Frequency allocation

WiMAX case study

SESSION 10: Challenges and opportunities facing Broadband Wireless Objectives

August 2009

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Legal Disclaimer

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Agenda

- Intel WiMAX Vision & Broadband Internet
- Intel WiMAX Roadmap & Targeted Profiles
- WiMAX Benefits and Worldwide Momentum
- Intel Spectrum Policy Recommendations for WiMAX

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Vision for Mobile Internet

Transparent Affordable Internet Access Wherever You Are

Wi-Fi + Mobile WiMAX* = 1ˢᵗ generation Mobile Internet

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Intel's Vision:
Three Waves of Internet Access

1,400M
1,200M
1,000M
800M
600M
400M
200M
0

10/100/1000 Ethernet ports*

Wi-Fi ports**

WiMAX ports***

1995   2002   2008   2016   2020
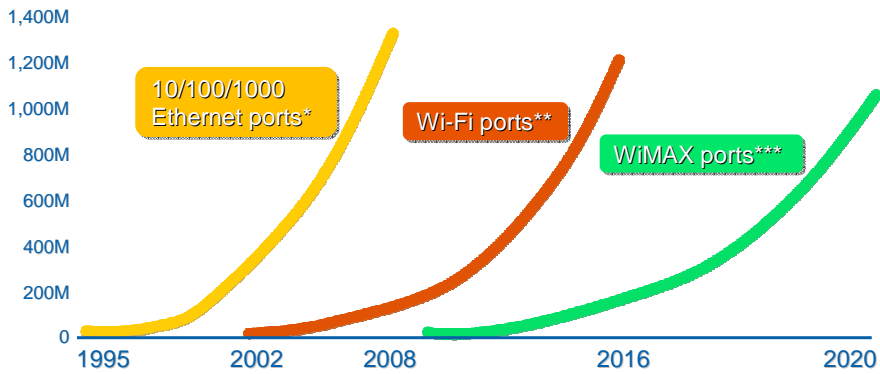
- Defining ITU 4G Standards
- WiMAX into notebooks
- Securing Spectrum

- Driving the Roadmap, Silicon
- WiMAX Open Patent Alliance coordination
- Significant Intel Capital investment

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*Source: Dell'Oro Group, Q1'08;
**Source: IDC, Q1'08; Intel estimates;
***Source: Intel Estimates

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Intel WiMAX Solutions Roadmap

2009 →
"Broad CE Devices"
WiFi+WiMAX Integration

2008-09
"Nomadic & Mobile
WiMAX Devices"

2004-07
"WiMAX Modems"

intel
WiMAX
Technology

acer   TOSHIBA
Leading Innovation   lenovo   Panasonic   ASUS

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Why WiMAX

New business model

- New low cost embedded devices
- Low cost & flexible service plans
- New spectrum cheaper than 3G
- Open Internet access
- New activation & distribution models

Technical performance

- Lowest cost, all IP network
- IEEE standard equipment with many vendors
- Best available multi-megabit bandwidth
- Scalable device design-in & certification

The Opportunity to Drive Fixed, Nomadic & Mobile Broadband

> 475 Commercial Deployments

Legend:
- 3.3-3.8GHz
- 2.3-2.7GHz
- 5.0-6.0GHz

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Illustration: Business Case for Turkey(*)

- **Target Market**
  93% of Turkey population
- **Deployment**
  Green field based on WiMAX IEEE 802.16e TDD
- **Wholesale Operator Spectrum** 2.5GHz - 30MHz
- **Services**
  - $20 for Fixed, Nomadic and Mobile:
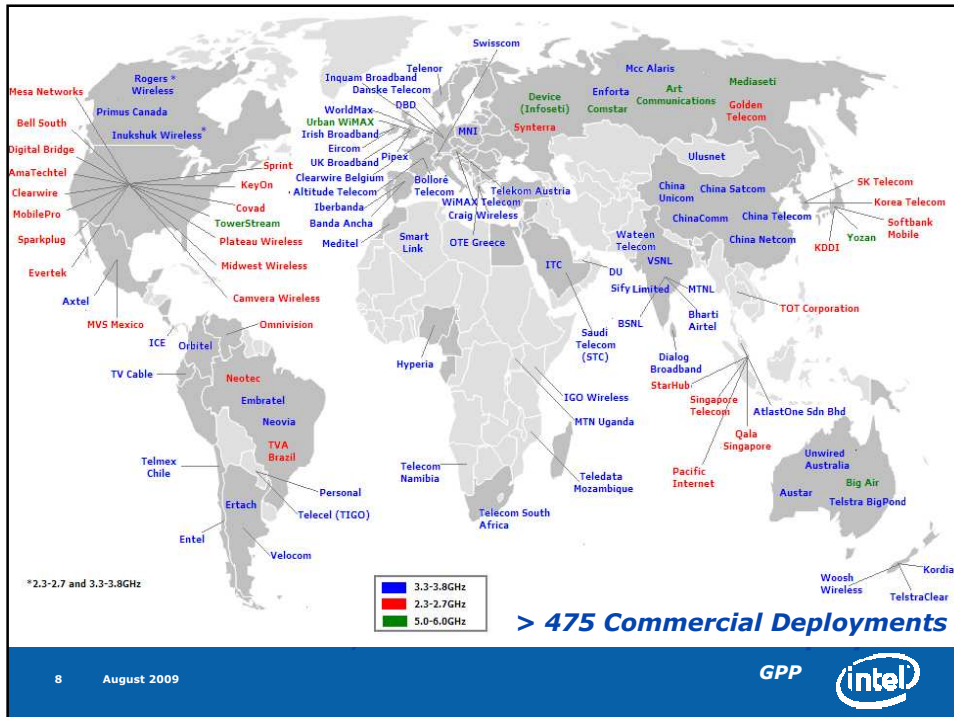   - 2Mbps in Year 1
    - 4Mbps in Year 10
  - VoIP: $10 with 25% attach rate
- **Adoption**
  15% of population in 10 years
- **WACC** (Weighted Average Cost of Capital) 5%

Turkey Demographics
- Total POPs: 73 M
- Total HHs: 15.4 M
- Total km²: 781.000

Turkey is a Good Example of an Emerging Market

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2.5GHz is More Desirable than 3.5GHz(*)
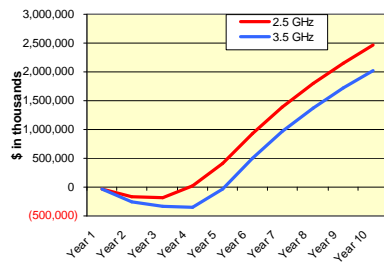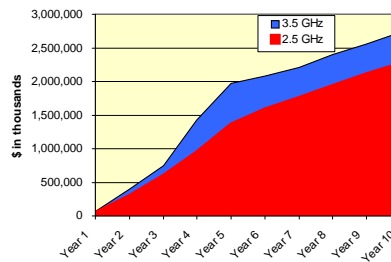
Metrics	16e - **2.5GHz** – 30MHz	16e - **3.5GHz** – 30MHz
Payback	~3 years	5.5 years
NPV	$2.46 B	$2.01 B
Peak Capital Need	$240 M	$478 M

The 2.5GHz case has better NPV, shorter payback and needs less peak capital

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16e Brings Significant Advantages over 16d (*)

NPV Sensitivity to Technology (2.5GHz)

Mobile WiMAX 802.16e
Fixed WiMAX 802.16d

$ in thousands

3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
(500,000)

Year 1, Year 2, Year 3, Year 4, Year 5, Year 6, Year 7, Year 8, Year 9, Year 10

CapEx Sensitivity to Technology (2.5GHz)

Mobile WiMAX 802.16e
Fixed WiMAX 802.16d

$ in thousands

2,500,000
2,000,000
1,500,000
1,000,000
500,000
0

Year 1, Year 2, Year 3, Year 4, Year 5, Year 6, Year 7, Year 8, Year 9, Year 10

Metrics	2.5GHz – 30MHz		3.5GHz – 30MHz	
	IEEE 802.16e	IEEE 802.16d	IEEE 802.16e	IEEE 802.16d
Payback	~3 years	7.5 years	5.5 years	9 years
NPV	$2.46 B	$131 M	$2.01 B	$48 M
Peak Capital Need	$240 M	$170 M	$478 M	$239 M

16e has much better spectral efficiency and better service penetration than 16d

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A Sustainable Business Requires 30+MHz(*)
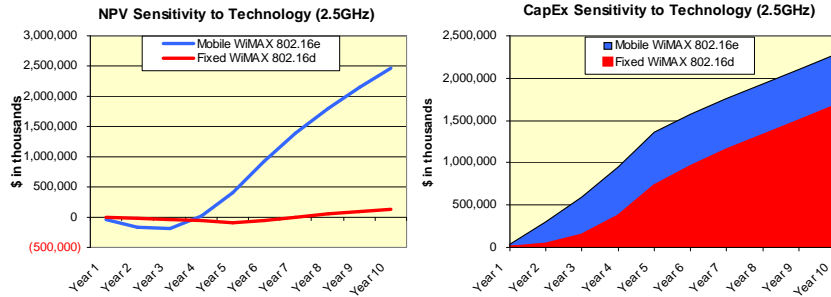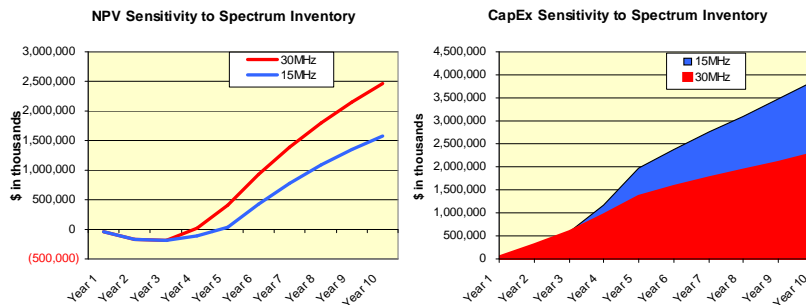
NPV Sensitivity to Spectrum Inventory

30MHz
15MHz

$ in thousands

3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
(500,000)

Year 1, Year 2, Year 3, Year 4, Year 5, Year 6, Year 7, Year 8, Year 9, Year 10

CapEx Sensitivity to Spectrum Inventory

15MHz
30MHz

$ in thousands

4,500,000
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0

Year 1, Year 2, Year 3, Year 4, Year 5, Year 6, Year 7, Year 8, Year 9, Year 10

Metrics	IEEE 802.16e - 2.5GHz – 30MHz	IEEE 802.16e - 2.5GHz – 15MHz
Payback	~3 years	~4 years
NPV	$2.46 B	$1.57 B
Peak Capital Need	$240 M	$249 M

Allocating at least 30MHz – net band - of spectrum improves significantly the business case

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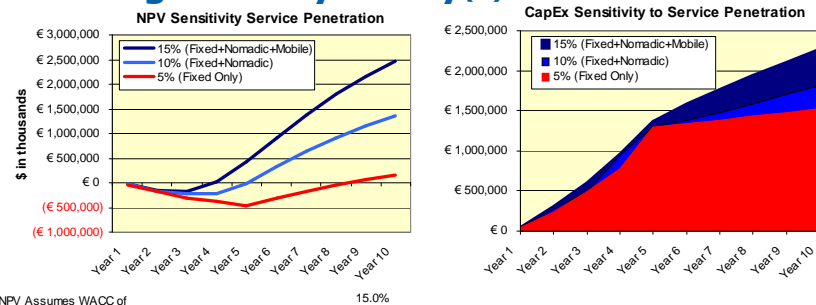GPP   (intel)

Nationwide Licensing Catalyze Success

	Nationwide License	Multiple Regional Licenses
Network Cost	Single Core Network	• Replicating Core network in every region is very expensive • Additional costs to implement roaming infrastructure are required
Service Adoption	Seamless roaming	• Roaming fees and different authentication methods/network profiles can cannibalize service adoption
Interference on Region Boundaries	No dead zone between the regions	• 50-100 km separation might be required (dead zone) (if different technologies are used or when operators are not coordinated)
Digital Divide	A nationwide operator can leverage on its existing core network to cover undesired regions	• Some regions might not be desirable (in terms of ROI) because of low population density and weak business case i.e. white spots

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Enabling Mobility is Key(*)

NPV Sensitivity Service Penetration

- 15% (Fixed+Nomadic+Mobile)
- 10% (Fixed+Nomadic)
- 5% (Fixed Only)

$ in thousands

NPV Assumes WACC of   15.0%

CapEx Sensitivity to Service Penetration

- 15% (Fixed+Nomadic+Mobile)
- 10% (Fixed+Nomadic)
- 5% (Fixed Only)

Metrics	Fixed–Nomadic-Mobile IEEE 802.16e - 2.5GHz – 30MHz	Fixed–Nomadic IEEE 802.16e - 2.5GHz – 30MHz	Fixed IEEE 802.16e - 2.5GHz – 30MHz
Payback	~3 years	~4.5 years	8 years
NPV	$2.46 B	$1.35 B	$149 M
Peak Capital Need	$240 M	$312 M	$728 M

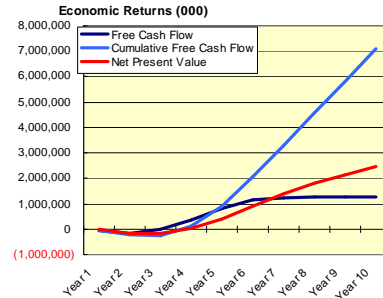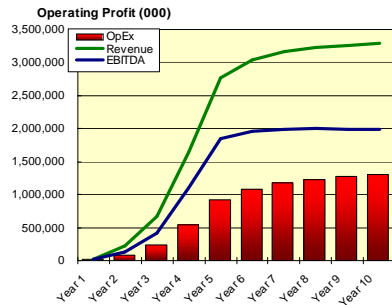**Mobility brings new devices/usage, increases service penetration and improves the business case**

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Business Model Summary(*)

Operating Profit (000)

Legend:
- OpEx
- Revenue
- EBITDA

Y-axis: 0 to 3,500,000
X-axis: Year 1 through Year 10

Economic Returns (000)

Legend:
- Free Cash Flow
- Cumulative Free Cash Flow
- Net Present Value

Y-axis: (1,000,000) to 8,000,000
X-axis: Year 1 through Year 10

Metrics	IEEE 802.16e - 2.5GHz – 30MHz
Payback	~3 years
NPV (net present value)	$2.46 B
Peak Capital Need	$240 M

The case for a WiMAX 2.5GHz Nationwide Operator Utilizing 30MHz is Quite Healthy

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Summary - Recommendations for WiMAX

- Preferably 2.5 and 2.3 GHz band

- permit IEEE 802.16e TDD operation

- Minimum 30MHz of spectrum per license – guard bands excluded

- Nationwide licenses to avoid market fragmentation and weaken the operator business case

- Wholesale model can help reduce the digital divide in the rural areas and villages – cooperation with local governments and municipalities to subsidy service

Create the Conditions to Accelerate Broadband Adoption and Reduce the Digital Divide

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Thank You!

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