

ITG Workshop 10/02  
Berlin

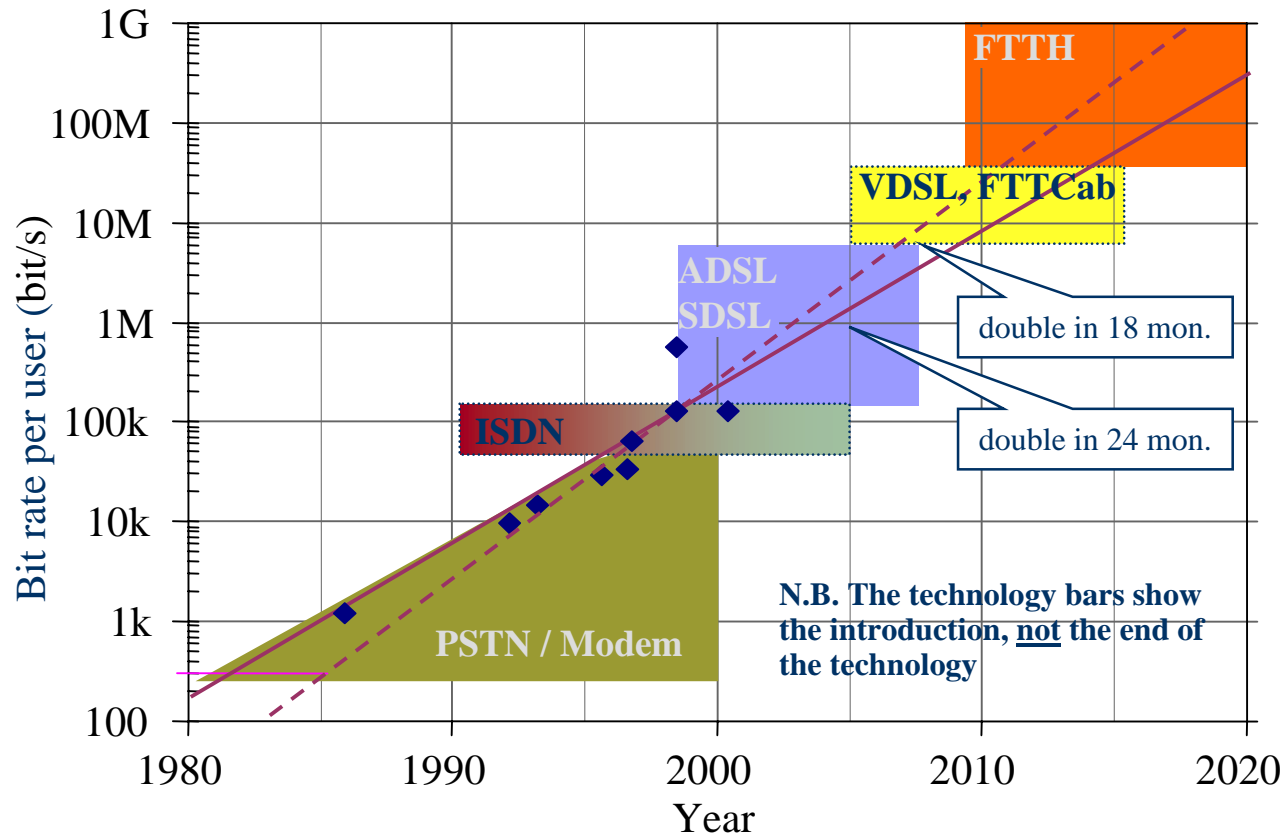
- **Zukünftige Anforderung**
- **Netzbetreiber**
- **Strategien für optischen Zugang**
- **Wirtschaftlichkeit**

## **Optische Zugangsnetze im technischen und wirtschaftlichen Umfeld**

# 64Kbps is Enough for all Applications?

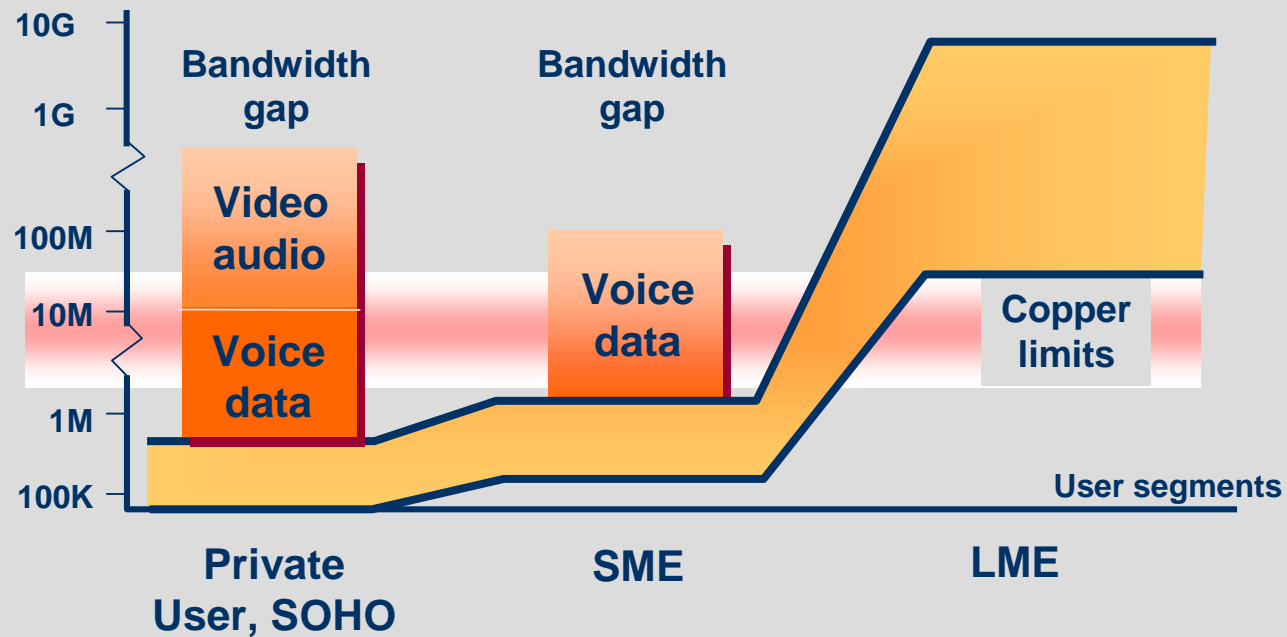
SIEMENS

Similar to the “famous last words” of Bill Gates 1981  
“640KB ought to be enough for anybody.”



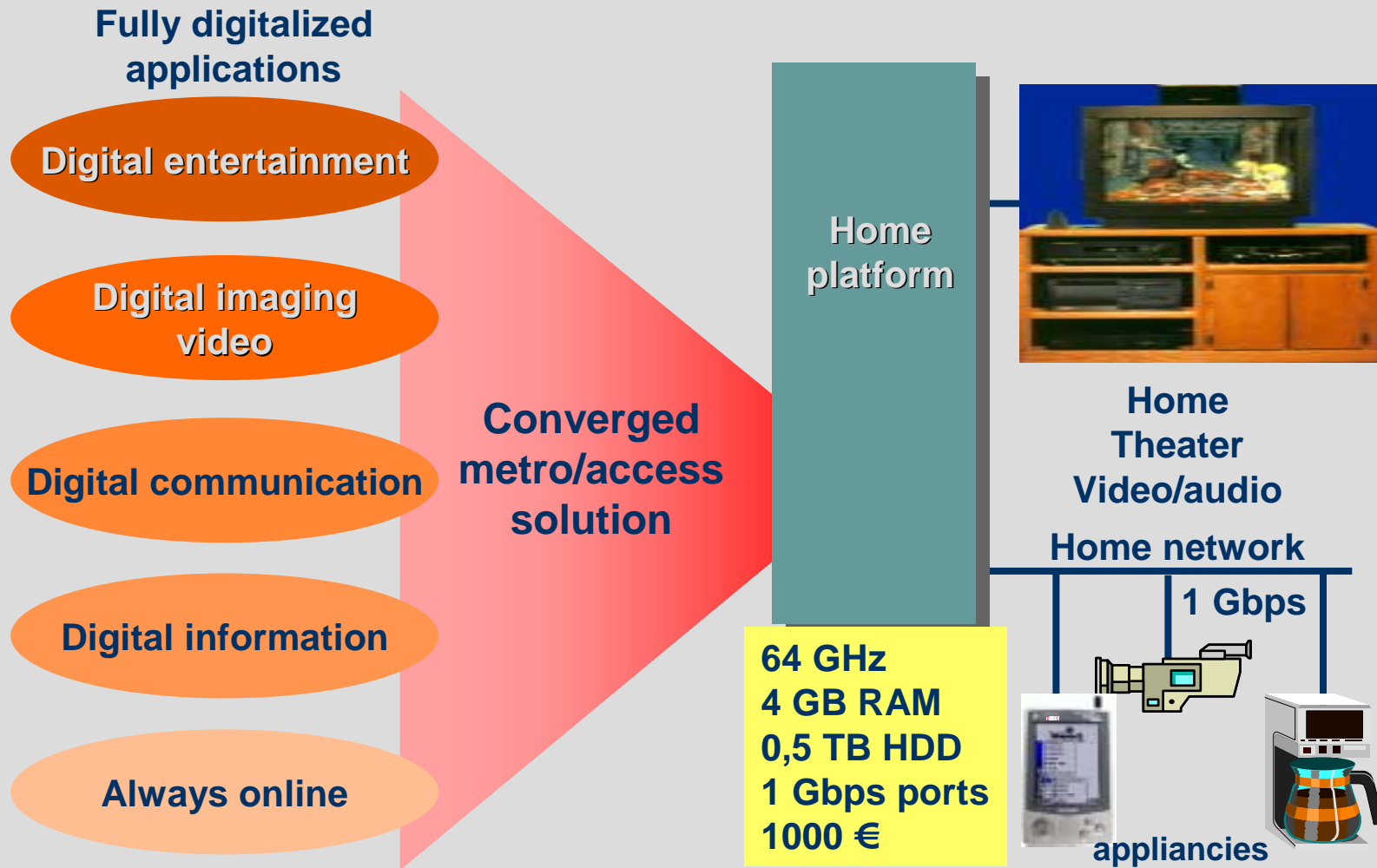
**There will never be enough! The bandwidth demand will continue to grow.  
Besides throughput, speed receives growing importance**

# The Copper Divide



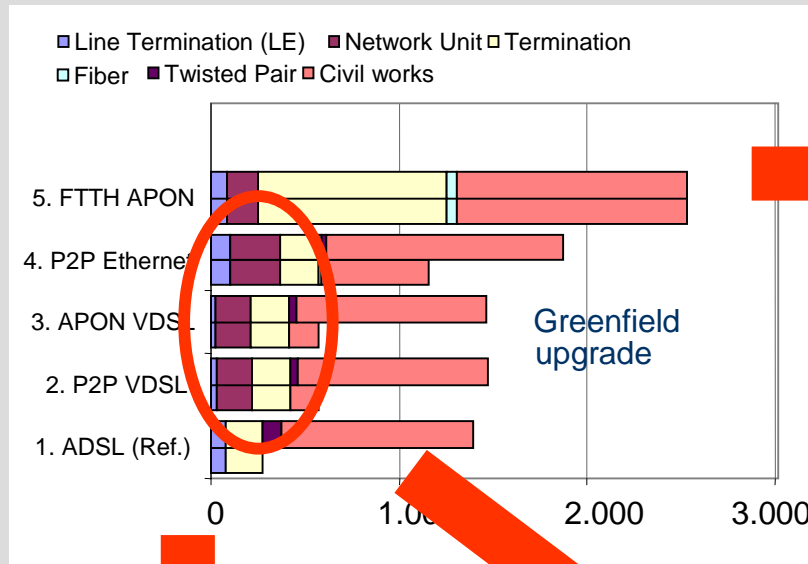
**Bandwidth requirements for majority of business sites are between 8-10 Mbps.  
Only <10% of business sites have fiber.  
RHK July 2001**

# 2010: Can Copper Survive?



# Overcoming the Cost Trap of Optical Access

Example: 4000 subscribers in 2 sq.km., ducted main cable, buried distribution cable



## Make civil works irrelevant

- Alternate access
- New developing areas
- Replacements of copper

„We did our due-diligence with all the various wire line solutions, and we kept coming back to fiber-to-the-home. We figured if we’re going to open the trench anyway, it doesn’t make sense to put in an infrastructure that has limited, short-term bandwidth capacity.“

Steve Sackrider, Wamego Telecommunications (ILEC Kansas)

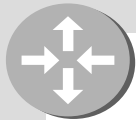
## Increase revenue

- Universal access
- Any service
- Every customer (SME, buildings, private user)

## Reduce system cost

- Ethernet I/O
- PON
- Cheap optical components

## Optical Access: Services



**Internet access**  
Telephony, VoD

- a) dedicated guaranteed bandwidth for Internet access “always on”
- b) statistically shared bandwidth using PPPoE like ADSL



**LAN to LAN**  
Ethernet VPN

- a) VPN service with guaranteed bandwidth and layer 2 switching (Ethernet)
- b) RLA e.g. for home offices



**Guaranteed**  
p t p  
leased line

**Leased Line service with STM1 / OC3 (155 Mbps) line speed. Additional VC 12 (2 Mbps) Mux possible**

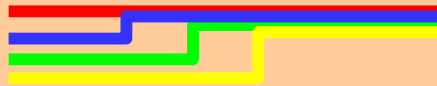


**Broadcast**

**Analog and digital broadcast according DVB standards using FDM, pay TV**

## Cases for Operators

### Lease fiber



**Example: City of Stockholm (one connection point each block in 2002)  
Milano (20% of households in reach of fiber)**

### Provide transport solution (Enet, SDH, ATM, FR)



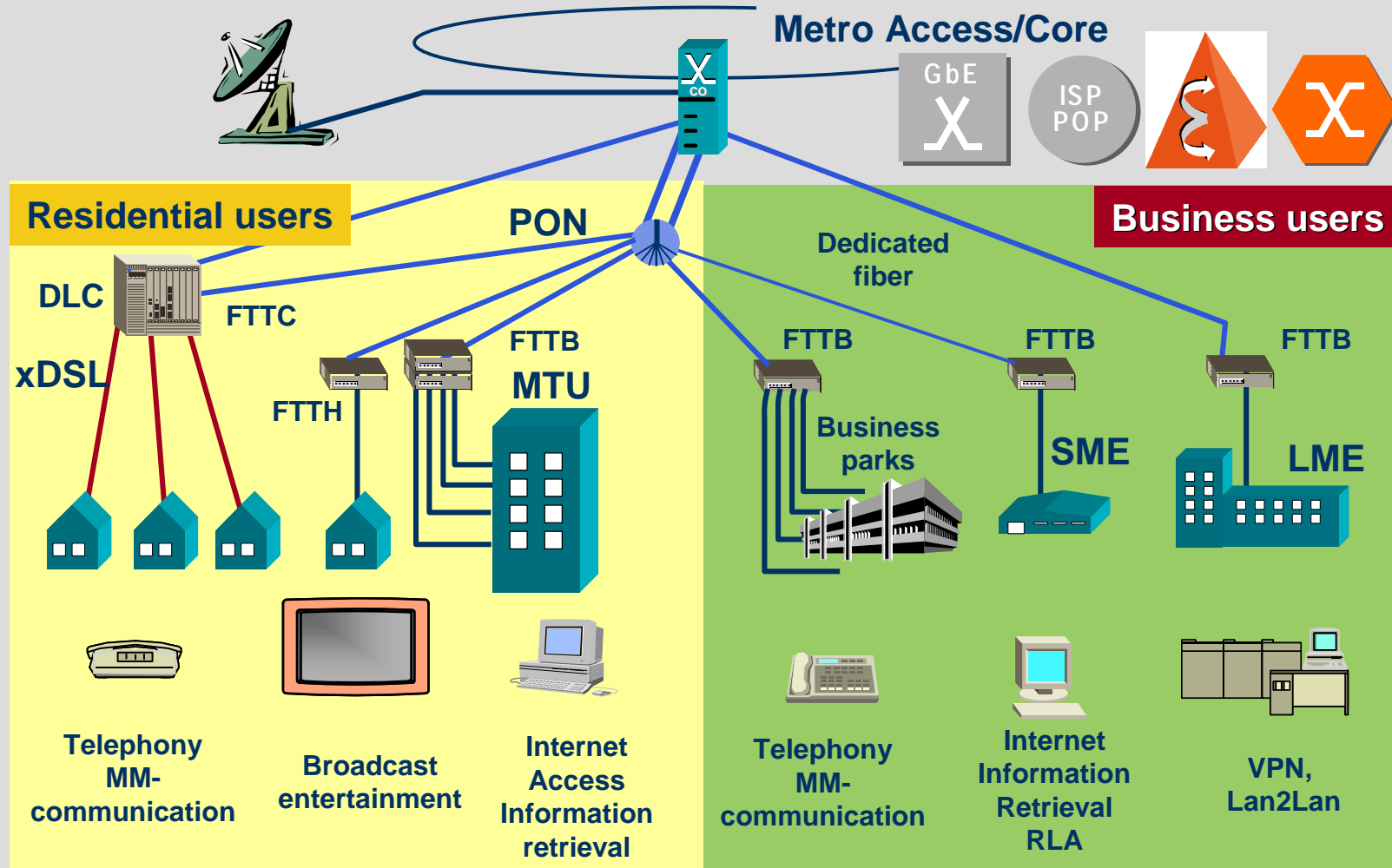
**Example: BT, City of Palo Alto CA, Colt  
France: State funded infrastructure –  
Caisse des Depots et Consignations  
(CDC)**

### Provide end user services Telephony, broadcast, Internet access, VPN, ..



**Example: Hamburg-Norderstedt,  
Bredbandsbolaget (video and transport) in  
Sweden, Norway, Denmark**

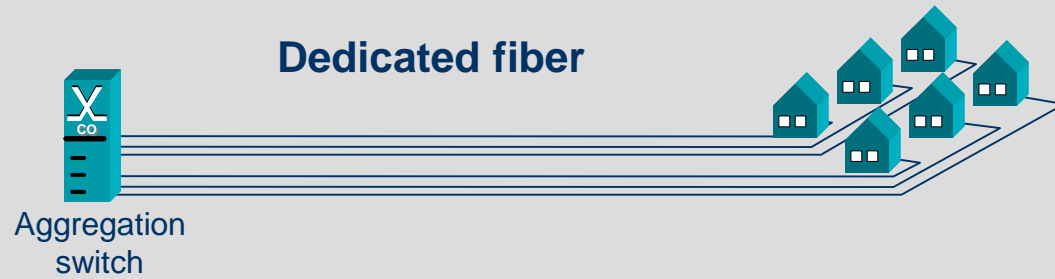
# Optical Access Network Concept



# Optical Access Principles

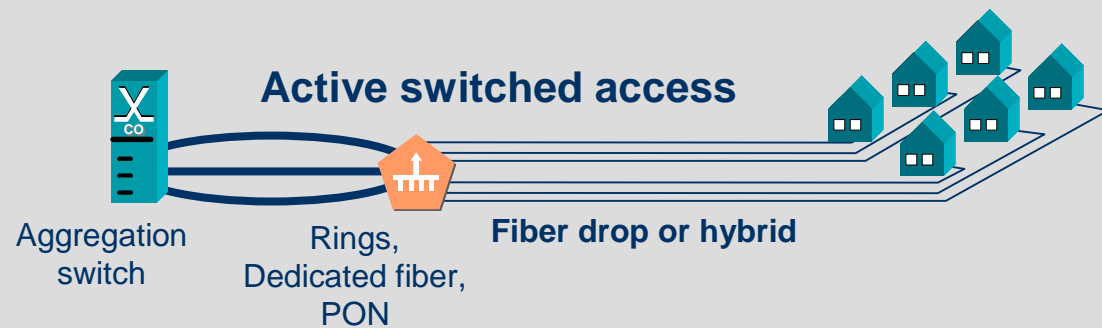
## Transport method:

- ATM
- SDH
- Enet
- PPP/IP



## switching method:

- IP/SRP
- Enet/RPR
- ATM
- MPLS
- SDH

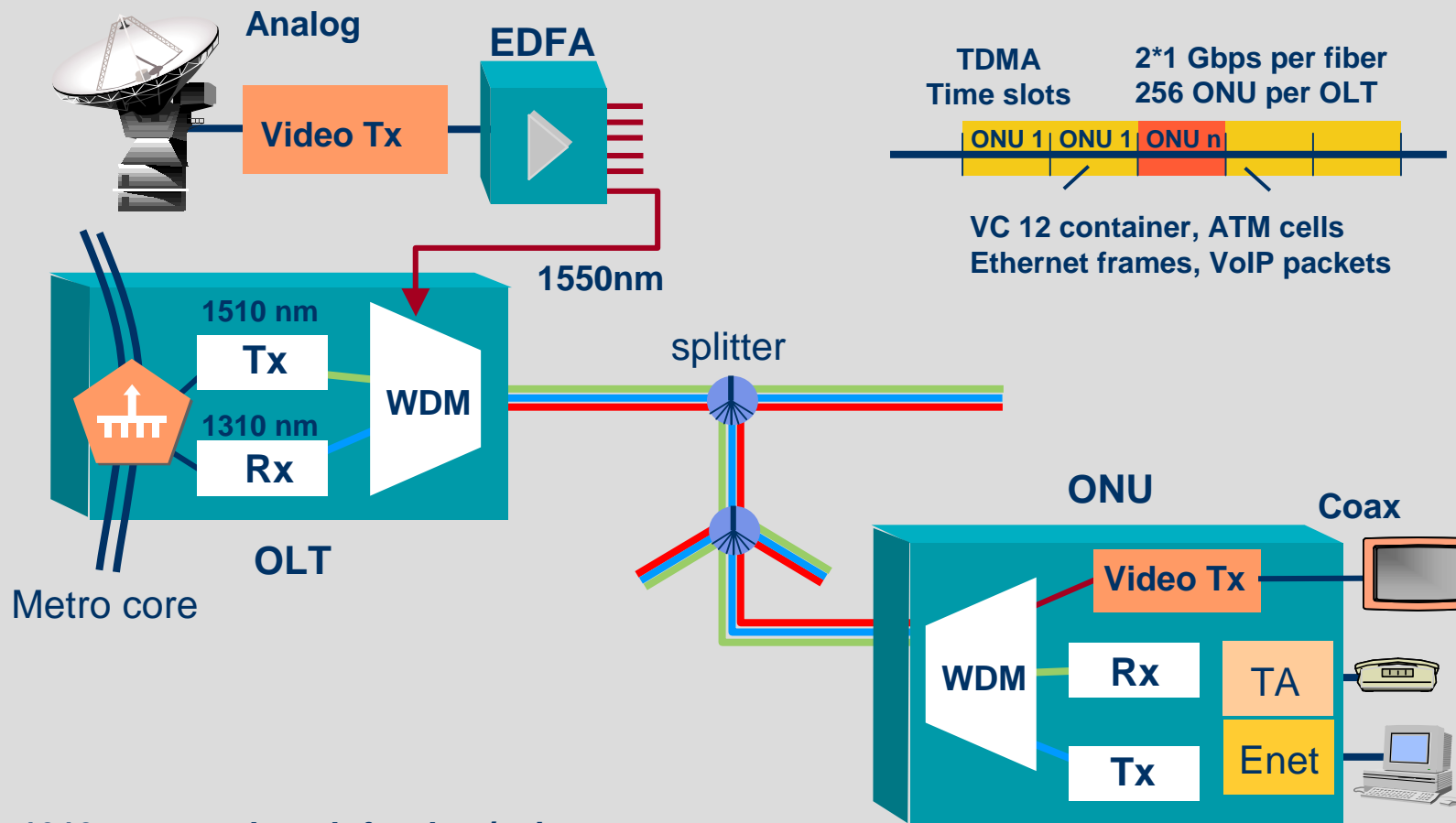


## MAC principle:

- WDM
- TDMA



# Multi Services on a Single Fiber



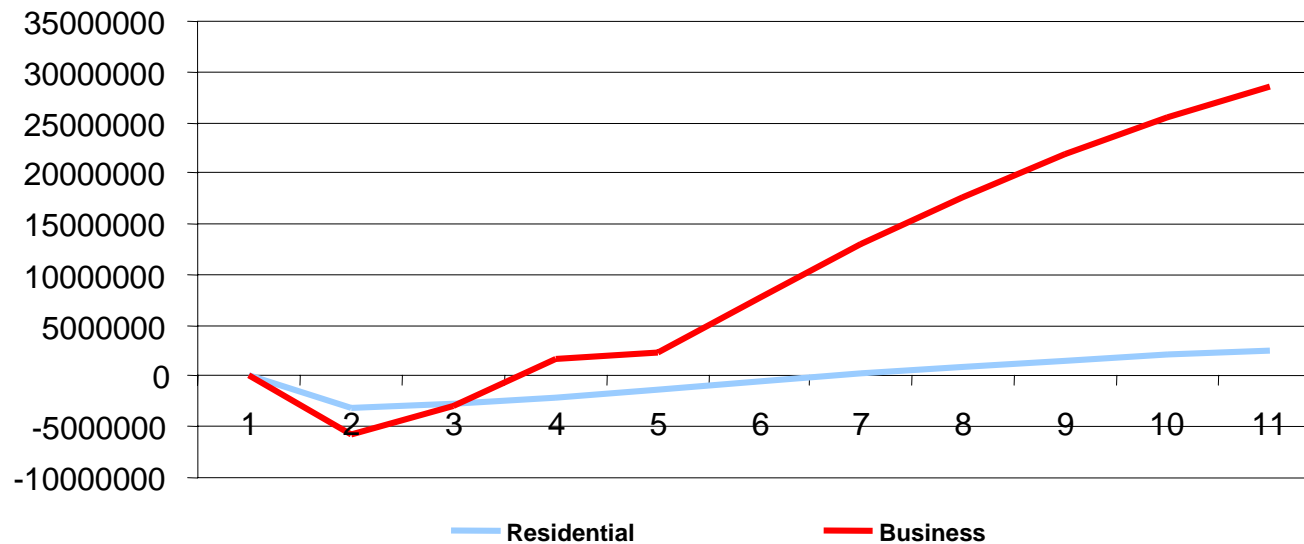
1310 nm wavelength for data/voice upstream  
 1510 nm wavelength for data/voice downstream  
 1550 nm wavelength for video/MPEG2

# Performance Examples

	<b>Total Bandwidth</b>	<b>Number of buildings</b>	<b>Number of Users</b> Conc. 1:6	<b>Committed bandwidth</b>	<b>Excess bandwidth</b>
<b>Per OLT</b>	26 Gbps + TV channels	<b>256</b>	<b>7680</b>	<b>2*2* STM 16</b>	<b>16 Gbps</b>
<b>Per fiber</b>	1Gbps + TV channels	<b>16</b>	<b>480</b>	<b>1 Gbps</b>	<b>1 Gbps</b>
<b>Per ONU</b>	≥ 60 Mbps Depending on # of ONUs	<b>30</b> Connected to ONU (FTTC)	<b>30</b>	<b>2 Mbps</b> Per user	<b>≥ 60 Mbps</b> Per user

# Business Case - Operator

NPV at 10%



2 Km<sup>2</sup> greenfield area, with 200 buildings  
 Operational expenses as percentage of installed CAPEX  
 Backbone costs and in-house cabling not included

# Danke für Ihre Aufmerksamkeit

## Optische Zugangsnetze sind wirtschaftliche Alternative:

- bei neuen Infrastrukturbaumaßnahmen
- Kostengünstige technische Konzepte
- Optimierte Einnahmen durch umfassendes Dienstangebot für Privat und Geschäftskunden

## Zukunftssichere technische Lösung:

- Passive optisches Netz für private Nutzer im Mehrfamilienhaus
- Dedizierte Faser für größere Firmen
- WDM Multiplexen für analoge FS Signale

## Rahmenbedingungen, regulatorische Hilfen:

- Steuerförderung
- Investitionssicherung/kein unbundled access