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5G Media Streaming Architecture

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5G Media Streaming Architecture
Quick guide

Which specifications are under implementation?
- 5g-mag.github.io/Standards/pages/5g-media-streaming.html

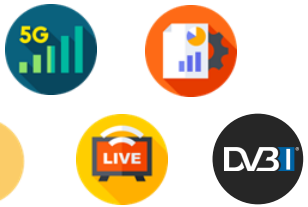
Which reference implementations are made available?
- 5g-mag.github.io/Getting-Started/pages/5g-media-streaming/
- **Repositories**
- **Projects**

How can I play?
- **Tutorials**

5g-mag.com/store

Check our **Store** for **APKs**, **VMs** and other **components**

Note that these tools may be run in combination with other projects:
- 5G Core Network Components
- UE Data Collection, Reporting and Event Exposure
- 5G Broadcast Hybrid Services
- 5G Multicast Broadcast Services
- DVB-I Services over 5G Systems



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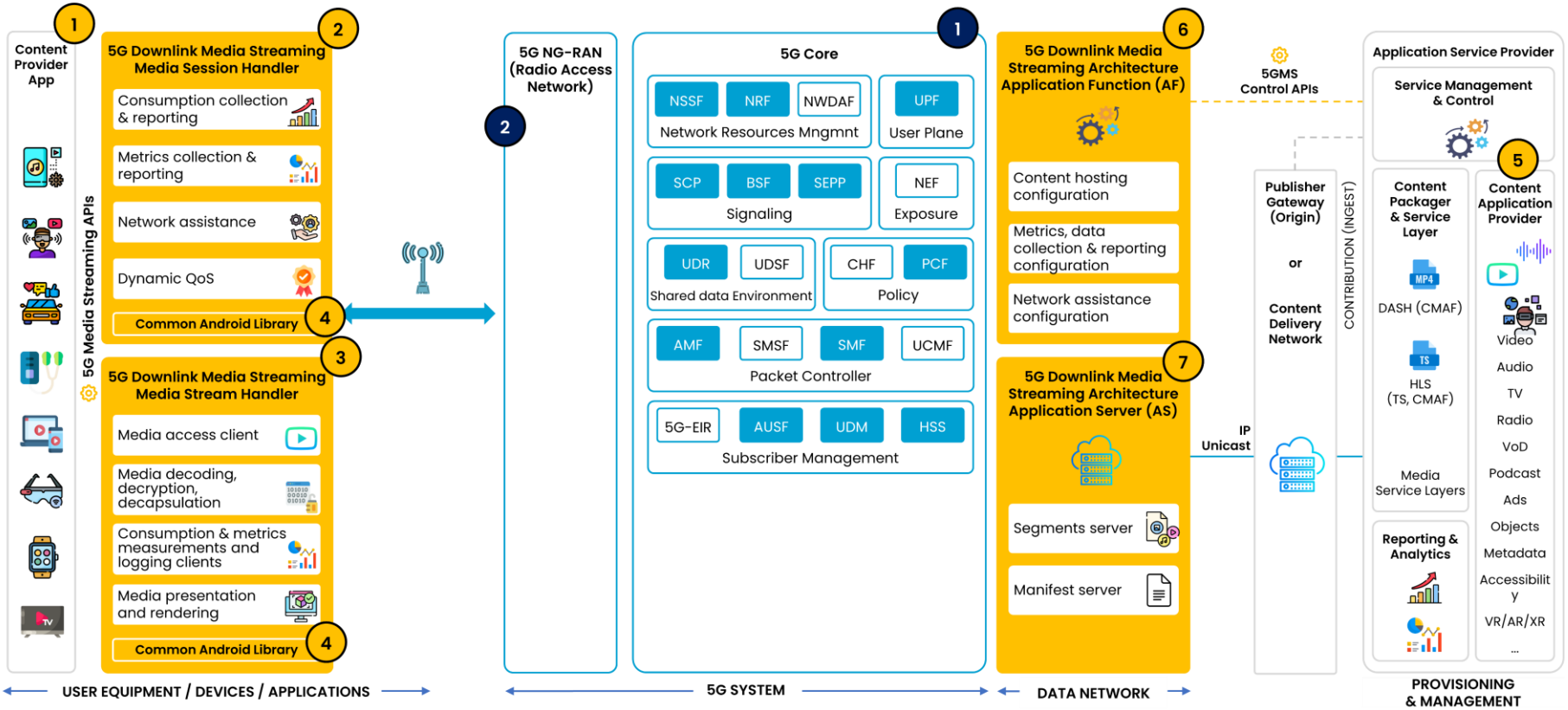
5G Media Streaming Architecture

What is being implemented?



5G Media Streaming Architecture | 5G Core and Radio Access Network | External Functions

5G Media Streaming Architecture

What is being implemented?

1. **rt-5gms-application** (5GMSd-Aware Applications) — Multiple
2. **rt-5gms-media-session-handler** (5GMSd Media Session Handler) — 5G-MAG PLv1.0
3. **rt-5gms-media-stream-handler** (5GMSd Media Stream Handler) — 5G-MAG PLv1.0 — ExoPlayer
4. **rt-5gms-common-android-library** (5GMSd Common Android Library) — 5G-MAG PLv1.0
5. **rt-5gms-application-provider** (5GMS Application Provider) — 5G-MAG PLv1.0
6. **rt-5gms-application-function** (5GMSd Application Function) — 5G-MAG PLv1.0 — Open5GS — OPENAPI INITIATIVE
7. **rt-5gms-application-server** (5GMSd Application Server) — 5G-MAG PLv1.0 — NGINX — OPENRESTY

rt-5gms-examples (5GMSd Examples) — 5G-MAG PLv1.0

rt-common-shared (Auxiliary tools common to various projects) — 5G-MAG PLv1.0 — Open5GS — Express JS

Public release · Early Access · Linux · Windows · Android · APK · Docker · Cloud · Postman API · Web Interface · Dependency · Code Licence

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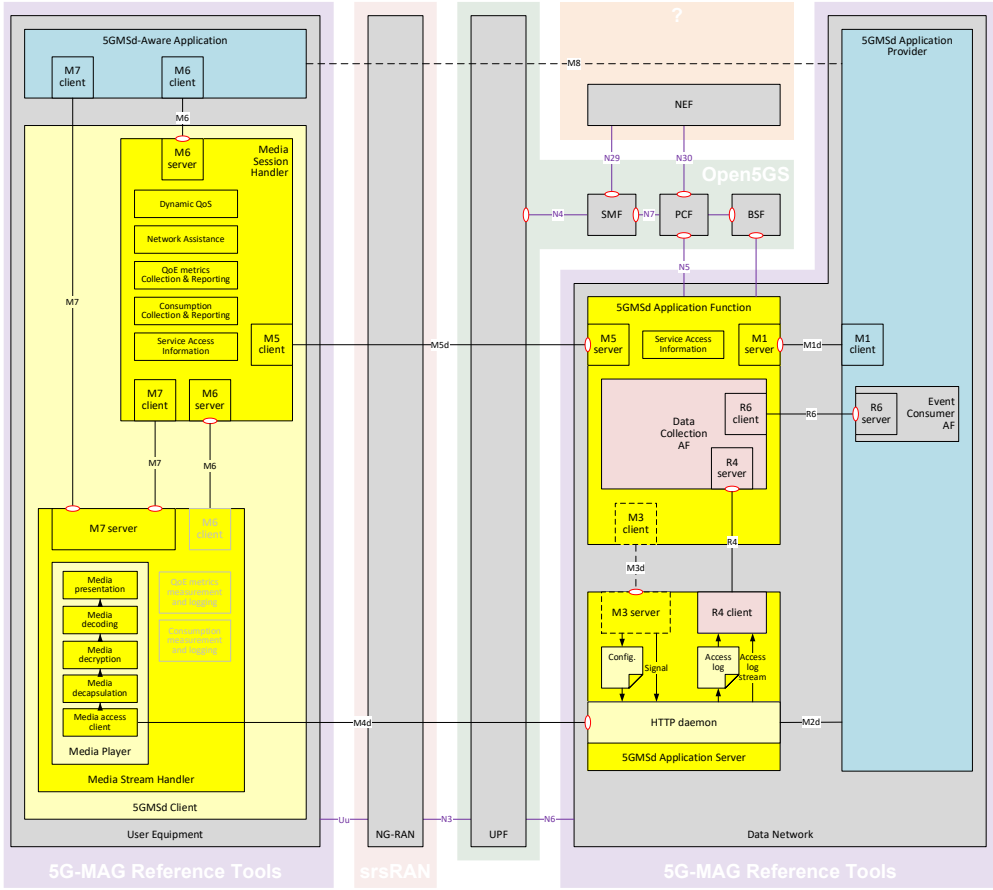
5G Media Streaming Architecture
What is being implemented?

3GPP Release 17 reference implementation of 5G Media Streaming network components :

- **5GMS Application Provider**
  - Web portal for service providrs
- **5GMS Application Server**
  - Wrapping OpenResty (Nginx)
- **5GMS Application Function**
  - Built in the Open5GS framework.

3GPP Release 17 reference implementation of 5G Media Streaming Client components for Android:

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



5G Media Streaming Architecture
What is being implemented?

Network Assistance

- Enables the 5GMS client to **interrogate or manipulate the network QoS** for an ongoing media streaming session
- **Bit rate Recommendation**: 5GMS Client requests an estimate from a network-side component of the 5GMS System of the bit rate that can currently be offered
- **Delivery Boost**: The 5GMS Client speculatively requests a temporary boost to the bit rate of a media streaming session from a network-side component of the 5GMS System

Dynamic Policies

- Enables the 5GMS Client in the UE to **manipulate the network traffic handling policies** for an ongoing media streaming session.
- Allows a **separate handling of data flows within the same PDU session**

QoE Metrics Reporting

- Allows the **Quality of Experience** of media streaming sessions to be **logged** by the 5GMS System **and exposed** for analysis.
- Example:

```
<QoeMetric>
    <BufferLevel>
        <BufferLevelEntry
level="29992" t="1688980890949" />
    </BufferLevel>
</QoeMetric>
```

Consumption Reporting

- **Measurement** and **logging** of **content consumption**-related information
- Example:

```
{
  "mediaPlayerEntry":
"https://dash.akamaized.net/envivio/E
nvivioDash3/manifest.mpd",
  "reportingClientId": "ab960db0-
9282-4626-8d45-188c51db0fad",
  "consumptionReportingUnits": [
    {
      "mediaConsumed": "v4_258",
      "serverEndpointAddress": {
        "ipv4Addr": "192.168.2.4",
        "portNumber": 80
      },
      "startTime": "2023-10-
24T13:55:26Z",
      "duration": 180
    }]
}
```

- The **reference points** defined in 5G Media Streaming (5GMS) are interfaces between different components of the 5GMS system. These reference points are used to exchange information and control messages between them.
  - **Provisioning (M1) APIs:** Used to provision 5GMS sessions, server certificates, content preparation, content hosting, protocols discovery, consumption reporting, metrics reporting, policy templates, edge resources, event data processing,
  - **Media Ingest and Publish (M2) protocols:** supporting HTTP pull-based and DASH-IF push-based content ingest.
  - **M4 (Media Streaming) interface:** Interface between the 5GMS AS and the 5GMS Client. Used for media data transmission (DASH and Progressive Download sessions).
  - **M5 (Media Session Handling):** Used by a Media Session Handler within a 5GMS Client to invoke services relating to downlink or uplink media streaming on the 5GMS AF
  - **R2:** Used to report ANBR-based Network Assistance to the Data Collection AF instantiated in the 5GMS AF.
  - **R4:** Used by the 5GMS AS to send media access logs to the Data Collection instantiated in the 5GMS AF.

5G Media Streaming Architecture
What is being implemented?

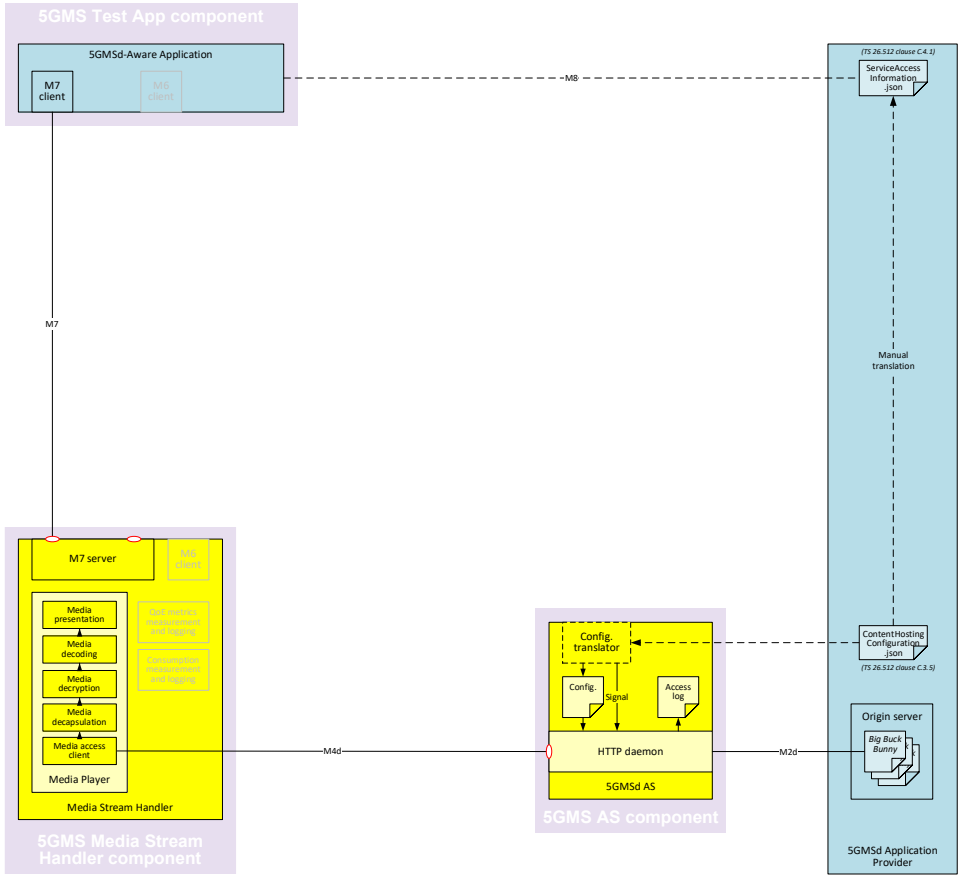
- Supported **features** and **reference points**

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

Projects

Basic media stream handling (MVP#1)

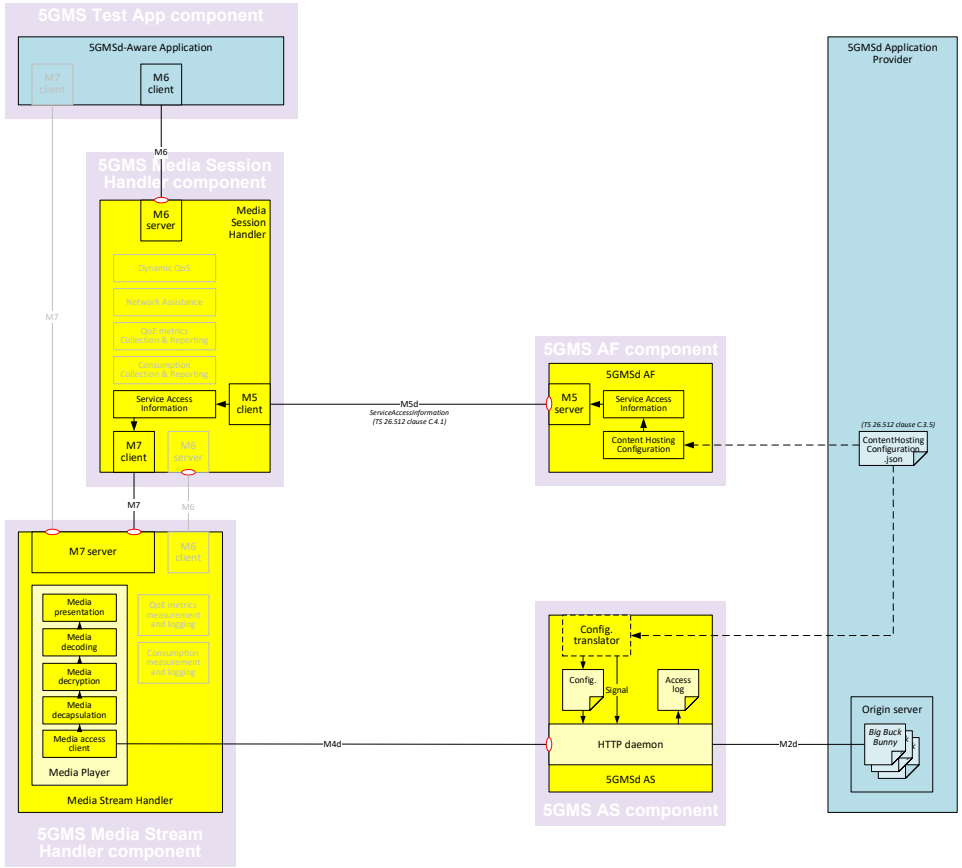
- Started with a single **static Content Hosting Configuration** file (JSON) following the syntax defined in TS 26.512 clause C.3.5.
- Exposes a **virtual host** at reference point M4d.
- HTTP redirect handling by the 5GMS AS



Projects

Media session handling (MVP#2)

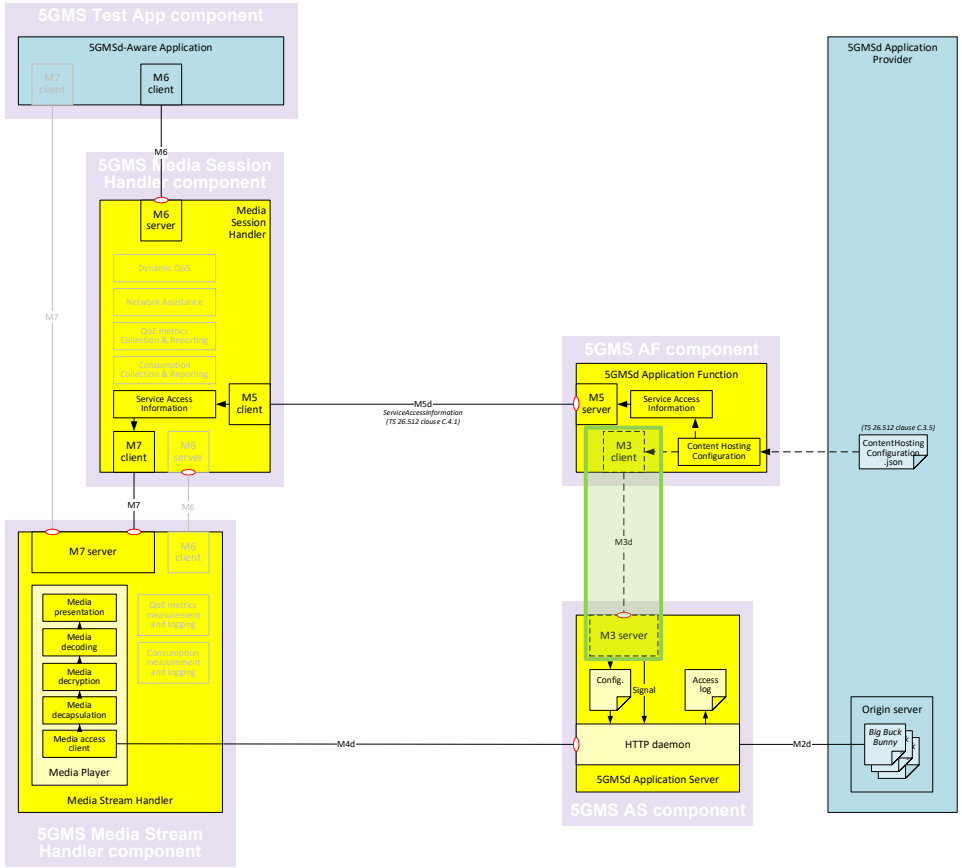
- Exposes corresponding **Service Access Information** at M5d.
- No further development work planned on Application Function under MVP#2.



Projects

M3 link (AF to AS RESTful OpenAPI)

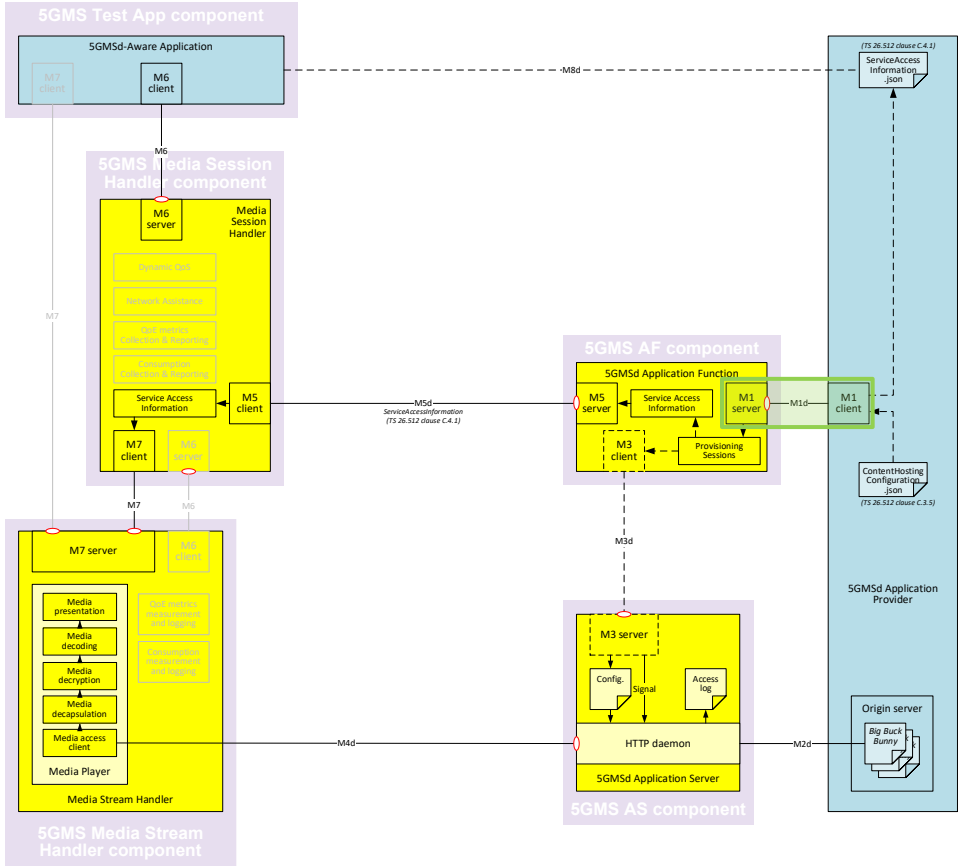
- **AS now configured by the AF** and no longer accepts a static Content Hosting Configuration.
- Model: AS maintains a flat **list of server certificates** and a flat list of **Content Hosting Configurations**.
- Initial implementation checked in to AS and AF repositories.
- No further work planned until Content Publishing Configuration for uplink media streaming is agreed (Release 18).



Projects

M1d Provisioning

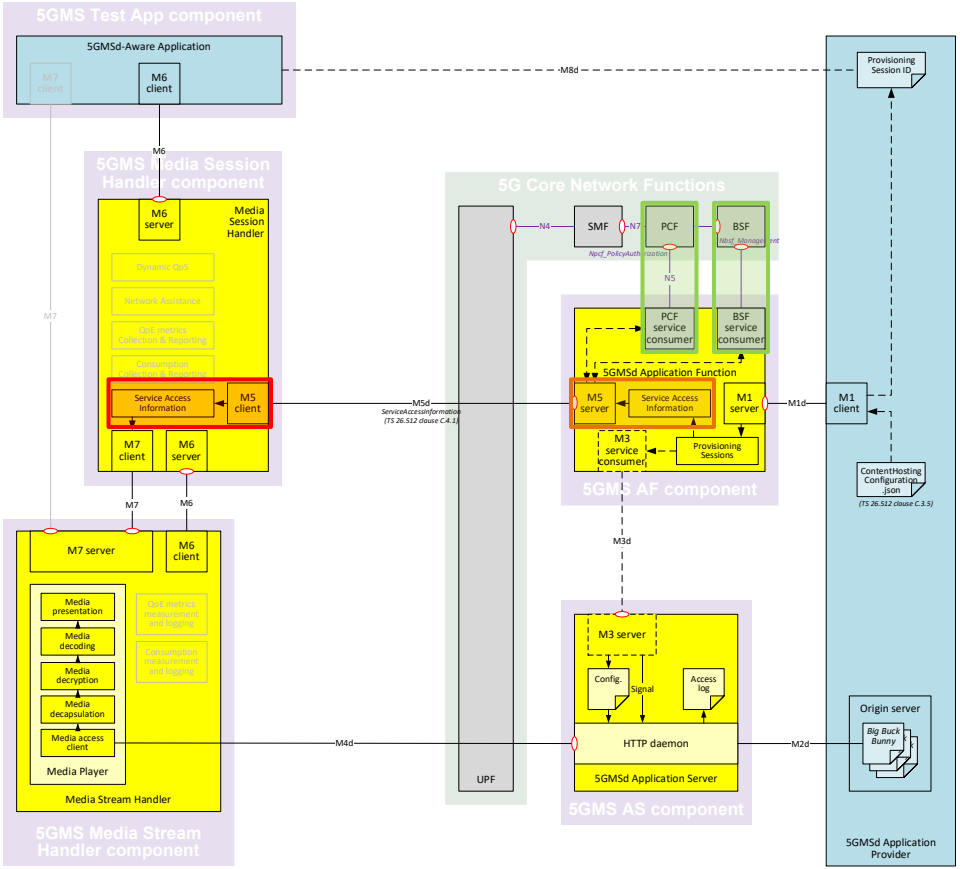
- **Application Function now configured via the M1d API** and longer accepts a static Content Hosting Configuration.
- Implemented first three APIs at M1d:
  - **Provisioning Sessions API.**
  - **Server Certificates Provisioning API.**
  - **Content Hosting Provisioning API.**
- Implementing the **Metrics Provisioning API**.
- Implementing **Policy Templates Provisioning API**.



Projects

Network Assistance and Dynamic Policies features

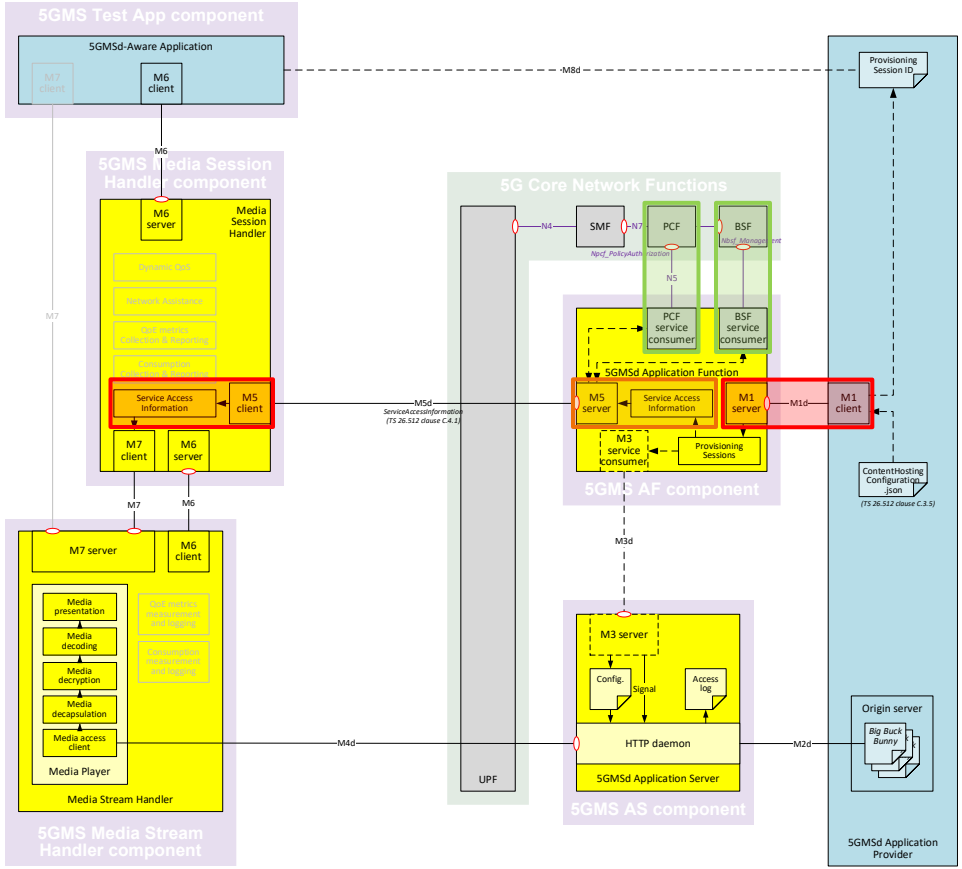
- Aiming to support both **delivery boost** and **throughput estimation** (bit rate recommendation).
- Developed new **service consumer libraries** for communicating with the **Binding Support Function (BSF)** and **Policy & Charging Function (PCF)**.
- Integration into 5GMS AF:
  - Additional **Service Access Information at M5** for use by the Media Session Handler;
  - Implement **M5 Network Assistance API**.
- Additional development of the Media Session Handler needed to invoke M5 APIs.



Projects

Network Assistance and Dynamic Policies features

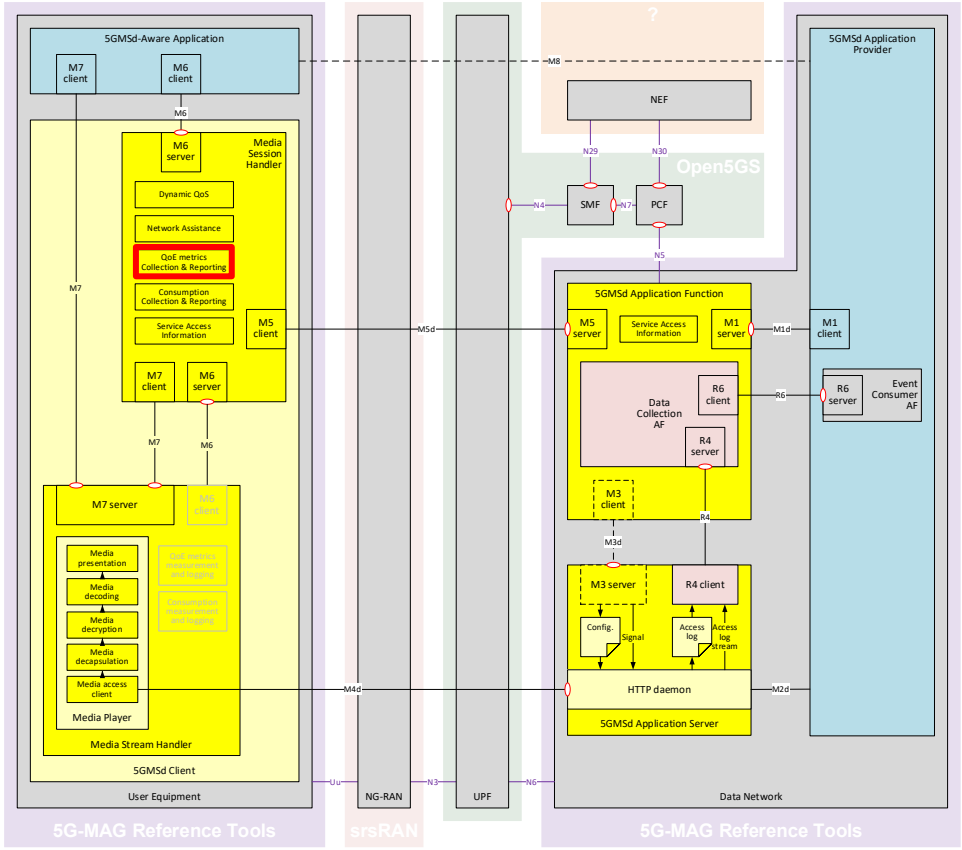
- Reuse **service consumer libraries** for communicating with the BSF and PCF.
- Development work in the 5GMS AF:
  - Implement **M1 Policy Templates API**.
  - Additional **Service Access Information at M5** to support the Media Session Handler.
  - Implement **M5 Dynamic Policies API**.
- Corresponding changes to the Media Session Handler needed to invoke these at M5.



Projects

QoE metrics collection and reporting feature

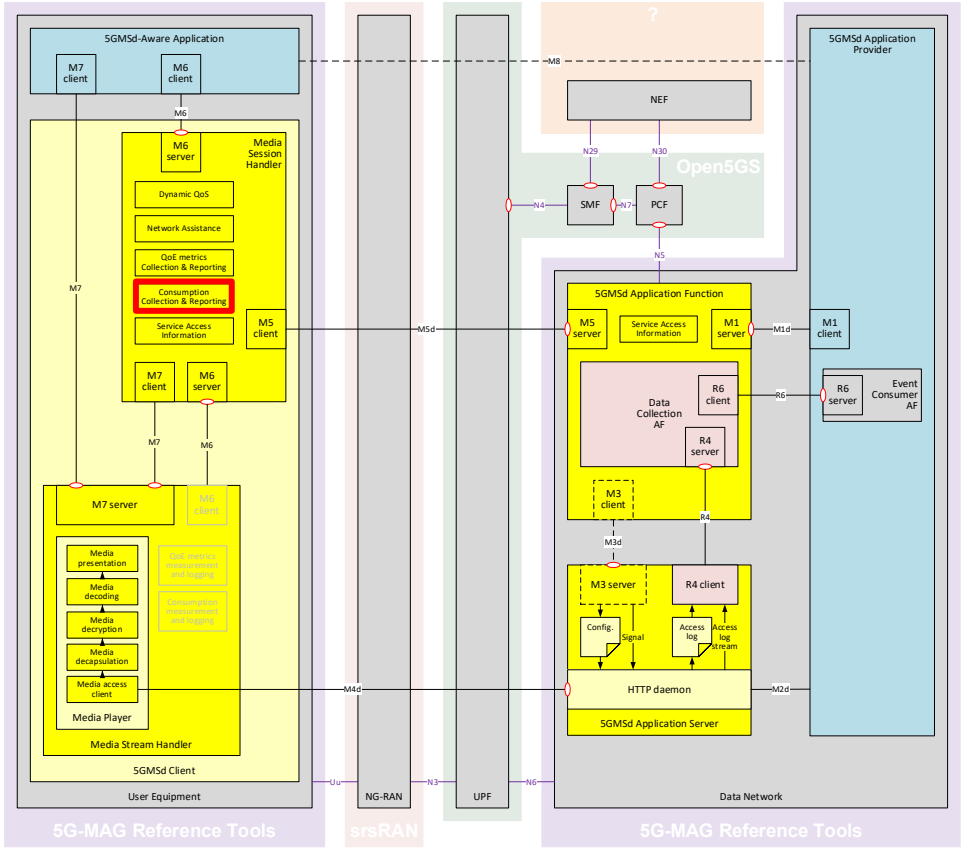
- **Metrics Measurement and Logging Client** in accordance with **the Metrics Reporting Configuration** part of provisioning data, supplied by the 5GMSd Application Provider to the 5GMSd AF, and forwarded by the 5GMSd AF to the Media Player via the Media Session Handler.



Projects

Consumption collection and reporting feature

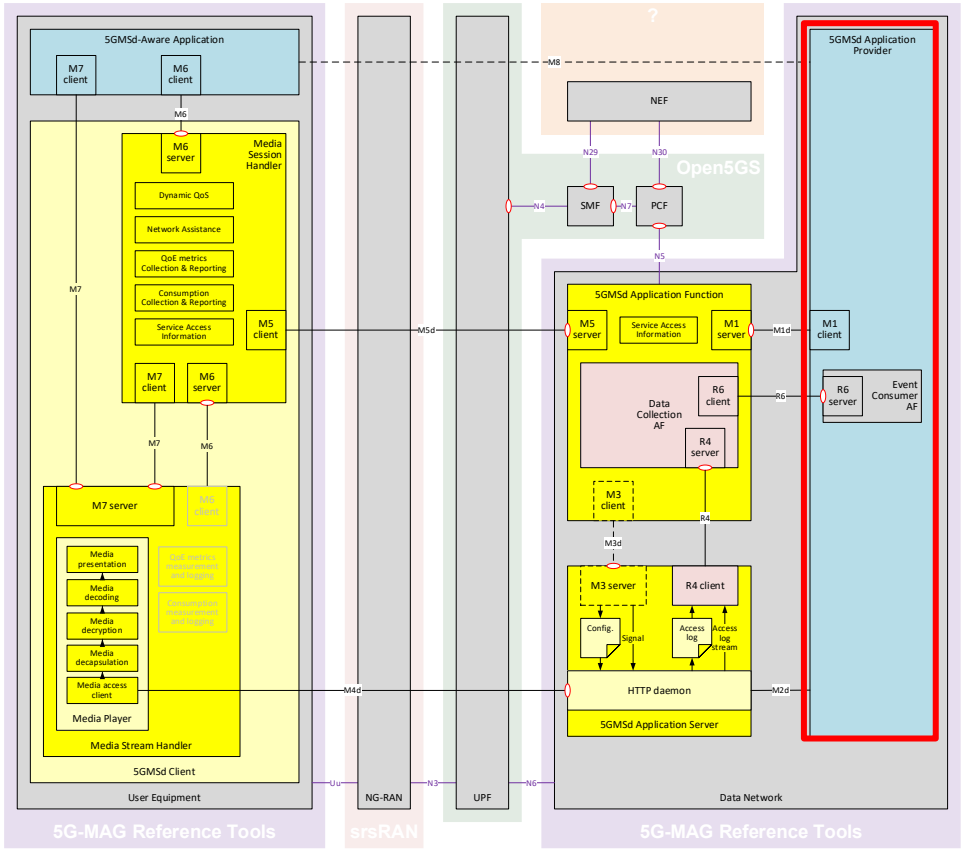
- **Consumption Measurement & Logging Client** in accordance with the **Consumption Reporting Configuration** part of provisioning data, supplied by the 5GMSd Application Provider to the 5GMSd AF, and forwarded by the 5GMSd AF to the Media Player via the Media Session Handler.



Projects

Application Provider User Interface

- Implementation of multiple tools to **interact with the 5GMS Application Function via the interface at reference point M1**.
- Implementation of a **web-based graphical user interface** to visualize QoE Metrics Reports.

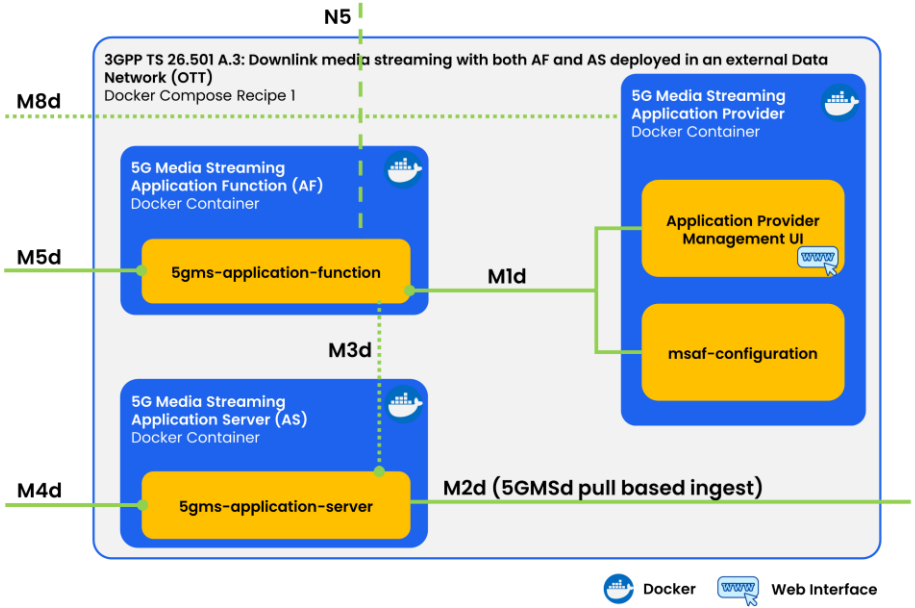


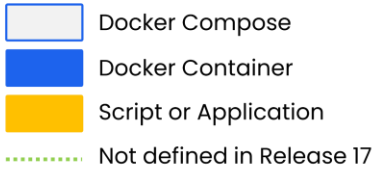
Projects

Project Dockerization and Launch Scripts

- Providing Docker support for 5GMS end to end setup

5G MEDIA STREAMING ARCHITECTURE (RELEASE 17) – DOCKER COMPOSE RECIPE 1





M1d: <<HOST_IP>>:5555

M2d: The 5GMSd AS is pulling content from an origin. The ingest URL is configured in "streams.json" and used by the msaf-configuration script.

M4d: <<HOST_IP>>:80

M5d: <<HOST_IP>>:7778

M8d: <<HOST_IP>>:80/m8.json

Management UI: http://0.0.0.0:8000

5G Media Streaming Architecture
Tutorials

- How to use the tools? [Check the GitHub Tutorials]
- Developer Xchanges and Updates: [5g-mag.com/tutorials]
- Video library for 5G Media Streaming: [https://youtube.com/playlist?list=PLFqKJZ78_IWUibB6dMiabaVNDFLSGBWIx]

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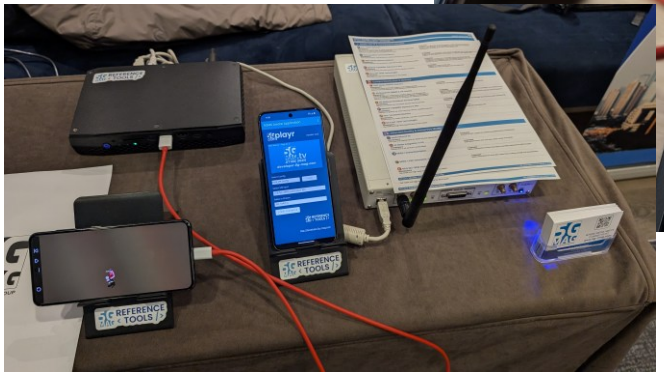
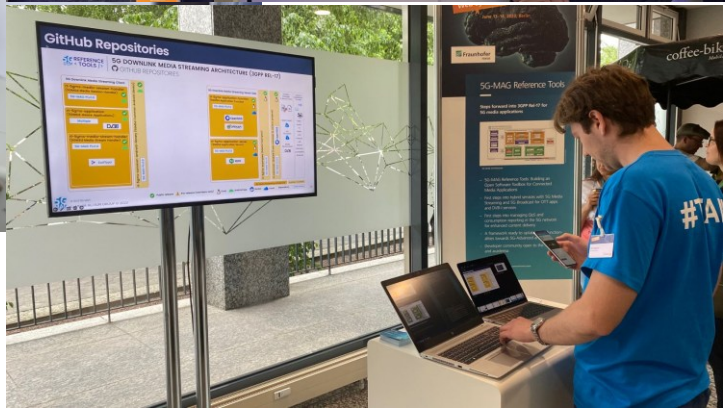
5G Media Streaming Architecture
Demonstrations and Trials

- 5G-MAG Reference Tools in use: 5g-mag.com/trials





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Visit www.5g-mag.com or contact us for more information

Eva Markvoort - Membership
markvoort@5g-mag.com

Jordi J. Gimenez - Technology
gimenez@5g-mag.com