DSL Trends

peter.steiner@alcatel.cz

DSL Market Drivers
User Market Drivers

Communication

Voice Telephony and Messaging, Fax, E-mail, Paging, V-Telephony, Chat, Directory, Diary, Address Book…

Information

E-Commerce, E-Banking, Web Surfing, GroupWare, Education...

Entertainment

Multi-Player Gaming, Digital TV, Video Games, Home Theater, Personal Photo/Video...

Home Automation

Integrated Management and Remote Control of:

Security, Heating, A/C, Energy, Appliances, Gates...

DSL Market Drivers
Business market drivers

Data communication networks need to grow in order to cope with the increasing demand

Higher Bandwidth per connection

Graphics
Streaming Video
Synchronized Audio

Networked and Multimedia Business Applications

More Internet Advertising

E Commerce (E Tailing)

Bandwidth

DSL Market Drivers
Regulatory market drivers

Loop unbundling in EU

copper

Option 1 : Unconditioned Local Loop

Option 2 : Conditioned Local Loop

service

Option 3 : Bit stream Access

Option 4 : Permanent Virtual Circuit

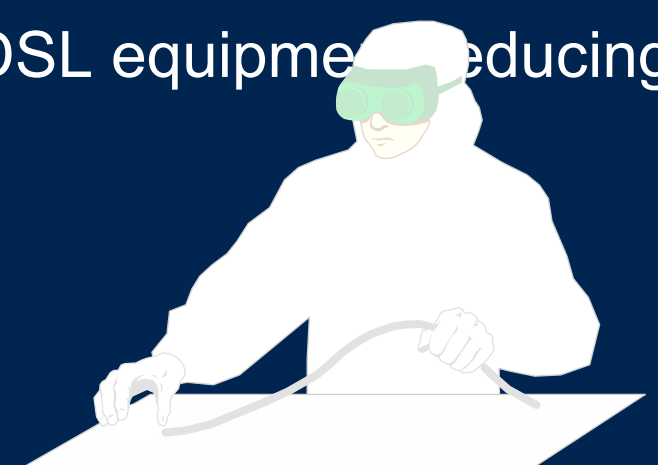
Option 5 : Switched Virtual Circuit

Line sharing in US and Japan

Time To Market

DSL Market Drivers
Technology market drivers

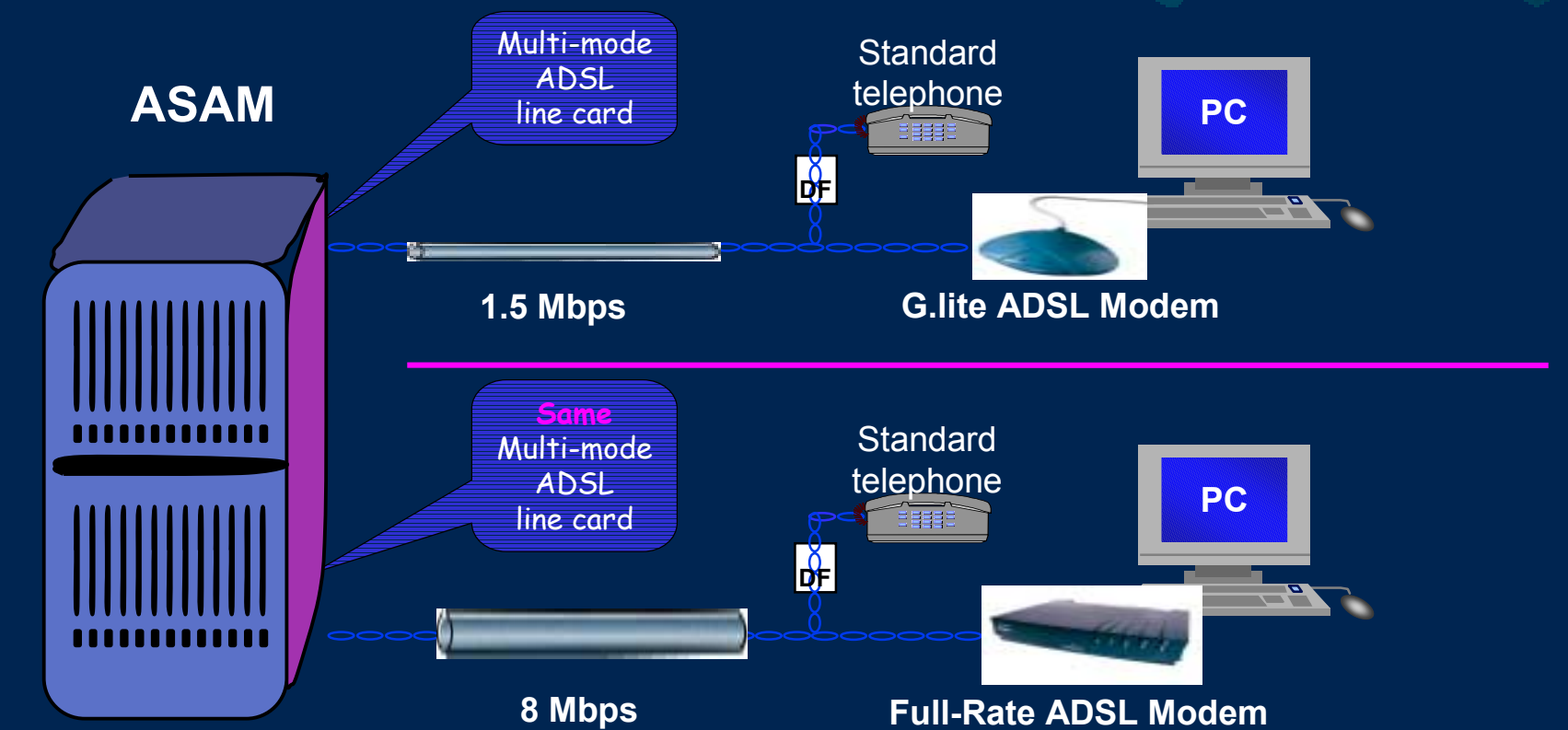
- Protection of investment through reuse of existing infrastructure
- Introduction of technical advanced DSL chipsets
- Introduction of standards that allow a mass roll-out
- Increased port density of central site DSL equipment reducing the cost of deployment
- DSL Service Network Models



DSL Market Drivers
DSL market evolution

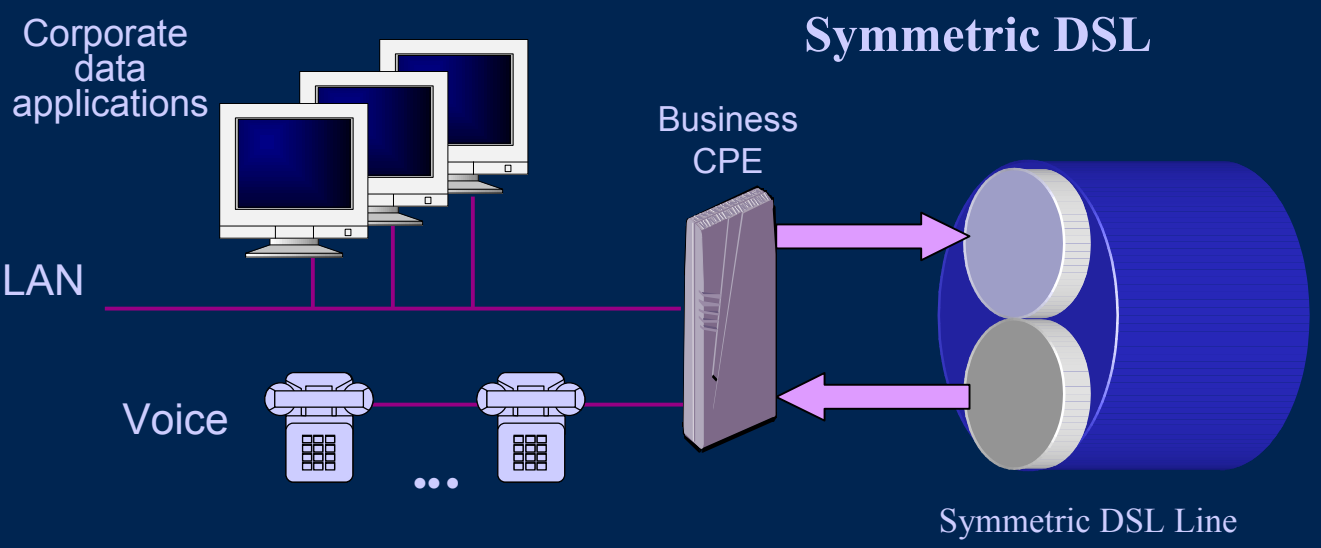
- New services and applications further drive market expansion
  - VoDSL
  - Internet TV
  - Interactive TV
  - Internet gaming
- Service primarily focussed on mass market (80% residential)
- Promising service take off
  - SBC: 3,000 new customers per day
  - Hanaro Telecom: 1,500 new customers per day

Multi-mode ADSL



- Same line card supports G.lite and Full-Rate ADSL
- Avoids costly equipment replacement when subscriber upgrades his service

Symmetrical DSL



- Symmetrical business services, e.g. LAN interconnect, video conferencing, web servers,...
- Cost effective alternative for traditional leased lines
- ANSI HDSL-2 (1.5 Mb), ETSI SDSL (rate adaptive 2.3 Mb)
- Spectral compatibility with ADSL in loop bundles

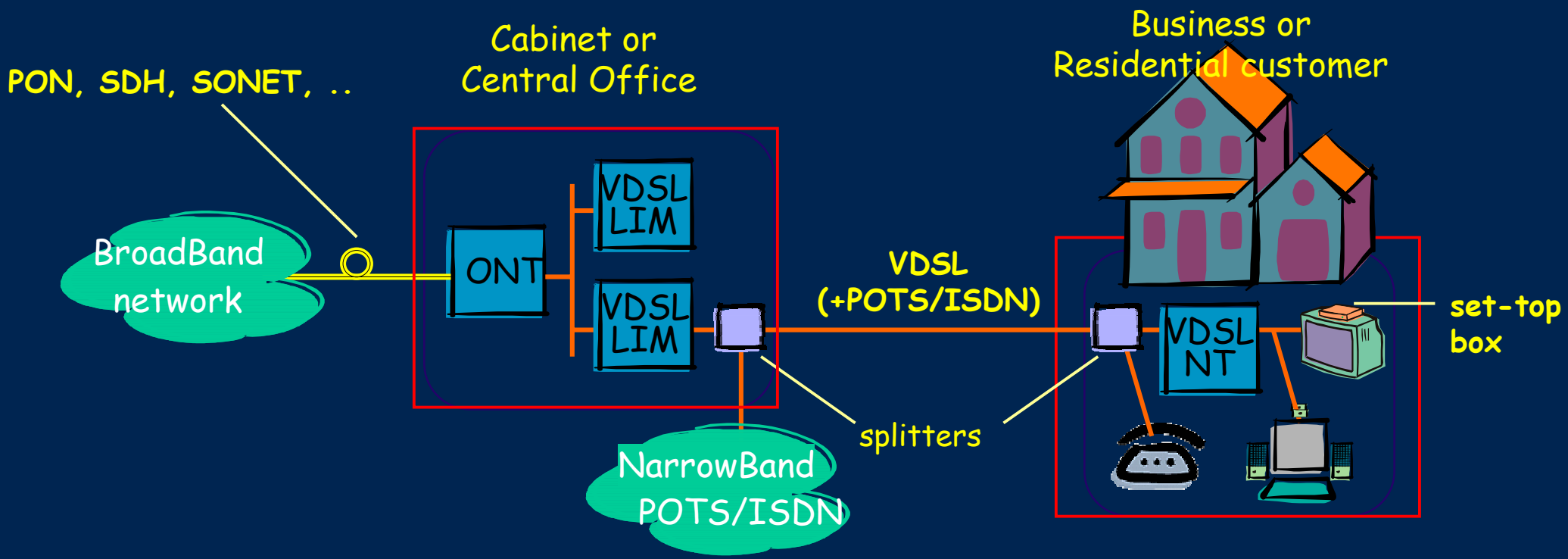
Symmetrical DSL technologies

Table 1	Traditional HDSL					
	ETSI					ANSI
line code	128 CAP Trellis coding	64 CAP Trellis coding	4 PAM, 2B1Q 2 information bits, no coding			
no. of pairs	1	2	2	2	3	2
data rate main application	1 x 2,320 kbit/s	2 x 1,168 kbit/s	1 x 2,320 kbit/s	2 x 1,168 kbit/s	3 x 784 kbit/s	2 x 784 kbit/s
Nyquist frequency	420 kHz	255 kHz	485 kHz	292 kHz	196 kHz	196 kHz
max. range for max. rate	2.1 km	2.8 km	2.0 km	2.4 km	2.8 km	2.8 km
main application	E1 replace	E1 replace	E1 replace	E1 replace	E1 replace	T1 replace

Symmetrical DSL technologies

Table 2	Multirate HDSL		Enhanced HDSL		
				ITU G.SHDSL	
	Europe	ANSI	ANSI	ANSI	ETSI
no. of pairs	MR SDSL HDSL RA	SDSL (tbd)	HDSL2	MR HDSL2 (tbd)	SDSL
line code	4 PAM, 2B1Q 2 information bits		16 PAM, 4B1H, 3 information bits, 1 redundant bit for Trellis coding		
data rate main application	208 - 2,320 kbit/s	144 - 1,552 kbit/s	1,552 kbit/s fixed	144 - 1,552 kbit/s	384 - 2,320 kbit/s
Nyquist frequency	- 485 kHz	- 387 kHz	260 kHz	- 260 kHz	- 387 kHz
max. range for max. rate	2.0 km	2.4 km	2.8 km	2.8 km	2.4 km
main application	SOHO	SOHO	T1 replace	SOHO	SOHO

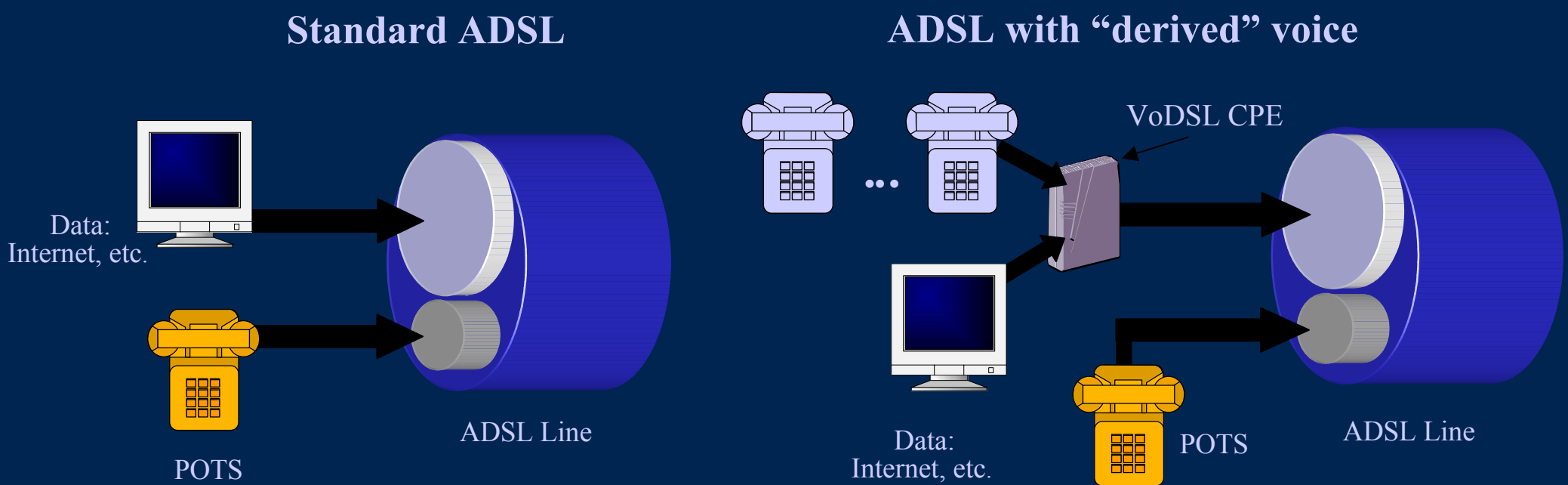
VDSL architecture



Abbreviations:
ONT: Optical Network Termination
NT: Network Termination
LIM: Line Interface Module
PON: Passive Optical Network

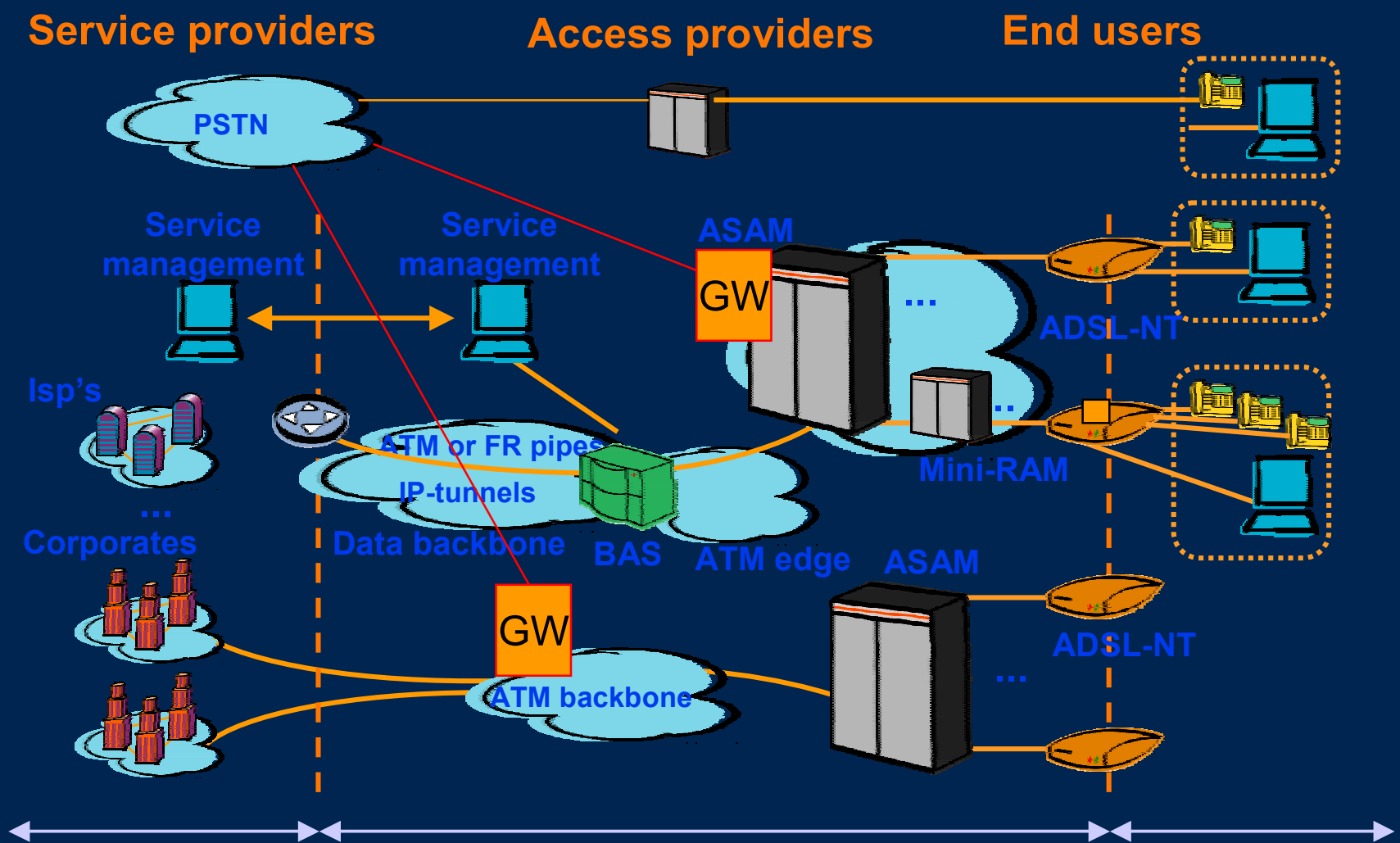
VDSL rates (up + down):
- **58 Mbit/s over 400 m**
- **29 Mbit/s over 1 km**
- **14.5 Mbit/s over 1.5 km**

Voice over DSL
Introduction



- Up to 16 simultaneous voice channels on a single copper pair
- Soft provisioning of additional voice channels - no truck roll
- Integrated voice and data solution
- Focused on SME and high-end residential market

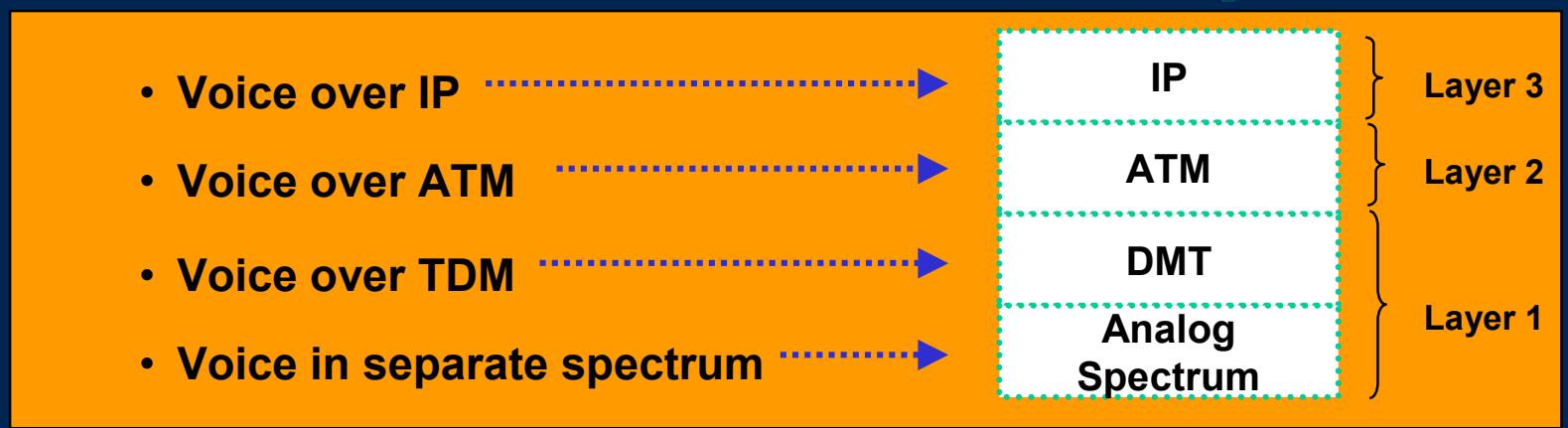
Voice over DSL
VoDSL Gateway positioning



Voice over DSL
Voice-Data convergence starts in Access

- VoDSL allows right away
  - FULL-featured telephony
  - Packet transport for voice and data
- Minimal TDM investments
  - Concentrated I/f (V5.2/GR303)
  - No analog line cards
- Maximum service
  - Existing telephony service (cfr. Transparency)
  - Existing billing and customer care services
  - Local number portability
  - Leverage operational methods

Voice over DSL
VoDSL transport



- Voice over packet
  - Optimising networking infrastructure
- Voice over ATM implementation choice in VoDSL
  - QoS support within ATM
  - Standard AAL-2, allowing optimised bandwidth usage
  - Voice handling includes compression, echo cancellation, ..

Voice over DSL
VOIP vs VoDSL

- Architecture
  - VOIP: convergence in core first (using softswitch)
  - VoDSL: convergence in access first (via VoATM)
- Service Operator key benefit
  - VOIP: off-load switched telephone network
    - Lower costs: core infrastructure
    - New revenues: new services (e.g. universal messaging)
  - VoDSL: leverage high speed DSL access
    - Lower costs: access infrastructure
    - New revenues: bundled services
- VoDSL and VOIP can/will coexist

Voice over DSL
Reducing Costs

- Integrated access network, lowering OAM costs
  - Multiple voice lines with data on one line
  - Integrated services
  - Dynamic bandwidth sharing
- Automated/soft provisioning (no truck roll)
- Lower access/switching costs (cfr. DLC model)
- Lower loop plant investments
  - Recuperate copper (cfr. Loop unbundling)
- Leverage DSL platform
  - Minimal incremental cost

Evolution to Full Digital Loop

- Key characteristics of packet based loop
  - Emergency power feeding
  - Very high density DSLAM (~1000 lines per rack)
  - DSL Home Gateway
    - 1 data interface
    - 2 POTS lines

The Alcatel ASAM
Video services - future

- DSL overtakes cable modem growth
- DSL has better IP performance in field tests
  - http://www.abac.com/dsl/dsl-vs-cable.html
  - massive worldwide investment in DSL
- video services are important to compete head-to-head with cable operators for data, voice and video services
- Move to MPEG4 which reduces drastically the required bandwidth per video channel
- VDSL standardisation coming