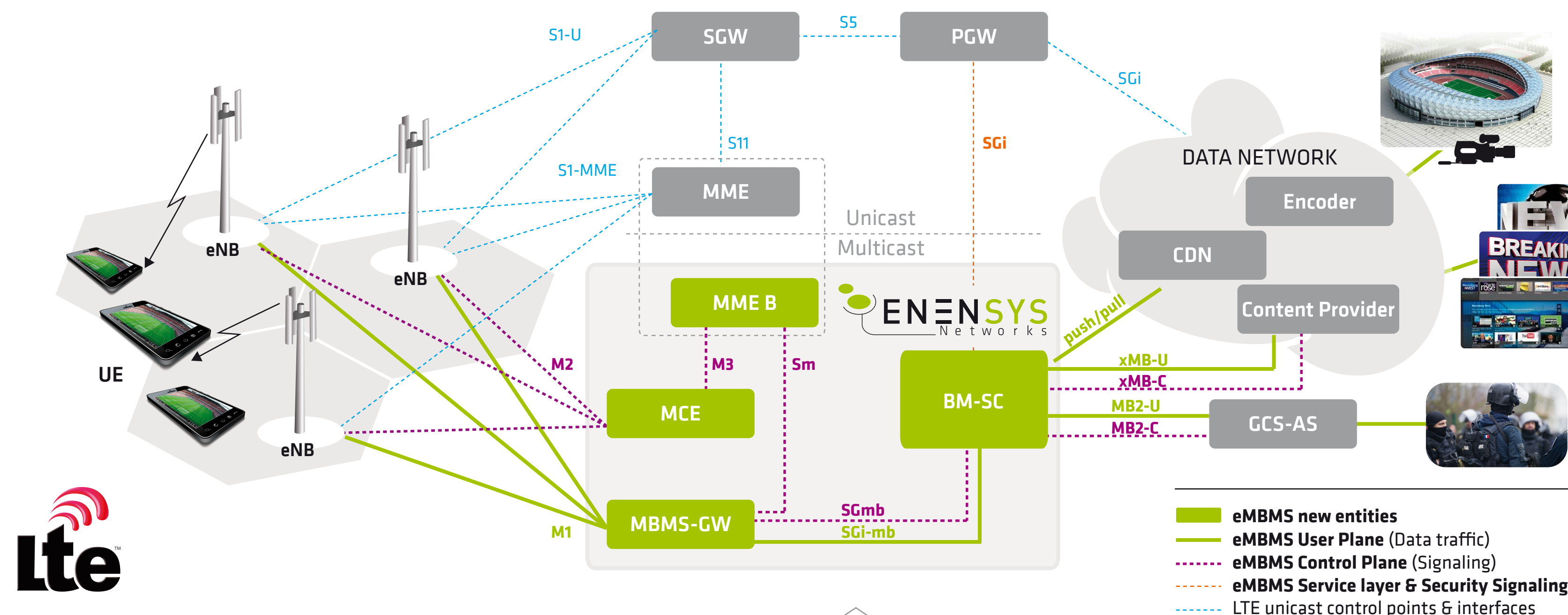


## eMBMS Architecture



### LTE existing Element

**MME** Mobility Management Unit  
**PGW** PDN Gateway  
**SGW** Serving Gateway  
**eNB** E-UTRAN Node B  
**UE** User Equipment  
**GCS-AS** Group Communication Service Application Server, eg MCPTT

### New LTE Elements for eMBMS

**BM-SC** Broadcast Multicast Service Center

**MBMS-GW** eMBMS Gateway  
 Distribute IP multicast content to eNodeB over M1 interface (GTP\_u). MBMS Session Control Signaling to MME.

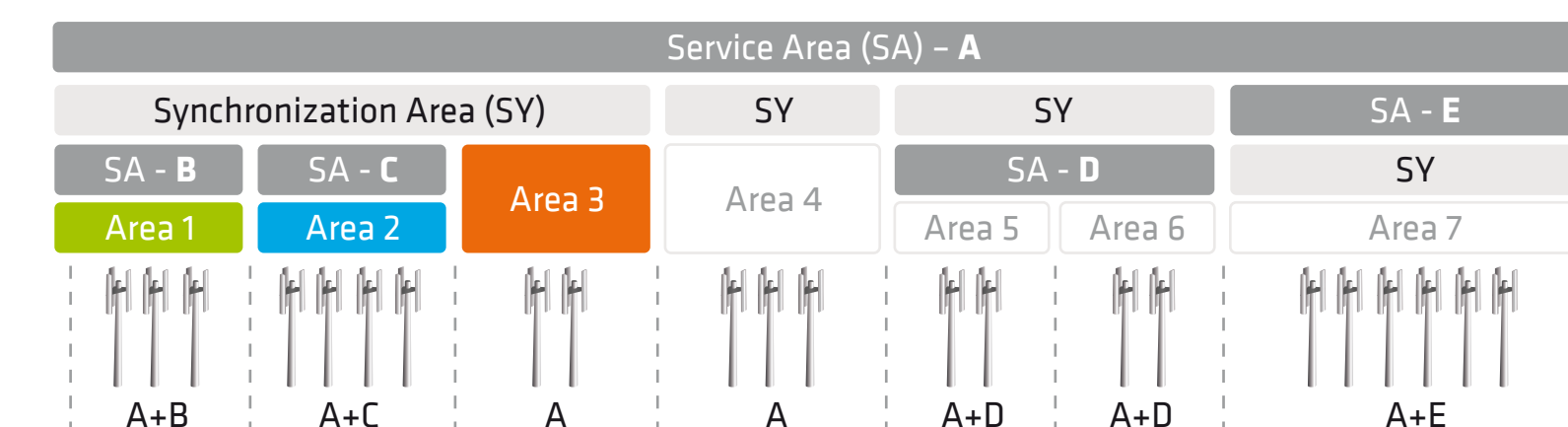
**MCE** Multi-cell Coordination Entity  
 Coordinates transmissions from multiple cells. Allocates time and frequency radio resources and radio configuration on all eNodeB in the MBSFN area.

**MME B** MME add-on  
 Convert Sm messages from eMBMS Gateway to M3 messages to MCE

### SYNC protocol

Each MBMS bearer carries SYNC information to synchronize all eNodeBs within a MBSFN Area to ensure the UE receives constructive signal from these eNodeBs.

## MBSFN AREA & SERVICE AREA



### MBSFN Synchronization Area

An area of the network where all eNodeBs can be synchronized and perform MBSFN transmissions. MBSFN Synchronization Areas are capable of supporting one or more MBSFN Areas. On a given frequency layer, an eNodeB can only belong to one MBSFN Synchronization Area.

MBSFN Synchronization Areas are independent from the definition of MBMS Service Areas.

### MBMS Service Area

The area within which data of a specific MBMS session (or service) are sent. Each MBMS Session of an MBMS Service may be sent to a different MBMS Service Area.

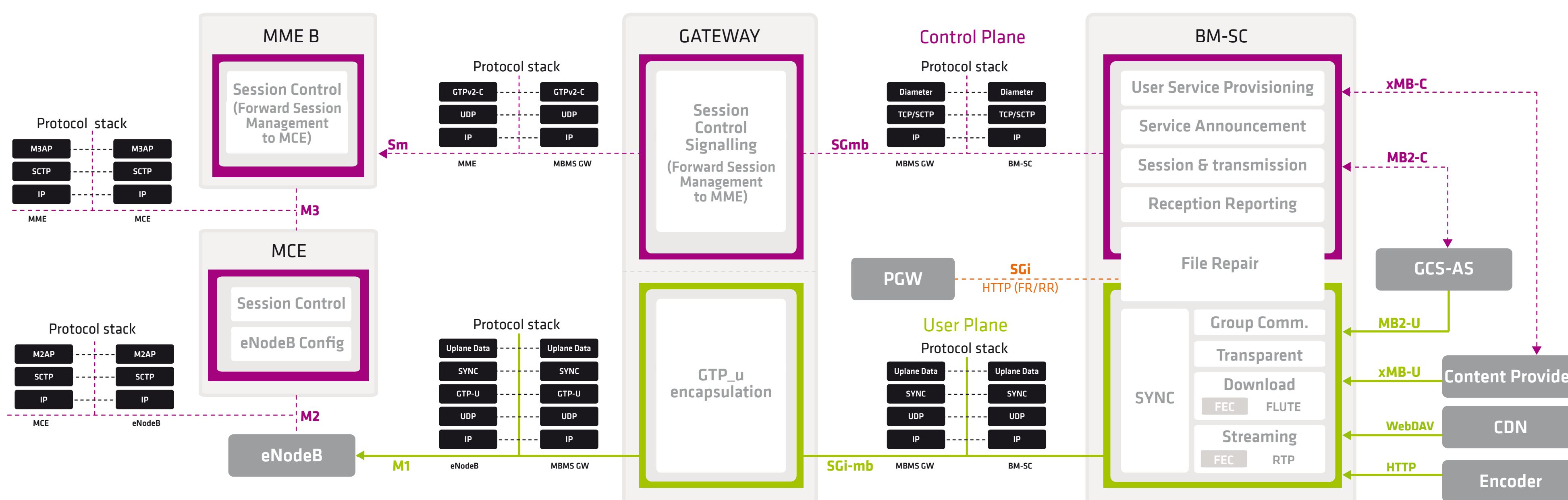
### MBSFN Area

Consists of a group of cells within an MBSFN Synchronization Area of a network, which are co-ordinated to achieve a MBSFN Transmission. A cell within an MBSFN Synchronization Area may form part of multiple MBSFN Areas, each characterized by different transmitted content and participating set of cells.

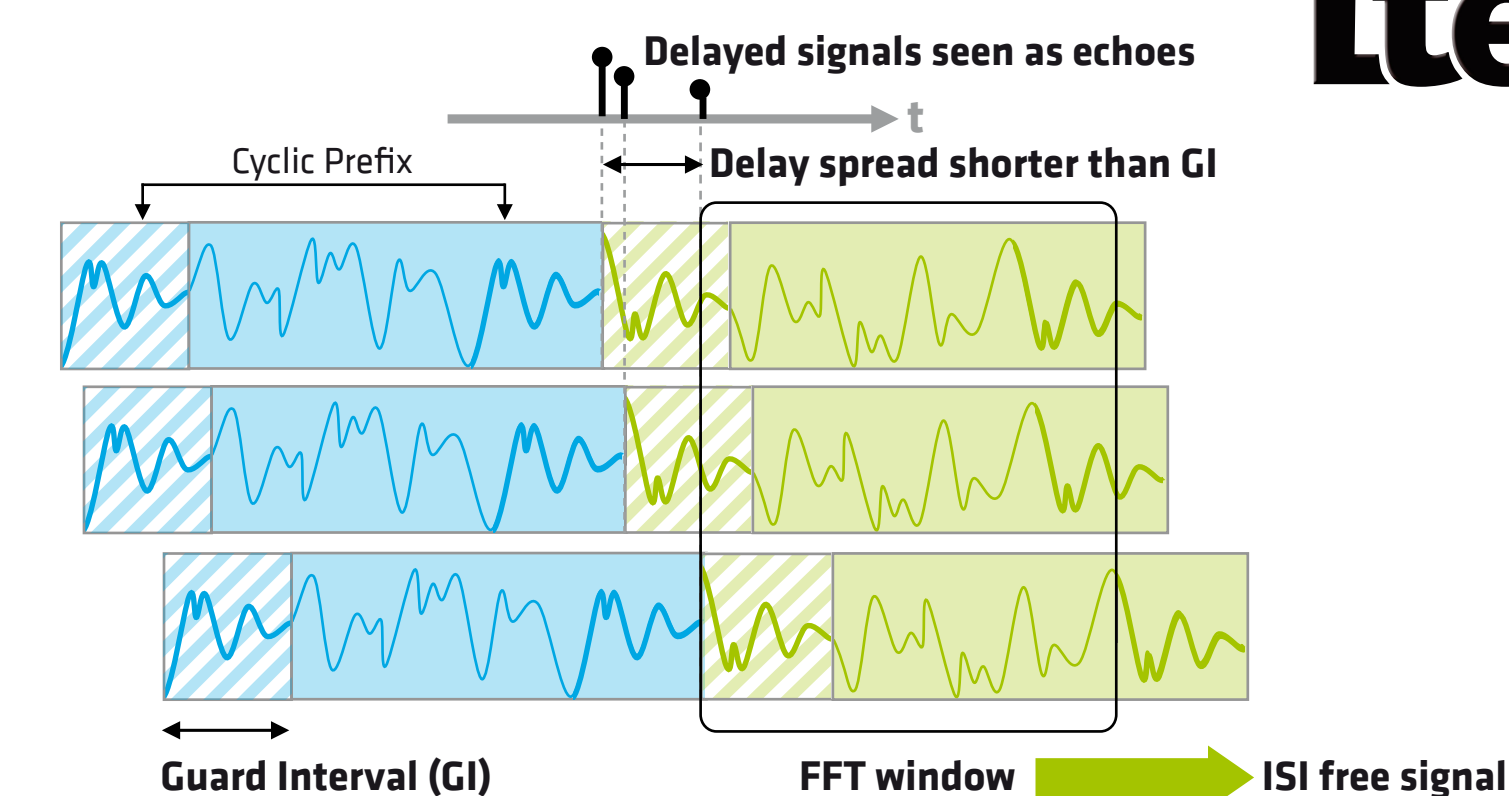
### MBSFN Area Reserved Cell

A cell within a MBSFN Area which does not contribute to the MBSFN Transmission. The cell may be allowed to transmit for other services but at restricted power on the resource allocated for the MBSFN transmission.

## BM-SC, eMBMS Gateway & MCE Functional Elements



## SYNC MODULE, ENABLING SFN FOR LTE BROADCAST



### Several eNodeBs are required to pave an MBSFN Area

Each eNodeB must send the same content at the same time & frequency.

### eNodeBs location spread generates multipath reception

UE receives signal from several eNodeBs, each signal being delayed with reduced amplitude.

### Managing Inter-Symbol Interference (ISI)

This spread creates ISI. A guard interval is added to the signal: As long as the signals spread is shorter than the guard interval, an ISI-free signal can be reconstructed from these paths.

### Must synchronize all eNodeBs within a MBSFN Area

The synchronization of all eNodeBs guarantees that each MBMS bearer will be ISI free and optimally decoded.