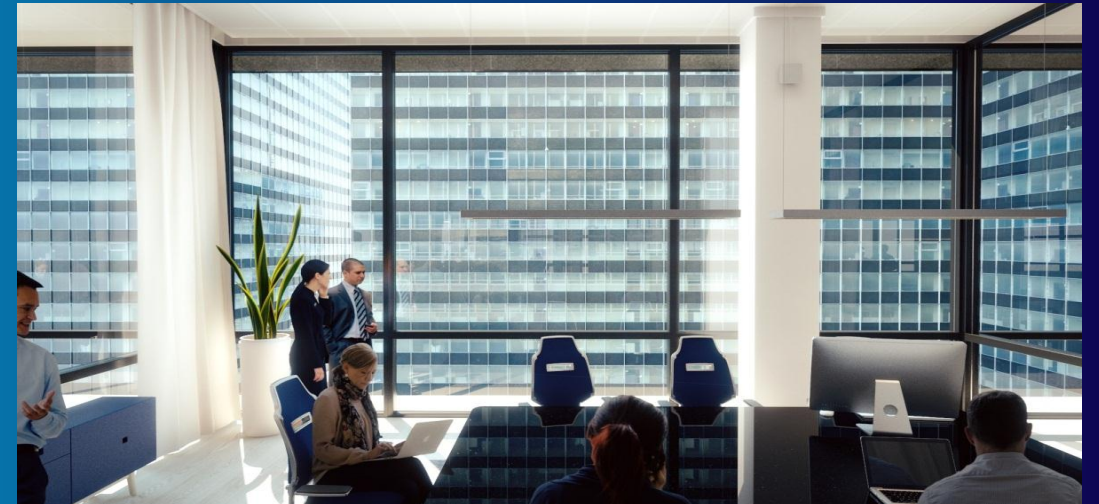




# Finding right frequencies

- new additional spectrum for future UMTS / IMT systems

Lasse Wieweg





# Agenda

- UMTS Forum contributions to the work on IMT
- the study work and IMT spectrum
- towards WRC-15
- new gigabit mobile broadband networks
- technology evolutions
- new network topologies
- additional spectrum

## UMTS Forum is a long-standing trade organization supporting UMTS/IMT technologies and 3GPP mobile broadband roadmap

– as well as in the ITU context

- UMTS Forum developed **Report 40** for WRC-07

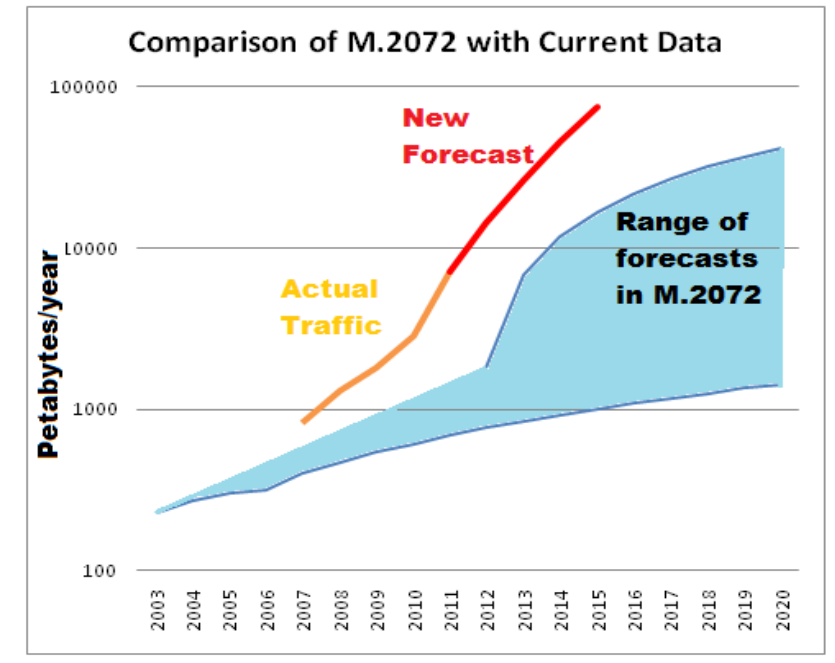
- for the Report ITU-R M.2072 on the future mobile market and estimates the total volume of mobile traffic will reach about **60 EB per year around 2020**
- in support of ITU-R Report M.2078 estimating the total UMTS/IMT spectrum requirements in 2020; 1280 MHz for a “low market” and 1720 MHz for a “high market”

- UMTS Forum developed **Report 07** for WRC-2000

- where the band 2500 – 2690 MHz was identified to UMTS/IMT

## UMTS Forum developed Report 44 for WRC-12 / 15

- forecasts addressing the year 2020 (2025)
- for a diverse range of applications and services that require very high peak data rate delivery
- in support of the new Report ITU-R M.2243 [IMT.UPDATE] forecasted the future mobile market



Report ITU-R M.2243

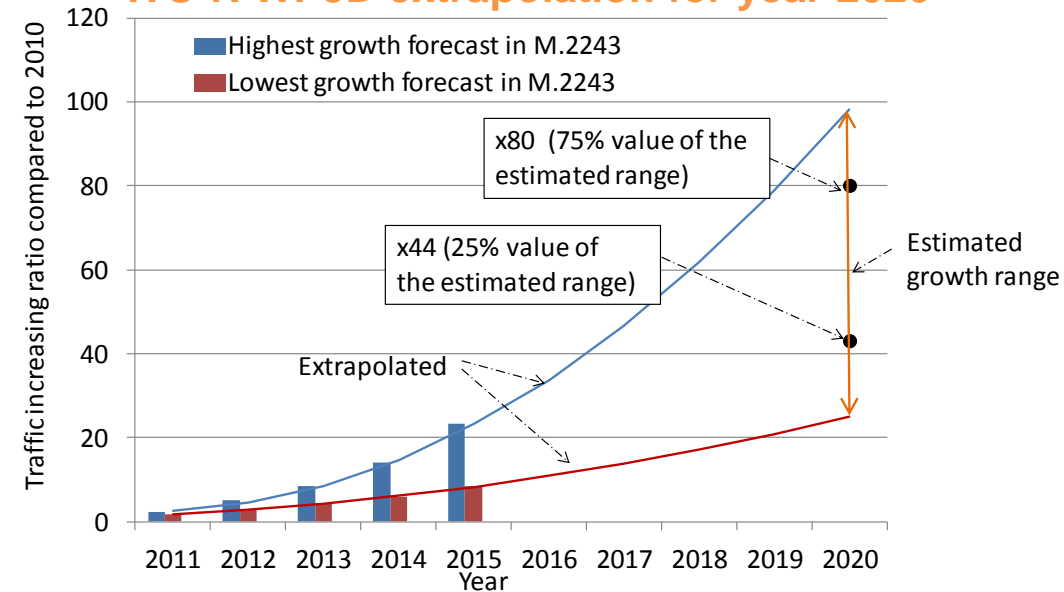
## Towards WRC-15

ITU-R Report M.2243, on some trends

- more mobile data traffic
- very high peak data rates
- need for capacity and coverage
  - new types of devices, smartphone and tablets
  - increased mobile Internet usage
  - more mobile software application offerings (Apps)
  - growth of video traffic
  - expansion of M2M traffic

in the light of these service trends, it is predicted that **mobile traffic in 2020 would increase by 44 – 80 times** subject to market developments, compared to year 2011

### ITU-R WP5D extrapolation for year 2020



## Gigabit networks

Future networks using UMTS/IMT-Advanced will be providing at least 1 Gbps of peak data rate

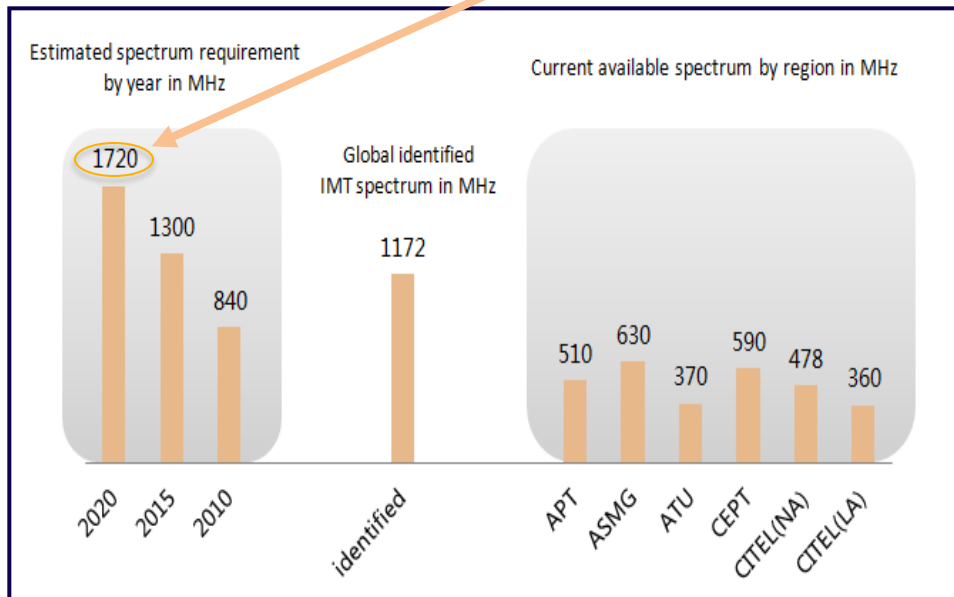
- in a nomadic environment in Recommendation ITU-R M.1645
- for service, spectrum and performance in Report ITU-R M.2134

1 Gbps has already been demonstrated in the mobile environment by UMTS Forum members companies



## The amount of IMT spectrum

New estimate for year 2020 is **1960 MHz**



Source: China input doc 5D/254

## Current terrestrial spectrum for mobile broadband in Region 1

791-862 MHz pw 832-862 MHz (FDD 800 MHz)  
 824-849 MHz pw 869-894 MHz (FDD 850 MHz)  
 880-915 MHz pw 925-960 MHz (FDD 900 MHz)  
 1710-1785 MHz pw 1805-1880 MHz (FDD 1800 MHz)  
 1920-1980 MHz pw 2110-2170 MHz (FDD Core)  
 2500-2570 MHz pw 2620-2690 MHz (FDD Extension)  
 2570-2620 MHz (TDD Extension)

Achievable total amount is of the order of **600 MHz**, subject to national arrangements

## Member companies were instrumental in updating Recommendation ITU-R M.1768

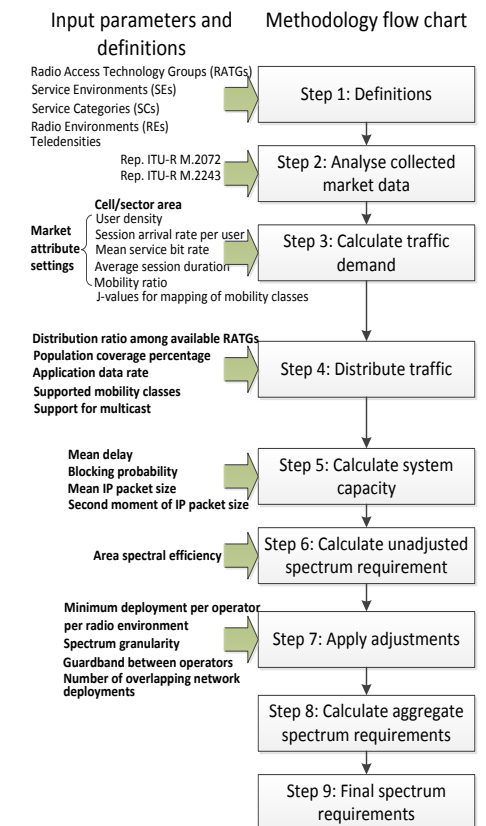
### Additional terrestrial spectrum for mobile broadband by 2020

a methodology for calculation of spectrum requirements for the future development of the terrestrial component of IMT

the Recommendation was used already for the WRC-07 preparations and Decisions

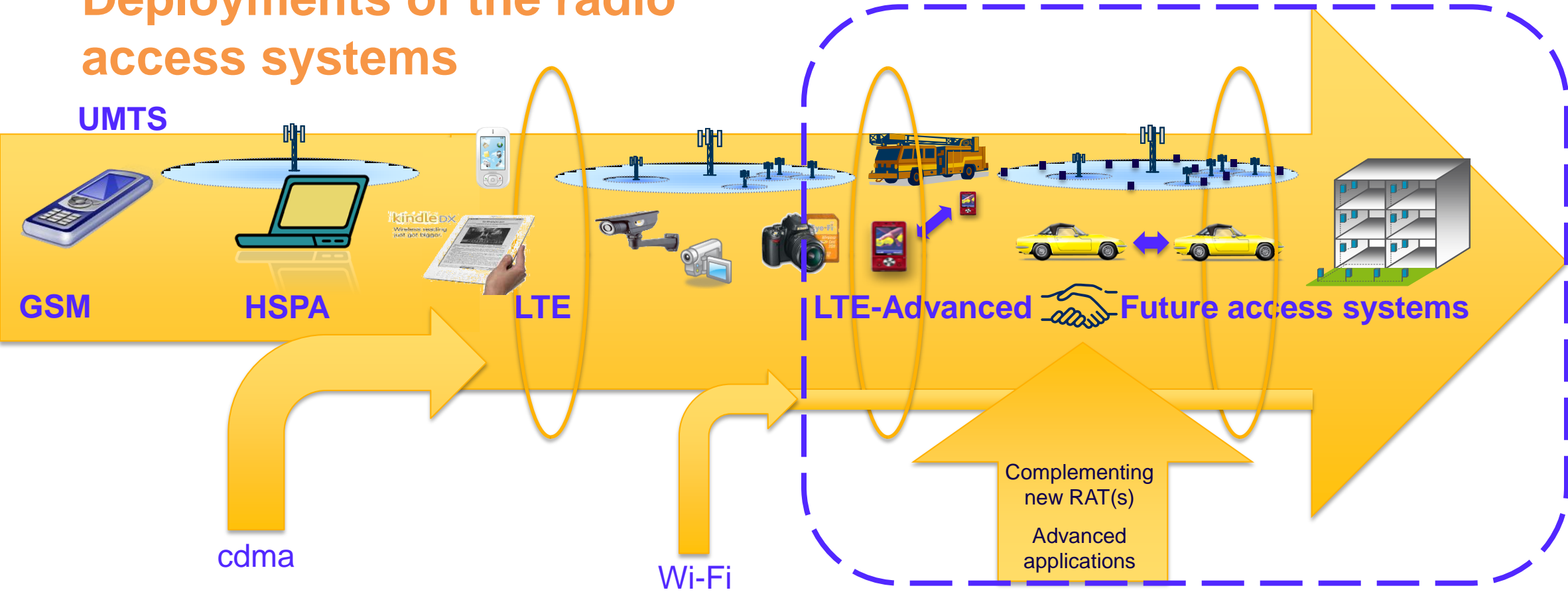
- updated and now also including the granularity concept for spectrum per operator per radio environment
- also allowing for macro and micro cells to use the same frequency

### ITU-R Methodology M.1768



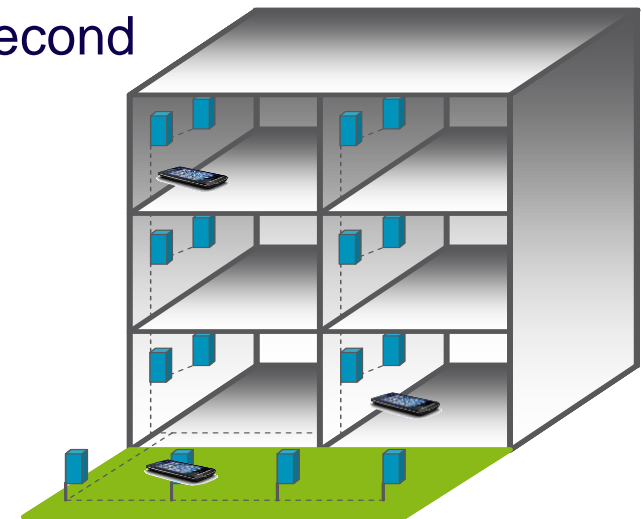


## Deployments of the radio access systems



## Ultra dense deployments

- order of magnitudes more dense than most dense networks of today
- locally, infrastructure density of the **same order or higher than device density**
- **both indoor and outdoor, very dense environments**
- **extreme peak data rates** and traffic capacity a few gigabits per second
- **minimized energy consumption**
- **very low cost** deployments and maintenance



## Additional communications

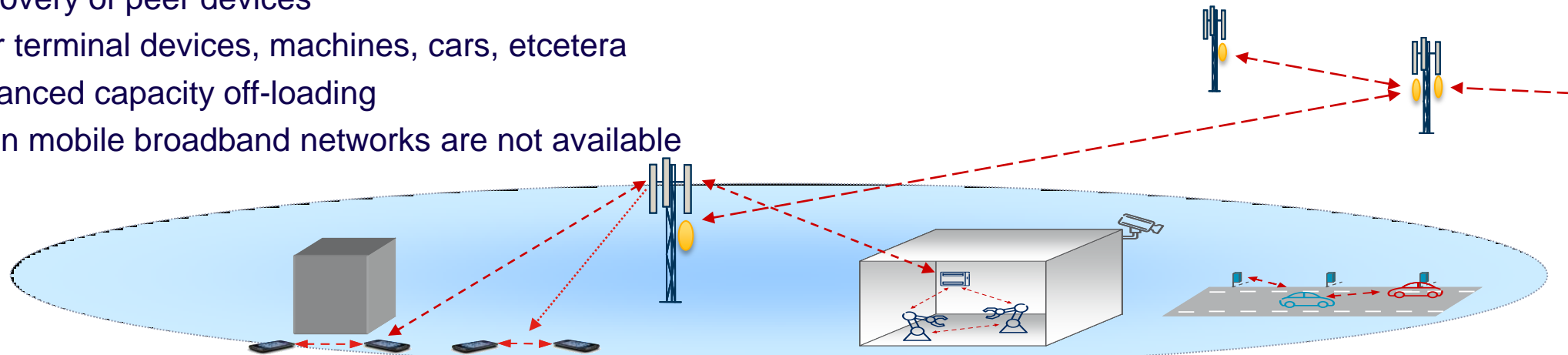
**Backhauling**, multi-gigabit for the gigabit cell sites

**M2M** communication, an integrated part of future networks

- communication link partly under network control, that is to say network assisted
- quality of service in licensed spectrum, but also in other spectrum

**D2D** direct peer to peer communications, network assisted

- discovery of peer devices
- user terminal devices, machines, cars, etcetera
- enhanced capacity off-loading
- when mobile broadband networks are not available



## Future challenges to mobile network operations

- significant increase of subscriptions and traffic placing demands for more spectrum resources
- in addition, more spectrum is also driven by demand for low latency and peak data rates
- more bandwidths of needed for the advanced gigabit services
- dedicated spectrum is fundamental for serving quality consumer needs
- complementary and supplemental use of spectrum would also be needed
  - downlink only (SDL) for broadcasting and unicasting
  - small cells (heterogeneous networks)
  - unlicensed indoor (RLAN)

# Suitable new additional spectrum for future UMTS / IMT systems

600 MHz (TV UHF)

1.4 GHz (L-band)

2.7 GHz (S-band)

3.9 GHz (C-band)





For more information

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