



> BUSINESS MADE **SIMPLE**

Wireless Broadband Will Change Your Life

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NORTEL

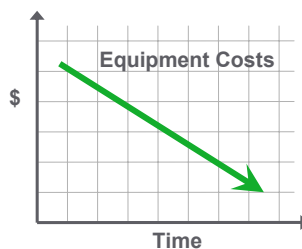
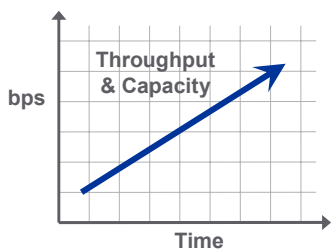
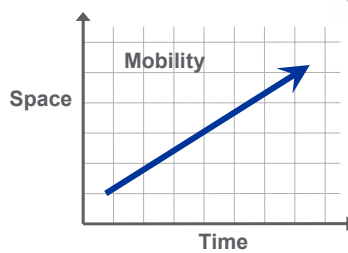
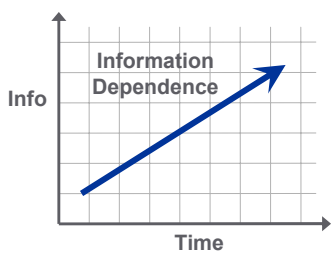
The Internet gets Personal



Wireless will break the broadband penetration ceiling

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Data Network Paradigm Drivers



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Need

> Broadband is great...but only when you're

- @ Work
- @ Home
- @ Airport
- @ McDonalds

> Basic primal drive

- ▶ Immediacy

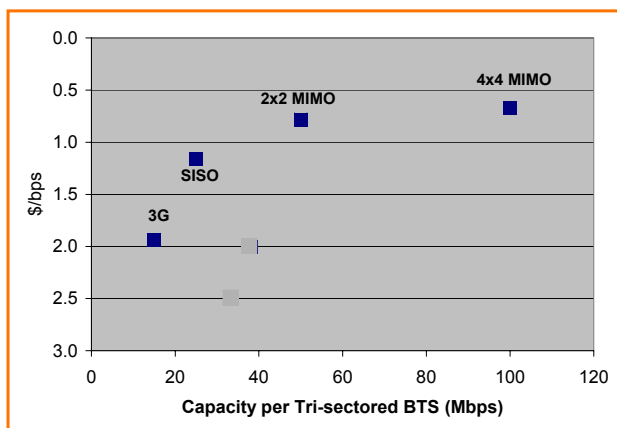
> MOBILITY

ENABLE COMMUNICATION
ANYWHERE, ANYTIME, WITH
ANY DEVICE.

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Cost Reduction

- > Flat IP Architecture
- > High efficiency air interface
- > Delete circuit switched infrastructure
- > Leverage cheap infill solutions such as WiFi



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Wireless Broadband Technologies

- > WiFi
 - IEEE 802.11 → Wireless Ethernet
- > EVDO
 - 3GPP2 CDMA evolution (Qualcomm)
- > HSDPA
 - 3GPP W-CDMA evolution of UMTS
- > WiMAX
 - IEEE 802.16 → Harmonised point to multipoint microwave access
- > Proprietary
 - All sorts, most failed to gain significant traction



All are key enablers of convergence

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What is WiMAX ?

- > Worldwide Interoperability for Microwave Access
- > Point-to-multipoint broadband wireless access system
- > All IP and QoS enabled
- > Fixed and mobile infrastructure and terminals
- > State of the art modulation and antenna technology
- > Global eco-system



Cost effective broadband access everywhere

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Wireless Options



Differentiating Wireless Technologies

	3G Cellular	WLAN / 802.11n	WiMAX / 802.16e
Coverage	Ubiquitous	Hotspot / Campus	Zone / Regional
QoS	Controlled	Shared Spectrum	Controlled
Mobility	Full, vehicular	Very limited	Mobile / Portable
Range	km	100m	km
User Speed	50–1000 kbps	1-10 Mbps	1-10 Mbps
Architecture	Hierarchical	Flat, IP	Flat, IP
Spectral Efficiency	Good	Better	Best

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WiMAX Enablers



- > Better processor technologies → more complex radio technologies
- > SOFDMA
 - Scalable Orthogonal Frequency-Division Multiple Access
 - Spectral efficiency
 - Suited to wide bandwidths
- > MIMO
 - Multiple Input Multiple Output
 - Makes multi-path a benefit
 - Coverage, Capacity, Throughput
- > Flat IP
 - Simplicity
 - Lower cost
 - Full Quality of Service



WiMAX takes wireless data to the next level

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WiMAX Comparison

Parameter		1xEVDO Rev A	1xEVDO Rev B	HSDPA	HSPA (HSDPA + HSUPA)	Mobile WiMAX
Duplex		FDD	FDD	FDD	FDD	TDD
Occupied Spectrum		2.5 MHz	10 MHz	10 MHz	10 MHz	10 MHz
Channel BW	DL	1.25 MHz	5 MHz	5 MHz	5 MHz	10 MHz
	UL	1.25 MHz	5 MHz	5 MHz	5 MHz	
Peak Data Rate	DL	3.1 Mbps	14.7 Mbps	14 Mbps	14 Mbps	63 ¹ Mbps
	UL	1.8 Mbps	5.4 Mbps	2.0 Mbps	5.8 Mbps	28 ² Mbps
Spectral Efficiency	DL	0.70 bps/Hz	0.79 bps/Hz	0.72 bps/Hz	0.72 bps/Hz	1.76 ³ bps/Hz
	UL	0.37 bps/Hz	0.28 bps/Hz	0.13 bps/Hz	0.30 bps/Hz	0.83 bps/Hz
Net Information Through-put per Channel/ Sector	DL	0.90 Mbps	3.96 Mbps	3.79 Mbps	3.79 Mbps	10.6 Mbps
	UL	0.45 Mbps	1.39 Mbps	0.70 Mbps	1.50 Mbps	2.74 Mbps

2x2 MIMO Downlink and Virtual MIMO Uplink

Best HSDPA device is 7.8Mbps not 14Mbps

Allocating all BW to Downlink or Uplink

Double for 4x4 MIMO

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Convergence – Is it real this time?

The attraction of Convergence lies in the promise of:

- delivering user-centric ubiquitous services,
- improving customer loyalty, defending against competition and attacking with innovative service bundles
- ensuring capital expenditure (CAPEX) and operating expenditure (OPEX) cost reduction through a migration to IP

Source: 3G Americas/Nortel, July 2005

- 67% of voice and data minutes now occurs indoors (work or home)
- More than 1/3 regularly use their mobile phone around the office
- Over 2/3 of laptop users have and use WLAN services
- Over 40% of mobile users are interested in a mobile extension to their PBX

Source: Strategy Analytics, August 2005

- One in 20 households have abandoned landline service, growing to one in 10
- In NA 21% & Europe 15% of enterprises have dual-mode trials/pilots or deployments underway

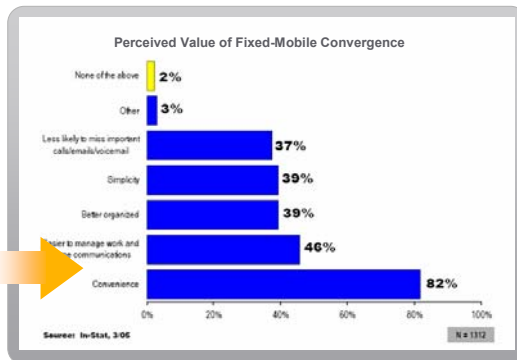
Source: Forrester June 2005 – "State of Network and Telecom Adoption"

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Consumer Survey Findings

> Consumers are seeking a better way to manage their communication services

- Home Phone
- Work Phone
- Cell Phone
- Multiple email accounts
- Multiple Instant Messaging IDs

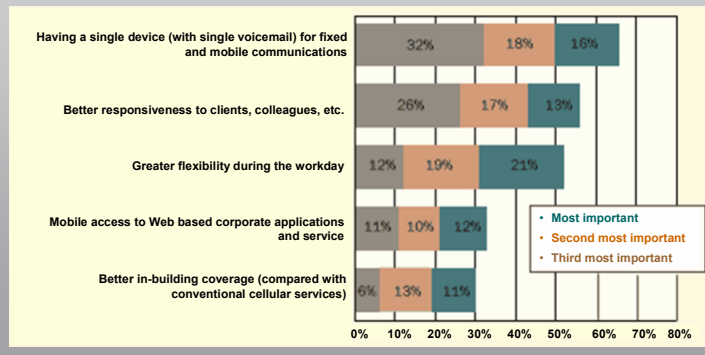


Convenience is driving demand

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Business Survey Findings

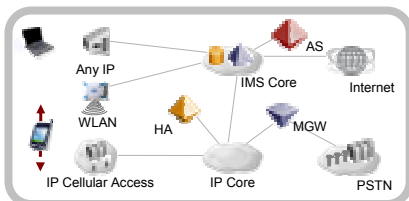
What Would Be The Most Important Benefit You Would Expect A Dual-Mode Service Offering To Bring To Your Company's Employees (End Users Of The Service)?



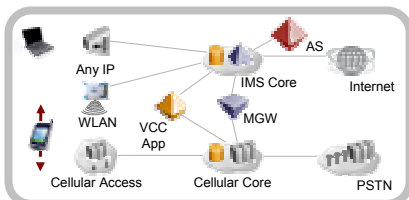
Convenience, simplicity & value-added apps

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Follow the user – Mobility is the key



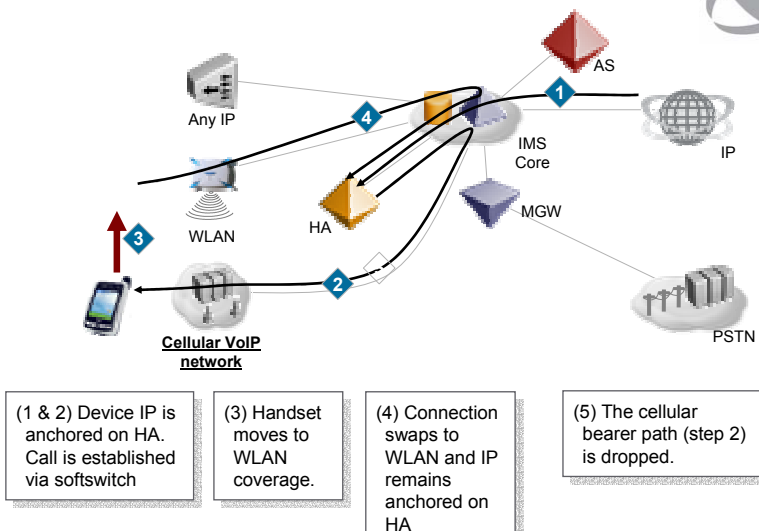
Mobile IP



Voice Continuity Model (3GPP)

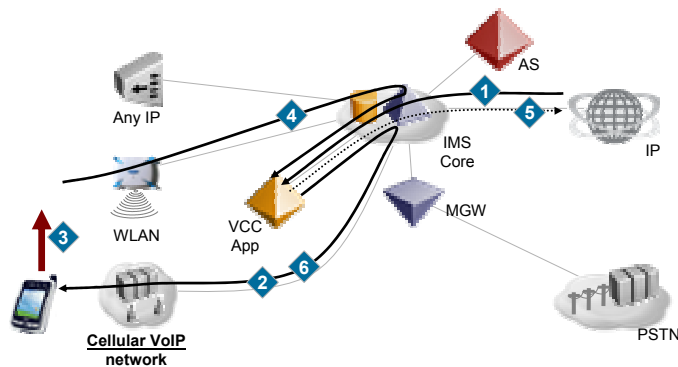
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Handover – Mobile IP



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Handover – VCC IP to IP



(1 & 2) Call is established to device and is anchored at the VCC app (not all steps are shown)

(3) Handset moves to WLAN coverage.

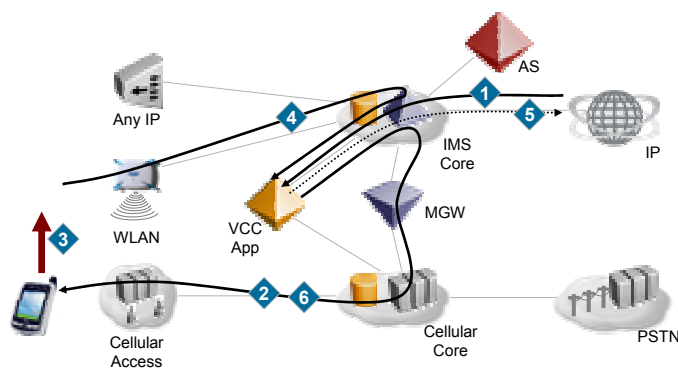
(4) Handset makes a call to a special handover number.

(5) VCC app notifies end point that the bearer path has changed.

(6) The cellular-VoIP bearer path (step 2) is dropped.

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Handover – VCC Cellular to WLAN



(1 & 2) Call is established to cellular device and is anchored at the VCC app (not all steps are shown)

(3) Handset moves from cellular to WLAN coverage.

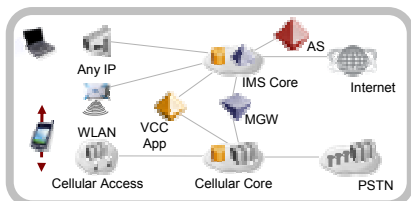
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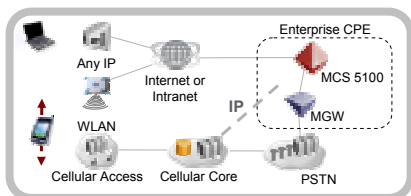
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The Evolving Campus



IMS-VCC Converged Mobility

- Seamless service set on WLAN and cellular
- Single number for incoming and outgoing calls
- Bi-directional handover
- IMS compliant → supports incremental services
- Multimedia service set
- Carrier-hosted enterprise and residential

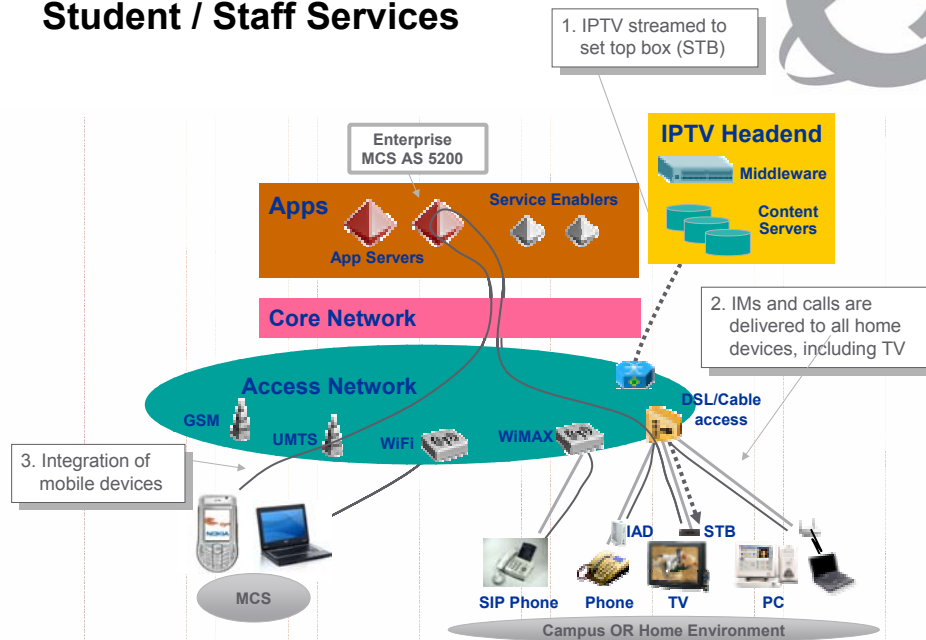


MCS 5100 Enterprise Converged Mobility

- Single number for incoming calls
- Works on any cellular network
- Software upgrade to existing MCS 5100
- Multimedia service set
- Enterprise CPE solution

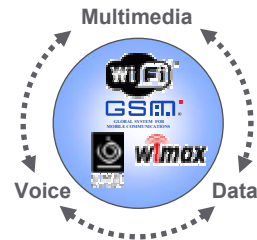


Student / Staff Services



Summary

- > Wireless broadband will change the way we connect
- > Wireless broadband is a key convergence enabler
- > Convergence will blur the boundary between campus / enterprise and carrier networks
- > Benefits: Lower costs, ubiquitous convenient services



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