

A Comparative Review of 4G Technologies, Services and Deployment Strategies

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About Pyramid Research

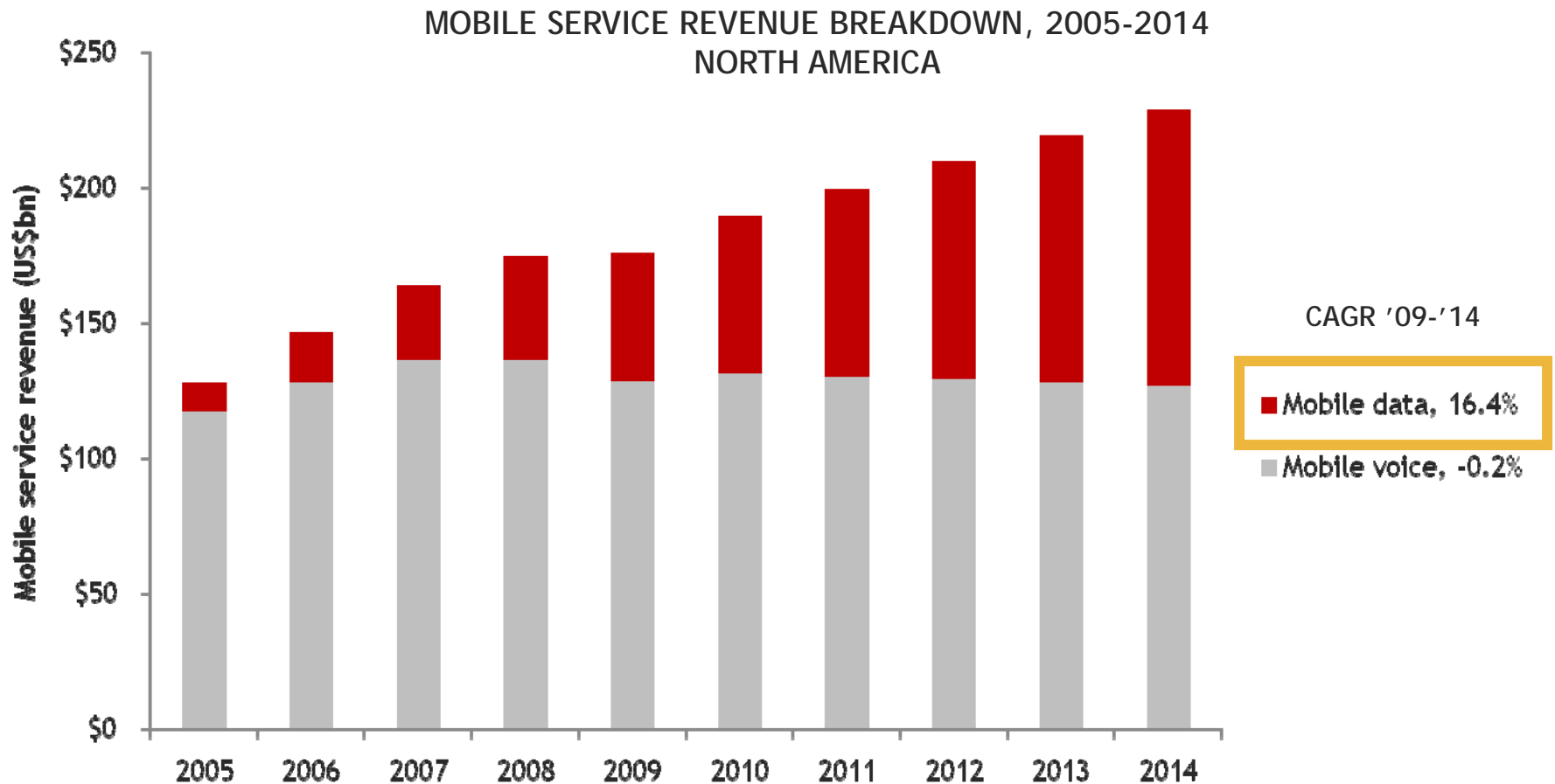
- For nearly 25 years, Pyramid Research has been providing practical advice on emerging market and service opportunities to leaders in the converged communications, media and technology industries.
- As the telecom research arm of the Light Reading Communications Network, Pyramid Research offers custom consulting and strategic advisory services based on rigorous quantitative and qualitative analysis and broad geographical coverage, with expertise in over 100 countries.
- In the past four years, Pyramid Research has led the market with relevant and accurate assessment of the 4G opportunity, from technical capabilities and spectrum and licensing trends worldwide to emerging business models and outlook on adoption.

Agenda

- Market context and drivers for 4G
- Review of 4G technologies, deployment timelines, service offerings and uptake
- Key takeaways

Evolving models

- Operators are caught between **the maturation of voice and the rise of the broadband business**;
- mobile penetration in the 70-90% range; substantial mobile pricing pressure; flat-rate plans; margins under pressure; **potential evolution toward mobile voice commoditization**



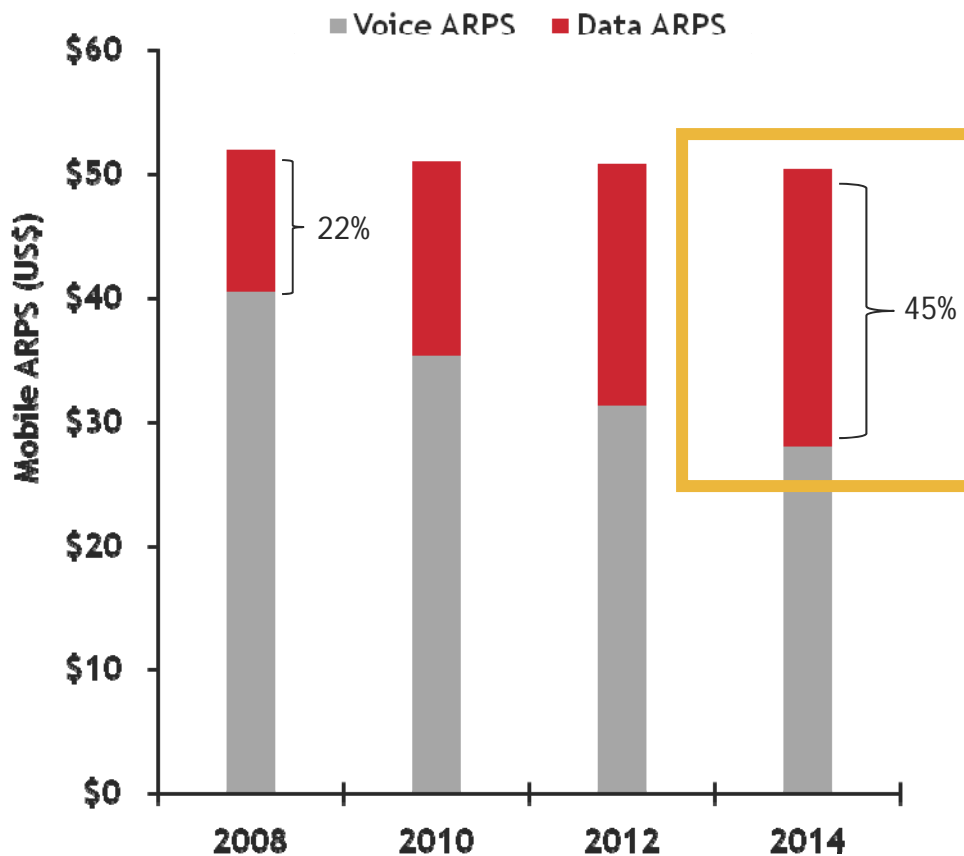
Source: Pyramid Research

The growing importance of mobile data services

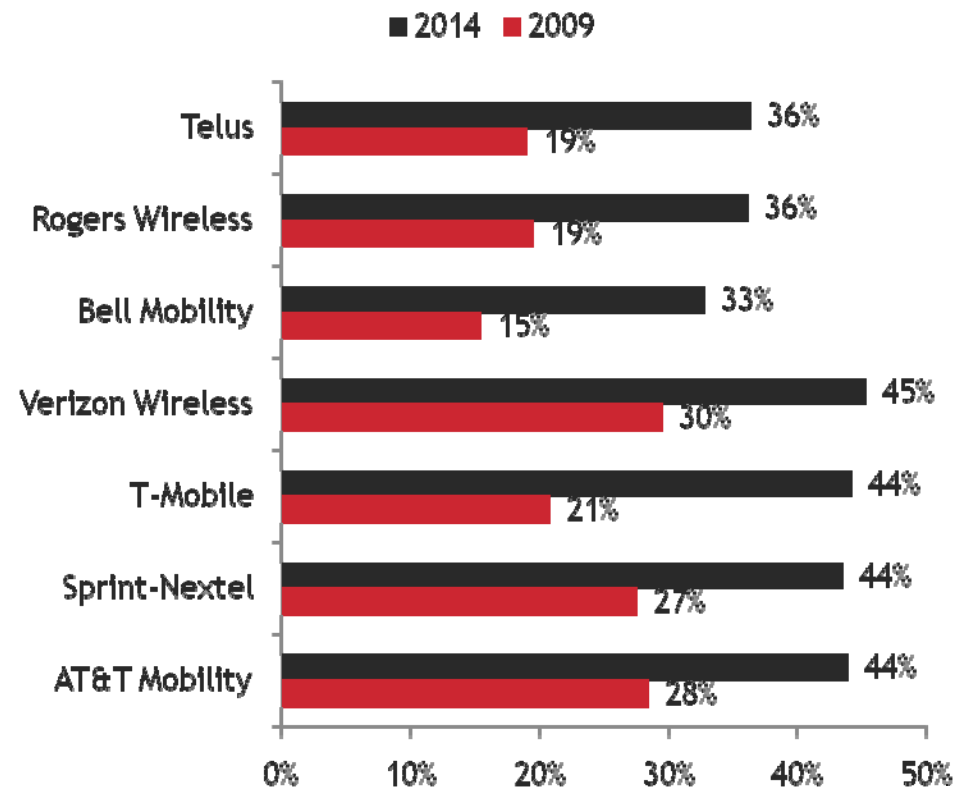
→ The increasing penetration of mobile data services has helped MNOs **maintain a steady ARPS trend**

→ Data services are expected to generate **almost half of total mobile ARPS** in five years in North America

MOBILE ARPS AND DATA ARPS AS A PERCENTAGE OF TOTAL NORTH AMERICA



DATA ARPS AS A PERCENTAGE OF TOTAL ARPS BY OPERATOR



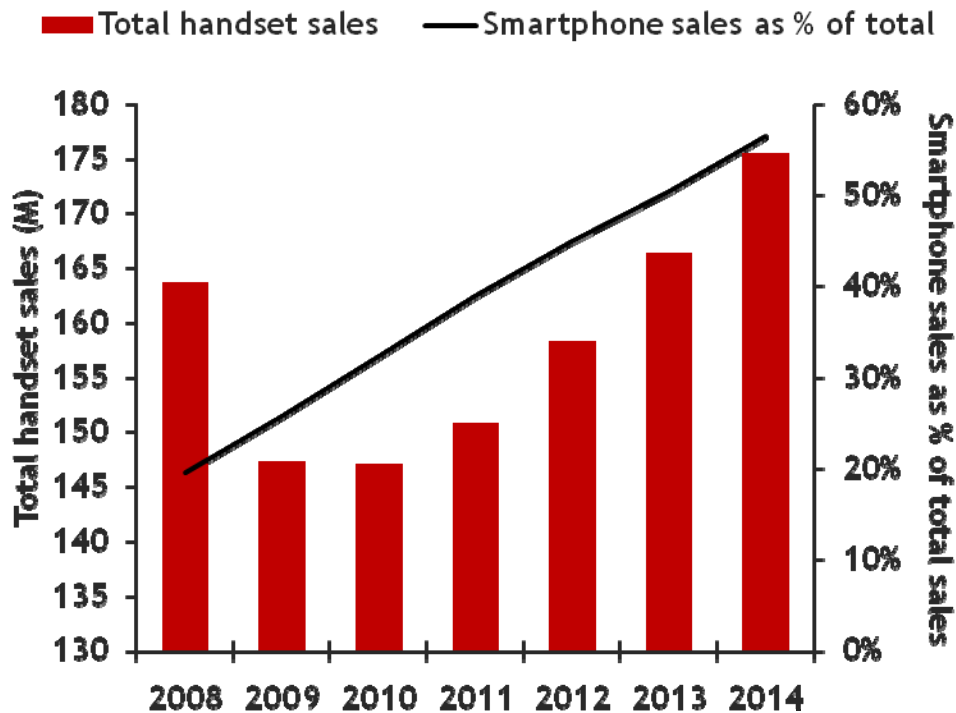
Source: Pyramid Research

Smartphones, mobile computing devices and bundles

→ Smartphones and new 3G-embedded computing devices are spurring the adoption of mobile data/broadband services

→ Flat-rate pricing and data/messaging as well as PC bundles have been effective in driving up mobile data usage though prices remain high for mass adoption

TOTAL HANDSET SALES AND SMARTPHONE SALES AS % OF TOTAL NORTH AMERICA



Source: Pyramid Research

MOBILE BROADBAND/PC BUNDLE FROM AT&T

STAY CONNECTED WITH DELL AND AT&T MOBILE BROADBAND
Get \$350 back with the purchase of an Inspiron Mini 9 with integrated mobile broadband.
Limited time offer at&t
[LEARN MORE ▶](#)

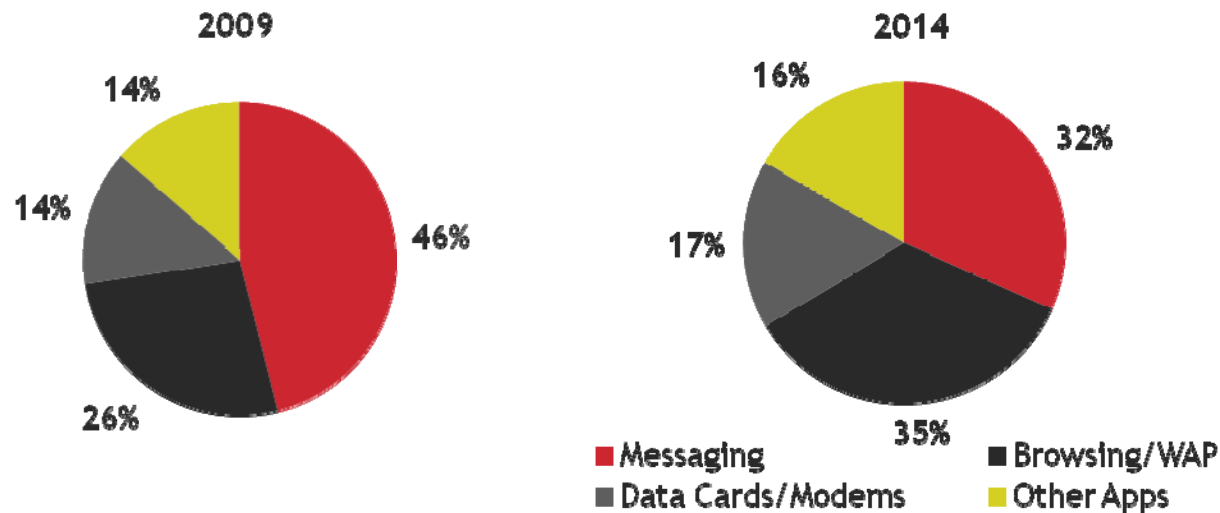
SIMPLY EVERYTHING PLAN FROM SPRINT NEXTEL

\$99.⁹⁹ /mo.
Simply Everything® Plan
Other monthly fees apply.™
Available on new lines of activation with a two-year agreement.

Mobile data revenue mix is changing

- The share of messaging revenue is decreasing with **the introduction of more sophisticated and richer mobile applications**
- mobile browsing and mobile broadband services are expected to generate **more than half of data revenue by 2014**, assuming operators carry out with their network upgrades

MOBILE DATA REVENUE BY SERVICE TYPE, NORTH AMERICA



Source: Pyramid Research

Agenda

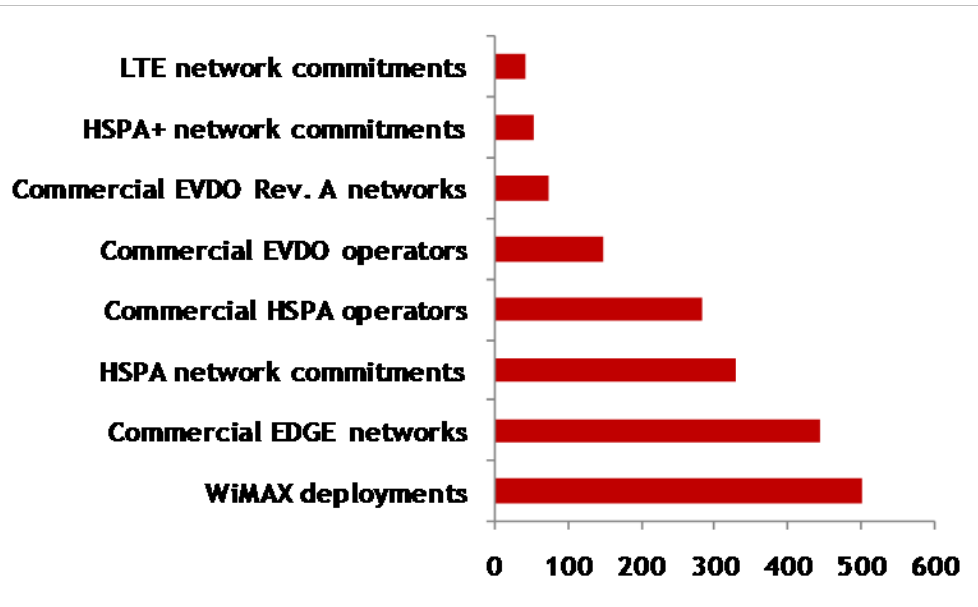
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LTE wins the popularity contest

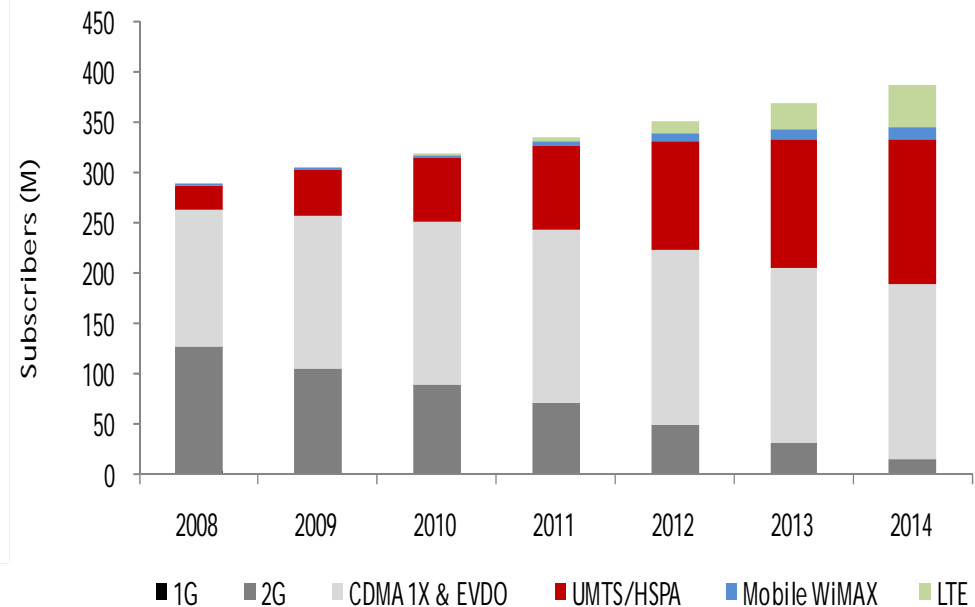
→ Despite the high number of WiMAX deployments to date, **WiMAX only covers roughly 6% of the world's population** in contrast to **more than 85-90% for cellular networks**

→ **Almost all of the North American MNOs plan for an LTE future**, but will get there at different times

MOBILE TECHNOLOGY DEPLOYMENTS AND COMMITMENTS BY TECHNOLOGY



MOBILE SUBSCRIPTIONS BY TECHNOLOGY NORTH AMERICA

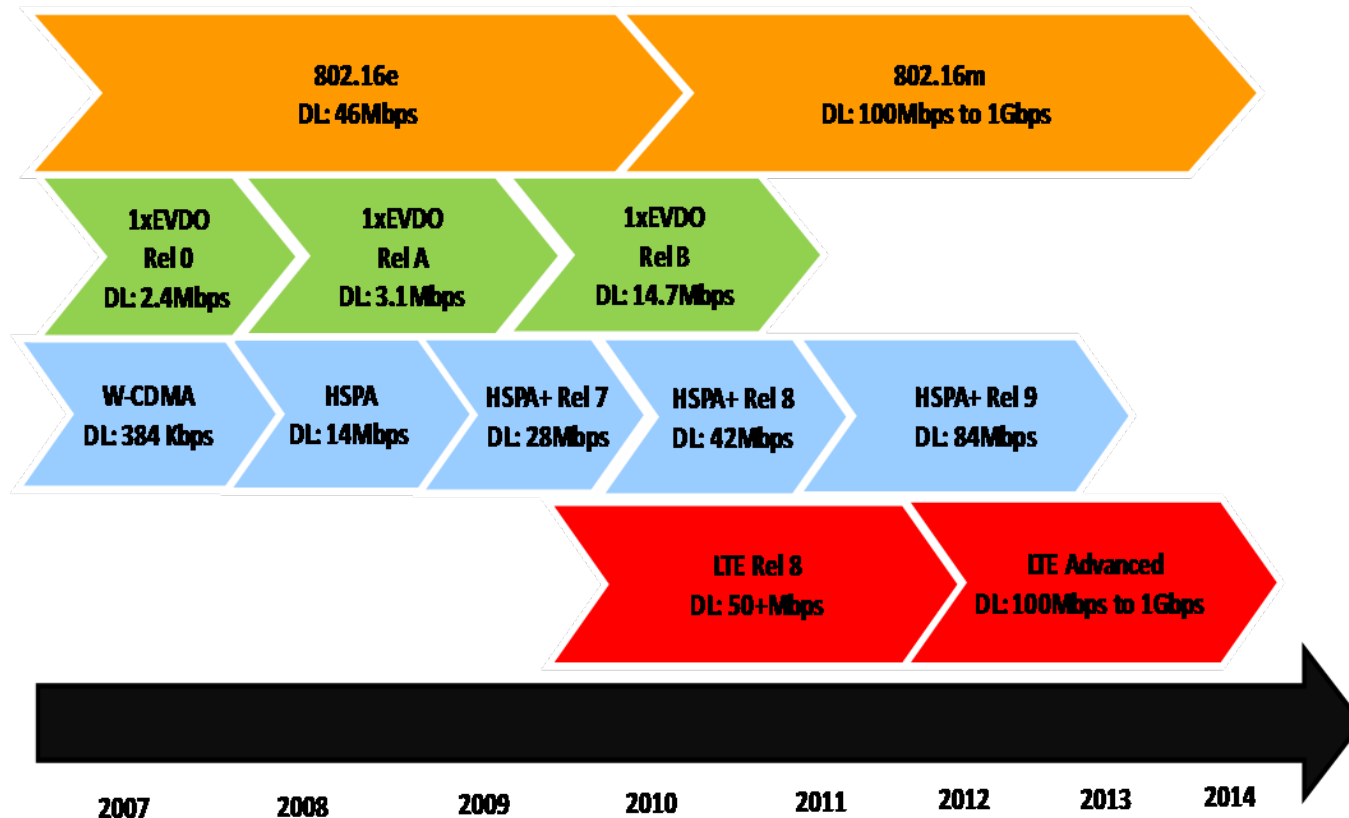


Source: Pyramid Research, WiMAX Forum, GSA, CDMA Development Group

Note: 2G includes GSM/GPRS/EDGE, TDMA, CDMAone and IDEN
Source: Pyramid Research

LTE vs. WiMAX: 80% the same

- Both use **OFDMA technology** and **advanced RF technologies**
- Both promise **lower OPEX**
- WiMAX has **time-to-market advantage** over LTE
- Drivers for LTE world dominance: **commitment, collaboration, consensus, costs and China**



Note: The downlink bitrates for all of these technologies are theoretical peak rates reported by the relevant associations. Under 4x4 MIMO, LTE and 802.16m could exceed 300Mbps and advanced iterations of these technologies may offer 1Gbps or more. LTE-Advanced specifications are to be determined in 2010-2011 time frame.
Source: Pyramid Research, based on data gathered from 3G Americas, ITU, IEEE and Qualcomm.

Diversification of revenue-generating services

→ Go **beyond broadband access**:

- Video: Video call, video sharing, video conference
- Entertainment applications (i.e. application store)
- Wholesale opportunities, M2M
- Service assurance and QoE
- Application enablement

→ **Network reliability and applications** sell technologies in the enterprise market

Businesses will pay for:

- Different levels of QoS
- Network reliability and performance supported by SLA
- Applications, including mobility, VPN, IP Centrex, videoconferencing, email, unified messaging, public safety, surveillance, collaboration tools.
- High-quality customer care

Connectivity with new media devices

→ Malaysian WiMAX operator Packet 1 is planning to extend its mobile broadband connectivity across **a slew of untraditional mobile devices**; LTE operators have similar plans



Source: P1 Malaysia

Flexible pricing schemes

→ Clearwire pioneers **new pricing models** for mobile broadband

Scenario	Plan	Usage	Speed (DL/UL)	Monthly price
Mobile	2GB Mobile Internet	2GB	4Mbps/1 Mbps	\$35
	Unlimited Mobile Internet	Unlimited	*Unlimited/1Mbps	\$45 (\$22.50/mo. for first 6 mos.)
	4G+ mobile Internet*	Unlimited	Unlimited/1Mbps	\$70
	Mondi** 2GB Promo	2GB	4Mbps/1 Mbps	\$35 (\$25/mo. for first 6 mos.)
	Mondi Unlimited Promo	Unlimited	Unlimited*/1Mbps	\$45 (\$35/mo. for first 6 mos.)
Home	Basic Home Internet	Unlimited	1Mbps/500Kbps	\$25
	Fast Home Internet	Unlimited	3Mbps/1bps	\$30
	Unlimited Home Internet	Unlimited	Unlimited/1Mbps	\$45 (\$22.50/mo. for first 6 mos.)
Combination Packages	Pick 2: Home and Mobile	Unlimited	Unlimited/1Mbps	\$60 (\$50/mo. for life)
	Pick 2: Mobile and Mobile	Unlimited	Unlimited/1Mbps	\$60 (\$50/mo. for life)
	Fast Home Internet and Voice	Unlimited	3Mbps/1bps	\$55 (\$50/mo. for 12 mos.)
	Pick 3 Unlimited: Home and mobile Internet, Voice	Unlimited	Unlimited/1Mbps	\$80 (\$70/mo. for life)
Business	Fast Business Internet	Unlimited	4Mbps/1Mbps	\$55
	Faster Business Internet	Unlimited	Unlimited/1 Mbps	\$75
	15 GB shared mobile	15 GB	4Mbps/1 Mbps	\$100
	20 GB shared mobile	20 GB	4Mbps/1 Mbps	\$120
	30 GB shared mobile	30 GB	4Mbps/1 Mbps	\$150

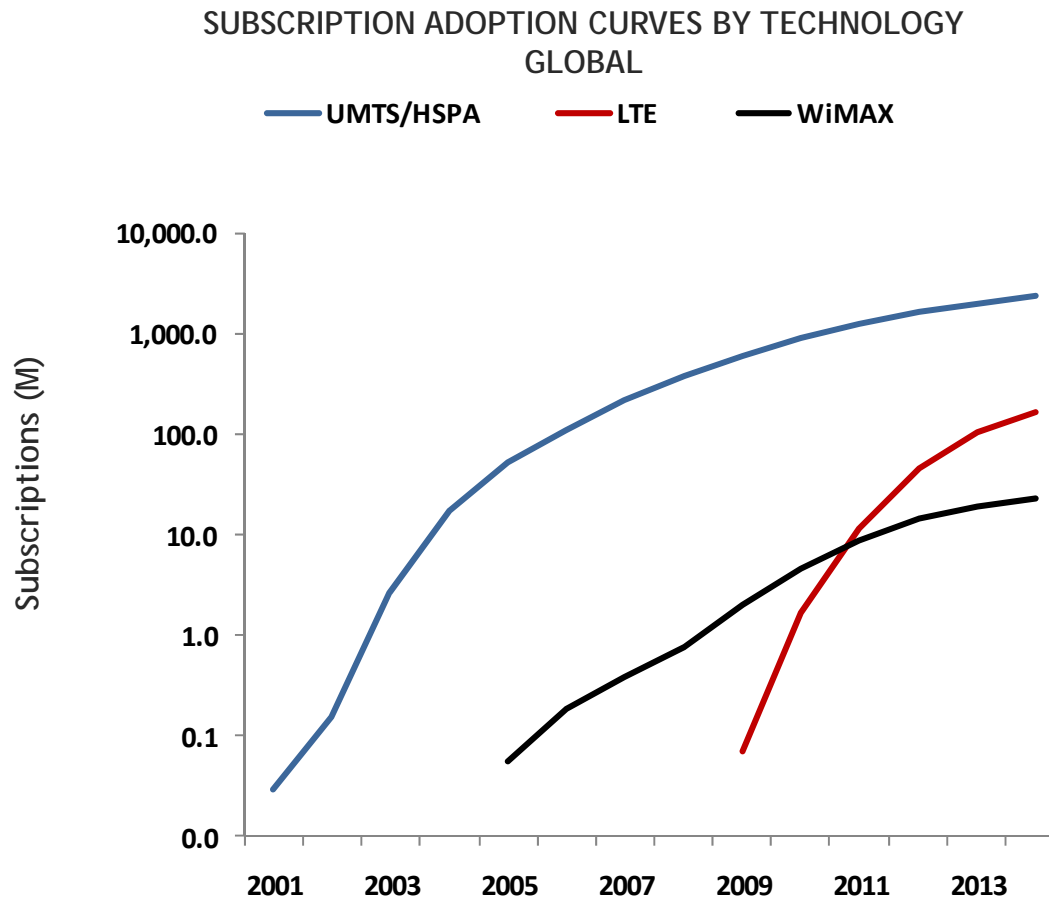
*Switches to Sprint's 3G network where WiMAX is not available. Speed is advertised as "fastest broadband available." We assume it to mean bursts in excess of 10 Mbps.

Month-to-month plans are available at the same cost per month as 2-year contract plans. An activation fee of \$35 applies to month-to-month plans but is waived for those who sign a 2 year contract. Exceeding capped usage plans costs \$10 per additional GB.

Source: Clearwire

4G uptake projections

→ LTE will reach 100m subscriptions **faster than** any previous wireless technology; by our estimates, LTE will attract a global total of over **181m subscribers by 2014**, compared to **23m mobile WiMAX users**.



Source: Pyramid Research

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Broadband represents **the single largest growth opportunity** for North American carriers over the next five years and they are aggressively investing to make it **“mobile”**

SUBSCRIBER CAGR PER COUNTRY, 2009-2014

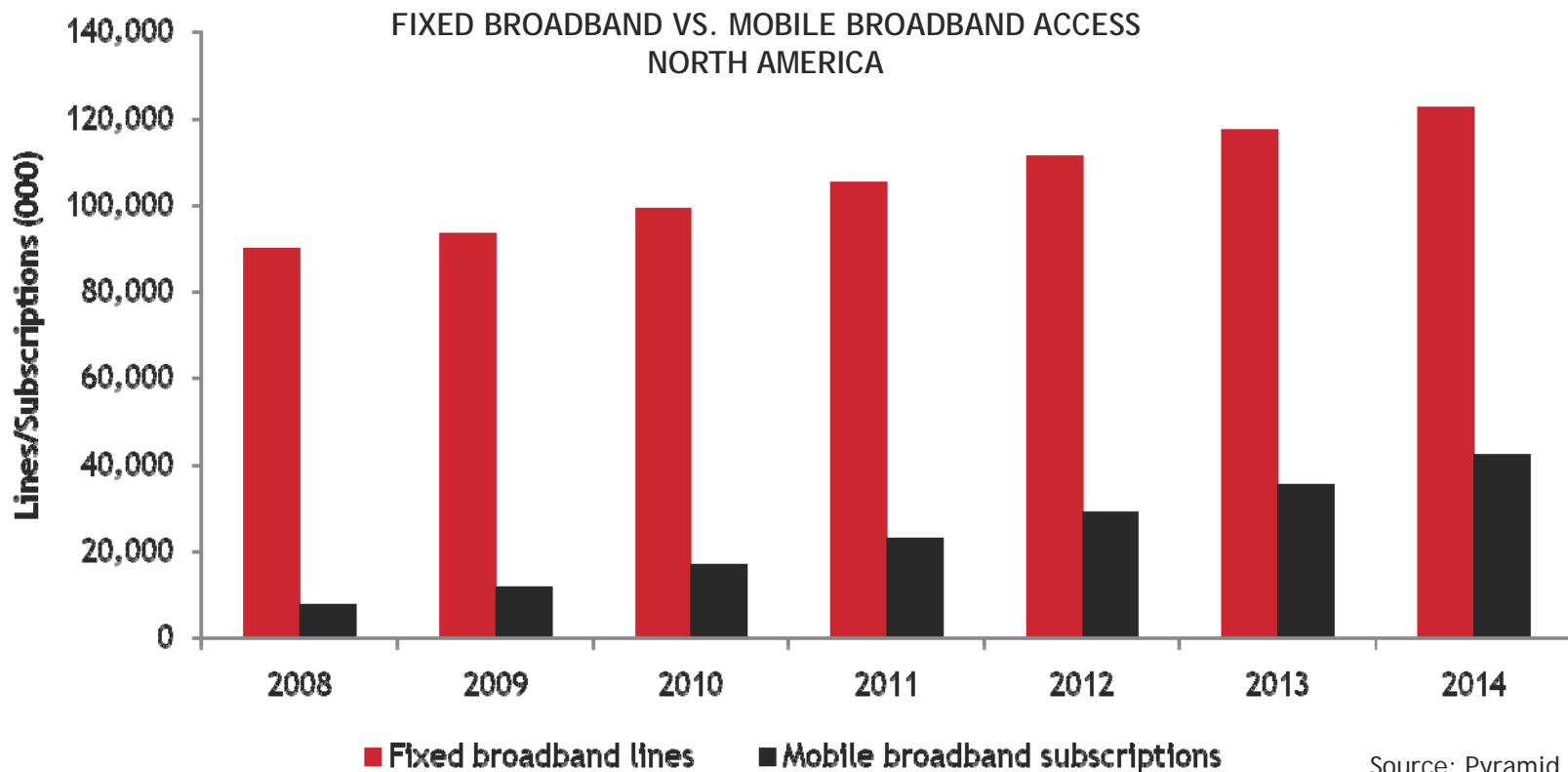
	Fixed circuit-switched voice	VoIP	Fixed broadband	Mobile	Mobile broadband	Pay TV
Canada	-10%	17%	6%	6%	30%	1%
US	-17%	18%	5%	5%	30%	1%

REVENUE CAGR PER COUNTRY, 2009-2014

	Fixed circuit-switched voice	VoIP	Fixed broadband	Mobile	Mobile broadband	Pay TV
Canada	-12%	8%	7%	8%	34%	3%
US	-14%	17%	6%	5%	21%	4%

Fixed broadband vs. mobile broadband access

- **Mostly complementary**: fixed and mobile broadband bundles for seamless coverage
- Clearwire positions **mobile WiMAX as a competitive offer** with home bundles and on-the-go bundles
- AT&T: **“In the long-term, if you don’t have mobile broadband, you don’t have broadband.”**



Competing in **the world of Google...**

Keys to success

- Platform agnostic, convergent: pure plays are at risk
- One network for multiple applications
- IP-based
- Short application development cycles
- Generating -at least some- revenue from advertising
- Open to third-party applications

There are some elements that are common to **all successful broadband deployments**

- The most successful operators have not always been “first to market;” they’ve been “**best to market.**” Mobile broadband product launches that happen before the network is ready or the coverage adequate often lead to backlash from early adopters - those most likely to have higher ARPU profiles
- Successful operators have not necessarily priced their broadband packages as the lowest on the market, but **focused instead on other value-added elements to add to their value proposition:** from unlimited voice to higher throughput speeds to quicker installation times
- End-users are not interested in broadband in and of itself, rather they are interested in the **applications and services that broadband enables.** Successful operators pay as much attention to the breadth and depth of their library of content and applications as they do to the quality and speed of their networks.
- **Successful operators work hand-in-hand with device manufacturers** to ensure that their customers get the most out of their user experience. Operators are even teaming with notebook makers like HP and Lenovo to make bundled broadband / PC bundles available to their clients.
- Wide-scale adoption of broadband offerings goes hand-in-hand with the **introduction of flat-rate pricing.** Often voice becomes the value-added service, in the form of an all-you-can eat plan layered on top of a broadband offering. Users remain reluctant to sign up for pay-per-usage models.

Thank You.

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