

*Online Event*

# **A 6G VISION**

## **3GPP Release 19 & Verticals Industries Requirements**

***Issam Toufik***

Director of the 3GPP Mobile Competence  
Centre at ETSI

***Roland Beutler***

5G MAG Vice Chair – 3GPP MRP Liaison  
Contact (SWR)

***Tero Pesonen***

TCCA Chairman of Critical Communications  
Broadband Group

***Michael Bahr***

5G-ACIA WG1 Chair

***Maxime Flament***

Chief Technology Officer,  
5G Automotive Association (5GAA)

***Raffaele De Peppe***

6G Industry Association – Vice Chair &  
Vertical Engagement Chair

20 July 2023 10:30-12:00 CEST

**6GStart**  
Grant Agreement No.101069987



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the European Union

# Speakers Lineup

- 10.30 – 10.40: **Claudio de Majo** – Research Analyst at Trust-IT Services
- 10.40 – 10.50: **Issam Toufik** – Director of the 3GPP Mobile Competence Centre at ETSI
- 10.50 – 11.00: **Roland Beutler** – 5G MAG Vice Chair, 3GPP MRP Liaison Contact (SWR)
- 11.00 – 11.10: **Tero Pesonen** – TCCA Chairman of Critical Communications Broadband Group
- 11.10 – 11.20: **Michael Bahr** – 5G-ACIA WG1 Chair
- 11.20 – 11.30: **Maxime Flament** – Chief Technology Officer, 5G Automotive Association (5GAA)
- 11.35 – 12.30: **Final Roundtable** moderated by **Raffaele De Peppe** – 6G Industry Association – Vice Chair & Vertical Engagement Chair

# Why this webinar?

This webinar brings together representatives from **vertical industries** and other **experts** to shape the future of **3GPP Release 19** and set the stage for the emergence of the 6G system.

The event delves into defining thoughts, ideas, and requirements for 3GPP release 19, in particular:

- *Ensuring that the 5G system continues to meet the evolving needs of different industries while paving the way for the future advancements of 6G.*
- *Exploring the ongoing studies for 3GPP release 19 and the additional capabilities of the 5G system.*
- *Providing insights into the future of 5G and offering guidance on the capabilities that the 6G system needs to encompass.*

# Housekeeping

This event will be **recorded** and available on 5GPPP's website (<https://5g-ppp.eu/>) over the next few days (including slides from each speaker and a post-webinar report).

The **interactive chat** is available at any time. We encourage the audience to type any question in the dedicated **Q&A box** in the lower toolbar. The speakers and moderators will do their best to answer your questions in real-time, both orally and in written form.

# Poll Questions

Speakers are encouraged to participate in our poll questions.

Go to <https://www.menti.com> and enter the code 3624 9544

Or, scan the QR code:





## Roundtable questions

# Question 1

3GPP content for Release 19 will be finalised this year in 3GPP SA and RAN.

*In this context, what features do you consider essential for Release 19?*

# Question 2

*What kind of trends in society/technologies are so relevant that 3GPP has to take them into consideration?*

e.g. AI, industrial automation, autonomous vehicles, energy efficiency, global security, quantum technologies, broadcasting and media, edge computing, satellites, metaverse, etc.



# Questions 3-4

*How can 3GPP be improved to address vertical industries' requirements?*

*How can vertical industries work together?*



# Thank you for attending!



# 3GPP Release 19

**Issam Toufik**

ETSI CTO

Head of 3GPP Mobile Competence Centre (MCC)

# 3GPP standards eco-system



## 3GPP Organizational Partners (OPs)

838 companies



- The 3GPP **Organizational Partners (OP)** - 7 Standards Organizations - from China, Europe, India, Japan, Korea and the United States.
- Participation in 3GPP by companies and organizations becoming Members of one of these 7 OPs.
- Inputs on market requirements may come in to the Project via 3GPP **Market Representation Partners (MRP)**.
- There is a lot of additional **external liaison** activity...SDOs, Industry bodies, projects...

## 3GPP Market Representation Partners (MRPs)



## Next Generation Projects

### 5G Projects



...

### Certification Bodies



## Official Liaisons on specification work:

450 MHz Alliance, AISG, Bluetooth, Broadband Forum (BBF), CableLabs, International Special Committee on Radio Interference (CISPR), CTIA, Digital Video Broadcasting (DVB) Project, Ecma, International, Expert Group for Emergency Access (EGEA), Eurescom, COST 273, European Radiocommunications Committee (ERC), Fixed Mobile Convergence Alliance (FMCA), GCF, Global TD-LTE Initiative (GTD), GPS Industry Council, GSM Association, HomeRF Forum, IDB Forum, IEEE, Internet Engineering Task Force (IETF), IrDA, International Multimedia Telecommunications Consortium (IMTC), Internet Streaming Media Alliance, ISO-ITU expert group, ISO MPEG / JPEG, ITU-T SG2, JAIN tm (Javatm APIs for Integrated Networks), The Java Community Process (JCP), Liberty Alliance Project, Metro Ethernet Forum (MEF), NENA, NGMN (Next Generation Mobile Networks), oneM2M, OMA (Open Mobile Alliance), Open Networking Foundation (ONF), Open IPTV Forum, Object Management Group (OMG), PCS Type Certification Review Board (PTCRB), Portable Computer and Communications Association (PCCA), Presence and Availability Management (PAM) Forum, RSA Laboratories, SDR Forum, Sun Micro Systems Inc., Steerco, SyncML Initiative, Trusted Computing Group (TCG), TeleManagement Forum (TMF), TCCA, TIA /TR45, TIA/TR47, ITU, TV-anytime Forum, Voice eXtensible Markup Language (VXML) Forum, Wi-Fi Alliance, Wireless Broadband Alliance (WBA), WLAN Smart Card Consortium, Wireless World Research Forum (WWRF), World Wide Web Consortium (W3C)

(Source: extract from <https://www.3gpp.org/about-3gpp/15-bodies-with-which-3gpp-has>)

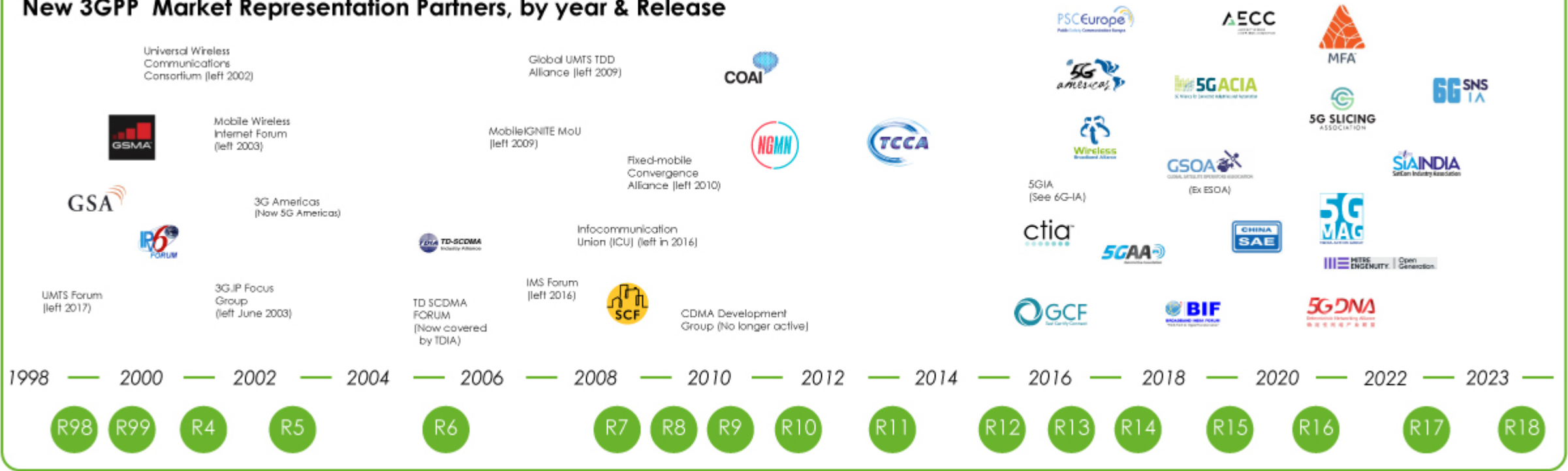


# Market Representation Partners (MRPs)



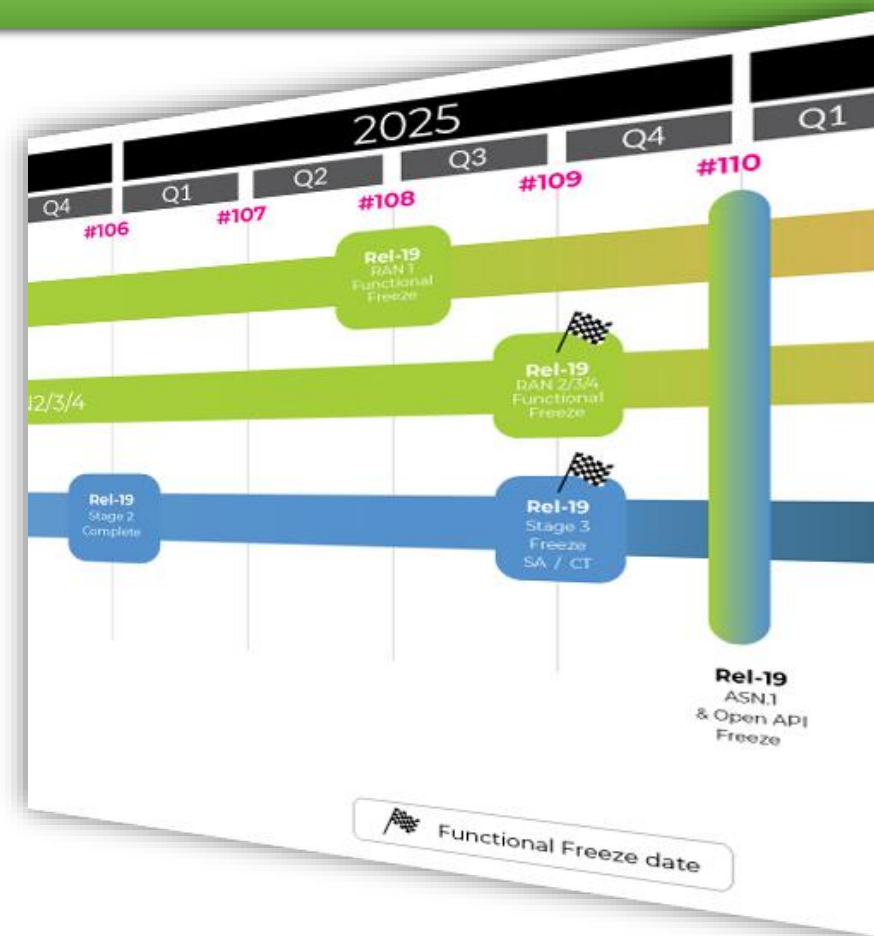
- 5G bringing new level of interest
- Several representing the interests of verticals

## New 3GPP Market Representation Partners, by year & Release

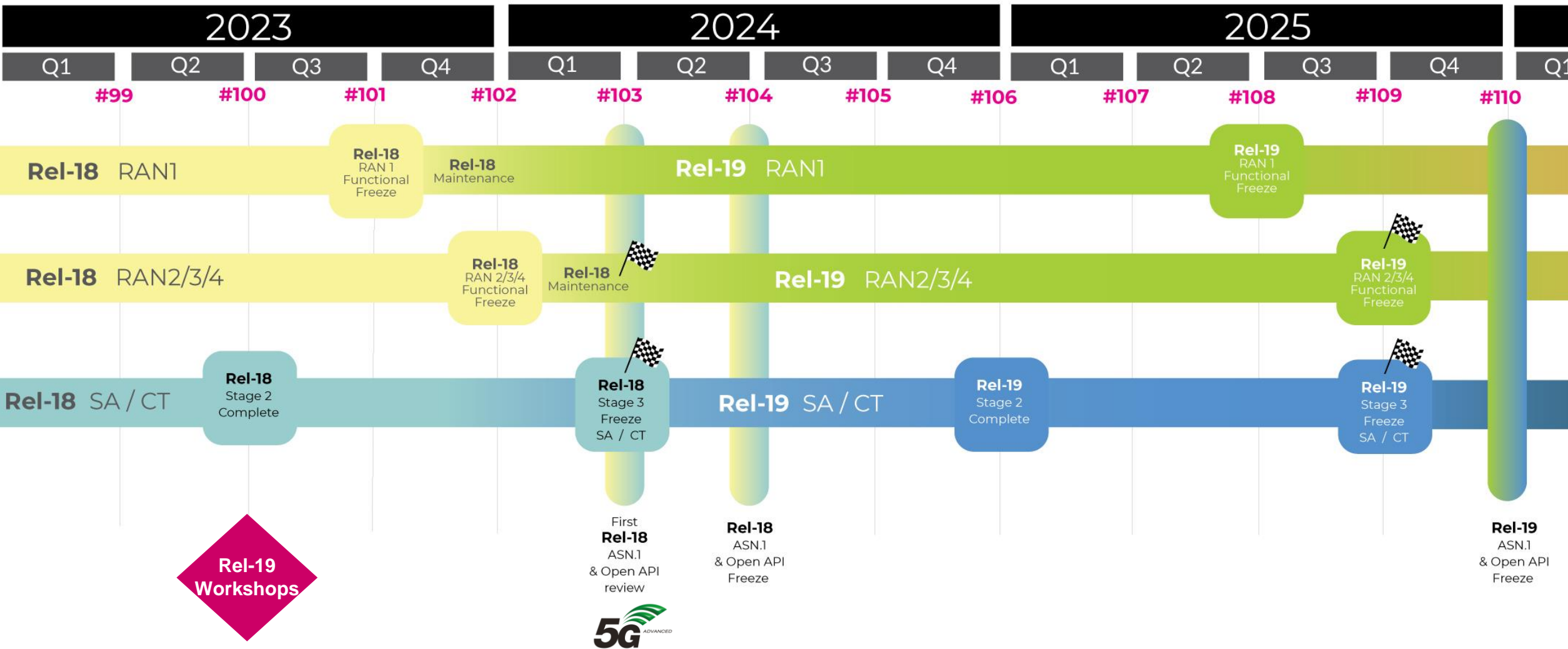


Current 3GPP MRPs represented by their logo.

- 📶 **Release 15:** The work on new radio (nr) and the 5G system (5GS) jointly addressed the urgent subset of needs for early commercial deployments.
- 📶 **Release 16:** Met all identified 5G use cases, to allow a full 3GPP IMT-2020 submission to ITU-R.
- 📶 **Release 17:** Enhances the earlier 5G work, meeting more 'vertical' industry needs, specifying NR operation in unlicensed bands, NR MIMO, V2-everything.
- 📶 **Release 18:** The current focus of the groups, scheduled for completion during 2024. Rel-18 will see a balanced evolution in terms of:
  - Mobile broadband evolution versus further vertical domain expansion;
  - Immediate versus longer-term market needs;
  - Device evolution versus network evolution.
  - **5G-Advanced** is a mid-generational marker (covers Rel-18, 19, 20)
- 📶 **Release 19:** From 2024
- 📶 6G mobile systems come later. 6G time-to-market expected to be 2030.



Graphic adapted from original data in [SP-230738](#) Work Plan report to TSG SA#100



Rel-19 Workshops



Functional Freeze date

Graphic adapted from original data in [SP-230738](#) Work Plan report to TSG SA#100

# Release 19 normative WIDs so far



1000026	<b>Integrated Sensing and Communication</b>	Sensing	S1
1000028	<b>Mobile Metaverse Services</b>	Metaverse	S1
1000029	<b>Indirect Network Sharing</b>	NetShare	S1
1000031	<b>FRMCS Phase 5</b>	FRMCS_Ph5	S1
1000030	<b>AI/ML Model Transfer Phase 2</b>	AIML_MT_Ph2	S1
1000024	<b>Satellite access Phase 3</b>	5GSAT_Ph3	S1
1000032	<b>Uncrewed Aerial System Phase 3</b>	UAS_Ph3	S1
1000033	<b>Energy Efficiency as Service Criteria</b>	EnergyServ	S1
990049	<b>PS Data Off for IMS Data Channel Service</b>	IMSDCDataOff	S1
1000036	<b>Sharing of administrative configuration between interconnected MC service systems</b>	MCSHAC	S6
1000037	<b>5GMSG Service phase 3</b>	5GMARCH_Ph3	S6
1000038	<b>Railways specific Enhancements to Mission Critical Services</b>	enh4FRMCS	S6
1000039	<b>Enhanced Mission Critical Architecture</b>	enhMC	S6
970002	<b>Lawful Interception Rel-19</b>	LI19	S3LI



# Rel-19 Workshops *J* (June 2023)



## TSG RAN ([RWS-230488](#))

- ~480 submissions.
- Presentations and Q&A focusing on RAN1/2/3-led items.
- Focus on 5G-Advanced to further improve performance and address critical commercial deployment needs.
- Release 19 to serve as a bridge to 6G - Strong interest to initiate some studies (e.g., channel modelling for new spectrum such as 7-24GHz, etc.)
- The overall Rel-19 load is expected to be lower than Rel-18 load

## TSG SA ([SP-230765](#))

- 65 contributions.
- SA identified 17 "core" and 15 "miscellaneous" potential topics for Rel-19.
- The next step involves SA2 undergoing Moderated Email Discussion (MED) in August to define study/work items on "core" items to be submitted to SA#101 (Sep.) for approval.
- The remaining core items and miscellaneous subjects will be further discussed in SA2 in Q4, 2023 for final Rel-19 content approval in SA#102 (Dec.).

# Rel-19 Workshops *II* (June 2023)



## TSG RAN ([RWS-230488](#))

- ☞ Categorization of the topics for better management in RAN#101 (Sep. 2023).
- ☞ All topics are subject to further discussion and justification.
- ☞ Categorization of major topics under: **AI/ML Air Interface, MIMO Evo., Duplex Evo., Ambient IoT, Network Energy Saving Enh., Mobility Enh., NTN Evo., XR Evo., AI/ML for NG-RAN, SON/MDT, Channel Modeling (& possibly additional aspects e.g. for ISAC) for further evol.**
- ☞ Plus, other RAN1, RAN2 & RAN3 led topics.
- ☞ Plus, others listed in [RWS-230488](#) slide 7.

## TSG SA ([SP-230765](#), [SP-230759](#))

- ☞ Guidance to SA2 on Rel-19 work planning:
- ☞ Headline “core” topics: **Satellite Access, Ambient IoT, AI/ML enh., Multi-access (Dual 3GPP + ATSSS Enh), Energy Efficiency / Energy Saving as a Service, XRM and Metaverse, IMS and NG\_RTC enh.**
- ☞ If SIDs approved in SA#101 (Sep.) then work can start Q4 2023.
- ☞ Final decision on the complete set of SIDs for Rel-19 taken in SA#102 (Dec. 2023).

- 3GPP is industry driven - Standardization of interfaces enables an interoperable, multi-vendor approach to deployment.
- The 3GPP processes are necessarily complex, but we will adapt to bring new sectors into the work.
- Release 19 content and priorities discussion ongoing. **NOW is the time to influence this work.**
- Release 18 and **Release 19 will have an important role in helping to lay early foundations for future work on 6G technologies.**

Meeting	Start	End	City
3GPP CT1#143	21-Aug-23	25-Aug-23	Goteborg
3GPP CT3#129	21-Aug-23	25-Aug-23	Goteborg
3GPP CT4#117	21-Aug-23	25-Aug-23	Goteborg
3GPP CT6#116	22-Aug-23	25-Aug-23	Goteborg
3GPP SA1#103	21-Aug-23	25-Aug-23	Goteborg
3GPP SA2#158	21-Aug-23	25-Aug-23	Goteborg
3GPP SA3#112	14-Aug-23	18-Aug-23	Goteborg
3GPP SA4#125	21-Aug-23	25-Aug-23	Goteborg
3GPP SA5#150	21-Aug-23	25-Aug-23	Goteborg
3GPP SA6#56	21-Aug-23	25-Aug-23	Goteborg
3GPP RAN1#114	21-Aug-23	25-Aug-23	Toulouse
3GPP RAN2#123	21-Aug-23	25-Aug-23	Toulouse
3GPP RAN3#121	21-Aug-23	25-Aug-23	Toulouse
3GPP RAN4#108	21-Aug-23	25-Aug-23	Toulouse
3GPP RAN5#100	21-Aug-23	25-Aug-23	Toulouse
3GPP CT#101	11-Sep-23	12-Sep-23	Bangalore
3GPP RAN#101	11-Sep-23	15-Sep-23	Bangalore
3GPP SA#101	11-Sep-23	15-Sep-23	Bangalore
3GPP CT#102	11-Dec-23	12-Dec-23	Edinburgh
3GPP RAN#102	11-Dec-23	15-Dec-23	Edinburgh
3GPP SA#102	11-Dec-23	15-Dec-23	Edinburgh



# For more info on 3GPP...



- All documents available online; [www.3gpp.org](http://www.3gpp.org)
- Attend special newcomers sessions at F2F Plenary meetings
- Subscribe to our regular newsletter 'Highlights'
- Keep in touch;
  - Info, membership, marcom, liaisons;  
[www.3gpp.org/contact](http://www.3gpp.org/contact)





# 5G-MAG towards 6G: Views on 3GPP Rel-19 Content

Dr. Roland Beutler

5G-MAG Vice-Chair





## Live Media Production and Contribution

Uplink streaming, local area networks, NPNs, edge



## 5G Broadcast System for TV, Radio & Emergency Alerts

LTE-based 5G Broadcast in dedicated broadcast networks



## Enhancing Live and On-demand Streaming

5G Media Streaming features for service providers and operators



## Multicast-Broadcast Delivery Modes in 5G Networks

5G Multicast-Broadcast Services to efficiently scale network traffic



## Advanced Media Services

Beyond 2D TV: Interactivity, multiview, VR, volumetric video, free viewpoint



## XR, Metaverse and Immersive Media

Enabling future user experiences without limits

# Areas of Work and Topics

Member- and contribution-driven work

[hub.5g-mag.com](https://hub.5g-mag.com)

# 5G-MAG inputs to 3GPP Rel-19 Workshops

TSG RAN Rel-19 Workshop  
Taipei, June 15 – 16, 2023



## 5G-MAG views on Media related topics for Rel-19 Radio Access Network (RAN)

5G MEDIA ACTION GROUP (5G-MAG)

[www.5g-mag.com](http://www.5g-mag.com)

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TSG SA Rel-19 Workshop  
Taipei, June 13 – 14, 2023



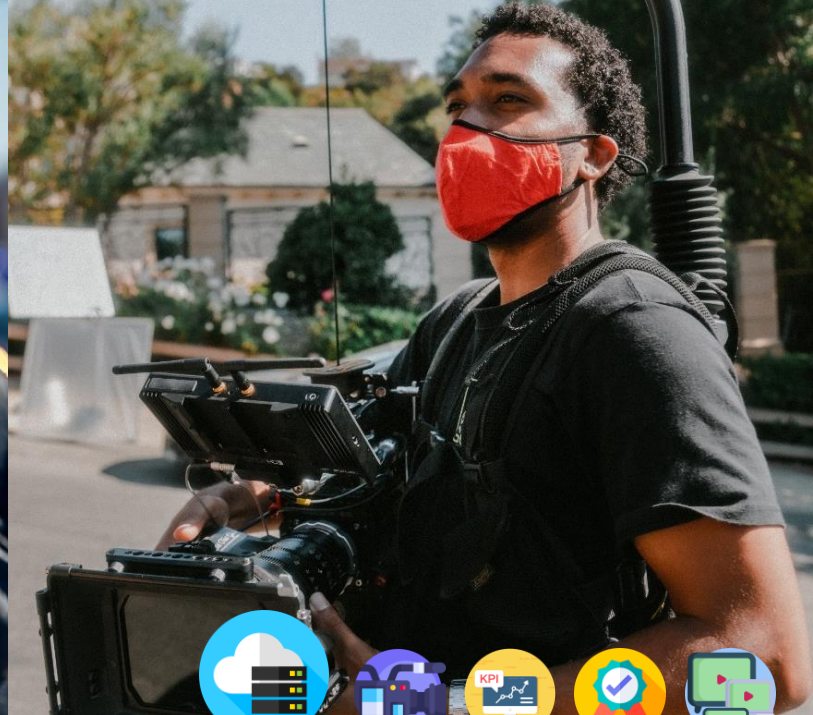
## 5G-MAG views on Media related topics for Rel-19 Service and System Aspects (SA)

5G MEDIA ACTION GROUP (5G-MAG)

[www.5g-mag.com](http://www.5g-mag.com)

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- **Proposals related to 3GPP SA4 Rel-19 will have to wait until December 2023**
- **Documents available at our website**
  - <https://www.5g-mag.com/standards#membersviews>



# Live Media Production and Contribution

Registration and Dual Steering  
Live broadcast assurance



# Proposals: Audiovisual Production

## ■ Registration and Dual traffic Steering

Registration and traffic steering via two 3GPP access paths for enhanced reliability and flexibility

- RAN** Enable additional 5GS tools, under MNO control/policy, to improve access/NW resources utilization, capacity, coverage, reliability and QoE, using dual 3GPP access
- RAN** Provide flexible user plane traffic aggregation, steering & switching at 3GPP layer
- RAN** Interworking with non-3GPP access, e.g., switch one 3GPP path to non-3GPP access
- RAN** Dual registration via NR-NR, TN and/or NTN, single PLMN, two PLMNs or one PLMN and one SNPN
- RAN** Allow registration via non-3GPP access
- RAN** Roaming scenarios supported: one or two VPLMNs, HR or LBO cases

## ■ Live broadcast assurance

On-demand guaranteed bit rate (GBR) and differentiated user

- RAN** Study the optimization of NWDAF- vertical federated learning to improve the accuracy of NWDAF's application service flow statistics and detection model
- RAN** Study the extension of NWDAF to support "Recommended Service" based on the "expected" output and model parameters, and close loop policy control

## ■ AI/ML for Media

- SA4** Understanding the potential of AI/ML for distribution and production of media services.



# 5G Broadcast for TV, Radio & Emergency Alerts

Coexistence with Digital Terrestrial Broadcast systems  
Concurrent operation with unicast

# Proposals: LTE-based 5G Broadcast

- **Coexistence with Digital Terrestrial Broadcast systems within same carrier**

Due to regulatory constraints and lack of spectrum, there is at least interest in the US to deploy both Digital Terrestrial TV (DTT) ATSC 3.0 and 5G Broadcast in the same carrier

**RAN** Additional periodicity patterns for cell acquisition subframes to allow TDM operation between 5G broadcast and non-3GPP DTT (e.g., ATSC 3.0 and DVB-T2) frame structures.

- **Concurrent operation of LTE-based 5G Broadcast and unicast**

Rel-18 RAN4 WI on “New bands and bandwidth allocation for 5G terrestrial broadcast – part 2” specifies bands and requirements for MBMS-dedicated cells but does not address coexistence aspects for the reception of LTE-based 5G Broadcast and unicast in the same UE, which is a key requirement for the deployment of LTE-based 5G Broadcast services.

**RAN** Base Station and/or UE requirements to allow the reception of LTE-based 5G Broadcast and unicast in the same UE.



# Enhancing Live & On-demand Streaming

General Requirements

Sustainability

Extensions to 5G Media Streaming

# Proposals: Distribution on mobile networks

- In general, 5G-MAG supports work aimed at enhancing:
  - Coverage (of services from all MNOs)
  - Capacity (sufficient capacity both in High Density Demand areas and rural areas)
  - Adoption (reducing barriers to uptake for consumers and MNOs)
  - Environmental sustainability (through design, measurement and reducing impact)

- **Sustainability for Media over mobile networks**

Environmental sustainability is a key requirement for the media industry

- **SA** Study the impact on the 3GPP system of normative outcomes of stage 1 work on “Energy Efficiency as service criteria”.

- **Extensions to 5G Media Streaming**

- **SA4** Ad Insertion and Content Replacement

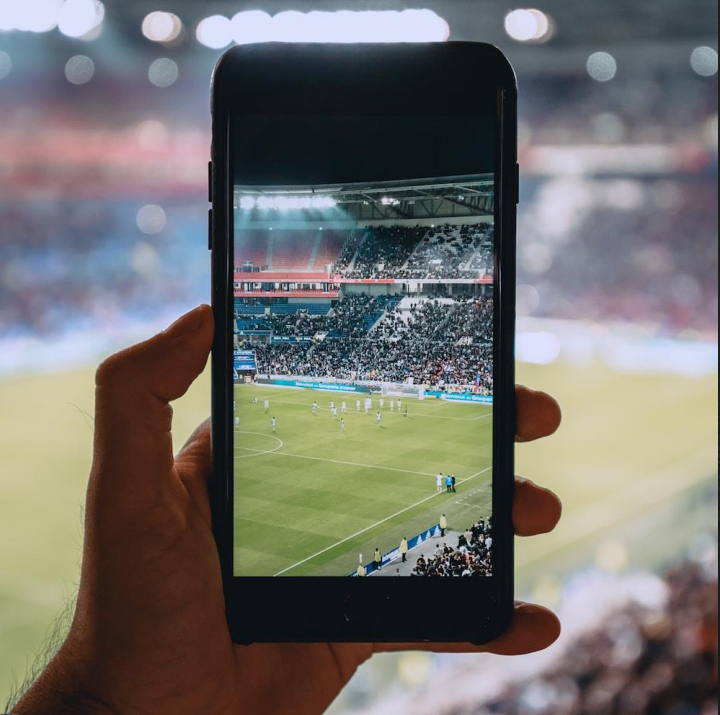
- **SA4** Content Steering

- **SA4** Digital Rights Management

- **AI/ML for Media**

- **SA4** Understanding the potential of AI/ML for distribution and production of media services.





# Multicast and Broadcast Delivery Modes

Multicast-Broadcast Services (MBS) enhancements and extensions

Support of Multicast-Broadcast Services (MBS) via Non-Terrestrial Networks

# Proposals: Multicast–Broadcast Delivery Modes

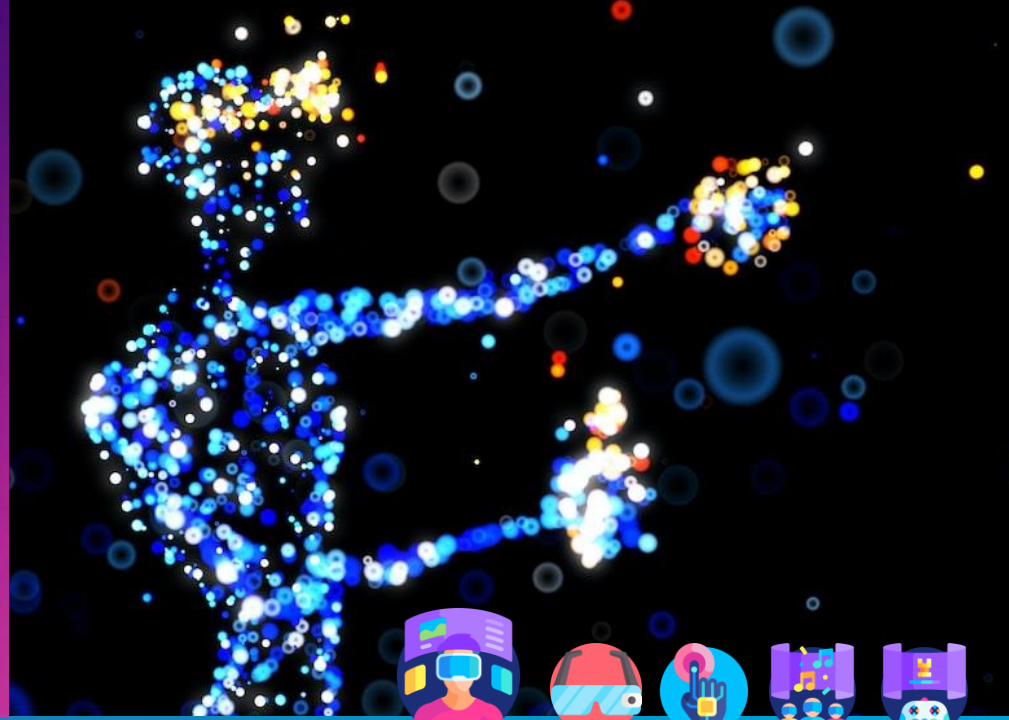
## ■ MBS enhancements and extensions

Advanced RAN techniques to further enhance spectral efficiency of 5G MBS

- RAN** NOMA techniques to enhance efficiency of joint broadcast/multicast/unicast transmissions
- RAN** Broadcast/Multicast/Unicast Superposition (BMUST); Rate-Splitting Multiple Access (RSMA)
- SA4** Usage of MBS Service Layer for LTE-based 5G Broadcast

## ■ Support of Multicast Broadcast Services via Non–Terrestrial Networks

- RAN** Study NTN enhancements to support NGSO mobile base stations and broadcast to a specific geographical area addressing the discrepancy with beam footprints
- RAN** NTN enhancements to support multicast in connected mode in NGSO, addressing mobility issues including hand-over in particular
- RAN** NTN enhancements on the HARQ feedback/retransmission which can be applied to both PTP and PTM transmission
- RAN** NTN enhancements to support multicast over a downlink only NTN combined with a terrestrial network cell.
- RAN** Study need for architectural enhancements for 5G multicast–broadcast services via NTN
- SA** Enhancements to support multicast/broadcast over a downlink only NTN and support for a heterogeneous return path (3GPP or non-3GPP access)
- SA** Study of necessary architectural enhancements for 5G MBS via NTN



# XR, Metaverse & Immersive Media

Enhancements to optimise XR awareness, capacity, power saving, latency

Extensions to enhance XR awareness and QoS handling

New immersive experiences

AI/ML for Media

# Proposals: XR, Metaverse & Immersive Media

## ■ Enhancements to optimise XR awareness, capacity, power saving and latency

- RAN** Capacity enhancements
  - RRM measurements and scheduling restrictions (measurement quality vs. latency)
  - Carrier aggregation (capacity vs. power)
  - High speed packetization
  - CSI enhancements including CBG-based transmission

- RAN** Power saving
  - Further DRX and PDCCH enhancements

- RAN** XR awareness
  - Uplink application awareness to support for very high UE data rates

- RAN** Latency:
  - Congestion-aware RAN (L4S in RAN) to help trim buffer lengths for latency-sensitive applications

## ■ Extensions to system architecture to enhance XR awareness and QoS handling

- SA** further enhancements for RAN scheduling: Awareness of Application Layer Forward Error Correction (AL-FEC) at RAN

- SA** PDU Set based QoS handling: Introduce PDU-Set delivery deadline (PSDD) as an alternative to PDU-Set delivery budget (PDB), and better adaptability of 5GS QoS level for XR traffic



# Proposals: XR, Metaverse & Immersive Media

- **New immersive experiences**

- SA4 Improvements of overall coding efficiency of 5G video services, including new video codecs (e.g. new profiles of HEVC, VVC)

- SA4 Improvements on description and transmission of new immersive and 3D experiences, including immersive video codecs considering appropriate solutions from (e.g., VDI, V3C MIV, MV-HEVC, V3C V-PCC, GPCC, Dynamic mesh)

- SA4 Improvements on description and transmission of avatars, including formats, codecs, protocols and associated metadata.

- **AI/ML for Media**

- SA4 Understanding the potential of AI/ML for distribution and production of media services.

# Thank you!

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# TCCA high level requirements for 3GPP Release 19 prioritisation

Tero Pesonen

July 2023

Critical communications for all professional users



# Critical Communications requirements

COVERAGE

AVAILABILITY

RESILIENCE

PERFORMANCE

SCALABILITY



**CONNECTION IS THE LIFELINE**



**24/7/365**



**Instant service**

FUNCTIONAL SUITABILITY

Critical communications for all professional users





# Top level priorities

## Coverage and Capacity

### Terrestrial network

- Avoidance of not-spots
- Data rates at the cell edge
- Uplink improvements

### NTN improvements

- Downlink budget
- Coverage indication

### Device-to-Device

- Multihop

## Resilience

- Black out/power outage handling
- Time as a Service – GNSS back-up

## Services

- Mobility enhancements
  - Reduced handover interruption
  - MCX roaming (with QPP support)
- Enhancements to network based positioning
- AR/XR enhancements
- RAN5 MCX testing enhancements

## Odd balls

- V2X sidelink sub 1GHz spectrum harmonisation for D2D
- HPUE usage in Europe, band 68?

Critical communications for all professional users



# Success in Cooperation

Potentially common topics include

- Satellite connectivity
- Sidelink communication
- Security & Resilience
- IoT
- UAV
- Spectrum
- ...



Critical communications for all professional users



# Questions?



Tero Pesonen

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Critical communications for all professional users

## TCCA CCBG

<https://tcca.info/broadband/critical-communications-broadband-group/>

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# 5G Vertical User Workshop 3GPP Release 19 & Verticals Industries Requirements

20 July 2023

Michael Bahr (Siemens)  
5G-ACIA WG1 Chair

The poster is for an online event titled "A 6G Vision" held on 20th July 2023 from 10:30 to 12:00 CEST. The main topic is "3GPP Release 19 & Verticals Industries Requirements". It features a list of speakers: Issam Toufik (Director of the 3GPP Mobile Competence Centre at ETSI), Roland Buetler (5G MFG Vice Chair - 3GPP MRP Liaison Contact (SWR)), Tero Pasonen (TCCA Chairman of Critical Communications Broadband Group), Michael Bahr (5G-ACIA WG1 Chair), Maxime Flament (Chief Technology Officer, 5G Automotive Association (5GAA)), and Raffaele De Pippo (5G Industry Association - Vice Chair & Vertical Engagement Chair). The event is sponsored by the European Union and 6GStart. The poster includes a "JOIN US" button and a background image of a factory with blue lighting and network lines.

# 5G-ACIA | Introduction of speaker



- Michael Bahr
  - Siemens Technology in Munich, Germany
  - 5G-ACIA
    - Working Group Chair of WG1 „Use Cases & Requirements“
    - Rapporteur of 5G-ACIA work item on 5G-ACIA-related use cases, requirements, and KPIs for 3GPP SA1
  - 3GPP SA1
    - Rapporteur of work items cyberCAV and (FS\_)eCAV – TS 22.104, TR 22.832; Rel-17



# 5G-ACIA | Major Objectives



## OT Industry



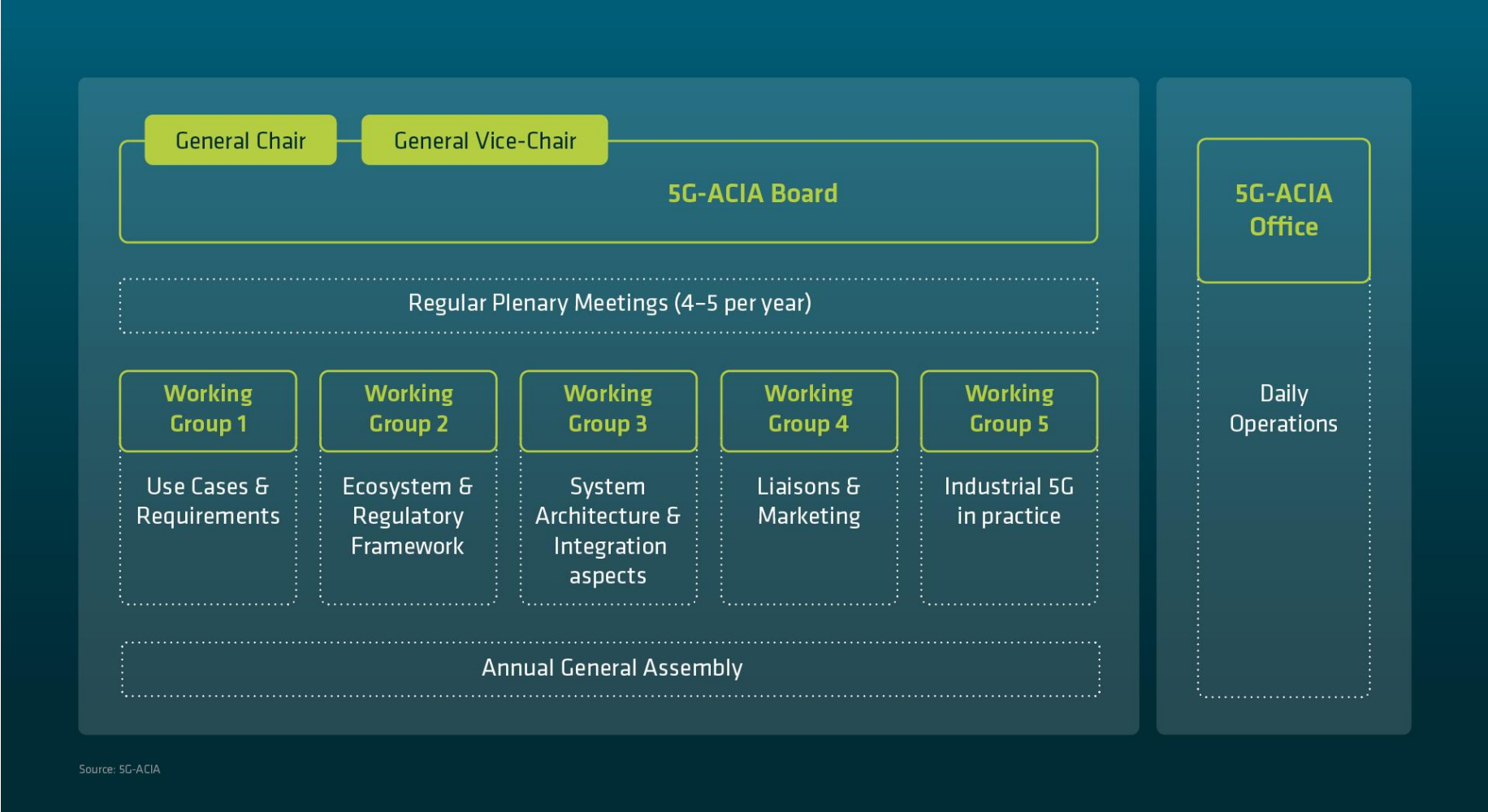
## ICT Industry



- 1 Establish a common language btw. ICT & OT
- 2 Reflect OT needs in standardization & regulation
- 3 Analyze how 5G may enhance the Industrial IoT
- 4 Identify relevant certification & testing needs
- 5 Develop a sustainable Industrial 5G ecosystem
- 6 Promote Industrial 5G worldwide

**5G-ACIA as the globally leading organization for driving and shaping Industrial 5G**

# 5G-ACIA | Working Group Structure



# 3GPP Market Representation Partnership



5G-ACIA was approved as 3GPP Market Representation Partner in Nov 2018

## 5G for future industry

*November 9, 2018*



This week, the 5G Alliance for Connected Industries and Automation (5G-ACIA) has been approved as a Market Representation Partner (MRP) in 3GPP.

The 5G-ACIA membership base includes a number of industrial equipment suppliers and end-users as well as ICT companies; with the automotive, energy, industrial manufacturing and production sectors all represented.

As 3GPP technology is now being applied to a diverse number of 'verticals', this is the best possible time for the 5G-ACIA to bring a coordinated industry based approach to the standards process, one that will help to align 3GPP to the 5G-ACIA vision to bring the "best possible applicability of 5G technology and 5G networks for the manufacturing and process industries".

After the formal approval process, by the seven 3GPP Organizational Partners (National and Regional SDOs), 5G-ACIA has been accepted as a 3GPP Market Representation Partner, as of November 2, 2018.

Source: [www.3gpp.org](http://www.3gpp.org)



# General Thoughts on 5G-Advanced Requirements



- Many industrial requirements are included in Rel-16/17 3GPP SA1 documents (CAV studies/work items, TS 22.104/22.261)
  - Not all requirements already covered
- Dependability and determinism are key
  - Guaranteed KPIs are important
- Rel-15 5G hardware is available – testing of Rel-15/16 hardware will provide (first) insights on required enhancements and improvements in 5G Advanced
- Looking forward to Rel-16 hardware/industrial 5G features being available and providing industrial features and important feedback
- New industrial 5G use cases and ongoing 5G-ACIA work lead to further specific requirements for enhancements in 5G-Advanced

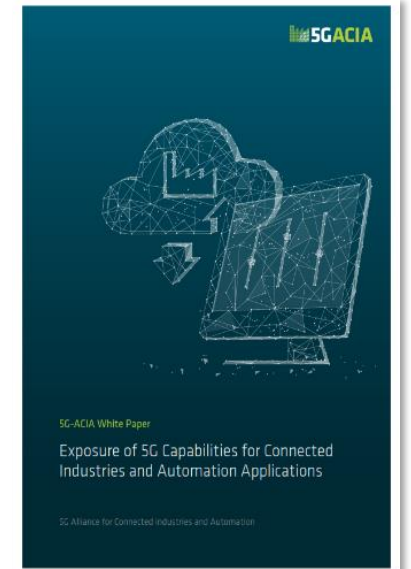
## Important areas for Industrial 5G

- Non-public networks
- IIoT – Industrial IoT
  - URLLC – ultra-reliable low-latency communication
  - TSC – time-sensitive communication (time sync and TSN support)
  - 5G-VN – 5G-Virtual Networks, 5G-LAN
- Positioning
- Sidelink use in industrial environments
- QoS Monitoring
- ...

# 5G-ACIA Industrial 5G-Advanced Requirements



- 5G-ACIA is collecting and investigating industrial 5G-Advanced requirements continuously
- Past, current, and proposed future work in 5G-ACIA potentially identifies further industrial 5G-Advanced requirements and input to 3GPP, for instance in areas of
  - 5G edge computing
  - 5G Sidelink communication for industrial usage
  - Non-public networks
  - Support of machine vision in industrial 5G applications
  - Time-Sensitive Communication and 5GS as logical bridge
  - ...
- Liaison Statements e.g. to inform 3GPP about findings, contributions to 3GPP by 5G-ACIA members
  - Liaison statements on e.g. network exposure, 5G edge computing, sidelink in industrial
  - Contributions e.g. on network exposure requirements in 3GPP SA1 (EXPOSE)
  - Whitepapers with further information e.g. on “Exposure of 5G Capabilities for Connected Industries and Automation Applications”  
<https://5g-acia.org/whitepapers/exposure-of-5g-capabilities-for-connected-industries-and-automation-applications/>
- Importance ranking of industrial 5G-Advanced requirements under evaluation in 5G-ACIA





# Industrial 5G-Advanced Requirements



*Please note, 5G-ACIA is collecting and investigating industrial 5G-Advanced requirements continuously, importance level/ranking of these industrial 5G-Advanced requirements is under evaluation in 5G-ACIA*

## **Improved positioning accuracy** (corresponding to 3GPP positioning service levels 6 and 7 in 3GPP TS 22.261)

- for absolute positioning towards 0.3 m / 2 m horizontal/vertical positioning accuracy, 99.9 % availability of position measurements within the accuracy limits, and  $\leq 10$  ms latency of position estimation;
- for relative positioning towards 0.2 m horizontal/vertical positioning accuracy, 99% availability of position measurements within the accuracy limits.

## **Enhancement of localization service output with accuracy of UE position**

- Provided to application at UE

## **Low-power high-accuracy positioning**

- Energy efficient provision of positioning services to allow battery-constrained UEs to sustain a long battery live time

## **Manipulation-protected positioning**

- Secure, uncompromised localization information for reliable position information of a UE

## **Sidelink ranging (relative positioning)**

- e.g. for asset/tool tracking use cases (e.g. indoor, horizontal accuracy  $\leq 1$  m, 99% availability,  $\leq 1$  s latency of position estimation)

# Industrial 5G-Advanced Requirements



*Please note, 5G-ACIA is collecting and investigating industrial 5G-Advanced requirements continuously, importance level/ranking of these industrial 5G-Advanced requirements is under evaluation in 5G-ACIA*

## **IIoT: Improved time synchronization** (smaller 5G time synchronization budget)

- Stable time synchronization of the 5G system of 700-800 ns with two wireless links

## **IIoT: Support of distributed TSN stream establishment**

- The 5G system needs to be able to interwork with distributed protocols in use in order to support deployments using distributed TSN stream establishment, e.g., the Link-local Registration Protocol (LRP, IEEE 802.1CS-2020) and the upcoming Resource Allocation Protocol (RAP, IEEE P802.1Qdd).

## **IIoT, Sidelink: Support of direct device communication (sidelink) for Industrial IoT in standalone NPNs**

## **QoS monitoring: Access at the UE**, for instance, access to Network Exposure Function (NEF) at the UE

## **QoS monitoring: Further QoS monitoring enhancements**

- Enlarge the functionalities of QoS monitoring: additional parameters, QoS monitoring of groups of UEs, enhanced event logging, configurability of QoS monitoring parameters by the user
- See also 5G-ACIA White Paper “Exposure of 5G Capabilities for Connected Industries and Automation Applications”  
<https://5g-acia.org/whitepapers/exposure-of-5g-capabilities-for-connected-industries-and-automation-applications/>

# Industrial 5G-Advanced Requirements



*Please note, 5G-ACIA is collecting and investigating industrial 5G-Advanced requirements continuously, importance level/ranking of these industrial 5G-Advanced requirements is under evaluation in 5G-ACIA*

## Support of **multi-modality/mixed communication services**

- 5G network assistance for coordinated transmission of multiple, related communication services with similar or different data characteristics (multi-modal/mixed, e.g. URLLC data, multiple audio/video, tactile information, sensor data) involving one or multiple UEs.

## Enhanced **predictive analytics**

- Predictive QoS allows the mobile network to provide notifications about predicted QoS changes to enable in-advance adjustment of the application behaviour

## **Ambient IoT**

- Support of communication with ambient IoT devices (using energy harvesting producing a limited amount of energy)
- device energy consumption, radio range for indoor (e.g. >25 m for automobile manufacturing) and outdoor (e.g. >100 m), message sizes (e.g. 96 bits from the Electronic Product Code standard used for asset and material tracking, inventory, etc.).

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Siemens provided similar vertical input to 3GPP SA Rel-19 Workshop at 3GPP SA#100 in Taipei (see [SWS-230070](#)).

# A 6G Vision



## The Perspective of Manufacturing and Process Industries / Industrial Automation

### 5G Evolution towards 6G

- Industrial requirements brought into 5G are carried forward into 6G – they are still valid for 6G.
- Ongoing and upcoming investments of industrial users in 5G applications, equipment, and infrastructure must be protected (lifetime >20 years).
- 5G deployments need to be able to evolve into upcoming next generation technology.

### Technical Targets

- Energy efficient and cost efficient solutions providing services for much higher number of reliable connections (increased scalability)
- Sophisticated self-management capabilities, for instance, based on AI/ML for intelligent and automatic adaptation of the 5G network to changing conditions.
- Strengthen non-public networks to even better support specific requirements of industrial customers (security, performance,

reliability, availability, independence)

- High-precision positioning and integrated sensing
- Control loops with demanding latency targets
- Tailored and optimized solutions for different scenarios enabled by truly open interfaces, scalable architecture and APIs, virtualization.

### On the move ...

- 5G has by far not reached its full potential in industrial automation yet. Looking forward to Rel-16 hardware/industrial 5G features being available and providing industrial features and important feedback
- Easier, direct engagement of vertical industries and tracking of relevant activities in the standardization process

*See „Our view on the Evolution of 5G towards 6G“, 5G-ACIA Position Paper, May 2021*

# Thank you!

Michael Bahr (Siemens)  
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## Online Event

# A 6G Vision

20<sup>th</sup> July 2023  
10:30 - 12:00 CEST

## 3GPP Release 19 & Verticals Industries Requirements

[JOIN US](#)

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### SPEAKERS



**Issam Toufik**  
Director of the 3GPP Mobile  
Competence Centre at ETSI

**Roland Beutler**  
5G MAG Vice Chair – 3GPP MRP  
Liaison Contact (SWR)

**Tero Pesonen**  
TCCA Chairman of Critical  
Communications Broadband  
Group

**Michael Bahr**  
5G-ACIA WG1 Chair

**Maxime Flament**  
Chief Technology Officer,  
5G Automotive Association (5GAA)

**Raffaele De Peppe**  
6G Industry Association – Vice  
Chair & Vertical Engagement Chair





**5GACIA**



# 5GAA input to 3GPP Rel-19 Workshop

Maxime Flament, 5GAA CTO

# Introduction

- 5GAA members submitted consolidated proposals for new features and requirements, as well as a study item, as input to 3GPP Rel-19 workshop.
- Via an online survey, all 5GAA companies were invited to:
  - Rate the listed proposals in terms of priority  
(Score: 1 = Very low priority – 5 = Very high priority)
  - Rate sub-topics of each proposal in terms of relevance  
(Score: 1= not at all relevant – 5 = Extremely relevant)
- The survey results were consolidated and provided in a decreasing order according to the final ranking
  - Sub-topics in “bold” indicate higher priority
- The input is reviewed and aligned amongst all 5GAA members.

# 5GAA list of proposals according priority ranking

5GAA features and requirements proposals	5GAA Priority ranking
NTN Satellite Connectivity High Level Requirements	1
Sidelink Enhancements	2
Sidelink Positioning Enhancements	3
Predictive QoS for Application and Network Adaptation	4

5GAA study item proposal
Integrated Sensing and Communications (ISAC)

# 1. NTN Satellite Connectivity High Level Requirements

## Motivation:

1. **Seamless and ubiquitous automotive user experience by TN/NTN integration (\*)**
2. Enable the evolution of automotive use cases leveraging satellite connectivity with
  - Narrowband data rate e.g., e-call, hazard information
  - Wideband data rate e.g., field monitoring, audio streaming
  - Broadband data rate e.g., entertainment (video streaming, gaming)
  - In 3GPP (TR 38.821) the NTN UE characteristics for evaluation assumptions do not fulfil automotive requirements:
    - E.g., current handheld antenna is limiting data rate for NTN
    - E.g., VSAT antenna (60 cm aperture) is too large for automotive

## Subtopic:

1. **Mobility enhancements between TN and NTN and between NTN and TN to ensure service continuity**
2. Consider additional NR NTN capable automotive UE characteristics (adapted to vehicle mounted constraints) to support satellite connectivity scenarios (e.g. for coexistence analysis)
  - automotive UE characteristics 1: targeting narrowband and wideband data rates in FR1 bands
  - automotive UE characteristics 2: targeting broadband data rates in above 10 GHz bands

These automotive UE characteristics might involve enhancements to e.g. antenna gain, UE Tx Power, improved noise figure

5GAA will provide further details on vehicle mounted NR NTN UE characteristics for consideration in Rel-19 work by December 2023 (RAN#102)

(\*) 5GAA NTN position paper: "5GAA wishes to clarify that ubiquitous and uninterrupted connectivity can only be provided if **terrestrial and non-terrestrial networks are integrated seamlessly**"



## 2. Sidelink Enhancements

### Motivation:

Underlying assumption: Backward compatibility with existing NR V2X operations. E.g. vehicles have a typical lifetime of +10 years

1. Support of a wider bandwidth for SL-based V2X operations using multiple narrowband SL channels
  - Examples include some ITS bands in 5.9 GHz that are fragmented into multiple 10 or 20 MHz channels.

### Other identified motivation:

2. Consider options for co-channel sharing with non-3GPP V2X technologies in Europe beyond 2030+
  - NR sidelink needs to be able to ensure sharing of spectrum with non-3GPP V2X technologies (e.g., ITS-G5) when it starts to use a channel which is already used by the other technologies.
  - Rel-16 NR sidelink operations in a channel where no other technology exists shall not be impacted.

### Subtopic:

General requirements for Rel-19 sidelink: any enhancement shall ensure that a Rel-19 UE can communicate with another UE operating NR sidelink defined in a previous release.

- 1. Enhancement for sidelink carrier aggregation (strongly recommended by 5GAA)**
  - **Introduction of the features defined Rel-15 LTE, including Mode-1 support, handling limited transmission/reception capability.**
  - **Enhancements for sidelink carrier aggregation shall ensure compatibility and coexistence with legacy sidelink operations.**

### Other identified subtopic:

2. Adaptation of unlicensed band sidelink channel access mechanism (defined in Rel18) for ITS band n47, as an optional feature

# 3. Sidelink Positioning Enhancements

## Motivation:

5GAA investigated the performance of Uu-based positioning and sidelink positioning (Rel. 18 study outcome) for different automotive use cases.

1. Due to limited available bandwidth in the ITS band, the required positioning accuracy for ADAS and safety use cases cannot be achieved in most evaluation scenarios
2. Vehicle applications already have a lot of “situational awareness information”, due to own sensors. Positioning accuracy can be improved by considering further non-RAT dependent technologies in the 5G protocol stack. Furthermore, enhanced positioning approaches could improve the accuracy as well
3. Automotive use cases have demanding latency requirements and reliability requirements for the positioning services

## Subtopic:

1. **Support of wider positioning bandwidth by using:**
  - **Unlicensed band in FR1**
  - **Licensed band, ITS band, Unlicensed in FR2.**
2. Support additional non-RAT dependent positioning (like UWB) and sensor data sharing
  - Support further enhanced positioning techniques, like sidelink carrier phase positioning, multi-panel positioning, etc.
3. Introduce sidelink positioning integrity study, considering error sources, etc. similar to the Uu-based positioning integrity study in Rel. 18.

# 4. Predictive QoS for Application and Network Adaptation

## Motivation:

1. Predictive QoS enables fast adaptation of vehicular applications QoS to improve user experience regarding comfort and safety.
2. Further, predictive QoS information can be exploited in the network to optimize the network performance for V2X services.

## Subtopic:

- 1. Prediction and network pre-adaption mechanism to improve network performance in consistent manner.**
2. Solutions/algorithms capable of generating high accuracy predictions.

# Integrated Sensing and Communications (ISAC) (5GAA Study Item proposal)

## Motivation:

From academic research, ISAC is expected to acquire information about a remote object and its surrounding. Perception of surrounding environment is a technology that is also involved with automotive industry, and it is expected to enable a basic technologies condition of ISAC for investigation of automotive use.

## Subtopic:

1. Study of ISAC approach for different scenarios, e.g., in network coverage, out of network coverage, partial coverage.
2. Study of possible frequency bands to support ISAC features
3. Enable a baseline for ISAC in RAN with an initial Study Item on channel modelling

# Outcome of 3GPP RAN and SA Workshops from 5GAA perspective

- 3GPP RAN delegates welcomed input from 5GAA as a Market Representation Partner for the automotive vertical.
- Some 3GPP delegates repeatedly pushed back V2X sidelink topics and questioned underperforming V2X sidelink deployment.
- It is normal that 5G verticals are lagging behind in terms of market adoption, but it should not be an argument to lower standardization support.
- 5G verticals should be more proactive to adopt 3GPP technologies AND provide more explicit market prospects (e.g. Roadmaps, announcements, product monitoring, market dashboard.)