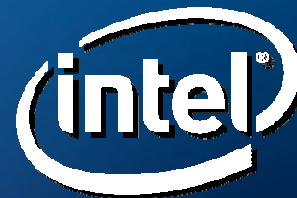


Next Generation Mobile Broadband and Regulatory Issues

Garth Collier

Managing Director
WiMAX Program Office, Asia-Pacific



Our Vision:

1 Billion "Connected Mobile Clients" in 5 Years

Core Business

Strategic Growth Areas

Client PCs



Windows, Mac OS



CE
(Internet)



Microsoft Windows / Moblin Linux-based OS / Services Port of Choice

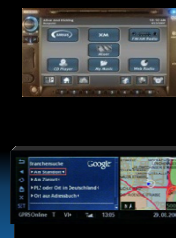
Mobile
Internet
Devices



Low-Cost
PCs



Embedded



One Architecture Across Multiple Mobile Client Platforms

The Internet is Big and Growing



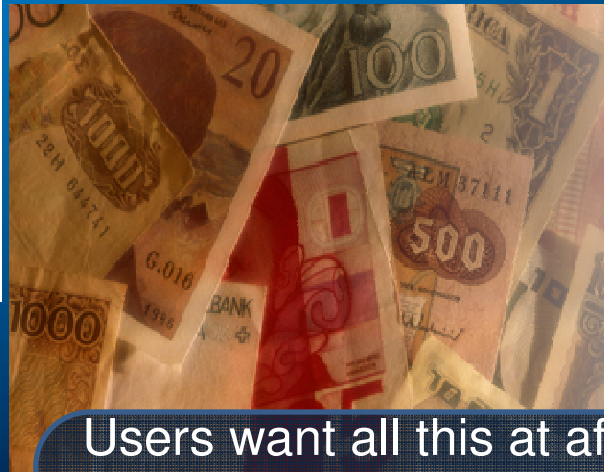
Users demand video and HD



Emerging Markets Increasing BB penetration



New mobile devices increase data capability



Users want all this at affordable costs

... And These New Devices and Applications Are Rapidly Overloading Existing Networks

Commerce



Information



Productivity



Entertainment



Medical




Communication



Education



0101001001001001001001001001010



Mobile Voice VS. Wireless Internet

Traffic Equivalents*

1 Smartphone = 30 Handsets
1 Laptop = 450 Handsets

< 10 Kbs Constant Rate

A Network Optimized For Mobile
Voice Cannot Handle High Numbers
Of Mobile Internet Users

1-5 Mbps Burst Traffic

*More Spectrum Needed
More Backhaul And Different Network Architecture Required*

Mobile Internet Requires a Technology Revolution

* Source: Cisco, 2009



Next Generation Mobile Broadband and Regulatory Issues

Global WiMAX Status

WIMAX Is The BEST Choice To Deliver The Future ... Today

Ecosystem



Approved Spectrum



Operators=Carriers

>450

Deployments & Trials in over 125 Countries*



Equipment Manufacturers

9



Device Manufacturers

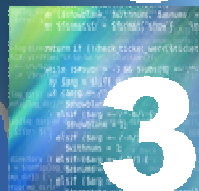
80

covering 480 Devices**



Chip Companies

3



Content & Application Providers

3

500***

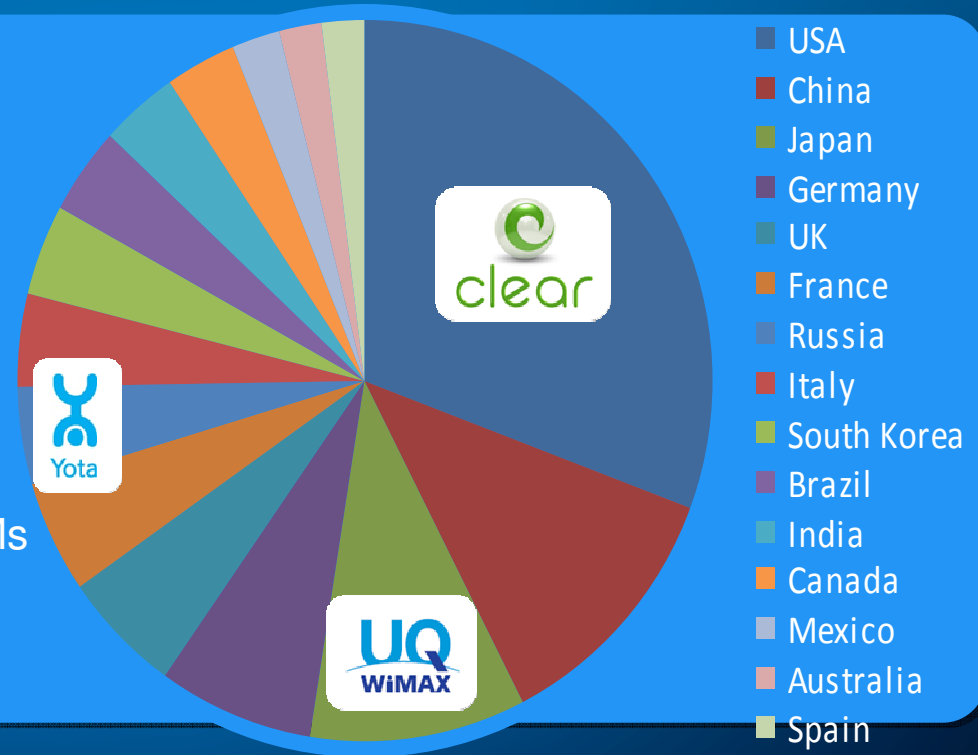
- Low-Cost Model
- Built for capacity
- All IP network
- Open Mobile Internet
- Global ecosystem
- Device Retail Model
- Affordable flat-rate charge
- Scalable – 16m

Source: *Informa, Mar 2009, **WiMAX Forum, Sept 2008, ***Mary Jo O'Connell, Morgan Stanley, 2008



Mobile WiMAX Being Deployed in 14 of Top 15 PC Markets

- 1.2 billion PCs deployed worldwide
- Top 15 represent 71% of total
- All countries have 2.3/2.5 or 3.5GHz
- 16 IA OEMs supporting WiMAX today
- Clear / US: 35+ models from 6 OEMs
 - 20+ available now
- UQ / Japan: 14 OEMs commit to embed
- Russia: 30 models available from 6 OEMs
- 100 notebook + netbook models by end of year



Source: Computer Industry Almanac, Jan '09



“We actually welcome the use of heavy bandwidth data applications that conventional 3G network operators may discourage or simply can't support.

Scott Richardson
Chief Strategy Officer, Clearwire



WiMAX-Ready
Notebooks



Clear
MODEM



Clear USB
MODEM



Clear Voice
ADAPTER



Clear Mobile Broadband
ENTERTAINER



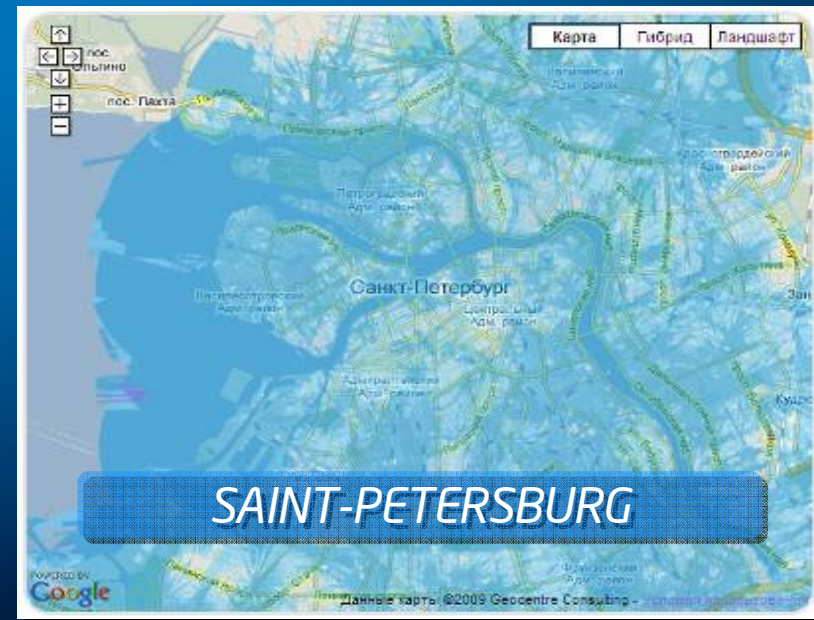
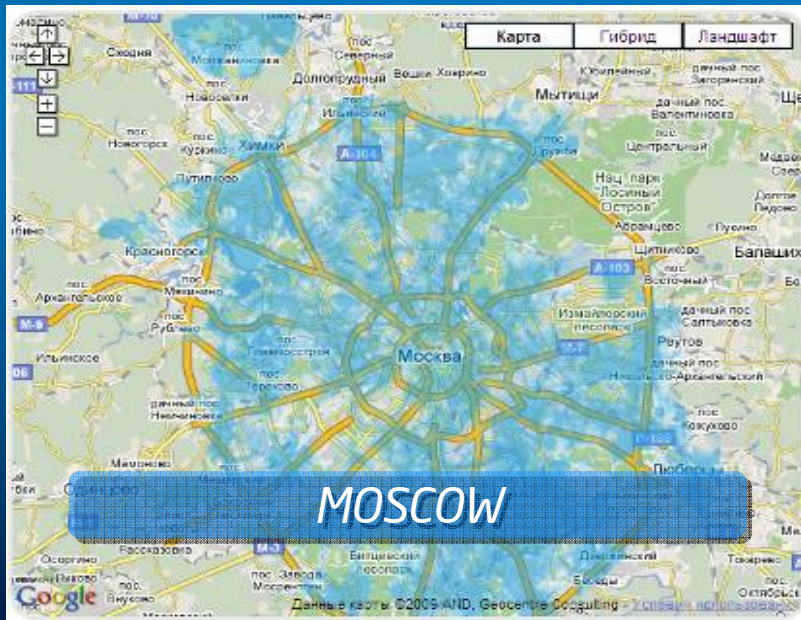
Clear
SPOT

- Over 35 notebook models from 6 manufacturers with over 20 in retail today
- Plug in your Clear access device and surf, often in less than 60 seconds
- Targeting coverage in over 80 markets by end of 2010
- Actual (typical) download speeds of 2-4 Mbps



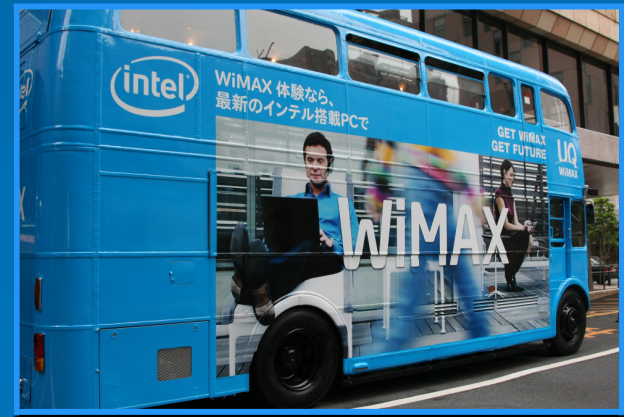
Scartel's Yota Service

- Targeting over 40 of the largest cities in Russia
- Carrying over 500TB of traffic per month TODAY
- Average subscriber is consuming 9.5GB per month!
 - Twice that of DSL/Cable subscribers
 - Twice that of typical monthly data limit set by operators (5GB)
- HTC GSM / WiMAX dual mode handset
- 1300 new subscribers per day



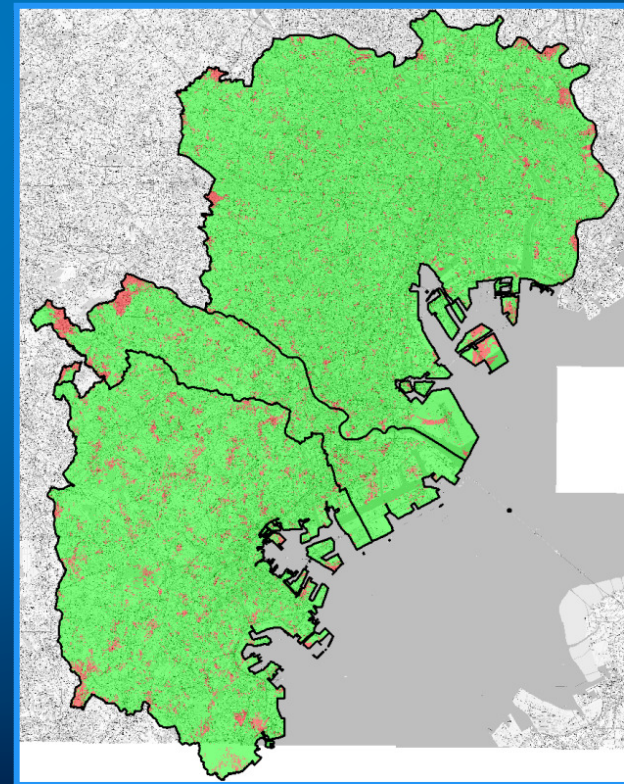


Initial Launch Markets:
Tokyo, Yokohama
and Kawasaki



Faster and Cheaper:
Live speed tests on notebooks
have reached about 16 Mbps
down and 4 Mbps up, as simple,
flat-rate pricing undercuts all
current HSPA offers

- Targeting over 40 million POPs by end of 2009; 90% POPs by 2013
- 14 PC manufacturers - embedded WiMAX notebooks
- Unique railway and mobile application service offerings
- Simple, flat rate “all you can eat” service for one affordable price





www.p1.com.my
1 300 800 888

Believe it
or not,
WiMAX
is plug
and play.



www.p1.com.my
1 300 800 888

Be the 1st*
in Malaysia
to discover
WiMAX!



*First on the 2.3 GHz WiMAX spectrum.

Packet One, Malaysia:

- Over 500 new subscribers / day
- World's largest 2.3 GHz deployment outside of So. Korea
- Wireless@KL provides free access to over 70,000 users





Next Generation Mobile Broadband and Regulatory Issues

Regulatory Challenges

Economics of Delayed Assignments

Assignment Sizing

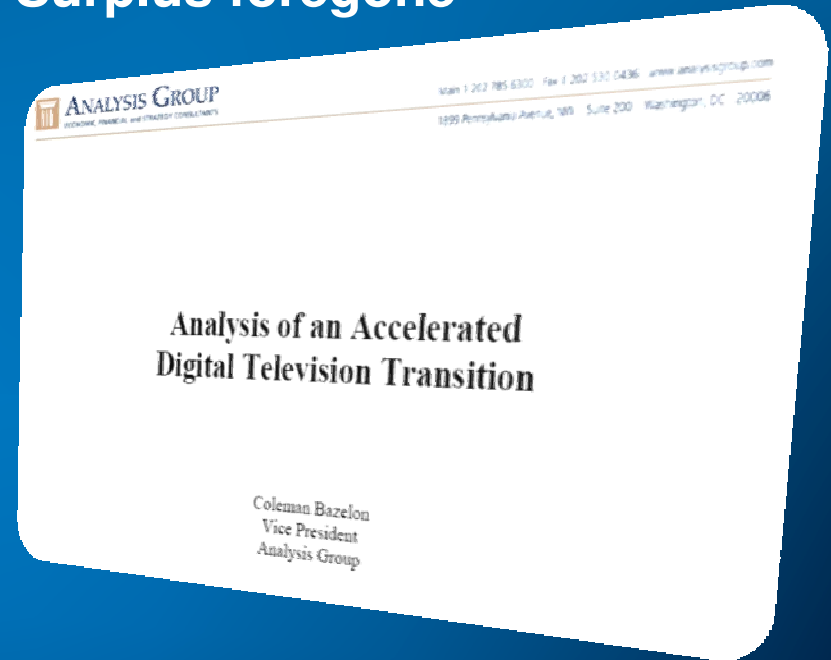
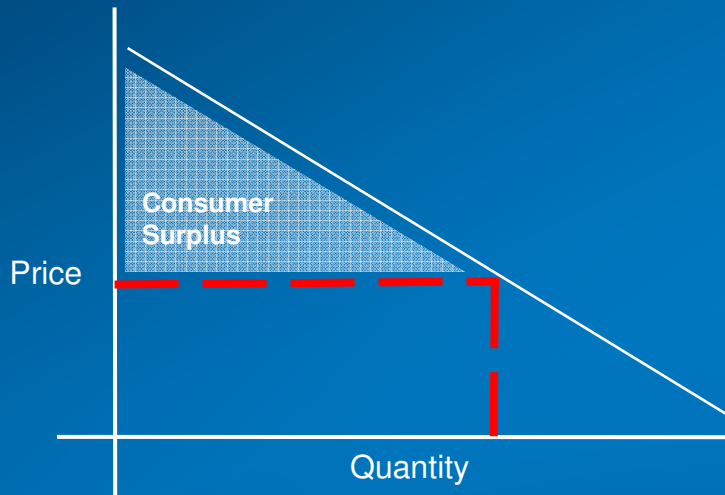
Band Plans

Band Refarm Planning

Summary

Economics: Delayed Assignments

Cost of Doing Nothing - Consumer Surplus foregone



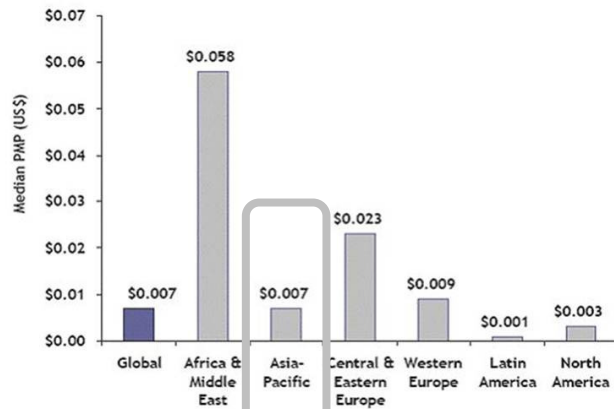
	Spectrum Auction Value (Reflection of Expected Profits by Operator)	Consumer Surplus Value (NPV)
Brazil 3.5GHz	USD1Billion	USD18B
Unites States 700MHz	USD20Billion	USD200-400B

10-20X

Economics: Delayed Assignments

South-East Asia Calculations

Exhibit 12: Price per megahertz per population by region



Source: Pyramid Research

<http://www.pyramidresearch.com/index.htm>

	Population '08 estimates	Estimated Auction Revenues (from 2.3GHz band) USD	Estimated NPV Consumer Surplus Value (from 2.3MHz band) USD
Indonesia	237m	166m	1.6-3.2B
Philippines	90.3m	63m	0.6-1.2B
Thailand	63m	44m	0.4-0.9B
Vietnam	86m	60m	0.6-1.2B

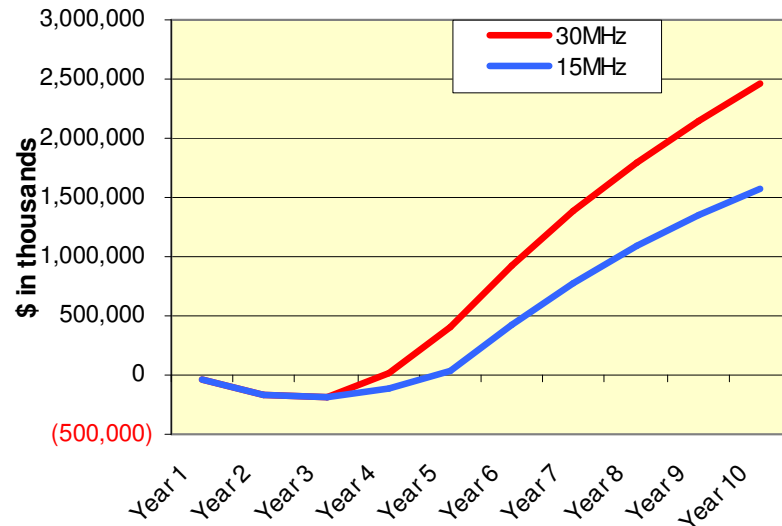
Estimated Auction revenue = population * \$/MHz * # Mhz on auction

Estimated Consumer Surplus Value = Estimated Auction Revenue * Factor (10 -20)

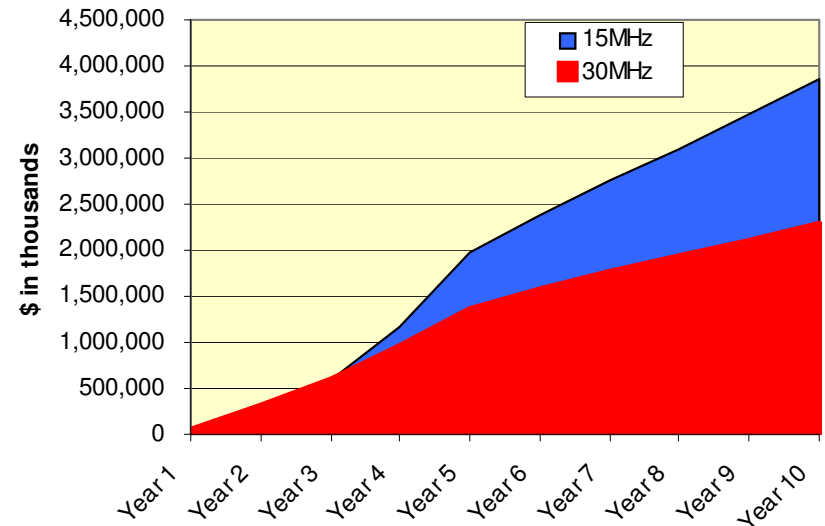
Assignments & Channel Bandwidth

Enabling successful businesses and attracting investment.

NPV Sensitivity to Spectrum Inventory



CapEx Sensitivity to Spectrum Inventory

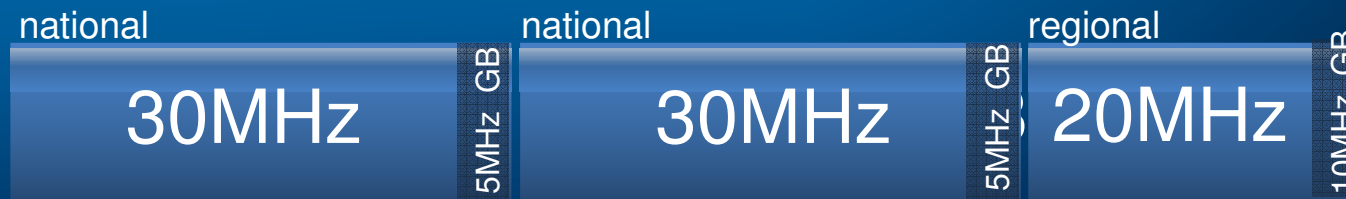


	16e - 2.5GHz – 30MHz	16e - 2.5GHz – 15MHz
Payback	~3 years	~4 years
NPV	\$2.46 B	\$1.57 B
Peak Capital Need	\$240 M	\$249 M

Band Plans

Quality services and frequency arrangements

- Band plan for the optimal channel bandwidth for the service
 - Wider channel BW (e.g. 10MHz) is preferred (e.g. 5MHz)¹⁾
- Band plan for the maximum spectrum efficiently
 - Coordination b/w operators is encouraged to reduce GB size
 - Spectrum license inclusive of GB to the operator
- 2.3GHz band-plan example -



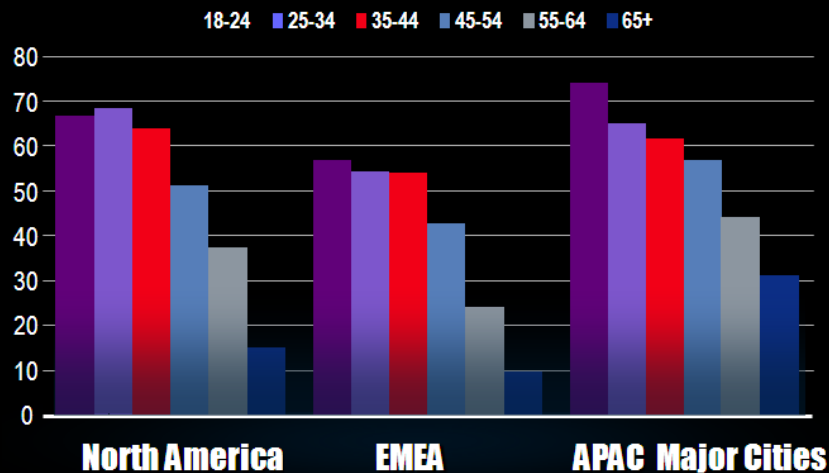
Band Refarm Planning

Demand and New Services – requires acceleration of reform plans

1. Consumer demand will drive demand for additional allocations.
2. Operators and technologies will need larger bandwidths (60-80MHz.)
3. BWA reform focus on: 2.5MHz, 2.3MHz and Digital Dividend

Desire to Be Connected:

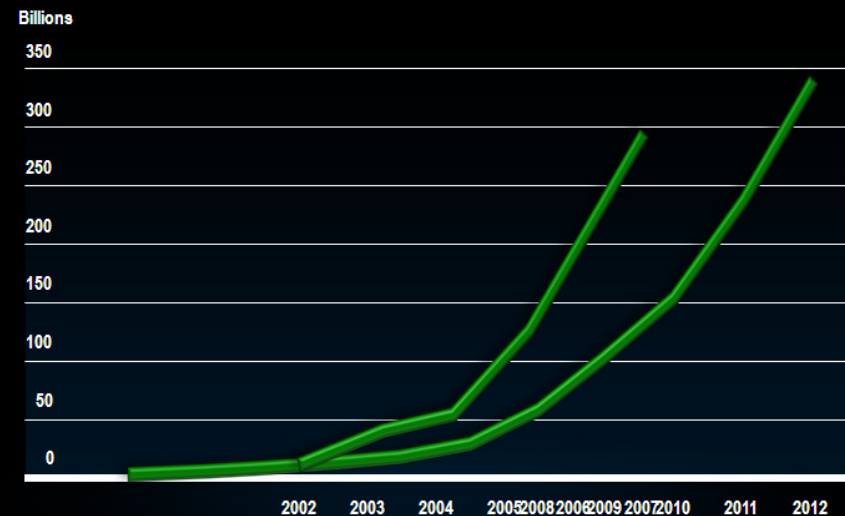
% of People Owning 3+ Devices by Age



Sources: Forrester 2007, Consumer Technographics and Intel Internal

The Explosion of Video

Nothing short of 3 Mbps+ will meet the required demands



Source: ABI Research



Next Generation Mobile Broadband and Regulatory Issues

Summary

Summary

- Current technologies struggling to meet requirements
- WiMAX rapidly growing, meeting market gap, bringing competition and consumer benefit
- Assignment delays have large economic costs
- Assignments >30MHz attracting investment
- Band Plans must ensure service quality
- Refarm planning in Asia needs to accelerate



