



FTTP Feasibility Study

for

The City of Decorah, IA

Confidential Work-In-Progress
Not for Disclosure

August 2017

Uptown Services, LLC
Dave Stockton & Neil Shaw, Principals



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4. Pro Forma Financial Analysis
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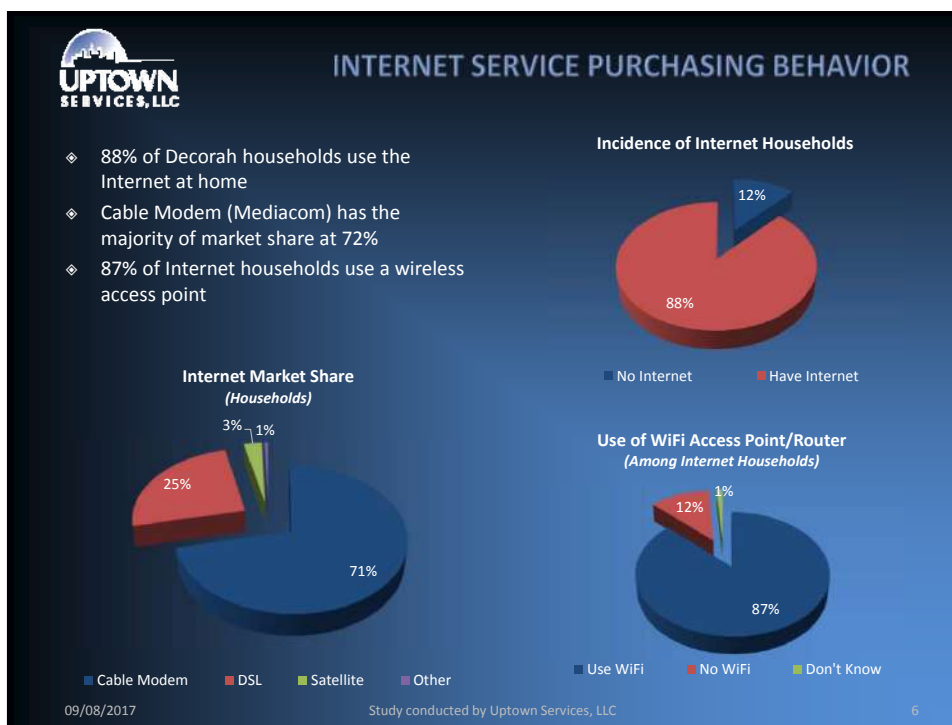
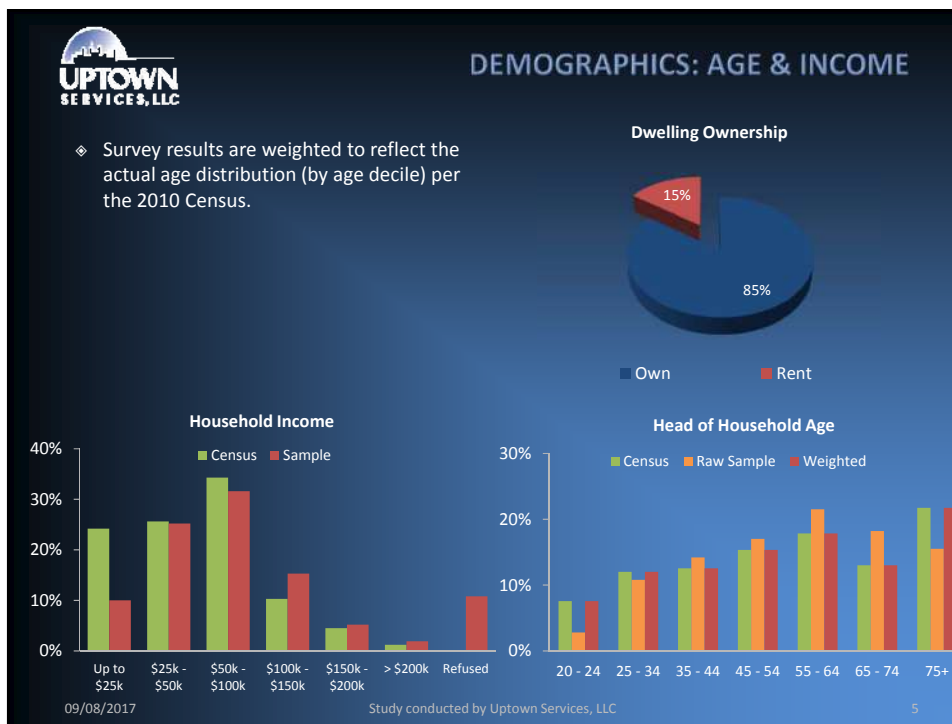
Residential Quantitative Survey Current Broadband Services Usage



DESIGN FRAMEWORK

- ◆ Area of Interest: Universe of $\approx 2,900$ households (HHs)
 - ❖ Total sample size of 400 respondents
 - ❖ 95% Confidence Interval with ± 4.6 sample error
- ◆ Results weighted to reflect actual age distribution from 2010 Census data (age of householder)¹
- ◆ Respondents screened to ensure
 - ❖ Decision-maker for telecommunications and entertainment services in the home
 - ❖ Respondents with immediate family members employed by any of the following were excluded:
 - City of Decorah
 - CenturyLink
 - Mediacom
 - Mabel Telephone
 - Northeast Iowa Telephone

¹ This can create slight rounding error in percent of respondent metrics.

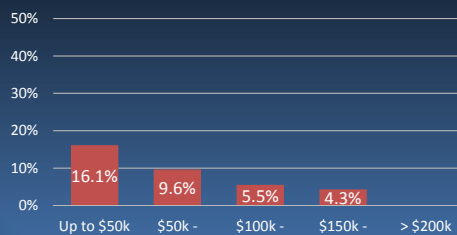




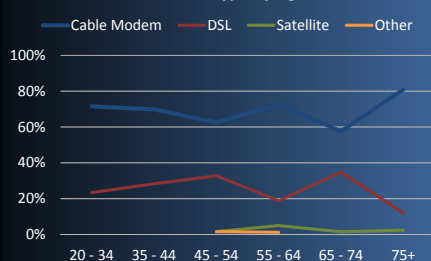
INTERNET USAGE BY HOUSEHOLD DEMOGRAPHIC

- Internet usage increases with income in Decorah
- Cable modem service is preferred across all age and income categories.

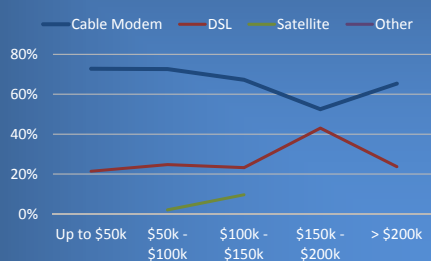
Incidence of No Internet by Income



Internet Type by Age



Internet Type by Income



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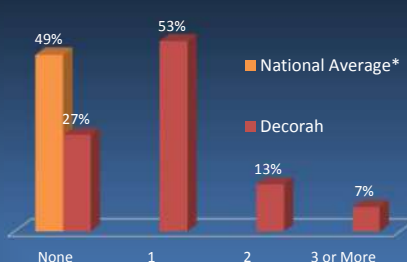
VOICE SERVICES USAGE

- Wireless substitution is lower than the national average at 27% of HHs
- A further 5% of wireline phone users will drop for wireless in the next 12 months
- The average number of lines is:
 - All Households: 0.99
 - Wireline Households: 1.35

Q11: "How likely are you to disconnect the wired phone line and only use your cell..."

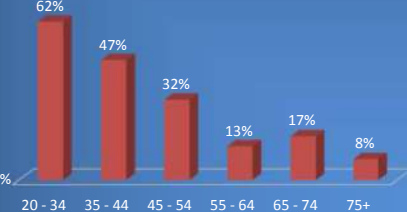


Number of Phone Lines in the Home



*Source: National Health Interview Survey, 2015

Households Without Wireline Phone Service by Age



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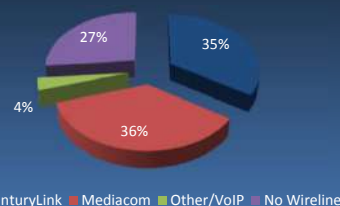
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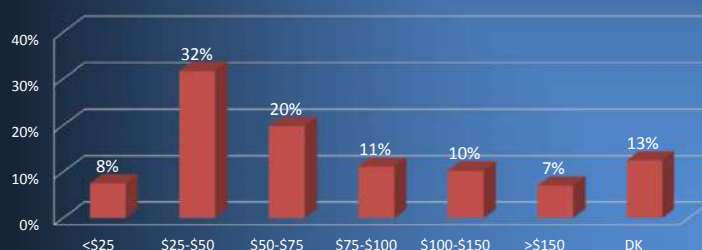
WIRELINE PHONE MARKET SHARE

- ◆ Mediacom has been able to capture market share leadership from CenturyLink by Internet service bundling

Q7: "Who is your local phone service provider?"



Monthly Local Phone Spending



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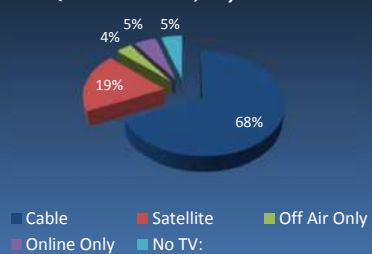
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VIDEO SERVICES PURCHASING BEHAVIOR

- ◆ 87% of households use traditional pay TV (cable or satellite dish)
- ◆ In Decorah today, 14% of households do not have Pay TV, compared to the national average of 22%

Q2: "For TV service, do you have..."



Monthly Pay TV Spend



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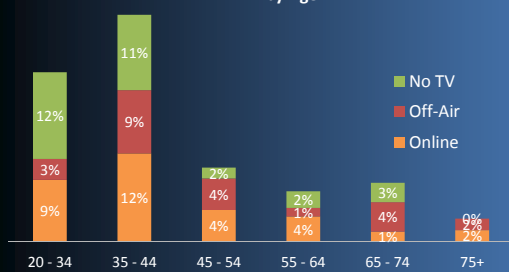
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- ◆ Over-the-Top (OTT) or online TV viewing significantly lags the national trend with 43% of Decorah households using OTT.
- ◆ Among younger households, up to 17% are using OTT or Off Air as a substitute service
- ◆ Uptown estimates a further 3% of pay TV users in Decorah will 'cut the cord' in the next 12 months

Households Using Substitute Service In Place of Pay TV by Age

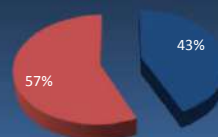


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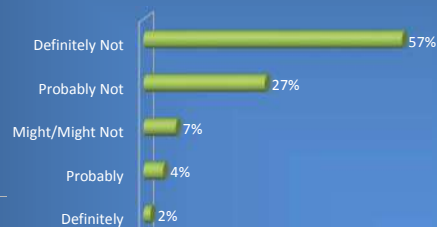
EMERGING VIDEO SERVICES

Q5: "Do you sometimes watch TV online?"
(Among Pay TV Households)



■ Yes ■ No

Likelihood of Cancelling Pay TV for OTT
(among all pay TV users)

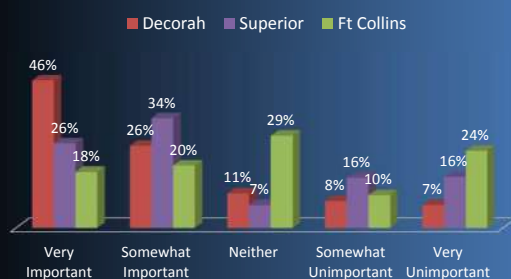


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- ◆ Across all households in Decorah, 42% have all 3 services from a single provider.
- ◆ The importance of bundling is high when compared to our Superior, CO (2017) and Ft Collins, CO (2016) surveys

Importance of Having All 3 Services from a Single Provider
(Among All Respondents)



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BUNDLING

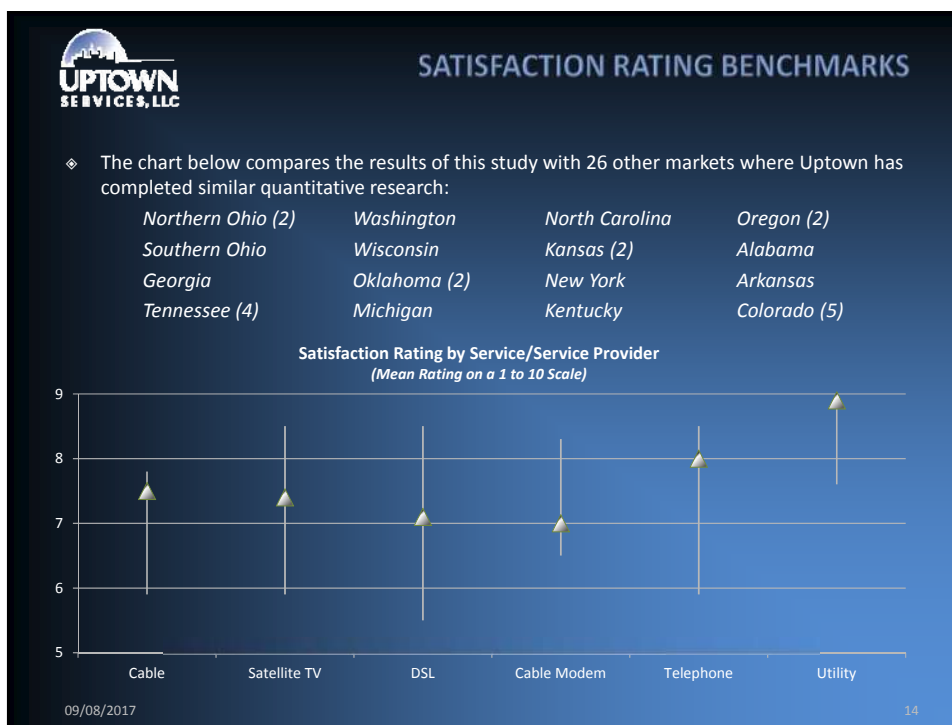
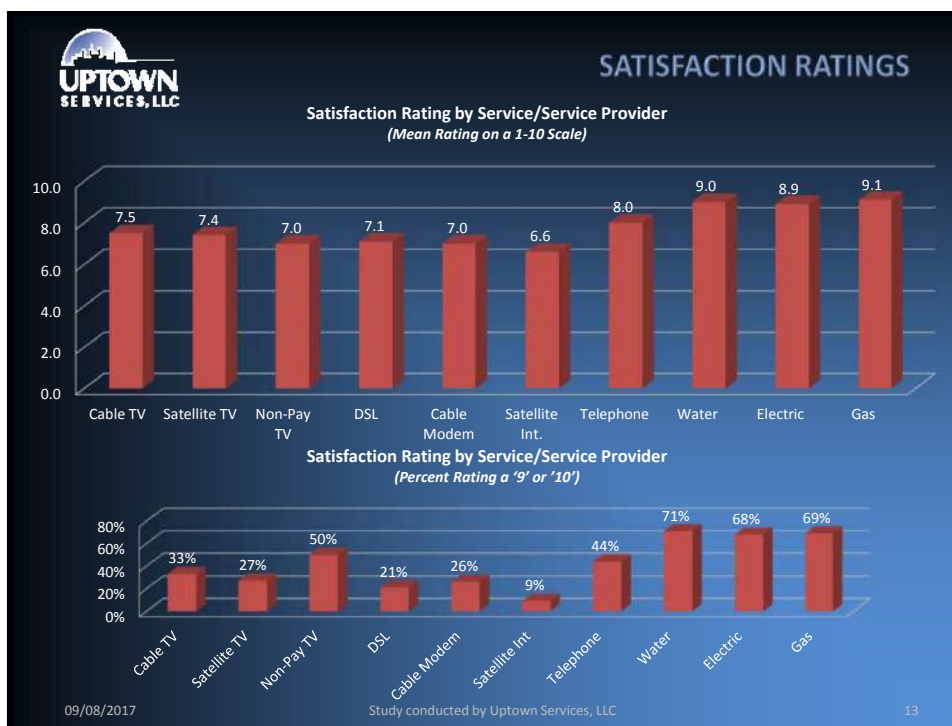
Monthly Bundle Spending



Incidence of Triple Play Bundle



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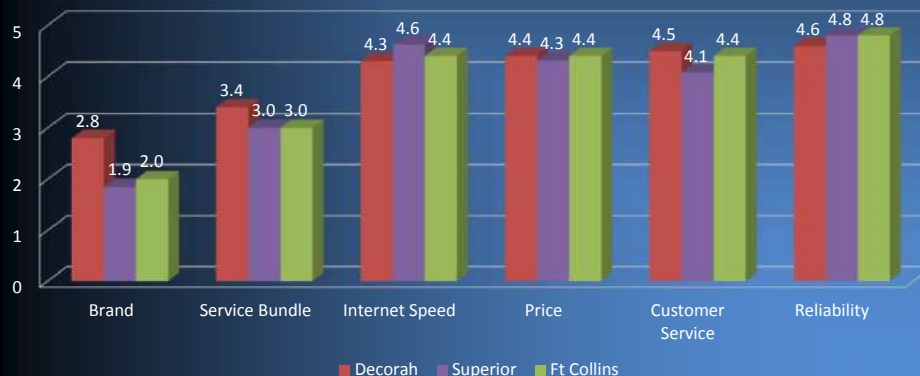




ATTRIBUTE IMPORTANCE

- While reliability and price are always important, Internet speed has dramatically increased in importance over the last several years. Bundling and Brand are secondary in importance to other attributes...

Importance Rating of Select Broadband Service Attributes
(Mean Rating on a 1-5 Scale)



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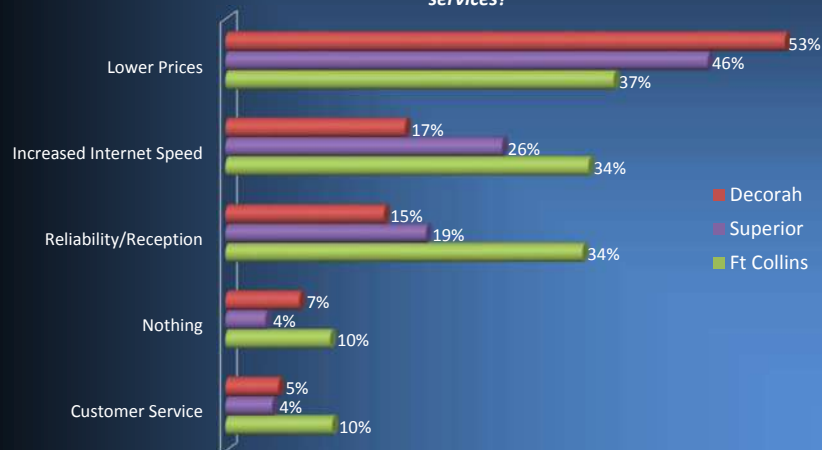
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CUSTOMER NEEDS

- Decorah households place importance on lower prices and Internet speed...

Q30: "What would you like to see most improved from your current broadband services?"



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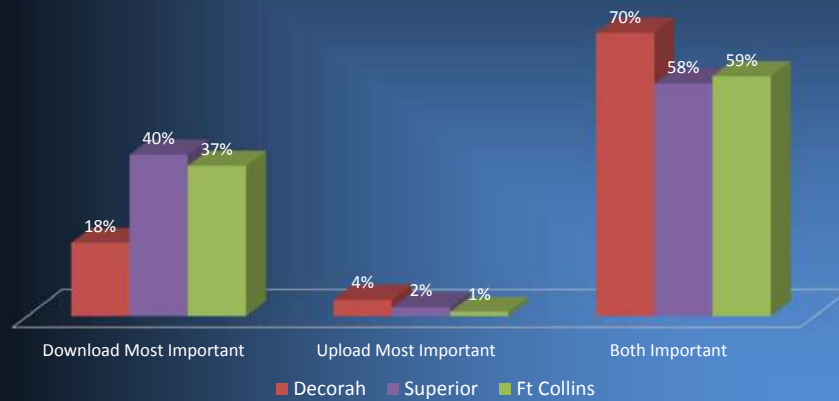
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IMPORTANCE OF DOWNLOAD VS. UPLOAD

◆ Question 33: "What aspect of Internet speed is most important?"

Importance of Internet Speed on Download vs. Upload



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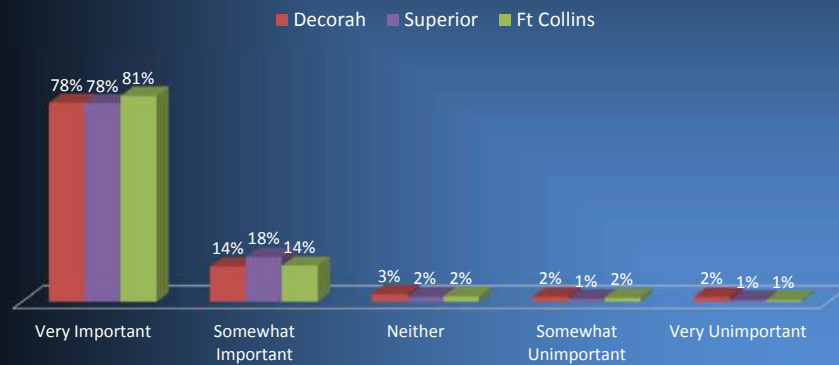
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IMPORTANCE OF LOW COST HIGH-SPEED INTERNET

◆ Question 27: "In your opinion, is the availability of low-cost, high-speed Internet important to the future local economy?"

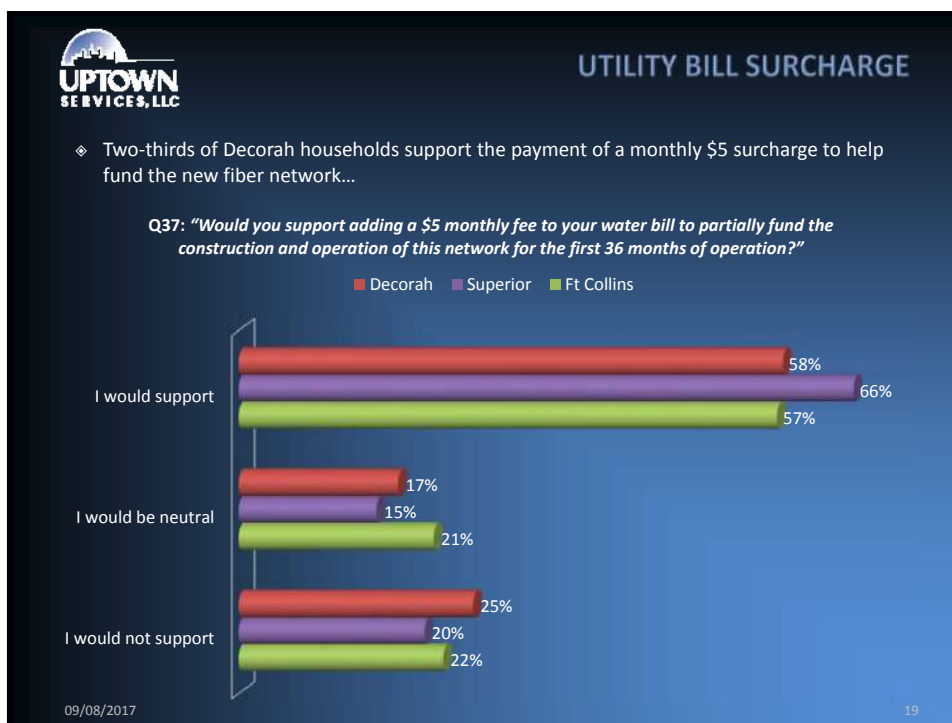
Importance of Having Low Cost High-Speed Internet



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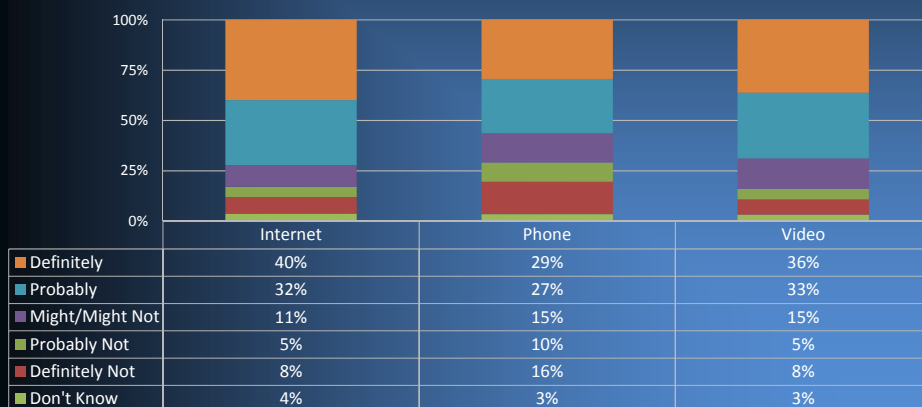
FTTP Market Potential – Current Market



PURCHASE INTENT

- 72% of respondents indicated they would definitely or probably switch to the FTTP system for Internet service...

Q26-28: "How likely would you be to subscribe to [insert service] if it were 10% less than Mediacom or CenturyLink charges?"



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PENETRATION CALCULATIONS

- Uptown uses a 'Likert Scale' with Overstatement Adjustment
 - Conservative research techniques from the Packaged Goods sector
 - Clearly specify purchase intent vs. "interest" and removes overstatement bias
- Example: "How likely would you be to subscribe?"
 - Definitely Would 21.5% x 70% = 15.0%
 - Probably Would 35.6% x 30% = 10.7%
 - Might/Might Not 20.0% x 10% = 2.0%
 - Probably Would Not 10.4%
 - Definitely Would Not 4.4%
 - Don't Know 8.1%

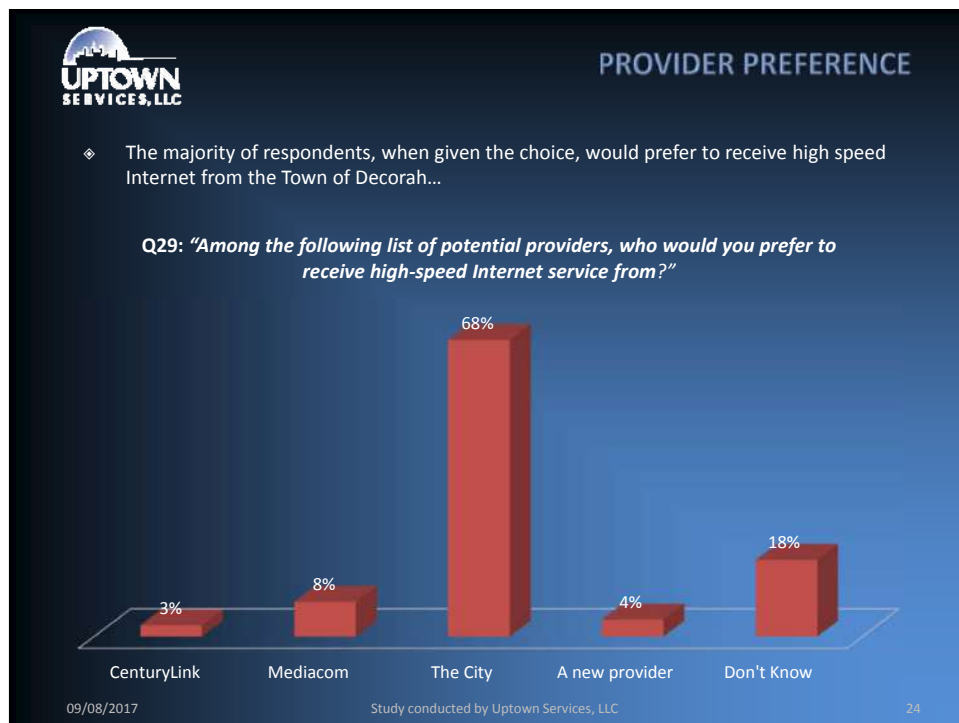
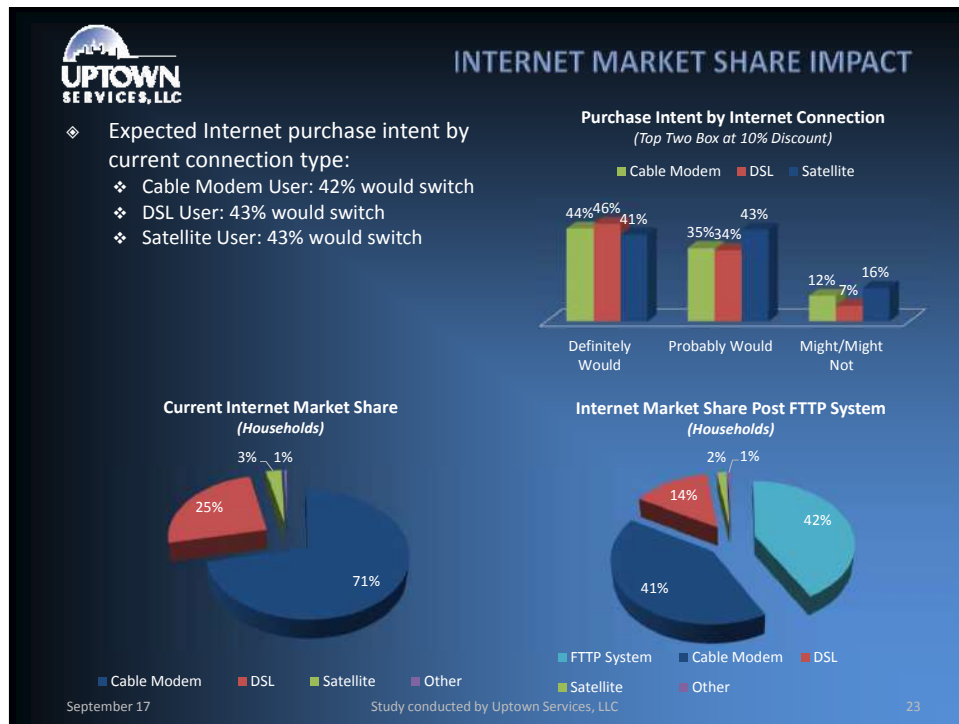
27.7% = Penetration Estimate

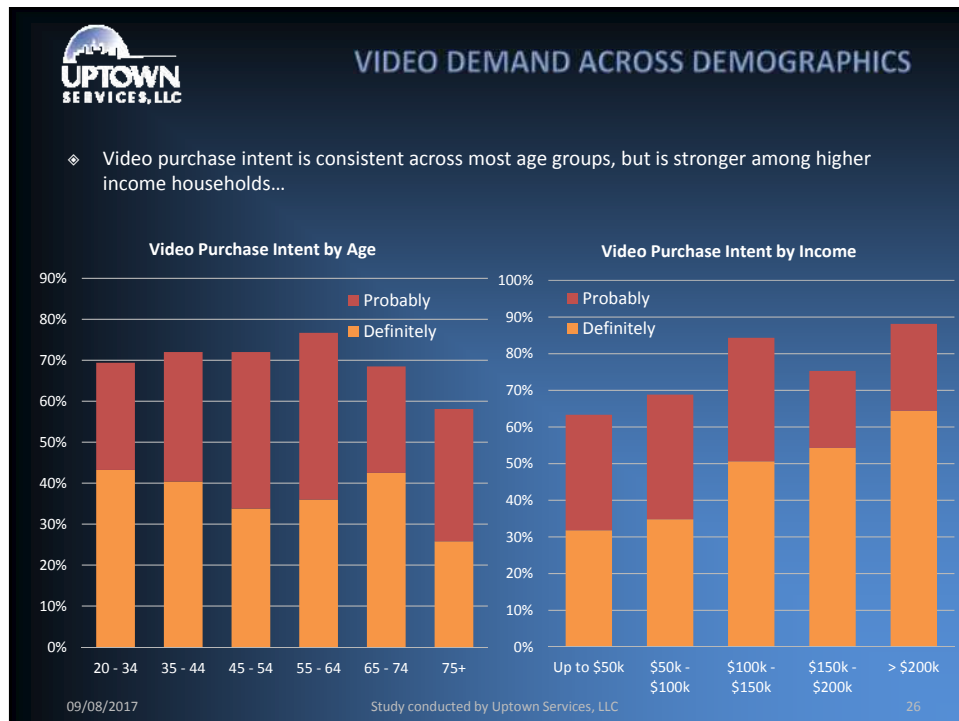
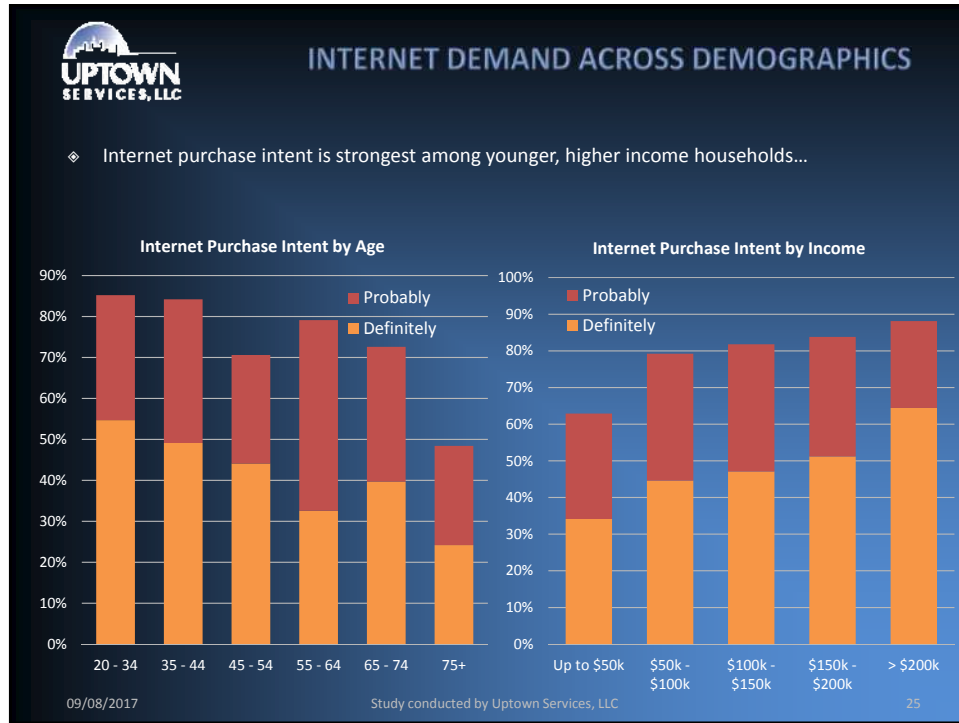
	Residential (Terminal / Year 5 Eroded)	Small Business (Terminal)
Video	36.7% / 31.2%	-
Internet	38.7%	40.0%
Telephone	30.1% / 21.1%	30.0%

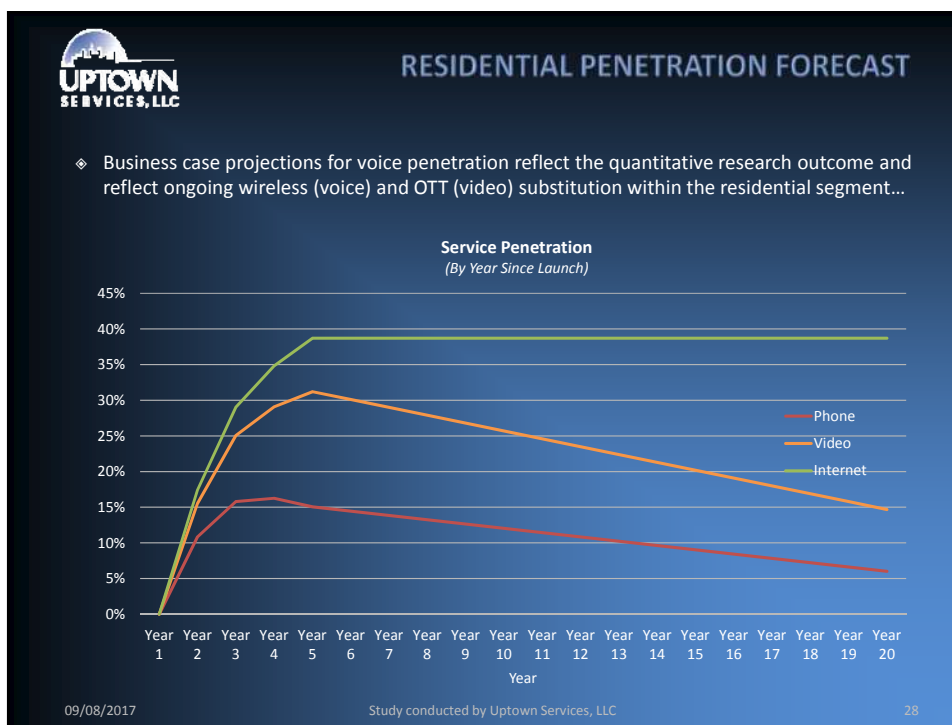
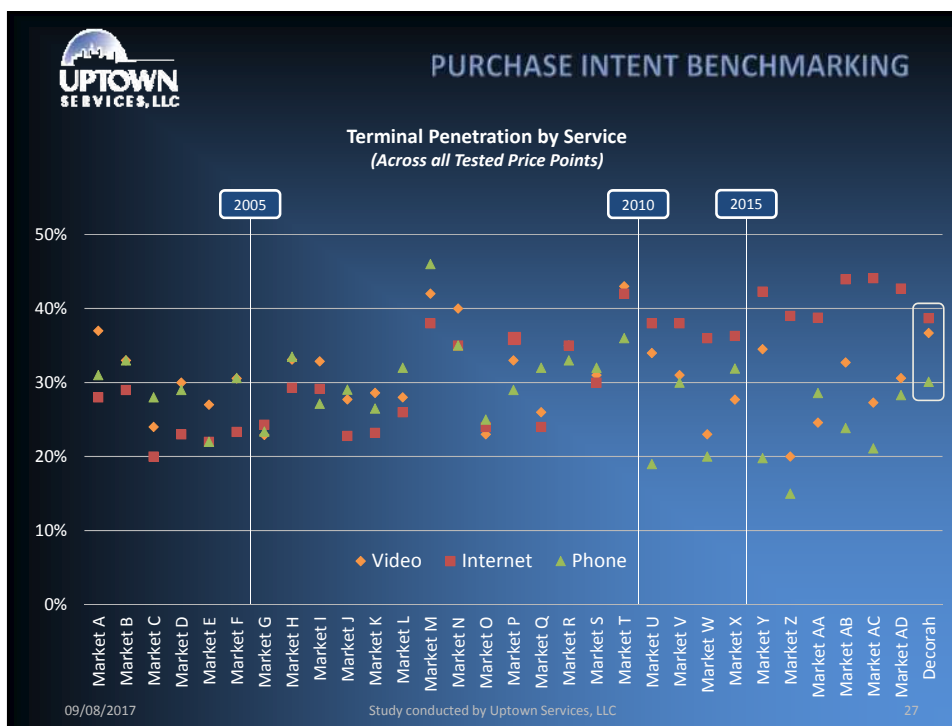
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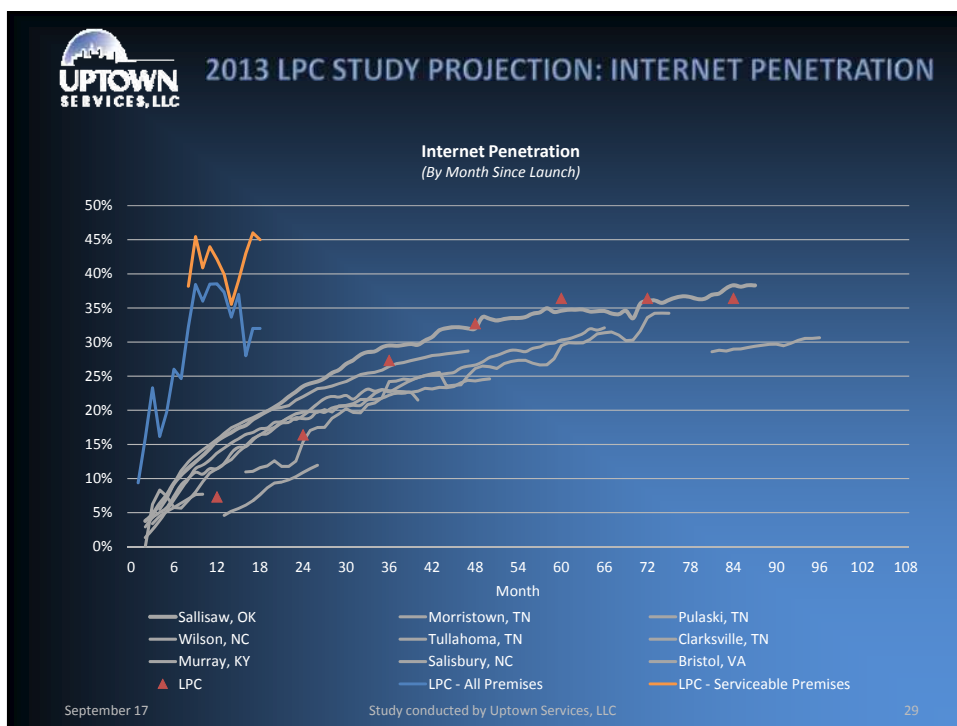
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Residential Quantitative Survey

FTTP Market Potential – Future Market



DOCSIS 3.1 TECHNOLOGY

- ◆ The DOCSIS3.1 cable modem standard was initially deployed by MSOs in select markets starting last year. DOCSIS 3.1 works by using a much denser compression scheme via 4096 QAM and a new channel division multiplexing protocol (OFDM). This has reduced channel width from 6 MHz to 20-50 kHz, enabling bonding of carrier channels into a frequency block of 192 MHz.
- ◆ The upgrade requires cable modem replacement and firmware upgrade to the deployed CMTS platform. Outside plant changes to the HFC distribution network are not required.
- ◆ Mediacom announced completion of its DOCSIS3.1 upgrade across Iowa in early 2017 with the launch of 500M and 1G tiers. Pricing for the 1G tier is \$100 for the first year under 24 month term (research tested \$70/mo. promotional rate).

Maximum Synchronization Speed (Maximum Usable Speed)				
	DOCSIS 1.x	DOCSIS 2.0	DOCSIS 3.0	DOCSIS 3.1
Downstream	42.88 (38) Mbps	42.88 (38) Mbps	171.52 (152) Mbps	Standard: 10 Gbps Initial Modems: 4-5 Gbps*
Upstream	10.24 (9) Mbps	30.72 (27) Mbps	122.88 (108) Mbps	1 Gbps
Year Deployed	1997	2005	2008	2016

September 17 * Due to backward compatibility requirement of initial 3.1 modems with DOCSIS 3.0.

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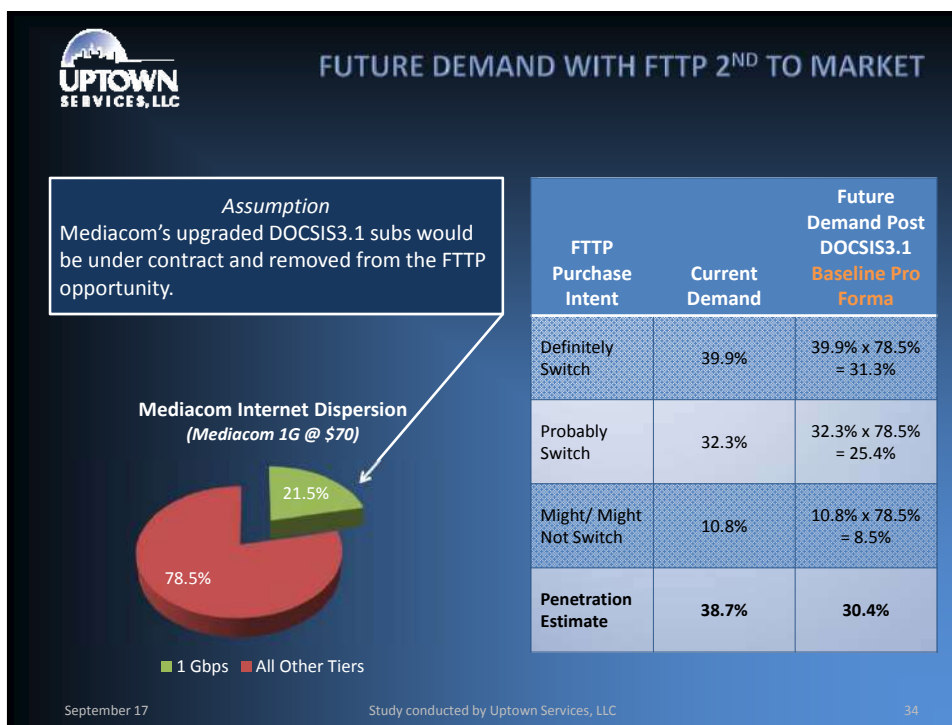
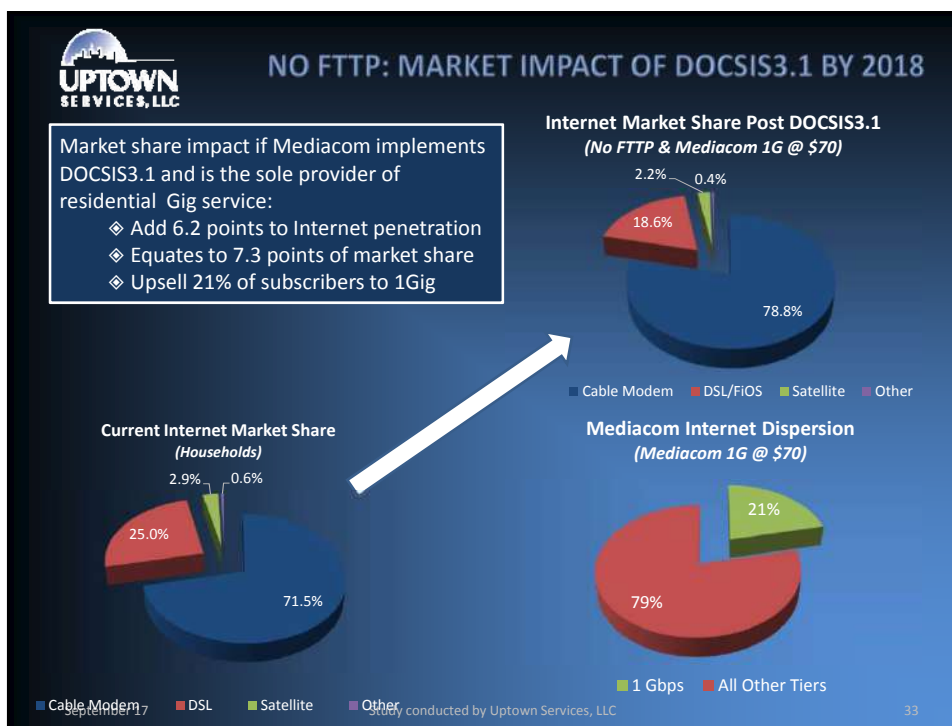


RESEARCH METHODOLOGY: FUTURE DEMAND

- ◆ Potential Disruption of DOCSIS3.1
 - Evolution of the cable modem standard can deliver 1Gbps over HFC
 - ❖ Mediacom has announced deployment in all IA markets
 - ❖ Two key market dynamics will drive penetration impact to pro forma
 - ❖ 1st to Market Advantage
 - ❖ Elasticity of Demand
- ◆ Research Methodology to Evaluate Sensitivity
 - Current demand
 - DOCSIS3.1 is available but Mediacom customers have not yet upgraded
 - Future demand in 2018 under 3 potential scenarios
 - No FTTP: Mediacom after 1 year of 1Gbps availability (sole 1G option)
 - If Mediacom and the Town both offer 1Gbps at price parity (\$50/mo.)
 - **Baseline pro Forma:** If Mediacom and the Town both offer 1Gbps and the Town has a price discount advantage (\$50 versus \$70/mo.)

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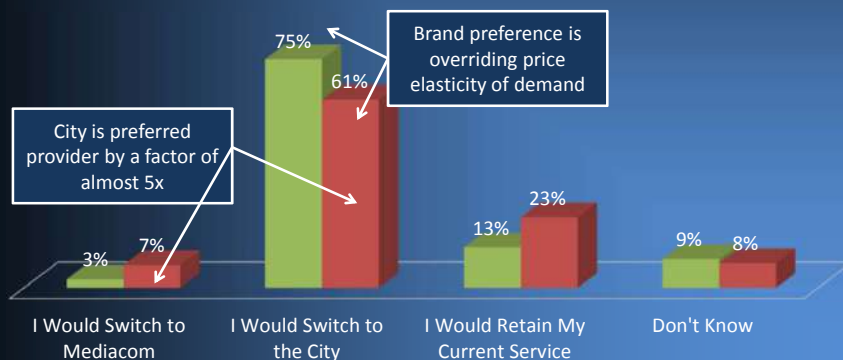


FUTURE DEMAND WITH 2 GIG PROVIDERS

Participants were asked if they would – or would not – switch to a different Internet service if both of the following services were provided in the future. The new service options would be the following two Internet services, both offering 1 Gbps speed...

Q32-33: "If these services were available to your home, and offer the same speed, which of the following statements best describes your likelihood to switch?"

■ Mediacom \$70/City \$50 ■ Both \$70



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Medium-Large Business Market



COMMERCIAL BROADBAND SERVICES MARKET

	Internet Access	Metro Ethernet (Transport)	Dedicated Internet (Access)
Market Segment	Small Businesses and Medium/Large depending on sector	Medium to Large Business and Institutions	
Network Architecture	Last Mile (Copper, Coax, or Fiber)	Last Mile or Middle Mile (Fiber lateral to ring)	
Potential Market Size	Majority of connections (90% of all premises)	Typically less than 100 connections per urban market	
Connection Type	Shared bandwidth (GPON)	Dedicated Private Circuit(s) or MAN	Dedicated bandwidth (ActiveE)
Typical Data Service Set	Standard Internet tiers up to 1G	Point-to-point transport from 100M to 10G+	Dedicated access bandwidth from 100M to 10G+

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HIGH CAPACITY COMMERCIAL MARKET NEEDS

- ◆ Typical High Capacity Needs and Desired Service Attributes
 - ◆ Infrastructure Availability: Fiber is the Standard
 - ◆ Dedicated Capacity: Superior to shared bandwidth connections
 - ◆ Competitive Pricing
 - ◆ Service Experience: Reliability, Customer Service, and Responsiveness
 - ◆ Network Integration: Select firms require national/global tier 1 provider
- ◆ High Capacity Providers in Decorah
 - ◆ Wireline: Mediacom, CenturyLink, AcenTek/DMN, NEIT, Windstream
 - ◆ Wireless: NEIT

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RESEARCH APPROACH

- ◆ Qualitative assessment of medium-large business market in Decorah
 - ◆ 10 Depth Interviews of 30-40 minutes
 - ◆ Responses aggregated for confidentiality
- ◆ Identify key market characteristics
 - ◆ Fiber availability, capacity needs, performance criteria
 - ◆ Current price levels, use of contracts, and connection requirements
- ◆ Estimate potential market share
 - ◆ Satisfaction and switching criteria
 - ◆ Openness to City-provided fiber services

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DEPTH INTERVIEW PARTICIPANTS

Services

- ❖ Hacker, Nelson & Co.
- ❖ Midwest Group Benefits

Retail

- ❖ Weis Buick

Technology

- ❖ Tritech Software Systems

Banking

- ❖ Decorah Bank & Trust

Manufacturing/Materials

- ❖ Gemini
- ❖ IRP
- ❖ Bruening Rock Products
- ❖ DECO

Other

- ❖ Open Decorah

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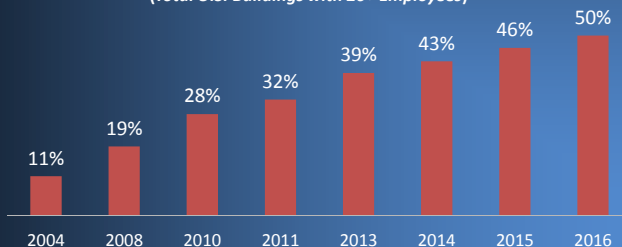


NATIONAL DEPLOYMENT OF COMMERCIAL FIBER

Nationally, aggressive rollouts of fiber by incumbent and alternative providers have substantially increased the availability of fiber to commercial buildings...

"The majority of new fiber deployments were focused on connecting medium and smaller buildings in the metro areas surrounding major cities across the U.S. Broader accessibility to on-net fiber has started to shake up the services markets." - Rosemary Cochran, principal at Vertical Systems Group

Percentage of Commercial Buildings Served by Fiber
(Total U.S. Buildings with 20+ Employees)



Source: Vertical Systems Group, April 2017

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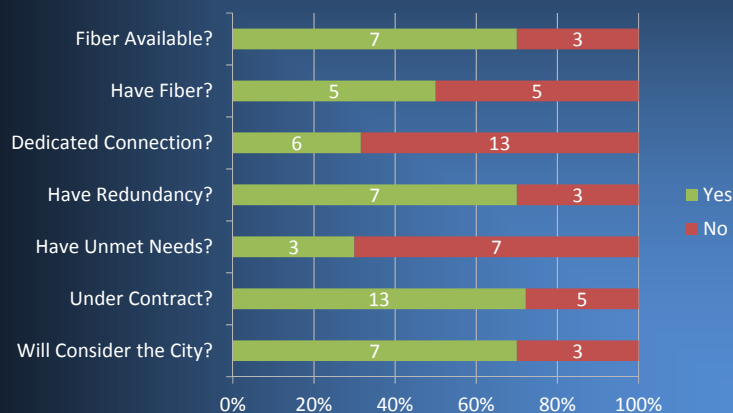
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NEEDS ARE BEING MET

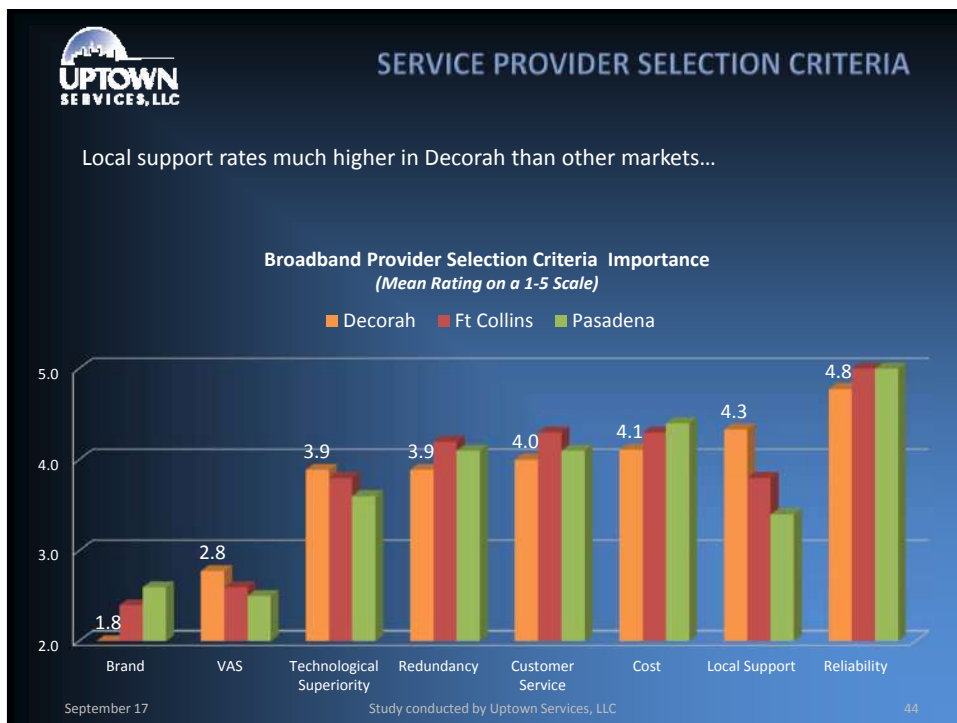
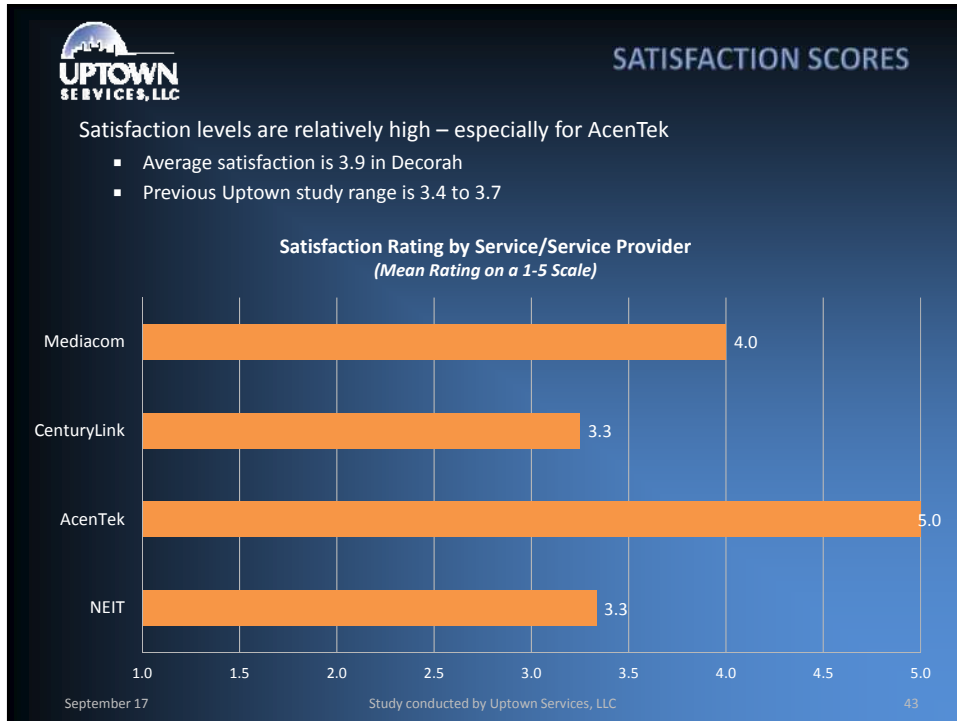
With the recent lease of DMN backbone strands to AcenTek, fiber has been deployed to several business/industry locations via backbone laterals. Advanced data needs are being met in these selective areas, but businesses will consider the City as a provider option...



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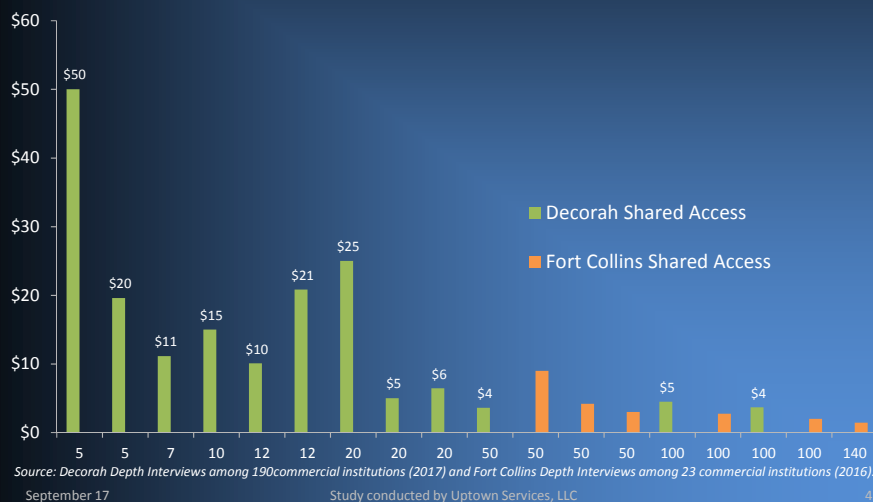
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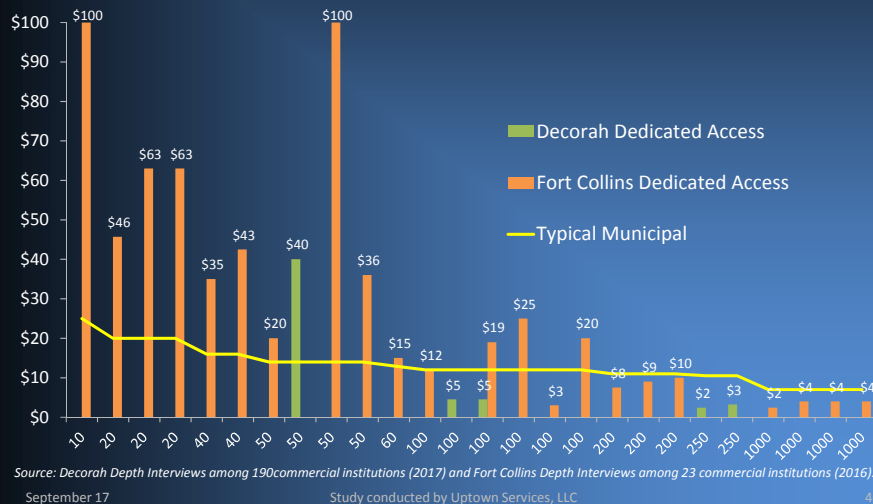
HIGH CAP PRICING – SHARED BANDWIDTH

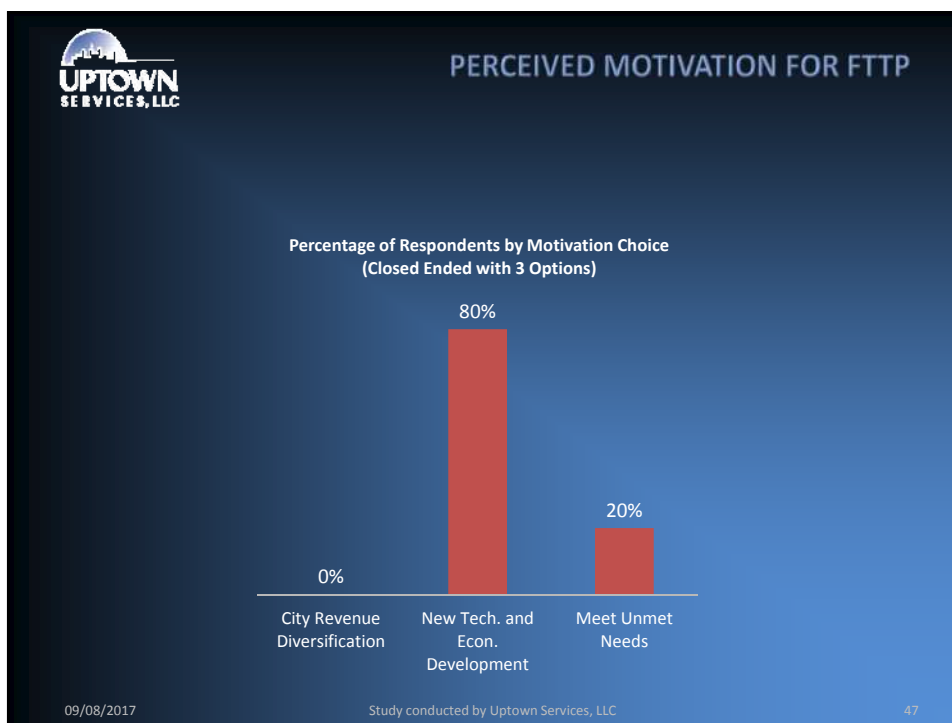
Price levels in Decorah for shared bandwidth commercial connections benchmark as high for capacities below 20M but are more competitive at higher capacities...



HIGH CAP PRICING – DEDICATED BANDWIDTH

Price levels in Decorah for dedicated bandwidth benchmark as low due to the aggressive pricing of AcenTek as a new market entrant to the area...





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LARGE BUSINESS SEGMENT FINDINGS

Research Findings:

- ◆ Fiber, with dedicated bandwidth, has recently become available in Decorah through AcenTek's lease of DMN strands
- ◆ Satisfaction scores are relatively high for AcenTek and Mediacom
- ◆ Telecom and broadband needs are being met, but firms are open to considering the City network for a data connection. Lower price is a key switching factor for these firms
- ◆ Some firms will wait to evaluate the track record of the FTTP system

Pro Forma:

- ◆ Estimate the dedicated access market as 10% of the all commercial entities (~ 35) with penetration growing to 50% by Year 8.
- ◆ High incidence of dedicated access, but competitive given the AcenTek rate card. Estimate ARPU at \$750 per connection

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SUMMARY OF RESEARCH FINDINGS

- ◆ Mediacom is the market share leader for all 3 services in Decorah. 88% of households have Internet access.
- ◆ Video and voice service satisfaction levels benchmark as average. Cable modem satisfaction is low.
- ◆ A desire for lower prices dominates potential areas for broadband improvement.
- ◆ Incidence of triple-play bundle is high. Purchase intent is high, especially for voice and video.
- ◆ Strong provider preference for the City of Decorah versus other incumbent options.
- ◆ Determined that Mediacom would add 6 points in market share and temporarily lock in 21% of Internet subscribers with a \$70 Gig tier (assumed promo/contract price point)
- ◆ This results in an initial drop of FTTP Internet penetration from 38.7% to 30.4% for the pro forma analysis.
- ◆ Once FTTP is launched, a Mediacom \$70 Gig service is not competitive with FTTP service if FTTP is at price parity or better due to strong provider preference

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Technology Analysis Gigabit Passive Optical Network vs. Active Ethernet



GPON VS. ACTIVE ETHERNET

- ◆ Gigabit Passive Optical Network (GPON)
 - ITU G.984.x standard
 - Delivered Ethernet services
 - 2.4G downstream / 1.2G upstream
 - Single fiber delivery to subscriber optical network terminal (ONT)
 - ONT's support GPON or ActiveE connections
 - Comprehensive bandwidth management standards
 - Passive system with up to 128 splits and 35 km reach
- ◆ Active Ethernet (IEEE 802.x)
 - Point to point GigE
 - Single fiber delivery to subscriber ONT
 - Dedicated symmetrical 1G to serving switch port - up to 60 km reach
- ◆ Majority of FTTP deployments have been GPON

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BANDWIDTH FORECAST

- ◆ GPON – Low Cost and Flexible
 - 2.5G of shared downstream bandwidth
 - Flexible splitter placement and less demand for fiber strands
 - High port density – up to 5,210 subs in one chassis (10 rack units)
 - Consumes less space in rack and 33% as much power required
 - Supports path to 10G GPON
- ◆ Active Ethernet – “Futureproof”
 - Dedicated GigE from serving switch to each subscriber
 - One strand from subscriber to serving switch location
 - Better suited for high capacity transport services than GPON
 - Longer reach – 60 km
 - Extreme fiber strand counts required without active field cabinets
 - Requires more fiber, space, power, cabinets, electronics and capital
- ◆ Tradeoffs can be quantified

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PON VERSUS ACTIVE ETHERNET ECONOMICS

- ◆ Network Electronics
 - GPON cards and ports = \$50 per subscriber
 - AE cards and ports = \$320 per subscriber
 - AE is \$350K more than GPON at 1,300 subscribers
- ◆ Outside Plant Materials
 - GPON splitters = \$15 more per passing
 - AE fibers per cable 2x-3x more = \$250K over 31 miles
 - AE is \$286,000 more than GPON at 2,600 passings
- ◆ Technical Services
 - AE requires two additional splices / passing = \$60 per passing
 - AE is \$156K more than GPON over 2,600 passings
- ◆ AE will also require more and larger equipment cabinets

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Technology Analysis
Evolving FTTP Standards



NEXT GENERATION APPROACHES – ITU AND IEEE

- ◆ ITU GPON Standards Evolution
 - XG-PON1 (G.987) – 10G Down / 2.5G Up
 - XG-PON1 available for four years
 - Operators waiting for symmetrical 10G (NG-PON2)
 - NG-PON2 (G.989) – 10G Down / 10G Up
 - Commercial deployments for NG-PON2 in 2017
- ◆ IEEE Ethernet Standards Evolution
 - Point to Point GigE (802.3ah) – 1G symmetrical
 - 10G EPON (802.3av) – 10G symmetrical
 - Commercially available in 2013

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FSAN – GPON ON STEROIDS

- ◆ Full Service Area Network (FSAN) NG-PON2
 - Four time and wave division multiplexing (TWDM) channels
 - Up to four 10G PONs combine for 40G aggregate capacity
 - Will operate over legacy splitters
 - Higher split ratios and longer reach included in the standard
- ◆ Will accommodate point to point overlay
 - WDM technology used to deliver line rates of 1, 2.5 and 10G over separate wavelengths
 - Will occupy 1603nm – 1625nm channels
 - Full coexistence with other services
- ◆ Full 4x10G capability not expected until 2017
 - XGS-PON - 10G/10G interim option to be available in 2016
 - XGS-PON standard expected to be ratified in early 2016
- ◆ Eventual capability of 8x10G PONs

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GPON OR ACTIVE ETHERNET?

- ◆ Deploy GPON as the ruling architecture
 - Design approach for mass market service areas
 - Implement robust design standards in terms of network capacity
- ◆ Deploy hybrid architecture as needed for hi-cap services
 - Design for dedicated fiber to equipment sites for active Ethernet
 - Less “cookie cutter” than GPON network
 - One-off designs to reflect specific market conditions
- ◆ Monitor GPON product lifecycle
 - Determine final GPON platform strategy based on bid results
 - Design system that will easily accommodate upgrades
 - Plan for upgrades based on service mix (linear video?)

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Technology Analysis
Reference Architecture – Building Blocks



PREMISES EQUIPMENT AND INSIDE WIRE

- ◆ Provider Owned Premises Equipment
 - Optical Network Terminal – indoor wall mount or desktop versions
 - Optional router capability (wireless or not)
 - Set Top Boxes required for all TV sets receiving digital video services
- ◆ Customer Owned Premises Equipment
 - Router – may not be GigE capable
 - All end user computing devices
 - Standard telephones for telephone service
- ◆ Inside Wire
 - Phone services use the existing phone wiring
 - Digital video services use new CAT6 wiring or Wi-Fi
 - Data services delivered over new CAT6 cable or Wi-Fi

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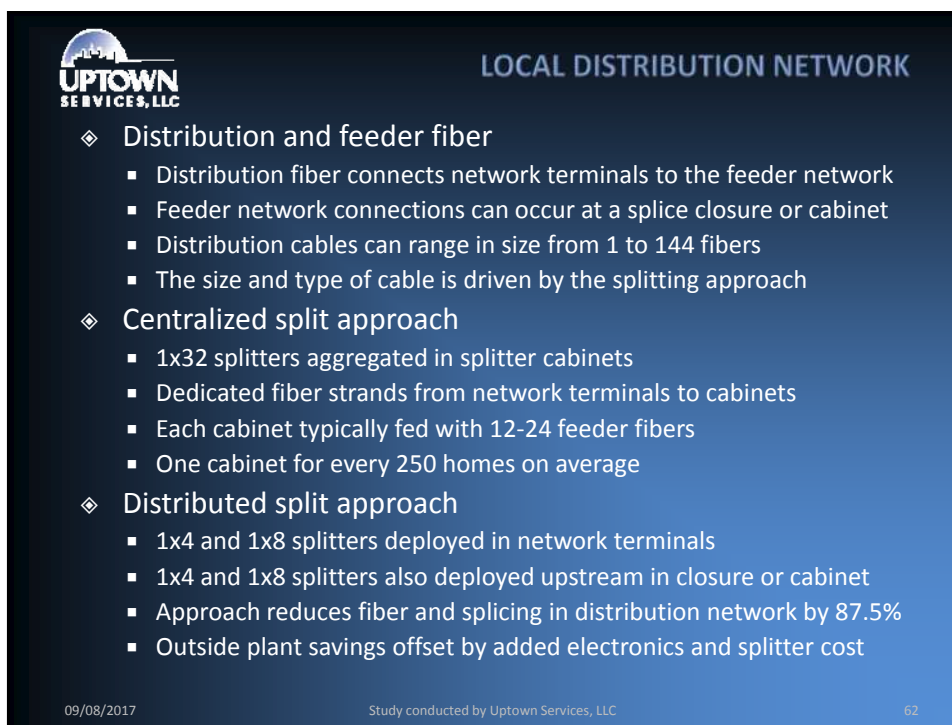
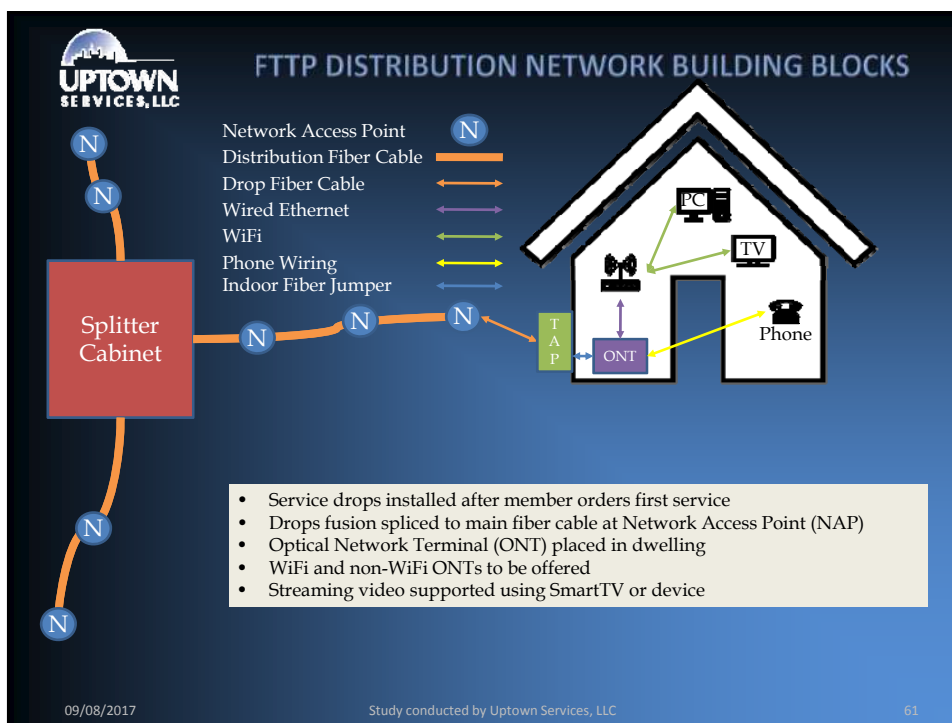
SERVICE DROP AND NETWORK ACCESS POINT

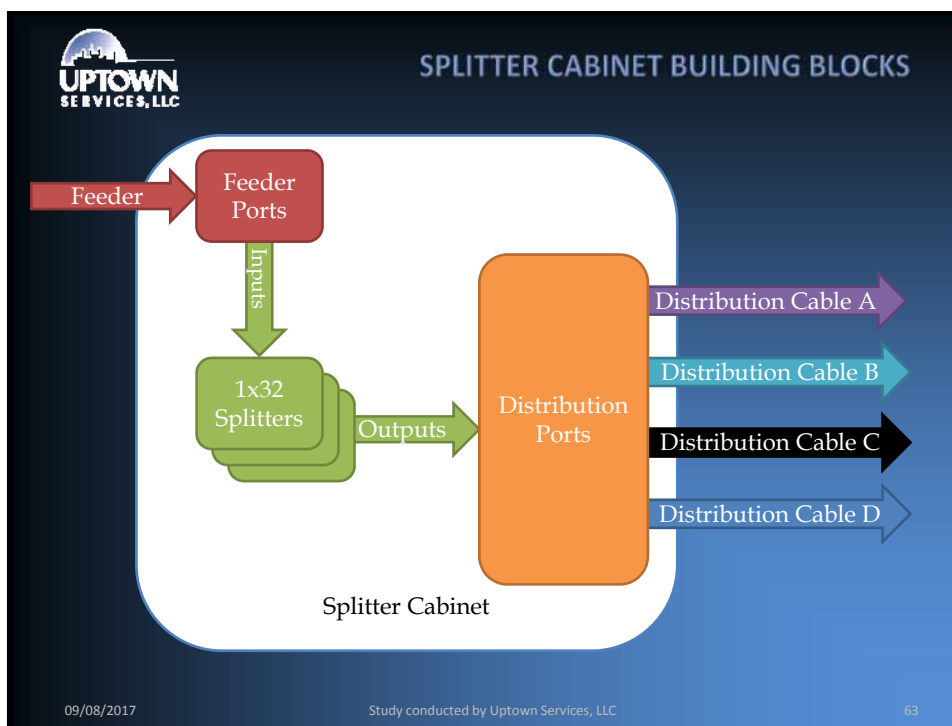
- ◆ Network Access Point (NAP)
 - NAPs connect drops to the FTTP outside plant network
 - One NAP serves between four and sixteen passings
 - Drops have traditionally been fusion spliced at the NAP
 - NAPs are connected to the distribution fiber network
- ◆ Service Drop and Test Access Point
 - Drops only installed after subscriber orders service
 - One fiber drop cable installed from NAP to each premises
 - Fiber drop pushed or pulled in shallow drop conduit in underground
 - Aerial drops are flat self support cable
 - Drop fiber terminated in test access point (TAP) mounted on dwelling
 - TAP provides demarcation between outside and inside fiber (bulkhead)

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OPTICAL LINE TERMINALS AND FEEDER

- ◆ Optical Line Terminals (OLTs)
 - An OLT combines all digital content onto PON ports
 - Each two card chassis supports up to 512 GPON subscribers
 - Environmentally hardened and two Rack Units
 - OLTs connect upstream via multiple 10G uplinks
- ◆ Feeder Network
 - Feeder connects splitter cabinets to serving OLTs
 - Typically one feeder fiber per 32 passings (PON port)
 - ≈ 82 feeder fibers would be required to service 2,600 passings
 - Typically 6-12 feeder fibers per splitter cabinet
 - Decorah FTTN network would include 12-15 splitter cabinets
- ◆ Decorah MetroNet
 - DMN could be used for feeder if the network included two OLT sites
 - Each OLT site would feed multiple DMN feeder routes
 - FTTN would need 24-26 fibers on each DMN feeder route leaving OLT sites

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NETWORK BACKBONE AND CORE

- ◆ **Backbone Network – Layer 2**
 - Backbone connects equipment sites to the core network routers
 - OLTs can connect to each other using protected 10G rings (ERPS)
 - Backbone uses much less fiber capacity than feeder – 12 to 24 fibers
- ◆ **Core Network – Layer 3**
 - Core network safely routes traffic to and from the outside world
 - Border Gateway Protocol (BGP) routers connect to the Internet
 - BGP routers deployed in pairs
 - Installed on backbone network in physically diverse locations
 - Each router connects to at least two Internet backbone providers
- ◆ **Outside World – Content**
 - Two physically diverse Internet backbone connections desired
 - Video content would come in over one or both Internet connections
 - Phone would also route over one or both Internet connections

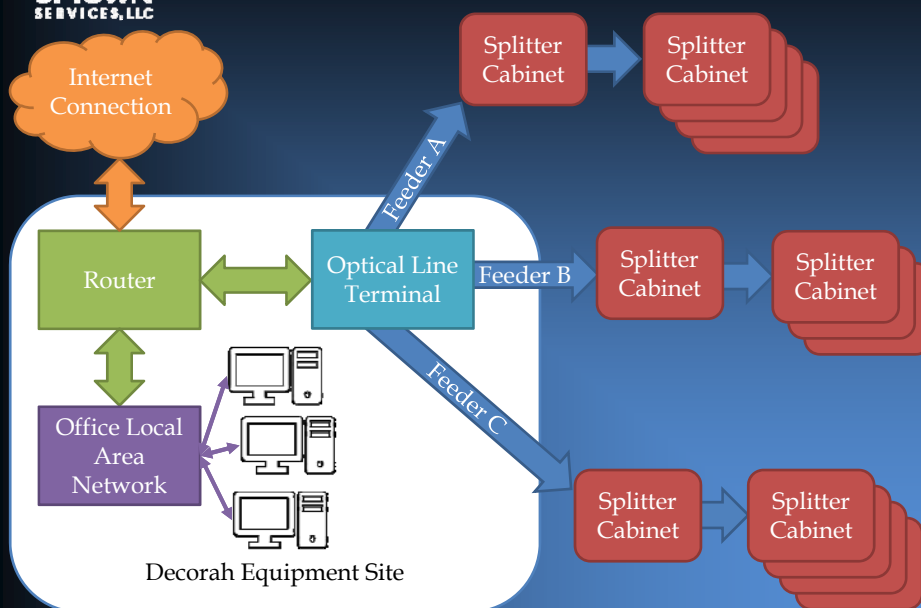
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PRIMARY EQUIPMENT SITE COMPONENTS



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Technology Analysis

Sample Designs



REFERENCE ARCHITECTURE

- ◆ 100% GPON standards based system
 - Relying on next generation standards to support future growth
 - Nx10G capabilities over time
- ◆ Centralized split architecture
 - One fiber per passing terminates in splitter cabinet
 - Approximately one splitter cabinet per 200 passings
 - Deploy 1x32 splitters as required in splitter cabinets
 - Network Access Points (NAPs) connect subscriber drops to network
 - All drops fusion spliced at serving NAP
- ◆ Design assumes the use of standard cable technology
 - Strand and lash aerial installation of armored fiber cable
 - Armored fiber cable pulled in new HDPE conduits
 - 1.5 IN HDPE conduits employed for drops and distribution pathways



DECORAH OUTSIDE PLANT ENVIRONMENT

- ◆ Aerial vs. underground
 - 85% of homes and businesses served via aerial plant
 - Most poles are in alleys with drops on both sides of the alley
 - New subdivisions are underground (rear lot and front lot)
- ◆ Advantages of underground approach
 - Fiber is not susceptible to wind and ice loading and failures
 - Facilities can be placed in City Rights of Way
 - Much cleaner overall
 - No pole attachment costs (make ready and annual fees)
- ◆ Drawbacks of underground approach
 - Cost is 4x to 10x the cost of aerial construction
 - More disruption for land owners during construction
 - Need to mark and locate in the future to avoid dig ins
 - Water intrusion risk with high water table or flooding

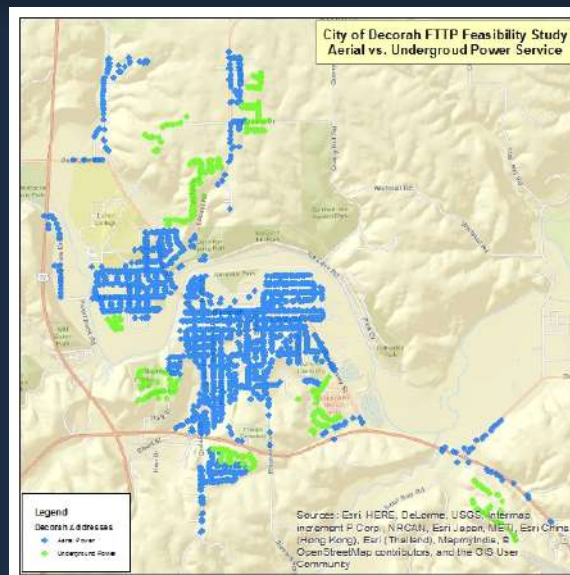
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AERIAL VS UNDERGROUND POWER SERVICE



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SAMPLE DESIGN BREAKDOWN

- ◆ Four sample designs completed for three Decorah neighborhoods
 - Area 1 - Underground Front Lot
 - Area 2 - Rear Lot Aerial
 - Area 3 - Underground Front Lot
 - Area 3 - Rear Lot Aerial
- ◆ Conservative labor costs
 - \$15 per foot for all directional drilling and hand hole placement
 - \$2.15 per foot for installing strand on existing pole lines
 - \$1.00 per foot for pulling fiber in conduit or lashing to strand
 - \$175 closure prep for all NAPs and splice points
 - \$30 per fusion fiber splice
- ◆ Some costs not as clear
 - Pole line survey requirements
 - Pole loading and make ready engineering requirements
 - Make ready construction costs (to make room for fiber on existing poles)
 - Ability and cost to use DMN assets for FTTP (conduit, fiber & strand)

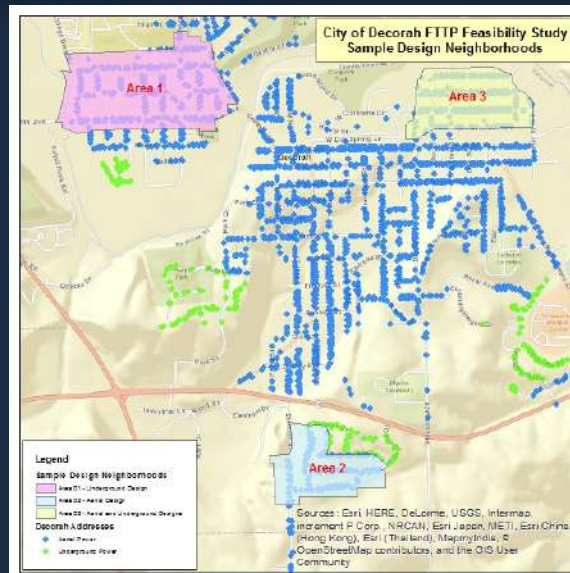
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SAMPLE DESIGN AREAS



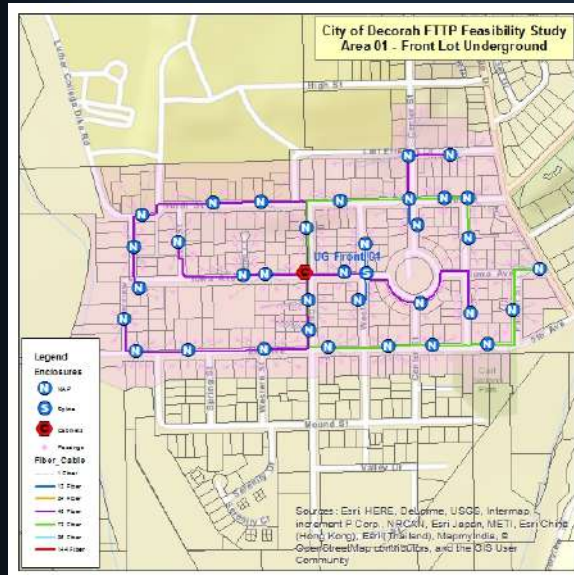
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AREA 1 – FRONT LOT UNDERGROUND



Design Metric	Value
Aerial Plant Miles	-
Underground Plant Miles	3.9
% Aerial	0%
% UG	100%
Passings	258
Passings per Mile of Plant	66
Materials Cost per Passing	\$242
Labor Cost per Passing	\$1,449
Total Cost per Passing	\$1,691
Total Materials (no drops)	\$62,380
Total Labor (no drops)	\$373,821
Total Cost	\$436,201

* - Does not include engineering, fixed equipment, subscriber capital and installation costs.

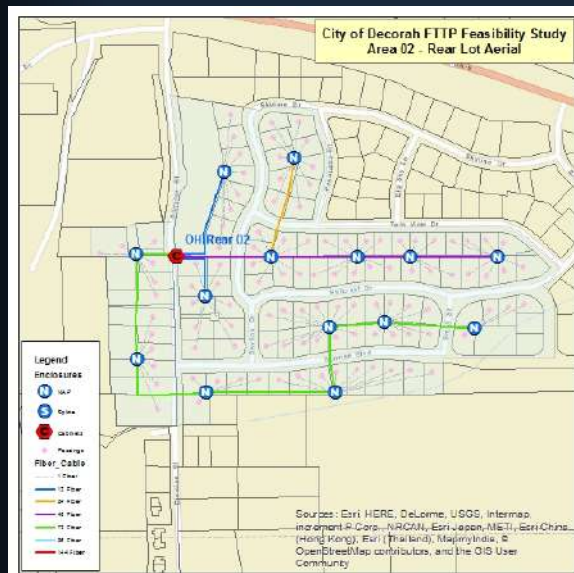
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AREA 2 – REAR LOT AERIAL



Design Metric	Value
Aerial Plant Miles	1.3
Underground Plant Miles	-
% Aerial	100%
% UG	0%
Passings	109
Passings per Mile of Plant	81
Materials Cost per Passing	\$113
Labor Cost per Passing	\$293
Total Cost per Passing	\$406
Total Materials (no drops)	\$12,344
Total Labor (no drops)	\$31,942
Total Cost	\$44,286

* - Does not include engineering, fixed equipment, subscriber capital and installation costs.

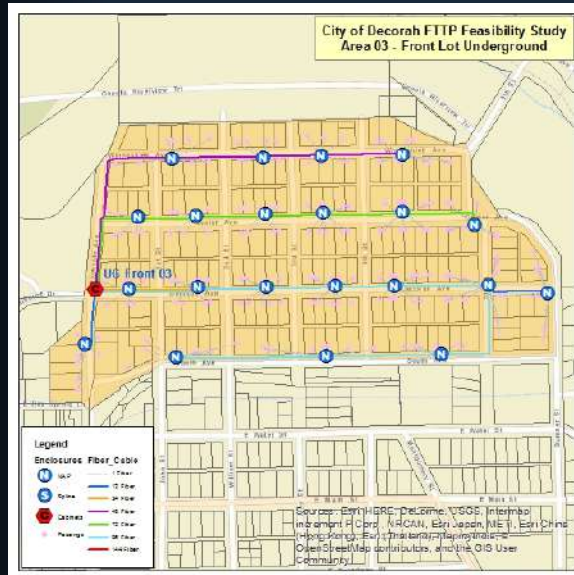
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AREA 3 – FRONT LOT UNDERGROUND





SAMPLE DESIGN SUMMARY

Sample Design Area	OH Miles	UG Miles	Passings	Passings per Mile	Weight	Materials per Passing	Labor per Passing	Total per Passing
Area 01 - Front Lot Underground	-	3.9	258	66	7.5%	\$242	\$1,449	\$1,691
Area 02 - Rear Lot Aerial	-	2.6	189	74	42.5%	\$233	\$1,301	\$1,534
Area 03 - Front Lot Underground	1.3	-	109	81	7.5%	\$113	\$293	\$406
Area 03 - Rear Lot Aerial	1.9	-	189	97	42.5%	\$101	\$242	\$343
Overall Weighted Average/Total			745	N/A	100%	\$127	\$437	\$564

- ❖ Weighting based on estimated number of passings in each category
- ❖ Total fiber mileage estimated to be 31 miles
- ❖ Total last mile outside plant construction estimate ≈ \$1.5M
- ❖ 100% underground approach would add \$2.7M in last mile OSP cost

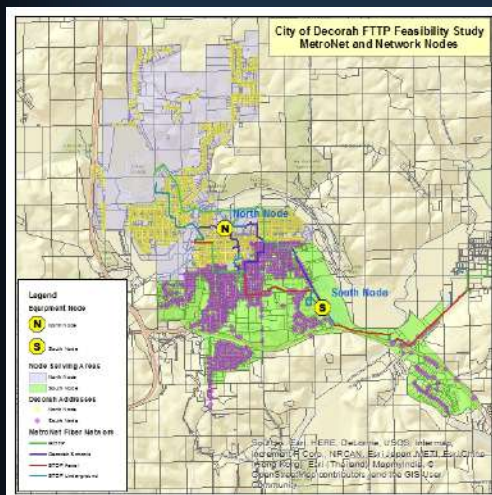
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FTTP BACKBONE STRATEGY



- ❖ Equipment per Node
 - Each serves 1,300 passings
 - Capacity to feed 40 splitters
 - (5) PON cards
 - (3) OLT chassis
- ❖ Node locations
 - North Node – Fire Station
 - South Node - Hospital
 - 20 Rack Units per Site
- ❖ Capital budget
 - Equipment - \$80,000 per site
 - Prof Svcs - \$5,000 per site
 - ≈ \$65 per passing

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Incumbent and Proposed FTTP Service Offerings Internet and Data Services



INCUMBENT RESIDENTIAL INTERNET PRICING

	Download	Upload	Usage	Year 1 / Year 2	Modem Rental	Technology
Mediacom	60M	5M	400 GB	\$60 / \$80	Included. Subtract \$10 if customer provided.	Cable Modem (DOCSIS 3.0 & 3.1)
	100M	10M	1,000 GB	\$70 / \$90		
	200M	20M	2,000 GB	\$80 / \$100		
	500M	30M	4,000 GB	\$90 / \$100		
	1G	50M	6,000 GB	\$100 / \$120		
CenturyLink	1.5M	896k		\$44.99		DSL
	7M	896k		\$54.99		
	7M	5M		\$59.99		
	12M	896k		\$64.99		
	12M	5M		\$69.99		
	20M	896k		\$74.99		
	20M	5M		\$79.99		
	40M*	5M		\$114.99		
	40M*	20M		\$124.99		

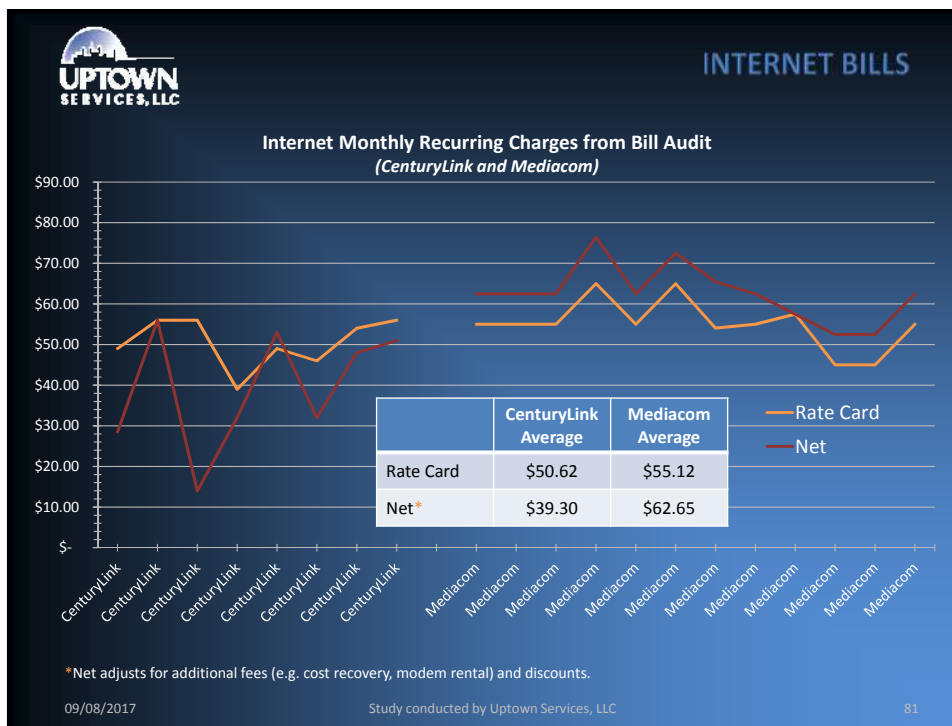
CenturyLink pricing per centurylink.com. CenturyLink prices reflect subscription to Internet service at non-promotional rates.
Mediacom pricing from mediacomcable.com as of June 2017, mystery shopping calls, and collected household bills.

*Not available in all areas.

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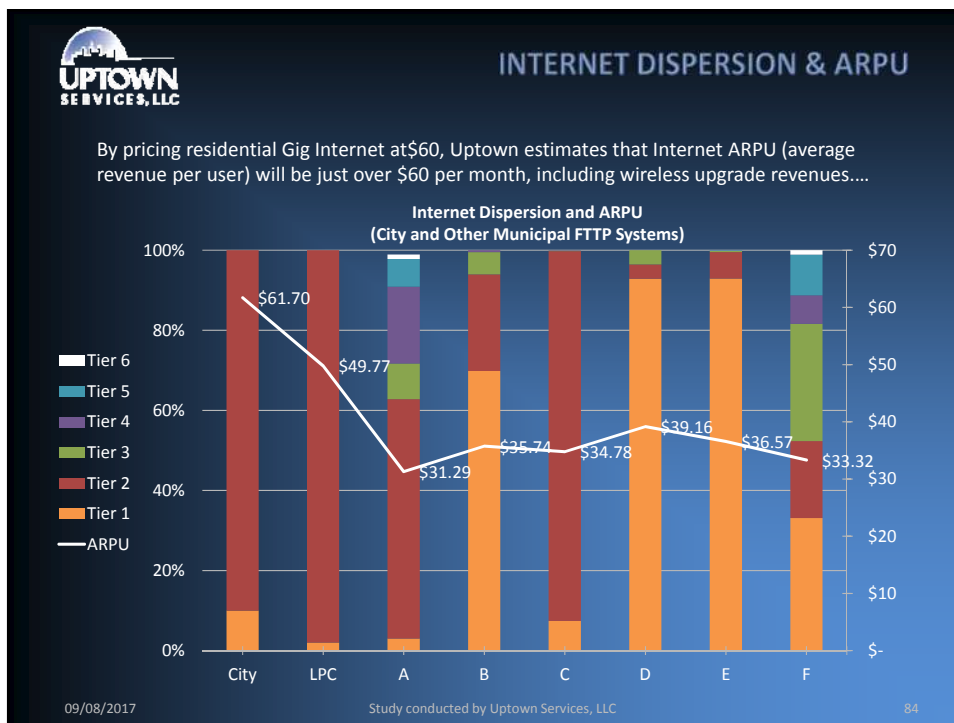
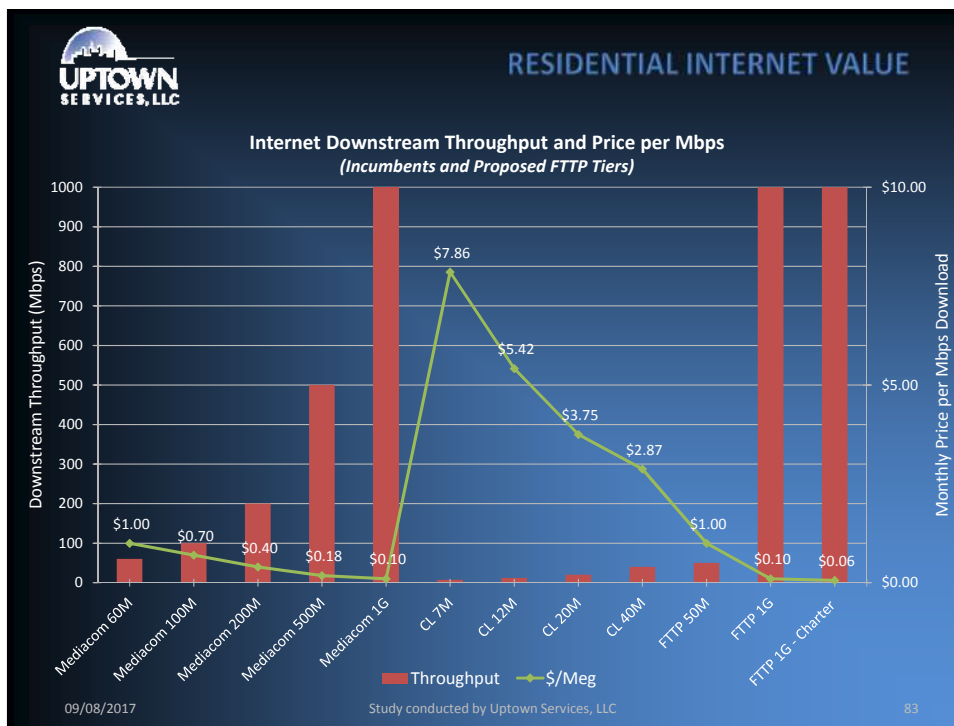


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PROPOSED RESIDENTIAL INTERNET PRICING

FTTP System	Mediacom Year 1 / Year 2	Discount
50M / 50M Tier \$49.95	\$60 / \$80	17% / 38%
1G / 1G Tier \$99.95	\$100 / \$120	0% / 17%
1G / 1G Charter Member \$59.95		40% / 50%
WiFi ONT Upgrade (80211.ac) \$10.00	\$10.00	0%

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FTTP COMMERCIAL DATA SERVICES

1. Standard Internet Access
 - ◆ Shared capacity connection over GPON
 - ◆ No contract requirement and no SLA guarantees
 - ◆ Can upgrade to symmetrical bandwidth and add BGP Routing (some tiers)
2. Dedicated Internet Access*
 - ◆ Dedicated capacity via ActiveE connection (same ONT)
 - ◆ Requires dedicated fiber strand. Practical option for pure commercial service areas
 - ◆ Contract agreement with SLA and term requirement
3. High Capacity Direct Fiber Access*
 - ◆ Multiple connection options:
 - ◆ Direct routed connection
 - ◆ Customer CPE connection (either non-protected media converter or protected)
 - ◆ Protected connection is optional
 - ◆ Contract agreement with SLA and term requirement
 - ◆ Resale rights may be included
4. Point-to-Point (Transport Circuit): Dedicated pathway of defined capacity without access*
5. MAN: Customized access and transport solution for multi-site business or institution*

*Not included in the FTTP business case as revenues.

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INCUMBENT COMMERCIAL INTERNET PRICING

	Download	Upload	Price Rate Card / Promo	Technology
Mediacom	10M	1M	\$69.95	Cable Modem (DOCSIS 3.0 & 3.1)
	20M	2M	\$129.95	
	50M	5M	\$199.95	
	105M	10M	\$299.95	
	20M	20M	\$299.95	
	1G	20M	\$349.95	
CenturyLink	12M	Not Disclosed	\$54.99 (24 mos.)	DSL
	20M		\$64.99 (24 mos.)	
	40M		\$84.99 (24 mos.)	
	100M		Custom Quote	
AcenTek	100M	100M	\$450	Direct Fiber (Dedicated bandwidth)
	250M	250M	\$800	
	500M	500M	\$1,500	

Note: Prices reflect providers single-service Internet rate card pricing. Mediacom pricing from mediacomcable.com as of June 2017. CenturyLink pricing from centurylink.com as of June 2017.

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PROPOSED COMMERCIAL INTERNET PRICING

Decorah Download / Upload	Decorah Price	Incumbent Comparable	Incumbent Price	Discount
25M / 5M <i>Add Symmetrical</i>	\$59.95 + \$10	Mediacom 20M CenturyLink 20M	\$129.95 \$64.99	54% 8%
50M / 10M <i>Add Symmetrical</i>	\$79.95 + \$30	Mediacom 50M CenturyLink 40M	\$199.95 \$84.99	60% 6%
100M / 20M <i>Add Symmetrical</i>	\$89.95 + \$50	Mediacom 105M	\$299.95	70%
250M / 50M <i>Add Symmetrical</i>	\$199.95 + \$100	-	-	-
500M / 250M <i>Add Symmetrical</i>	\$349.95 + \$150	-	-	-
1G / 500M <i>Add Symmetrical</i>	\$599.95 + \$200	Mediacom 1G	\$349.95	<i>Not comparable due to upload speed</i>

Note: Prices reflect providers single-service Internet rate card pricing.

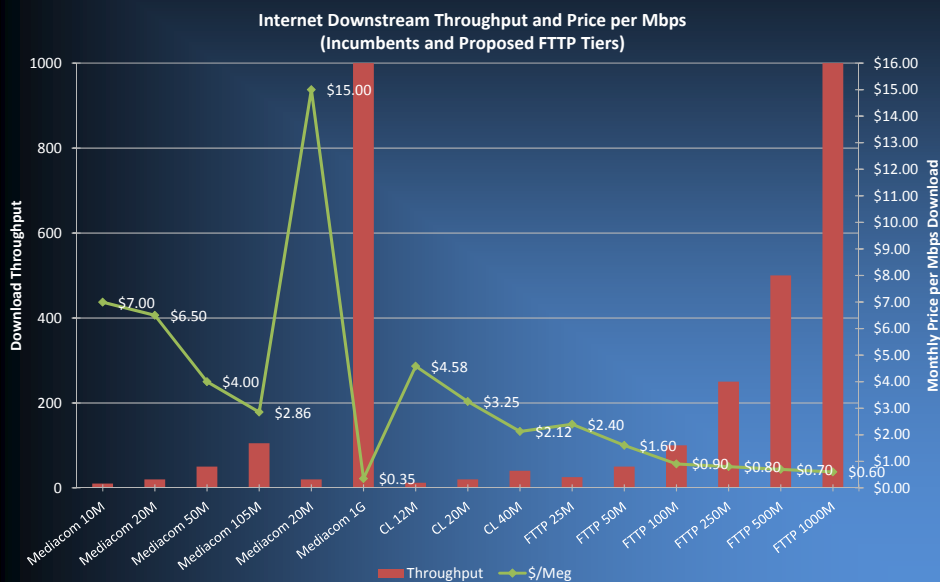
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COMMERCIAL INTERNET VALUE



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Incumbent and Proposed FTTP Service Offerings

Video Services



TRADITIONAL VIDEO VS. OTT

	Traditional Pay TV	Over-The-Top
Examples	Mediacom, Spectrum, AT&T (U-verse)	Hulu Plus, Netflix, PlayStation Vue, AT&T (DirecTV Now)
Regulation	FCC rules require: <ul style="list-style-type: none"> • Ownership and control of 'closed-end path' • Video franchise • Pricing deregulated via 'effective competition' 	Unregulated
Access to Content	Guaranteed via FCC rules	No programmer requirement (specific OTT rights required)
Signal Delivery	Provider last mile plant (may be leased access with 'ownership and control')	End user's Internet connection
Signal Format	Analog, Digital (QAM), or IP Video	IP Video
Signal Decryption & Authentication	Set top box controlled by service provider	Subscriber authentication only



MARKET FORCES AFFECTING VIDEO DISTRIBUTORS

- ◆ Margin Erosion
 - ◆ Sub loss due to value destruction from rate increases and no perceived increase in value
 - ◆ Gross margin has been halved by programming cost increases despite these rate increases
- ◆ Ongoing Capital Investment
 - ◆ Traditional QAM systems out of capacity face a major capital investment to migrate to IP video (hardware, software, set tops)
 - ◆ Headend capex continues in all systems due to MPEG4 adoption and vendors' end of life announcements
- ◆ Loss of Competitive Advantage
 - ◆ Existing traditional Cable Systems had market protection as a duopoly via last mile infrastructure and franchise agreements entry barriers. Key assets were last mile infrastructure and local operations.
 - ◆ New 'Virtual Video Providers' (OTT) will have ubiquitous market reach across the U.S. via the broadband connection. Key assets will be national brand power and consumer platform integration.
 - ◆ National consumer brands can leverage their brand, existing consumer base, and huge cash positions to quickly capture market share (e.g. Google, Apple...)

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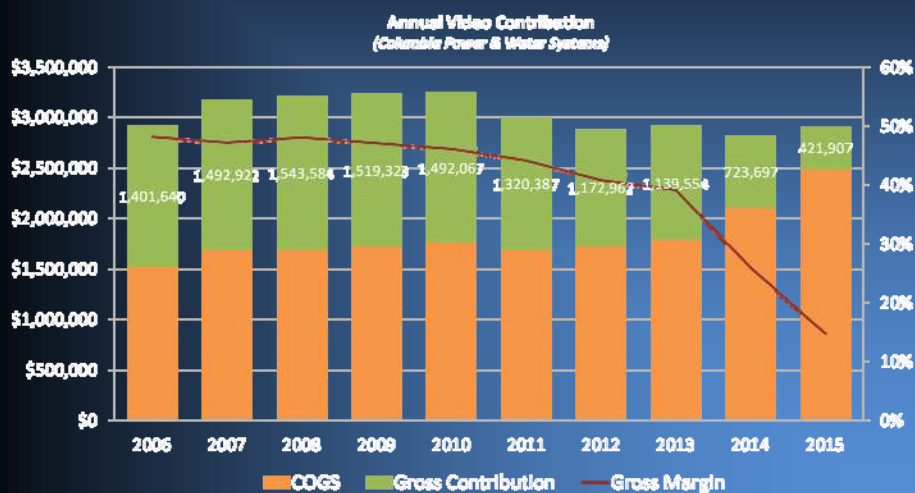
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TYPICAL VIDEO GROSS CONTRIBUTION TREND

Market forces have dramatically impacted video gross margins from a combination of subscriber loss and escalating video COGS...



Source: CPWS Comprehensive Annual Financial Report, 2014-2015
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VIDEO STRATEGY OPTIONS

1. **No Video**
 - ◆ Example: Longmont, CO from 2015-2016
 - ◆ Risks: Loss of bundling and no financial contribution
2. **Cooperative Marketing (co-branding with 3rd party)**
 - ◆ Receive a one-time commission
 - ◆ Example: Longmont, CO in 2017 (Layer3 TV)
 - ◆ Risks: No control over video service and minimal financial contribution
3. **Hosted Video (wholesale model)**
 - ◆ Receive a wholesale fee or gross margin split per sub/month
 - ◆ Example: Skitter TV
 - ◆ Risks: Capex requirement (off-airs, custom channels, set tops)
4. **Hosted Video (retail model)**
 - ◆ Pay a license fee per sub/month
 - ◆ Example: MobiTV
 - ◆ Risks: Content rights
5. **Joint Ownership (partial equity and operating support)**
 - ◆ Initial equity and annual cost sharing based on Decorah % of total premises
 - ◆ Example: CFU, Waverly & Bellevue 28E Agreement
 - ◆ Risks: Minimized, but subject to OTT competition

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CAPEX/OPEX BY STRATEGY

	Capex	Opex
Hosted Video (wholesale)	Headend Initial Buy-In: \$60k Channel Customization Costs: \$30k Tower & Dishes: \$15k Generator/UPS: Not Included VOD Platform: Not Included Set Top (Gateway w/ DVR): \$300 ea. Set Top (Client): \$100 ea. Total Capex (Years 1-5): \$514K	Middleware License Fees: \$1.90/STB Network DVR Service Fee: \$4.00/Subscriber/Mo. Video Transport License Fee: \$1.00/Subscriber/Mo. Leased Transport Circuit: \$3k/Mo. Premise Install Contractor Rate: +\$55 OSS/BSS Software: +\$50,000 Total Opex (Years 1-5): \$484K
Hosted Video (retail)	Set-Up Fee: \$30k Edge Servers: \$30k Off-air encoders: \$3k each broadcast stream Total Capex (Years 1-5): \$105K	Leased Transport Circuit: \$6k/Mo. Premise Install Contractor Rate: +\$55 OSS/BSS Software: +\$50,000 NCTC Membership Fee: \$1/premise passed Headcount: 1 FTE for Headend Technician Content License Fees: Vary by programmer Total Opex (Years 1-5): \$3.3M
Joint Ownership CFU Headend	Total Capex (Years 1-5): ≈\$446k	Total Opex (Years 1-5): ≈\$3.5M

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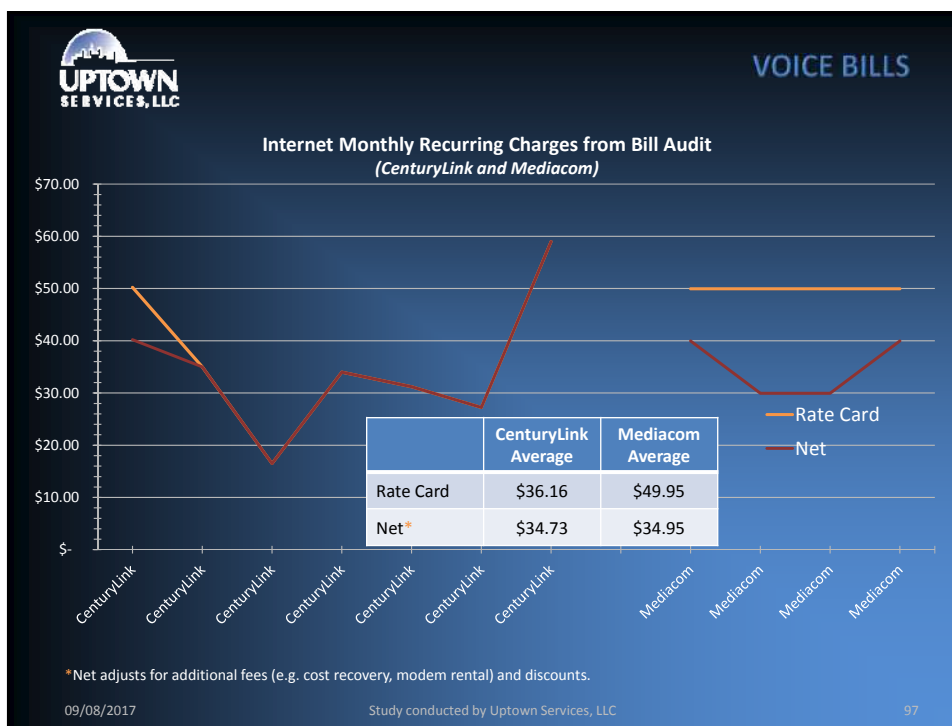
Incumbent and Proposed FTTP Service Offerings Voice Services



RESIDENTIAL VOICE SERVICES

		CenturyLink	Mediacom	FTTP System	Discount to CL / Mediacom
Package	Line Only LD per Minute	\$22.00	-	-	-
	Line & Features LD per Minute	\$35.00 <i>11 features</i>	-	-	-
	Line & Features Unlimited LD	\$49.00	\$49.95	\$34.95 Bundled	29% / 30%
Subscriber Line Charge		Yes	No	No	-

CenturyLink prices from centurylink.com as of June 2017. Mediacom pricing from Mediacom.com as of June 2017.



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COMMERCIAL VOICE EXCHANGE SERVICES (PER LINE)

Service		CenturyLink	Mediacom	FTTP
Line & Feature Packages	Business Prime (3 Calling Features)	Monthly: \$40.00		
		1 Year: \$36.00		
		2 Year: \$34.00	-	-
		3 Year: \$32.00		
	Choice Business (3 Calling Features and Voicemail)	Monthly: \$45.00		
		1 Year: \$40.50		
		2 Year: \$38.25	-	-
		3 Year: \$36.00		
	Choice Business Plus (15 Calling Features)	Monthly: \$55.00		With Internet
		1 Year: \$49.50		Monthly: \$29.95
		2 Year: \$46.75	1 st Line: \$39.95*	2 Year: \$24.95
		3 Year: \$44.00	Addl. Lines: \$29.95*	3 Year: \$22.95
Long Distance	Unlimited Domestic	\$28.00	Included	Without Internet
				Monthly: \$39.95
				2 Year: \$34.95
				3 Year: \$32.95
				Add \$2/line

* Requires 3 year term.

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COMMERCIAL VOICE NETWORK SERVICES

Service		CenturyLink	Mediacom	FTTP (Contract Required)
ISDN / SIP Trunks	Primary Rate Interface Access / Per B Channel (23B+D)	Facility Charge	Not rate carded.	With Internet
		Monthly: \$150		2 Year: \$24.95
		3 Year: \$127		3 Year: \$22.95
		5 Year: \$110		
		7 Year: \$108		Without Internet
		Per B Channel		2 Year: \$29.95
		Monthly: \$30.49		3 Year: \$27.95

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VOICE PROVIDER ROLE

Function	Operational Responsibility	FTTP System	CLEC
Capital	Local Loop and Premises NIU	✓	
	Fiber MUX, Transport, and Switch		✓
Interconnect	LNP, Operator Services, PSAP, IC Agreements		✓
Marketing & Sales	Advertising, Sales	✓	
	Brand, Pricing	✓	✓
Provisioning	Work Order Creation	✓	
	Bell Processes		✓
	Switch Provisioning		✓
	Customer Install	✓	
Billing	Bill Fulfillment	✓	
	Call Detail Record (LD), Taxes & Fees		✓
Internet	Backbone Interconnection		✓

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VOICE ARPU

		FTTP Retail	Wholesale Rate	FTTP Share	Dispersion	Contribution per Line
Residential	Unlimited local & LD	\$34.95	≈ \$10.00	≈ \$25	100%	≈ \$25
	Business Package (Monthly)	\$29.95	≈ \$12.00	≈ \$18	40%	-
Commercial (Unl. LD)	Business Package (2 Year)	\$24.95	≈ \$12.00	≈ \$13	20%	-
	Business Package (3 Year)	\$22.95	≈ \$12.00	≈ \$11	40%	-
	Total Commercial					≈ \$14

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Financial Analysis

Overview of Revenue, Opex, & Capex Inputs



BASELINE MODEL OVERVIEW

- ◆ Reflects specific Decorah service area market conditions
 - ◆ Quantitative market research
 - ◆ Sample designs to evaluate and cost out construction budget
 - ◆ Salaries, wages, and overhead
- ◆ Retail Business Structure (wholesale options evaluated as a separate pro forma scenario)
- ◆ Internet and voice services (video included as a pro forma scenario)
- ◆ Cost inputs based on Longmont and other Municipal FTTP deployments
 - ◆ Local construction costs (boring, splicing, etc.)
 - ◆ Headcount and contractor costs
 - ◆ Recent bids/proposals for equipment, construction labor, software, CLEC terms, etc.
- ◆ Assumes FTTP launch subsequent to Mediacom deployment of DOCSIS3.1
- ◆ Capital budget uses estimated cost/passing + 10% contingency
- ◆ Long term debt interest rate at 4.0% for 20 year revenue bond (w/ 3 years capitalized interest)

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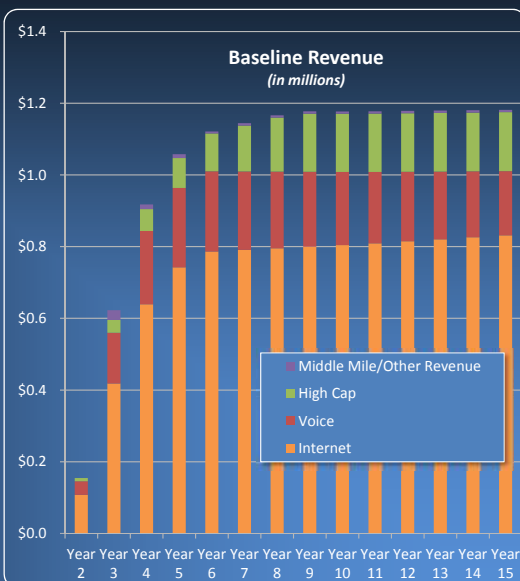
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REVENUES

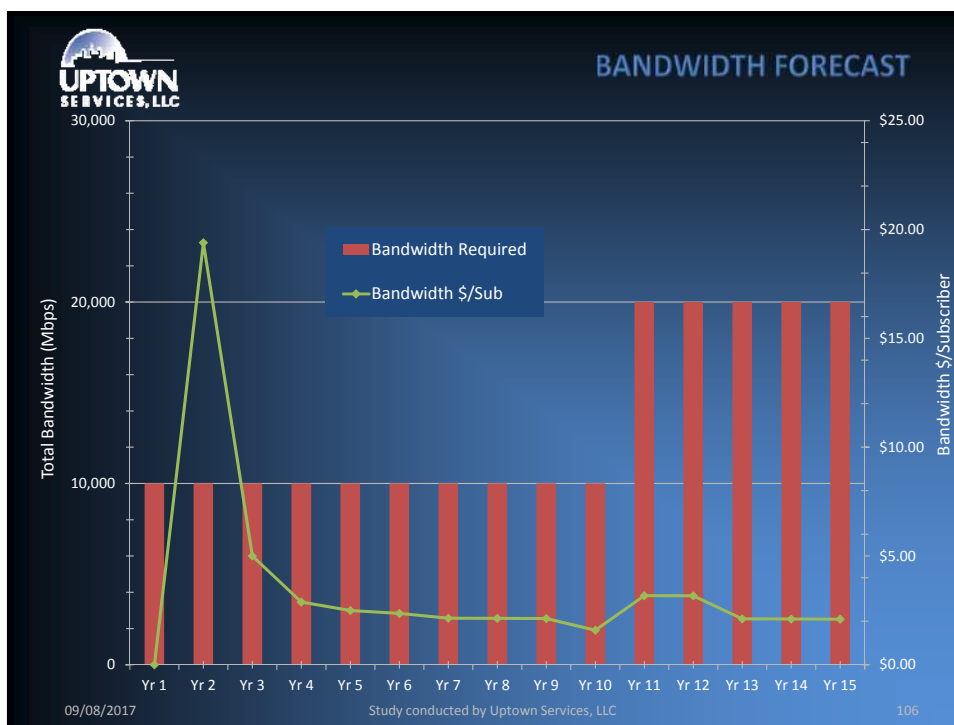
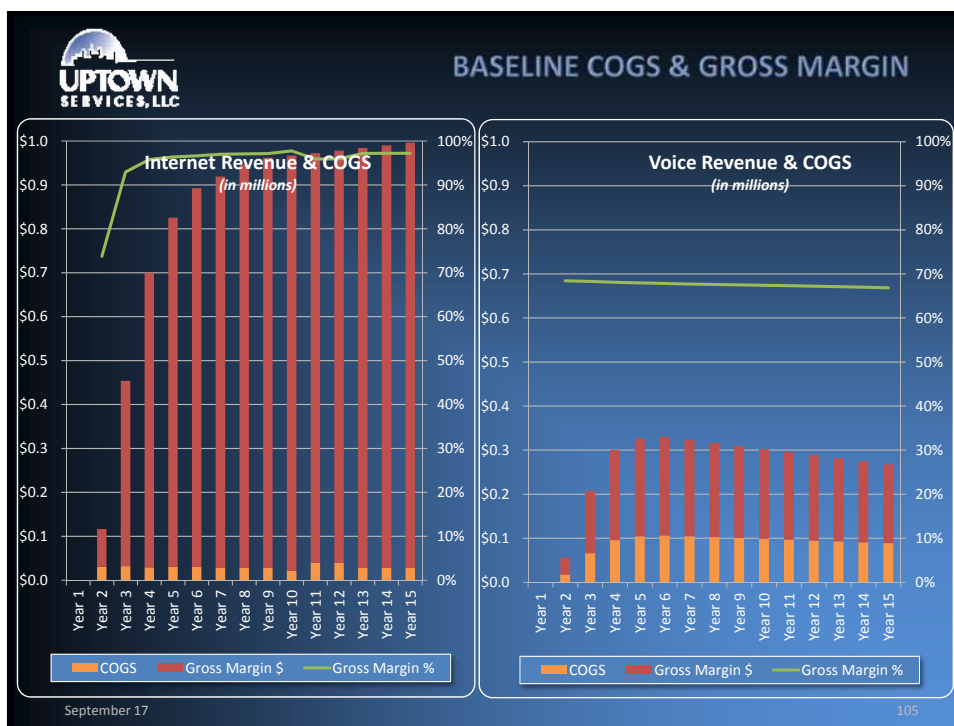
KEY INPUTS

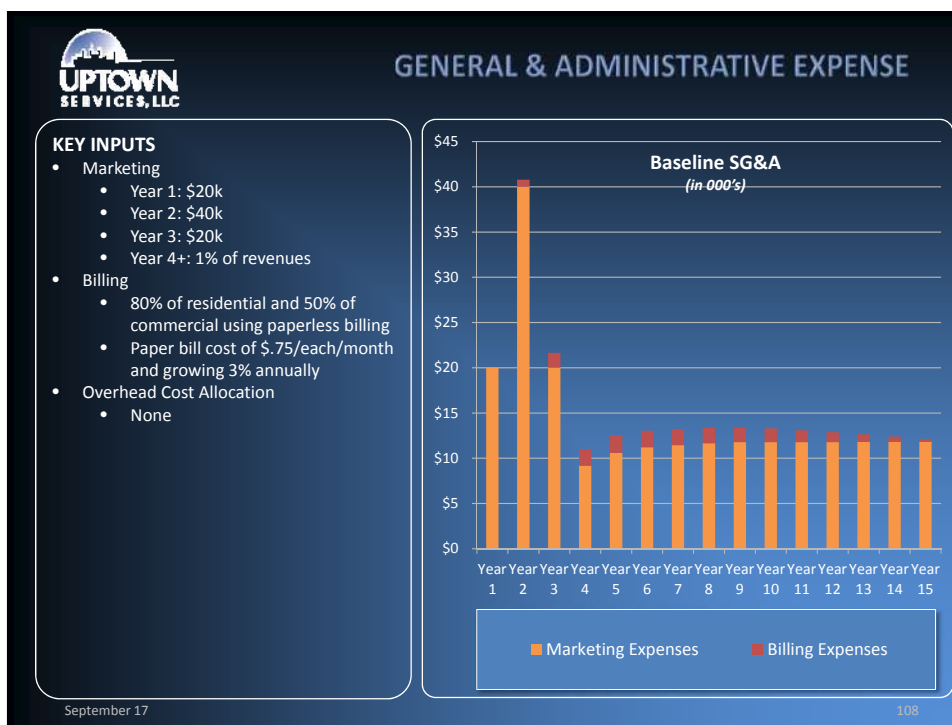
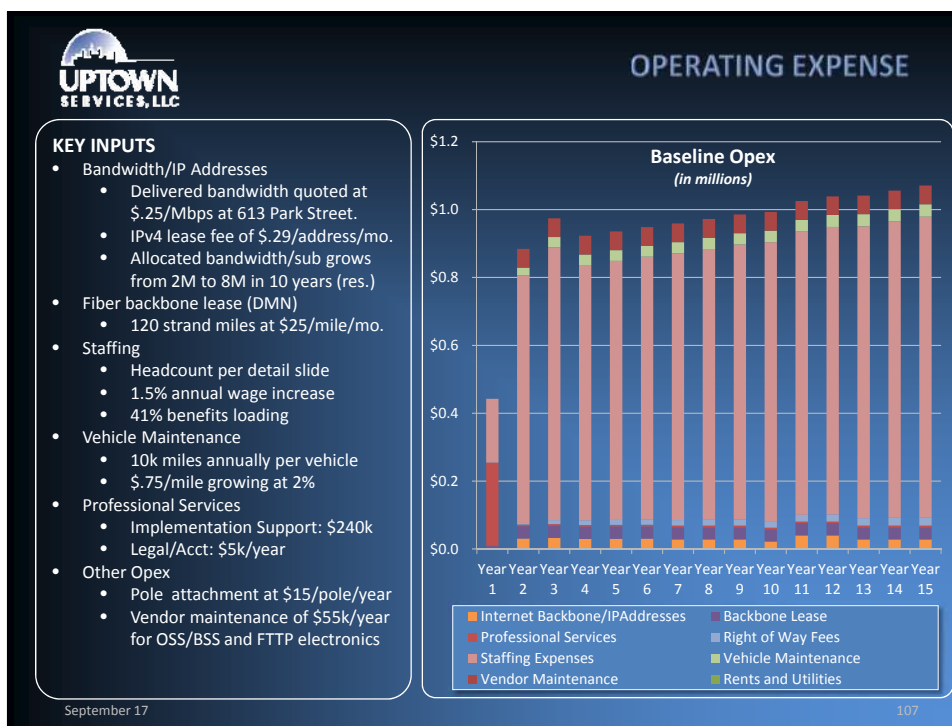
- Premises
 - Residential: 3,000
 - Commercial: 350
 - Premise Growth: .5% (Res & Biz)
 - % Complex: 10% of commercial
- Year 5 Penetration
 - Internet: 30.4%
 - Voice (eroded): 21.1%
- Residential Internet
 - 25Mbps Tier: \$49.95
 - 1Gbps Tier: \$59.95
 - WiFi Upgrade: \$10.00
- Commercial Internet
 - 25Mbps Tier: \$59.95
 - 50Mbps Tier: \$79.95
 - WiFi Upgrade: \$10.00
- Voice
 - Residential: \$25 net wholesale
 - Commercial: \$14 net per line
- Install Fees
 - Residential: \$49.95 (Year 3)
 - Commercial: \$99.95 (Year 3)



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FTE LEVELS: MANAGEMENT EMPLOYEES

- ◆ Dedicated FTTP System Full Time Equivalents (FTE)
 - ◆ System GM: 1 FTE
 - ◆ Data Technician: 1 FTE
 - ◆ Marketing Coordinator: 1 FTE
 - ◆ Customer Service Liaison: 1FTE (outsourced customer care scenario only)
 - ◆ Commercial Account Rep: Not included
 - ◆ Sales Engineer / MDU Accounts: Not included
- ◆ Positions funded using 2017 proposed pay plan, 41% benefits loading, and 1.5% annual salary increase

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FTE LEVELS: DEDICATED FRONTLINE EMPLOYEES

- ◆ Customer / Technical Service Representatives (CSRs/TSRs)
 - ◆ CSRs handle inbound/office sales, order entry and first tier support
 - ◆ TSRs handle all second tier customer support, dispatch and service provisioning
- ◆ Install Technicians
 - ◆ Installs are 2-phase with pre-install followed by separate premise install
 - ◆ Pre-Install: Install fiber drop and Test Access Point
 - ◆ Premise Install: Place ONT and inside wiring
- ◆ Service & Maintenance Technicians
 - ◆ Service techs fix subscriber problems. Network techs maintain the fiber system outside plant
 - ◆ Service call volume equals 50% of all subscribers/year dropping to 25% by year 5
 - ◆ Each Service Tech can complete 4/day growing to 6/day by Year 5
 - ◆ 1 Maintenance Tech per 1,000 plant miles

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FRONTLINE EMPLOYEE STAFFING OPTIONS

- ◆ **Baseline Pro Forma:** All Insourced
 - ◆ Install Techs, CSRs, and TSRs staffed by City without contractor staffing
 - ◆ CSRs/TSRs staffed at 1 FTE per 2k accounts growing to 4k by Year 5, but with minimum of 3 CSR FTE and 2 TSR FTE to ensure phone coverage
 - ◆ Each Install Tech can complete 3/day
- ◆ **Scenario Analysis:** Outsourced Install Techs
 - ◆ All installs (pre-installs and premise installs) are outsourced during Years 1-3
 - ◆ Pre-installs completed by a contractor at fixed rate of \$185
 - ◆ Premise installs are completed by a contractor at fixed rate of \$170
- ◆ **Scenario Analysis:** Outsourced Customer Care
 - ◆ CSRs and TSRs are outsourced to a 3rd party call center (e.g. Aureon in Des Moines) at hourly rate of \$28.00/\$29.75 (business/after hours)
 - ◆ Requires staffing a single FTE as Customer Services Liaison

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INCREMENTAL BROADBAND FTE REQUIRED

Position Title	City Salary Grade/Step	Salary (unloaded)	Year1	Year2	Year3	Year4	Year5
System GM	12 – S4	\$61,000	1	1	1	1	1
Marketing Coordinator	3 – S4	\$40,000	1	1	1	1	1
Data Tech	8 – S10	\$65,000	0.5	1	1	1	1
Customer Service Liaison	Utility Operator III – Step C	\$43,000	0.5	1	1	1	1
CSRs			-	3 / 0	3 / 0	3 / 0	3 / 0
TSRs			-	2 / 0	2 / 0	2 / 0	2 / 0
Install Techs			-	1 / 0	2 / 0	1	1
Maintenance Techs			-	1	1	1	1
Service Techs			-	1	1	1	1
Total Headcount			2.5 / 1	11 / 4	12 / 4	11 / 7	11 / 7

Note: FTE required if outsourced

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CAPITAL

- ◆ Network Construction
 - ◆ OSP Construction: \$487 composite cost per premise passed
 - ◆ Subsequent plant extensions: \$244/premise passed
 - ◆ Backbone/Feeder Construction: \$25/premise passed*
 - ◆ OLT cost: \$54/premise passed
 - ◆ Remote Cabinet cost: \$40/premise passed (2 remote cabinets)
 - ◆ Make Ready cost: \$250/per pole
 - ◆ Year 10 Network electronics upgrade: \$75/premise passed
- ◆ Software
 - ◆ OSS/BSS: \$250k
 - ◆ Fiber Management & Network Management: \$50k
- ◆ Fixed Equipment
 - ◆ Core HE switch/router: \$150k (2 routers)
 - ◆ Internet systems back office: \$50k
 - ◆ Field Tech Equipment/Tools: \$80k

* With access to DMN backbone strands

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CAPITAL (CONT.)

- ◆ Vehicles
 - ◆ Service Vans Per Install Technician: 1.0
 - ◆ Heavy Service Trucks Per Maintenance Technician: 0.5
 - ◆ Service vans: 3 at \$45k each
 - ◆ Heavy Service Trucks (non-insulated): 1 at \$90k each
 - ◆ Install Rigs: 1 per Install Technician at \$20k each
 - ◆ Vehicles replaced at 6 year intervals
- ◆ Contract Labor (not in Baseline pro forma)
 - ◆ Pre-Installs: \$185 each
 - ◆ Premise Installs: \$170 each
- ◆ Optical Network Terminals (ONTs)
 - ◆ Residential/Business ONT (non-WiFi): \$150 each
 - ◆ Residential/Business ONT (80211.ac WiFi): \$200 each
 - ◆ Year 7 ONT upgrade: \$48k (\$40/ea.)
- ◆ Fiber Drop & Powering
 - ◆ Fiber drop and connectors: \$125 each
 - ◆ Power cord and UPS: \$52 each (\$12 for non-voice install without UPS)

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CAPITAL (CONT.)

- ◆ Engineering and Integration
 - ◆ Walk out & strand mapping: \$1,000 per mile
 - ◆ Make ready engineering: \$500 per mile
 - ◆ FFTP design: \$1,250 per mile
 - ◆ Construction management services: \$3,000 per mile
 - ◆ As-built drawings: \$250 per mile
 - ◆ Backbone/Feeder design: \$25k flat fee
 - ◆ Headend engineering & integration: \$20k flat fee
- ◆ Locates
 - ◆ Not included

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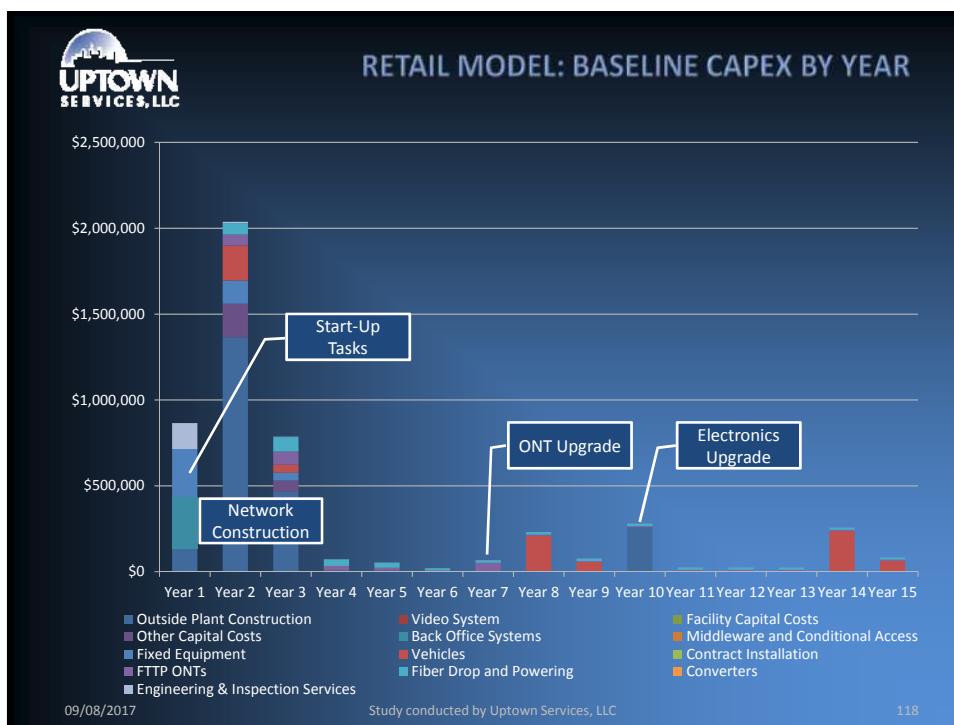
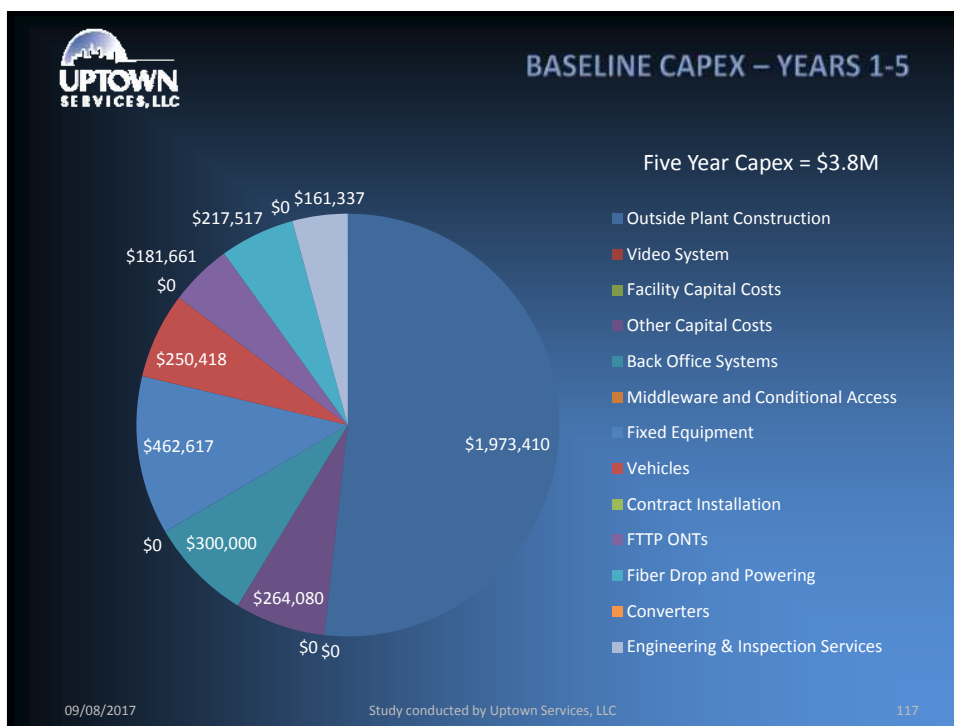
PROJECT FINANCING

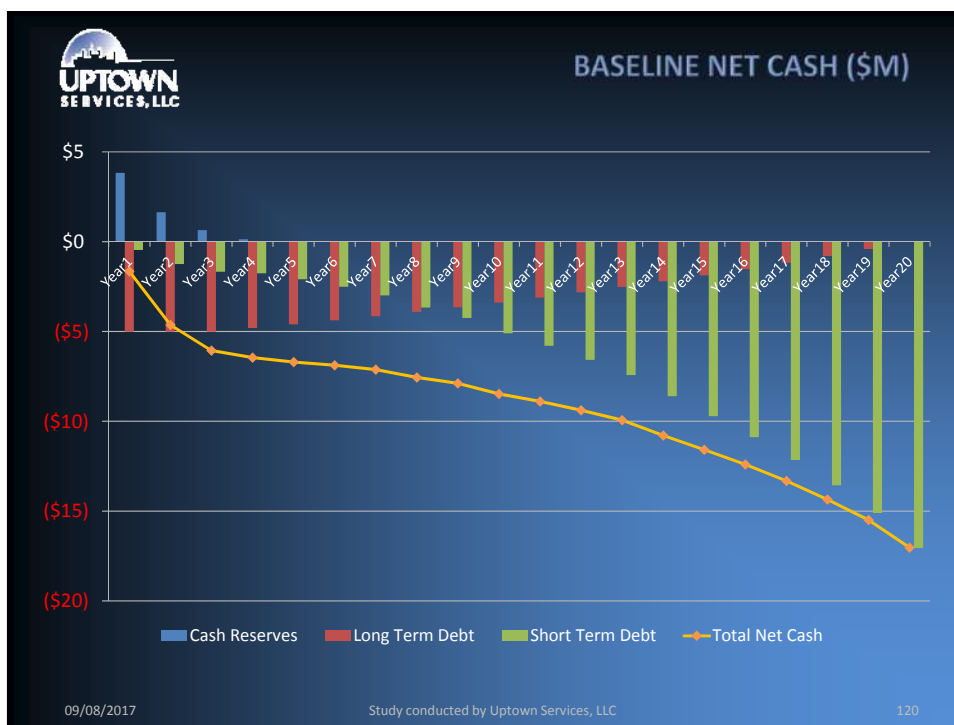
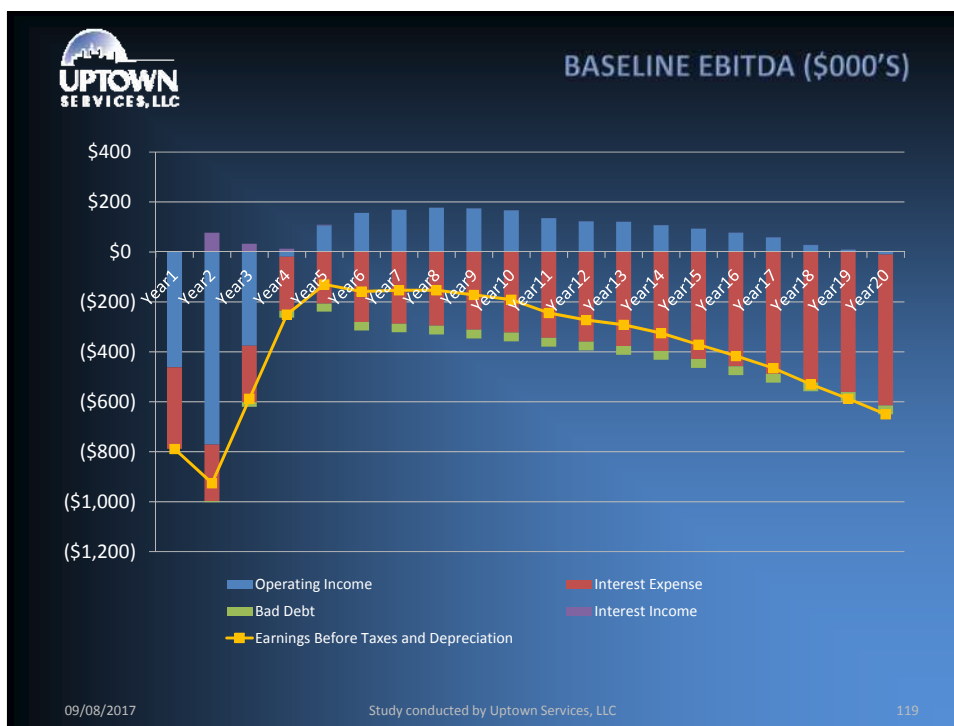
- ◆ Long term financing
 - ◆ Single round of financing (Year 1)
 - ◆ Three years interest only and 17 years of principal payments
 - ◆ 2.0% issuance, \$0 reserve requirement
 - ◆ Interest rate – 4.5%
- ◆ Short term financing
 - ◆ Provides for cash needs not covered by long term financing
 - ◆ Balance accumulates over first 10 years including interest (4%)
 - ◆ Level payments begin in year six over ten year payment plan
- ◆ Start-up period included as Year 1 of the business case
 - ◆ No revenues assumed during first year of the plan
 - ◆ Technical Trial underway at the end of Year 1
- ◆ Other assumptions
 - ◆ Bad debt = 3% of gross revenues
 - ◆ 2% interest on cash reserves
 - ◆ Discount rate = 5% for present value calculations
 - ◆ 10 billable months in Year 2

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Pro Forma Scenario Analysis



SCENARIO ANALYSIS

- ◆ Use outsourcing to reduce staffing expense
 - ◆ Install Technicians
 - ◆ CSR's
 - ◆ TSR's
- ◆ Offer triple play service to increase revenue
 - ◆ Joint headend ownership with CFU
 - ◆ Hosted traditional Pay TV with video headend transport feed (e.g. Skitter TV)
 - ◆ Hosted video in-home streaming (e.g. MobiTV)
- ◆ Greater Internet penetration
 - ◆ Year 20 net cash break-even penetration requirement
- ◆ Wholesale models



FINANCIAL OUTCOMES

Outcome	Baseline	Outsourced Installs & Customer Care	Triple Play via Skitter TV	Triple Play via AcenTek	Joint Headend Ownership	Triple Play** & Internet @40% Penetration
Business Model	City is Retailer					
Internet Penetration*	30.4%					40.0%
Voice Penetration*	21.1%					
Video Penetration*	0%		31.2%			
Long Term Debt	\$5.0M	\$5.0M	\$5.7M	\$5.6M	\$5.8M	\$5.9M
Working Capital	\$15.5M	\$11.3M	\$7.9M	\$10.6M	\$4.2M	\$1.3M
Total Funding	\$20.5M	\$16.3M	\$13.6M	\$16.2M	\$10.0M	\$7.2M
Net Cash – Year 20	(\$17.7M)	(\$13.0M)	(\$8.6M)	(\$12.2M)	(\$3.7M)	\$1.5M
Project Break Even	>20 Years	>20 Years	>20 Years	>20 Years	>20 Years	18 Years

* Penetration metrics are Year 5 and are eroded where applicable.

** Video via Joint Headend Ownership.

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Financial Analysis
Business Structure Options



EXAMPLE MUNICIPAL FTTP SYSTEMS MODELS

Business Model	Municipality	Retail Service Provider (RSP)	Funding
Retail	Longmont, Colorado	The City	The City via Revenue or General Obligation Bond
Wholesale	Westminster, Maryland	Ting	
	Huntsville, Alabama	Google Fiber	
Franchise	Lincoln, Nebraska	Allo	The Service Provider
	Austin, Texas & Others	Google Fiber	

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WHOLESALE AND FRANCHISE MODELS

- ◆ Wholesale Model
 - ◆ Decorah builds and maintains the physical fiber network to pass all premises
 - ◆ Retailer is responsible for all other functions/costs
 - ◆ Details of partner roles on next slide
- ◆ Franchise Model
 - ◆ Franchising authority grants franchise agreement including terms for franchise fee, premises passed, ROW access, and construction requirements
 - ◆ End user fees are not specified or regulated other than non-discriminatory pricing
 - ◆ Decorah plays no role and does not fund the FTTP system*
 - ◆ Not recommended based on recent withdrawal of Google Fiber and Axia

* Pro forma analysis is not relevant to the Franchise Model with no Decorah investment requirement.

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		WHOLESALE MODEL ROLES	
Function	Operational Responsibility	Retail Model	Wholesale Model (Westminster)
Private Partner		NA	Ting
Network Services		Data: Decorah Voice: CLEC Video: Not Offered	Data: RSP Video & Voice: RSP or 3 rd Party
Network Assets	Backbone, Feeder, and Distribution Conduit/Fiber	Decorah	Decorah
	FTTP Electronics		RSP
	Fiber Drop		Decorah
	ONT and Inside Wiring		RSP
Network Maintenance	Fiber & Conduit		Decorah
	Electronics		RSP
	Outage Response		Decorah
Bandwidth	Backbone Interconnection		RSP
Software	OSS/BSS		RSP
	Fiber Management		Decorah & RSP
Marketing & Promotion	Advertising, Sales, Branding		RSP or 3 rd Party
	Community Engagement		Decorah & RSP
	End User Pricing		RSP
Customer Operations	Help Desk, Service Calls, Billing		RSP or 3 rd Party
	Customer Installs and Disconnects		RSP

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		WESTMINSTER MARYLAND	
◆	City Role		
◆	Design, construction, and maintenance of the fiber network. City retains title to the network.		
◆	24/7 availability for unscheduled maintenance with 4 hour on-site response timeframe		
◆	Network Point of Demarcation		
◆	Residential: Exterior wall closest to public ROW		
◆	Commercial: Patch panel in telecom closet		
◆	Services		
◆	Triple Play with Ting providing data service (up to 1Gbps) and 'arranging' for voice and video		
◆	Retail rates are at the sole discretion of Ting		
◆	Financial Terms		
◆	Premise Passed Fee: \$6/month		
◆	Connected Premise Fee: \$17/month		
◆	Fees apply whether business or residential connection		
◆	ARPU Adjustment: The Connected Premise Fee will increase by \$1 for every 10% increase in Ting's realized ARPU (compared to baselined ARPU at 1,500 subscribers)		

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WESTMINSTER MARYLAND (CONT.)

- ◆ Ting is exclusive provider for Phase 1
 - ◆ 'Open Access', but with initial period of exclusivity for Ting for data service. Exclusivity protection lasts until either:
 - ◆ Two years after the launch of each deployment phase service area, or
 - ◆ Penetration reaches 20% and/or Ting achieves 3,000 end user customers (of 7,200 HHs)
- ◆ Ting operates under 2 roles: Network Operator and Services Provider
 - ◆ As Network operator it is the active wholesaler to unaffiliated Service providers that it will be competing with. The City has no active role with RSPs other than Ting.
 - ◆ Ting will individually negotiate wholesale agreements with each additional RSP. Agreements must be non-discriminatory but terms can vary across these agreements.
 - ◆ As Network Operator Ting will install and maintain all premise inside wiring and CPE, including the ONT. The ONT will be outdoor vs. indoor.
- ◆ Other Terms
 - ◆ 10 Year Term with 2 ten year renewal periods
 - ◆ City must renew if actual wholesale revenues exceed debt service by 10% or more
 - ◆ Termination for Convenience: City can terminate with 6 months notice

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TING (WESTMINSTER PROVIDER)

- ◆ Background
 - ◆ Virtual Wireless Network Operator launched in 2012. Sprint and T-Mobile are their host networks.
 - ◆ Owned by parent Tucows
- ◆ FTTN Services
 - ◆ Residential and commercial Internet access (1G residential/commercial and 5M residential)
 - ◆ Video in development
- ◆ Retail Service Provider for 2 municipal FTTN systems
 - ◆ May 2015: Charlottesville, VA (18k households)
 - ◆ August 2015: Westminster, MD (7k households)
 - ◆ In development: Holly Springs, NC (8k households) and Sandpoint, ID (4k households)
- ◆ Overbuild Competitors
 - ◆ Charlottesville, VA: Mediacom and CenturyLink
 - ◆ Westminster, MD: Mediacom and Verizon
 - ◆ Holly Springs, NC:

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BUSINESS STRUCTURE RISKS

- ◆ Retail Model Risks
 - ◆ Service revenues may be insufficient to cover debt service requirement
 - ◆ Technology advances may require more frequent or costly system upgrades than forecast
 - ◆ Personnel or other operating expenses may exceed forecast
- ◆ Wholesale Model Risks
 - ◆ Lease rates may be too low to pay off the long term debt from the fiber build
 - ◆ Retailer price levels may not be competitive in a DOCSIS3.1 environment with Mediacom's \$100 Gig service
 - ◆ Retailer may go bankrupt or default on wholesale payments
- ◆ Franchise Model Risks
 - ◆ Not applicable to Decorah

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Pro Forma Analysis

Wholesale Models



FINANCIAL ANALYSIS OF WHOLESALE

- ◆ Financial feasibility requires both parties to meet financial return obligations
 - ◆ Wholesaler: Debt service of the bond(s)
 - ◆ Retailer (RSP): Sufficient ROI for shareholders = Net Cash positive by Year 8
- ◆ Pro forma methodology
 - ◆ City Case: Identify the Per Passing and Per Connect wholesale fees that enable the City to become Net Cash positive by Year 15
 - ◆ RSP Case: Input these Per Passing and Per Connect wholesale fees as lease rates in the RSP case and evaluate feasibility (minimum 8-Year IRR of 0%)
- ◆ RSP Case key financial inputs
 - ◆ Same penetration levels as Retail Case
 - ◆ Same services pricing (to match expected penetration)
 - ◆ Headcount efficiencies (detail next slide). Same wage levels, but lower overhead loading (30% vs. 41%)
 - ◆ Higher cost of debt as a taxable bond or higher cost 3rd party financing (5.5% vs. 4.5%)

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RETAILER BUSINESS CASE

- ◆ Private partner serves as Retailer and offers Triple Play
- ◆ RSP staffing:
 - ◆ 1 FTE as system GM (higher wage scale than City)
 - ◆ 1 FTE as Data Technician (higher wage scale than City)
 - ◆ No incremental CSRs or marketing staff
 - ◆ No incremental TSRs
 - ◆ Same resource levels for Install and Service Technicians and/or install contractors. No Maintenance Techs.
- ◆ RSP responsible for:
 - ◆ Customer drop, ONT, set tops, and installation process and materials
 - ◆ Bandwidth, voice switch, video feed
 - ◆ Customer service, billing, help desk, and ONT monitoring

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BROADBAND FTE FOR WHOLESALE MODEL

Position Title Decorah / RSP Headcount	Salary (unloaded)	Year1	Year2	Year3	Year4	Year5	Year6	Year7
System GM	\$120,000	1	1	1	1	1	1	1
Data Tech	\$90,000	1	1	1	1	1	1	1
TSRs	\$43,000	1	1	1	1	1	1	1
Install Techs	\$55,000	-	1	1	1	1	1	1
Maintenance Techs	\$43,000	-	1	1	1	1	1	1
Service Techs	\$60,000	-	1	1	1	1	1	1
Total Headcount		1 / 2	2 / 4	2 / 4	2 / 4	2 / 4	2 / 4	2 / 4

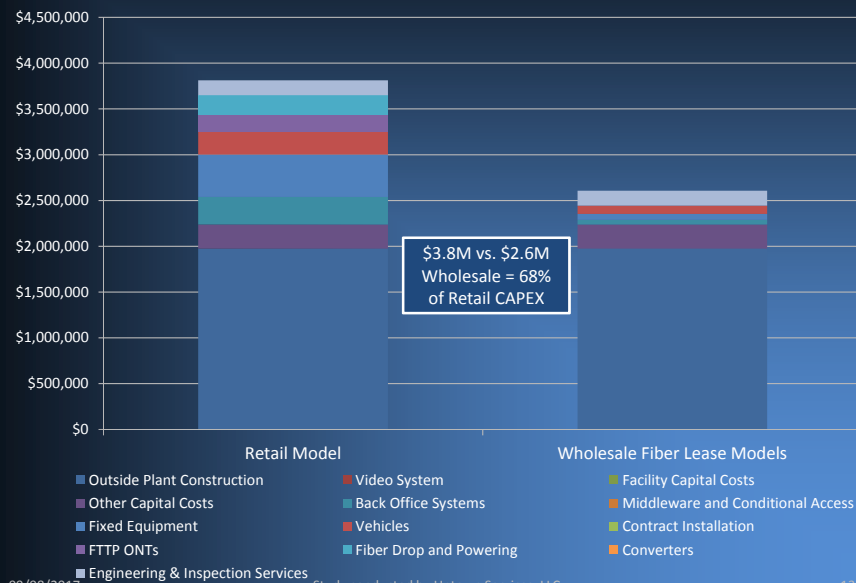
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CAPEX: RETAIL VS. WHOLESALE (YEARS 1-5)



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WHOLESALE FINANCIAL OUTCOMES

Outcome	Decorah as Wholesaler (Westminster terms)	Decorah as Wholesaler (15 year payback terms)	Retail Service Provider
Wholesale Fee (per passing/connect)	\$6 / \$17	\$10 / \$17	
Equity Investment	-		\$4.0M
Long Term Debt	\$3.6M		-
Working Capital Requirement	\$2.1M	\$0.3M	\$1.4M
Total Funding	\$5.7M	\$3.9M	\$5.4M
Net Cash – Year 8	-	-	(\$1.8M)
Net Cash – Year 15	(\$2.5M)	\$0.2M	\$600K
IRR – Year 8	-	-	(7.4%)
Project Break Even	> 20 Years	15 Years	13 Years

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