3G Standards and Architecture

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1 3G Standards
   - Introduction to 3G cellular network
   - IMT-2000 Radio Standards
   - Migration to 3G network

2 3G Architecture
   - GPRS architecture reminder
   - 3G Architecture (UMTS)
1. **3G Standards**
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2. **3G Architecture**
   - GPRS architecture reminder
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Introduction to 3G cellular network

- Universal global roaming
- Multimedia (voice, data & video)
- Increased data rates (up to 2 Mbps)
- Improved spectral efficiency
- IP architecture

Figure 1: 3G vision
Introduction to 3G cellular network

- Result of research and development International Telecommunication Union (ITU)
- Technical specification publicised under the name IMT-2000
- First pre-commercial 3G network launched in Japan by NTT DoCoMo based on W-CDMA technology
- First pre-commercial 3G network launched in Europe by Manx Telecom based on W-CDMA run on UMTS network
- 3G Partnership Projects (3GPP & 3GPP2) focused on evolution of access and core networks
IMT-2000 Radio Standards

- **IMT-DS** Direct Spread CDMA: **W-CDMA**
- **IMT-MC** Multi Carrier CDMA: **CDMA2000**
- **IMT-TC** Time Code CDMA: **TD-CDMA**
- **IMT-SC** Single Carrier: **EDGE**
- **IMT-FT** FDMA/TDMA (**DECT** legacy)
Figure 2: IMT-2000 radio standards
W-CDMA (UMTS)

- Wideband CDMA
  - Standard for Universal Mobile Telephone Service (UMTS)
- Committed standard for Europe
  - Leverages GSM’s dominant position
- Legally mandated in Europe
- Operated commonly on the 2100 MHz band
- Evolution from original Qualcomm CDMA
  - Now known as cdmaOne or IS-95
- Better migration story from 2G to 3G
  - cdmaOne operators don’t need additional spectrum
  - 1xEVD0 promises higher data rates than UMTS
- Arguably better spectral efficiency than W-CDMA
TD-SCDMA

- Time division duplex (TDD)
- Chinese development
- Good match for asymmetrical traffic
- Single spectral band (1.6MHz) possible
- Costs relatively low
  - Handset smaller and cost less
  - Power consumption lower
  - TDD has the highest spectrum efficiency
- Power amplifiers must be very linear
  - Relatively hard to meet specifications
Figure 3: Migration to 3G
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Reminder of GPRS architecture

Figure 4: GPRS architecture
Figure 5: 3G architecture (3GPP Release 99)
Figure 6: 3G architecture (3GPP Release 5)
Thank You