

5G-MAG Reference Tools

“Target 2023”

5G Media Streaming

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What is the goal of 5G Media Streaming?

Driving **effective**
collaboration between
mobile media applications
and **mobile networks**

What is 5G Media Streaming?

- 3GPP asked itself whether **better media streaming Quality of Experience** could be achieved by content providers **collaborating** more actively with mobile networks.
- The result is a set of technical specifications collectively referred to as **5G Media Streaming** (5GMS).
 - Main contributors in **3GPP SA4**: Qualcomm, Ericsson, Sony, Enensys, KPN/TNO and BBC.
 - Both **downlink** (content distribution) and **uplink** (content contribution) directions are in scope.
 - *(Uplink is still being worked on in 3GPP Release 18.)*
- 5GMS is also aligned with the mobile industry's current direction of travel on **Network Exposure**.
 - GSM Alliance **Open Gateway** initiative and the Linux Foundation's closely related **Camara** project exposing higher-level service APIs to external parties.

5G Media Streaming: Key features (3GPP Rel-16)

1. Content Hosting

- Segment-based CDN deployed inside/outside the mobile network.
- Encrypted URL tokens.
- Geofencing.

2. Network Assistance

- **Throughput estimation** (bit rate recommendation).
- Temporary **delivery boost**.
- **(Rel-18) Background data transfer** (e.g., zero-rated).

3. Dynamic network QoS policy

- Automatically tracking representation switching during a streaming session.

4. Quality of Experience metrics reporting

- Supporting non-real-time performance auditing.

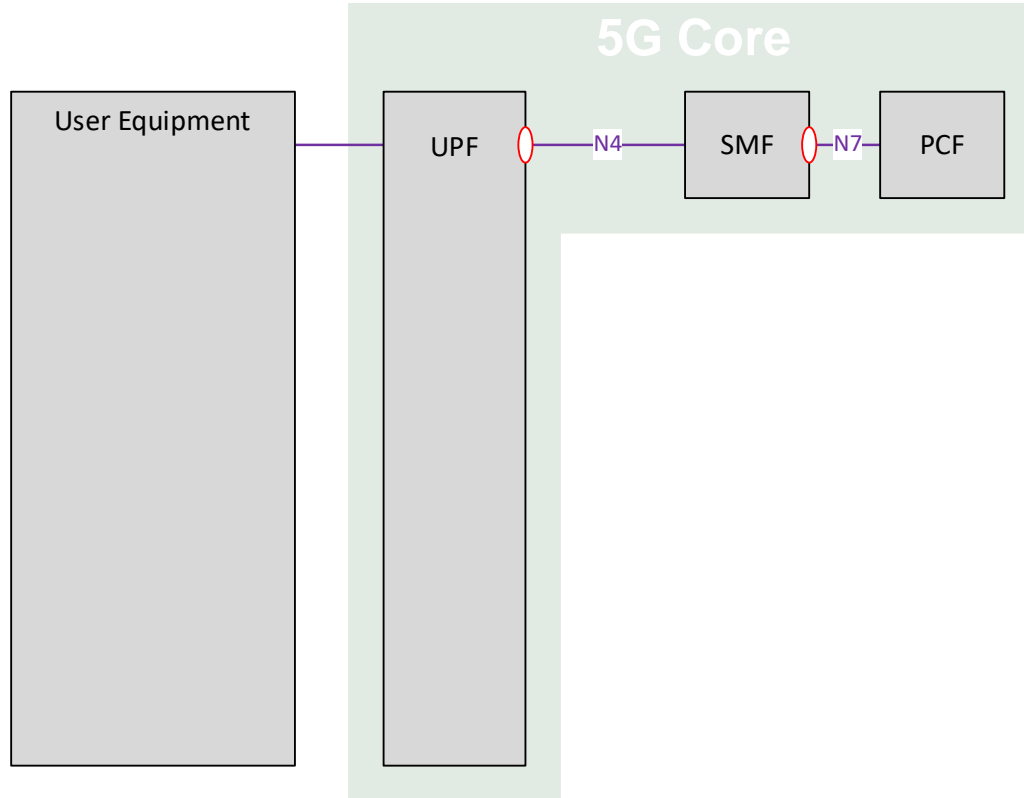
5. Consumption reporting

- Including exposure of CDN access logs.

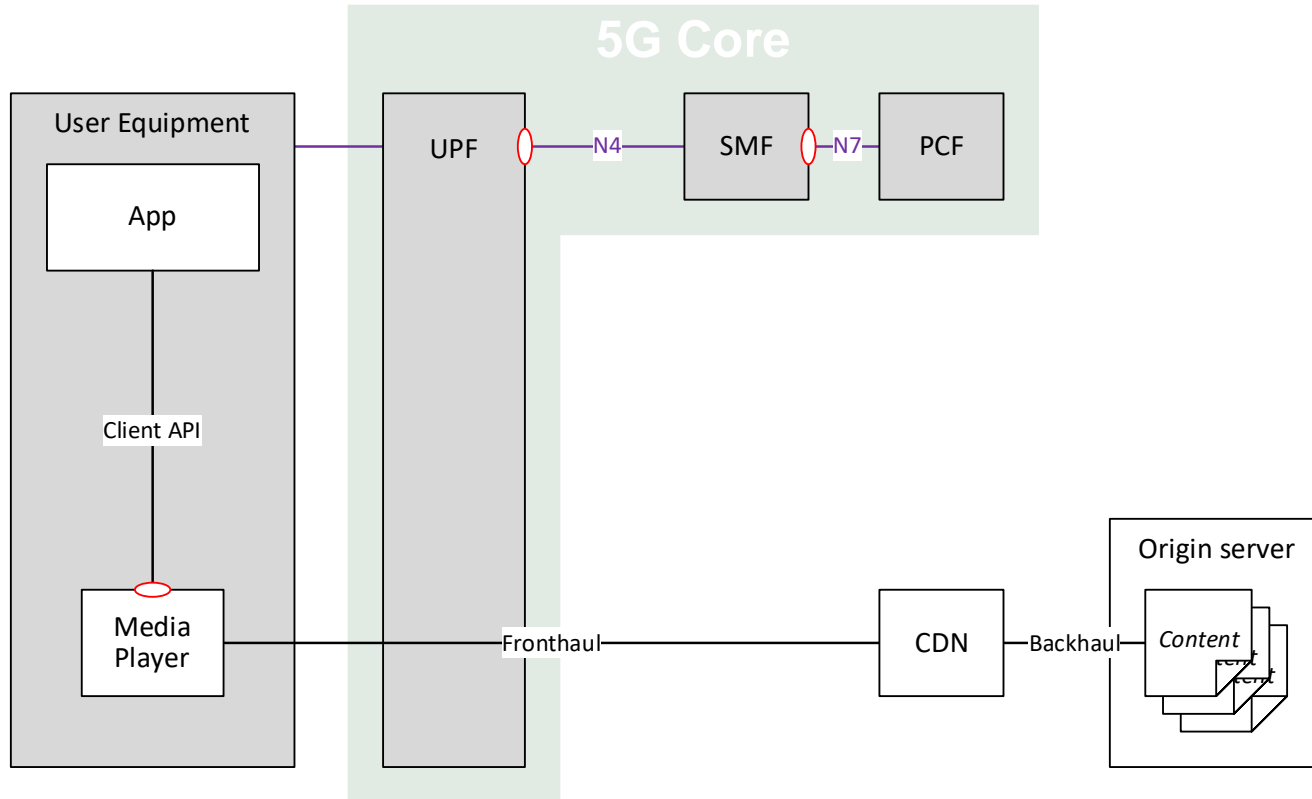
How does 5G Media Streaming work?

A little bit of architecture

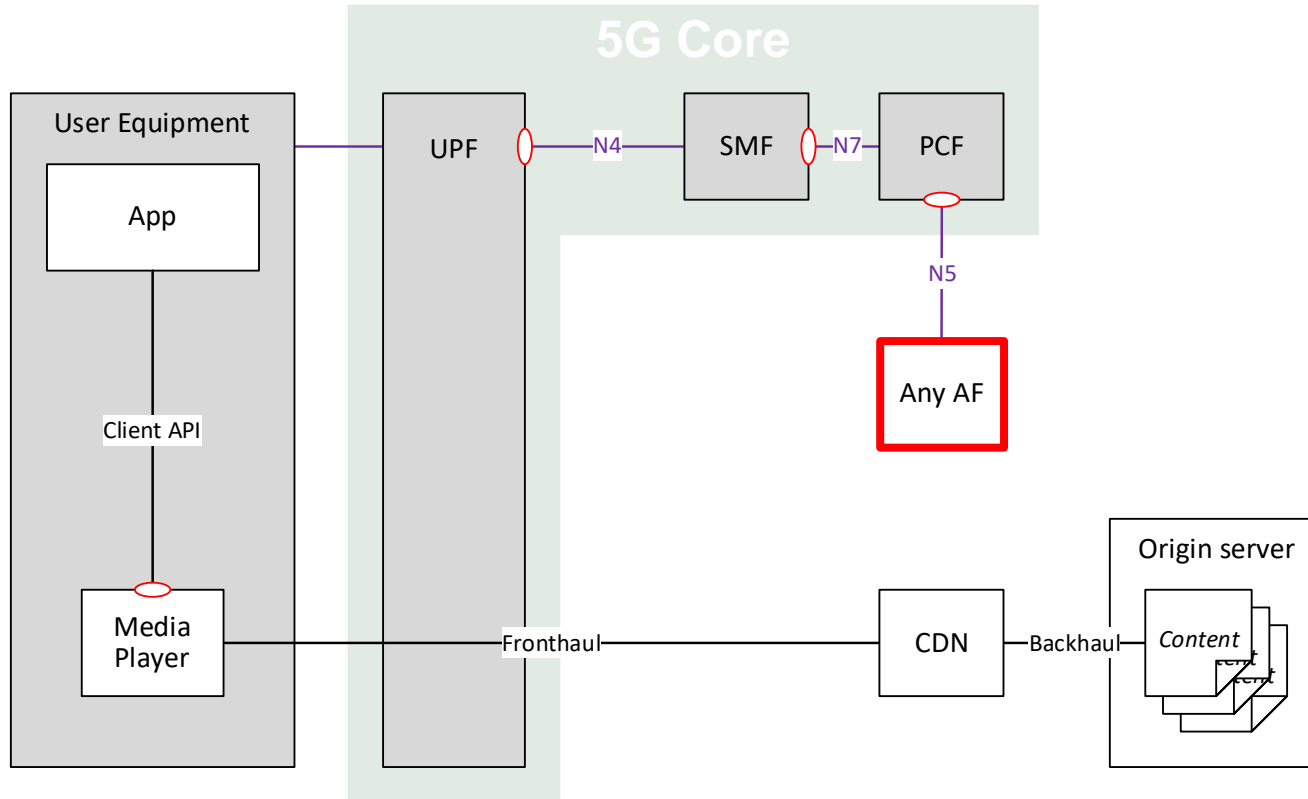
The 5G System (*3GPP Release 15 onwards*)



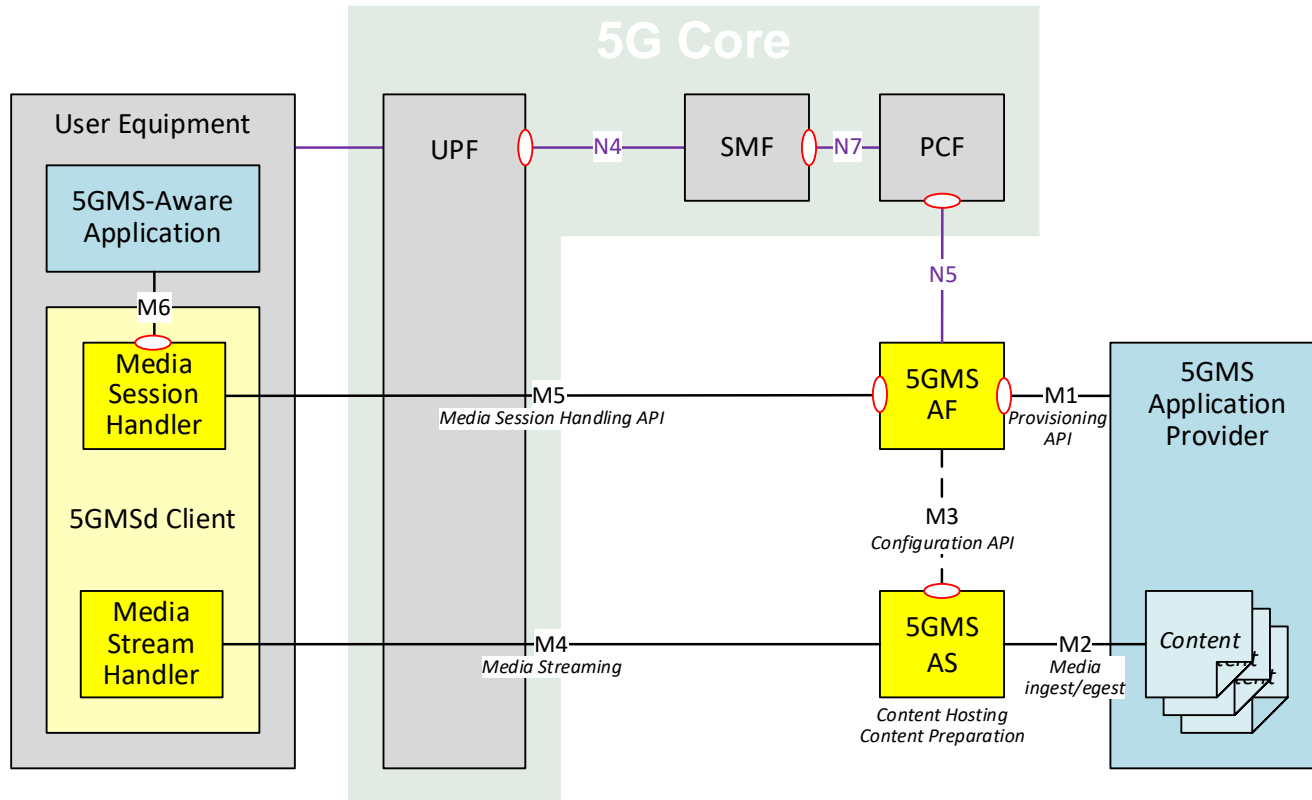
Over-the-top media streaming (eMBB)



Collaboration opportunity



5G Media Streaming architecture (3GPP Rel-16)



5G-MAG's role

5G-MAG is a **3GPP Market Representation Partner** (MRP) representing the **media industry vertical**.

1. MRP status gives it some influence over the **3GPP standardisation road map**.
2. 5G-MAG curates a **Reference Tools initiative** implementing relevant 3GPP specifications as Open Source software.
 - As well as contributing to the 3GPP technical specifications for 5G Media Streaming, we also want to convince ourselves that they are deployable in practice.
 - Working alongside fellow travellers **Fraunhofer FOKUS**, **Qualcomm** and **Dolby**, **BBC R&D** has spent the past year bringing the 5G Media Streaming specifications to life by creating a working reference implementation that we are demonstrating on the EBU Stand.
3. Practical implementation experience gives 5G-MAG a useful role in **providing constructive feedback on 3GPP standards**.

5G-MAG Reference Tools “Target 2023” Use Cases



Reliable Video-on-Demand over Mobile Networks with 5GMS



Premium and Targeted Content Insertion with 5GMS



DVB-I over 5GMS



DVB-I Hybrid Service over 5G Broadcast and 5GMS



5G Broadcast-on-Demand with 5GMS

5G-MAG Reference Tools: Development

5G Media Streaming network components developed so far:

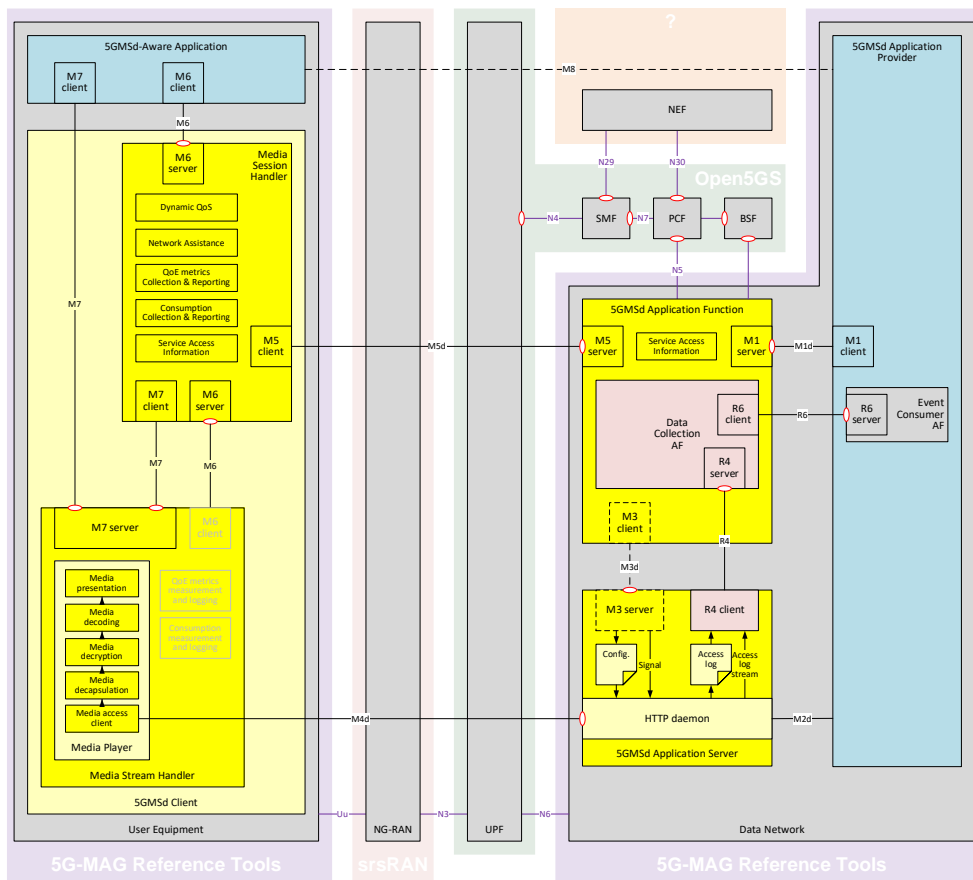
- 5GMS Application Server
 - Wrapping **OpenResty** (Nginx)
- 5GMS Application Function
 - Built in the **Open5GS** framework.

5G Media Streaming Client components developed so far on Android:













- 5GMS-enabled Media Player
 - Wrapping **ExoPlayer**.
- Media Session Handler
 - Background service.
- 5GMS-Aware Application
 - App, optionally incorporating the Media Player component.

5G-MAG Reference Tools – 5G Media Streaming (downlink) functional map

<Richard.Bradbury@bbc.co.uk> [2.March.2023]

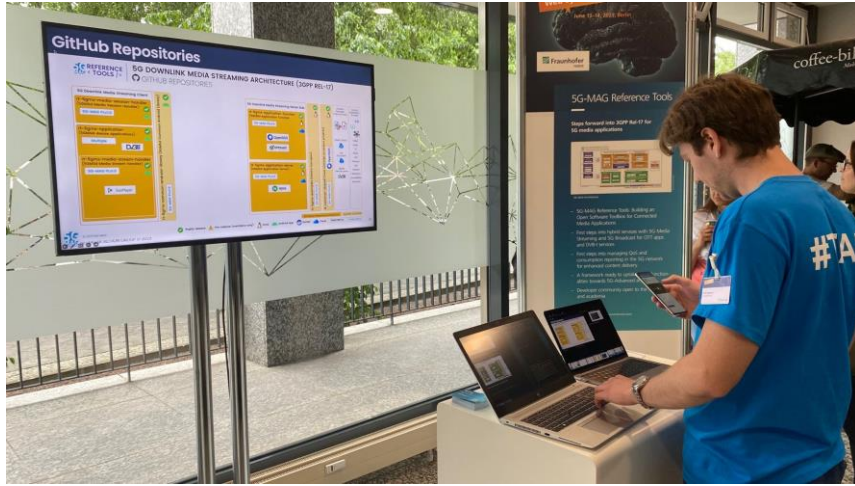


Under development: 5GMS Features (Update: November'23)

5G Media Streaming feature	5GMS Application Function		5GMS Client
	Provisioning (M1)	Usage (M5)	
Content hosting	Pull-based 	Done 	Done 
QoE metrics reporting	Done 	Pending release 	Done 
Consumption reporting	Done 	Done 	Pending release 
Network Assistance			
Delivery boost	<i>Not applicable</i>	Pending release 	To do
Throughput estimation	<i>Not applicable</i>	To do	To do
Dynamic Policies	Pending release 	Pending release 	To do



5G-MAG Reference Tools Demos 2023



FOKUS Media Web Symposium 2023

BBC R&D Open Day 2023

IEEE International Symposium on
Broadband Multimedia Systems and
Broadcasting (BMSB) 2023

www.5g-mag.com/events



5G-MAG Reference Tools @ IBCShow 2023



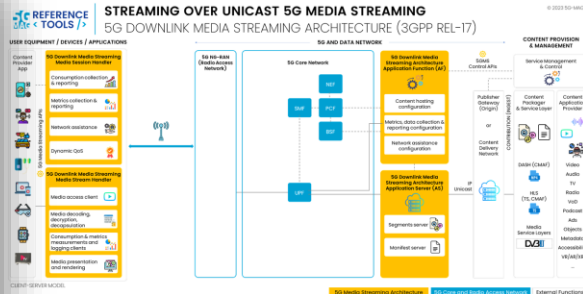
BRINGING 5G MEDIA STREAMING TO LIFE

5G-MAG DEMO POWERED BY 5G-MAG REFERENCE TOOLS

VISIT US AT BOOTH 10.D21 (EBU)

DEMO SETUP BY BBC R&D

CONTRIBUTIONS FROM: Fraunhofer FOKUS, Qualcomm, Dolby and BBC R&D

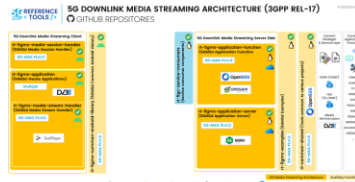


5G Media Streaming (5GMS) is a set of technical specifications defined in 3GPP with the aim to achieve better media streaming Quality of Experience by effective collaboration between content providers and mobile networks. Key features under development include:

- Content Hosting
 - o CDN deployed inside/outside the mobile network
- Dynamic network QoS policy
 - o Automatically tracking representation switching during a streaming session
- Quality of Experience metrics reporting
 - o Supporting non-real-time performance auditing
- Network Assistance
 - o Throughput estimation
 - o Bit rate recommendation
- Consumption reporting
 - o Including exposure of CDN access logs

The demo is using some of the 5G-MAG Reference Tools available in our GitHub. In particular the following:

- 5GMS Application Function
- 5GMS Application Server
- 5GMS Media Session Handler
- 5GMS Media Stream Handler
- 5GMS Application
- 5GMS Common Android Library
- 5GMS Service Consumers



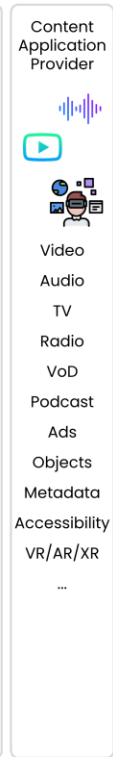
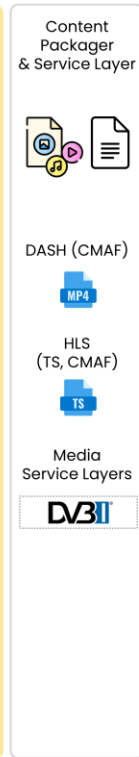
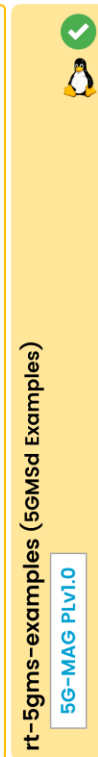
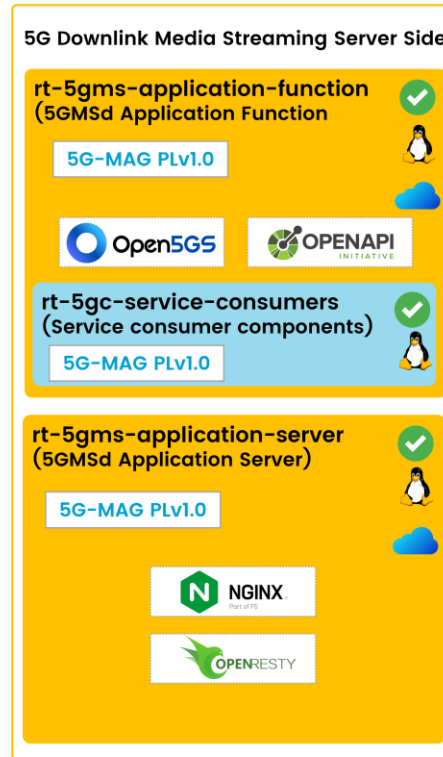
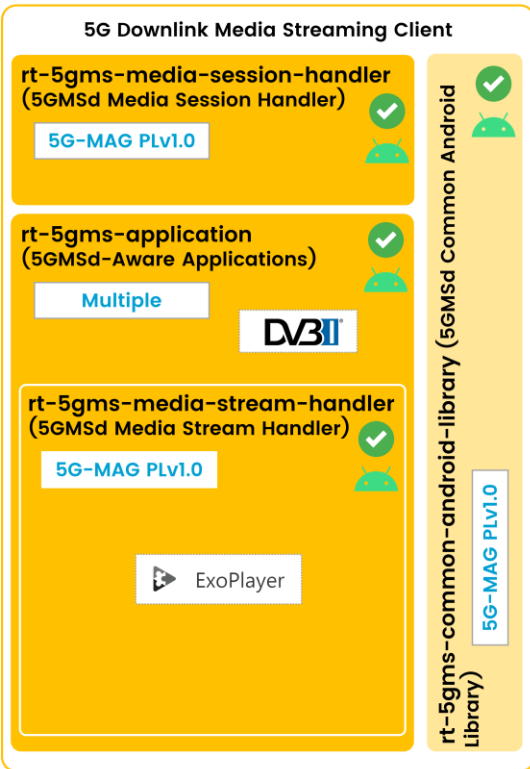
Note that this demo is partially supported by third-party components (srsRAN nodeB and Open5GS 5GCore)



5G-MAG Reference Tools: What next for 5GMS?

1. Having integrated the 5GMS Application Function with the Policy Control Function (PCF) of the 5G Core, we are keen to test it out on **real 5G Cores**.
2. We have started to prototype a new launch mechanism for 5G Media Streaming based on a Rel-18 **Service URL** and Android **intent filters**.
3. As the specifications for **uplink media streaming** become more complete in 3GPP Rel-18, colleagues in 5G-MAG WG2 will assess their suitability for **content production** and **contribution** Use Cases.
4. We're working to combine the simple test application on show with a **DVB-I Client** for Android already contributed by Dolby.
5. We want to implement the missing **Data Collection, reporting and event exposure** feature to expose metrics and consumption reports.

How can I get involved?



5G Core Network Auxiliary Functions

5G Media Streaming Architecture

Auxiliary Functions



Public release



Pre-release (members-only)



Linux



Android



Docker



Cloud

Dependency

Code Licence

Participate



tinyurl.com/join5gmagslack

Discussions around development of features and resolving issues. Dedicated channels for each project



Calls

5g-mag.com/community

Public Calls

- Last Friday of the month
- 13:00 – 14:30 CEST

Internal Calls

- Fridays – every other week
- 13:00 – 14:30 CEST



Groups

tinyurl.com/join5gmagggroup

Announcements of upcoming meetings, new release candidates and new releases

Contribute



- All development is happening on Github
- Dedicated **project boards** for each new feature:
<https://github.com/orgs/5G-MAG/projects>
- **Getting started guide** for each topic, e.g., 5G Downlink Media Streaming:
<https://github.com/5G-MAG/Getting-Started/wiki>
- All information at
<https://github.com/5G-MAG>



The screenshot shows the GitHub repository page for 5G-MAG. The repository is named "5G-MAG's GitHub" and is owned by "5G Media Action Group (5G-MAG)". It has 27 followers and is located in Switzerland. The page includes a "Follow" button and a "Verified" badge. The main content area displays a README file with the following text:

Hi, welcome to 5G-MAG's GitHub 🍌

The 5G Media Action Group (5G-MAG) 5G-MAG (Media Action Group) fosters collaboration between the media and information and communication technology (ICT) industries. A core objective of 5G-MAG is to drive the market-oriented implementation of technologies for the connected media world, leveraging global Internet and 5G access technologies. The work spans from conception of a use case, service or application, up to implementation of proof-of-concepts and products. We aim to be open, agile, pragmatic and instrumental to the industry. Therefore some of our activities are publicly handled within this GitHub.

Repos for 5G-MAG REFERENCE TOOLS

GETTING STARTED: <https://github.com/5G-MAG/Getting-Started/wiki>

The 5G-MAG Reference Tools Development Programme is developing the ecosystem of common open software reference tools to support the implementation and interoperability of 5G Media technologies.

Complete information about the development programme can be found at <http://developer.5g-mag.com/> and the 5G-MAG WG Development and Implementation.

Repos for STANDARDS and specifications relevant to 5G-MAG

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

5G-MAG maintains a GitHub repository open to the community to provide feedback on specifications, in particular, comments, bug-fixing or request for new features. Complete information can be found at <https://www.5g-mag.com/standards>.

This wiki contains specifications in the scope of 5G-MAG's Areas of Work.

5G-MAG and 3GPP SA4 organize regular joint meetings to discuss issues found on standards. Agenda and Notes are [here](#).

Repos for REQUESTS FOR FEEDBACK on 5G-MAG Publications

REQUESTS FOR FEEDBACK repo: <https://github.com/5G-MAG/Requests-for-Feedback>

5G-MAG maintains a GitHub repository open to the community to provide feedback on publications related to 5G-MAG's areas of work. More information can be found at <https://publications.5g-mag.com> and the related 5G-MAG Workgroups.

Contact

For general information about 5G-MAG, [send us an e-mail](#). For 5G-MAG Reference Tools, follow the instructions [here](#).

Enjoy! 🍌

On the right side of the page, there are sections for "Discussions", "People", "Top languages", and "Most used topics".

Thank you

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BBC R&D

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