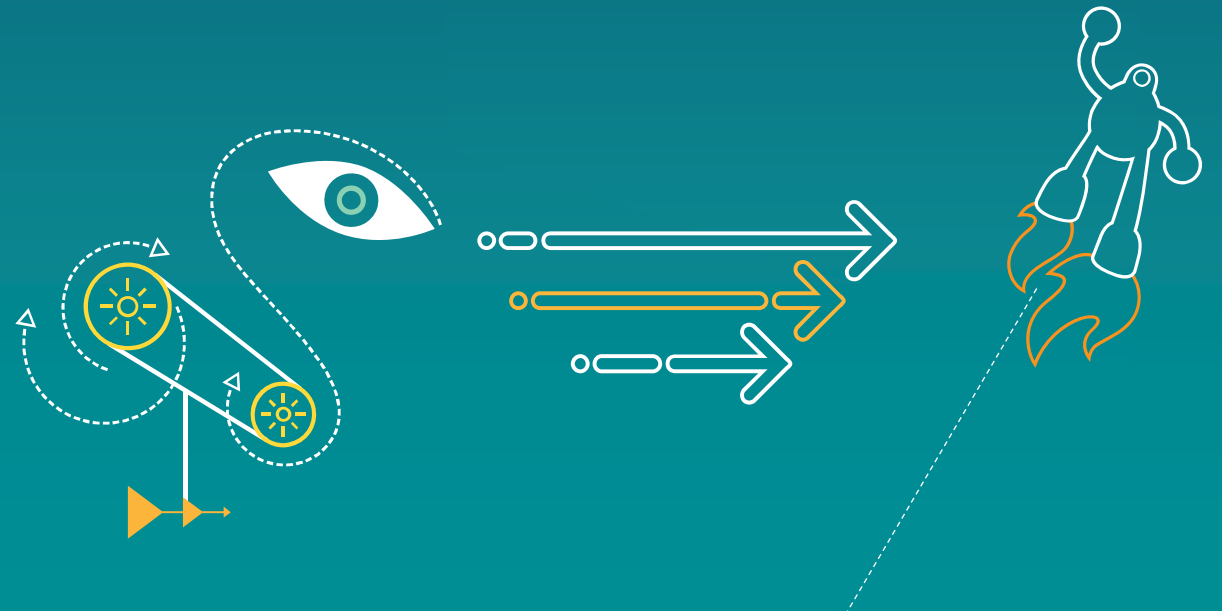# Dr. Bienvenu AGBOKPONTO SOGLO
Gov't Affairs Director, West and Central Africa

IMT for Developing Countries

**Seminar on IMT Towards 2020 and Beyond, February 11, 2014, Vietnam**

QUALCOMM®

Agenda

1   ICT Facts and Figures in Developing Countries

2   Purpose and Focus of the Handbook on Global Trends in IMT

3   IMT system characteristics, technologies and standards

4   IMT spectrum & Regulatory Issues

5   Criteria leading to technology decisions

6   Conclusion and Recommendations

1

ICT Facts and Figures in Developing Countries
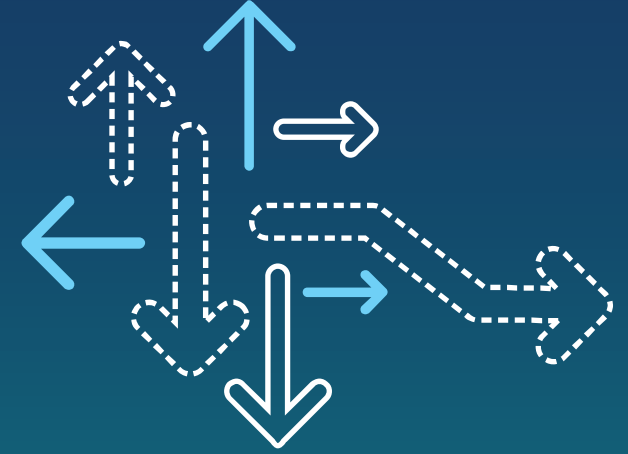
Mobile is the largest technology platform in the world

~6.7 Billion connections, almost as many as people on Earth[1]

~7 Billion smartphones to be shipped 2013-2017[2]

New form factors; **tablet/laptop variants, wearables**, etc.

Evolving into **Internet of Everything**: cars, meters, health-devices, etc.

More prevalent than electricity or running water in some regions

ICT Facts and Figures in Developing Countries

89%

Mobile cellular penetration in Developing Countries[1]

31%

Internet penetration in Developing Countries[1]

~ 20%

Active mobile broadband subscriptions in Developing countries[1]

+ 0.81% GDP

Impact of 10% increase in mobile voice penetration for developing countries[2]

> 80%

of broadband is expected to be mobile by 2016[3]

+ 1.38% GDP

Impact of 10% increase in Internet/ broadband penetration for developing countries[2]

1 ITU, "The World in 2013: ICT Facts and Figures," (2013) , 2 World Bank Information and Communications for Development 2009: Extending Reach and Increasing Impact, 3 The state of Broadband: Universalizing Broadband (A report by the Broadband Commission, Sept. 2013)

Consideration for Developing Countries
Servicing urban, rural and remote

- A number of Mobile Broadband systems and applications, based on different standards, are available and the suitability of each depends on usage (fixed vs. nomadic/mobile), performance and geographic requirements, among others

- In countries where wired infrastructure is not well established e.g. developing countries, Mobile Broadband systems can be more easily deployed to deliver services to population bases in dense urban environments as well as those in more remote areas

- The 2013 Annual Broadband Commission Report contains a list of special requirements/barriers faced by developing countries and offers examples of strategies to overcome such barriers:

Barrier/obstacle	Examples of strategies to overcome the barriers
Lack of infrastructure/ high costs of deployment	• National broadband plan, including roll- out of a mutualized national backbone, as well as in-building infrastructure • Grants to operators to build out infrastructure, • Sharing of infrastructure and works
Limitations in amount of spectrum available	• Streamline spectrum licensing and re-farming practices, • Implementation of the digital switch-over, • More effective policies for spectrum allocation/assignment
The low levels of ICT skills of some of the population	• ICT training, • Connecting up educational establishments, • ICT lessons in schools and universities, and ICT equipment furnished at low or no cost
…	…

2

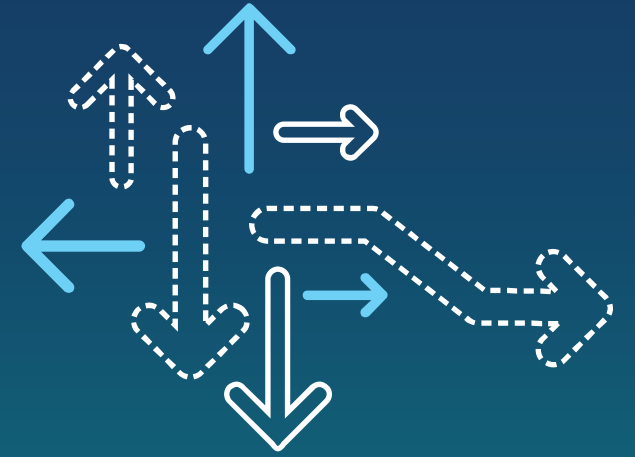# Purpose and Focus of Handbook on Global Trends in IMT
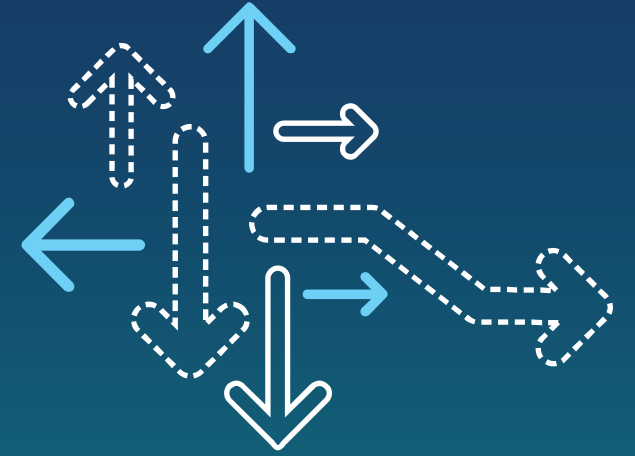
Handbook on Global Trend in IMT
Purpose, Scope and Focus

- Provide general guidance to ITU Members, network operators and other relevant parties on issues related to the deployment of IMT systems to facilitate decisions on selection of options and strategies for introduction of their IMT-2000 and IMT-Advanced networks

- A collaborative effort involving groups in the three ITU Sectors with WP 5D assuming the lead and coordinating role and responsible for developing text for the terrestrial aspects

- Special attention would be given to needs of developing countries responding to the first part of Question ITU-R 77/5

- Focus on the technical, operational and spectrum related aspects of IMT systems, including information on the deployment and technical characteristics of IMT as well as the services and applications supported by IMT

3

## IMT system characteristics, technologies and standards

IMT system characteristics, technologies and standards

IMT system concepts and objectives

- IMT-2000, third generation mobile systems started service around the year 2000, and provides access by means of one or more radio links to a wide range of telecommunication services including advanced mobile services, supported by fixed networks (e.g. PSTN/Internet), which are increasingly packet-based, and other services specific to mobile

- International Mobile Telecommunications – Advanced (IMT-Advanced) is a mobile system that includes the new capabilities of IMT that go beyond those of IMT-2000.

- IMT-Advanced systems provide enhanced peak data rates to support advanced services and applications (100 Mbit/s for high and 1 Gbit/s for low mobility were established as targets for research)

- Objectives on IMT are summarized from the view point of multiple perspectives:
    - End User, Content provider, Service provider, Network operator, Manufacturer/ Application Developer
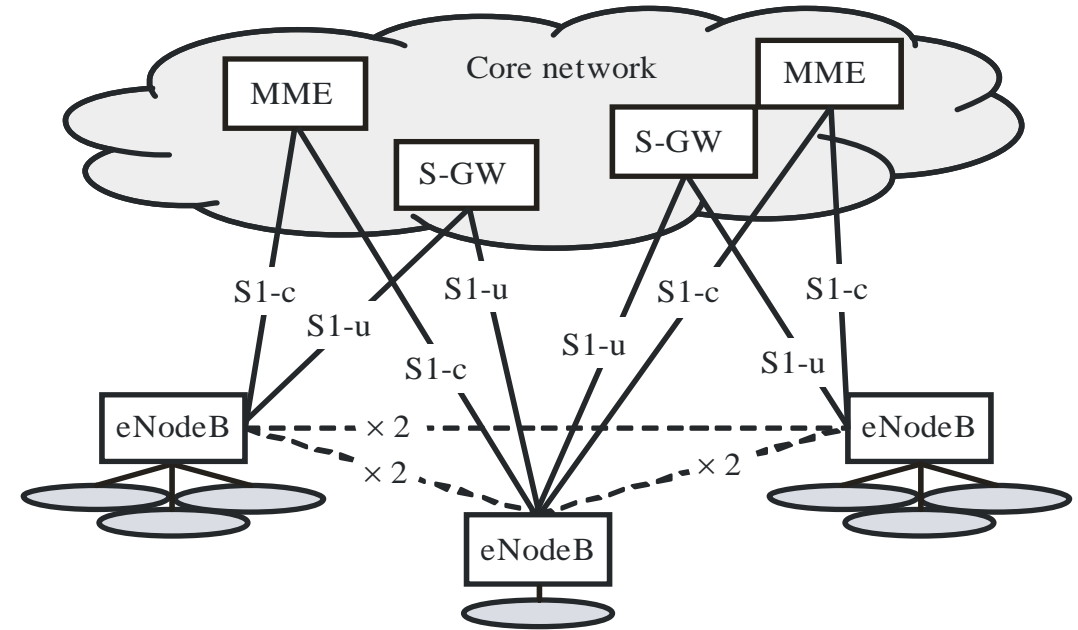
IMT system characteristics, technologies and standards

Network Configurations
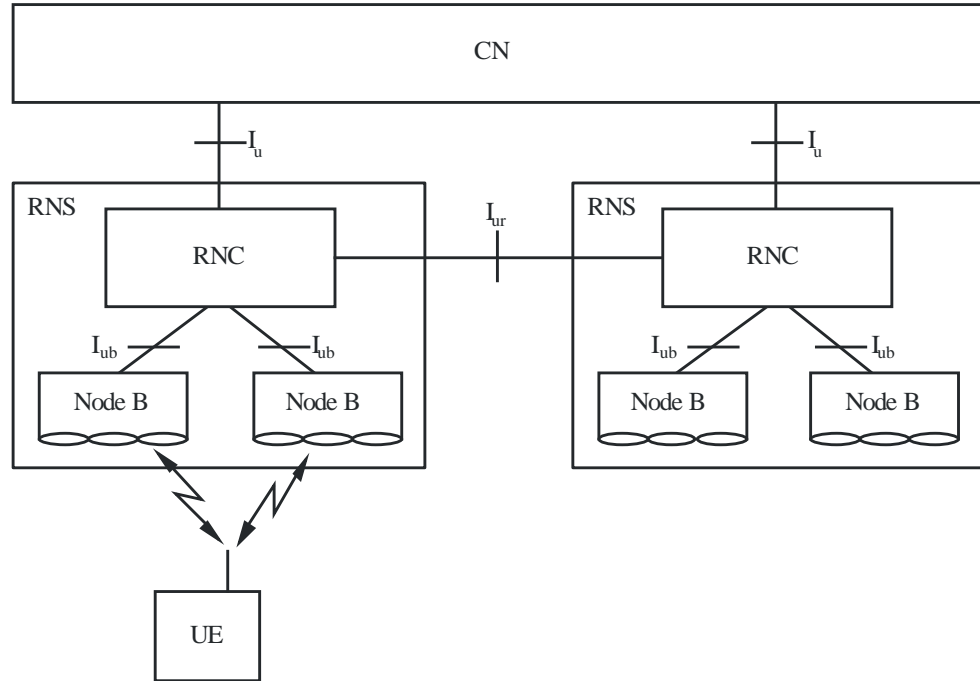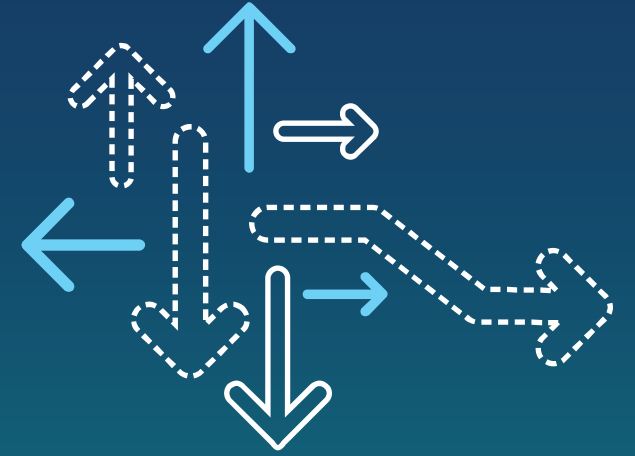

M.1457-01

° IMT2000 - UTRAN architecture

5-275-01-01

° IMT-Advanced : Radio-access network interfaces

IMT spectrum & Regulatory Issues

IMT spectrum

International spectrum identified for IMT

- The following bands are identified for IMT in the Radio Regulations (RR) edition 2012, as shown in Table 1 below

TABLE 1

Band (MHz)	Footnotes identifying the band for IMT
450-470	5.286AA
698-960	5.313A, 5.317A
1 710-2 025	5.384A, 5.388
2 110-2 200	5.388
2 300-2 400	5.384A
2 500-2 690	5.384A
3 400-3 600	5.430A, 5.432A, 5.432B, 5.433A

IMT spectrum

Frequency arrangements

- The frequency arrangements for IMT contain in Recommendation ITU-R M.1036 are provided with the intent of enabling the most effective and efficient use of the spectrum to deliver IMT services – while minimizing the impact on other systems or services in these bands – and facilitating the growth of IMT systems

- An example of the recommended frequency arrangements (based upon Recommendation M.1036) for implementation of IMT in the bands listed in Table 1 above is shown below

Paired frequency arrangements in the band 698-960 MHz

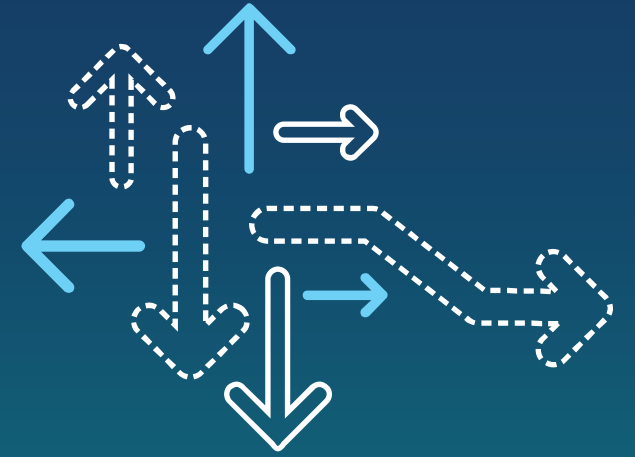| Frequency arrangements	Paired arrangements				Un-paired arrangements (e.g. for TDD) (MHz)
	Mobile station transmitter (MHz)	Centre gap (MHz)	Base station transmitter (MHz)	Duplex separation (MHz)	
A1	824-849	20	869-894	45	None
A2	880-915	10	925-960	45	None
A3	832-862	11	791-821	41	None
A4	698-716 776-793	12 13	728-746 746-763	30 30	716-728
A5	703-748	10	758-803	55	None
A6	None	None	None		698-806

Regulatory Issues

- Institutional aspects and arrangements

  - To guarantee that spectrum policy is aligned with the country's main objectives, it is important that telecommunications should figure on country's main agenda

  - All stakeholders should have a clear understanding of the decision-making process

    - could be accomplished through the development of a code of practice for the decision-making process,

    - enabling both regulators and operators to have a clear understanding of how regulatory decisions are made, and any applicable processes for appealing such decisions

  - In order to foster IMT deployment, the agency responsible for the spectrum policy should pay close attention to the role of each government agent (national and subnational) as well as other market stakeholders

- Transparency and stakeholder involvement

  - In order to ensure that regulatory and policy decisions are made in the best interest of all, an open and public decision-making process should be used. This can be achieved by:

    - using a process that provides for public review and comment of proposed regulations and decisions

    - an open and public policy development process will lead to greater transparency, a key characteristic of any good decision-making process (standing advisory panels or groups, public consultations, and targeted solicitation of inputs)

- Market knowledge

  - In order to develop good IMT spectrum policy, it is important for regulators and government institutions to know the actual market status and the community needs

15

Regulatory Issues (Cont.)

- Spectrum licensing
  - IMT licensing considerations
    - technology requirements, coverage/ roll-out obligations, timing of license assignments, duration of licenses, spectrum block size, number of operators , infrastructure sharing, number portability
  - IMT licensing principles and methods
    - non-market based assignments such as comparative process (also known as beauty contests) and lotteries
    - In cases of limited demand for a particular frequency band in a particular geographic area, first-come first served licensing may also be considered
    - Licensing is a national prerogative and each country must decide what methodology is appropriate

- IMT spectrum clearing (including refarming) guidelines
  - a combination of administrative, financial and technical measures aimed at removing users or equipment of the existing frequency assignments either completely or partially from a particular frequency band
  - The frequency band may then be allocated to the same or different service(s)

- Global circulation of terminals
  - allows users to carry their personal terminals into a visited country and the ability to use them wherever possible

- Unwanted emissions
  - Information regarding unwanted emissions on IMT-2000 can be found in Recommendation ITU-R M.1580 & Recommendation ITU-R M.1581

5

Criteria leading to technology decisions

Criteria leading to technology decisions
Spectrum implications, Channelization and Bandwidth

- The current availability of frequency bands and amount of bandwidth differs across Member States and regions
  - leads to many challenges such as roaming, device complexity, lack of economics of scale, and interference

- Assignment of contiguous, broader and harmonized frequency bands which are aligned with future technology development is recommended
  - support continued introduction of mobile devices with longer battery life
  - improving spectrum efficiency; and potentially reducing cross border interference

- Flexible spectrum usage can improve the frequency efficiency by spectrum sharing and making use of spectrum holes, which includes :
  - aspects of cognitive radio techniques, authorized spectrum sharing e.g. ASA (Authorized Shared Access) / LSA (Licensed Shared Access) and joint management of multiple RATs

Criteria leading to technology decisions
Importance of multi-mode/multi-band Solutions & Technology Development Path

- The increasing availability of multi-radio mobile devices has fueled a growing trend towards exploiting multiple radio access technologies (RATs)

  – 2G/3G/4G to address capacity as well as connectivity limitations

- Integration of multiple radio access technologies would help seamlessly integrate the new spectrum bands, existing licensed bands, and unlicensed bands

  – meet capacity and service demands and provide better user experience

- Multi-radio networks also offer an opportunity for future IMT systems to support all footprints

  – Wide area networks (WANs), local area networks (LANs), and personal area networks (PANs)

- ITU-R WP 5D has a system in place to continually revise Recommendations M.1457 and M.2012 as several technologies have and will continue to introduce technological advancements to both established and more recent IMT systems

  – Member States can follow these advancements in many ways including tracking the latest revisions of these recommendations

Criteria leading to technology decisions
Backhaul Considerations

- As traffic demands for mobile broadband communications increases, backhaul is increasingly becoming an important infrastructure in the IMT network architecture that requires special consideration

  - Backhaul performance not only affects the data throughput available to users, but also the overall performance of the radio-access network

- Networks with large numbers of (small) cell sites require backhaul solutions that can use a selection of physical transmission media, including microwave, fiber and wireless connectivity

- Backhaul solutions should not limit the radio access network

  - there should be adequate backhaul capacity provision at the network cell sites

- Backhaul solutions should have sufficient end-to end performance to meet the desired user quality of experience (QoE) everywhere for the provision of mobile broadband

Criteria leading to technology decisions
Technology Neutrality

- With the rapid changes and developments occurring in the mobile sector, a technology neutral approach in developing policies and regulations for the wireless communications sector will support the continued and robust growth of mobile broadband

  - directly benefit the entire community, both the public and private sectors

- Policies and regulations that mandate or only address specific technology solutions frequently become impediments for continued growth, limit competition and stifle innovation

6

Conclusion and Recommendations
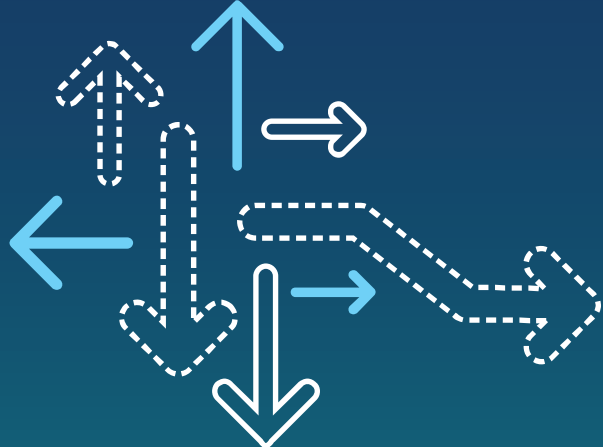
Conclusion and Recommendations

- IMT is becoming the primary medium for the delivery of Broadband in developing countries
  - by 2016, over 80% of broadband is expected to be mobile
- Recommend the assignment of contiguous, broader and harmonized frequency bands which are aligned with future technology development
- In order to meet capacity and service demands and provide better user experience, integration of multiple radio access technologies e.g. 2G/3G/4G would help seamlessly integrate the new spectrum bands, existing licensed bands, and unlicensed bands
- Recommend to provide adequate backhaul capacity with sufficient end-to end performance to meet the desired user quality of experience (QoE) everywhere for the provision of mobile broadband
- Technology neutral approach in developing policies and regulations for the wireless communications sector is necessary to support the continued and robust growth of mobile broadband
- In order to ensure that regulatory and policy decisions are made in the best interest of all, an open and public decision-making process should be used

Thank you

Follow us on: f ⟨twitter⟩ ⟨linkedin⟩

For more information on Qualcomm, visit us at:
www.qualcomm.com & www.qualcomm.com/blog