



# Views from 5G-MAG towards IMT-2030

5G-MAG MEDIA ACTION GROUP

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



## 3GPP Stage 1 Workshop on IMT2030 Use Cases

Rotterdam, NL  
08 - 10 May 2024

SWS-240007



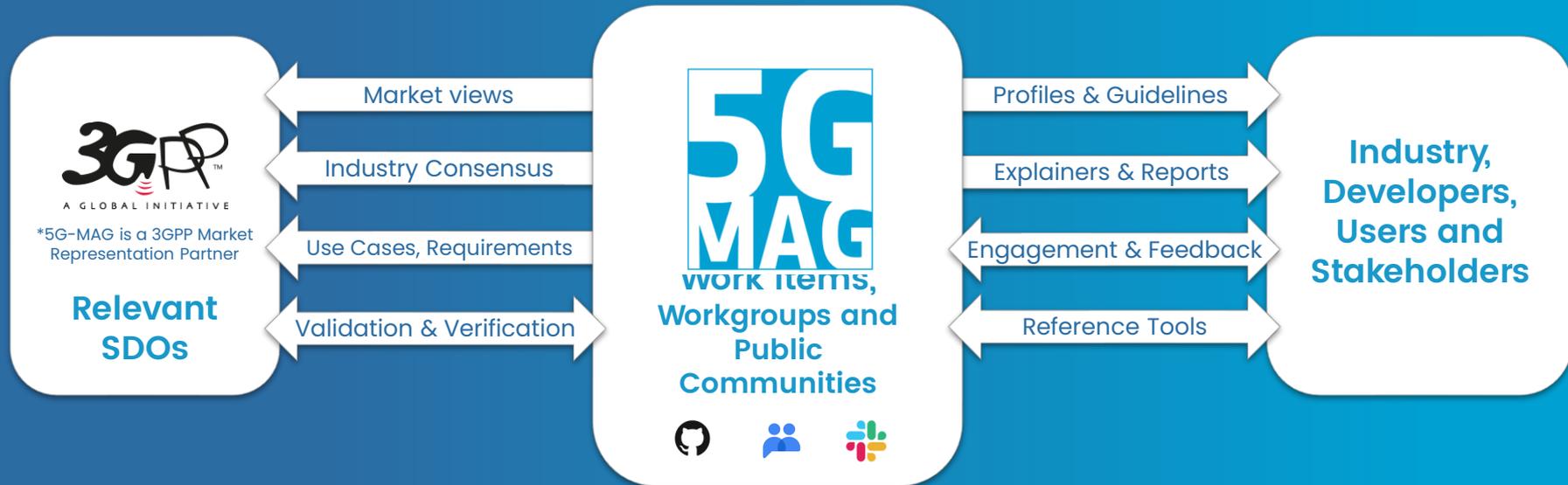


# 5G MAG



**5G-MAG MEDIA ACTION GROUP**

WHERE MEDIA MEETS CONNECTIVITY



# 5G-MAG MEDIA ACTION GROUP

## WHERE MEDIA MEETS CONNECTIVITY



# Structure of the presentation

If 6G specifications are to be developed towards 2030...



**Which design principles should be considered?**

To answer this question, we provide **GENERAL VIEWS** on **IMT-2030 technologies** supporting **MEDIA** use cases, services and applications.



**Which MEDIA use cases could 6G help supporting?**

To answer this question, we provide **EXAMPLES** of **MEDIA** use cases, services, applications alongside potential features, capabilities and requirements

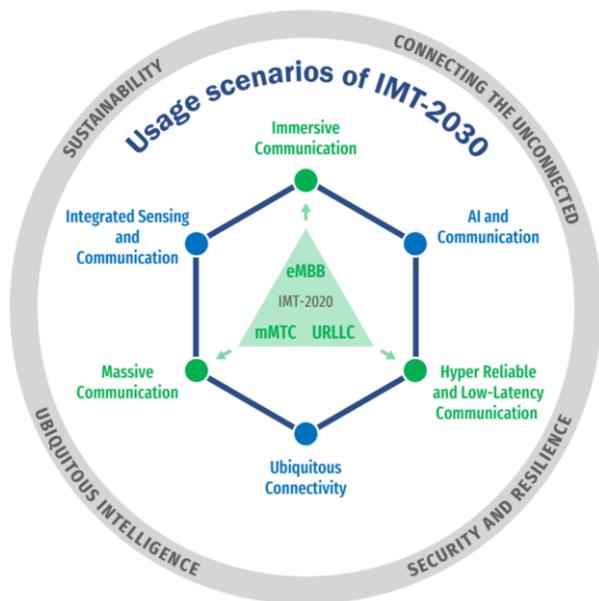


**On IMT-2030 technologies supporting Media  
General views and considerations**

# How IMT-2030 may support Media Applications

## ■ Relevant IMT-2030 usage scenarios

Source: Framework and overall objectives of the future development of IMT for 2030 and beyond, ITU-R M.2160-0, Nov. 2023.



### Immersive Communication

To support XR, telepresence, holography, metaverse,...

### Hyper Reliable and Low-Latency Communication

To support responsive accurate interaction, remote control

### Massive Communication

Multi-camera arrays, sensors for sports, large audience interaction (to be seen if qualify as “massive”)

### Ubiquitous Connectivity

Mobile, NTN, HIBS, UAS, RLAN (Wi-Fi), Broadcast

### AI and Communication

distributed training, inference, model sharing, data acquisition, preparation, processing, resource orchestration/chaining

### Integrated Sensing and Communication

spatial information about surroundings (for AI, XR, digital twins)

# How IMT-2030 may support Media Applications

- The development of technologies towards **IMT-2030** should facilitate the introduction, at **scale**, of **new media applications and services** taking into account the following **key aspects**:

Advancements in **network** and **computing** technologies

A focus on **Sustainability** and **energy consumption**

**Cost reductions** for deployment and operations along the value chain

**Automation** and **AI** with a focus on **deployability**

**Developer friendly** and **implementable** specifications

Early **RAN** considerations driven by **services, applications** and **use cases**

# How IMT-2030 may support Media Applications

- The development of technologies towards **IMT-2030** should facilitate the introduction, at **scale**, of **new media applications and services** taking into account the following **key aspects**:

Coverage

in both urban and rural environments

Sustainability

reduction of environment impact

Latency

Low+consistent latency for immersive media & media production

User experience data rate

consistent throughput for continuous, uninterrupted service

Spectrum efficiency

efficient use of scarce spectrum resources

Area traffic capacity

services in congested environments (High Demand Density areas)

Security and resilience

service continuity and the ability to provide services in times of crisis

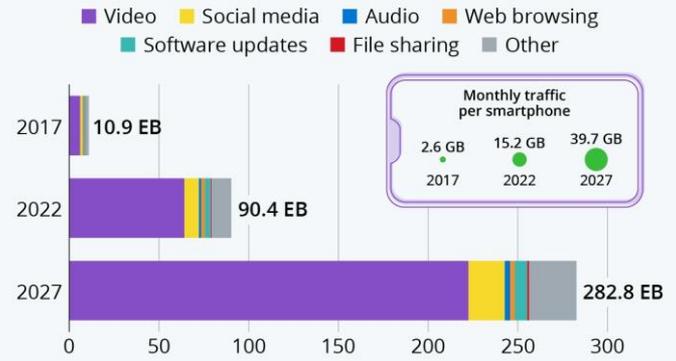
# Media Traffic driving Mobile Data Traffic



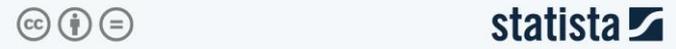
- **Increasing** media production, consumption, storage, processing over mobile and data networks
- Immersive applications with **higher bandwidth** requirements can further increase **data volumes**
- Warning on transmission cost CDN egress bandwidth
- Concerns on **Sustainability** and **Cost**

## Video Drives Surge in Mobile Data Traffic

Estimated global mobile data traffic by application category (in exabytes per month)\*



\* one exabyte equals one million terabytes  
Source: Ericsson Mobility Report



### Exemplary CDN egress bandwidth cost affected by different video data rates



# Design principles: Sustainability



The 6G System should **positively contribute towards reducing mobile network energy consumption** while still meeting traffic demand

- Prior Gs prioritized performance requirements (throughput, latency) while Energy Efficiency was only a qualitative measure (mainly for UE and Radio).
- All parts of the network to be taken into account **holistically** by considering sustainability and energy consumption as key aspects to minimize the footprint of next-generation networks.
- Key design principle for **foundational enablers** such as registration, connectivity management, session management, QoS, mobility, handover, security, identifiers,...
- **Video** is a key driver of increased mobile data traffic → reduce environmental impact through **design and measurement**.

# Design principles: Cost Reduction



Cost reduction for operators and users to foster **technology adoption**

Help reducing the **cost of video delivery**

- **6G cost per GB** may pose problems.
  - <https://www.fiercewireless.com/tech/trouble-ahead-6g-cost-gb-may-pose-problems-madden>
  - Cost/GB and retail price/GB both reducing. With retail price further reducing, how to **reduce cost**?
- **Reducing...**
  - **deployment cost** with new spectrum deployment, existing network upgrade, cost effective coverage, leverage device density, ...
  - **operating cost** energy saving, automation, cooperative communications, ...
  - **total costs of ownership** with shared RAN deployment, separate Core networks and service differentiation, RAN resource sharing
- **Cost of video** delivery
  - New codecs, AI, Smart delivery, Monetization, New KPIs, Energy Saving
  - Enhance **collaboration** models between Media Service providers and MNOs

# Design principles: Operation, Automation, Security



Enhancing **deployability**, efficiency, operational cost

**Secure** data framework

**Exposure** of data and **management options** to service providers

- Features such as AI/ML can provide **automated network operation to increase systems efficiency** and **reduce costs**.
- More and more **data** is collected in multiple parts of the network and consumer by, e.g., ML agents and network analytics. Need for **common exposure, discovery and delivery framework**
- Combination of resources and information from **multiple networks, clouds** and **third-party providers**
- Provide simple, intuitive, on-demand, and elastic **access to network resources, capabilities** and **analytics**
- **Hiding complexity** of the federated telco capabilities to open the network for **innovation**



**Examples of Media-related Use Cases,  
Requirements and Capabilities (not only KPIs)**



**Example of Use Cases, Requirements and Capabilities supported by 6G Uplink Streaming and Content Production**

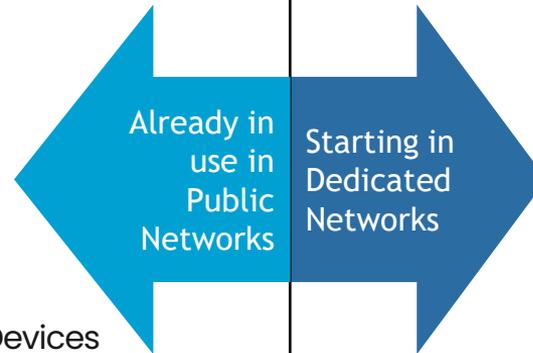
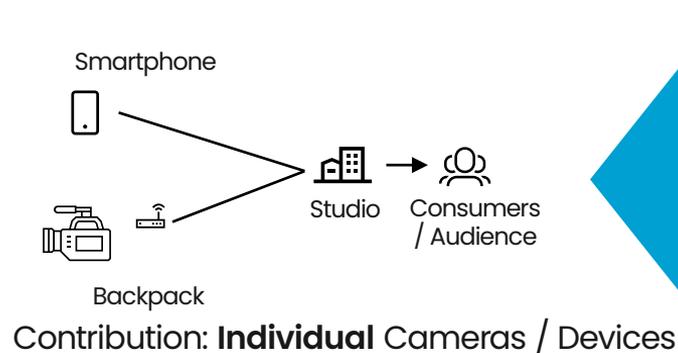
# Enhancing Uplink Streaming & Content Production

## Contribution (today)

- Primarily for “News Gathering” today

## Key Requirements

- Increased Flexibility, reduced setup-time
- Variable quality and high latency acceptable

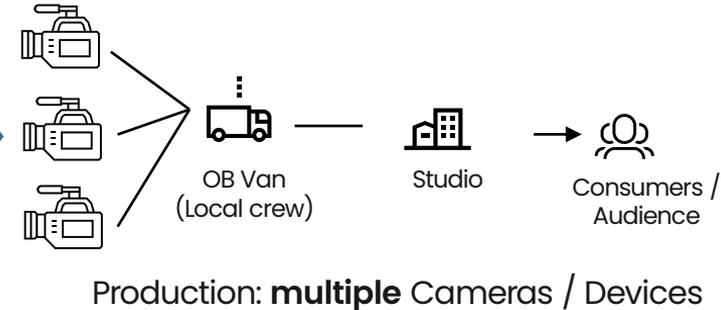


## Local Content Production (new)

- Multiple cameras & devices simultaneously in a confined area (sometimes moving)

## Key Requirements

- No compromise on **quality** and **latency**
- Time **Synchronization** between cameras & devices



# Enhancing Uplink Streaming & Content Production

Scenario	Requirements					
	Direction	Resolution	Talk back & monitor	Timing rendezvous	Remote Network Type	Latency Req (1 way M to E)
1. Piece to camera	1 way	SD / HD	None / 2 way	N/A	Local	< 1.7s
2. Two-way to camera	2 way	SD / HD	2 way	N/A	Local	< 200ms / < 1.7s
3. Lightweight studio facility	2 way	SD / HD	N way	N/A	Local	< 200ms (<150ms, jitter 50ms)
4. Multi camera event, facility edit	2 way	HD / UHD	N way	Studio or remote	Local	< 200ms (<150ms, jitter 50ms)
5. Multi camera event, remote edit	2 way	HD / UHD	N way	Remote location	Local	< 200ms (<150ms, jitter 50ms)
6. Multi camera, multi locations	2 way	HD / UHD	N way	Primary location	Local, each location	< 200ms (<150ms, jitter 50ms)
7. Remote panel show	N way	SD / HD	N way	Host location or studio	Local, each home	< 50ms, jitter < 25ms
8. Remote panel, live audience	N + M way	SD / HD	N way	Core network	Local, multiple	< 50ms, jitter < 25ms
9. Isolated music recording	1 way	SD / HD	None / 1 way	Studio	Local, multiple	< 1.7s or N/A
10. Live distributed music, AR/VR	N way	SD / HD	N way	Primary performer	5G	< 15ms, jitter < 1ms
11. Audience mobile contribution	N to 1 way	SD / HD	None	Studio	4G	< 1.7s or N/A
12. In Studio / In-Ear Monitoring	1 / 2 way	Audio	2 way	Studio	Local, single network	< 3ms, jitter < 1ms)



One-way: Not time critical

Two-way: Structured conversation

Multi-way: Natural conversation

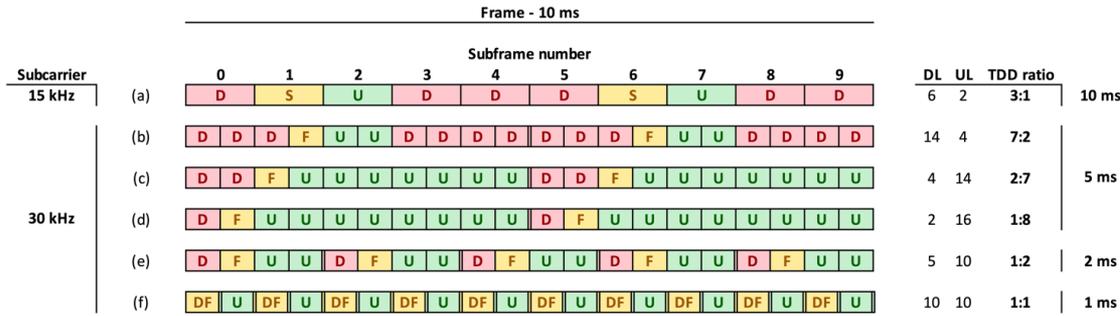
Multi-way: Time critical

Ultra-low latency

Control latency < 50ms

# Enhancing Uplink Streaming & Content Production

- Media services, including AR/VR and interaction, require **low latency, low jitter and low packet loss.**



- 5G network configured for higher upstream capacity, e.g. DL:UL is 2:7.
- Improved latency > reduced upstream capacity.
  - DL:UL of 1:2 can reduce latency and affect HARQ retransmission time.
  - Reduced MCS can increase reliability and reduce re-transmissions.

- Coexistence with other networks may require coordination
- NR TDD configurations are **limiting for ultra low latency**
- 6G RAN design should **address such limitations** to expand applicability and deployability of 6G systems



# Enhancing Uplink Streaming & Content Production

## 3GPP North API\*

Attribute name	Description
flowInfos	Description data flow.
qosReference	Pre-defined QoS information.
medType	Media type of the service.
marBwUl	Maximum requested bandwidth for the Uplink.
marBwDl	Maximum requested bandwidth for the Downlink.
mirBwUl	Minimum requested bandwidth for the Uplink.
mirBwDl	Minimum requested bandwidth for the Downlink.
tsnQos	Transports QoS parameters for TSC traffic.
tscaiInputUl	Transports TSCAI parameters for TSC DS-TT/UE (UL direction).
tscaiInputDl	Transports TSCAI parameters for TSC DS-TT/UE (DL direction).
rTtLatencyReq	<b>Round-Trip (RT) latency required.</b>

## 3GPP PCF\*\*

Information	Description
MBR (UL/DL)	The uplink/downlink maximum bitrate authorized for the service data flow.
GBR (UL/DL)	The uplink/downlink guaranteed bitrate authorized for the service data flow.
UL sharing indication	Indicates resource sharing in uplink
DL sharing indication	Indicates resource sharing in downlink
Priority Level	Priority in scheduling QoS Flows.
Averaging Window	Duration over which the guaranteed and maximum bitrate shall be calculated.
Maximum Data Burst Volume	Denotes the largest amount of data that transferred within a period
UL Maximum Packet Loss Rate	The maximum rate for lost packets that can be tolerated in the uplink.
DL Maximum Packet Loss Rate	The maximum rate for lost packets that can be tolerated in the downlink.
Threshold value(s)	Threshold value(s) for maximum RTT or maximum Packet Loss Rate.
Packet Delay Budget	<b>Indicates the packet delay budget.</b>
Packet Error Rate	Indicates the packet error rate in this Alternative QoS Parameter Set.
GBR (UL/DL)	The uplink/downlink guaranteed bitrate authorized for flow.

## 3GPP Media Streaming\*\*\*

Property name	Description
marBwDlBitRate	<b>Maximum requested bit rate</b> for the Downlink.
marBwUlBitRate	<b>Maximum requested bit rate</b> for the Uplink.
minDesBwDlBitRate	<b>Minimum desired bit rate</b> for the Downlink.
minDesBwUlBitRate	<b>Minimum desired bit rate</b> for the Uplink.
mirBwDlBitRate	<b>Minimum requested bit rate</b> for the Downlink.
mirBwUlBitRate	<b>Minimum requested bandwidth</b> for Uplink.
desLatency	<b>Desired Latency.</b>
desLoss	Desired <b>Loss Rate.</b>

- \* R18 more complex
- \*\* Monitoring
- \*\*\* Monitoring & media specific

## CAMARA QoD

QoS Profile labels	Network Service Description
QOS_E	Latency stays stable under congestion (throughput up to a certain bit rate limit).
QOS_L	The 5G System throughput is prioritized up to certain <b>higher bit rate limit</b> (e.g. 20Mbps), or without an explicit limit.
QOS_M	The 5G System throughput is prioritized up to certain <b>medium bit rate limit</b> (e.g. 8Mbps).
QOS_S	The 5G System throughput is prioritized up to certain <b>lower bit rate limit</b> (e.g. 4Mbps).

- E.g. No parameters to set **min/max latency** or required **jitter**.
- Disparity of APIs with unclear relation. Lack of API “continuity”
- **6G** should emphasize on **APIs driven by services and applications**



**Focus on Implementability and APIs**



Example of Use Cases, Requirements and Capabilities supported by 6G Content Delivery and Streaming

# Enhancing the Global Media Delivery Platform

- **Global universal Media Delivery Platform**
  - Continue and accelerate the integration of Media Services to the 3GPP global delivery platform – **economy of scale**
  - Build on existing architectures: 5G Media Delivery Architecture and IMS
  - No revolution, but **evolution** and **adaptation** to 6G core, radio and design principles
- **Early RAN design consideration** ensuring future extensibility and addition of new features
  - even if not addressed in first release, ensure **extensibility**, not an afterthought



**Focus on Architecture and Scalability**

# Enhancing the Global Media Delivery Platform

- **High-Fidelity Inflight entertainment with Non-Terrestrial Networks**
  - Extending your “personal broadband” experience to the sky
  - From limited and pre-defined choice to bringing your own subscriptions



Focus on **improvements** for:

- Serving a **mass audience** (better codecs and protocols, point to multipoint, broadcast)
- **High speed mobility**
- **Seamless handover** to maintain stream continuity

**Value** for satellite/terrestrial **operators, airlines, service providers** and **passengers**.

Efficient **integration** of GSO and NGSO



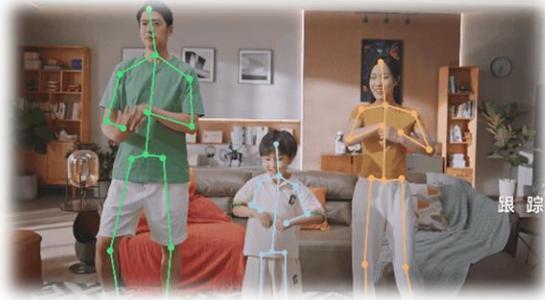
**Focus on Data Rate and Mobility**



**Example of Use Cases, Requirements and Capabilities supported by 6G  
Media Beyond 2D**

# Media beyond 2D: Increased Interactivity and Sociability

- **Network assisted AI agents: Fitness, sports, games...:**
  - Interactive media experience where participants enjoy a **multi-sensory experience** using smart devices such as phones, TVs, automotive infotainment,...



Focus on **improvements** for:

- Distributed AI service processing (training/inference/rendering/sensing) with E2E **ultra low latency** at **large scale**.
- **Network assisted** AI agents with context understanding, user intent reaction
- **User data** and **privacy protection**.

**Value** for users through:

- **Sociability:** instant content sharing without barriers.
- **Intelligence:** augmented content matching users' interests and preference.
- **Immersiveness:** social TV enhanced with metaverse-like experience.



**Focus on Computing, AI and Security**

# Media beyond 2D: Increased Interactivity and Sociability

## AI augmented watch party

- Remote participants joining an event or program as if they are **watching it physically**. Contents can be augmented or transformed in real time based on the service context and user intents.



Focus on **improvements** for:

- Easy to integrate **APIs for immersive RTC** services and media services with **cross-service** and **cross-user synchronization**.
- AI for content augmentation/generation based on **user intents** and **cross-service context** (media delivery and multi modal RTC)

**Value** for users through:

- Intelligence**: advanced AI experience with reduced device complexity and cost
- Interactivity**: real-time and multi-modal natural interaction with users
- Ubiquity**: consistent experience across different access means and devices



**Focus on APIs, Synchronization and AI**



Example of Use Cases, Requirements and Capabilities supported by 6G  
eXtended Reality and Immersive Media

# Massively Interactive Live Events & Digital Twins



- **Large-scale crowds** with audience interactions within the **XR experience**. Remote audience with same **sense of immediacy**. Performers are captured and reconstructed as **photorealistic streams**. Real-time performances **remotely distributed between venues and interacting**
- Focus on **improvements** for
  - High performance **media processing** resources for advanced volumetric media rendering
  - real-time **XR/avatar communications** for massive users and light-weight devices
  - serving a **mass audience** and **high data rates**
  - Media and AR/VR services require **consistent latency**
  - Interaction requires **low latency, low jitter** and **low packet loss**.
  - **Synchronization** of audio, video, lighting, and volume

[IBC Accelerator Project: Synthetic Humans for Entertainment and Accessibility \(ibt.org\)](https://www.ibt.org)



**Focus on User Density, Reliability and Latency**

# Immersive e-gaming & virtual sports

- **Enhancing remote multiplayer e-gaming**
  - To experience **physical proximity**
  - From physically separated gaming, to **immerse multiplayer experience**



Focus on **improvements** for:

- Accurate **positioning**
- **Reliability** in transmission
- **Bandwidth-efficient** formats
- Low and consistent **latency**

**Value** for **gaming platforms, VR-device vendors, CSP/Telcos, gamers**



**Focus** on **Reliability** and **Position Accuracy**

# Holographic Interview & Entertainment

- **Extending remote participation towards perceived physical presence**
  - From 2D high quality video to **interactive 3D experiences**



Focus on **improvements** for:

- realistic **sensing**
- massive **data-rate** (codecs, formats, protocols)
- **low latency UL** connection with media processing resources and mobility support
- Enhanced **real time communication** supporting **avatar and holographic** representations

**Value** for **application providers, VR-device vendors, CSP/Telcos, consumers**



**Focus** on **Sensing, Data Rates and Latency**

# 5G-MAG & 6G: A Platform for Innovation in Media

If 6G specifications are to be developed towards 2030,  
**5G-MAG MEDIA ACTION GROUP** is ready to...

## Support enhancing Network APIs

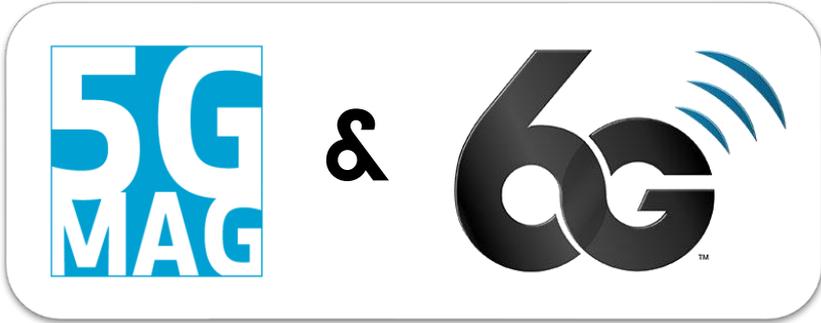
Simple, intuitive, on-demand, and elastic access to network resources, capabilities and analytics  
Hiding complexity of federated telco capabilities, open the network for innovation

## Focus on Developer-friendly and implementable specs

APIs, code, examples, git-environments, exchange with developers, testing, evaluation, code, reference software

## Help 3GPP developing specifications

against meaningful KPIs for media services and supporting gap analysis to justify why new RAT is needed



## Evolve technology based on experiences and learning

building principles established in 5G

**Foster fluent collaboration** with the industry and market representation partners

# Thank you

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**For further reading...**



About  
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# WHERE MEDIA MEETS CONNECTIVITY

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About us  
Who we are



About  
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# 5G MAG



**5G-MAG MEDIA ACTION GROUP**

WHERE MEDIA MEETS CONNECTIVITY



We foster **collaboration** across the **global media and telecom industries** through pragmatic and member-driven work.



Our focus: **new media experiences** powered by the **Internet, mobile technologies, networks, multimedia systems, codecs, and APIs.**



We are an **independent international non-for-profit cross-industry** association

# 5G-MAG MEDIA ACTION GROUP

WHERE MEDIA MEETS CONNECTIVITY



# About us

## Member and Contribution-driven Work



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

# Pre-Standardization: Market- and Consensus-driven

Services & Applications



We identify **market needs** and translate them into concrete **use cases, applications, services** and related **requirements**.

Requirements



As **3GPP Market Representation Partner (MRP)**, we advise 3GPP on market demands and help members reaching **consensus** on requirements, services, features, and functionalities.

Architectures, Features, APIs

Market Opportunities



We leverage fast **innovation** cycles by working with **global** technologies, networks, and platforms developed together by **multiple industries**.

## 5G-MAG MEDIA ACTION GROUP

WHERE MEDIA MEETS CONNECTIVITY

# Post-Standardization: Technology into Action

 We create **specification profiles, implementation guides, and deployment guidelines** to make technologies easy to adopt.

**Specification Profiles & Guidelines**

 We provide valuable **feedback** to **Standards Development Organizations (SDOs)** based on software implementation, trials and demos

**Reference Tools & Interop**

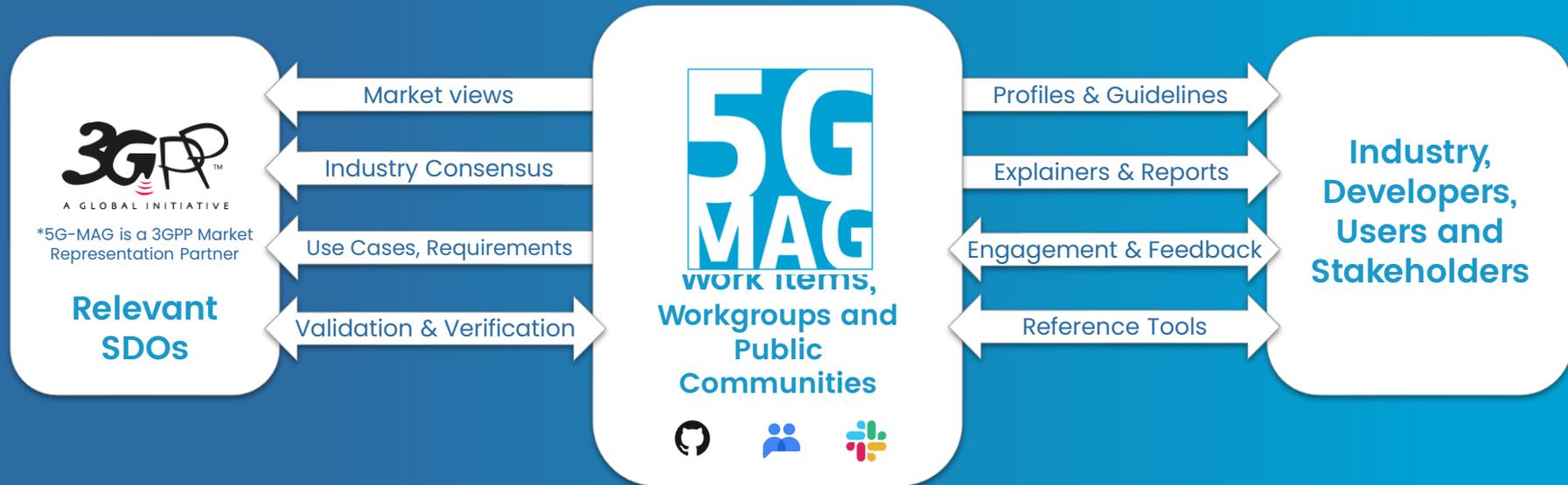
 We create **open-source software reference implementations** to empower developers and users. Ultimately, we **promote technology** uptake.

**Feedback & Validation**

**Ecosystem & Technology Uptake**

## 5G-MAG MEDIA ACTION GROUP

WHERE MEDIA MEETS CONNECTIVITY



# 5G-MAG MEDIA ACTION GROUP

## WHERE MEDIA MEETS CONNECTIVITY





About our work...

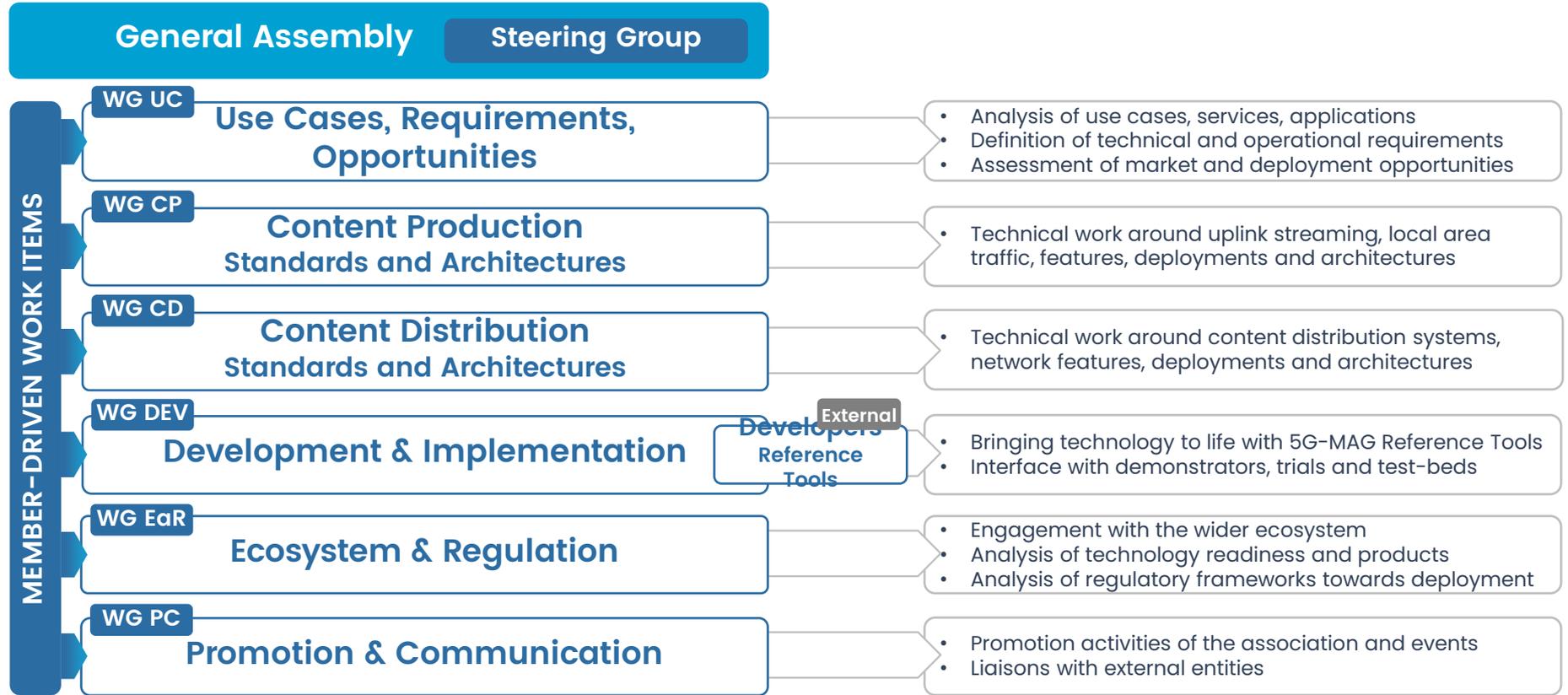
**How we Work and What the Outcomes are**



Work

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

# Our structure and its relation to the work



# Member-driven Work

## WORK ON USE CASES AND REQUIREMENTS

Which [WORKGROUPS](#) to join?

UC

Check [RESOURCES](#) for outcomes in the form of Reports or inputs to industry organizations.

For instance, 5G-MAG, in its role as 3GPP MRP, has provided input to define the scope of 3GPP Releases

Reports are open to feedback from the industry. Learn how to provide feedback in [FEEDBACK LOOPS](#)

Use the relevant GitHub projects to provide feedback ([GitHub/Requests-for-Feedback](#))

## WORK ON SPECIFICATIONS, ARCHITECTURES, FEATURES

Which [WORKGROUPS](#) to join?

CP

CD

Check [RESOURCES](#) for outcomes in the form of Profiles, Guidelines and Reports.

Practical lists of specifications and reference guidelines can also be found in GitHub ([GitHub/Standards](#))

Feedback on specifications can be provided in [GitHub/Standards](#). Learn how to provide feedback in [FEEDBACK LOOPS](#). 5G-MAG liaises with relevant SDOs or industry organizations to discuss the issues raised and resolve the problems found.

## WORK ON ECOSYSTEM AND REGULATORY ASPECTS

Which [WORKGROUPS](#) to join?

EaR

Check [RESOURCES](#) for related Reports on ecosystem and regulatory aspects.

Reports are open to feedback from the industry. Learn how to provide feedback in [FEEDBACK LOOPS](#)

# Member-driven Work

## WORK ON REFERENCE TOOLS

Which [WORKGROUPS](#) to join?

DEV

The work happens in an [OPEN developer community](#), which both organizations and individuals can join.

A [PUBLIC CALL](#) is organized each last Friday of the month to reach a wider audience and get feedback beyond the 5G-MAG Community.

All the relevant information can be found in the [DEVELOPER SPACE](#), while the actual software and documentation is in GitHub ([GitHub/Getting-Started](#)).

As part of the 5G-MAG Reference Tools Development Programme, developers provide insight into specs towards development/implementation and how to use the reference tools, for instance, in demos and trials ([ACADEMY](#)).

While developing code, potential feedback to specifications ([FEEDBACK LOOPS](#)) is handled in GitHub ([GitHub/Standards](#)).

Communication between the developer community happens in the 5G-MAG Forum ([Slack](#)).

Announcements on release candidates and new releases are made available through the Mailing List ([Google Groups](#)).

## WORK ON COMPREHENSIVE MATERIALS

Which [WORKGROUPS](#) to join?

ALL

Materials are available at [RESOURCES](#) (e.g. 5G-MAG Explainers)

Other resources are under [ACADEMY](#), as results of Workshops, invited speakers, videos by developers, etc.



About our work...  
**Current Topics and Work Items**



Work

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



## Media over IP

Live Contribution and Remote Production beyond just connectivity



## 5G Media Streaming

Driving effective collaboration between media applications and mobile networks



## 5G Broadcast

Global broadcast standard for TV, radio and emergency alerts on mainstream devices



## 5G Multicast Broadcast

Scalability for content delivery in mobile networks through point-to-multipoint communication



## Media beyond 2D

User experiences beyond traditional 2D services to apps and browsers



## eXtended Reality & Immersive Media

Towards the next computing platform converging the digital, physical & virtual worlds



## Non-Terrestrial Networks

Media over Satellites, HAPS, UVAs and hybrid TN and NTN networks



# Check the Current Topics at [5g-mag.com](https://5g-mag.com)

Member-, contribution-driven and pragmatic work



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

## SCOPE OF THE WORK

# “From Unreliable to Reliable Connectivity: Enhancing Media Production and Uplink Streaming”



### AVAILABLE RESOURCES

**Report:** [Towards a comprehensive 5G-based toolbox for live media production](#)

**Report:** [Spectrum access for live media production over Non-Public Networks \(NPNs\)](#)

**Report:** [Guidelines on registration and onboarding for media production equipment over 5G NPNs](#)

**Report:** [Time synchronization services for media production over 5G networks](#)

**Explainer:** [Non-Public 5G Networks for Content Production](#)

**Explainer:** [Deploying stand-alone Non-Public 5G Networks for media production](#)

**Explainer:** [5G NPNs for media production in collaboration with third-party networks](#)

**3GPP TR:** [3GPP TR 26.805 Study Item on “Media Production over 5G NPN Systems](#)

**Workshops** organized to collect input for 3GPP SA4-led Study Item on “Media Production over 5G NPN Systems”: [5g-mag.com/workshops](https://5g-mag.com/workshops)



### WORK IN PROGRESS

Related 5G-MAG Work Items:

**WI\_006\_5GNPN «Non-Public Networks in Media Production»** [INFO FOR MEMBERS](#)

**WI\_008\_FeasibilityAVPROD «Feasibility Analysis for Audiovisual Production over 5G»** [INFO FOR MEMBERS](#)

For information on the Work in Progress, please contact us at [info@5g-mag.com](mailto:info@5g-mag.com)

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



## Media over IP: Live Contribution and Remote Production

## SCOPE OF THE WORK

“Driving effective collaboration between mobile media applications and mobile networks”



### AVAILABLE RESOURCES

**Specifications** relative to 5G Media Streaming at [5g-mag.com/standards](https://5g-mag.com/standards)

**Feedback** to specifications at [github.com/5G-MAG/Standards/issues](https://github.com/5G-MAG/Standards/issues)

Regular **exchanges with 3GPP SA4** [5g-mag.com/post/5g-mag-xchange-with-3gpp-sa4](https://5g-mag.com/post/5g-mag-xchange-with-3gpp-sa4)

**5G-MAG REFERENCE TOOLS** at [developer.5g-mag.com](https://developer.5g-mag.com) and [5g-mag.github.io/Getting-Started/](https://5g-mag.github.io/Getting-Started/)

**ETSI Document:** [ETSI TR 103 972](https://www.etsi.org/standards-search/ETSI-TR-103-972) “Deployment Guidelines for DVB-I services over 5G Systems”

**TECH XCHANGES** relative to 5G Media Streaming can be found at [5g-mag.com/tech-xchanges](https://5g-mag.com/tech-xchanges)

**DEVELOPER XCHANGES** relative to 5G Media Streaming can be found at [5g-mag.com/tutorials](https://5g-mag.com/tutorials)



### WORK IN PROGRESS

Related 5G-MAG Work Items:

WI\_002\_MobileDistribution «Media distribution over 5G Mobile Networks» [INFO FOR MEMBERS](#)

WI\_003\_5GStreaming «5G Linear and On-Demand Streaming» [INFO FOR MEMBERS](#)

WI\_005\_AVCodecs «Audio-Video Codecs and Protocols» [INFO FOR MEMBERS](#)

For information on the Work in Progress, please contact us at [info@5g-mag.com](mailto:info@5g-mag.com)

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



# Live and On-Demand Media Streaming

## SCOPE OF THE WORK

### “Global broadcast standard to mainstream 3GPP devices”



#### AVAILABLE RESOURCES

**Specifications** relative to 5G Broadcast at [5g-mag.com/standards](https://5g-mag.com/standards)

**Maintenance** of [ETSI TS 103 720 "5G Broadcast System for TV and Radio Services"](https://www.etsi.org/standards-search/ETSI-TR-103-720)

**Explainer:** [LTE-based 5G Terrestrial Broadcast for TV and radio distribution](#)

**Explainer:** [Spectrum for LTE-based 5G Terrestrial Broadcast](#)

**Report:** [Time and Frequency Interleaving for broadcast services in 3GPP Systems](#)

**ETSI Document:** [ETSI TR 103 972 "Deployment Guidelines for DVB-I services over 5G Systems"](https://www.etsi.org/standards-search/ETSI-TR-103-972)

**Feedback** to specifications at [github.com/5G-MAG/Standards/issues](https://github.com/5G-MAG/Standards/issues)

**5G-MAG REFERENCE TOOLS** at [developer.5g-mag.com](https://developer.5g-mag.com) and [5g-mag.github.io/Getting-Started/](https://5g-mag.github.io/Getting-Started/)

**TECH XCHANGES** relative to LTE-based 5G Broadcast can be found at [5g-mag.com/tech-xchanges](https://5g-mag.com/tech-xchanges)

**DEVELOPER XCHANGES** relative to LTE-based 5G Broadcast can be found at [5g-mag.com/tutorials](https://5g-mag.com/tutorials)



#### WORK IN PROGRESS

Related 5G-MAG Work Items:

**WI\_001\_LTE5GBroadcast «LTE-based 5G Terrestrial Broadcast»** [INFO FOR MEMBERS](#)

**WI\_003\_5GStreaming «5G Linear and On-Demand Streaming»** [INFO FOR MEMBERS](#)

**WI\_005\_AVCodecs «Audio-Video Codecs and Protocols»** [INFO FOR MEMBERS](#)

For information on the Work in Progress, please contact us at [info@5g-mag.com](mailto:info@5g-mag.com)

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



# 5G Broadcast for TV, Radio and Emergency Alerts

## SCOPE OF THE WORK

# “Optimizing Mobile Network Scalability for Concurrent Content Consumption with Multicast”



## AVAILABLE RESOURCES

**Specifications** relative to 5G Multicast Broadcast Services at [5g-mag.com/standards](https://5g-mag.com/standards)

**Explainer:** [Media distribution with 5G Multicast-Broadcast Services](#)

**Report:** [Time and Frequency Interleaving for broadcast services in 3GPP Systems](#)

**Feedback** to specifications at [github.com/5G-MAG/Standards/issues](https://github.com/5G-MAG/Standards/issues)

Regular **exchanges with 3GPP SA4** [5g-mag.com/post/5g-mag-xchange-with-3gpp-sa4](https://5g-mag.com/post/5g-mag-xchange-with-3gpp-sa4)

**5G-MAG REFERENCE TOOLS** at [developer.5g-mag.com](https://developer.5g-mag.com) and [5g-mag.github.io/Getting-Started/](https://5g-mag.github.io/Getting-Started/)

**TECH XCHANGES** relative to 5G MBS can be found at [5g-mag.com/tech-xchanges](https://5g-mag.com/tech-xchanges)

**DEVELOPER XCHANGES** relative to MBS User Services can be found at [5g-mag.com/tutorials](https://5g-mag.com/tutorials)



## WORK IN PROGRESS

Related 5G-MAG Work Items:

**WI\_004\_MulticastBroadcast «5G Multicast Broadcast Services»** [INFO FOR MEMBERS](#)

**WI\_003\_5GStreaming «5G Linear and On-Demand Streaming»** [INFO FOR MEMBERS](#)

For information on the Work in Progress, please contact us at [info@5g-mag.com](mailto:info@5g-mag.com)

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



# Multicast and Broadcast Delivery over 5G Networks

## SCOPE OF THE WORK

“User experiences beyond traditional 2D services to apps and browsers”



### AVAILABLE RESOURCES

The members are working on it...



### WORK IN PROGRESS

Related 5G-MAG Work Items:

WI\_009\_AdvancedMedia5G «Advanced Media Services over 5G» [INFO FOR MEMBERS](#)

For information on the Work in Progress, please contact us at [info@5g-mag.com](mailto:info@5g-mag.com)

[5g-mag.com/beyond2D](https://5g-mag.com/beyond2D)



# Media beyond 2D: Advanced Media Services over 5G

## SCOPE OF THE WORK

“Towards the next computing platform converging the digital, physical and virtual worlds”



### AVAILABLE RESOURCES

**Specifications** relative to XR Media Integration in 5G at [5g-mag.com/standards](https://5g-mag.com/standards)

**5G-MAG REFERENCE TOOLS** at [developer.5g-mag.com](https://developer.5g-mag.com) and [5g-mag.github.io/Getting-Started/](https://5g-mag.github.io/Getting-Started/)

**TECH XCHANGES** relative to XR can be found at [5g-mag.com/tech-xchanges](https://5g-mag.com/tech-xchanges)



### WORK IN PROGRESS

Related 5G-MAG Work Items:

**WI\_011\_XR\_3D\_Assets «XR and 3D Assets in 5G-based communication»** [INFO FOR MEMBERS](#)

For information on the Work in Progress, please contact us at [info@5g-mag.com](mailto:info@5g-mag.com)

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



# eXtended Reality and Immersive Media

## SCOPE OF THE WORK

“Media over Satellites, HAPS, UVAs and hybrid TN and NTN networks”



### AVAILABLE RESOURCES

The members are working on it...



### WORK IN PROGRESS

Related 5G-MAG Work Items:

WI\_012\_Media\_NTN «Media Distribution over Non-Terrestrial Networks» [INFO FOR MEMBERS](#)

For information on the Work in Progress, please contact us at [info@5g-mag.com](mailto:info@5g-mag.com)

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



# Media Distribution over Non-Terrestrial Networks

## SPECIFICATION PROFILES, IMPLEMENTATION & DEPLOYMENT GUIDELINES

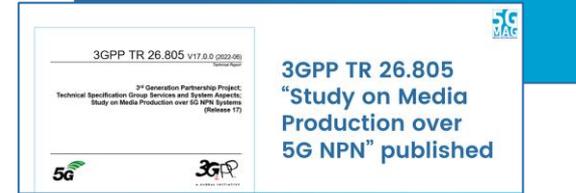
We get specifications closer to developers, operators and users  
[5g-mag.com/standards](https://5g-mag.com/standards) - [github.com/5G-MAG/Standards/](https://github.com/5G-MAG/Standards/)

## LIAISON STATEMENTS AND INPUTS TO SDOS

We build consensus on technologies, features and requirements  
[5g-mag.com/techinputs](https://5g-mag.com/techinputs)

## FROM HIGH-LEVEL TO EXTENSIVE DETAILS ON TECHNICAL TOPICS

We elaborate 5G-MAG Explainers and Reports  
[5g-mag.com/explainers](https://5g-mag.com/explainers) - [5g-mag.com/reports](https://5g-mag.com/reports)



# Resources

Our work on technologies and specifications

 [github.com/5G-MAG/Standards](https://github.com/5G-MAG/Standards)

 [Discussions at the 5G-MAG Forum](#)



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

## FEEDBACK ON SPECIFICATIONS: ISSUES, BUG-FIXING & FEATURE REQUESTS

We help enhancing specifications with feedback from developers, operators and users  
[github.com/5G-MAG/Standards/](https://github.com/5G-MAG/Standards/)



Collaboration with 3GPP SA4



**3GPP SA4  
XCHANGE**

## 5G-MAG WELCOMES FEEDBACK FROM THE INDUSTRY

We let the industry improve 5G-MAG Publications with expert feedback  
[github.com/5G-MAG/Requests-for-Feedback](https://github.com/5G-MAG/Requests-for-Feedback)



# Feedback Loops

Enhancing technology through expert feedback

 [github.com/5G-MAG/  
Requests-for-Feedback](https://github.com/5G-MAG/Requests-for-Feedback)

 [github.com/5G-MAG/  
Standards](https://github.com/5G-MAG/Standards)



**Feedback Loops**  
[5g-mag.com/feedback](https://5g-mag.com/feedback)

# Technology into Action

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



## Community of Developers

We bring technology closer to developers



## Reference Implementations

To validate, test, demo and create products



## Feedback to SDOs

To help improve specifications



## IPR-friendly License Model

To encourage contributions from the industry

# 5G-MAG Reference Tools

Open-source Software for Multimedia Applications



[5g-mag.github.io/  
/Getting-Started](https://5g-mag.github.io/Getting-Started)



Developer Space

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

## WORKSHOPS

To engage with relevant stakeholders: [5g-mag.com/workshops](https://5g-mag.com/workshops)

## TECH XCHANGES

Providing insight into technologies: [5g-mag.com/tech-xchanges](https://5g-mag.com/tech-xchanges)

## ACADEMY XCHANGES

With invited experts: [5g-mag.com/academy-xchanges](https://5g-mag.com/academy-xchanges)

## «5G-MAG MEETS...»

Interacting with other organizations: [5g-mag.com/5g-mag-meets](https://5g-mag.com/5g-mag-meets)

## DEVELOPER XCHANGES

Directly from 5G-MAG Reference Tools developers: [5g-mag.com/tutorials](https://5g-mag.com/tutorials)

## OSMART WORKSHOPS

Collaborating with other organizations on Reference Tools: [5g-mag.com/osmart](https://5g-mag.com/osmart)



# Academy

Opportunities to learn, discuss and engage



[github.com/5G-MAG/Standards](https://github.com/5G-MAG/Standards)



[www.youtube.com/@5gmag](https://www.youtube.com/@5gmag)



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



Join and contribute to the efforts  
**Membership**



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

# Become a member

Membership Fee Category

**LARGE**

Annual Revenues

> €1 billion

Annual Membership Fee

**€15.000**

Membership Fee Category

**MEDIUM**

Annual Revenues

€100 million – €1 billion

Annual Membership Fee

**€10.000**

Membership Fee Category

**SMALL**

Annual Revenues

€5 million – €100 million

Annual Membership Fee

**€5.000**

Membership Fee Category

**MICRO**

Annual Revenues

< €5 million

Annual Membership Fee

**€2.000**

The "Micro" category also includes: Universities, Regulators, Public research bodies, Institutions, NGOs, and not-for-profit organisations.



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