Millennium-Skyline PROJECT

FTTx…A “2020” Vision

A Briefing For…

Jefferies & Company

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Millennium-Skyline Project

- **Kermit Ross**
  - **39 years telecom industry experience**
  - **Indiana Bell, Raychem, Danavox, Seiscor, Optilink, DSC, Teltone, Teledata, Taqua**
  - **Founded Millennium Marketing in 1996**
- **John Celentano**
  - **33 years telecom industry experience**
  - **Bell Canada, Nortel Networks, Northern Business Information**
  - **Founded Skyline Marketing Group in 1990**

Millennium-Skyline Project

- A collaboration of Millennium Marketing and Skyline Marketing Group
- A fresh look at the telecommunications market in light of…
  - TA-96 and the forces it unleashed
  - The simultaneous dawn of the Internet-Age
- Use data from “Automated Reporting Management Information System” (ARMIS)
- Extensive databases of companies, products, carriers and trends
- Extensive contacts in carrier community
- Published “An Excess of Access: U.S. Access Equipment Market Brief, Issue 2” in 12/03
- Published “A Switch To Packet: U.S. Central Office Switch Market Brief” in 12/03
- New reports on U.S. Independent Telcos, Nortel, and Canada Market planned for 2004

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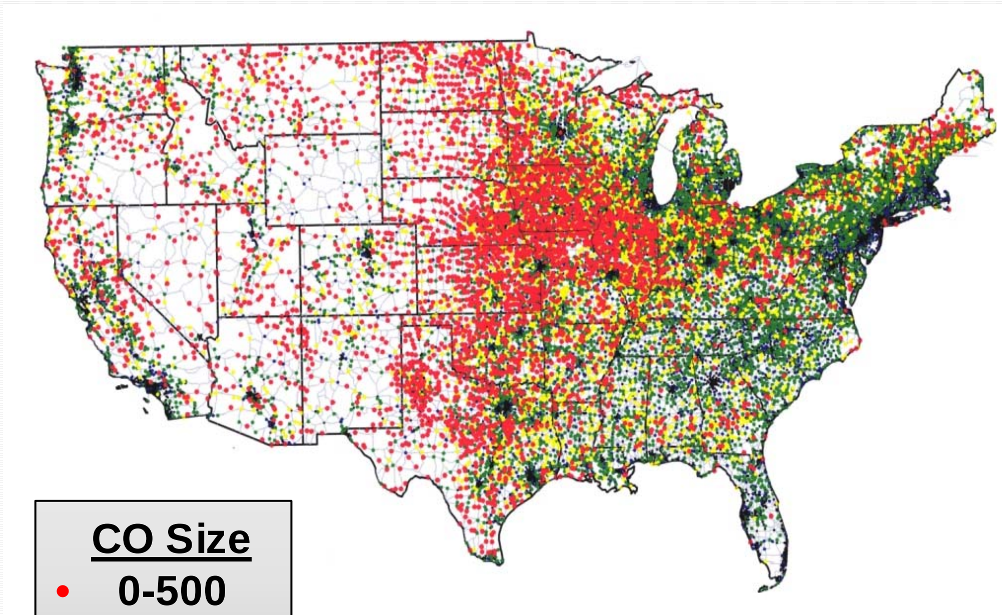
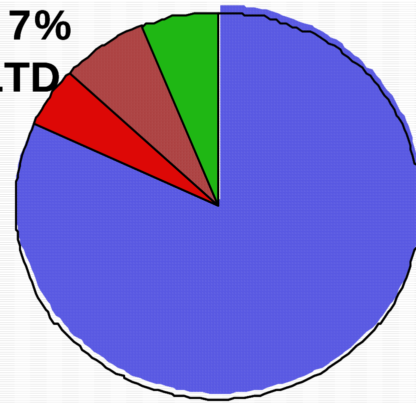
Local Exchange Carriers

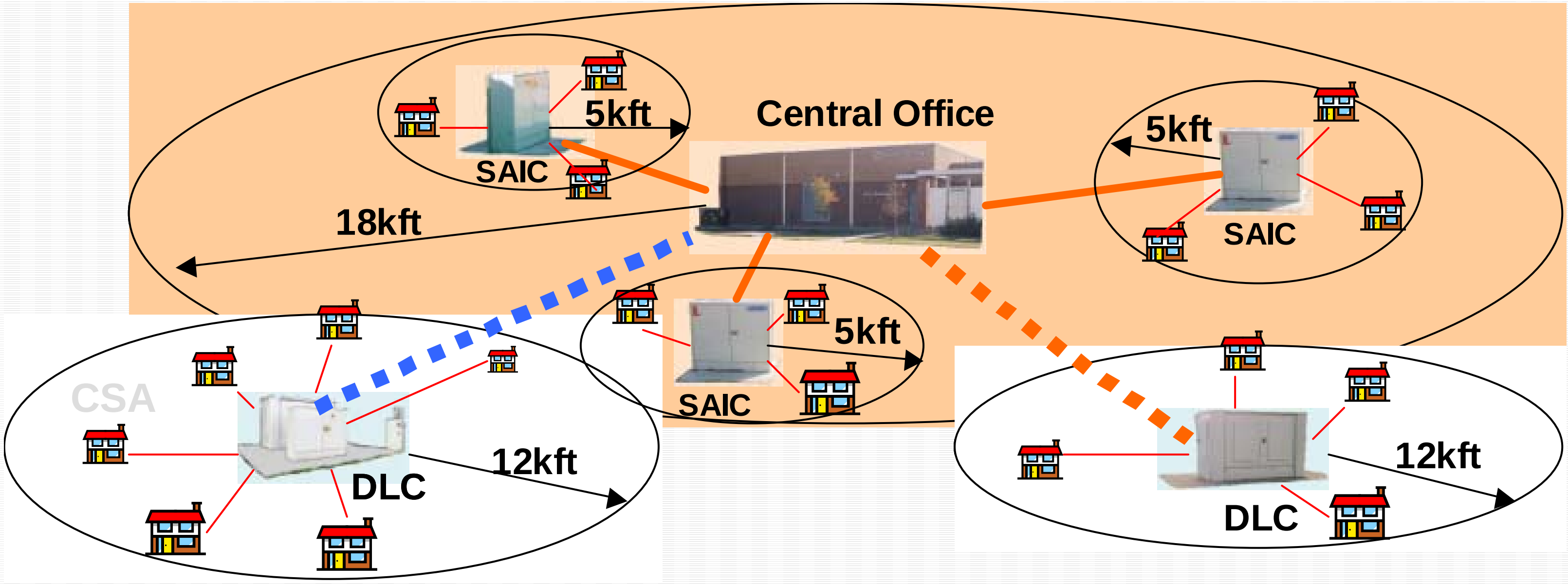


CO Size
- 0-500
- 500-1K
- 1K-5K
- 5K-10K
- > 10K



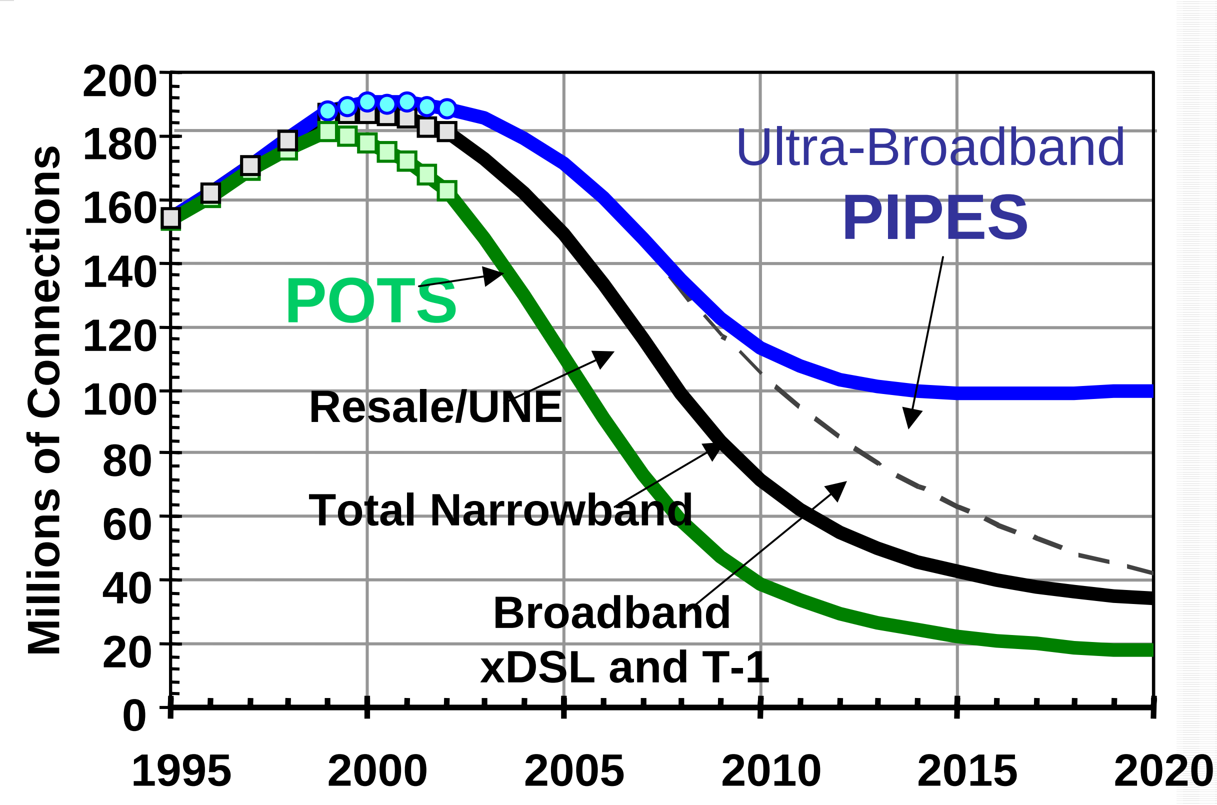
- Regional Bell Operating Cos (RBOCs)
- Independent Telcos (IOCs)
- Competitive Local Exchange Carriers (CLECs), including Cablecos

The "Local Loop"



- 23,500 "exchanges", aka "central offices"
- 176 million access lines
- ~75% are connected by copper, ~25% are connected by DLCs
- ~40% of subs within 5Kft of CO or DLC
- ~90% of subs within 5Kft of SAIC

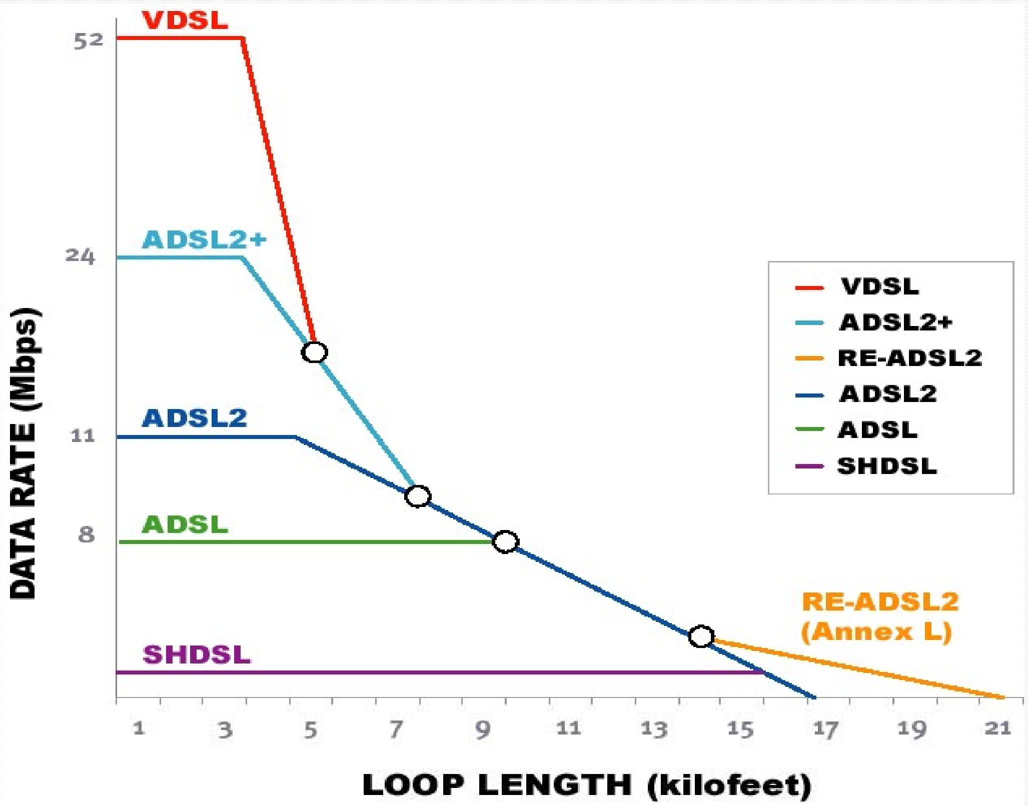
A "2020" Vision



- Circuit switches to packet (C2P)
- Narrowband POTS to broadband PIPES (P2P)
- "Triple-Play" services: POTS + Internet + TV on unified networks
- Reduce costs: redirect capex and reduce opex

Core Business Shifts From POTS To PIPES!

The Physics of DSL



- Triple-play defined as 3 simultaneous TV channels + Internet + Voice
- Plan for HDTV, probably sooner than we think
- Latest ADSL2+ designed for >25 Mbps (best case), >15 Mbps (worst case)…***for about a mile***!
- VDSL and advanced modulation and encoding has potential to increase rates…***for about a mile!***

Telcos must find ways to reduce the copper loop to less than a mile!

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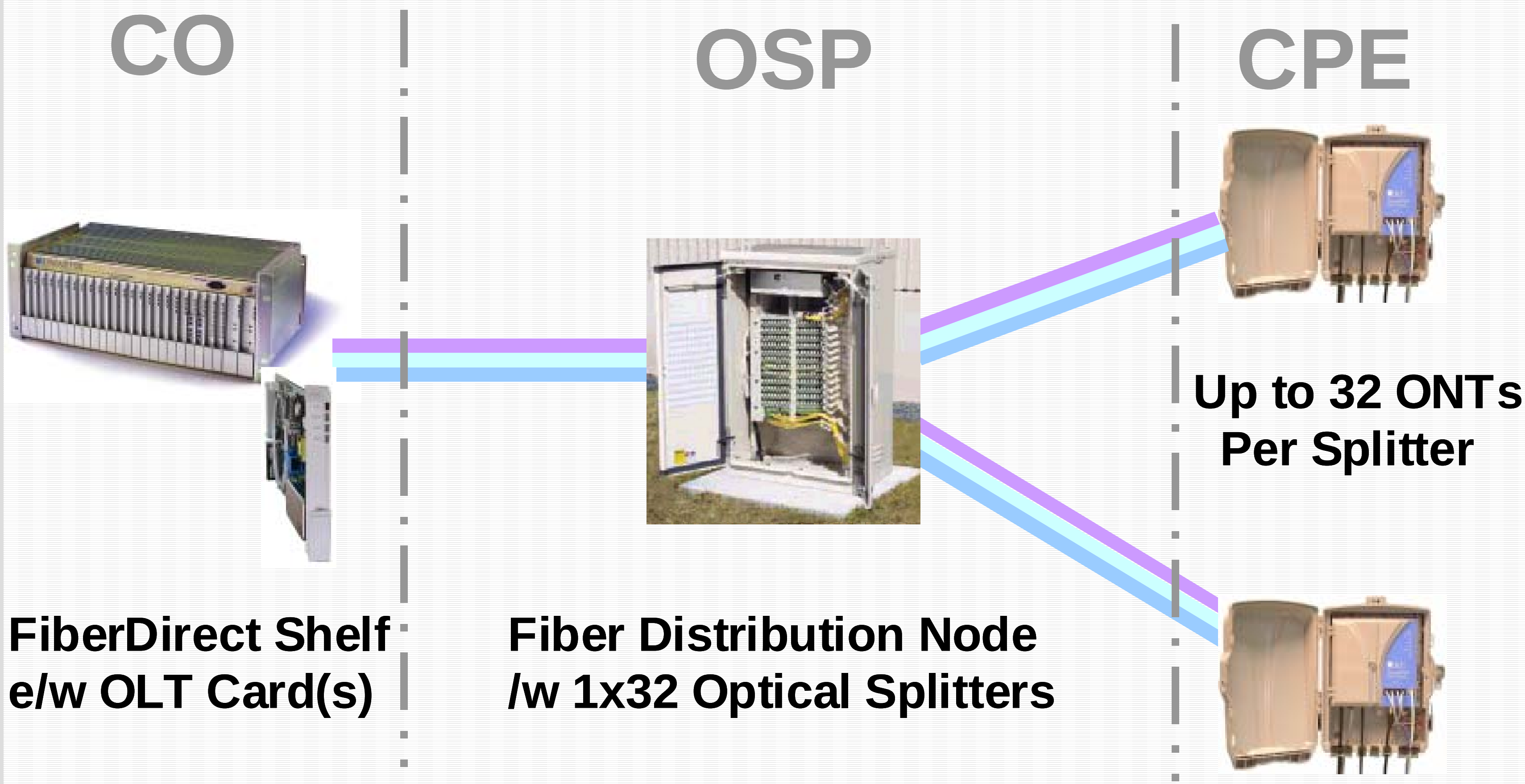
Fiber-To-The-Premise (FTTP)



FTTP…Issues & Implications

- Costs…Can you really build it for $1,500 per customer?
- Market…Can you really afford to do it in anything but “green fields”?
- Marketing…If you build it, will they really come?
- OPEX…Can you really pay for it out of OPEX savings?
- Stranded Investment…Can you really retire the copper plant?
- Is an ATM system really future-proof in the face of IP?

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Fiber-To-The-Curb (FTTC)

CO | OSP | CPE

IDT, ATM Switch, SONET Mux, Etc.

8 to 12 Customers Per ONU

DLC RT Supports Many ONUs Placed Within A Few Hundred Feet of Customers.

FTTC…Issues & Implications

- Good strategy if you're already doing it!
- Extension of familiar DLC architecture.
- New services require new line cards.
- Shares optics and electronics over several customers.
- Same customer interface as copper or DLC.
- If you've got it, you're stuck with it!…No migration path to FTTP.
- Is FTTC the right architecture for IPTV?

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Fiber-To-The-Node (FTTN)

CO | **OSP** | **CPE**

No Changes To Existing POTS Services. Add Fiber For Broadband.

Enables Entire Neighborhood For Broadband

Convert SAIC To Neighborhood Node. Extend Fiber Feeder To SAIC. Add Remote DSLAMs As Required. Use Existing Distribution Pairs To Connect To Customers.

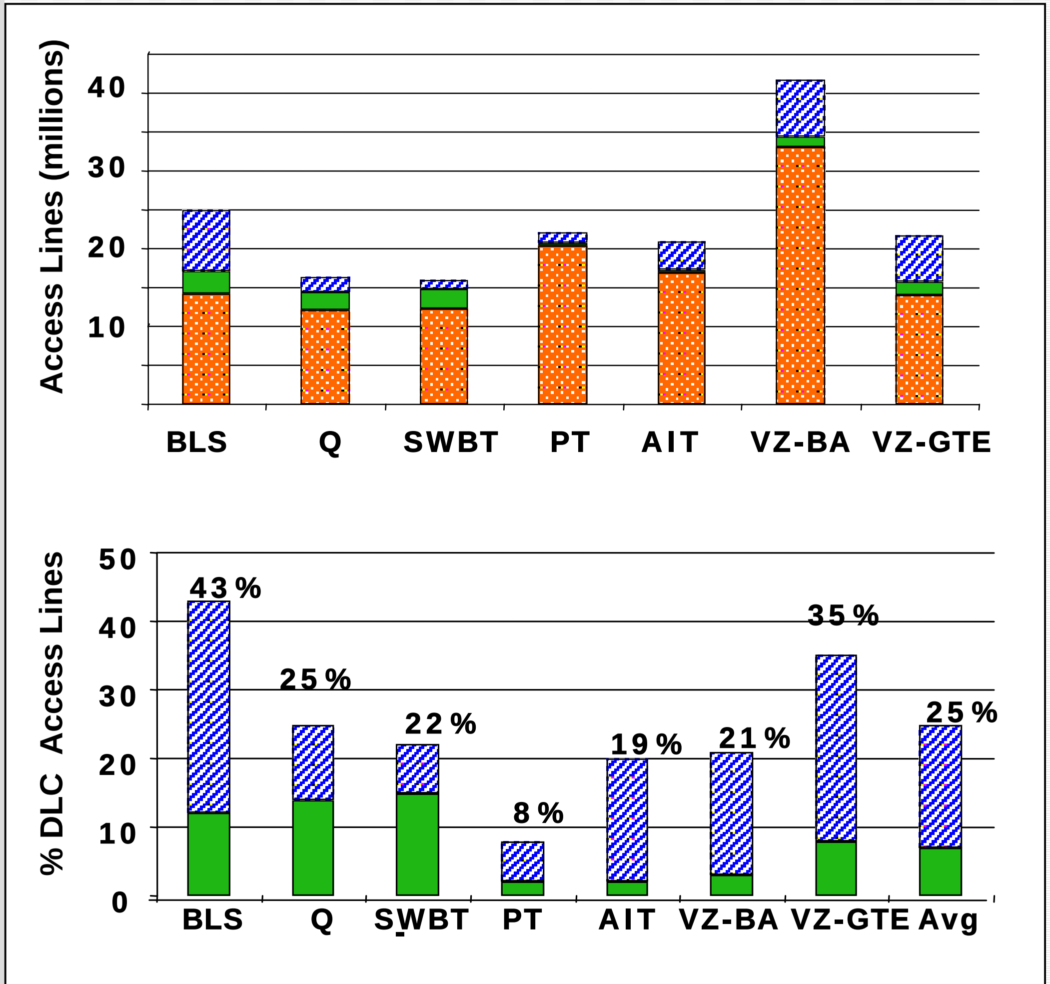
FTTN…Issues & Implications

- Costs…Low first costs; spreads over a whole neighborhood.
- Market…About 40% of existing loops.
- Marketing…Spreads business risk over a whole neighborhood.
- OPEX…Fits with PMO. No new OSS's required.
- Stranded Investment…Maximum leverage of existing OSP copper, cabinets, etc.
- Best architecture for IPTV.

What About The Other 60%?

- New Access Platforms
  - "Broadband Loop Carriers…Calix, Occam, Ciena/Catena, Entrisphere, etc.
  - IP-DSLAMs…Allied Telesyn, Paradyne, etc.
  - Remote DSLAMs…Adtran, Pedestal Networks, Conklin, Critical Telecom, etc.
  - Upgrade or replace existing CO DSLAMs, DLCs and NGDLCs
- DSL Encoding and Modulation
  - UDSL, VDSL2, etc.
  - "Increase the radius of the circle."
- DSL Bonding
  - Actelis, Hatteras, Net-To-Net, Aware, Aktino, etc.
  - Leverage copper to create PIPES
- Video Compression
  - MPEG-4
- Switching/Access Convergence
  - C2P + P2P = "Line Access Gateways"

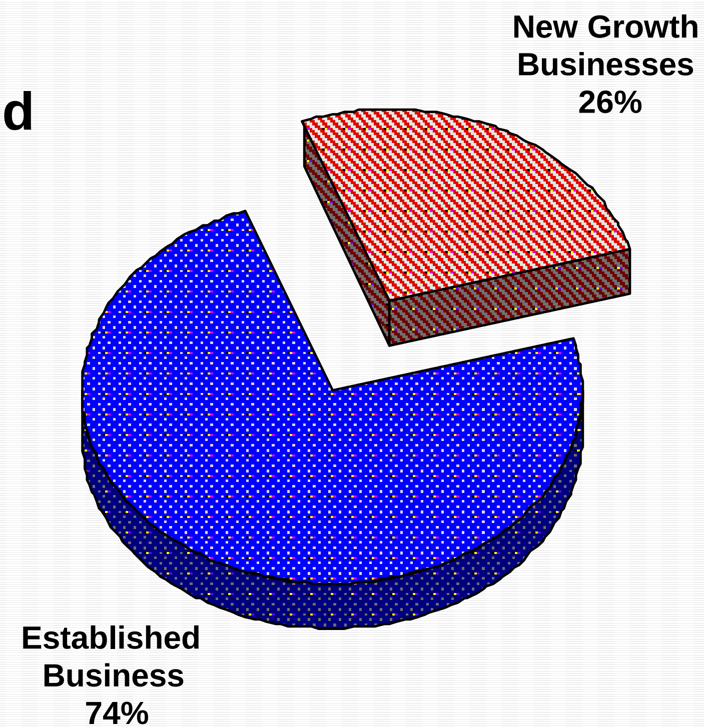
The Major Telcos' OSP



- No homogeneous access market
- 75% of all working lines connected by CuBB
- 8% connected by CuDLC
- 17% connected by FoDLC
- DLC penetration varies from 43% (BLS) down to 8% (PT)

Major Telco Priorities

- New revenue streams to replace POTS
- Bundled services to boost ARPU and replace profits
- Significant and sustainable OPEX reductions
- Retain and win-back customers
- Shift CAPEX to new technologies …C2P and P2P
- BLS: Leverage DLCs and FTTC
- VZ: Break with the past…FTTP
- SBC: Leverage copper…Fast-track FTTN



2004e CapEx = $15.7 B

MSP's "2020" Vision

- US telcos are beginning a major reconstruction cycle of local networks
  - C2P – Convert network core and local switches to packet technology
  - P2P – Convert POTS access networks to broadband PIPES
- This cycle will drive the telecom equipment market through the first quarter of the century
  - Market driver shifts from POTS growth to C2P/P2P
  - CAPEX redirected to C2P/P2P
  - Major, organic reductions in OPEX
- It's a high-stakes game
  - Telcos will make strategic decisions at the company level
  - No more box-at-a-time sales
  - Penetration of big telcos is critical
- Opportunities abound in the second order effects
  - Reinforce interoffice and feeder network
  - More, new, and different ancillary equipment
    - Power, OSP apparatus, Testing, Middleware, OSS, etc.

Any Questions?

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