



NAVAL
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Trends in Global Communications

18 May 2011

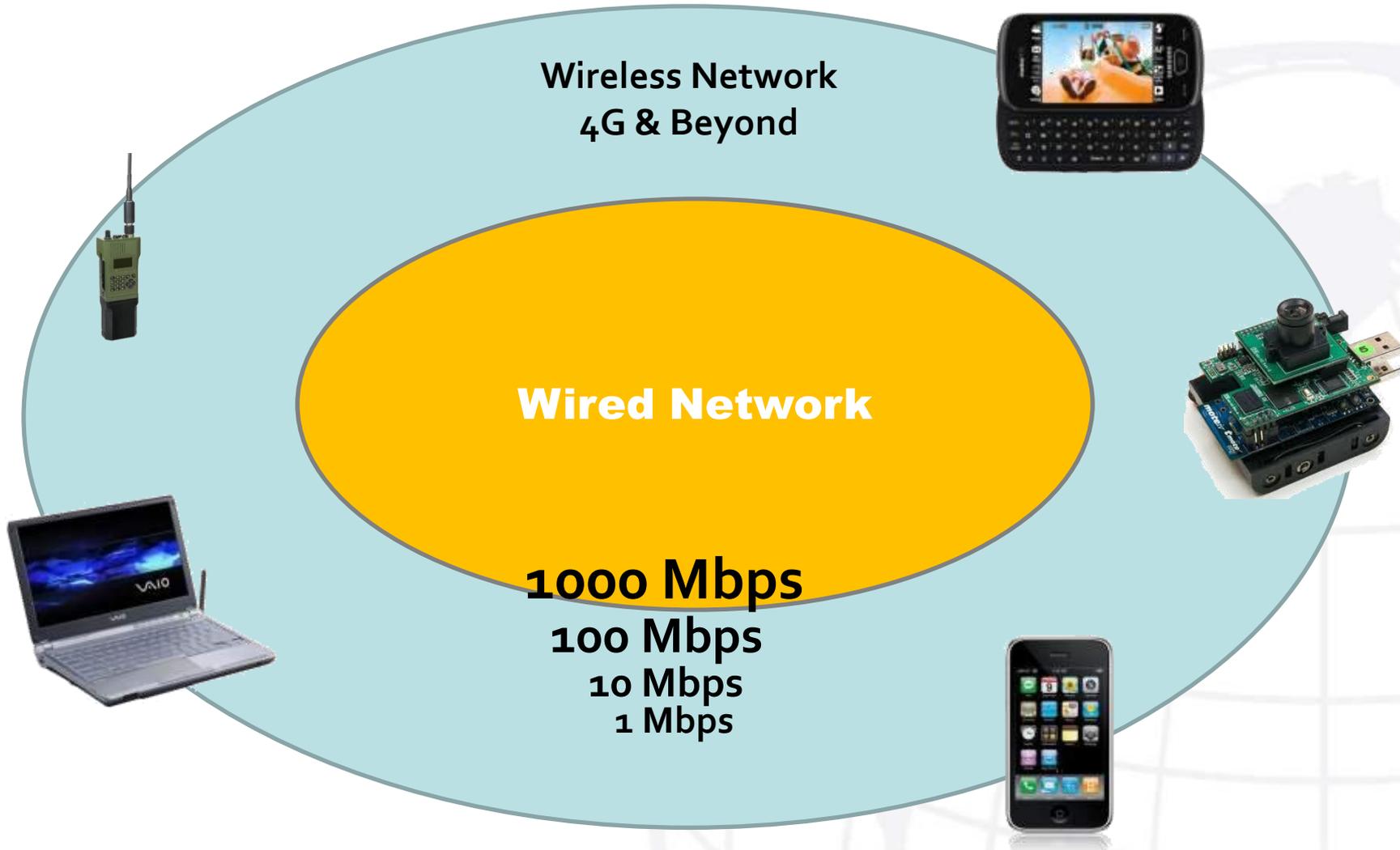
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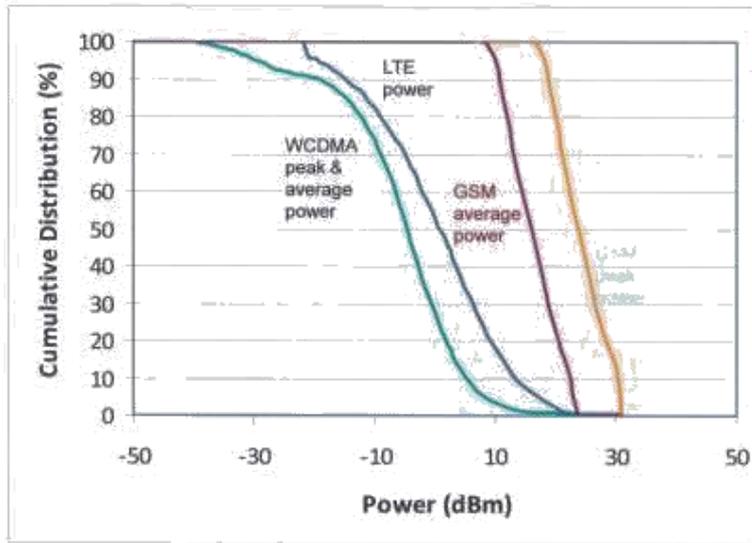


The Future Information Grid



New waveform: CDMA → OFDMA

*Increasing Bandwidth: 25 KHz → 100 MHz
(4,000 x increase!)*



(U) Sources:
Aalborg University
Lulea University
ETSI

Decreasing Handset Power!

Increasing Complexity!





Trend: SDR slowly being accepted

- Widespread commercial use (i.e. mobile phones) of Software-defined radio still not foreseen
 - Craig Partridge (DARPA) – “\$50 SDR in 2020”
- Increasing use of SDR by international tactical radio manufacturers
- Superb opportunities for SDR in SIGINT systems



Aselsan
PRC-9651
(Poland)

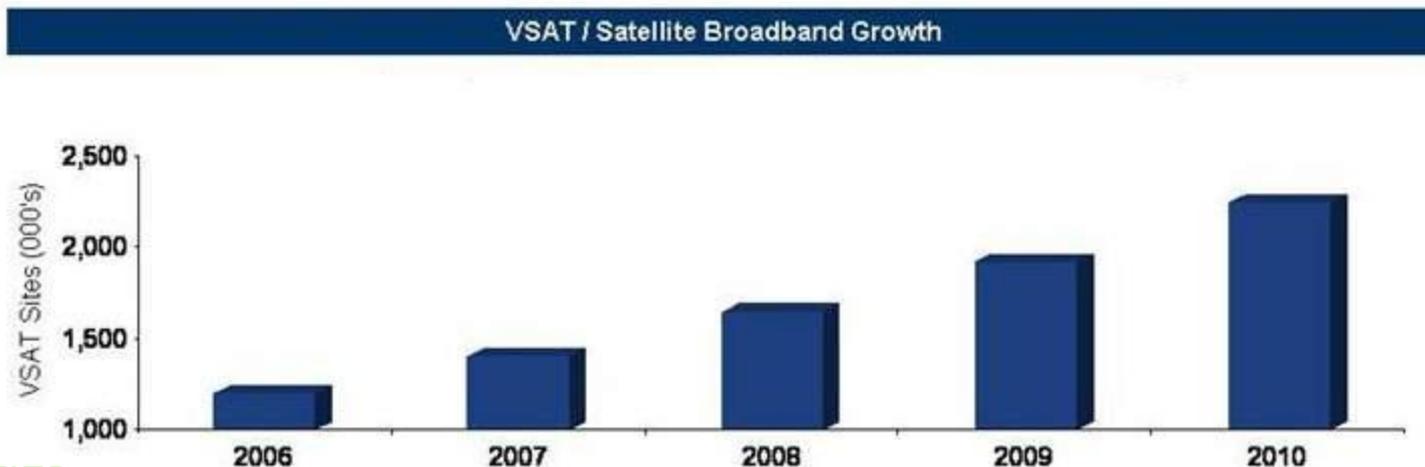


Aselsan
PRC-9651
(Turkey)



Trend: Broadband SATCOM Small Growth

- Broadband satellite data services will continue to see zero to linear growth for the next five years
- Renewed interest after Middle East turmoil
- Providers looking to new Ka-band satellites (50Mbps) beginning in 2014

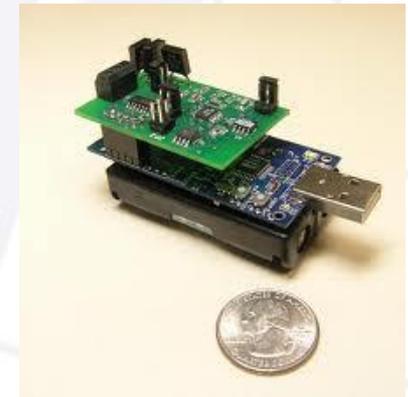


Source: Pro Brand International, Inc.



Trend: Smart Dust Disillusionment

- Sensor networks, or smart dust, considered to have flat growth in the next five years
- Market share leader, Crossbow, abandoned the technology in 2010 to focus on GPS systems
- Difficulties in reliability, deployment
- Primary interest remains industrial
- No consumer applications

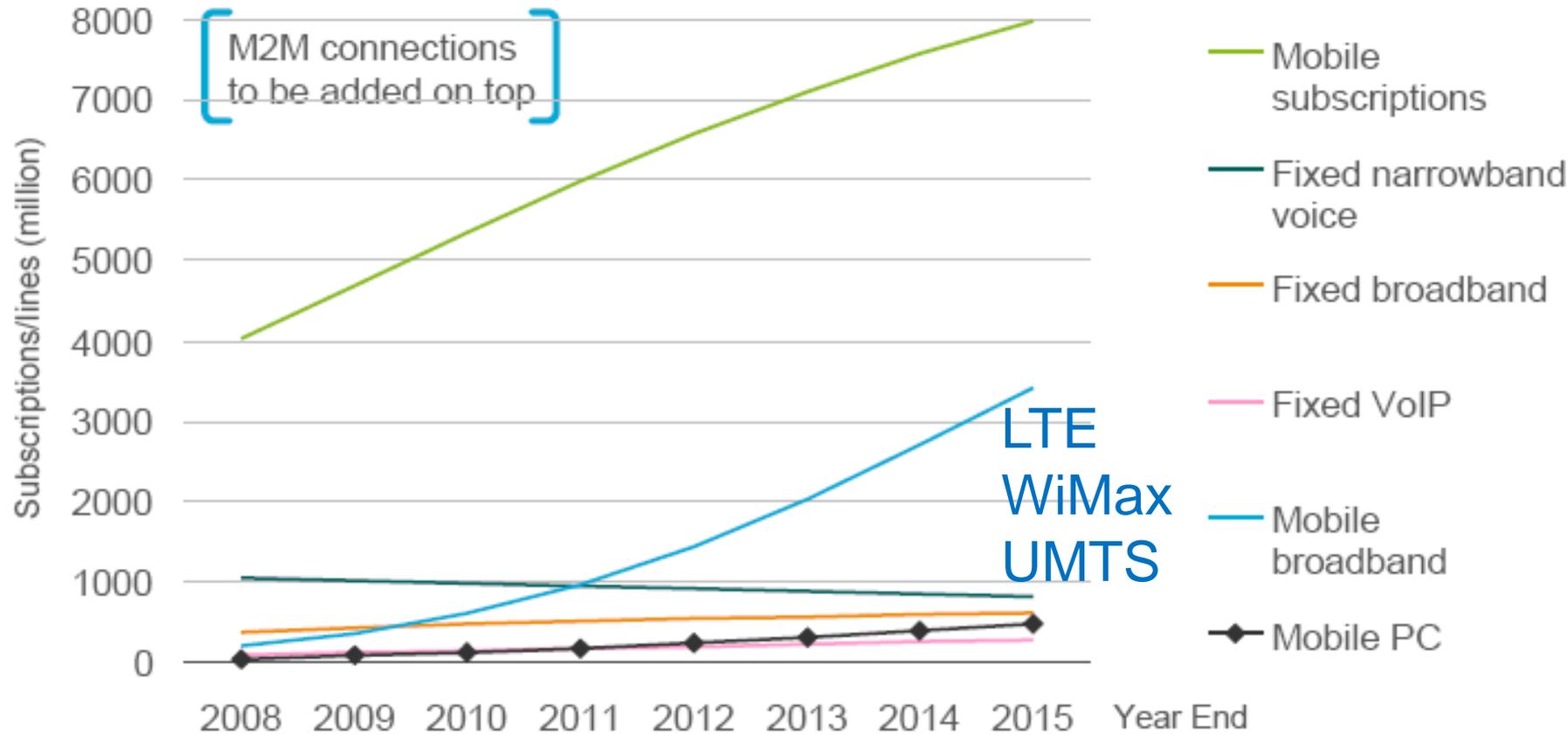




Trend: Mobile Broadband is growing fastest

Mobile Broadband...

...fastest growing technology in history!



Source: Internal Ericsson

Mobile Broadband: CDMA2000 EV-DO, HSPA, LTE, Mobile WiMAX, TDSCDMA. Both mobile PC and handheld devices.

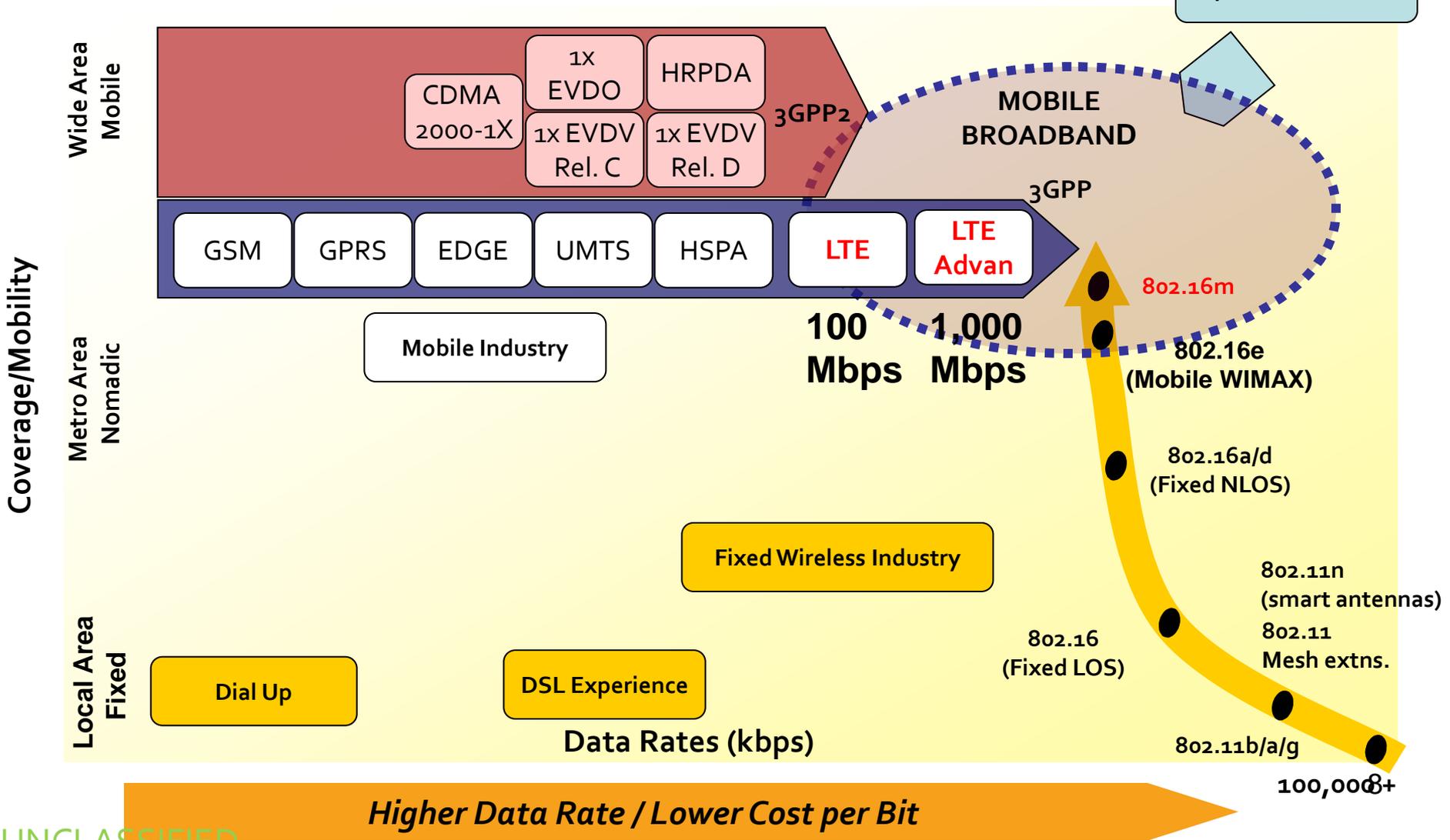
Mobile Broadband and Mobile PC are subsets of total mobile subscriptions

Fixed Broadband: Cable, xDSL, Fiber, PC-to-PC VoIP e.g. Skype not included in VoIP

This slide contains forward looking statements



Two Key technologies are evolving to meet the Wireless Broadband Requirements



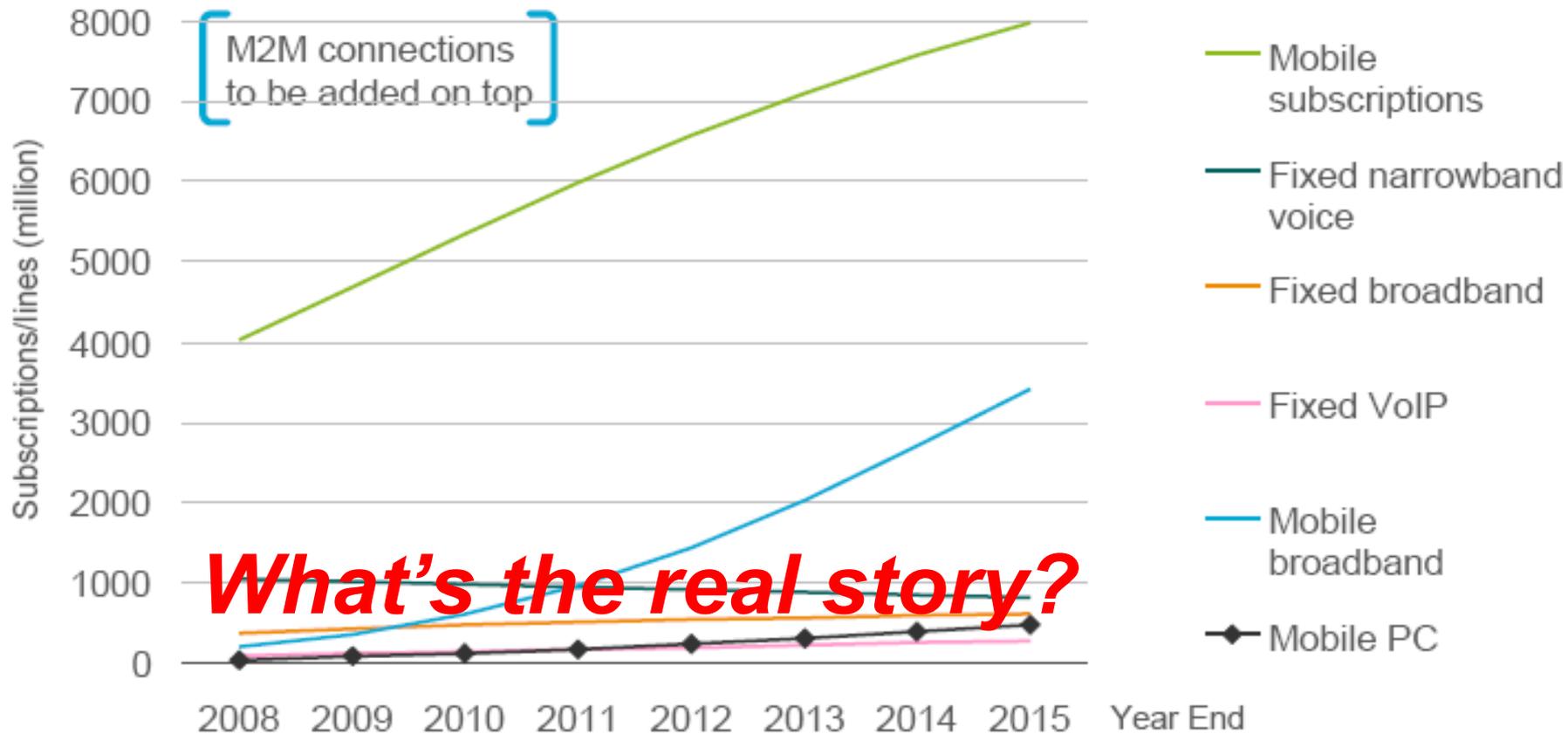


What will we do?





Trend: Mobile Broadband is growing fastest



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Sprint makes \$3B bet on WiMax

[My Sprint](#)[Shop](#)[Digital Lounge](#)[Community](#)[Support](#)[Welcome to Sprint](#)[Already have Sprint?](#)

**WHAT WILL YOU DO FIRST WITH
EVO, THE FIRST 4G PHONE?**

[Get it now](#)

htc EVO™ 4G



Wateen : First nationwide WiMAX 4G deployment in the world (Nov 2008)

Background



Division of Warid Telecom (Abu Dhabi)
Nationwide WiMAX license (3.5 GHz) in Pakistan

Value Proposition



Speedy Installation
Low Cost replacement to DSL
E2E network (IP NGN Core, IMS)
Nationwide service footprint
One Stop Triple Play

Target Segments



Residential
Enterprise
SME
SoHo

Differentiators



Nationwide Coverage
Untethered (Wireless)
Fixed and Mobility

Services Offered

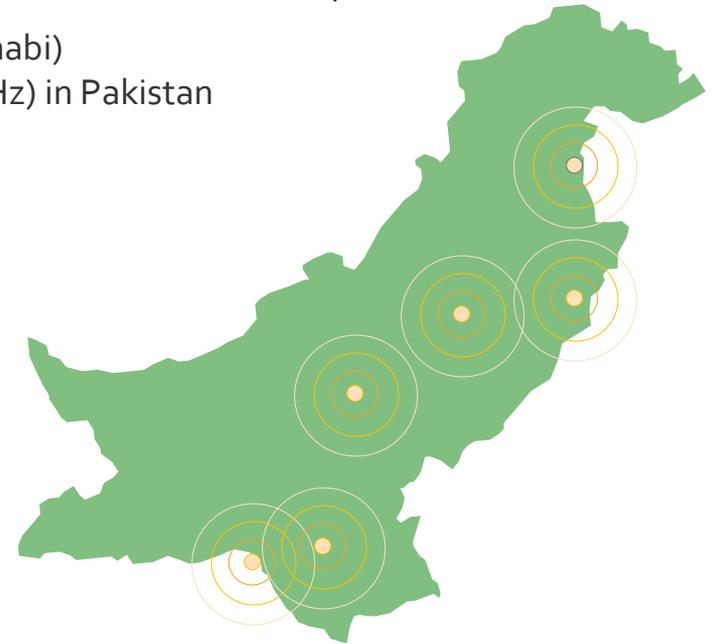


Internet Access
VoIP
VPN

Major Competitors



Incumbent Fixed Operators



Mobile WiMax Phones



Samsung
(Korea)

HTC
(Russia)



Mobile WiMax Networks



Globe (Philippines)

Mobinnet (Iran)

شرکت ارتباطات مبین نت
(سهامی خاص)

تنها دارنده پروانه سراسری
WiMax در ایران

Operational Iranian 4G Networks

(all supplied by Chinese vendors Huawei or ZTE)

MTN Irancell

Over 300 Mobile WiMax cells in 48 cities. Largest 4G provider in Iran.
(www.mobinnet.ir/wimax)

Laser Telecom

First Mobile WiMax in Iran,
covers 80% of Tehran



Second largest 4G provider in Iran.
Mobile WiMax in 7 largest provinces

(http://www.mtn.com/AboutMTNGroup/GroupFootprint/MiddleEastAndNorth/MiddleEastAndNorth_Iran.aspx)

Golestan



Datak Telecom



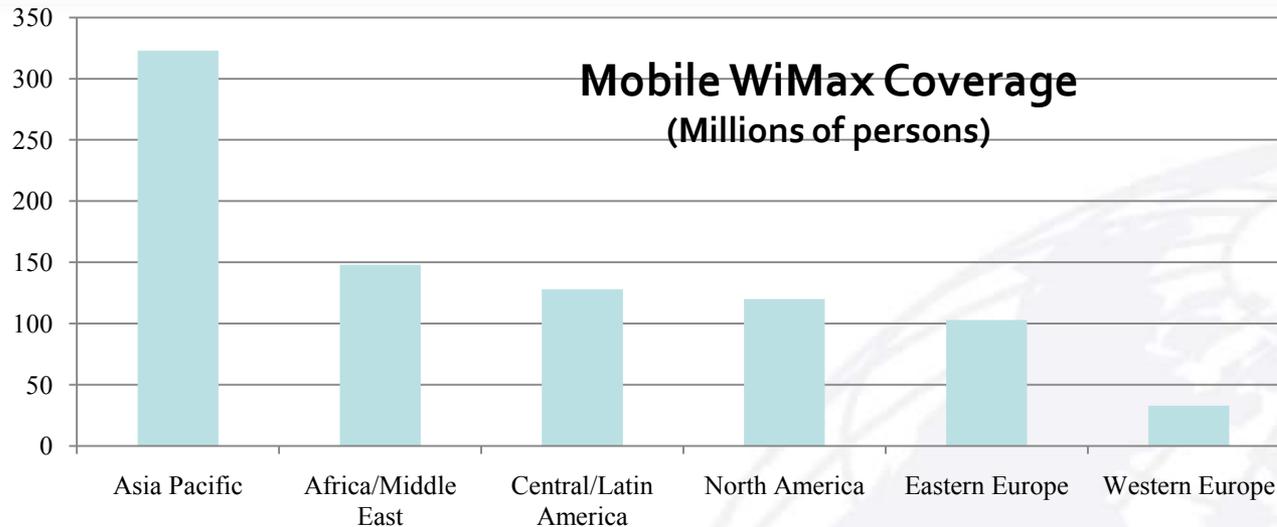
Nationwide Mobile WiMax Networks Based on Huawei Core Infrastructure



Source: www.huawei.co.cn



WiMax Forum Estimates

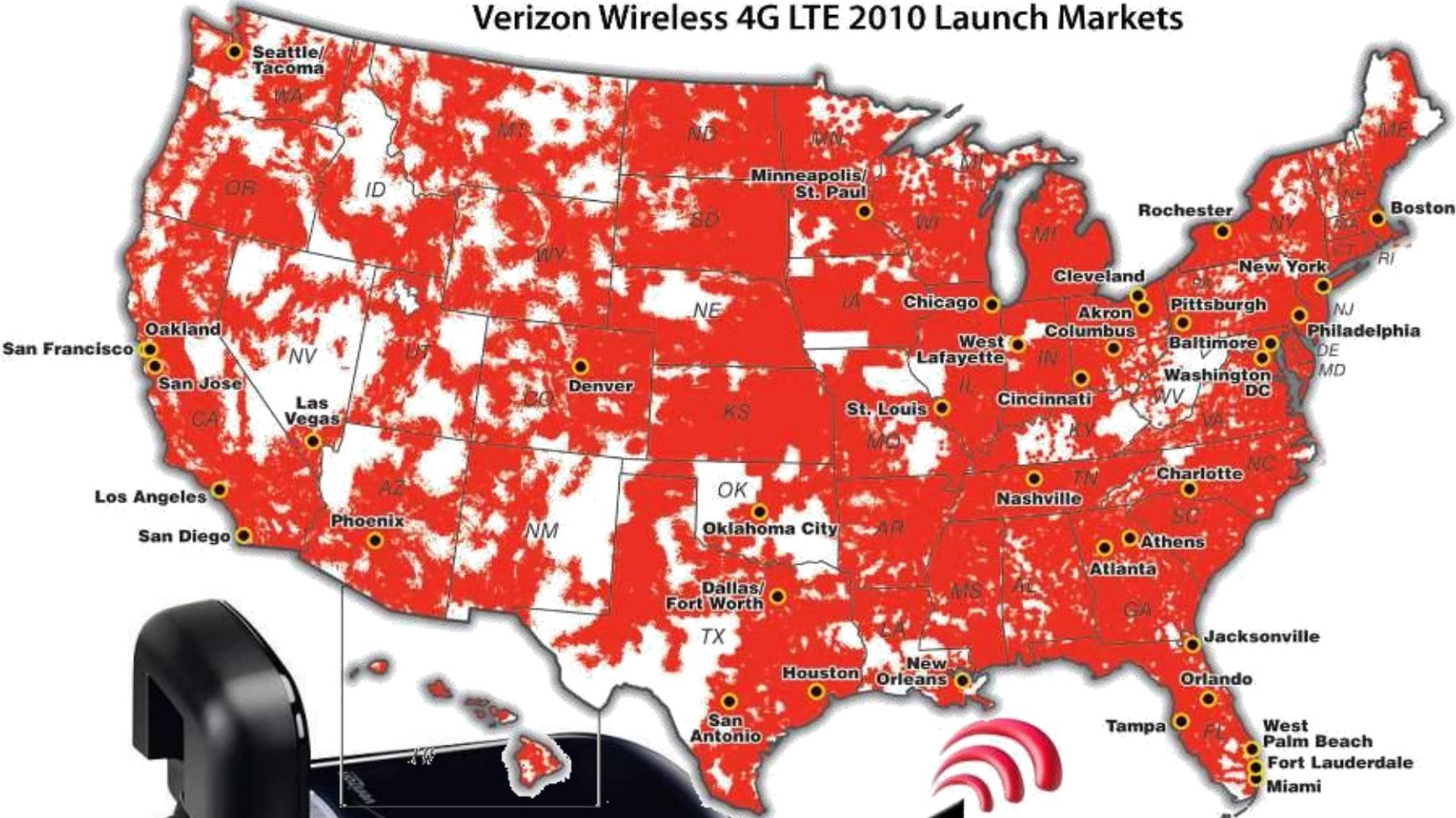


- Currently 582 operators in 150 countries
- \$1.2 B investment planned for 2011 (China, US, Taiwan, Korea, Malaysia)
- Coverage of 823 mil persons end of 2010
- Coverage of 1.4 bil persons end of 2011



What about LTE?

Verizon Wireless 4G LTE 2010 Launch Markets



Map Key	
	4G Market
	3G Data Coverage
	Data Coverage Not Available





LTE is Gaining Steam!

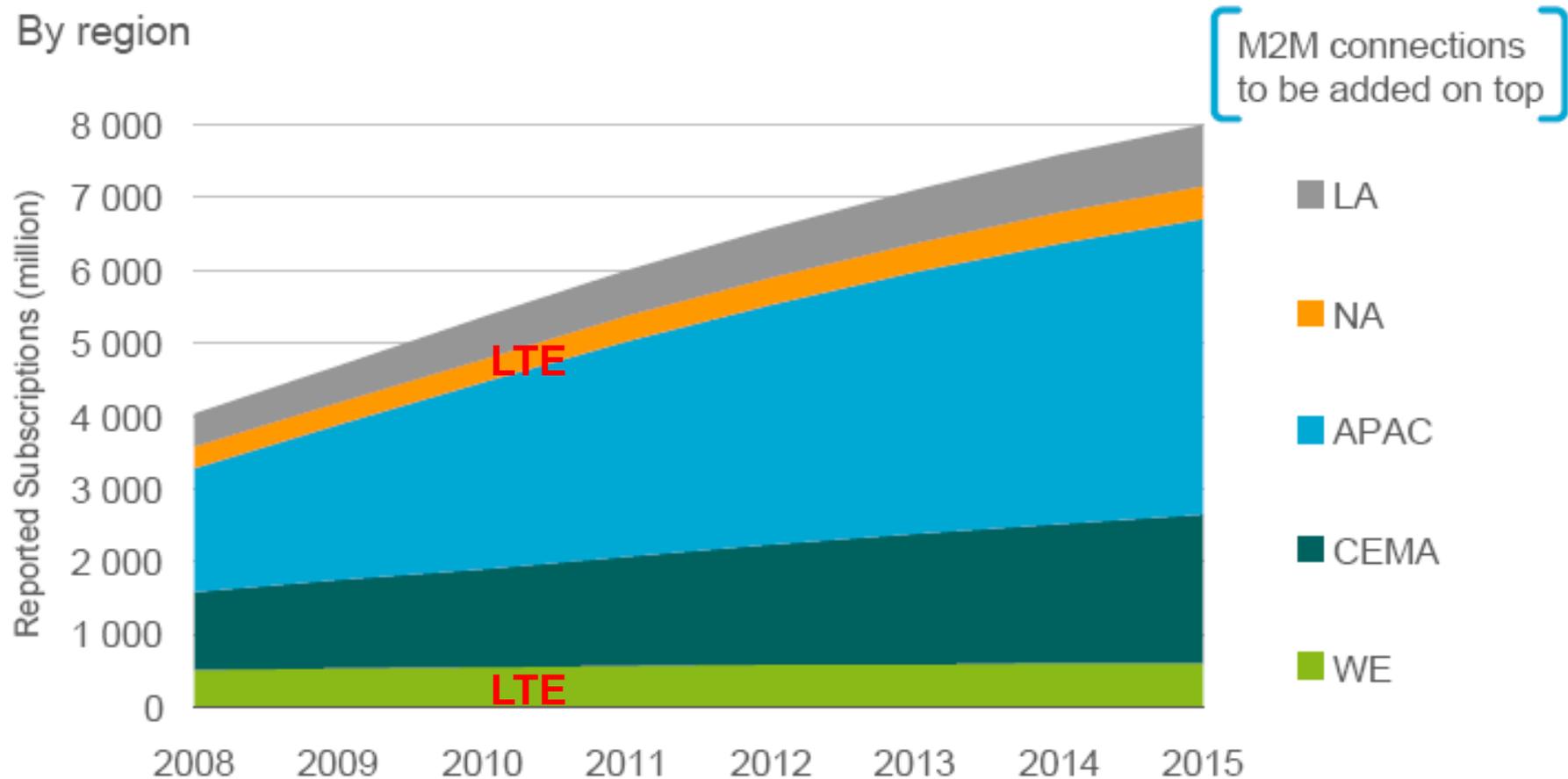
- January 2010 – First public LTE network operational in Stockholm/Oslo
 - Uses Samsung devices, Ericsson network core
 - 50 Mbps download, 20 Mbps upload
- Sparse operational networks in Uzbekistan, Japan, Austria, Germany, US
- Test demonstrations in Moscow, Shanghai, Hong Kong
- Top ten global network providers committed to LTE
- LTE adoption in North America, Western Europe assured
- China? India? Russia? Middle East?





Mobile Subscriptions by Region

By region



Source: Internal Ericsson



Worldwide Deployment



Operational WiMax operators
(www.wimaxmaps.org)



(Blue) Operational LTE operators
(Red) Planned LTE operators
(www.ltemaps.org)

Three Very Different Signals

WiFi

Bandwidth is fixed
 Carrier frequency is known
 10's of users
 Users transmit when they want
 Small area networks

≠

Fixed WiMax (2004)

Variable bandwidths
 User bandwidth is fixed
 Carrier frequency determined by operator
 100's of users
 Users transmit on a schedule
 Cable modem/DSL alternative (Non-mobile)

≠

WiMax (2009)

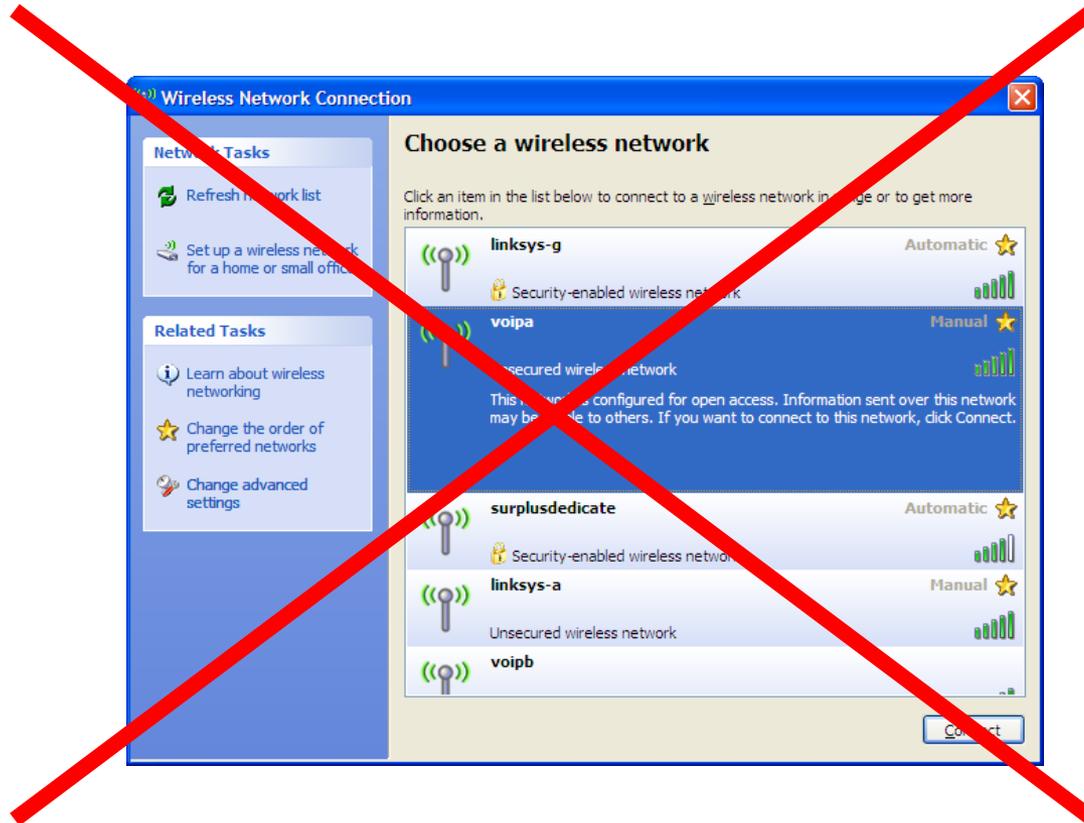
Variable bandwidths
 Variable User bandwidth
 Carrier frequency determined by operator
 100's of users
 Users transmit on a schedule
 Mobile Phone technology +

No Cheap Packet Sniffers!



If You Don't Know What You're Looking For...

...finding a 4G network is not easy!





4G Geolocation using Timing Advance

- Potential for Better than 10x Improvement Over GSM TA Location Techniques
 - 40m for 4G vs. 400m for GSM
- RNG-RSP Successfully Received in Traffic
- Small Timing Adjust Variance in Repeated Observations
- Periodic and Handoff Ranging Can Add to Location Accuracy



- Mobile broadband is the fastest growing technology in history
- Adoption is occurring in underdeveloped nations 10x faster than developed nations
- LTE will be the dominant mobile technology in developed countries in four years
 - WiMax has made significant inroads in underdeveloped countries
 - Jury is still out in China
- Collecting 4G signals will be challenging but exciting potential for geolocation

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