



2020

DATA CENTER

VISION

Key factors likely to influence data center choice and function 2016-2020.

While it is clear that 2020 vision is only truly possible with hindsight, there are clear infrastructure trends taking enterprise data architectures in new directions, and there is plenty of good forecast data. Although nothing is certain about the future – and the speed of change in particular is very hard to predict – limiting prediction to the next four or five years makes it possible to build a useful reference model for CIOs, CTOs, and other data and infrastructure managers, that will help to calibrate plans and retain or build a competitive edge over the next few years.

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THE DATA DELUGE

As always, the key driver is the exponential growth of data, but the sources of that data - and the way that data needs to be treated - are different.

By 2020 global data center IP traffic will be more than 10 zettabytes. Growth is currently running at 25% CAGR which means a doubling every three years.

The Internet of Everything (IoE) will be the single greatest driver of this data growth. IoE applications will account for well over 500 ZB of data by 2020. However, only a small part of this (between 3 and 4 ZB) will be stored. According to [Cisco](#), the data created by IoE devices will be 269 times higher than the amount of data being transmitted to data centers from end-user devices and 49 times higher than total data center traffic by 2019.

Over time, as connectivity improves and cloud storage services become the norm, more and more of the data resident on client devices will move to the data center. According to Gartner, Internet of Things (IoT) will include 26 billion devices by 2020, and the rise in machine-to-machine applications will drive the growth of a new segment specializing in [edge analytics](#) – flagging and processing of relevant data in real time at the edge of the network.

The Internet of Everything (IoE) will be the single greatest driver of this data growth. IoE applications will account for well over 500 ZB of data by 2020.

CLOUDS ON THE HORIZON

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The technology which is both driven by and enabling this deluge of data is cloud computing. According to [Gartner](#), 2016 was a milestone year for adoption, with the bulk of IT spend going on cloud resources for the first time. This puts us at the tipping point where early adopters – generally the larger enterprises – make the way clear for smaller and more technologically conservative businesses.

Growth in cloud as opposed to overall data is forecast to have a CAGR of 33% rather than the 25% overall figure. And the vast majority of data center traffic will be from and to the cloud. Globally cloud IP traffic will account for more than four-fifths (83 percent) of total data center traffic by 2019. This figure is worth stopping to consider, as it effectively marginalizes the traditional data center compared to the situation today.

So the move to the cloud will be universal. What types of cloud service will we be using? The pattern is already clear in 2016: Today,

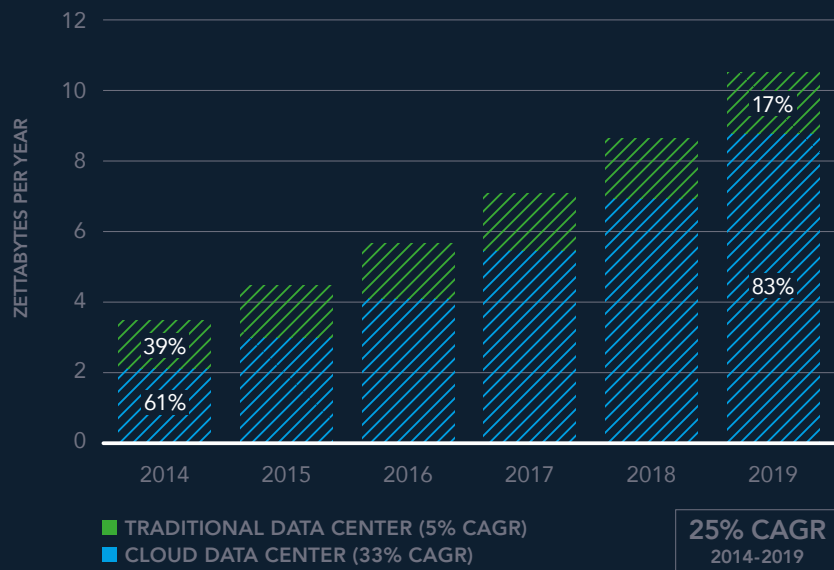


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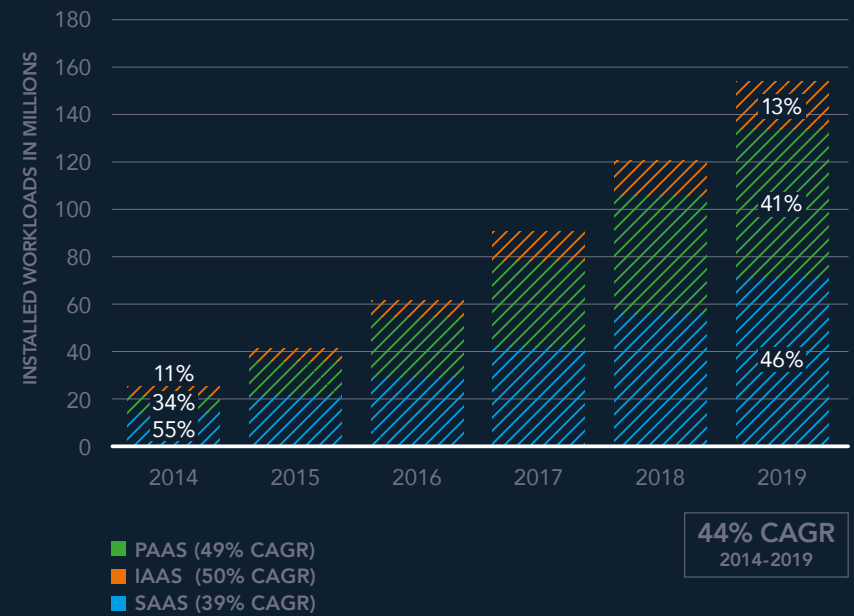
total SaaS/PaaS revenues of the top 50 software companies globally are \$22.4B (PWC Software 100, July 2016). The top ten software companies worldwide are Microsoft, Oracle, IBM, SAP, Symantec, EMC, VMWare, HP, Salesforce and Intuit. Subscription-based enterprise software deployments are quickly replacing traditional software licensing models.

By 2019, according to [Cisco](#), the bulk of the cloud workload will be from Software-as-a-Service (SaaS; 46%), followed by Infrastructure-as-a-Service (IaaS; 41%) followed by Platform-as-a-Service (PaaS; 13%), with IaaS and PaaS showing the fastest growth over the coming years. The range of services on offer will impact every aspect of the enterprise, even the core. As pointed out in a recent [EvoSwitch blogpost](#) the range of SaaS offerings will encompass every business function, culminating in integrated support for complete business processes, or Business-as-a-Service (BaaS).

**Data Center Traffic Growth:
Cloud Data Center v Traditional Data Center**



**IaaS and PaaS Gain Public Cloud
Share of Workloads**



EVERYONE DRIVES A HYBRID

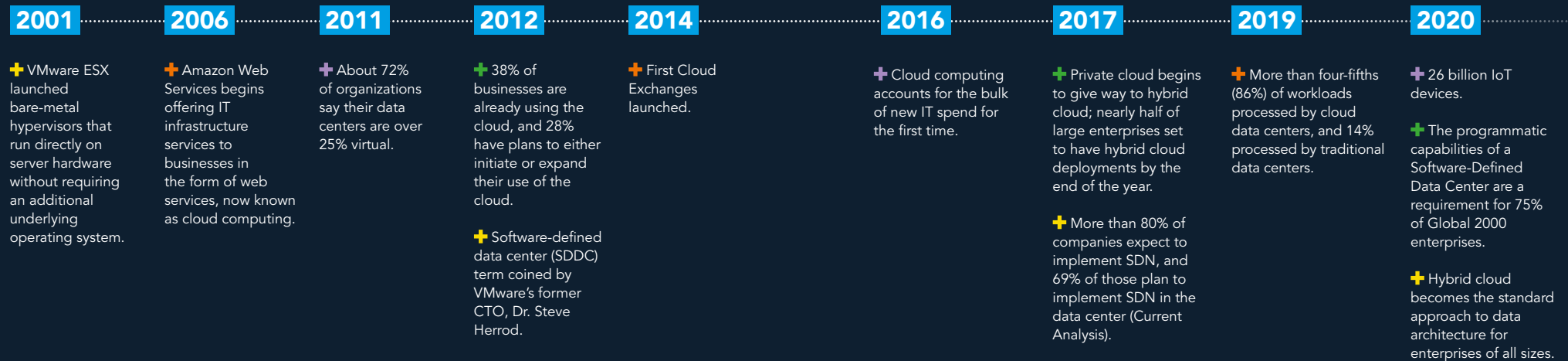
The speed, flexibility and cost-effectiveness of public cloud services will drive widespread adoption at all levels, and it may seem as though the ultimate goal should be for data centers to exist exclusively in the cloud. However, as well as being a practical impossibility, this is not a desirable solution for most businesses. Applications and data that are really at the heart of competitive advantage will be the most prominent candidates for private clouds.

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For the majority of enterprises a mix of dedicated and cloud data storage and services will work best; in other words everyone will drive a hybrid. By the end of 2017, nearly half of large enterprises plan to have hybrid cloud deployments. By 2020 there is little doubt that hybrid cloud will be the accepted approach to data architecture, not just for larger enterprises but for enterprises of all sizes.

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Timeline: Into the Cloud



THE DISAPPEARING DATA CENTRE

Will the shift to the cloud combine with new technologies to change the face of the data center? Yes, but mainly in terms of efficiencies, capabilities, and the way the data center is set up and used.

From now to 2020, we will see significant improvements in network, server and storage equipment in cloud data centers, and one of the key impacts of this will be to drive a wedge between the new cloud-driven infrastructures and legacy equipment.

The workload density for cloud data centers was 5.1 in 2014 and will grow to 8.4 by 2019 (Cisco). However, data centers will capitalise on the virtualization technology behind the cloud to create even more efficient and dynamic services. Virtualization and resource pooling will enable more efficient use and increased resource utilization and combine with sophisticated design and cooling as well as the universal use of renewables to reduce the environmental footprint of the physical infrastructure.

Servers and storage will converge into a single box, using super-fast non-volatile memory express (NVMe) solid-state drives (SSDs). Ethernet performance will improve fast, adding RDMA capability. Servers will offer ultra-fast dynamic random access memory (DRAM), and this will lead to a major reduction in server count and space. These new servers will offer tens of terabytes of DRAM, and as a result all database systems will move to the in-memory model. All-SSD storage products will replace bulk hard drive secondary tier boxes by 2020, while vSANs (virtual Storage Area Networks) will host primary storage. Backup and archive storage will move to public clouds, as well as some secondary storage, as service providers solve the latency issues for public cloud storage.

Cloud computing will ultimately change the way we think about data centers by changing the way they are structured and managed.

Enterprises will be distanced from the physical infrastructure decisions and management as cheaper storage and connectivity and a dynamic marketplace for cloud services increasingly defines data location.

New technologies can now apply the same virtualization principles of the cloud to the other components of a data center in the form of SDS and SDN. The ultimate expression of this distance is the Software-Defined Data Center, also described as Software-Led Infrastructure

A Software-Defined Data Centre is a data centre in which all the infrastructure is virtualized and delivered 'as-a-service'. This enables increased levels of automation and flexibility that will underpin business agility through the increased adoption of cloud services and enable new IT approaches such as DevOps (the collaboration between development, operations and testing). According to the Current Analysis 2015 Global SDN Buyer Study, by 2017 more than 80 percent of companies expect to implement SDN, and 69 percent of those plan to implement SDN in the data center, compared to 47 percent and 31 percent for WAN and LAN, respectively. Gartner predicts that the programmatic capabilities of a Software-Defined Data Center will be a requirement for 75 percent of Global 2000 enterprises by 2020.

Everyone will be discussing software-defined infrastructure in 2020. With user control extended to the virtual infrastructure and service on demand, the traditional admin tasks of setup and configuration maintenance will no longer be relevant. This means that data center administration will consist of setting up policies and procedures rather than installing and configuring physical IT equipment, so that while data centers will still look much the same, they will be less visited and therefore less visible. And as workloads are shifted from one site to another with ease, and increasing amounts of data are generated via IoT and processed 'on the edge', the physical locations of primary data centers will become less significant.

THE ROLE OF THE CIO

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Change will come fastest for enterprises not yet operating a hybrid architecture, and - where the board is listening - this change will be driven by an increasingly influential CIO. His or her central concerns

will be to increase and maintain agility, while acquiring flexible, cost effective capacity and ensuring security for the business and its customers. A careful path will have to be mapped out between relatively young hosting companies and service providers offering extremely high agility versus traditional Systems Integrators and the growing breed of hyper-scale businesses trying to dominate complete ecosystems.

Shrinking data centers, growing clouds and full orchestration will change the role of central IT and jobs will be redefined or disappear as a result. Self-orchestrating infrastructure will give users virtual control over private and hybrid cloud deployments. The CIO will send staff out to clients in different business units to facilitate this and to match the agility these internal clients expect.

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Security will as ever be paramount. Cloud-based strategies will require a new architecture based more on policy, audit, analysis, and team-work skills than the pure technical depth of legacy data centers. CIOs will aggregate resources, set very specific control and management policies, and allow access to workloads based on user context. By aggregating data around application, desktop, and content delivery they will be able to create controls over sensitive data points. From this converged architecture it will be possible to control where these resources go and how they interact with cloud technologies.

CIOs will need in-house expertise with encryption and data loss prevention controls for content-rich cloud applications. IT teams will need to know where the enterprise data resides in the cloud, what offerings cloud service providers have for data protection, and most importantly, how to integrate data protection policies in the cloud with existing company policies.

**HYBRID CLOUD BECOMES
THE STANDARD APPROACH
TO DATA ARCHITECTURE
FOR ENTERPRISES
OF ALL SIZES.**

THE MULTI-CLOUD MARKETPLACE

As mentioned above, a tipping point has been reached, where the cloud accounts for the majority of spend and slower adopters of a hybrid cloud infrastructure – generally smaller and medium-sized enterprises - will be able to move their IT operations into the cloud with confidence.

Why has it taken this long for this point to be reached? Small and medium-sized enterprises often have limited technical expertise compared to larger ones, and they don't tend to spend on cloud infrastructure at the levels that motivate large IaaS providers to offer individual support. This is unfortunate, as while these businesses may not need large-scale elasticity or complex infrastructure deployments, they can definitely benefit from the flexibility, cost, and complexity reduction inherent in cloud platforms. But there are many real concerns. As well as expertise, training, and habit, there is the issue of abandoning existing investment, and worries around finding exactly the right cloud components for their purposes, successfully migrating, and avoiding vendor lock-in. For these reasons, spend on public IaaS and PaaS is still small compared to spend on enterprise data center equipment and facilities.

Those difficulties are multiplied if the company wants to maximize the benefits of the cloud by using multiple vendors. IaaS can be seen as complex and raises a range of questions - which cloud platform is best for which workloads? Who can be trusted to store data and where will they store it? What about downtime? Is it possible to move between

different cloud vendors without loss of business continuity as requirements change or if the service is unsatisfactory? This is where neutral cloud data centers stand out. Over the last couple of years, the issues above have been addressed at the data center level by the creation of cloud exchanges. These exchanges, such as [EvoSwitch's OpenCloud exchange](#), bring new efficiency to the whole cloud ecosystem by using vendor-neutral, widely accepted standards for the benefit of service providers, brokers and users. They prevent lock-in because they enable real-time trading of bandwidth, supported by a bilateral contract with all the suppliers.

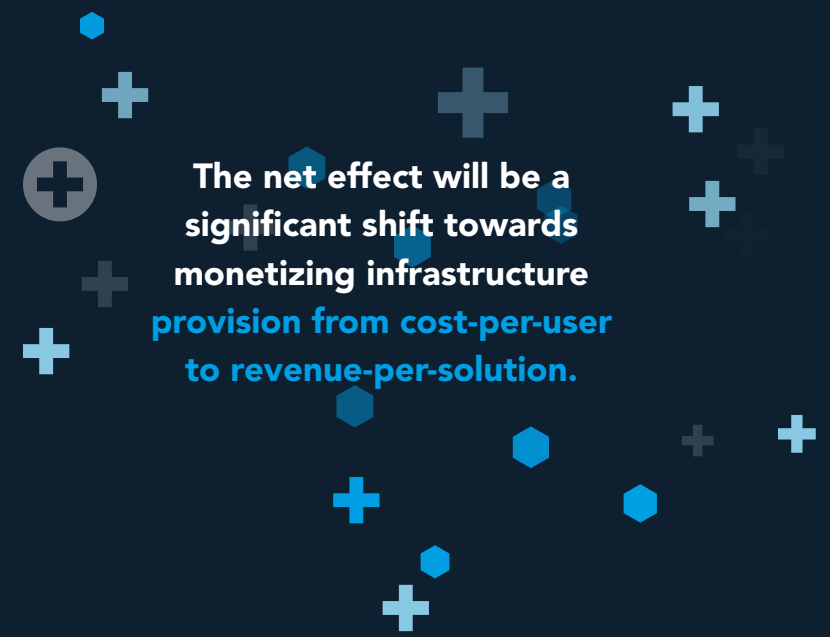
For the enterprise, the cloud exchange service provides high-speed, secure and cost-effective access to the broadest possible range of cloud service providers and partners, including, but not limited to, the largest IaaS players (Microsoft, Amazon, Google). They are an ideal location in which to build hybrid clouds, coupling private clouds for latency- or compliance-sensitive applications and data with the scalability of public clouds. They contain partners that can help IT teams back up data, orchestrate multiple clouds or synchronize data across multiple devices and locations.

Enterprises can build their own ecosystems, picking and choosing from a wide range of networks, exchanges, and cloud infrastructure and specialist service providers. They can also evolve into cloud service providers in this environment, building or commissioning their own cloud services using open source cloud development partners.

Businesses that join these fast-expanding cloud marketplaces can provision and deprovision resources based on context, application, desktops, and business unit. This makes them much more agile and creates real competitive advantages. The ability to respond to market dynamics is enhanced by the capabilities of the cloud and data center ecosystem, and will drive universal adoption of the hybrid cloud model by 2020.

The impact of the growth in enterprise customers in these cloud-rich data centers will also be noticeable by 2020 in terms of skills and service provision. Greater levels of software and networking skills will be available at the datacentre operations level to support the shift to software-led infrastructure discussed above, enabling much higher levels of data-driven efficiency. Brokers of cloud capacity are likely to emerge in the datacentre ecosystem, acting as intermediaries and negotiators on behalf of enterprise customers and offering economies of scale by aggregating purchasing power.

Probably the most noticeable change in the data center skillset will be the growth of market guidance and support from the exchange operator. New roles will be defined to offer expert support and guidance to customers looking to leverage the data center's permanently changing ecosystem, by connecting with new providers, partners, and prospects. As the facilitator of traffic and interconnection in a marketplace in which data flow can be tied increasingly to revenue flow, data center-based consultants will be well placed to advise on new and profitable interconnection opportunities. They will also be able to help with other core customer business concerns, which for the CIO are likely to be scaling out to new markets and making sure new software integrates seamlessly. The net effect of such services will be a significant shift towards monetizing infrastructure provision from cost-per-user to revenue-per-solution.



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CONCLUSION: THE END OF THE ENTERPRISE DATA CENTER?

What are we likely to see in 2020? Disruption aside, the most likely scenario will follow current trends to their natural conclusions. The sharp growth in data (in particular IoT), the maturation of the cloud marketplace to deliver a reliable wide-ranging enterprise-grade portfolio, and the innovation and convergence this has driven at all levels (application, storage, network and infrastructure) will make the 'enterprise data center' – whether this is an in-house or a colocated resource – a rather outdated concept. Instead, enterprises of all sizes will operate an increasingly software-defined, and highly fluid 'data architecture', where workloads are moved from one territory to another, data is gathered and processed at the edge, where storage and specialist analytical services tap into data warehouses and lakes which will be located wherever either latency or legal requirements dictate. Apart from the 'Fort Knox' of the enterprise – the most sensitive data – which will continue to run within a firewalled private cloud, data will sit in the public cloud, spread across IaaS, PaaS, third party cloud services and proprietary or customised dedicated enterprise cloud services, such as those currently launching on OpenStack. Security will be managed on an app-by-app distributed basis, with user restrictions based on access rights and the monitoring of behaviour forming the first line of defence. CIOs will deal with the design, negotiation, orchestration and development of these highly complex overlapping services. 'The Cloud' will be so ubiquitous that the term itself will be used less often. By 2020 it will be more useful to point to what is 'non-cloud'.

The Springboard for the Cloud-based Enterprise

In this multi-cloud environment the premium colocation provider will provide a 'springboard' for the agile cloud-based enterprise. Continuing specialization in space, power, cooling, capacity planning and physical security, combined with strides forward in processing and storage will make efficiency levels (green energy usage, processing speeds, uptime) minor determining factors in hub facility selection; minor but not to be ignored. Compliance with new software-led infrastructure standards will be a point of differentiation, with server virtualization, software-defined networks (SDN), software-defined storage (SDS) and automation allowing the creation of a truly dynamic, virtualized data center which will support the most advanced new fluid data architectures. The most significant factor will be the provision of high-speed, secure and cost-effective access to the broadest possible range of cloud service providers and partners through vendor-neutral exchanges. Reliable neutrality will be a key factor. The most successful facility providers will grow their skills to become critical connectivity-rich partners for the successful CIO in creating a strong, flexible, hybrid cloud; minimising lock-in and enabling business agility; identifying new opportunities which depend on interconnection and partnership, and in the process helping to generate new (many as yet unrecognised) types of revenue. This ability to add to the bottom line will distinguish the winners from the also rans.

SOURCES & FURTHER READING

Cisco cloud index

www.tinyurl.com/oavvpbo

Tech Target on equipment improvements

www.tinyurl.com/p4skv69

Data Center Knowledge on cloud impact

www.tinyurl.com/pjuz2ja

IDG on Security and CIO orchestration skills

www.tinyurl.com/nfqkqdx

Computer Weekly on flexibility, cost per user,
impact of environmental regulation

www.tinyurl.com/q6f3vtd

Gartner on Software-Define Data Centers

www.tinyurl.com/z2nx7va

Wikibon on drivers and trends

www.tinyurl.com/pycfg3j

PWC Software 100 in Forbes

www.tinyurl.com/pmbpwua

ZDNet collating assorted research on breadth and success of SaaS

www.tinyurl.com/jxrujz2

Colophon

Text

The Communication Matrix Ltd
Sander Deutekom
Patrick van der Wilt
Eric Boonstra

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