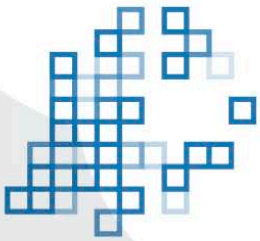


Wireless in the U.S. and Texas

Past, Present, and Future



PULS Conference
August 27, 2010



Topics to be Discussed

How does wireless work?

U.S. Wireless Industry Growth and Statistics

Texas-specific Information



How does wireless work?



What does “G” Mean?

“G” stands for Generation

1G – Analog (no longer exists)

2G – Digital

3G – Faster Digital

4G – Even Faster Digital



There are 5 Fundamental Components of a Wireless Network

Wireless device

Cell site

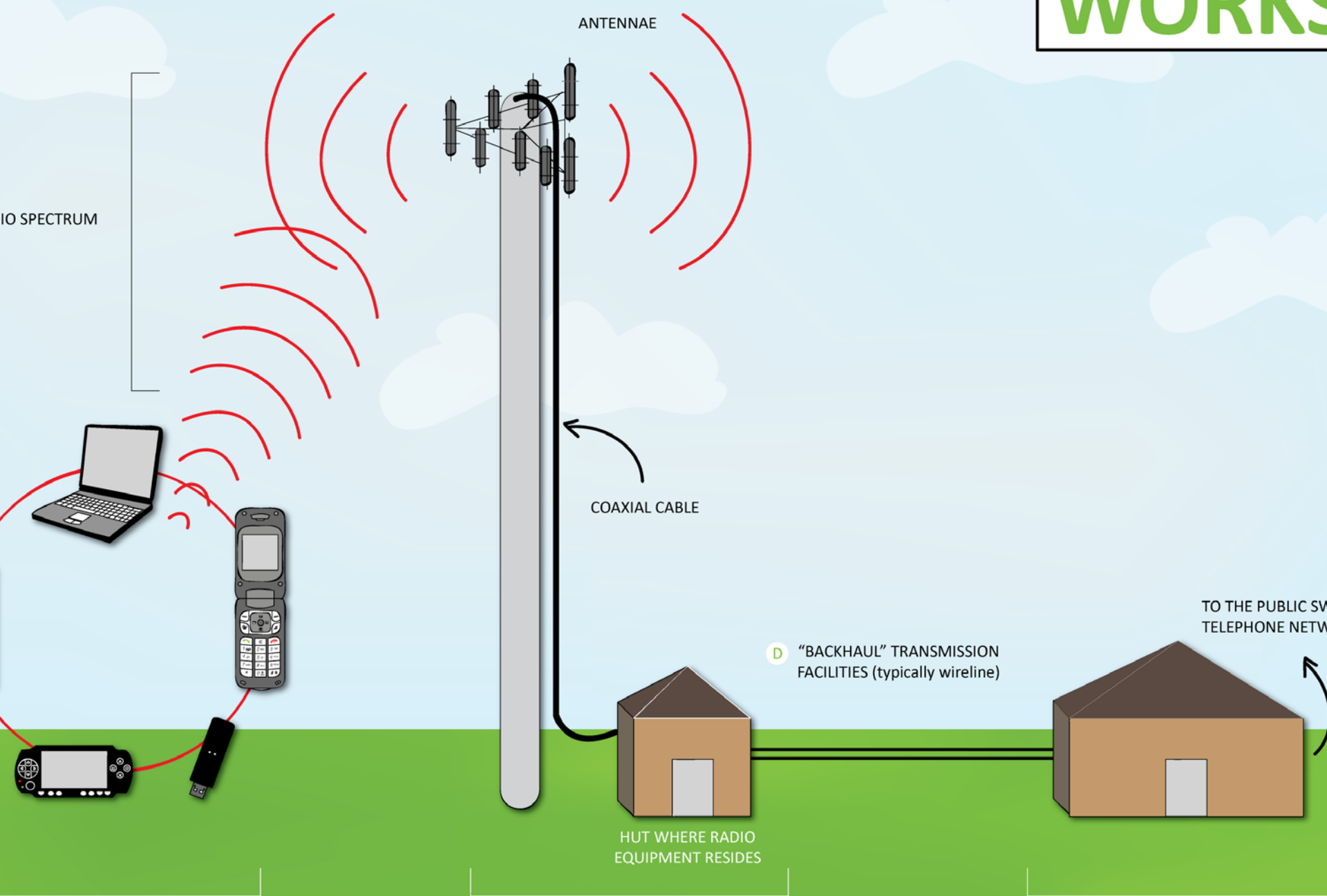
Radio spectrum

Backhaul transmission facilities

Wireless switch



HOW WIRELESS WORKS



RADIO SPECTRUM

ANTENNAE

COAXIAL CABLE

D "BACKHAUL" TRANSMISSION FACILITIES (typically wireline)

TO THE PUBLIC SWITCHED TELEPHONE NETWORK

HUT WHERE RADIO EQUIPMENT RESIDES

A WIRELESS DEVICES

C CELL SITE

E WIRELESS SWITCH

Wireless Device

Could be a phone, a PDA like an iPhone or Blackberry, a laptop card, a Netbook, etc.); they are, in reality, small sophisticated two-way computing devices that are capable of transmitting and receiving radio signals.



Cell Site

- This is any location that houses antennas and radio equipment
- Is usually a tower or monopole, but can be on a roof top, on the side of a building, on a water tower, or inside a building like an airport terminal
- The tower/structure supports the antennas and a hut on the ground holds the radio equipment.
- The cell site communicates via two way radio signals (using radio spectrum) from the wireless device to the triangular antenna arrays on the tower which, in turn, are connected to the radio equipment in the hut at the base of the tower via thick coaxial cables that can often be seen running down the tower.



Examples of Cell Towers



Cell Tower with Microwave Backhaul



Not Just Towers.....



Not Just Towers.....



We Also Disguise Them....



We Also Disguise Them....



410-136, Stealth Flagpole at Shipyard Plantation on Hilton Head



Coaxial Cables From Cell Site Antennas to Equipment Hut



Different Types of Equipment Huts (they house the radio equipment)



Radio Spectrum

Provides the wireless link between the device and the cell site's antennas. In many cases, this may be the ONLY portion of the call that is actually "wireless".

The remainder of the wireless call may be handled by wireline facilities such as fiber and copper transmission networks, or by microwave radio.

Various frequencies used in providing wireless service (e.g., 850 MHz, 1900 MHz, 700 Mhz, etc.)



Backhaul

- The cell site is connected to the wireless switch over facilities that “backhaul” wireless voice and data from the cell site to the switch.
- These backhaul connections are usually wireline circuits, but also may be high capacity point to point wireless microwave links. In fact, the use of wireless backhaul is expected to increase substantially over the next couple of years.
- Historically, wireline backhaul circuits have been copper facilities. However, wireless carriers are currently upgrading these facilities to fiber with Ethernet or IP based connectivity.
- These upgrades will allow carriers to better handle the increased data traffic demands from the growing number of smartphone, laptop, and Netbook users.



Wireless Switch

- Contains the computing brains and performs the task of connecting the wireless device to other wireless or landline devices.
- Authenticates the call attempt and routes it to the appropriate destination.
- Monitored 24 hours a day.



Wireless Switch



Registration

When a wireless device is turned on, it periodically “registers” with the wireless network.

This enables the network to deliver voice calls or data requests to the mobile device faster and more efficiently by knowing where within the network the device is located.



Making a Wireless Voice Call

When the wireless user dials a number and presses the "SEND" key, the device sends a radio signal to the nearest cell site's antennas where the signal is delivered to the radio equipment at the base of the tower via coax cables.

The signal is then transmitted to the wireless switch via the backhaul transmission facilities.

The switch processes the information being sent by the wireless device, validates the customer's telephone number and other info, and then enables the connection from the wireless caller to the destination of the called number.



Receiving a Voice Wireless Call

The wireless switch receives the incoming call and then needs to locate the wireless user.

It does this by accessing a database that has the last known general location of the wireless user based on the last "registration".

Once it has narrowed the search for the wireless user, the switch sends out a unique paging signal that only the called wireless device can "see".

Once the wireless device recognizes the page and automatically responds back to the network, the wireless switch enables the communication path from the calling number to the wireless device.



Handoffs from Cell Site to Cell Site

- When a wireless caller is traveling by car or train and on a call, the wireless network and the wireless device constantly monitor the quality of the call and compare it to how the call may be handled by surrounding cell sites.
- The wireless device and the switch make decisions to hand a call to the neighbor cell site if the call quality on the serving cell site starts to degrade.
- The determination of call quality and hand off to different sites happens automatically and is transparent and seamless to the wireless user.



Data Sessions (SMS, MMS, Internet Browsing, etc.)

- The connection of the wireless device to the cell site is the same, but the data session is routed to a data switch, which is the equivalent of the switch for voice calls, which then routes the data session to a commercial internet server to establish and connect the data session request.

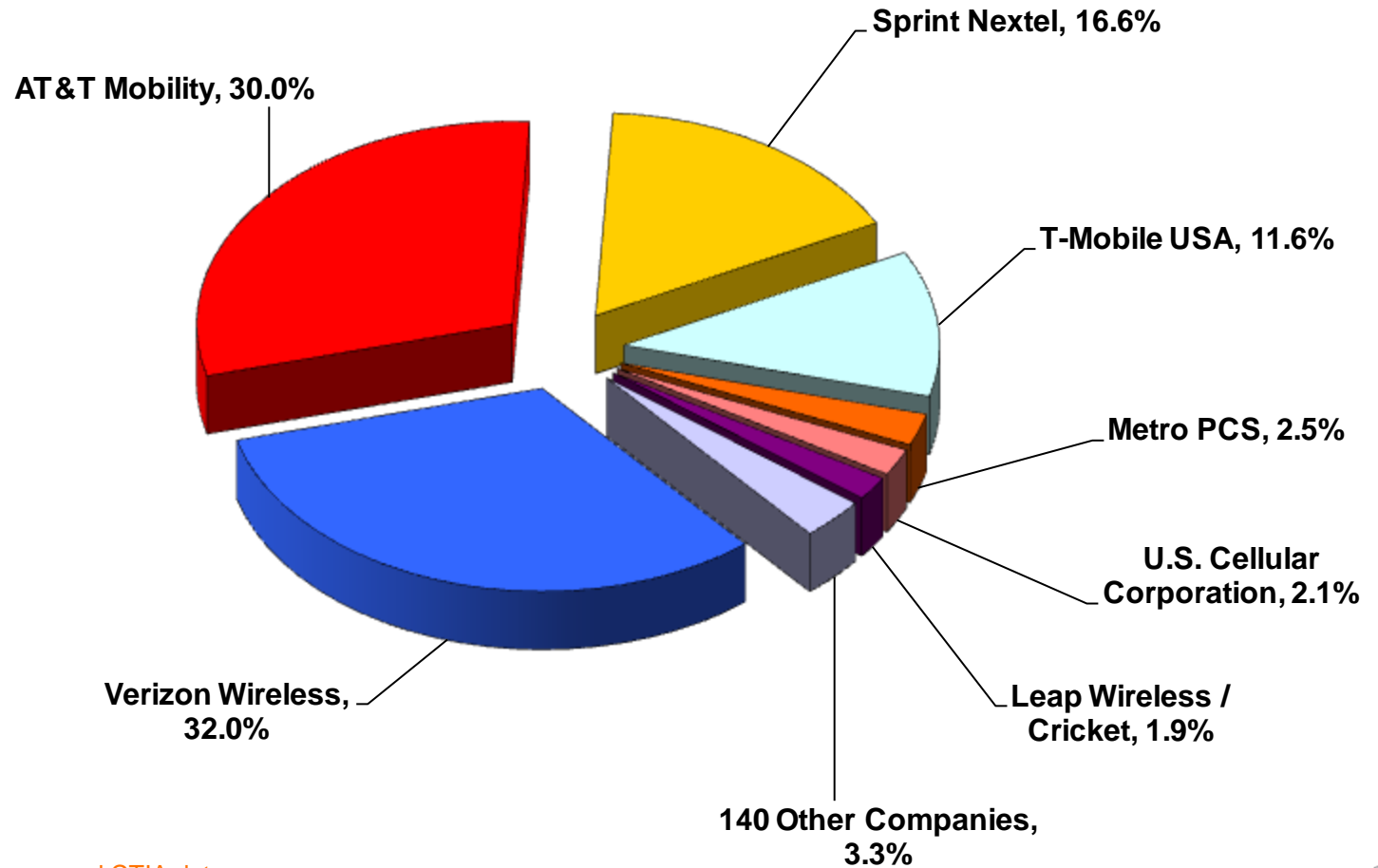


U.S. Wireless Industry Growth and Statistics



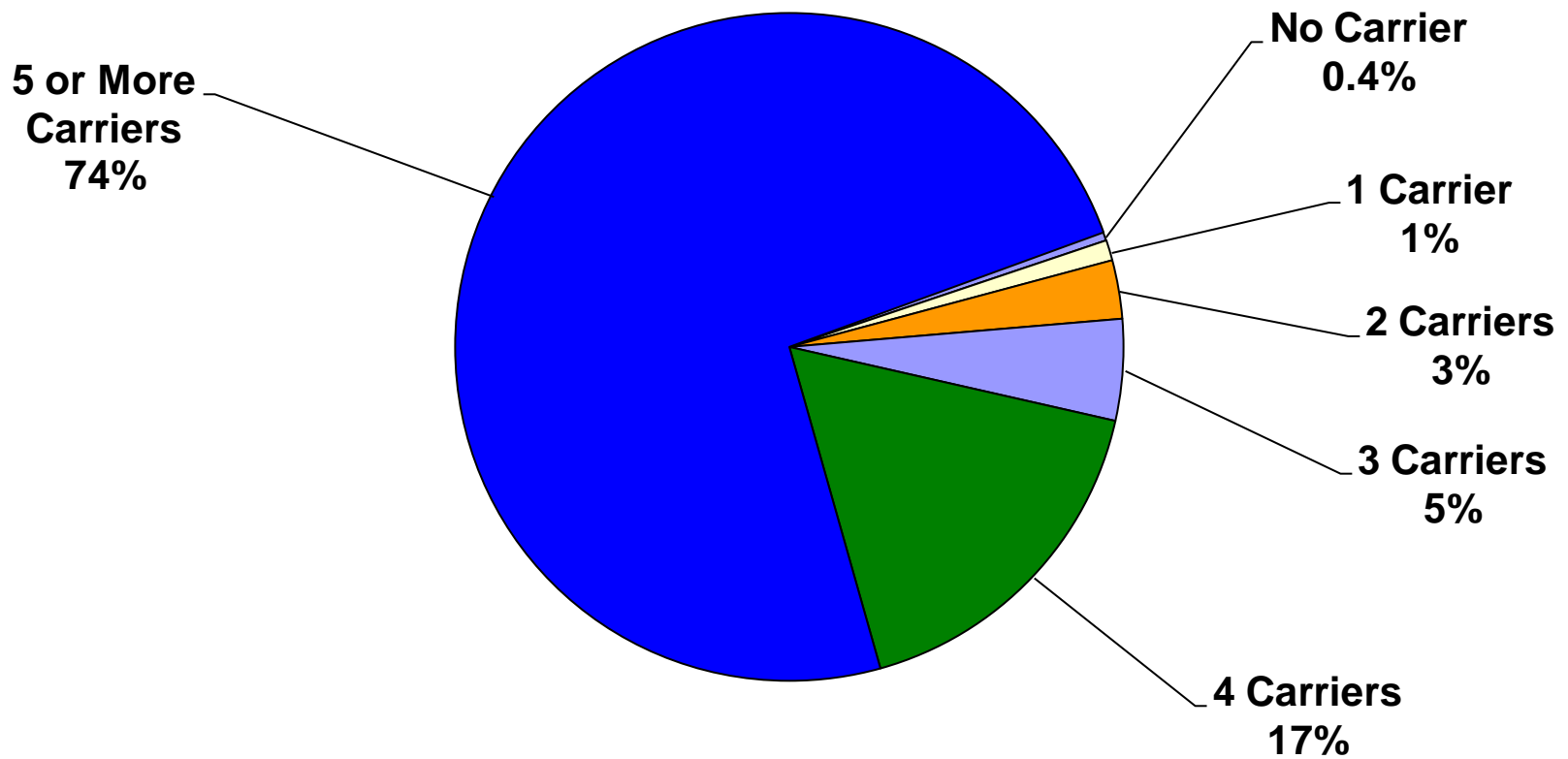
The U.S. Landscape

U.S. Carrier Market Shares: 1Q 2010



Wireless Has Delivered More Choices for More People

Nearly Three-Quarters of Consumers Have a Choice of Five or More Wireless Service Providers



Sources: FCC, American Roamer



The U.S. Competitive Landscape

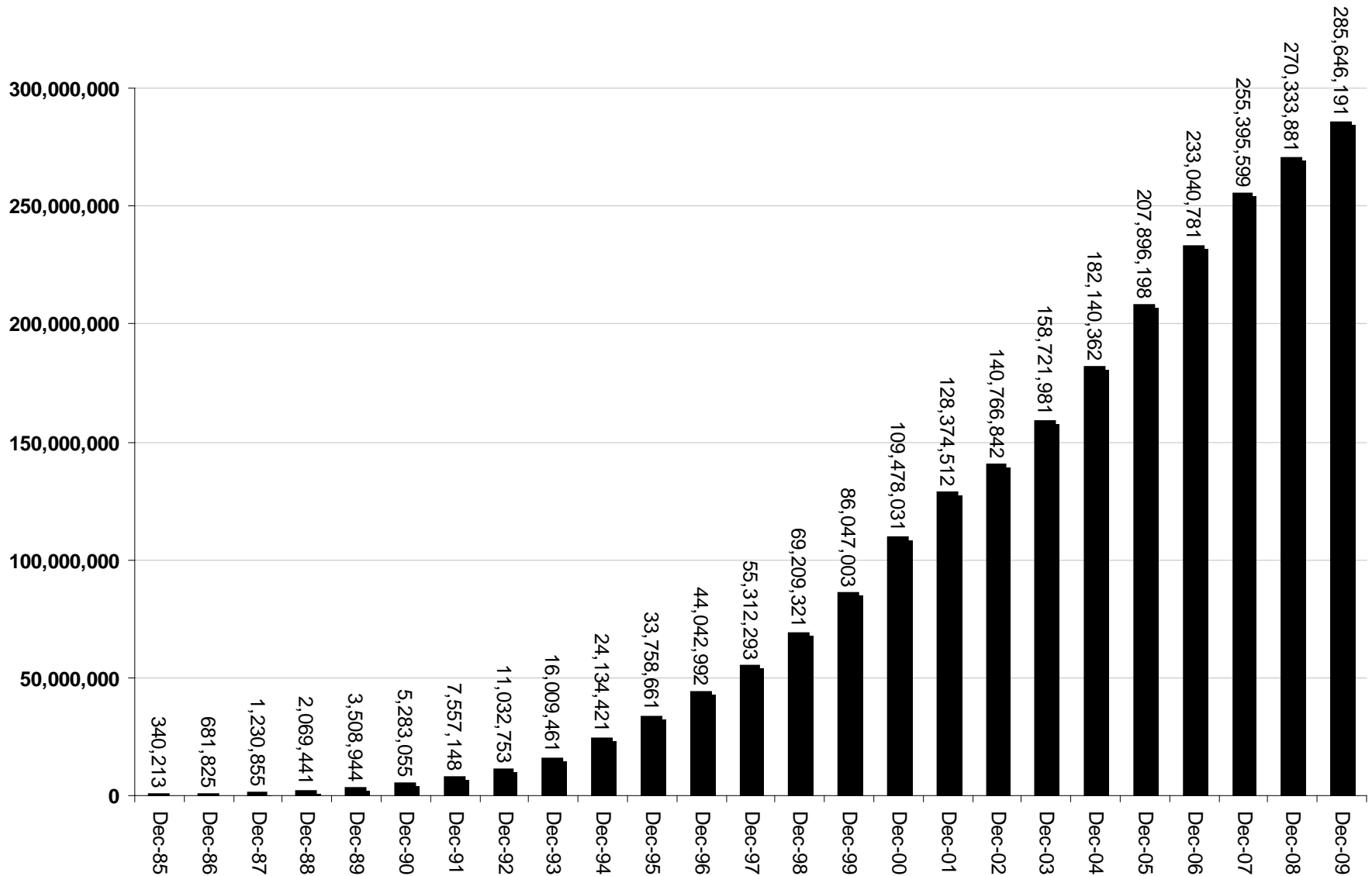
Current wireless providers include:

- 4 nationwide (Tier 1) licensed wireless service providers
- 8 regional / "super-regional" (Tier 2) licensed wireless service providers
- About 140 smaller (Tier 3) licensed wireless service providers
- More than 50 Mobile Virtual Network Operators (MVNOs) serving about 8 percent of all subscribers

New entry / expansion is occurring as a result of new licenses (AWS, 700 MHz) being issued



285.6 Million U.S. Wireless Subscribers at YE2009

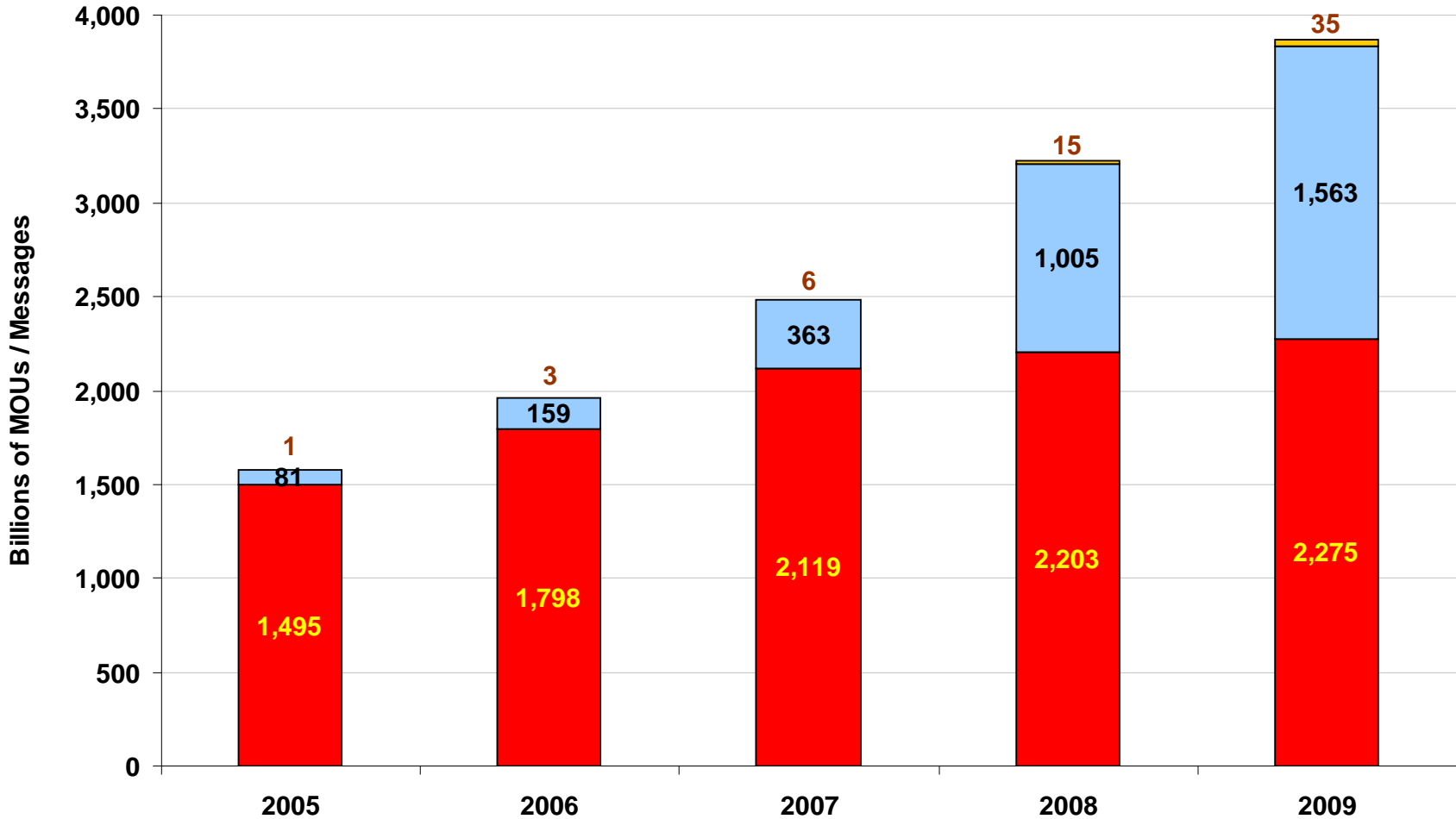


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Using Trillions of MOUs and Text Messages, and Billions of MMS

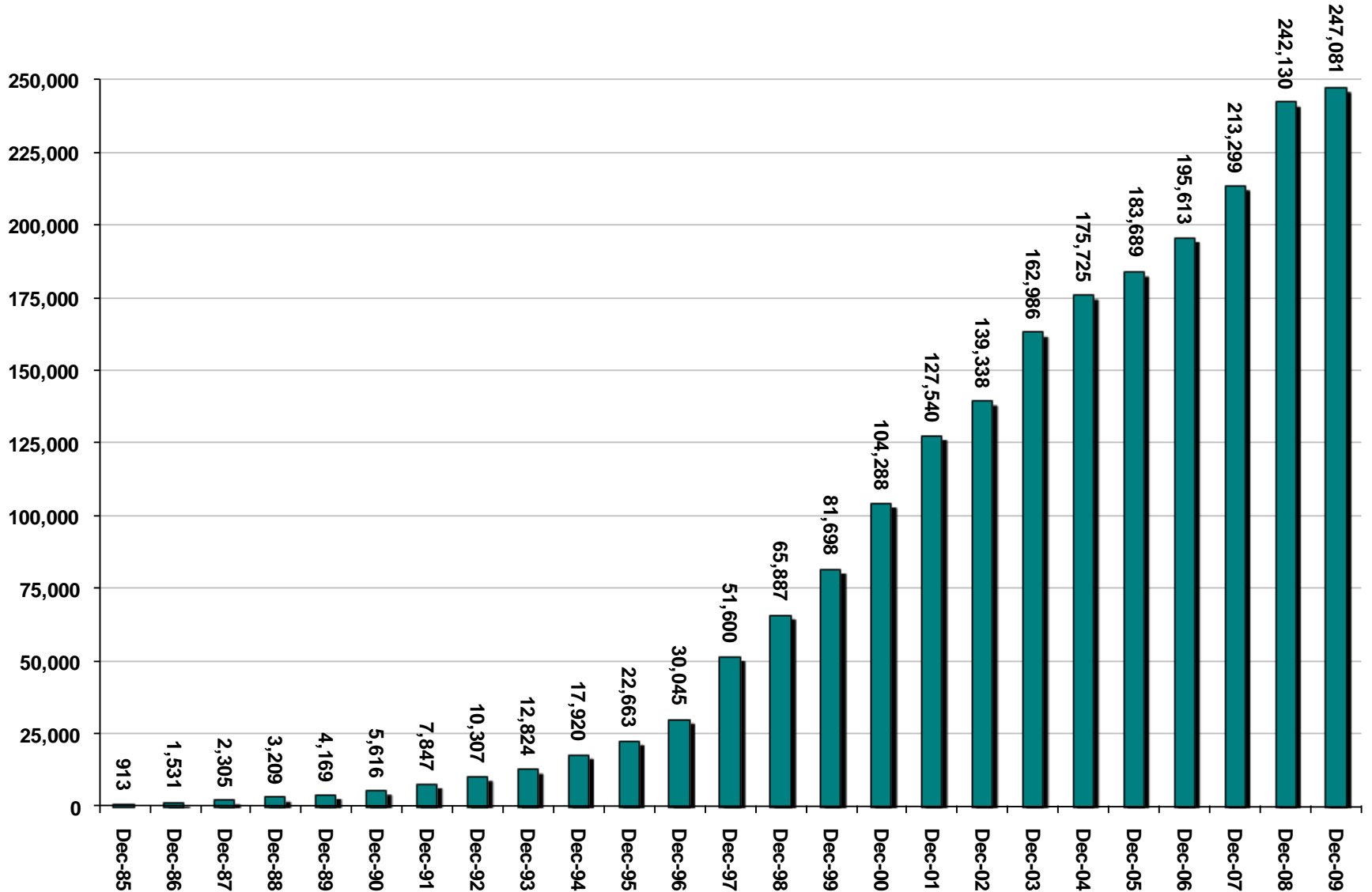
Minutes and Messages as a Measure of Wireless Usage



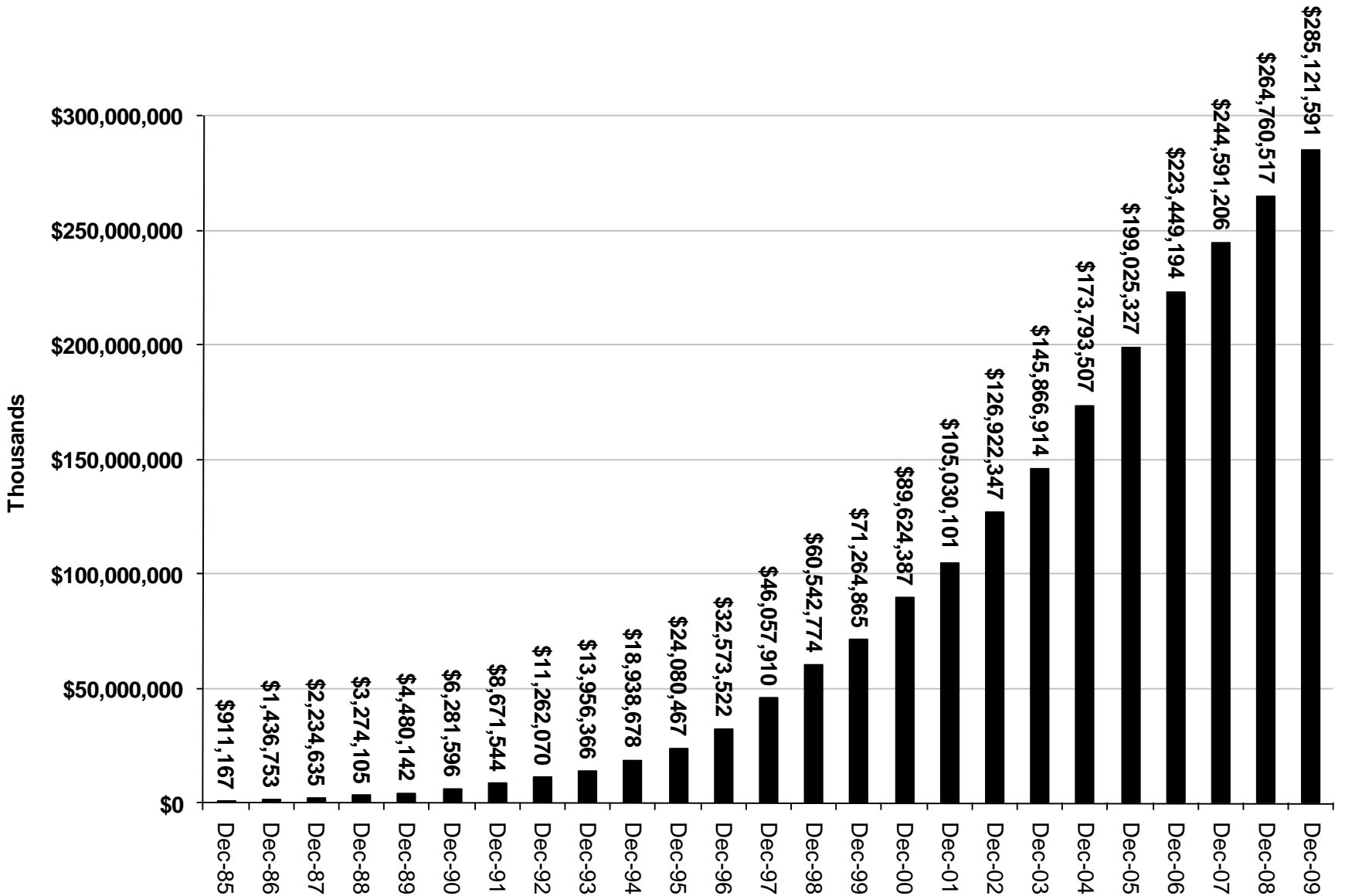
■ MOUs ■ Text Messages ■ MMS Messages



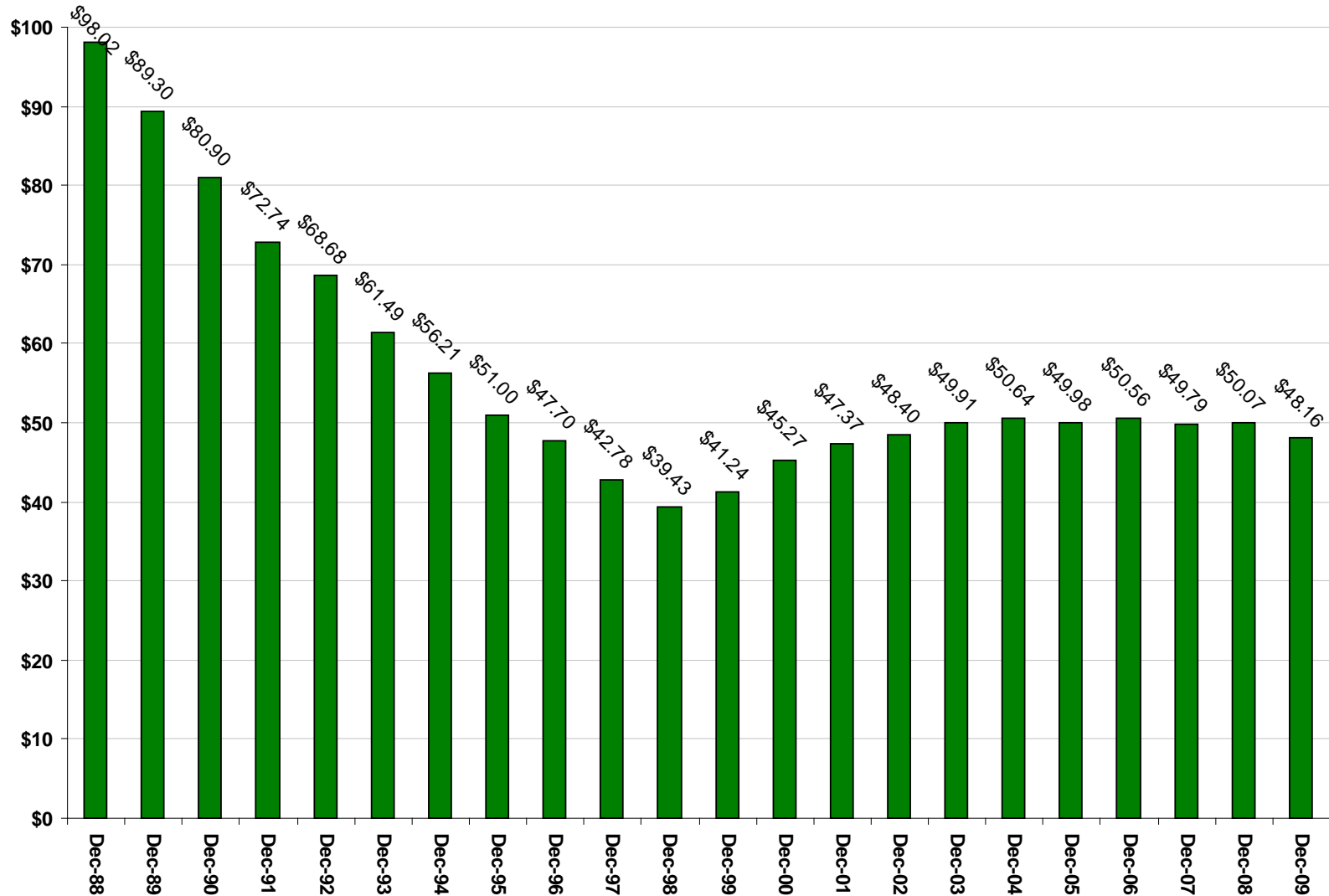
A Spectrum-Based Service Depends on Cell Sites (Antennas)



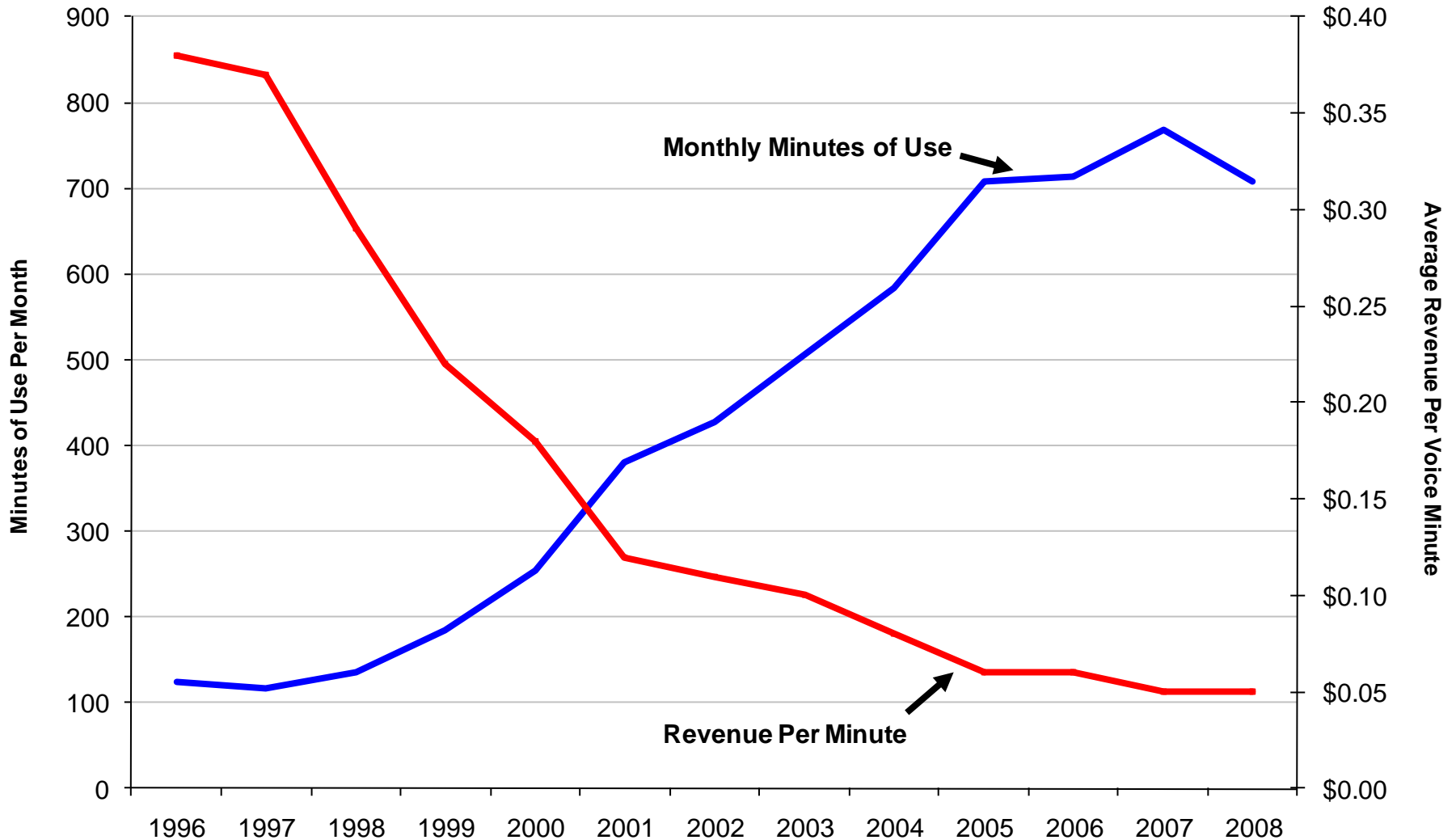
Wireless Investment Amounts to Billions Annually



ARPU (Average Revenue Per User) has Remained Relatively Stable Recently, While Individual Subscriber Usage Has Soared and Diversified



Steady Decline in Rates has Resulted in Increased Voice MOUs



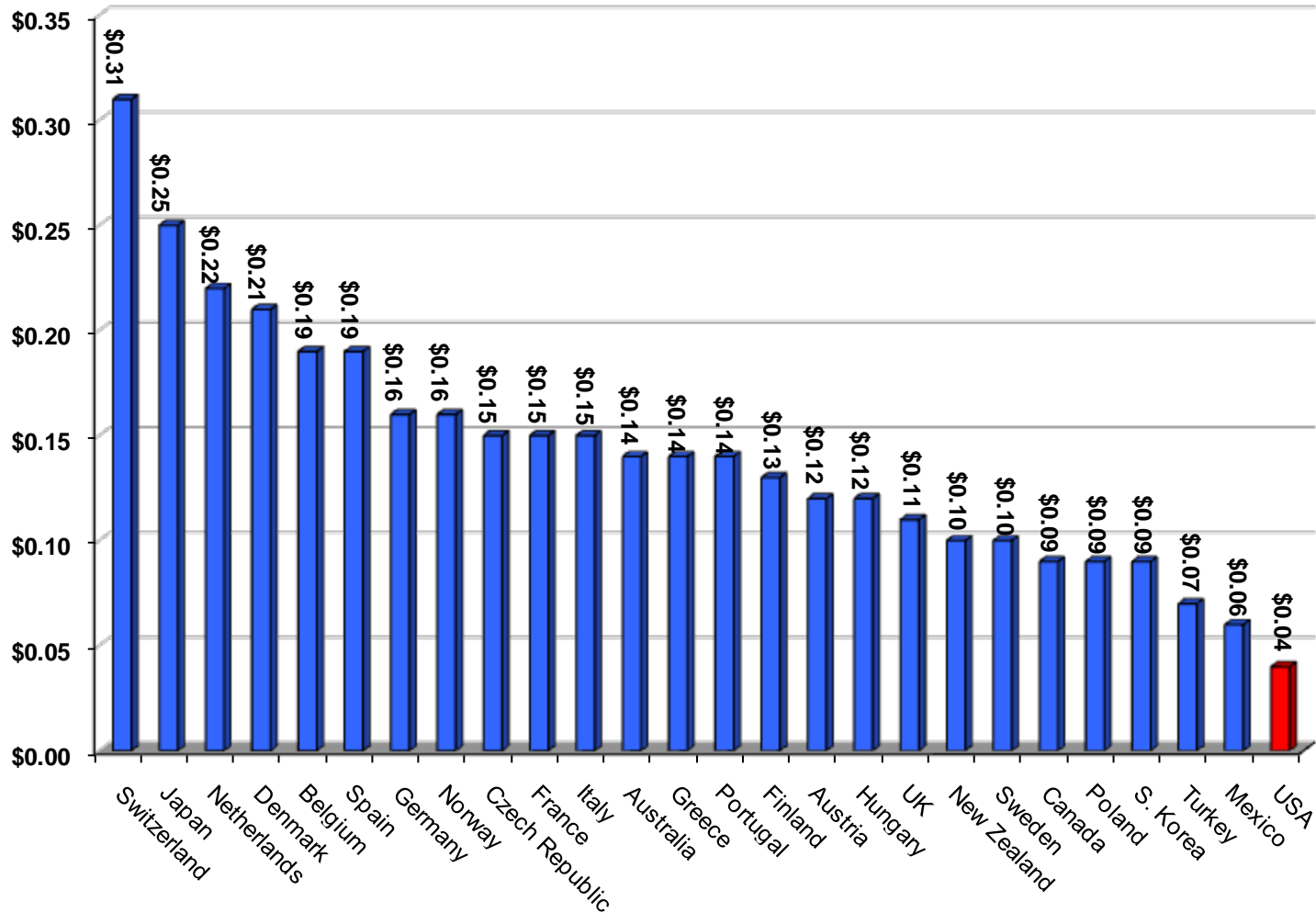
Source: FCC 14th CMRS Report

— Minutes of Use Per Month

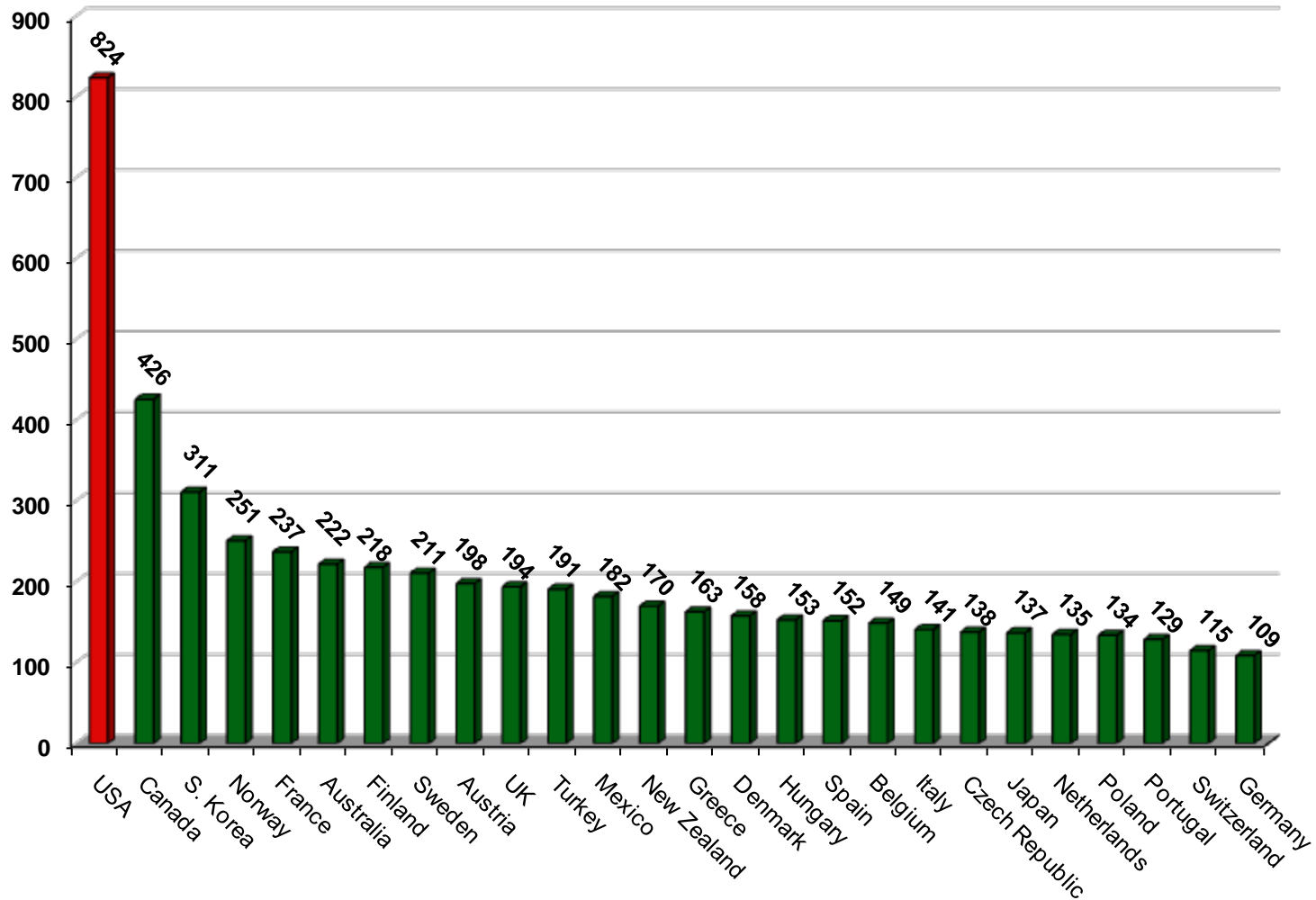
— Average Revenue Per Voice Minute



The U.S. Leads in Affordable Wireless Service (Average Revenue per Voice Minute, YE 2009)



The U.S. Leads in Wireless Voice Service (Average Monthly Minutes of Use, YE2009)

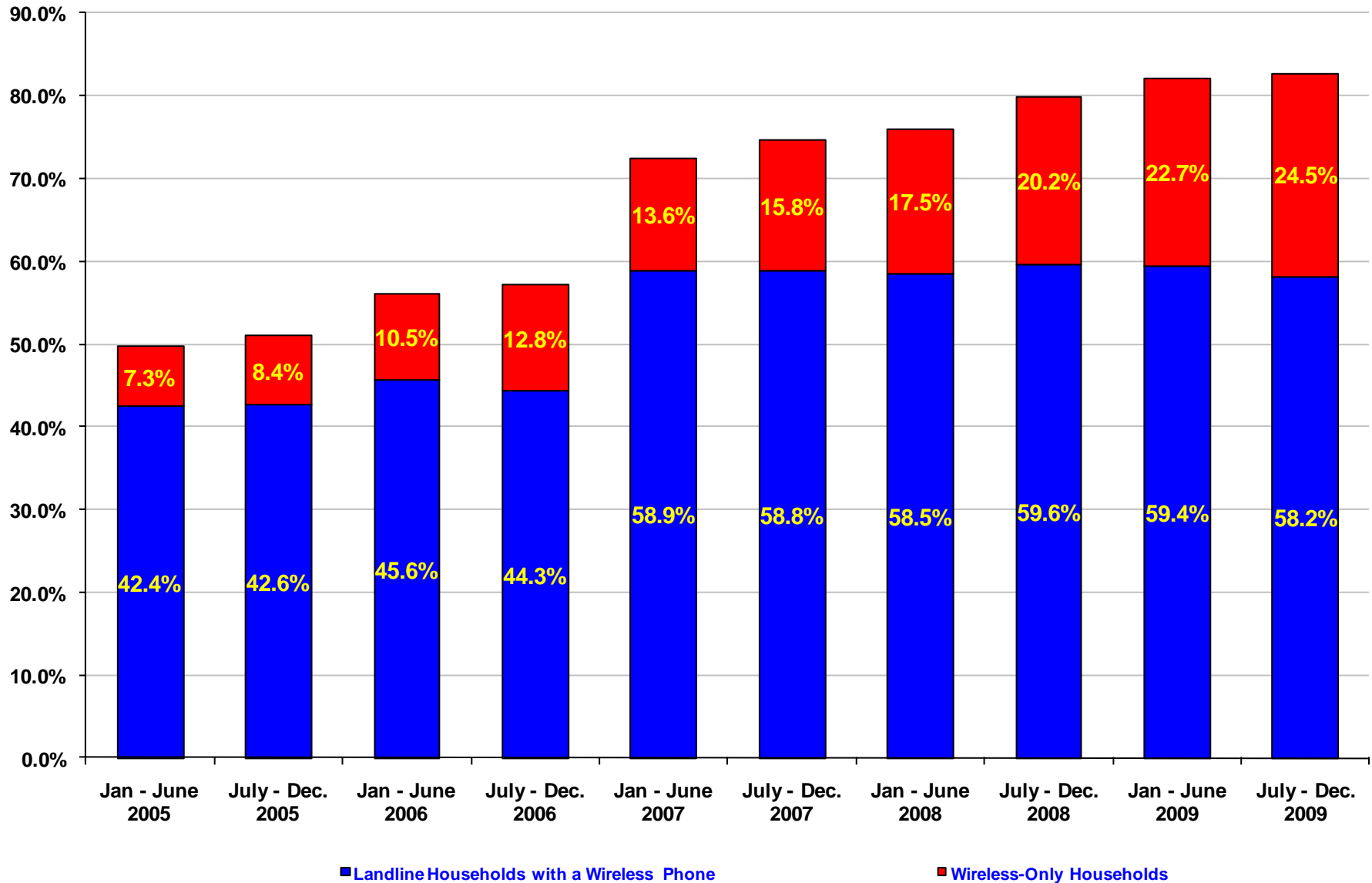


Source: Bank of America Merrill Lynch Research, April 2010

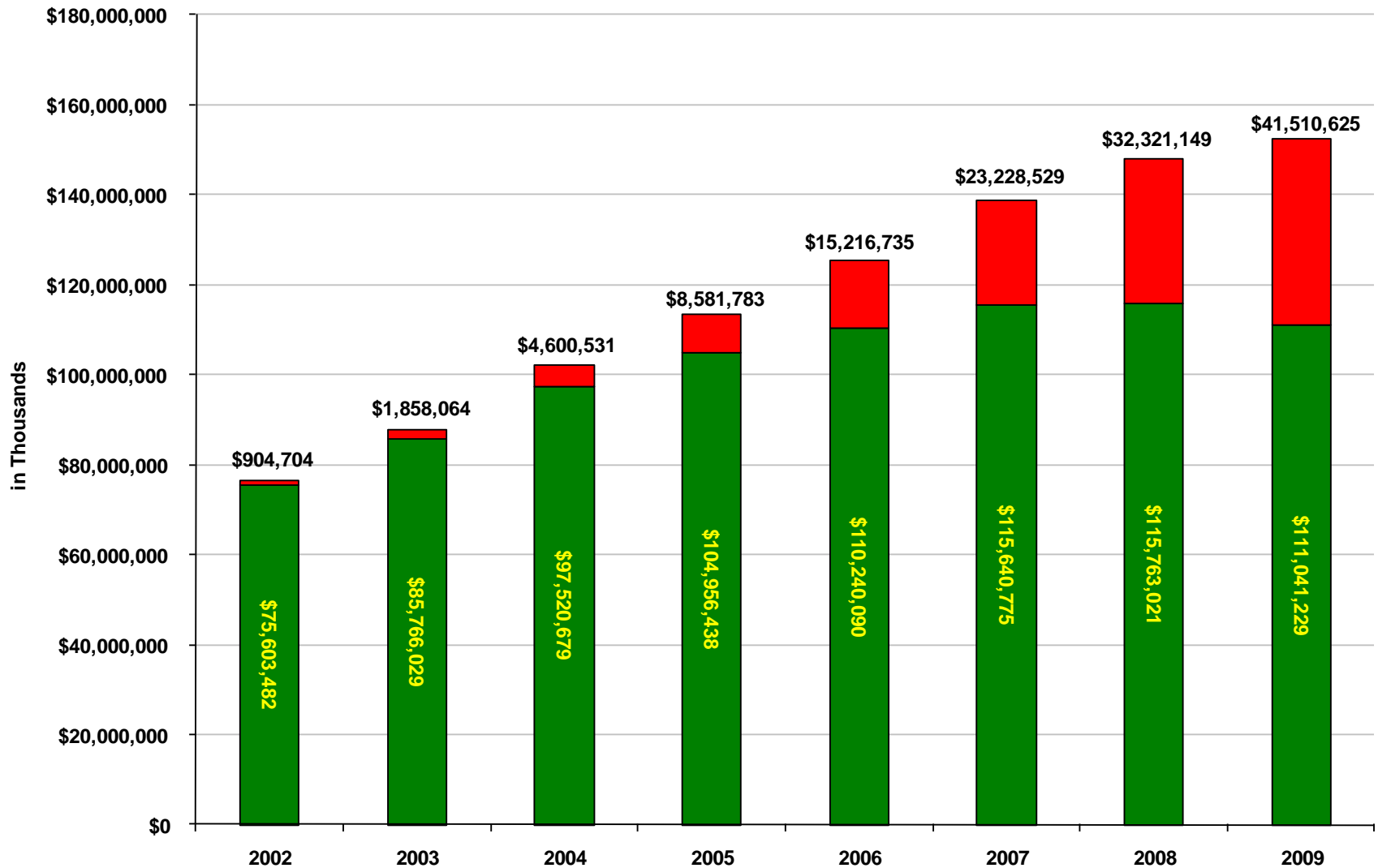
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82.7% of All Households Use Wireless

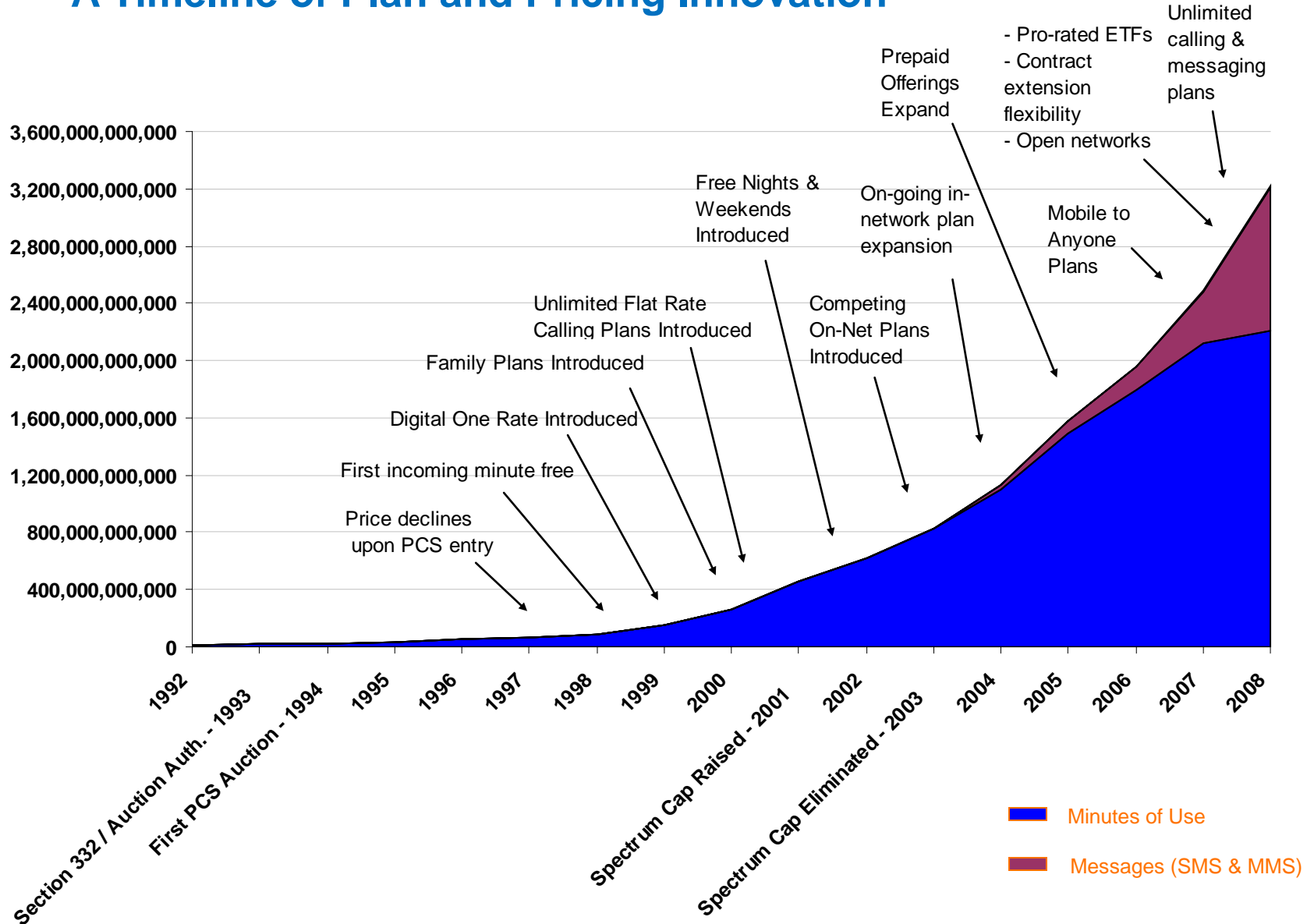


Data Now Accounts for 27% of All Wireless Service Revenues



A Timeline of Plan and Pricing Innovation

Minutes of Use / Messages (SMS & MMS)



Incredible Wireless Data Growth

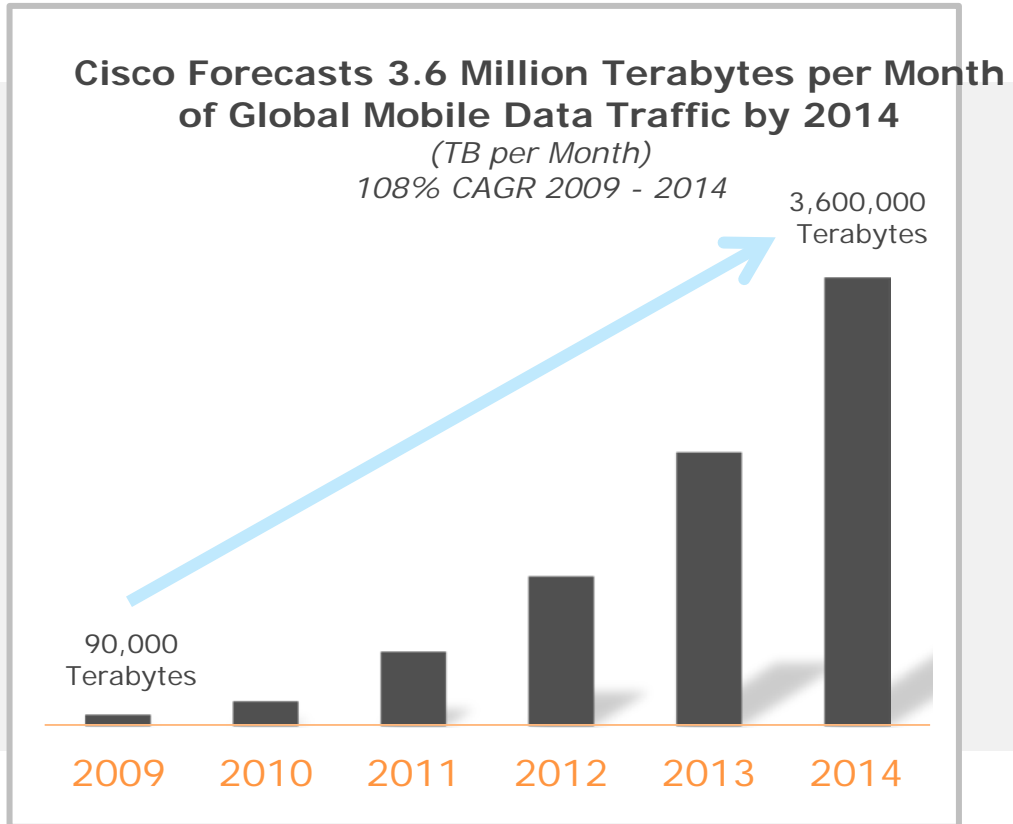
The Library of Congress says that they have 21 million books in their Library of Congress catalog system, and it's estimated that one book equals one MB.

During the second half of 2009, the wireless industry handled, on average, 585.9 million MB per day, or 24.4 million MB per hour.

In other words, U.S. wireless carriers' networks handle every hour in an average day more MB than the entire Library of Congress' book catalog.



Customer Demand For Data is Surging and is Projected to Grow 40-Fold by 2014



- > Mobile broadband growth outpaces every other platform**
- > Pew estimates that by 2020, mobile devices will be the primary Internet devices for most people in the world***
- > The average smartphone user generates 10 times the amount of traffic generated by the average non-smartphone user

*Source: Cisco, VNI Mobile, 2010

**Source: CTIA, Written Ex Parte to FCC, Sept. 29, 2009

***Source: Pew Internet & American Life Project, Dec. 2008



Texas-specific Information



Texas Wireless Industry Information

Major wireless competitors in the state:

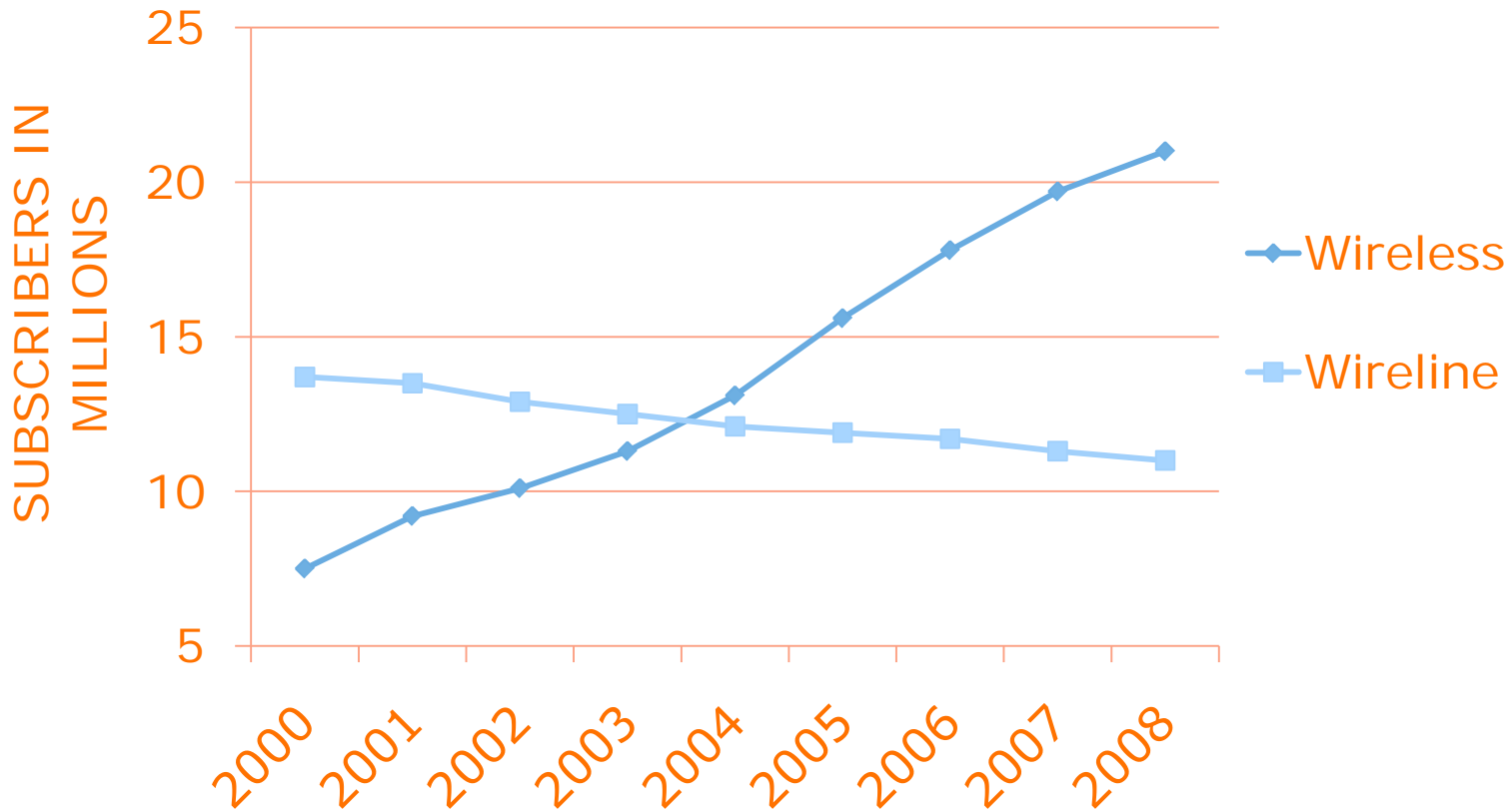
- AT&T
- Sprint Nextel
- Verizon Wireless
- T-Mobile
- Cricket
- Metro PCS
- Pocket
- US Cellular

21.0 million total wireless customers in the state as of Dec 31, 2008 (doubled since 2003); source – FCC Local Telephone Competition Report; released Jun 2010

The number of wireless subscribers in the state surpassed the number of wireline subscribers during 2004 and the gap has widened each year (11.0 million wireline subs in TX as of Dec 2008); source – FCC Local Telephone Competition Report; released Jun 2010



Wireless vs. Wireline Growth in Texas Since 2000



Advanced 3G and 4G Plans in Texas

- **AT&T** – Fastest 3G network in Texas (doubled theoretical speeds earlier in 2010 and will double them yet again by EOY 2010); 4G trials in 2010 with 4G commercial deployments in 2011 (LTE)
- **Verizon Wireless** – deploying 4G in Texas by EOY 2010 in Dallas-Ft. Worth and other markets (LTE)
- **Sprint** – has deployed WiMAX in 10 Texas markets thus far
- **T-Mobile** – has announced it will upgrade its 3G capabilities to “HSPA+” in 5 Texas markets this year
- **Metro PCS, Cricket, and US Cellular** – all announced LTE as their 4G platform



Questions?

