




...umění optické komunikace

Testování služeb Triple Play na Ethernetu a xDSL

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SLUŽBY TRIPLE PLAY ŠÍŘKA PÁSMA



Triple-Play services require bandwidth from 25 to 100 Mbit/s per user!

xPON, xDSL, LTE, HSPA, WiFi, Ethernet, IP/MPLS, Optical

IPTV: 20-30 Mbit/s
(multiroom HDTV, VoD)


Internet: 5-10 Mbit/s
VoIP: 0.1 Mbit/s

research, 2006

Typická šířka pásma na jednoho uživatele: **73 Mbit/s**

3

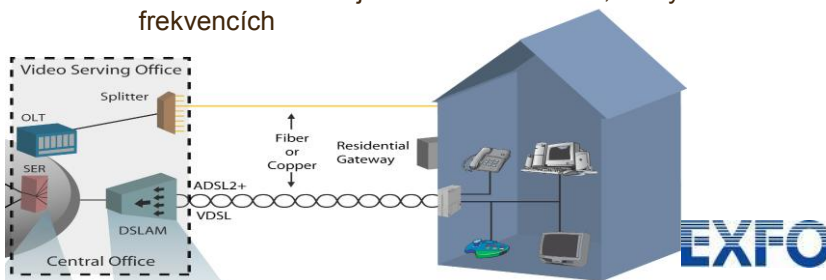
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METALICKÉ VEDENÍ

Optické vlákno v „poslední míli“ bude někdy všude???

- ADSL2+ a VDSL2 poskytuje „IP“ konektivitu až do domu
 - Služby IP vyžadují větší šířku pásma (IPTV)
 - Větší šířka pásma znamená vyšší frekvence (VDSL2)
 - Metalická kabeláž je více citlivá na šum, na vyšších frekvencích



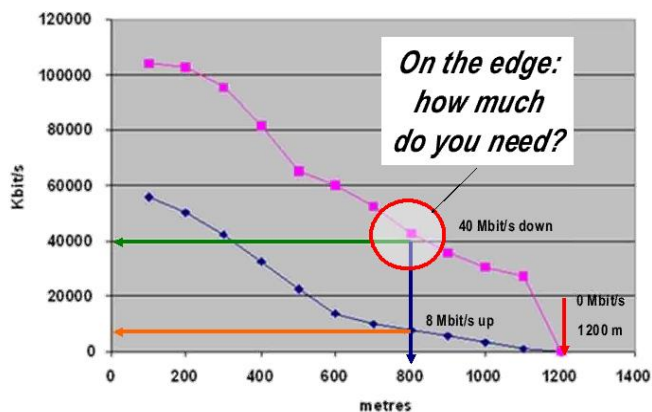
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METALICKÉ VEDENÍ

VDSL2, FTTCab M2, profile 17a (no U0)
14.5 dBm, -130 dBm/Hz AWGN, AWG26



- VDSL2 profile 17a allows 40 Mbit/s on 800 m copper loops (8 Mbit/s up), and is optimized for FTTN deployments
- Profile 17a allows a maximum bandwidth of 100 Mbit/s, on shorter copper loops (250 m)
- Profile 17a uses 17.7 MHz of bandwidth on the physical layer of the copper medium
- Maximum effective copper loop length is 1100 m for ~25 Mbit/s (2 Mbit/s up)

Source: Ericsson

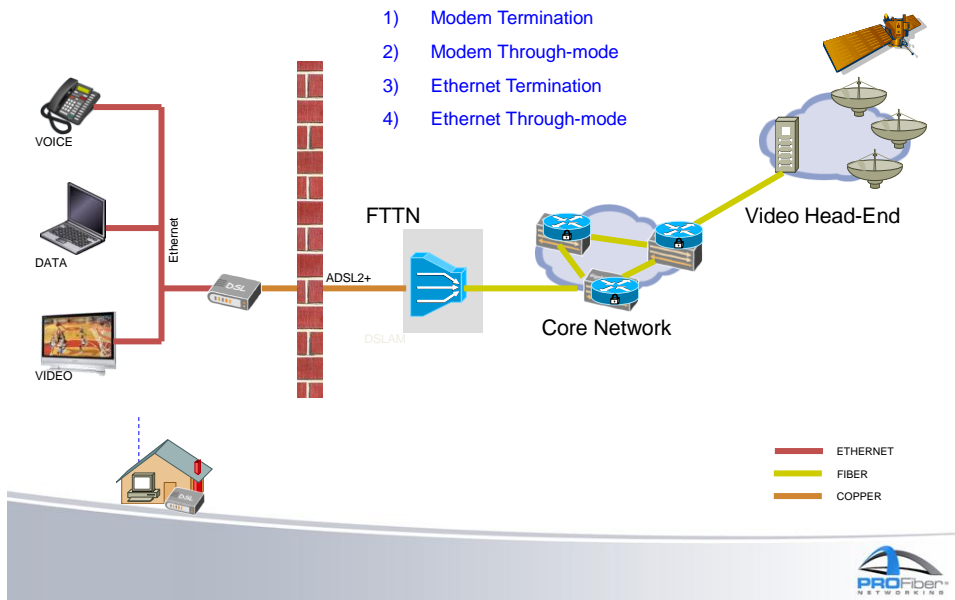
◆ Upstream

◆ Downstream



TESTOVÁNÍ

- 1) Modem Termination
- 2) Modem Through-mode
- 3) Ethernet Termination
- 4) Ethernet Through-mode



MODEM TERMINATION

Line Status: Showtime Reconnect

OperationalMode: ADSL2plus

Annex: A

COVendorID: BDCM

COVersion: 0x544D0000

Latency: Fast

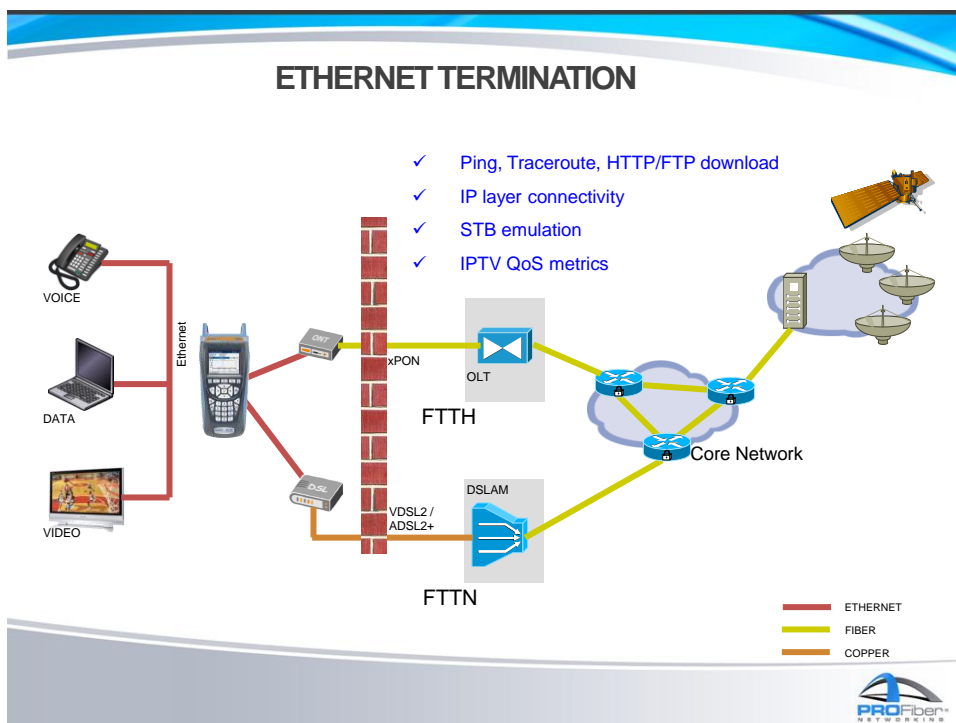
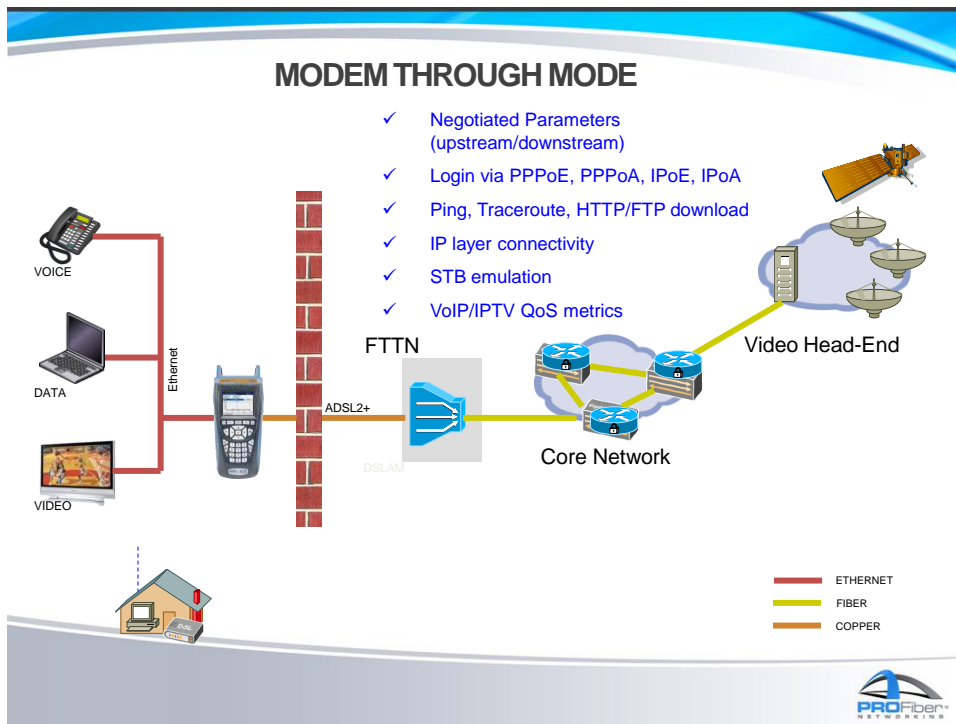
- ✓ Negotiated Parameters (upstream/downstream)
- ✓ Login via PPPoE, PPPoA, IPoE, IPoA
- ✓ Ping, Traceroute, HTTP/FTP download

Parameter	Dwn	Up
MaxBitRate:	26512 kbps	1300 kbps
ActBitRate:	24447 kbps	1023 kbps
Capacity:	92 %	78 %
SNRMargin:	9.5 dB	12.0 dB
Attenuation:	1.0 dB	11.5 dB
TxPower:	8.0 dBm	0.3 dBm

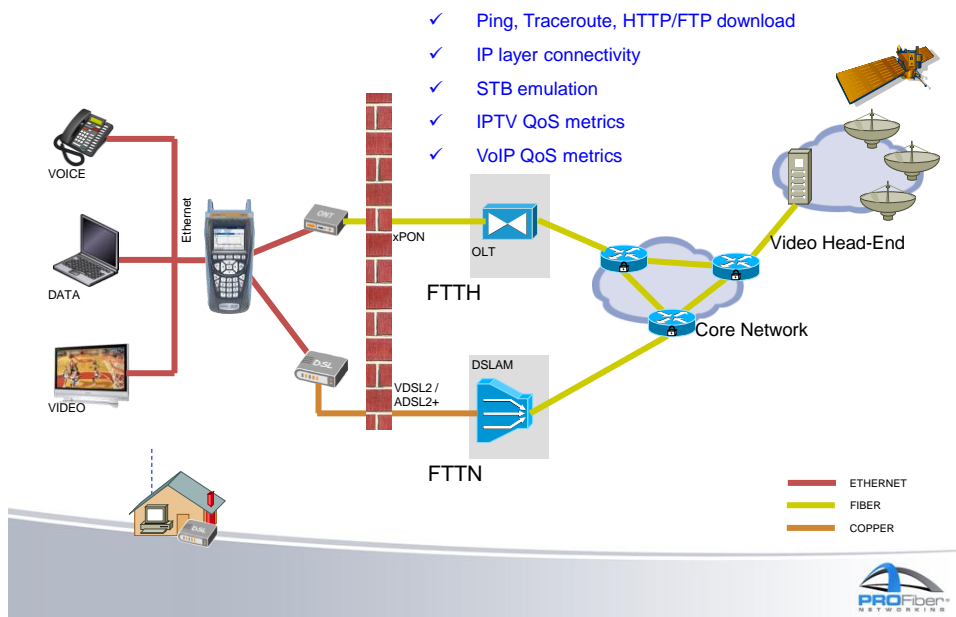
Statistics Bits per Bin NetworkStatus

COPPER

PROFiber NETWORKS



ETHERNET THROUGH MODE



Testování

IPTV Service testing

- MPEG2/4 TS, WM9/VC-1
- Bandwidth usage
- IGMP and STB Info
- IGMP Emulation
- Packet Loss, Jitter counter and Graph
- Zap Time
- QoS Pass/Fail Indicators

VoIP Service Testing

- Monitors SIP, MGCP, SCCP
- ATA/Phone initialization
- Call Flow
- Codec indicator,
- Packet Loss, Jitter, Delay counter and Graph
- QoS Pass/Fail Indicators

Data Service Testing

- Tx / Rx counters
- PING, Traceroute, Webpage Download Speed
- ATM Setup & Statistics – VPI/VCI, OAM Loopback

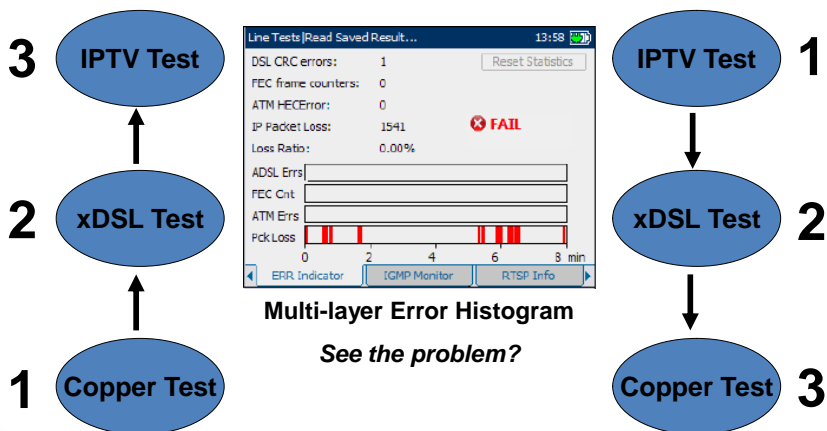
ADSL2+ Service Verification

- Attenuation
- Transmit (Tx) power
- Signal-to-noise ratio (SNR) margin
- Bit rates Actual and Maximum (upstream/downstream)

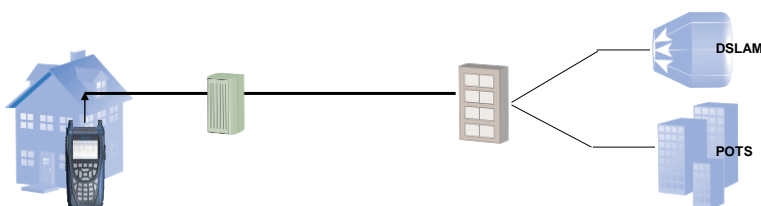
TESTOVACÍ FÁZE

Installation Test Process

Troubleshooting Test Process



DataRatePrediction



Test Results Screenshot (17:22):

- DMM Tests : Completed ✓
- Load Coils Detected: 0 ✓
- WB Long. Balance : Completed ✓
- WB PSD Noise : Completed ✓
- WB Attenuation : Completed ✓
- WB Impulse Noise : Completed ✓
- Data Rate Test : Completed ✓
- HD Streams : 0
- SD Streams : 0
- Predicted Rate : Dwn: 11.5 Mbps Up: 1.6 Mbps

Configuration Screenshot (17:23):

- Annex: B
- Technology: ADSL2
- Target SNR: 6
- Predicted Rate: Dwn: 11.5 Mbps Up: 1.6 Mbps

Spectrum Graph Screenshot (17:25):

- Y-axis: dB (0 kHz, -20.00)
- X-axis: Frequency (0, 64, 128, 191, 255 kHz)
- Buttons: Horizontal Zoom, Zoom In, Zoom Out



DATA TEST

..[Data Analysis|Test Results] 23:32 [FAIL]

Reconnect ✖ FAIL

Parameter	Down	Up
MaxBitRate:	26616 kbps	1300 kbps
ActBitRate:	24447 kbps	1023 kbps
Capacity:	91 %	78 %
SNRMargin:	10.0 dB	12.0 dB
Attenuation:	0.5 dB	11.5 dB
TxPower:	8.0 dBm	0.3 dBm

Test Status | Line Status | ADSL Param

..[Data Analysis|Test Results] 23:29 [PASS]

Reset Statistics

Client IP	Received	Transmit
192.168.0.10	547111	115735
239.255.255.250	53198	0
192.168.0.255	1524	0
224.0.0.1	120	0

IP Packets | Protocols | DnStream Rates

..[Data Analysis|Test Results] 23:27 [PASS]

Reset Statistics

ADSL Rate (kbps): 24447
Average ATM Rate (kbps): 22140
Max DownStream Rate (kbps): 361

IP Packets | Protocols | DnStream Rates

Data tests are used to test connectivity past the ATM layer. To ensure the customer has “sync and surf”, we need to confirm the “surf”!

Vital statistics:

- IP Packet statistics
- Downstream and Upstream rates
- LAN/WAN status
- Ping and TraceRoute

VoIP TESTING

..[Voice Analysis|Test Results] 6:05 [PASS]

Clear History Protocol: SCCP

Scop Call Flow:
Phone Off Hook
Call Proceed
OutBound Call
Call From: 1007
Call To: 1005
Ringing...

Network Activity | Call History | Pcks Analysis

..[Voice Analysis|Test Results] 6:06 [PASS]

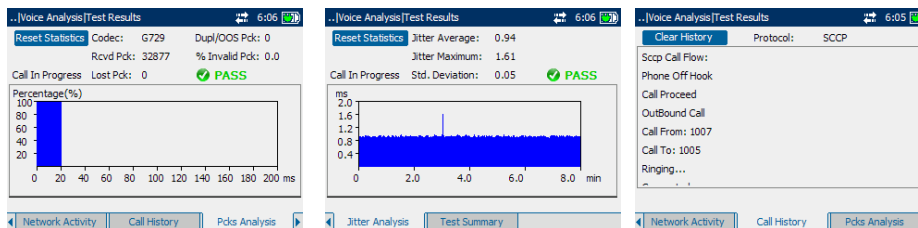
Reset Statistics

Codec: G729 Dupl/OOS Pck: 0
Rcvd Pck: 32877 % Invalid Pck: 0.0
Call In Progress Lost Pck: 0 ✔ PASS

Network Activity | Call History | Pcks Analysis

Key VoIP Performance Indicators	
ADSL, ATM, IP Layer Analysis	Up/downstream rates, SNRm, Attn, IP Packet loss
Gateway/ATA Traffic	ATA MAC, IP address, DHCP handshaking
VoIP Call Flow	Incoming/outgoing call handshaking details for each protocol
Jitter Analysis	Plots max jitter for voice conversation
Delay	Plots inter-packet delay distribution

VoIP METRICS

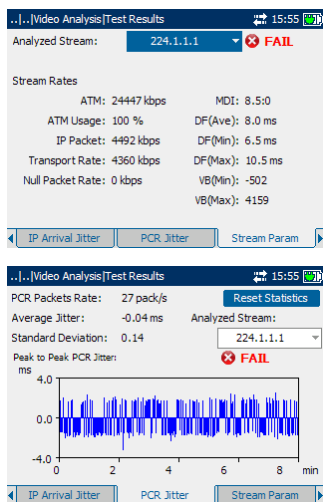


We can monitor call flow of SIP based VoIP calls

Other protocols such as SCCP and MGCP can be detected under the Data Analysis test



IPTV TESTING



Key IPTV Performance Indicators	
ADSL, ATM, IP Layer Analysis	Up/downstream rates, SNRm, Attn, ATM errors, IP Packet loss
Bandwidth Usage per Channel	Multicast IP address, Stream rate, bandwidth utilization
IGMP Packet Statistics	Queries, reports, join/leave requests
STB Traffic	STB MAC and IP address, DHCP handshaking, Ethernet verification
IP Packet Loss	Indicates errored and out of sequence packets. Loss ratio considered for QoS metrics
Jitter	Indicates max stream jitter
Zap Time	Time duration for channel change
PCR Jitter	Jitter indication for MPEG Program Clock Reference (PCR)
PID Info	Indicates consistency of Video Stream. Video and Audio bit rate and packet loss for a specific stream
MDI (option)	Based on RFC 4445. Provides an indication of expected video quality based on network level (IP) measurements



VIDEO STREAM INFORMATION

The first screenshot shows a table of detected video streams:

Stream IP	Type	Rates	Usage
239.0.1.14:7534	Multicast	1986 kbps	0%
239.0.1.22:7534	Multicast	2014 kbps	0%
239.0.1.23:7534	Multicast	2124 kbps	0%

The second screenshot shows details for a multicast video stream:

- Multicast video stream
 - From: 10.0.13.10 Port 2927
 - To: 239.0.1.14 Port 7534
 - Stream Rate 1986 kbps, 0% of total usage
- Multicast video stream
 - From: 10.0.13.12 Port 1746
 - To: 239.0.1.22 Port 7534
 - Stream Rate 2014 kbps, 0% of total usage

The third screenshot shows join and leave statistics for stream 224.1.1.1, which is marked as FAIL:

Join	Leave	zap time(ms)
Join 239.0.1.22		48
Join 239.0.1.23		43
Join 239.0.1.14		44

Vital statistics provided by the AXS-620:

- Stream IP address AND port ID
- Stream Rate and Bandwidth utilization
- IGMP Zap Time – time required to join and leave IGMP streams



IPTV

The first screenshot shows jitter statistics for stream 224.1.1.1, which is marked as PASS:

- Max Recorded Jitter: 1.00 ms
- Average Jitter: 0.59 ms
- Standard Deviation: 0.08
- IP packet Jitter: 0.08

The second screenshot shows a Multi-layer Error Histogram (MLEH) with the following data:

- DSL CRC errors: 7
- FEC frame counters: 0
- ATM frame errors: 1
- IP Packet Loss: 5
- Loss Ratio: 0.00%
- ADSL Errs: 7
- FEC Cnt: 0
- ATM Errs: 1
- Pck Loss: 5

The third screenshot shows stream parameters for stream 224.1.1.1, which is marked as FAIL:

Stream Rates	MDI
ATM: 24447 kbps	MDI: 8.5:0
ATM Usage: 100 %	DF(Ave): 8.0 ms
IP Packet: 4492 kbps	DF(Min): 6.5 ms
Transport Rate: 4360 kbps	DF(Max): 10.5 ms
Null Packet Rate: 0 kbps	VB(Min): -502
	VB(Max): 4159

3 VERY powerful IPTV Diagnostic screens:

- IP Arrival Jitter – jitter measurements for the arriving IP video stream packets
- Multi-layer Error Histogram – the ultimate finger pointer! (more about this later!)
- Stream Parameters – MDI analysis

A wealth of IPTV information in single screen representation!



IPTV

<u>Parameter</u>	<u>Acceptable</u>	<u>Marginal</u>	<u>Unacceptable</u>	
MDI – Delay Factor	9 to 15 * de-jittering of STB allows for higher DF	15 - 50	> 50	ms
MDI – Media Loss	0	.02 to .05	> .05	Frames per second
Packet Jitter	< 5	5 – 20	> 20	ms
Packet Loss	< 0.1	0.1 to 0.2	> 0.2	%
Zap Time	< 100	100 – 249	> 250	ms
PCR Jitter	0	1 - 9	> 10	ms



KOMPLEXNÍ TESTOVÁNÍ

- Fyzické parametry
- DSL technologie (VDSL2, ADSL2+)
- Služby (Triple Play)

Řada AXS-600
3 měření v jednom přístroji





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DĚKUJEME ZA POZORNOST

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