

# NGN Mobile Networks

*Meeting the future traffic and  
User demands*

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**UMTS Forum**



# Content

- Drivers and Trends
- Radio Access today and tomorrow
- Services
- Evolution path towards the future
- Conclusions



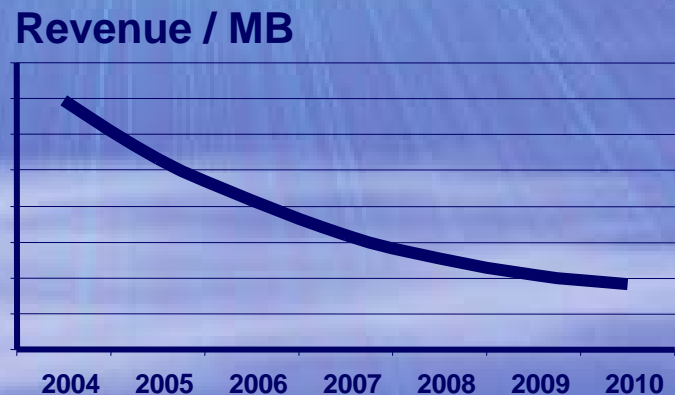
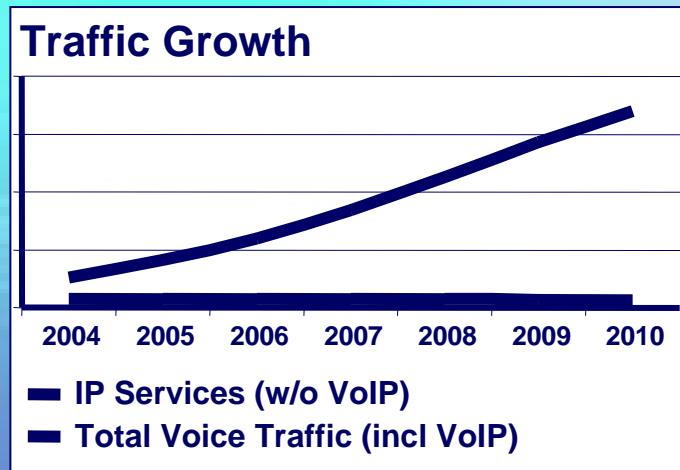
# Mobile Broadband Globally Today



- HSPA technology (HSDPA, HSUPA), is enabling the delivery of high speed mobile broadband globally. It defines the migration path for 3GSM and W-CDMA operators worldwide.
- Supported by the majority of mobile operators and vendors worldwide with huge economies of scale.
- Over 240 3G/UMTS networks commercially operational in 80 countries worldwide
  - including 135 networks with commercial HSDPA operations in around 55 countries
- Approaching 160 million 3G/UMTS subscribers (Aug. 2007)... and growing rapidly
- More than 900 WCDMA/HSDPA terminal devices launched or announced.
- The world's most popular 3G technology: WCDMA subscribers exceed EV-DO by a factor of approx 2



# Traffic increases while revenue per volume decreases

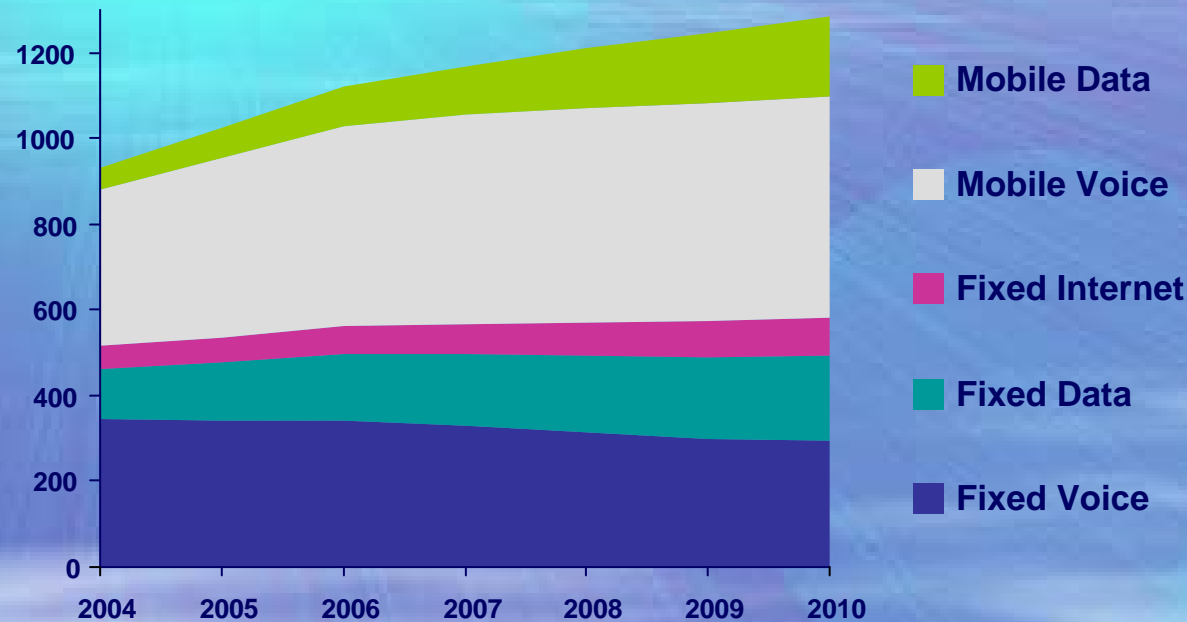


- Operators differentiate by innovative service offers, flexibility and QoS
- Network operators provide new services (eg multimedia, VoIP, HSPA etc) to win customers and increase their revenue
- New services increase bandwidth demand in all network layers – also in the transport layer
- As services are getting more common the main differentiator will be price. Revenue per volume will decline

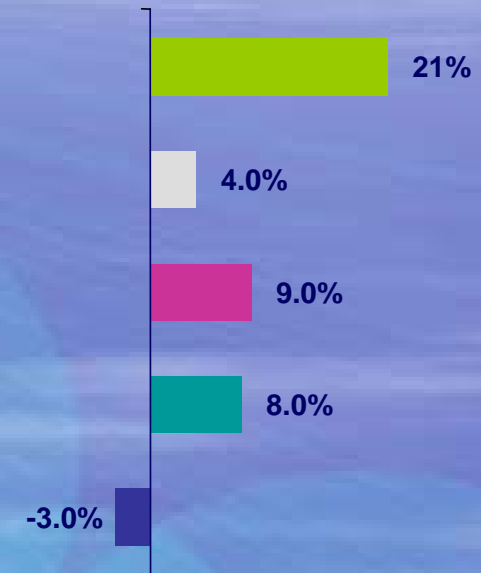


# Revenue growth comes from data

Telecom services revenue [bn €]



CAGR 2005-2010



Source: Gartner, April. 2006

- Data services makes almost all the revenue growth although voice will stay the main revenue generator
- Data traffic volume increases faster than data revenue





# Trends



UMTS  
Forum



## All IP Trends

- I&C industry observes a growing trend towards an all-IP architecture



## Wireless Data

- Operators observe increase in wireless data usage



## Device Capabilities

- Ever increasing device capabilities are moving away from network capabilities



## Services / Applications

- Services and Applications are moving towards the network/internet



## Spectrum

- Wireless industry faces spectrum liberalization



## Flat Rates

- Subscribers go for predictable communication costs



# Shaping the world of 2010-2020

## ... and new challenges Worry about threats to privacy



*Exploitation of personal information will require customer trust.*

**New working trends**  
*demand wireless "always on" tools*



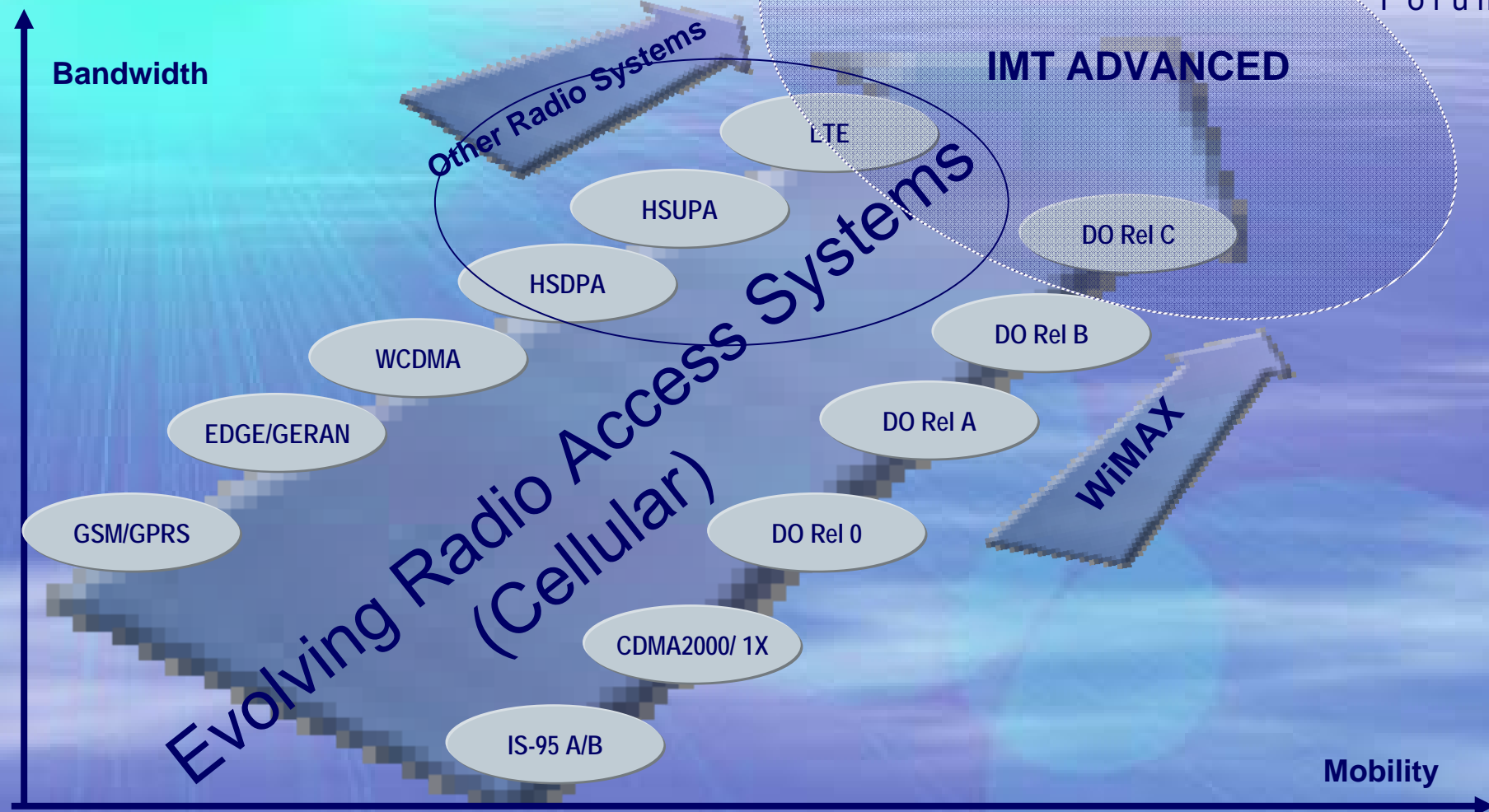
**Personalization**  
*demands products that match  
users' values*



**Expectation of instant response**  
*45 seconds is too long to wait!*

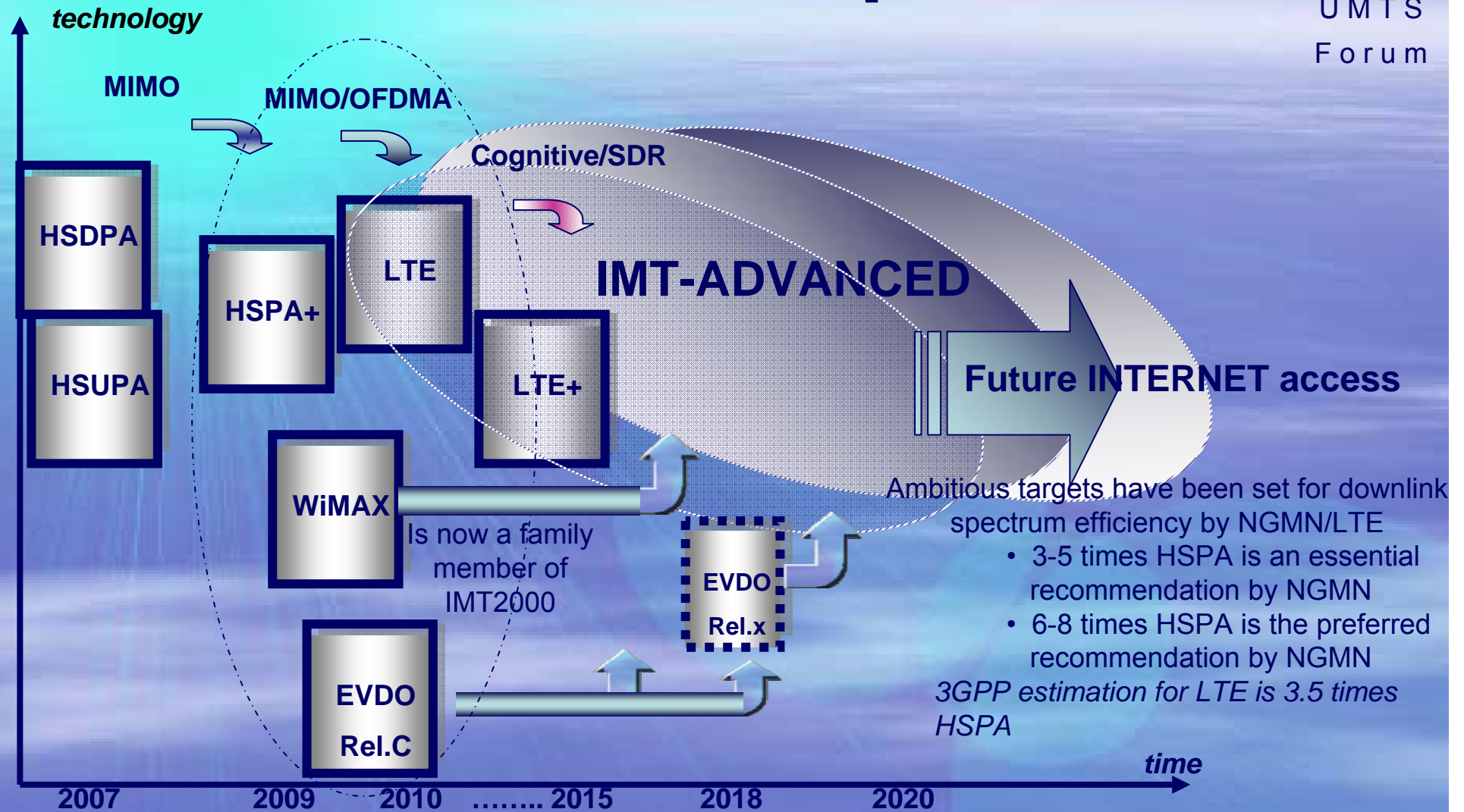


# Meeting the higher traffic demand





# The Evolution path



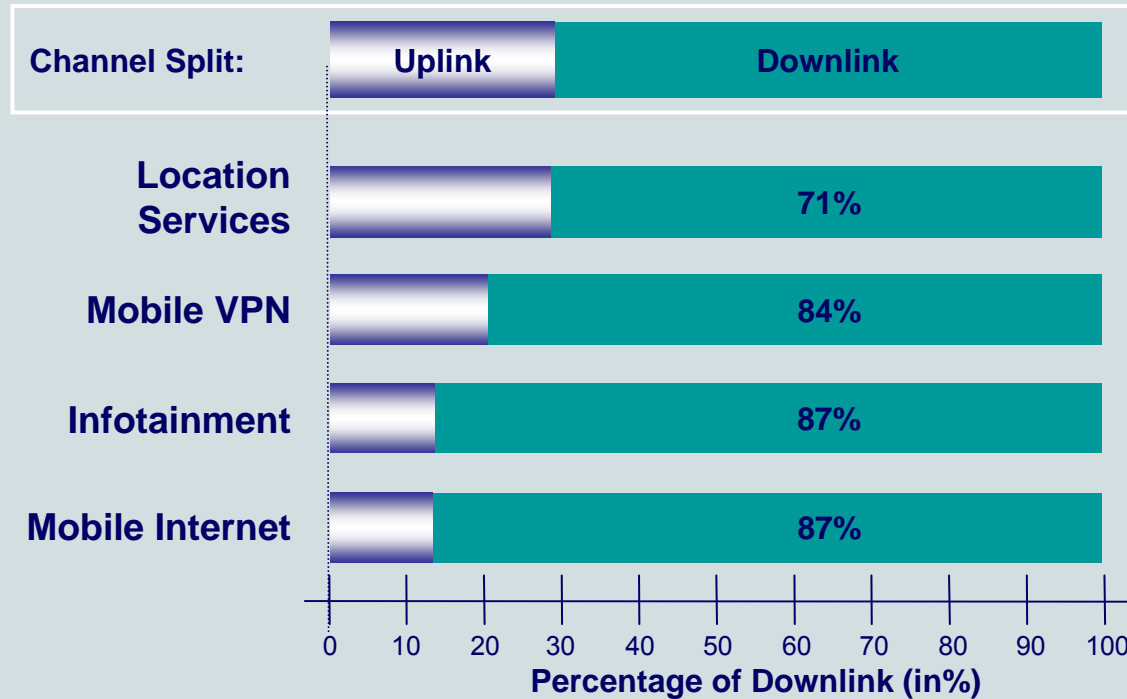
# Technological Drivers

- Moore's law continues to drive
  - Increase in processing power and memory availability
- Heavy increase in digitized media
  - E.g., YouTube expected to push 20% more traffic per month!
- Location determination will become ubiquitous
  - knowing where something is when
- End-user provided infrastructure and services
  - e.g., through Net2.0 and Web2.0
- Security becomes an issue of paramount importance



# High Speed Packet Access (HSPA)

*Provision of high performance data services*

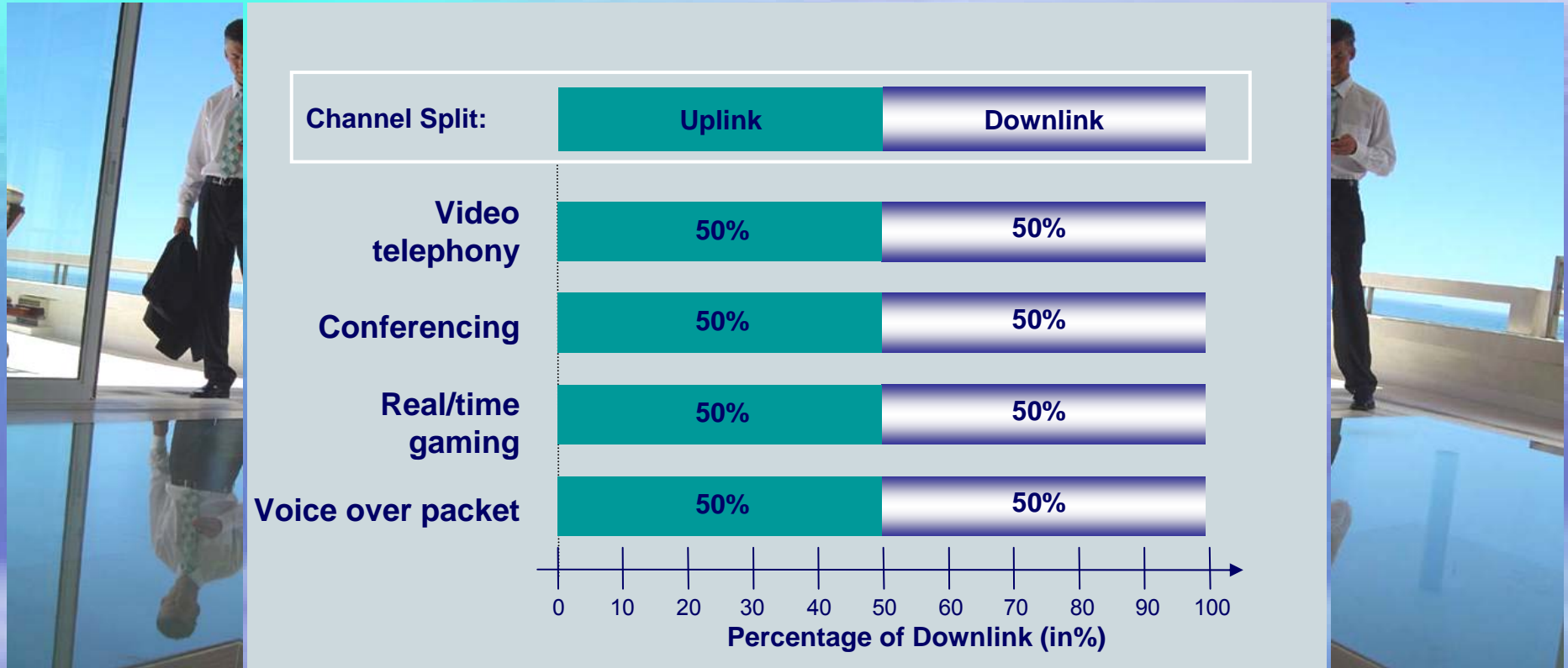


**HSDPA provides the highest effect regarding quality enhancement for mobile Internet Access in the download (“wireless DSL”), e.g. Infotainment services (streaming and download) Mobile VPN Services (remote Intranet Access, remote office, etc.)**



# High Speed Packet Access (HSPA)

*Combining HSDPA & HSUPA*



**HSDPA & HSUPA provides the highest effect regarding quality enhancement for e.g. video telephony & conferencing, real-time gaming or voice over packet**





# What will HSPA and 3G LTE bring ? *To the end-users*

## Increase QoS

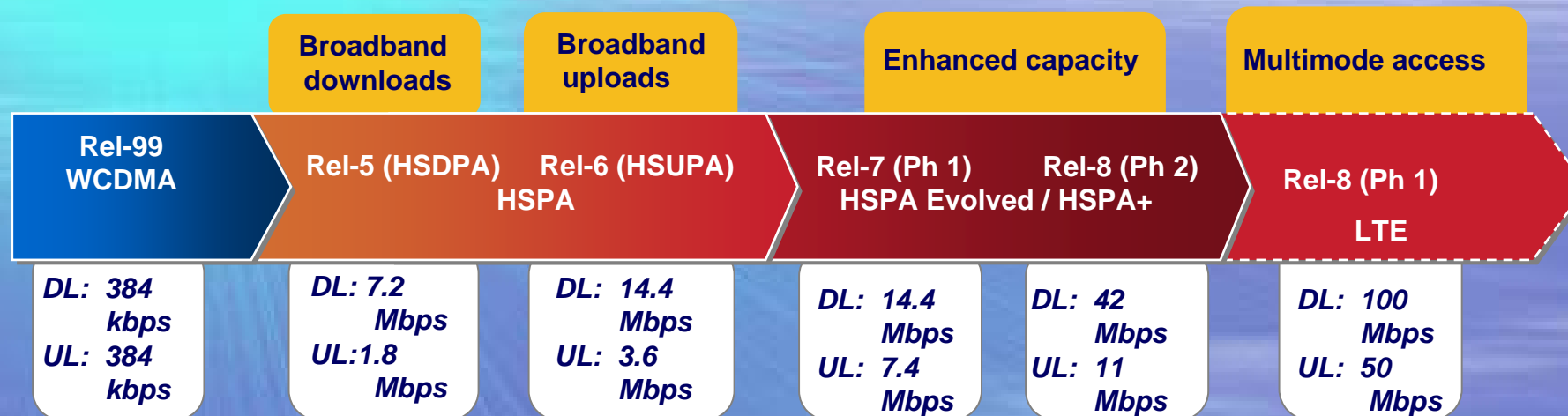
- Increase the number of subscribers with service differentiation (incl. **VOIP & IMS**)
- For legacy services like downloading faster audio & video

## Broadband Services



Promoting the global success of  
third generation mobile

# What do HSPA/LTE deliver

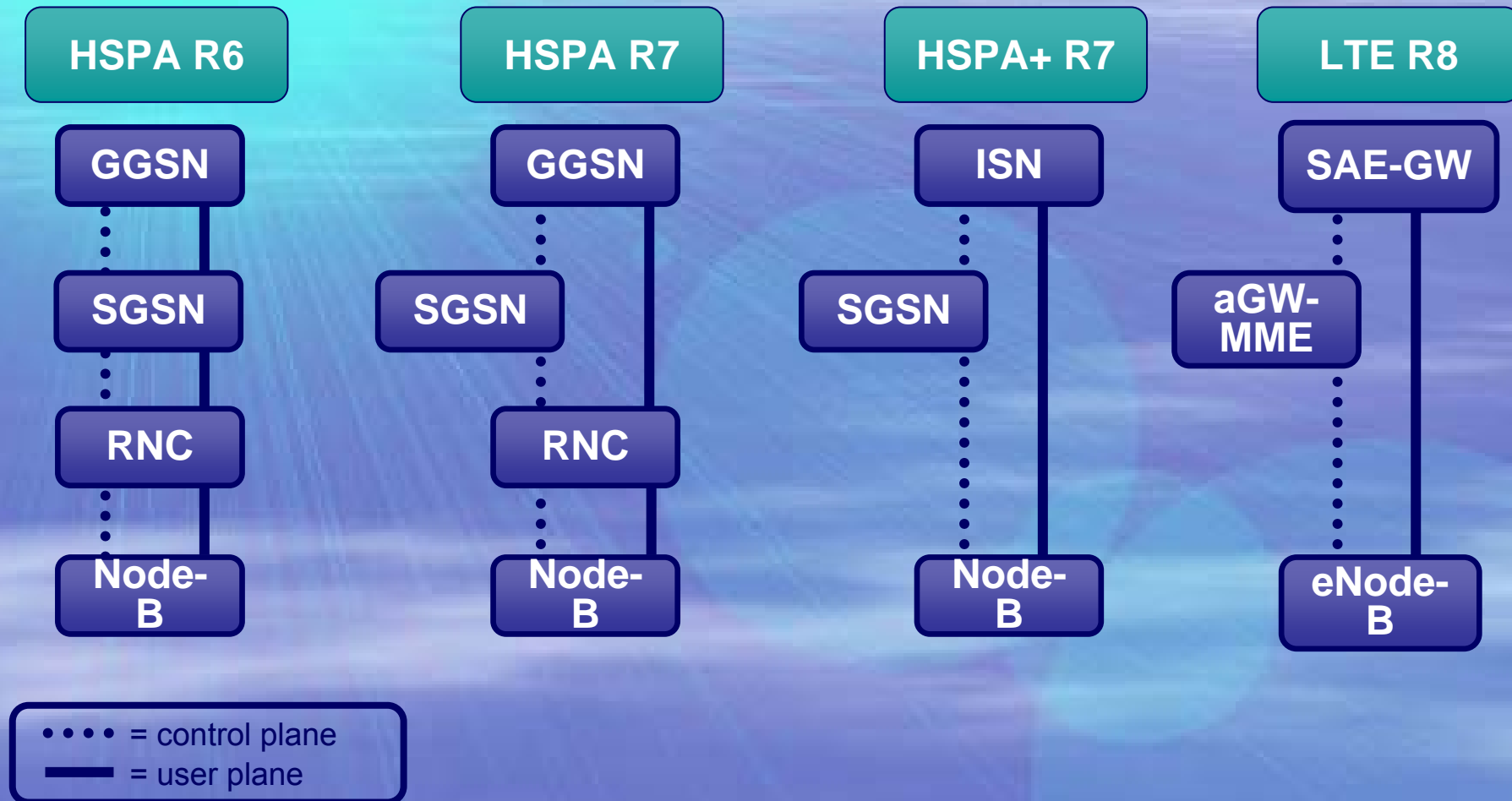


***The True Mobile Broadband bandwidth and QoS for the applications!!!***

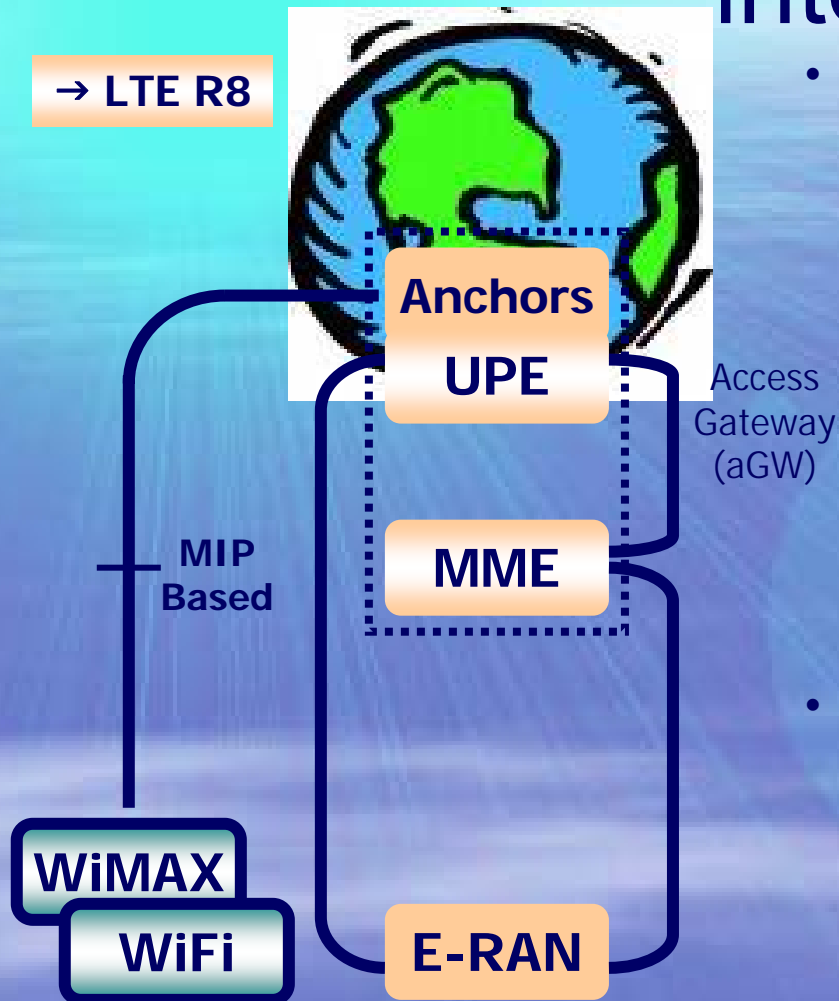


# Evolution Path

Proposed Architecture Evolution towards a flat architecture



# Completing the picture: System interworking



- 3GPP Interworking:
  - **3GPP Anchor** functional entity introduced for handling U-plane mobility between 2G/3G access & LTE
  - Interworking architecture aligned with legacy approaches (i.e. 2G↔3G)
  - Mobility I/F between the 2G/3G SGSN & aGW based on evolved GTP
  
- Non-3GPP Interworking:
  - **SAE Anchor** functional entity introduced for handling U-plane mobility between non-3GPP access & LTE
  - Mobility I/F between non-3GPP access & aGW based on Mobile IP





# What will 3G LTE bring

## Better interactivity

Latency: only 10 ms

## Larger Data Rate Possible Per User

Peak > 100 Mb/s

- **Decrease of the cost per Mb/s**
  - Better spectrum efficiency (factor 2 at least)
  - Simpler architecture (less nodes)
  - Optimized backhaul
- **Smaller frequency granularity** (from 1.4 to 20 MHz)
  - More flexible spectrum usage
  - Faster introduction of 3G LTE
- **Less Nodes**
  - **Simpler O&M** Self and assisted tuning
- **Improved IPR Regime** & more competition between the suppliers and better products at lower price

## Broadcast / Multicast

> 20 \* 256 kb/s  
channels over 5  
MHz

## Mobility

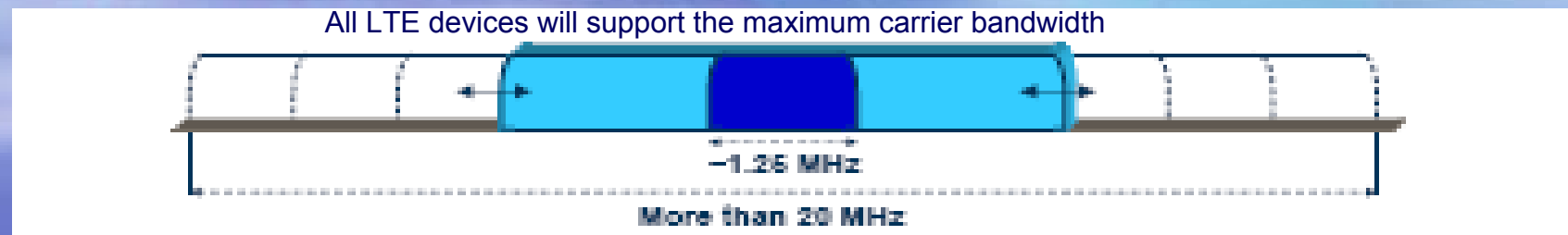
350 Km/h



# Bandwidth Flexibility

LTE supports any bandwidth **from 1.4 MHz up to 20 MHz**, but **in discrete increments**;

- Therefore, and in practice, a limited set of bandwidths will be supported:
  - due to regulatory conditions;
  - planned bandwidths **1.4 MHz, 3.0 MHz, 5 MHz, 10 MHz, 15 MHz and 20 MHz**,
- **Feasible** to extend specification to **additional bandwidths**, e.g. to match arrangements in new additional spectrum allocations.



# Spectrum considerations

- **Existing** public mobile communication **bands are sufficient** for mobile broadband technologies like **HSPA**;
  - HSPA will operate in the Extension band on 5 MHz channels,
- however, **LTE** will require **broader channel bandwidths**;
- Regulators, as matter of **priority**, are therefore invited make available the band **2500 – 2690 MHz**:
  - to the benefit of the more capable services that LTE can provide;
- focus on the channel bandwidths between **10 MHz to 20 MHz**;
- implementing the **2 x 70 MHz**, in accordance ECC/DEC/(05)05 spectrum arrangement is essential.

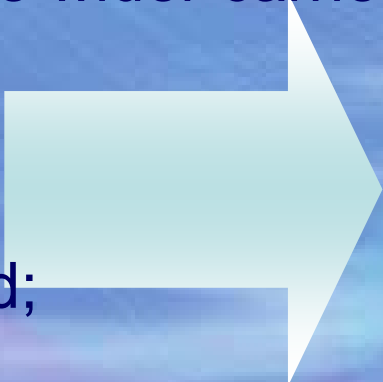


# Challenges

- frequency bands, and carrier bandwidths

More than **70 possible combinations**:

- standardization is **time consuming**, even if done in parallel;
- most **attractive bands to be addressed first**:
  - new bands where the wider carriers are possible;
  - harmonized bands;
  - migration of existing bands when required;



**important to introduce the “LTE bands” in the right order, subject to market demand**

Regulatory clarity urgently needed – spectrum arrangements / interference





# 3GPP identified bands for LTE

FDD		
Band	Popular name	Frequencies (MHz)
I	IMT Core	1920-1980/2110-2170
II	PCS 1900	1850-1910/1930-1990
III	GSM 1800	1710-1785/1805-1880
IV	AWS (US)	1710-1755/2110-2155
V	850 (US)	824-849/869-894
VI	850 (Japan)	830-840/875-885
VII	IMT Extension	2500-2570/2620-2690
VIII	GSM 900	880-915/925-960
IX	1700 (Japan)	1750-1785/1845-1880
X	3G Americas	1710-1770/2110-2170

TDD		
Band	Popular name	Frequencies (MHz)
a	TDD 1900	1900-1920
b	TDD 2.0	2010-2025
c	PCS Center Gap	(1915)1910-1930
d	IMT Extension Center Gap	2570-2620

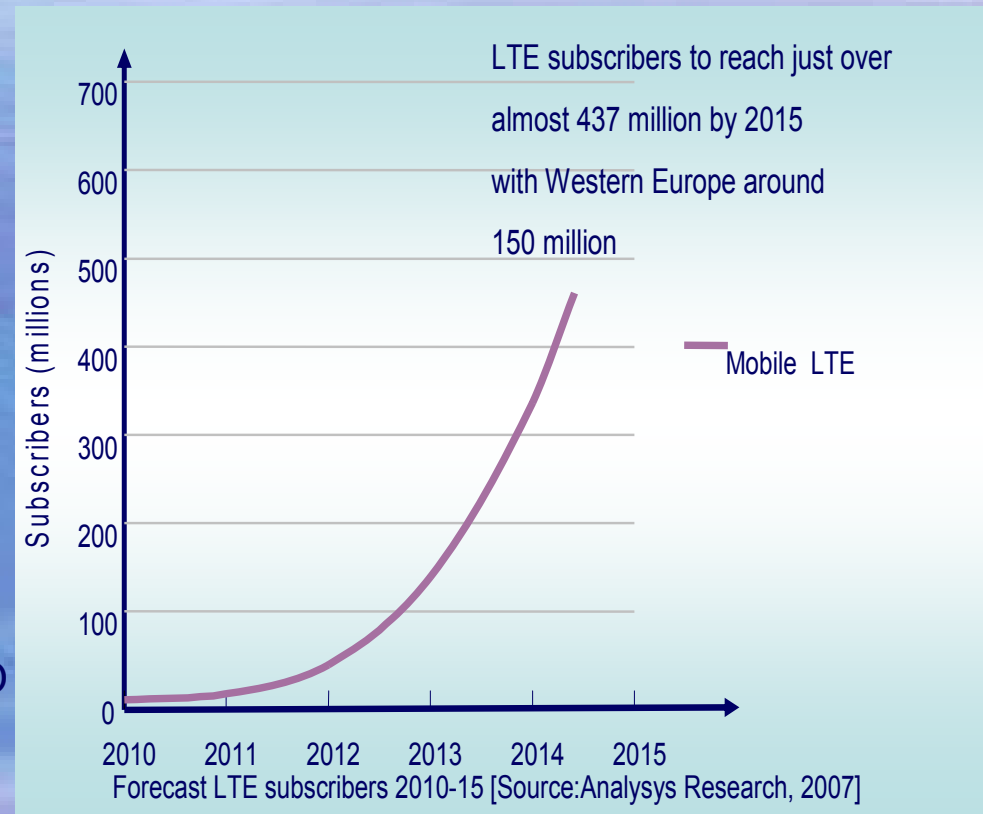
**1** Possible early target bands

Agreed bands enables global economies of scale



# Deployment Scenarios

- **Hotspot coverage** – under this scenario, the deployment of LTE is limited to major urban hotspots, analogous to current WiFi hotspot deployments, although the area covered by LTE is much greater than the localised low power coverage of WiFi hotspots
- **Urban coverage** – under this scenario, LTE is deployed in urban centres and the surrounding suburbs – reaching total population coverage of the order of 70%
- **National coverage** – under this scenario, LTE is deployed to provide the same coverage as existing 2G and 3G mobile networks
- **Home base stations** – here LTE(FEMTO CELLS) is assumed to be deployed in individual subscriber's homes, communicating with core network infrastructure either through the subscriber's home broadband connection or through other LTE home base stations through a mesh network



# Conclusions

- UMTS is built on the footprint of GSM and allows for smooth evolution and further innovation, taking all investments and security into consideration.
- 3G/UMTS and its evolution (HSDPA, HSUPA, LTE...) offers the optimal solution to providing Broadband Mobile & Wireless Access.
- Offers capacity advantage and support for service innovation to meet the market demand from simple voice to VoIP and all multimedia services hence, ideal differentiators will merge.
- WiMAX is now a IMT2000 family member and is seen as a complementary technology rather than the competitive aspect.
- At some stage all of these technologies be able to co-habitat and the Multi-standard Radio will evolve to meet the IMT Advanced demand of high traffic and services.



*Thank You for your attention!!!!*

