THE CABLE QUARTERLY - POST 2Q18

THE COWEN INSIGHT

Our in-depth report published each quarter compares Cable/Satellite results including sections on video, the OTT threat, broadband, wireless MVNO, the 5G threat, business services, and financial performance. All in, we favor ATUS into the 3Q18 print as we note a valuation disconnect on expected buybacks, margin, and FCF improvements. Key takeaways include:

Broadband Showed Surprising Unit Growth, But From Where?

In 2Q18, the industry surprisingly gained 2.4% broadband subscribers Y/Y, a rebound after the previous two quarters of 2.1% growth (Figures 13/14). It’s especially surprising given the seasonally softer quarter and overall market maturation story. Strength in Cable broadband would not have been overly surprising as we could have attributed strength to share-stealing from Telcos. However, even the Telcos showed surprising strength (including the smaller RLEC’s such as Windstream, posting internet gains for the first time since 1Q15). The broadband acceleration was not driven by greenfield builds, as we’ve seen no meaningful growth in additional homes (Big Cable Y/Y HHP growth actually decelerated to 1.4% in 2Q18). The growing inherent value of broadband (as a necessary utility) coupled with the stronger economy could be partly responsible, which one could also argue bolstered the broadband penetration to lower-income households. In the same vein, moderating Broadband ARPU growth trends at most MSO’s (factoring in ASC 606) suggest that the industry is partially trading rate for sub growth (Figure 19).

Video Losses Slightly Improve

Industrywide Y/Y Video losses have stabilized in the -3.5% range over the past four consecutive quarters, noting slight improvement in 2Q18 (Figure 2). Interestingly, Telco TV losses are now better than Satellite/DBS losses, bolstered by solid U-Verse performance (Figure 3). Our explanation for the stabilization (and slight improvement) is that the competitive industry simply needed to take a breather. Losses escalated in 2017 after the emergence/traction of deep-pocketed, “irrationally priced”, full service vMVPDs. With these vMVPD providers already in place, and no vMVPDs of similar stature entering the market for the foreseeable future (outside of perhaps Apple TV), we argue that Pay TV loss trends have leveled out (until Gen-Z enters the workforce in 2021). Going forward, our most recent survey data (link) shows OTT adoption is modestly increasing yet again. All in, we should expect video losses to remain in the 3.4-3.6% range with a bias toward the downside in 2H18.

Stable Fundamentals Drive Modest Sector Rerating; We Like ATUS Set-Up

With the aforementioned solid broadband strength, stable (and slightly improved) video losses, margin preservation/expansion, and Cable self-inflicted wounds in the past (Comcast drops Fox, Altice storms/Starz, Charter TWC sub-base clean-up), the industry showed a modest rerating since earnings season, up roughly one-half EV/EBITDA turn (or FCF yields down 100 bps). It’s worth noting that typically Charter traded at a 2-turn EBITDA premium to Comcast; however, with Comcast strength, coupled with an eroding M&A story for Charter, the premium has decreased to 1.5x and stabilized at these levels, which could be the “new normal” spread. As we think about the months ahead, we like the Altice set-up into the 3Q18 print noting 2019 margin expansion, an accelerated buyback (currently underway), and a valuation disconnect.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top 5 Takeaways</td>
<td>3</td>
</tr>
<tr>
<td>Investment Thesis for Each Company</td>
<td>5</td>
</tr>
<tr>
<td>Pay TV</td>
<td>7</td>
</tr>
<tr>
<td>Broadband</td>
<td>13</td>
</tr>
<tr>
<td>Business Services</td>
<td>18</td>
</tr>
<tr>
<td>Wireless MVNO</td>
<td>20</td>
</tr>
<tr>
<td>5G Fixed Wireless</td>
<td>25</td>
</tr>
<tr>
<td>Financials, Capex, and Valuation</td>
<td>29</td>
</tr>
<tr>
<td>Appendix</td>
<td>34</td>
</tr>
</tbody>
</table>
Top 5 Takeaways

1) Broadband Showed Surprising Unit Growth, But From Where? In 2Q18, the industry surprisingly gained 2.4% broadband subscribers Y/Y, reboun after the previous two quarters of 2.1% growth (Figures 13/14). It’s especially surprising given the seasonally softer quarter and overall market maturation story. Strength in Cable broadband would not have been overly surprising as we could have attributed that to share-stealing from Telcos. However, even the Telcos showed surprising strength (including the smaller RLEC’s such as Windstream, posting internet gains for the first time since 1Q15). The broadband acceleration was not driven by greenfield builds, as we’ve seen no meaningful growth in additional homes (Big Cable Y/Y HHP growth actually decelerated to 1.4% in 2Q18). The growing inherent value of broadband (as a necessary utility) coupled with the stronger economy could be partly responsible, which one could also argue bolstered the broadband penetration to lower-income households. In the same vein, moderating Broadband ARPU growth trends at most MSOs (factoring in ASC 606) suggest that the industry is partially trading rate for sub growth (Figure 19).

2) Video Losses Slightly Improve. Industrywide Y/Y Video losses have stabilized in the -3.5% range over the past four consecutive quarters, noting slight improvement in 2Q18 (Figure 2). Interestingly, Telco TV losses are now better than Satellite/DBS losses, bolstered by solid U-Verse performance (Figure 3). Our explanation for the stabilization (and slight improvement) is that the competitive industry simply needed to take a breather. Losses escalated in 2017 after the emergence/traction of deep-pocketed, “irrationally priced”, full service vMVPDs. With these vMVPD providers already in place, and no vMVPDs of similar stature entering the market for the foreseeable future (outside of perhaps Apple TV), we argue that Pay TV loss trends have leveled out (until Gen-Z enters the workforce in 2021). Going forward, our most recent survey data [link] shows OTT adoption is modestly increasing yet again. All in, we should expect video losses to remain in the 3.4-3.6% range with a bias toward the downside in 2H18.

3) Stable Fundamentals Drive Modest Sector Rerating; We Like ATUS Set-Up. With the aforementioned solid broadband strength, stable (and slightly improved) video losses, margin preservation/expansion, and Cable self-inflicted wounds in the past (Comcast drops Fox, Altice storms/Starz, Charter TWC sub-base clean-up), the industry showed a modest re-rating since earnings season, up roughly one-half EV/EBITDA turn (or FCF yields down 100 bps). It’s worth noting that typically Charter traded at a 2-turn EBITDA premium to Comcast; however, with Comcast strength, coupled with an eroding M&A story for Charter, the premium has decreased to 1.5x and stabilized at these levels, which could be the “new normal” spread. As we think about the months ahead, we like the Altice set up into the 3Q18 print noting 2019 margin expansion, an accelerated buyback (currently underway), and a valuation disconnect.
4) **T-Mobile Fixed Wireless Broadband Hype Machine Continues.** Going forward, we continue to believe Cable MSOs will be seen as home connectivity companies in which video will simply ride as an app (of many apps) to the home. To that point, we see 5G fixed wireless broadband as the biggest existential threat to broadband providers (by far). To that point we’ve been closely tracking initiatives from the more vocal carriers, namely Verizon and T-Mobile (see linked reports on page 3). On its earnings call, T-Mobile mgmt. continued to speak aggressively on its FWBB endeavors, expecting to capture 10MM BB adds by 2024. As our analysis shows on page 25, this target would be a large majority of the entire Cable industry’s BB adds over the next 6 years. Cable stocks were down 2.4%, on average, following the T-Mobile call. We suspect there was much political (Sprint) posturing around these comments, and are skeptical on 5G network capacity in non-rural areas, but it’s a risk we will watch closely.

5) **Economics and Sizing the MVNOs.** On June 30, Charter soft-launched its wireless MVNO. Taking a page out of the successful Comcast playbook, the Charter rate card copies Xfinity Wireless with a $45/mo unlimited plan; however, the PAYG plan is $2 higher at $14/GB (vs. Xfinity’s $12/GB). Unlike the Xfinity launch, Charter looks for a more tempered “crawl, walk, run” launch. As for sizing the wireless TAM, in our latest survey, we found Comcast customers to be older, lower income, and lower usage customers, which is ideal for Cable’s differentiated and successful PAYG offering. Though we question where the cable providers will hunt after tapping this niche cohort. We also question the costs as Comcast has lost $854MM in OCF (and far more in cash from device EIP) on just 781K subs. Altice expects its “facilities based” Sprint MVNO to be positive Year 1. We acknowledge Comcast’s upstart costs and a grossly subscale model, but it’s an MVNO, and at $854MM we consider the possibility of transferred costs to wireless for better cable optics during its Sky bidding war. In any case, we believe the venture could be “testing the waters” before a larger move with an incumbent national carrier.
Current Investment Thesis for Each Company

Altice USA (ATUS $18.65, Outperform (1) - $13.7B Market Cap)

Altice USA reported in-line 2Q18 revenue and EBITDA results as lower residential revenue (ARPU on delayed rate hikes) was offset by solid advertising. Pay TV losses were -24K vs. our -39KE and the St.'s -28KE while Broadband adds were +10K vs. our +4KE and the St.'s +6KE. Mgmt. reiterated top-line guidance, calling for a 2H acceleration bolstered by sub growth and the delayed rate hikes (to June, ~3% hike). Perhaps most importantly, mgmt. reiterated confidence in 2H margin expansion, making a point that 2Q18 margins were impacted by i24 News costs and one-time legal and ATS-consolidation costs, while also reminding us that the Altice mgmt. fees (of ~$7.5MM/qtr) will go away. Further margin expansion will come from the revenue growth (especially the operating leverage on price hikes), the OSS/BSS initiative (October), care cost reductions, and FTTH efficiencies. While the lack of buyback appears disappointing, mgmt. noted the company only had a 10-day window post spin-off, signaling a 2H buyback (with a target to remain under its 5.0x net leverage, which by our model affords them ~$600MM). As for the wireless MVNO, interestingly mgmt. did not immediately endorse the Comcast playbook for its 2019 launch and expects to be EBITDA (and EBITDA less capex) positive in Year 1, a far different story vs. its cable peers. Lastly mgmt. messaged no intention of acquiring media assets (general entertainment, RSN's, or production), seeing very little synergies, instead will focus on news (for its local sub base), similar to Charter comments on its earnings call. All in, the solid metrics and positive mgmt. commentary validates that the muted 1Q18 results were indeed short-lived as we look for buybacks, meaningful margin, and FCF improvements ahead. Altice shares look attractive on essentially all valuation metrics, and we recommend accumulating shares before the 3Q18 print.

Charter (CHTR $305.08, Outperform (1) - $80.9B Market Cap)

Charter posted upside revenue and EBITDA results highlighted by improved video losses, impressive internet adds, and slightly better margins despite continued integration. Charter posted Video losses of just -73K vs. our -150K and the St. -108K and impressive Internet adds of +218K vs. our +175K and the St. +185K. Much of the upside came from the TWC footprint, which is highly encouraging considering mgmt. had previously messaged the 1H18 subscriber base cleanup. With the clean-up complete, the seasonal weaker 2Q behind the company, and managing the OTT competition, the company is well poised for a rebound in 2H18 sub metrics. Margins and capex tell a similar story for a solid 2H18+ set-up (even with Mobile investment). Programming costs continue to rise mostly in line with expectations, while Charter more than offset the programming pressure with non-programming scale and efficiencies, beating our margin expectations by 47 bps (up 18 bps Y/Y) despite $33MM in Mobile upstart costs. The company remains on pace with SPP adoption, the all-digital transformation, and widening the speed gap vs. telco competitors (offering 200 Mbps in 40% of its footprint). Mgmt. reiterated full-year capex intensity to be modestly lower Y/Y, and reaffirmed a steeper drop off in 4Q18 and beyond. Mgmt. repurchased $1.9B shares and has little interest in buying overpriced Media assets, noting buybacks provide a better return. All in, a Charter takeout may be temporarily on the backburner, but we like Charter noting margin preservation/expansion and capex efficiencies delivering a >20% FCF/share CAGR. With the 2Q seasonal weakness and sub base clean-up behind the company, we like the set-up going forward, coming from an incrementally improved position, and reiterate our Outperform rating.
Comcast posted good 2Q18 results, in-line with mgmt’s previous commentary of an “excellent” quarter. Cable had multiple highlights including HSI adds, healthy ARPU, programming cost moderation, non-programming transformation, and capex efficiencies. HSI adds of +260K easily beat our already impressive estimate of +185K and the St. +191K in the seasonally slower quarter. Margins were driven by continued low churn and said cost efficiencies and raised margin guidance to up 50-100 bps (from up 50 bps), though it’s worth noting 2Q18 had 1x storm insurance and a tax settlement that helped by ~30 bps. Cable capex was better across the board. In Media, NBCU delivered upside to our revenue and EBITDA estimates, primarily driven by Cable Networks performing ahead of our estimates, and lower than expected intersegment eliminations. Cable advertising growth benefitting from strong pricing and MSNBC ad sales. Core broadcasting ad growth (ex World Cup) was consistent. Mgmt. noted that they completed the “strongest upfront in the seven years that we’ve been here”. Cable distribution benefitted from previous renewal agreements and moderating subscriber declines. Studio and Parks both reported revenue and EBITDA a bit light of our expectations on tough Y/Y comparisons (holiday timing). All in, despite the impressive FCF delivery, mgmt. reiterated its subdued buyback guide of “at least $5B”, a telling sign that mgmt. is preserving dry powder for a possible topping bid for Sky and/or additional media M&A after losing Fox. We continue to stress our skepticism with any and all Comcast M&A that involves traditional media assets, especially those with programming assets that will undergo an underappreciated painful transition as video shifts to D2C OTT models. We could see a pullback on a Sky topping bid and/or other Media M&A in the weeks ahead, making it difficult to recommend.

Dish reported upside revenue and EBITDA results with top-line strength driven by both better DBS sub loss metrics and solid ARPU. Dish TV losses were -192K vs. our -262K and the St.’s -235K driven mostly by impressive churn. The churn and subsequent sub losses were especially impressive considering subdued promotions and rate hikes. To that last point, Dish posted rebounding DBS ARPU, clearly benefiting from a full pull-through of the 1Q18 price hikes, meanwhile should further improve with recent $5/month Sling price hikes. The lower promotions also drove a solid margin beat. All in, Dish’s rural focus is clearly paying off, as the targeted TAM allows Dish to drive margin and tolerate non-rural subscriber losses, the ideal strategy to preserve cash flow as it “ages” its spectrum. Meanwhile Sling adds of +41K came mostly in line with our estimate of +48K but fell short of aggressive St. estimates. All said, the stock is still largely at the mercy of the spectrum portfolio value. We believe Dish will work a solution for both the AWS-3 DE dispute as well as the NB-IoT shot-clock by YE. Senior mgmt. departures (CFO and CTO) may suggest the company is not for sale in the near-term and instead that the NB-IoT network is underway, which may discourage some investors looking for a quicker payout. Either way, Dish’s results proved fundamentals are “good enough” to drive sufficient FCF to serve debt maturities into Phase II and “age” the spectrum, while commentary around more favorable media leverage, the AWS-3 dispute, the NB-IoT buildout (acceptable shot-clock requirements), and Phase II optionality bolster our view that Dish’s spectrum value is worth far more than the implied value of the stock today. To that point, we advise patience as the catalysts may not be near-term but are meaningful which include (1) a new market entrant or (2) a prolonged 5G deployment as existing carriers would subsequently face an LTE capacity crunch.
Pay TV

Our figure below details the traditional Pay TV net additions performance for 2Q18. The figure shows that the industry incurred Y/Y traditional video subscriber losses of -3.5%. However, not all providers are created equal, as we’ve noted in the past telco TV and satellite are taking (and will continue to take) the brunt of the losses. Specifically, the public large caps (which provides us Street estimates and a good indicator of the larger players, which include Altice, Comcast, Charter, Dish, DirecTV, AT&T U-Verse, and Verizon FiOS) lost 3.6% Y/Y LQA (vs. Street estimates of -4.0%). Telco TV (we include AT&T U-Verse, Verizon FiOS, Frontier, and Windstream) lost -4.6% of its base, while Satellite lost -5.4%. Meanwhile Big Cable MSO’s (Altice, Comcast, Charter, Cox) lost just -2.0%.

<table>
<thead>
<tr>
<th>Video Provider</th>
<th>2Q18 EOP Subs</th>
<th>2Q18A Pay TV Adds</th>
<th>Consensus</th>
<th>2Q18 LQA % of Base</th>
<th>Y/Y % Base Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cablevision</td>
<td>2,327</td>
<td>(13)</td>
<td>-</td>
<td>-2.2%</td>
<td>-3.1%</td>
</tr>
<tr>
<td>Suddenlink</td>
<td>1,023</td>
<td>(12)</td>
<td>-</td>
<td>-4.5%</td>
<td>-3.6%</td>
</tr>
<tr>
<td>Total Altice</td>
<td>3,351</td>
<td>(24)</td>
<td>(28)</td>
<td>-2.9%</td>
<td>-3.2%</td>
</tr>
<tr>
<td>Comcast</td>
<td>22,121</td>
<td>(140)</td>
<td>(139)</td>
<td>-2.5%</td>
<td>-1.8%</td>
</tr>
<tr>
<td>Brighthouse</td>
<td>1,857</td>
<td>(6)</td>
<td>-</td>
<td>-1.3%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Legacy Charter</td>
<td>4,275</td>
<td>(13)</td>
<td>-</td>
<td>-1.2%</td>
<td>-1.5%</td>
</tr>
<tr>
<td>Time Warner Cable</td>
<td>10,074</td>
<td>(54)</td>
<td>-</td>
<td>-2.1%</td>
<td>-2.2%</td>
</tr>
<tr>
<td>Total Charter</td>
<td>16,206</td>
<td>(73)</td>
<td>(108)</td>
<td>-1.8%</td>
<td>-1.8%</td>
</tr>
<tr>
<td>Cox</td>
<td>3,758</td>
<td>(38)</td>
<td>-</td>
<td>-4.0%</td>
<td>-3.7%</td>
</tr>
<tr>
<td>Dish DBS</td>
<td>10,653</td>
<td>(192)</td>
<td>(235)</td>
<td>-7.1%</td>
<td>-7.5%</td>
</tr>
<tr>
<td>DirecTV</td>
<td>19,984</td>
<td>(286)</td>
<td>(222)</td>
<td>-5.6%</td>
<td>-4.2%</td>
</tr>
<tr>
<td>AT&amp;T U-Verse</td>
<td>3,656</td>
<td>24</td>
<td>(48)</td>
<td>2.6%</td>
<td>-4.4%</td>
</tr>
<tr>
<td>Verizon Fios</td>
<td>4,560</td>
<td>(37)</td>
<td>(32)</td>
<td>-3.2%</td>
<td>-2.3%</td>
</tr>
<tr>
<td>Frontier (incl. Dish)</td>
<td>1,121</td>
<td>(40)</td>
<td>-</td>
<td>-13.8%</td>
<td>-11.1%</td>
</tr>
<tr>
<td>Windstream</td>
<td>257</td>
<td>(11)</td>
<td>-</td>
<td>-15.7%</td>
<td>-14.7%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>85,666</strong></td>
<td><strong>(817)</strong></td>
<td>-</td>
<td><strong>-3.8%</strong></td>
<td><strong>-3.5%</strong></td>
</tr>
<tr>
<td>Public Large Caps</td>
<td>80,531</td>
<td>(728)</td>
<td>(812)</td>
<td>-3.6%</td>
<td>-3.4%</td>
</tr>
<tr>
<td>Big Cable MSOs</td>
<td>45,436</td>
<td>(275)</td>
<td>-</td>
<td>-2.4%</td>
<td>-2.0%</td>
</tr>
<tr>
<td>Telco TV</td>
<td>9,594</td>
<td>(64)</td>
<td>-</td>
<td>-2.6%</td>
<td>-4.6%</td>
</tr>
<tr>
<td>Satellite</td>
<td>30,637</td>
<td>(478)</td>
<td>(457)</td>
<td>-6.1%</td>
<td>-5.4%</td>
</tr>
</tbody>
</table>

Source: Company data, Cowen and Company estimates

Video Losses are Stabilizing: Perhaps the most important trend is the stabilization of video losses, which further improved in 2Q18. In our last Post Q report we suggested that we could see industry video loss improvement, and we saw just that. As Figure 2 shows, after a year of accelerating traditional video sub losses to the -3.5% levels, the past four quarters have shown a stabilization. In fact, the industry saw slight improvement in 2Q18, especially encouraging in a typically weak seasonal quarter. Interestingly Telco TV losses are now better than Satellite/DBS losses, bolstered by solid U-Verse performance (Figure 3).

Our explanation for improvement was that the competitive industry simply needed to take a breather. Losses escalated in 2017 after the emergence/traction of deep-pocketed, full service vMVPD’s (YouTube TV, Hulu Live TV, DirecTV Now, and Sling TV) that we’d argue do not have the economic mandate for profit as a formidable competitor to traditional video. With these vMVPD providers already in place, and...
no vMVPDs of similar stature entering the market for the foreseeable future (outside of perhaps Apple TV), we argue that Pay TV loss trends have leveled out (until Gen-Z enters the workforce in 2021, see page 26 linked here).

---

**Figure 2** Subscriber Losses Show Slight Improvement

![Diagram showing Total Traditional Video Y/Y Subscriber Growth %](chart.png)

Note: excludes FTR (FiOS + Dish) and WIN (Kinetic + Dish) video

Source: Company data, Cowen and Company estimates

---

**Figure 3** ...And Losses Not as Bad with Big Cable

![Diagram showing Total Traditional Video Y/Y Subscriber Growth %, by Delivery](chart2.png)

Source: Company data, Cowen and Company estimates
Going forward, our most recent survey shows OTT adoption is picking up yet again (see Figure 2 linked here). Dish DBS losses should continue to moderate as the company fine-tunes its focus on the rural market (previously seeing outsized losses in non-rural markets), DirecTV should see continued outsized losses as AT&T pivots back toward U-Verse and DTV Now, Altice should remain constant, slightly impacted by June rate hikes, while Charter should improve in 2H18 following the TWC integration clean-up. All in, to make sense of all of the noise and data points, we should expect video losses to remain in the 3.4-3.6% range with a bias toward the downside.

The Virtual Cable Impact: Traditional Video vs. vMVPDs

A key insight into the cord-cutting threat is the emergence and growth of the vMVPD subscriber base. The vMVPD has the “big bundle” and traditional feel of linear TV. That said, we argue the VSP may have appeal to the older generation of...
“cord cutters” that still consume video in the traditional linear fashion. The vMVPD space includes DirecTV Now, Sling, Sony PlayStation Vue, YouTube TV, and Hulu with Live TV. The vMVPD growth has been dominated by DirecTV Now and Sling, as the seasoned and aggressive players in the market. That said, the figure below shows that traditional video losses are still greater than DirecTV Now/Sling gains, suggesting cord-cutters may be going to smaller vMVPD players, or more likely, customers are leaving the linear video experience all together and headed to SVODs (Netflix, Amazon Prime Video) and DTC apps (Disney, CBS All Access, HBO GO, Showtime). In other words, customer video behavior is changing, leaving live linear TV of all kinds.

Video ARPU and Revenue: Video ARPU is admittedly often an allocation as few MSO customers take a single play video product. In any case, the Cable industry continues to balance between offsetting the rising programming costs with rate hikes, but still remaining competitive on high-value customers that could leave for OTT solutions (Cable will not chase low-value subscriber growth). All in, the figures below suggest that video ARPU gains are <2% Y/Y (except at Charter), not enough to offset unit losses.
Figure 9 Y/Y % Video ARPU Trends

Figure 10 Y/Y % Video Revenue Trends

Note: 1Q18+ negatively impacted by ASC 606 accounting changes, for less reliable trend comps; ASC 606 impacted AT&T by -130 bps in 1Q18 and -120 bps in 2Q18
Source: Company data, Cowen and Company

The tables below show a high level Cowen view of Pay TV revenue growth by provider, broken into the two growth drivers (ARPU and sub growth). Broadly speaking Altice and especially Charter have room for rate, and we can expect ARPU gains to offset video sub losses. At Comcast and especially Dish, the larger unit losses will offset any rate hikes for overall Y/Y revenue declines.
Figure 11 Cowen Pay TV Estimates by MVPD

### Altice USA Pay TV

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pay TV Adds as a % of Base</td>
<td>-2.4%</td>
<td>-2.7%</td>
<td>-2.4%</td>
<td>-2.9%</td>
<td>-3.1%</td>
<td>-3.5%</td>
<td>-3.6%</td>
<td></td>
</tr>
<tr>
<td>Pay TV ARPU Growth %</td>
<td>1.2%</td>
<td>3.0%</td>
<td>2.4%</td>
<td>5.2%</td>
<td>3.0%</td>
<td>3.0%</td>
<td>3.0%</td>
<td></td>
</tr>
<tr>
<td>Pay TV Y/Y Growth %</td>
<td>-1.2%</td>
<td>0.2%</td>
<td>-0.1%</td>
<td>2.1%</td>
<td>1.4%</td>
<td>-0.4%</td>
<td>-0.6%</td>
<td></td>
</tr>
<tr>
<td>Suddenlink</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pay TV Adds as a % of Base</td>
<td>-4.1%</td>
<td>-5.8%</td>
<td>-3.0%</td>
<td>-3.3%</td>
<td>-3.1%</td>
<td>-3.2%</td>
<td>-3.3%</td>
<td></td>
</tr>
<tr>
<td>Pay TV ARPU Growth %</td>
<td>4.5%</td>
<td>4.4%</td>
<td>1.6%</td>
<td>4.4%</td>
<td>3.5%</td>
<td>3.0%</td>
<td>3.0%</td>
<td></td>
</tr>
<tr>
<td>Pay TV Y/Y Growth %</td>
<td>0.3%</td>
<td>-1.7%</td>
<td>-1.4%</td>
<td>0.9%</td>
<td>1.9%</td>
<td>-0.2%</td>
<td>-0.3%</td>
<td></td>
</tr>
</tbody>
</table>

### Charter Video

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Legacy Charter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EOP Video PSUs</td>
<td>4,322</td>
<td>4,364</td>
<td>4,320</td>
<td>4,245</td>
<td>4,150</td>
<td>3,950</td>
<td>3,850</td>
<td></td>
</tr>
<tr>
<td>Video net adds</td>
<td>(2)</td>
<td>42</td>
<td>[44]</td>
<td>[75]</td>
<td>(95)</td>
<td>(100)</td>
<td>(100)</td>
<td>(100)</td>
</tr>
<tr>
<td>Video Adds % of Base</td>
<td>0.0%</td>
<td>1.0%</td>
<td>1.0%</td>
<td>1.7%</td>
<td>2.2%</td>
<td>2.4%</td>
<td>2.5%</td>
<td>2.5%</td>
</tr>
<tr>
<td>TWC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EOP Video PSUs</td>
<td>10,821</td>
<td>10,481</td>
<td>10,217</td>
<td>9,978</td>
<td>9,646</td>
<td>9,314</td>
<td>9,154</td>
<td></td>
</tr>
<tr>
<td>Video net adds</td>
<td>32</td>
<td>(340)</td>
<td>(264)</td>
<td>(223)</td>
<td>(210)</td>
<td>(210)</td>
<td>(210)</td>
<td></td>
</tr>
<tr>
<td>Video Adds % of Base</td>
<td>0.3%</td>
<td>3.1%</td>
<td>2.5%</td>
<td>2.2%</td>
<td>2.1%</td>
<td>2.2%</td>
<td>2.2%</td>
<td>2.2%</td>
</tr>
<tr>
<td>Brightouse</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EOP Video PSUs</td>
<td>1,919</td>
<td>1,856</td>
<td>1,860</td>
<td>1,865</td>
<td>1,840</td>
<td>1,820</td>
<td>1,800</td>
<td></td>
</tr>
<tr>
<td>Video net adds</td>
<td>(82)</td>
<td>(63)</td>
<td>7</td>
<td>(3)</td>
<td>(5)</td>
<td>(15)</td>
<td>(20)</td>
<td></td>
</tr>
<tr>
<td>Video Adds % of Base</td>
<td>4.1%</td>
<td>3.3%</td>
<td>0.4%</td>
<td>0.2%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Total Charter Video</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EOP Video PSUs</td>
<td>17,062</td>
<td>16,701</td>
<td>16,400</td>
<td>16,099</td>
<td>15,789</td>
<td>15,464</td>
<td>15,134</td>
<td>14,804</td>
</tr>
<tr>
<td>Video net adds</td>
<td>(52)</td>
<td>(364)</td>
<td>(380)</td>
<td>(391)</td>
<td>(390)</td>
<td>(391)</td>
<td>(391)</td>
<td>(391)</td>
</tr>
<tr>
<td>Video Adds % of Base</td>
<td>0.3%</td>
<td>-1.1%</td>
<td>-1.8%</td>
<td>-1.8%</td>
<td>-1.9%</td>
<td>-2.1%</td>
<td>-2.1%</td>
<td>-2.2%</td>
</tr>
<tr>
<td>ARPU Y/Y Growth %</td>
<td>0.0%</td>
<td>3.4%</td>
<td>3.6%</td>
<td>6.5%</td>
<td>3.9%</td>
<td>3.3%</td>
<td>3.3%</td>
<td>3.3%</td>
</tr>
<tr>
<td>Video rev. Y/Y Growth %</td>
<td>0.9%</td>
<td>-2.3%</td>
<td>1.5%</td>
<td>4.5%</td>
<td>1.9%</td>
<td>1.2%</td>
<td>1.1%</td>
<td>1.0%</td>
</tr>
</tbody>
</table>

### Comcast Video

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Video Adds % of Base</td>
<td>0.2%</td>
<td>0.7%</td>
<td>-0.7%</td>
<td>-2.4%</td>
<td>-2.6%</td>
<td>-2.5%</td>
<td>-2.8%</td>
<td>-3.1%</td>
</tr>
<tr>
<td>ARPU Y/Y Growth %</td>
<td>4.3%</td>
<td>2.7%</td>
<td>2.7%</td>
<td>-0.2%</td>
<td>1.9%</td>
<td>2.3%</td>
<td>2.3%</td>
<td>2.3%</td>
</tr>
<tr>
<td>Video Rev Y/Y Growth %</td>
<td>3.6%</td>
<td>3.3%</td>
<td>3.0%</td>
<td>-1.8%</td>
<td>-0.7%</td>
<td>-0.4%</td>
<td>-0.4%</td>
<td>-0.8%</td>
</tr>
</tbody>
</table>

### Dish DBS Video

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DBS Adds % of DBS Base</td>
<td>-4.4%</td>
<td>-9.6%</td>
<td>-8.2%</td>
<td>-6.7%</td>
<td>-7.4%</td>
<td>-7.5%</td>
<td>-7.2%</td>
<td>-7.0%</td>
</tr>
<tr>
<td>ARPU Y/Y Growth %</td>
<td>5.8%</td>
<td>6.0%</td>
<td>2.1%</td>
<td>1.6%</td>
<td>1.5%</td>
<td>1.0%</td>
<td>1.0%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Pay-TV Rev Y/Y Growth %</td>
<td>2.2%</td>
<td>-1.1%</td>
<td>-7.0%</td>
<td>-6.0%</td>
<td>5.7%</td>
<td>6.7%</td>
<td>6.4%</td>
<td>6.2%</td>
</tr>
</tbody>
</table>

**Note:** 2018 Y/Y revenue comps less reliable due to ASC 606 accounting changes

Source: Company Reports, Cowen and Company
Broadband – 2Q18 Strength Suggests Downstream Penetration

High speed internet (HSI, or Broadband) is the biggest driver of revenue growth in the cable industry. Unlike video and its high programming costs, set-top box, install cost, and care volume, broadband generates far superior margins and subsequent FCF delivery. That said, unit growth has been moderating, and to no surprise as the industry matures (Figure 16 shows US Broadband household penetration >80%, meanwhile 26% of households make <$30K and 24% of homes have “no earners” in the household).

That said, in 2Q18, the industry surprisingly gained 2.4% broadband subscribers Y/Y, a rebound after the previous two quarters of 2.1% growth. It’s especially surprising given a typically seasonally softer quarter. Cable strength would not have been overly surprising as we could have attribute strength to share-stealing from Telcos. However, even the Telcos showed surprising strength (including the smaller RLEC’s such as Windstream, posting internet gains for the first time since 1Q15). Big Cable grew 4.6% Y/Y (Altice, Comcast, Charter, Cox) while telco losses were -1.3% Y/Y.

Figure 12 2Q18 Internet Net Adds by Provider

<table>
<thead>
<tr>
<th>Internet Provider</th>
<th>2Q18 EOP Subs</th>
<th>2Q18A BB Adds</th>
<th>Consensus</th>
<th>2Q18 LQA % of Base</th>
<th>Y/Y % Base</th>
<th>Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cablevision</td>
<td>2,681</td>
<td>8</td>
<td></td>
<td>1.2%</td>
<td>1.3%</td>
<td></td>
</tr>
<tr>
<td>Suddenlink</td>
<td>1,401</td>
<td>2</td>
<td></td>
<td>0.5%</td>
<td>3.2%</td>
<td></td>
</tr>
<tr>
<td>Total Altice</td>
<td>5,082</td>
<td>10</td>
<td>6</td>
<td>0.9%</td>
<td>2.0%</td>
<td></td>
</tr>
<tr>
<td>Comcast</td>
<td>26,509</td>
<td>260</td>
<td>191</td>
<td>4.0%</td>
<td>4.8%</td>
<td></td>
</tr>
<tr>
<td>Brighthouse</td>
<td>2,406</td>
<td>13</td>
<td></td>
<td>2.2%</td>
<td>5.6%</td>
<td></td>
</tr>
<tr>
<td>Legacy Charter</td>
<td>6,146</td>
<td>59</td>
<td></td>
<td>3.9%</td>
<td>4.8%</td>
<td></td>
</tr>
<tr>
<td>Time Warner Cable</td>
<td>14,518</td>
<td>146</td>
<td></td>
<td>4.4%</td>
<td>4.7%</td>
<td></td>
</tr>
<tr>
<td>Total Charter</td>
<td>23,070</td>
<td>218</td>
<td>185</td>
<td>3.8%</td>
<td>4.8%</td>
<td></td>
</tr>
<tr>
<td>Cox</td>
<td>5,679</td>
<td>56</td>
<td></td>
<td>4.0%</td>
<td>3.4%</td>
<td></td>
</tr>
<tr>
<td>AT&amp;T (IP)</td>
<td>13,692</td>
<td>76</td>
<td>96</td>
<td>2.2%</td>
<td>3.4%</td>
<td></td>
</tr>
<tr>
<td>AT&amp;T (DSL)</td>
<td>763</td>
<td>(53)</td>
<td>(77)</td>
<td>-26.0%</td>
<td>-28.0%</td>
<td></td>
</tr>
<tr>
<td>Verizon (DSL)</td>
<td>997</td>
<td>(53)</td>
<td>(60)</td>
<td>-20.2%</td>
<td>-20.3%</td>
<td></td>
</tr>
<tr>
<td>Verizon Fios Internet</td>
<td>5,959</td>
<td>43</td>
<td>50</td>
<td>2.9%</td>
<td>3.9%</td>
<td></td>
</tr>
<tr>
<td>Frontier Total (incl SMB)</td>
<td>3,863</td>
<td>(32)</td>
<td>(51)</td>
<td>-3.3%</td>
<td>-4.9%</td>
<td></td>
</tr>
<tr>
<td>CenturyLink (Consumer)</td>
<td>4,906</td>
<td>(80)</td>
<td>(60)</td>
<td>-6.4%</td>
<td>-6.1%</td>
<td></td>
</tr>
<tr>
<td>Windstream</td>
<td>1,007</td>
<td>2</td>
<td>(11)</td>
<td>0.9%</td>
<td>-1.9%</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>90,526</td>
<td>447</td>
<td></td>
<td>2.0%</td>
<td>2.4%</td>
<td></td>
</tr>
<tr>
<td>Big Cable</td>
<td>53,661</td>
<td>488</td>
<td>382</td>
<td>3.7%</td>
<td>4.6%</td>
<td></td>
</tr>
<tr>
<td>Telco</td>
<td>31,187</td>
<td>(97)</td>
<td>(113)</td>
<td>-1.2%</td>
<td>-1.3%</td>
<td></td>
</tr>
</tbody>
</table>

Source: Company data, Cowen and Company estimates
Where Did the Subscriber Strength Come From? The broadband acceleration was not driven by greenfield builds, as we’ve seen no meaningful growth in additional homes. Big Cable results (Altice, Comcast, Charter, and our estimate of Cox) suggest that greenfield (homes passed) Y/Y growth actually decelerated to 1.4% in 2Q18 from 1.6% in 1Q18 and 1.5% in 4Q17. The stronger economy could be partly
responsible which one could argue bolstered the broadband penetration of lower-income homes.

**Downstream Customers?** On a similar note, broadband has undoubtedly become a utility for all income classes. We've argued lower-income cohorts have broadband alternatives, mainly in the form of wireless (prepaid for subprime customers), WiFi sharing, or public hotspots. Perhaps the stronger economy and greater need to stay connected, lower-incomes homes are simply are rethinking wallet share for broadband, sacrificing other non-essential services. MSOs such as Comcast have “Internet Essential” and “Economy Service” plans for low-income households, and recent company reports suggest solid growth ([link](#)). In a similar topic, Figures 19 and 20 suggest weaker ARPU growth trends (considering ASC 606) suggesting most MSOs are trading rate for sub growth, further penetrating downstream.

![Figure 15 Internet Subscriber Trends 2008-2017](image)

**Figure 15 Internet Subscriber Trends 2008-2017**

![Figure 16 Internet Penetration 2008-2017](image)

**Figure 16 Internet Penetration 2008-2017**

![Figure 17 Detailed View of Y/Y Internet Subscriber %](image)

**Figure 17 Detailed View of Y/Y Internet Subscriber %**

![Figure 18 Internet Household Penetration](image)

**Figure 18 Internet Household Penetration**

---

Source: Company data, Cowen and Company

This report is intended for ajackson@businessinsider.com. Unauthorized redistribution of this report is prohibited.
All in, the tables below show a high level Cowen view of Broadband revenue growth by provider, broken into components (unit gains and ARPU gains). The tables suggest that Altice and especially Charter have additional room for rate.
## Figure 21 Cowen Internet Estimates by Cable Provider

### Altice USA Broadband

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimum</td>
<td>-</td>
<td>2.2%</td>
<td>1.9%</td>
<td>1.4%</td>
<td>1.7%</td>
<td>1.6%</td>
<td>1.4%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Broadband ARPU Growth %</td>
<td>-</td>
<td>9.2%</td>
<td>8.0%</td>
<td>12.3%</td>
<td>6.5%</td>
<td>4.0%</td>
<td>4.0%</td>
<td>4.0%</td>
</tr>
<tr>
<td>Broadband Y/Y Growth %</td>
<td>-</td>
<td>11.6%</td>
<td>10.1%</td>
<td>13.9%</td>
<td>8.2%</td>
<td>4.9%</td>
<td>5.7%</td>
<td>5.7%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimum</td>
<td>-</td>
<td>2.2%</td>
<td>1.9%</td>
<td>1.4%</td>
<td>1.7%</td>
<td>1.6%</td>
<td>1.4%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Broadband ARPU Growth %</td>
<td>-</td>
<td>9.2%</td>
<td>8.0%</td>
<td>12.3%</td>
<td>6.5%</td>
<td>4.0%</td>
<td>4.0%</td>
<td>4.0%</td>
</tr>
<tr>
<td>Broadband Y/Y Growth %</td>
<td>-</td>
<td>11.6%</td>
<td>10.1%</td>
<td>13.9%</td>
<td>8.2%</td>
<td>4.9%</td>
<td>5.7%</td>
<td>5.7%</td>
</tr>
</tbody>
</table>

### Suddenlink

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadband Adds as a % of Base</td>
<td>-</td>
<td>5.3%</td>
<td>2.4%</td>
<td>3.4%</td>
<td>3.1%</td>
<td>2.9%</td>
<td>2.7%</td>
<td>2.6%</td>
</tr>
<tr>
<td>Broadband ARPU Growth %</td>
<td>-</td>
<td>11.0%</td>
<td>12.4%</td>
<td>7.6%</td>
<td>5.0%</td>
<td>4.0%</td>
<td>4.0%</td>
<td>4.0%</td>
</tr>
<tr>
<td>Broadband Y/Y Growth %</td>
<td>-</td>
<td>19.0%</td>
<td>15.1%</td>
<td>11.2%</td>
<td>8.2%</td>
<td>5.5%</td>
<td>6.9%</td>
<td>6.8%</td>
</tr>
</tbody>
</table>

### Altice USA

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadband Adds as a % of Base</td>
<td>-</td>
<td>3.3%</td>
<td>2.1%</td>
<td>2.1%</td>
<td>2.1%</td>
<td>2.1%</td>
<td>2.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Broadband ARPU Growth %</td>
<td>-</td>
<td>10.6%</td>
<td>9.7%</td>
<td>10.6%</td>
<td>6.0%</td>
<td>3.0%</td>
<td>4.1%</td>
<td>4.0%</td>
</tr>
<tr>
<td>Broadband Y/Y Growth %</td>
<td>-</td>
<td>14.2%</td>
<td>12.0%</td>
<td>12.9%</td>
<td>8.2%</td>
<td>5.1%</td>
<td>6.9%</td>
<td>6.8%</td>
</tr>
</tbody>
</table>

### Charter Internet

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Legacy Charter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EOP Internet PSUs</td>
<td>5,227</td>
<td>5,688</td>
<td>6,005</td>
<td>6,252</td>
<td>6,472</td>
<td>6,687</td>
<td>6,885</td>
<td>7,050</td>
</tr>
<tr>
<td>Internet net adds</td>
<td>442</td>
<td>461</td>
<td>317</td>
<td>247</td>
<td>210</td>
<td>198</td>
<td>198</td>
<td>198</td>
</tr>
<tr>
<td>Internet Adds % of Base</td>
<td>9.2%</td>
<td>8.8%</td>
<td>5.6%</td>
<td>4.1%</td>
<td>3.3%</td>
<td>3.0%</td>
<td>2.4%</td>
<td>2.4%</td>
</tr>
</tbody>
</table>

| Legacy Charter | | | | | | | | |
| EOP Internet PSUs | 12,675 | 13,501 | 14,191 | 14,758 | 15,288 | 15,813 | 16,313 | 16,788 |
| Internet net adds | 2,009 | 2,185 | 2,349 | 2,456 | 2,556 | 2,656 | 2,756 | 2,856 |
| Internet Adds % of Base | 8.6% | 6.5% | 5.1% | 4.0% | 3.6% | 3.4% | 3.2% | 2.9% |

### Brighthouse

| Legacy Charter | | | | | | | | |
| EOP Internet PSUs | 2,009 | 2,185 | 2,349 | 2,456 | 2,556 | 2,656 | 2,756 | 2,856 |
| Internet net adds | 68 | 176 | 164 | 107 | 100 | 100 | 100 | 100 |
| Internet Adds % of Base | 3.5% | 8.8% | 7.5% | 4.6% | 4.1% | 3.9% | 3.8% | 3.6% |

### Total Charter Video

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Legacy Charter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EOP Internet PSUs</td>
<td>19,911</td>
<td>21,374</td>
<td>22,545</td>
<td>23,466</td>
<td>24,316</td>
<td>25,156</td>
<td>25,954</td>
<td>26,694</td>
</tr>
<tr>
<td>Internet net adds</td>
<td>4,510</td>
<td>4,463</td>
<td>4,171</td>
<td>821</td>
<td>800</td>
<td>790</td>
<td>780</td>
<td>770</td>
</tr>
<tr>
<td>Internet Adds % of Base</td>
<td>8.2%</td>
<td>7.3%</td>
<td>5.5%</td>
<td>4.1%</td>
<td>3.6%</td>
<td>3.5%</td>
<td>3.2%</td>
<td>2.9%</td>
</tr>
</tbody>
</table>

### ARPU Y/Y Growth % | 0.0% | 4.2% | 4.5% | 3.6% | 4.0% | 4.0% | 4.0% | 4.0% |

### Internet rev. Y/Y Growth % | 11.0% | 12.3% | 11.2% | 8.5% | 8.0% | 7.7% | 7.4% | 7.1% |

### Comcast High Speed Internet

| Legacy Charter | | | | | | | | |
| HSI Adds % of Base | 5.2% | 5.9% | 4.7% | 4.7% | 4.1% | 3.5% | 3.1% | 3.0% |
| HSI ARPU Y/Y Growth % | 0.0% | 8.8% | 3.2% | 4.2% | 3.1% | 3.3% | 3.2% | 3.1% |
| HSI Rev Y/Y Growth % | 10.2% | 11.5% | 8.7% | 9.1% | 7.6% | 7.1% | 6.7% | 6.5% |

Note: 2018 Y/Y comps less reliable due to ASC 606 accounting changes

Source: Company Reports, Cowen and Company
Business Services – High Single/Low Double Digit Growth Continues

While the investor focus has been primarily around video sub losses and broadband growth moderation, business services has been the unsung hero in the industry, with impressive gains in market and wallet share. Overall, the business services segment is still relatively smaller for MSOs, at 8-14% of total revenue depending on the carrier (and how they classify commercial services). However, commercial services remains a focus for all operators and has been a success story with a compelling runway and provides underappreciated offsets to the residential concerns. 1Q18 results remained in this 8-14% range, albeit the lower end, as Cable continues to take share, especially in SMB, from the legacy telco providers.

Fiber Rollout, DOCSIS 3.1, SD-WAN, and UCaaS Combination Could be a Game Changer. Businesses are migrating more applications from the traditional desktop/on-prem wire closet into the cloud. This includes communication services in the form of UCaaS (unified communications as a service). Connecting to the cloud affordably and reliably via the SD-WAN solution to access UCaaS products provides an intriguing combination for cable providers. The reluctance of telco providers simply sweetens the proposition. Lower down the stack, cable can further bolster these efforts with the ongoing fiber rollouts riding DOCSIS 3.1. All in, the combination allows cable to provide the speed (fiber, DOCSIS), the networking and cloud connection (SD-WAN, see our report linked here), and the rich communication features (UCaaS) to finally become the one-stop shop for the SME market, expand its footprint nationwide, and with low capex commitments.

Figure 22 SMB Y/Y Customer Growth %

Source: Company data, Cowen and Company estimates
Figure 23 SMB and Enterprise ARPC

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>1Q16</th>
<th>2Q16</th>
<th>3Q16</th>
<th>4Q16</th>
<th>1Q17</th>
<th>2Q17</th>
<th>3Q17</th>
<th>4Q17</th>
<th>1Q18</th>
<th>2Q18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comcast (Bus. Services – 70% SMB)</td>
<td>$213</td>
<td>$244</td>
<td>$243</td>
<td>$246</td>
<td>$253</td>
<td>$252</td>
<td>$251</td>
<td>$259</td>
<td>$257</td>
<td>$257</td>
<td>$259</td>
<td>$259</td>
<td>$259</td>
</tr>
<tr>
<td>Y/Y Growth %</td>
<td>12.3%</td>
<td>10.6%</td>
<td>9.9%</td>
<td>9.1%</td>
<td>5.0%</td>
<td>4.5%</td>
<td>4.5%</td>
<td>4.2%</td>
<td>5.1%</td>
<td>4.8%</td>
<td>5.0%</td>
<td>4.8%</td>
<td>4.5%</td>
</tr>
<tr>
<td>BrightHouse</td>
<td>$178</td>
<td>$180</td>
<td>$179</td>
<td>$186</td>
<td>$181</td>
<td>$181</td>
<td>$179</td>
<td>$176</td>
<td>$175</td>
<td>$175</td>
<td>$175</td>
<td>$175</td>
<td>$175</td>
</tr>
<tr>
<td>Y/Y Growth %</td>
<td>0.8%</td>
<td>0.3%</td>
<td>0.3%</td>
<td>0.3%</td>
<td>1.7%</td>
<td>1.3%</td>
<td>3.2%</td>
<td>1.6%</td>
<td>0.1%</td>
<td>0.2%</td>
<td>0.2%</td>
<td>0.2%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Legacy Charter</td>
<td>$163</td>
<td>$164</td>
<td>$161</td>
<td>$159</td>
<td>$158</td>
<td>$159</td>
<td>$159</td>
<td>$157</td>
<td>$157</td>
<td>$157</td>
<td>$159</td>
<td>$159</td>
<td>$159</td>
</tr>
<tr>
<td>Y/Y Growth %</td>
<td>0.0%</td>
<td>0.1%</td>
<td>0.3%</td>
<td>0.3%</td>
<td>0.2%</td>
<td>0.2%</td>
<td>0.2%</td>
<td>0.2%</td>
<td>0.2%</td>
<td>0.2%</td>
<td>0.2%</td>
<td>0.2%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Time Warner Cable</td>
<td>$208</td>
<td>$211</td>
<td>$213</td>
<td>$212</td>
<td>$209</td>
<td>$208</td>
<td>$202</td>
<td>$202</td>
<td>$202</td>
<td>$202</td>
<td>$202</td>
<td>$202</td>
<td>$202</td>
</tr>
<tr>
<td>Y/Y Growth %</td>
<td>0.3%</td>
<td>0.3%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Frontier</td>
<td>$704</td>
<td>$658</td>
<td>$668</td>
<td>$665</td>
<td>$673</td>
<td>$684</td>
<td>$682</td>
<td>$685</td>
<td>$726</td>
<td>$726</td>
<td>$742</td>
<td>$742</td>
<td>$742</td>
</tr>
<tr>
<td>Y/Y Growth %</td>
<td>4.3%</td>
<td>4.3%</td>
<td>2.1%</td>
<td>4.0%</td>
<td>4.3%</td>
<td>4.3%</td>
<td>4.3%</td>
<td>4.3%</td>
<td>4.3%</td>
<td>4.3%</td>
<td>4.3%</td>
<td>4.3%</td>
<td>4.3%</td>
</tr>
<tr>
<td>Windstream (ILEC SMB)</td>
<td>$198</td>
<td>$197</td>
<td>$202</td>
<td>$200</td>
<td>$201</td>
<td>$200</td>
<td>$203</td>
<td>$205</td>
<td>$206</td>
<td>$201</td>
<td>$201</td>
<td>$201</td>
<td>$201</td>
</tr>
<tr>
<td>Y/Y Growth %</td>
<td>4.0%</td>
<td>3.0%</td>
<td>3.0%</td>
<td>3.0%</td>
<td>2.8%</td>
<td>2.8%</td>
<td>2.8%</td>
<td>2.8%</td>
<td>2.8%</td>
<td>2.8%</td>
<td>2.8%</td>
<td>2.8%</td>
<td>2.8%</td>
</tr>
</tbody>
</table>

Source: Company data, Cowen and Company estimates

Figure 24 SMB and Enterprise Revenue Y/Y Growth %

<table>
<thead>
<tr>
<th></th>
<th>1Q17</th>
<th>2Q17</th>
<th>3Q17</th>
<th>4Q17</th>
<th>1Q18</th>
<th>2Q18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cablevision (Bus. Svcs. &amp; Wholesale)</td>
<td>3.7%</td>
<td>5.1%</td>
<td>4.5%</td>
<td>4.0%</td>
<td>2.4%</td>
<td>2.4%</td>
</tr>
<tr>
<td>Suddenlink (Bus. Svcs. &amp; Wholesale)</td>
<td>7.7%</td>
<td>7.7%</td>
<td>6.9%</td>
<td>6.1%</td>
<td>7.5%</td>
<td>8.8%</td>
</tr>
<tr>
<td>Comcast (Bus. Services – 70% SMB)</td>
<td>13.7%</td>
<td>12.7%</td>
<td>12.6%</td>
<td>12.4%</td>
<td>11.9%</td>
<td>11.1%</td>
</tr>
<tr>
<td>Time Warner Cable (est.)</td>
<td>17.1%</td>
<td>8.7%</td>
<td>5.5%</td>
<td>2.4%</td>
<td>1.1%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Verizon (Business Markets)</td>
<td>2.0%</td>
<td>9.0%</td>
<td>8.3%</td>
<td>7.7%</td>
<td>-0.9%</td>
<td>-7.7%</td>
</tr>
<tr>
<td>Frontier Commercial</td>
<td>N/A</td>
<td>-6.4%</td>
<td>-8.5%</td>
<td>-7.2%</td>
<td>-2.1%</td>
<td>-1.2%</td>
</tr>
<tr>
<td>CenturyLink (SMB)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Windstream (SMB ILEC)</td>
<td>2.9%</td>
<td>2.5%</td>
<td>5.7%</td>
<td>4.5%</td>
<td>5.0%</td>
<td>5.7%</td>
</tr>
<tr>
<td>BrightHouse (Enterprise)</td>
<td>17.4%</td>
<td>17.2%</td>
<td>14.3%</td>
<td>9.5%</td>
<td>8.3%</td>
<td>5.3%</td>
</tr>
<tr>
<td>Legacy Charter (Enterprise)</td>
<td>13.8%</td>
<td>9.5%</td>
<td>11.8%</td>
<td>10.6%</td>
<td>8.7%</td>
<td>7.8%</td>
</tr>
<tr>
<td>Time Warner Cable (Enterprise)</td>
<td>12.5%</td>
<td>8.6%</td>
<td>7.4%</td>
<td>7.4%</td>
<td>7.0%</td>
<td>6.3%</td>
</tr>
<tr>
<td>AT&amp;T (National Fixed)</td>
<td>7.6%</td>
<td>7.0%</td>
<td>6.1%</td>
<td>5.6%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>AT&amp;T (Business Wireline)</td>
<td>-7.3%</td>
<td>-5.6%</td>
<td>-6.0%</td>
<td>-3.3%</td>
<td>-8.0%</td>
<td>-8.9%</td>
</tr>
<tr>
<td>CenturyLink (Enterprise only)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.8%</td>
<td>-0.1%</td>
</tr>
<tr>
<td>Verizon (Enterprise)</td>
<td>-1.4%</td>
<td>0.5%</td>
<td>-0.5%</td>
<td>0.4%</td>
<td>-3.1%</td>
<td>-4.2%</td>
</tr>
<tr>
<td>Windstream (Enterprise)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-1.8%</td>
<td>1.0%</td>
</tr>
</tbody>
</table>

Source: Company data, Cowen and Company estimates

Figure 25 2017 US Commercial Revenue ($B)

Figure 26 2017 US Commercial Revenue Y/Y Growth %

Source: Company reports, Cowen and Company estimates
Wireless MVNO

Charter Soft Launches MVNO. On June 30, Charter soft launched its wireless MVNO. Taking a page out of the successful Comcast playbook, the Charter rate card copies Xfinity Wireless with a $45/month unlimited plan; however, the PAYG plan is $2 higher at $14/GB (vs. Xfinity’s $12/GB). Unlike the Xfinity launch, Charter looks for a more tempered ‘crawl, walk, run’ launch as it ramps up features, adds new devices, adds new sales channels, and will market throughout the summer.

It will be interesting to see Charter’s launch specifically as it will impact large markets in T-Mobile focused cities (unlike Comcast) such as NYC and L.A. All in, the MVNO for both cable providers still seems like a niche play. Distribution is limited (for example Comcast ~500 stores, though our channel checks suggest expansion, compared to T-Mobile’s 5,300 stores, though also expanding).

Also Cable looks to target older, low usage-based customers from the Big 2 (as our survey results suggest below). The Comcast/Charter rate card suggests this “older, low usage” target customer as the Cable rate card is strongest by far in single-line plans, while Cable is far less competitive in the multi-line tiers (especially considering T-Mobile includes taxes and fees, see Figure 27).

Lastly, Charter and Comcast are sharing a 50/50 partnership to build a back-end OSS/BSS platform and share back-office costs more effectively. The move makes industrial sense but actually supports the case for eventual wireless convergence with a national carrier. With two companies sharing the platform costs, it shows that (1) both are committed to moving forward into the wireless foray but (2) neither company wants to dig deeper with a respective stand-alone platform, mitigating the strategic importance of wireless.

We maintain the view that cable will play effectively with high-end, older, low-usage customers, but still a niche market, and is testing the waters before making a larger M&A move with a national carrier.
### Figure 27 Postpaid Rate Card: Current vs. One Year Ago (from Wave7 Research)

#### Current Unlimited Plans Rate Card

<table>
<thead>
<tr>
<th>Number of Lines</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT&amp;T &amp; More Prem.</td>
<td>$80</td>
<td>$150</td>
<td>$170</td>
<td>$190</td>
</tr>
<tr>
<td>AT&amp;T &amp; More</td>
<td>$70</td>
<td>$125</td>
<td>$145</td>
<td>$160</td>
</tr>
<tr>
<td>Sprint Basic</td>
<td>$60</td>
<td>$100</td>
<td>$120</td>
<td>$140</td>
</tr>
<tr>
<td>T-Mobile One Plus</td>
<td>$80</td>
<td>$120</td>
<td>$170</td>
<td>$200</td>
</tr>
<tr>
<td>T-Mobile One</td>
<td>$70</td>
<td>$100</td>
<td>$140</td>
<td>$160</td>
</tr>
<tr>
<td>Verizon Above</td>
<td>$95</td>
<td>$180</td>
<td>$230</td>
<td>$240</td>
</tr>
<tr>
<td>Verizon Beyond</td>
<td>$85</td>
<td>$160</td>
<td>$180</td>
<td>$200</td>
</tr>
<tr>
<td>Xfinity Mobile*</td>
<td>$45</td>
<td>$90</td>
<td>$135</td>
<td>$180</td>
</tr>
</tbody>
</table>

#### Average Cost per Line

<table>
<thead>
<tr>
<th>Number of Lines</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT&amp;T &amp; More Prem.</td>
<td>$80</td>
<td>$75</td>
<td>$57</td>
<td>$48</td>
</tr>
<tr>
<td>AT&amp;T &amp; More</td>
<td>$70</td>
<td>$60</td>
<td>$50</td>
<td>$45</td>
</tr>
<tr>
<td>Sprint Basic</td>
<td>$60</td>
<td>$50</td>
<td>$40</td>
<td>$35</td>
</tr>
<tr>
<td>T-Mobile One Plus</td>
<td>$80</td>
<td>$60</td>
<td>$57</td>
<td>$50</td>
</tr>
<tr>
<td>T-Mobile One</td>
<td>$70</td>
<td>$50</td>
<td>$47</td>
<td>$40</td>
</tr>
<tr>
<td>Verizon Above</td>
<td>$95</td>
<td>$90</td>
<td>$70</td>
<td>$60</td>
</tr>
<tr>
<td>Verizon Beyond</td>
<td>$85</td>
<td>$60</td>
<td>$60</td>
<td>$50</td>
</tr>
<tr>
<td>Xfinity Mobile*</td>
<td>$45</td>
<td>$45</td>
<td>$45</td>
<td>$45</td>
</tr>
</tbody>
</table>

#### Unlimited Rate Card One Year Ago

<table>
<thead>
<tr>
<th>Number of Lines</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT&amp;T Plus</td>
<td>$90</td>
<td>$145</td>
<td>$165</td>
<td>$185</td>
</tr>
<tr>
<td>AT&amp;T Choice</td>
<td>$60</td>
<td>$115</td>
<td>$135</td>
<td>$155</td>
</tr>
<tr>
<td>Sprint Existing</td>
<td>$60</td>
<td>$100</td>
<td>$130</td>
<td>$160</td>
</tr>
<tr>
<td>Sprint Port-in***</td>
<td>$50</td>
<td>$90</td>
<td>$90</td>
<td>$90</td>
</tr>
<tr>
<td>T-Mobile One</td>
<td>$70</td>
<td>$130</td>
<td>$140</td>
<td>$160</td>
</tr>
<tr>
<td>Verizon Go</td>
<td>$75</td>
<td>$130</td>
<td>$150</td>
<td>$160</td>
</tr>
<tr>
<td>Verizon Beyond</td>
<td>$85</td>
<td>$160</td>
<td>$180</td>
<td>$200</td>
</tr>
<tr>
<td>Xfinity Mobile*</td>
<td>$65</td>
<td>$130</td>
<td>$195</td>
<td>$260</td>
</tr>
<tr>
<td>Xfinity Mobile**</td>
<td>$45</td>
<td>$90</td>
<td>$135</td>
<td>$180</td>
</tr>
</tbody>
</table>

#### Average Cost per Line

<table>
<thead>
<tr>
<th>Number of Lines</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT&amp;T Plus</td>
<td>$90</td>
<td>$73</td>
<td>$55</td>
<td>$46</td>
</tr>
<tr>
<td>AT&amp;T Choice</td>
<td>$60</td>
<td>$58</td>
<td>$45</td>
<td>$39</td>
</tr>
<tr>
<td>Sprint Existing</td>
<td>$60</td>
<td>$50</td>
<td>$43</td>
<td>$40</td>
</tr>
<tr>
<td>Sprint Port-in***</td>
<td>$50</td>
<td>$45</td>
<td>$30</td>
<td>$23</td>
</tr>
<tr>
<td>T-Mobile One</td>
<td>$70</td>
<td>$50</td>
<td>$47</td>
<td>$40</td>
</tr>
<tr>
<td>Verizon Go</td>
<td>$75</td>
<td>$65</td>
<td>$50</td>
<td>$40</td>
</tr>
<tr>
<td>Verizon Beyond</td>
<td>$85</td>
<td>$80</td>
<td>$60</td>
<td>$50</td>
</tr>
<tr>
<td>Xfinity Mobile*</td>
<td>$65</td>
<td>$65</td>
<td>$65</td>
<td>$65</td>
</tr>
<tr>
<td>Xfinity Mobile**</td>
<td>$45</td>
<td>$45</td>
<td>$45</td>
<td>$45</td>
</tr>
</tbody>
</table>

---

*Source: Wave7 Research*
The anatomy of an Xfinity Mobile customer: older, lower income, not OTT cord cutters but thinking about it. In our latest survey we cross-tabulated data across 70+ Xfinity Mobile customers. While we previously suggested that Comcast is targeting a low-usage, older customer, our survey shows an Xfinity Mobile customer average age of 49.2 (highest among the postpaid carriers), spend ~$107/mo on their cable bill (vs. survey average of $100/mo), have a household income of $72K (second lowest among postpaid wireless carriers, ahead of T-Mobile), and subscribe to just 1.0 OTT providers (vs. survey average 1.2). Also 10% of Xfinity Mobile customers are still considering cutting the cord (vs. 7% survey average), Figures 30-33.

Can Comcast Sustain Adds Momentum Outside of PAYG Cohort? It’s interesting to note the older, lower income cohort suggested in our survey results is very well suited for Comcast’s $12/mo PAYG plan, and could be the driver for recent success. It will be interesting to see if (and how) Comcast drives gross adds with new cohorts to sustain the momentum, as we’ve suggested Cable is dabbling in wireless (and now sharing OSS/BSS platforms) before a larger move with a national carrier, currently observing the Sprint/T-Mobile merger.
The Wireless Venture is Getting Expensive. We believe Comcast is paying heavily for wireless subscriber growth (and reports of phone slippage). By our math, assuming $650 per device COGS (though we admit could be declining as Xfinity recently introduced BYOD), and the reported wireless OCF losses, the losses equate to a monthly wireless CCPU of $146 for 2Q18, down from $187 in 1Q18 and $241 in 4Q18 as the company scales the business (typical industry CCPU is ~$50). Said plainly, the company has lost $854MM in OCF (far more in cash from device EIP) on just 781K subs.

While we understand the still very much sub-scale nature of the venture, the losses still seem outsized given the carrier is sharing its back-office systems with Charter, while gross margins in the MVNO model should be highly positive ($12/GB revenue, reports of $5/GB to Verizon). With the negative investor sentiment on the Sky saga, Comcast 2018 cable margin guidance becomes even more important. The company recently raised its EBITDA Y/Y growth guidance (to 50-100bps from +50bps) as we
consider the possibility of cable costs being transferred to wireless for better cable optics during its Sky bidding war. Meanwhile, Altice’s “facilities based” Sprint MVNO expects to be positive on “EBITDA less capex” in Year 1.

In any case, Charter has incurred $41MM YTD in wireless driven EBITDA loss (or $141MM cash), and while suggesting a less aggressive launch vs. Xfinity (and bolstered by a ramped OSS/BSS platform), we remain cautious on the alarming spending levels for these ventures. This brings us back to the point that we believe the MVNOs could be “testing the waters” before a larger move with an incumbent national carrier.
5G Fixed Wireless: Updates from Verizon and T-Mobile

We continue to believe Cable MSOs will be seen as home connectivity companies in which video will simply ride as an app (of many apps) to the home. To that point, we see 5G fixed wireless broadband as the largest existential threat to broadband providers, by far. For now, the largest threats are coming from Verizon and T-Mobile as we note below (and further reports linked on the left).

Verizon adds Houston and Indianapolis. Since our last Post Q report, Verizon has added Houston and Indianapolis to round out the four fixed wireless broadband (FWBB) markets for 2018. We’ve noted in the past that in sizing Verizon’s “30MM homes passed” target, we believe it would be in cities where Verizon has a deep fiber footprint (80% of the cost to deploy a small cell node is the fiber) and outside of its ILEC markets (to avoid cannibalization and attack greenfield markets), thus likely Verizon’s XO markets.

More specifically, to size the opportunity (or Cable threat), we previously ran a nationwide fiber study, tracking top fiber providers in the top 30 US cities. To this point, Verizon is a top 5 fiber provider in 16 of the top 30 US cities where it is not the incumbent LEC (see our report linked here). Applying this data, Houston makes perfect sense as a high population market in which Verizon has a strong fiber presence (along with LA and Sacramento). Indianapolis is admittedly a bit of a surprise given its low population and Verizon’s low level of fiber presence (Verizon is not a top 5 fiber provider, measured by route miles). That said, Verizon has noted in the past that municipal partnerships are very important, and could be in play here. It’s also worth noting the flat topology of Indianapolis which could allow for better mmWave propagation (i.e. fewer nodes and lower fiber density as the spectrum can travel further).

Figure 34 Verizon Deep Fiber Non-ILEC MSAs

<table>
<thead>
<tr>
<th></th>
<th>Verizon Fiber Route Miles</th>
<th>Total Route Miles in Market</th>
<th>% Verizon Housing Units</th>
<th>Cable Provider</th>
<th>ILEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlanta</td>
<td>585</td>
<td>14,194</td>
<td>4.1%</td>
<td>2,266,547</td>
<td>Comcast AT&amp;T</td>
</tr>
<tr>
<td>Chicago</td>
<td>1,846</td>
<td>15,150</td>
<td>12.2%</td>
<td>3,820,657</td>
<td>Comcast AT&amp;T</td>
</tr>
<tr>
<td>Dallas</td>
<td>978</td>
<td>18,978</td>
<td>5.2%</td>
<td>2,740,964</td>
<td>Charter AT&amp;T</td>
</tr>
<tr>
<td>Denver</td>
<td>579</td>
<td>5,208</td>
<td>11.1%</td>
<td>1,149,070</td>
<td>Comcast CenturyLink</td>
</tr>
<tr>
<td>Houston</td>
<td>829</td>
<td>9,202</td>
<td>9.0%</td>
<td>2,556,349</td>
<td>Comcast AT&amp;T</td>
</tr>
<tr>
<td>Indianapolis</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>423,376</td>
<td>Comcast AT&amp;T</td>
</tr>
<tr>
<td>Las Vegas</td>
<td>108</td>
<td>2,172</td>
<td>5.0%</td>
<td>881,238</td>
<td>Cox CenturyLink</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>&lt;748</td>
<td>19,073</td>
<td>&lt;3.9%</td>
<td>4,610,932</td>
<td>Charter AT&amp;T</td>
</tr>
<tr>
<td>Miami</td>
<td>487</td>
<td>6,777</td>
<td>7.2%</td>
<td>2,528,173</td>
<td>Comcast AT&amp;T</td>
</tr>
<tr>
<td>Minneapolis</td>
<td>482</td>
<td>8,509</td>
<td>5.7%</td>
<td>1,432,683</td>
<td>Comcast CenturyLink</td>
</tr>
<tr>
<td>Orlando</td>
<td>187</td>
<td>3,999</td>
<td>4.7%</td>
<td>1,007,557</td>
<td>Charter AT&amp;T</td>
</tr>
<tr>
<td>Phoenix</td>
<td>470</td>
<td>5,561</td>
<td>8.5%</td>
<td>1,882,098</td>
<td>Cox CenturyLink</td>
</tr>
<tr>
<td>Portland</td>
<td>191</td>
<td>4,433</td>
<td>4.3%</td>
<td>972,088</td>
<td>Comcast CenturyLink</td>
</tr>
<tr>
<td>Sacramento</td>
<td>188</td>
<td>3,252</td>
<td>5.8%</td>
<td>893,869</td>
<td>Comcast AT&amp;T</td>
</tr>
<tr>
<td>San Diego</td>
<td>286</td>
<td>4,852</td>
<td>5.9%</td>
<td>1,202,397</td>
<td>Cox AT&amp;T</td>
</tr>
<tr>
<td>San Francisco</td>
<td>267</td>
<td>5,476</td>
<td>4.9%</td>
<td>1,792,249</td>
<td>Comcast AT&amp;T</td>
</tr>
<tr>
<td>Seattle</td>
<td>455</td>
<td>6,802</td>
<td>6.7%</td>
<td>1,552,272</td>
<td>Comcast CenturyLink</td>
</tr>
<tr>
<td>St. Louis</td>
<td>249</td>
<td>8,034</td>
<td>3.1%</td>
<td>1,246,499</td>
<td>Charter AT&amp;T</td>
</tr>
<tr>
<td><strong>18 Markets</strong></td>
<td><strong>8,935</strong></td>
<td><strong>141,675</strong></td>
<td><strong>6.3%</strong></td>
<td><strong>32,959,018</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Sizing the Threat.** As an illustrative example, we entertain the idea that Verizon will launch its Fixed Wireless Broadband (FWBB) solution in top markets where it has deep fiber networks (largely augmented by XO) and where the carrier is not the incumbent. Crossing our data from our aforementioned Fiber Report with U.S. Census Household data, we note Verizon has fiber in 17 of the top “NFL” U.S. markets (where it is not an ILEC), and interestingly these markets sum to 33MM households (interestingly close to Verizon’s 30MM home target).

If we took this illustrative example further, identifying the top cable provider in each of these markets (assuming a 45% take rate for the cable provider), our analysis shows Comcast could have 2.1MM homes exposed (8.3% of its base) and Charter at 1.1MM homes (4.7% of its base). Assuming a 25% Verizon win rate, simple math suggest ~2.1% of Comcast customers and ~1.2% of Charter customers could go to Verizon FWBB, a limited risk, especially considering the multi-year timeframe to deploy.

<table>
<thead>
<tr>
<th>Assumed BB % Cable</th>
<th>HH at Risk</th>
<th>% of Base</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comcast</td>
<td>2,181,075</td>
<td>8.3%</td>
</tr>
<tr>
<td>Charter</td>
<td>1,080,670</td>
<td>4.7%</td>
</tr>
<tr>
<td>Cox</td>
<td>446,145</td>
<td>7.9%</td>
</tr>
<tr>
<td>Altice</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>AT&amp;T</td>
<td>2,195,337</td>
<td>15.2%</td>
</tr>
<tr>
<td>CenturyLink</td>
<td>688,577</td>
<td>13.8%</td>
</tr>
</tbody>
</table>


**Cable Stocks Pulled Back as T-Mobile Continued to Push FWBB on Its Earnings Call:** The other 5G FWBB threat is coming from T-Mobile. The Un-carrier released a Public Interest Statement to the FCC (see the PIS linked here). As part of its pitch to the FCC for approval of the Sprint merger, T-Mobile notes the combined company will deploy a viable fixed wireless in-home broadband play as a direct threat to cable/DSL.

Specifically, with the 5G deployment of 600 MHz, PCS (re-farm), and 2.5 GHz spectrum, T-Mobile expects to become a viable in-home broadband alternative, especially in rural areas. The carrier notes that by 2021, it will provide data rates in excess of 100 Mbps to 2/3 of the U.S. population, and by 2024 to 90% of the U.S. population. Though understanding that 100 Mbps is more of a mobile solution, and not necessarily an in-home solution for denser/populated areas, the carrier noted that currently 19% of the population could eliminate their home broadband by tethering with T-Mobile and by 2024, that number could increase to 35-45%.

This would make T-Mobile the fourth largest ISP in the U.S. as the carrier plans to market the in-home solution “aggressively, particularly in rural areas”. As for an in-home solution take rate, the carrier notes that by 2024 it expects to provide a high-speed, in-home broadband service to 9.5MM households, or 7% of the market, of which 20-25% of these are in rural markets. On the lower-tier 25 Mbps level, by 2024 T-Mobile expects to serve 52.2MM rural residents with a fixed in-home solution, which we expect could be a “DSL killer” and/or low-income solution that
largely lacks competition today (see pages 58-69 of the PIS, pages 68-79 in the pdf format).

A few weeks later on its earnings call, T-Mobile mgmt. was again highly bullish on its FWBB initiative, with the following statements:

**T-Mobile CMO Mike Sievert, 2Q18 Earnings Call 08/01/2018**

“We see the opportunity to offer broadband during -- in huge swaths of the market, which will bring competition benefits to customers, even those who don’t choose us. But we think about 10 million will choose us over the first few years because we’ll be offering a better-priced broadband offering and by the way, an offering to parts of the market that have literally no competition today. Like half of Americans today have 1 or 0 high-speed broadband offers. That’s crazy. It’s the definition of uncompetitive. Once we do that, now all of a sudden, the TV is even more interesting because you’re offering the broadband, and you can offer the TV on top of it. So that’s a big piece of the future of the new T-Mobile.”

**T-Mobile CEO John Legere, 2Q18 Earnings Call, 08/01/2018**

“Amongst the things that I’m watching happening in the industry in various announcements is when you see what’s happening in the cable industry, for example, and what broadband access is driving for their value, and you realize the speeds that they’re giving, what people haven’t really connected to until recently is that with the new T-Mobile, by 2021, 2/3 of the country will have greater than 100-megabit speed. So when you think about it in the context of broadband, by 2024, it will be 90%. And very importantly, in the underserved rural America segment, when you get out to 2024, we’ll have 74% of them covered with greater than 10 megs but with home CP and in-broadband distribution opportunity that we see, you’ll have 84% that can get greater than 25 megabits. Now that’s a big learning because I don’t think people have really thought through what’s going to come with the network capabilities that the wireless players like us will bring and what its impact is going to be on, amongst other things, in-home broadband. Well, we expect to serve close to 10 million customers out by 2024, and 20% to 25% of them will be in rural America. And these are the things that I don’t think people have double clicked on yet with what happens when network speeds get to be 150, 450 megabits and certainly greater in hard areas.”

Cable stocks were down 2.4%, on average, the day following the T-Mobile earnings call (T-Mobile up 4.8%, the S&P up 0.5%).

**T-Mobile 5G Reality or Hype?** We believe much of the in-home pitch could be political posturing, changing the narrative away from the FCC’s “4 to 3 wireless” market to “one big market” with many converging wireless/ISP players. The PIS continues to stress the rural play, which we do believe poses credible threats (fewer subscribers, preventing network degradation, as we’d argue in-home broadband performance tolerance has a far higher bar). Meanwhile, the current T-Mobile/Sprint spread suggests a merger probability of approval of ~50%. In any case, the “9.5MM” customers by 2024 is an alarming number as we note in the Figure below, could essentially steal the vast majority of total US broadband adds over the next few years.
Figure 38 Sizing Verizon and T-Mobile: Illustrative Worst Case Risk

<table>
<thead>
<tr>
<th></th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VZ mmWave 5G Fixed (1Gbps, Small Cell and Dense Market Focus)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VZ HHP</td>
<td>5,000</td>
<td>10,000</td>
<td>15,000</td>
<td>20,000</td>
<td>25,000</td>
<td>30,000</td>
</tr>
<tr>
<td>VZ Take Rate</td>
<td>7.5%</td>
<td>10.0%</td>
<td>12.5%</td>
<td>15.0%</td>
<td>17.5%</td>
<td>20.0%</td>
</tr>
<tr>
<td>VZ FWBB Customers</td>
<td>375</td>
<td>1,000</td>
<td>1,875</td>
<td>3,000</td>
<td>4,375</td>
<td>6,000</td>
</tr>
<tr>
<td>VZ Net Adds</td>
<td>375</td>
<td>625</td>
<td>875</td>
<td>1,125</td>
<td>1,375</td>
<td>1,625</td>
</tr>
<tr>
<td><strong>TMUS 5G Fixed (Macro-tower and Rural Focus)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TMUS HHP</td>
<td>10,000</td>
<td>20,000</td>
<td>30,000</td>
<td>40,000</td>
<td>50,000</td>
<td></td>
</tr>
<tr>
<td>TMUS Take Rate</td>
<td>5.0%</td>
<td>7.5%</td>
<td>11.0%</td>
<td>14.0%</td>
<td>19.0%</td>
<td></td>
</tr>
<tr>
<td>TMUS FWBB Customers</td>
<td>500</td>
<td>1,500</td>
<td>3,300</td>
<td>5,600</td>
<td>9,500</td>
<td></td>
</tr>
<tr>
<td>TMUS Net Adds</td>
<td>500</td>
<td>1,000</td>
<td>1,800</td>
<td>2,300</td>
<td>3,900</td>
<td></td>
</tr>
<tr>
<td><strong>U.S. HHP</strong></td>
<td>128,252</td>
<td>129,278</td>
<td>130,312</td>
<td>131,354</td>
<td>132,405</td>
<td>133,464</td>
</tr>
<tr>
<td>FWBB HHP Penetration</td>
<td>0.3%</td>
<td>1.2%</td>
<td>2.6%</td>
<td>4.8%</td>
<td>7.5%</td>
<td>11.6%</td>
</tr>
<tr>
<td>Total Customers to FWBB</td>
<td>375</td>
<td>1,125</td>
<td>1,875</td>
<td>2,925</td>
<td>3,675</td>
<td>5,525</td>
</tr>
<tr>
<td><strong>Net Adds to FWBB</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of HHP per year</td>
<td>0.3%</td>
<td>0.9%</td>
<td>1.4%</td>
<td>2.2%</td>
<td>2.8%</td>
<td>4.1%</td>
</tr>
</tbody>
</table>

Cowen Broadband Projections, Excluding Verizon and T-Mobile FWBB

<table>
<thead>
<tr>
<th></th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Broadband Adds</td>
<td>2,393</td>
<td>2,088</td>
<td>2,095</td>
<td>2,007</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Big Cable BB Adds, ex FWBB</td>
<td>2,622</td>
<td>2,128</td>
<td>2,034</td>
<td>1,942</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Big Cable BB Adds w/ FWBB</td>
<td>2,247</td>
<td>1,003</td>
<td>159</td>
<td>(983)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Financial Performance

Broadly speaking, the Cable industry is entering market maturity in which revenue is moderating to the low-single digits. Growth will be driven by unit growth via share stealing from the Telco providers (which will ebb and flow over the next few years, but become a source of long-term growth as consumers adopt more demand-rich applications). That said, more of the revenue growth (50-60% of the growth) will come from rate hikes, especially where Cable has few/no competitors (40-50% of the footprint and made easier with the repeal of the Open Internet Order and Title II designation). We believe there could be further downside risk in video and broadband business over the next five years, but upside to business services.

Despite moderating revenue, margin preservation is expected (and in fact expanding with some providers, driven by scale/integration efficiencies). The OTT threat is minimal (we estimate at worst ~$7 of EBITDA per sub per month), programming costs are rising but moderating to mid-single digit Y/Y growth (from previous years of >10% growth), and non-programming costs are moderating on scale, digitalization/automation, simplification, and efficiencies.
Figure 39 Programming Costs Rise...

Programming Costs as % of Video Revenue

Source: Company reports, Cowen and Company estimates

Figure 40 ...But Unit Cost Increases Beginning to Moderate

Programming Cost per Sub per Month

Source: Company reports, Cowen and Company estimates

Figure 41 Non-Programming Costs Shows Improvement in 2Q18, Downward Trend to Continue

Non-Programming Costs as a % of Cable Revenue

Source: Company data, Cowen and Company estimates

Capex and FCF

Customer CPE represents ~30-40% of a typical cable capex budget, followed by scalable infrastructure (typically 20-25%, increasing network capacity; space, network optronics/equipment), with the remainder line extensions (typically for business services, often success-based), support capital, and upgrade/rebuilds. Generally for cable MSOs, capex as a % of revenue can run ~15% however can vary widely on company specific initiatives. For example, with CPEs as the largest use of capital dollars, Comcast has reached 60% penetration with its X1 platform and thus can expect modest capex declines. Charter (WorldBox) and Altice (AlticeOne) are
ramping their next-gen set top boxes and in the midst of platform integrations following M&A.

Figure 42 Cable Capex Expected to Moderate...

![Cable Capex as a % of Cable Revenue](chart)

Source: Company reports, Cowen and Company estimates

Figure 43 ...and Margin Preservation for FCF/Share Growth at ATUS, CMCSA, and CHTR

![FCF/Share](chart)

Source: Company reports, Cowen and Company estimates

Valuation

A modest 2Q18 rerating: Cable and Satellite shares are underperforming YTD on both broader secular concerns that drove a de-rating of the sector (OTT threats that began in 3Q17, broadband moderation, rising interest rate fears in early 2018, 5G fixed wireless) as well as company-specific concerns (Comcast-Sky-Fox saga, Charter’s Time Warner sub base clean-up, Altice storms and Starz dispute). However, following 2Q18 results, proving out the thesis that OTT migration has little/no impacts margins, solid broadband growth, and company specific strengths (Comcast dropping Fox, Altice/Charter showing 1Q18 one-time issues are behind the company, and Dish posting solid EBITDA to “age” its spectrum), the industry showed a modest re-rating up roughly one-half EBITDA turn (or FCF yields down 100 bps).
Figure 44 Cable Industry YTD Stock Performance (Indexed to 100 on 01/01/2018)

Source: Thomson, Company data, Cowen and Company estimates

Figure 45 Industry FCF Yield %

Source: Thomson, Company data, Cowen and Company estimates
It’s worth noting that typically Charter traded at a 2-turn EV/EBITDA premium to Comcast; however, with Comcast strength coupled with an eroding M&A story for Charter, the premium has decreased to 1.5x and stabilized at these levels (Figure 47), which could be the “new normal” spread.

![Graph showing EV/EBITDA ratios for Dish, Altice, Altice IPO, Charter, and Comcast over time.](image)

Source: Thomson, Company data, Cowen and Company estimates

![Graph showing CHTR Premium over CMCSA over time.](image)

Source: Thomson, Company data, Cowen and Company estimates
Figure 48 Industry Net Debt/EBITDA

Source: Thomson One, Company reports, Cowen and Company

Figure 49 MVPD Valuation and Financial Summary

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Altice USA</td>
<td>$18.65</td>
<td>1</td>
<td>$13,746</td>
<td>$21,595</td>
<td>$160</td>
<td>$35,181</td>
<td>3.0%</td>
<td>3.0%</td>
<td>43.0%</td>
<td>43.8%</td>
<td>8.5x</td>
<td>8.1x</td>
</tr>
<tr>
<td>Charter</td>
<td>$305.08</td>
<td>1</td>
<td>$80,938</td>
<td>$72,117</td>
<td>$773</td>
<td>$149,782</td>
<td>4.6%</td>
<td>4.3%</td>
<td>37.0%</td>
<td>36.5%</td>
<td>9.3x</td>
<td>9.0x</td>
</tr>
<tr>
<td>Comcast</td>
<td>$35.74</td>
<td>2</td>
<td>$165,941</td>
<td>$64,580</td>
<td>$5,726</td>
<td>$227,461</td>
<td>6.0%</td>
<td>2.1%</td>
<td>32.3%</td>
<td>32.6%</td>
<td>7.9x</td>
<td>7.6x</td>
</tr>
<tr>
<td>Dish</td>
<td>$35.56</td>
<td>1</td>
<td>$18,699</td>
<td>$15,144</td>
<td>$1,555</td>
<td>$28,289</td>
<td>-4.8%</td>
<td>-4.8%</td>
<td>20.6%</td>
<td>18.4%</td>
<td>10.0x</td>
<td>11.8x</td>
</tr>
</tbody>
</table>

Rating: 1 - Outperform, 2 - Market Perform, 3 - Underperform, NR - Not Rated
Note: priced as of 8/21/2018
Source: Company reports, Cowen and Company
Appendix

**Figure 50** Short Interest as a % of Float (ATUS Post Spin-Off Declines)

Source: Company reports, Cowen and Company estimates

**Figure 51** Short Interest % Change in Past 30 and 90 Days

Source: Company reports, Cowen and Company estimates

**Figure 52** 2Q18 U.S. Video Subscriber Share

Source: Company data, Cowen and Company estimates

**Figure 53** 2Q18 U.S. Video Subscriber Share

Source: Company data, Cowen and Company estimates
**Figure 54 $1B+ M&A Transactions Since 2015 (Altice Entry)**

<table>
<thead>
<tr>
<th>Company</th>
<th>Target</th>
<th>Date Announced</th>
<th>Price $M</th>
<th>EV/EBITDA (CY) per Video Sub</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cogeco</td>
<td>MetroCast</td>
<td>7/10/2017</td>
<td>$1,400</td>
<td>11.6x NM</td>
</tr>
<tr>
<td>TPG (RCN)</td>
<td>Wave Broadband</td>
<td>5/22/2017</td>
<td>$2,360</td>
<td>12.3x NM</td>
</tr>
<tr>
<td>Liberty Interactive</td>
<td>GCI</td>
<td>4/4/2017</td>
<td>$2,680</td>
<td>8.6x NM</td>
</tr>
<tr>
<td>TPG</td>
<td>RCN</td>
<td>8/15/2016</td>
<td>$1,600</td>
<td>8.3x $5,536</td>
</tr>
<tr>
<td>Altice</td>
<td>Cablevision</td>
<td>9/17/2015</td>
<td>$17,700</td>
<td>8.8x $6,712</td>
</tr>
<tr>
<td>Charter</td>
<td>Time Warner Cable</td>
<td>5/26/2015</td>
<td>$78,700</td>
<td>9.1x $7,138</td>
</tr>
<tr>
<td>Charter</td>
<td>Bright House</td>
<td>5/26/2015</td>
<td>$10,400</td>
<td>7.6x $5,200</td>
</tr>
<tr>
<td>Altice</td>
<td>Suddenlink</td>
<td>5/20/2015</td>
<td>$9,100</td>
<td>9.3x $8,250</td>
</tr>
</tbody>
</table>

Since Altice Entry 9.4x

Source: Company reports, Cowen and Company

**Figure 55 The Cable/Telco Footprint Overlap**

<table>
<thead>
<tr>
<th>AT&amp;T U-Verse</th>
<th>Charter (50MM HHP)</th>
<th>Comcast (57MM HHP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frontier</td>
<td>4%</td>
<td>23%</td>
</tr>
<tr>
<td>CenturyLink</td>
<td>10%</td>
<td>8%</td>
</tr>
<tr>
<td>Windstream</td>
<td>&lt;5%</td>
<td>&lt;5%</td>
</tr>
<tr>
<td>Verizon Fios</td>
<td>33%</td>
<td>4%</td>
</tr>
<tr>
<td>Other/no telco*</td>
<td>-37%</td>
<td>-35%</td>
</tr>
</tbody>
</table>

Source: Company reports, Cowen and Company. *includes non-upgraded AT&T and Verizon plant

**Figure 56 FCC Total ILEC Zip Code Overlap**

<table>
<thead>
<tr>
<th>Bright House</th>
<th>CenturyLink</th>
<th>Frontier</th>
<th>Verizon</th>
<th>Windstream</th>
</tr>
</thead>
<tbody>
<tr>
<td>3%</td>
<td>2%</td>
<td>3%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>5%</td>
<td>4%</td>
<td>9%</td>
<td>0%</td>
<td>2%</td>
</tr>
<tr>
<td>0%</td>
<td>1%</td>
<td>2%</td>
<td>15%</td>
<td>1%</td>
</tr>
<tr>
<td>22%</td>
<td>19%</td>
<td>19%</td>
<td>5%</td>
<td>11%</td>
</tr>
<tr>
<td>32%</td>
<td>25%</td>
<td>26%</td>
<td>53%</td>
<td>31%</td>
</tr>
<tr>
<td>7%</td>
<td>6%</td>
<td>1%</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>9%</td>
<td>6%</td>
<td>8%</td>
<td>0%</td>
<td>7%</td>
</tr>
<tr>
<td>23%</td>
<td>12%</td>
<td>25%</td>
<td>23%</td>
<td>20%</td>
</tr>
<tr>
<td>8%</td>
<td>2%</td>
<td>5%</td>
<td>0%</td>
<td>5%</td>
</tr>
</tbody>
</table>

Source: FCC
| Source: Company reports, Cowen and Company |  

### Figure 57 Residential Wireline - KPIs

| KPI | ALLO | Cablevision | Suddenlink | Comcast | Charter | Legacy Charter | Time Warner | Cable | BrightHouse | Cox | Dish/DirecTV | AT&T Total Wireline | AT&T U-Verse | Frontier | CenturyLink | Windstream | Verizon | Verizon Fiber | Cable Margin |
| BB Subs | 3,406 | 2,363 | 1,042 | 22,357 | 16,480 | 4,320 | 10,217 | 1,863 | 3,852 | 11,050 | 20,458 | 3,631 | 3,631 | 1,196 | 285 | - | 4,619 | 4,619 |
| 2016 Y/Y Growth | -3% | -2% | -4% | 1% | -2% | 1% | -3% | -3% | -2% | -8% | 6% | - | -24% | -19% | - | - | - | - | 1% |
| 2017 Y/Y Growth | -4% | -3% | -6% | -1% | -2% | -1% | -3% | 0% | -2% | -9% | 3% | - | -15% | -16% | - | - | - | - | -2% |
| 2018Y/Y Growth | -3% | -2% | -3% | -2% | -2% | -2% | -2% | 0% | -2% | -7% | 5% | - | 1% | -12% | - | - | - | - | -3% |
| 2019Y/Y Growth | -3% | -3% | -3% | -3% | -2% | -2% | -2% | 0% | -2% | -7% | 5% | - | 0% | -11% | - | - | - | - | -3% |
| Video ARPU | $103.13 | $109.79 | $88.06 | $84.82 | $83.19 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2016 Y/Y Growth | 2% | 1% | 3% | 2% | 2% | - | - | - | - | - | - | - | - | - | - | - | - | - | -4% |
| 2017 Y/Y Growth | 3% | 3% | 4% | 3% | 4% | - | - | - | - | - | - | - | - | - | - | - | - | - | 2% |
| 2018Y/Y Growth | 2% | 2% | 2% | 2% | 0% | - | - | - | - | - | - | - | - | - | - | - | - | - | 2% |
| 2019Y/Y Growth | 5% | 5% | 4% | 2% | 4% | - | - | - | - | - | - | - | - | - | - | - | - | - | 3% |
| Video ARPU + Sub % | 2016 Y/Y Growth | -1% | -1% | 0% | 3% | 1% | - | - | - | - | - | - | - | - | - | - | - | - | -2% | 10% |
| 2017 Y/Y Growth | 0% | 0% | -1% | 2% | 2% | - | - | - | - | - | - | - | - | - | - | - | - | - | -1% |
| 2018Y/Y Growth | 0% | 0% | -1% | -1% | 3% | - | - | - | - | - | - | - | - | - | - | - | - | - | -5% |
| 2019Y/Y Growth | 2% | 2% | 1% | -1% | 2% | - | - | - | - | - | - | - | - | - | - | - | - | - | -6% |
| BB ARPU | $52.80 | $50.03 | $51.18 | $51.63 | $53.16 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2016 Y/Y Growth | 11% | 9% | 13% | 9% | 4% | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2017 Y/Y Growth | 10% | 8% | 12% | 3% | 5% | - | - | - | - | - | - | - | - | - | - | - | - | - | -4% |
| 2018Y/Y Growth | 11% | 12% | 8% | 4% | 3% | - | - | - | - | - | - | - | - | - | - | - | - | - | -4% |
| 2019Y/Y Growth | 6% | 6% | 5% | 2% | 3% | - | - | - | - | - | - | - | - | - | - | - | - | - | -4% |
| Cable ARPC | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2016 Y/Y Growth | 14% | 11% | 10% | 9% | 12% | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2017 Y/Y Growth | 12% | 10% | 11% | 8% | 10% | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2018Y/Y Growth | 13% | 14% | 11% | 9% | 7% | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2019Y/Y Growth | 8% | 8% | 8% | 7% | 7% | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

*EQUITY RESEARCH*  
*COWEN*  
August 22, 2018
<table>
<thead>
<tr>
<th>Company</th>
<th>Ticker</th>
<th>Rating</th>
<th>Price</th>
<th>Mkt Cap</th>
<th>EV/Growth</th>
<th>Revenue</th>
<th>Basic Financials</th>
<th>EBITDA</th>
<th>FCF/Share</th>
<th>Sales</th>
<th>Growth</th>
<th>EBITDA</th>
<th>Margin (C2018)</th>
<th>CapEx/</th>
<th>Dividend</th>
<th>Net Debt/ 8/21/18 8/21/18</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT&amp;T</td>
<td>T</td>
<td>2</td>
<td>$53.40</td>
<td>246,249</td>
<td>222,899</td>
<td>167,092</td>
<td>153,413</td>
<td>61,025</td>
<td>62,869</td>
<td>3,322</td>
<td>4.1%</td>
<td>3,349</td>
<td>10.5%</td>
<td>5.2%</td>
<td>4.0%</td>
<td>17.6%</td>
<td>2018</td>
</tr>
<tr>
<td>Sprint</td>
<td>S</td>
<td>2</td>
<td>$21.51</td>
<td>25,097</td>
<td>58,525</td>
<td>12,379</td>
<td>8,883</td>
<td>3,765</td>
<td>7,085</td>
<td>508</td>
<td>8.9%</td>
<td>528</td>
<td>4.5%</td>
<td>3.6%</td>
<td>3.7%</td>
<td>24.7%</td>
<td>2018</td>
</tr>
<tr>
<td>T-Mobile</td>
<td>TMUS</td>
<td>1</td>
<td>$66.51</td>
<td>56,669</td>
<td>84,614</td>
<td>43,012</td>
<td>43,331</td>
<td>11,404</td>
<td>12,262</td>
<td>6,097</td>
<td>8.4%</td>
<td>6,922</td>
<td>5.4%</td>
<td>5.5%</td>
<td>5.6%</td>
<td>18.6%</td>
<td>2018</td>
</tr>
<tr>
<td>US Cellular</td>
<td>ESM</td>
<td>NR</td>
<td>$44.47</td>
<td>3,804</td>
<td>5,060</td>
<td>1,941</td>
<td>3,969</td>
<td>899</td>
<td>873</td>
<td>1,09</td>
<td>11.9%</td>
<td>762</td>
<td>3.7%</td>
<td>3.2%</td>
<td>3.5%</td>
<td>32.3%</td>
<td>2018</td>
</tr>
<tr>
<td>Verizon</td>
<td>VZ</td>
<td>2</td>
<td>$59.41</td>
<td>227,272</td>
<td>340,162</td>
<td>113,356</td>
<td>133,025</td>
<td>47,764</td>
<td>49,836</td>
<td>6,227</td>
<td>4.3%</td>
<td>6,482</td>
<td>4.1%</td>
<td>3.9%</td>
<td>4.1%</td>
<td>18.8%</td>
<td>2018</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td></td>
<td>$7.84</td>
<td>6.5%</td>
<td>9.8%</td>
<td>7.91</td>
<td>7.7%</td>
<td>9.6%</td>
<td>9.9%</td>
<td>10.1%</td>
<td>2.3%</td>
<td>2.3%</td>
<td>13.3%</td>
<td>2.2%</td>
<td>2.2%</td>
<td>3.1%</td>
<td>2019</td>
</tr>
<tr>
<td>Median</td>
<td></td>
<td></td>
<td>$7.57</td>
<td>6.9%</td>
<td>10.0%</td>
<td>7.7%</td>
<td>7.9%</td>
<td>9.8%</td>
<td>10.0%</td>
<td>10.1%</td>
<td>2.2%</td>
<td>2.2%</td>
<td>13.3%</td>
<td>2.2%</td>
<td>2.2%</td>
<td>3.1%</td>
<td>2019</td>
</tr>
<tr>
<td>Cable &amp; Satellite</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Altice USA</td>
<td>ATUS</td>
<td>1</td>
<td>$188.65</td>
<td>13,746</td>
<td>35,181</td>
<td>9,588</td>
<td>9,876</td>
<td>4,133</td>
<td>4,331</td>
<td>1,777</td>
<td>4.8%</td>
<td>1,996</td>
<td>11.2%</td>
<td>3.4%</td>
<td>4.1%</td>
<td>12.1%</td>
<td>2018</td>
</tr>
<tr>
<td>Charter</td>
<td>CHTR</td>
<td>1</td>
<td>$305.08</td>
<td>80,938</td>
<td>149,782</td>
<td>43,476</td>
<td>45,346</td>
<td>10,066</td>
<td>10,572</td>
<td>14,73</td>
<td>3.2%</td>
<td>14,20</td>
<td>5.0%</td>
<td>4.3%</td>
<td>4.6%</td>
<td>15.0%</td>
<td>2018</td>
</tr>
<tr>
<td>Comcast</td>
<td>CMCSA</td>
<td>2</td>
<td>$135.74</td>
<td>165,941</td>
<td>227,462</td>
<td>89,611</td>
<td>91,480</td>
<td>28,908</td>
<td>29,805</td>
<td>2,927</td>
<td>8.8%</td>
<td>2,742</td>
<td>3.4%</td>
<td>3.1%</td>
<td>3.8%</td>
<td>15.7%</td>
<td>2018</td>
</tr>
<tr>
<td>Dish</td>
<td>DISH</td>
<td>1</td>
<td>$35.56</td>
<td>18,699</td>
<td>28,289</td>
<td>13,706</td>
<td>13,045</td>
<td>2,072</td>
<td>2,406</td>
<td>2,47</td>
<td>14.9%</td>
<td>2,48</td>
<td>3.0%</td>
<td>3.4%</td>
<td>3.9%</td>
<td>10.0%</td>
<td>2018</td>
</tr>
<tr>
<td>Cable One</td>
<td>CABO</td>
<td>NR</td>
<td>$30.00</td>
<td>4,624</td>
<td>5,637</td>
<td>1,070</td>
<td>1,085</td>
<td>506</td>
<td>526</td>
<td>3,017</td>
<td>4.9%</td>
<td>4,07</td>
<td>3.9%</td>
<td>3.9%</td>
<td>3.9%</td>
<td>17.7%</td>
<td>2018</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td></td>
<td>$9.97</td>
<td>6.8%</td>
<td>6.8%</td>
<td>9.5%</td>
<td>9.5%</td>
<td>7.0%</td>
<td>7.0%</td>
<td>9.8%</td>
<td>1.2%</td>
<td>1.2%</td>
<td>13.0%</td>
<td>1.6%</td>
<td>1.6%</td>
<td>9.8%</td>
<td>2018</td>
</tr>
<tr>
<td>Median</td>
<td></td>
<td></td>
<td>$9.88</td>
<td>7.0%</td>
<td>6.7%</td>
<td>9.5%</td>
<td>9.5%</td>
<td>7.0%</td>
<td>7.0%</td>
<td>9.8%</td>
<td>1.2%</td>
<td>1.2%</td>
<td>13.0%</td>
<td>1.6%</td>
<td>1.6%</td>
<td>9.8%</td>
<td>2018</td>
</tr>
</tbody>
</table>

Source: Company data, Thomson One, Cowen and Company estimates. Earnings are based on Fiscal Year
Valuation Methodology and Risks

Valuation Methodology

Telecom Services:

Our valuation methodology consists of an absolute and relative value approach. We arrive at a fair value utilizing a five-year discounted cash flow (DCF) and when appropriate a segmented sum-of-parts (SOP) analysis. Our relative value approach takes into account EV/EBITDA, P/FCF, and P/E and, when applicable, P/AFFO and dividend yield.

Cable & Satellite Services:

Our valuation methodology consists of an absolute and relative value approach. We arrive at a fair value utilizing a five-year discounted cash flow (DCF) and when appropriate a segmented sum-of-parts (SOP) analysis. Our relative value approach takes into account EV/EBITDA, P/FCF, FCF Yield, P/E and, when applicable, P/AFFO and dividend yield.

Investment Risks

Telecom Services:

Risks Include: (1) many companies within Telecom Services are highly regulated where a change in rules could lead to unfavorable conditions; (2) rapidly changing/disruptive technology, new product/service offerings, and evolving industry/technology standards could have an impact on demand and/or pricing; and (3) deterioration in the macro environment both domestically and internationally could lead to a reduction in demand and a consequent impact on valuation multiples.

Cable & Satellite Services:

Risks Include: (1) rapidly changing/disruptive technology (specifically the threat of OTT video on traditional video services), new product/service offerings, and evolving industry/technology standards could have an impact on demand and/or pricing; and (2) many companies within Cable & Satellite Services are highly regulated where a change in rules could lead to unfavorable conditions; and (3) deterioration in the macro environment could lead to a reduction in demand and a consequent impact on valuation multiples.
**Analyst Certification**

Each author of this research report hereby certifies that (i) the views expressed in the research report accurately reflect his or her personal views about any and all of the subject securities or issuers, and (ii) no part of his or her compensation was, is, or will be related, directly or indirectly, to the specific recommendations or views expressed in this report.

**Important Disclosures**

This report constitutes a compendium report (covers six or more subject companies). As such, Cowen and Company, LLC chooses to provide specific disclosures for the companies mentioned by reference. To access current disclosures for the all companies in this report, clients should refer to https://cowen.bluematrix.com/sellside/Disclosures.action or contact your Cowen and Company, LLC representative for additional information.

Cowen and Company, LLC compensates research analysts for activities and services intended to benefit the firm’s investor clients. Individual compensation determinations for research analysts, including the author(s) of this report, are based on a variety of factors, including the overall profitability of the firm and the total revenue derived from all sources, including revenues from investment banking, sales and trading or principal trading revenues. Cowen and Company, LLC does not compensate research analysts based on specific investment banking transactions or specific sales and trading or principal trading revenues.

**Disclaimer**

Our research reports are simultaneously available to all clients on our client website. Research reports are for our clients only. Not all research reports are disseminated, e-mailed or made available to third-party aggregators. Cowen and Company, LLC is not responsible for the redistribution of research by third party aggregators. Selected research reports are available in printed form in addition to an electronic form. All published research reports can be obtained on the client’s website, https://cowenlibrary.bluematrix.com/client/library.jsp.

The information, opinions, estimates and forecasts are as of the date of this report and subject to change without prior notification. We seek to update our research as appropriate, but various regulations may prevent us from doing so. Research reports are published at irregular intervals as appropriate in the analyst’s judgement.

Further information on subject securities may be obtained from our offices. This research report is published solely for information purposes, and is not to be construed as an offer to sell or the solicitation of an offer to buy any security in any state where such an offer or solicitation would be illegal. Other than disclosures relating to Cowen and Company, LLC, the information herein is based on sources we believe to be reliable but is not guaranteed by us and does not purport to be a complete statement or summary of the available data. Any opinions expressed herein are statements of our judgment on this date and are subject to change without notice. The opinions and recommendations herein do not take into account individual client circumstances, objectives or needs and are not intended as recommendations of investment strategy. The recipients of this report must make their own independent decisions regarding any securities subject to this research report. In some cases, securities and other financial instruments may be difficult to value or sell and reliable information about the value or risks related to the security or financial instrument may be difficult to obtain. To the extent that this report discusses any legal proceedings or issues, it has not been prepared to express or intended to express any legal conclusion, opinion or advice. Our salespeople, traders and other professionals may provide oral or written market commentary or trading strategies to our clients that reflect opinions that are contrary to the opinions expressed in our research. Our principal trading area and investing businesses may make investment decisions that are inconsistent with recommendations or views expressed in our research. Cowen and Company, LLC maintains physical, electronic and procedural information barriers to address the flow of information between and among departments within Cowen and Company, LLC in order to prevent and avoid conflicts of interest with respect to analyst recommendations.

For important disclosures regarding the companies that are the subject of this research report, please contact Compliance Department, Cowen and Company, LLC, 599 Lexington Avenue, 20th Floor, New York, NY 10022. In addition, the same important disclosures, with the exception of the valuation methods and risks, are available on the Firm’s disclosure website at https://cowen.bluematrix.com/sellside/Disclosures.action.

**Equity Research Price Targets:** Cowen and Company, LLC assigns price targets on all companies covered in equity research unless noted otherwise. The equity research price target for an issuer’s stock represents the value that the analyst reasonably expects the stock to reach over a performance period of twelve months. Any price targets in equity securities in this report should be considered in the context of all prior published Cowen and Company, LLC equity research reports (including the disclosures in any such equity report or on the Firm’s disclosure website), which may or may not include equity research price targets, as well as developments relating to the issuer, its industry and the financial markets. For equity research price target valuation methodology and risks associated with the achievement of any given equity research price target, please see the analyst’s equity research report publishing such targets.

**Cowen Credit Research and Trading:** Due to the nature of the fixed income market, the issuers or debt securities of the issuers discussed in “Cowen Credit Research and Trading” research reports do not assign ratings and price targets and may not be continuously followed. Accordingly, investors must regard such branded reports as providing stand-alone analysis and reflecting the analyst’s opinion as of the date of the report and should not expect continuing analysis or additional reports relating to such issuers or debt securities of the issuers.

From time to time “Cowen Credit Research and Trading” research analysts provide investment recommendations on securities that are the subject of this report. These recommendations are intended only as of the time and date of publication and only within the parameters specified in each individual report. “Cowen Credit Research and Trading” investment recommendations are made strictly on a case-by-case basis, and no recommendation is provided as part of an overarching rating system or other set of consistently applied benchmarks. The views expressed in this report may differ from the views offered in the firm’s equity research reports prepared for our clients.

**Notice to UK Investors:** This publication is produced by Cowen and Company, LLC which is regulated in the United States by FINRA. It is to be communicated only to persons of a kind described in Articles 19 and 49 of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005. It must not be further transmitted to any other person without our consent.

**Notice to European Union Investors:** Individuals producing recommendations are required to obtain certain licenses by the Financial Regulatory Authority (FINRA). You can review the author’s current licensing status and history, employment history and, if any, reported regulatory, customer dispute, criminal and other matters via “BrokerCheck by FINRA” at http://brokercheck.finra.org/. An individual's licensing status with FINRA should not be construed as an endorsement by FINRA. General biographical information is also available for each Research Analyst at www.cowen.com.

Additionally, the complete preceding 12-month recommendations history related to recommendation in this research report is available at https://cowen.bluematrix.com/sellside/Disclosures.action

The recommendation contained in this report was produced at August 21, 2018, 22:58 ET. and disseminated at August 22, 2018, 06:00 ET.

Copyright, User Agreement and other general information related to this report
COWEN
EQUITY RESEARCH

August 22, 2018

© 2018 Cowen and Company, LLC. All rights reserved. Member NYSE. FINRA and SIPC. This research report is prepared for the exclusive use of Cowen clients and may not be reproduced, displayed, modified, distributed, transmitted or disclosed, in whole or in part, or in any form or manner, to others outside your organization without the express prior written consent of Cowen. Cowen research reports are distributed simultaneously to all clients eligible to receive such research reports. Any unauthorized use or disclosure is prohibited. Receipt and/or review of this research constitutes your agreement not to reproduce, display, modify, distribute, transmit, or disclose to others outside your organization. All Cowen trademarks displayed in this report are owned by Cowen and may not be used without its prior written consent.

Outperform (1): The stock is expected to achieve a total positive return of at least 15% over the next 12 months

Market Perform (2): The stock is expected to have a total return that falls between the parameters of an Outperform and Underperform over the next 12 months

Underperform (3): Stock is expected to achieve a total negative return of at least 10% over the next 12 months

Assumption: The expected total return calculation includes anticipated dividend yield

Cowen and Company Equity Research Rating Distribution

<table>
<thead>
<tr>
<th>Rating</th>
<th>Count</th>
<th>Ratings Distribution</th>
<th>IB Services/Past 12 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buy (a)</td>
<td>476</td>
<td>63.55%</td>
<td>113 23.79%</td>
</tr>
<tr>
<td>Hold (b)</td>
<td>266</td>
<td>35.51%</td>
<td>18  6.74%</td>
</tr>
<tr>
<td>Sell (c)</td>
<td>7</td>
<td>0.93%</td>
<td>0   0.00%</td>
</tr>
</tbody>
</table>

(a) Corresponds to “Outperform” rated stocks as defined in Cowen and Company, LLC’s equity research rating definitions. (b) Corresponds to “Market Perform” as defined in Cowen and Company, LLC’s equity research ratings definitions. (c) Corresponds to “Underperform” as defined in Cowen and Company, LLC’s equity research ratings definitions. Cowen and Company Equity Research Rating Distribution Table does not include any company for which the equity research rating is currently suspended or any debt security followed by Cowen Credit Research and Trading.

Note: “Buy”, “Hold” and “Sell” are not terms that Cowen and Company, LLC uses in its ratings system and should not be construed as investment options. Rather, these ratings terms are used illustratively to comply with FINRA regulation.
POINTER OF CONTACT

Analyst Profiles

Gregory Williams, CFA
New York
646 562 1367
gregory.williams@cowen.com

Gregory Williams is a member of the telecom services team. He has 12 years of telco/research experience at AT&T, J.P.Morgan and Sidoti.

Colby Synaesael
New York
646 562 1355
colby.synaesael@cowen.com

Colby Synaesael is a senior analyst covering comm. infra. and telecom services. He joined Cowen in 2010 and has been on Wall Street since 2001.

Doug Creutz, CFA
San Francisco
415 646 7225
doug.creutz@cowen.com

Doug Creutz is a senior analyst covering media, entertainment, and video games. He has been covering the media sector at Cowen since 2003.

Jonathan Charbonneau
New York
646 562 1356
jonathan.charbonneau@cowen.com

Jon Charbonneau is a member of the telecom services team. He joined Cowen in 2010 and has worked in research since 2007.

Michael Elias
New York
646 562 1358
michael.elias@cowen.com

Michael Elias is a member of the telecom services team. He received a BS in engineering management systems from Columbia University.

Stephen Glagola
San Francisco
415 646 7224
stephen.glagola@cowen.com

Stephen Glagola is an associate covering the media and entertainment sector. He joined Cowen in August 2013 from Barclays.

Reaching Cowen

Main U.S. Locations

**New York**
599 Lexington Avenue
New York, NY 10022
646 562 1010
800 221 5616

**Atlanta**
3399 Peachtree Road NE
Suite 417
Atlanta, GA 30326
866 544 7009

**Boston**
Two International Place
Boston, MA 02110
617 946 3700
800 343 7068

**Chicago**
181 West Madison Street
Suite 3135
Chicago, IL 60602
312 577 2240

**Cleveland**
20006 Detroit Road
Suite 100
Rocky River, OH 44116
440 331 3531

**Stamford**
262 Harbor Drive
Stamford, CT 06902
646 616 3000

**San Francisco**
One Maritime Plaza, 9th Floor
San Francisco, CA 94111
415 646 7200
800 858 9316

**Washington, D.C.**
2900 K Street, NW
Suite 520
Washington, DC 20007
202 868 5300

International Location

Cowen International Limited
London
1 Snowden Street - 11th Floor
London EC2A 2DQ
United Kingdom
44 20 7071 7500