



Introduction to MBMS

v1.6

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Before we begin

- ☐ Please switch off your mobiles (or put them on silent)
- ☐ About Myself
- ☐ About eXplanoTech Ltd
- ☐ Why am I qualified to provide this training

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The rise of Mobile TV

□ According to Infonetics research report titled, *“Mobile Video Devices, Services and Subscribers”* published in May 2007:

- The number of worldwide mobile subscribers has increased by 300% between 2005 and 2006.
- There will be 46 million Mobile Video subscribers by 2010
- Asia Pacific will be the regional stronghold of mobile video subscribers through at least 2010, with 57 per cent of the world total in 2006, followed by EMEA at 31 per cent



Mobile TV – How and which Technology?

- ❑ Most of the Mobile TV about which you may hear is actually “Video on Demand” and it uses streaming technology similar to Youtube (for example).



- ❑ The Mobile TV broadcast technologies have not yet been rolled out worldwide and is not yet available
- ❑ Qualcomm's MediaFLO is patented and is rolled out in some parts of US
- ❑ ISDB is used specifically in Japan
- ❑ DMB-T is Korean standard and is being standardised in other parts as well but has its limitations.
- ❑ DVB-H is the most popular and supported by major manufacturers but cannot be rolled out until spectrum is available (2012 in UK).

Is MBMS Mobile TV?

- ❑ MBMS is **'Mobile TV+'**
- ❑ The Mobile TV technologies mentioned can only be used for Mobile TV purposes whereas MBMS can also be used for broadcasting Clips, Information, Software patches, Games, etc
- ❑ With MBMS Interaction is possible like online voting and **'Red Button'** feature as in SKY Tv.
- ❑ No additional Spectrum is required as it uses 3G spectrum
- ❑ No major hardware cost involved as its software upgrade

What does MBMS stand for?

- ❑ Multimedia Broadcast Multicast Service
- ❑ Part of 3GPP Release 6
- ❑ Way for 3G Networks to offer Multimedia content
- ❑ Capacity for Voice and Data Communications unaffected
- ❑ No additional hardware needed



What is MBMS?

- ❑ MBMS is an unidirectional point to multipoint bearer service in which data is transmitted from a single source to multiple recipients
- ❑ MBMS architecture enables the efficient usage of radio and core network resources, with an emphasis on the radio interface efficiency



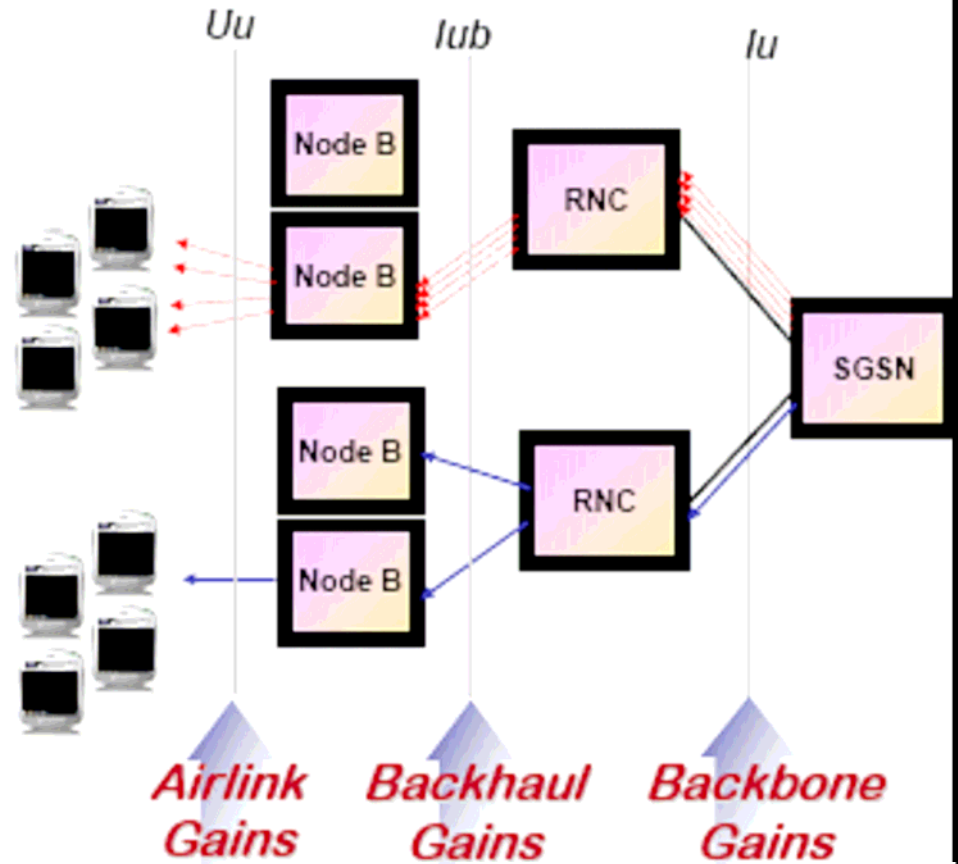
- ❑ MBMS is realised by extending functionalities of UTRAN and PS core network (e.g. SW upgrade) and by addition of a new functional entity, the Broadcast Multicast Service Center (BM-SC)
- ❑ 3gpp has defined 2 modes of operation for MBMS: broadcast mode and multicast mode

Why MBMS?

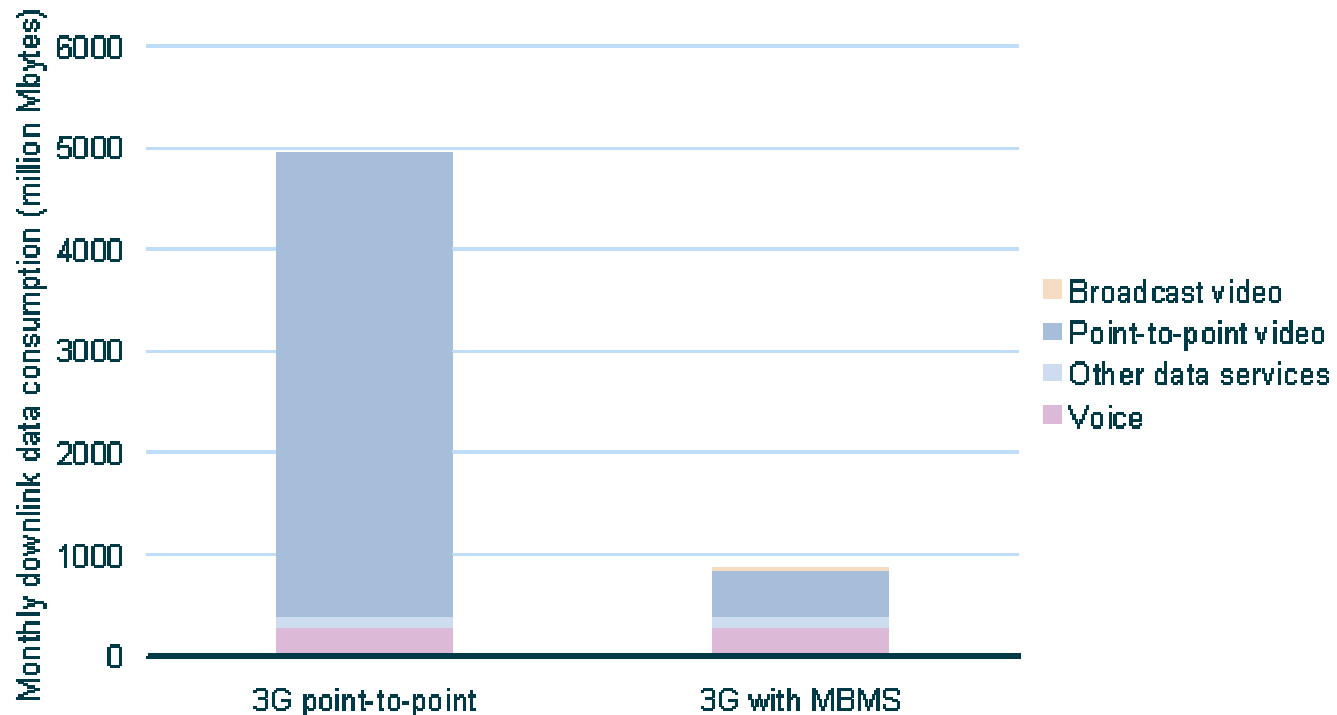
- ❑ Increasing use of high bandwidth application in 3G mobile systems
 - E.g. mobile TV and content download
- ❑ Some applications require transmission of identical data to multiple users at the same time
 - With large number of users receiving same content, efficient distribution is essential
- ❑ Using multicast/broadcast techniques, data to be delivered to multiple receivers are not necessarily forked or duplicated
 - E.g. the SGSN will send data once to an RNC regardless of the number of Node Bs and UEs that need to receive that same data
 - On the air interface, multiple users can receive same data on a common channel avoiding the congestion that would arise with multiple transmissions

Multimedia Transport Efficiency Gain

- ❑ MBMS enables higher efficiency UTRAN and Core traffic transport
 - One Iub, Iu and Gn per service
- ❑ As multimedia demand increases, so does the need for higher BW transport links



3G Network Capacity Consumption in 2010



Source: *Sound Partners Research Report – Making a Success of Mobile TV and Video: 3G MBMS v/s DVB-H, DMB and MediaFLO*

State of Market

Huawei and Qualcomm complete IOT

Shenzhen 23 January 2007 - Huawei Technologies Co., Ltd. ("Huawei"), a leader in providing next generation telecommunications network solutions for operators around the world, has announced the completion of the first commercial IOT (Internet of Things) Service) in



Ericsson Showcase MBMS at 3GSM

Stockholm, Sweden, February 8, 2007 -- The MBMS demonstration showcased high-quality mobile TV on a prototype U360, demonstrating the interactivity and the world's first demonstration of the world's first to the commercial



Rohde & Schwarz presents first MBMS test scenario for R&S CRTU-



13/02/07: Rohde & Schwarz presents first MBMS test scenario for R&S CRTU-1000, a new test scenario for R&S CRTU-1000 chipsets to check the company is among the developer



Anritsu - First-to-market MBMS test capability for protocol test system

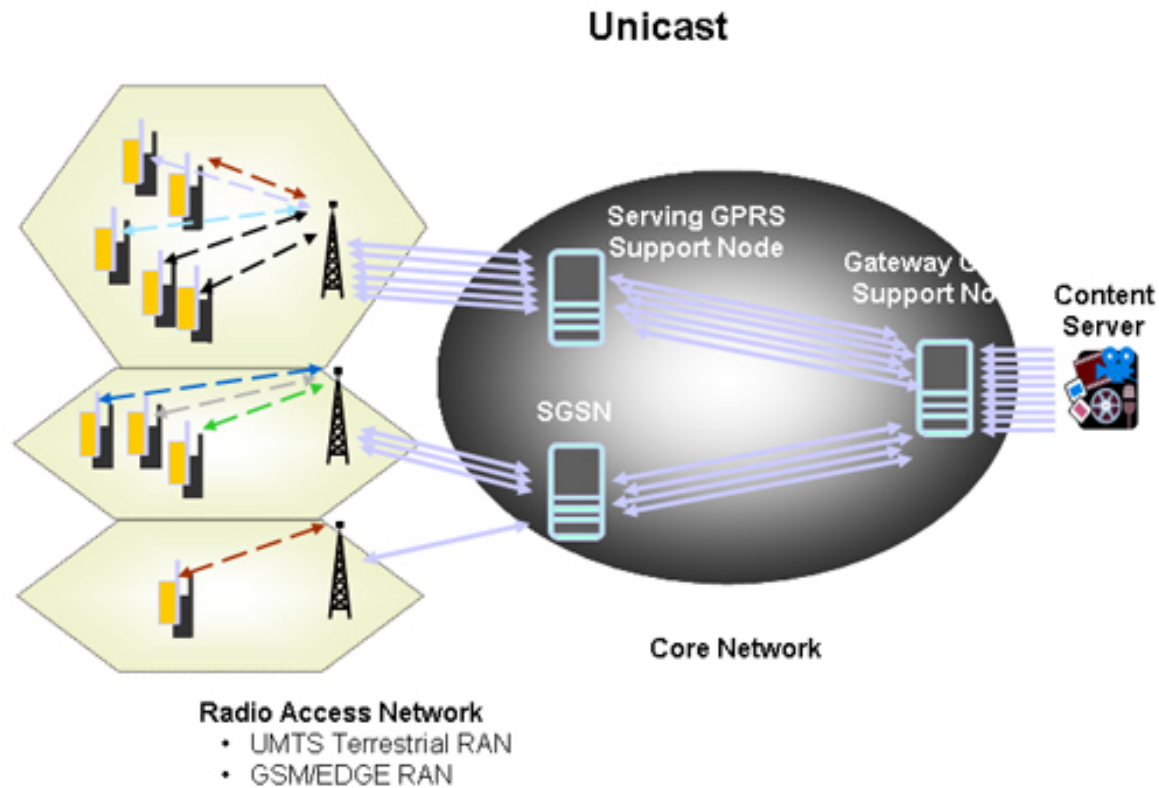
27/02/07 -- MBMS physical layer test capability was first launched in the MD8480C W-CDMA Signalling Tester in January 2007. Initial layer 3 test functionality will be introduced into the Protocol Test System (PTS) in February with further MBMS enhancements planned during the year. An MBMS protocol conformance test capability for GCF certification is also planned



Discover What's Possible®

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Unicast



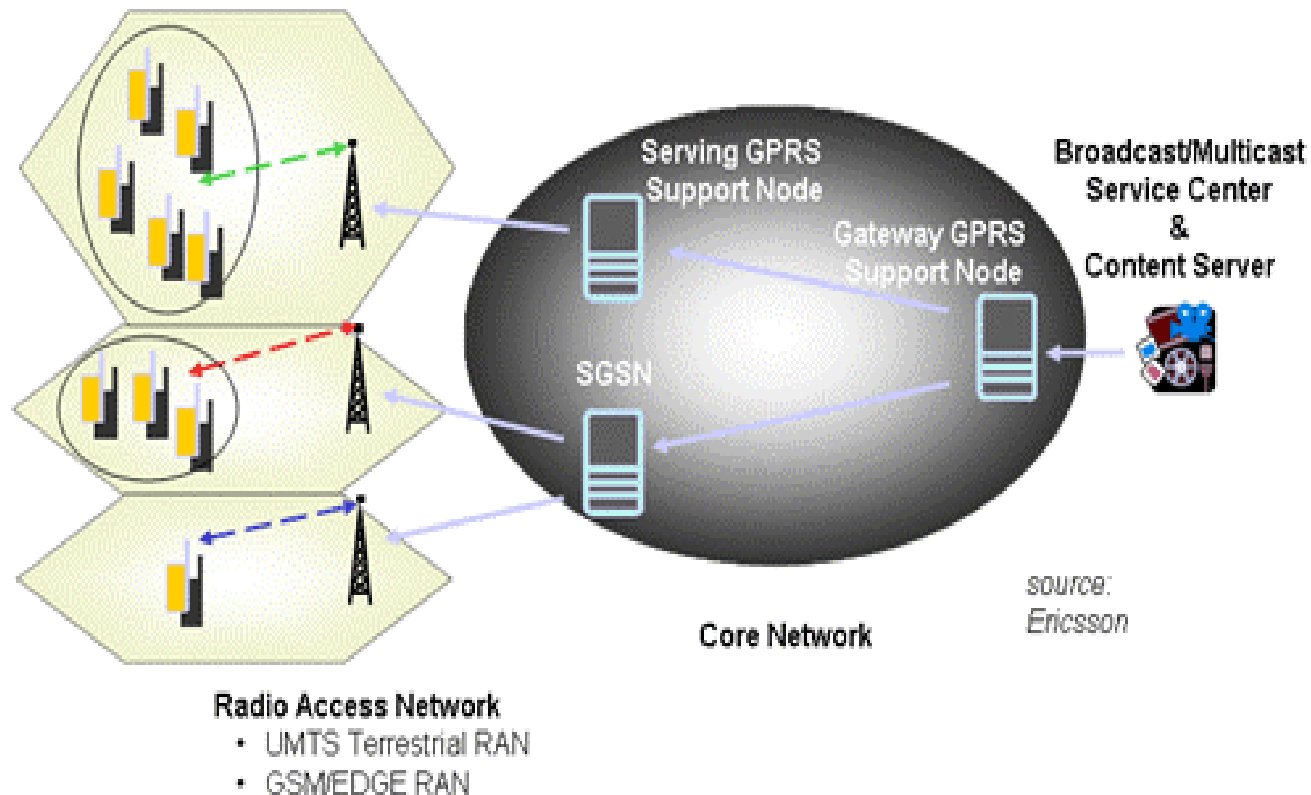
Unicast Practicality

Unicast is not very practical with lots of users subscribed to a service. Lets take an example of a “breaking news” service:

- ◆ 100,000 users
- ◆ Data transfer speed 128 kbps streaming
- ◆ File size 1MB
- ◆ Server capable of 1000 connections simultaneously
- ◆ It will take around 2 hrs to serve all the users with this clip
- ◆ Also Unicast is very resource consuming

Broadcast/Multicast

Broadcast/Multicast (MBMS)



Broadcast versus Multicast

Broadcast

- ☐ P-t-m service to multiple UE's in *Broadcast area*
- ☐ Push services
- ☐ No Interaction possible
- ☐ Free

Multicast

- ☐ P-t-m service to multiple UE's in *Multicast area*
- ☐ UE part of Multicast group
- ☐ Interaction possible
- ☐ Free or Paid

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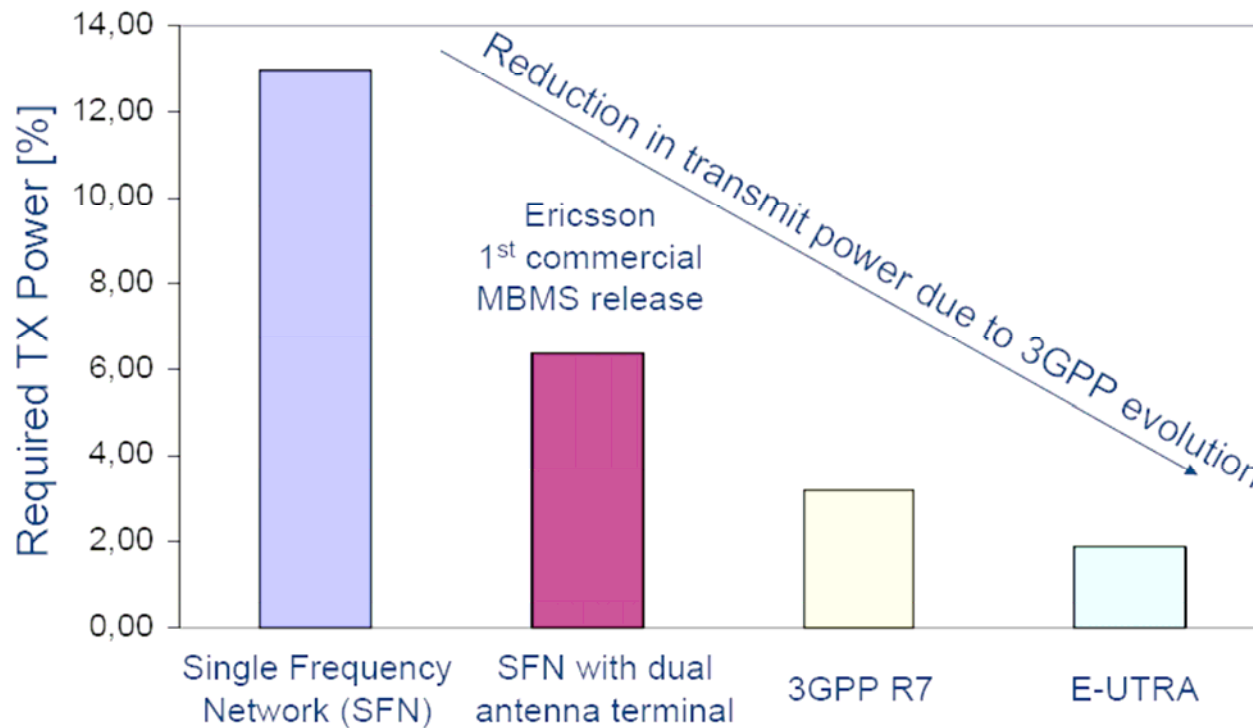
Capacity Impact

Technology	Transport channel	Cell Capacity (per 5MHz)	
		TV channel @ 128 kbps	Number of users per TV channel
QuickPlay Streaming over WCDMA	DCH	5	1
MBMS	FACH	4	hundreds
MBMS with Tx diversity	FACH	6	hundreds
MBMS with Tx and Rx diversity	FACH	9	hundreds
		TV Channel @ 256 kbps	Number of users per TV channel
MBMS	FACH	2	hundreds
MBMS with Tx diversity	FACH	3	hundreds
MBMS with Tx and Rx diversity	FACH	4	hundreds

3GPP/MBMS broadcast capacity

Per 5 MHz carrier

# of channels @ 128 kbps	6	12	24	40
# of channels @ 256 kbps	3	6	12	20

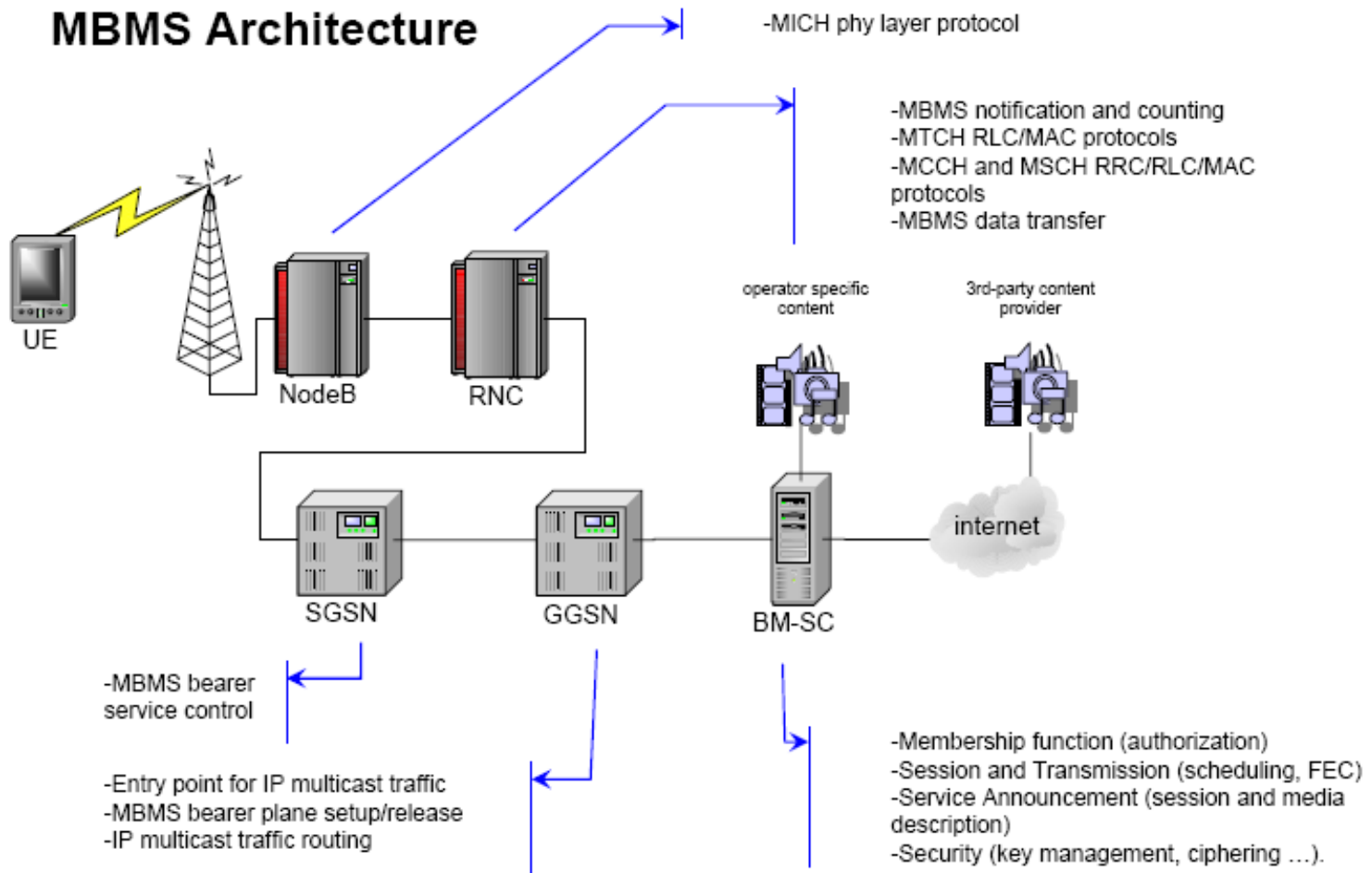


Source: Ericsson, MMC 2006, Germany, Oct 2006.

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MBMS Architecture

(3GPP TS 23.246)



Functional Entities to support MBMS (1)

□ UE:

- The UE shall support functions for the activation/deactivation of the MBMS service
- Once a particular MBMS service is activated, no further explicit user request is required to receive MBMS data although the user may be notified that data transfer is about to start
- The UE shall support security functions as appropriate for MBMS
- The UE should, depending on terminal capabilities, be able to receive MBMS service announcements, paging information or support simultaneous services

□ UTRAN/GERAN:

- UTRAN/GERAN are responsible for efficiently delivering MBMS data to the designated MC or BC service area
- MBMS transmissions may be initiated and terminated intermittently
- Intra/inter-RNC/BSC mobility of MBMS receivers shall be supported
- Transmission of MBMS service announcements, paging information and support other services in parallel with MBMS

Functional Entities to support MBMS (2)

❑ SGSN:

- To perform user individual network control functions and to provide MBMS transmissions to RAN/GERAN
- Provides support for intra/inter SGSN mobility procedures.
- It stores the user specific MBMS context for each activated multicast service and pass these contexts to the new SGSN during the inter-SGSN mobility procedures
- Generates charging data per multicast service for each user

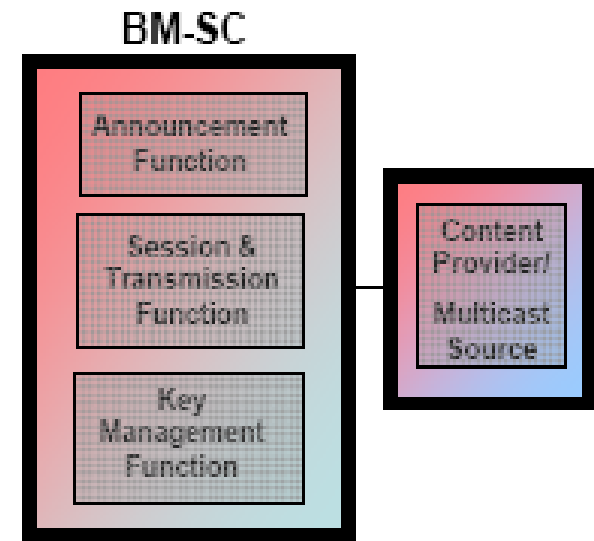
❑ GGSN:

- Serves as an entry point for IP multicast traffic as MBMS data.
- Upon notification from the BM-SC the GGSN shall be able to request the establishment of a user plan for a broadcast or multicast MBMS transmission
- Able to receive IP multicast traffic and route this data to the proper GTP tunnel setup as part of the service
- Charging data Collection

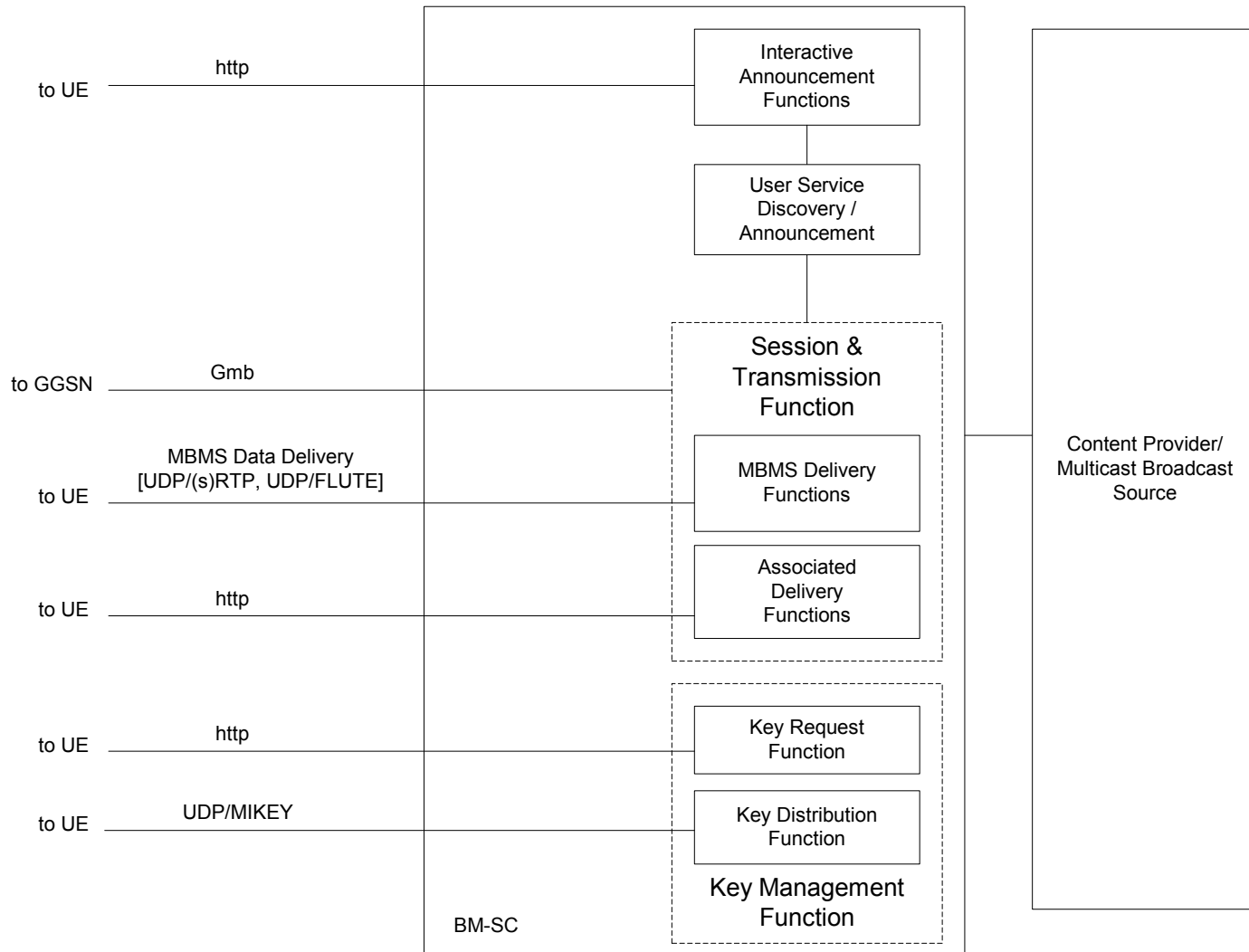
Functional Entities to support MBMS (3)

□ BM-SC

- Responsible for MBMS service provisioning and scheduling
- Entry point for content provider transmissions
- Advertises media availability to UEs
- Trigger session initiation
- User registration and authorization
- Content encryption and key negotiation
- Apply erasure correction codes
- Generates charging records

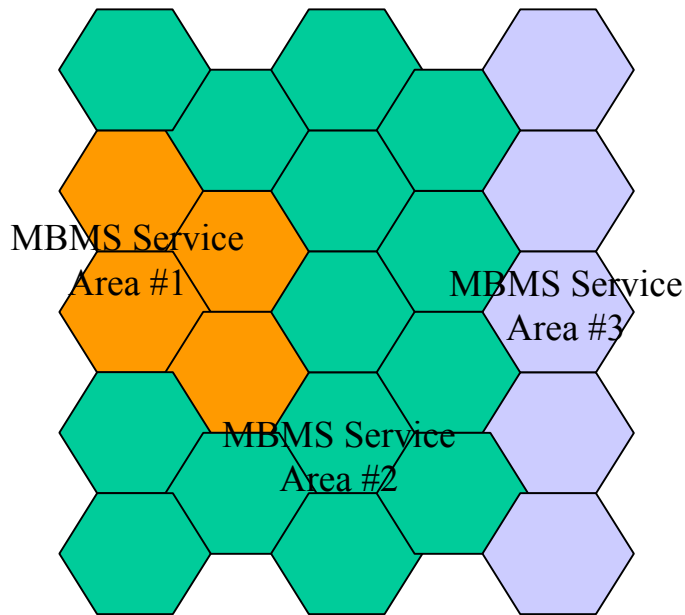


BM-SC sub-functional architecture (26.346)



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MBMS Service Area Concept



- ❑ MBMS Sessions received only inside the according MBMS Service areas
- ❑ Only MBMS UE's in the Service Area are paged in case of an upcoming MBMS transmission
- ❑ MBMS Service areas may consist of one or more cells

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MBMS Service Provisioning

(3GPP TS 23.246)

MBMS functions in two modes:

☐ The Broadcast Mode

- available without subscription for all UEs in a cell

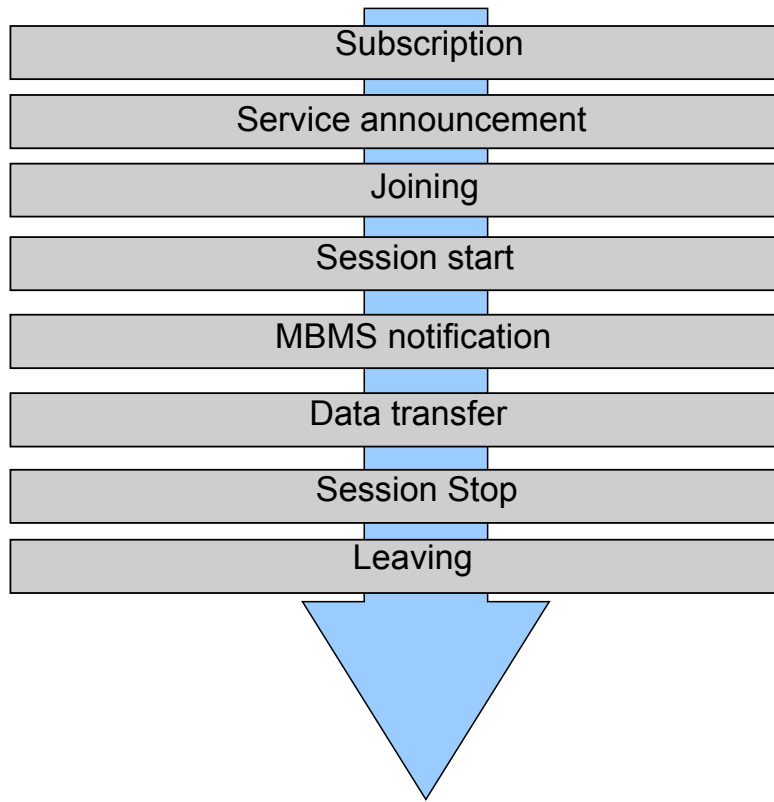
☐ The Multicast Mode

- requires subscription

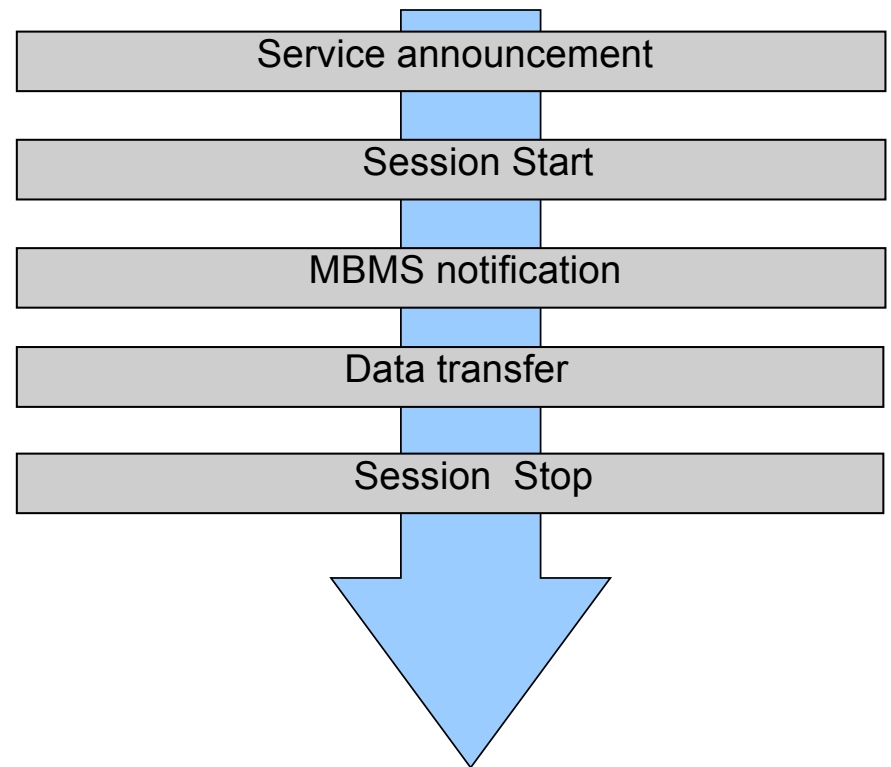
MBMS service provisioning

The connection procedure

The multicast mode



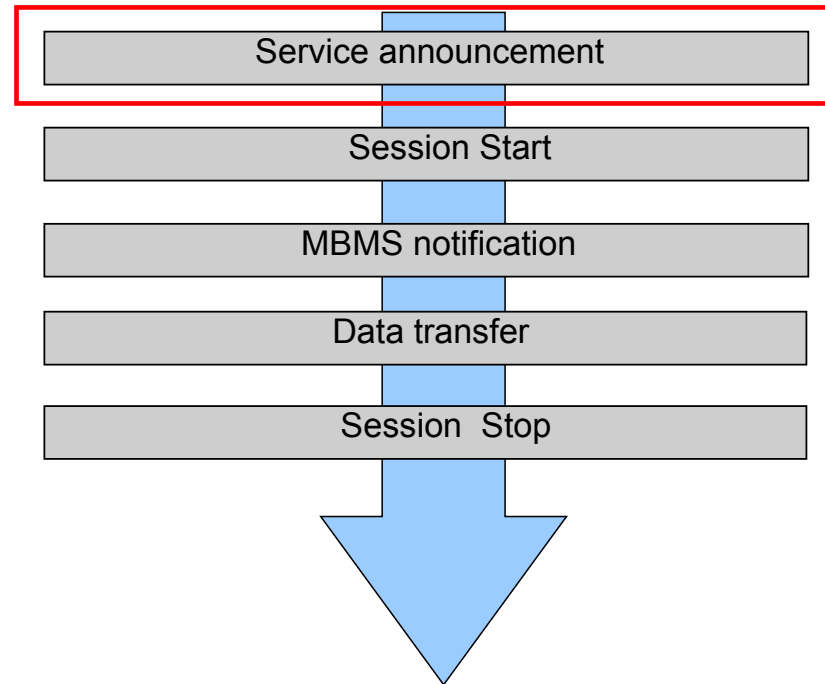
The broadcast mode



The broadcast mode

Service announcement

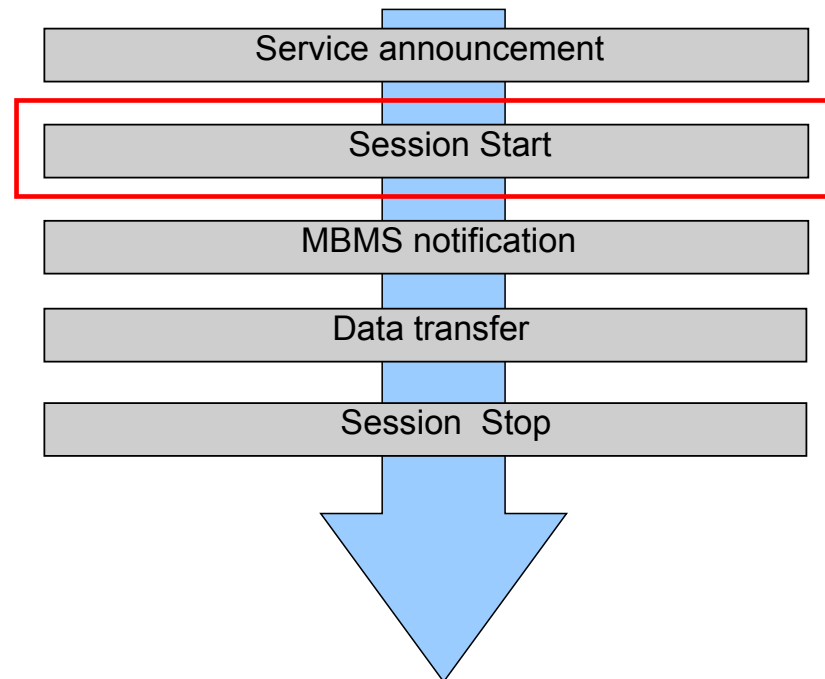
- ❑ Operator may use different mechanisms to inform users about available MBMS services (service discovery)
- ❑ Announcements are available for everyone who supports MBMS
- ❑ Location information may be used



The broadcast mode

Session start (network set up)

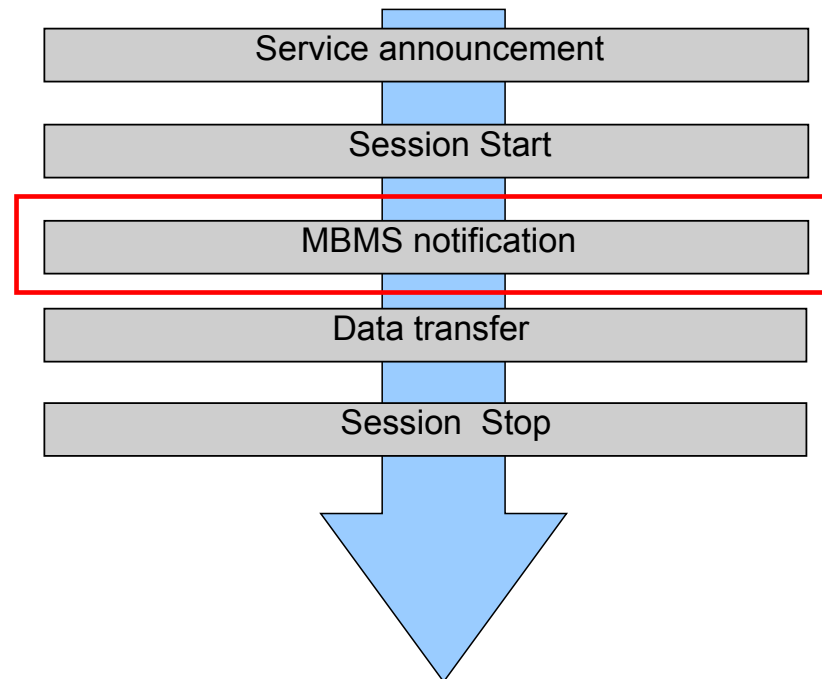
- ❑ It is the point at which BM-SC is ready to send data
- ❑ It occurs independantly of Service Activation by the user
- ❑ Establishes the needed network resources for the MBMS data transfer
- ❑ Resources are reserved from both core network and radio access network
- ❑ A user service can be carried by more than one MBMS bearer service in which case there is session start for each.



The broadcast mode

MBMS notification

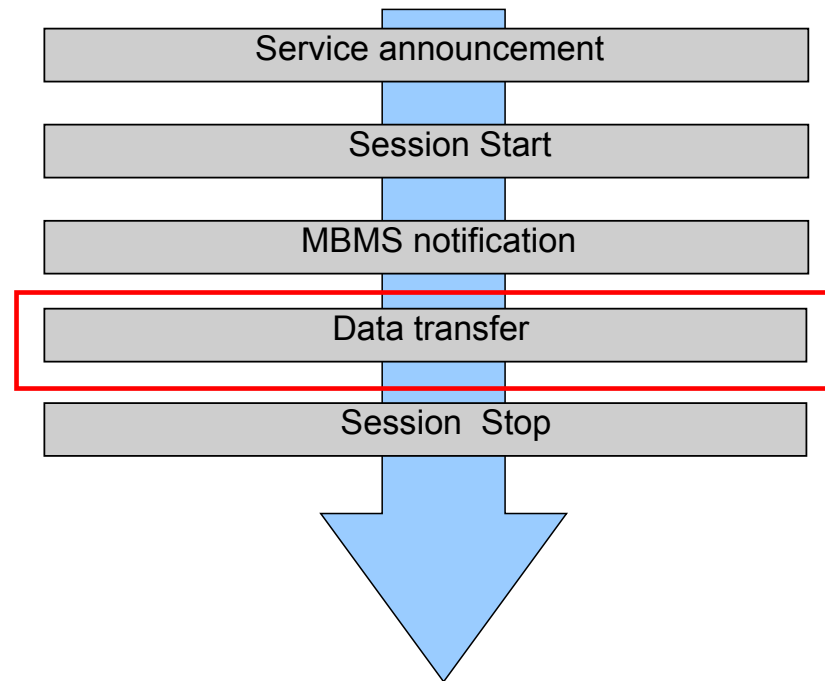
- ❑ Informs users about on-going or forthcoming services
- ❑ Available for all users with activated MBMS services



The broadcast mode

Data transfer

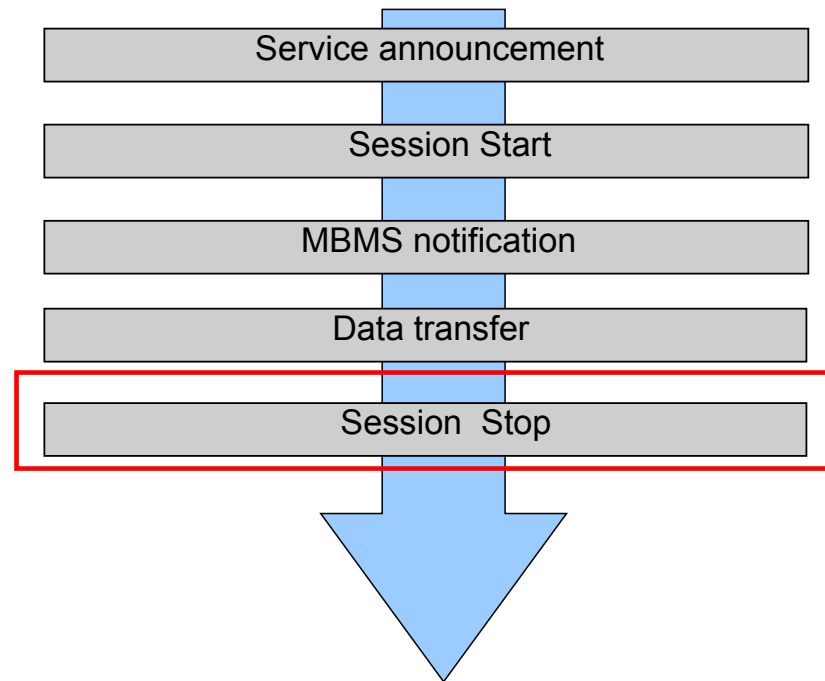
- ❑ The data is transferred to the user equipments (UEs)
- ❑ No ciphering
- ❑ No retransmitting, so there may be some data loss



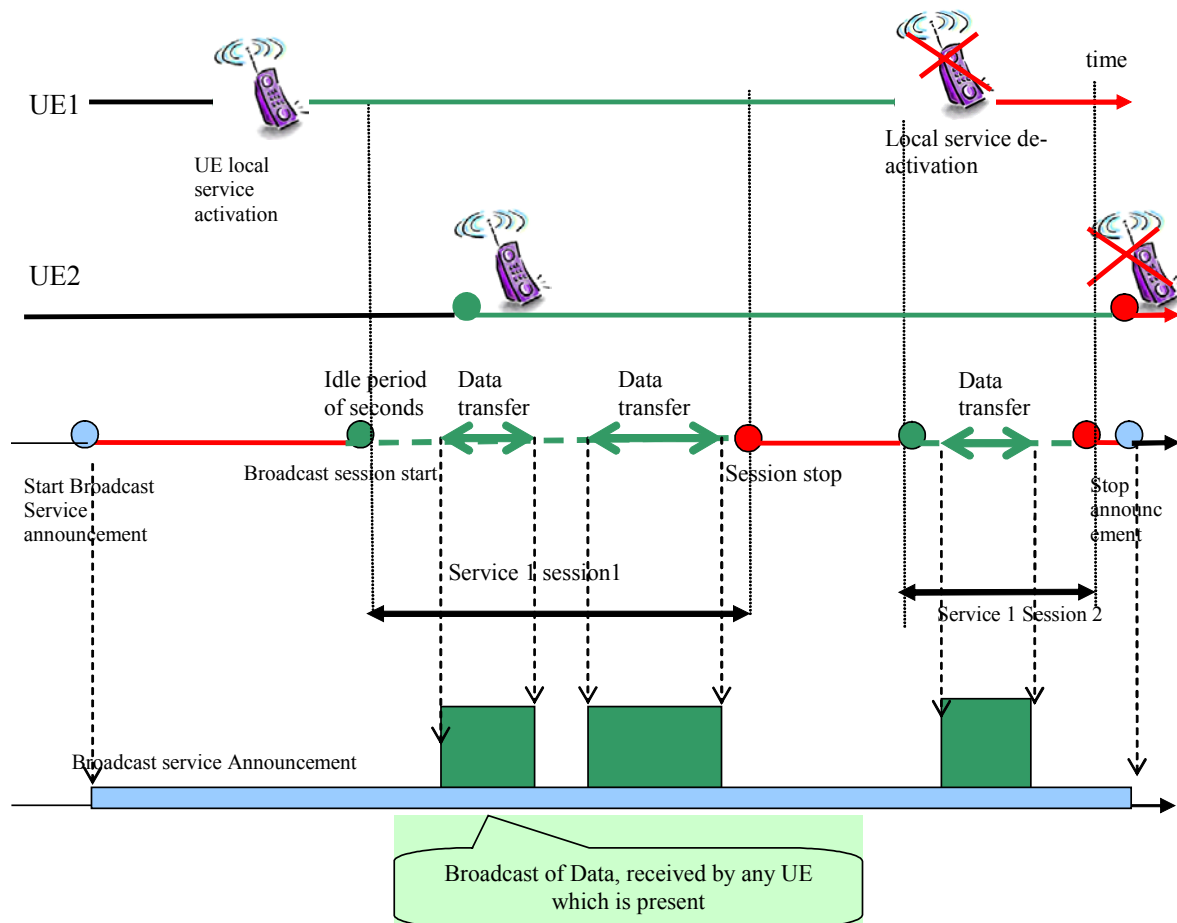
The broadcast mode

Session stop

□ The reserved network resources are released when there's no more data to be transferred



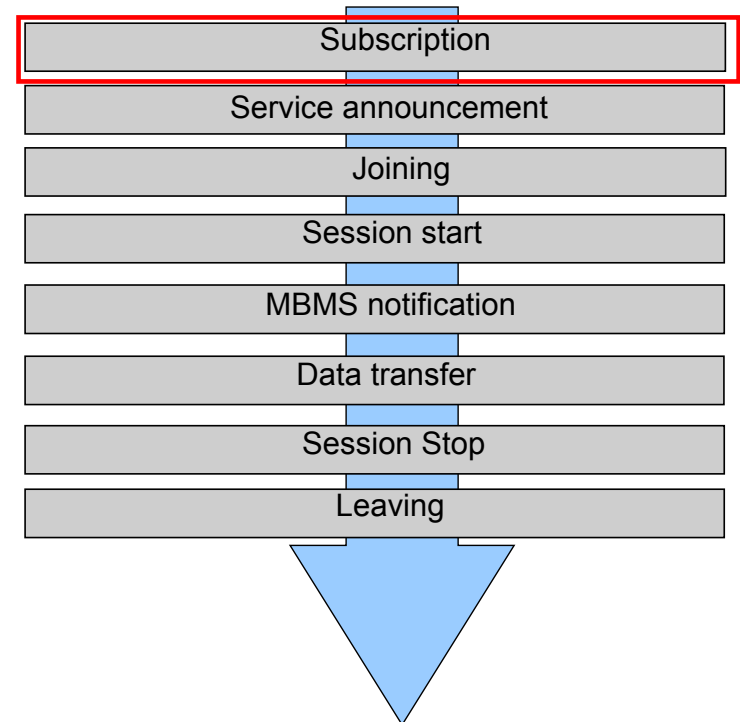
The broadcast mode



The multicast mode

Subscription

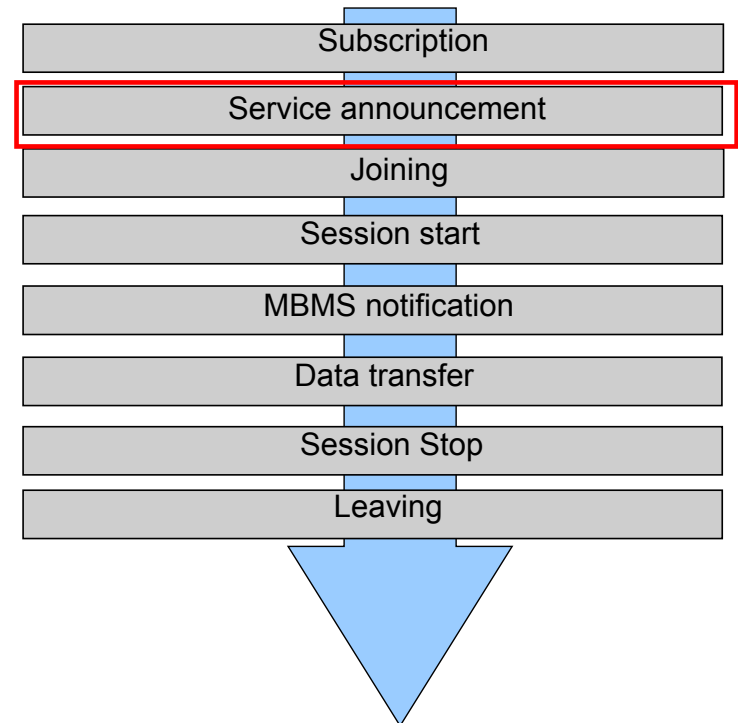
- ❑ First the user starts a relationship with the operator by subscribing to a specific MBMS service
- ❑ After subscription the user may receive related MBMS service and operator may charge for it
- ❑ Subscription can be made for example in the internet



The multicast mode

Service announcement

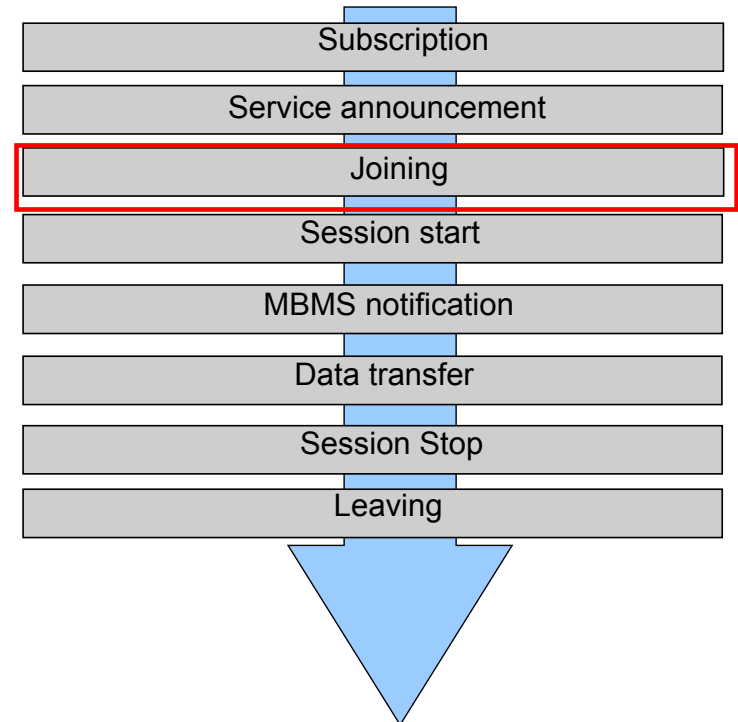
- ❑ Operator may use different mechanisms to inform users about available MBMS services (service discovery)
- ❑ Announcements are available also for those who are not subscribed
- ❑ Location information may be used



The multicast mode

Joining

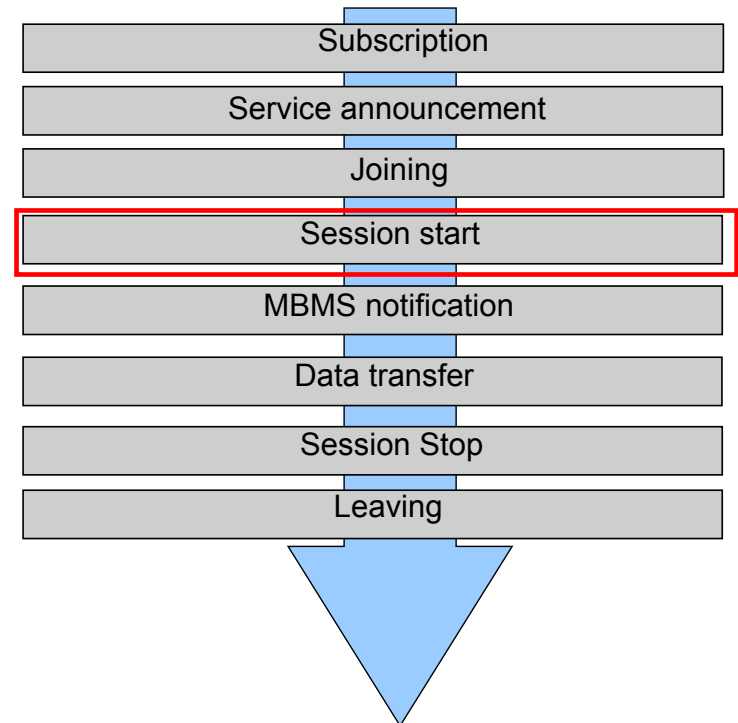
- ❑ In the joining phase the user indicates to the network that he/she wants to specific multicast data stream
- ❑ Joining can be made at any time
- ❑ Used for charging so authentication is needed



The multicast mode

Session start

- ❑ Same as in broadcast mode with one exception:
- ❑ The network decides whether a common channel for all UEs in a cell is used, or separate channel for each UE



The multicast mode

MBMS notification

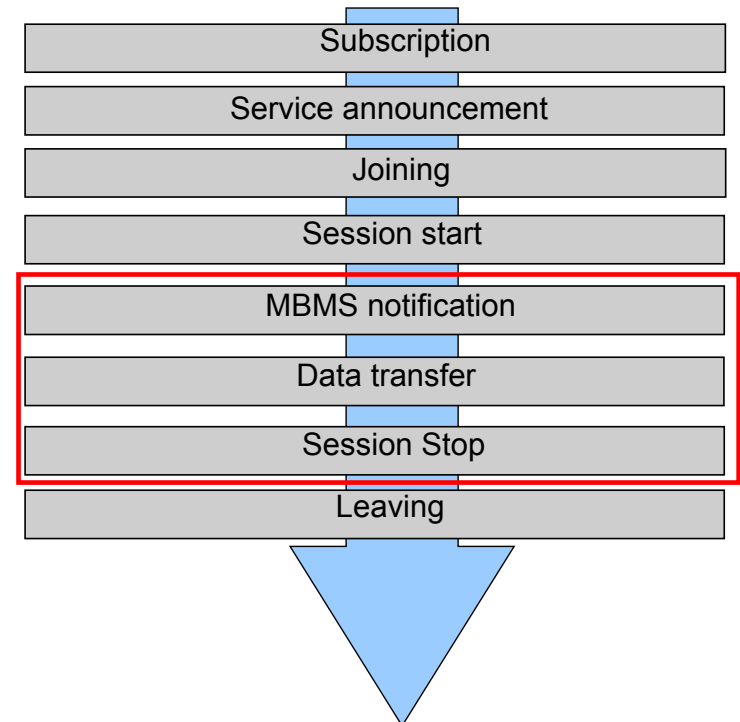
- ❑ Same as in the broadcast mode

Data transfer

- ❑ Data is encrypted
- ❑ Otherwise same as in the broadcast mode

Session stop

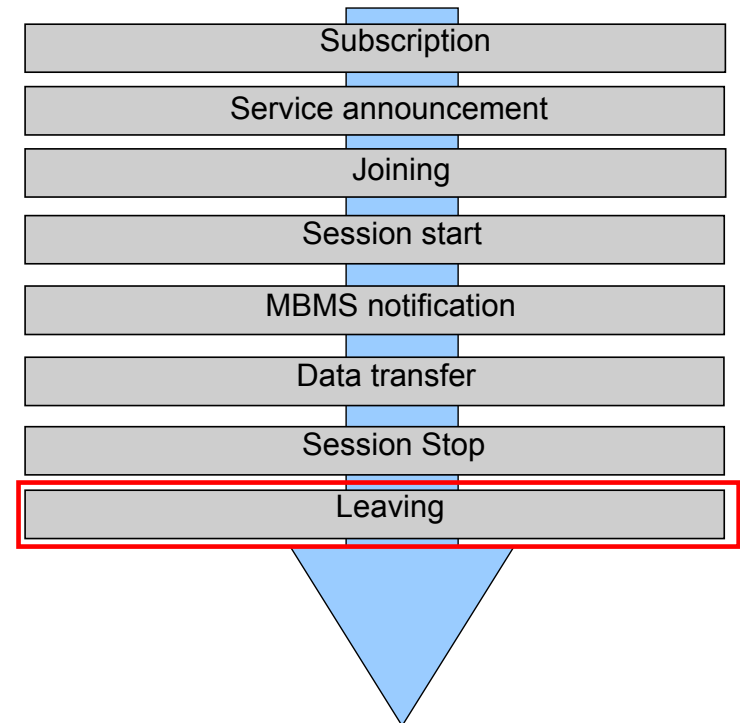
- ❑ Same as in the broadcast mode



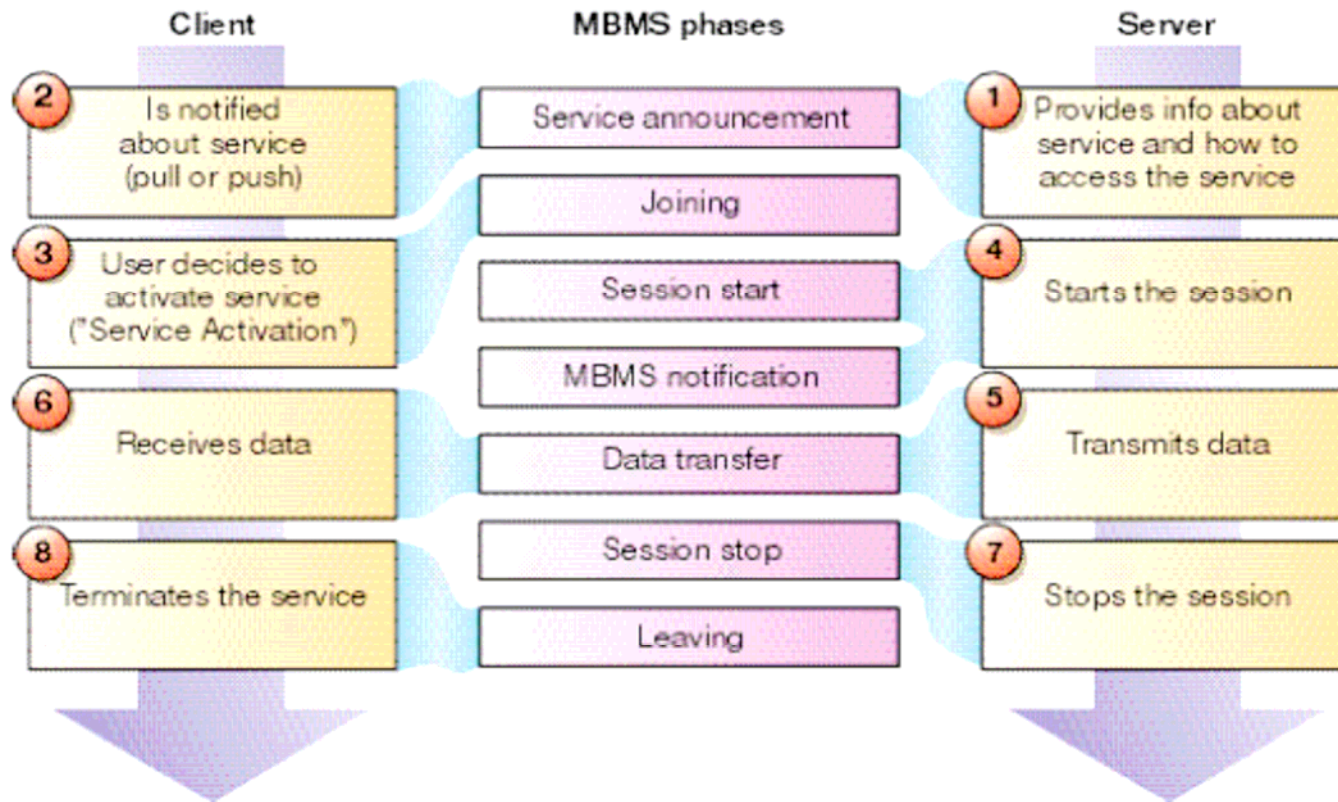
The multicast mode

Leaving

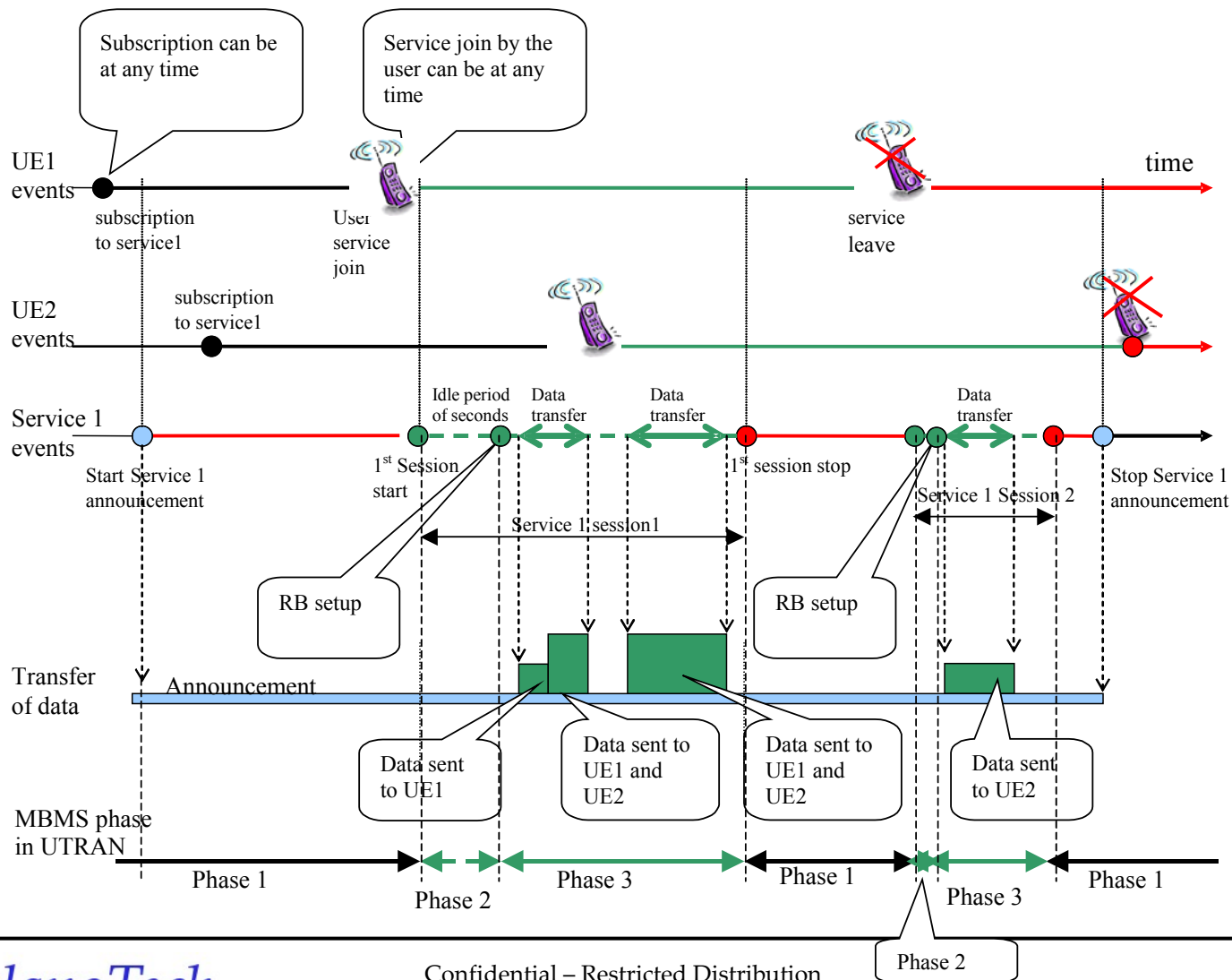
- ❑ When user no longer wants to belong to a multicast group and receive data transfer
- ❑ Doesn't unsubscribe the user from the service, just from the current data transfer
- ❑ Can be made any time



MBMS Multicast mode - Snapshot



The multicast mode



Multicast mode – Phase 1 and Phase 2

The Phases are for the cell

□ Phase 1

- No ongoing session for the MBMS service
- UE does not request service delivery to UTRAN

□ Phase 2

- This phase starts when “Session Start” received
- This phase ends when UTRAN sets up RB for the session
- UTRAN transmits notification to the UE's about service
- UTRAN performs counting procedure is required
- UTRAN decides the need of p-t-p or p-t-m bearer

Multicast mode – Phase 3

□ Phase 3

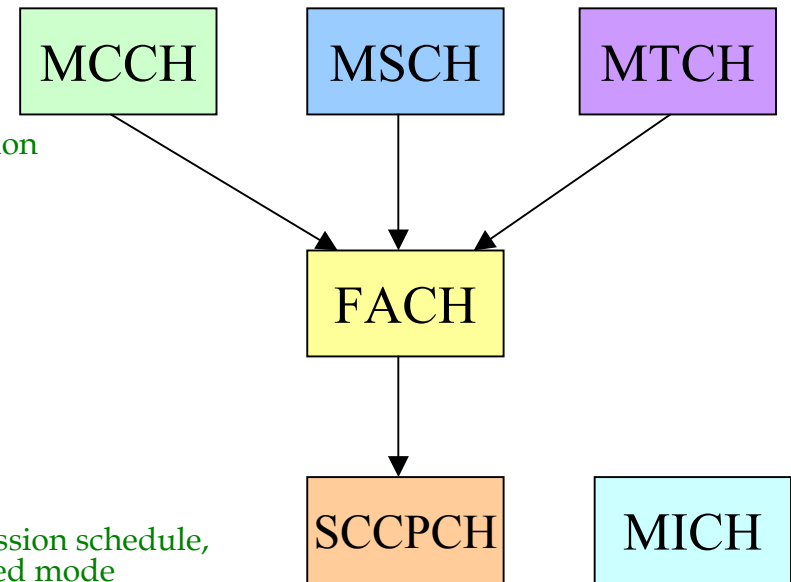
- This phase starts after the initial RB is setup
- This phase ends when “Session Stop” received from CN
- UTRAN transmits the data received for MBMS service from CN
- Recounting and RB Reconfiguration may be performed
- Each cell in this phase can be in any of the three states:
 - No Transmission
 - P-t-p transmission
 - P-t-m transmission

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MBMS Channels – PTM

❑ Logical Channels

- MCCH: MBMS Control Channel
 - For ptm transmission of control plane information
 - System status and info per service
 - Mapped on FACH/S-CCPCH
- MTCH: MBMS Traffic Channel
 - For ptm transmission of user plane information
 - One MTCH per MBMS Service
 - Mapped on FACH/S-CCPCH
- MSCH: MBMS Scheduling Channel
 - For ptm transmission of MBMS service transmission schedule, between N/w and UEs in Idle or RRC Connected mode
 - One MSCH is sent in each SCCPCH carrying the MTCH
 - MSCH is mapped to different SCCPCH than MTCH due to different error requirements



❑ Transport Channels

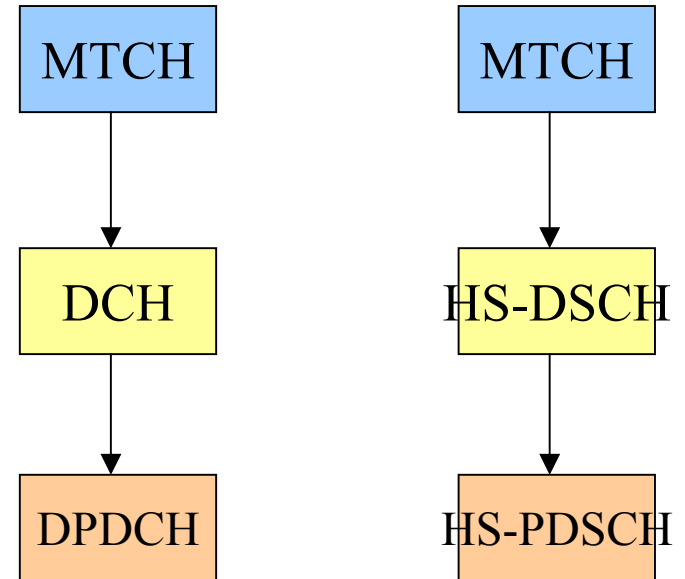
- FACH is the transport channel for MCCH, MTCH and MSCH

❑ Physical Channels

- S-CCPCH is the physical channel for FACH carrying MBMS
- MICH: MBMS indicator Channel indicates that MCCH transmission is pending (PICH)

MBMS Channels – PTP

- ❑ In PTP case MCCH and MSCH are still mapped on FACH
- ❑ MTCH can be mapped on:
 - DCH
 - HS-DSCH



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MBMS procedures (1)

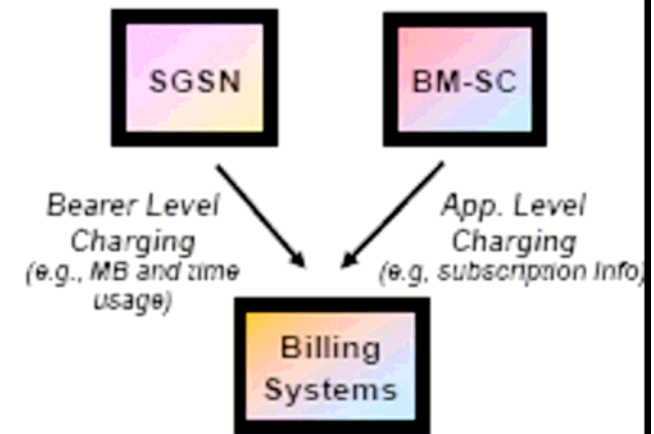
(3GPP TS 25.346, 3GPP TS 25.331)

❑ Security:

- Secure content delivery for Multicast services
- UE is authorised for each MBMS service
- BM-SC encrypts content at app layer
- UE receives encryption keys for each service Requested
- Authentication needed upon MBMS joining phase
- Encryption needed upon session transmission

❑ Charging:

- Billing made by service provided or operator
- Based on service subscription
- Based on number of accesses
- Based on amount of data received during MBMS
- Based on duration of MBMS service session



MBMS procedures (2)

❑ MBMS Notification

- Service specific NI sent on MICH with similar encoding as PICH
- It is sent to signal change in MCCH contents or start/modification of service
- Battery saving for the UE while in standby
- Forces UEs to read at least one 'MCCH transmission'.

❑ MBMS Counting

- UTRAN queries UEs if there is interest on MBMS service, prior to data transmission
- Brings selected UEs to RRC connected state
- May be activated on a cell by cell basis depending on concentration of MBMS users
- Allows selection between p-t-p and p-t-m
- Allows sending data only to the cells of a multicast Service Area where we know that UE's that joined a particular service exist

MBMS procedures (3)

❑ Frequency Layer Convergence (FLC)

- The UEs preferentially reselect to the frequency layer on which MBMS service is intended to be transmitted, i.e. the preferred layer (PL)
- Both inter-frequency measurements and cell ranking criteria are affected by FLC
- UE perform inter-frequency measurements on the MBMS PL, if the serving cell does not belong to the PL, even if serving cell quality is good

❑ Frequency Layer Dispersion (FLD)

- The UTRAN redistributes UEs across the frequencies
- The request to perform dispersion can be signalled to UEs by the RNC after session stop
- When FLC is applied, the UE stores the frequency where it was camped previously. Upon session stop, the UE attempts to return to that frequency
- If the UE does not find a suitable cell on the target frequency, the UE attempts to select a cell on a randomly chosen frequency

MBMS procedures (4)

❑ MBMS Prioritization

- UE can set up priorities between MBMS services as well as MBMS and non-MBMS services

❑ MBMS Modification

- Used to stop ptp RBs and/or to ask to be moved to a PL

❑ MBMS Combining

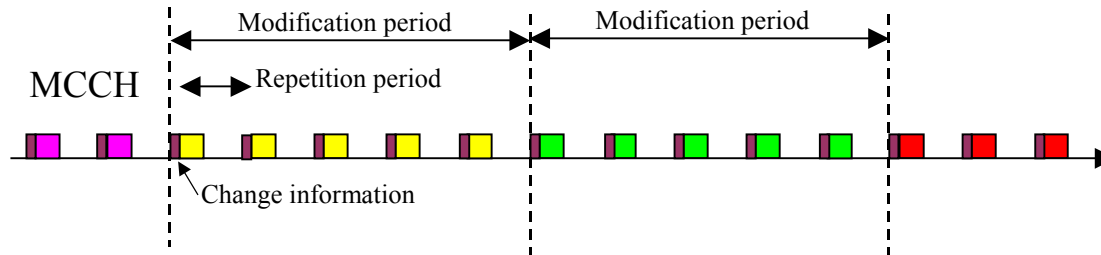
- To improve link level performance under fading conditions
- UE is allowed to combine MTCH (not MCCH) across up to 3 cells
- Combination can happen at Physical layer (soft combining) or Layer 2/RLC (Selection combining)
- Option to select any of the above by soft combining is better

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MCCH Information Scheduling - 1

- ❑ MCCH Information transmitted based on fixed schedule
- ❑ This schedule will identify the TTI containing the beginning of MCCH schedule
- ❑ The transmission of this information will take variable number of TTI's
- ❑ UTRAN transmits MCCH in consecutive TTI's
- ❑ UE keeps receiving SCCPCH until:
 - It receives all MCCH information
 - It receives a TTI that does not include MCCH data
 - The contents indicate that further reception is not required
- ❑ UTRAN may repeat MCCH information to increase reliability
- ❑ The MCCH schedule is common for all services

MCCH Information Scheduling - 2



Three new durations defined (in number of frames)

❑ Modification Period

- Multiple of Repetition Period
- Critical messages remain the same

❑ Repetition Period

- Entire set of Critical MCCH messages transmitted once

❑ Access Info Period

- Integer divider of Repetition period
- Access Info Message can be transmitted once
- Multiple Access Info periods in once Repetition period

Note: Different colors mean different message content.

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Mapping of MBMS Control Information in DL - 1

- ❑ MICH – Transmitted Continuously – Modified at modification period boundary
 - MBMS Notification Indicators
- ❑ BCCH – Transmitted Periodically
 - MCCH System Information
- ❑ MCCH – Non critical Information – Transmitted at Access Info events – Can be modified anytime
 - MBMS Access Information
 - MBMS Service Identity
 - Probability Factor

Mapping of MBMS Control Information in DL - 2

- ❑ MCCH – Critical Information – Transmitted at Repetition Period events – Can be modified at modification period boundary
 - MBMS Change Information
 - MBMS Service Identity
 - MBMS Session Identity
 - MBMS Service Information
 - MBMS Radio Bearer Information
 - MBMS Neighbouring Cell Information
 - Required for UE to perform Soft Combining
 - MBMS Service Identity
 - Cell Identity
 - Physical channel/Transport channel/RB information
 - L1 scheduling Info
 - Soft/Selective combining Info

Mapping of MBMS Control Information in DL - 3

□ MSCH – Transmitted Periodically

■ MTCH Scheduling Information

- Allows UE to perform DRX for MTCH
- For each of one or more services, it includes:
 - MBMS Service Identity
 - The start time and duration of a period of data transmission
 - Indication that there is no data transmission for one or more MSCH repetition periods

Mapping of MBMS Control Information in UL

□ DCCH – Service related Control Information

- MBMS Joined Indication
 - Sent in Initial Direct Transfer or SRNS Relocation Info
 - Indicates that a PMM IDLE state UE in RRC Connected mode has joined at least one MBMS service
- MBMS Modification Request
 - New dedicated mode UL message
 - Request to release p-t-p MBMS RB for higher priority MBMS service

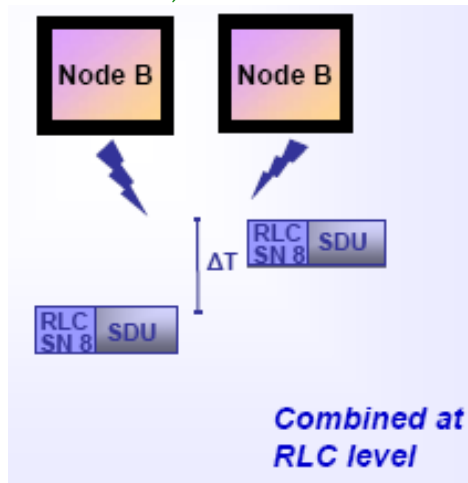
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MBMS Benefits from Multiple Cells

UE combines data from up to 3 cells with algorithms based on synchronisation levels seen by the UE

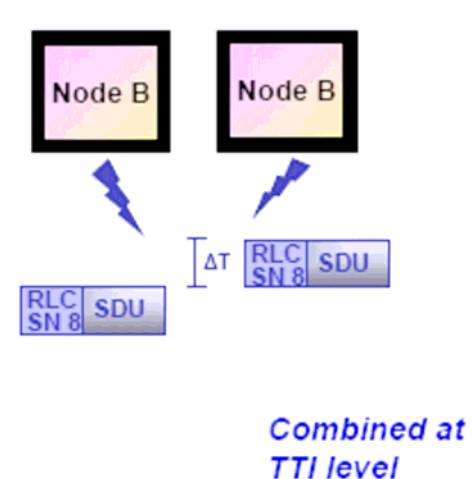
❑ Selection Combining

- PDU received from different cells
- Data is delivered to the higher layers
- RLC SN is used to combine data (same RLC and PDCP is shared among multiple cells)
- RLC will reorder data and eliminate duplicates
- Maximum window of 64 PDUs (up to 5.12s w/ 80ms TTI)



❑ Soft Combining

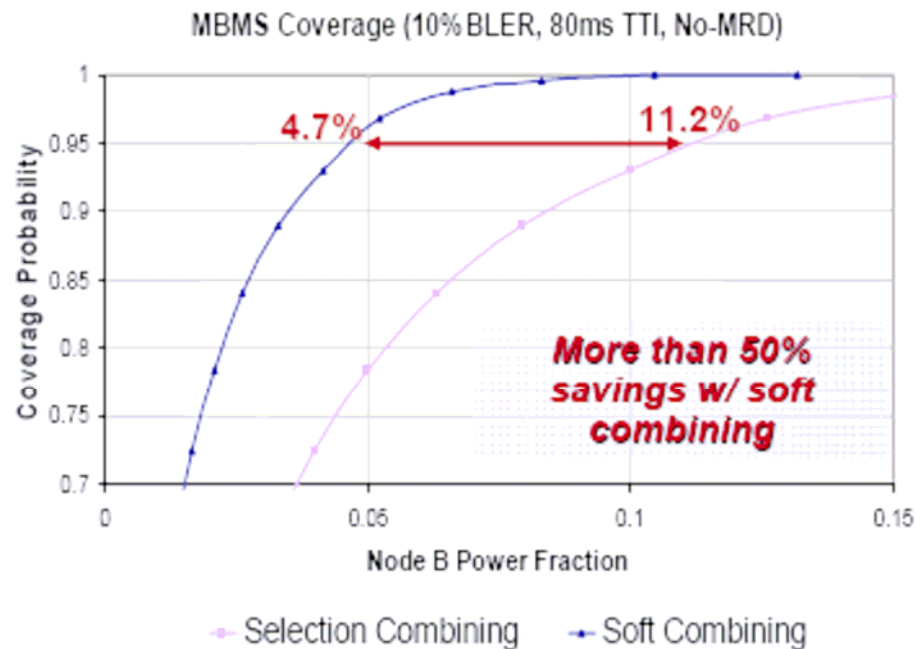
- S-CCPCH of different cells are combined at TTI level: Max delta time is one TTI (e.g. 80ms)
- Only one decoded PDU is sent to RLC level



Soft Combining Gain

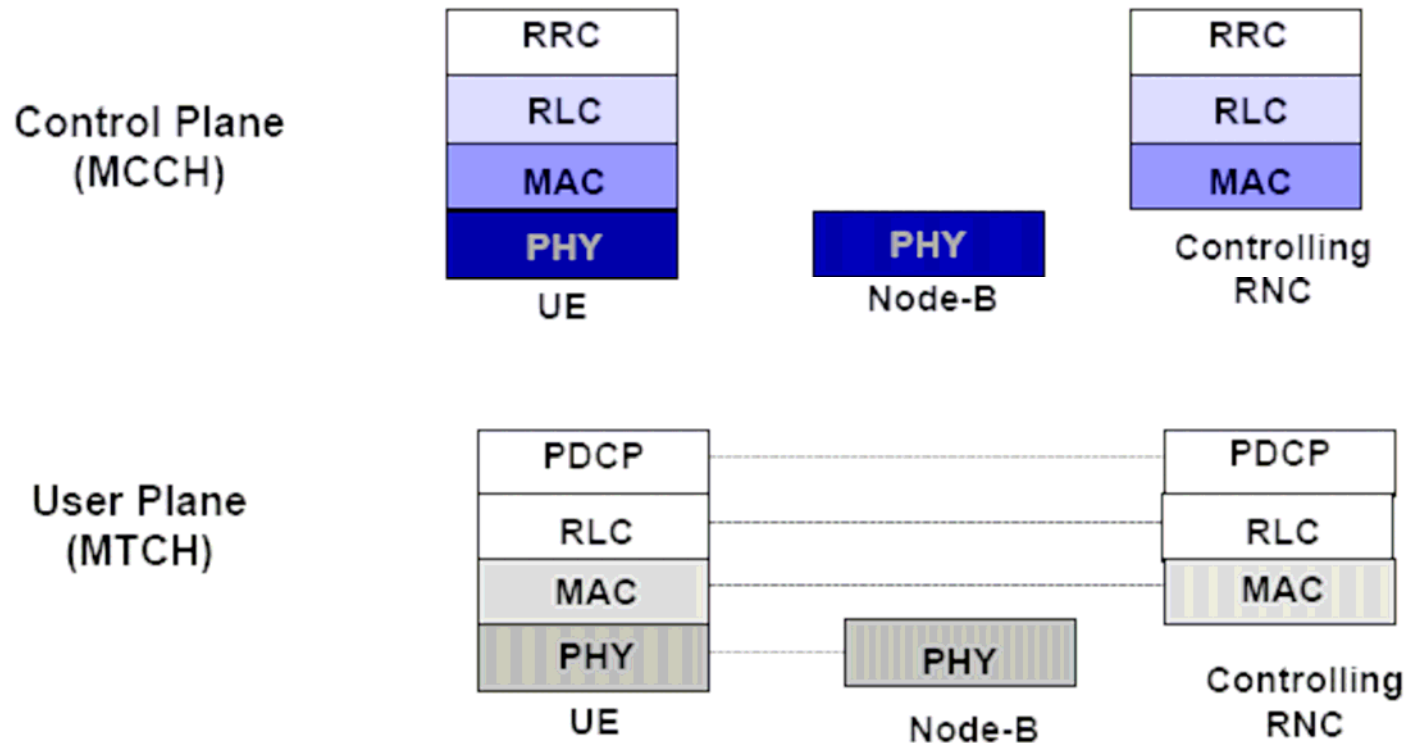
- UE combines data from up to 3 cells resulting in higher system capacity

- **Greater gains with Soft-Combining**
 - Example: 64kbps MBMS simulation



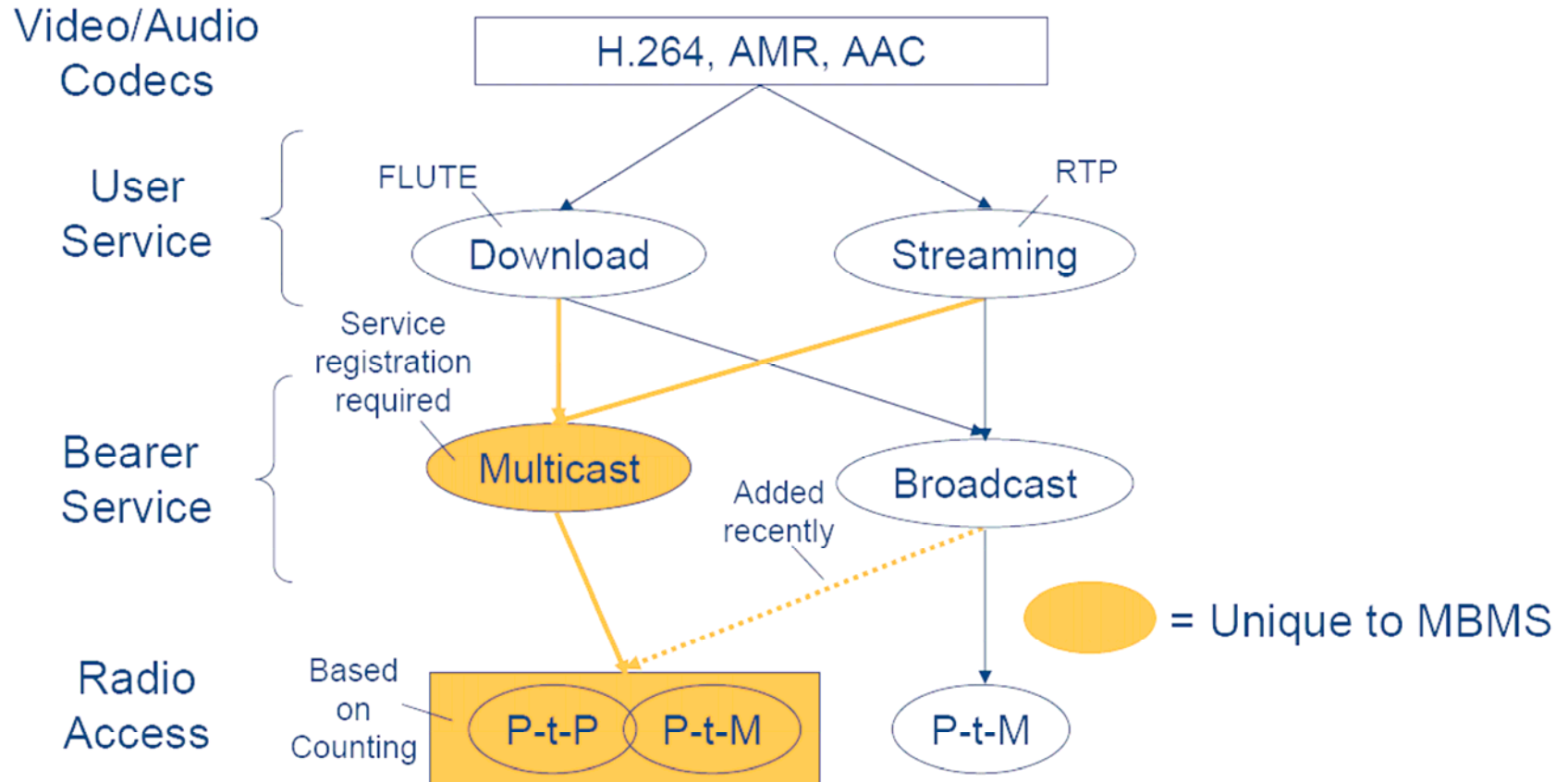
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MBMS RAN Protocol Stack



One PDCP entity and RLC entity shared over multiple cells belonging to one RNS (MBMS Cell Group) for each MBMS service

MBMS from a bird's-eye view



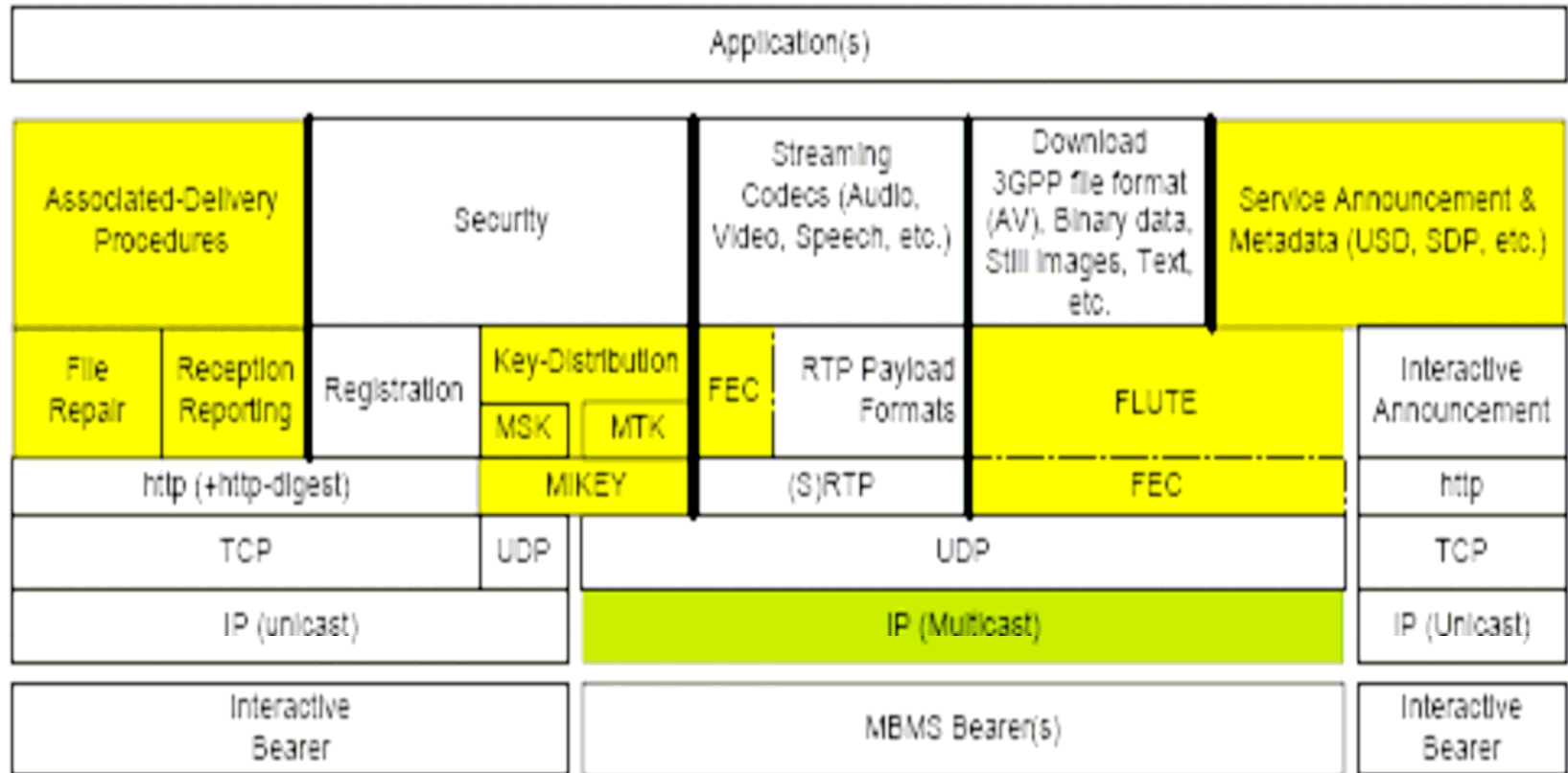
Source: Ericsson in MMC 2006 (Oct 2006, Germany)

MBMS Service Layer Tools

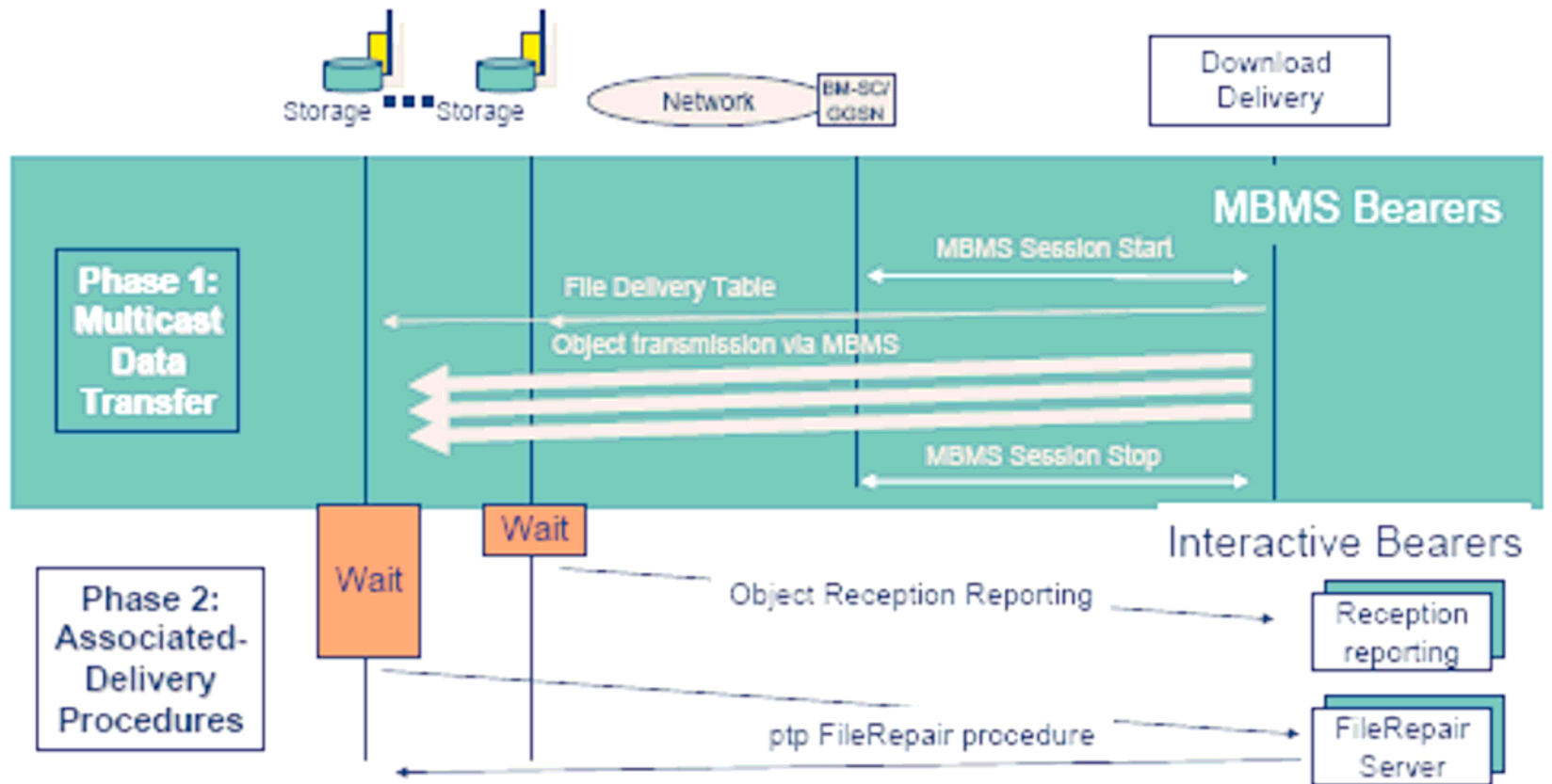
- ❑ *Usage of MBMS bearers is transparent to users*
- ❑ MBMS Download Delivery Method
 - New IETF distribution protocols for MC/BC file distribution (i.e. FLUTE and ALC – no TCP)
 - Storing received files in the phone
 - Quality is kept constant, transmission duration may vary
 - Push a multimedia message or files into the phone
- ❑ MBMS Streaming Delivery Method
 - Re-use of PS Streaming Protocols (i.e. RTP)
 - Continuous media streaming transmission
 - Transmission duration is kept constant
 - Security keying Streams (e.g. MIKEY)
 - Example: Mobile TV applications
- ❑ Auxiliary functions for Content transmission methods:
 - Post transmission File Repair Function
 - Reception Reporting for files and streams

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MBMS UE Protocol Stack



MBMS Download Principles

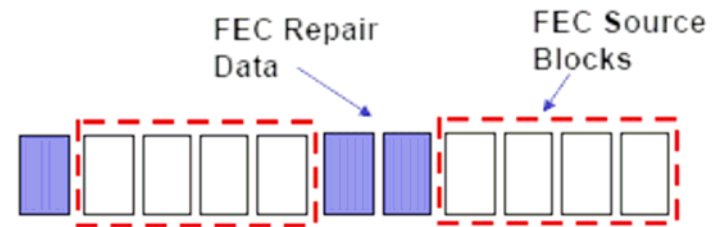


Application Layer - FEC

- ❑ No MBMS retransmission at radio link layer
 - Longer interruptions or highly variable channels could impact service quality/integrity
- ❑ Application layer outer coding enables recovery of missed or corrupted packets

- ❑ Raptor codes utilized

- Adds redundancy for source blocks
- Target recovery probability defined by operator (e.g. 95-99%)
- Redundancy level dependant on lower layer BLER, file size

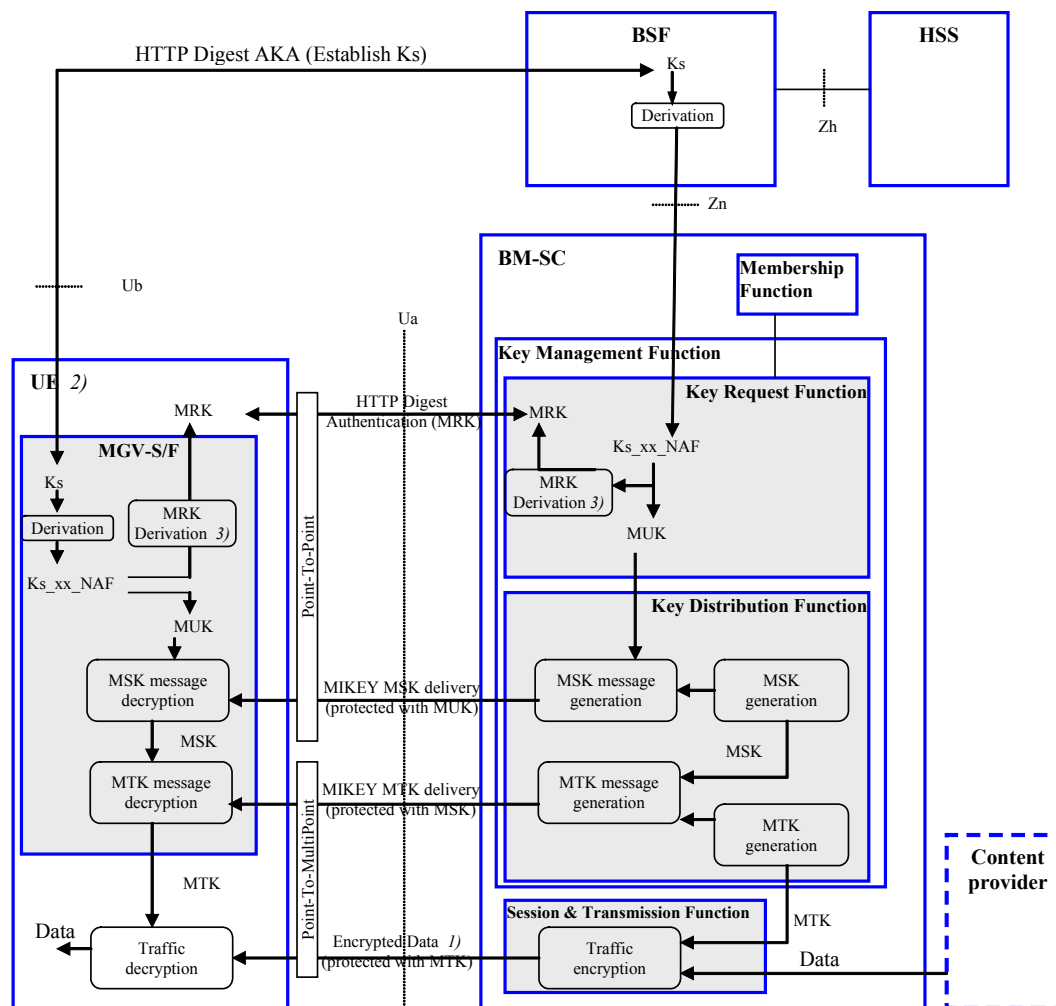


MBMS Use Cases

Service Example	Media	Distribution Scope	MBMS User Service Classification	Application Bit Rate	Delivery Verification Required	User Charging
Reliable text distribution (eg Local news)	Text	Multicast	Download	Up to 10 kbps	Yes	Event
Unverified text distribution	Text	Multicast, Broadcast	Carousel, download	Up to 10 kbps	No	-
Audio streaming	Stereo Audio	Multicast	Streaming	Up to 48kbps	Service dependent	-
Audio download	Stereo Audio	Multicast	Download	Up to 48kbps	Yes	Event
Audio distribution with low quality video	Stereo Audio, Video (e.g. 3fps)	Broadcast	Streaming	Up to 128kbps	No	-
Audio distribution with low quality video	Stereo Audio, Video (e.g. 3fps)	Multicast	Streaming	Up to 128kbps	Service dependent	-
Audio distribution with low quality video	Stereo Audio, Video (e.g. 3fps)	Broadcast	Download	Up to 128kbps	Service dependent	-
Audio distribution with low quality video	Stereo Audio, Video (e.g. 3fps)	Multicast	Download	Up to 128kbps	Yes	Event
Secure data download	File	Multicast	Carousel, download	Up to 10kbps	-	-

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MBMS Security Architecture (3GPP TS 33.246)

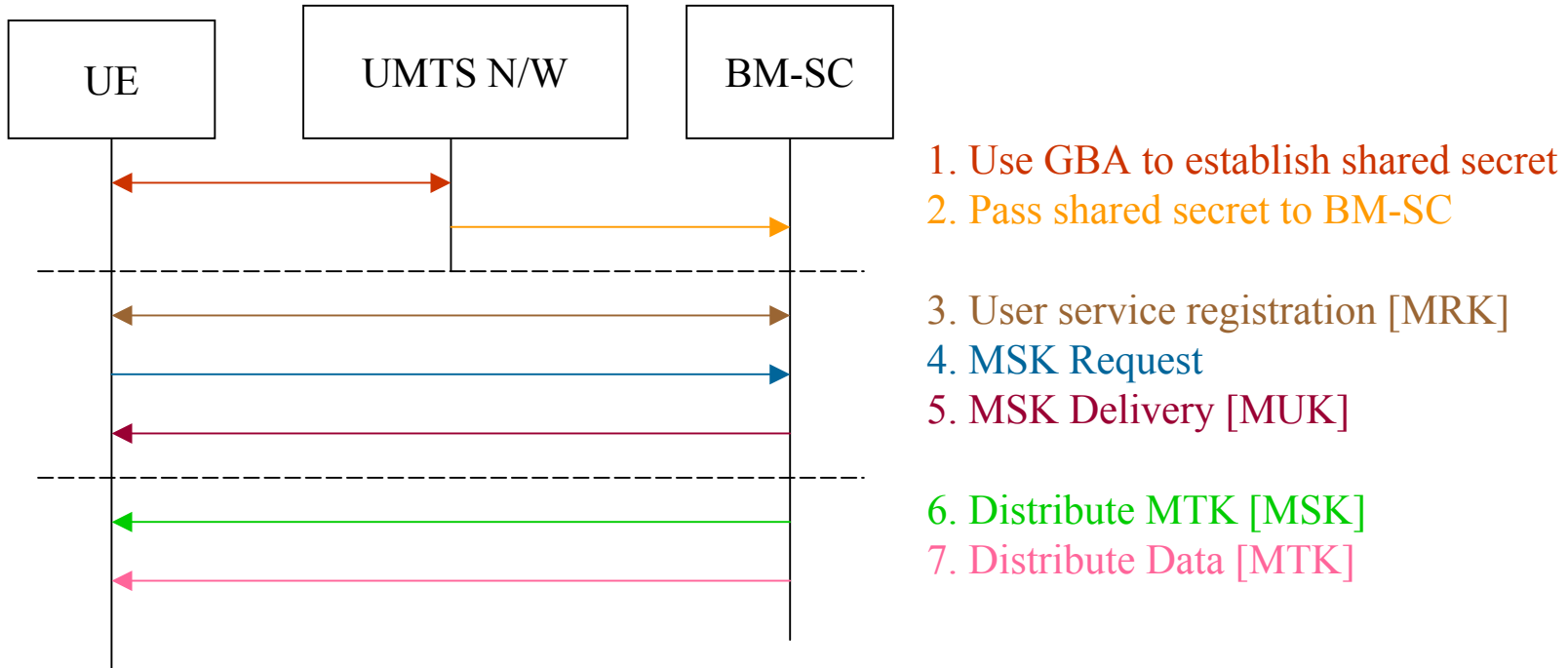


Note 1) SRTP is used for streaming and modified DCF format for download

Note 2) $K_{s_xx_NAF}$ stands for GBA_ME or GBA_U based NAF keys

Note 3) Not applicable for GBA_U, since $MRK = K_{s_ext_NAF}$

MBMS Security



GBA – Generic Bootstrapping Architecture

MRK – MBMS Request Key

MUK – MBMS User Key

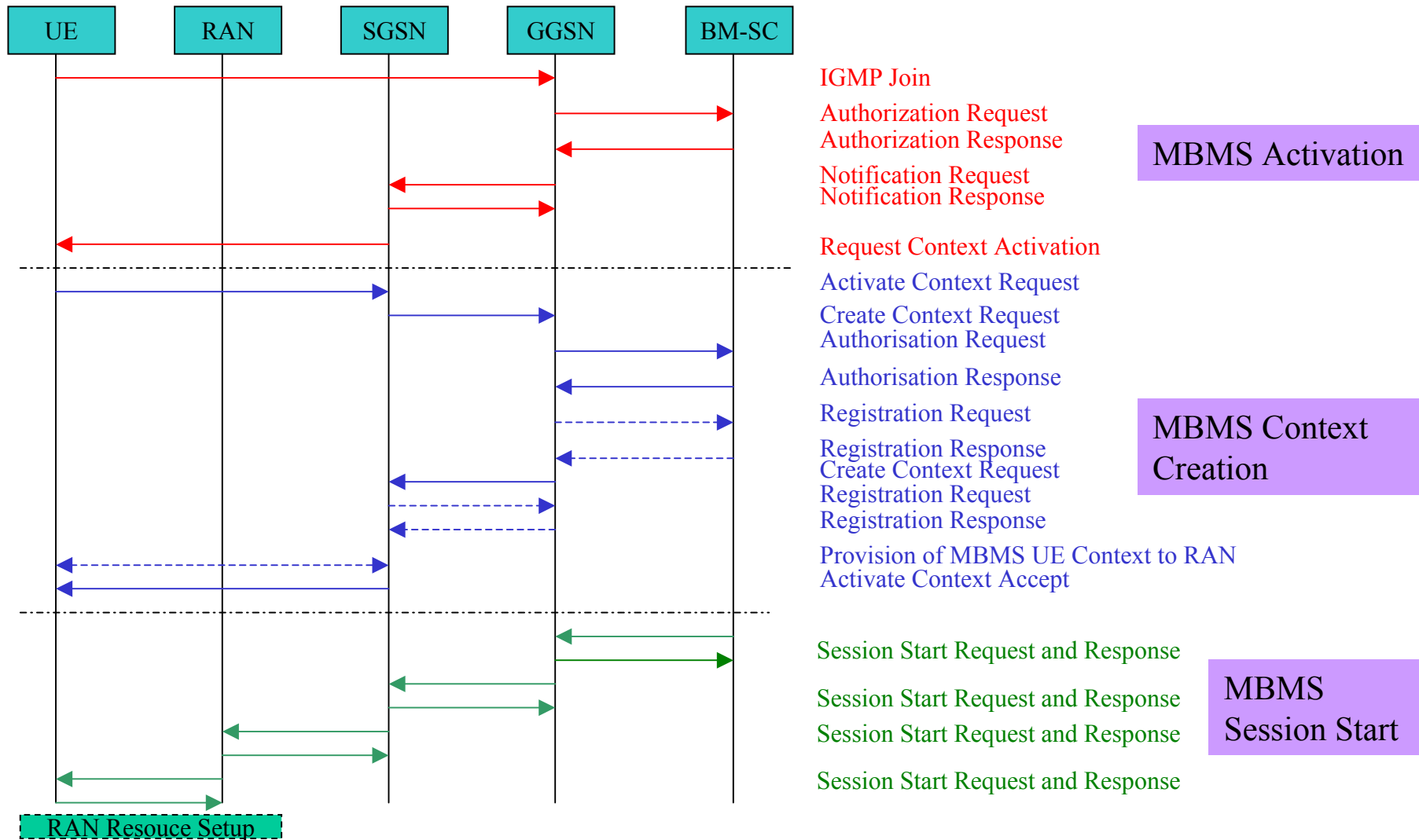
MSK – MBMS Service Key

MTK – MBMS Traffic Key

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MBMS Signalling example

(Multicast Mode Example)



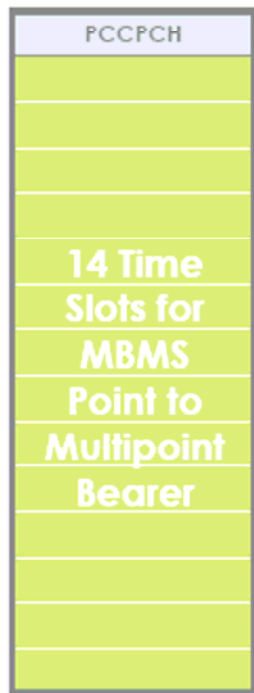
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TDtv

- ❑ TDD MBMS championed by IP Wireless
- ❑ TDD bands already available but not being used
- ❑ Implement MBMS in TDD band while all other functionality is normal FDD operation
- ❑ IP Wireless boasts of 10+ TV channels possible at 30fps/QVGA
- ❑ Since all Base stations are synchronised, soft combining possible with many cells.
- ❑ Idea catching up with Operators and trials underway in Bristol
- ❑ Vodafone, 3, Orange and O2 in UK taking part in trials
- ❑ Small handset manufacturers have committed to adding TDtv chips if trials are successful

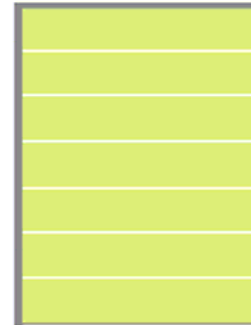
TDtv – Comparison of TDD and FDD MBMS

UMTS TD-CDMA for MBMS



- > Maximizes bandwidth for broadcast and multicast services
- > Gain from Macro Diversity (up to 10dB) reduces CAPEX – increases Capacity
- > Supports up 10-15 high quality channels in 5MHz carrier
- > Paired with WCDMA network for interactivity and Unicast integration
- > Support for high speed mobility
- > Support for broadcast services other than TV (audio, clip casting, file distribution,...) via the MBMS protocol suite

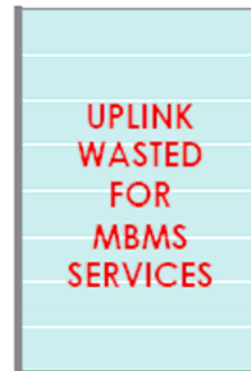
W-CDMA MBMS



- > WCDMA operators may launch MBMS on FDD first.
 - > FDD pair likely to support 4-5 channels (1.3 Mbps/300kbps)

- > Adding MBMS services to unpaired spectrum allows operators to:

1. Increase the number of channels to DVB-H levels
2. Use their paired spectrum more efficiently



Proprietary and Confidential



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MBMS in GSM Network

- ❑ TS 43.246 – MBMS in GERAN; Stage 2
- ❑ P-t-m and p-t-p both possible
- ❑ For MBMS p-t-m transmission:
 - Traffic data carried on PDTCH
 - Control data on PACCH
 - New logical channel MPRACH (UL) defined
 - MBMS Packet Random Access Channel
 - Maybe used during Initial counting procedure
 - Packet access bursts or Extended Packet access bursts can be transmitted
 - Mapped on uplink PDCH
- ❑ Existing GPRS and E-GPRS coding schemes used for MBMS

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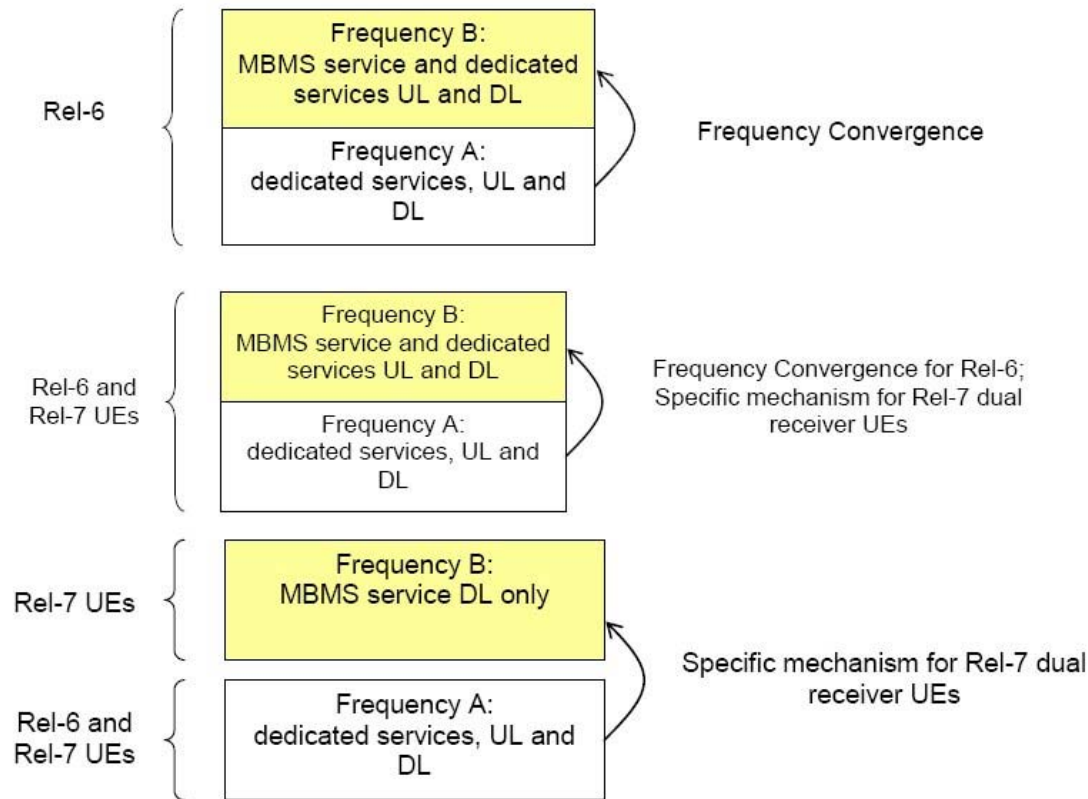
MBMS Enhancement (Release 7) - 1

- ❑ MBMS is being enhanced in Release 7 and IMS will be able to use MBMS transport. The advantage of this approach is:
 - MBMS reception is possible over IP accesses (e.g. I-WLAN)
 - Higher MBMS bit rate services possible (e.g. HDTV)
 - Support for adaptation of MBMS to the QoS resources provided by the access network(s)
 - MBMS services will be available regardless of access technologies and other services will be able to use MBMS transport

MBMS Enhancement (Release 7) - 2

- ❑ The MBMS Enhancement is still under development and the following is being investigated:
 - Radio Interface Physical Layer
 - Introduction of new transmission schemes and advanced multi-antenna technologies
 - Layer 2 and 3
 - Signalling optimisations
 - UTRAN Architecture
 - Identify the most optimum architecture and functional splits between RAN network nodes

Dual Receivers for MBMS



Source 3GPP TR 25.905

PTM MBMS Transmissions over HSDPA

- ❑ A possible enhancement is to use different H-RNTI's per group of UE's per MBMS service. This way the same MBMS service can be provided with different QoS depending on the UE radio channel conditions. This will require more complexity in the scheduler.
- ❑ No soft combining for HS-DSCH from different cells.
- ❑ Better quality if the customer distribution in the cell is closer to the Node B.

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Enhanced MBMS (E-MBMS)

- ❑ Part of LTE (Long Term Evolution)
- ❑ MIMO (Multiple Input Multiple Output) will be used for transmitting MBMS data
- ❑ All Node B's transmitting the same data synchronously
- ❑ Probably no feedback so reliability should be very high
- ❑ Diversity will be used and UE's will have at least 2 antennas (mandatory)
- ❑ MTCH will be mapped to DL-SCH (Downlink Shared Channel)
- ❑ Variable bandwidth of 1.25, 1.6, 2.5, 5, 10, 15 or 20MHz is being considered for LTE
- ❑ E-MBMS will aim to support atleast 16 TV channels over 5MHz at 300kbps per channel in urban or suburban environment
- ❑ There will be a time restriction in changing between different streams (broadcast or unicast on same or different carriers) so switching channels will be very quick

Comparison of E-MBMS and MBMS

	DVB-H	DMB	S-DVB-H	MediaFlo	MBMS FDD	MBMS TDD	MBMS LTE
Concept	Enhancement of DVB-T	Multimedia enhancement of DAB	Hybrid broadcast network	Proprietary terrestrial broadcast solution	Usage of WCDMA spectrum for broadcasting	Allocated unused UMTS spectrum	Evolution of W-CDMA system
Band-width	8 to 9 Mbit/s per MUX	1.1 Mbit/s per MUX	2.3 Mit/s (Satellite) 4.6 Mbit/s (Terrestrial)	8 to 9 Mbit/s	1.8 Mbit/s shared	3.4 to 5.3 Mbit/s exclusively	20 to 30 Mbit/s
Channels	20 to 30 (with 16QAM 40)	3 to 4	9 (Satellite) 18 (terrestrial)	ca. 50	3	10 to 15	Around 20
Devices	7 handset manufactures	Samsung, LG, Perstel	Limited CPE support	Samsung & LG announced support	Limited CPE support so far	Limited CPE support so far	No statement possible
Availability	Mid 2007	End 2006	2008	End 2006	2007/08	2007/08	2010 onwards
Conclusion	Efficient broadcast solution	Available but limited broadcast solution	Proprietary solution	Proprietary solution & spectrum	Competition with UMTS data traffic	Mostly allocated spectrum	Long term perspective
Network ownership outside of MNO's core domain				Network ownership inside of MNO's core domain			

Source: Detecon Consulting - COMMUNICASIA2006

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Further Reading

- ❑ <http://www.3g4g.co.uk/Mbms/>
- ❑ 3GPP TS 22.146 – Multimedia Broadcast/Multicast Service; Stage 1 (Rel 6+)
- ❑ 3GPP TS 22.246 – Multimedia Broadcast/Multicast Service (MBMS); user services; Stage 1 (Rel 6+)
- ❑ 3GPP TS 23.246 – Multimedia Broadcast/Multicast Service (MBMS); Architecture and Functional Description (Rel 6+)
- ❑ 3GPP TS 23.846 – Multimedia Broadcast/Multicast Service (MBMS); Architecture and Functional Description (Rel 6+)
- ❑ 3GPP TS 25.346 – Introduction of the Multimedia Broadcast/Multicast Service (MBMS) in the RAN; Stage 2 (Rel 6+)
- ❑ 3GPP TS 25.992 – Multimedia Broadcast/Multicast Service (MBMS); UTRAN/GERAN Requirements (Rel 6+)
- ❑ 3GPP TS 26.346 – Multimedia Broadcast Multicast Service (MBMS); Protocols and Codecs (Rel 6+)
- ❑ 3GPP TS 33.246 – Security of Multimedia Broadcast/Multicast Service (Rel 6+)
- ❑ MBMS Evolution in 3GPP and the IST project C-Mobile
- ❑ 3GPP TR 25.905 – Improvement of the Multimedia Broadcast Multicast Service (MBMS) in UTRAN (Rel 7+)
- ❑ 3GPP SP-050389 – New WI for MBMS Enhancements

Other trainings from eXplanoTech

- ❑ Advanced MBMS - 1 day course
- ❑ Advanced MBMS with Signaling and Mobile TV - 2 days course
- ❑ IP Multimedia Subsystem (IMS) – 1 day course
- ❑ IP Multimedia Subsystem (IMS) and Session Initiation Protocol (SIP) – 2 days course
- ❑ Robust Header Compression (RoHC) – ½ day course
- ❑ Long Term Evolution (LTE) – 1 day course