# Metaverse CG activity and progress

**Kepeng LI**
**ITU-T SG16 Metaverse CG Co-chairman**
**Senior Standard Expert in Tencent**
**kernli@tencent.com**

# CONTENTS

# Introduction of Correspondence Group on Metaverse

- [Created in Jan, 2022](#)
- Scope and objectives
  - Carry out the preliminary standardization analysis.
  - Technical analysis of future standardization directions, potential work items and future coordination needs.
  - Develop a report of CG activities.
- CG Convenors
  - Shin-Gak Kang (ETRI, Korea)
  - Kepeng Li (Tencent, China)

# Progress of Correspondence Group on Metaverse

- Held three e-meetings in July, August and Sep, with the average of 50+ participants

- Received <u>29 contributions</u> from 8 entity members

- Produced consolidated <u>CG report</u> including use cases, scenarios, technical analysis, standard analysis, future work suggestions etc.

# Contributions of Correspondence Group on Metaverse

| No | Source | Title |
|----|--------|-------|
| 1 | ZTE corporation | Discussion: two user cases for Metaverse |
| 2 | Oppo | XR-Device Portal for Metaverse |
| 3 | Spain | Standard activities about metaverse in other SDOs |
| 4 | Huawei, GEF, Tencent, China Telecom, China Mobile, ZTE, etc. | Proposed ToR for a new ITU-T Focus Group on "AI and Metaverse Open Unified Study (FAMOUS)" |
| 5 | China Unicom | Entrance to the metaverse-XR |
| 6 | China Unicom | NFT Applications in Metaverse |
| 7 | Tencent | 3GPP Metaverse and Related Standardization Progress |
| 8 | Tencent | CG report baseline |
| 9 | Tencent | Mobile Metaverse Service |
| 10 | China Mobile | AI for Metaverse and Metaverse for AI |
| 11 | China Mobile | Application Scenarios of the Metaverse |
| 12 | China Mobile | Gap Analysis of the Metaverse Standardization in SG16: the Digital Human |
| 13 | China Mobile | Landscape of the Metaverse Standardization-Metaverse Standards Forum |

# Contributions of Correspondence Group on Metaverse

| No | Source | Title |
|---|---|---|
| 14 | ETRI | Standardization issues and strategy for Metaverse interoperability in ITU-T SG16 |
| 15 | ETRI | Proposal for analysing key technologies powering the Metaverse |
| 16 | ETRI | Proposal for classifying Metaverse use cases |
| 17 | ETRI | Standardization activities on Metaverse in the relevant groups |
| 18 | ETRI | Trends and evolution of Metaverse |
| 19 | ETRI | Updates for Metaverse interoperability issues |
| 20 | ETRI | Proposal for use cases and requirements of metaverse platform interoperability |
| 21 | China Telecom | An important application scenario of metaverse-intelligent manufacturing |
| 22 | China Telecom | Key technology of the metaverse underlying architecture-edge computing |
| 23 | China Telecom | The basic unit of the metaverse- digital twin |
| 24 | China Telecom | The digital avatar of the metaverse-virtual digital human |
| 25 | China Telecom | Metaverse and Cloud Rendering Technology |
| 26 | China Telecom | Metaverse and Modeling Technology |
| 27 | China Telecom | Standardization plan and research direction of digital human in ITU-T SG16 |
| 28 | China Telecom | Standardization plan of edge computing for metaverse in ITU-T SG16 |
| 29 | China Telecom | Standardization plan for video coding technology in Metaverse in ITU-T SG16 |

# Metaverse workshops

- AI for Good Webinar, <u>Exploring AI in the Metaverse</u>, on 26th May, 2022

Speaker(s):

**Kepeng Li**
Senior Standard Expert
Tencent

**Lia DiBello**
Chief Science officer
Applied Cognitive Sciences Labs Inc.

**Melvin Kuek**
Vice-Chair, Metaverse Council & Chief Communications Officer
Global Esports Federation (GEF)

**Noah Luo**
Vice President, Standards and Industry Development
Huawei

**Justin McCall**
Head of Demand Generation and Partnerships
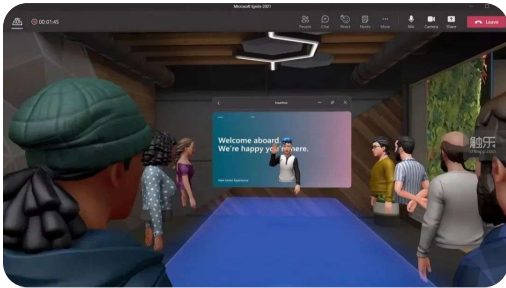Hewlett Packard Enterprise (HPE)

- Metaverse workshop in China on 27th May, 2022

- <u>Multimedia in the metaverse</u> workshop on 18th Oct, 2022

# Metaverse application scenarios



Game
scenario

Shopping
scenario

Office
scenario

Sports
scenario

Events
scenario

Education
scenario

Production
scenario

Travelling
scenario

# Metaverse applications – Carbon neutrality

## Metaverse along with Digital Transformation

### Entertainment
VR/AR、UGC/PGC

### Manufacture
Sensor、Robot、Chip

### Intelligent Transportation
Auto Pilot、V2X、MEC
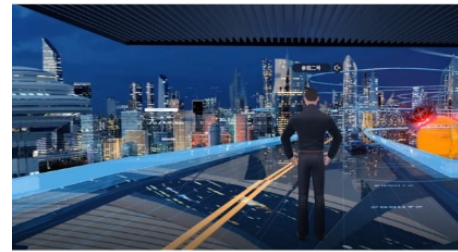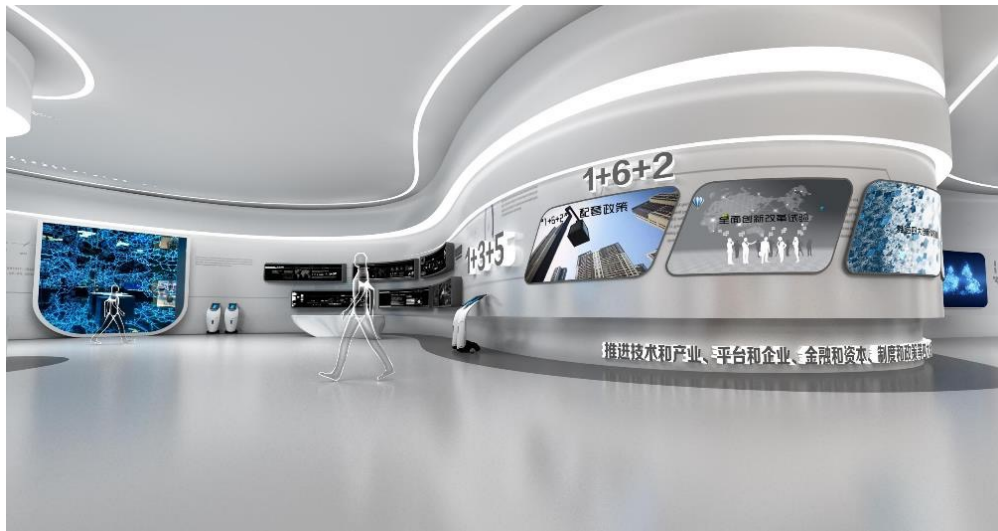
### New Energy
High Efficiency
Energy Storage/Saving

Digital Industrialization

Metaverse

Industrial Digitization

5G/6G、MEC、NFT、Blockchain、AR/VR、AI
Digital Technologies

# Metaverse applications – Digital twin online exhibition hall



This virtual exhibition hall is constructed by the high-tech VR room. It supports 360-degree free viewpoint and immersive interacting experience while makes the visitors fell stand in the real exhibition hall.

# Metaverse applications – Virtual digital human
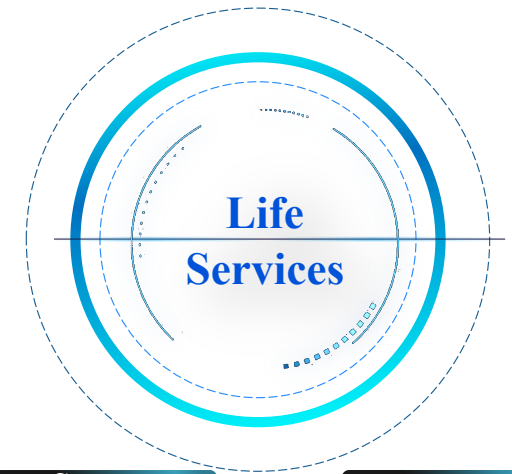


**To B: Service promotion**

Enterprise Services

**To C: Experience improvements**
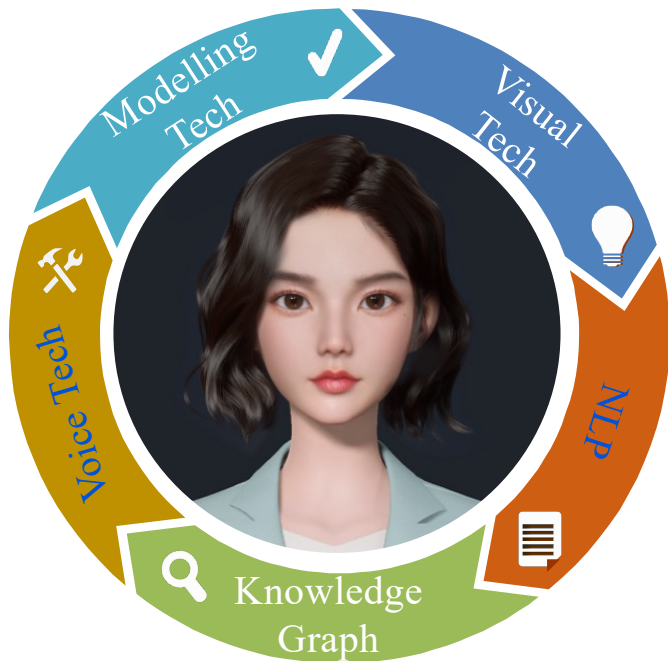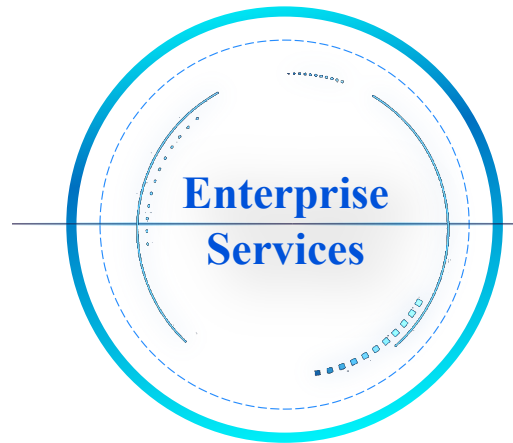
Life Services

| | | |
|---|---|---|
| Customer Care | Service Guide | Financial Advisor |
| Exhibition Host | Guided Tour | Online Class |

Smart Transportation

Smart Home

Modelling Tech

Visual Tech

Voice Tech

NLP

Knowledge Graph
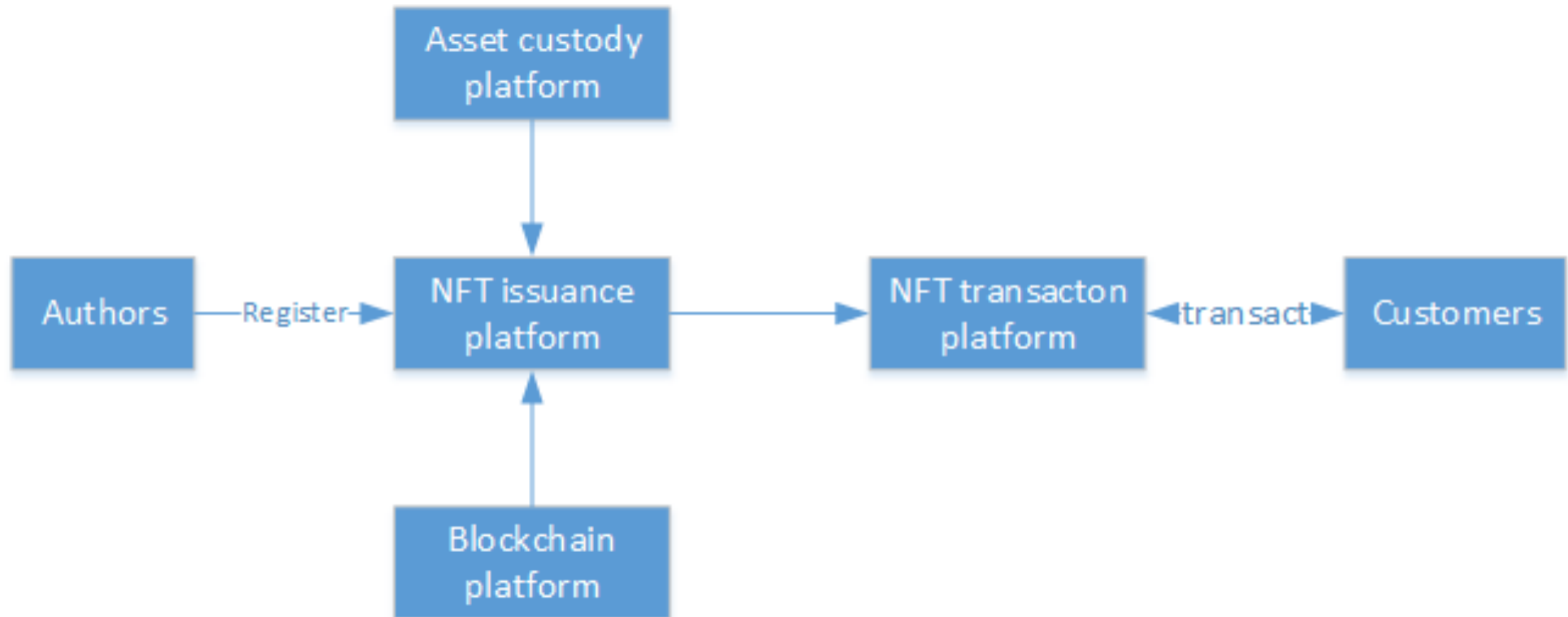
# Metaverse applications – Mobile metaverse services
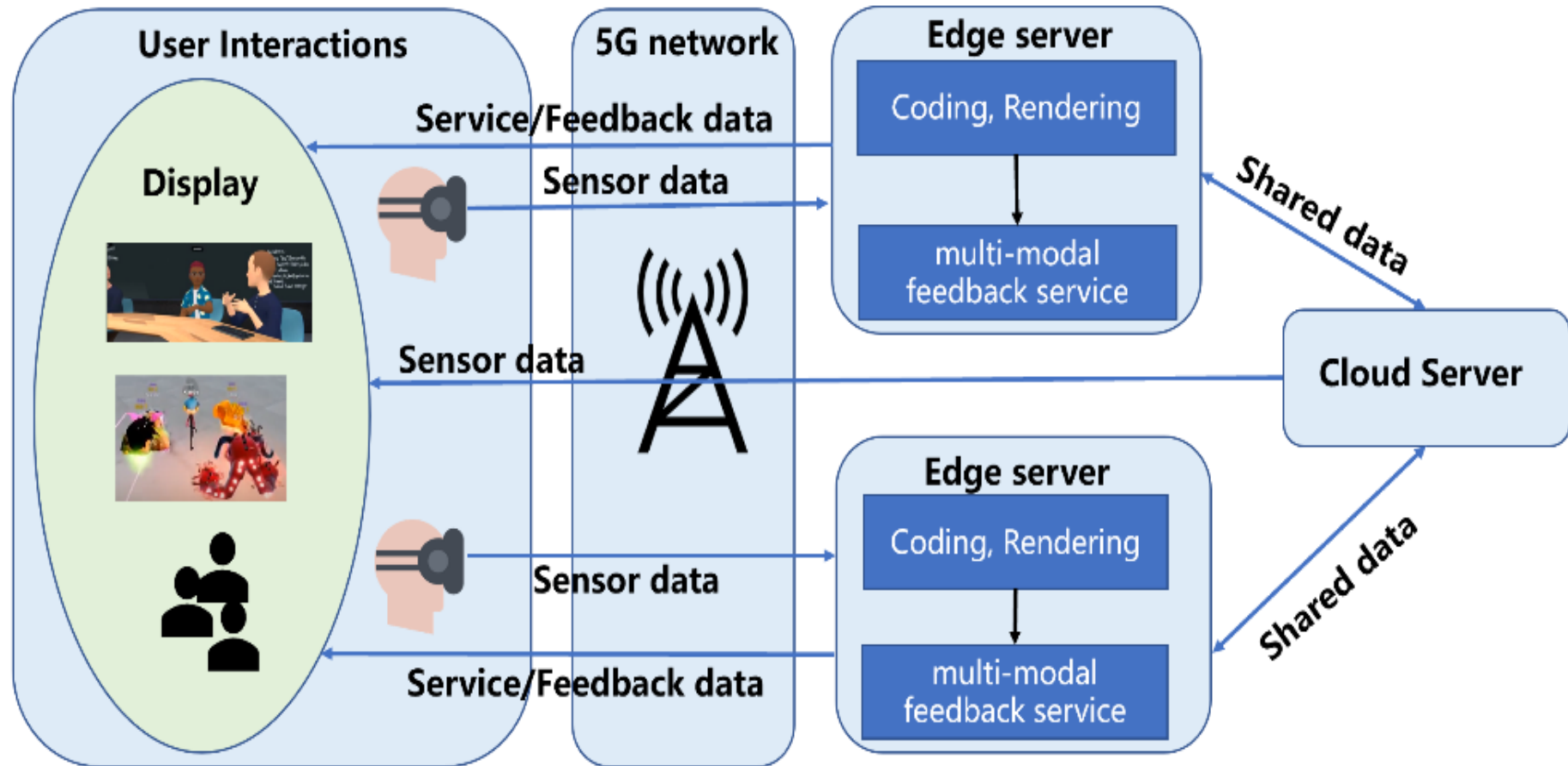
# Metaverse applications – NFT applications

# Metaverse technical analysis

## Backend Infrastructure

### IOT Technology
- Application layer
- Perception layer
- Network layer

### Interaction Technology
- Voice/Video interaction
- Gesture interaction
- Brain-computer interaction

### E-game Technology
- Realtime rendering
- 3D modelling
- Game engine

## Underlying Architecture

### Network & Computation
- 5G/ 6G network
- Cloud computing
- Edge computing

### AI Technology
- Machine learning
- NLP
- Intelligent voice
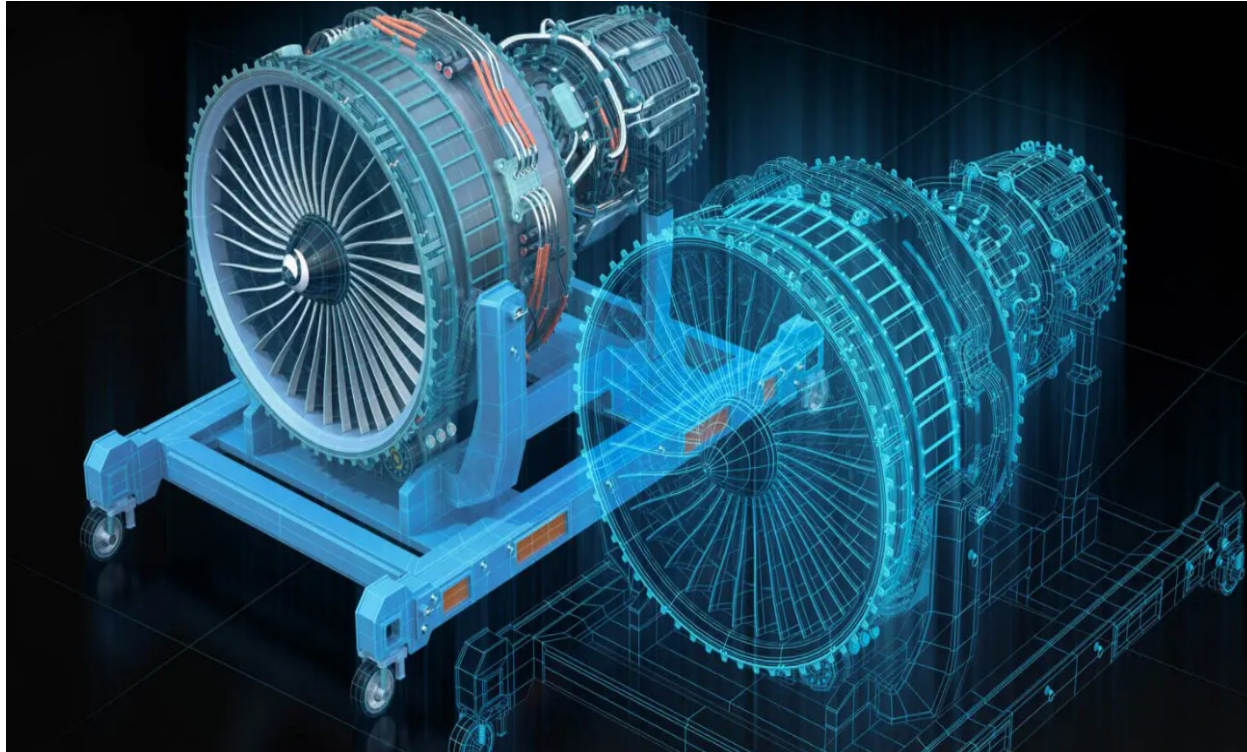- Computer visual

### DLT Technology
- Smart contract
- Distributed identity
- Distributed storage
- Consensus mechanism

ITU

# Metaverse key technology: digital twins



Metaverse is a large-scale, interoperable three-dimensional virtual world rendered in real time, which relies on digital twin technology to construct virtual world and interact with the real world.

# Metaverse key technology: Extended Reality

**VR (Virtual Reality)**

**MR (Mixed Reality)**

**AR (Augmented Reality)**

45°F

Virtual world ←――――――――――――――――――→ Real world
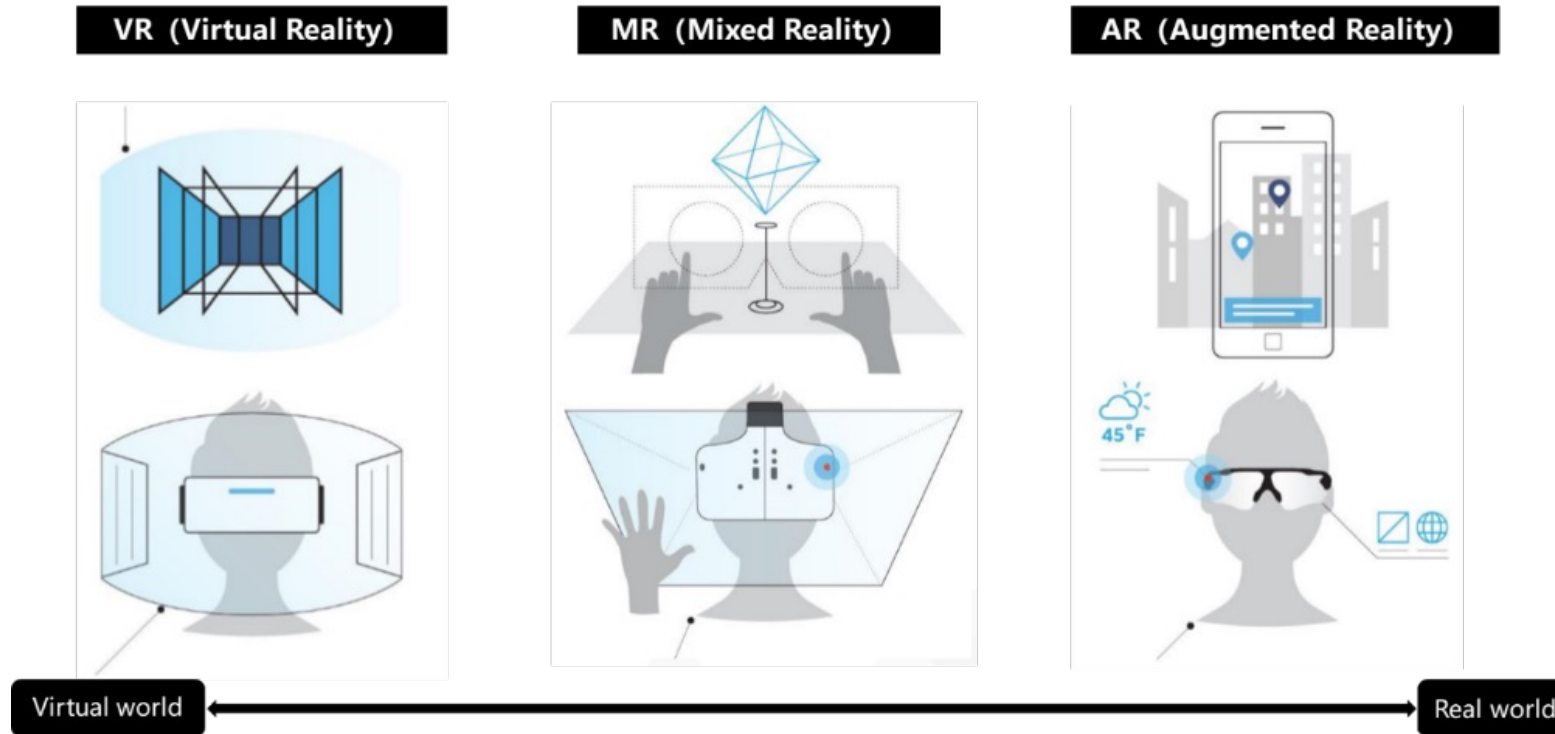
| Period | Early: Virtual construction | Mid-term: Virtual integration into reality | Long-term: Mix of virtual and actual reality |
|---|---|---|---|
| Field | Games, films, advertising | E-commerce, Education, Tourism | Medical, Industry, Design |

# Metaverse key technologies

- ## Edge computing

  - Edge computing can split the large services required from metaverse computing into small, manageable sub-tasks and distributes these tasks to edge nodes for processing.

- ## Cloud rendering

  - A cloud rendering solution using a distributed cloud can provide the optimal solution for shortening the rendering cycle and accelerating the arrival of the metaverse.

- ## Modeling technology:

  - Modelling technology is the core technology for constructing digital virtual world.

- ## Video coding

  - Low-latency codec modules, improve data transmission efficiency.

# Metaverse standard landscape

- ISO/IEC JTC 1/SC 24 (Computer graphics, image processing and environmental data representation)

- ISO/IEC JTC 1/SC 29 (Coding of audio, picture, multimedia and hypermedia information)

- ISO TC 172/SC 9 (Laser and electro-optical systems)

- IEC TC 110/WG 6 (3D Display Devices)

- IEEE 2888 Working Group (Interfacing Cyber and Physical World)

- IEEE 3079 Working Group (Human Factor for Immersive Content)

- IEEE Metaverse Standards Committee

- IEEE Computer Society  Metaverse PAR Study Group

- Khronos Group

- World Wide Web Consortium (W3C)

- 3GPP

- ETSI

# Metaverse standards forum

◻ **Overview**

- Launched on June 21$^{st}$, 2022

- Hosted by the Khronos Group.

- Founding members include 37 organizations: Adobe, Alibaba, Epic Games, Huawei, Khronos, Meta, Microsoft, NVIDIA, OpenAR Cloud, the Open Geospatial Consortium, Qualcomm Technologies, Sony Interactive Entertainment, Spatial Web Foundation, Unity, the World Wide Web Consortium, and the XR Association (XRA), etc.
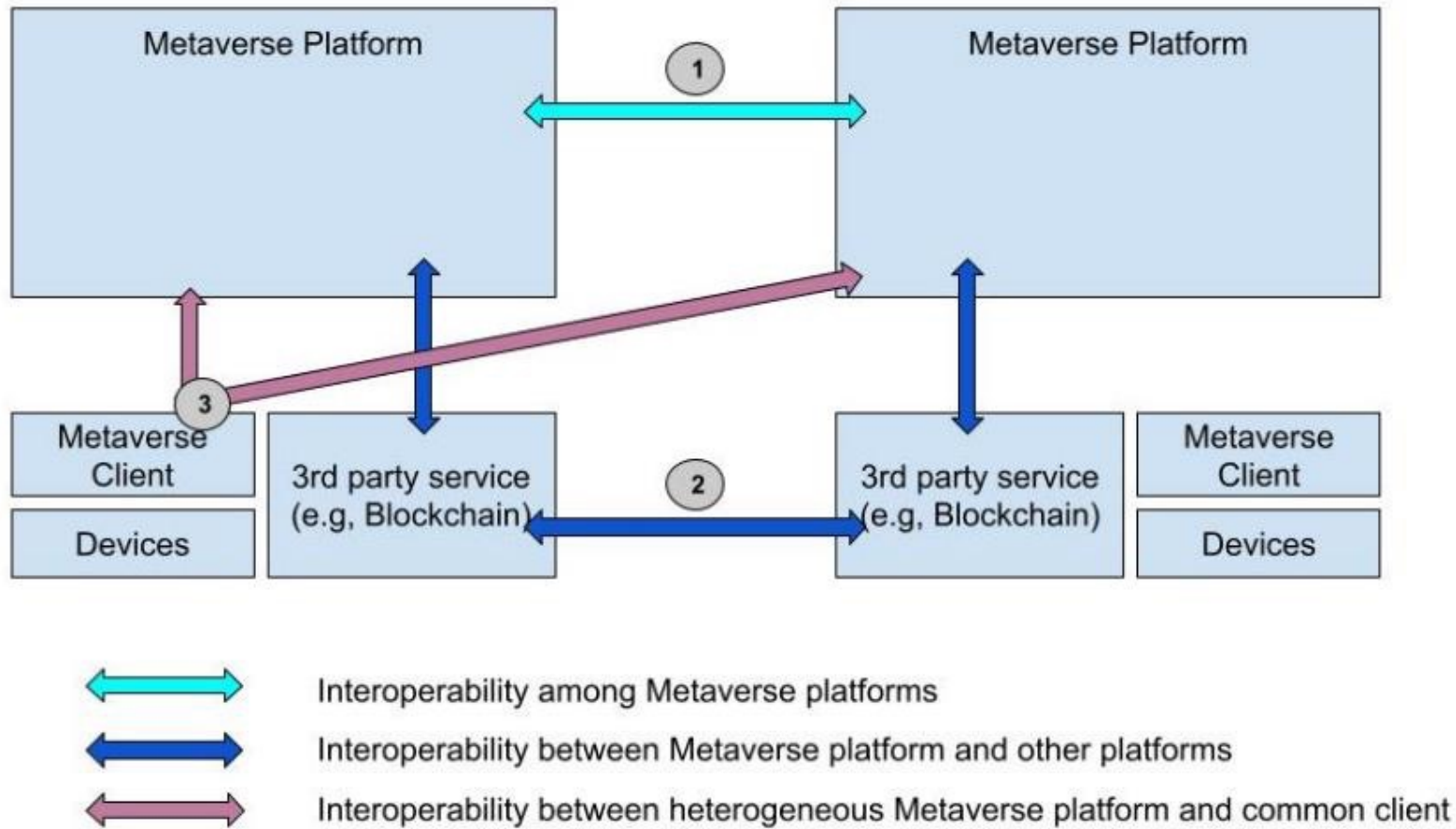
◻ **Three Statements**

- Industry-wide forum to coordinate and encourage metaverse interoperability

- Open to all, no participation fee, no NDA, no IP framework

- Coordinated cooperation between industry and Standards Developing Organizations (SDOs)

◻ **Three Output Goals**

- Agreed industry-wide terminology

- Standards usage recommendations and guidelines

- Interoperability prototypes, hackathons, plugfests and tooling projects

# Metaverse standard gap analysis



Interoperability among Metaverse platforms

Interoperability between Metaverse platform and other platforms

Interoperability between heterogeneous Metaverse platform and common client

# Future work

☐ **A new dedicated Focus Group (under discussion)**

☐ **Possible aspects to consider for pre-standardization work**

- New technical requirements for the metaverse.

- Technical framework for the metaverse.

- Interoperability specifications for the metaverse.

- Application interfaces for the metaverse.

- Guidance to use multimedia related technologies in Metaverse.

# Thank you!