



3GPP LTE & 3GPP2 LTE STANDARDIZATION

KRnet 2006, June 27-28, 2006

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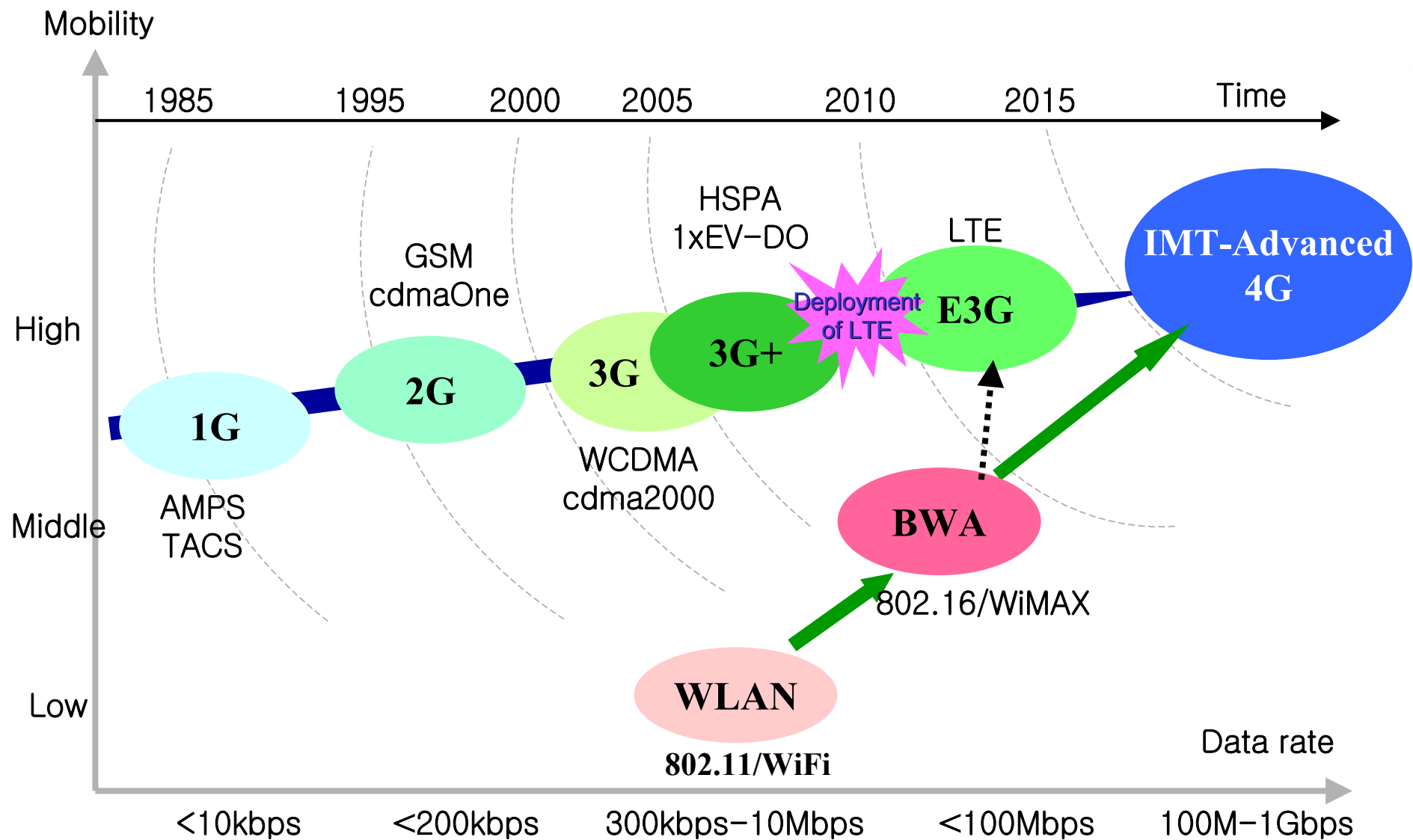
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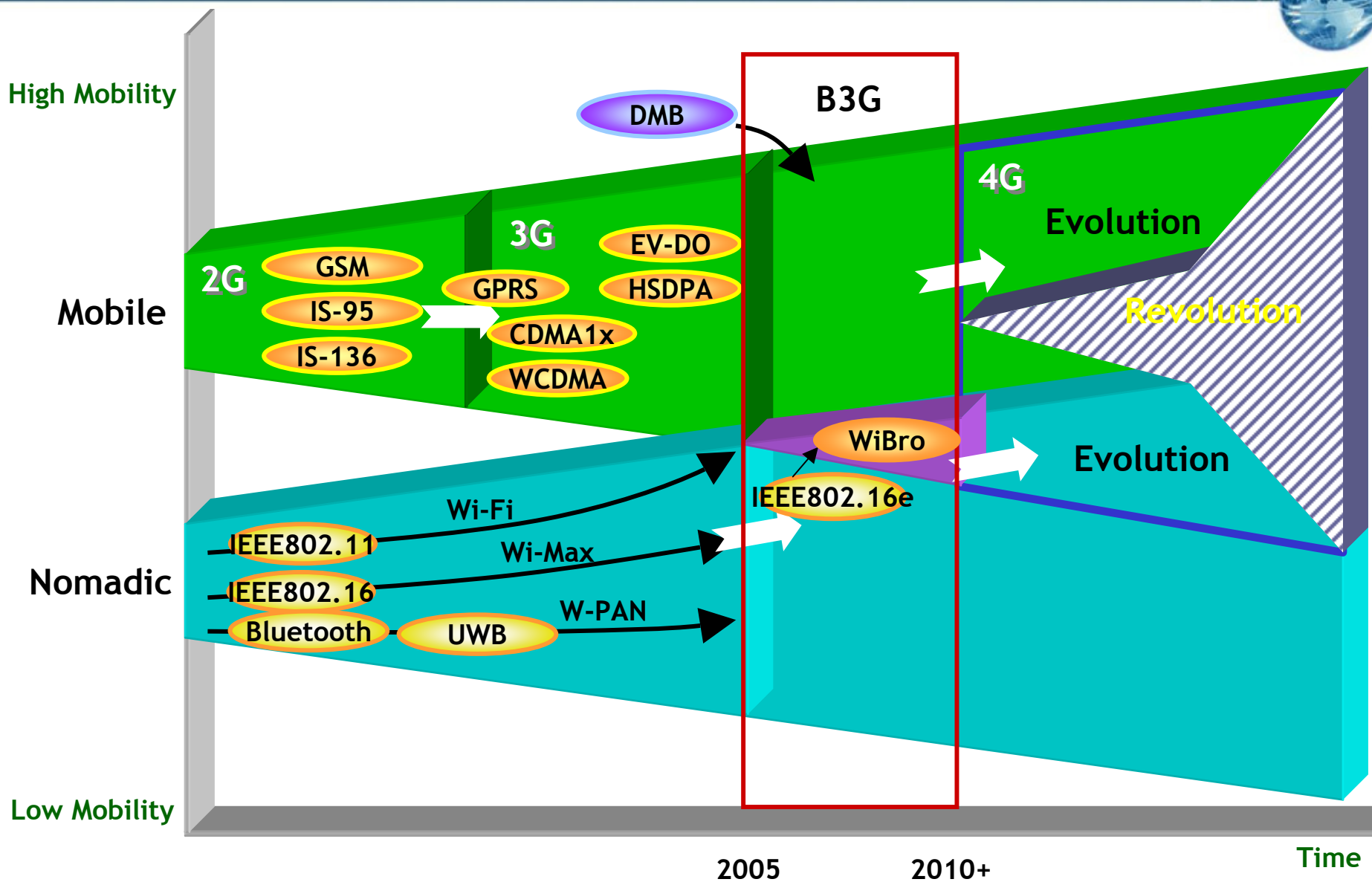


- Mobile Communication Roadmap
- 3GPP Long Term Evolution
- 3GPP2 Long Term Evolution
- IMT-Advanced

Mobile Communication Roadmap



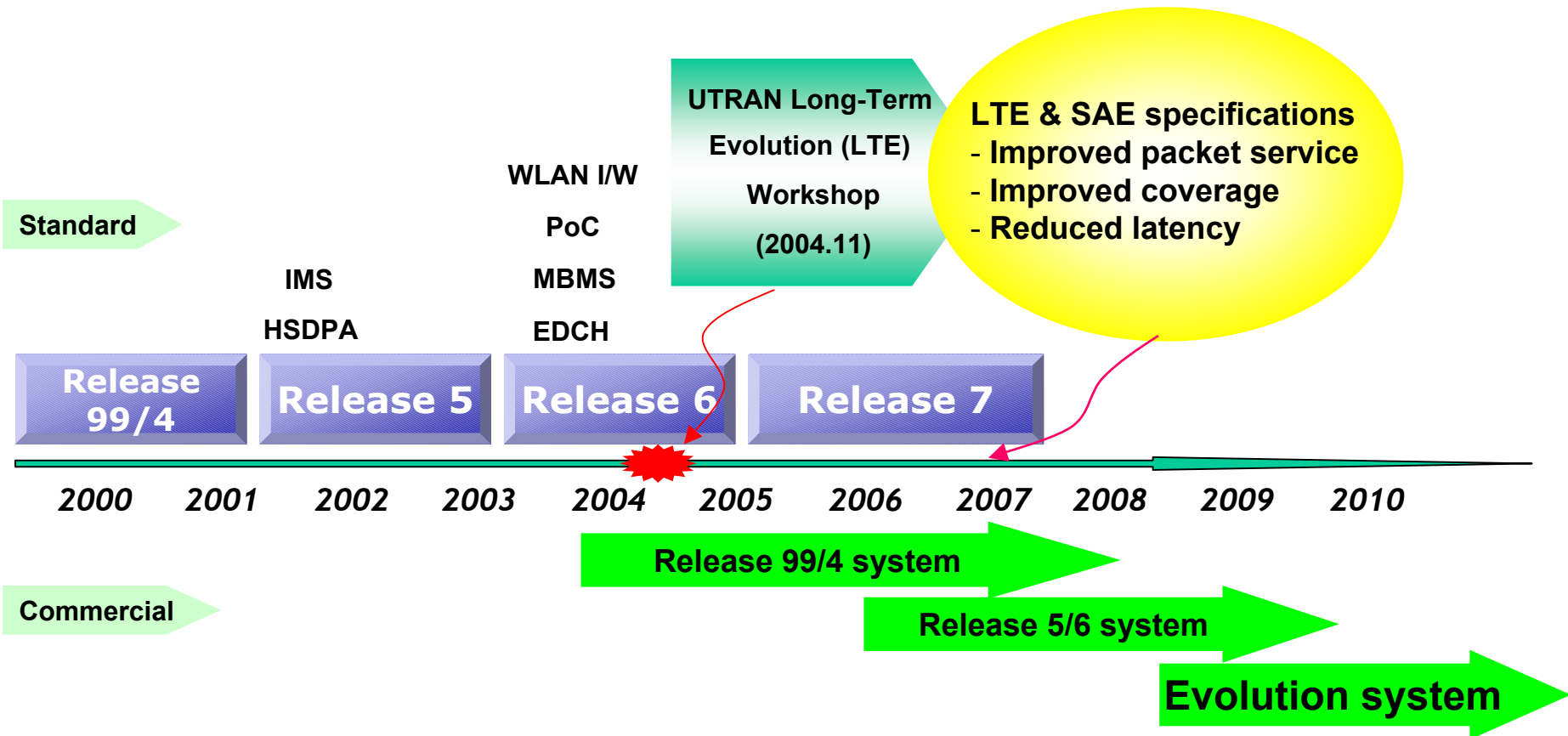
View toward 4G/IMT-Adv



3GPP Roadmap



- *UTRA-UTRAN Long Term Evolution Study Item (TSG-RAN): **Air Interface***
- *System Architecture Evolution Study Item (TSG-SA): **Network Architecture***



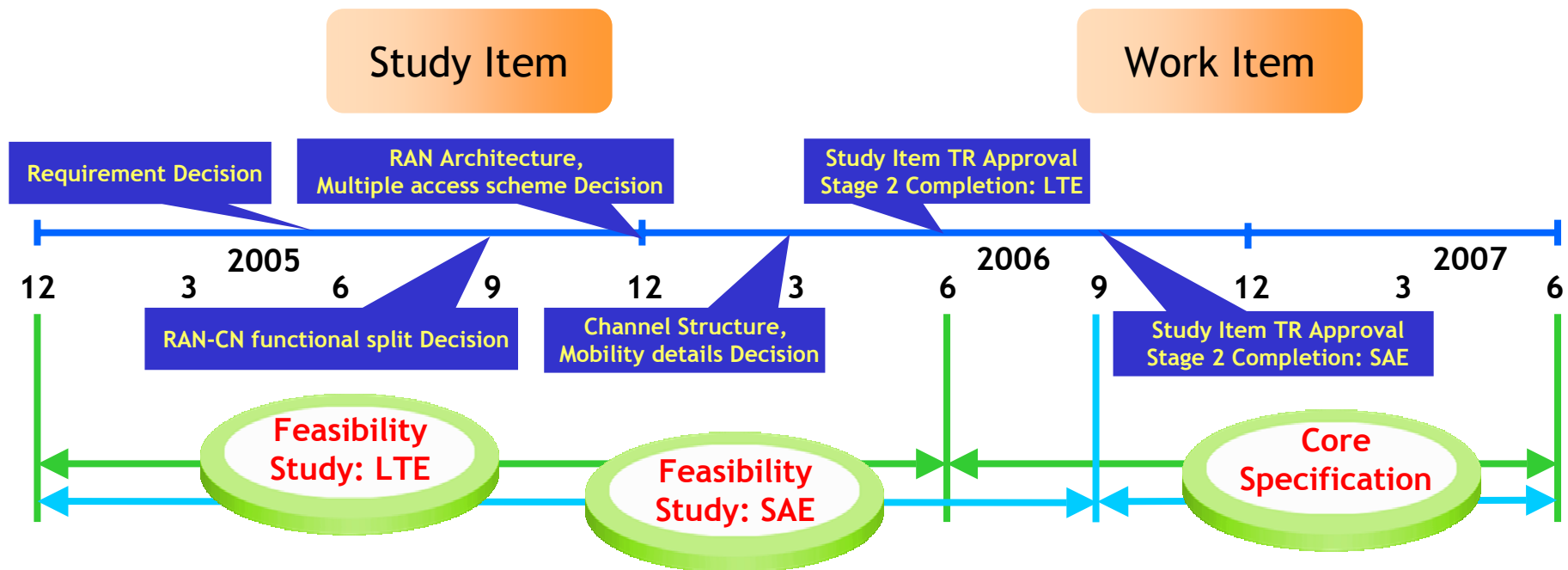
3GPP Long Term Evolution (LTE) and System Architecture Evolution (SAE)



● Evolution target

- Max. data rate: **100 Mbps (downlink)**, **50 Mbps (uplink)** @ 20 MHz
- Improved system throughput
- Reduced user plane latency: less than **5ms** (btw RAN edge and Mobile)
- Reduced control plane latency: less than **100ms** (from IDLE to ACTIVE state)
- Support of scalable system bandwidth: 1.25/1.6/2.5/5/10/15/20 MHz

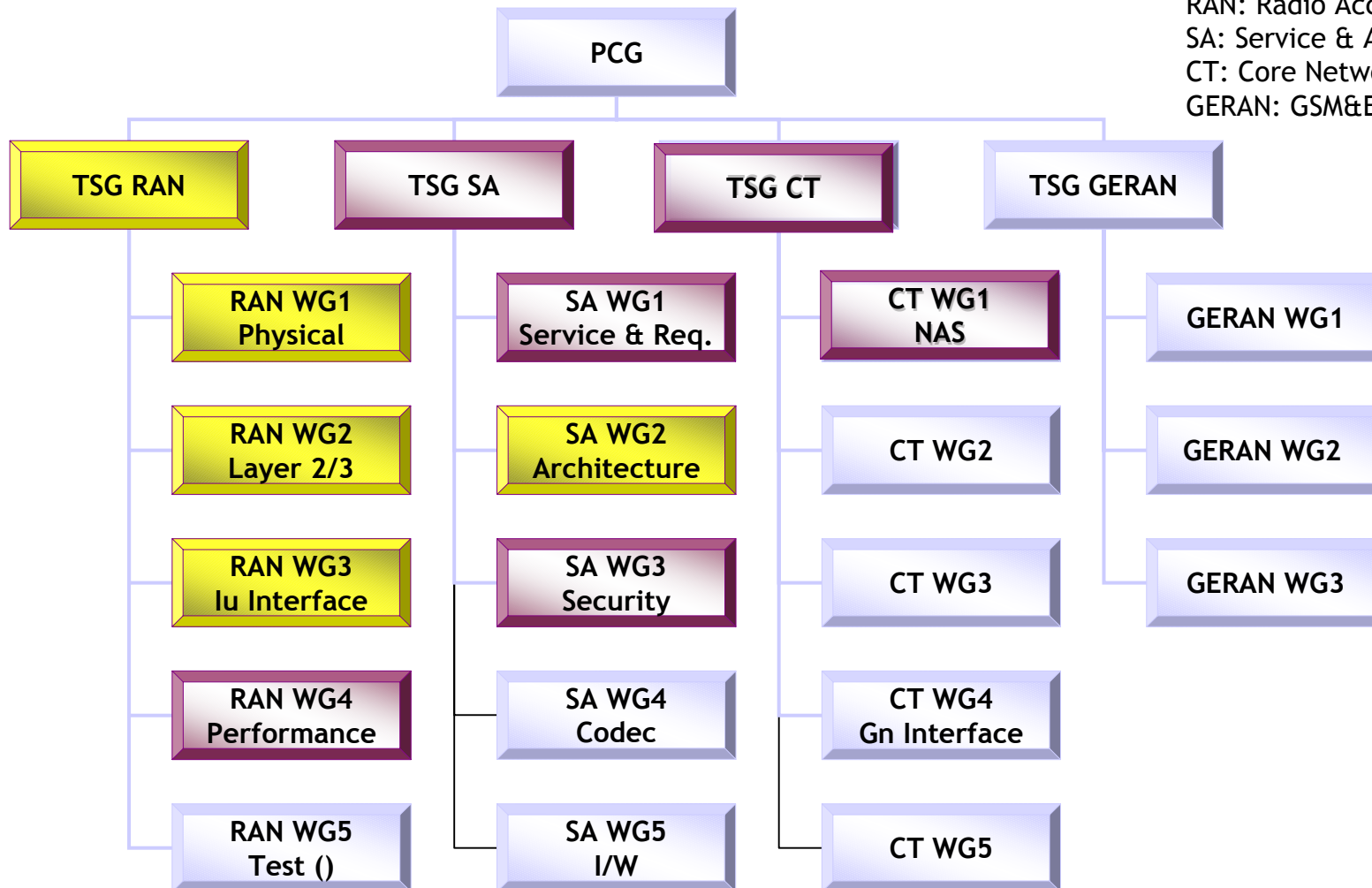
● LTE/SAE Schedule



3GPP LTE/SAE related working group



TSG RAN WG and TSG SA WG2 are the main groups.



RAN: Radio Access Network
SA: Service & Architecture
CT: Core Network and Terminal
GERAN: GSM&EDGE RAN

LTE general



- LTE focus is on
 - Enhancement of the Universal Terrestrial Radio Access (UTRA)
 - Optimisation of the UTRAN architecture

LTE Background

Expectations of additional 3G spectrum allocations

Demand for higher data rates

Greater flexibility in frequency allocations

Continued cost reduction

LTE

LTE Targets

- **Significantly increased peak data rates**
- Increased cell edge bit rates
- Improved spectrum efficiency
- **Improved latency**
- Scalable bandwidth
- **Reduced CAPEX and OPEX**
- Acceptable system and terminal complexity, cost and power consumption
- Compatibility with earlier releases and with other systems
- Optimised for low mobile speed but also supporting high mobile speed



- Downlink based on OFDMA
 - OFDMA offers improved spectral efficiency, capacity, etc
- Uplink based on SC-FDMA (single carrier)
 - SC-FDMA is technically similar to OFDMA but is better suited for uplink from hand-held devices
 - (more considerations on battery power)
- For both FDD and TDD modes
- Macro-diversity (soft handover) is not used.

LTE performance (1/2)



● Downlink

	Rel'6 (HSDPA)	LTE	LTE target / Fulfillment
Peak bitrate (Mbps)	14.4	144	100Mbps target / Fulfilled
Spectral efficiency (bps/Hz/s)	0.75	1.84	3-4 times of HSDPA / 2.5
Cell edge user throughput (bps/Hz/s)	0.006	0.0148	2-3 times of HSDPA / 2.5

● Uplink

	Rel'6 (HSUPA)	LTE	LTE target / Fulfillment
Peak bitrate (Mbps)	5.7	57	50Mbps target / Fulfilled
Spectral efficiency (bps/Hz/s)	0.26	0.67	2-3 times of HSUPA / 2.6
Cell edge user throughput (bps/Hz/s)	0.006	0.015	2-3 times of HSUPA / 2.5

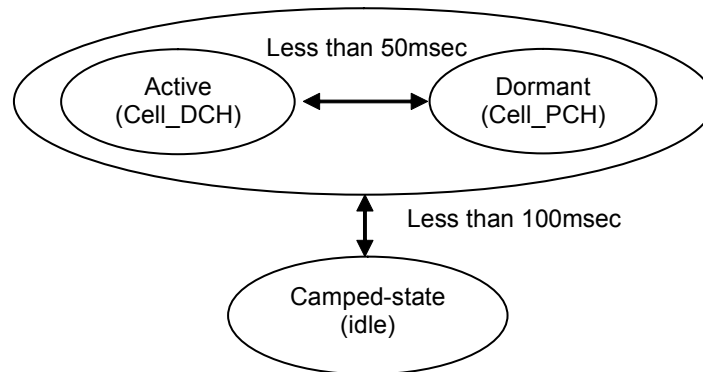
LTE performance (2/2)



● Latency

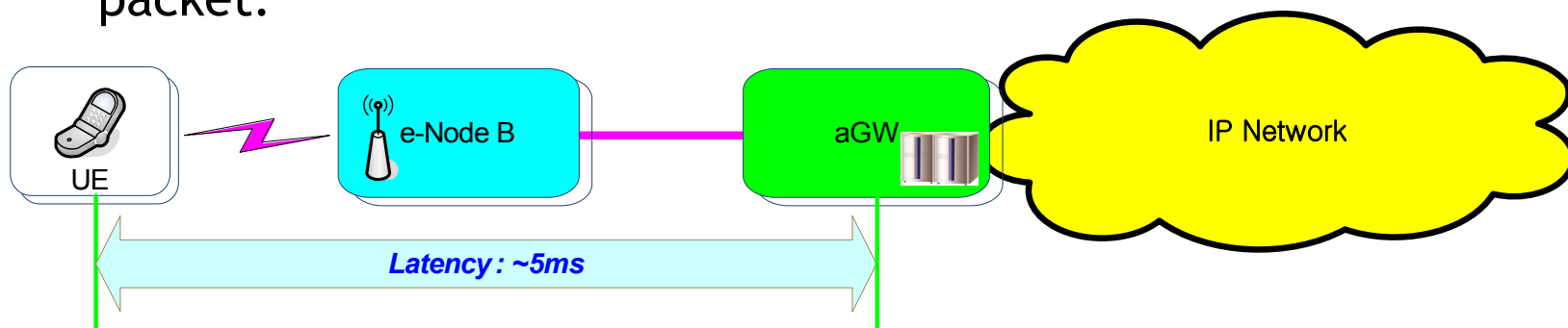
■ Control-plane

- Significant reductions in transition times (~100ms) from idle or dormant states to active state



■ User-plane

- Radio access network latency below less than 5 ms in unloaded condition (i.e. single user with single data stream) for small IP packet.



Major decisions made in RAN WGs

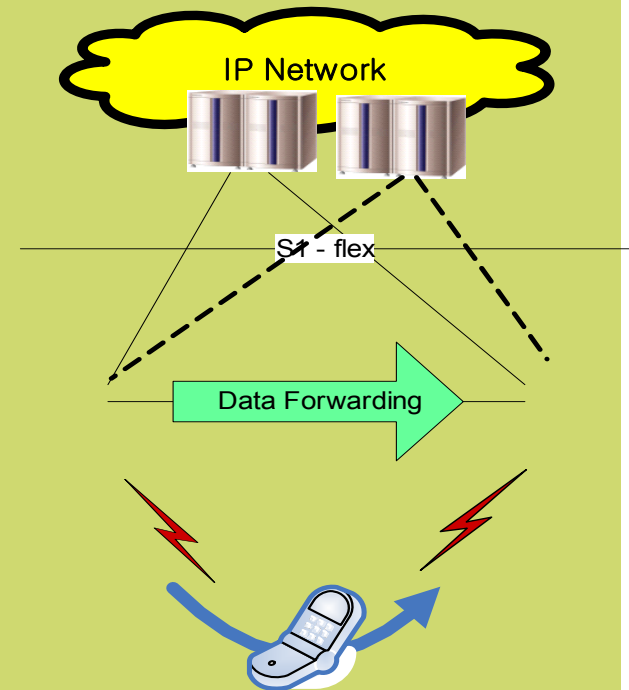


- OFDMA for downlink
- SC-FDMA for uplink

- 0.5ms TTI
- 375 KHz resource block

- 2 node architecture (aGW & eNB)

- Functions in eNB: ARQ
- Functions in aGW:
Header compression / Ciphering

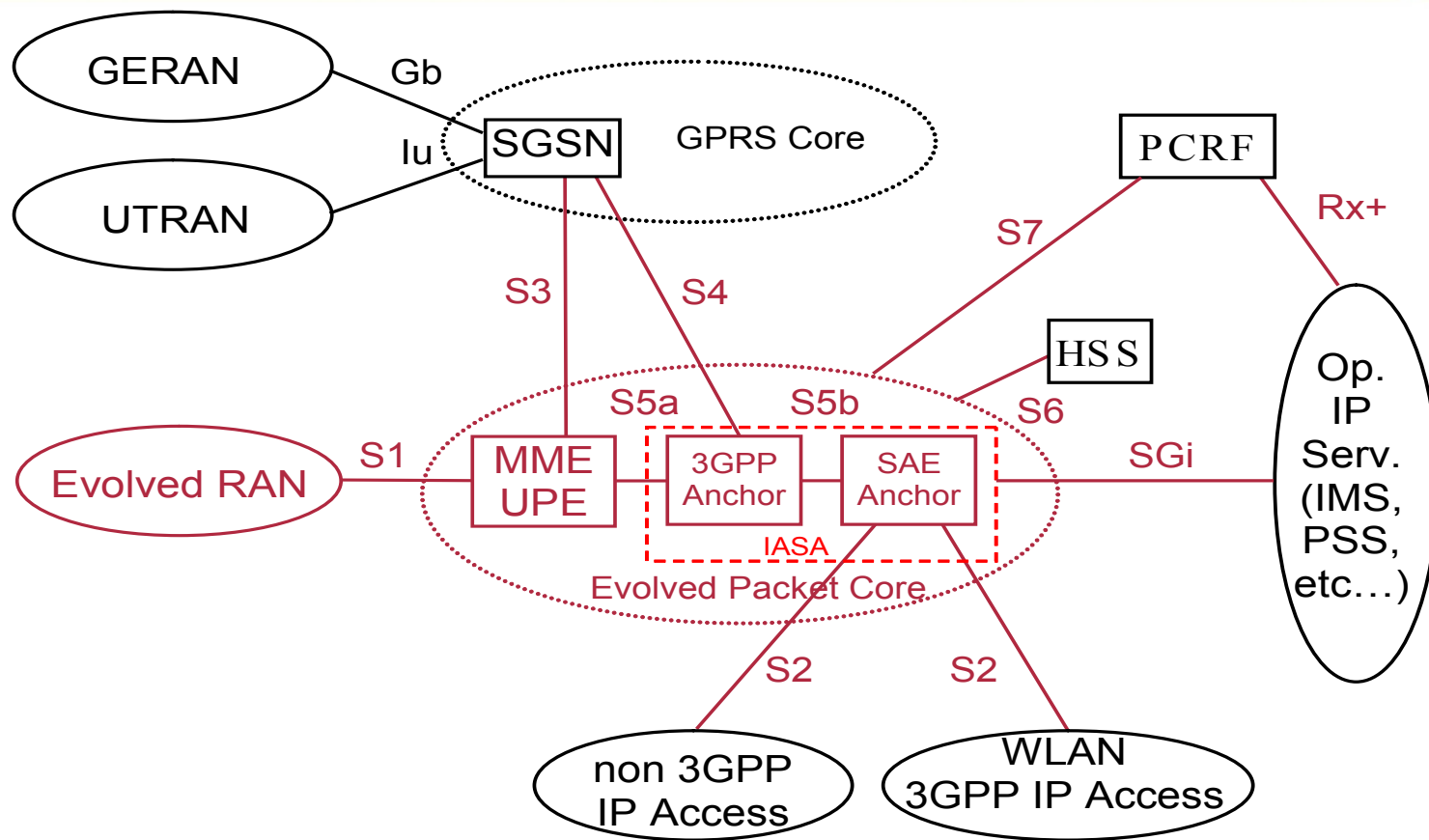




● Objectives

- New core network architecture to support the high-throughput/low latency LTE access system.
 - Symplified network architecture
- All IP network
 - All services are via PS domain only, No CS domain
- Support mobility between multiple heterogeneous access system
 - 2G/3G, LTE, non 3GPP access systems (e.g. WLAN, WiMAX)

Baseline of SAE architecture



* Color coding: red indicates new functional element / interface

MME - Mobility Management Entity

UBE - User Plane Entity

3GPP Anchor - Mobility anchor between 2G/3G and LTE access systems (based on GTP)

SAE Anchor - Mobility anchor between 3GPP access systems (2G/3G/LTE) and non-3GPP access systems (e.g. WLAN, WiMAX)

From TR 23.882

LTE/SAE Technical Reports (for info.)



SAE

SA WG1

TS22.xxx V0.0.0
Requirements for evolution of the 3GPP system architecture (S1-060602)
Editor: T-mobile

SA WG2

TR23.882 V1.1.0
System Architecture Evolution (SP-060152)
Editor: Vodafone

LTE

TR25.913 V7.3.0: Requirements for EUTRA and UTRAN

TR25.912 V0.1.3: Feasibility Study for EUTRA and EUTRAN

Outcome

RAN WG1

TR25.814 V1.2.3
Physical layer aspects for EUTRA (RP-060178)
Editor: NTT DoCoMo

RAN WG2

TR25.813 V0.8.4
EUTRA and EUTRAN Radio interface protocol aspects (RP-060176)
Editor: Nokia, LG, NEC, Motorola, Samsung

RAN WG3

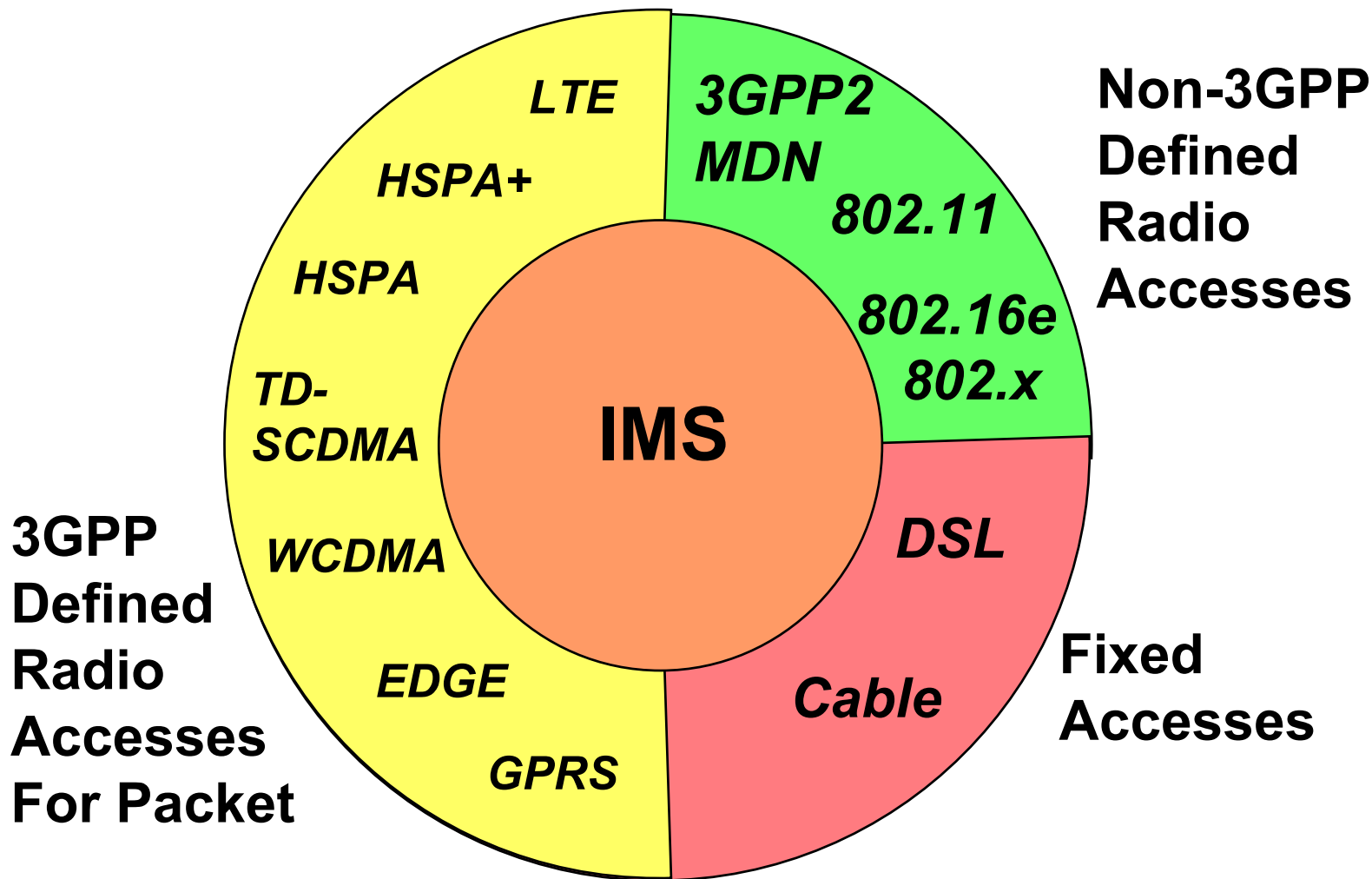
TR R3.018 V0.4.0
EUTRA and EUTRAN Radio Access Architecture and Interfaces
Editor: Vodafone

RAN WG4

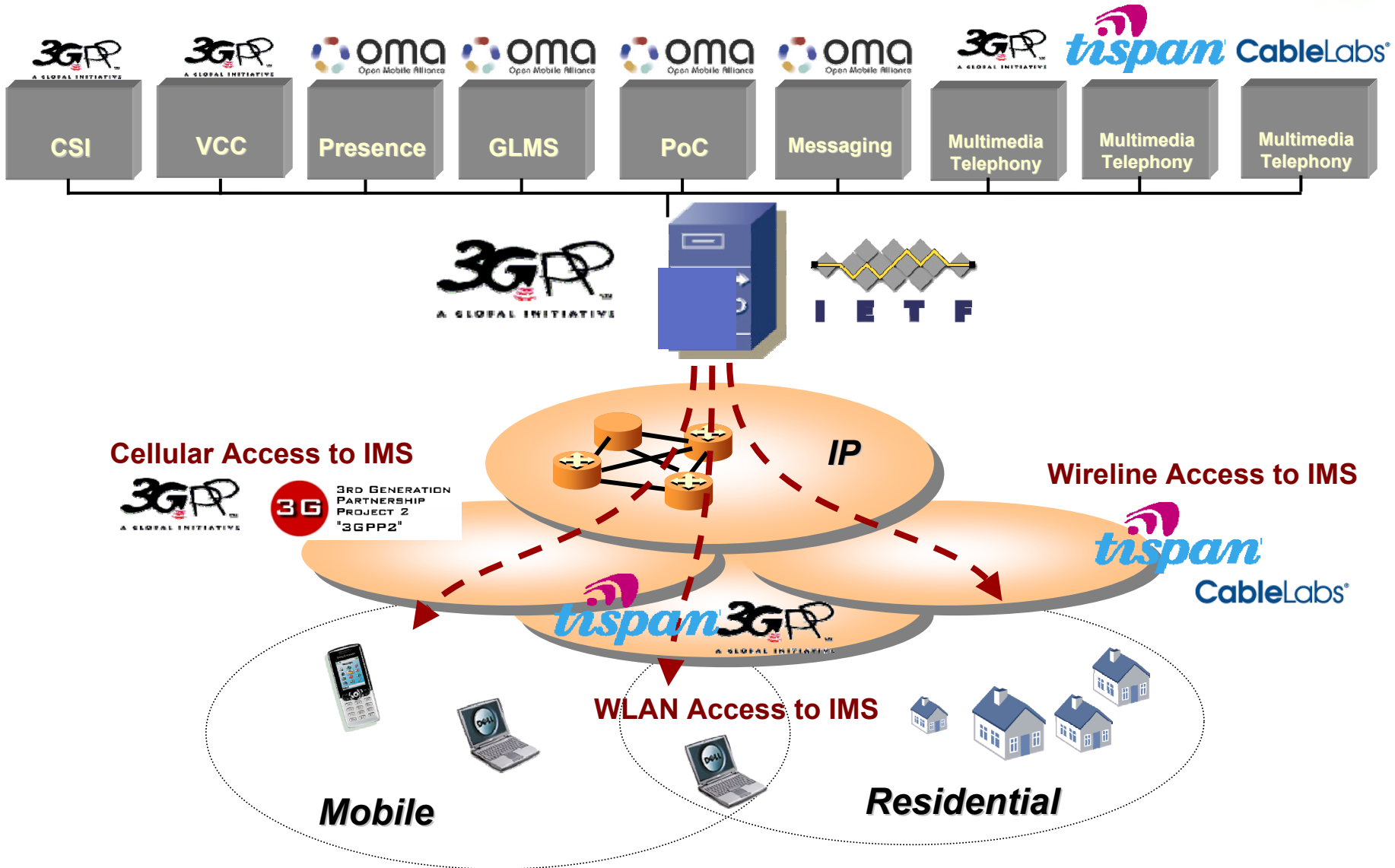
SI TR: NTT DoCoMo
Base Station: Ericsson
Terminal: Motorola
RRM: Nokia
RF System Scenarios: Siemens

WG specific TRs

IMS is Access Independent (in Theory)



Organizations using IMS

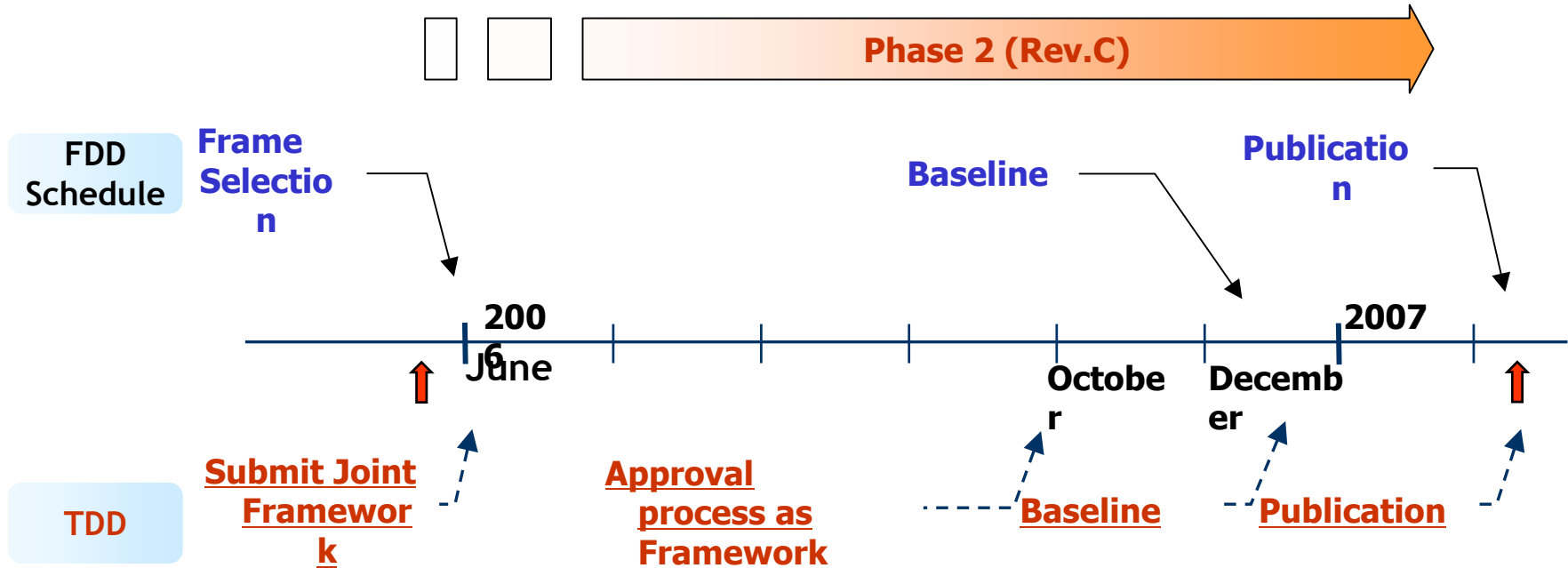




Objective: Migration from CS voice services to PS IMS multimedia services

- CSI (Combinational Services)
 - Complement CS services with IMS services
- VCC (Voice Call Continuity)
 - Voice handovers between IMS and CS bearers
- Multimedia Service Definition
 - Robust interoperable multimedia telephony
- Improving IMS quality
 - Faster session setup, improved performance, better voice quality

3GPP2 Phase 2 (LTE) Timeline



- Both FDD and TDD pursue same publication date

Framework proposals for 3GPP2 Phase 2



1. Lucent-Nortel-Samsung Proposal
2. Qualcomm Proposal
3. Motorola Proposal
4. HRZC(Huawei, RITT, ZTE, China Unicom) Joint Proposal
5. LG Proposal

	Characteristics	Pros & Cons
Strictly Backward Compatible (SBC)	<ul style="list-style-type: none">● Co-existing Legacy AT and new AT● FL: OFDMA and CDMA multiplexed in time slot● RL: CDMA or Hybrid OFDM-CDMA	<ul style="list-style-type: none">- Smooth Migration from legacy system- Performance loss due to backward compatibility
Loosely Backward Compatible (LBC)	<ul style="list-style-type: none">● Legacy AT and new AT in separate carrier● Maximize reuse of existing upper layer● FL: OFDM / RL: OFDM-CDMA	<ul style="list-style-type: none">- Optimized for broadband system- Minimum backward compatibility

LNS vs. HRZC Framework comparison

Item	LNS (Lucent-Nortel-Samsung)	HRZC (Huawei-RITT-ZTE-China Unicom)	Remarks
Multiple Access	OFDMA (with Precoded CDMA)	OFDMA	Key issue
Supportable Bandwidth	1.25, 2.5, 5, 10, 20 MHz	1.25, 2.5, 5, 10, 20 MHz	
Resource Allocation Unit	DRCH/LRCH And Multiplexing	DRCH/LRCH And Multiplexing	Key issue
Data Control Channel (MAP)	Grouped	Unicast	
HARQ	FL: Synch HARQ RL: Synch HARQ	FL: Asynch HARQ RL: Synch HARQ	
Coding	Turbo Coding	Turbo Coding	
MIMO	Open Loop: STBC, Cyclic shift Diversity	Open Loop: STBC, open loop SDMA	
	Closed Loop: SCW/MCW/Beam forming	Closed Loop: SCW/MCW/Beam forming	
	Feedback: Code book index	Feedback: Precoder vector/matrix	
Power Control	Yes	Yes	
Resource Management	Support persistent assignment	Support persistent assignment	

Migration from 3G LTE to 4G (IMT-Adv.)

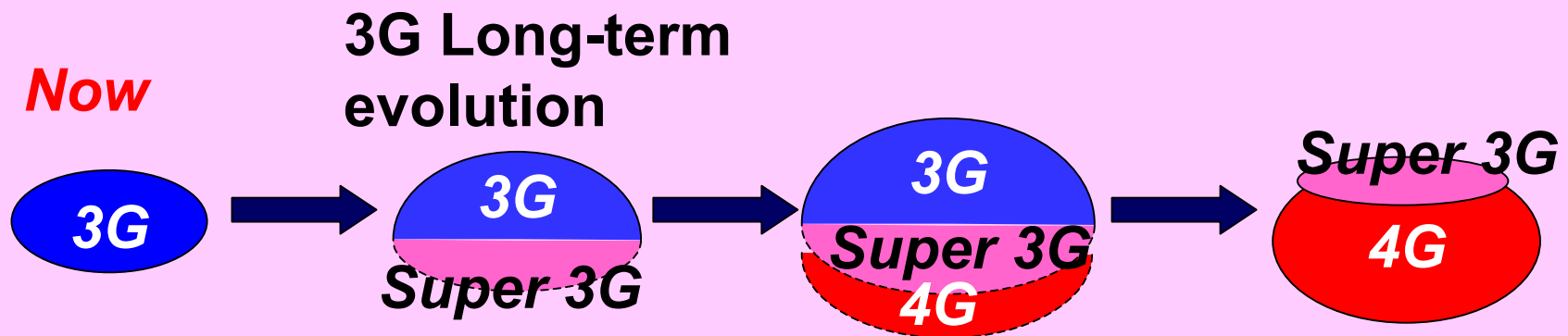


◆ Mid-term 3G RAN evolution:

HSDPA, uplink enhancement, MBMS, etc.

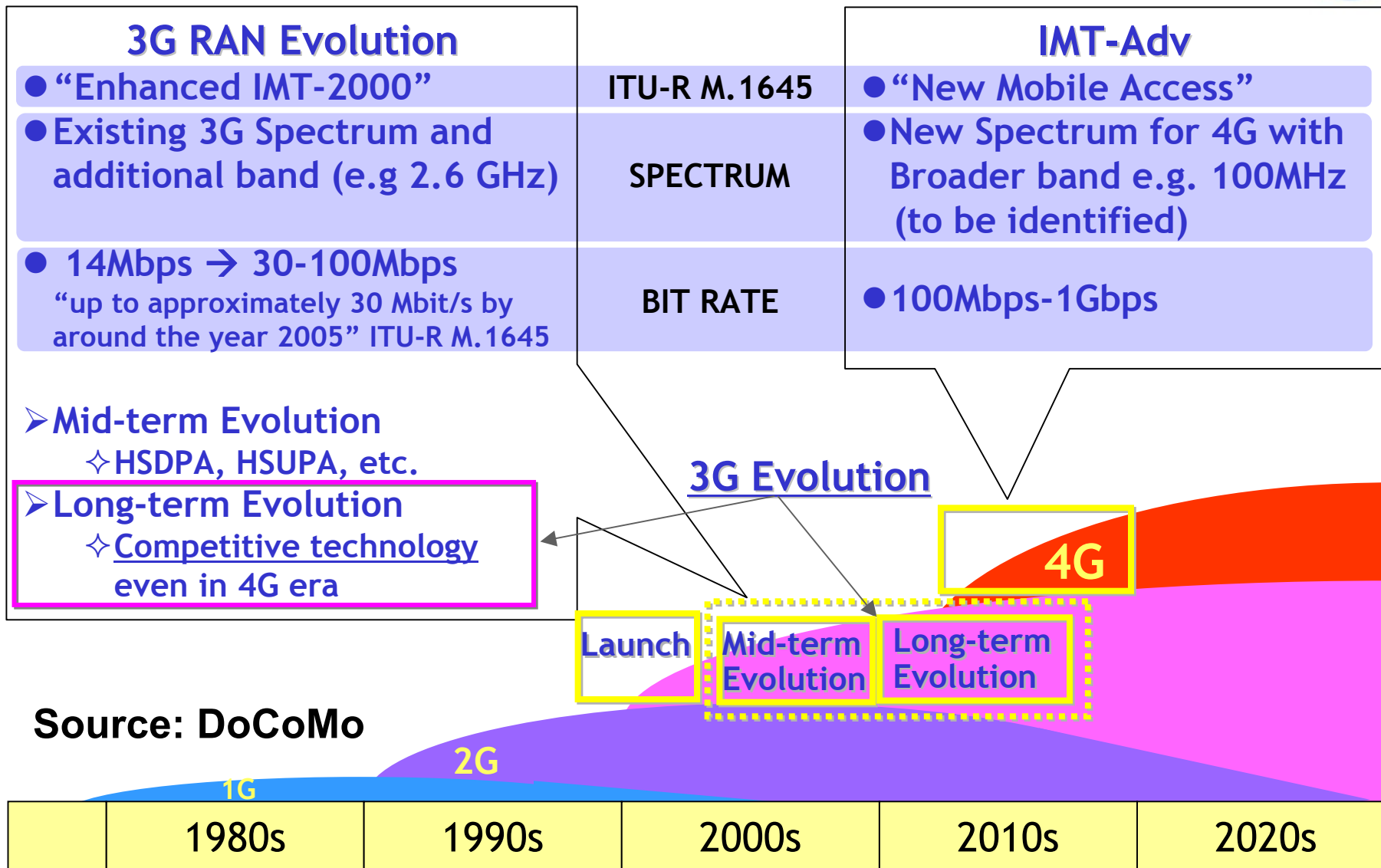
◆ Evolved UTRA and UTRAN (Super 3G)

- Super 3G system will provide support for full IP capabilities
- Smooth introduction of future 4G system



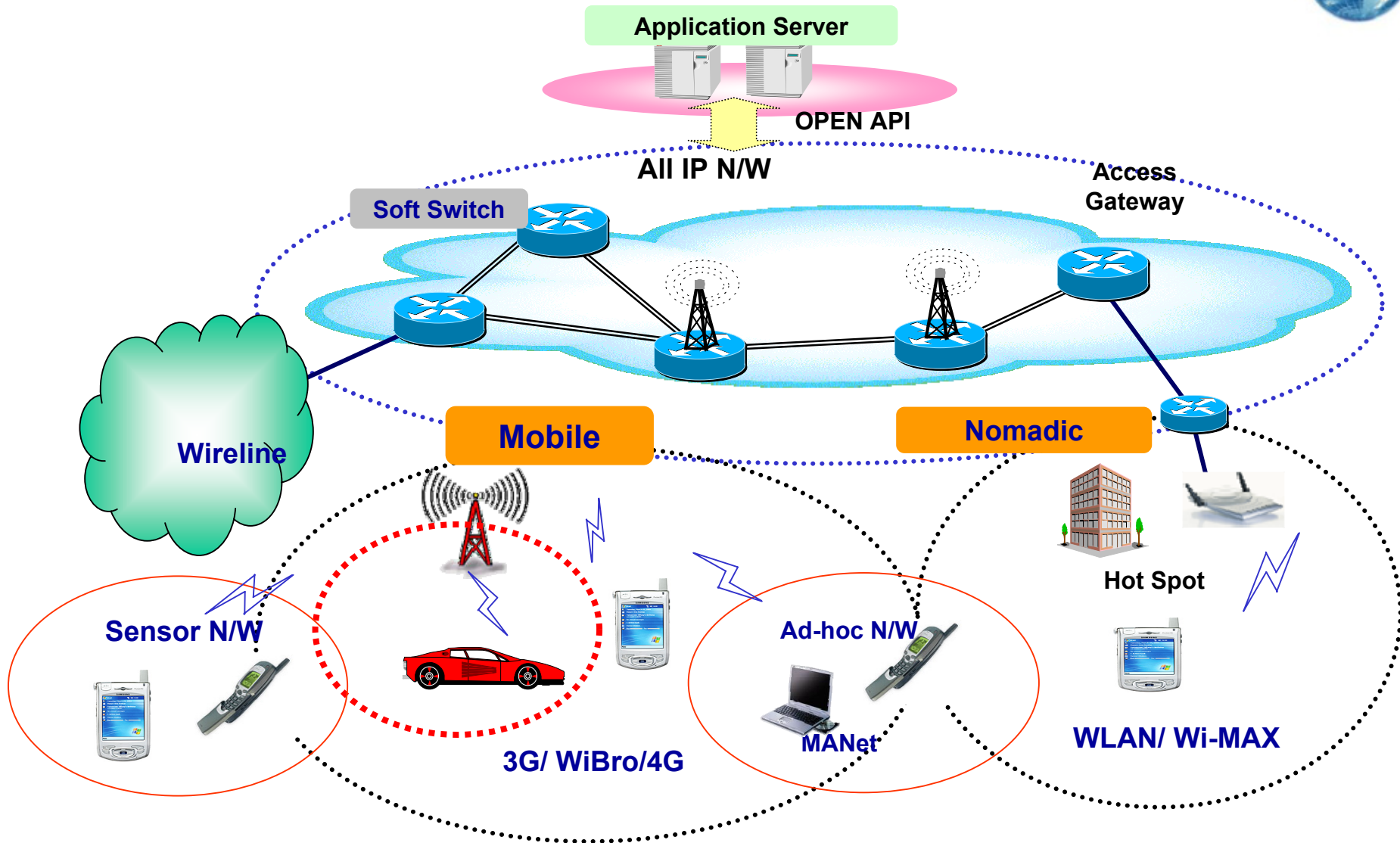
Source: DoCoMo

3G Evol vs. IMT-Adv



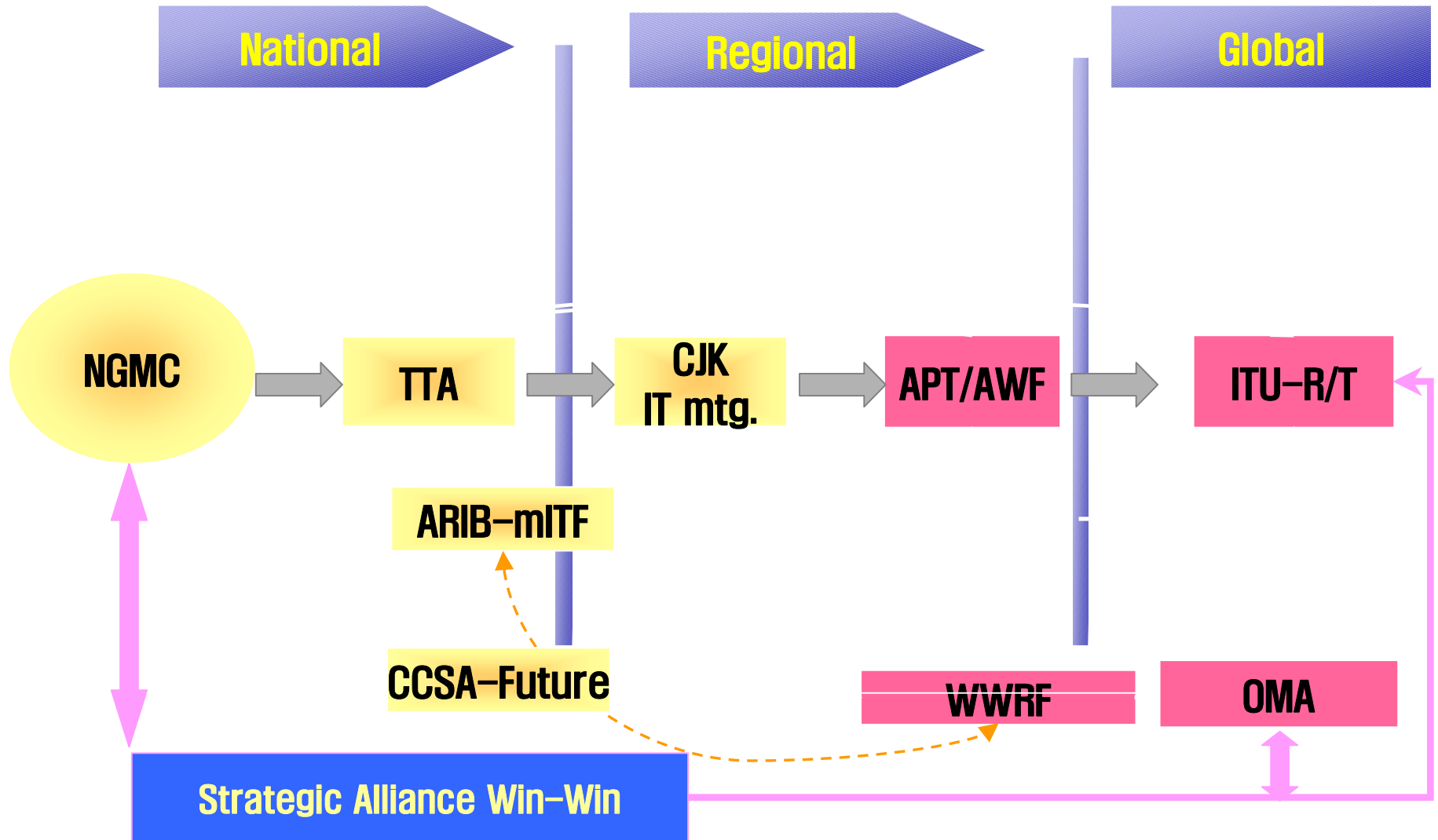
Source: DoCoMo

Network configuration in IMT-Adv. era



Strategy toward Global 4G Standard

- Korea: TTA, Asia : CJK/APT, Global: WWRF, OMA/IEEE, ITU





- **3G LTE is one of strong migration paths toward IMT-Adv.**
- **Smooth migration from 3G LTE and IMT-Adv. Is key for success in market**
- **However, other migration paths are also important for consideration.**
- **We will continue to lead technology and standardization in 3G LTE and IMT-Adv.**