ANNUAL ECONOMIC REPORT **I 2016**

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01/ ETNO: EUROPE'S DIGITAL SPINE

ETNO has been the strong and reliable voice of Europe's telecommunications network operators since 1992.

ETNO's **34 member companies and 7 observers* from Europe and beyond** are the backbone of Europe's digital progress and, in a fully digitised future, they will be enablers of Europe's progress as a whole. Thanks to their investment and innovation in new e-communications services, they have been and will continue to be the enablers of a smarter, more competitive and prosperous continent.

ETNO member companies investment accounted for 60% of total CapEx in 2015 (EUR 26.6bn). In the same year, **ETNO investment in fixed networks accounted for 70% of the total in EU28**. In 2015, ETNO member companies employed 670,000 people, thus being the main employer in the sector.

The telecom industry is instrumental to accelerating the implementation of a European Digital Society, leveraging its assets, expertise and knowledge and serving as a key agent of change. ETNO closely contributes to shaping the best regulatory and commercial environment for its members so they can continue to deliver top quality services to European consumers and businesses.

*December 2016. Qualcomm is to be accounted as an Observer Member as from January 2017, bringing the total number of Observers to 8.

> **" Our 34 members & 7 observers are the digital spine of the Continent "**

The State of the digital Union: A path towards new digital networks and services

By Lise Fuhr, ETNO Director General, and Steven Tas, ETNO Chairman

Communication networks and services are much more than just that. They are the digital spine of modern societies, as well as the lever- to achieve more opportunities for all citizens. That is why numbers are not everything, but the stories behind them are especially important when writing about telecoms.

However, good policymaking is both politically-driven and fact-based. For this reason, for 10 years, ETNO has partnered with the leading telecom consultant IDATE to provide an annual report on the state of the telecoms sector. As we live in digital times, the state of the telecoms sector is a good indicator for the state of our digital Union.

Positive trends in the industry

When looking ahead, we need to start from the positives. There are many reasons to be enthusiastic about our sector. The first is that consumer demand for connectivity and for data is solid. And it keeps growing. In 2016, for the first time, **the data share of mobile revenues will be the same as the voice share** (€62bn each).

Secondly, we see that this goes hand in hand with the strengthening of usage trends. Adoption of social networks will continue booming, e-commerce is projected to grow across key markets and online search will become more and more widespread.

Thirdly, our companies will continue developing growing markets, such as M2M – with a projected revenues of €4.2bn across EU28 by 2020. Similarly, revenues from the Internet of Things will increase, with utilities and automotive being the strongest drivers of growth.

The need for accelerating investment and regulatory modernisation

These positive trends are particularly encouraging, especially in a context in which we need to boost investment levels in order to timely deploy 5G and push fibre deeper into the network. Such technological changes will be needed to achieve the Gigabit society vision, which was embraced by both the industry and by the European Commission in its 2016 Communication on the topic.

As recently reported by the Boston Consulting Group (November 2016), the required level of investment is gigantic. Ultrafast broadband coverage might require up to €360bn, 5G networks will cost up to €200bn and proximity data centres up to €100bn.

In this context, it is good to see how investment levels are slightly growing. More in specific, we are proud that ETNO members continue representing the lion share of network investment in Europe. In 2015, ETNO companies deployed a total of €31.5bn CapEx, which adds to the €20.7bn jointly deployed by a range of non-ETNO companies and cable operators. More than that: if we look at the top 5 EU markets (DE, IT, FR, ES, UK), **ETNO companies and cable operators have deployed 83% of the total sector investment.** An impressive number.

This, however, is not going to be enough to accelerate the achievement of the Gigabit society objectives, as not all the CapEx is devoted to networks, but also to services, equipment as well as other types of investment. For this reason, regulatory modernisation is particularly important.

Communications Code & e-Privacy: towards change?

The telecoms sector is not only driven by demand and technology, but also by regulatory choices. Luckily, Europe is now busy with reforming both its telecom and its sector-specific privacy laws.

As for telecom laws, the European Commission draft for a new European Electronic Communications Code (Sept. 2016), points to the right direction: deployment of new networks should be incentivised by regulation. However, as the debate evolves, it becomes apparent that achieving a Gigabit society is a challenge of considerable magnitude. For this reason, ETNO agrees with all those voices that are pointing to technology neutrality as a key regulatory principles, which should always remain at the core of EU rules. The reason is simple: **in an increased CapEx scenario, efficient technological choices are essential** to create the necessary business case. This, in turn, allows operators to upgrade networks and ensure no European territory is left behind.

As concerns services, the upcoming review of the e-Privacy Directive could turn into a huge opportunity for boosting innovation, consumer offers and business opportunities. This will strictly depend on how ambitious and pro-innovation the reform will be. In an ideal world, the General Data Protection Regulation – which applies horizontally to all companies and service providers – should grant enough reassurances for the e-Privacy Directive to be repealed. This would open up a huge space for European innovation and ensure that also EU telcos can start offering new data-based services to citizens. Today, because of many unjustified asymmetries, telecom operators are impaired in their ability to deliver more choice to users and more competition on the service markets. **An unequivocal pro-innovation stance by regulators would create opportunity and consistency for all.** Europe needs the reform to be forward-looking.

The State of our digital Union can improve. Consumer demand and telecoms investment will do their part. And so needs to do regulation. Beyond numbers, what is at stake is our ability to deliver societal and economic opportunities to all Europeans.

GOOD DATA FOR GOOD POLICY: THE TELECOMS WORLD IN 2016

By François Barrault, Chairman, IDATE DigiWorld

With this new edition of the Annual Economic Report, ETNO continues its good tradition of providing stakeholders in the digital community with a set of key indicators showing the recent evolution of markets. If they are used to make objective arguments in the sometimes heated debates within and about the sector, this exercise will have been a successful one.

The data for 2015 and the estimations for 2016 and beyond hold several **positive messages for the industry.** In 2016, for the first time since 2008 overall revenues in the ETNO perimeter will sport a positive growth rate in 2016. Data revenues in mobile are picking up and are about to surpass voice revenues. Demand for fixed and mobile services remains high throughout Europe.

While the recovery of revenues is still slow, the industry's environment continues to be fast-paced. As LTE adoption in Europe is steeply moving up on the S-curve, the industry is busy with defining the future 5G standard. 5G will not only deliver more bandwidth to the users but will also be tailored to the needs of with lower latency, improved security and the capacity to support a massive amount of connected objects. Significant trials in Europe and other regions are expected to take place before the end of the decade and large scale roll-out is expected to take place as of 2020.

In fixed networks, too, Europe is doing a good job already. **Millions of households are added to NGA networks' footprints every year** – more than 35m in the ETNO perimeter in 2015 alone- and their market shares are increasingly eating into that of legacy broadband technologies. Yet, if Europe is serious about its bandwidth targets and notably the Gigabit ambitions, significantly more fibre will have to be rolled out in the years to come. Fibre will have to be deployed closer to the user's premises, but not necessarily all the way to the home. In parallel, fixed network operators are working on the transition to all-IP networks. Certain frontrunners, including notably ETNO members in Slovakia, Croatia or Hungary, have already completed the process or have migrated a significant share of their subscribers already. By 2025, legacy networks will have largely disappeared.

These new mobile and fixed networks offer great opportunity to users and operators alike: innovative services, higher bandwidth, better quality, reduced time to market and greater efficiency. Upgrading these infrastructures also presents a **significant investment challenge to operators.** ETNO members and other operators have made significant investment efforts over the years. However, policy makers and regulators must increase the industry's momentum by providing a set of rules that favours investment as much as sustainable competition and does not drive the industry into cut-throat price competition. The new code governing the sector in the EU must not miss this opportunity.

> " **Investment leadership : in 2015, ETNO companies accounted for 70% of the fixed investment in EU28** "

The European telco scene remains challenging

Although the European telecom market remains far from being buoyant – let alone reaching the revenue levels the industry knew in 2008 – **the bleeding of the industry has finally stopped.** Growth rates in the ETNO perimeter and the EU28 were still negative with -1.7% and -1.2% , respectively, in 2015, but are expected to turn slightly positive at 0.2% across the markets in which ETNO companies are present (see last page for definitions), while they will be flat for the EU28.

On a global scale this means that Europe will remain the region with slowest growth, but the gap with other areas, notably North America, is diminishing. Growth in wider Europe beyond the EU was -1.4% in 2015 and is expected to reach 0.3% this year. In comparison, the North American market contracted by -0.4% last year and should grow by 0.8% in 2016. Growth in Asia-Pacific was slightly negative in 2015 with -0.1%, but is set to have recovered to 1.5% by the end of 2016.

At the global level, the telecoms industry is expected to see its revenues progress at a pace of around 1.2% in 2016, up from 0.5% in 2015.

Demand for access to mobile and fixed broadband services continues to be on the rise, while the number of traditional fixed line telephony subscriptions keeps falling. The number of POTS lines is now well below that of broadband access lines. At the end of 2014 subscriptions for both types of access were at the same levels with roughly 173 million lines each. By the end of 2015 the number of fixed broadband accesses had progressed to 181.5 million in the ETNO perimeter, compared to 164.4 million POTS lines in the same area. By the end of 2016 the gap will have widened to more than 30 million lines with

189.8 million broadband subscriptions, compared to 155.6 traditional telephony access lines.

European users do not only ask for more connectivity but the **demand for data outpaces the growth of access lines.** Between 2015 and 2020 data traffic will continue its steep progression on fixed and mobile networks. European users will more than double their downstream and upstream traffic loads per fixed broadband line between 2015 and 2020. On the mobile side the increase will be even more significant, with downstream traffic per mobile Internet user growing from 1.1 GB per month to 7.4 GB per month and upstream traffic will increase six-fold to 0.6 GB per line and month in 2020.

Combined, all of the above elements show that telcos remain in a complex situation. Modest revenue growth and growing demand for connectivity as well as data combine to a significant investment challenge. Telcos have shown they are prepared to live up to this challenge and have kept their **CapEX level steady or even slightly higher over time,** thus devoting a higher share of their income to investments.

Within the overall European ICT industry, telecoms remain one of the most important building blocks of the value chain, second only to IT services with respect to revenues generated. In 2015 telecom services accounted for more than a quarter of the European ICT industry's total revenues of EUR 974bn.

Across the footprint of ETNO, its members employed more than 660k people in 2015. This figure corresponds to about 83% of total sector employment in the area.

Telecom service revenues in Europe
(growth, % y-o-y)
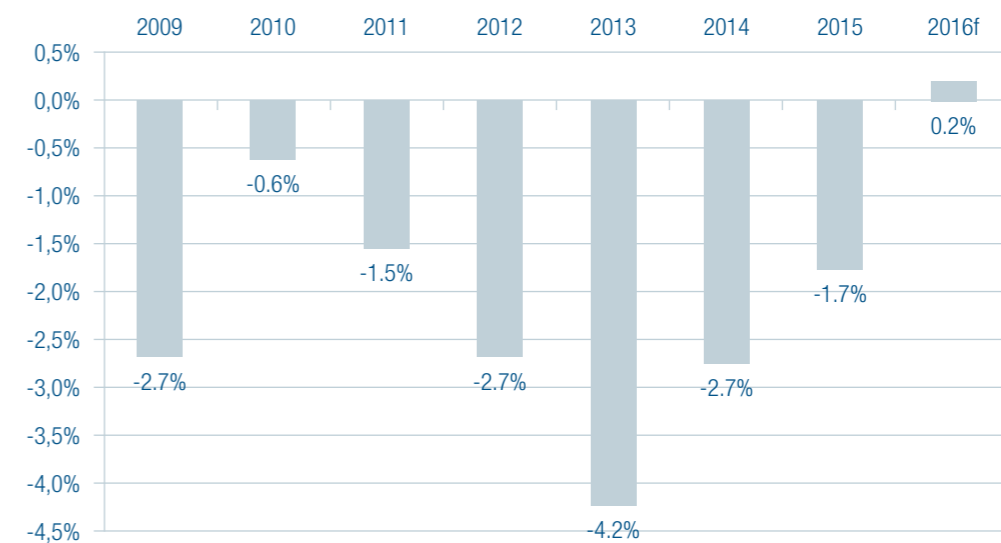
ETNO perimeter
This includes both ETNO & non-ETNO companies in the countries in which ETNO members operate.
For a full list, see the last page of this report

	2009	2010	2011	2012	2013	2014	2015	2016f
ETNO perimeter	-2.7%	-0.6%	-1.5%	-2.7%	-4.2%	-2.7%	-1.7%	0.2%
EU 28	-3.0%	-1.2%	-1.9%	-3.1%	-4.6%	-3.3%	-1.2%	0.010%

Source: IDATE

Telecom service revenues
(EUR bn)
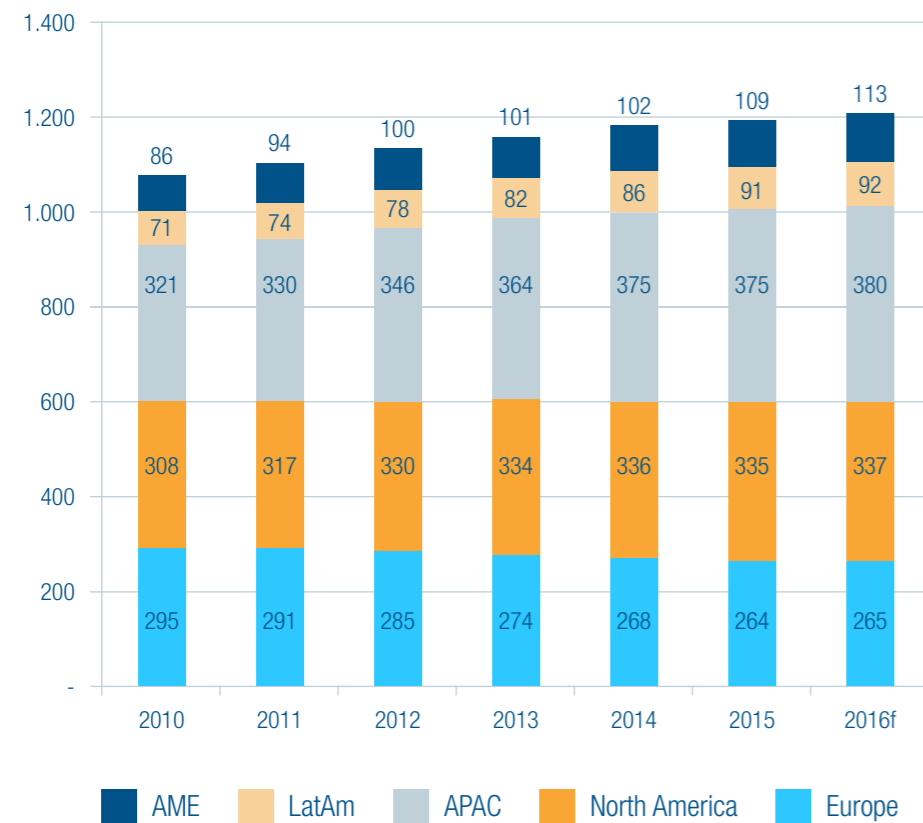
Telecom service revenues growth (EUR bn)	2011	2012	2013	2014	2015	2016f
Europe	-1.2%	-2.2%	-3.8%	-2.3%	-1.4%	0.3%
North America	2.9%	4.0%	1.3%	0.4%	-0.4%	0.8%
APAC	2.9%	5.0%	5.1%	3.0%	-0.1%	1.5%
LatAm	3.6%	5.8%	4.6%	5.7%	5.1%	1.5%
AME	8.8%	6.4%	1.8%	0.7%	7.2%	2.8%
Global	2.3%	3.0%	1.5%	1.0%	0.5%	1.2%

Source: IDATE

Access to telecom services
(ETNO perimeter, 000s of lines)
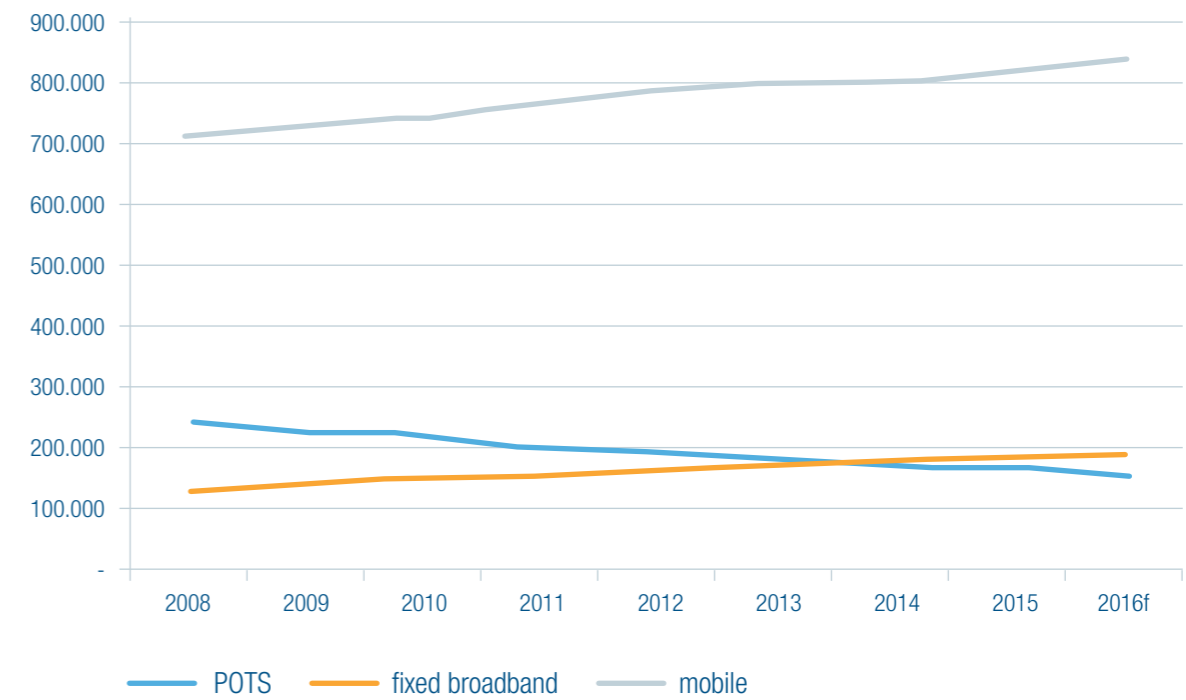
Access lines (000s)	2008	2009	2010	2011	2012	2013	2014	2015	2016f
POTS	238 070	224 882	215 331	203 587	191 621	182 543	173 296	164 372	155 628
fixed broadband	124 190	135 675	145 762	153 886	160 093	166 503	173 553	181 530	189 780
mobile	711 993	731 469	744 289	769 630	786 588	799 501	806 295	817 906	837 396

Source: IDATE

Teledensities
(ETNO perimeter; lines/subscribers per population)

Legend: POTS, fixed broadband, mobile
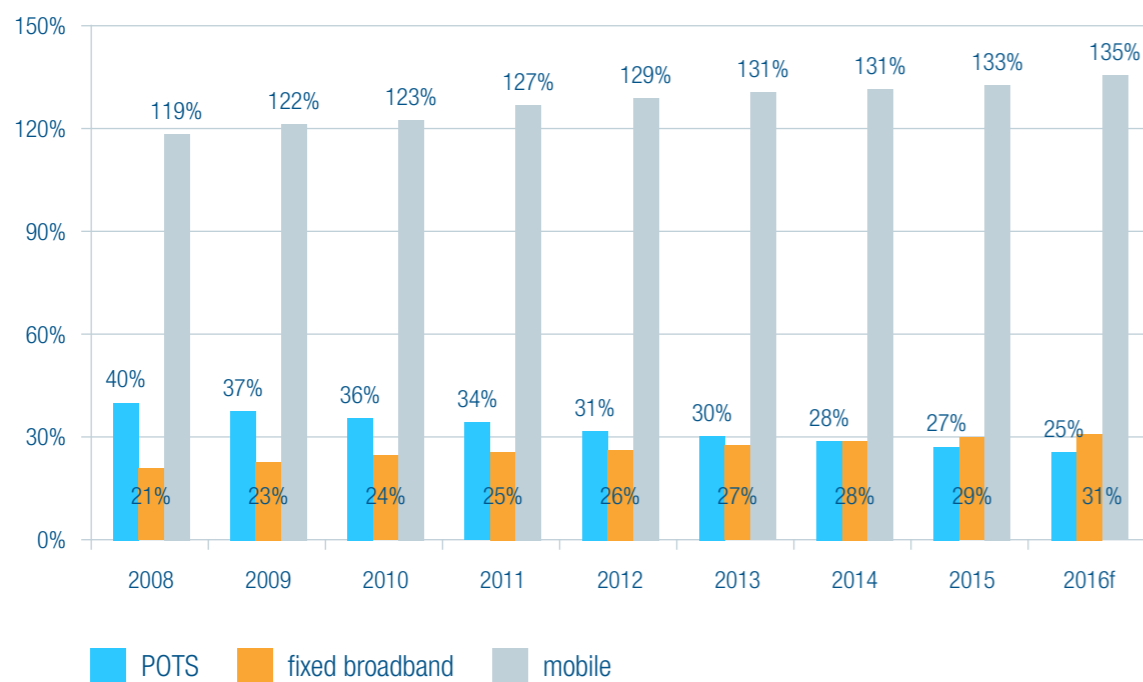
Teledensity (% of pop.)	2008	2009	2010	2011	2012	2013	2014	2015	2016f
POTS	40%	37%	36%	34%	31%	30%	28%	27%	25%
fixed broadband	21%	23%	24%	25%	26%	27%	28%	29%	31%
mobile	119%	122%	123%	127%	129%	131%	131%	133%	135%

Source: IDATE

Fixed data traffic
(EU28, GB/line/month)

Legend: downstream, upstream
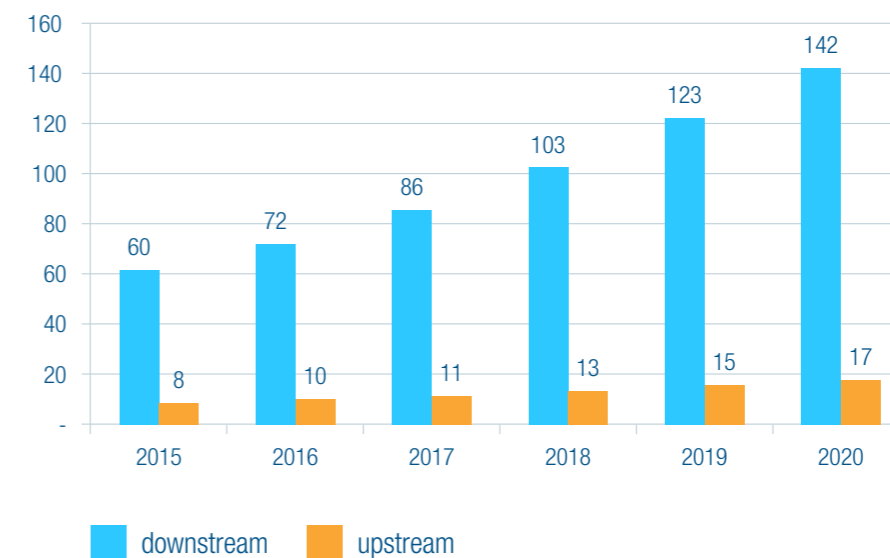
Mobile data traffic
(EU28, GB/user/month)

Legend: downstream, upstream
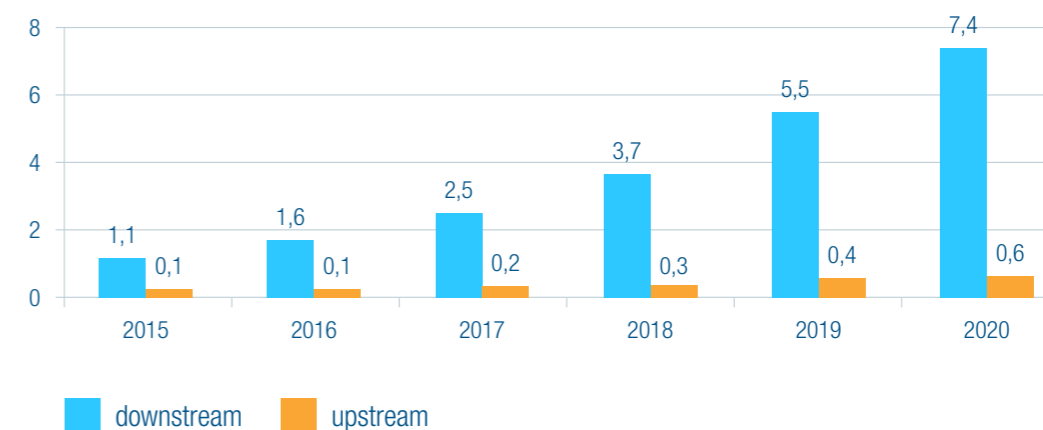
Traffic (GB/month/line), EU28		2015	2016	2017	2018	2019	2020
Fixed BB	downstream	60.2	71.8	85.8	102.7	122.9	142.5
	upstream	8.4	9.7	11.3	13.2	15.4	17.4
Mobile	downstream	1.1	1.6	2.5	3.7	5.5	7.4
	upstream	0.1	0.1	0.2	0.3	0.4	0.6

Source: IDATE

ICT industry revenues
(EUR bn)
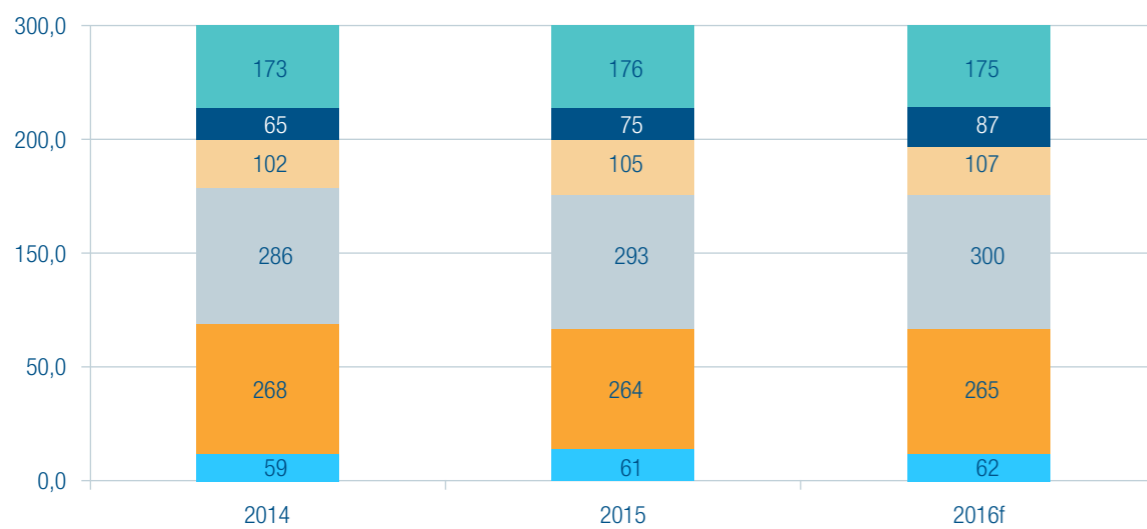
- network equiment
- telecom services
- IT services
- audiovisual services
- online services
- devices

ICT industry revenue, Europe, EUR bn	2014	2015	2016f
network equipment	59	61	62
telecom services	268	264	265
IT services	286	293	300
audiovisual services	102	105	107
online services	65	75	87
devices	173	176	175

Source: IDATE

ETNO members' share of employment
(ETNO perimeter, 2015) *
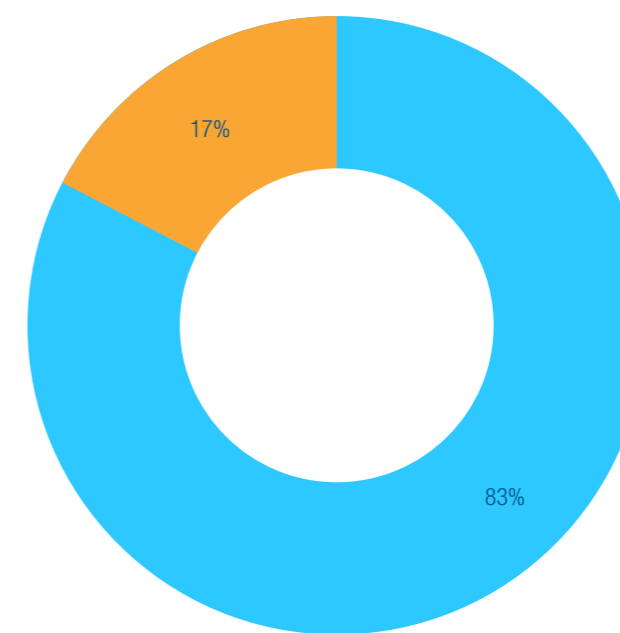
- ETNO members
- Others

ETNO	670'000
Others	138'000

* ETNO perimeter for 2015 includes BT
Source: IDATE

ETNO perimeter closing in on revenue turn-around

As mentioned in the previous chapter, the most important message regarding the revenues section is probably the **prospect of the ETNO perimeter and the EU28 to have stabilized their revenue levels,** while potentially even scoring a positive growth for the first time since 2008 – according to IDATE estimates.

In total, revenues in the ETNO perimeter reached EUR 245bn in 2015. Despite cautiously positive estimates on the decline of revenues coming to an end, a comparison with the US shows how **European revenue levels remain consistently lower compared to the American counterparts.** In 2015, US telecom service revenues attained EUR 306bn. Only eight years ago, in the ETNO were slightly higher in the ETNO perimeter than in the US with EUR 289bn vs. EUR 282bn, respectively. Last year that gap stood at EUR 65bn in favour of the telecoms industry stateside. In Japan, revenues have remained relatively stable over time. After slightly dipping to EUR 97bn in 2011, revenues are approaching the EUR 100bn mark again and will likely have surpassed it in 2016.

Data services are the driver of revenue growth in fixed as well as in mobile services. Voice still accounts for a significant chunk of total revenues, but its share is on a downward trend in both fixed and mobile services. This trend reflects the demand for underlying connectivity; however, the growth in revenues is trailing the growth in take-up of fixed broadband and mobile data services. The risk of fixed broadband services turning into negative revenue growth rates, which was very real two or three years ago, now seems to have been avoided. In 2013, this category grew by a mere 1.0% in the ETNO perimeter and by 0.7% in the EU28. Last year, the trends were somewhat more positive with growth rates improving to 1.6% and 2.3% in the respective geographies. The positive trend is expected to last in 2016.

Mobile services as a whole have not quite reached the turnaround point, but the situation is encouraging with growth rates improving from -2.6% in 2014 to just -1.3% in 2015 in ETNO countries. For 2016 mobile should grow by 1.2% in the ETNO perimeter. For the EU28 a positive growth of 1.1 % is within reach as revenues are forecasted to rise from EUR 112bn to EUR 113bn. Split into voice and data services, it is interesting to note that the latter are by now almost able to compensate the losses in voice revenues. In 2015, mobile voice revenues fell from EUR 69.5bn to EUR 65.0bn in the ETNO perimeter, whereas data revenues rose from EUR 56.9bn to 59.8bn over the period. In 2016, revenues from voice and data services will be on par with revenue curves intersecting at EUR 63bn. Going forward, the situation in mobile will equal the one in the fixed market, where data revenues have already outgrown voice revenues.

Average revenues per user (ARPU) continue being on a downward slope. Fixed broadband revenue per line in ETNO's footprint fell from EUR 25.3/month to EUR 24.8/month on 2015. Overall mobile ARPU attained EUR 12.5/month in 2015 compared to EUR 12.9/month in the previous year. Mobile voice ARPU in 2015 was EUR 6.5/month compared to EUR 6.0/month for data. Like overall revenue levels, ARPU curves for voice and data show diverging trends and will reach parity in 2016 at EUR 6.2/month.

Fixed telephony revenues are consistently falling and reached EUR 46bn in 2015 after EUR 49bn in 2014 and EUR 80bn back in 2008.

Falling revenue and ARPU levels despite ever-growing usage hint at the **extremely intense competition in the telecoms sector.** This very high level of competition is fuelled by players from within the sector – often leveraging the provisions of the regulatory framework in place- and players that are exogenous to the telecoms industry, i.e. over-the-top players and online platforms.

Within the telecoms sector, ETNO's member companies seem to deliver what the customers are asking for. Also not really sheltered from the financial impacts of the raging price wars in the region, ETNO members, be it as local incumbents or through their subsidiaries outside their respective home countries, are attracting and retaining large numbers of subscribers. In fixed broadband markets, 54% of subscribers trusted in their networks for broadband access in the ETNO zone in 2015.

Telcos are competing with OTTs on numerous layers: communications services, video, advertising, etc, with OTTs currently frequently enjoying a lighter regulatory regime than telecom operators. This year, OTTs' communications revenues are expected to reach slightly more than EUR 1bn in the EU28. This level is quite low compared to telecom operators, but the OTT's business model is very different from that of telcos and has contributed to taking away significant value for the latter. The success with which OTTs compete in this market is reflected in their growth rate. Where flat revenue growth is already good news for the telecoms sector, OTTs have enjoyed double-digit growth rates of their communications revenues for many years and will continue to do so into 2020s. For 2016, their growth is estimated at 22.3% compared to 30.4% in 2015. By 2020, this level will have declined, but with an estimated 13.7% year on year growth it is still expected to stay solidly at double-digit levels.

Telecom service revenues (EUR bn)

| ETNO perimeter | EU28 | Japan | USA |
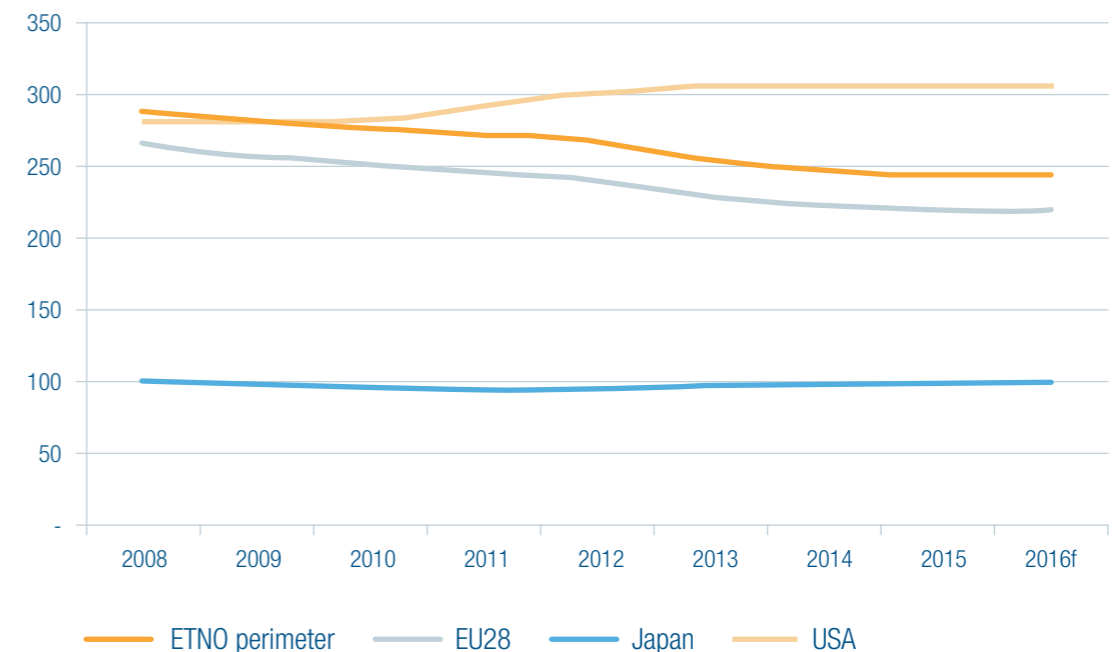
Telecom services revenues (EUR bn)	2008	2009	2010	2011	2012	2013	2014	2015	2016f
ETNO perimeter	289	281	279	275	267	256	249	244.6	245.1
EU28	266	258	255	250	242	231	223	221	221
Japan	102	100	98	97	98	99	99	98.8	100.4
USA	282	280	283	292	304	308	308	306.5	308.9

Source: IDATE

Revenues by type of service
(ETNO perimeter, EUR bn)

Legend:
- Fixed telephony revenue
- Fixed data and Internet revenue
- of which mobile voice
- of which mobile data
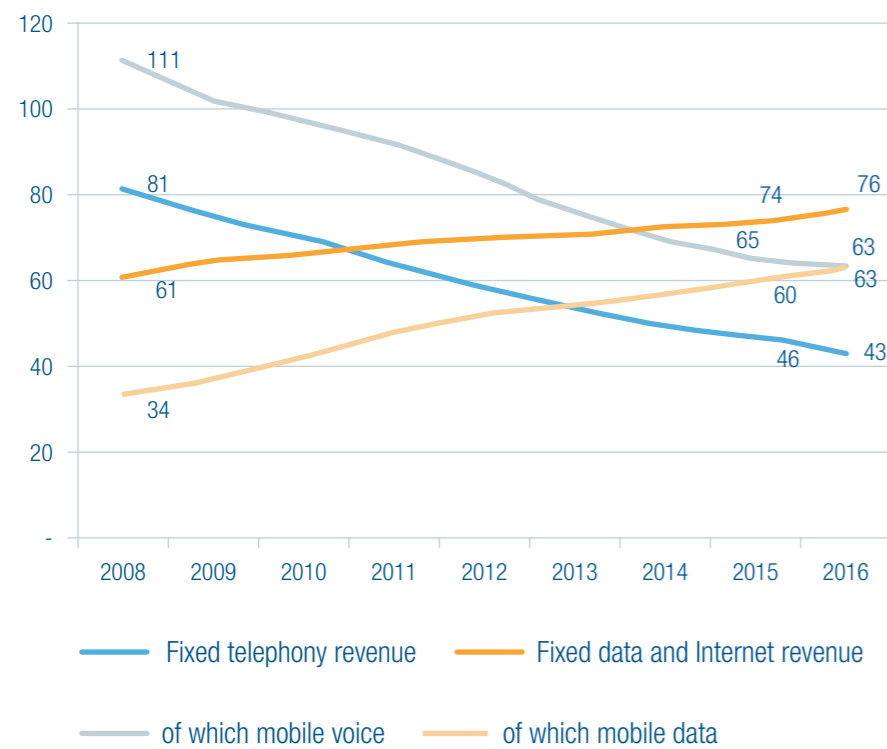
Revenues EUR bn	2008	2009	2010	2011	2012	2013	2014	2015	2016f
fixed telephony	81	75	69	64	59	54	49	46	43
fixed data and internet	61	65	67	69	70	70	73	74	76
mobile voice	111	101	97	92	85	75	70	65	63
mobile data	34	37	42	48	52	54	57	60	63

Source: IDATE

ARPU evolution
(ETNO perimeter, EUR/month)

Legend:
- fixed broadband
- mobile voice
- mobile data
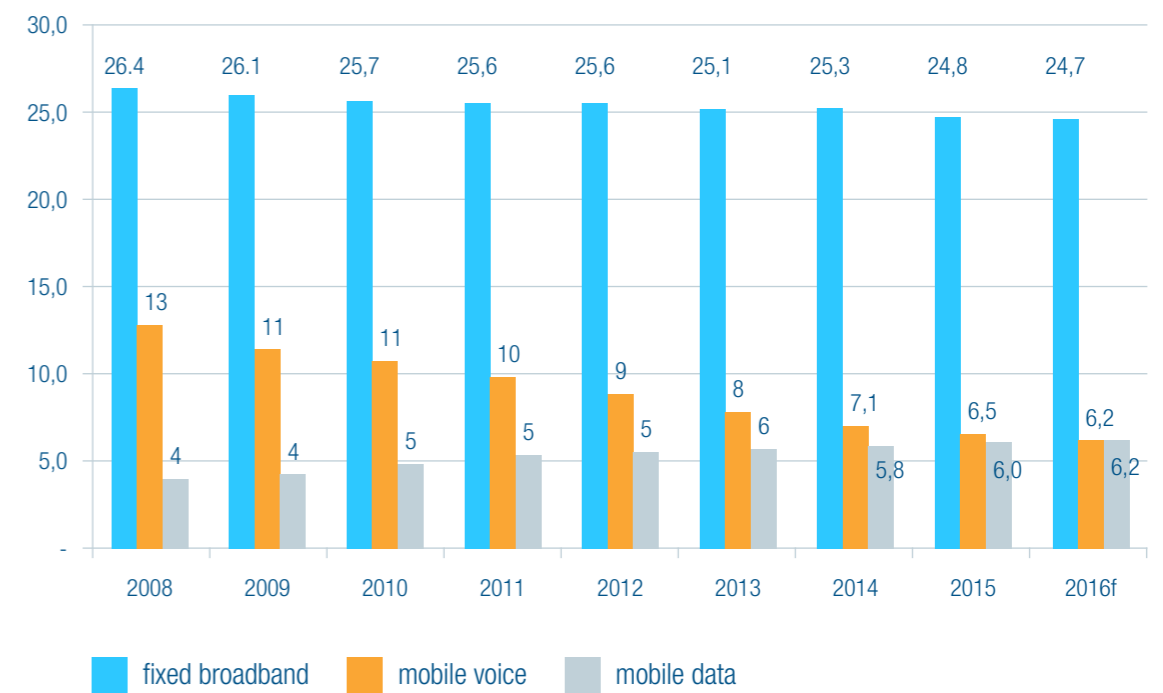
ARPU/ARPL (EUR/month)	2008	2009	2010	2011	2012	2013	2014	2015	2016f
fixed broadband	26.4	26.1	25.7	25.6	25.6	25.1	25.3	24.8	24.7
mobile voice	13	11	11	10	9	8	7.1	6.5	6.2
mobile data	4	4	5	5	5	6	5.8	6.0	6.2

Source: IDATE

Data as share of mobile revenues
(%, ETNO perimeter)

	2008	2009	2010	2011	2012	2013	2014	2015	2016f
mobile data	23%	27%	30%	35%	38%	42%	45%	48%	50%
mobile voice	77%	73%	70%	65%	62%	58%	55%	52%	50%

Legend: ■ mobile voice ■ mobile data
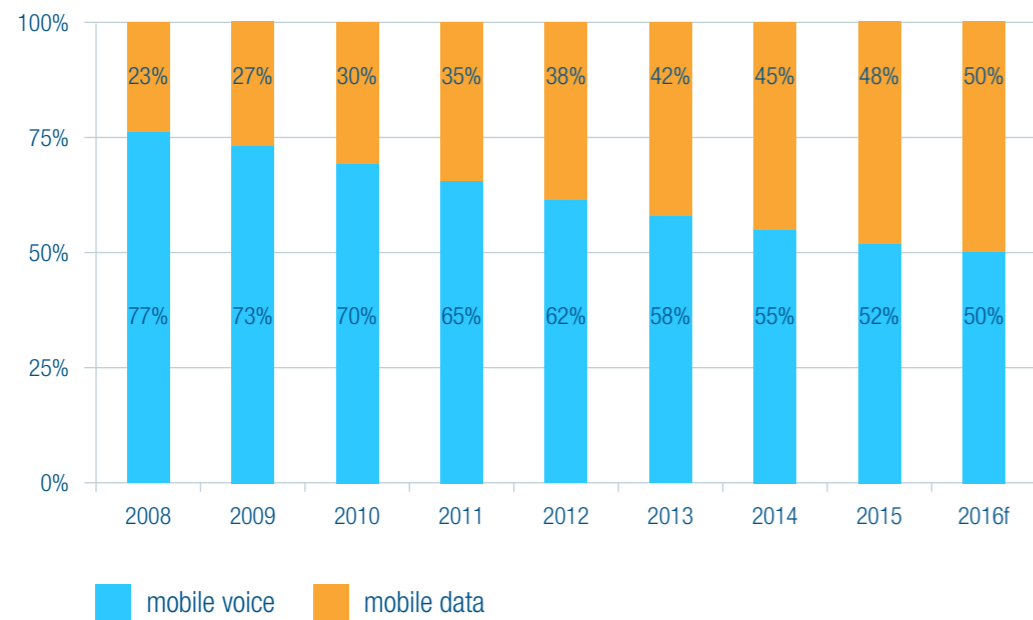
Share of mobile revenues	2008	2009	2010	2011	2012	2013	2014	2015	2016f
voice	77%	73%	70%	65%	62%	58%	55%	52%	50%
data	23%	27%	30%	35%	38%	42%	45%	48%	50%

Source: IDATE

Service revenue growth
(EU28, % y-o-y)

Legend: ■ OTT Communication ■ telecom
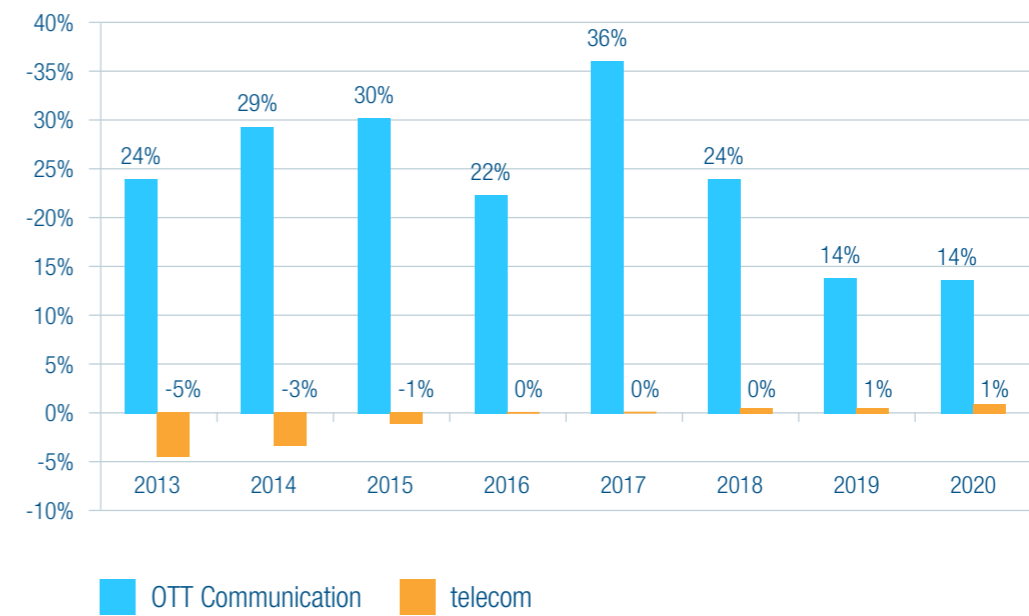
service revenue growth	2013	2014	2015	2016	2017	2018	2019	2020
OTT Communication	24%	29%	30%	22%	36%	24%	14%	14%
telecom	-5%	-3%	-1%	0%	0%	0%	1%	1%

Source: IDATE

ETNO members lead the investment effort

The demand for more connectivity, more data and higher quality of service combine to keep high pressure on network operators to expand and upgrade their infrastructures.

In 2015, integrated and stand-alone fixed, mobile and cable players have cumulatively invested EUR 52.5bn in tangible assets. This is a substantial increase compared to 2014's EUR 49.4bn. If we look at the EU5, this means that **ETNO and cable investment together touched 83% of the total.** Similarly, in the EU28 countries investment by operators rose from EUR 45.1bn to EUR 47.0bn. In the United States, operators raised their investment spending too, by a combined amount of EUR 1.8bn. At the absolute level, with EUR 63.8bn, **CapEX levels in the US remain vastly superior to those observed in Europe,** which at least partially reflects the healthier evolution of revenues over the recent past on that side of the Atlantic.

Among the operators investing in telecom networks in the ETNO perimeter, members of ETNO continue playing the leading role. In 2015, members of ETNO contributed EUR 31.5bn of 60.3% of the industry's total investments. If we look at fixed, the leadership is even more striking: ETNO companies invest 70% of the total CapEX in fixed networks.

In relative terms, **ETNO member companies further increased their investment compared to 2014** as well. In the previous year, they invested 15.8% of their revenues in tangible assets. By 2015, this share has increased by almost one percentage point to 16.6% of revenues in the ETNO perimeter.

Upgrades to fiber and 4G technologies in the access are certainly an important driver of the investments observed? However, other elements also account for important shares of overall capital expenditures. The transition to all-IP networks, the expansion and densification of mobile networks or increased backhaul capacity and regular maintenance are among the different cost items. How much of total CapEx is devoted to fibre and 4G will vary significantly between different operators depending on technology choices, availability of passive infrastructures, topology and the like.

Tangible CapEx in EU5, Fixed
(% Fixed CapEx, EU5 : DE, IT, FR, UK, ES) *

OTHERS 17%
CABLE 13%
ETNO 70%

Tangible CapEx
(EUR bn)

ETNO perimeter *   EU-28   Japan   USA
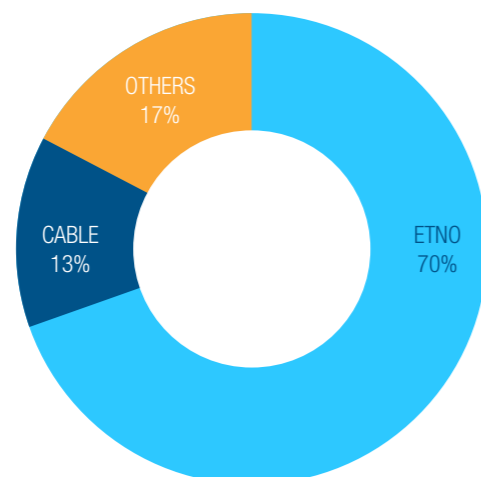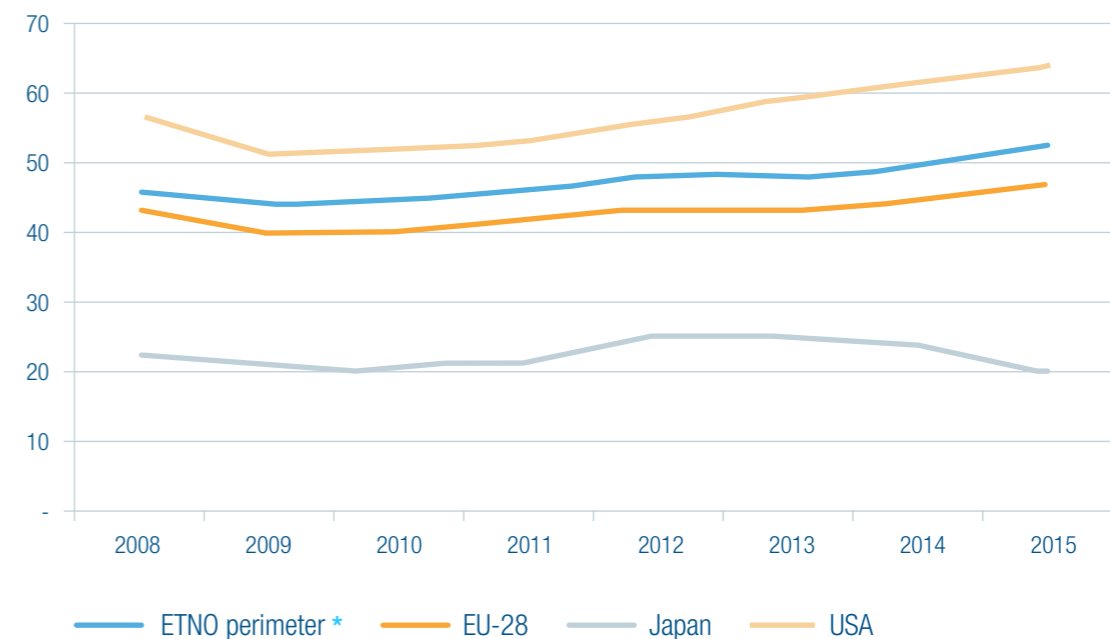
Tangible CapEx (EUR bn)	2008	2009	2010	2011	2012	2013	2014	2015
ETNO perimeter *	46.1	43.9	44.2	46.2	48.1	47.8	49.4	52.5
EU-28	43.0	40.1	43.9	42.7	43.3	43.5	45.1	47.0
Japan	22.4	20.5	20.6	21.6	24.8	24.9	23.5	20.1
USA	57.0	51.3	52.1	53.5	56.3	59.4	62.0	63.8

Source: IDATE
* 2015 incl. UK

CapEx growth
(%, y-o-y)

Legend: ETNO perimeter | EU28 | Japan | USA
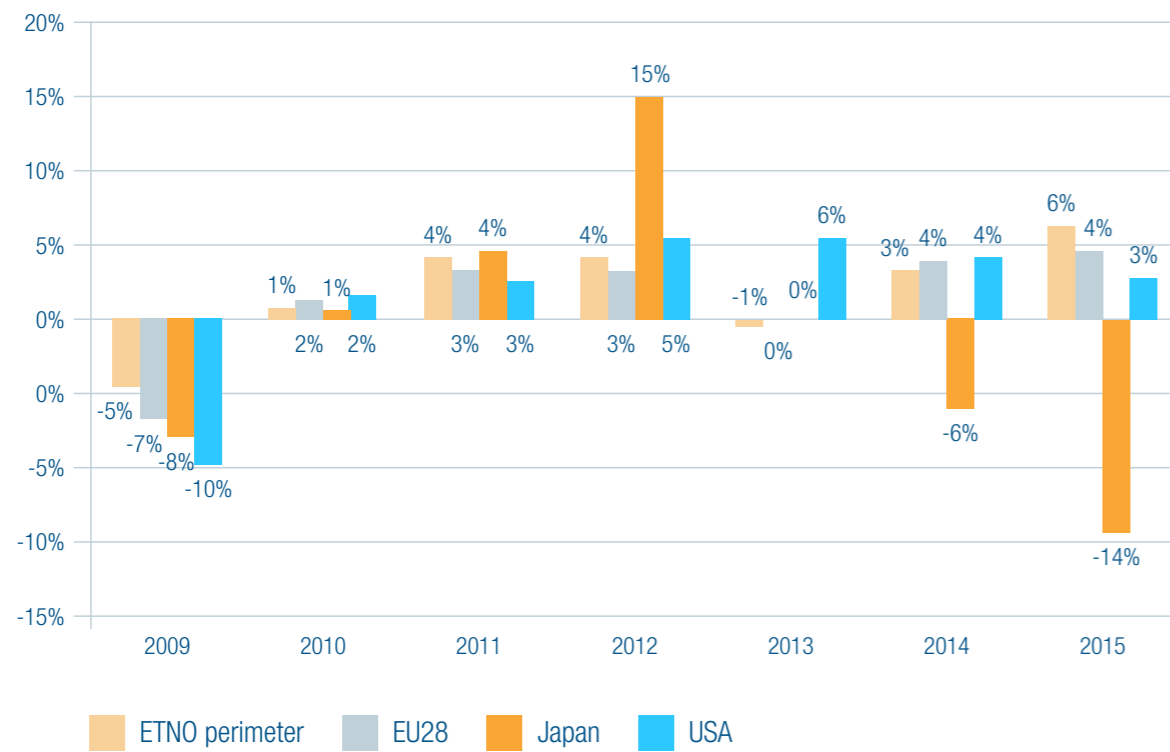
Tangible CapEx (EUR bn)	2009	2010	2011	2012	2013	2014	2015
ETNO perimeter *	-5%	1%	4%	4%	-1%	3%	6%
EU-28	-7%	2%	3%	3%	0%	4%	4%
Japan	-8%	1%	4%	15%	0%	-6%	-14%
USA	-10%	2%	3%	5%	6%	4%	3%

Source: IDATE
* 2015 incl. UK

Fixed and mobile CapEx
(EU28, EUR bn, 2015)

Legend: ETNO | other
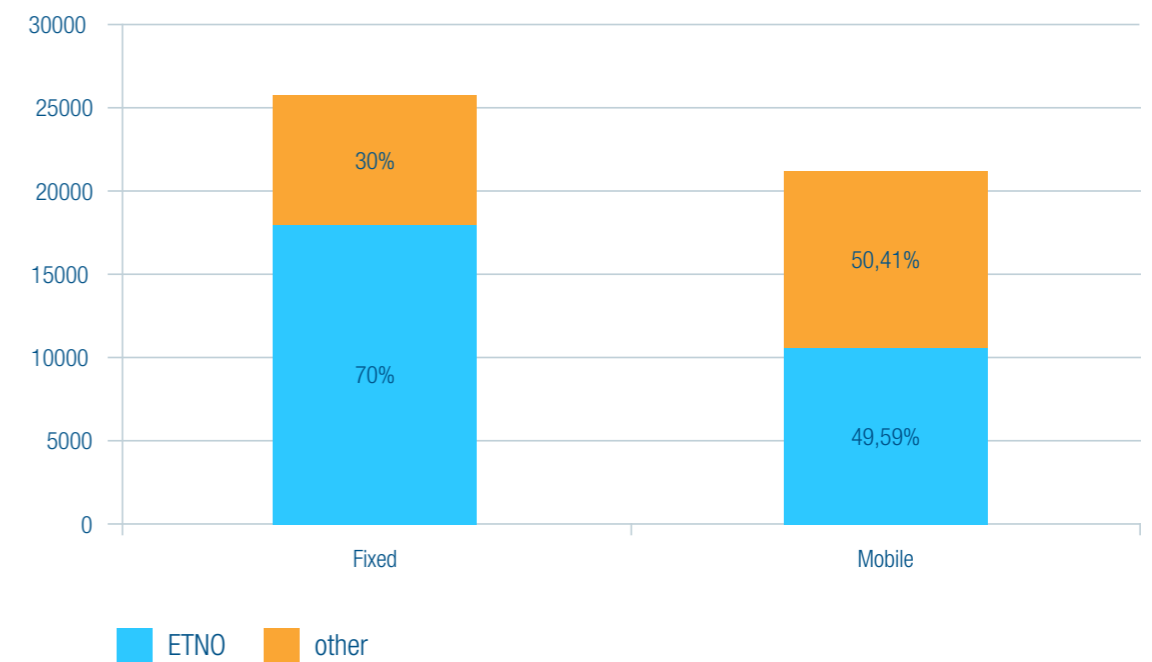
Tangible CapEx (EUR bn)	fixed	mobile
ETNO	18 022	10 545
other	7 737	10 718
total	25 759	21 263

Source: IDATE

ETNO perimeter CapEx
(EUR bn)
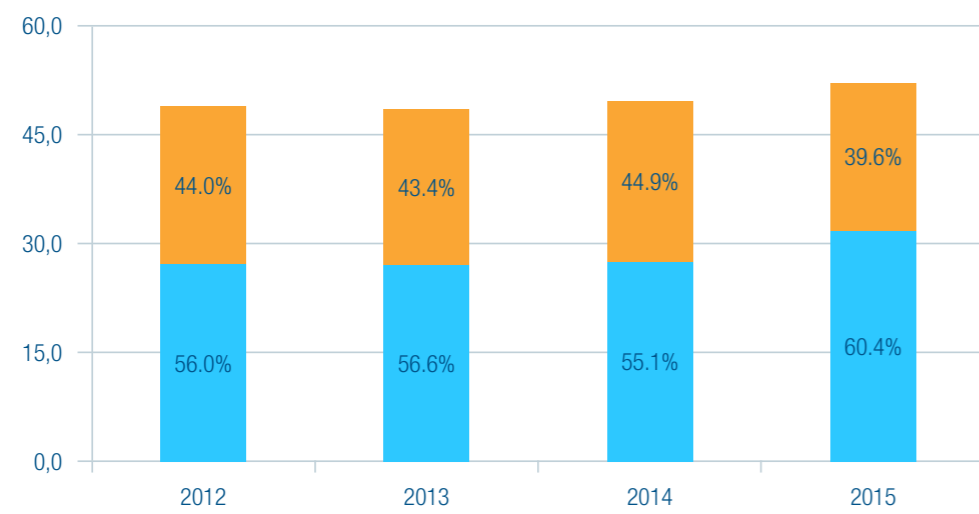
ETNO members	other operators (incl. Cable)

Tangible CapEx (EUR bn)	2012	2013	2014	2015
ETNO members	26.9	27.0	27.2	31.5
other operators (incl. Cable)	21.8	21.4	22.5	20.7
total	48.1	47.8	49.4	52.5

Source: IDATE

ETNO perimeter, Fixed CapEx in EU5
(EUR bn)
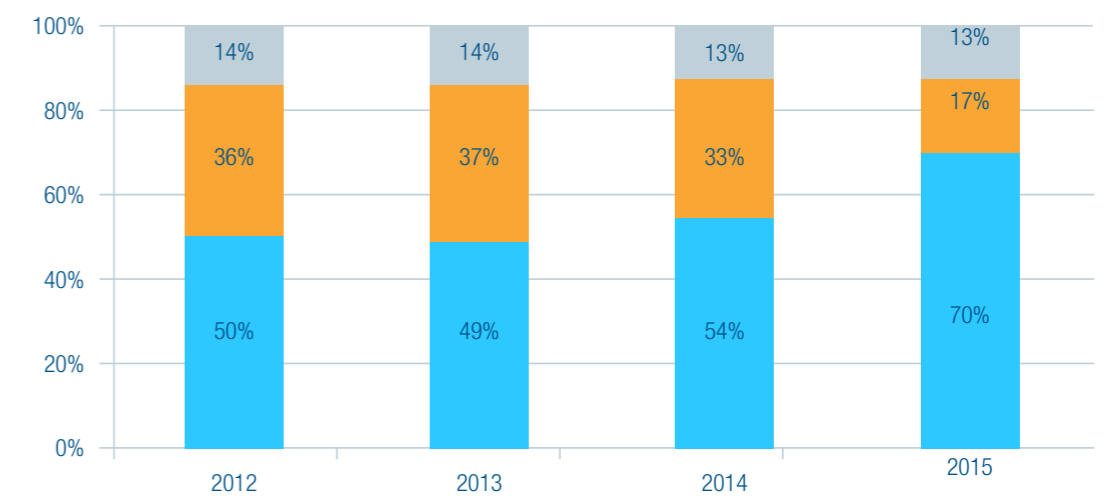
ETNO members	other telcos	cable-cos

* ETNO members include BT for 2015

total CapEx (EUR bn)	2012	2013	2014	2015
ETNO members	9.1	9.2	9.8	13.4
cable-cos	2.5	2.6	2.4	2.5
other telcos	6.6	6.8	5.9	3.3
total	18.2	18.6	18.1	19.3

Source: IDATE

CapEx share of revenues
(%, ETNO perimeter, 2015, ETNO members)

Year	CapEx share
2014	15,8%
2015	16,6%
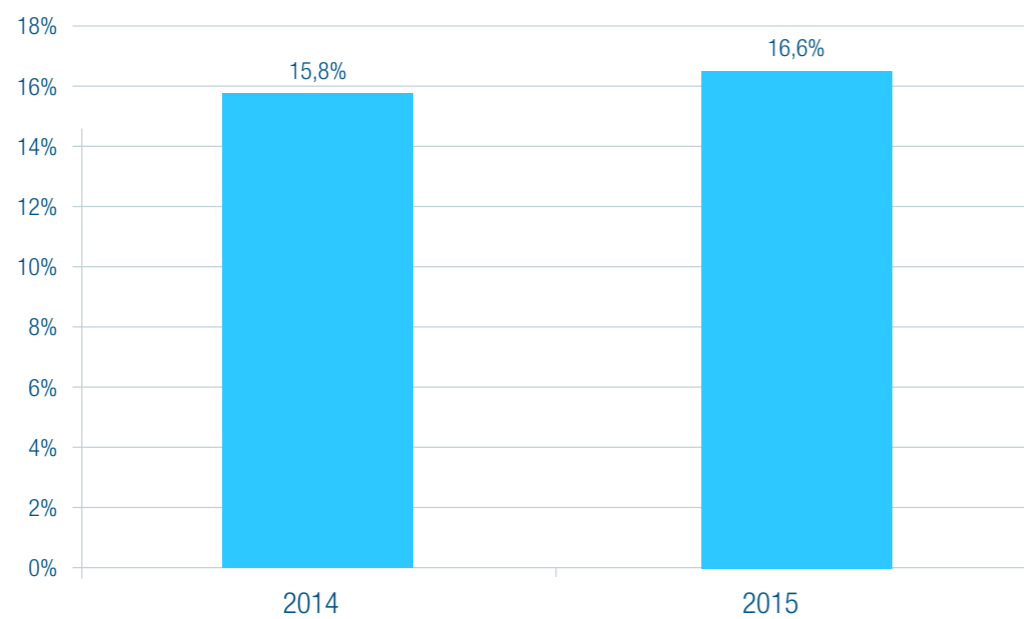
Source: IDATE

Building a networked future: ETNO companies deployed €31.5bn investment in 2015, leading the market for both mobile and fixed investment

Users keep asking for more broadband

As pointed out in previous chapters already, the number of broadband connections across the ETNO perimeter and the European Union is progressing. This is true for the fixed as well as for the mobile broadband market. On the fixed side, the market is more mature, thus the progress is less rapid than in mobile, but with a 4.6% growth rate in 2016 fixed markets remain rather healthy. In mobile, the take-up is happening at greater speed, the combined number of 3G and 4G subscriptions grew by 17% in 2015.

The growth in mobile broadband is essentially fuelled by 4G. The number of 3G subscribers is plateauing with 392.7m lines in 2015 compared to 391.0m in 2014. 4G in the ETNO perimeter added a whopping 79m subscriptions in 2015, i.e. growing by 101% in just one year. At 157.2m subscribers, the take-up of 4G is approaching that of fixed broadband services and will likely surpass it in 2016.

Beyond the absolute subscriber numbers in the fixed broadband market, **the transition from standard broadband to fast Internet access** over NGA technologies is a crucial development. In 2012, access over VDSL, Docsis 3.0 or FTTH/B represented only 14% of the total fixed broadband subscriber base. In 2014 already 27% of broadband users in the ETNO perimeter relied on one of these NGA technologies to access the web from a fixed location. By the end of 2015 this share had risen to 37%. In total, their number has increased from 23.2m to 65.0m over the 2012-2015 period. Docsis 3.0 remains the most commonly adopted NGA technology, but as the availability of other technologies, in particular VDSL increases cable networks' lead is shrinking. Between 2012 and 2015 the market share of VDSL subscriptions grew from 21.3% to 31.3% of NGA lines. FTTH/B's share remained fairly stable, with a decrease from 31.2% to 29.8% in the given time span. Cable had a 47.6% share of NGA subscriptions in 2012 compared to 42.0% in 2015 across ETNO member markets.

The coverage of NGA networks continues to expand. 49% of homes in ETNO's footprint have access to a line based on one of the different flavours of the VDSL technology, which are increasingly capable of delivering triple-digit download speeds. Docsis 3.0 was available to 39% of households in 2015. The next evolution of cable broadband, Docsis 3.1 is currently beginning to hit European markets and will further ameliorate the performance. ETNO's TDC was the first player worldwide to announce a nationwide upgrade of its infrastructure towards this technology. Fibre-to-the-home and fibre-to-the-basement is considered as the most "future-oriented" technology in terms of meeting growing capacity demand but they are also the most costly to deploy. FTTH/B is therefore not surprisingly the technology with the lowest coverage level. 27% of homes in ETNO countries had access to this technology in 2015, up from 24% in 2014.

In 2015, in the EU28 and Switzerland, 74% of households had access to a network capable of delivering 30Mbps or more, when taking into account the overlap between different networks. For 23% of households 30Mbps was the best speed they could get. 26% of homes where passed by networks offering between 30Mbps and 100Mbps downstream. Almost half of the households, i.e. 48.2%, had access to high-speed internet services of 100Mbps and more. As operators invest and technologies evolve, the share of households having access to top-tier internet speeds will expand rapidly over the next couple of years.

ETNO's members are playing a crucial role in paving the way for European residential and business customers to world-class Internet access. With more than 60% of all homes passed, ETNO members have expanded their lead over other telcos and cable operators compared to 53% of NGA coverage established by them in the previous year.

Fixed broadband lines by technology
(ETNO perimeter, % of subscriptions)
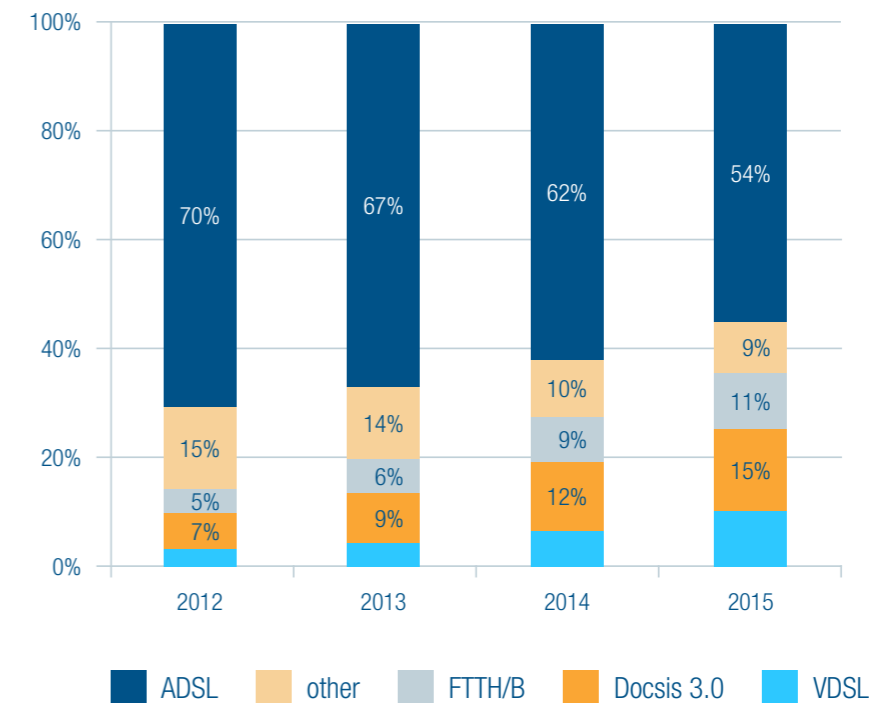
Broadband subscriptions	2012	2013	2014	2015
VDSL	4.9	7.7	11.8	20.4
Docsis 3.0	11.0	14.4	21.0	27.3
FTTH/B	7.2	9.7	14.9	19.4
Other	24.1	23.3	18.2	16.8
ADSL	112.8	111.3	107.7	97.7

Source: IDATE

Fixed and mobile broadband take-up
(ETNO perimeter, of subscribers)

Legend: fixed BB — 3G — 4G
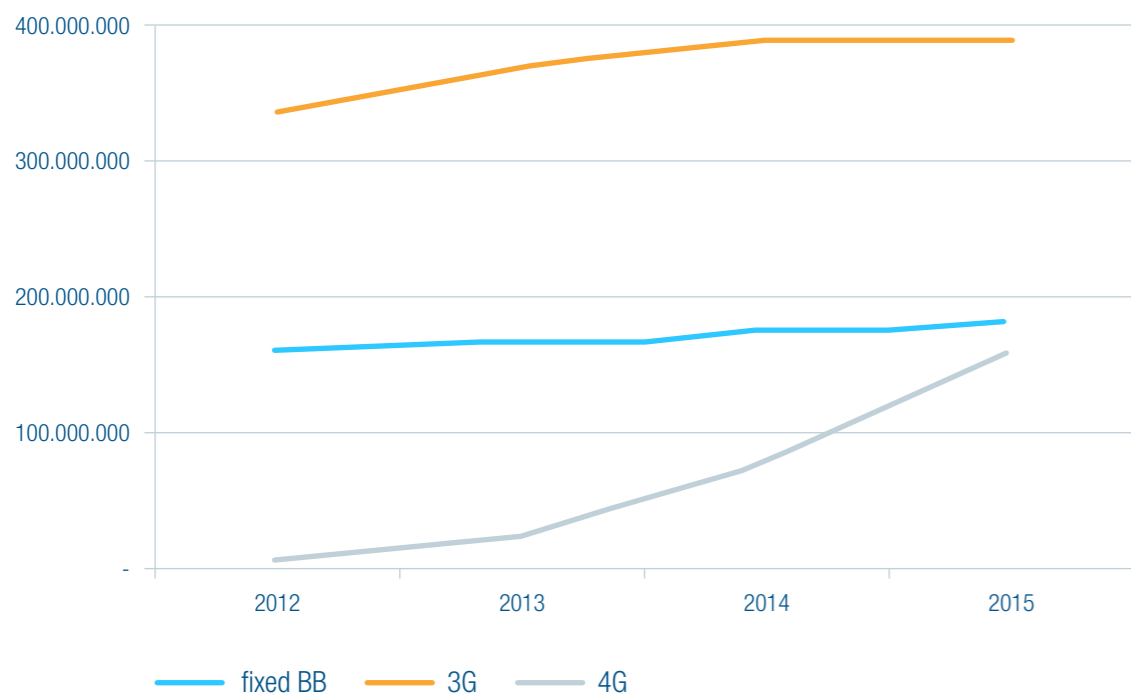
Broadband lines	2012	2013	2014	2015
fixed	160 093 476	166 503 409	173 552 683	181 530 119
3G	334 767 015	370 514 725	390 971 492	392 736 180
4G	3 113 522	23 145 721	78 278 926	157 243 332

Source: IDATE

NGA coverage and ETNO share
(ETNO perimeter, homes passed)

FTTH/B	VDSL	DOCSIS	ETNO share
67 668 209	120 910 109	96 579 343	62%

Source: IDATE

NGA coverage
(% of households, 2015)

Legend: VDSL | DOCSIS 3.0 | FTTH/B
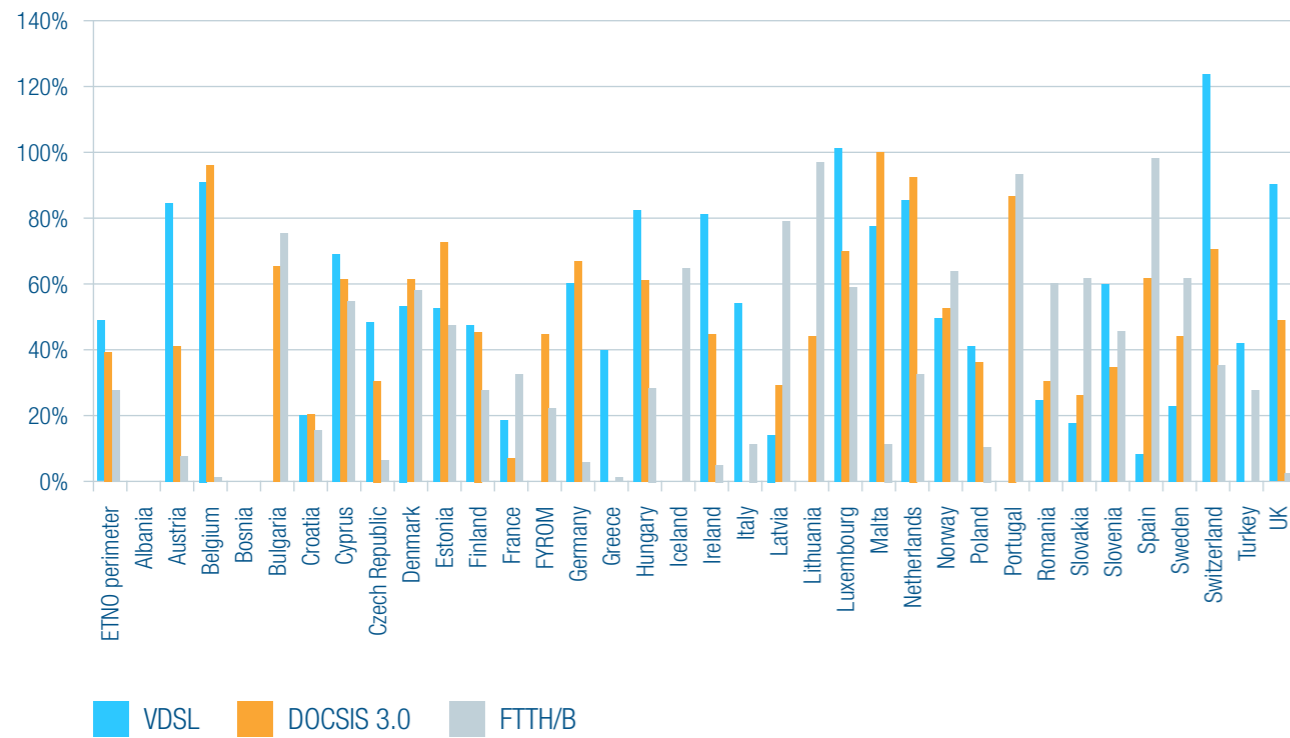
Coverage	VDSL	DOCSIS 3.0	FTTH/B
ETNO perimeter	49%	39%	27%
Albania	n/a	n/a	n/a
Austria	85%	41%	7%
Belgium	91%	96%	0%
Bosnia	n/a	0%	0%
Bulgaria	0%	66%	75%
Croatia	19%	20%	15%
Cyprus	69%	61%	54%
Czech Republic	48%	30%	6%
Denmark	53%	61%	58%
Estonia	52%	72%	47%
Finland	48%	45%	28%
France	18%	6%	33%
FYROM	0%	45%	22%
Germany	61%	67%	5%
Greece	40%	0%	0%
Hungary	83%	61%	28%
Iceland	0%	0%	65%
Ireland	81%	45%	5%
Italy	54%	0%	11%
Latvia	14%	29%	79%
Lithuania	0%	44%	97%
Luxembourg	100%	70%	59%
Malta	77%	100%	11%
Netherlands	85%	92%	32%
Norway	49%	52%	64%
Poland	41%	36%	10%
Portugal	0%	87%	93%
Romania	24%	31%	60%
Slovakia	18%	26%	62%
Slovenia	60%	35%	45%
Spain	8%	62%	98%
Sweden	22%	44%	62%
Switzerland	90%	71%	35%
Turkey	41%	n/a	27%
UK	91%	49%	2%

Source: IDATE

NGA subscribers
(ETNO perimeter, 2015, % of homes)

Legend: VDSL | DOCSIS 3.0 | FTTH/B
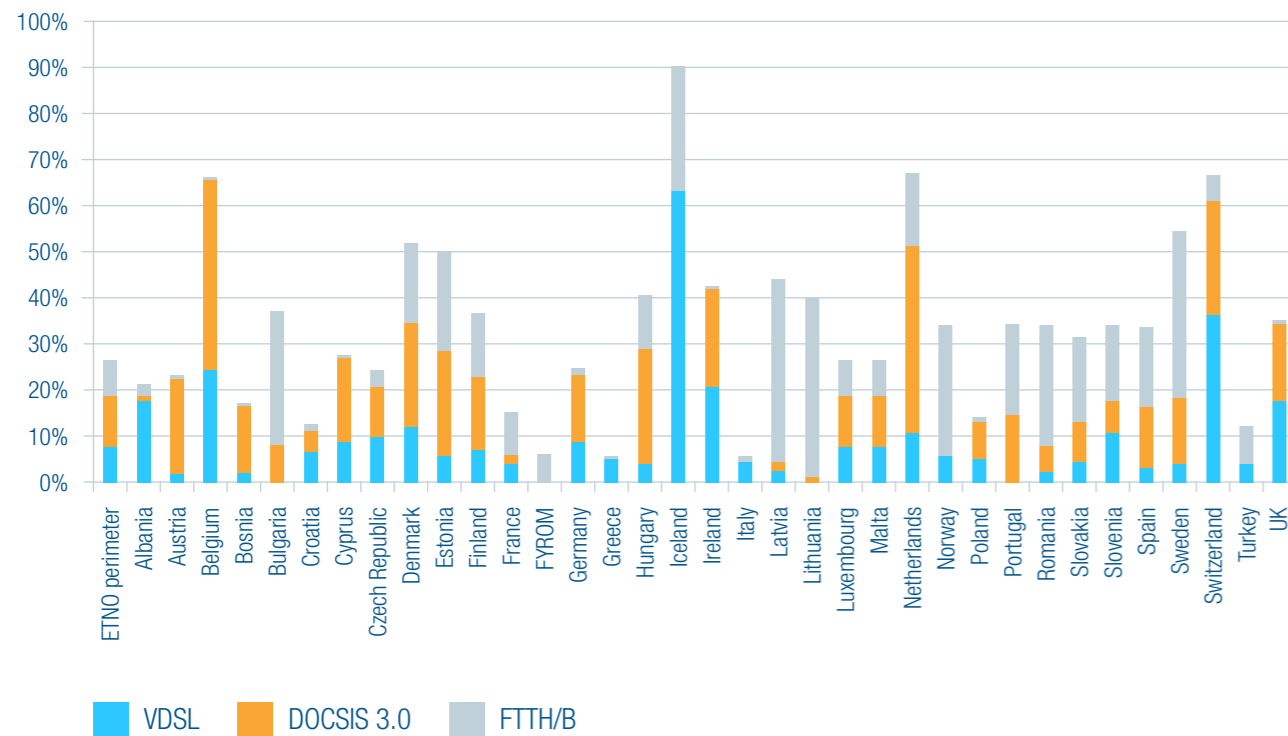
Coverage	VDSL	DOCSIS 3.0	FTTH/B
ETNO perimeter	20 384 275	27 294 947	19 384 351
Albania	126 292	7 820	17 001
Austria	60 000	759 600	40 300
Belgium	1 212 000	2 063 000	7 800
Bosnia	17 276	160 778	428
Bulgaria	-	234 000	883 790
Croatia	118 900	84 888	24 800
Cyprus	25 702	57 179	500
Czech Republic	438 000	535 000	153 000
Denmark	308 172	595 000	450 511
Estonia	30 000	138 000	130 000
Finland	180 000	415 000	370 000
France	1 034 000	606 000	2 625 000
FYROM	-	-	33 103
Germany	4 800 000	6 081 000	539 800
Greece	185 760	-	6 600
Hungary	142 653	930 386	442 669
Iceland	78 000	-	33 962
Ireland	358 000	368 000	10 000
Italy	1 041 000	-	370 000
Latvia	20 000	15 000	330 000
Lithuania	-	11 821	517 099
Luxembourg	41 171	17 500	36 479
Malta	-	81 724	4 950
Netherlands	800 000	3 101 400	1 200 500
Norway	125 000	N/A	665 343
Poland	698 000	1 150 000	166 000
Portugal	-	600 000	835 000
Romania	164 180	494 140	2 279 000
Slovakia	78 000	159 812	343 638
Slovenia	88 000	63 000	139 000
Spain	450 000	2 400 000	3 113 580
Sweden	170 169	650 000	1 669 870
Switzerland	1 360 000	914 900	199 000
Turkey	827 000	N/A	1 672 628
UK	5 407 000	4 600 000	73 000

Source: IDATE

Fixed broadband coverage by downstream speed
(EU28, CH; 2015)

Legend:
- NGA coverage > 100 Mbps
- NGA coverage > 30 and < 100 Mbps
- Fixed <30M
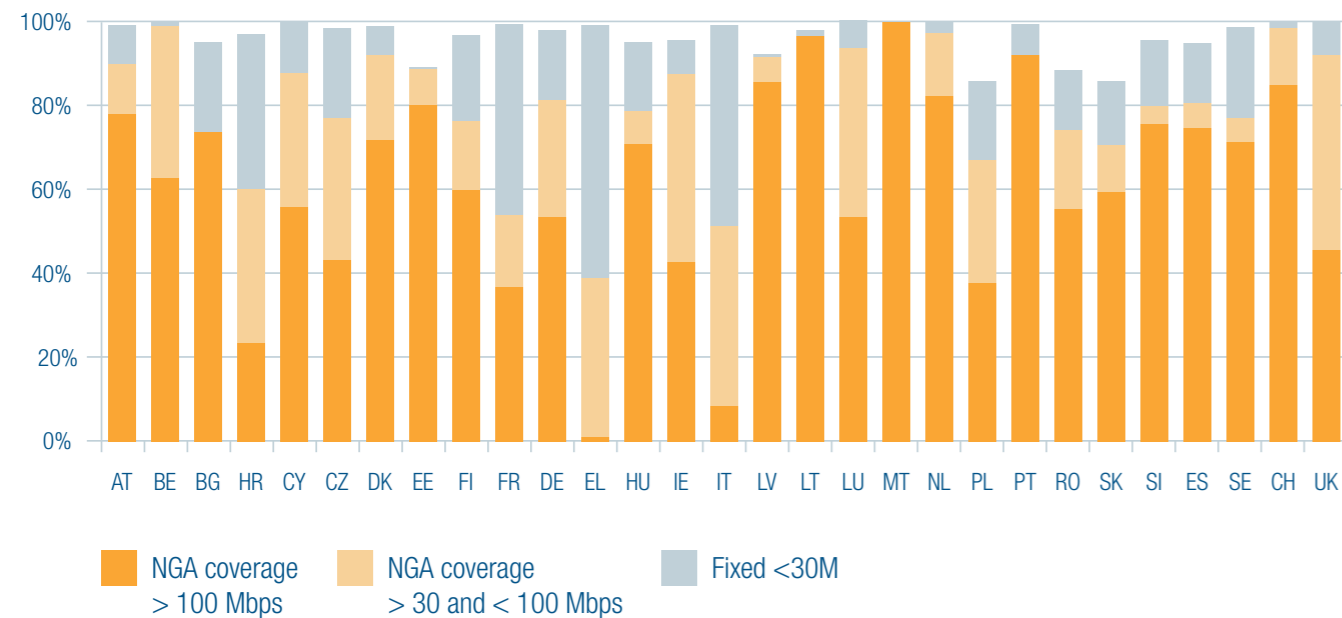
	Country	Fixed Broadband coverage	NGA coverage > 30 Mbps (wo network overlapping)	Fixed <30M	NGA coverage > 30 and < 100 Mbps	NGA coverage > 100 Mbps
AT	Austria	99.2%	90.0%	9.2%	12.0%	78.0%
BE	Belgium	99.9%	99.0%	0.9%	36.1%	62.9%
BG	Bulgaria	95.2%	74.0%	21.2%	0.0%	74.0%
HR	Croatia	96.9%	60.0%	36.9%	36.9%	23.1%
CY	Cyprus	100.0%	88.0%	12.0%	32.0%	56.0%
CZ	Czech Republic	98.5%	77.0%	21.5%	33.9%	43.1%
DK	Denmark	99.0%	92.0%	7.0%	20.0%	72.0%
EE	Estonia	89.3%	89.0%	0.3%	9.0%	80.0%
FI	Finland	97.0%	76.0%	21.0%	15.9%	60.1%
FR	France	99.8%	51.0%	48.8%	18.2%	32.8%
DE	Germany	98.3%	82.0%	16.3%	28.4%	53.6%
EL	Greece	99.3%	39.0%	60.3%	38.2%	0.8%
HU	Hungary	95.2%	79.0%	16.2%	8.0%	71.0%
IE	Ireland	96.3%	88.0%	8.3%	45.0%	43.0%
IT	Italy	99.3%	51.0%	48.3%	42.4%	8.6%
LV	Latvia	92.5%	92.0%	0.5%	6.0%	86.0%
LT	Lithuania	98.3%	97.0%	1.3%	0.0%	97.0%
LU	Luxembourg	100.0%	94.0%	6.0%	40.7%	53.3%
MT	Malta	100.0%	100.0%	0.0%	0.0%	100.0%
NL	Netherlands	100.0%	98.0%	2.0%	15.4%	82.6%
PL	Poland	86.2%	67.0%	19.2%	29.2%	37.8%
PT	Portugal	99.8%	92.0%	7.8%	0.0%	92.0%
RO	Romania	88.8%	74.0%	14.8%	18.6%	55.4%
SK	Slovakia	86.3%	71.0%	15.3%	11.2%	59.8%
SI	Slovenia	95.5%	80.0%	15.5%	4.3%	75.7%
ES	Spain	95.1%	81.0%	14.1%	6.1%	74.9%
SE	Sweden	99.0%	77.0%	22.0%	5.6%	71.4%
CH	Switzerland	99.9%	99%	0.9%	14.1%	84.9%
UK	United Kingdom	100.0%	92.0%	8.0%	46.1%	45.9%

Source: IDATE

New services are growing

Users are keenly adopting the services delivered to them over the Internet, provided in some cases by their access provider, but in most cases by over-the-top (OTT) service providers. The use of social networks, online search and e-commerce has become an integral part of the everyday life of large parts of the population in Europe and elsewhere. Businesses in a broad range of verticals have begun tapping into the enormous potential of the Internet of things. Machine-to-machine communications are a key underlying enabler for this evolution.

For fixed internet users, **online search** is probably the most popular service in terms of take-up; with its usage being virtually universal. In the EU5, the last rate of adoption in 2015 was 81.8% of fixed internet users in Italy, while take-up reached 95% and 97% in France and Germany, respectively. Mobile internet users also search the web for information relevant to them, but the service is less popular on mobile than for instance social networks. In Italy, Spain, France and Germany 32% to 34% of mobile Internet users did online search in 2015. In the UK that was the case for 41% of mobile users. **Social networks** on the other hand were used by a majority of Internet users in each of the 5 largest EU countries. The adoption rate in Germany was the lowest, with 52.9% of mobile users. British mobile subscribers are the most avid users of social networks. More than two thirds among them, or 68.3%, used these services in 2015. On fixed networks, the usage of social networks tends to be several percentage points higher than on mobile for each given markets. At 61.8% and 62.3%, respectively, German and French users are the most hesitant to adopt social networks. With 72.2% of users visiting social networks, the UK is in the lead on fixed networks, too. Among Italian and Spanish fixed Internet users, 67.3% and 63.6% use social networks.

When it comes to buying online, the difference between fixed and mobile is marked. **E-commerce** is vastly more popular fixed access to the Internet than via mobile networks. About one quarter of mobile internet users in the five countries observed buy online. The adoption rates lies between 22.9% in France and 26.2% in the UK. Although e-commerce is generally much more widely used on the fixed Internet, the differences between the countries are much more significant as well. In Italy and Spain, 45.9% and 50.5% of users, respectively, shop online. This is almost twice as much as on the mobile in these countries, but well below the numbers observed in the three other countries, where e-commerce is adopted by 72.6% (France), 77.6% (Germany) and 80.4% (UK) of fixed internet users.

OTT services have generated revenues of EUR 69.1bn in the EU28 in 2015. Search remains one of the biggest revenue drivers with EUR 12.5bn. E-commerce commissions for the facilitating OTT services amounted to EUR 12.1bn. Revenues from 'social' services were comparatively low with EUR 2.5bn. Cloud services where the single biggest source of OTT revenues with EUR 22.2bn.

OTTs' revenues have grown consistently over the last years and this trend is expected to last. Overall OTT revenues in the EU28 are forecast to surpass the EUR 100bn mark in 2018 and reach EUR 124.3bn in 2020.

Between 2015 and 2020 the number of cellular **M2M** modules in the EU28 will rise from just under 58 million units to 200 million, representing around 25% of all SIM cards in the European Union. By 2020, m2m connectivity will account for as much as 3.5% of total mobile data revenues.

The **IoT market** will see a rapid expansion over the next decade. Utilities will be the biggest market within IoT in Europe by 2025, in volume, reaching 685 million units (essentially smart meters). This market is mainly driven by the regulation for gas and electric meters, where there is a roll-out target of 80% market. The automotive sector will sport admit the highest CAGR over the 2015-2025 period (reaching 37%). This boost is largely driven by the eCall regulation.

Adoption of OTT services
(% of users)

Social networks	FR		DE		IT		ES		UK	
	2015	2020	2015	2020	2015	2020	2015	2020	2015	2020
fixed	62.5%	68.1%	61.8%	64.8%	67.3%	fixed	62.5%	68.1%	61.8%	64.8%
mobile	58.8%	66.7%	52.9%	57.4%	62.1%	mobile	58.8%	66.7%	52.9%	57.4%

Search	FR		DE		IT		ES		UK	
	2015	2020	2015	2020	2015	2020	2015	2020	2015	2020
fixed	95.0%	97.6%	97.0%	97.6%	81.8%	fixed	95.0%	97.6%	97.0%	97.6%
mobile	34.9%	44.6%	33.3%	46.0%	32.3%	mobile	34.9%	44.6%	33.3%	46.0%

E-commerce	FR		DE		IT		ES		UK	
	2015	2020	2015	2020	2015	2020	2015	2020	2015	2020
fixed	72.6%	78.6%	77.6%	80.8%	50.5%	56.3%	45.9%	50.4%	80.4%	80.9%
mobile	22.9%	28.5%	23.3%	29.5%	24.6%	30.9%	25.7%	31.9%	26.2%	32.8%

Source: IDATE

OTT revenues
(EURm, EU28)

	2012	2013	2014	2015	2016	2017	2018	2019	2020
Search	9 344	10 385	11 642	12 461	14 003	15 041	16 549	17 278	18 947
Social	1 580	1 845	2 106	2 479	2 866	3 285	3 717	3 888	4 249
Mobile	2 791	4 828	7 001	8 698	10 305	11 835	13 668	15 198	16 685
OTT Video	1 288	1 881	2 693	3 940	5 018	6 114	7 278	8 493	9 842
Communication (VoIP, IP messaging)	394	488	632	824	1 008	1 374	1 705	1 941	2 208
Cloud (excluding mobile apps)	11 505	14 526	18 563	22 160	27 132	32 449	38 389	44 304	50 673
Digital contents	1 307	1 670	2 098	2 663	3 174	3 607	4 150	4 843	5 131
E-commerce commission	8 303	9 512	10 796	12 055	13 124	13 935	14 939	15 985	17 023
Online games (excluding mobile)	1 860	2 160	2 428	2 703	2 969	3 110	3 223	3 288	3 297
Total OTT services market	42 707	50 872	60 263	69 161	79 896	89 509	101 302	112 248	124 287

* Note: Simple addition of each OTT service type does not equal total OTT services market, as there are various overlaps (such as mobile being part of search, social, etc.)

M2M connectivity revenues
(EURm, EU28)

Total M2M connectivity revenues

Share of M2M connectivity revenues in total mobile data revenues
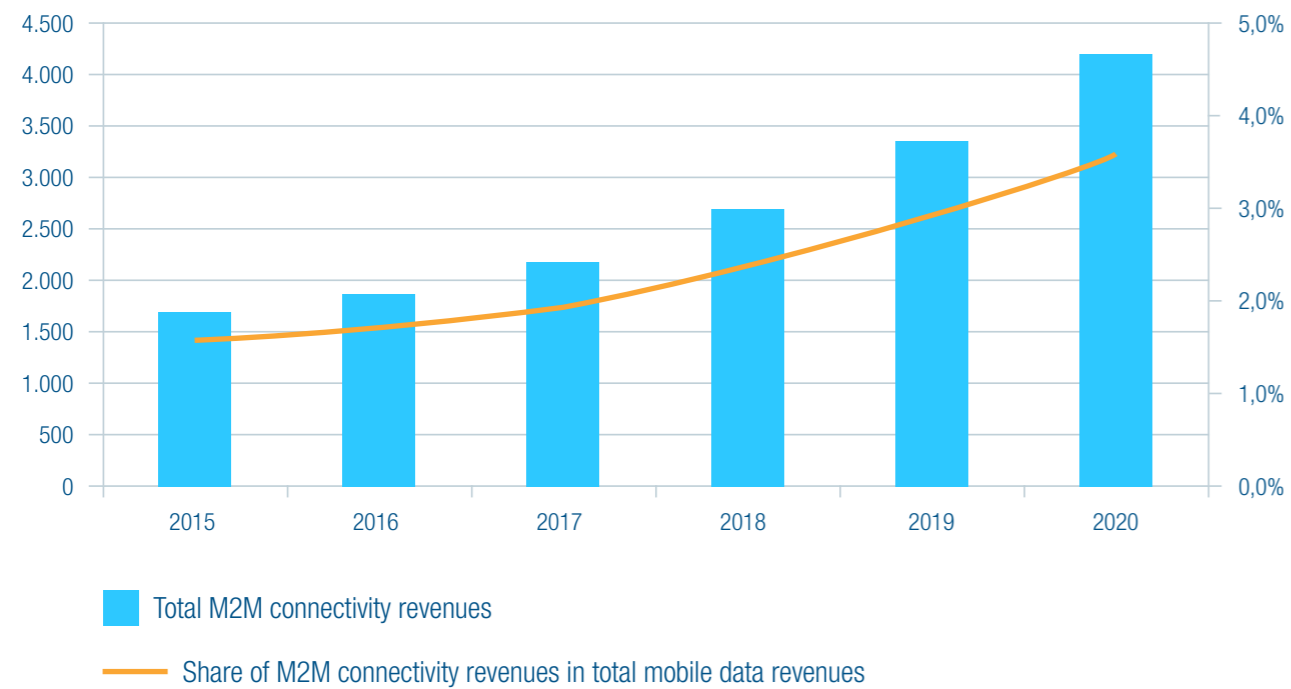
Communication & associated services revenues	2012	2013	2014	2015	2016	2017	2018	2019	2020
EUR m	1 328	1 584	1 653	1 697	1 877	2 185	2 703	3 365	4 201
Share of total mobile revenues	1.1%	1.3%	1.5%	1.5%	1.7%	1.9%	2.4%	2.9%	3.6%

Source: IDATE

IoT units by vertical
(EU28, million)
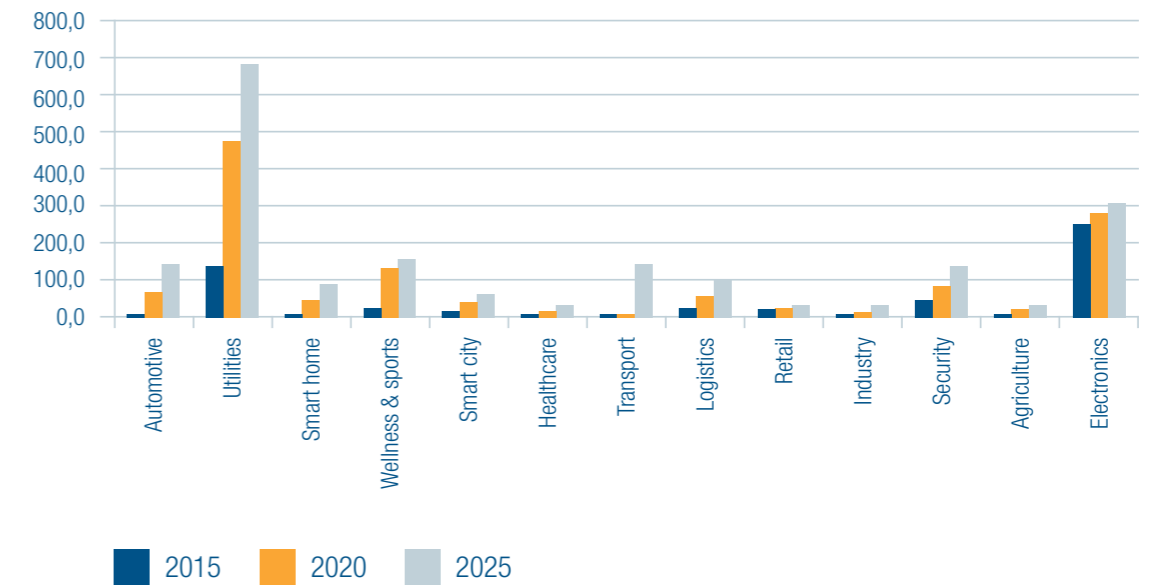
■ 2015   ■ 2020   ■ 2025

vertical	2015	2020	2025
Automotive	6.2	64.2	144.9
Utilities	138.1	471.8	684.2
Smart home	7.3	42.8	88.8
Wellness & sports	22.6	132.8	156.2
Smart city	13.7	37.9	63.2
Healthcare	8.5	17.3	26.7
Transport	2.2	3.0	3.7
Logistics	22.7	57.3	96.2
Retail	19.3	24.8	31.8
Industry	3.5	12.9	29.1
Security	37.1	82.3	134.4
Agriculture	7.2	19.0	32.2
Electronics	251.6	277.4	305.0
Total	539.9	1243.6	1796.5

Source: IDATE

European top 20 communications providers by revenue*
(2015, EUR bn)

🏳 : ETNO observers

🏳 : ETNO Members

Rank	Company	Country	2015 revenues	
1	Deutsche Telekom	Germany	69.2	🏳
2	Vodafone	UK	58.2	
3	Telefónica	Spain	47.2	🏳
4	Orange	France	40.2	🏳
5	BT	UK	24.6	🏳
6	Telecom Italia	Italy	19.7	🏳
7	Telenor	Norway	14.3	🏳
8	Numericable-SFR	France	11.0	
9	Swisscom	Switzerland	10.9	🏳
10	MTN	South Africa	10.4	
11	TeliaSonera	Sweden	9.3	🏳
12	Rogers Communications	Canada	9.1	
13	Vimpelcom	Netherlands	8.7	
14	MTS	Russia	8.5	
15	KPN	Netherlands	7.7	🏳
16	MegaFon	Russia	6.2	
17	Belgacom-Proximus	Belgium	6.0	🏳
18	Turk Telecom	Turkey	4.8	
19	Bouygues Telecom	France	4.5	
20	Turkcell	Turkey	4.2	

* incl. non-European revenues
Source: IDATE

Global top 50 communications providers by revenue*
(2015, EUR bn)

Rank	Company	Country	2015 revenues	
1	AT&T	USA	132.4	🏳
2	Verizon	USA	118.7	🏳
3	China Mobile	China	96.8	
4	NTT	Japan	82.6	🏳
5	Deutsche Telekom	Germany	69.2	
6	Comcast	USA	67.2	
7	Softbank	Japan	64.6	
8	Vodafone	UK	58.2	
9	America Movil	Mexico	50.9	
10	China Telecom	China	48.0	
11	Telefónica	Spain	47.2	🏳
12	Orange	France	40.2	🏳
13	China Unicom	China	40.1	
14	KDDI	Japan	34.1	
15	BT	UK	24.6	🏳
16	Time Warner Cable	USA	21.4	🏳
17	Telecom Italia	Italy	19.7	🏳
18	Telstra	Australia	18.0	
19	KT	South Korea	17.8	
20	Liberty Global	USA	16.5	
21	CenturyLink	Norway	16.1	
22	BCE	Canada	14.7	
23	Telenor	Norway	14.3	🏳
24	SK Telecom	South Korea	13.7	
25	Bharti Airtel	India	12.9	
26	Etisalat	EAU	12.7	
27	STC	Saudi Arabia	12.2	
28	Singtel	Singapore	11.3	
29	Numericable-SFR	France	11.0	
30	Swisscom	Switzerland	10.9	🏳
31	MTN	South Africa	10.4	🏳
32	TeliaSonera	Sweden	9.3	
33	Rogers Communications	Canada	9.1	
34	Vimpelcom	Netherlands	8.7	
35	LG U+	South Korea	8.6	
36	Telus Corporation	Canada	8.5	
37	MTS	Russia	8.5	
38	Ooredoo	Qatar	8.0	
39	KPN	Netherlands	7.7	🏳
40	Oi	Brazil	7.4	
41	Hutchison	Hong Kong	7.3	
42	MegaFon	Russia	6.2	
43	Belgacom-Proximus	Belgium	6.0	🏳
44	Turk Telecom	Turkey	4.8	🏳
45	Bouygues Telecom	France	4.5	
46	Turkcell	Turkey	4.2	
47	Telekom Austria	Austria	4.0	🏳
48	TDC	Denmark	3.3	🏳
49	Tele2	Sweden	2.9	
50	Portugal Telecom	Portugal	2.3	🏳

* incl. non-European revenues
Source: IDATE

Definition of geographic perimeters

ETNO perimeter	EU28
Albania	Austria
Austria	Belgium
Belgium	Bulgaria
Bosnia	Croatia
Bulgaria	Cyprus
Croatia	Czech Republic
Cyprus	Denmark
Czech Republic	Estonia
Denmark	Finland
Estonia	France
Finland	Germany
France	Greece
FYROM	Hungary
Germany	Ireland
Greece	Italy
Hungary	Latvia
Iceland	Lithuania
Ireland	Luxembourg
Italy	Malta
Latvia	Netherlands
Lithuania	Poland
Luxembourg	Portugal
Malta	Romania
Netherlands	Slovakia
Norway	Slovenia
Poland	Spain
Portugal	Sweden
Romania	UK
Slovakia	
Slovenia	
Spain	
Sweden	
Switzerland	
Turkey	
UK	

" **Internet of Things is growing: utilities, electronics, automotive & wellness will be the main vertical industries by number of connected units** "

ETNO Members

Albania

ALBtelecom

Austria

TELEKOM AUSTRIA GROUP

Belgium

proximus

Bosnia and Herzegovina

bh

Bulgaria

VIVACOM

Croatia

Hrvatski Telekom

Cyprus

cyta

Denmark

TDC

Finland

elisa

France

tdf

France

orange

Germany

T

Greece

OTE

Hungary

T

Iceland

Síminn

Ireland

eir

Italy

TIM

Latvia

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