

Technologies and applications of Passive Optical Networks (PON)

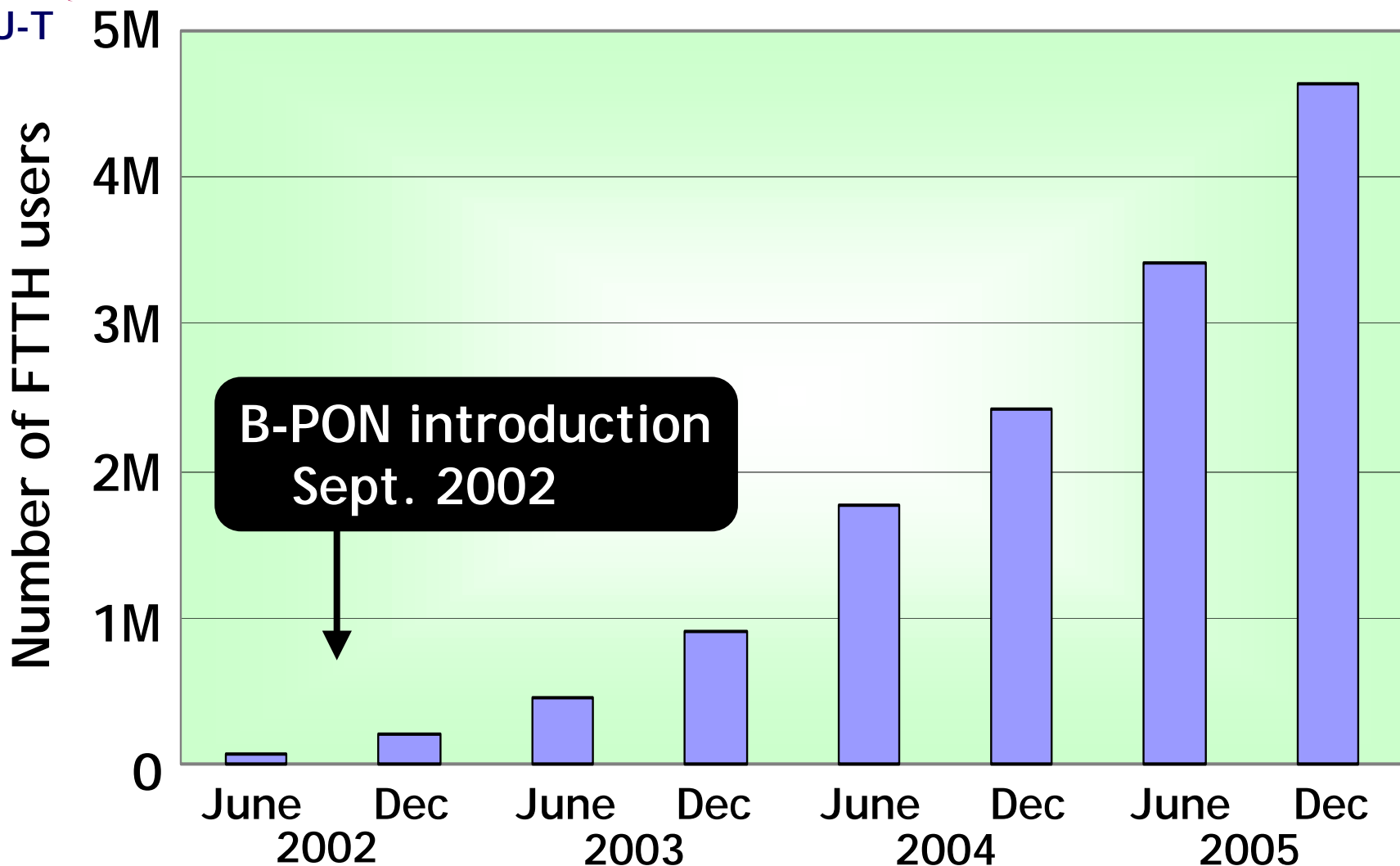
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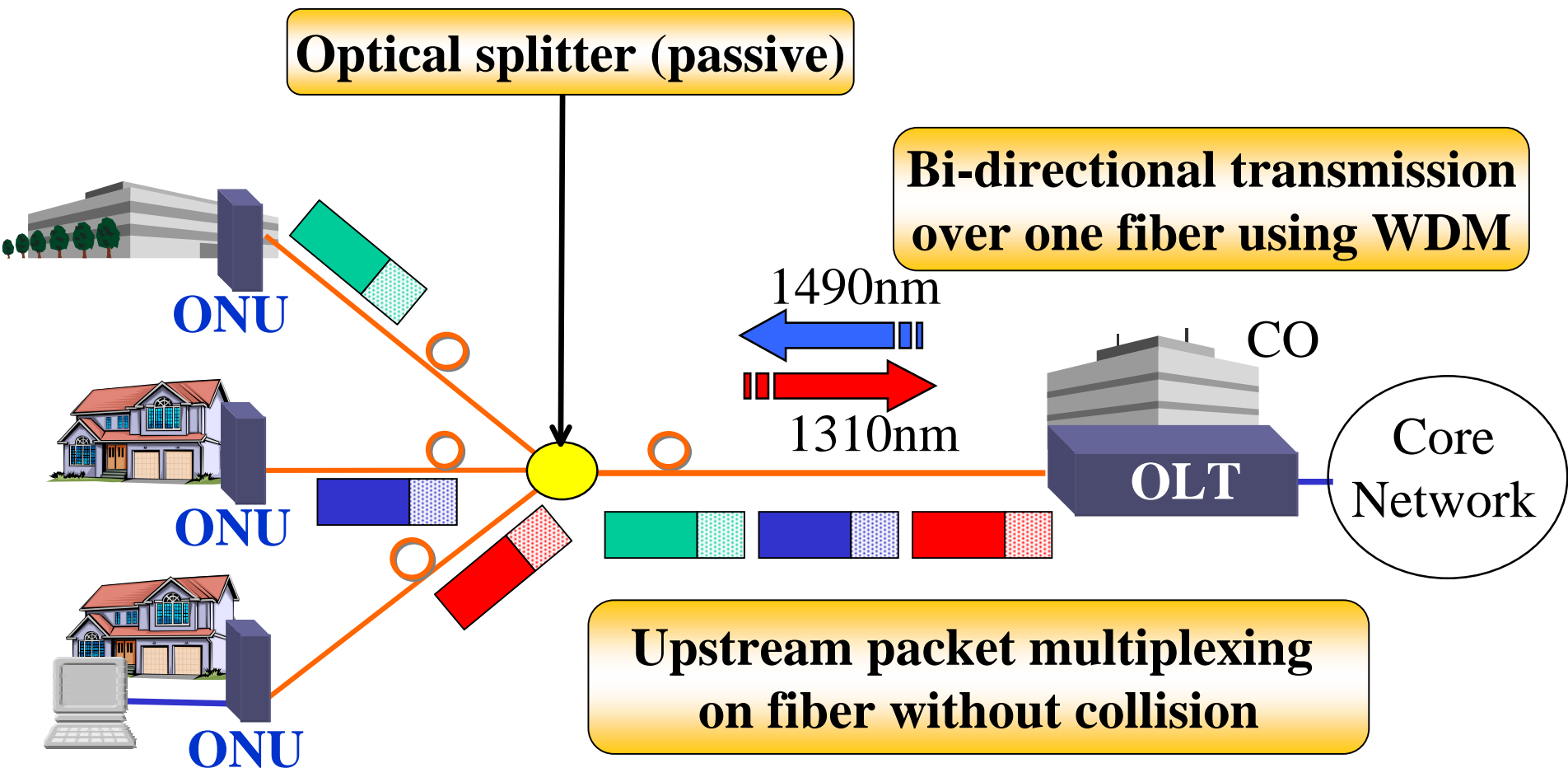
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FTTH Penetration in Japan



Source: Ministry of Internal Affairs and Communication, Japan

PON Technologies





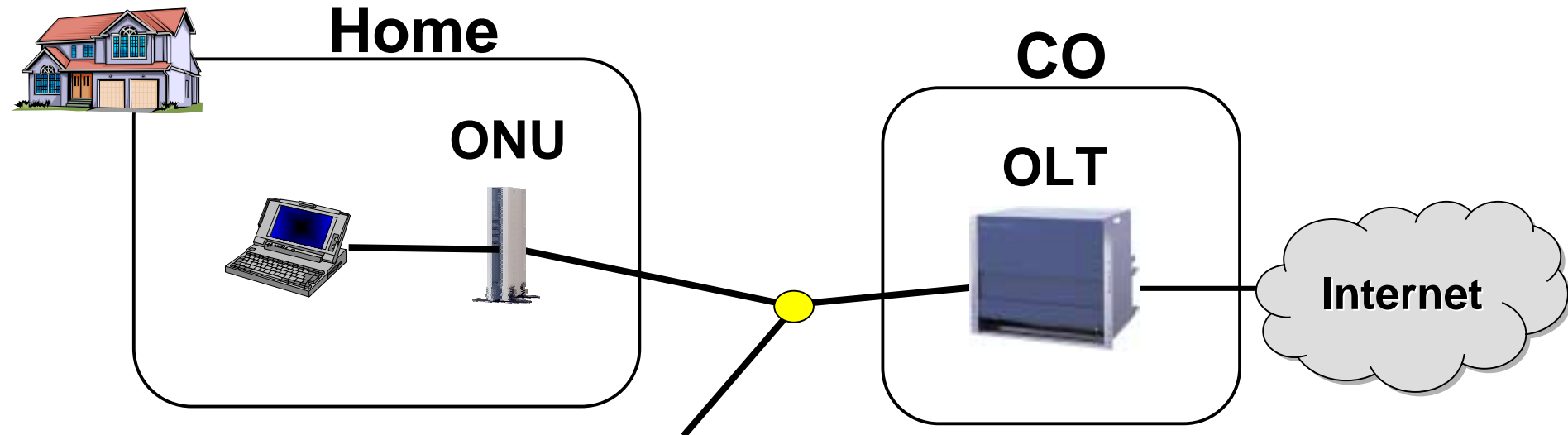
PON Advantages

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- o Very high speed data up to 1 Gbit/s to home and businesses
- o Maintenance cost reduction due to no electronics between CO and customers
- o Low cost due to fiber and CO interface shared by several customers
- o Constant data rate regardless of reach
- o Multiple applications including data (IP), video and voice (triple play)

Broadband Internet application

- FTTH in Japan started from simple application of IP/Ethernet and it is still dominant
- Simple indoor ONU enabling economical Broadband access of 100 Mbit/s best effort service
- The service is like simple extension of ADSL

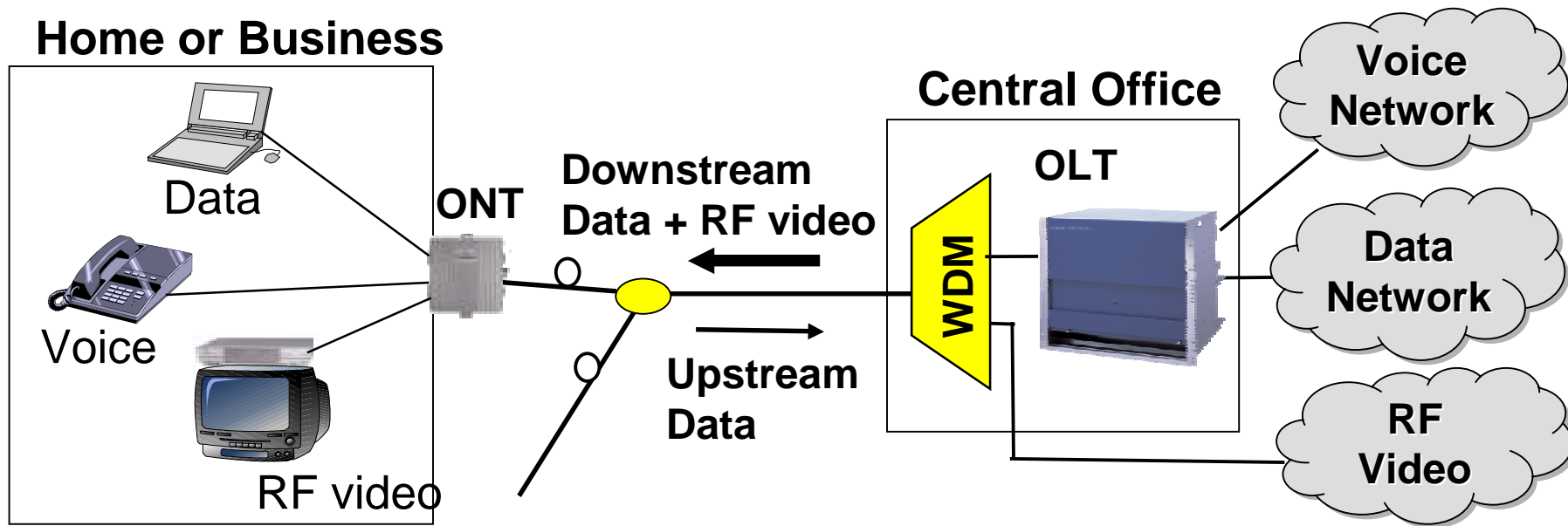




Triple play with RF video

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- o RF overlay using WDM provides conventional CATV type video service in addition to Broadband Internet
- o Very popular in North America

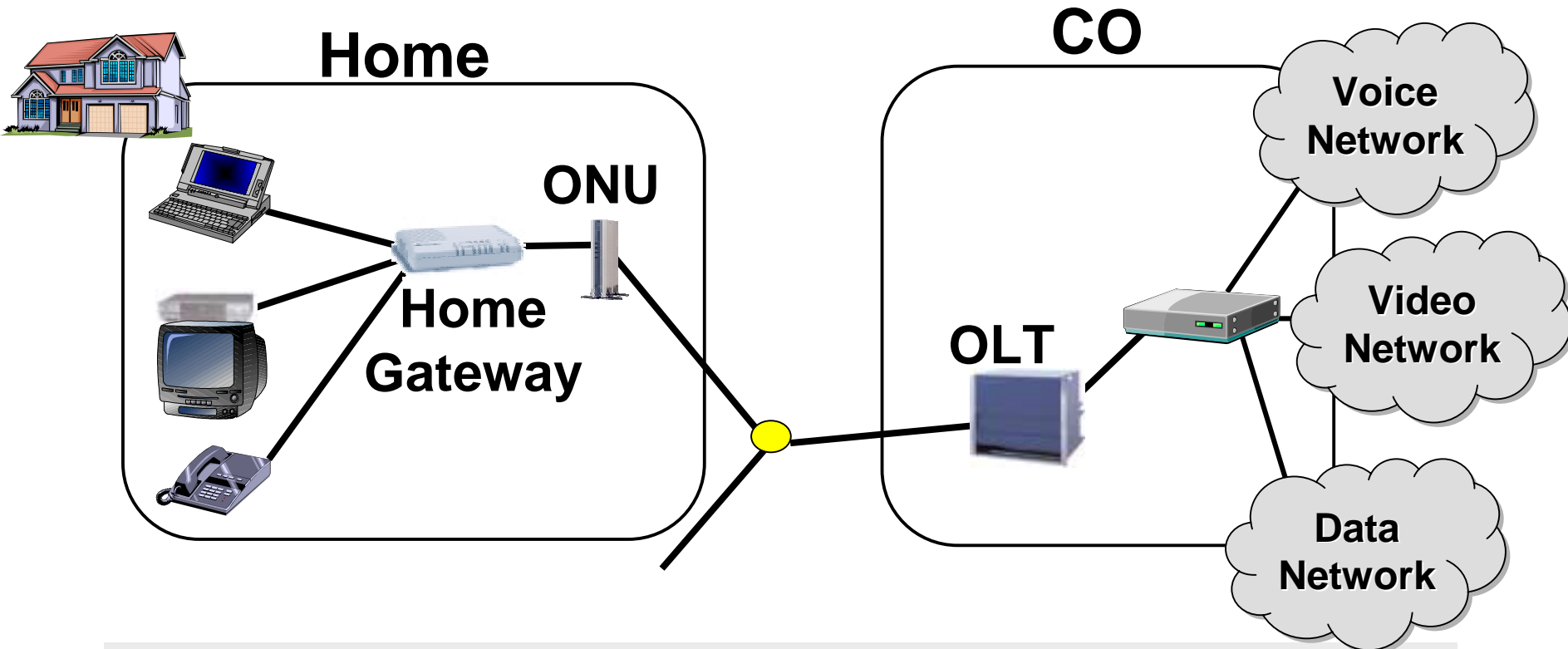




IP triple play application

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- o Home Gateways to separate IP video and provide POTS conversion
- o Entire network based on IP and Ethernet





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PON Comparison

	B-PON	GE-PON	G-PON
Standard	ITU-T G.983	IEEE 802.3ah	ITU-T G.984
Downstream data rate	600 Mbit/s	1 Gbit/s	2.4 Gbit/s
Upstream data rate	150 Mbit/s	1 Gbit/s	1.2 Gbit/s
Transmission Format	ATM	Ethernet	Ethernet + TDM +ATM

(Note) Rates of common practice.

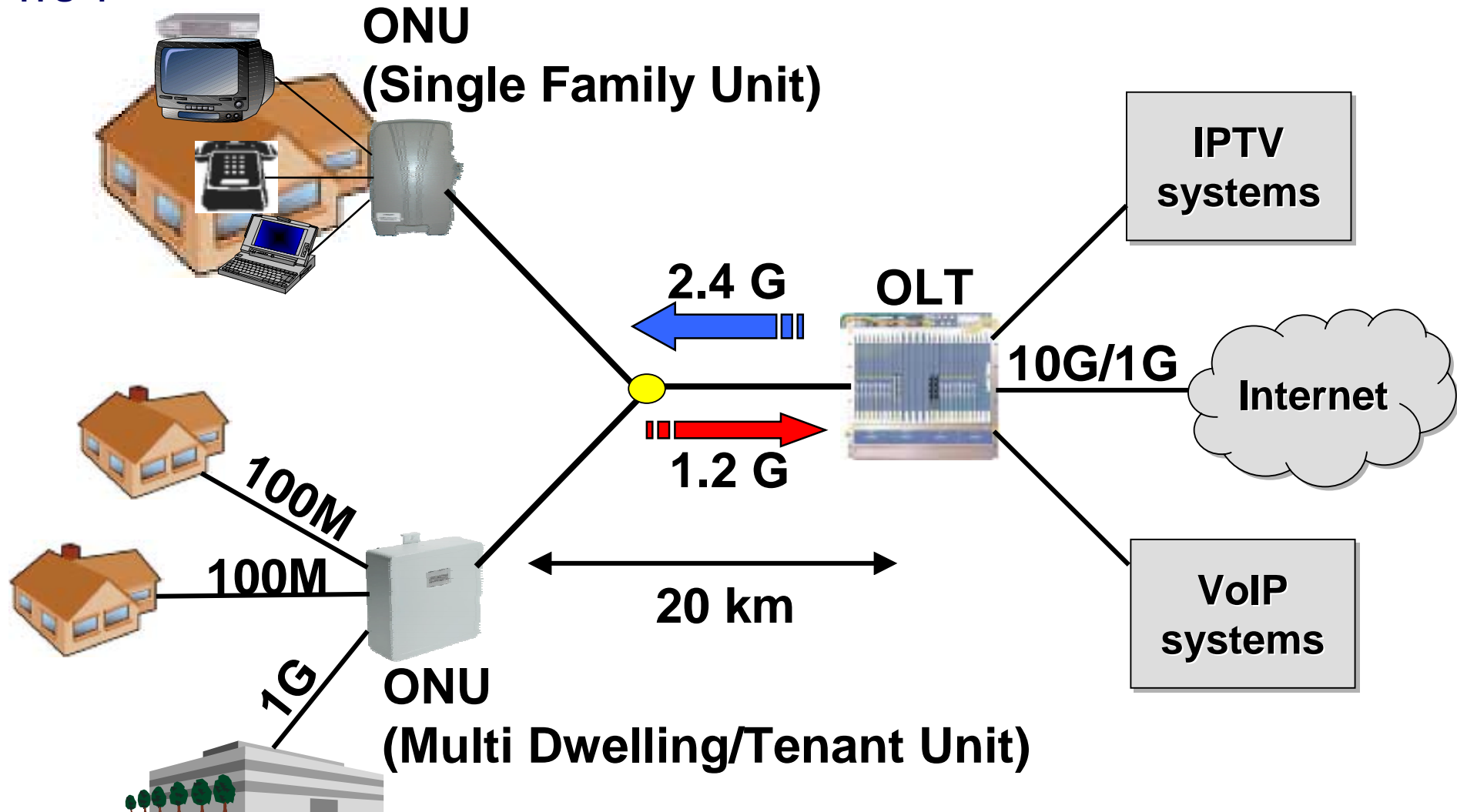


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Why GPON now?

- o Standardized by telecom operators and telecom vendors in ITU-T
- o Various operation and management capability inherited from conventional proved telecom technologies
- o Future-proof bandwidth
 - $2.4 \text{ G} / 64 \text{ users} = 35 \text{ M per user}$
 - $35 \text{ M} = 6 \text{ M (HDTV-MPEG4)} \times 4 \text{ ch} + 10 \text{ M (Internet)}$
- o Suitable for business users because of various QoS and bandwidth management

GPON example



Possible Future Directions

- o Technology available and massive GPON deployment soon
- o IP HDTV service in near future
- o More bandwidth by higher transmission rate or WDM technology
- o Longer reach by optical amplifier
- o Higher splitter ratio (more users per PON) by optical amplifier

Conclusion

- o B-PON initiated the first massive PON rollout in Japan
- o PON technology is suitable for triple play services (voice, video, data)
- o Future-proof G-PON technology available and soon to be deployed massively