

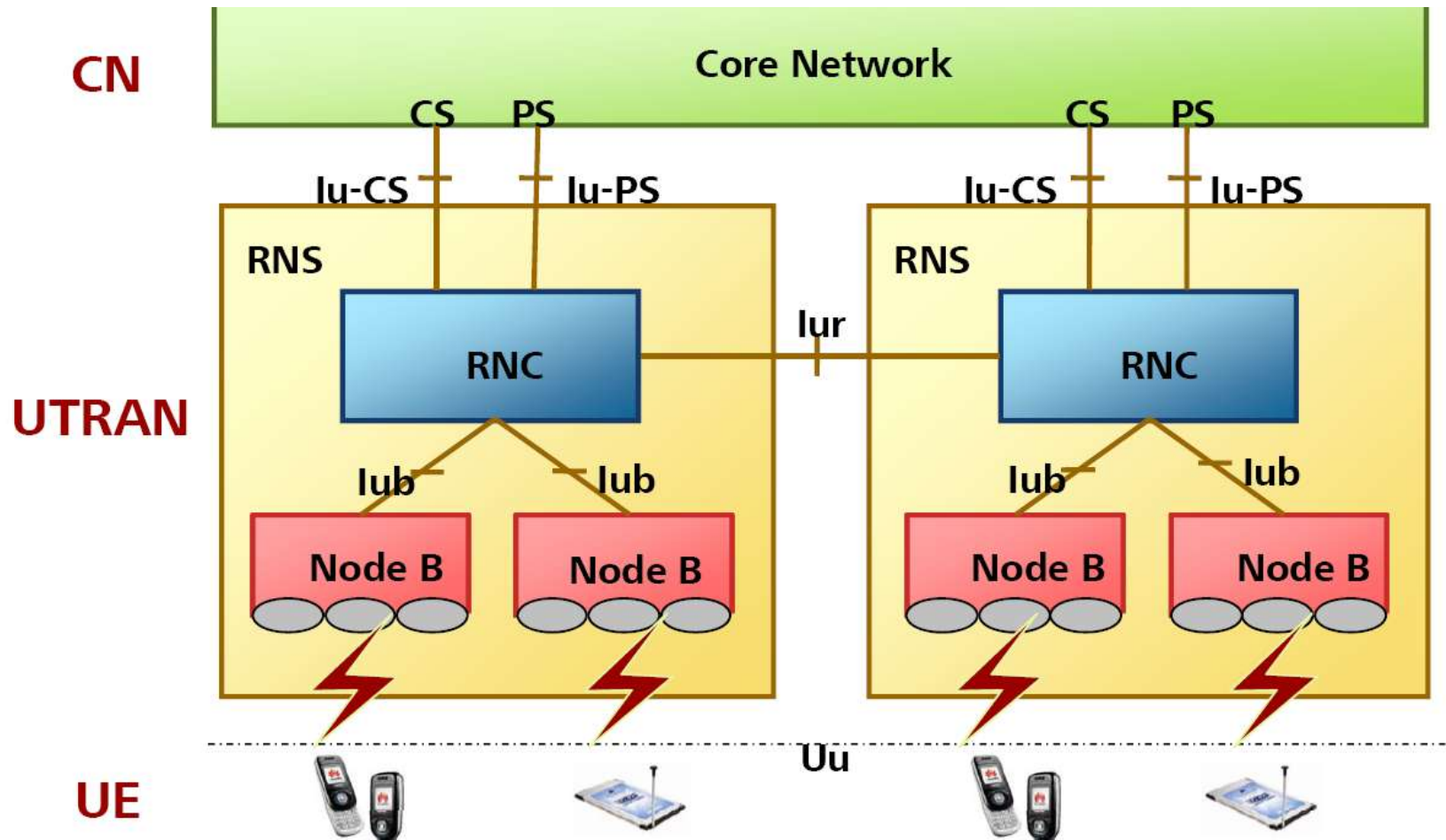


Migration from
UMTS to LTE

Main procedures

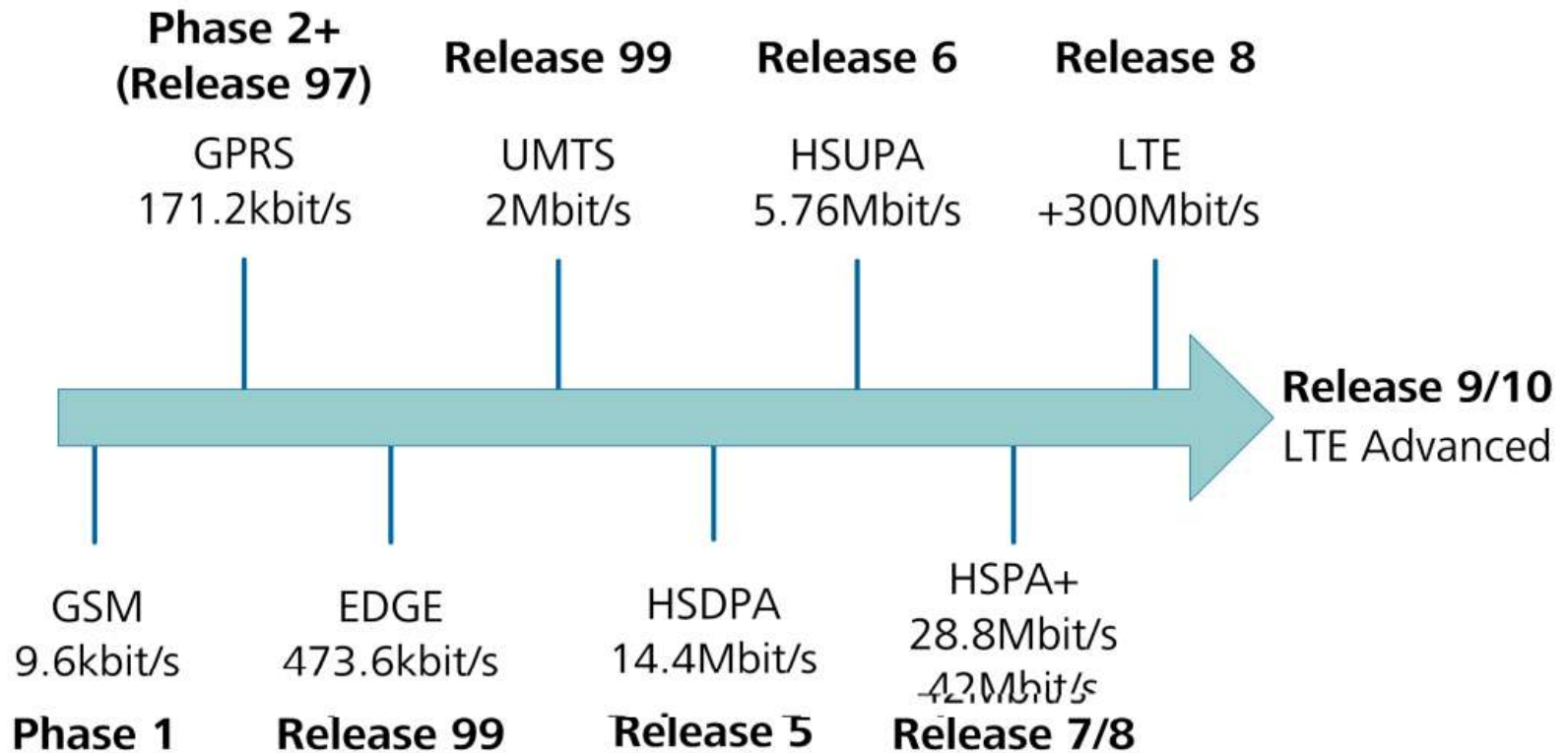
- **Background.**
- **Preparation.**
- **Challenges.**

3G network Architecture



3G network evolution

3GPP Evolution : Before LTE

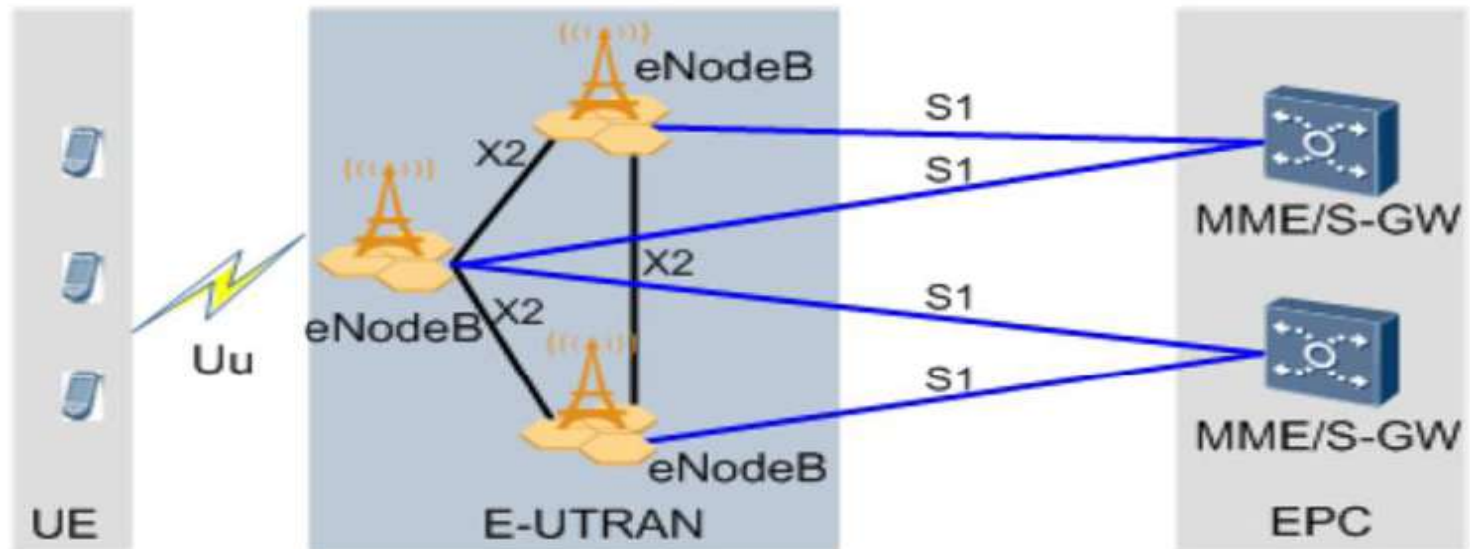


Why move towards LTE?

- 1. Support interaction multimedia services, teleconferencing wireless internet.
- 2. wider bandwidth, high bitrates.
- 3. Low cost.
- 4. Global mobility and service portability.
- 5. increase the smart phone users.
- 6. reduce the time lost from end to end services.
- 7. improvement over 3G networks.

4G network Architecture

eNodeB in LTE/SAE Network



- E-UTRAN: Evolved UMTS Terrestrial Radio Access Network
- EPC: Evolved Packet Core network
- MME: Mobility Management Entity
- S-GW: Server Gateway

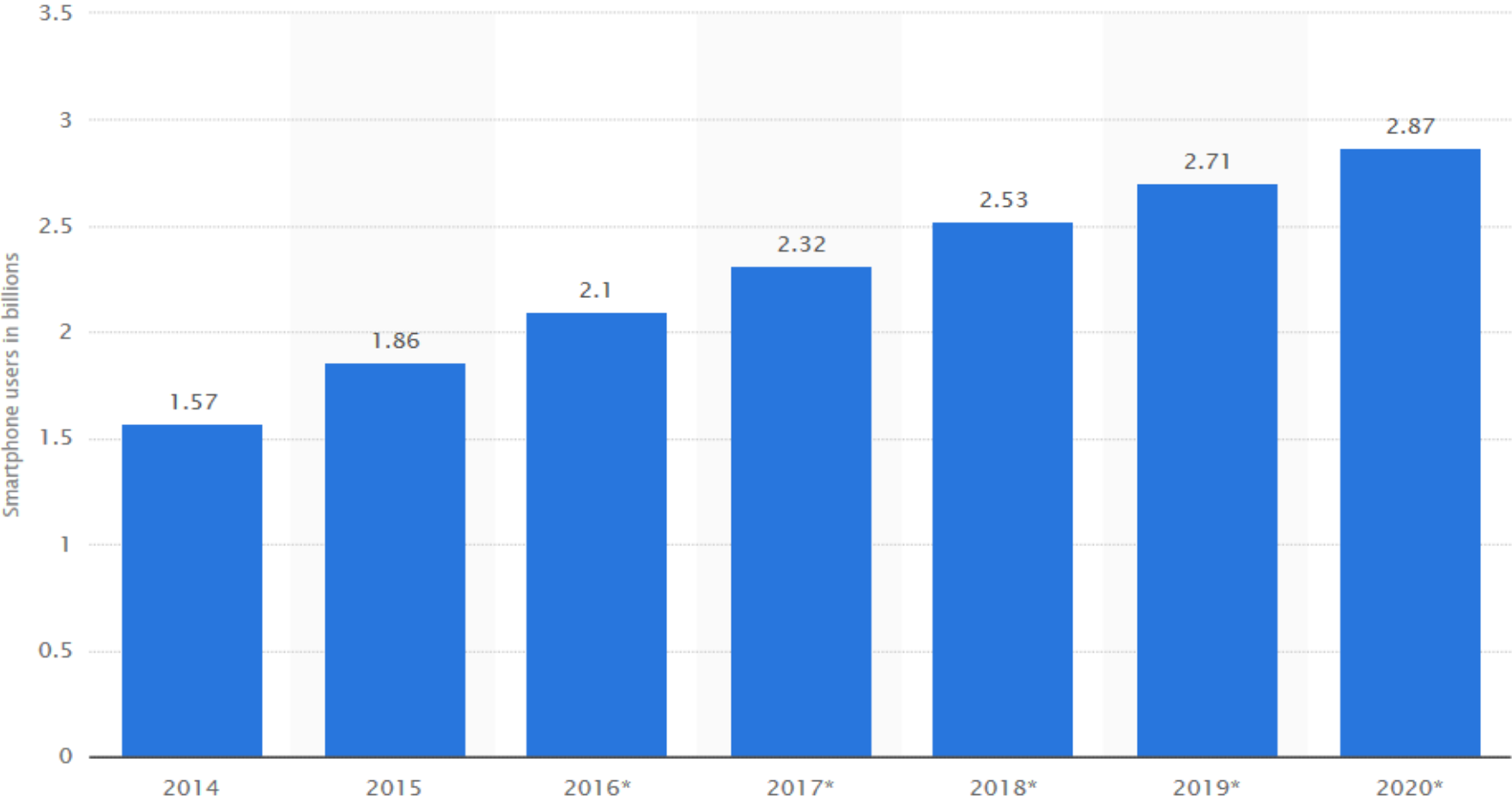
LTE technical objectives

LTE Requirements from ITU	LTE Technical Features from 3GPP
Flexible bandwidth	1.4MHz, 3MHz, 5MHz, 10Mhz, 15Mhz, 20MHz
Higher spectrum efficiency	DL: 5(bit/s)/Hz, 3~4 times than R6HSDPA UL: 2.5(bit/s)/Hz, 2~3 times than R6HSDPA
Higher peak throughput (@20MHz) DL:100Mbps, UL: 50Mbps	DL:100Mbps, UL: 50Mbps
Control plane:< 100ms, User plane: < 10ms	Control plane:< 100ms, User plane: < 10ms
Shall support stationary/pedestrian/vehicular/high speed vehicular	Shall support high speed vehicular(>350km/h) for 100kbps access service.
Support inter-system handover	Support interoperability between 3GPP existed and non-3GPP
VoIP Capacity	Remove CS domain, CS service realized in PS domain which can support multiple service, especially voice service (such as VoIP).
Decrease network evolution cost	Remove BSC/RNC
Reduce CAPEX and OPEX	SON

comparison

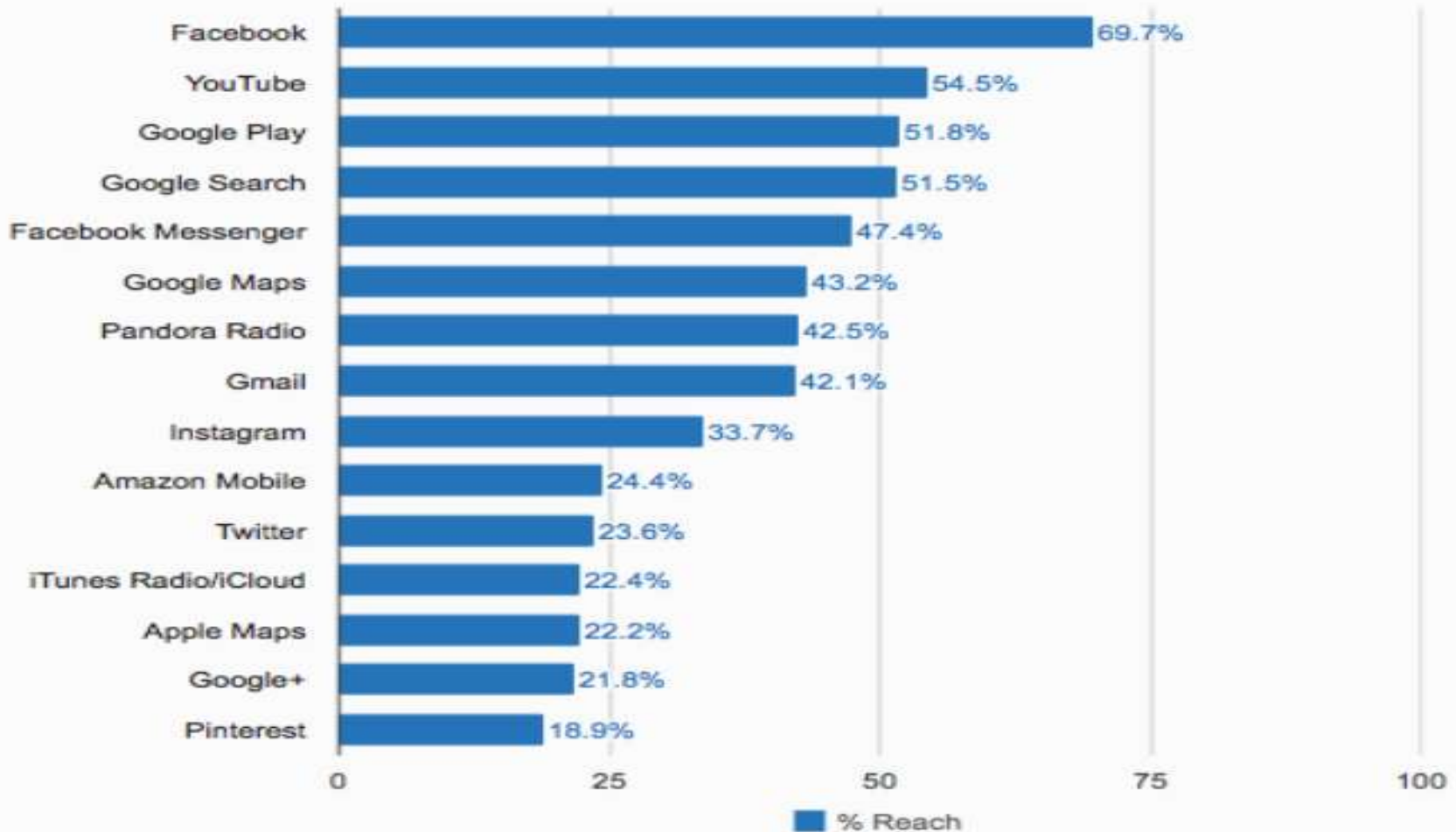
Technology	1G	2G	2.5G	3G	4G
Design Began	1970	1980	1985	1990	2000
Implementation	1984	1991	1999	2009	2012
Service	Analog synchronous voice, data to 9.6Kpbs	Digital voice, short messages	Higher capacity, packetized data	Higher capacity, broadband data up to 2Mbps	Higher capacity, completely IP. Oriented, multimedia, data to hundreds of megabits
Standards	AMPS, TACS, NMT, etc	TDMA, CDMA, GSM, PDC.	GPRS, EDGE	WCDMA, CDMA, 2000	Single standards
Bit rates	19Kpbs	14.4Kpbs	384Kpbs	2Mbps to 42Mbps	100Mbps to 300Mbps
Multiple access	FDMA	TDMA, CDMA	TDMA, CDMA	CDMA	OFDMA
Band width		200KHZ	200KHZ	5MHZ	20MHZ

Over the world smart phone penetration

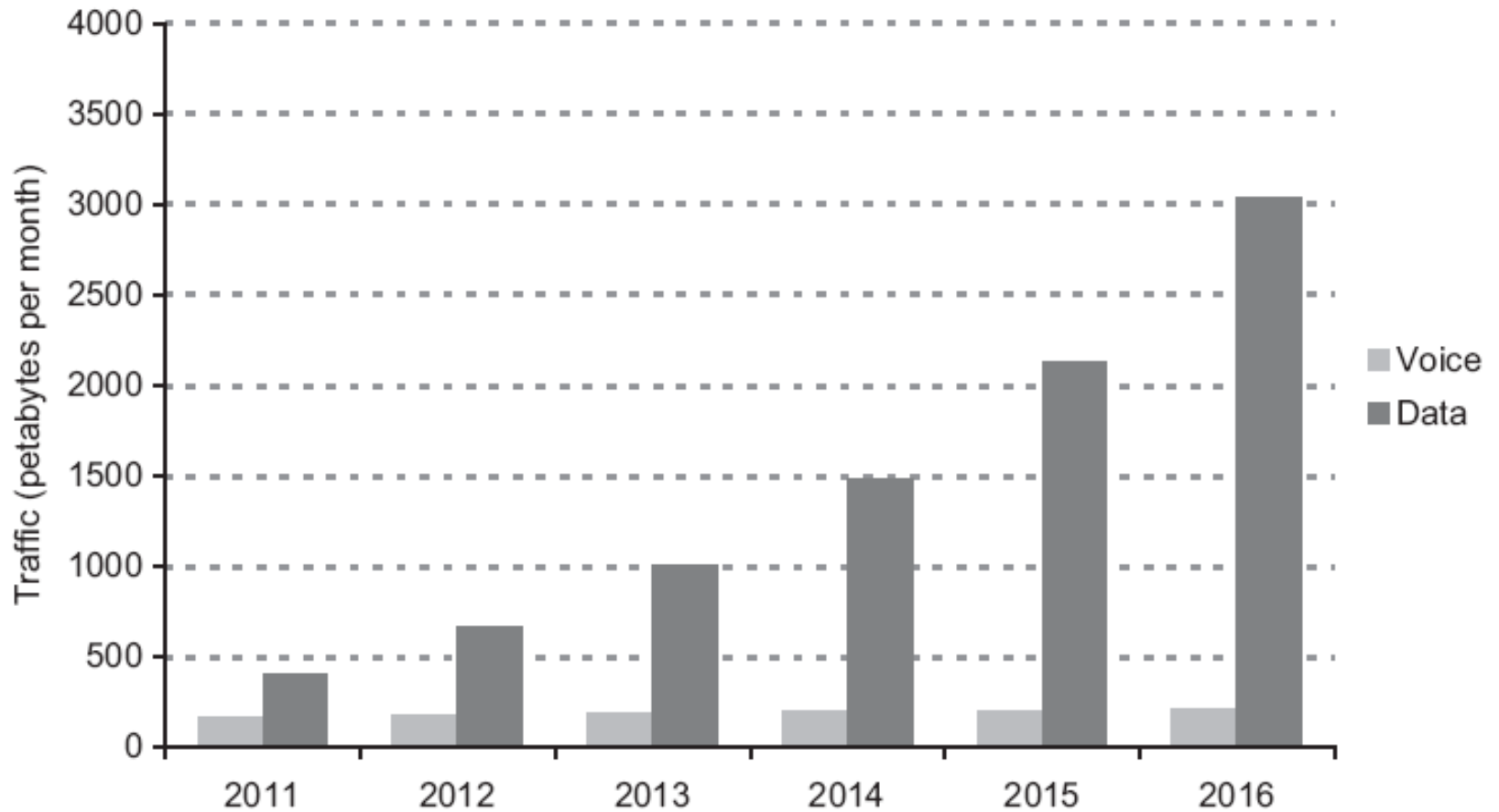


Smart phone application over the world

Top 15 Smartphone Apps



Voice and data worldwide mobile telecommunication network



preparation

Software preparation

Hardware preparation

Frequency preparation

License

Software preparation

- **Software Version:**

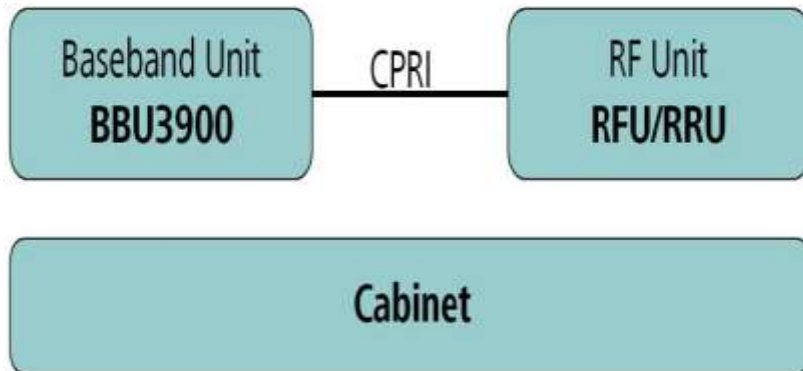
Our current version is **V100R010C10SPC160** for NodeBs, also this version support eNodeB (LTE).

Also need to download the LTE APP model.

Application Type	Application Version	Application Hot Patch Version	Software Version	Software Hot Patch Version
GBTS	V100R017C10SPC100	V100R017C10SPH101	BTS3900 V100R010C10SPC100	BTS3900 V100R010C10SPH101
NodeB	V200R017C10SPC000	V200R017C10SPH001	BTS3900 V100R010C10SPC000	BTS3900 V100R010C10SPH001
eNodeB	V100R010C10SPC000	V100R010C10SPH001	BTS3900 V100R010C10SPC000	BTS3900 V100R010C10SPH001

Hardware preparation

eNodeB Modules



Capacity Specification

Item	Specification
Maximum cells	<ul style="list-style-type: none"> ✓ 4 x 2 MIMO: 6 cells (1.4 MHz/3 MHz/5 MHz/10 MHz/15 MHz/20 MHz) ✓ 2 x 2 MIMO: 12 cells (1.4 MHz/3 MHz/5 MHz/10 MHz/15 MHz/20 MHz)
Maximum throughput per cell (20 MHz)	<ul style="list-style-type: none"> ✓ Downlink rate at the Media Access Control (MAC) layer: 150 Mbit/s ✓ Uplink rate at the MAC layer: 70 Mbit/s
Maximum throughput per eNodeB	<ul style="list-style-type: none"> ✓ Downlink and Uplink data rate at the MAC layer: 1500 Mbit/s
Maximum UEs in RRC_CONNECTED mode in an eNodeB	<ul style="list-style-type: none"> ✓ 3024 (bandwidth of 1.4 MHz) ✓ 6480 (bandwidth of 3 MHz) ✓ 10,800 (bandwidth of 5 MHz/10 MHz/15 MHz/20 MHz)
Maximum concurrent Data Radio Bearers (DRBs) per UE	8

Hardware preparation

- BBU3900 and 3910

2U Height, 8 slots



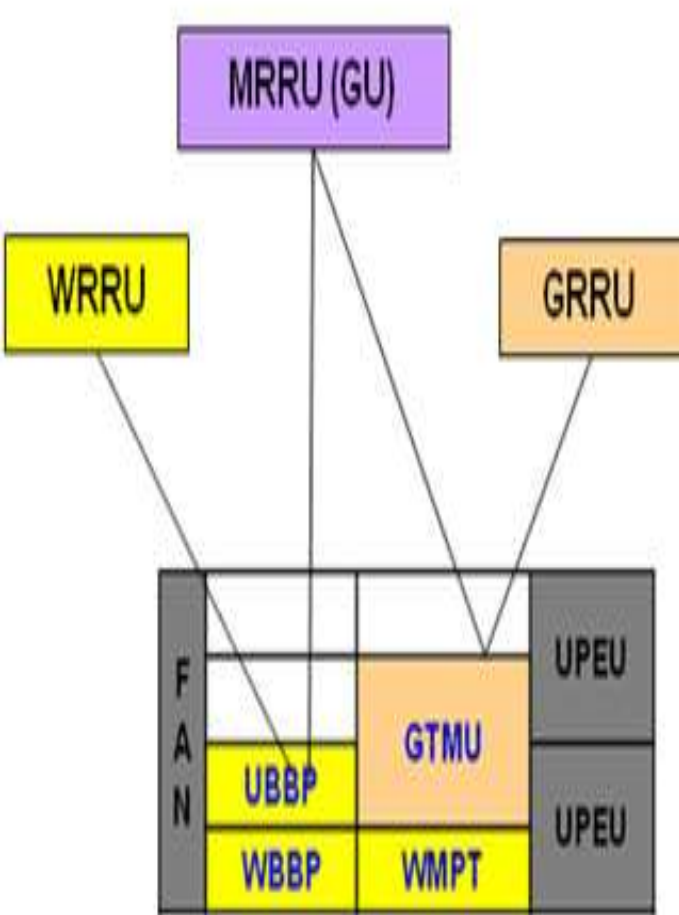
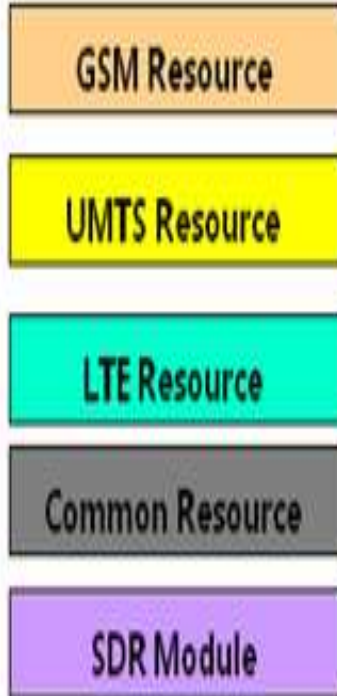
Specifications:

- GSM/UMTS/LTE,
- Weight: 7~12Kg
- Power supply: -48V DC or 220V AC
- Power consumption: 50W
- Temperature: -20°C ~ +55°C
- Abis: 4E1+ 2FE
- Capacity: 72 TRX, 6CPRI,
24 UMTS cells, UL/DL 1536CE

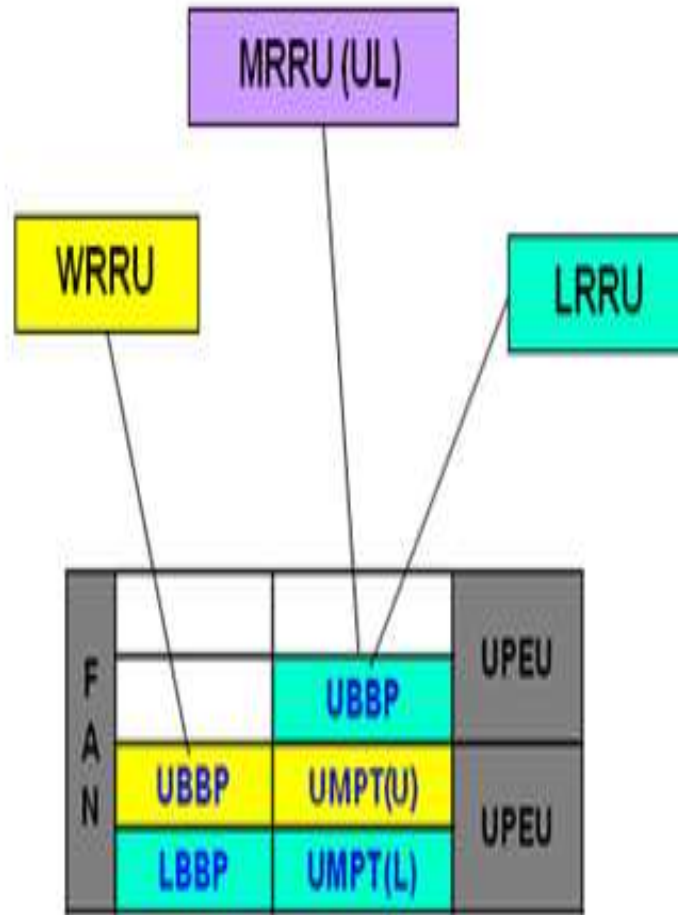
For GSM, just need GTMU (GBTS Main Processing & Transmission Unit)

Hardware preparation

Legend:

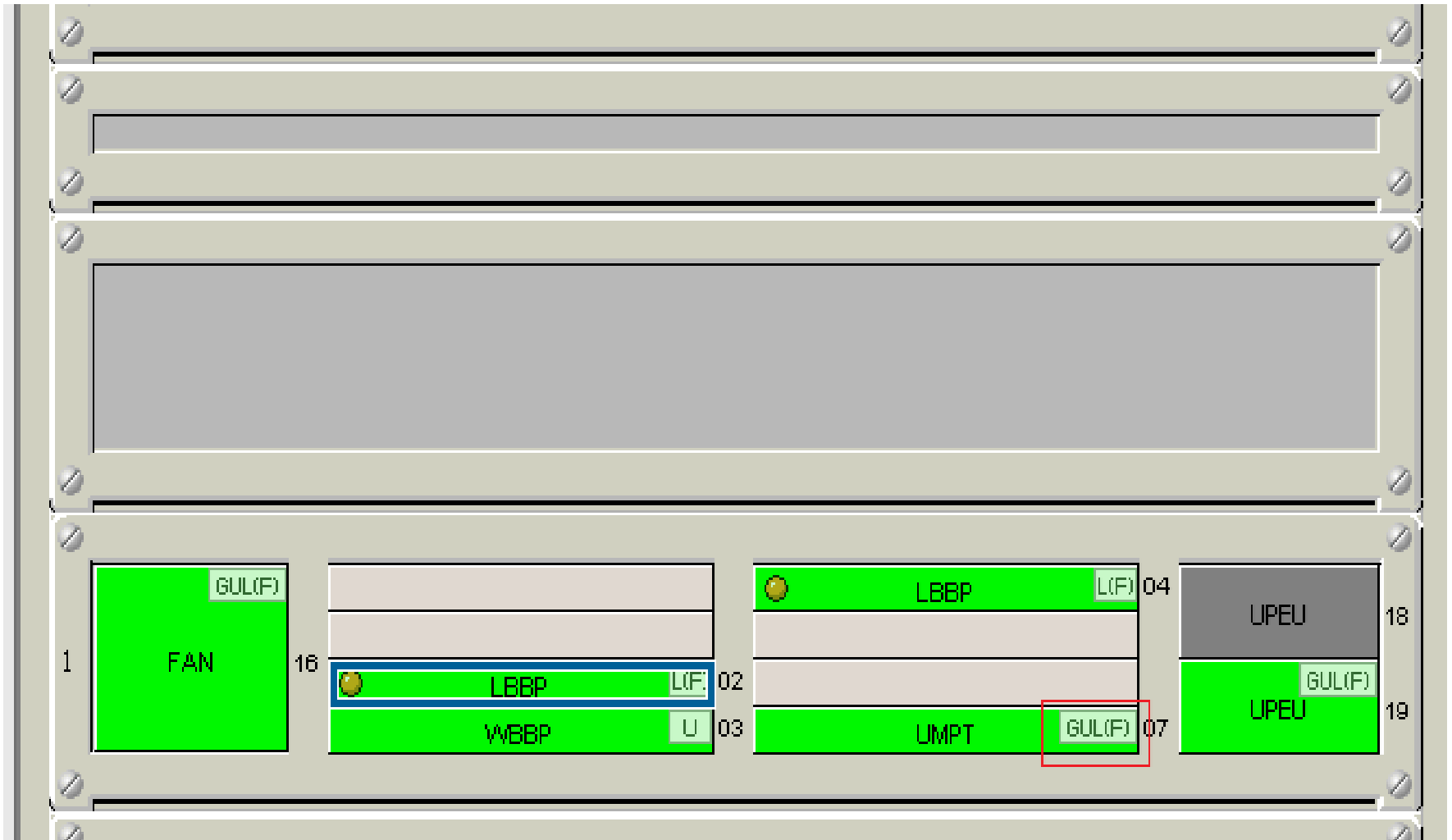


Separate-MPT G&U

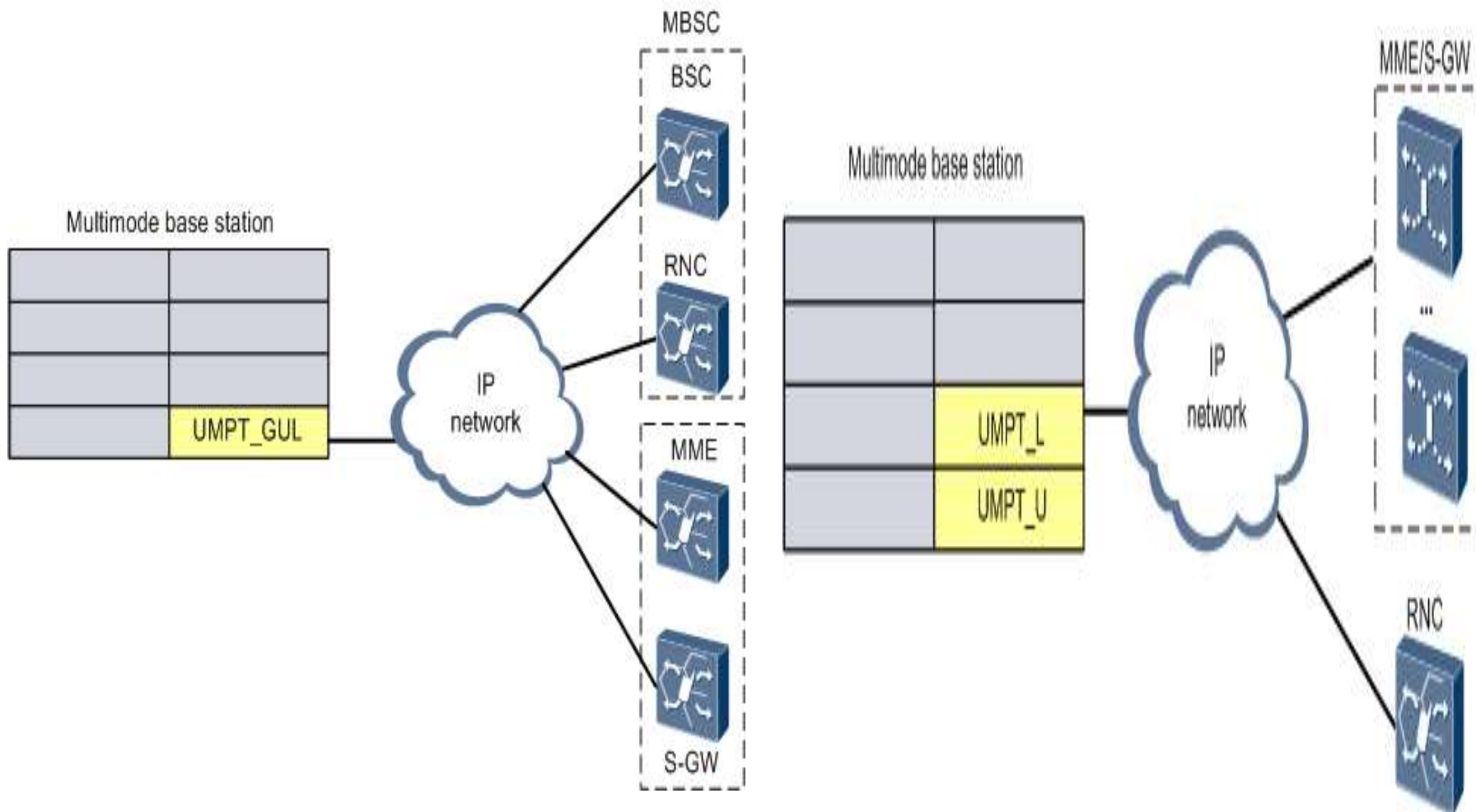


Separate-MPT U&L

Hardware preparation

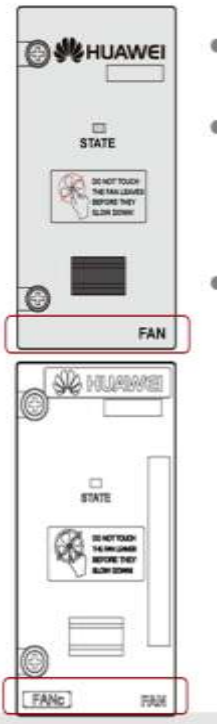


Hardware preparation

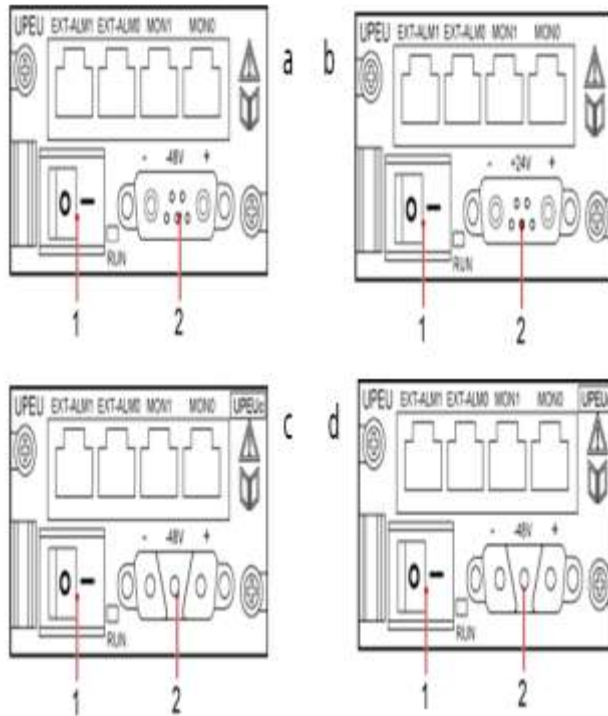


Hardware preparation

FAN



UPEU



UPEU Board Specification:

- UPEUa: The output power of a UPEUa is 300 W. 1+1 backup
- UPEUc: The output power of a UPEUc is 360 W, and the output power of two UPEUc boards is 650 W. 1+1 backup
- UPEUa+UPEUc: The total output power of a UPEUa and a UPEUc is 360 W. -
- UPEUd: The output power of a UPEUd is 650 W. 1+1 backup

Hardware preparation

Types	RRU Name	TX/RX	FRE. Band	Output Power	G/U/L
RRU	RRU3808	2T2R	2.1G/AWS	2*40W	UMTS, LTE FDD, and UL
	RRU3821E	2T2R	1800M	2*5W	UMTS, LTE FDD, and UL
	RRU3832	2T4R	2.1G/AWS	2*60W	UMTS, LTE FDD, and UL
	RRU3201	2T2R	700M/2.6G	2*40W	LTE FDD
	RRU3203	2T2R	700M	2*40W	LTE FDD
	RRU3220	2T2R	800M	2*40W	LTE FDD
	RRU3221	2T2R	2.6G	2*40W	LTE FDD
	RRU3222	2T2R	800M	2*40W	LTE FDD
	RRU3229	2T2R	2.6G	2*60W	LTE FDD
	RRU3240	2T4R	2.6G	2*40W	LTE FDD
	RRU3260	2T4R	2.6G	2*40W	LTE FDD
	RRU3268	2T2R	700M/800M/2.6G	2*40W	LTE FDD
	RRU3628	2T2R	2.1G	2*40W	LTE FDD
	RRU3632	2T4R	2.1G	2*60W	LTE FDD
	RRU3638	2T2R	2.1G	2*40W	LTE FDD
	RRU3642	2T4R	800M	2*40W	LTE FDD
	RRU3841	4T4R	AWS	4*30W	LTE FDD
	RRU3908	2T2R	1.8G/900M	2*40W	GSM, UMTS, LTE FDD, GU, and GL
	RRU3926	1T2R	900M/1.8G	1*80W	GSM, UMTS, LTE FDD, GU, and GL
	RRU3928	2T2R	900M/1.8G	2*40W	GSM, UMTS, LTE FDD, GU, and GL
	RRU3929	2T2R	900M/1.8G	2*60W	GSM, UMTS, LTE FDD, GU, and GL
	RRU3936	1T2R	900M/1.8G	1*80W	GSM, UMTS, LTE FDD, GU, and GL
	RRU3938	2T2R	900M/1.8G	2*40W	GSM, UMTS, LTE FDD, GU, and GL
	RRU3939	2T2R	1800M	2*60W	GSM, LTE FDD, and GL
RRU3942	2T4R	900M/1.8G	2*60W	GSM, UMTS, LTE FDD, GU, GL, GUL, and UL	
RRU3961	2T2R	800M/900M	2*40W	GSM, UMTS, LTE FDD, GU, GL, UL, and GUL	

Hardware preparation

Speedy

- Small volume light weight, easy to move (12L/14KG)
- Complete install about 5 minutes, expand quickly.

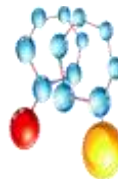


Succinctly

- Make up of a BOX, easy to gain the station.
- The volume of 3 RRU is 36L, reduce the volume of the station.

Independence

- Every frequency band install independence, easy to net plan
- Every RRU maintenance independence

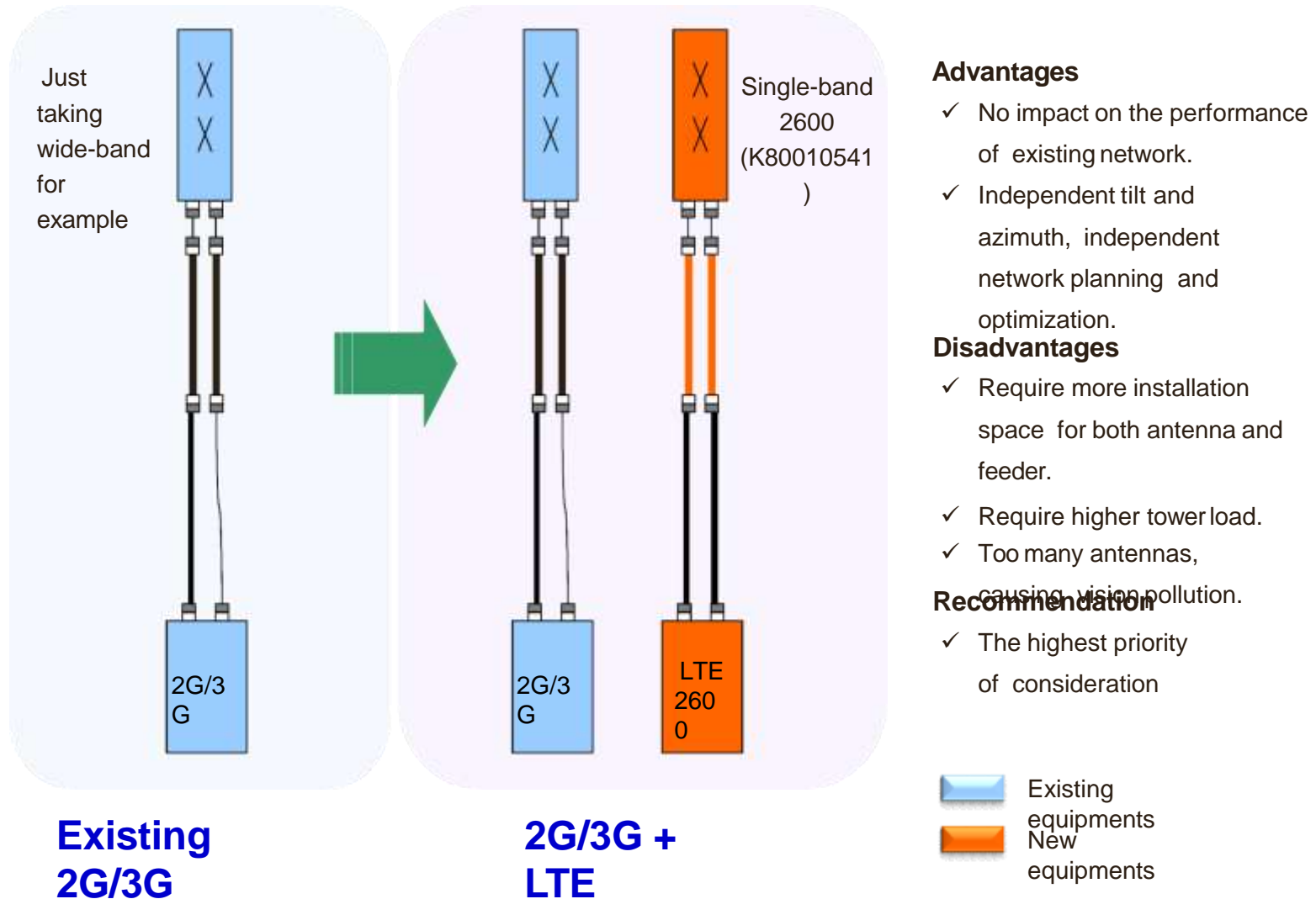


Agility

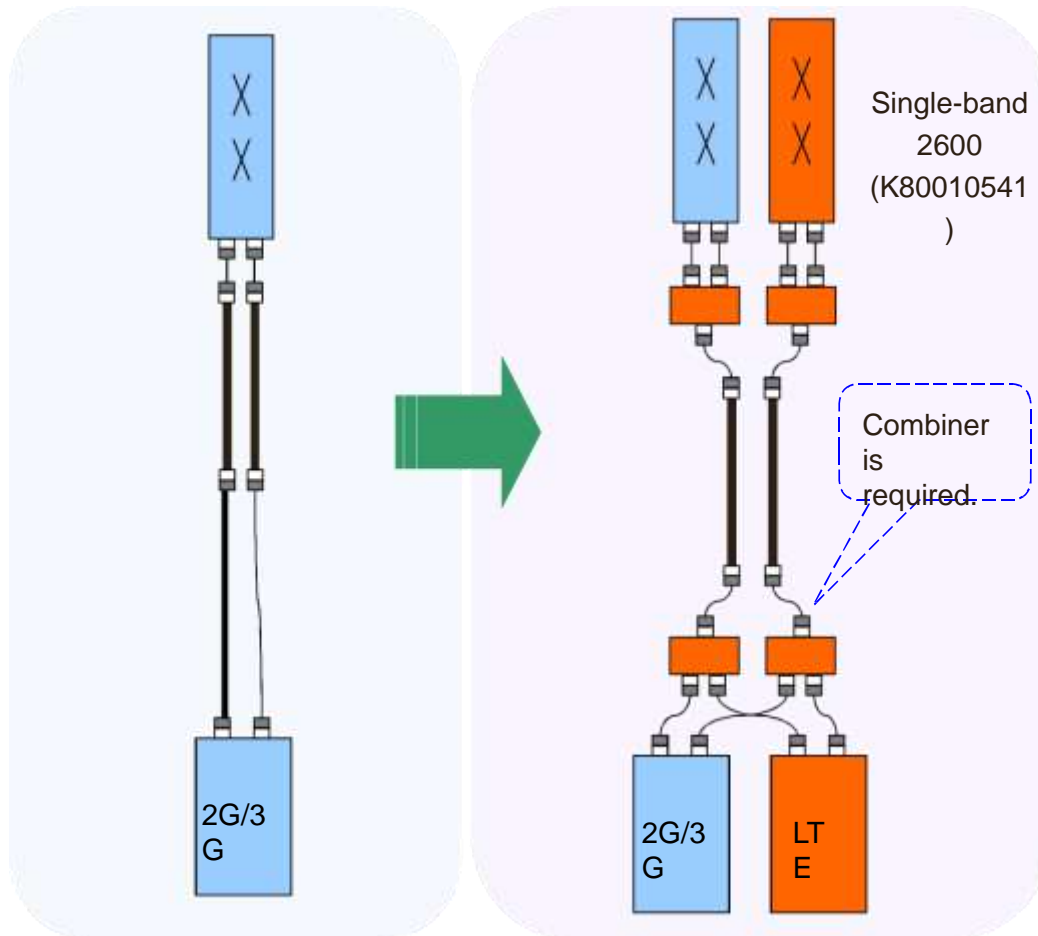
- Multiple frequency band(900M, 1800M, 2.1G,2.6G and so on)
- Reduce spare part, easy to import the new frequency band.



Hardware preparation



Hardware preparation



Existing 2G/3G

2G/3G + LTE

Advantages



- ✓ Reusing existing feeder, no need additional space for new feeder.
- ✓ Independent tilt and azimuth, independent network planning and optimization.
- ✓ Require more antenna

Disadvantages

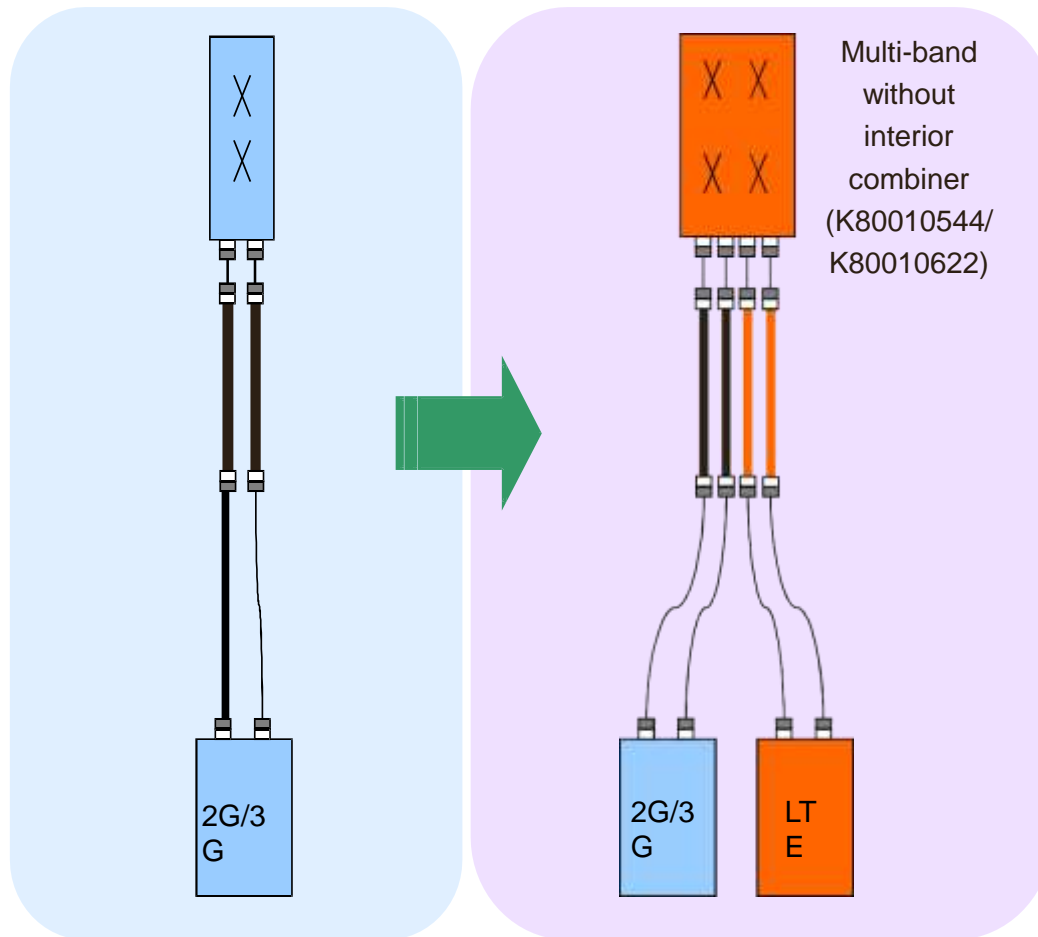
- ✓ Require more space and higher tower load.
- ✓ Additional diplexer cost.
- ✓ Additional diplexer loss, negative impact on existing network

Recommendation

- ✓ To mandatorily use combiners, causing signal pollution.
- ✓ applicable to impossible additional feeder

-  Existing equipments
-  New equipments

Hardware preparation



**Existing
2G/3G**

**2G/3G +
LTE**

Advantages

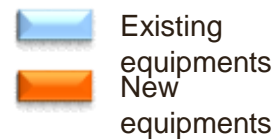
- ✓ No need additional space for new antenna.
- ✓ No or Small impact on performance of existing network

Disadvantages

- ✓ Require more feeder installation space.
- ✓ Replacing new antenna.
- ✓ Independent tilt but same azimuth, partly independent network planning and optimization.

Recommendation

- ✓ New antenna should keep same beam width and gain for existing network.

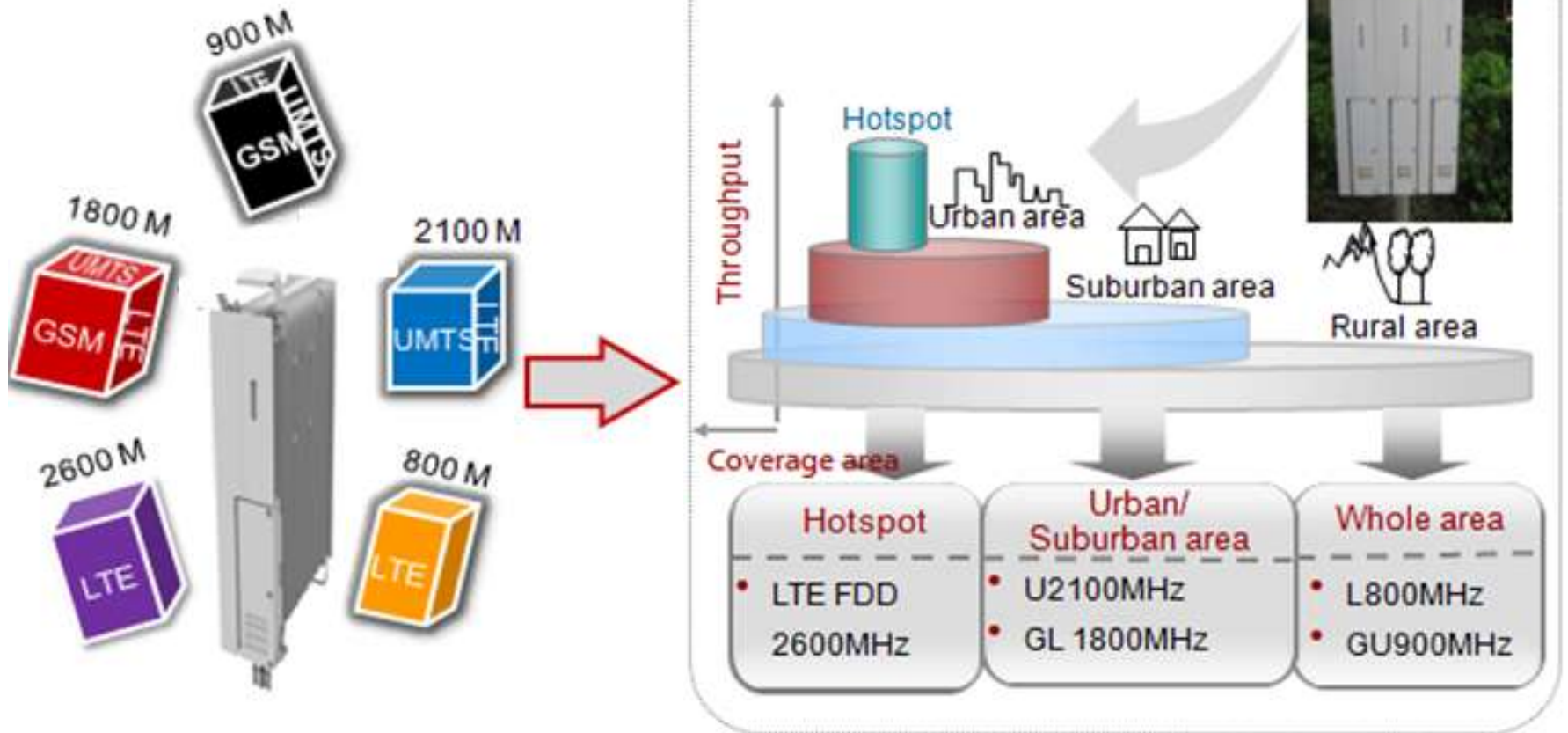


Frequency preparation

LTE Release 9 FDD/TDD Frequency Band

E-UTRA Operating Band	Downlink			Uplink			Duplex
	FDL_low [MHz]	N _{Offs-DL}	Rang of N _{DL}	F _{UL_low} [MHz]	N _{Offs-UL}	Range of N _{UL}	
1	2110	0	0 – 599	1920	18000	18000 – 18599	FDD
2	1930	600	600 – 1199	1850	18600	18600 – 19199	FDD
3	1805	1200	1200 – 1949	1710	19200	19200 – 19949	FDD
4	2110	1950	1950 – 2399	1710	19950	19950 – 20399	FDD
5	869	2400	2400 – 2649	824	20400	20400 – 20649	FDD
6	875	2650	2650 – 2749	830	20650	20650 – 20749	FDD
7	2620	2750	2750 – 3449	2500	20750	20750 – 21449	FDD
8	925	3450	3450 – 3799	880	21450	21450 – 21799	FDD
9	1844.9	3800	3800 – 4149	1749.9	21800	21800 – 22149	FDD
10	2110	4150	4150 – 4749	1710	22150	22150 – 22749	FDD
11	1475.9	4750	4750 – 4949	1427.9	22750	22750 – 22949	FDD
12	729	5010	5010 – 5179	699	23010	23010 – 23179	FDD
13	746	5180	5180 – 5279	777	23180	23180 – 23279	FDD
14	758	5280	5280 – 5379	788	23280	23280 – 23379	FDD
...							FDD
17	734	5730	5730 – 5849	704	23730	23730 – 23849	FDD
18	860	5850	5850 – 5999	815	23850	23850 – 23999	FDD
19	875	6000	6000 – 6149	830	24000	24000 – 24149	FDD
20	791	6150	6150 - 6449	832	24150	24150 - 24449	FDD
21	1495.9	6450	6450 – 6599	1447.9	24450	24450 – 24599	FDD
...							
33	1900	36000	36000 – 36199	1900	36000	36000 – 36199	TDD
34	2010	36200	36200 – 36349	2010	36200	36200 – 36349	TDD
35	1850	36350	36350 – 36949	1850	36350	36350 – 36949	TDD
36	1930	36950	36950 – 37549	1930	36950	36950 – 37549	TDD
37	1910	37550	37550 – 37749	1910	37550	37550 – 37749	TDD
38	2570	37750	37750 – 38249	2570	37750	37750 – 38249	TDD
39	1880	38250	38250 – 38649	1880	38250	38250 – 38649	TDD
40	2300	38650	38650 – 39649	2300	38650	38650 – 39649	TDD

Frequency preparation



License

```
graph TD; License[License] --> GovernmentLicense[Government License]; License --> LTELicense["LTE License(wireless)"];
```

Government License

- Approve from the Governments to get for LTE license and which freq. Will be lunch.
- We will go on to apply 2600MHZ for lunching new LTE technology.

LTE License(wireless)

- 1. eNodeB license: every eNodeB have separate license that need generate with the BBU serial no.
- 2. number of connected users.
- 3. cell band width.
- 4. Max cell throughput.

Challenges

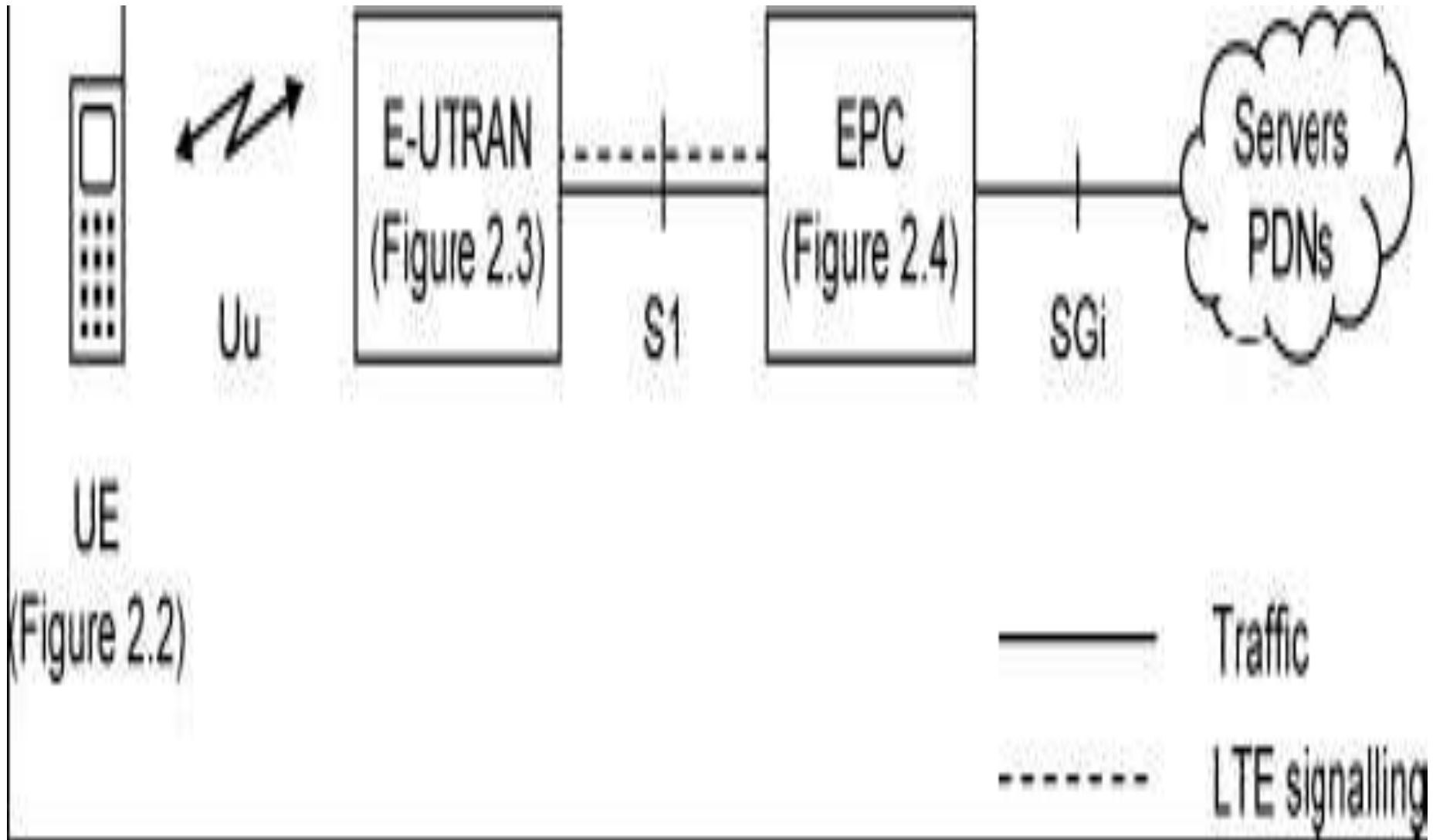
Mobile Station
(Multimode user
terminal)

network Radio
design and
deployment

Network
infrastructures.

LTE voice solution

UE is one part for high LTE level architectures of LTE



LTE UE category

UE Category	Maximum number of DL-SCH transport block bits received within a TTI (Note 1)	Maximum number of bits of a DL-SCH transport block received within a TTI	Total number of soft channel bits	Maximum number of supported layers for spatial multiplexing in DL
Category 1	10296	10296	250368	1
Category 2	51024	51024	1237248	2
Category 3	102048	75376	1237248	2
Category 4	150752	75376	1827072	2
Category 5	299552	149776	3667200	4
Category 6	301504	149776 (4 layers, 64QAM)	3654144	2 or 4
		75376 (2 layers, 64QAM)		
Category 7	301504	149776 (4 layers, 64QAM)	3654144	2 or 4
		75376 (2 layers, 64QAM)		
Category 8	2998560	299856	35982720	8
Category 9	452256	149776 (4 layers, 64QAM)	5481216	2 or 4
		75376 (2 layers, 64QAM)		

Network Radio design and deployment



Item	Parameter	Value	Unit
Max. Antenna	Power	30W	W
Channel Model	ITU-M		
Cellular Model	3GPP		
Channel Bandwidth	5MHz		MHz
Antenna Configuration	Vertical		
Antenna Height	30m		m
Antenna Azimuth	0		deg
Antenna Tilt	0		deg
Antenna Beamwidth	120		deg
Antenna Gain	15		dBi
Antenna Model	Omni		
Antenna Type	Omni		
Antenna Color	Blue		
Antenna Size	100		cm
Antenna Weight	100		kg
Antenna Power	30		W
Antenna Frequency	2100		MHz
Antenna Bandwidth	5		MHz
Antenna Gain	15		dBi
Antenna Model	Omni		
Antenna Type	Omni		
Antenna Color	Blue		
Antenna Size	100		cm
Antenna Weight	100		kg

Dimensioning

Inputs: Coverage, Capacity & Service Requirement

Outputs: eNodeB coverage radius and site numbers based on capacity calculation



Preplanning



Inputs: Calculated coverage radius, digital map and subscriber distribution information

Outputs: Preliminary eNodeB numbers



Detailed

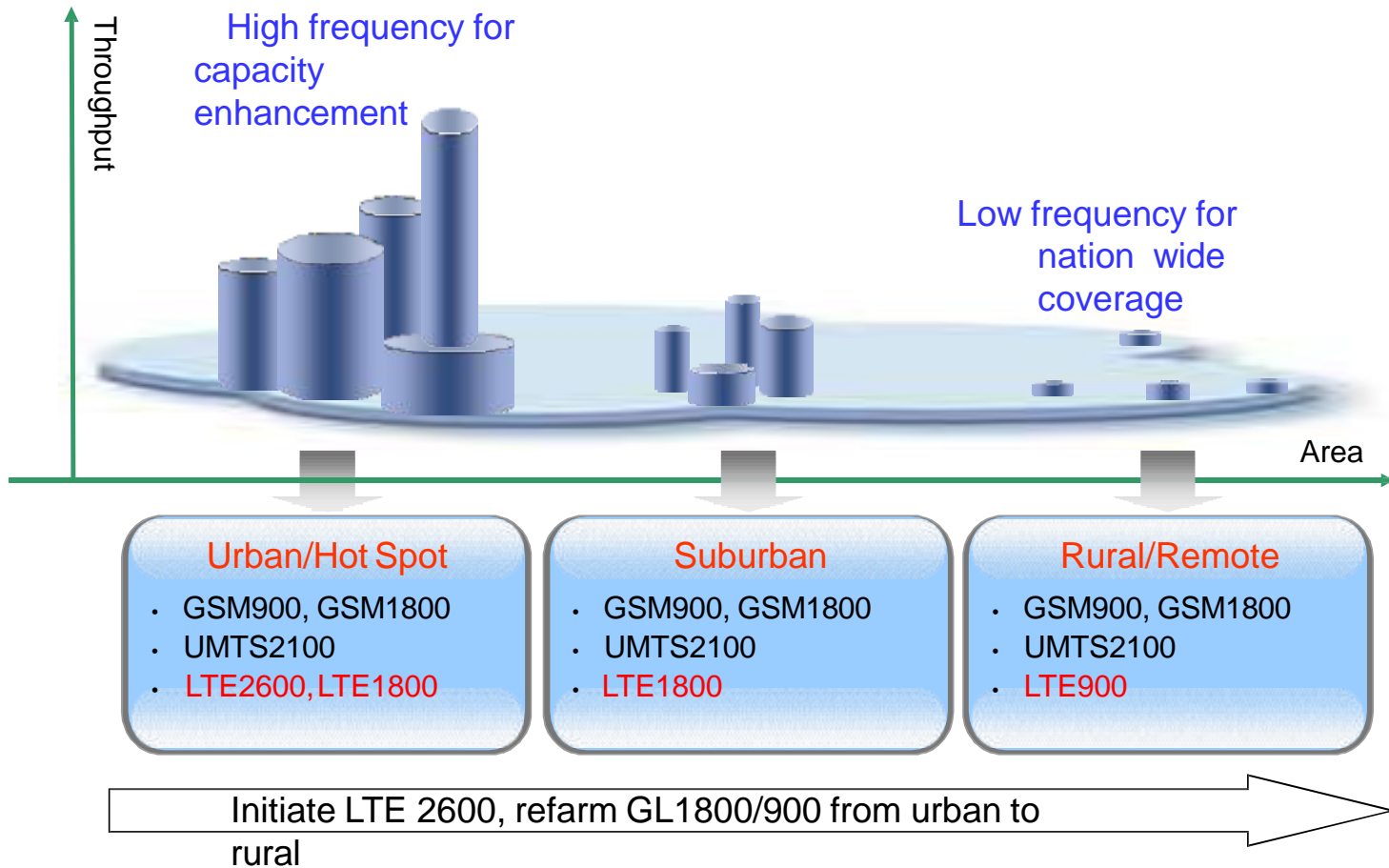


Inputs: Coverage target and site survey result

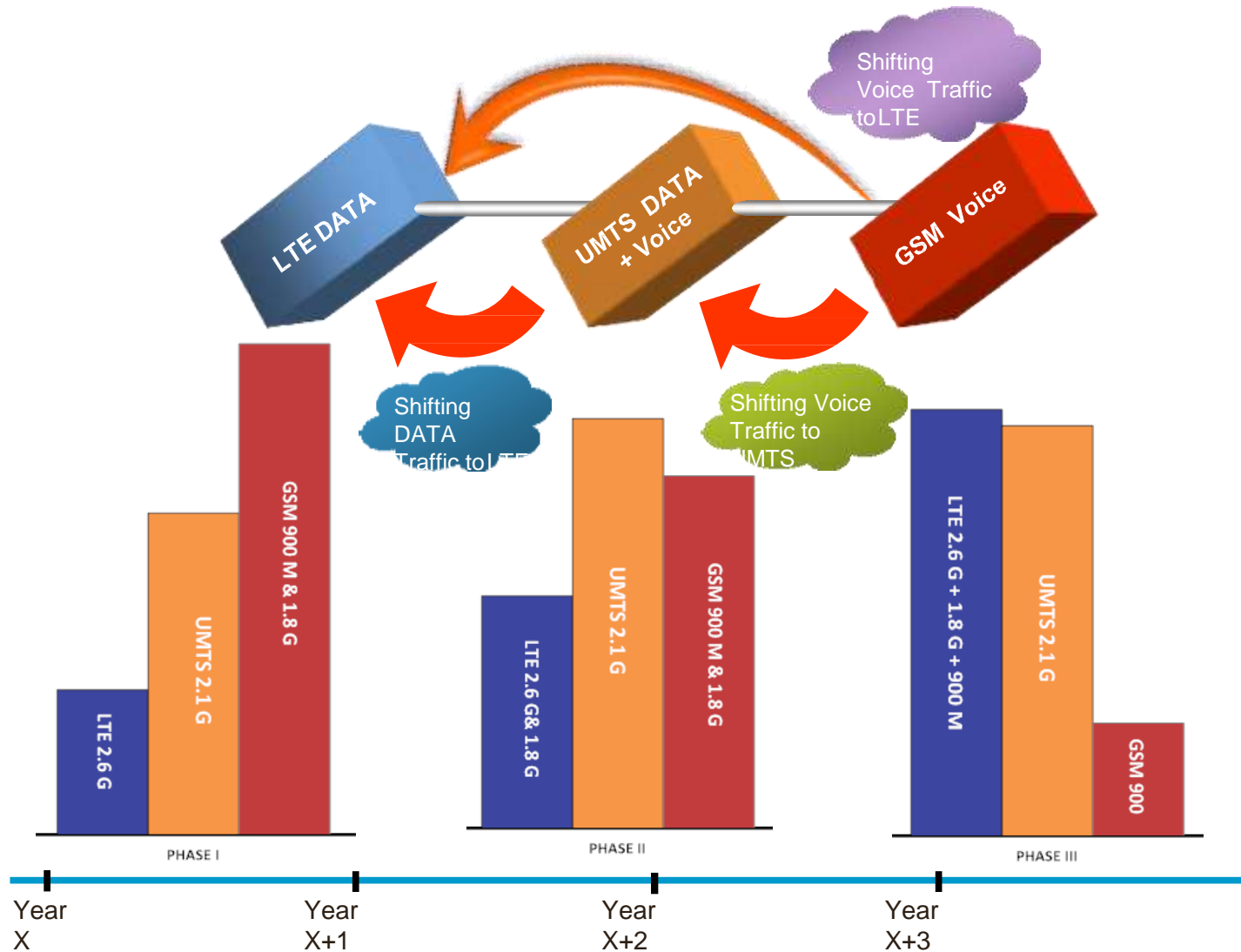
Outputs: Actual site location and engineering parameters



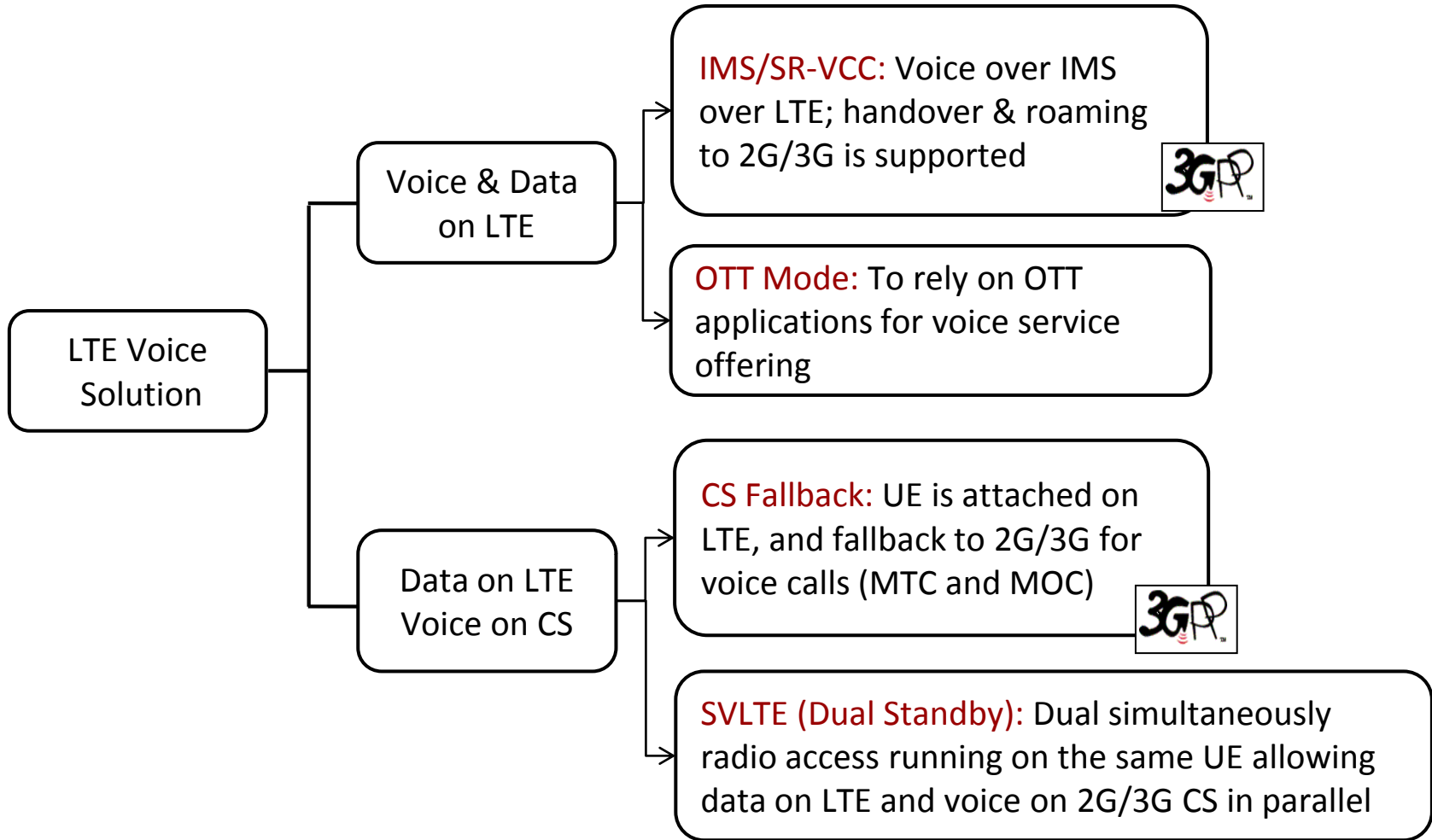
Network radio design and deployment



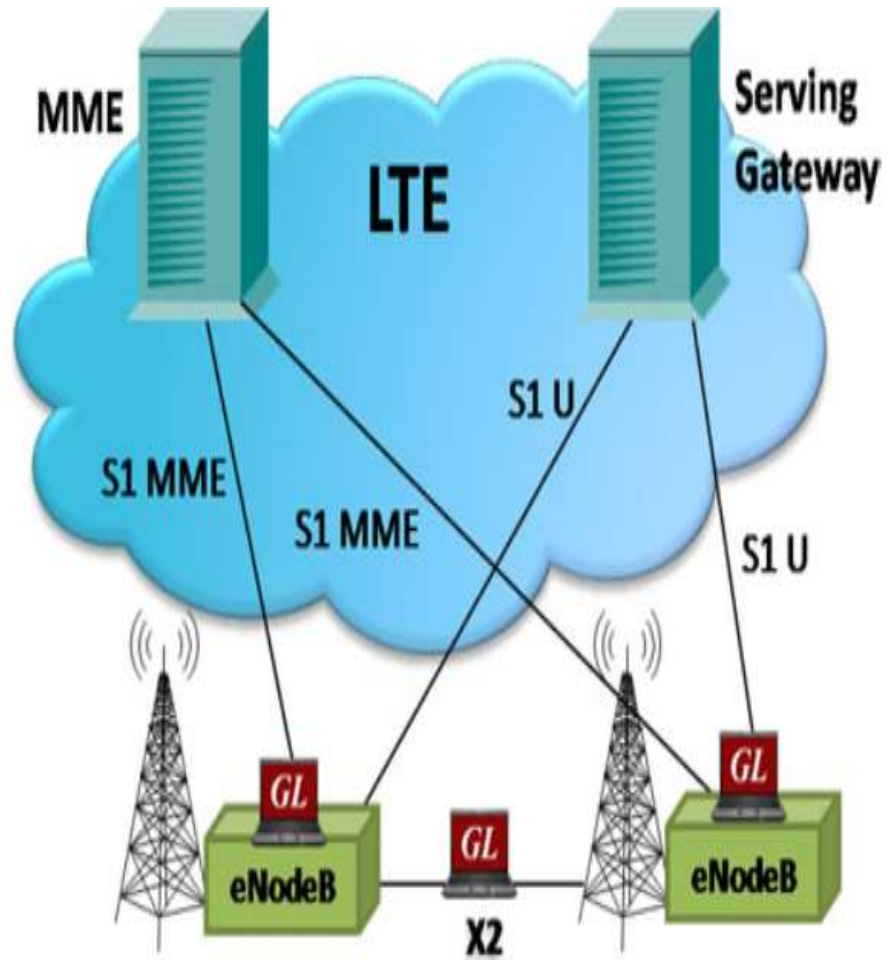
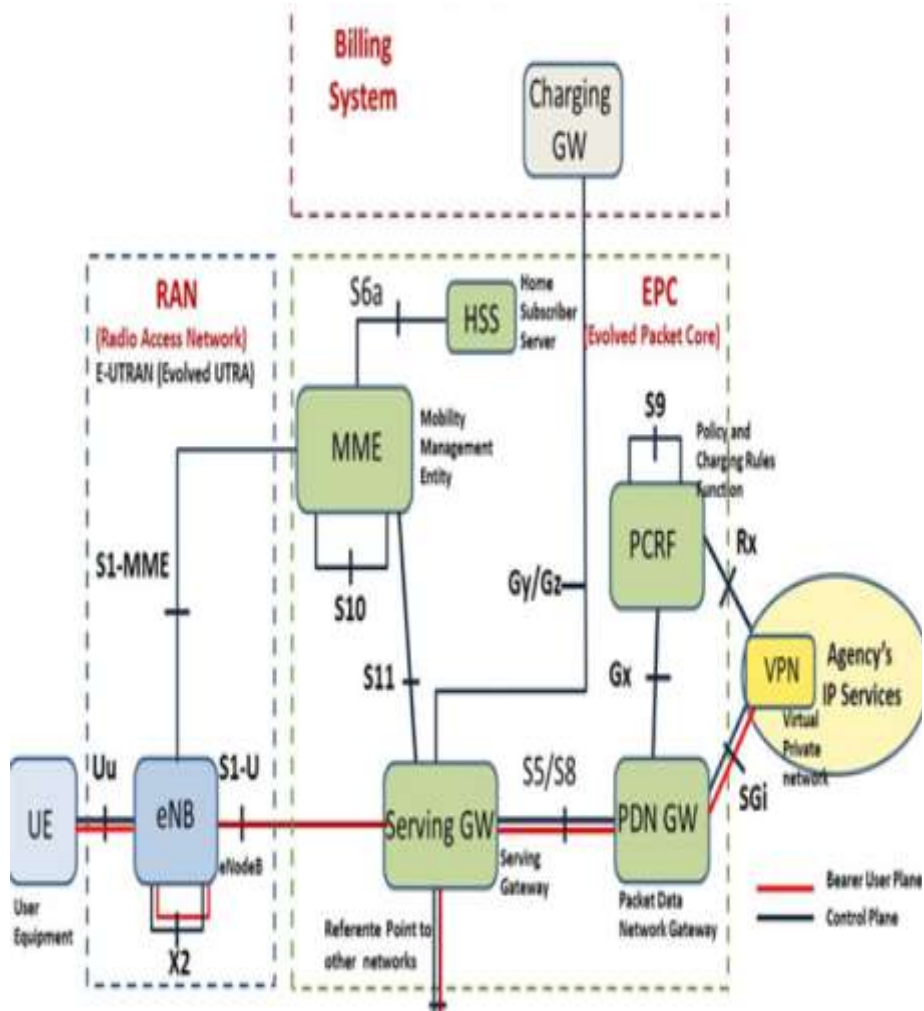
Network radio design and deployment



LTE voice solution



Network infrastructure



Thank You

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