Activity Report

2019

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2019
In Retrospect

In Retrospect

Continuous optimisation of infrastructure and processes – developing innovative services – providing technological and Internet policy momentum – substantial promotion of the open, free and secure Internet – and, last but not least, enhancing the relevance of .de domains on a sustainable basis: Also in 2019, DENIC's project portfolio consistently reflected the Cooperative's strategic goals.

3-in-1: Added Value to Domains and Ethical Data Handling through ID4me

In March, DENIC presented a first market-ready implementation of its new DENIC ID service (⌂ denic.de/en/my-digital-id/) at the largest global event of the cloud and hosting industry, CloudFest. Part of a single sign-on solution for digital identity management on the Internet, DENIC ID is built on the open and federated ID4me standard. The domain-based alternative to social media logins is attractive to businesses, private Internet users, and the public sector alike: Next to convenience aspects, data privacy and security have top priority.

In the federated system, which relies on the principle of distributed responsibilities, DENIC assumes the role of an ID authority. The related tasks include registering user IDs, authenticating users to access online services (login partners), and managing user consent for sharing their personal information with the individual login partners. DENIC member companies can get involved in this federated model as identity agents. In this role, they offer users to acquire and set up an ID account for them, store their personal data and share data with the login partners as consented by the user. A first partnership agreement on the use of the DENIC ID service was signed with 1&1 IONOS, prior to the official market launch.

Within the scope of a developer hackathon organised by DENIC and the ID4me co-initiators at the CloudFest, numerous plugins ready for integration by and web frameworks for login partners – such online providers that accept ID logins for users to identify for access – were developed. They have been available since then for content management systems like Joomla, Typo3, WordPress or Plone and as code in applications like Go, Java, Python or .NET. The participants of the hackathon were able to draw on the Open Code Libraries co-developed by DENIC. These are designed especially for hosting, cloud and SaaS providers to facilitate integration of an ID4me login into their respective IT setups and thus enable seamless on-boarding and central authentication of customers.

In June, DENIC conducted a developer workshop designed particularly for ID agents who offer their customers the establishment of an ID account and intend to market the new added value for a domain this way. Next to implementing an agent identity management client, integrations were created for three programming languages (Perl, Ruby and PHP) and made accessible via an open GitLab repository.

In October, ten national domain registries in Europe joined the ID4me initiative as supporters at the second ID4me Summit. The organisations, which in total have more than 40 million domains under management, came together at an ID Authority Workshop to discuss and exchange information about business potentials and technical possibilities for implementation. The participants were highly interested in a white label solution each registry can adapt to its own system thanks to existing open source toolkits without major initial investments and implementation work being required. The attending registries further agreed to draft a common policy framework for ID authorities and ID agents.

Changes in the Supervisory and the Executive Board

At the General Assembly on 11 April, regular elections for the members of the statutory bodies of the Cooperative were held.

Two members of the Supervisory Board were replaced. For the tenure ending in 2022, it is composed as follows:

- Thomas Keller – 1&1 IONOS SE (chairman)
- Dr. Johannes Loxen – SerNet Service Network GmbH (vice chairman)
- Oliver Elste – Smart-NIC GmbH (secretary)
- Dennis Nizard – HEXONET GmbH
- Daniel Rink – Profihost AG

There also was a change among the honorary members of the Executive Board. For the next three years, the General Assembly elected

- Martin Küchenthal – LEMARIT GmbH
- Sebastian Röthler – info.at Internet GmbH

Enhancing DDos Resilience Through a Broader and More Diversified Name Server Landscape

One of the cornerstones of DENIC‘s activities has always been the optimisation of the operation and security of its name service. The service operated for the .de TLD and DENIC‘s Anycast customers is provided at a range of name server locations (NSL), which – depending on the customer’s ordered capacities – are grouped into one or more service addresses.

While in the previous years DENIC focussed on upsizing the existing geographic locations by increasing bandwidths and response capacities and applying more and more automated orchestration tools, top priority is now on lateral variability and diversification of locations.

Instead of continuing to topologically rely on a limited amount of one-size-fits-all locations, DENIC will use a pool with multiple NSLs of different performance classes in the future, whose capacities, connectivity and availability will be tailored to the respective traffic volume.

Scalable infrastructures that allow data traffic to be (re-)routed to or pooled within a variable number of instances – right up to ISP networks – will enable more efficient mitigation even of larger and more complex traffic data streams, if necessary.

The long-term goal is full redundancy at minimal latency, thus eliminating fate sharing in case of potential attack and further improving the DDoS resilience of systems and customer zones involved.

In the course of the year, a first virtual NSL (vNSL) prototype was developed and implemented as an operational container in an external cloud. vNSLs will enable highest possible flexibility in the future, as they can be operated on any target platform. They combine a facilitated rollout and operation of NSLs and the option to expand the footprint flexibly in case of changing query volumes with improved reactivity in case of an incident and optimal cost efficiency through tailored solutions.

Data Center Architecture Put to the Test: Hybrid On-Premises Private and Public Cloud Operation Envisaged as Future Solution

Considerations aiming at medium-term reduction of capital expenditure and operating costs in the network, compute and storage areas of its IT infrastructures have been a reason for DENIC since the end of 2018 to reassess and revise the existing concept of its data center operations from scratch. As part of this review, registry and office services as well as standard DNS applications shall be identified that would be suited for cloud-based operation.

Decisive for a final assessment shall be, on the one hand, whether scaling advantages can be achieved by migrating entire services or parts thereof into a cloud environment, thus reducing costs through the elimination of own machine instances, also because the constant provision of security, administration and maintenance resources would

become dispensable, while keeping the same or achieving an even higher level of performance, reliability and information security.

On the other hand, feasibility is analysed in each individual case, next to the additional outlay and the amortisation of the costs that would result from the necessary virtualisation and containerisation of the currently used systems and tool chains, part of which proprietary, to enable a potential transfer to cloud-based applications. Further considered are the various protection requirements of the data that are stored and/or processed by DENIC.

Based on the selected cloud management platform and orchestration software, the project team initially developed several test scenarios and established test clusters at various qualified enterprise cloud providers. Then, dedicated software clusters were set up in fully automatic managed cloud landscapes with integrated persistent storage, and a local private registry was deployed for container-based virtualisation.

In the course of the year, the individual specialist teams investigated which of the applications and CI/CD pipelines they are responsible for should be transferred to a cloud environment and which core services should continue to be operated on-premise, however with increased efficiency through greater network automation. Parallel to this, the design team made available basic services to all specialist teams, including Backup, Monitoring, Logging, Storage and Password/Certificate Management as a Service for a future cloud-native service management.

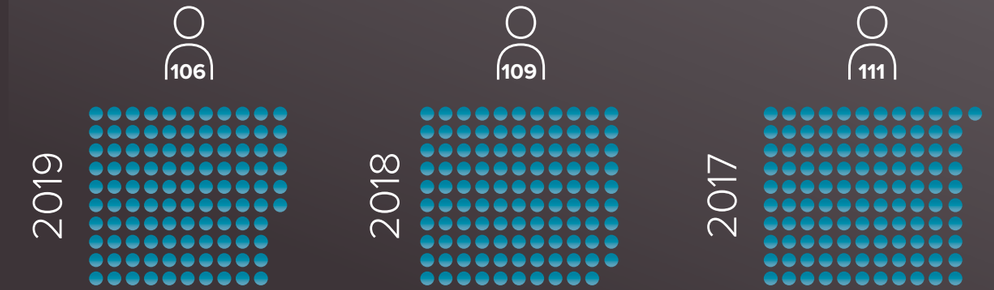
Cross-Registry Security Initiative Scored at CENTR Awards

In October, DENIC and the national registries of Belgium (DNS Belgium), the Netherlands (SIDN), Austria (nic.at) and Switzerland (SWITCH) jointly won the CENTR Innovation Award 2019 of the Council of European National Top-Level Domain Registries, CENTR. The prize was awarded for the "CENTR Member Security Maturity Model (CM-SMM)", a cooperation framework of the involved registries that establishes security standards at a high level and ensures continuous, future-oriented optimisation. The initiative works with clearly defined benchmarks that provide information about the implementation status of the various information security measures in the respective organisations.

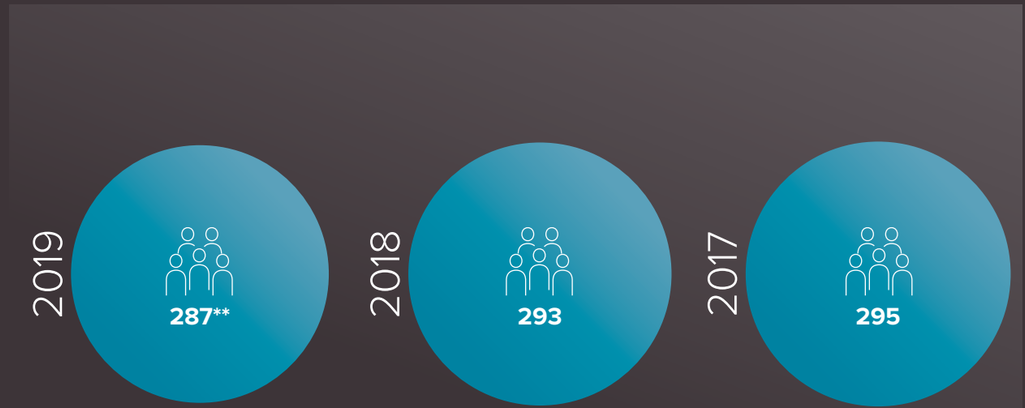
Based on industry standards like ISO/IEC 27001 and supplemented by specific aspects of the domain sector, the maturity model supports the responsible registry

Domains under Management as of 31 Dec.

Workforce as of 31 Dec.



Membership*



*Year-end figures including all membership terminations that take effect from January 1 of the following year, in accordance with DENIC's statutes
**among which 69 from abroad (≈24%)

staff in the evaluation of security processes. A so-called Self-Assessment Scorecard provides each registry with an analysis of its strengths and weaknesses. On this basis, it can develop targeted plans for improvement to tackle potential security incidents, constantly measure the advancement in maturity level of its security precautions, and compare it to the industry average, if required.

The award for the model, which was successfully introduced already in 2018, underpins the importance of good cooperation between the registries and of establishing best practices in the sector.

DNSmeter Tool: Know-How Transfer to The Technical Community to Increase Resilience on the Internet

In October, DENIC provided an in-house developed DNSmeter software tool to conduct high-performance measurements of name servers to the technical Internet community for free use.

The tool was made available via DNS-OARC, the platform for DNS developers and operators. It runs on Linux and FreeBSD and, compared to similar tools, offers various unique features. DENIC also uses the tool for measuring performance on its own DNS platform.

With the proper network setup, raw sockets with access to lower layers of the network can be used to test a variety of client addresses over the UDP protocol. The resulting query patterns are as close as possible to real production conditions.

Optimised for high package throughput, the tool allows for live production recordings to be handed over or network areas to be specified from which client addresses are randomly generated to execute variable load levels independently. The test results are automatically logged.

Further options include a rate limiting for different load levels, so that it is possible to determine which query capacities the target systems have and when they will collapse. The tool also permits free parameterisation of the traffic share with active DNSSEC. Source addresses can be manipulated for any network areas on a test basis, but the response rate can still be reliably counted by backward routing to the load generator, even if the source address is false.

By providing the DNSmeter free of charge to the technical community as an open source tool, DENIC has rendered yet another important contribution to increasing the resilience of the Internet.

Near-Real-Time Zone Rollout: The Window Between Domain Registration and Accessibility Decreases Considerably

To accelerate the connection process and thus make .de domains available for use on the Internet much faster, DENIC launched an optimised technical solution at the end of November. The previously used hourly zone updates through one large zone file were replaced by smaller incremental updates by the minute.

The incremental zone generation ensures that newly registered domains and domain updates entering the .de zone and hence DENIC‘s DNS infrastructure via the registration system can be made available promptly, i.e. within minutes. The main beneficiaries of the accelerated zone update and zone signing, i.e. worldwide availability in near-real time, are holders of newly registered .de domains or holders of .de domains whose registration data has changed, for instance due to an update of name server records.

The signing software used is an open source solution that has been adjusted to DENIC’s needs and is controlled by an in-house developed orchestration tool. High availability of the service is achieved through a redundant software cluster in DENIC’s geo-redundant data centers in Frankfurt am Main, Germany, and Amsterdam, Netherlands. Switching the signing from hardware to software components and combining it with a role-based user access concept and appropriate physical protection has also led to considerably improved cost efficiency compared to the previous signing solution.

Status Information About Key DENIC Services Anytime Available Online

DENIC consistently pursues the aim to operate its services troublefree. Therefore, comprehensive tests and simulations are always performed prior to introducing new technical features and technologies. To keep both the DENIC member companies and other Internet players and the interested wider public informed about scheduled maintenance activities or potential impairments or malfunctions of essential DENIC services, the Cooperative has provided corresponding availability information since 2019 via a public status dashboard: On the platform status.io (⌂ denic.status.io/) and also on the DENIC website (⌂ status.denic.de) the current operating status of the most important DENIC services can constantly be retrieved.

Market & Business Development

Market & Business Development

After a mixed picture in 2018, the business year 2019 was a good year again for DENIC: Even though the macroeconomic environment remained bleak, .de domain registrations reached a new all-time high after last year's first decrease ever of domains under management in the DENIC history. At the same time, the DNS Infrastructure Services and Data Escrow Services business lines, which are managed by DENIC eG's subsidiary DENIC Services GmbH & Co. KG, since the end of 2018, developed very positively and thus additionally secure DENIC's core business. Earnings of the Cooperative remained stable and .de is still the best known and most relevant TLD in the German market.

According to calculations by the German Federal Statistical Office, the economic situation in Germany lost further momentum in 2019. Scoring a plus of 0.6 percent, Germany's price-adjusted Gross National Product was below the – also weaker – EU-28 average (1.1 percent; 2018: 1.9 percent; 2017: 2.4 percent) and grew far less dynamically than in the preceding years (GDP 2018: 1.5 percent; GDP 2017 and 2016: +2.2 percent each). The business climate within the domain sector, in contrast, was balanced again as far as the Cooperative is concerned: No insolvency proceedings were opened among the DENIC members in the year under review.

.de: Rallying DUMs in a Maturing Market

After the total number of domains under management (DUMs) in the German market had declined in the financial year 2018 for the first time ever since the .de domain was launched in 1986, .de experienced another positive turnaround in 2019.

Looking at the entire year, DUMs had increased by 120,000 domains or 0.7 percent to 16,325,000 domains at the end of the year, which compensated for the loss in 2018 and narrowly exceeded the 2017 figure. So the 2019 overall result represented a new all-time high (2018: 16,205,000, -110,000/-0.7 percent; 2017: 16,314,000, +200,000/+1.2 percent; 2016: 16,115,000, +105,000/+0.7 percent). Thus, growth was 1.4 percent or 230,000 domains higher than in 2018 (all DUM figures rounded to thousand). The domestic market showing only moderate growth, the main reason for this development was another sharp rise in non-domestic demand.

The comparably low growth over the last five years is mainly attributable to the increasing saturation of both the

namespace and the domain market, even though the demand for attractive .de domains remains high. This trend has been apparent for quite some time and must be expected to lead to a further slowdown in domain growth in the coming years. Nevertheless, this is not likely to bring about a major change in the DUM numbers or DENIC's solid earnings performance.

Stagnation in inventory growth is being recorded also for the majority of the other high-volume country code (ccTLDs) or legacy generic Top Level Domains (legacy gTLDs). Only .com with an end-of-year result of 145.4 million DUMs and a 5.9-percent plus and .uk (13 million DUMs, +8.8 percent), which continues to benefit from making available second-level domains for direct registration, are exceptions. .org (10 million DUMs) and .net (13.4 million DUMs) scored slight to moderate drops by 2 and 3.9 percent respectively, and thus continued last year's trend.

.info (4.5 million DUMs), in contrast, was able to curb its slump after a massive decrease exceeding 25 percent in 2018 to a more moderate 6.3 percent in 2019. A considerable loss, when compared on a year-on-year basis, recorded .biz with a decrease exceeding 27 percent and as little as 1.5 million DUMs at the end of 2019.

Level of Digitisation and Internet Use in Germany

In 2019, 86 percent (2015: 78 percent) of the German resident population aged 14 years and older used the Internet, 74 percent (2015: 54 percent) also on mobile devices. 97 percent of these belonged to the higher, 92 percent to the middle and 64 percent to the lower educational strata. In the age groups up to the age of 49, broken down according to decades of life, general use of the Internet was between 97 and 99 percent (mobile: 88 to 95 percent), in the group of those aged 50 to under 60, it was 92 percent (80 percent), and in that over the age of 60 it was 81 percent, whereby mobile use in this group was far lower with only 64 percent. For 96 percent of the working population in Germany, Internet use has become part of their everyday working life.

The largest user group, 44 percent, is now considered to be the digital-savvy pioneers with very high digital competence and above-average use of a large number of online services, followed by cautious pragmatists and conservative occasional users with 38 percent. The services and applications most frequently used by Germans include search engines (82 percent), online shopping (71 percent), instant messaging (70 percent), online ordering or booking of services (58 percent), online pay-

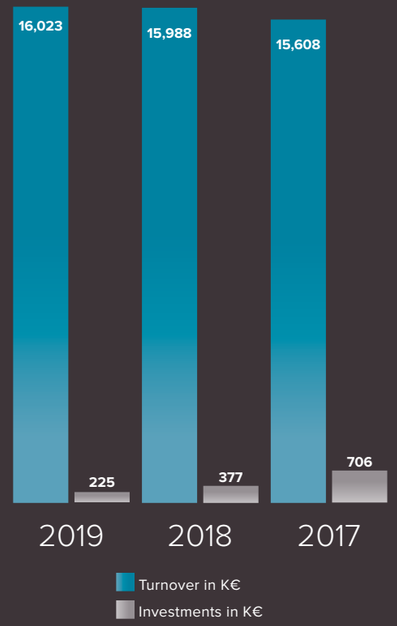
Financial Position	K€	2019	2018	2017
Gross Earnings		13,805	14,538	14,228
Payroll & Material Expenses		12,992	12,878	12,595
Annual Surplus		28	329	338

The annual surplus of 27,586.70 € (including 8.74 € brought forward from 2018) has been reduced according to the bylaws by 10 percent = 2,758.67 € to raise the legal reserve. Furthermore, an allocation to the free reserves of 24,800.00 € was undertaken to cover business risks. The remaining surplus of 36.77 € was brought forward.

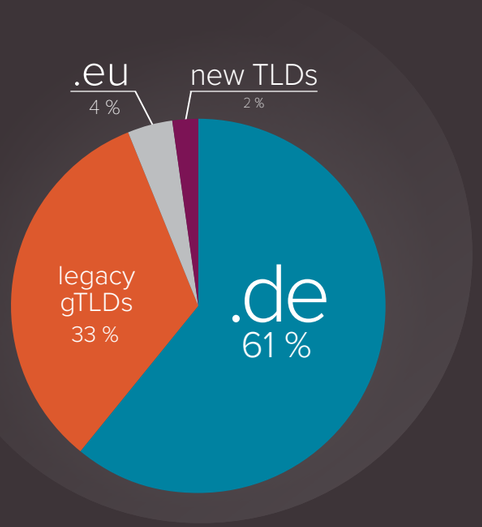
2019 Income	K€
Turnover Members	14,922
Other Operating Income	183
Other Non-Operating Income	145
Total Gross Income	16,168
Net Earnings Before Tax (EBT)	145
Annual Surplus	28

2019 Expenses	K€
Material Expenses	2,364
Payroll Expenses	8,855
Depreciations	848
Other Operating Costs	4,138
Total Operating Costs	16,205

Turnover & Investments



2019 Market Shares of Domains Registered in Germany



ment (55 percent) and on-demand or streaming services (44 percent). Seven out of ten citizens in Germany use 2.7 social media on average.

Competitors in the Social Media Segment

With the foundation of the online social networking service Facebook and the video-sharing platform YouTube in 2004 and 2005, the worldwide – still uncurbed – boom of social media began. Together with instant messaging services such as WhatsApp, which was launched in 2009, or the video and photo sharing app Instagram, which went online in 2010, these platforms are particularly popular with Y and Z generation users because of their ease of use and simple sharing functions. These users often do not mind the limited design options and the dependence on platform operators or the extensive data mining and social profiling of these services, and thus prefer them to domains.

Companies and organisations, in contrast, for whom integrity is highly important, are increasingly recognising the advantages of integrated communication concepts in addressing customers. They rely more and more on a multi-channel approach in which their own website remains the trustworthy, customisable basis of their digital presence and that – in combination with accompanying social media channels as drivers for the selective, event-related increase in visibility and reach – places the website at the center of their Internet activities.

At the end of 2019, there were around 15 million .de domains registered in Germany and around 7.8 million domain holders, compared with 37.6 (2018: 31.6) million German Facebook users. The Federal Statistical Office reports a German population of 83.2 million at that time, which corresponds to about 42 active Facebook users per 100 inhabitants. With an estimated total market volume of 26.2 million domains in Germany, this results in approximately 1.4 Facebook accounts per domain.

21.2 million Germans used Instagram in 2019 (2018: 19.8 million); 9.8 million used LinkedIn, the international business and professional networking online service. The number of users of messenger services, on the other hand, fell to 17 million compared to the previous year (2018: 20.4 million users).

No statistical data is currently available on the extent to which users in Germany use domains and social media in parallel or exclusively.

Competitors in the gTLD Segment

Despite the muted overall growth, the German country code again achieved a share of 60.7 percent (2018: 61 percent, 2017: 62 percent) in the domestic market during the period under review and could thus clearly sustain its long-standing unchallenged market leadership. The slight decline in the market share over the recent years was mainly due to the launch of the new generic Top Level Domains (new gTLDs). By the end of 2019, they accounted for an accumulated share of roughly 2 percent in the German market. The legacy generic TLDs (with .com accounting for the largest share) had an accumulated share of just under 34 percent (2018: 33 percent, 2017: 32 percent), .eu achieved 3.7 percent (2018: 3.9 percent; 2017: 4 percent).

Moreover, the relevance of .de domains shows not only in their – always prominent – position in search engine ranking but also in the Alexa ranking of the top 500 sites in Germany: With a page views share of 37 percent – compared to 49 percent of legacy gTLDs, 13 percent of other ccTLDs and 1 percent of new gTLDs – .de clearly exceeded the European average of 30 percent; only the Russian Federation's (58 percent) and Poland's (55 percent) ccTLDs scored higher in their domestic markets.

As to the admission of new Top Level Domains by ICANN in 2015 and the launch of another application round planned to start in 2021/2022, DENIC sticks to its attitude of wait and see. Further developments will show whether the large number of new endings will meet with a corresponding lasting demand in the market. The 1,930 new gTLD applications submitted to ICANN included 116 IDN TLDs in 12 international, non-Latin scripts. Roughly 1,400 were individual applications based on unique strings. Only 24 applications originated from South America and 17 from Africa, compared to 911 applications from North America, 303 from Asia Pacific and 675 from Europe. 70 endings were from Germany, 35 of these based on company names (.<brand>), 28 on generic concepts, and 8 were so-called geo TLDs and thus referred to geographical names.

In total, there were just over 615,000 (2018: 590,000; 2017: 475,000) nTLD domains of 556 endings registered in Germany at the end of 2019. Nearly half (2018: 47 percent; 2017: 43 percent) of these were accounted for by the ten nTLDs with the largest inventory in Germany (.online, .shop, .berlin, .bayern, .koeln, .hamburg, .club, .nrw, .xyz and .one). Most popular in Germany, behind the consistent market leader .online (ca. 69,000; 2018: ca. 55,000), were .shop (ca. 52,000; 2018: ca. 48,000) and .berlin (ca. 50,000; 2018: ca. 54,000). Compared to the preceding year, the composition of the top 10 group remained unchanged, only the ranking was different: .shop and .koeln climbed up while .berlin, .bayern, .hamburg and .nrw dropped to lower ranks.

Overall registration numbers for the German geo TLDs, i.e. .bayern, .berlin, .cologne, .hamburg, .koeln, .nrw, .ruhr and .saarland, stagnated at roughly 174,000 at the end of 2019, which was similar to the level of the preceding years. For three years now, the figure has established itself at just over 170,000 (2018: ca. 174,000; 2017: ca. 175,000, 2016: ca. 171,000, 2015: ca. 160,000, 2014: ca. 250,000 – due to major promotion campaigns on TLD launching). Unlike the international nTLD market, the German submarket with five purely generic endings and five regional geo TLDs among the top 10 is not governed by speculation. In total, 161 active domestic registrars (of 368 worldwide) offered their customers registrations under new endings in 2019.

All in all, 1,235 (2018: 1,232; 2017: 1,227) new TLDs were delegated at the end of 2019. After deducting the 642 withdrawn applications and the 41 rejected by ICANN, this is roughly 95 percent of all TLDs under ICANN's international new gTLD program. By then, 583 of them had completed the sunrise phase. They accounted for roughly 29.3 (2018: 23.8; 2017: 20.6; 2016: 24.6) million registrations compared to more than 176 (2018: 171; 2017: 165) million under legacy generic TLDs, like .com or .net, and 158 (2018: 155; 2017: 146) million under the 305 country code TLDs worldwide (including 58 IDN TLDs). Thus, the accumulated share of nTLDs in all TLDs of the world amounted to 8.1 percent (2018: 6.8 percent; 2017: 6.2 percent; 2016: 7.8 percent).

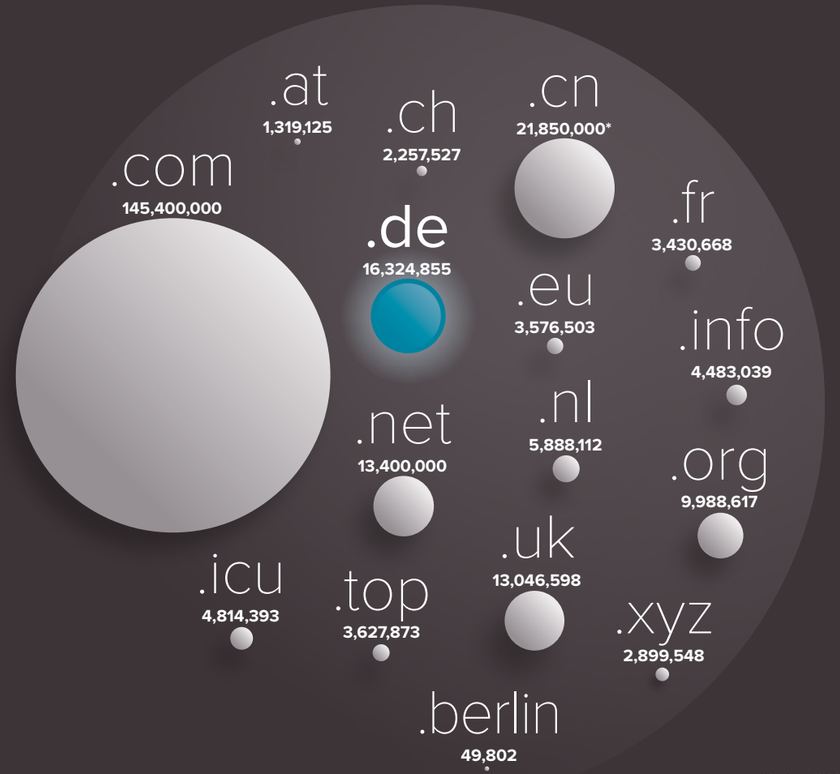
In 2019, about 63 percent (2018: ca. 55 percent; 2017: ca. 49 percent) of all nTLD domains were registered under the top ten nTLDs (.icu, .top, .xyz, .site, .vip, .online, .club, .wang, .live and .shop), more than one third or 36 percent under the top three. Within just one year, registration numbers of the new market leader .icu leapt up by a factor of 16 from about 300,000 to more than 4.8 million DUMs. Thus, .icu did not only skyrocket to the top of the nTLD group far ahead of .top on rank two (3.6 million DUMs) but also climbed to position 10 of the top 10 of all TLDs. In 2016, .xyz with then roughly six million (2019: ca. 2.9 million) domains had been the first of the new generic endings to make it to the top 10 of all TLDs. In 2018, the then largest nTLD .top with ca. 3.5 million domains held rank 12 among the top 15. By the end of 2019, there were 48 geo TLDs with more than 1,000 registered

domains each, following the start of their respective general-availability phase. More than half or 58 percent of the international geo market was split between the top ten of this segment (.tokyo, .nyc, .berlin, .london, .bayern, .koeln, .amsterdam, .hamburg, .africa and .paris), which included four German endings alone.

Six years after their gradual introduction, nTLDs turned out to be far from forming a homogeneous submarket: Depending on their different objectives and strategies ranging from volume to niche market orientation, they show widely varying dynamics, which is reflected in a large disparity of managed domain numbers. Accordingly in 2019, out of the 526 nTLDs available for registration to the wider public or at least to a specific community and thus not subject to general access restrictions for third parties like the brand TLDs, 43 percent accounted for less than 5,000 registrations, only 6.5 percent for more than 100,000, and less than 2.7 percent for more than 500,000.

Scoring about 16.3 (2018: 15.5; 2017: 15; 2016: 17.5) million or over 47 percent (2018: 59 percent; 2017: 63 percent; 2016: 72 percent), the share among the new gTLD domains of parked, thus unused domains continued to be rather high in 2019 (latest data were available in August). In the same period, the redirects to main pages with other, non-nTLD domain extensions decreased from 8.5 percent in 2018 to 7.5 percent in 2019. Roughly 57 percent of the nTLD domains were not assigned a host IP address (DNS A Resource Record), 34 percent referred to a ‚No content' page.

The new gTLD market continues to be largely dominated by the strong demand from China. Accounting for 43.4 percent (2018: 38.6 percent; 2017: 33.4 percent) of all registrations, the most populous country in the world was once again far ahead in 2019 of the USA whose share was roughly 10 percent (2018: 13.5 percent; 2017: 9.6 percent) of all registrations. Scoring 1.9 percent (2018: 2.2 percent; 2017: 3 percent), which corresponds to a total volume of just above 615,000 (2018: 590,000; 2017: 475,000) of all nTLD registrations, Germany maintained rank five, behind Japan (2.7 percent). Anonymous registrants, who use a whois proxy service and can thus not be attributed to any country of origin, amounted to 18.6 percent in 2019 (2018: 19.8 percent; 2017: 23 percent) and thus accounted for almost one fifth of all registrations again. This represents an increase from 5.25 million to roughly 6.45 million or a plus of about 23 percent (2018: 31 percent; 2017: 470) within one year.



* last available value: 07/2019

2019 International Comparison – Domains as of 1 Jan. 2020

The Niche Sector of ENUM

Business development of the German ENUM domain under .9.4.e164.arpa has not come up to initial expectations. ENUM (tElephone NUMber mapping) is used to make available a range of Internet and telecommunications services, including (mobile) phone, fax, e-mail or websites, under a single telephone number. Yet, since its launch in 2006, it has not taken root as an enabling technology for innovative services. Not even service provision free of charge for many years stimulated the service in the retail market. When cost-covering fees were introduced as of the start of the business year 2016, registration for many ENUM domains was not renewed. As a result, registration numbers dropped substantially over the year by roughly 95 percent to a medium three-digit range. Since then, the remaining ENUM inventory has largely stagnated, with a slight downward trend.

Solidary Contribution to Enhanced Internet Security: DNS Infrastructure Services

Third-party operators of ccTLDs, gTLDs or brand TLDs can benefit from DENIC's DNS anycast slave services, which are offered for joint use under a cost-sharing scheme. Next to operative benefits, such as an enlarged footprint and clearly improved resilience and robustness for the co-users of the service, growing numbers of customers and domains under management (DUM) also result in economies of scale for all connected TLD clients.

Next to providing global anycast network presence, DENIC's service portfolio includes 24/7 monitoring and support as well as optional customised web APIs for advanced monitoring at client's end. Presently, the shared global anycast infrastructure run by DENIC includes 11 locations spread across the EMEA region (Amsterdam, Berlin, Frankfurt, Moscow, Stockholm, Vienna), Asia Pacific (Hong Kong, Seoul) and the Americas (Los Angeles, Miami, São Paulo). Situated close to major Internet exchange points, the anycast locations feature large bandwidths, support IPv6 and are fully DNSSEC-enabled.

On 1 November 2018, the non-member business of DENIC eG was transferred to DENIC Services GmbH & Co. KG. From then on, the newly founded subsidiary took over full sales and marketing responsibility for the DNS anycast services. However, all related technical infrastructure continues to be run by the parent company DENIC eG.

Compared to 2018, the anycast volume managed by the DENIC group grew by 20 percent over the year 2019.

The customers are eleven country-code registries, which are located in the European, Asian Pacific and American markets. DENIC concluded agreements with two additional ccTLD registries before 2019 came to an end. Together with a third country code customer, who is going to join in at the beginning of 2020, they will go live in February. Additionally, starting with the 2nd quarter of 2020, the anycast portfolio will newly include registries of the gTLD segment.

Multiplied Customer Numbers, New Major Clients: Data Escrow Services

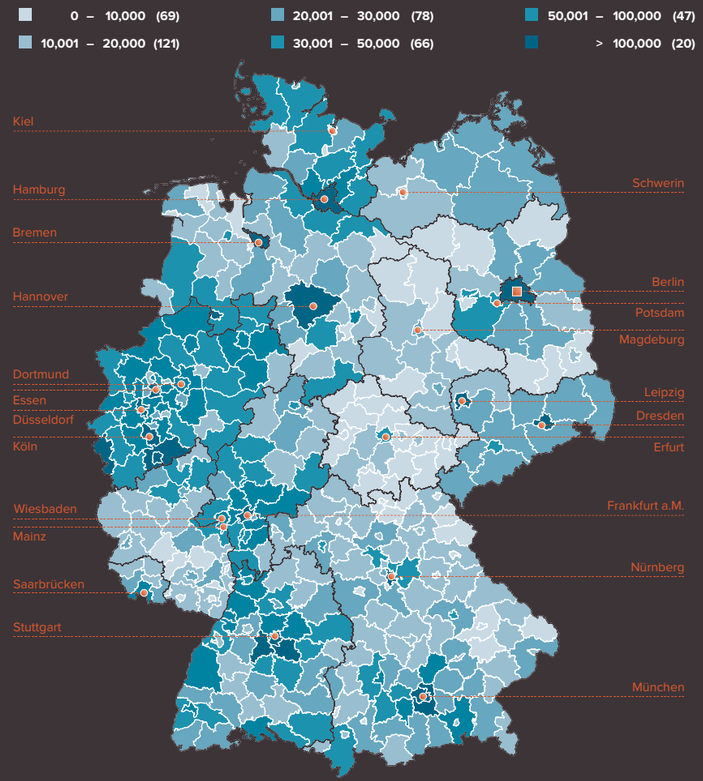
In May 2018, DENIC eG emerged as the only successful bidder from the international tender to become Designated Escrow Agent (DEA) for ICANN-accredited registrars. After its prior accreditation as an ICANN-approved Registrar Data Escrow Agent (TPP RDE) in June 2016 and as a New gTLD Data Escrow Agent for Domain Registries (Registry Data Escrow, RyDE) in July 2017, this was a new milestone.

With the spin-off of the non-member business of DENIC eG on 1 November 2018, sales and marketing responsibilities for the data escrow services, which are designed to provide secure storage of their business data for players of the domain industry, were transferred to the newly founded subsidiary DENIC Services GmbH & Co. KG, together with all related ICANN accreditations. Operation of the technical infrastructure, however, remains entirely with the parent company DENIC eG.

In the business year 2019, DENIC Services GmbH & Co. KG continued to expand the data escrow services business: At the end of the year, 60 RDE customers had migrated to DENIC. Another five had already arranged for their migration to take place in 2020.

As to Registry Data Escrow (RyDE), 32 customers with a total of more than 6.6 million domains under management had onboarded by the end of the year. 17 of these were geo TLDs from Europe and Asia, seven were brand TLDs and eight purely generic endings. Another 12 had signed agreements to migrate in 2020. As to the generic TLDs, these include two major clients from the top 10 nTLDs, which jointly account for a market share of ca. 20 percent in the overall nTLD market. The accumulated market share of DENIC Escrow customers from the geo TLD segment adds up to roughly 32 percent. They include five of the top 10 geo TLDs and five of the eight German geo TLDs with the largest number of domains under management.

2019 Absolute Number of Domains in Rural and Urban Districts in Germany



.de Report

DENIC's domain map visually breaks down .de domain registrations within the German territory. It shows the geographic domain distribution in nominal figures and the penetration rate within the country's 401 urban and rural districts at the end of each business year.

2019 saw hardly any changes in the ranking according to absolute domain numbers. The large German cities continued to be dominant in this league. Berlin maintained its clear lead on Munich and Hamburg. All in all, penetration was higher in the urban than in the rural districts. The 13 cities with more than half a million inhabitants alone, corresponding to 16 percent of the total German population, accounted for more than one quarter of all .de domains in Germany. More than half of the domains under management, in contrast, were distributed among the 291 rural districts, if the municipal associations with the larger cities of Aachen, Hannover and Saarbrücken are left aside.

Looking at the distribution of domains per 1,000 inhabitants, the federal average still was 180. This value was exceeded by 47 percent of the urban, but only by 15 percent of the rural districts. Outliers included in the data may reflect local domain traders holding large-scale domain portfolios.

At federal-state level, Hamburg (313) still scored best ahead of Berlin (275) with regard to domain penetration, while Saxony-Anhalt (82) brought up the rear again. In most German regions, in particular in the southern federal states, the number of .de domains increased slightly in 2019. Excluding Berlin, the average percentage domain growth among the states in the east of Germany (-0.7%) fell noticeably short of that scored by those in the west (+0.4%) in 2019. The west-east divide thus slightly widened.

At domestic level, the number of .de domains in Germany grew by 0.2 percent to 14.9 million compared to a 0.7 percent plus overall. This means that an increasing share of the growth was attributable to domains registered by holders from abroad. At the end of 2019, they accounted for about 1.3 million or 8 percent of all .de domains (2018: 1.2 million). Registrants stem from all parts of the world, more than three quarters, however, from the top ten countries of origin. The top ranks in the list according to nationalities remained unchanged. The US consolidated its leading position with 360,000 domains (+7.4%) or more than 25 percent of international .de domain holders. The Netherlands with 148,000 domains and Russia with 132,000 domains maintained ranks two and three. Then followed Switzerland and Austria with a six-percent share each in the .de domains held by non-residents, and Great Britain and the United Arab Emirates, which accounted for 4 percent each.

DENIC – the Networkers

It is one of DENIC's main concerns that the Internet continues to exist as a forum of the many and a place of global exchange, a platform for innovation, creativity and business ideas that works beyond all conventional borders. Therefore, DENIC has made the commitment to add to the preservation and enhancement of the single, free, open and secure Internet part of its key set of values. To this end, it builds on strong alliances and is closely networked within a multitude of contexts, at both national and international level. This enables the Cooperative to remain constantly involved in shaping the Internet of the presence and the future, in accordance with the interests of the German Internet community. A key focus of DENIC's Internet governance activities is on avoiding the Internet's core infrastructure, the identifier system, to be exposed to influences that may encourage it being subjected to conditions and controls that lack a valid legal basis.

DENIC in Coordination and Standardisation Organisations

Since 2009 DENIC has been a member of the Country Code Names Supporting Organization (ccNSO), which represents the interests of the ccTLDs at ICANN (Internet Corporation for Assigned Names and Numbers, ⌂ icann.org), the central coordination body for Internet infrastructure. DENIC representatives attend the regular ICANN conferences to make sure that the interests of DENIC, its members and the German Internet community are taken into account.

From 2014 to 2016 DENIC was involved in the national and international consultations related to the so-called IANA Stewardship Transition. The negotiations culminated in a new management model which released the Internet Assigned Numbers Authority (IANA, ⌂ iana.org) from the US government's scope of responsibility as of October 2016. Thus, the oversight of the central technical functions of Internet address management rendered by IANA were transferred to the global Internet community, which comprises the private sector, governments, civil society, technical operators and academia and is represented by ICANN.

In line with the new management model, various supervisory bodies were established, which, true to ICANN's principle of diversity, were composed of representatives from all of ICANN's sub-organisations. In October 2019, DENIC's Policy Advisor Peter Koch was re-appointed by the Country Code Names Supporting Organization (ccNSO) to represent the ccTLDs at the Root Zone

Evolution Review Committee (RZERC). RZERC is a standing committee that monitors and reviews proposed major architectural changes to the administration and the distribution mechanisms of the DNS root zone.

In February 2017, DENIC's Chief Information Security Officer Boban Kršić was elected to ICANN's second Security, Stability & Resiliency Review Team (SSR2). The SSR2 team investigates and assesses if ICANN meets its obligation to enhance the security, stability and resiliency of the Domain Name System (DNS). An important task from the community's point of view is to ascertain whether and to what extent ICANN has implemented action recommendations of the 2012 SSR1 review. The draft final report of SSR2 is planned to enter the initial public consultation phase in January 2020. The final version of the report is expected to be available in the course of 2020.

For the term November 2019 to October 2020, Policy Advisor Peter Koch was delegated by the Internet Architecture Board (IAB) to ICANN's Nominating Committee (NomCom) as voting member. The NomCom has the task to select candidates to fill various positions in the ICANN Board as well as a range of leadership positions in ICANN's substructures. Peter Koch will take the seat assigned to the Internet Engineering Task Force (IETF). He is further one of the ccNSO representatives in the IANA Naming Function Review Team (IFRT). The IFRT has the task - as an important consequence of the IANA transition – to conduct a first check of contract performance by the ICANN subsidiary PTI.

Before assuming this post, he chaired the "ccNSO Study Group on the use of Emoji in Second Level Domains", which submitted its final report in September. Giving a detailed overview of the emoji SLDs offered by registrars and ccTLD registries, the report helps to analyse the risk of emoji symbols in domain names, which according to IDN2008 are no permitted characters.

As member of the ccNSO working group "Retirement of ccTLDs", Peter Koch is further involved in developing a retirement policy for ccTLDs. The policy will close a gap left in the realm of RFC 1591 and the "Framework of Interpretation" (FoI) in case a country code is removed from the ISO 3166 list, which is the basis for determining country codes for ccTLDs.

In 2020, one of the three annual ICANN meetings will be held in Germany for the first time in 21 years. Thus, important decisions of the international Internet community on the core functions of the Internet will be taken while Germany also holds the EU Council presidency. The selection of Hamburg to host the ICANN 69 Meeting honours the commitment of the German Internet community and provides an opportunity to introduce German and European perspectives on an even broader basis. DENIC and eco – Association of the Internet Industry will jointly host the meeting from 17 to 22 October together with the City of Hamburg. Around 2,500 to 3,500 participants from academia, technical operators, politics, the private sector and civil society are expected to attend.

From 25 to 29 November, the **Internet Governance Forum of the United Nations** (UN-IGF, ⌂ igf2019.berlin) was held in Germany for the first time, under the auspices of the German Federal Ministry for Economic Affairs and Energy. The multistakeholder symposium under the motto "One World. One Net. One Vision", which brought together several thousand attendants from all over the world, was opened by UN Secretary-General António Guterres and German Chancellor Dr. Angela Merkel. DENIC took part in various panels and had its own information booth in the IGF Village exhibition area. Several hundred visitors came to the booth and could gain comprehensive insight into the structure and tasks of the Cooperative and its commitment to promoting and preserving the open, free and secure Internet.

Due to the occasion, DENIC's information website "Internet Governance Radar" (⌂ internet-governance-radar.de/en/) was a central item of demonstration. Established in mid-2018, the web presence is unique in the German-speaking area for its fully bilingual (English and German) concept. Consistently updated and extended, it gives long-standing IG stakeholders as well as the media and the interested wider public a topical overview of global IG players and the dialogues they lead on digital governance issues. It also provides up-to-date conference reports in blog format as well as references to upcoming IG events.

The Internet Governance Forum Germany (IGF-D, ⌂ igf-d.de), which plays an important role in societal discussions about national and international issues of Internet policy and Internet governance, has been supported in its work by its own advisory board since February 2016. The committee of 29 experts is composed of the Internet policy spokespersons of the different parliamentary groups of the German Bundestag, delegates from the relevant ministries, civil society, the private sector, the technical community and academia as well as from IGF-D's Next Generation sec-

tion. Represented by its CEO Jörg Schweiger, DENIC has been one of the five technical infrastructure delegates at IGF-D's advisory board since its foundation. DENIC co-organised and contributed to the panel discussions of the IGF-D conference in September and to the catalogue of demands addressed to German policymakers that emerged from it.

DENIC was also actively involved in the establishment of the IGF Deutschland e. V. sponsoring association, which was launched in the margins of the United Nation's Internet Governance Forum's (UN-IGF) annual meeting at the end of November in Berlin to structurally strengthen the idea of a national dialogue on Internet policy. The association deals with the special concerns and interests of German citizens, companies and authorities in connection with Internet governance as well as with general questions of digital policy coordination at federal level. The Federal Ministries for Economic Affairs and Energy, of the Interior, of Transport and Digital Infrastructure and the Federal Foreign Office support the association's inclusive, open and transparent framework.

Furthermore, DENIC is actively involved in the **Internet & Jurisdiction Policy Network** (I&J, ⌂ internetjurisdiction.net). Since August 2018, DENIC CEO Jörg Schweiger adds the Cooperative's position as a member of the Domains & Jurisdiction Contact Group, which is composed of international multistakeholders, including a representative of the German Federal Ministry for Economic Affairs and Energy. Drafting interoperable action guidelines that are to define if and how malicious use of the Internet can or should be tackled by cross-border measures, possibly also at DNS level, the group puts into concrete terms the work plan and guidelines adopted at the 2nd Global Conference of the I&J Network in February 2018, by more than 200 attendants from 40 countries. Founded as a non-governmental organisation in 2012, I&J is supported by a number of international organisations: OECD, EU Commission, Council of Europe, UNESCO and ICANN. Acting as an interface between international and national IG, the initiative facilitates policy coherence and global coordinated action.

Within the **Internet Engineering Task Force** (IETF, ⌂ ietf.org), which is responsible for technical Internet standards, DENIC in 2019 continued to accompany diverse working groups dealing with the maintenance and further development of the Internet protocols.

At **RIPE** (Réseaux IP Européens, ⌂ ripe.net), the open forum of European operators of IP networks and network infrastructure, DENIC is traditionally strongly engaged. Since 2019, DENIC Policy Advisor Peter Koch has been a member of the RIPE Database Requirements Task Force, which is to draft the new content requirements for the RIPE database. The question which database functions result directly from the role of RIPE NCC as a Regional Internet Registry (RIR) and how this purpose is maintained in the light of claims by third parties is also of considerable relevance to TLD registries.

In Germany's national **CERT** Association of Computer Emergency Response Teams (⌂ cert-verbund.de), DENIC contributes its DNS expertise to enhance security on the Internet and better protect German IT networks. The alliance of more than 40 large private, commercial, academic and public CERTs at German national and federal state level regularly meets to discuss how to organise CERT teams, how to treat specific incidents, and how to learn from and prevent IT security incidents in the future.

Since October 2017, DENIC has been a member of the **OpenID Foundation** (OIDF) (⌂ openid.net/foundation). The Foundation promotes and protects licence-free OpenID technologies and manages OpenID intellectual property and trademarks. DENIC strives to possibly standardise and obtain certification for its single sign-on identity solution ID4me, developed in conjunction with 1&1 Ionos and Open-Xchange, and its related Domain Name System (DNS) based mechanisms. Since 2019, DENIC has been an active member of the eKYC & IDA (Electronic Know Your Customer & Identity Assurance) working group, where the operators of OpenID Connect 4 Identity Assurance implementations collaborate to jointly develop standards and trust frameworks.

Memberships in the **German Institute for Standardization e.V.** (DIN, ⌂ din.de/en) and the **Competence Center for Applied Security Technology** (CAST, ⌂ cast-forum.de/en) have extended the Cooperative's strategic sphere of influence since January 2018.

As a member of the DIN Standards Committee on Information Technology and selected IT Applications (NIA), DENIC was involved in the creation of a data privacy standard with a special focus on data privacy management, which shall ensure that the international IT security and data privacy standards are applied uniformly all over Europe.

In 2019, the ISO/IEC 27701 standard covering the provision of evidence for compliance with data protection regulations was published. It is an extension to the ISO/IEC 27001 standard for Information Security Management Systems (ISMS) according to which DENIC has been certified since 2014. Adding issues of personal data processing such as the encryption of specific data categories or the mandatory consideration of the "Priva-

cy-by-Design" principle to ISO/IEC 27001, ISO/IEC 27701 further supplies measures that facilitate the provision of evidence of GDPR-compliant handling of such data.

As a member of the CAST association with its relation to the Technical University of Darmstadt in Germany, DENIC is intensifying its bond to research and development in the field of IT security.

Cooperation with State Institutions

In 2014, at the initiative of DENIC, the Internet Infrastructures Working Group (BAK IIS) was founded within the scope of the ICT sector under the German Critical Infrastructure Protection (CIP) Implementation Plan (**UP KRITIS**). KRITIS is a public-private partnership of critical infrastructure operators, their related associations, parties with a fundamental interest, and the responsible government authorities in Germany. As the working group's chair and spokesperson, DENIC, represented by Chief Information Security Officer Boban Kršić, in cooperation with the Internet hub operators DE-CIX, B-CIX, E-CIX and the Federal Office for Information Security (BSI), is actively involved in the coordination of the technical security requirements for the players in the Internet industry, in the discussions at supreme level with the competent Federal Ministry of the Interior.

The cross-sector and cross-industry Audits and Standards Working Group (TAK AS), founded in 2016 within the scope of UP KRITIS, is also chaired by DENIC, represented by Boban Kršić. It supports a targeted implementation of the German IT Security Act by the KRITIS Regulation in a resource-efficient way. In 2019, the Working Group further enhanced the guideline on contents and requirements of industry-specific minimum standards (B3S) and thus supported the sectors and industries in developing methods and procedures for conducting the obligatory compliance audits stipulated by the IT Security Act for all operators of critical infrastructure. Another issue of discussion was the potential impact of the EU Cybersecurity Act on critical infrastructures in the IT sector.

Cooperation with Academic Institutions and Security Experts

In 2018, DENIC entered into a cooperation agreement with **CISPA – Helmholtz Center for Information Security** (⌂ cispa.saarland) to combine research with practical experience in the fields of cyber security and data protection. The cooperation with the scientific excellence cluster is planned to initially extend until 2022. The research areas include testing and optimisation strategies for DENIC's Anycast locations and concepts for the tailored scalability of the implied resources that will yield important information for DENIC with regard to the diversification of its network topology. An additional focus will be on the development of a resolver reputation service for protection against DDoS attacks and the establishment of statistics as a basis for developing defence strategies to mitigate infrastructure attacks.

In March, DENIC subjected its new service for digital identity management, the single sign-on (SSO) solution DENIC ID, which is based on the open standard ID4me, to an extensive external penetration test to comply with the Registry's high security standards. The review of the applied software components and systems on vulnerabilities and security gaps was performed by **HackmanIT**, an independent SSO specialist enterprise founded in the realm of Bochum University, in Germany. The results of the targeted manipulation and attack simulations, which were published on the DENIC website, proved that the DENIC ID login procedure, and thus the authentication and authorisation of registered users, meet highest security standards.

DENIC in Associations

In view of the extended namespace on the Internet as a result of the market launch of new generic Top Level Domains (new gTLDs) since the end of 2013, country code Top Level Domains (ccTLDs) need to constantly enhance and strengthen their brand profiles. To pursue this aim, DENIC continues to be deeply involved in a variety of regional associations of national domain registries. All these organisations offer their members a platform to exchange information on best practices and to discuss and build consensus regarding questions of global Internet policies. At the same time, the umbrella associations act as an interface to organisations and bodies like ICANN or IETF that coordinate the Internet, where - speaking with one voice - the ccTLDs have a much better standing.

Right from 1998, when **CENTR** (Council of European National Top Level Domain Registries, ⌂ centr.org) was founded, DENIC has been strongly committed in key functions at the association of European ccTLDs. At present, CENTR unites more than 60 registries and organisations as full and associated members. Together they manage more than 80 percent of all country code domains in the world. The 12 member organisations with observer status include, among others, the European Commission, eco - Association of the Internet industry, and the Association of European Internet Services Providers EuroISPA.

Over the last few years, the CENTR member registries and the ccTLDs operated by them have increasingly been

faced with regulatory efforts on national and on EU level. This situation makes it ever more important to have a strong common voice to present joint interests in the dialogue with the competent authorities and political entities.

With DENIC CEO Jörg Schweiger having been re-elected as Chairman of the CENTR Board of Directors in February 2018, DENIC assumed a prominent role also in 2019 in shaping the association‘s strategic orientation and further evolution with regard to policy and participation issues.

One of CENTR’s activities in 2019 was to comment on the EU‘s plans for the e-Evidence Regulation and the EU Cybersecurity Act. It explained the domain registries’ concerns with regard to the envisaged implementing provisions and recommended changes in this respect.

With the intention to promote a well-founded, fact-based assessment prior to a potential resolution of regulatory measures, CENTR additionally launched a comprehensive policy document. Clearly outlining the limits of domain registries when it comes to combating malicious content on the Internet, CENTR thus aimed at creating awareness among the competent policy makers for the important functional correlations of the technical Internet infrastructure and its operators.

CENTR also took a critical look at the advantages and possible risks of implementing DNS over HTTPS (DoH) as a new, global protocol standard in a position paper. DNS over HTTPS could on the one hand enhance the privacy of Internet users through the encryption of DNS communication, but on the other hand bears the risk that all Internet traffic is handled by a few large providers, which might pose a threat to the free Internet.

Within the framework of an interdisciplinary initiative of the CENTR Security and L&R (Legal & Regulatory) working groups, DENIC’s Chief Information Security Officer Boban Kršić took over the co-lead of a task force in 2019 which is designed to develop sector-specific security guidelines (S3G) by an industry-driven bottom-up approach. Taking into account the requirements for concerted measures of IT security at EU level laid down in the NIS Directive and the EU Cybersecurity Act, the task force wants to establish a global standard based on proven best practices that could serve as a basis for subsequent certification. If appointed to join the Cyber Security Stakeholder Group planned by the European Commission and coordinated by the European Cyber Security Agency ENISA, the task force aims to introduce such standard into the political process. By the end of 2019, the 30-member CENTR task force had agreed on the project scope and steps in a preliminary draft and recorded these in a draft vision statement.

The international data science working group called "Registry Registrar Data Group” (RRDG) has been in place since 2017. Representatives of European ccTLDs, including DENIC, and a representative group of registrars work together in the project, which aims at developing harmonised standards and classifications for a cross-industry analysis of domain and registration data. CENTR acts as centralised data source for the project.

With the Domain Registration Metrics, the RRDG Group developed standardised definitions of common concepts that enable a uniform understanding of registration activities and contribute to an improved benchmarking. A jointly defined set of key performance indicators for standard analyses and transaction data will enable registrars to access information on emerging trends at an early stage and thus improve the quality of their business forecasts. Registrar assignment to different peer groups based on seven RRDG-defined business models and on various size categories shall allow benchmarking across ccTLD boundaries in the medium term.

It is further planned to identify underrepresented markets with a potential for domain marketing by assigning domains to defined sectors. Based on the Statistical Classification of Economic Activities in the European Community, i.e. the Nomenclature statistique des activités économiques dans la Communauté européenne (in short NACE), the RRDG prepared a "Domain Industry Taxonomy" (DIT), which combines all NACE codes into meaningful domain-specific categories and shall serve as a standard for the domain industry in the future.

Additionally, technical experts and data scientists of the registries involved jointly develop crawler and analysis tools in the "Registry Data Nerds" (RDN) Group. Using big data and machine learning tools, their mission is to assign domains to specific industries on the basis of the DIT taxonomy and to cluster them by means of context-based fuzzy hashing. In the future, they also want to investigate types and scenarios of use (such as web, e-mail, parking, redirect, etc.) as well as the lifetimes and geographic distribution of domains with the aim to gain insights into domain usage patterns and the related safety aspects on an ongoing basis.

Since July 2012, DENIC has also been an associated member of the umbrella organisations **APTLD** (Asia-Pacific Top Level Domain Association, ⌂ aptld.org) and **LACTLD** (Latin America and Caribbean Top Level Domain Association, ⌂ lactld.org). Via these memberships, next to being involved in and benefiting from the intercontinental dialogue, DENIC also contributes to further strengthening the coherence and close solidarity among all ccTLDs.

DENIC Events

DENIC regularly organises industry events for its members and other stakeholders, like **Domain pulse** (⌂ domainpulse.org), the annual expert congress of the three D-A-CH area registries, DENIC, nic.at and SWITCH. With high-profile talks and panel discussions, these industry forums offer abundant information about a wide variety of topical technical, legal and socio-political issues of the domain and Internet ecosystem. The 16th domain industry key event in Central Europe with roughly 250 attendants was hosted by SWITCH in Bern. Internet industry professionals looked into multiple issues on security, resilience and the future framework of the Internet together with ethical hacking and IT research experts and representatives from politics, authorities and law enforcement.

Sponsoring Partnerships

Also in 2019, DENIC was one of the sponsoring partners of the pan-European **EuroDIG** forum (European Dialogue on Internet Governance, ⌂ eurodig.org). EuroDIG deals with the specific problems and interests of the European Internet community regarding the development of collective Internet governance strategies.

The 2019 congress with the overarching theme "Cooperating in the Digital Age" was held in The Hague under the auspices of the Ministry of Economic Affairs and Climate Policy of The Netherlands. One of the key issues was a potential tightening of the European regulatory framework, if for instance the Budapest Convention on Cybercrime was extended to include aspects such as disinformation or hate crime. Another focus lay on the future handling of technologies such as AI or IoT and the associated ethical requirements of making human control over algorithms a binding legal condition. Overcoming persistent information barriers at the interface of politics and the technical Internet community by means of the multi-stakeholder model in order to create a better understanding of the complexity of the respective fields of activity and thus strengthen mutual trust was the subject of a panel, in which DENIC was actively involved. The results of the open multi-stakeholder platform for an informal inclusive dialogue, which is supported by the Council of Europe and the European Commission, are reported to the international IGF Secretariat and are thus taken up in the global debate about Internet issues of public interest.

As regards promotional activities for the leaders of tomorrow, DENIC was one of the co-founders of the **European Summer School on Internet Governance** (EuroSSIG, ⌂ eurossig.eu) and has been its main sponsor ever since. In 2019, EuroSSIG was held for the 13th time. More than 350 fellows from more than 80 countries have attended the academy since it was established by an initiative that had emerged from the World Summit on the Information Society (WSIS). Next to expert presentations, in-depth workshops and discussion rounds, the curriculum comprises realistic simulation games in which the fellows practice the participation and consensus-finding procedures that are common practice in multi-stakeholder environments. Thus having acquired broad knowledge of the political, legal, sociocultural and technical aspects of Internet governance, fellows are qualified to collaborate in international Internet governance organisations where some of them already hold (initial) decision-making functions.

Since 2011, the agile working concept with Scrum, Kanban and DevOps is being applied to operational processes at DENIC. In short work cycles, self-organised, interdisciplinary teams deliver sustainable, customised solutions of high (technical) quality. In order to further improve agile frameworks as a method and to promote their establishment in practical use, DENIC sponsored two conferences of the German agile community in 2019: the **Scrum Day** and the developers' event **Frankfurter Entwicklertag**.
In May, DENIC presented itself as an attractive employer with challenging fields of activity at **konaktiva**, one of Germany's largest career fairs for students. The Cooperative used the annual event organised by the Technical University of Darmstadt to systematically recruit students and young academics among the broad audience of the fair for internships, degree theses or a direct start in employment.

In September, DENIC supported the Frankfurt edition of the IT youth hackathon initiative "**Jugend hackt**" for the second time in a row. The project launched by the Open Knowledge Foundation Germany in 2013 under the motto "To code a better world" aims to promote and network young talents and to bring them together in their local communities with qualified mentors in live hackathons of several days. Here, they jointly develop open data projects and can establish contacts with potential training companies.

2020
Prospects

Prospects

Despite the still noticeably slow economy in Germany in the last year, with only a few signs of an economic upturn towards the end of the year, DENIC expects the positive development of the Cooperative to continue. Nevertheless, the Executive Board anticipates a slight reduction in relative domain growth in 2020/2021 compared with 2019 and assumes a similar development in the foreseeable future.

The actual number of domains under management is impacted not only by the economic development but also by the extent to which Internet users turn to alternative web presences in social media and, even though only at a lower level, by the diversification of the market as a result of ICANN's new gTLD program launched in 2012. This could be fuelled once more by another round of applications for the introduction of further new generic top-level domains, which is expected to start in 2021/2022. Yet all in all, DENIC does not expect these factors to have a substantial impact on the development of .de domains or their high market share in Germany that has been stable for years.

In view of the expenditure required for ongoing operation and to further augment the resiliency of DENIC's technical systems while market prospects remain modest, sales stimulation is an aspect increasingly taken into account when evaluating potential complementary fields of business.

Next to the provision of domain market data to the registrar channel, readily compiled and structured to allow easy individual statistical analyses, incentive is given by the abolition of the previously mandatory condition for non-resident domain holders to state a summonable postal address in Germany upon registration. Further promising options include every measure that would add value to a domain and can thus enhance their overall attractiveness.

User Desire for Digital Self-Determination – A Market Opportunity for DENIC ID

The rising awareness of Internet users concerning the handling of their personal data and the entailing scepticism towards social media and the social logins they offer, open up opportunities for alternative electronic authentication procedures like DENIC ID.

For 2020, intensive marketing is planned for the domain-based digital identity solution built on the open-source, federated ID4me standard that grants the user full sovereignty over their data. Both B2B and B2C scenarios will be pushed. Single sign-on solutions with DENIC ID

used within the Cooperative's network could serve as a reference for future on-premises applications in the internal networks of larger enterprises. Already since the end of 2019, attendants can register online with an ID4me login to the world's largest conference of the hosting industry, CloudFest. By the time the event takes place, DENIC will further be able to issue limited-term eIDs free of charge to boost pioneering of the domain-based solution and give users an idea of how the ID4me login works in practice.

In the next step, priority will be given to the validation and verification of user data by the registrars acting as ID agents, through assurance-level implementations. A potential approach could include a new DENIC service that helps domain holders to build up a reputation of trustworthy partner vis-à-vis the online community, by having their registration data verified and confirmed by a DENIC-issued certificate. In the case of natural persons, this would comprise the validation of the postal correctness of the holders' data, and in the case of legal entities, the verification of the company data and authorised persons as well as their optional authentication by specialised service providers, so-called Trusted Third Parties. Domain holders subscribing to the service could also use it as a reliable and inexpensive alternative to EV SSL or Trusted Shop certificates and also protect themselves effectively against identity theft.

Registry Lock: Protection Against A "Hostile Takeover"

In the preceding years an increasing number of cases has become known in which attackers made unauthorised changes to key domain data of a third party and thus re-directed the data traffic to their own servers. With Registry Lock, DENIC is going to offer an additional security service to prevent this so-called DNS hijacking. It will enable users not only to better protect their domain against being infringed by unauthorised parties but also to minimise the risk of temporary unavailability due to a technical mistake: The authentication mechanism secures DNS and holder data of specific domains against unintended or unauthorised changes. The "lock" status can only be disabled by a separate release, which cannot be triggered by the usual means of registrar-registry communication.

Recognizing Patterns, Drawing Conclusions: Improved Risk Assessment and Business Forecasting Through Data Warehousing

At the end of 2019, DENIC set up the organisational structures for the establishment of a central data warehouse, which is to systematically bundle and evaluate a multitude of business-critical data that accumulate during operation: As a single source of truth, the planned information platform will soon provide the DENIC management and

specialist departments with access to consolidated key figures and metrics relating to DNS traffic, registry operations, information security, business continuity management, data science and accounting, and, with the knowledge gained, support them in important operational and business decision-making.

DENIC is further planning a business intelligence approach that will correlate its own primary registry data with those of selected secondary sources. As of mid-2020, a domain market information system is scheduled to make available segmented business data and metrics on a day-to-day basis to DENIC member registrars that will give them an idea about their position in the market and competitive environment. By assigning the registrars to peer groups based on their business model and size, the benchmarking will gain additional informative value. The aim of the new service is to aggregate currently unavailable overall data about .de domains (transaction data, use patterns, industry penetration rates) and to thus point out future growth potentials. Another goal is to identify underrepresented markets with a potential for domain marketing by assigning domains to defined sectors with the help of web crawling and machine learning.

All in all, DENIC plans to make available three separate stakeholder dashboards for the DENIC management, the DENIC member registrars and for the interested wider public, in each of which the respective data will be prepared for the specific target group by means of interactive visualisations.

Diversification 2.0: Continuous Optimisation of Name Service Operation and Security

Always thinking ahead of future availability and protection requirements of its systems and services, DENIC gives consistent priority to the strategic performance enhancement and careful hardening of its network and service infrastructures. To this end, the Cooperative will start to diversify its name server landscape by initially launching the vNSL prototype developed in 2019 with a .de zone for test operation under live conditions. In this context, the current Anycast topology with its sites in Europe, Asia, North and South America will initially be expanded by additional locations in Africa and Australia. By the end of 2020, the development of NSL architectures for all performance levels as defined in the functional, technical and organisational requirements are envisaged to be completed. It is further planned to roll out first micro NSLs as virtual machines in the hosting environment of larger ISPs and thus keep data traffic at local level, which can lead to shorter response times and improved reaction to malicious data traffic.

Data Center in the 21st Century:
Roll-out of New Architectures

Continuing last year's intensive analytical and planning preparations to remodel the DENIC data center architecture for the registry and office services, the product teams and the design team will go on by jointly developing a roadmap that defines which of the selected services are to be migrated to a public cloud environment and in what order. Transfer of applications to the cloud will start gradually in the course of 2020.

The top guiding principle in this context is to create an infrastructure that ensures the high availability of all services without vendor lock-in. This will also accelerate the switch to modern quasi-standards of system orchestration. Using Infrastructure as a Service could thus replace DENIC's own managed resources, such as the geographically remote data centers in Germany (Frankfurt) and the Netherlands (Amsterdam), and help to reduce the overall cost of operations.

Providing Expert Advice to Digital Policymakers
in Germany and in Europe

In its role as DNS operator and domain registry, DENIC is increasingly affected by regulatory initiatives at national and EU level. In 2020, this will include in particular consumer protection initiatives at both these levels. In January, the reformed **CPC Regulation** bringing changes to consumer protection cooperation in the EU Single Market will come into effect. It creates a legal basis for establishing a European network of national authorities that will be responsible for cross-border enforcement of collective economic consumer interests in case of serious infringements. Next to the obligation to disclose personal data to governmental and non-governmental organisations at EU Member State level, the CPC Regulation may entail for DENIC and its members the obligation to delete a domain without prior judicial order.

With the **"Digital Services Act"**, the EU Commission has been pursuing a legislative project since mid-2019 to revise the rules for services on the Internet. The Cooperative will be watching closely if this will possibly lead to a tightening of the liability of Internet service providers for illegal content, as it is practised to date under the existing e-Commerce Directive, in accordance with the notice-and-take-down principle. Up to now, only those DENIC members who offer hosting services have been affected by the regulations.

Relying on the current case law, DENIC maintains a critical and negative stance towards all European and national efforts that aim at imposing self-regulation on DENIC with regard to web content. Neither has DENIC, being a domain registry only, access to such web content nor is such web content transmitted via the DENIC networks. Thus, DENIC can neither delete any web content nor prevent it from being spread over the web. Furthermore, judging if any given content is legitimate or not does not fall within the area of competence of a private cooperative.

The trialogue negotiations between the EU Parliament, Council and Commission on the **e-Evidence Regulation** are expected to begin in the second half of 2020. The regulation is designed to give police and judicial authorities rapid access to electronic evidence in case of suspicion by authorising them, by order of a local court in their own country, to request inventory and communication data directly from any service provider operating in Europe. For DENIC and its members, the e-Evidence Regulation could mean that they would have to transfer electronic evidence in the form of customer data across borders directly to authorities in other EU countries without any prior verification by a domestic authority of the legality of such a request, for example by checking compliance with fundamental rights in accordance with the applicable law of the executing State.

Also highly relevant for the Cooperative is the extent to which the redrafted version of the **German IT Security Act** (IT-SiG 2.0), which is currently being coordinated by the competent ministries involved, will have an impact on DENIC and its members, for example due to the definition of new threshold values and/or the classification of additional DENIC services – such as the registry function – as critical infrastructure, which already includes the authoritative name servers for the .de zone, in Germany. Furthermore, DENIC is keeping an eye on the planned extension of the powers of the Federal Office for Information Security (BSI) allowing them to have malicious traffic from botnets blocked or redirected to state servers on demand.

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