



ACE IP Wireless Loop Alternatives Wireless Broadband Access Platforms

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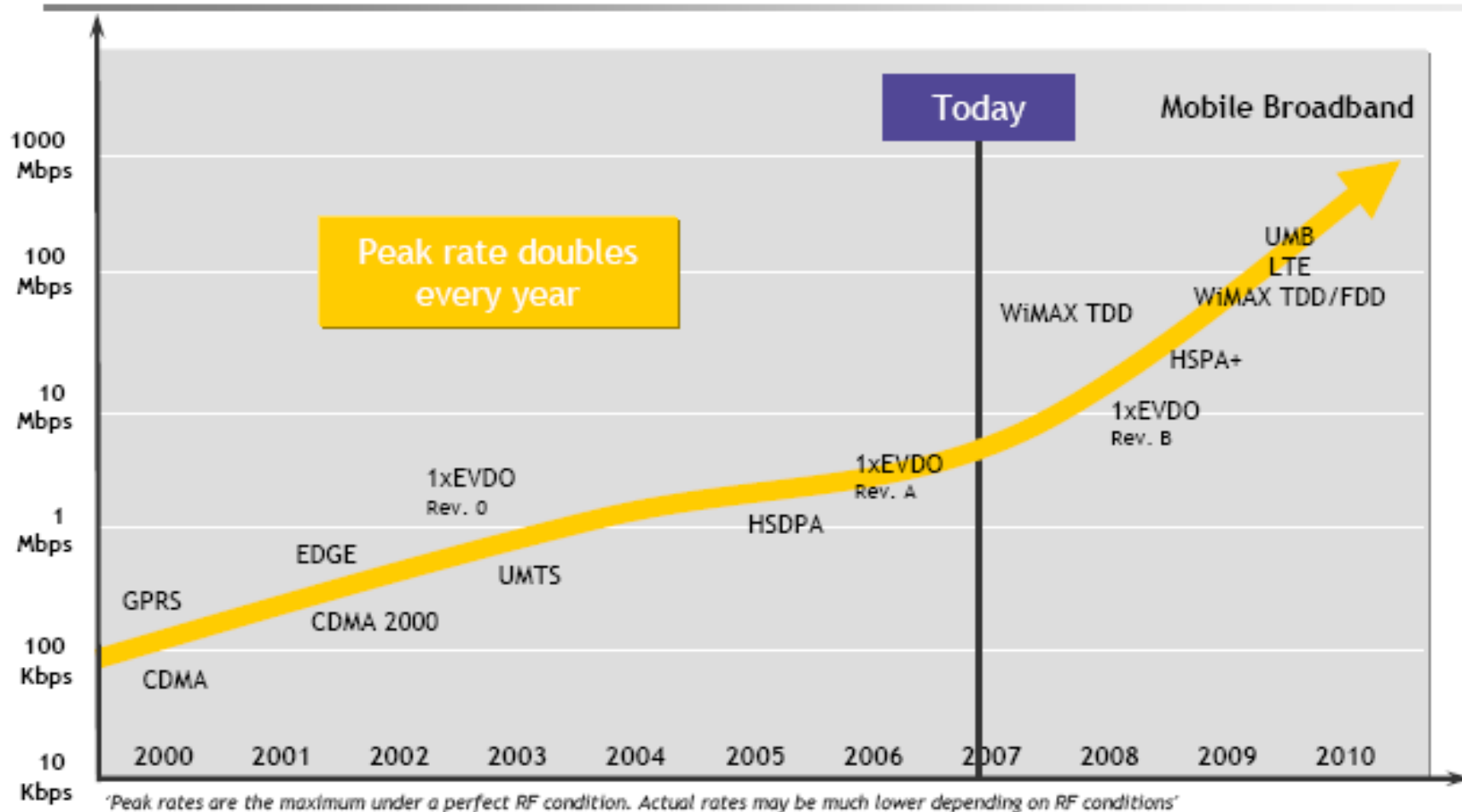
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Agenda

- **Is Wireless A True Broadband Option?**
- **4G?**
- **LTE**
- **WiMax**
- **Femtocells**
- **Fixed Options**
- **Backhaul**

Is Wireless a True Broadband Option

And Deliver Similar Speed and Performance...



Is Wireless a True Broadband Option

... And Provide Similar Improvements in Spectral Efficiency

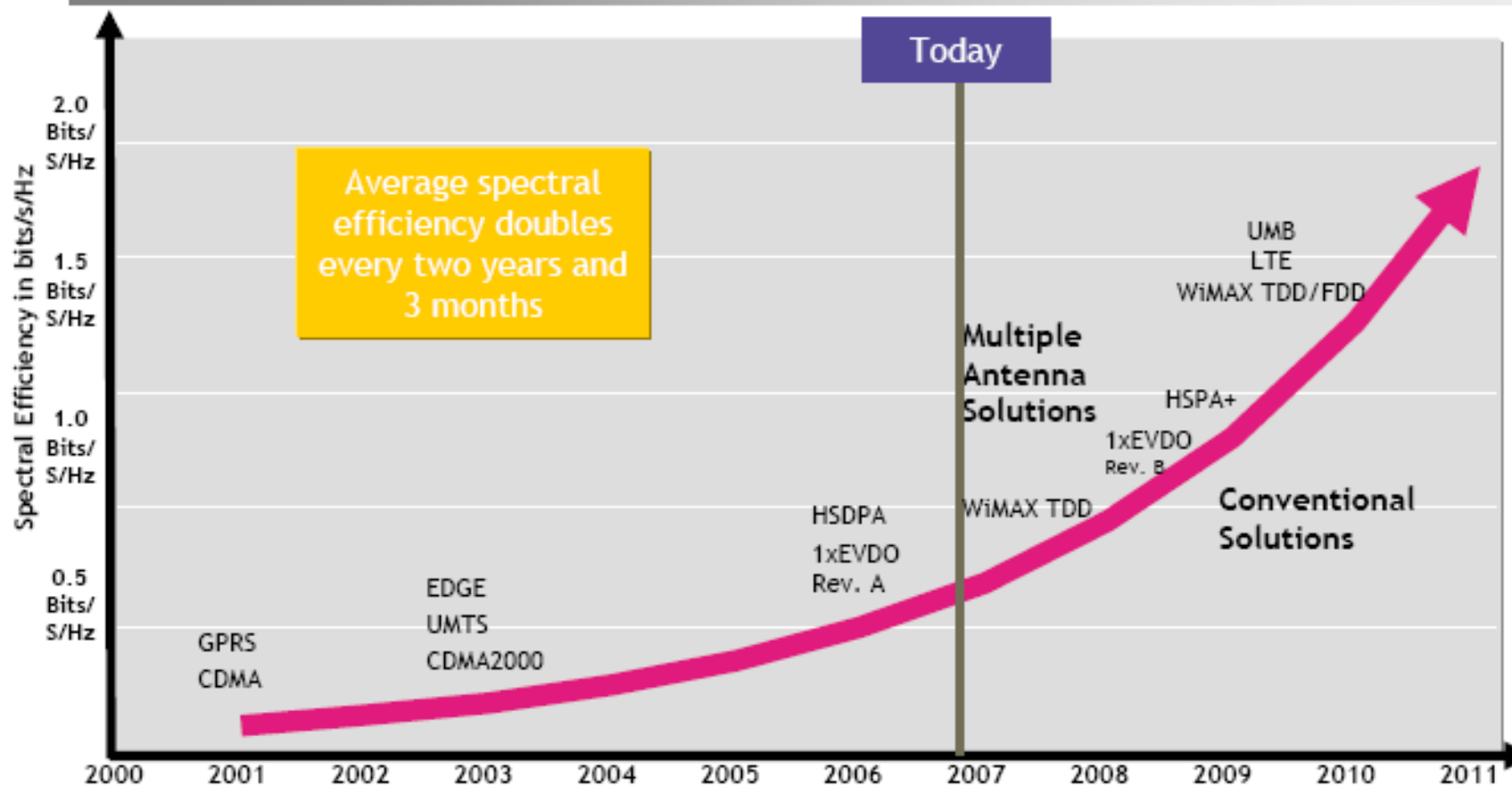


Chart Courtesy of Alcatel - Lucent

4G - What is it?

- Are we even at 3G yet?
- 4G appears to consist of two possible technologies
 - LTE
 - WiMax
- Both technologies are flat IP networks that were designed from the start to be packet networks
- Both use OFDM to achieve better non-line of sight service
- Both can use MIMO technology to dramatically increase the effective bandwidth available to the subscriber

Long Term Evolution (LTE)

- **What is Long Term Evolution?**
 - LTE is the next step on the UMTS Migration Path
- **Who has made commitments to use it?**
 - Verizon
 - AT&T
 - T-Mobile
- **Technology Specs**
 - Can use 1.25 MHz to 20 MHz channels
 - 100 Mbps per sector possible, 40-50 Mbps more likely

Long Term Evolution (LTE)

- **Expected Deployments in the US**
 - 700 MHz
 - AWS
 - Possible PCS
- **“Verzion Wireless executives said that LTE will support the nation’s growing desire for high-speed data services, and predicted the data will account for as much as 50% of carriers revenues in the future. Executives said such growth will come from machine to machine communications, navigation systems and other advanced services.”**
RCRWireless News, 4-4-2008
- **Expected general availability in 2010**

WiMax

- **The Most Hyped Wireless Technology of the last decade**
- **New Frequencies must be approved by the forum**
- **Current Frequencies**
 - 3.5 GHz (including 3.650-3.70 in the US)
 - 5 GHz
 - 2.3 GHz
 - 2.5 GHz
- **Two standards available**
 - Fixed 802.16d-2004
 - Mobile 802.16e-2005
 - They are not interoperable.

WiMax

- **Expected to be used in the 700 MHz deployments in the next couple of years.**
 - This frequency band however is not currently approved by the WiMax forum
 - Several carriers may make WiMax “like” equipment that will operate in the 700 MHz pending formal approval
- **Strong International sales will continue to provide incentive for further development of this technology.**
- **Sprint Nextel is the biggest proponent in the US**
 - Still planning on a trial deployment in the next year

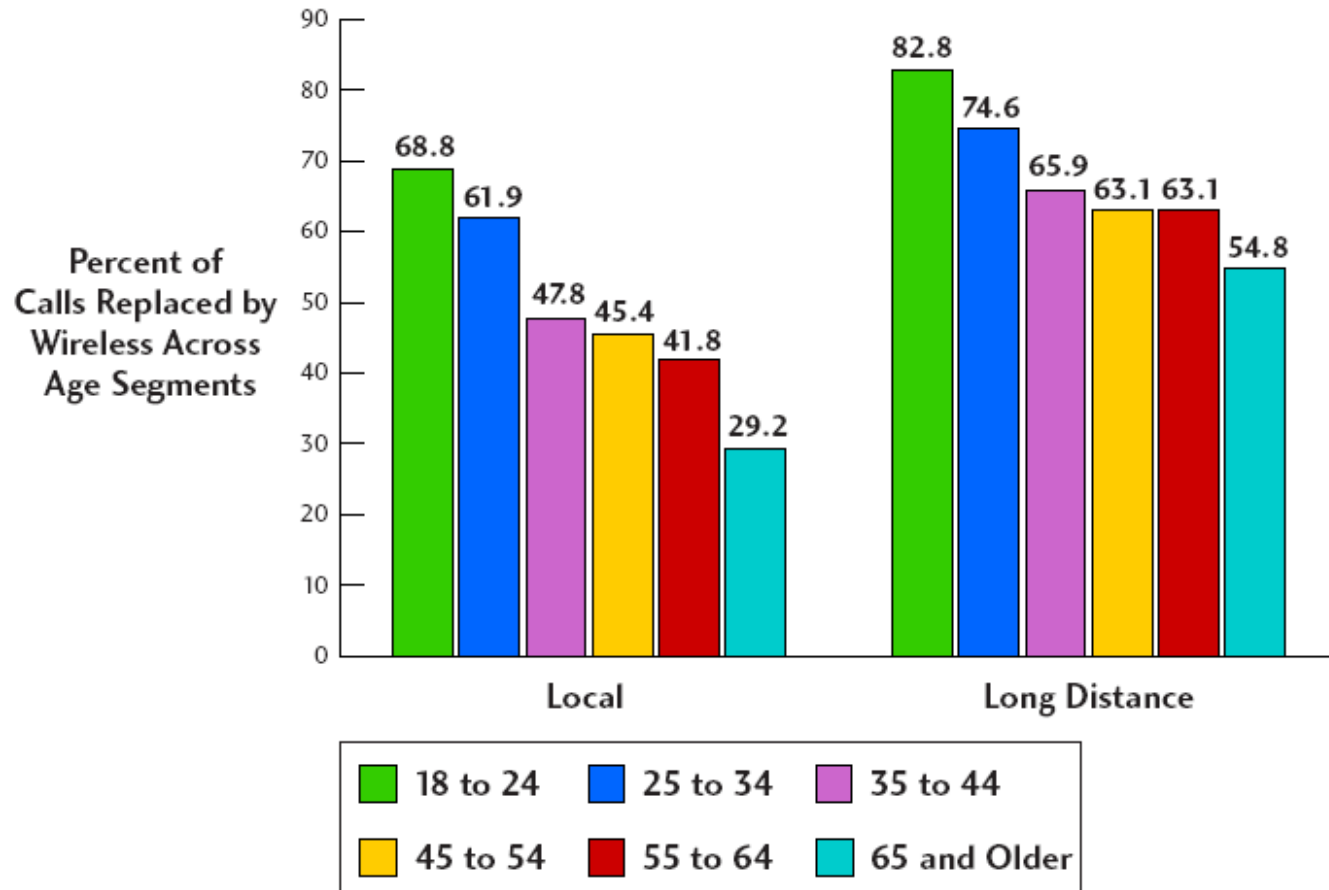
Femtocells

- **A Femtocell is a small base station that is installed at the subscribers home.**
 - Connects back to the MTSO via the customers broadband connection (i.e. DSL or Cable Modem)
 - At the MTSO, a gateway is required to interface between the femtocells and the switch
- **This allows the wireless operator to overcome the problem of a weak signal in the subscribers house**
- **This could also reduce the amount of traffic that needs to be backhauled from the cell tower**

Femtocells

- **There are several potential problems remaining**
 - **Cost**
 - Carriers want a sub \$100 device that can be purchased from a box retailer
 - Current cost is in the \$200-300 range
 - **Potential interference issues**
 - Will it rebroadcast on a licensed frequency or unlicensed?
 - **How do you limit the devices that link to it?**
 - **Potential Power mismatch issues**
- **Sprint is the only current US provider with a Femtocell option**

Why do Femtocells Matter?



Wireline substitution, Source: Yankee Group 2006 TAF Survey Courtesy of Airvana

Fixed Wireless Options

- **The main new development is the 3.650-3.70 GHz band**
 - Registration not licensed
 - One time registration fee
 - WiMax is an option in the 3.650-3.675 GHz portion
 - Higher power limits than unlicensed bands
 - Definite advantages to being the first in the market to deploy service
- **Aperto, Soma, and Alvarion have all thrown their marketing and R&D money behind WiMax, especially in the 3.650 Band**

Possible Wireless Site Backhaul Issues

- **All Wireless Base Stations are increasingly moving to Ethernet backhaul**
 - In some scenarios up to 120 Mbps per BTS may be needed
- **Can your transport network support this kind of request?**
 - Are you ready to support MPLS and other QoS requests?
- **Will this create a moving bottleneck in your network?**
 - How big is your connection to the outside world?
 - How big does it need to be?
 - How can you organically grow it?

Thank You

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