eMBMS with Samsung

Simplified Approach to Broadcasting Content over LTE

Contents

Executive Summary

As mobile operators migrate towards the all-IP environment of LTE, the capabilities needed to deliver services should be evaluated under a new paradigm. There is a constant need to increase network capacity, but there is no definite answer for the growing data demand and operators are adopting a range of solutions to improve their networks' capacity, such as acquiring additional spectrum or introducing small cells.

With eMBMS there is an opportunity to better utilize the available bandwidth by intelligently managing and delivering content. The ability to broadcast over LTE can also lead to new revenue streams. In this whitepaper, we discuss the potential of eMBMS.

Introduction

The telecommunications industry expects massive growth in mobile data traffic over the next five years. Mobile users in 2011 consumed about 432,000 terabytes (TB) per month. However, by 2016, the world's consumption of mobile data is expected to increase to about 6.6 million TB per month, a fifteen fold increase.

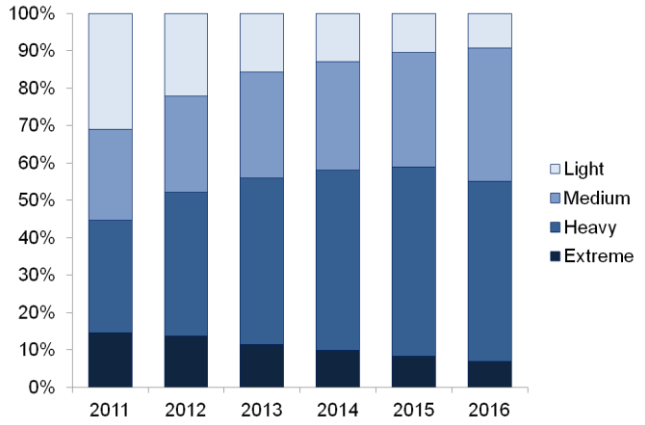

Figure 1 Changing mobile data traffic by user category in North America
Source: iGR, 2012[1]

Currently the majority of the mobile data traffic is consumed by heavy data users. But by 2016, as depicted in Figure 1, over 80 percent of mobile data users will fall into the medium and heavy categories[1]. In other words, more data is being consumed by more subscribers, not just by a few heavy users.

Figure 2 captures the smart phone originated traffic distribution for the US market. It clearly shows the increasing popularity of streaming video and audio applications like Netflix, Hulu, YouTube and Pandora[2].

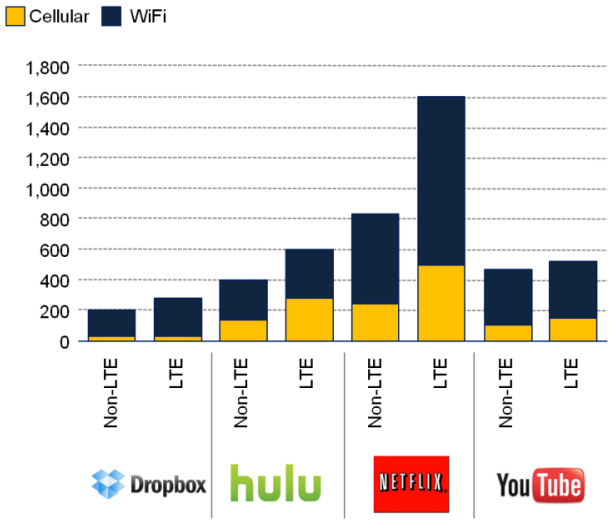

Figure 2 US Smartphone traffic by access type – Megabyte per month
Source: Informa 2012[2]

In case of Netflix, one of the most popular premium video streaming services, its cellular centric usage jumps from 243 MB per month to 499 MB on LTE-capable smartphones, while its average Wi-Fi usage jumps significantly from 584 MB to 1.1 GB.

As depicted in Figure 3, by 2016, video will account for over 66 percent of total mobile consumption[3].

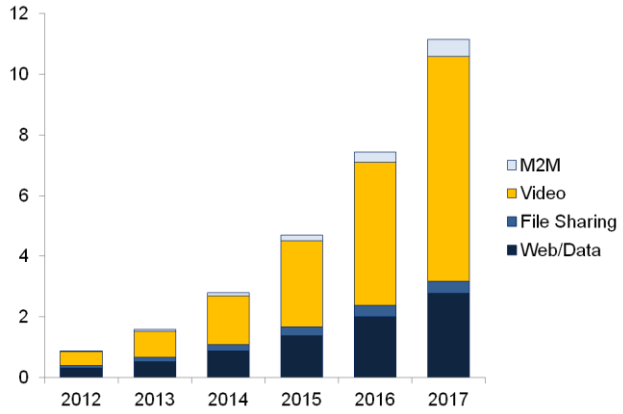

Figure 3 Mobile data consumption by type – Exabyte per month
Source: Cisco VNI 2013[3]

With video streaming services such as Netflix, end users no longer need to be at home at a pre-determined hour to watch their favorite programs. They are getting more and more used to pulling content out of the air whenever they desire. On the other end, there are still plenty of people consuming broadcast video and audio on their phones, TVs and car stereos.

Over the past few years there has been a change in the trend of services delivered over linear broadcast TV. Broadcasters are evolving their traditional services to offer VoD (Video on Demand) and Interactive TV services.

To deliver these interactive audio and video services, service providers are leveraging bi-directional broadband networks and IP-based technology.

Consumption of video content over cellular networks is on the rise and is set to be a killer app in the coming years, with more and more users subscribing to them. Convergence of linear TV and on demand content indicates the potential for a delivery model that is a mix of broadcast, multicast and unicast services.

Broadcasting Challenges

A big advantage of using broadcast transmission over LTE is that the same content can be received by many users simultaneously. The bandwidth consumption is not dependent on the number of simultaneous users, but on the number of simultaneous channels that the operator wishes to broadcast. Within the amount of bandwidth earmarked for broadcasting, operators have full control on the content to be broadcasted. The challenge is now to identify the right amount of bandwidth to be earmarked for providing the right mix of unicast and broadband services.

Dedicated broadcast video systems such as DVB-H (Digital Video Broadcasting – Handheld) and STIMI (Satellite and Terrestrial Interactive Multiservice Infrastructure, Chinese standard for Mobile TV broadcasting) are considered more economically suited for the transmission of linear TV on mobile devices. However, as eMBMS supports a mix of unicast and broadcast, there is an opportunity to use its broadcast mode for specific purposes rather than full-fledged linear TV services.

While operators are drawn by the potential of LTE for delivering video services, it is important to note the trend in video content consumption. Increasingly, technically savvy users are moving away from broadcast models when it comes to digital content. So operators clearly cannot impose a full-fledged broadcast model for delivering such services. There is also a tendency to constantly switch from live streaming (broadcast) to on-demand services (multicast/unicast), resulting in a considerable debate on the best business case for delivering video.

The advantage of LTE in comparison to other broadcast video systems is that the operator has the flexibility to dimension unicast and broadcast. Identifying the right mix of services to keep subscribers interested is the real challenge.

eMBMS support in LTE

The eMBMS architecture was introduced in Release 9 to support broadcast/multicast services in LTE. The key network elements of an LTE network that supports eMBMS are shown in Figure 4.

For supporting eMBMS, new nodes and interfaces with existing LTE nodes have been introduced.

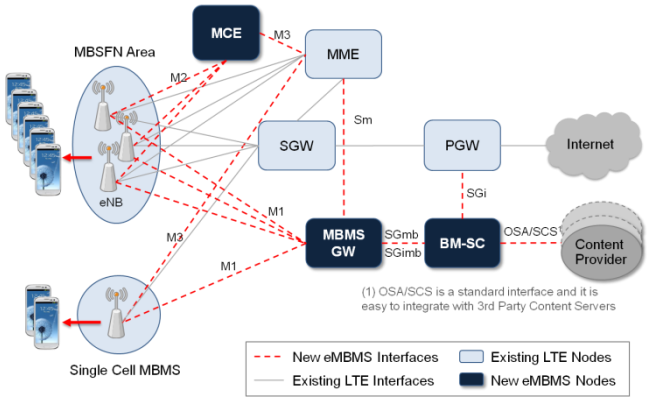

Figure 4 eMBMS Reference Architecture

Single Frequency Network

LTE eMBMS employs a Single Frequency Network (SFN) configuration. The area where a group of eNodeBs are synchronized to transmit in the same Multicast Channel (MCH) is called 'MBSFN Synchronization Area'. All the cells in an MBSFN area have to be tightly synchronized. This allows eNodeBs within the SFN area to transmit the same broadcast signal in a synchronized manner for better signal reception at the User Equipment (UE).

MBMS Coordination Entity

The MBMS Coordination Entity (MCE) is a logical node that is responsible for allocating time and frequency resources. The MCE acts as an MBMS scheduler which allocates radio resources, performs session admission control and manages MBMS services.

MBMS Gateway

The MBMS GW is a logical entity whose main function is to deliver MBMS packets to each eNodeB transmitting the service. It uses IP multicast to deliver the downlink packets.

Broadcast Multicast Service Centre

The BM-SC is responsible for authentication, content authorization, billing and configuration of the data flow through the core network. It acts as a proxy content server.

MBMS Channels

New Logical, Transport and Physical channels are added in LTE to support eMBMS. The Multicast Traffic Channel (MTCH) carries data corresponding to a certain MBMS service. The Multicast Control Channel (MCCH) provides necessary control information to receive MBMS services, including subframe allocation and Modulation Coding Scheme (MCS).

Device Support

On the device front there is a need for supporting eMBMS channels. There is also a need for middleware that can simplify broadcast and provide consistent user experience.

Samsung eMBMS Solution

Samsung, as provider of end-to-end broadcasting over LTE, recommends the following eMBMS architecture.

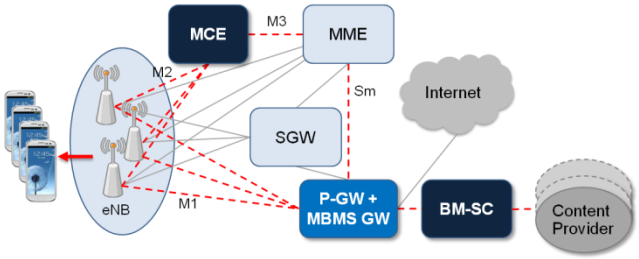

Figure 5 Samsung eMBMS Solution Summary

Samsung's eNodeB already supports all the necessary eMBMS functionalities and Samsung MCE is based on a standard IT platform that can serve a large number of eNodeBs. This centralized MCE architecture allows operators to maximize the MBSFN gains with a large MBSFN area.

At the core, Samsung MME already supports the M3 and Sm interfaces, which are needed to link the MME to the MCE and the MBMS Gateway respectively. Samsung PGW supports the MBMS GW functionality which simplifies the overall architecture. The BM-SC Server is deeply related with the eMBMS service model and can be customized to meet different requirements.

The latest LTE handset chipsets are offering eMBMS support and it is expected that more and more LTE devices will include it in the following months, as eMBMS deployments get started throughout 2013.

The necessary infrastructure for a commercial grade end-to-end eMBMS solution is therefore ready for operators who decide to add broadcast based services to their portfolios.

Samsung has an end-to-end eMBMS solution that is ready for commercial service and that can be customized to deliver specific service models.

eMBMS Based Service Opportunities

As the broadcasting capability is inbuilt into the LTE Technology, there is no necessity for any additional infrastructure in addition to the LTE Network. Operators merely need to add server platforms to their network core. This opportunity is driving operators to explore new business models for delivering content and applications.

eMBMS support in LTE provides operators with new means for delivering content in a cost effective manner. Operators can deliver live streaming, near-live content and VoD services. eMBMS is a good option to deliver simultaneous streams or "TV channels" but the limited MBSFN Subframe resources can restrict the delivery of linear TV content. Hence, it should be noted that eMBMS is not yet a full replacement for linear TV, but it can be used for a subset of channels.

Live streaming

eMBMS allows operators to deliver pre-scheduled content like in linear TV, on demand content through explicit user requests or predefined content based on models that predict what is likely to be consumed. If several users are subscribing simultaneously to popular content, that content can be broadcasted, freeing up bandwidth during peak hours.

Pre-load during off-peak hours

eMBMS is a good option for delivering Near-live, pre-recorded and pre-published content. It is ideal for multicasting content to specified users during off-peak hours. The content could be stored in the device side and users could view it later.

Events Coverage

Operators can also target venues where people are most likely to view the same content. For example, at sports events, operators can stream specific video content like replays, statistics, etc.

Advertising

Another use case would be to use eMBMS for broadcast of "teasers" for available VoD content or advertisements for third parties. A clear example of this would be a sports event, where nearby brick and mortar businesses advertise directly to the audience as they utilize eMBMS to view replays.

Emergency Services & Disaster Management

Content and services, such as linear broadcast TV, group communications, and support of regulatory services like emergency alerts are also well suited for broadcast/multicast transmission.

Advantages of eMBMS

Major standards like ATSC-M/H (Advanced Television Systems Committee–Mobile/Handheld), DVB-H and DVB-T2 (2nd Gen. Terrestrial) are widely considered for broadcasting TV to mobile terminals. The key advantages of eMBMS in comparison to these technologies are listed below.

End-to-end IP Network

An end-to-end IP architecture enables a unicast and broadcast service with high capacity, high bandwidth and high scalability.

Device Support

eMBMS is based on the LTE radio specifications and major chipset vendors have committed to support it in their LTE products from the beginning of 2013. Device support will become widespread as eMBMS launches get started the same year.

LTE Network Reuse

Operators can leverage the existing LTE infrastructure for broadcast services, without the need to deploy a parallel infrastructure, as would be the case with other mobile broadcasting technologies.

Economies of Scale

The number of commercial LTE networks and handsets is increasing very rapidly. eMBMS can therefore offer greater economies of scale than ATSC-M/H or DVB-H, as terminals and infrastructure that support these technologies are not as spread.

Technical Advantages

From a technical perspective, eMBMS delivers superior performance when compared to other technologies as shown in Table 1.

Broadcast Technology	Delay Spread Tolerance	Deployment Density	SFN Performance	Mobility
ATSC M/H	Medium	Sparse	Low	High
DVB-T/ DVB-H	Medium-High	Sparse	Low-Medium	Low-Medium
DVB-T2	Medium-Very High	Sparse	Low-High	Low-Medium
LTE eMBMS	Low	Very Dense	High	Very High

Table 1: Comparison of key metrics of digital broadcasting technologies

Conclusion

Mobile video consumption is on the rise with more and more users subscribing to video streaming. Convergence of linear TV and on demand content indicates that there is potential for a delivery model that mixes broadcast, multicast and unicast services. The advantage of LTE in comparison to other video broadcast systems is that with LTE the operator has the flexibility to dimension unicast and broadcast with minimum changes to their LTE infrastructure. Identifying the right mix of services to keep subscribers interested is the real challenge. Operators clearly cannot impose a full-fledged broadcast model. That is why eMBMS is a good option for delivering near-live, pre-recorded and pre-published content, especially for multicasting content during off-peak hours and storing them in the terminal.

Samsung has a commercial grade end-to-end eMBMS Solution that is ready for deployment.

Samsung eMBMS Solution provides a platform that is optimized for delivering video services to end users with the desired quality of service.

Operators can now plan to further extend existing capabilities to deliver broadcast and multicast services.

References

1. “Changing Mobile Data Traffic by User Category”, iGR, 2012

2. “Understanding today’s smart phone users: De-mystifying data usage trends on cellular and Wi-Fi networks”, Informa Telecoms & Media, 2012

   Dropbox® is a cloud storage service that allows to store and share files
   Hulu® is a premium Internet TV service, available on handsets
   Netflix® offers premium Internet TV and is available on handsets
   YouTube® allows to share and view videos online

3. “Cisco Visual Networking Index”, Cisco, 2013

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