ERICSSON

Hybrid media & TV delivery using Mobile Broadband combined with terrestrial/satellite TV

Rev A

1 Abstract

Hybrid media & TV delivery using Mobile Broadband combined with Satellite/Terrestrial TV

In today's fragmented media landscape there are several different technology platforms for delivering video content to consumers: Satellite, Cable Terrestrial TV and fixed/mobile Broadband. As TV evolves, it will be critical for service providers to harness the various benefits of these platforms through a hybrid approach to simplify current complexities.

The user experience and cost efficiencies can be improved by combining personalization and interactivity functionalities through a broadband connection with broadcasting over satellite or terrestrial TV. Popular TV shows with high viewing numbers will be broadcasted, while Video on Demand (VoD) and niche linear TV content will be delivered via broadband unicast technology. In such hybrid solutions, the mobile and fixed broadband connections complement each other for at-home coverage, while mobile networks, including LTE broadcast, will ensure coverage for smartphone users on the move. Hybrid solutions will also enable more efficient use of terrestrial TV spectrum.

Terrestrial/satellite-TV and Mobile Broadband (MBB) hybrid solutions are already today deployed in some markets, enabling attractive and cost efficient household solutions for TV/Video viewing and broadband access. Evolved 4G and 5G will play a crucial growth role, enabling mobile video to grow much faster than any other network traffic. New mobile technologies for home usage, with higher spectral efficiency, self-adjusted directional antennas, and portable home gateways optimized for video distribution, will significantly reduce mobile broadband delivery costs, making mobile broadband a cost-efficient alternative to fixed broadband.

2 Background

Traditional terrestrial and satellite broadcasting technologies are cost and spectral efficient for delivering popular content to many viewers, but broadcasting efficiency declines for the delivery of niche shows which attract less viewers. Video on Demand (VoD) is rapidly growing; according to Ericsson Consumerlab research it accounts for nearly a third of all content viewing. Even though much of this content is popular and holds high viewing figures, the viewing of on-demand content is not simultaneous and is usually spread over long periods of time, meaning that broadcast becomes inefficient. From a cost and spectral efficiency point of view it is more efficient to deliver VoD and "long-tail" linear TV content in unicast mode, whereas broadcast should be used for the most popular content. It is therefore logical to include both broadcast and unicast receivers in all devices. By doing this, there will also be an uplink channel associated to the broadcasted content, which can be used for an improved, interactive user experience and the enabling of targeted ads.

Fixed broadband video delivery, both IPTV and OTT, is increasing. The user experience becomes very good wherever enough capacity is at hand, and CDN costs are decreasing. However, parts of the fixed broadband deployments lack enough quality and capacity to provide a good TV service and the majority of global households will never get a fixed broadband connection.

Global video viewing on mobile broadband is forecasted to grow 55% YoY in the coming years.

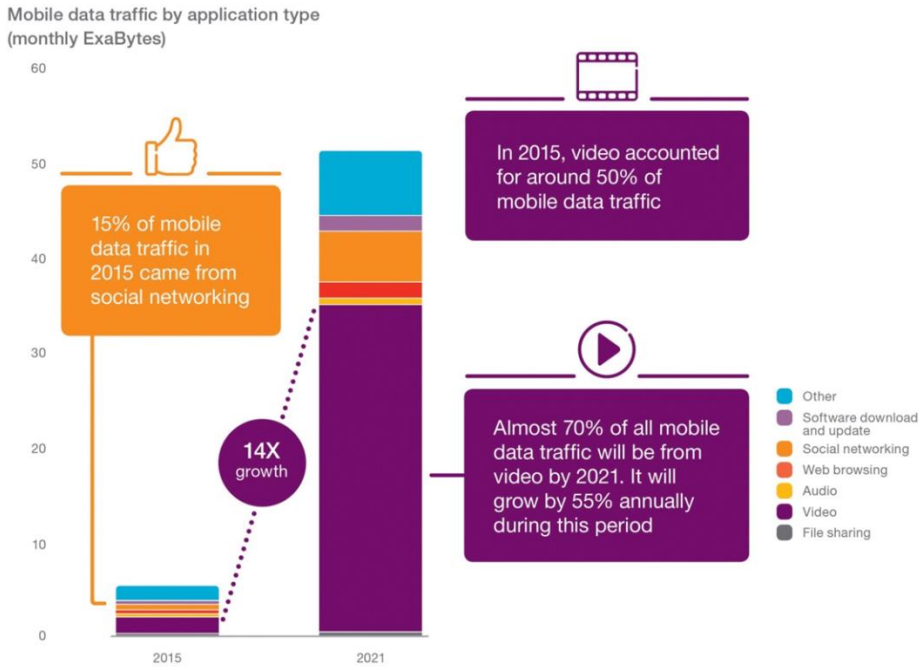

Diagram 1: Mobile BroadBand Video consumption growth

Smartphone evolution as well as network build out is stimulating this strong growth in mobile broadband video viewing, although delivery costs in general are still currently higher than for satellite, terrestrial, cable or fixed BB delivery. However, these costs are rapidly declining and within the next 10 years mobile broadband will be able to compete with other delivery mechanisms for all TV/Video delivery.

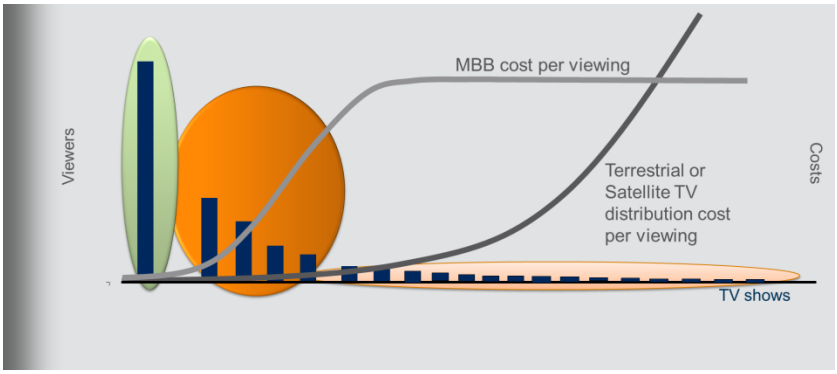

Diagram 2: Terrestrial/Satellite TV and Mobile BB cost comparison

Terrestrial/Satellite TV distribution is cost efficient for popular content, as indicated in Diagram 2. MBB is equally efficient on the most popular content (short tail) due to LTE-Broadcast and more efficient than DTT/DTH on long tail and VoD content, whereas Terrestrial/Satellite is more cost efficient on the mid tail content. The long and mid tail cross-over point, where LTE becomes more cost effective, is moving to the left due to mobile cost reduction. In markets where terrestrial or satellite TV is declining due to tough competition from cable-TV and IPTV, the cross-over point is also moving to the left since delivery costs have to be carried by fewer viewers.

3 The Hybrid Proposition

Many devices are already connected to several access technologies, such as terrestrial/satellite antennas and fixed or mobile broadband. By integrating content from these different inputs into one user interface, an improved user experience will be achieved and the content delivery costs will be reduced. Such hybrid propositions based on combinations of Terrestrial-TV, Satellite-TV, MBB or DSL will provide a similar user experience to Cable or fiber IPTV solutions.

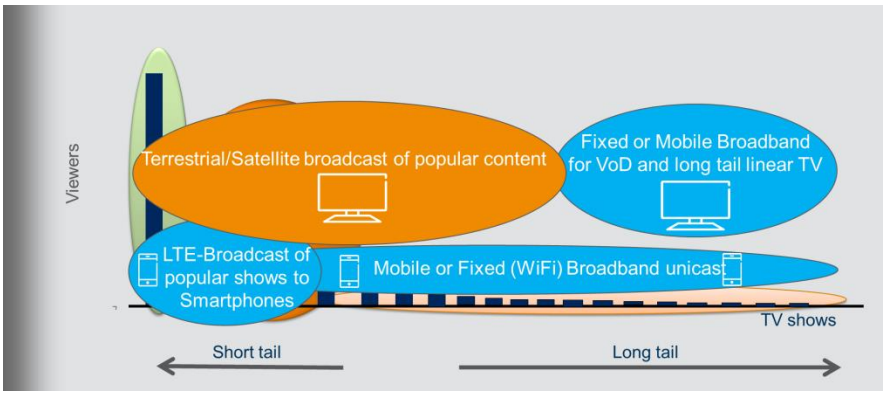

Diagram 3: The Hybrid delivery model

In the Hybrid set-up, terrestrial or satellite broadcasting is used to deliver popular content to TVs, whereas broadband is used to deliver less popular and VoD content. Devices not connected to a terrestrial or satellite antenna get their content over WiFi or cellular access.

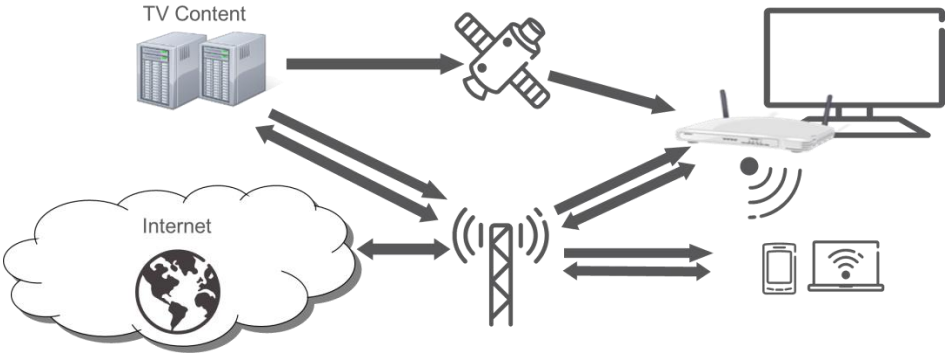

Diagram 4. Satellite and MBB Hybrid

4 The Hybrid effectiveness

The effectiveness of hybrid solutions results from utilizing the best from each delivery platform.

Satellite and terrestrial TV can use the roof top Yagi/dish antennas for a spectrally efficient delivery. The broadcast-only paradigm requires a synchronized device technology deployment plan; it is cumbersome to phase in and out new technologies.

Cellular networks are optimized for providing the highest capacity wherever the demand exists, including in-door. The devices have short life cycles and the IP/Unicast paradigm allows an easy technology phase in/out.

Compromises, such as terrestrial delivery also being tuned for in-door coverage to portable devices with different technology generations, become inefficient, as shown in ref (3).

The hybrid approach to optimize for each situation and device is key for success. For content with fewer users unicast is obviously more efficient than broadcast, and it is also more efficient to deliver popular content over several broadcast streams than to create a single compromised stream which has to comply with the worst criteria for each device and situation. The multiplication effect of the lowest modulation for in-door coverage, the oldest codec technology and the highest video resolution implies a big waste of resources.

5 The Mobile Broadband opportunity in Hybrid

Fiber installations and other high speed broadband technologies provide strong platforms for interactive, high quality and cost efficient TV/video delivery. CDN costs for larger TV providers are already below 1 USDc/GB (ref 4) and are approaching 0.2 USDc/GB by 2020 if the current YoY price degradation continues.

However, only a small minority of households have sufficient fixed broadband capacity for IPTV. For the fixed subscribers with for example DSL networks not fully capable of delivering IPTV, hybrid deployments especially with satellite TV providers have already been broadly deployed. These TV providers typically offer proprietary STBs to aggregate the satellite and broadband connections into a hybrid experience.

The HbbTV industry initiative (ref 5) has developed a standard for integrating terrestrial or satellite TV reception with broadband. TVs with HbbTV are widely available in Europe.

The majority of global households does not have, and will never get, a fixed broadband connection. Mobile broadband is their only choice. Also those with a limited fixed broadband connection would benefit from aggregation with mobile broadband access. The issues with mobile broadband for TV/Video delivery to household consumption have been costs related to in-door coverage of high traffic volumes. A typical IPTV service 2015 consumes 200-1000 GB/month, which would be expensive to deliver with cellular networks, considering the high requirements on quality and in-door coverage.

Fixed installed cellular antennas on roof-tops or other locations with optimal reception will significantly reduce mobile broadband delivery costs. Hybrid deployments provide the opportunity to leverage investments already made on in-building installations. The leading STB vendors already support hybrid STBs including LTE modems, or alternatively GWs with LTE modems could be connected to STBs/TVs via WiFi.

Adaptive directional antenna technologies also known as beamforming available in 4G/5G (ref 6), further improve efficiency and reduce costs.

With 5G, the hope is to be able to use very large frequency bands at higher frequencies. Beamforming techniques at the base station make these high frequencies useable, and may also yield higher spectral efficiency. Additionally, for wireless to homes, advanced antennas at the terminal side, and potentially also outdoor or window mounted antennas, are possible. Together this results in a dramatically improved capacity, also on the existing site grid.

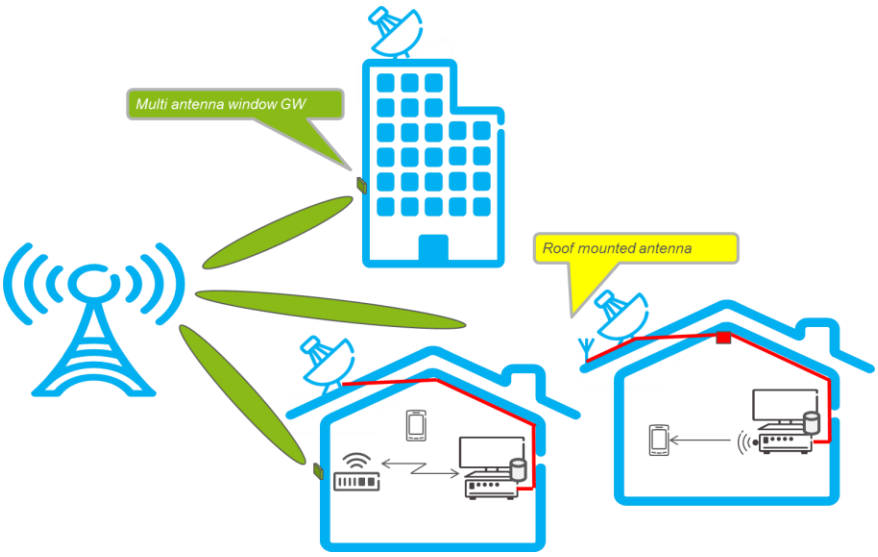

Diagram 5. Hybrid fixed wireless household installations

The combined effect of roof-top, directional antennas and high frequencies mean that cellular distribution by 2020 will be cost competitive against fixed broadband for many households with reasonable consumption levels, The threshold estimations are of course subject to local variations. Many households tend to discard fiber installation CAPEX since these are considered as an investment that gets paid off by increased property value. This perception might change and by comparing with the true fixed costs, mobile installations will increasingly become very competitive.

The hybrid solution not only has the advantage of keeping broadband volumes low, it also provides TV operators with the opportunity to tailor their service offerings so that mobile broadband delivery volumes match the willingness of the user to pay.

6 Future: Transfer from Hybrid to mobile IPTV

In successfully deployed hybrid networks, for example with households having a cellular roof-top antenna installed, a transfer of also part of the more popular linear TV content from the terrestrial/satellite to the cellular network will increase efficiency, since the mobile network can dynamically switch between unicast and broadcast and thereby optimize the resource utilization.

With LTE-Broadcast the mobile network is capable of delivering video either as broadcast or unicast. Throughout most of the day unicast video delivery is the most efficient method because viewing consumption is less and is VoD centric. At peak evening times this changes to high volume viewing where the linear TV concept also manages to bring high volumes of people watching the same content simultaneously. These peaks are especially high on weekend evenings. Diagram 6 shows a theoretical example of how broadcasting popular content on Friday and Sunday evening peaks can save up to half of the radio resources. During other times of the day, viewing volumes will not be high enough to require broadcast.

In LTE the switch between broadcast and unicast can be done dynamically by popularity based switching. This will ensure the most optimal resource utilization.

In markets with low terrestrial TV penetration, the possibility to transfer TV delivery to mobile operator networks is already being discussed, and increasingly 4G/5G technology could also be considered in markets with higher terrestrial TV penetration. 3GPP has initiated study/work items for linear TV distribution over 4G/5G, based on contributions from both Telcos and Broadcasters, including Ericsson and the European Broadcast Union (EBU).

Transfers of content from terrestrial/satellite distribution to cellular networks should be handled with care. An overly aggressive transfer will risk causing service disruption for households who haven't yet implemented the necessary installations and adjustment. A roll-out requesting household actions to avoid service degradation should be avoided. It is instead recommended to take a step-by-step hybrid approach where households are incentivized to upgrade by improved service offerings and QoE.

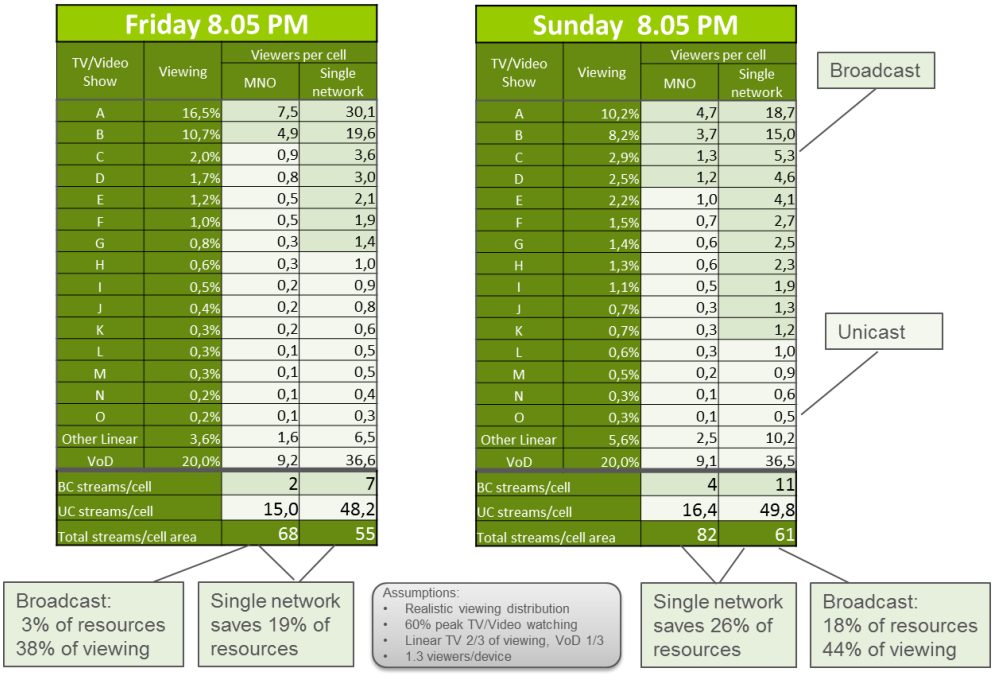

Diagram 6: Theoretical example of Mobile BB TV/Video delivery if 25% of the population would get all their TV/Video delivered over Mobile BB.

In diagram 6 a single network is defined as one Mobile Network Operator (MNO) carrying all TV/Video distribution. Another scenario is two or more MNOs sharing part of their networks with each other on commercial terms, which has the potential to offer almost the same efficiency and still provide MNOs with the opportunity to differentiate with content. Advanced shared networks are deployed in some markets and are also being discussed from a competition perspective in other markets.

7 Conclusion

- TV/Video Hybrid solutions using Terrestrial/Satellite and broadband distribution provide attractive, personalized and cost efficient service offerings with high QoE
- New technologies for fixed household installations of mobile broadband antennas, leveraging the terrestrial or satellite in-house installations, make mobile broadband a cost competitive alternative to fixed broadband.

8 References

1) Ericsson Mobility report. http://www.ericsson.com/mobility-report

2) Ericsson 2015 Media report
http://www.ericsson.com/res/docs/2015/consumerlab/ericsson-consumerlab-tv-media-2015.pdf

3) VIDEO OVER LTE: EXPLORING EFFICIENCY IN DISTRIBUTION
Jörg Huschke Ericsson, Germany, Henrik Voigt Ericsson, Sweden
http://digital-library.theiet.org/content/conferences/10.1049/ib.2014.0044

4) The State Of The CDN Market: Video Pricing, Contract, Volume and Market Sizing Trends, Dan Rayburn
http://blog.streamingmedia.com/wp-content/uploads/2015/08/2015CDNSummit-Rayburn-Pricing.pdf

5) https://www.hbbtv.org/

6) Providing extreme mobile broadband using higher frequency bands, beamforming, and carrier aggregation. Athley, F. Ericsson Res., Ericsson AB, Sweden Tombaz, S. ; Semaan, E. ; Tidestav, C. ; Furuskar, A.
http://ieeexplore.ieee.org/xpl/articleDetails.jsp?reload=true&arnumber=7343512&ranges=2014_2015_Year&searchWithin=%22First%20Name%22:anders&searchWithin=%22Last%20Name%22:furuskar