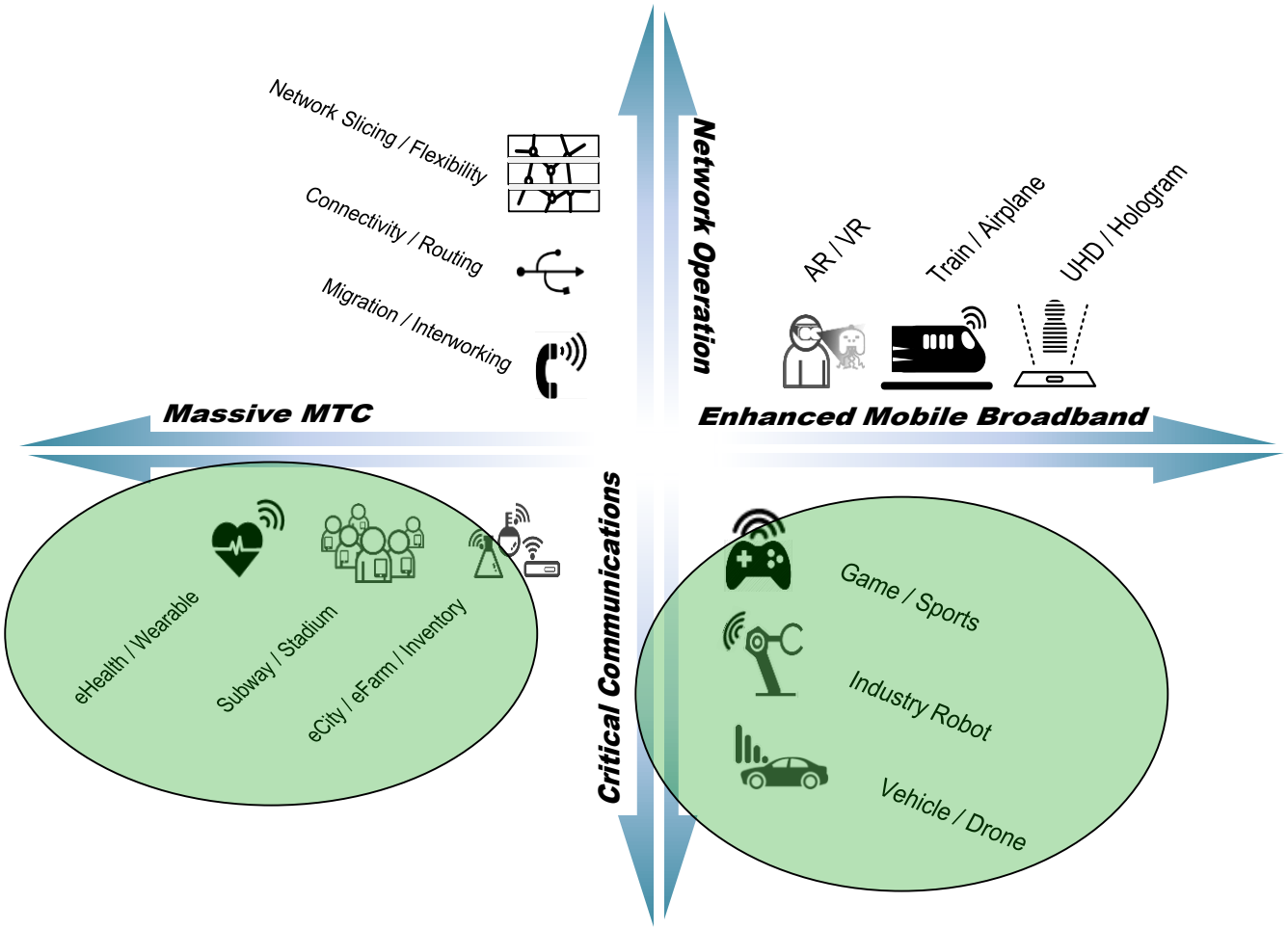
Media Handling for 5G Systems

3GPP SA4#93 at Busan, Korea

April 24-28, 2017

5G Usages in 3GPP



- Rel-14 use cases and requirements related to 5G systems defined in TR 22.891 as part of the (completed) study item on "New Services and Markets Technology Enablers" (FS_SMARTER)

5G-Related Study Conducted by SA1

- Rel-14 Feasibility Study on New Services and Markets Technology Enablers (FS_SMARTER, TR 22.891) in SA1 has developed a set of wide-ranging use cases of the identified market segments and verticals that the 3GPP eco-system would need to support in the future.
- Emerging from the FS_SMARTER work, four building block studies have been created and completed corresponding to the identified key groups, namely:
  - Massive Internet of Things (FS_SMARTER-mIoT, TR 22.861),
  - Critical Communications (FS_SMARTER-CRIC, TR 22.862),
  - Enhanced Mobile Broadband (FS_SMARTER-eMBB, TR 22.863)
  - Network Operation (FS_SMARTER-NEO, TR 22.864).
- The building block studies have further identified the key families of use cases and consolidated the desired system requirements and capabilities that enable 3GPP network operators to support the needs of new scenarios and markets.

5G-Related Stage-1 Work @ SA1

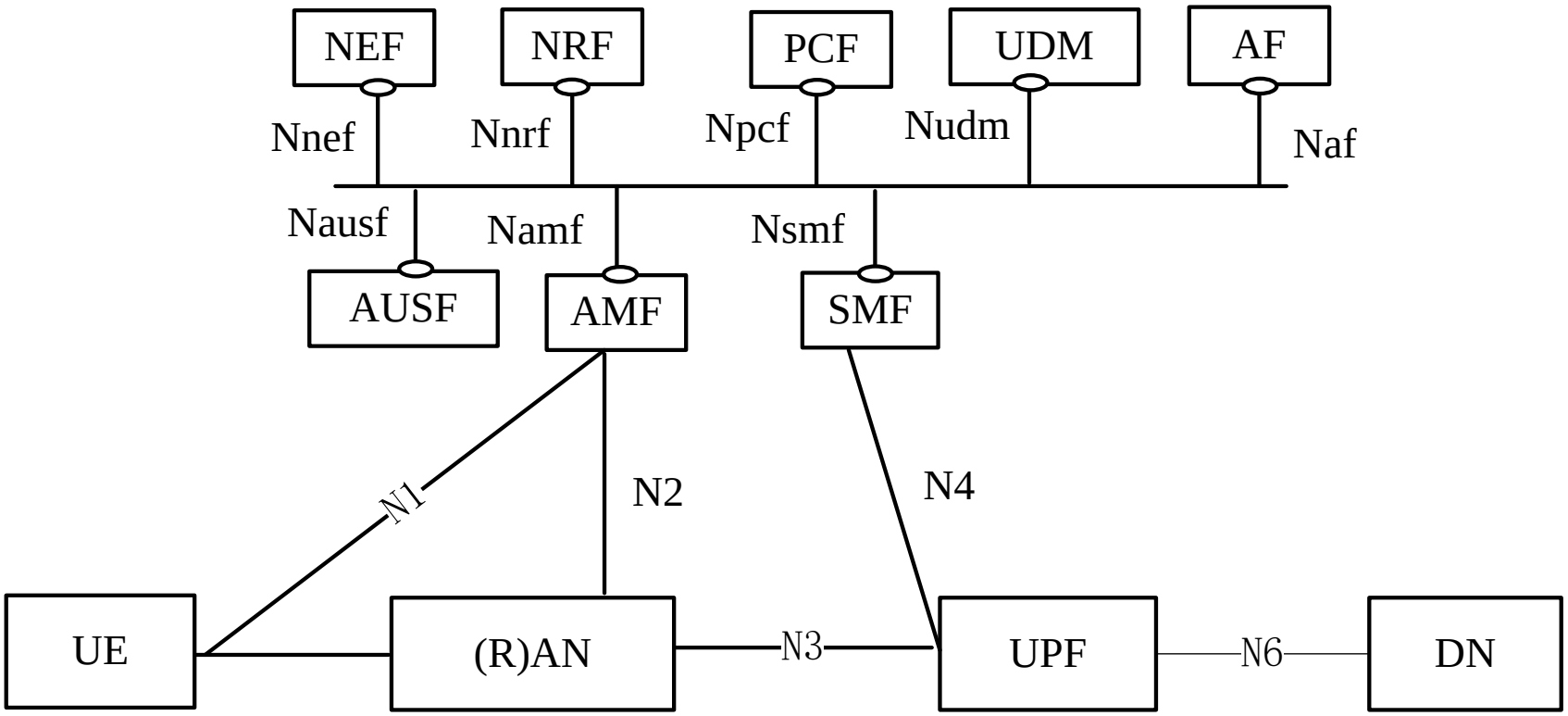
- Rel-15 work item on SMARTER was completed by SA1 in March 2017, resulting in the specification TS 22.261.
- TS 22.261 compiles Stage-1 requirements that define a 5G system. The 5G system is characterised, for example, by:
  - Support for multiple access technologies
  - Scalable and customizable network
  - Advanced Key Performance Indicators (KPIs) (e.g., availability, latency, reliability, user experienced data rates, area traffic capacity)
  - Flexibility and programmability (e.g., network slicing, diverse mobility management, Network Function Virtualization)
  - Resource efficiency (both user plane and control plane)
  - Seamless mobility in densely populated and heterogeneous environment
  - Support for real time and non-real time multimedia services and applications with advanced Quality of Experience (QoE)

5G-Related Stage-2 Work @ SA2

- In order to address the Stage-2 architectural aspects of 5G systems, SA2 has started Rel-15 normative work "5G System - Phase 1".
- TS 23.501 is under development to address 5G system architecture including the following aspects:

• network slicing • use of virtual environments • service-based architecture • network capability exposure • support for edge computing • access and mobility management • session management separate from mobility management • (re)selection of efficient user plane path, • session and service continuity • QoS • policy framework • network discovery and selection	• network sharing • untrusted non-3GPP accesses • roaming with EPS • interworking with and migration from EPS • IMS services (including support for emergency calls) • Public Warning System (PWS) • location services as per related service requirements and in alignment with NG RAN • SMS over NAS

5G Architecture in TS 23.501



5G-Related Use Cases in TR 22.891

Many of the considered 5G system-related use cases involve multimedia delivery, processing and/or storage.

- Network slicing
- Best connectivity per traffic type
- On-demand networking
- Flexible application traffic routing
- Connectivity for drones
- Industrial Control
- Tactile Internet
- Localized real-time control
- Extreme real-time communications and tactile internet
- Remote control
- In network and device caching
- ICN-based content retrieval
- Wide area sensor monitoring and event driven alarms
- Bio-connectivity
- Wearable device communication
- Virtual presence
- Domestic home monitoring
- Broadcasting support
- Ad-hoc broadcasting
- Cloud robotics
- Vehicular internet and infotainment
- Local Unmanned Aerial Vehicle (UAV) collaboration
- Moving ambulance and bio-connectivity
- Telemedicine support

In the meantime, there is no study or gap analysis yet on the relevant media handling aspects (e.g., delivery interfaces, media codecs, formats and protocols) to support these 5G-based media usages and how they will be supported over the 5G system architecture.

Media Handling Examples for 5G

Enhanced Mobile Broadband

- **UHD / 4K / 8K content delivery** anywhere anytime for unicast and broadcast
- **Interactive conferencing and telepresence** with 'being there' experiences
- **Virtual / augmented reality,** with immersive 360 degree video and content analytics capabilities, e.g., scene detection/manipulation, object classification, voice recognition, etc.
- **Network operation enhancements** to deliver better efficiencies for media services (e.g., network slicing, edge caching, flexible broadcast, routing, QoS, priority, policy control, etc.)

Mission Critical Comms, Internet of Things and Other New Verticals

- **Industrial Control:** Deliver uplink live video stream over a high bandwidth connection to a physical operator for real-time analytics and control
- **Domestic home monitoring:** Video monitoring and surveillance for home security, where captured videos are delivered to an aggregation point
- **Remote control:** UAV (unmanned aerial vehicle) shoots real-time pictures or video along the road and sends the content back to the manipulator.
- **Automotive:** Video analytics for self-driving cars, voice recognition, conversational services (video telephony, conferencing, telepresence), video streaming, etc.
- **Connected Drones:** Analyze, in real time, the video and infrared imaging of the fields that are streamed from the cameras and sensors. Broadcast live outdoor events like marathon, F1 auto racing.
- **Bio-connectivity, telemedicine and remote health care:** Patient examination performed remotely supported by a video stream
- **Cloud robotics:** Robot sends captured video/audio/data collected to the cloud in real time, receiving in return action instructions.

Proposed Scope of SA4 Study - I

- The objective of this study media handling aspects of 5G, taking as baseline the Stage-1 requirements developed by SA1 in TS 22.261, and corresponding use cases as documented in TRs 22.861, 22.862, 22.863, 22.864 and 22.891, as well as the Stage-2 architecture for 5G systems developed by SA2 in TS 23.501.
- In particular, the following areas will be investigated:
  - Investigate media handling aspects of the 5G system architecture in relation to the existing set of 3GPP multimedia services (e.g., PSS, MBMS, MTSI, MMS, etc.)
  - Identify relevance and potential reuse of components in existing 3GPP multimedia services (e.g., PSS, MBMS, MTSI, MMS, etc.) in the context of 5G systems and related Stage-2 architecture, e.g.,
    - use of MTSI features for supporting video calls using 5G terminals
    - applicability and extensions of existing unicast and broadcast protocols and formats in 5G systems
    - use of 3GPP DASH formats and interfaces for adaptive media delivery, including SAND for 5G edge computing
    - applicability of existing QoE monitoring and QoS handling mechanisms in 5G systems

Proposed Scope of SA4 Study - II

- Study potential enhancements to existing 3GPP multimedia services (e.g., PSS, MBMS, MTSI, MMS, etc.) towards better fulfilling the Stage-1 requirements in TS 22.261, e.g., in terms of criteria such as latency, bandwidth efficiency or energy efficiency, while also taking into consideration the Stage-2 architecture for 5G systems
- Study the need for and feasibility of new media delivery interfaces, formats and protocols for 5G systems, e.g.,
  - for enabling efficient content delivery towards fulfilling 5G application requirements such as latency and interactivity
  - for uploading captured audio / video / image contents to a central or edge server, e.g., related interfaces, file formats, delivery protocols, service-layer definitions, etc.
- New codec requirements for 5G systems, e.g., for low complexity audio / video encoding, etc.
- Investigate performance-related aspects such as media adaptation, quality, QoE / QoS handling, energy efficiency, etc. that are relevant for 5G-related media handling

• Coordination and liaison with SA1 and SA2 expected during the course of this study.