The future role of Broadcasting in a world of changing electronic communication

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The growing availability of access to the Internet has changed – and is still changing – the technical, economic and regulatory conditions under which broadcasting is taking place. This is in particular an issue for terrestrial broadcasting, as mobile services try to gain access to spectrum once exclusively used by terrestrial broadcasting networks. Changes in users' habits and expectations, and the need for broadcasters to offer a great variety of linear, nonlinear and hybrid radio and television programmes, all add to the pressure on terrestrial broadcasting.

This article tries to shed some light on relevant developments which are likely to determine the future direction that terrestrial broadcasting will take. Opportunities and threats are discussed and the actions that broadcasters need to take in order to safeguard the future of terrestrial broadcasting are addressed.

Introduction

The development of terrestrial broadcasting reached its climax in Europe in June 2006 when the Regional Radiocommunication Conference of ITU-R adopted a new frequency plan for digital terrestrial broadcasting. However, just one year later, the sweet dreams of the broadcasting future turned into a nightmare for broadcasters when WRC-07 decided to re-allocate the band 790 – 862 MHz to the Mobile Service on a co-primary basis. In the meantime, many European countries have released the band from broadcasting. Within the EU27 countries, the band will be available exclusively for IMT by 2013.

Only slowly did the broadcasters start to realize that their business was no longer perceived as so important, when large portions of scarce spectrum resources started being allocated to these other services. As the world of communication and media had entered a process of transformation, broadcasters started to reclaim their fundamental needs and objectives. This is still ongoing and far from concluded.

EBU Technical went through a similar process and decided to put in place two so-called Strategic Programmes dealing with the issues of the future of terrestrial broadcasting and the cooperation between broadcast and broadband networks, with a focus on terrestrial broadcasting and mobile broadband. The first group (SP-TB) came up with EBU Technical Report 13 in which a broader approach was employed to look at future perspectives of the terrestrial platform in a more holistic manner [1].

The development of new distribution technologies has been in focus for a long time in the broadcasting world. However, the advent of the Internet and the progress of mobile broadband technology have changed the picture. Via broadband connections, access to audio and video was becoming a

more and more widespread option. Hence, broadcasting distribution technologies were confronted with a new and potent competitor in the battle for the favour of customers.

The Strategic Programme on Cooperative Terrestrial Networks (SP-CTN) is currently making the next step. Its objective is to look into ways of making broadcast and broadband networks work together in the task of delivering broadcasters' content. Market investigations in recent years have clearly shown two fundamental trends in broadcasting. Firstly, linear television is and remains a killer application for the foreseeable future. An average viewing time of more than 4 hours/day for each European citizen, with a tendency to increase, is a remarkable figure (see for example [2]). However, there is also a very pronounced increasing demand for nonlinear broadcast content. This can be derived from the traffic data of broadcasters' web portals and the increasing traffic figures on broadband networks which are driven by audio-visual content.

Therefore, SP-CTN decided to base its analysis on three elements, i.e.

- the services that broadcasters may wish or have to provide in the future;
- the technical devices on which these services are consumed; and
- the habits and expectations of users which have changed under the influence of the digital revolution in communication.

Only once all these aspects are clearly understood, should appropriate distribution technologies be investigated in order to decide which technical platforms (or a combination of them) are best suited to meet the broadcasters' and users' demands.

Changing media environment

In the middle of the last century, audio-visual media consumption was clearly arranged. Radio and television services were all linear and, in order to receive them, the audience had to put up a roof-top antenna directed towards a broadcast transmitter. Moreover, listening to radio or watching television was a group event, it was a shared experience. Typically, families gathered in the living room to enjoy music and movies.

Even though the world of today has changed completely, there are two elements dating back to the beginning of broadcasting which are still very important. This refers to the consumption of audio-visual content in company with others and the fact that a roof-top antenna is used. However, broadcasting has become far more diverse in the meantime.

When looking at the service side, an amazing improvement in the technical quality of programmes[1] can be witnessed. The step from SD television to HD television is certainly remarkable; however, another quantum leap is just around the corner with UHDTV (4k) offering even higher resolution pictures. Apparently, 3DTV adds another dimension to the user experience in terms of providing, so far, unknown impressions. On the audio side, surround sound has also opened a new chapter in media consumption experiences.

Nevertheless, all this refers to linear programmes in the first place. "Linear" in this context means that an editorial department of a broadcasting company has produced and organized programmes in a way to be consumed by listeners and viewers passively. After having tuned to the programme, one can either watch what is offered or – if it is not interesting – change to another channel. Clearly, switching off is also always an option.

Today, broadcasting offers much more. Linear content is complemented by many different nonlinear offers. It starts with straightforward time-shifted consumption of audio-visual content, moving on to real on-demand requests. In between one will find catch-up services implemented in terms of podcasts or access to media libraries (for example ARD-Mediathek or BBC iPlayer). These different

1. Some may argue that this may not apply to the quality of the content of programmes itself, i.e. what is actually shown. Even though there may be some truth in such a view, this aspect will not be dealt with here.

types of broadcast services are not necessarily used independently but linear and nonlinear elements could be combined to create a new user experience. HbbTV is a good example for this.

Furthermore, a completely new branch of content is gaining interest, the so-called cross media production of a movie project for example. The exiting new feature is that content is produced from the very beginning for distribution on television, radio and Internet platforms simultaneously. This does not mean we simply re-cast the same content via different paths. Rather, there may be slightly different versions of the same story offered on radio, television and the Internet. Together they create a more holistic media use experience.

In the past there was not much choice with regard to the device that was used for listening to the radio or watching television. Nowadays, the capabilities of different devices begin to overlap and therefore their usage is no longer exclusive as it used to be. Most large-screen TV sets can be connected to the Internet while smartphones and tablets offer media consumption capabilities alongside their original communication features. The same is naturally true for PCs and laptop computers. However, it seems that smartphones and tablets are getting more important in the future due to their easy handling and portability.

Media consumption is omnipresent today. It happens in the company of others or individually and is no longer restricted to the living room as it used to be, not so long ago. People listen to music, watch video clips or access the Internet while they are on the move from home to work and back. They do so at work or during their leisure time. What is very important in this respect is that such usage has to be affordable and should be easy and straightforward. At the same time, consumers are basically not interested in technology per se. Indeed, as long as they get what they want under acceptable economic and technical conditions, they do not seem to care about the underlying technology at all. Sometimes, even high quality is traded off, at an individual level, against costs and ease-of-use. As the case of Apple clearly shows, many people are even prepared to accept restrictions regarding freedom of choice ... as long as the devices they are using reflect a life-style commonly perceived as exiting.

Use cases and usage patterns

Confronted with all the big changes in the media and communication sector, it is absolutely crucial for broadcasters to carefully analyze the contemporary media usage environment in order to prioritize their technical and economic efforts. To this end, SP-CTN decided to define use cases and usage patterns. Both are based on the three elements described at the end of the first section (Introduction).

A **use case** is determined by:

- a service which is consumed;
- a device which is used for this;
- and an environment in which consumption takes place.

Abbreviations

BB	Broadband
BC	Broadcast
CR	Cognitive Radio
EC	European Commission
eMBMS	Evolved Multimedia Broadcast / Multicast Service
EU	European Union
EU27	The 27 countries of the European Union
HbbTV	Hybrid Broadband Broadcast Television
IMT	International Mobile Telecommunications
IP	Internet Protocol
ISP	Internet Service Provider
ITU-R	ITU - Radiocommunication Sector
LTE	Long Term Evolution (4th generation mobile networks)
QoS	Quality of Service
UHDTV	Ultra High Definition Television
WLAN	Wireless Local Area Network
WRC	(ITU) World Radiocommunication Conference
xDSL	*(Different variants of)* Digital Subscriber Line

The big challenge for the definition of a use case is to specify the three elements widely enough to encompass all relevant situations while at the same time limiting the list appropriately. It turns out that regarding the environment, in particular, it suffices to distinguish only between “in the home” and “on the move”. However, it has to be emphasized that these definitions should not be taken literally. Rather, “in the home” can also include an office environment where people spend a longer period at a given location. Furthermore, “on the move” does not only cover true mobile usage for example in a car or on public transport but is meant to include also situations which refer to particular stationary usage, for example at an airport or a train station while waiting for a plane or a train, respectively. *Fig. 1* shows the way in which use cases can be defined, together with the corresponding specification of the three defining elements.

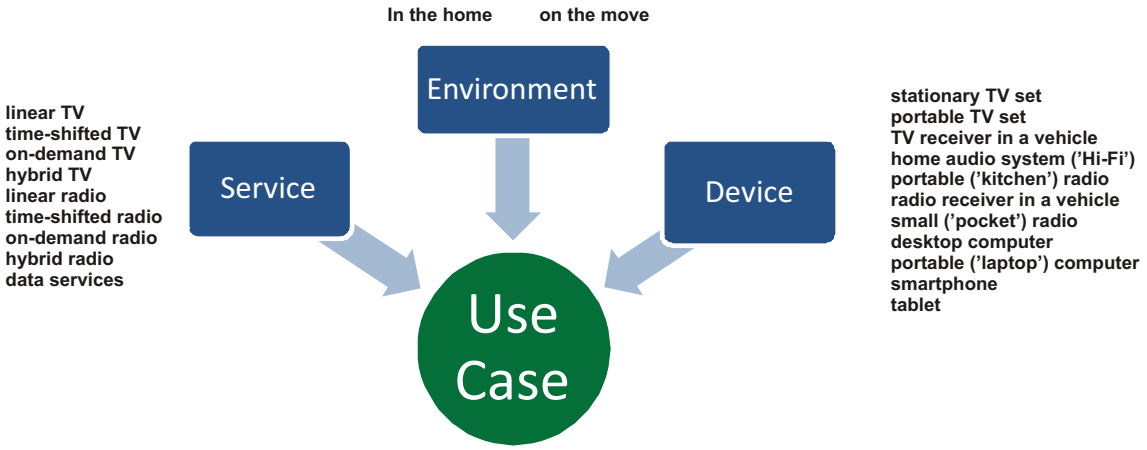

Figure 1
Definition of use cases

Two frequently encountered use cases covered by the definition scheme of *Fig. 1* are shown in *Fig. 2*.

linear TV
in the home
stationary TV set

on-demand TV
on the move
tablet

Figure 2
Two important use cases

Following the methodology sketched in *Fig. 1*, a total of 198 different use cases can be constructed. However, it has to be noted that some of these are not relevant; for example, the combination of “linear TV – on the move – home audio system”. Nevertheless, this way of defining use cases should be general enough to cover all situations that broadcasters are interested in but, at the same time, be specific enough to clearly identify relevant use cases. In any case, such a methodology gives broadcasters the opportunity to assess use cases in terms of their importance, both now and in the future, in order to focus on the highly relevant ones.

Use cases are just one element to be analyzed. They can also be combined either at the same time and location or as a sequence in space and/or time. Both types of combinations are called usage

patterns. The basic idea behind this is that users would like to follow a particular service even though their environment or the device they are using may change. *Figs 3* and *4* illustrate two examples.

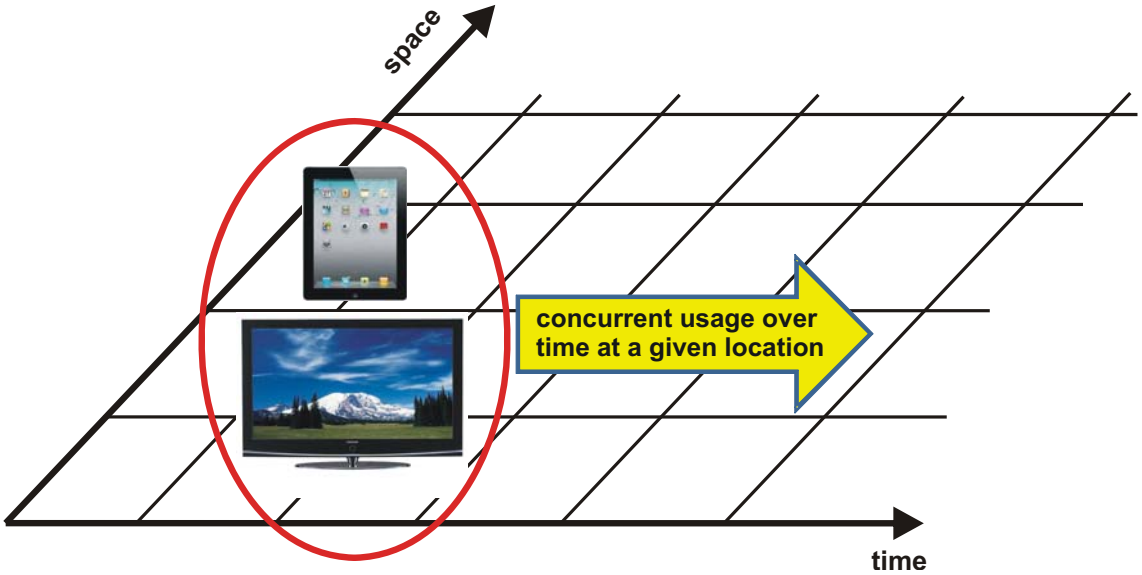

Figure 3
Example of a usage pattern consisting of watching linear TV while using a tablet to access associated non-linear broadcast content concurrently for a certain period of time (i.e. as a second screen)

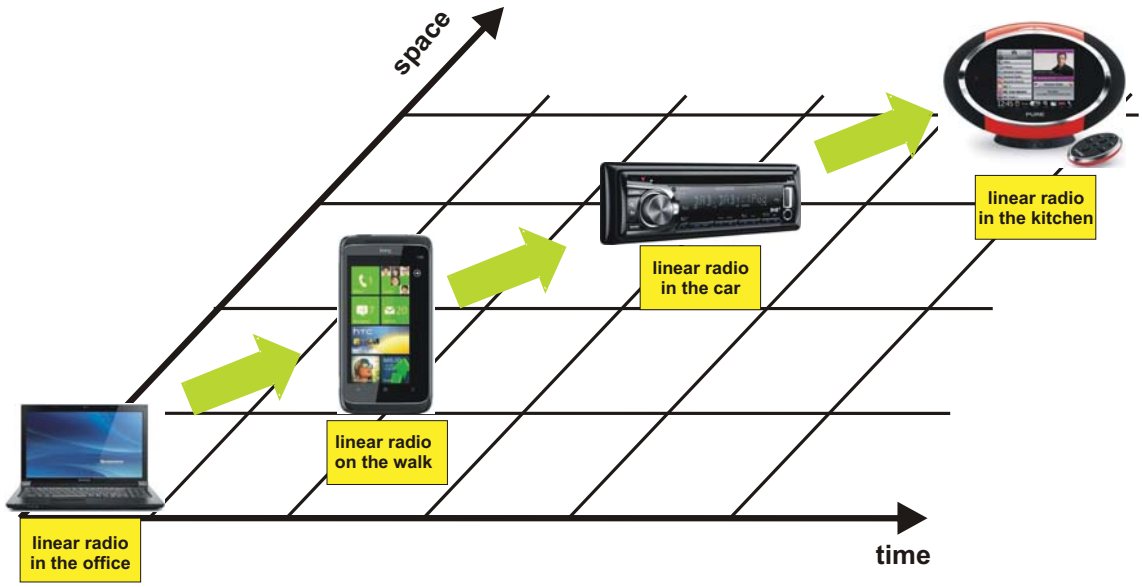

Figure 4
Example of a usage pattern consisting of listening to linear radio while both the location and the receiving device change

As indicated above, the next step is to analyze which distribution technologies are in principle available today, and in the mid- to long-term future, to support relevant use cases and usage patterns. In addition to the technical ability and availability of a distribution platform, the economic and regulatory issues need to be considered in order to assess the different options and their relevance for broadcasters.

Finding the right distribution mechanism for a given use case may be challenging already, but the issue becomes even more involved when looking at the usage patterns. Here, cooperation between different technical platforms and different network operators becomes the decisive element for success.

The process of deciding which use cases and usage patterns are relevant for broadcasters cannot very likely be answered in general terms. Rather, due to the very different economic and regulatory

environments in which broadcasters operate in different European countries, they have to make up their minds for themselves. However, there are some simple and obvious trends which have been identified by SP-CTN so far:

- Usage of broadcast content in the home seems to be very relevant for broadcasters.
- In the case of radio, both linear radio and on-demand radio seem to play major roles. These two services have to be accessible on all receivers in the home, in the car and on smartphones and tablets.
- Hybrid radio seems to be less important as this requires frequent or continuous user interaction which is in contradiction to radio being a “listening-while-doing-something-else” medium.
- All types of TV services seem to be highly relevant for traditional TV sets, both stationary and portable at home.
- Smartphones and tablets seem to be highly relevant for all types of TV services, due to their multi-functionality combined with ease of use, availability and portability.
- Data services represent a very broad category. While they are highly relevant for all devices, there may be different data service types for different devices.

Cooperation between networks

There are different views within the community of European broadcasters about which use cases and usage patterns are really relevant today and will be in the future. However, there will probably be no dissent that a single distribution technology cannot cover all requirements, certainly not today and maybe not even in the future.

Generally speaking, broadcast networks are superior with respect to the delivery of linear audio-visual media services across large areas to a mass audience ... while broadband networks are strong in the area of unicast delivery of on-demand content. As broadcasters obviously have to provide both linear and nonlinear content, they need to exploit the potential of these different technologies in a complementary manner.

Today, broadcasters employ terrestrial broadcasting, satellite or cable networks to deliver radio and television programmes. Even IPTV which has gained a significant market share in some European countries may be counted under broadcasting technology with regard to its ability to provide one-to-many distribution. All of these broadcast delivery options could be combined with either fixed or wireless broadband networks to achieve the broadcasters’ objectives.

Terrestrial broadcasting and wireless broadband

Cooperation between terrestrial broadcast and wireless broadband networks is very attractive for broadcasters for several reasons. First of all, smartphones and tablets are devices which are designed to display audio-visual content. They are easy to use and their market penetration is increasing explosively. Indeed, it can be expected that within the next few years these devices will gain utmost importance as they tend to develop into universal personal communication devices. Thereby, users will naturally expect that they are able to provide any kind of communication service, or access to their preferred audio-visual content. Hence, it is important for broadcasters that their content is available on these devices.

Moreover, terrestrial broadcast and wireless broadband networks are truly complementary to each other. *Table 1* illustrates the complementarity of both technologies [3].

From an analysis of *Table 1*, it can be concluded that the weakness of one technology is compensated by the strengths of the other one. This makes cooperation between terrestrial broadcast and wireless broadband a natural option.

Nevertheless, broadcasters have several requirements which have to be met to fully take advantage of such cooperation. These are:

Table 1 — Complementary features of terrestrial broadcasting and wireless broadband

	Terrestrial Broadcasting	Wireless Broadband
Pros	❍ universal coverage ❍ any reception mode ❍ guaranteed, predictable quality ❍ cost-efficient delivery to large audiences (independent of the number of simultaneous users) ❍ every user has access to the total capacity of the network	❍ bi-directional ❍ designed for mobile/portable reception ❍ potential unlimited choice of services ❍ well suited to serve small audiences ❍ growing population of user equipment ❍ IP-based
Cons	❍ unidirectional, no return channel ❍ the offer is limited by the platform capacity (no niche channels) ❍ limited delivery to mobile devices ❍ no access to IP-only devices	❍ limited coverage (where quality is sufficient) ❍ only best effort QoS ❍ high costs, depending on the number of users; not suitable for large audiences ❍ total capacity is shared between users

- All service types have to be accessible, i.e. linear, nonlinear and data services.
- All reception modes have to be supported, i.e. fixed, portable and mobile reception.
- All existing screen sizes of devices need to be supported.
- A given level of technical quality needs to be provided. This refers to network up-time, error rate, latency, average buffering time, etc.
- The end-to-end service-specific quality is to be defined by the broadcaster and not the network operators along the delivery chain.
- Broadcasters have to be in a position to define the level of service availability, i.e. geographical coverage at given QoS, roll-out timeline, consistent QoS independent of audience size, guaranteed number of concurrent programmes, etc.
- The free-to-air model of broadcasting has to be implementable, which means:
  - no additional costs should be imposed on users beyond their national licence fee or its equivalent;
  - national roaming between different wireless network operators may need to be enabled;
  - no gate keepers should interfere with the delivery of broadcast content; and
  - the integrity of broadcast content has to be safeguarded.
- Ease-of-use of the user devices has to be ensured.

Obviously, these conditions cannot all be met today on wireless broadband networks. One source of obstacles is linked to the fact that broadcast content can usually be accessed on smartphones and tablets only by virtue of a unicast broadband connection. In particular, when it comes to the consumption of linear TV services on smartphones and tablets by large audiences across wide areas, the basic unicast delivery mode of wireless broadband networks may be problematic. *Fig. 5* illustrates the issue.

Today, smartphones and tablets can be used to make phone calls, send text messages and access the Internet. The latter includes connecting to audio-visual streaming content on the web portals of broadcasters. However, smartphones and tablets in Europe do not come with a broadcast receiver and therefore cannot receive services via broadcast networks. There are countries such as Korea and Japan where smartphones and tablets contain broadcast receivers. So, there does not seem to be a technical problem incorporating broadcast receivers.

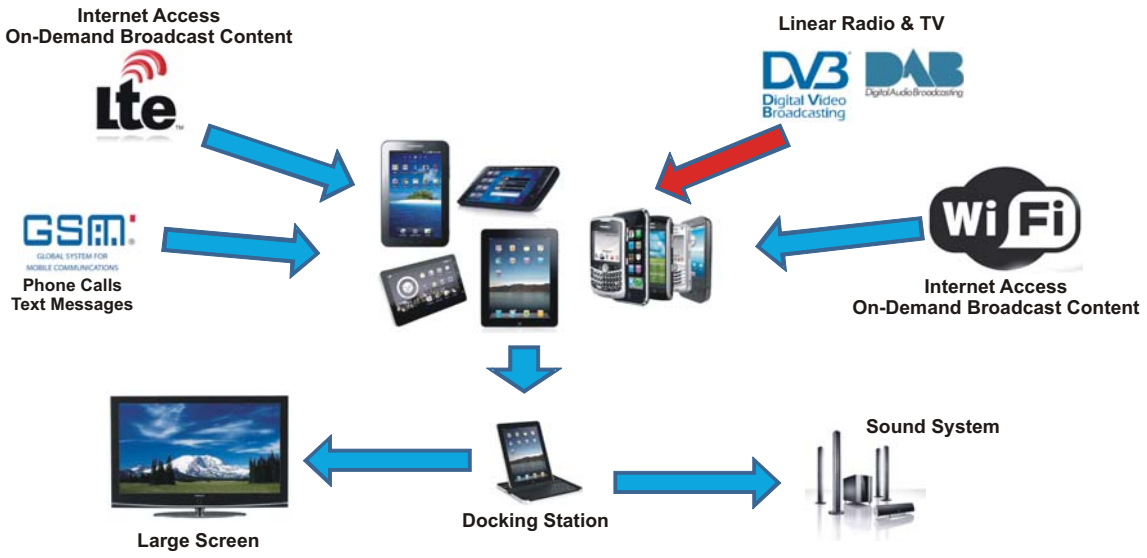

Figure 5
Capabilities of smartphones and tablets. In Europe, linear broadcast content can be accessed only by means of a broadband connection, as no broadcast receivers are integrated in these devices

For broadcasters it is vital to be able to offer their content on all relevant devices under the regulatory and economical conditions to which they have to adhere. This includes all forms of linear and nonlinear offers. Linear content can be most efficiently delivered by terrestrial broadcasting networks while, for the nonlinear part, broadband networks are required. As it will be economically prohibitive to roll out their own wireless broadband networks, broadcasters consequently have to seek cooperation between broadcast and broadband networks.

From a technical point of view, there seem to be obvious ways to facilitate such cooperation between broadcast and mobile networks.

- If smartphones and tablets are equipped with broadcast receivers, all services can be received straightforwardly. As both technologies would be integrated, synergies – in terms of more efficient usage of spectrum resources – could be achieved. This integration corresponds to a short- to mid-term objective that broadcasters should pursue actively.
- Integration of broadcast receivers into smartphones and tablets does not necessarily mean cooperation between networks. Even hybrid services such as HbbTV do not require cooperation between networks, as the intelligence where to get the content from and how to combine it lies with the receiving devices and not with the networks. However, as soon as more efficient management of resources is envisaged – i.e. spectrum or data capacity, depending on the actual demand – then cooperation between networks becomes an issue. The large-area broadcast networks need to “talk” to cellular wireless or mobile broadband networks and vice versa to optimize the delivery of content. The major challenge in this respect is not the technology but rather bringing together the very different business models of the corresponding network providers.
- On a long-term basis, the development of a terrestrial delivery system should be supported which is able to use unicast, multicast and broadcast modes, depending on the demand and the available resources, in an optimal way. Basically, this corresponds to combining the strengths of broadcast and broadband technologies under one roof. Whether this is a viable option for broadcasters, from an economic point of view, is an important question which has to be addressed alongside all the technical issues.

Clearly, there is a need for detailed research to fully exploit the potential of these options. In particular, with regard to the development of a future system that is capable of responding to all requirements, it may be argued that LTE already today exhibits such features by means of its eMBMS option. Even though this might be true to some extent, there are some technical restrictions which do not qualify LTE as the sought-after system. To date, there are no implementations of eMBMS apart from some trials. Obviously, the existing population of mobile devices is not eMBMS-ready. In

the light of the short life cycles of user devices, this could be changed within a few years. On the other hand, the networks could be eMBMS-enabled by rather simple software updates. So, why is this not done? It seems that, at least for the time being, there is no business model which is attractive enough for mobile operators to go down this route.

Broadcasting and fixed broadband

Looking at the discussion about cooperation between networks or convergence of technologies from a more general point of view gives rise to the basic question: *"What kind of distribution do broadcasters actually need?"* Putting it into simple words, it seems broadcasters are in need of a big downstream pipe for linear audio-visual content and a unicast link to satisfy requests for nonlinear content.

Therefore, the cooperation between terrestrial broadcasting and wireless broadband networks such as LTE looks different when considered in the light of activities taking place around the world, with regard to deploying broadband connectivity to citizens.

In Europe, the European Commission (EC) is promoting its so-called "Digital Agenda 2020". The idea is to provide broadband access to all European citizens by the end of 2020. The coverage target is 30 Mbit/s for 100% of citizens and 100 Mbit/s for 50% of Europeans. Broadband connectivity will be provided by exploiting any kind of suitable technology, i.e. fibre, copper (xDSL), mobile broadband, cable or satellite. The EC is convinced that market forces will be strong enough to achieve this goal in the end.

Australia is going a different way under the project title "National Broadband Network". Here, the idea is to connect all premises with a new high-speed network. The time frame is also 2020 as in Europe. A total of 93% of all homes, schools and businesses will have access to broadband via fibre links with a data rate of up 1 Gbit/s. The remaining 7% will be connected by fixed wireless and satellite links providing up to 12 Mbit/s. All this will be put in place under the leadership of a newly-founded government company which is called NBN Co Limited. Once the physical network has been rolled out, access to it is intended to be sold to ISPs in order to provide corresponding services to citizens.

There are many other projects of this type around the world. These two have been mentioned only because they represent two different ways of enabling the building of fixed high-speed broadband network infrastructure, i.e. a market-driven vs. a centralized approach.

What approach is actually chosen, is not that important for the future distribution of audio-visual content including broadcast content. At the end of the day it can be assumed that fast broadband networks will be in operation which allow transporting any kind of high data-rate service to the locations

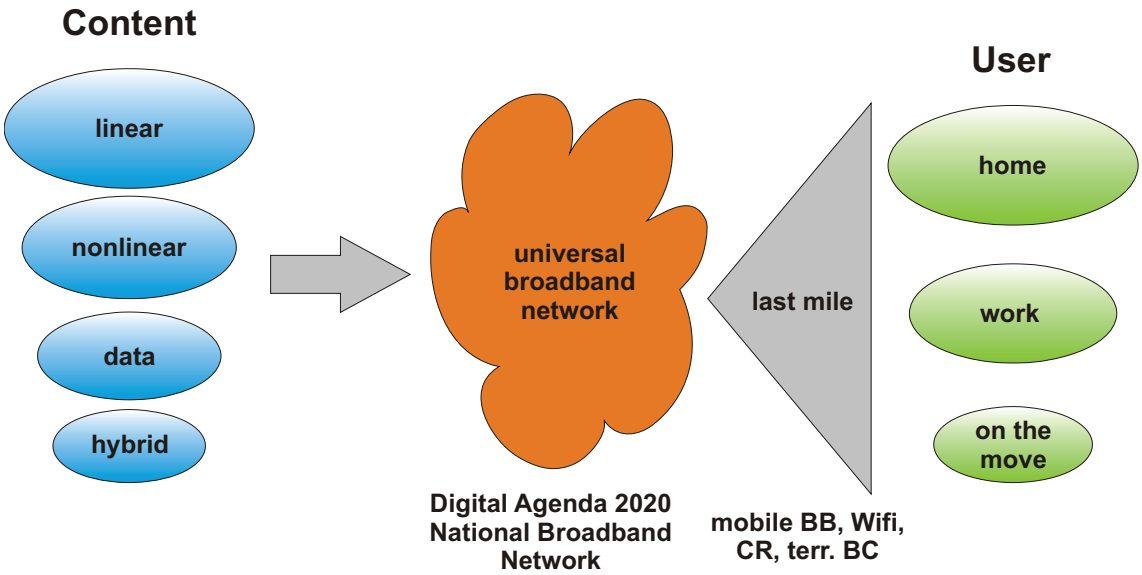

Figure 6
Universal broadband network for the delivery of audio-visual content

where users are actually using them. Thus, the remaining question to be answered will be. *"How large is the last mile?"*. This scenario will fundamentally change the position of all radio-based communication technologies. Their role may be reduced to that of becoming access technologies, predominately to the big national fibre networks. All radio technologies would be affected, i.e. mobile networks, Wi-Fi, cognitive radio and also terrestrial broadcasting. *Fig. 6* sketches out these thoughts.

Most of the consumption of audio-visual content actually takes place inside a building, be it in the home, at the office or in a public location such as an airport or a train station. Consequently, there does not seem to be any need to deliver broadcast content across long distances by employing radio technologies if adequate fixed connections are available. Terrestrial broadcasting, as any other radio technology, can then be used to reach portable and mobile devices exclusively.

One may argue that this sounds like pure fiction. However, even in a country like the UK which still promotes the idea that the primary objective for terrestrial broadcasting is to serve fixed reception, a serious debate about this was started in mid 2012. The Communication Committee of the House of Lords published a report which proposes to shift broadcast content delivery entirely to fixed broadband networks [4]. It says in particular:

> *139: "It is likely that IPTV services will become ever more widespread, and eventually the case for transferring the carriage of broadcast content, including public service broadcasting, from spectrum to the internet altogether will become overwhelming. This may well be a more sensible arrangement, as spectrum is perfectly suited to mobile applications. … Most people watch their television in fixed locations from fixed sets. Actually, spectrum's great wonder is its ability for mobility."*
>
> *140: "As such, it might be argued that spectrum's current use for fixed, broadcast purposes is wasteful."*
>
> *141: "We recommend that the Government, Ofcom and the industry begin to consider the desirability of the transfer of terrestrial broadcast content from spectrum to the internet and the consequent switching off of broadcast transmission over spectrum, and in particular what the consequences of this might be and how we ought to begin to prepare.*

The idea of using radio-linked technologies to exclusively serve portable and mobile devices is further supported by the fact that not only high data-rate broadband connections could be used as content feeds. Already today there are converters from satellite TV reception to IP-distribution on the market, for example in Germany. These devices allow picking up a TV signal from a satellite and distributing it, for example, across the home Wi-Fi network to any IP-enabled fixed, portable or mobile device. This is particularly interesting in connection with the capabilities of the next release of Wi-Fi, i.e. WLAN 802.11ac, which will be able to provide up to 600 Mbit/s for a line-of-sight connection. In cases where there is a brick wall between the transmitter and receiver, the data rate drops to 100 Mbit/s. This allows in-home HDTV distribution to any relevant receiver which, especially in a country like Germany with a satellite market penetration of about 40%, seems to be an attractive and easy-to-implement option for in-home distribution of high-quality audio-visual content. Similar solutions can also be conceived for cable and terrestrial broadcasting reception.

Conclusions

The preliminary results obtained so far by the EBU's SP-CTN group support important short- and mid-term consequences for broadcasters. Short-term refers to the preparation process of WRC-15 and beyond while mid-term would address the time period beyond 2020. The following conclusions can be deduced from the analysis so far and need to be considered as the starting point for actions to safeguard the future of broadcasting:

- Linear television remains a strongly-requested service for the foreseeable future. Indeed, the average usage times in Europe are currently more than 4 hours/day with a tendency to increase.

- At the same time there is an increasing demand for nonlinear broadcast content such as catch-up TV or real on-demand.
- The fastest developments are currently taking place with regard to the penetration of smartphones and tablets and their technological capabilities. Linear broadcast content can in principle be consumed on these devices but for the time being only by means of using a broadband connection. This can be either fixed or mobile broadband across Wi-Fi or mobile networks.
- It has to be expected that smartphones and tablets will gain more and more importance as they tend to develop into universal personal communication devices and hence constitute the preferred electronic personal interface to any kind of audio-visual media content and communication.
- None of the currently existing wireless networks that can provide access to audio-visual media content can cope with all the demands of broadcasters and users at the same time. Traditional broadcast networks lack a return channel while mobile broadband networks are not capable of providing high-quality television services across large areas for a mass audience at a given high QoS. Whether or not future releases of LTE will be able to do so seems to be rather an economic than a technical question.

Terrestrial broadcasting remains a very important pillar for the future ecosystem of broadcast content distribution. As such it is important to ensure that enough spectrum remains accessible for terrestrial broadcasting. This refers in the first place to the 700 MHz band which is one of the hot topics of the WRC-15 preparation work.

However, as a matter of fact, WRC-12 has already co-allocated the 700 MHz band to the mobile service in ITU Region 1 under certain conditions, to be re-assessed and confirmed by WRC-15. Therefore, the political and economic pressure to free this band from broadcasting services is steadily increasing. There seems to be little hope that WRC-15 will retract the co-primary mobile allocation of 2012. Hence, broadcasters in Europe need to make sure that their interests remain guarded with respect to using the spectrum above 694 MHz for the benefit of broadcasting.

In order to safeguard the future role of terrestrial broadcasting, broadcasters should engage in the following fields which require actions in the short- and mid-term:

1) WRC-15 preparation and influence on spectrum allocation

Some European mobile operators are pressing for the 700 MHz band to be auctioned off as soon as 2016. However, if this happens shortly after WRC-15 then the auction process will certainly not take into consideration the need to use this band for the delivery of nonlinear broadcast services. Rather, similar to the auctions in the 800 MHz band, the spectrum will be used for traditional IMT networks. Then, calling for cooperation between broadcast and mobile networks will most likely not be successful.

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Dr Beutler has been participating in EBU Technical activities for more than 10 years and has chaired several EBU groups dealing with the future of radio (S/FOR and S/FB2). He was chair of the Strategic Programme on Terrestrial Broadcasting (SP-TB) and currently acts as chairman for the Strategic Programme on Cooperative Terrestrial Networks (SP-CTN) and the focus team ECS-SDB.

Roland Beutler is also involved in ITU and CEPT work and has been responsible for several of their working groups. He participated in RRC-06 and was heavily involved in the preparation of this conference. Moreover, he has published several articles and three books on frequency and network planning for digital terrestrial broadcasting systems and the Digital Dividend.

Therefore, broadcasters should:

- Lobby their administrations to propose, at WRC-15, postponing the allocation of the 700 MHz band in the Northern part of ITU Region 1 to an appropriate date. This can be achieved by virtue of a corresponding footnote; and
- Lobby administrations on a European level to postpone the auctions of the 700 MHz band spectrum to a point in time when the concepts for cooperation between broadcast and mobile networks are mature in order to prevent it being used only for traditional IMT services. Alternatively, if auctioning is envisaged at an early stage, conditions for the usage of spectrum should be imposed which would enable cooperation between broadcast and broadband networks at a later point in time.

2) Integration of broadcast receivers in smartphones and tablets

In some markets this is already reality, such as Japan and Korea. It is important to investigate what regulatory and economic conditions there are. What are the differences and, if such integration proves to be applicable for Europe too, develop a strategy to lobby for this at a European level.

Furthermore, in other regions of the world, such as Mexico for example, there is a serious debate about this issue going on. Typically, regulators base their decisions on the feedback received during corresponding consultation processes. Broadcasters around the world should carefully monitor any such activities and participate in associated consultation processes if possible.

3) Development of technically feasible options for network cooperation

Broadcasters should actively engage in the development of technological options for cooperation between broadcast and broadband networks. Several activities in this area are already underway which are associated with what is called “Dynamic Broadcasting” or “Overlay broadcast and cellular mobile networks”. Broadcasters should decide to actively participate in this research. Also, it would be beneficial to convince the EC to support such activities at a European level. It is important in this respect to consider a wider range of broadband technologies beyond IMT (for example Wi-Fi) to ensure optimal usage of resources such as spectrum and network infrastructure.

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