Qualcomm Perspective on Next Generation Television
The information contained herein is for informational purposes only.

Any dates, release numbers, features, capabilities, applications and upgrades, both existing and future, are subject to change at any time without notice.

Nothing in these materials is an offer to sell any of the components or devices referenced herein. Certain components for use in the U.S. are available only through licensed suppliers. Some components are not available for use in the U.S.
Overall Vision

- Television in the broadest sense should converge with “Internet streaming”
- What does this mean?
  - The tools available for Internet streaming become available to mainline linear television
  - For example Dynamic Adaptive Streaming over HTTP (DASH) and the XML based Service and Signaling structures available from 3GPP eMBMS
  - Native support for broadcast (multicast) to broadband (unicast) handoff and return
  - Support for broadcast, broadband and hybrid services
- Why this approach?
  - A large and rapidly increasing fraction of A/V media consumption is already on this platform
  - These tools are widely available on mobile devices, smartphones, and second screens i.e. tablets, laptops, and desk tops
  - Increasingly smart televisions already support DASH as practiced by Netflix, YouTube, and HbbTV 2.0
  - Unifying television on IP delivered DASH can enable new features and revenue streams
New Features Related to Internet Streaming

What does this combination of broadcast and broadband DASH enable?

- By utilizing the unified DASH Media Presentation Description (MPD) of 3GPP eMBMS, it is straight forward to create hybrid services
  - Services for which the primary components perhaps video, primary text, and primary audio are delivered via broadcast and secondary languages and ancillary media via broadband
  - This allows for a much richer service offering with minimal impact on consumed broadcast bandwidth
- The DASH MPD Period structure enables targeted ad insertion on personal devices
  - This potentially achieves higher revenue per ad view
- Television services running in a browser friendly environment
  - DASH is a commonly available plug in for HTML platforms
  - Both encryption and rights management are inherently supported
  - The provider can have a dedicated applications for their service
    - Multiple video views
    - Personalized ad opportunities
    - Related applets e.g. a per football player stat widget
What Parts of This are Already Available?

Available from 3GPP eMBMS/LTE Broadcast

- Defined and documented User Service Bundle Description
  - Provides structure of streaming services
  - Contains all the tools to enable handoff from broadcast (multicast) to and from broadband (unicast)
  - Supports unified MPD for broadcast, broadband, and hybrid services

- Provides the means to deliver Non Real Time (NRT) service components (files) based on File Delivery over Unidirectional Transport (FLUTE)
  - FLUTE is file delivery for broadcast based on Layered Coding Transport (LCT) and Asynchronous Layered Coding (ALC)
  - Includes support for Application Layer Forward Error Correction (AL-FEC)
  - There are number of well documented and commercially available efficient AL-FEC codes such as RFC 5053 Raptor and RFC 6330 RaptorQ that run in FLUTE
What Needs Enhancement in LTE Broadcast?

Work has already started

- The FLUTE delivery protocol of eMBMS was designed to do generic NRT file delivery and not for streaming television
- The FLUTE structure is not designed to optimize streaming media experience
  - Single file per delivery
  - No media aware encapsulation
  - Complete object reception required for playback start
- Qualcomm has developed Real-time Object delivery over Unidirectional Transport (ROUTE) which addresses all the major limitations of FLUTE
**Key Features and Benefits of ROUTE**

- **ROUTE allows multiple deliveries i.e. LCT sessions to be bundled under common repair**
  - This enhances time diversity for the entire collection of objects/files
  - Achieves constant QoS for all service components within the bundle
  - Enables so called late binding on the unified broadcast/broadband server
- **ROUTE provides support for out of order delivery**
  - Can allow lower end to end latency
- **ROUTE enables media aware byte range delivery**
  - This feature allows fast channel change and fast start up
  - Whole files (Segments) are not required to start playback
- **ROUTE supports Extended FDT, which may be delivered as part of a more robust main delivery**
- **ROUTE is constructed of existing IETF protocols, ALC and LCT**
What about Physical Layer?

There are a variety of physical layers suitable for broadcast carriage of IP traffic:

- DVB-T2 with GSE encapsulation of IP
- ATSC 3.0 with as yet TBD IP encapsulation
- LTE eMBMS/LTE Broadcast, which is native IP
  - There is a current study activity in 3GPP to further enhance eMBMS for linear television service
  - Enhanced eMBMS can be used to deliver television to roof tops, while enabling mobile and indoor reception in urban and suburban areas
  - Utilization of such a delivery approach is dependent on the existing cellular infrastructure sites
  - Not all countries as yet have a robust enough cellular infrastructure to achieve the desired coverage, but many do and low power low tower deployment style can increase spectral efficiency by approximately a factor of two\(^1\).
  - A television or set top box with unicast connectivity opens up many business opportunities
    - For example view history tracking and personalized ad insertion, which both add value
  - Use of roof top reception of LTE enables broadband service in currently under served rural areas
  - Most of the interior areas of the network do not require a directional or outdoor antenna

What About Next Generation Codecs and Formats?

DASH and LTE Broadcast Are Evolving to Support Advanced Services

- The 3GPP is currently considering profiles suitable for television applications of HEVC e.g. UHDTV
- The support of MPEG-H Audio, Dolby AC4, and DTS immersive audio technologies is on the agenda at DASH IF
- The potential impacts of high dynamic range (HDR), extended gamut, and UHD are being considered
- DASH has a plan and is evolving to provide support for the codecs and formats of next generation television
How Reasonable Is This Converged Approach?

- Given all the moving parts in the US and Europe it seems unlikely that a transition to IP centric television can start much before 2020.
- This seems a potentially reasonable time frame.
- There is potential for substantial economic benefits.
- The use of LTE Broadcast/eMBMS for television distribution makes economic sense even without consideration of the related benefits of mobile television, personalized ad insertion, and rural broadband ¹.
- Broadcasters stand to benefit substantially from the robust and rapidly growing DASH ecosystem.
  - DASH formatted streaming media is already more than 50% of the total traffic in the Internet.

¹. http://www.plumconsulting.co.uk/pdfs/Plum_Jul2014_-_Convergence_second_workshop_0.pdf
Conclusions

Convergence of TV & Internet Streaming Is a Significant Opportunity for Broadcasters

- Clearly there is a substantial work associated with a shift in the primary delivery method for broadcast television
- Such a transition is not undertaken lightly
- Unifying the television experience with IP streaming offers substantial opportunities for broadcasters to more closely engage with their audience and provides the broadcasters access to new and enhanced revenue streams
- The potential access to mobile platforms via eMBMS offers a real opportunity for broadcasters to reverse the current decline in linear television viewership and revenues
- Committing to an IP centric and mobile capable platform has the potential to significantly enhance broadcaster economics
Thank You