

Enhanced MBMS

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Introduction

Why do we need an efficient multicast solution?

Motivation

- **Offer portable TV on demand type of devices**
 - UE effectively becomes the last caching node in the network
- **Generate additional usage of data services**
 - Provide dedicated data services related to the content
- **Enablers**
 - Multi-mode / multi-system devices with powerful processing
 - Increasing storage capacity in portable devices

User download alternatives

- **Two main alternatives**
 - Home/office based delivery (portable)
 - Wireless WAN based delivery (mobile)
- **Benefits of mobile WAN based multicast**
 - Enables real time or near real time delivery
 - Ubiquitous
- **Key factor influencing adoption rate**
 - Cost

Motivation for mobile WAN multicast

- **Starting point**
 - Content delivery using unicast
- **Issue**
 - Cost of delivery does not benefit from economies of scale
- **Requirement**
 - Reduce cost per user for popular content delivery
- **Solution**
 - **Multicast**

Multicast technology options

- **Satellite based**
 - S-DxB
- **Terrestrial based**
 - **Broadcast based**
 - T-DxB
 - QUALCOMM's MediaFLO
 - **Cellular based**
 - 3GPP MBMS

Some key parameters affecting technology choice

- **Type and mix of services**
 - Live TV or simple downloads?
- **Type and mix of content**
 - Global or local?
- **User penetration**
 - Variable or consistently high?
- **Traffic models**
 - Periodic or continuous?
- **Coverage requirement**
 - Outdoor or in building?
- **Market timing**
 - 2006, 2007, 2008, 2009?
- **Regulatory framework**
 - Allowed to broadcast?
- **Spectrum asset**
 - Which band?
- **Power and tower height limits**
 - Influences site density
- **Existing infrastructure**
 - Greenfield or incremental upgrade?
- **Technology**
 - Standard based?

QUALCOMM's approach

- **Strongly believes in wireless content delivery services**
- **Will support the operators' choice of technology**
- **Developing and promoting further technology enhancements**
 - MediaFLO for the broadcast approach
 - 1x-EV-DO Platinum in 3GPP2
 - Enhanced MBMS as part of the 3GPP evolution effort

3GPP-MBMS

Possible enhancements in the context of the 3G evolution

MBMS Release-6

- **Re-use of Release-99**
 - Mapping on common channel
 - Long interleaving for time diversity
 - Open loop transmit diversity
- **New functionality**
 - **Spectrum efficiency**
 - Simulcast + block selection at MAC layer
 - Simulcast + soft combining at physical layer
 - **Battery saving**
 - Periodic notification of new sessions
 - Data scheduling

MBMS Release-6 performance

- **Single cell transmission/reception**
 - No diversity
 - 100 kbps
 - Transmit diversity
 - 150 kbps
- **Multi-cell transmission/reception**
 - Loose synchronization
 - 384 kbps
 - Tight synchronization (few ms)
 - 512-768 kbps
- **Spectrum efficiency**
 - 0.02 to 0.2 bit/Hz depending on condition & methodology
- **Results based on TR 25.803**
- **Assumptions**
 - 90% power assigned to MBMS
 - Ped-A 3 km/h (most demanding)
 - 95% coverage
 - Typically ensures 99%+ coverage in less demanding channels

Why not better?

- **PtM spectral efficiency is driven by the worst case scenarios**
 - Typically edge of cell coverage users
- **Efficiency is limited by inter-cell interference**
 - Simulcast + combining improves C but does not help on I
 - Equalization is complex due to cell specific scrambling code
- **Asynchronous network operation**

What else?

- **Requirement**
 - Simulcast such that signals received from multiple cells can be processed in the same way as a signal from a single cell with additional delay spread.
- **Possible solutions**
 - CDM based
 - Same single scrambling code used for all cells
 - OFDM based
 - Cyclic prefix

OFDM & CDM in the context of multi-cell PtM

- **Performance**
 - Fundamental performance should be in a similar range assuming equalization for the CDM approach.
- **Complexity**
 - Related to the maximum delay spread to be supported and BW of the system.

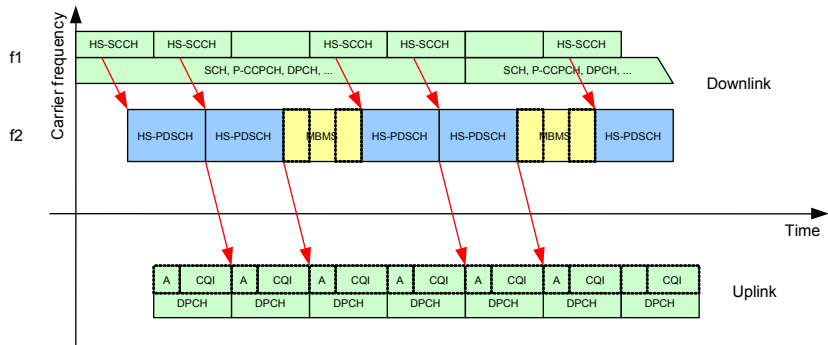
Deployment scenario - Spectrum

- **Transmission of DL only data in paired spectrum makes sense if the service is such that transmission can occur during off peak times.**
- **Transmission of DL only data in paired spectrum is a waste of UL resource if and when considered during peak hours.**
- **An ideal multicast signal structure would be one that can be deployed transparently in both paired and unpaired spectrum.**

Deployment scenario - Multiplexing

- **Continuous allocation of a DL carrier frequency to MBMS services may not always be the preferred deployment scenario depending on the service offering and user demand.**
- **Possibility to efficiently multiplex the MBMS services with other services is highly desirable and will facilitate support for simultaneous services operation**
- **Assuming the new MBMS signal has a slot level TDM structure:**
 - **Can be time multiplexed with the HS-PDSCH (and its evolution) in the FDD domain**
 - **Can be time multiplexed with any of the channels in the TDD domain**

Dual carrier operation for HSDPA+ & enhanced MBMS



UTRA and UTRAN Evolution

- 3GPP recently approved to study the longer term evolution of the UTRA and UTRAN beyond release-6
- Enhanced MBMS is in the scope of the 3GPP evolution work
- Key component of QUALCOMM's flexible downlink proposal

QUALCOMM's priorities for 3G Evolution

- **Priorities**
 1. Enhanced network architecture and protocols
 2. Enhanced Multicast
 3. Flexible bandwidth Unicast

- **Enhanced multicast in 3GPP**
 - Enhance MBMS efficiency
- **Unicast evolution in 3GPP**
 - Multi-carrier WCDMA

- **Similar evolution efforts are being considered in 3GPP2**