

The Interconnected Ecosystem Everyone Will Need

Always Connected



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The Interconnected Ecosystem Everyone Will Need

OVERVIEW

In an increasingly interconnected world, the Multi-Tenant Data Centre (MTDC) Ecosystem is already playing a key role in bringing businesses, their partners and their customers together, and its importance is growing exponentially. In this article we draw on the experience of Global Switch and the research insight of Gartner to answer some of the big questions this evolving business environment is posing:

Who is participating in the Ecosystem?

We analyse the organisations that form our Ecosystems and how they interconnect

What makes a multi-tenant data centre into a digital hypermarket?

We look at the role MTDCs are increasingly playing in creating and growing our Ecosystems

How can I plan and futureproof my own Ecosystem?

We outline the key considerations, from infrastructure to a critical mass of participants

What are the key challenges to a viable Ecosystem?

We focus on the factors that are shaping this still-evolving digital territory

Which locations work best for an MTDC Ecosystem?

We help you narrow the search for the ideal MTDC

We conclude with a look at Global Switch, the part we are already playing in a fast-growing global Ecosystem and how we can help your business take advantage of the opportunities on offer.

INTRODUCTION

There is no doubt that MTDCs are increasingly taking centre stage in the evolving world of digital business. Recent Gartner research has identified a cultural shift that is needed among technology decision-makers to cement this new role:

Digital business is enabled and enhanced through high-speed, secure, low-latency communication among enterprise assets, Cloud resources, and an Ecosystem of service providers and peers. Architects and IT leaders must consider carrier-neutral data center interconnection as a digital business enabler.¹

The role of the modern MTDC

Gartner is not a lone voice in extolling the virtues of the MTDCs – large, anonymous buildings with more CCTV cameras than people in secretive locations and with tenants often happy to stay anonymous. Their growing importance, though, is bringing more attention to the modern MTDC.

The economic reality is that building cost-effective data centre space and compute/storage infrastructure requires real scale, so only the most important data and unique services are likely to get the personal in-house treatment for much longer. Customers from all sectors looking towards the future and deciding where to place important data and applications have what seems like an ever-growing number of choices, with new topologies for Cloud solutions being created almost daily.

Connecting the connectors

There are several iconic 'Carrier Hotels' across the globe which today offer the best examples of successful Ecosystems within the MTDC industry. There is not one telecoms Carrier that connects everywhere on the planet and, with the users' expectation of being able to dial any phone number or load any website instantly, the only way that works is for the world's Carriers to interconnect with each other.

It was recently the 20th birthdays of LINX, AMS-IX and DE-CIX. These European Peering Exchanges have been instrumental in demonstrating that massive interconnection fabrics are not only possible to create and scale, but also how important a sense of community is within a successful Ecosystem. This is especially true today as we see the European exchanges

bringing their models to the US, where peering and interconnect is often considered less open and so more difficult and costly.

When looking for the value-creating future Ecosystems which we are discussing here, the Carrier Hotel can certainly play its part and often has small deployments from non-Carriers who want to distribute or aggregate content with that community. It is not, however, somewhere an Enterprise or someone looking for something a little larger than a few racks would likely select; this is not after all the core business of a Carrier Hotel.

Next generation hubs

Today, we are seeing Enterprise, Internet/Content, Cloud, Media and Telecoms companies with a common desire for locations where they can interconnect. We will also see entirely new sectors sucked into this Ecosystem with the expected IoT revolution. The expectations of users in terms of mobility, performance and flexibility are increasing and an ability to deliver is why the developing Ecosystems within large scale Carrier and Cloud neutral MTDCs are becoming so magnetic.

The argument here, as with Cloud service adoption, is that reducing cost is a driver but the main aim and approach should be to realise real

strategic benefit from your selection. The MTDC should be a considered a platform which supports multiple areas of the business and where competitive advantages are more easily found and more quickly delivered.

Gartner stresses the importance of this integrated approach, identifying a need to: *Integrate colocation planning with IT and business unit functions beyond the standard facilities and procurement organisations, where possible, to ensure that colocation decisions are optimized to support broader digital business plans and not just one-off, silo-driven projects.*²

WHO IS PARTICIPATING IN THE ECOSYSTEM?

Enterprises, Internet/Content providers, Systems Integrators, Cloud, Media and Telecoms businesses are all discovering the advantages that come from colocation-based interconnectivity.

A diverse and increasingly interdependent population

The days of the Enterprise data centre being a secure island with a resilient connection back to the head office and an Internet connection are gone. The Internet is now not the only third party 'location' to which access is required –



Global Switch London East

applications such as Salesforce, ServiceNow and Microsoft Office 365 are deemed mission critical, and even social resources such as Facebook, Twitter and LinkedIn are tools customers expect to be engaged with and informed by. This is all before we consider the growth in consumption of Cloud computing resources provided by Alibaba, Amazon, Google, IBM, Microsoft, SoftLayer and many others.

Gartner research is clear on this point: *with hybrid solutions and a plurality of Cloud providers and service providers overwhelmingly likely, establishing a 'home base' in a neutral, well-connected location is critical for future proofing an architecture.*¹

Furthermore, Gartner's researchers have suggested that it is necessary for businesses to: *plan for a multi-provider strategy, and begin transforming their organisation into a broker of Cloud services. Delivering IT as a service (ITaaS) will require training, integration and investments in hybrid architectures for networking, identity, data and other key services.*³

Now the Internet may be the most resilient of networks, but with all these new and critical endpoints being brought into play it should not be considered as Plan A, B and C for the delivery method of IT services for a company. Direct connections with diversity and redundancy will increasingly be required. As usage increases and new applications are delivered in this way, even more bandwidth will be needed, with fibre or high capacity Ethernet being the solution of choice.

Even the large Systems Integrators who have held onto their own modestly-sized data centres have been divesting of these locations in favour of large footprints within MTDCs. Here they can take advantage of the wider Ecosystem, fireproofing themselves from changing customer requirements and tapping into resources which they no longer want to build themselves, or cannot build competitively.

Gartner has charted a fundamental shift in approach: *when we combine interconnection with high-speed enterprise access to the multi-tenant data centre (for example, Ethernet over fiber), and include enterprise assets such as compute, storage and, in particular, networking, located in the multi-tenant data centre, what we've done is bring the enterprise and its applications to the network, as opposed to the outdated model of bringing the network to the enterprise.*¹

The large Internet companies who are providing much of these Cloud computing resources alongside their other businesses are also adapting their strategies. Although they are ahead of the curve in many ways, they still have much ground to cover if their aim is to service the entire globe, and we are seeing a huge amount of activity focussed on scaling and optimising their capabilities at strategic network Edge locations.

Addressing the latency question

Gartner has found that: *where applications may include integration of multiple databases and data sources, the latency involved in communications is likely to stack up in complex transactions, slowing information flow to an unusable crawl. Latency becomes a killer.*¹

Latency, although a relative term for many within the Ecosystem, is a key factor in its development. Initially the large Internet companies set about building their region-serving hyperscale data centres in low cost locations, which made sense at the time, and for many applications this has worked well and continues to do so. Amazon also developed their availability zone model with others following. However all have realised they needed to complement this with edge nodes as these locations were not always near the end-users of the services and, with aspirations to provide Cloud services to large Enterprise users who had performance expectations (and required SLAs), a new approach was required.

Gartner further emphasises this point here: *Advanced digital business applications are likely to involve significant database use, disparate data sources and multiple Cloud providers, with a need for very low latency between the systems. This is unlikely to be served through WAN links from enterprise to individual Cloud providers, with switching taking place back on the enterprise's premises. What's needed is very high performance via a programmatic, secure and manageable fabric. Early trials of such technologies between Cloud providers and associated service providers have been very promising, but have demonstrated the need for speed.*¹

Living on the Edge

With the speed of light through glass (optical fibre) not something which can be materially improved, latency here would seriously impact upon more sensitive applications' performance. As Gartner suggests, the impact on complex transactions where latencies for

different elements get stacked can destroy the user experience:

The goal of the Edge approach is keeping the heaviest of the new traffic and processing at the edges of the Internet, closest to the user applications and devices that are the sources and sinks of this traffic.

Despite the common image of huge 'Cloud farms' in remote locations, many Cloud providers already augment these mega data centers with Edge presence in colocation centers near concentrations of users. They have been exploiting the Edge concept for years.⁴

Despite the significant reduction in connectivity costs over recent years, the enormous amount of data that needs to be transported to and from these remote locations, with a continually changing regulatory environment (including issues of data sovereignty), has made moving some functionality to the Edge – closer to the end-user – a more common approach for all the major public Cloud providers.

A shift in strategy

Telecoms Carriers and service providers have spent years doing their best to interconnect as many MTDCs as possible, as their analysis tells them the returns on investments made at these locations are consistently above other building types. Enterprise customers and Systems Integrators have been increasingly using MTDCs instead of building their own sites. Financial exchanges and information services have been creating new communities and locations for trading and hosting companies, fuelled by the continued growth of e-commerce. This has all meant more demand for telecoms services to and from these sites. With the impact of Cloud, the IoT and further globalisation, these demands will keep changing into the future, and most likely with an increased pace.

Every single Carrier is now expected to have a public Cloud interconnect product and a roadmap to a software-defined future with 'elastic' (utility) based pricing. Indeed, the Carrier sector is one of the most interesting to observe as this is where the biggest changes in strategy are occurring:

- Large US Carriers are acquiring significant media and content assets.
- Cable companies are looking to bolster and extend their infrastructure reach and enter the Enterprise IT and connectivity services marketplace.
- Fibre and global cable system owners are providing data centres and their own Cloud services.

There is also the Asia-Pacific (APAC) region's explosive growth in both telecoms and Cloud services, with Singapore and Hong Kong providing beach-heads for many western companies. Potentially more exciting is the reverse with the APAC Carriers expanding into the US and Europe, especially with the major Chinese Carriers all expanding at a pace often in tandem with their hyperscale Cloud and e-commerce compatriots. Then there is India, which is already an integrated part of many international companies from a service perspective, but some say has the potential to even surpass the US in terms of GDP over the next several decades.

New entrants to the Ecosystem

We must also consider the new entrants into the Ecosystem such as the specialist Cloud Exchange providers. We have seen the success of Peering Exchanges and other network interconnection fabrics, and the models for these new platforms and the underlying technology (Ethernet switching) are essentially the same for Cloud Exchanges. However, these providers are generally software specialists above and beyond their networking expertise. We have described how the public Cloud providers are moving services and access points towards the edge of the network, but what should be noted is that not every major MTDC will have every Cloud provider resident. Today, most Cloud providers have 1 or 2 access points and deployments per Tier 1 city, although new infrastructure is being deployed all the time. Whilst latencies within metro areas are low and the price of fibre and bandwidth are competitive, these service providers are filling in a gap by placing themselves in more of the main MTDC locations with not only direct access to the

Cloud providers but also with slick user interfaces and ‘elastic’ pricing, where you only pay for what you use.

Cloud Exchanges ensure, using the best local Carriers and fibre providers, that they have high quality low latency access to the Clouds, just like the Carriers themselves – although their neutrality should allow them to provide more optimal solutions. The Carriers who no doubt have the lower cost base, and so will increasingly benefit as bandwidth demands to the Cloud increase, are now up against solution providers with enhanced user interfaces, open API’s and an agile development approach. They of course must buy from the Carriers to interconnect their nodes and so the Ecosystem is further reinforced.

The impact of the Internet of Things

The IoT is much talked about and anticipated and, along with Artificial Intelligence advances with personal helpers and interaction with Bots, it promises to change the world in which we live considerably. There is no doubt the Internet and the Cloud have democratised the ability to provide services to a wider audience. What we are now seeing – with the new suites of big data and analytics tools – is the ability for just about anyone to interact more efficiently and effectively with their own and even large publicly-available data sets. There are not many industries which do not capture and, to varying degrees, analyse and utilise their operating data. So what we will see is the ability to move this data to a service provider in an MTDC to better analyse it with previously unavailable smart tools. This will be made easier as the applications and databases are also moved into the Cloud. So we will see existing data sets being analysed by industries who have perhaps not been huge users of the MTDC previously.

A growing community that has reached critical mass

The natural next step is for the technology companies and Carriers and, in particular, mobile operators to allow more of these technologies to be connected in order to analyse this data in real time. This only works at the likely scale required if Cloud computing is at its heart and where resources can be quickly scaled up and down and adapted over time. The inhabitants of the Smart City are often cited as the big winners in the IoT and it is hard to argue with the potential benefits and savings which could be seen in areas such as transport networks and utility infrastructures.

This again sees more and more companies and organisations drawn into the MTDC Ecosystem, either directly or via the Systems Integrators and Cloud Providers.

The net result is a growing list of participants, all of which see opportunities and often necessity in being a part of the right MTDC community.

WHAT MAKES AN MTDC INTO A DIGITAL HYPERMARKET?

Location, power availability, connectivity, scale and scalability – these are some of the key ingredients that every MTDC needs in order to attract participants and evolve into a fully functioning digital hypermarket.

Understanding participants’ needs

For the MTDC to become a strategic platform for its participants, it must firstly understand their requirements for core services such as space, power, cooling and security. Increasingly, these requirements can vary within a single customer deployment, certainly in terms of power density, redundancy and the associated floor layouts. So an open and flexible approach to design is seen as attractive, especially with global companies who increasingly use pod-based IT designs, each specific to a certain application or function.

Being close to end-users

The MTDC needs to make it fast, easy and cost effective for the participants to interconnect, and should be open to helping its service provider community promote their services. The MTDC should be in a geographical location which is close to the end-users its customers are looking to serve, whether that is the general population consuming rich media or central business districts where enterprises congregate. Being a hub for the procurement of digital services and supporting its local communities, minimising latency impacts and enabling the smart city are all part of its new role.

Gartner finds that geography is every bit as important as technology: *In essence, the edge manifesto borrows from the real estate slogan of “location, location, location”. The concept is to avoid issues of latency and congestion by placing compute resources and content closer to concentrations of users and sources of data. Rather than simply a technology, it’s also a concept of topology.*⁴

Opening up the widest connectivity possibilities

The MTDC also needs to understand that it is not an island and its service provider community holds the keys to interconnecting its customers to the outside world – and, yes, to other MTDCs as required. Where the MTDC does not have all the participants it would like from a service provider perspective, it needs to work out how to fill those gaps. This is a challenge, certainly for some of the more out-of-town MTDCs.

Delivering scalable infrastructure

The MTDC must have a robust connectivity infrastructure which is built at scale over years to provide capacity for the future. Where there is flexibility in design, there also needs to be flexibility with regards to interconnection. The Meet-Me-Room (MMR) was traditionally where the Carriers terminated their fibre and placed their network transmission equipment, and the customer suites were connected via cross connects delivered over structured cabling systems from there. Now we are seeing service providers spread throughout the building, and the interconnection system must cater for this. We also see customers who need to bring in thousands of dark fibres directly into their areas with a preference to avoid intermediate patch panels, or terminating in an MMR en route. The MTDC who does not cater for these extreme requirements, or who maintains a policy of charging per fibre even for bulk deployments, will not be considered too highly by these often magnetic customers.

Gartner sees stark consequences for those failing to act: *Any inability of the colocation providers to scale their interconnection resources to meet the demands of hundreds of thousands or even millions of users could make the model unusable by the very constituency it most appeals to – very large enterprises.*¹

So an MTDC with infrastructure such as a structured cabling system, which is both scalable and flexible, can be crucial in attracting important participants to our Ecosystem. Indeed many MTDC operators will actively subsidise acquiring participants they believe will be beneficial to their Ecosystem. What is harder to control is establishing a good connectivity profile and getting real fibre from multiple providers along multiple routes into the building.

Participants are increasingly global in their requirements, so an MTDC which has service providers with direct access to major fibre routes and cable systems (where capacity can be accessed to reach other countries and continents) is becoming more important all the time.

Ultimately, today's MTDC really needs to present itself as a modern digital hypermarket or digital services exchange. Its internal marketplace needs to be competitive and should be open to all service providers. Prices for fibre and wavelength capacity, which are the building blocks for many of the high bandwidth and Edge services, can make or break MTDC deployments for an increasing number of companies. When all these elements do come together effectively, it is easy to see how growth amongst the Ecosystem participants can become a virtuous circle.

HOW CAN I PLAN AND FUTUREPROOF MY OWN ECOSYSTEM?

Identifying your own Ecosystem requirements is critical, but imagining how that Ecosystem and your priorities may develop and change past, say, 5 years out is probably impossible. This is again why a good MTDC is important as it can futureproof your investment by being able to adapt as your requirements evolve.

Scalability and flexibility are key

If the MTDC has enough scale it will have scope to allow for its service provider community to expand and its larger customers to grow over longer periods of time. It is worth noting here that ownership of the land and building can play a major role in the long-term investment approach MTDC providers will take.

Gartner explains that businesses ready to take this need for flexibility on board must: *Design and build prospective digital business applications paying particular attention to the complexities of connecting many 'sources and sinks' (originators and consumers) of information with the appropriate business logic, in a manner that is low latency enough to prevent excessive delay.*¹

This is why the MTDC Ecosystem will be the place where so many requirements for so many different types of companies will be satisfied. Each customer not only has their own 'sources and sinks', but is often an originator or consumer of information for other members of

the Ecosystem. Within the MTDC, the Enterprise customer may use the Systems Integrator and Cloud Provider for infrastructure, data storage and applications hosting and, as Gartner states, likely a combination of multiple providers. They will then all rely on the Telecoms Carriers to move the data between external sources and sinks (end-users and other remote Cloud infrastructures). For those Enterprises who prefer to deal directly with the MTDC and maybe value greater control over their Cloud adoption strategy, having so many different service providers on-tap will provide excellent levels of flexibility – exploring the Ecosystem to identify new trusted advisors and building new relationships should certainly be on the to-do list.

A community that is evolving with business demand

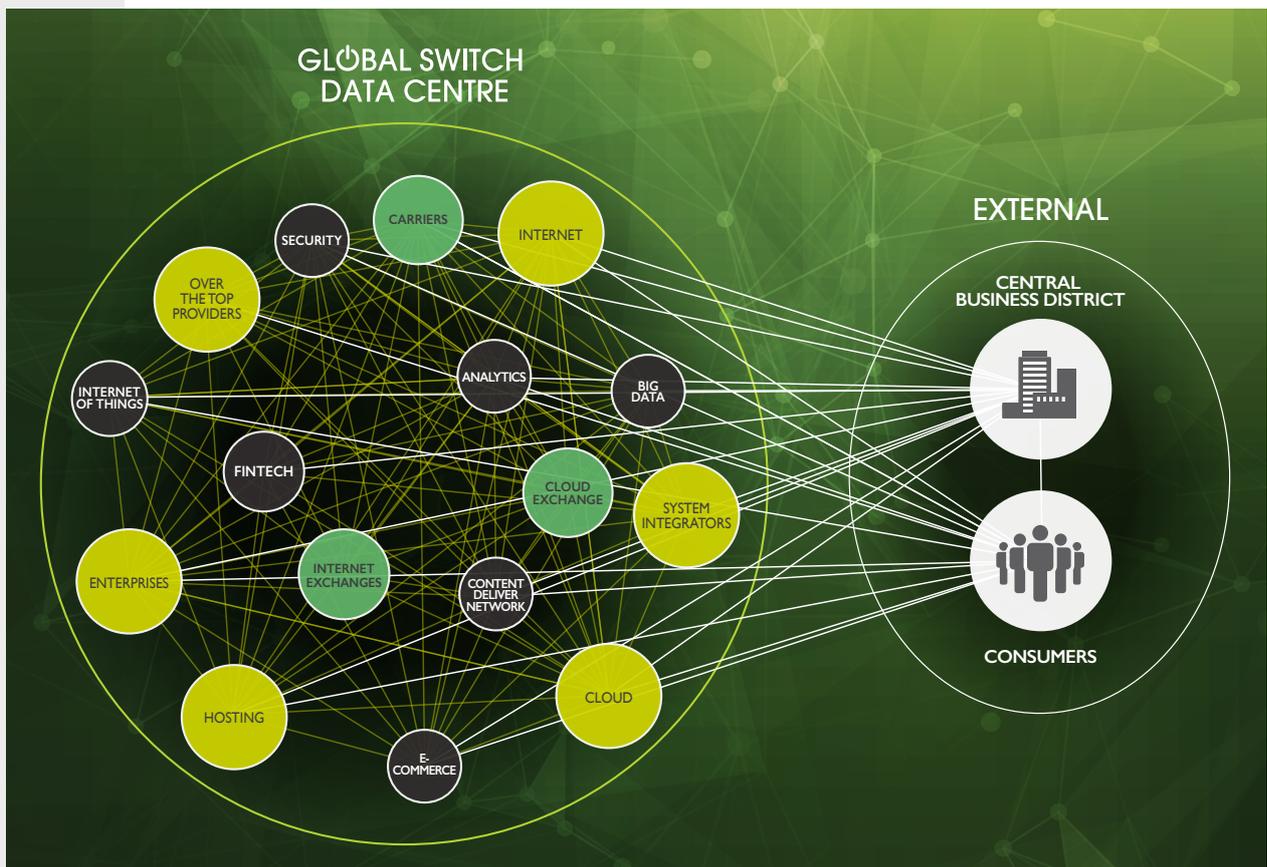
Right now the Carriers are laser-focussed on improving their Cloud connectivity offerings and are working hard to find the right locations to interconnect with everyone and hopefully differentiate themselves. The Cloud providers also have their day job, which is to provide access portals for the general public and Enterprise end-users to find information and goods and services – which are often provided by the Enterprises themselves and which further ties them all together.

All of these activities are critical and their requirements are satisfied from within a well-located MTDC with a strong Ecosystem.

Gartner research shines a light on this fast-changing landscape: *The notion of edge computing is not novel, but conducting business directly and digitally involving rich media calls for spreading the deployment model out, not consolidating into one geographically centralized source. Cloud providers, content-offering cable TV providers and large industrial companies such as GE are proving the concept valuable. Whether for reasons of data sovereignty, avoiding latency, business continuity/resilience or simply lowering costs, the edge computing model will continue to grow in practice.*⁴

WHAT ARE THE KEY CHALLENGES TO ECOSYSTEM DEVELOPMENT?

Developing a strong, well-populated Ecosystem is obviously desirable for the MTDC operator, but there are some challenges that need to be overcome. They include attracting initial and subsequent Carriers to the site and ensuring the availability of popular Cloud services.



The evolution of the Ecosystem

Going back 10+ years, there were the Peering Exchanges which could bring in Carriers with their fibre. Around seven years ago, we saw the rise of the MTF's (Multilateral Trading Exchanges) and high frequency trading which brought a niche of financial companies competing in microseconds. Now we have the public Cloud access points and Internet Edge deployments. Capturing these larger (300kW+) deployments can be crucial to a strong Ecosystem as it often means more of the real compute and Edge functionality is taking place within the site rather than it being simply a collection of network aggregation points with work being done elsewhere.

Attracting the first Carrier is just the start

Often the first focus for a new MTDC, along with securing an anchor tenant, is to encourage the Telecoms Carriers to connect the building onto their fibre networks. Carriers are very keen to connect these buildings, but investments which require the construction of large sections of new network can be considerable. If the MTDC is away from the CBD or from an existing campus or fibre route, it is harder to attract significant connectivity. In some cases, only one or two providers make the investment with others simply purchasing this fibre for their own access, although even these last mile costs can still be prohibitive.

More diversity, less neutrality

Whilst this often ticks the marketing box for connectivity, the requirements for multiple diverse routes and hundreds of fibres which Ecosystems often require is not satisfied. The Carrier owning the fibre is also better placed to maintain higher margins to recoup the investment they made in a shorter time, which is good for them but bad for the Ecosystem. What we also see is the MTDC partnering with a single Carrier or building, and then subsidising their own connectivity solutions back to better-connected locations to enhance their connectivity offerings. This can be a double-edged sword as it obviously immediately helps potential customers but also discourages other Carriers from connecting as they feel competition with the building owner may not be easy.

Up until recently, MTDC providers often had a strict 'Carrier neutral' policy proudly displayed and discussed enthusiastically with customers. As aging sites have filled up and business models have been challenged to show growth, the Carrier

neutral banner has become somewhat greyed. From some MTDCs the message has become, "Yes, any Carrier can become a customer, but we are going to be competing or reselling our preferred providers services as well".

Gartner suggests this agnostic approach is now the norm: *we propose that topology, technology and design all favor building a digital business solution using colocation-based, programmable networking, which we will call "data center interconnect fabric", allowing dynamic interconnection between enterprise peers, Cloud providers, communications providers and a growing marketplace of service providers.*¹

Building a Cloud Exchange platform

We also know that no MTDC provider has all the major Cloud service providers in all their locations, so the challenge has been how each MTDC has filled in those gaps. This is where we see much current activity and the real difference in strategies between some of the MTDC providers. Most have decided to build their own Cloud Exchange platforms, some have upgraded old Ethernet Exchanges and inter-site network infrastructures with limited success. For a new, remote or poorly connected MTDC, it is almost a necessity to be able to list these services as available, and building a basic Exchange can be done relatively cheaply.

As most Carriers will agree, building the network itself is relatively straightforward. Indeed, you can buy 'off-the-shelf' Cloud Exchange solutions from a number of very credible vendors. The complexity comes when you get customers who want to use the network and when several of them want to use it at the same time, or when a user tries to take advantage of its 'elastic' abilities.

An Exchange that does more than tick the boxes

Operating and scaling a network is a specialist occupation, and especially so if you have a lot of bursty traffic. The disciplines of capacity planning, upgrades, maintenance and certification of new software releases are well understood by many, but with these new platforms also being based on software defined networking (SDN) which is still in its relative infancy, acquiring experienced, skilled engineers will also present challenges. If your customers are going to rely on this service, you must get it right.

If, however, the Cloud Exchange is simply an expensive marketing tool to tick the 'we have Cloud access' box, then maybe the operation and scaling is something that does not get tested.

If the MTDC wants its customers to be able to use the Cloud Exchange, the service orchestration piece is very important. It is possible to build a network platform and link in all the major public Cloud providers, but if the platform then requires a fully qualified network engineer to bring up a connection and a team of accountants to understand the elastic invoice, it may not be that successful. The investment in the software required is not insignificant and there are very few examples of MTDCs doing this well today.

The Carriers themselves with their established network provisioning, monitoring and billing systems have generally made a better fist of this area, but much of what is on offer is still just functional rather than intuitive. It seems logical that, with this being much more closely related to their core businesses and the fact that they have established systems, they will develop the offerings to the required standard more quickly – you would imagine it will form a key part of several current SDN projects deliverables.

A role best left to the specialists?

It is the new breed of specialist Cloud Exchange providers, discussed earlier, who are leading the way in terms of customer engagement and user interface, and it will be interesting to see how long they stay ahead of the game and also how long they remain independent.

When you consider our aspirations to have important Enterprises interconnecting with Internet companies and the biggest Carriers and Cloud service providers, the wisdom of an MTDC providing a Cloud Exchange or other intelligent connectivity services can be questioned. For it to be successful, you need usage and therefore volumes of bandwidth and data flowing, but you would question if any of the participants in an Ecosystem would really rely on a network infrastructure built by the relatively inexperienced MTDC provider, especially as the skills and resources required sit outside of their core offering. If this also comes at the expense of competitive pricing and choice, the Ecosystem is disadvantaged further still.

There is an element of the chicken and egg here as they will not get experience in operating and scaling the infrastructure without customers trusting them, but it should be expected that, longer term, the Carriers and specialist Exchanges will provide superior platforms, certainly without significant investment on behalf of the MTDC.

WHICH LOCATIONS WORK BEST FOR AN MTDC ECOSYSTEM?

The decision on where to be part of an MTDC Ecosystem comes down to its ability to deliver against your key connectivity requirements today, and to adapt when your needs and your business inevitably change.

A centre equipped to move with the times

If an MTDC is able to constantly develop and refresh its Ecosystem against the backdrop of a fast-changing technology landscape, it should provide a high level of protection from any adverse headwinds.

Gartner sees this as an increasingly business-critical decision: *The ability to integrate multiple applications, data types and data sources in a secure, predictable, lower-latency fashion will spell the difference between digital business success and failure.*¹

Sites which are larger and capable of supporting several major Edge deployments will have the scale to further protect participants from the impact of these changes. MTDC providers who own the land and buildings will also always have more of an incentive to plan for the long-term and upgrade and redevelop facilities over many years.

Well-positioned for global business developments

Looking at the global marketplace, depending on your own Ecosystem, it may be wise to consider the potential impact of the fast-developing regions of the world, with China and India the obvious economic engines within Asia. An MTDC whose Ecosystem provides access to companies from these regions could provide real opportunities and be the first step towards potential international expansion.

Low latency and connectivity-rich locations

As Cloud services develop and their complexity increases, the issues of latency and location will only get more acute. Being close to the end-user – whether a business district or a population centre – will for many core applications be the only way of ensuring adequate performance. The delivery method will increasingly be wireless at the point of use, but that will actually only increase use of the fibre backbones which will be needed to connect the new generation of very local access points at even higher speeds.

Access to excellent connectivity, including high volumes of dark fibre and low latency Ethernet for metro aggregation and distribution, will be a

necessity for many. Access to international capacity and to the global Tier 1 IP backbone providers is equally important, and we will continue to see new cable systems designed to terminate in major MTDCs where their end-users are located.

Maintaining neutrality is vital

The importance of an open policy with respect to connectivity and, in particular, Cloud connectivity should also not be underrated – especially by Enterprises when selecting their MTDC. No MTDC will have all of the world’s largest Carriers and Cloud providers present on site, and Cloud or Peering Exchanges can fill in these gaps excellently, but they need proper investment and are probably best provided by specialists who have the focus, experience and level of expertise truly required.

An MTDC with a policy which skews competition at best reduces competition but at worst stunts Ecosystem growth and its long-term value. As more and more critical applications are moved to the Cloud, the components which are responsible for the delivery of those services, from the physical cross connect to the Cloud Exchange and telecoms network, become only as strong as their weakest link.

A truly open policy towards service providers and a desire to help promote their services will result in an internal marketplace which should be competitive and return levels of service and pricing which benefit all Ecosystem members. Sites which have scale will provide constant opportunity for the service provider and that should see continued investment, leading to infrastructure upgrades which will deliver innovation and further competition.

A location that works on every level

So for our participants, the ideal MTDC will be close to its customers’ customers and will be highly connected. It should have real scale and an owner with a long-term investment horizon. It should have an open policy and look to promote its service provider community, who in turn should deliver a competitive marketplace for services. If it can open up new global markets and provide protection for the inevitable changes, it will serve you and your fellow Ecosystem members well.

Source: Global Switch

¹Colocation-Based Interconnection Will Serve as the ‘Glue’ for Advanced Digital Business Applications – Published 28 July 2016 ID: G00308712

²Eight Trends Will Shape the Colocation Market in 2016 - Published: 20 January 2016 ID: G00299639

³2017 Planning Guide for Cloud Computing Published: 13 October 2016 ID: G00311457

⁴The Edge Manifesto: Digital Business, Rich Media, Latency Sensitivity and the Use of Distributed Data Centers – Published 31 July 2015 ID: G00290109

Research from Gartner

Colocation-Based Interconnection Will Serve as the 'Glue' for Advanced Digital Business Applications

Digital business is enabled and enhanced through high-speed, secure, low-latency communication among enterprise assets, cloud resources, and an ecosystem of service providers and peers. Architects and IT leaders must consider carrier-neutral data center interconnection as a digital business enabler.

Key Findings

- Digital business will require the integration of a wide variety of applications and information sources. Some will be traditional customer-owned and on-premises, while others will involve new data types and sources, as well as third-party data feeds.
- It is unlikely that enterprises will be able to build rich digital business applications based solely on a traditional on-premises data center, with a limited number of data sources and applications.
- The ability to integrate multiple applications, data types and data sources in a secure, predictable, lower-latency fashion will spell the difference between digital business success and failure.

Recommendations

- Design and build prospective digital business applications paying particular attention to the complexities of connecting many "sources and sinks" (originators and consumers) of information with the appropriate business logic, in a manner that is low latency enough to prevent excessive delay.
- Deploy applications that can benefit using a data center interconnect fabric model offered in a carrier-neutral facility.
- Plan for the eventual marriage between nascent data center interconnect fabrics, technologies such as container orchestration systems, and concepts such as workload and application migration, to provide the next generation of dynamic workload scheduling and placement.

Analysis**Introduction**

While there are many definitions and examples of digital business offered by pundits, several points are universal. Digital business will include enterprise-owned assets, whether enterprise-premises-based, colocated or in the cloud. These assets will utilize cloud technology for integration and deployment, and will be optimized in designs where dynamic, high-speed, secure communications will reduce the friction between multiple sources and sinks of information. We propose that topology, technology and design all favor building a digital business solution using colocation-based, programmable networking, which we will call "data center interconnect fabric," allowing dynamic interconnection between enterprise peers, cloud providers, communications providers and a growing marketplace of service providers.

Digital Business Defined

Digital business is the creation of new business designs by blurring the digital and physical worlds. The transition from simple digital marketing to digital business occurs as things become actors in transactions, and information about transactions (in fact, information about any measured or reported activities that can provide value to someone somewhere in a value chain) can be systematically gathered and sold for their strategic value. Digital business is closely related to digital infonomics, which assigns economic value to digital information and develops frameworks to manage digital information assets. Digital business then, is based on the interconnection of enterprises, partners and service providers. To support digital business and related new initiatives, the data center infrastructure must keep up with the changing demands of fragmented applications, many and diverse data sources and sinks, massive data growth, the desire for real-time analytics, and bimodal IT.

Inefficiencies of an On-Premises-Only Model for Digital Business

While many modern data centers may be well-connected with other enterprise data centers and have adequate internet access, they are not likely to have many specialized high-speed circuits to multiple cloud providers, service providers, information and data sources, or a plethora of peers. In essence, we look at the enterprise data center as somewhat of an island, necessitating building “bridges” or connections one by one to the partners, technologies and information that will be required of a full-featured digital business application (see Figure 1).

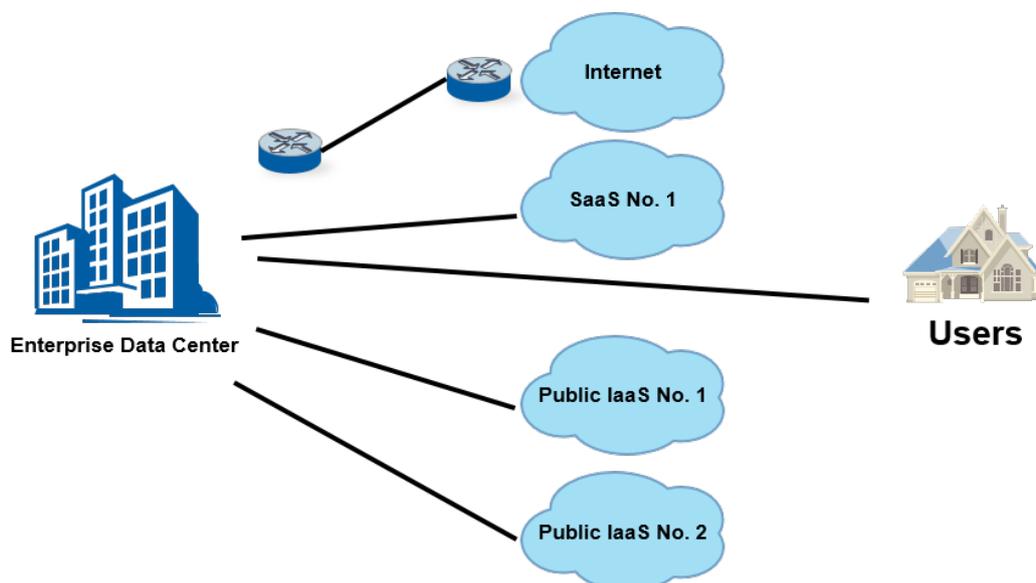
In other words, in an enterprise-located integration model, we must bring external networks and services to the enterprise, bring the cloud-based and enterprise-based applications to the enterprise, and, finally, build out connections to the many peer organizations involved in the digital business solution. Where applications may include integration of multiple databases and data sources, the latency involved in communications is likely to stack up in complex transactions, slowing information flow to an unusable crawl. Latency becomes a killer. In this model, the enterprise is also responsible for building out a security framework to ensure a consistent stance and degrees of access for all the various elements of the solution. While none of these pressures are entirely new, the explosion of sources, locations and datasets has exponentially raised the complexity.

Shortcomings of a Cloud-Only Model for Digital Business

One seeming solution to the inefficiencies of an on-premises model could be to base digital business applications, data and connections to peers, all meeting at a single public cloud provider. While this might mitigate the need to bring all these assets to the enterprise, as we bring the enterprise instead to the cloud, this presupposes little use of existing on-premises-based applications, and also implies the use of one single cloud provider. In fact, many of the most valuable assets of enterprises are likely still to be located on-premises, and it is also extremely unlikely that large enterprises will rely solely on one cloud provider. We expect enterprises to use major cloud providers based on use case, much like they may have used an OS or hardware platform for specific use cases in the past. This doesn't include simply multiple SaaS offerings and a single infrastructure as a service (IaaS) provider, but also multiple IaaS providers based on use case. We also expect the need for integration between multiple cloud providers, including SaaS providers and cloud-based information sources and services (see Figure 2).

Basing the solution solely on cloud-based assets, and concentrating on one cloud provider, complicates the integration with existing assets, and particularly with other cloud providers, service providers, and sources and sinks of information. As shown in Figure 2, we expect significant value will be reliant on east-west

FIGURE 1 Star-Connected Enterprise Service Access



Source: Gartner (July 2016)

traffic — that is, the integration between multiple cloud providers and on-premises-based assets. What we are describing is the role of hybrid applications that make use of enterprise-located or colocated assets in conjunction with one or more cloud platforms. With hybrid solutions and a plurality of cloud providers and service providers overwhelmingly likely, establishing a “home base” in a neutral, well-connected location is critical for future proofing an architecture. Whether this fits into a neat definition of “hybrid cloud” or not, such messy integration will be necessary and common. These needs lay the groundwork for using an interconnected, carrier-neutral data center as the meeting place for this multitude of information sources and partners.

Data Center Interconnect Fabric Defined

Data center interconnection is a model in which discrete assets within a multitenant data center are connected to each other directly (today, usually over fiber), and in a peer-to-peer fashion. These connections may be as simple as fiber-optic cross-connects, but allow data-center-based assets to horizontally connect to multiple carriers, cloud providers, peers and service providers. When we combine interconnection with high-speed enterprise access to the multitenant data center (for example, Ethernet over fiber), and include enterprise assets such as

compute, storage and, in particular, networking, located in the multitenant data center, what we’ve done is bring the enterprise and its applications to the network, as opposed to the outdated model of bringing the network to the enterprise (see Figure 3). This creates many opportunities for advanced solutions based on technology as well as topology options.

Peering in Ecosystems

The concept of data center peering using interconnection is not new. Colocation providers were connecting network providers to each other over a decade ago in order to facilitate extended reach for network providers, interconnecting content delivery networks with communications providers, etc. Spurred by demand for very low latency connectivity for applications such as high-frequency trading, the concept of using interconnection to build ecosystems of like-minded enterprises and information providers was spawned. In high-frequency trading (HFT) applications, where the speed of communications between partners can mean the difference in winning an individual transaction, or making millions of dollars in a short period of time, connectivity between systems directly over fiber had obvious appeal. Where there is a technological advantage, there is demand, and soon financial services ecosystems sprang up in selected colocation centers in key markets,

FIGURE 2 East-West Traffic Between Cloud Providers and the Enterprise

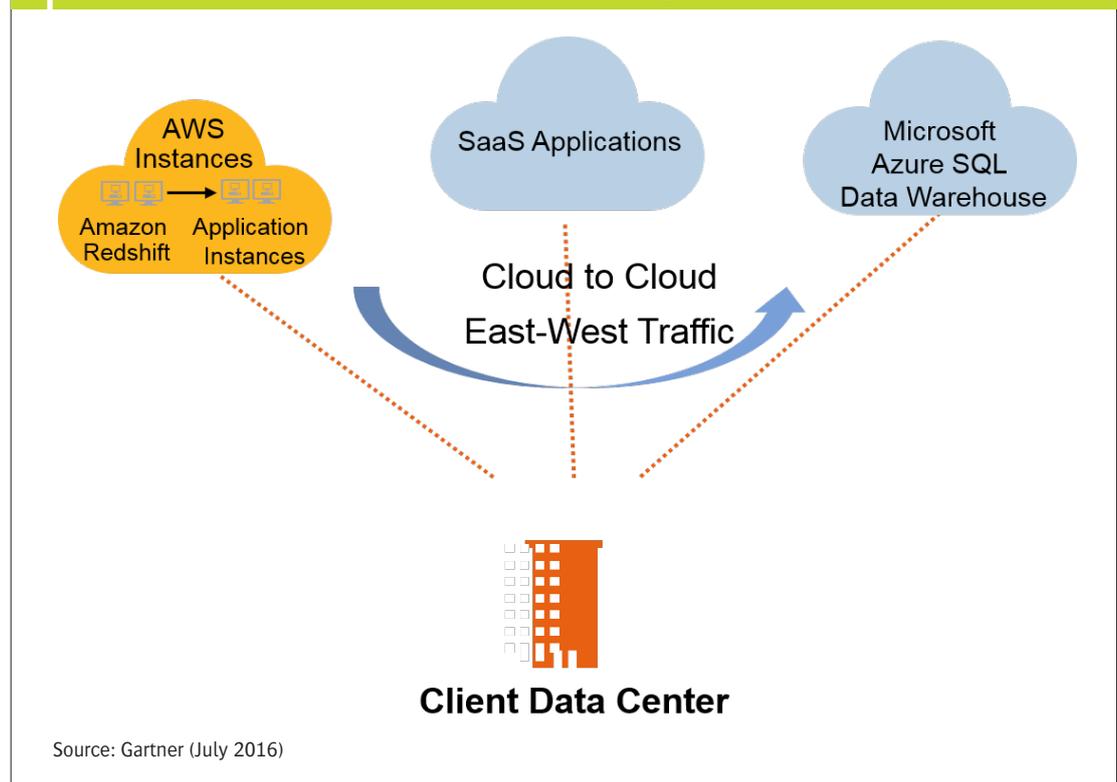
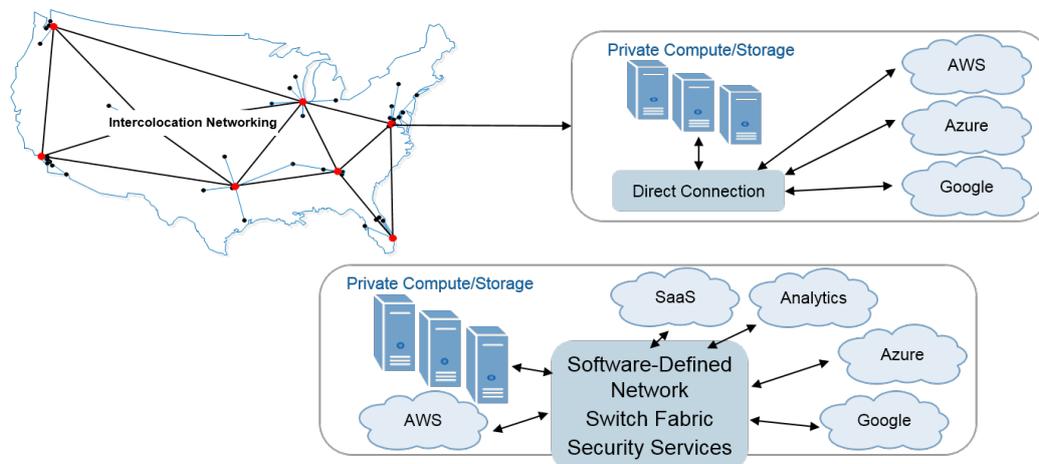


FIGURE 3 Data Center Interconnect


Source: Gartner (July 2016)

where customers were willing to pay a premium to be as close as possible to the exchanges and each other (see Figure 4).

This high-speed, low-latency concept has expanded beyond HFT to other vertical industries where very large file sizes, or the need for speed or low latency, are in effect. Examples include oil and gas exploratory data in the energy sector, radiographic images in healthcare, etc. To date, many of these solutions have been based on simple point-to-point connections of fiber optics between the routers of participants. While such connections are not particularly dynamic, requiring human physical intervention to make or break a connection, the model has been quite successful. Another important effect of this interconnection has been, to paraphrase Metcalfe's Law, to increase the value of the ecosystem or local network as each additional partner joins the network. This leads to the demonstrable business value of presence in the respective interconnection centers, making it difficult, if not impossible, for partners to leave.

Peering Ecosystem Model With Programmable Networking (Data Center Interconnect Fabric)

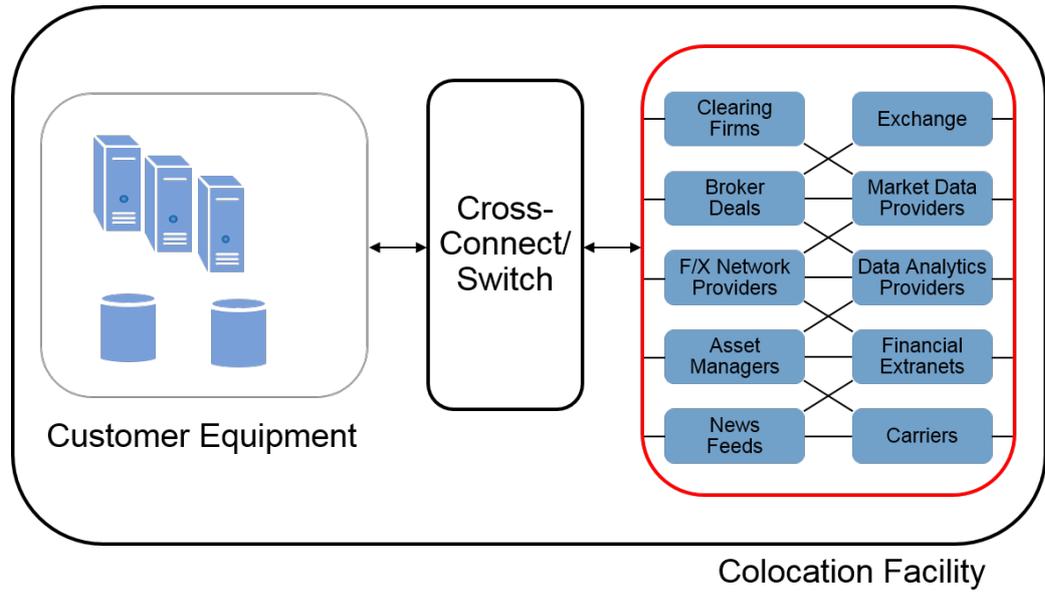
Marrying modern switching technology with the topological benefit of intra-data center interconnection increases the utility, intelligence and use cases of the interconnection model. A programmable network model involves using a software-defined network that can make or break connections much like the fiber-optic connections of the past, but on a dynamic basis,

either from a command line or, increasingly, API-driven. This allows participants to interconnect with peers and service providers based on logic, such as external triggers, thresholds or events. A simplified example might be establishing a connection with a cloud provider's router to spin up additional cloud instances when utilization or performance dictate. Not surprisingly, the more services, communications providers and cloud providers that are located in such an automated, switch-fabric-enabled data center, the richer the set of solutions that can be built.

The Current and Future State of Data Center Interconnection Using Programmable Network Infrastructure

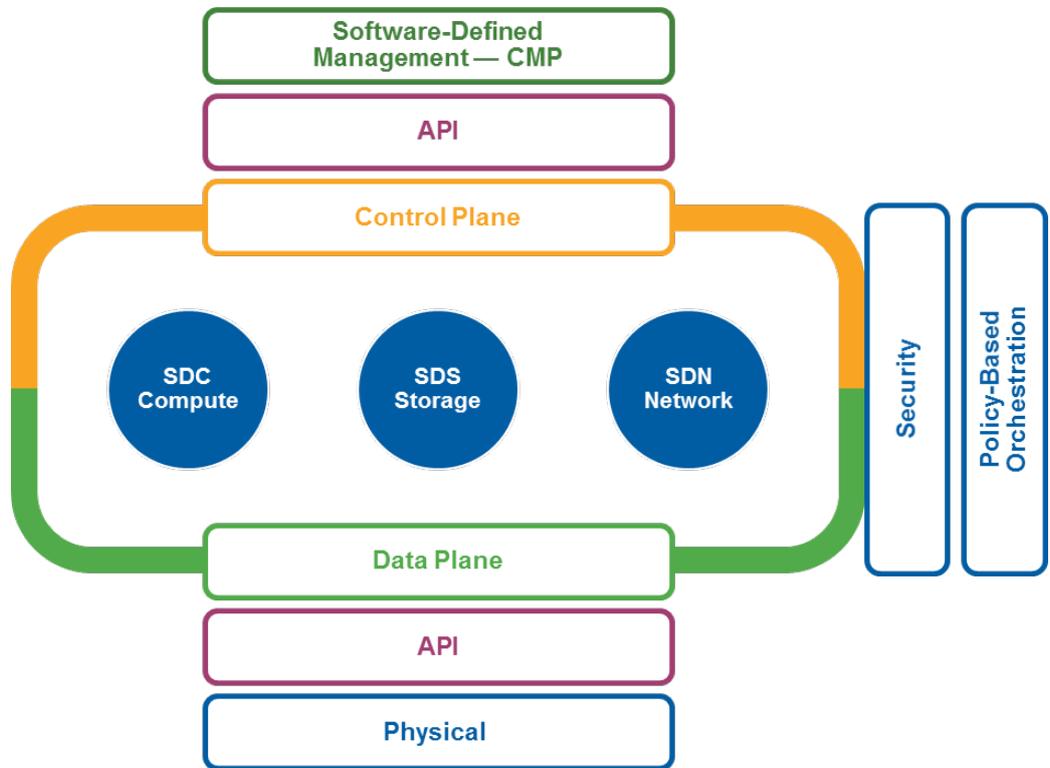
Such switching technologies are not yet universally deployed across all colocation providers. CoreSite demonstrated an early product with its Any2 switch capability, and Equinix has provided the capability in its IBX, in conjunction with its multicloud capability. Epsilon has had such a capability in the European and Asia/Pacific markets for some time, and Console offers an "as a service" implementation. What is emerging, however, is the ability to control such switching through an API, enabling a broad range of application possibilities. In Gartner's view of the software-defined data center (SDDC), we migrate IT services — in this case, networking and security — from hardware provided by a single provider to a more open software model (see Figure 5).

FIGURE 4 Enterprise Peering Example in Financial Services



Source: Gartner (July 2016)

FIGURE 5 SDDC Components



CMP: cloud management platform; SDC: software-defined compute; SDN: software-defined networking; SDS: software-defined storage

Source: Gartner (July 2016)

As we show in Figure 6, interoperable services (and, of particular interest to interconnection, programmable networking) enable a fertile ground to serve as the glue in complex digital business architectures. While such systems are complex, their design and implementation by the colocation provider reduces this burden to simply a service to be consumed by the enterprise. Once we can dynamically connect between a range of applications running on cloud platforms as well as colocated assets, and interconnect them via a programmable networking system under the watchful eye of an orchestrator (including, perhaps, a security service, pulling data from a SaaS solution), the value of proximity (i.e., the immediacy of such services) and the performance inherent in a high-speed switching fabric become apparent.

Future Promise: Data Center OS and Container Orchestration Frameworks Will Provide Coordination, Scheduling and Management of Applications Deployed Across Myriad Distributed Physical Servers and Service Providers

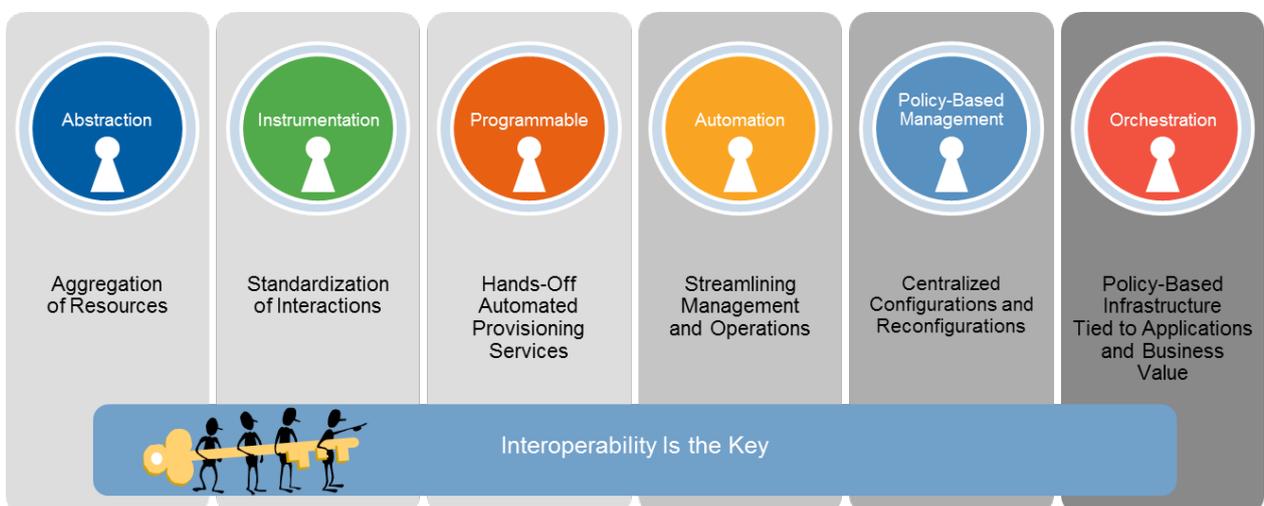
Containers will continue to become very broadly implemented in net-new applications and those “born in the cloud,” continuing the advances in efficiency and decoupling of logical from physical workloads begun by virtualization. Containers decouple applications from infrastructure, requiring business application developers and operations professionals to think about their software in an application-service-oriented, rather than server-infrastructure-oriented,

way. While virtualization radically changed application hosting and deployment options by allowing workloads to be moved and replicated across physical hosts, containers will take this concept to the next level, enabling more efficient and evolved development models, as well as simple deployment of virtual machines and their applications. A future phase of deriving value from containers lies in the use of orchestration systems to serve as scheduling and deployment masters. As the market shakes out, and orchestration offerings such as Kubernetes, Apache Mesos or Docker Swarm gain traction, it is likely that data center interconnect fabric-based networking will be integrated at the base of the stack, in order to facilitate workload balancing, movement and distribution. In this way, the data center of the future becomes even more software-defined and dynamic.

Applicability of the Data Center Interconnection Model to Digital Business Requirements

Advanced digital business applications are likely to involve significant database use, disparate data sources and multiple cloud providers, with a need for very low latency between the systems. This is unlikely to be served through WAN links from enterprise to individual cloud providers, with switching taking place back on the enterprise’s premises. What’s needed is very high performance via a programmatic, secure and manageable fabric. Early trials of such technologies

FIGURE 6 SDDC Evaluation Attributes



Source: Gartner (July 2016)

between cloud providers and associated service providers have been very promising, but have demonstrated the need for speed. As we add distributed data sources and sinks, and the Internet of Things, a data center interconnection model in conjunction with edge data centers will be the most likely means of success.

A Contrarian View

There are a number of factors that, if they come to fruition, could inhibit or even prevent the data center interconnection model from becoming successful:

- The cost of the pipes from enterprises to colocation centers remains prohibitively expensive, blocking the three-tier model at the start (namely, local access).
 - If cloud will not be a major factor in large enterprise solutions going forward, the need to connect multiple clouds to application logic or disparate data sources will be diminished.
 - Organizations with no physical infrastructure needs may use cloud services connected via a managed service provider for their digital business interconnection.
 - A lack of agreed-on and supported standards and/or interfaces for applications and cloud providers to interact with the fabric would drive fragmentation, with a smaller number of custom-made designs implemented by those with critical needs.
 - A lack of gravity or availability of “peering targets” in the data center will make some centers less likely to gain momentum.
 - A lack of attention to standard interfaces acceptable to cloud and service providers will leave some solutions handicapped.
- Any inability of the colocation providers to scale their interconnection resources to meet the demands of hundreds of thousands or even millions of users could make the model unusable by the very constituency it most appeals to — very large enterprises.
 - If hurdles to implement security across the fabric and extended to the applications prove too complex, then enterprises may opt for other solutions.
 - Timing limits market success. While there are providers and customers working on solutions today, it may be five years before the average enterprise makes significant use of such services. The extent to which early adopters can thrive in the interim without more fully monetizing such solutions will be critical. One encouraging sign is that, while enterprises may see the need for such technology to be a future capability, there may be enough immediate business from the hyperscale providers to fuel market growth.

Bottom Line

In the near term, simple topology and physical interconnection via fiber optics will provide compelling reasons to use data center interconnect as the integration point, or glue, for digital business. As data center interconnect fabrics become more prevalent, and their APIs standardized and written to, the dynamism and speed of these connections will foster the development of even more useful applications. Finally, as container orchestration systems develop affinity and capabilities in conjunction with data center interconnect fabrics over the next three to five years, the advantages of a data-center-centric model become overwhelming.

Source: Gartner Research Note: G00308712, Bob Gill, 28 July 2016

About Global Switch

The leading large-scale provider of MTDC space within our regions, we have over 3 million square feet strategically located close to key business districts in eight Tier 1 markets¹ across Europe and APAC. Our service offering is focussed on supporting leading international organisations who have substantial space and power requirements.

Our mission is to enable the global Ecosystem

We recognise ourselves as being part of the greater Ecosystem and there are plenty of other great MTDC providers doing a good job across the globe right now. We only operate in Tier 1 markets and understand that great interconnectivity between ourselves and other major MTDCs' locations is to the benefit of us all. The wider Ecosystem is bigger than any one provider or location, and the more of us doing a great job can only help to make progress easier and faster.

A longstanding focus on multi-tenant spaces

Our approach is somewhat different to many of the industry's prominent players. Even though we have a focus on the larger requirements, we have always been multi-tenant focussed as we recognised early on that the Ecosystem was at the core of our success. We own or have very long-term interests in all of our locations and have demonstrated our desire to continually invest substantially. We are very proud to be the highest credit-rated data centre company in the world, which in turn makes our cost of capital to make these investments low. Our new Hong Kong data centre, which will be the largest Carrier neutral data centre in Hong Kong is a very good demonstration of us executing on our business model.

A solid foundation for evolution and growth

The scale of our sites and continued investment and redevelopment means our Ecosystem stays fresh and relevant, and we become a truly long-term partner for many of our biggest customers. Our physical locations within cities, close to the key business districts and population centres, mean we provide a true low latency access platform. Our approach is also more bespoke and tailored than many others, with space fitted out to customer requirements and services such as fibre connectivity delivered in a way which fits their own model and security requirements. With the addition of new MMR facilities, structured cabling systems and subsea cable landing capabilities across our portfolio, we continue to set standards our customers recognise and value.

A policy of neutrality

We value the specialists and think our customers do too, so we have a completely open policy for Cloud and Connectivity service providers. We will not build a Cloud Exchange or Peering Exchange to simply tick some marketing boxes. We already have an extensive service provider community who deliver the services our customers require and right now we see new innovations every week. We control and maintain the physical infrastructure including the cross connect systems we operate, but we believe our service provider community is much better placed to offer intelligent interconnection and Cloud access services.

A thriving marketplace and a growing community

We look to promote our service provider community, and our customer portal now includes a built-in marketplace to allow our customers to advertise their services to each other. This window into our Ecosystem will enhance interconnection opportunities and set us up to be that digital hypermarket and a hub for the new generation of smart city infrastructure solutions. Our service providers have the focus, expertise and drive to move faster than we likely could and we will not be competing with them.

We already have a minimum of 10 accredited providers in each site, offering high capacity direct connectivity to the major Cloud providers, and this is growing weekly. We also have the majority of global Carriers and the important regional and metro players in each facility with access to wholesale levels of capacity and dark fibre. Our large customers include the big Internet companies, the global System Integrators and Enterprise organisations, and we have the scale to sustain them.

Our System Integrator community is especially important to the Ecosystem's development, as what used to be relatively closed communities within our sites are now opening up and keen to engage with other service providers. The smart System Integrators are now very focussed on what parts of the service stack they do well and want to focus on and are more open to pulling non-core services from outside. Rather than try and compete for cheap storage business or basic compute resources, they provide the service wrap which takes advantage of the Ecosystem they sit within to the benefit of their customers and ultimately themselves.

Global Switch is well-placed to tap into the incredible potential of the Ecosystem.

As we think about our business and how we are approaching the future, we recognise that the pace of change and competitive activity is only likely to increase but we also believe that our approach is unique:

- We maintain our position as the highest credit-rated data centre company in the world, which provides us a low cost of capital. We have a long-term investment horizon and see land ownership and building our own data centres as the cornerstone of our business.
- We build truly large-scale sites designed to accommodate multi-megawatt customer requirements. We also understand how proximity to central business districts and areas of high population density solve issues of latency so all our sites are located centrally in Tier 1 markets.
- We are already home to some of the world's leading international organisations from across all industry sectors. From the Internet and Cloud giants to the world's largest Enterprises and Systems Integrators, many of our customers trust us to support their businesses in multiple locations across the globe.
- Our data centres are some of the best connected in the world and are considered network dense from a fibre availability perspective. Our internal infrastructure, particularly our structured cabling systems supporting our customers' connectivity requirements, are built to scale and flex as our customers demand.

- We will continue to be both Carrier and Cloud neutral and help to promote our substantial service provider community. We will not build a Cloud or Peering Exchange which would compete with our customers and we will not obstruct or suppress competition and opportunity.

We really do value our existing Ecosystems and realise how important they can become over the next few years. We should, however, still remember how early we are in this cycle. We believe that there will be a lot more change in the medium-term. Ultimately, we understand we are only a small part of this giant new globally interconnected services platform, but we think our approach is right and we hope to play an increasingly important role supporting our Ecosystems' future development and successes.

**GLOBAL
SWITCH**

¹ Tier 1 markets are defined as principal metropolitan business, communication and internet hubs.