The Broadband Access Report

Comdex 2001

April 4, 2001

Panelists And Format

- Beth Gage, VP of Consulting, TeleChoice
- Jim Hannan, VP Network Technology, Sprint Broadband Wireless
- Marc Josephson, CEO and Chairman, IntelliSpace

- 15 Min presentations from each
- Panelist questions from moderator
- Open Q&A

TeleChoice View Of Broadband Access Marketplace

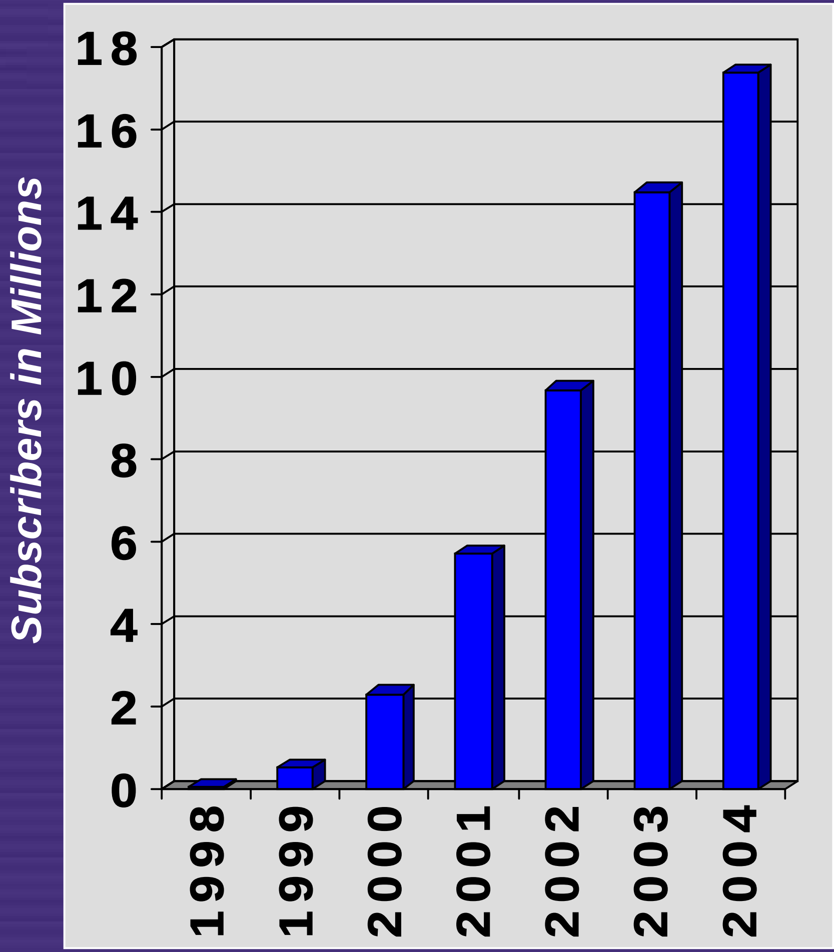
The Good News...

- Lots of broadband access options
  - DSL, cable modems, fixed wireless, free space optics, gigabit Ethernet, fiber
- Something for everyone
  - Consumers and Teleworkers: DSL, cable modems, some fixed wireless
  - Small and Medium Businesses: DSL, fixed wireless, gigabit Ethernet, T1/T3
  - Larger Businesses: free space optics, fixed wireless, satellite, T3 to fiber
- Data services still in high demand
  - Internet access, VPNs for teleworking
  - Some voice and data bundles for small businesses
- No slack in demand for cheaper high-speed access

The Bad News...

- With market downturn, can expect slower growth for entire broadband industry in 2001
- With reduced competitors, expect service prices to stay the same (maybe increase)
- Slow provisioning still a major issue for DSL
- Service reliability a major issue for DSL and cable modems
- Fixed wireless still not widely deployed
- Free space optics just barely getting started
- Other optical services just getting started, “coming to a building near you”

DSL Market Size: US



- Strong historical growth
  - YE 1999 - 1192% growth
  - YE 2000 - 382% growth
- Growth rate in 2001 will be 135%
- TeleChoice predicts the market will continue to grow at a healthy rate
  - YE 2001 - 5.7 million
  - YE 2002 - 9.7 million
  - YE 2003 - 14.5 million
  - YE 2004 - 17.4 million
- Main driver is still data

DSL Pricing Trends

- The pricing plateaus
  - SBC raised monthly price from $39 to $49 in January
  - Looking to reduce losses from capital build-out
  - Price hike appears anti-competitive
    - Occurring just as CLECs backing out of residential market
  - Will trigger other providers to increase their prices
    - EarthLink launched at $49, Speakeasy.net recently announced mark-up
    - Increased revenue may be too little, too late for some
  - Consumers notice price increases, may choose other broadband technologies

Other Trends In The DSL Industry

- DLEC news more negative than positive
  - NorthPoint's customer cut-off gives DSL industry a black eye
  - Expect accelerated shakeout with market downturn, missed earnings, and layoffs
  - Service steadily improving - line sharing and self-install rapidly picking up
- ILECs' strong market share in 2000 to continue
  - SBC and Verizon made up 54% of total market share in 2000
  - Provisioning improvements with 95% of new sales self-install
- AT&T (with NorthPoint buy) and Sprint accelerating nationwide rollout
- ISPs struggling to make payments, getting pressure from the DSL providers

Cable Modem Deployment Statistics

- Deployment
  - Cable with 3.9 million US subscribers at the end of 2000 *(Kinetic)*
  - Roughly 77% percent of these were @Home or Road Runner (*Kinetic)*
  - Excite@Home reported 64% of its North American footprint was upgraded to two-way as of YE 2000
  - Cox reporting penetration rates above 20% where service available in Orange County, CA
- Excite@Home is the market leader
  - Recently reaffirmed relationship with AT&T, Cox, and Comcast
  - Road Runner partnership officially dissolved as of Dec. 2000 - not clear when services switch to AOL (TW) or @Home (MediaOne) respectively
- Projections
  - Total US subscribers will reach 16 million by end of 2004 *(Kinetic)*

Other Cable Notes

- Residential Consumer Orientation
  - Strong on content integration - carries over from cable TV
  - @Home relationship with Excite and partnerships with RealNetworks, Sega, CATV channels, music
  - Geographic - cable networks in suburbs - not downtowns
- Retail Channels
  - Retail partners in US include: CompUSA, Circuit City, Office Depot, Staples, RadioShack
  - Self-install available for some AT&T, Comcast, Cox systems
- Security
  - Was somewhat of a concern with shared network - early reports of users being able to look into neighbors' computers if file sharing was enabled in Windows
  - DOCSIS 1.0 standards addressed this through encryption measures

Cable Packages And Pricing

- Packages
  - With two-way cable speeds can be between 1.5Mbps - 3Mbps downstream
  - Upstream channel is smaller than downstream (2Mhz vs. 6Mhz) and could provide speeds up to 1.5Mbps -- but operators like @Home have limited it to 128Kbps to avoid network congestion
  - Cable modems frequently perform at less than optimal speeds because they are on a shared network - much like a giant LAN
- Pricing
  - $39.95/month - some are less expensive if you purchase your own modem
  - Many operators have price incentives for consumers to subscribe to cable television - $39.95 if you do subscribe, $44.95 - $49.95 if you don’t

The Fixed Wireless Market

- Fixed wireless will grow considerably over the next five years
  - Revenues to grow at a 418% pace over the next five years (*Strategis*)
  - In 2003, services revenue will be $3.4 billion to $7.5 billion (*Strategis, IGI*)
  - Over 1.8 million subscribers worldwide by 2005 (*Juniper*)
- Promising access technology because it
  - Avoids the ILEC last-mile blockade
  - Can potentially reach far more customers than DSL and cable
  - Can be deployed and built faster than landline solutions
  - Is less expensive to build a wireless network than a land-based network

Overview Of Fixed Wireless

- Entering early-adopter stage
  - Market is 18 to 24 months behind DSL market
- Many different service providers utilizing different frequencies
- Service pricing: less than comparable connectivity from landline provider/competitive with DSL and cable
- Point-to-multipoint services are steadily rolling out
  - Primarily targeting the residential/SOHO/SMB markets
  - Sprint and WorldCom are rolling out services steadily
    - Sprint in 13 markets throughout the country
    - WorldCom not aggressively deploying, available in Memphis
  - AT&T Angel hit bumps in early deployment, improving
    - Service in LA, San Diego, Houston, Fort Worth, Anchorage
  - Other providers include Air2Lan, Nucentrix

Overview Of Fixed Wireless

- Point-to-point services available today in select areas of major metro areas
  - Primarily targeting MTU/MDU market - major buildings in business districts
  - Teligent, Winstar, ART, Worldwide Wireless
  - Target business that need bandwidth speeds ranging from DSL speeds all the way up to OC-12
- Next-generation, non-line-of-sight technology will facilitate more rapid deployment
  - Current line-of-sight technology is good, but limits penetration and makes for higher installation expenses

Sample Fixed Wireless Offerings

- Targeting Residential/SOHO/SMBs
  - Sprint
    - Residential - $44.95/month + $99 installation + $99-299 CPE
    - Up to 5Mbps down and 256Kbps up
    - Service installed within 2 days to 2 weeks of order
  - Nucentrix
    - $79/month (384Kbps/128Kbps) + $200 installation
    - Variable speeds: 256Kbps-1.5Mbps up and 56-384Kbps down
- Targeting Businesses and MTUs
  - Winstar
    - Like others targeting the business market, positioned as communications provider first (who just happens to use wireless)
    - $177-699/month for bundled local/long distance and data
    - Speeds from 128Kbps - 622Mbps (OC-12)
    - Fiber redundancy

Looking Ahead

Free Space Optical Networks

- Next-generation competitor to DSL, cable, RF wireless networks for last mile
- Viewed as a solution to “fiber to the curb”
  - Enables line speeds of fiber without the expensive build-outs
- Transmit optical (laser) signals between buildings in metro area over free air media
- End-user CPE consists of window-mounted optical receiver/transmitter, connects to standard LAN equipment (routers, hubs, etc.)
- Current technologies require line of sight, subject to interference
- Early providers include Terabeam Networks, LightPointe Communications

Home Networking Becomes Reality

- Moving beyond hobbyist phase
  - Structured wiring - with CAT5, RG6 coax, etc. - is being designed into many new homes
  - Companies like Home Director offer installation and complete packages for high-end households
- Existing wiring applications offer inexpensive and simple extensions of data networking throughout the home
  - Phone line networking systems are already inexpensive, fast, and proven
    - 2.0 HomePNA specification (10Mbps) with low price point (as low as $45 per node)
    - Widely available both as consumer-installable add-on product (USB form factor) or preinstalled by PC manufacturer (Compaq, Dell, Gateway, etc.)
  - Two approaches to networking over powerlines - Homeplug and Inari

Home Networking Becomes Reality

- Wireless LAN technologies reaching maturity
  - 802.11 Wireless Ethernet widely available at 11Mbps
    - Standards-based
    - Becoming increasingly more consumer-friendly..price points down to about $100 per node and $300-400 for an access point
    - Standards activity to add higher speeds, QoS
  - Easy-to-use product offerings on the market
    - Apple's Airport
  - HomeRF Consortium winning supporters, available now in DSL CPE
    - Speed lower now (1.6Mbps), but expected FCC ruling to increase to 10Mbps
    - Designed for lower cost than 802.11
    - Built-in voice QoS mechanism to allow single system to provide in-home voice and data wirelessly

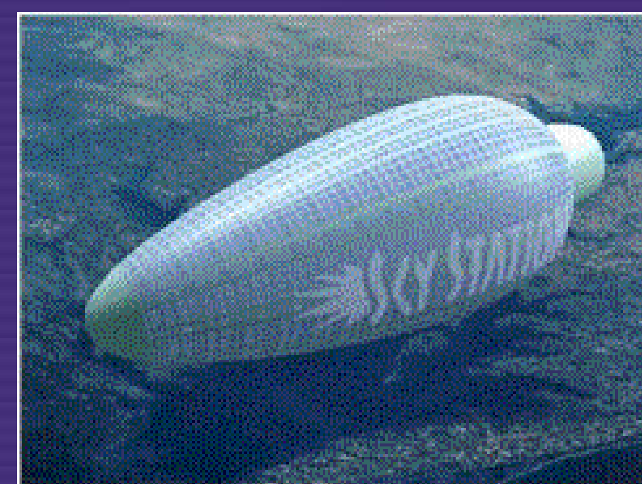
Residential Gateways

- Interface between broadband and home networks
- Voice and Data IAD, with DSL modem incorporated
- Phoneline, Powerline, or Wireless home networking interface
- Provides firewall security
- Intelligent routing of data/Internet traffic
- Connectivity with non-PC information appliances
- Intelligence within the gateway to control/connect “smart” devices/appliances throughout the home
- “Low-End” DSL market (single PC households) supported by PC-installed DSL CPE

Next-Generation Set-Top Boxes

- Variation of Residential Gateway
- Full-rate ADSL or VDSL connectivity
- Support for multiple video channels/video on demand
- Home networking interface for connectivity to PC/information appliances
- Eventual integration of voice
- Enhanced TV features
  - TV Web integration
  - Pay per View
  - On-screen Caller ID
  - Customized advertising with “show-me-more” capability

So Crazy It Just Might Work



So Crazy It Just Might Work - But Probably On The Shelf For A While

- Blimps
  - Sky Station
- High Altitude Aircrafts
  - Angel Technologies' HALO (High Altitude Long Operation)
  - AeroVironment's Helios
- Pros
  - Easy to upgrade, broad market coverage, few line-of-sight restrictions
- Cons
  - Believability, untested, critical mass

The Strategic Catalyst™

TeleChoice

for the Telecom Industry