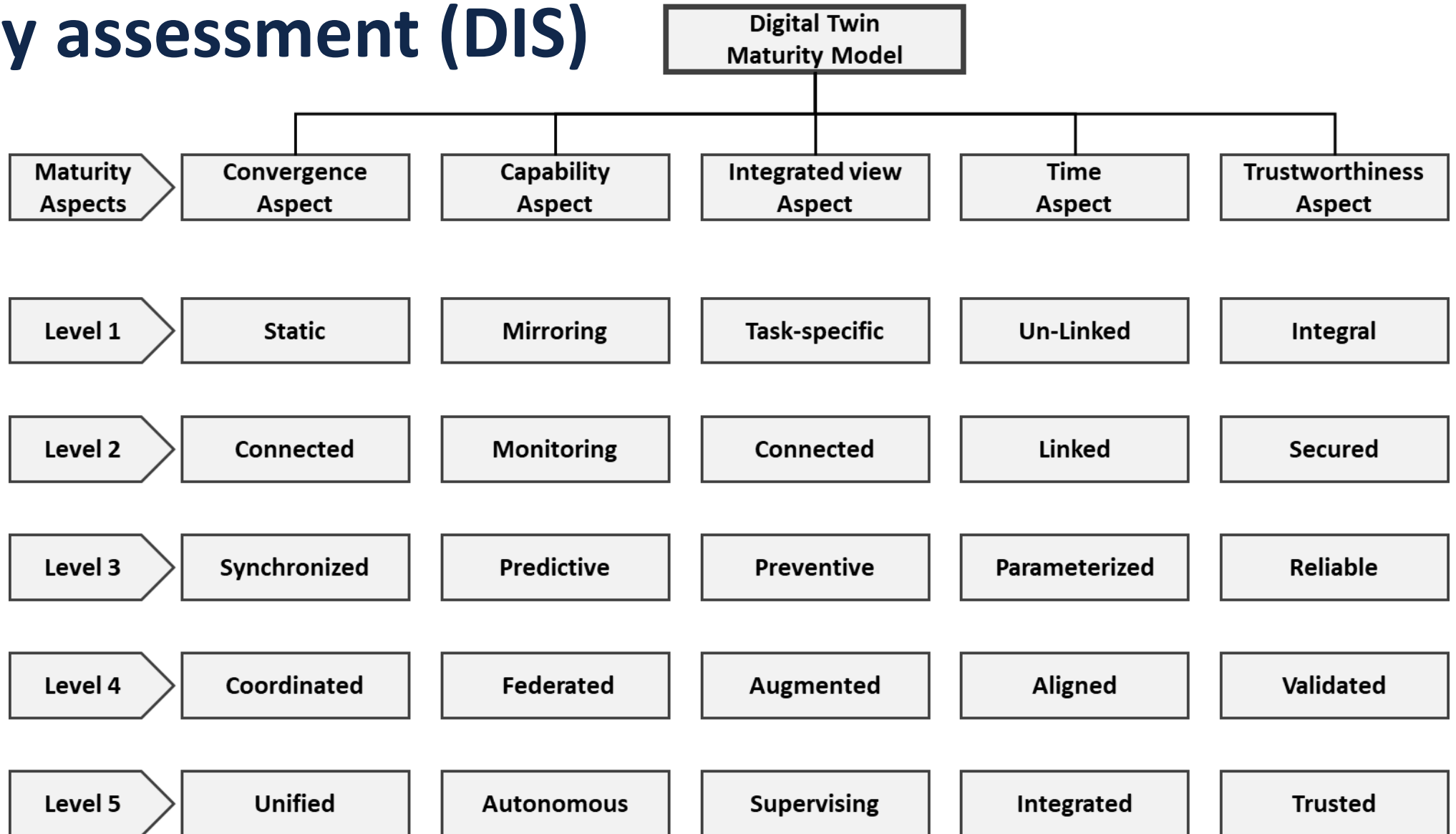
3 Transversal interoperability

Standards under development



 Under development  Published

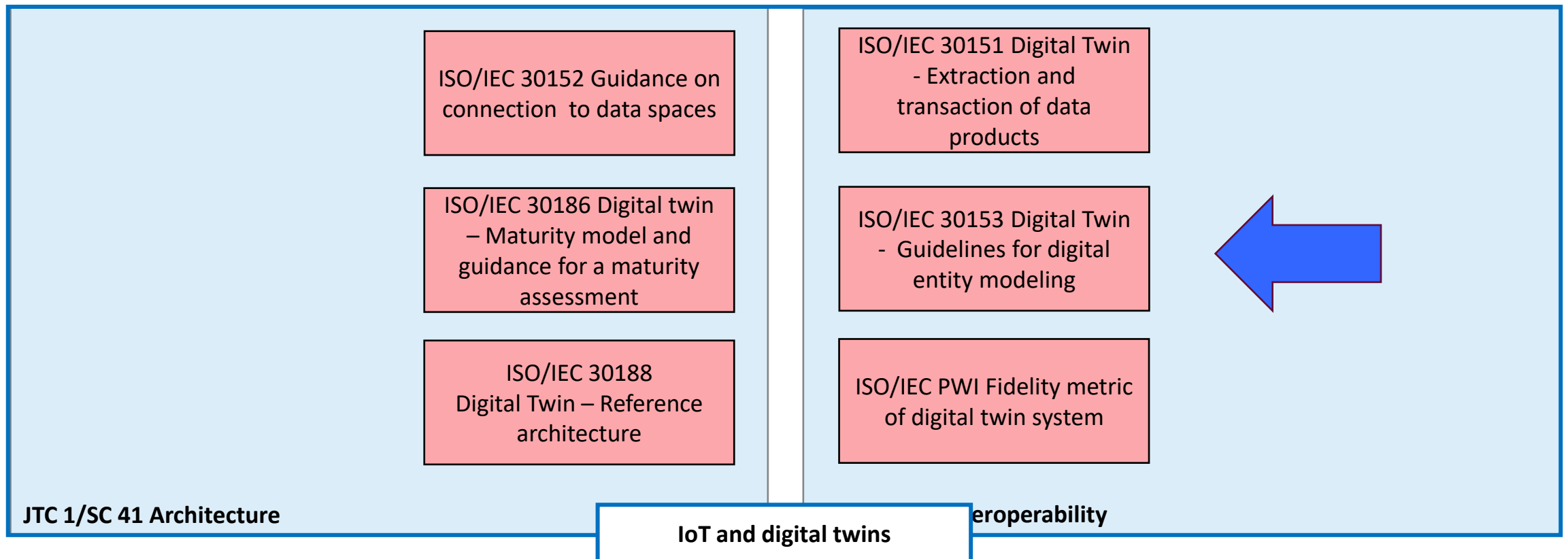


ISO/IEC 30186 Maturity model and guidance for a maturity assessment (DIS)

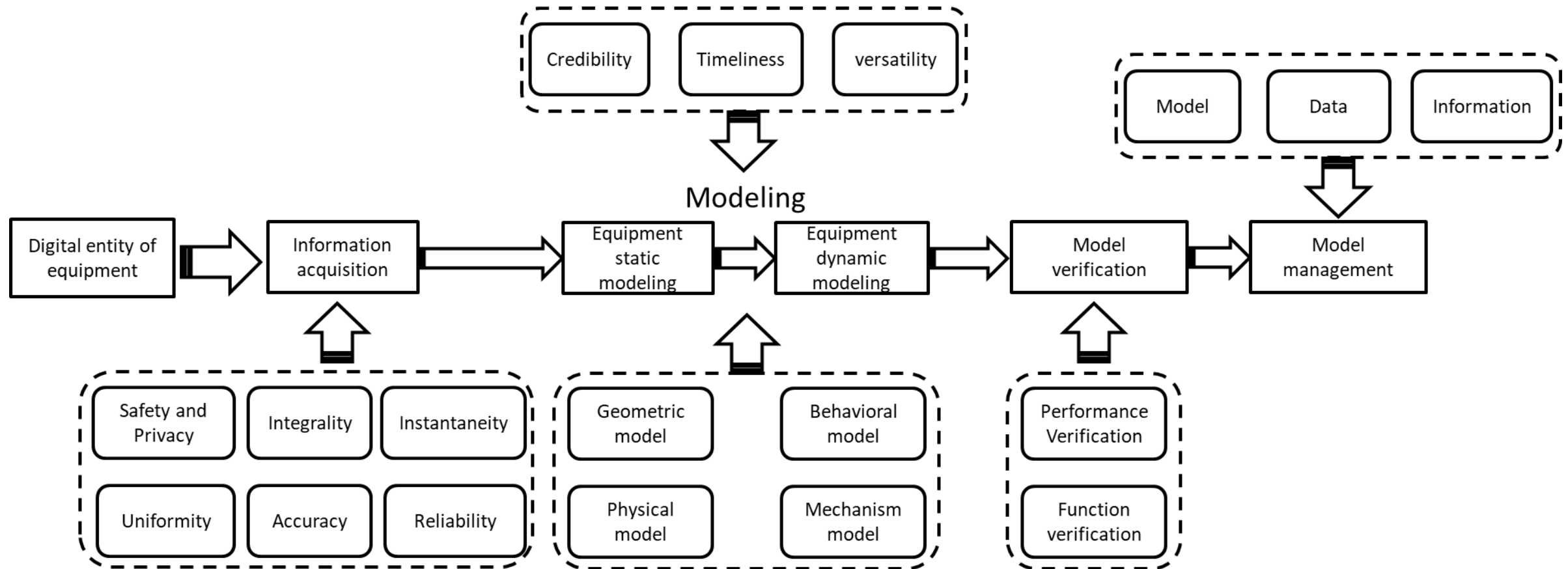


Standards under development

 Under development  Published





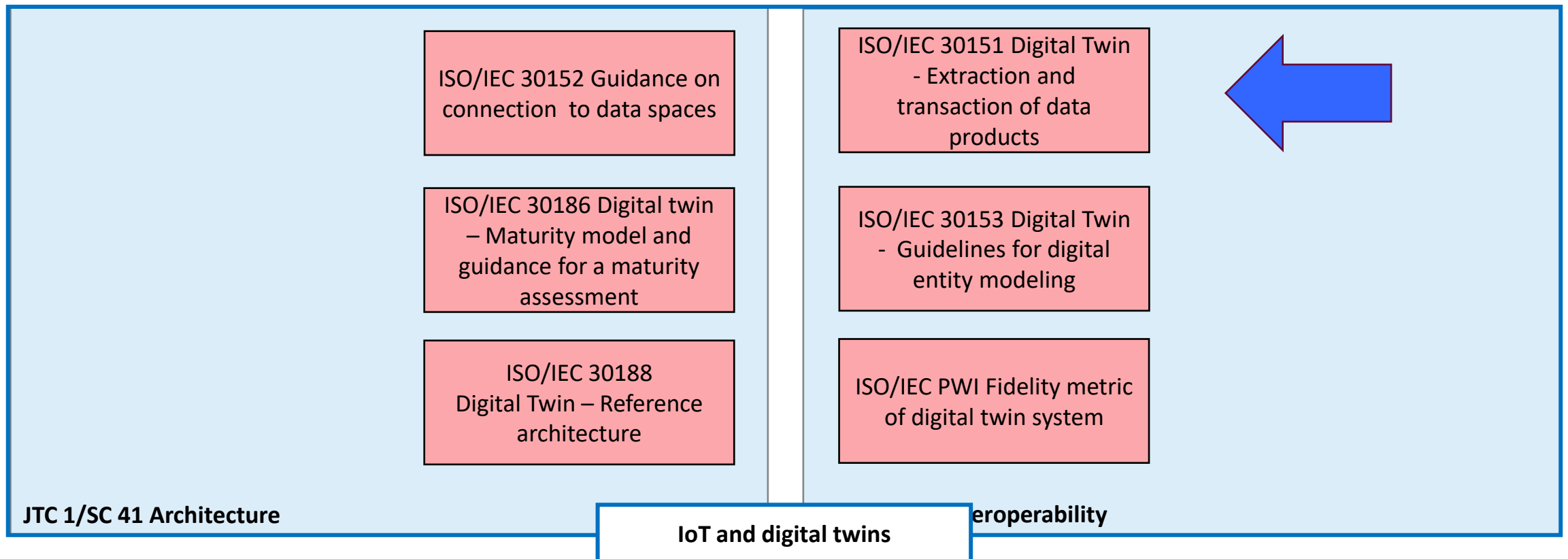
ISO/IEC 30153 Digital Twin - Guidelines for digital entity modeling (working draft)



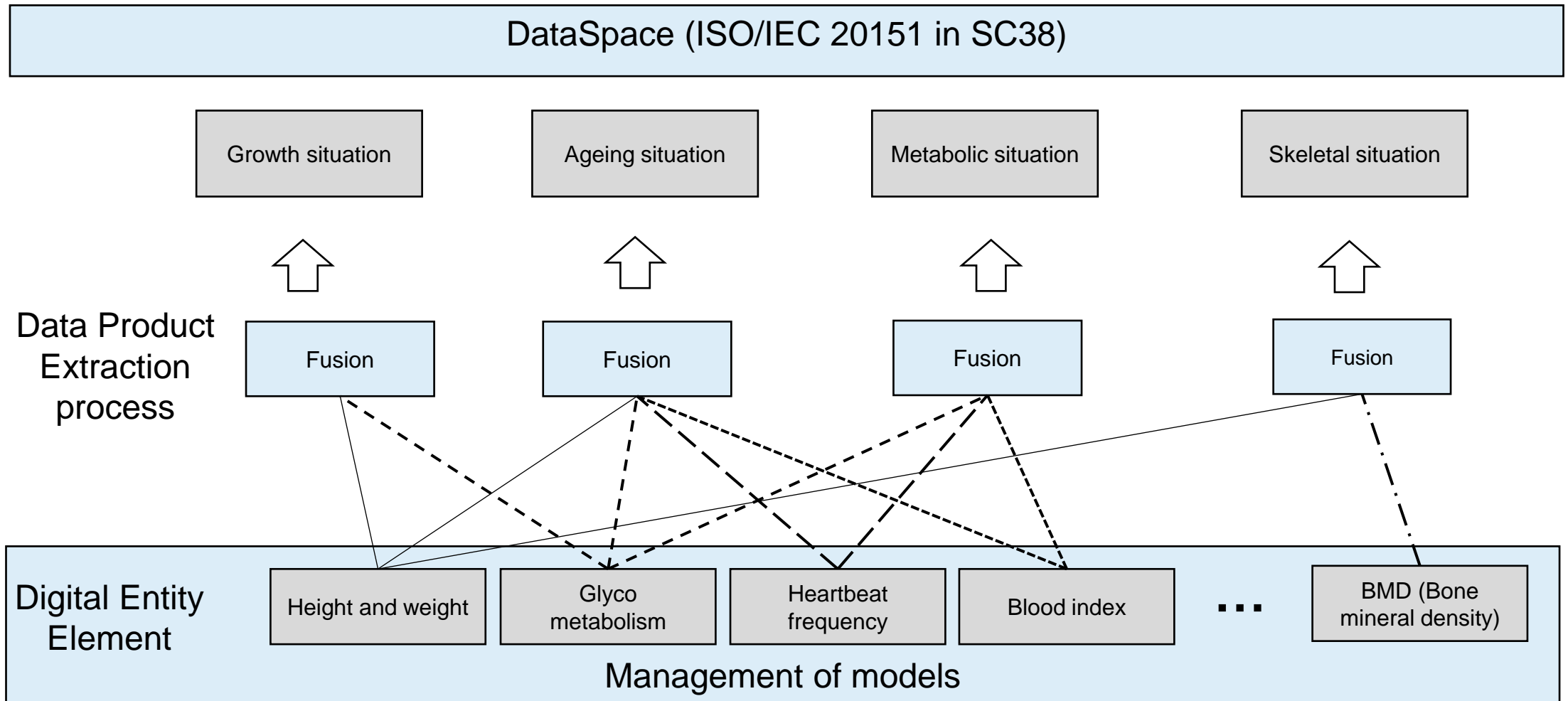
Process of digital entity modeling

Standards under development



 Under development  Published

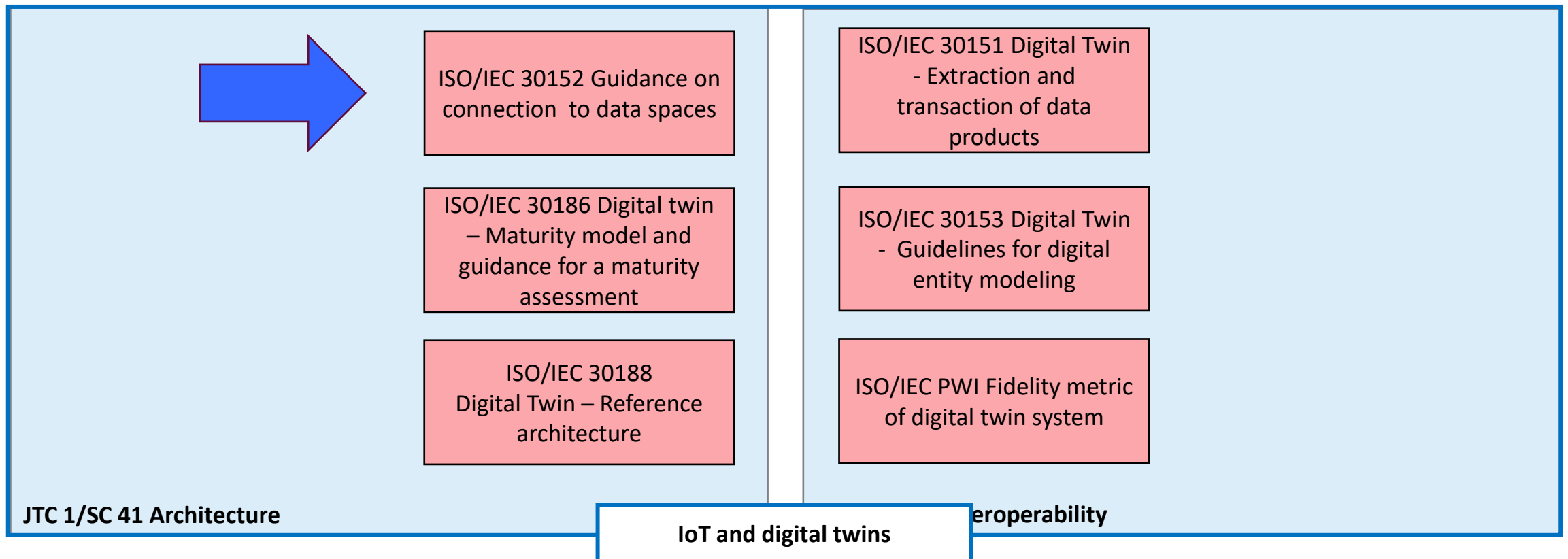


ISO/IEC 30151 Extraction and transaction of data products (under ballot)



Standards under development

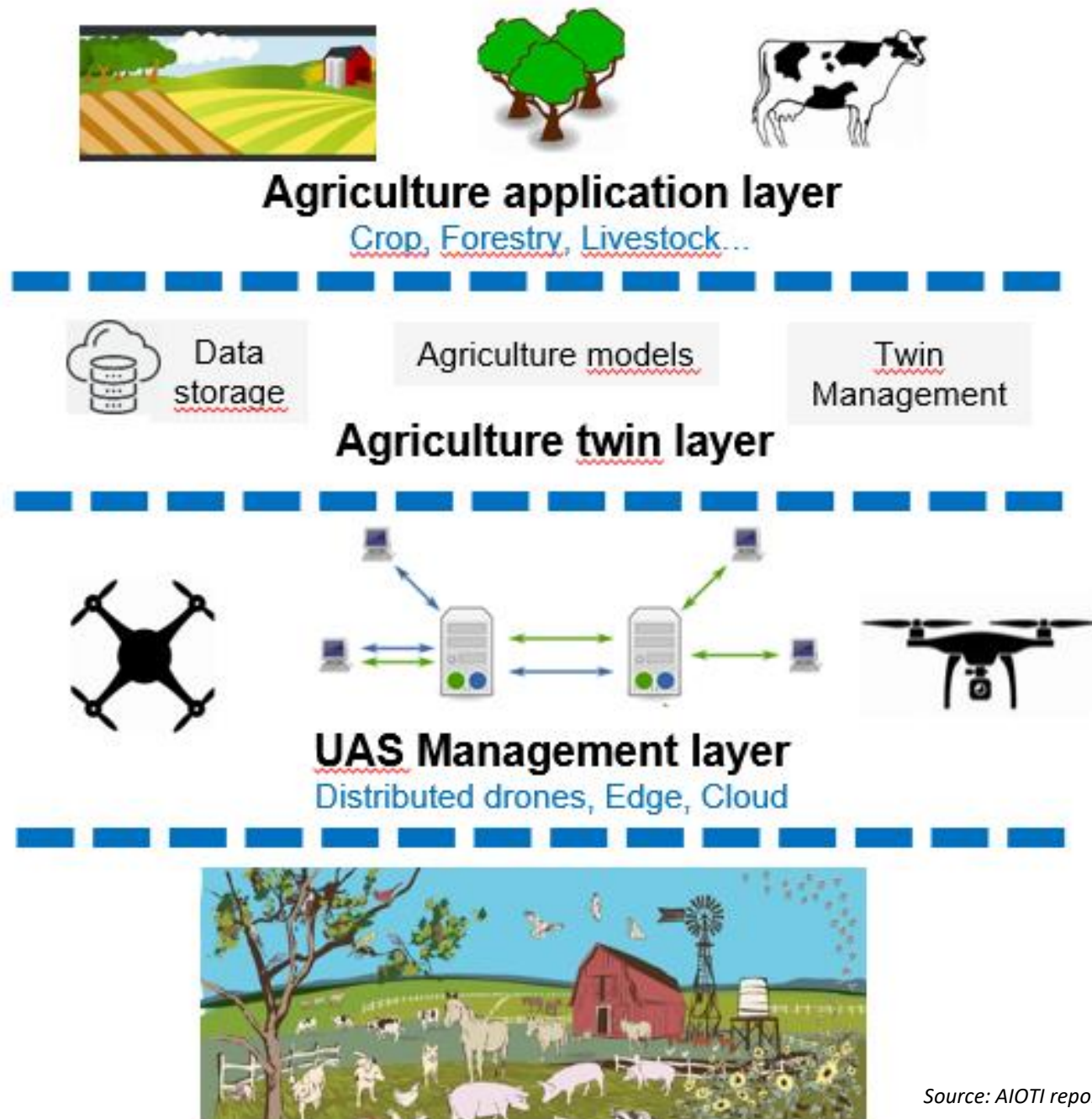
 Under development  Published



ISO/IEC 30152 IoT and digital twins – Guidance on the connection to data spaces

- Integration of digital twins in a complex ecosystem
- Connecting IoT systems to data spaces
 - Using connectors
 - Patterns
- Connecting digital twin systems to data spaces
 - Using connectors
 - Patterns
- Examples

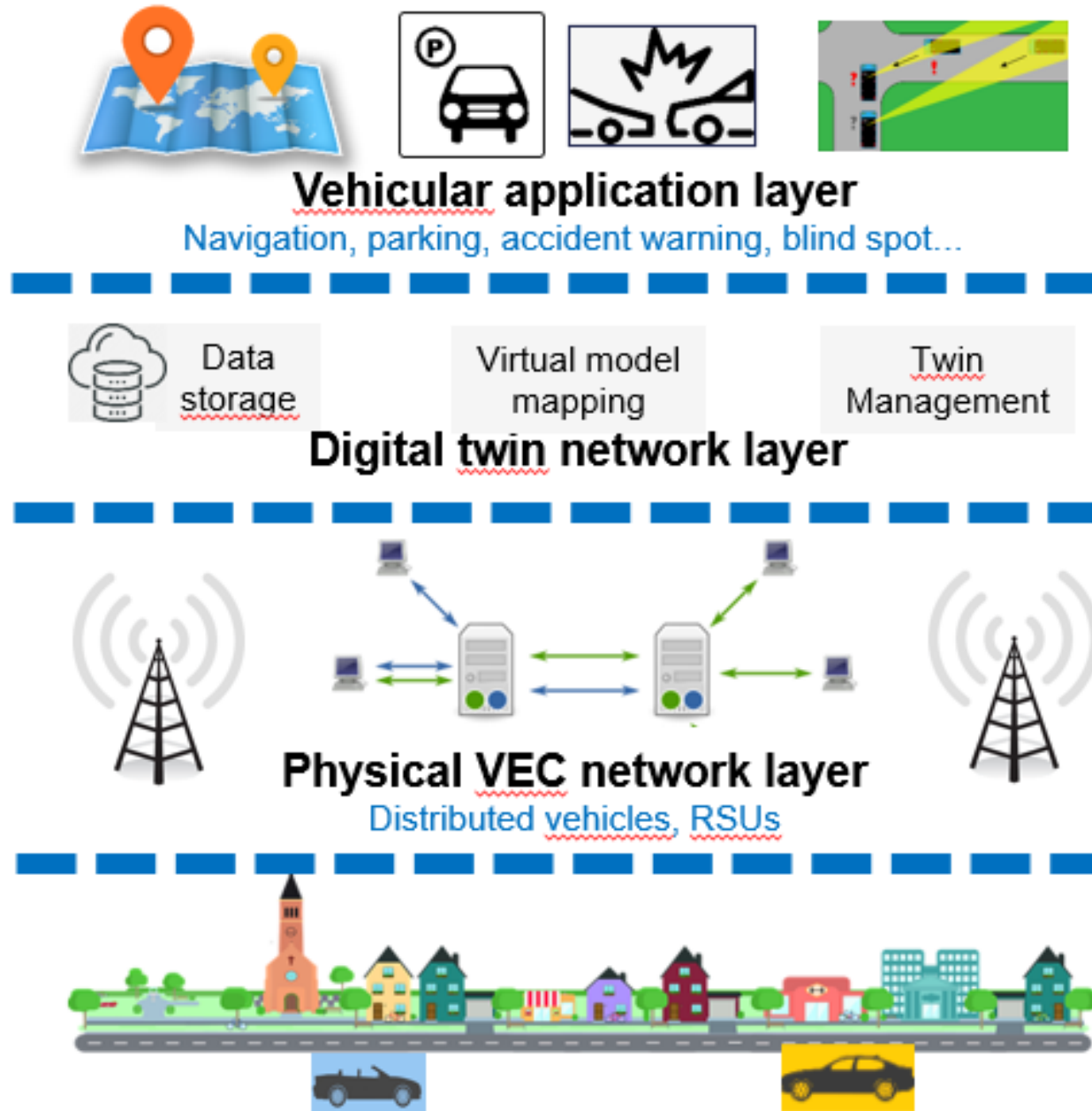
Example 1



Concern:

Integration of
digital twins in
a complex
ecosystem



Example 2

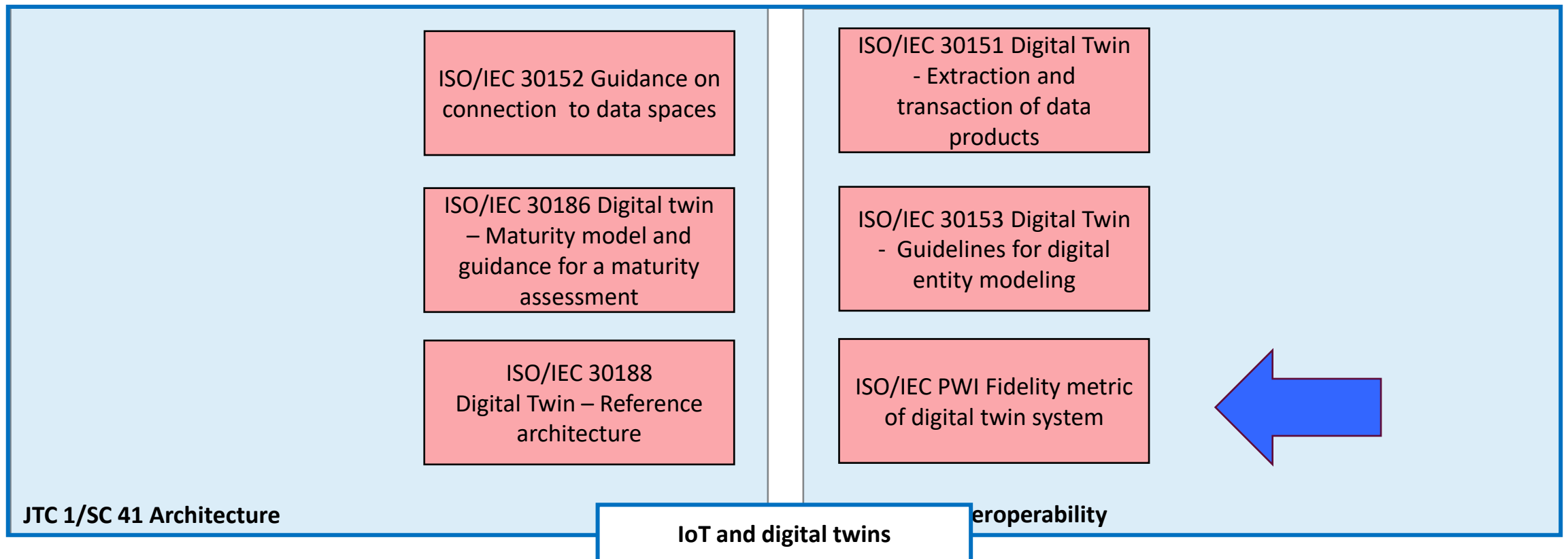


Concern:

Integration of digital twins in a complex ecosystem

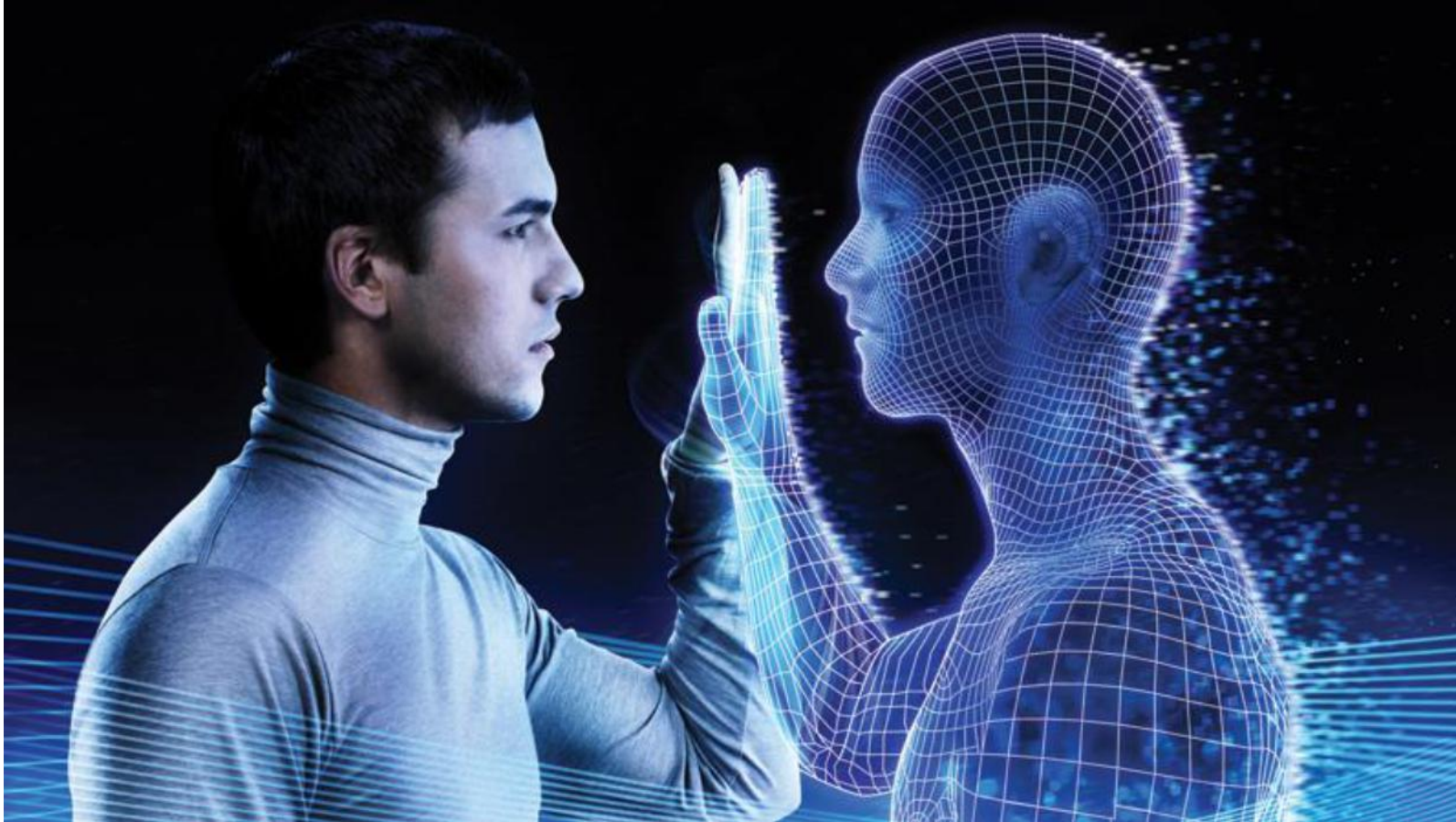
Standards under development

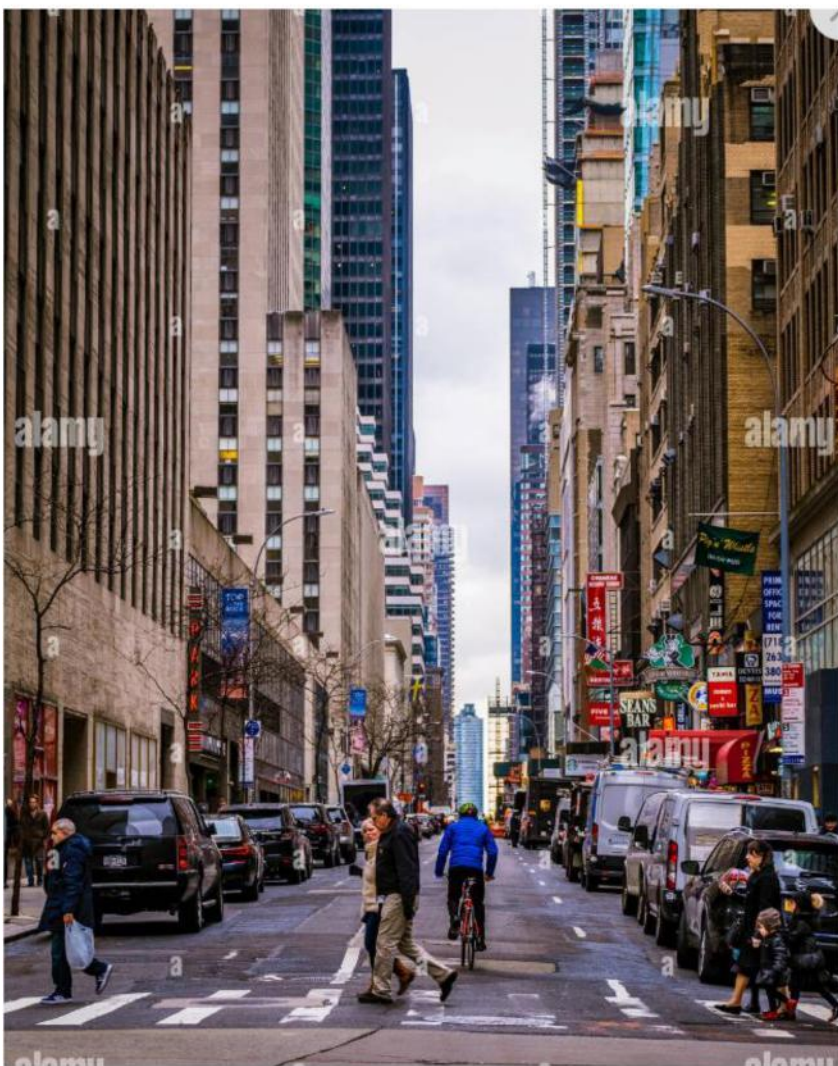
 Under development  Published



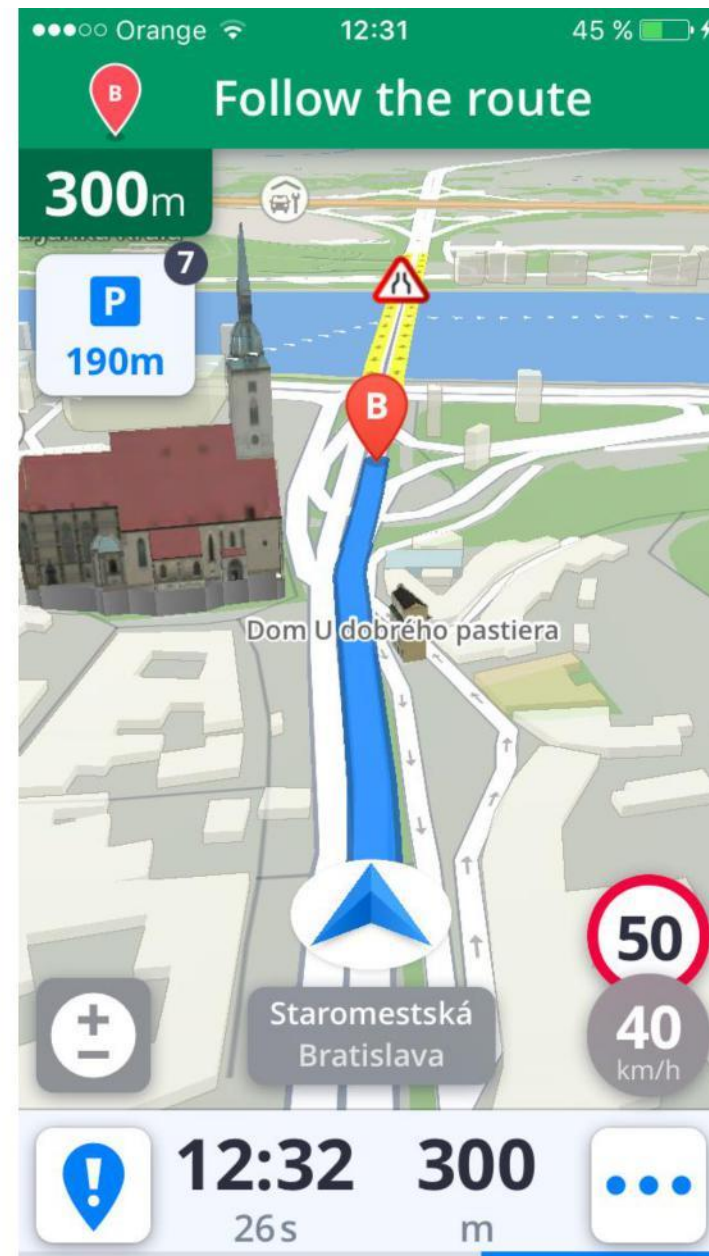
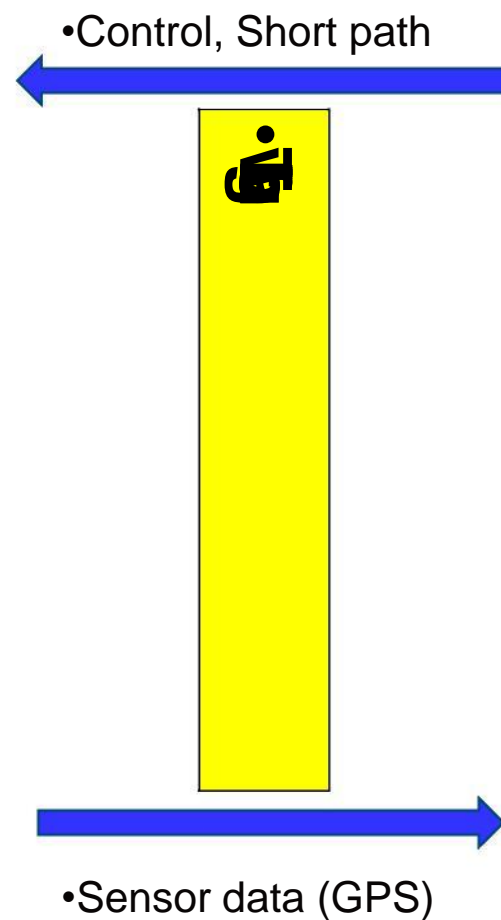
Looks and behaves similar ?

<https://cmte.ieee.org/futuredirections/2017/09/27/can-we-have-a-digital-twin/>





• www.alamy.com/typical-new-york-city-street-view-image241338592.html



<https://www.sygic.com/what-is/voice-guided-navigation>



Virtual
Singapore



<https://ru.pinterest.com/pin/137922807328651263/>

Thanks

25 September 2024