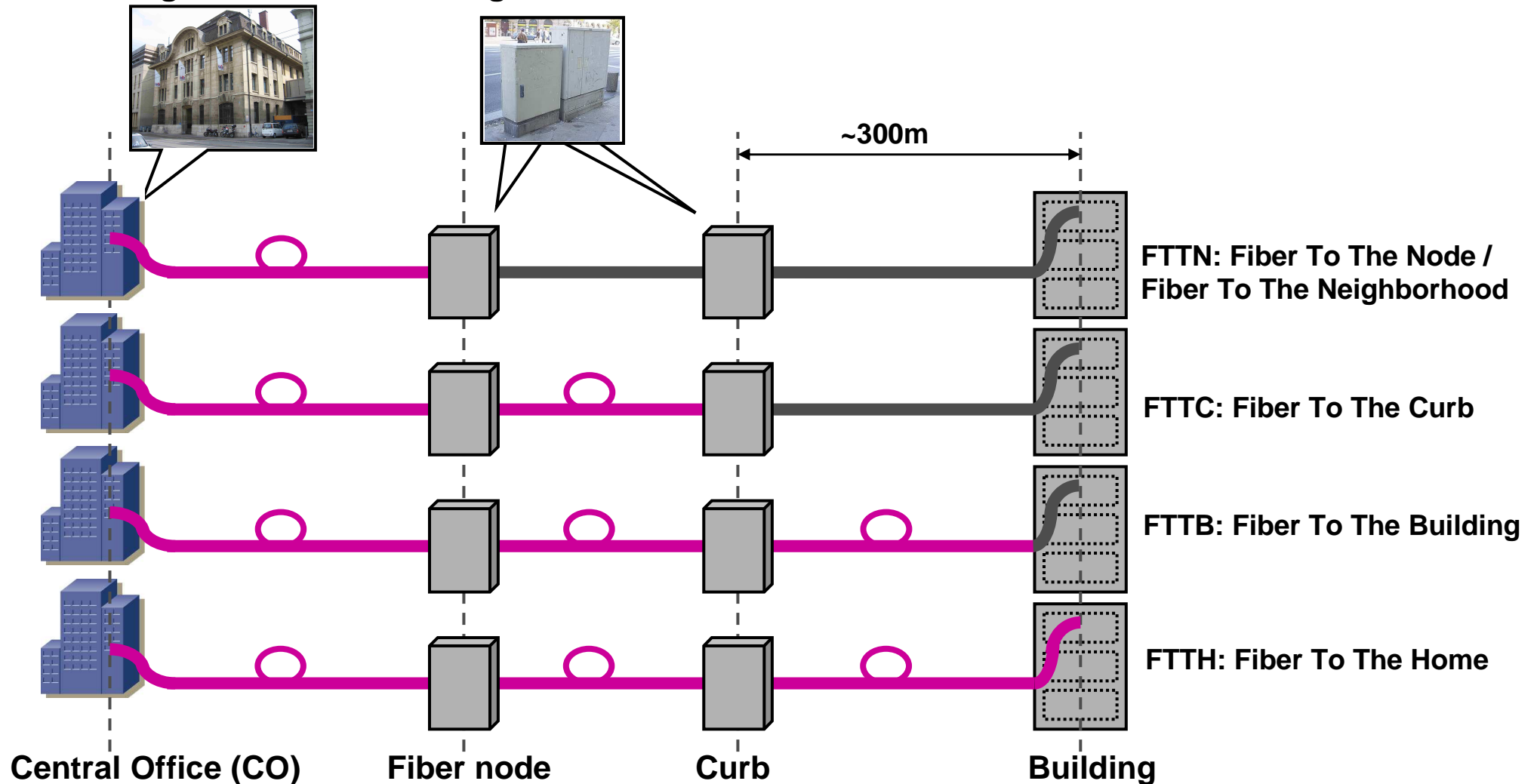# FTTx

- **Fiber network architecture terms**

FITL → Fiber In The Loop. (Local) loop = connection from telco building to customer building.
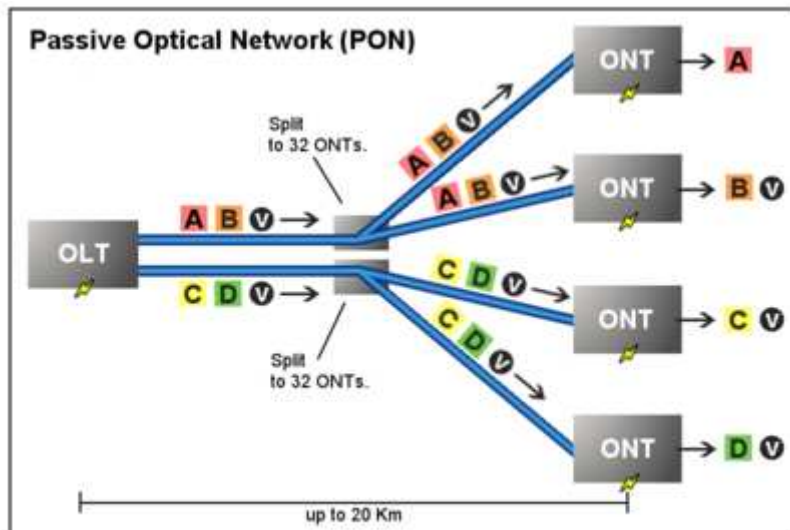
— **Fiber (optical)**
— **Cable (copper)**

~300m

FTTN: Fiber To The Node / Fiber To The Neighborhood

FTTC: Fiber To The Curb

FTTB: Fiber To The Building

FTTH: Fiber To The Home

Central Office (CO)   **Fiber node**   **Curb**   **Building**

• Fiber distribution network technologies

PON (Passive Optical Network):

→ **Point to multipoint fiber network.**

→ **Use of unpowered optical splitters.**

+ Passive (no electrical power needed)

- No buffering of frames / packets (collisions)

AON (Active Optional Network):

→ **Use of active switches (usually Ethernet) to distribute the signals.**

+ Buffering of frames (reduce collisions)

- Electrical power needed (reliability)

Source: http://en.wikipedia.org/wiki/FTTH

Source: http://en.wikipedia.org/wiki/FTTH

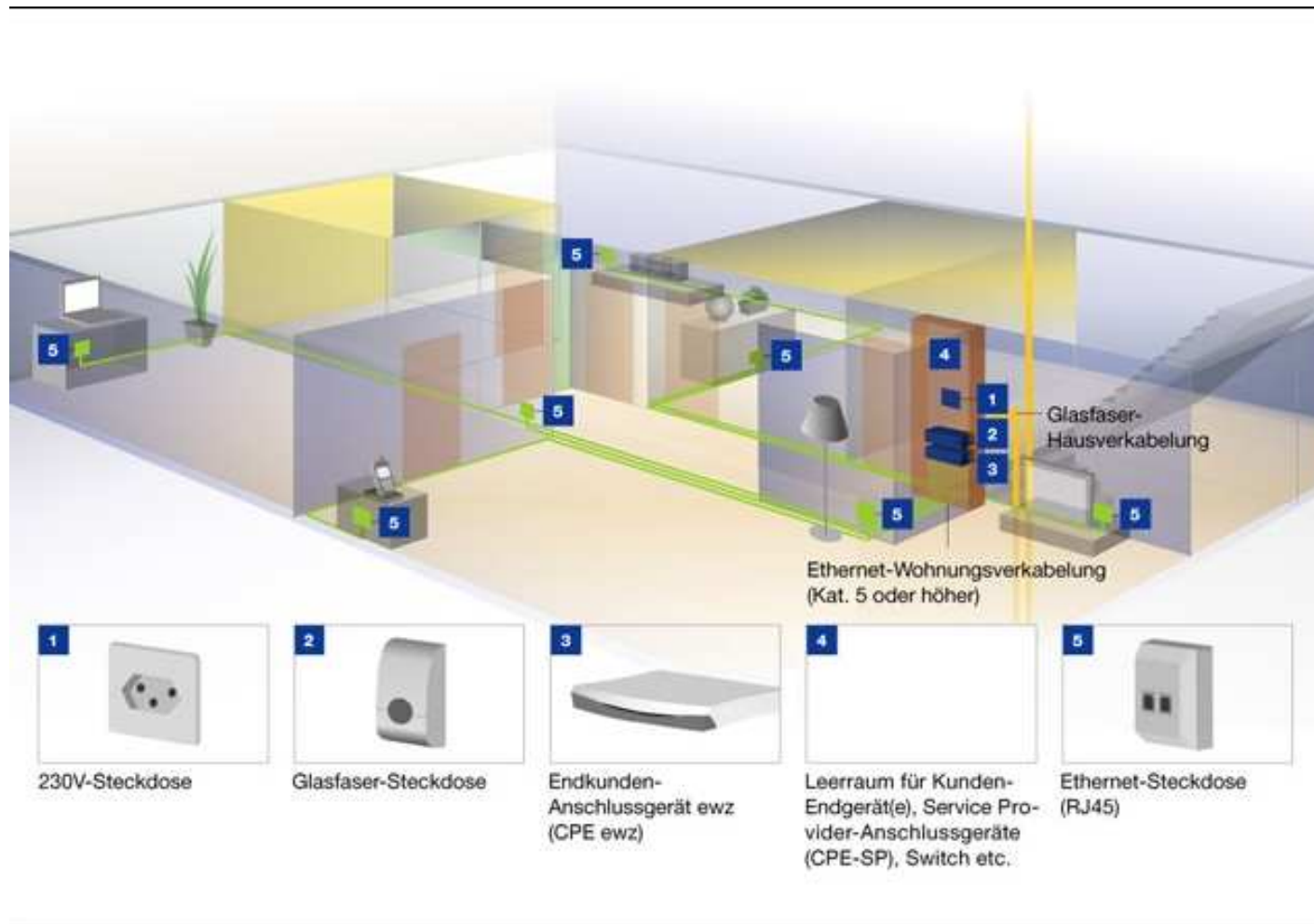**Direct fiber:**

→ **1 dedicated fiber to each customer.**

+ Dedicated bandwidth for each customer
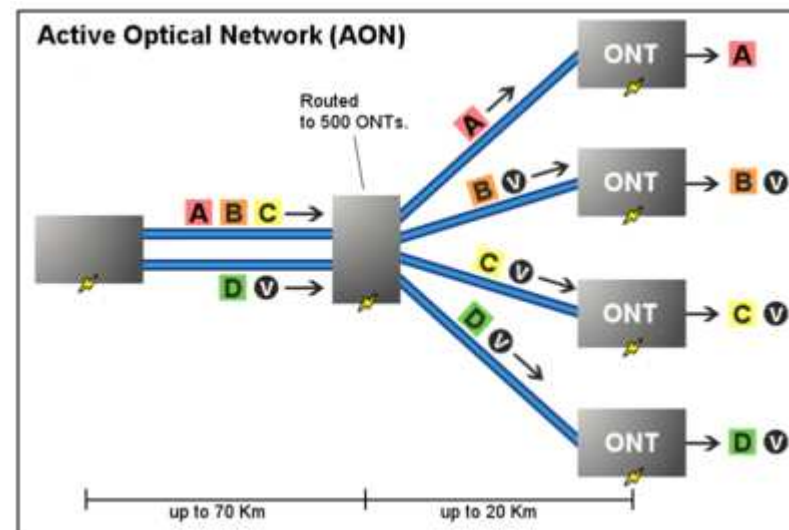
- Expensive

• ewz.zürinet (1/6)

Hausinstallation

Wireless LAN

Endkunden-Anschlussgerät ewz (CPE ewz)

Ethernet-Wohnungsverkabelung

Endkunden-Anschlussgerät ewz (CPE ewz)

Glasfaser-Wohnungsverkabelung

Endkunden-Anschlussgerät ewz (CPE ewz)

Glasfaser-Hausverkabelung

Hausanschlusskasten
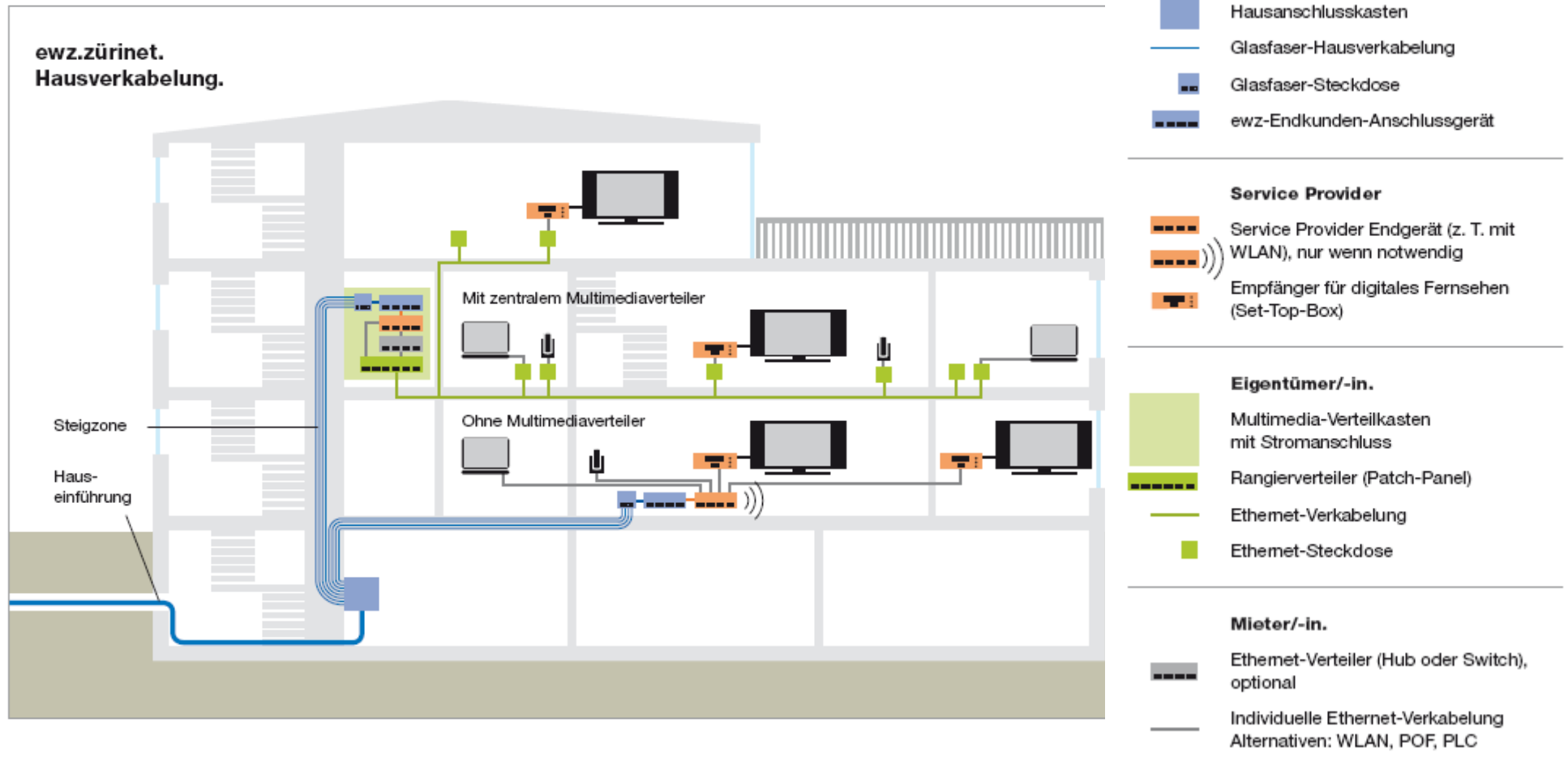
ewz-Netzknoten

ewz-Glasfasernetz   Glasfaser-Anschlussleitung

Source: http://www.stadt-zuerich.ch/content/ewz/de/index/telecom/ewz_zuerinet.html

• ewz.zürinet (2/6):
Wohnungsanschluss (1/2)

1	2	3	4	5
230V-Steckdose	Glasfaser-Steckdose	Endkunden-Anschlussgerät ewz (CPE ewz)	Leerraum für Kunden-Endgerät(e), Service Provider-Anschlussgeräte (CPE-SP), Switch etc.	Ethernet-Steckdose (RJ45)

Glasfaser-Hausverkabelung

Ethernet-Wohnungsverkabelung (Kat. 5 oder höher)

• ewz.zürinet (3/6):
### Wohnungsanschluss (2/2)

- **ewz.zürinet (4/6):**

Diskriminierungsfreier Zugang:

EWZ installs 4 fibers to each home.
1 fiber is reserved for EWZ, the other 3 may be used by other providers (also by EWZ).
The customer / home owner selects his preferred provider(s) and grants these the right to use the fiber(s) and offer services.
Template contract see http://www.hev-zuerich.ch/aktuelles/ewz.zuerinet.pdf
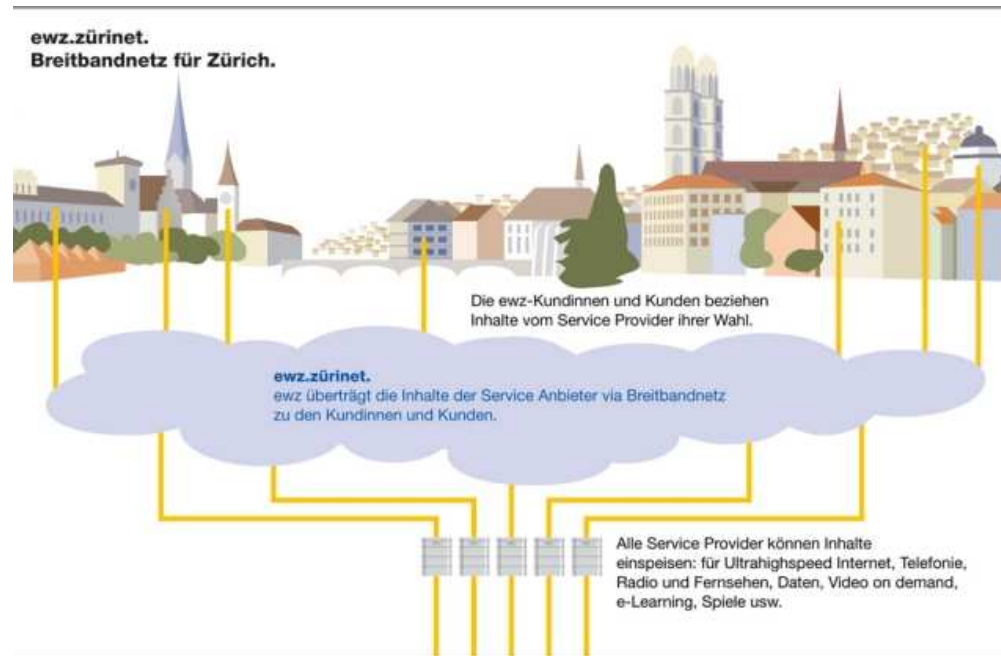
Source: http://www.stadt-zuerich.ch/content/ewz/de/index/telecom/ewz_zuerinet/das_breitbandnetzfralle.html

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• **ewz.zürinet (5/6):**

Carrier Ethernet as base technology for connecting customers:

Advantages of Ethernet as base technology:

→ **Proven technology (successfully deployed in LANs around the world)**

→ **Simple**

→ **Integrates well with TCP/IP (ARP, multicast)**

Differences of carrier (grade) Ethernet versus LAN:

+ **Reliability (99.999%, protection switching < 50ms in case of failures)**

+ **Scalability (many customers)**

+ **Service management (supervision of SLA – Service Level Agreement)**
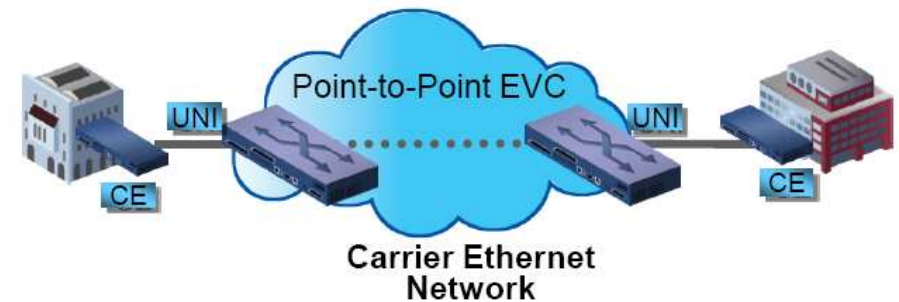
+ **QoS (Quality of Service)**

• ewz.zürinet (6/6):

ewz.zürinet services:

1. E-Line:

→ **Ethernet Private Line (like leased line, but based on Ethernet)**
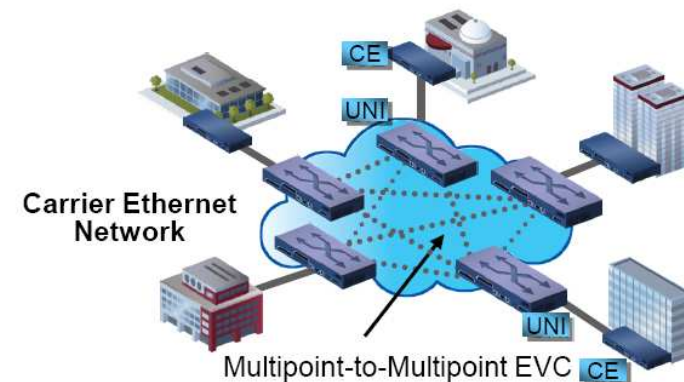
→ **Application: Residential Internet access**

2. E-LAN:

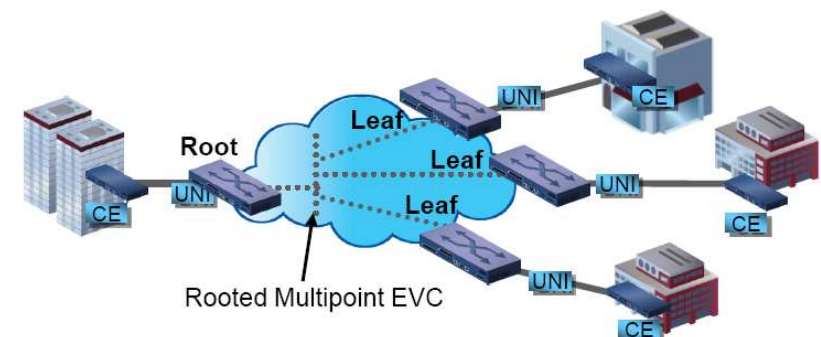→ **Multipoint layer 2 service (like Ethernet LAN, but metropolitan span)**

→ **Application: Connection of branch offices**

3. E-Tree:

→ **Point to multipoint (1 root, multiple leafs, no direct connection between leafs)**

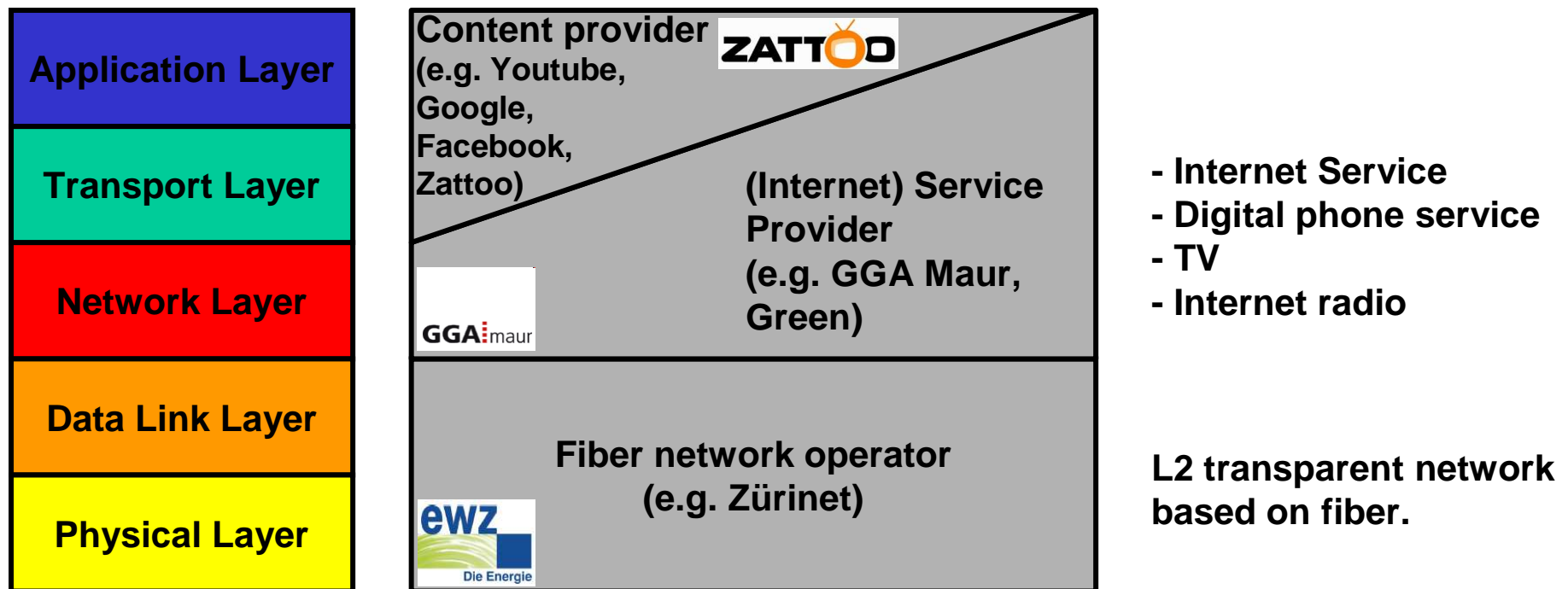→ **Application: Video distribution (Video on Demand)**

Source: http://www.security-zone.info/download/kongress09/s8_ewz.pdf

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HOCHSCHULE
FÜR TECHNIK
ZÜRICH

• **Separation between providers through protocol layers**

Clear separation between fiber network operator (L1+L2) and ISP (>=L3).
ISPs of course see themselves also as content provider (TV, Video on Demand, Internet radio).

| Application Layer |
| Transport Layer |
| Network Layer |
| Data Link Layer |
| Physical Layer |

Content provider (e.g. Youtube, Google, Facebook, Zattoo)

ZATTOD

(Internet) Service Provider (e.g. GGA Maur, Green)

GGA maur

Fiber network operator (e.g. Zürinet)

ewz Die Energie

- Internet Service
- Digital phone service
- TV
- Internet radio

L2 transparent network based on fiber.

See also http://www.slideshare.net/ceobroadband/ftth-conference-2009-ewz-zurinet-case