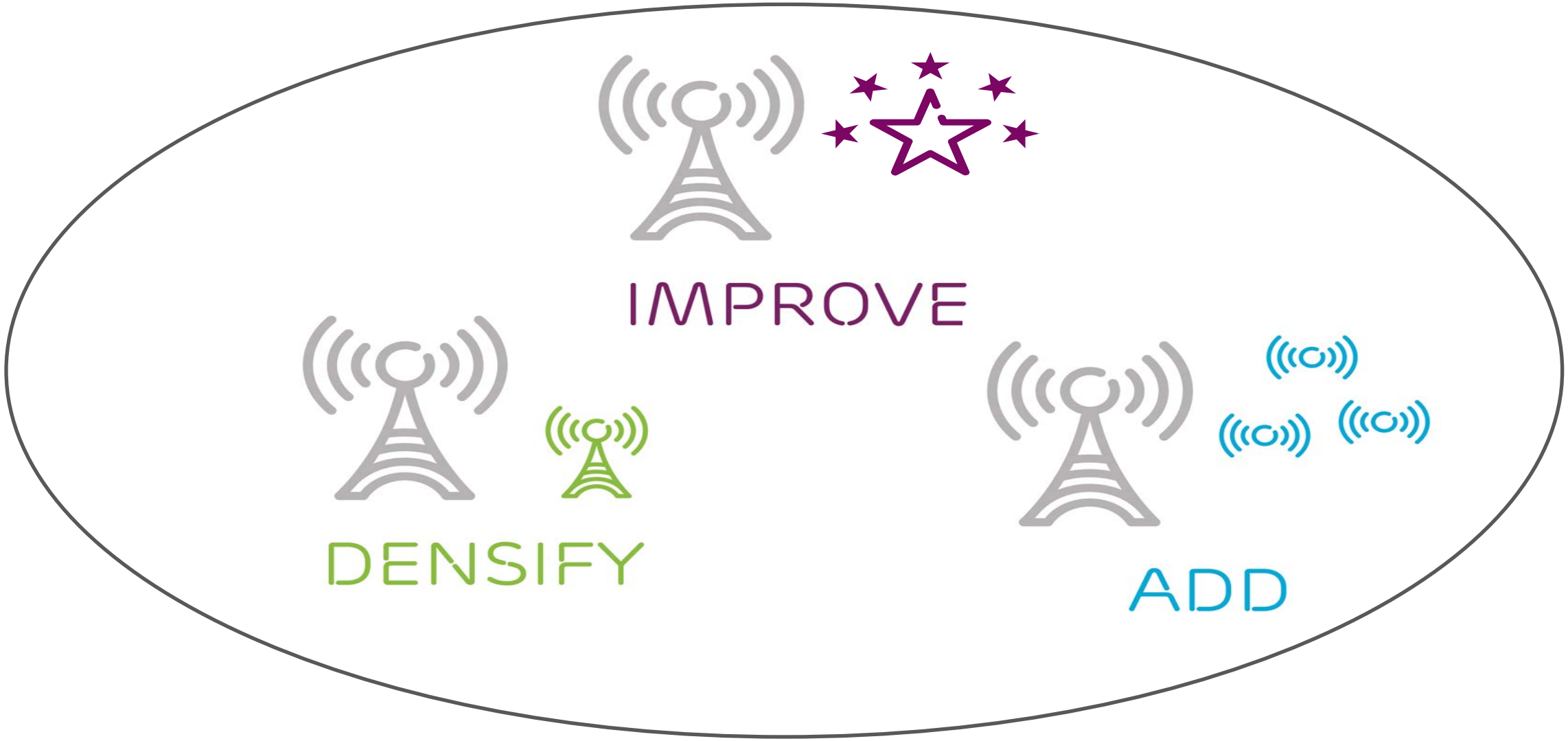
LTE broadcast - revolutionizing video delivery in mobile network -QOS related technical aspects

DIPANKAR RAY

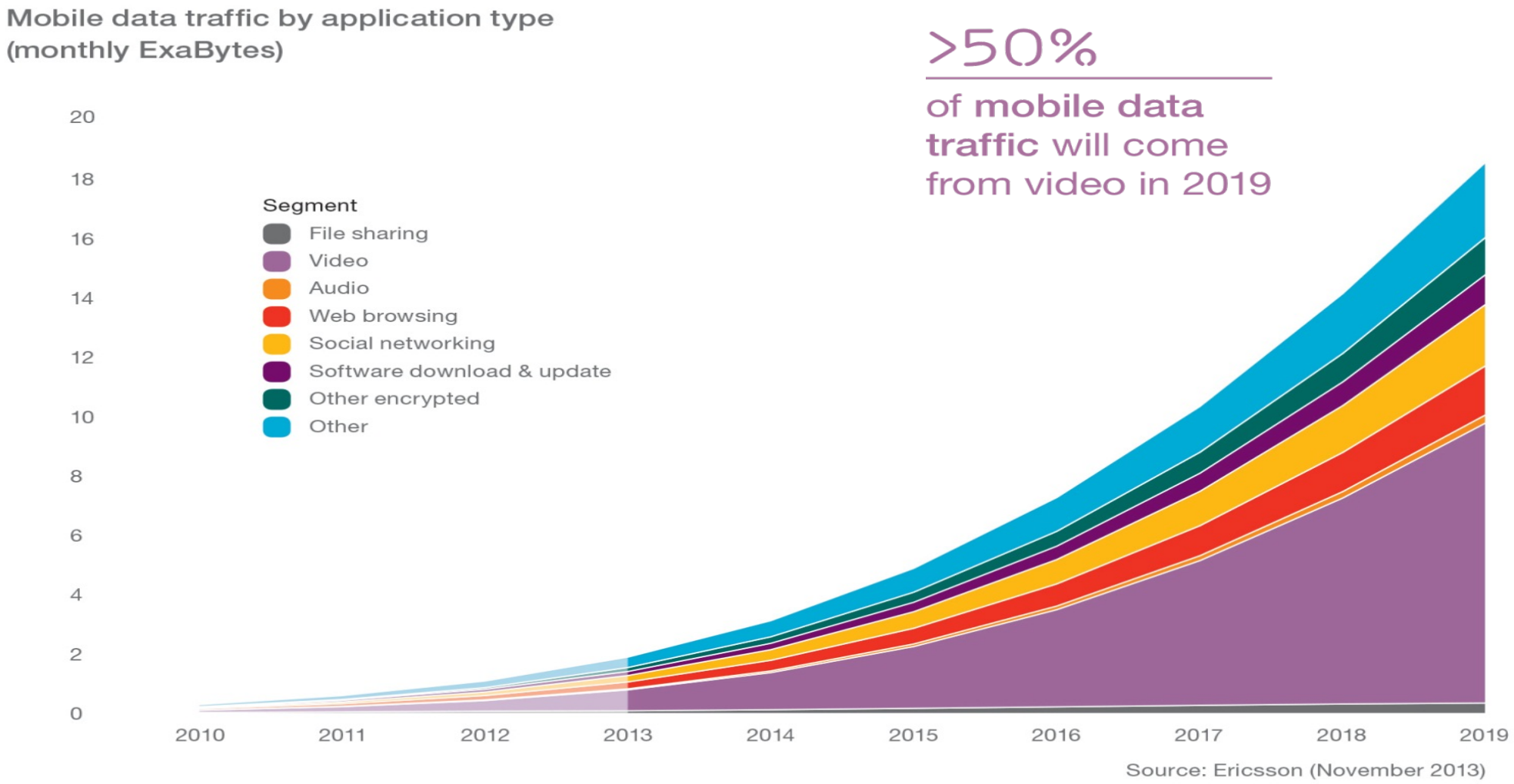
PRINCIPAL SOLUTIONS ARCHITECT

ERICSSON

Making the right heterogeneous network choices



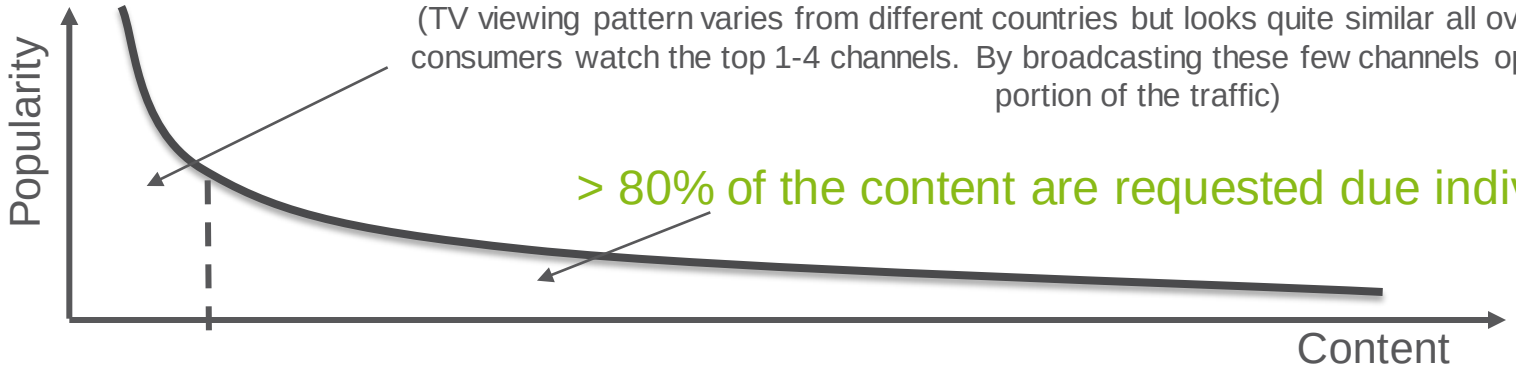
Video in Mobile Traffic



User consumption of video content

< 20% of the content fits the mass market

(TV viewing pattern varies from different countries but looks quite similar all over the world, 80% of the consumers watch the top 1-4 channels. By broadcasting these few channels operator can offload major portion of the traffic)



> 80% of the content are requested due individual interest

- **Broadcast:** <20% of content is applicable for eMBMS. These 20% of the content cope with up to 80% of the consumed Video
- **Unicast:** Long tail and Video on demand (the other" 80%) can be consumed with unicast. These ~80% of video content is consumed by up to 20% of the consumers

Broadcast VS. Unicast

Diverse capability within one network

BROADCAST

UNICAST

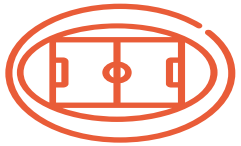
Brings scalability and cost optimization

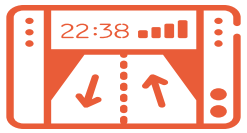
- One data channel per content
- Limited data channels and unlimited number of users
- Offer popular services over dense areas

Brings advanced personalized services

- One data channel per user
- Unlimited channels and limited number of users
- Any content, any time, anywhere

value of lte broadcast is driven by a large number of use cases





Live Broadcasting

- In-venue
- Nationwide or Regional Coverage

Content Caching

- Cached Media

Data Offload

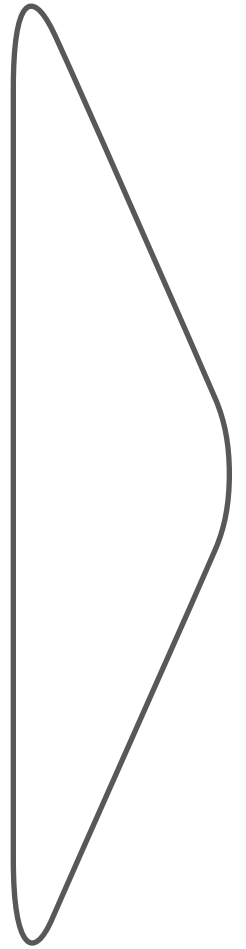
- Over-The-Air (OTA) Software, Firmware, Application Updates

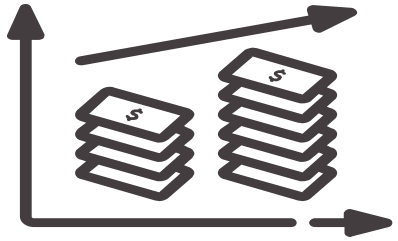
M2M

- Digital Signage
- Connected Car

Emergency Service

- Public Safety Announcement
- Emergency Notification

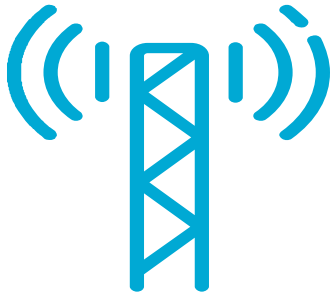




Innovative Solution with three combined new technologies

eMBMS

Evolved Multimedia Broadcast Multicast Service (3GPP standard)



Enables mobile networks to offer broadcast/multicast services dynamically, reducing the cost of service delivery over the radio network and for backhaul

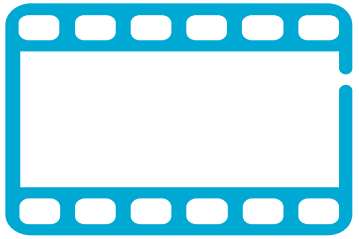
HEVC

High Efficiency Video Coding

New video compression standard promises to half the bandwidth required to transport video content compare to today's leading implementation of MPEG-4 AVC

MPEG-DASH

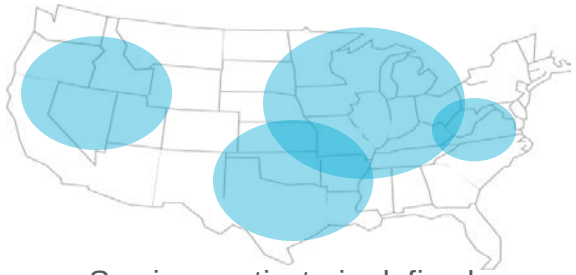
MPEG-Dynamic Adaptive Streaming over HTTP



Supports common use of a player on device and a live encoder head-end system for both unicast and broadcast, reducing operational cost and maximizing infrastructure usage

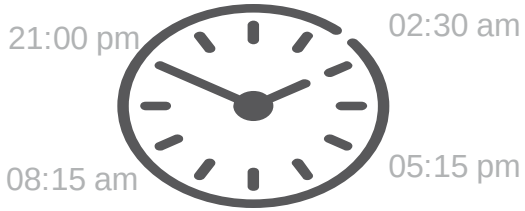
Service Dynamic

GEO DYNAMIC



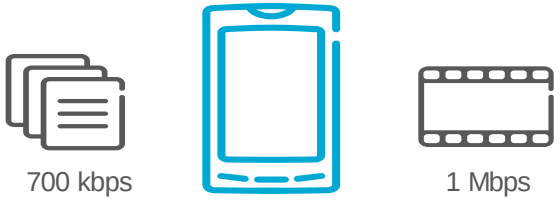
Services activate in defined area in the LTE network

TIME DYNAMIC



Services activate for scheduled duration

QUALITY DYNAMIC

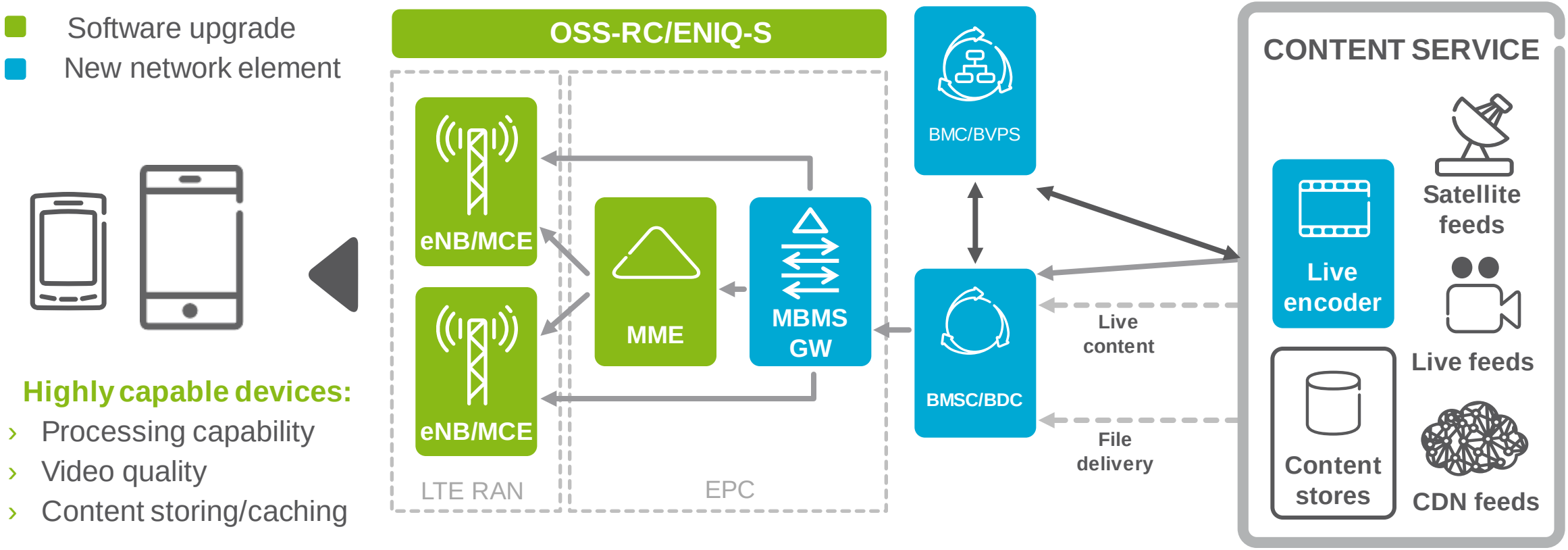


Bitrates are dimensioned to the service requirement

CHARGING DYNAMIC

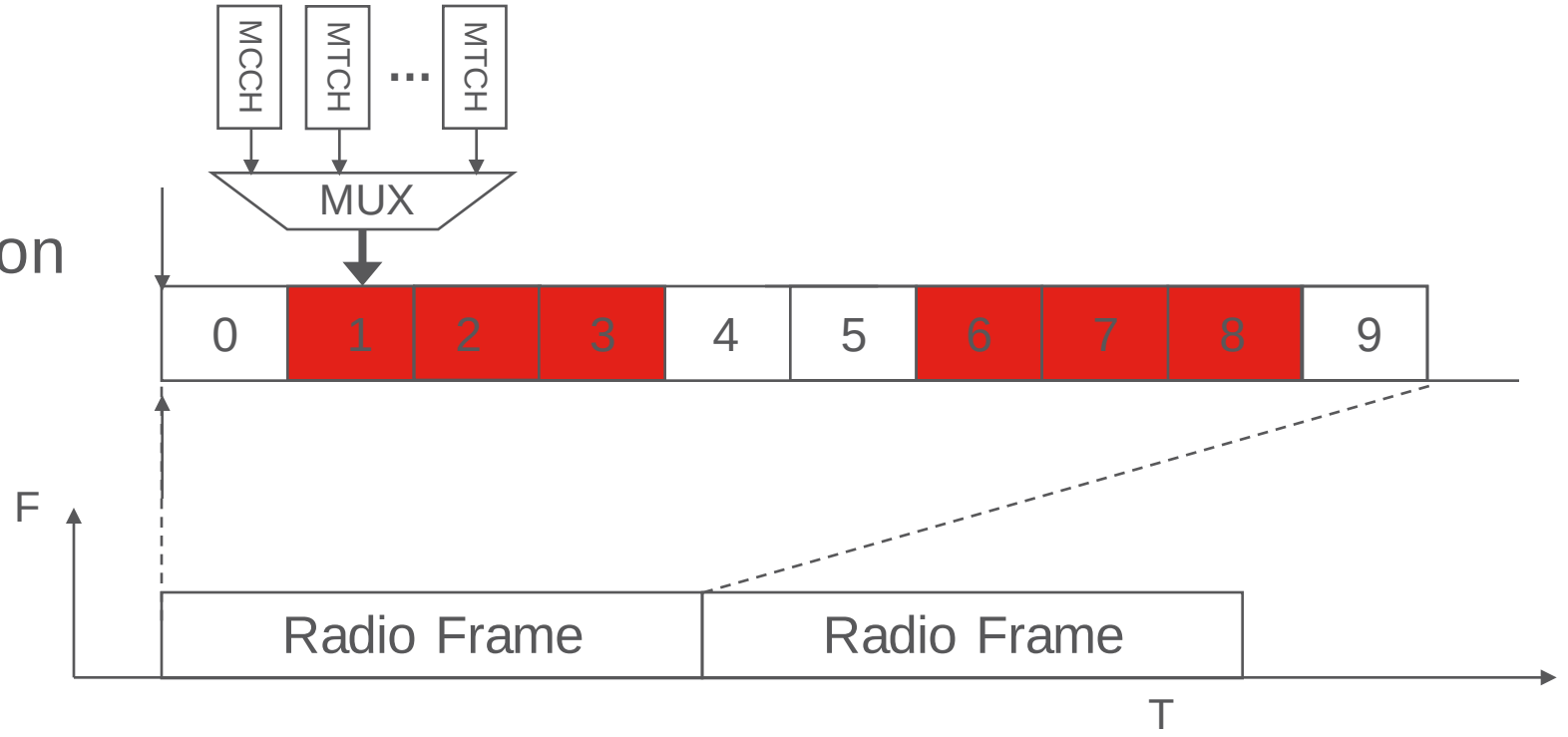
Premium content services and guaranteed user experiences open up new business models for media services and content packages

END-TO-END SOLUTION OVERVIEW

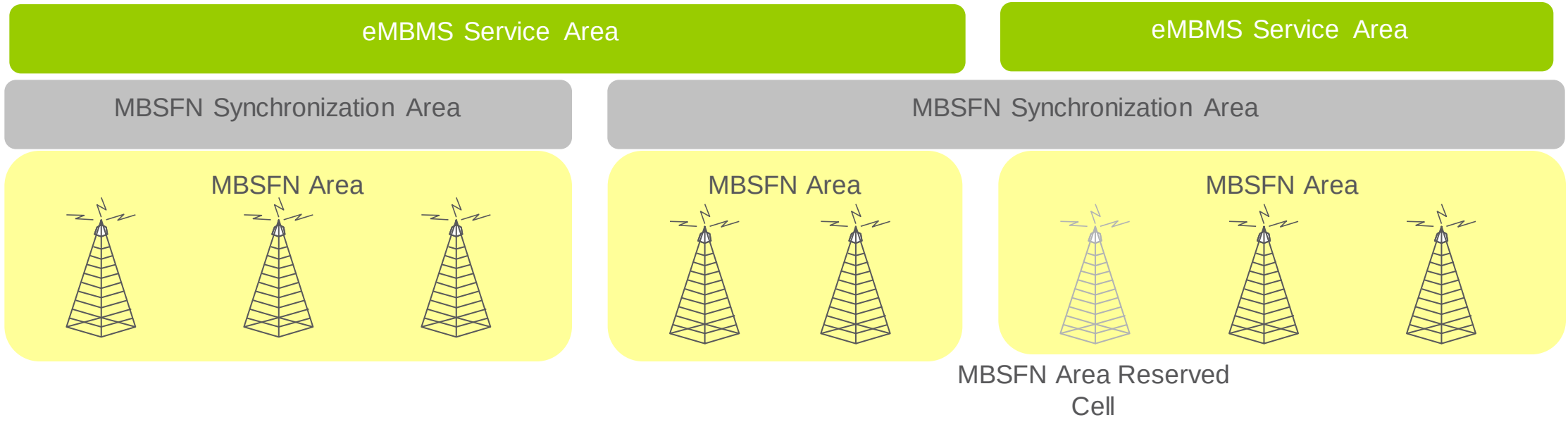


Basic radio interface principles

- Maximum 6 subframes of a radio frame can be used for eMBMS
- No HARQ re-transmissions
- No UE feedback on utilization and Radio Conditions

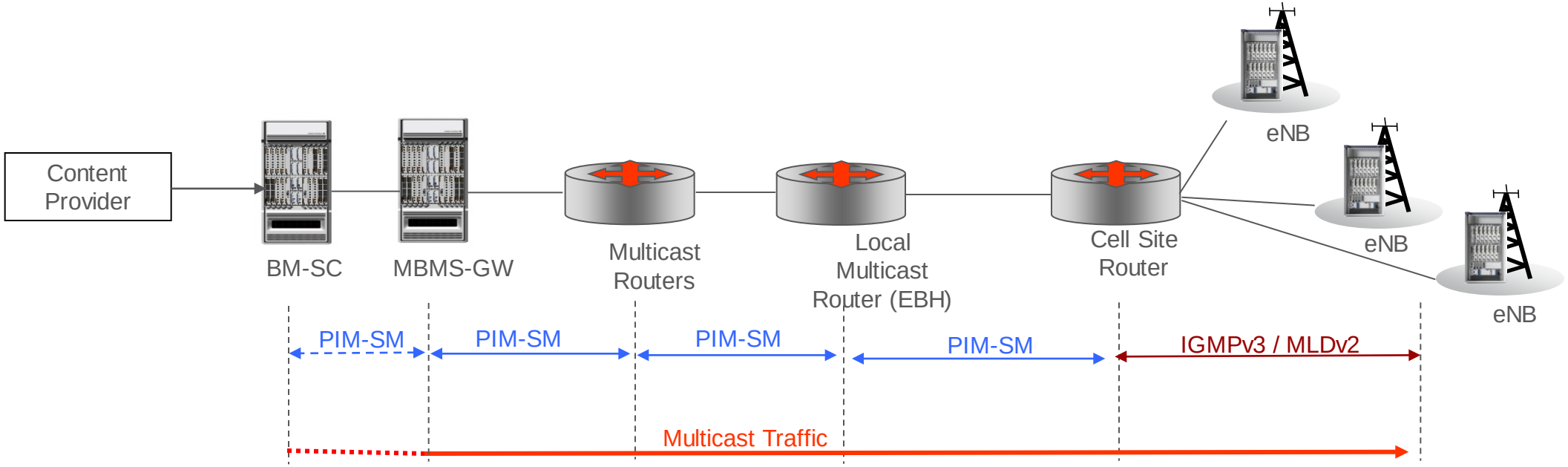


EMBMS Service area



- eMBMS service area could consist of one or multiple cells
- In case of multiple cells, eMBMS service area could be divided to one or multiple MBSFN areas
- MBSFN area may also contain reserved cells that do not participate in MBSFN transmission but transmission of other channels is at reduced power level

IP Multicast in transport network

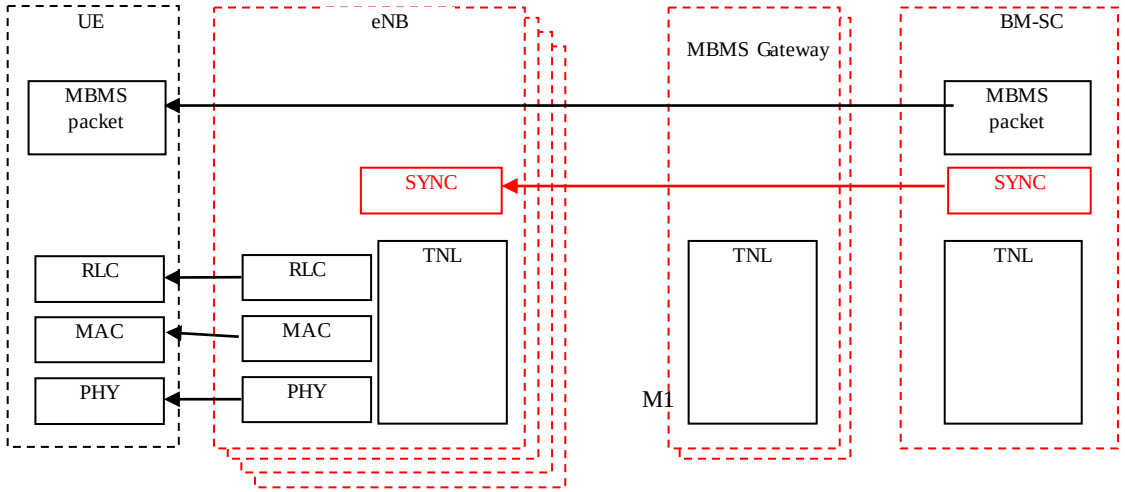


BM-SC	Broadcast Multicast Service Center
MBMS-GW	Multimedia Broadcast/Multicast Service Gate Way
PIM-SM	Protocol Independent Multicast Sparse-Mode
IGMP	Internet Group Management Protocol
MBMS	Multimedia Broadcast/Multicast Service
MLD	Multicast Listener Discovery

MBMS synchronization

3GPP 25.446 MBMS synchronisation protocol (SYNC)

- *MBMS Synchronization protocol located on top of TN layer in the M1 User Plane comprises following elementary procedures:*
  - *Transfer of User Data for MBMS procedure with use of SYNC PDU Type 1*
  - *Transfer of synchronization information for MBMS procedure (without User Data) using SYNC PDU Type 0 and Type 3*



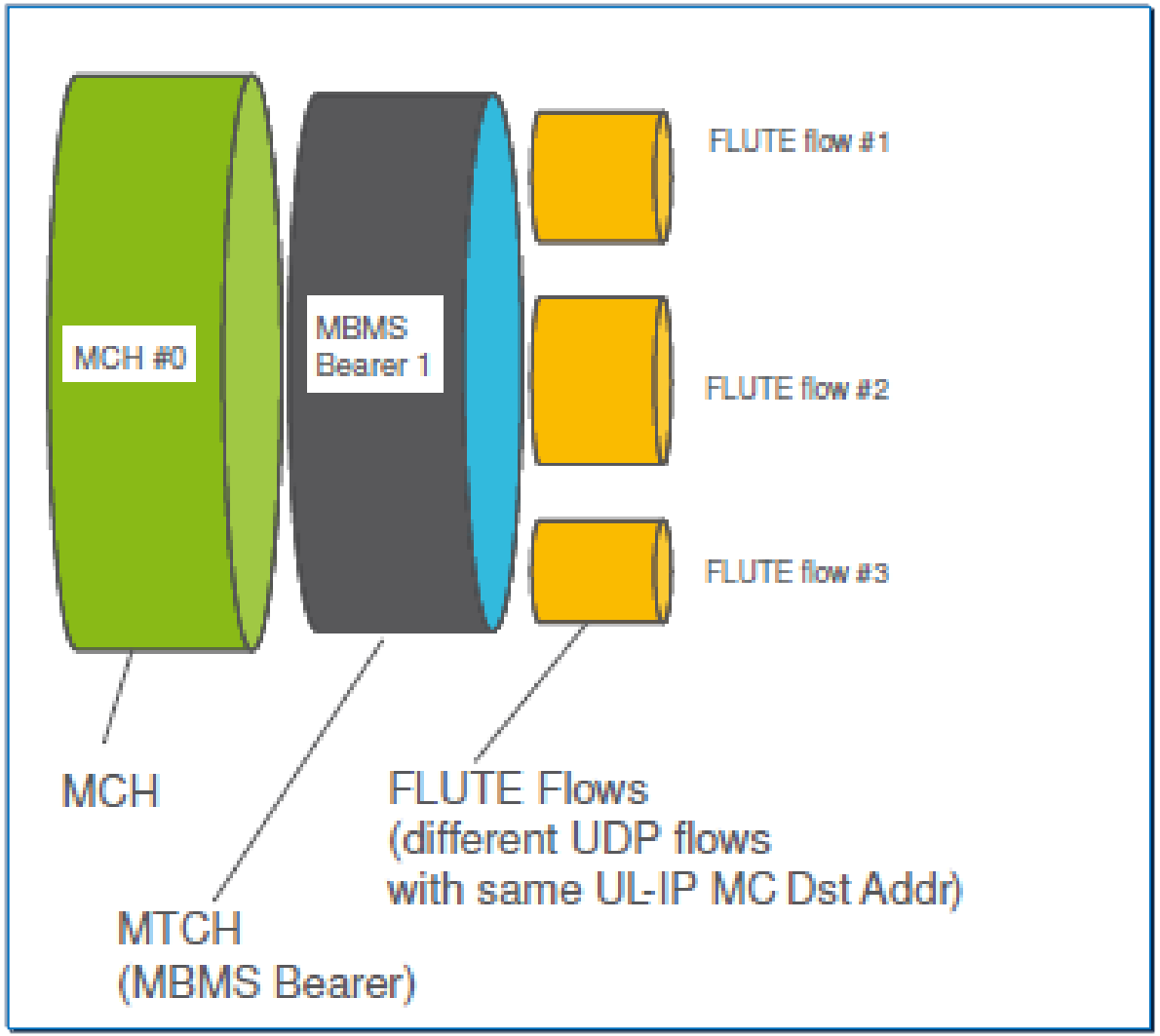
- ***eNB**, based on the parameters in the SYNC Header can:*
  - *Derive the timing for DL radio transmission*
  - *Notice lost SYNC packets during transmission from BM-SC to the eNB*
  - *Reorder the PDUs before passing them to RLC processing, if needed*

QoS over M1 is most important
- Any packet loss affects all the MBSFN users serving off the affected eNodeB
- Packet loss rate of 10e-6 or less desired

QOS information

- 3GPP TS 23.246:

- QoS Class Indicator (QCI)
  Not critical:
- MCS for data and signaling is fixed
- No RAN retransmissions possible
- – BLER cannot be guaranteed
- BLER depends on UE RF condition
- Allocation and Retention Priority (ARP)
- – Pre-emption not to be used except with unicast eMBMS bearers
- Maximum Bit Rate (MBR)
- Guaranteed Bit Rate (GBR)
- – Where MBR = GBR
- – UE-AMBR and APN-AMBR do not apply



Ericsson INVOLVEMENT

Ericsson's unique combination of three new standards (eMBMS, HEVC and MPEG-DASH) enables operators to efficiently launch media services over LTE

- End-to-end capability
- First mover of new technologies
- Driving standardization and ecosystem

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