



Technical Report EBU

5G FOR THE DISTRIBUTION OF AUDIOVISUAL MEDIA CONTENT AND SERVICES

Abstract

Media organizations have evolved their content offer from a limited number of linear radio and TV channels into a rich and differentiated offering available across a range of different distribution platforms. This includes IP based services with linear as well as nonlinear and catch up content. Portable and mobile devices such as smartphone and tablets play an increasing role for the consumption of media content and services in the home, as well as on the move.

For the time being, the only way of delivering nonlinear services to portable and mobile devices is by means of unicast connections. However, the large scale delivery of audio visual content over mobile unicast networks is at present not satisfactory both from media service providers and user perspectives, due to deficits regarding QoS, coverage and costs. 5G as specified by 3GPP may offer an opportunity to bridge this gap.

This report elaborates on the potential of 5G to facilitate the distribution of the whole range of PSM services to portable and mobile devices. It is a result of collaboration between stakeholders in the media sector, including public and commercial broadcasters, broadcast and telecom network operators, equipment manufacturers, and technology providers. Hence, the views presented in the report do not necessarily reflect a formal position of the EBU or any of the contributing parties.

The report addresses 5G network deployment opportunities for the distribution of media services. Even though the media industry, led by the EBU, successfully engaged in the standardization of 5G, in particular 5G Broadcast, this does not guarantee that all standardised features will inevitably be implemented in 5G networks and devices. The scope and timing of market deployment of a particular feature are largely driven by the existing or expected market demand.

This report elaborates on those issues which need to be resolved to bring the new technology to the market. These are related to technology, network infrastructure, regulation including spectrum and business arrangements between different stakeholders. Possible actions to support the use of 5G technology in the media industry and to verify the market demand for specific features are identified.

The report starts with an overview about distribution requirements from the media industry. Then the current state of the 5G standardization is summarized followed by a chapter which contains the views of the stakeholders which were involved in drafting this report. Next, 5G deployment opportunities for the distribution of media content and services are presented, first for 5G Broadcast, then for 5G Mobile Broadband in a broader sense. The report includes an analysis looking to which extent 5G may be able to fulfil the requirements in the distribution of different types of audio visual media services. The annexes contain more details regarding spectrum, business aspects and network design.

The main conclusions emphasise the fact that, technically, 5G may be able to meet the distribution requirements of both PSM and commercial media providers if a combination of 5G Mobile Broadband and 5G Broadcast is used. To achieve this in practice, collaboration between stakeholders across the media value chain is required. In addition, further investigations into cooperative models between broadcasters and mobile network operators in term of joint use of spectrum and site assets would be useful. Such cooperation may deliver the cost benefits and the economies of scales required to trigger the device and infrastructure ecosystem for 5G broadcast.

As the roll out of 5G networks has widely started only recently, this report constitutes a snapshot in time. It may help media organizations though in developing their individual distribution strategy with regards to 5G technology.

Keywords:

Programme Distribution, Broadcast, Linear, Nonlinear, 5G, Enhanced Services, 5G deployments, 5G Broadcast, Mobile Broadband.

1. Introduction

The EBU, in collaboration with several companies across the mobile and broadcasting industries have investigated how 5G may help media organisations to improve the distribution of their audio visual (AV) content and services for their audiences.

Content and services of media organizations, in particular public service media (PSM) organizations, have evolved from a limited number of linear channels into a rich and differentiated offering across digital distribution platforms including IP based services which, often through media players, now also provide nonlinear and catch up content – content and services which are increasingly popular with audiences.

Audiences now widely consume media content and services (audio and video) on conventional and smart TV sets, portable and in car entertainment systems, smartphones, tablets, personal computers, smart speakers, etc. Much of this consumption happens in the home, as well as on the move.

Conventional broadcast technologies (e.g. DVB T/T2) could deliver linear services to portable and mobile devices. However, these standards are not widely supported in such devices. Typical HPHT broadcast networks for TV are in general not designed to support mobile use cases and will need to be adapted for such use cases, e.g. for public transport in cities. Additionally, conventional broadcasting standards are not capable of delivering nonlinear services without a complementary IP connection.

In principle it is possible to deliver linear and nonlinear media content and services to mobile and portable devices with conventional mobile broadband (e.g. unicast IP over mobile networks), however questions remain about this distribution mode, for example:

5G has the potential to provide answers to some of the questions above, particularly for linear services which can be delivered with 5G's broadcast functionality. This may enable meeting the media industry's technical, commercial and regulatory requirements at the same time.

To date, most of the media industry's efforts related to 5G have been directed towards 3GPP standardisation. This is a necessary step, but it does not guarantee that all standardised features will inevitably be implemented in 5G networks and devices. Therefore, it is not possible to identify a reliable timeline for the availability of various standardized 5G features on the market.

The scope and timing of market deployment of a particular feature are largely driven by the existing or expected market demand. This report addresses 5G deployment opportunities for the distribution of audio visual content and services. Issues regarding technology, networks, regulation including spectrum and business arrangements between different stakeholders are discussed. Possible actions to support the use of 5G technology in the media industry and to verify the market demand for specific features are identified.

2. AV Media Services and Requirements

Today, AV media companies offer two broad categories of content and services that are relevant for this report: linear media services and nonlinear media services. These services are now commonly being brought together into a single offer – referred to herein as an Enhanced Media Service that builds on the strengths of each. These services, as well as the requirements that AV companies have for distributing them, are further described below.

2.1 Linear Services

Linear Media refers to conventional, curated broadcast TV or radio channels where programmes such as news, sport, entertainment and documentaries are scheduled by a service provider to be viewed at the time of transmission. Programmes in a linear channel may include live coverage of events (e.g. sports, news, cultural and entertainment) whereas others may be pre recorded (documentaries, drama, movies etc.). The programme schedules, or sequence of programmes, are determined by the service provider and do not require, or allow, the user to interact with the programme or the service provider to view the content. Users can tune in to, or change to a different channel, but they cannot view programmes other than those being transmitted at the particular time in question, change the order of the programmes in the schedule, or the time of a programme's transmission.

Beyond conventional broadcast TV and radio, new forms of linear service are also arising on other platforms such as the live streaming service of Amazon Live or the use of social TV to cover, in particular, live events. These types of service, which are only meant to be available on certain occasions, are also treated under the category of linear services.



Linear services can be transmitted by platforms that do not require bi-directional communication between service provider and user to access the content – they can be broadcast with no return channel.

Linear services are conventionally delivered by broadcast platforms such as DTT, Satellite and cable. However, they may also be delivered over IP by the fixed internet e.g. ADSL and fibre, including Wi-Fi as an extension for indoor scenarios. Mobile networks (e.g. 3G/4G/5G) may also deliver linear services via unicast IP streams to compatible devices.

2.2 Nonlinear Services

Nonlinear media is a type of media content that is offered on-demand at the request of the user.

Users can select content they wish to watch or listen to from a content library and control, as a minimum, the timing and sequence of the consumption. It is normally possible to rewind and replay content from libraries as desired. Particularly popular nonlinear services are catch-up and time-shifted services as well as VoD and AoD. Content may also be stored in the cloud, in personal video recorder offerings or downloaded to local storage for future consumption at times where there is no access to the network, or it is intermittent.

Nonlinear services require bi-directional communication between a service provider and user to access the content the user requests. Some content may be pushed to the user device – via a unidirectional transmission – for storage and later consumption should the functionality be enabled.

However, such content is usually only pushed out to users at their request or agreement.

Nonlinear services are normally delivered over IP by the fixed internet e.g. ADSL and fibre, including Wi-Fi. Mobile networks (e.g. 3G/4G/5G) may also deliver nonlinear services, particularly to mobile devices. Note that in terms of bandwidth, the downstream is significantly more demanding than the upstream as it conveys the AV content.

2.3 Enhanced Media Services and Platforms

Enhanced media services create an enriched content proposition by combining the best of both linear and

nonlinear services. Conventional curated linear services are available alongside nonlinear content, and these services may be complementary, or entirely new. Enhanced media services allow content to be personalised for users based on their viewing and listening preferences of the past as well as content genres to which they may have signed up to or previously liked.

Enhanced media services typically offer audiences/users the following:

- Access to linear stations (national and local), particularly for significant events such as international sporting matches.
- Time-shifting, pause and rewind of live services.
- Easy search of media libraries including video clips, podcast, audio books, chapters, programmes, etc.
- Downloadable programmes to watch or listen to offline.
- Additional value-added information such as targeted advertising and programme substitution (e.g. regional breakouts and regional news), and other location-aware services.
- Personalized services to match users' interests and preferences such as content recommendations.
- Possibility of user feedback and audience statistics back to the CDN or service provider.

Enhanced media services are available today and may be accessed through devices that support them. Smart TVs, for example, can receive conventional linear content through their broadcast receivers as well as nonlinear content through their IP capabilities. HbbTV services or software applications (apps) for smartphones, tablets, PCs and smart TVs also offer enhanced media services, usually delivered over-the-top (OTT), thus requiring an internet connection.

Examples of applications offering enhanced media services include the BBC iPlayer, RaiPlay, ARD Mediathek, RTL TVNOW, Atresmedia Player, etc. Several hybrid radio services are also available, or emerging e.g. Kronehit (Austrian radio application), ARD Audiothek, and BBC Sounds.



Figure 1: Linear TV and Nonlinear Video on Smartphones and Tablets. From left to right: The ARD Mediathek (PSM), RaiPlay (PSM) and Atresmedia (commercial) and RTL' TVNOW (commercial) applications.

Note that there are examples of several platforms such as waipu.tv or TuneIN Radio that aggregate content from PSM and commercial broadcasters under their own applications.

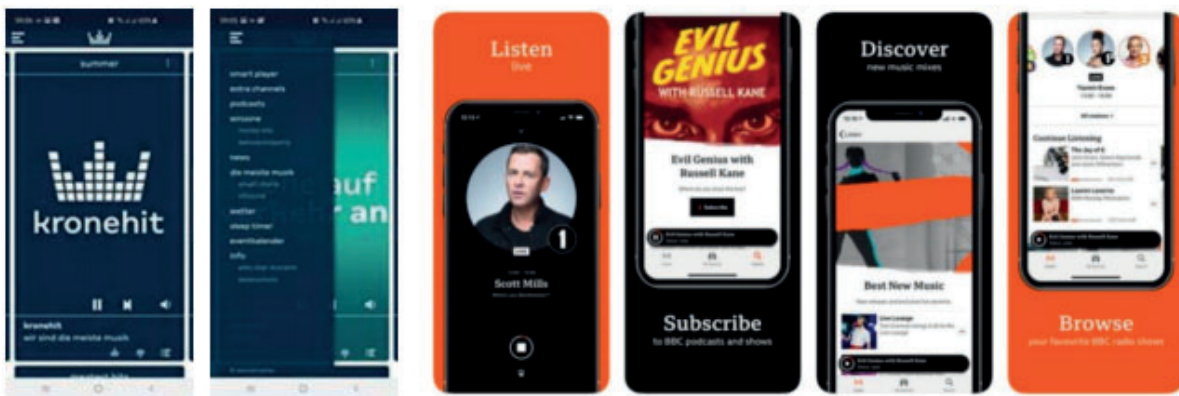


Figure 2: Radio and Podcast on Smartphone and Tablets. From left to right: The Kronehit (commercial) and BBC Sounds (PSM) applications.

These applications may also be installed on car entertainment systems provided that an internet connection is available either through the car itself or by means of pairing with a mobile phone.

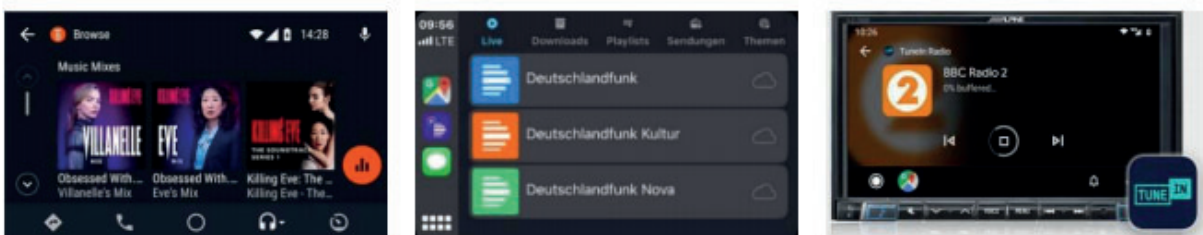


Figure 3: Radio and Podcast in Car infotainment systems. The BBC Sounds (PSM) for Android Auto, the DLF App (PSM) for Apple CarPlay and TuneIn Radio (aggregator) for Android Auto

Social networks such as Facebook, Twitter, Instagram or Snapchat, as well as YouTube, also allow live streaming of AV content alongside interaction between users by means of comments, etc. Both private users and institutional users (like TV service providers) make use of the live streaming functionalities on social media platforms. Some broadcasting companies in Europe provide live streams on

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Figure 4: Live TV over social networks. Examples of Amazon Live and the ARD Tagesschau over Facebook.

2.4 Distribution Requirements

2.4.1 Public Service Media Organizations

Public Service Media organizations have several requirements intended to ensure the desired integrity, availability and quality of media services delivered across different platforms. Such requirements reflect the conditions in which public service media operate and their regulatory obligations and constraints. Many of the main requirements that are relevant for this document have been captured in [1], and are reproduced below:

- **Universal Coverage and Access:** Geographical availability of the service (e.g. national, regional, local) according to regulatory requirements.
- **Free to air Access:** users can consume content without the need to subscribe to the service provider or the network operator.
- **Defined Quality of Service (QoS):** to be defined by the broadcaster, e.g. availability of network transmissions, robustness, up time, latency, and reliability.
- **Scalability:** QoS for each user shall be independent of the size of the audience.
- **Service integrity:** No modification of the PSM content or service by third parties. For example, TV content and additional services (e.g. subtitles) must be displayed on screen, unaltered and without unauthorised overlays.
- **Prominence:** provisions should exist for adequate prominence of several PSM services intended to be offered (e.g. position in programme guides)
- **Ease of Use:** Straightforward accessibility and prominence of the PSM offer.
- **Accessibility:** support for people with disabilities (e.g. subtitles, audio description and signing).

- **Public Warning:** Ability to reach audiences in emergency situations.
- **No Gatekeeping:** Deliver PSM content to the public without unduly constraining the service offer e.g. blocking or filtering content, restricting access to services or network infrastructure.
- **Costs:** nationwide content distribution and universal access should be affordable for PSM (including content royalty fees) and consumers alike.

Specific use cases may entail several additional requirements that need to be taken into account, for example data rate, bit error rate, targeted peak concurrent audience size, mobility, etc.

PSM requirements have been developed over many years, often with linear broadcast and fixed reception in mind. Ideally it would also be possible to meet them across all distribution platforms, including for mobile devices such as smartphones. However, it is recognized that the use of bi directional communication – particularly IP distribution – currently involves additional implications that may require new technical enhancements or commercial arrangements to substantially fulfil these requirements.

2.4.2 Commercial Content and Service Providers

Commercial Broadcasters' requirements are broadly consistent with the requirements of PSM organizations, especially in areas such as service integrity, access to media platforms and easy discoverability in user interfaces. These issues are also handled in the EU AVMS Directive [2]. Distinctions can however be observed regarding monetization and advertising:

- **Monetization / Encryption / Copy Protection:**

Private Broadcasters and Pay TV Operators must monetize their products. In linear TV this is done in the first place by airing advertisements and selling subscriptions. In the case of nonlinear Catch up & VoD services typical business models are SVoD, AVoD and TVoD. Industry standard Encryption and copy protection technologies (e.g. CI+, embedded CA System, AES encryption, DRM protection) allow to protect linear TV services and nonlinear content and are thus also mandatory for any new distribution technology. Here, it needs to be considered that content rights and product offerings are becoming increasingly complex.

- **Targeted Advertising (TA):** Addressable TV functionalities allowing for a personalized TV experience (e.g. regional services, customized UI and content) are essential for the market and have to be established, both for vertical (with platform operator offering services with proprietary STB) and horizontal (without platform operator) deployment scenarios. With the shift of Ad Budgets to “addressable” also new ad products like so called “Switch In” display ads and dynamic ad substitution (DAS) are of growing importance.

First DAS implementations based on HbbTV technology are currently on air, but additional standardization is required to provide a high reach and reliability. In early 2020, DVB released its targeted advertising specification that complements the new HbbTV TA specification for this specific use case with a standardized way of signalling the advertisement substitution opportunities in the live TV broadcast [3]. This enables broadcasters to provide specific audience groups with customized advertising during commercial breaks, where the ‘normal’ advertisement on the TV channel’s conventional broadcast feed is replaced on a screen by screen basis with a specific targeted advertisement.

- **Enhanced media services**, combining interactive elements providing access to additional linear (e.g. alternative audio tracks, real time gaming) and nonlinear content (like e.g. time shifted viewing, video on demand) with traditional linear TV, are an indispensable part of today’s TV experience. The ability to provide enhanced TV services should be a common basic requirement of PSM and commercial broadcasters for any 5G media deployments.

References:

[1] “Distribution of Public Service Media”, EBU Technology Fact Sheet, available at: https://tech.ebu.ch/docs/factsheets/ebu_fs_psm_requirements.pdf (accessed in Apr. 2020)

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[3] DVB Document A178 1, “Dynamic substitution of content in linear broadcast: interfacing an advert decisioning service and optimal preparation”, Nov 2019

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