3GPP activities around Virtual Reality
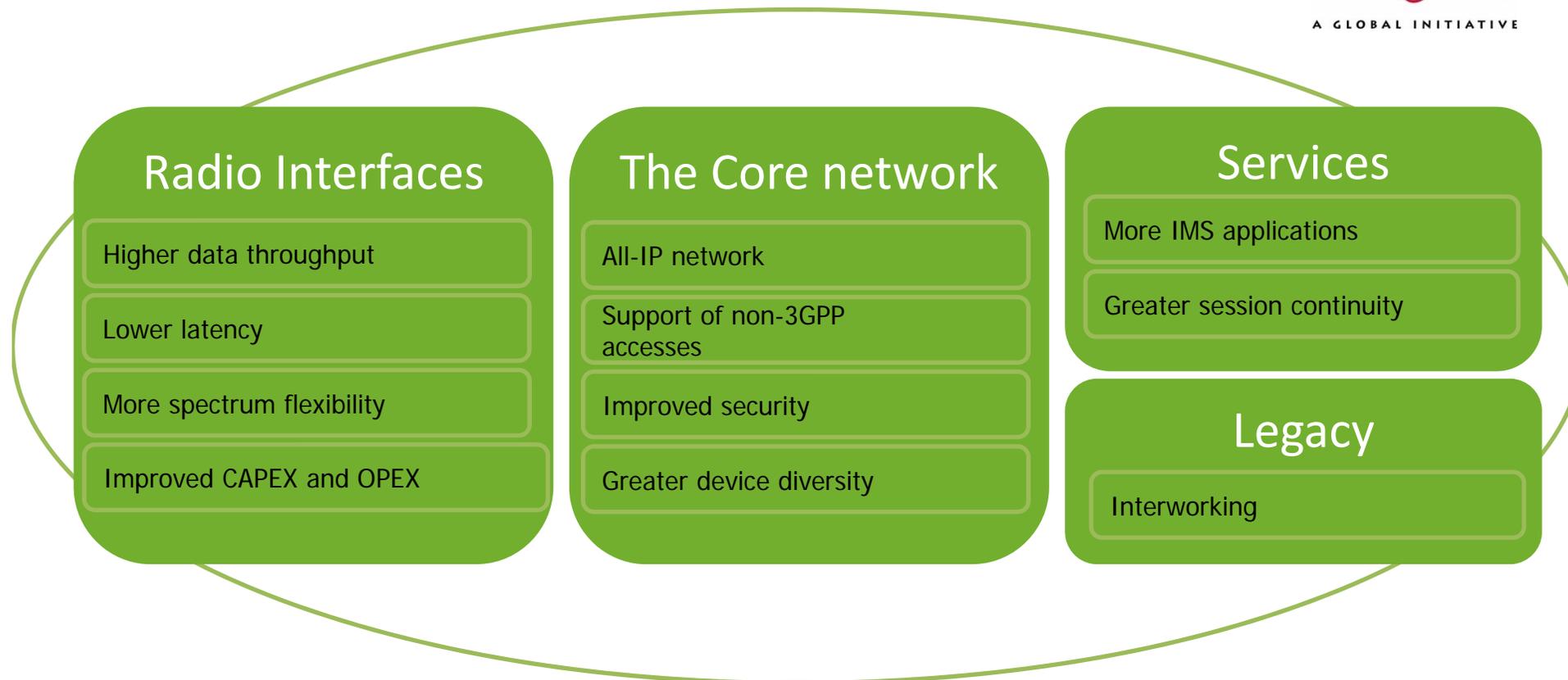
Gilles TENIOU – 3GPP SA4 Vice-Chair / VIDEO SWG Chairman

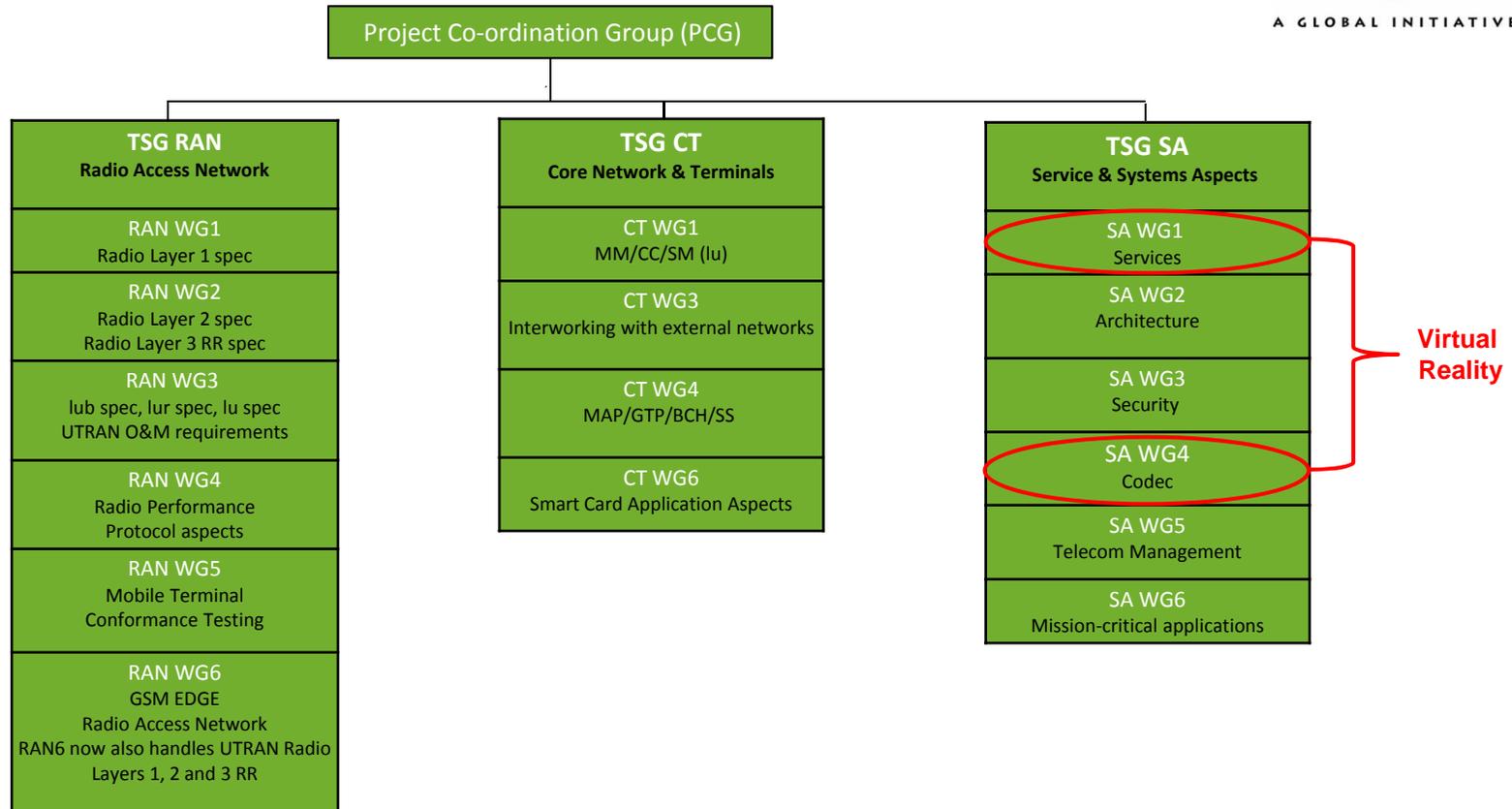# Outline

- The 3GPP organization

- Service requirements

- The past study on virtual reality

- The ongoing studies and work items

3GPP: Whole System Approach

Radio Interfaces

- Higher data throughput
- Lower latency
- More spectrum flexibility
- Improved CAPEX and OPEX

The Core network

- All-IP network
- Support of non-3GPP accesses
- Improved security
- Greater device diversity

Services

- More IMS applications
- Greater session continuity

Legacy

- Interworking

The 3GPP organization

Project Co-ordination Group (PCG)

TSG RAN Radio Access Network
RAN WG1 Radio Layer 1 spec
RAN WG2 Radio Layer 2 spec Radio Layer 3 RR spec
RAN WG3 Iub spec, Iur spec, Iu spec UTRAN O&M requirements
RAN WG4 Radio Performance Protocol aspects
RAN WG5 Mobile Terminal Conformance Testing
RAN WG6 GSM EDGE Radio Access Network RAN6 now also handles UTRAN Radio Layers 1, 2 and 3 RR

TSG CT Core Network & Terminals
CT WG1 MM/CC/SM (Iu)
CT WG3 Interworking with external networks
CT WG4 MAP/GTP/BCH/SS
CT WG6 Smart Card Application Aspects

TSG SA Service & Systems Aspects
SA WG1 Services
SA WG2 Architecture
SA WG3 Security
SA WG4 Codec
SA WG5 Telecom Management
SA WG6 Mission-critical applications

Virtual Reality

3GPP SA1 service requirements

- In June 2016, SA1 finalized service requirements for 5G called *New Services and Markets Technology Enablers* (SMARTER)

- They are documented in the **TS 22.261 service requirements for the 5G system**

- VR aspects are addressed under ***efficient content delivery*** and ***Low latency and high reliability*** sections.

  - Requirements on the data rate : 250 Mbps

  - Requirements on motion-to sound and motion-to-photon latencies

  - Requirements on audio/video synchronization

The past study on virtual reality

- 3GPP SA4 (Codec group) conducted a study from <u>April 2016 </u>to <u>June 2017 </u>on (***360-3DOF) VR*** with the following objectives:
  - Analyse the different **technologies** and equipment that provide a VR experience,
  - Collect the associated **use cases** and identify the 3GPP service(s) they map to,
  - Identify the **media formats** (including audio and video), interfaces and delivery procedures between client and server required to offer such an experience,
  - Conduct **subjective tests** so as to estimate the audio and video formats and encoding parameters required for ensuring the quality of experience
  - Draw **conclusions** on the potential need to update the 3GPP video and audio decoding capabilities in order to enable the implementation of VR services.

The Technical report TR 26.918

Virtual Reality (VR) media services over 3GPP

Introduction to VR (what it is, how it works…)
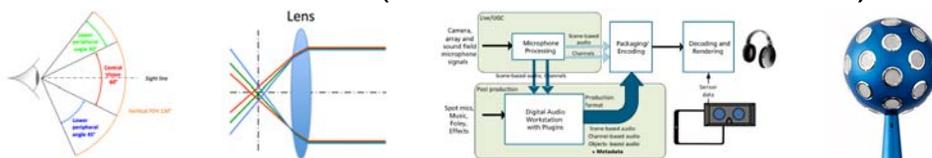
Media formats description

Audio codecs and models
- Channel based
- Scene based
- Object based

Video codecs
- Viewport dependent and independent coding

Use cases for VR
- Only based on single observation point (3DOF)
- Listed into categories:
  - Event broadcast/multicast
  - VR Streaming
  - Cinematic VR
  - Learning applications
  - VR calls
  - User generated
  - HMD-based legacy content consumption

Subjective tests
- Viewport independent & dependent video

- Audio quality evaluation of scene-based and object-based formats
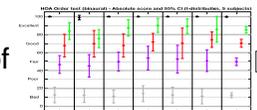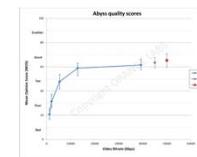
Latency and synchronization aspects
- Motion to sound, motion to photon latency
- Audio-video synchronization

Conclusions
-> More work to be done including normative for release 15!!

Ongoing work in 3GPP SA4 (1/2)

As a consequence of the study item a few Work/Study items have been launched:

- **_Study Item_** _on QoE metrics for VR (FS_QoE_VR)_

  - Study on the identification of QoE metrics specific to VR describing Content, Network and Device conditions and capabilities.

- **_Study Item_** _on codecs for VR Audio (CODVRA)_

  - Study on the evaluation of Fist Order Ambisonic approach for fulfilling the requirements of VR streaming services. 2 meetings long Study with intent to provide guidance on the Release 15 VR Streaming Work Item

- **_Release 15 Work Item_** _on VR profile for streaming media (VRStream)_

  - Work item defining enablers for implementing VR streaming services over 3GPP

- **_Release 15 Work item_** _on Subjective/objective test methods for immersive audio systems (LiQuiMas)_

  - Work item specifying the test conditions and methodologies for assessing the quality and performance of audio systems (codec, renderer…)

- **_Release 16 Work Item_** _on Codec for Immersive Voice and Audio services (IVAS)_

  - Work item with the main objective to define EVS extensions for supporting immersive and 3D Audio capabilities.

Ongoing work in 3GPP SA4 (2/2)

- ***Study Item*** *on codecs for VR Audio* **CODVRA** (Finalized)

  - Conclusions:
    - FOA enables a user experience for VR exceeding the experience with mono or stereo audio in a statistically significant manner,
    - There is additionally a statistically significant quality increase with HOA over FOA
    - The results show further that some existing 3GPP speech/audio codecs are capable of encoding FOA audio with high quality. (Resp. EVS and eAAC+ tested)

- ***Release 15 Work Item*** *on VR profile for streaming media* **VRStream**

  - Technical specification initiated: TS 26.118: 3GPP Virtual Reality profiles for streaming applications

  - Reference client architecture defined

  - Objective to define operation points for viewport independent and dependent configurations (similarly to TV profiles in TS 26.116)
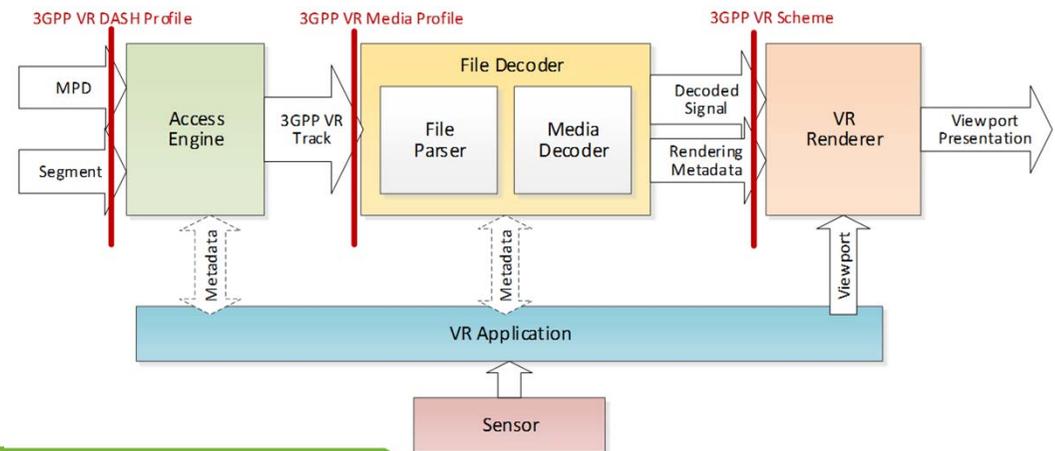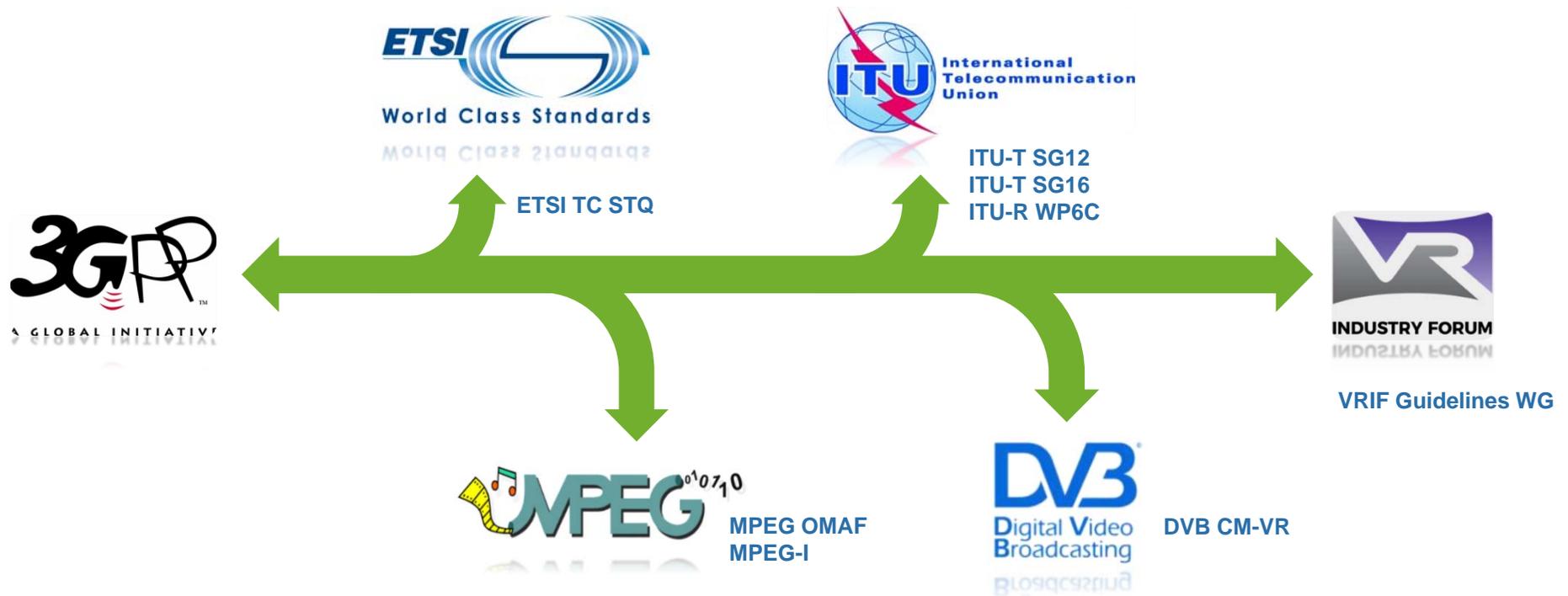
Timeplan of VR-related activities

3GPP SA4 Virtual reality related activities
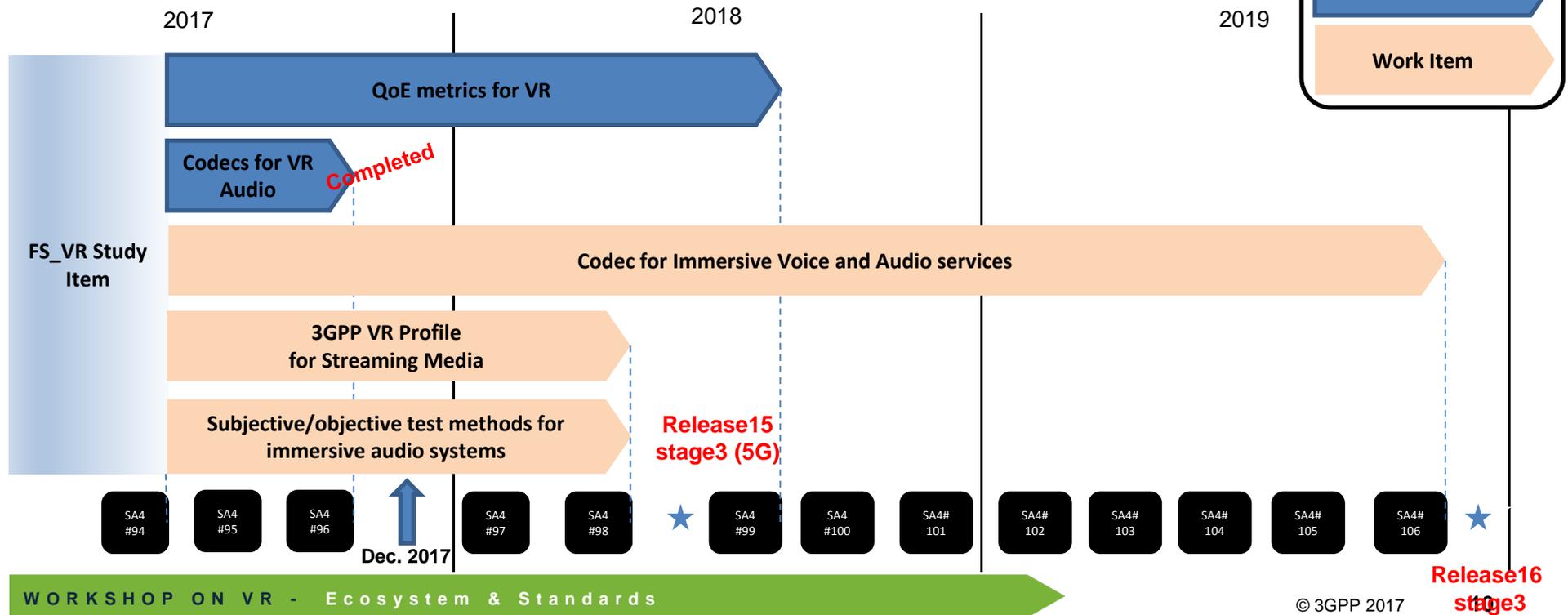
Ongoing communication with standardization organizations and fora

THANK YOU

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