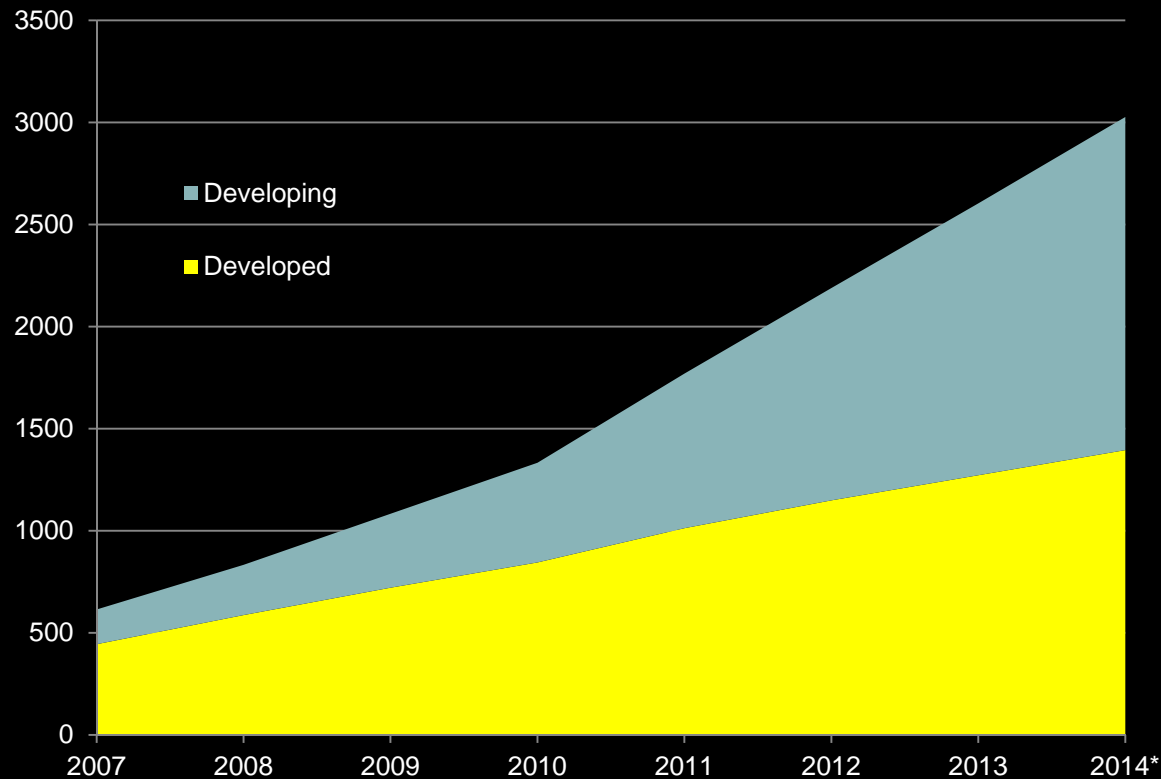


Key Work by ITU-T Study Group 15 on Key Standards

Hiroshi Ota,
Study Group Advisor, SGs 12 & 15
ITU

We've come a long way...

Broadband subscriptions (millions)

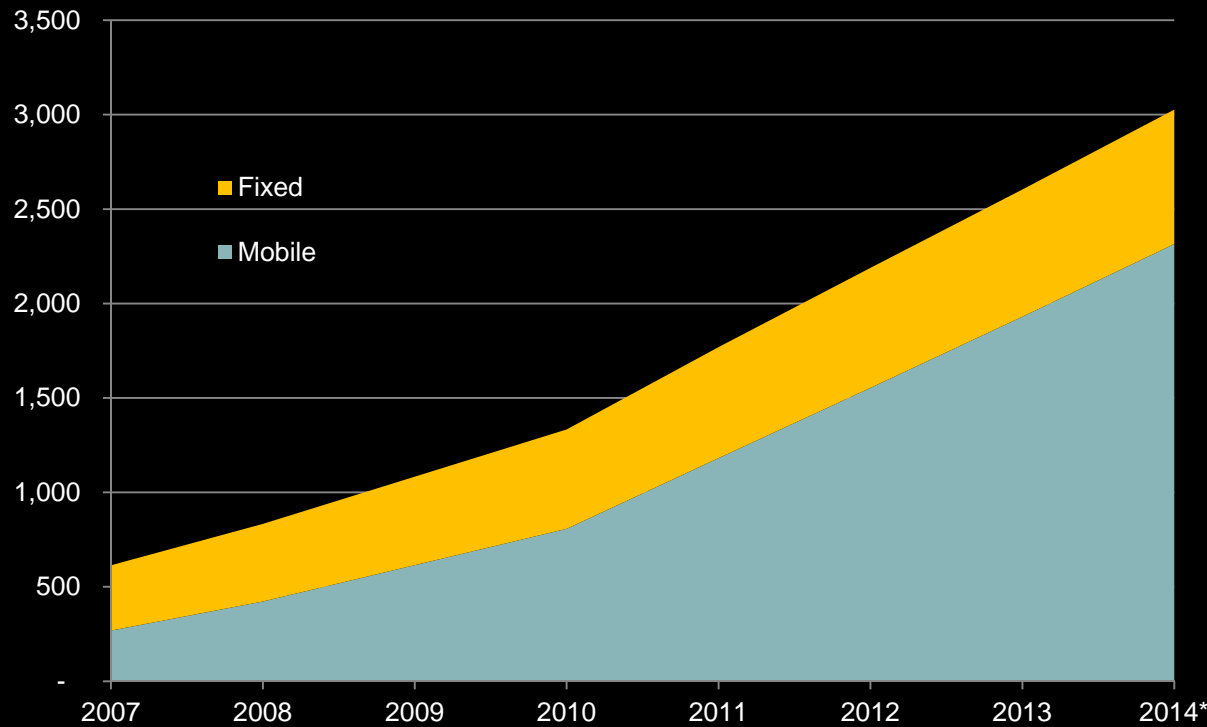


Total: 3.0 bn (2014 year end)

Source: [ITU](#)

Broadband to go...

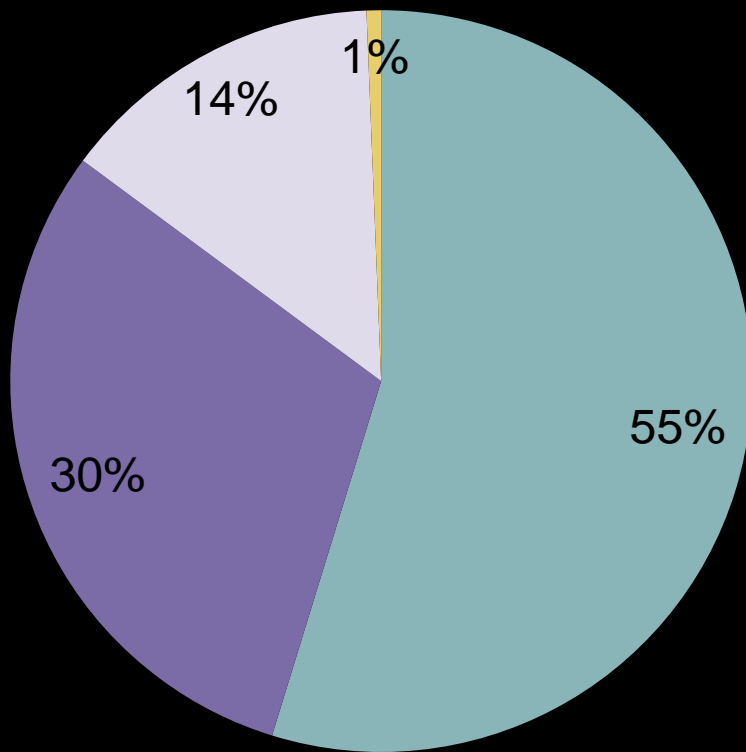
Broadband subscriptions (millions) by access



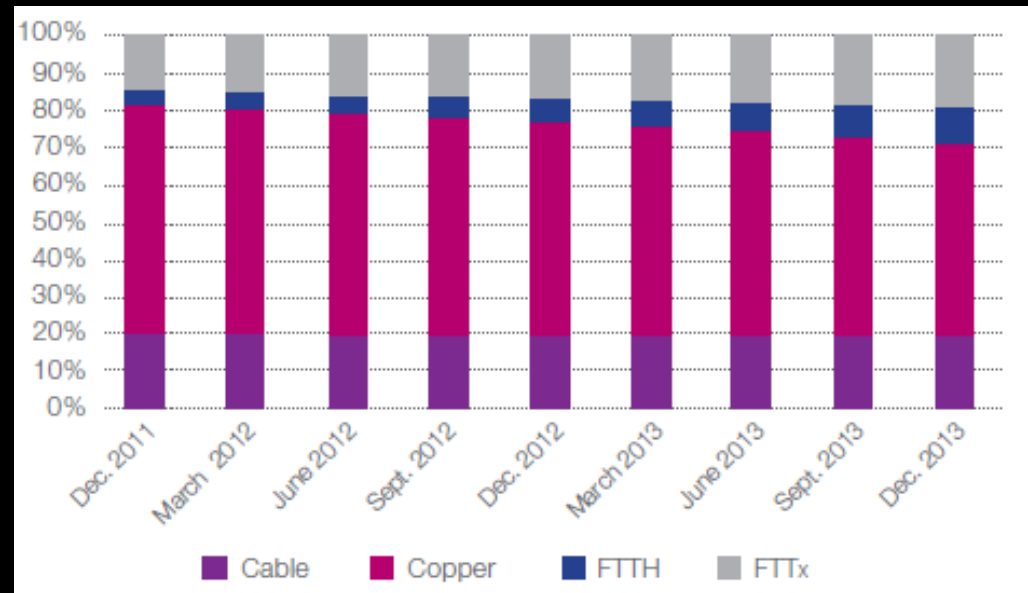
Total: 3.0bn (2014 year end)

Source: [ITU](#)

Fixed broadband by technology



- DSL
- Cable
- Modem
- Fibre + LAN



Total: 321 million subscriptions in OECD countries (June 2012)

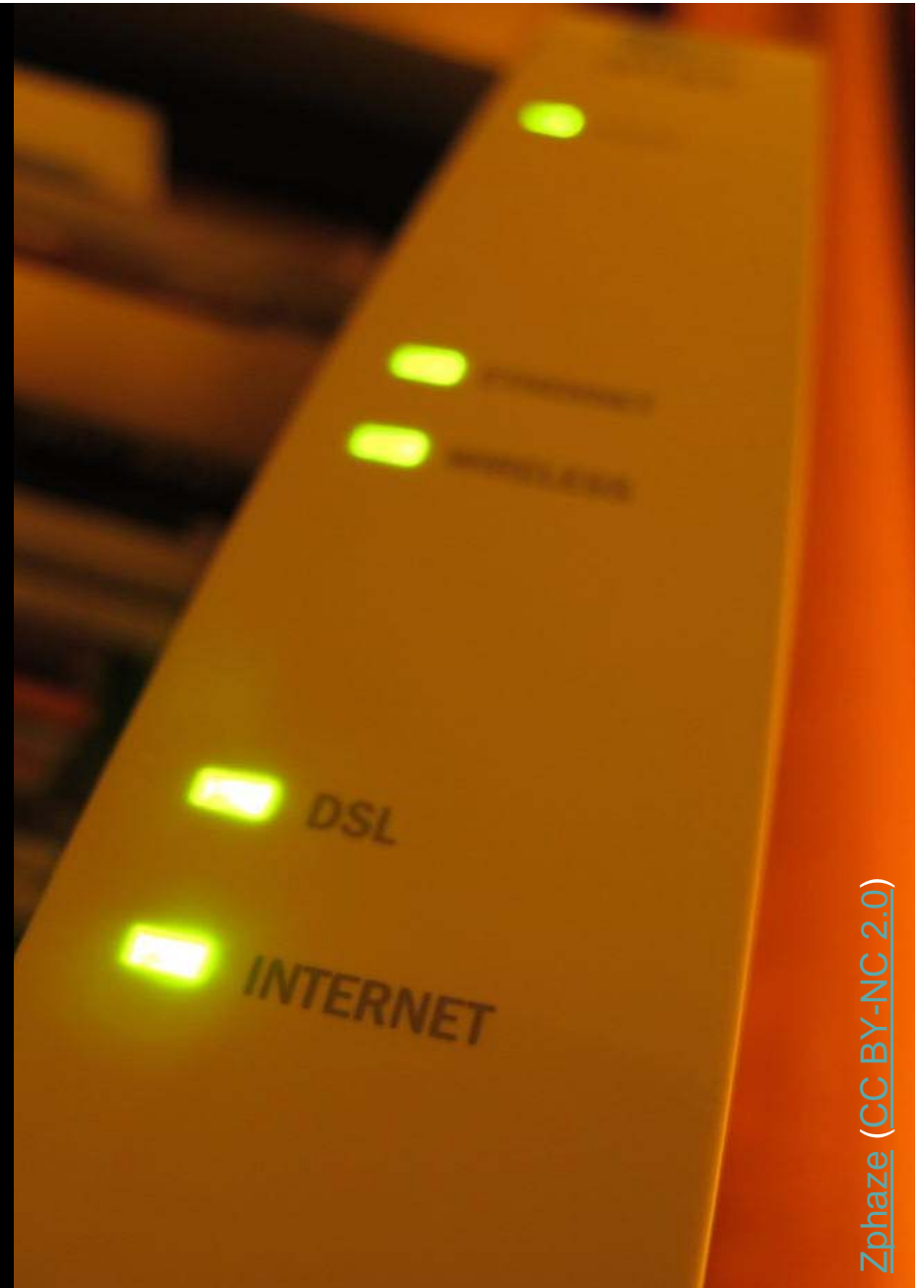
Source: [OECD](#)

DSL

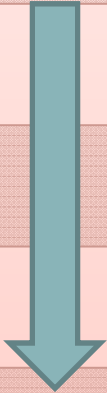
Copper based

Available in any
region of the world

Capable of providing
up to 100 Mbps, today



DSL

Type	ITU-T	Initial approval	Max down
HDSL	G.991.1	1998	2 Mbps
ADSL	G.992.1	1999	
SHDSL	G.991.2	2001	
ADSL2	G.992.3	2002	
VDSL	G.993.1	2004	
VDSL2	G.993.2	2006	100 Mbps
	G.fast	[2014]	1 Gbps



Cable

Hybrid Fibre Coaxial
wiring

Originally developed
to carry TV signals

Up to 250 Mbps



Cable

Type	ITU-T	Initial approval	Max down
	J.83	1998	38 Mbps
DOCSIS 1.1	J.112 (Annex B)	2001	50 Mbps
DOCSIS 2.0	J.122	2002	50 Mbps
DOCSIS 3.0	J.222.1	2007	$n \times 50$ Mbps
	J.atrans	[2013]	

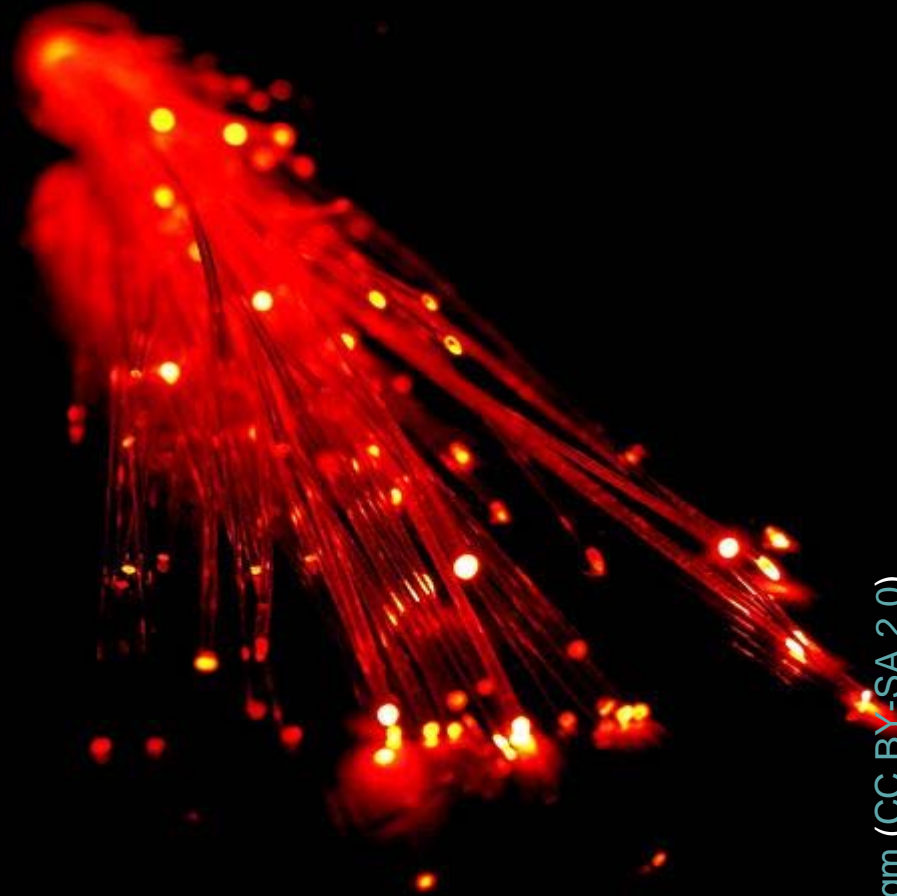
Specification



Fibre

Optical fibre to replace
all or part of the metal
local loop

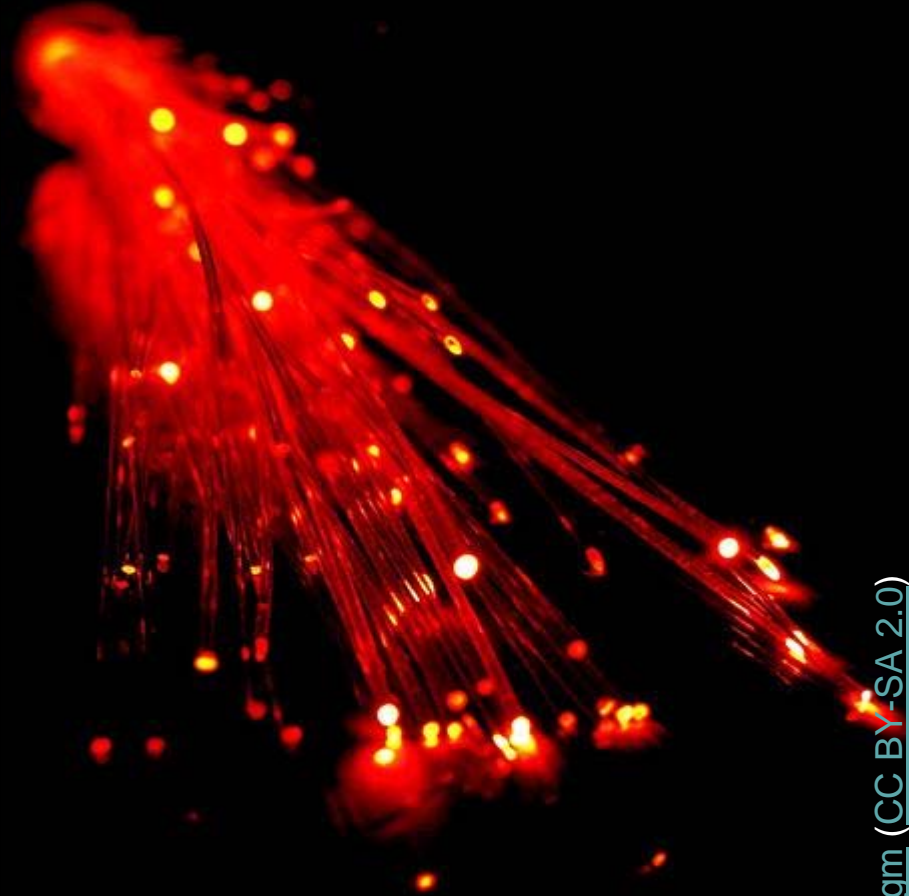
High speed over
(relatively) long
distances



Fibre

Type	ITU-T	Initial approval	Max down
BPON	G.983	1998	622 Mbps
GPON	G.984	2003	2.5 Gbps
XG-PON	G.987	2010	10 Gbps
NG-PON2	G.989	2013	40 Gbps

NETWORK



Optical Transport Networks (OTN)

Key enabler for fixed and mobile Broadband uptake

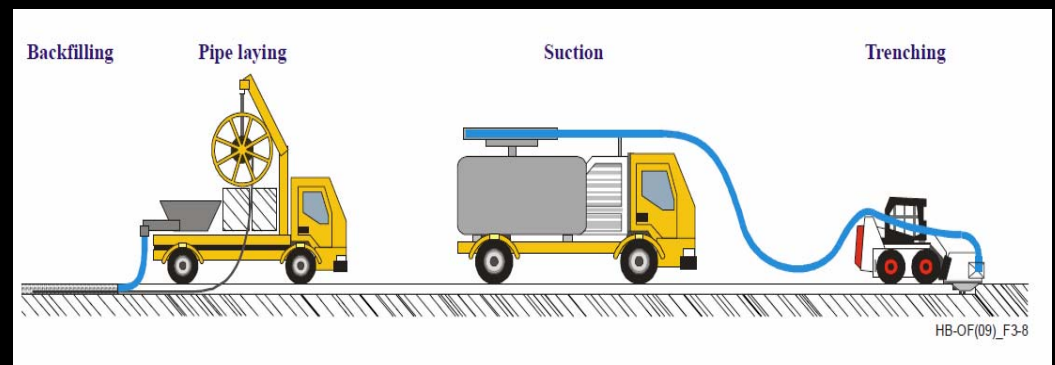
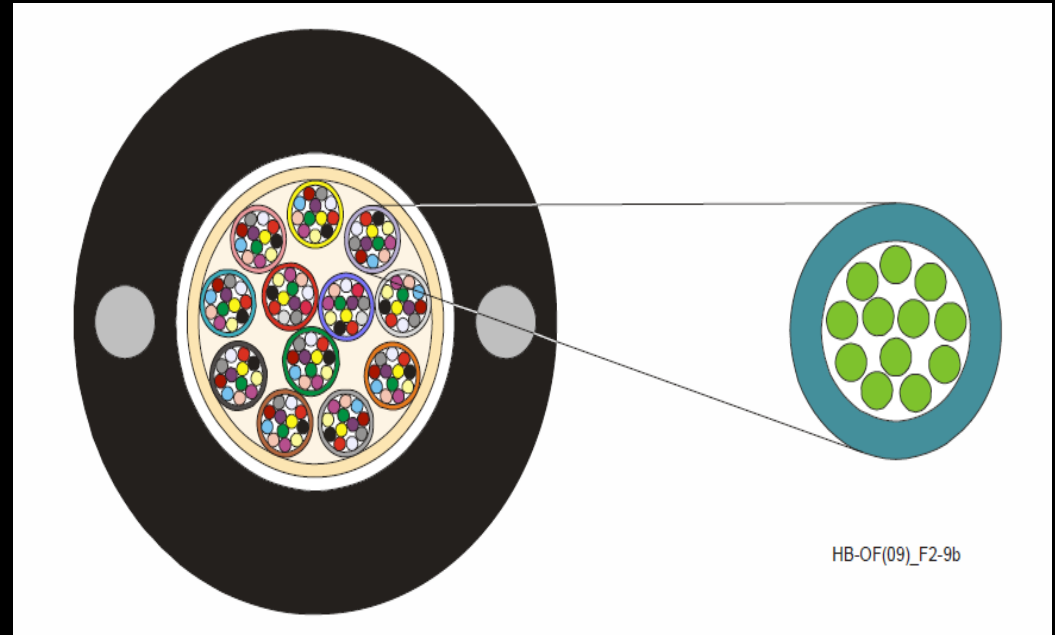
Mechanism to build multiple networks and services (e.g., video, Internet) over a single infrastructure

Key standards: ITU-T G.709, ITU-T G.798

Outlook: Faster, more efficient, resilient, cheaper core transport solutions – beyond 100 Gbps

The Fibre Basics

ITU-T L series standards for characteristics of fibres and cables, installation, system design, etc.



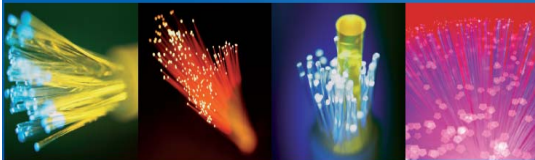
Taking Broadband to the Next Level

Ever faster broadband transport and access solutions over fibre, copper and fibre plus copper are in the pipeline.

ITU-T standards are an essential aid to countries in building and upgrading their infrastructure and encouraging economic development.

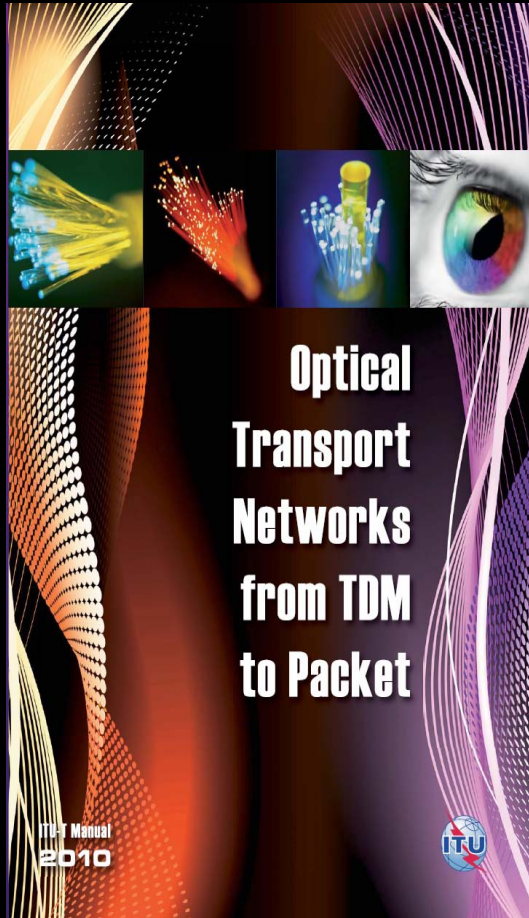
Through economies of scale, standards help reduce costs for manufacturers, operators and consumers.

International Telecommunication Union



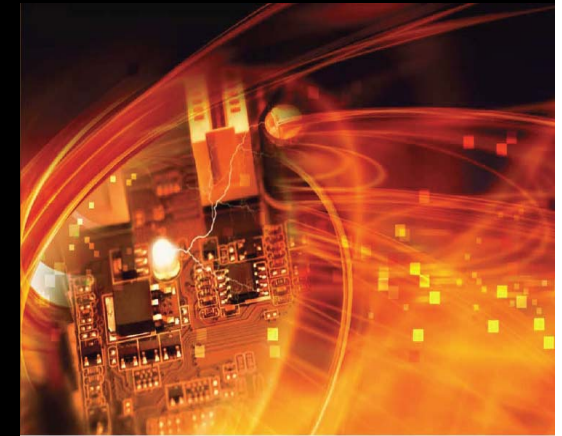
Optical fibres, cables and systems

ITU-T Manual
2009



Optical Transport Networks from TDM to Packet

ITU-T Manual
2010



The Optical World

ITU-T Technology Watch Report
June 2011

The use of optical technologies in computing is very promising indeed for the future. It will help to support the bandwidth requirements of next-generation networks, cloud computing and the expansion of the Internet. Major breakthroughs are expected in the areas of optical networking, silicon photonics, nanotechnologies and non-linear optics which could lead to major changes in the way computers, networks and data centres are designed. This ITU-T Technology Watch Report provides an overview of the optical world and surveys standards and ongoing research that will lead to a new generation of Internet and computing devices.



Find out more:

<http://www.itu.int/en/ITU-T/techwatch/Pages/optical-standards.aspx>

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Thank you very much

Hiroshi Ota, ITU