

MBMS from A – Z (Multimedia Broadcast / Multicast Service)

Course Duration:

2 Days

Course Description:

- ▶ This course addresses the needs of engineers and technicians, who need to get familiar with Multimedia Broadcast technologies in general and the MBMS extensions introduced with 3GPP Release 6 in particular.
- ▶ The course provides an overview of the important video broadcasting technologies, such as Digital Video Broadcasting (DVB), Digital Multimedia Broadcast (DMB), Advanced Television Systems Committed (ATSC) and their area of application (stationary desktop, in-car usage, handheld devices).
- ▶ Having the general broadcasting overview in mind, the subject will be expanded with the specific architecture of MBMS. We will explain the reference points, new network entities, operation modes and important session scenarios.
- ▶ Clear focus is on MBMS in the Radio Access Network with the description of new logical channels (MCCH, MICH, MSCH, MTCH) as well as the mapping to transport and physical channels.
- ▶ Another important focus is the MBMS operation in the Radio Access Network (RAB setup, handover, service registration).
- ▶ Protocol extensions and enhancements introduced with 3GPP release 6 compared to the UMTS system of 3GPP release 5 will be explained in detail. This section also contains a detailed description and analysis of the FLUTE protocol.
- ▶ The MBMS user services, such as service subscription, data delivery, charging, security and QoS, which use the bearer services explained before, will be presented in detail. Some important service scenarios will intensify the understanding of MBMS services.

Pre-Requisites:

- ▶ The student should possess basic technical understanding of mobile technologies, such as GSM and / or UMTS.

Course Target:

After the course, the student will be able to...

- ▶ ... describe all technical aspects of the new broadcast technology development in 3GPP and how it compares to other broadcast technologies .
- ▶ ... describe in detail the changes imposed with 3GPP release 6 of UMTS to the UE, the Radio Access Network and the service delivery platform as well as changes in the protocol stack(s).

Table of Contents:

Overview of Broadcasting Technologies

- **Important Broadcast Technologies**
 - ⇒ What is Broadcast and Multicast and how does it work?
 - ⇒ Important Broadcast Technologies
Satellite Broadcast, Terrestrial Broadcast, Cellular Broadcast
- **The DVB Alternative to MBMS**
 - ⇒ DVB Standards and System Overview
 - ⇒ DVB Architecture
 - ⇒ Important DVB-H Features of the Physical Layer
 - ⇒ Important DVB-H Features of the Link Layer
Multi Protocol Encapsulation (MPE), MPE Example, DVB-H Time Slicing, DVB-H Handover
 - ⇒ MPEG-2 Multi Program Transport Streams
Practical Exercise:
 - ⇒ IPDC over DVB-H
- **MBMS Overview**
 - ⇒ Some MBMS Use Cases and Service Categories
 - ⇒ Comparison of MBMS and DVB-H Protocol Structures
 - ⇒ Frequency Bands Overview – Example: European Situation
- **Comparison between MBMS and other technologies**

MBMS Architecture and Operation

- **The MBMS Architecture**
 - ⇒ Overview of the Reference Model
 - ⇒ MBMS Service Distribution
- **Network entities to support MBMS**
 - ⇒ The Broadcast-Multicast Service Center (BM-SC)
Service Announcement and Discovery, MBMS Content Delivery, Key Management and Distribution
 - ⇒ Protocols at the Gmb Interface

- ⇒ MBMS Specific Requirements on the UE
- ⇒ MBMS Specific Requirements on GERAN / UTRAN
- ⇒ MBMS Specific Requirements on SGSN
- ⇒ MBMS Specific Requirements on GGSN
- **MBMS Service Phases**
 - ⇒ MBMS Service Areas
 - ⇒ Overview of MBMS Service Phases
 - ⇒ Overview of Broadcast Mode Service Phases
Broadcast Service Timeline Example
 - ⇒ Overview of Multicast Mode Service Phases
Multicast Service Timeline Example Exercise
- **MBMS Operation Details**
 - ⇒ MBMS Multicast Service Activation
 - ⇒ MBMS Context Activation
 - ⇒ Important MBMS parameters and attributes
Use of MBMS UE and Bearer Contexts, Detailed View of MBMS Contexts at the Network Nodes, Relation between NSAPI and Linked NSAPI, 2.4.3.4 TMGI Format and Use, MBMS QoS
 - ⇒ MBMS Session Start
 - ⇒ MBMS Session Stop
- **Comparison of Broadcast and Multicast**

MBMS in the Radio Access Network

- **Changes to the GERAN protocol stack with Rel. 6**
 - ⇒ New BSSGP Messages for MBMS
MBMS SESSION START REQUEST, MBMS SESSION START RESPONSE, MBMS SESSION STOP REQUEST, MBMS SESSION STOP RESPONSE
- **GERAN Channels used by MBMS**
- **Changes to the UTRAN protocol stack**
 - ⇒ MBMS Packet Switched Control Plane
 - ⇒ MBMS Packet Switched User Plane
- **UTRAN Protocol Details**
 - ⇒ New RRC Messages for MBMS
MBMS ACCESS INFORMATION, MBMS COMMON PTM RB INFORMATION, MBMS CURRENT CELL PTM RB INFORMATION, MBMS GENERAL INFORMATION, MBMS MODIFICATION REQUEST, MBMS MODIFIED SERVICES INFORMATION, MBMS

NEIGHBOURING CELL PTM RB INFORMATION, SCHEDULING INFORMATION,
MBMS UNMODIFIED SERVICES INFORMATION

- ⇒ New NBAP Messages for MBMS
MBMS NOTIFICATION UPDATE COMMAND
- ⇒ New RANAP Messages for MBMS
MBMS SESSION START, MBMS SESSION START RESPONSE, MBMS SESSION
START FAILURE, MBMS SESSION UPDATE, MBMS SESSION UPDATE RESPONSE,
MBMS SESSION UPDATE FAILURE, MBMS SESSION STOP, MBMS UE LINKING
REQUEST, MBMS UE LINKING RESPONSE, MBMS REGISTRATION REQUEST,
MBMS REGISTRATION RESPONSE, MBMS REGISTRATION FAILURE, MBMS CN DE-
REGISTRATION REQUEST, MBMS CN DE-REGISTRATION RESPONSE, MBMS RAB
ESTABLISHMENT INDICATION
- ⇒ New RNSAP Messages for MBMS
MBMS ATTACH, MBMS DETACH

• Overview of New Logical Channels in UMTS Rel. 6

- ⇒ An Overview of channels in UMTS
Logical Channels, Transport Channels, Physical Channels
- ⇒ Logical UMTS Channels used by MBMS
BCCH:, MCCH:, MSCH:, DTCH:, MTCH:
- ⇒ UMTS Transport Channels used by MBMS
FACH:, HS-DSCH:, DCH:
- ⇒ Physical UMTS channels (FDD) used by MBMS
MICH:, S-CCPCH:, HS-SCCH:, HS-PDSCH:, DPCCH:, DPDCH:, HS-DPCCH:

• Details of New UMTS Channels with MBMS

- ⇒ New Logical and Physical MBMS Channels – UE Perspective
MBMS-Data on MTCH, MBMS-System Infos on MCCH, MTCH-Scheduling and Content
Infos on MSCH, MCCH-Change Indications on MICH
- ⇒ Mapping of MBMS Channels to TrCH's and Physical Channels – UE
Perspective

• MBMS Details of the Physical Layer

- ⇒ The MBMS Indicator Channel (MICH)
- ⇒ MICH Timing Relation with S-CCPCH

• MAC Layer Enhancements for MBMS

- ⇒ UTRAN MAC Architecture Overview for MBMS Support
- ⇒ The MAC-m Entity Additions
MBMS-Id, TCTF MUX, TCTF DEMUX, Scheduling / Buffering / Priority Handling, TFC
selection
- ⇒ Overview of FACH Channel Configurations Supported by MBMS
- ⇒ Mapping of a 128 Kb/s MBMS Bearer to the Physical Layer
Exercise: Mapping of 256 Kb/s and 384 Kb/s MBMS Bearer to the Physical Layer

- **MBMS Reception and UE capability requirements**
 - ⇒ Minimum UE Capability Requirements for MBMS
 - ⇒ Bearer Setup Initiation
GERAN Case, Bearer Setup Initiation (UTRAN)
 - ⇒ 3.9.3 MBMS Reception in RRC_Idle Mode
 - ⇒ Selective and Soft Combining
Selective Combining at the Receiving UE, Selective Combining Configuration Example, Soft Combining at the receiving UE, Example: Combining Improvements, Exercise: Calculate the Soft Combined Value
 - ⇒ MBMS Reception in RRC_Connected Mode
Reception in CELL_DCH Mode, Reception in CELL_FACH or CELL_PCH Mode, Reception in URA_PCH Mode
- **MBMS Resource Management**
 - ⇒ MBMS Notification
MBMS Notification and Scheduling, Notification in A/Gb mode (GERAN), Notification in Iu mode (UTRAN / GERAN)
 - ⇒ Multicast Subscriber Counting
Notification, Scheduling and Counting Response, Access Control procedure
 - ⇒ MBMS Service Prioritisation
- **MBMS Mobility**
 - ⇒ RRC_IDLE state
 - ⇒ MBMS Mobility Action in RRC connected mode
URA_PCH state, CELL_PCH state, CELL_FACH state, CELL_DCH state
 - ⇒ MBMS Mobility Procedures
MBMS Linking and De-Linking, MBMS Inter SGSN Routing Area Update

MBMS User Services

- **User Service Architecture**
 - ⇒ PTM part with MBMS Bearer(s)
 - ⇒ Part with PTP Bearer
 - ⇒ User Service Data Formats
- **Details of the FLUTE protocol and usage in MBMS**
 - ⇒ Operational Overview of FLUTE
 - ⇒ Service Distribution with FLUTE
 - ⇒ Segmentation of Data with FLUTE
- **Supported MBMS Media Formats and Codecs**

- **MBMS Security**

- ⇒ User Authentication and Authorization
Overview, Authentication and authorizing the user
- ⇒ MBMS Key Management
Key Management (Request and Distribution), Data Protection Methods
- ⇒ Security Protocols

MBMS – Quo Vadis

- **Changes planned for 3GPP Rel.7 and Rel.8 (LTE)**

- **MBMS Architecture Evolution**

- ⇒ MBMS Overlay with TDD Downlink (Rel. 7)
- ⇒ eMBMS Architecture within LTE
Rel. 7 MBMS, LTE MBMS (EPC, MCE)
- ⇒ Single Cell Architecture vs SFN

- **Overview of new MBMS channels with LTE**

- ⇒ DL-SCH
- ⇒ MCH
- ⇒ PMCH
- ⇒ PBCH
- ⇒ PDSCH

- **Solutions for the Exercises**