FTTx | 2010

Markets & Trends | Facts & Figures

IDATE
Consulting & Research

FTTx 2010

The Ultra Broadband access market (FTTH/B and VDSL combined) is expected to grow steadily in the coming years, to reach close to 150 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.

Against a backdrop of pioneer rollouts and recent announcements, several questions emerge on the topic of FTTx:

- At what pace will FTTx networks be deployed, and using which technologies?
- What role will investments by cities and local authorities play over the long term? What can we hope for, or fear, from government stimulus packages that include support for the Ultra Broadband access market?
- What regulatory measures could impede operators' investments?
- What impact will FTTH have on the current broadband market and competition?
- What innovative services are currently available on FTTx networks? How are FTTx players marketing and pricing these services, compared to ADSL-based broadband services?

In this new edition of our FTTx yearbook, you will find valuable data on the central components of the Ultra Broadband world, along with analyses from IDATE's experts and a comprehensive round-up of the highlights of the year gone by:

- **FTTx : The leading operators' strategies**
- **FTTx pricing policies**
- **FTTH network sharing: technical solutions and challenges ahead**

- **FTTx Technologies & vendor dynamics**
- **Australia's National FTTH Plan**
- **Regulation and FTTx: state of affairs at the end of 2009**

FTTx Watch Service

These are just a few of the conclusions drawn from the ongoing monitoring of the globe's ultra-broadband markets by IDATE's FTTx Watch Service:

- **Database:** a unique, continually updated FTTx market database, providing market data by country and by technology, along with forecasts for the coming months and years
- **Insights:** Monthly views on key issues
- **Market reports:** Quarterly
- **Analyst Access:** consulting hours, analyst briefs, presentations

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In your diary **DigiWorld Summit 2010** > 17 & 18 November 2010

1.   FTTx markets

1.1.   FTTx market: leading countries and players

While the rate of deployment for very high-speed offers (number of homes passed) is tending to slow (6% increase between January and June 2009, compared to 24% during the previous six months), the rise in the number of FTTH/B subscribers is holding relatively steady – increasing by 17% in the first half of 2009, compared to 19% in the previous six months, which translates into around 4.9 million additional customers around the globe.

FTTx subscribers as of mid-2009, by geographical area

	FTTH/B	VDSL	FTTLA	FTTx + LAN	Total FTTx
Western Europe (1)	1 806 515	1 645 350	20 000	0	3 471 865
Eastern & Central Europe (1)	962 165	34 000	225 393	0	1 221 558
North America (2)	4 805 500	1 585 000	na	0	6 390 500
Latin America	2 000	0	na	0	2 000
Asia	26 293 000	1 500	na	16 900 000	43 194 500
Middle East & Africa	66 100	0	0	0	66 100
TOTAL World	33 935 280	3 265 850	245 393	16 900 000	54 346 523

(1) Western, Eastern & Central Europe includes: the EU-27, Norway, Switzerland, Iceland, Andorra, Luxembourg, Croatia and Russia
(2) USA, Canada & Mexico

The gap in the rate of progress for very high-speed coverage and penetration can be attributed in part to the fact that rollouts have been quite swift from the onset in most countries, and especially in the major cities in Northeast Asia, whereas sales and marketing campaigns took quite a bit longer to be defined and to become operational, and for services to be adopted by the public. But, given the growth rates cited earlier, we do appear to be entering a more intense marketing phase.

In terms of FTTH/B subscribers, the top 10 countries remained virtually the same between the end of 2008 and June 2009, the only real differences being the rising prominence of Taiwan and China which have moved up the ranks to 4th and 7th spot, respectively (from 6th and 9th). We should also point out that factoring in China Telecom's FTTB+LAN customers would put China in the number two spot.

Top 10 countries in terms of FTTH/B subscribers as of mid-2009

Rank	Country	FTTH/B subscribers
1	Japan	15 500 000
2	South Korea	8 050 000
3	USA	4 800 000
4	Taiwan	1 345 000
5	Hong Kong	740 000
6	Russia	724 000
7	China (*)	612 000
8	Sweden	478 900
9	Italy	324 500
10	France	252 900

(*) Not included are China Telecom's roughly 10 million FTTx + LAN subscribers
Source: IDATE

Distribution of FTTH/B subscribers around the globe as of mid-2009
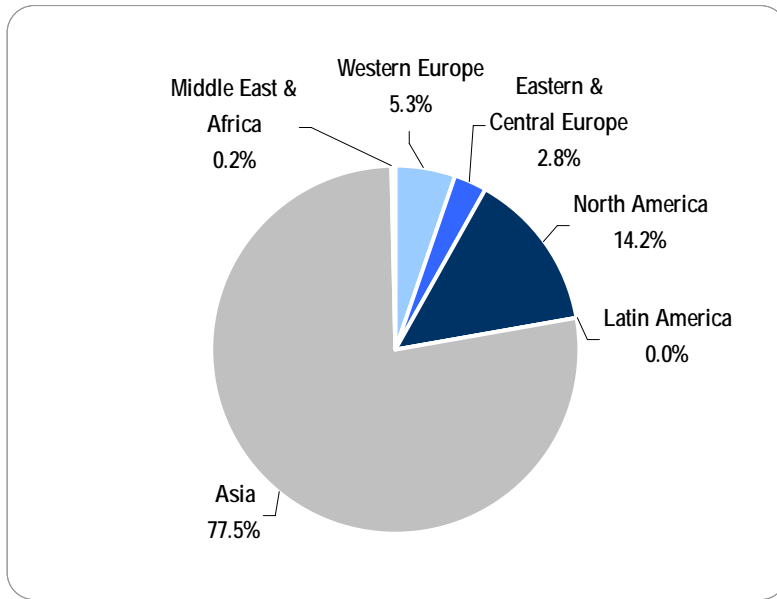
Source: IDATE

On the business side of the equation, Asian carriers have been the most active in terms of rolling out and marketing very high-speed offers. We find proof of this in the fact that, as of mid-2009, seven of the top 10 FTTx operators in terms of subscribers are in Asia, and two are American. Rounding out the top 10 is Russia's Beeline, which gives a good indication of the interest in fibre access in countries where the overhaul of telecom infrastructure has been stepped up over the past several years.

Top 10 FTTx players around the globe as of mid-2009

(in number of subscribers)

| Rank	Operator	Country	Main technology & architecture	FTTx subscribers
1	NTT	Japan	FTTH/B GEPON	11 793 000
2	China Telecom (1)	China	FTTH - FTTx+LAN EPON LAN/DSL	11 160 000
3	KT	South Korea	FTTB EPON/GEPON	3 555 644
4	Verizon	USA	FTTH BPON/GPON	3 100 000
5	SK Broadband	South Korea	FTTB/LAN GEPON	2 733 141
6	AT&T	USA	FTTN VDSL2	1 585 000
7	LG Powercom	South Korea	FTTH/B EPON/GEPON	1 504 090
8	Chunghwa Telecom	Taiwan	FTTB GEPON	1 342 000
9	KDDI	Japan	FTTH/B EPON/GEPON	1 211 000
10	Beeline	Russia	FTTB EP2P	724 000

(1) of which 560,000 FTTH subscribers and 10.6 million FTTx/LAN subscribers

Source: IDATE

The fact that there is not a single European telco in the top 10 ranking shows that the situation has changed over the past six months since FTTH pioneers such as Italy's FastWeb were among the globe's top 10 players in terms of subscribers not that long ago.

Also noteworthy is that subscriber bases have grown to the point that only one of the top 10 carriers had fewer than 1 million FTTx subscribers as of mid-2009.

Rate of progress of some of the major FTTx access providers' subscriber bases between December 2008 and June 2009
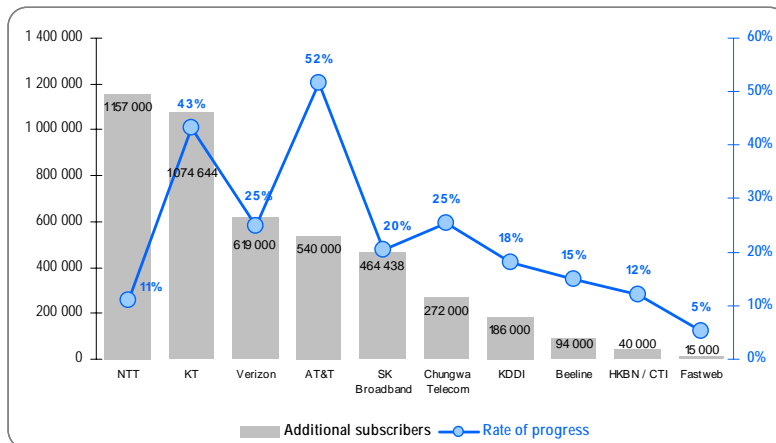
Source: IDATE

1.2. FTTx market still sustained by Asian players' growth momentum

Asian carriers sustained their healthy momentum during the first half of 2009 – with the region marked by the growing prominence of players such as China Telecom which is banking as much on FTTH as on a solution that combines FTTB and LAN/xDSL, and which had attracted 11 million subscribers as of mid-2009.

Revived growth in China

FTTH/B subscriber numbers are rising steadily in Asia, and we even saw a slight increase in the growth rate there: up to 16% between December 2008 and June 2009, compared to 15% during the previous six months. Although these growth rates are below what we find in other parts of the world, Asia remains home to the largest number of subscribers (around 78% of the world's FTTH/B subscribers). If the countries that are now rolling out FTTx maintain the pace of deployment and manage to attract a growing number of subscribers, Asia's dominance will likely decline gradually over time.

The rate of progress in the number of subscribers in Asia is being sustained by countries such as China and Taiwan (+ 167% and + 25% growth, respectively, in the first half of 2009) while in Japan, which has the most mature market, growth has dropped from +11% in the second half of 2008 to +7% in the first half of 2009.

FTTH/B subscriber growth in Asia, 2007-2009
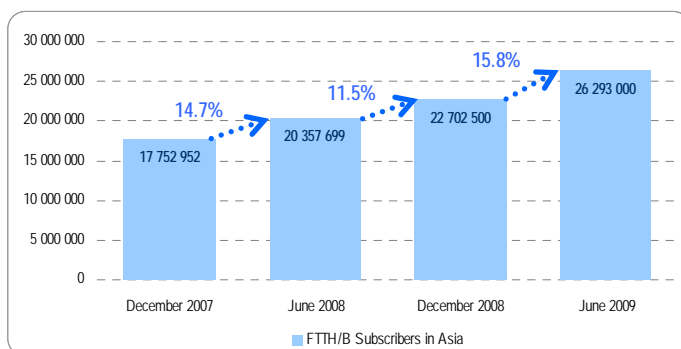
Source: IDATE

As of June 2009, NTT was the world's largest very high-speed access provider, with close to 11.8 million FTTH/B subscribers, followed by China Telecom with 11.16 million FTTH/B subscribers, of which 10.6 million subscribe to an FTTx+LAN/VDSL solution. It seems likely that the rankings will change slightly over the next six months, due to a substantial increase in the number of Chinese subscribers.

Top 5 FTTH/B providers in Asia, mi 2009

Rank	Operator	Country	Main technology & architecture	FTTH/B subscribers
1	NTT	Japan	FTTH/B GEPON	11 793 000
2	China Telecom	China	FTTH – FTTx + LAN EPON LAN/DSL	11 160 000
3	KT	South Korea	FTTB EPON/GEPON	3 555 644
4	SK Broadband	South Korea	FTTB/LAN GEPON	2 733 141
5	LG Powercom	South Korea	FTTH/B EPON/GEPON	1 504 090

Source: IDATE

If we look at things from another angle, namely FTTH/B subscribers' share of the broadband customer base as a whole, Asian countries have a solid lead over the most advanced markets in Europe. In Japan, for instance, FTTH/B is now the main broadband access mode, accounting for 51% of all subscribers. In South Korea FTTH/B accounts for 50% of all subscribers, for 33% in Hong Kong and for 27% of the broadband customer base in Taiwan.

1.3. FTTx in America: imbalance between North and South

FTTH and VDSL gaining ground in the United States

As of mid-2009, there were close to 6.4 million FTTx subscribers in the United States, of which 4.8 million via FTTH. In terms of subscriber numbers, this puts the US in third spot, behind Japan and South Korea, or in 4th spot if we factor in China Telecom's FTTx +LAN/VDSL subscribers in China.

The FTTx market is still growing at a healthy clip in the States: at a rate of close to 27% in the first half of 2009, which confirms that that market's top two players, AT&T and Verizon, continue to attract new subscribers and are becoming serious contenders for cable companies, although not yet threatening their dominant position.

FTTx subscriber growth in the United States, 2007-2009
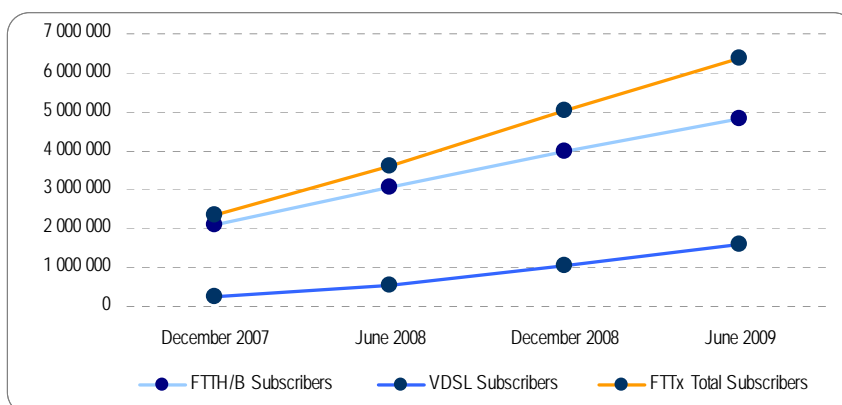
Source: IDATE

Taken separately, AT&T and Verizon have not adopted the same ultra-fast broadband strategies, with AT&T banking on VDSL and Verizon on FTTH/B. Their subscriber numbers grew by 52% and 25%, respectively, during the first half of the year, which are among the highest growth rates anywhere in the world: only KT and Chunghwa Telecom rivalled them, with +43% and +25%, respectively, between December 2008 and June 2009.

The increase in AT&T's VDSL customer numbers offers proof of the technology's growing popularity with users: it now accounts for close to 25% of the country's FTTx subscriber base, while FTTH/B still accounts for relatively few customers, only 6% of the total base –below the global average, but above what we find in Europe.

Elsewhere in America, FTTx still in the planning stage

Aside from a handful of small-scale rollouts in Mexico, Canada, Chile and Brazil, there are no other major FTTx networks on the American content outside the United States. Brazil nevertheless shows signs of becoming an important FTTx market down the road, notably thanks to plans by Telefónica which wants to roll out a large FTTH network in and around Sao Paulo.

1.4. In Europe, FTTx struggling to unseat traditional broadband technologies

In Europe, FTTx subscriber growth rates are well below those in Asia and the United States, even if some carriers are making real strides. On the whole, the number of homes passed is smaller and commercially available offers have not yet fully convinced potential customers, most of whom are still satisfied with their existing DSL solution. Even in the most advanced markets, such as Scandinavia, subscriber bases are still relatively small – aside from a few major players like B2/Telenor in Sweden – due to the disparities in rollout projects, which are often initiated by local authorities.

Europe still has a very small share of the global FTTH/B base: only 8% as of mid-2009, and the situation changed very little during the first six months of the year, with the vast majority of FTTH/B subscribers still located in Western Europe.

1.4.1. Western Europe

With a 19% increase in FTTH/B subscribers between December 2008 and June 2009, above the growth rate in Asia and virtually identical to the one in the United States, Western Europe is still home to a healthy momentum, and growth rates are actually quite high in some countries: +23% in Austria, +38% in Portugal, +40% in France, +57% in Switzerland.

But the popularity of existing broadband solutions, combined with regulatory issues and rollout restrictions are hampering the FTTx market's development. As a result, FTTx subscribers account for only around 2%, on average, of all broadband customers, except in the most advanced markets, of course, such as Norway and Sweden.

As of mid-2009, there were over 1.8 million FTTH/B subscribers in Western Europe and more than 1.6 million VDSL subscribers. VDSL therefore seems to progressing more rapidly, thanks especially to its more or less recent adoption by incumbent carriers such as Belgacom, Swisscom and Deutsche Telekom – all of which are rolling out VDSL2 solutions, and reporting between 336,000 and 600,000 subscribers.

In terms of subscriber numbers, three Western European countries are among the globe's 10 largest markets: Sweden, Italy and France. Market potential is still high, given the number of homes passed (increasing by 14% in six months to 11.7 million as of mid-2009), and this situation is expected to continue for several years to come.

On the carrier side of things, however, the fragmentation of European markets is affecting their place in global rankings, and not a single Western European carrier is currently among the world's largest FTTH/B providers, in terms of customers – although FastWeb was among the top 10 at the end of 2008. According to IDATE, there should be close to 2.5 million FTTH/B subscribers in France in 2011, while Germany will reach the one million mark in 2012.

Operators with more than 150,000 FTTx subscribers in Western Europe as of mid-2009

Rank	Operator	Country	Technology & architecture	FTTx subscribers
1	Deutsche Telekom	Germany	VDSL2 FTTN	600 000
2	Belgacom	Belgium	VDSL2 FTTN	500 000
3	Swisscom	Switzerland	VDSL2 FTTN	336 000
4	Fastweb	Italy	Ethernet FTTH/B	300 000
5	B2	Sweden	Ethernet FTTB	183 000
6	Numericable	France	FTTB DOCSIS3.0	175 000
7	KPN	Netherlands	VDSL2 FTTN	150 000
8	Lyse	Norway	Ethernet FTTH	150 000

Source: IDATE

1.4.2.   Central and Eastern Europe

Eastern Europe is home to some 962,000 FTTH/B subscribers, of which 724,000 are in Russia. Aside from Russia, Slovakia and Slovenia, where FTTH/B accounts, respectively, for 7%, 9% and 13% of all broadband subscribers, fibre-to-the-home is not yet very well developed in that part of the world.

FTTH/B subscriber growth rates are high, however, totalling 23.5% in six months – bringing the total base in Eastern Europe to 962,165 FTTH/B subscribers as of mid-2009.

The most advanced countries in the zone are Lithuania, Slovenia and Slovakia – the latter being home to heavyweight players such as Orange and T-Com via local subsidiaries, which should give its ultra-fast broadband market a boost.

In terms of technologies and architectures, FTTLA (fibre to the last amplifier) seems to be enjoying a degree of success in several countries (Estonia, Lithuania, Romania, the Czech Republic), and accounts for a base of close to 225,400 subscribers.

The special case of Russia

Russia is a special case in Eastern Europe. With 724,000 FTTH/B subscribers, it is the country with the largest number of FTTH/B subscribers in Europe, and the 6th largest base in the world.

Fibre networks have been deployed chiefly around the country's main cities, namely Moscow and Saint Petersburg, where there are a great many apartment buildings. The market's top payer is Beeline, which is among the globe's 10 largest FTTH/B providers – the only European player to be in the top 10, in fact. The market still has a great deal of growth potential, and Russia is expected to continue to move up the global rankings.

Top 5 FTTH/B providers in Central & Eastern Europe, in number of subscribers, as of mid-2009

Rank	Operator	Country	Technology & architecture	FTTH/B subscribers
1	Beeline	Russia	Ethernet FTTB	724 000
2	T2	Slovenia	Ethernet FTTH	40 000
3	Teo LT	Lithuania	Ethernet FTTH	41 700
4	Orange Slovensko	Slovakia	GPON FTTH	29 000
5	Telekom Slovenije	Slovenia	Ethernet FTTH	22 000

Source: IDATE

1.5. FTTx market in the Middle East still only nascent, but promising in many cases

The first FTTx rollouts in the Middle East were in Dubai in the year 2000, and in 2005 in other countries. But nothing terribly concrete took place prior to 2008. The situation is expected to evolve significantly over the next few years, especially given the great many building projects in the works in these countries.

As of mid-2009, there were 66,100 FTTH/B subscribers in the Middle East, out of a total 549,200 homes passed, located chiefly in the United Arab Emirates. FTTx is still very little developed in other parts of the Middle East-Africa zone.

The two main players in that part of the world are based in the UAE: Etisalat and DU which have a combined base of 54,000 FTTH/B subscribers (i.e. more than 81% of the region's subscribers) and around 520,000 homes passed.

The FTTx market in Saudi Arabia is expected to enjoy considerable growth, given the projects announced in recent months, especially for King Abdullah Economic City, and STC's plans in the area of very high-speed access.

From a broader perspective, several announcements were made in summer 2009 that seem to point to several major rollouts in the short and medium term:

- in Egypt, property developer Palm Hills Developments (PHD) has announced 4,200 FTTH connections based on GPON technology;
- LTT is expected to deploy an FTTH network serving 800 buildings around Alzohor district in Tripoli;
- LS Cable has signed an agreement to deploy an FTTH network in Iraq between 2009 and 2012;
- in Lebanon, the Ministry of Telecommunications commissioned a study on an FTTH rollout in Hamra and Ashrafieh, estimated at 15 million USD.

Several factors seem to be coming together in favour of swift FTTH/B rollouts in the Middle East over the next few years: the many construction projects, the good economic health of the countries concerned, which have been less affected by the global recession these past months, strong public demand for future-proof and high performance telecom infrastructure and services…

2.   FTTx : The leading operators' strategies

Key findings

- This report draws on a series of interviews with some 30 operators who were contacted with the purpose of obtaining answers to specific questions about their FTTx strategies.

- The distribution of FTTx subscribers around the globe has long leaned heavily in favour Asia which accounts for almost 80% of all fibre-based customers, and 10 times the number in Europe (West and East, including Russia).

- There are several motives at play in decisions to invest in FTTx rollouts, but the primary ones are competitive and/or regulatory pressures, followed by a desire to capitalise on industrial assets, seizing an opportunity…

- A number of elements can affect the rate and scope of FTTx rollouts, including technical and/or financial difficulties, a shift in market rules, a market momentum that differs from initial expectations. In most cases, this results in scaling back initial targets.

- On the whole, the competitive structure in ultra-fast broadband markets is similar to what we find in existing broadband markets.

- Given the sums involved, it is the private sector that will be shouldering the bulk of investments. But, generally speaking, operators believe that public monies will be needed for fibre rollouts in non-urban areas, i.e. in those areas where the market is not big enough to earn a return on investments within a reasonable timeframe.

- In most cases, superfast broadband access prices are in line with those charged for regular broadband access, or slightly higher to factor in the added capacity being provided, but they can be exactly the same as DSL or cable broadband access prices.

- There are several ways to view the relationship between fixed and mobile NGA (new generation access). We can view it in terms of network synergies, for instance, with a potential to generate savings on transport/backhaul.

Global overview of FTTx as of June 2009

While the rate of deployment for very high-speed offers (number of homes passed) is tending to slow (6% increase between January and June 2009, compared to 24% during the previous six months), the rise in the number of FTTH/B subscribers is holding relatively steady: 17%, compared to 19% in the previous six months, which translates into roughly 4.9 million additional customers worldwide.

The distribution of FTTx subscribers around the globe has long tilted heavily towards Asia which accounts for almost 80% of customers, all FTTx technologies combined (including FTTx+LAN, which is the configuration of choice in China), or 10 times more than in Europe (West and East, including Russia).

In Europe, the rate of growth for FTTx subscribers is much lower, even though some operators are enjoying increasing success with their offers. On the whole, however, there are far fewer homes passed, and potential customers have still not been wooed by available solutions as many are still satisfied with their existing DSL services.

Reasons for deploying FTTx

There are a number of reasons to invest in FTTx rollouts, starting with competitive and/or regulatory pressure, followed by a desire to capitalise on industrial assets, seizing an opportunity… For some operators, it can be a combination of several factors. In most cases, however, issues concerning demand (e.g. end users' need for added capacity) are still only secondary and seen as future justifications for the appeal of superfast broadband.

Japan's incumbent carrier, NTT, and the top two telcos in the US, AT&T and Verizon, initially invested in FTTH/B or FTTN to take back broadband market share.

In South Korea, incumbent carrier KT is also working to consolidate its position in a highly competitive market through investment in very high-speed access.

Meanwhile, in Europe, the reasons for investing in superfast broadband are more open ended. The continent's pioneers, Italy's FastWeb and Sweden's B2, took advantage early on of opportunities to gain access to passive infrastructure. The owners of the infrastructure may also be tempted to capitalise on their networks through diversification, as Swedish power utility Mälarenergi did. Of course we also find competition and regulatory considerations in the latest rollout announcements. In Germany, Deutsche Telekom cites both competitive pressure coming from cablecos, city carriers and utilities, along with increased demand for ever-higher speeds and greater bandwidth.

The reasons for undertaking fibre rollouts can also be political. Mälarenergi, for instance, cites the particularly positive climate for IT developments in Sweden in the early 2000s, with the launch of a strategic government support programme. Korea Telecom also speaks of the commitments it made as part of the national government's BcN programme to deploy a convergent broadband network.

Are players in line with initial targets?

A number of outside elements can affect the rate and scope of FTTx rollouts, including technical and/or financial difficulties, a shift in market rules or a market momentum that diverges from initial expectations. In most cases, this results in scaling back initial targets.

Portugal Telecom provides us with a good example of technical constraints.

NTT, on the other hand, scaled back its targets because of reactions from the market. As customer take-up was slower than expected, the Japanese incumbent first reduced its targets in late 2007, from 30 to 20 million customers by the end of 2010.

Meanwhile, in the United States there have also been delays, or risks of seeing the country's top two carriers push back their initial targets, even though they have already been decreased. AT&T was covering 19 million households as of mid-2009, but its goal of 30 million by the end of 2010 has been pushed back a year. Meanwhile, Verizon had 14.5 million homes passed for FTTH at the end of September 2009, and it will need to maintain a steady pace with its rollouts to achieve its target of 18 million by the end of 2010.

Added to these particular constraints are those caused by the recession which poses the dilemma for operators of whether to focus on short-term management issues (reducing investments is one way to improve the balance sheet immediately, and especially cash flow) or on long-term outcomes (maintaining investments to prepare for the future). It can be difficult to decide which is best…

Could FTTH weaken competition in the fixed access market?

On the whole, competition in the ultra-fast broadband market is similar in structure to what we find in classic broadband markets. This is particularly true in the best developed markets. In South Korea, for instance, all of the country's fixed telcos are involved in ultra high-speed access, and most of Korea Telecom's competitors already offers solutions running at 100 Mbps.

In Scandinavia, the arrival of new players, namely utilities, into the fibre access market appears to be expanding the solutions on offer: these operators are organized by region or by municipality, and do not generally compete with one another. Plus, market consolidation has already begun, notably in Denmark where, in November 2009, TDC announced its takeover of DONG Energy, the utility that leads the way in FTTH rollouts in the country.

In addition to regional development, there are also concerns over how to handle competition inside shared buildings, the goal being to limit the quantity of infrastructure installed indoors and the amount of work performed, as residents are often reluctant to agree to several requests to perform installations on the premises, while guaranteeing that tenants and/or property owners have access to a choice of operators. In its "Fibre Suisse" programme, Swisscom plans to install four fibres for each household, one for itself and the other three for alternative ISPs – a deliberate move to shield itself from overly stringent regulation, while also reducing costs and protecting its market share.

The FTTx business model: what positioning for market players?

The position assumed by an incumbent carrier such as Portugal Telecom, for instance, is clearly aimed at monetising content and services, even if the access market, particularly via wholesale offers, can provide added revenue (and may also be an obligation). Its prime target is multiple dwelling units as it can be harder to earn a return on singe family dwellings, although this depends on the penetration rate.

Another incumbent carrier, as is the case with NTT in Japan, may be clearly working to regain its dominant position in the fixed market. It has essentially been the carrier's mobile arm, DoCoMo, that has enabled NTT to finance its FTTH/B rollouts since 2001, and the Japanese incumbent does not expect to reach the breakeven point for its fibre deployments until 2011.

Utilities generally take a different stance, however: Mälarenergi, for instance, views its positioning as horizontal, contrary to telcos which are devoted more to vertical integration.

Does FTTx need help from the State? From local authorities?

Given the sums involved, it is the private sector that will be shouldering the bulk of investments. But, generally speaking, operators believe that public monies will be needed for fibre rollouts in rural areas where the market is not big enough to earn a return on investments within a reasonable timeframe.

Aid can come from public authorities at different levels (local, regional, national and even supra-national, such as the European Commission) and rollout projects need to be selected based on purely economic considerations, without looking at the candidates' past and future investments nor their position in the market, according to Deutsche Telekom.

The incumbent carriers in Switzerland and Portugal share the view that public and/or regulatory interference needs to be kept to a minimum as it can act as a disincentive to invest. Swisscom goes even further than Portugal Telecom here, stating that, even in rural areas, the role of public authorities needs to be confined above all to promoting suitable private investment solutions: public financing must only ever be a last resort when all other means employed to provide incentives for private investment have failed.

Open access networks: are they *the* solution for stepping up FTTH take-up?

One of operators' primary questions is what is an open network: a public network? A shared network? "None of the above," says Deutsche Telekom which feels that the best way to maintain a network's open nature is to develop infrastructure-based competition.

Swisscom fully shares this view of infrastructure-based competition. Unlike the Portuguese and Germany incumbents, however, it has implemented a scheme for sharing physical infrastructure, based on the installation of multi-fibre networks.

Korea Telecom, meanwhile, has deployed its own network and does not share its fibre with other operators. Inside of buildings, the incumbent's fibre is pulled directly to the cabinets where the copper pairs were installed, and is connected from there to the ONT.

FTTx and pricing strategies: in line with DSL or disruption?

In most cases, superfast broadband access prices are in line with those charged for regular broadband access, or slightly higher to factor in the added capacity being provided. But they can be exactly the same as broadband access prices – especially with vendors, such as Free and SFR in France, which have a single price point.

In many cases, operators are proceeding as though their ultimate goal is to gradually switch their ADSL customers over to FTTH/B: as it stands, there are only minor differences in terms of associated services, and fibre solutions offer lower per-Mbps prices. But we also find considerable differences in some pricing schemes, with certain operators, including Telefónica and Sonaecom, charging up to twice as much for fibre access.

Comparison of the price of a selection of ADSL2 and FTTH bundles at 100 Mbps

(EUR/month)
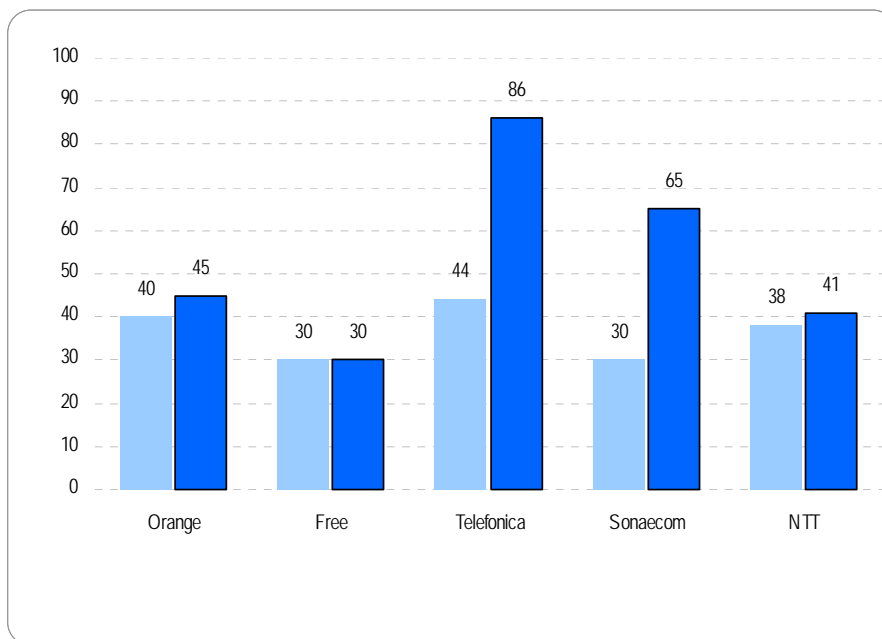
Source: IDATE

FTTx and content policies

Korea Telecom believes that FTTx serves the Internet access market first and foremost, with other services and advanced applications, such as IPTV and SoIP (Storage over IP), etc. being add-ons. As a corollary to this, partnerships in the area of content are not based on size or genre-related criteria, but rather on concerns over quality of service and reliability.

Through its FiOS TV solution, Verizon is working to expand its target clientele by focusing on new niche markets. To this end, it views cultural diversity as a niche market ripe for innovative services, offering multilingual programming, for instance.

Cultural, social, etc. aspects need to be taken into account when planning programming, to persuade consumers to subscribe. Verizon offers a package called "Connexion Latina", for instance, which includes 70 channels in English and Spanish, and another called "International Premium" that includes 33 channels in 19 different languages, which subscribers pick and mix themselves.

Ultimately, then, Verizon's selling points are clearly centred around the options it offers customers in the realm of new services, and especially TV services, which allows the company to meet its initial challenge, namely rivalling cable companies' market dominance by offering equivalent or better services, using a different technology.

FTTH and LTE

There are several ways to view the relationship between fixed and mobile NGA (new generation access). We can view it in terms of network synergies, for instance, with a potential to generate savings on transport/backhaul. We can also view it in terms of complementarity/competition, as each type of access can support, at least to a degree, the same services and applications: choosing between one or the other could therefore come down to the features of the terrain that needs to be covered, each operator's original positioning, etc.

Korea Telecom is examining fibre's potential as a backhaul network for LTE solutions, but does not expect very strong synergies in terms of CAPEX or OPEX.

For Portugal Telecom, the two solutions are complementary: a common IMS control platform already makes it possible to create a gateway for content between fibre and mobile access, currently HSPA+ and LTE down the road. From a technical perspective, fibre networks can also provide backhauling solutions for 3G+ and 4G mobile services – a configuration that is being tested by the Portuguese incumbent.

Swisscom already uses optical links for backhauling traffic from HSPA stations when needed. It will be able to take increasing advantage of connection to the FTTH network as it is deployed.

3. FTTx pricing policies

3.1. FTTx offers: often comparable to ADSL offers

Fibre is not yet a widespread success, particularly in Europe where FTTH/B users often account for less than 5% of broadband subscribers. It is much further along in Asia where FTTH/B subscribers represent 48% of high-speed customers in Japan, 44% in South Korea and 30% in Hong Kong. How should fibre offers be positioned with respect to ADSL? As a premium service, so more expensive for end users? Or, on the contrary, aside from speed is it a similar offer, and so charged at a comparable price?

Some operators market only access (T2 in Slovenia), TV and/or telephony, or offer other services as options (Telia in Sweden). Customers are billed a monthly flat rate. In addition, as with ADSL in its early days, prices are often attached to a given bitrate.

The content and services attached to FTTH offers are often identical to those offered via ADSL – with trip play bundles that include access, unmetered calling and TV being the main components.

For operators that do not market a triple play bundle, telephony and TV services are generally offered as options, in some cases with a discount when subscribing to two or more services (see tables 1 and 2 below). The options associated with FTTH bundles are identical those offered over ADSL, with the exception of certain features such as symmetrical bitrates. Orange France, for instance, offers all communication (e-mail accounts, domain name, etc.), security, online gaming and music services plus a symmetrical bitrate option with its fibre solutions.

Television, including HDTV, plays an important role in telcos' FTTH offers, coming to compete with cable operators' offers, especially in the United States where cable companies dominate the broadband access and pay-TV markets.

HDTV services are either included or offered as an option, and are often the same as those offered over ADSL: additional channel packages, DVR, VOD, etc. Some vendors enhance their fibre solutions with a few extra TV channels, with HDTV channels or a DVR service. One example comes from Orange France: starting in April 2009, its optical fibre customers will have a package of 12 channels which usually costs €9.90 a month included in their basic offer, plus a thirteenth channel, Game One.

KPN in the Netherlands has made TV a key selling point, as has FastWeb in Italy which has launched a website to promote VOD and its usage. FastWeb has a large selection of TV content on offer, both on its pay-TV channels and available on-demand. The company's success is also due to its array of solutions: more than 15 different offers are available, from simple access to a quadruple play bundle.

If high definition TV is also available in ADSL bundles, its consumption is improved with the increased capacity of fibre networks. HDTV, and 3D TV further down the road, are emerging as key selling points for acquiring new customers.

For now, then, there is no real difference between how ADSL and fibre are used, no real killer app being rolled out thanks to fibre, although some operators are working to make a distinction, as with the France Telecom example above, or with NTT in Japan which is exploring forays into gaming through a partnership with Nintendo which wants to have a greater number of its Wii consoles connected to the Web. NTT views this partnership as a means of acquiring new customers.

Aside from a handful of cases, however, the only real difference that fibre offers are bringing to the table for now concern bandwidth, and the ability to enjoy symmetrical bitrates (50 Mbps, 100 Mbps and even 1 Gbps).

Operators offering only access, with or without TV and telephony as options

	Access only	Optional TV or telephony services
Telecom Italia (Italy)	20/1 Mbps: €24.95/month telephone included	TV pour 2.95/month
FastWeb (Italy)	20/1 Mbps: €39.90/month	TV (14 channels): 9.9/month Telephone: 19.9/month
Telia (Sweden)	100 Mbps: €27.20/month	TV: between 17 and 45 channels included, from €9 to 22.60/month
Net Cologne (Germany)	100 Mbps: €35/month telephone included	TV (270 channels): €6.50/month
T2 (Slovenia)	10 Mbps: €14/month 100 Mbps: €100/month	
Beeline (Russia, Moscow)	29.3 Mbps: €29.80/month	
Verizon (USA)	50/20 Mbps: €117/month	Telephone: from €52 to 99/month TV (200 channels): €62.30/month VOD: from €4 to €5/month Quadruple play bundle: €10 off the combined price of the services
KDDI (Japan)	100 Mbps: €37.50/month telephone included 1 Gbps: €42/month	TV (30 channels): €19/month 1Gbs offer: Telephone: €4/month
Chunghwa Telecom (Taiwan)	100/5 Mbps: €25.50/month	Telephone
SK Broadband (South Korea)	100 Mbps: €18.40/month	TV: between €6, 13 and 7.24/month Telephone: €1.10/month
KT (South Korea)	50 Mbps: €16.70/month	TV: €5/month

Operators marketing a triple play bundle

	Triple Play bundle
FastWeb (Italy)	20/1 Mbps: €39.70/month
Sonaecom (Portugal)	100Mbps: €64.91/month
Orange (France)	100/10 Mbps: €44.9/month
Free (France)	100/50 Mbps: €29.90/month (over 100 channels + DVR)
Telefónica (Spain)	30 Mbps 70 channels + TV on demand and telephone: €85.90/month
KPN (The Netherlands)	30/3 Mbps: €65/month 50/5 Mbps: €80/month 60/6 Mbps: €110/month
AT&T (USA)	Several packages, depending on internet capacity 18/1.5 Mbps: €226/month
NTT (Japan)	100Mbps: €40/month
HKBN (Hong Kong)	25/25 Mbps: €20/month 100 Mbps: €51/month 1 Gbps: €161.6/month

Source: IDATE

3.2. Different prices in Europe, Asia and the United States

An analysis of the prices charged in the different geographical zones also needs to include a closer look at the capacity offered for access only solutions and as part of bundles.

In Europe, the highest speed on offer is 100 Mbps, aside from a few services offering 1 Gbps, notably in Sweden. In any event, this is the access rate being marketed by most incumbent carriers, such as Orange in France, Sonera in Finland, KPN in the Netherlands, Telecom Slovenia and Telenor in Norway. 100 Mbps could be the future FTTH/B standard.

Faster services are available in Asia, with several operators, including HKBN in Hong Kong and KDDI in Japan, marketing offers at 1 Gbps.

Prices in the United States are the highest of anywhere. Verizon, for instance, charges 115 EUR/month for access at 50 Mbps, or twice what is being charged in Europe. To this, customers need to add 50 EUR a month for telephone services and more than 60 EUR for a TV package.

In Europe, triple play bundles are widely available and at much more affordable prices: a triple play with access running at 100 Mbps is generally offered at between 29 and 65 EUR/month. The average is 37 EUR/month for the operators covered here.

Asia is home to the least expensive FTTH/B offers: Chunghwa Telecom in Taiwan markets a 100 Mbps service for 25 EUR/month; SK Broadband in South Korea offers the same access speed for 24 EUR/month, including TV. The cheapest of all is KT in South Korea, which charges only 17 EUR/month for an offer running at 50 Mbps.

We need to be careful, however, in stating that FTTH/B service prices are at their lowest in Asia since Chunghwa Telecom provides only Internet access and no TV option, and KT's offer delivers an access speed of only 50 Mbps. For a proper comparison of the prices charged in Europe and in Asia, we have selected offers that include telephone and TV services, and an Internet connection running at 100 Mbps.

Comparison of a selection of FTTH/B prices in Europe and in Asia (bundles including telephone + TV + Internet access at 100 Mbps)
(EUR/month)
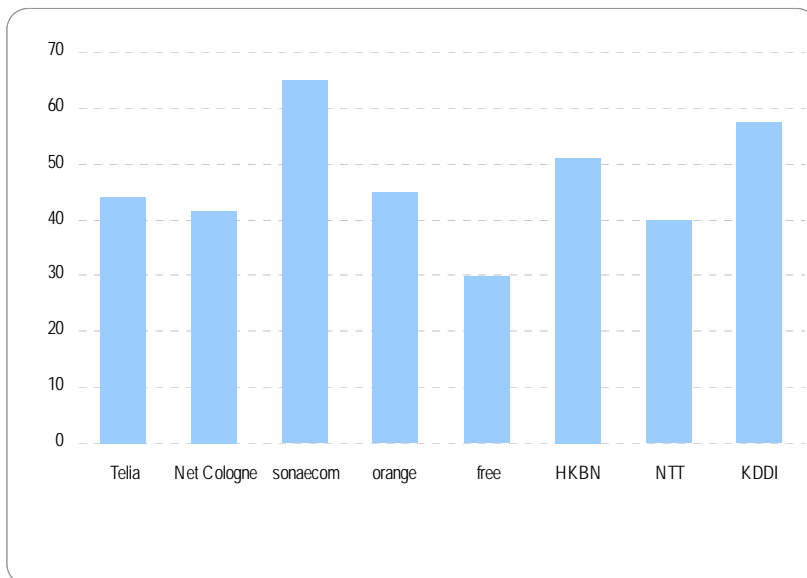
Source: IDATE

3.3. Will the prices enable subscribers to switch from ADSL to fibre?

What can we conclude about FTTx operators' current pricing policies? Is the goal to migrate ADSL customers to fibre, or are operators working to position fibre as a high-end offer – providing customers with the option of a faster version of ADSL services?

Comparison of a selection of ADSL2 and FTTH bundles, with access at 100 Mbps
(EUR/month)
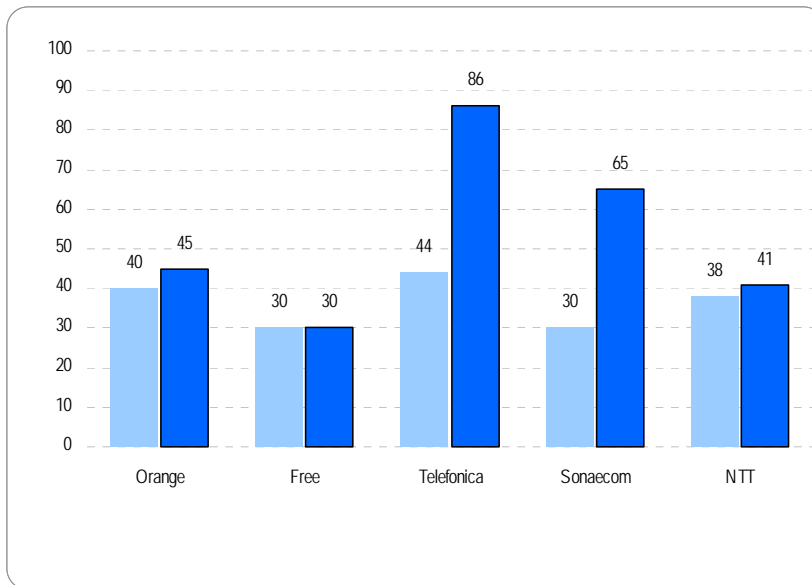
Source: IDATE

In a growing number of countries, we have observed that the price charged for FTTx triple play bundles are comparable, and in some cases identical, to the price being charged for standard ADSL2+ triple play bundles.

The price per Mbps is lower for fibre offers. In Europe, for instance, Orange charges 40 EUR a month for an ADSL connection at 18 Mbps, or more than 2 EUR per Mbps, whereas with its fibre offer the price per Mbps is 0.45 EUR. Telefónica in Spain offers a rate of 6 Mbps in its triple play bundle for 44 EUR, or more than 7 EUR per Mbps, compared to less than 3 EUR per Mbps with its FTTH offer.

In France, operator Free, which is part of the Illiad group, has a unique fibre strategy: side from bandwidth, the FTTH offer is an exact replica of its ADSL triple play, both in terms of service and price: 29.90 EUR/month. This means that ARPU needs to be boosted through a range of optional value-added services, such as those tied to IPTV. Here, Free has a very large selection of VOD programming, offers subscription to VOD services and is always working to secure exclusive rights over more channels by developing partnerships.

In a number of cases, the strategies appear to reflect a desire amongst operators to have their customers gradually switch from ADSL to FTTH/B offers: for now, the differences in terms of associated services are minor, and the price per Mbps is lower with fibre solutions. Some operators, such as Telefónica and Sonaecom, are making a real distinction with prices, however, charging as much as double for their fibre services.

4. FTTH network sharing: technical solutions and challenges ahead

In a considerable number of developed countries, one of the central challenges facing pioneer FTTH/B rollouts that are currently underway is maintaining the levels of competition and service innovation that have been achieved in the broadband market which, in Europe, is built primarily around ADSL – albeit with a few exceptions such as Benelux. An initial response to this challenge centres on infrastructure-based competition, through initiatives from the Portuguese (ANACOM) and French (ARCEP) regulators in particular which have introduced solutions for renting ducts from the incumbent carrier – the first of which are already available.

It nevertheless remains true that, in Europe and in accordance with the analysis of markets 4 and 5, although the first regulatory texts on fibre (ducts and network sharing inside of buildings) have not been enough, passive or active wholesale could be possible.

It is therefore an entirely legitimate exercise to examine the different possibilities available for developing a wholesale offer, either passive or active, and particularly on the PON that have been widely deployed by incumbent carriers around the globe.

What we propose to do here is to describe the two solutions that appear to be the furthest along: one the one hand a wholesale Ethernet solution, being backed by UK regulator **Ofcom (ALA)** among others and, on the other, **WDM PON solutions and their derivatives** which are found in **Asia** in particular.

4.1. Wholesale Ethernet and Ofcom's ALA proposals

By and large, the implementation of active wholesale offers concerns the highest layers of the network. Regardless of the optical fibre architecture deployed, in other words whether a point-to-point (Ethernet P2P) or a point-to-multipoint (PON) configuration, Ethernet-based active wholesale offers can be implemented – in the same way as IP bitstream (Level 3) offers that are available on copper networks.

**Implementation of an active IP bitstream wholesale offer**
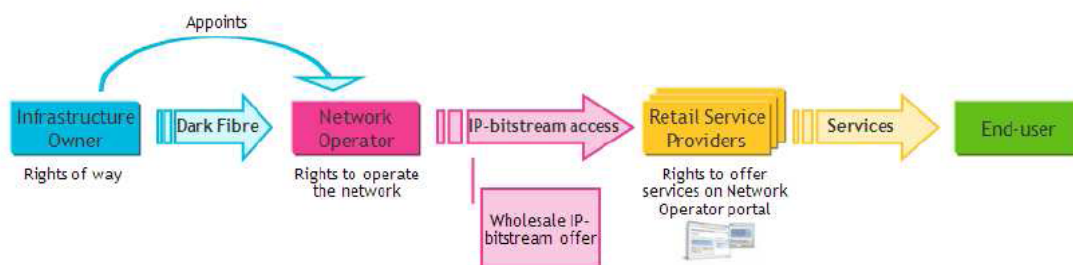
Source: Alcatel Lucent

Another possible approach, and one which would ideally adapt to the service innovations enabled by FTTH, is the one being recommended by British regulator Ofcom, namely ALA, or Active Line Access.

Its chief appeal lies in the intrinsic properties of Ethernet technology, and especially:

- flexibility in terms of the location of interconnection points in the optical network: ability to implement a local or regional interconnection point;
- compatibility with existing CPE (Customer Premises Equipment);

- quality of service supported, notably in terms of bandwidth guarantees and classes of service;
- enables multicasting;
- security and integrity of data streams, including for PON infrastructure on which fibre is shared by several users.

Regulatory option for the implementation of an active wholesale offer on FTTH networks
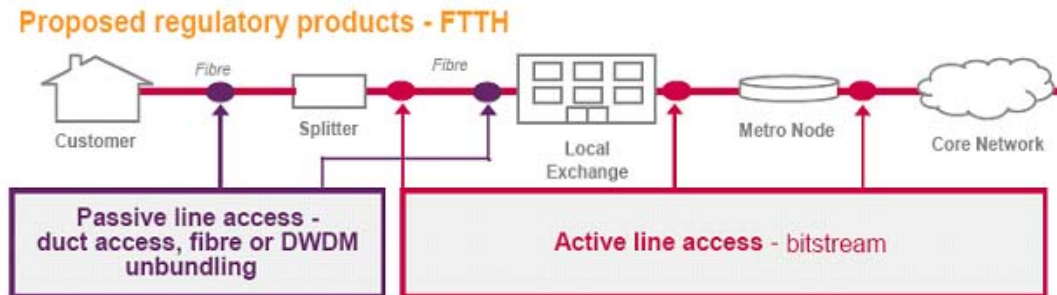
Source: Ofcom

According to Ofcom, ALA wholesale offers make it possible to ensure a certain degree of innovation on both the technical and marketing fronts even if, **up until now, it is the operators that had direct control over the physical infrastructure that have been in the best position to roll out innovative solutions.** One example is unbundling which went a long way to enabling the development of triple play bundles.

The main advantages of ALA are tied to its **neutrality**:

- at the physical level: it can be implemented regardless of the type of architecture chosen (P2P, PON, copper…) and at different interconnection points;
- and right up to the applications level (video, voice, data…).

This makes it possible to implement a unique wholesale solution regardless of the initial technical context, while benefitting from economies of scale enabled by the use of Ethernet, a protocol that is widely employed around the globe.

Ofcom's role in the promotion of ALA corresponds to its desire to implement an efficient and lasting infrastructure sharing solution. According to the British regulator, which is also examining possible local sub-loop unbundling solutions and duct access solutions (which it has noted could not be available everywhere, as with copper local loop unbundling), it is crucial to also devise wholesale solutions that offer the advantage of minimising investments in network rollouts.

The regulator can, however, only encourage the development of such a solution. It is then up to equipment manufacturers and operators to become involved in its development and in standardisation efforts, while ensuring a certain concomitance with current FTTx network rollouts.

Ofcom has nonetheless defined some of the specific **properties** that would need to be part of the technical solutions that are developed.

The five basic functionalities listed by Ofcom as necessarily included in a standard are:

- **security** enablement (user authentication, security of services): technical impact on data stream separation, each operator able to manage its own security solution;
- **quality of service** enablement (especially for video streams);
- **multicast** enablement (bandwidth reserve for different types of service);
- **flexible CPE** (each operator able to develop its own CPE);
- **flexible interconnection** (especially for the location of the interconnection point and the ability to change it).

## ALA: standardisation process
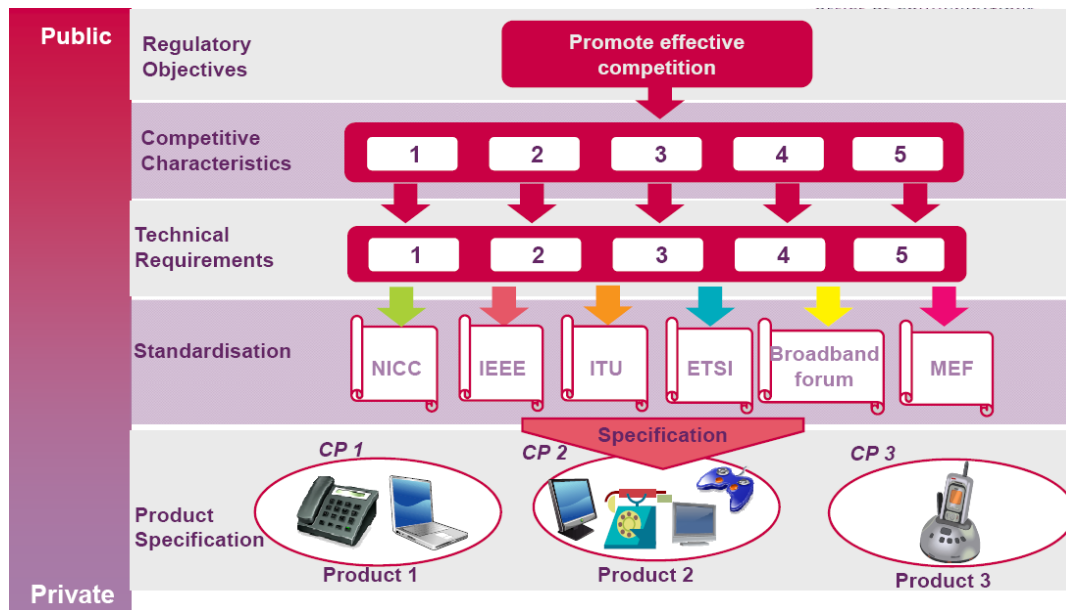
Source: Ofcom

Ofcom's involvement in the promotion of the ALA solution has included several seminars which have been held since 2007, along with the production of documentation for operators and manufacturers, the latest of which was on the topic of technical requirements and published in March 2009.

In the meantime, the **Broadband Forum** and the **MEF** have each launched an ALA programme, and several operators and equipment makers have expressed their interest in this type of solution.
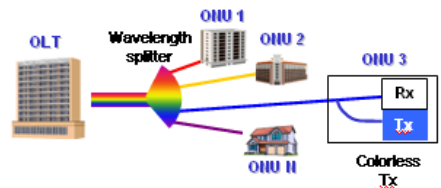
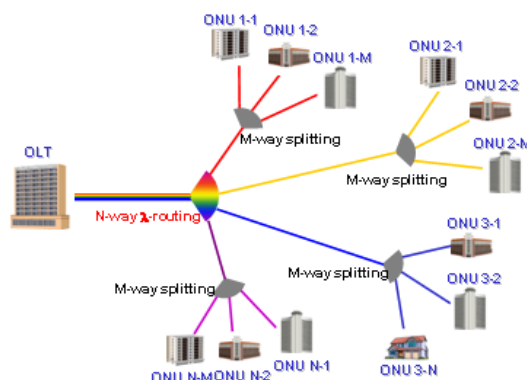# 4.2. WDM PON solutions and their derivatives

The different WDM PON solutions
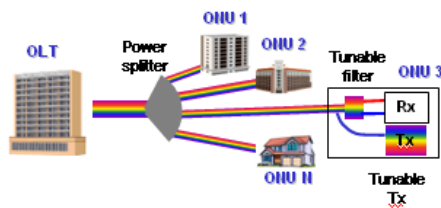
Source: Samsung

To be clear on the different terms that will be used in the following paragraphs, we should begin by defining the three main categories of WDM PON technology currently in the market.

The first, which comes to us from the past, is referred to here as **flexible WDM PON**. Its main drawback is that it requires an operator to implement so-called "coloured" ONT, in other words which are distinct for each residential user, depending on their provider. It is clear that this type of technology is ill-suited to large-scale residential rollouts.

The technology referred to here as **fixed WDM PON** is also known as pure WDM PON, and makes it possible to employ "colourless" ONT which is much more suitable for large-scale deployments.

The third solution examined here is a **hybrid TDM/WDM PON** solution wherein the number of wavelengths is limited, and assigned to each operator for instance. This hybrid technology currently offers several advantages that we will detail here.

4.2.1.   The hybrid TDM/WDM PON solution

As it stands, the chief drawback of this hybrid TDM/WDM PON technology is the **lack of standardisation** from the FSAN (Full-Service Access Network interest group), for instance. Moreover, according to manufacturers, there does not currently appear to be a high level of demand from operators for the swift rollout of this technology.

### Implementation on an existing GPON
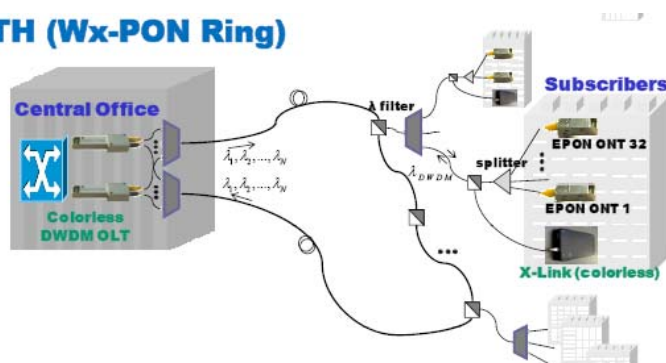
Source: ETRI

One of the advantages of this technology is that a hybrid TDM/WDM PON solution can be installed on an existing PON **without changing the existing GPON equipment**, in other words the GPON splitters and the ONT installed on customer premises. A wavelength splitter (AWG) is installed upstream from the GPON (in the central office, for instance). Under this configuration, each operator installs a transceiver in the central office (OLT) and an AWG. The advantage of this solution is thus the ability to keep the entire existing portion of the GPON.

This is undoubtedly the first solution to enjoy operator support as it offers the advantage of being relatively easily installed on an existing GPON.

One important point of interest to incumbent carriers in particular: this hybrid technology makes it possible to **extend the reach between the OLT and the ONT considerably**. While, with a GPON, this range is currently between 10 and 12 km, with a hybrid TDM/WDM PON solution, it can go as high as 60 km. This is referred to as **a long-reach PON**, and could allow incumbent telcos to shut down several central offices in exchange for a greater concentration in the core network.

10G and GPON convergence
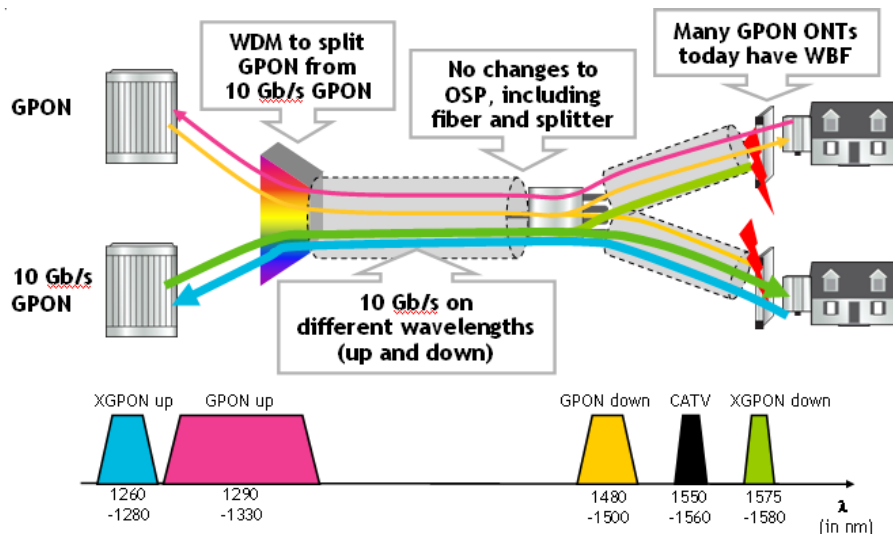
Source: Alcatel Lucent

As we can see in the above diagram, with four wavelengths (lambdas) a **GPON and a future generation 10G GPON can coexist**. This architecture is currently being examined by the FSAN.

However, because of the difficulty in having several operators cohabitate on differentiated wavelengths, this solution is currently being tested by the FSAN only for use by **a single operator.** Base on a single OLT, for instance, this operator could serve buildings with a large number of units with a 10G GPON solution and single-family houses with a GPON.

4.2.2. PON sharing in Japan

10G and GPON convergence
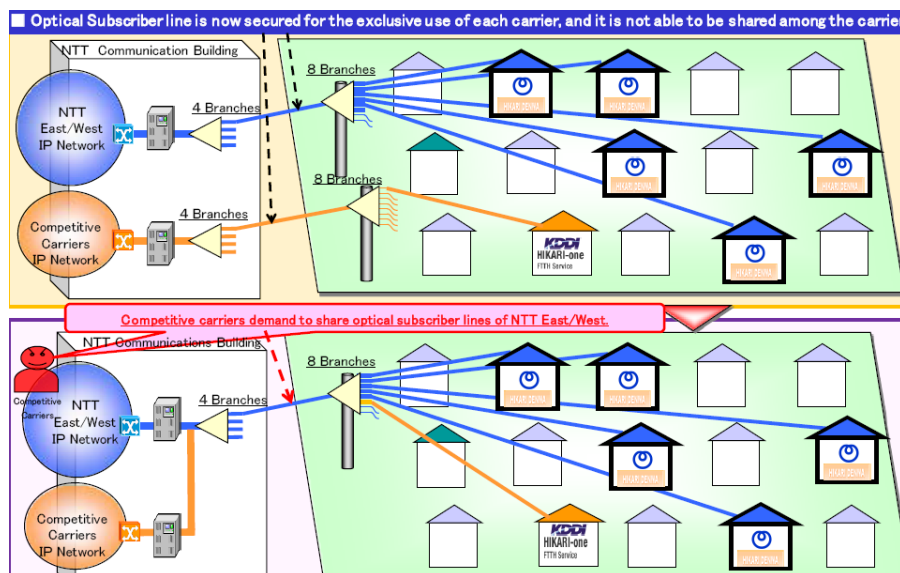
Source: MIC

The above diagram illustrates a solution backed by alternative operators in Japan, and KDDI in particular. Unlike what is depicted in the top half of the diagram (an existing solution), KDDI does not want to have to install two splitters (a potential 32 subscribers) to ultimately serve only a single customer.

The solution that KDDI supports involves connecting to the first NTT splitter, and then sharing the cascade of the next two splitters down the line.

Although this does seem to be an interesting solution, **it is not currently being used by KDDI or any other operator**, and so remains only a wish scenario.

Implementing this type of configuration would require each operator to use distinct wavelengths, which corresponds to a **hybrid TDM/WDM PON solution**, which is also called a stacked PON. Without this type of solution, there would be interference between the different operators' signals. Such solutions are currently available from some manufacturers, but have yet to be standardised.

4.3.   Conclusion

While Ofcom's **ALA** initiative is a step in the right direction, there are still a number of challenges ahead.

First is the fact that, as it stands, it is only in LLU configurations controlled by the incumbent carrier or infrastructure-based competition which have enabled innovative services in the area of broadband access (notably IPTV over ADSL2+). We can cite a number of players in Europe that are currently marketing triple play bundles over this type of architecture: France Telecom, Free and SFR in France, FastWeb in Italy, Telia Sonera in Sweden, Lyse in Norway, Telefónica in Spain… In some countries, and especially in northern Europe where open network models exist, most of the services delivered by service providers are centred around broadband, ultra-fast broadband or VoIP.

Another uncertainty lies in the roadmap for ALA, as none appears to be emerging from the manufacturer side of things.

It is possible that the ALA initiative suffers from being to "British", hence the goal Ofcom's alliance with the MEF to give it greater exposure on the international stage. Ofcom is also working to gain support for its initiative from other regulators, particularly in Europe, to help increase pressure on manufacturers.

Although the South Korean government backed **WDM PON** as part of its BcN plan, its new UBcN programme which runs to 2013 seeks to be less restrictive on the technological front – with the focus being more on services, and allowing operators more freedom of choice. This rather unusual attitude from the South Korean government would seem to indicate that it does not have complete faith in the potential of pure WDM PON. The goal of the new UBcN programme is nevertheless ambitious, targeting the availability of connections running at 1 Gbps by 2012.

South Korea is currently the only country with **two manufacturers** marketing WDM PON and hybrid TDM/WDM PON solutions: MEL (an ETRI spin-off) and LG Nortel. But ETRI is a young company and LG Nortel is in bad shape. In addition, as concerns pure WDM PON solutions, both companies market colourless ONT technologies but use different approaches: Wavelength Locking for LG Nortel and Wavelength Re-use for MEL (ETRI).

Other manufacturers from other countries are, however, forging themselves a position in WDM PON technologies: NSN, Huawei, ZTE, Ericsson and Cisco. Not all are equally motivated, and none have quite as complete an offering. On the other hand, some manufacturers such as Alcatel Lucent have no intention of becoming involved in pure WDM PON for at least another three years.

We can draw the general conclusion that colourless ONT has a clear lead in pure WDM PON configurations, but the hybrid TDM/WDM PON solution is appealing as it allows operators to keep their existing GPON equipment and to increase their reach.

But there is no sense of urgency coming from the South Korean operators that are the most involved in these technologies (KT, SK BB and LG Powercom) to develop pure WDM PON, whereas enthusiasm for hybrid TDM/WDM PON is more palpable. KT already has operational WDM PON solutions with Novera Optics, albeit on a very small scale. The introduction of EPON then of GEPON put an end to all of KT's and so to its competitors' desires to deploy WDM PON, with mass support now going out to EPON.

Pure WDM PON continues to suffer from **several technological choices** (locking, re-use, tuneable laser) and from a **lack of standardisation** despite the commercial availability of products. According to ETRI, the per-subscriber **costs** associated with pure WDM PON are still **3.5 times higher** than with an Ethernet PON, although the difference in price between a TDM/WDM PON and an EPON solution is minor.

The implementation of a pure WDM PON solution appears to still have a considerable impact on existing installations, particularly on an existing GPON due to the need to replace and perhaps even move the splitter.

There is virtually no impact when deploying a 10G GPON solution since, according to the FSAN GPON 1 standard, it must be compatible with GPON technology.

In the same vein, when deploying a **TDM/WDM PON solution, an operator can keep the existing GPON OSP, and merely extend the OLT/ONT reach by adding an AWG**.

Ultimately, although WDM PON technologies appear attractive, **they are not likely to be a commercial reality until at least five years from now.** The standard has not yet been defined and there are no major manufacturers strongly positioned in the technology. Even in South Korea operators are not overly enthusiastic about the technology, and equipment costs are still three times that of current PON solutions.

The intermediate solution, hybrid TDM/WDM PON, has the advantage of the likelihood of being standardised within the next two years. In addition, it is relatively easy to deploy as it allows operators to keep their existing GPON OSP (NGPON1). It also has the added advantage of offering a long reach between the OLT and the ONT, which should appeal to incumbent carriers.

5. FTTx Technologies & vendor dynamics

5.1. Panorama of the global FTTx market

This chapter details the status of FTTx deployments around the globe, along with a breakdown by type of architecture and by geographical zone.

For the purposes of this report, the FTTx market includes FTTH/B, VDSL, FTTLA and FTTx+LAN[1], while the geographical zones covered are Asia-Pacific, Western and Eastern Europe, the Middle East, North America and Latin America.

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

FTTx subscribers by geographical zone

Decembre 2008	VDSL subscribers	FTTH/B subscribers	FTTLA subscribers	FTTx/LAN	Total
Western Europe (1)	776 550	1 512 960	15 000	0	2 304 510
Eastern & Central Europe (1)	32 000	778 940	212 393	0	1 023 333
North America (3)	1 045 000	3 995 000	na	0	5 040 000
Asie Pacifique	1 500	22 717 500	na	17 000 000	39 719 000
Middle East & Africa	0	15 000	0	0	15 000
Total	**1 855 050**	**29 019 400**	**227 393**	**17 000 000**	**48 101 843**

(1) Western, Eastern & Central Europe = the EU-27 + Norway + Switzerland + Iceland + Andorra + Luxembourg + Croatia + Russia - Source: IDATE

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

FTTx subscriber breakdown by type of architecture – end of 2008
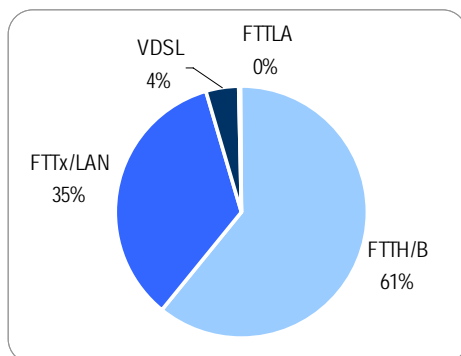
Source: IDATE

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[1] VDSL includes Fibre To The Node + VDSL and VDSL2 technologies. FTTLA stands for Fibre To The Last Amplifier: depending on cablecos' network architecture, the optical fibre is generally installed up to a location outside the building. FTTx/LAN is used mainly in Asian countries where Ethernet LAN can be the used for connecting end users from a point located outside the building or SDU. On the whole, the term FTTx refers to FTTH/B, FTTLA, FTTN+VDSL and FTTx+LAN.

5.2. FTTH/B technologies

This following section will focus on technologies used to deliver FTTH/B accesses, which include EPON[2], GPON[3], BPON and Ethernet P2P. Worth noting is the fact that FTTx/LAN lines (installed ports) are included here in the calculation of total FTTx access lines for the first time, as we believe that this architecture will soon be delivering higher speeds than the current 2 to 10 Mbps available in China.

5.2.1. EPON, the most widely deployed FTTH technology

EPON (and now GEPON) is by far the most popular FTTH technology worldwide, representing 60% of the market in 2008 – in large part due to Asia-Pacific's almost exclusive use of EPON, with both Japanese and South Korean carriers backing the technology. Moreover, its future development is clearly mapped out, with the 10G EPON standard expected by September 2009.

GPON deployment is still lagging behind EPON around the globe. Up until now, GPON has been gaining momentum chiefly in Europe and North America but has become the technology of choice in the thriving Chinese market as well. It should also be pointed out that EPON is being used for mobile backhauling, notably by China Mobile, especially in the 3G rollouts that are currently underway in that country. Equally noteworthy are the GPON-related announcements and trials conducted by China Telecom, China Unicom and, more recently, China Mobile.

The success of EPON in China, thanks to the current large-scale deployments, could rapidly influence the choices made in other emerging markets, and we already seeing it in pioneer rollouts in Thailand and Ethiopia. The widespread installation of EPON in China will help drive down the price of this technology. Largely used by European carriers, Ethernet P2P deployments remained marginal, along with BPON technology which had only been deployed in North America by Verizon (now replaced by GPON).

Breakdown of the FTTx technologies worldwide – end of 2008
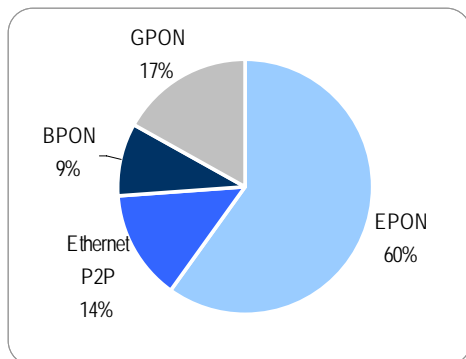
Source: IDATE

Breakdown of FTTx technologies by region (subscribers) – end of 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 American figures

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[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 in its GEPON version: Symmetrical bi-directional 1Gbps. Version 10GEPON enabling symmetrical speeds of 10 Gbps 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, delivering 2.5 Gbps downstream and 1.25 Gbps upstream. Version 10GPON enabling a speed of 10 Gbps is expected for 2011.

5.2.2. The situation in Asia-Pacific: EPON hotbed

Service providers in Asia-Pacific have invested heavily in PON, and especially in EPON technology as high volumes have meant lower costs. Incumbents in most of the bigger FTTH/B and FTTx/LAN markets have adopted EPON in the main: KT, NTT, China Telecom…

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

The optical fibre broadband access network has been deployed on a considerable scale in China. In 2008, EPON dominated rollouts in that country (accounting almost 100%) as Chinese carriers have adopted this technology due to its lower cost. In the meantime, although marginal, GPON has 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 and China Mobile, the country seems to be on its way to becoming the largest FTTx market.

5.2.3. 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

Technology	Country	Type of players	Players
	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-Illiad
	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

5.3. FTTx vendor dynamics

This section will examine the leading FTTx equipment manufacturers.

5.3.1. Existing vendors

The installed base of FTTx ports worldwide is estimated at 83.3 million at the end of 2008.

We can now offer a first estimate of vendors' global market shares for Q2 2009 (figures to be confirmed later by IDATE). In a very fragmented FTTx market, the globe's top six vendors are all Asian equipment vendors, ZTE being the market leader with a 19% share of the market, followed by Huawei with 13% and Japanese manufacturer Mitsubishi in third place with a 7% share.

These results confirm that ZTE the global FTTx market leader in Q2 2009 thanks to shipments in the first and second quarter of the year, and especially given the size of the contracts it has been awarded in its domestic market (e.g. China Unicom).

Vendors' share of FTTx ports worldwide – Q2 2009
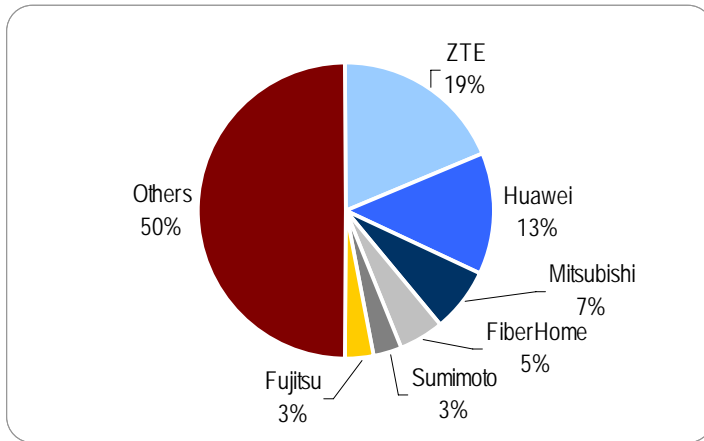
Source: IDATE

5.3.2. Local vendors selected in the main FTTx markets

Given how fragmented this market is, vendors distinguish themselves from one another with the technologies they support and their geographical presence.

In the two main FTTx markets (Japan and China), FTTx players prefer local suppliers: In Japan, Sumitomo, Mitsubishi and Fujitsu remain the market leaders, benefitting from the sizeable FTTH/B rollouts in that country.

In China, meanwhile, home-grown vendors are also the suppliers of choice for FTTx network rollouts, with ZTE, Huawei, FiberHome and Alcatel-Lucent (through Shanghai Bell) enjoying top spot.

We can offer a first estimate of vendors' market share in China in Q2 2009 (figures to be confirmed later by IDATE).

These results confirm that ZTE has strengthened its lead in China, boasting a 45% share of the FTTx market.

Vendors' share of FTTx ports in China - Q2 2009
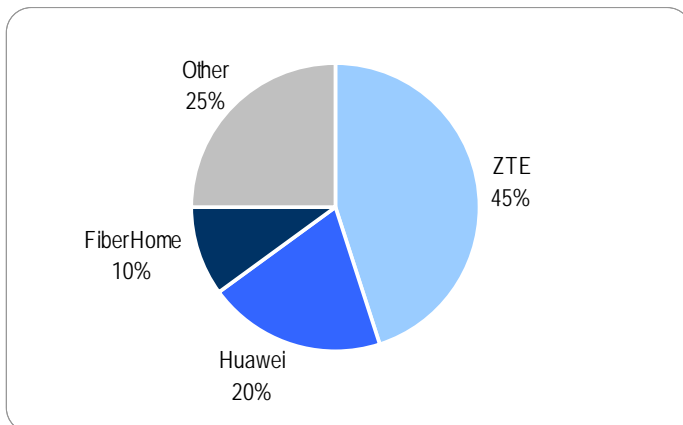
Source: IDATE

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

5.3.3. Vendor positioning

As we can see in the table below, FTTx port suppliers all back one technology in particular, with the exception of ZTE, Alcatel Lucent and Huawei.

Technologies promoted by equipment vendors

Equipment vendors	EPON	GPON	BPON	P2P
ZTE	✔	✔		
Huawei	✔	✔		
Mitsubishi	✔			
FiberHome	✔			
Sumitomo	✔			
Fujitsu	✔			
Nokia Siemens Networks[4]		✔		
Hitachi	✔			
Alcatel-Lucent		✔		✔
Cisco				✔
Tellabs		✔	✔	
Ericsson		✔		
Motorola		✔	✔	
Packetfront		✔		✔
UTStarcom	✔			

Source: IDATE

5.3.4. Active development of Chinese vendors

ZTE

ZTE has the advantage of providing both EPON and GPON technologies. Heavily involved in the evolution of PON technology, ZTE has been pushing for the development of PON standards and especially interoperability aspects. The company also participated in the development of next generation PON technologies (10GEPON) and launched the first prototype in October 2008. 10GEPON will be used to provide greater bandwidth to end users, but will be combined more and more with VDSL2 in an FTTB architecture.

ZTE's strategy is therefore to continue their commitment to GPON and EPON (10GEPON) standards.

As indicated earlier, ZTE is currently the FTTx market leader, in addition to being awarded the largest portion of China Unicom's orders in Q2 2009, which helped further consolidate its position in its home market.

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[4] In mid-2008, NSN announced that it will stop investing in GPON technology but will continue to support existing customers. The company will focus instead on developing the next generation of optical access for when the market is ready.

Huawei

Huawei also holds both EPON and GPON licenses.

Unlike many of its competitors, Huawei is positioned in overseas markets and mainly in Europe and the Middle East, where it is deploying GPON. Huawei provides EPON in its domestic market.

The company now has some GPON rollouts under its belt in Europe and the Middle East, but its overseas shipments are few in number, and Huawei's FTTx revenue still derives chiefly from its domestic EPON market.

FiberHome

Promoting EPON architecture, FiberHome is a major player in China.

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

5.3.5.   Focus on the Chinese FTTx market

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

Furthermore, for those Chinese operators that are already heavily committed to EPON, the temptation to migrate to the new 10G EPON standard will be great, especially as it expected in September 2009. China Telecom is already testing 10G EPON equipment, in fact. So vendors who have already taken a position on future 10G EPON will have a strong advantage: such is the case for ZTE which launched the world's first symmetrical 10 GEPON equipment prototype in May 2009.

China will spur the GPON industry's progress

GPON is still little deployed in China compared to the massive EPON rollouts that have been announced. At the end of 2008, GPON was mainly the focus of trials:

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

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

To summarize, we can say that although Chinese operators have developed an unshakable faith in EPON developments up to now, they are also starting to focus their 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: Beijing, Guangzhou, Wuhan and Shanghai
China Unicom	Ericsson, Huawei, ZTE	Upgrade of fibre cable and FTTH deployment (especially in Shanxi Province for GPON)
China Mobile	Alcatel-Lucent, Ericsson, ZTE	Deployment of an FTTH GPON network in 10 cities in Guangdong and Anhui provinces

Source: IDATE

6. Australia's National FTTH Plan

Australia is not the first country to launch a government sponsored investment plan for high speed and very high speed broadband access technologies. There are many financing projects, especially for FTTH, in Europe (Greece and France, by local governments) as well as in Asia, in Singapore for example. What's different about Australia's national FTTH plan is its size and the amount of money involved. This Australian scenario should be taken seriously and could undoubtedly lead to other grassroots initiatives in other countries.
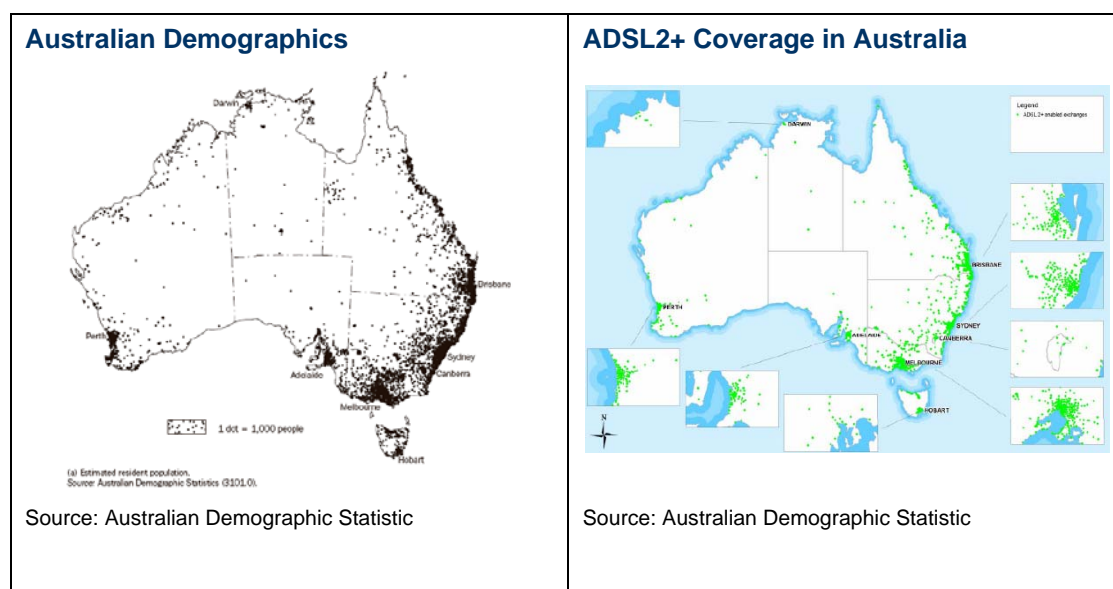
6.1. Australian demographics and the broadband market

The geographic uniqueness of this country-continent is that Australia's geography is frequently compared to Canada's. Actually, Australia, which has 21 million inhabitants, has one of the lowest population densities on the planet, with 3 inhabitants per km^2 (compared to 31 in the United States, and even 246 in the United Kingdom). In addition, the population is extremely concentrated in the southwest of the country, the most urban area.

This situation posed several technical challenges when the telephone network now used within the country was constructed in the 1960s. This has resulted in:

- the current switched network being very dense in urban areas and much more dispersed elsewhere;
- nearly 70% of the switched network's subscribers are located in cities and served by 12% of the telephony network central stations.

The Australian geography has led to the fact that the copper lines are much longer in sparse areas, which results in major disparities in broadband access service: no broadband access or very poor quality access in rural areas, but offering up to 20 or 30 Mbps in the cities.

Australian Demographics	ADSL2+ Coverage in Australia
Source: Australian Demographic Statistic	Source: Australian Demographic Statistic

The deployment of ADSL2+, delivering up to 20 Mbps, is essentially concentrated in urban areas, with 80% of STN lines in the country equipped with ADSL2+.

In March 2009, nearly 60% of the broadband market was held by the incumbent operator, Telstra (ADSL and cable modem). Its competitor, SingTel Optus, also multi-platform (cable modem and ADSL), holds 14% of the market.

Unbundling is highly developed in Australia; it represented nearly 27% of broadband lines at the end of 2008.

The uniqueness of the Australian market is not limited to the presence of the incumbent operator and its primary competitor in ADSL, because these two operators are also present in the pay TV market. Telstra's position in both cable broadband and pay TV markets has led to many battles over the years with the Australian regulator (ACCC).

6.2. The First National Broadband Network (NBN): FTTN

At the end of 2007, a new (Labour) government came into power under the leadership of Prime Minister Kevin Rudd who named, in December 2007, Senator Stephen Conroy to the post of Minister "for Broadband, Communications and the Digital Economy". Quickly, the Minister took charge of Very High Speed broadband and, since April 2008, the first national request for proposal was released for deploying the NBN. This first NBN was generally focused on FTTN and expected to cover 98% of the population with a minimum access speed of 12 Mbps. This NBN was presented as a neutral and open network that needed to have the same price throughout Australia (despite the geographic differences outlined above). The government then announced a public investment of up to 4.7 billion AUD (2.7 billion EUR).

This request for proposal was closed on November 26, 2008, with the rejection of Telstra's offer and acceptance of five other offers: Optus, Axia, Acacia plus two regional offers from TransACT (Canberra region) and the Tasmanian Government (Tasmania). The total cost of this essentially FTTN deployment was then estimated to cost 15 billion AUD (8.6 billion EUR) over a five year deployment period.

The selection of the winner was given to a panel of experts who, in March 2009, submitted a report to Minister Conroy, who will make the final decision. In the meantime, with the decision date approaching, several rumours have circulated about the possibility of cancelling this request for proposal and a probable change in the government's strategy.

NBN Coverage based on FTTN: minimum 12 Mbps for 98 % of the population
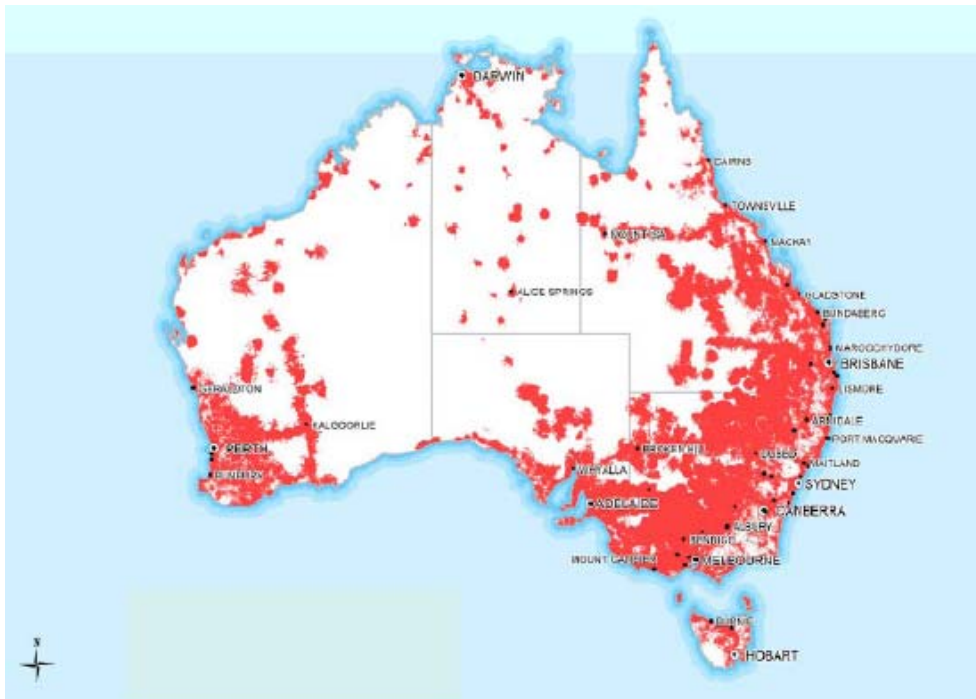
Source: Australian Government

The main concern for this project was mostly about the regulatory landscape. Actually, as far as the framework for this request for proposal, the government encouraged bidders to propose an open

model and in addition refused to clearly define the structural separation from the incumbent operator, Telstra. Due to this major regulator uncertainty, Telstra decided to propose a partial response to the NBN, which in the end was rejected.

The project was also criticized by some for its technological basis, demanding some flexibility from the government: wireless solutions for rural areas and FTTH solutions for urban areas, to complete especially with cable modems.

The minimum speed of 12 Mbps required by the government was also criticized. Actually, ADSL2+, widely deployed throughout the country, already provides speeds up to 20 Mbps and cable modems (covering nearly 40% of Australian homes) already offers speeds up to 30 Mbps. In addition, Telstra announced the deployment of DOCSIS 3.0 offering speeds up to 100 Mbps. Some also pointed the finger at progress in cellular technology soon to deliver mobile access at 21 Mbps throughout the country.

Finally, a conflict of interest was also called out by some, by not involving Telstra in the project: how could the government be both an investor in NBN and impose its regulatory vision on Telstra, which would be the NBN's primary competitor?

6.3.   The new NBN: FTTH

On April 7, 2009, to everyone's surprise, faced with several questions on the first NPN project based on FTTN, the Australian government announced the creation of a new national company to construct and operate a Very High Speed Broadband NBN based on FTTH architecture. The government's decision was based on advice from a panel of experts from the first NBN, which had determined that the responses to the first NBN were not viable, especially under the conditions of the current recession.

The government had determined that this network, which was to be built in partnership with the private sector, would be the largest infrastructure project in Australian history. This new NBN's objective was to link 90% of Australian homes as well as all schools and businesses to an FTTH network providing 100 Mbps access. The remaining population would be linked to at least 12 Mbps using wireless or satellite technology. According to the powers that be, this project would create up to 25,000 jobs per year, over the eight years it would take to finish the projects (with up to 37,000 jobs at the peak of the project).

The government would be the primary shareholder in the new company called "the NBN Company" holding a minimum of 51% of the capital. However, the government intended to begin selling its shares after five years of network operation. The total cost of the network was estimated to cost 43 billion AUD (24.7 billion EUR) over the eight years required to build the network. This investment will be supported by both the government and the private sector.

For its investment, the government would depend on the Australian infrastructure fund (Building Australia Fund) and would release a set of bonds using AIB (Aussie Infrastructure Bonds), which would be a way for households and institutions to invest in the NBN.

The government insists on bringing the NBN's level of service to homes and businesses. By covering 90% of the homes, it would service towns with up to 1,000 inhabitants and would be based on a national transmission backbone. This NBN would be simultaneously deployed in cities and all regions, down to the most rural locations.

This open network would also represent, according to the government, the largest regulatory reform in the electronic communications sector in two decades. It would offer wholesale services throughout the country.

The first estimate for the project is based on expert calculations; it must be confirmed by a feasibility study that will take place in 2009. Network construction should start in 2010 in Tasmania based on the Tasmanian government's bid for the first NBN, which planned for an initial investment of 4.7 billion AUD (2.7 billion EUR). It also plans to release an investigation into the regulatory changes needed for the NBN's success.

Deployment schedule for Australia's FTTN NBN

Phase	Timing
Creation of NBN Company.	In progress
Feasibility Study	In 2009
Deployment start	Beginning of 2010 in Tasmania
NBN Construction	2010-2017
Public-private partnership	2017-2022
Sale of government shares	Starting in 2022
Initial public investment	4.7 billion AUD (2.7 billion EUR).

Source: Australian Government

6.4. Latest developments

Faced with more investigations due to the size of the government project, the Minister in charge of the issue recently stated that the price for FTTH access at 100 Mbps for consumers would be comparable to current prices in Australia's broadband market. Australia is unique in that its broadband access prices are on the high side, especially compared to Europe. For double play access, the monthly subscription price could be as much as 88 EUR per month (Telstra or Optus).

This July 1, Minister Conroy released an initial request for proposal at 250 million AUD (143 million EUR) for the construction of the first part of the backbone that will make up the NBN's architecture. The government has clearly stated that the final NBN backbone will be more widespread and that other nodes will be connected by the end of 2009. This first backbone is expected to link six Australian states. Work on the backbone is expected to begin in September 2009, which is quite ambitious.

On the other hand, as previously announced, Minister Conroy introduced new legislative provisions to facilitate the NBN's deployment. At the end of June 2009, the Minister stated that one law being prepared would require the country's "utilities" as well as operators to provide the government with information on their passive infrastructure (ducting, poles, enclosures, etc.).

Finally, it's in the regulatory arena where the liveliest debate in Australia is taking place, against the background of the same question regarding functional and structural separation of Telstra. In June 2009, the Australian regulator (ACCC) confirmed that only a structural separation of Telstra could result in an egalitarian transition for all toward the NBN. For his part, Minister Conroy is calling urgently for regulatory reform. A press release recently confirmed that the government would be ready to offer Telstra between 20 and 49% of the NBN Company as long as the operator readily accepts structural separation or sells its fibre infrastructure under a form of functional separation.

6.5. Identified Risks

Comparison between the NBN and the major Australian infrastructure projects
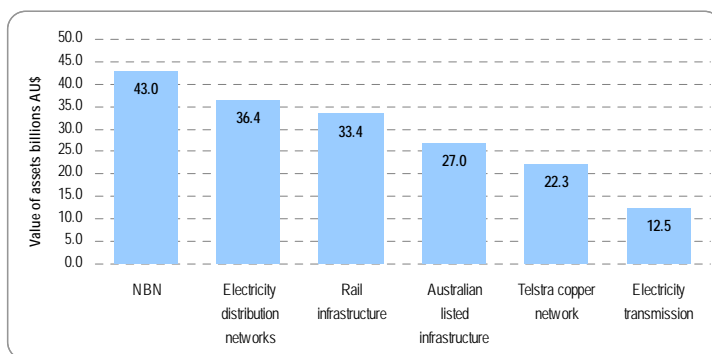
Source: Concept Economics

Scepticism about the project is based primarily on its huge size. Questions focus on the maximum investment of 43 billion AUD, which may not be enough. There are also questions about the business plan for the NBN project. what should be the wholesale price and retail price for the project to be profitable?

Concept Economics has already developed a business model for the project, based on the fact that the government confirmed that the NBN would be profitable for investors. Concept Economics calculated the wholesale price required to reach a ROI of 15% based on various penetration rates. For a 40% penetration rate, the company stated that the nationwide retail price had to be between 281 and 314 AUD (ROI between 11 and 15%), which is much higher that current broadband access prices in Australia (see above).

Other voices are crying out in reaction to these calculations, denouncing the ROI rate as being way too high, especially in light of the current recession.

However, other than the Telstra case, several operators and investors have already shown interest in the project, such as the Canadian company, Axia, as well as Optus through its parent company, SingTel. The operator is ready to sell its fixed infrastructure to NBN in exchange for a 30% share in the new company.

Besides the project's financing challenges, there are other risks identified associated with the market, with the deployment of DOCSIS 3.0, especially on HFC networks, a technology that also can meet or exceed 100 Mbps.

The technical issue associated with the project is also its size, especially its capacity, under wholesale services, to deliver high value add end user services. Currently, innovative broadband access services have been deployed (notably IPTV over ADSL2+) in local loop configurations under the control of the incumbent operator or competition with various infrastructures (total unbundling).

There are several players in Europe selling triple play services over this architecture: France Telecom, Free and SFR in France, Fastweb in Italy, TellaSonera in Sweden, Lyse in Norway, Telefonica in Spain, etc. In some countries, especially in northern Europe where Open Network models have been deployed, most services provided by SP (Service Providers) are based solely on broadband, Very High Speed broadband or VoIP.

6.6. Australia : FTTx Watch Service 2009
"Final Market - June 2009"– Abstract of the Data Base

ASIA	Australia	China	Hong Kong	Japan
	Malaysia	New Zealand	South Korea	Taiwan

AUSTRALIA

Number of	FTTH/B	VDSL	FTTLA
Subscribers	20,000	na	na
Homes Passed	na	na	na

FTTH vs FTTB:
Main architecture deployed : majority of FTTH
Main technology deployed : majority of PON (mainly GEPON)

FTTH/B players market shares : Telstra is the main FTTH provider
FTTH/B in total Broadband : 0 % FTTH/B ; 80 % DSL ; 17 % Cable modem ; 3 % Other

National regulation regarding FTTH/B & Government initiatives :
In March 2008, the Ministry of Communications made the first concrete steps towards the possibility of a FTTH network by naming a seven-member panel to consider bids for a new network.
In April 2009, Australian governements announced a AUD 43 billion (EUR 23 billion) plan for the deployment of FTTH/B network. This network will cover 90 % of Australian homes and businesses with downstream speeds of up to 100 Mbps until 8 years. It will be an open access network which will be built and operated by a new company specifically established by the Australian Government.
Optus, one of the main Australian operator but not involved in FTTH/B deployments yet, is pushing for a specific regulation that would ensure a good competitive context for fiber optic development in the country.

Bright Telecommunications	Telstra	Others

Bright Telecommunication	Bright Telecommunication is a subsidiary of Western Power which trailed blown fibre with dedicated fibre links to homes in Perth in 2003. It focuses now on the business and governement telecommunications market
Subscribers & Homes Passed	not relevant
Deployment targets	na
Financial data	na
Technical data & main vendors	GEPON FTTH
	na
Services provided & Tariffs	na
	www.brightonline.com.au/

Telstra	Telstra is Australia's former fixed line monopoly operator. The Telstra Broadband and Media unit was established in 2003 and is the main broadband provider in Australia with more than 50 % of market share. Telstra began FTTH test in 2004 targetting greenfileds areas
Subscribers & Homes Passed	December 2008
	FTTH Subscribers na
	FTTH Homes passed 3,100
Deployment targets	cover 90% of the population with mix of architecture and technology providing Internet access between 25 to 50 Mbps
Financial data	EUR 372 Million for the first 1,400 residences with FTTH, furthemore Telstra plan to invest EUR 3.75 billion in NGN
Technical data & main vendors	GPON FTTH
	Alcatel-Lucent is the main provider of Telstra
Services provided & Tariffs	the network peak speeds of 100 Mbps, no masive commercial roll out
	www.telstra.au

Others	In 2008, we count around 200 FTTx projects in Australia with a majority of them in the Western side.
	In addition of Telstra and Bright Telecommunication, projects were launched by The Queensland, the Victorian and the Tasmanian Governements, the Trans ACT and OptiComm.
	TransACT announced in May 2007 a rollout of 1,000 households connected to a FTTH network, providiging Internet speed up to 30/10 Mbps.
	OptiComm, deploying GEPON from **NEC** plans to connect at least 50,000 households and businesses until 5 years (2009 - 2013) for EUR 3.8 million per year
	TransACT plans to cover 98 % of Canberra with VDSL2.

Source: IDATE

7. Regulation and FTTx: state of affairs at the end of 2009

7.1. Introduction

Regulation is one of the central issues facing ultra high-speed access around the globe. In a great many countries, the lack of regulation or the lack of clarity prevented operators, and especially incumbent carriers, from performing rollouts early on, as most were concerned that they would be the only ones to invest in infrastructure that would later benefit their competitors.

Some regulators were required to clarify the situation, in some cases by restricting infrastructure sharing to passive infrastructure only, and in some cases by allowing the market to develop on its own.

The result has been a wide variety of regulatory schemes governing FTTx in the different countries around the globe. It is still difficult to assess what impact this has had on the market's development but, whatever the case may be, it is clear that regulation does need to be put into place, as it has been for broadband, to stimulate competition and enable the supply of competitive offers for users.

For most regulators in well established markets, part of the challenge is managing the transition from regulation that has applied to broadband markets up to now, and to DSL in particular, to regulation that is specific to these new fibre networks. Unlike the copper networks that were deployed several dozen years ago by incumbent carriers, and which have therefore been amortized by now, these are entirely new networks, usually very costly and to which the regulatory mechanisms that worked for copper cannot necessarily be applied.

7.2. Disparate national regulatory schemes

### 7.2.1. Asia: restrictions on the incumbent carrier in Japan, but a strong lead in FTTH/B

Now home to more FTTH/B subscribers than DSL customers, **Japan** is by far the globe's largest ultra-fast broadband market. The incumbent carrier was quick to feel the need to deploy an FTTH/B network, to take back top position from its rivals who were enjoying a solid command of the country's broadband market. Very early on, NTT focused its efforts technological innovations to be able to deploy high-performance and future-proof networks.

The situation in Japan also evolved to take account of these new infrastructures. National authorities, the MIC (Ministry of Internal Affairs and Communication) and the regulator, undertook a close examination of the terms that should apply to NTT for making its optical fibre network available to competing operators. The incumbent carrier controls around 74% of the country's FTTH/B market and the regulator wanted to impose restrictions that would temper its dominance. One of the basic tenets of the Japanese market is open access, which was extended to include FTTH/B. As a result of, NTT has been obligated to provide unbundling on its optical fibre network since 2001. However, to prevent NTT from cutting back on its investments in fibre, the regulator also set wholesale tariffs that ensure the incumbent earns a steady income, while leaving its rivals little economic leeway, which has created a situation that is close to a price squeeze.

On the content side of things, NTT is forbidden from providing video products directly over its optical fibre infrastructure.
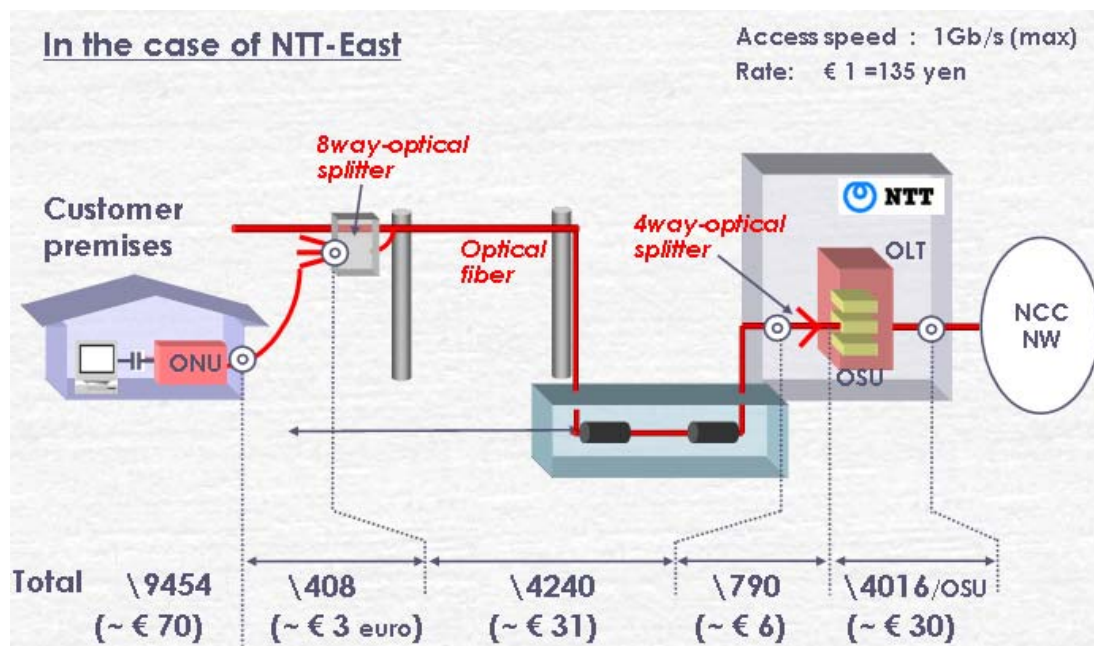
Fibre sharing tariffs in Japan (example of an MDU)
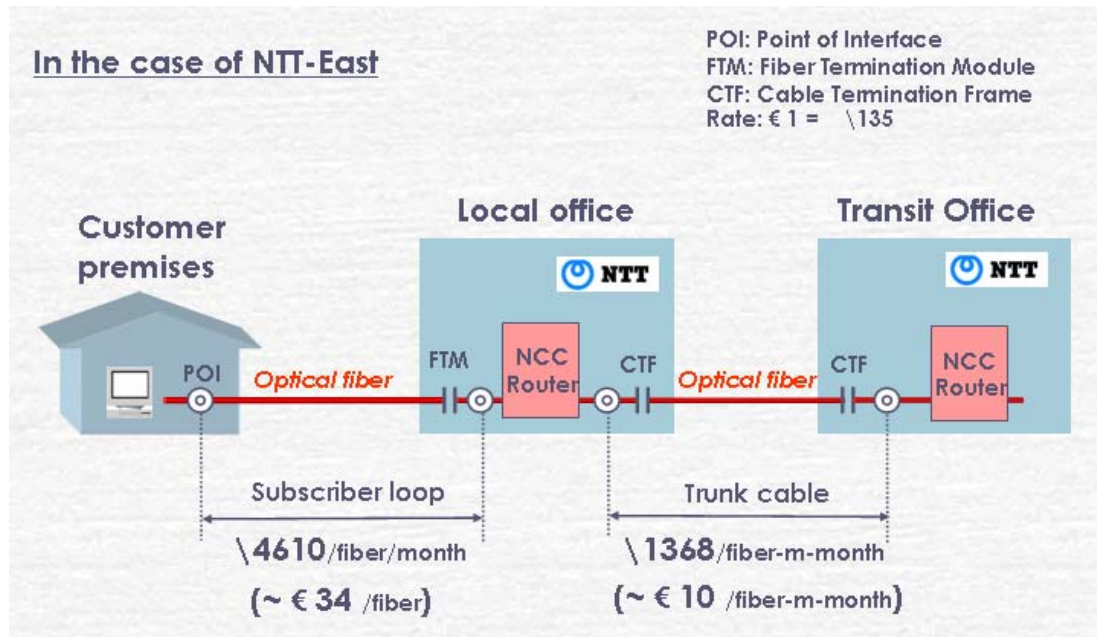
Source: NTT East

Fibre sharing tariffs in Japan (example of an SDU)

Source: NTT East

The regulation governing FTTH/B networks in the rest of Asia is very loose – with regulators in many countries having made no specific decisions on the matter.

The situation could change, however, as some regulators are showing a growing interest in the FTTx development environment in their country. But their role has not yet been clearly established. In **Sri Lanka**, for instance, nation regulator TRC (Telecommunications Regulatory Commission) hopes to establish an agreement with operators and equipment manufacturers for developing a national optical fibre network by spring 2010, which will be the springboard for future FTTH rollouts in the country. Here, the TRC would act more as an instigator than a regulator, even if it has already announced that access prices for this backbone will be regulated to ensure that all operators have equal access to it.

7.2.2.   USA: minimal regulation to encourage rollouts

When they began their FTTx network rollouts, the RBOCs' initial goal was the same as t was for the Japanese incumbent, namely strengthening their position with respect to the broadband market leaders which, in the case of the United States, were the country's cable companies.

Verizon and AT&T, the two biggest DSL access providers at the national level in the US, adopted different strategies for their FTTx rollouts but, after several months of operations, both have managed to persuade a significant number of subscribers to choose optical fibre access over cable modem, even if the latter is still by far the most popular access mode in the country. But, as with any operator deploying new infrastructure, and particularly in the case of FTTx networks, the required investments were so big that both RBOCs used their power of persuasion to force the FCC to relax regulations concerning these new networks. As a result, the FCC has been gradually lifting regulations in the very high-speed optical fibre market since 2004. In practice, carriers are required to provide the competition with local loop unbundling offers on their copper networks, but have no comparable obligation on their optical fibre network. This is a direct response to the concerns of Verizon and AT&T which did not want to be the only ones to shoulder investments in infrastructure that would then indirectly benefit the competition.

The RBOCs do nevertheless offer their rivals duct rental solutions, and Verizon and AT&T are entirely free to market wholesale offers to the competition at unregulated prices.

On the content side of things, the RBOCs can also market any services they want over their networks, the only constraint being the need to obtain a franchise from local state authorities when they want to provide TV services.

7.3.   In Europe: decisions on a case-by-case basis, depending on the country

7.3.1.   General situation in each country

Most of Europe's national regulatory authorities, or NRAs, believe they have an important role to play in stimulating the development of FTTx networks in their country.

But very few have defined specific regulations concerning infrastructure sharing and the obligations of the different players in optical fibre network rollouts.

Countries with no specific FTTx market regulation

In some countries in Western Europe, and in Scandinavia, national regulators have elected not become overly involved in the FTTx market's development. Such is the case in Denmark, Norway, Italy and Greece. One of the main reasons for this relative lack of involvement is tied directly to the development of the market itself: either there are very few players involved (Italy) and so require no intervention from the authorities, or there are several market players but each is acting in only a small area (Denmark) and no single one dominates the market.

In Belgium, on the other hand, aware of the importance of the FTTx market, national regulator IBPT wants to have greater leeway, and particularly the ability to provide local authorities with more incentives to invest in optical fibre networks in their region, and to promote infrastructure sharing between operators.

In the same vein, in **Switzerland**, NRA ComCom, which has not had a big hand in the FTTx market's development, wants to become more involved, in particular to encourage infrastructure sharing and the deployment of multi-fibre networks in buildings. As it stands, its role is limited to organising meetings between FTTH market players to help further rollouts.

There has been no specific FTTx regulation put into effect in Eastern Europe either, although rollouts are stepping up in several countries, including Slovakia and Slovenia, among others.

Countries with FTTx market regulation

The situation in the rest of Western Europe is very disparate. Some regulators made decisions several months or even several years ago, or have launched public consultations to be able to regulate this new market as effectively as possible. In certain countries, operators had been waiting for the regulator's decisions to be able to have prior knowledge of the rules that that would apply to their future network rollouts. On the other side of the equation, the regulators need to know operators' deployment plans to better assess their requirements in terms of regulation, and create the most conducive environment for the development of FTTx.

It was no doubt in **the Netherlands** that regulation was the easiest to put into place. The FTTx market is regulated in the same way as "classic" broadband, with same restrictions applied to operators in the areas of infrastructure sharing and reference offer pricing.

In the **United Kingdom**, Ofcom wants to create a regulatory framework that reassures operators planning to invest in optical fibre networks of their ability to earn a return on their investments over time. As a result, regulation is relatively flexible, and Ofcom has opted to focus more directly on innovation and competition in the active portion of network infrastructure. The British NRA has therefore devoted its efforts to defining a new standard called ALA, for Active Line Access, that helps stimulate the introduction of active wholesale offerings.

Portugal, meanwhile, stands out for being the first country in Europe to have defined a dedicated regulatory framework for FTTx, notably on the matter of infrastructure sharing on public property. Back in 2004, national regulator ANACOM requested that incumbent carrier Portugal Telecom establish a reference offer for accessing its infrastructure, and particularly its ducts. PT thus became the first operator in Europe to provide such an offer, and it was not until four years later that France Telecom became the second carrier to do so.

This type of involvement was what drove the **Spanish** NRA to request, albeit much later, that Telefónica publish a similar offer. In November 2009, the CMT therefore released the incumbent carrier's reference offer for providing alternative operators with access to its civil engineering infrastructure, ducts and towers. According to the regulator, this will help speed up FTTH rollouts in Spain. Earlier in the year, the CMT had required Telefónica to provide the competition with a wholesale solution, while limiting the supply of services to under 30 Mbps, regardless of the infrastructure delivering the services (i.e. copper for optical fibre).

In the same vein, the national regulator in **Germany** also issued a decision recently that clarifies the terms that apply to Deutsche Telekom for sharing its VDSL network with competing vendors. Up until now, the German incumbent had enjoyed a certain regulatory flexibility, and has not been obligated its to provide the competition with access to its VDSL infrastructure. In December 2009, however, the European Commission requested that regulator BNetzA review the state of regulatory holiday which Deutsche Telekom had asked for and obtained when it performed its first rollouts, arguing that it did not want to be deprived of the benefits of an investment in superfast broadband access that it alone was willing to make.

However, the most noteworthy regulatory decisions to have been made on FTTx are no doubt the ones made in autumn 2009 by the nation regulator in **France**. In a matter of months, ARCEP issued its opinion on infrastructure rollouts inside apartment buildings and defined different zones in the country where regulations governing rollouts and the role of market players may vary.

The initial goal for ARCEP is to encourage multi-fibre network rollouts inside of buildings: infrastructure sharing is to take place indoors for apartment buildings located in very densely populated areas and which have more than 12 units. This applies to 148 municipalities in France, involving some 51.6 million households. This decision was recently approved by the European Commission. The goal is to favour shared optical fibre networks inside MDUs to avoid having multiple operators install their infrastructure, and to streamline negotiations with property owners and managers. The recommended system involves having the first operator present in the building install as many fibres as necessary, depending on requests made by other operators. In practice, a maximum of four optical fibres can be installed per flat. Competing operators that request a dedicated fibre must share the installation costs. These rollouts are performed from a shared access point, which is generally located at the entrance to the building.

Another major decision from ARCEP concerns the segmentation of the country. Three types of zone have been defined, with different rollout regulations applying to each (for more information, see Insight no. 9 from November 2009).

7.3.2. Gradual implementation of Europe-wide regulation

The European Commission has issued its opinion on the latest decisions made by European regulators. The Commission is playing an increasingly active role in stimulating the development of very high-speed access in Europe, but it also needs to take national issues into consideration before enacting any broader regulation that would apply to the whole of the EU.

For now, the decisions that the Commission has made on a case-by-case basis do offer some hints at what pan-European FTTx regulation might look like.

The fact of asking the German regulator to intervene and require Deutsche Telekom to share its VDSL infrastructure, and of approving the ARCEP decision, do indicate that the European Commission wants to encourage network sharing to limit the needed investments and optimise installations and infrastructures.

Another noteworthy decision from the European Commission reveals that it is fully aware of the role that local authorities can play. By approving the Hauts de Seine Departmental Council's partial financing of the THD 92 network (a regional ultra-fast broadband network in France), the Commission opens to way to other large-scale initiatives of this kind around Europe.

World FTTx Markets
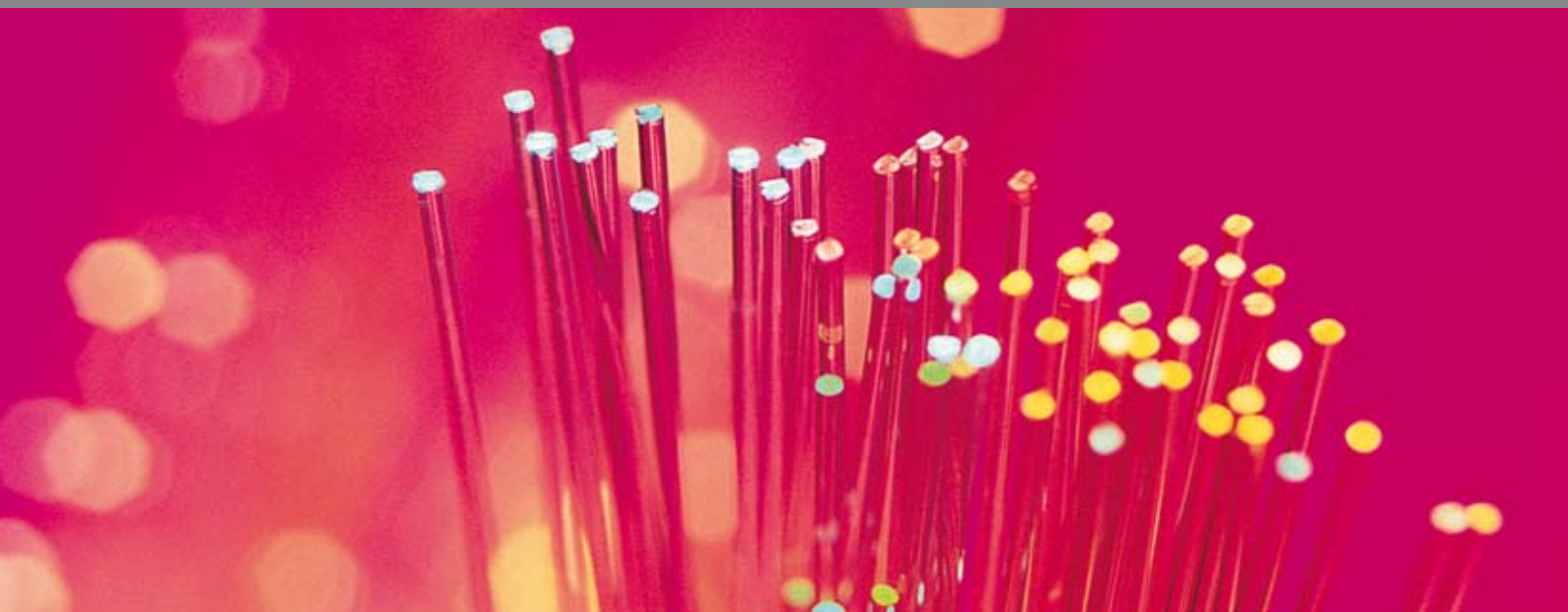
3rd edition

FTTx Watch Service - 2010

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  - Operator market share by country
  - Vendor market share by technology
  - Forecasts up to 2014

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World FTTx Markets

The Ultra Broadband access market (FTTH/B and VDSL combined) is expected to grow steadily in the coming years, to reach close to 150 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.

Against a backdrop of pioneer rollouts and recent announcements, several questions emerge on the topic of FTTx:
- At what pace will FTTx networks be deployed, and using which technologies?
- What role will investments by cities and local authorities play over the long term? What can we hope for, or fear, from government stimulus packages that include support for the Ultra Broadband access market?
- What regulatory measures could impede operators' investments?
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- What innovative services are currently available on FTTx networks? How are FTTx players marketing and pricing these services, compared to ADSL-based broadband services?

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Insights · **Database** Market and Forecasts · **Analyst Access** · **Market Reports**

FTTx Watch Service Calendar - 2010

		January	February	March	April	May	June	July	August	September	October	November	December
Database	Markets, Operators & Vendors market shares, FTTx projects, Forecasts up to 2014				DB1						DB2		
Insights	Monthly		I-1	I-2	I-3	I-4	I-5	I-6		I-7	I-8	I-9	I-10
Reports	Public Fundings & FTTx / Services over FTTx					R-1					R-2		
Complementary Reports	IPTV over FTTx / NGA Regulation	CR-1			CR-2								
Consulting Hours		5 hours - on demand											
Analyst Brief		30 min. Conference Call - on demand											
On-Site Presentation		Optional Report Presentation											

Methodology
- Primary research on 150+ FTTx market players
- In-depth analysis of technological issues based on one-on-one interviews with vendors
- Penetration and subscription data for 64 countries
- Rollout and market share data on 150+ players, classified by country

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Database (Excel file)

A unique database devoted to FTTx, including national market data and forecasts, along with a breakdown by technologies – drawing on our continuous tracking of agreements between operators and vendors

<table>
<tr><td colspan="3" align="center">**Markets & Forecasts**</td></tr>
<tr>
<td valign="top">

Regulation
- Major FTTx regulatory issues and national FTTx programs

Market data
- 2007-2008-2009
- By zone and for 64 countries

Subscribers
- VDSL
- FTTH/B
- FTTLA (DOCSIS 3)
- FTTx/LAN

Homes Passed
- VDSL
- FTTH/B
- FTTLA (DOCSIS 3)
- FTTx/LAN

Network architectures
- FTTH

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- FTTB
- FTTN

Technologies & vendors
- BPON
- GPON
- EPON/GEPON
- Ethernet
- DOCSIS 3

Operators Market Share
- Top 3 or 5 by country
- % FTTx amongst the total Broadband
- Breakdown by architecture: FTTN, FTTH/B, FTTLA

Projects
- Up to 5 main projects by country: Operators, Utilities, Local Authorities

</td>
<td valign="top">

- Architectures
- Technologies
- Investments
- FTTx deployments
- ARPU
- Subscribers and homes passed
- Services & pricing

Forecasts
- 2010 to 2014
- By zone and by country (64 countries covered)
- FTTH/B vs. VDSL subscribers
- Homes passed for FTTH/B
- Technologies by zone: VDSL, BPON, GPON, EPON/GEPON, EP2P, as well as 10 GPON, 10GEPON and WDM PON

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Geographical Zones & Countries

Africa
Algeria
Egypt
Morocco
Nigeria*
South Africa

Asia-Pacific
Australia
Bangladesh*
China
Hong Kong
India
Japan
Malaysia
New Zealand
Philippines*
South Korea
Singapore
Taiwan
Vietnam*

Latin America
Argentina
Brazil
Chile
Venezuela*

Middle East
Bahrain
Kuwait
Iran*
Iraq*
Israel*
Jordan*
Lebanon*
Oman
Qatar
Saudi Arabia
UAE

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Canada
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Mexico

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Bulgaria
Croatia*
Estonia
Latvia
Lithuania
Poland

Romania
Russia
Serbia*
Slovakia
Slovenia
Ukraine
Turkey

Western Europe
Andorra
Austria
Belgium
Denmark
France
Germany
Greece
Italy
Netherlands
Norway
Portugal
Spain
Sweden
Switzerland
The UK

* Emerging FTTx countries

Insights

Monthly insights on key FTTx market issues: outstanding event of the month, analysis of the latest market trends, player interviews (operators, vendors, regulators, public authorities), highlights from major conferences…

Market Reports (pdf, 50-100 pages)

• Public Funding & FTTx

In both Europe and the Asia-Pacific region (incl. Australia), we are seeing more and more government programmes devoted to stepping up FTTx coverage. This public authority involvement can be at the local or the national level, with most of the rollouts being open access networks. This report will focus on public initiatives in Europe, Asia-Pacific and North America. What best practices are we seeing? National vs. local funding: which is the most suitable solution? What role does regulation play in these public investments: promotion of active wholesale vs. infrastructure-based competition?

• Services over FTTx

TV-oriented services are clearly the main driving force behind current FTTx rollouts. Can we expect to see innovative TV services that will really use fibre's full capabilities: interactive TV? 3DTV? Aside from programming, other fibre-based solutions could also emerge, such as TV-based video communication. This report will analyse existing offers and, drawing on interviews with market experts, will explore the fibre-based services of tomorrow.

• IPTV over FTTx

The relationship between IPTV and FTTx is at the heart of this report which explores operators' key strategies through a detailed examination of their offerings. An analysis of existing technologies, combined with national market conditions, allows us to better understand the motives behind innovative solutions, and the respective issues inherent in the development of IPTV services and FTTx networks.

• NGA Regulation

As more and more FTTx rollouts are taking place across Europe, the regulatory framework is now gradually taking shape. Reactions to the European Commission's substantially altered draft recommendation run the full gamut, while NRAs continue to set the rules for their own national markets. This report will provide an overview of the current status of regulatory debates in the EU and in several of the major Member States. It will also analyse operators' positioning with respect to NGA regulation and highlight a number of critical issues, such as the ability to replicate bundled offerings.

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IDATE FTTx Team

A **dedicated team** of consultants specialised in analysis of the FTTx sector, devoted to meeting the needs of operators, equipment suppliers, service providers, content providers, regulators, governments & public authorities.

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Roland Montagne joined IDATE in 1998 and is now the Director of the Telecom Business Unit. Since 2004, Roland has been the project leader for the FTTH Council Europe's yearly European FTTH project panorama. In 2006, he conducted a major study for the French Government on FTTH deployment scenarios in France (cost model and government options). Roland has also performed several strategic analyses on the development of the American and Asian FTTH markets, on behalf of the FTTH Council APAC, among others. He has also been involved in FTTH cost model analysis for the United Kingdom, and in a recent study that examines the maturity of next-generation PON technologies. Roland is a regular speaker at major International conferences on FTTx-related topics (FTTH Council Europe, US, Asia-Pacific, IEC Broadband World Forum, IEC C5, DigiWorld Summit, IIR & Informa events).

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Telecom Equipment

Basile CARLE
Broadband Access Markets

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