



2016 Annual Report

of the Federal Communications Commission
(ComCom)

Federal Communications Commission (ComCom)
Marktgasse 9
CH - 3003 Bern

Tel.: +41 (0)58 463 52 90
Fax: +41 (0)58 463 52 91
Website: www.comcom.admin.ch

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Editorial

The brave new world of digital communications - and questions to the legislator and the regulator

On 31 December 2016, Marc Furrer's term of office as the ComCom President came to an end. He has had a considerable influence on the development of telecommunications in Switzerland, initially as a co-founder and the first Director of OFCOM and then as ComCom President. The liberalisation of the Swiss telecommunications market, the award of frequencies for the 3G and then 4G mobile radio, the introduction of smartphones and the associated change in our communication behaviour, and the promotion of the expansion of fibre networks, probably uniquely in the world, in the form of a "round table" of interested companies, were the high points of Mark Furrer's activity. He actively contributed to Switzerland's position as a global leader in terms of network quality and coverage of mobile radio services. For this we owe him our acknowledgment and our thanks.

Development in relation to digital communications does not stand still: new technologies make new services possible which we will soon use on a daily basis, though which also raise new questions which legislators and the regulator will have to address.

For example, in the immediate future ComCom will be awarding additional spectrum for mobile communications, e.g. in the 700 MHz, 1400 MHz, 2.6 GHz and 3.4 - 3.8 GHz range. Additional frequencies are needed in particular for the next generation of mobile radio, 5G. In Asia and the USA, the technical development work is proceeding at full speed. The forthcoming Olympic Games in Korea (2018), Japan (2020) and China (2022) seem to be giving significant impetus to the governments and businesses of those countries in order to present to the world the possibilities which the new technologies offer. What can the regulator contribute to ensure that Switzerland keeps pace?

A further increase in the capacity of the networks is also indispensable in Switzerland. This cannot simply be a matter of improved reception of videos and images: electronic communication is an essential factor in our occupational activity. Industrial processes, the Internet of Things and increasingly also the health sector are making high demands on the quality and capacity of digital communications. It is precisely in the area of economic support for regions in Switzerland outside the urban centres that this development is promising.

For the network operators, further expansion of the communications networks requires significant investment. They will increasingly be thinking about the joint creation and use of infrastructures, and this in turn raises regulatory issues: to what extent does such cooperation influence the competition which has led to good quality and extensive coverage in the telecommunications sector in Switzerland?

The demand for digital network capacity is growing faster than the supply and this is creating infrastructure bottlenecks. According to what criteria is this demand to be met? Should the network operators be allowed to apply such criteria even if this is advantageous from an economic viewpoint? Should network neutrality be legally regulated and monitored by the regulator, or is it sufficient if the answers to these questions are left to the network operators themselves?

The new technical possibilities of the next mobile radio generation are giving rise to high expectations. However, this does not belie the fact that the increasing intrusion into our private and professional life is associated with growing dangers and risks. How do we protect our private lives? How do we prevent the abusive use of our data? How do we protect our intellectual property? Are our traditional legal instruments adequate to combat the abuse of data on the internet and cybercrime? What contribution can and must the providers of digital services make? Answering these questions is also made more difficult because digital services are also provided by companies which are not currently subject to regulation but which operate globally and make use of the infrastructure of the regulated network operators to do this.

Every year, ComCom is obliged to account for its activities. It does so by means of this report. The report also indicates which tasks ComCom will focus on in the current year, e.g. the award of the universal service licence, the preparation of the forthcoming allocation of mobile radio frequencies, decisions on access procedures, monitoring the partial revision of the Telecommunications Act (TCA) and representing Swiss interests in European and global regulators groups. In addition, it will also continue to participate actively in discussions on subjects which are closely related to its statutory mission, such as, for example, questions on network neutrality, the protection of personal data on the internet or the future form of the legal basis for digital communications.

As in past years, ComCom will also focus on the available – *nota bene* pleasing – performance indicators for the Swiss telecommunications market. Unlike in earlier years, however, ComCom is forgoing an ambitious graphical presentation of its printed annual report. For this purpose it will be expanding its internet presence: in future, up-to-date information will be made available more quickly and in a practical form.

ComCom sees itself as a supporting, mediating body at the service of all participants in the market and wishes to make a contribution to ensuring that the entire population of Switzerland can continue to avail itself of digital services of the highest quality and at reasonable prices, regardless of the stages of technical development.

Stephan Netze, President

March 2017

I. Overview of the telecommunications market

ComCom has for many years presented data providing a brief overview of the evolution of the telecommunications market in Switzerland.

In order to produce its aggregated statistical data, ComCom relies primarily on the figures published by the main telecommunications service providers. In certain cases, it makes use of publications by the OECD, the EU, specialist organisations or research institutes (Gartner, IDC, Analysys Mason, etc.). It also relies on the data provided by OFCOM, which also originates from data obtained from the telecommunications service providers in Switzerland or from OFCOM's analyses.

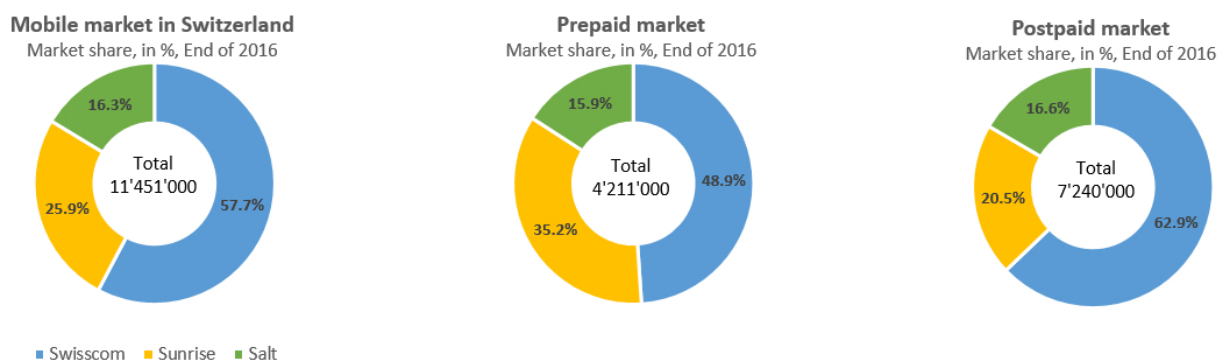
1. Development of the mobile network

In a market which is nearing saturation, the number of mobile customers in Switzerland is down for the second consecutive year, by some 2.2% in 2016. The migration to subscription products (postpaid) no longer offsets the loss of customers with prepaid offerings, and the three network operators registered a fall in their customer numbers during 2016.

At the end of 2016, Swisscom had 6,612,000 customers, Sunrise 2,967,000 and Salt 1,872,000 - giving a total of 11,451,000 mobile users in Switzerland. Swisscom therefore had 57.75% of the market, Sunrise 25.90% and Salt 16.35% (cf. fig. 1).

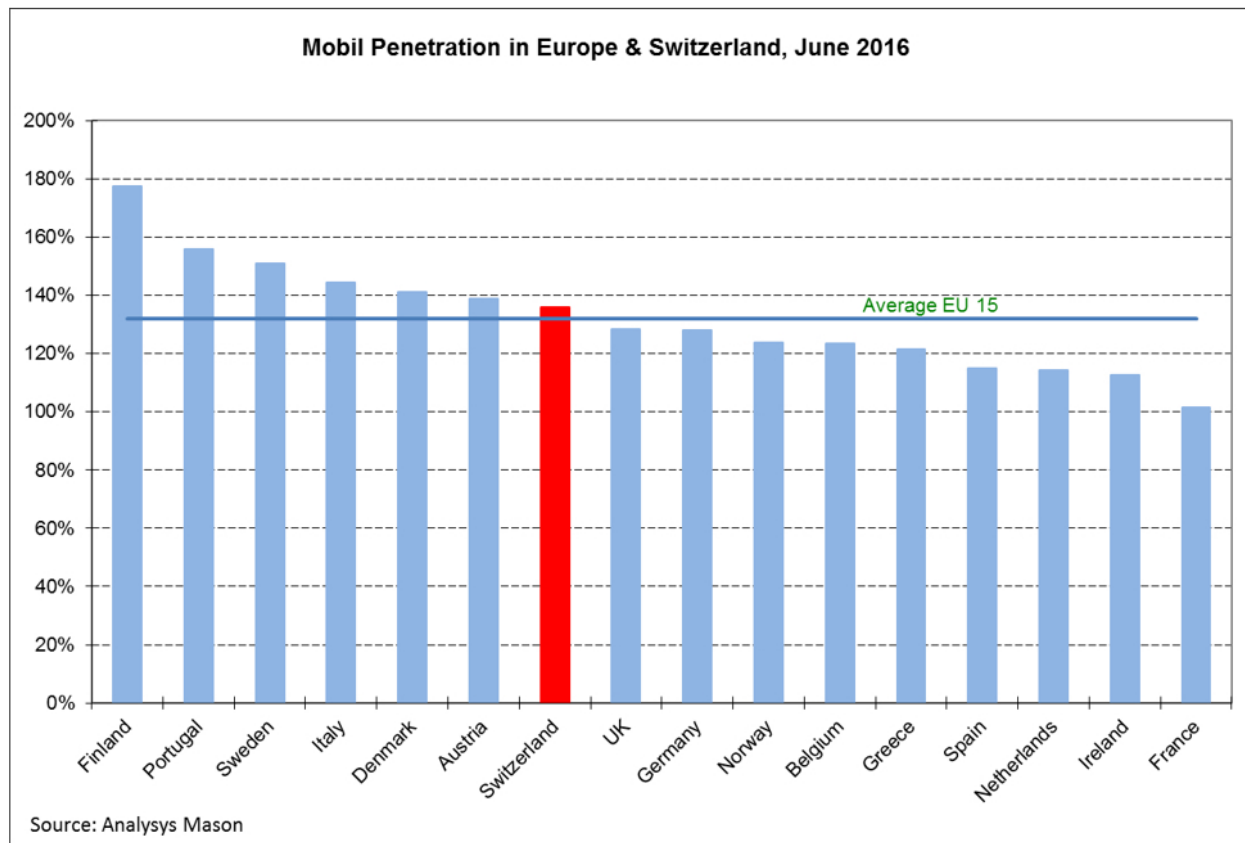
These figures are based on the so-called 12-month rule. This involves taking into account all prepaid customers whose SIM card is active and who have made at least one incoming/outgoing call on the network over the last twelve months.

Fig. 1: Market shares of mobile operators in Switzerland at the end of 2016



Sources: operators

With approximately 11.5 million subscribers for a total population of 8.4 million inhabitants, the mobile telephony penetration rate in Switzerland was approximately 136% in mid-2016. This rate is slightly higher than the average for the countries of Europe (cf. fig. 2).

Fig. 2: Penetration of mobile telephony in Europe and Switzerland, June 2016

Source: Analysys Mason, Telecom Market Matrix, September 2016

Over 2016 as a whole, Swisscom lost 13,000 customers; its customer base shrank from 6,625,000 at the end of 2015 to 6,612,000 at the end of 2016, down 0.2% over the period. The loss of 64,000 customers with a prepaid card was not offset by the gain of 51,000 customers with a contract. In this latter market segment, Swisscom's growth was only 1.1% in 2016 (compared to 2.8% in 2015).

Sunrise lost a total of approximately 96,000 mobile customers in 2016. Although it gained more postpaid customers, (+85,000 in 2016, i.e. a growth of 6.1%) than Swisscom, Sunrise suffered a substantial loss of 181,000 prepaid customers over the same period. At the end of 2016, Sunrise had 2,967,000 mobile customers, down 3.1% over one year.

Salt also gained a few more postpaid customers than Swisscom in 2016, with 52,000 additional subscribers, up 4.5% compared to 2015. But over the same period the operator registered a considerable loss of 204,000 prepaid customers (- 23%); the total loss of mobile customers during 2016 was 152,000 (-7.5%).

It should be noted that UPC (formerly upc cablecom), which entered the mobile market in spring 2014 and which uses Salt's mobile network, continued to grow and gained 47,100 mobile customers; it had 80,000 customers at the end of 2016. The combined total of mobile customers of all the cable operators was 102,000 at the end of 2016 and cable might in the long term constitute a serious competitor in this market.

The fall in the total number of mobile customers can be explained in particular by the increase in fixed-price contracts - unlimited or with inclusive data - which make it possible to share a connection on the mobile network between two devices and thus to do without an additional SIM card to surf the mobile internet on a tablet.

The other MVNO providers and resellers do not publish their figures.

The growth in mobile data traffic

After several years of extremely rapid growth, the smartphone market is in turn slowing down and also seems to have almost reached saturation.

From the beginning of the decade in 2010, the global mobile telephony landscape has been characterised by the extremely rapid adoption of smartphones by users. This evolution seems to have slowed somewhat since 2015, it is expected that the annual growth in 2016 will be less than 10%. All the same, approximately 1.5 billion smartphones were sold world-wide in 2016, according to the Gartner research company.

Over the same period, a market in used smartphones has been developing for several years. This phenomenon initially appeared in the United States but has spread to Western Europe and Asia over the last three to five years. According to the International Data Corporation (IDC), this market is expected to continue to grow, and sales of reconditioned smartphones could reach 222.6 million units in 2020, compared to 81.3 million in 2015, and could represent a turnover of 30 billion dollars.

In its latest report on mobility published in November 2016, Ericsson indicated that in the third quarter of 2016, there were 7.5 billion mobile subscribers worldwide, up 3% over the last twelve months. The number of smartphones has overtaken that of "basic" telephones and represents 55% of all mobile telephones in the world. Again according to the Gartner company, the mobile penetration rate in the developed countries is 90% and the growth in the smartphone market is being seen essentially in the emerging nations.

In Switzerland too, though the proportion of smartphones is indeed continuing to increase, this is at a lower rate because of an penetration rate which is already high. In Switzerland, 4.9 million people own a smartphone (78% of those aged 15-74 according to Comparis). For Swisscom, for example, the proportion of customers with a contract using a smartphone increased from 75% at the end of September 2015 to 78% a year later.

According to the fourth edition of the JAMES study published by the Zurich University of Applied Sciences and Swisscom at the beginning of November 2016, 99% of young people aged between 12 and 19 have a mobile telephone – almost always a smartphone – together with a contract. Young people are therefore spending more and more time surfing on their mobile, mainly on video, music or photo-sharing sites.

The widespread use of these intelligent telephones has also involved major changes in user behaviours – with increasing use of data exchanges, in particular video, generating a large increase in data traffic on the mobile networks.

At a global level, again according to Ericsson, data consumption on the mobile networks increased considerably. The volume of data exchanged on the mobile networks increased by 50% in one year, between September 2015 and September 2016, mainly because of the increase in the number of "data" contracts and the increase in the volumes of data included in these contracts. In this context, Ericsson notes strong growth in the number of high-speed mobile contracts, of the order of 25% in one year, reaching 4.1 billion units in September 2016.

The report reveals a significant increase in the consumption of videos on mobile devices, which could result in a tenfold increase in the volume of data on smartphones in Western Europe and North America by 2022. In 2016, video consumption already accounted for 50% of the volume of mobile data and could attain almost 75% in 2022, with annual growth of 50% a year globally between 2016 and 2022.

The growth in mobile data traffic in Switzerland was consequently substantial in 2016. For example, it almost doubled on the Swisscom mobile network (+78%).

The demand for mobile broadband services has also enjoyed very strong growth in Switzerland in recent years. According to the OECD, the number of broadband contracts on the mobile networks reached 8.4 million units in mid-2016, and the penetration rate of high-speed mobile in Switzerland was 101.2% at that time, above the average for the OECD countries (95.1%).

Telecommunications service providers are investing considerable sums in their network infrastructure in order to be able to cope with this significant growth in data traffic on the mobile network.

In 2013 Swisscom announced its intention to invest CHF 1.5 billion in the expansion of its mobile telephone network by 2017. Having already invested CHF 210 million in 2015, its investments in mobile telephony infrastructure amounted to CHF 231 million in 2016, up 10%. For its part, Sunrise reduced the level of its investments in 2016, though after investing more than CHF 1 billion in the roll-out of its network infrastructure between 2012 and 2015. In 2016, Sunrise nevertheless invested more than CHF 140 million in improving its mobile network infrastructure. Under the five-year investment programme started in 2010, Salt (formerly Orange) invested over CHF 700 million in the modernisation and expansion of its mobile communications network. In 2014, Salt invested CHF 158 million in improvements to its LTE network (more recent figures for this operator are not available).

The intense competition between operators extending over several years has led them to invest significant amounts in improving their networks.

This year too, independent testing published at the end of November 2016 by the German magazine Connect, which draws up a comparative classification of mobile networks in Germany, Austria and Switzerland, confirmed the very good quality of all the mobile networks in Switzerland. Sunrise, which heads the ranking for the first time this year, was even lauded as being "exceptional". Together with Swisscom, in second place after heading this table for seven consecutive years, they lead all the active operators in Germany and Austria. Swisscom and Salt were also rated as very good for the third time running. It should be noted above all that the results obtained by Sunrise and Swisscom were up on the previous year, whilst those for Salt remain stable but were described by the German magazine as reflecting a high level of performance. Swiss customers therefore have a choice between several high-quality networks for both voice and data transfer.

According to this same study, Swiss users also benefit from excellent quality mobile communications in trains, well above the level of the services provided in Germany and Austria. The improvement of mobile communications for travellers on the entire rail network is moreover cited as a priority by Swiss Railways SBB.

The Swiss rail company SBB, in collaboration with mobile operators, working together in the InTrainCom consortium, has equipped all 1083 coaches and 51 combined units on its main line routes with repeaters for mobile service reception in trains. SBB and the mobile telephony operators also want to equip the approximately 1700 coaches on regional routes with signal amplifiers by the end of 2022. The mobile communications operators are further improving the service by installing new antennas along the tracks.

In Switzerland, mobile communications coverage is almost total. The GSM networks serve almost 100% of the population and cover some 90% of the territory. It is therefore possible to make calls from almost anywhere, even in the remotest areas.

As for UMTS/HSPA services, which provide mobile internet access, these cover up to 99% of the Swiss population, depending on the operator concerned.

Extension of the LTE and LTE-A networks

In order to deal with the continuous increase in the volumes of data exchanged on the mobile networks, operators are continuing with the modernisation of their mobile networks in Switzerland. Swisscom launched its LTE network in late November 2012. Sunrise and Salt launched theirs in the spring of 2013.

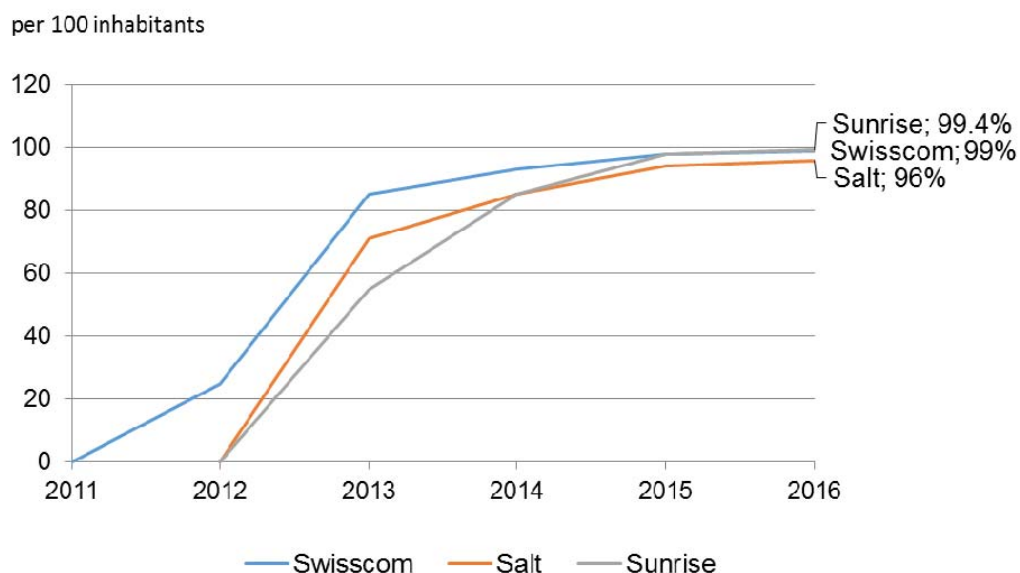
At the end of 2016, the coverage of these LTE/4G networks was 99% of the population for Swisscom, 99.4% for Sunrise and 96% for Salt (cf. fig. 3).

The term LTE (Long Term Evolution, 4G) describes a major evolution of the previous generations of mobile telephony networks UMTS, HSDPA and HSDPA+ (3G), giving access to very high speeds on the mobile networks. This new generation of 4G/LTE networks effectively allows mobile internet access at theoretical speeds of up to 150 Mbit/s.

The operators also continued their roll-out of LTE-Advanced (LTE-A) on their networks. This technology makes it possible to increase speeds up to 300 Mbit/s, or even 450 Mbit/s, with carrier aggregation, which further improves the experience and convenience of internet access for consumers. Swisscom's population coverage for LTE-A technology reached 40% by the end of 2016.

In spring 2016, in partnership with Ericsson, Swisscom achieved a data transfer rate of 1 Gbit/s on its mobile network. Swisscom envisages marketing this service at the beginning of 2017. However, there are as yet no compatible mobile devices on the market.

Fig. 3: Coverage of LTE networks in Switzerland, December 2016
as % of the population



Sources: operators

Elsewhere in the world, the roll-out continues at an intensive pace. According to the GSA (Global mobile Suppliers Association), there were 1.45 billion 4G LTE contracts world-wide in mid-2016, i.e. almost 700 million more than the year before. This figure is expected to rise significantly over the next few years to approach the 4 billion mark by 2020.

According to the GSMA (GSM Association), coverage by 4G LTE networks will reach 75 % of the world's population by 2020. Moreover, 41% of all mobile connections will be made on LTE networks by 2020, compared to 23% at the end of 2016.

5G mobile radio standard

5G is the next generation of mobile radio and has for some time been on everyone's lips in specialist circles. Although 5G is still under development, it is already apparent what the innovations will be: very high data transfer rates (up to 10 Gbit/s), low latencies (1 ms) and high reliability, very many simultaneous data connections and extensive networking between devices. 5G will open up many new possibilities: in addition to fast data transfer (e.g. for video in high quality), time-critical applications (such as self-driving cars or remote control of robots) and the Internet of Things (IoT) are often cited as examples, as well as many new applications in the areas of healthcare, smart cities and smart homes, for example. In 2016, Swisscom announced a test and research programme in conjunction with the EPFL and the Ericsson Company.

The standardisation of 5G is currently in progress. The first "definitive" 5G specifications are expected in 2018 (3GPP Release 15). Commercial 5G systems are therefore expected to be under development from 2018 onwards and will be in service from about 2020. With the introduction of 5G, the demand for frequencies will also increase.

More favourable situation for mobile payment

Whilst the financial sector makes an essential contribution to the Swiss economy, generating value equivalent to 10% of GDP in 2015, it is faced with an evolution linked in particular to the digitisation of many services.

Mobile payment, which promises to simplify purchases for users by enabling them to pay with their smartphone, is one of the development strands which could also benefit from the growth potential of fintechs in Switzerland.

According to the Gartner institute, mobile payment is slowly winning the trust of consumers in North America, Japan and in some countries of Western Europe, to such an extent that half of them were expected to make payments with their smartphone or a wearable mobile accessory by 2018.

Although it took off rather slowly, mobile payment is now booming in Switzerland. It has enormous potential and a lot is at stake for a large number of participants. But the development of electronic payment has for a long time occurred in piecemeal fashion, without much dialogue between participants in the various sectors which sought to roll out their own solution.

Whereas the banks have equipped their credit cards with NFC technology for contactless payment, the mass retailers have developed their own mobile applications, using different technologies (QR code, Bluetooth, NFC). As for the mobile telephony operators, Swisscom launched Tapit, a mobile payment application which it finally abandoned in 2016 due to lack of customers.

Two other smartphone payment projects saw the light of day in 2014 and 2015, launched by two separate groups around major banks: first Twint, supported by PostFinance, BCBE, Valiant and the Coop, then Paymit, supported in particular by SIX, UBS and Raiffeisen, joined by Swisscom in 2016.

Swiss consumers remain relatively sceptical of mobile payment; they see no advantage compared to payment in cash or by card. Finally, there is the particular situation in Switzerland,

with an over-representation of the iPhone among users; NFC was for a long time unavailable on the iPhone and it remains limited to the Apple Pay application.

Nevertheless, the situation seems to be increasingly favourable to mobile payment in Switzerland and Europe. First of all because the “big players” are entering the market: Apple Pay arrived in Switzerland in July 2016; Samsung and Google were expected to follow. Samsung concluded an agreement in Europe with MasterCard and launched in Spain in mid-2016 and Google launched Android Pay in the United Kingdom, also in mid-2016. Swiss traders are already very well equipped with NFC-enabled terminals, which will favour mobile payment. Lastly, the merger of Twint and Paymit, which was announced in mid-2016 and which received the green light from the Competition Commission COMCO in September 2016, will make it possible to compete with multinational companies and to offer a common Swiss solution from 2017 onwards.

Prices of mobile communications

In 2016, Swiss consumers benefited from slight reductions in the prices of mobile communication services. All types of users benefited in 2016 from this price reduction, which varied according to the products and market segments concerned (contracts or prepaid cards). Based on the three main service providers in Switzerland, the prices of the least expensive products fell by 2.8% for a low user, 3.7% for a medium user and 1.4% for a high user (cf. fig. 4).

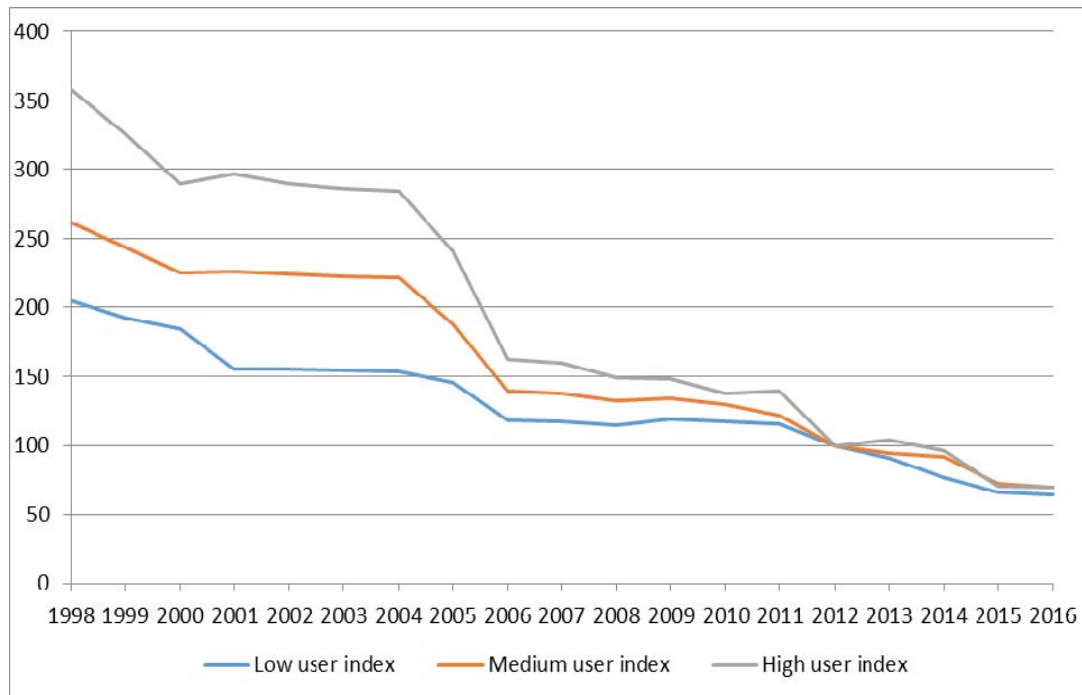
However, this evolution of prices must be qualified according to market segments.

According to a study on the retail prices of mobile communication services published by OFCOM on its website for the year 2016, the reduction in prices was markedly larger for users with a prepaid card than for users with a contract. In the contract market, prices dropped by 8.4% for low users, 9.5% for medium users and 2.4% for high users. In the prepaid card market, prices fell by 15.6% for a low user, 11.20% for a medium user and 4.9% for a high user.

We also note that the trend which had long prevailed, whereby prepaid products were more advantageous for users with low or moderate consumption – with contracts being more suitable for high users – has now changed. Since 2011, contracts have also consistently been more advantageous for medium users, whilst prepaid cards are still more suitable for the needs of low users.

According to OFCOM, this trend is explained in particular by the strategy of the main operators, who are making contracts more attractive than prepaid cards, leaving the prepaid card market to resellers of mobile services.

Fig. 4: Evolution of end prices for mobile telephony in Switzerland 1998 – 2016
(cost indices according to user profile, 100 = 2012)

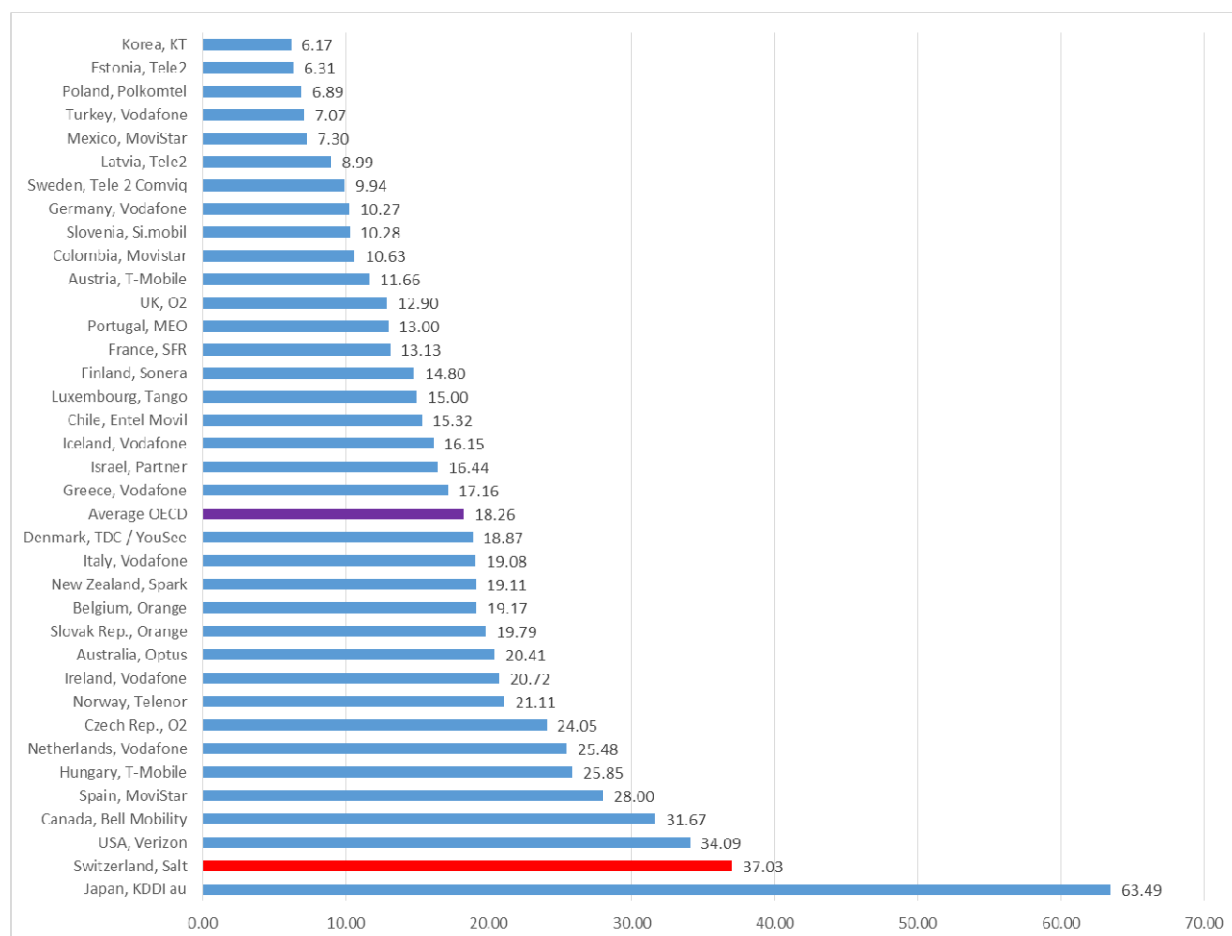


Source: OFCOM

Compared with the other OECD countries, however, mobile telephony prices in Switzerland are still among the most expensive.

The Teligen price baskets published by Strategy Analytics, and based on the OECD's methodology which takes into account the least expensive products marketed by the largest operators in each country, confirm this. For an average basket including voice and data, a medium user in Switzerland (100 calls and 500 MB of data) is still paying 20 euros per month more than the average price in the OECD countries (37 euros compared to 18 euros; cf. fig. 5). The price paid by a high user in Switzerland (900 calls and 2 Gb of data), however, decreased significantly between 2015 and 2016 (-13 euros), whereas the other OECD countries experienced only a very slight fall in prices (-3 euros) over the same period. The gap therefore narrowed somewhat between 2015 and 2016, though a Swiss consumer still pays almost 9 euros more than the average for the OECD countries (37 euros compared to 28 euros).

Fig. 5: OECD mobile basket voice + data, 100 calls + 500 MB
(euros incl. VAT), lowest cost product by country, August 2016



Source : Results from Teligen Price Benchmarking System. Copyright Strategy Analytics, UK

2. Evolution of fixed networks

The reduction in the number of fixed network connections in Switzerland, which began in the early 2000s, continues. The reason for this is the continuous growth of mobile telephony, particularly since the advent of the smartphone. In fact, a continuous reduction in the number of subscribers to traditional fixed telephony has occurred between 2006 and 2015, amounting to approximately 32 %.

The substitution of calls on fixed networks by those made on mobile networks is continuing and fixed telephony traffic has reduced markedly over the last 10 years. The total number of calls made on the fixed network was reduced by a factor of 2.5 between 2005 and 2015 (2.2 billion against 5.5 billion calls), and the total duration of calls made from the fixed network decreased by half between 2005 and 2015 (9.3 billion against 18.5 billion minutes).

Despite a very slight fall (-3.5%) between 2014 and 2015, there has been considerable long-term growth in voice telephony over VoIP on the fixed network. According to the official

telecommunications statistics for 2015 published by OFCOM¹, the number of customers accessing telephony services on fixed networks from a VoIP access provided by the telecommunications service provider (DSL, cable, etc.) tripled between 2006 and 2015, with a total of 880,896 connections at the end of the year

However, the fixed networks will not disappear, quite the reverse.

The progressive migration to IP telephony, plus the growth of the cable operators in this sector and the increase in the number of fibre optic connections, indicate the importance which the fixed network still has in Switzerland. In addition, the new forms of telecommunications (such as WiFi calling, launched in Switzerland in 2015) or the growth in digital TV via DSL lines also militate in favour of complementarity between the fixed and mobile networks.

In addition to the three mobile communication networks, Switzerland has several “backbone” networks and quality access networks. Swisscom's access network (2,367,000 active connections at the end of 2016) covers the entire territory. The cable television networks are also well established and offer subscriber connections, although with the exception of UPC, most of these networks offer broadband and telephony services on a fairly localised basis.

The distribution of fixed network market shares has changed little in recent years. Swisscom lost some 262,000 customers between 2015 and 2016, and Sunrise gained more than 22,000 customers over the same period, notably thanks to the growth in bundled offerings including fixed telephony. According to OFCOM's official telecommunications statistics for 2015, Sunrise's market share again increased to 9.6 % at the end of 2015, though Swisscom's market share, at more than 60% at the end of 2015, remained high.

For their part, the cable operators are continuing to make progress in fixed telephony, though at a slower rate than in previous years. They had 736,000 fixed telephony customers at the end of 2016, up by almost 2.5% (+18,000) compared to the previous year. At the end of 2016, UPC, the leading provider of cable telephone services, had 512,000 telephone subscribers. Its market share was 13.2% at the end of 2015. The numerous other providers have marginal shares of the market.

It should be noted that billing for the subscriber connection by alternative operators to their customers, instead of Swisscom, continues to fall considerably, down from 47,430 connections in 2014 to 20,468 in 2016, i.e. a drop of 56.8%. This fall – like the fall in the number of automatic carrier preselections (-81,000 between 2015 and 2016; see p. 31) – can be explained by the increase in customer migration to the cable operators and the gains made by bundled offerings including VoIP telephony.

Phase-out of analogue telephony

In spring 2014, Swisscom announced its intention to phase out analogue telephony and ISDN by 2017 and to replace it by Internet Protocol (IP). At the end of 2016, almost two thirds of its customers (approximately 1.5 million) were already benefiting from IP technology. The migration from traditional fixed telephony to IP technology represents a fundamental “movement” at the global level. Virtually all data (music, images, videos and voice communication) is already being carried by the current IP network. Moreover, as a general rule, IP telephony offers better voice quality and is proving to be less expensive for users.

¹ It should be remembered that the collection and processing of data from telecommunications service providers performed by OFCOM cannot provide analysis in the same year. Unless otherwise indicated, figures from the official telecommunications statistics do not date from the reporting year.

Except for ISDN telephones, telephones with pulse dialling (featuring a rotary dial) and fax machines, the majority of existing devices will continue to function after the migration. In some cases users will have to check the compatibility of their equipment, such as home automation systems, some alarm systems or communication systems inside lifts, though there are already IP products for these types of installations on the market. There are also products which guarantee coverage in the event of a power failure; finally, as is currently already the case, users can use a mobile device or a call diversion service on mobile telephones.

Price of fixed communications

After three years characterised by slight rises, fixed telephony prices in Switzerland fell appreciably in 2016, but differently according to the user profile. According to an OFCOM study of retail prices for fixed telephony services in 2016, the index for the cheapest offerings fell slightly by approximately 7.1% for low users in 2016. On the other hand, the price drop was 28.6% for a medium user and 27.3% for high users in 2016; in its study OFCOM explains this in particular by the appearance of Swisscom's Line plus contract product. OFCOM notes, furthermore, that the most appropriate products for the three user profiles are bundled products, often including internet access services, at an all-in price for unlimited telephony on all the networks in Switzerland.

Compared to other countries, fixed telephony prices are now in line with the average for the OECD countries. According to the Teligen price baskets published by Strategy Analytics, for an average basket including 140 calls (national and international calls), a medium user in Switzerland pays the equivalent of 40.50 euros per month (compared to 39.70 euros for the average of the OECD countries).

Broadband on the fixed network

For several years, Switzerland has been highly ranked for high-speed access (concerning the definition of the terms used in this section, please refer to the 2015 ComCom annual report).

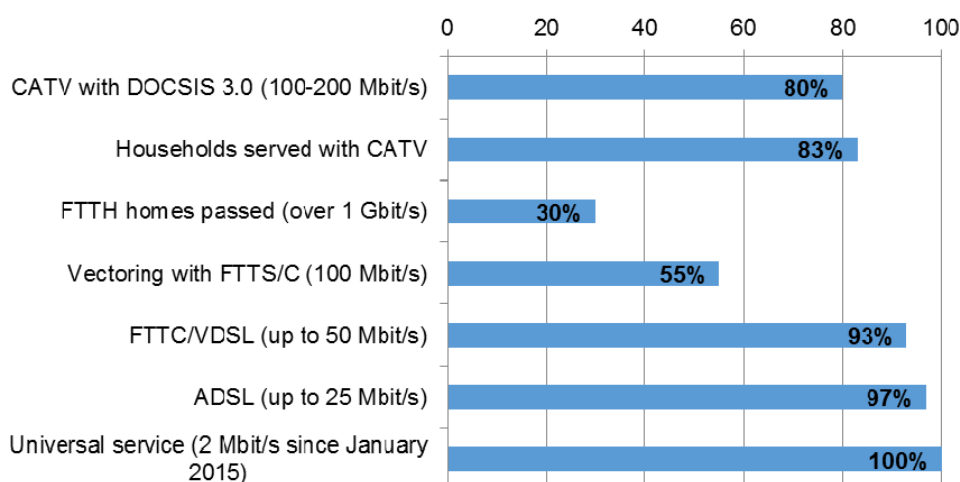
To achieve this, operators are committing considerable investment in the network infrastructure every year.

Swisscom, for example, invested more than CHF 1.7 billion in Switzerland in the course of 2016, of which more than half, i.e. over CHF 950 million, has been invested in improving its fixed network infrastructure and extending its fibre network. Investment by Sunrise in Switzerland is down slightly, at around CHF 230 million in 2016, of which approximately 30%, i.e. some CHF 70 million, was invested in the fixed network infrastructure. UPC, for its part, states that it invests more than CHF 200 million each year in its hybrid cable-fibre network. With its Autostrada program, UPC also envisages investing an additional CHF 250 million over the next five years in the roll-out of its very high-speed network in Switzerland and Austria.

Switzerland therefore has very high-performance, high-speed telecommunications infrastructures (cf. fig. 6). The economy as a whole therefore benefits from competition in infrastructures and services, which provides consumers with a wider choice.

Fig. 6: Broadband access in Switzerland

% of Swiss households, 2016



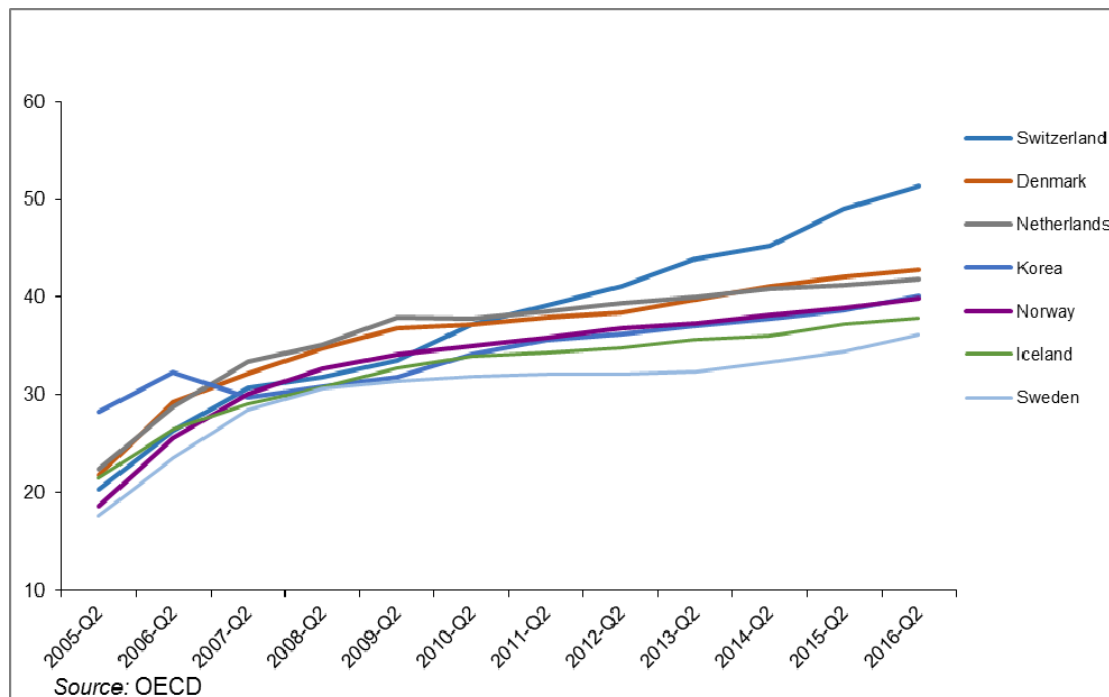
Sources: Swisscom, Suissedigital, ComCom estimate

In the report “Measuring the Information Society Report” 2016 published by the International Telecommunication Union (ITU) at the end of November 2016, Switzerland moved up one position and is now ranked in 4th place. This classification, established by the ITU for 175 countries according to the development index for information and communication technologies, measures access to ICT, the use of these technologies and the skills in this area. This IDI index (ICT Development Index), which is broadly recognised by governments, the organisations of the United Nations and the private sector, is based on a series of indicators allowing comparisons between countries and over time.

South Korea continues to dominate this ranking, followed by Denmark, Iceland and Switzerland. The ITU confirms the strong correlation between high values for IDI and *per capita* gross national income (GNI). A high gross national income would have an influence on both consumer demand for information and communication technologies (ICT) and on investment in network infrastructures capable of meeting this demand. Similarly, the ITU report notes that countries with a high level of ICT development have liberalised and competitive markets which encourage innovation, as well as a population enjoying a relatively high income and having the skills necessary to use these ICT effectively. Lastly, the ITU stresses that all these countries record high levels of internet use, thanks in particular to the high levels of connectivity of homes and the wide availability of broadband services.

As one of the world leaders in terms of penetration of broadband connections, Switzerland experienced growth greater than 8%, considerably higher than the average for the OECD countries (+3,5%) between 2015 and 2016.

With more than 51% of the population having broadband internet access as of the end of June 2016, Switzerland consolidated its position at the top of the ranking of OECD countries (cf. fig. 7), and is still well ahead of Denmark (43%) and the Netherlands (42%). Over the same period, the average for the OECD countries was 30% and the figure for the EU countries was 32.7% (July 2016).

Fig. 7: Broadband penetration rate (per 100 inhabitants), June 2016

Source: OECD

In an international comparison, Switzerland is still one of the best connected countries in the world. Not only does Switzerland have good broadband access penetration, Swiss surfers are also benefiting from ever higher speeds. According to a study published in March 2017 by Akamai Technologies (The State of Internet, Fourth Quarter 2016), 95% of Swiss internet users had an internet connection faster than 4 Mbit/s at the end of 2016, up 1% on the same period in 2015; the average world-wide is 79%. As in the last two years, it is above all faster connections which have continued to make strong progress in the last few months. Switzerland is fifth in this world ranking, with average speeds of the order of 21.2 Mbit/s, up 27% on the same period in 2015, whilst the average speed world-wide is 7 Mbit/s. Moreover, 73% of broadband connections in Switzerland are at least equivalent to 10 Mbit/s (+18% over one year). Fifty-four percent of Swiss surfers even have a broadband connection of at least 15 Mbit/s (up 43%), whilst 24% of Swiss surfers already enjoy speeds at least equivalent to 25 Mbit/s, up 75% in one year.

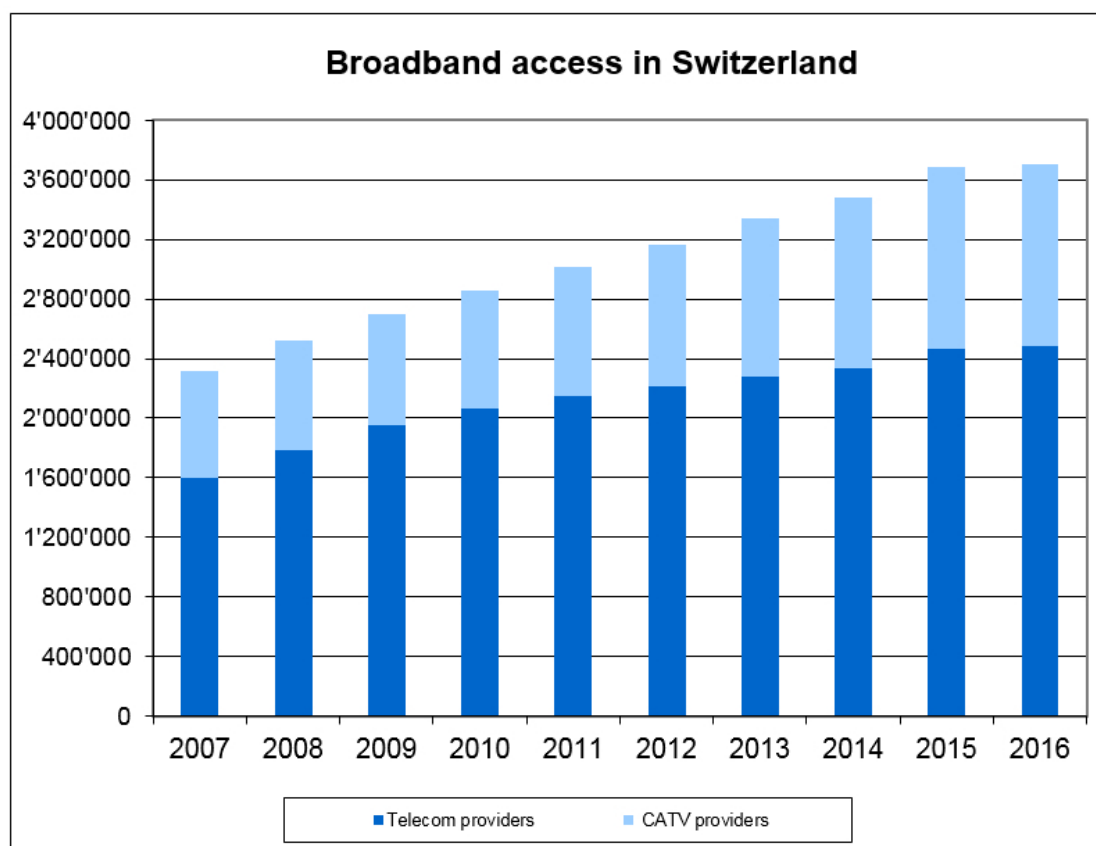
During 2016, Swiss customers therefore benefited from the increase in speed of certain products, without any increase in price. For Sunrise for example, the speeds of the basic offering increased from 30 to 40 Mbit/s; for Swisscom the speeds of the inexpensive Vivo XS and Vivo S offerings doubled, to 20 and 40 Mbit/s respectively. The basic offering of many other internet service providers also starts at this minimum speed level.

According to another study on the retail prices of broadband services published by OFCOM, the increase in speeds was accompanied by a slight reduction in prices in 2016. Thus the costs incurred by a medium user for broadband services fell by 5.2% between 2015 and 2016. For high users, this reduction was 10.6%, whilst it was 4.2% for low users. According to OFCOM, the combination of increased speeds and reduced prices led to a reduction in the Mbit/s price

index for all types of users. This reduction was 6.8% compared to the previous year for a medium user.

In terms of internet access, DSL providers are still far ahead of cable providers: thus at the end of 2016, 67% of surfers opted for an offering from a DSL provider (2,484,000 connections) and 33% for an offering from a cable operator (1,224,000 connections) (cf. fig. 8).

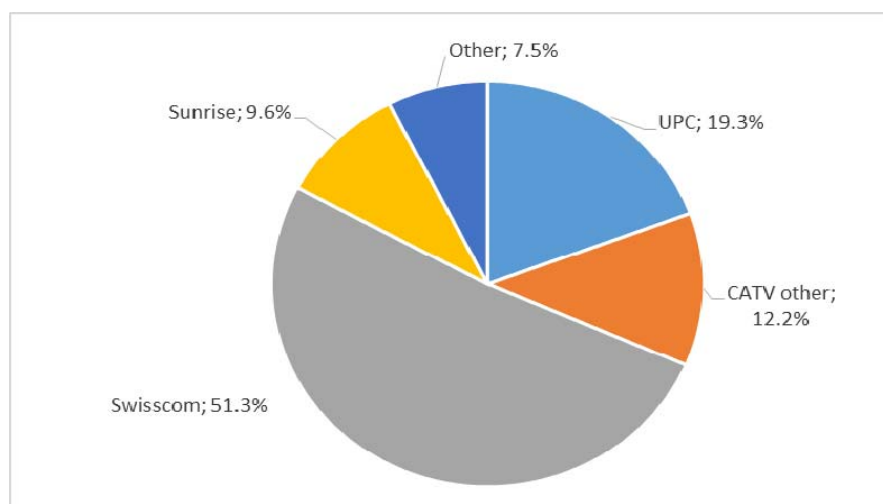
Fig. 8: Broadband access in Switzerland: xDSL vs. CATV 2006-2016



Sources: Swisscom, Suissedigital

Considering the high-speed internet service providers as a whole (CATV, DSL and FTTx), the distribution of market shares still favours Swisscom (cf. fig. 9). With a market share of 51.3% at the end of 2016, Swisscom is far ahead of its main competitors.

Fig. 9: Market shares of broadband connections in Switzerland, end of 2016
(incl. optical fibre connections)



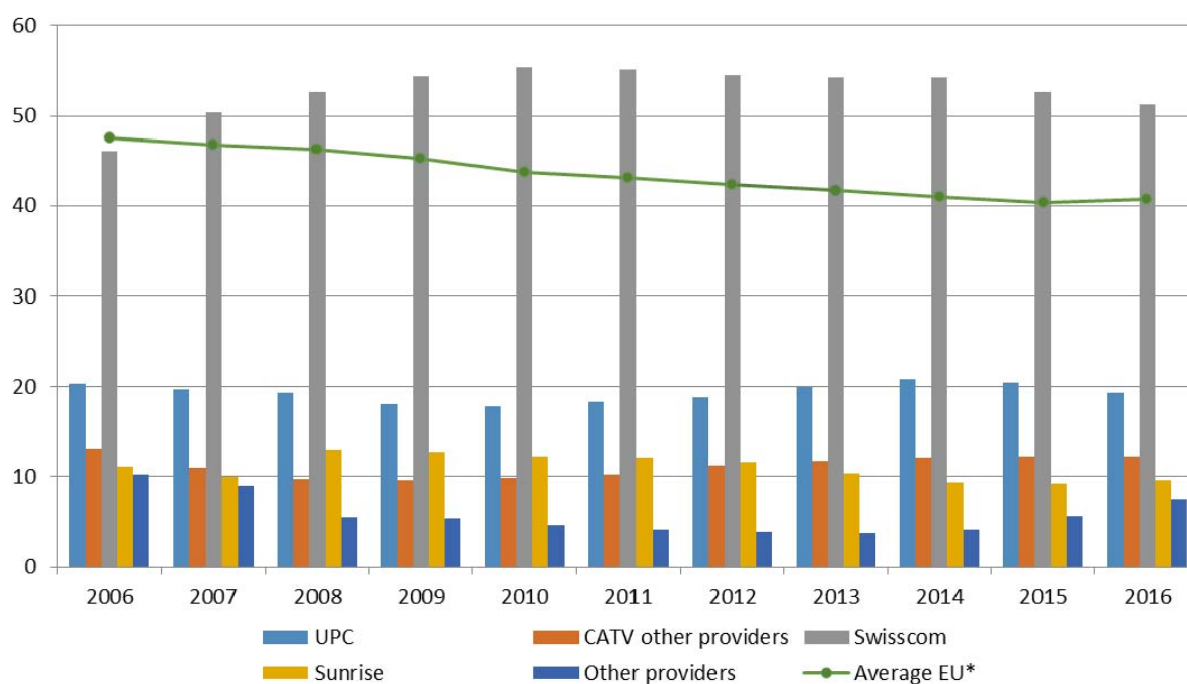
Sources: operators

The share of all the alternative DSL providers was 17.1%, with Sunrise accounting for 9.6%. As far as the cable operators are concerned, UPC's market share at the end of 2016 was 19.3% and that of the other CATV providers was 12.2%.

By way of comparison, the average market share of the historic operators in the European Union is constantly falling and was approximately 40% in 2016 (cf. fig. 10).

Fig. 10: Market shares of broadband connections in Switzerland and in the EU, 2006-2016

* market shares of the historic operator



Sources: operators, European Commission

The figures for broadband connections include Swisscom's FTTH/B users, as well as those benefiting from Swisscom's hybrid fibre/copper technologies (FTTC and FTTS). At the end of September 2016, Swisscom had almost 230,000 fibre subscribers. Sunrise also has fibre subscribers, but no details about them are available. According to Analysys Mason, on the same date there were approximately 170,000 additional fibre subscribers; these are customers of the other alternative providers using the historical operator's network or the infrastructure of the utility companies of towns and cities.

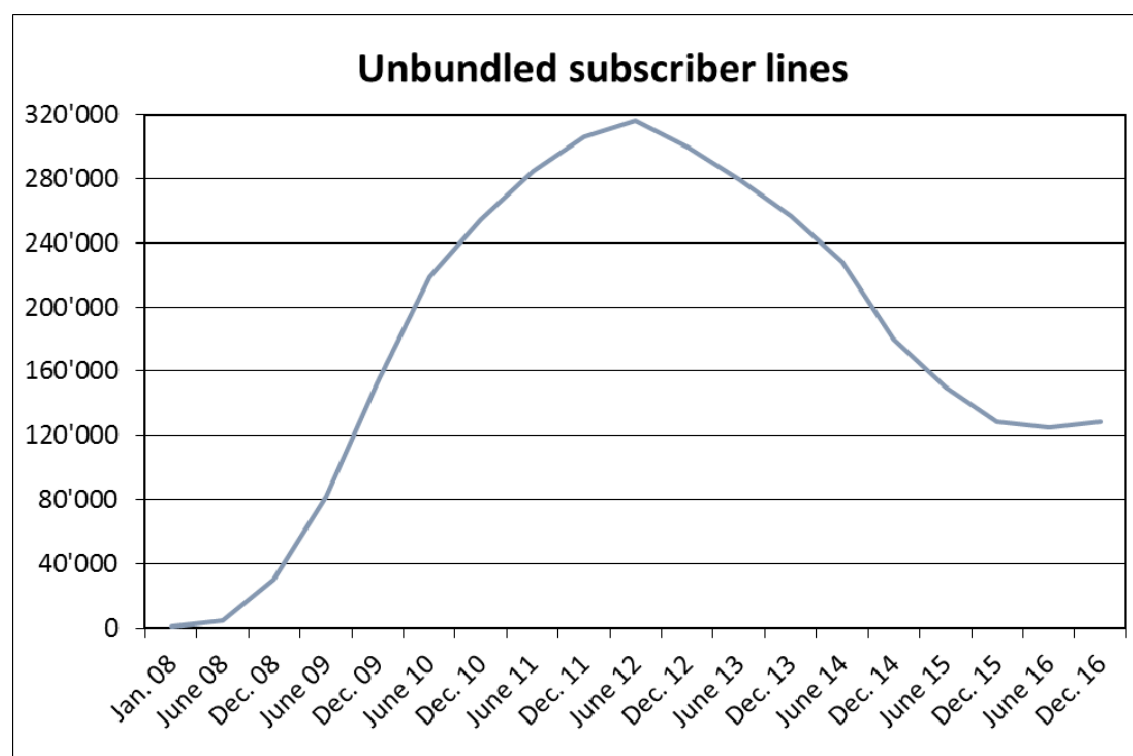
Fibre subscriber connections therefore already constituted more than 10% of all high-speed lines at the end of 2016.

Indeed, unbundling, which registered a very considerable drop over three consecutive years, falling from 300,000 unbundled lines at the end of 2012 to less than 130,000 lines at the end of 2015, was stabilising at approximately 128,000 lines in 2016. However, fully unbundled lines (Full Access) only accounted for 5.2% of all DSL lines and barely 3.5% of all broadband lines.

This is explained on the one hand by the products from the cable network operators and the increasing use of fibre connections which are further strengthening competition at the infrastructure level. Furthermore, the growing interest of customers in bundled offerings, combining telephony, the internet and digital TV, is a negative factor for unbundling technology, which is not appropriate.

Fig. 11: Evolution of the number of unbundled lines in Switzerland, December 2016

Unbundled subscriber lines



Source: Swisscom

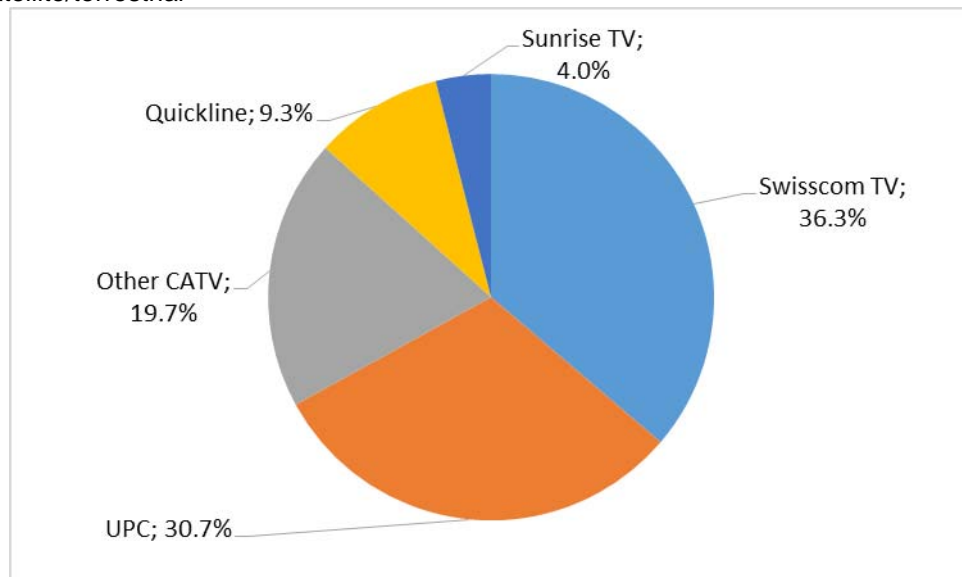
Digital TV in Switzerland

The number of digital television subscribers on the fixed network continued to grow at an intensive rate during 2016, whereas the cable operators continued to lose customers in their core sector. The DSL providers are entering into very serious competition with the cable operators in this market segment. The market share of all the cable operators, with their 2.43 million digital television customers, is still close to 60%. But considering the providers individually, Swisscom consolidated its first place, which it took over from UPC the previous year, only 10 years after its entry into this market. Swisscom in fact gained 145,000 customers in 2016 and hence reported growth of almost 11% between 2015 and 2016. The historical operator had 1,476,000 subscribers to its digital TV offering and has seen its market share grow to 36.3%. Sunrise, the last to enter this market in 2012, gained 29,000 customers over the same period, i.e. a rate of growth of almost 22%. Sunrise's market share grew to 4 % (cf. fig. 12).

The cable operators as a whole lost more than 80,000 customers in 2016, a decline of more than 3%. UPC, which lost more than 50,000 customers for its digital TV product, down almost 4%, saw its market share fall to 30.7% at the end of 2016.

The Quickline grouping of cable operators, for its part, reported a growth in the number of its TV customers, notably thanks to the arrival of two new partners in autumn 2016. Quickline thus gained 17,000 customers in 2016 and its market share increased to 9.3%. With nearly 380,000 TV customers in total at the end of 2016, Quickline was the second largest CATV provider in Switzerland after UPC.

Fig. 12: Market shares for digital television in Switzerland, end of 2016
excl. satellite/terrestrial



Sources: operators

Expansion of ultrafast-broadband networks

As already indicated, in terms of broadband provision on the fixed network, Switzerland has for some years occupied a leading position in international comparisons. In relation to the development of ultrafast broadband (100 Mbit/s and over), although Switzerland is not yet a world leader, considerable sums continue to be invested in the expansion of the network.

Against the background of rapidly increasing data traffic and digitisation of the economy, on the one hand network operators are proactively investing in future-oriented networks in order to be able to meet future customer requirements. On the other hand, infrastructure competition is an important driver for this investment. For communities and regions which support the expansion of fibre, it is also a matter of reinforcing the attractiveness of the location for businesses.

The development path is clear: on both the telecoms and CATV networks, optical fibre, which has been used to construct backbone networks for some time now, is being brought ever closer to end customers. Either the entire subscriber line will be fibre, or the last section to end customers, which still consists of conventional copper or co-axial cable, will get shorter and shorter.

In the case of "Fibre to the Home" (FTTH), a fibre connection extends right up to a main socket in the home, enabling service offerings with bandwidths of 1 Gbit/s and over.

In the case of "Fibre to the Street" (FTTS) and "Fibre to the Building" (FTTB), the copper or co-axial cables are only 50-200 metres long. Today, for these remaining distances from a distribution box, from a duct in the road or from a basement, there are technologies which enable high transfer rates even via copper or co-axial cable and which require significantly less investment than laying fibre into the home. In the case of telecom networks with copper cable over the last stretch, these are "vectoring" (which enables bandwidths up to 100 Mbit/s) and "G.fast" (up to 500 Mbit/s). In the case of CATV networks, these technologies which ensure higher bandwidths via co-axial cable are known as DOCSIS 3.0 and now DOCSIS 3.1.

For several years now, within the framework of co-operation between Swisscom and local energy suppliers in more than 20 cities and regions of Switzerland, FTTH networks have been built, as a rule on the basis of the multi-fibre model agreed at ComCom's FTTH Round Table between 2008 and 2012 (cf. 2012 ComCom Annual Report). This means that the co-operating partners have at least one fibre each into every household.

In other locations, either Swisscom or individual political municipalities are going it alone to invest in a fibre network. Fibre expansion is taking place not only in the large conurbations but also in many rural areas (for example in the Upper Valais or in the Lower Engadine). Individual cantons are also pursuing the goal of reaching as large a proportion of households as possible with fibre, even in remote areas.

The canton of Freiburg is a pioneer in this context: Since 2012, ftth fr AG, a joint venture of the canton of Freiburg and several energy suppliers, has been implementing a strategy to supply all households and businesses in the canton with FTTH, in the long term; a third of households have already been connected.

In addition, in spring 2016 the Ticino cantonal parliament decided by a large majority to develop a strategy so that in the coming decade up to 90% of the population in the remoter areas of the canton can enjoy a fibre connection. The canton of Ticino wants to use resources for the New Regional Policy (NRP) for this purpose.

Swisscom, in cooperation with local energy suppliers or on its own, provided approximately 1 million households with fibre (FTTH) by the end of 2015. This means that in Switzerland approximately one third of households are already equipped with fibre (FTTH "homes passed").

However, where Swisscom is developing the high-speed broadband network on its own, it has been opting for the last three years for a technology mix; with FTTS/FTTB and vectoring up to 100 Mbit/s can be achieved. Since 2016, Swisscom has been the first European telecoms provider to opt for G.fast, achieving bandwidths of up to 500 Mbit/s.

By the end of 2016 Swisscom had upgraded some 2.5 million connections with these latest fibre technologies. Swisscom's investments in the development of fibre amounted to CHF 476 million in 2016 (according to the Swisscom business report).

Swisscom's strategic goal is to be able to supply approximately 90% of all households and business with at least 80 Mbit/s by the end of 2021 – and for 85% of the connections ultra-fast broadband at 100 Mbit/s and over is to be achieved.

Compared with other countries, broadband provision in Switzerland is so good because the CATV operators have also invested heavily in recent years in expanding fibre and in DOCSIS 3.0. Approximately 80% of Swiss households have a cable network connection and for 95% of these an ultra-fast broadband product is possible. In 2016 Quickline was the first CATV enterprise to introduce the new DOCSIS 3.1 technology for faster data transfer (at to 1 Gbit/s). In 2016 UPC (formerly Cablecom) not only acquired several local CATV networks but also announced that it would be investing in the next generation of technology. Individual CATV providers decided in the context of network expansion to install fibre directly into households; a pioneer in this area was Sierre energy in the Valais.

Since 2013 there has also been an additional player in the market, Swiss Fibre Net (SFN). SFN is a joint venture consisting of various energy suppliers which have constructed local fibre networks. SFN offers those providers who do not have their own fibre network uniform FTTH products for resale throughout Switzerland via a common platform. In 2016 several new network partners joined. The networking association now comprises 14 partner companies which together cover almost 900,000 households with FTTH in all parts of the country.

In addition, various providers who do not have their own access network offer their services via the fibre network (among others Init7, 1tv, iWay.ch, GGA Maur, Sunrise and VTX).

II. Commission and secretariat

1. Commission

ComCom is an independent extraparlimentary commission with decision-making powers, in charge of awarding licences and regulating the telecommunications market.

In accordance with the TCA, its main tasks are:

- the award of radiocommunication licences for the use of the frequency spectrum (Art. 24a TCA),
- the award of the universal service licence (Art. 14 TCA),
- fixing access conditions and prices when providers cannot reach agreement (Art. 11 and 11a TCA),
- approval of the national numbering plans (Art. 28 TCA),
- regulation of the methods of application of number portability and carrier selection (Art. 28 TCA),
- implementation of the necessary measures and sanctions in the event of violations of the applicable legislation within the framework of a licence granted by ComCom (Art. 58 TCA).

The Commission consists of seven members, all independent specialists, appointed by the Federal Council.

In 2016, the Commission consisted of the following members:

- **Marc Furrer, President**, Lawyer and notary
- **Monica Duca Widmer, Deputy-President**, Dr. dipl. chem. Ing. ETH, Ticino entrepreneur
- **Andreas Bühlmann**, Dr. rer. pol., Head of the Finance Office, Canton of Solothurn
- **Adrienne Corboud Fumagalli**, Dr. rer. pol., Vice President for Innovation and Technology Transfer, Swiss Federal Institute of Technology, Lausanne (EPFL)
- **Reiner Eichenberger**, Doctor of Economics, Professor of Economics at the University of Fribourg
- **Jean-Pierre Hubaux**, Electrical engineer, Professor at the Swiss Federal Institute of Technology, Lausanne (EPFL)
- **Stephan Netze**, Doctor of Law, LL.M., lawyer.

At the end of the 12-year legal mandate, the President, Marc Furrer left the Commission at the end of 2016. The Commission thanks him very warmly for his commitment and his long-term vision of the development of the telecommunications market and the information society in Switzerland.

On 9 December 2016, the Federal Council appointed Stephan Netze, Doctor in Law, lawyer and Member of the Commission since 2008, to the presidency of the Commission to succeed Marc Furrer as of 1 January 2017.

The Federal Council also appointed Stephanie Teufel as a new member of ComCom. Professor, holder of the Chair of Management in Information and Communication Technologies at the Faculty of Economics and Social Sciences of the University of Fribourg, she also heads the international institute of management in technology (iimt) at the University of Fribourg.

On 25 November 2015, at the time of the renewal by the Federal Council of the extraparlimentary bodies for the period from 2016 to 2019, the other members of ComCom were all re-elected and Monica Duca Widmer was confirmed in the post of Deputy-President.

As a general rule, the Commission meets almost once a month. The members also devote considerable time to preparation of the meetings and to circulating comments. In order to remain informed about developments in information and telecommunications technologies, the Commission also made a study trip to Japan and South Korea in autumn 2016.

2. Secretariat

The Commission is assisted by a secretariat which is responsible for coordinating Commission business, fulfilling communication tasks and public relations. The secretariat also coordinates the activities of the Commission with OFCOM, which prepares case files and generally implements ComCom decisions.

This secretariat consists of a secretary general (90%), a scientific collaborator and internet site administrator (80%) and an administrative assistant (70%).

For further information, please contact the colleagues in the Secretariat:

- Peter Bär, Secretary of the Commission,
- Pierre Zinck, scientific collaborator and webmaster
- Jacqueline Fischer Pulfer, administrative assistant

III. Activities of the Commission

The following sections provide an overview of ComCom's activities in 2016.

1. Access procedures

Introduction

In order to promote competition in the telecoms market, the Telecommunications Act (Art. 11 TCA) specifies that market-dominant companies (such as, for example, the former monopolist Swisscom) must provide the other providers with access to its existing infrastructure or to services. If a market-dominant position exists, this access must be enabled in a non-discriminatory manner and at cost-based prices.

The areas in which a market-dominant provider must grant access to the infrastructure are definitively enumerated in the Act – in contrast, for instance, to the technology-neutral access regime in the EU. Specifically, the TCA enumerates the following six forms of access (Art. 11):

1. Full unbundling of the local loop
2. Fast bitstream access (for four years)
3. Charging for subscriber connections on the fixed network
4. Interconnection
5. Leased lines
6. Access to cable ducts, in so far as these have sufficient capacity.

Another feature of Swiss telecommunications legislation is the so-called primacy of negotiation. This means that the smaller providers must first negotiate with the market-dominant provider concerning the infrastructure access conditions. Only if these negotiations do not result in an agreement can an application be made to ComCom for a definition of the access conditions and prices. This procedure is known as *ex-post* regulation.

In all other respects access in the access network is currently limited to conventional copper technology. In Switzerland the fibre networks and cable networks are currently not subject to any access obligation or regulation.

Pending procedures

At the end of 2016 a total of three access procedures were pending.

On 18 January 2016, the Federal Administrative Court (FAC) partially upheld Sunrise's appeal against a ComCom decision from 2013 and referred the prices for interconnection and other forms of access for the years 2012 and 2013 to ComCom for re-evaluation. ComCom reinstated the procedure and at the end of 2016 came to a decision on the prices for 2012.

Furthermore, an appeal against a ComCom decision from December 2015 concerning transit services in relation to interconnection is also pending before the FAC.

1.1. Interconnection and other forms of access according to Art. 11 TCA

Fibre as a Modern Equivalent Asset

In the calculation of regulated interconnection and access prices, customary switching technology and copper technology have until now been used as an established technology (MEA - Modern Equivalent Asset). Today a company which is constructing a new telecoms network would, however, construct it using fibre technology. Therefore a change in this reference technology is appropriate, in ComCom's opinion.

Originally, ComCom had planned the introduction of fibre as an MEA from 2013 onwards. In the summer of 2012, however, ComCom came to the conclusion that updating the MEA by 1.1.2013 was an overambitious target. The reason for this was a revision of the ordinance which was ongoing at that time, in which the Federal Council wished to make changes in the price calculation method in the Telecommunications Services Ordinance. In summer 2012, however, it was already apparent that the new provisions of the ordinance would enter into force in the course of 2013 at the earliest.

Since ComCom feared that a change in the MEA in 2013 might in this constellation lead to unforeseeable large price movements, it wanted to wait for the Federal Council's revision of the Telecommunications Services Ordinance. In order to ensure security in the market concerning planning and the legislation, ComCom decided in July 2012 to defer the change to fibre technology until 2014.

Consequently, ComCom's decision at the end of 2013 on access prices for the years 2012 and 2013 was still based on copper technology. Sunrise submitted an appeal to the Federal Administrative Court concerning the deferral of the MEA change to 2014 and other aspects of the procedure. In its judgement of 18.1.2016, the Court partially upheld Sunrise's appeal.

Though the Court maintains that substantial price movements could well have resulted from a change in the MEA, which could have led to serious uncertainties in the market and seriously jeopardised the willingness of participants in the market to invest, the Court was of the opinion that this circumstance was not a sufficient reason for a deferral of the MEA change. According to the Court, ComCom had had an adequate legal basis in the Ordinance for the MEA change and should also have been able to define transitional measures (cf. Federal Administrative Court Judgement A-549/2014 of 18.1.2016). ComCom did not therefore have to wait for the results of the TSO revision and could have, indeed should have, completed the MEA change by 2013 – as previously notified.

Thus not only should the access prices from 2014 have been computed on the basis of fibre technology, but also those for the year 2013. In view of the Court's decision, ComCom reinstated the procedure.

Decision on access prices for 2012

In December 2016 ComCom took a new decision, which has since acquired the force of law, on access prices for the year 2012. On the basis of the FAC judgement, this procedure still hinged on examining in greater detail the facts concerning three points appealed before the FAC, namely the "marginal amount per subscriber line", the "ducts and splicing in the carrier network" and "adaptation to the network structure on the basis of new findings" (for details see the decision of 16.12.2016, published online).

On all three points ComCom finally came to the conclusion that adjustments to the parameters which are the basis for the price calculation are not justified. Consequently the same access prices were decreed for 2012.

Current access procedures

At the end of 2016 two access procedures were still in progress in which the prices for different forms of access (interconnection, unbundling, leased lines, access to cable ducts) are to be calculated for the years from 2013 onwards.

These procedures are particularly significant because for the first time new provisions which the Federal Council had laid down in 2014 in the TSO (cf. Federal Council press release of 14.03.2014) will be applied; this is also a major reason for the lengthy duration of the procedures. As explained above, fibre technology now applies as the network technology which would be used today to construct a new telecoms network.

Moreover, the current procedures will be subject to application of the following innovations:

- **Unbundling of the copper subscriber line:** Since a fibre network has much greater capacity than the old copper network, the value difference between old and new technology must be determined for the calculation of the regulated price of the unbundled copper line. The Federal Council laid down the procedure in this context in Art. 58 TSO.
- **Cable ducts:** In the future, the price calculation for the use of cable ducts will no longer be based on model costs, but on the actual costs for the long-term maintenance and expansion of cable ducts (Art. 54a TSO). ComCom will use the actual expenditure of the companies concerned for the price calculation.
- **Glide path for the transition to fibre technology:** In the case of interconnection and leased lines, the TSO envisages a graduated transition to the fibre network over three years.

1.2. Interconnection Peering

In 2013, the Init7 (Switzerland) company applied to ComCom to oblige Swisscom to grant it peering free of charge and this was also to be decreed as a precautionary measure.

The background to the procedure is the dissolution of the peering agreement between the two parties to the procedure and the change demanded by Swisscom from free peering to charged-for peering.

In June 2013 ComCom decreed a precautionary measure which re-established the former contractual relationship between the parties: for the duration of the access procedure, Init7 can use the existing data connections free of charge. Collateral security as demanded by Swisscom was rejected by ComCom. Swisscom's appeal against this decision by ComCom was rejected in November 2013 by the Federal Administrative Court; the judgement was published by the FAC on the internet (www.bvger.ch).

After the exchange of correspondence in 2014 regarding clarification of the issue of market dominance, a market survey was carried out by OFCOM and the Competition Commission (COMCO) was consulted. Since COMCO initiated a preliminary clarification on this matter in the spring of 2015 (cf. COMCO 2015 annual report), the procedure which was pending with ComCom was suspended. As soon as COMCO has decided on the future procedure, ComCom can reinstate this procedure.

2. Licences

In accordance with the Telecommunications Act (TCA), ComCom grants radio licences and the universal service licence.

ComCom has permanently delegated to OFCOM the granting of those radio licences which are not the subject of a public tender procedure (e.g. licences for amateur radio operators or for private company radio) and those which are wholly or primarily intended for the broadcasting of access-authorised radio and television programme services.

The following overview deals only with those licences awarded by ComCom itself.

2.1. The universal service

The universal service includes a basic range of telecom services which must be offered throughout the country to all sections of the population in good quality and at an affordable price. These basic services should enable participation by the population throughout Switzerland in social and economic life. The universal service also includes special services which extend the communication possibilities for persons with disabilities.

The scope of the universal service is defined in the Telecommunications Act (Art. 16 TCA). It is the task of the Federal Council to periodically adapt the content of the universal service to social and economic needs and to the state of technology. The services which form part of the universal service are defined more precisely by the Federal Council in the Telecommunications Services Ordinance (Art. 15 and 16 TSO). In addition, the Federal Council sets some upper price limits for these services (Art. 22 TCA) and determines the criteria for measuring the quality of the universal service (Art. 21 TSO).

Currently the universal service includes voice telephony, fax, the fixed network connection (including an entry in the public telephone directory) and broadband internet access. Furthermore, an adequate provision of telephone boxes and access to emergency services and subscriber directories must be guaranteed. A transcription service and switching services are available to facilitate communication for the hearing- and visually-impaired.

Since 2008, in addition to the normal telephone connection, the universal service has also included a broadband internet connection. The minimum transmission speed of this broadband connection is currently 2000 Kbit/s download and 200 Kbit/s upload. The Federal Council has set the upper price limit for this internet connection at CHF 55 per month (excl. VAT). A standard telephone connection costs CHF 23.45 in the universal service (excl. VAT).

Adaptation of the scope of the universal service

With regard to the award of the next universal service licence, which will enter into force at the beginning of 2018, the Federal Council has redefined the future scope of the universal service in the TSO.

On 2 December 2016 the Federal Council redefined the content of the universal service from 1 January 2018 onwards as follows:

- The classic analogue and digital connections will be replaced by a multi-functional IP-based connection from 2018. The Federal Council also set upper price limits for these connections (cf. Art. 22 TSO).
- The minimum data transfer rate for internet access is increased to 3000/300 kbit/s.
- Each household can request an additional directory listing entry free of charge.

- The services for the disabled are being extended: in addition to offerings such as SMS transcription and the directory service, a sign-language service using video telephony will be included in the universal service for the hearing-impaired.

The current universal service licence

ComCom is responsible for the tender procedure and award of the universal service licence. The current universal service licence was awarded in 2008 and runs until the end of 2017. Since the liberalisation of the telecoms market in 1998, Swisscom has been the universal service provider.

The provision of the population with a universal service including a high-quality and affordable basic offering of telecom services is currently assured throughout Switzerland.

Public telephones

In an international comparison, Switzerland has a good provision of public telephones. However, in recent years these telephone boxes are generally being used less and less, as both the resident population and visitors have mobile telephones and can therefore make telephone calls virtually everywhere in Switzerland.

When the current universal service licence was awarded in 2007, the minimum number of public telephones for each municipality was specified (taking the historical context into account).

Consideration was given to the number of inhabitants and the surface area of the municipality.

However, municipalities can also opt to forgo public telephones. In the case of many rarely used telephone boxes, in recent years the competent municipalities, together with Swisscom, have come to the conviction that they would like to forgo certain kiosks.

If the municipality concerned and Swisscom agree on the withdrawal from service of a telephone box, an application for decommissioning can be submitted to ComCom. In 2016 – on the basis of municipalities' waivers – ComCom approved the withdrawal of a total of 105 public telephone boxes; this corresponds to approximately 3.5% of public telephones. In the year 2016, therefore, fewer public telephones were withdrawn than in previous years. At the end of 2016, there were still 2844 public telephones ('Publifons') in Switzerland which are part of the universal service. Outside of the universal service, Swisscom operates a substantial number of additional public telephones in commercially advantageous locations.

Award of the new universal service licence

Swisscom's current universal service licence expires at the end of 2017 and therefore has to be awarded anew by ComCom. On the basis of the statutory provisions, this licence is in principle put out to tender in the form of a competition based on criteria. However, if it is foreseeable that multiple telecommunications service providers are not interested or not eligible, ComCom awards this licence in accordance with Article 14 of the Telecommunications Act (TCA) to a suitable bidder, without a tender procedure.

A clarification of interest addressed to the major providers in the Swiss market who are in principle capable of providing the universal service revealed that Swisscom alone was interested in providing the telecommunications services forming the universal service. A tender procedure for the universal service licence – as provided for in the TCA – cannot therefore take place under competitive conditions.

In December 2016, ComCom therefore decided to award the licence for the Swiss universal service from 2018 onwards once again to Swisscom, for a term of 5 years. The licence will be awarded to Swisscom in the spring of 2017.

2.2. GSM technology

At the beginning of the liberalisation of the telecommunications market in 1998, ComCom awarded three GSM licences to DiAx, Orange (now Salt) and Swisscom. As the result of a merger with DiAx, Sunrise became a GSM licensee in 2000.

In the turbulent initial phase of telecoms competition, mobile telephony was still based exclusively on GSM technology, the main services being telephony and SMS. Later came technological evolutions of GSM - GPRS and EDGE – which permitted slightly higher data transfer rates and which gradually gave promise to the mobile internet. Currently practically 100% of the population and approximately 90% of the land area are still covered by GSM and EDGE.

Here too, though, times are changing. On the one hand the three GSM licences expired at the end of 2013 and on the other hand GSM technology itself is now gradually becoming the "discontinued model". For example, last October Swisscom expressed the intention to switch off GSM technology at the end of 2020. Thus the frequencies used for this purpose could be used in a different way.

2.3. UMTS licences

Four UMTS licences were auctioned in 2000. The unused UMTS licence held by the 3G Mobile company was revoked in 2006. The UMTS licences of Salt, Sunrise and Swisscom expired at the end of 2016.

As with GSM, the UMTS network continues to operate after the licence ended. The frequencies allocated to the UMTS licences until the end of 2016 are now part of the technology-neutral mobile radio licences which were auctioned in 2012 and which expire in 2028.

As part of this transition, there was some switching of frequencies (frequency refarming) in summer 2016. The three operators planned this work in close cooperation with OFCOM. The changes were implemented smoothly.

According to information provided by the operators, population coverage with UMTS is up to 99%. It is precisely in rural areas, which are still less well provided for with LTE, where UMTS and its further development HSPA+ is an important pillar of mobile broadband provision.

2.4. Technology-neutral mobile radio licences

In February 2012, all mobile radio frequencies currently available in Switzerland were awarded afresh. The frequencies in the 800 MHz, 900 MHz, 1800 MHz, 2100 MHz and 2600 MHz were auctioned for just short of CHF 1 billion. In June 2012, the new licences, with a term extending to 2028, were awarded. This gives mobile operators long-term planning security. All three mobile operators – Salt, Sunrise and Swisscom – acquired a much larger, future-proof frequency entitlement in the auction.

Thanks to the technology-neutral allocation of the frequencies, the operators themselves are free to determine which technologies they wish to use in which frequency bands. Thus all three providers operate different technologies in parallel (GSM, UMTS and LTE). Since the auction in 2012, all three mobile radio operators have invested massively in 4th generation LTE. With a

high LTE coverage of 94-99% of the population, Switzerland is one of the leading European countries. In order to be able to satisfy customers' demand for high quality, the Swiss mobile operators are often early adopters of new technologies compared with other countries.

The third and last tranche of the auction fees were due in 2016, so by the end of the year CHF 144 million flowed into the Federal Treasury.

3. Free choice of provider

Free choice of provider is an important instrument introduced at the time of liberalisation of the market in order to ensure competition. Consumers must in effect be able to choose their provider freely, without any constraints.

In mobile telephony, consumers have a choice between three network operators and various providers which have entered into commercial partnerships with operators.

On the fixed network, in addition to Swisscom's traditional telephone connection, several telephony service providers and some cable operators offer a high-speed internet connection as well as telephony services. Finally, the roll-out of fibre by the urban utility companies offers, via this third network infrastructure, an additional choice to consumers.

In order to make it as easy as possible to switch providers on the fixed network, manual selection of the provider for each call (carrier selection call-by-call) and automatic preselection (carrier pre-selection) were introduced in 1999.

Although carrier preselection initially made a large contribution to stimulating competition, with 1.37 million connections reached in 2002, corresponding to one third of all connections, this number has since fallen continuously. Thus the number of preselections amounted to only 94,053 units in 2016, down 46% over one year (-81,253 units). At that time, preselection applied to only 4% of connections. The net reduction in the number of connections with carrier preselection is due to the fact that customers are opting for cable networks or bundled products including VoIP telephony.

Consumer protection

To better protect consumers from an unwanted change of provider, in 2007 ComCom strengthened the practical steps for automatic preselection (Annex 2 of the ComCom Ordinance). Preselection orders placed by telephone must, for example, be recorded and verified by a recognised third-party organisation (Third Party Verification). When registering, customers must in no case be influenced and must give their explicit consent to the oral conclusion of the contract. The entire sales conversation preceding the actual preselection application must also be recorded. In the event of a dispute, the customer can request this recording.

Consumer protection was further strengthened by the Federal Council's decision of October 2015 against abuses of telephone canvassing. Since 1 January 2016, the right of cancellation, which was previously restricted to door-to-door sales, also applies to contracts concluded by telephone. Moreover, the cooling-off period granted to the consumer was extended from seven to fourteen days, except for transactions for values under CHF 100. However, the extension of this right does not apply to the conclusion of an insurance contract or negotiations which

consumers have expressly requested, nor to other contracts concluded remotely, notably transactions concluded on the internet.

4. Number portability

Since 2000, it has been possible to transfer one's telephone number when changing operator.

According to the Teldas company, which operates the central database on portability in Switzerland, the trend which was observed in 2015 continued in 2016, with a considerable increase in the number of ported numbers in relation to the previous year (+25%).

Teldas also specified that number portability now relates predominantly to the mobile sector, after it experienced strong growth on the fixed network from 2004, and in particular in 2009 in the context of unbundling.

Thus almost 370,000 numbers were ported on the mobile network during 2016 (compared to 310,000 in 2015, up 20%), which corresponds to approximately 3% of all mobile users. As in 2014 and 2015, there was also a considerable increase in ported numbers in the contract segment (+18% compared to 2015).

On the fixed network, the number is transferred only when the customer switches the connection operator, choosing either a cable network, a VoIP service provider or another operator within the unbundling framework. Some 200,000 numbers were transferred to different operator in 2016, which constitutes approximately 8% of fixed subscriber connections.

Since 2002, fixed telephony operators have been able to offer geographical portability of numbers throughout Switzerland: if customers move house, they can also take their telephone number with them to other dialling code areas, as long as their service provider offers this possibility.

5. ComCom study trips

Since technologies and market trends evolve rapidly in the ICT sector, ComCom also undertakes study trips regularly, at home and abroad. In the autumn of 2016 ComCom made a very insightful study trip to Japan and South Korea, which was prepared with the committed, professional support of the Swiss embassies and the Swiss Business Hubs in these countries.

In both countries, ComCom visited national authorities as well as various telecoms providers (NTT Docomo, SoftBank, Line, Korea Telecom and SK Telecom) as well as other companies (Panasonic, MEC and Samsung) and research institutions (e.g. ATR) active in the ICT sector.

The two countries visited are not only pioneers in fixed-network fibre development, they are also trendsetters in the use of mobile radio; this is of particular interest to ComCom. Apart from fibre expansion and regulatory issues, the meetings focussed in particular on the 5th generation of mobile radio, the Internet of Things, robotics and artificial intelligence – all topics which are also at the top of the agenda in Japan and South Korea.

Both countries have a strong industrial policy, in which the ICT industry is actively supported, along with other sectors. The forthcoming Olympic Games in South Korea (winter 2018) and Japan (summer 2020) are driving the development of the 5th mobile radio generation, since both countries wish to exploit the opportunity to present themselves to the world as progressive ICT nations.

The authorities and companies visited are to a large extent convinced that 5G will foreseeably be commercially available around the year 2020; before that pre-standards will be applied. In 5G, most telecom companies see a major opportunity and wish to benefit from the fact that 5G will also open up new areas of business. In addition to the trend towards networking of many devices and sensors (the Internet of Things), new business opportunities are expected, for example, in the following areas: healthcare and education, smart cities and smart homes, self-driving cars and networked transport, gaming and virtual reality.

There were, however, also sceptical voices, which do not assume that national 5G coverage will rapidly become a reality due to the high investment cost of 5G. First, it was said that 5G will presumably be used to increase transmission capacities and will only secondarily involve applications, for which short latencies are critical (e.g. self-driving cars). Another aspect of 5G is that the full possibilities of this technology can only be exploited if additional frequency ranges are available. In this respect, the next ITU World Radio Conference in 2019 will be of great importance.

6. Outlook for 2017

Nothing will change in 2017 as far as ComCom's basic mission as a licensing and regulatory authority is concerned: in the interests of the economy and consumers, ComCom must guarantee consumers a good universal service, promote competition in the telecoms market and ensure efficient use of the frequency spectrum. ComCom is also committed to ensuring an investment-friendly environment and to promoting technological innovation in the telecommunications market.

In 2017, ComCom will focus on the following activities:

- **The universal service:** ComCom will award the universal service licence by mid-2017.
- **Mobile radio frequencies:** On the occasion of the World Radio Conference (WRC), which was held in Geneva in November 2015, additional frequency resources were identified at a global level for mobile broadband communications. Among other things, one main focus was on the frequencies in the 700 MHz band (694 to 790 MHz), the so-called L-Band (1427 to 1518 MHz) and the C-Band (3.4 to 3.6 GHz). In the 2017 edition of the frequency allocation plan, the Federal Council has already strategically announced that the 700 and 1400 MHz bands should be used in future for mobile radio services. As soon as the Federal Council definitively authorises the use of these frequency bands for mobile radio services, ComCom will decide how it intends to proceed with the allocation of these frequencies. In this decision process, ComCom will include not only technological development, but naturally also the needs of the market participants and the population.
- **Access procedures:** The various pending access procedures are being further processed by OFCOM as the instructing authority and the first decisions on the basis of the new ordinance provisions in relation to calculation methodology are planned. ComCom can only regulate access disputes if the parties cannot reach agreement. It is, however, a concern for ComCom to speed up access procedures and it will also make an effort to accelerate any subsequent legal procedures.
- **Revision of the Telecommunications Act (TCA):** In the past year the Federal Council conducted a consultation process on a partial revision of the TCA and came to the conclusion that an amendment of certain legal foundations was effectively necessary (cf. the OFCOM press release of 23.09.2016). However, the Federal Council will refrain from the originally proposed phased revision of the legislation. DETEC was charged to draw

up a message on changes to the TCA by September 2017. In 2017, ComCom will deal with the new proposals by the Federal Council. In principle, ComCom very much welcomes the fact that the Telecommunications Act will be updated, particularly since the law was last revised a decade ago, when there were no smartphones or apps and when mobile broadband communication and social media (Facebook, Twitter, etc.) were still in their infancy and many currently dominant internet providers were less powerful. ComCom is pleading for technology-neutral regulation of network access. It also considers it reasonable to be able to intervene *ex officio* in exceptional cases in the event of a failure of the market, not just after a failure of negotiations between parties (ex post).

- **International affairs:** Together with OFCOM, ComCom monitors regulatory practice in the other European states as well as the proposals of the European Commission for a complete review of its legal framework for telecoms. To this end it participates as an observer in BEREC meetings and is actively engaged in the Independent European Regulators Group (IRG).
- **Structure of ComCom:** Among other things, ComCom is taking the change in its presidency as an opportunity to consider in greater detail its structure, working methods and corporate governance with the aim of being able to exercise its statutory mission even more competently, more efficiently and more independently.

IV. Finances

Regulators from various infrastructure sectors are administratively affiliated to the Federal Department of the Environment, Transport, Energy and Communications (DETEC). Together with the Federal Electricity Commission (ElCom), the Postal Services Commission (PostCom), the Railways Arbitration Commission (RACO) and the Independent Complaints Authority for Radio and Television (UBI), ComCom in 2012 became part of the "Infrastructure Regulation Authorities" (RegInfra) administrative unit. The General Secretariat of DETEC provides services to the RegInfra administrative unit in various administrative areas; in particular, ComCom is also supported in terms of budgeting and accounting. ComCom's independence in its activity is therefore not compromised.

Very close practical cooperation exists with OFCOM, which prepares most of ComCom's business and instructs the legal proceedings. In any general picture of the revenue and expenditure of the telecoms regulator, OFCOM's relevant costs and revenues must also be included. OFCOM's most important activities for ComCom in 2016 were, for instance, briefings for the access procedures, the development of regulatory foundations, supervision and preparation of tender procedures in the areas of the universal service and radiocommunications licences. OFCOM's costs within the framework of these activities for ComCom amounted to CHF 3.17 million in 2016. OFCOM received CHF 245,000 in administrative fees.

For the use of radio licences, network operators pay either annual radio licence fees or one-off payments in accordance with the respective auction results.

The Confederation received approximately CHF 1.2 million in radio licence fees in 2016. In addition, in 2016 the third and last tranche of payments for the mobile radio licences auctioned in 2012 became due; this produced CHF 144 million of extraordinary revenue for the Confederation.

The expenditures of the Commission and its administrative secretariat were just under CHF 1.4 million in 2016. The 2016 outgoings were some CHF 50,000 lower than in 2016 and significantly under budget (more detailed information is published in the Confederation's estimates and state accounts; cf. www.efv.admin.ch).

Abbreviations

5G = Fifth generation mobile radio

ADSL = Asymmetric Digital Subscriber Line

BEREC = Body of European Regulators for Electronic Communications

CATV = Cable television

COMCO = Competition Commission

ComCom = Federal Communications Commission

DETEC = Federal Department of the Environment, Transport, Energy and Communications

DOCSIS = Data Over Cable Service Interface Specification (technology for high bandwidths on co-ax cable)

DSL = Digital Subscriber Line

EDGE = Enhanced Data rates for GSM Evolution (GSM technology)

ESC = Energy supply companies

FAC = Federal Administrative Court

FDD = Frequency Division Duplex (two radio channels are needed for one connection)

FTTB = Fibre to the Building

FTTC = Fibre to the Cabinet

FTTH = Fibre to the Home

FTTS = Fibre to the Street

G.fast = Gigabit fast access to subscriber terminals (technology for bandwidths up to 500 Mbit/s on copper cable)

GPRS = General Packet Radio Services (GSM technology)

GSM = Global System for Mobile Communications (standard for second-generation mobile radio networks)

HDTV = High-definition television

HFC = Hybrid Fibre Coaxial

HSDPA = High Speed Downlink Packet Access (UMTS technology)

IC = Interconnection

ICT = Information and communication technologies

IP = Internet Protocol

IPTV = Internet Protocol Television

ISDN = Integrated Services Digital Network

ISP = Internet Service Provider

LRIC = Long Run Incremental Costs (model for calculation of interconnection prices)

LTE = Long Term Evolution (standard for fourth-generation mobile radio networks/3.9G standard)

LTE-A = LTE-Advanced (standard for fourth-generation mobile radio networks)

MEA = Modern Equivalent Asset

NFC = Near Field Communication

NGA = Next Generation Access Network

OFCOM = Federal Office of Communications

PSTN = Public Switched Telephone Network (traditional telephone network)

SMS = Short Message System

SVOD = Subscription Video on Demand

TCA = Telecommunications Act (CC 784.10)

TDD = Time Division Duplex (bidirectional communication on only one radio channel)

TSO = Telecommunications Services Ordinance (CC 784.101.1)

UMTS = Universal Mobile Telecommunications System

VDSL = Very-high-bit-rate DSL

VoD = Video on Demand

VoIP = Voice over IP

VoLTE = Voice over LTE

Wi-Fi = Wireless Fidelity (wireless local networks)

WLAN = Wireless Local Area Network