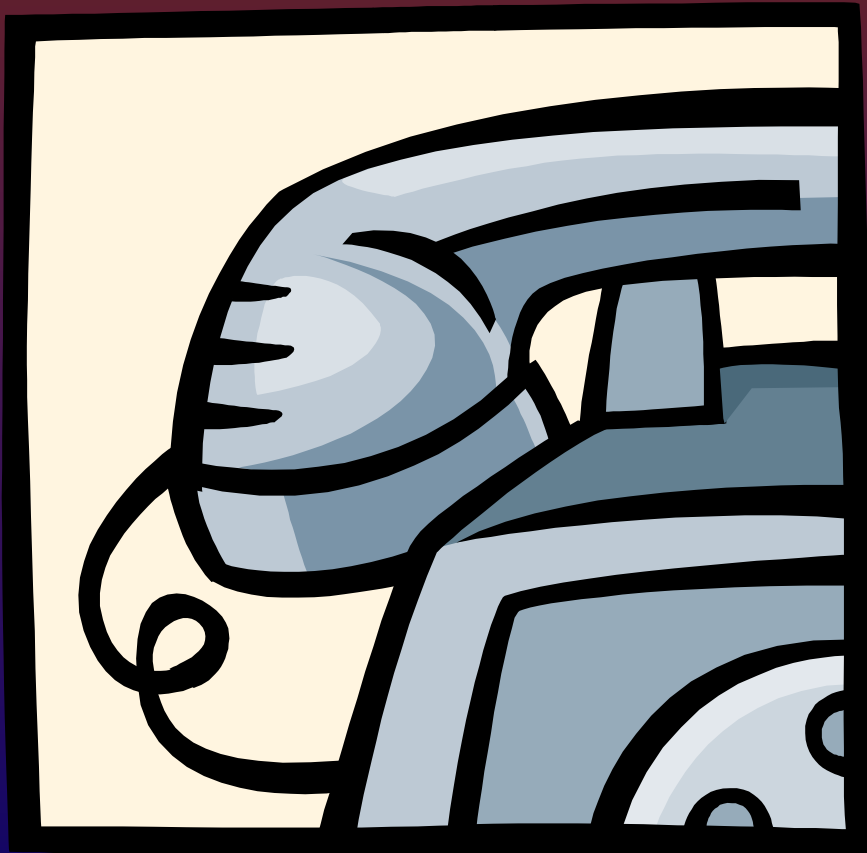




Voice Over DSL

An Overview



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Scope

- ❖ What is VoDSL?
- ❖ Implementation Schemes
- ❖ Reference Model
- ❖ System/Signaling/Service Requirements
- ❖ What does the Future hold for VoDSL?



What is VoDSL?

- ❖ Uses DSL lines over existing copper wire infrastructure to transport voice
- ❖ Supports multiple phone lines over single subscriber line
- ❖ Voice calls are converted into digital data packets
- ❖ Uses the extra DSL bandwidth dynamically
- ❖ Main goal: simulate the traditional phone system
- ❖ Why VoDSL? More cost effective!



Device Requirements For VoDSL

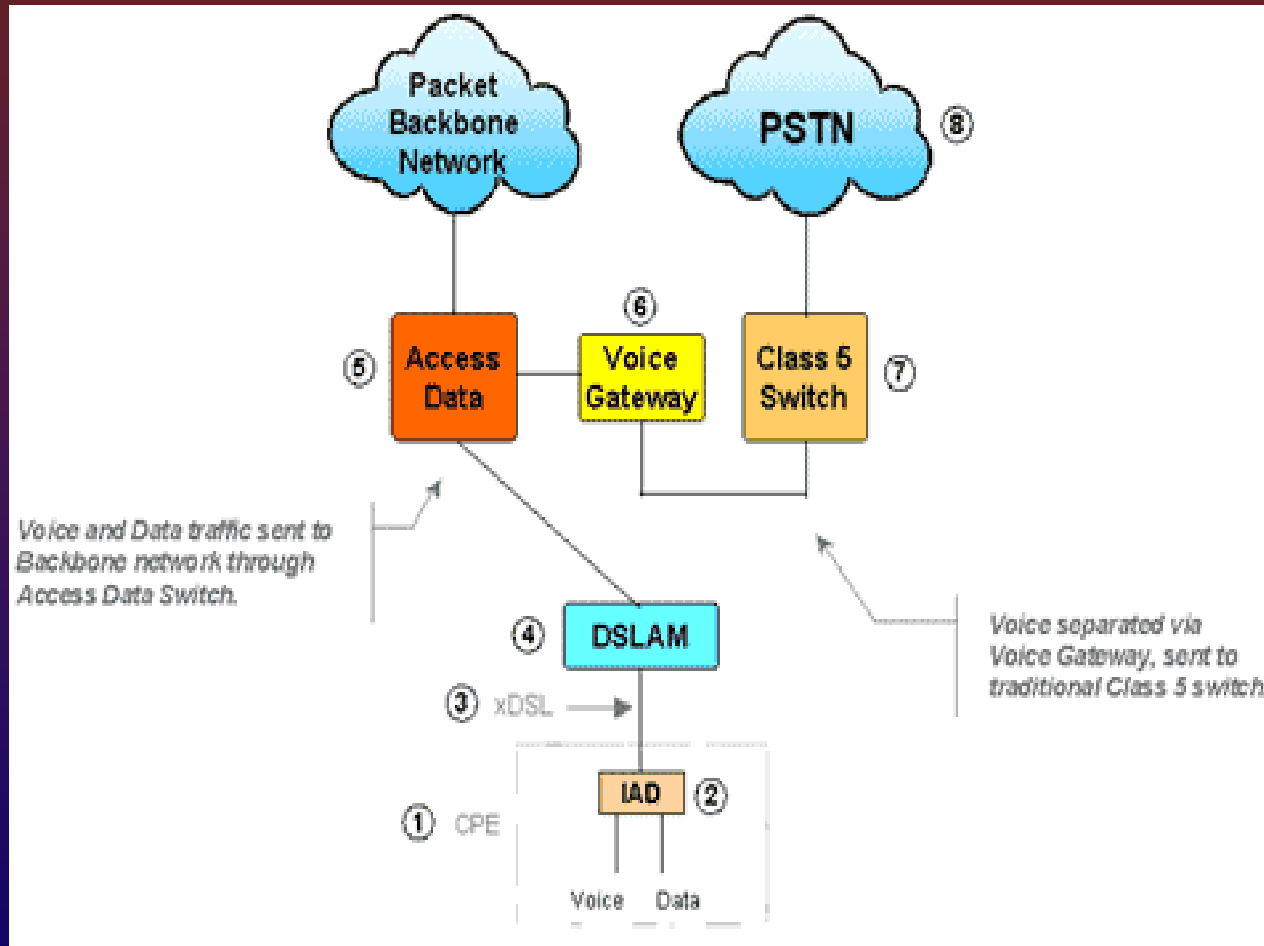
1. Customer Equipment – telephones, private branch exchange, fax, etc.
2. Integrated Access Device (IAD) – serves many different functions including DSL modem. The IAD serves as an interface between the DSL network service and the customer's voice and data equipment. The packetization of voice traffic takes place and is prioritized over data traffic to ensure toll-quality voice delivery.
3. DSL Line – transports data and packetized voice to nearest carrier facility over twisted-pair copper loops.
4. DSLAM – terminates multiple DSL lines



Device Requirements For VoDSL (cont'd)

5. Data Switch – receives traffic from the DSLAM and separates the data from the voice packets; data traffic is sent to data network, voice packets are sent to the voice gateway.
6. Voice Gateway – voice packets are depacketized and converted to a standards-based format for delivery to a Class-5 voice switch.
7. Class-5 Switch – telephony switch providing dial tone, call routing, and services; also generates records for billing.
8. PSTN – the public telephone network.

Device Requirements For VoDSL (cont'd)

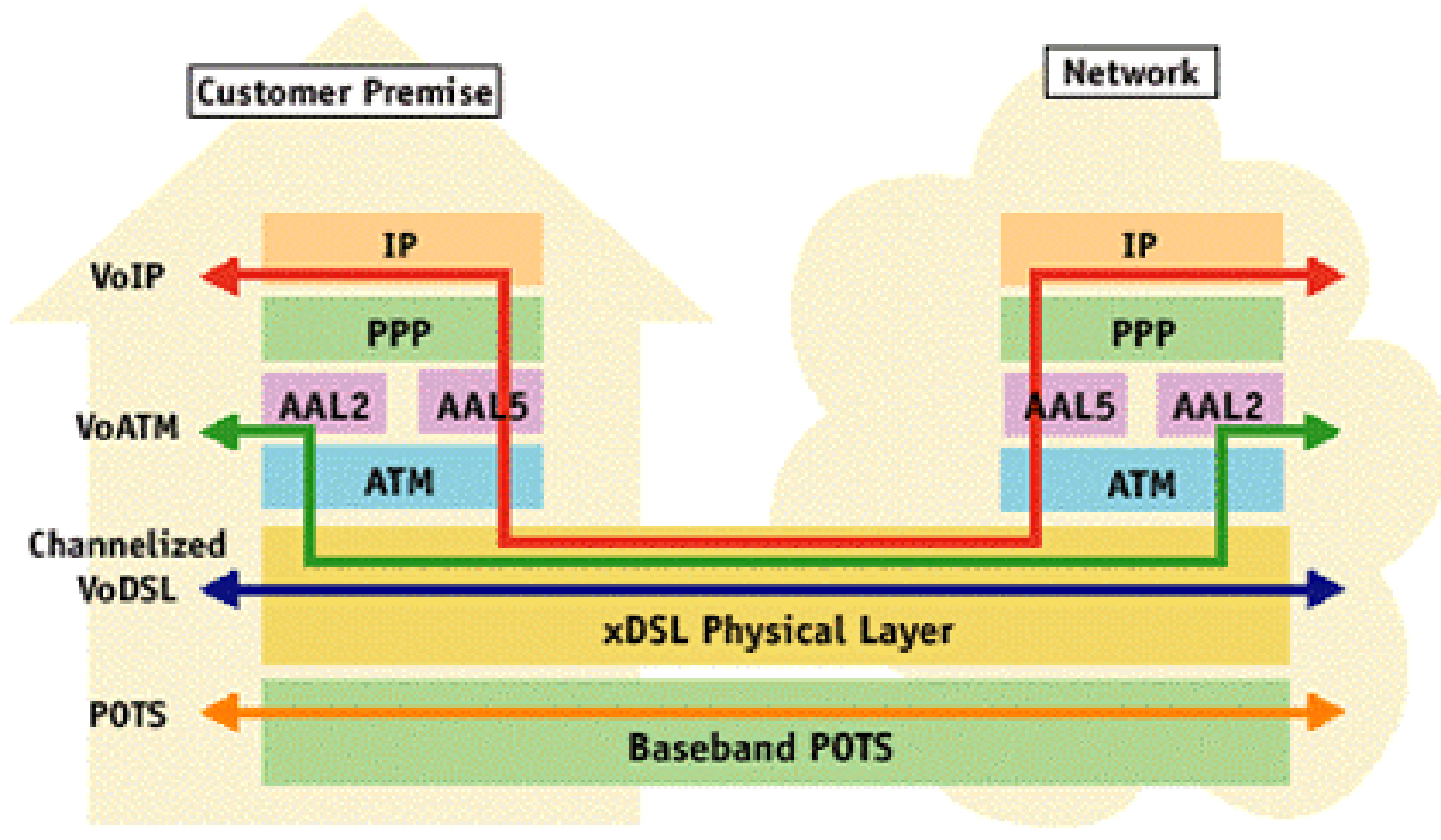


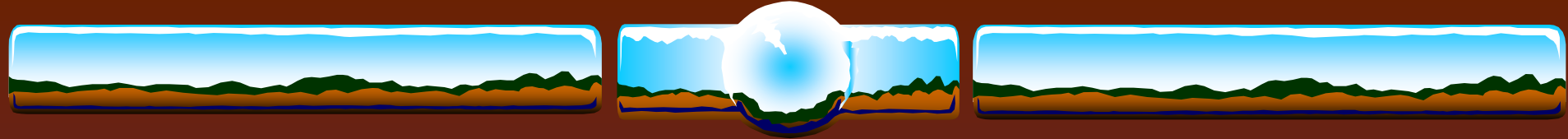


Implementation Schemes

- ❖ Channelized VoDSL (CVoDSL)
- ❖ ATM Broadband Loop Emulation Service (BLES)
- ❖ Voice over IP / Multi-service Broadband Network (MBN)

CVoDSL vs. VoATM and VoIP

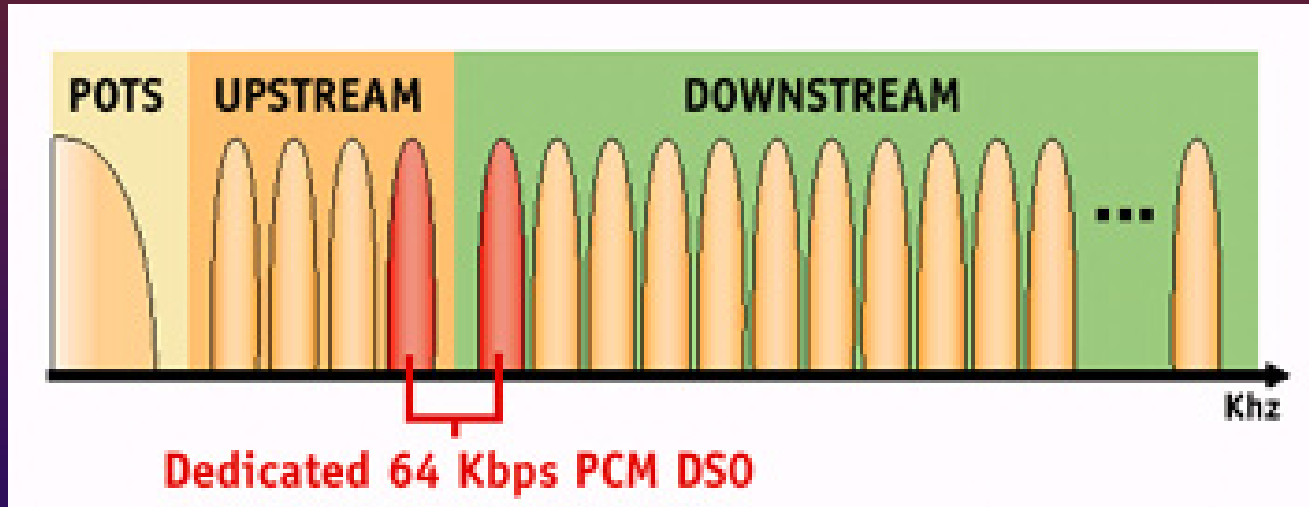




CVoDSL

- ❖ Physical Layer of OSI Model
- ❖ 64 kbps channels upstream and downstream for each voice line, supports up to 4 lines
- ❖ Reduces available bandwidth
- ❖ Dynamically allocated
- ❖ Cost savings

CVoDSL (cont'd)

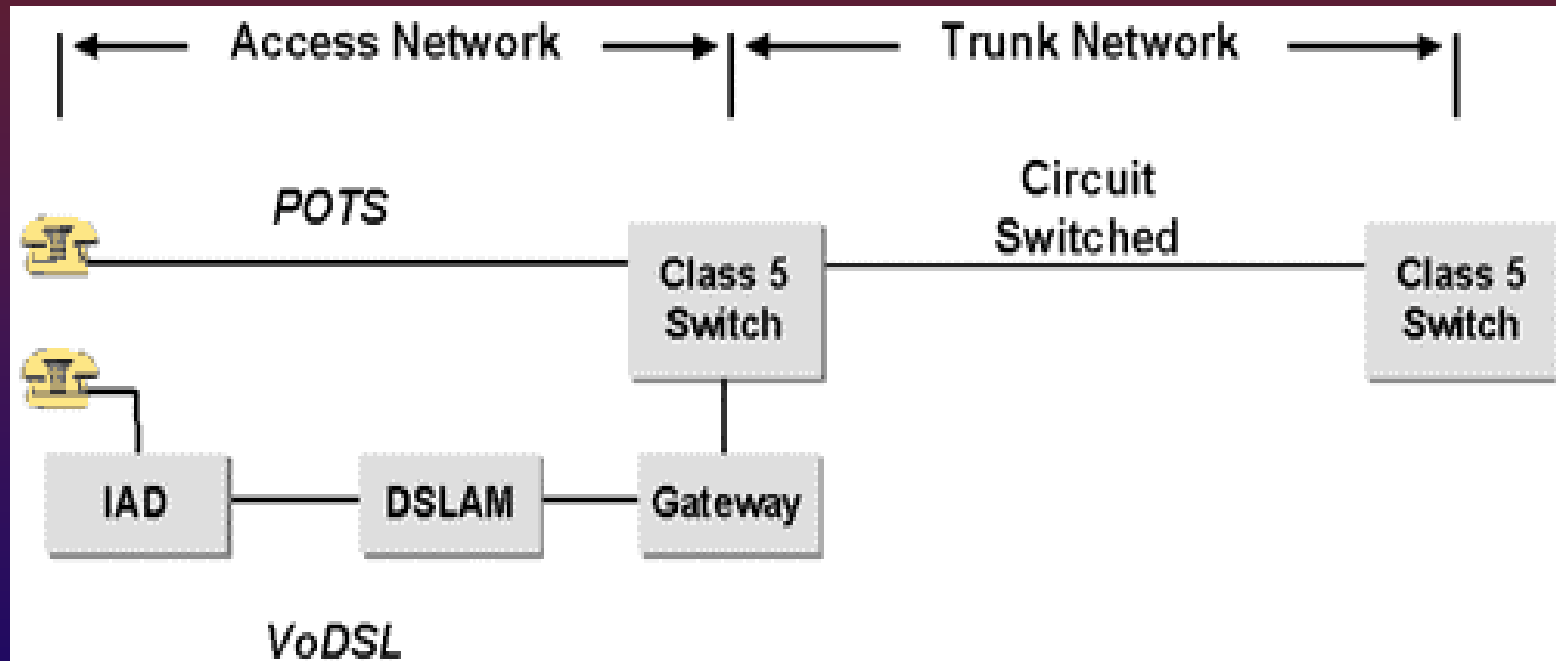




BLES

- ❖ Goal: fully functional transport of Class-5 switch subscriber line services through the broadband access network to the end user
- ❖ CP-IWF provisioned with at least 2 PVCs, one for data and one for voice, voice having a higher priority to ensure toll-quality service
- ❖ Voice gateway in the network sends voice traffic to Class-5 switch
- ❖ Most cost effective where there is existing voice services over switching network
- ❖ Guaranteed QoS

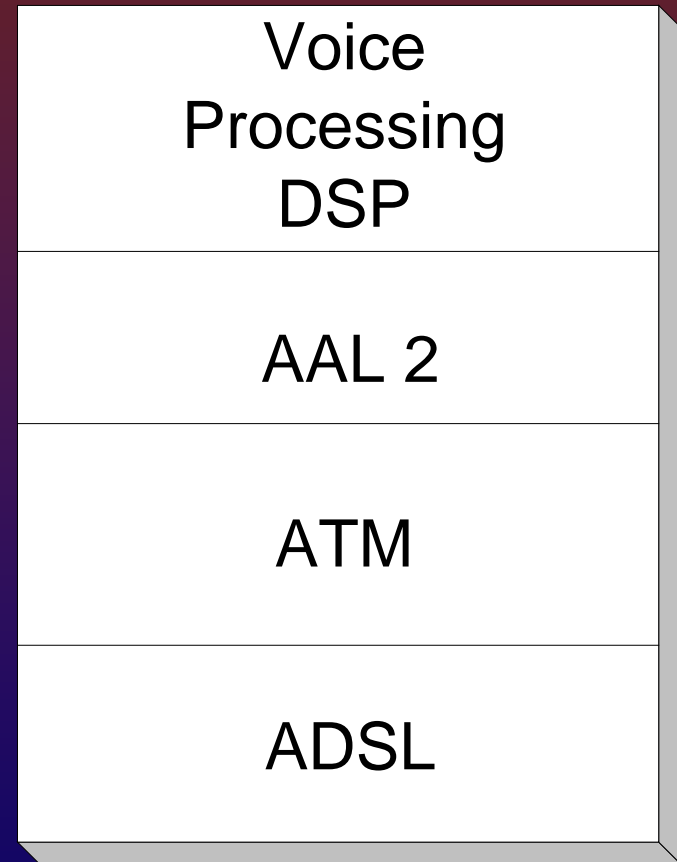
BLES (cont'd)





BLES Protocol Stack

- ❖ Voice Processing in DSP
 - ❖ Compression
 - ❖ Echo Cancellation
 - ❖ VAD/ Comfort Noise
 - ❖ Jitter Lost Packets etc.
- ❖ AAL2 Signaling
- ❖ ATM Transport
- ❖ ADSL Physical

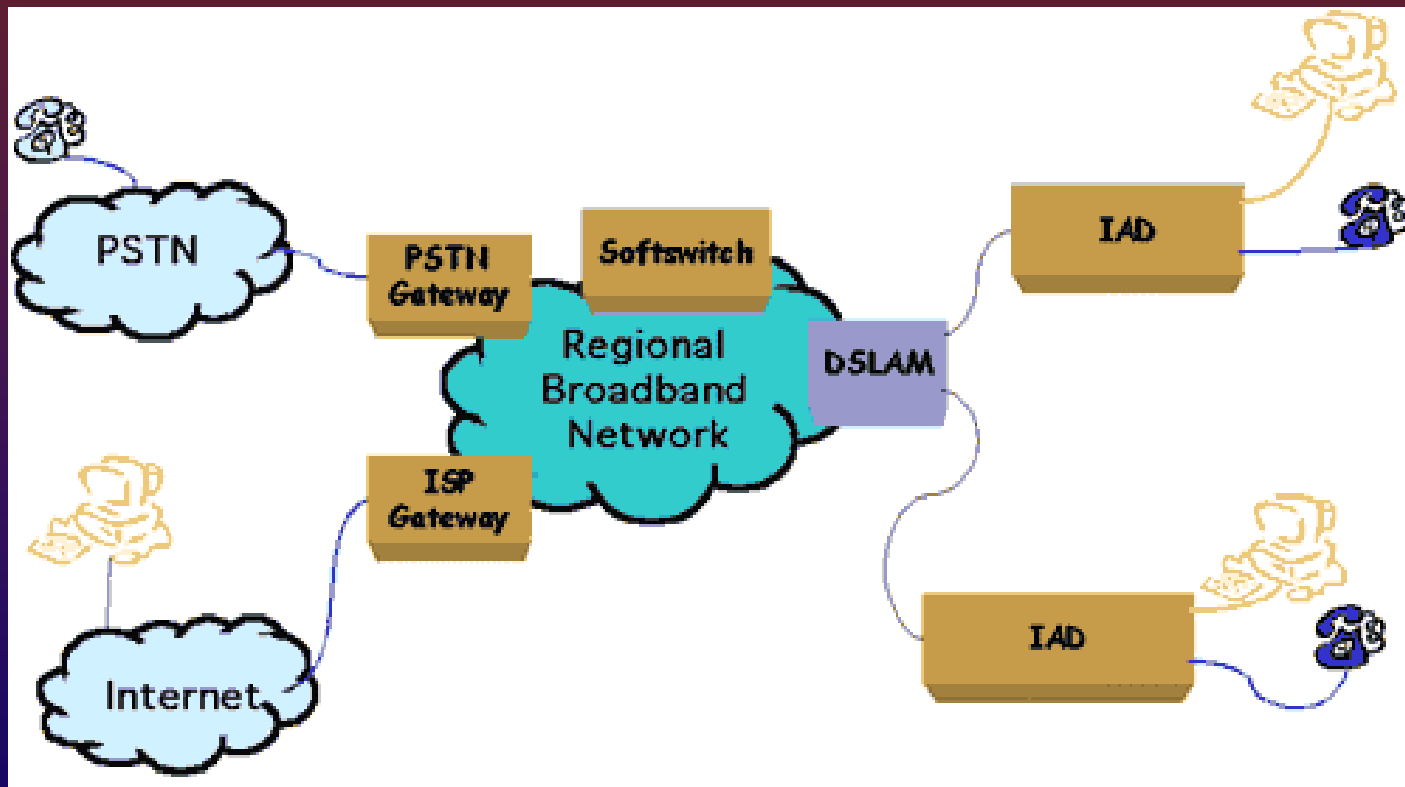




VoIP/MBN

- ❖ Provides voice service over DSL from the regional broadband network, without the need for Class-5 switch
- ❖ Customer side like BLES, but on network side the Class-5 switch is replaced with various gateway devices
- ❖ Most cost effective where a service provider wants to add voice services over existing data network
- ❖ QoS is not guaranteed

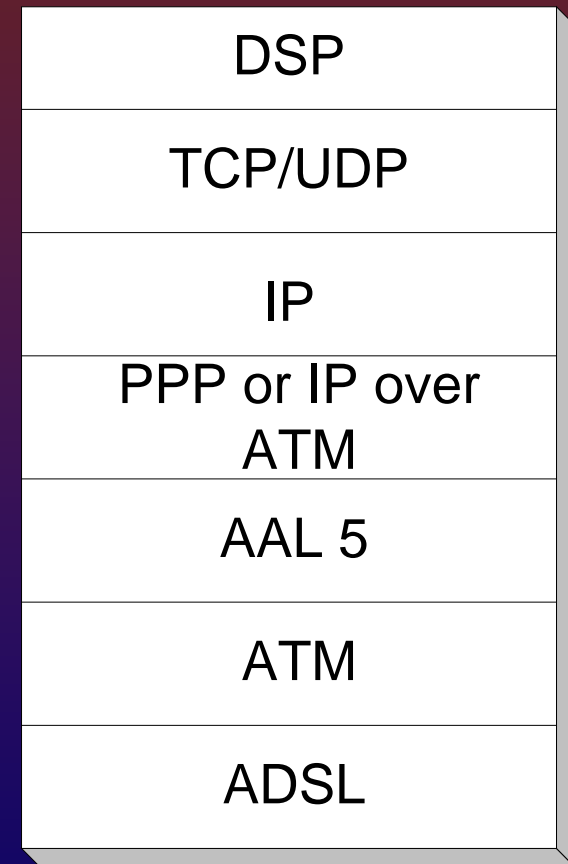
MBN (cont'd)





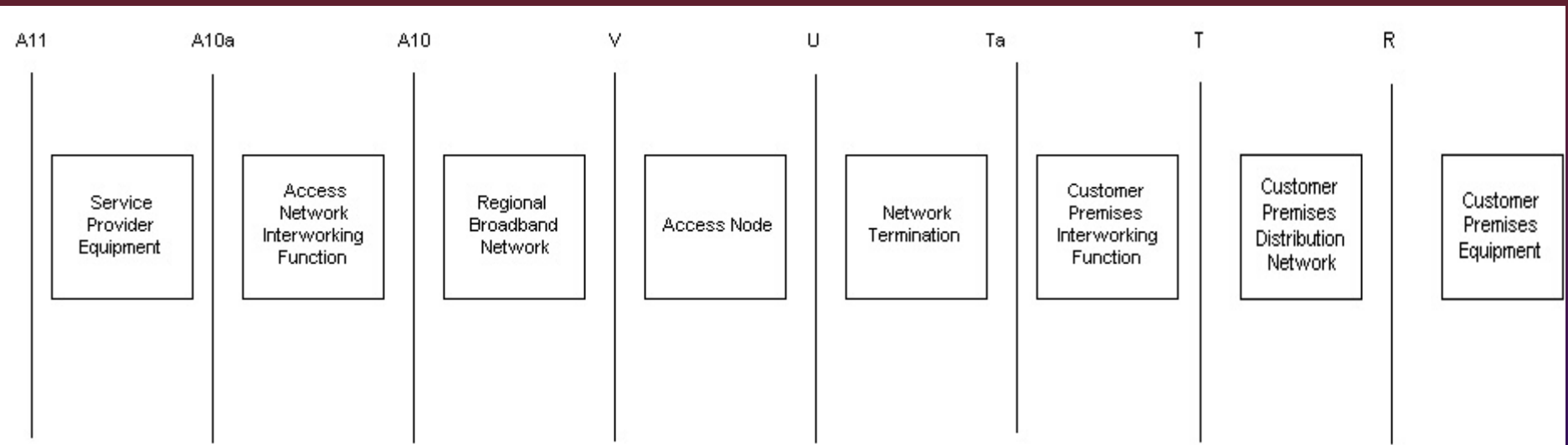
MBN Protocol Stack

- ❖ Voice Processing in DSP
 - ❖ Compression
 - ❖ Echo Cancellation
 - ❖ VAD/ Comfort Noise
 - ❖ Jitter Lost Packets etc.
- ❖ Voice over UDP/IP
- ❖ Encapsulation is either PPP or IP over ATM
- ❖ AAL 5 circuit emulation
- ❖ ATM Transport
- ❖ ADSL Physical





VoDSL Reference Model





VoDSL Reference Model Definitions with Interfaces

- ❖ Service Provider Equipment (SPE)
- ❖ Access Network InterWorking Function (AN-IWF)
- ❖ Regional Broadband Network (RBN)
- ❖ Access Node (AN)
- ❖ Network Termination (NT)
- ❖ Customer Premises InterWorking Function (CP-IWF)
- ❖ Customer Premises Distribution Network (CPDN)



VoDSL Reference Model Definitions w/ Interfaces cont'd

- ❖ Customer Premises Equipment (CPE)
- ❖ Signaling Protocol Between the Elements
 - ❖ Dependant on Implementation Schemes
 - ❖ Still Varies – A11, A10a, A10, V, U, Ta, T, R



System Requirements

- ❖ Multi-line Capabilities
- ❖ Over Subscription
 - ❖ Blocking
- ❖ Dynamic Bandwidth Allocation
 - ❖ AAL2/AAL5
 - ❖ Silence Suppression
- ❖ Voice Quality
 - ❖ Maximum Delay
 - ❖ Echo Cancellation



System Requirements cont'd

- ❖ Service Feature Transparency
- ❖ Continuous Availability
 - ❖ Possible Service Interruptions
- ❖ Performance
 - ❖ Comparable to POTS
- ❖ Management
 - ❖ Will Talk About Later



System Requirements cont'd

- ❖ Network Security

 - ❖ Denial of Service

 - ❖ Theft of Service

- ❖ Network Compatibility

 - ❖ Compatibility with the existing base

 - ❖ Ability for Future Growth

- ❖ Reliability

 - ❖ Minimum Reliability

 - ❖ Cross Layer Communication



General Service Requirements

- ❖ 64 Kbps μ /A-law encoding
- ❖ Quality of Service (QoS)
- ❖ End to End DTMF signaling
- ❖ Bearer Capabilities Negotiation
- ❖ Fax & Modem Transmission
- ❖ Hook-Flash Support
- ❖ Distinctive Ringing Support
- ❖ TTY (TDD) Terminal Support



Signaling Requirements

- ❖ Class 5 Services
 - ❖ Regular Telephony Features
 - ❖ Outgoing Call Establishment
 - ❖ Incoming Call Request
 - ❖ Call Release
 - ❖ Basic Service Characteristics
- ❖ Supplementary Features
 - ❖ Custom Calling Features



Signaling Requirements cont'd

- ❖ CLASS Features

 - ❖ CLASS (Custom Local Area Signaling Service)

- ❖ CENTREX Features



Management

- ❖ Configuration, Fault
- ❖ Performance, and Security
- ❖ Two Means of Initiation
- ❖ Protocols:
 - ❖ SNMP (Simple Network Management Protocol)
 - ❖ CMIP (Common Management Information Protocol)



Future of VoDSL

- ❖ Some Protocols More Feasible Than Others
- ❖ Early Wide Deployment Problems
 - ❖ Small to Medium Enterprises (SME)
- ❖ Must be Compatible with Legacy Equipment
- ❖ Still Testing
- ❖ Pros
 - ❖ Integrated Services
 - ❖ Bandwidth Conservation
 - ❖ Speculations for a Growing Market
 - ❖ Cost Savings
 - ❖ CLEC (Competitive Local Exchange Carrier)
 - ❖ ILEC (Incumbent Local Exchange Carrier)

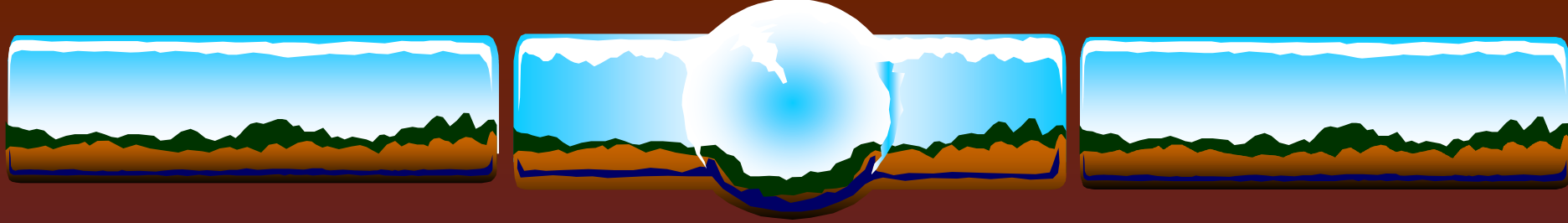


Cost Savings Example

VoDSL vs. POTS: A Sample Pricing Comparison¹

Provider/Service	Lines	Local Service	Long Distance	Internet Access	Monthly Price
CLEC VoDSL	4	Unlimited	625 minutes	Yes	\$200
ILEC business POTS lines	4	Unlimited	Not included	Not included	\$268
CLEC VoDSL	8	Unlimited	1000 minutes	Yes	\$350
ILEC business POTS lines	8	Unlimited	Not included	Not Included	\$580
CLEC VoDSL	12	Unlimited	1000 minutes	Yes	\$600
ILEC business POTS lines	12	Unlimited	Not included	Not included	\$892

(1) Prices and included minutes are averages derived from an averaging of published CLEC and ILEC offerings of VoDSL and POTS services.



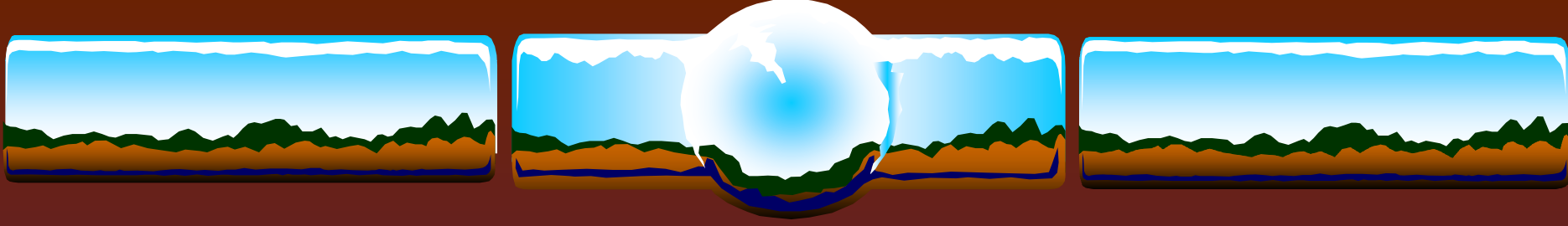
Future of VoDSL cont'd

- ❖ Voice Line Increase
- ❖ Long Distance Service Increase
- ❖ Open VoB
- ❖ Compete with Larger Carriers
- ❖ Cons
 - ❖ No Transport Consensus
 - ❖ Lack of Power Backup
 - ❖ Current Telecom Market Slowdown
 - ❖ Lack of Support on Lifeline Services



Future of VoDSL cont'd

- ❖ Technical Issues
 - ❖ Flow Through Provisioning
 - ❖ Soft-Switch Based VoDSL



THE END!!!



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- ❖ Global Sources (<http://www.telecom.globalsources.com>)
- ❖ Open VoB (<http://www.openvob.org>)
- ❖ Xchange Magazine (<http://www.xchangemag.com>)