Mobile Broadband Everywhere:
Impact of the Spectrum Harmonisation

Wladimir Bocquet

Deputy Director

Strategy & International Planning

Group Spectrum Office

wladimir.bocquet@orange-ftgroup.com

August 24-26, 2009

Agenda

1 General introduction

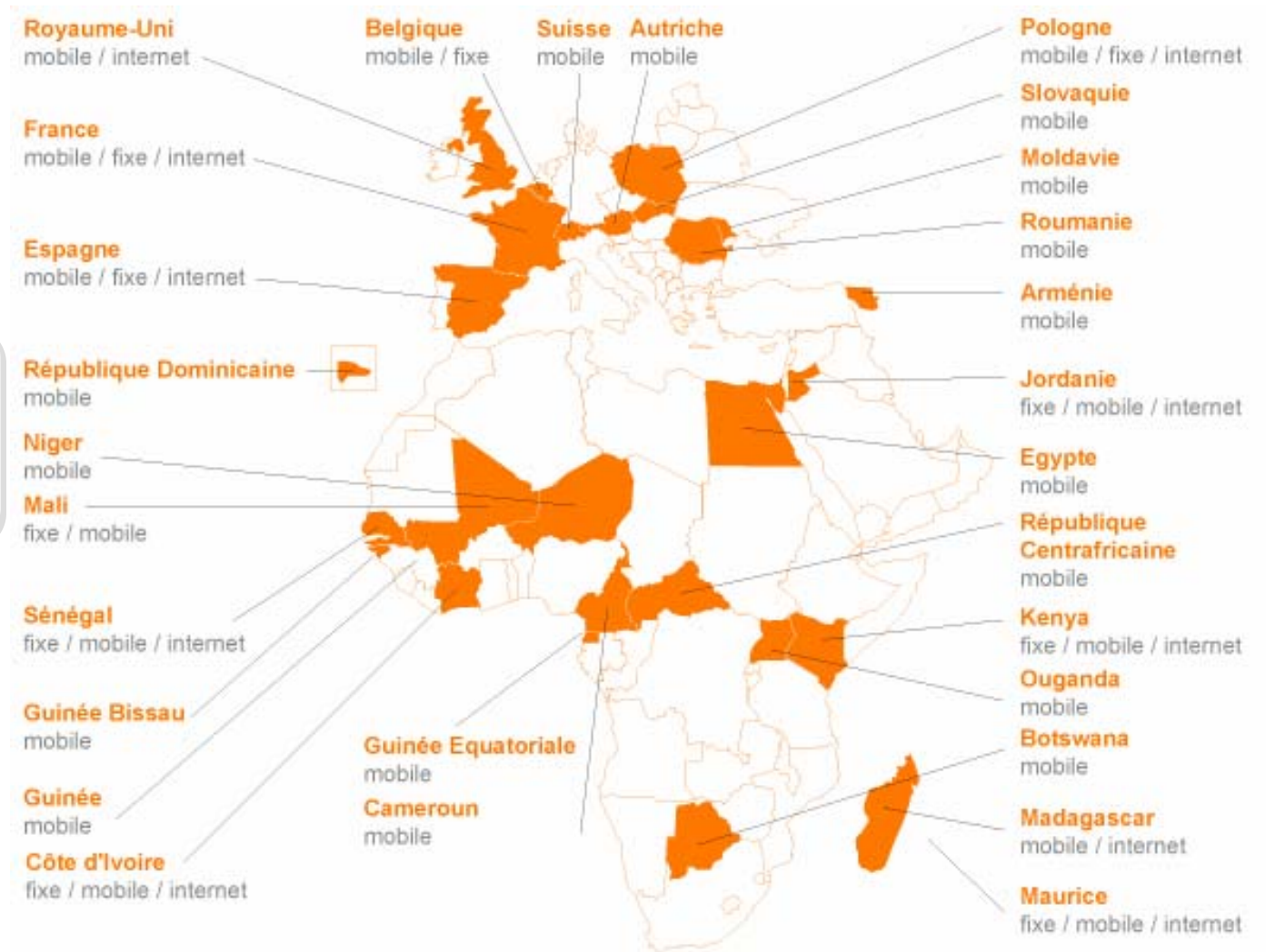**2** Concept of Mobile Broadband

3 Importance of spectrum harmonisation

4 Next steps & Conclusion

Orange – FT Group: Where we are?

end Q3 2008
- 118 M mobile
- 12 M fixed broadband

Royaume-Uni
mobile / internet

France
mobile / fixe / internet

Espagne
mobile / fixe / internet

République Dominicaine
mobile

Niger
mobile

Mali
fixe / mobile

Sénégal
fixe / mobile / internet

Guinée Bissau
mobile

Guinée
mobile

Côte d'Ivoire
fixe / mobile / internet

Guinée Equatoriale
mobile

Cameroun
mobile

Belgique
mobile / fixe

Suisse
mobile

Autriche
mobile

Pologne
mobile / fixe / internet

Slovaquie
mobile

Moldavie
mobile

Roumanie
mobile

Arménie
mobile

Jordanie
fixe / mobile / internet

Egypte
mobile

République
Centrafricaine
mobile

Kenya
fixe / mobile / internet

Ouganda
mobile

Botswana
mobile

Madagascar
mobile / internet

Maurice
fixe / mobile / internet

➔ serving - consumers in 27 countries
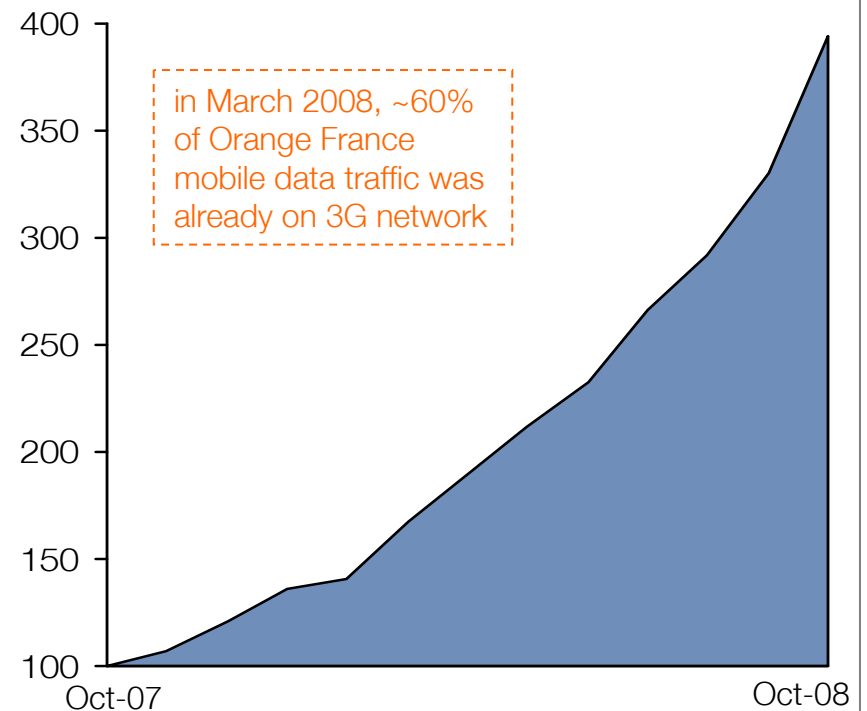- corporates in 220 countries and territories

Background:
better understanding of mobile data traffic in Europe

significant increase of voice + data traffic

- traffic growth driven by

  - new Mobile Broadband capable devices
 - Increase in term of penetration

% of laptops connected with Mobile Broadband

Strategy Analytics — Lehman
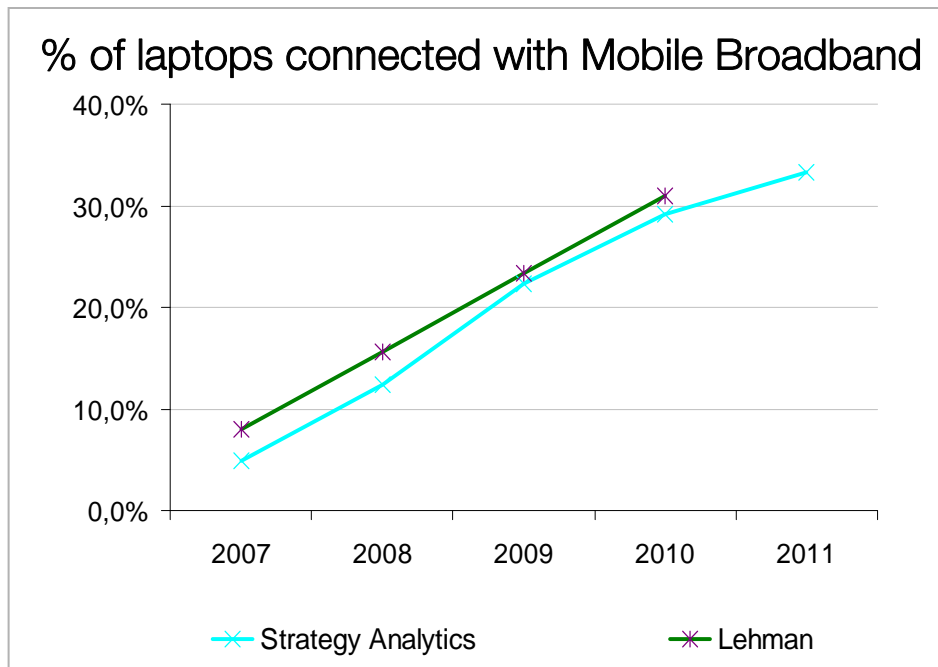
cumulated mobile data traffic in France, UK, Spain and Poland: 12 month evolution

in March 2008, ~60% of Orange France mobile data traffic was already on 3G network

Background:
mobile broadband subscription growth in Eastern Europe

- 445 million GSM & WCDMA-HSPA

- Including over 12 million WCDMA-HSPA subscriptions
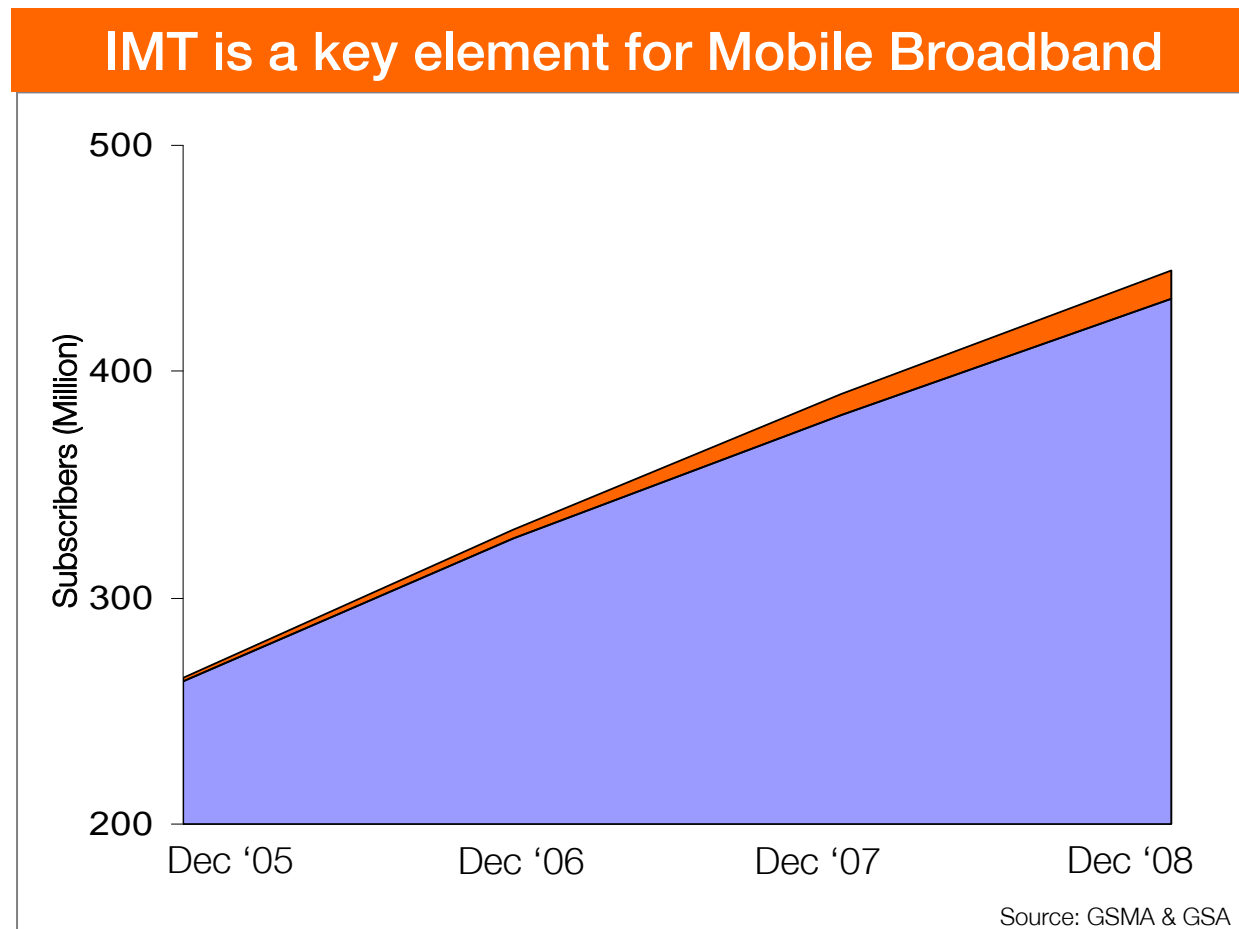
IMT is a key element for Mobile Broadband

Source: GSMA & GSA

Agenda

1   General introduction

2   Concept of Mobile Broadband

3   Importance of spectrum harmonisation

4   Next steps & Conclusion
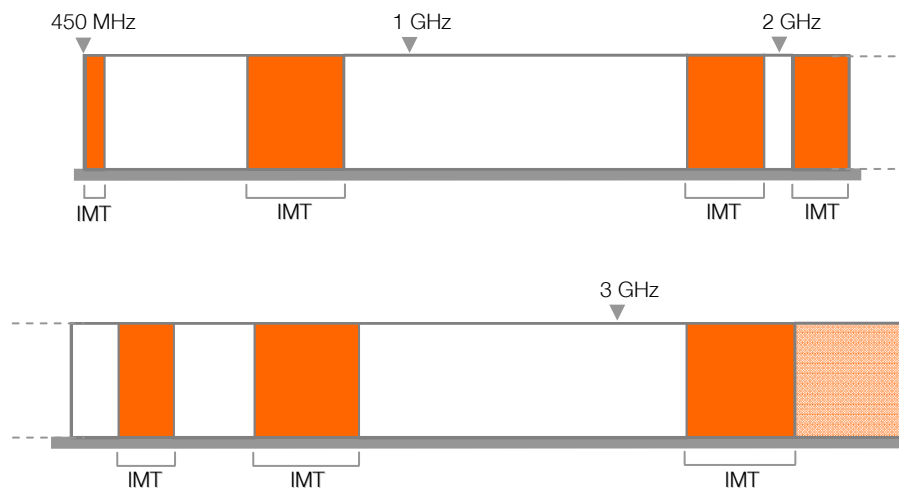
What is Broadband?
Importance of Spectrum & Technology

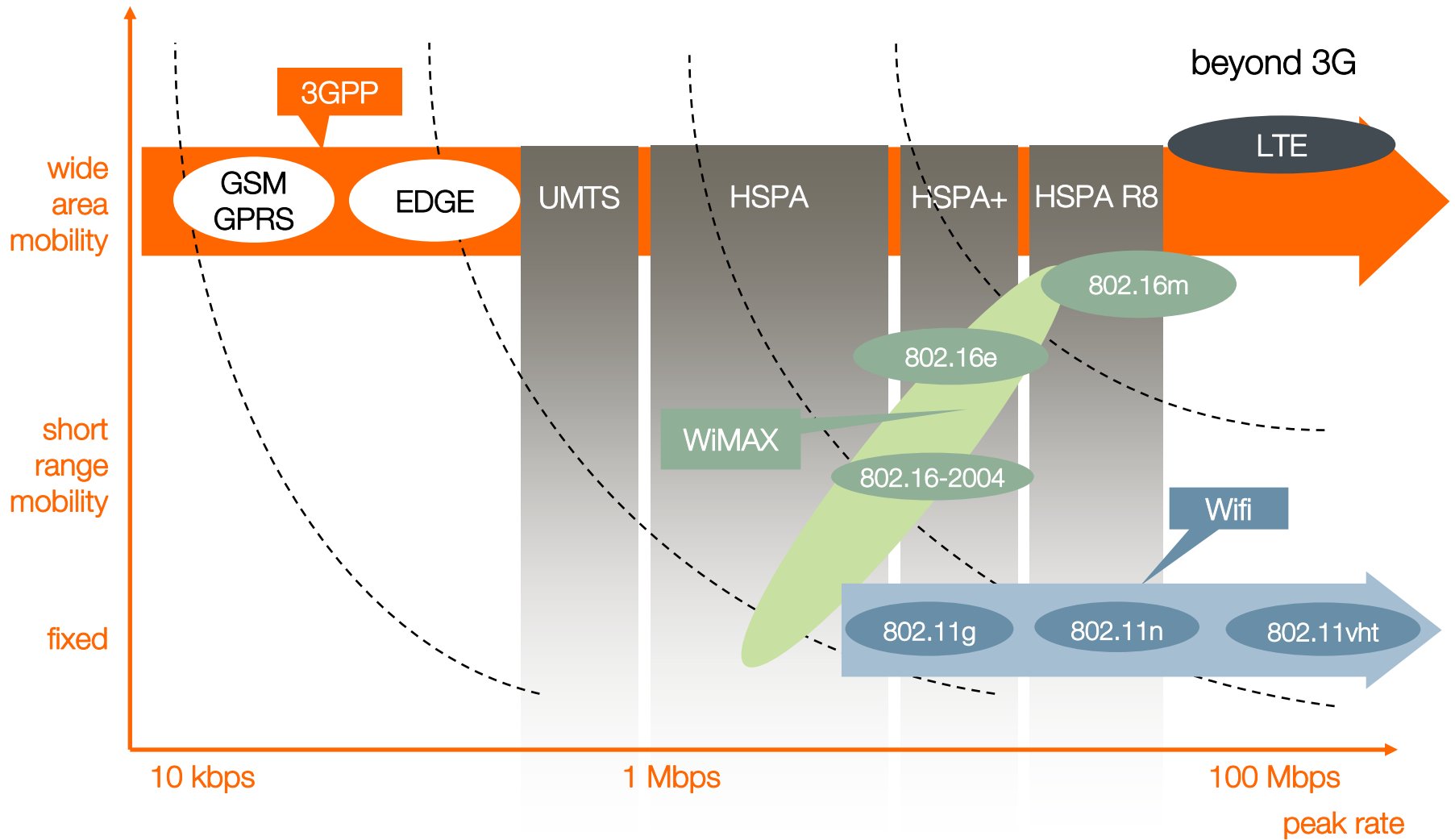$$\text{system} = \text{bandwidth} \times \text{spectrum efficiency}$$

Spectrum Regulation
(ITU-R and regional organisations)

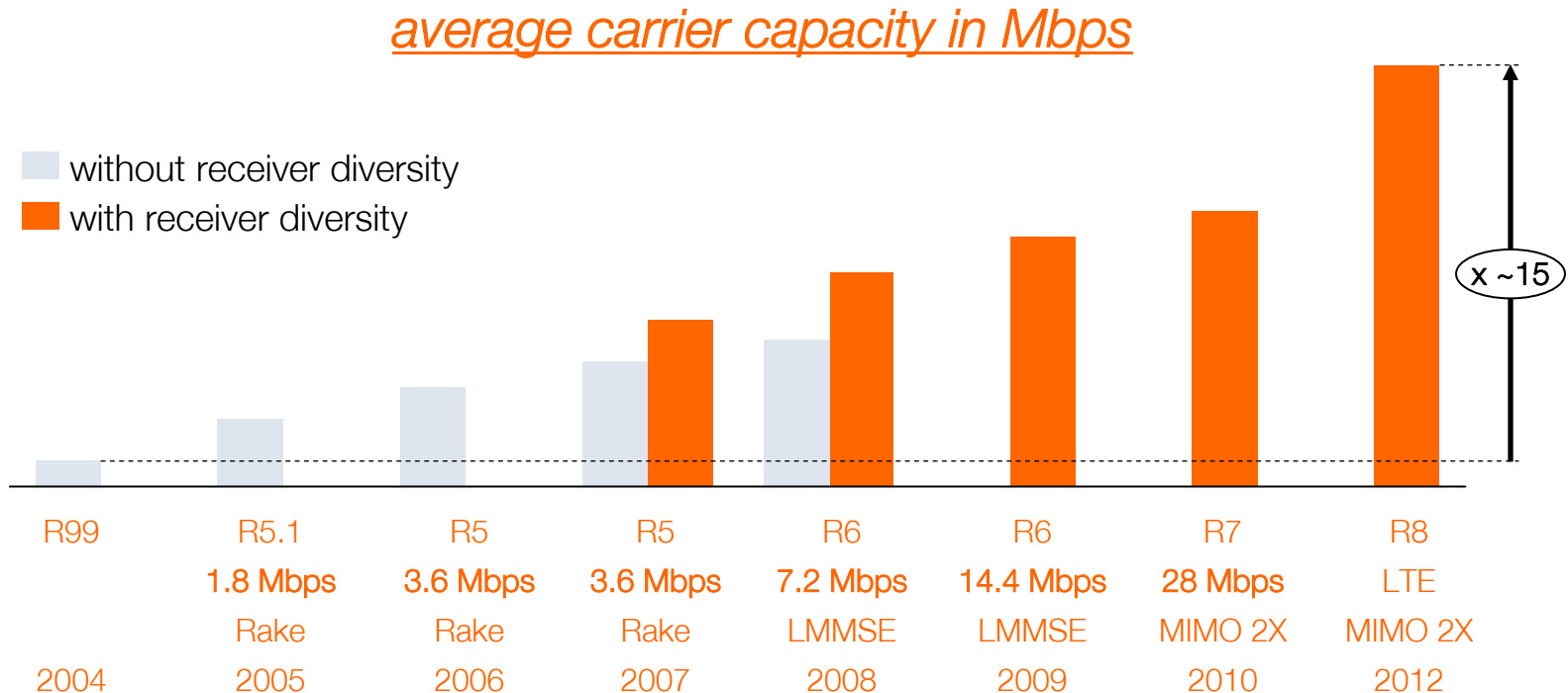Technology and Standards

Allocated IMT bands

450 MHz   1 GHz   2 GHz

IMT   IMT   IMT   IMT

3 GHz

IMT   IMT   IMT

Mobile Broadband:
A global trend toward LTE

Mobile Broadband:
Radio efficiency improves regularly with new features

average carrier capacity in Mbps

without receiver diversity
with receiver diversity

x ~15

R99	R5.1	R5	R5	R6	R6	R7	R8
	1.8 Mbps	3.6 Mbps	3.6 Mbps	7.2 Mbps	14.4 Mbps	28 Mbps	LTE
	Rake	Rake	Rake	LMMSE	LMMSE	MIMO 2X	MIMO 2X
2004	2005	2006	2007	2008	2009	2010	2012

- Improvement requires devices at the same level of standard to achieve full capability

- Some devices features greatly influence capacity, notably receiver diversity and advanced receiver

Agenda

Why do we need harmonisation?

- Harmonisation is still key
  - Harmonising spectrum has been the bedrock of the success of technologies such as GSM by driving equipment & device economies of scale
  - The process of releasing more spectrum has, however, highlighted the difficulties of harmonising both spectrum allocation & band-plans across regions
  - Concerted efforts are needed by national & international regulators to limit any differences on spectrum licensing

Maximising technology economies of scale through spectrum harmonisation and ensuring effective link between spectrum strategy & device availability is key

Spectrum Harmonisation & Mobile Broadband:
The customer perspectives

customer benefit
from the Spectrum Harmonisation

efficiency
- always connected / distant presence
- acceleration of transactions
- time ambivalence, hyper life
- network valuation

flexibility
- Access to common contents
- Large device offer
- FMS/FMC
- Facilitate roaming

customer behaviour
with Mobile Broadband

serenity
- abundance promise
- peace of mind / simplicity
- security and privacy

entertainment
- on demand (content & services)
- me and my communities
- from mass media to my media

ethics and involvement
- responsible purchase
- CO_2 footprint lowering
- information transparency

Spectrum Harmonisation: A time consuming process

Time to achieve regional & international spectrum harmonization is about several years from start to commercial volumes
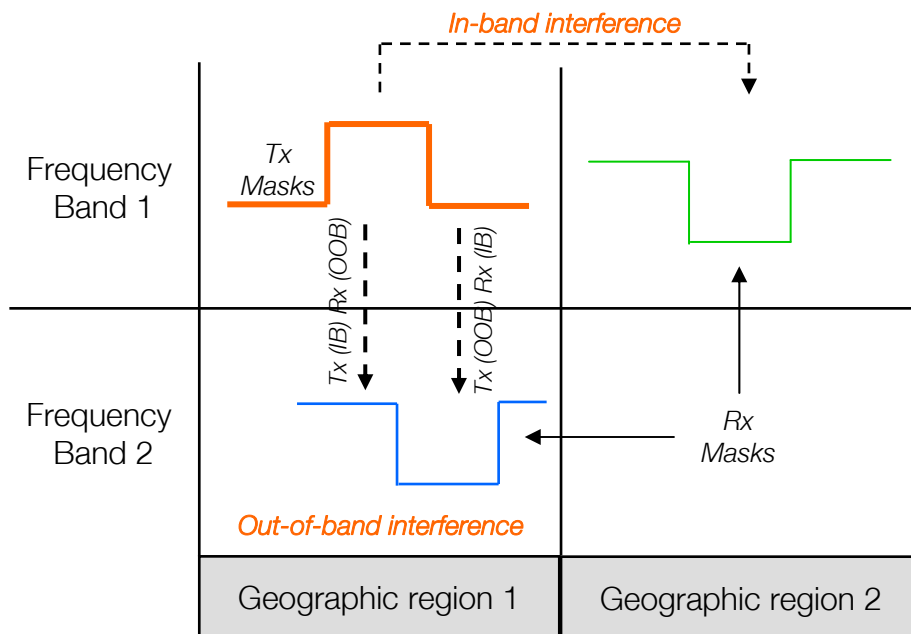
Example of the IMT systems

- **1985**: SG8 IWP8/13 Established in ITU CCIR for initial study of FPLMTS

- **1992**: WARC'92 allocated 230MHz for IMT-2000 in 2GHz band:
  - 1885-2025 MHz
  - 2110-2200 MHz

- **1997**: FPLMTS renamed to IMT-2000 & Study of introduction of family concept started

- **2000**: IMT.RSPC (M.1457) detailed specification of five IMT-2000 families member and approved by RA'00

- **2000**: WRC'00 identified additional frequency bands for IMT-2000
  - 806-960 MHz
  - 1710-1885 MHz
  - 2500-2690 MHz

- **2007**: WRC'07 additional frequency for IMT Family
  - 450-470 MHz
  - 698/790-960MHz ➔ Digital dividend partially UHF band
  - 2300-2400 MHz
  - 3400-3600 MHz

More than 20 years to harmonise IMT

Spectrum Harmonisation: Limit the interference risks

- Ensure availability of clean spectrum

  – Protect the rights of users

  – Keep the records of rights of use (assignments)

  – Control spectrum use (spectrum monitoring)

In-band interference

Tx Masks

Frequency Band 1

Tx (IB) Rx (OOB)   *Tx (OOB) Rx (IB)*

Frequency Band 2

Rx Masks

Out-of-band interference

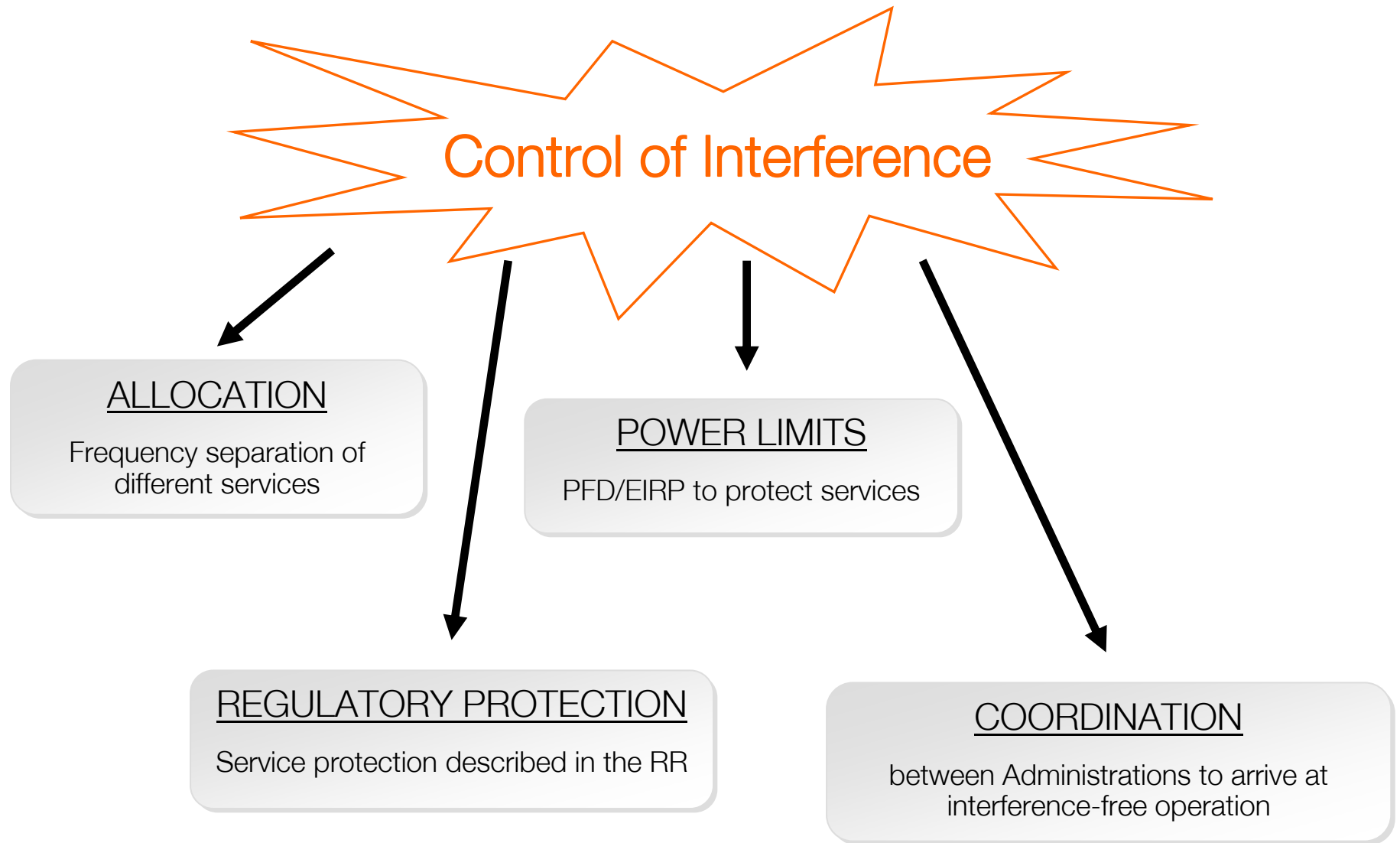| Geographic region 1	Geographic region 2

• **In-band interference:** frequency overlap between the transmitter and receiver operating bandwidths.
➔ Typically for both to be able to operate without excessive interference this implies a degree of geographic separation or coordinated time/code sharing.

• **Out-of-band interference:** no overlap in frequency between the transmitter and receiver's bandwidth, but the geographic separation is sufficiently small that there can be appreciable interfering signal.
two sub-types of this path:
  o In-band emissions received out-of-band
    - due to imperfections in the filtering of the receiver
  o Out-of-band emissions received in-band
    - due to imperfections in the filtering of the transmitter

Spectrum Harmonisation: How to prevent interference?

Control of Interference

ALLOCATION

Frequency separation of different services

POWER LIMITS

PFD/EIRP to protect services

REGULATORY PROTECTION

Service protection described in the RR

COORDINATION

between Administrations to arrive at interference-free operation

15

Agenda

Key topics for WRC 2011: Importance of the Backhauling

radio access

backhaul

core
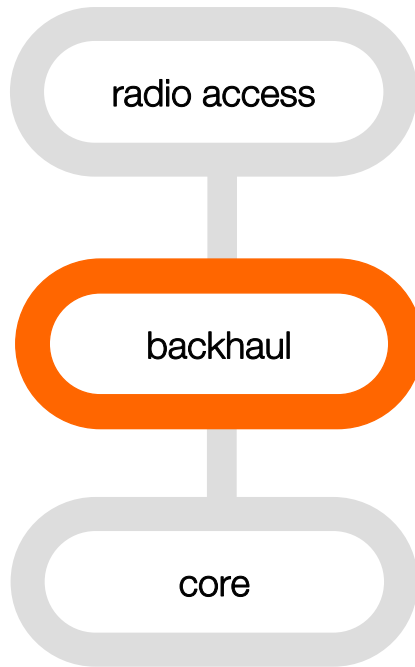
- Risk of interference

  - Long term impact on the ICT regional development

  - Importance of the harmonisation

- Some Agenda Items of the WRC11 may impact Fixed Services

  - Need specific attention

17

Agenda Item	Resolution
1.11	consider a primary allocation to the SRS (Earth-to-space) within the band 22.55-23.15 GHz Res. **753 (WRC-07)**
1.12	protect the primary services in the band 37-38 GHz from interference resulting from AMS operations Res. **754 (WRC-07)**
1.13	studies on spectrum usage of the 21.4-22 GHz band for the BSS and the associated feeder-link bands in Regions 1 and 3 Res. **551 (WRC-07)**
1.14	consider requirements for new applications in the RLS and review allocations or regulatory provisions for implementations of RLS in the range 30-300 MHz Res.**611 (WRC-07)**
1.20	studies on spectrum iden-tification for gateway links for HAPS in range 5850-7075 MHz to support operations in the FS and MS Res.**734 (WRC-07)**
1.21	consider a primary allocation to the RLS in the band 15.4-15.7 GHz Res.**614 (WRC-07)**

Spectrum Harmonisation: Summary

- Critical Resource

  - Spectrum is not infinite for mobile broadband

    - Importance of ITU activity and WRC-11

  - Long term vision is necessary for spectrum allocation

- Regional & International harmonization of spectrum

  - Access to common services

  - Ecosystem to perform interoperability

  - International roaming

  - Economy of scale ➔ availability of affordable products

Harmonised approach required across Regions to secure affordable mobile broadband with high performance at reasonable cost

thank you