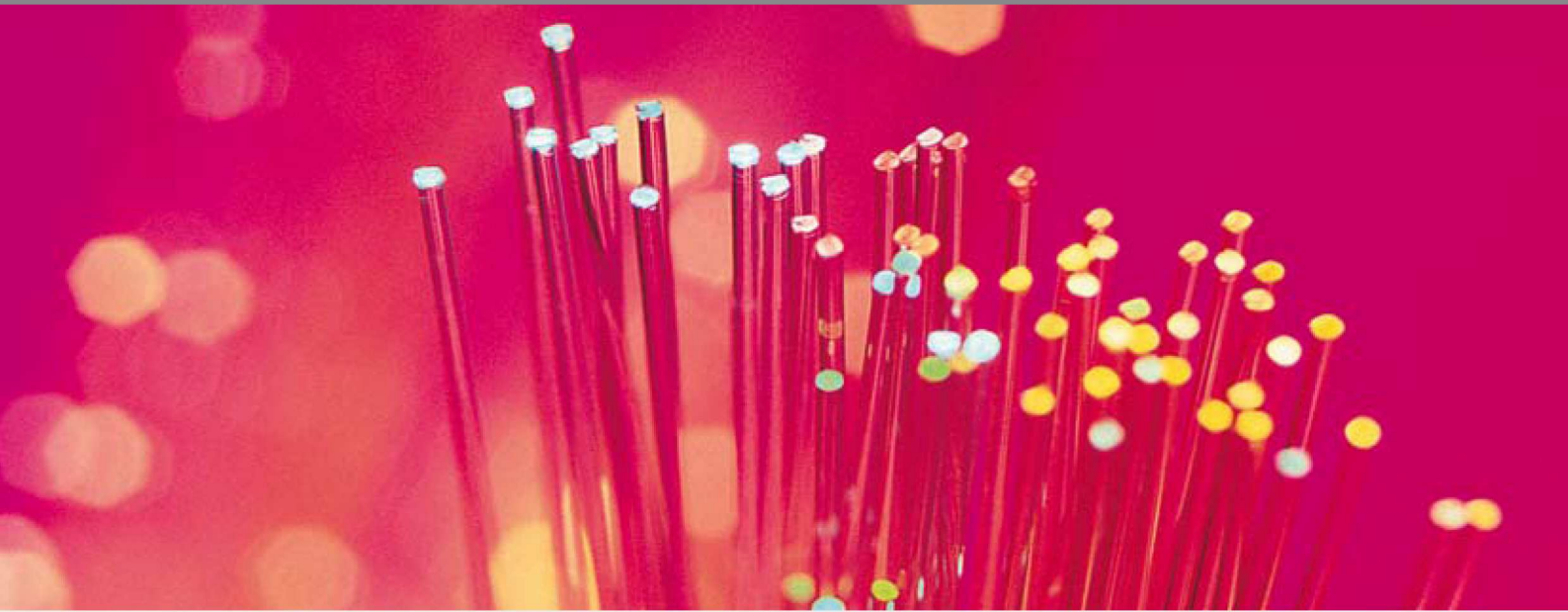




World FTTx Markets



FTTx Market Report

July 2009

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ISBN 978-2-84822-146-5

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1. FTTx Market panorama worldwide

This chapter is presenting the status of FTTx deployments on a worldwide basis with a breakdown by architecture type and by geographic zone.

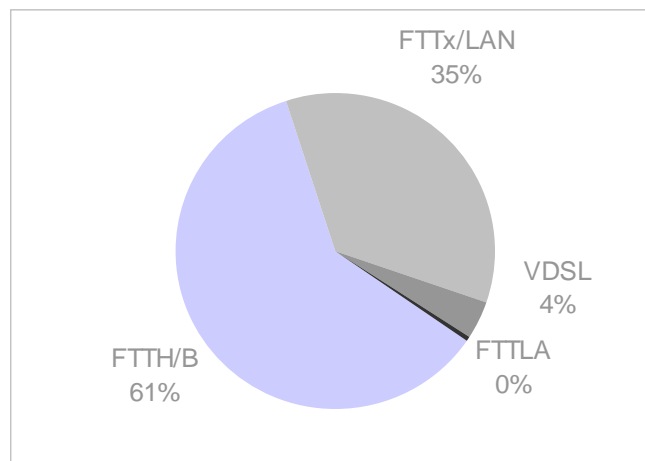
The FTTx market here includes FTTH/B, VDSL, FTTLA and FTTx+LAN¹ and the geographical zones covered are Asia Pacific, Western and Eastern Europe, Middle East, North America and Latin America.

FTTx deployments still in progress

As end of 2008, the global FTTx market which includes FTTH/B, VDSL, FTTLA and FTTx+LAN architectures represented 48 million subscribers.

FTTH and FTTB are still the most prevalent network architectures, accounting for more than 61% of the fibre-connected subscribers. Those architectures and in particular FTTB based, are the most economic and the most suitable solution for operators to increase their bandwidth in many countries especially in Asia (densely populated areas) and also now starting in emerging countries.

FTTx subscribers breakdown by architecture type – end 2008



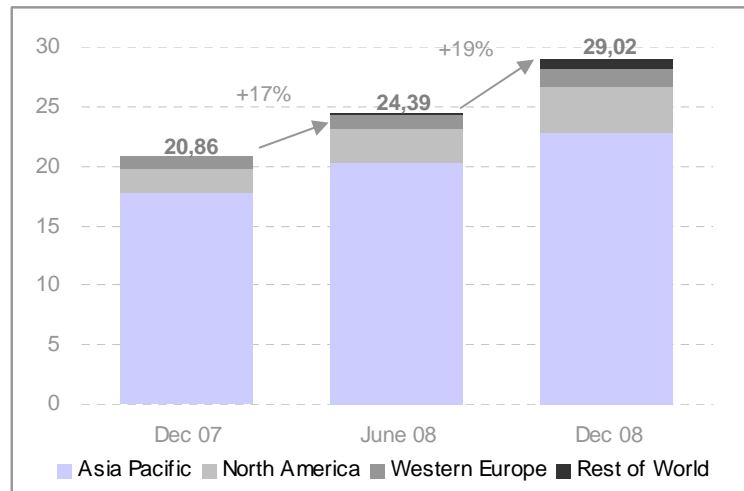
Source: IDATE

¹ VDSL includes Fiber To The Node + VDSL and VDSL2 technologies. FTTLA stands for Fiber To The Last Amplifier : depending on cablecos networks' architecture, the fiber optic is deployed until a point generally located before the building. FTTx/LAN is mainly used for Asian countries where Ethernet LAN can be the technology used for connecting the end users from a point located outside the building or SDU. More generally, when talking about FTTx, we include FTTH/B, FTTLA, FTTN+VDSL and FTTx+LAN.

FTTH/B: the prevailing architecture

The global FTTH/B market continues to make strides. Growth in 2008 was significant, with more than 8 million additional subscribers (+39% over the past 12 months) bringing the number of FTTH/B subscribers around the world to just over 29 million at the end of 2008.

Global FTTH/B subscribers' growth per geographic zones, in million, 2007-2008



Source: IDATE

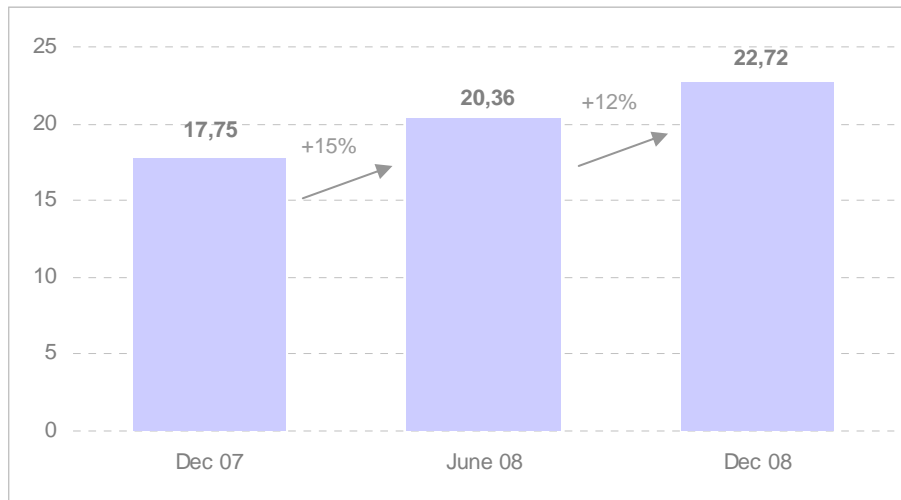
Asia Pacific is still the FTTH/B market leader, and subscriber growth is accelerating thanks to China

It is not surprising that Asia Pacific continued to dominate the FTTH/B and was the major contributing region in terms of subscribers with near 5 million additional users in one year.

The highest worldwide concentration of FTTH/B subscribers was in the Asia region: with close to four-fifth of the global FTTH/B subscribers at the end of 2008. The number of FTTH/B subscribers in the Asia Pacific region rose from 17.9 million to more than 22.7 million between December 2007 and December 2008.

Thus, the Asian market accounted for the bulk of the global FTTH/B market, with Japan and South Korea still leading the way. With 14.5 and 6.8 million respectively, the two countries represented the largest number of ultra high-speed Internet users in the world. There was a sharp rise in FTTH/B subscribers in Japan (3 million new subscriptions) and in South Korea (1.6 million) in 2008.

FTTH/B subscriber growth in Asia, 2007-2008



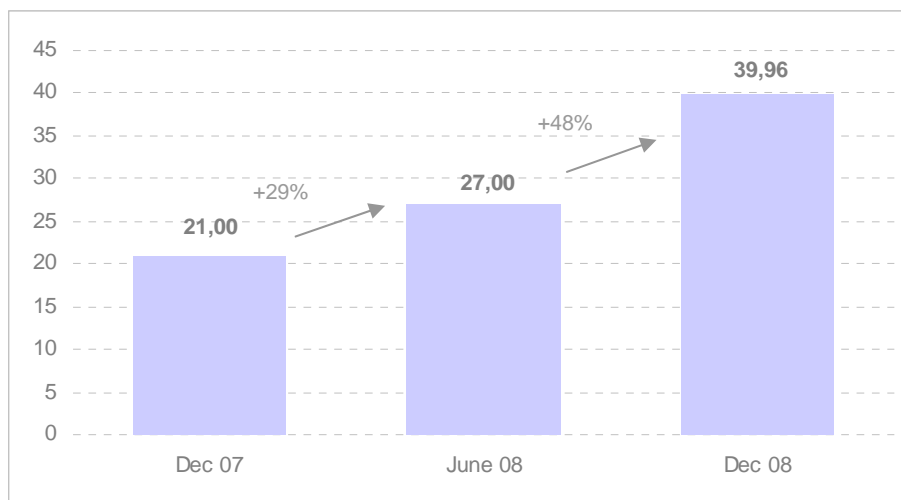
Source: IDATE

If those last years the Asia Pacific FTTx market booming was mainly explained by large scale deployments in Japan and South Korea, now the dynamism is clearly evolving toward China. Indeed at end 2008, China is already counting 17 million subscribers, but the growth in China will continue and even explode if we take into account the last announcements coming. Indeed on July 16th, China Unicom completed the world's largest EPON purchasing involving 11.3 million lines.

North America region marked by a substantial growth driven by United States

Reaching 5 million FTTx subscribers at the end of 2008, the United States market continued to progress, particularly in the FTTH/B market with 1.9 new subscribers in one year. The US is the global third largest fibre access market, behind Japan and South Korea, and accounts for 16% of the globe's FTTx subscribers. Marking a 90% increase over the end of 2008, it makes the United States the globe's fastest growing FTTH/B market.

FTTH/B subscriber growth in the United States, 2007-2008



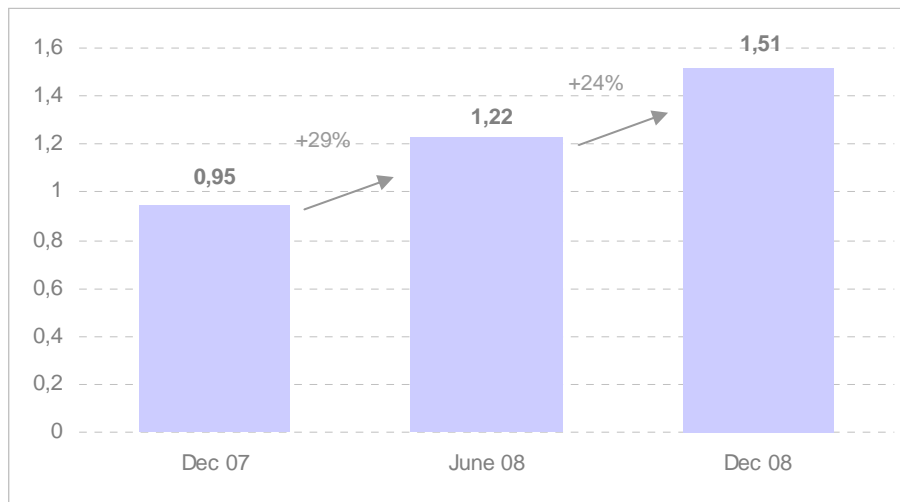
Source: IDATE

European market gaining momentum

Still well behind the Asian and North American markets, the Western Europe market appears to gain momentum. As of December 2008, it accounted for 5% of the global FTTH/B market with more than 1.5 million subscribers, compared to just over a million at the end of 2007 (+60% growth in on year).

High disparities characterize the European FTTH/B market as only six countries combined account for 81% of the subscriber base: Sweden, Italy, Norway, France, Denmark and the Netherlands.

FTTH/B subscriber growth in the Western Europe, 2007-2008



Source: IDATE

FTTx market still in the embryonic stage in the rest of the World

Aside from a few small-scale rollouts in Mexico, Canada, Chile and Brazil, there are no major FTTx networks in other Americas countries. Brazil does, however, appear to have a bright future when it comes to fibre, in part thanks to Telefónica which has plans to deploy a vast FTTH network in and around Sao Paulo.

In the Middle East and Africa, outside the United Arab Emirates, FTTx is still not very well developed. At the end of 2008, there were no more than 15 000 FTTx subscribers in the geographical zone, with the majority of networks being either new or still in the planning stage. But, given the number of homes that are currently under construction, especially in the UAE, it is entirely possible that this will be one of the most dynamic FTTx markets of the next five years.

Two players in particular in the United Arab Emirates will likely contributed to this momentum in the region, namely du and Etisalat.

The alternative architectures still lagging behind

Alternative architectures including VDSL, FTTLA and FTTx/LAN were not largely adopted, but are however deployed in specific regions: FTTx/LAN being the architecture adopted largely until now in China; VDSL in Europe and North America and FTTLA in Eastern & Central Europe.

VDSL, FTTLA and FTTx/LAN subscribers in the different geographical zones at the end of 2008

	VDSL	FTTLA	FTTx/LAN
Western Europe	776 550	15 000	0
Eastern & Central Europe	32 000	212 393	0
North America	1 045 000	na	0
Asia Pacific	1 500*	na	17 000 000
Middle East & Africa	0	0	0
Total	1 855 050	227 393	17 000 000

* In many countries in Asia, VDSL subscribers are included in FTTH/B figures as fibre stops at the basement of the MDUs.

Source: IDATE and FTTH Council Europe.

FTTx/LAN driving the FTTx market in China

China is a special market where until now the majority of fiber-based connections are based on FTTx/LAN solutions which supply 2 to 10 Mbps of bandwidth on average (that could not enough high to be considered as a very high speed connections). We estimate the number of FTTx/LAN lines at 17 million as end of 2008. Starting in particular in 2009, FTTB architectures will gain momentum in china in the years to come, especially in large cities.

VDSL slightly increased in Europe and in USA

VDSL did appear to be making strides, and accounted for 4% of the FTTx market as end of 2008.

This is due in part to the take-off occurred in Europe (42% of deployments) where growth has been particularly substantial, as VDSL is faster and cheaper to deploy than FTTH/B. This trend was particularly observable with the involvement of incumbent operators from Switzerland, Belgium and Germany. Meanwhile, in the United States (56% of deployments), AT&T's VDSL base continued to grow as well.

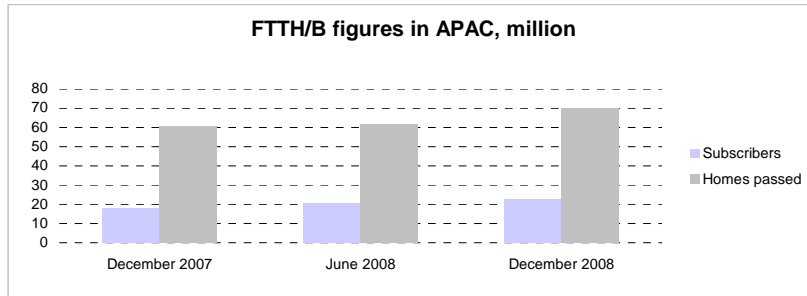
VDSL subscribers are virtually non-existent in Asia as fibre is pulled to the basement of apartment buildings, so VDSL technologies are considered to be part of FTTH networks. Only 1 500 subscribers were accounted as VDSL ones in 2008 and came from Hong Kong.

Handful FTTLA roll outs in Central and Eastern Europe

FTTLA technology appears to enjoy a solid position in the Eastern and Central Europe region, serving 212 393 subscribers who are located in four countries in particular: Estonia, Lithuania, Rumania and the Czech Republic. There have also been a handful of FTTLA rollouts, chiefly in Eastern Europe (Romania, Lithuania and Estonia).

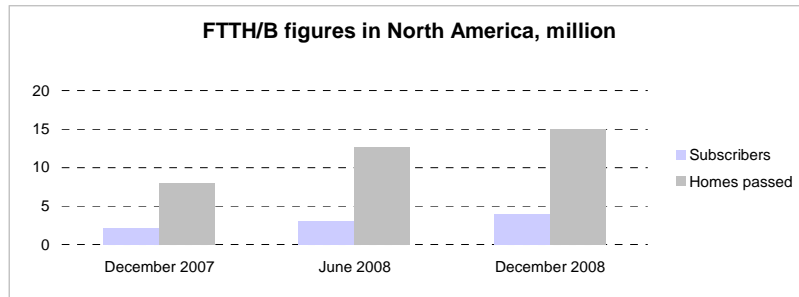
FTTH/B Homes passed and Subscribers

Breakdown of homes passed and subscribers in Asia Pacific



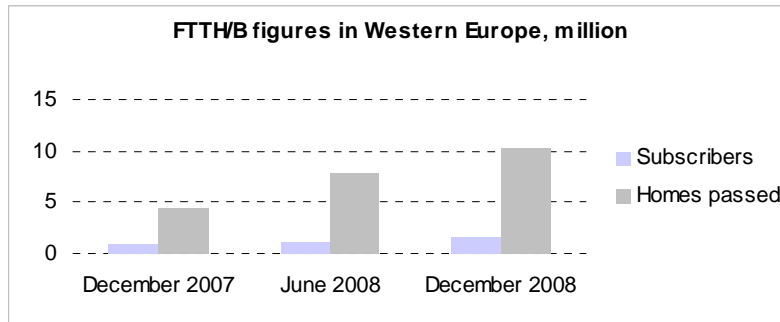
Source: IDATE

Breakdown of homes passed and subscribers in North America



Source: IDATE

Breakdown of homes passed and subscribers in Western Europe



Source: IDATE

Players involved ...

... in Asia Pacific

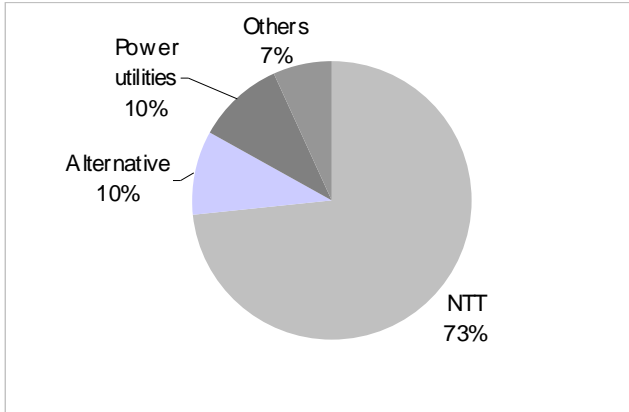
Incumbent carriers represented the major type of players involved in FTTH/B projects in Asia including emerging countries.

In Japan, NTT and KDDI have invested massively in optical fibre chiefly focusing on the country's most densely populated areas while local authorities and power utilities investing in the more sparsely populated areas.

In South Korea, the incumbent KT and its main rivals SK Broadband and LG Powercom are the players the more involved in FTTH.

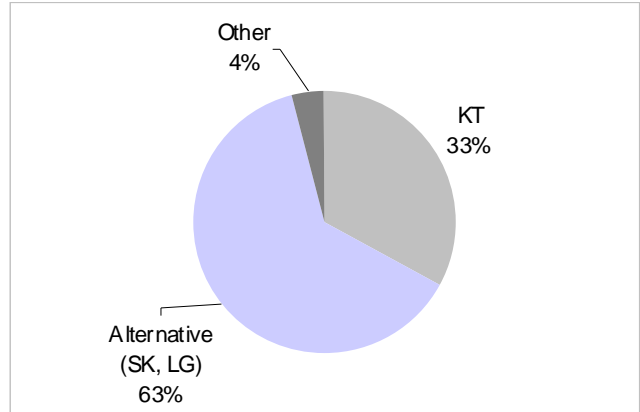
In China, China Telecom and China Unicom but also very recently China Mobile, are clearly motivated in deploying large scale FTTH/B network.

FTTx operator market share in Japan – 2008



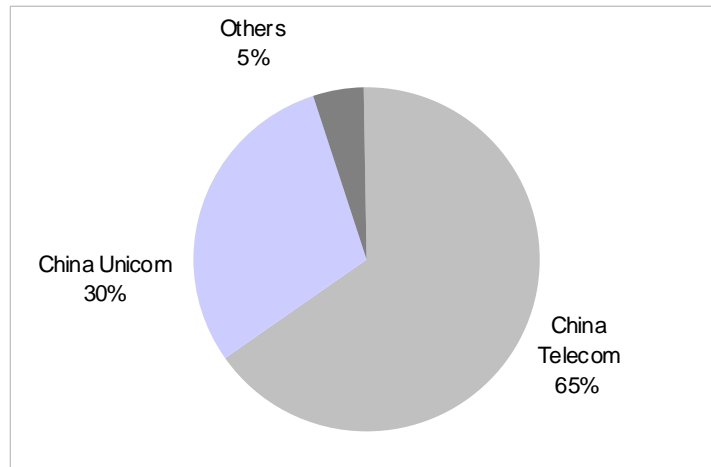
Source: IDATE

FTTx operator market share in South Korea - 2008



Source: IDATE

FTTx operator market share in China - 2008



Source: IDATE

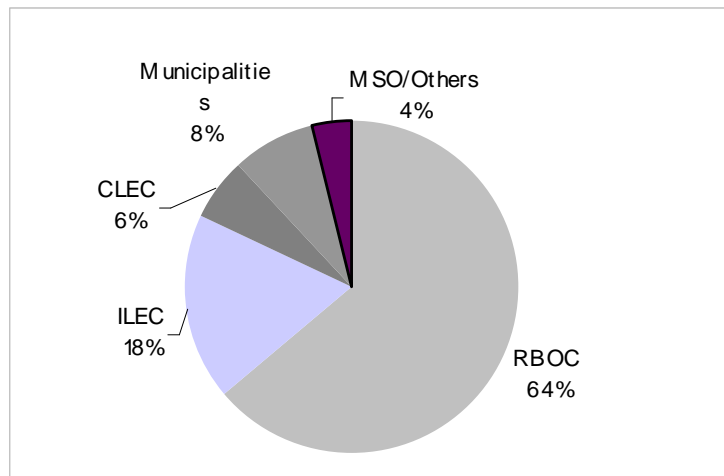
... in North America

The American broadband market is highly fragmented. RBOCs have 64% share of the FTTH market while ILECs (Incumbent Local Exchange Carriers) control 18% of this market; alternative operators, or CLECs (Competitive Local Exchange Carriers), control 6%; and local authorities about 8%. This means that local operators, excluding municipal projects, have a just under 25% share of the country’s FTTH market.

By becoming involved in FTTH rollouts, local players are helping to compensate for the RBOCs’ lack of interest in the zones concerned, most of which are rural areas with little market potential – despite which local actors appear to be having some success.

Verizon (FTTH) and AT&T (VDSL) are particularly very aggressively deploying FTTx and have a substantial lead in this market.

American FTTH market by type of player – end 2008



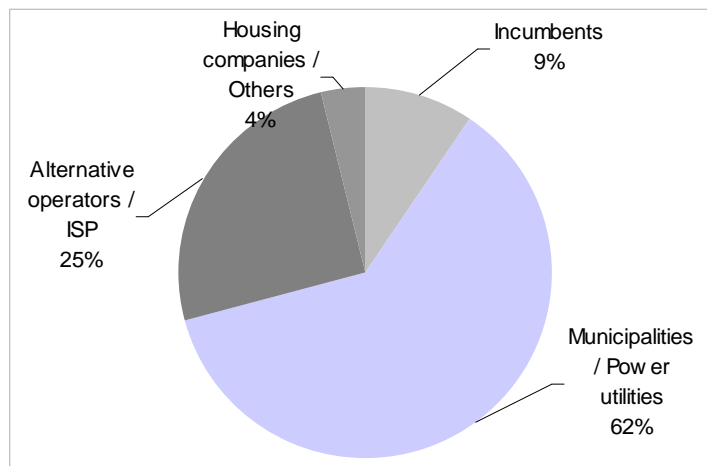
Source: IDATE, based on Broadband Properties

... in Europe

Municipalities and power utilities continued to be the players the more involved in FTTH/B projects in 2008 in Europe, representing quite 60% of the market, by deploying very often the FTTH/B through an open network model.

Alternative operators were also still dynamic but significant FTTH/B deployments are now launched or announced by European incumbent operators like France Telecom, Telefonica, Swisscom, Portugal Telecom, Telecom Italia or KPN in the Netherlands.

European FTTH market by type of player – end 2008



Source: IDATE

2. FTTH/B technologies

This following section will focus on technologies used to deliver FTTH/B accesses that include EPON², GPON³, BPON and Ethernet P2P.

Worth noting that for the first time, FTTx/LAN lines (installed ports) are included in the calculation when assessing the total FTTx access lines as we believe that this architecture will supply soon higher speed than the current 2 to 10 Mbps available in China.

EPON, the most widespread FTTH technology deployed

EPON (and now GEPON) is by far the most popular FTTH technology on a worldwide basis, representing 60% of the market in 2008 due to Asia Pacific's almost exclusive use of EPON with Japanese and South Korean carriers backing the technology. Moreover, its evolution is clear with the expected 10G EPON standard expected by September 2009.

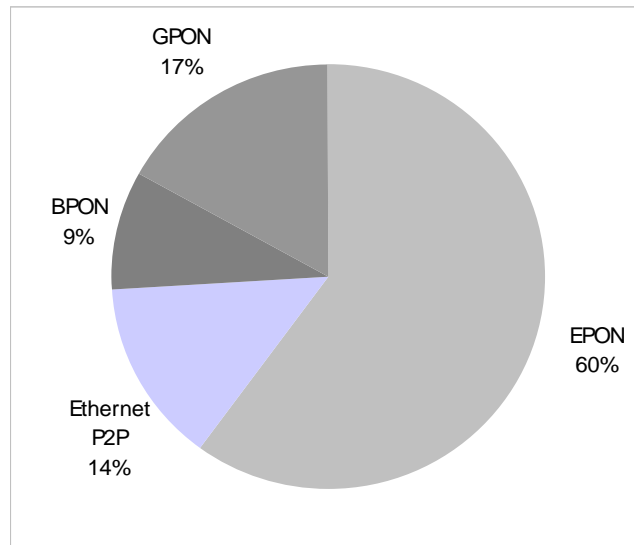
GPON deployment is still lagging behind EPON on a worldwide basis. Indeed until now GPON is gaining momentum mainly in Europe and North America but in currently Chinese dynamic market, EPON is clearly today the selected technology. Certainly that EPON technology will remain dominating until 2011 in China because of the first choices of Chinese operators. Nevertheless, we must notice that EPON is used also (China Mobile) for mobile backhauling especially for the current 3G deployments in the country. We must notice also the GPON recent announcement and trials conducted by China Telecom, China Unicom and China Mobile (more recently).

The success of EPON in China with the current large scale deployments could rapidly influence the choice of other emerging markets as we already notice first deployments in Thailand or Ethiopia.. Indeed, Chinese huge EPON deployment will drive this technology costs down.

Largely used by European carriers, Ethernet P2P deployment remained marginal like BPON technology which was only deployed in North America by Verizon (now replaced by GPON).

² EPON (Ethernet Passive Optical Network - IEEE 802.3ah) is a point-to-multipoint connectivity technology based on Ethernet and supporting all FTTx architectures. EPON is now available on his GEPON version: Symmetrical bi-directional 1Gbps. 10GEPON version allowing symmetrical 10Gbps is expected for September 2009.

³ GPON (Giga Optical Passive Optical Network - ITU-T G.984) is a point-to-multipoint connectivity technology based on Ethernet + ATM and supporting all FTTx architectures. GPON is now available giving 2.5 Gbps Downstream and 1.25 Gbps Upstream. 10GPON version allowing 10Gbps is expected for 2011.

Breakdown of the FTTx technologies worldwide – end 2008

Source: IDATE

Breakdown of FTTx technologies per region (subscribers) – end 2008

	EPON	GPON	BPON	Ethernet P2P
Asia Pacific	91%	-	-	9%
China	100%			
North America	5%	74%	12%	9%
Europe	-	19%	-	81%

Source: IDATE and Broadband Properties for North America figures

The situation in Asia Pacific: hotbed for EPON

Service providers in Asia Pacific have invested heavily in PON, and mainly in EPON technology due to its lower cost driven by high volumes. Indeed large FTTH/B markets or FTTx/LAN markets have adopted mainly EPON chosen by incumbents: KT, NTT, China Telecom,...

The situation in China – "China is getting to deploy the world's largest FTTH deployment"

The optical fiber broadband access network was deployed on a considerable scale in China. In 2008, EPON has dominated China deployments (almost 100%) as Chinese carriers have adopted this technology for its lower cost. In the meantime, even being marginal, GPON gained moderate momentum in the recent months.

China is still the market with the greatest growth potential. Thanks to the involvement of China Telecom, China Unicom as well as China Mobile, the country seems to have begun the largest FTTx market.

Choice of operators

Technology adopters

Technology	Country	Type of Players	Players
EPON	China	Local authorities	Beijing Unicom, Beijing Telecom, Shanghai Telecom, Wuhan Telecom, Hangzhou Telecom, Fuzhou Telecom, Shanxi Taiyuan Telecom, Guizhou Telecom and Hubei Telecom.
	China	Incumbent	China Telecom
	China	Incumbent	China Unicom
	Japan	Incumbent	NTT (for FTTH)
	South Korea	Incumbent	KT
	Japan	CLEC	KDDI
	France	Local authorities	SICOVAL: science park SIPPEREC: suburbs of Paris
	Malaysia	Incumbent	Telekom Malaysia
	Mexico	Local authorities	El Tamarindo Resort and Spa
	Taiwan	Incumbent	Chunghwa Telecom
	USA	Local authorities	US SONET Jackson Energy Authority City of Chattanooga Telecom Tennessee
GPON	China	Incumbent	China Telecom (trials of 2 300 GPON lines)
	Cyprus	Incumbent	CYTA
	Denmark	Utilities	EnergiMidt, EnergiRanders, NRGi Fibrenet
	France	Incumbent	France Telecom / Orange
	France	CLEC	SFR
	Hong Kong	CLEC	HKBN/city telecom
	Italy	Incumbent	Telecom Italia
	Kuwait	Local bodies	The Kuwaiti Ministry of Telecommunications
	Portugal	CLEC	Sonaecom
	Russia	CLEC	COMCOR (in Moscow)
	Singapore	Incumbent	Singtel
	Sweden	Utilities	Jönköping Energi
	South Korea	CLEC	SK Broadband
	UK	Incumbent	BT
	USA	Incumbents	Verizon AT&T
USA	Local authorities	Cities of Las Vegas, New Orleans, Baton Rouge, Lafayette... (enterprises)	
Ethernet P2P	Austria	Local authorities	City of Ried
	Cyprus	Incumbent	CYTA
	France	CLEC	Free-Iliad

	Germany	Local authorities	City of Schwerte
	Italy	CLEC	FastWeb
	The Netherlands	Incumbent	KPN
	The Netherlands	Local authorities	Amsterdam CityNet Nuenen
	Norway	CLEC	Lyse
	Sweden	CLEC	B2
	Switzerland	Incumbent	Swisscom
BPON	USA	Incumbent	Verizon

Source: IDATE

3. FTTx Vendors' dynamics

This section will treat about the leading FTTx equipment manufacturers.

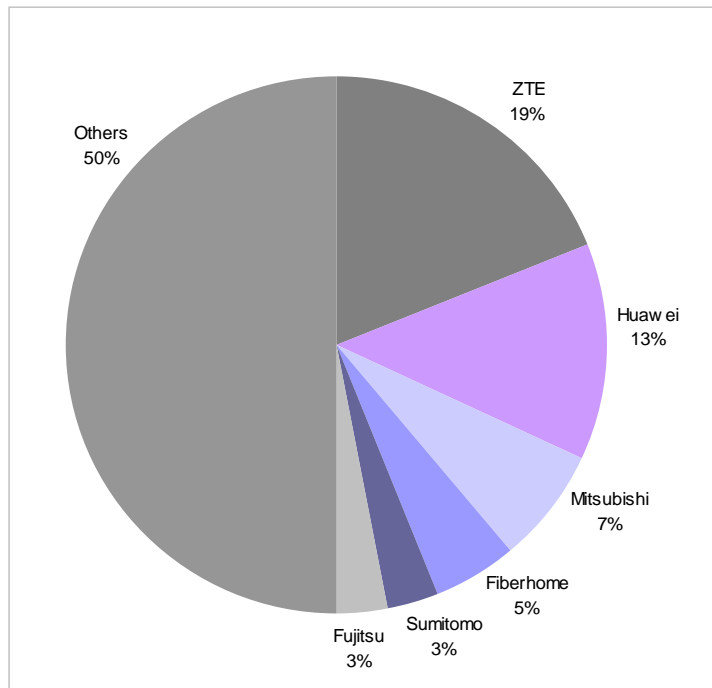
Vendors positioned

The installed FTTx ports are estimated worldwide at 83.3 million as end of 2008.

At end of July 2009, we can now present a first estimate of the vendors global market shares at 2009, Q2 (those figures will be confirmed later by IDATE). In a very fragmented FTTx market, the global top six vendors is composed of Asian equipment vendors, ZTE being the market leader with 19% of market share. Huawei came in second position with 13%, followed by the Japanese manufacturer Mitsubishi in the third position at 7%.

These results confirm that ZTE is taking the FTTx market worldwide lead in 2009,Q2 because of the shipments realised by ZTE in 2009,Q1 and 2009,Q2 especially taking into account the last important contracts won in the domestic market (China Unicom for instance).

FTTx ports market share per vendor worldwide – 2009, Q2



Source: IDATE

Local vendors selected in main FTTx markets

Given the high level of fragmentation of the market, the vendors distinguished each others by the technologies backed and their geographical presence.

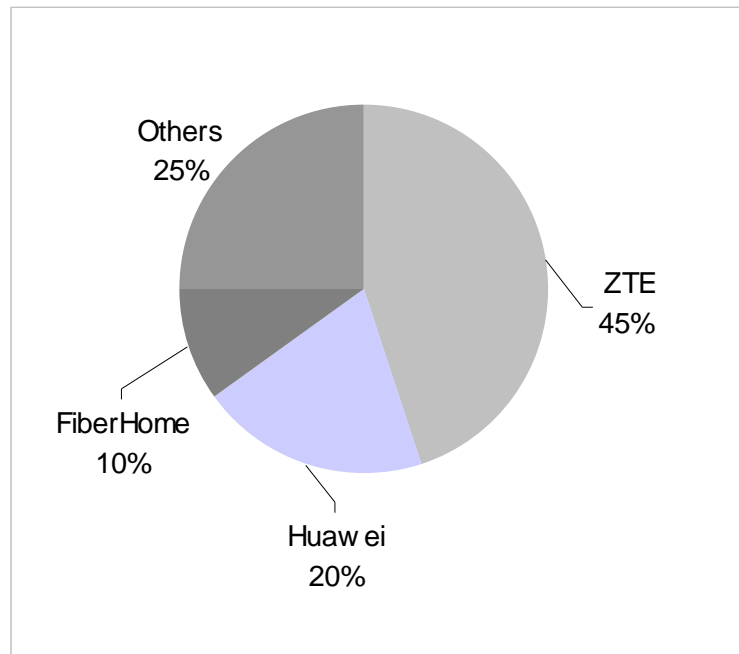
In the two main FTTx markets (Japan and China), the FTTx players' favourite suppliers are the local ones. Indeed, in Japan, Sumitomo, Mitsubishi and Fujitsu remained the market leaders, which ones benefit of the significant FTTH/B deployments there.

In China, Chinese vendors are also preferred to deploy FTTx networks. ZTE, Huawei, FiberHome and Alcatel-Lucent (through Shanghai Bell) lead the market.

At end of July 2009, we can now present a first estimate of the vendors market shares in China at 2009, Q2 (those figures will be confirmed later by IDATE).

These results confirm that ZTE is consolidating its first place on the Chinese FTTx market with 45% FTTx market share.

FTTx ports market share per vendor in China- 2009, Q2



Source: IDATE

In Europe, the market is mainly shared between the two main Ethernet P2P providers which are Cisco and Packetfront then Alcatel Lucent GPON. In North America, the main equipment manufacturers involved in supplying local players include both international heavyweights (Alcatel-Lucent for GPON, and Motorola and Tellabs for BPON); other smaller players such as Calix are also focused on a niche market by supplying ILECs in the US.

Vendors positioning of main vendors

As seen on the table below, each FTTx ports suppliers back one promising technology except from ZTE, Alcatel Lucent and Huawei.

Technologies mainly promoted by equipment vendors

Equipment vendors	EPON	GPON	BPON	P2P
ZTE	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
Huawei	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
Mitsubishi	<input checked="" type="checkbox"/>			
Fiberhome	<input checked="" type="checkbox"/>			
Sumitomo	<input checked="" type="checkbox"/>			
Fujitsu	<input checked="" type="checkbox"/>			
Nokia Siemens Networks ⁴		<input checked="" type="checkbox"/>		
Hitachi	<input checked="" type="checkbox"/>			
Alcatel-Lucent		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Cisco				<input checked="" type="checkbox"/>
Tellabs		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Ericsson		<input checked="" type="checkbox"/>		
Motorola		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Packetfront		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
UTStarcom	<input checked="" type="checkbox"/>			

Source: IDATE

Active development of Chinese vendors

ZTE

ZTE has the advantage to provide both EPON and GPON technologies. Really involved in the evolution of PON technology, ZTE push the development of PON standards and mainly on interoperability issue. The company also participated in the development of the next generation PON technologies - 10GEPON - and has launched the first prototype last October 2008. 10GEPON will be used to provide greater bandwidth to the final used but will be more and more used combined with VDSL2 in a FTTB architecture.

The strategy of ZTE is therefore to continue their commitment in GPON and EPON (10GEPON) standards.

As already mentioned, ZTE is today leading FTTx market. Furthermore the fact that ZTE won the largest share in China Unicom's group purchase in 2009 Q2, is confirming this leadership.

⁴ At mid 2008, NSN announced that he will stop his investments in GPON technology but will continue to support existing customers. NSN is until then focusing on next generation of optical access for when the market is ready.

Huawei

Huawei also owns both EPON and GPON licenses.

Comparatively with its competitors, Huawei is positioned in overseas countries and mainly in Europe and Middle East, deploying GPON. Huawei provides EPON in his domestic market.

Huawei has some references in Europe like Deutsche Telekom, British Telecom, and Telecom Italia for GPON deployments and also in Middle East supplying Etisalat and STC. Nevertheless overseas shipments on GPON are still small and Huawei FTTx market rely still mainly on the domestic EPON market.

Fiberhome

Promoting the EPON, FiberHome is an incontestable player in China.

Overseas, the company provides GEPON such as in Russia, Thailand and Malaysia.

Focus on the FTTx Chinese market

Two largest operators in China, China Telecom and China Unicom, have confirmed their EPON strategies. China Mobile is today the only major Chinese operator now involved in GPON (more for final access) as well as in EPON (more for 3G mobile backhauling).

Furthermore for those Chinese operators already deeply involved in EPON, the temptation will be high to migrate to the new 10G EPON (as the standard is expected in September 2009). Indeed China Telecom is already testing 10G EPON equipments. So vendors who have already taken position on future 10G EPON will then have a strong advantage: this is the case of ZTE who launched world first symmetrical 10 G EPON equipment prototype in May 2009.

China will push the GPON industry ahead

Today GPON is still very confidential in China compared to the EPON massive deployments announced. At end 2008, we have noticed mainly trials concerning GPON:

- China Telecom is testing around 2 300 GPON lines,
- China Unicom is testing in the Shanxi Province around 170 000 GPON lines.

The very recent announcement of China Mobile concerning GPON could be the sign of a collaborative development of EPON and GPON in China.

To summarize we can say that even if until now Chinese operators have developed an unshakable faith in EPON developments, they are now also paying attention on GPON.

Chinese carriers' GPON announcements

	Equipment manufacturers involved	GPON announcement
China Telecom	Alcatel-Lucent, Ericsson , FiberHome, Huawei, ZTE	FTTH trials in four Chinese cities of Beijing, Guangzhou, Wuhan and Shanghai
China Unicom	Ericsson, Huawei, ZTE	Upgrade of fiber cable and FTTH deployment (especially in Shanxi Province concerning GPON)
China Mobile	Alcatel-Lucent, Ericsson, ZTE	Deployment of FTTH GPON network in 10 cities in Guangdong and Anhui provinces

Source: IDATE

4. FTTH Market Forecasts 2014

The very high broadband access (FTTH/B and VDSL⁵ combined) is expected to experience steady growth in the coming years, to reach close to 140 million subscribers around the globe by 2014. Naturally the rate of progress will not be the same across the board, as each national market will be shaped by the country’s intrinsic features and its players.

Worldwide

Growth of the number of FTTH/B and VDSL subscribers around the world has increased significantly in recent months, with forecasts up to 2014 indicating a steady increase across the globe for all ultra-broadband systems.

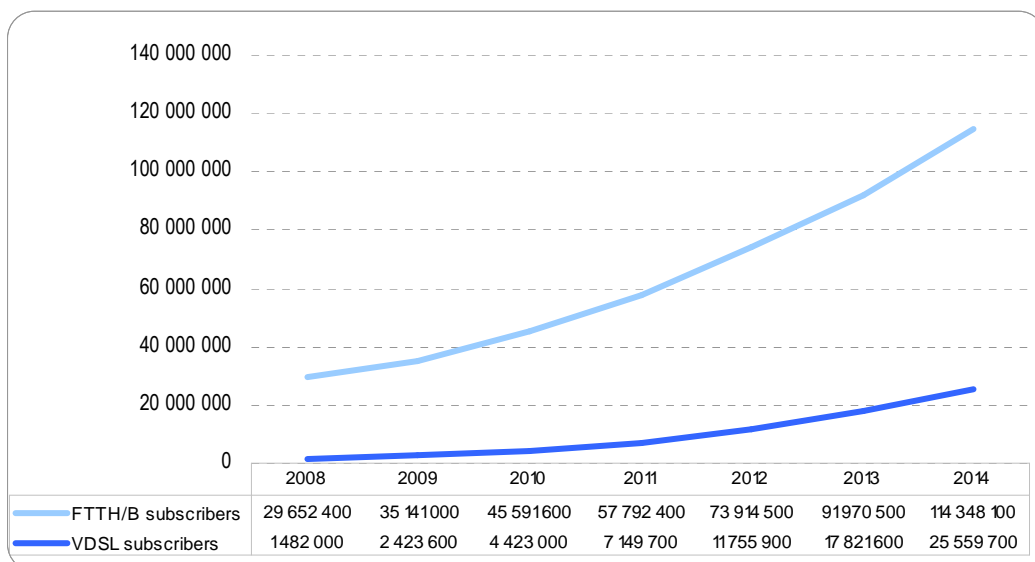
FTTH/B will continue to dominate VDSL in the medium term.

According to IDATE, FTTH/B technologies will dominate the market in 2014, with some 114.4 million subscribers – compared to around 25.6 million VDSL subscribers.

This translates into a 21% to 33% annual increase over the next five years – with a steady rate of growth expected between 2010 and 2012 when rollouts will be in their final stages, or properly underway in those zones where deployments are currently in the planning phase.

Asia will remain the largest FTTH/B market, but the gap with Europe and the United States will shrink. The opposite is expected to be true for VDSL, however, with Asia in general, and China in particular, forecast to have more VDSL subscribers than Europe and North America by 2011.

Growth of FTTH/B and VDSL subscribers around the world between 2008 and 2014

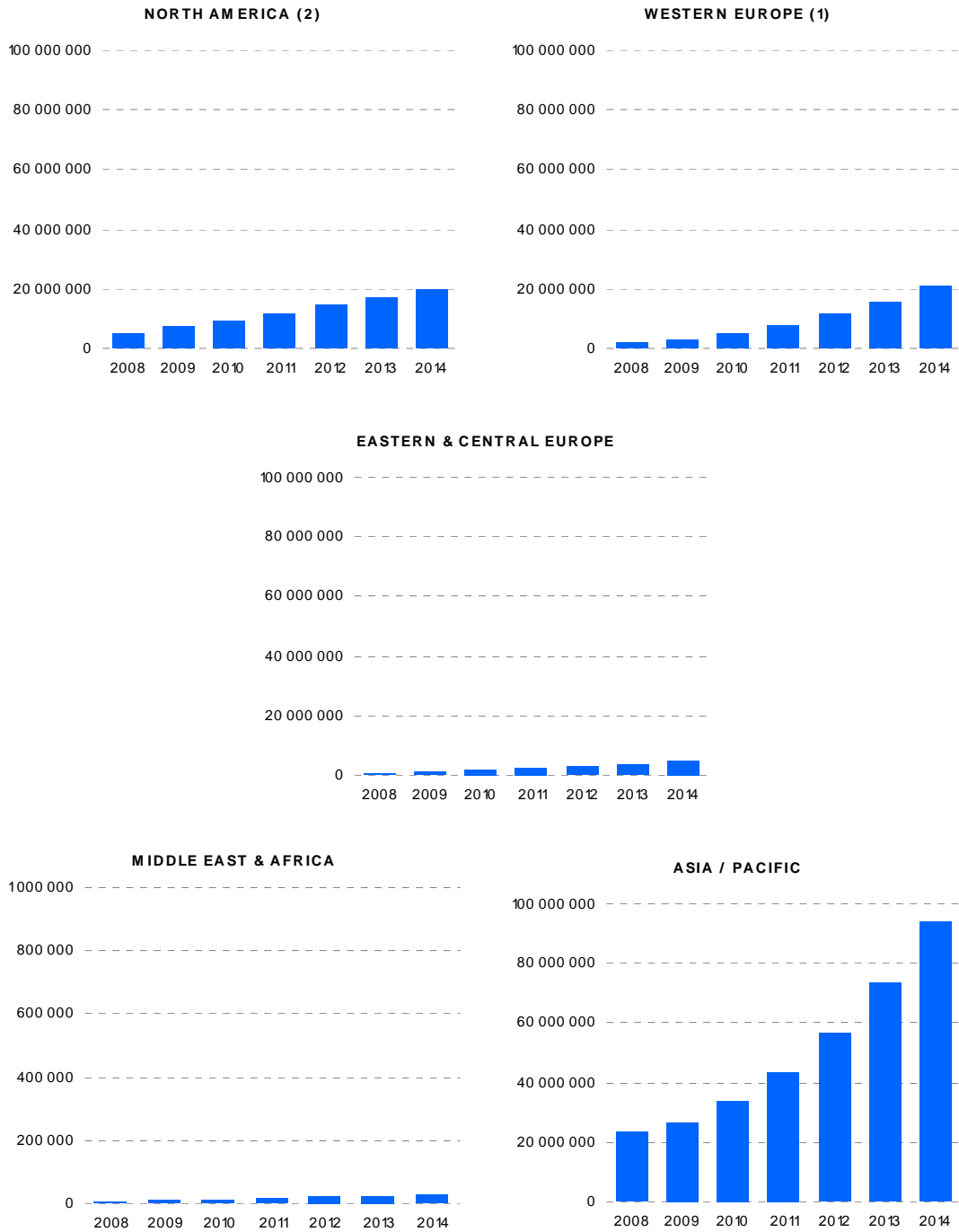


Source: IDATE.

⁵ In this chapter we mention VDSL but in fact the version now being adopted worldwide is clearly VDSL2.

Forecasts by Region

Growth by zone of the very high-speed subscriber base between 2008 and 2014



1) EU 27 + Norway, Switzerland, Iceland and Andorra
 2) Forecasts excluding the Canadian market for which data is irrelevant.

Source: IDATE