

5G Media Streaming And 5G Broadcast

How 3GPP Leverages new 5G Capabilities for OTT Media Distribution

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Outline

1. Beyond the Best Effort Delivery Pipe with 5G Media Streaming
2. Multicast Broadcast Capabilities and How To Integrate Them
3. DVB-I: an Access Independent Service Layer for 5G



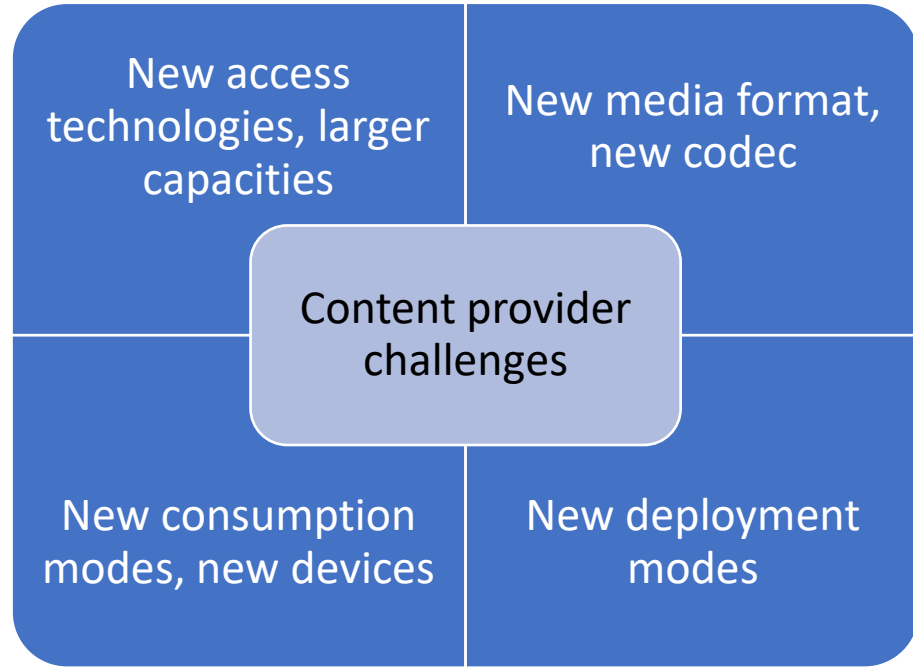
3GPP Rel 16:

- 5GMS
- LTE-based 5G broadcast

DVB-I
DVB-MABR

3GPP Rel 17:
5MBS

Beyond the Best Effort Delivery Pipe with 5G Media Streaming



Design of a new 3GPP framework for content providers to fully benefit of the expansion of 5G technologies: 5G Media Streaming

Beyond the Best Effort Delivery Pipe with 5G Media Streaming

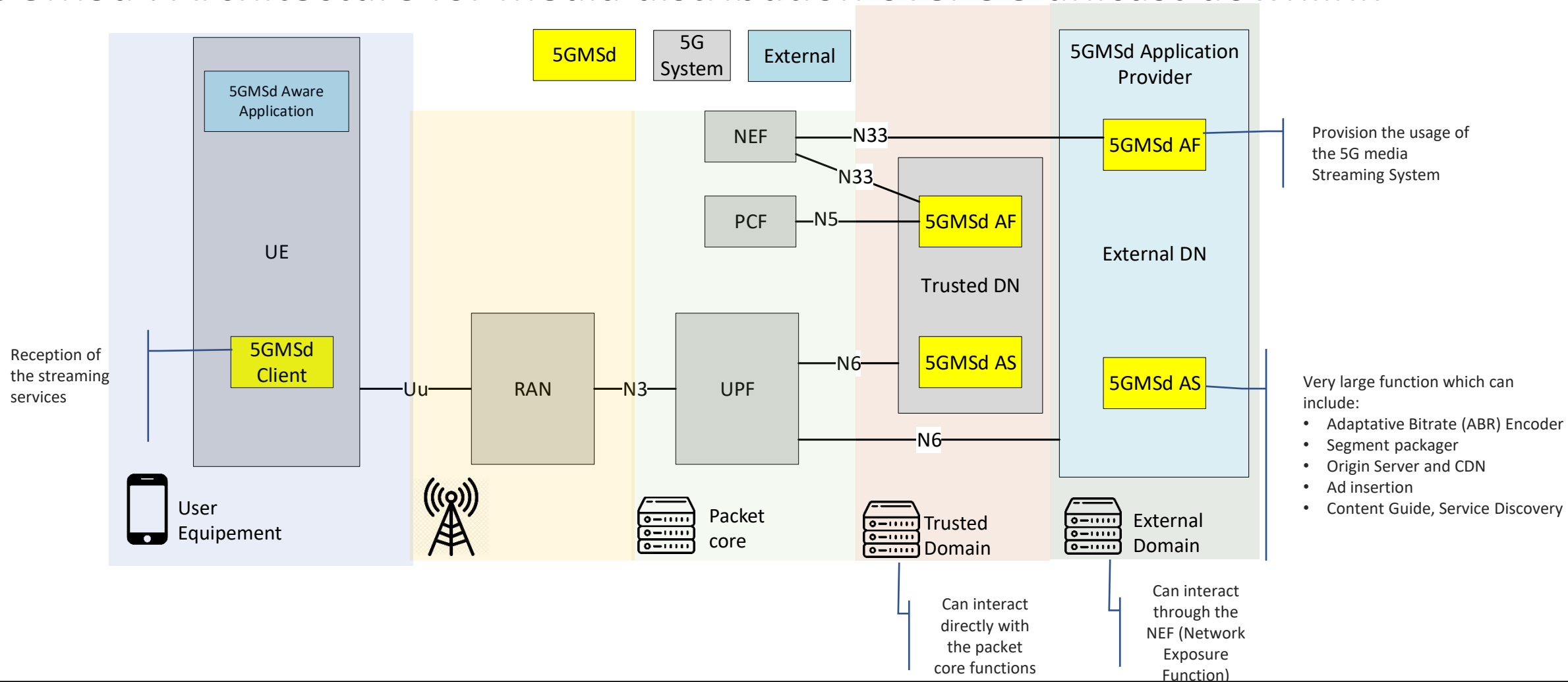
- 5G New Radio brought a lot of improvements for the enhanced Mobile Broadband (eMBB) use case in terms of spectral efficiency and throughput
- Nevertheless, by default, Delivery of Over The Top streaming services is done over a best effort 5G pipe
- 5G Media Streaming addresses 2 primary objectives:
 - Take advantage of new 5G features for vertical applications to increase QoS and QoE for video delivery
 - Offer a more flexible architecture adapted to the evolving media streaming ecosystem

Beyond the Best Effort Delivery Pipe with 5G Media Streaming

- Leveraging existing 5G capabilities with respect to QoS management:
 - Dynamic policy selection: the 5GSM client can ask for specific QoS policy and the 5GMS AF interacts with the Policy Control Function (PCF, providing policy rules to other control plane functions to enforce them)
 - Network slicing instantiation: 5GMS facilitates the creation of dedicated network slices satisfying the service level requirements (bandwidth, latency, reliability, mobility, etc.) for the service distribution of a given service provider.
 - Network assistance: assisting functions provided by the 5GSM AF to the 5GMS Client and Media Player in the form of bit rate recommendation (or throughput estimation), to be used for the media player's selection of media representations to avoid interruption and rebuffering. The 5GMSd Client may request a temporary delivery boost from the AF.
 - ANBR-based Network assistance: the 5GMSd Client accesses the RAN modem driver to acquire the Access Network Bitrate Recommendation (ANBR) provided by the MAC layer of 5G New Radio.

5G Media Streaming Architecture

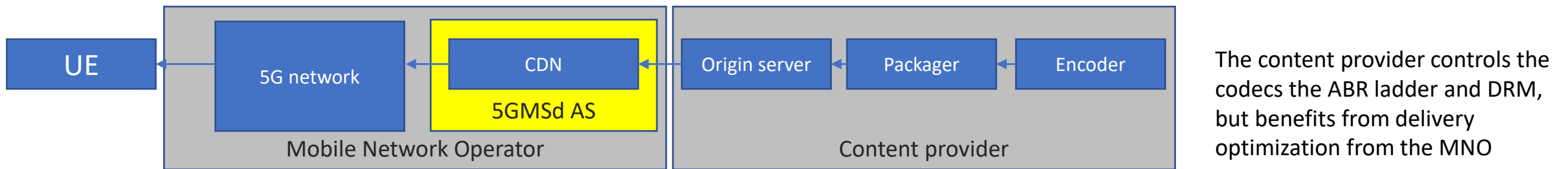
- 5GMSd : Architecture for media distribution over 5G unicast downlink



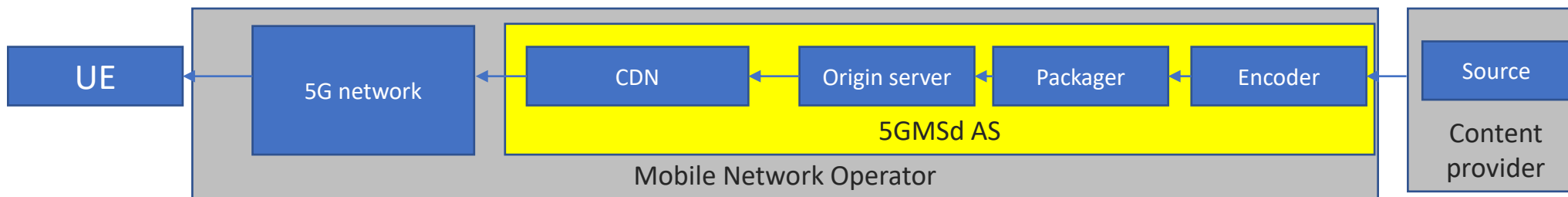
Collaboration models

- Modularity is at the core of the 5G Media Streaming design, to allow many different collaboration scenarios and business arrangements between content providers and operators.
- 5GMS AS subfunctions (encoder, CDN...) may not be instantiated/used, and can be located in the operator trusted domain or hosted externally.

- Example 1: reusing the operator CDN

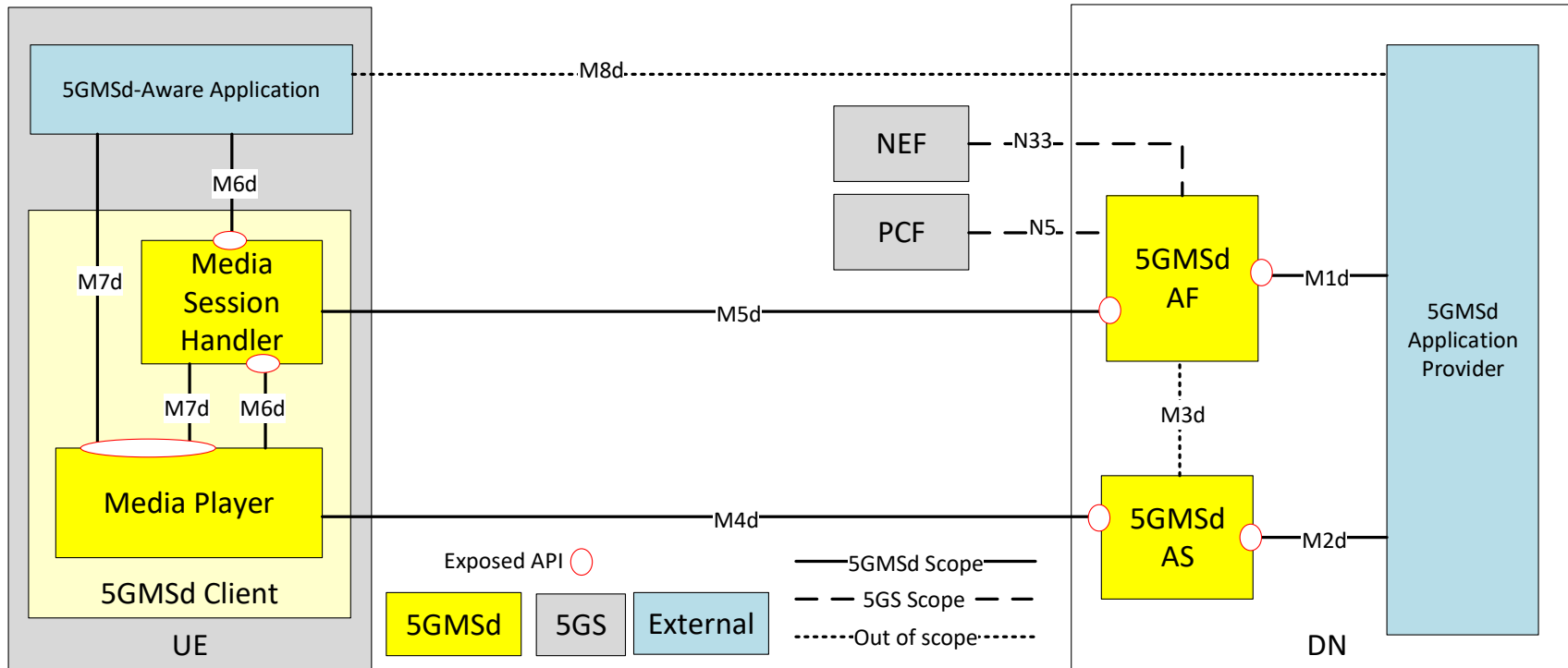


- Example 2: reusing the full media delivery pipeline



5G Media Streaming APIs

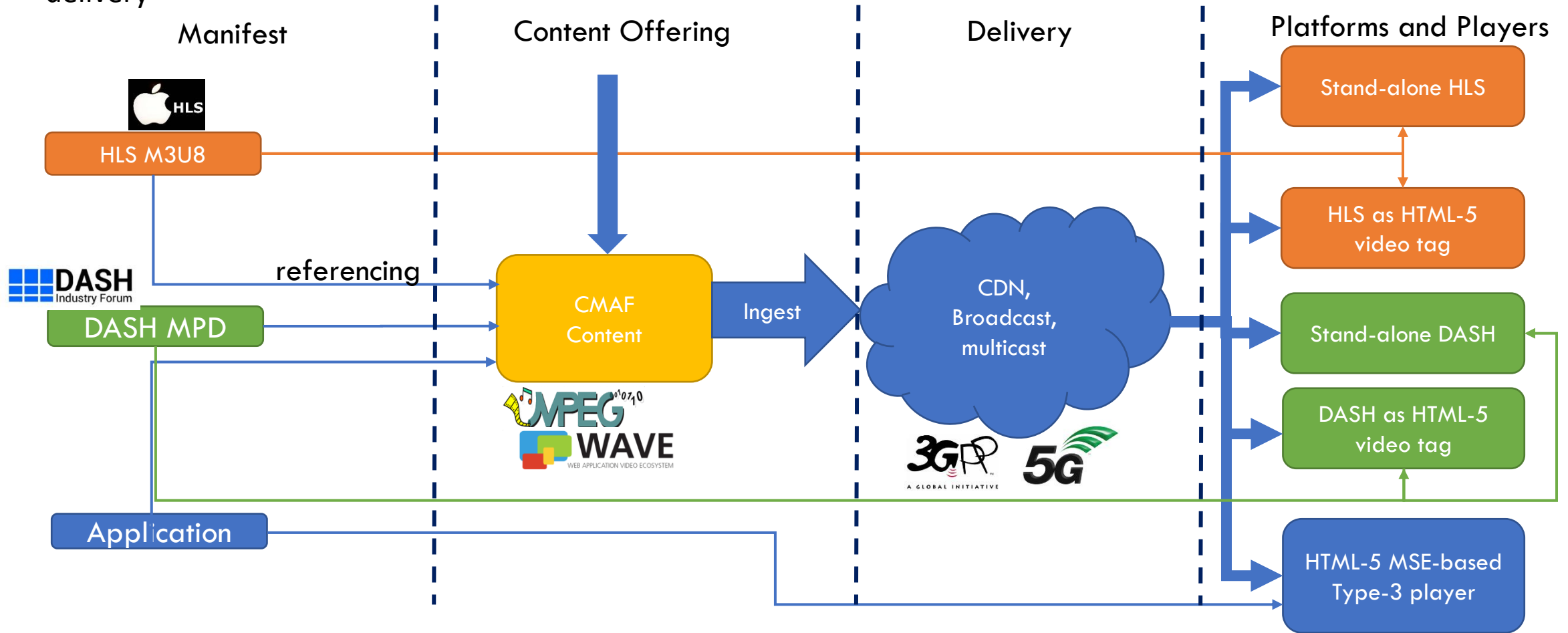
- Each of the 5GMSd functions operates with well-defined API/interfaces specified in 3GPP TS 26.512



- M1d:** RESTful provisioning interface
- M2d:** reference point for content ingestion
- M3d:** reference point between the 5GSMd AF and 5GSMSd AS (no standardized API).
- M4d:** content distribution to the media player, (HTTP pull-based content retrieval protocols)
- M5d:** RESTful configuration and reporting interface
- M6d:** control of the Media Session Handler
- M7d:** control of the Media Player
- M8d:** app-based communication

5G Media Streaming format and codecs

- 5GMS relies on CMAF (Common Media Application Format): Different Players – single encoding/encryption - common delivery



5G Media Streaming format and codecs

- 5G Media Streaming specifies a collection of recommended media profiles and codecs for different media types in TS 26.511 and 26.116
- TS 26.511 is not restrictive and other CMAF media profiles may be distributed via 5G Downlink Media Streaming.

Operation Point	Resolution format	Aspect ratio	Scan	Max. fps	Chroma format	Chroma subsampling	Bit depth	Colour space	Transfer Characteristics
H.264/AVC 720p HD	1280×720	16:9	Progressive	30	Y'CbCr	4:2:0	8	BT.709	BT.709
H.264/AVC Full HD	1920×1080	16:9	Progressive	60	Y'CbCr	4:2:0	8	BT.709	BT.709
H.265/HEVC Full HD HDR	1920×1080	16:9	Progressive	60	Y'CbCr	4:2:0	10	BT.2020	BT.2100 PQ

- This list may be enriched in the future with nextgen codecs and additional profiles

5G Multicast/Broadcast Capabilities

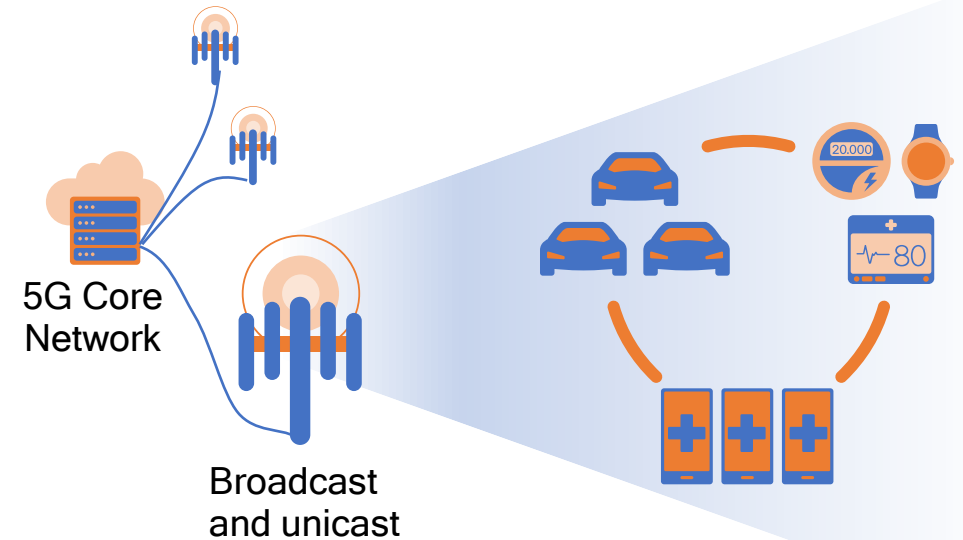
- In 3GPP Release 16, 5GMS is focused on delivery over unicast
- For Release 17, the integration of two capabilities is scheduled:

- LTE-Based 5G Broadcast



Dedicated broadcasting network to provide a common delivery platform for different contents/services

- 5G Multicast/Broadcast Services (5MBS)



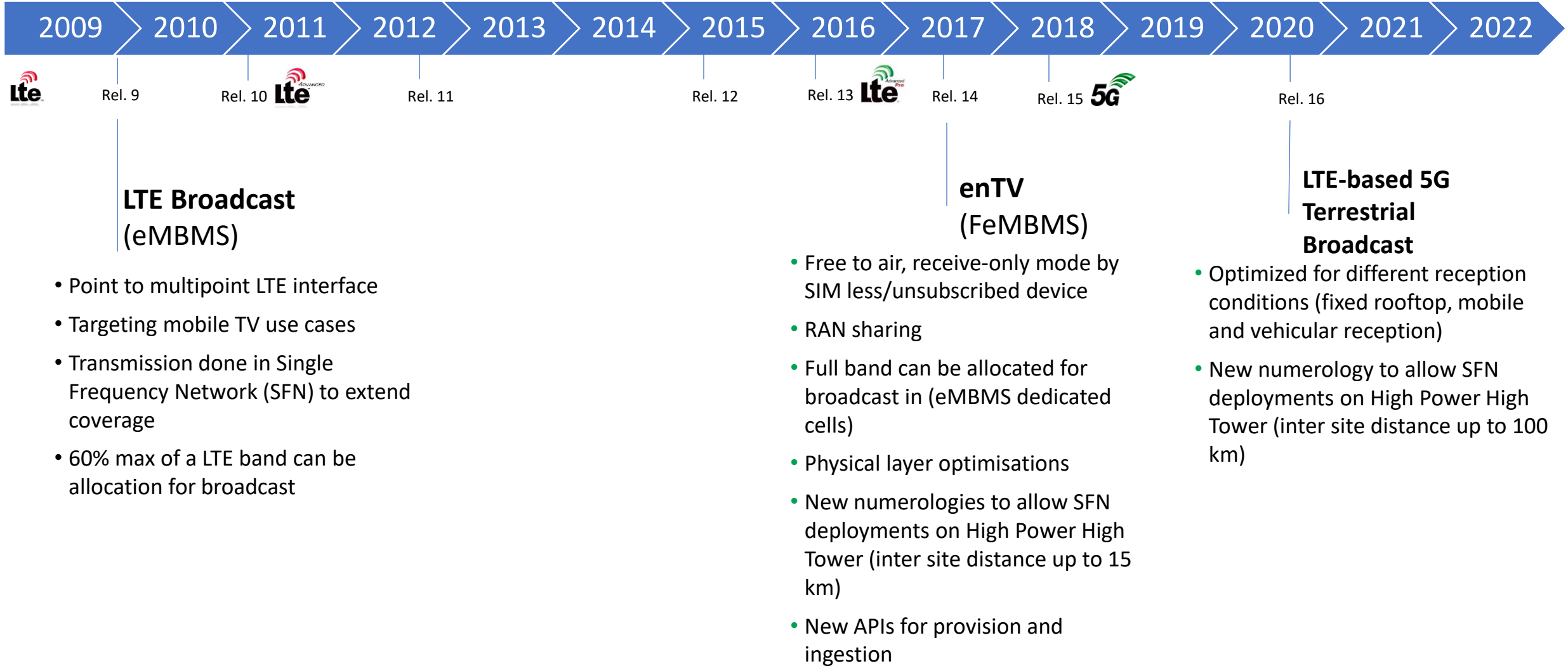
Dynamic mode switching between unicast and broadcast to more efficiently deliver identical content

Supporting a wide range of 5G NR use cases, including media delivery, SW/FW update, IoT multicast, efficient V2N, public safety

Why integrate Multicast/Broadcast in 5GMS

- to scale up the network capacity for linear contents
- Create new opportunities beyond regular broadcast for the delivery of hybrid services provide the following functionalities:
 - Same service available over multicast/broadcast and unicast. The client can decide which delivery mode to use depending on reception qualities, capabilities...
 - Fast service acquisition at start-up
 - Auxiliary components over unicast such as alternative languages
 - Unicast-based ad insertion/substitution
 - Audience measurement
- Integration is needed depending on the collaboration model and the targeted use-case.

LTE-Based 5G Broadcast

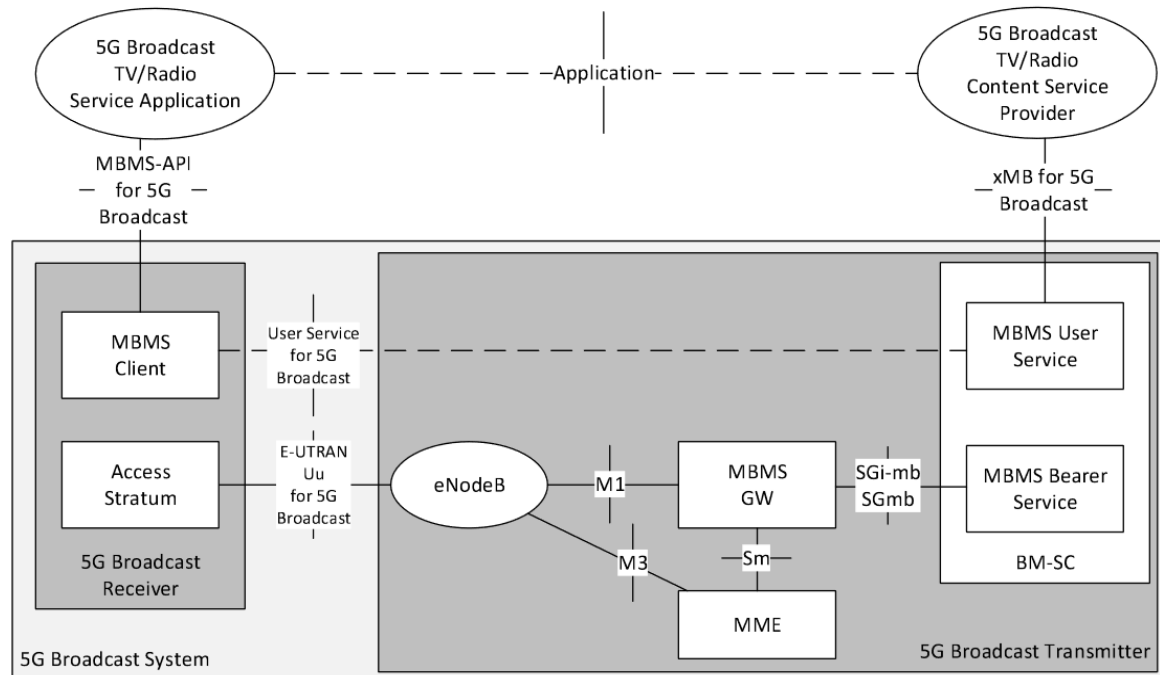


LTE-Based 5G Broadcast

- 3GPP specifies a service layer including:
 - Service discovery and announcement procedures
 - Delivery methods (protocol stacks over UDP multicast and associated procedures for reporting or loss recovery)
 - *Streaming delivery method* for RTP-based services
 - *Download delivery method* for file delivery over multicast, adapted to support the delivery of live ABR services as DASH or HLS
 - *Transparent delivery method*, added in Release 14, forwarding any IP packet streams received from the service provider. It allows the distribution of any other IP multicast services and the support of external content formats specified by other organizations as DVB or ATSC.

LTE-Based 5G Broadcast

- This set of features addresses all the requirements of a 5G Broadcast System, formulated in TS 22.261 and are profiled by the European Telecommunications Standards Institute (ETSI) in TS 103 720 for 5G dedicated broadcast networks. This profile is referred to as *LTE-Based 5G broadcast*.

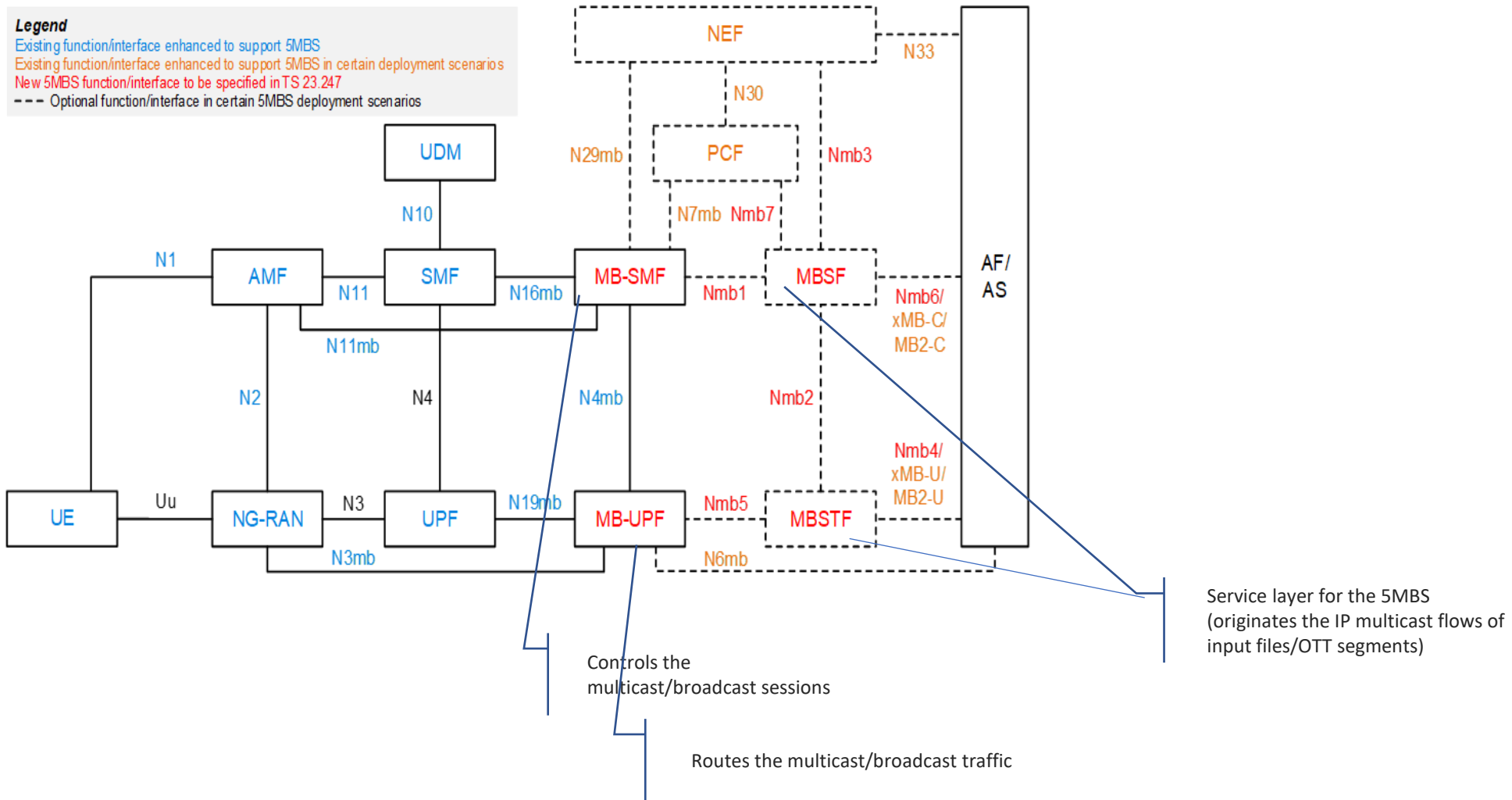


Reference architecture for 5G Broadcast System (TS 103 720)

5G Multicast Broadcast Services (5MBS)

- Based on 5G New Radio, expected in Release 17
- High commonality with unicast, e.g. a common physical layer
- Allows coexistence of unicast and multicast/broadcast within the same band
- Suitable for use cases where the required coverage is limited (a few cells) due to user interests and may change due to user movements. The multicast/broadcast area can be dynamically adjusted cell by cell according to user's distribution.
- Addresses public safety use cases, Vehicle To Network (V2N) and can also covers media delivery scenarios.

5G Multicast Broadcast Services (5MBS) architecture



Integration of multicast/broadcast capabilities in 5GMS

- How to integrate ?

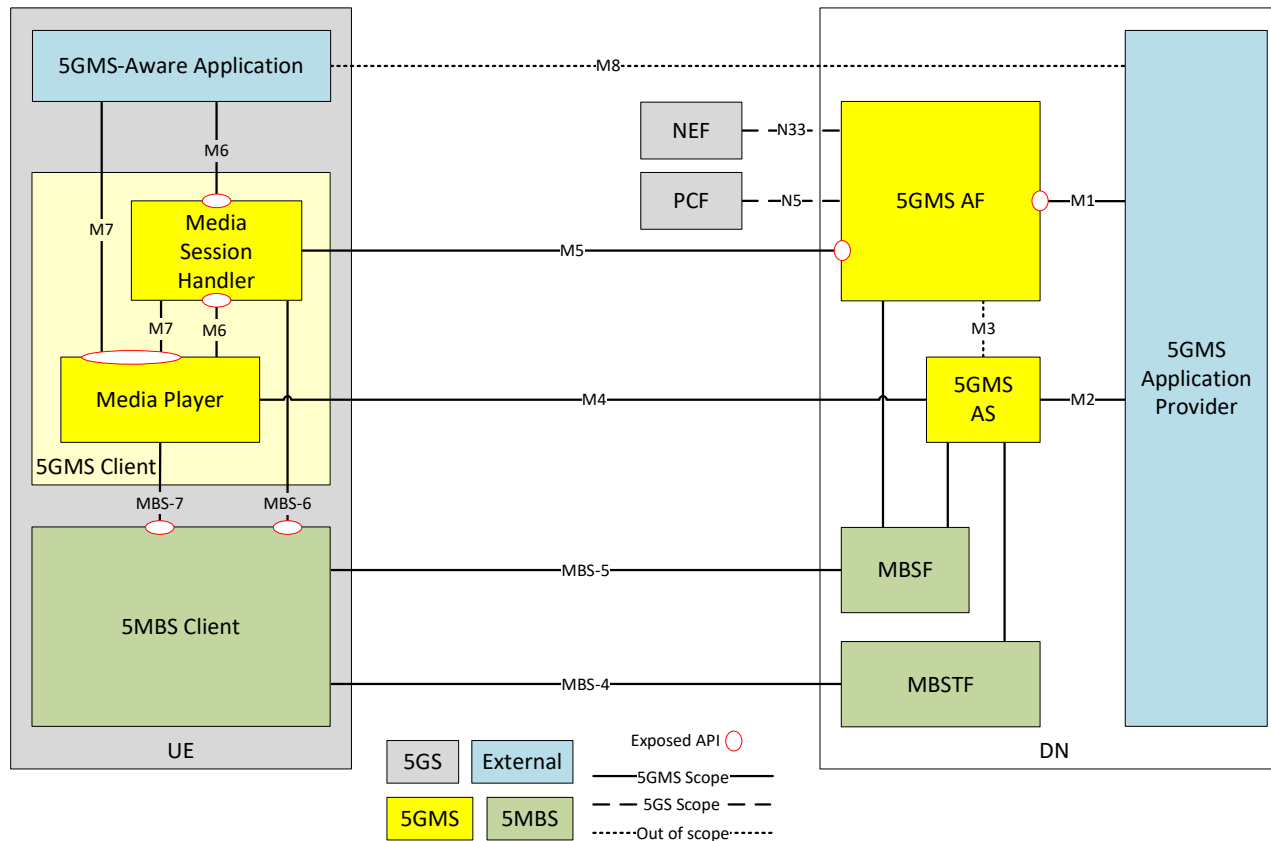
- 5GMS allows many collaboration models
- 2 different multicast broadcast capabilities to be integrated
- For both LTE-Based 5G Broadcast and 5MBS, the third party content provider can directly provide IP multicast streams. It can also provide a pointer towards the origin server hosting the OTT content to be multicasted by the 3GPP service layer/protocol stack.

⇒ It could lead to a multiplication of architectural and collaboration variants ...

2 main options can be distinguished

Integration of multicast/broadcast capabilities in 5GMS

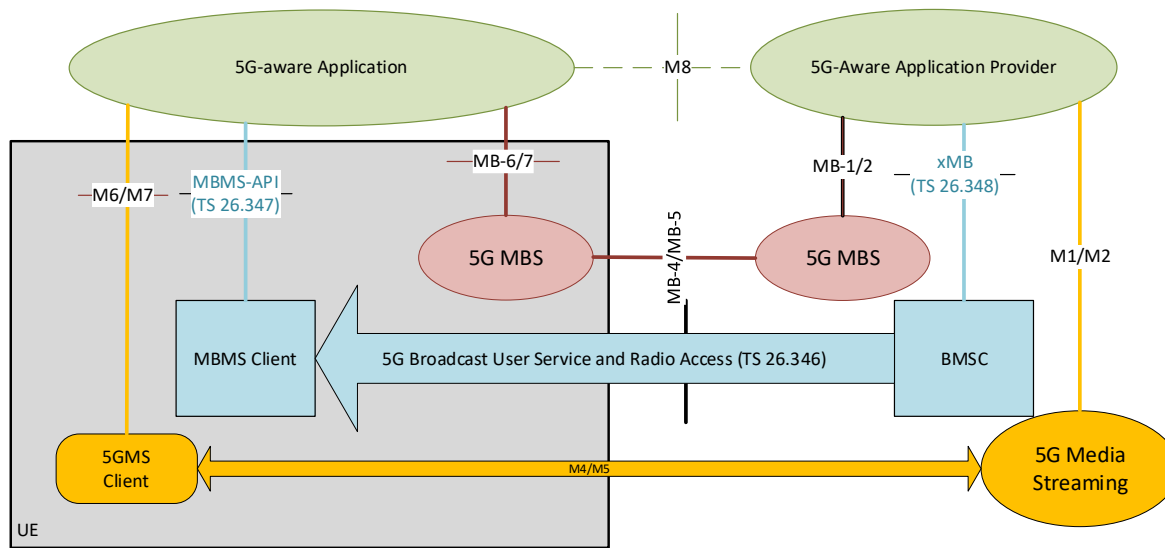
- Option 1: multicast/broadcast used by the operator, transparent to the application



- The content provider only interacts with the 5G Media Streaming API
- The 5G Media Streaming System can decide to distribute the content over multicast/broadcast
- Usage of multicast/broadcast is transparent to the content provider

Integration of multicast/broadcast capabilities in 5GMS

- Option 2: multicast/broadcast used by the content provider as another delivery options



- 3 distinct pipes within 5G Media Streaming for unicast, and multicast/broadcast capabilities.
- Leverages existing capabilities and APIs/interfaces... but requires multiple integrations.
- Matches with the vision of DVB-I

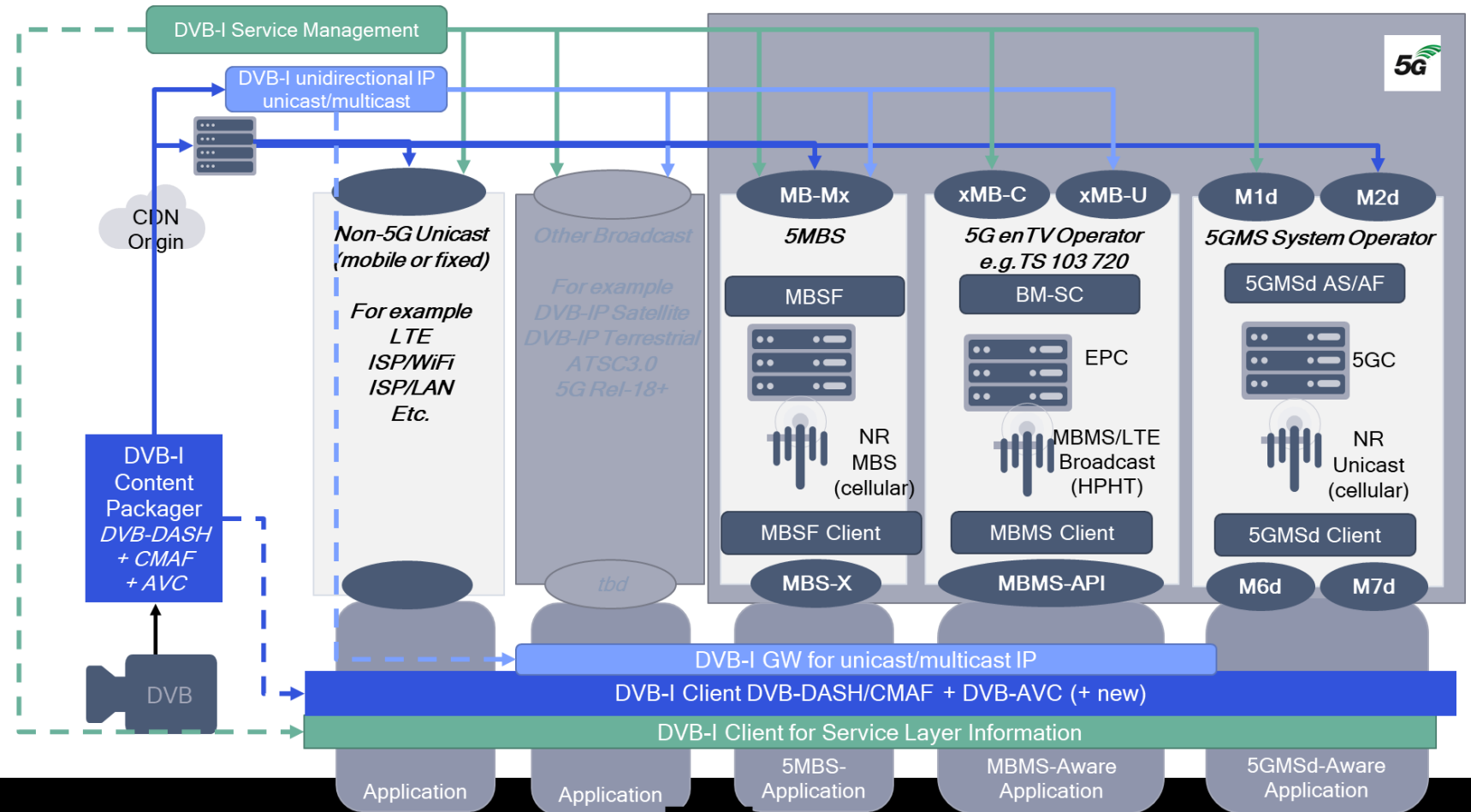
DVB-I: an Access Independent Service Layer for 5G

- DVB-I aims to bring linear TV delivered over IP networks up to the user experience level of traditional broadcast. It includes delivery over unmanaged networks and managed networks (satellite, fiber, cable, mobile...)
- Objective is to signal and distribute services in a standardized manner without the need of a specific application.
- DVB-I specifications includes
 - DVB-I Service Discovery and Programme Metadata.
 - DVB MPEG-DASH Profile for transport of ISO BMFF Based DVB services over IP
 - DVB multicast ABR (DVB-MABR), specifying how segment streaming services can be delivered over IP multicast

DVB-I: an Access Independant Service Layer for 5G

- DVB has achieved a study about the delivery of DVB-I services over 5G and is initiating the specification work.

High level vision consists in adding the 5G delivery systems as new alternative pipes:



DVB-I: an Access Independent Service Layer for 5G

- DVB-I benefits from the latest enhancements brought by DVB-MABR.
- In particular, DVB-MABR provides a solution for the delivery of Low Latency DASH over multicast, not supported yet by the 3GPP service layer.
- Over unicast, low latency is achieved by transporting chunks of segments before the full segment generation. DVB-MABR specifies how these CMAF chunks can be delivered over multicast.

Conclusion

- 5G Media Streaming is an important effort by 3GPP, taking into account the complexity of the streaming ecosystem.
- 5G Media Streaming allows benefiting from the latest 5G features and capabilities through a set of well-defined APIs and interfaces.
- Broadcast/Multicast, to be included in Release 17, is a key capability to scale up network capacity. The combination of unicast and broadcast will allow the delivery of enriched hybrid services.
- DVB-I, as an access independent service layer, is a promising candidate to implement these hybrid services in a wide range of delivery broadband/broadcast networks, including soon the capabilities of 5G mobile networks.

From Here



A cross-industry association to collaborate on the implementation of 5G technologies for media production and distribution, identifying relevant use cases for media distribution over 5G



DVB-I over 5G requirements

Thank you!