

AT&T Mobility

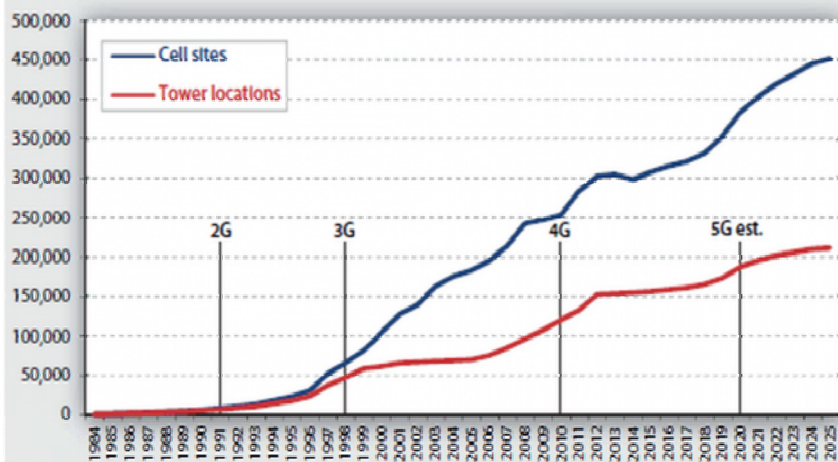
Gary Wiggins ASA, CAE

TFI Communications Technology
 Asset Valuation Conference
 January 21-22, 2016



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U.S. wireless towers and sites, 1984-2025



A "tower" is a physical structure. A "cell site" refers to a carrier's equipment on a tower.
 Active towers. Includes poles, rooftops and DAS. Excludes Small Cells.
 Excludes broadcast-only sites and "available" locations without equipment like empty rooftops.
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North America's leadership with LTE crosses nearly all measurement points including market share, penetration and coverage.

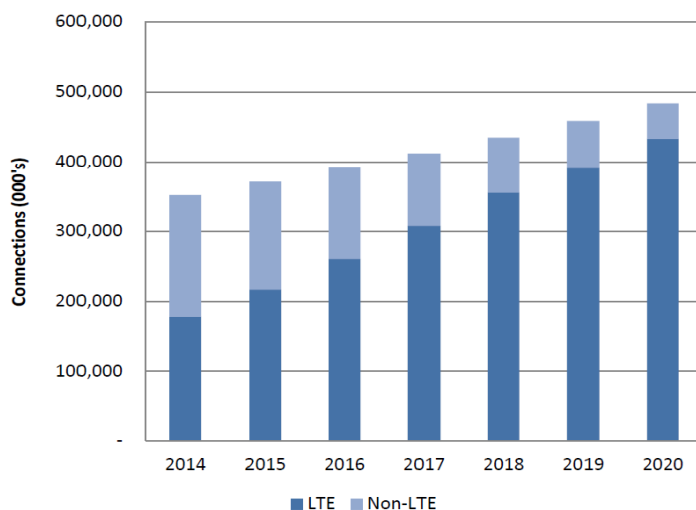


- LTE subscriptions represent 47.5 percent of all mobile connections in North America.
- Penetration of LTE in the U.S. with 198 million LTE connections was over 54 percent.
- 98 percent of Americans have access to LTE.
- North America comprises only 5 percent of the world's population, and more than a quarter of its LTE users.
- By the end of 2020, the proportion of LTE connections in North America is forecast to reach almost 90 percent.

Source: 4G Americas



LTE vs Non-LTE Connections (U.S. 2014-2020)



Source: Stratcast



5 G

- Verizon expects to be able to offer up to 1 Gbps and will be live at headquarters in January 2016
- Huawei announced in July 2015 a string of 4.5G and 5G-related achievements
- AT&T recently met with FCC to discuss 5G as part of the use of bands above 24 GHz for mobile radio services.
- AT&T is doing everything in 5G that everyone is doing: Sit on the standards boards, trialing different flavors of the technology, earmarking cities for early deployment.
- AT&T wants options to be early, mid, or on the back end depending on whether the need is to optimize speed, capacity or cost.
- Currently laser-focused on incremental cost per megabyte as customers consume more and more video on wireless."

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Current AT&T Network

- **AT&T Network is Comprised of 3 Separate Technologies:**
 - GSM – Voice and Data Network
 - UMTS – Voice and Data Network
 - LTE – Primarily a data network, VoLTE currently being implemented
 - Traffic literally exploding – We can't add capacity fast enough
 - Before we can get a new site in place we already have to add additional carriers
- **Current configuration is inefficient and costly to operate:**
 - Inefficient use of existing spectrum
 - Cost of building & operating GSM and UMTS networks is excessive in comparison to current LTE technology
 - As LTE grows, GSM and UMTS equipment is experiencing declining utilization and obsolescence
 - AT&T will shut down its GSM network by yearend 2016
 - AT&T shuttered the last of Leap's CDMA in September 2015
 - UMTS HSPA+ network peaked November 2012
 - Much of the specialized equipment will simply go away between now and 2020

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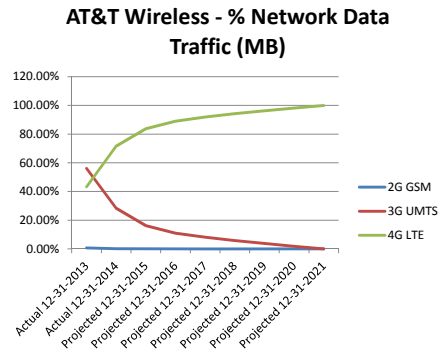
Historical & Projected Network Traffic Trends

Wireless Network Traffic Trends

Traffic in Millions of Bytes (MBs)* Equivalents								
Technol ogy	Actual 12-31-2013	Actual 12-31-2014	Projected 12-31-2015	Projected 12-31-2016	Projected 12-31-2017	Projected 12-31-2018	Projected 12-31-2019	Projected 12-31-2021
2G GSM	0.65%	0.11%	0.06%	0.00%	0.00%	0.00%	0.00%	0.00%
3G UMTS	56.13%	28.29%	16.19%	10.99%	8.16%	5.77%	3.77%	1.86%
4G LTE	43.23%	71.60%	83.75%	89.01%	91.84%	94.23%	96.23%	98.14%
Total	100.01%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

* Includes Voice if digitized as a data packet (VoIP / VoLTE)

Source: AT&T Network Organization



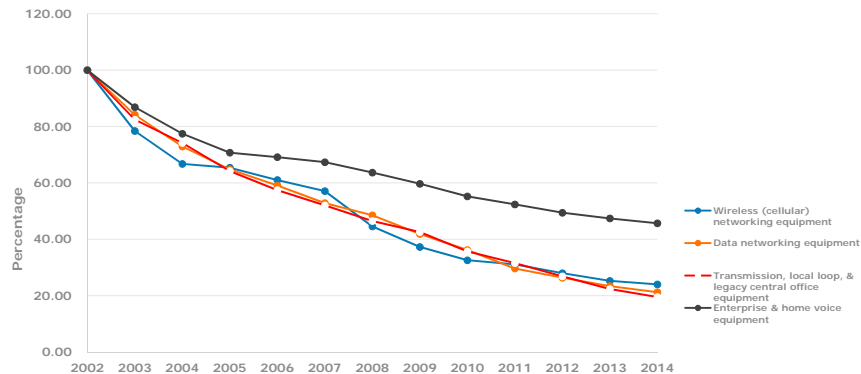
As evidenced by the above chart and graph, 2G GSM has already reached the end of its life cycle, while 3G UMTS is quickly declining and will reach the end of its life cycle in the very near future.

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Federal Reserve Product Price Indexes – Communications Equipment

Source: Board of Governors of the Federal Reserve



Declining New Equipment Prices

Source: Board of Governors of the Federal Reserve

Year	Wireless (cellular) networking equipment	Data networking equipment	Transmission, local loop, & legacy central office equipment	Enterprise & home voice equipment
2002	100.000	100.000	100.000	100.000
2003	78.421	84.193	82.442	86.867
2004	66.743	72.919	74.186	77.444
2005	65.392	64.792	64.199	70.729
2006	61.029	59.077	57.458	69.143
2007	57.098	52.839	52.041	67.347
2008	44.562	48.512	46.492	63.662
2009	37.281	41.914	42.588	59.681
2010	32.567	36.211	35.712	55.224
2011	31.079	29.646	31.57	52.364
2012	27.983	26.375	26.866	49.42
2013	25.242	23.413	22.344	47.417
2014	24.002	21.209	19.545	45.681

* 2014 figures estimated based on average of actual 2014 Q1 through Q3



Declining New Equipment Prices

Source: CostQuest, Development of Wireless Replacement Cost New Index Factors

CostQuest RCN Wireless Indexes						
Year	Tower	Power	Shelter	RAN Control Electronics	RAN Electronics	Cabling, Antenna
1995	164.0%	105.2%	57.4%	14.0%	1.8%	5.3%
1996	163.0%	104.2%	59.8%	15.1%	2.2%	6.2%
1997	157.7%	103.4%	63.7%	16.4%	2.7%	7.3%
1998	155.8%	102.6%	69.6%	17.8%	3.2%	8.6%
1999	159.1%	101.5%	85.6%	19.3%	3.8%	10.1%
2000	153.1%	101.1%	87.1%	20.8%	4.4%	12.1%
2001	153.8%	98.7%	96.8%	22.6%	5.2%	14.3%
2002	148.9%	97.3%	109.1%	24.7%	6.2%	16.7%
2003	141.9%	97.4%	123.4%	28.9%	8.6%	19.4%
2004	119.6%	103.9%	120.0%	32.7%	12.2%	24.9%
2005	112.0%	104.7%	112.9%	35.7%	14.9%	29.4%
2006	109.6%	105.1%	108.4%	39.9%	18.1%	36.1%
2007	106.1%	105.6%	97.0%	45.2%	21.0%	34.2%
2008	103.9%	103.1%	94.7%	53.3%	26.1%	35.5%
2009	96.0%	103.1%	91.4%	62.7%	32.7%	43.5%
2010	95.5%	103.6%	94.2%	68.2%	41.6%	52.7%
2011	101.4%	102.5%	105.8%	73.1%	53.4%	61.7%
2012	101.6%	101.9%	105.5%	86.5%	69.3%	70.5%
2013	99.9%	99.7%	100.0%	97.8%	92.9%	93.4%



Obsolescence Inherent In Older Equipment

- Continued decline in new equipment acquisition costs (e.g., "Negative Trend Factor")
- Depreciation curves must be steeper to reflect declines in equipment cost & capability
- GSM & UMTS have significant operating cost & performance disadvantages compared to LTE

Current Cost Comparison Using Same Amount of Capacity

Note: Not adjusted for speed differences/throughput OR additional capital costs for spectrum

Technology	Cost
GSM Base Station (including 911 LMU)	\$388,728
UMTS / NodeB	\$109,878
LTE / E Node B	\$38,498

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GSM BASE STATION UMTS BASE STATION New UMTS – NODE B



LTE



LTE-A not pictured because it's primarily software!



Depreciation Issues for Wireless Equipment

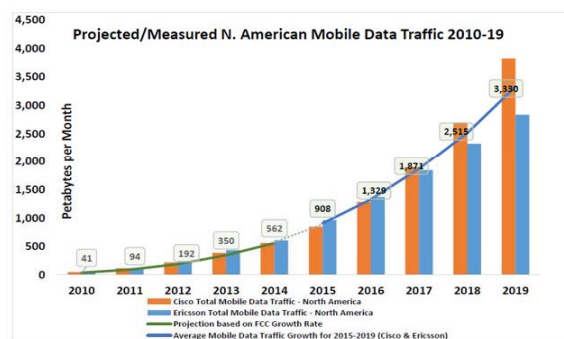
- Declining new equipment costs results in a value loss for the existing asset base - Negative Trend Factors or Replacement Cost
- Much faster adoption of LTE indicates economic lives are getting shorter. Depreciation curves must be steeper.
- Software Define Network is planned to carry 75% of network functionality by 2020. This 4G LTE network of servers/routers eliminates the need to operate most Edge Switching Centers. Replaced with fewer network hubs.
- Declining utilization of the GSM and UMTS technology-based networks significantly shortens the lives of equipment.
- GSM & UMTS have significant operating cost & performance disadvantages compared to LTE and even current UMTS.
- **Cost to retrofit sites after initial construction create huge distortions in accounting costs due to duplication of cost, inclusion of removal cost, failure to retire displaced investment**

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The U.S. Mobile Wireless Industry is Mature

- In 2014, the U.S. wireless industry experienced its first ever YoY decline in service revenues, marking an end to nearly three decades of rapid growth
- The number of connected devices now exceeds the U.S. population
- The wireless industry needs to enable new services for future growth
 - For new services, a new “5G” network is required
 - 4G has been pushed to its limit as current networks are stretched to capacity



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Price & Service Competition Increasing

- During 2014, T-Mobile and Sprint initiated a price war
 - price, data allowances, early termination fees, device offer and trade-in allowance
- As of late 2015, Sprint is offering “biggest wireless offer in U.S. history” – 50% off the price of most Verizon, AT&T and T-Mobile rate plans.
- Sprint just recorded its first quarter of positive phone net adds in several years.
 - Every other carrier saw a decline in year over year net phone adds
 - **AT&T has now lost phone subscribers for four quarters straight and six of the last eight quarters**
- **Price cuts featured in these plan offers push down ARPU, AT&T experienced a 4.4% monthly decline in 2014.**

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New Competitors

- **Google is up to... something**
 - Project Loon is designed to deliver the Internet to under-served regions of the world
 - Project Titan involves using drones to deliver packages
 - Project Fi includes handset financing with cell service
- **Freewheel** from Cablevision announced Jan. 26, 2015
 - Available nationwide in February 2015
 - **Wi-Fi only** service offered with Motorola Moto G smartphone
- **Xfinity Wi-Fi** from Comcast
 - **Current lawsuit in California:** pushed to arbitration
 - CEO Cavanaugh said “I know enough to be dangerous” and is exploring MVNO options
- **Republic Wireless** - \$5 and \$10 per month plans
- **FreedomPop** – WiFi with \$19/month iPhone plans
- **WhatsApp** - WiFi
- **Scratch Wireless** – No cost WiFi and \$1.99 roaming day pass
- **Karma Go** – WiFi hotspot
- **C Spire** - privately held
- **NTS Communications** - alternative fiber-to-the-premises (FTTP)
- **Municipal broadband** i.e., Chattanooga's “Gig City”

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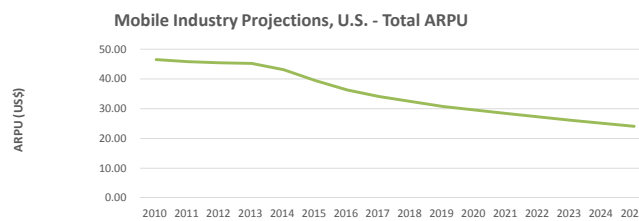


Anticipated Industry ARPU

SNL Kagan, as of October 2015

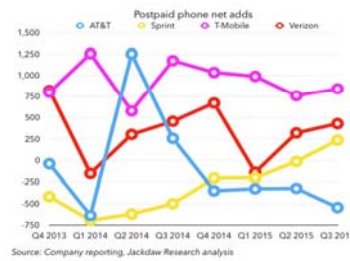
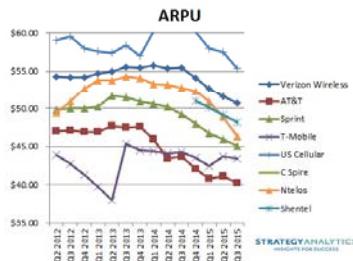
Mobile industry projections, U.S., 2010-2025																'15-'25 CAGR		
ARPU	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024		2025	
Total ARPU	(\$)	46.52	45.81	45.44	45.23	43.16	39.44	36.28	34.11	32.40	30.78	29.55	28.37	27.23	26.14	25.10	24.09	(4.8%)

The following figures are provided as guidelines but cannot be used to calculate accurate revenue figures due to lack of specific revenue information from operators from these subscriber sets: Postpaid ARPU, Prepaid ARPU, Wholesale + CDs Blended ARPU and Postpaid ARPA.



Price & Service Competition Increasing

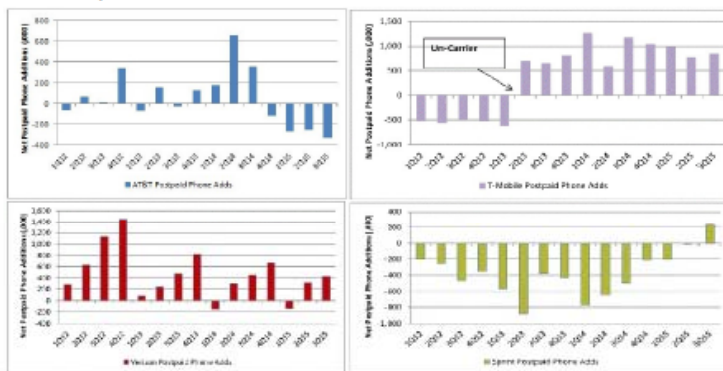
- **Postpaid ARPUs are down across the board for all four major carriers**
 - Since Q3 2012, T-Mobile and Sprint have had the steepest declines.
 - Over the same period, AT&T and Verizon have experienced high single digit percent declines.
 - Postpaid phones are the mainstay of the U.S. mobile market, but growth in this category is really starting to slow. However, all carriers are not seeing the same trend.
 - the trend is particularly striking at AT&T, which has now lost phone subscribers for four quarters straight. In fact, AT&T has lost phone subs for six of the last eight quarters.



Margin Erosion – Issues Impacting Margins

- Aggressive promotions from T-Mobile and acquisition of low revenue accounts by Sprint and Verizon via discounts and promotions has led to positive phone net additions.
- AT&T is positioned for continued subscriber declines and lower prices.

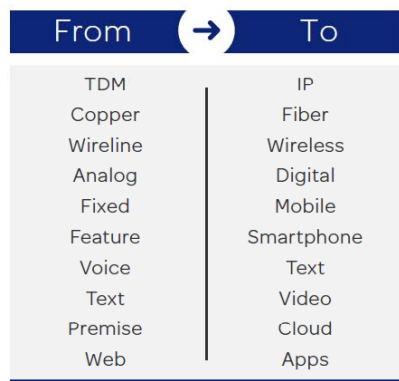
Chart 6: Postpaid Phone Net Additions



Source: Company reports, Pacific Crest Securities estimates



Mobile, cloud and fiber are the critical architectures

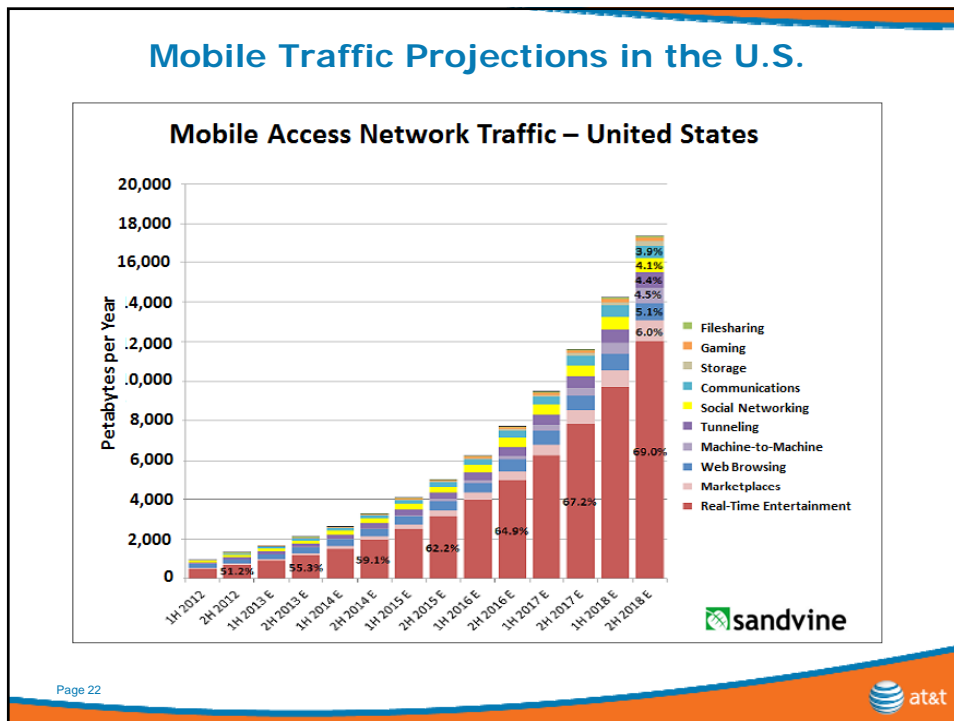
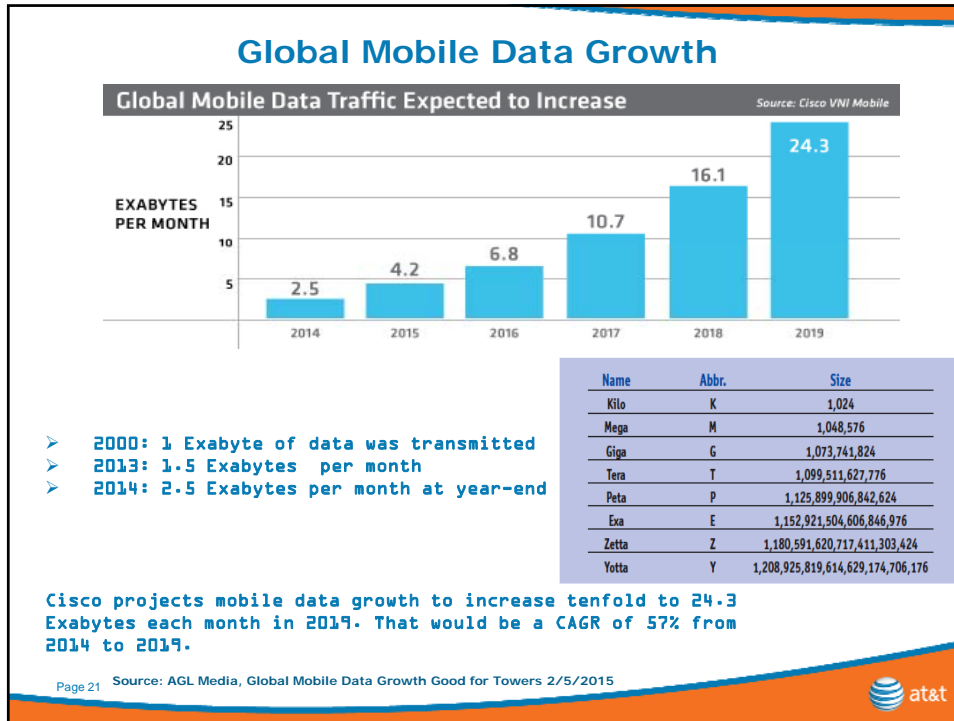


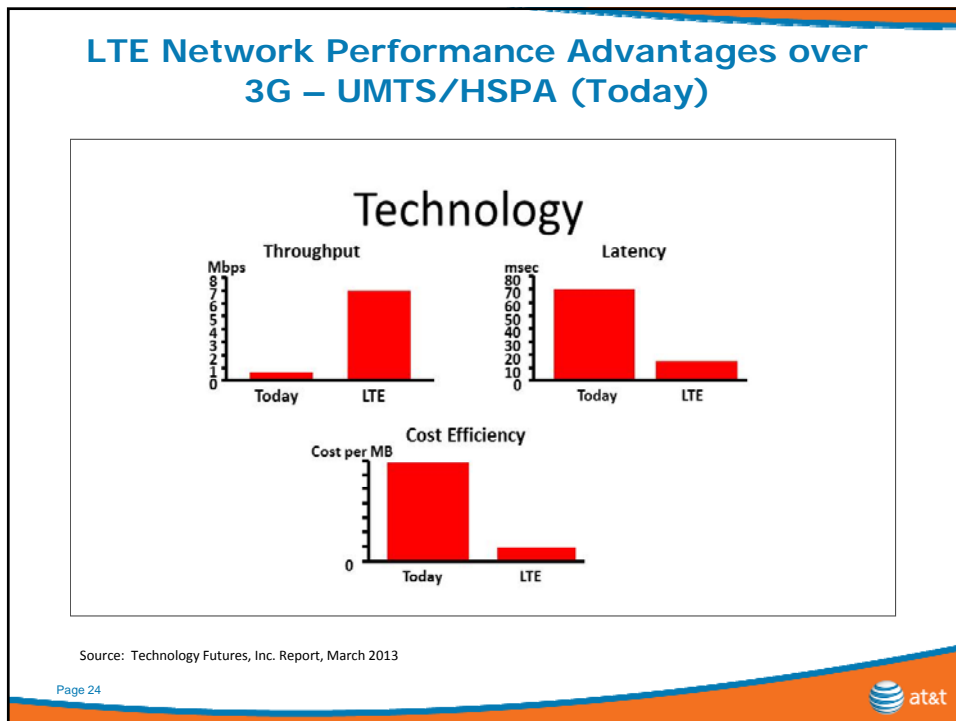
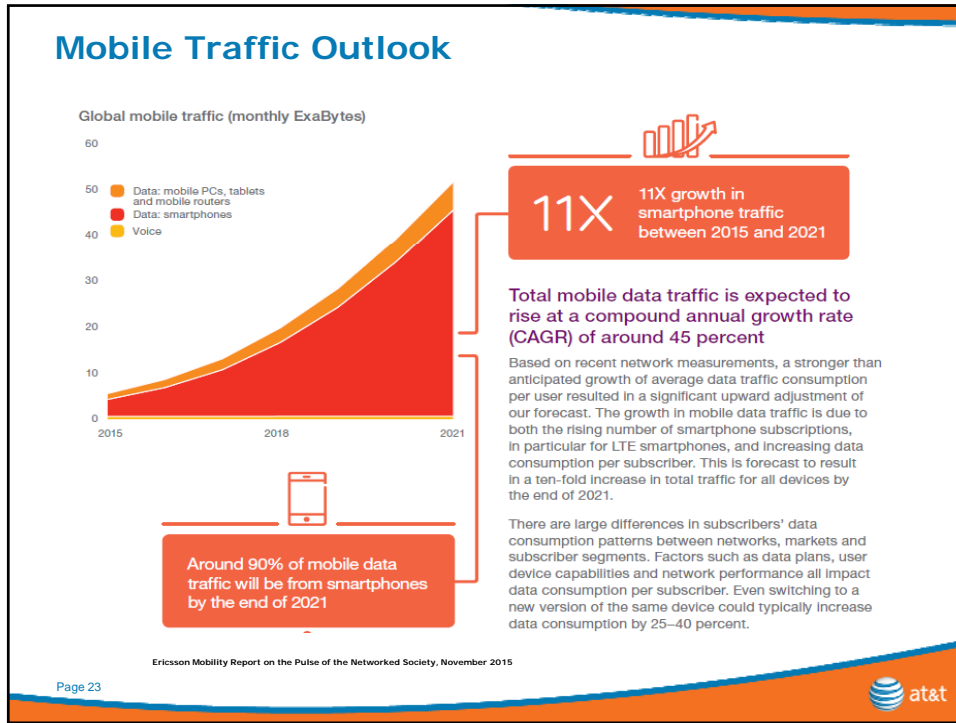
100,000% increase
in AT&T wireless data traffic

2007 2008 2009 2010 2011 2012 2013 2014

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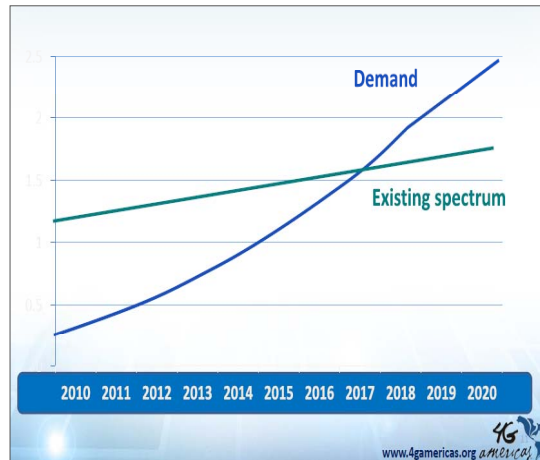






Other Risk Factors (cont.)

Spectrum vs. Demand in the U.S.



Per the FCC's National Broadband Plan:

"The Mobile Industry will need an additional 500 MHz above the existing spectrum base by 2020."

Source: The Evolution of Mobile Broadband and Regulatory Policy; Chris Pearson, President, 4G America, Presentation at LTE North America, Dallas Texas, November 21-22, 2013.

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AWS Spectrum Auction Impact

- The FCC closed the 2014 spectrum auction on Jan. 29, 2015 the total AWS-3 spectrum bids total in excess of \$44.8 billion
 - AT&T was the highest bidder at the auction with winning bids totaling \$18.2 billion
- Craig Moffett has stated the spectrum auction will highlight deep cash flow challenges for the winning wireless carriers
 - "In order to earn even a modest return on the \$38 billion bid in the auction, the Big Four carriers will need to generate an incremental \$1.40 per month of wireless revenue for every man, woman and child in America. In perpetuity."
 - "earning even a modest 6.5% after-tax return on this huge new investment will require that the industry generate more than \$5 billion in incremental annual revenue."
- Wells Fargo predicts that AT&T will outspend its rivals during the FCC's incentive auction next year, spending up to \$10 billion on a 2x10 MHz block of spectrum with nationwide capability.
- Total bids expected in the \$30 to \$35 billion range. The price could be driven up by "dark horse" players (i.e., Comcast, Google, Facebook and other companies that do not currently play in the wireless industry).

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**But... what about...
BIG RED?**

"Those who lump AT&T and Verizon Communications together simply because of their past behaviors miss the importance of their 2014 and 2015 activities. **Future cash sources for these two companies will be different if they are successful.**"

Jim Patterson, CEO Patterson Advisory Group

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Profit margins are shrinking

EBITDA declining

The Search for Growth

AT&T must innovate to find new revenue

New ventures:

Mexico

DirecTV

Multicast

Connected **everything**

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Internet of Things

- AT&T expects 50 billion "things," or connected apps and hardware, to be linked up and sharing data from smartphones to traffic lights and beyond by 2020.
- AT&T plans to take what could be mass confusion and make sense of it all:
 - Smart cities
 - Smart homes
 - Smart cars
 - entertainment

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AT&T Digital Life brings the Internet of Things home

- AT&T Mobility stakes its claim as being the leader in the "Internet of Things" arena in terms of investment and commercialization.
- AT&T Digital Life is smart home, security and automation solution that is available in most markets
- Offers automated solutions such as camera solutions, energy, door locks, water controls, receive notifications when a door opens, schedule tasks such as lights turning on at sunrise, to set up protocols that could time doors to unlock, lights to turn on and the air conditioning to kick in when the garage door opens.

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AT&T Building Smart Cities

- Building a framework to help cities better serve their citizens. Alliances with Cisco, Deloitte, Ericsson, GE, IBM, Intel, and Qualcomm Technologies, Inc
- **Citizen Engagement** – Mobile apps give people information to stay better prepared. Traffic, parking spots & reserve parking
- **Transportation** – Digital signage lets commuters know in near real-time when the next bus or train will arrive. People can rent electric bikes at stations across the city to reduce traffic.
- **Public Safety** – Cities can better manage traffic patterns of pedestrians at stadiums, parks, and busy intersections. Gun fire detection technology helps law enforcement know where a shooting occurred. It also helps them determine the number of people involved and rounds fired.

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Cloud Services

- Faced with declining voice revenues and shrinking margins in both mobile and wireline broadband, telcos have jumped into cloud services
- Telco-in-the-cloud phenomenon began in earnest in 2012, the market is just now beginning to come of age
- Telco goal to uncover new revenue streams and make the most of their investment in the network.
- Could services growing at around 30 percent CAGR, and the firm estimates that telcos could garner around 18 percent of the market this year, across SaaS,

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AT&T launched Multicast in 2015

- Ability to more efficiently broadcast the same content to a large number of users with much greater network efficiency
- Largest example to date was the Multicast during the 2015 college championship game at AT&T Stadium in Dallas
 - 6.34 Terabits (TB) of AT&T data transmitted
 - 1.41 TB over the DAS system and 4.93 TB over WiFi
 - 2.00 TB used by other carriers (Sprint, Verizon, T-Mobile)
 - 8+ TB flowed through the AT&T-equipped site
- **Video** drives the bulk of wireless traffic
 - Ericsson's August 2015 mobility report shows that globally there was 55% data traffic growth year-on-year to Q2 2015 to over 4000 Petabytes per month (uplink and downlink, excluding WiFi, mobile WiMAX or DVB-H)

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AT&T Connected Car

- Company calls that platform [AT&T Drive](#),
- Global solution that is flexible enough to meet the needs of manufacturers throughout the world
- Relationships with 9 manufacturers
- AT&T is deeply involved with building out connected cars as a category. It's developing foundational software, coming up with useful features that wireless access can make possible, and providing hand-holding for automobile companies as they figure out their digital future.
- 75% of new cars will sport built-in connectivity by 2020.

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AT&T's Acquisition of DirecTV

- Purchase price:
 - Cash and Stock **\$48.5B**
 - Debt Assumed \$18.6B
 - Total Cost \$67.1B
- **39M** Satellite TV customers compared to AT&T's **5.9M** TV customers
- All about cost of content
 - **60%** of AT&T video subscription revenue is paid for content
- Value in ability to stream content on mobile devices on AT&T's wireless network
- Significant service provider in Latin America. Rumors AT&T may sell Latin America
- **Transaction approved July 2015**

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AT&T plans to leverage DirecTV content for upcoming mobile video service

- The Direct TV acquisition was all about video services over mobile devices
- Mobile video service launching in January 2016
- Deploying 40 MHz of contiguous nationwide spectrum to support the service
- AT&T has also entered into a joint venture with The Chernin Group called Otter Media, with the intent to create content for streaming video services.
- AT&T Resurrects Unlimited Data in Bid to Get More Customers for TV and Wireless
- The unlimited data plans will cost \$100 for the first line and \$40 for additional lines. Those who buy three lines can get a fourth one for free.

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Moody's: AT&T's new unlimited plans could hinder long-term data revenue growth

January 12, 2016 | By [Colin Gibbs](#)

- Moody's believes AT&T's unlimited plans are a direct response to T-Mobile's ([NYSE:TMUS](#)) Binge On service, which provides zero-rated data from specific providers and lightens traffic on the network by throttling network speeds for video.
- Moody's said, a return to unlimited data plans could potentially trigger a price war. The firm added that data volume growth is one of the last remaining avenues for industry revenue growth, and that a return to unlimited plans could be a road block for that avenue.

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Regulatory Issues Add Risk

February 26, 2015: FCC passed a measure to more strictly regulate the Internet

- Title II regulation of data services, including wireless data
 - Reclassify broadband as an old style public utility service
 - Prohibit paid priority services
 - Require providers to share networks with competitors
 - Google supportive of the move to Title II

Now

- Litigation
- Some AT&T projects were shelved due to uncertainty

"Title II regulation stems from an era of rotary telephones when there was only one telecommunication service and it was delivered in a monopoly setting. While Title II was certainly appropriate for that age, it's not appropriate for the modern era of multimedia broadband services offered by the range of competitive service providers."

Internet Innovation Alliance Honorary Chair and former Virginia Congressman Rick Boucher

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