Research Sources

350 Provider/ Vendor/ Expert Interviews:
RVA LLC  March to September, 2013

2,100 Consumer Interviews:
RVA LLC  June, 2013

Conducted in part for the FTTH Council
Advanced Broadband Enhances Value
Advanced Broadband Is Important In A Community
Two -Three Elements Most Important To New Community

ALL AGES:
- Green space, parks, and trails: 66%
- Shops and restaurants/ walking distance: 52%
- Diverse mix of housing types and prices: 34%
- Extremely high speed fiber broadband: 33%
- Public/ Mass transit in walking distance: 28%

AGE UNDER 45:
- Green space, parks, and trails: 50%
- Shops and restaurants/ walking distance: 38%
- Extremely high speed fiber broadband: 27%
- Diverse mix of housing types and prices: 25%
- Public/ Mass transit in walking distance: 21%
Advanced Broadband Is Important In A Neighborhood

Percent Saying Somewhat Or Very Important

**ALL AGES:**
- Green space/ walking, jogging: 83%
- Internet from a direct fiber optic line: 78%
- 24 hour neighborhood patrol: 61%
- Fitness center/ Club house: 55%
- Community pool/ park: 53%

**AGE UNDER 45:**
- Green space/ walking, jogging: 81%
- Internet from a direct fiber optic line: 79%
- Community pool/ park: 58%
- 24 hour neighborhood patrol: 56%
- Fitness center/ Club house: 55%
External Wireless Alone Is Insufficient
Many Mistakenly Think “Wireless” Is Really Wireless

Perception All Cell/Mobile Communication is Over Air

- All over air: 36.0%
- Not sure: 27.0%
- Air and network: 37.0%
Wireless Is Actually An Important App On Fiber!

A very small percent of most wireless communications are over air because wireless energy disperses rapidly.

Network in the ground (usually fiber)
Small External Fiber Fed Antennas Are Needed
Lifestyles Are Changing
The Majority Of Adults Are Now Internet Dependent

2015 Age Pyramid

<table>
<thead>
<tr>
<th>Age</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>00-04</td>
<td>11.4</td>
<td>10.9</td>
</tr>
<tr>
<td>05-09</td>
<td>11.0</td>
<td>10.6</td>
</tr>
<tr>
<td>10-14</td>
<td>10.7</td>
<td>10.3</td>
</tr>
<tr>
<td>15-19</td>
<td>10.4</td>
<td>9.9</td>
</tr>
<tr>
<td>20-24</td>
<td>11.2</td>
<td>10.7</td>
</tr>
<tr>
<td>25-29</td>
<td>11.3</td>
<td>10.9</td>
</tr>
<tr>
<td>30-34</td>
<td>11.1</td>
<td>10.8</td>
</tr>
<tr>
<td>35-39</td>
<td>10.4</td>
<td>10.2</td>
</tr>
<tr>
<td>40-44</td>
<td>10.1</td>
<td>10.1</td>
</tr>
<tr>
<td>45-49</td>
<td>10.4</td>
<td>10.5</td>
</tr>
<tr>
<td>50-54</td>
<td>11.0</td>
<td>11.4</td>
</tr>
<tr>
<td>55-59</td>
<td>10.5</td>
<td>11.1</td>
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<tr>
<td>60-64</td>
<td>9.0</td>
<td>8.3</td>
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<tr>
<td>65-69</td>
<td>7.3</td>
<td>6.0</td>
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<tr>
<td>70-74</td>
<td>5.0</td>
<td>4.4</td>
</tr>
<tr>
<td>75-79</td>
<td>3.4</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Boomers 51-69 (74M)

Millennials 19-37 (83M)
In-Home Broadband Time Is Increasing

Online Hrs. For Average Person Spending 9 Waking Hours At Home

Traditional TV (Cable, Air, DVD) 2.7
Online:
Communication/ Personal 2.6
Work 1.6
Online TV 0.6

4.8 online hours

Estimated “screen time” is 7.5 hours - 83% of waking hours at home. (Note: some time could be screen-to-screen multitasking and screen-to-non screen multitasking.)
The Number Of In-Home Internet Devices Is Growing

Consumers believe their home now supports approximately five Internet-ready devices....

... and an estimated 2.8 HD televisions/DVRs (many fed by IP).
### The Use Of Apps Already Available Is Increasing Rapidly

#### Internet Activities Completed At Least Once/Month By FTTH Users

<table>
<thead>
<tr>
<th>Activity</th>
<th>2010</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shop online</td>
<td></td>
<td>68%</td>
</tr>
<tr>
<td>Upload large files</td>
<td>25%</td>
<td>36%</td>
</tr>
<tr>
<td>Use VOIP for audio</td>
<td>10%</td>
<td>24%</td>
</tr>
<tr>
<td>Download/stream video to television set</td>
<td>5%</td>
<td>23%</td>
</tr>
<tr>
<td>Upload video content to Internet</td>
<td>13%</td>
<td>20%</td>
</tr>
<tr>
<td>Use two-way video conferencing</td>
<td>7%</td>
<td>19%</td>
</tr>
</tbody>
</table>

The use of apps is increasing rapidly, with activities such as shopping online and uploading large files becoming more common. For example, the percentage of users who shop online increased from 25% in 2010 to 68% in 2013.
OTT Video Has Only Started To Drive More Wireline Traffic

### ALL AGES:
- OTT only ("Video cord cutter") 4.9%
- OTT heavy (66%-99.9%) 2.9%
- OTT medium (33%-65.9%) 13.5%
- OTT light (1%-32.9%) 19.0%
- Traditional TV only 59.7%

### AGE UNDER 35:
- OTT only ("Video cord cutter") 12.2%
- OTT heavy (66%-99.9%) 7.8%
- OTT medium (33%-65.9%) 26.6%
- OTT light (1%-32.9%) 20.1%
- Traditional TV only 33.2%
Home Mobile Devices Are Being Handed Off To Wireline

A total of 67% of mobile users say they already or at least sometimes connect their devices to in-home WiFi to increase speed or avoid cellular charges.
Multi Screen Use Is Increasing
*Tablet Devices Are Often Used While Watching TV*

A total of 34% percent of random fixed broadband users own both a Smartphone and a Tablet.

This heavy mobile device user group estimates they use a second device about 47% of the time while watching TV.
• Employed FTTH users say they work 1.3 extra days per month from home (on average).

• 14% of FTTH users have a home-based business with over $10,000 in estimated incremental income from having advanced broadband.

"I have a young baby so I work around his napping schedule."

"Saves gas, tolls, clothes, and lunch costs."

"I have seizures and my driving is limited."
Emerging Applications Will Require Extreme Bandwidth

Special Interest now: Young Men & Women

Special Interest now: Seniors, Young Mothers

Special Interest now: Women

Special Interest now: Young Males
Our Homes Will Have HD Perimeter Monitoring
Saved To The Cloud
We Will Even Travel From Our Home

In our lifetimes....

We may be getting a full diagnostic in-home checkup from a clinic in Germany.

We may be playing tag with our grandchildren across the country by “inhabiting” an “Avatar”-like robot.
Broadband Is Not A Commodity
FTTH Has The Highest Tested Download Speeds

*Median Tested Download Speeds*
FTTH Is “Pulling Away” With Tested Upload Speeds

Median Tested Upload Speeds

- FTTH
- Cable Modem
- FTTN
- DSL
- Wireless

Graph showing the median tested upload speeds from 2007 to 2013 for different technologies.
For The Home, Gigabit Internet Is Coming!
Advanced Broadband Is Appreciated
Users Are More Satisfied With The FTTH Experience

Percent "Very Satisfied" With Aspects Of Data

- **Broadband speed (upload)**
  - FTTH: 51%
  - Cable: 31%
  - DSL: 26%
  - Wireless: 27%

- **Broadband speed (download)**
  - FTTH: 53%
  - Cable: 32%
  - DSL: 27%
  - Wireless: 26%

- **Consistency of speed**
  - FTTH: 53%
  - Cable: 36%
  - DSL: 31%
  - Wireless: 35%

- **Streaming quality**
  - FTTH: 42%
  - Cable: 23%
  - DSL: 20%
  - Wireless: 19%
Customers Describe Diverse FTTH Advantages

*Categorization Of Open-End Responses*

- Fast / Speed / Capacity: 56%
- Better Video / TV: 48%
- Reliable / Cust Service: 25%
- Better Price: 6%
- Positive general: 3%
- Packaged / Bundled: 3%
- Other: 5%
Higher Capacity Broadband Is Winning
Advanced Broadband Enhances Value
FTTH Increases Home Value

Perceived Increase When Considering $300,000 Home With FTTH

<table>
<thead>
<tr>
<th>Perceived Increased Value: No Prior FTTH ownership</th>
<th>$5,337</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Increased Value: Prior FTTH Ownership</td>
<td>$6,451</td>
</tr>
</tbody>
</table>

FTTH Increases Home Value

Perceived Increase When Considering $300,000 Home With FTTH

<table>
<thead>
<tr>
<th>$0</th>
<th>$2,000</th>
<th>$4,000</th>
<th>$6,000</th>
<th>$8,000</th>
<th>$10,000</th>
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</thead>
<tbody>
<tr>
<td>$0</td>
<td></td>
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<td>$5,337</td>
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</tbody>
</table>
Advanced Broadband Has Excellent ROI
### Amenity Cost Per Home Versus Top Two Importance Cost Estimates – Extremely Rough, Directional Only!

<table>
<thead>
<tr>
<th></th>
<th>Green Space</th>
<th>Town Center</th>
<th>Diverse Housing</th>
<th>Technology / Broadband</th>
<th>Mass Transit Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of planning</td>
<td>$300,000</td>
<td>$400,000</td>
<td>$300,000</td>
<td>$75,000</td>
<td>$1,500,000</td>
</tr>
<tr>
<td>Costs not directly recoverable</td>
<td>$5,000,000</td>
<td>$15,000,000</td>
<td>$0</td>
<td>$0</td>
<td>$125,000,000</td>
</tr>
<tr>
<td>Total cost</td>
<td>$5,300,000</td>
<td>$15,400,000</td>
<td>$300,000</td>
<td>$75,000</td>
<td>$126,500,000</td>
</tr>
<tr>
<td>Homes</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Cost per home</td>
<td>$500.00</td>
<td>$1,500.00</td>
<td>$30.00</td>
<td>$7.50</td>
<td>$12,500.00</td>
</tr>
</tbody>
</table>

- Among top two most important factors for community (all ages):
  - Green Town: 66%
  - Diverse Technology / Mass Transit: 52%
  - Space Center: 34%
  - Housing: 33%
  - Broadband Link: 28%
Developers Have Room To Improve
FTTH In RCLCO Top 20 MPCs
Based On Survey Of Developments, November 2013

- DSL/ Cable modem only: 45%
- FTTH available throughout: 35%
- FTTH available in parts: 10%
- "Stealth FTTH" Available *: 10%

* AT&T FTTH with little current service differentiation from non FTTH Uverse
Possible Development Technology Planning Needs

• Very high capacity fiber broadband to each home
• Densely distributed small cell antennas
• In home wiring (or “fibering”)
• Applications that have local planning component
  (Security, Telemedicine, Energy Management, Local content...)
Communication Technology In Next Generation Developments

Michael Render
November, 2013