

*"Where networks
and people meet ..."*

Why customers believe in DE-CIX

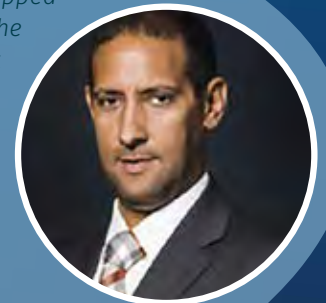


"Istanbul has become a major hub through the rapid development of the domestic and regional market. The majority of the important Tier-1 providers and CDNs have opened their PoPs in Turkey in the last decade especially. Moreover, the major regional telecom players' interest in Istanbul is growing steadily. At this point, DE-CIX's contribution to the resiliency and the availability of the networks in a neutral and cost-effective way is unquestionable."

Emre Erdem, Carrier Relations and Wholesale Director, TURKCELL

"After successfully cooperating over the past two years – topped off with winning the Best Africa Service Innovation Award at the Capacity Africa conference in late September – we felt it was the right move to deepen our partnership with DE-CIX to support Africa's digital transformation. The rise of the mobile work force with cloud enablement in Africa will push hyper-connected ecosystems that have transcontinental impacts."

António Nunes, Chief Executive Officer, Angola Cables





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Message from the CEO

Cutting-edge, world-best interconnection technology, peak traffic of 5.6 Terabits per second (Tbps), and connected capacity up well above 20 Terabits in Frankfurt. 11 Internet Exchanges distributed around the globe, with more than 1,000 connected networks. 2016 was another year of excellence in interconnection and global growth for DE-CIX.

But DE-CIX is much more than the sum of its technological parts. DE-CIX is where networks meet, certainly, but that also means it is where the people behind and within those networks meet.

In its essence, DE-CIX is about people – about our team of specialists who offer know-how and support to connected networks around the planet, at any time of the day or night; about the people this team is supporting – the peering managers and network operators using the DE-CIX platforms to exchange their traffic and move it around the world; and ultimately, it's about the end-customers of those networks, whose communication, viewing pleasure, and general user experience is enhanced through the DE-CIX platforms.

Harald A. Summa

*CEO, DE-CIX Management GmbH &
DE-CIX International AG*



However, added to that, DE-CIX is also about business. Connectivity is central to all business activities and business relationships today, and this is only going to increase. Networks can leverage their connectivity over the DE-CIX platforms to create new business cases, new services for their customers, and new revenue potential.

At DE-CIX, we want to help you achieve exactly that, through extending our own portfolio of interconnection services. In addition, in so doing, it comes back to people again – we will increase our flexibility to meet the individual interconnection needs of our customers through creating alliances and close strategic partnerships – just as we have already done with our DirectCLOUD service. Just like in the world of peering, so also in the world of business: working together, we are stronger and more able to proactively and reactively support our customers' business objectives.

We have come a long way since the early days. Today, we are no longer a simple peering point: DE-CIX is an enabler for global and local interconnectivity of people and networks – of all kinds, and with varying needs.

Want to know more? Visit our website or just ask us!

Harald A. Summa
Chief Executive Officer
DE-CIX Management GmbH &
DE-CIX International AG

The Future of Data Traffic





"Growth for mobile data traffic of around 50 percent per year demonstrates clearly that data traffic is appreciably migrating from business applications across to the end consumer."



Arnold Nipper

Chief Technology Evangelist

The Future of Data Traffic

How strongly data traffic in the Internet has developed in recent years can be easily seen at DE-CIX in Frankfurt. I remember when, back at the end of 2001, the peak was at around 700 Mbps. Today, we're achieving a peak throughput via our infrastructure of 5.6 Tbps. Roughly speaking, this corresponds to a growth over the 15 years by a factor of one million. Or growth by a factor of 100 every five years. We may well not see such gigantic increases in Frankfurt in the coming years. But what will the drivers of data be in the coming years?

It is not only in Germany that data traffic is migrating appreciably from fixed to mobile devices. Reluctant economic policy in Germany has been one of the causes preventing us from counting as one of the leading nations for digital infrastructure. The DigiNetz Act – concluded in December 2016 – designed to simplify the rollout of high-speed networks, will not change much there. It is 10 years too late. It may well be possible to achieve a gigabit on short stretches over VDSL, but in the long-term, Fiber to the Home (FTTH) is the only sensible way to equip ourselves for the future. So it should not be a surprise that the renowned Cisco Visual Networking Index (Cisco VNI) forecasts growth of merely 20 percent for “fixed” data traffic worldwide for the coming years.

The drivers of data in the next few years will without question come from mobile devices. For many today, the smartphone is already the second identity. The mobile is always at hand, and permanently available. And the applications will continue to multiply! Or who is already using video telephony today? There is not enough bandwidth! We are still a long way from nation-wide LTE, while 4G is available in some areas; but it will only be with the new standard 5G that we will advance to transfer speeds of up to 10 Gbps. And we'll achieve that with the

mobile! Today we have a ratio of fixed to mobile data traffic of around 10:1, but by 2020 this will shift to around 4:1. Growth of around 50 percent per year demonstrates this clearly. And thus it also becomes clear that data traffic is appreciably migrating from business applications across to the end consumer. Whether and how providers can make this pay off financially is a discussion for another time. What is certain is that the price cannot continue indefinitely in a downward spiral.

But how is it looking “under the hood” of the Internet? For the backbones and the Internet Exchanges? Will they be able to keep up? The 100 Gbps interface has been available for several years, even though it came somewhat too late. Currently, the IEEE P802.3bs 400GbE Task Force is working feverishly at finalizing the new standard for 4x faster Ethernet. At the same time, the transceivers – these are the electronic components that are responsible for the opto-electrical transformation – are becoming increasingly compact and consuming less and less power. Where five years ago a device the size of a jumbo-sized fridge was required, today one the size of a cabin trolley is sufficient. With the same or greater capacity and lower power consumption. And after 400 Gbps, presumably the next standard will be

800 Gbps. Here, we may see a slowing down – until now we have been used to steps at multiples of 10. We can remember that it went from 10 Mbps to 100 Mbps (FastEthernet), to 1 Gbps, 10 Gbps and, ultimately, today to 100 Gbps. At the same time, we can observe that data traffic is becoming increasingly decentralized and closer to the end consumer. The role of small Internet Exchanges will therefore become increasingly important.

The Internet has changed our lives enormously in recent years. Not only because it is fast, but because we are able to transmit more and more increasingly reliably. An end is not in sight. So I am not going to take the line that “No-one needs more than 10Gbps at home”, because I am sure in 10 years I would be laughed at for it. But, alongside all the data communication, we should not forget that there is nothing more important than direct face-to-face communication between people – true to our motto “DE-CIX – where networks and people meet”.

Executive Summary



The background of the slide is an aerial photograph of a city, showing a grid of streets and various buildings. A large, light blue speech bubble shape is overlaid on the right side of the image, containing the text. The top left corner of the slide features a horizontal bar with a yellow-to-green gradient. The right side of the slide is a solid dark blue.

"DE-CIX is present in key locations to enable the development of the digital society of the future."

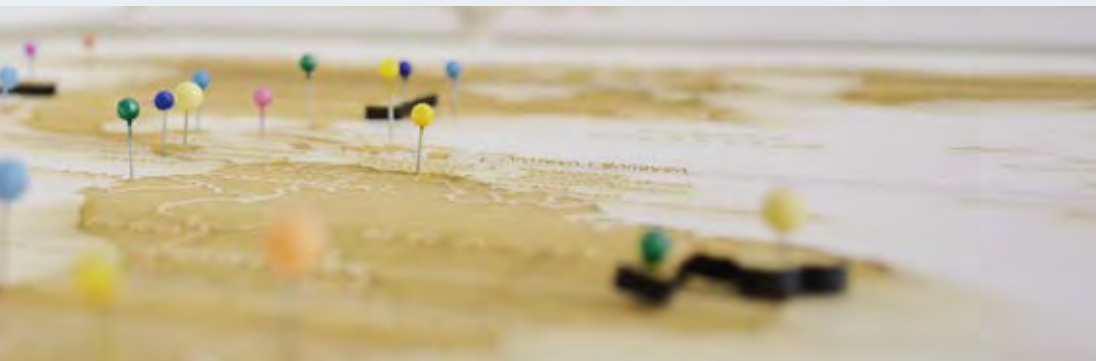


Executive Summary

DE-CIX exchanges worldwide grew strongly in 2016, in all respects. Reflecting the evolving orientation of the DE-CIX family of Internet Exchanges – with increasing international activities, new locations around the world, and new interconnection services in addition to peering – the Annual Report for 2016 offers a consolidated perspective on the year's endeavors.

The international locations were – in previous reports – still in their very early stages of development; in 2016, these became clearly a force to be reckoned with. Without question, the global interconnection hub DE-CIX Frankfurt – the world's leading Internet Exchange – remains the powerhouse of the DE-CIX family, but established and growing hubs, like DE-CIX New York, and new exchanges, like DE-CIX Madrid, are rising stars in the global interconnection landscape.

Consolidating the reporting for the 11 exchanges owned and operated or powered by DE-CIX offers a comprehensible overview of an increasingly complex company structure. This reorientation means, however, that comparison with previous years is more difficult, especially from a financial perspective. Conversely, by making this transition for the 2016 reporting, the company is in a good position to achieve a sustainable reporting structure for the coming years.



Globally, growth remained a defining feature of the DE-CIX Internet Exchanges in 2016. The majority of exchanges experienced strong through to exceptionally strong growth in customer numbers and traffic.

On the Frankfurt hub, customer numbers swelled by another 10 percent – with a net growth of 64 networks becoming connected – and an equivalent rise in peak traffic was also recorded. Thus Frankfurt maintained its world-leading position of the Internet Exchange with the most traffic throughput. The popularity of 100 GE ports in Frankfurt led to more than 20 percent growth in connected capacity.

In international locations, growth was also impressive in 2016. Highlights included DE-CIX New York (50 percent growth in signed networks) and DE-CIX Madrid (the fastest-growing Internet Exchange in the world, with close to 70 networks signed in its first seven months of operations, by the end of 2016). The new service model, introduced in late 2016 and to be implemented worldwide in the course of 2017, will enable a simplified method of provisioning an increasing range of interconnection services for DE-CIX customers. The first of the new interconnection services, DirectCLOUD, was also established in late 2016, and has been well received by both Cloud Service Providers and connected customers such as Internet Service Providers.

Despite consolidating all financial reporting, the results across all companies for the financial year 2016 demonstrate the healthy financial state of the DE-CIX companies. Turnover across all companies grew by 15 percent, finishing the year at 29.3 million Euros. Revenues from international activities accounted for 7.7 percent of total revenue, with strong growth anticipated in coming years. In particular, DE-CIX New York experienced extremely strong growth in turnover. The company finished the year in a healthy position, able to make further investments for the future.

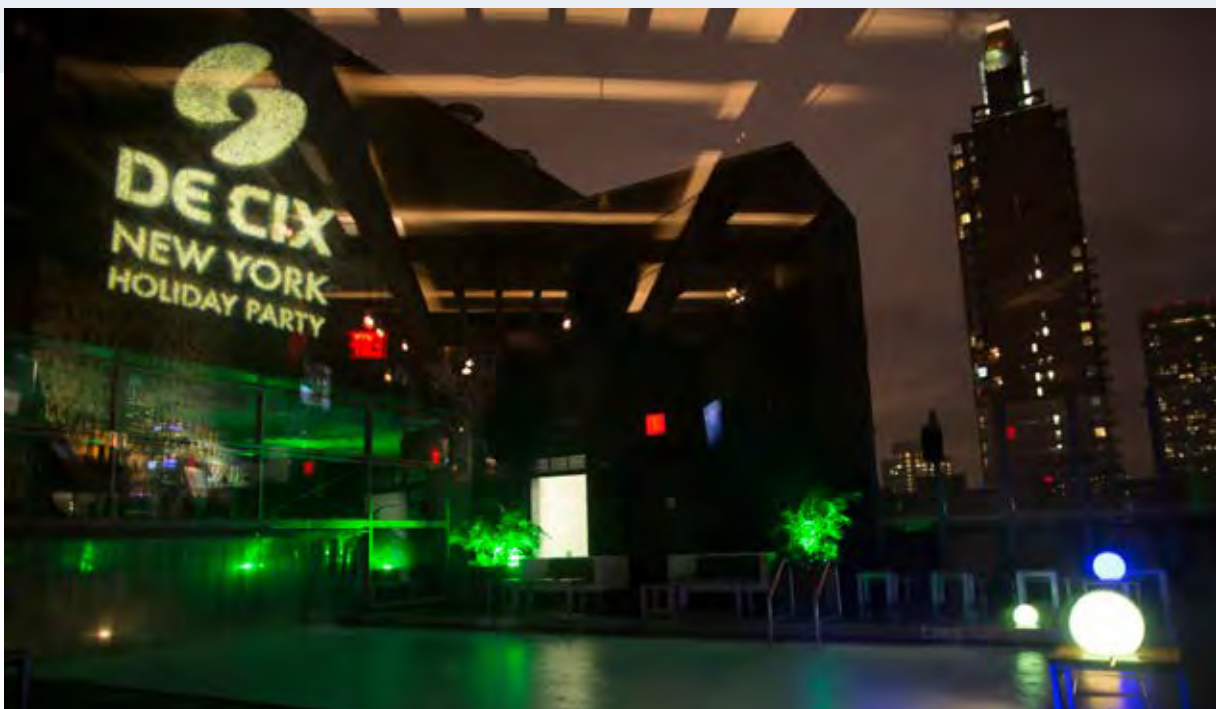
Through locating DE-CIX exchanges at strategically important intersections of global traffic flows, DE-CIX is positioning itself to support the exchange of traffic between important global geographical regions – offering enhanced interconnection possibilities in North America, and between Africa, Europe, the Middle East, and Asia. In this way, DE-CIX is present in key locations to enable the development of the digital society of the future in both developed and developing regions. This strategy, and the associated company structures for the various regions where DE-CIX is active, puts DE-CIX on a firm footing for future growth and sustainable business.

Why DE-CIX?





"It's about our team, our experience, and the range of services we offer. We interconnect Internet actors. We build up ecosystems and try every day to make our customers' lives easier."



DE-CIX Holiday Party 2016, New York



Why DE-CIX?

Why customers prefer to do business with DE-CIX

There are multiple reasons to do business with us. Many customers say that DE-CIX is where networks and people meet – just as our company claim expresses. We think it's about our team, our experience, and the

range of services we offer. Everything we do is for the Internet and its community. We interconnect Internet actors that have common or complementary needs and interests. We build up ecosystems and try every day to make our customers' lives easier. That's our day-to-day ambition – that's DE-CIX.

Talking about experience and expertise: DE-CIX has been operating Internet Exchanges for more than 20 years, and DE-CIX Apollon is the most advanced interconnection platform worldwide. DE-CIX is carrier and data center-neutral and our exchanges are community-backed and community-driven.



We help customers to get the most out of their peering connection, and can offer customized solutions on the basis of individual customer wishes and needs. Peering is the cost-neutral exchange of data traffic, but it's so much more than just that. Just to give an overview: Peering on DE-CIX platforms

- Improves network performance
- Allows the exchange of traffic with the most important destinations
- Connects to hundreds of networks instantly with just one port

Benefits – what peering at DE-CIX does for customers

Customers take advantage of the potential to optimize traffic flows and interconnections on the DE-CIX platforms. This offers:

- The lowest-latency path
- More control over routing

- Availability of security features such as route servers and Blackholing to fight hijacks and DDoS attacks.
- More flexibility to route around congested paths
- Reduced network costs
- Enhanced end-user Internet experience



UAE-IX Peering Workshop and Cruise 2016, Dubai

→ Redundancy:

- If peering sessions fail, transit services provide backup connectivity to peer networks
- If the transit connectivity fails, the peering connectivity is unaffected

→ Innovative interconnection services such as DirectCLOUD and MetroVLAN

→ Last, but not least: Peering increases revenues

We are close to the customer - Working with and for the community

Listening to our customers' needs is essential at DE-CIX. We place an emphasis on customer

contact and outreach, not only through our 24/7 customer support, but also through organizing our own events and participating in many more – to be there where our customers are, both globally and locally.

DE-CIX will continue to support the community through attending, sponsoring,

and supporting events like ITW, NANOG, DENOG, ENOG, RIPE, AfPIF, Capacity events, and many more. In addition, we will continue conducting round tables for DE-CIX customers to meet and network with our customers locally. In 2016, along with many other global events, we attended Africa Coms and Capacity Africa for the first time.



Highlights from our own events include the parallel Customer Summits in Istanbul, Munich, and New York (for the first time in three DE-CIX hubs simultaneously), and offering peering workshops globally.

DE-CIX triumphs at Global Carrier Awards 2016: Best Internet Exchange for the second year in a row

DE-CIX was honored as Best Internet Exchange again in 2016 by the renowned international trade magazine Capacity. The annual Global Carrier awards recognize innovation, vision, and excellence across the global and regional data center and Internet Exchange market. A panel of telecoms analysts, industry experts, and the

senior editorial team of Capacity magazine independently judge the awards.

Africa Service Innovation Award 2016

In addition to operating Internet Exchanges, DE-CIX assists networks by offering its knowledge and experience in planning, setting up, and running interconnection platforms and projects to international third parties. One of these consulting partnerships, between Angola Cables and

DE-CIX, was crowned with the Best Africa Service Innovation Award at the Capacity Africa conference in late September this year. The interconnection solution meets the low-latency needs of countries located in West Africa by allowing for shorter routes to exchange traffic directly and wherever needed. With this, Angola Cables combines its presence and role as a main shareholder of the WACS consortium and DE-CIX's expertise to satisfy the interconnection needs of Internet providers in West Africa.

Organization and Corporate Governance





"The Customer Advisory Board members can be seen as representatives of the variety of networks connected to DE-CIX: national and international, small and large ISPs as well as global content providers."

Executive Management



Harald A. Summa
Chief Executive Officer
DE-CIX Management GmbH &
DE-CIX International AG



Ivo Ivanov
Chief Strategy and Corporate
Development Officer, DE-CIX
Management GmbH / Executive
Board, DE-CIX GmbH & DE-CIX
International AG

The Customer Advisory Board



Klaus Landefeld
Board Member
eco – Association of the
Internet Industry e.V.



Zaid Ali Khan
Senior Director Global
Infrastructure Architecture
and Strategy; LinkedIn



Bernhard Krönung
Managing Director and Founder
regio [.NET]

Organization and Corporate Governance

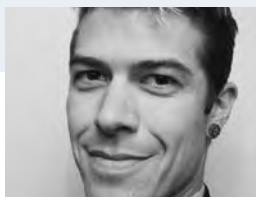
Company Structure

DE-CIX, and all the legal entities which run the DE-CIX exchanges, is owned by eco e. V., the Association of the Internet Industry, Europe's largest Internet industry association. eco is a nonprofit organization that promotes the development of the Internet and provides advice and support to companies that do business with or on the Internet. DE-CIX is strictly carrier and data center-neutral.

DE-CIX Management GmbH operates the DE-CIX exchanges in Frankfurt, Hamburg, Munich and Dusseldorf. The company is led by CEO Harald Summa, founding member of eco e. V., and is guided in its decision-making by the Customer Advisory Board. The Board is elected by DE-CIX customers, and meets twice a year to oversee management, develop strategy, and ensure the secure and stable growth of the company.

DE-CIX International AG is a wholly owned sister to DE-CIX Management GmbH, and is responsible for the majority of the international activities of the DE-CIX brand. For ease of international operations, subsidiaries to DE-CIX International AG have been established in Istanbul and the USA. Together, the international companies operate the DE-CIX Internet Exchanges in the Mediterranean region and North America, and the Dubai-based UAE-IX in cooperation with datamena.

The Customer Advisory Board



Joshua Sahala
Interconnection Strategist
Microsoft



Falk von Bornstaedt
Head of Group Peering and
IP-Trading
Deutsche Telekom AG

Senior Management



Daniel Melzer
Chief Technology Officer
DE-CIX Management GmbH



Thomas King
Chief Innovation Officer
DE-CIX Management GmbH



Andreas Sturm
Chief Business Development
Officer
DE-CIX Management GmbH

The Customer Advisory Board – DE-CIX Management GmbH

The Customer Advisory Board reflects the customer base, as its members can be seen as representatives of the variety of networks connected to DE-CIX: national and international, small and large ISPs as well as global content providers. The current DE-CIX Advisory Board was elected in 2014, with the following members:

- **Klaus Landefeld**
Board Member,
eco – Association of the Internet Industry e.V.
- **Zaid Ali Kahn**
Senior Director Global Infrastructure Architecture and
Strategy, LinkedIn
- **Bernhard Krönung**
Managing Director and Founder,
regio[.NET]
- **Joshua Sahala**
Interconnection Strategist,
Microsoft
- **Falk von Bornstaedt**
Head of Group Peering and IP-Trading,
Deutsche Telekom AG

Senior Management



Lucia Falkenberg
Chief People Officer
DE-CIX Management GmbH



Stephan Rohloff
Chief Marketing Officer
DE-CIX Management GmbH



Gregor Reinhold
Chief Financial Officer
DE-CIX Management GmbH



Arnold Nipper
Chief Technology Evangelist and
Co-Founder of DE-CIX

Human Resources

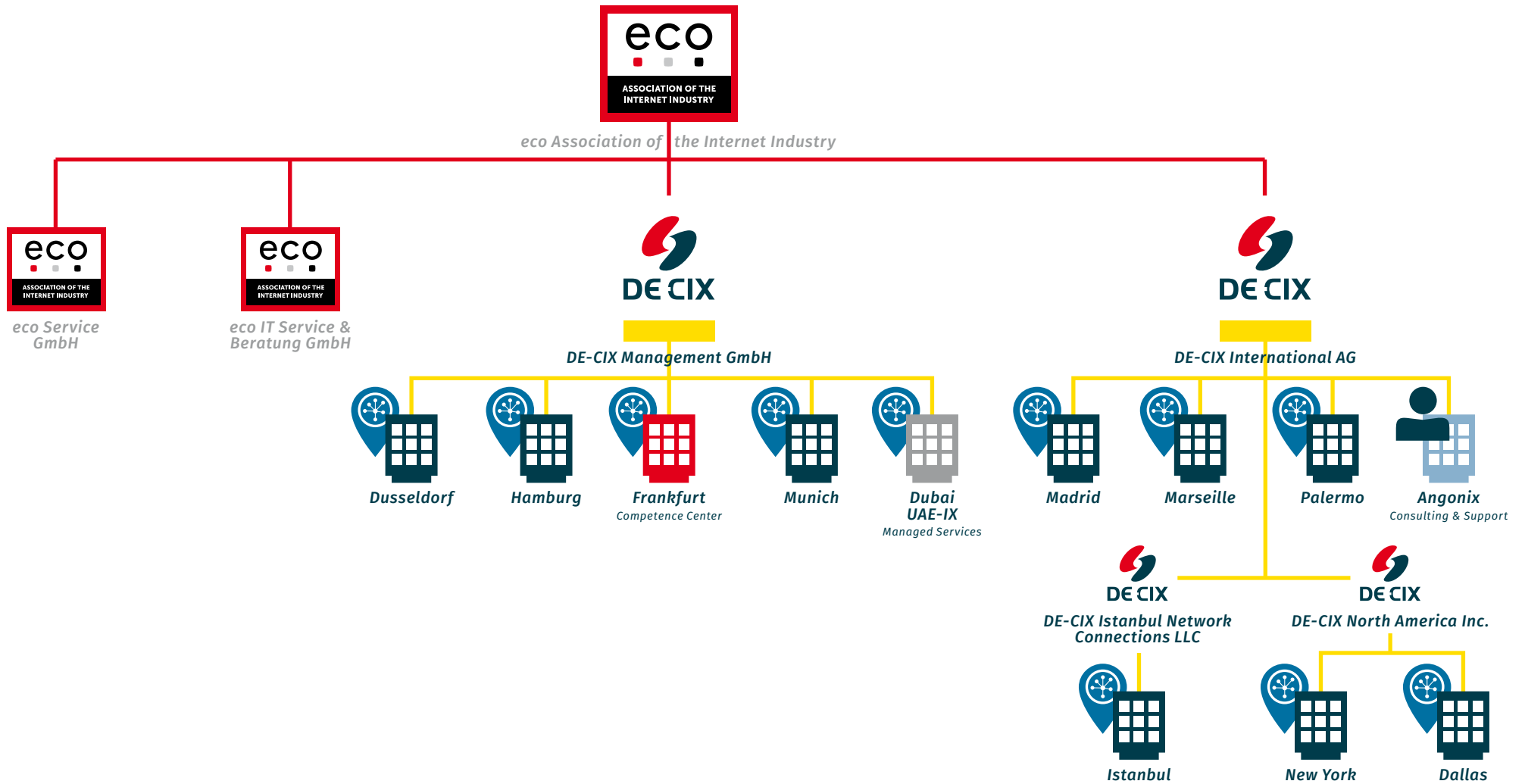
Human Resources at DE-CIX endeavors to provide a motivating and engaging atmosphere for DE-CIX's high-quality staff. This includes offering weekly English lessons, German lessons for the international colleagues, and a growing range of professional development opportunities. Added to this, DE-CIX offers their staff an increasingly varied health care program, and a range of extra benefits. A relaxed and collegial atmosphere is encouraged.

As well as building an internationally diverse team, the HR department is also intent on developing more of a gender balance, and is actively seeking female specialists to join



the team. In 2016, Kununu, the employer evaluation platform for the German-speaking region, recognized DE-CIX for its excellence as an employer.

Further growth in staff is anticipated in 2017, most especially in the technical and customer-related areas.



Technical Infrastructure





"The cutting-edge platform DE-CIX Apollon provides world-class reliability and availability in a scalable design which can grow with the needs of our customers."



Technical Infrastructure

The cutting-edge platform DE-CIX Apollon provides world-class reliability and availability in a scalable design which can grow with the needs of DE-CIX's customers. Current plans see the core capacity being scaled up to 24 Tbps in 2020.

The platform utilizes ADVA Optical Networking's FSP 3000 for the optical backbone, and Nokia's 7950 XRS. The optical backbone has a total capacity of 48 Tbps across a mesh-network topology and provides transport capacity of up to 8 Tbps per fiber. The Nokia Core Router 7950 XRS supports a world-leading port density of up to 320 100 Gigabit Ethernet ports.

DE-CIX Apollon is built from four supernodes, each of them being a combination of an ADVA optical node, an Alcatel-Lucent edge switch, and an Alcatel-Lucent core switch. DE-CIX Apollon delivers a very high level of redundancy: All four cores are in operation all the time. Should one fail, there is still sufficient capacity to switch all the traffic in every case. Only in the case of two simultaneous failures could a certain amount of congestion occur.



A range of activities were undertaken around the world to enhance DE-CIX services in 2016. The German regional exchanges in Munich and Hamburg were upgraded to Nokia technology, while DE-CIX Dusseldorf was taken live. The new GlobePEER Remote service became operational. With this service, customers can peer at an additional DE-CIX location with their existing port. Networks can peer with their DE-CIX Frankfurt port at Dusseldorf, New York, and Istanbul, and

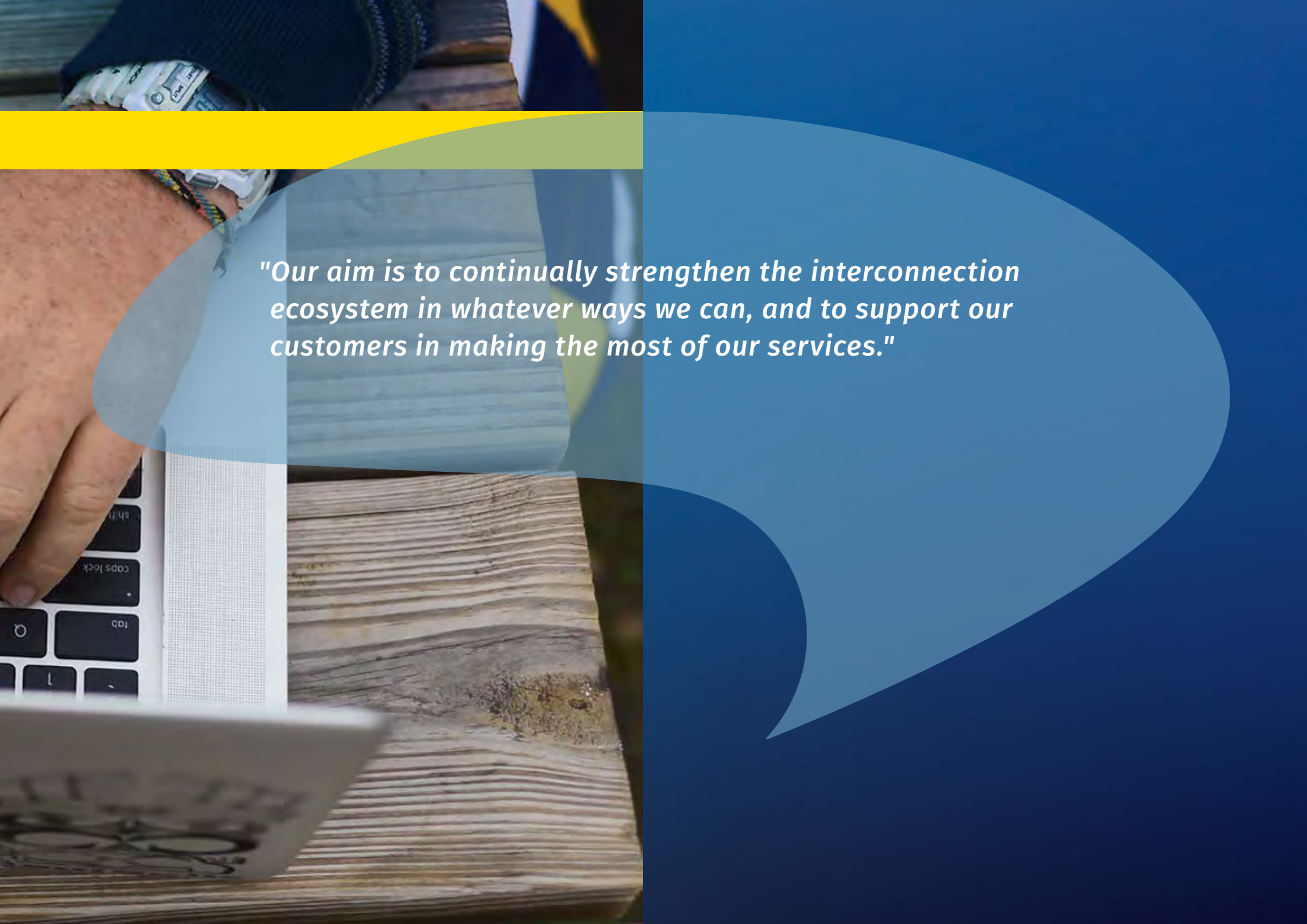
vice versa. Alongside these activities, both DE-CIX Dallas and DE-CIX Madrid were taken live with two initial sites, and a third site became operational for DE-CIX Istanbul (IST3 - TurkNet). In Frankfurt, an additional site was taken operational at the Global Switch data center, the 20th DE-CIX-enabled site in Frankfurt.

Further infrastructure-related activities planned for 2017 include the migration of the largest site in Frankfurt (DE-CIX 7) to a new location. Aside from the Apollon migration in 2013, this will be the biggest migration in the history of DE-CIX. UAE-IX in Dubai will be upgraded to the Apollon infrastructure in 2017, and a further location will become operational in Dallas (DFW5). In addition to this, Hamburg and Munich will be connected via the GlobePEER Remote

service to the Frankfurt platform in early 2017, and capacities will be expanded in all locations during the year.

How We Support



A close-up photograph of a person's hand typing on a laptop keyboard. The laptop is resting on a wooden surface. A large, light blue speech bubble is overlaid on the right side of the image, containing white text. The background is a solid dark blue.

"Our aim is to continually strengthen the interconnection ecosystem in whatever ways we can, and to support our customers in making the most of our services."

How We Support

DE-CIX places great emphasis on supporting customers and the community as a whole with high quality services, educational initiatives, and research & development. Our aim is to continually strengthen the interconnection ecosystem in whatever ways we can, and to support our customers in making the most of our services. Following is a roundup of some of the ways we support and serve.

Corporate IT-Security

DE-CIX Frankfurt is BSI IT-Grundschutz (IT Baseline Protection) certified in accordance with ISO-27001. The Federal Office for Information Security (BSI) awards the certificate for implemented organizational and technical measures to guarantee the safe and sound operation of DE-CIX Frankfurt. The triennial re-certification process was due in 2016 again. DE-CIX executed and documented all mandatory actions and was successfully audited in August.

DE-CIX Research & Development

While the Internet ecosystem continues to evolve at a fast pace, the DE-CIX Research & Development department tackles technical challenges to remain ahead. During 2016, the R&D team again contributed to international research and standardization with an RFC and multiple scientific publications and internal development efforts.

X-Check

DE-CIX R&D started a new public research project in 2016, funded by the German Ministry of Education and Research. The ultimate goal of X-Check is to increase security in the operation of critical ICT systems. By leveraging Internet Exchanges (IXs or IXPs, Internet Exchange Points) as Internet-wide vantage points, we perform a threat analysis for public network access points and an

analysis of network incidents at IXPs. In particular, DE-CIX's Research & Development team works on understanding and mitigating threats to the route server infrastructure as well as improving inter-domain routing security by integrating technologies such as RPKI, BGPSEC, and SEND into existing infrastructure.

Ongoing Projects

ENDEAVOUR and BDSec, both research projects running since 2015, achieved considerable intermediate results which were presented at several operators' conferences (RIPE, NANOG). While ENDEAVOUR focuses on developing the next generation of IXPs based on the Software-Defined Networking paradigm, BDSec aims to improve DDoS mitigation for our customers. Moreover, the Research & Development team summarized their findings in the scientific papers "Inter-

domain Networking Innovation on Steroids: Empowering IXPs with SDN Capabilities" (ENDEAVOUR) and "Blackholing at IXPs: On the Effectiveness of DDoS Mitigation in the Wild" (BDSec).

IETF

In 2016, the R&D department continued its standardization activities within the IETF community. The objective is to absorb demands for technical harmonization of the industry and thus ease operations for IXP customers and operators. The Internet draft to define a well-known BGP community to trigger blackholing "BLACKHOLE Community" became RFC 7999. In addition, four other Internet drafts were improved, some of which the IETF community will presumably accept as RFCs in the near future.

Customer Service

Above and beyond the support offered by any other Internet Exchange, DE-CIX customer service offers customers high quality 24/7 support for dealing with a wide range of emergencies, as well as standard enquiries.

The customer service hotline can be accessed by email and phone during (CET) business hours, and by phone after hours, and the international team offer support for all DE-CIX locations worldwide. DE-CIX is the only Internet Exchange operator to offer such comprehensive customer service – we take our customers' needs seriously, and we understand the importance of swift reaction times in critical situations.

The responsibilities of the Customer Service team include:

- Fault analysis and troubleshooting
- Pro-active customer notification in case of faults
- Provisioning
 - New customers
 - Upgrades
- Documentation
- Customer circuit database
- Port database
- Customer-related projects, for example site migrations
- Customer portal
- Improving the Customer Service Department

During 2016, there were many changes in the Customer Service team. Tobias Neumann took over from Wolfgang Tremmel as the new Head of Customer Service in August 2016 and the Customer Service department underwent a process of restructuring. The new CRM system was integrated in the customer service work, and new processes were implemented to ensure the smooth handling of customer care and customer enquiries. Staff numbers in the department were also increased with the hiring of two new highly experienced members of staff and one student assistant.



From Ports to Services – Accessing DE-CIX Services

DE-CIX will introduce a new service model in 2017 and expand its product portfolio. The new service model creates a logical separation of the port into two parts: a physical access and virtual services. This means that in future, alongside the familiar DE-CIX GlobePEER Service, further services – such as DirectCLOUD – can be booked from a single access. Customers have a greater return on their investment in a port.

This new service model will facilitate the introduction of new products, services, and features on the Apollon platform. The change to the new structure based on the service model serves as a simplification, and will enable customer needs to be fulfilled individually. For example, in future a customer will not need an Autonomous System Number (ASN) to get access to the platform. The new service model will become available at all DE-CIX locations worldwide in the course of the year 2017.

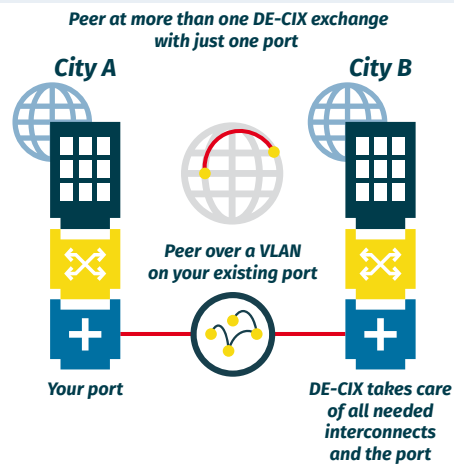


Blackholing

The Blackholing service, to protect customer networks against DDoS attacks, is available at all DE-CIX exchanges, except Dubai, and is free of charge. Our Blackholing support is available for peers running both IPv4 and IPv6.

A new way to blackhole was introduced in 2016 – Blackholing with BGP BLACKHOLE community – in order to make the DE-CIX Blackholing service even easier. Instead of manually rewriting the next hop IP address to the pre-defined Blackhole IP address in BGP announcements, customers can simply use the BGP BLACKHOLE community.

Given the enormous use of the Blackholing service at DE-CIX Frankfurt, DE-CIX also set up a dedicated Blackholing route server in 2016. Customers do not need to change the configuration of their existing route server sessions, but simply announce/accept all blackholes (i.e. prefix(es) to be blackholed) to/from the Blackholing route server.



GlobePEER Remote: Peer in two locations with the one port

DE-CIX extended the offer of the GlobePEER Remote service, originally only available for customers in Frankfurt and New York, to further exchanges in 2016. GlobePEER Remote offers customers the possibility to peer at an additional exchange with their existing port. In 2016, this service also became available between Frankfurt and Dusseldorf, and Frankfurt and Istanbul.

Aside from exchanging traffic in the remote location, another use case for this service is Remote Blackholing, which enables customers to drop DDoS traffic closer to the source of the attack, reducing the impact on backbones and networks, and keeping transit and peering connections closer to the customer's service region unburdened.



DE-CIX DirectCLOUD

Launched in October 2016 at the DE-CIX Customer Summits, DE-CIX's DirectCLOUD service offers something completely new in the cloud service market: the interconnection of Internet Service Providers with multiple Cloud Service Providers (CSPs) via just one connection. It enables ISPs to offer their enterprise customers multiple cloud services, whilst for CSPs thousands of enterprises are in easy reach. This greatly enhances the visibility of cloud services, simplifies the setup and multiplies the touch points. Overall, DirectCLOUD will allow for a more diversified cloud service landscape. Today, ISPs need to sign a contract and set up dedicated connections to every CSP. The result: ISPs offer their customers a limited choice of cloud services. With DirectCLOUD, ISPs can use their existing connection at DE-

CIX to get connected to multiple CSPs without having to negotiate contracts and set up dedicated connections over and over again. This enormously simplifies the connection process and therefore enables ISPs to offer their enterprise customers multiple cloud services easily.

For CSPs, DirectCLOUD provides direct access to hundreds of ISPs and their enterprise customers.

For enterprises, DirectCLOUD will bring more choices. ISPs can easily establish connections to multiple cloud service providers, even regional or niche providers.

The benefits for customers cannot be overestimated. In a contested market like cloud services, enabling customers to reach as many CSPs as possible, even small niche CSPs, and as easily as possible, will provide for healthy competition and the greatest range of possible choices for customers.

The renowned data center and carrier neutrality of DE-CIX has now also been extended to cloud service provider neutrality.

DE-CIX Academy

In 2016, DE-CIX launched DE-CIX Academy to help our customers to better understand the details of the peering world. DE-CIX Academy since then has developed a number of online presentations and webinars. The webinars are currently broadcast twice a week and are free for all customers and prospects. Upcoming events are announced on the DE-CIX website, and new topics are added regularly.

The DE-CIX Academy is targeted at customers new to peering, who want to learn about tools, infrastructure and services.

Wolfgang Tremmel, who has 20+ years of experience in the industry, heads DE-CIX Academy.

Consultancy Services

DE-CIX professional consulting targets telecom operators, ISPs, corporate entities, government agencies, and regulatory authorities around the globe. DE-CIX Consultancy Services support the establishment of Internet Exchanges in developing regions; to enable local peering in these regions and to further strengthen the global Internet. DE-CIX provided consulting in several locations in 2016, with a focus on Africa and the Middle East

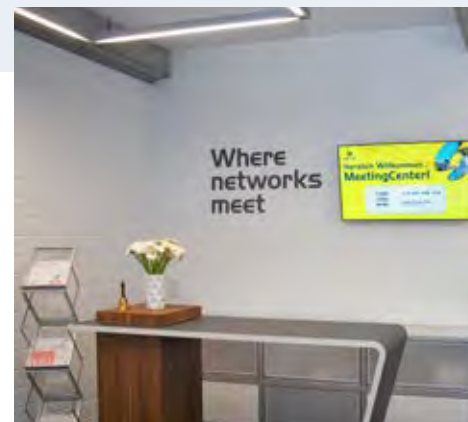
DE-CIX Consultancy Services provide customers with the relevant set of both strategic and operational insights to allow a decision on the best approach for the establishment and management of an IXP and the creation of a vibrant ecosystem, with a focus including the following objectives:

- Consulting on mechanisms for developing healthy interconnection ecosystems in a variety of regions
- Assessing the readiness of the dedicated region for an IXP, taking into consideration (benchmarking) the market and the regulatory/legal framework and further IXP developments in the region, providing a gap analysis, SWOT, and risk analysis;
- Providing an Implementation Plan with an appropriate time-line for the establishment of an IXP, consisting of a CAPEX/OPEX outlook based on the recommendations, amended by technical and organizational information.
- Providing a Go-To-Market Plan, consisting of a revenue plan, amended by a business development and marketing plan.
- Integrating and operating the IXP in line with the Go-to-Market Plan.

DE-CIX Workshops

As part of DE-CIX's emphasis on supporting the community and offering training in peering, a diverse range of workshops were given by DE-CIX staff in 2016. These workshops were designed to

- increase the awareness and understanding of the benefits of peering,
- help existing customers to optimize their peering and to engage in traffic engineering to generate more volumes through peering,
- provide 1:1 opportunities for customers, to identify whether and how our products can support them,
- support partners like Angola Cables with internal and public workshops to achieve success with peering-based products



→ develop awareness through Peering Workshops for entrance into new markets, like Spain and Turkey.

Workshops included:

- Peering Workshops during Capacity Dubai 2016
- Peering Workshops for Enterprise Customers
- Peering Workshop in conjunction with the Dubai Peering Cruise
- Peering Workshops with Angola Cables
- Peering Workshops in Istanbul, Bahrain, Dubai, Zürich, and Valencia

DE-CIX MeetingCenter

The DE-CIX MeetingCenter provides 170 square meters containing the latest in conferencing technology, offering everything required to host a successful event. The MeetingCenter is used for DE-CIX and eco Association meetings and events, and is available for hire to customers. Customers of DE-CIX and members of the eco Association are entitled to free usage of the facilities once per quarter.

Growth is in the Air – DE-CIX 2016 in Numbers





"DE-CIX Frankfurt maintained its place as the leading Internet Exchange in Europe in 2016, dominating in traffic throughput."

Growth is in the Air – DE-CIX 2016 in Numbers

DE-CIX Frankfurt – The Global Hub at the Center of German Interconnection

DE-CIX Frankfurt maintained its place as the leading Internet Exchange in Europe in 2016, dominating in traffic throughput. Constant growth characterized the year in Frankfurt – in terms of customer numbers, upgrades, connected capacity and traffic. Of particular significance was the growing trend of upgrades from 10GE to 100GE ports. Upgrades to 100GE ports were made increasingly frequently also from smaller capacities (e.g. directly from a single 10 GE port to a 100 GE port).



"It's all good news:

The tendencies we saw in 2016 will continue in 2017 – we can expect more of the customer and traffic growth we've seen in the last few years. Connecting the regional exchanges directly to Frankfurt will be a boon for all of the German locations. The new and existing interconnection possibilities are expected to bring another 15% overall customer growth to the German exchanges."

Andreas Sturm, Chief Business Development Officer, DE-CIX

On the national level within Germany, peering is clearly becoming more widespread – large enterprises and small to medium-sized companies are beginning to connect to the DE-CIX exchanges – not only the large DAX corporations. This nascent tendency began in 2016, and is expected to continue developing in 2017. The growing cloud market is driving this trend. The cloud is drawing new customer groups to the Internet Exchanges, giving them access to the data center landscape.

New data centers are being built throughout Germany. This tendency will further strengthen the attractiveness of interconnection services within Germany. Frankfurt, with the largest capacities in Germany for carrier neutral data centers, is encouraging this growth, followed by the regional locations Hamburg, Munich, Dusseldorf, and Berlin, which are also showing signs of growth.

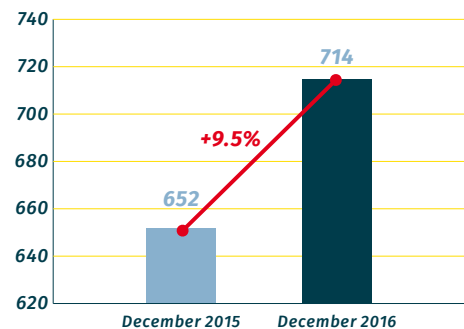
The outlook for 2017 is positive, with continued growth in customers, traffic and 100GE ports forecast. Further, a reinvigoration of the regional DE-CIX locations Hamburg, Munich, and Dusseldorf is anticipated, as a result of the direct interconnection of each site with Frankfurt, in a star-shaped topology.

This design, planned in 2016 and to be implemented in early 2017, puts Frankfurt in the center of the star, meaning that a growth in traffic is expected in Frankfurt as the regional customers begin to peer there. However, migration of peering activities is also expected toward the regional locations, which will increase the attractiveness and visibility of these Internet Exchanges. Rather than one single access point for peering in Germany, there will be four in 2017.

Customers in Frankfurt

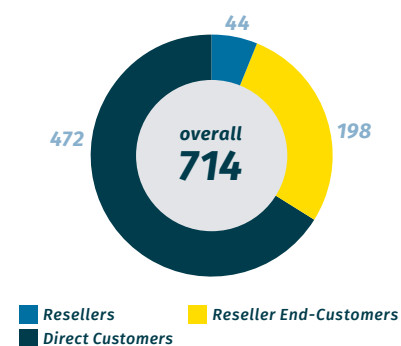
Customers connected to the Frankfurt exchange grew by around 10 percent, to 714, by the end of 2016.

DE-CIX Frankfurt Growth in Customers



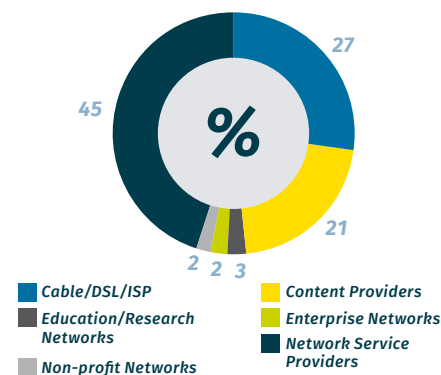
Looking into the composition of connected customers, the vast majority remained direct customers in 2016. Resellers and their end-customers made up around one third of customers on the DE-CIX Frankfurt platform.

DE-CIX Frankfurt Customers December 2016



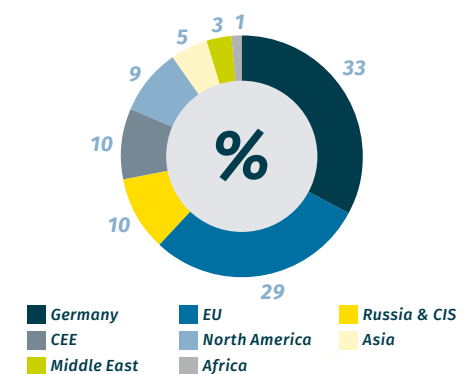
The connected networks comprise a healthy mix of network types, with a strong concentration of network service providers, carriers, ISPs, and content providers.

DE-CIX Frankfurt – Segmentation of Connected Networks



Note: Segmentation based on data from PeeringDB.

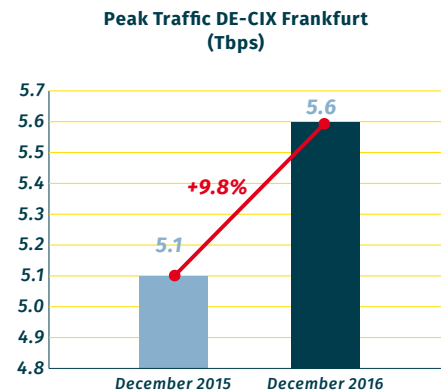
Customers Frankfurt per region 2016



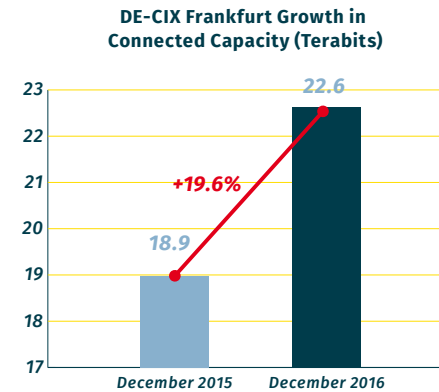
The geographical distribution of customers connected to Frankfurt clearly demonstrates the continuing strong importance of the DE-CIX hub for German and Western European networks. In 2016, the presence of networks from North America, Central and Eastern Europe, and Russia and the CIS was further strengthened, with these three regions combined now accounting for almost one third of connected customers.

Traffic and Port Growth Frankfurt

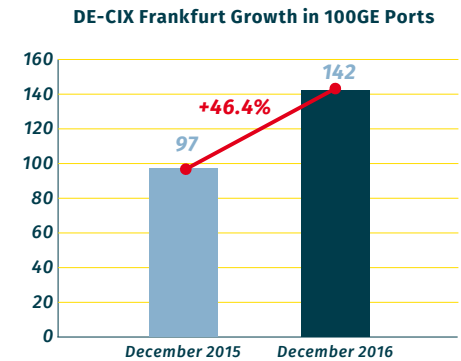
In line with the increase in customers on the Frankfurt exchange, traffic also continued to grow in 2016, with peak traffic rising by half a terabit (a 10 percent increase) over the twelve-month period, to more than 5.6 Tbps.



Connected Capacity in Frankfurt shot up by another 20 percent during the year, to more than 22 Terabits.

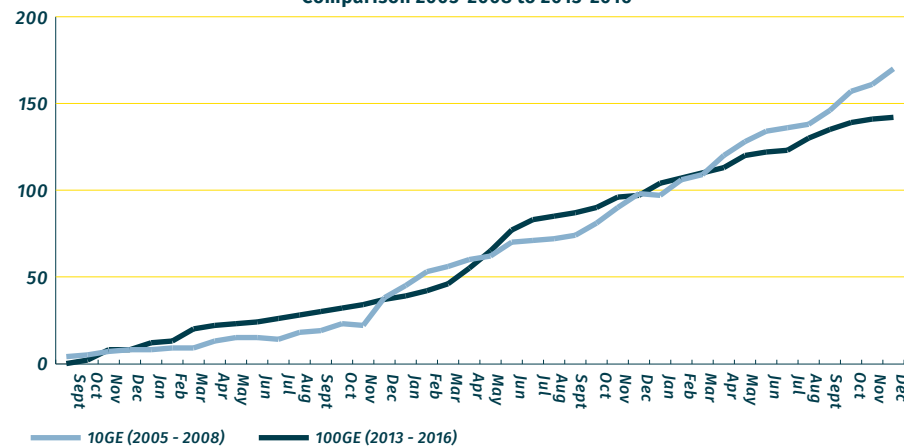


This growth in capacity has been enabled by growing demand for 100GE ports, which grew again in 2016 by almost 50 percent.



The trend toward 100 GE ports reflects very closely the growth in 10GE ports experienced at DE-CIX Frankfurt more than a decade ago.

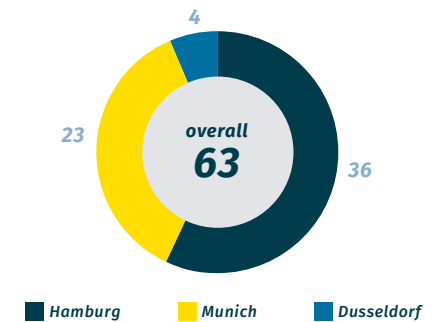
10 GE and 100 GE Port Growth at DE-CIX Frankfurt
Comparison 2005-2008 to 2013-2016



German Regional Exchanges

Against this backdrop of a major inter-connection hub for global traffic, the three regional German Internet Exchanges, in Hamburg, Munich, and Dusseldorf, continued their important operations in keeping local traffic local in 2016. Regional customers continued to peer and exchange traffic at the five data centers of the regional exchanges. Hamburg remains the largest of the three, and experienced strong peaks early in the year at close to 54 Gbps. Munich peaked at around 30 Gbps, and spent a lot of the year in the mid-20s. Dusseldorf, the youngest and smallest of the regional German exchanges, showed signs of traffic growth towards the end of 2016, but did not yet reach the gigabit level during its first year of operations. The planned interconnection of each of these exchanges with the Frankfurt hub will certainly affect growth in these regions in the coming years.

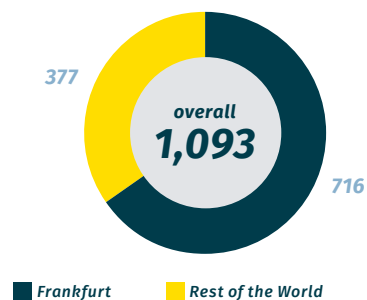
German Regional Exchanges Customers
December 2016



DE-CIX from a Global Perspective

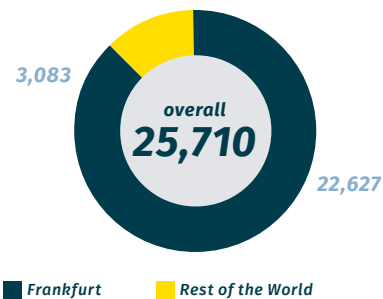
Looking at the family of DE-CIX exchanges, Frankfurt stands out clearly as one of the major global hubs for Internet traffic. In 2016, the number of customers connected to DE-CIX Frankfurt was almost twice the number of all other DE-CIX exchanges combined.

Customers Connected to DE-CIX Exchanges
December 2016



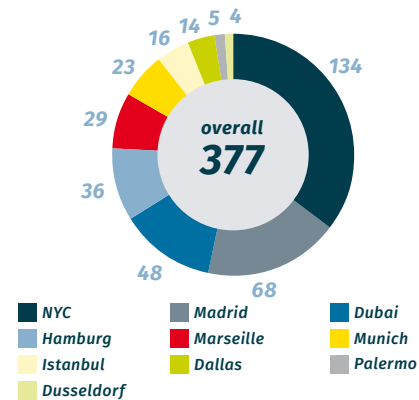
Added to this, the connected capacity in Frankfurt far exceeded, by a ratio of almost 7:1, that of the other DE-CIX Exchanges combined.

Connected Capacity (GE) All DE-CIX Exchanges
December 2016



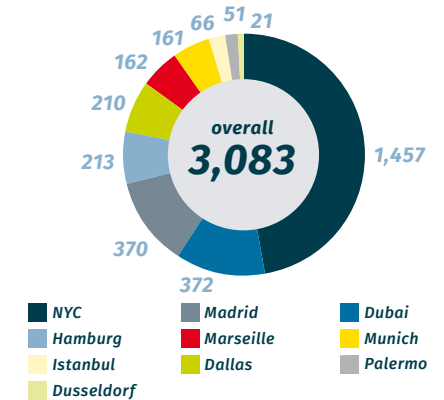
Despite this, the success of the young DE-CIX exchanges around the world are a testament to the strength of the DE-CIX model, and these Internet Exchanges are generating their own gravity. Several of the new DE-CIX exchanges are becoming vital interconnection hubs in their own right and are projected to develop into global hubs over the next few years. Two exchanges in particular stand out on the basis of growth and customer numbers: DE-CIX New York and DE-CIX Madrid.

Customers Connected to DE-CIX Exchanges
(excluding Frankfurt) December 2016



In terms of connected capacity, however, the UAE-IX in Dubai also stands out – actually exceeding that of Madrid.

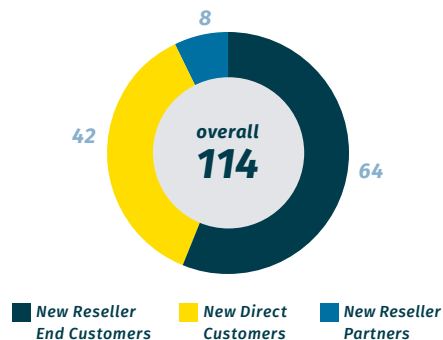
Connected Capacity (GE) at DE-CIX Exchanges
(excluding Frankfurt) December 2016



Reseller Program

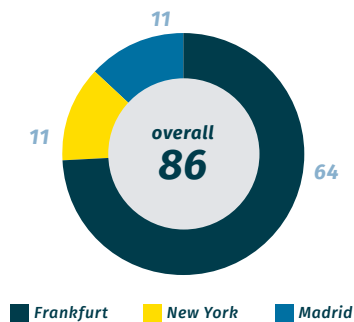
The Reseller Program was further extended in 2016, connecting to new locations and attracting customers in three locations. Customer growth for DE-CIX Frankfurt was very strong, allowing it to exceed the growth in direct customers to the platform, and increasing the diversity of networks connected to the Internet Exchange.

New Customers in Frankfurt 2016



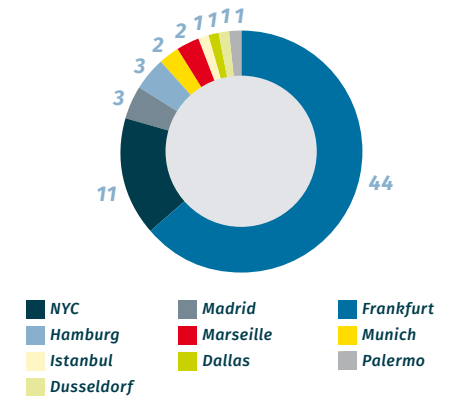
Globally, the Reseller Program also grew strongly. In total, the program brought 86 new end customers to DE-CIX exchanges.

Total New Customers Globally via Resellers 2016



The Reseller Program grew also in the number of resellers connected – to a total of 51 around the world, many offering reselling at multiple DE-CIX exchanges. In preparation for the interconnection of the German locations and the anticipated growth in interest aroused by remote peering, reselling was introduced for the first time in Hamburg, Munich, and Dusseldorf.

Reseller Partners per Location End 2016



"The reseller partners are an important channel for DE-CIX to attract a diverse range of

new customers to all our Internet Exchanges across the globe. We will introduce a Premium Reseller Division in 2017, showing the list of premium resellers – those that are actively reselling DE-CIX services and adding more than five networks to the exchanges. We would also like to bring more diversity in the Reseller Program. This means we will work on introducing new services into the DE-CIX portfolio for resellers, and will develop new forms of partnerships."

Melanie Kempf, Director Global Partner Relations, DE-CIX



DE-CIX International





"From zero to hero: DE-CIX Madrid is the fastest-growing Internet Exchange on the planet."

DE-CIX International Executive Board



Harald A. Summa
CEO,
DE-CIX International AG &
DE-CIX Management GmbH



Ivo Ivanov
Chief Strategic and Corporate
Development Officer, DE-CIX
Management GmbH / Executive
Board, DE-CIX GmbH & DE-CIX
International AG

DE-CIX International Supervisory Board



Felix Höger
Board Member
eco – Association of the
Internet Industry e.V.



Klaus Landefeld
Board Member
eco – Association of the
Internet Industry e.V.



Rudolph van Megen
Managing Director, S.T.O.L.
Verwaltung GmbH

DE-CIX International

2016 was another exciting and successful year for DE-CIX's international activities. Two new Internet Exchanges – DE-CIX Madrid and DE-CIX Dallas – were established, and the DE-CIX presence in key regions strengthened substantially. DE-CIX now has strong and developing ecosystems in North America, the Mediterranean region, and the Middle East.

Below is a summary of some of the international highlights from 2016.

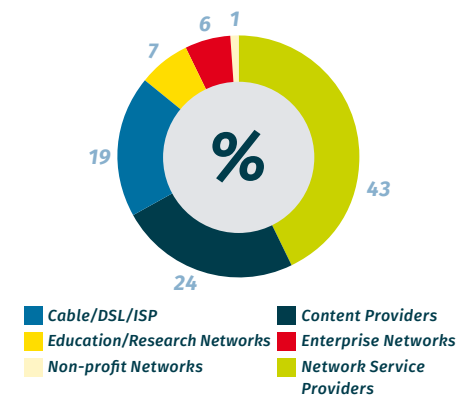
North America

DE-CIX offers a very strong disruptive approach in America. Factors for the success of DE-CIX in North America are our data center and carrier neutrality and the best IX metro coverage, with numerous access points in all relevant data centers across the metro regions.

New York

DE-CIX New York continues to grow strongly – now being the second largest Internet Exchange in the New York/New Jersey/Long Island metro region. The continued impressive growth for DE-CIX New York – with a 50% growth in networks and a tripling of data traffic in 2016 – demonstrates the strength and gravity of the ecosystem, being the one relevant data center and carrier neutral Internet Exchange operator in the metro region. A healthy mix of different types of networks are now connected to DE-CIX New York, including, ISPs, carriers, network service providers, content providers, and enterprise networks.

**DE-CIX New York –
Segmentation of Connected Networks**



The connected networks also demonstrate diversity in the geographical distribution of their business activities, with a spread of global, regional, and national networks, including also a strong European focus.

DE-CIX North America Customer Advisory Board



Phil Koblence
COO
New York Internet – NYI

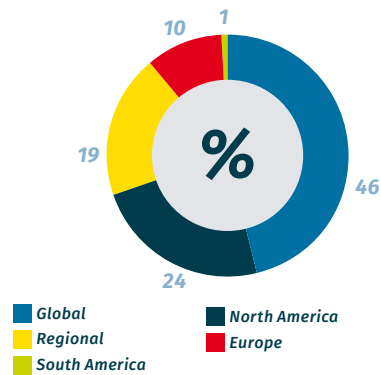


Steven Schecter
Senior Manager of Network
Architecture
Akamai Technologies Inc.



Bryan Socha
Senior Network Engineer
DigitalOcean

**DE-CIX New York –
Areas of Activity of Connected Networks**

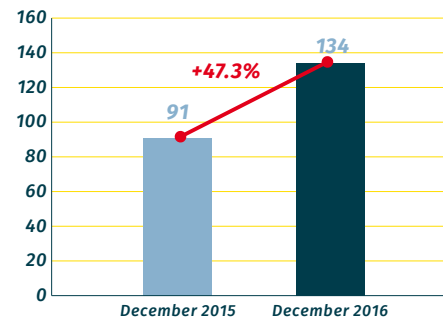


Note: Segmentation based on data from PeeringDB.

DE-CIX New York displaced Equinix NY as the #2 exchange in the market based on network count in 2016.

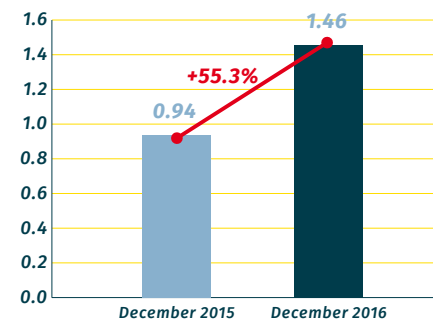
DE-CIX New York is second only to Frankfurt in the DE-CIX family in terms of customer numbers, connected capacity and traffic. 43 new customers (an increase of 47 percent) were signed in 2016, bringing the total to 134 networks by the end of the year.

Customer Growth DE-CIX New York



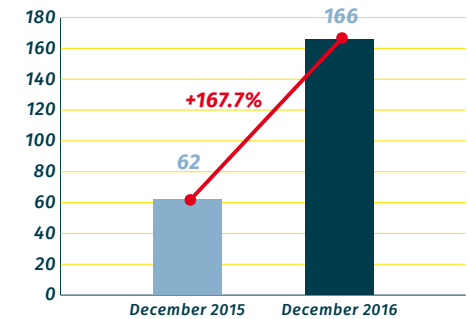
In line with this, the connected capacity of DE-CIX New York rose by 55 percent to 1.46 Terabits by December 2016.

Connected Capacity DE-CIX New York (Terabits)



Peak traffic on the platform surged to 167 Gbps, almost tripling in twelve months.

Peak Traffic DE-CIX New York (Gbps)





"We aim to make DE-CIX New York the #1 exchange in metro region in terms of network count in 2017, and will firmly establish DE-CIX Dallas in the Dallas market and expand to additional data centers."

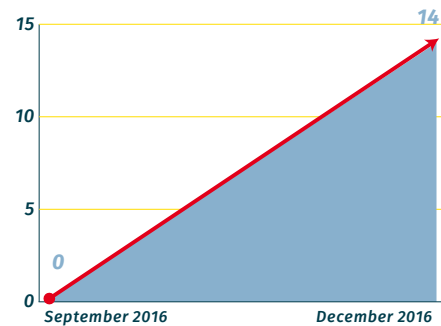
Ed d'Agostino, Vice President DE-CIX North-America

Dallas

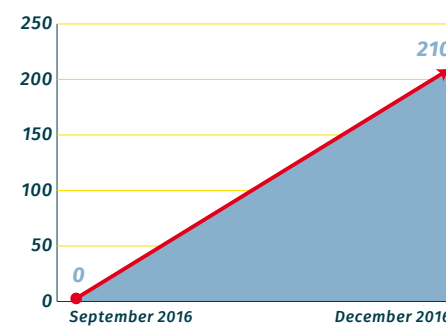
DE-CIX Dallas, the youngest DE-CIX Internet Exchange, started in September 2016. Although still very new to the market, the IX has already experienced rapid growth in 2016.

In the four months September to December 2016, it signed 14 customers and ended the year with 210 Gigabits connected capacity and peak traffic of almost 12 Gbps.

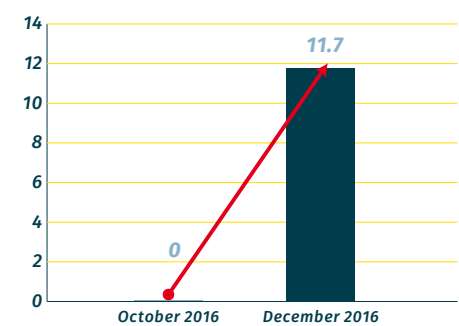
Customer Growth DE-CIX Dallas



Connected Capacity DE-CIX Dallas (Gigabits)



Peak Traffic DE-CIX Dallas (Gbps)



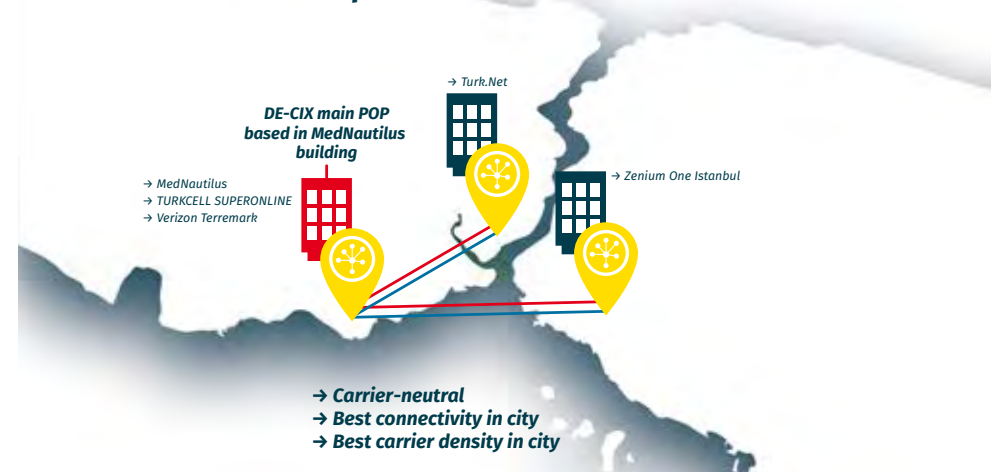
Strategically located in the heart of the US, Dallas is the center of an extensive telecommunications network and a vital juncture for many networks and cable systems. Yet, while it is a leading mobile market and a burgeoning market for video streaming, its interconnection platforms have lagged behind. The market in Dallas deserves more IX alternatives in a wider range of locations – DE-CIX offers exactly this – making it the right alternative for network operators and owners, as an Internet Exchange should be open, distributed, and neutral. The growth of DE-CIX Dallas demonstrates clearly the need for such interconnection services in this region.

The Mediterranean Region

Istanbul

Istanbul, standing at the crossroads between Europe, the Middle East and Asia, also saw impressive growth in 2016. DE-CIX Istanbul's operations started in December 2015, with Bülent Şen joining the company as Regional Director for Turkey and surrounding countries in January 2016. Despite the challenging start with the turbulent political year in Turkey, DE-CIX Istanbul is growing well. The platform was extended over five data centers across the metro region in 2016 (four on the European side and one on the Asian side).

Current presence in Istanbul



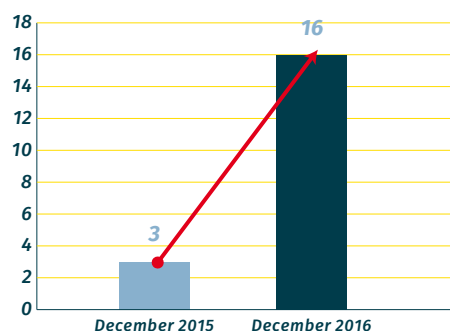


"We are the only official Internet Exchange in Turkey and the only one on the planet that connects two continents in one country – Asia and Europe! Our number of networks has grown to almost 20 within just one year and this number will keep growing in 2017. Same with our traffic, which went from "0" to hit 10Gbps in 2016. And we will reach new records in 2017, with new international customers showing interest and connecting to DE-CIX Istanbul. Beyond our classical peering and interconnection offers – such as GlobePEER and GlobePEER Remote – we will soon introduce new services to our customers in Istanbul."

Bülent Sen,
Regional Director,
DE-CIX Turkey

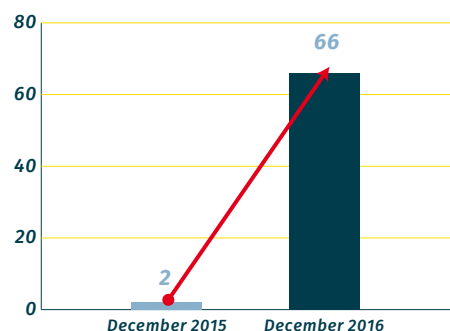
Connected customers were well on the way to 20 operators by the end of the year.

Customer Growth DE-CIX Istanbul

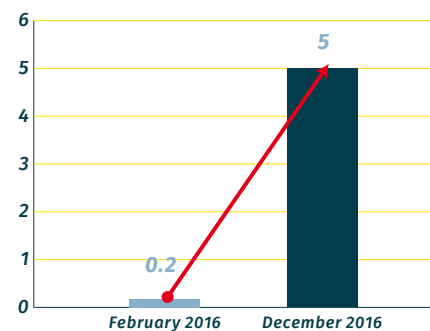


Connected capacity at the end of the year stood at 66 Gigabits, and peak traffic reached 5 Gbps.

Connected Capacity DE-CIX Istanbul (Gigabits)



Peak Traffic DE-CIX Istanbul (Gbps)



In early March 2016, DE-CIX and Zenium Istanbul One announced their partnership, and this was followed shortly after with the partnership with Turknet.

Now, a healthy mix of regional and international content and eyeball providers and network operators (relevant tier 1, 2 and 3 networks) are exchanging traffic. The diverse range of connected networks includes hosting & CDNs, such as Medianova and Netdirekt, cloud service providers like Cloudflare, international network providers, e.g. IQ Networks and Interoute, and alternative operators in Turkey like Turkcell, Turknet, and Millenicom, as well as social networks like LinkedIn, security network providers, such as Forcepoint, and system integrators, e.g. Koç Sistem. Added to this, the DE-CIX GlobePEER Remote Service to Frankfurt went live successfully in October 2016.

"In 2017 and beyond, we will enable Madrid to grow into one of the most relevant interconnection hubs in the south of Europe, serving the important economic market of the Iberian Peninsula, but also – together with Lisbon – acting as the gateway for West African traffic flows to Europe, replacing London."

Theresa Bobis, Regional Director South Europe, DE-CIX



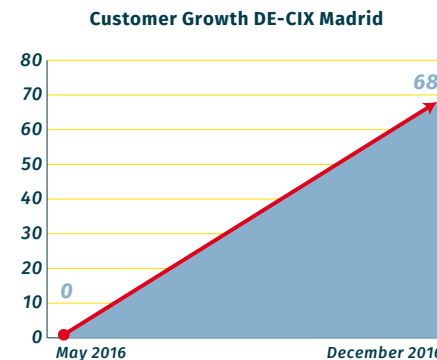
DE-CIX was host and sponsor of the MENOG event (Middle East Network Operators Group) which was held in Istanbul in 2016. The second DE-CIX Istanbul Summit was held in October 2016 and was a great success, not only in terms of the number of attendees, with over 80 participants, but also concerning the content of the event as it was featured in numerous media articles.

Madrid

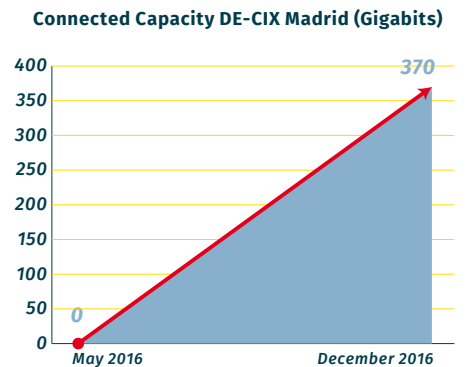
"From zero to hero"; this could sum up the amazing start that DE-CIX Madrid has managed to accomplish. DE-CIX Madrid started with two access points right from the beginning – Interxion and Interoute – and a healthy mix of national & international network operators connected very rapidly. DE-CIX Madrid has strongly surpassed initial expectations, with close to 70 networks signed within seven months of its start in May 2016, making it the fastest growing IX in the world.

DE-CIX Madrid is on a path to achieve strong regional and international importance, serving the strong domestic market in Spain, the Iberian Peninsula and the west coast of Africa, due to its geographical proximity to Lisbon and because of the landing stations for cables coming up from Southern Africa.

Coming into a previously underserved market, the IX stands out as one of the stars in the DE-CIX family, and one of two important new sites in 2016. Partnerships with three resellers were established in 2016, adding diversity to the connected networks and also connecting to Valencia. More partnerships will be added in 2017.



Connected capacity also shot up in this time, finishing the year at 370 Gigabits.



The traffic is growing continuously, reaching 12 Gbps in December 2016, with a current peak traffic in early 2017 of almost 40 Gbps.

Palermo & Marseille

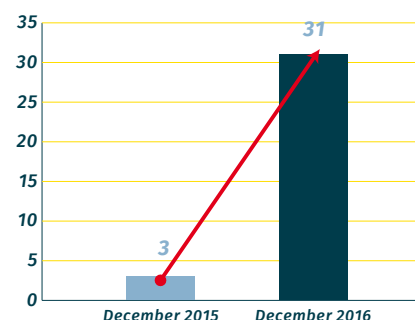
The new exchanges in southern Europe have been an important strategic move for DE-CIX on the traffic gateways from the Middle East, and from Northern and Eastern Africa to Europe. At DE-CIX, we want to create new aggregation hubs for interconnection closer to the edge, to serve the flow as content itself moves closer to the edge. In addition to the west-to-east trend of previous years, we at DE-CIX believe that content is now also moving southwards – shortening the path to Eastern and Northern African and Middle-Eastern/Asian traffic.

Because of new cable connections like SEA-ME-WE 5 (landing in Palermo/Marseille) and AAE-1 (landing in Marseille), tremendous growth in interconnection needs is expected in 2017 and the upcoming years. These systems will dramatically improve connectivity between the Middle East,

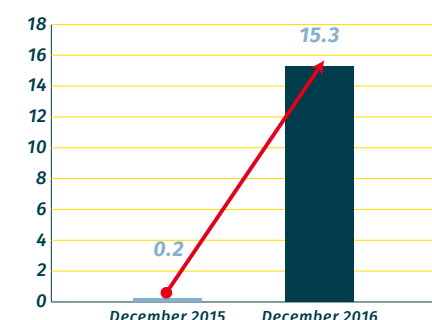
Asia, Africa, and Europe and change the commercial landscape on long-haul capacity. Offering high volumes at reasonable costs, these exchanges will change the aggregation gravity for interconnection in the region: DE-CIX is already there where the future of interconnection business is heading – with Internet Exchanges in Palermo and Marseille.

After a smooth start in 2015, DE-CIX Marseille is beginning to grow even more strongly, with 31 networks signed by the end of 2016. DE-CIX's success in bringing so many networks on board in 2016 – despite there being three IXs present at the Interxion data center – shows our commitment to growing the exchange, as well as demonstrating the trust of our customers there, especially the big content providers.

Customer Growth DE-CIX Marseille



Peak Traffic DE-CIX Marseille (Gbps)



Connected capacity rose in line with customer growth.

Despite having smaller customer numbers than Madrid, the traffic exchanged over the Marseille platform skyrocketed, ending the year with a peak of over 15 Gbps – exceeding that of DE-CIX Madrid for the end of 2016. This suggests a promising future for the exchange.



Middle East

Dubai

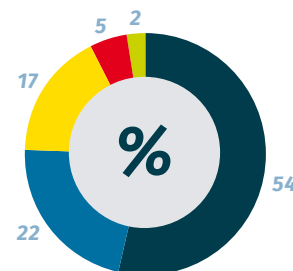
UAE-IX remains unparalleled in the region for its success, acceptance, and excellence. There is a strong and clear need in the region for local and regional interconnection, which is well served by the UAE-IX platform, powered by DE-CIX. Dubai, as an economic hub for the Middle East region, is the right place for a strong regional setup. For example, DE-CIX was able to add new customers from Iraq and India in 2016, and is aiming to extend the outreach to customers in Pakistan in 2017.

A healthy mix of different types of networks are now connected to UAE-IX, including, ISPs, carriers, network service providers, and content providers.

The connected networks also demonstrate diversity in the geographical distribution of their business activities, with a spread of global, regional, and national networks, including also a strong European focus.

UAE-IX grew by 10 percent in terms of customer numbers in 2016, and by around 25 percent in terms of connected capacity.

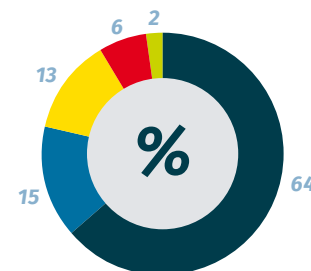
UAE-IX Dubai –
Segmentation of Connected Networks



■ Network Service Providers
 ■ Content Providers
 ■ Cable/DSL/ISP
 ■ Educational/Research Networks
 ■ Non-profit Networks

Note: Segmentation based on data from PeeringDB.

UAE-IX Dubai –
Areas of Activity of Connected Networks



■ Global
 ■ Regional
 ■ Middle East
 ■ Europe
 ■ North America

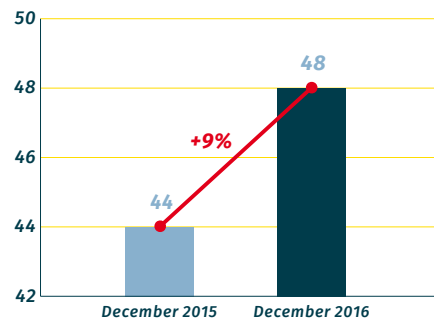
Note: Segmentation based on data from PeeringDB.

"2016 was the year of big decisions about the future direction of the UAE-IX – and one of these decisions was to upgrade the exchange to the Apollon platform. 2017 will be the year to execute this and more. The market is responding well and I believe we will be able to confirm and extend our position as the number one exchange in the region."

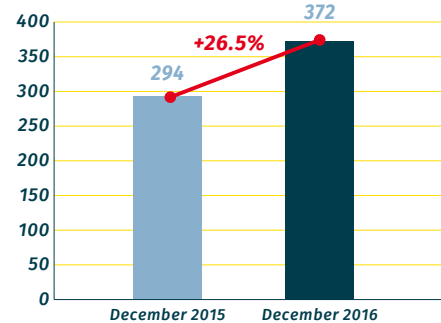
Marco Brandstaetter, Business Development Manager, DE-CIX



Customer Growth UAE-IX



Connected Capacity UAE-IX (Gigabits)



UAE-IX finished the year with peak traffic of close to 70 Gbps, with prominent new customers peering, such as AliCloud.

One of the highlights of the season was the 2016 UAE-IX Peering workshop and cruise in its fifth edition. With a sold-out audience of more than 80 customers and partners attending the workshop – followed by a cruise on the coastline of Dubai – the event was a full success. The Internet Exchange will retain its importance in 2017 with the goal of hitting 100 Gbps of peak traffic. On top, the UAE-IX will be upgraded to the powerful DE-CIX Apollon technology platform in due course as the foundation for its regional infrastructure in the United Arab Emirates.

Africa

Angola

DE-CIX partnership with Angola Cables renewed in 2016

Angola Cables, the leading international IP carrier and international gateway provider of Angola, and its innovation partner DE-CIX announced at AfricaCom 2016 in Cape Town that the two companies will continue their expansion ambitions as influential drivers of Africa's digital enablement. With the support and advice of DE-CIX, Angola Cables operates Angonix (the Angolan IXP) in its data center in

Luanda. Angonix, as one of the fast growing neutral Internet traffic exchange platforms in the region, became operational in 2015 to push the transformation of the digital economy in Angola and in the SADC region. The exchange improves Internet resilience and robustness of Angolan and SADC IP networks and provides reliable connectivity within the SADC. Angonix serves as a regional hub for cloud scale interconnections and content localization. The exchange creates a regional interconnection ecosystem for the SADC out of Angola, and is open for all networks that have an ASN globally. In order to overcome the digital divide and to attract international content for the SADC

region, Angonix addresses academic and foreign content, DNS servers, and several root servers.

For all countries in between Angola and Portugal, there is a reduction of at least 50 ms latency to Lisbon. For Angola, the digital distance to Lisbon has been reduced by more than 60 per cent. This enhancement may also become an advantage for DRC, Ghana, Cameroon, Nigeria, and all other countries going up the coastal line towards Senegal or Cape Verde islands, implying a reduction in latency.

The interconnection solution meets the low-latency needs of countries located in West Africa by allowing for shorter routes to exchange traffic directly and wherever needed. With this, Angola Cables combines its presence and role as a main shareholder of the WACS consortium and DE-CIX's expertise to satisfy the interconnection needs of Internet providers in West Africa.

The Angola Cables and DE-CIX partnership was crowned with the Best Africa Service Innovation Award at the Capacity Africa conference in late September 2016.

Financial Report





*"DE-CIX is expecting continued growth in all areas
of business in 2017."*

Gregor Reinhold
Chief Financial Officer
 DE-CIX Management GmbH



Financial Report

Consolidated Reporting of DE-CIX Finances

Due to the increasing internationalization of DE-CIX activities, it was decided in 2016 to consolidate finances into one single report that reflects the activities of all locations within the DE-CIX family and will enable in future an overview of the further financial evolution of DE-CIX. There are several reasons for this. While Frankfurt remains the central Internet Exchange from operations, customer, and revenue perspectives, a considerable focus has been placed on increasing the international presence of DE-CIX in the last two years. The extension of

our international business has resulted in a growing proportion of revenues coming from DE-CIX's international exchanges in 2016.

Consequently, DE-CIX's business activities and revenues in 2016 were in a period of transition, with the clear potential for new and diverse revenue sources in 2017. To enable the tracking of growth in coming years, the financial report for 2016 is provided

as a consolidated report, encompassing income and expenses for all DE-CIX locations. This reorientation means, however, that comparisons cannot easily be made with the reporting from previous years.

Overall, and looking back, 2016 was a successful, but unexceptional, year for DE-CIX Management GmbH, compared to 2015, which had much higher commercial demand. The steady growth in traffic was accompanied by solid growth in revenues.

Financial Results

On basis of the consolidation of DE-CIX's local and international business, and compared with the 2015 turnover across all companies, total revenues for 2016 grew by more than 15 percent to over 29.3 million Euros; up from 25.4 million Euros in 2015.

Due to the internationalization activities, OpEx across all companies increased by 5.9 percent in 2016 to slightly over 27 million Euros. Personnel costs accounted for 18.9 percent of turnover, growing by 24 percent from 2015 levels, in line with continued demand for qualified staff. In the same time period, CapEx reduced from 2.1 million Euros in 2015 to 1.65 million Euros in 2016.

The majority of revenues continued to flow from DE-CIX Frankfurt. However, revenues from international activities more than doubled in 2016. This resulted in a strongly increasing proportion of revenues derived from international operations, standing at just over 2.3 million Euros and making up 7.7 percent of total revenues for 2016. DE-CIX New York, already well established in the New York/New Jersey/Long Island metro market, experienced excellent growth in 2016, with revenues increasing by 500 percent during the year.

The consolidated EBIT jumped more than 36 percent to 1.9 million Euros, and the EBITDA by 23.5 percent to nearly 3.7 million Euros.

This resulted in a consolidated profit of over 1,000,000 Euros in 2016.

The equity-to-assets ratio strengthened further in 2016, increasing by more than 7 percent to a healthy 79.6 percent.

More detailed information can be found in the Balance Sheet and Profit/Loss Account on page 63.

Forecast

Overall, DE-CIX is expecting continued growth in all areas of business in 2017, with an increasing revenue proportion from international activities. This will lead to an anticipated turnover across all companies of over 30 million Euros in 2017. Of this sum, over ten percent of turnover is anticipated to come from DE-CIX's international activities. This forecast also takes the implementation of the new service access model into account, which will take place during the 2017 financial year.

The demand for the 100GE ports is overwhelming, and further growth is forecast in this area; they are already available or are becoming available in the course of 2017 at all DE-CIX locations.

A substantial budget has been set aside for reinvestment in new equipment in 2017, on the one hand to support the growth in 100 GE ports, and on the other to support international growth. The relocation of one of the biggest core nodes in Frankfurt will also be a thrilling new challenge, both on the project management side as well as on the investment and cost side.

Risk Analysis

The majority of DE-CIX Internet Exchanges grew in line with projections, or exceeded expectations, in 2016. Despite the slow growth of DE-CIX Palermo, signs of growth in early 2017 demonstrate the potential of African traffic to grow the exchange in the future. This growth will also cause a domino effect within the Mediterranean region, encouraging further growth in the other DE-CIX locations.

The connection of a growing number of large networks to DE-CIX Istanbul will make it increasingly attractive in 2017, also for the smaller networks.

At the same time, the company structure of the DE-CIX family future-proofs the organization, protecting the sisters and parent company from national, political, and financial risks which the subsidiaries may face in the future.

The current positioning of DE-CIX enables the company to exploit a range of exciting opportunities for future revenue potential. The current strong growth in the international locations will translate into growing revenues in 2017 and beyond. Added to this, DE-CIX will continue investigating and developing new locations, as well as undertaking the expansion and interconnection of existing locations.

The undersea cable connecting Argentina and Spain, to be finished in 2017, will result in a completely new intercontinental connection, with the associated potential for the Internet Exchanges in the Mediterranean region.

Finally, DE-CIX will solidify its financial success through the provision of new interconnection services.

Balance Sheet 2016


Assets	2016	2015	Liabilities and Equity	2016	2015
Assets			Equity		
1. Intangible Assets	442,213	412,253	1. Authorised Capital	1,050,000	1,050,000
2. PP&E	2,459,101	2,615,274	2. Reserve Capital	2,501,895	1,001,895
3. Investments	28,712	0	3. Additional paid-in capital	5,000	5,000
			4. Profit carried forward	6,671,938	7,346,914
			5. Profit	1,004,240	554,074
Current Assets	3,938,047	4,000,630	Provisions	531,675	849,102
Cash	6,656,649	6,090,492	Liabilities		
			1. Trade accounts payable	1,663,532	1,569,065
			2. Other current liabilities	638,218	1,362,135
Other receivables and pre-paid expenses	585,276	619,536	Other payables and deferred income	43,500	0
Total	14,109,998	13,738,185	Total	14,109,998	13,738,185

Profit and Loss Account 2016

	2016	2015
Turnover	29,345,737	25,468,345
Other Revenues	1,339,363	3,015,995
Personnel Costs	5,799,517	4,691,982
Depreciation	1,724,629	1,545,349
Other Operating Costs	21,212,337	20,819,080
Interest earned	25,959	26,185
Interest paid	17,300	51,468
Net Operating Income	1,957,276	1,402,646
Tax	953,036	848,572
Profit	1,004,240	554,074

Strategic Outlook



A person wearing a sailing helmet and gear, looking out at the ocean from a boat. The image is split into two main sections: the left side shows the person's profile and the boat's rigging, while the right side is a solid dark blue background with a large, light blue abstract shape. A yellow horizontal bar is at the top left.

"We will continue to build on DE-CIX's strategically key strengths for success: The creation of healthy ecosystems and neutrality."



Ivo Ivanov

*Chief Strategy and Corporate Development Officer,
DE-CIX GmbH / Executive Board, DE-CIX Management
GmbH & DE-CIX International AG*

Strategic Outlook

Who we are

In 2017, we will continue to build on DE-CIX's strategically key strengths for success and growth. These are:

1. The creation of healthy ecosystems:

The ability to create healthy ecosystems and to use existing peering infrastructures as a natural environment for all types of interconnections. The DE-CIX digital hubs in Frankfurt and New York, for example, and the new ones being created, are a logical and natural place for operators to interconnect and are a demonstration of the power of the DE-CIX platforms.

2. Neutrality: At DE-CIX, we take great care to maintain data center and carrier neutrality, as well as neutrality to other business models of the wide variety of network operators, Content Delivery Networks, and Internet Service Providers connected, at all of our Internet Exchanges. This neutrality is vital for the strong distribution of our setup – offering a rich variety of options for connecting to the platforms – and is essential for our position in the market.

Where we are going in 2017 and beyond

New markets: After extremely successful international growth in 2016 (with new exchanges in Dallas and Madrid – the latter becoming the fastest growing on the planet) we will continue to extend the global DE-CIX presence into new markets, serving the needs of the market for a better traffic distribution closer to the edge, reducing latency and costs. Our focus is on markets with great potential and the need for a better interconnection environment.

Partners and alliances: In a dynamic, fast-growing, and very vibrant market, we will ensure our ability to deliver the variety of interconnection services needed within the DE-CIX ecosystems by using partners, creating alliances, and being very flexible

in our reaction to new trends. This will be in the focus of our further development in 2017 and the following years. We will investigate further markets and close strategic partnerships in order to be able to offer participants in all DE-CIX ecosystems around the globe the interconnection services they deserve and desire. These strategic partnerships will offer us increased flexibility and extend our reach.

Enabler of innovations in interconnection – changing the way IXs serve an ecosystem

While peering remains a mainstay of DE-CIX's operations, we are also developing new interconnection possibilities to offer a variety of different services, keeping pace with the changing digital society and the needs of network operators and enterprises to deliver their innovative products and services. The first of these, DirectCLOUD, was established in 2016 and has been well received on the one hand by large and small Cloud Service Providers (e.g. AWS, DARZ, and PFALZKOM | MANET) and on the other hand by network operators using DE-CIX as an aggregation solution for their cloud connectivity needs.

The new Access-Service model - announced at the DE-CIX Customer Summit in late 2016 - is a unique service model, pioneering the way customers can improve the efficiency of usage of their existing infrastructure on different DE-CIX platforms. The DE-CIX platform is a playing field for all types of interconnections: providers can use the neutral, reliable, and effective DE-CIX Apollon interconnection platform to develop further interconnection business models – following on from their hybrid and multi cloud strategies. This offers network operators and owners opportunities for new revenue streams, as they can use the platform to deliver all manner of existing and new services in their product portfolio.

A range of different industries, including new types of network owners and businesses that have not previously been present at

IXs, including the finance, health-care, and the automotive sectors, can use DE-CIX's interconnection platform and services. Our goal is to create flexible and customized solutions for operators and network owners, as well as different types of businesses; so that they can optimize the way they interconnect with others. Network operators, owners, and enterprises can build their own private interconnection communities on the DE-CIX platform, regardless of the type of traffic or business model involved. We can deliver different Service Level Agreements for different needs, to serve different customer groups and business models.

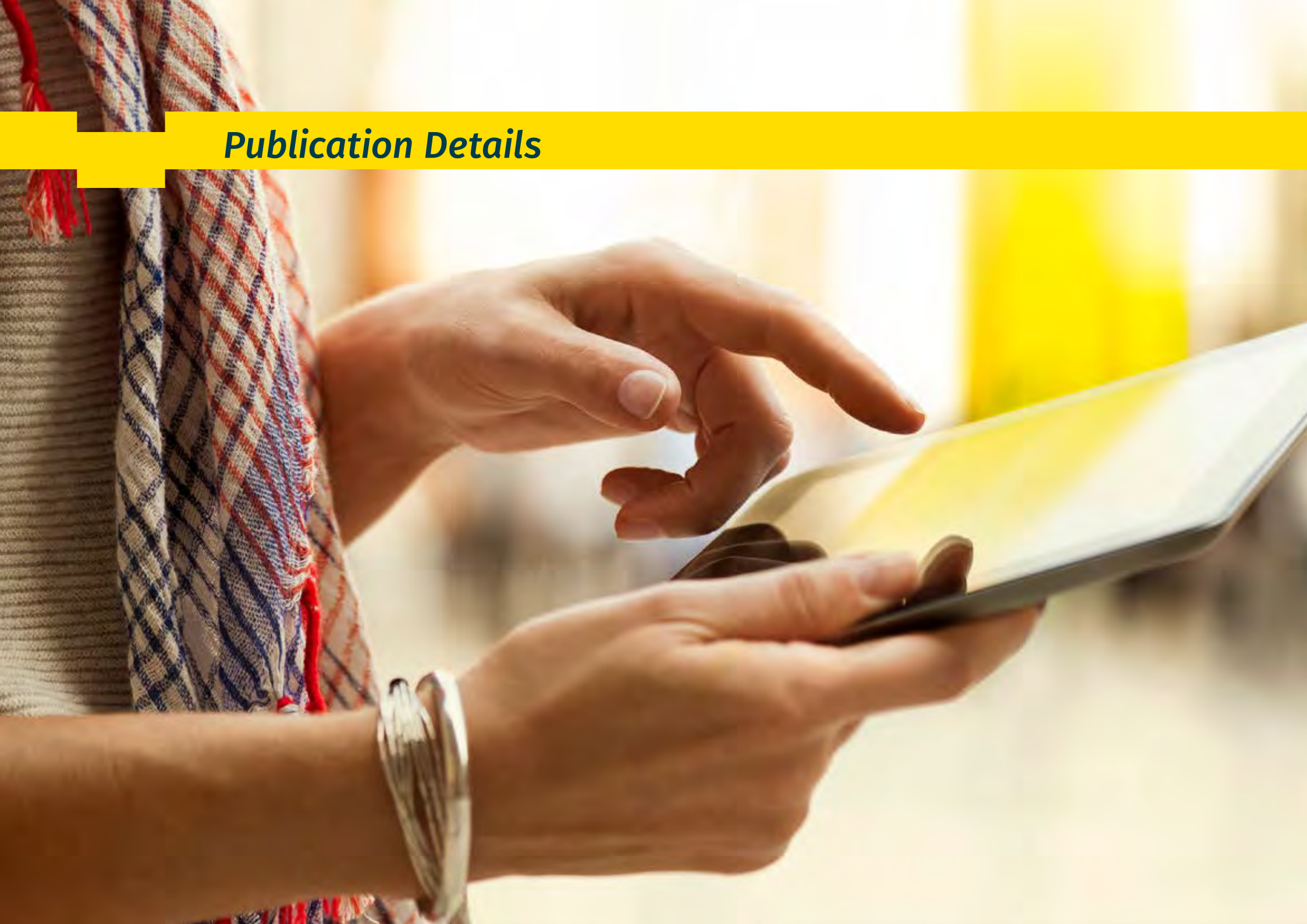
Digital transformation means enterprises have to be interconnected – they have to be present in different regions worldwide, they have to interact with others from the same industry and diverse other industries and

they need to develop their interconnection community. At DE-CIX, they can aggregate their interconnection requirements and build their own ecosystem within our globally operating platforms.

We see ourselves as an enabler of the burgeoning digital society of tomorrow – a connected world demands high quality, robust interconnection, and service excellence, something that DE-CIX has been offering for decades.

We are not simply a peering point: DE-CIX is evolving to enable customized solutions based on individual customer wishes and needs. We offer flexibility and reactivity to help our connected customers generate the interconnected world of today and tomorrow.

Publication Details





"Digital transformation means enterprises have to be interconnected: they have to be present in different regions worldwide, they have to interact with others from the same industry and diverse other industries and they need to develop their interconnection community."

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Why customers believe in DE-CIX



"DE-CIX is a world-class leader in peering and interconnection services.

As one of the largest data center operators in Europe and the Asia-Pacific, Global Switch recognizes the importance of robust and far-reaching connectivity to our customers. The ability to directly connect to the DE-CIX ecosystem, and exchange Internet traffic with hundreds of carriers, ISPs, and content providers will provide real benefits to our customers – which include some of the largest organizations in the world."

Aman Khan, Managing Director Germany, Global Switch.



"We have chosen DE-CIX as we value the company's long term knowledge in peering and interconnection services and their high level service support."

Hatem Mestiri, Chief Technical Officer, Ooredoo Tunisie

