Wireless Broadband – Network Migration Strategies

ITU ASP COE TRAINING ON "WIRELESS BROADBAND ROADMAP DEVELOPMENT"

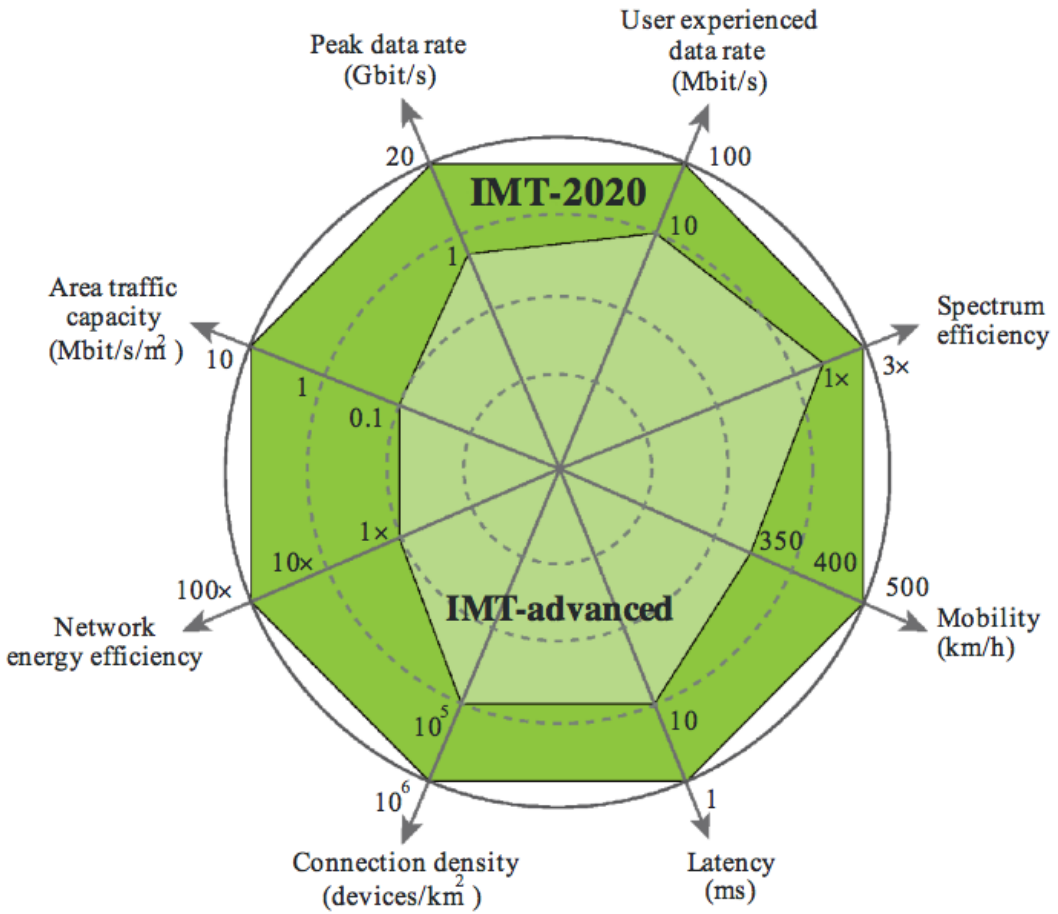
06-09 August 2016

Tehran, Islamic Republic of Iran

Digital Mobile Telephony Overview

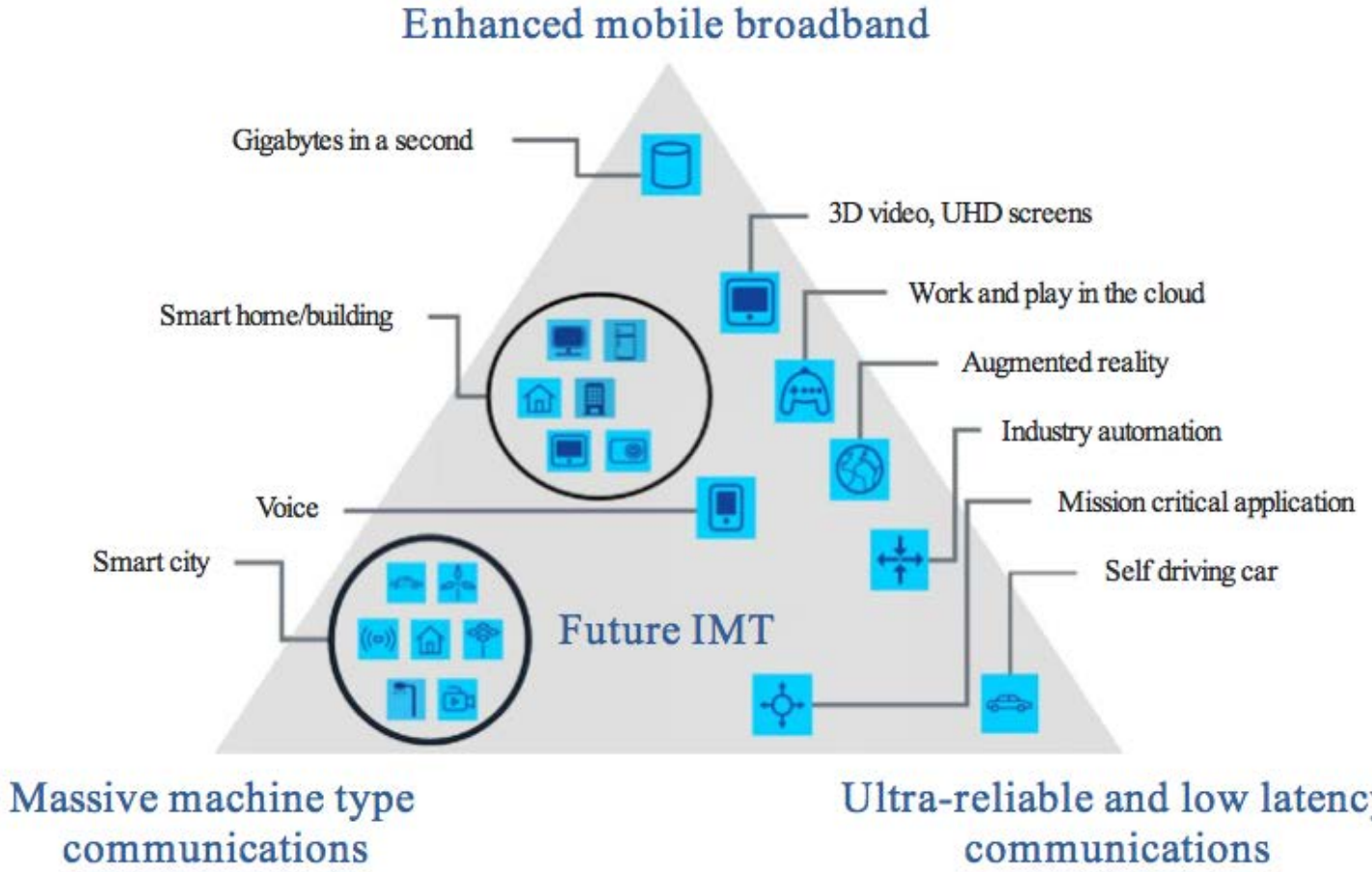
- 2G
  - TDMA (GSM), CDMA …..
  - Circuit-switched voice, SMS
- 2.5G
  - GPRS (General Packet Radio Service)
  - EDGE (Enhanced Data rates for GSM Evolution)
- 3G
  - W-CDMA, CDMA2000 …..
  - Circuit-switched voice
- 4G (LTE & SAE)
  - All packet
  - Packet voice (e.g. IMS)
- 5G
  - High bandwidth & extremely low latency (<1ms)

IMT-2020 Enhancement of ...



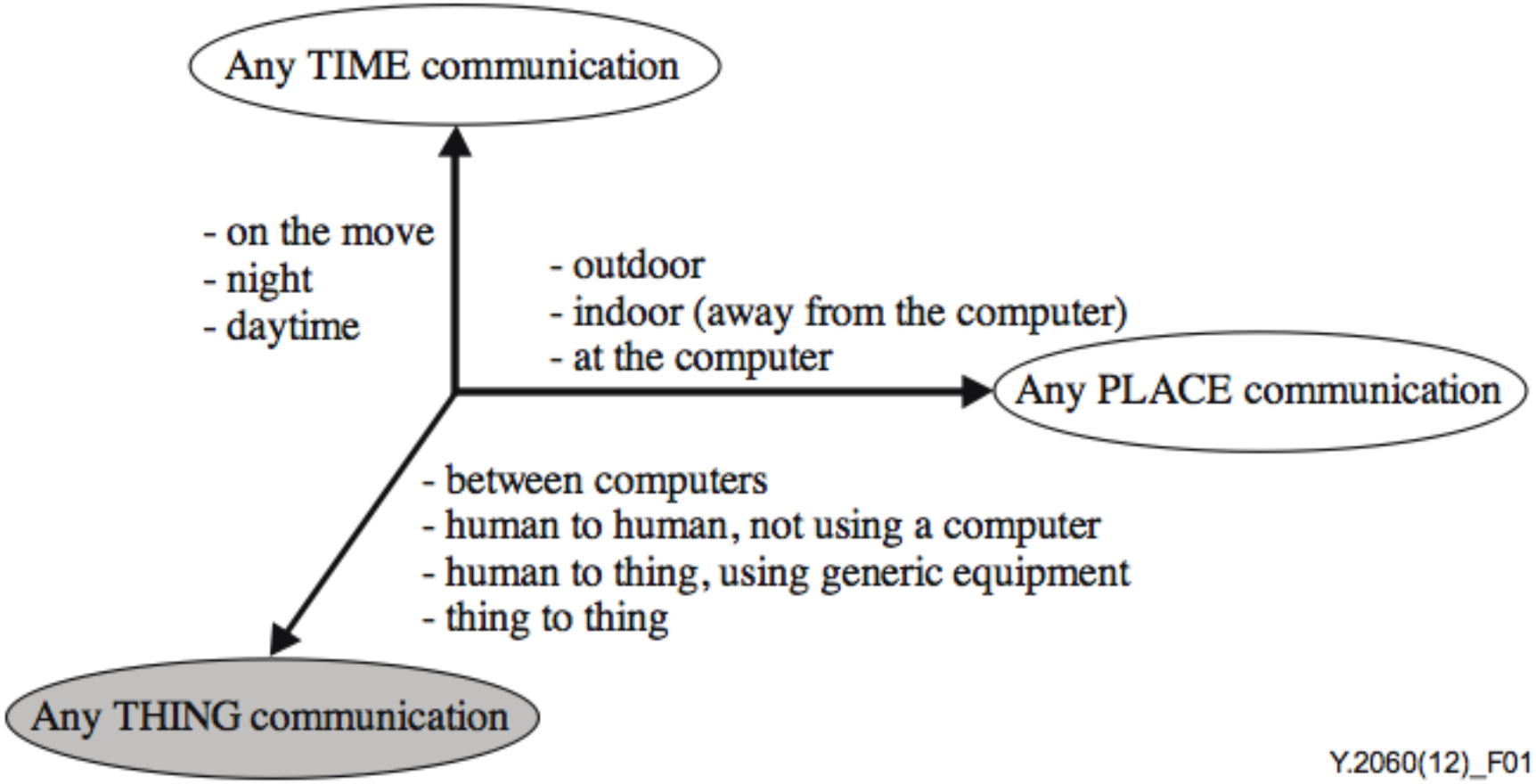
Source: ITU-R Recommendation M.2083

IMT-2020 Usage scenarios



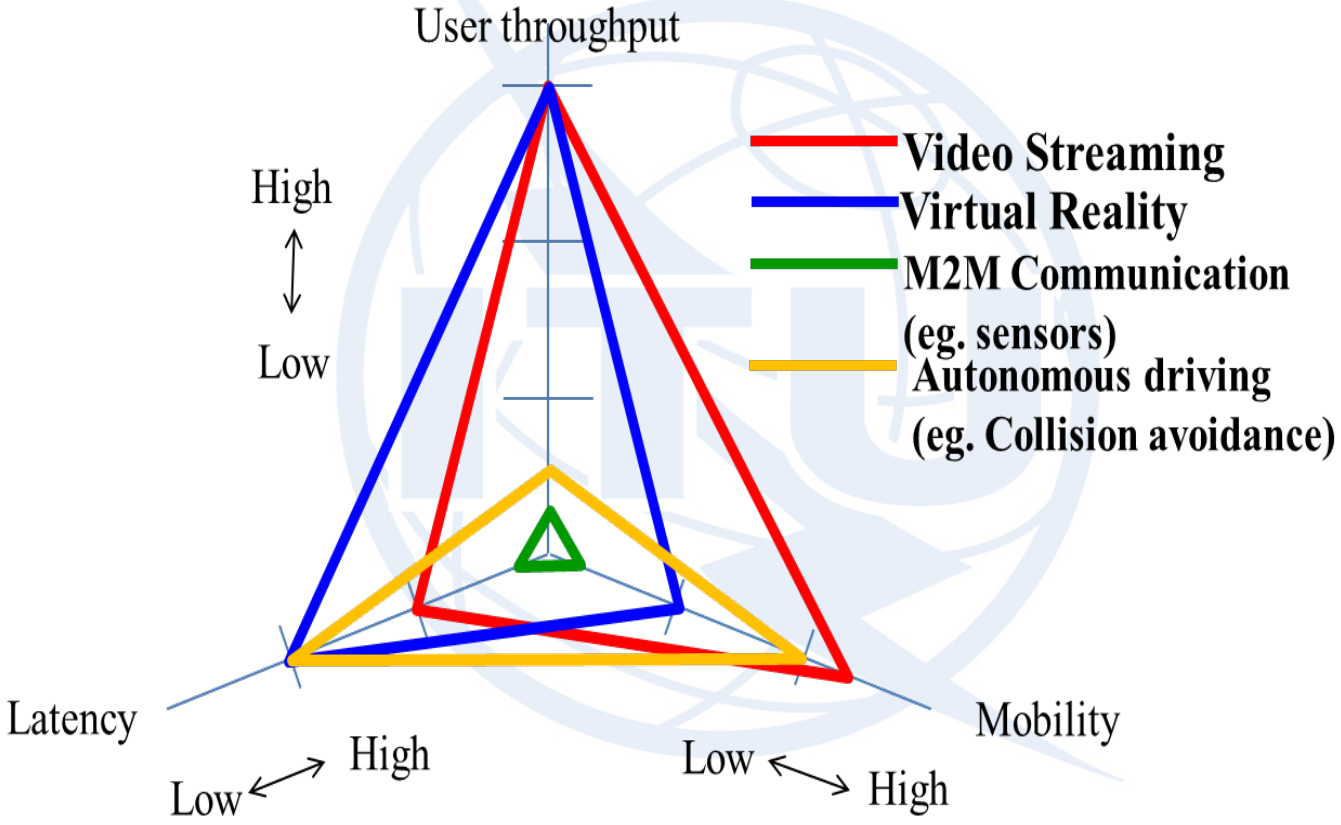
Source: ITU-R Recommendation M.2083

Internet of Things



Source: ITU-T Recommendation Y.2060

Capabilities required per application



"Mobile Communications Systems for 2020 and beyond", ARIB 2020 and Beyond Ad Hoc Group White Paper, October 2014.

Source: ITU-T Focus Group on IMT-2020

5G Issues

- Can 1ms latency be achieved?
- Interconnection
- Roaming
- Single network infrastructure
- Spectrum

5G - Spectrum

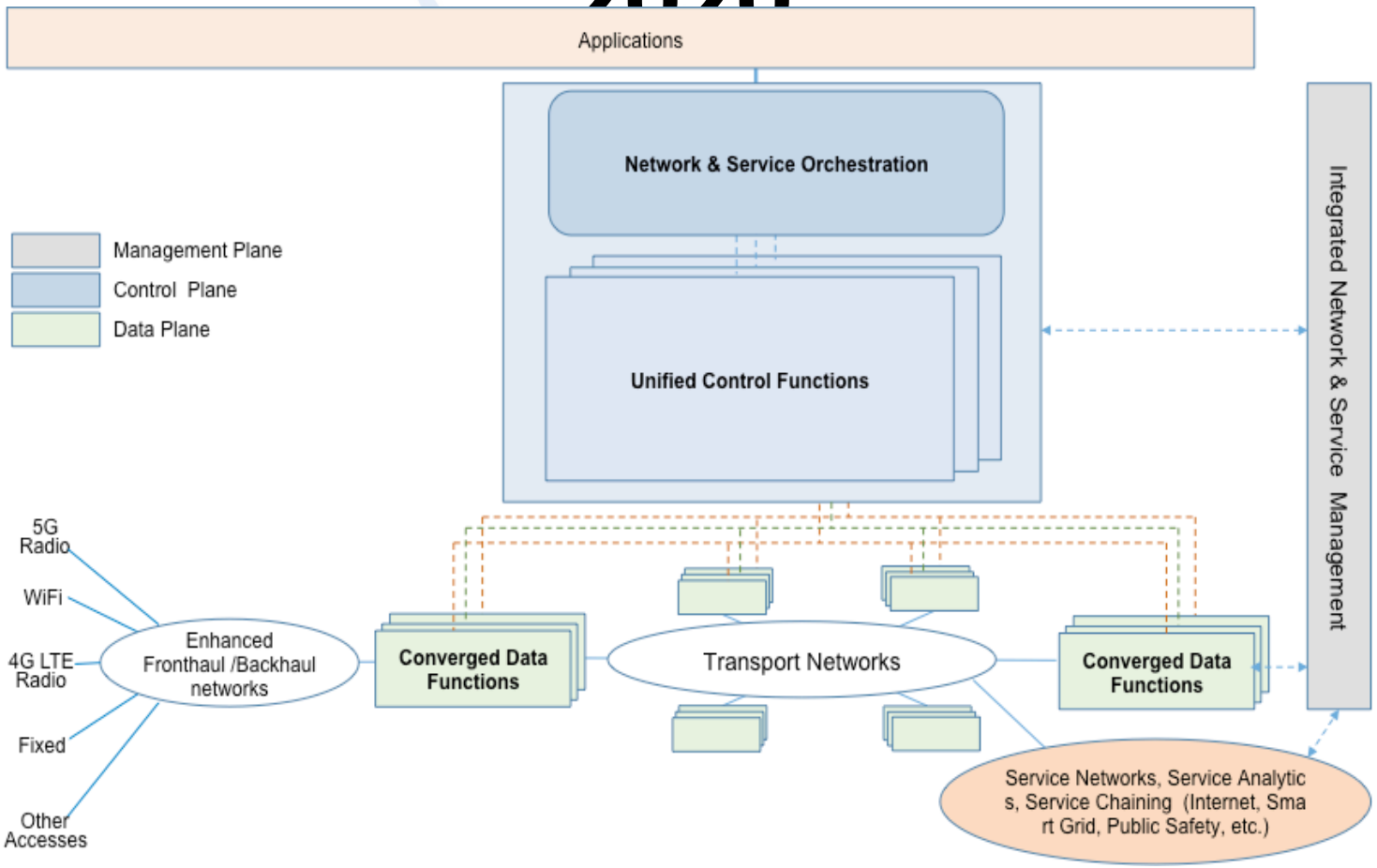
High-level Requirement	Potential Spectrum-Related Implications
Ultra-high speed radio links	Ultra-wide carrier bandwidths, e.g. 500 MHz Multi-gigabit fronthaul/backhaul
High speed radio links	Wide carrier bandwidths, e.g. 100 MHz Gigabit fronthaul/backhaul
Support for low to high-Doppler environment	Depends on the throughput requirement
Ultra-low latency	Short range implications
Low latency	Mid-short range implications
Ultra-high reliability radio links	Severe impact of rain and other atmospheric effects on link availability in higher frequencies, e.g. mm-wave, for outdoor operations
High reliability radio links	Impact of rain and other atmospheric effects on link availability in higher frequencies, e.g. mm-wave, for outdoor operations
Short range	Higher frequencies, e.g. mm-wave
Long range	Lower frequencies, e.g. sub-3 GHz
Ground/obstacle penetration	Lower frequencies, e.g. sub-1 GHz
Operation in cluttered environment	Diffraction dominated environment in lower frequencies Reflection dominated environment in higher frequencies
Operation near fast moving obstacles	Frequency-selective fading channels
Mesh networking	High-speed distributed wireless backhaul operating in-band or out-of-band

Source: “5G Spectrum Recommendations” 4G Americas August 2015

Impacts on the fixed network

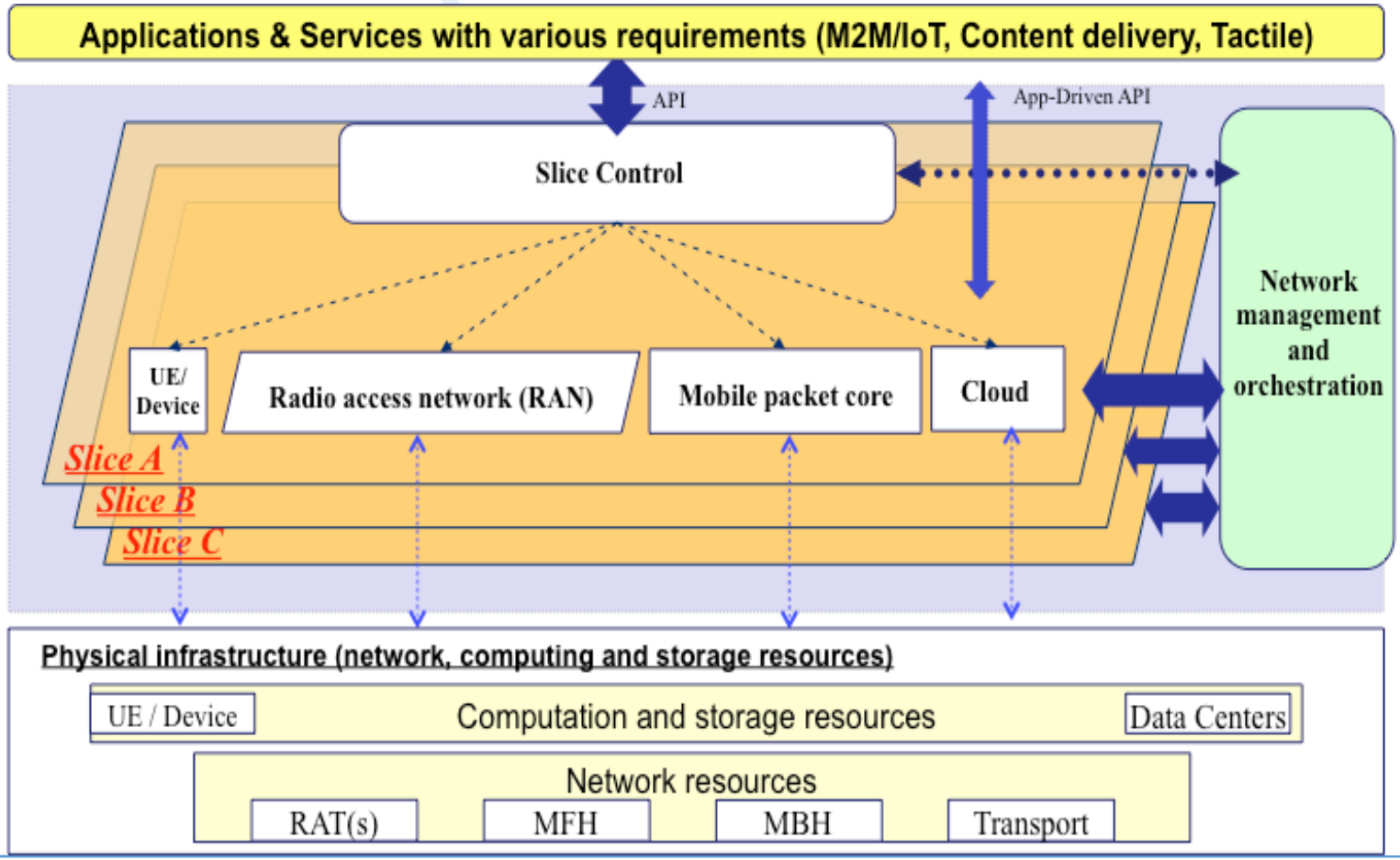
- Architecture
  - Flat
    - Enormous capacity required at edge
    - Mesh rather than hub-and-spoke
  - Flexible
    - Highly variable traffic volumes
  - Slicing (one slice per use case)
- Technologies
  - Network Function Virtualisation (NFV)
  - Software Defined Networking (SDN)
  - Content distribution
  - Optical transmission
  - Machine Type Communication (MTC)

Network architecture for IMT-2020



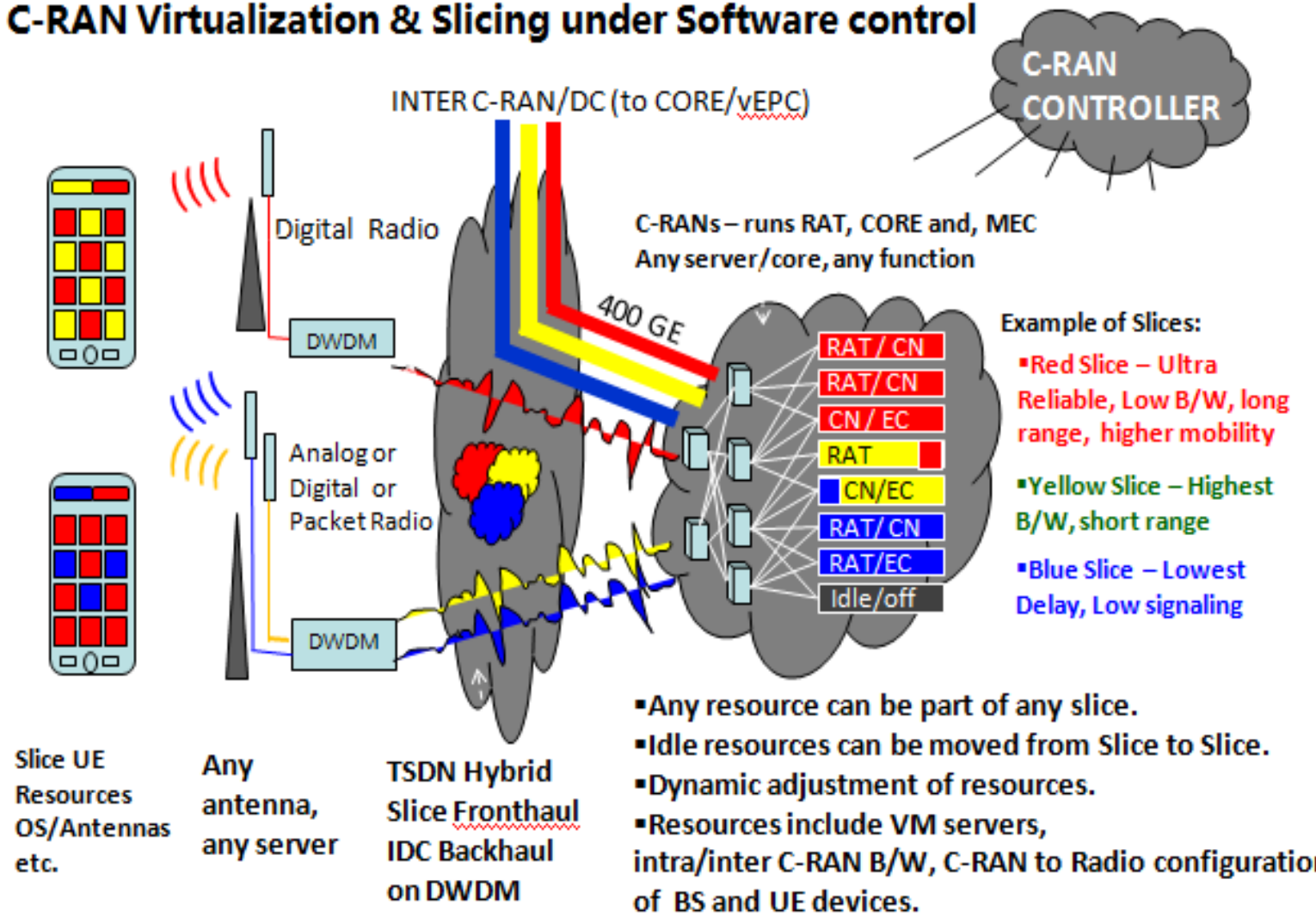
Source: ITU-T Focus Group on IMT-2020

Network “softwarization”



Source: ITU-T Focus Group on IMT-2020

C-RAN Virtualization & Slicing under Software control



Source: ITU-T Focus Group on IMT-2020

Migration strategy – technology aspects

- Infrastructure
  - Radio frequency spectrum
  - Network components & architecture
  - Protocols
- Services
  - Protocols

Migration strategy – regulatory aspects

- Spectrum allocation
- Licensing
- Competition
- Resource sharing
- Access & Interconnection
- Technical standards
- Equipment approval & market surveillance
- International coordination

Thank You