

FTTH – the path from HDTV – 8K TV

Thomas Schacherer / BKtel - Germany



- ❖ Linear TV
 - ❖ Trends in TV resolution and bandwidth
 - ❖ Consequences
 - => GPON & PtP
 - ❖ Upgrade to 8K TV
 - ❖ Convergence of RVO & IPTV
- Summary

❖ **Linear TV, transmitted via:**

❖ Terrestrial video (DVB-T)

❖ RF video overlay (RVO)

❖ IPTV as well:

❖ In most cases in a kind of LAN/WLAN to achieve exactly this purpose,

❖ Broadcast TV then converts into IPTV.

Current trends with new TV-transmission

❖ Higher resolution

- ❖ “native” HD = 1080p
 - ❖ resolution of 1.920 x 1.080 Pixel ~ **2 Mio. Pixel**
- ❖ 4K = 4 x HD-resolution (VHDTV, already “on air”))
 - ❖ Resolution of 4.096 x 2.160 Pixel ~ **8 Mio. Pixel**
- ❖ 8K = 16 x HD-resolution = UHDTV, to be launched with Rio Olympics)
 - ❖ Resolution of 8.192 x 4.320 Pixel ~ **32 Mio. Pixel**

Consequences for IP related bandwidth

- Estimated bandwidth requirement per TV stream:

Videoformat	# of lines	Bandwidth with latest H.264, H.265 Compression*
HD	1080p	16 Mbit/s
4k	2160p	30 Mbit/s
8k	4320p	100 Mbit/s

- Consequently on short term the bandwidth requirement will **double**, on medium term even at least the **six-fold** data rate will be required

Consequences for GPON

- ❖ GPON installations typically use 1:32 or 1:64 splits; therefore the guaranteed data rate per subscriber is
 - ❖ 78 Mbit/s for 1:32 splits
 - ❖ 39 Mbit/s for 1:64 splits
- ❖ If the full capacity is allocated to video, disabling additional high speed internet access at the same time, GPON can carry:
 - ❖ 4 channels of native HD content with 1:32 splits and
 - ❖ 2 channels of native 4K TV content with 1:32 splits
 - ❖ **no channel of 8K TV content**

PON upgrade for 4K to 8K TV transmission

- ❖ **Option #1:** GPON will not be capable to handle the upcoming video data and will need to be replaced/complemented by higher speed technology such as NG-PON2 (TWDM-PON)
- ❖ **Option #2** comes from applying IPTV and broadcast TV by utilizing PON technology combined with RVO (RF Video Overlay) technology
 - ❖ RVO introduces a multi Gbit/s video broadcast pipe
 - ❖ RVO is a mature technology compatible to all PON standards incl. E-PtP
- ❖ **RVO is the easier and cheaper way to overcome lack of IP bandwidth**

Consequences for Point to Point upgrade to 8K TV transmission

- ❖ **Option #1:** passive multiplexing of 1550nm TV RVO (RF Video Overlay) on one fiber (same as PON)
- ❖ **Option #2** separate fiber network for broadcast TV transmission (IPTV via Ethernet)

RVO technology overview

- ❖ RF Video Overlay (RVO) transmits broadcast TV-Signals transparently on the same fiber as the PON data signals using optical wavelength multiplexing
- ❖ The transmitted signal is compatible with current TV sets – no need for separate STB
- ❖ RF Video Overlay is compatible and independent from the selected PON / PtP technology

RVO for CATV/SAT signals

CATV signals via RF Video Overlay

- ❖ Uses signals which are widely used in terrestrial broadcast video transmission
 - ❖ Analog: PAL (compatible with all TV sets)
 - ❖ Digital: DVB-T or DVB-C (digital video broadcast standards requesting a STB or last generation TV sets)
 - ❖ Frequency range: 45 MHz – 862 ... 1.000 MHz

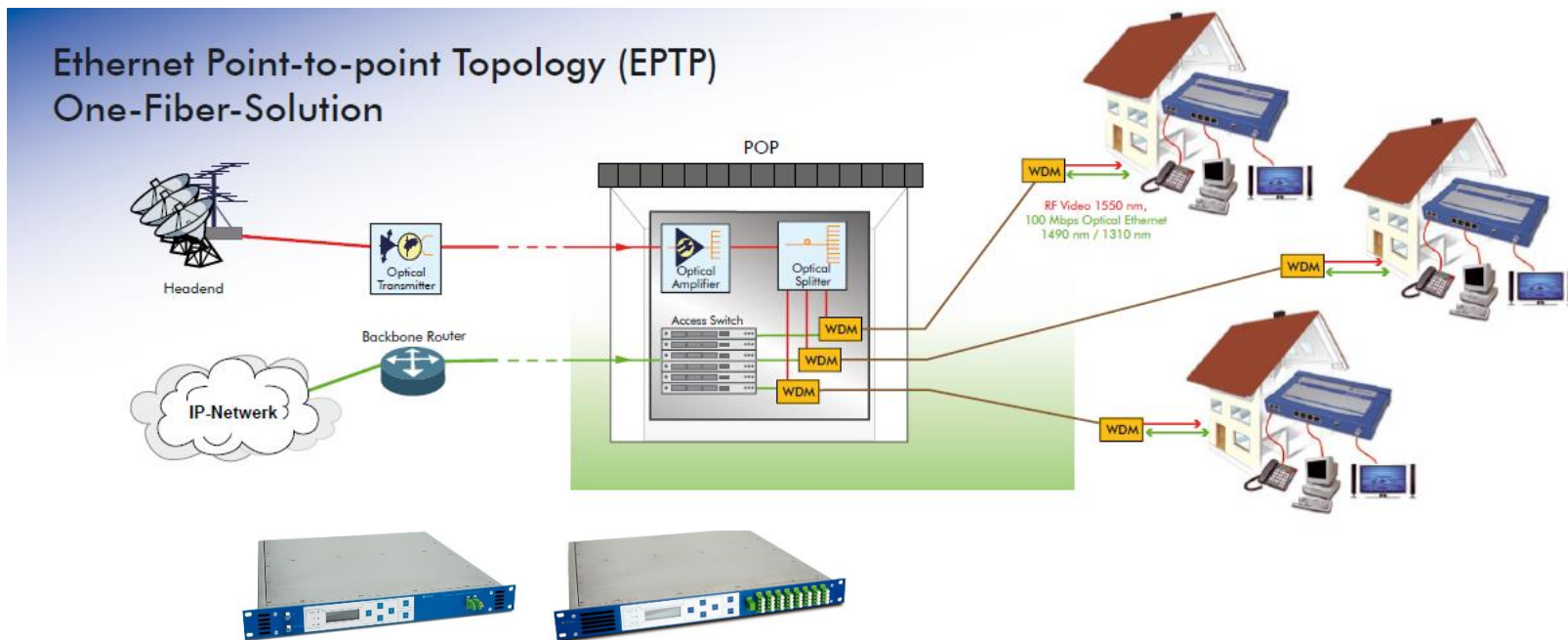
Satellite signal transmission via RF Video Overlay

- ❖ 2,4 GHz bandwidth
 - ❖ Transmission of satellite IF (L-band):
 - ❖ QPSK/8-PSK (for digital Set Top Box DVB-S or last generation TV sets)
 - ❖ Frequency range: 950 MHz – 2.150 MHz

IPTV and RVO together: a strong couple

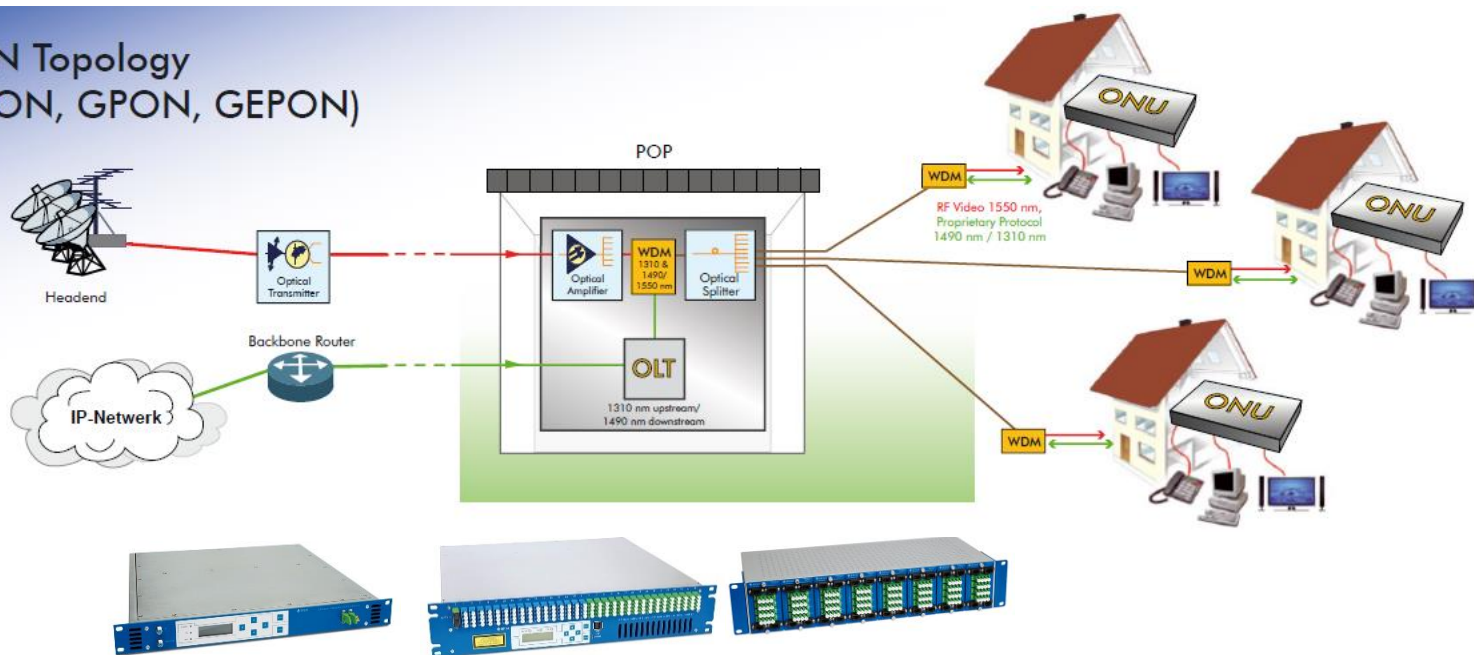
- ❖ IPTV is the most attractive service today to deliver unicast video services like Video on Demand (VoD); very important in low resolution video transmission to e.g. mobile terminals
- ❖ RVO is the most cost effective technology to deliver broadcast type of video services with high resolution to TV Sets (e.g. transmission of real life video e.g. sports events, concerts, ...)
- ❖ To transmit broadcast TV over IP will cause delay of ca 5 ~ 15s. => user will see the goal delayed

Point to Point (single fiber) + RVO



GPON + RVO

PON Topology (BPON, GPON, GEAPON)



Summary

- ❖ IPTV via GPON on medium term will not be able to handle Broadcast TV due to the expected increasing data rates!
- ❖ IPTV and Broadcast TV are not excluding each other but complimentary.
- ❖ The separate „Media-Pipe“ via RVO does not put any load on the IP backbone and GPON network.
- ❖ Additionally to the hundreds of programs delivered via RVO the customers benefit from the full GPON IP capacity for all other services incl. IPTV.
- ❖ Broadcast TV services remain very simple and user friendly:

Talk to the Speaker : Exhibition Hall, BKtel booth

Thomas Schacherer

schacherer@bktel.com

www.bktel.com