Are Multiple Broadband Infrastructures Sustainable: Key Characteristics of Competing Broadband Platforms

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Agenda – Key Characteristics of Competing Broadband Platforms

- Overview of Broadband Market
- Fiber
- Wireless
- WiMax
- Broadband over Power Lines (BPL)

Overview of Broadband Market

Overall revenue growth forecast depends on type of market and type of broadband (BB) network that will likely be available in the next 1-2 years:

<table>
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<tr>
<th>Urban</th>
<th>Suburb/Exurb</th>
<th>Rural</th>
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<tbody>
<tr>
<td>Fiber, Cable, DSL, Wireless</td>
<td>Fiber, Cable, DSL, Wireless</td>
<td>Fiber, WiMax</td>
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KEY PLAYERS

- Cable MSOs
- RBOCs/LECs
- Satellite

Leichtman Research 2004 & 2005

Current U.S. BB Market:

- 20 largest Cable & DSL providers account for 95% of all BB subs
- 2004: Record 8.6M total subs added
- Cable maintains 60% share of market
- % of lines +200 Kbps in both directions: Cable (94%), DSL (29%)

Fiber Deployment

Who's investing in fiber?

- As of 5/10/05: 400 U.S. Communities receive FTTH service (+83% from 2004)
  - CLECs (40%), Non-Bell ILECs (33%), RBOCs (16%), Munis (6%)#
- U.S. Fiber Market Predictions (homes passed) vary:
  - 2009: 11.6M^*
  - 2010: 60M*#

#TR Daily 5/10/05
^Telephony Online 4/28/05
*Broadband Daily 1/20/05

Capabilities: Telco Fiber Networks vs. Cable & Satellite (DirecTV/DISH)

<table>
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<tr>
<th>Capabilities</th>
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<tbody>
<tr>
<td>Maximum Downstream Rate*</td>
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<tr>
<td>FTTP</td>
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<tr>
<td>62.5-125 Mbps</td>
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<tr>
<td>Maximum Upstream Rate*</td>
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<tr>
<td>5 Mbps</td>
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</table>

Sources: Deloitte Research, Verizon

Satellite

- 500 Kbps
- 50 Kbps

Fiber Costs & ROI

Deployment Costs

- Verizon (FiOS) – FTTP - $1,000 per home
  - FTTP-based FIOS BB now offered in 250+ communities^%
  - $1B spent to pass 1M homes in 13 states in 2005^%
- SBC (Lightspeed) – FTTN
  - IPTV still in development
  - $4B to be spent over the next 3 years to pass 18M homes in 13 states by mid-2008*
- BellSouth - FTTC
  - Network will offer download speeds of 12-24Mbps
  - Trial of IPTV in late 2005 will depend on Microsoft software testing

Costs: Buried Deployment can range $80-$260K per mile; Aerial deployment: $17-37K per mile#

Capital Expenditures per household:

- FTTP: $600
- FTTC: $1,000
- Line card/loop top box: $350-600

ROR COULD TAKE UP TO 1-2 YEARS

Costs: Capital Expenditures per household:

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Wireless

Evolution Data Only (EvDO)

- Average download speeds of 300-500Kbps with bursts of 2.0-2.4Mbps
- Deployment costs of $15B per year (VerizonWireless & Sprint)

Deployments

- VZW: Sept. '04; spent $4B annually over past 4 years; NYC investment totaled $435M in 2004, $138M YTD in 2005^%
  - Altel: 1Q05 in Tampa, Akron, Cleveland##
  - Sprint: Trial underway; 60 metro areas by early 2006**
- Bell Canada: 2005-2006 in major Canadian business centers ^%#

Blackberry

- Research in Motion’s (RIM) Blackberry: 2.5M subs worldwide, partners with all U.S. mobile networks (CDMA, GSM, iDEN) and 802.11b^^

^ VZW 9/22/04 & Sprint PCS 6/22/04
# VZW 5/7/05
* Alltel 3/29/04
** www.evdoinfo.com
## Bell Canada PR 12/14/05
^^ RIM PR (4/5/05)
WiMax – “Wi-Fi on Steroids”

WiMax (802.16)
due to advances in mobile devices; usage will be "rate-driven"^2
- Current entrants offer download speeds of 500Kbps (residential), 1.3Mbps (business)#
- Currently testing: Intel, Nokia, Sprint, BellSouth
- Intel predicts speeds of 50-100Mbps^4
- Most usage: 0.5-0.8% of all markets
  - Marietta, GA ends service after losing $35M
  - Lafayette, LA and others face legal battles from Telcos and MSOs. 13 states have passed laws
  - Global 2000 Market Projection: 7M subs^^

Will WiMax be a success?
- "I think that will be very competitive with those technologies, and especially where those technologies aren't built out, in
  rural areas. "Will it compete with wired access? Absolutely. Will it be perhaps the only broadband solution you have in
  some areas? Absolutely, especially in rural areas." - Craig Barrett, CEO - Intel
- "WiMax ... has a tremendous advantage over CDMA2000 1x EV-DO or WCDMA HSDPA. ... One of the great things is that it
  has the name. But it's still not a technology," Jacobs quipped, referring to the fact that WiMax for fixed broadband will not
  ship until later this year and the mobile version of it is still being standardized. - Irwin Jacobs, CEO - Qualcomm

Broadband over Power Lines (BPL)

- Early Success^:
  - Energy (first to deploy BPL commercially) currently passes 50,000 homes in Ohio; Duke Energy – 15,000 homes
  - ComTel – first CityWide network in Mansassas, VA; $29/mo. with download speeds up to
  100Kbps: testing 1000Kbps apps
  - ComEd/Alliant/Earthlink JV for 251-unit condo on NYC’s Upper West Side
  - U.S. Market Projections (3-5 yrs)
    - $4.5B Revenue, 13M subs
- Potential Roadblocks
  - Cost-prohibitive? TXU believes deployment across 70-80% of its territory will cost
  $300M-500M; could look to outsource#
  - Technical constraints: NARUC Task Force finds that current BPL technology is feasible
  to reach clusters of residential homes but not to widely dispersed rural users^^

BPL initially is as much about an upgrade to the electrical management and delivery network (i.e. “Smart grid
capabilities” - cost savings through remote meter monitoring, dynamic monitoring to prevent surges or unplanned
spot blackouts to manage demand) as it is in the delivery of residential broadband to capture new revenue streams.

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