

# Metaverse Interoperability (Deliverables of FG-MV WG5)

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Hide IMANAKA, NICT (Japan)  
Chair, FG-MV Working Group 5

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# Introduction myself

Name: Dr. Hideo IMANAKA

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Job history:

- 1987-2022 NTT (Laboratories, NTT Com, Standards management, NTT-AT)
- 2022- NICT, Standards promotion office

Standardization Activities:

- From 2003, Participation in International Telecommunication Union Activities
- ITU-T Q1/13(NGN coordination) rapporteur (former)
- ITU-T FG-IMT2020 (5G mobile) vice-chair (former)
- ASTAP EG-IoT chair(former), [EG-DRMRS chair](#)
- [ITU-D Q3/1 \(Disaster Management\) vice-rapporteur](#)
- [ITU-T Q8/16 \(Immersive Live Experience\) rapporteur](#)
- [ITU-T WP3/16 \(Media coding\) chair](#)
- [ITU-T FG-MV \(metaverse\) vice-chair](#)
- Other experiences:  
ITU-T SG11, SG13, SG16, SG17, WTSA, ITU-R WP5A, WRC, WTDC, PP  
ISO/IEC JTC1 SC29, 3GPP SA4, ETSI NFV, W3C, IOWN GF

[WG5\(Interoperability\) Chair](#)



# Current metaverse



Virtual Shibuya (KDDI): <https://vcity.au5g.jp/shibuya>



XR world (NTT docomo): <https://official.xrw.docomo.ne.jp/>

<https://www.youtube.com/watch?v=LywmgSfZdl8>

## Metaverse in the world

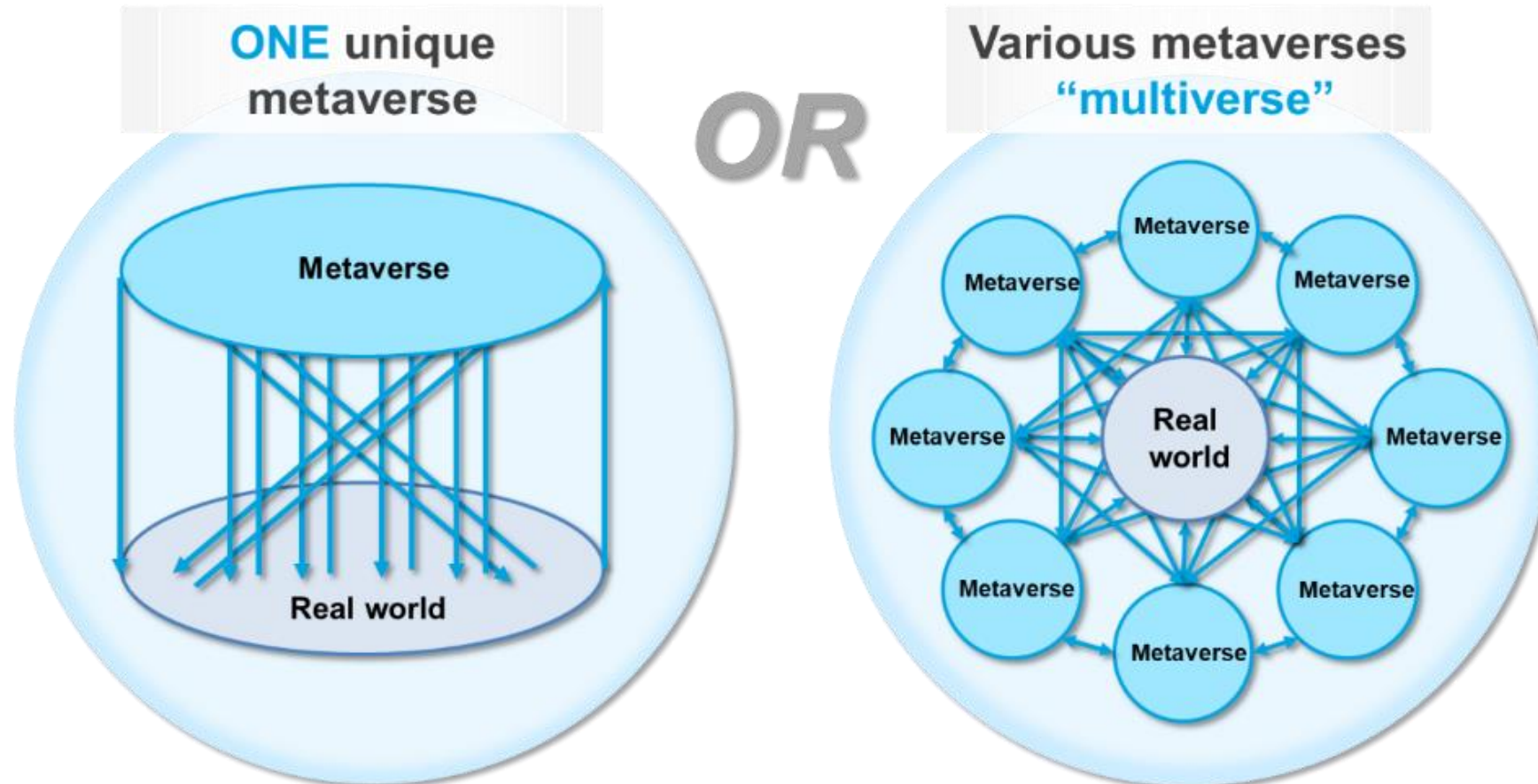
- The Sandbox, Fortnite, Roblox, VRChat, Decentraland, Horizon, etc
- Cluster, HIKKY, DOOR, ZEPETO, etc
- In Japan, several metaverse use cases exist. Especially local governments want to promote their sightseeing assets.



Virtual Yabu  
(Yabu City, Hyogo pref.)

# Concept of metaverse

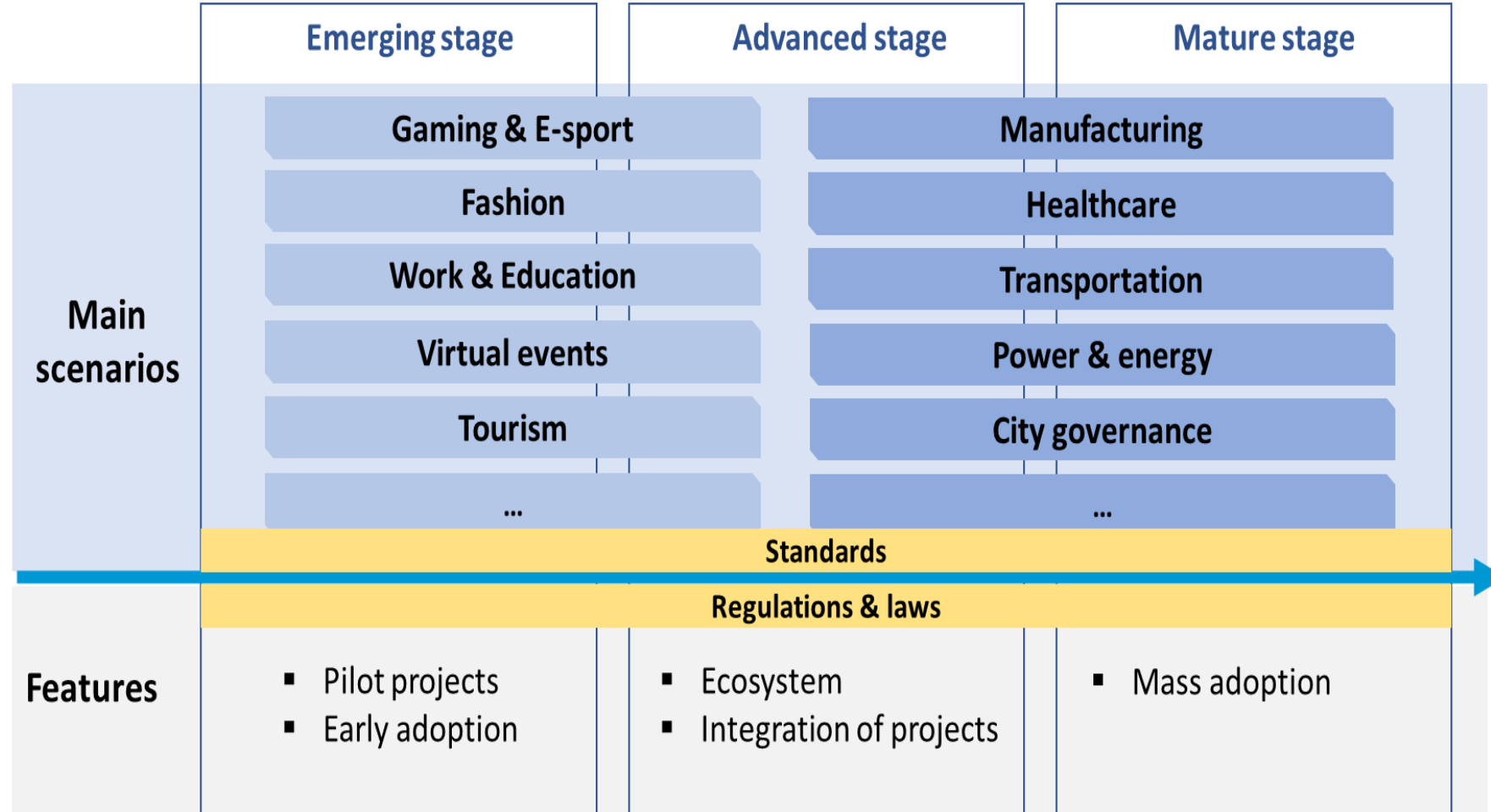
The concept of metaverse and multiverse is shown in FGMV-01, **Exploring the metaverse: opportunities and challenges**. ITU-T FG-MV aims to create additional value by multiverse, and the key is collaborative space achieved by standardizing interoperable metaverse.



[Source: ITU-T FGMV-01]

# Metaverse development stage

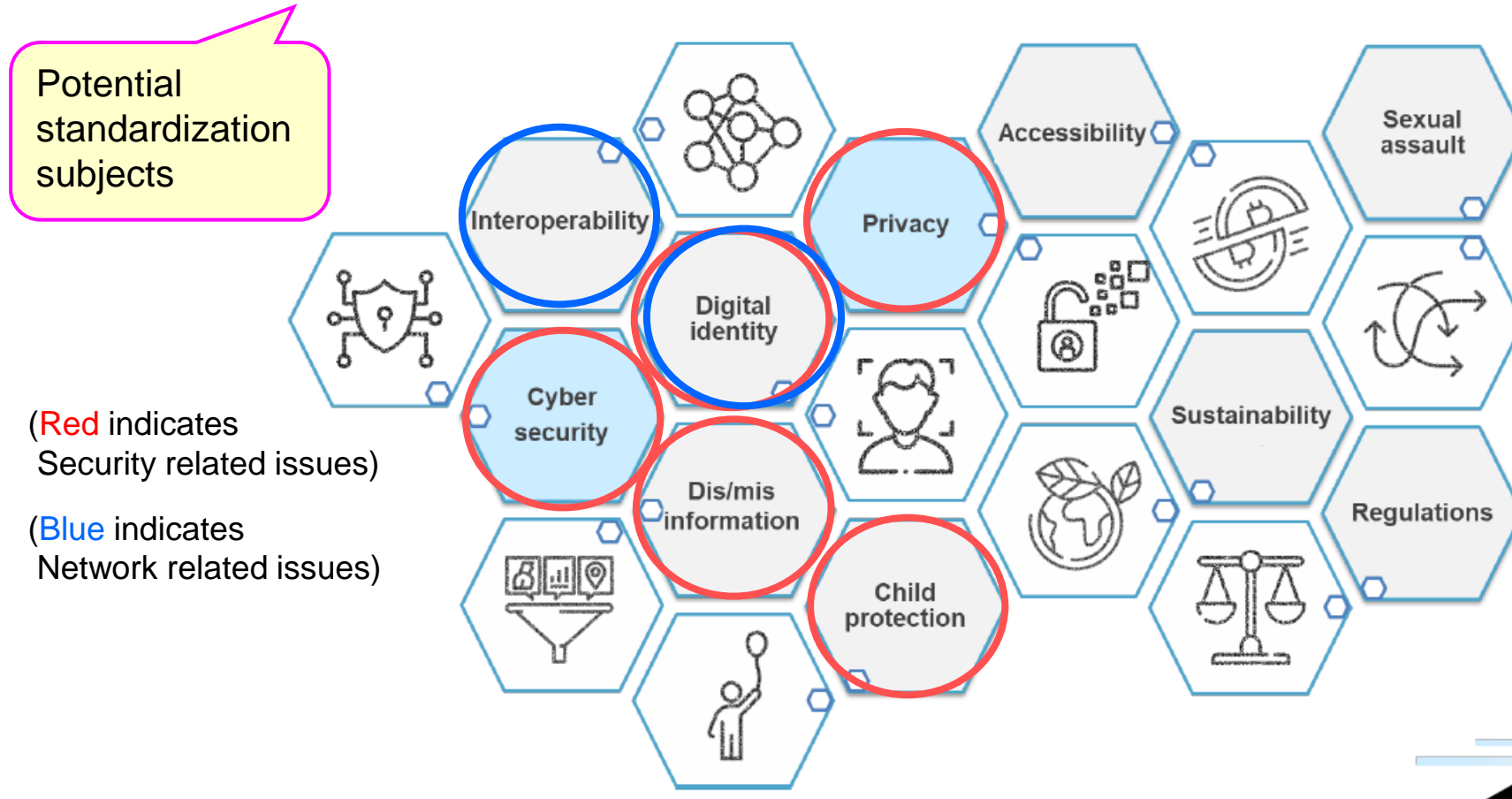
Use cases of metaverse starts entertainment and commerce areas, and then will extend to industrial areas.



[Source: ITU-T FGMV-01]

# Need standardization for interoperability

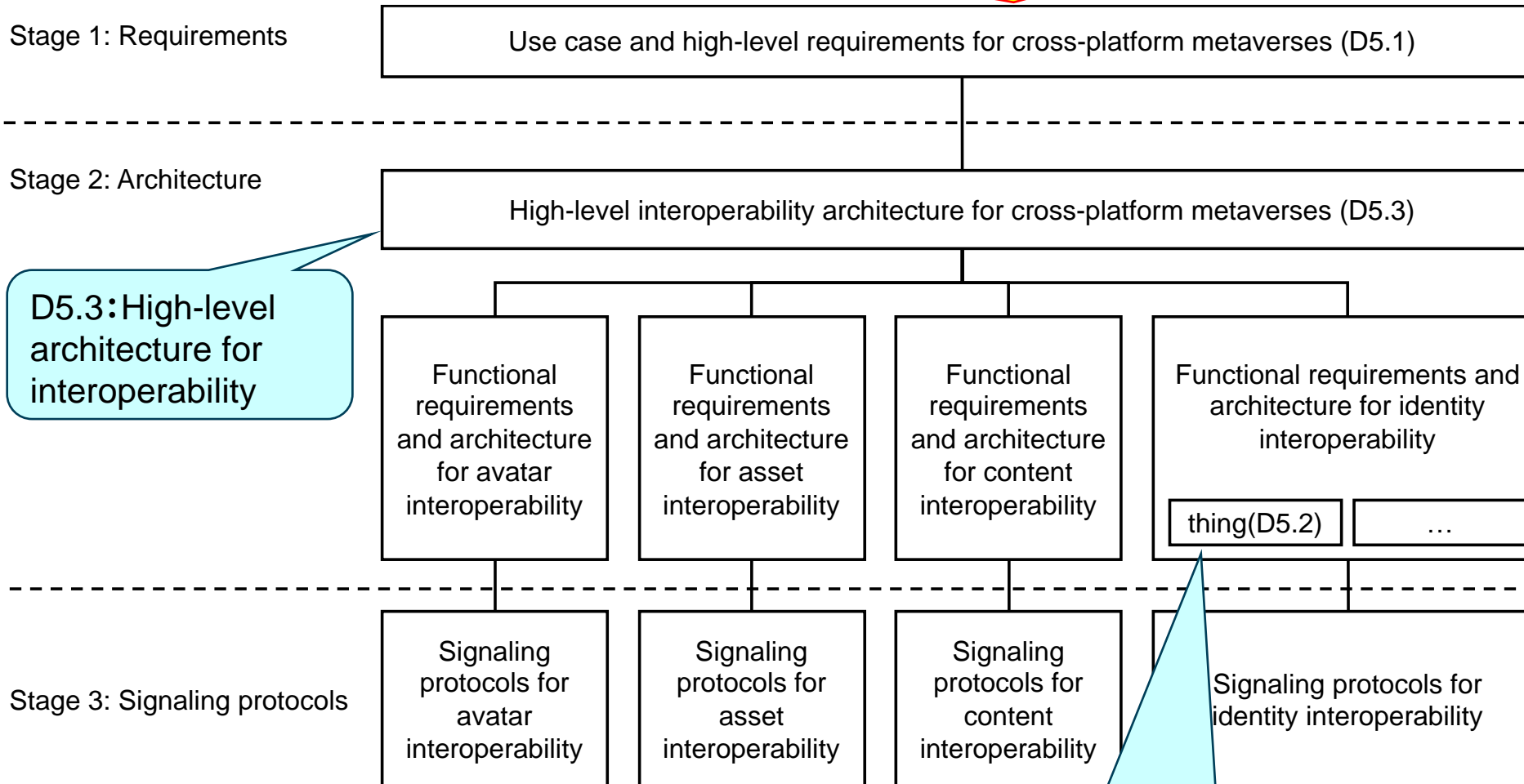
## Challenges in the metaverse



[Based on figure 4 of ITU-T FGMV-01]

# Planned document structure of metaverse interoperability

## FGMV-19: Service scenarios and requirements



D5.3: High-level architecture for interoperability

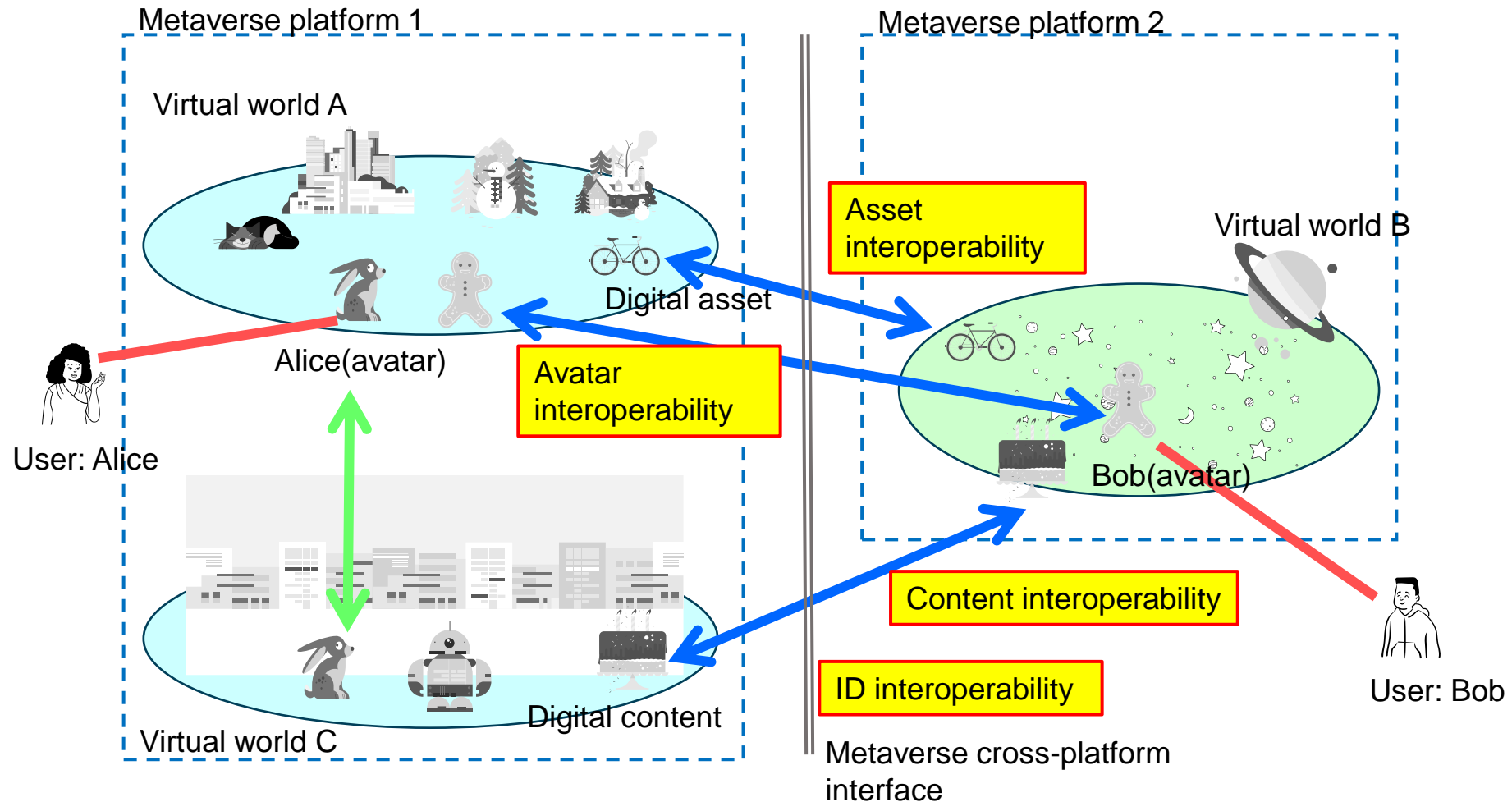
D5.2: Requirements for ID interoperability of IoT

# metaverse cross-platform interoperability



# Images of cross metaverse interoperability

Cros-platform interoperability realize that Bob (avatar) in virtual world B can move to virtual world A where Alice (avatar) lives, to make conversation and other interaction like commerce using their avatars.



# Service scenarios and requirements for interoperability

Currently there exist no interoperable services across metaverse platforms, so FGMV-19, **Service scenarios and high-level requirements for metaverse cross-platform interoperability**, estimates 9 potential interoperable service scenarios.

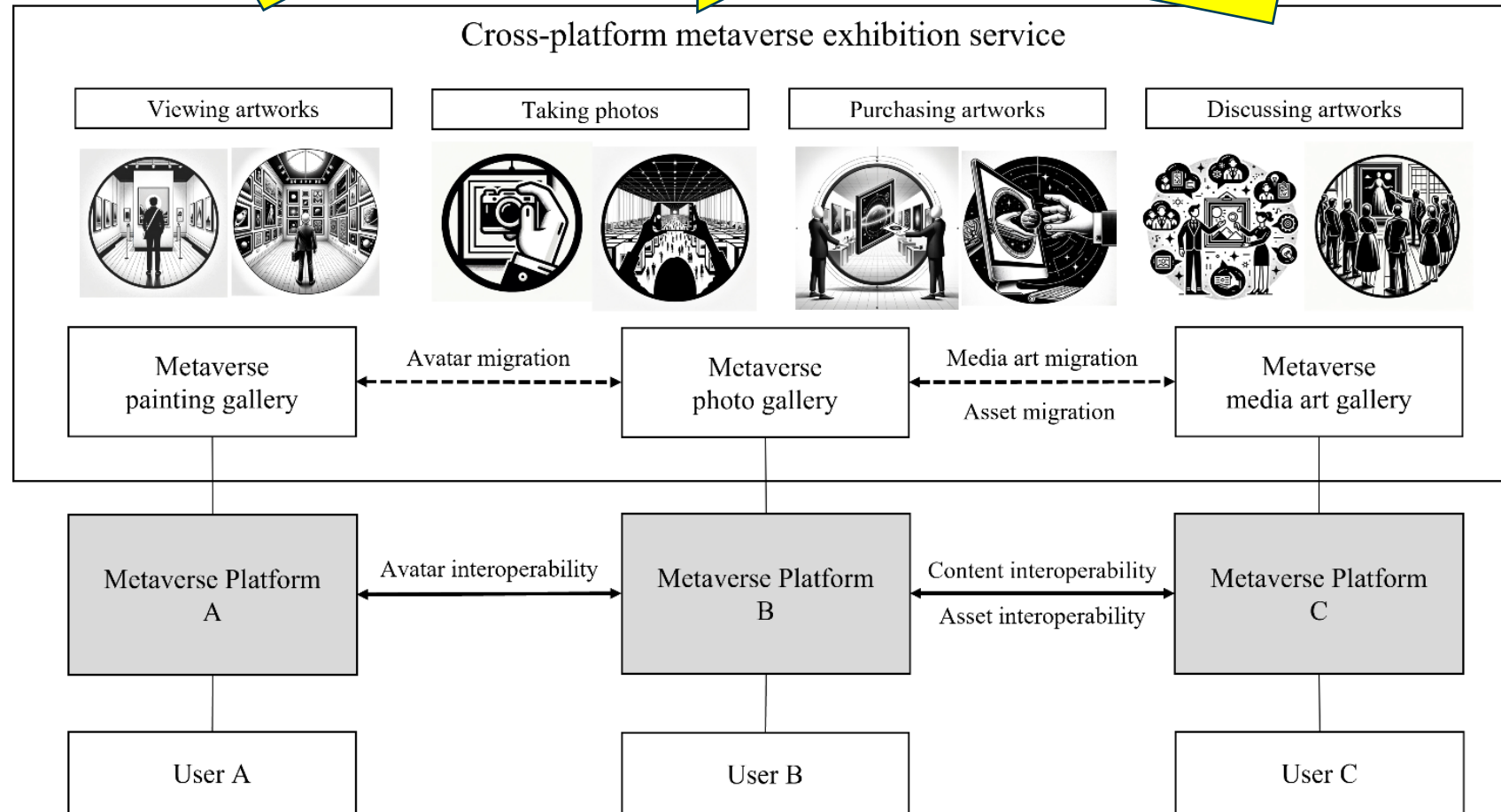
Scenarios	Avatar IOP	Asset IOP	Content IOP	ID IOP
Metaverse Search		Content purchase/publish	Discover/preview/mashup	
Metaverse Learning	Migration		Retrieval/purchase	
Metaverse Exhibition	Migration	Migration	Migration	
Metaverse Safety Patrol	Avatar dispatch			Access control
Metaverse SNS	Migration	Migration	Sharing photos	Access control
Metaverse Shopping	Migration	Migration	Item purchase	
Metaverse Tourism	Migration	Purchase		
Metaverse Signage	Migration			
Metaverse Co-working	Migration		Material migration	

# Metaverse exhibition service

User A visits metaverse photo gallery  
(Avatar interoperability)

Content of User B is moved to metaverse art gallery  
(Content interoperability)

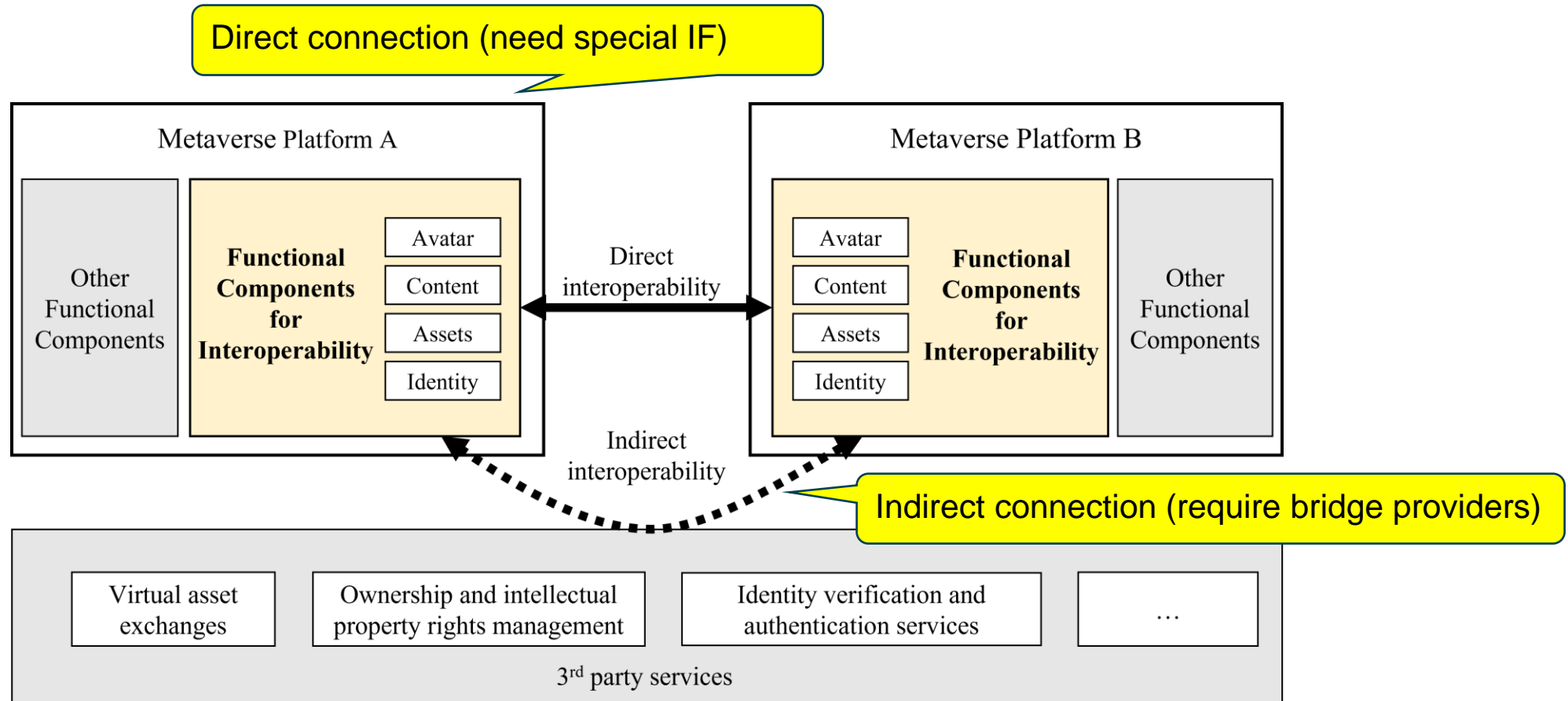
Asset of user C is transferred to metaverse photo gallery



# Requirements for metaverse cross-platform interoperability

# Overview of metaverse cross platform interoperability

Two types of metaverse cross platform interoperability are considered in FGMV-19. Metaverse interconnection bridge function might be provided by 3<sup>rd</sup> party services.



# High-level requirements for metaverse interoperability

## General requirements

Req.ID	Requirements
GENHR-001	It is recommended that metaverse platform is <b>interoperable with other metaverse platform</b> .
GENHR-002	It is recommended to be interoperable between metaverses on heterogeneous platforms.
GENHR-003	It is recommended to ensure <b>secure and trust environment</b> for exchanging information between metaverse platforms.

## High-level requirements for avatar interoperability

Req.ID	Requirements
AVIHR-001	It is recommended to enable <b>avatars to migrate across different metaverse platforms while retaining their original characteristics</b> .
AVIHR-002	It is required that each metaverse platform <b>exchanges the constrains</b> during the migration procedures for compliance and performance.
AVIHR-003	It is recommended to <b>synchronize attributes of avatar</b> after experiencing by roaming avatar across metaverse platforms.
AVIHR-004	It is recommended to ensure avatar's consistent representation across metaverse platforms.
AVIHR-005	It is required to be accessible to the avatar-related data across the metaverse platforms.

# High-level requirements for metaverse interoperability

## High-level requirements for asset interoperability

Req.ID	Requirements
ASIHR-101	It is recommended to ensure secure and trust environment for transforming digital assets between metaverse platforms.
ASIHR-102	It is recommended to facilitate the seamless exchange, recognition, and use of digital assets across different metaverse platforms.

## High-level requirements for content interoperability

Req.ID	Requirements
COIHR-101	It is required that content data including information for management, searchability, and interoperability, be able to transfer between metaverse platforms.
COIHR-102	It is required to ensure content portability and format compatibility on moving or sharing content across metaverse platforms.
COIHR-103	It is recommended to facilitate secure sharing of user content across metaverse platforms.

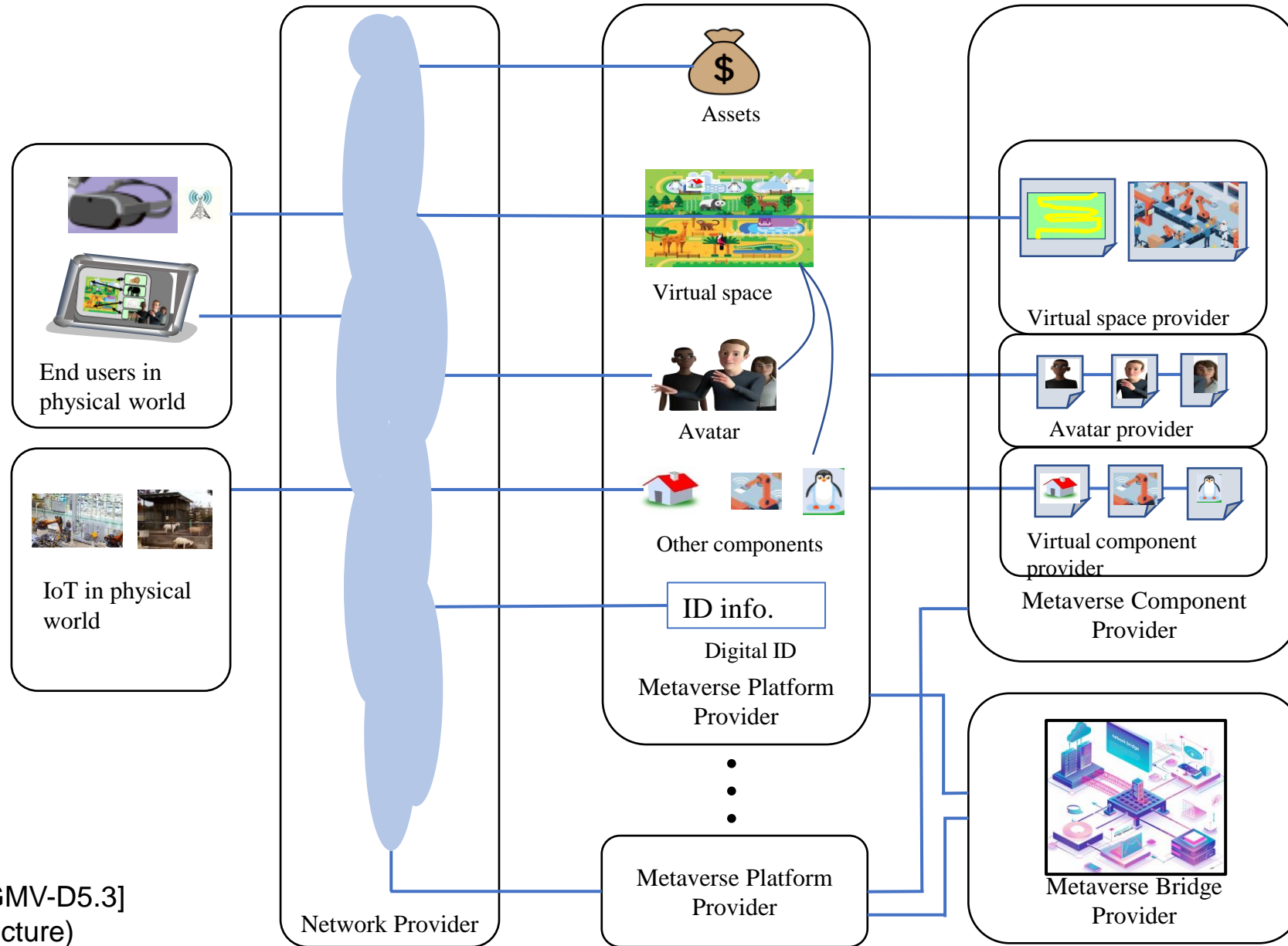
## High-level requirements for ID interoperability

Req.ID	Requirements
IDIHR-101	It is recommended to use the same identity of digital entity in the home platform when digital entity moves to other metaverse platforms.
IDIHR-102	It is required to follow the policy of identity usage of visiting metaverse platform when digital entity moves to other metaverse platforms.
IDIHR-103	It is recommended to support a variety of authentication methods for identity from visited metaverse platforms.
IDIHR-104	It is recommended to support users to view and manage all identities of their digital entity when it moves to other metaverse platforms.
IDIHR-105	It is recommended to support users to view and manage all avatars associated with their unique identities across the metaverse platforms.

# High-level architecture for metaverse cross-platform interoperability

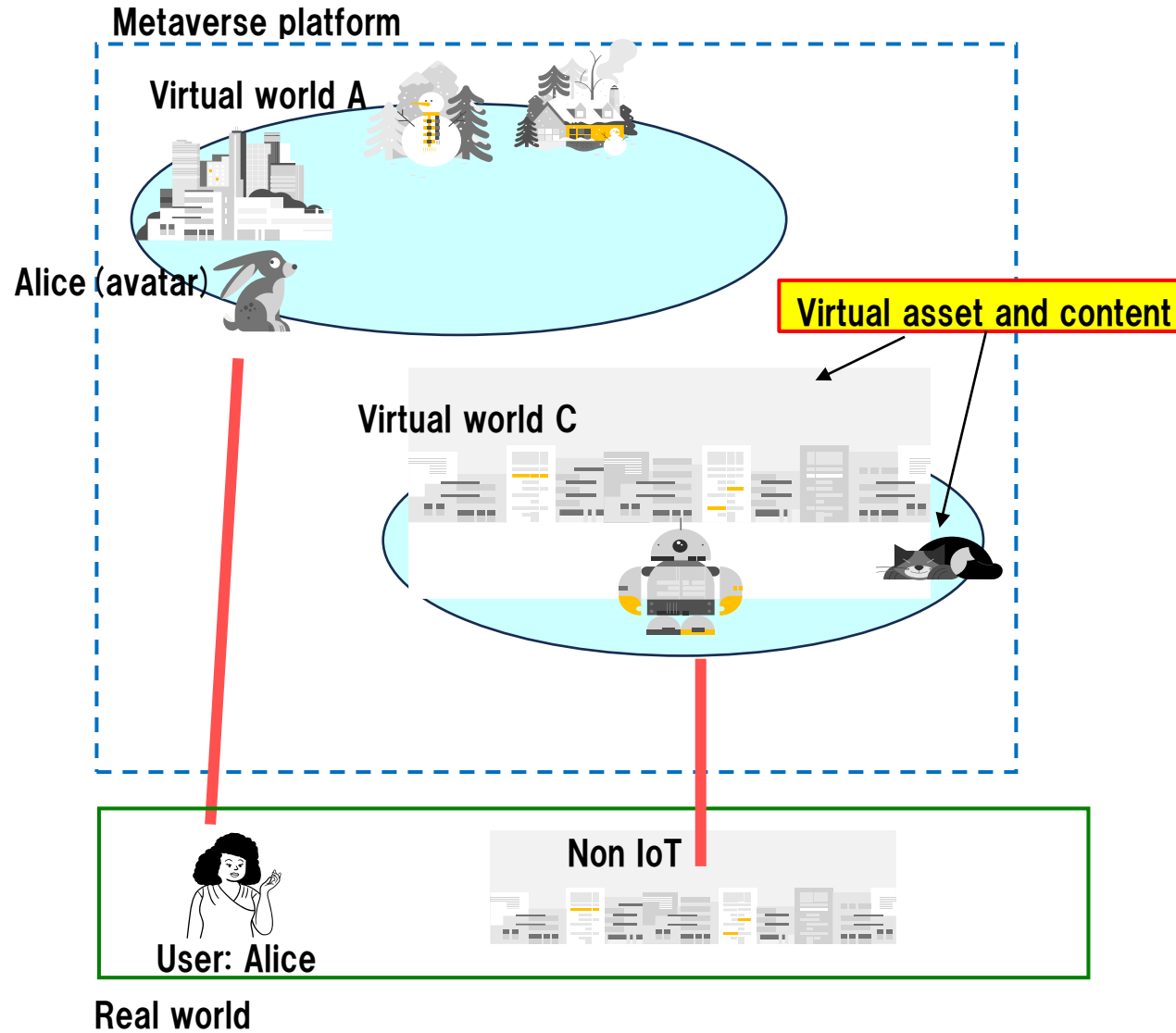


# Stakeholders for metaverse interoperability



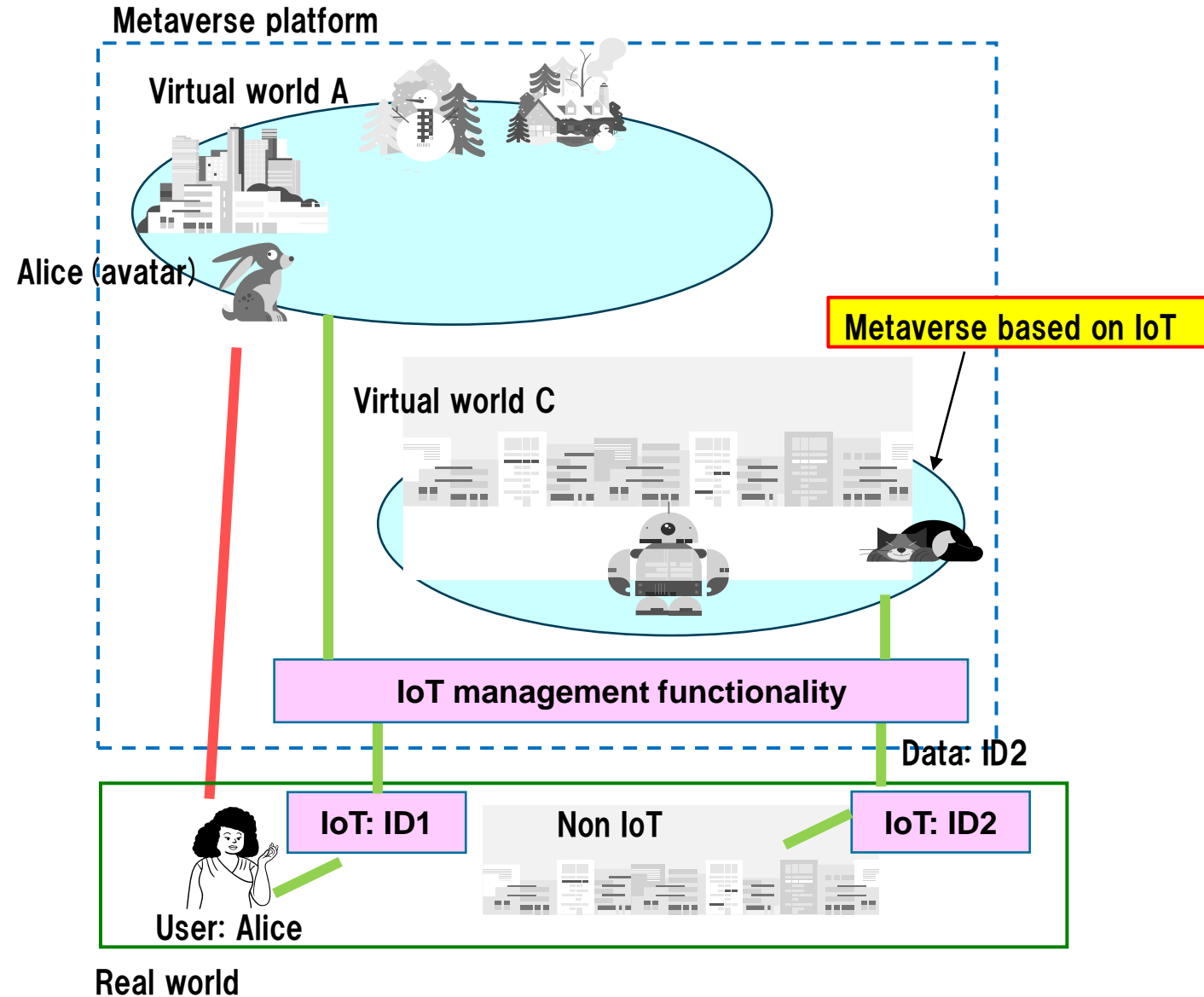
[Source: ITU-T FGMV-D5.3]  
(High-level architecture)

# metaverse without IoT nor digital twin



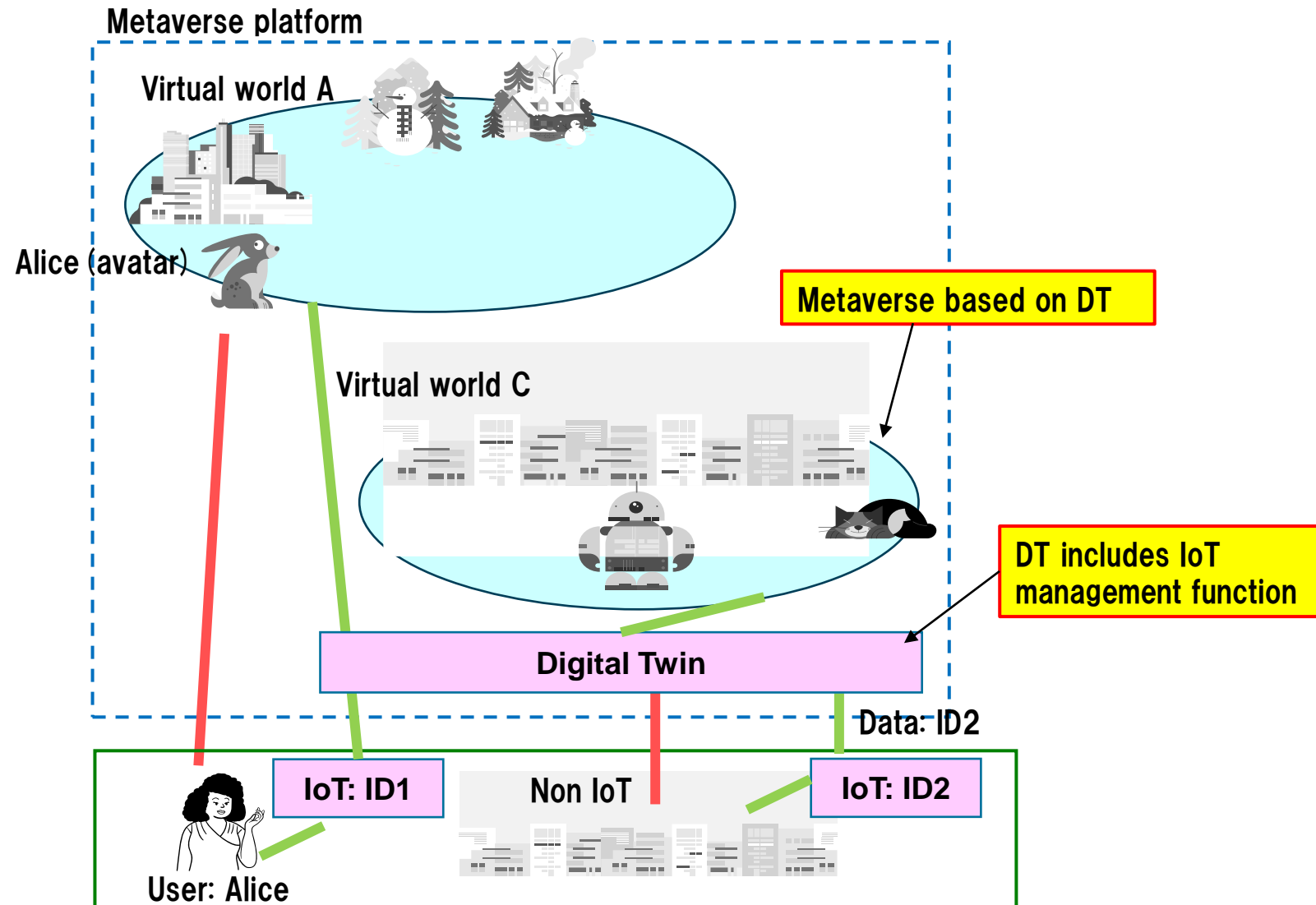
[Source: ITU-T FGMV-D5.3]  
(High-level architecture)

# metaverse based on IoT



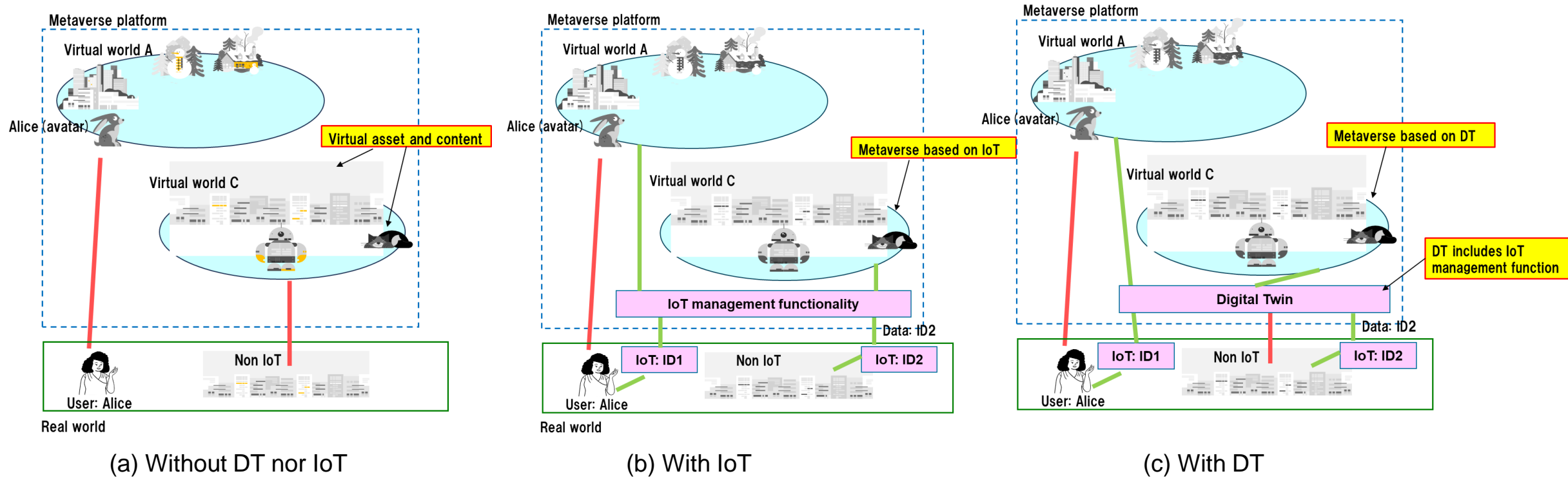
[Source: ITU-T FGMV-D5.3]  
(High-level architecture)

# metaverse with IoT and digital twin



[Source: ITU-T FGMV-D5.3]  
(High-level architecture)

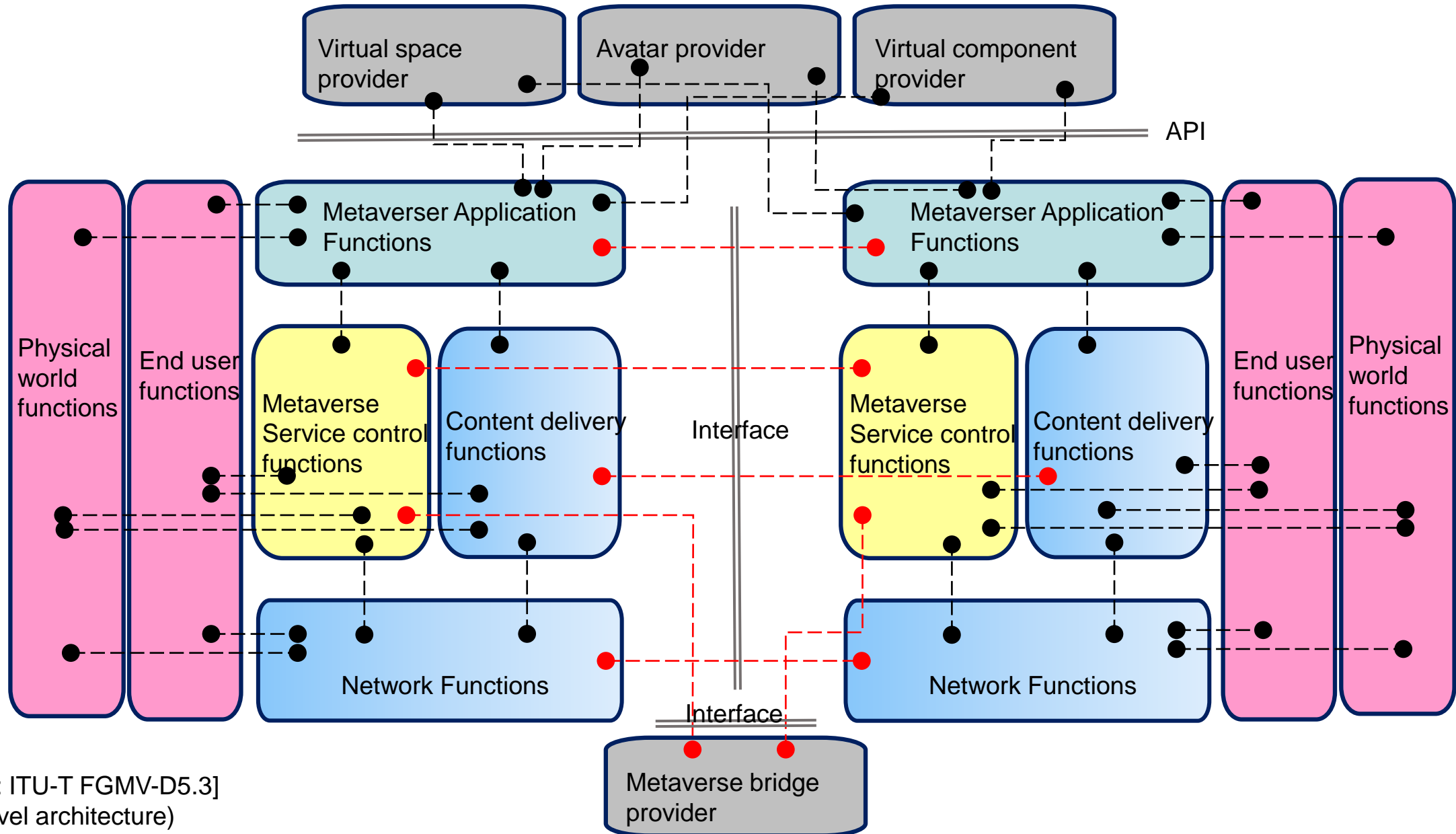
# Types of interoperability between different types of metaverse



Type of metaverse	(a) without DT or IoT	(b) with IoT	(c) with DT
(a) without DT or IoT	Case A	Same as A	Same as A
(b) with IoT	-	Case B	Same as C
(c) with DT	-	-	Case C

[Source: ITU-T FGMV-D5.3]  
(High-level architecture)

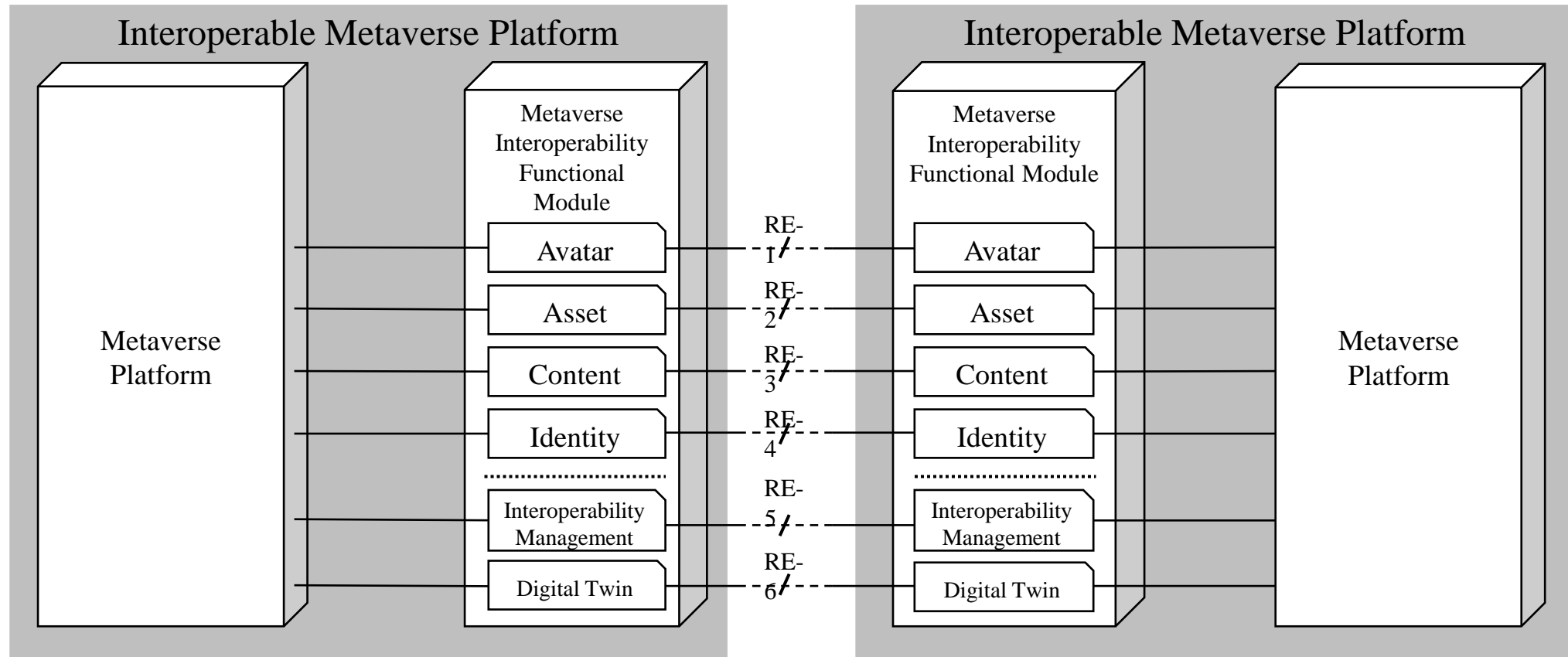
# Architectural domain for metaverse interoperability



[Source: ITU-T FGMV-D5.3]  
(High-level architecture)

# Architectural overview of metaverse interoperability

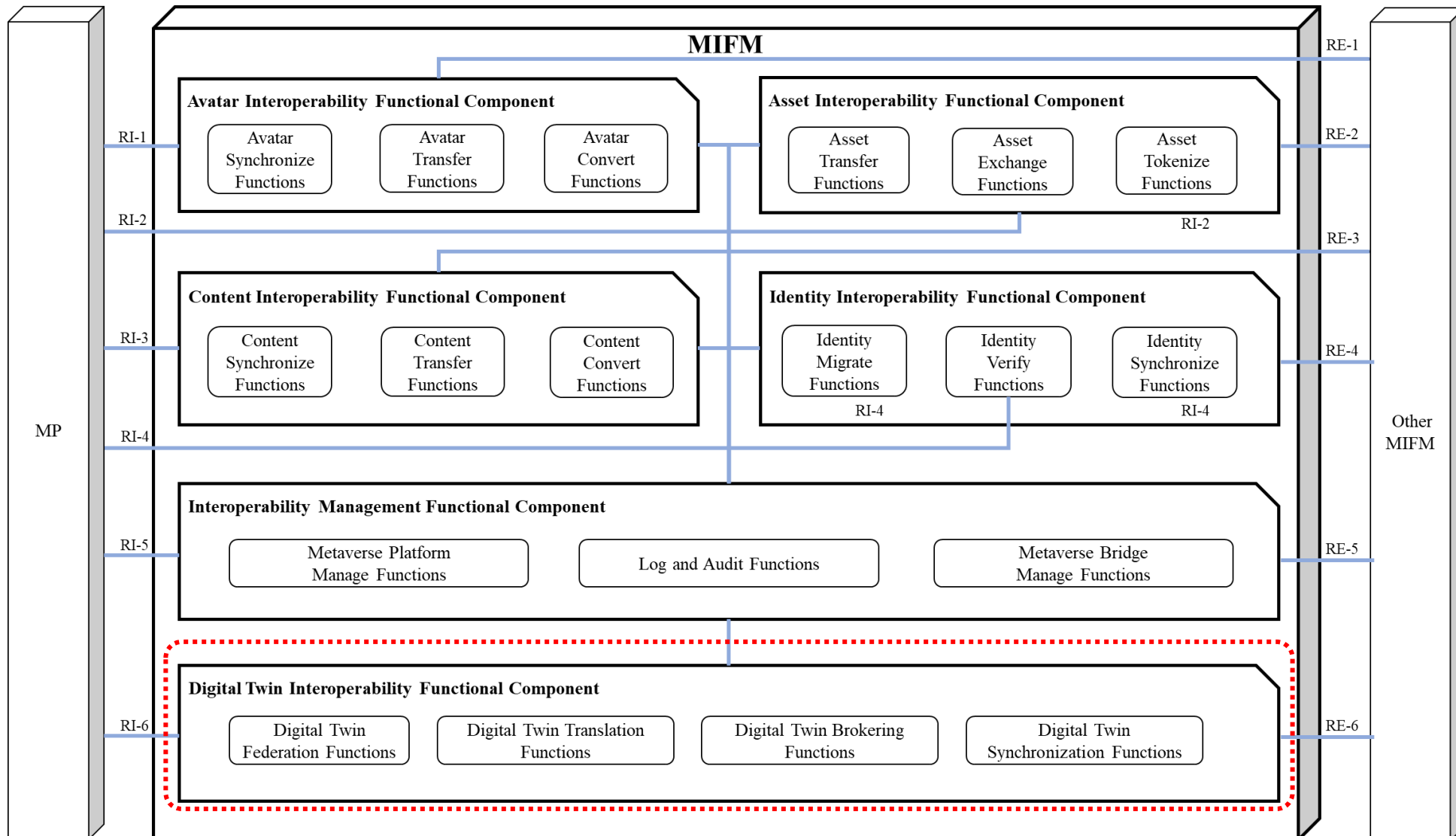
A metaverse platform can interact with other platforms using standardized protocols. Since the interoperable metaverse platform bears both Metaverse Platform (MP) and Metaverse Interoperability Functional Module (MIFM), there is no need for reference points.



[Source: ITU-T FGMV-D5.3]  
(High-level architecture)

Scope of this specification

# High-level metaverse interoperability architecture

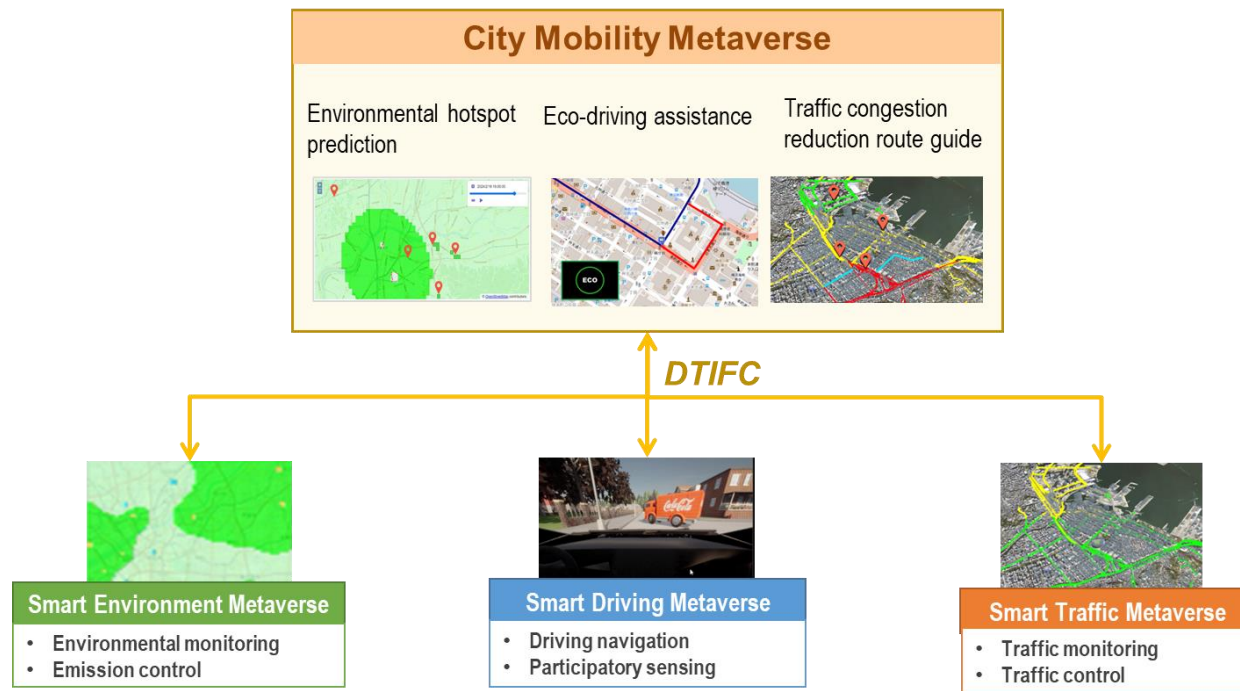




# Interoperability of metaverses with Digital Twin

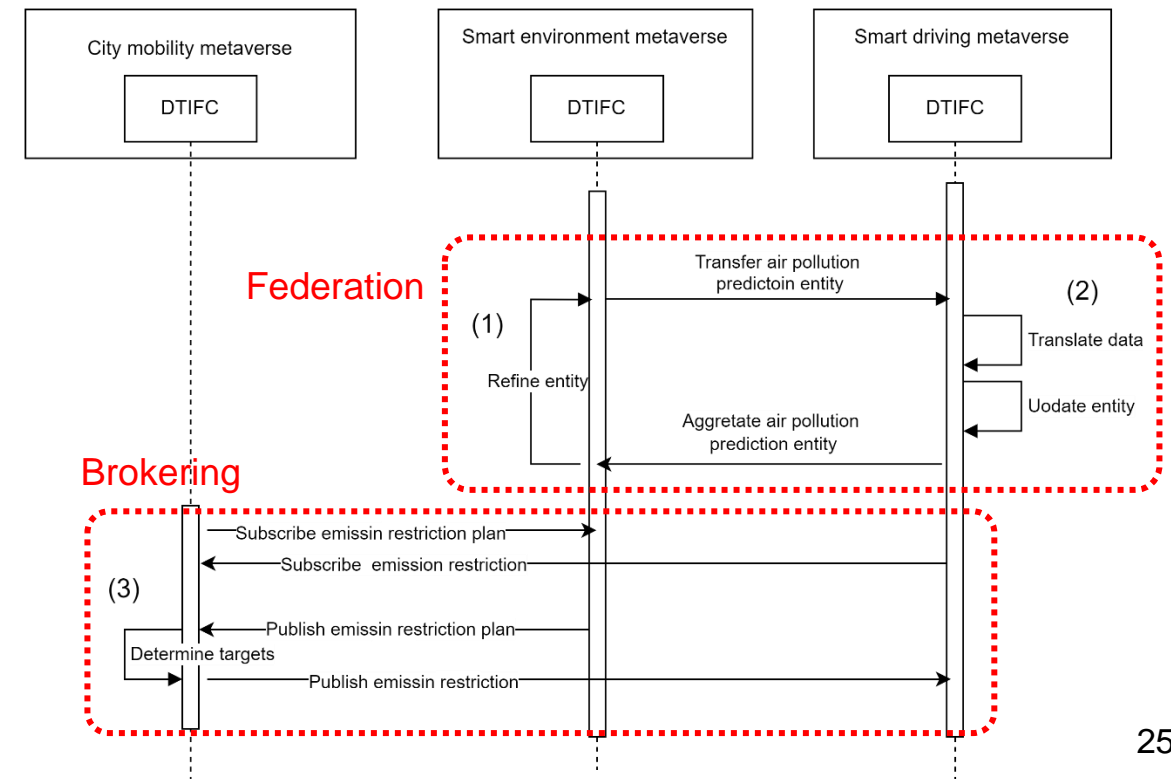
- Data and functions of each metaverse with digital twin can be linked to provide services that cannot be provided by individual digital twins alone
  - Digital Twin Interoperability Functional Component (**DTIFC**) provides **Federation, Translation, Brokering, Synchronization** functions
  - Use cases for smart sustainable mobility and cyber physical security

## Use case: Smart sustainable mobility



[Source: ITU-T FGMV-D5.3]  
(High-level architecture)

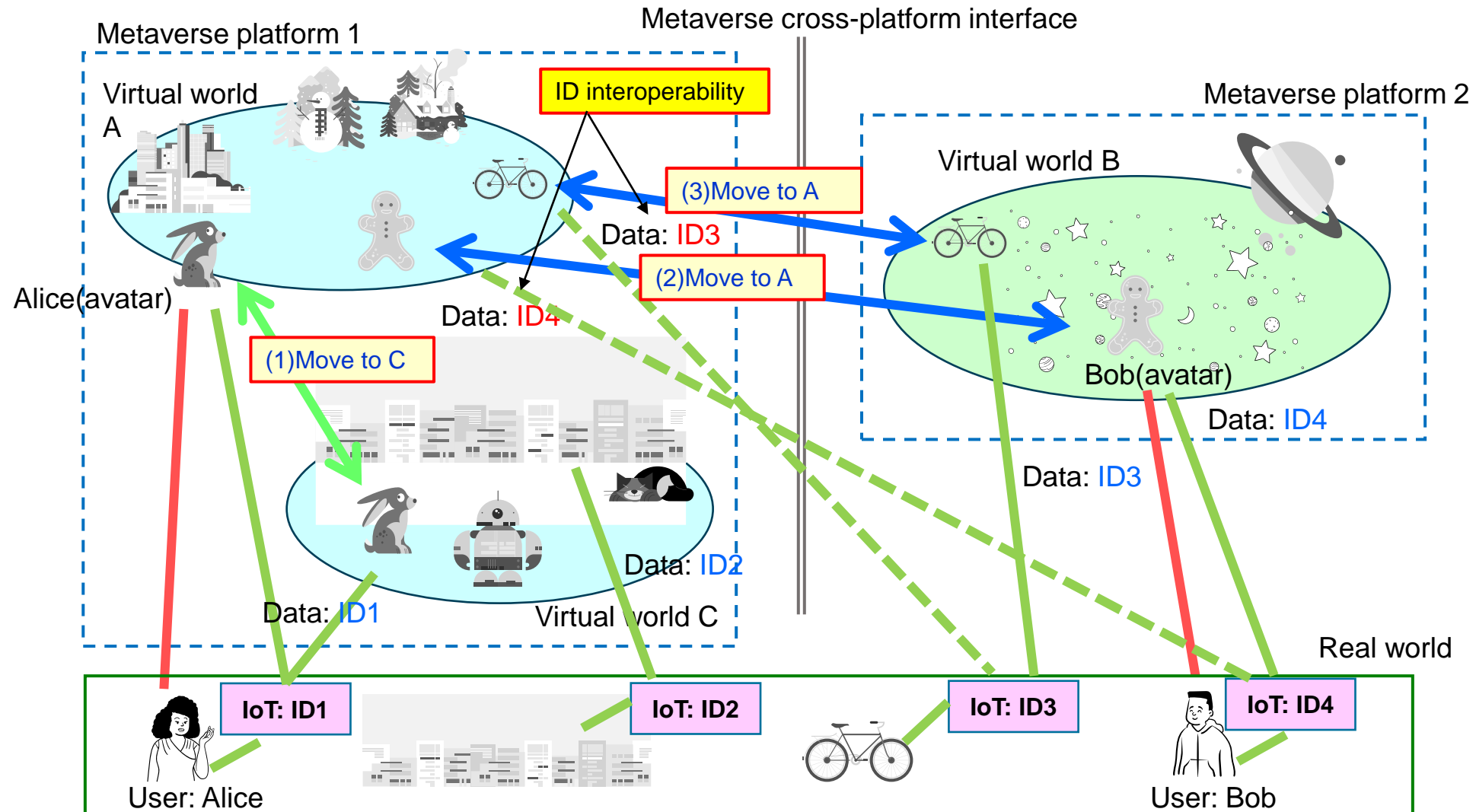
## Operation flow for eco-driving assistance



# ID interoperability of IoT devices for metaverse cross-platform interoperability

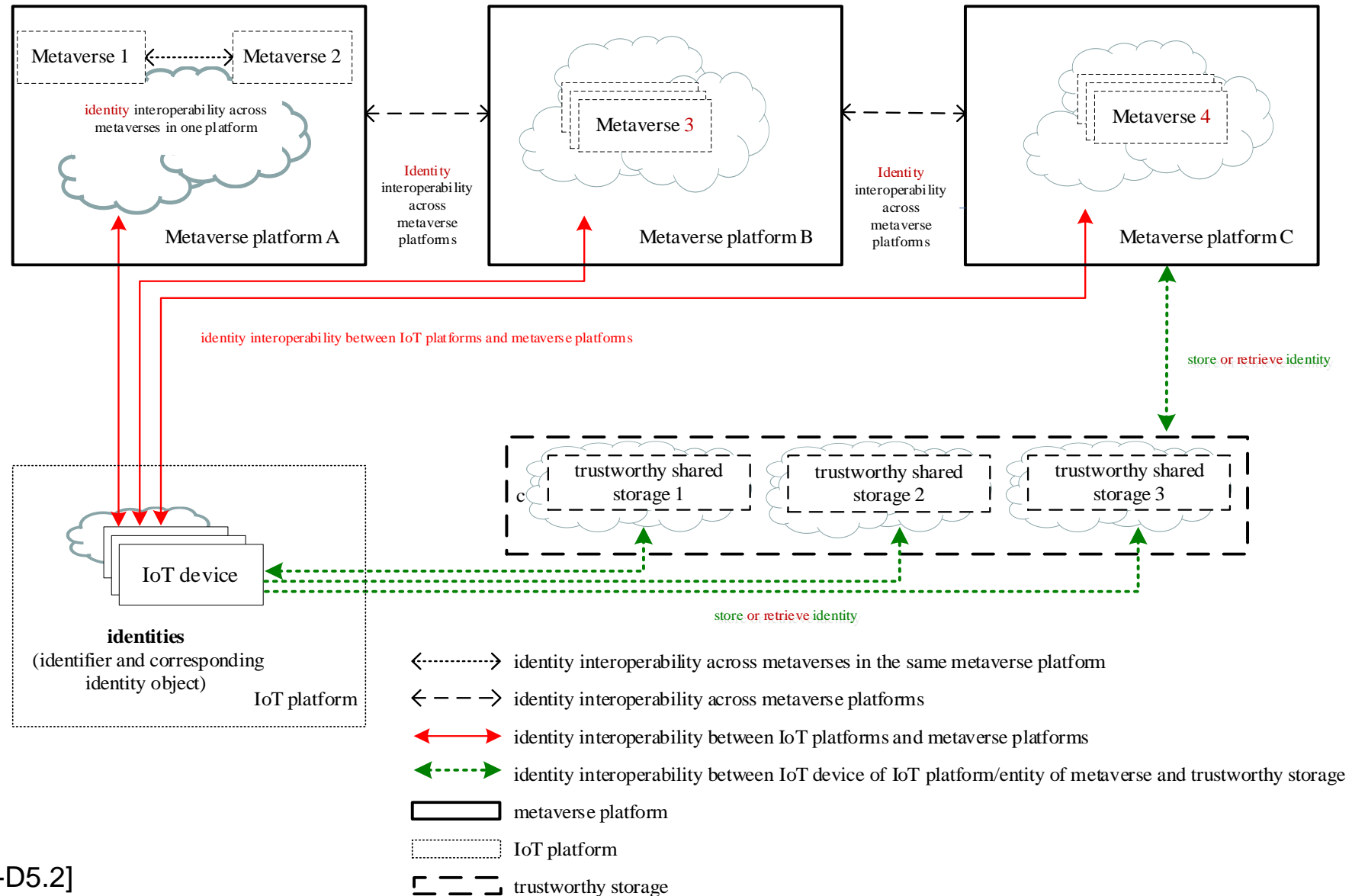
# Identity interoperability

In order to utilize the same IoT devices in different metaverses, Identity (ID) interoperability for IoT devices across metaverse platforms is now under development.



[Source: ITU-T  
FGMV-D5.2]  
(ID  
interoperability)

# Technical feature of ID interoperability

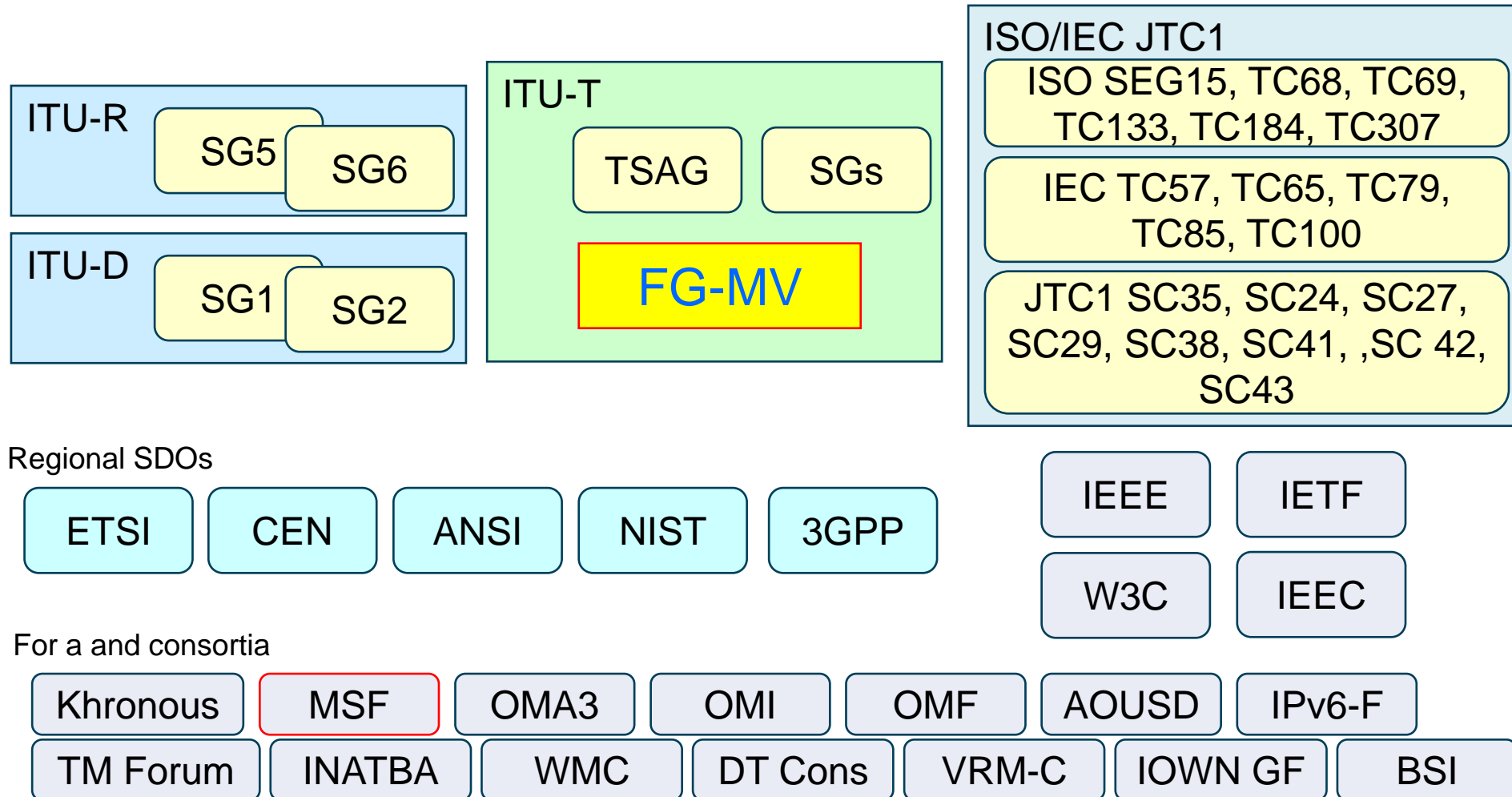


[Source: ITU-T FGMV-D5.2]  
(ID interoperability)

# Future work and conclusion

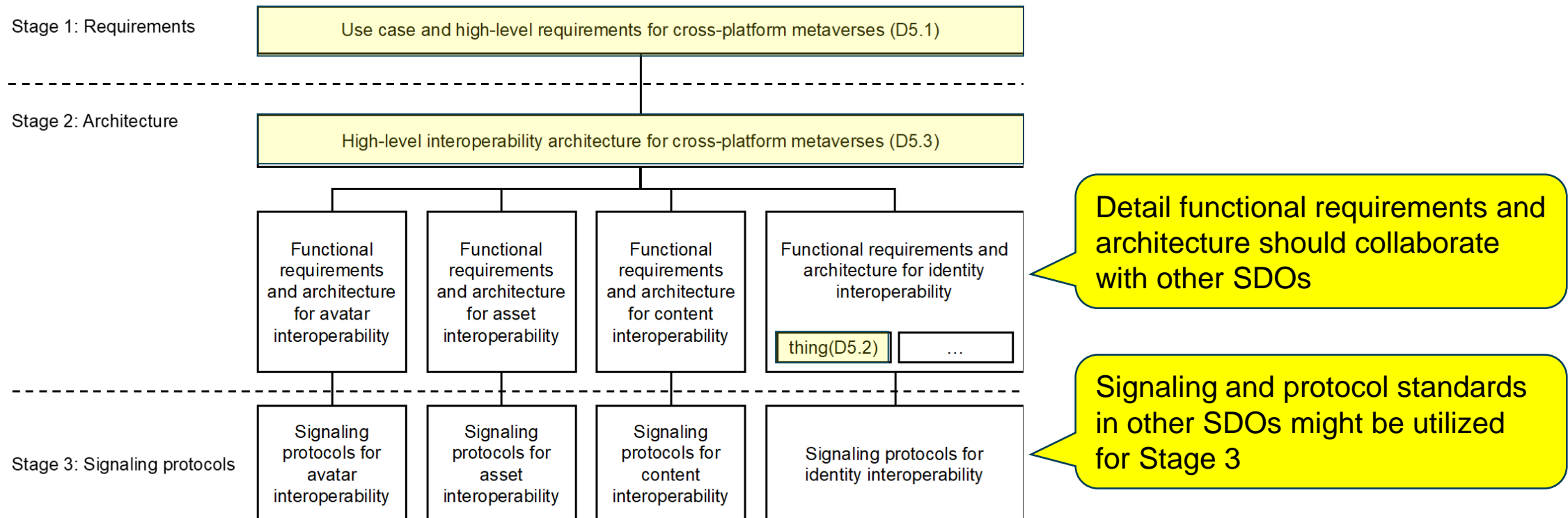
# Collaboration with other SDOs

FG-MV collaborated several SDOs inside and outside ITU by using liaison statements, and some of key players participated FG-MV. This collaboration should continue in the future.



## Future work

- ✓ Study for remaining work for metaverse interoperability
- ✓ Collaborate with SGs and other SDOs
- ✓ Utilize existing specifications of other SDOs
- ✓ Promote standardized interoperable metaverse platform



# Thank you!



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**Website**

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