

메타버스를 위한 데이터 교환 표준화 (JTC 1 SC 29)

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1. 메타버스 이해

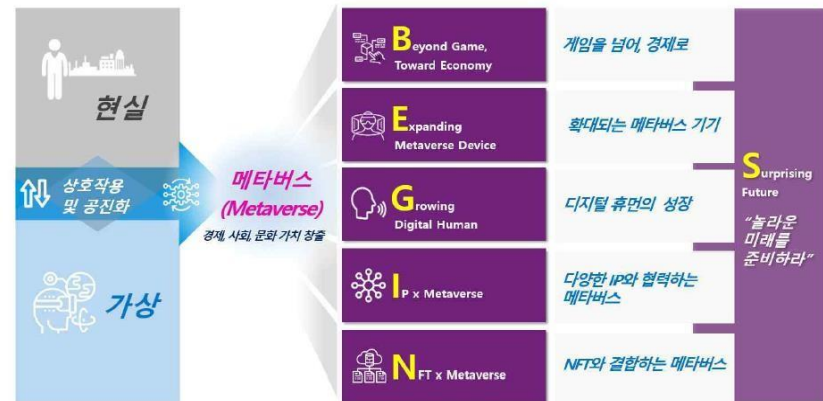
■ 메타버스 2.0

- 현재 메타버스(Metaverse)에 대한 관심이 급증하고 있으며, 관련 플랫폼으로 이용자들이 로그인(Log In) 중임
- 메타버스란, 가상과 현실이 상호작용하며 공진화하고, 그 속에서 사회·경제·문화 활동이 이루어지면서 가치를 창출하는 세상임

✓ 메타버스 비긴즈: 5대 이슈와 전망

1. 게임을 넘어서 경제로(Beyond Game, Toward Economy)
2. 메타버스 기기의 확대(Expanding Metaverse Device)
3. 디지털 휴먼의 성장(Growing Digital Human)
4. 다양한 IP와 협력하는 메타버스(IP × Metaverse)
5. NFT와 결합하는 메타버스(NFT × Metaverse)

[그림] 메타버스 BEGINS : 5대 이슈



출처: SPRIS ISSUE REPORT | 2021.04.20. IS-116, 메타버스 비긴즈:5대 이슈와 전망

- 미디어 플랫폼으로의 메타버스
 - 메타버스 휴먼(아바타)의 활성화
 - **Metaverse** Youtube, Twitch, Facebook, Instagram, Tik Tok?
 - **Metaverse** busking, contest, exhibition, fashion show ...
 - 미디어 생성, 공급 및 소비 패턴 변화: 수동적 → 능동적

언제, 어디서나 메타버스 안에서 만나고 소통하고 공감할 수 있다!

- 메타버스 미디어 플랫폼 기술

Metaverse



Realistic
scene
rendering



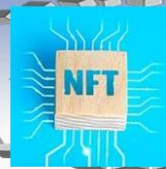
Sensory
stimuli



Real2Virtual world



Big data
AI



Metaverse
Token Economy

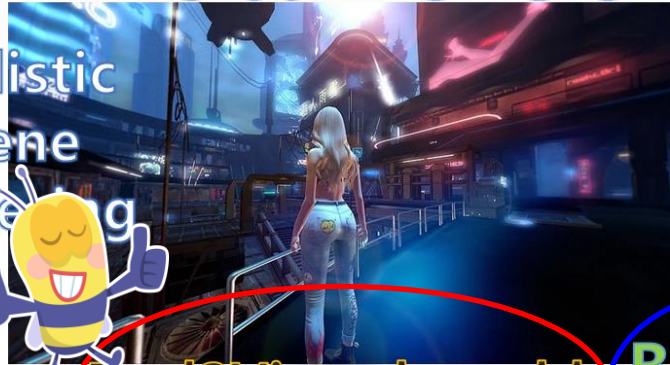


- 메타버스 미디어 플랫폼 기술

Metaverse



Realistic
scene
rendering



Sensory
stimuli



Real2Virtual world
interfaces



Big data
AI



Metaverse
Token Economy



2. 메타버스 표준 MPEG-V, MPEG-IoMT

■ MPEG-V History

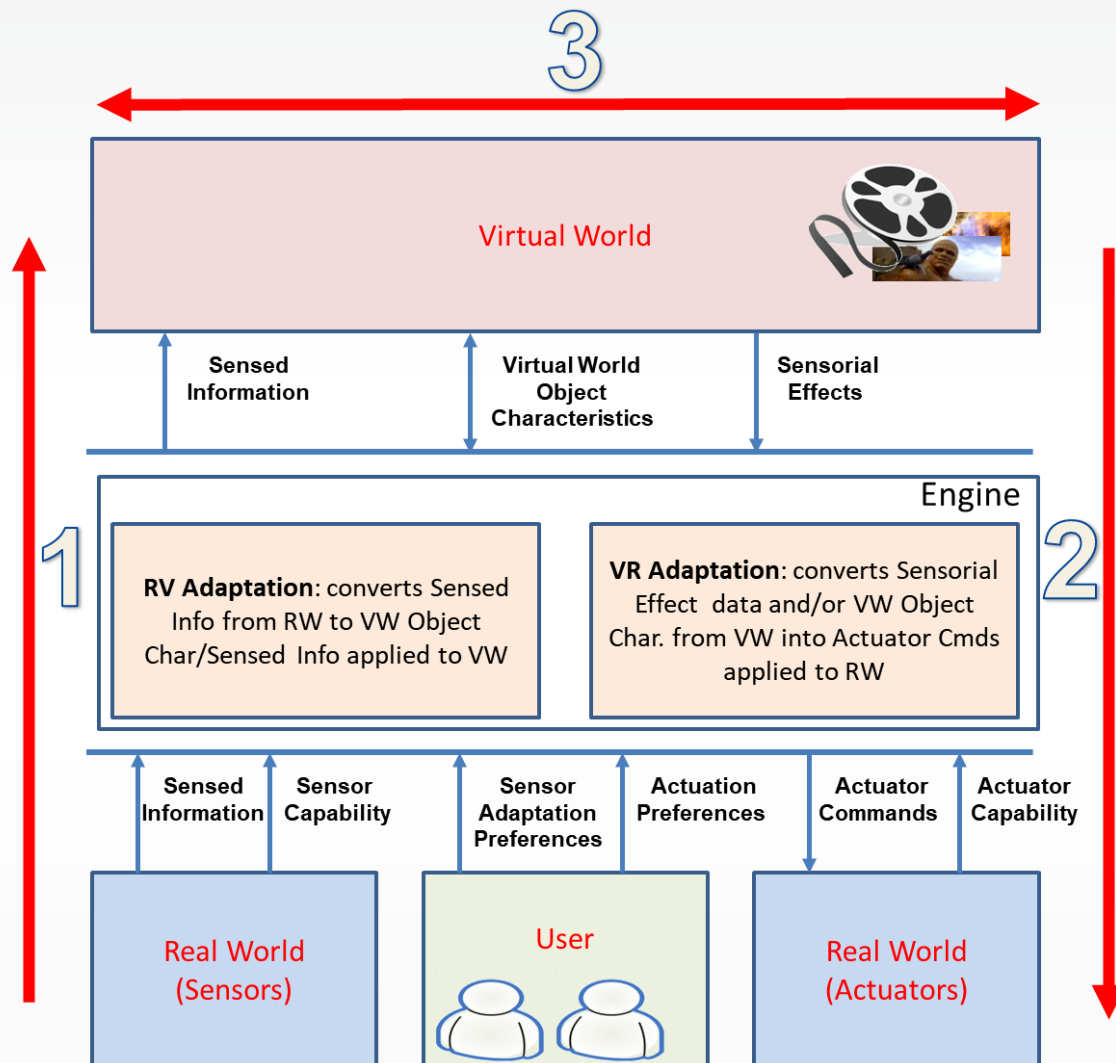
- Starts at 2008
- Standardize 4D sensorial effects (RoSE) and virtual worlds (Metaverse)
- Define the data exchange interface between the real world and the virtual world
- Compose of 7 parts (ISO/IEC 23005-1 ~ 23005-7)
- Finished 4th edition in 2019

■ MPEG-IoMT History

- Starts AhG from 2014.10 in MPEG
- Specify standard interfaces (data formats and APIs) for Media Things!
- Compose of 4 parts (ISO/IEC 23093-1 ~ 23093-4)
- Finished FDIS 2nd edition (will start its 3rd edition soon!)
- Support enhanced Media Services in IoT

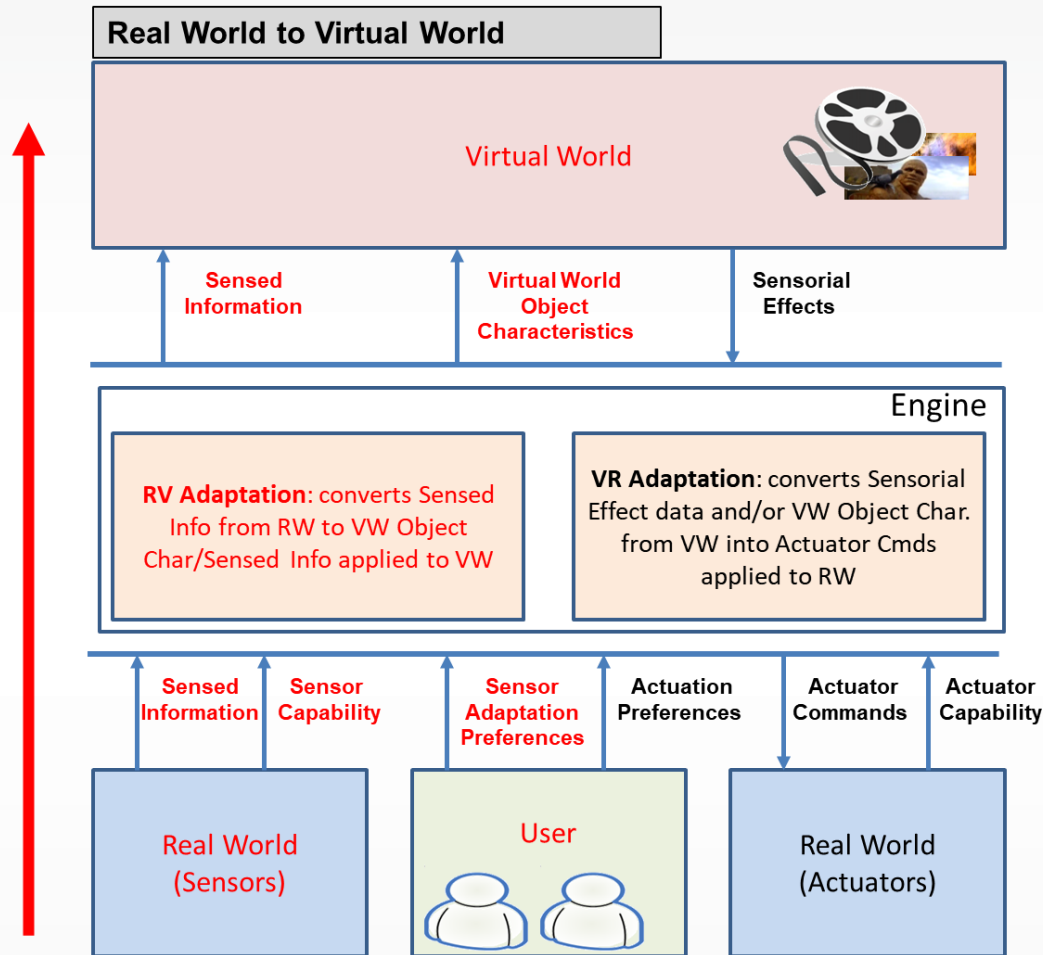
2

MPEG-V Architecture



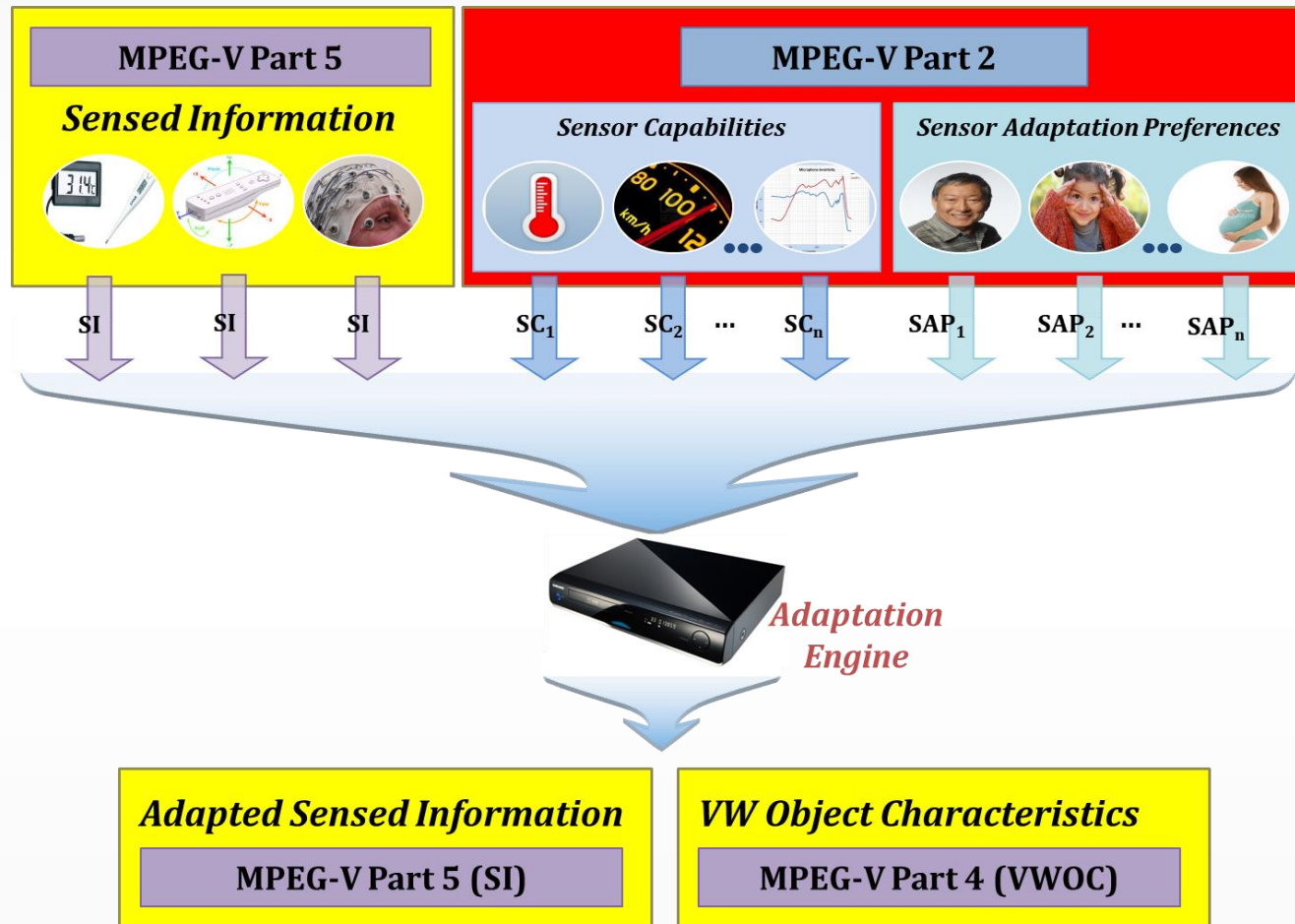
2

MPEG-V Architecture (Real-to-Virtual)



2 Real-To-Virtual (MPEG-V Data)

Real world-to-Virtual world



2 Real-To-Virtual (MPEG-V Data)

■ E-nose Sensed Information Syntax

```
<!-- ##### -->
<!-- Definition of E-Nose sensor Type -->
<!-- ##### -->
<complexType name="EnoseSensorType">
  <complexContent>
    <extension base="iidl:SensedInfoBaseType">
      <choice>
        <element name="MonoChemical" type="mpeg7:termReferenceType"
minOccurs="0"/>
        <element name="MixtureChemical" type="mpeg7:termReferenceType"
minOccurs="0"/>
      </choice>
      <attribute name="strength" type="siv:strengthType"/>
      <attribute name="harmfulness" type="siv:harmfulnessType" use="optional"/>
      <attribute name="chemicalGasDensity" type="float" use="optional"/>
      <attribute name="chemicalGasDensityUnit" type="mpegvct:unitType"
use="optional"/>
    </extension>
  </complexContent>
</complexType>

<simpleType name="strengthType">
  <restriction base="NMToken">
    <enumeration value="imperceptible"/>
    <enumeration value="very_weak"/>
    <enumeration value="weak"/>
    <enumeration value="distinct"/>
    <enumeration value="strong"/>
    <enumeration value="very_strong"/>
    <enumeration value="intolerable"/>
  </restriction>
</simpleType>

<simpleType name="harmfulnessType">
  <restriction base="NMToken">
    <enumeration value="no_hazard"/>
    <enumeration value="minimal"/>
    <enumeration value="slight"/>
    <enumeration value="moderate"/>
    <enumeration value="serious"/>
    <enumeration value="severe"/>
  </restriction>
</simpleType>
```

2 Real-To-Virtual (MPEG-V Data)

▪ E-nose Sensed Information Instance

- The E-nose has an ID of “**enose01**” and references “**ENID01**”
- The recognized scent is “**orange**”
- The strength of recognized scent as mixture gas is “**distinct**” with **no harmfulness**

```
<iidl:SensedInfo xsi:type="siv:EnoseSensorType" id="enose01" activate="true"
sensorIdRef="ENID01" strength="distinct" harmfulness="no_hazard">
  <siv:MixtureChemical>
    urn:mpeg:mpeg-v:01-CI-ScentCS-NS:orange
  </siv:MixtureChemical>
</iidl:SensedInfo>
```

2 Real-To-Virtual (MPEG-V Data)

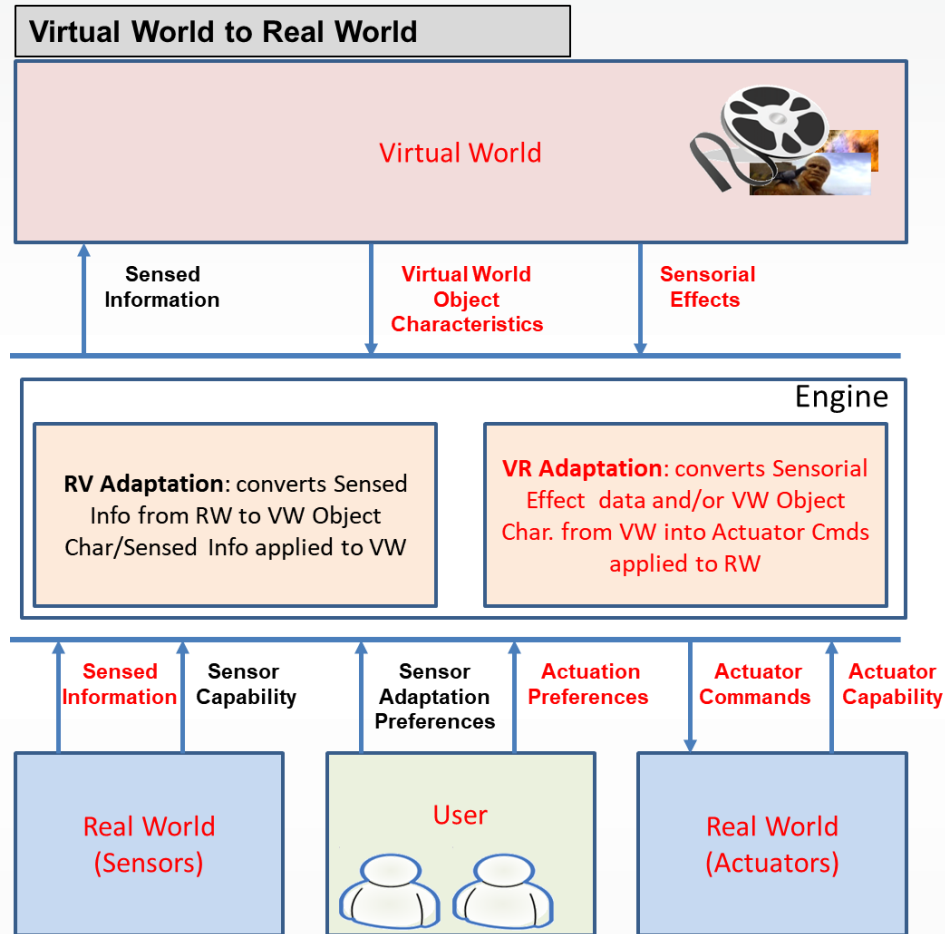
■ Virtual World Object Characteristic Syntax and Instance

```
<complexType name="ControlFaceFeaturesType">
  <sequence>
    <element name="HeadOutline"
      type="vwoc:OutlineType" minOccurs="0"/>
    <element name="LeftEyeOutline"
      type="vwoc:OutlineType" minOccurs="0"/>
    <element name="RightEyeOutline"
      type="vwoc:OutlineType" minOccurs="0"/>
    <element name="MouthLipOutline"
      type="vwoc:OutlineType" minOccurs="0"/>
    <element name="NoseOutline"
      type="vwoc:OutlineType" minOccurs="0"/>
    <element name="LeftEyeBrowOutline"
      type="vwoc:Outline4PointsType" minOccurs="0"/>
    <element name="RightEyeBrowOutline"
      type="vwoc:Outline4PointsType" minOccurs="0"/>
    <element name="LeftEarOutline"
      type="vwoc:Outline4PointsType" minOccurs="0"/>
    <element name="RightEarOutline"
      type="vwoc:Outline4PointsType" minOccurs="0"/>
    <element name="FacePoints"
      type="vwoc:OutlineType" minOccurs="0"/>
    <element name="MiscellaneousPoints"
      type="vwoc:PointType" minOccurs="0"
      maxOccurs="unbounded"/>
  </sequence>
</complexType>
```

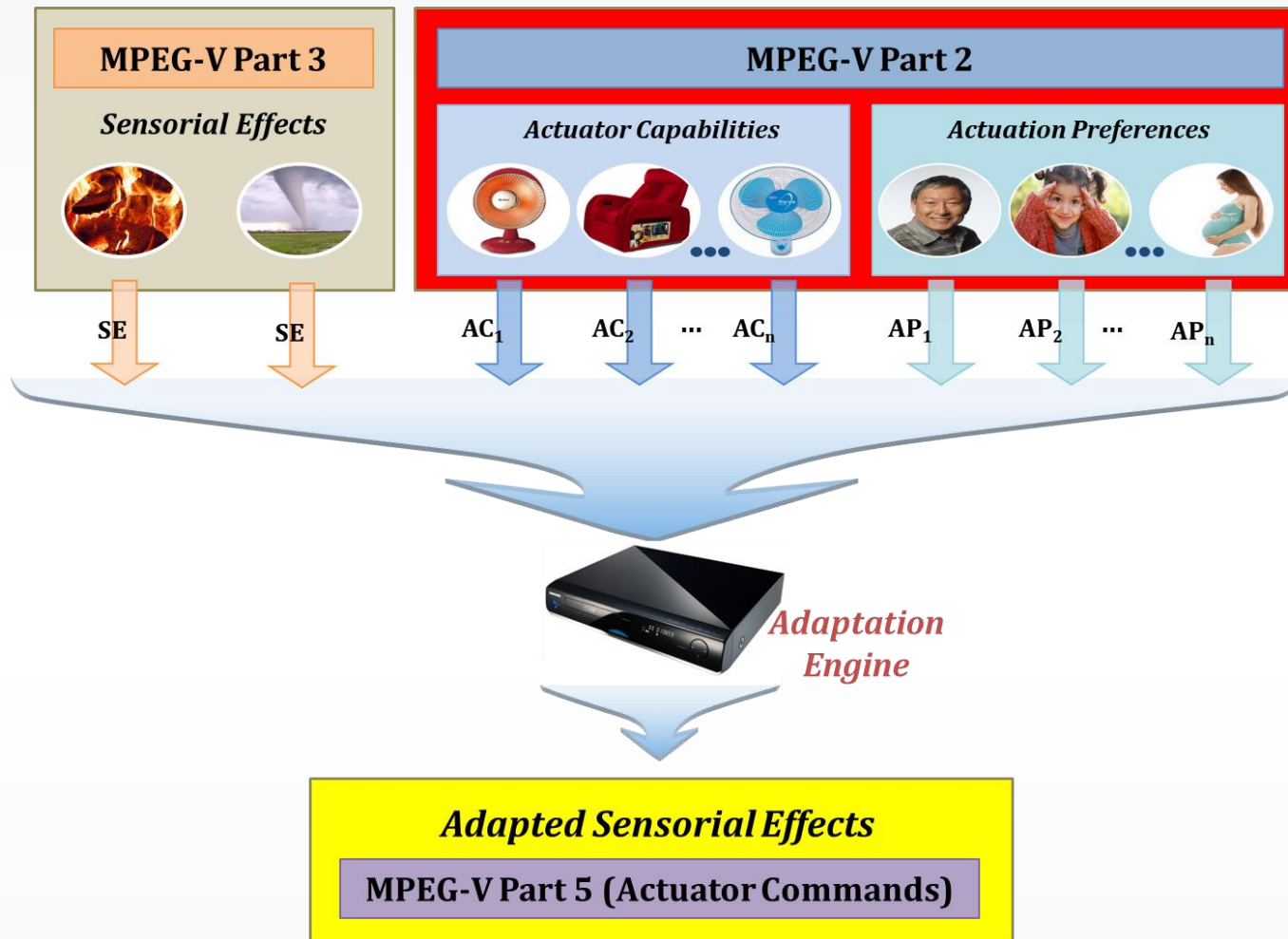
```
<Avatar xsi:type="AvatarType">
  <ControlFeatures>
    <ControlFaceFeatures>
      <LeftEyeOutline>
        <Outline8Points>
          <Point1 xsi:type="Physical3DPointType"
            z="0" y="88.4034" x="82.25715" />
          <Point2 xsi:type="Physical3DPointType"
            z="0" y="90.78987" x="85.4884644" />
          <Point3 xsi:type="Physical3DPointType"
            z="0" y="92.0758" x="88.81471" />
          <Point4 xsi:type="Physical3DPointType"
            z="0" y="91.4023743" x="92.52211" />
          <Point5 xsi:type="Physical3DPointType"
            z="0" y="89.6318054" x="96.32446" />
          <Point6 xsi:type="Physical3DPointType"
            z="0" y="88.0785751" x="92.80879" />
          <Point7 xsi:type="Physical3DPointType"
            z="0" y="87.52385" x="89.20732" />
          <Point8 xsi:type="Physical3DPointType"
            z="0" y="87.46607" x="85.77515" />
        </Outline8Points>
      </LeftEyeOutline>
    </ControlFaceFeatures>
  </ControlFeatures>
</Avatar>
```


2

MPEG-V Architecture (Virtual-to-Real)



2 Virtual-To-Real (MPEG-V Data)



2 Virtual-To-Real (MPEG-V Data)

▪ Scent Sensorial Effect Syntax

```
<complexType name="ScentType">␣  
  <complexContent>␣  
    <extension base="sed1:EffectBaseType">␣  
      <attribute name="scent" type="mpeg7:termReferenceType" ␣  
        use="optional"/>␣  
      <attribute name="intensity-value" type="sed1:intensityValueType" ␣  
        use="optional"/>␣  
      <attribute name="intensity-range" type="sed1:intensityRangeType" ␣  
        use="optional"/>␣  
    </extension>␣  
  </complexContent>␣  
</complexType>␣
```

2 Virtual-To-Real (MPEG-V Data)

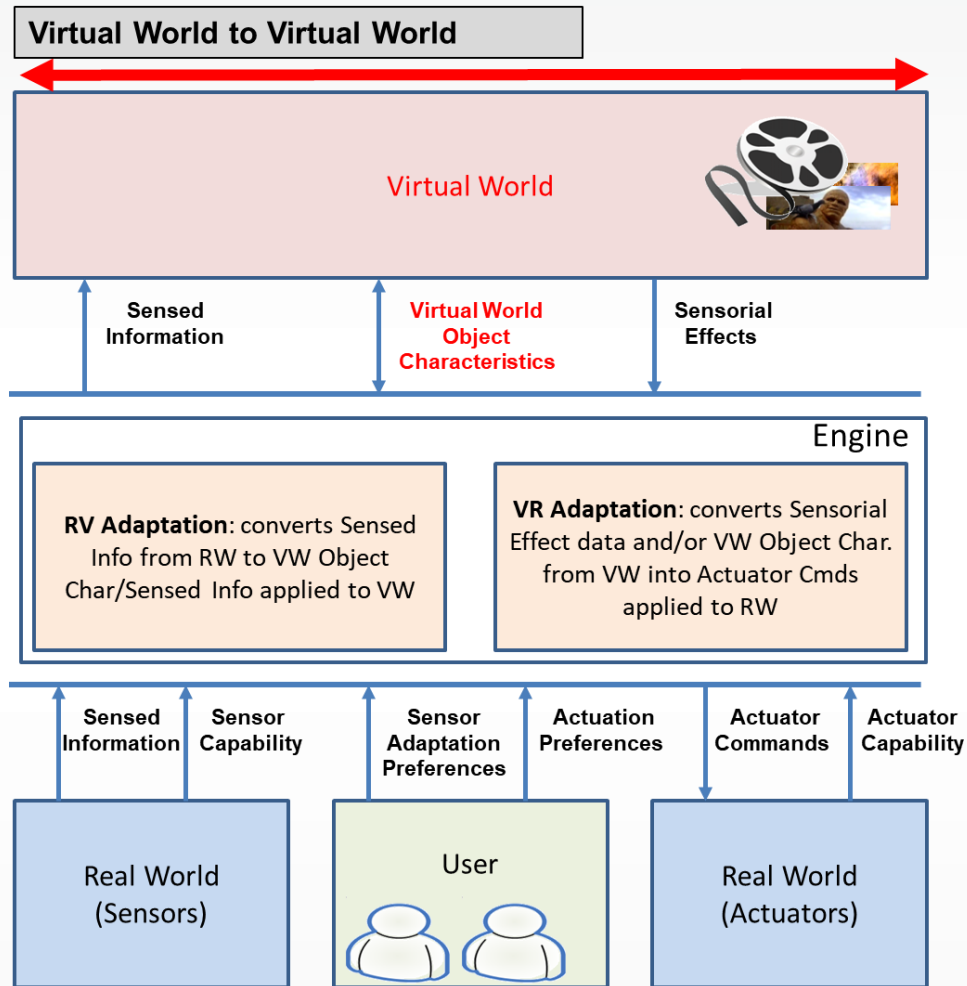
▪ Scent Sensorial Effect Instance

- The scent is **lilac**
- The intensity is **0.1 ml/h** [within a range of (0.0,10.0) ml/h] with a duration of **10s** and the effect starts at **si:pts="0"**

```
<sedl:DescriptionMetadata>␣  
  <sedl:ClassificationSchemeAlias alias="SCENT" href="urn:mpeg:mpeg-v:01-SI-  
ScentCS-NS"/>␣  
</sedl:DescriptionMetadata>␣  
<sedl:Effect xsi:type="sev:ScentType" intensity-value="0.1" intensity-range="0.0  
10.0" duration="10" scent=":SCENT:lilac" si:pts="0"/>␣
```

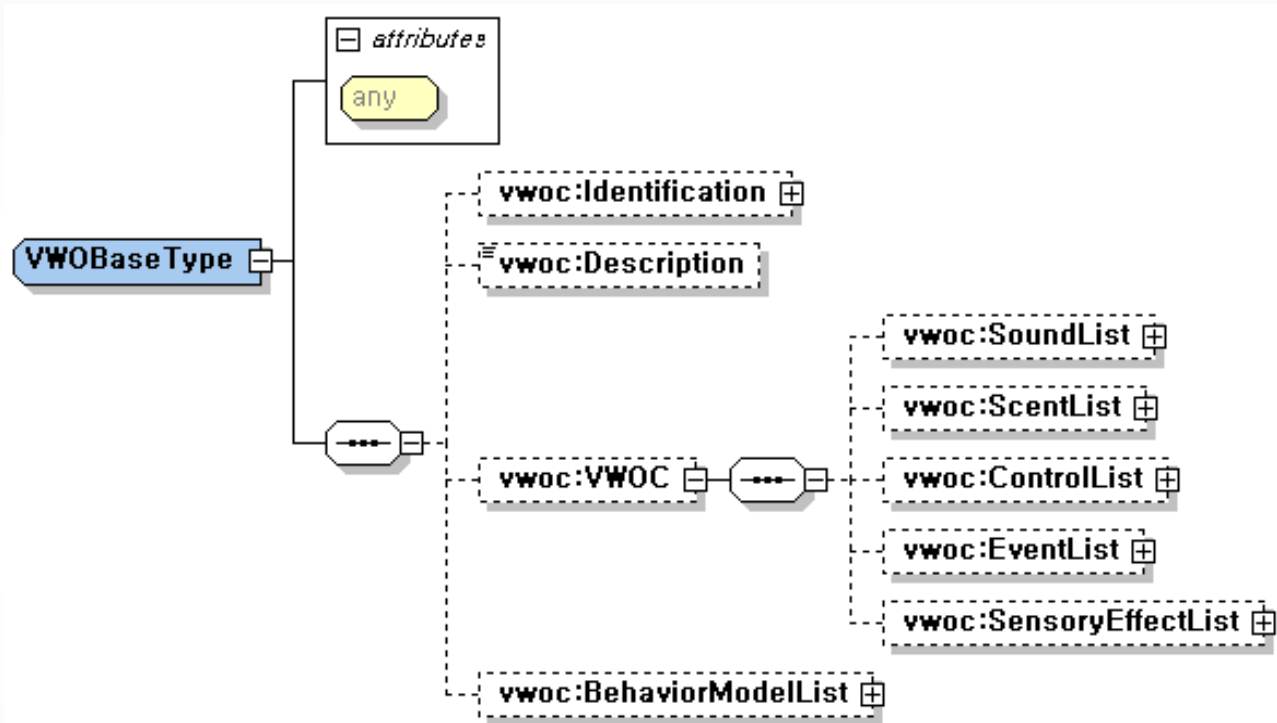
2

MPEG-V Architecture (Virtual-to-Virtual)



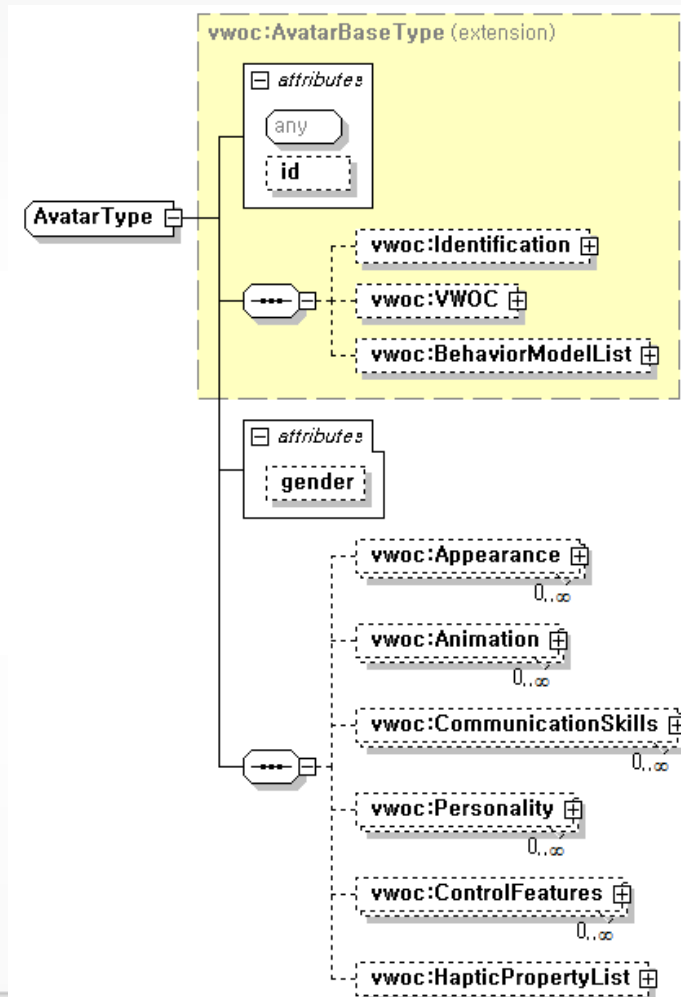
2 Virtual-To-Virtual (MPEG-V Data)

- Describes the metadata for **virtual objects**



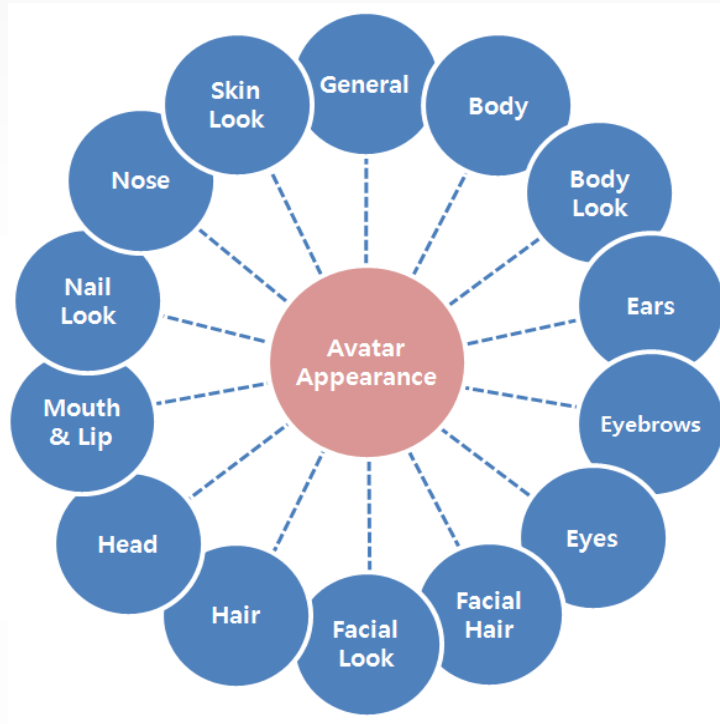
2 Virtual-To-Virtual (MPEG-V Data)

- Describes the metadata for **avatars**



2 Virtual-To-Virtual (MPEG-V Data)

- Describes the metadata for **avatars**

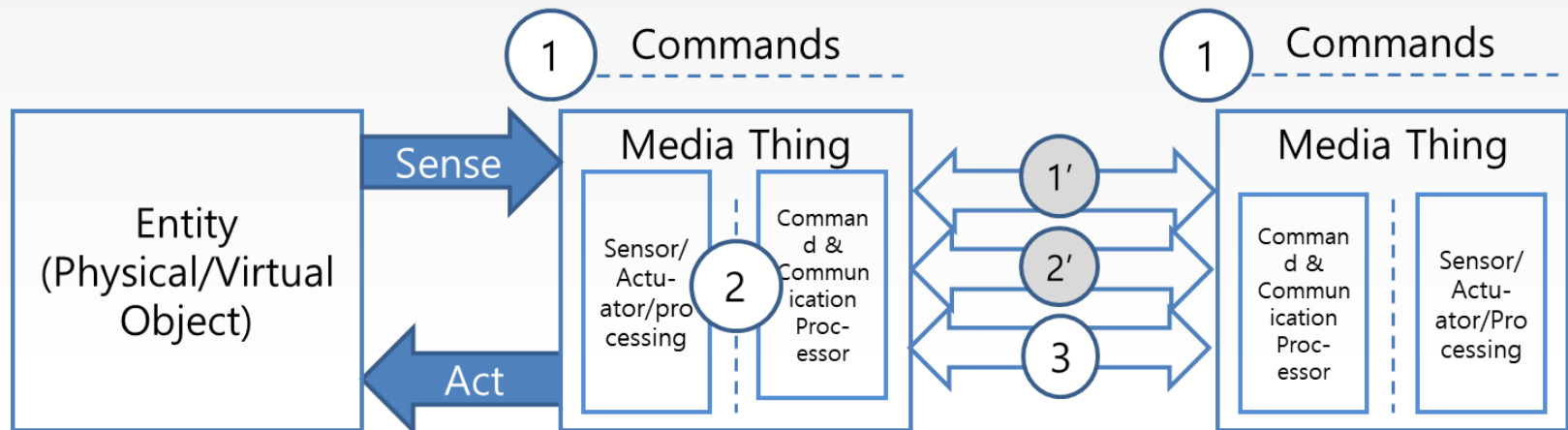


(a) Avatar appearance



(b) Avatar animation

2 MPEG-IoMT Architecture

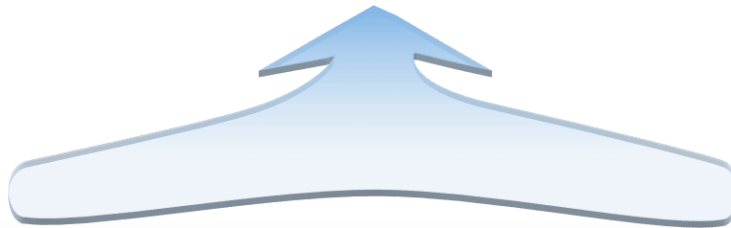


- 1: **User commands (setup info.)** between a system manager and a MThing
- 1': User commands (setup info.) forwarded by an MThing to another MThing, possibly in a modified form (e.g., subset of 1)
- 2: **Sensed data (Raw or processed data) (compressed or semantic extraction) and actuation information**
- 2': **Wrapped interface 2 (e.g., for transmission or for semantic transformation)**
- 3: MThing **characteristics** and **discovery**

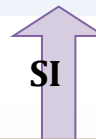
2 MPEG-IoMT Sensor Interface

■ Sensor data APIs

Modifier and Type	Method and Description
MPEGVSensedDataType	getMPEGVEnose()
	The function returns a class (i.e., Java or C++) or a structure (i.e., C) that shall include a returning type (e.g., XML, Binary) and sensed data defined by EnoseSensorType from ISO/IEC 23005-5 (MPEG-V Part 5).



```
<iidl:SensedInfo xsi:type="siv:EnoseSensorType" id="enose01" activate="true"
sensorIdRef="ENID01" strength="distinct" harmfulness="no_hazard">
  <siv:MixtureChemical>
    urn:mpeg:mpeg-v:01-CI-ScentsCS-NS:orange
  </siv:MixtureChemical>
</iidl:SensedInfo>
```



Sensed Information

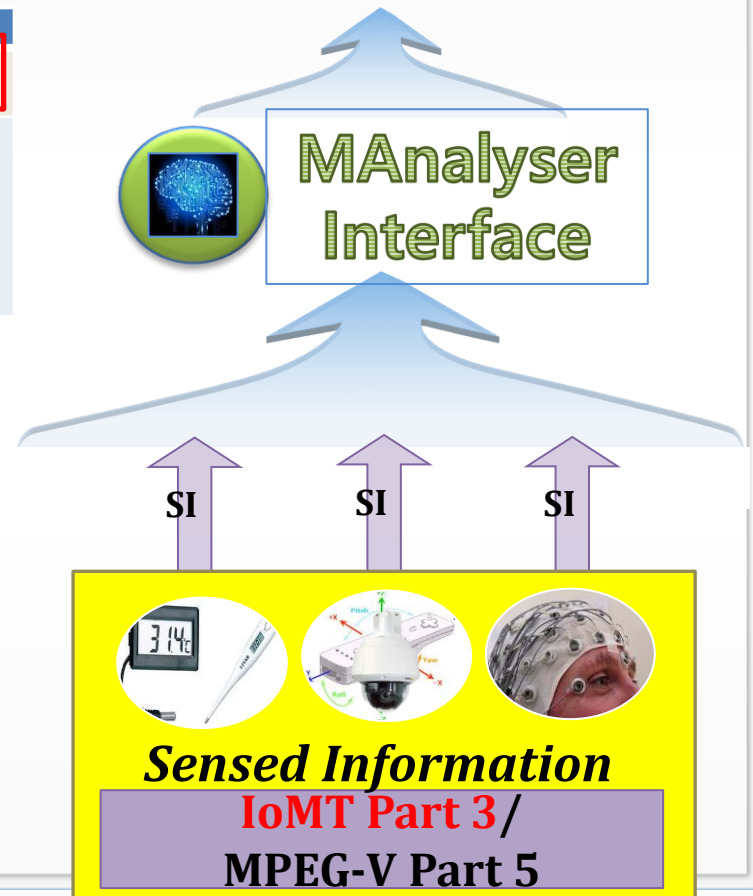
**IoMT Part 3/
MPEG-V Part 5**

2 MPEG-IoMT Analyser Interface

■ Analysed data APIs

Modifier and Type	Method and Description
AnalysedDataType	getAnalysedMusicFrequency()
	This function returns a class (i.e., Java or C++) or a structure (i.e., C) that shall include a returning type (e.g., XML, Binary) and an analysed music frequency according to the audio source and the sampling rate following the specification in subclause 8.11.2.

- Music frequency analyser
- People counter
- Face region detector/verifier
- Object detector
- Light color converter
- ...



2 MPEG-IoMT Interface to Metaverse

■ What to do in Metaverse?

- 메타버스 환경 수정
- 메타버스 객체 제어
- 메타버스 서비스 컨텍스트 변화



2 MPEG-IoMT Actuator Interface

■ Actuation data API

```
<iidl:InteractionInfo>+  
  <iidl:DeviceCommandList>+  
    <iidl:DeviceCommand xsi:type="dcv:ScentType" id="scent01">+  
      deviceIdRef="scentdevice001" activate="true" intensity="30">+  
      scent="urn:mpeg:mpeg-v:01-SI-ScentCS-NS:acacia">+  
      <iidl:TimeStamp xsi:type="mpegvct:AbsoluteTimeType" absTime="1:30:23"/>+  
    </iidl:DeviceCommand>+  
  </iidl:DeviceCommandList>+  
</iidl:InteractionInfo>+</pre>
```

int **setSprayScent(MPEGVCommandType scentSpray)**

This function sets a command to a scent sprayer with a class (i.e., Java or C++) or a structure (i.e., C) that shall include a returning type (e.g., XML, Binary) and sensed data defined by ScentType from ISO/IEC 23005-5 (MPEG-V Part 5). This function returns 1; if the task succeeds, it returns 0, otherwise.



3. 맺음말

■ Conclusion

- MPEG-V 표준은 실세계와 Metaverse, Metaverse와 Metaverse 간 교환하는 데이터를 정의
- MPEG-IoMT 표준은 이러한 MPEG-V 데이터를 전달하는 API 표준을 정의
- 실세계의 사물과 Metaverse의 사물을 연결하기 위한 추가적인 표준화가 필요

- 메타버스 표준의 필요성에 대한 고찰
 - 왜? 메타버스 표준화가 필요한가?
 - 표준화를 통한 메타버스 관련 산업(예: 기존 사업자)의 이익(Benefit)은 무엇인가?
 - 기존 사업자들이 표준을 채용할 타당한 이유나 필요성이 있나?
 - 메타버스 산업계에 표준의 필요성에 대한 명확한 메시지 필요!
 - 메타버스 표준 컨소시엄 가능성?
 - 표준화 적용을 통해 메타버스 소비자(예: 개인)가 얻는 이익(Benefit)은 무엇인가?
 - 메타버스 표준 채용 후 소비자 이익은 무엇인가?

- 메타버스 표준의 필요성에 대한 고찰 (계속)
 - 빅테크 플랫폼 시장 독점? vs 중소기업들의 새로운 성장 동력?
 - 메타버스 산업 생태계의 활성화?
 - 메타버스 Nomad: 멀티버스의 통합 가능성?
- 필요성을 충족시키는 기존 기술이나 표준은 무엇이 있는가?
- 부족한 기술이나 표준은 무엇인가?

감사합니다!

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