2022 Activity Report

from the Federal Communications Commission (ComCom)

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EDITORIAL

Telecommunications and its infrastructure play a vital part in everyday life, not just for communication itself, but also in business, mobility and public safety. The development of this market was handed over to the industry participants some time ago. The universal service provisions were sufficient to ensure a high-quality service. But times change and with the digitalisation of all activities in society comes the need for much more high-performance networks.

The gigabit society concept was introduced at EU level in 2016 with the long-term goal of minimum transmission rates of 100 Mbps for all households. At the same time, the first political initiatives to promote high-speed broadband were launched in Switzerland (e.g. the canton of Ticino's initiative, April 2016). However, the issue was less prominent in the political debate in Switzerland than in other countries. This was because Switzerland already had a high-quality infrastructure provided by the various operators. There was no urgency as the performance of the legacy provider's copper network had been upgraded through technological innovation and achieved high transmission rates nationwide – well in excess of the minimum speeds required for universal service. The existing networks proved robust during the COVID-19 crisis, enabling new forms of working and learning.

The performance of telecommunications via mobile networks is also improving. 5G enables the requirements of increasingly mobile usage patterns to be met. This new technology has proven its effectiveness and operates at a level of radiation that is still well below the extremely stringent limits which have applied in Switzerland for decades under the precautionary principle. This is highlighted by the FOEN's first monitoring report on non-ionising radiation, published in 2022. These findings should help to dispel public fears.

In light of the existing solutions, the question as to whether the minimum performance of universal service in the fixed-line sector should be increased today – as an instrument of social integration – is well justified. The aim of regulation is to prevent the misuse of a dominant market position. A look at the current situation shows that Switzerland has complementary networks based on different technologies and can currently provide all broadband services (copper, optical fibre, cable networks, mobile communications). The need for technology neutrality is tacitly recognised, even if ComCom's remit is restricted to regulation of the copper network.

At the request of the legislator and the Federal Council, Switzerland will have universal service with a transmission rate of 80 Mbps from 2024, whereas most countries still only require a maximum of 10 Mbps. This amendment to universal service is an intermediate step on the path to a genuine high-speed broadband strategy that will not only foster social integration, but also promote economic growth. The term high-speed broadband refers to optical-fibre cable and mobile networks from the 5th generation (5G). Switzerland is nevertheless lagging behind with the rollout of optical fibre networks compared with other OECD countries. Optical fibre networks are a key technology in a genuine, future-oriented high-speed broadband strategy as the demand for online services – such as video streaming, video conferences and cloud computing as well as the number of applications requiring high-speed broadband (e.g. in the healthcare sector) or almost immediate response times (such as in the security sector) – will only increase in the future.

Several fundamental issues must be addressed before a national digital strategy can be implemented. These include ensuring data security in a globalised world, transparency over the origin of algorithms and ethical issues related to tools based on artificial intelligence, such as chatbots.

Regulatory policy in the telecommunications sector is subject to constant change in Europe. Discussions often focus on how regulations can be amended to promote investment in telecommunications infrastructure and ensure consumer protection. This includes, for example, the conditions for guaranteeing the security of telecommunications networks which is an increasingly significant issue in Europe.

Regulation of the use of future-oriented telecommunications services must take various factors into account. New technologies, such as the Internet of Things (IoT) and virtual reality (VR), are changing the telecommunications sector. The aspects of symmetrical communication and latency must be addressed so that the services and the user experience enable genuine integration of digital services into everyday life by reducing the gap between urban and rural areas and between the generations.

The telecommunications industry plays a vital role in major social changes. This means ComCom's role should not be restricted to that of regulating a soon-to-be outdated technology generation. Through its key function of awarding frequencies, it can make a vital contribution towards achieving social change and the emergence of a gigabit society in Switzerland. ComCom, comprising experts in the field, would welcome a shift in this direction.

Adrienne Corboud Fumagalli, President

March 2023

REVIEW – 25TH ANNIVERSARY OF COMCOM

SOME MAJOR MILESTONES:

- **September 1997**
  Under the new Telecommunications Act (TCA), the Federal Council established the **Federal Communications Commission (ComCom) as a regulatory authority in the telecommunications sector** before market liberalisation on 1 January 1998.

- **April 1998**
  ComCom awarded a **GSM mobile communications licence** each to diAx and Orange, giving the **go-ahead for competition** on the Swiss mobile communications market (under the TCA, Swisscom was already the holder of a mobile communications licence).

- **May 2000**
  Awarding of **34 wireless local loop (WLL) licences** worth a total of CHF 583 million. The wireless subscriber connection, as an **alternative to the fixed-line access network**, largely owned by Swisscom, sought to increase competition in the area of access networks (‘last mile’).

- **October 2000**
  Following the withdrawal of two candidates, ComCom decided not to hold an auction and to award **additional frequencies in the 900MHz band directly** to the three existing GSM licence holders – Swisscom, diAx and Orange – to increase the capacity of their networks.

- **November 2000**
  After the withdrawal of several candidates and the announcement of the merger between Sunrise and diAx, ComCom decided to **postpone the auction for the UMTS licences**.

- **December 2000**
  Awarding of four UMTS licences worth CHF 205 million to Swisscom, Orange, Sunrise and 3G Mobile (the latter provider had its licence revoked in 2006 for failing to use the allocated frequencies).

- **May 2001**
  ComCom decided to introduce **10-digit numbering for local fixed-network and mobile connections** and to make the area code a fixed component of telephone numbers from March 2002. In the Zurich region, the area code 01 was gradually replaced by 043 and 044 despite some opposition.

- **February 2002**
  ComCom **continued to express support for the unbundling of subscriber connections**. However, as no sufficient legal basis existed, the opening of the last mile to competition did not take place until 2007, after the next TCA revision.

- **June 2002**
  After a tender procedure, **ComCom awarded the universal service licence** for the period 2003–07 to Swisscom, which was the only interested operator.

- **December 2003**
  Awarding of **two additional GSM licences** in the 1800MHz frequency band **for innovative projects** to the companies Tele2 (attractively priced services in cities) and In&Phone (private networks).

- **June 2006**
  Awarding of a licence for **broadband wireless access (BWA)** to Swisscom Mobile, which was the only bidder.

- **March 2007**
  ComCom **agreed a renewal of the GSM licences** of Swisscom, Orange and Sunrise for a five-year period and **permitted the operation of UMTS** in the 900MHz frequency range, which had previously been reserved for GSM. This decision was challenged at the Federal Administrative Court (FAC) which is why ComCom decided to temporarily extend the three licences in April 2008.

- **June 2007**
  ComCom made Swisscom – the only participant in the tender procedure – **the universal service licence holder for the period 2008–2017**. Universal service in Switzerland now also included broadband internet access with a transmission rate of at least 600/100 kbps, which was a unique development worldwide.

- **September 2007**
  ComCom awarded Swisscom Broadcast a **nationwide licence for Handy-TV (DVB-H)** for the broadcast of football's 2008 European Championship hosted by Switzerland and Austria.

- **November 2007**
  Based on the revised TCA of April 2007, ComCom received **ten access requests** from five companies. **ComCom makes its first decision on the unbundling of the last mile** and obliges Swisscom, as the dominant market provider, to make bitstream access available to competitors. Over the following years, ComCom increased the competition through further decisions on the opening-up of the last mile.

- **June 2008**
  ComCom held the first **FTTH Roundtable**, which focused on the rollout of optical fibre networks to the home and was attended by 13 management executives from telecommunications providers and electricity supply companies. **The participants met nine times between 2008 and 2012**, enabling the coordinated construction of optical fibre networks, open access for all providers and the definition of technical standards.

- **September 2008**
  After several complaints from competitors about the amount billed by Swisscom, **ComCom set the unbundling price for the first time**, reducing the monthly price for an unbundled subscriber access connection for that year from CHF 23.50 to CHF 18.18.

- **May 2009**
  ComCom **renewed the three GSM licences** of Orange, Sunrise and Swisscom **until the end of 2013**. Thanks to a **technology-neutral award procedure** and a slight redistribution of the frequencies, all three licence holders could now use UMTS in the 900MHz band.

- **February 2012**
  After several years of preparation, **ComCom auctioned all mobile communications frequencies** for a total of CHF 996 million. The three existing network operators – Orange, Sunrise and Swisscom – acquired a frequency spectrum that enabled them to meet growing demand for mobile broadband services using state-of-the-art technology (in particular LTE/4G).

- **May 2017**
  ComCom awarded the **universal service licence for the period 2018–2022 to Swisscom again**, as the only company registering an interest.

- **February 2019**
  After a two-year preparation period, **ComCom successfully concluded the awarding of additional mobile communications frequencies to the three operators Salt, Sunrise and Swisscom.** The proceeds from this auction amounted to CHF 380 million. Some of these frequencies are used by the operators to provide 5G in Switzerland.

- **May 2019**
  As part of a tender procedure, ComCom awarded an additional **DAB+ licence** for the digital broadcast of radio programmes in the French-speaking part of Switzerland to the company DABcom.

- **2021–2022**
  Due to an ongoing revision of the Ordinance on Telecommunications Services (OTS), ComCom extended Swisscom's existing **universal service licence** by one year and is preparing to award the licence again for the period from 2024 onwards.

I. AN OVERVIEW OF THE TELECOMS MARKET

The Swiss telecommunications market has changed significantly since liberalisation began 25 years ago, on 1 January 1998.

In 1997, for example, there were fewer than one million mobile communications customers. Until market liberalisation on 1 January 1998, only Telecom PTT, today's Swisscom, held a mobile communications licence. After ComCom awarded two new GSM licences to diAx and Orange in April 1998, paving the way for competition on the mobile communications market, the number of customers rose rapidly: in 1999, there were already three million, four years later six million, and today over 10.5 million.

At the same time, a continual decline in the number of fixed-network customers has been observed – there were over six million at the turn of the millennium and currently fewer than three million. The public payphones have gradually disappeared from the scene too. There were almost 60,000 public payphones in Switzerland 25 years ago, of which almost 10,000 were part of universal service. In 2017, there were fewer than 3,000, and they have no longer been part of universal service since 2018.

As far as fixed-network internet is concerned, fewer than half a million people had an internet connection in Switzerland in 1998. Today, the number of contracts stands at four million, and Switzerland has had the highest share of the population with broadband access for many years amongst the OECD countries.

Despite the competition, Swisscom has preserved its leadership position in all market segments. Today, its market share in mobile communications stands at just under 60% and in fixed network and broadband internet at almost 50%. Furthermore, the prices for mobile and broadband services in Switzerland are still above the average of OECD countries.

Thanks to substantial network infrastructure investment, but also the rapid rollout of state-of-the-art technologies, Switzerland’s telecom providers perform very well in the annual European and global rankings.

In terms of both coverage and transmission rates, Switzerland has a reliable, high-performance broadband infrastructure, in mobile as well as fixed-network communications.

Swiss consumers have a wide range of options with the three mobile network operators – Salt, Sunrise and Swisscom – and their secondary brands, a number of resellers, several fixed networks, almost nationwide coverage through cable networks and a growing number of optical fibre connections. The economy also benefits from the competition between various types of infrastructure and services as well as the complementarity between fixed and mobile networks.

The first section of this report provides a selection of data that give an overview of how the Swiss and international telecommunications markets are developing.

For its statistical data, ComCom relies primarily on the figures released by the major telecommunications providers, as well as on publications by the OECD, EU and professional bodies or specialised research institutes such as Gartner and IDC. It may also use various data sets and analyses from OFCOM as a

basis.[1] Further information on the latest developments in the Swiss fixed network and mobile telephony market is available on the ComCom website under the heading 'Facts and figures'.

1. DEVELOPMENT OF MOBILE NETWORKS

Customer numbers in the already saturated mobile telecoms market remained more or less stable, with the COVID-19 crisis having little impact in 2022. Perhaps it is still too early to judge whether the merger of Sunrise and UPC is beginning to have an impact on the mobile market. There was a slight shift in market share last year and Swisscom lost a percentage point to Sunrise, in particular thanks to the market segment of customers with contracts.

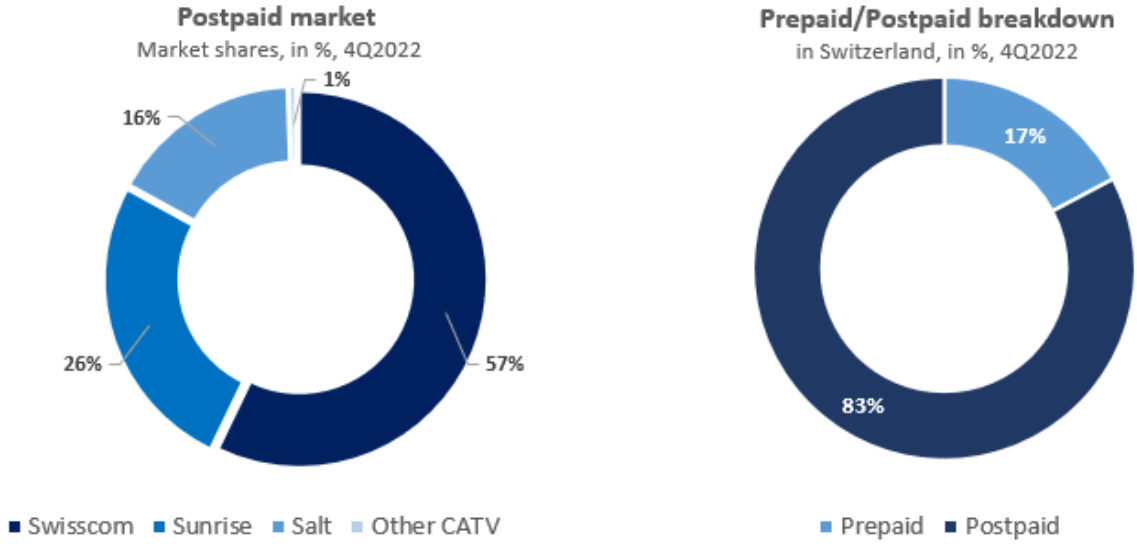
At the end of 2022 Swisscom had 6,173,000 mobile telephony customers in Switzerland, just 0.1% or a total of 4,000 fewer than in 2021. It gained 166,000 contract customers (postpaid offers) but lost 170,000 prepaid customers. Sunrise recorded strong growth of 6% over the same period. The operator had 2,766,000 mobile customers at the end of 2022. It won 173,000 customers in the postpaid segment, while losing 17,000 in the prepaid segment. The number of Salt customers increased to 1,883,000 (+4.1%). The operator added some 107,000 postpaid contracts during the year, but at the same time lost 33,000 customers in the prepaid segment. The data available to us indicate that Swisscom had a market share of around 57% at the end of 2022, while Sunrise occupied 25% and Salt 17%. The market share of other cable network operators remained relatively low at less than 1% (cf. fig. 1).

For over ten years now users of prepaid offers have increasingly been switching to contracts. Indeed, the market dynamic is being driven largely by this market segment, with the proportion of customers with contracts rising from 60% in 2012 to 83% in 2022. The proportion of contract customers has continued to rise at each of the three network operators in recent months, and now stands at 84.1% at Sunrise, 83.4% at Swisscom and 78.8% at Salt.

Together they gained more than 440,000 additional postpaid contract customers in total in 2022. In this segment around 57% of the market fell to Swisscom, 26% to Sunrise, 16% to Salt and less than 1% to other cable network operators.

[1] All sources used are detailed in the source list at the end of the report.

FIG. 1: MARKET SHARES OF MOBILE TELEPHONY OPERATORS IN SWITZERLAND, 2022



SOURCES: OPERATORS

Development of the smartphone market

There were around 8.4 billion mobile communications subscriptions worldwide at the end of 2022, according to the Ericsson Mobility Report published in November 2022.

The number of mobile connections made using smartphones continues to rise, and was expected to have reached a total of 6.6 billion at the end of 2022, corresponding to approximately 79% of all mobile telephony subscriptions. The Ericsson report forecasts it to increase still further to 7.8 billion in 2028, representing 84% of all mobile contracts.

The recovery of the smartphone market came to an abrupt halt in 2022. This sector achieved growth again in 2021 after seeing falling global sales for several years. This was mainly due to factors inherent to the market (high share of the population who already have a smartphone, lack of major innovations, longer lifespan of devices). There were also external factors related to the COVID-19 pandemic, persisting geopolitical tension and economic instability which are impacting on consumer purchasing power.

The renewed growth that 5G was hoped to achieve was delayed in 2020 by the COVID-19 crisis, while an increase in sales in 2021 was held back by a shortage of semi-conductors. 5G is nevertheless continuing to develop, and 5G smartphones already accounted for over half of all smartphone sales in 2022. This share is set to increase to 80% by 2026.

However, the figures published by the International Data Corporation (IDC) at the end of January 2023 indicate the recovery will begin later than expected. Economic uncertainty and inflation also dampened consumer demand in 2022. Global smartphone sales shrank by 11.3%, amounting to 1.21 billion units – this means total annual smartphone sales in 2022 were the lowest since 2013. IDC revised its forecasts downwards and there are major doubts over forecasted growth of 2.8%. According to the IDC, the global smartphone market looks set to face continued difficulties, with a recovery not expected to start before the end of 2023.

The consultancy firm Gartner also expects the subdued mood on the market to continue holding back demand throughout the whole of 2023. Gartner is forecasting a 4% decrease in global smartphone sales with total sales falling from 1.28 billion units in 2022 to 1.23 billion units in 2023.

While providers are passing on inflation-related increases in component costs to users, consumers are using their devices for longer, waiting for a brighter economic outlook before changing. This means that, again in 2023, it will take longer and longer for mobile phones to be replaced.

Ongoing increase in device recycling

The principles of the circular economy – which encourage better use of resources and using devices for longer – can be perfectly applied to the telecom market as global annual smartphones sales exceed one billion and users buy a new device every two years on average.

Whether for financial or environmental reasons: recycled smartphones are proving increasingly popular amongst consumers worldwide. Most studies agree that the market for these devices will enjoy further growth over the coming years.

According to Strategy Analytics, recycled smartphones sales are set to exceed 250 million units by the end of 2022, compared with 200 million in 2020. Total sales volumes could reach 400 million units by 2030.

The IDC estimates that over 280 million used smartphones will be sold worldwide in 2022, which represents an 11.5% jump compared with 2021. The IDC believes this growth will continue and that used smartphone sales will rise to 415 million units by 2026, with an annual growth rate of 10.3% from 2021 to 2026 and a market value of USD 99.9 billion.

Clearly, increasing numbers of consumers in Switzerland are planning to hold on to their mobiles for longer. In June 2022, Swisscom announced it had collected over a million old devices since the launch of its sustainability programme ‘Mobile Aid’ in 2012.

In partnership with the key actors in Switzerland’s circular economy (Revendo, Recommerce), the three mobile network operators, Sunrise, Swisscom and Salt, but also mobilezone, M-Budget and online shops such as Digitec, introduced buyback schemes enabling their customers to resell their old smartphones in return for credit or a discount on the purchase of a new device.

However, the latest Comparis study on smartphones, published in early December 2022, says the intention of using smartphones for longer is still more wishful thinking than reality. While almost 40% of survey participants indicate that they intend to keep their smartphone for four years or longer, only 11% actually continue using it for that period of time and just 15% have used the same device for three or four years. 45% of those surveyed plan to buy a new smartphone in the next 12 months. The average period of use in Switzerland is still around two years.

Growth in mobile data traffic

Global data traffic over mobile networks has almost doubled in the last two years, as indicated by Ericsson’s Mobility Report published at the end of November 2022.

Excluding the traffic generated by fixed wireless access (FWA), this figure stood at 90 exabytes (EB) per month (90 billion billion bytes) at the end of 2022. Global data traffic over mobile networks is set to

increase almost four-fold by 2028, reaching 325EB per month. If the traffic generated by FWA is included, the monthly data quantity reached 115EB by the end of 2022 and is set to climb to 453EB per month by 2028 (cf. fig. 2).

The report also highlights the increasingly important role of FWA in the provision of broadband services. Ericsson revised its FWA forecast upwards, estimating that there were over 100 million FWA connections in 2022, a figure set to increase three-fold by 2028 to 300 million.

Reasons for the sharp growth in mobile data traffic include the rising number of mobile contracts linked to smartphones, and an increase in the data volumes included in those contracts, which is being driven mainly by the rising consumption of video content. According to Ericsson, video already accounted for 70% of mobile data traffic worldwide in 2022. This is the fastest growing share of mobile data traffic worldwide and is estimated to climb by a further 30% per year and will account for almost 80% of mobile data traffic by 2028. The report said that most of this data traffic is accounted for by the streaming of videos, which are shared via popular social media platforms (YouTube, TikTok, Facebook, Instagram), followed by on-demand streaming services, like Netflix.

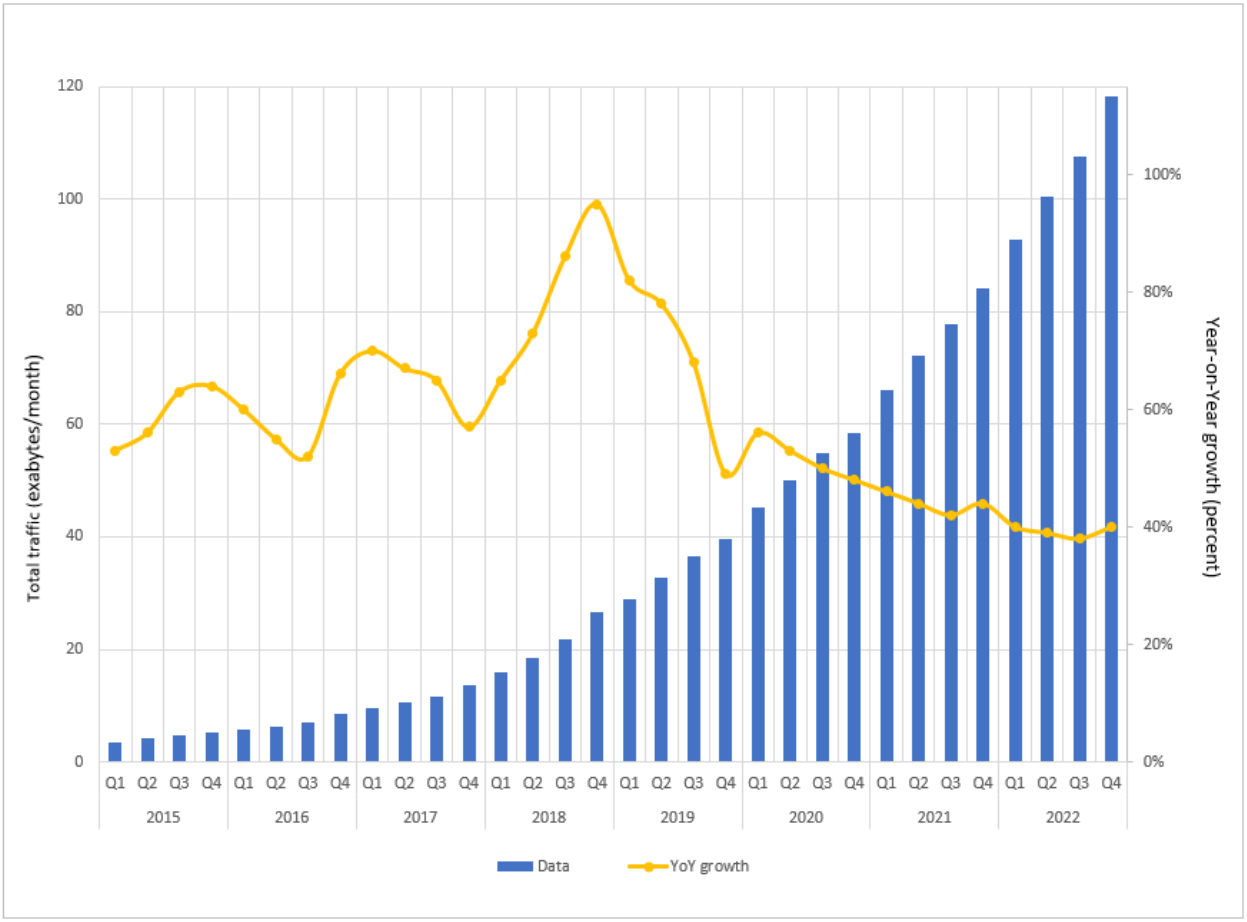
While the bulk of mobile data traffic is absorbed by the networks of the previous generations (3G and 4G), 5G's share of mobile data traffic is continually rising. It amounted to 17% in 2022 (compared with just 10% at the end of 2021) and is expected to make up almost 70% of global data traffic via mobile networks by 2028.

However, the number of 4G contracts continues to grow, rising by 41 million to a total of 5 billion in the third quarter of 2022. While this technology reached a record level of 5.2 billion contracts at the end of 2022, it is set to fall to 3.5 billion by 2028 when the migration of users to 5G has been completed.

The number of 5G contracts went up by 110 million in the third quarter of 2022 to 870 million. An increase to over one billion was expected by the end of 2022. Almost a third (30%) of the world population now has access to 5G coverage. The report estimated that around 85% of the world population would be able to use 5G by 2028.

The Ericsson report also confirms that 5G is developing at a faster pace than all previous mobile communication technology generations and the one-billion-contract mark will be reached two years earlier than was the case with the 4G standard introduced in 2009.

FIG. 2: MOBILE DATA TRAFFIC WORLDWIDE, 2015–2022



SOURCE: ERICSSON TRAFFIC MEASUREMENTS

Network coverage

Switzerland enjoys almost complete mobile coverage.

The GSM technology (2G) was introduced in Switzerland in 1993 and definitively switched off at the end of 2022. This technology, originally designed for voice telephony and the exchange of small quantities of data (SMS, email), was outdated and was being used less and less. While Salt and Swisscom gradually decommissioned their 2G networks (GSM, GPRS, Edge) between 2019 and 2021, Sunrise announced it would no longer support this technology from 3 January 2023.

The third-generation (3G) networks, which enable mobile internet access for small data volumes with a speed of 42 Mbps and cover 99% of the Swiss population, will also gradually be retired by the operators who will follow a global trend. According to a report published in July 2022 by the Global mobile Suppliers Association (GSA), the industry organisation had already determined that 135 operators in 68 countries and regions had already decommissioned their 2G and 3G networks by mid-2022 or were in the process of implementing this step or planned to do so. In Switzerland, Swisscom announced that it would continue operating the 3G network until the end of 2025, while Sunrise will retire the 3G standard over the next three to four years.

The network resources that this freed up can be used for latest-generation 4G and 5G. ComCom awarded these mobile communications frequencies as technology-neutral. In other words, the licensee is free to decide the technologies to use with their frequencies.

At the end of 2022, more than 99% of the Swiss population was covered by LTE (4G), which was launched almost ten years ago now. All carriers also report high mobile coverage with LTE Advanced (4G+). At Swisscom, 96% are now thought to have access to speeds of up to 300 Mbps, and as many as 72% enjoy maximum speeds of 500 Mbps. In 2022 Sunrise achieved 98% reach with its LTE-A network, offering data transfer rates of up to 900 Mbps. Salt's LTE-A network reach stood at 55% and permitted data transfers at up to 1 Gbps.

The explosive growth in data traffic, with volumes doubling roughly every two years, nonetheless means that fourth-generation mobile telecommunications networks are approaching their limits.

Having acquired additional frequencies in early 2019, providers quickly began to roll out their 5G networks. By the end of 2022 Swisscom reached 99% of the population with 5G and transmission rates of up to 1 Gbps, and 74% with 5G+ and transmission rates of up to 2 Gbps. In September 2022 Sunrise covered over 96% with 5G and transmission rates of up to 1 Gbps. It also already supplies more than 1,100 towns and localities with 5G broadband, with transmission rates of up to 2 Gbps. Salt announced in early 2023 that it could reach 99.9% of the population and could provide an internet speed of up to 750 Mbps thanks to aggregation of the 3G, 4G and 5G signals.

In relation to the speeds indicated by the operators, it is important to bear in mind that mobile networks have a cellular structure and the transmission rates are distributed between users within a cell.

Network quality

At the end of November 2022 German trade magazine Connect published its independent test for 2023 comparing mobile networks in Germany, Austria and Switzerland. As in the past, the results confirm the excellent standard of all Swiss mobile communications networks.

Swisscom and Sunrise again received an 'outstanding' rating, while Salt was rated ‘very good’. Connect points out that the high performance level of the mobile networks in Switzerland will be improved this year due to Salt closing the gap on its two main competitors in several categories.

Swisscom received the best scores in the ‘voice’ and ‘crowdsourcing’ categories, whereas Sunrise was ranked highest in the ‘data’ category. Salt lies slightly behind, but is also achieving a high level of performance and is increasingly gaining ground on its competitors.

Using voice over LTE (VoLTE) technology, the three operators provide very high-quality voice telephony services in terms of availability, call set-up time and call quality, and in both large cities as well as small towns and villages. On the Swiss roads and during rail journeys, “travellers can rely on […] being able to make mobile calls almost unrestrictedly while on the move – and with almost perfect quality,” wrote Connect.

In terms of data connections, the Swiss operators are almost neck and neck. The performance and reliability of the Swiss networks are also impressive, with users benefiting from very high transmission rates. It is also worth noting that there is less disparity between urban and rural areas in Switzerland than in its neighbouring countries.

Finally, the specialist publication evaluated the 5G networks for the third time and determined that the figures of the three operators have improved compared with the previous year. Swisscom and Sunrise in particular achieved maximum transmission rates of over 800 Mbps in many categories, even in small towns, on the roads and during rail travel. As mentioned above, Salt rolled out its own 5G network at a later stage and is lagging behind slightly. The company has nevertheless made significant progress with the launch of 5G and has caught up impressively.

The crowdsourcing measurements – in other words the measurement of users – confirm the test results and prove once again the high and long-term stable quality of the Swiss mobile networks.

Data transfer rates

Mobile communications users in Switzerland enjoy high and ever-faster transmission speeds. This is validated by several analyses carried out in 2022. However, other studies point to the challenges that operators face in expanding their networks and highlight the risk of deteriorating conditions of use for customers.

An analysis of the DACH markets (German, Austrian and Switzerland) published in June 2022 by mobile network monitoring app Opensignal unsurprisingly identifies a significant increase in 5G speeds compared with 4G in all three markets. Switzerland achieved the best results for 5G speeds: this stands at 182.5 Mbps for download, with a download peak of 572.4 Mbps, while the upload speed is 38.2 Mbps. This means the download speeds are 3.4 times higher than 4G, the download peak is 2.8 times higher and upload speeds 2.3 times faster.

The latest Mobile Network Experience Report for Switzerland published in November 2022 by Opensignal also states that Swisscom has exceeded an average 5G download speed of 200 Mbps for the first time. On the whole, all operators improved their download speeds.

However, in a study published just a few weeks later in December 2022, Opensignal indicated that the operators were struggling to fully exploit the potential of the 5G networks due to more stringent provisions on electromagnetic radiation in Switzerland. This study says that the average 5G downloads in Switzerland have slowed down considerably, with weaker signal strengths in comparison to its neighbouring countries of Germany, France and Italy. The operators are categorised as ‘fair’ or ‘weak’, which means the signal strength in the 3.5GHz band is insufficient in over 50% of cases.

This new study confirms the results of an initial study published in May 2022 which compared the 5G experience in Switzerland, Germany, France and Italy and showed a close relationship between signal strength and average download speed. Here too, weaker signal strengths than in neighbouring countries were identified which was due to strict provisions on the transmission power of base stations. The installation limits set out in the Ordinance on Protection against Non-Ionising Radiation (NIRO) are amongst the most stringent in the world. This meant Switzerland was the only country with over 50% ‘weak’ measurements, but also the only country in the study where signal strength was ‘excellent’ or ‘good’ in less than 20% of the measurements.

Finally, according to the global comparative analysis of the 5G experience published by Opensignal in June 2022, Switzerland occupies an impressive fourth position for 5G upload speed. However, the analysis points out that the services in this market segment remained largely unchanged as the operators mainly focused on increasing download speeds for users as part of the 5G rollout. Switzerland also achieves strong results and ranked in the top 15 in the categories of ‘5G video experience’ (6th

position), ‘5G games experience’ (5th position) and ‘5G reach’ (proportion of locations where users found a 5G signal). The situation is different in the ‘5G availability’ category, which indicates how long users have to wait for connection set-up on the 5G network. The reason given by the analysis is the effect of lower transmission power in Switzerland on coverage in buildings. As a result, Switzerland does not feature in the ranking list of countries with the top 5G download speeds in the world, which is still led by South Korea with average speeds of 432.7 Mbps. Six countries achieved the 300 Mbps mark.

According to the latest Speedtest Global Index, published by Ookla in November 2022, Switzerland lies in 18th position by international comparison with an average connection speed of 77.4 Mbps. Ranked in top position is Qatar, where users enjoy average download speeds of over 176 Mbps, whereas the global average stands at just under 34 Mbps. In the ranking of the major cities, Zurich is in 27th place with 86.75 Mbps and Geneva in 43rd place with 61.75 Mbps. Two cities from Qatar occupy the top spots with speeds of 197 and 166 Mbps. The top European cities are Oslo (3rd position with 160 Mbps) and Copenhagen (5th position with 153.75 Mbps).

With the growing number of compatible devices and an increasingly large share of the population that owns a smartphone, the number of people using 5G is also rising. In light of this trend and increasing quantities of data being transmitted over the networks, Switzerland may face serious challenges in the near future to even maintain a satisfactory quality standard.

Prices of mobile communications

According to the National Consumer Price Index issued by the Federal Statistical Office (FSO), which measures price trends on the basis of a basket of the principal consumer goods and services purchased by Swiss households, the overall index for telecommunications services declined by 0.7 percentage points between 2021 and 2022. The index for mobile telephone communications rose slightly since last year (+1.3%). Prices for combined fixed-line and mobile services, which are proving ever more popular with customers, have been falling for a number of years. They dropped by 2.2% between 2021 and 2022.

The mobile telephony prices covered by OFCOM's Statistical Observatory, which are based on the lowest rates offered by providers on the Swiss market, reveal considerable differences, however.

Regardless of the basket analysed, the least expensive deal can cost less than half as much as the most expensive one.

The most attractive package for low-level users in 2022 was provided by Yallo, starting at CHF 10.60, making it 2.3 times less expensive than Salt’s at CHF 24.30. For medium-level users, M-Budget’s package priced at CHF 20.10 is also 2.3 times cheaper than Swisscom’s at CHF 45.50. Finally, for customers with high usage requirements, the most inexpensive option from Yallo at CHF 25.60 costs almost half as much as Swisscom’s package at CHF 50.60.

Mobile telephony prices in Switzerland are still among the highest internationally for the medium-sized basket. This is confirmed by the Teligen price baskets published by the market research company Strategy Analytics, which are based on OECD methodology and take into account the most competitive products offered by the largest carriers in each country. They are below the OECD average for the large baskets, however, although more detail is needed to understand this finding fully.

The price basket for Switzerland factors in the three network operators Salt, Sunrise and Swisscom, as well as the secondary and tertiary brands Yallo and M-Budget. These include products and options from both the prepaid and contract segments. For a medium-use basket of voice and data connections (100

calls and 2 GB of data), customers in Switzerland paid almost CHF 6 per month more than the OECD-wide average in August 2022 (CHF 20.10 vs. CHF 14.40). In terms of the cheapest offer Switzerland comes in 29th and thus in the third containing the most expensive countries. Only six countries have higher prices.

In terms of the price paid by a small user (30 calls and 500 MB of data), Switzerland was in the middle of the OECD countries, with an average price of around CHF 10.50. Even with its cheapest offer, Switzerland is still only in 24th place.

Customers with high usage requirements (unlimited calls and 20 GB of data) paid almost CHF 3 less per month in Switzerland than the OECD average (CHF 25.60 vs. CHF 28.20). This places Switzerland in the middle of the field at 16th place.

2. DEVELOPMENT OF FIXED NETWORKS

2.1. ACCESS NETWORKS

Switzerland has several backbone networks as well as high-quality access networks. Swisscom's access network is available nationwide.

The cable television (CATV) networks are also well developed and offer fixed-network connections in much of the country. A little over 80% of Swiss households have a CATV network connection.

Several market players have also been constructing optical fibre networks for over ten years. In addition to Swisscom and the cable network operators, they also include the municipal utility companies, which use these networks for themselves or make them available to other providers to allow them to market their own telecom services.

2.2. FIXED-LINE TELEPHONY

In early 2020, Swisscom's last fixed-line connections were converted to all-IP – a digital technology based on the internet protocol. The gradual replacement of traditional fixed-line telephony with IP technology is a global trend. Today, practically all data, including voice communication, is transported via IP-based networks.

Given the continuing boom in mobile telephony, the downward trend in the number of fixed-network telephone lines in Switzerland continues. The number and duration of fixed telephony connections has been declining for many years now. According to the provisional data from OFCOM's Statistical Observatory for 2021, there has been a 68% drop in the number of connections made over the past ten years, from 4 billion calls in 2011 to less than 1.3 billion in 2021. In the same period the duration of those calls has contracted by over 55% from almost 14 billion minutes (2011) to just over 6 billion (2021). After a 10% increase in 2020, resulting from the COVID-19 crisis (lockdown, working from home, etc.), the call duration fell again by 17% in 2021.

Fixed-line telephony via VoIP technology has been provided by telecommunications companies and cable network operators for many years. The migration from analogue to IP technology fosters the progress of VoIP. More than 99% of fixed-network subscribers now use a VoIP connection.

In view of the downward trend in the fixed-line market, customer numbers in this segment are obviously also falling as more and more people are doing without a fixed-line connection altogether.

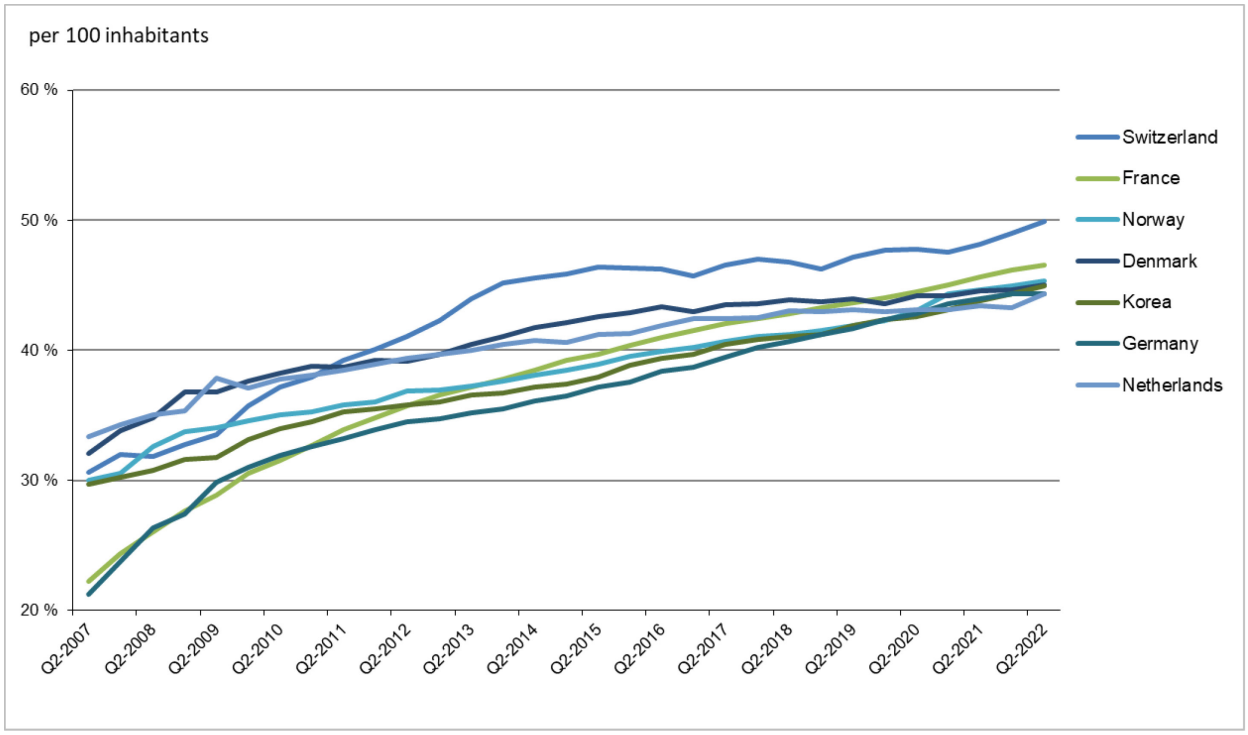
The number of customers making calls on the fixed network via the VoIP access of a telecom provider (DSL, cable, etc.) has more than trebled over the past ten years and almost hit the 3-million mark (2,929,245, prov. 2021) by the end of 2021. However, that figure has declined by around 2% per year over the past three years. The number of connections set up via a VoIP access also fell by 12% between 2020 and 2021, while the duration of these connections dropped by 15.7% over the same period.

2.3. Broadband on the fixed network

Switzerland has a high number of fixed-network broadband subscribers. By mid-2022 almost 49.9% of the Swiss population had a broadband internet connection, thereby consolidating the country's top-ranking position in an OECD-wide comparison (cf. fig. 3). It remains ahead of France (46.5%), Norway (45.3%) and Denmark (45.1%). In the same period, the average for OECD countries was 34.7%, while that of EU countries was 37.2% (July 2021).

Switzerland is not, however, currently a world leader in terms of optical fibre connections to the home or basement (FTTH/B). Updated OECD figures from mid-2022 indicate that only 13% of Swiss households use an FTTH connection. This puts Switzerland right in the mid-range of OECD countries, slightly above the average of 12.5%, but well behind countries like South Korea with a penetration rate of 39.3%, Sweden (32.6%) and Norway (30.8%).

FIG. 3: BROADBAND PENETRATION IN TOP OECD COUNTRIES, 2007–2022



SOURCE: BROADBAND PORTAL – OECD

Data transfer rates

There are many tools for measuring internet data transfer rates that can also be used to produce comparisons and rankings. Two of the best-known are Ookla and M-Lab, which are also recognised by organisations such as the OECD. Switzerland fares more or less well in an international comparison depending on which tool or method is used. According to data collected by Ookla in December 2022, Switzerland takes 15th place with transmission rates of 145 Mbps. The average (the median transmission rates of 180 countries) is 74.5 Mbps. Focusing only on OECD countries and excluding territories such as Jersey, Andorra, Gibraltar and Monaco, Switzerland's 145 Mbps would put it in 7th place.

The comparison now also contains a ranking of transmission rates for some of the world's major cities. This list is led by Beijing (256 Mbps), Shanghai (229 Mbps) and Bangkok (228 Mbps). The highest ranked Swiss cities are Geneva in 14th position with 177 Mbps and Zurich in 18th place with 172 Mbps.

M-Lab data published by Cable.co.uk measured the performance of household internet connections in 220 countries and territories between June 2021 and June 2022. Its figures show Switzerland in 39th place with average transmission speeds of a little over 63 Mbps. Western Europe dominates this ranking by far, with seven countries in the top-ten countries with the fastest transmission rates. While Macau tops the ranking, with average transmission rates of 263 Mbps, it is followed by five European countries: Jersey (257 Mbps), Iceland (217 Mbps), Liechtenstein (166 Mbps), Gibraltar (160 Mbps) and Andorra (160 Mbps). All Western European countries are positioned in the top half of the ranking and combined have the highest average transmission rate at regional level (99 Mbps). The analysts at Cable.co.uk conclude that Europe – thanks to its outstanding infrastructure – once again tops the ranking list and that the countries performing best in all cases are those focusing on full fibre networks (FTTP).

It is worth noting that the major providers in Switzerland have since September 2021 provided customers with a standardised instrument for measuring the quality of their own internet access. This is available at www.networktest.ch and in the app shops for mobile devices.

Pricing

According to the National Consumer Price Index issued by the Federal Statistical Office (FSO), prices for fixed-network communication services rose by 1.6% between 2021 and 2022.

The major providers tended to charge less for their broadband services, however. This is confirmed by tracking the communications prices that are covered by OFCOM's Statistical Observatory. These are based on the lowest rates offered by providers on the Swiss market.

For a small and medium basket, the least expensive services are available from Quickline (CHF 46.20), while Swisscom’s are almost 20% more expensive at CHF 55.20 in both cases. Salt provides the most attractively priced product for a large basket at around CHF 47, while Swisscom’s is the most expensive option here, costing 61% more at CHF 76.

Since 2020 OFCOM has published the survey of prices of product bundles on fixed and mobile networks on its Statistical Observatory website. These products reflect demand from a growing number of consumers that prefer to purchase all of their telecommunications services from the same provider. Further information can be found on the OFCOM website.

Prices for broadband services in Switzerland remain much higher than the OECD-wide average, however. According to the Teligen price baskets published by Strategy Analytics, which for Switzerland take into

account only Swisscom, Sunrise, Salt and Quickline, the lowest-cost product for medium usage offers a transfer rate of at least 100 Mbps for around CHF 46.20 per month.

In September 2022, consumers in Switzerland with medium usage requirements therefore paid almost CHF 15 more per month for such a basket than the average of all OECD countries (CHF 31.60). A small basket with 30 GB and a transmission speed of at least 10 Mbps cost Swiss consumers over CHF 17 more (CHF 46.20 vs. CHF 29.10). For these two baskets of goods, Switzerland is among the five most expensive countries.

For the basket with 300 GB of data and a transmission rate of at least 1 Gbps – where the price reduction was clearest – Switzerland now lies in the middle tier of the OECD countries. With an average price of CHF 47.20 for a large basket, Swiss customers paid slightly less than the OECD-wide average (CHF 48) in 2022.

Structure of the broadband market

The merger of Sunrise and UPC marked a significant restructuring of the Swiss broadband market and increasingly blurs the distinction between telecommunications providers and cable network operators.

However, looking at broadband providers as a whole (CATV, DSL and FTTx) Swisscom remains far ahead of its closest competitors, with a market share of 48%.

Sunrise's market share stood at around 28%, that of the other cable network operators at around 13% (including Quickline at 4%), while the market share of the other telecom operators was 7% and Salt's 4%.

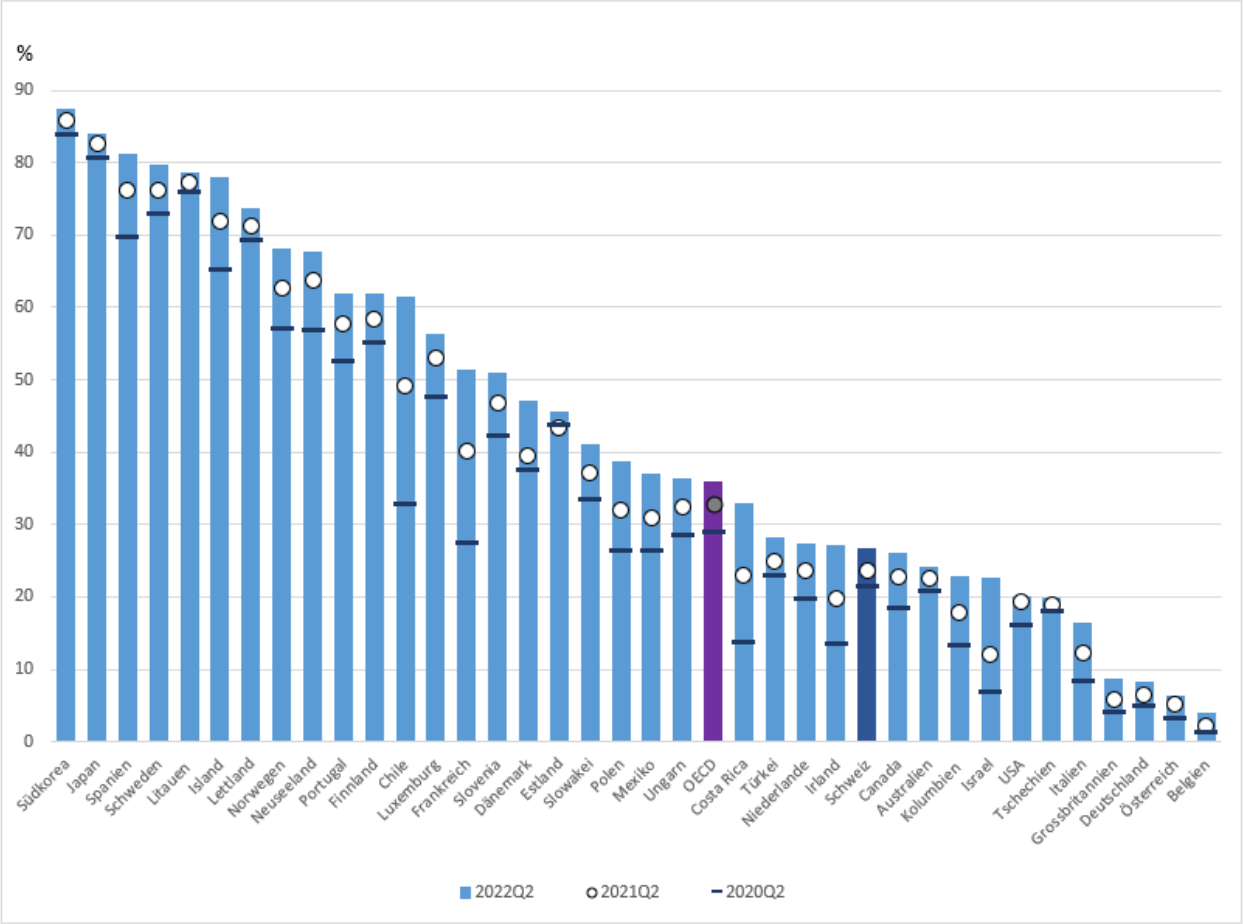
The number of optical fibre contracts (FTTH/B) used in Switzerland is rising, while the broadband market is almost saturated with around 4.2 million connections. Growth in the fibre-optic segment is primarily the result of DSL and CATV subscribers migrating to this new technology. Estimated at just over one million, these lines represented almost 26.5% of all broadband connections in Switzerland by mid-2022.

By international comparison, the growth in optical fibre contracts in Switzerland (+17.5% between June 2021 and June 2022) is above the average of OECD countries (+12.3%), but below that of its neighbouring countries. Italy recorded growth of 34.3%, France 31%, Germany 28.7% and Austria 19.9%.

This means Switzerland is still slightly behind by international standards: optical fibre penetration in the OECD countries was almost 36% on average over the same period. While Switzerland is better positioned than most of its neighbouring countries, such as Italy (16.4%), Germany (8.1%) or Austria (6.2%), only France has a relatively high share of optical fibre contract holders (51.4%), putting it amongst the 15 OECD countries where this share exceeds 50% (cf. fig. 4).

Finally, it is worth noting that optical fibre has overtaken cable (32.7%) to become the main technology for fixed-line broadband connections in the OECD countries. DSL, which is increasingly less significant, accounts for just 25.4% of broadband contracts in the OECD. The share of optical fibre connections is also higher than that of cable (24.7%) in Switzerland, but DSL still makes up almost half of contracts (46.9%) and remains the dominant technology.

FIG. 4: PERCENTAGE OF FIBRE CONNECTIONS IN TOTAL FIXED BROADBAND, OECD, 2020–2022



SOURCE: BROADBAND PORTAL – OECD

Expansion of ultra-high-speed broadband networks

In contrast to its superior ranking in the provision of broadband services via hybrid fixed networks, Switzerland is not a world leader when it comes to fibre to the home (FTTH). But it has made up some ground over recent years: Switzerland now stands in the middle of the European field in terms of rollout and use of optical fibre connections.

In Europe, further investment was also made in developing FTTH accesses during the pandemic period. On average, around 49% of households in the EU (EU27 + UK according to FTTH Council Europe 2022) have an optical fibre access which is around the same as the share of households with FTTH connections in Switzerland so far.

The forecasts of the FTTH Council Europe assume that the number of connections will continue to expand throughout Europe. By 2027 almost two thirds of households in the EU are expected have a fibre-optic connection and half of the households should then also effectively use such a connection, which will narrow the digital divide that exists in many countries between rural and urban areas.

In Switzerland, too, various players have been investing considerable sums in expanding the fibre-optic access network over the past 15 years. Since 2008, over CHF 1 billion a year on average has been invested in the renewal of the fixed-network infrastructure (cf. OFCOM's telecommunications statistics).

Exact figures on the FTTH rollout are not yet available. Swisscom, for example, indicates in its 2022 annual report that it has an annual budget of CHF 500 to 600 million for the rollout of optical fibre. This budget will also remain unchanged in future, but the network rollout will take longer if Swisscom – due to the Competition Commission (COMCO) proceedings mentioned below – is no longer able to build on the point-to-multipoint architecture, and instead has to construct point-to-point connections. According to its annual report, Swisscom invested CHF 480 million in the rollout of the optical fibre network in 2022 and CHF 550 million in 2021.

The infrastructure competition also played a key role in the rollout of the optical fibre network. If operators invest in upgrading their network infrastructure and then launch services with higher bandwidths on the market, this puts pressure on the other network operators to improve their infrastructure to a similar or even better level of performance. The high quality expectations of Swiss customers may also be a major driving factor.

The infrastructure competition in the 2000s was primarily triggered by the network expansion of the CATV operators who were present with a cable network connection in over 80% of Swiss households. In 1999 Cablecom (subsequently UPC) was the first company to launch 'hispeed internet' via coaxial cables. It was followed a year later by Swisscom offering ADSL through the telephone network. In 2000 there were just 42,000 broadband connections in Switzerland: 38,000 through the cable network and 5,000 via ADSL. By 2003 this had multiplied to 850,000 (350,000 CATV / 500,000 ADSL). Connections then passed the 2-million mark in 2006.

The CATV operators raised the bar again later by investing in the transmission standard DOCSIS 3.0 for coaxial cable and later in DOCSIS 3.1. According to the SUISSEDIGITAL association, this allows very high data transfer rates today of up to 1 Gbps to be offered via 90% of CATV connections. In this way, hybrid fibre/coax (HFC) networks can reach speeds that telecoms operators such as Swisscom can achieve only with a fibre-only network. CATV networks are now also completely switching to fibre to the home.

The general technological development path seems clear: Optical fibre has long been used for backbone networks, but it is being taken ever closer to the end customers in telecoms and CATV networks alike. Fibre-optic cables were extended from the telephone exchange to a neighbourhood distribution box (Fibre to the Cabinet, or FTTC) more than a decade ago. Since then, they have been laid either to a manhole in the street (FTTS) or even to building basements (FTTB). Here, only the final few metres to the home consist of conventional copper or coaxial cables.

For almost 15 years now, local utilities companies have been working – often in cooperation with Swisscom – to construct fibre-only FTTH networks in numerous cities and regions. The cooperation partners build a local FTTH network together and then each have at least one of their own P2P optical fibre connections to every household. Major players in the industry agreed on this 'multifibre model' at the FTTH roundtables organised by ComCom between 2008 and 2012 (cf. ComCom's 2021 Activity Report).

Some of the cooperation ventures that began around 2010 have now been completed (e.g. Basel, Bellinzona, St Gallen, Yverdon and Zurich), while others are in the final stage. Over recent years, it appears there has only been occasional new cooperation between Swisscom and energy supply companies (for example, access provision in the town of Kriens).

In many places, Swisscom has also invested in upgrading the fixed network without any partners. Over the past decade it primarily used a hybrid copper-fibre connection (FTTC and FTTS), opting not to replace

the old copper cable for the last few metres to the socket in the home. Copper-based complementary technologies, such as 'G.fast', enabled Swisscom to still provide relative high bandwidths on this kind of hybrid access line (up to 500 Mbps).

Since around 2020, Swisscom has increasingly focused on extending fiber to the home again, but in the more cost effective 'point-to-multipoint' (P2MP) network architecture. However, in December 2020 COMCO opened an investigation into the issue of whether this type of network architecture favoured by Swisscom was permitted under competition law. Swisscom was prohibited by precautionary measures from "refusing competitors access to through lines as it expands its optical fibre network" (COMCO press release of 17 December 2020).

According to Swisscom, the rollout of the optical fibre network has slowed down due to the ongoing COMCO proceedings and connections already integrated into the P2MP architecture can no longer be marketed. Just under two years after the start of the COMCO investigation, Swisscom announced its intention in October 2022 "to predominantly create new connections on the point-to-point architecture (P2P) and to convert some of the existing P2MP connections to P2P".

Swisscom has revised its FTTH penetration target for the end of 2025 downwards slightly to 50–55% of connections. However, Swisscom aims to increase FTTH coverage to 70–80% by 2030.

Swiss Fibre Net (SFN), which joined the market in 2013, is also stimulating competition. SFN is a network consortium set up to market local fibre-optic networks. It consists of five shareholders – the utility providers of the cities of Bern, Lucerne and St Gallen plus the network carriers Danet (Upper Valais) and Didico (Meilen-Herrliberg). There are now 53 network partners in the consortium.

SFN offers service providers from all over Switzerland that do not have their own access networks (e.g. Init7, iWay, GGA Maur, Salt, Sunrise and VTX) the opportunity to use a shared platform to source standardised FTTH products for resale. It also offers mobile operators fibre-optic connections for mobile communications antennas.

SFN is now constructing optical fibre networks itself and is proposing a slightly different model to Swisscom. SFN believes this 'manoeuvrable model' should become the industry standard. It is also based on the less expensive P2MP construction method, but according to SFN enables a "layer 1 network access through the manoeuvrability of the optical fibres in the district distributors of the cable network operators". SFN has presented this model to COMCO for evaluation. In COMCO's view, "the conditions for effective competition will exist when the layer 1 service based on the manoeuvrable part of the FTTH network can meet the total demand of all telecommunications providers interested" (cf. COMCO's responses of 25 October 2022 and 2 February 2023 on www.weko.admin.ch).

However, many local utility companies do not market their fibre connections via SFN. Some offer telecoms services to both retail and business customers (e.g. Industrielle Werke Basel) themselves, while others stick to operating their network and leave service provision to third parties. This is the case in the cities of Zurich and Geneva. In French-speaking Switzerland, many network operators market their connections via netplus.ch.

Swiss4net is another company that is investing in the construction and operation of local optical fibre networks. Swiss4net is planning, constructing and financing FTTH networks based on P2P architecture in communes and cities where they can lease the duct installations required from the commune or energy

provider (cf. www.swiss4net.ch). Swiss4net now has at least eight local optical fibre networks (e.g. in Morges, Pully, Chiasso, Ascona, Baden and Wettingen). Various telecom providers deliver their services via the networks operated by Swiss4net.

High-speed broadband throughout Switzerland

Optical fibre networks are being rolled out not only in major conurbations but also in many rural areas, such as – already at an early stage – in the canton of Fribourg, the Upper Valais and the Lower Engadine. In addition, cantonal projects have been launched in Grisons and Ticino to promote ultra-fast broadband (100 Mbps and above) coverage, particularly in peripheral areas. These cantons want to play an active role in promoting service provision to ensure that their outlying regions remain competitive with Switzerland's urban areas.

In the canton of Graubünden, the infrastructure is to be expanded on a regional basis. After the cantonal authorities had drawn up their plan for promoting ultra-high-speed broadband access, a strategy and coordination team was created to provide technical support to regional projects and manage rollout across the regions. The construction work and financial measures are planned and determined by regional teams (cf. ultra-high-speed broadband access in the canton of Graubünden, www.gr.ch).

In the canton of Ticino, the preliminary work on a 'Piano strategico per la banda ultra-larga in Ticino' (strategic plan for ultra-high-speed broadband in Ticino) was outlined in autumn 2019, and on 14 March 2022 the Cantonal Council of Ticino presented a dispatch for a framework credit for CHF 95 million to provide the canton with ultra-high-speed broadband. The canton of Ticino aims to provide at least 95% of properties in the building zones with ultra-high-speed broadband within 15 years. The incentive model proposed encourages the development of the network in peripheral regions in particular (cf. www4.ti.ch).

Investment has been made in fibre to the home (FTTH) in Switzerland for over 15 years − with regional differences and at various times. So far this has largely been market-driven and carried out without financial support from the Swiss Confederation.

In contrast to the EU countries, Switzerland does not yet have a national broadband strategy, and national policymakers have refrained from setting provision targets and defining support models for high-speed broadband infrastructure.

The market-driven development of optical fibre provision has led to impressive results in many areas, especially central and commercially attractive ones. However, it has become increasingly clear over recent years that the market-driven development of optical fibre provision cannot be achieved in many peripheral regions. Modern optical fibre networks can ultimately only be constructed in such locations with public financial support. This also chimes with the experience of most European countries, all of which have long had national strategies to encourage high-speed broadband.

This is why ComCom welcomes the fact that the National Council Transport and Telecommunications Committee (TTC-N) proposed the definition of a 'Swiss Confederation high-speed broadband strategy' in a postulate in April 2021 (Po. 21.3461 of 27 April 2021). The postulate, which was adopted by an overwhelming majority in the National Council, calls on the Federal Council to present a high-speed broadband strategy for Switzerland by mid-2023.

2.4. Digital television in Switzerland

The telecom providers operating on the digital television market are faced with growing competition as more and more participants enter the market – Salt entered the fixed-network market in spring 2018 with a triple-play service – while there are also more and more streaming services (Netflix, Disney, Amazon, etc.).

Total customer numbers have been falling for around five years by around 1% per year on average. Between 2021 and 2022, the number decreased by 28,000 customers (–0.7%).

The merger of Sunrise and UPC in 2021 also significantly changed the balance of forces between the major participants in this market segment, without actually having an impact on its structure so far.

Swisscom has defended the strong market position it took over from UPC in 2015, notwithstanding the difficult economic situation. Despite losing 21,000 customers in 2022 (–1.3%), Swisscom had 1.57 million digital TV subscribers, and its market share remained stable at 41% at the end of 2022.

Over the same period, Sunrise (incl. UPC) also lost around 23,000 customers (–1.9%), but retained its market share of almost 31.5%.

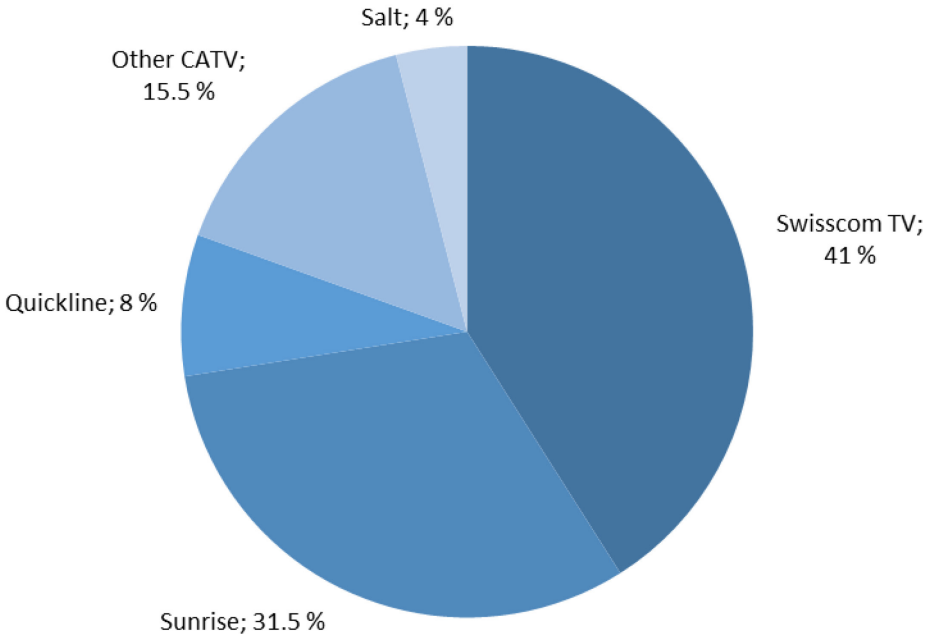
Quickline, an association of several cable network operators, experienced a slight year-on-year decline in TV customer numbers of some 10,000, or –3.2%. With 302,400 TV customers at the end of 2022, Quickline's market share stood at around 8%. Other cable network operators occupied roughly 15.5% of the market, Salt 4% (cf. fig. 5).

To counteract the ever fiercer competition from streaming services (Netflix, etc.) or YouTube and changes in usage habits, Swisscom launched ‘blue Play’ in autumn 2021 – its own streaming service for films and series to complement its digital TV offering in Switzerland. SRG had previously launched the ‘Play Suisse’ platform in November 2020. It offers a broad selection of films, series and documentaries from all of Switzerland's language regions, both in-house and co-productions.

The rise in the use of streaming services is still remarkable. According to the Digimonitor study on media usage in Switzerland published in early September 2022, the US giants Netflix and Disney+ each acquired around 400,000 new users in 2022. Netflix broke through the 3-million-user mark in Switzerland (48% of the population), while Disney+ reached the 1-million mark (17% of the population). Of the major streaming services in Switzerland, ‘Play Suisse’ occupies second place and already has over a million occasional users (17% of the population). Swisscom’s Blue-TV app has 1.1 million users (18% of the population), while amongst the other internet TV providers, Zattoo has 630,000 users (10%) and Wilmaa, which was taken over by Sunrise in 2020, 290,000 users (4.5%).

Also according to information provided by Digimonitor, YouTube has 4.5 million users in Switzerland (70% of the population), making it the most popular platform. Despite the competition from these digital services, conventional television remains very popular in Switzerland and is still watched by much of the population with 5.9 million viewers (91% of the population).

FIG. 5: MARKET SHARES OF DIGITAL TV IN SWITZERLAND IN 2022



SOURCES: OPERATORS, SUISSEDIGITAL

EXCLUDING SATELLITE/TERRESTRIAL

II. COMMISSION AND SECRETARIAT

1. COMMISSION

ComCom is an independent, extra-parliamentary commission tasked with licensing and market regulation in the telecommunications sector.

Under the Swiss Telecommunications Act (TCA), ComCom's main tasks are:

- Granting licences for the use of radiocommunications frequencies (Art. 22a TCA)
- Awarding the universal service licence (Art. 14 TCA)
- Determining access prices and conditions when service providers fail to agree among themselves (Art. 11a TCA)
- Determining conditions of access to the building entry point and the joint use of installations within buildings in the event of disputes between telecommunications service providers (Art. 35b TCA)
- Imposing measures and sanctions in the event of violations of applicable law in connection with a licence granted by ComCom (Art. 58 TCA).

Following the revision of the Telecommunications Act, which was passed by Parliament in March 2019 and entered into force on 1 January 2021, ComCom ceased to be responsible for approving national numbering plans, the arrangements for number portability and the free choice of service provider. These have fallen to the Federal Council and OFCOM respectively from January 2021.

The Commission consists of seven independent experts appointed by the Federal Council.

In 2022 it was composed of the following members:

- **Adrienne Corboud Fumagalli**, **President**, Doctor of Economics and Social Sciences, independent non-executive director of several companies
- **Christian Martin**, **Deputy President**, Electrical Engineer HTL, independent consultant and entrepreneur
- **Matthias Grossglauser**, Doctor of Information Technology, Professor at the Swiss Federal Institute of Technology Lausanne (EPFL)
- **Patrick Krauskopf**, Lawyer, Professor, and Head of the Center for Competition Law and Compliance at Zurich University of Applied Sciences (ZHAW)
- **Jean Christophe Schwaab**, Dr. iur., Member of the Communal Council of Bourg-en-Lavaux
- **Stephanie Teufel**, Independent science advisor, Professor emeritus of Management in Information and Communication Technology at the University of Fribourg and Docent at the international institute of management in technology (iimt)
- **Flavia Verzasconi**, Lawyer and Notary, President of the Administrative Court of the Canton of Ticino

The Commission generally meets on an almost-monthly basis. In addition, its members spent much time preparing the meetings and adopting opinions by means of circular communications.

2. SECRETARIAT

The Commission is assisted by its own Secretariat, which is responsible for management and public relations. The Secretariat coordinates the Commission's activities with OFCOM, which prepares ComCom business and generally implements its decisions.

The Secretariat consists of a Commission secretary (90%), a scientific collaborator and webmaster (80%), and an administrative assistant (70%).

The **Members of the Secretariat** will be happy to provide you with any information you might require:

- Peter Bär, Secretary of the Commission

- Pierre Zinck, Scientific Collaborator and Webmaster

- Jacqueline Fischer Pulfer, Administrative Assistant

Next page: all members of the Commission from 1997 to 2022

- **Fulvio Caccia**, President 1997–2004
- **Gian Andri Vital**, Member 1997–2004, Deputy President 1998–2004
- **Yvette Jaggi**, Member 1997–1998
- **Pierre-Gérard Fontolliet**, Member 1997–2006
- **Heidi Schelbert-Syfrig**, Member 1997–2004
- **Hans-Rudolf Schurter**, Member 1997–2007
- **Beat Kappeler**, Member 1997–2007
- **Christian Bovet**, Member 1998–2011, Deputy President 2005–2011
- **Marc Furrer**, President 2005–2016
- **Monica Duca Widmer**, Member 2005–2017, Deputy President 2012–2017
- **Reiner Eichenberger**, Member 2005–2017
- **Jean-Pierre Hubaux**, Member 2007–2019
- **Andreas Bühlmann**, Member 2008–2020
- **Stephan Netzle**, Member 2008–2020, President 2017–2020
- **Adrienne Corboud Fumagalli**, Member since 2012, Deputy President 2018–2020, President since 2021
- **Stephanie Teufel**, Member since 2017
- **Christian Martin**, Member since 2018, Deputy President since 2021
- **Flavia Verzasconi**, Member since 2018
- **Matthias Grossglauser**, Member since 2020
- **Patrick Krauskopf**, Member since 2021
- **Jean Christophe Schwaab**, Member since 2021


Fulvio Caccia


Gian Andri Vital


Pierre-Gérard Fontolliet


Heidi Schelbert-Syfrig


Hans Rudolf Schurter


Beat Kappeler


Yvette Jaggi


Christian Bovet


Marc Furrer


Monica Duca Widmer


Reiner Eichenberger


Jean-Pierre Hubaux


Andreas Bühlmann


Stephan Netzle


Adrienne Corboud Fumagalli


Stephanie Teufel


Flavia Verzasconi


Christian Martin


Matthias Grossglauser


Patrick Krauskopf


Jean Christophe Schwaab

III. ACTIVITIES OF THE COMMISSION

The following sections provide an overview of ComCom's activities in 2022.

1. ACCESS CASES

To promote competition in the telecoms market, the Telecommunications Act (Art. 11 TCA) specifies that dominant undertakings – such as former monopolist Swisscom in certain areas – must offer other providers access in various forms to the existing infrastructure or services. Where this is the case, this access must be offered in a non-discriminatory manner and at cost-oriented prices.

In contrast to the technology-neutral access regime in the EU, the Act contains an exhaustive schedule of the areas in which a dominant provider must grant access to infrastructure (cf. Art. 11 TCA). Since 2021 the following four forms of access have remained subject upon application to regulation:

1. Fully unbundled access to the local loop (copper technology only, however)
2. Interconnection
3. Leased lines
4. Access to cable ducts, provided these have sufficient capacity.

When the TCA was last revised in 2019, Parliament decided that two forms of access, fast bitstream access and charging for fixed-network subscriber connections, should no longer be subject to regulation and should be removed from the law.

In this last revision of the TCA to date, lawmakers explicitly refrained from introducing technology-neutral network access regulation. However, the new Article 3a TCA tasks the Federal Council with presenting an evaluation report on the development of the telecoms market every three years and submitting proposals to promote effective competition where necessary.

In Switzerland, subscriber lines based on fibre or coaxial cable therefore continue to be exempt from regulation.

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

Pending access cases

A brief overview is provided below of the four access cases pending with ComCom at the end of 2022 and the appeal against ComCom's decision on the payment of interest on repayments rejected by the Federal Administrative Court (FAC).

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

Also at the end of 2022, two extensive access cases were pending before ComCom concerning the prices for various forms of access:

a) Sunrise vs. Swisscom concerning prices for interconnection, unbundling, leased lines and cable ducts from 2013 onwards
b) Salt vs. Swisscom concerning prices for interconnection and leased lines from 2014 onwards.

These extremely complex and extensive proceedings were divided into two parts: ComCom had issued a partial decision on the disputed prices for 2013 and 2014 to 2016 in February of 2019. However, because all parties to the proceedings lodged an appeal against that decision to the FAC, OFCOM suspended its instruction concerning proceedings on prices from 2017 onwards until the FAC had delivered its judgment.

The FAC partially upheld the appeals in two judgments of 16 July 2021 (A-1286/2019 and A-1496/2019 ; cf. www.bvger.ch) and referred the matter back to ComCom for review. The FAC nonetheless agreed with ComCom on the key points in dispute, and rejected many of the appellants' criticisms.

These parties had the same number of complaints admitted in both proceedings. An overview can be found in the summaries of the two 16 July 2021 judgments (A-1286/2019 E. 52 and A-1496/2019 E. 57; in German).

The majority of objections upheld by the FAC related to the review or examination in greater depth of certain factors relevant to price calculation and greater justification for the decisions made.

OFCOM resumed the proceedings in autumn 2021 and took the lead on instructions concerning the issues raised by the FAC in 2022. ComCom will decide again in spring 2023 on the contentious prices until 2016. Provided this decision is not challenged, this will also establish a stable basis for calculation of prices in the subsequent years.

1.2. Interconnect Peering

In Init7’s access case against Swisscom concerning free peering, ComCom rejected Init7’s application in July 2018 (for further information please refer to the 2018 ComCom Activity Report). ComCom had assumed that peering was subject to functioning competition. In its view, there were substitutes for IP interconnection with Swisscom at all times, and certain disciplinary effects were also present. Init7 appealed against this decision to the FAC.

The FAC upheld the central points of Init7's appeal, and referred it back to ComCom for a revised decision (FAC judgment of 22 April 2020, A-5235/2018; in German). With regard to the period from 2013 to January 2016, the FAC judged Swisscom to be a dominant undertaking in the sense of Article 4 paragraph 2 Cartel Act. It determined that cost-oriented prices should therefore be set for the peering requested by the appellant during this period. The question of market dominance was to be clarified for the time thereafter.

On behalf of ComCom, OFCOM reopened the case and is now pursuing what have become two-part proceedings:

- Annual cost evidence must be obtained from Swisscom for the 2013 to January 2016 period for which it was judged to be dominant. This was reviewed by OFCOM and will serve as a basis for ComCom's difficult price-setting task.
- For the period from February 2016 onwards, the first task was to clarify the issue of market dominance. To this end, OFCOM conducted a market survey in 2021 and then sought an expert opinion from the Competition Commission (COMCO), in accordance with Article 11a Telecommunications Act.

COMCO then issued its opinion on the matter of market dominance from 2016 on 25 October 2021. Under certain conditions, the COMCO also answered the question in the affirmative for the years from 2016 onwards (cf. the publication series RPW of the Competition Commission, 2022-1, p. 545).

OFCOM has continued with proceedings and pushed ahead with the complex background work to calculate an interconnection price for peering. ComCom expects to be able to make a decision in 2023.

1.3. Payment of interest on repayments

In February 2020 Sunrise UPC submitted an application concerning interest on repayments on the grounds of excessively high prices for access services. It requested that such interest should be based on the weighted average cost of capital (WACC) approach in future. The well-established previous system was for interest to be paid at the 12-month LIBOR in Swiss francs, plus a risk premium of 1.3%.

Having been instructed by OFCOM to consider the application, ComCom decided in June 2021 that the WACC was the appropriate rate at which interest on repayments should be paid (see ComCom website, decision of 24 June 2021). Swisscom lodged an appeal against ComCom's decision with the FAC.

On 19 December 2022, the FAC fully rejected Swisscom’s appeal. The court ruled that ComCom’s decision and the method of repayment selected complied with federal law. ComCom had exercised its discretion correctly by relying on the industry’s WACC method. This judgement cannot be referred to the Swiss Federal Supreme Court, which means it is final.

1.4. Colocation

A competitor of Swisscom lodged a new access case in October 2022. The case was based on the request rejected by Swisscom to install certain equipment, including batteries, at leased colocation sites. For safety reasons, Swisscom insisted on the batteries being located in separate rooms on its premises.

In relation to the forms of access set out and regulated under Article 11 TCA, in the event of disputes ComCom can, at the request of one party, decide not only on pricing, but also on the conditions of colocation. However, this does not apply to unregulated products.

In this case it quickly became apparent that the applicant’s case did not concern regulated access products. Instead it concerned a difference of opinion over commercial optical fibre connections not regulated by ComCom in Switzerland.

Regulated colocation only applies in conjunction with the forms of access provided for under Article 11 TCA. However, ComCom is not authorised to decide on which equipment providers may install and operate in the case of unregulated products. ComCom therefore rejected the case in February 2023.

2. LICENCES

Pursuant to the Telecommunications Act (TCA), ComCom grants radio communications licences for the provision of telecommunications services (Art. 22a TCA) and the universal service licence (Art. 14 TCA).

ComCom has permanently delegated to OFCOM the granting of those radio communications licences which are not in short supply, and which are therefore not the subject of a public tender procedure. These include licences for amateur radio operators or private companies' radio networks. Information concerning licences awarded by OFCOM can be found on the www.bakom.admin.ch website.

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

2.1. UNIVERSAL SERVICE

The universal service comprises a basic range of telecoms services of a good standard which must be offered throughout the country at an affordable price to all sections of the population. These services are intended to enable people in every part of Switzerland to participate in social and economic life. The universal service also includes special services that ensure that those with disabilities have various communications options.

The scope of the universal service is described in the Telecommunications Act (Art. 16 TCA). However, the Federal Council also periodically adapts its definition of a universal service to social and economic needs and to technological progress. The current content of the universal service (including price caps in some areas) is laid down in the Ordinance on Telecommunications Services (see Arts 15 and 22 OTS).

It is ComCom's task to grant the universal service licence by means of a public tender procedure, or by appointing a licensee directly. This licence was last awarded to Swisscom on 1 January 2018.

Universal service currently covers the following telecommunications services (Art. 15 OTS):

- A public telephony service enabling national and international telephone calls to be made (with one or three telephone numbers).
- An internet access service with a minimum transmission rate of 10 Mbps for download and 1 Mbps for upload (since 1 January 2020).
- An entry in the public telephone directory. Every household can request a second directory entry free of charge.
- Services for people with disabilities:
  - For the hearing impaired, a round-the-clock transcription service, which also covers emergency calls, and a text message intermediary service. Since 2018 there has also been a sign language interpreting service via video telephony at certain times.

- For the visually impaired and those with reduced mobility, there is a round-the-clock directory enquiries and operator service which ensures access to the directory data of customers of all providers, using the 1145 number.

The Federal Council also sets quality criteria for services under the universal licence (Art. 21 OTS) that the licensee must meet. As the market supervisory authority, OFCOM checks annually (on the basis of reports from Swisscom) whether the licensee is providing the universal service to the required standard. Swisscom once again met these quality criteria in full in 2022.

Amendments to universal service by the Federal Council

In December 2021, the Federal Council announced its intention to redefine the services to be covered in future by the telecom universal service in the OTS. In particular, it proposed increasing the speed of internet access for universal service to 80/8 Mbps. At the same time, the Federal Council initiated a public consultation procedure on the revision of the OTS. The results of the consultation procedure were published on OFCOM's website in April 2022.

ComCom also submitted a position statement as part of this procedure. It generally welcomed the Federal Council's intention to improve broadband coverage in poorly covered areas as soon as possible. However, increasing the speed of internet access in the universal service provision to 80/8 Mbps should only represent a first step towards a well-planned overall strategy to provide ultra-high-speed broadband throughout the whole of Switzerland. It has become clear that the provision of such services in peripheral regions to all households and businesses using modern optical fibre infrastructure can only be achieved with public financial support.

It should also be avoided that the speed of internet access in universal service – as in the recent years – is continually increased. The instrument of universal service designed in the 1990s for this purpose is not suitable.

ComCom called for the rapid definition of a high-speed broadband strategy by the Confederation and for a overhaul of universal service as part of the next TCA revision.

Extension of the current licence by one year

As it was foreseeable in early 2022 that this ordinance revision would take some time and because the current universal service licence was going to expire at the end of 2022, ComCom extended the licence by one year in May 2022. ComCom expects to award the new universal service licence in spring 2023.

On 16 December 2022, the Federal Council agreed to increase the minimum internet speed for universal service to 80 Mbps for download and to 8 Mbps for upload. This is unprecedented worldwide. However, this level of service only has to be provided where an alternative does not already exist on the market.

The existing telephone connection and internet access with 10/1 Mbps will remain part of universal service; however, a telephone connection with three numbers will no longer be part of it from 2024.

These amendments to the OTS will enter into force in January 2024 together with the newly awarded universal service licence.

2.2. Mobile radio communications licences

All available mobile frequencies were awarded anew in 2012. Seven years later, newly available frequencies in the 700 MHz, 1400 MHz and 3500 – 3800 MHz bands were auctioned for mobile radio communications use. Please refer to the activity reports for 2012 and 2019 for more information on these auctions. ComCom awarded these frequencies as technology-neutral. This means the operators can decide for themselves which internationally recognised technology to use for the frequencies.

The three Swiss mobile network operators have since each had two licences with different frequencies and terms:

- In 2012, all three licensees acquired the right to use frequencies in the 800 MHz, 900 MHz, 1800 MHz, 2100 MHz and 2600 MHz bands. The three licences run until the end of 2028.
- The licences awarded in 2019 contain frequencies from the 700 MHz, 1400 MHz and 3500 MHz bands; these licences expire at the end of 2034.

The three licensees each have a broad range of the different frequencies that are needed to operate a high-performance mobile telecommunications network with fast data transmission and practically unbroken national coverage.

The conditions of use stipulated in the licences require the licensees to serve at least 50% of the Swiss population with mobile communication services via their own infrastructures. All three network operators fulfil these conditions.

Definitive switch-off of second-generation mobile communications (GSM)

As mentioned above, the licence holders have a free choice of technology. Up to 2022 four very different systems were operated in parallel, from the outmoded and inefficient GSM (2G) and UMTS (3G) to LTE (4G) through to the much more efficient 5G.

The relatively energy and radiation-intensive GSM technology from the 1990s has no longer been used in Switzerland since early 2023: Salt decommissioned GSM in 2020, and Swisscom stopped using GSM in early 2021 before GSM was definitively consigned to the history books when Sunrise switched it off in early 2023.

2.3. DAB+ licence for French-speaking Switzerland awarded in 2019

Digital radio is playing a greater role: according to the ‘Digital Migration’ working group, digital radio usage in autumn 2022 stood at 77% in total, 41% of which was accounted for by DAB+ and 36% by radio via internet. The use of ultra-short wave (USW) is falling sharply. 53% of radio use in cars is currently via DAB+. In Switzerland, digital radio is set to replace analogue USW reception by 2024 at the latest (cf. press release of 10 February 2023 at www.bakom.admin.ch).

In OFCOM’s view, DAB+ has many benefits as a broadcast technology for radio programmes, both for listeners and broadcasters: DAB+ offers better sound quality, less disruption, lower costs, greater transmission areas and a wider range of programmes as up to 18 radio programmes can be broadcast per transmission frequency. Energy consumption is also lower overall with DAB+. A DAB+ radio receives

programmes almost everywhere via antenna and does not need an internet connection (cf. ‘Digital transmission’ on www.bakom.admin.ch).

In May 2019, ComCom awarded the company DABcom a new DAB+ licence for the French-speaking part of Switzerland after an award procedure using a criteria-based competition. Due to an appeal, the licence could only be used after the objection was rejected by the Federal Administrative Court (FAC) in April 2021 (for more information see the 2019 and 2021 Activity Reports).

ComCom took account of this delay by extending the term of the licence and its conditions of provision by two years. The licence holder began operation in September 2021 and is fulfilling the provision obligation under the licence.

3. INTERNATIONAL RELATIONS

The new Article 64 of the Telecommunications Act that entered into force in 2021 states that ComCom: "shall carry out the tasks within the scope of its responsibilities at an international level and shall represent Switzerland in the related international organisations".

ComCom is one of the founding members of the Independent Regulators Group (IRG), the association of European national telecommunications regulatory authorities to which independent telecoms regulators of all European countries now belong.

The member states of the European Union have also formed the Body of European Regulators for Electronic Communications (BEREC). While the IRG considers itself to be a platform for experience-sharing at the European and interdisciplinary level, BEREC is a body associated with the European Commission that is primarily engaged in harmonising telecommunications law and implementing European directives in the member states. BEREC maintains numerous expert groups that do the groundwork for regulatory decisions and legislative projects.

Since BEREC was set up, Switzerland has held observer status, which is renewed on an annual basis. Represented by OFCOM and ComCom, it also plays an active part in a variety of expert groups, thereby fostering exchange that benefits both sides. In 2022, BEREC once again allowed ComCom and OFCOM to participate in individual expert working groups.

4. OUTLOOK FOR 2023

In the interests of consumers, in 2023 ComCom will continue to ensure that the universal service obligation is fulfilled, market competition is encouraged, and the frequency spectrum is used efficiently. It will also continue to strive for investment-friendly framework conditions and technological innovation in the telecoms market.

ComCom will focus on the following activities in 2023:

1. **Universal service**: To guarantee universal service at all times, ComCom will hold a new award procedure for the universal service licence by early summer 2023 at the latest. The new licence will then enter into force with the new provisions in the revised OTS on 1 January 2024.
2. **Radio frequencies:** ComCom will track international developments in frequency usage, and continue to promote high-performance mobile communications provision that reaches as many people as possible with the most efficient technologies. ComCom does not plan to carry out any new frequency award procedures in 2023.
3. **Access cases:** OFCOM will take the lead with the instruction on pending proceedings. ComCom expects to be in a position to make various decisions on ongoing access cases within 2023.
4. **International relations:** ComCom and OFCOM will continue to contribute to the Independent Regulators Group (IRG) and to selected working groups under the aegis of the Body of European Regulators for Electronic Communications (BEREC). ComCom and OFCOM are in regular dialogue with the regulatory authorities of German-speaking countries, and should also organise a meeting of the French-speaking telecommunications regulation network (FRATEL) in Switzerland.

IV. FINANCES

Regulators from various infrastructure sectors report for administrative purposes to the Federal Department of the Environment, Transport, Energy and Communications (DETEC). Since 2012 ComCom has formed part of the Infrastructure Regulatory Authorities (RegInfra) administrative unit alongside the Federal Electricity Commission (ElCom), the Postal Services Commission (PostCom), the Rail Transport Commission (RailCom) and the Independent Complaints Authority for Radio and Television (ICA). DETEC's general secretariat provides services to RegInfra in various administrative areas. In particular, it supports ComCom with regard to budget and accounting. However, this does not compromise ComCom's abilities to conduct its activities independently.

ComCom collaborates very closely with OFCOM, which prepares most of ComCom's business and conducts the legal proceedings. Costs incurred by OFCOM for ComCom are also given below to permit an overview of the income and expenditure of the telecoms regulator.

OFCOM's costs in connection with its activities for ComCom totalled CHF 2.37 million in 2022.

On the income side, in 2022 OFCOM charged administration fees of CHF 200,000 and radiocommunications licence fees of CHF 197,855. Administrative fees connected with ongoing legal proceedings and invitations to tender can be billed only once the cases concerned are legally binding.

The Commission and its secretariat recorded expenses of CHF 1.018 million in 2022. ComCom thus closed its 2022 financial statements well under its budget of CHF 1.116 million. Information on RegInfra is published in the federal government's estimates and state financial statements; *cf. www.efv.admin.ch*).

ABBREVIATIONS

5G = Fifth generation mobile radio

ADSL = Asymmetric Digital Subscriber Line

OFCOM = Federal Office of Communications

BBCS = Broadband Connectivity Service (commercial wholesale offering from Swisscom)

BEREC = Body of European Regulators for Electronic Communications

FAC = Federal Administrative Court

CATV = Cable television

ComCom = Federal Communications Commission

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

DSL = Digital Subscriber Line

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

ESC = Energy supply companies

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

TSO = Telecommunications Services Ordinance (CC 784.101.1)

TCA = Telecommunications Act (CC 784.10)

FTTB = Fibre to the Building

FTTC = Fibre to the Cabinet

FTTH = Fibre to the Home

FTTS = Fibre to the Street

FWA = Fixed Wireless Access

G.fast = Gigabit fast access to subscriber terminals (technology for bandwidths up to 500 Mbps 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

IRG = Independent Regulatory Group

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

SMS = Short Message System

SVOD = Subscription Video on Demand

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

UMTS = Universal Mobile Telecommunications System (standard for third-generation mobile radio networks)

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

VDSL = Very-high-bit-rate DSL

VoD = Video on Demand

VoIP = Voice over IP

VoLTE = Voice over LTE

COMCO = Competition Commission

Wifi = Wireless Fidelity (wireless local area networks, WLAN)

WLAN = Wireless Local Area Network

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