

January 27, 2017

2017 TFI Asset Valuation Conference

Broadband Industry Panel

TFI Communications Technology & Asset Valuation Conference

January 26-27, 2017, Austin, Texas

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Broadband Internet Subscribers (3Q 2016)

	Subscribers	% of All	Rank
Cable Companies			
Comcast	24,316,000	26%	1
Charter	22,202,000	24%	2
Altice	4,122,000	4%	8
Mediacom	1,145,000	1%	
WOW (WideOpenWest)*	728,400	1%	
Cable ONE	510,573	1%	
Other Major Private Company**	4,765,000	5%	6
Total Top Cable	57,788,973	62%	
Phone Companies			
AT&T	15,618,000	17%	3
Verizon	7,038,000	8%	4
CenturyLink	5,950,000	6%	5
Frontier^	4,404,000	5%	7
Windstream	1,063,000	1%	
FairPoint	309,547	0.3%	
Cincinnati Bell	299,800	0.3%	
Total Top Phone Companies	34,682,347	38%	
Total Broadband	92,471,320		
Sources: Leichtman Research Group Inc. and FierceTelecom			
** Est. for COX			

Broadband – Becoming More Important

John Donovan, chief strategy officer and group president at AT&T Technology and Operations, claims explosive data growth across its network. Latest numbers claim **250,000%** increase, with video services noted to be a significant contributor.

Can no longer measure broadband connections, as in previous slide, based on fiber and coax internet connections.

Will need to include all forms of wireless and 4G and 5G.

Broadband – Does the customer care?

Customers just want their content when they want it and **quickly**

On a flight, do you care about who made the engine or wheels?
Just get me from point A to B **economically** and **safely**.

AT&T wants to get content to the customer anytime anywhere

Serving Customers Anywhere, Anytime

Customer will be Technology Agnostic

- ❖ Home or Office hardwired?
- ❖ Home or Office wireless and hardwired?
- ❖ Car, bus, bike or train
- ❖ Walking around
- ❖ In an airplane

Hybrid of mixed technologies is needed for ubiquitous broadband

Broadband at AT&T

GOAL: 1 Gig service to all customers, **anytime anywhere**

The delivery mediums are not important and will/may be hybrid:

- ☐ Fiber – home or business
- ☐ Fiber mix with coax or copper
- ☐ Wireless
- ☐ Fixed Wireless
- ☐ Satellites

Broadband at AT&T

Fiber

- At least 12.5 million locations in 67 metro areas with 100% fiber network by mid 2019
- G.fast technology has speed of fiber on existing copper starting in 2017 mostly to MDUs

Fixed Wireless

- 400,000 locations by end of 2017
- 1.1 million locations by the end of 2020

Wireless

- 1 Gbps speeds in 2017
- Deploy additional 4G LTE Advanced
A Foundation for 5G evolution

Innovative hardware developed by AT&T will upgrade electrical poles to deliver high-speed wireless broadband, called **AirGig**.



Broadband at AT&T

AirGig – Field trials in 2017

Low-cost multi-gigabit speeds over existing power lines

5G Lab trials achieving wireless speeds of 14 Gbps

1 Gbps at some cell sites in 2017

2017 trials in Austin streaming DIRECTV NOW video
over fixed wireless

2016 5G business trials for video and conferencing

2017 mobile and fixed trials in 28 and 39 Ghz bands
operating in mmWave spectrum – multi-gigabit rates

Property Tax Issues

Obsolescence due to competition and earnings pressure?

Verizon, AT&T set to lose 9M customers to cable operators by 2018, New Street says:

“This is worse than we thought for the incumbents and is **set to get worse** still with cable entering the market in 2017.”
The imminent increase in competition is a major reason why Verizon and AT&T are looking to expand into digital media and advertising. (Fiercewireless.com, 11/23/2016)

Property Tax Issues

Obsolescence due to competition and earnings pressure?

Advertising may be a partial offset to lost revenue

Especially in video, advertising and addressable advertising will become more and more important as a revenue source for AT&T.

New competitors will challenge current market shares.

Property Tax Issues

New competitors will challenge current market shares.

Amazon runs what most experts consider the world's biggest cloud hosting service. Untold numbers of apps and websites rely upon this service to carry their data. Traditional **telcos have no part** of that. They have their own fiber infrastructure.

The *Wall Street Journal* reported in 2013 that Google had about 100,000 miles of fiber-optic routes. If Amazon, Google and Facebook don't already control more telecommunications infrastructure than the largest national telcos, they soon will.

(LightReading 12/30/16)

Property Tax Issues

New competitors will challenge current market shares.

Satellite – Companies such as SpaceX, OneWeb, and Boeing proposing networks of low-Earth satellites.

OneWeb – By 2022 operational and eventually a 700 satellite constellation of 330 pound satellites.

SpaceX – Plans 4,000 13 x 6 foot satellite network

Boeing – Plans 2,900 satellite constellation to serve worldwide

