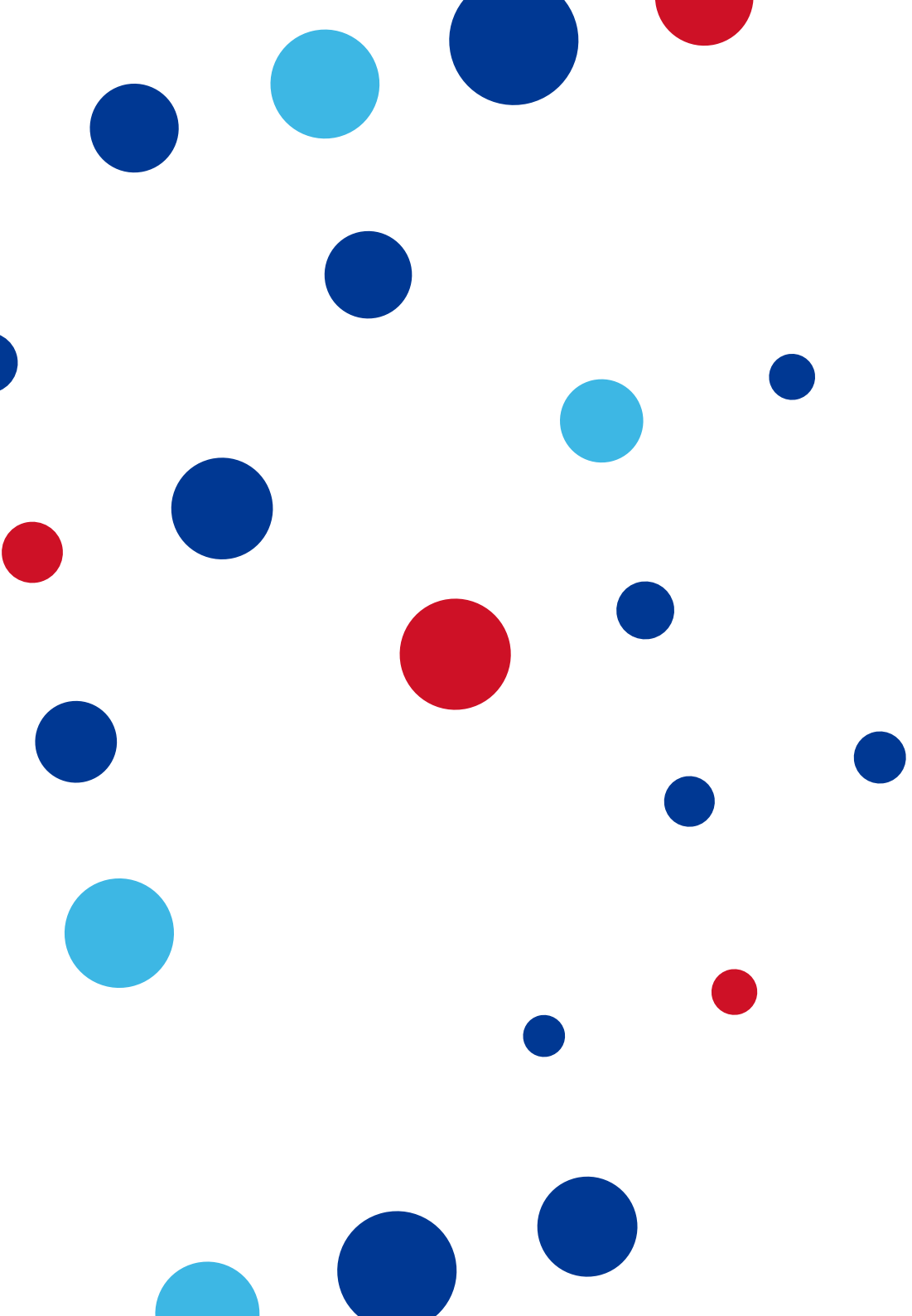
CZ DOMAIN REGISTRY

Annual Report 2018

1 Association Profile



CZ.NIC is an interest association of legal entities, an open and independent entity, whose long-term goal is to support the development of the Internet community both in the Czech Republic and abroad.

The core activity of the association is the administration and security of operation of the top-level national.CZ domain registry. The activity of the association in the field of security is also very important and proceeds both through the Czech CSIRT.CZ National Security Team and through security projects, particularly the Turris home router ecosystem.

In addition to these activities, the association is dedicated to research and development in the field of the Internet, Internet protocols or network traffic. Other activities include education and trainings in the Internet and new technologies domains.

The CZ.NIC association was established in May 1998 and the main reason for its establishment was the growth of the importance of the Internet and thus the number of its users and those interested in registering domain names in ccTLD .CZ. By the end of 2017, the association had 114 members, which are divided into three chambers.

The association is a stable and trustworthy entity capable of ensuring the reliable operation of the Czech national domain .CZ. Since 2013, CZ.NIC has been the holder of the ISO 27001 certificate confirming the safe handling of information, including the setting of appropriate rules and procedures.

For domain owners, registrars but also other entities that use the Internet for their work and leisure time, the association is a reliable partner that not only provides domain name management, but also safeguards Internet security and socially beneficial activities – whether in the form of laboratory projects or education.

2 Foreword from the Chairman of the Board of Directors

Ladies and Gentlemen,

Please, let me briefly introduce our annual report, as we do every year.

I am glad that, as in previous years, the Czech National Internet Domain functioned reliably in 2018 and that it served its users so well. Other services, which we operate mainly in the field of security, also functioned as expected. In addition, we managed to improve many of them during the year. I would like to mention, at least, the increase of the throughput of some of our DNS nodes to the capacity of 100 Gbps in order to make them more robust against DOS attacks and the preparation of the possibility of mojeID user validation at Czech POINT contact points. We also managed to develop and produce another model of a small secure router – the modular Turris MOX, which serves users in their networks and also in education at Charles University, with which our association concluded a memorandum on cooperation in network teaching.

In our strategy, we set out to run and develop a trusted, robust and secure Internet service infrastructure. I think that we can say, not just thanks to the above, that we have been successful in implementing this strategy.

Our association's income is generated mainly from fees for keeping a domain name record in the Central Registry for ccTLD .CZ and, to a large extent, also revenue from the provision of services (e.g. paid support for our Bird and Knot software projects, training sales) and sales of Turris routers. Funds obtained from the European Union are also significant and the Czech Republic's state budget (e.g., for projects such as CZ.PEPS, CEF Cyber Security, HaaS, MoQoS, PROKI, Safer Internet, DNS Health) as well.

The number of domains in the .CZ registry increased by about 1% last year. In some similar registries, the number of domains decreased. Due to the rapid wage growth in the Czech Republic in 2018 (which significantly outperformed the percentage growth in the number of domains, as well as the revenue growth of our services and products), the association decided, at the end of 2018, for the first time in its history, to increase the wholesale price for the yearly domain name record keeping, by CZK 20. This is probably not a popular measure, but the alternative was to prepare a loss-making budget for the next period or limit the number, quality or safety of our services.

I would like to thank the association's management and its employees for their work throughout 2018. Thanks to them, we can look back on the excellent results achieved by the association. We managed to meet the financial plan and the very demanding internal plan of activities.

All relevant information on the association and its activities in 2018 can be found in this Annual Report. I firmly believe that we will continue to be a trusted, reliable and transparent partner for all.

RNDr. Karel Taft, MBA – Chairman of the Board of Directors

3 Foreword from the CEO

Ladies and Gentlemen,

In the preface to the Annual Report for 2017, I informed you about the launch of a massive upgrade of our infrastructure. In 2018, of course, this project continued, and in addition to a number of improvements and enhancements to our network, we launched a second DNS node, which operates at 100 Gbps. Of course, such a sharp increase in capacity did not escape attention abroad. Thanks to our experience in programming, DNS software and managing these two 100Gbps nodes, we have been selected by the administrator of the Canadian CIRA domain as the operator of the European part of its Anycast DNS. Canada's domain contains approximately twice as many registrations as ours.

And the good news about the domain does not stop there. CZ.NIC has long been a populariser of DNSSEC technology. We signed the .CZ domain with this technology as the fourth in the world, changing the signing algorithm first, and in 2018 we changed the signing algorithm again. This time, we were the first in the world to introduce elliptic curve-based cryptography (ECDSA) signing.

The mojeID electronic identification system has long been an integral part of our FRED registry. Thanks to the development of this service and participation in European and national projects, our association has considerable know-how in this area. As a result, we won a tender to manage the core registry for operating the national eIDAS node, which we successfully launched at the end of September.

Our efforts to increase the level of security did not end with the construction of DNS nodes. Our CSIRT.CZ security team also made a very important step, i.e. they received the status of "certified" within the TF-CSIRT security team international organisation, which is the highest level that a security team can achieve.

We also worked very intensively on the Turris project. Last year we introduced the brand-new modular concept, Turris MOX, and again tried to test the interest in this product through a crowdfunding campaign. This time we managed to collect over USD 370 thousand, which is less than in the Turris Omnia campaign, but it is still one of the most successful campaigns in the Czech Republic.

Lastly, I would like to mention the establishment of the CSNOG conference of Czech and Slovak network administrators. We organised this conference, together with the NIX.CZ Association in Brno. Almost 130 members from many European countries and the United States attended the first annual event.

I firmly believe that it is clear from my preface that the 20th year of our association can be considered successful. I would like to thank my colleagues for this.

I wish you a pleasant reading of this Annual Report.

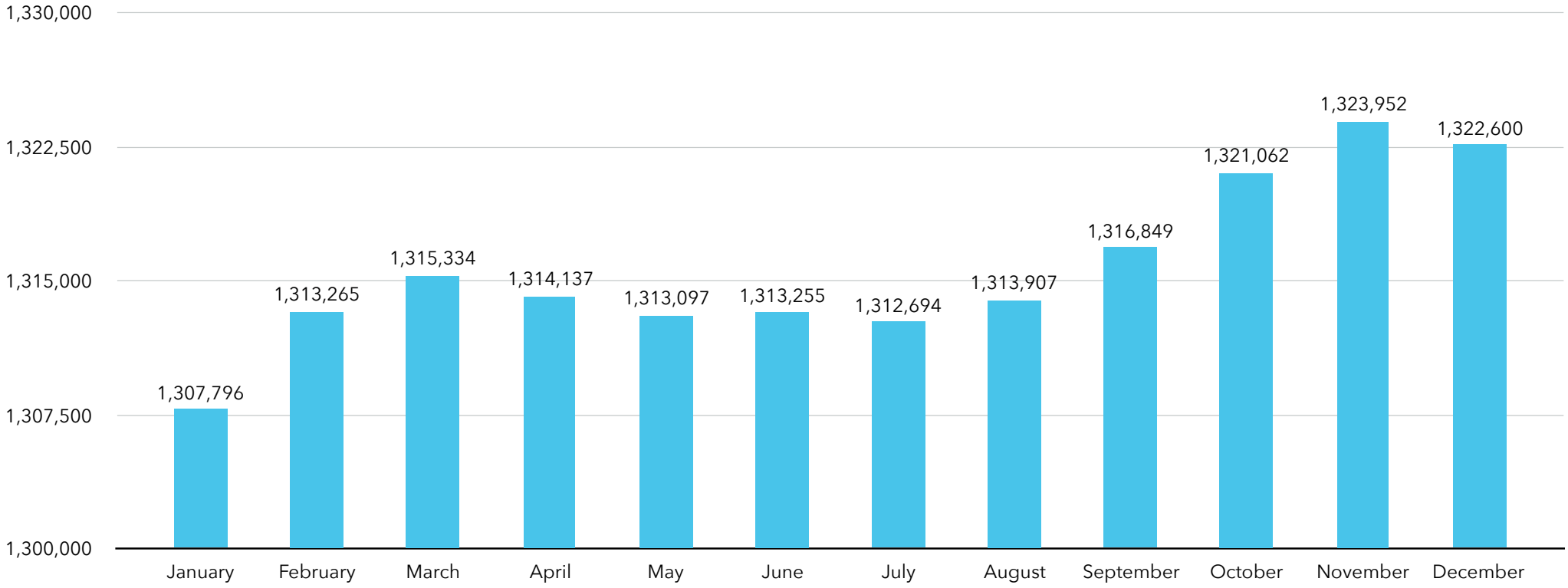
Mgr. Ondřej Filip, MBA – CEO

4 The .CZ domain

4.1 Registration status and trends

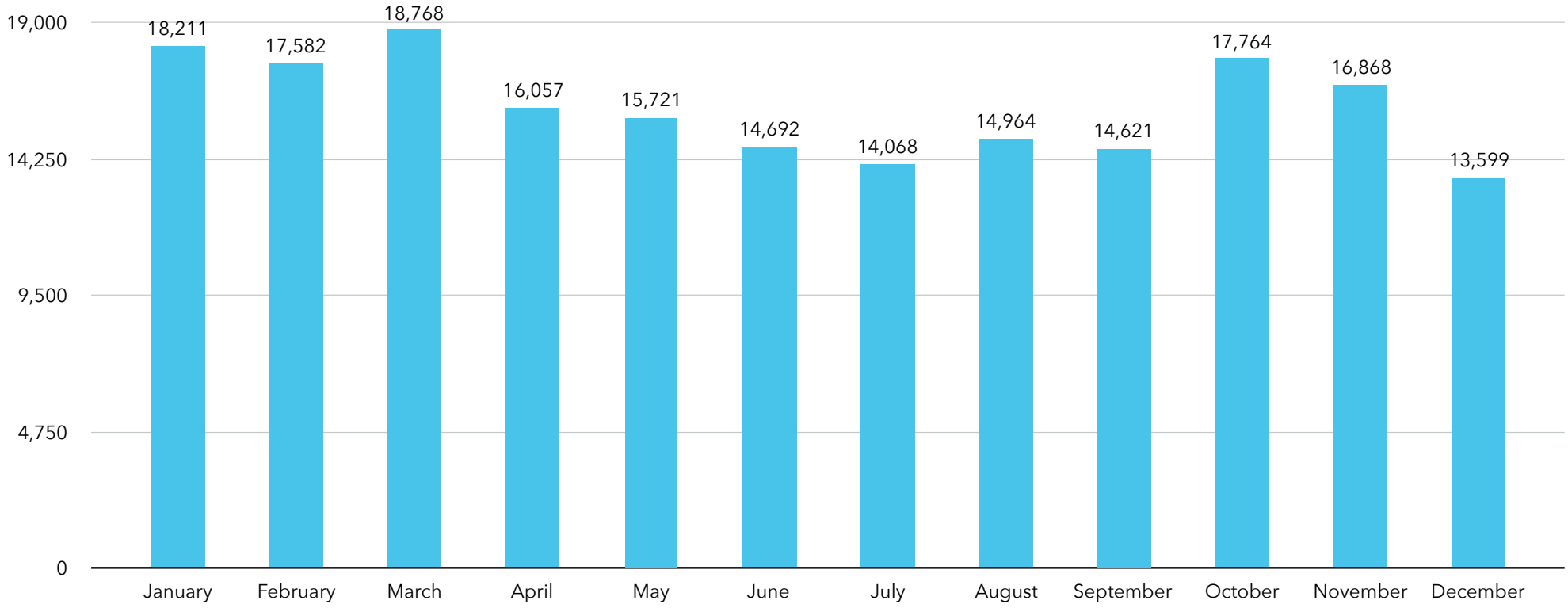
Throughout 2018, the total number of domains in the .CZ zone rose by 16,780, which constitutes growth by only 1%. The Czech national domain .CZ, therefore, reflects a trend that is being experienced by almost all national registries: a falling tendency of national domain registrations (ccTLD), caused mostly by market saturation and also partly by new alternatives for domain name registration through new, generic domains (new gTLD).

Total number of registered .CZ domain names in 2018

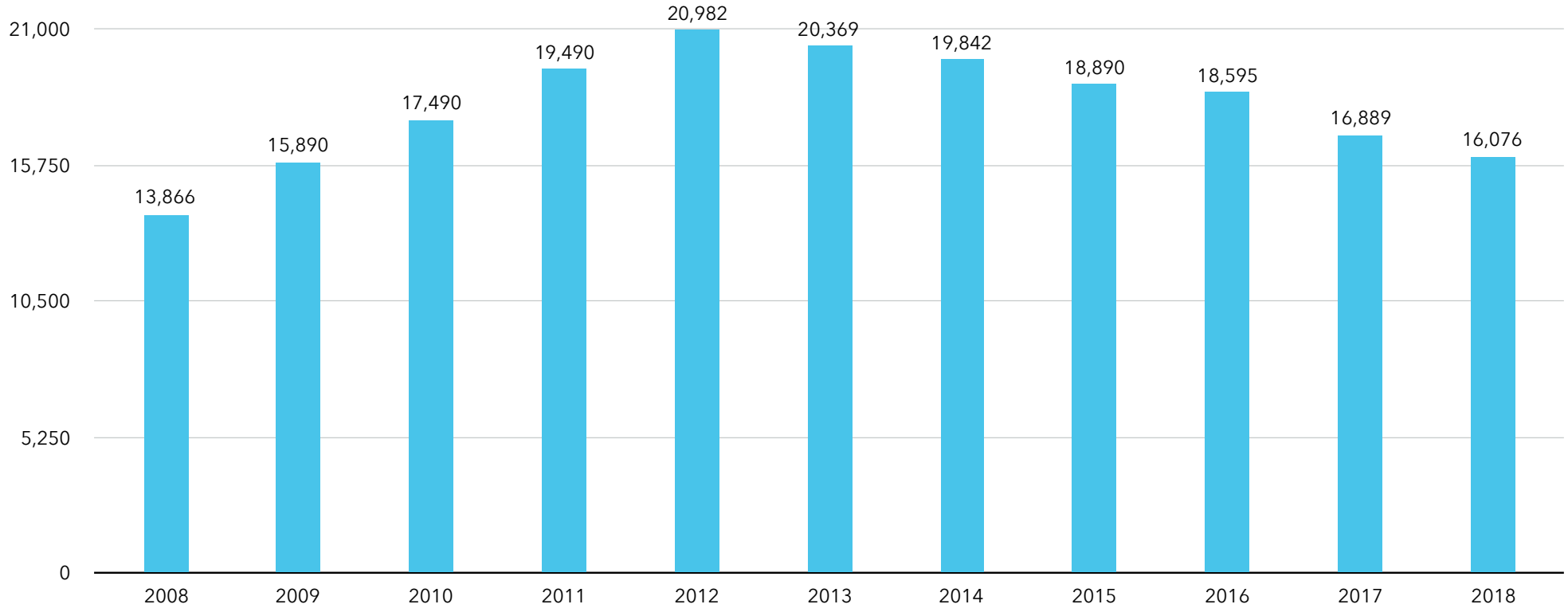


In 2018, an average of 16,076 new domain names were registered every month. Like in the past period, this slight drop in the average number of registrations reflected the trend of global growth in new domains. The following charts show the number of new registrations in 2018 by month and the development of the average rate of new registrations since 2008.

Number of newly registered .CZ domain names in 2018



New registrations 2008–2018 (monthly average)

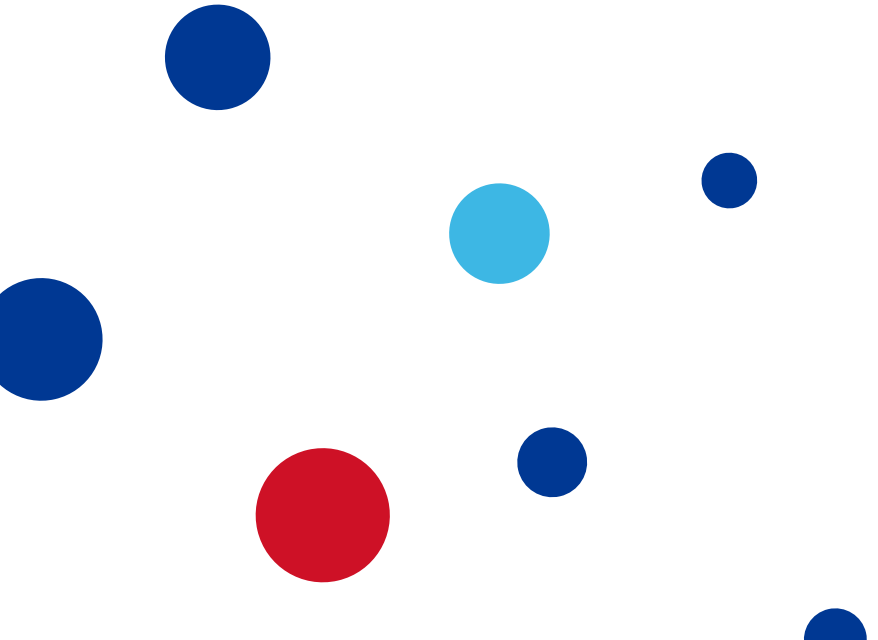


4.2 Registrars

The system of .CZ domain administration is based on a distributed principle in which the registration of domain names is carried out by contractual partners of the CZ.NIC Association – registrars. CZ.NIC acts as their wholesale partner that is responsible for the technical operation of the .CZ top-level domain.

In 2018, registrars Above.com Pty Ltd and SAS DomRaider terminated their contracts and Seznam.cz a.s. became a new registrar.

At the end of the year, a total of 43 companies, 27 domestic and 16 foreign, concluded a registrar contract with the association. This number offers a wide choice for the end user and also provides sufficient competition.



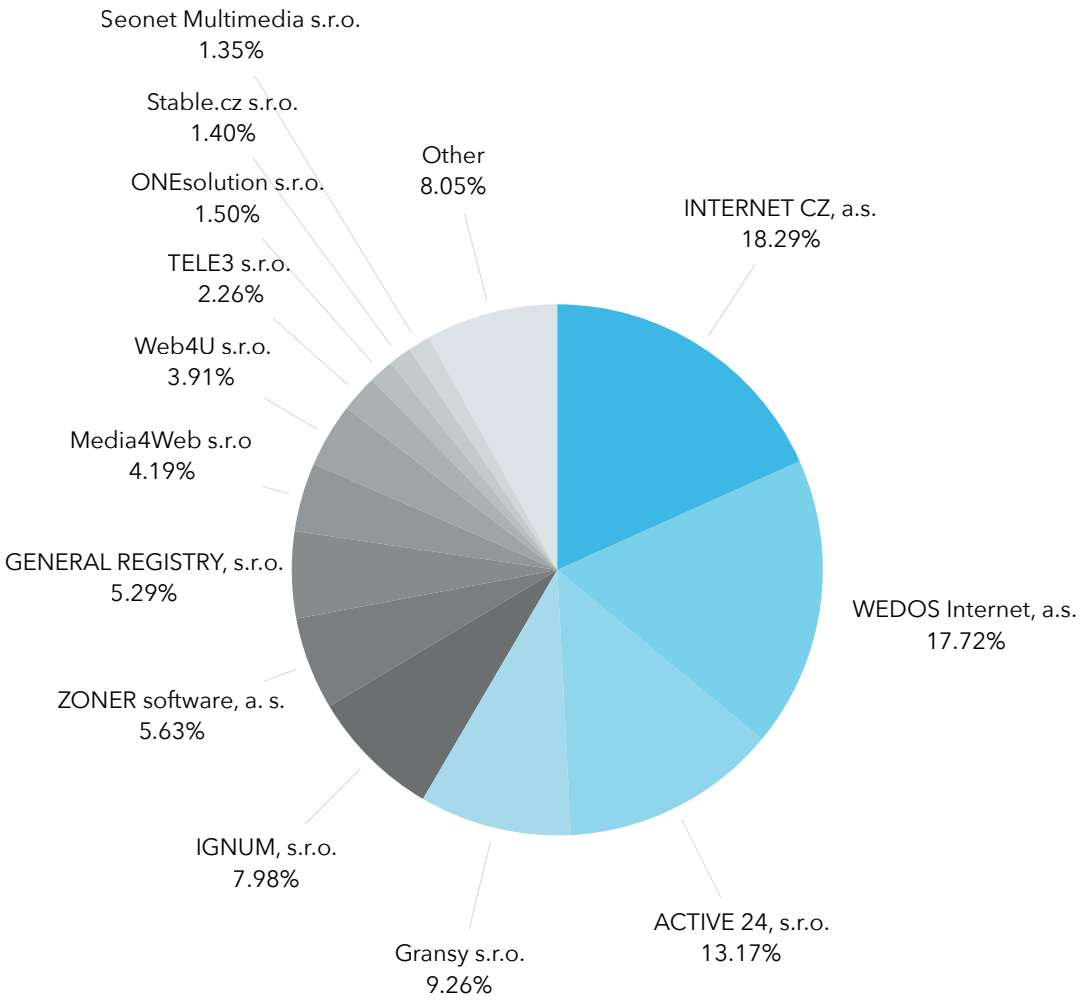
4.2.1 List of .CZ domain name registrars

List of all accredited registrars as of the 31 December 2018

1API GmbH
ACTIVE 24, s.r.o.
AERO Trip PRO s.r.o.
Ascio Technologies inc.
ASPone, s.r.o.
e-BAAN Net s.r.o.
Economia, a.s.
CORE ASSOCIATION
O2 Czech Republic a.s.
Dial Telecom, a.s.
Gandi SAS
GENERAL REGISTRY, s.r.o.
Gransy s.r.o.
IGNUM, s.r.o.
Instra Corporation Pty Ltd
INTERNET CZ, a.s.
InterNetX GmbH
IP Mirror Pte Ltd
Key-Systems GmbH
KRAXNET s.r.o.
MarkMonitor Inc.
Media4Web s.r.o.
MIRAMO spol. s r.o.
nexum Trilog a.s.
Com Laude
ONE.CZ s.r.o.
ONEsolution s.r.o.
OVH, Sas
PIPNI s.r.o.
Safenames Ltd.
Seonet Multimedia s.r.o.
Seznam.cz, a.s.
Sonexo B.V.
Stable.cz s.r.o.
TELE3 s.r.o.
TERMS a.s.
united-domains AG
Variomedia AG
Web4U s.r.o.
Websupport, s.r.o.
WEDOS Internet, a.s.
ProfiHOSTING s.r.o.
ZONER software, a.s.

4.2.2 Most important .CZ domain name registrars

The major registrar, according to the number of administered domains, was the same as last year: INTERNET.CZ, a.s., followed by WEDOS Internet, a.s., ACTIVE 24, s.r.o., Gransy s.r.o. and IGNUM, s.r.o. An overview of registrars with a market share above 1% is shown in the following chart.



4.2.3 Registrar certification

Launched as early as the middle of 2011, the certification project makes it easier for end users (i.e. parties interested in a new registration, as well as existing domain name holders) to find their way amongst the high number of registrars, particularly regarding portfolio and service quality. The certification method was prepared in collaboration with registrars and APEK (Association for Electronic Commerce).

Registrars who participate in the programme can always receive the "Certified Registrar" logo for one year. From the initial 9 registrars involved in voluntary certification in 2011, the number rose to 12. The end customer can, hence, enjoy the constantly improving quality of services offered. At the end of 2018, it was the 9 registrars that met the most demanding criteria for the award of five stars. There is also no longer a registrar among the certified registrars with only three stars. The service quality of registrars, reflected by the number of stars, is shown in the following chart.

	2011	2012	2013	2014	2015	2016	2017	2018
*****	3	6	8	9	10	10	9	**9**
****	3	5	4	3	2	2	3	**3**
***	2	1						
**	1							

4.2.4 Cooperation with registrars – co-marketing scheme

In accordance with its main activities and long-term objectives, the CZ.NIC Association wants to promote and support domain registration under the top-level .CZ domain. Given the distributed administration method of the national domain, the CZ.NIC Association has limited options on how to address potential domain name holders through direct marketing.

This fact gave birth to the co-marketing scheme, which CZ.NIC contributes to registrars' (provided that they have fulfilled applicable requirements) communication campaigns, promoting domain name registrations in ccTLD .CZ. The amount of contribution from CZ.NIC depends on the registrar size, campaign volume and compliance with other factors, such as the use of mojeID or domain security through DNSSEC, all of which are used by CZ.NIC to motivate the registrars to expand these technologies.

The popularity of the co-marketing scheme, thanks to the .CZ Czech national domain being popular among users, and clearly and frequently visible (e.g., on outdoor advertisement surfaces), is still high in terms of the number of registrars involved and the volume of funding. In 2018, the scheme was attended by 13 registrars to which CZ.NIC paid a record amount of more than CZK 11,000,000.

4.3 Registry data improvement

Quality improvements of data maintained in the domain name holder registry continued in 2018 when, like in the previous year, the aim was to merge multiple duplicate contacts that have been accumulating in the database over the years. Also, user data was verified to improve security, correctness and, hence, make it easier for CZ.NIC to contact the holder, e.g., when there was a risk that the domain would be cancelled due to an outstanding payment on the registration fee. Domain name holders were motivated to update and verify their data – a small reward (promotional item of CZ.NIC) was offered to them.

4.3.1 Disputes about domain names in ccTLD .CZ

Given that the average duration of litigation before a general court is about 3 years, and only if there are no complications (which may not look so bad but still it is quite a long time (not only) for the Internet environment), the association tried to find an alternative solution for resolving domain name-related disputes that is fast, stable and trustworthy. Therefore, the Alternative Dispute Resolution (ADR) system has been in use since the summer of 2004. Until 2015, it took the form of arbitration, where it was possible to file a dispute concerning the domain name against its holder with the Arbitration Court, which is attached to the Czech Chamber of Commerce and the Agrarian Chamber of the Czech Republic.

The Arbitration Court considered over one hundred disputes during the ten years of existence of this alternative dispute solving method.

However, following a decision by the Supreme Court at the end of 2013, there was a change. In March 2015 a new ADR method was introduced, the basic principles of which are identical to those that have been and continue to be used successfully in disputes over generic TLDs (UDRP) or domain names registered in the .EU top-level domain. On the basis of a memorandum, the platform where the disputes are conducted is still administered by a trustworthy entity, i.e. the Arbitration Court attached to the Czech Chamber of Commerce and the Agrarian Chamber of the Czech Republic, which is one of the three permanent arbitration courts that exists in the Czech Republic. It enjoys considerable authority and an indisputable advantage. Especially in the case of domain name disputes, it is one of the few courts to offer online proceedings.

However, the ADR system used since 2015 is not an arbitration process that complies with the arbitration law and this is also reflected in the terminology used. The system is based on contractual arrangements and only a domain name transfer or cancellation (no other claims, such as damage compensation) can be claimed. The decision is not an execution title for the judgement and a dispute pending, according to the new ADR system. It does not obstruct lis pendens (i.e. proceedings pending in the same matter) and an ended dispute does not obstruct decided matters. The same claims can be, therefore, forwarded to a general court during the proceedings or afterwards.

The year 2015, when the new ADR was introduced, was very cautious in terms of use, but the following years show that this method of dispute resolution has been accepted:

Year	Number of disputes initiated in ADR
2015	7
2016	20
2017	22
2018	**22**

Of general courts, the Municipal Court in Prague most often decides on disputes over domain names, especially in view of the fact that it is a specialised court for, inter alia, competition and intellectual property disputes, which are the most frequently violated rights in the case of domain disputes.

4.3.2 Customer support

24/7 customer support is an integral part in securely operating the .CZ domain. The objective of customer support is to provide the best possible care to domain name holders, particularly in situations where a domain registration is to be cancelled or transferred, or where contact details change. Assistance for mojeID service users and their validation is also an integral part of customer support.

In the relationship with domain holders, customer support is based on a proactive approach, the aim of which is to prevent domain name de-registration or expiry due to obsolete contact details or forgotten payment. Given the distributed .CZ domain administration system, customer support is the only case where the CZ.NIC association is in direct contact with domain name holders.

In addition to standard e-mails that are sent to customers automatically by the domain registration system, notifying them, in particular, of the non-payment of the renewal fee, our customer support manually reviewed more than 300,000 domains prior to exclusion or contacted by phone (which was discontinued at the end of 2017) or via SMS (the service was introduced gradually in the second half of 2017) almost 100,000 holders at risk of cancelling their domain names.

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Manual check of domain names before exclusion	-	8,916	15,176	18,586	21,598	20,512	20,894	21,834	**21,437**
Manual check of domain names before cancellation	-	4,314	11,061	14,378	16,666	16,041	16,529	16,864	**17,000**
Calls to holders (contacts) of domain names scheduled for cancellation	4,263	4,314	4,767	6,690	7,808	7,367	7,826	7,573	**790**
SMS – information about upcoming domain name cancellation	-	-	-	-	-	-	-	8,139*	**8,948**
E-mails sent before exclusion	1,201	1,429	1,708	1,716	1,915	1,718	1,849	3,157	**2,826**
Responses to e-mail inquiries	828	1,240	1,746	1,945	2,782	3,015	2,074	2,319	**2,080**
Responses to telephone inquiries	561	1,063	1,120	1,242	1,416	1,262	1,227	994	**774**
Requests (validation, blocking…)	145	180	248	315	455	405	701	776	**559**

The data represents the average number of given tasks per month (* monthly average of sent SMS in the second half of 2017)

5 Infrastructure

5.1 Technical aspects of domain administration

The DSDng central registry system was designed to be fully redundant. All hardware and software is located in three mutually independent locations:

- The TOWER data centre of České Radiokomunikace in Prague 3,
- Telehouse CE Colo in Prague 10 and
- A non-public location outside Prague.

All locations have their own Internet connection and also a connection to the power grid. The TOWER data centre is connected to the distribution network from three independent transformer stations, the Telehouse CE Colo and the location outside Prague are supplied from two transformer stations. A back-up power supply is available in all data centres via UPS and possible longer outages are bridged by power from diesel generators.

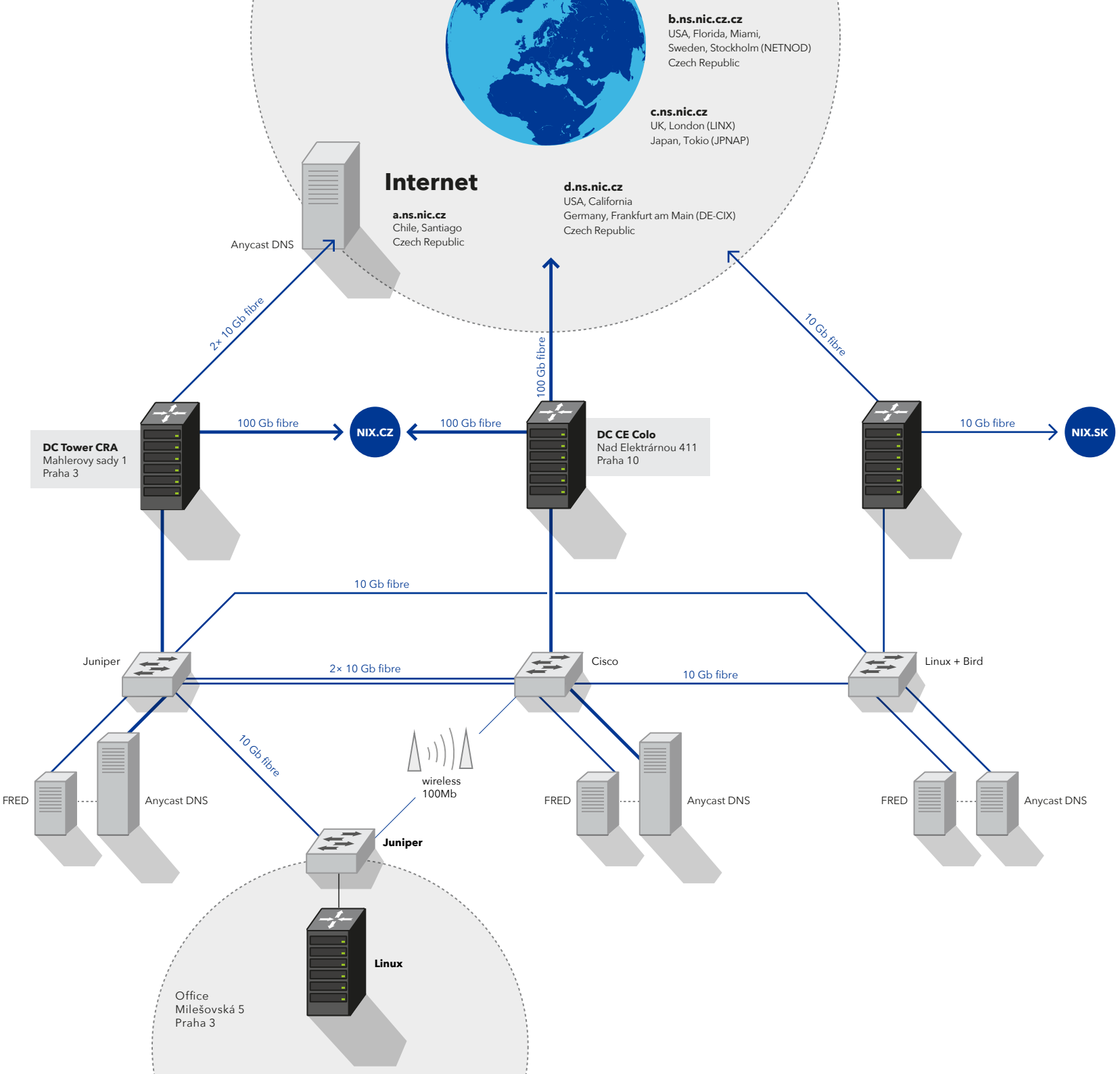
The system is built as a fully heterogeneous system – any defect of any hardware manufacturer must not bring down the central registry. Therefore, technologies from different suppliers are installed in every location. The same approach applies to authoritative DNS (Domain Name System) servers, operating on even three different systems (KNOT, Bind and NSD).

The actual software of the central registry is designed in a way that ensures that any component of the architecture can be replaced by any copy that runs on the server in the other locations, at any time. A critical component is the PostgreSQL database, which is always being replicated to both of the other locations during standard operation. When the primary location is down, traffic can be redirected to the replicated database without any limitation or impact on functionality. Back-up systems are designed and operated in a way as to make it possible for any components to take over the operation of the registry within a very short period of time in the event of an outage.

The central registry system is prepared for operation on IPv4 and IPv6 and its current implementation for the .CZ domain (as well as all DNS servers) is operated on both these protocols.

In 2018, the KSK algorithm for .CZ was changed to ECDSA, the FRED system modularity was increased by earmarking the payment module, the build system was changed from Autotools to Cmake, the registry interface was optimised, the transition to the new C++14 standard was completed, the refactoring of the part sending poll messages and auth-info took place and the mail archive operation was streamlined. Work continued to increase the level of automation of EPP tests and the unification of public testing environments was completed. There was a greater intervention in the FRED system and, hence, the .CZ registry was to comply with GDPR requirements, which led to the data hiding policy change to “hidden by default”. Disclose flags are newly adjustable to make the FRED system easy to use worldwide.

The FRED system has been very popular for a long time with its documentation, which was further expanded in 2018, especially according to the preferences of foreign users, namely by the life cycle description of objects, communication via poll messages and e-mails and technical tests. Thanks to this extended documentation, technical communication rules could also be streamlined. In order to increase the efficiency of the helpdesk work and also to further increase the attractiveness of the FRED system abroad, the development of a new web application that allows data management in the registry has begun.


b.ns.nic.cz.cz
USA, Florida, Miami,
Sweden, Stockholm (NETNOD)
Czech Republic
c.ns.nic.cz
UK, London (LINX)
Japan, Tokio (JPNAP)
Internet
d.ns.nic.cz
USA, California
Germany, Frankfurt am Main (DE-CIX)
Czech Republic
a.ns.nic.cz
Chile, Santiago
Czech Republic
Anycast DNS
2× 10 Gb fibre
100 Gb fibre
10 Gb fibre
DC Tower CRA
Mahlerovy sady 1
Praha 3
100 Gb fibre
NIX.CZ
100 Gb fibre
DC CE Colo
Nad Elektrárnou 411
Praha 10
10 Gb fibre
NIX.SK
10 Gb fibre
Juniper
2× 10 Gb fibre
Cisco
10 Gb fibre
Linux + Bird
10 Gb fibre
wireless
100Mb
FRED
Anycast DNS
FRED
Anycast DNS
FRED
Anycast DNS
Juniper
Linux
Office
Milešovská 5
Praha 3

FRED (Free Registry for ENUM and Domains)

The central registry software developed and operated by the CZ.NIC Association was made available as open-source to support smaller registries. This way, smaller and newly-started registries can operate their domains on the system, designed for the Czech domain environment and prepared (thanks to its parameters and capacity) for a much higher number of domain names than currently registered in ccTLD .CZ.

Besides the Czech Republic, this system controlled the domain administration in eleven more countries in 2018. It is used to administer the domains of Argentina (.AR), Costa Rica (.CR), Albania (.AL), North Macedonia (.MK), Faroe Islands (.FO), Tanzania (.TZ), Angola (.IT.AO and .CO.AO), Toga (.TG), Malawi (.MW), Lesotho (.LS) and Macao (.MO). The deployment in Argentina, with over 500,000 domains, is the second largest instance of FRED.

In 2018, CZ.NIC started offering commercial support for the operation and implementation of the FRED system for other TLDs, but it has not been used yet.

Authoritative DNS server system for .CZ

The .CZ domain management servers are operated by CZ.NIC in several locations around the world. In addition to the three locations in the Czech Republic mentioned in chapter 5.1 Technical aspects of domain administration, others include Sweden (Stockholm), Austria (Vienna), United Kingdom (London), Germany (Frankfurt), Chile (Santiago de Chile), the United States (Redwood City and Culpeper) and Japan (Tokyo).

DNS infrastructure upgrade

In 2018, CZ.NIC completed the major part of the project by implementing a significant upgrade of the Anycast DNS infrastructure. The main motivation of the project was to increase the resistance of the .CZ DNS infrastructure against DoS attacks and to cover the needs of the continuous growth of normal traffic. The theoretical maximum traffic that the DNS infrastructure had before the upgrade was about 20 million queries per second (QPS) and about 60 Gbps of traffic. Now the .CZ DNS infrastructure is capable of handling 100 million queries per second at data rates of more than 300 Gbps. In 2018, the planned part of the DC CeColo upgrade was carried out. By launching a new robust DNS stack with a powerful hardware router and thirty DNS servers, and connecting it via a 100 Gbps connection to the NIX.CZ node and transit connectivity, the planned DNS infrastructure performance parameters were achieved. Along with significantly strengthening the DNS infrastructure for locations in the Czech Republic, the locations in London, Frankfurt and Vienna were also upgraded.

The project will continue in 2019 by upgrading other foreign locations.

For major Internet service providers, CZ.NIC operates mirrors of .CZ Anycast DNS nodes, called ISP DNS Stacks, in the networks of those providers. The main advantage of this service is the full availability of services in the .CZ domain in the case of an attack against DNS servers of CZ.NIC. Customers of companies with the ISP DNS Stack will not be affected by any attack and the Internet services in the .CZ domain will remain fully available to them. Another advantage is the acceleration of their responses in the provider's network with the ISP DNS Stack. The first companies to join the CZ.NIC Association in this activity are Seznam.cz and Vodafone Czech Republic. Negotiations with others continue.

Utilisation of .CZ DNS infrastructure

In 2018, the CZ.NIC Association agreed on commercial cooperation with the Canadian organisation CIRA (*Canadian Internet Registration Authority*), consisting in the operation of part of the secondary DNS servers of the .CA domain. The CZ.NIC Association, thus, entered a narrow group of trusted providers with which CIRA cooperates on the administration of the Canadian national domain. The Canadian registry counts about 2.7 million domains and is, therefore, approximately twice the size of the Czech one. From a technical point of view, it shares the capacity of DNS servers that are primarily intended for the .CZ domain with another entity. This capacity is, due to significant upgrades in the last two years, dimensioned many times higher than the real utilisation, and therefore, it is useful and beneficial to use it for other projects as well.

5.2 Internet infrastructure support

5.2.1 Support of IPv6

IP addresses are the basic building element of the Internet. Without IP addresses, it is not possible to connect to the global network, which also prevents mutual recognition and interconnecting computers. The current space of IP addresses of the version 4 (IPv4) Internet protocol has almost been exhausted. The new, version IPv6 Internet protocol is the response to the lack of IPv4 addresses, as it offers a much bigger bank of addresses and also new options.

The long-term goals of the association include supporting the deployment of this technology at all levels, i.e. content, networks and end devices. CZ.NIC also cooperates with registrars, who often provide webhosting, so it can seek support for IPv6 on the side of web, e-mail and DNS servers. The association also participates in promoting IPv6 in the state administration.

Thanks to these activities, IPv6 has been enjoying growing support in the Czech Republic and, according to independent surveys our country, belongs among the world powers in IPv6 introduction.

Support of IPv6 within the Czech national domain (percentage)

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Web servers	5.19	9.48	15.06	19.46	23.33	25.95	29.28	30.33	**31.66**
DNS servers	20.31	45.90	51.27	55.11	60.71	59.16	73.40	74.04	**75.70**
Mail servers	8.61	8.70	13.15	15.22	16.08	16.15	17.31	18.58	**19.70**

As IPv6 support grows, in 2018 CZ.NIC proceeded to reduce IPv6 tunnelling by using the Teredo relay router. Promotion of Teredo prefix 2001::/32 takes place only to peering nodes NIX.CZ and NIX.SK.

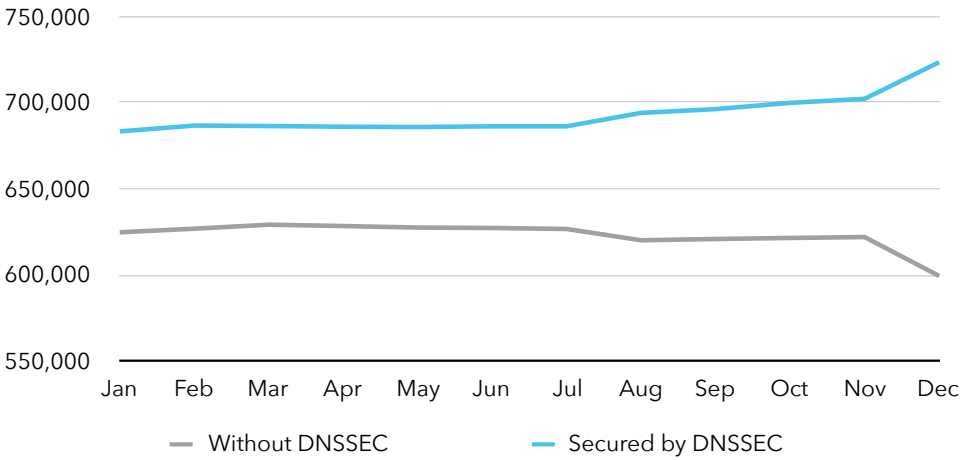
5.2.2 Support of DNSSEC

DNSSEC is an extension of the domain name system (DNS), which increases its security. The DNSSEC technology gives the users the certainty that the information they obtained from DNS was provided from a correct source, that it is complete and that its integrity was not compromised during the transfer.

The DNSSEC technology has been available since 2008 within the Czech national domain .CZ. The number of such secured domains has grown steadily since then, and cooperation with registrars also contributes to this. At the end of 2018, the DNSSEC support rate for .CZ exceeded 54%. Most signed domains can only be found in .NO, .NL, and then in .CZ domains among ccTLDs. With its share of signed domains, the Czech Republic clearly ranks among world leaders.

Share of .CZ domains secured through DNSSEC (percentage)

2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
0.01	0.23	14.74	34.07	37.70	37.12	38.57	38.77	51.83	52.33	**54.68**



Besides support from registrars, DNSSEC has been gradually introduced among main Internet connectivity providers in the Czech Republic, which has made this system fully functional for the majority of standard Internet users.

In 2018, the CZ.NIC Association was the first in the world to replace the KSK key, which is used to secure the .CZ domain by DNSSEC with the new ECDSA key that is based on elliptical curve technology. This update offers the .CZ domain a higher level of security and makes it less attractive for attackers using the DNS system for DDoS attacks.

The high support for DNSSEC for the .CZ domain is, among other things, aided by the support of the DNSSEC key automation management, which CZ.NIC introduced in 2017 as the first in the world. This was made possible by introducing support for the new RFC 7344 and RFC 8078 standards in the FRED domain administration system. These standards are available to administrators of all TLDs that use FRED. In 2018 they could implement support for automated DNNSEC key management in, for example, Costa Rica in the .CR domain. Administrators of authoritative DNS servers will then be helped to implement this simplification via KNOT DNS, which is also compatible with these standards. DNSSEC can now be easily deployed for those domains where it was not previously possible (e.g., for domains that the DNSSEC registrar does not support), or for domains that are administered by someone other than the registrar. However, this technology is also interesting for registrars. In December, one of the registrars used it to secure 18,000 domains (also shown in the chart above).

5.3 Support of basic Internet infrastructure

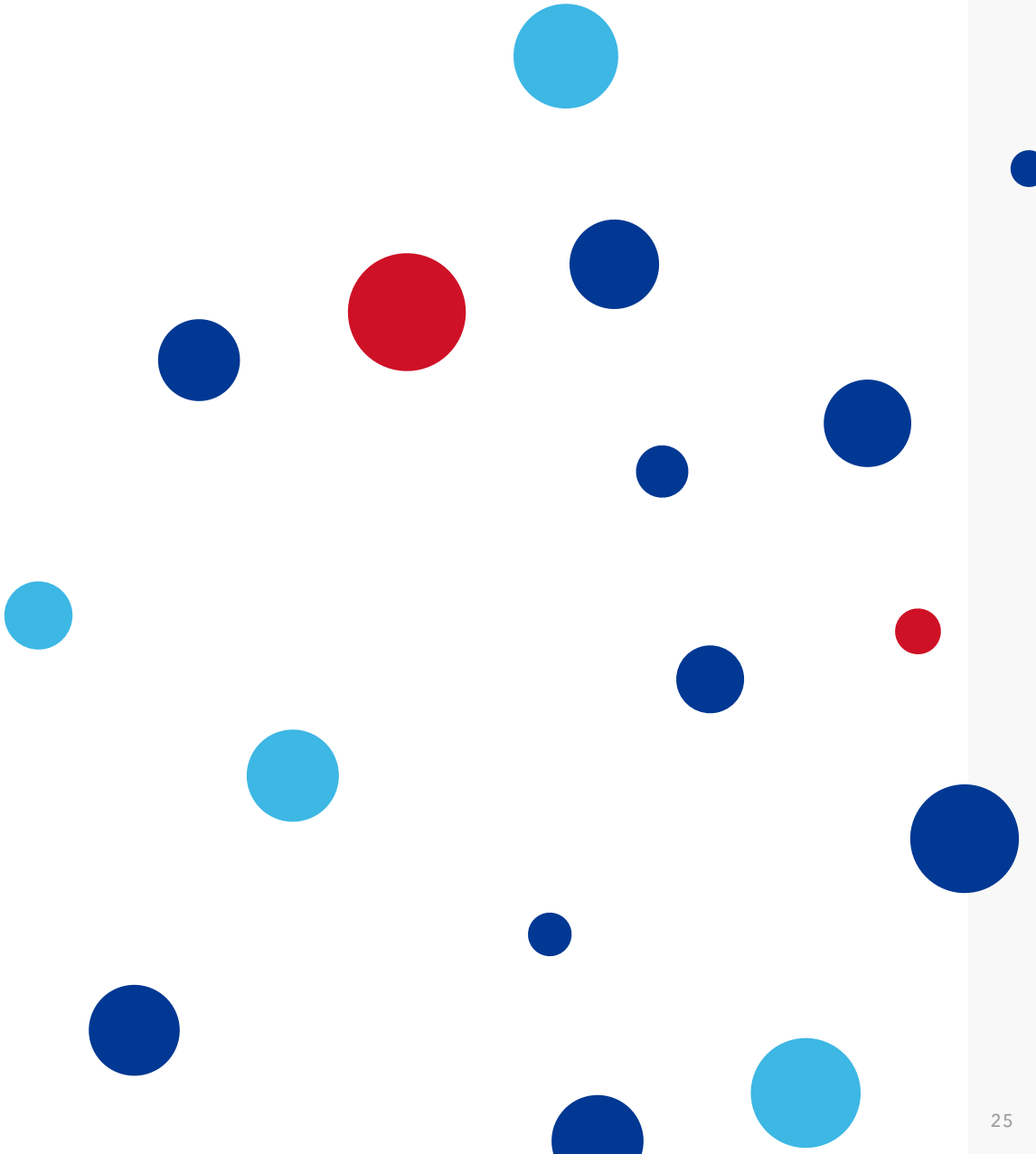
The CZ.NIC Association continued to operate mirrors on root servers F, K and L. Therefore, CZ.NIC it runs mirrors on three of a total of thirteen root name servers that are the basis of the Internet domain names system (DNS). Their operation improves, not only the security and stability of the root server system on a global scale, but also their availability in the European region.

Besides these root servers, the association uses its infrastructure to support growing registries through secondary name servers for their ccTLD. Angola, Tanzania and North Macedonia are using this option for the administration of their national domains.

Hosting the websites of some NGOs (e.g. the popular Ubunt Linux distribution) is another form of support for the local Internet community.

CZ.NIC is also actively involved in the RIPE Atlas Global Monitoring Network project. As one of the first organisations to support this project, CZ.NIC hosted fixed monitoring points called the RIPE Atlas Anchor.

One of the key operating conditions of many computer systems is correct time synchronisation. Systems connected to the Internet for this purpose use the NTP Internet Protocol. CZ.NIC hosts a public top-level NTP server (stratum 1) controlled by GPS and fitted with a high-quality oscillator of the OCXO DHQ type.



6 The CSIRT security team

The growing importance of the Internet, and the rising number of its users, is connected with an increasing number of security incidents (misuse of PC, a network element or network for an illegal purpose, e.g. spam, copyright breach, phishing, tapping of confidential data) and the severity has been growing as well. This creates an acute need for creating efficient protection against these attacks and giving it a formal shape. CSIRT teams (Computer Security Incident Response Teams) are created for this purpose. CZ.NIC, an entity with long-standing experience with Internet infrastructure projects, engages security teams on the national and academic levels. The association also has its own CZ.NIC-CSIRT team, responsible for dealing with incidents within AS25192, as well as incidents that affect the name servers for the .CZ domain and 0.2.4.e164.arpa.

6.1 CSIRT.CZ – National CSIRT of the Czech Republic

The CSIRT.CZ security team is the official national security team of the Czech Republic and is operated in accordance with Act No. 181/2014 Coll. on Cyber Security, and the public contract was made on 18 December 2015 with the National Security Authority. The main objective of the CSIRT.CZ team is to resolve incidents related to cyber security in networks operated in the Czech Republic. The team collects and evaluates information on reported incidents and forwards such incidents to persons responsible for the network or services being the source of the incident and/or provides help with coordination.

In its activities, the team cooperates with entities at the national level, such as the National Cyber and Information Security Agency (NÚKIB), the Police of the Czech Republic (PCR), academic CSIRT, Internet providers (ISPs), banks and others. At the international level (National CSIRTs of other states, it cooperates with the European Network and Information Security Agency (ENISA), EUROPOL and others), with which the team exchanges information on individual incidents and their solutions based on mutual trust.

CSIRT.CZ is also involved in a number of grant projects, including PROKI (Prediction and Protection from Cyber Incidents), which is supported under the Security Research Programme of the Czech Republic 2015-2020.

In 2018, the verification phase of this project continued. In particular, improvements were made to the internal components of the system. A new incident filtering system was developed and integrated into the upstream of the IntelMQ core open source project, which is part of the PROKI system. Similarly, improvements to the web interface for administering and debugging were accepted into the IntelMQ project upstream. An alternative way of collecting incidents by end network administrators in the form of APIs was also implemented based on community requirements. In addition, the sources of incident information used in the project were improved. Throughout 2018, the preparatory work on the CyberSecurity publication was also completed, in which members of the CSIRT.CZ security team participated under the leadership of the renowned expert and university teacher Jan Kolouch. It was officially released in January 2019.

The team also continued activities related to the SIC CZ project (Safer Internet Centre) – more specifically, the operation of the STOPonline.cz hotline for reporting illegal online content and education for children and their parents. CSIRT.CZ successfully continued another project, called the Support for the Development of Cyber Security Capacities in

the Czech Republic, which supports further deepening of national and international cooperation, as well as extended education and training of CSIRT.CZ team members. As part of this project, for example, we publish a regular educational series, "Observations in Security," on the root.cz server. In 2018, CSIRT.CZ earned the status of a "certified" international security team organisation TF-CSIRT, the highest level of certification that a CSIRT/CERT security team can obtain.

Traffic statistics

In 2018, CSIRT.CZ handled a total of 1,079 security incidents. Last year, the number of e-mails sent as part of the incident resolution process increased (from 6,867 in 2017 to 10,264 in 2018). This trend is due to the increasing complexity of incidents, where more than one party is often involved in a single incident and all of these parties need to be contacted as part of the incident resolution.

The open-source Convey tool was already developed in 2016 to automate communication regarding security incidents involving multiple parties.

In 2018, the Convey utility was updated to version 1.0. It is easy to distribute, a single-line installable package allows the user to compute their own CSV columns with an external script and it works better with less common WHOIS queries. A browser add-on was created to speed up work with internally used applications – especially OTRS. It offers a number of keyboard shortcuts and pre-filled information that the operator previously had to enter manually. In 2018, the CSIRT.CZ team's solution made it possible to participate in the Safer Internet Centre project's activities beyond the STOPonline operation without the need to expand the team.

Number of incidents addressed

	2011	2012	2013	2014	2015	2016	2017	2018
Sensor Network*	491	3,924	2,121	2,380	3,771	9,944	13,858	**18,435**
Phishing	144	159	175	368	367	363	409	**518**
Spam	26	43	73	159	108	290	121	**144**
Malware	10	20	45	117	240	104	99	**135**
Other	62	14	75	102	264	181	200	**58**
Trojan	5	5	12	56	90	79	94	**0**
Probe	25	12	26	86	42	13	26	**171**
DOS	2	68	72	32	37	12	14	**7**
Botnet	5	8	15	0	4	71	29	**20**
Virus	0	0	0	0	0	0	0	**0**
Portscan	6	1	3	2	5	6	13	**16**
Pharming	0	0	0	18	3	2	3	**10**
Total	285	330	496	940	1,160	1,121	1,008	**1,079**

* Sensor Network is not included in the total number

The cross-section of the incidents addressed did not change compared to the previous years. However, a phenomenon known as webcam blackmailing or sextortion began to appear to a greater extent than before. Several of these campaigns were recorded in 2018, first in German and English, and later also in Czech. It also revealed the problem of user data leaks and login details from poorly secured servers. One of the campaigns used leaked passwords, where the user was convinced that the attacker had access to his/her computer and knew almost everything about him/her because of access to the user's password.

Awareness and educational activities

Throughout 2018, CSIRT.CZ team members participated in various conferences and expert groups (Internet and Technology, Peeringdays, CSIRT.CZ Working Group, Safe Internet, Incident Handling Automation Project meeting, TF-CSIRT, the Police Academy of the Czech Republic and the Ministry of Industry and Trade of the Czech Republic).

In addition, a new Internet Security and Privacy training was prepared in 2018 and was successfully held in four courses. In total, CSIRT.CZ conducted three courses of the Fundamentals of CSIRT Team Operation, five courses of specialised training for the police on cybercrime, one specialised training for headmasters of secondary schools within the project Regional Action Plan of Education Development of the Moravian-Silesian Region and one specialised training on various aspects of security for NGOs at an event of the People in Need organisation.

Among other achievements in the field of education and training, we should highlight the already mentioned completion of the CyberSecurity book. Other publishing activities included the publication of awareness-related and educational articles. To specify, there were twenty-four episodes of the series "Observations in Security" and fourteen posts on blog.nic.cz. According to current topics and situation in the field of cyber security, it was also a matter of publishing articles in the printed media.

In 2018, CSIRT.CZ also participated in the ECSM (European Cyber Security Month) event. The selection of events was made with an objective to reach all potential target groups (children, students, professionals, the public, state administrations, schools, members of the Police of the Czech Republic etc.).

In 2018, a total of 130 news pieces were also published in the information section of security news at www.csirt.cz.

National and international cooperation

The strategic partners in the area of national cooperation are NÚKIB and the GovCERT team. We cooperate with these entities, for example, in the field of legislation, cyber exercises, formulation of common positions within the CSIRT Network and other projects. National and Governmental CERTs meet several times a year on various occasions, providing a sufficient scope for regular information provisions on the work of individual teams and their possible coordination. In addition, both organisations regularly participate in meetings on the TF-CSIRT or CSIRTs Network.

To successfully resolve incidents, it is important to maintain contacts with Czech Internet providers. CSIRT.CZ Working Group's meetings are important because they aim, precisely, to improve communication and cooperation at the national level. An unwritten rule was that in the first half of the year, the association organised a "large" CSIRT.CZ Working Group, to which all those interested in cyber security issues were invited. A total of 93 participants attended this meeting in April 2018.

National and international cooperation also includes support for teams wishing to join TF-CSIRT and FIRST, based on the on-site visit requirements that involve functionality and compliance requirements for candidates wishing to join these organisations.

In 2018, CSIRT.CZ participated in international exercises, such as Locked Shields (a technical exercise organised by NATO) and Cyber Europe (a technical and organisational exercise in which team members participated at two levels, as players and as organisers for the Czech community). The exercise was attended by 8 Czech teams and 44 players from 15 companies and institutions.

Preventive activities

The year 2018 was again dedicated to the area of prevention, mainly by continuing to extract information from operated honeypots, developing the PROKI project and analysing new malware that was found on the server of one of the host companies. In addition, an inversion of control (IoC) was published in the form of a list of servers that malware used for its communications, as well as changes it made to the operating system.

Attention was also paid to testing web presentations in the .CZ domain. The goal was to identify potentially infected domains spreading malware that the community was not yet aware of. The impetus for this action was outputs from the Turris project, which in the past, had indicated that such domains or web applications operating on them could exist. As part of the research carried out by the CSIRT.CZ team, websites that downloaded components from several different (mainly foreign) IP addresses and domains were sought and further analysed. Although the original hypothesis was not confirmed, the project provided interesting information and verified the usefulness of the MDM application, which works with public data on the .CZ domain.

Web scanner

The web scanner is one of the preventive security services that was launched in 2013. This project is intended for website providers and administrators whom it helps, free of charge, to reveal the potential vulnerability of their Internet presentations. The service is intended, primarily, for non-profit organisations and public administration.

A vulnerability analysis is performed in two phases. First, with the use of automatic tools and then in a manual website test by a senior tester who evaluates, among other things, the vulnerabilities he/she found in the entire website and offers corresponding solutions. At the end, the party that ordered the test is sent a final report containing detected vulnerabilities, their classification based on the gravity level and also proposals for possible solutions. In analysing potential vulnerabilities, the service is based on its own measurements, the security team's experience and on a list of the general, top 10 most serious security risks according to the Open Web Application Security Project (OWASP).

In total, 64 domains were tested in 2018 on the basis of 38 orders – of which 21 were domains of major entities and 3 as part of the Safer Internet Centre project.

6.2 CZ.NIC-CSIRT

The CZ.NIC-CSIRT team is responsible for handling incidents that affect name servers for the .CZ domain, 0.2.4.e164.arpa and AS 25192. Based on the conditions of registration, CZ.NIC is entitled to cancel the delegation of a domain name if it is used in such a way that national or international computer security is threatened. This can happen, for example, by distributing harmful content (viruses, malware) or by faking the content of another service (phishing) through the domain name or services available through it.

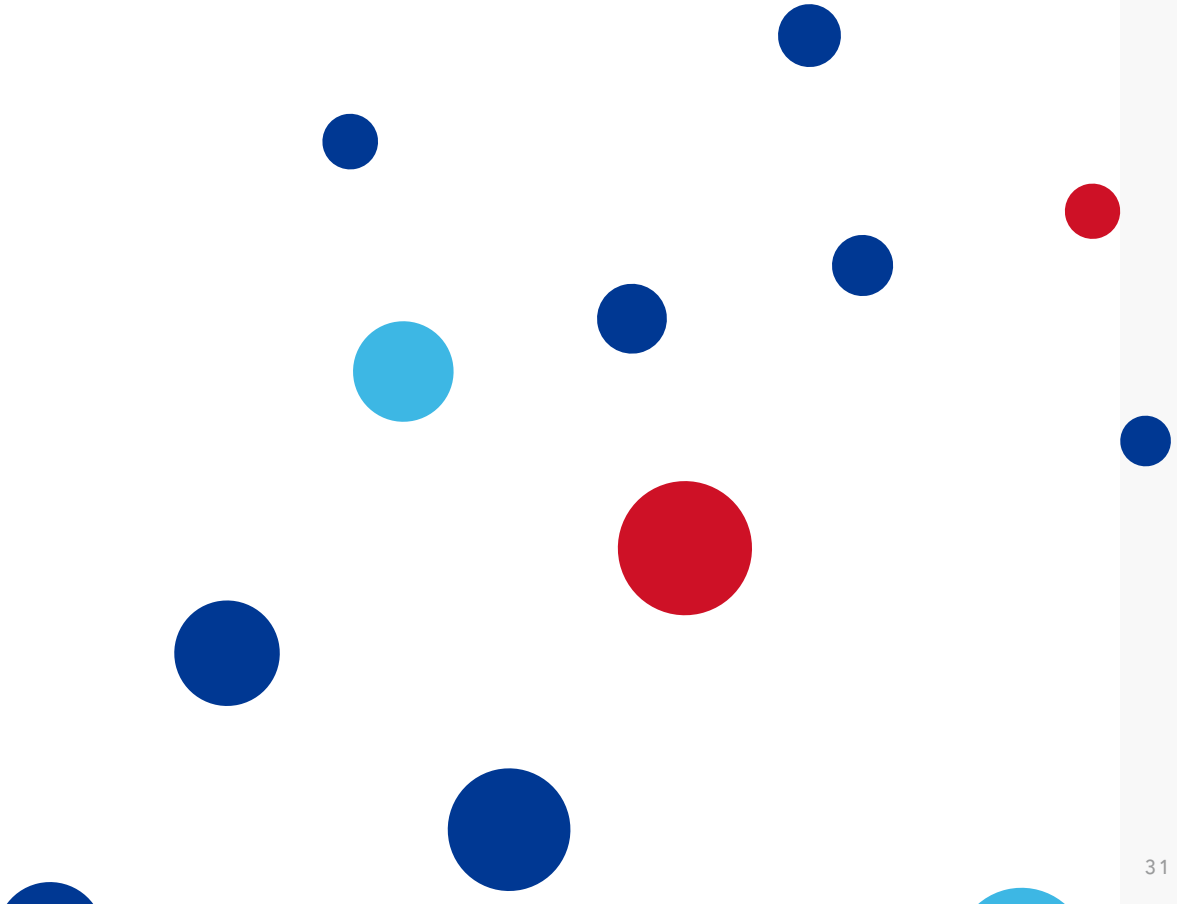
The CZ.NIC-CSIRT team can also cancel the domain name when the server, available through the domain name, is the control centre of networked hardware, which distributes the malign content (botnet).

Activities of CZ.NIC-CSIRT in 2018

CZ.NIC-CSIRT operates its own system used for searching websites with .CZ (MDM) domains that have been attacked. In the CZ.NIC Association, the CZ.NIC-CSIRT team implements internationally accepted information security management systems (ISMS) in compliance with the ISO 27001 standard.

An external audit took place in 2018 to confirm that CZ.NIC continues to meet all requirements of that standard. Furthermore, a technical adjustment of the KSK ceremony, in connection with the transition to elliptic curves (ECDSA), was made.

At the beginning of 2018, CZ.NIC-CSIRT continued to focus on the issue of GDPR, primarily mapping the association's systems that process personal data.



7 MojeID

7.1 When we say mojeID...

MojeID is a unique service that enables Internet users in the Czech Republic to use uniform identification data to log in to various Internet services. This service, operated by the CZ.NIC Association, was put into operation in 2010, and has thus been serving its users for the eighth year in a row.

If an Internet user uses mojeID, they do not have to create a separate account for each new service and go through a lengthy registration process. Instead, they enter their registration data only once into mojeID, where this data is verified and then used to sign up for Internet services. Operators implementing mojeID will not only increase their users' comfort in using their service but will also get verified information about their visitors, to whom they can subsequently provide additional benefits.

The mojeID service is based on the OpenID standard, extended with unique features that other OpenID services do not have – e.g. user identity data transfer with every user login and user validation on multiple levels in different ways.

In the development of this service, emphasis was placed on the security and trustworthiness of the entire system, as well as on the protection of personal data. The registry of user details is protected on the same high level as the .CZ domain registry. Users, themselves, can define which details from their profiles can be provided to the given provider for whose services the user wants to sign up using mojeID. This gives the user full control over his/her data. The user also knows what data he/she provided to what entity, and when.

The service is constantly evolving and responding to the current needs of its users. In recent years, for example, it introduced a public profile that allows mojeID to serve as an Internet calling card, or the possibility of directly opening mojeID and pre-populating data directly from Facebook, LinkedIn and Google user accounts.

The most visible change in 2018 was a complete redesign of the service's website, preceded by an independent UX analysis. The information architecture of the website was optimised, the main output was the division of pages into separate sections intended for users and providers. The website received a number of new features, such as an operator chat, full-text search and a responsive design for a full experience and functionality on all types of devices. All graphics used are now vectors, which improve the display at different resolutions. The texts were also rewritten to be as clear as possible.

7.2 Support of mojeID

A key factor in the systematic expansion of the mojeID service is its support by Internet service providers. The growing number of sites where mojeID can be applied has had an impact on attracting new users, for whom it is important to be able to sign in to as many services as possible with a single username and password – whether they use them on a daily basis or those (e.g. online stores) they visited for the first time – and mojeID saves them time in registering and provides control over the information they provide.

Regarding service providers, in addition to striving to break into new segments, focus is also on maintaining or consolidating positions

in existing areas, such as e-commerce, community servers, city and community web presentations and library systems.

In the last of the aforementioned areas, in 2018 mojeID was successful in establishing cooperation with the community surrounding the Koha Open Integrated Library System. The result is the implementation of mojeID, which opens the way for the service to a number of new locations where this integrated system is used. At present, mojeID has the support of operators of all major domestic library systems, such as KP-Sys, Cosmotron, Tritius, Aleph and newly also the above-mentioned Koha.

7.3 External validation points

The expansion of the network of validation points, which is a means to facilitate the user's validation process, i.e. the highest level of validation in the mojeID service, continued in 2018. The main effort was devoted to the white spots, i.e. districts where no validation point had been established yet. As in previous years, municipal libraries prevailed among newly opened validation points, such as Tábor, Svitavy, Klatovy and Uherské Hradiště. An interesting addition is also the validation point established on the premises of the Regional Authority of the Zlín Region.

Systematic work with existing validation points and their employees is also a significant aspect of the operation of the network of external validators. A series of regional workshops has proven useful in gathering feedback from validation staff, as well as in raising awareness and exchanging experience in the operation of validation workplaces. These were held in 2018 in Brno, Pilsen, Olomouc, Liberec and Hradec Králové, and were attended by 58 validators from a total of 18 validation points.

In relation to operators of external validation points, the year 2018 was also marked by adjustments to contracts in relation to GDPR.

7.4 MojeID users

The user base is the most valuable asset of the mojeID service. Without an increasing number of users, it would be difficult to attract more and more important service providers and make the service known among the general public. During 2018, the mojeID user base grew by 38,789 new users to a total of 633,803 users. The trend of an increasing share of validated users continued to rise, reaching a total of 23,233 at the end of the year. This result is attributable to three main factors – the expansion of the validation point network, the continuing interest in validation, in relation to the Účtenkovka state lottery, and the new possibility to validate the mojeID account via the data box information system.

Account security level of mojeID

Year	Validated contact	Identified contact	Partially identified contact	Users total
2010	163	2,168	1,324	3,655
2011	680	17,218	24,369	42,267
2012	1,760	75,513	86,218	163,491
2013	3,324	143,364	144,376	291,064
2014	5,920	207,242	211,409	424,571
2015	8,280	249,649	241,270	499,199
2016	10,446	273,334	257,650	541,430
2017	18,378	293,503	283,133	595,014
2018	**23,233**	**308,764**	**301,806**	**633,803**

7.5 MojeID as a tool of cross-border authentication in Europe

In 2018, CZ.NIC also actively participated in the Czech Republic's involvement in building an infrastructure for cross-border electronic identification, as defined by the eIDAS Regulation. This regulation builds on the work under the STORK (Secure idenTity acrOss boRders linKed) pilot project, which our association participated in with the Ministry of the Interior of the Czech Republic. Throughout 2018, the CZ.NIC Association operated a gateway that was created within the framework of the STORK project and, which allowed logging into the services of the European Commission (Commission) using mojeID. This gateway will be completely replaced in the future by an official eIDAS node for the Czech Republic. At the beginning of the year, the CZ.NIC Association, as a holder of the INEA (Innovation and Networks Executive Agency) grant for the years 2017-2019, concluded a contract with the Ministry of the Interior of the Czech Republic for the operation of a test eIDAS node and launched the test eIDAS node linked, on the one hand, to the testing National Identification Authority (NIA) and, on the other, to those foreign nodes that had already been put into operation (approx. 15 countries). Testing continued successfully throughout the year and included active involvement of the association's staff in the functioning of the platforms that were established by the European Commission, namely eIDAS Cooperation Group and eIDAS Technical SubGroup.

The production version of NIA was officially launched in the middle of the year and the National Registries Authority announced a tender for the eIDAS node operator. The association applied to the tender and was successful in it. Based on the results of the tender, a two-year contract was concluded with the National Registries Authority for the production operation of the eIDAS node. It was launched, as of the 29 September 2018, as the official start date of the obligation to recognise cross-border electronic identities for Czech public electronic services. The only country that had fulfilled all the requirements for the recognition of its identity means by that date was Germany. Germany requires the other member countries to operate their technical solutions on their own infrastructure, and therefore (also under the contract with the National Registries Authority) this solution was put into operation in parallel with the eIDAS node.

These initiatives are based on the concept of the association's activities, including, in particular, cooperation with the state in the area of eGovernment expansion. We plan to continue working on the initiatives, at least in 2019.

8 CZ.NIC Labs

The CZ.NIC Labs are an organisationally separate research and development centre that focuses primarily on innovative projects for the benefit of the Czech and world Internet community. The projects focus, mainly, on infrastructure protocols and services, traffic monitoring and network security. Some of the projects deliberately support major trends in today's digital society, such as open data, eGovernment, open source software and support for disadvantaged users.

8.1 Summary of 2018 activities

In 2018, the CZ.NIC Labs focused primarily on further development of existing projects. Key projects are:

- *Turris* router for end home and SOHO network security,
- Pair of DNS servers – authoritative *Knot DNS* and recursive *Knot Resolver*,
- Multiprotocol routing daemon *BIRD*,
- *Tablexia* educational application for children with dyslexia and other learning difficulties.

8.2 Projects and activities

ADAM (Advanced DNS Analytics and Monitoring)

Continuous and detailed monitoring of real DNS traffic and its immediate and additional analysis are necessary for reliable operation of DNS servers of the .CZ domain. These procedures can detect any technical problems or network attacks to which the DNS infrastructure is permanently exposed.

The ADAM project aims to more effectively and robustly implement the collection and processing of data on DNS transactions, to improve and expand the methods of their analysis, and to develop appropriate user interfaces and reporting methods.

In 2018, cooperation with the Faculty of Information Technology of the Brno University of Technology was launched, focusing on the development of a high-performance and configurable software probe for DNS traffic monitoring. This probe is intended to replace the current practices that are based on storing complete DNS queries and responses in the PCAP format and generating statistics using DSC (DNS Stats Collector). The probe prototype was developed on the basis that the DPDK library can capture and process DNS traffic at full line speed of 10 Gb/s.

In the area of processing data from PCAP files and storing them in the Hadoop database, the procedure was greatly simplified and some problems were eliminated, such as errors when pairing queries and responses.

The DNS resolver classification for CZ domain data was added to the portfolio of analytical methods. The classification is based on cluster analysis and also allows for detection of anomalous behaviour of particular resolvers. This way, for example, the misconfiguration and vulnerability of one of the major Czech telecommunications operator's resolvers was discovered.

BIRD

The routing daemon for dynamic IP protocol routing is designed for Linux and BSD. The project began at the Faculty of Mathematics and Physics of Charles University, and the CZ.NIC Labs are participating in its further development. It is currently the most used route server software in peering centres in the world. According to a survey conducted by EURO-IX, more than two-thirds use it.

In 2018, the experimental development branch 2.0.x received two new releases – 2.0.1 and 2.0.2. In addition to the planned code stabilisation and adaptation to evolving standards (including RFC 8212), it brought a number of new user enhancements. Enhancements were also performed for the (still) supported stable 1.6.x branch, specifically in release 1.6.4.

In this important anniversary year for the Czech Republic, the BIRD project, whose origin is connected with the Charles University, was also introduced to the Czech public. The LINX Awards, which the BIRD project won in 2010, were part of the celebratory exhibition "University and Republic: 100 years – 100 items – 100 stories".

Datovka – multi-platform interface for access to data boxes

The Datovka software was created in the CZ.NIC Labs in 2010 to support the Internet infrastructure, and free and open software, as an interface for access to the data box information system (ISDS). The desktop version is intended for users of personal computers running Linux, Windows and macOS. Datovka is also available for Android and iOS mobile devices.

In 2018, keyboard control of the application was improved in the desktop version. The application can be launched faster because not all of the saved data is loaded at startup. Functions for backing up and restoring stored data messages were added. Windows and macOS installation packages are digitally signed, making it easier for users to install them.

The desktop and mobile application code that describes ISDS data structures was unified. The functions for generating the program run log were also unified and can now be displayed directly in the application. Users can easily use these logs to identify problems or report errors. Both the mobile and the desktop applications have added support for making filings to public administration electronic registr services. For example, it is possible to request a copy of the penalty point statement from the central registry of drivers or an extract from the criminal record. Users receive responses to these requests in tens of minutes to their data boxes.

User interface customisations were implemented in the mobile application to make the content of the application available to screen readers. In addition, it became easier to manage accounts in cases where the user forgot the access password. For existing accounts, the login details can be changed if the new account is also used to access the same box. The mobile application can now also upload data messages to the filing service.

JetConf

The JetConf project is developing the RESTCONF [RFC 8040] protocol implementation, which is used to remotely configure and manage network devices and services securely. The Lab employees are also

personally involved in the development of this protocol and related standards in IETF.

In 2018, the employees focused on using the RESTCONF protocol for configuring and managing DNS servers (authoritative and resolver). This activity is the object of international cooperation, among others, with Deutsche Telekom, Comcast and NLnet Labs. The following components were added to the previously created data model and backend for the authoritative Knot DNS server:

- A multi-platform data model for DNS resolvers, currently with support for the implementation of Knot Resolver and Unbound,
- Data model for zone data editing.

Knot DNS

Knot DNS is a purely authoritative DNS server that is primarily developed with an emphasis on high-performance inbound query processing and strict adherence to modern DNS standards. It is a multi-threaded implementation with lockless synchronisation. This allows reconfiguration of the server or modification of the provided zones without any delay in responding to incoming DNS queries. Another advantage is the support of a large number of functions, from basic to very advanced. For example, a fully automated and easily configurable DNSSEC security management is implemented. Knot DNS also offers an interface for user modules that can be used to add new features or modify server behaviour. Currently, Knot DNS is used by root DNS server operators, TLD domain providers and hosting companies.

Throughout 2018, memory and performance optimisations of shared libraries and the server itself were implemented. The results of the security code audit from the previous year were also incorporated. The set of modules was expanded with restricting queries by network addresses, customising responses based on the client's geographic location and supporting DNS Cookies. The online DNSSEC signing module now supports automatic key rotation.

Knot Resolver

The Knot Resolver project is developing an independent implementation of a recursive DNS resolver. It was introduced to the public in 2015 as a sister project to the open, high-performance authoritative Knot DNS server, and was deployed on Turris Omnia routers in 2016. To improve performance and protect against attacks, an aggressive DNSSEC cache was implemented in 2017. At the same time, support for TLS forwarding was added to protect user privacy.

In 2018, a new server identification module was added, support for maintaining established TCP and TLS connections was improved, and support for verifying the configuration status of the root zone keys was added. In April 2018, Knot Resolver was deployed by Cloudflare as a public DNS resolver at IP address 1.1.1.1. Currently, this resolver serves millions of users.

Tablexia

Tablexia is a modern educational application for children with dyslexia at the second level of elementary school. It is used either directly in schools as a supplement to standard teaching, or also in pedagogical and psychological counselling centres, and other counselling facilities for pupils with learning difficulties. The mobile application is available for free on Android and iOS devices.

In 2018, the desktop version, which is now available for download on the project website at www.tablexia.cz, was also completed. The association believes that this version will help further expand the application and will be available to schools, counselling facilities and families without

tablets. The desktop version was created for Windows, macOS and Linux operating systems.

In addition to continually improving the graphics in games and other parts of the application, developers are trying to improve and customise games so that they are not only understandable and easy for children to use, but also fun. That is why a system of lives has been added to games that forcefully end after a certain number of mistakes have been made. This applies to the games of Robbers (Lupiči), Kidnapping (Únos), Patrol (Hlídka), Symbols (Symboly) and Secret Code (Tajný kód). With the hearts in the upper right corner of the screen, the child can now see how many mistakes can still be made without ending the game prematurely.

In 2018, a new level of difficulty was created for all of the current ten games. This is a bonus level that is a bit more difficult and different than the difficult level. Access to the bonus level is limited and it is necessary to play the difficult level of the given game ten times and to get three cups – the best ranking each time.

Turris

2018 began with the Turris project by completing the goals set out in the Turris Omnia crowdfunding campaign. Among other things, users were supplied with the first version of the Pakoň application for monitoring the traffic generated by home devices. This application is based on opensource IDS Suricata. This gives users an overview of the device's behaviour in their home network and users can detect suspicious behaviour and potential security threats.

Work continued on an alternative to the Turris Omnia project – Turris MOX throughout the year. The entire product is designed as a modular solution to meet the needs of new user groups that will benefit from the same security as users of the Turris Omnia routers. At the same time, it will give them the opportunity to easily join security research through data collection. The project was announced to the public in April and a crowdfunding campaign was launched. Several other modules were designed in its course. The campaign ended successfully and raised more than 350K USD. The first orders were shipped at the end of 2018. Due to the number of different variants, distribution and production will continue in the following year.

In addition to preparation for production and the production of Turris MOX routers, another series of Turris Omnia routers was produced in 2018.

Work also started on migration to the new distribution base on which Turris OS powering Turris routers is based. During the year, the development process for the new version of the system was stabilised, some patches were upstreamed and the experimental branch was made available to users for testing. Actual deployment is planned in 2019.

With more and more routers involved in data collection, the current security data collection system reached its limits. In order to expand the user base, the amount and type of data collected, work began on its successor in 2018, which has the character of a distributed system and will be able to scale across servers. The main advantages of the new solution include very easy extensibility with a new type of probes and analyses. The received data move through an analytical network, where they are enriched with additional metadata from the analyses and subsequently distributed. This allows for an easy integration into other services (even external) and the ability to generate different types of outputs without additional burden on the internal system. When designing the new solution, the possibility of its operation not only on Turris routers but also on volunteer servers was envisaged. The plan is to deploy this system across all routers from the CZ.NIC Association in 2019. It is already possible to join the new data collection system and start using some of its outputs.

9 Education and awareness

9.1 Communication with the public

Public and private media – daily newspapers, radio, television and major media servers dealing with the Internet and technologies – provided information about CZ.NIC and its activities throughout the year.

In 2018, the association issued 24 press releases and 15 press communications, which were received both by professional journalists and media journalists aimed at the broader public or specific groups of recipients. CZ.NIC publishes these releases in the News section at www.nic.cz. The News section is also part of the information website of the association's education centre (CZ.NIC Academy), the CSIRT.CZ security team and selected projects of the CZ.NIC Labs.

The topics communicated in 2018 were associated with the association itself, with its projects and activities, and with topics that are more or less relevant to CZ.NIC and its activities (cyber security, personal data protection etc.).

Last year, press releases and communications were published mostly by media with a technical focus. The most frequent portals were Root.cz and Lupa.cz. In printed form, it was mainly the Securityworld magazine. Among the non-technical media, we can name the Řízení školy magazine.

In 2018, CZ.NIC employees published over 50 articles, not only on the above-mentioned Internet portals and in the aforementioned magazines but also, for example, in the Hospodářské noviny paper, and in the Data Security Management and Bankovnictví magazines. Ondřej Filip, the CEO of the CZ.NIC Association, as well as other employees were guests of television and radio programmes last year, especially the @online programme broadcast by Czech Television and the Czech Radio Online Plus programme. There was interest in topics related to Internet security or the Czech national domain.

A separate chapter of communication last year came from the support of the Indiegogo campaign for the modular router Turris MOX. A total of 247 media outputs were published, the most significant of which being published on the portals Heise.de, Golem.de or Root.cz and Lupa.cz. In terms of communication, the router sparked the greatest interest in the Czech Republic, the United States of America and Germany.

For administrators of the Czech national domain, accounts on social networks – Facebook, Twitter and Google+ – are an integral part of communications with the public. Supporters are informed, in regular contributions, about the activities of the association, events and current happenings in individual projects. The Twitter account was the most watched in 2018, which had 3,942 followers at the end of that year – 11% more than in 2017. In the long term, the popularity of the Facebook account is also increasing, with more than 2,900 fans in December 2018.

An important part of communication is also the NIC-NEWS newsletter, through which messages are sent to subscribers to the e-mail conference of the same name, and the online CZ.NIC Employee Blog. 55 contributions were published in 2018, thanks to the activities of the association employees. The blog plays the role of the association's official communication channel, so it is used by journalists with different focuses.

	Outputs in media		Social networks (fans)	
	Papers	Blog	Facebook	Twitter
2012	21	97	900	630
2013	29	95	1,100	1,000
2014	38	84	1,500	1,750
2015	57	82	1,800	2,370
2016	57	59	2,600	3,088
2017	73	49	2,826	3,573
2018	**56**	**55**	**2,905**	**3,942**

Internal communication is provided primarily by the IN newsletter, which CZ.NIC employees usually receive once or twice in 14 days.

9.2 Popularisation TV series

The Jak na Internet (How to use the Internet) series is the largest educational activity of the association, which is focused on the general public. With its 125 episodes broadcast on Czech Television channels in 2012-2018, it has reached over 220 million viewers. In addition to the public service media, the series is also used in local cable television. In 2018, for example, Kopřivnice Cable TV joined the broadcasters. The popularity of the series is also evidenced by the repeatedly positive results in awareness surveys among the Internet public. More than a quarter (25-35 %) of Internet users know the programme.

Jak na Internet is no longer just a television series. The YouTube channel that presents the online version of each episode has earned approximately half a million total views. The video content can also be found in the entertainment portals of RegioJet buses and trains and on the Methodological Portal of RVP.cz for teachers. Expanding texts published on the website www.jaknainternet.cz also gained popularity, as evidenced, among other things, by the fact that they are widely cited in graduation theses (see Theses.cz). The series is also published as a comic book, which had its second volume released in 2018.

In the past, the CZ.NIC Association also made it possible to create several co-production programmes of Czech Television for children and youth. These included two seasons of the series Nauč tetu na netu (Teach Your Aunt to Use the Internet) and selected episodes from the series Lovci záhad (Hunters of Mysteries). The original series Nebojte se Internetu (Don't be afraid of the Internet) (www.nebojteseinternetu.cz) is targeted at seniors. All of the above-mentioned video materials were also available online in 2018 and systematically used by organisations that focus on educating the selected risk groups – children and seniors.

9.3 The CZ.NIC Academy education centre

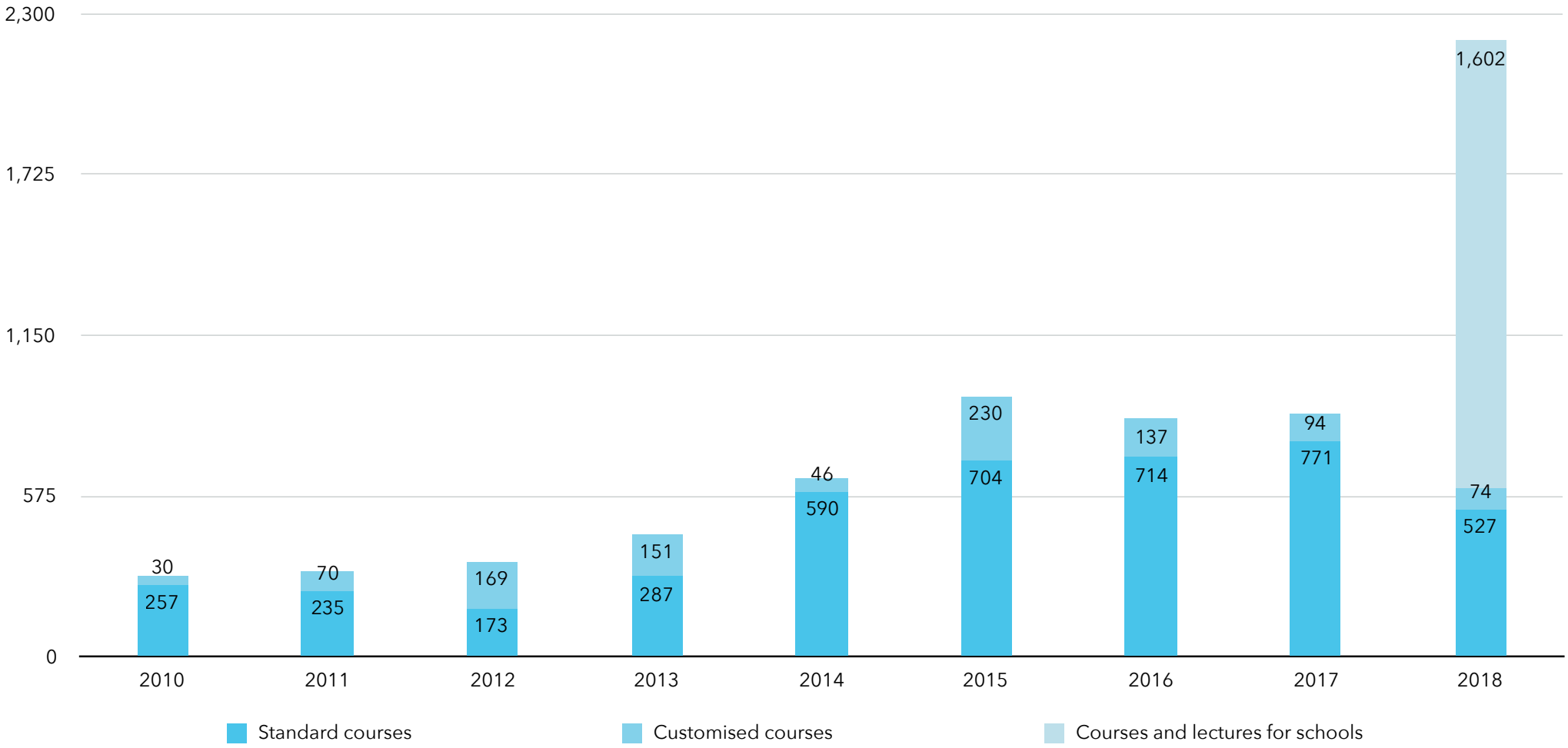
In 2018, the CZ.NIC Academy expanded its portfolio of courses by three new ones: Internet security and privacy, Advanced Vim and Barrier-free digital design for beginners. In addition to these full-time courses, a new Introduction to a Linux electronic course was created at the academy.

In 2018, the CZ.NIC Academy provided its rooms, not only for internal training and meetings of the association's employees, but also to other organisations and groups, such as the Central Bohemia Education Institute and PyLadies. In the summer, in cooperation with Prague 3, a weeklong

children's cyber camp took place at the Academy. The CZ.NIC Academy not only offers rooms but it also provides support for other educational activities. In 2018, it was mainly the SOČ (Secondary-School Specialised Activities) competition and the school web sCool Web competition.

In January 2018, the Prague branch of the CZ.NIC Academy moved to the newly reconstructed new premises at the Olšanka Hotel.

Development of the number of students in the CZ.NIC Academy



List of professional courses conducted at the CZ.NIC Academy in 2018

Name	Number of courses	Number of students
Arduino for teachers	1	7
Internet security and privacy	5	41
Security of mobile applications	3	31
Security of web applications	4	38
Barrier-free digital design for beginners	1	6
DNSSEC – securing DNS	2	16
Git – universal versioning system	4	50
Advanced IPv6	2	26
The eIDAS Regulation in a clear way	1	4
Advanced networking in Linux	7	105
DNS principles and administration	2	15
The BGP routing protocol	2	23
Technical Writers' Exchange of Experience Workshop	1	15
The practicalities of Turris Omnia	2	23
Introduction to Linux	5	56
Vim	2	19
How the CSIRT team works	3	52

List of customised courses conducted at the CZ.NIC Academy in 2018

Name	Number of courses	Number of students
Arduino for teachers	1	14
Internet security and privacy	1	25
Git	2	20
Advanced networking in Linux	1	15

List of courses and lectures for schools

Name	Number of courses	Number of students
(Not) Safe mobile phone	52	1,602

Total number of courses organised by the CZ.NIC Academy in 2018

Course type	Organised in total	Total students
Professional courses	47	527
Customised courses	5	74
Schools	52	1,602
Total	**104**	**2,203**

9.4 Conferences

CZ.NIC organised a traditional Internet and Technology conference on the 15 and 16 November 2018 (18). As part of the programme, participants could look back at two important anniversaries (25 years of the Czech national domain .CZ and 20 years of the CZ.NIC Association) and also hear an overview of the most important things that had taken place in the association's key projects. At the same time, optional workshops and seminars took place, where those interested could get acquainted with the open-source tool Sphinx, which is used in CZ.NIC to publish documentation, as well as the basics of dynamic routing and news from the Turris project.

In 2018, CZ.NICpresented itself at a number of events and professional conferences in the Czech Republic and abroad. Among the domestic ones, we can name, for example, Open Source Network Solutions, Security Fest, OpenAlt, OpenCamp Bratislava, InstallFest, Linux Days,

Peering Days, Dyskorunka, Internet in State Administration and Local Government (ISSS), Maker Faire, Trends in Cyber Security Education, Cyber Violence and Cybercrime Conference, Safe Internet 2018, EurOpen, HackPrague, Cyber and Information Security, Cryptofest, Technology 4.0, Technology for Schools, IPv6 CESNET conference, IT Security Workshop and Technology for Schools fair.

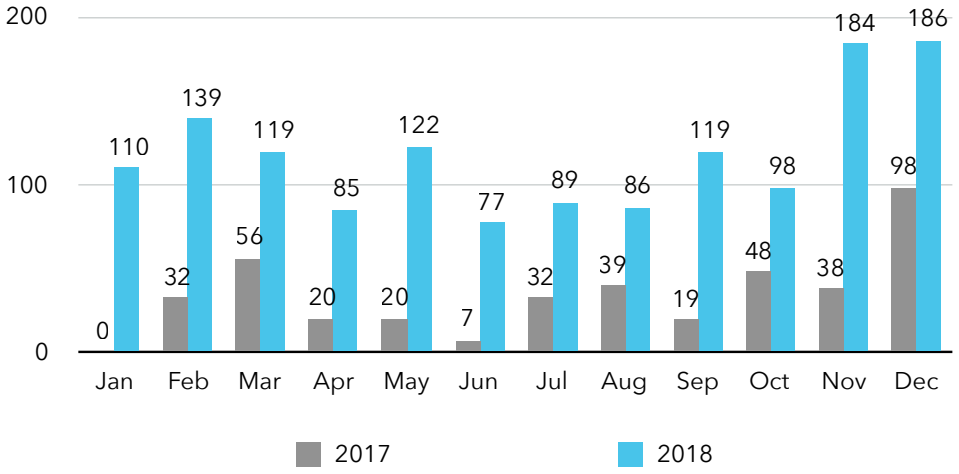
In 2018, the CZ.NIC Association, in cooperation with NIX.CZ, organised the first year of the CSNOG (Czech and Slovak Network Operators Group) community meeting. The main objective of that event was to exchange experience, discuss current topics and share solutions leading to the development of Internet networks in the Czech and Slovak Republics. The meeting took place on the 11th and 12th of June 2018 at the Voroněž Hotel in Brno and was attended by 130 people, mostly from the Czech and Slovak Republics.

9.5 CZ.NIC Edition

Publishing specialised and popular publications on topics related to the Internet and its technologies is already a traditional educational activity of the association. In the CZ.NIC Edition, printed and electronic books are published. Electronic versions of books are available for free download at knihy.nic.cz, as well as in the content distributor network (Palmknihy, Wooky, eReading, Municipal Library of Prague and newly in the Flexibooks network) in PDF or e-reader formats (ePub and MOBI). Printed books are now also available in the Kosmas, Euromedia Group and Pemic Books distribution networks and newly in the IKAR network in Slovakia, opening the door for the Edition titles to hundreds of bookstore counters and e-shops in the Czech Republic and Slovakia.

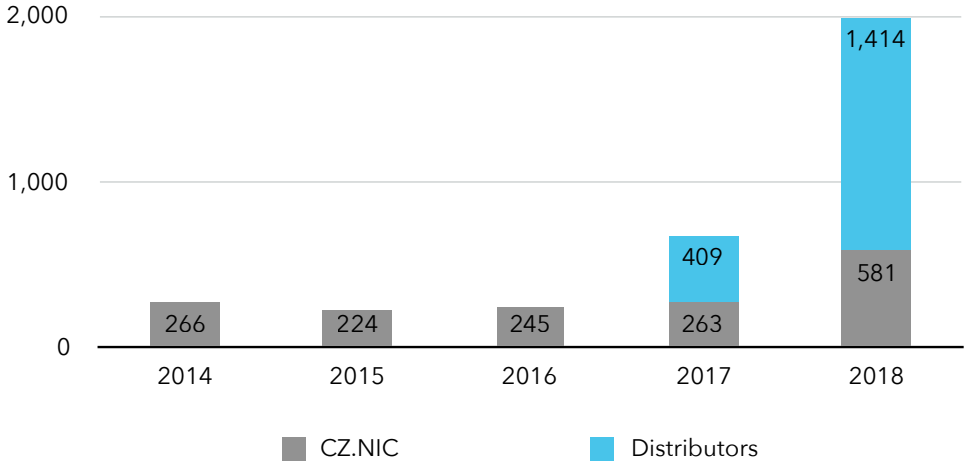
In 2018, the Edition was expanded to include four more titles and now has a total of 20 specialised and popular science publications. The first title, published in 2018, was a book for children called Online Zoo, which introduces the youngest readers to the basics of safe behaviour on the Internet. The book was translated from the German original Der Online-Zoo, published as part of the Safer Internet project. The second book, published in 2018, is a free sequel to the successful comic book Jak na Internet, which was based on the themes of the eponymous television series, this time with the subtitle "Safely". Twelve comic book stories alert the reader of the pitfalls of the online world, as well as add basic security rules and recommendations on how to best avoid the risks. At the end of the year, the CZ.NIC Edition published the third updated edition of the book Perl pro zelenáče by Pavel Satrapa, which provides readers with the basics of the Perl programming language – for both beginners and advanced users. The latest title published in the Edition in 2018 is CyberSecurity by a team of authors and headed by Jan Kolouch. In addition to the theoretical and legal sections, the book contains a practical part, useful especially for IT professionals who want to educate themselves in cyber security issues. The book also provides information on the activities of the CERT and CSIRT security teams in cyberspace, and their capabilities and limits.

Development of the sale of titles in the CZ.NIC Edition



In 2018, a total of 1,414 printed books were sold in the CZ.NIC Edition, which represents an increase of almost 250% compared to 2017.

Overview of book sales by distributor



10 **Cooperation and partnerships**

Today, without exaggeration, the Internet is the most important communication tool that connects tens of millions of users across continents, including Antarctica. We can often hear that the Internet has no borders and does not fall under the authority of any government. This does not mean, however, that the Internet is not controlled and has no rules. However, unlike many other sectors, those rules are often created by the Internet community (and with a great deal of pride, we add that the employees of the association also have a share in it), constituting a large family of supporters of this global network. To ensure that no efforts of any member or organisation are in vain, mutual cooperation is essential, both at the national and international level.

Cooperation with our domestic partners helps find the most acceptable system for national domain administration for the Czech user. At the same time, it contributes, mostly thanks to the projects of our Labs, to the expansion of new technologies and the development of the information society.

International cooperation helps, not only follow world trends, but also – thanks to active participation of the association's employees – contributes to their creation and shaping that affects our everyday lives.

Thanks to their high level of expertise, the representatives of the association, both management and staff, are the welcome guests in domestic and international expert forums.

10.1 Czech Republic

Due to the importance of its activities, CZ.NIC is a natural partner of the public administration, as well as special-interest associations that focus on the Internet.

10.1.1 Cooperation with public administration

The importance of the domain name administration system and related Internet infrastructure is comparable to that of other critical infrastructures, for example in the energy and transport sectors. The CZ.NIC Association, as the administrator of the national .CZ domain, considers the protection of this infrastructure its duty and a moral obligation to the Czech Republic. It establishes cooperation with a number of state authorities, such as the National Security Authority (NSA), the National Cyber and Information Security Agency (NÚKIB), the Czech Telecommunication Office, the Ministry of the Interior of the Czech Republic, and the Ministry of Industry and Trade of the Czech Republic.

Cooperation with the Czech state, in the field of critical infrastructure, was intensified in 2017 with the launch of the project "Securing DNS servers in the Czech Republic" (see chapter 11 Grant projects). It is being implemented within the framework of the Security Research Programme for the needs of the state in 2016-2019.

The representatives of the CZ.NIC Association from the "Development Projects" department made significant contributions to the implementation of Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market (the so-called eIDAS Regulation). In this context, our colleague, Jiří Průša, worked in expert groups of the European Commission and at the Ministry of the Interior, and became a sought-after and respected expert in this European legislation. In connection with the operation of the national eIDAS node mentioned in chapter 7.5, our colleague, Jaromír Talíř, as the representative of the Czech Republic that regularly attended the eIDAS Technical SubGroup meeting, which defines the technical standards of cross-border authentication.

The position of a trustworthy and reliable public administration partner was also confirmed by the CZ.NIC Association as part of the Safer Internet Centre project (see chapter 11 Grant projects), as it took over the operation of the Police Cybercrime Reporting Line and further deepened cooperation with regions, especially via the project Regions for Safer Internet and recently also with the Central Bohemia Region.

Furthermore, the association cooperates with the Police of the Czech Republic, enforcement authorities, courts and authorities according to the statutory authorisation, i.e. with the Office for Personal Data Protection, trade and tax offices, the Czech Trade Inspection Authority, the Customs Administration, etc.

10.1.2 Collaboration with the non-profit sector and social responsibility

Člověk v tísni (People in Need)

Other social activities of the CZ.NIC Association include the support of the Člověk v tísni (People in Need) Foundation, in particular its *Jeden svět na školách* (One World in Schools) educational project, which offers schools documentary films and accompanying methodological aids to teach current topics of the contemporary world and modern history.

Open Data Forum

The Open Data Forum is a project of the Otakar Motejl Fund, the Faculty of Mathematics and Physics of Charles University and the Faculty of Informatics and Statistics of the University of Economics in Prague. The CZ.NIC Association is a long-term partner of this activity, whose main objectives are to promote the principles and standards of open data, as well as to promote, teach and coordinate activities and experts in this field. In 2018, the partnership also included participation in the 5th annual hackathon "Code for the Czech Republic", whose main prize was a Turris Omnia router for each member of the winning team. CEO of the association, Ondřej Filip, was the chairman of the jury of the "Together we open data" competition, which, for the sixth time in a row, awarded the best student and public applications using open data for socially beneficial services.

Helping animals

The CZ.NIC Association is a long-time contributor to the Prague and Zlín zoos, supporting the breeding programmes of the Southern Cassowary, a bird native to New Guinea and Australia. In the Czech Republic, there is a rare occurrence of its not yet scientifically examined relative – the Casuarius Domenus. For more information see www.kasuar.cz.

The Srdce na dlani (Heart on the Palm) endowment fund

In support of children from children's homes, the CZ.NIC Association once again became a partner of a charity concert on the 16th anniversary of the Srdce na dlani (Heart on the Palm) endowment fund held at the National House in Vinohrady on the 21 November 2018. The proceeds from the endowment fund's benefit concert were used for activities for children in children's homes. Our colleagues from CSIRT.CZ also organised workshops for children from children's homes during the year to discuss safe behaviour on the Internet and social networks.

10.1.3 Membership in industry and interest organisations

Czech Television – Déčko

Jiří Průša is a member of "Déčkolegium", an informal board of advisors, which provides expert advice, feedback and opinions on the programmes and content of the popular Czech children's channel Déčko. It also helps to acquaint parents with media issues.

NIX.CZ

The largest Czech Internet Exchange Point (IXP) covers domestic and foreign Internet service providers for the interconnection of their networks. The NIX.CZ Association is the largest IXP in the Czech Republic and one of the most important in the world. The CZ.NIC Association is a member of NIX.CZ and actively contributes to its activities primarily through the FENIX project. NIX.CZ is also a notable user of products of the CZ.NIC Labs, particularly BIRD.

Involvement in the FENIX project

CZ.NIC helped establish the FENIX project on the platform of the largest Czech peering node, NIX.CZ, in 2013. Its aim is to provide availability of Internet services among entities involved in this activity in the case of massive DoS attacks. The FENIX project is intended for companies that provide connectivity for major connectivity and content providers, who need to secure their operation in the most critical situations as well.

Any entity that meets the entry requirements can join the FENIX project. These requirements go hand in hand with the values of CZ.NIC and its long-term mission. This primarily involves the development of trustworthy, secure and stable Internet infrastructure and services of general benefit. To join the FENIX project, the applicant must, for example, run its CERT/CSIRT team, support IPv6 and DNSSEC, have the response rate limiting implemented and use BCP-38 source address filtering in its network.

10.2 From abroad

Thanks to the activities of the association on the international Internet scene, stakeholder foreign organisations are increasingly choosing

CZ.NIC as a partner for cooperation and the Czech Republic as the location for their meetings. The CZ.NIC Association welcomes this fact, as the representatives of the local Internet community, thus, gain easier access to interesting topics, as well as to leading experts from the world of the Internet.

10.2.1 Membership in professional and interest organisations

APWG (Anti-Phishing Working Group)

A global coalition of private companies, state institutions and security forces focused on the global fight against cybercrime, especially spam.

CENTR (Council of European National Top Level Domain Registries)

A non-profit organisation that associates top-level national and generic domain name administrators. It primarily targets European registries, but among the members are also the representatives of more remote regions – e.g. Canada and Japan. The CZ.NIC Association has been a member since 2001 and has been regularly involved in individual working group meetings. In 2018, the head of the CENTR Technical Working Group was Jaromír Talíř.

DNS-OARC (The Domain Name System Operations, Analysis and Research Centre)

A trusted platform where key stakeholders meet and share their experience with DNS operation, analyses and research, so that they can coordinate their work as efficiently as possible, particularly in the field of security. In 2018, the third representative of the Czech Republic and the CZ.NIC Association, Jaromír Talíř, was a member of the Board of Directors of DNS-OARC. In the autumn, he was elected to that office for another two years at the General Meeting.

EURid (The European Registry of Internet Domain Names)

An association, which, under the authority of the European Commission, administers the .EU top-level domain. CZ.NIC is an associate member and has a representative in the Board of Directors.

EuroISPA (European Internet Services Providers Associations)

The European Internet Services Providers Association is the largest organisation, bringing together more than 2,300 organisations around the world. The main objective of EuroISPA, of which CZ.NIC has been a member since 2008, is to represent ISPs within the legislative processes of the European Union and facilitate the exchange of experience between individual Internet service providers.

CSIRT Network

A CSIRT team interest group, which acts as a contact point for obliged entities identified in the NIS Directive (Directive of the European Parliament and of the Council concerning measures for a high common

level of security of networks and information systems across the union). The CZ.NIC Association, through the CSIRT.CZ team, fulfils the role of the CSIRT team for digital service providers, and is, therefore, expected to participate in this group. The group primarily deals with technical issues related to the implementation of this agenda. In 2018, the CSIRT.CZ team actively participated in most meetings.

FIRST (Forum of Incident Response and Security Teams)

The first international organisation that associates security teams. It has around 400 members, and the American and European teams are represented to a significant degree. It is the only organisation that provides membership to teams from around the world and also covers product teams. The CSIRT.CZ team became member of the FIRST organisation in 2015. In 2018, support was given to Accenture's CSIRT team, which requested the CSIRT.CZ team to perform an onsite visit, under which an applicant for membership in FIRST is audited by representatives of a team that is already a member and has sufficient experience.

ICANN (Internet Corporation for Assigned Names and Numbers)

An international non-profit organisation founded in 1998, the main task of which is not only to administer and assign generic top-level domain names (gTLDs) and top-level national domain names (ccTLDs) but also IP addresses. The CZ.NIC Association, as a national domain administrator, sends its representatives to regular meetings and its experts actively participate in activities of the working groups. Ondřej Filip, CEO of CZ.NIC, is a member of the prestigious Security & Stability Advisory Committee (SSAC) within ICANN.

IETF (Internet Engineering Task Force)

An organisation founded in 1986, which is directly linked to the birth of the Internet. It includes an international community of leading experts, network architects and representatives of the commercial sphere. The IETF approves and enforces Internet standards, the RFC documents that govern most Internet traffic, and our employees are actively involved in some of them. Meetings of members of this organisation have also taken place several times, thanks to the cooperation of the CZ.NIC Association in Prague.

The CZ.NIC Labs' employees participate in the IETF, mainly in the DNSOP (DNS operation) activities, NETCONF (network device configuration) and NETMOD (configuration and status data modelling) working groups. Ladislav Lhotka, Head of the CZ.NIC Labs, is the author or co-author of six RFC standards.

INHOPE (International Association of Internet Hotlines)

INHOPE is an international association of over 50 hotlines aimed at combating and eliminating illegal online content, mainly child pornography. The main benefits of INHOPE membership include access to the ICCAM database (derived from "I see Child Abuse Material") and the possibility of effective cooperation with other countries and institutions, particularly Interpol, in removing illegal content. The CZ.NIC Association, and the STOPonline.cz line operated by it, became an associate member of the association in June 2017. In 2018 CZ.NIC acquired full membership in a prestigious association within the implementation of the Safer Internet Centre project, which is associated with a deeper analysis of individual incidents.

RIPE NCC (Réseaux IP Européens Network Coordination Centre)

An independent non-profit organisation that supports Internet infrastructure. Its core activities include the RIR operation (Regional Internet Registry), which allocates Internet resources and related services (such as IP addresses) to its members. As one of the members, the CZ.NIC Association attends regular meetings and participates in other thematic meetings and trainings organised by this organisation.

TF-CSIRT

TF-CSIRT is an organisation that brings together security teams mainly from Europe. The CSIRT.CZ and CZ.NIC-CSIRT teams are its accredited members. In 2018, thanks to the European project, the CSIRT.CZ team achieved the highest possible recognition – the certified level.

11 Grant projects

In line with its long-term objective of developing Internet technologies and the information society, and the medium-term concept of the association for the years 2016-2019, the CZ.NIC Association is actively involved in processing grant projects.

Thanks to the great success, grant projects are an increasingly important source of funding for the entire association, of which some parts (mostly the CSIRT.CZ security team) are now largely paid from these funds. Grant projects also contribute significantly to the development of the Turris project. The successful implementation of the projects and the achieved results are also reflected in the media outputs of the whole association, where the staff of the EU Projects Department wrote eleven blog posts, nine professional articles for print and online media and appeared on radio and television.

In 2018, two new European projects were launched (CyberExchange and THREAT-ARREST). Another project – SPARTA, whose implementation will start in 2019, was prepared and approved by the European Commission for support. Two of these projects are scientific projects aided by the prestigious Horizon 2020 instrument.

11.1 Involvement in European cooperation projects

European cooperation projects represent a significant source of income for CZ.NIC and the possibility of participating in unique projects that often help determine the future direction of the information society.

Within the projects aided by the European Commission from the Connecting Europe Facility (CEF), CZ.NIC became the most successful Czech applicant and one of the most successful in the whole EU.

Thanks to these projects, CZ.NIC is significantly involved in building infrastructure intended primarily for cross-border electronic services of the public administration. The implementation of these projects also helps strengthen the status of the association as a trusted partner of the state. In 2018, one of the greatest achievements, of not only EU projects but also the whole association, was the successful integration of the eIDAS node into the official architecture of Czech eGovernment.

The reputation of the association, and its experience in project implementation, was reflected in 2018, mainly in the CyberExchange project, which involves 11 national and government security teams from all over Europe and, which is coordinated by our association. The European Commission as one of the two flagship projects also selected this project.

The following projects were implemented with the support of the European Commission in 2018:

CyberExchange

The CZ.NIC Association became the coordinator of the international CyberExchange project, which responds to the increasing threats in the area of cyber security and the resulting necessity of cross-border cooperation in the fight against them.

A total of eleven national and government security teams from the Czech Republic, Croatia, Latvia, Luxembourg, Malta, Poland, Austria, Romania, Greece and Slovakia are involved in the project.

Representatives of these teams will take part in internships during which they will have the opportunity to exchange experience and strengthen their professional capacities.

The project also aims to support the deployment of software tools developed by one team to serve the wider security community and combat cyber threats in another country. This project will suitably complement the MeliCERTes platform, which is said to be one of the building blocks of cross-border digital infrastructure services.

At the end of 2018, the European Commission identified the CyberExchange project as one of two flagship projects implemented under the CEF Telecom (Connecting Europe Facility in Telecom) programme.

CZ.PEPS (Czech Pan European Proxy Services)

The objective of the CZ.PEPS project, launched in January 2016, is, primarily, the implementation and operation of national infrastructure (the so-called eIDAS node) for cross-border recognition of electronic identification in Europe in accordance with Regulation No 910/2014 of the European Parliament and of the Council (eIDAS).

As part of a project, funded by the European Commission through the Connecting Europe Facility, the eIDAS node was linked in 2018 to the National Identification Authority (NIA), which is operated by the National Registries Authority. As a result, the node has become an official national node of the Czech Republic and part of the Czech eGovernment infrastructure. Since September 2018, this operation has been provided on a commercial basis.

At the same time, the operation of the node will be running until the end of 2019, enabling, on the basis of voluntary cooperation, to connect to the EU login service, among other things.

MoQoS (open crowdsourcing data related to the quality of service of high-speed Internet)

Since January 2017, CZ.NIC has been heading an international consortium of a project aimed at building a multi-platform framework for measuring high-speed Internet (QoS) quality and publishing results in the form of open data (which will also published on the Czech national open data portal).

Together with the association, the project is implemented by national telecommunication regulators from the Czech Republic (Czech Telecommunication Office), Slovakia (Regulatory Authority for Electronic Communications and Postal Services) and Slovenia (Agency for Communication Networks and Services of the Republic of Slovenia), as well as the Austrian company Specure and Martes from Slovakia.

Within the project, we managed to expand the functionality of the NetMetr application and to prepare a measurement tool for Turris routers.

SIC CZ (Safer Internet Centre)

Since 2016, CZ.NIC has been involved in the Safer Internet Centre project, which primarily focuses on increasing the online safety of children and their protection in cyberspace. Within the project, CZ.NIC ensures the operation of the STOPonline.cz line, designed for reporting content with sexually abused children, inappropriate child nudity and cybergrooming, and it also significantly participates in educational activities.

The main focus of the educational activities was through school visits and direct contact with the target group. In 2018, employees of the association, specialising in EU projects and CSIRT.CZ, visited more than 50 schools, and over 3,000 children participated in individual seminars. Other educational activities were prepared for social workers or representatives of the Police of the Czech Republic.

Thanks to the Safer Internet Centre project, the CZ.NIC Edition was further expanded in 2018 with two titles – ONLINE ZOO and Jak na Internet – bezpečně (How to use the Internet – safely).

Significant success was also achieved by the STOPonline.cz line, which received a total of 2,445 reports in 2018, i.e. 75% more than in the previous year. Even more significant growth was recorded in the number of cases uploaded in the international ICCAM database, as the number of reported sites increased from 49 in 2017 to 371. This increase was mainly caused by the termination of activities of a similar line that was operated by the Ministry of the Interior of the Czech Republic. This made STOPonline.cz the only line for reporting illegal and harmful content in the Czech Republic. An important award granted to STOPonline.cz line, as well as the entire project, was 3rd place in the prestigious eGovernment the Best competition.

Strengthening cybersecurity capacities in the Czech Republic

The project launched in 2017 primarily focuses on strengthening the knowledge and technical capacities of the CSIRT.CZ national security team and its role based on the European Information and Network Security Directive (NIS Directive).

In 2018, thanks to the project, the CSIRT.CZ national security team achieved the highest status (certified) with TF-CSIRT. The project also supported the establishment of the CSIRT/CERT security teams and their internationalisation within TF-CSIRT, where, thanks to the project, CZ.NIC now has the most teams from around the world. Last but not least, the project also contributed to an increase in professional capacities, as 5 members of CSIRT.CZ have completed the prestigious SANS Institute course.

The project consortium also includes the Czech Neutral Internet eXchange NIX.CZ, which, in cooperation with CZ.NIC, is developing the FENIX project within the project. Four new members joined, thanks to the project in 2018.

THREAT-ARREST

The THREAT-ARREST scientific project, implemented as part of the prestigious European Horizon 2020 programme, aims to develop an advanced training platform, including emulation, simulation and gaming and visualisation capabilities serving different types of stakeholders. It aims to prepare and develop expertise in the field of protecting high-risk cyber systems and organisations, including the ability to face advanced, known and new cyber attacks.

In order to achieve this goal, the project plans primarily to develop the so-called CTTP (Cyber Threat and Training Preparation) platform, designed to train defence against cyber attacks and improve the protection of selected systems.

11.2 Engagement in national projects and other projects

In addition to European projects, the CZ.NIC Association also participates in national projects, especially within the framework of Czech security research.

HaaS (Honeypot as a Service)

The aim of the HaaS project is to develop and implement a public honeypot, to which end users of the Internet can redirect attacks on their end devices (typically home routers).

More than 2,000 users have been involved in the project, of which almost three-quarters are Turris router users. As a result, more than 73 million sessions and almost 42 million commands were recorded on the central honeypot. On average, 250 attacks per day are directed at each user of home routers.

The project, supported by the Technology Agency of the Czech Republic (TA CR) within the Delta programme, is being developed in cooperation with the Institute for Information Industry from R.O.C. (Taiwan).

Ludus

The project, aided by the TA CR within the Epsilon programme, uses scientific knowledge applied by the Czech Technical University in Prague, specifically from the field of machine learning and the application of game theory, to increase collaborative defence against Internet attacks. The Turris router network is used as the infrastructure for testing this approach.

PROKI (Prediction and Protection from Cyber Incidents)

The aim of the project, aided within the security research of the Czech Republic between 2015-2020, is mainly the development of a system that addresses the analysis of information on cyber incidents from a wide range of sources. The evaluation of this information is made by the CSIRT.CZ national security team, operated by the CZ.NIC Association pursuant to Act No. 181/2014 Coll., on Cyber Security. When developed, the system will then enable the sharing of information on cyber threats among key players, especially national and government CERT/CSIRTs and major ISPs.

Building and testing Cyber Threat Intelligence (CTI)

This project, supported by the Ministry of the Interior of the Czech Republic within the framework of the Security Research Programme for the needs of the state from 2016-2021, aims to build an effective mechanism for detection, identification and prevention of cyber threats and the evaluation of cyber security incidents. The project also includes

the distribution and placement of more than 800 hardware probes, based on Turris routers at selected public administration entities, to provide better protection against cyber attacks.

Securing DNS servers in the Czech Republic

The subject of the two-year project, implemented within the framework of the Security Research Programme for the needs of the state from 2016-2021, was research focused on DNS server security in the Czech Republic.

During the project, CZ.NIC created and developed the Zonemaster software tool, which enables individual testing of DNS settings through the web interface to be performed. The project also created a unique database of domain names held by the public administration, which allowed for mass security testing. Created recommendations, including alerts on problematic domains, were then forwarded to the National Cyber and Information Security Agency.

12 **Structure of the association**

12.1 Member base

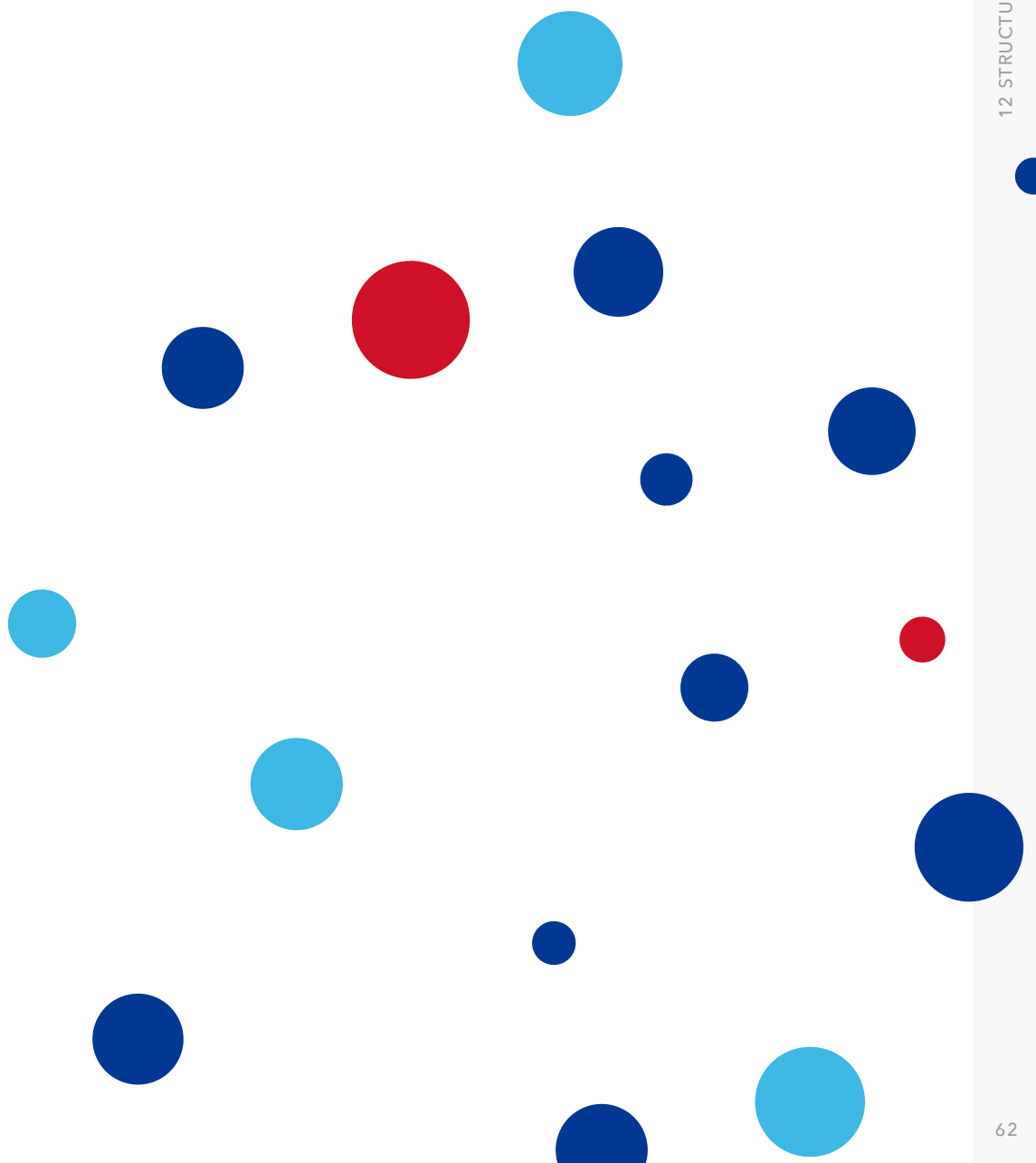
The member base of the association is made up of a number of entities, which are significantly involved in the functioning of the Czech Internet. Among its members are representatives of Internet and telecommunications service providers, domain name registrars, publishers of Internet and print media, e-commerce businesses and companies for whom the Internet and domain names are an important communication tool.

The CZ.NIC Association is one of the places where these representatives can meet and influence the future direction of the Czech Internet. The wide range of members' business activities and their involvement in the activities of the association, either through participation in general meetings, working groups and seminars, in e-mail conferences or directly in the bodies of the association, enriches and expands the knowledge portfolio of the association, makes its management more effective and responds to the constant development that is so typical of the Internet.

Membership conditions

Any legal entity that fulfils the general membership requirements, including the location of a registered office or an organisational unit in the territory of one of the Member States of the European Union, the holding of at least one domain name in ccTLD .CZ and payment of an entry membership fee, can become a member of the association.

The association members are divided into three chambers – the Chamber of Domain Name Holders, the ISP Chamber and the Chamber of Registrars. The statutes govern the special conditions of the membership in the individual chambers. The chamber arrangement brings benefits to the members of the association, who can easily formulate and defend their opinions and interests, together, with other similarly oriented entities. The chamber arrangement also streamlines the course and the meetings of the association bodies, in particular, the Collegium and the General Meeting.



12.1.1 Members count according to chambers

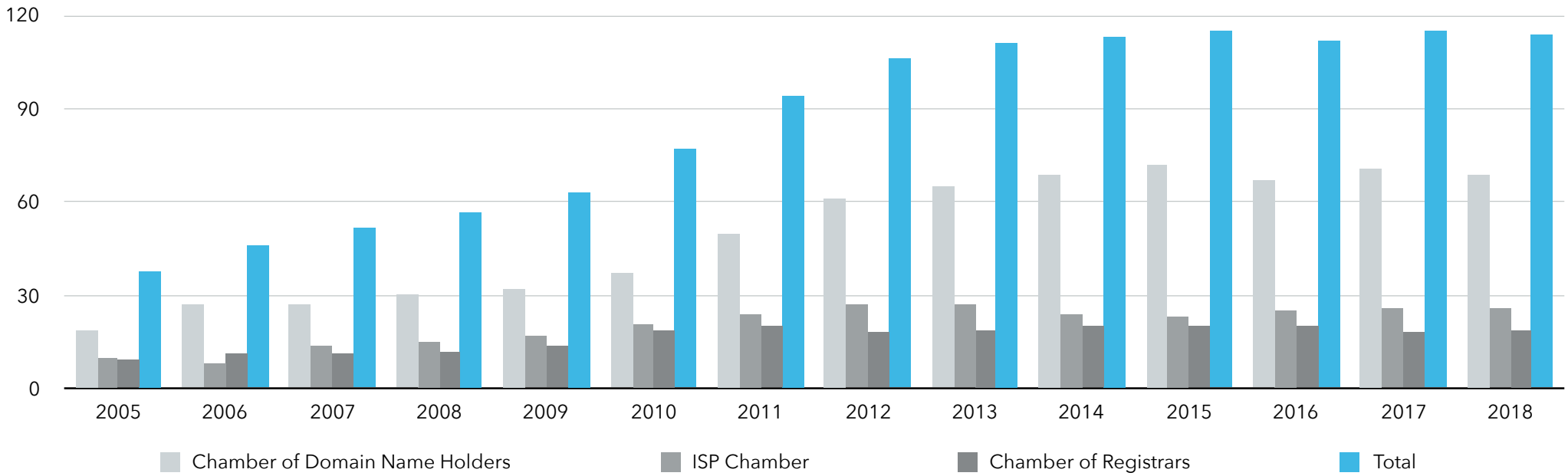
As of the 31 December 2018, the CZ.NIC Association had a total of 114 members. Four new members were added to the Chamber of Domain Name Holder. One member joined the ISP Chamber, and two members left the Chamber of Registrars, as they had ceased to be domain name registrars, and became members of the Chamber of Domain Name Holders.

Member division according to chambers

Chamber of Name Holders	61%
ISP Chamber	23%
Chamber of Registrars	16%

Development of the number of members by chamber

Year	Chamber of Domain Name Holders	ISP Chamber	Chamber of Registrars	Total
2005	19	10	9	**38**
2006	27	8	11	**46**
2007	27	14	11	**52**
2008	30	15	12	**57**
2009	32	17	14	**63**
2010	37	21	19	**77**
2011	50	24	20	**94**
2012	61	27	18	**106**
2013	65	27	19	**111**
2014	69	24	20	**113**
2015	72	23	20	**115**
2016	67	25	20	**112**
2017	71	26	18	**115**
2018	**69**	**26**	**19**	**114**



12.1.2 List of chamber members list

Overview of chamber members as of 31 December 2018

Chamber of Domain Name Holders (business name, company identification number)

ABRATICA s.r.o.	26108534
ACOMWARE s.r.o.	25047965
ADAPTIVITY s.r.o.	24156027
AdminIT s.r.o.	27864901
Advio Network, s.r.o.	28565673
AKREDIT, spol. s r.o.	25797387
ALEF NULA, a.s.	61858579
ALENSA, s.r.o.	27179681
AliaWeb, spol. s r.o.	26117363
Asociace pro elektronickou komerci, z.s.	68684797
AUDITEL, s.r.o.	26775034
CD PROFESIONAL security agency, s.r.o.	25712713
CISCO SYSTEMS (Czech Republic) s.r.o.	63979462
ComSource s.r.o.	29059291
Com-Sys TRADE spol. s.r.o.	16188781
CQK HOLDING a.s.	28405579
CYBERSALES a.s.	26199653
Datahost s.r.o.	26390973
DELL Computer, spol. s.r.o.	45272808
ECOMOLE LTD.	9526615
ekolo.cz s.r.o.	27141659
Fortion Networks, s.r.o.	26397994
Greenlux s.r.o.	28608747
Holubová advokáti s.r.o.	24686727
H17 Networks, s.r.o.	27374041
ICZ a.s.	25145444
igloonet, s.r.o.	27713482
I. H. P. společnost s ručením omezeným	48117846
INBES, spol. s r.o.	14502593
Intell. Net s.r.o.	27971546
Internet Info, s.r.o.	25648071
Internet Mall, a.s.	26204967
i - registry s.r.o.	28451082
Klíč, spol. s r.o.	28129377
Laurián s.r.o.	29018919
MAFRA, a.s.	45313351
MARIAS s.r.o.	26136139
MASANTA s.r.o.	25730533
MEDIA FACTORY Czech Republic a.s.	26288311
Michal Krsek & partneři s.r.o.	27418570
MITE Infonet s.r.o.	25660292
Moonlake Web Services, s.r.o.	29249911
Neutral czFree eXchange, z.s.p.o.	75093201
NEW MEDIA GROUP s.r.o.	26124611
Nux s.r.o.	27234631
Občanské sdružení Ubuntu pro Českou republiku	22674608
Orego finance s.r.o.	24718955
Panificium, s.r.o.	4526767
PharoCom s.r.o.	25172131
Prague Business Office s.r.o.	27143481
Pražský Účetní Servis s.r.o.	26740575
Q3, s.r.o.	26226073
Skymia s.r.o.	28238613
Software602 a.s.	63078236
Socha, spol. s.r.o.	48291153

SuperNetwork s.r.o.	25492063
SVBsoft, s.r.o.	28523644
Tech Ware spol. s.r.o.	14891107
TIKWI s.r.o.	28917651
Trustica s.r.o.	26514362
Unie vydavatelů, z.s. (Czech Publishers Association)	15887081
ÚVT, s.r.o.	25701118
Vema, a.s.	26226511
VIZUS.CZ s.r.o.	27155315
VOLNÝ, a.s.	63080150
Vymáhání a odkup pohledávek s.r.o.	27566510
Webarium, s.r.o.	26089602
Webnames s.r.o.	44848692
1X s.r.o.	44632142

ISP Chamber (business name, company identification number)

ABAK, spol. s.r.o., CZE ABAK, GmbH GER ABAK, Co.Ltd. ENG	40763153
CASABLANCA INT s.r.o.	25079832
CentroNet, a.s.	26165473
CESNET, z.s.p.o.	63839172
COOLHOUSING s.r.o.	14893983
ČD - Telematika a.s.	61459445
České Radiokomunikace a.s.	24738875
Dragon Internet a.s.	27237800
Družstvo EUROSIGNAL	26461129
Faster CZ spol. s.r.o.	60722266
FreeTel, s.r.o.	24737887
INTERNEXT 2000, s.r.o.	25352288
IPEX a.s.	45021295
ISP Alliance a.s.	28205812

JHComp s.r.o.	26051362
LAM plus s.r.o.	25129619
Mach3net s.r.o.	27344860
Master Internet, s.r.o.	26277557
NetArt Group s.r.o.	27612694
PODA a.s.	25816179
Qnet CZ s.r.o.	25518097
STARNET, s.r.o.	26041561
T-Mobile Czech Republic a.s.	64949681
ÚVT Internet s.r.o.	24288705
VSHosting s.r.o.	61505455
2 connect a.s.	29007542

Chamber of Registrars (business name, company identification number)

ACTIVE 24, s.r.o.	25115804
Dial Telecom, a.s.	28175492
e-BAAN Net s.r.o.	26867257
GENERAL REGISTRY, s.r.o.	26027267
Gransy s.r.o.	28087755
IGNUM, s.r.o.	26159708
INTERNET CZ, a.s.	26043319
KRAXNET s.r.o.	26460335
Media4web, s.r.o.	26735903
ONE.CZ s.r.o.	25503651
ONEsolution s.r.o.	27710335
O2 Czech Republic a.s.	60193336
Seonet Multimedia s.r.o.	27522041
Seznam.cz, a.s.	26168685
Stable.cz s.r.o.	28741048
TELE3 s.r.o.	26096960

TERMS a.s.	14499037
Web4U s.r.o.	26058774
ZONER software, a.s.	49437381

12.2 Bodies of the association

General Meeting

The supreme body of the association is the General Meeting, in which all members are members of the association. They are divided into three chambers – the Chamber of Registrars, the ISP Chamber and the Chamber of Domain Name Holders. Each association member has the right to participate in the General Meeting and promote its ideas, and provide opinions and comments.

Collegium

The Collegium is a body of the association, consisting of members elected by the individual chambers of the General Meeting and/or by other persons. The powers of the Collegium include, for example, approving the association's concept and budget, approving agreements between the association and the state, and electing and removing members of the Board of Directors and Supervisory Board. The Collegium has a total of 21 members, of which 18 members are elected by the individual chambers of the General Meeting. Public administration authorities nominate three members. Members of the Collegium are elected to serve three-year terms.

Members of the Collegium elected by the General Meeting in the period from 1 January to 21 December 2018

Chamber of Domain Name Holders

- Antoš Marek
- Ohnesorg Dan
- Pajr Michal
- Redl Jan
- Šváb Jan (until 2 February 2018)
- Vorlíček David

ISP Chamber

- Filip Ondřej
- Košňar Tomáš
- Kysela Jiří
- Pečínka Vlastimil
- Pospíchal Zbyněk
- Taft Karel

Chamber of Registrars

- Fiala Tomáš
- Kukačka Martin
- Kysela Stanislav
- Syrovátka Erich
- Šmída Petr
- Štětina Jaroslav

Members of the Collegium elected by the General Meeting in the period from 21 December to 31 December 2018

Chamber of Domain Name Holders

- Antoš Marek
- Ohnesorg Dan
- Redl Jan
- Taft Karel
- Tvrdík Pavel
- Vorlíček David

ISP Chamber

- Filip Ondřej
- Košňar Tomáš
- Kysela Jiří
- Pečínka Vlastimil
- Pospíchal Zbyněk
- Švácha Milan

Chamber of Registrars

- Fiala Tomáš
- Kukačka Martin
- Kysela Stanislav
- Syrovátka Erich
- Šmída Petr
- Štětina Jaroslav

Collegium members nominated by state authorities:

- Marie Moravcová, Czech Chamber of Commerce
- Tereza Vyleťalová, Ministry of Industry and Trade of the Czech Republic (until 30 September 2018)
- Vilém Veselý, Ministry of Industry and Trade of the Czech Republic (from 1 October 2018)
- Jiří Peterka, Czech Telecommunication Office

12.3 Board of Directors

The Board of Directors is a governing body that manages the association's activities and acts in its name.

Members of the Board of Directors in the period from 1 January to 31 December 2018

- Karel Taft (born in 1971), Chairman of the Board of Directors
- Marek Antoš (born in 1979), Deputy Chairman of the Board of Directors
- Tomáš Košňar (born in 1965), member
- Martin Kukačka (born in 1980), member
- Jiří Kysela (born in 1955), member

12.4 Supervisory Board

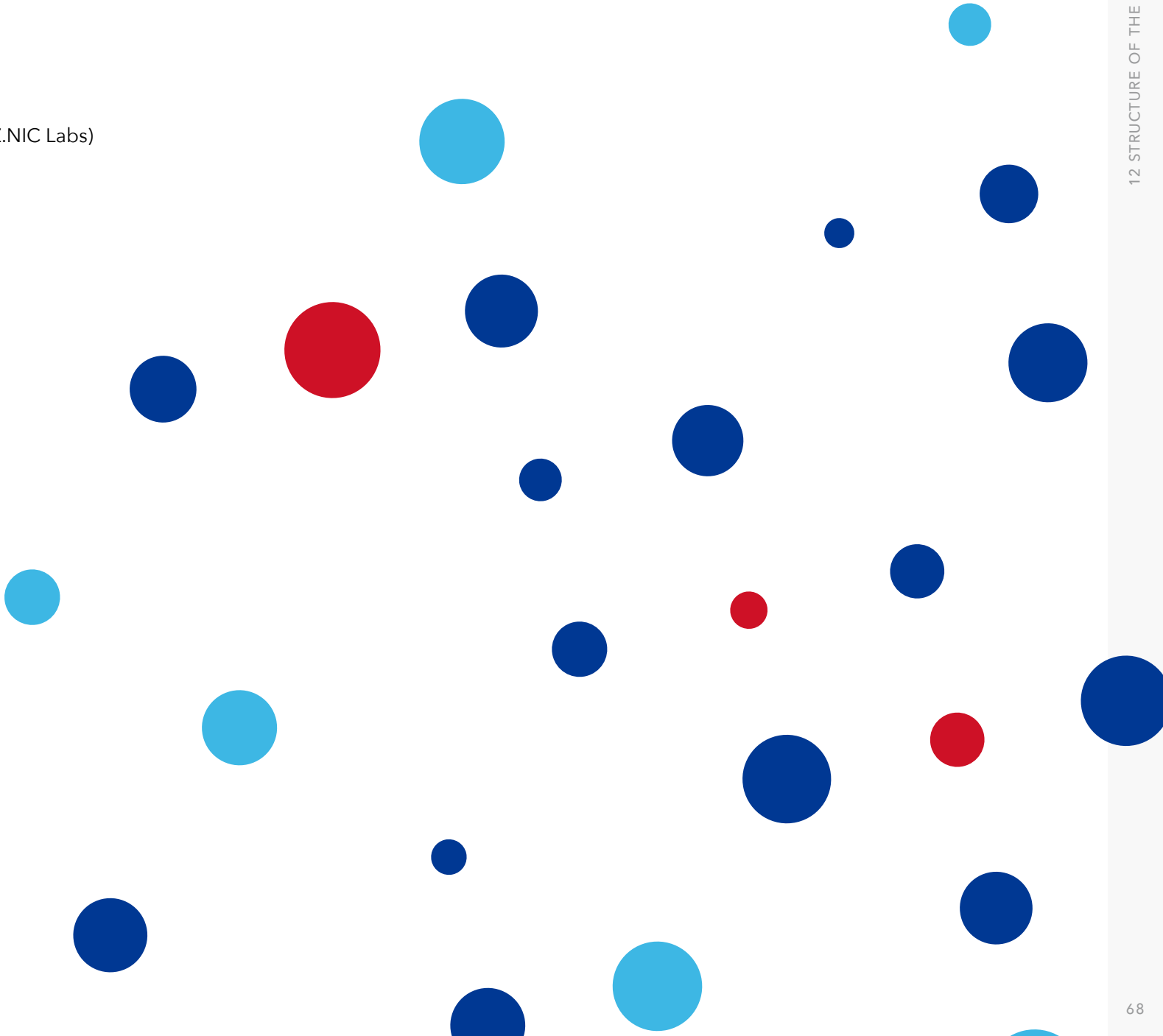
The association's control body, which supervises the performance of the Board of Directors and the implementation of the association activities.

Members of the Supervisory Board in the period from 1 January to 31 December 2018

- Jan Redl, Chairman of the Supervisory Board
- Ilona Filípková, member
- Vlastimil Pečínka, member

12.5 Management

- Ondřej Filip, CEO
- Martin Peterka, COO and Deputy CEO
- Zdeněk Brůna, CTO
- Ladislav Lhotka, Head of Research Team (CZ.NIC Labs)
- Jaromír Talíř, Technical Fellow
- Ondřej Písek, CMO
- Vilém Sládek, CCO



13 **Human resources**

The association's strength lies in the professionally competent and qualified employees, who are essential for achieving its mission and further development. For many employees it is possible to say, without exaggeration, that they are leading experts in the field who have both domestic and international reputations. To strengthen individual competencies, all employees are continuously educated in the field of foreign languages, so-called soft skills and professional knowledge, so that they can achieve the highest possible professional and personal qualities and contribute, with their knowledge and skills, to further development of the association and the Czech Internet.

13.1 Staffing and development

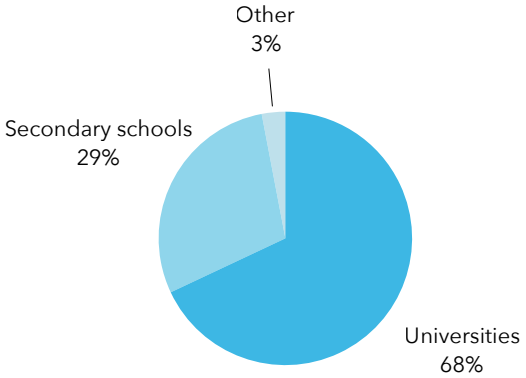
In 2018, the number of employees of the association decreased slightly. The situation in the IT labour market is reflected by a decrease in the number of employees in the CZ.NIC Labs. On the contrary, the development and network administration teams strengthened. The association created a new HR department, which is represented by one employee. In total, the number of employees decreased by two last year, but the number of FTEs increased, especially due to the need to ensure that CZ.NIC Labs runs smoothly.

	Status			
Department	**Number of employees (as of 31 December 2017)**	**Number of FTEs (as of 31 January 2017)**	**Number of employees (as of 31 December 2018)**	**Number of FTEs (as of 31 December 2018)**
Management	7	7.000	7	7.000
Marketing/PR	8	7.500	8	7.500
Academy	2	2.000	2	2.000
Development	18	16.800	20	18.200
Network Administration	10	9.375	12	10.875
CZ.NIC Labs	55	43.800	50	42.250
Legal	2	1.625	2	1.625
Secretariat	3	2.250	2	2.000
HR	0	0.000	1	0.800
Customer Support	12	12.000	11	10.800
CSIRT	10	8.450	9	8.550
EU Projects	2	2.000	3	3.000
Total	**129**	**112.800**	**127**	**114.600**

13.2 Structure of emploxees

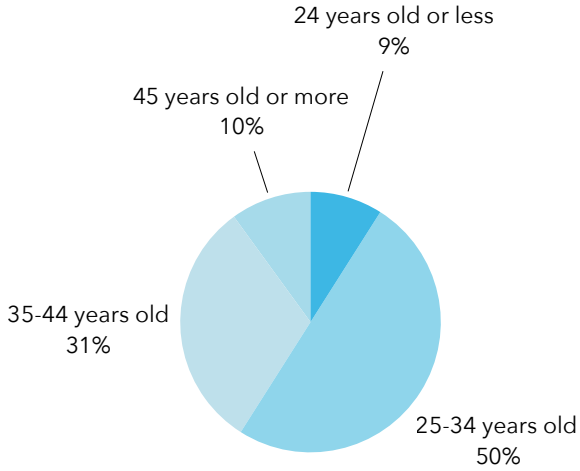
Employee structure by education

Most association employees have a university degree. The CZ.NIC Association gives an opportunity to acquire professional experience to fresh university graduates as well, for which it is trying to build suitable conditions and places them in its branches in Brno, České Budějovice and Pilsen. Thanks to this, we managed to maintain, and even slightly increase, the share of university-educated employees.



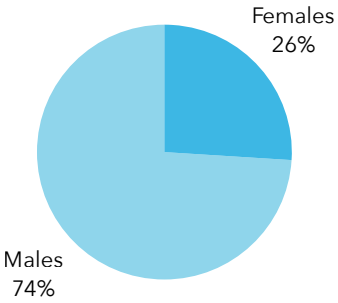
Employee structure by age

The average age of employees of the association is 34 years old. In terms of the age structure, employees aged between 25 and 34 prevail, mainly due to the high number of university graduates and the support of university graduates.



Employee structure by gender

In recruiting new employees, CZ.NIC encourages equal opportunities and the involvement of women. In 2018, the association again managed to increase the share of employed women. This is certainly, partly due to the possibility of working part-time, which allows employees to combine their work and parental responsibilities. Due to the structure of graduates in the technical branches of higher education institutions, however, the proportion of men still prevails, as in other technology companies.



14 **Selected financial indicators**

14.1 Profit or loss after tax

	2011	2012	2013	2014	2015	2016	2017	2018
Income	136,998	141,912	222,736	199,898	197,704	210,708	305,718	**260,683**
Expenses	104,370	125,352	209,127	186,092	211,703	189,057	295,442	**254,950**
Profit or loss after tax	32,628	16,560	13,609	13,806	13,999	21,650	10,276	**5,733**

In CZK '000

14.2 Balance sheet

	2011	2012	2013	2014	2015	2016	2017	2018
Total assets	361,566	387,674	405,154	431,392	449,278	491,643	503,747	**534,656**
Fixed assets	8,781	63,840	77,095	101,406	89,398	84,611	85,885	**89,103**
Intangible assets	0	300	249	331	281	1,914	659	**1,438**
Tangible assets	8,781	63,540	76,846	101,075	89,117	82,697	85,226	**87,665**
Financial investments								
Securities								
Current assets	351,125	322,087	326,095	327,745	358,842	406,080	416,699	**444,082**
Inventory	278	189	277	453	798	14,340	20,829	**40,435**
Long-term receivables	1,379	1,335	59	59	58	58	304	**258**
Short-term receivables	12,180	10,676	18,540	22,100	4,948	6,282	16,870	**8,602**
Financial assets	337,288	309,887	307,219	305,133	353,038	385,400	378,696	**394,787**
Other assets	1,660	1,747	1,964	2,241	1,038	952	1,163	**1,471**
Total liabilities	352,036	387,674	405,154	431,392	449,278	491,643	503,747	**534,656**
Equity	243,795	261,094	274,591	288,397	302,395	324,045	332,308	**338,039**
Registered capital								
Capital funds								
Funds from profit	44,597	44,597	93,784	107,393	121,198	135,197	156,847	**167,121**
Profit or loss from previous years	166,570	199,937	167,198	167,198	167,198	167,198	165,185	**165,185**
Profit or loss for accounting period	32,628	16,560	13,609	13,806	13,999	21,650	10,276	**5,733**
External sources	15,988	17,684	27,479	22,497	32,140	48,059	53,906	**67,723**
Reserves	9,530	884	1,832	1,662	2,662	2,359	3,064	**6,454**
Long-term payables		241	304	235	1,344	617	8,571	**9,990**
Short-term payables	15,988	16,559	25,343	20,600	28,134	45,083	42,271	**51,279**
Bank loans								
Other liabilities	92,253	108,896	103,084	120,498	114,743	119,539	117,533	**128,894**

In CZK '000

14.3 Profit and loss statement

	2011	2012	2013	2014	2015	2016	2017	2018
Performance and sales	127,135	134,030	142,295	155,134	167,480	195,269	196,746	**189,797**
Of which earnings and sales	127,133	134,144	138,755	150,880	166,318	194,897	196,746	**189,797**
Own work capitalised	0	0	3,379	4,044	797	153	0	**0**
Performance consumption and costs	44,440	70,414	67,042	66,335	64,701	73,668	75,970	**67,523**
Added value	82,693	63,616	75,253	88,799	102,779	121,754	120,776	**122,274**
Staff costs	39,227	43,328	57,245	66,541	72,930	85,706	98,706	**111,018**
Depreciation of assets	6,145	4,183	4,922	13,296	15,552	16,807	16,524	**12,747**
Clearance of reserves	533	313	1,020	-137	1,020	-124	393	**2,256**
Other operating income	1,208	1,082	2,290	2,029	1,800	1,884	12,184	**13,304**
Other operating expenses	351	626	916	1,432	994	1,789	1,865	**1,701**
Operating profit or loss	37,795	16,245	13,442	9,664	14,259	19,450	15,472	**8,807**
Other financial income	8,435	6,724	78,118	42,736	40,943	13,555	96,788	**57,582**
Other financial expenses	4,623	685	74,915	38,254	39,428	11,731	100,810	**58,233**
Profit or loss from financial operations	3,812	6,039	3,203	4,482	1,515	1,824	-4,022	**-651**
Profit or loss from ordinary activities	41,607	22,284	16,645	14,146	15,774	21,274	11,450	**8,156**
Income tax	8,979	5,724	3,036	340	1,775	-376	1,174	**2,423**
Extraordinary income						0	0	**0**
Extraordinary expenses	32,628	16,560	13,609	13,806	13,999	21,650	10,276	**5,733**
Extraordinary profit or loss						0	0	
Profit or loss after tax	32,628	16,560	13,609	13,806	13,999	21,650	10,276	**5,733**

In CZK '000

14.4 Revenue development

	2011	2012	2013	2014	2015	2016	2017	2018
Revenue	127,133	134,144	138,755	150,880	166,318	194,897	196,746	**189,797**

In CZK '000

15 List of contractors acc. to clause 45.4. of the Statutes

AVNET Europe COMM.VA (An Operating Company)	Company ID No.: 424297182	CZK 6,726,182.86
HEWLETT-PACKARD s.r.o.	Company ID No.: 17048851	CZK 5,288,098.59
COMPEX SYSTEMS PTE LTD	Company ID No.: 198601256N	CZK 9,059,056.00

16 Data on the facts between the date of the financial statements and the general assembly

No events occurred in the given time, which had an impact on the data presented in the financial statements for 2018.

17 **Auditor's report**

ADU.CZ
AUDIT . DANĚ . ÚČETNICTVÍ

TEL: +420 383 371 000
E-MAIL: INFO@ADU.CZ
WWW.ADU.CZ

ZPRÁVA NEZÁVISLÉHO AUDITORA

pro členy zájmového sdružení právnických osob

Výrok auditora

Provedli jsme audit přiložené účetní závěrky zájmového sdružení právnických osob CZ.NIC (dále jen „CZ.NIC") sestavené na základě českých účetních předpisů, která se skládá z rozvahy k 31.12.2018, výkazu zisku a ztráty, za rok končící 31.12.2018, přehledu o změnách vlastního kapitálu, přehledu o peněžních tocích a přílohy této účetní závěrky, která obsahuje popis použitých podstatných účetních metod a další vysvětlující informace. Údaje o CZ.NIC jsou uvedeny v části 1 přílohy této účetní závěrky.

Podle našeho názoru účetní závěrka podává věrný a poctivý obraz aktiv a pasiv zájmového sdružení právnických osob CZ.NIC k 31.12.2018 a nákladů a výnosů a výsledku jejího hospodaření za rok končící 31.12.2018 v souladu s českými účetními předpisy.

Základ pro výrok

Audit jsme provedli v souladu se zákonem o auditorech a standardy Komory auditorů České republiky pro audit, kterými jsou mezinárodní standardy pro audit (ISA) případně doplněné a upravené souvisejícími aplikačními doložkami. Naše odpovědnost stanovená těmito předpisy je podrobněji popsána v oddílu Odpovědnost auditora za audit účetní závěrky. V souladu se zákonem o auditorech a Etickým kodexem přijatým Komorou auditorů České republiky jsme na CZ.NIC nezávislí a splnili jsme i další etické povinnosti vyplývající z uvedených předpisů. Domníváme se, že důkazní informace, které jsme shromáždili, poskytují dostatečný a vhodný základ pro vyjádření našeho výroku.

ADU.CZ s.r.o. - společnost zapsána v Obchodním rejstříku u Krajského soudu v Českých Budějovicích, oddíl C, vložka 4943
Zámostí 68, 387 06 Malenice, IČO: 62522078, DIČ: CZ62522078

ADU.CZ

Ostatní informace uvedené ve výroční zprávě

Ostatními informacemi jsou v souladu s § 2 písm. b) zákona o auditorech informace uvedené ve výroční zprávě mimo účetní závěrku a naši zprávu auditora. Za ostatní informace odpovídá představenstvo CZ.NIC.

Náš výrok k účetní závěrce se k ostatním informacím nevztahuje. Přesto je však součástí našich povinností souvisejících s auditem účetní závěrky seznámení se s ostatními informacemi a posouzení, zda ostatní informace nejsou ve významném (materiálním) nesouladu s účetní závěrkou či s našimi znalostmi o účetní jednotce získanými během provádění auditu nebo zda se jinak tyto informace nejeví jako významně (materiálně) nesprávné. Také posuzujeme, zda ostatní informace byly ve všech významných (materiálních) ohledech vypracovány v souladu s příslušnými právními předpisy. Tímto posouzením se rozumí, zda ostatní informace splňují požadavky právních předpisů na formální náležitosti a postup vypracování ostatních informací v kontextu významnosti (materiality), tj. zda případné nedodržení uvedených požadavků by bylo způsobilé ovlivnit úsudek činěný na základě ostatních informací.

Na základě provedených postupů, do míry, již dokážeme posoudit, uvádíme, že

- ostatní informace, které popisují skutečnosti, jež jsou též předmětem zobrazení v účetní závěrce, jsou ve všech významných (materiálních) ohledech v souladu s účetní závěrkou a
- ostatní informace byly vypracovány v souladu s právními předpisy.

Dále jsme povinni uvést, zda na základě poznatků a povědomí o CZ.NIC, k nimž jsme dospěli při provádění auditu, ostatní informace neobsahují významné (materiální) věcné nesprávnosti. V rámci uvedených postupů jsme v obdržených ostatních informacích žádné významné (materiální) věcné nesprávnosti nezjistili.

Odpovědnost představenstva CZ.NIC za účetní závěrku

Představenstvo CZ.NIC odpovídá za sestavení účetní závěrky podávající věrný a poctivý obraz v souladu s českými účetními předpisy a za takový vnitřní kontrolní systém, který považuje za nezbytný pro sestavení účetní závěrky tak, aby neobsahovala významné (materiální) nesprávnosti způsobené podvodem nebo chybou.

ADU.CZ s.r.o. - společnost zapsána v Obchodním rejstříku u Krajského soudu v Českých Budějovicích, oddíl C, vložka 4943
Zámostí 68, 387 06 Malenice, IČO: 62522078, DIČ: CZ62522078

Při sestavování účetní závěrky je představenstvo CZ.NIC povinno posoudit, zda je CZ.NIC schopno nepřetržitě trvat, a pokud je to relevantní, popsat v příloze účetní závěrky záležitosti týkající se jejího nepřetržitého trvání a použití předpokladu nepřetržitého trvání při sestavení účetní závěrky, s výjimkou případů, kdy představenstvo CZ.NIC plánuje zrušení CZ.NIC nebo ukončení její činnosti, resp. kdy nemá jinou reálnou možnost než tak učinit.

Odpovědnost auditora za audit účetní závěrky

Naším cílem je získat přiměřenou jistotu, že účetní závěrka jako celek neobsahuje významnou (materiální) nesprávnost způsobenou podvodem nebo chybou a vydat zprávu auditora obsahující náš výrok. Přiměřená míra jistoty je velká míra jistoty, nicméně není zárukou, že audit provedený v souladu s výše uvedenými předpisy ve všech případech v účetní závěrce odhalí případnou existující významnou (materiální) nesprávnost. Nesprávnosti mohou vznikat v důsledku podvodů nebo chyb a považují se za významné (materiální), pokud lze reálně předpokládat, že by jednotlivě nebo v souhrnu mohly ovlivnit ekonomická rozhodnutí, která uživatelé účetní závěrky na jejím základě přijmou.

Při provádění auditu v souladu s výše uvedenými předpisy je naší povinností uplatňovat během celého auditu odborný úsudek a zachovávat profesní skepticismus. Dále je naší povinností:

- Identifikovat a vyhodnotit rizika významné (materiální) nesprávnosti účetní závěrky způsobené podvodem nebo chybou, navrhnout a provést auditorské postupy reagující na tato rizika a získat dostatečné a vhodné důkazní informace, abychom na jejich základě mohli vyjádřit výrok. Riziko, že neodhalíme významnou (materiální) nesprávnost, k níž došlo v důsledku podvodu, je větší než riziko neodhalení významné (materiální) nesprávnosti způsobené chybou, protože součástí podvodu mohou být tajné dohody (koluze), falšování, úmyslná opomenutí, nepravdivá prohlášení nebo obcházení vnitřních kontrol.
- Seznámit se s vnitřním kontrolním systémem CZ.NIC relevantním pro audit v takovém rozsahu, abychom mohli navrhnout auditorské postupy vhodné s ohledem na dané okolnosti, nikoli abychom mohli vyjádřit názor na účinnost jejího vnitřního kontrolního systému.
- Posoudit vhodnost použitých účetních pravidel, přiměřenost provedených účetních odhadů a informace, které v této souvislosti představenstvo CZ.NIC uvedlo v příloze účetní závěrky.

- Posoudit vhodnost použití předpokladu nepřetržitého trvání při sestavení účetní závěrky představenstvem a to, zda s ohledem na shromážděné důkazní informace existuje významná (materiální) nejistota vyplývající z událostí nebo podmínek, které mohou významně zpochybnit schopnost CZ.NIC nepřetržitě trvat. Jestliže dojdeme k závěru, že taková významná (materiální) nejistota existuje, je naší povinností upozornit v naší zprávě na informace uvedené v této souvislosti v příloze účetní závěrky, a pokud tyto informace nejsou dostatečné, vyjádřit modifikovaný výrok. Naše závěry týkající se schopnosti CZ.NIC nepřetržitě trvat vycházejí z důkazních informací, které jsme získali do data naší zprávy. Nicméně budoucí události nebo podmínky mohou vést k tomu, že CZ.NIC ztratí schopnost nepřetržitě trvat.
- Vyhodnotit celkovou prezentaci, členění a obsah účetní závěrky, včetně přílohy, a dále to, zda účetní závěrka zobrazuje podkladové transakce a události způsobem, který vede k věrnému zobrazení.

Naší povinností je informovat představenstvo CZ.NIC mimo jiné o plánovaném rozsahu a načasování auditu a o významných zjištěních, která jsme v jeho průběhu učinili, včetně zjištěných významných nedostatků ve vnitřním kontrolním systému.

Ve Strakonicích, dne 14. června 2019

ADU.CZ s.r.o.
Zámostí 68, 387 06 Malenice
oprávnění Komory auditorů České republiky číslo 368
za auditorskou společnost vypracovala Ing. Simona Pacáková, auditor
auditorské oprávnění Komory auditorů České republiky číslo 1825

ADU.CZ auditorská společnost oprávnění KA ČR č. 368

Digitálně podepsal Ing. SIMONA PACÁKOVÁ
Datum: 2019.06.14 11:45:17 +02'00'

18 **Registered office and contact details**

CZ.NIC, z.s.p.o.

Milešovská 1136/5
130 00 Prague 3

Company ID No.: 67985726
Tax ID No.: CZ67985726
Phone: +420 222 745 111
Fax: +420 222 745 112
www.nic.cz

The association is registered in the association registry kept by the Municipal Court in Prague, under file number L 58624.

CZ.NIC – 24-hour customer support

Phone: +420 222 745 111
Phone: +420 731 657 660
E-mail: podpora@nic.cz