



Hytera

## Hytera Mission Critical LTE Solution

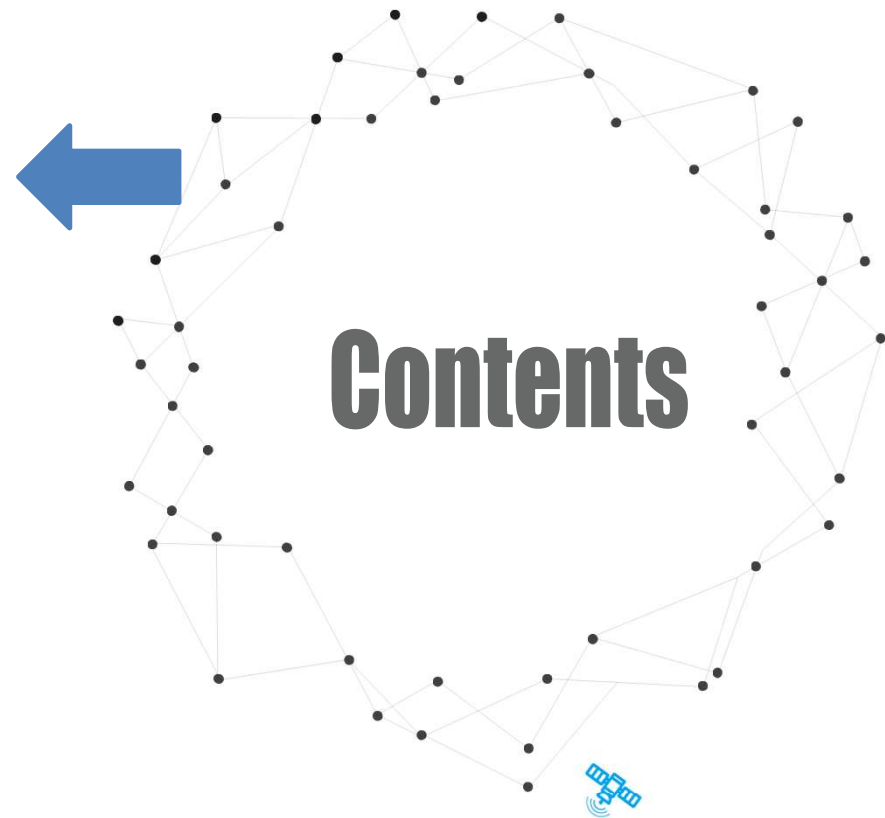
21 November 2019

# Contents

01 MCPTT and 3GPP

02 Hytera MCS solution

03 Hytera P-LTE system family



# Why Mission Critical needs LTE?

## DATA SPEED

10M-100M

1M-2M

9K-64K



- Voice PTT
- Short message



- Database Access
- File transmission
- Image
- SMS
- E-Mail



- HD video calls
- Multimedia APP
- Video dispatch

## CORE SERVICES

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# Public safety applications

Functionality	Bandwidth	TETRA	4G Current status
Emergency call	Low		
Voice PTT, Group call	Low		
Status & availability messaging	Low		
Automatic Vehicle & Person Location	Low		
Health monitoring (sensors, ECG)	Medium		
Mobile video (dashcam, bodycam)	High		
License plate tracking	Medium		
Emergency Centre Communication	Medium		
Mobile office (Internet, Email, Word, Excel, ...)	High		
Facial recognition analysis	High		
Information databases (maps, drawings)	High		
	Not possible	Possible	Preferred



Source: Strict Consultancy; TCCA World 2019 presentation

# Solution for Public Safety Agencies



***Mission Critical Services are based on the 3GPP standard, working over LTE network, providing mission critical voice, mission critical data, and mission critical video with **guaranteed service** and fair investment.***



**MCPTT**

(Mission Critical Push-To-Talk)



**MCVIDEO**

(Mission Critical Video)



**MCDATA**

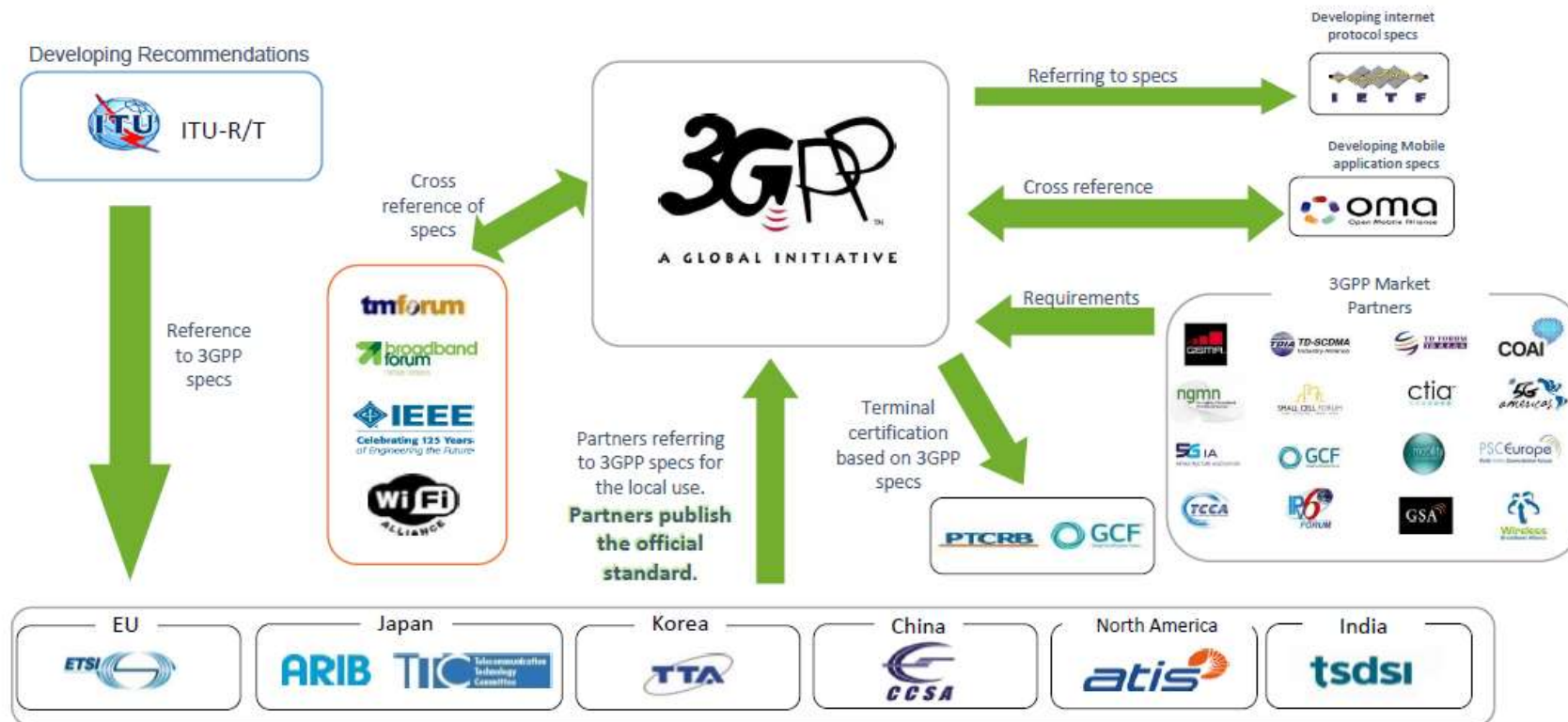
(Mission Critical Data)



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6



# 3GPP evolution for Mission Critical



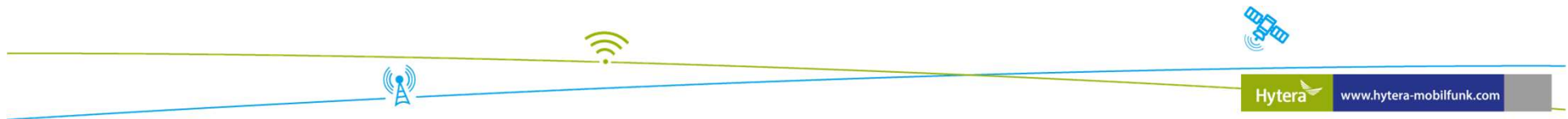
## MC standardization was initiated in 2013

Initiated by public safety departments of Korea, USA, UK, France, Germany, Netherlands, TCCA, ETSI, ATIS, TTA

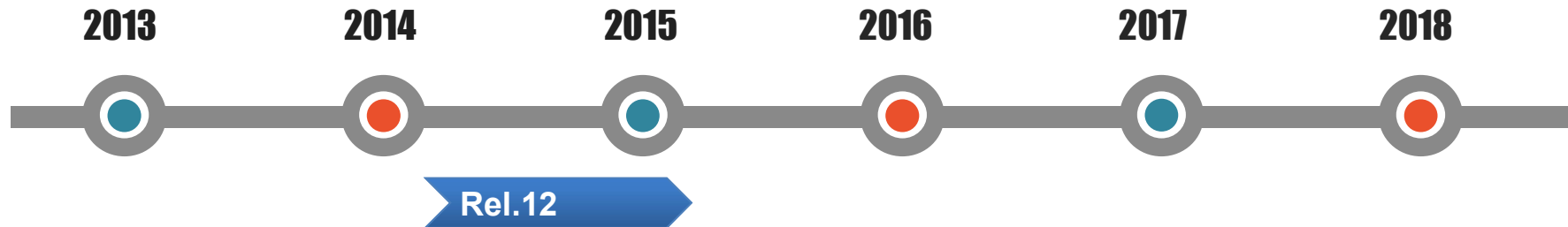
## 3GPP source of global Mission Critical Services (MCX) Standards

Over 600 user requirements were developed with inputs from TETRA, P25 and mobile broadband industry

New Working Group dedicated for Mission Critical Applications (SA6)



# 3GPP evolution for Mission Critical



Group Communication  
System Enable(GCSE)

Proximity Services  
(ProSe)

MC QCI 65,66,69 and 70

## ProSe (Proximity Services)

a D2D (Device-to-Device) technology that allows LTE devices to detect each other and to communicate directly.

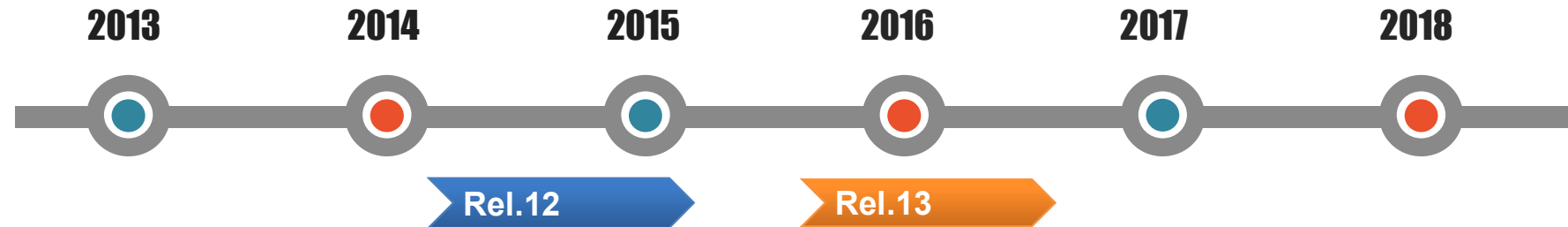
## Quality of Service:

- QCI-65: Mission Critical user Push To Talk voice
- QCI-66: Non-Mission-Critical user Push To Talk voice
- QCI-69: MC-PTT signaling
- QCI-70: Mission Critical Data





# 3GPP evolution for Mission Critical



## First global MCPTT standard published in 2016 (Rel-13)

- Call types (group calls, broadcast calls, private calls, etc.)
- Different types of groups
- Dynamic regrouping
- Late entry to groups
- Bespoke security functions
- Floor control (e.g. queue in priority order)
- Override based on priority
- Real time location information
- Audio / Voice Quality standards and performance

Mission Critical  
Push-To-Talk(MC-PTT)

Isolated E-UTRAN  
Operate Service(IOPS)

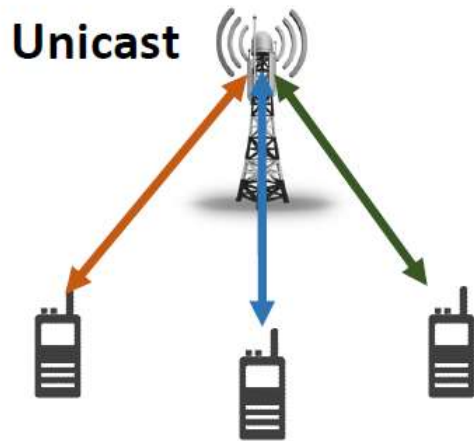
Enhancement for  
eMBMS



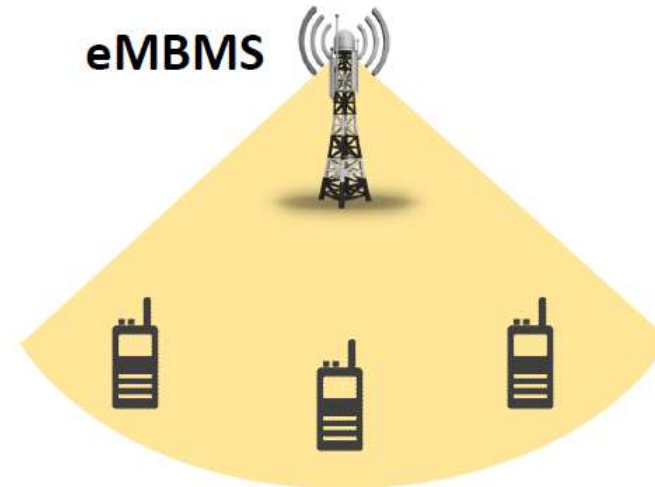
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## Created for PMR - eMBMS



- Each user receive own copy @ 1Mbps
- Network load = 1Mbps \* N

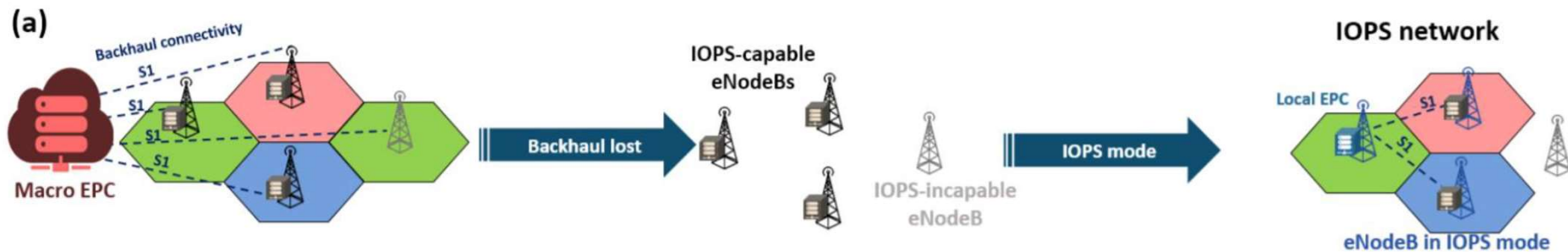


- Each user receive same copy @ 1Mbps
- Network load = 1Mbps

- Efficient mechanism to deliver broadcast / multicast content over LTE network
- Significantly improve performance & efficiency of concurrent mission critical communications



# Created for PMR - IOPS



- IOPS: Isolated Operation for Public Safety
- Hytera eNodeB supports IOPS function with MCS provision capabilities
- Allow users under the site coverage maintain a reliable communication network under isolated situation

- Designed for communication enabling for local users when site backhaul link is lost
- Crucial functions for mission-critical & business-critical users under various disaster scenarios



# 3GPP evolution for Mission Critical



2013

2014

2015

2016

2017

2018



Rel.12

Rel.13

Rel.14



MC-PTT 2.0

Mission Critical Video

Mission Critical Data

## MCPTT 2.0

Ambient listening call  
Remote change of selected group

## MCVideo

Group Call  
Private Call (off network)

## MCDData

Short Data Service (SDS)  
File Distribution (FD)



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# 3GPP evolution for Mission Critical

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2013

2014

2015

2016

2017

2018



Rel.12

Rel.13

Rel.14

Rel.15



**MCPTT 3.0**

**MCVideo 2.0** (Usage of MBMS)  
Video push and pull  
Private call (on network)  
Ambient viewing call

**FRMCS**  
Future Railway Mobile Communication System

Interworking with  
PMR

MCS Enhancement

Future Railway Mobile  
Communication System

**MCDATA 2.0** (Usage of MBMS)



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# 3GPP evolution for Mission Critical



2017

2018

2019

2020

2021

2022



Rel.16



MC MBMS API

MC over 5G study

MCSAA study

## MC MBMS API

Enables 3<sup>rd</sup> party MC apps to access MBMS

Ambient listening call

Remote change of selected group

## MC over IOPS (MCSAA)

Switching to/from IOPS system

Data synchronization between IOPS and MC system

Determining list of registered users on IOPS



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# MC services over 5G ?

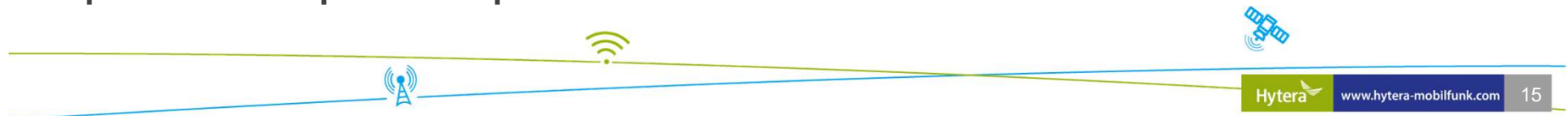
## Key Objective

- How to support MC services over 5G?

## Progress

- Identified gaps required to enable MC services over 5G
- Use of multicast
- Use of ProSe
- Resource control (QCI vs. 5QI)
- Key issue on 5G Network Slicing impacts

**Expected to complete in Sep 2020**



# ETSI MCS Plugtest programme

## Key Objective

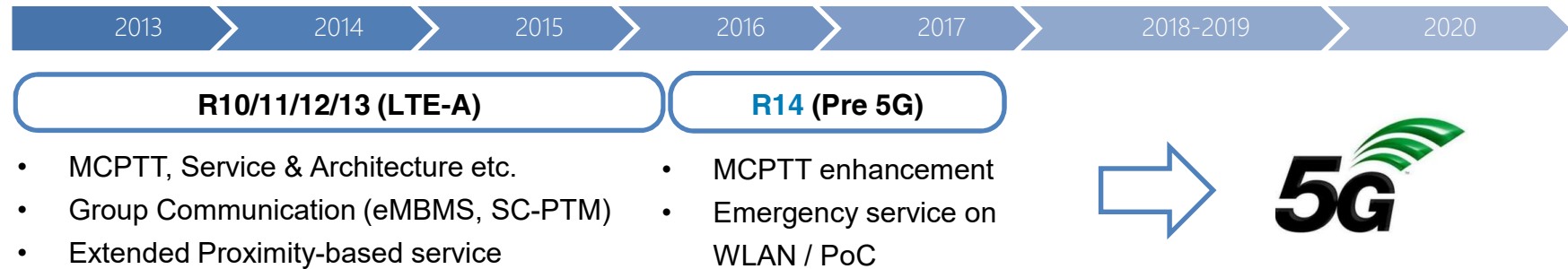
- The goal of the MCX Plugtests event is to validate the interoperability of a variety of implementations using different scenarios based on 3GPP Mission Critical Services.
- The tests are based on 3GPP, ETSI and IETF standards.

## Plugtests

1. June 2017 in Sophia Antipolis, France
2. June 2018 in College Station, Texas
3. December 2018 – January 2019
4. September 2019 in Kuopio, Finland



# Hytera in 3GPP



3GPP SA6	Date	Proposals	Passed
The 12 <sup>th</sup> Meeting	2016/07/25	2	2
The 13 <sup>th</sup> Meeting	2016/10/10	6	4
The 14 <sup>th</sup> Meeting	2016/11/14	1	1

Hytera took part in the process of 3GPP **R14** standards developing, and bringing LTE industry forward.



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# Contents

01 MCPTT and 3GPP

02 Hytera MCS solution

03 Hytera P-LTE system family



# Hytera committed to standard solutions

## International Open Standard



**Participant** in establishing  
Mission Critical-LTE Standard  
(Rel.13 & Rel.14)



A GLOBAL INITIATIVE



**Rank 1<sup>st</sup>** in MCPTT Plug Tests  
by ETSI @ Jun 2017



**Fully Support** the MC-  
PTT/MC-Video/MC-Data in  
LTE Standard (Rel.13 &  
Rel.14)



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19

# MCS features



## Common Feature

- ✓ User Login
- ✓ User/Group Subscription Data Management
- ✓ Affiliation/Presence
- ✓ Late Entry
- ✓ eMBMS
- ✓ GIS Location
- ✓ Backup&Redundancy (Enhance Function)
- ✓ IOPS(Enhance Function)

## MCPTT

- ✓ Full/Half-Duplex Private Call
- ✓ Emergency Private Call
- ✓ Group/Chat Group/Imminent Peril Group Call
- ✓ Emergency Group Call
- ✓ Group Call Upgrade and Degrade
- ✓ Floor Control
- ✓ Call Forwarding

## MCVideo

- ✓ Full-Duplex Video Private Call
- ✓ Video Group Call
- ✓ Video Chat Group Call
- ✓ Emergency Video Group Call
- ✓ Video Push
- ✓ Video Pull

## MCDData

- ✓ Point-to-Point SDS
- ✓ Point-to-MultiPoint SDS
- ✓ Point-to-Point MMS
- ✓ Point-to-MultiPoint MMS
- ✓ Status Message

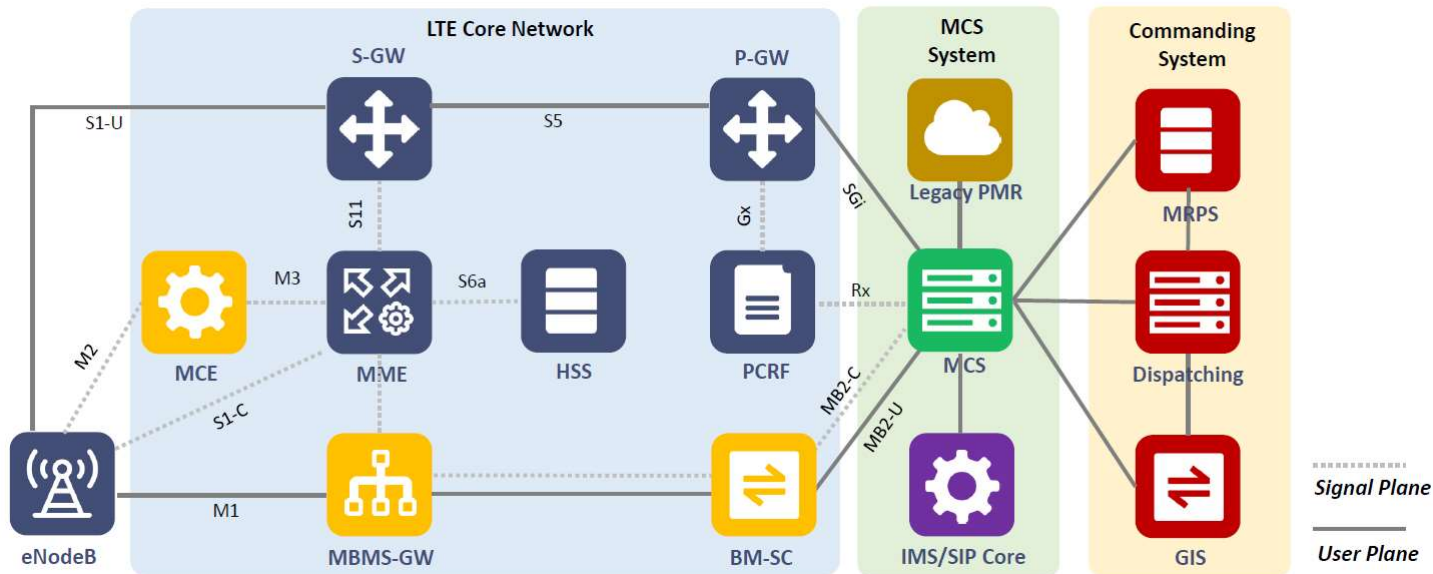
## Dispatching

- ✓ Ambience Listening
- ✓ Quick Combining
- ✓ Group Combining
- ✓ Broadcast Call
- ✓ Temporary / Permanent Disable
- ✓ Dynamic Group Number Assignment (DGNA)
- ✓ Voice/Video Call Recording





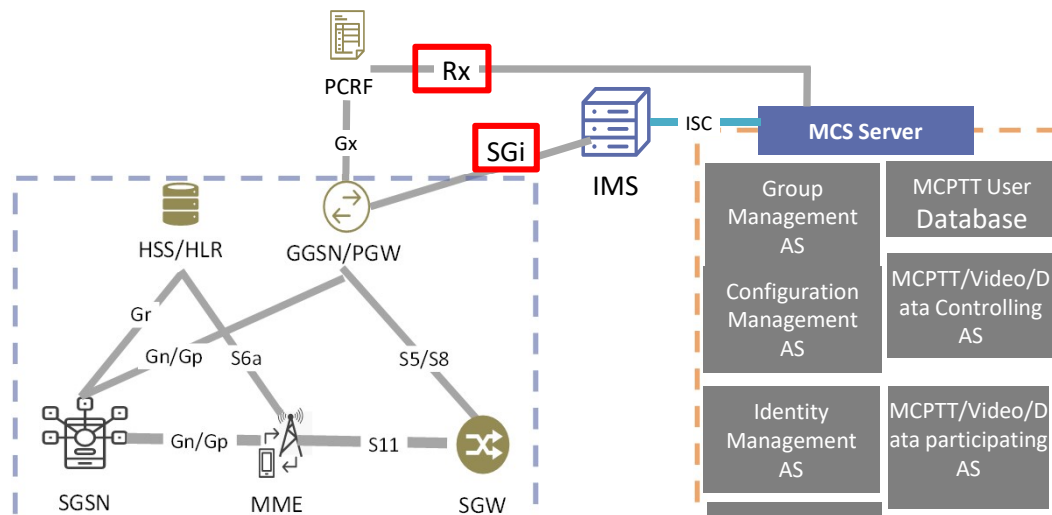
# MCS – Network Architecture Overview



- eMBMS is “prefer to have” system for better MCS quality & efficiency
- IMS / SIP Core can be reused with telecom operator’s IMS if applicable
- Commanding System provides optional VAS to Mission Critical Agencies
- Supportive on 3GPP R13 or above by LTE RAN & Core elements are required



# How to guarantee Mission Critical Services?



QoS: QCI 65/67/69/70 to ensure end to end MCS

Operator part: LTE network, open Rx, SGI interfaces

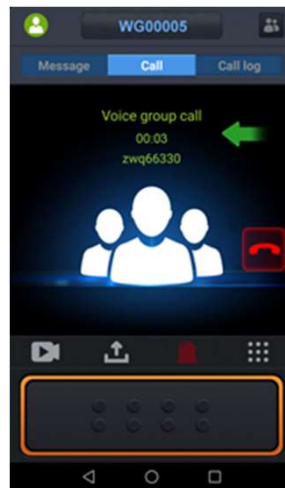
- KPI1: Push-to-talk request access time < 300ms
- KPI2: End-to-end MCPTT access time < 1000ms
- KPI3: Mouth-to-ear latency < 300ms
- KPI4: Max late call entry time < 150ms (encrypted 350ms)

According to 3GPP TS 22.179

# Mission Critical Service Application



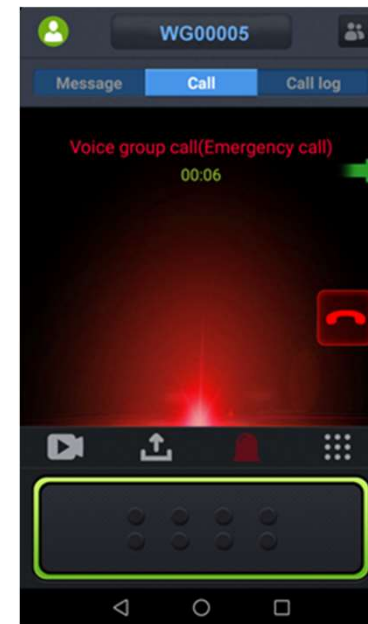
Voice call



Video call



Emergency call



# MCS – Mission Critical Service



MCS APP	MCS Server	LTE System
Airbus	Airbus	Athonet
Alea	Alea	Ericsson
Genaker	Genaker	Huawei
Harris	Harris	Expway
Nemergent	Nemergent	one2many
TASSTA	TASSTA	Nokia
ZTE	ZTE	
	Funkwerk	

- Experienced interoperations with different syst from mainstream industry players.
- 3GPP R14 Based, Full MC-PTT / MC-Data / MC-Video service.
- Enhanced Supplementary services: Group Operations / Visualized Dispatching / Multimedia Recording / ...
- Industry leading interconnection capabilities with legacy PMR techniques: TETRA / DMR

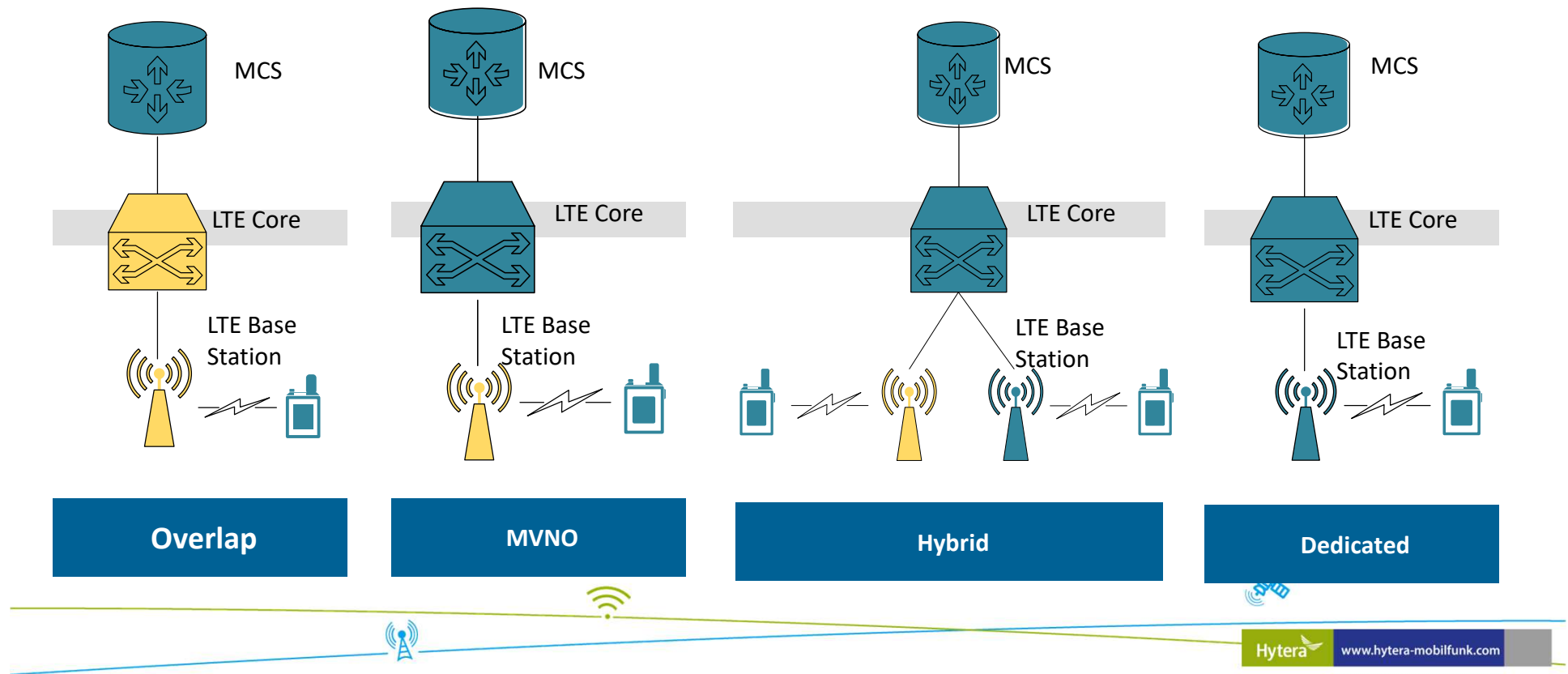


# MCS deployment models

\*MVNO: Mobile Virtual Network Operator

Operator

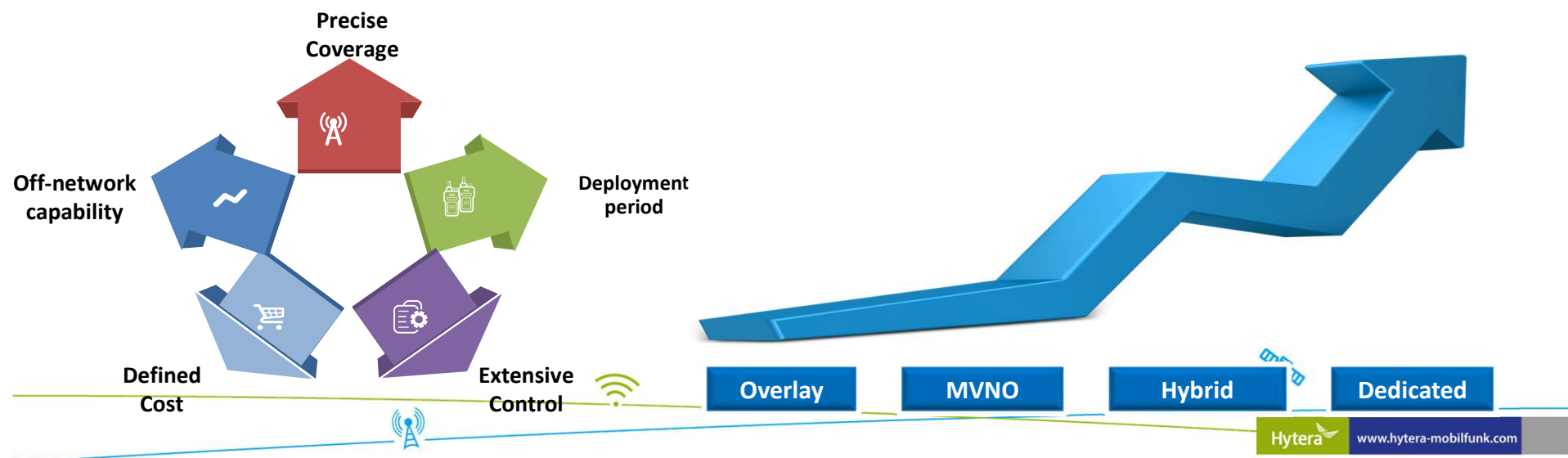
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# Comparison of the deployment models



	Overlay	MVNO	Hybrid	Dedicated
Frequency	Shared	Shared	Shared+Dedicated	Dedicated
Core Network	Shared	Dedicated	Dedicated	Dedicated
OPEX/CAPEX	Low	Medium	Medium+	High
Security	Low	Medium	Medium	High
Path Finders	N/A	U.K.	Australia, New Zealand	USA, South Korea





# Contents

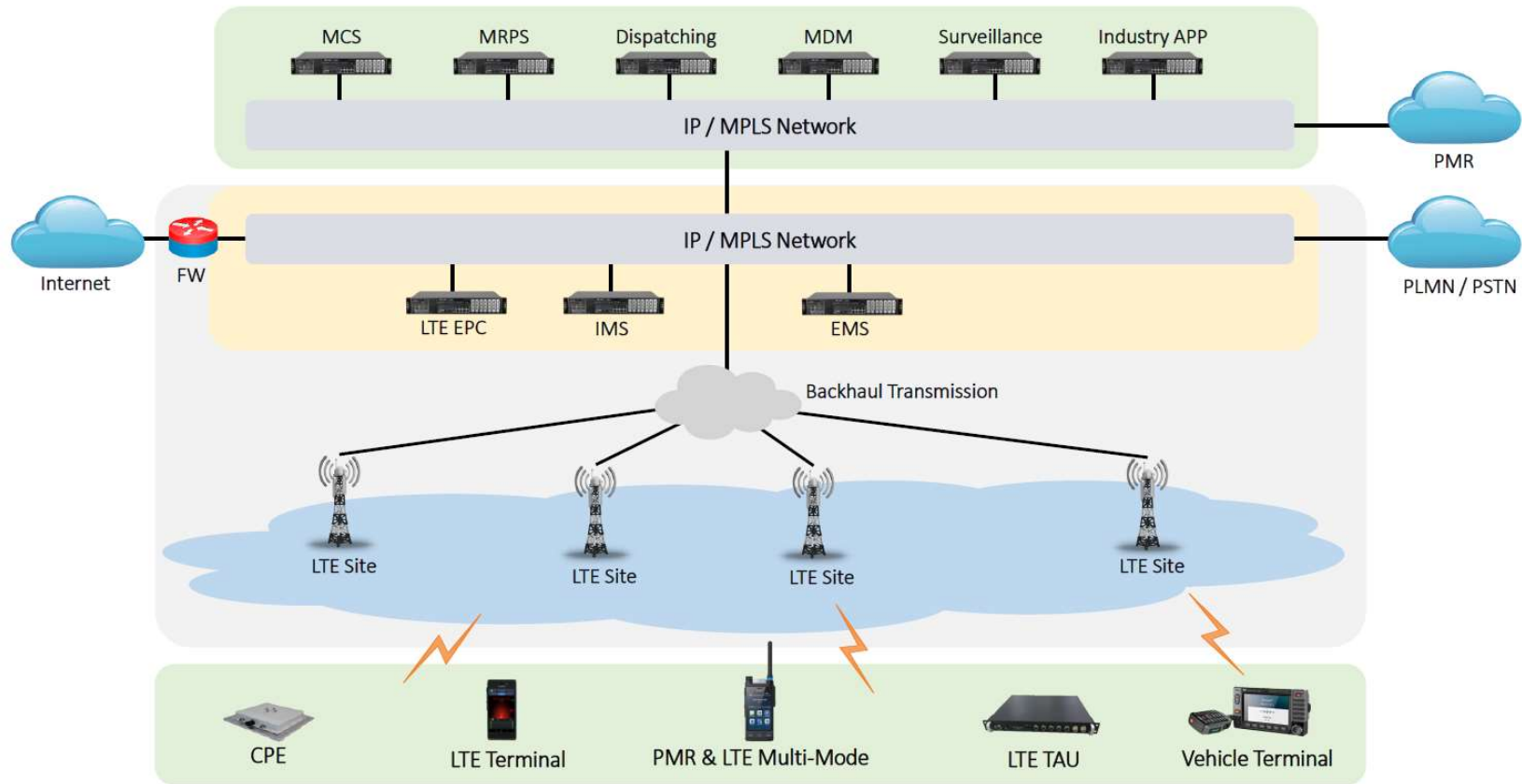
01 MCPTT and 3GPP

02 Hytera MCS solution

03 Hytera P-LTE system family



# P-LTE Solution Overview



# Hytera P-LTE Highlights



## End-to-End Solution

- Terminal - Network - Application
- Fully in-house developed
- Smooth user experience
- Quick response to customer needs



## Created for PMR

- Mission Critical Service (3GPP MCS / eMBMS/ IOPS)
- NB/BB convergent solution
- Multi-mode terminals / HPUE
- High security & reliability



## Flexible Solution

- RF customization
- High integrated LTE emergency & on-demand communication



# End-to-End Solution

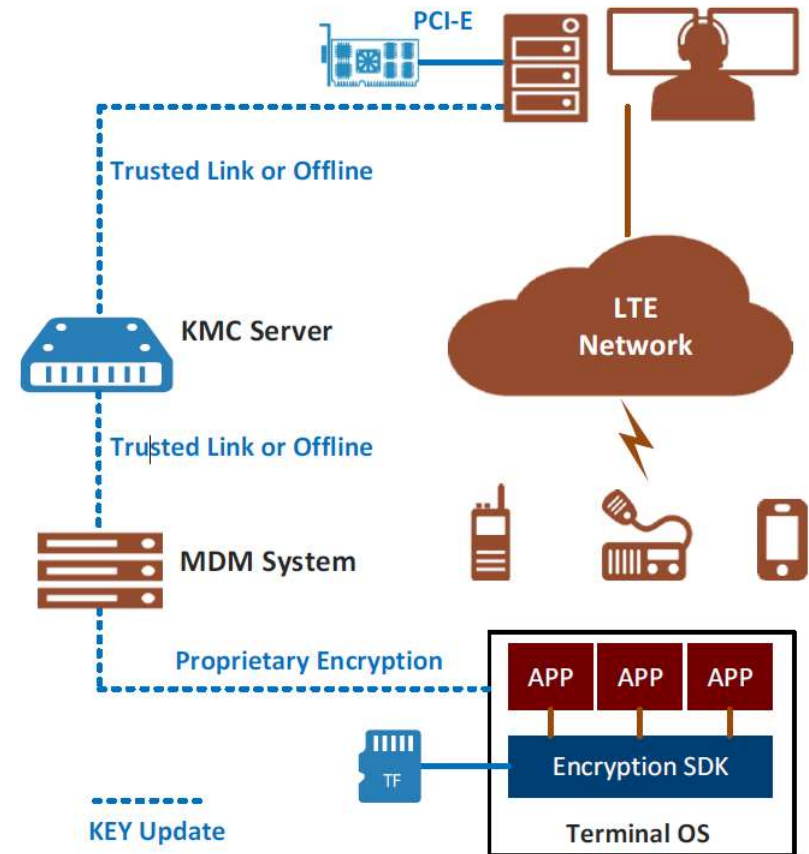


- Powerful & Professional Terminals
- Dedicated Design for PMR scenarios
- Professional Communication Applications
- Guaranteed User Experience

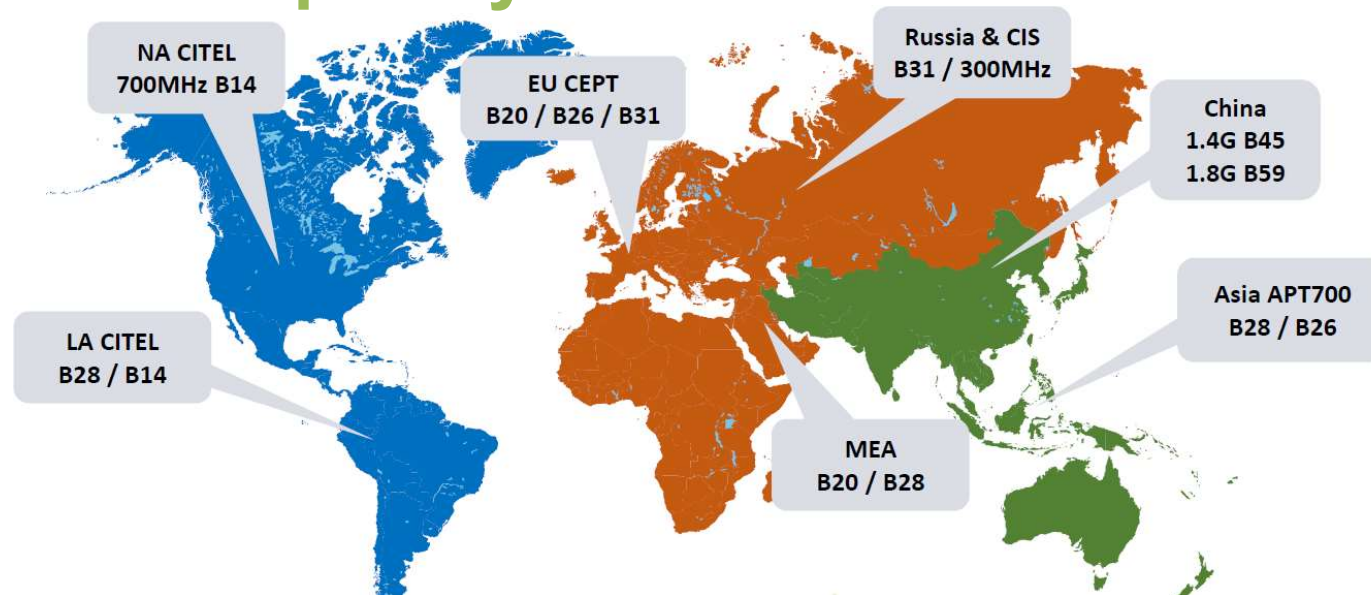


# Created for PMR – End-to-End Encryption

- Full 3GPP Security Framework
- Complete End-to-End encryption
- Offline KEY Management & Distribution
- Adaptive for 3<sup>rd</sup> party encryption algorithm
- Hardware & Software encryption SDK



# Flexible Frequency



Hytera P-LTE supports main stream frequency choices for PMR industries

- Band 26 @800MHz; Band 28 @ 700MHz
- Band 31 @ 450MHz
- Band 45 @ 1.4GHz (China); Band 59 @ 1.8GHz (China)





# LTE Infrastructure - eNodeB

BBU Specifications	
Frequency Band	Band 26 / Band 28 / Band 31 / Band 45 / Band 59
Antenna Configuration	2T2R or 2T4R
Transmission Power	40W * 2; 50W * 2 for B45/
Sensitivity	≤-105dBm
Synchronization	GPS / GLONASS / BeiDou / 1588V2
Voltage	DC -48V
Power Consumption	BBU: 320W Max RRU: 400W Max
RRU IP Rating	IP65
BBU Dimension (H*W*D)	88*483*300 (mm)
Max.Cell per BBU	18 cells
Max Number of Active Users per Site	1800



**Remote Radio Unit**



**Base Band Unit**

- SDR Based, Mature Architecture
- IOPS Supported, Born for PMR Industry
- 3GPP R14 Based, Latest Services / Features
- Trunking Communication Enhanced by eMBMS



# LTE Infrastructure - EPC

Specifications	„Small“ Server
Max Registered Subscribers	100K
Max On-line Subscribers	30K
Max e-NodeB	400
Max Throughput	10 Gbps



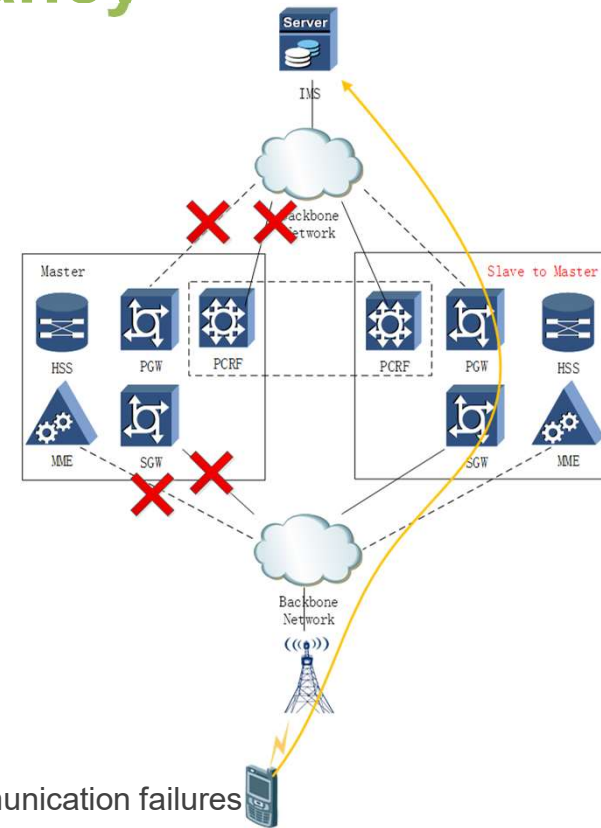
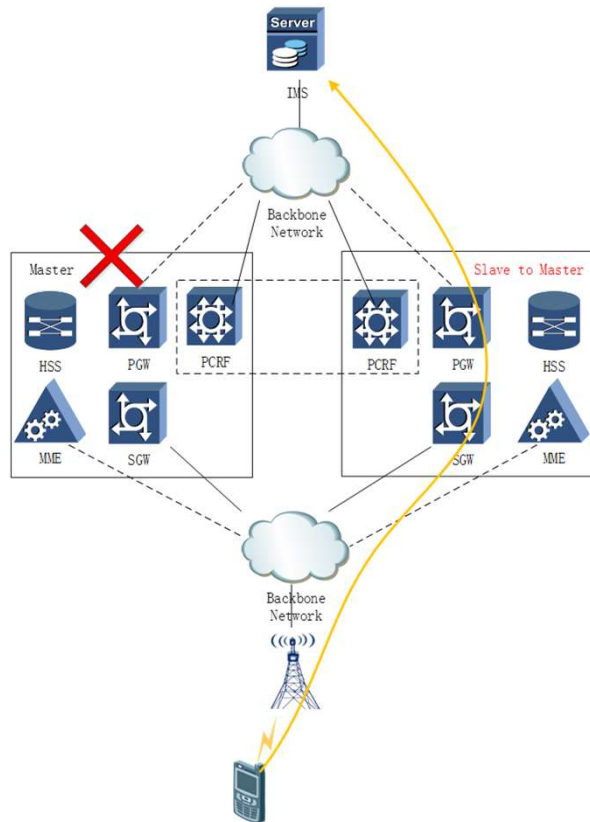
EPC Server



- High Integrated Core, MME/xGW/HSS/PCRF
- High Performance over COTS Platform
- Simple Deployment, Easy Extension
- High Reliability, Multi-level Redundancy



# LTE Infrastructure – EPC Redundancy



- Server failure, including overall failure, power loss, etc.

- Near-end communication failures
  - including network port failure, network card failure, network cable failure or disconnection
- including all user planes and signaling plane interfaces



# LTE Infrastructure - iBS

BBU Specifications	
Frequency Band	Band 28 / Band 45 / Band 59
Antenna Configuration	2T2R@ B28; 2T4R @ B45/B59
Transmission Power	20W* 2 @ B28; 40W * 2 @ B45/B59
Sensitivity	≤-105dBm
Synchronization	GPS / GLONASS / BeiDou / 1588V2
Voltage	DC -48V
Power Consumption	500W Max
RRU IP Rating	IP66
BBU Dimension (H*W*D)	435*340*157 (mm)
CascadeQty.	4 iBS
Max. Users per iBS	128



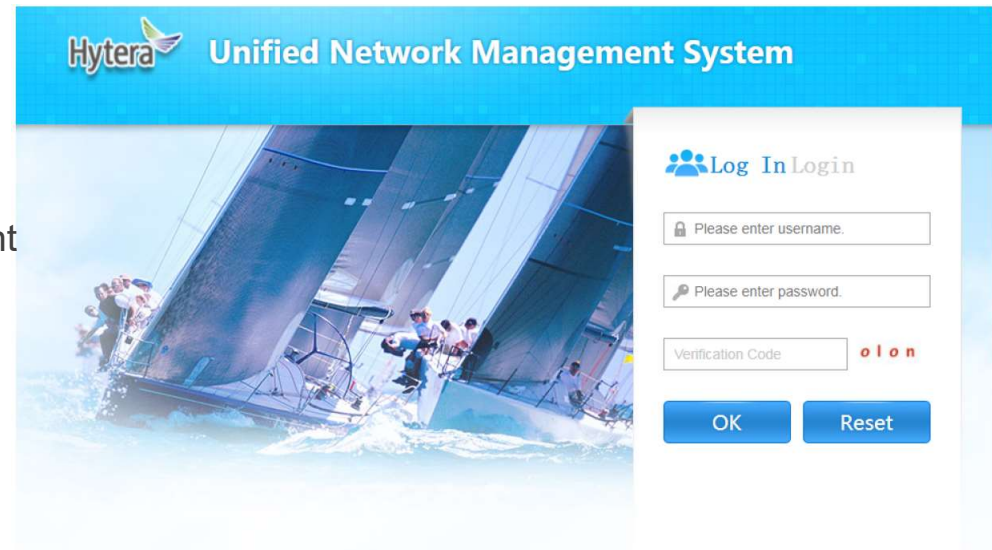
**High Integrated iBS  
eNodeB + EPC + MCS  
All in ONE**

- SDR Based, Mature Architecture
- GPP R14 Based, Full MCS Services
- eNodeB + EPC + MCS, High integration
- Zero Footprint, Fixed or Emergency Deployment



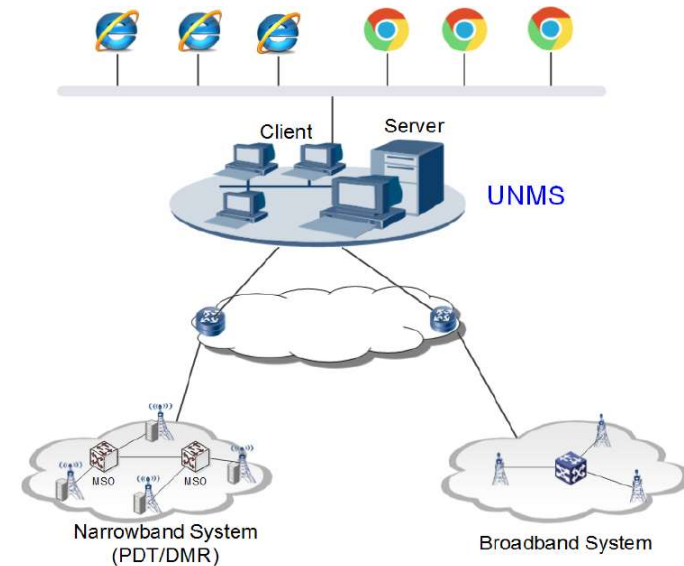
# NM-8000 – Unified Network Management System

- Unified Network Management System
- Adopts browser-sever (B/S) architecture
- NM-8000 supports Monitoring and Management of broadband system (eNB/EPC/iBS) devices
  - Monitoring Management
  - MML Management
  - Upgrade Management
  - System Management
  - Trace Management
  - Diagnose Management



# NM-8000 – Unified Network Management System

- Subscriber Management:
  - LTE users
  - MCS users and groups
- Alarm Management:
  - Displays alarms of all network management subsystem
  - Provides various options for handling the alarms
- Security Management:
  - User management
  - Role management
  - Policy management
  - Log management



- |                         |                               |   |
|-------------------------|-------------------------------|---|
| ▪ Topology Management   | ▪ Configuration Management    | ▪ Performance Management                                    |
| ▪ Security Management   | ▪ Fault Management            | ▪ Multi-language Extension                                  |
| ▪ Subscriber Management | ▪ Software Version Management | ▪ Simultaneously creation of single or multiple subscribers |



# SmartOne – Unified Dispatch

- Unified & Visualized Dispatch
  - GIS-based Visualized Dispatching
  - Unified Network Resource Management
  - Instant Group Communication

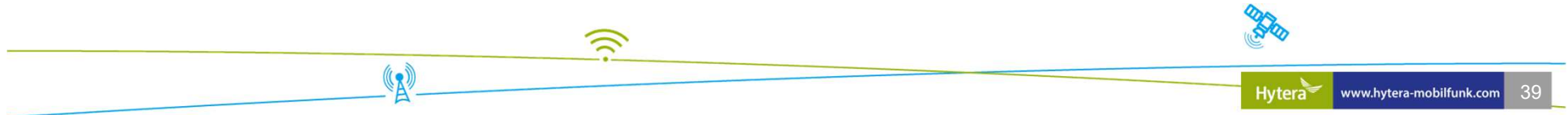


- Multi-Network Interworking
  - Legacy PMR Interworking
  - PSTN / PLMN Interworking
  - CCTV / MRPS Interconnection

- Versatile Dispatching Service
  - Temporary Grouping
  - GPS tracking
  - Stun / Kill / Revive



- High Performance Platform
  - 32 concurrent FHD streams / server
  - 2K concurrent Voice calls / server
  - 35K terminals GPS subscription / server





## 3GPP LTE capable terminals

PTC-760



PTC-680



PNC-550



VM-780







# Disclaimer

- This presentation contains simplifications
- Therefore, it must not be considered as a specification of products, systems or solutions
- The contents of this document are subject to revision without notice due to ongoing progress in methodology, design and manufacturing
- Hytera assumes no legal responsibility for any error or damage resulting from the usage of this document

