Deploying xDSL Solutions
Session 207
Defining xDSL: Digital Subscriber Loop

- xDSL is an enabling Transmission Technology like dial, cable, T1, etc.
- The challenge centers around leveraging xDSL to deploy value-added solutions

Agenda

- xDSL Transmission Options
- End-to-end xDSL Architecture Choices and their Associated Configurations
- Operational Tools
- Examples of Deployed Services
- Upcoming Attractions
- Closing Remarks
xDSL Transmission Options

What Is xDSL?

Layer 1 Transmission Techniques That Deliver High Data Rates Over Existing Copper Telephone Lines by Making Use of the Higher Frequencies Spectrum
### xDSL Technology Options

<table>
<thead>
<tr>
<th>xDSL Transmission Option</th>
<th>Max. Data Rate Down/Uplink (bps)</th>
<th>Copper Pairs Required</th>
<th>Analog Voice Support</th>
<th>Max. Reach (km/feet)</th>
<th>Modulation Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADSL: Asymmetric</td>
<td>8M/1M</td>
<td>1</td>
<td>Yes</td>
<td>5.5/18</td>
<td>CAP DMT</td>
</tr>
<tr>
<td>IDSL: ISDN</td>
<td>144K/144K</td>
<td>1</td>
<td>No</td>
<td>11/36</td>
<td>2B1Q</td>
</tr>
<tr>
<td>SDSL: Symmetric</td>
<td>784K/784K</td>
<td>1</td>
<td>No</td>
<td>6.9/22</td>
<td>2B1Q</td>
</tr>
<tr>
<td>HDSL2: High Bit Rate</td>
<td>1.5M–2.0M/1.5M–2.0M</td>
<td>2</td>
<td>No</td>
<td>4.6/15</td>
<td>2B1Q</td>
</tr>
<tr>
<td>VDSL: Very High Bit Rate</td>
<td>52M/2M or 8M/8M</td>
<td>1</td>
<td>No</td>
<td>.9/3</td>
<td>QUAM</td>
</tr>
</tbody>
</table>

### xDSL Applications

<table>
<thead>
<tr>
<th>xDSL</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADSL</td>
<td>Telecommuting, Remote Office Connectivity, Intense Web Access</td>
</tr>
<tr>
<td>IDSL</td>
<td>Telecommuting, Remote Office Connectivity</td>
</tr>
<tr>
<td>H/SDSL</td>
<td>T1 Replacement, Remote Office Connectivity</td>
</tr>
<tr>
<td>VDSL</td>
<td>Video, V.R., Multimedia</td>
</tr>
</tbody>
</table>
Typical Cable Plant Issues

- Mixture of 22, 24 and 26 gauge wire
- Load coils
- Bridge taps
- Repeaters
- Disturber model and spectral management
ADSL Subscriber/Loop Qualification

- Typically an automated process
  - Self directed, Web-based for individuals
  - Bulk load and batch process for corporations
  - Third-party test equipment available 2H ’99
- Rule of thumb for one key customer
  - Relaxing ADSL disturber model 1 db or adding 1k feet of reach = 100k new loops

**On Average, Less Than 5% of the Copper Loops Qualified Require Conditioning**

Analog Voice and RADSL

- Consumer installable RADSL solution with no truck roll
- Utilizes distributed micro-filters versus Network Interface Design (NID)
- Compliant with standard PSD masks (CAP and DMT)
End-to-End xDSL Architecture Choices and their Associated Configurations

xDSL Deployment Options

- Subscriber
- ILEC/CLEC
- ATM
- DSLAM
- Tier 2/3 ISP
- Content Provider
- Corporate
- Transport
- Wholesale Internet/VPN
- Internet/Web Hosting/E-mail/VPN
- End-to-End (Voice Centric)
### Associated Architecture Options

- **Subscriber**
  - CPE: Connectivity
    - Single/Multiple users
    - Bridged/Routed
    - Feature Set
    - Service Selection
  - DSLAM

- **ILEC/CLEC**
  - ATM

- **xDSL**:
  - ADSL
  - SDSL
  - IDSL
  - VDSL

- **Edge**
  - Aggregation:
    - PVC
    - PPPoA
    - PPPoE
    - SVC

- **Core**
  - AT: ATM Frame
  - IP: Tunneling
  - MPLS

- **End-Point**:  
  - PPP/Tunneled ATM/Frame
  - IP
  - MPLS

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### Product Building Blocks (One Size Does Not Fit All)

- **Subscriber**
  - CPE:
    - Cisco 605/607
    - Cisco 673/675/677
    - Cisco 7xx
    - Cisco 14xx
    - Cisco 26xx / 36xx

- **CPE**: Cisco 61xx
- **DSLAM**: Cisco 61xx
- **Aggregation**: 6400
- **Core**: BPX
- **End-Point**: Cisco 7200

- **Tier 2/3**: ISP
- **Content Provider**
- **Corporate**
### Single Destination PVC Architecture

- PVC per end point
- Destination owns end point and terminates PVC (PPP option)
- Protocol transparency
- IP address independence
- CPE in bridge or routed mode with config options

### Single Destination PVC Architecture Challenges

- PVC nailed up to a single destination
- Ability to scale core
- Coordination with end point on PVC
- PPPoE client software issues
Layer 2 Service Selection

- PPP forwarded via tunnels or PPP termination/aggregation
- Layer 2TP/LF tunnel options
- Protocol transparency
- IP address independence
- PPP troubleshooting
- Radius accounting

PTA Similar to Wholesale Dial

Wholesale Dial

- NAS Sends AAA to GRS
- GRS Re-Directs AAA

PTA

- PTA Software Directs AAA and Data
- AAA Performed Here
Layer 2 Service Selection

Architecture Challenges

- New provisioning methods
- Requires an L2TP (LNS) server
- Layer 2 service selection
  
  PPP—username@servicename

Layer 3 Service Selection via Enhanced Web

- Customer benefits
- Turn services on/off instantly
- Access multiple services simultaneously
- Access personalized-service portfolio
- Select varying services security and quality options
- Service provider benefits
- Advertise services available
- Offer on-demand services
- Keeps users “on-net”
- Accounting and billing on usage
Multiservice Profile

User Profiles

- jdoe
  - Password = letmein
  - Service = Internet
  - Service = Games

- dsmith
  - Password = wombat
  - Service = Internet
  - Service = coke.com
  - Service = Games

Service Profiles

- cisco.com
  - Password = cisco
  - vpdn:隧道id=cisco-gw
  - vpdn:ip-addresses=1.1.1.2
  - vpdn:nas-password=12000
  - vpdn:gw-password=GSR

- Games
  - Password = cisco
  - vpdn:隧道id=games-gw
  - vpdn:ip-addresses=3.1.3.1
  - vpdn:nas-password=Space
  - vpdn:gw-password=Invader

- VoIP
  - Password = cisco
  - vpdn:隧道id=voip-gw
  - vpdn:ip-addresses=3.3.2.1
  - vpdn:nas-password=pin
  - vpdn:gw-password=drop

Dashboard

Radius Server

Layer 3 Service Selection with Web Dashboard and SSG

- Account logon connects PPP or bridge to SSG
- As long as the account is logged on, the Web Interface is always available to connect and disconnect services
Managed Business Service Architecture with (VoIP/VoATM)

Cisco 2600
Cisco 3600
Cisco 633
SDSL CSU/DSU (v.35) with Frame Interworking

Jetstream IAD
SDSL
Cisco 61xx
SDSL
Cisco 677
Cisco 673

Private Peering (Premium QoS)
ATM, IP

ISP POP
Cisco 6400
Voice Gateway/Call Agent
PSTN
Ex. Jetstream CPX-1000
Corporate

Managed Business Service Architecture Challenges

- Multiple market segments:
  LAN telephony, PBX extension/call center, Toll bypass, etc.
- Multiple end-to-end QoS levels:
  UBR, VBRnrt, VBRrt, and ABR
- Multiple options:
  xGCP, H.323, GR303, etc.
MPLS and SVC Option

Operational Tools
Management Architecture

CPE Operational Tools

- **Provisioning options**
  - Config Express
  - Telnet/tftp, Serial port access Web Interface

- **Performance management**
  - Extensive MIBs
  - Layer 2/3 utilities
  - optional “commander” for Subscriber

- **Fault management**
  - Alarm traps/clears
  - LED Indicator
**DSLAM/Concentrator Operational Tools**

- Provisioning and configuration management
  
  Auto-discovery and domain views

- Performance management
  
  Logical pool and port statistics/Connection and traffic statistics

- Fault management
  
  Alarm traps and clears

- Accounting management
  
  Oracle database extractions can feed legacy OSSs

- Security management
  
  Three ID/password access levels

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**Aggregator Operational Tools**

- Provisioning options
  
  GUI wizard  Telnet/ftp  Predeployment of subscribers

- Performance management
  
  Extensive MIBs  Automated map building

- Fault management
  
  Alarms
Help Desk Tools

- Customer developed Web tool that integrates key information
  - Reference via name, address, or phone number
- Leverages existing infrastructure
  - Subscriber/service database
  - Network management systems
  - Trouble ticket system

End-to-End DSL Management Path
Examples of Deployed Services

Shared Success

Source: Press Releases as of 5/22/99

Source: Press Releases as of 5/22/99
Megabit Services—Layer 2 High-Speed Access to a Single Destination

**Subscriber Offering:**
- Free CPE, installation option $150
- Monthly ISP charge not included
- MegaHome
  - 256 kbps access
  - $30 per month
- MegaOffice
  - 512 kbps access
  - $65 per month
- MegaBusiness
  - 768 kbps access
  - $80 per month

**End-Point Destination Offering:**
- Hub of a hub and spoke design (MegaCentral)
- ATM access link DS1 or DS3
- Bandwidth in 3Mbps increments
- Pricing based on: ATM port charge + bandwidth + DS3 access charge to ATM PoP
- Ability to reach users in LATA
- Subscriber's VPI/VCI info via: web site, email, or bulk process
- RFC 1483 bridging or PPPoA

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PLAnet Services—High-speed Internet Access

<table>
<thead>
<tr>
<th>Speed</th>
<th>Price*</th>
<th>Internet</th>
<th>CPE Cost</th>
<th>Installation*</th>
<th>IP Address</th>
<th>Email Address</th>
<th>Web Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Offering</td>
<td>512k x 1.5 Mbps</td>
<td>$39.95/Month</td>
<td>5 Hrs./Month</td>
<td>None</td>
<td>$50-100</td>
<td>3</td>
<td>5 MB</td>
</tr>
<tr>
<td>Professional Offering</td>
<td>1 x 2.5 Mbps</td>
<td>$99.95/Month</td>
<td>30 Hrs./Month</td>
<td>None</td>
<td>$175</td>
<td>5 Dynamic</td>
<td>5 MB</td>
</tr>
<tr>
<td>Small Business Offering</td>
<td>1 x 12.5 Mbps</td>
<td>$164.95/Month</td>
<td>60 Hrs./Month</td>
<td>None</td>
<td>$175</td>
<td>5 Static</td>
<td>On Site</td>
</tr>
</tbody>
</table>

*Canadian Dollars

Source: http://www.telusplanet.net
Service Offerings

**ZoomTown—Layer 3 Multidestination Service**

- No cost CPE and installation special
- ZoomTown test drive on web site
- ZoomTown base speed 90k x 384 kbps access $29.95 per month
- ZoomTown turbo speed 384k x 768 kbps access $59.95 per month
- ZoomTown warp speed 768k x 1.5 mbps access $159.95 per month

Source: [http://www.cincinnatibell.com](http://www.cincinnatibell.com)

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Service Offerings

**Total Access Solutions™ National Provider of End-to-End Business Solutions**

- Enterprise Telework
  - IP-routed Telework
  - Multiprotocol bridged Telework
- Branch office interconnect
- Internet access

Source: [http://www.rhythms.net](http://www.rhythms.net)
Upcoming Attractions

Near-Term Solutions Roadmap

• Integrated voice on xDSL SOHO routers
• Introduction of IDSL and HDSL-2
• DLC and multitenant deployable products
• SVC support
• Tag-edge routing on Cisco 6400
• Integrated management system with Corba I/f
Closing Remarks

DSL Is Ready for Prime Time

"I work faster, I work happier, and I’m more productive. DSL is good for me. DSL has changed my life."

Death to the Office by Stewart Alsop, Inter@ctive Week—April 28, 1999
DSL Is Ready for Prime Time

"Last week I got DSL... I’m getting much better performance at home now than I get at work... I actually feel something pretty close to what I imagine Alexander Graham Bell must of felt... I’m Serious."

Death to the Office by Stewart Alsop, FORTUNE—April 12, 1999

Finally...

• Cisco has a fully staffed DSL-solutions lab available to support your network architecture and services development. We welcome the opportunity to partner with you in making DSL a key component of your business success
Please Complete Your Evaluation Form

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