



The significance of Frankfurt as a location for Cloud Connectivity

Executive Summary

- On the infrastructural side the location Frankfurt am Main is the backbone of the digital business in Germany. As far as data center density and connectivity to central internet hubs are concerned, Frankfurt is the leader throughout Germany and Europe.
.....
- The continuous relocation of data and applications to external cloud provider infrastructures made Frankfurt the stronghold for cloud computing in Europe. It is expected that almost all relevant cloud computing providers will make their investments in Frankfurt during the upcoming years.
.....
- Criteria, such as latency, data throughput and scalability are playing a decisive role in operating enterprise- and real time applications. The significance of Frankfurt will increase continuously due to meeting these conditions.
.....
- The provision of applications through modern cloud-operating concepts is of increasing importance to the CIO's of larger corporations. Against this background, the location- and provider selection plays an elementary role. Only high-performance connectivity between an on premise cloud and the customer-infrastructure guarantees the desired "quality of service".
.....
- The term "cloud connectivity" is going to play a central role in creating cloud strategies and architectural concepts. Cloud computing for companies only makes sense if hybrid cloud operation systems are displayed on networks and can be operated cost-efficiently.

Table of contents

1	Executive Summary
2	Table of Contents
3	Cloud Connectivity: The secret sauce
6	Influences on the CIO and IT-Infrastructure Decision Maker
8	Frankfurt am Main as IT-Location in Germany and Europe
10	Frankfurt am Main as Cloud-Connectivity Hub
14	Outlook
16	Authors
17	About Crisp Research

Cloud Connectivity: The secret sauce

Due to continuous relocation of business-critical data, applications and processes to external cloud infrastructures, the IT-operating concepts (public, private, hybrid), as well as network architectures and connectivity strategies are significantly changing for CIO's. On the one hand, modern technology is required to provide applications in a performance-oriented, stable and secure manner, on the other hand, the location is significantly decisive for optimal "Cloud-Connectivity".

Against this background, Crisp Research assesses the role of Frankfurt as data center location and connectivity hub with this strategy paper.

Numerous modern business applications are currently already provided through cloud-infrastructures. From the current viewpoint of a CIO, stable and performance-oriented connectivity to systems and services is imperative. This trend will continue. Crisp Research projects that approximately a quarter of all business applications will be used as cloud services within the next five years. At the same time, hybrid scenarios combining local company IT-infrastructures and infrastructures in cloud-based data centers is becoming increasingly important.

The digital change does not stop at any segment of our lives today. Approximately 95 percent of all smartphone apps are connected to services located on servers in global and worldwide distributed data centers. Likewise, the apps are not functional without direct and mostly constant connection to those services. Access to metadata or other information is imperative for trouble-free operation. In addition, the majority of productive data required by the apps is stored on data center systems and only a small selection is cached on the smartphone locally if necessary.

Therefore it is important to understand that the quality of a cloud service is significantly dependent on its connectivity and the performance on the backend. A cloud service is only as good as the connectivity that provides it.

"Frankfurt has the unique advantage to be located in Central Europe, guarantee low latency and a high connectivity density at the same time, which renders it the preferred location for us Akamai."

Christian Kaufmann
Director Network Services, Akamai

The steadily increasing data requirement especially demands a reliable, and above all, a stable service connectivity in order to be able to access and save data and information at any time. This becomes even more significant if business-critical processes and applications are outsourced to a cloud-infrastructure. High-performance access with low latency must be guaranteed at all times and may result in significant financial and image damages in the event of failure. This represents a high risk for corporations.

Requirement of Current and Future Applications

“Cloud Connectivity“ can technically be defined by the following values:

- Latency
- Throughput
- Availability

	Critical threshold value	Example	Comment
Latency	300ms	E-Commerce, Finance services	Latency greater than 2500 ms results in noticeable delay of transfer.
Throughput	10 Gbit/s	Video streaming, Big Data Analytics	10 Gbit/s connectivity is the current standard for minimum data center connectivity. The current maximum is 200 Gbit/s.
Availability	99,9999%	E-Commerce, Enterprise Applications	Critical business applications require 99,9999 percent availability. This corresponds to a downtime of less than 5 minutes per year.

 SOURCE: Crisp Research, 2014

Three types of applications have especially high requirements on throughput, latency and availability (zero downtime) to provide availability to customers on a high-performance and reliable level.

E-Commerce solutions

Modern E-Commerce solutions pursue an integral approach. This approach includes the order process of diverse contents and goods, as well as services, and assists in processing all procedures.

A web shop provides a self-service portal to the customer on which goods can be selected and ordered independently on 365 days per year, 7 days per week and 24 hour per day. An overall availability of 99,999 percent is imperative. Amazon¹ calculated that each 100 millisecond delay costs 1% of revenue. Considering that Amazon generated sales in the amount of 48 billion US-Dollars in 2012, 100 milliseconds represents approx. half a billion US-Dollars per year.

Financial services

In particular, insurance, banking and financial services organizations depend on low latencies to operate their applications performant between different locations. This is mainly to sales-and business-critical applications, which would not work well under conditions of high latency. However, it is not the question of whether an application works, but that a low latency has a significant impact on its performance and thus leads to business benefits.

Real-Time Processing and Transactions

Speed is the key for generating competitive advantages in all industries. Especially in the financial industry and all real-time analyses segments, it is imperative to aggregate and process data and information quickly and reliably. The low latency and high throughput requirements play a superior role here, so the data can be processed with as little delay as possible and is transmitted at a high speed in order to meet the requirements of real-time applications.

Above all, the requirement of real-time analyses in which all available internal and external corporate data and resources are collected to perform forecast- and competition analyses immediately upon request is on a steady rise. This type of dynamic analysis and reporting also considers data that has been collected in the system recently.

¹ Strangeloop, "Amazon: 100ms faster = 1% revenue increase", <http://www.strangeloopnetworks.com/resources/infographics/web-performance-and-ecommerce/amazon-100ms-faster-1-revenue-increase/>

Influences on the CIO and IT-Infrastructure Decision Maker

CIO's contemplate a myriad of topics within the framework of build-or-buy decisions regarding the IT-infrastructure. Topics, such as cost, security, usage rate, energy supply and business continuity play an important role and basically influences which operating concepts (public or hybrid), providers and locations are suitable.

All points mentioned require a high amount of expertise for stable and reliable data center operation, which has emerged into a business-critical component not to be neglected.

In the era of cloud computing the contemplations regarding connectivity of private, public and hybrid infrastructures and/or "cloud connectivity" play an increasingly significant role and are explained in the following paragraphs:

Technology Connectivity and Network Strategy

CIO's increasingly contemplate how hybrid operating concepts can be implemented on the connectivity- and networking side to achieve the desired results with regard to latency, throughput and availability. In this aspect innovations in the network technology (e.g. data enter connection with up to 100 Gbit/s, SDN), as well as services, such as CDN, WAN optimization or direct connections to public cloud platforms, play an important role.

Costs – Cost Efficient Connectivity

The relocation of applications and data to the cloud parallel increases the data volume of corporations and service providers dynamically. The connectivity- and network costs in the IT- budgets rise accordingly. The costs for bandwidth and connectivity in the rural areas rising significantly in comparison with the concentrated areas (Frankfurt, Hamburg, Cologne, Munich etc.). Deciding on the location is extremely important with regard to connectivity costs.

Strategy – Benefits of Cloud Connectivity Hubs

When planning their cloud-networking strategies, CIO's should also consider the opportunities created by closing the ranks between numerous large cloud service- and infrastructure providers in metropolis regions such as Frankfurt. These capitals form so called "cloud connectivity hubs" and enable new standardized connectivity services, such as Amazon AWS Direct Connect and Microsoft ExpressRoute (direct connectivity of infrastructure to diverse data center locations). In the future, large corporations will have the option to create direct connection from their corporate network to Salesforce or Microsoft cloud-services in order to increase performance and security during usage and decrease their connectivity cost.

In conclusion, a decision regarding the operation between a company-owned data center or selecting a suitable data center provider must be made. A high-performance and stable infrastructure environment, in which the location is also an important factor in order to be connected to the important cloud providers and to decide on the design and concept of modern hybrid cloud architecture, is of significant importance.

Therefore Crisp Research recommends that IT-decision makers question and evaluate the core competencies of their IT to decide whether their IT-infrastructure should be outsourced to an external data center such as in Frankfurt for example. Numerous national and international cloud platforms featuring the most reliable connectivity with DE-CIX and over 550 ISPs will be located there in the future.

Frankfurt am Main as IT-Location in Germany and Europe

Frankfurt am Main is one of the most important European locations for information- and communication technology in Europe. With DE-CIX and its top-transfer rate of approximately two terabit per second, 90 percent of the German- and 35 percent of the European Internet traffic, Frankfurt is home to the worldwide largest Internet hub .

"Frankfurt am Main is the European control center for Cloud Computing."

Gerd Simon
Senior Consultant,
Digital Hub FrankfurtRheinMain e.V.

This hub ensures the global interconnection of the local and financially strong industries, such as the finance industry, corporations from digital infrastructure, IT-security and satellite navigation. This is supported by an excellent infrastructure for traffic and mobility and therefore guarantees all interfaces for a modern and quick transfer of information and financial resources throughout national and international markets.

These positive circumstances resulted in the move of numerous German and international companies to Frankfurt and its regions during the past decades. Amongst them, renowned providers, such as Microsoft, Oracle and HP, the IT-service provider Lufthansa Systems, T-Systems and Accenture or telecommunication providers, such as Colt Telecom, T-Online and Vodafone.

Especially the financial industry has had a hand in establishing numerous data centers to satisfy the requirements of necessary capacities for computing power and memory. This resulted in an upward industry for data center service providers, which offer data center facilities and other services in their portfolios. They depend on the development of vertical eco-systems within the data center, in order to exhaust the facilities to the utmost extent.

² Branchenreport IKT FrankfurtRheinMain, 2010

„Frankfurt is an excellent location as the leading financial center for Germany and Europe, because it already has a high-performance infrastructure. Many of our Cisco customers build their data centers in the Frankfurt region and this of course provides the foundation for additional investments in the cloud sector.“

Patrick Schmidt

Managing Director Architecture Sales,
Cisco Mittel- und Osteuropa

This is met by the settlement of new IT companies and young innovative industries, such as virtual engineering. Simultaneously they also depend on a reliable power infrastructure, as well as international connectivity with low latency periods, which is provided by DE-CIX, amongst others, and which makes it especially attractive for the gaming industry.

Frankfurt am Main as Cloud-Connectivity Hub

More than 600 internet service providers from over 60 countries meet in Frankfurt with connectivity and ensure global networking. This renders Frankfurt the Internet-hub with the highest global data throughput. In addition, more than 250 telecommunication providers and Internet service providers have settled here throughout the course of the past decades. Therefore, Frankfurt features a very high fiber glass concentration at high speed. It is a great environment to house an utmost amount of data centers

A Very High Density of Data Centers

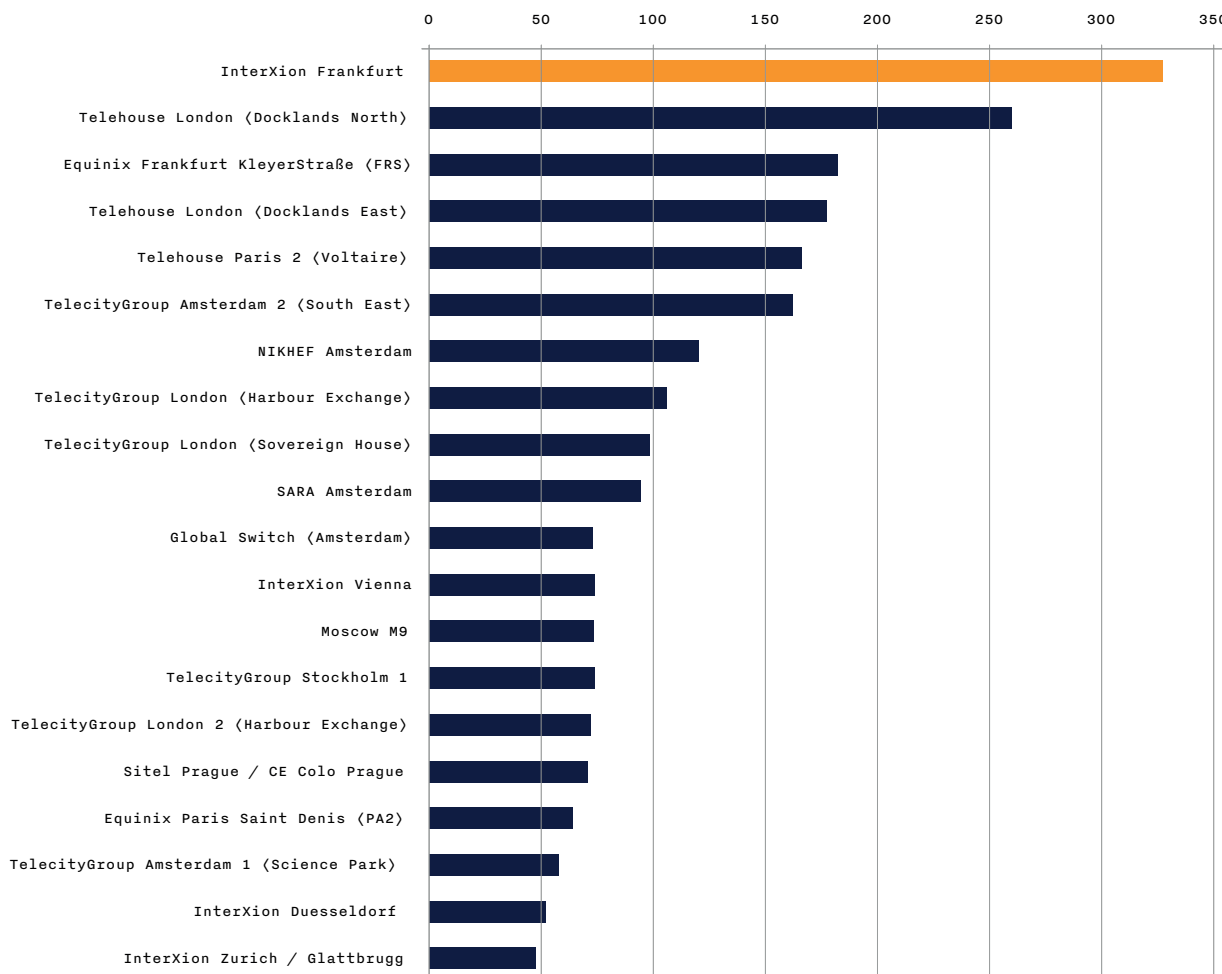
In the course of the past decades, Frankfurt developed into a data hub and one of the globally leading information capitals. This can be contributed to the excellent geographic location and the well-established infrastructure as well as the economic situation. Moreover, the upward mobile markets in Asia and Eastern Europe are also connected here, which leads to additional growth.

In comparison to the main competitors in London and Amsterdam, Frankfurt was able to establish well, despite the high electricity costs in Germany. This can be contributed to the high data protection standard and sensitivity with regard to data locality in Germany, as well as the communities and eco systems (industry hubs) located in Frankfurt, such as the financial-, logistics- and media industry. A so called community effect, in which diverse cloud platforms, amongst other things, meet in multiple data centers to profit from the same advantages of the data center environments and their infrastructures is also unique to Frankfurt.

For example, the data center of German customs is located in Frankfurt. This means, no container moves in Hamburg until it is digitally processed in Frankfurt.

Frankfurt's data center density is comprised of multiple data center providers- and operators with different volumes. The differentiating factors are the power capacity (in MVA = Mega Volt Ampere) and the data center property (in sqm = square meters).

Best connected Data Center in Europe
by number of connectivity partner



SOURCE: PeeringDB, Crisp Research, 2014

„Frankfurt am Main operates data systems for over 500 Million users globally, which are permanently connected to each other, through digital infrastructures so they can interact in real-time as an added-value-chain.“

Gerd Simon
Senior Consultant,
Digital Hub FrankfurtRheinMain e.V.

According to the Digital Hub FrankfurtRheinMain - status April 2014 – Frankfurt features more than 400,000 sqm gross data center property. Of this, 230,000 sqm net property are for sale. The growth rate from 2013 to 2014 was 10 percent. These properties are currently distributed amongst 47 locations by a total of 31 providers. The numbers of the local electricity company Mainova and the Digital Hub FrankfurtRheinMain³ indicated that electricity use in the past 15 years has doubled from 0,5kw/sqm to 1kw/sqm. This portrays the constant development of the data center locations and simultaneously, the immense electricity use resulting from this development.

³ Digital Hub FrankfurtRheinMain e.V., Gerd Simon

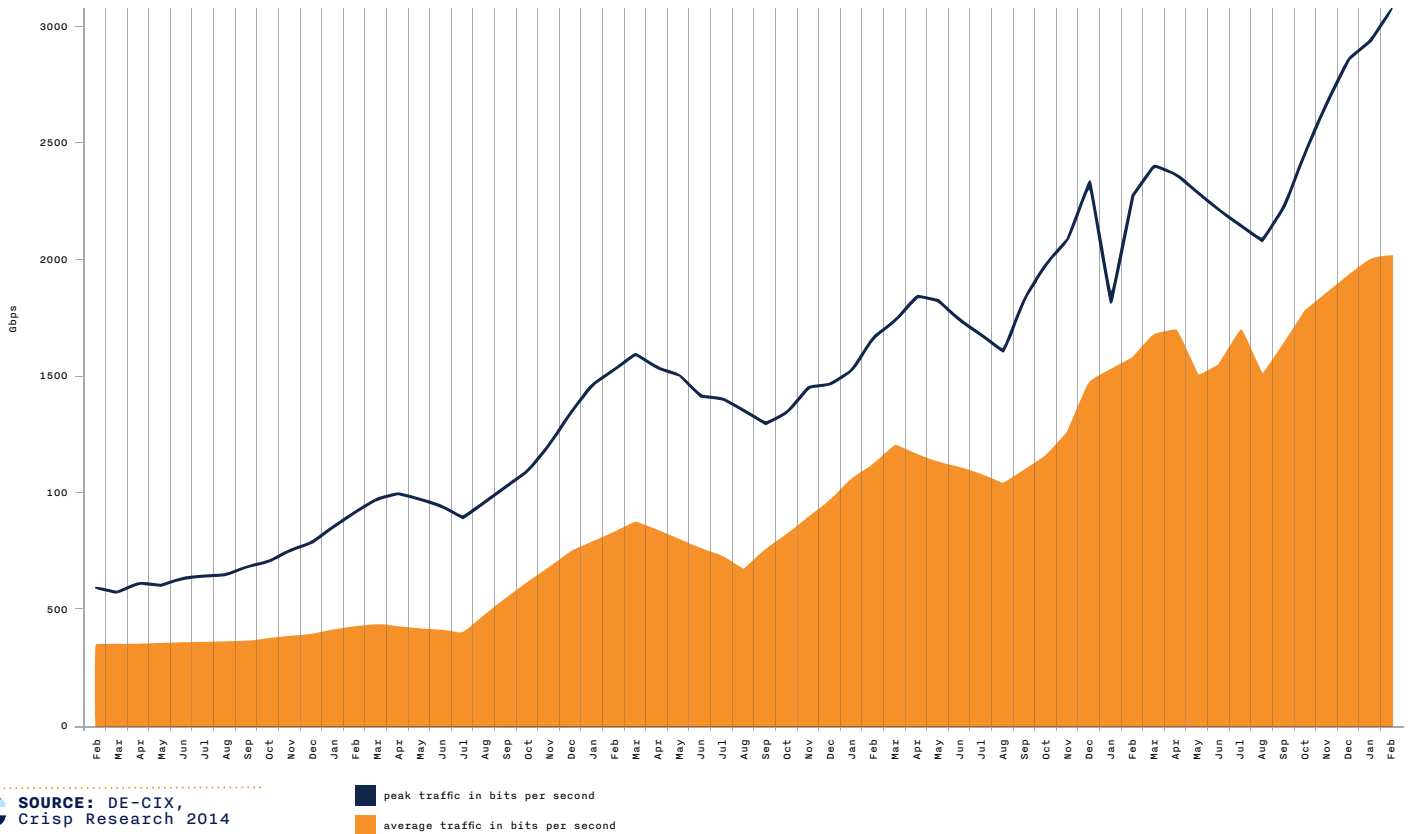
"Frankfurt is an important location for the global IT-network of TeliaSonera, because it enables easy access to many decisive European networks and at the same time it is a natural interface for Eastern Europe, the Balkan and the Western European networks."

Mattias Fridström
Vice President & Head of Technology,
TeliaSonera International Carrier

Data Growth as Catalyst

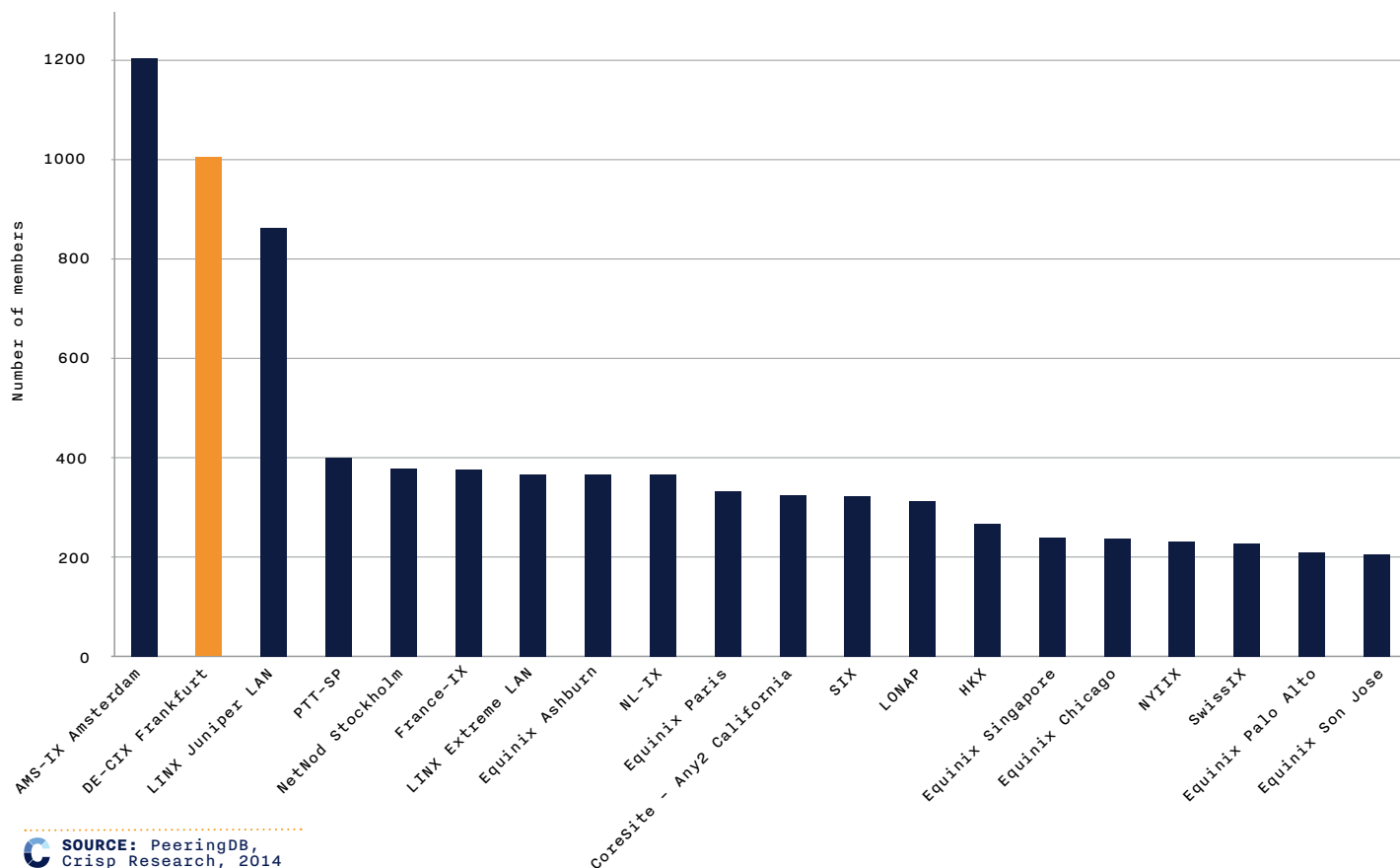
Within the last five years, DE-CIX Frankfurt has experienced annual consumption of HD-videos, HDTV, online games, cloud services and digital media libraries. In addition to the steadily rising Internet use, the social networks and mobile data usage via smartphones are considered data growth drivers. Further, the constant requirement for new data sources for obtaining information also contributes to a significant increase of annual data volume. The growing requirement for real-time analysis and the corresponding backup is another reason.

Internet Exchange DE-CIX: Frankfurt Bandwidth Growth over the past 5 years



⁴ DE-CIX Management GmbH, <http://www.de-cix.net/about/statistics/>

Top 20 of global internet exchanges by number of members



"We invest significant amounts in our network capacities to raise the annual growth rate of 30 percent which we see in this important connectivity hub."

Mattias Fridström
 Vice President & Head of Technology,
 TeliaSonera International Carrier

The current topology of the network hub in Frankfurt is capable of processing a data volume of up to 80 Terabit/s. This is another advantage for the data center location in Frankfurt, because it enables a growth rate for years to come. The users profit from a low data package run-time because Frankfurt is connected to all important national and international data traffic networks. This increases the attractiveness of the location, which also makes Frankfurt increasingly attractive to global and national cloud platform providers. At the same time, almost all large Asian carriers use Frankfurt to connect to the intercontinental WAN-connections. This results in the European data traffic flowing through Frankfurt.

Outlook

Within the past 20 years a cluster of infrastructure providers for the digital economy has formed in Frankfurt and assists companies to position their goods and services on the market. These providers have characterized Frankfurt and its economy and provide integration services for IT and networks, as well as data center services. The foundation has been established in the 1990 by Internet hub DE-CIX and data center providers such as Interxion, IT-Service providers, such as Colt Technology Services and NRM Netzdienste Rhein-Main GmbH. Beside the biggest data center space and the highest bandwidth available in Germany, more than 7,000 IT companies are part of the IT-location Frankfurt Rhein-Main.

Frankfurt's Attractiveness Continues to Increase

An increasing amount of providers understood that they have to be available to their customers locally and on-site in the respective countries, despite a global cloud-infrastructure. This is an important acknowledgement. No provider who wants to do serious business in Germany can do this without a local data center.

Crisp Research sees an important trend in the fact that numerous providers will establish and/or expand their cloud platforms in Frankfurt within the next two to three years.

"Connectivity is business-critical for the DTS AG and its subsidiaries in order to supply all customers with stable and high-quality cloud-services."

Kai Mallmann
Geschäftsführer,
DTS Systems GmbH

Cloud Connectivity is Critical to Business

The connectivity of a data center is a decisive and important benchmark in order to provide customers and their customers with stable and reliable access to cloud services at any given time. This includes high-level downtime safety based on diverse carriers (network providers) and a redundant infrastructure with regard to routers, switches, cabling, as well as the network topology. Within this scope, carrier-neutral connectivity is an important characteristic for the customer, so he is able to select a suitable provider amongst them. At this point, the acceptance of a carrier based on customer requirements is desired as well, in an effort to meet the respective requirements with regard to speed, price/performance and existing contracts. Meeting these requirements has become a critical business factor for the customers in these times to ensure the reliable access of their cloud, big data- and mobility applications.

Authors



René Büst
Senior Analyst

rene.buest@crisp-research.com

Rene Buest is Senior Analyst and Cloud Practice Lead at Crisp Research, covering cloud computing and IT infrastructure. He is member of the worldwide Gigaom Research Analyst Network, top cloud computing blogger in Germany and one of the worldwide top 50 bloggers in this area. In addition, he is one of the world's top cloud computing influencers and belongs to the top 100 cloud computing experts on Twitter. For more than 16 years he is focused on the strategic use of information technology in businesses and the IT impact on our society as well as disruptive technologies.

Rene Buest is the author of numerous professional cloud computing and technology articles, speaker and participant of experts rounds. On CloudUser.de he writes about topics from the fields of cloud computing, it-infrastructures, technologies, management and strategies. He holds a diploma in computer engineering from the Hochschule Bremen (Dipl.-Informatiker (FH)) as well as a M.Sc. in IT-Management and Information Systems from the FHDW Paderborn.



Steve Janata
Managing Director & Senior Analyst

steve.janata@crisp-research.com

Steve Janata manages the research projects for cloud computing, digital customer experience and mobility. He advises and supports IT-users and providers on their journey to a digital economy. Prior to his employment with Crisp Research, Steve was the Senior Advisor and Practice Lead for Cloud Computing & Innovation“ at the Experton Group. He has 15 years of experience as an analyst and strategy consultant in the IT-industry. Within the scope of his consulting career, Steve has worked with companies such as IBM, Microsoft, T-Systems and Telefonica, among others.

Steve Janata is author of numerous studies and professional articles. An expert in cloud, channel and digital economy, he is a sought after speaker and moderator at conferences and events. In addition, Mr. Janata is a member of the board at the manager forum Rhine/Main for the Friedrich Ebert Foundation.

About Crisp Research

Crisp Research is a European IT-research and consulting company. With a team of experienced analysts, consultants and software developers, Crisp Research evaluates current and future market trends. Crisp Research supports IT-providers in strategy-, content marketing-, cloud marketing- and sales questions.

Cloud computing and digital business transformation are the main focus points at Crisp Research. To test current cloud services and products under live-conditions we have an internal research team in our Crisp Research labs.

Weißenburgstraße 10
D-34117 Kassel
TEL +49 561 2207 - 4080
FAX +49 561 2207 - 4081

MAIL info@crisp-research.com

WEB crisp-research.com

TWITTER twitter.com/crisp_research

Copyright

Erstellt im Auftrag von:

Interxion Deutschland GmbH
Hanauer Landstraße 298
60314 Frankfurt am Main

Telefon: +49 (0) 69 40 147-0
Telefax: +49 (0) 69 40 147-199
E-Mail: de.info@interxion.com

Alle Rechte an den vorliegenden Inhalten liegen bei Crisp Research. Die Daten und Informationen bleiben Eigentum von Crisp Research. Vervielfältigungen, auch auszugsweise, bedürfen der schriftlichen Genehmigung von Crisp Research.

Gestaltung, Layout & Infografiken:

Hellwig & Buntenbruch
MAIL info@hellundbunt.de
WEB hellundbunt.de

Weissenburgstraße 10

D-34117 Kassel

TEL +49 561 2207 - 4080

FAX +49 561 2207 - 4081

MAIL info@crisp-research.com

WEB crisp-research.com

TWITTER twitter.com/crisp_research

