



# Standards and Software for Connected Media Experiences

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Updated in November 2025

# About us

Driving **Standards** and **Software**  
for **Connected Media Experiences**

**Media Applications**

supported by **internet-based** tech and networks

**Connectivity**

leveraging **ubiquity**,  
**computing** and **APIs**



**Standards**

for global **scalability** and  
seamless interoperability

**Open-Source**

fostering **trust** towards  
**services** and **products**

**Industry Collaboration**

under a **neutral**, **hands-on** non-for-profit **industry association**

# Our Work in 3 steps

1

## Pre-Standardization

- Collaboration scenarios & use cases
- Architectures and Features
- Market-driven requirements and features

2

## Supporting Standards Development

- Standards tracking and roadmaps
- Feedback to Standards
- Implementation and deployment guidelines

3

## Post-Standardization

- Open source developer community
- Validation Standards & Applications
- Prototyping, Trials and Ecosystem-drive



# Member-driven Topics and Projects...

Internet-based  
Media  
Delivery



Media Production over  
Mobile  
Networks

5G Broadcast

Towards 6G Media



eXtended Reality (XR)  
and  
Immersive Media Experiences



# ... supported by global connectivity standards

5G-MAG is a **3GPP Market Representation Partner (MRP)** and supports the ecosystem of standards for connected media





## About Standards...

# Internet-based Media Delivery

Supporting **Audiovisual content** (including TV/radio) increasingly consumed over the **internet** and **mobile networks**



-  **5G Media Streaming Architecture**
-  **UE Data Collection, Reporting & Event Exposure**
-  **5G Multicast Broadcast Services**
-  **Real-Time Media Communication**
-  **Network Capability Exposure through APIs**
-  **Non-Terrestrial Networks**
-  **Multimedia Content Delivery Protocols**
-  **DVB-I Services over 5G Systems**

- Streaming platforms
- Collaboration with mobile networks
- Network assistance, throughput estimation, QoS policies,...
- Data collection and event reporting
- Scalability through multicast
- RTC and low-latency comms



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[hub.5g-mag.com/Getting-Started](http://hub.5g-mag.com/Getting-Started)



# Media Production over Mobile Networks

**Content creation and media transport simplified by ubiquitous connectivity (NPNs, venues, NTN,...)**



-  **Non-Public Networks**
-  **Time Sensitive Communication**
-  **5G Media Streaming Architecture**
-  **UE Data Collection, Reporting & Event Exposure**
-  **Real-Time Media Communication**
-  **Network Capability Exposure through APIs**
-  **Non-Terrestrial Networks**

- Uplink video contribution
- Non-Public Network (Private Networks) for Media Production
- UE Credentials and Remote Provisioning
- Time Synchronization
- Network APIs for Communication Quality
- Advanced Media Delivery



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# 5G Broadcast

Scalability for streaming services (TV/Radio) over dedicated **broadcast** networks



-  5G Broadcast: TV & Radio Hybrid Services
-  5G Broadcast: Emergency Alerts
-  5G Media Streaming Architecture
-  UE Data Collection, Reporting & Event Exposure

- Dedicated broadcast networks
- Receive-only mode
- Single-frequency networks
- DASH/HLS/CMAF
- Integration with streaming services to mobile devices
- Dynamic unicast/broadcast switching
- Broadcast-on-Demand



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[hub.5g-mag.com/Getting-Started](http://hub.5g-mag.com/Getting-Started)

# eXtended Reality and Immersive Media

**Immersive experiences** maturing with more accessible devices, computing capabilities,...



 **XR Media with MPEG-I Scene Description**

 **Volumetric Video Experiences with MPEG V3C**

 **Real-Time Media Communication**

 **Beyond 2D Video Experiences**

 **AI/ML in Mobile Media Services**

- XR Scene Representation
- Integration of Media in XR Scenes
- Volumetric Video Experiences and Beyond 2D
- Real-Time Media Comm



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# Towards 6G Media

Enabling next-generation media use cases  
for 2030 and beyond



6G & MEDIA  
General views and priorities  
Cross-TSG aspects

5G-MAG Media Action Group  
info@5g-mag.com

3GPP Workshop on 6G  
Incheon, Korea, March 10-11, 2025

6GWS-250137

5G MAG  
MEDIA ACTION GROUP

Views from 5G-MAG towards IMT-2030

5G-MAG MEDIA ACTION GROUP  
www.5g-mag.com

3GPP Stage 1 Workshop on IMT2030 Use Cases  
Bilbao, NL  
08 - 10 May 2024

SWS\_240007

5G MAG

	Security	AI	Immersive Com	Sustainability	Energy Efficiency	Ubiquitous and Resilient coverage	Sensing	“Smart life”	Native VoG/G	FWA-FWC	LPWA	Northbound API	Healthcare	Autonomous Driving	Positioning	Backward Compatibility
GSMA	✓	✓	✓	✓				✓								
NGMN	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓		✓	✓
5GAA	✓	✓	✓	✓	✓	✓	✓							✓	✓	
5G-ACIA	✓	✓	✓	✓	✓	✓	✓								✓	
<b>5G-MAG</b>	✓	✓	✓	✓	✓	✓	✓	✓				✓				
GSOA	✓								✓					✓		
TCCA	✓	✓				✓										✓
WBA	✓	✓					✓									✓
B5GPC	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	
6GForum	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	
IMT-2030RG	✓	✓	✓	✓	✓	✓	✓	✓						✓		
B6GA	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NextGA	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
6GSNS-ICE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ITU	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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



# Standards – The Topics

 5G Media Streaming Architecture

 UE Data Collection, Reporting & Event Exposure

 5G Broadcast: TV, Radio and Emergency Alerts

 5G Multicast Broadcast Services

 Real-Time Media Communication

 Network Capability Exposure through APIs

 Non-Terrestrial Networks

 Non-Public Networks

 Time Sensitive Communication

 XR Media with MPEG-I Scene Description

 Volumetric Video Experiences with MPEG V3C

 Beyond 2D Video Experiences

 AI/ML in Mobile Media Services

 Multimedia Content Delivery Protocols

 DVB-I Services over 5G Systems

 Towards 6G Media

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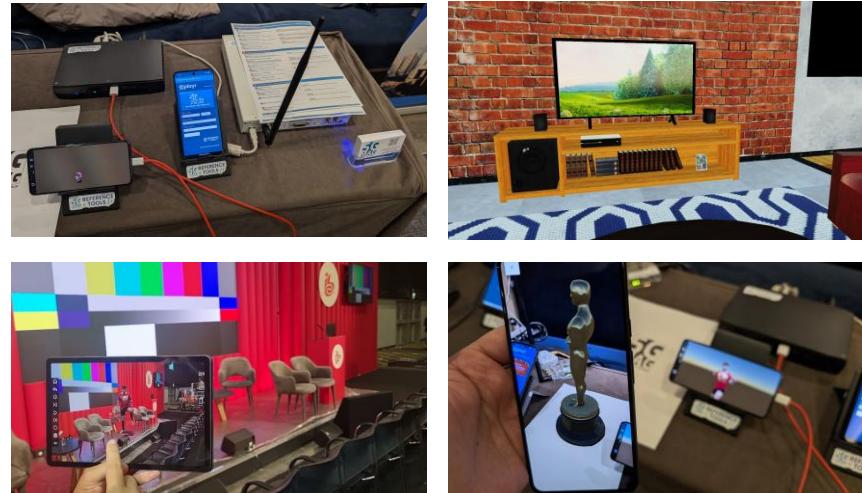
## About Software...

# Transforming Specifications into Products



## Open-source Toolbox for Connected Media Applications

-  Standards validation & verification, early demonstrations and testing
-  Ready-to-use code in production environments and as benchmark
-  Shared development effort avoids duplication across companies
-  Transparency, trust and collaborative enhancements



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[hub.5g-mag.com/Getting-Started](http://hub.5g-mag.com/Getting-Started)



# 5G-MAG Reference Tools – The Projects

 **5G Media Streaming Architecture**  
5G REFERENCE  
MAG < TOOLS />

 **UE Data Collection, Reporting & Event Exposure**  
5G REFERENCE  
MAG < TOOLS />

 **5G Broadcast: TV, Radio and Emergency Alerts**  
5G REFERENCE  
MAG < TOOLS />

 **5G Multicast Broadcast Services**  
5G REFERENCE  
MAG < TOOLS />

 **Real-Time Media Communication**

 **Network Capability Exposure through APIs**

 **Non-Terrestrial Networks**

 **Non-Public Networks**

 **Time Sensitive Communication**

 **XR Media with MPEG-I Scene Description**  
5G REFERENCE  
MAG < TOOLS />

 **Volumetric Video Experiences with MPEG V3C**  
5G REFERENCE  
MAG < TOOLS />

 **Beyond 2D Video Experiences**  
5G REFERENCE  
MAG < TOOLS />

 **AI/ML in Mobile Media Services**  
5G REFERENCE  
MAG < TOOLS />

 **Multimedia Content Delivery Protocols**  
5G REFERENCE  
MAG < TOOLS />

 **DVB-I Services over 5G Systems**  
5G REFERENCE  
MAG < TOOLS />

 **Towards 6G Media**



# Reference Tools – The Projects

## Media Delivery & Content Distribution

### 5G Media Streaming Architecture

[hub.5g-mag.com/Getting-Started/pages/5g-media-streaming/](http://hub.5g-mag.com/Getting-Started/pages/5g-media-streaming/)

### 5G Core Service Consumers

[hub.5g-mag.com/Getting-Started/pages/5g-core-service-consumers/](http://hub.5g-mag.com/Getting-Started/pages/5g-core-service-consumers/)

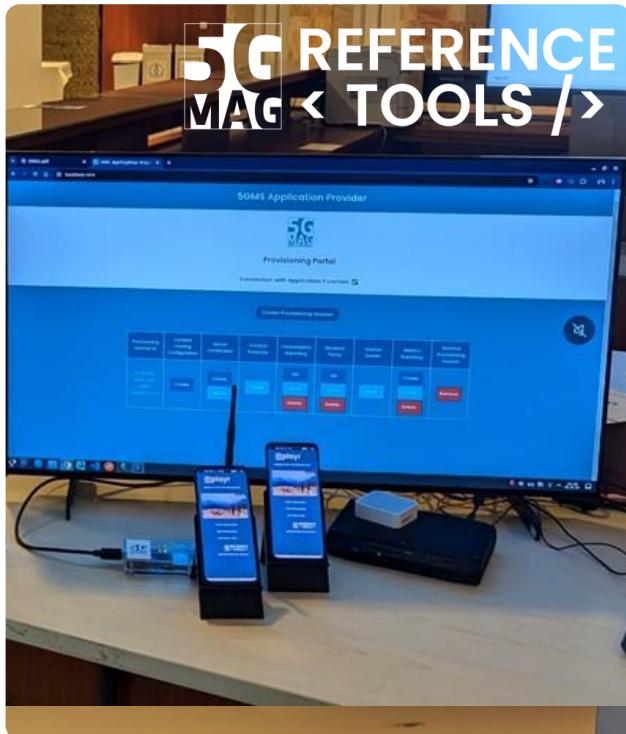
### UE Data Collection, Reporting and Event Exposure

[hub.5g-mag.com/Getting-Started/pages/ue-data-collection-reporting-exposure/](http://hub.5g-mag.com/Getting-Started/pages/ue-data-collection-reporting-exposure/)

## + Complementary Projects

### DVB-I Services over 5G Systems

[hub.5g-mag.com/Getting-Started/pages/dvbi-over-5g/](http://hub.5g-mag.com/Getting-Started/pages/dvbi-over-5g/)



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# Reference Tools – The Projects

## 5G Broadcast Hybrid Services

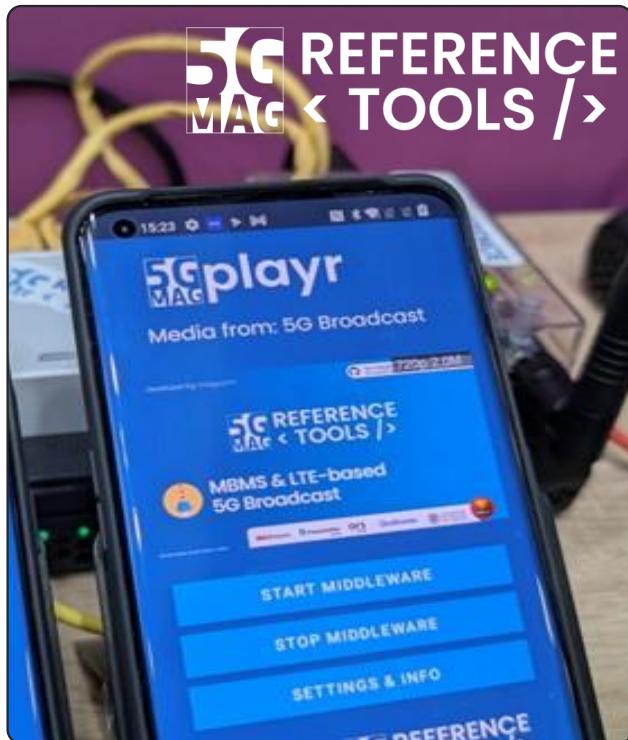
 **5G Broadcast: TV & Radio Hybrid Services**  
[hub.5g-mag.com/Getting-Started/pages/lte-based-5g-broadcast/tutorials.html](http://hub.5g-mag.com/Getting-Started/pages/lte-based-5g-broadcast/tutorials.html)

 **5G Broadcast: Emergency Alerts**  
[hub.5g-mag.com/Getting-Started/pages/emergency-alerts/](http://hub.5g-mag.com/Getting-Started/pages/emergency-alerts/)

## + Complementary Projects

 **Multimedia Content Delivery Protocols (FLUTE and ROUTE)**  
[hub.5g-mag.com/Getting-Started/pages/multimedia-content-delivery/](http://hub.5g-mag.com/Getting-Started/pages/multimedia-content-delivery/)

 **DVB-I Services over 5G Systems**  
[hub.5g-mag.com/Getting-Started/pages/dvbi-over-5g/](http://hub.5g-mag.com/Getting-Started/pages/dvbi-over-5g/)



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# Reference Tools – The Projects

## 5G Multicast Broadcast & MBS User Services



### 5G Multicast Broadcast Services

[hub.5g-mag.com/Getting-Started/pages/5g-multicast-broadcast-services/](https://hub.5g-mag.com/Getting-Started/pages/5g-multicast-broadcast-services/)

## + Complementary Projects



### Multimedia Content Delivery Protocols (FLUTE and ROUTE)

[hub.5g-mag.com/Getting-Started/pages/multimedia-content-delivery/](https://hub.5g-mag.com/Getting-Started/pages/multimedia-content-delivery/)



# Reference Tools – The Projects

## eXtended Reality and Immersive Media



### XR Media with MPEG-I Scene Description

[hub.5g-mag.com/Getting-Started/pages/xr-media-integration-in-5g/](https://hub.5g-mag.com/Getting-Started/pages/xr-media-integration-in-5g/)



### V3C Immersive Platform

[hub.5g-mag.com/Getting-Started/pages/v3c-immersive-platform/](https://hub.5g-mag.com/Getting-Started/pages/v3c-immersive-platform/)



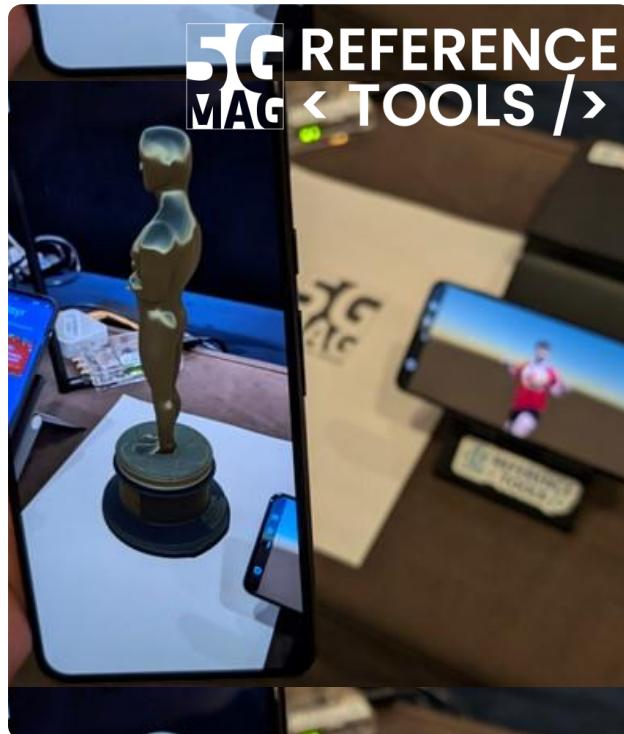
### Beyond 2D Video Experiences

[hub.5g-mag.com/Getting-Started/pages/beyond-2d-evaluation-framework/](https://hub.5g-mag.com/Getting-Started/pages/beyond-2d-evaluation-framework/)



### AI/ML in Mobile Media Services

[hub.5g-mag.com/Getting-Started/pages/ai-ml-evaluation-framework/](https://hub.5g-mag.com/Getting-Started/pages/ai-ml-evaluation-framework/)



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# Join our Public Software Developer Community

## Sponsored by 5G-MAG Members

Define the roadmap and prioritization of 5G-MAG's resources

Open to the Industry, Academia, Independent Developers,...

To collaborate and contributor your code

OFFICIAL CONTRIBUTORS WITH A SIGNED CLA



OPERATING EUROVISION AND EURORADIO



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# Join the Software Developer Community



GITHUB

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

Getting Started guides with documentation, access to repos, projects, releases, tutorials,...



GITHUB

<https://github.com/5G-MAG>

Software Development is handled in GitHub. Find there all the repositories



[5G-MAG Dev Community](#)

Join us in Slack for communication between developers

[tinyurl.com/join5gmagslack](https://tinyurl.com/join5gmagslack)



Groups

[Mailing List with Releases & News](https://tinyurl.com/join5gmaggroup)

Announcements and publication of new projects, software releases and documentation

[tinyurl.com/join5gmaggroup](https://tinyurl.com/join5gmaggroup)



[Join the Developer Calls](#)

WG DEV: Every Friday for 5G-MAG members

**Public Friday Calls**

Last Friday of the month from 13:00 to 14:30 CET for everybody  
[5g-mag.com/community#calendar](https://5g-mag.com/community#calendar)



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

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

# Tutorials and Developer Xchange

<p><b>Multimedia Content Delivery Protocols</b></p> <p>GPAC Flute interop with 5G-MAG Reference Tools</p> <p>Sohail Larbi Motion Spell</p> <p>BBC Dolby Fraunhofer FOKUS Qualcomm</p>	<p><b>5G Media Streaming Architecture</b></p> <p>5G Media Streaming in the BBC standalone testbed</p> <p>Richard Bradbury, David Waring, Dev Audsin and John Elliott BBC R&amp;D</p> <p>BBC Dolby Fraunhofer FOKUS Qualcomm</p>	<p><b>5G Broadcast TV and Radio Hybrid Services</b></p> <p>Unicast/Broadcast Seamless Switching</p> <p>Klaus Kühnhammer TEAM-UPV Daniel Sihlavy Fraunhofer FOKUS</p> <p>Bitstream Fraunhofer FOKUS Ors group Qualcomm UNIVERSITATIS POLYTECHNICAE VALENCIA</p>	<p><b>XR Media with MPEG-I Scene Description</b></p> <p>XR Unity Player in 5G-MAG Reference Tools</p> <p>Imed Bouazizi Qualcomm</p> <p>Qualcomm Interdigital</p>
<p><b>5G Media Streaming Architecture</b></p> <p>5GMS with Application Provider Portal</p> <p>Vuk Stojkovic Fraunhofer FOKUS</p> <p>BBC Dolby Fraunhofer FOKUS Qualcomm</p>			<p><b>UE Data Collection, Reporting &amp; Event Exposure</b></p> <p>Docker Setup with Insomnia REST Client</p> <p>Daniel Sihlavy Fraunhofer FOKUS</p> <p>BBC Fraunhofer FOKUS</p>
<p><b>5G Multicast Broadcast Services</b></p> <p>Initial support of 5MBS core network functions</p> <p>Borja Iñesta Hernández TEAM - UPV</p> <p>BBC UNIVERSITATIS POLYTECHNICAE VALENCIA</p>			<p><b>V3C Immersive Platform</b></p> <p>Unity Player for Android with DASH Streaming Server</p> <p>Interdigital PHILIPS</p>



More information at [developer.5g-mag.com](https://developer.5g-mag.com) and [5g-mag.github.io](https://github.com/5g-mag)



Join us and support the activities!

# Our Structure

## Member-driven

Bottom-up work and topics

## Minimum bureaucracy

to concentrate on the actual work

## Maximizing efficiency

by limited telcos & on-line work

## Contribution-driven

to ensure relevance of the work

### General Assembly

(All members)

### Steering Group

(elected by members)

#### WG TECH

Members' Workgroup  
**Technology & Standards**

#### WG DEV

Members' Workgroup  
**Development & Ecosystem-drive**

#### WG PC

Members' Workgroup  
**Promotion & Communication**

#### FORUM

Members' Forum  
**Collaborative Activity Hub**

#### PUBLIC/EXTERNAL

Developer Community  
**5G-MAG Reference Tools**



# How does 5G-MAG support the industry and you?

## 5G-MAG supporting the industry

**Driving** the development of **open standards** for connected media services

**Contributing** industry's feedback to SDOs in a coherent way

**Supporting** open-source software implementations towards products

**Accelerating** adoption of global **connectivity solutions** for media

**Fostering** tech interoperability and trust

## 5G-MAG supporting you

**Understanding standards, specifications** and **technologies**

**Creating collaboration** opportunities with partners

**Contributing** consensus-driven requirements to SDOs

**Scouting** opportunities for projects and funding aligned to 5G-MAG's work

**Promoting** your work at events

# Who is supporting our work?



ANIXENET

ASTRUM  
MOBILE

ATEME  
Capitate your audience

BBC

Belgian Tower Company

BIG BLUE MARBLE  
ORF

broadcast networks europe

Dolby



EBU

OPERATING EUROVISION AND EURORADIO

EITOWERS

ERICSSON

esa

eutelsat

france.tv

Fraunhofer  
FOKUS

HAIVISION



BTS  
IEEE Broadcast  
Technology Society

interdigital.

kronehit

MAINDATA

mbi

MCC

Media  
Broadcast

NABA



NOKIA

npo

ONE  
Media  
Technologies

PHILIPS

plus

PROGIRA

Qualcomm

Rai



rtve

SENNHEISER

ses

SMART  
MOBILE  
LABS

swisscom

SWISS  
TXT

SWR

TemX  
COMMUNICATIONS



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POLITÈCNICA  
DE VALÈNCIA

XGN

Yotta  
Media



# Join, support the work and benefit

## Who is supporting our work?

Check the list of members at [www.5g-mag.com/membership](http://www.5g-mag.com/membership)

Membership Fee Category <b>LARGE</b>	Annual Revenues › €1 billion	Annual Membership Fee <b>€ 15.000</b>
Membership Fee Category <b>MEDIUM</b>	Annual Revenues €100 million - €1 billion	Annual Membership Fee <b>€ 10.000</b>
Membership Fee Category <b>SMALL</b>	Annual Revenues €5 million - €100 million	Annual Membership Fee <b>€ 5.000</b>
Membership Fee Category <b>MICRO</b>	Annual Revenues < €5 million	Annual Membership Fee <b>€ 2.000</b>

The **Micro** category also includes: Universities, Regulators, Public research bodies, Institutions, NGOs, and non-for-profit organizations



# Fostering industry collaboration

## Workshops

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

## Open-Source Media Application Reference Tools (osmart)

<https://osmart-community.github.io/>



## Open-Source Core Applications RAN (OSCAR)

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



## Part of the Metaverse Standards Register

<https://register.metaverse-standards.org/pogs>



More information at <http://www.5g-mag.com/partnerships>

# Promoting Technology and Members' Efforts





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Eva Markvoort – Membership  
[markvoort@5g-mag.com](mailto:markvoort@5g-mag.com)

Jordi J. Gimenez – Technology  
[gimenez@5g-mag.com](mailto:gimenez@5g-mag.com)



Back-up slides: Some more details...

# More details about our structure

## WG TECH

### Technology & Standards

Requirements gathering (e.g. 3GPP workshop, GitHub requests, feedback from implementation)  
Profiles and Guidelines (e.g. documentation in GitHub pages, explainers, ETSI specifications,...)  
Technical liaison with standards bodies (e.g. LS and members' input towards 3GPP)  
Management of [5G-MAG - Execution Plans](#) together with the Project Office

## WG DEV

### Development & Ecosystem-drive

Coordination of software development [5G-MAG Reference Tools Roadmaps](#)  
Maintenance of Tutorials, Documentation (e.g. documentation in GitHub pages,...)  
Drive engagement with technology "users" and testbeds  
Management of [5G-MAG - Execution Plans](#) together with the Project Office

## WG PC

### Promotion & Communication

5G-MAG's engagement in events and promotion opportunities  
Communication of association and members' activities  
Maintenance of liaisons with external associations/industry bodies

## FORUM

### Collaborative Activity Hub

Discussion forum open to all members to explore opportunities for collaborative projects

## PUBLIC/EXTERNAL

### 5G-MAG Reference Tools

Open-Source software developer community  
Sponsored by 5G-MAG members. Open to the industry, academia, software developers,...

# 5G-MAG – Execution Plans

5G-MAG - Execution Plans

All 5G Media Streaming UE Data Collection 5G Broadcast 5G Multicast Broadcast RTC Network APIs Non-Terrestrial Network Non-Public Networks Time Sensitive Commu XR Media Experience

Filter by keyword or by field

Candidates 1 This is a candidate for future work.  
Tech #25 Integration of 5GMS clients with commercial OTT app  
Topic: 5G Media Streaming

Under Study 2 This is under study.  
Tech #17 Testing of 5G Media Streaming Reference Tools in Testbeds  
Topic: 5G Media Streaming  
Tech #19 Documentation  
Topic: 5G Media Streaming

Work in Progress 6 This is actively being worked on.  
Tech #24 Report on Uplink Media Delivery  
Topic: 5G Media Streaming

Completed 1 This has been completed.  
Tech #23 Gathering requirements towards FS\_AMD  
Topic: 5G Media Streaming

Not pursued 0 This is disregarded.

What members have done, are doing or are planning to do

Generation of Docker instances for 5GMS collaboration scenarios  
Topic: 5G Media Streaming

Implementation of Reference Tools (Rel-18)  
Topic: 5G Media Streaming

+ Add item + Add item + Add item + Add item + Add item

<https://github.com/orgs/5G-MAG/projects/44>

# 5G-MAG Reference Tools – Roadmaps

5G-MAG Reference Tools - Roadmaps

All 5G Media Streaming 5GC Components UE Data Collection 5G Broadcast Emergency Alerts 5GBC Multicast Broadcast Se Multimedia Content De XR Media with MPEG-I V3C Immersive Platform

label:"Project: 5G Media Streaming"

Candidates 1 ...  
This is a candidate for future work.  
Getting-Started #126  
Advanced Media Delivery (AMD) - In-band reporting of CMCD information

Under Study 1 ...  
This is under study.  
Getting-Started #137  
Cloud Deployment support

Under Development 4 ...  
This is actively being worked on.  
Getting-Started #132  
Dynamic Policies (M1 Policy Templates API + M5 Dynamic Policies API)

Completed 0 ...  
This has been completed.

Completed + Tested 6 ...  
Getting-Started #134 Consumption collection and reporting  
Getting-Started #130 Implementation of M1d Provisioning APIs  
Getting-Started #133 QoE metrics collection and reporting  
Getting-Started #129 Implementation of AF to AS RESTful OpenAPI (M3)  
Getting-Started #128 Support for basic media session handling (Application Function + Media Session Handler)  
Getting-Started #127 Support for basic media stream handling (Application Server + Media Stream Handler)

All the contributions, on-going developments and opportunities for contributors

+ Add item + Add item + Add item + Add item + Add item

<https://github.com/orgs/5G-MAG/projects/48>

# 5G-MAG Reference Tools – Standards Feedback

3GPP Specifications - Feedback

Kanban TS.26.501 (SA) TS.26.512 (SA) TS.26.517 (SA) TS.26.532 (SA) + New view

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