# Radio Interface Evolution: Contents

- **GSM & UMTS Evolution: From 2G to 4G**

A GLOBAL INITIATIVE



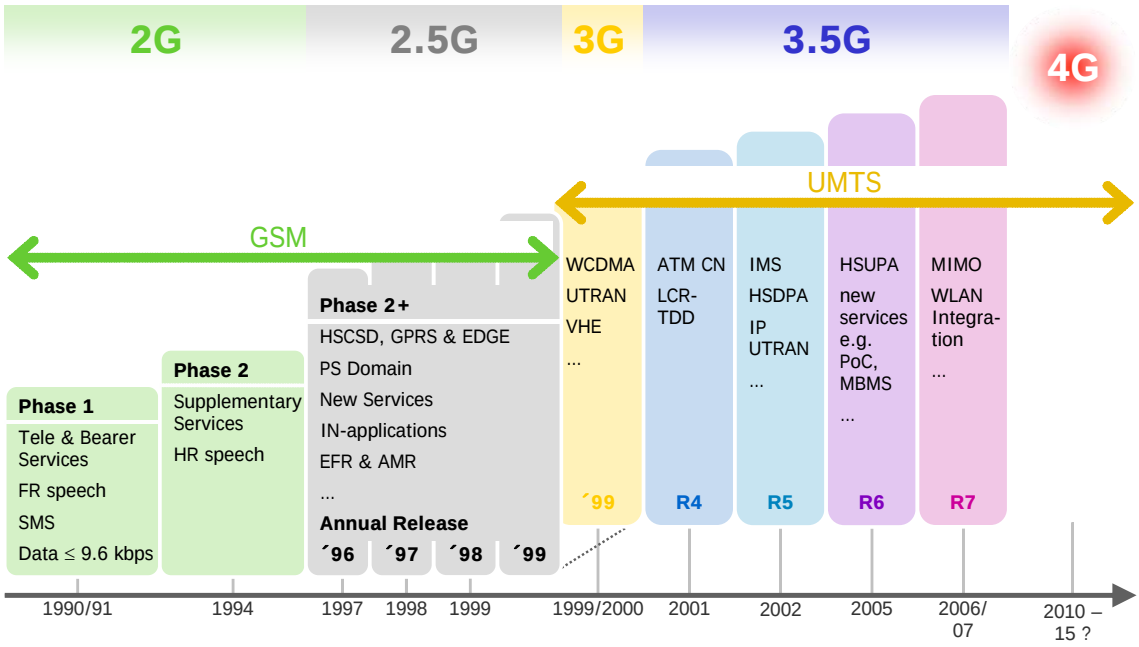
***GSM & UMTS Evolution***

*In the same way as GSM, UMTS is undergoing a permanent evolutionary process. Step by step different aspects of the system such as services, network architecture and the radio interface are enhanced and additional options are integrated. This process should be continued towards 4G and beyond.*

**Abbreviations used in the following:**

AMR: Adaptive Multi Rate
EDGE: Enhanced Data Rates for the GSM Evolution
EFR: Enhanced Full Rate
EUDCH: Enhanced Uplink for Dedicated Channels
FR: Full Rate
GPRS: General Packet Radio Services
HR: Half Rate
HSCSD: High Speed Circuit Switched Data
HSDPA: High Speed DL Packet Access
IMS: IP Multimedia Subsystem
LCR-TDD: Low Chip Rate Time Division Duplex
MBMS: Multimedia Broadcast Multicast Service
MIMO: Multiple-Input Multiple-Output
PoC: Push-toTalk over Cellular
UTRAN: UMTS Terrestrial Radio Access Network
VHE: Virtual Home Environment
W-AMR: Wideband AMR
WCDMA: Wideband Code Division Multiple Access
WLAN: Wireless LAN

# GSM & UMTS Evolution






***Milestones of the GSM & UMTS Evolution:***

*1990/91: GSM Phase 1 (GSM900/1800) with Tele-, Bearer- & some Supplementary Services*

*1994: GSM Phase 2 with full set of Supplementary Services, Half Rate speech,..*

*1996: ETSI GMM Report '96: Compatibility between UMTS & GSM; Evolution of GSM towards UMTS to reduce costs & risks of UMTS implementation*

*1997- 99: GSM Phase 2+ Annual Releases '96, '97, '98 & '99: PS Core Network (GPRS), enhanced Service Concept (VHE, CAMEL, MExE, STK, OSA), higher data rates (HSCSD, GPRS & EDGE), enhanced speech codecs (EFR & AMR), MMS,…*

*1999/2000: UMTS Rel. '99: UMTS on basis of GSM '99 CN & Service Concept + UTRAN & WCDMA Air Interface (FDD & TDD Mode)*

*2002: UMTS Rel. 4: "ATM"-CN, LCR-TDD Mode*

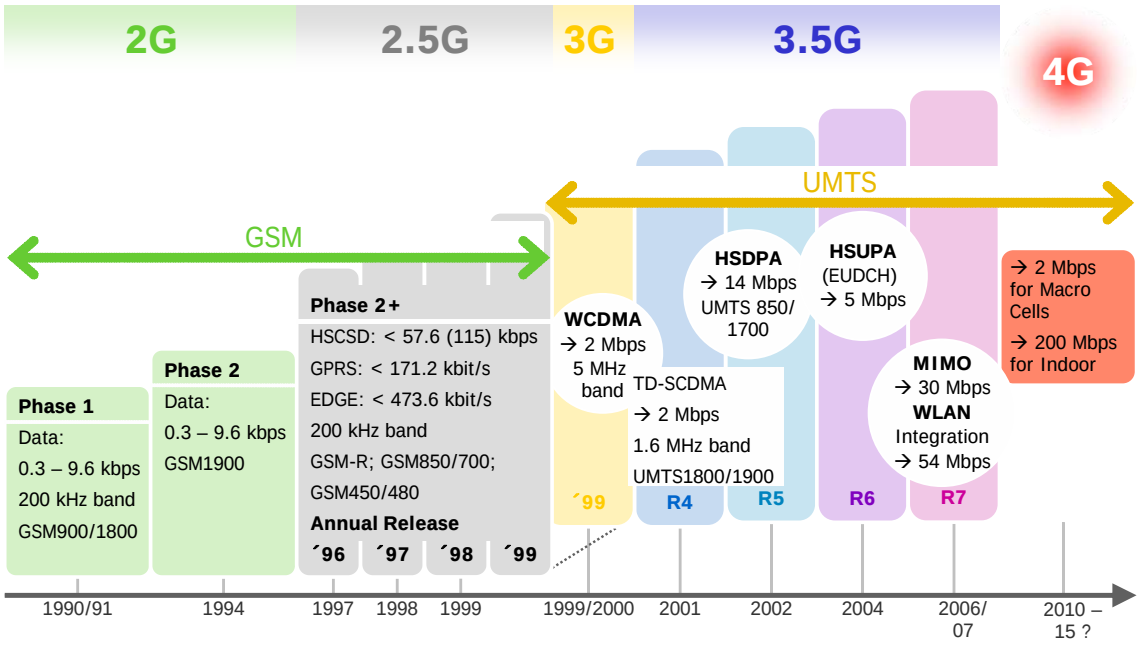
*2002/03: UMTS Rel. 5: IP Multimedia Subsystem IMS, HSDPA for enhanced data rates,..*

*2005: UMTS Rel. 6: Enhanced IMS support, new Services (MBMS, PoC), enhanced data rates: HSUPA & WLAN Integration,..*

*2006/07: UMTS Rel. 7: Enhanced antenna concepts & data rates: MIMO; 7.68 Mcps TDD,..*

*2010–15?: 4G Pure IP Core Network and Radio Access Network*

# Radio Interface Evolution: From 2G to 4G






***Radio Interface Evolution: From 2G to 4G***

*Services with higher data rates are demanding for more capacity. The radio resources are very limited. Therefore, a permanent evolution of the capabilities of the radio interface is necessary. Larger bandwidth and especially higher resource efficiency have been and are the target of this GSM & UMTS radio interface evolution.*

***Milestones of the GSM & UMTS Radio Interface Evolution:***

*1990/91: GSM Phase 1 (GSM900/1800) CS data up to 9.6 kbps*

*1997- 99: GSM Phase 2+ Annual Releases '96, '97, '98 & '99: HSCSD (CS data up to 57.6 (115.2) kbps, GPRS (PS data up to 171.2 kbps) & EDGE (E-GPRS: PS data up to 473.6 kbps)*

*1999/2000: UMTS Rel. '99: WCDMA Air Interface (FDD & HCR-TDD Mode: up to 2 Mbps)*

*2002: UMTS Rel. 4: LCR-TDD Mode: up to 2 Mbps*

*2003: UMTS Rel. 5: HSDPA: up to 14 Mbps*

*2004: UMTS Rel. 6: HSUPA (EUDCH): up to 5.7 Mbps; WLAN Integration: PS data up to 54 Mbps*

*2006/07: UMTS Rel. 7: enhanced WLAN Integration; MIMO (enhanced antenna concepts for HSDPA: up to 30 Mbps), 7.68 Mcps TDD mode*

*2010-15?: 4G Radio Access Network for data rates up to 2 Mbps for Large Area Coverage & High Mobility; 200 Mpbs & more for Indoor Coverage*