글로벌 ICT 표준 컨퍼런스 2023

Global ICT Standards Conference 2023

(세션1) ICT 표준 전문가 워크숍

ISO/IEC 메타버스 표준화 현황 및 JTC 1 표준화 전략

이명원 대표, ㈜VRSTA

주최 과학기술정보통신부 Ministry of Science and ICT
특허청 Korean Intellectual Property Office
주관 국립전파연구원 National Radio Research Agency
TTA IITP KEA kista ETRI

01. Overview

- Summary of the ISO/IEC workshop on the metaverse (2023-06-26, Zoom)
  - JTC 1/SC 24 standards and projects for the metaverse
  - JTC 1/SC 29 standards and projects for the metaverse
  - JTC 1/SC 36 standards and projects for the metaverse
  - IEC/TC 100 work on the metaverse
  - ISO/IEC JSEG 15 work on the metaverse
- Expectation of other JTC 1/SCs' work on the metaverse
- JTC 1 strategies for the metaverse
- JTC 1 collaboration with JSEG 15

02. Workshop on ISO/IEC standards for the metaverse

ISO/IEC Workshop (Online)

STANDARDS FOR THE METAVERSE

Location: <Zoom link>
Date: June 26, 2023
Time: 21:00 - 24:00 UTC
Organized by: IEC Academy and ISO/IEC JTC 1/AG 1

Program

Chaired by Tony Holland and Muhammad Ali (JTC 1/AG 1 Communications)

Session 1 **21:00 - 22:50 UTC** **ISO/IEC JTC 1 Standards and Projects for the Metaverse**	▪ Introduction, Philip C. Wennblom, JTC 1 Chair ▪ JTC 1/SC 24 Standards and Projects for the Metaverse, Myeong Won Lee, JTC 1/SC 24 Chair ▪ Standards and Projects of JTC 1/SC 24/WG 9 on Metaverse and Interverse, Takeshi Kurata, JTC 1/SC 24/WG 9 Convenor ▪ Metaverse Fundamentals: Concepts, Definitions, and Terminology, Peter Ryan, JTC 1/SC 24/WG 10 Convenor ▪ JTC 1/SC 29 Coding of Audio, Picture, Multimedia, and Hypermedia Information - Standards for the Metaverse, Gary J. Sullivan, JTC 1/SC 29 Chair ▪ JTC 1/SC 29/WG 4 MPEG Video Codding - Standards and Projects for the Metaverse, Lu Yu, JTC 1/SC 29/WG 4 Convenor ▪ JTC 1/SC 29/WG 7 MPEG 3D Graphics and Haptics Coding - Standards and Projects for the Metaverse, Marius Preda, JTC 1/SC 29/WG 7 Convenor ▪ Learning, Education and Training (LET) in the Metaverse, Opportunities and the Need for Standards, Erlend Øverby, former JTC 1/SC 36 Chair, and Jon Mason, JTC 1/SC 36 Chair
Break **22:50 - 23:00 UTC**	
Session 2 **23:00 - 23:40 UTC** **IEC and ISO/IEC Standards and Projects for the Metaverse**	▪ Introduction of IEC/TC 100, Masatake Sakuma, IEC/TC 100 Assistant Secretary ▪ Metaverse of the IEC/TC 100, Ockwoo Nam, IEC/TC 100/WG 12 Convenor ▪ Thoughts on Metaverse Standardization, Ming Li, ISO/IEC JSEG 15 Convenor
Session 3 **23:40 - 24:00 UTC** **Discussion and Conclusions**	▪ Discussion, including Q and A, Tony Holland and Muhammad Ali, JTC 1/AG 1 Communications ▪ Conclusions and further steps, Philip C. Wennblom, JTC 1 Chair

03. JTC 1/SC 24 Standards and Projects for the Metaverse, — Myeong Won Lee, SC 24 Chair (1)

Concepts for the metaverse

- Connection and integration of the real world into virtual worlds
  - Standardized ICT integration technologies between
    - Real and virtual worlds
    - ICT and industry areas
- An extended social, economic, and cultural life in virtual worlds
  - Standardized life and business environments with safety, security, and reliability in virtual worlds
- A new order and ethical and moral conduct in the metaverse

Requirements for the metaverse

- Standardized ICT integration technologies for diverse metaverse areas
- Standardized software development guidelines
- Standardized user interface guidelines
- Standardized ownership, authority, safety, and security
- Standardized governance guidance for social, economic, and cultural order and ethics in the metaverse

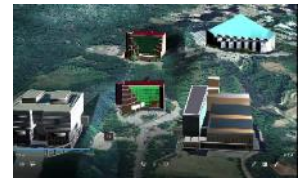
03. JTC 1/SC 24 Standards and Projects for the Metaverse, — Myeong Won Lee, SC 24 Chair (2)

- 3D virtual world representation, visualization, and information definition and processing → ISO/IEC IS 14772, 19775-1, 19775-2, 19776, 19777, 18023, 18024, 18025, 18026
- 3D avatar representation, visualization, and information definition and processing → ISO/IEC IS 19774-1, 19774-2, AWI 20538
- VR/AR/MR-based information definition and processing in 3D virtual worlds → ISO/IEC IS 18038, 18039, 18040, 18520, 23488, TS 23884, DIS 3721
- Knowledge and semantic information definition and processing in 3D virtual worlds → ISO/IEC IS 18023, 18038
- ICT integration technologies with diverse industry sectors and applications → ISO/IEC TS 5147, CD 9234,
- VR/AR/MR-based safety, security, identity, authority, usability, and reliability in 3D virtual worlds → ISO/IEC DIS 5927

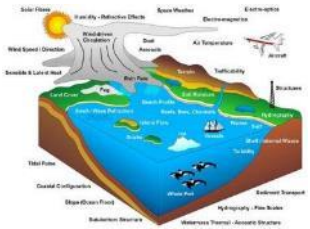
ISO/IEC 19775-1

ISO/IEC 19775-1

ISO/IEC 18038



ISO/IEC 18038

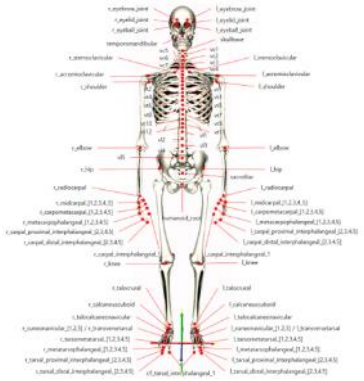


ISO/IEC 18023

ISO/IEC 19774-1

ISO/IEC 19774-2

ISO/IEC 19774-3

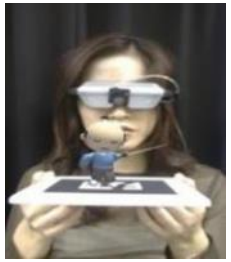


ISO/IEC 19774-1

04. Standards and Projects of SC 24/WG 9 on Metaverse and Interverse — Takeshi Kurata, SC 24/WG 9 Convenor (1)

- ISO/IEC 18039:2019 MAR reference model
- ISO/IEC 18038:2020 Sensor representation in MAR
- ISO/IEC 18040:2019 Live actor and entity representation in MAR
- ISO/IEC 23488:2022 Object/environmental representation for image-based rendering in VR/MAR
- ISO/IEC TS 23884:2021 Material property and parameter representation for model-based haptic simulation of objects in VR/MAR
- ISO/IEC PRF 3721 (Formerly 3721-1) Information model for MAR content - Core objects and attributes
- ISO/IEC PRF 21145 (Formerly 3721-2) Style representation for MAR
- ISO/IEC AWI TR 16088 Constructs for Visual Positioning Systems in MAR
- ISO/IEC 18520:2019 Benchmarking of vision-based spatial registration and tracking methods for MAR
- ISO/IEC AWI 21134 Benchmarking of integrated indoor localization and tracking methods using dead reckoning

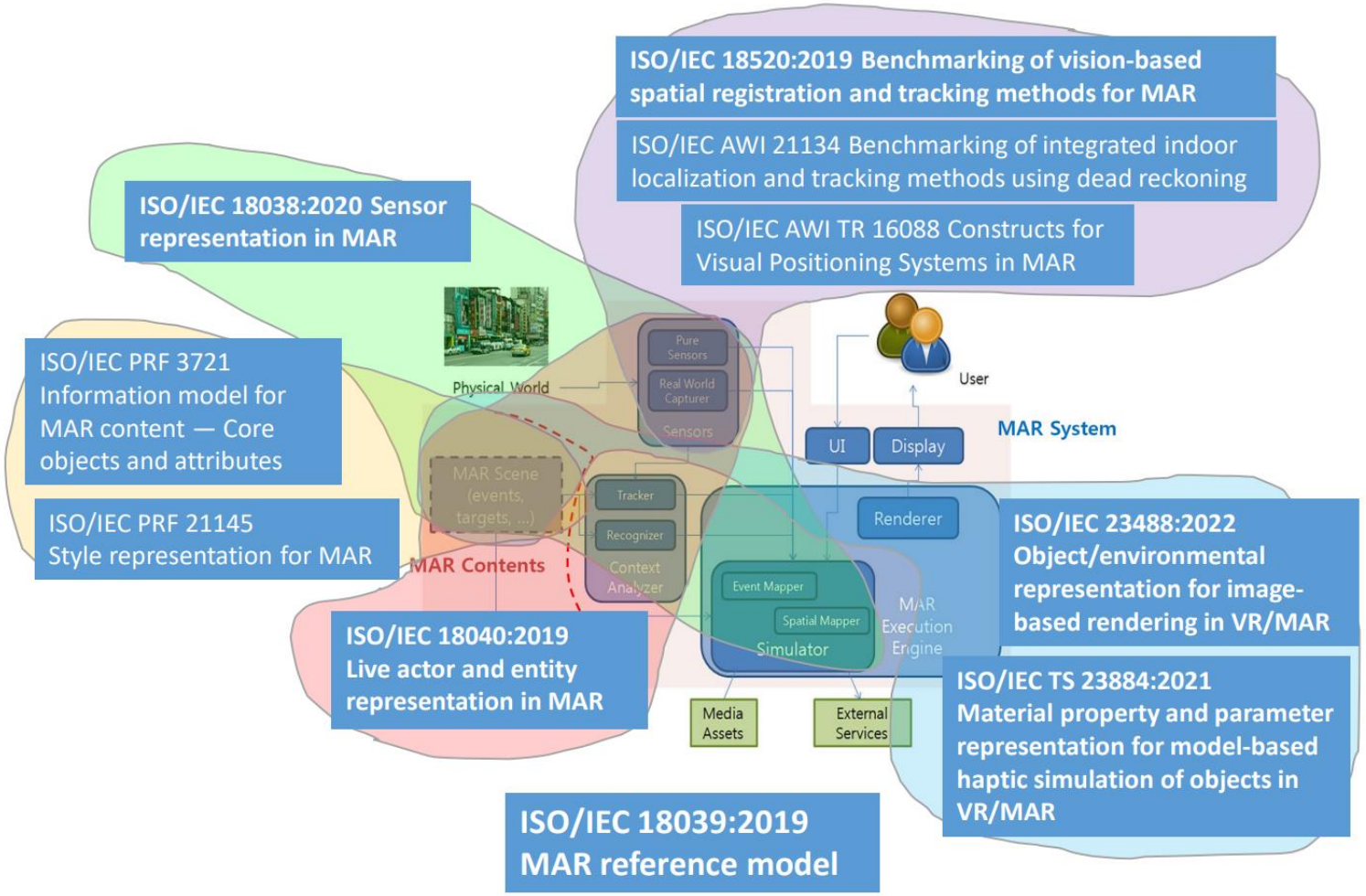
ISO/IEC 18038



ISO/IEC 18039

ISO/IEC 18040

04. Standards and Projects of SC 24/WG 9 on Metaverse and Interverse, — Takeshi Kurata, SC 24/WG 9 Convenor (2)

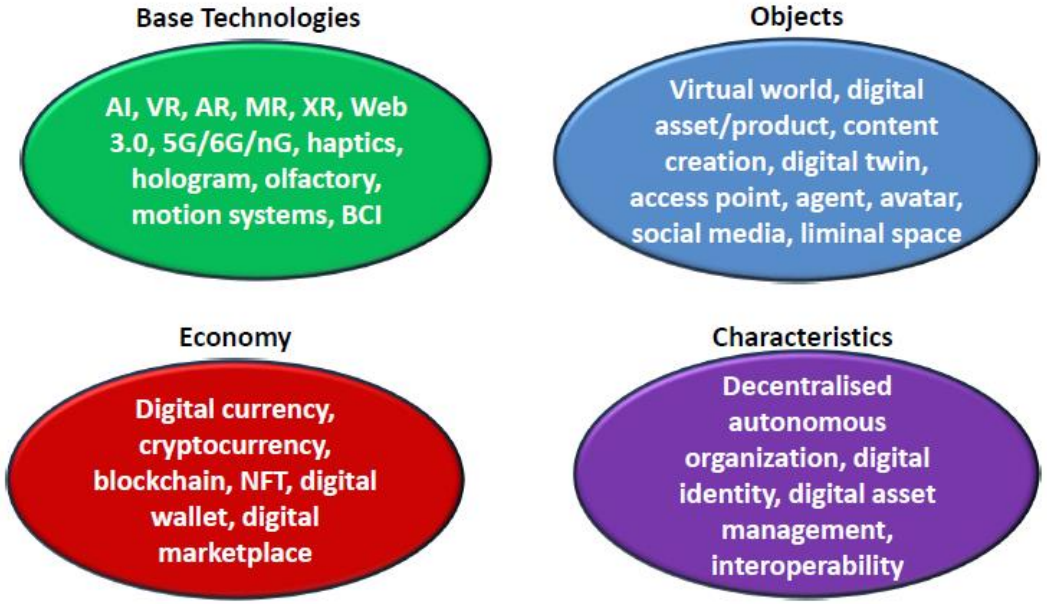


05. Metaverse Fundamentals: Concepts, Definitions, and Terminology, — Peter Ryan, SC 24/WG 10 Convenor (1)

Metaverse concepts

- Spatial computing
- Virtual world
- Virtual presence
- Digital identity
- Avatars
- Decentralization
- Digital twin/product/object
- Content creation
- Access point
- Economy
- Social media

Metaverse terminology



05. Metaverse Fundamentals: Concepts, Definitions, and Terminology, — Peter Ryan, SC 24/WG 10 Convenor (2)

Metaverse Access Points

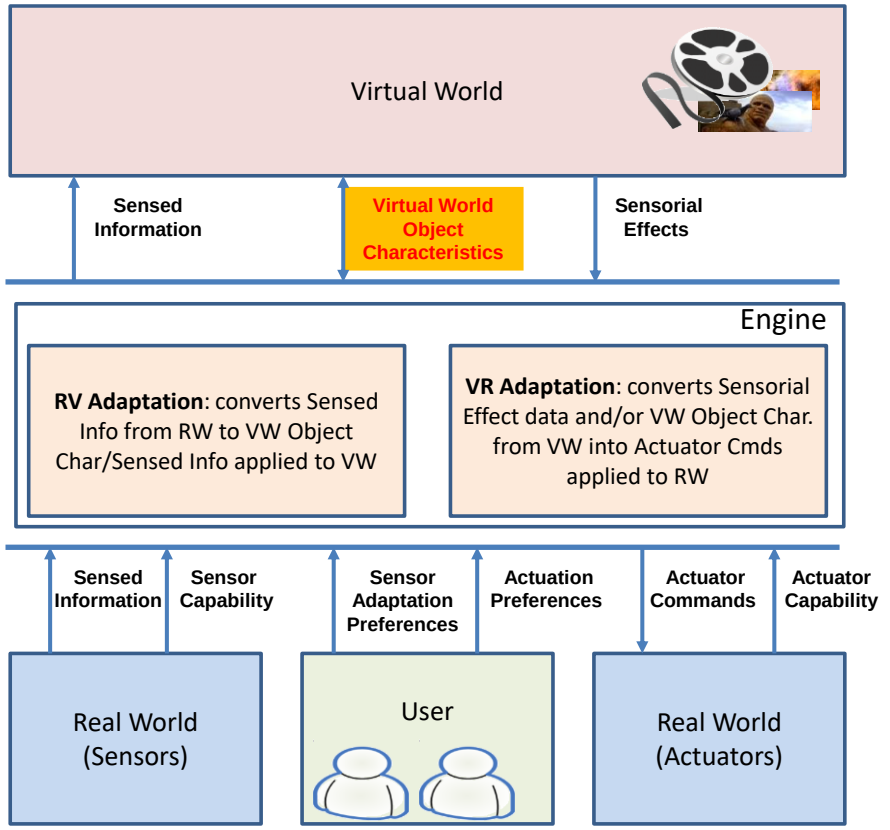
- VR headset
- AR gear
- Gaming consoles
- Computer / tablet
- Smartphone
- Equipment such as exercise bicycle
- Brain computer interface

NP with WD in Progress

- Part 1: Terminology and concepts
  - Terminology: metaverse, avatar, crypto currency, NFTs, AR, VR …
  - Concepts: immersive virtual world, access point, virtual presence …
- Part 2: Framework
- Part 3: Use cases
  - Education, gaming, entertainment, social networking, tourism, retail, business, medicine …

06. JTC 1/SC 29 Standards for the Metaverse, — Gary J Sullivan, SC 29 Chair (1)

- Efficient coding and carriage standards
  - ISO/IEC 14496-16 Animation Framework eXtension (AFX), ISO/IEC 14496-25 3D Graphics Compression Model, ISO/IEC 23008-3 3D Audio, ISO/IEC 23090-2 Omnidirectional media format (OMAF), ISO/IEC 23090-5 Visual volumetric video-based coding (V3C) and video-based point cloud compression (V-PCC), ISO/IEC 23090-6 Immersive media metrics, ISO/IEC 23090-7 Immersive media metadata, ISO/IEC 23090-8 Network based media processing, ISO/IEC 23090-9 Geometry-based point clouding, ISO/IEC 23090-10 Carriage of visual volumetric video-based coding data, ISO/IEC 23090-14 Scene description.
- Real-to-Virtual-to-Real communication
  - ISO/IEC 23005 Media context and control: ISO/IEC 23005-2, 23005-3, 23005-4, 23005-5, 23005-6, 23005-7

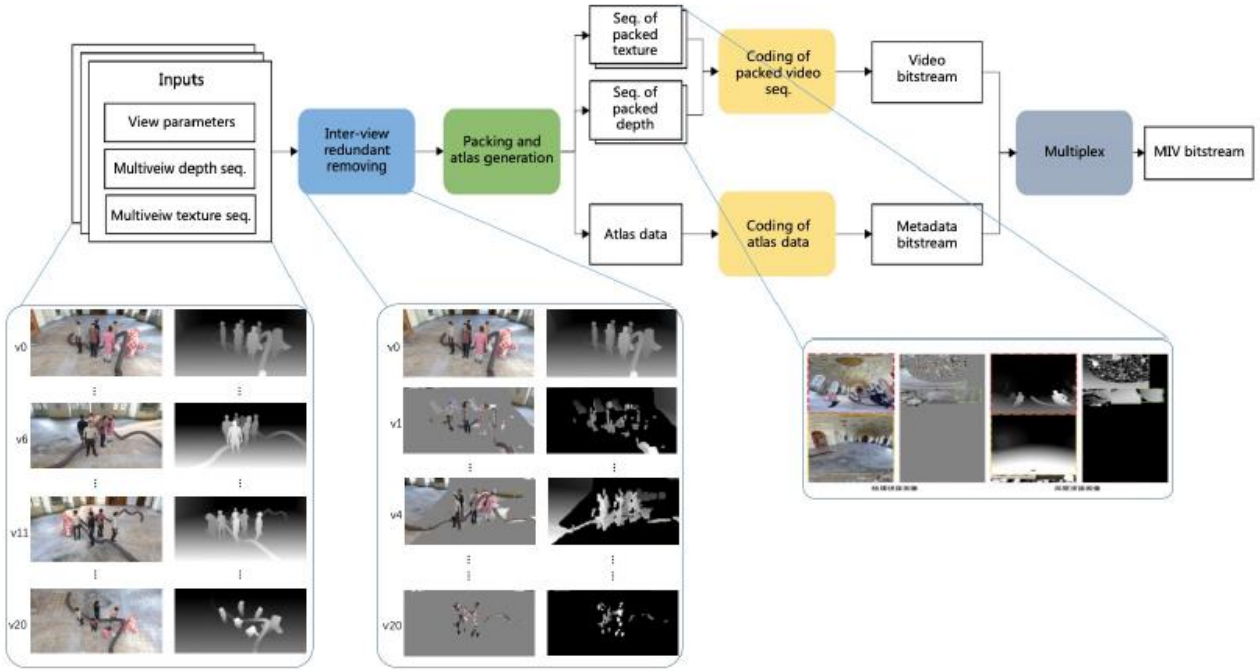


06. JTC 1/SC 29 Standards for the Metaverse, — Gary J Sullivan, SC 29 Chair (2)

- 3D video and graphics coding
  - ISO/IEC 23090-5 Realistic 3D humans
- Coded representation of immersive media
  - ISO/IEC WD 23090-4 Immersive video, ISO/IEC FDIS 23090-12 MPEG immersive video, ISO/IEC 23090-13 Video decoding interface for immersive media, ISO/IEC FDIS 23090-18 Carriage of geometry-based point cloud compression data, ISO/IEC AWI 23090-28 Efficient 3D graphics media representation for render-based systems and applications, ISO/IEC 23090-29 Video-based dynamic mesh coding

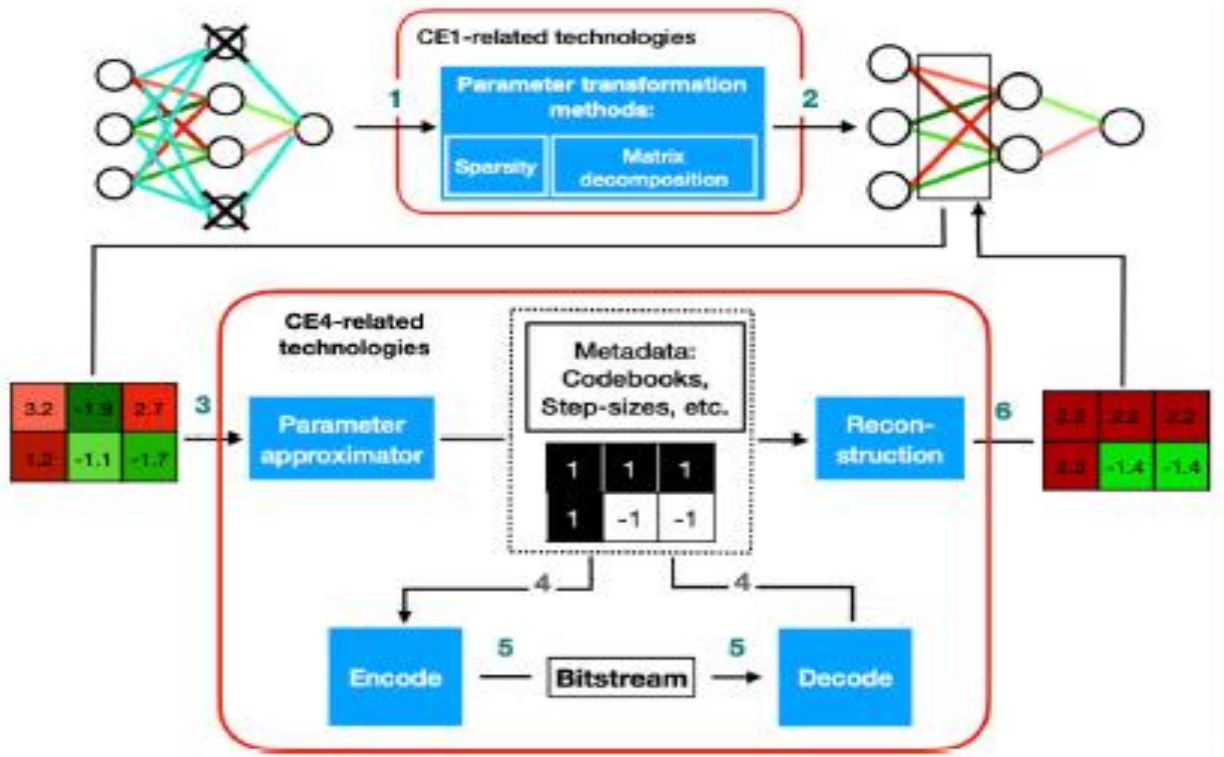
07. JTC 1/SC 29/WG 4 Standards and Projects for the Metaverse, — Lu Yu, SC 29/WG 4 Convenor (1)

- 2D video coding standards
  - ISO/IEC 14496-10 Advanced video coding, 23008-2 High efficiency video coding, 23090-3 Versatile video coding, 23094-1 Essential video coding, 23094-2 Low complexity enhancement video coding
- Immersive video coding
  - ISO/IEC 23090-12 FDIS Immersive video coding



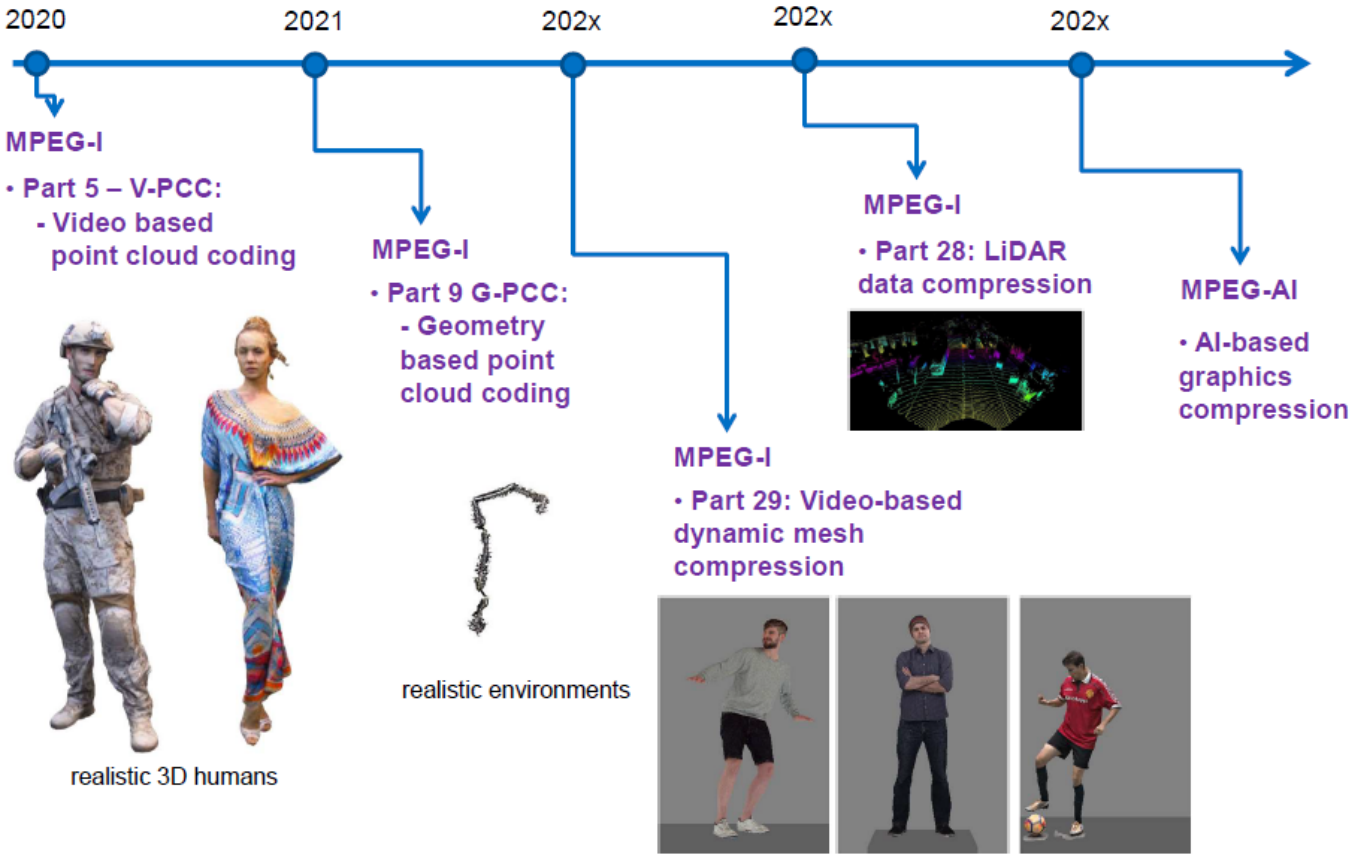
07. JTC 1/SC 29/WG 4 Standards and Projects for the Metaverse, — Lu Yu, SC 29/WG 4 Convenor (2)

- Neural network compression
  - ISO/IEC 15938-17 Compression of neural networks for multimedia content description and analysis



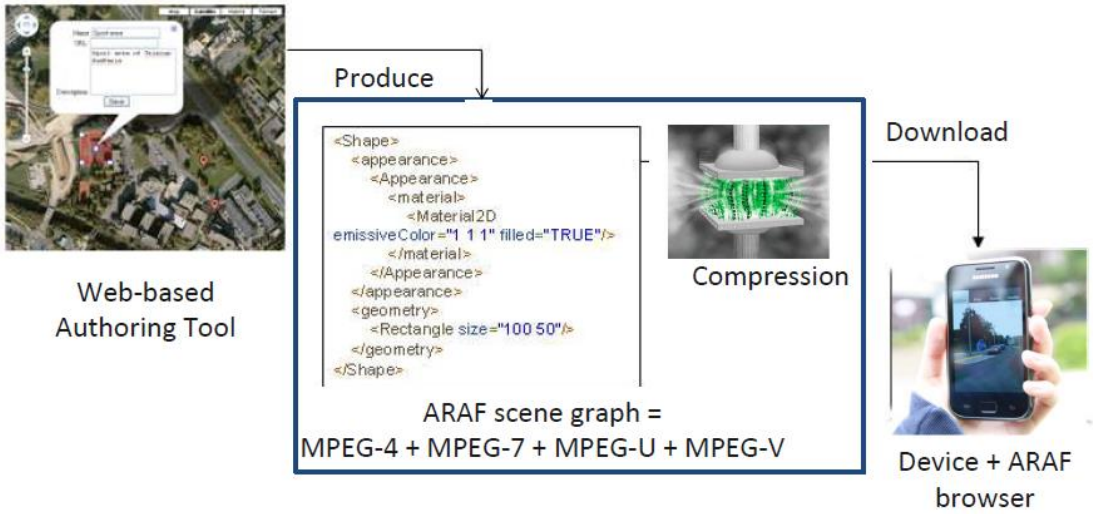
08. JTC 1/SC 29/WG 7 Standards and Projects for the Metaverse, — Marius Preda, SC 29/WG 7 Convenor (1)

MPEG 3D Graphics and Haptics Coding



08. JTC 1/SC 29/WG 7 Standards and Projects for the Metaverse, — Marius Preda, SC 29/WG 7 Convenor (2)

- MPEG-V: ISO/IEC 23005 Media context and control
- MPEG-V: Digital assets exchange between virtual worlds
- MPEG-ARAF: Augmented reality application format



09. JTC 1/SC 36 Learning, Education and Training in the Metaverse, — Jon Mason (SC 36 Chair) and Erlend Øverby (JWG 12 Co-Convenor) (1)

ISO/IEC 19788 Metadata

- Framework for describing the semantics of information
- Based on linked data and RDF
- Metadata could be embedded in resource or external to resource
- Metaverse challenge:
- How do we specify a location of a learning event or a learning opportunity within the 4D space of metaverse?

ISO/IEC 24751 AfA

- Access for All
- Because we cannot discriminate
- It is a human right to be able to participate in a digital learning experience
- An important part of AfA is a registry of Personal Needs and Preferences (PnP) where a learner can specify how a resource should adapt to the individual learner
- The goal is the learning outcome
- Establishes the principle of equivalent resource

09. JTC 1/SC 36 Learning, Education and Training in the Metaverse, — Jon Mason (SC 36 Chair) and Erlend Øverby (JWG 12 Co-Convenor) (2)

Contemporary Context

- Metaverse: interoperability has an expanding scope
  - Systems interoperability
  - Data interoperability
  - Virtual worlds interoperability
  - New entities (avatars, AI, etc.)
- Domain ontologies
- Technical architectures, reference models, technical specifications, schemas, vocabularies, etc.
- Codified codes of conduct that address engaging with and within the digital environment
  - Safely
  - Responsibly
  - Ethically

10. Introduction to IEC/TC 100, Masatake Sakuma, — IEC/TC 100 Assistant Secretary (1)

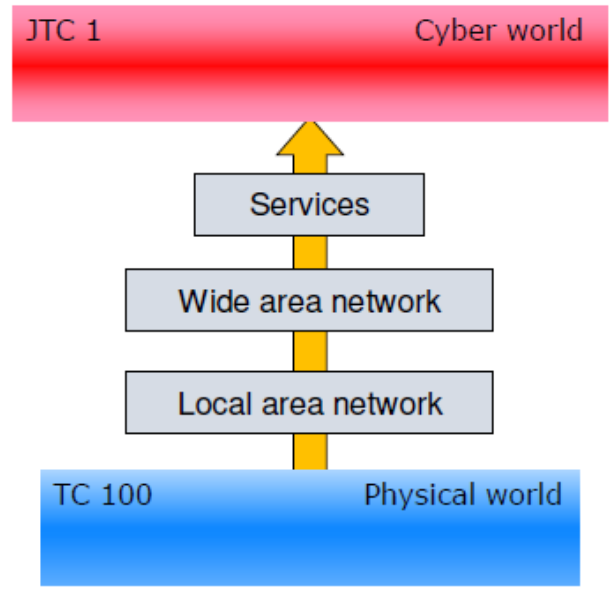
IEC/TC 100 structure, technical areas and groups

- **TA 1: Terminals for audio, video and data services and content**
- **TA 1/WG 1:Terminals for VR/AR/MR**
- TA 2: Colour measurement and management
- TA 4: Digital system interfaces and protocols
- TA 5: Cable networks for television signals, sound signals and interactive services
- TA 6: Storage media, storage data structures, storage systems and equipment
- TA 15: Wireless power transfer
- TA 16: Active Assisted Living (AAL), wearable electronic devices and technologies, accessibility and user interfaces
- TA 17: Multimedia systems and equipment for vehicles
- **TA 18: Multimedia home systems and applications for end-user networks**
- TA 19: Environmental and energy aspects for multimedia systems and equipment
- TA 20: Analogue and digital audio
- TC 100/WG 11: User's Quality of Experience (QoE) on Multimedia Conferencing Services
- **TC 100/WG 12: Multimedia systems and equipment for metaverse**
- AG 1: Advisory Group on Strategy
- AG 2: Advisory Group on Management
- AG 3: General Maintenance Team
- ahG 10: TC 100 AGS strategic priorities and future topics and Use cases and related studies
- EG 5: Editing Committee

10. Introduction to IEC/TC 100, Masatake Sakuma, IEC/TC 100 Assistant Secretary (2)

- After the 2019 joint TC100/JTC 1 workshop
  - TC 100/AGS (Advisory Group on Strategy) resolved to investigate the following standardization themes
    - IoT and CPS in the field of AV multimedia
    - Wearable systems and equipment
    - VR, AR, and MR = XR
    - Haptics, Vibrotactile as multimedia
  - These work areas are now being addressed in several TC 100 TAs and WGs

- Relationship between JTC 1 and TC 100



11. Metaverse of IEC/TC 100, Ockwoo Nam et al., — IEC/TC 100/WG 12 Convenor (1)

MV- related structure of TC 100

- TA 1/WG 1: Terminals for VR/AR/MR
  - Liaison with JTC1/SC24
- WG 12: Multimedia systems and equipment for metaverse
  - Liaison with ITU T/FG MV
- TA 18: Multimedia home systems and applications for end user networks

TA 1/WG 1

- TA 1/WG 1: Terminals for VR/AR/MR
- PWI 100-45: AR technology
- IEC 6yyyy: "Terminals for VR/AR/MR - Glossary of terms"
- IEC 6xxxx-3-1: "Terminals for VR/AR/MR - Test method - Part 1: Durability test for AR devices"
- IEC 6xxxx-1-1: "Terminals for VR/AR/MR - Reference model - Part 1: Consumer VR/AR/MR devices"

11. Metaverse of IEC/TC 100, Ockwoo Nam et al., — IEC/TC 100/WG 12 Convenor (2)

WG 12

- IEC TR 63289:2020 Conceptual model for TC 100 standardization on multimedia cyber technology
- PWI 100-49: Concept of metaverse for multimedia equipment and standardization areas in TC 100
- Q for PWI: Definitions and Classifications of Metaverse
- Q for PWI: Gap Analysis for Metaverse Systems and Equipment
- Expected items: Implementation aspect of immersive metaverse device

TA 18

- IEC TR 63344:2021 Conceptual model of standardization for haptic multimedia systems
- PWI PT 100-43 on Haptics-conceptual model of standardization
- PWI PT 100-42 on Remote control and remote assist system in home and local area

12. Thoughts on Metaverse Standardization, — Ming Li, ISO/IEC JSEG 15 Convenor (1)

Key content of Metaverse based on ontology

Ontology of Metaverse			
Conceptualization Key components	Explicit Key factors	Formal Engineerning	Share Consensus
Governance system Cooperative system Economy system Content system Technical system	Collaboration Identity Asset Activities (Data)	Space Application Service System Network	Governing & regulation Application & service Content & asset Data & protocol Tech & platform Basic

12. Thoughts on Metaverse Standardization, — Ming Li, ISO/IEC JSEG 15 Convenor (2)

- Key components
  - Regulation, consensus, circulation, openness, integration
- Key factors
  - Collaboration, identity, asset, activities
- Engineering practice
  - Space, application, service, system, network
- Standard focus
  - Data and protocol: data format, data sharing, HCI, compatibility and interoperability
  - Application service, content and asset, technology and system
  - Governing and regulation: copyright protection, content regulation, asset compliance, network security, privacy, cryptography

13. JTC 1 Strategies for the Metaverse (1)

JTC 1 standards development on the metaverse

- Provide standards for integrating real world information into virtual worlds
- Provide standards for metaverse information definition and processing for virtual worlds and humans/avatars based on VR/AR/MR and 3D simulation and interaction
- Provide standards for software development and guidelines for metaverse service applications
- Provide standards for user interfaces for metaverse service applications
- Provide ICT integration standards necessary for metaverse service development
- Provide governance standards for social and cultural order in the metaverse

13. JTC 1 Strategies for the Metaverse (2)

Direction of basic JTC 1 standards development for the metaverse

- Because many JTC 1/SCs (SC 6, SC 7, SC24, SC 27, SC 29, SC 32, SC 35, SC 36, SC 38, SC 42, etc.) are considered especially relevant to the metaverse, basic technologies for standards development in each scope would be progressed in the SCs.

Further JTC 1 standards development for the metaverse

- In the case that the scope of a new proposal on the metaverse covers diverse areas and an SC may have difficulty with the progress of the proposal, JTC 1 will coordinate the creation of a JWG between the relevant SCs.

The first anticipated coordinated work on the metaverse

- Governance standards for social and cultural order for the metaverse

14. Collaboration with JSEG 15

- JTC 1 governance standards development on social and cultural order for the metaverse
- Work items related to metaverse application services that will be covered by jointed scopes.
- JSEG 15 collaboration for selection of the work items when classifying all relevant use cases for the metaverse.

감사합니다.

이명원 대표, ㈜VRSTA
myeongwonlee@gmail.com