

**VDE/ITG-FG 5.2.4 Meeting #26**  
**Düsseldorf, February 28<sup>th</sup>, 2008**

# **Monetizing Wireless Broadband – what does it take to succeed ?**

Dr.Klaus-D. Kohrt / Nokia Siemens Networks

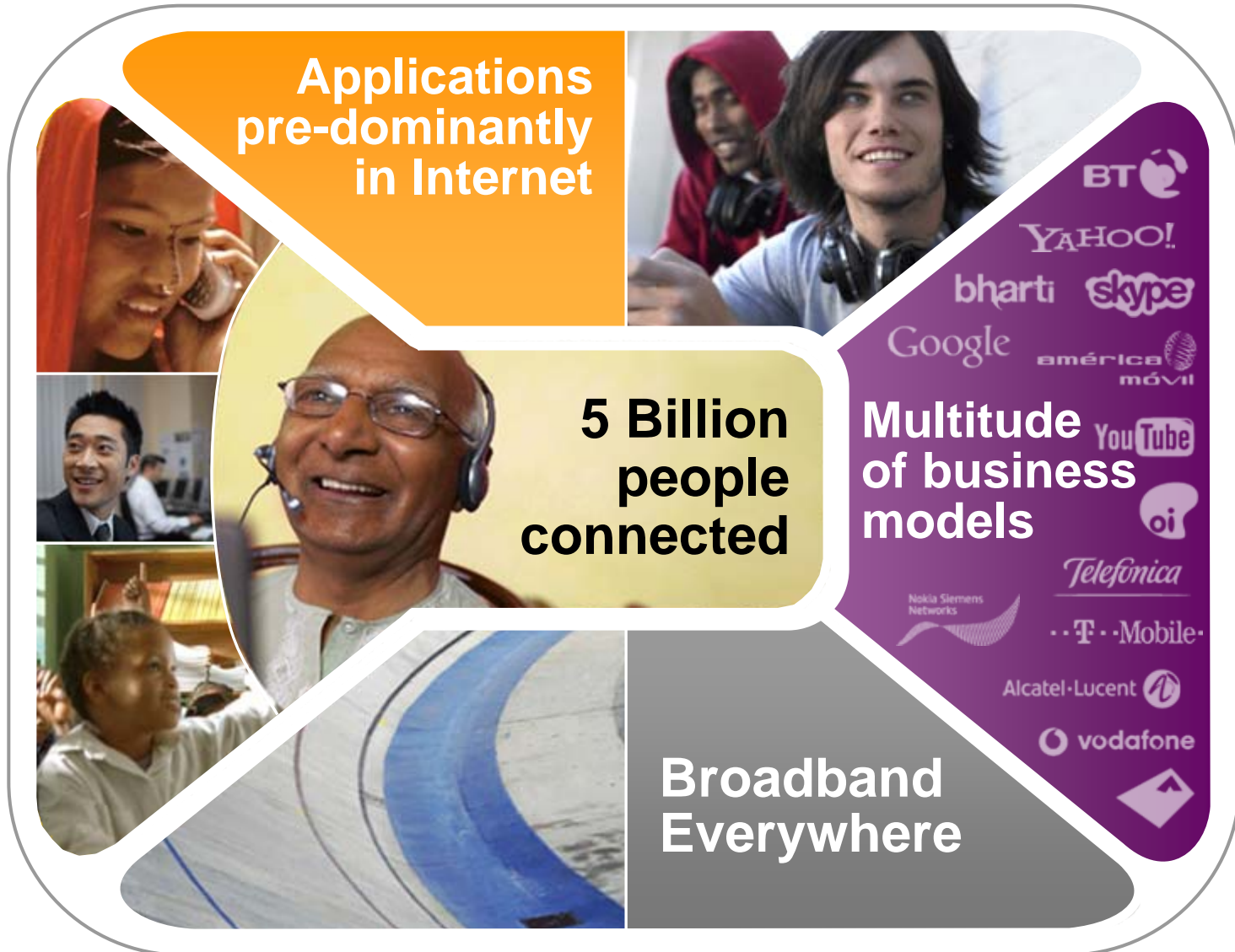
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# Our market vision of 2015



# We'll face a major scaling challenge...

## Key trends

1B => 3B broadband connected people

Bandwidth hungry applications (Video, P2P file sharing etc.)

New devices driving data use

Flat-fee subscriptions



# The Web2.0 paradigm shift fosters the need for ubiquitous Broadband access

## Changing user behaviour drives Web2.0

### Deep group interaction

Intensive communication over various channels

Communities like Facebook growing in quadruple digits

### Individual media discovery

Search and UGC replacing media company control

YouTube reaching nearly 20% and Google 50% penetration\*

### Flexible consumption

Usage is time-, place- and device-shifted

IPTV gaining substantial revenues and user growth in Europe and Asia

### Strong multimedia orientation

Strongly increasing video usage

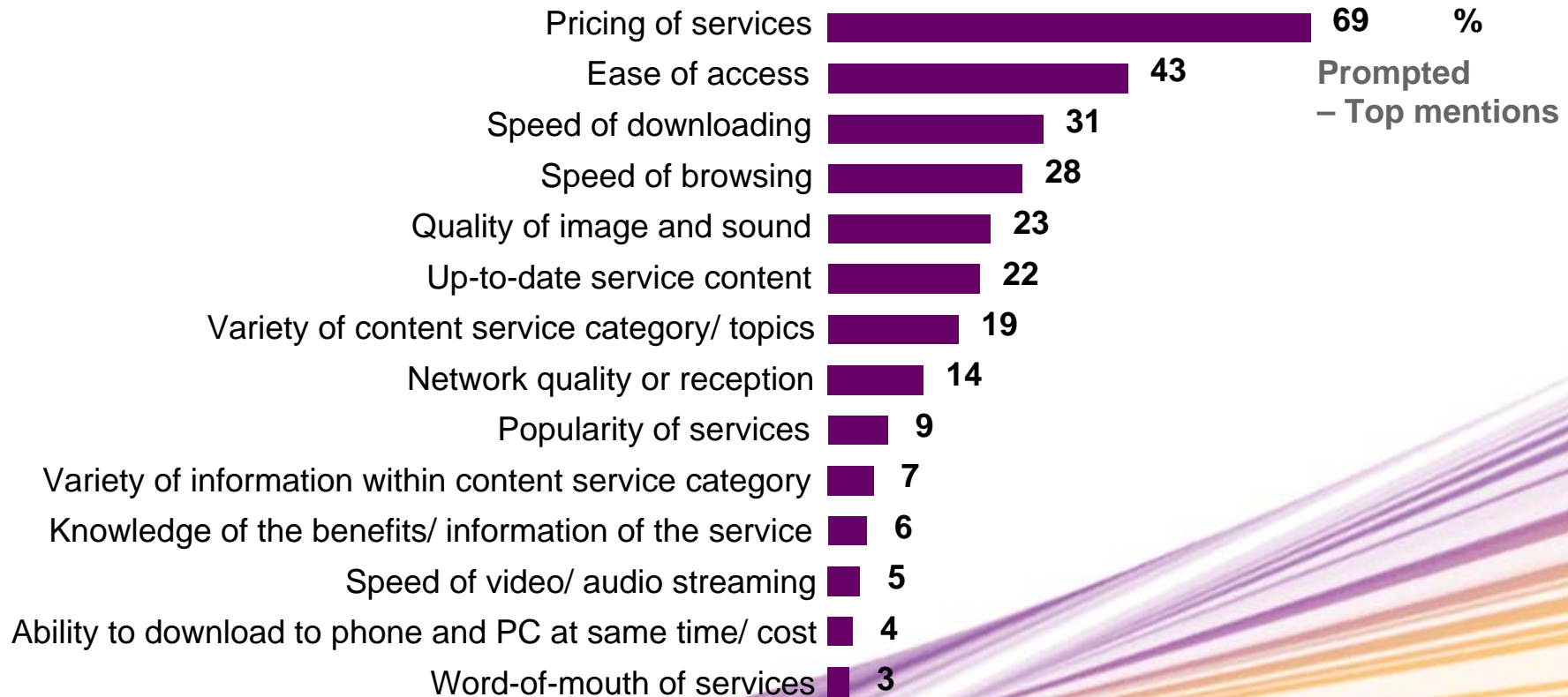
Internet traffic growing at 75%, mainly driven by video\*\*

About half of mobile users are member of an online community, with most of them actively sharing self-generated content

\*advanced markets like UK \*\*Business Week, indications that about 90% of Internet traffic is video

# User experience in terms of simplicity, quality, speed and ubiquitous availability is key

## Top 3 most influential factors for using broadband content services (Italy and UK)

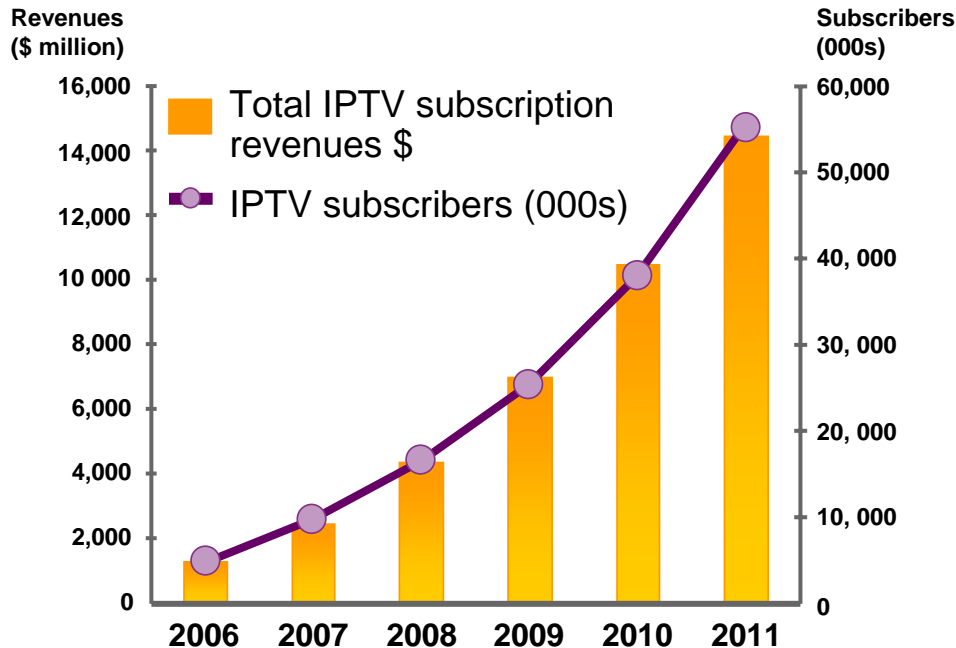


Source: Nokia



# IPTV is one major Broadband revenue driver

## IPTV development in the EU



Source: OVUM, 2007

### IPTV enables

- Time-shift TV
- Interactive TV
- Targeted/Personalized Advertising
- Video-on-Demand
- Integrated home entertainment

belgacom

- 250.000 IPTV customers - among 4,5 mio. households -by September 2007 with an ARPU of 15,8 EUR.
- Today, thanks to the technology, the three media, TV, Web and 3G mobile are fully integrated“ (Jean-Charles De Keyser, Vice President Belgacom TV)

Nokia Siemens  
Networks



# Terminal, network and application development drive traffic growth

European operator:  
350% growth in  
HSPA data volume  
in 6 months



**Advanced terminals**

**HSPA radio networks**

**Internet applications**



# HSPA increases MNO ARPU levels – Users are willing to pay for mobile access to internet

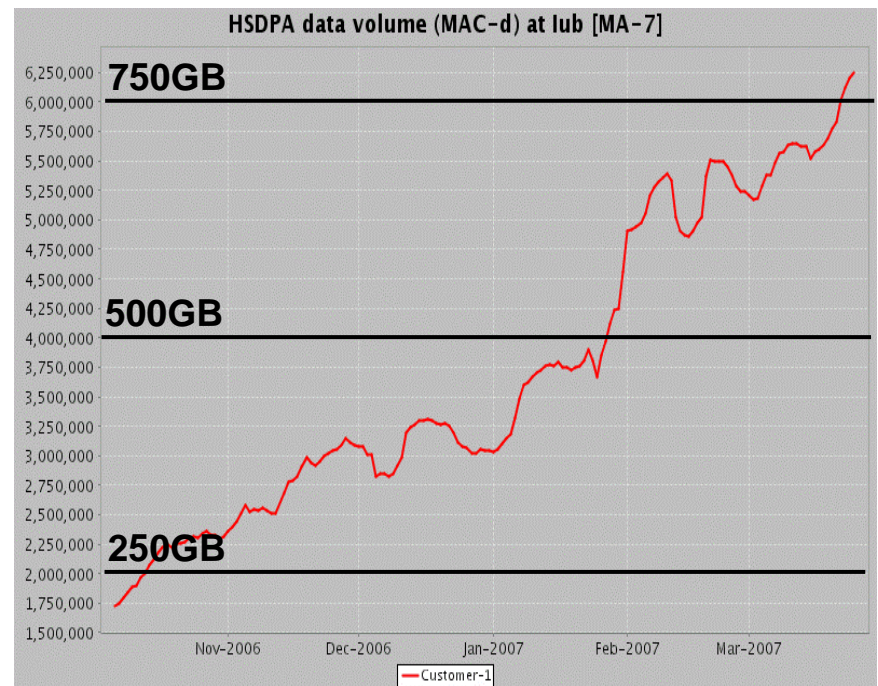
## Result of consequent Wireless Broadband rollout

### Effect on revenues

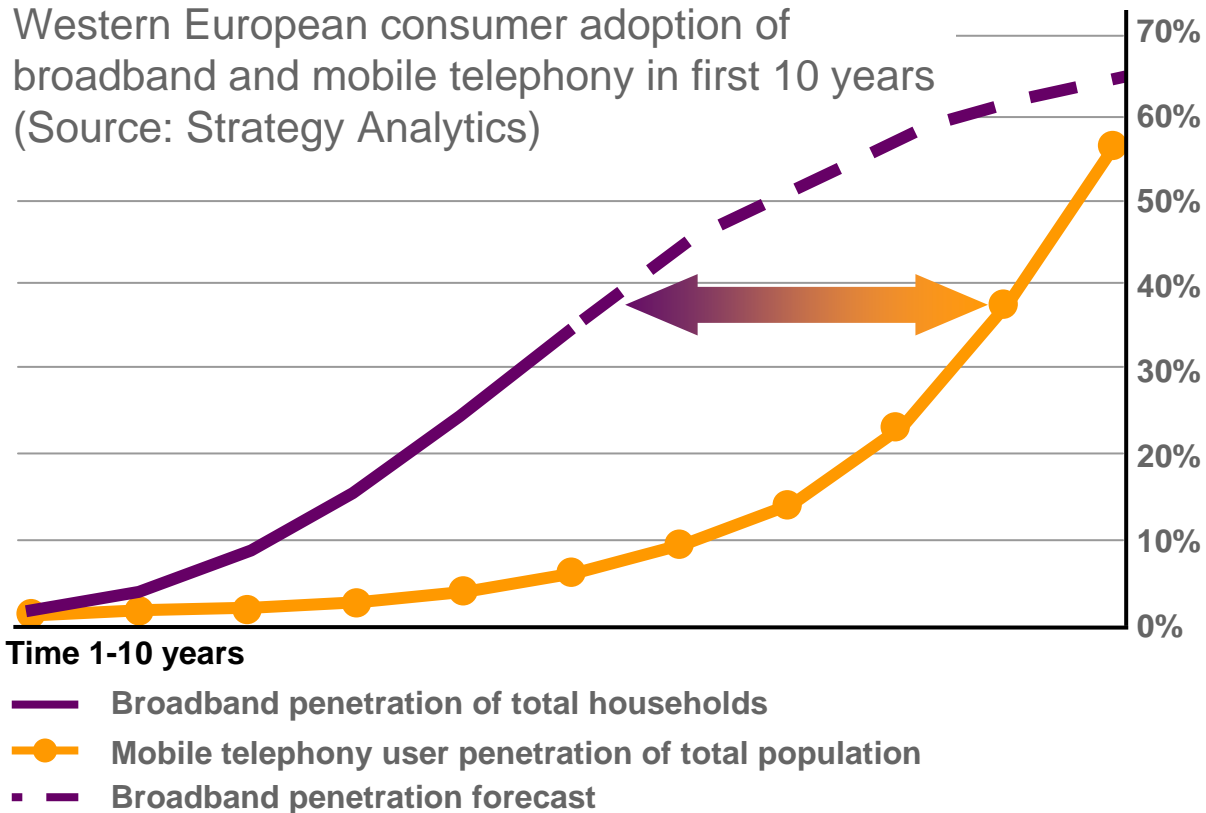
- Non-messaging data revenue growth far above market
  - 40%-60% p.a. compared to 11% European market average
- HSPA specific data revenue growth at triple digits
  - More than 100% growth for pure connectivity
- Significant portion of non messaging data on total revenues
  - 7% share as a benchmark

### Effect on traffic

Daily HSDPA traffic over European network

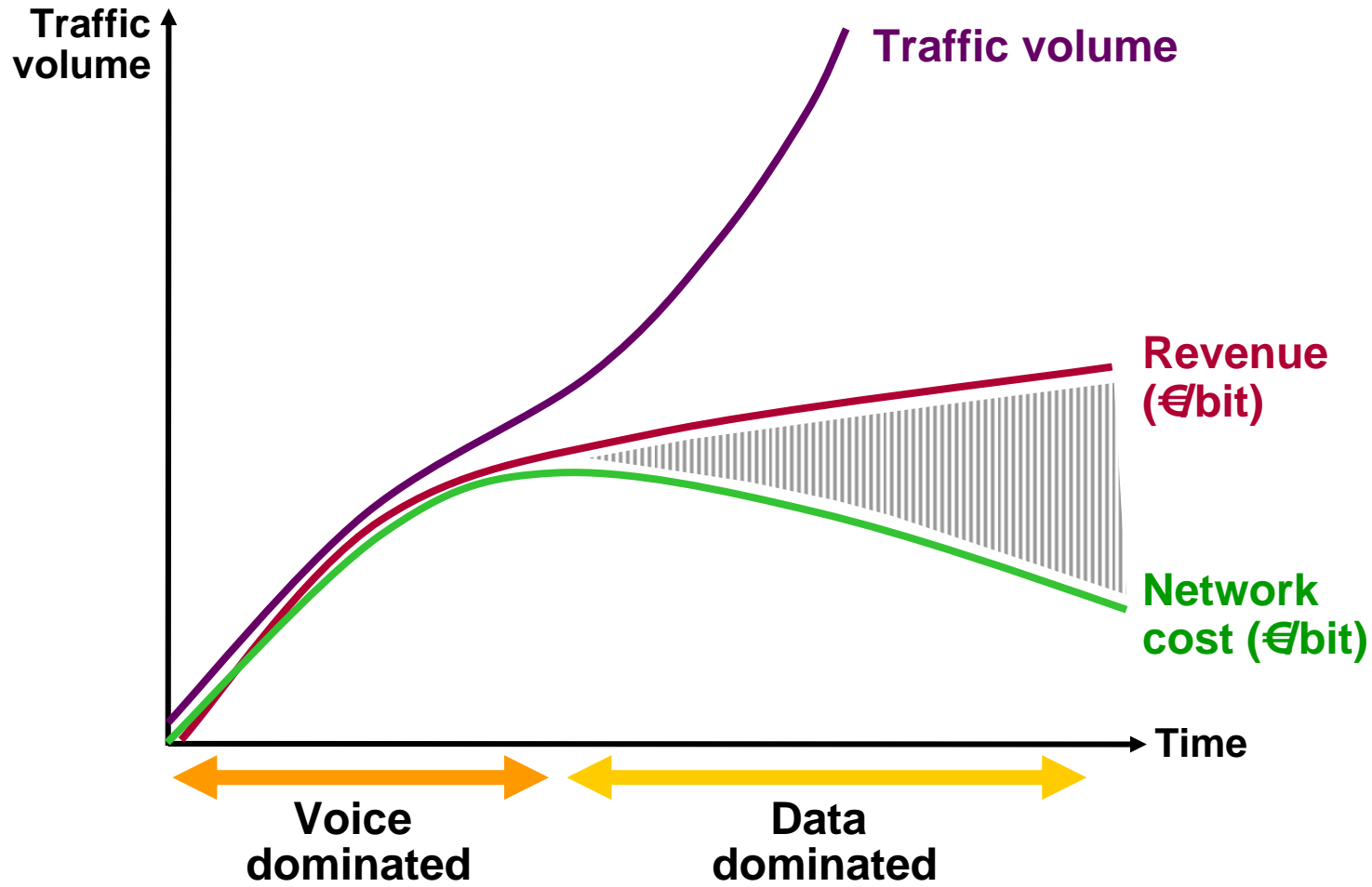


# Demand for broadband connections continues to increase



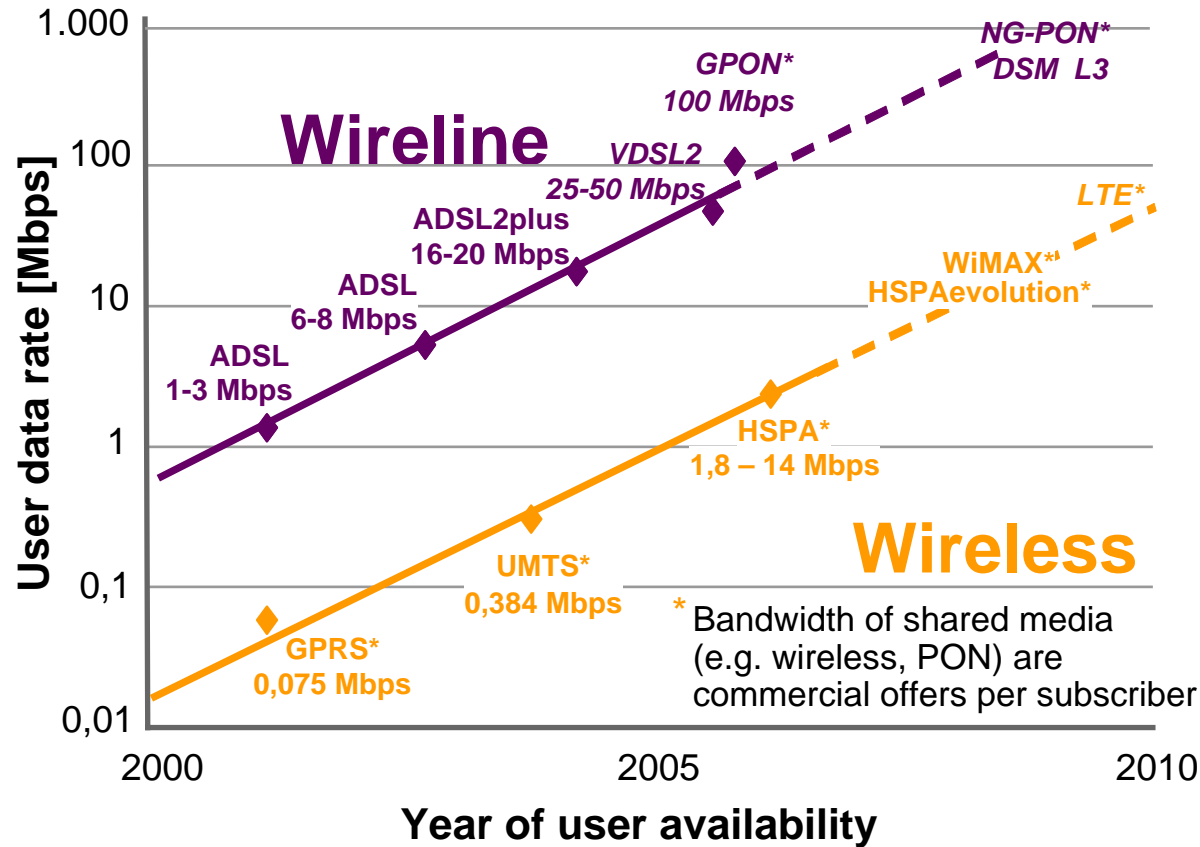
**Continuing growth in fixed broadband connectivity creates demand and market potential for wireless broadband**

# Price per Mbyte has to be reduced to remain profitable



Source: Light Reading (adapted)

# Mobile and fixed broadband complement each other



Multi channel -HD TV  
Fastest Broadband



Multimedia Home,  
Broadcast TV / VoD  
Fast Broadband  
Premium VoIP



Fast Internet,  
Streaming Media,  
Tele-working  
VoIP

Webbrowsing  
E-mail

Wireless Broadband provides ubiquitous coverage, VDSL and GPON provide bandwidth for next generation home entertainment



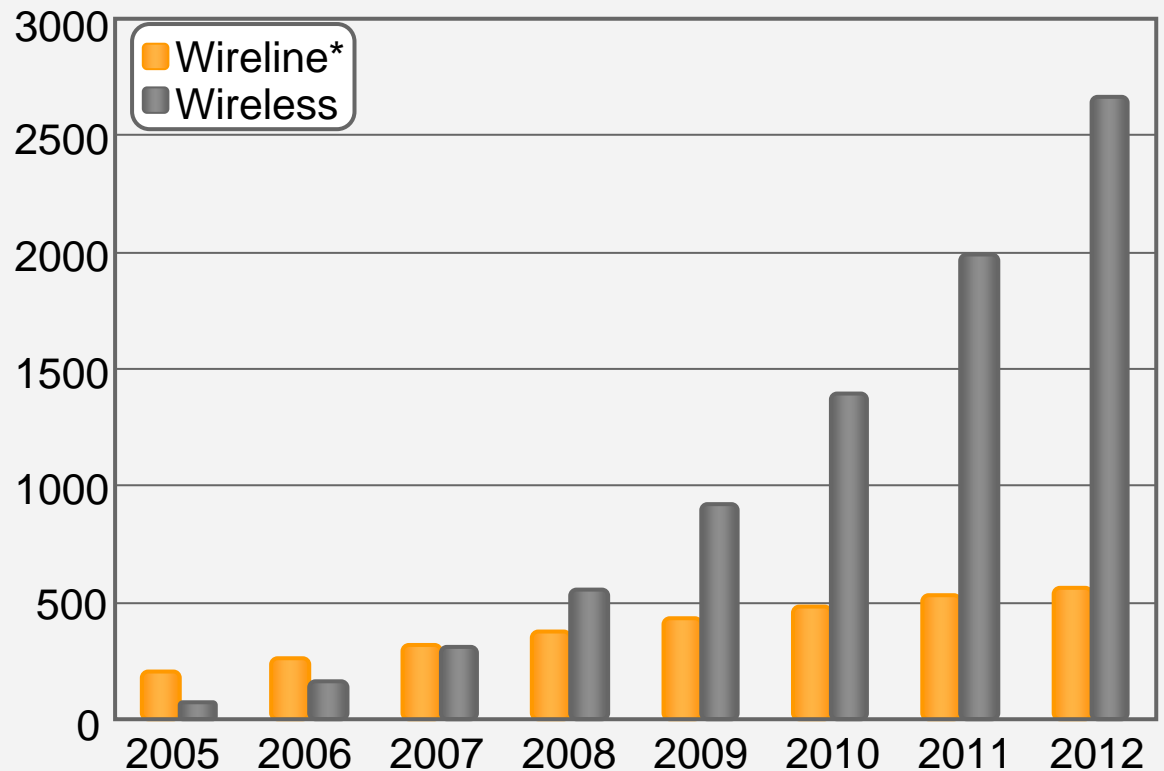
# Wireless & wireline will enable broadband connections for over 3 billion people

5 billion people covered by Wireless Broadband spectrum licenses

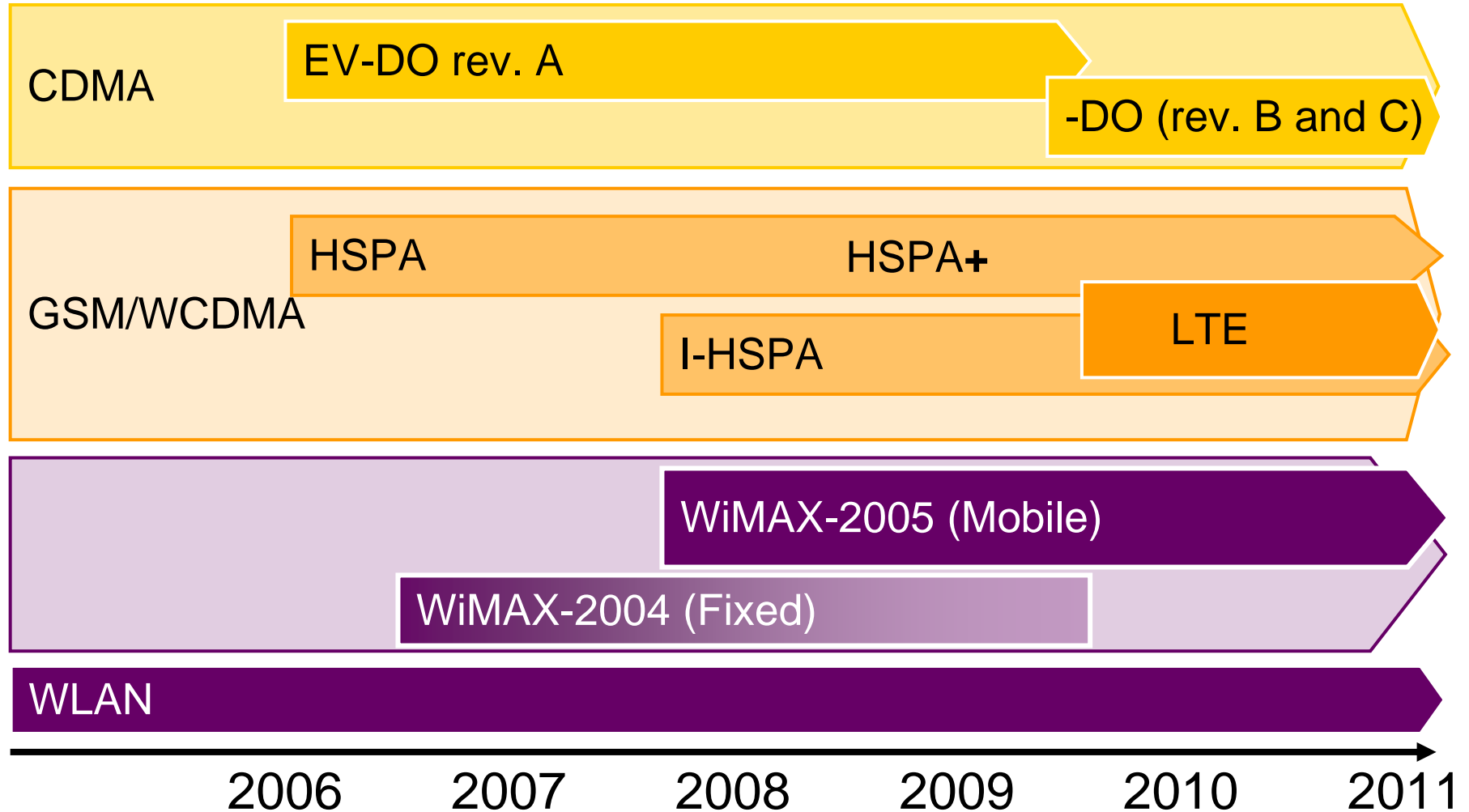
Technology per situation

- Installed base
- Service offering
- Spectrum

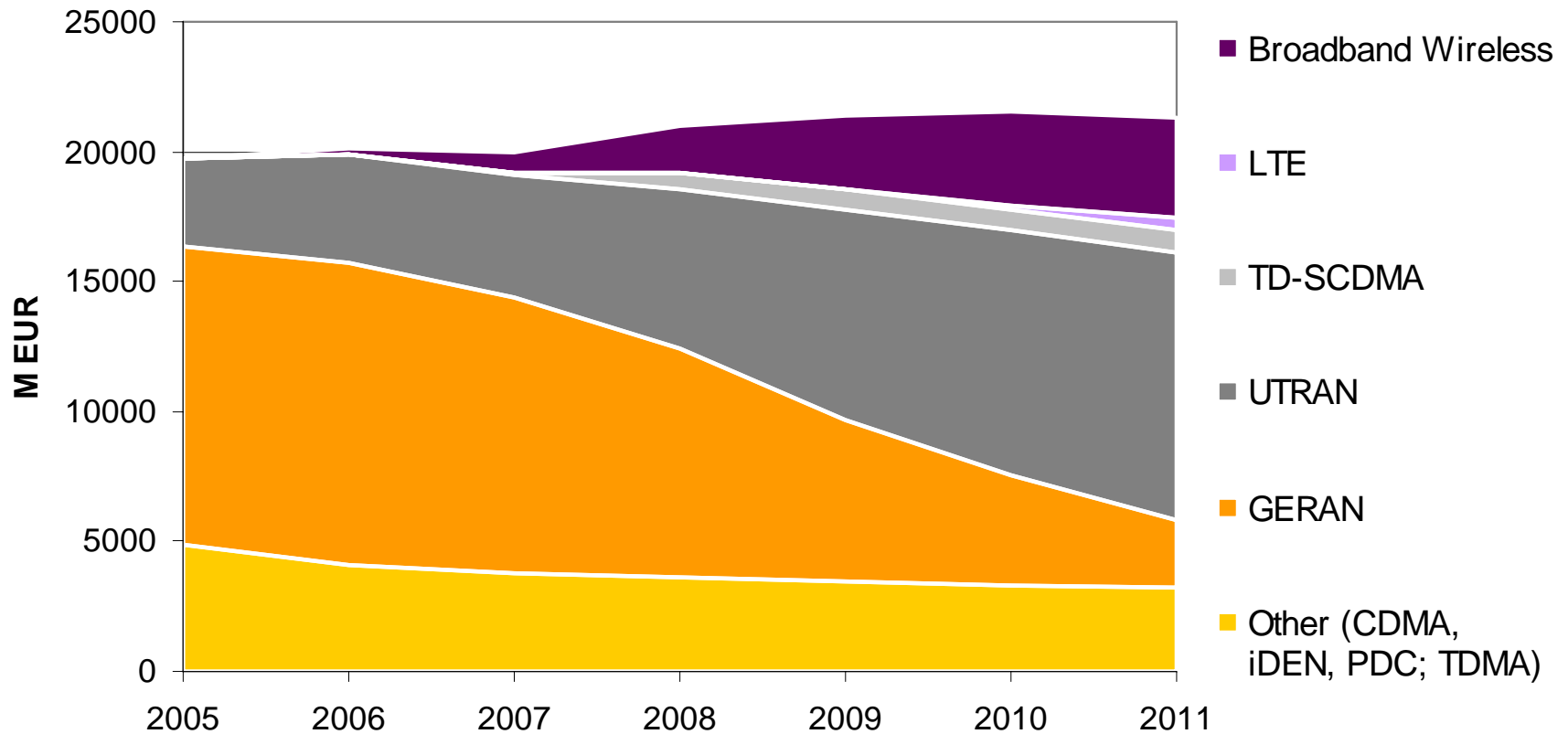
Total broadband subscribers, Millions



# Broadband wireless technologies



# World market for radio access



Source: NSN Business Intelligence Status: March 2007

# Great minds think alike ?

## or the laws of physics are the same for everyone

name	NGMN	LTE	UMB	mobile WiMAX
"owner"	Ltd.	3GPP	3GPP2	WiMAX-Forum
target GA	2010	2010	2009	2008(+)
bands	.5 to 5 GHz	.5 to 5 GHz	.5 to 5 GHz	.5 to 5 GHz
focus	cellular	cellular	cellular	2.3, 2.5 & 3.5
carrier	scaleable 1.25 to 20	scaleable 1.25 to 20	scaleable 1.25 to 20	scaleable 1.25 to 20
mode	FDD/TDD	FDD+	FDD+	TDD+
scheme	OFDMA	OFDMA	OFDMA	OFDMA
antennas	MIMO	MIMO	MIMO	MIMO
deployment	outdoor / indoor	outdoor / indoor	outdoor / indoor	outdoor / indoor
environment	rural to dense urban	rural to dense urban	rural to dense urban	rural to dense urban



# Peak Bit Rate per MHz Same in all Technologies

– LTE has Highest Bit Rates with Largest Bandwidth

<b>Downlink 2x2MIMO<sup>2</sup></b>	HSPA R6	HSPA R8	WiMAX TDD <sup>1</sup>	LTE FDD
2x2.5 (1x5) MHz	-	-	20 Mbps	21 Mbps
2x3.5 (1x7) MHz	-	-	28 Mbps	-
2x5 (1x10) MHz	14 Mbps	43 Mbps	40 Mbps	43 Mbps
2x10 (1x20) MHz	-	-	80 Mbps	86 Mbps
2x20 MHz	-	-	-	173 Mbps

<b>Uplink<sup>3</sup></b>	HSPA R6	HSPA R7	WiMAX TDD <sup>1</sup>	LTE FDD
2x2.5 (1x5) MHz	-	-	4.1 Mbps	7 Mbps
2x3.5 (1x7) MHz	-	-	5.5 Mbps	-
2x5 (1x10) MHz	5.7 Mbps	11.5 Mbps	8.3 Mbps	14 Mbps
2x10 (1x20) MHz	-	-	16.6 Mbps	29 Mbps
2x20 MHz	-	-	-	58 Mbps

 = typical bandwidth

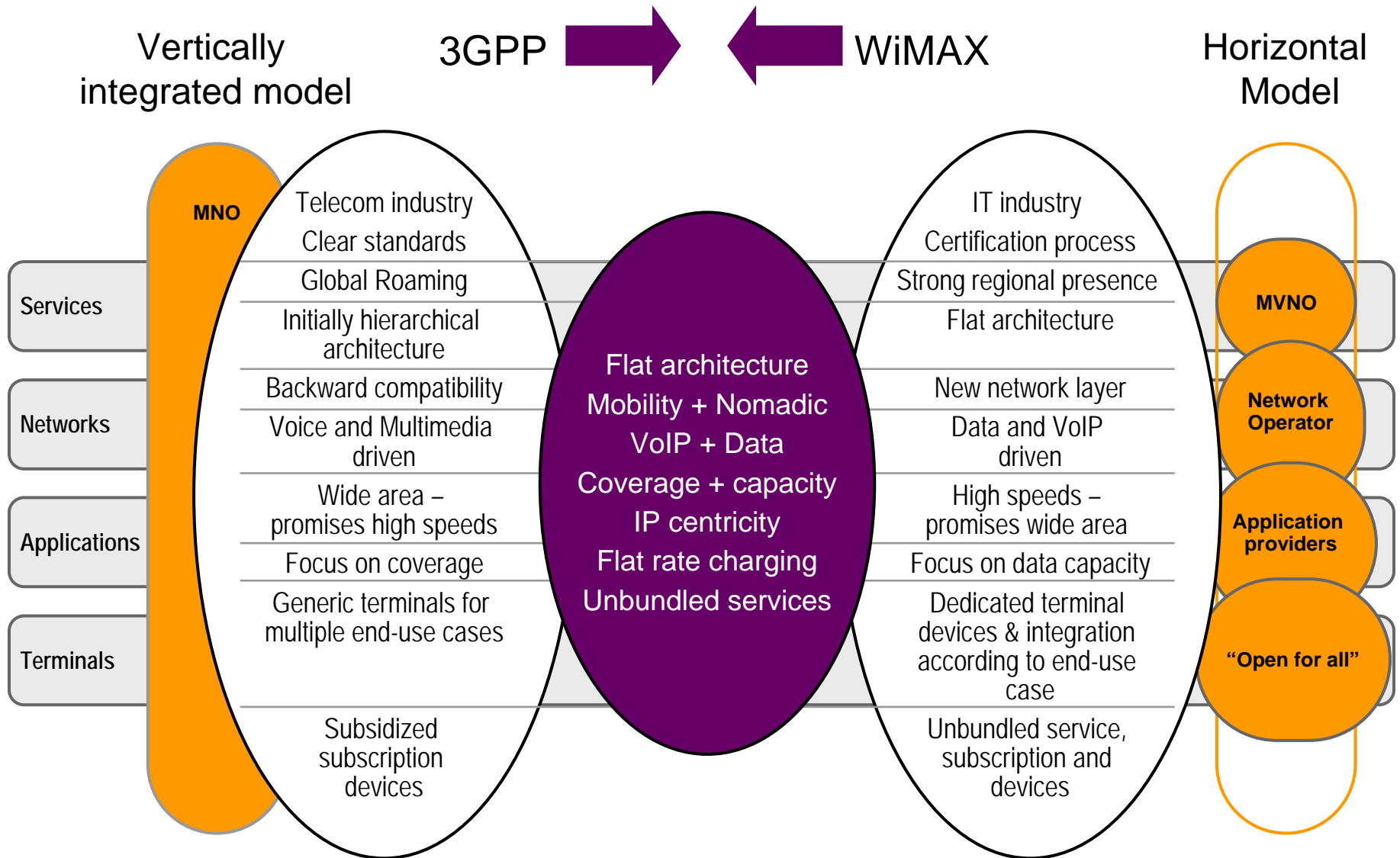
<sup>1</sup>Downlink:uplink ratio 29:18

<sup>2</sup>Downlink with 2x2MIMO and 64QAM

<sup>3</sup>Uplink with 16QAM

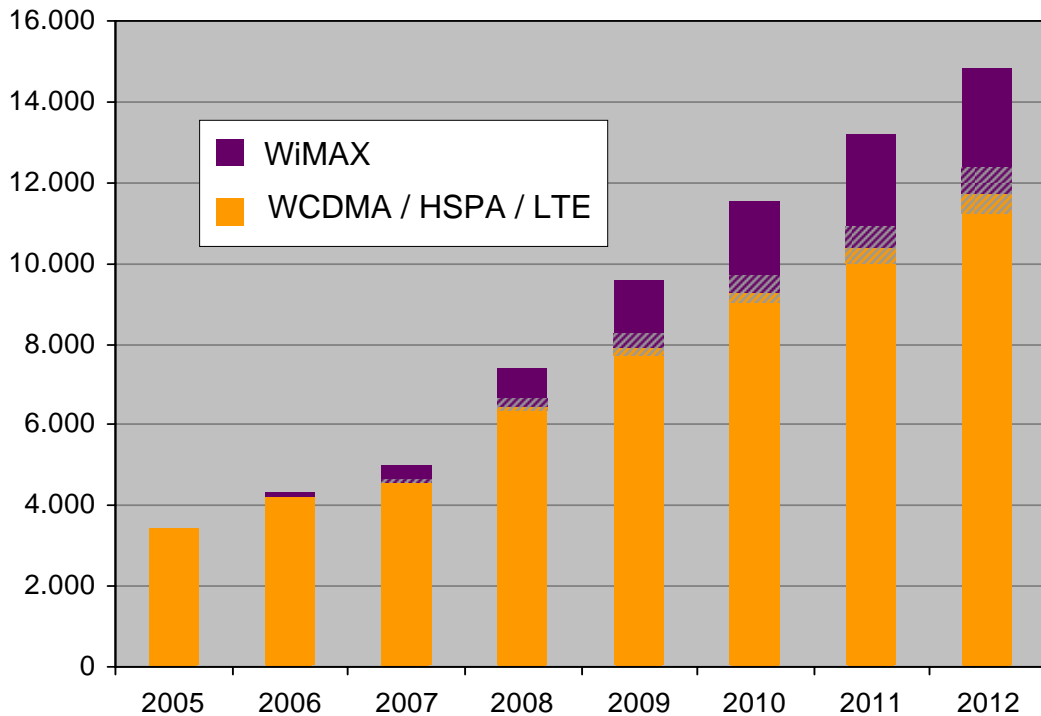


# Related industry camps are coming together




# Wireless mobile broadband market develops with aggressive pace

Operator investments in WiMAX and WCDMA / HSPA / LTE (Million EUR)



Source: NSN Business Intelligence, August 2007

 = area of uncertainty

## WiMAX

- Broadband market growth provides significant potential for WiMAX entrants
- Initially, selective market focus for fixed or nomadic deployments for all-IP data
- Extension to mobility and quality VoIP

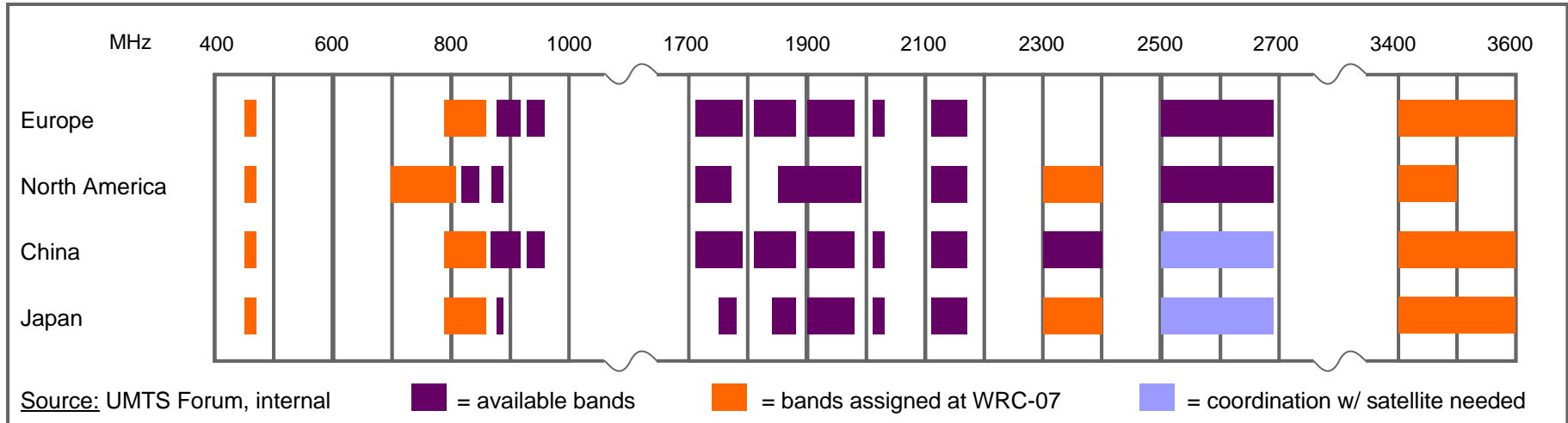
## 3GPP

- 2.8+ Billion GSM and WCDMA / HSPA embedded subscriber base globally\*
- 86% market share of GSM/WCDMA mobile communications worldwide\*
- 150+ commercial HSDPA launches
- Used for mobile browsing and email
- Excellent basis for further mass diffusion and LTE enhancements\*

\* GSA - Global mobile Suppliers Association, January 15, 2008

# WCDMA/HSPA, LTE and WiMAX are IMT-2000 technologies and can be globally operated in IMT radio spectrum

## IMT bands for 3GPP and WiMAX technologies



- WCDMA, HSPA and LTE primarily use paired spectrum (FDD) with profiles for all frequency bands
- Currently, WiMAX profiles exist for TDD mode operating in the 2.5 and 3.5 GHz bands, work for 700MHz is ongoing; economical considerations require a min bandwidth of 15 MHz
- Additional spectrum for IMT technologies has been identified at the recent WRC: 450-470 MHz, 698-862 MHz, 2300-2400MHz, and 3400-3600 MHz

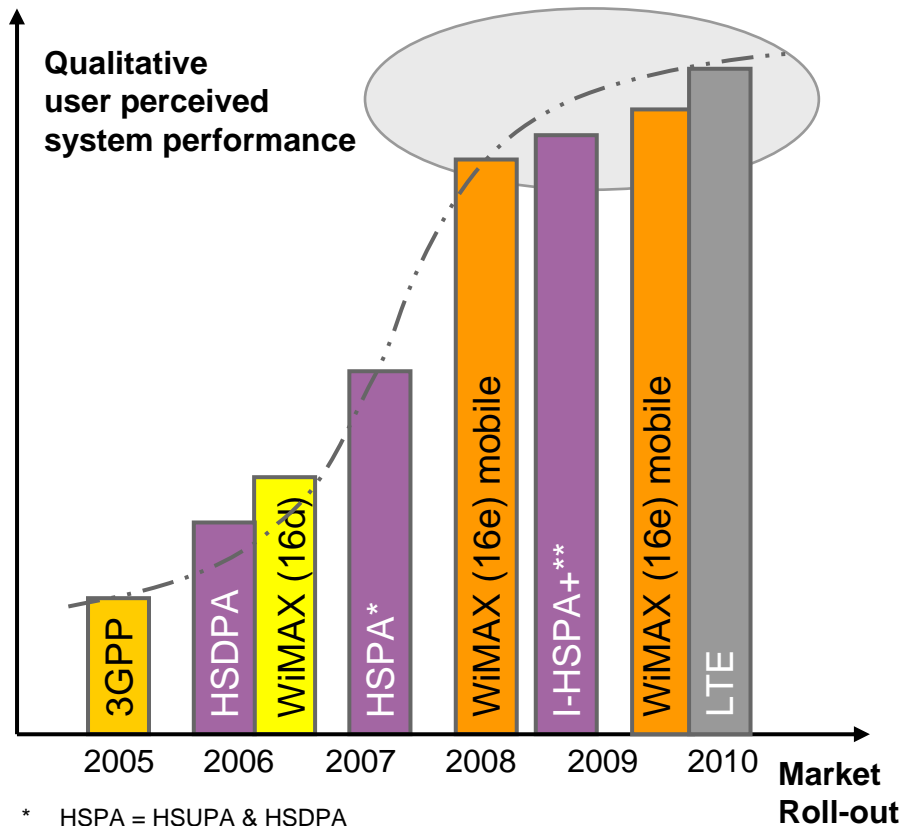
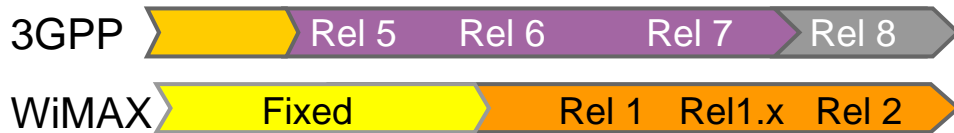
# All ecosystem elements necessary to guarantee business success are available both for WiMAX and 3GPP

	3GPP	WiMAX
<b>Standardization and regulation</b>	<ul style="list-style-type: none"> <li>• Global standard (adopted by all RSOs) with broad acceptance by stakeholders (700+ operators, 200+ suppliers)</li> <li>• Stable regulatory framework and globally available spectrum</li> </ul>	<ul style="list-style-type: none"> <li>• IEEE standard with global profiles</li> <li>• WiMAX forum with 470+ members</li> <li>• Increasing acceptance (ITU adopted)</li> <li>• Stabilizing regulatory framework and widely available spectrum</li> </ul>
<b>Chipsets and devices</b>	<ul style="list-style-type: none"> <li>• 800+ WCDMA devices by 90+ suppliers*; 403+ HSPA devices from 80+ suppliers</li> <li>• Great variety (simple phones, PDAs, Smartphones, PC cards)</li> <li>• Commercial LTE devices expected for 2010</li> </ul>	<ul style="list-style-type: none"> <li>• Strong commitment by 4 leading chipset manufacturers</li> <li>• Confirmed terminal plans by leading vendors, commercial availability in 2008</li> <li>• Reasonable initial variety (terminals, CPEs, modems, integrated in PCs and consumer electronics, PDAs)</li> </ul>
<b>Network equipment</b>	<ul style="list-style-type: none"> <li>• Legacy based, IP extended</li> <li>• Several leading manufacturers</li> <li>• Tested interoperability</li> </ul>	<ul style="list-style-type: none"> <li>• IP centric</li> <li>• Smaller plus larger vendors</li> <li>• Certification instances, IOT on its way</li> </ul>
<b>Operators and service providers</b>	<ul style="list-style-type: none"> <li>• Global operators and service providers with proven business models</li> <li>• Large subscriber base, solid growth</li> <li>• Global network / service interoperability, global roaming</li> </ul>	<ul style="list-style-type: none"> <li>• BWA entrants and Internet service providers with disruptive business models worldwide</li> <li>• Significant subscriber potential</li> <li>• Regionally / locally optimized</li> </ul>

**3GPP ecosystem is established today, WiMAX ecosystem is widely committed**

\* GSA - Global mobile Suppliers Association, January 15, 2008

# WiMAX and 3GPP are playing in the same league - performance is not a key differentiator



\* HSPA = HSUPA & HSDPA  
\*\* I-HSPA+ = I-HSPA & HSPA+

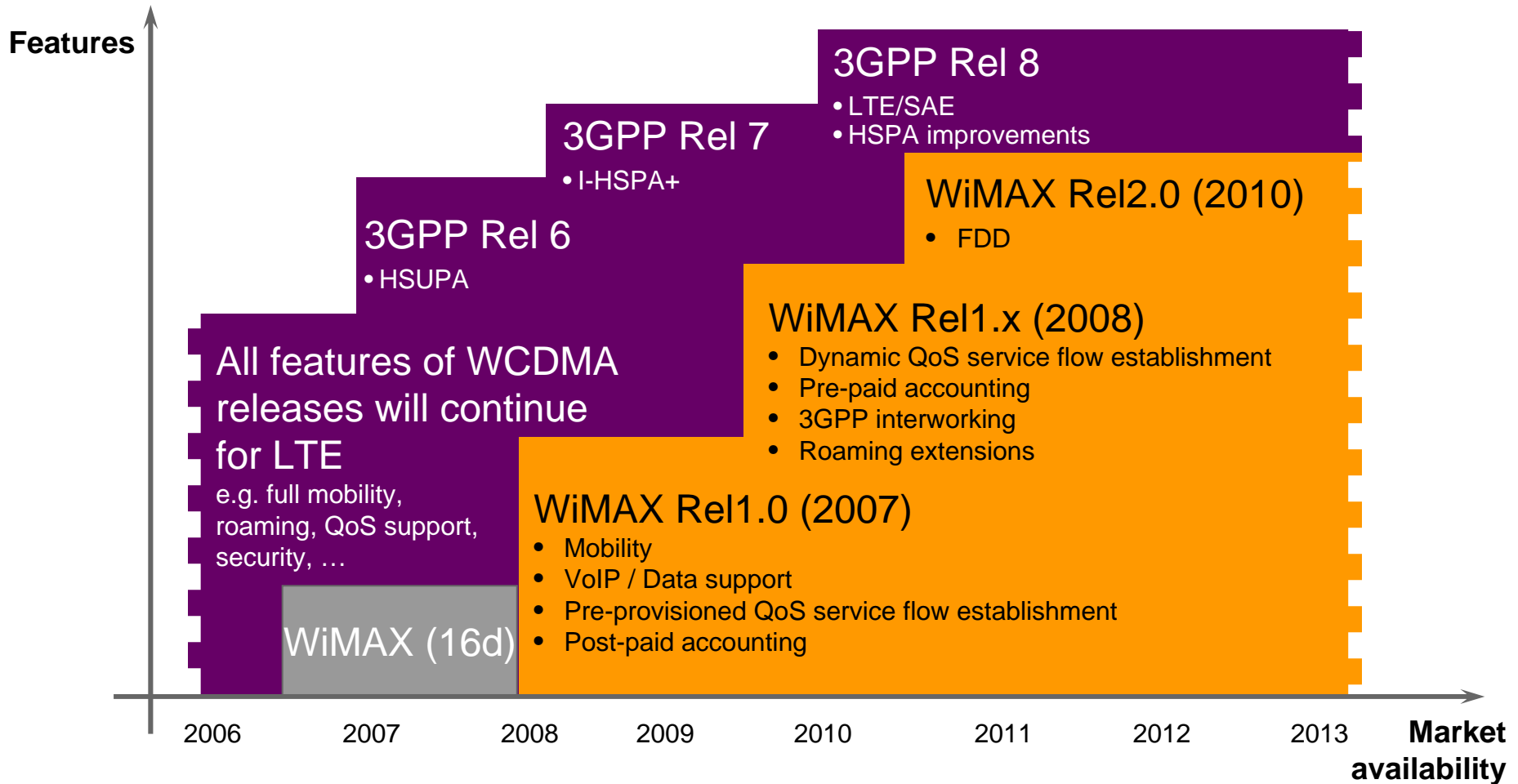
## Technology characteristics and evolution:

- HSDPA, HSUPA and I-HSPA+ are radio evolution tracks of WCDMA
- I-HSPA introduces flat architecture to 3GPP
- LTE is the long term 3GPP evolution based on OFDM radio and flat network architecture.
- WiMAX is based on OFDM radio and IP centric network architecture.

## Common design goals for increased cost efficiency:

- Flat network architecture
- Strong IP-centricity
- Optimal user experience

# Network features of 3GPP will precede the availability for WiMAX



# Radio deployment cost of WiMAX and 3GPP is comparable for urban areas

- Majority of deployment cost is not associated with base station equipment, but is site related and scaling with the volume of traffic carried.
- Technology differences in BTS components (primarily for protocol complexity and signal processing) account for only a minor portion of overall BTS cost.
- In urban areas, WiMAX can exploit its capabilities at competitive cost.

## Capacity limited (urban)

### Spectral efficiency is key

- ➔ Spectral efficiency of HSPA R7 and WiMAX are similar; LTE will be leading

## Coverage limited (rural)

### Link budget is key

- ➔ FDD has an inherent link budget advantage over TDD resulting in less BTS sites

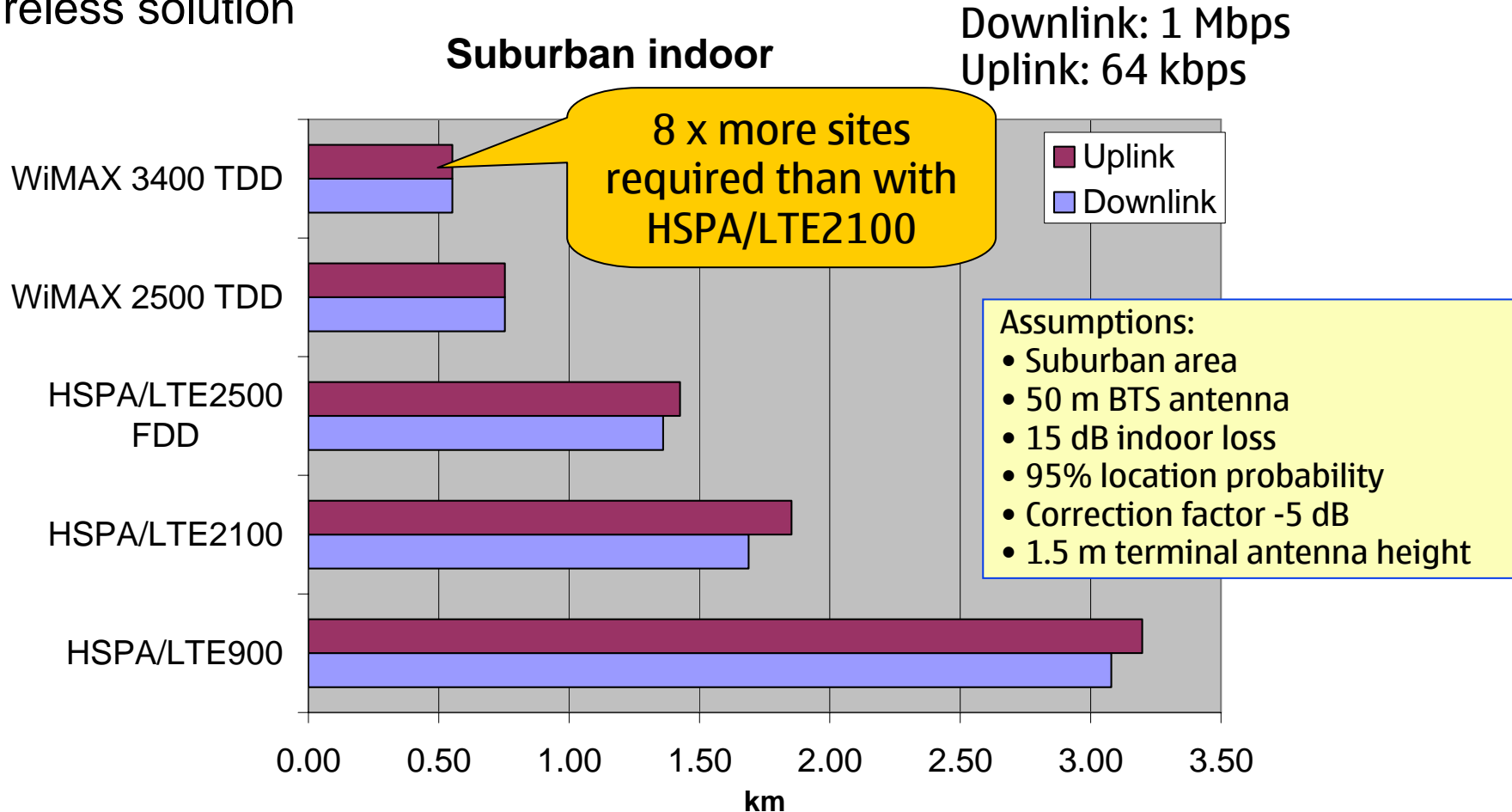
Note 1: Typically, WiMAX coverage ranges from ~750m (@2.5GHz) up to ~2500m (@700MHz) without directive antennas.

Note 2: The same parameters are assumed where applicable.



# Cell Range

- WiMAX has shorter cell range due to TDD duplexing and higher frequency
- Outdoor fixed antennas can be used to improve the link budget for fixed wireless solution



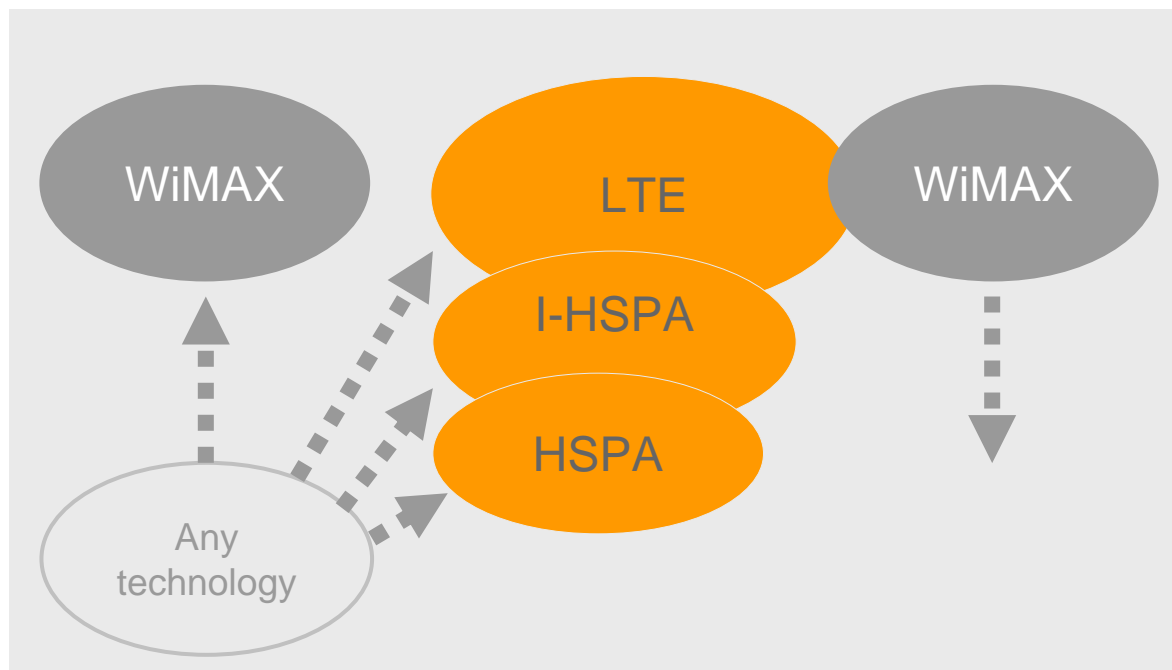
For reference: Sprint-Clearwire coverage 125 M pops by 2010 = 40% population

# Positioning: Service focus and type of operator

Mobile Open  
Internet Access



Mobile Voice  
& Multimedia



**Non-3GPP  
Incumbent**

**3GPP Incumbent  
(GSM, WCDMA)**

**BWA entrant  
(new, FNO, ISP, ...)**

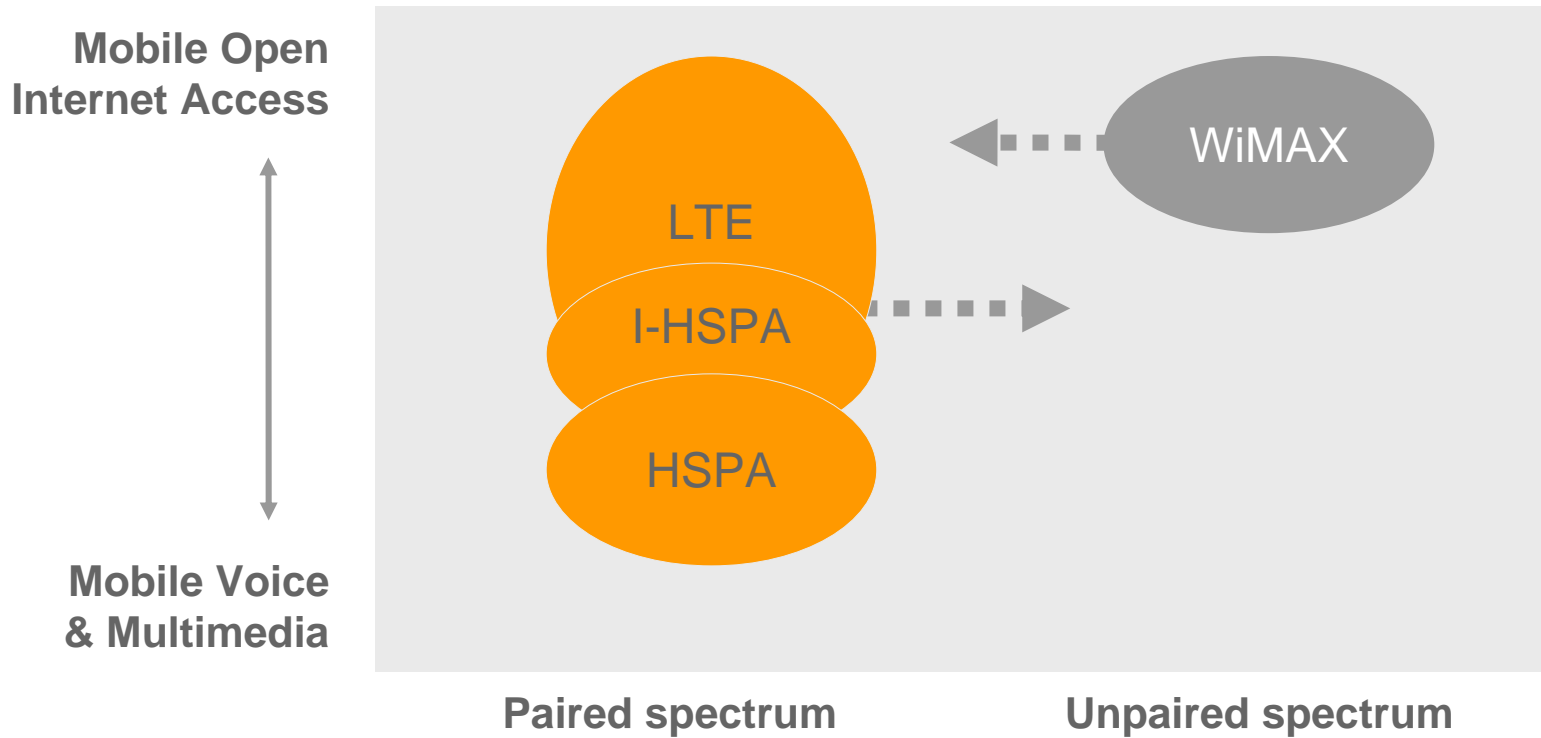
**Business  
opportunity**

Fast to market with  
Internet connectivity

Enhanced legacy  
mobile data business

New mobile  
broadband business

# Positioning: Service focus and type of spectrum

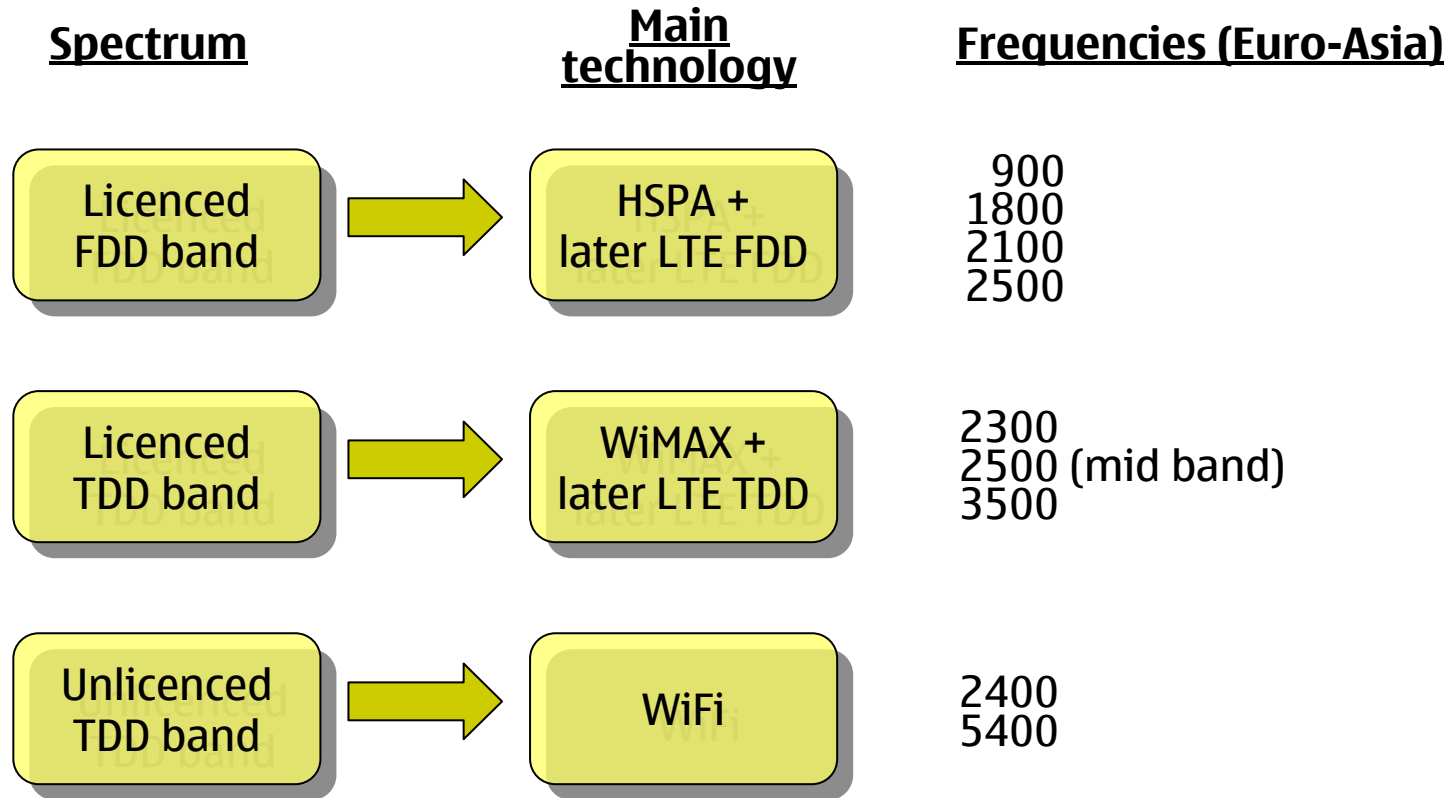


**Business  
opportunity**

New or re-farmed FDD spectrum  
for traffic of new services

Early opportunities of WiMAX for  
available TDD spectrum

# Conclusion: Spectrum Defines Technology Choices



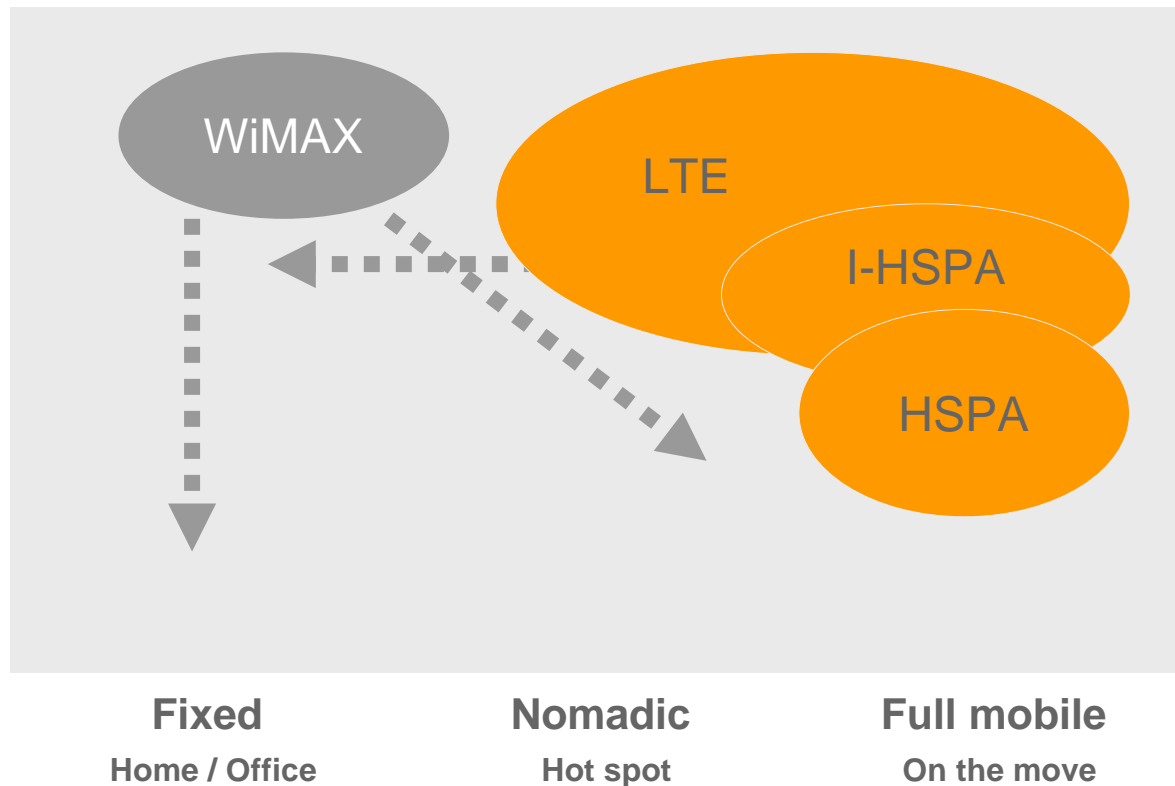
- **Combining WiMAX + HSPA/LTE provides access to more spectrum**

# Positioning: Service focus and grade of mobility

Mobile Open  
Internet Access



Mobile Voice  
& Multimedia



**Business  
opportunity**

Multi-service offers to  
home and office

Hot spots with  
mobile data business

Enhanced legacy  
mobile data business

# LTE is the optimal mobile broadband evolution path for 3G and CDMA

Interworking with all 3GPP technologies  
Evolution for operators with paired spectrum  
Designed for full Mobility  
Committed to Voice quality  
Smooth evolution from 3G via I-HSPA  
Interworking with non-3GPP radio access systems (e.g. CDMA)

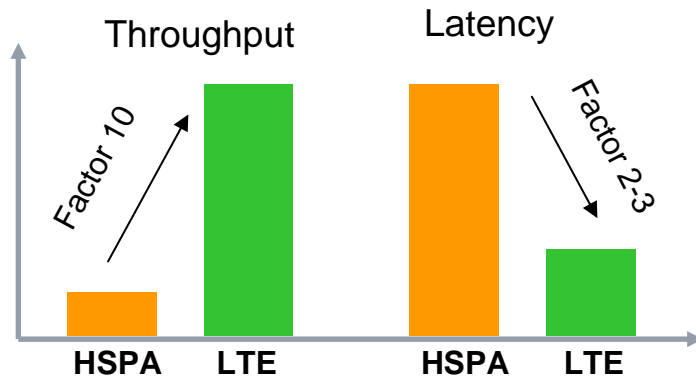
## LTE/SAE Trial initiative members



Nokia Siemens Networks LTE is a smooth upgrade from existing 3GPP Platform

# LTE/SAE key benefits

## User experience → ARPU



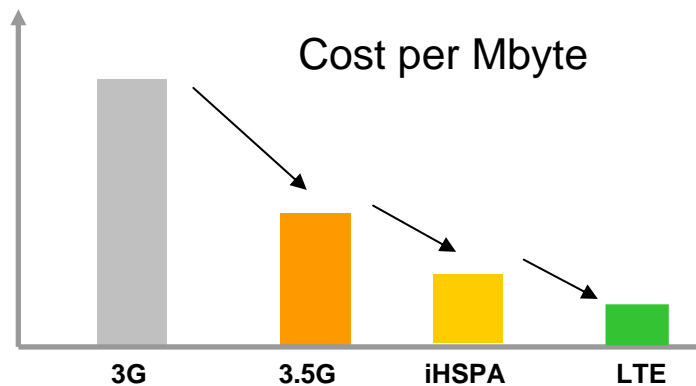
## Investment Protection

Re-use of

- Sites and infrastructure
- Backhauling
- Frequency bands

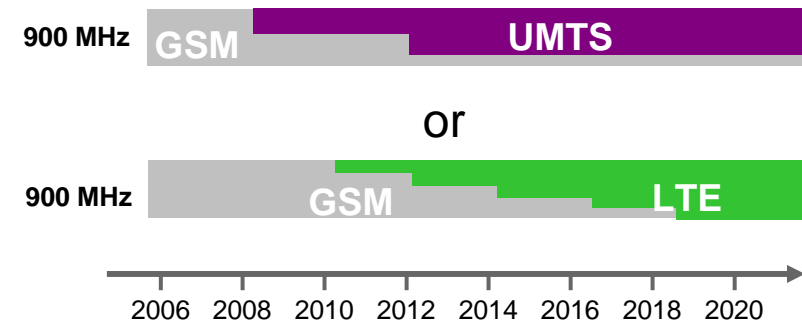


## Low cost per Mbyte



## Scalable bandwidth

Optimized spectrum usage







# LSTI (LTE-SAE Trial Initiative)

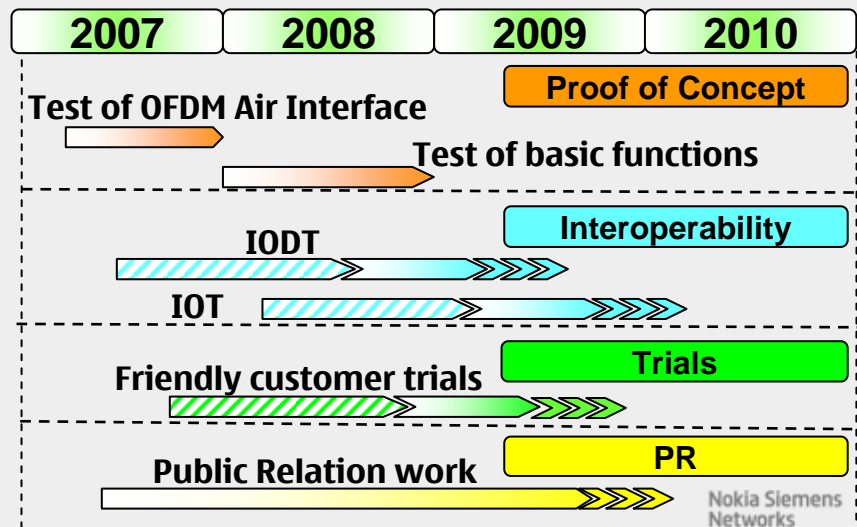
- joint test bed for LTE worldwide



## LSTI initiatives goals/objectives

- demonstrate feasibility and capabilities of 3GPP LTE-SAE technology under real world conditions. Indoor & outdoor tests
- accelerate development of 3GPP specification by identifying shortcomings out of test phases
- reduce risk of market introduction of new LTE-SAE technology

## Nokia Siemens Networks drives LSTI. Schedule & Program Office:



# Mobile WiMAX for wireless broadband

Extending (fixed) broadband services with mobility

Extending broadband services to areas without (fixed) broadband access

Supporting operators with unpaired spectrum allocations

Extending cellular operator business with additional mobile broadband offering

Providing broadband wireless entrants with open internet business access



Nokia Siemens Networks Mobile WiMAX end to end solution supports both WIRELESS and MOBILE broadband applications

# Nokia Siemens Networks in 3GPP and WiMAX



Market Leadership in 3GPP evolution and WiMAX  
Technology and Market leadership in flat architectures  
Complete end-to-end infrastructure and services offering  
Same platform across technologies and generations

GSM



WCDMA



WiMAX



LTE



# The right solution for each segment

## W-CDMA/HSPA

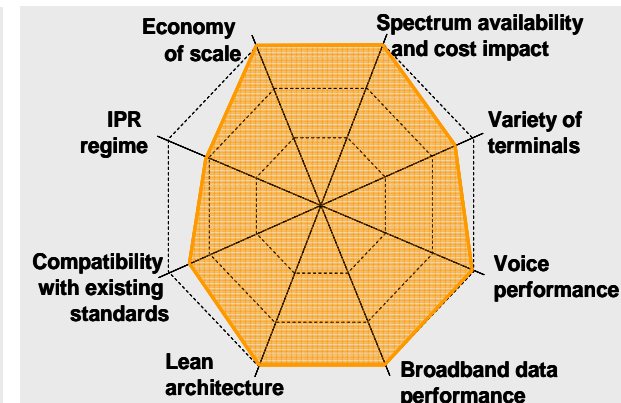
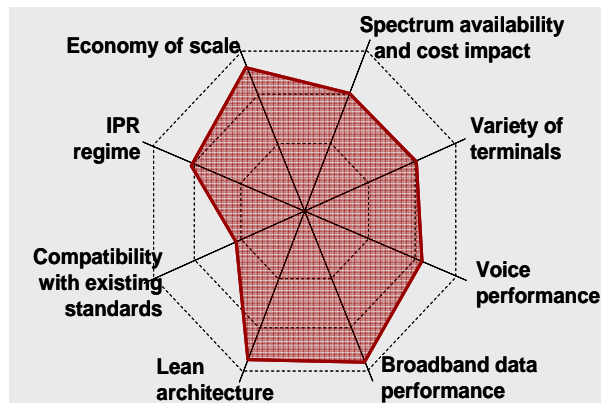
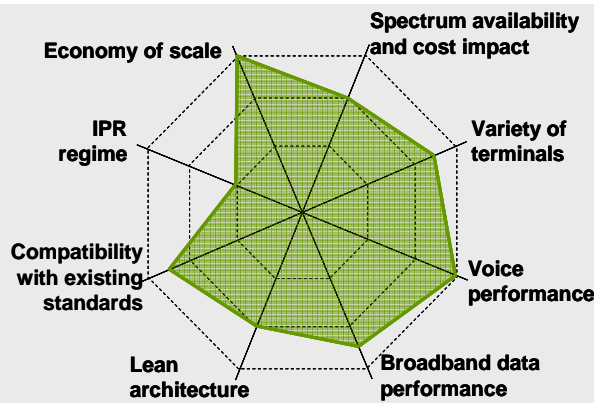
For operators with 3G spectrum  
 Broad terminal eco system  
 High data security and QoS  
 Quick and cost-effective upgrade of existing networks  
 Seamless 2G/3G handover – global coverage, global roaming  
 Proven technology

## WiMAX

Fixed or mobile network operators with WiMAX spectrum  
 Device eco system started to evolve  
 Optimized wireless-DSL services  
 High capacity and low latency  
 Flat and IP based architecture  
 Short term availability

## LTE

Mainstream; 3G evolution – leverage large installed 3G base  
 Utilizes 2G and 3G spectrum – efficient re-farming with flexible bandwidth  
 Broad terminal eco system expected  
 Highest capacity, lowest latency  
 Very flat and IP based architecture

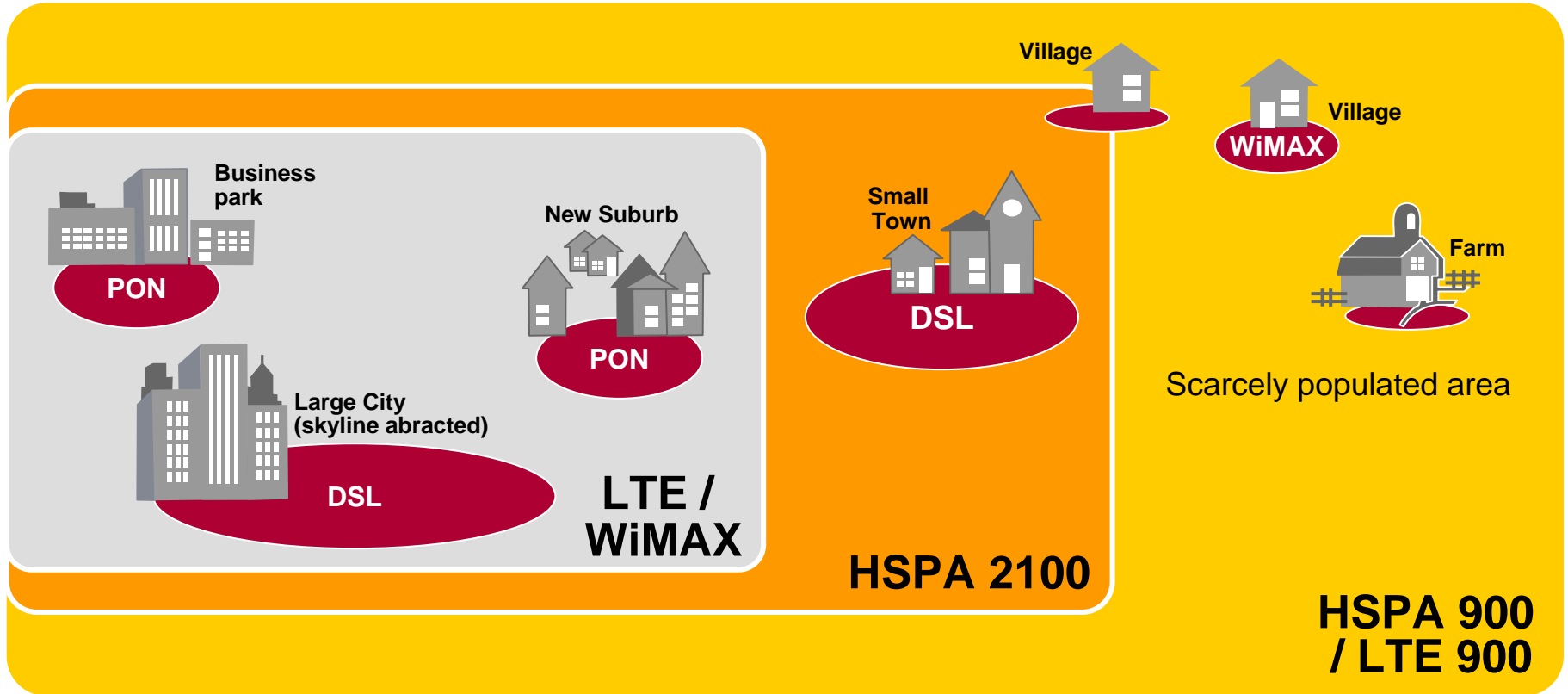


High speed data rates with full mobility

High speed data with limited mobility

Broadband multimedia with full mobility

# User density and installed base imply technology choice



- Broadband access strategy
- Residential access** - *Bandwidth optimized*
  - Mobile broadband** - *Mobility and coverage optimized*
  - Always best connected** - *Bandwidth and mobility optimized*

# Leader in 3GPP and WiMAX evolution

Our **GSM/EDGE BSS** is operational in **259** operator networks in 115 countries offering services to more than 1.5B subscribers.

We have **100+ WCDMA radio** references.

**85** of our WCDMA radio customers have **launched HSDPA**.

**World's first flat architecture I-HSPA** deal with **Terrestar** in the U.S.

**First ever LTE** selection - Selected as a LTE vendor to **NTT DoCoMo** (as a partner with Panasonic)

Selected as **LTE** trial vendor to **Verizon U.S.**

Mobile **WiMAX** Supplier to **Sprint** - the leading WiMAX operator; 12 Contracts and about 50 trials already made with WiMAX

# Summary and conclusion

- WiMAX and 3GPP show similar performance for comparable scenarios, LTE will be leading
- 3GPP benefits from 2.8 billion users embedded base, WiMAX provides an alternative for BWA entrants
- Spectrum, legacy interworking, timing and business focus will be key selection criteria
- Nokia Siemens Networks is in a leading position for providing the optimal radio solution regardless of technology



# Thank you!

[klaus.kohrt@nsn.com](mailto:klaus.kohrt@nsn.com)