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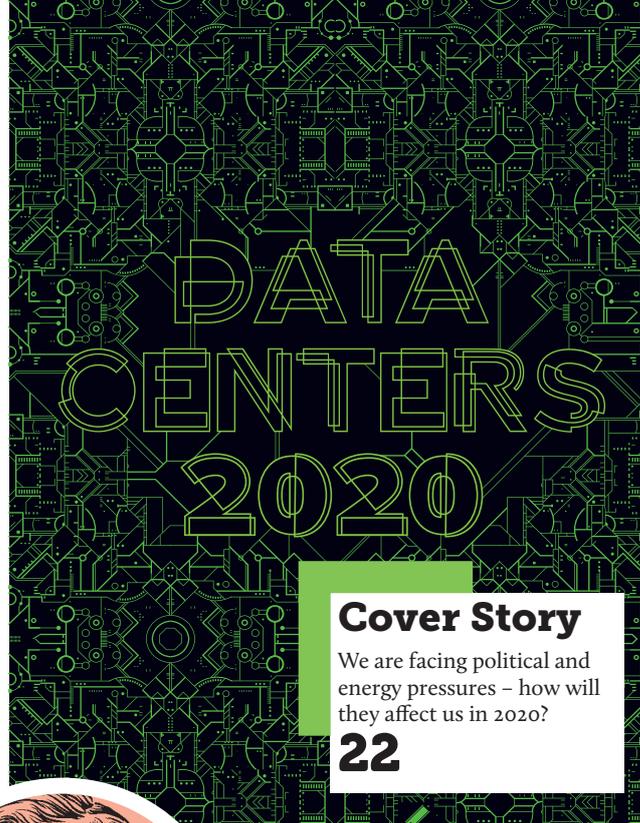
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Ensuring reliability and protecting online data and services from the data center.



Critical Environment
Issues faced by professionals who manage the performance, efficiency and resilience of the critical environment.



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Innovation at the speed of...

Technology moves fast, doesn't it? Today's leading-edge tech is tomorrow's junk, right? Well, maybe not so much. It turns out that data centers, like everything else in the world, don't change overnight.

This year has been a good one to consider predictions. October 21 2015 is the day Marty McFly visited in the 1985 film *Back To The Future 2*. He found hoverboards (which don't exist) and video phoning (which does, although we have it in our pockets, not on our TVs). Much fun has been had considering how well, or how badly, the film did in its predictions. So let's not go out on a limb here: data centers of 2020 will have lots of similarities to those of today. However, they will have to address a market that is new and different.

Consider that politics can change quickly, but data centers take 10 years to build and fill out. There are external forces that will change data centers over the next five years (page 22), and there are innovations that will enable us to adapt to those changes (page 27).

But each data center will see several generations of technology come and go in its lifetime. We don't have time or money to upgrade and implement every single new power or cooling technique, so we would have to predict that in five years' time, you'd still find plenty of today's technology in any data center.

Among the political changes we've seen this year, the long-established Safe Harbor agreement fell apart. Max Smolaks tells you how it will affect you (page 53). In the short term, you could see data centers appearing in Europe to handle European citizens' data.

A different political debate, on a much smaller scale, is the ongoing conversation between DCIM and ITSM. David Chernicoff listens in on page 56, and comes to the conclusion that the two rivals are finally getting together. Maybe so, but we'd have to bet the conversation will still be going on in five years' time.

Let's not get stuck in the future, though. This month we look at two providers of today: Amazon Web Services (page 33) and Internap (page 43).

And if we have to make one prediction, it's a fairly safe bet the Olympic Games will go ahead in Rio in 2016. They will have a heavyweight technology infrastructure behind them, as Tatiane Aquim explains on page 20.

•
Peter Judge - Global Editor
@PeterJudgeDCD



Data centers of 2020 will have many similarities with those of today, but will address a market that has changed

\$70.3bn

Investment in colocation by 2020. This is 36 percent of total data center spend (DCDi)

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Malaysia Increasingly Attractive Data Center Hub for Companies

Real Estate, Affordable Energy and Location make the country suitable for firms looking to build data centers in South East Asia

It's not uncommon for images of beaches, wildlife, densely-populated cities and Formula One racing to be conjured up when Malaysia is mentioned. Increasingly, data centers are mentioned in association with the South East Asian country given Malaysia's concerted effort to make itself a world-class data center hub by 2020.

That's because the country is particularly well suited to handle the expected influx of data center investment when compared to regional neighbours Indonesia and Thailand. This is because of the country's service orientation of Malaysia's economy, close proximity to the Asia Pacific region's major hub city (Singapore) and a concerted policy of attracting ICT and data center business in specially zoned and provisioned areas in the Kuala Lumpur metropolitan area (Cyberjaya) as well as the Sedenak Iskandar Data Hub (SIDH), which is fast becoming known as a data centre park with abundant, readily accessible and top notch infrastructure and utilities. The Data Hub is a government initiative led by MDEC.

Investment Advantages In Malaysia Apparent

Malaysia, which is already a major established investment hub for multinational companies in South East Asia, is also attractive to data center investors given that it is a mere 60 kilometres from Singapore which makes latency for those with operations in the city-state virtually a non-issue. Proximity to Singapore has been cited as an advantage by companies, such as NTT Communications, that have primary data centers in Singapore and recovery facilities in Malaysia.

Competitive real estate prices and the country's lower electricity tariff relative to Singapore and resource availability for potential data center operators compared with many other markets at a relatively similar level of development are also factors that make it



A depiction of Malaysia's Sedenak Iskandar Data Hub which is known as a resource-rich data center park

attractive for investors considering larger data centers in Malaysia.

Fast-Growing Data Center Market

These advantages are not lost on data center operators and led DCD Intelligence to project double-digit growth on a year-over-year basis from 2016 to 2020 which will make it the fastest-growing South East Asian country when white space is considered.

The type of data centers Malaysia offers matters to investors as well. The Malaysian data center sector is designed to meet the needs of both the IT needs of an emerging economy that typically grows at least 4% quarter-on-quarter, according to DCD Intelligence. That's in addition to the requirements of international clients using Malaysia to house their local or regional IT capacity. Malaysia's availability of suitable local outsourcing facilities and services, which has increased significantly over the years, is a core data center requirement and the country is better suited to meet those needs than ever. As such, DCD Intelligence expects colocation and outsourced space in Malaysia to grow 21% in 2016.

Investment dollars have flowed into the country as a result of the many cited

advantages. Huawei is one example of a company that clearly sees the data center advantages of Malaysia. The Shenzhen, China-based company opened the Asia Pacific Digital Cloud Exchange data center, a 90,000 sq. ft. facility of office and warehouse space for data hosting and logistics in Iskandar, in June. Huawei is using the data center to service its regional customers.

The data center sector is already an integral part of the country's economic transformation and will soon be a well-known part of the Malaysian landscape.



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2020 Global Data Center Statistics

45.6
million
sq m



Global data center space requirement which is an area greater than the Netherlands

57.9
GW



Global data center power consumption



Global in house facility investment will exceed in US\$.



Overall global investment will exceed in US\$.

11.7%

Global investment in colocation and outsourcing growth on a compounded annual growth rate (CAGR) from 2015–2020

15.4%

Total data center investment in mainland China growth on a compounded annual basis from 2015–2020



Asia data center space will be as large as Europe in terms of facilities, and as large as North America in terms of investment

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Fine over data center death

Two UK facilities firms, Norland and Balfour Beatty, have been fined a total of £380,000 after an electrician died at a Morgan Stanley data center near London. The court ruled that health and safety procedures were not followed during the installation of a second power supply.

IBM brings its Bluemix cloud to China

IBM has launched its Bluemix cloud service in China, with local giant 21Vianet hosting the service in its data centers. IBM was forced to go with a partner as its SoftLayer arm has no data centers in China. Microsoft also runs on 21Vianet in China.

Alibaba opens second US site

Alibaba, the cloud arm of China's Alibaba, has opened a second data center in Silicon Valley in the US – its ninth facility globally. It opened its first US data center in March, a Singapore data center in August, and a Chinese data center at Qiandao Lake in early September.



Court orders Interxion to close Paris data center

A French court has ordered Interxion to close a data center in Paris, following complaints from residents about noise and stored fuel. The Administrative Court of the Parisian suburb of Montreuil has withdrawn Interxion's licence to operate the €132m data center in La Courneuve, cancelling the planning permission that allowed the data center to open in 2012.

The decision comes after a hearing on 1 October to consider the complaint of a residents' group, the Urbaxion '93 Association. Other data centers in the area, known as

the "Data Valley" of Paris, may also become the target of protests.

The group, many of whom live across the road from the data center, complained about noise and the proximity of storage tanks containing 580,000 liters of diesel fuel. The court's decision to cancel Interxion's operating licence was based specifically on the noise pollution the refrigeration and backup generator systems produce.

The 9,000 sq meter (97,000 sq ft) data center has eight halls, is rated at 76MW and contains an uninterruptible power system

with lead acid batteries, as well as eight diesel generator sets and a stored supply of 580,000 liters of fuel. Its power demands are the equivalent of a town of 50,000 people, says Urbaxion '93.

This sort of facility should not be built close to homes, said Roxiane Sageloli, the lawyer representing the residents.

While many of France's data center sites are located in remote industrial areas, *Le Monde* says there are other data centers that are close to urban areas. Indeed, so-called "edge" data centers have to be close to users, to support services such as streaming media.

"The public inquiry was poorly conducted and did not allow people to get [all the] information," said Sageloli. "The notice was hard to understand and did not indicate that it concerned a data center."

Interxion has two months to appeal the decision.

<http://bit.ly/1RWab2d>

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Learn how
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benefit on
page 36

US national nuclear body focuses on safety with open supercomputer

The US National Nuclear Security Administration (NNSA) is planning to deploy a high performance computing (HPC) system comprising one of the world's largest clusters of Open Compute hardware to help ensure nuclear safety. The 7 Petaflop system will be shared among three top US research sites – Lawrence Livermore, Los Alamos and Sandia National Laboratories – and will be based on Tundra Extreme Scale (ES) servers by American HPC specialist Penguin Computing.

The NNSA is a sub-agency of the US Department of Energy that looks after the safety, security and reliability of the nation's nuclear deterrent. It aims to avoid additional testing of nuclear weapons, instead running simulations and experiments at its labs. The agency has chosen Open Compute hardware to build its tri-laboratory Commodity Technology System (CTS-1), which will replace the ageing Tri-Lab Linux Capacity Cluster 2 (TLCC2). The cost of the project stands at \$39m.

Tundra ES servers were developed to apply the benefits of Open Compute to high-density HPC environments. They are stripped of the proprietary technologies and features, freeing up space to support three dual-processor servers per rack.

The systems for NNSA will be based on upcoming Intel Xeon E5-2695 v4 chips, expected in the first quarter of 2016. Penguin Computing will begin delivering its HPC system in the first quarter of 2016, and will continue deployment of additional hardware for the next three years.

The Department of Energy has recently contracted IBM to build Summit and Sierra – two supercomputers that are set to be considerably faster than today's most powerful machine, the Chinese-made Tianhe-2.

<http://bit.ly/IhXtdZz>



TALKBACK



"The end of Safe Harbor puts a profound burden on companies to ensure they are not breaching EU data protection laws when they transfer data to the US"

*–Toby Duthie, Partner
Forensic Risk Alliance*

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Brightsolid opens new Tier III in Aberdeen as part of expansion

Brightsolid, a subsidiary of British publisher DC Thompson, has opened its second Tier III data center at the Lang Stracht offices of the *Aberdeen Journal* in Aberdeen, Scotland.

Completed in nine months, the site cost £5m (\$7.7m) and provides the first Microsoft Azure-enabled cloud platform in Scotland. It is located at the center of Aberdeen's so-called energy triangle, benefiting from some of the most abundant power in Europe. Brightsolid parent DC Thompson is best known for the British comic books *Beano* and *Dandy*, as well as numerous Scottish publications.

"We decided to build our next Tier III data center in Aberdeen for a number of reasons," said Richard Higgs, CEO of Brightsolid. "Our primary facility in Dundee was reaching capacity, and expansion was always in our business strategy. After a detailed review of the market we realised that Aberdeen had an absolute need for a world-class data center."

At full capacity, the 2,200 sq meter carrier-neutral facility will be able to store the same amount of data that Facebook currently holds on a global scale. It will connect Aberdeen nationally and internationally through high-speed, low-latency links, including a 100Gb link from Aberdeen to London.

The site uses Keysource's Ecofris cooling technology and will have a PUE of 1.25, which makes it environmentally better and cheaper to run. It will have a 1MW IT load, and can support up to 25kW per rack with no hotspots. It has 2N critical power with N+1 backup, and 24x7 onsite security.

<http://bit.ly/1LLs2VZ>

Cemex's CEEDA badge is a concrete achievement



Mexico-based cement supplier Cemex has been awarded the Certified Energy Efficient Datacenter (CEEDA) Gold Certification, in recognition of its strategy for data center energy efficiency. It was granted the award after a four-month process in which its data center facilities were inspected onsite and remotely. It is the first CEEDA Enterprise Gold Certified company in the Americas, and only the fifth to get this certification in the world.

The CEEDA Awards were defined in the UK in 2011, and have been gaining a global reputation, with CLP Power in Hong Kong winning the first CEEDA Gold award in Asia in February. The award grades organizations' use of best practices in energy efficiency, measuring them against specifications coming from The Green Grid, Energy Star and the European Commission Code of Conduct for Data Centre Energy Efficiency. It complements other awards, such as the LEED scheme for buildings from the US Green Building Council.

CEEDA Awards are given on three levels: bronze, silver and gold. Cemex's gold award means it has a holistic energy management program, including automation, use of green energy and water, heat efficiency and reutilization. The certification lasts for two years, after which the company would need to be reassessed to keep its certificate.

"We are honored to receive this certification, which recognizes our commitment to sustainability," said Roberto Chaverri, Cemex's VP of IT.

<http://bit.ly/1kwiHdb>

Switch to set up facility in Italy

Switch, the US data center provider behind the giant SuperNAP facilities in Nevada, is coming to Europe, with a €300m (\$340m) facility near Milan.

Switch announced a joint venture with Egypt-based Orascom Telecom Media and Technology Investments (OTMTI) in 2014, which has now started work on a 450,000 sq ft (42,000 sq m) Italian SuperNAP site in Siziano, Pavese, located in the region of Lombardy in northern Italy, according to *La Stampa*. The site will be the first of a series of international sites, according to Switch.

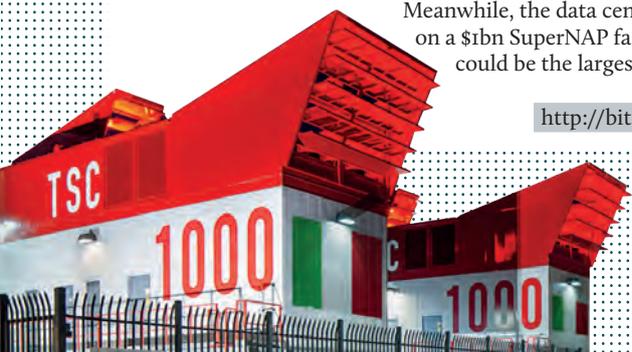
To fund this international expansion, Switch has set up a joint venture, SuperNAP International, along with financial backers ACDC Fund, Orascom Telecom Media and Technology (OTMT) Investments and Accelero Capital. The CEO of SuperNAP International, Egyptian businessman Khaled Bichara, is obviously a key figure in this, as he is also head of Accelero Capital and a former CEO of OTMT.

With four data halls and 19.2MW of IT load (40MW overall), the site could be Italy's largest data center.

Another figure in Orascom is the Egyptian billionaire Naguib Sawiris, who recently attracted media attention with an offer to buy an island off the coast of Greece or Italy to house Syrian refugees. According to *La Stampa*, Sawiris said the Italian SuperNAP will "play a key role in developing the European digital economy."

Meanwhile, the data center maker has started work on a \$1bn SuperNAP facility in Reno, Nevada, which could be the largest data center in the world.

<http://bit.ly/1RZ5apH>





Sweden urged to slash data center power tax

A study commissioned by the Swedish government has proposed that data centers should get a 97 percent rebate on their electricity tax, potentially cutting a quarter of the running costs of facilities there.

The study, commissioned by the Swedish Ministry of Finance, says that a tax break currently offered to manufacturing should be extended to data centers, bringing them into line with Sweden's Nordic neighbors, where data centers already have low taxes.

The proposal would cut electricity prices at Swedish data centers by about 40 percent in January 2017, with large operators such as Facebook saving millions of dollars per year. "This is a clear signal to the market that Sweden aspires for global cloud service leadership," commented Anne Graf, investment and development director at the so-called "Node Pole,"

an area of Sweden where data centers for Facebook, Hydro66 and KnCMiner are located. Despite Sweden's abundant renewable energy and good fiber connections, specialist bitcoin operation KnCMiner has threatened to move across the border to Finland for a more favorable tax regime.

The cut would be a big deal, because electricity makes up the bulk of the cost of running a data center – even in a cold region where the PUE can be pushed very low. According to Erik Lundström, chief executive of the Node Pole, electricity can vary between 30 and 60 percent of the total cost of ownership (TCO) of a data center.

The Nordic region, including Sweden, Norway, Finland and Iceland, is expected to triple its data center business, with an investment of \$3.3bn by the end of 2017, according to a survey by BroadGroup.



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Colo providers need their own cloud

Colocation providers will have to diversify into cloud services if they hope to stay relevant – whether by building their own cloud, partnering with cloud providers hosted in their facilities, or offering connections to public infrastructure from major vendors like AWS, SoftLayer or Azure, according to research.

The cloud is known to be disrupting the traditional

colocation business, but a report from DCD Intelligence (DCDi) measures the trend and warns that organizations which don't adapt will be trampled by competition. "The response of colocation providers to the rapid market uptake of cloud, and the simultaneous threat and opportunity this presents, is a classic example of market evolution," said DCDi analyst Nick Parfitt.

Colocation currently accounts for 23.6 percent of global data center space, but investment in facility equipment and IT optimization solutions by colocation providers make

up a higher proportion of the overall market at 30.1 percent or around \$40bn. Meanwhile, investment in colocation facilities is expected to rise to reach 36 percent of the overall data center market, or \$70.3bn by 2020.

According to DCDi, the growth rate for colocation facilities through 2020 will be seven times higher than the growth rate for end-user facilities, but a third lower



than growth of facilities built by cloud and IT service providers.

The report says colocation providers will need to develop a hybrid approach to infrastructure

to keep their customers happy. This could result in symbiotic relationships, where colocation providers refer business to their public cloud partners in return for being able to promote cloud services within their facility.

<http://bit.ly/rW6WfZc>

EMC pools its cloud resources

With a mega-merger pending with Dell, EMC has established a cloud unit to combine its cloud assets with those of its VMware subsidiary, under the Virtustream brand.

EMC acquired managed cloud specialist Virtustream earlier in 2015 for \$1.2bn, and has made it a new entity in its 'federation' – which also includes RSA, VCE and Pivotal – that would focus on services and products for the hybrid cloud.

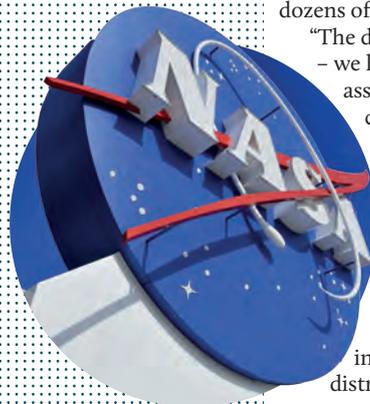
The new cloud services business will be led by Rodney Rogers, co-founder and former CEO of Virtustream, who said: "We expect Virtustream will become one of the top five service providers globally."

Virtustream was founded in 2009 to provide enterprise-class IT in the cloud. The company offered extensive cloud security, performance SLAs and charging based on usage, not resource allocation.

Virtustream's xStream cloud management software platform is integrated with VMware vSphere – yet another reason why the company is a good fit for EMC. The new Virtustream will incorporate existing VMware cloud management products and the vCloud Air public cloud platform, Virtustream's software assets including xStream, and EMC's Storage Managed Services and Object Storage Services.

Half of the company will be owned by EMC and half by VMware. EMC expects Virtustream to generate hundreds of millions of dollars in recurring revenue in 2016, and grow into a multi-billion business over the next several years. "Through Virtustream, we are addressing the changes in buying patterns and IT cloud operation models that we are seeing in the market. Our customers consistently tell us they are focused on their IT transformations and journeys to the hybrid cloud. The EMC federation is now positioned as a complete provider of hybrid cloud offerings," said Joe Tucci, chairman and CEO of EMC.

<http://bit.ly/rOKWwwp>



\$1.2bn
The price EMC paid
for Virtustream

NASA consolidates

NASA has opened a new data center at the Kennedy Space Center in Florida, which consolidates infrastructure from five different data centers and dozens of small server rooms and closets.

"The data center will support multiple activities – we have a lot going on," said Kelvin Manning, associate director of the Space Center. The consolidation project began in 2012 and will cut energy costs, saving money to invest in space flight.

The Kennedy Space Center was originally built to support the Apollo manned Moon landing mission, and has been used to launch every NASA human space flight ever since.

Such projects rely on extensive IT infrastructure, which was previously distributed around the 200 square mile campus. The new data center in the Kennedy Industrial Area is meant to replace all existing IT facilities and support multiple programs. The facility was built to Tier II standards and is LEED Silver certified.

At 16,000 sq ft, this is not a huge facility, but it replaces approximately 45,000 sq feet of power-guzzling 'legacy' IT estate. Once fully occupied, the facility will be three times more efficient than the data centers it replaced.

As an additional benefit, the move will enable NASA to demolish some of the older buildings on campus, like the Apollo-era Central Instrumentation Facility.

The consolidation project is part of the Federal Data Center Consolidation Initiative, launched by the US Office of Management and Budget in February 2010. The initiative requires government agencies to improve the efficiency of their infrastructure in order to reduce costs.

NASA previously said that its new data center facility will pay for itself in approximately eight years out of energy and operations savings.

<http://bit.ly/rRqNH8C>



66%
Percent of data center floor space in Luxembourg that is Tier IV

LuxConnect adds new green center

Luxembourg-based colocation provider LuxConnect has opened its fourth Tier IV data center. The new 5,500 sq m (60,000 sq ft) data center, an extension to LuxConnect's original Bettembourg campus, was opened in August, and has since been completed with a new joint reception area.

The new data center is connected to the old one via an aerial walkway that has fire doors at each end and a fire-suppression system that

would prevent the spread of any conflagration.

LuxConnect's other data centers are powered by green energy bought from Norway, but the Luxembourg government suggested that this one should use local renewable energy from biomass (wood waste).

LuxConnect built its own plant to recycle wooden pallets that are converted into energy which runs all the data center's power and cooling. The recycling plant sits opposite the new data

center and is connected directly via massive underground pipes.

Claude Demuth, business development manager of LuxConnect, said: "Luxembourg has many benefits which we are confident will attract many more of the large organizations similar to those we already service.

"Apart from a stable and business-friendly environment, we have a very favorable legal and regulatory framework, are cloud-friendly – being the first country offering data reversibility – and have the highest concentration of Tier IV N+1 data centers in the world.

Demuth said: "Luxembourg has more than 28 different fiber routes into the country provided by companies including Tier 1 carriers such as BT, Cogent, Level3, Telefonica, TeliaSonera,

Verizon, NTT Communications and AT&T. We already have some of the world's biggest online companies working from Luxembourg, such as Amazon Web Services. We have direct low-latency circuits from Luxembourg to data centers in Brussels, Frankfurt, Kehl, Saarbrücken, Amsterdam, Paris, Strasbourg, London and Slough."

Two thirds of Luxembourg's data center floor space is Tier IV certified. Approximately one third of European Tier IV data centers are located in Luxembourg.

Like its predecessor, this new data center is entirely covered in a Faraday cage to protect the facility from hostile or accidental electromagnetic pulse (EMP) incidents.

<http://bit.ly/2o0PrMc>

VOX BOX / DCD VIDEO



Richard Jenkins
VP marketing
RF Code

What do sensors and the Internet of Things mean for data centers?

We've been doing the Internet of Things for 17 years, with systems monitoring everything from hand sanitization to shipping containers. In data centers, DCIM won't give the value it promises without input from sensors in racks and rows. But it must be flexible and can track assets including financial attributes.

<http://bit.ly/1PDFNA9>



Don Beaty
President
DLB Associates

What is the biggest challenge facing the data center industry?

Software is eating the world, and we have three different factions: software, hardware and facility. Each has a different vocabulary and we effectively have three silos. The thing to figure out is how to bridge the communications gap between those three areas. The problem won't go away, because containerized workloads will change the demands on facilities.

<http://bit.ly/1W7CfWk>



Dell and EMC agree \$67bn mega deal, backed by Silver Lake finance

Dell has announced a \$67bn deal to buy enterprise tech giant EMC, promising to keep the group's management and federated structure intact.

Dell CEO Michael Dell downplayed the possibility of layoffs and shrugged off doubts about paying the company's increased debt load. He added that the CEOs in VMware's federated structure would continue in post, including Pat Gelsinger at VMware and Amit Yoran at EMC's security outfit RSA. However, it seems that VMware might become more independent from EMC following the merger.

The deal is backed by finance firm Silver Lake, and MSD Partners, which manages the capital of Michael Dell and his family, along with other investors. In the European data center market, the merger will double Dell's share, as Dell and EMC have four percent and 3.5 percent each of a combined market, including storage, systems, infrastructure software, networking and cloud.

The deal will avoid technology lock-in for customers, said Dell, mentioning that EMC's VCE joint venture with Cisco would continue, although this resells Cisco servers in VCE converged hardware.

By a similar token, he said that Dell would not now prioritize VMware's vSphere hypervisor, where the market did not demand it.

Dell would not give details of plans for the firms after the merger, which will have to gain regulatory approval, but admitted there would be cost synergies, although he brushed off a question about redundancies, saying: "Some other companies in the industry are better at reducing headcount than we are. Why not join their conference calls?"

<http://bit.ly/1QXuz2m>

OCP networks on test

Aiming to increase trust in open products, the Open Compute Project (OCP) has turned to a university lab with more than 25 years' experience to set up interoperability testing for OCP-compatible network products.

The University of New Hampshire's InterOperability Laboratory (UNH-IOL) has published a list of all the products that have been validated under networking standards defined by OCP, the Facebook-backed open source hardware group.

The products were tested at an Open Networking plugfest in September, and the tests are available for vendors and users to apply to white label network boxes.

<http://bit.ly/1jZ3EIP>

'Unbranded' hardware

Users are turning away from traditional servers and considering unbranded hardware, according to a survey by 451 Research.

Just 17 percent of senior IT professionals plan to increase spending on traditional infrastructure from the likes of HP, Dell and Lenovo this quarter, while 40 percent want to spend more money on hardware from converged infrastructure vendors like VCE and NetApp.

"Speed and ease of deployment rank as top drivers in the shift to converged infrastructure; lack of in-house expertise is the biggest single inhibitor," according to Nikolay Yamakawa, senior analyst at 451 Research.

<http://bit.ly/1MGwlvB>

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Kingsland joins the Singapore swing

A real estate player tells *Paul Mah* that it has something fresh to bring to the South East Asian data center hub

Singapore is a top data center destination, attracting large global players such as Amazon, Google, Microsoft and IBM. So our interest was piqued when a local real estate developer, 40-year-old Kingsland Development, opened its very first data center. So how does this intrepid new venture hope to stand against the incumbents?

Before the grand opening, Kingsland chief operating officer Asher Ling took us on a tour. An engineer by training, he can rattle off statistics such as the critical IT load per floor, the name and purpose of all the mechanical equipment, and even the type of Ethernet cable snaking up a communications riser.

Of course, Ling doesn't know everything. We spotted video cameras from Axis Communications, a well-established and

acknowledged expert in high-quality IP TV systems, and he had to check with his security manager how many are installed in the site – currently 180, with more due to arrive soon.

The site has mantraps to defend against tailgating, and a system to manage the physical keys to mission-critical rooms. It logs who takes keys and how long they keep them – data that is crucial for security audits.

The site has top-of-the-line hardware, including two 4-ton cargo lifts serving the unloading bay at the back. But the firm is pragmatic about things that are less mission-critical. For example, the meeting room that Ling ushered us into was spartan, with a functional table and some chairs. The data center doesn't have a DRUPS (diesel rotary



The unique multi-tier design allows for Tier II, III or III+ mechanical infrastructure



of individual systems to guard against external hackers. “Clients are unlikely to pre-commit in Singapore these days,” says Ling. “They will come and see what you have. They have very strong engineering teams to do their own technical due diligence.”

High capital expense means data centers are tailored towards maximizing profits, but in Kingsland’s case there is a strong sense that decisions are made with customers in mind.

The data center sports a unique multi-tier design that allows it to deliver Tier II, III or III+ mechanical and electrical infrastructure in accordance with the requirements of a specific customer. This means customers can decide on various levels of redundancy based on their needs, gaining capex and opex savings by not

paying for capabilities that are not required.

The site’s meeting rooms are adjacent to the data halls, instead of in their traditional location on the ground floor, and are spacious enough to be used as a network operations center if needed. Some customers want to locate their operations team close to the hardware at this site, and Kingsland set the proportion at 15 percent of the gross floor space.

Finally, Ling is keen for Kingsland Data Center to serve as a hub for connectivity between both telcos and communications providers. To encourage this, he has decreed an open cross-connect arrangement in which no recurring cost fees are charged. And to show his seriousness towards the development of what he calls a “natural” ecosystem, he will not deal with network connectivity at all. “No data center can be an island by itself, either within a country or a region. There is a critical need for data centers to be interconnected together. There are actually a lot of strategic partners, including carriers and consortiums, that will be operating from our premises. In due time, I will share who they are.” ●

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uninterruptible power supply), a solution increasingly found in new data centers and lauded for its environmental friendliness over banks of lead-acid batteries.

The team incorporated the Threat Vulnerability Risk Assessment (TVRA) guidelines of the Monetary Authority of Singapore (MAS) into its blueprints from the start. These recommendations contain stipulations against underground car parks and specifications for perimeter fencing that may be hard to meet in an existing facility. The MAS recommendations are not mandatory but are evolving into a de facto standard for financial institutions and other Singapore bodies with mission-critical infrastructure to protect.

How is Kingsland tuning into market requirements without a pool of existing customers? “We don’t pretend to know everything about [data centers],” says Ling. “We work closely with our partners, data center operators and customers to incorporate their wish lists.”

Some of this feedback can be seen in the physical design of the site, with its generous raised floor height of 1m, and a higher than usual slab-to-slab height of 7.2m. Other enhancements are less obvious, such as physically wiring up the DCIM system for monitoring only and separating the controls

Clients are unlikely to pre-commit in Singapore. They will come and see what you have



In 2016, Rio de Janeiro will become the first South American city to host the Olympic and Paralympic Games. Capitalizing on its experience hosting the Pan American Games in 2007, and the World Cup in 2014, the 'Marvelous City' surpassed Chicago, Tokyo and Madrid. The project is budgeted at Brazilian Real 28.8bn (\$7.6bn).

The communications infrastructure for the Games will be provided by Brazilian telecommunications company Embratel, a subsidiary of Mexico's América Móvil, along with partners Atos, EMC and Cisco. The team's job is to make sure that video statistics and raw performance data from the events are instantly available around the world.

Embratel will take charge and handle network connectivity, while Cisco and EMC will provide equipment, and Atos will manage the storage infrastructure and data protection.

For the Games, Atos changed its IT services hosting model to use cloud services provided by other event partners. The new cloud-based model will deliver IT services more efficiently, and can expand or contract based on user demand.

Security is important, but so is ease of access, says Shailesh Chauhan, Atos IT security manager. Working with network hardware and service providers from the start of the project, he intends to deliver the Games' IT services for multi-platform devices, including PCs, laptops, tablets and smartphones.

The project will use tried-and-tested hardware and software, including Cisco network switches, Cisco traffic management devices, firewalls from multiple vendors, UCS server hardware and EMC storage – all in a high-availability configuration.

As well as operating the Olympic network, Embratel will collaborate in planning the structure. There will be 10 types of service,

Running the race to Rio

The 2016 Olympic and Paralympic Games in Brazil will need world-class data centers. *Tatiane Aquim* explains why



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Brazil
Correspondent
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including data centers, internet access, high-capacity data, voice, mobility, CATV and wifi. Since 2013, the basic services, including the data center, have been in use at the organizing committee's headquarters in downtown Rio.

During the event, Rio de Janeiro will host representatives from 206 countries and millions of visitors, and it is estimated that more than 21,000 journalists will cover the event – all of which will require an unprecedented telecoms infrastructure.

The Olympic backbone is nearly complete, with links extending 360km, equivalent to 971 laps of a standard football pitch, or the length of 6,800 Olympic swimming pools.

Embratel has been working to expand 3G and 4G networks, with improved coverage at airports, sports facilities and tourist attractions. The Olympic backbone network, which links facilities and Olympic sites, will be redundant and robust.

Today there are five data centers interconnected through the backbone, which runs over fibers 100 percent owned by Embratel. Mario Rachid, executive director of Embratel Claro Enterprises, says this will guarantee reliability and low latency.

The technology partnerships for the Games are strategic, says Rachid, taking advantage of each company's strengths.

The Rio 2016 Olympic Games will use more than 60,000 network points connecting all the Olympic arenas, and approximately 18,000 fixed lines, 16,000

SIM cards, three million SMS messages and 15,000 points of CATV.

Embratel CEO José Formoso Martínez says that four data centers are ready and approved by the Olympic Committee, with the right levels of security, reliability, flexibility and robustness. The company is also using Embratel's Star One satellite to provide better quality data and image transmission.

Today, Embratel has two data centers in São Paulo and two in Rio de Janeiro. They cater to the internal IT infrastructure of América Móvil in Brazil and to customers. The facilities are connected by Embratel's fiber-powered MPLS network.

The data centers have air-conditioning systems with aisle containment (in-row), designed for high thermal loads, which can support 15kVA of power in a single rack. There are independent electrical systems supported by a three-bus UPS system with 1500kVA distributed in modules of 25kVA each, ensuring greater modularity and higher availability.

The sites have diesel backup for 72 hours of redundant backup, current capacity of 144 hours. The buildings also have independent electrical

systems for the IT and air-conditioning.

By following ASHRAE 90.1 guidelines, Embratel has achieved a PUE of 1.8, with plans to reduce this to 1.6 by the end of 2015, and to reach 1.5 by Q2 2016, ready before the Olympic Games finally open on 5 August.

It looks as if technology support for the Rio Olympics will arrive at the starting line in good shape. ●

The Olympic backbone is equivalent to 971 laps of a standard football pitch



Olympic-grade data centers

- 15kVA per rack
- Three-bus UPS system
- 1500kVA backup distributed in modules of 25kVA each
- 72 hours of dual redundant backup form diesel gensets
- Independent power supplies for IT and air-conditioning
- PUE of 1.8, due to fall to 1.5 before the Games open



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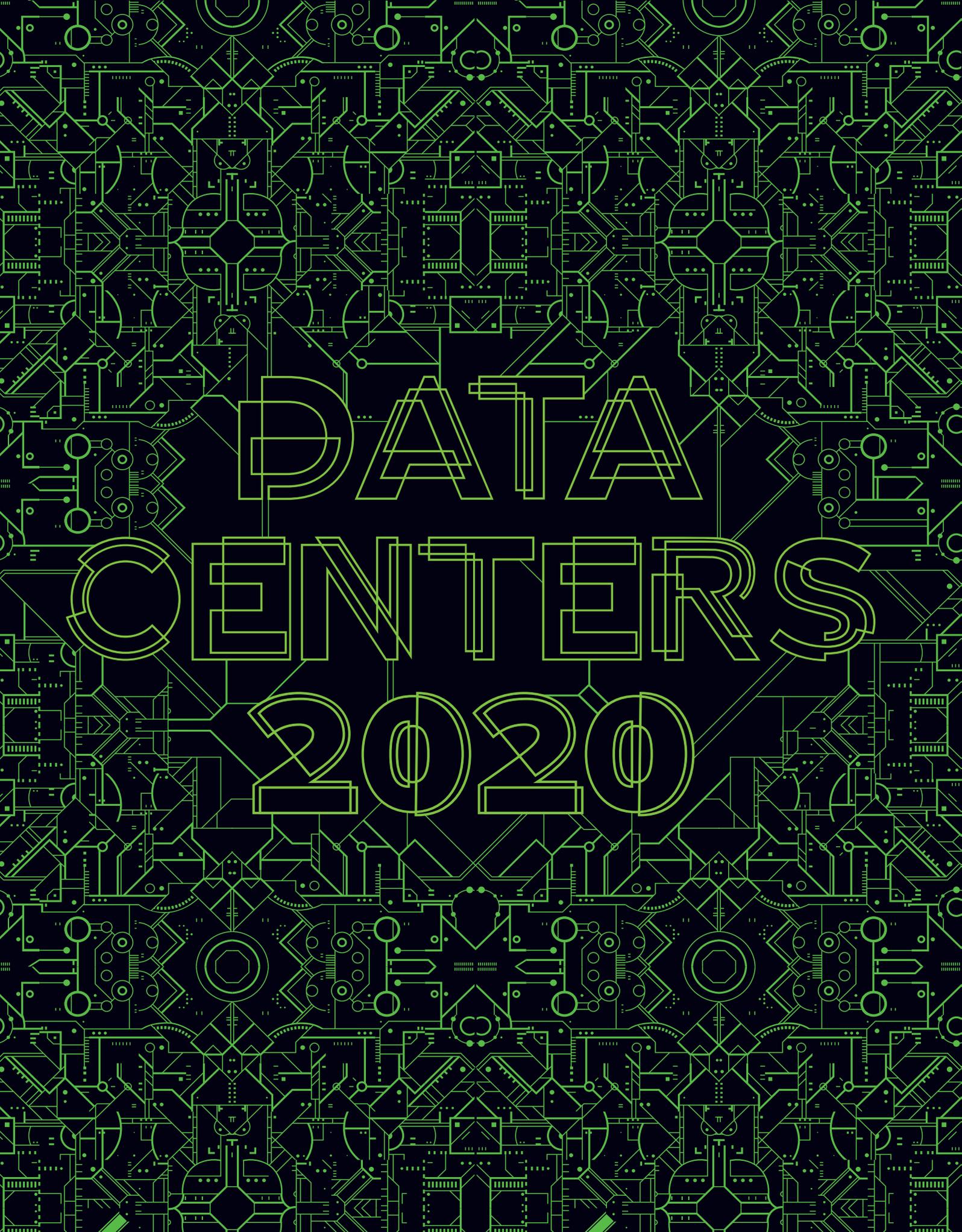
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Thanks to political demands and the struggle for energy supplies, data centers could face some big changes in the next five years



David Chernicoff
US Correspondent

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Ask the data center industry, and the future is simple: ever-bigger and more power-hungry facilities that centralize more and more business processes by providing Everything-as-a-Service to a business community that continues to look for the slightest competitive advantage that can be gained from service-provided technologies. But the reality may not be quite so clear. External factors, driven by technological and societal pressures, will reshape the future of the data center in ways the industry may not be expecting.

There is little question that the greening of the data center is an issue that, while seemingly driven by societal pressures, is seen as one that impacts the corporate bottom line. Regardless of the type of data center involved, being able to deliver IT workloads more cost effectively is a goal of IT, and improved energy efficiency while reducing environmental impact meets both business needs and those of society. What is most interesting, however, is that more energy efficient technologies are not being used to reduce the power requirements of existing data centers, but, in most cases, being used to increase data center densities, allowing more work to be done for that same amount of power.

Completely external issues to the data center are going to have a significant impact on power. Driven by a political agenda in the US, the cost of power is likely to increase sharply as existing power resources are put in a vise. Coal-fired power plants will need to be replaced with more environmentally friendly sources of energy.

Unfortunately, the technology to replace coal as an energy source either does not exist, or is not exploited, so data centers will have to optimize their operational efficiency as much as possible. The cost of power will necessarily increase, meaning the cost of delivering services will increase. And this increased cost will apply to all kinds of data centers, no matter what form they take in future.

Given that data centers will always require power, their owners are making efforts to plan for the increase in power costs by future-proofing their power supplies. This can only realistically be achieved by signing contracts that guarantee power costs from 10 to 25 years, but not everyone can get this kind of power contract. They are only available to a very limited subset of data center operators, generally on the scale of Facebook, Amazon, Google, Microsoft and Apple.

Politics may also have a say in the location and operation of data centers. After the level of access to customer data by the security services was revealed, organizations are increasingly wanting to keep data located in their home state, and the European Union has invalidated the Safe Harbor agreement, under which US cloud providers were trusted to comply with European privacy rules (page 53).

In the short term, data will be “repatriated” to where it seems to be safer, but in the longer term, some arrangement will replace the Safe Harbor arrangement, and this will affect any new facilities that are deployed.

With the trend towards moving data storage to the cloud for every type of device, the information that can be gleaned from that data on individuals, their behaviors and their lives is immense. The privacy requirements for maintaining that data will affect where data can reside and how it will be handled.

Privacy polices could become a confusing morass, driven by court decisions and political needs, and this may even slow the growth of the Internet of Things (IoT) and its supporting infrastructure.

It is entirely possible that the future of data centers is one where there are only large-scale operations, with just about everyone else moving from their own data centers to either services on demand or colocation providers. Most businesses should focus on their core business, and generally this is not providing data center services.

Online movie provider Netflix is seen as a proof of concept for the future picture of how data centers will be used: it moved its entire IT operation into the cloud on Amazon’s AWS service. However, while the core of Netflix’s streaming services, along with its entire operational IT load, has been moved to AWS, it is important to note that Netflix elected to continue to deploy its own content delivery network (CDN), putting its own equipment in “edge” data centers for the final delivery of its service to customers.

The Netflix Open Connect CDN uses appliances that maximize the streaming experience of Netflix users by caching content at locations closer to the end consumer of the service. Netflix has partnered with hundreds of ISPs across its service area to place these appliances at their location and offers an open peering policy with its interconnection locations.

This moves the cached content closer to the end consumer and allows the ISP to have better control over bandwidth consumed by the streaming service. The key here is that Netflix maintains overall control over content delivery, with greater control over the cost and performance of that delivery, that Netflix hardware is being deployed into the ISP’s data centers, and that the

AWS cloud is not the only point where end-user requests are being served. Without the existence of these smaller ISPs to host its appliance, Netflix would have to take a different approach to its CDN.

The point here is that the future of data centers isn’t tied up in large, centralized facilities. The nature of net-based services is that they need to be relatively close to the consumers of those services. Whether you are considering IoT, streaming content, or any type of network-delivered services, you must be aware of latency, connectivity and network bandwidth availability.

By moving these capabilities to the edge, you address the plethora of issues that these technologies bring up. But you also have to reimagine what you think of as a data center.

Looking forward, very dense, small-scale facilities, which bring data and services down to a local level, could address many of the potential political, technological and societal issues that the data center faces.

Personally, I believe that edge data centers will be the single biggest growth area in the next five years. The edge data center doesn’t take a single form, but is designed to suit the needs of those consuming its services.

It might be what we think of as a normal data center, just in smaller form when compared with the core data centers that ultimately host the services. It could be a containerized data center, moving a full set of data center services in a form that is easy to transport and expands

the footprint of a data center provider to an underserved area. Or it might look nothing like what we think of as a data center.

It could be a self-contained box installed at a local PoP or access point that acts as a cache point for services, allowing small numbers of local users to get high-speed services without relying on a long backhaul that can be expensive to use with high levels of bandwidth.

New vendors are appearing with their own takes on what an edge data center should be, with a significant focus not only on smaller versions of the traditional data center model, but also innovative takes on smaller installations that can be deployed in non-specialized environments to deliver the necessary services.

Some are proposing that this go even further, with combined heat-and-compute servers, from players such as Germany’s Cloud&Heat, which can be placed in the basement of multi-tenant buildings, where their waste heat can warm the building. Distributing individual cloud servers to provide heat in living rooms has also been proposed by Qarnot in France, Nerdalize in the Netherlands, and Exergy in the US.

The bottom line is that while large cloud facilities get bigger and more commoditized, so-called edge computing will be scaled to meet the needs of users and may change how we see the data center. ●

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Slow and steady

New technologies can shake up the data center world – but it will happen gradually, says *Chris Drake*

Businesses tend to innovate by applying a new idea or technology to generate value, so innovation is therefore linked to growth. Data centers innovate to deliver business operations reliably and resiliently while expanding to handle growing volumes of increasingly complex data.

Bandwidth-hungry internet traffic such as HD and 3D video, more sophisticated connected devices, and trends such as Big Data and the Internet of Things are driving the innovation agenda, and facility and IT administrators are working with scarce, finite and expensive resources such as space, power and skills. Despite all this, data center innovation is surprisingly gradual, incremental and piecemeal.

Why is this? Limited operational and capital expenditure (opex and capex) budgets are acting as constraints and barriers to innovation, causing managers to defer investments that would otherwise enhance data center innovation. Other barriers to innovation include institutional inertia, created by cultural or organizational factors within the enterprise itself. Many of the barriers to innovation are reflected in the external factors that data center operators predict will impact on their operations (page 20).

Traditional data centers are designed for a lifecycle of 10 to 15 years. This creates ►

Sources of innovation

Modular data centers

Modular and prefabricated data centers look like an answer to a thorny problem: lengthy data center lifecycles conflict with the need for ongoing upgrades. Prefabrication promises faster project times, improved scalability, portability and standardization. Standardized data centers could be a boon for both commissioning and staff training. Modular data center solutions are also being adopted by enterprises looking to boost their green IT credentials.

Power and cooling

Energy-efficient strategies include the use of low-energy servers, or micro servers, which rely on low-power central processor units (CPUs). Others include the use of natural air cooling, which uses outside air to cool data center facilities instead of power-hungry mechanical refrigeration or air-conditioning units. Meanwhile, computational fluid dynamics (CFD) promises a scientific approach, using numerical analysis to model fluid flows.

Virtualization

By allowing consolidation, virtualization is transforming data centers. Virtualization has been applied to servers and applications, allowing faster development, better backups and speedier deployments. New virtualization technologies could improve data centers further, including desktop virtualization, network functions virtualization (NFV) and the virtual storage area network (VSAN) – a software-defined storage solution that will help to increase flexibility and automation.

New architectures

Mega data centers are being driven by cloud and colocation providers needing economies of scale. Cloud

services can be delivered from multiple data centers, a trend that will increase as services and applications move to the cloud. Meanwhile, large enterprises will look for better ways to connect multiple data center facilities, trying out options such as Cisco's overlay transport virtualization (OTV).

Automation

Data center operators are investing in automation, a benefit that has long been promised by technologies such as data center infrastructure management (DCIM). Meanwhile, software-defined networking (SDN) promises to help automate networks. At a higher level, between data centers, open trading exchanges could automate the way in which resources are bought and sold, providing compute, cloud and data center capacity more flexibly.

Machine Learning

Artificial intelligence (AI) and "machine learning" is increasingly being applied to improve data center operations. Google now uses machine learning in proprietary systems that gather data to manage and optimize its IT systems and regulate power and cooling. Commercial implementations include Vigilent's dynamic cooling management system, which responds intelligently to temperature data collected from wireless sensors.

Human skills

Data centers need staff with specialist skills due to the complexity of integrating IT and facility infrastructures. Automation also requires implementation by specialists. Rather than doing away with data center personnel, automated systems could allow staff to make decisions that are currently either impossible or impractical.

► practical challenges, such as the expense and difficulty of expanding or upgrading a data center. It also has cultural implications, as traditional skillsets and legacy ways of thinking may dominate decision-making.

Given all this, it is perhaps not surprising that, according to DCD's *Global Census* survey, the pace of industry change continues to be one of gradual, incremental progress. For example, server virtualization and outsourcing are major forms of innovation that have been available for several years, pursued by the industry for some time now. Yet growth in these areas remains slow but steady.

In 2015, 17 percent of total global data center racks were located in-house but were virtualized or managed as part of a private cloud. This figure was up from 15.6 percent in 2014, reflecting an increase of just 1.4 percent. Meanwhile, 10.4 percent of total global racks were outsourced to cloud-based service providers. This figure was up from 9.6 percent in 2014, reflecting an increase of just 0.8 percent.

Media exposure of new technologies can sometimes give the impression that everyone is doing X or Y, but in fact the DCD Census reveals that whatever new technology you choose to look at, there will be no more than a quarter to a third of data center operators investing in that technology in a given year. Once again, this points to the cyclical nature of data center investment and the need to stagger investment in costly technologies over longer periods.

Innovation is slow and steady, while legacy equipment and processes linger alongside new technologies. But despite this, most data center operators are convinced about the benefits of innovation, acknowledge that it can reduce their total cost of ownership as well as increase agility and flexibility, while satisfying customers better.

Data center innovation can address a spectrum of things, including facility design and construction, the use of virtualization, automation and monitoring in IT, the adoption of business models such as outsourcing, and the application of specialist human skillsets (see box).

These innovations will be adopted in different ways, and at different speeds, in various geographical markets and market sectors. For example, data center sectors in so-called emerging markets have picked up new technology differently from how it has been adopted in long-established markets, sometimes picking up new ideas at an earlier stage, "leapfrogging" over the traditional market. For instance, emerging markets have adopted modular technologies and outsourced service models in the early stages of data center growth, instead of evolving through the traditional in-house model that dominated in more established markets.

Despite geographical variations, the data

Data Center Hub City Concerns: Impact of capital shortages on operations over the next 12-18 months

(■ indicating significant concern about capex shortage)



Data Center Hub City Concerns: Impact of power costs on operations over the next 12-18 months

(■ indicating significant concern about power costs)



center industry has been converging, and the gap between “established” and emerging markets has been getting narrower. This is partly due to the international transfer of technologies and strategies – a development that is contributing to the steady globalization of data center innovation.

This is especially true of energy-efficiency initiatives within IT and data centers, which are no longer the preserve of Western data centers and governments, but have instead moved anywhere where there is a critical mass of data centers.

The traditional structures and culture of the data center industry mean that innovation will most likely remain evolutionary, sporadic and incremental. Most new technologies and business models will be adopted steadily across a range of infrastructure and business areas.

New technologies will need to sit alongside legacy infrastructures and processes, producing a hybrid culture with its own set of challenges. Owners and operators will have their hands full, making sure their staffs’ skills and tools are up to date and effective.

But while this happens, many will question whether data center owners and operators are responding fast enough to external pressures, including those associated with Big Data and the Internet of Things. Some organizations will be more successful than others at setting the right pace of innovation. ●



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Taming the 'Internet of Threats'

Many ubiquitous smart devices have no security protocols. Soeren Jensen tells us how to respond

As the world connects more and more smart devices to the internet, the number of potential vulnerabilities will increase in linear fashion.

I don't want to give ammunition to the doomsayers about the Internet of Things, as I believe that on the whole it's going to be a major agent of change. But a colleague describes the IoT as the Internet of Threats!

Many smart devices that are ubiquitous throughout manufacturing and processing industries turn out to have been installed with no security protocols. They were originally commissioned with the expectation that they would only be used in a closed, secure loop. But recent cyber security breaches have taught us that even the most humble industrial (and office) equipment can be subverted for malicious purposes.

We should be looking to protect the data center from generic attacks, and the best way of doing this is not to leave the security door wide open or roll out the welcome mat.

Internet security advice is often aimed at IT. So, for data center and facility professionals, here are five basic things that will help protect your company and its reputation. Other than time and employee costs, many are "free".

1. Simplify: Complexity increases the number of attack surfaces. An easy way to reduce this is to turn off default functionality that is not being used, and disconnect equipment that is not in use.

2. Strengthen: Adopt the view that published default usernames and passwords are 100 percent compromised and should be changed. Eliminate default credentials (passwords, SNMP community strings, etc). Replace them with strong passwords and, wherever possible, use different usernames and passwords for different people.

3. Partition: Isolate the facility network from the enterprise network. If possible build a separate physical network for the data center and hide it behind a physical firewall to keep hackers away from mission-critical equipment.

4. Update: Ensure that all devices have the latest firmware, and

revisit this regularly to keep up with security patches. Do not make it easy to exploit known vulnerabilities.

5. Lock down: Physically secure critical equipment, create an access control plan and be sure to use it. Some protocols used on equipment are 30 years old, developed at a time when we didn't have security concerns. Putting equipment behind closed doors with access control goes

Many smart devices were installed with no security protocols. They were originally expected to be used only in a closed, secure loop

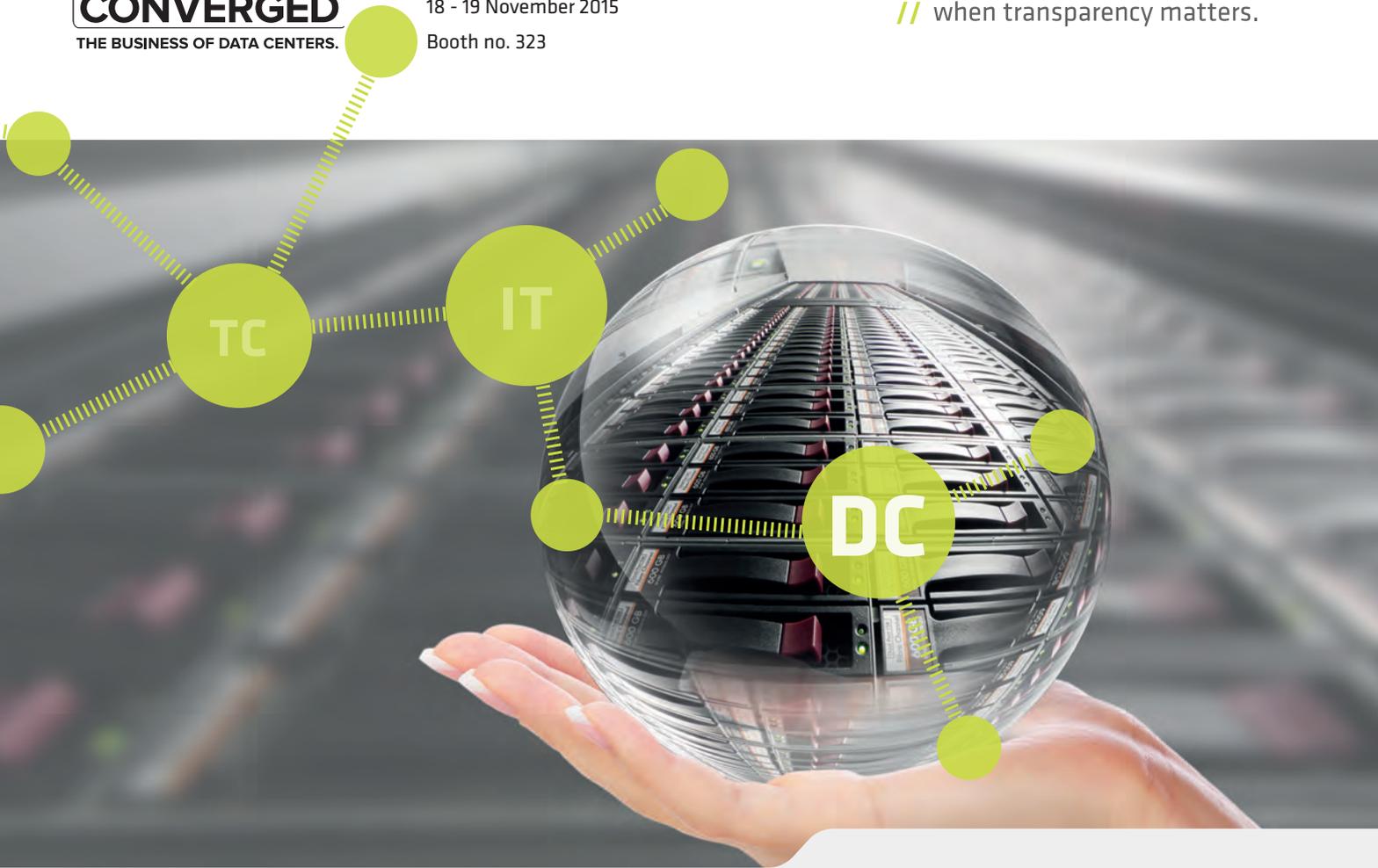
a long way to making them secure.

I have assumed that active scanning tools (network scans, intrusion-detection and penetration logs, email scanners and antivirus software) will have been implemented by IT as part of sensible enterprise protection measures.

But if you work in the data center and are unsure about this, definitely go check. ●

Illustration: Studio Nippoldt





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AWS KEEPS HIDING IN THE CLOUD

It's the biggest cloud provider by miles, yet *Paul Mah* found that Amazon Web Services wouldn't share much about its facilities



Paul Mah
SEA Correspondent

 @paulmah

Data center operators and cloud services provider are notoriously secretive about their trade, especially about failures or areas where they think they have a competitive edge. But Amazon Web Services (AWS) goes beyond this to operate in a veil of almost complete secrecy.

Facebook founded the Open Compute Project, and has been joined by Microsoft, Rackspace and Apple. Even Google has been happy to talk about its efforts to build more energy-efficient data centers.

AWS doesn't share like that – but it sometimes opens up a bit. In 2014, AWS offered glimpses of custom servers and even custom Intel processors, and in April 2015 it finally revealed the revenue numbers for its cloud computing service.

Pictures from inside Amazon data centers are rare; however, during a talk at the 2015 AWS re:Invent conference in Las Vegas, Jerry Hunter, vice president of infrastructure at AWS, included images of a Google rack in his presentation (see box). Hunter said that sheer scale lets AWS build radically different data centers – and then leverage them to the hilt.

Gartner analysts estimate the AWS infrastructure-as-a-service cloud is 10 times larger than the next 14 competitors combined. “From building our own networks, to building our own servers, to building our own data centers, and from the largest facilities to the smallest appliances and networking gear –



this [scale] allows us to simplify the design,” said Hunter in his session, explaining that everything is ultimately delivered at reduced cost compared with off-the-shelf hardware.

Part of this obsession with building its own specialized hardware stems from the fact that commercially available hardware simply doesn’t meet the needs of AWS. As an example, old-world networking gear is often encumbered by a generic design that is sub-optimized for AWS work and burdened with complex features it does not need. Without offering details, Hunter said each AWS data center operates on a purpose-built network that offers traffic engineering and other specific optimizations that it needs.

In other ways, these data centers are reassuringly familiar. “Each data center has two fiber paths coming out of it,” said Hunter. Existing dark fiber is used where available, though AWS will also entrench its own fiber as necessary.

Ample fiber connectivity between data centers is necessary, based on recent clarifications from AWS that each Availability Zone (AZ) is located in a separate data center at a minimum – and could span over up to six data centers. The inter-AZ network has a peak capacity of more than 25 Terabits, or 25,000Gbps.

Hunter also revealed that AWS started to build its own internet backbones in 2013 for direct control, better quality of service and reduced cost. And AWS is not against using the public internet either. “If it turns out that the fastest and most effective route is the internet, then we will go through the internet,” said Hunter. “This improves performance and reduces jitter.”

It appears that no data center or cloud is an island, even one as large as AWS. It still has to rely on suppliers to get its servers and networking equipment manufactured and shipped to its many data centers – and here the sheer size of the AWS cloud could have potentially worked against it.

In 2011, flooding in Thailand affected millions. AWS was hit because most the world’s hard disk drives (HDDs) are assembled in Thailand, and some critical parts are made there. “Our wake-up call came in the Thailand flood of 2011,” said Hunter. “When we did this tour of the HDD manufacturers, there was a part that was made by a single vendor.”

And it turned out that getting the parts that AWS requires is hard without a direct relationship with suppliers, which showed the company the importance of its supply chain. Since then, AWS has worked hard to build up its supply chain relationships for getting its

own servers, storage and networking gear.

To get the hardware back to the various AWS data centers efficiently, AWS was able to use the delivery expertise of its parent, Amazon, establishing mechanisms to feed new hardware back to its ever-growing data centers. “Amazon is world-famous for delivering products... so we spent time with Amazon to learn more about how we can improve our processes,” he said. “We turned our supply chain from a potential liability into a strategic advantage.”

AWS is dogmatic about security. The right badge and personalized pin is required to access a data center, as well as special locations such as the switchboards and power generators. And in case you are thinking of mounting a *Mission Impossible*-like mission to infiltrate an AWS data center, “many of them” are also secured by internal sensors that can be tripped, and are manned by a security force. Is it a problem or not? As an additional layer of security, video camera feeds are monitored in tandem by local and remote teams.

The data center must be secure before the first networking or server gear rolls into the facility. Hunter ticked off a list of items, such as the perimeter fence, building perimeter, doors and also a metal detector, which he says is managed around the clock. If you are ever invited to visit an AWS facility, don’t bring a storage device. Hunter said any disks that are introduced into the data center are tagged and closely monitored. “So, once something goes into the data hall, it doesn’t come out without setting off the alarm.”

And when it’s time to retire a storage drive, it gets degaussed first, before being shredded to bits of metal. “This is the only way storage drives leave our data centers,” he said. “We don’t RMA [return] them for repairs. This is not a place where we cut costs; ensuring that customer data is secured is our first priority.”

The attraction of the public cloud is inexorable, and many enterprises are looking to hybrid deployments to balance their compute needs with regulatory compliance. Will other cloud providers eventually get large enough to necessitate their own custom-built everything? And if so, will they be more generous in sharing about their proprietary hardware and how to do data centers better?

Hunter’s presentation was heavily scripted, and peppered with generic facts and figures about the cloud. Showing Google’s kit was not a big deal, but there could be no better illustration of how AWS continues to hold its cards close to its chest. The company declined to comment for this story. ●

Amazon is great at delivering. We turned our supply chain to our advantage

Mistaken identity

When Jerry Hunter of AWS showed a rack of network equipment during his re:Invent talk, it was later found to show the Jupiter switch fabric, a project that Google created and – unlike AWS – shared with the world months ago.

So how did it happen? Because pictures from inside AWS facilities are hard to come by. “This was my mistake,” admitted Jim Sherhart, a product marketing manager at AWS. “Because we have a lot of IP in our data centers, we don’t typically show images of them in presentations. I just grabbed what I thought was a generic stock photo from a Google search since it had no branding, trademark or meta identification. I’ve replaced the image in the presentation.”

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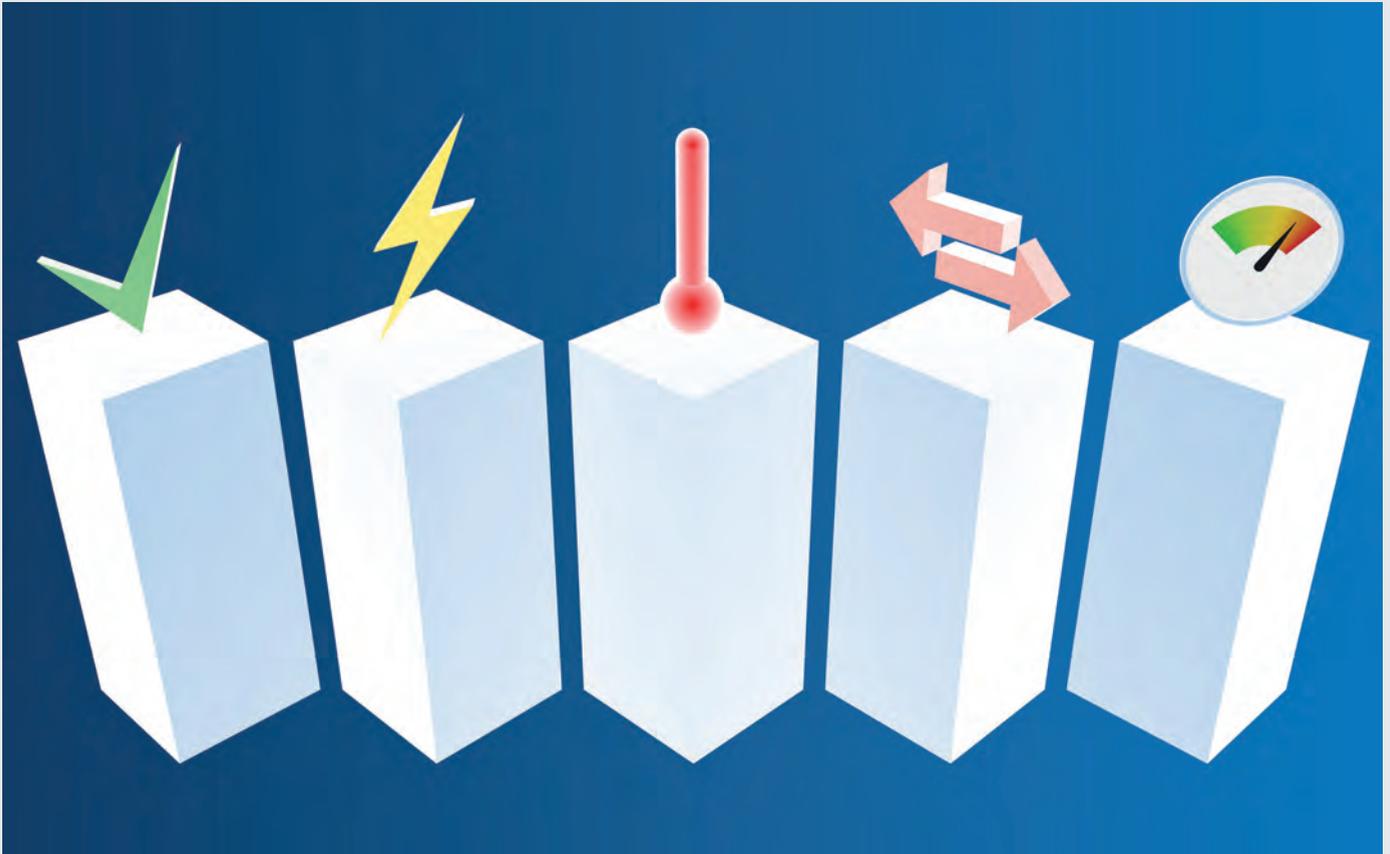
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Anixter's five senses of DCIM: Turning data into insight, and insight into action.

DCIM Enablement: Start With the End in Mind

When gathering requirements for a DCIM tool, think about how it can solve other stakeholders' challenges as well as your own to help achieve complete organizational acceptance.

As data centers grow in size and cost, so does the pressure to maximize the usage of power, cooling, physical network connectivity and space. The art of doing this is called capacity planning, and it's one of the biggest drivers behind the adoption of Data Center Infrastructure Management solutions.

DCIM is a data management system that provides users with dashboards and reporting tools that allow them to make better decisions. It should be a holistic approach with the right combination of hardware, software, data, staff adoption and most importantly, a sound business process to take action on its findings. Missing one of these elements can force the system to break down and fail, costing time and money.

What DCIM doesn't do, for the most part, is take action automatically. Prior to implementing DCIM, it's best to formalize a business process on how to execute on the data. This might mean involving other departments and listening to their opinions on what they'd like to see out of an information management platform. It might seem like a lot of upfront work, but it should save headaches later.

The trick is to think about what that collective organizational goal should be — the reasons that keep your CIO up at night

versus just solving individual, short-term requirements. For example, if you are looking for a DCIM tool that can track IT assets down to the rack, consider how a holistic asset management strategy that tracks maintenance and service information for the UPS systems can benefit facilities and how tracking each asset's owner could help accounting with more accurate departmental charge backs.

Taking this approach at the beginning of the project encourages collaboration and can help achieve the total organization's buy in to secure the budget and streamline deployment.

Evaluating Your Current Physical Infrastructure

After the collective business challenges and thinking about your current departmental processes, the next step is to evaluate hardware to determine if it will need to be replaced or upgraded prior to deployment.

By giving you better reporting capabilities, DCIM will help to better visualize problems, but this cannot be done without the right hardware. DCIM reporting is only as good as the data collected and that depends on having hardware with the capabilities to feed information to the DCIM interface. If you want to reduce operating expenses by making your cooling system more efficient, then you will need accurate and reliable data from airflow temperatures, pressure and humidity sensors.

After identifying the goals associated with a customized DCIM platform, determining how other departments can leverage that information and learning what hardware gaps need to be addressed, the next step is supplier evaluation.

Comparing Apples and Oranges

The two big challenges with evaluating DCIM suppliers are the amount of available solutions in the market and the lack of DCIM specific standards.

With more than 65 suppliers in today's

market who claim to have a DCIM solution, evaluating potential products requires a significant time investment. Additionally, the lack of industrywide standards means no two DCIM solutions are alike and the various offerings have evolved without a formalized open-architecture approach. This makes it difficult to compare one solution to another.

The first step when comparing DCIM solutions is to develop a standardized evaluation process. In order to do that there needs to be a clear definition of the different challenges that DCIM can help solve. Anixter has identified five common challenges or senses that DCIM can help with.

Five Senses of DCIM

Anixter's five senses of DCIM address the common areas data center managers need to be aware of when evaluating and implementing a DCIM solution.

- 1. Asset management** gives users the ability to manage their hardware and software assets under one centralized database.
- 2. Power monitoring** through an intelligent power chain provides users with real-time data from the utility through the IT equipment to provide users with real-time data that allows for better power management.
- 3. Environmental** monitoring uses data from chillers, cooling units and various environmental sensors to help users achieve a state of conditional environmental control, making for a more efficient and reliable thermal management system.
- 4. Change management** gives users the ability to assess and plan changes before they happen to see how they might impact the data center. Some DCIM software allows for integration into various ticketing systems.
- 5. Capacity planning** is generally the end game for most data center managers. This aggregates all power, cooling and physical

asset data to predict when these resources will run out as well as provides information that a data center manager could use to make adjustments that could lead to significant cost savings.

When evaluating a potential DCIM solution understand that some only focus on one or a combination of the following areas, while others can address all five areas.

Working with a Trusted Partner

Because DCIM is such an investment of time and resources before and after installation, it is important to work with a partner that can help map your company's business challenges into the right solution agnostically. This will free valuable time normally spent on research and evaluation and allow your focus to be on working closely with other departments to discover those common challenges so DCIM can benefit everyone. This will help achieve a faster ROI and could mean the difference between a failed and successful deployment.

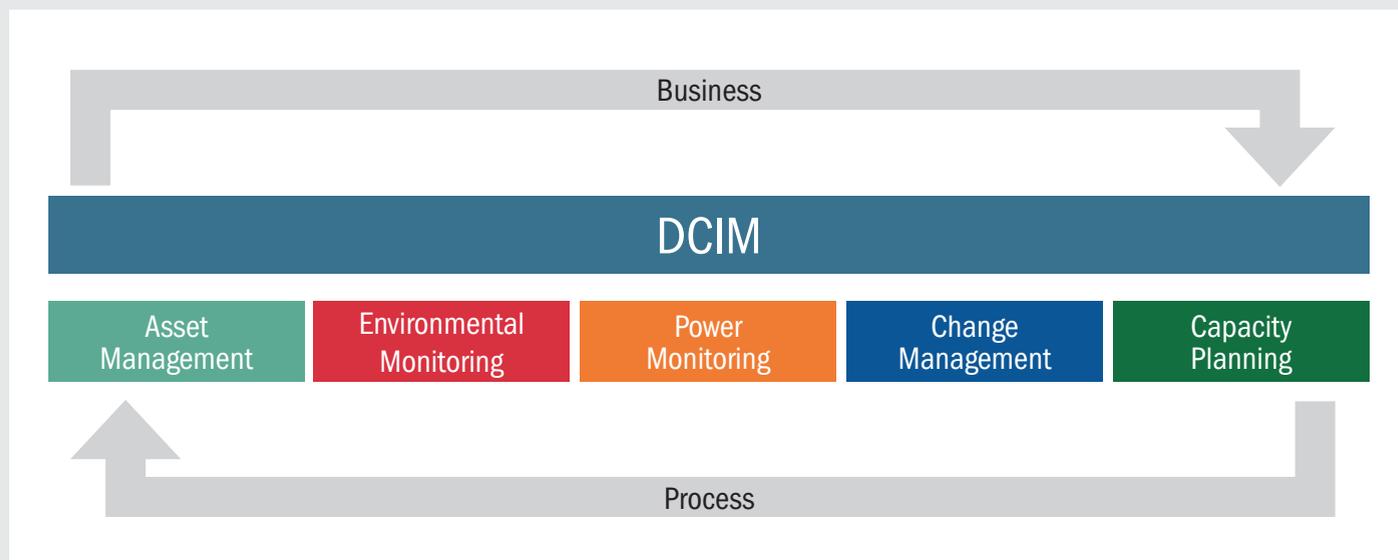
To learn more about Anixter's approach to better enable DCIM in the data center, attend our webinar co-hosted with DatacenterDynamics on December 3 by registering at anixter.com/datacenterdynamics.



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Five senses of DCIM.



Campaigning to lead the EU

The Grand Duchy of Luxembourg has cloud-friendly laws and lots of Tier IV data centers. *Bill Boyle* asks, can it become Europe's new IT hub?



Bill Boyle
Global Managing Editor
@BillBoyleDCD

Luxembourg is a small, stable country strategically located in the heart of Europe. Apart from a wobble around 2008, when the world financial crisis disrupted its economy, it has been a haven of financial stability. It has a high standard of living, half of its 563,000 inhabitants are trilingual, and its coalition-driven centrist government wants to make it the data center destination for all foreign companies. So can

it do it? Luxembourg's government has taken a strategic view of IT and connectivity for the past few years – and it's no empty public relations campaign. The country has fast broadband, and a media and IT industry with a modern legal and financial framework.

A government-owned and privately run company, LuxConnect, is speculatively building data centers. The most recent, DC1.3, has just been opened at the company's Bettembourg Campus.

Could this become the data center destination for North America?

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“We already have household brand names in our data center campuses – DC1.1 and DC1.2 – so building the new data center wasn’t a leap of faith,” says Claude Demuth, business development manager at LuxConnect.

Seven of Luxembourg’s 10 data centers are Tier IV design certified, with other certifications, including ISO 9000. DC1.2 has gone for the highest quality it could achieve, while still leaving openings for those companies that also transact with a Tier II data center rather than a Tier IV one.

Luxembourg’s laws were recently changed to make digital business easier, with a major update to the country’s Commercial Code (see box). Many companies welcomed Luxembourg’s change to its Commercial Code, among which is KPMG: “This legislative change mainly aims at making cloud computing, e-archiving and data center activities in Luxembourg more secure.”

The country is one of the first to offer cloud-friendly legislation with data reversibility, the protection of electronic transactions to PCI DSS level 1 and secure electronic archiving procedures.

Security in Luxembourg’s data centers is particularly tight, boosted by the work of the Computer Incident Response Center, Luxembourg. Some security services are provided by the government, providing security as an infrastructure; for example, incident and response and early warning (BGP ranking) and Exchange of Indicators of Compromise (MISP).

For businesses prepared to collaborate with Luxembourg’s universities, there are direct opportunities for companies to outsource research. Luxembourg already hosts a large number of international brands, these include PayPal, Mangopay, eBay, iTunes, Amazon.com, Rakuten, Huawei, Skype, Vodafone, eSante, Barnes & Noble and many more.

There are more than 28 different fiber routes to Luxembourg, including eight Tier I carriers, among which are AT&T, BT, Cogent, Level3, NTT Communications and Verizon. There are direct low-latency circuits, from Luxembourg to Brussels (3.5ms), Frankfurt (4.5ms), Kehl, Saarbrücken, Amsterdam (6ms), Paris (4.8 ms), Strasbourg (4.8ms), London (8ms) and Slough.

“We are convinced that Luxembourg can provide a stable, innovative and agile platform for the most ambitious of companies, particularly those entering the EMEA market for the first time,” says Demuth. “London, Amsterdam and Frankfurt are great cities, but we can provide the highest-quality data centers and interconnects for every industry.”

Another area where Luxembourg scores well is the reliability of its power supplies. The average outage per year is 10 minutes, making it number one in Europe, compared with the UK’s 68 minutes and Italy’s 132.

“Luxembourg has to try harder than other data center locations,” says Demuth. “We have the highest concentration of Tier IV facilities in Europe. However, we saw the need for advanced Tier IV facilities housed in the same building as Tier II facilities, therefore we provide an almost unique mixture of both, side by side in the data center.”

The same applies to the cost of grid energy, which is lower only in Montenegro, Kosovo and Bosnia. All of Luxembourg’s data centers run on renewable energy, but some are much greener than others.

Tom Kettels, senior ICT advisor to the Luxembourg government, says: “We are a small country but located in the heart of Europe, with a well-educated, multilingual workforce. We also have a high volume of commuters, approximately 170,000 per day, or 45 percent of the workforce, who come in daily from Belgium, Germany and France. We therefore have an extensive pool of IT talent to draw on – 46 percent of the population are of foreign origin.”

Now the question is, why would an American company looking for a European base choose Luxembourg over London, Amsterdam or Frankfurt? Kettels says: “We have a stable and very safe country, with a well-educated population, great transport links, low taxation fixed for three years for incoming companies, and great universities that form an innovative IT hub. Our energy prices are lower than Amsterdam or France, and the total cost of ownership of one of our Tier IV N2+ data centers is less than an equivalent Tier III in any of our nearest rivals.”

The question of latency is one that is often asked, but latency will only be a problem if you need to do high volumes of high-speed trading. For all other jobs latency is well within limits. The only other problem would be if you had to store and retrieve large amounts of data from abroad, and bandwidth charges may become an issue unless you owned your own interconnect.

Vincent Koller, partner and head of management consulting at KPMG Luxembourg, says: “We carried out the first IT outsourcing study for the financial and insurance industries in Luxembourg, *IT Outsourcing Provider Study*, and it was quite clear that Luxembourg has many strong advantages over other traditional European destinations. It has the lowest corporate tax rate in the EU, ultra-high bandwidth and connectivity via direct fiber connections to all the main EU hubs, and extremely low latency.” Maybe Luxembourg just has to shout a bit louder to get its message across. ●

Clearing the clouds

Recent changes to Luxembourg’s Commercial Code are intended to ensure that if a provider of distance IT services or cloud computing goes bankrupt, its customers are allowed to recover their stored data. It also demands that data confidentiality is kept in these cases.

The new Code gives a right to claim back intangible and freely exchangeable movable assets from a bankrupt company, and data in particular, as long as:

- The bankrupt company must not be the legal owner of the data but only hold it.
- The claimant must have entrusted the data with the bankrupt company or be the legal owner of the data.
- The data must be separable from other intangible and non-fungible assets of the company at the time of the bankruptcy proceedings opening.

The law also states that the claimant companies are responsible for the related data recovery costs.

Developing: the Apache Way

The Apache Software Foundation resists attempts at modernization. Max Smolaks investigates the reasons



Max Smolaks
News Editor
@MaxSmolaksDCD



The Apache Software Foundation has had a profound impact on the technology landscape. This non-profit enables developers from various, often competing, commercial organizations to collaborate on open source software. It has long been trusted, with visionary projects emerging from the academic world – such was the case with Apache Spark. We can thank the ASF for such everyday tools as the HTTP Server, Tomcat, Cassandra, Drill, Hive and Hadoop.

In total, the foundation now manages almost 280 top-level projects, plus 44 ‘podlings’ in incubation stage – and it does all this with an annual budget of just \$1m. Despite the relative absence of money in ASF, the number of contributors to its projects has been growing steadily since it was incorporated in 1999.

The successful track record of the foundation has been attributed to its unique approach to governance, reliance on mailing lists, meritocracy and almost scientific rigor – all collectively known as ‘the Apache Way’.

The rules state, for example, that a business can’t be a member – only individuals are accepted. To be granted the right to commit source code to the project, a developer has to have a proven record of participation, before the matter is put to a vote by existing committers.

To get an insight into the current state of ASF, we asked Rich Bowen (aka Dr Bacchus), the executive vice president of the foundation. By day, Bowen is an open source evangelist at Red Hat, where he looks after the RDO Project. By night, he writes documentation for Apache projects and works with the community. The meeting took place in Budapest,



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where the ASF was holding two independent events, dividing its annual conference for the very first time into ApacheCon: Core, and ApacheCon: Big Data.

According to Bowen, the split is meant to reflect the range of projects within ASF. At the time of the very first ApacheCon, the foundation was managing just two or three projects. Today, it has arrived at a point where it can't host enough sessions to cover everything it does. It's no secret that the most active projects at Apache today by commit volume and download volume are 'Big Data' tools, so it made sense for these to get a separate event, although both are still hosted in succession at the same venue.

So what does Bowen think about the track record of the ASF? "If you look at just the web server market, we're half of that. Hadoop is a very important player in the Big Data world. Lucene and Solr are very important in the search engine world. Tomcat is a major player in web applications.

"The Apache Traffic Server – which hardly anyone has ever heard of – is a traffic accelerator and caching service used to deliver huge quantities of data on the web without ever being visible to anybody. So, yes, I'm very proud to be a part of the Apache Software Foundation. I think what we have done has changed the world."

But running the non-profit presents its issues, chief among which is the need to increase its membership while keeping all the traits that make it unique. "When we were two projects, everybody knew what 'the Apache Way' was. As we started to bring on more and more projects, it became obvious that not everyone did," Bowen explained: "Trying to maintain our culture while

growing – you see this in any big company as well – is a huge challenge. You see projects that come in and want to be a snowflake, they want to do things their own way while benefiting from being part of the foundation.

"Holding that line and remembering why it's important has been a real challenge over the years, as more and more people come into the foundation who don't have that back story, that history."

Bowen admits the ASF is not right for everyone, and developers who want to join need to know what they are getting themselves into. His advice to them is to spend a few months watching the mailing lists – in particular, the incubator mailing list.

"The incubator is the part of our organization where we take a project and we say: here's how you become part of the foundation. We train them on the collaborative decision-making process as we see it."

And then there's the financial question. The foundation strives to provide software for the public good, so most of its work is done by volunteers. Out of its \$1m budget, the ASF spends 75 percent on physical infrastructure.

Bowen explains that projects are indirectly funded by the companies that have a vested interest. For example, the Hadoop project enjoys resources donated by a dozen different companies to run continuous integration systems and new-builds.

"CloudStack is a great example of this. People in the media seem to believe that CloudStack is a Citrix thing. In reality,

what you see in Citrix is a small player [in development] and most of the people involved in developing CloudStack are folks who use it in their own infrastructure, so they provide developers and resources.

"Citrix sells a product that's based on this and that's wonderful – we wouldn't survive without their sponsorship of the foundation – but it's all these people who rely on the software and so contribute back to it."

So if the ASF is so reliant on tradition, what, if anything, would Bowen want to change about it? "I would like to see more Africans involved in our projects. We have a lot of Asian participation, and we have nothing from Africa – and I'm African myself. I want to see more women participating. I want to see less of us, old white guys, defining who the new white guys are that join our projects. This is a big thing that is

really important to me over the coming 20 years – that we fix that. It's going to be difficult, because the people who are trying to fix it are the ones who caused the problem – but we are making slow progress."

Critics of the foundation say that the Apache Way is old and inflexible. They say the rules are too strict and public voting slows down the

development process. But they can't ignore the impact of Hadoop, or the meteoric rise of Spark. Or the fact that despite occasional criticism, the ASF still attracts hundreds of new contributors and dozens of projects.

The Apache Way is still delivering results, and in the age of agile development, automation and daily builds, it remains faithful to its original orthodox open source model. ●

\$1m
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we have done
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The answer is blowing in the wind...

Believe it or not, Hurricane Sandy helped build a data center in Secaucus, New Jersey – which also won a green accolade. *Michael Kassner* reports

Commercial data center operators are at a disadvantage when it comes to site selection. Being near their customer base is critical. That can reduce the opportunities to use environmentally-friendly cooling and power-generation options.

So when a commercial site such as Internap’s newest data center in Secaucus, New Jersey, obtains a US Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) Platinum certification, it certainly means something.

The LEED award says the Secaucus data center is saving money and resources, having a positive impact on the health of occupants, and promoting renewable, clean energy. To determine that, USGBC employs a rating system consisting of several credit categories. “Within each of the credit categories, there are specific prerequisites that projects must satisfy, and a variety of credits that projects can pursue to earn points,” says the LEED website. “The number of points the project earns determines its level of LEED certification.”

Over the following page are some of the categories in which the Secaucus data center obtained the LEED Platinum rating. ►



Michael Kassner
US Correspondent
@MichaelKassner

► **Energy and atmosphere:** More than 90 percent of the facility's equipment (computers, printers, even refrigerators) is Energy Star certified by the US Environmental Protection Agency.

Materials and resources:

More than 90 percent of all construction and demolition debris was recycled instead of going to landfill.

Regional priority: The USGBC prefers construction materials to be obtained from local sources (within 500 miles). Internap exceeded the requirement of 20 percent, with 60 percent of the site's building supplies locally sourced.

Green infrastructure and buildings:

More than 40 percent of construction materials had recycled content from pre- and post-consumer materials.

Water efficiency: Efficient plumbing gave water savings of 40 percent.

How can a hybrid facility offering cloud, colocation and managed hosting services obtain these valued environmental certifications, when the facility cannot be fine-tuned like single-purpose data centers?

We put the question to Randy Ortiz, VP of data center design and engineering at Internap. Ortiz

has managed the creation of more than one million square feet of data center space around the world in the past two decades.

After what seemed like forever, the team finally called. The area was dry!

He started with

Internap in 2009, and then CEO Eric Cooney warned him the company had plans for five new data centers. Ortiz quickly pulled together an internal team of electrical and mechanical experts, and people versed in site selection.

To work at the speed required, Ortiz and the team opted for data centers that are as similar and modular as possible.

That saves money, reduces build time, and it means staff can walk into any data center and know how it operates. The sameness and modularity means data centers can be built quickly – in approximately five months.

With Ortiz and the team working through the details, the site selection group started looking for real estate. Site selection is vitally important to Ortiz, but not for the same reasons that companies such as Apple or Facebook choose a site. Internap locates its data centers to serve the largest number of businesses possible.

The Secaucus site is close to existing customers, was approved by upper management, and the area has support from utilities, government agencies, and connectivity providers.

But there was one potentially show-stopping concern. The city of Secaucus is located near the Meadowlands, a low and swampy area in New Jersey, and finding a site above the 500-year flood mark seemed unlikely. The site selection team, however, managed to find one spot on a slight hill that looked promising, but they had some

LEED Platinum

Secaucus – a look at how it measures up:

- **Energy and atmosphere – 90 percent of the equipment is Energy Star certified by the EPA**
- **Materials and resources – 60 percent of construction materials were locally sourced**
- **Green infrastructure – 40 percent of building materials were recycled**
- **Water efficiency – 40 percent water savings from efficient plumbing**

reservations. Ironically, Superstorm Sandy put those concerns to rest.

As Sandy rolled through the eastern portions of New York and New Jersey, it tried its best to flatten and/or flood everything in its path. Once Ortiz knew that conditions were safe, he sent the site selection group to inspect the proposed site. "After what seemed like forever, the team finally called," Ortiz says. "The area was dry, and they could drive right to the location without any trouble."

That news eliminated the last hurdle, and the project went forward, with the 110,000 sq ft data center being commissioned in January 2014.

At any given time, Ortiz and his team have one or more data centers in the build process. How does he keep everything straight? "Priority number one: team up with the right people."

Selecting the right people also applies to the contractors and builders who do the actual work. "We do not hire the company per se, we hire the people in the company. That way we think alike and things go a lot smoother."

Every Internap data center build and upgrade Ortiz has overseen is concurrently maintainable, offers maximum availability and, as the LEED Platinum rating suggests, is energy efficient. "Certifications are a bonus," adds Ortiz. "We intend to meet current best practices, regardless if it impacts the bottom line."

He doesn't use the Uptime Institute Tier-rating certifications, though: "We approach every build with customer feedback and requirements in mind, and we just aren't seeing demand for tier ratings. Our facilities are built to SOC 2 Type II availability and security standards, and clients are always welcome to bring in a third party to ensure we meet their criteria."

Ortiz is clearly into his job, but what does he like best? "It is a challenge I cannot get anywhere else – the variety, having an impact, and helping customers," he says. "I know it may sound corny," adds Ortiz. However, it all comes down to people caring about the product, caring about lives – other people's lives. ●

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Know your embodied impact

As data centers become more efficient, their embodied impact will be more significant, says *Robert Tozer*

Human life on earth is currently unsustainable due to excessive consumption and emissions, with time running out to prevent the worst impacts of climate change.

Lifecycle assessment is a methodology that measures the environmental impact of a system over its entire lifecycle – from raw material extraction, production and manufacturing, to the use phase, end-of-life and final disposal. It includes human health, ecosystem quality, resource depletion and climate change.

Most data centers measure their energy efficiency and electricity usage during operation, but ignore the production, transportation and disposal of the materials, components and systems used.

In 2015, Beth Whitehead and Amip Shah assessed the lifecycle of a UK data center. The main contributors to total environmental impact are energy consumption, energy mix (electricity source) and embodied impact of IT and mechanical and electrical (M&E) systems.

For a UK facility using free cooling with a three-year server refresh rate, the operational impact is four times that of the embodied impact, Whitehead found.

But a similar facility located in Sweden could achieve an operational impact of half its embodied impact, by using more servers and reducing energy consumption through IT consolidation and virtualization.

IT equipment is the largest energy consumer in most data centers, and if this is reduced it has a cascade effect on M&E energy consumption.

For most existing data centers, cooling is the second-largest energy

consumer. The largest part of this is from the refrigeration compressors, followed by fans and UPS losses.

New facilities designed for low energy consumption in favorable climates can achieve a PUE of around 1.2 by using free cooling to minimize refrigeration requirements. This can be facilitated by increasing temperature set points and air management.

Renewable energy sources produce lower carbon emissions than fossil fuels, and have positive branding and corporate social responsibility benefits.

Whitehead and Shah showed that the embodied impact of the IT equipment is double that of the M&E equipment, and both together are many hundreds of times that of the building itself. Despite this, building assessments such as LEED and BREEAM do not consider the embodied impact of IT and M&E equipment.

The main embodied impact from IT equipment stems from the disposal of waste products from the manufacture of components; in particular, toxic sulphidic tailings. Design decisions such as zero refrigeration and avoiding excessive redundancy can reduce embodied impact.

The full embodied impact of data center equipment and materials is still largely unknown, but organizations can measure it with lifecycle assessment. Environmental leadership could increase brand value, reduce total cost of ownership and increase profitability. ●

Beth Whitehead and Sophia Flucker contributed to this article

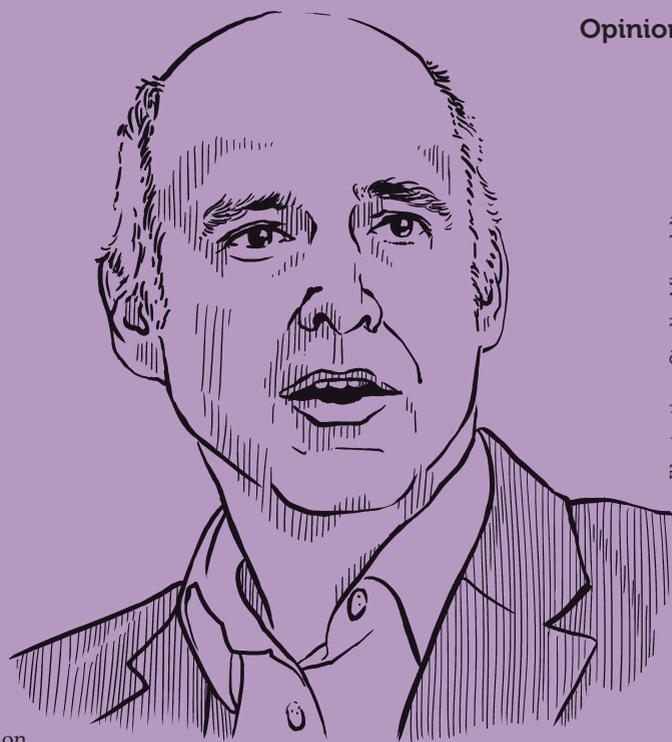


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The embodied impact of equipment is hundreds of times that of the building, but LEED ignores it

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On the surface, mining for crypto-currencies seems like an ideal application for data centers. The technology requires lots of power and significant cooling, yet places little demand on expensive data center technologies such as high availability, replication and backup. A web search will find dozens of sites that are promoting cloud-based currency mining, but drilling down into the technology paints a confusing picture.

The best known, and most valuable of the crypto-currencies, bitcoin, has had its ups and downs, with a peak value of more than \$1,000 crashing quickly to the \$500 range and continuing a low decline to where it seems to have stabilized in the mid to high \$200 range at the time of writing. And with such a volatile currency, it is unsurprising that companies set up to take advantage of bitcoin mining have been equally unstable.

The brief history of crypto-currency mining is filled with a litany of complaints to regulatory authorities, as everything from basic mining hardware to large-scale cloud mining entities have failed to live up to the claims made by the vendors. The fledgling crypto-currency sector has been plagued with hardware announcements that took pre-orders for products that never saw the light of day, and vendors declaring bankruptcy after losing tens of millions of dollars of investor and customer money.

Few things highlight the duality of the currency mining business better than events of January 2015. First, currency mining darling BitFury, fueled by additional venture capital investment in 2014, bought immersion-cooling company Allied Controls to help it build better, more efficient data centers focused on currency mining. And then well-known bitcoin mining company CoinTerra declared bankruptcy, having managed to hit almost all the highpoints of bitcoin failure, including late or non-delivery of hardware, failure to refund monies owed, and not paying its colocation data center bills. Having failed at almost every aspect of the currency mining business, it left the business with somewhere in the range of \$10m to \$50m in liabilities.

Even today, anyone looking into the state of crypto-currency mining will find a surprisingly large number of dead links and suspended web pages, even from reference websites that are actively updated. We decided to investigate two different approaches to currency mining: actual mining, with equipment bought from hardware vendors, and the use of third-party cloud-based mining services. The complexity involved in determining where consumers should spend their money is significant, and not for the faint of heart.

There's gold in them there clouds!

Bitcoin mining seems like a good match for data centers, but is it a viable business model? *David Chernicoff* reports



David Chernicoff
US Correspondent



@DavidChernicoff



These systems take a lot of power...



... and generate a lot of heat

With such a volatile currency, companies that handle bitcoin mining are equally unstable

Crypto-currency mining started out as something that could be done with standard computing hardware, but it has evolved to the point where specialized systems using ASICs and large power supplies are the bare minimum for effective mining. These systems, even in small incarnations, take a lot of power and generate a lot of heat. This has led to an interesting data center incarnation – the currency mining colocation provider.

These facilities allow customers to send them as little as a single mining system to run in their dedicated hosting facility, giving the customer access to their systems and providing a location, power and cooling so the mining rigs can run in an optimal fashion. These colo facilities price their services based on how much power the customer plans to use, generally on a kilowatt per month basis, with the unit power price going down as the customer power commitment goes up.

Like cloud currency mining facilities, these colocation providers don't necessarily look like what you'd expect a data center to be. As these facilities want to support any customer-

provided currency mining rig, traditional 19 in-racks may not be appropriate, and custom facility providers such as AsicSpace use simple industrial shelving in lieu of traditional server racks. Meanwhile, other colocation providers such as the bitcoin company SAIC Hosting have contracted with more traditional wholesale data center space providers. In SAIC's case, it uses the Quincy, WA data center run by Dell.

Cloud mining for crypto-currencies has definitely been a boon to the data center business. BitFury has opened multiple data centers in Iceland and the Republic of Georgia, where it has also invested sufficiently to create an entire technology park that is a boon to the local economy. Genesis Mining has a dedicated facility in Iceland, while other data centers have been built in areas as diverse as Estonia and China.

The nature of currency mining means that cheap power and cooling are the driving factors in selecting where their data centers are located, to the exclusion of almost every other traditional data center decision factor. With the price volatility of individual bitcoins,

minimizing the cost of mining is critical for successful operation. Without driving the cost of mining down, currency mining becomes a crapshoot, with investors wagering that crypto-currency values will reach a point where their mining costs still make it profitable. Is that a lot of water?

This list of colo and cloud providers (see box) is nowhere near complete, and there is no guarantee that any of these operations will still be in business by the time you read this. Many of the sites are hosted in small dedicated data centers in Eastern Europe, while others are using commercial wholesale data center space or traditional colocation providers to host their servers.

Before making any financial commitments to any of these providers, significant due diligence is required, whether as an investor, user, or potential data center host. Currency mining information site Coindesk (www.coindesk.com) is a good place to start for current information on what is happening in the crypto-currency business, while community forums such as www.reddit.com/r/bitcoin provide a great deal of feedback about individual vendors and current happenings in the crypto-currency world. ●

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- Nimbus Mining
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- Pacific Cloud
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- Terabox
www.terabox.me

Information sources:

- www.coindesk.com
- www.reddit.com/r/bitcoin



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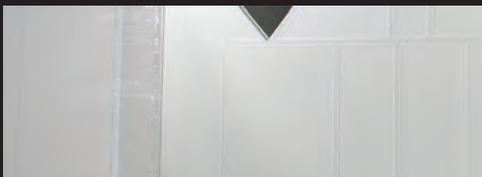
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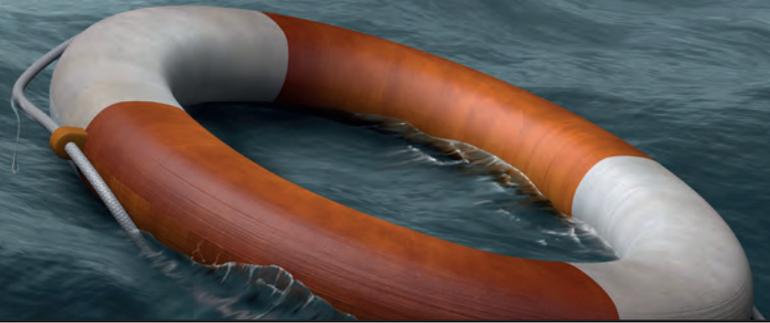
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Lost at sea

The framework that facilitated the exchange of customer data between Europe and the US is dead in the water. What happens now?



Max Smolaks
News Editor



@MaxSmolaksDCD

In the beginning of October, the European Court of Justice (ECJ) ruled that the Safe Harbor framework that enabled the flow of customer data from the EU to the US for the past 15 years is, in fact, invalid. The ECJ said that no American business could guarantee that personal data would be safe from the prying eyes of the US intelligence agencies, as required by the principles of Safe Harbor. This decision is final and cannot be appealed.

The change in regulation came as a result of a complaint filed by Austrian privacy activist Max Schrems against Facebook in Dublin. Those who have followed the case – mostly lawyers and fellow privacy activists – knew this outcome was possible.

The instant demise of the framework caught businesses and privacy regulators by surprise, put transatlantic relationships at risk, and paved the way for future lawsuits. And it's all the fault of Edward Snowden.

European regulators treat the issues of data privacy much more seriously than their American counterparts. The reasons are mostly historic: for example, Germany still vividly remembers Stasi, the surveillance apparatus of the Communist government. Other EU

states with 'Big Brother' heritage include Greece, Italy, Portugal and Poland.

The EU had to find a way to make its citizens' data available to US businesses for economic reasons.

The Safe Harbor framework was proposed by the US Department of Commerce and adopted by the EU in 2000. It outlined seven principles to give an "adequate level of protection" of data in a non-EU country, as per the 1995 Data Protection Directive.

Organizations must notify individuals that their data is being collected, allow them to opt out and, most importantly, make "reasonable efforts" to prevent loss of information.

But Safe Harbor enforcement has long been criticized as ineffective. The framework allowed self-assessment and just assumed that organizations would comply. The European Commission has no power to force American companies to submit to an audit.

In 2010, management consultants Galexia found 1,597 organizations on the Safe Harbor list, of which only 348 met even the most basic requirements of the framework. Many had no publicly available privacy policy, while some had a policy that was two sentences long. Researchers also found 206 organizations that claimed ►

"Companies need to be careful that they are not breaking the law when using third parties"

Toby Duthie
FORENSIC
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► membership of Safe Harbor, but were not present on the list. Despite this, the framework remained.

In 2013, we saw the first reports of indiscriminate mass surveillance by entities like the National Security Agency (NSA). Especially riled were the Germans, after it emerged that their beloved Chancellor was targeted by US allies.

Activists pored over the documents published by *The Guardian*, *The Washington Post* and *Der Spiegel*, and Schrems realized his personal data could have been compromised so he launched a legal challenge in Ireland, where Facebook has its European base.

The Irish High Court realized the case's importance and referred it to the ECJ, which sided with Schrems, creating a legal limbo. In a nutshell, the court told privacy regulators across Europe that they should ignore the framework approved by the European Commission and look at the facts, suggesting that American businesses cannot be trusted due to the activities of the NSA.

The Irish Data Protection Commissioner will have to decide whether Facebook has adequately protected European user data, and whether it should block transfers of such data to the US – and this might be the first of many such cases. This could affect any business that uses infrastructure in the US to process EU citizen data. European regulators said they will not take co-ordinated enforcement action, at least until the end of January 2016, but in the meantime they will be required to respond to user complaints.

“The judgment means that businesses which use Safe Harbor will need to review how they ensure that data transferred to the US is done so in line with the law. We recognize that it will take them some time to do this,” said David Smith, deputy commissioner at ICO, the British privacy watchdog, adding that some transfers already take place based on different provisions.

American businesses have several options, the easiest of which is to simply move their data processing to Europe. Alternatively, they can negotiate agreements that satisfy European regulators (see box).

If none of these measures are in effect, and personal data is still exchanged, a business

could be taken to court by its customers.

“This puts a profound burden on companies – and more than 4,000 have been relying on Safe Harbor provisions – to ensure they are not breaching EU data protection laws when they transfer data to the US. Companies need to be especially careful that they are not inadvertently breaking the law when using third parties – such as outsourcing companies and specialist IT providers,” commented Toby Duthie, partner at Forensic Risk Alliance.

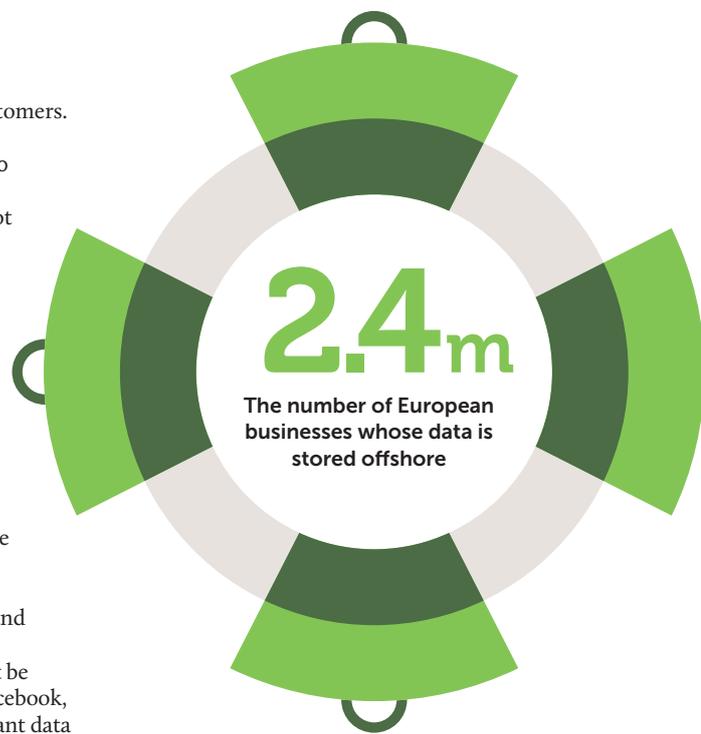
“This will complicate the regulatory environment in Europe and affect how corporate entities and their advisors analyze data for marketing, fraud prevention and response to litigation,” he said.

“The biggest casualties will not be companies such as Google and Facebook, because they already have significant data center infrastructure in countries like the Republic of Ireland. It will hit medium-sized, data-heavy tech companies that don't have the resources to react to this decision,” warned Mike Weston, CEO of data science consultancy Profusion. “Many of these businesses will reconsider how and whether they operate in Europe, which is bad news for everyone.”

A replacement may emerge, somehow taking intelligence agencies into account. By the time the ECJ announced its decision, the EU was already in negotiations with the US to develop a revised set of principles that could replace Safe Harbor. But the demise of Safe Harbor is not the only thing on the European lawmakers' minds.

The European Commission is working on an updated General Data Protection Regulation – likely to be approved by the end of 2015 or early 2016. This document is expected to introduce even stricter rules and give significant powers to EU regulators, with the European Parliament able to levy fines for non-compliance of up to €100m, or five percent of global turnover. For Facebook, that could be as high as €500m.

Seriously, just get that data center in Europe. ●



What are the options for American businesses?

- They can simply move processing to data centers in Europe.
 - They can use one of four 'model contract clauses' approved by the European Commission to satisfy privacy regulations, without having to make their own assessment of data protection measures.
 - Larger organizations can adopt Binding Corporate Rules (BCRs), specifically designed to allow them to transfer personal data, although the related policies and procedures have to be approved at a European level – a process that could take some time.
 - Some online retailers can obtain direct consent to data transfer by simply asking their users.
 - Pseudonimization, or anonymization, of data is another way to operate within the law.
- If none of these measures are in effect, and personal data is exchanged, a business could be taken to court by its customers and partners.

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When DCIM met ITSM

DCIM delivers results, but ITSM integration makes it even more valuable, says *David Chernicoff*



David Chernicoff
US Correspondent

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There is no question that data center infrastructure management (DCIM) has been recognized as a valuable piece of the data center puzzle. However, there are many different ways to approach DCIM, as well as methodologies to integrate it into larger hardware/software and ITSM solutions.

ITSM (IT service management) refers to all of the activities – directed by policies, organized and structured in processes and supporting procedures – that are performed by an organization to plan, deliver, operate and control IT services offered to customers.

Current technologies provide information about your data center infrastructure. Making information usable and relating it to your other IT data is where the real value lies.

One of the biggest problems when dealing with the wealth of DCIM solutions is trying to integrate them with your existing IT management tools, since DCIM tools often cross the divide between traditional IT and facilities management.

DCIM vendors have addressed this issue by providing tools and services. Some are offering direct connections to major management platforms from vendors such as HP and BMC. The tools allow IT to get a real world view of critical infrastructure issues.

IT departments have often been completely insulated from facilities issues, regardless of their impact on IT. As operating costs grow, this is no way to run a data center, and tighter integration between facilities and IT means increased value in DCIM and ITSM.

Smaller DCIM vendors are disadvantaged by the lack of integration with larger management systems and often seem blinded by the abilities of their solutions. When asked how they plan to integrate with other tools or large-scale management systems, the responses most often look to place the responsibility on the customer.

Offering just SNMP information doesn't cut it any more, and the very common response – “we have an open API” – is equivalent to saying “you need to write code to integrate our product with what you use, or pay us to do that for you.” Neither answer builds confidence in the user.

This is why the technologies of DCIM and ITSM are converging. Once users got their hands on DCIM tools they realized that the data they delivered would be invaluable in refining their ITSM processes and procedures. Ad hoc and makeshift integration between the two technologies demonstrated the value of this approach. As customers ask for tighter integration between tools, vendors respond.

Hardware vendors are actively working with DCIM vendors to provide the hooks necessary to deliver information about their products. DCIM vendors are taking that data, organizing it, and feeding it to integrated ITSM solutions.

Rather than releasing a single DCIM package, CA Technologies approached it as a process; slowly integrating DCIM tools into their primary product CA Unified Infrastructure Management, allowing existing customers of their Unified Management tools to add not only CA DCIM but a range of third-party products as well. They have also enabled customers who are using third-party hosting services that deploy CA DCIM to receive the data from that host through their own CA management tools.

This approach gives customers choices and allows for a staged implementation of the solution. By not requiring the use of CA products at every level, the company has enabled users of the CA solution to save on their existing investments.

Schneider Electric, which produces a suite of data center management tools under the name StruxureWare for Data Centers, takes

DCIM

Data center infrastructure management tools monitor, measure, manage and/or control data center utilization and energy consumption of all IT-related equipment, such as servers, storage and network switches, and facility infrastructure components such as power distribution units and computer room air conditioners.

ITSM

IT service management is a strategic approach to how IT is used in an organization. Its goal is to ensure that the right processes, people and technology are in place, and it is often associated with ITIL (information technology infrastructure library).



the view that it needed to provide its tools with a better look further up the stack, and into VMs and applications running on the hardware that their DCIM products could already see. To this end it worked with HP's Composable Infrastructure Partners Program. Schneider's integration with HP OneView Advanced means that the automatic asset identification and analysis data that HP acquires when a new device is added to the network is passed to the DCIM software. Users can see information from both products, giving them a more detailed look into, and control of, their environment.

A different approach was taken by CommScope, which chose to partner with HP and its Converged Management Consulting Services. In this environment, HP uses the CommScope iTRACS DCIM solution to deliver those services to customers looking to build DCIM into their HP infrastructure. HP customers are provided with what the team thinks are the most appropriate solutions for the project.

Siemens went back to its roots for its Clarity DCIM product, according to Philippe

Hiem, global portfolio manager: "In designing our Data Center Clarity LC solution, we went back to basics. We looked at the tools we were using in our own product environment and found that two we were already using were doing an excellent DCIM job."

In his view, operators need vendors that can impose a logical approach. "The reality is that what data center operators are looking for is outsourcing. They are looking at their staff's rather haphazard methods of collecting information, and they would like to automate through DCIM solutions." Without this, staff use temporary 'fixes' such as spreadsheets, and if key staff leave there is no way to continue to collect and use this information.

Nlyte software has taken the most aggressive approach to integrating DCIM with ITSM. On its own, the company has developed a connector framework and now offers direct integration of its DCIM software with the three most common ITSM offerings. It has produced three editions of

its own solution into Nlyte for HP ITSM, Nlyte for BMC ITSM, and Nlyte for Service Now ITSM. It has also developed framework infrastructure to allow rapid integration with any ITSM platform currently on the market. Nlyte claims that the process can

be completed in days, rather than the more common month-long projects to build this type of integration.

Siemens would not agree. Hiem said: "It is important not to say to a client, 'We can do everything for you quickly' because you can't. We do it in real time and we don't deploy all of our DCIM modules at once."

Regardless of the approach taken, it is clear that DCIM

and ITSM are on convergent paths. Eventually, customers will be able to deploy end-to-end solutions that combine the features of both technical approaches. It is most likely that future products will be integrated modular tools rather than large, monolithic applications, but the end result will be a combined delivery of information from both facilities and IT points of view. ●

It's important not to say, 'We can do everything for you quickly'



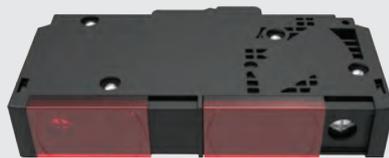
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Are you ready for open shaming?

Vendors that pretend to be 'open' may soon meet their nemesis, says *Peter Judge*



Open, commoditized IT equipment doesn't just save money, it enables better data centers. When customers escape vendor lock-in, they gain flexibility, and when the hardware and software they buy is truly open (as in open source), they gain the power to get exactly what they want.

That's why DCD runs StackingIT as a platform to track the progress and explore the possibilities with open technologies. But there's a problem: how do we know that vendors are being truly open? When manufacturers present their equipment as "open" it can mean a number of things. There could be open APIs. It could comply with formal or de facto standards. Or the product could be based on open source code and designs, so you can see exactly how it works and how it might be improved. Though even then, there could be caveats.

What if you can only make proper use of this open source product through a proprietary dashboard? What if the open source part of the product provides only a fraction of the functions you need, or is a fork from a better supported open source project?

Because "open" is now seen as a desirable trait, vendors are going to start applying what we might call "open wash" – finding ways to use that label on products that perhaps don't deserve it. And some users will be fooled, because some open technologies are only just finding their way into widespread use.

How do we guard against this? The answer may be emerging from our StackingIT events. The Open Performance Grid (OPG) is a proposal for a chart that will rate vendors for how open they really are.

If vendors are not what they claim to be, the grid could combat their open wash with "open shaming," placing them at the bottom of the open scale for all to see.

It's also more positive than that: the OPG could guide users' buying decisions, placing the power where it should be – in their hands. It might get complicated. "Open" will be measured in various dimensions, including the size of the contributing community to a given technology and the way it is licensed. Different factors will have to be weighted, and maybe weighted differently according to who is looking at the grid.

Take a theoretical example: HP and Dell have both launched servers aimed at service providers. HP's CloudLine servers could well

score higher than Dell's Datacenter Scalable Solutions products, because HP is meeting the Open Compute Project specifications and Dell isn't. To work properly, the grid must be developed by a community in which vendors

and users have broad agreements about how best to collate and present results.

The next step is to see some prototypes, to build some web demonstrations, and start having talks about which attributes will weigh heaviest in the way companies are placed. But at the DCD-as-a-Service event in Chicago, some of these discussions started. We'll come back to the topic again at our London event. We want to produce something concrete in 2016, although it is still being shaped.

As Frank Zappa said: "Minds are like parachutes: they are only really useful if they are open." ●

The Open Performance Grid is a proposal for a chart to rate how 'open' vendors are

DCD Com

Chicago as-a-Service Conference Snaps



Oliver Jones



Joe Weinman

Latin America Awards



Enrique Becerril and Rosalinda Perez from Rittal



Taking a break



Showtime



The ceremonies begin

DCD Converged upcoming events

A world map background with event locations marked by logos and dates:

- New York**: DatacenterDynamics ENTERPRISE THE BUSINESS OF DATA CENTERS, April 19–20, 2016
- Hanover**: DatacenterDynamics CONVERGED THE BUSINESS OF DATA CENTERS, GEBIT, March 14–18, 2016
- Madrid**: DatacenterDynamics CONVERGED THE BUSINESS OF DATA CENTERS, April 07, 2016
- Bangkok**: DatacenterDynamics FOCUS EVENT THE BUSINESS OF DATA CENTERS, January 28, 2016
- Jakarta**: DatacenterDynamics CONVERGED THE BUSINESS OF DATA CENTERS, April 07, 2016
- DCD SÃO PAULO**: Transamerica Expo Center, November 10–11

munity

This month we have hosted the DCD as-a-Service event in Chicago, and DCD Hyperscale in Beijing. Meanwhile, look out for Awards ceremonies in São Paulo, Brazil and London

DCD Awards

BRAZIL

Tuesday, November 10, 2015
Buffet Dell'Orso, São Paulo

EMEA

Thursday, December 10, 2015
Lancaster London Hotel,
London

US & CANADA

Wednesday, April 20, 2016
New York

Research

OUT NOW REPORT

Colocation Provider Investment:
Co-opting the Cloud For Future
Growth

Metropolitan Hub Series:
US West Coast

Metropolitan Hub Series: Singapore

COMING SOON

Digital Realty Trust (DRT)
Case Study (December 2015)

Tencent, Alibaba & Baidu Growth:
Implications for Data Centers
Globally (December 2015)

Metropolitan Hub Series: Beijing
(December 2015)

New Webinars From The Leaders In Data Center Technology

ANIXTER'S 5 SENSES OF DCIM: TURNING DATA INTO INSIGHT, INSIGHT INTO ACTION

Thursday, December 3, 2015, 3pm (GMT),
4pm (CET), 11am (PST), 2pm (EST)
Friday, December 4, 2015, 1pm (SGT)
Speakers: Zachary LaFever,
Director of Technology, Anixter
Stephen Worn, CTO, DatacenterDynamics



Join Anixter's Zachary LaFever and DCD's
Stephen Worn for a LIVE debate on the
different components that make up a Data
Center Infrastructure Management (DCIM)
solution, and how you can align them with
your business' goals to enable a successful
deployment.



[www.datacenterdynamics.com/
webinars/anixter-webinar](http://www.datacenterdynamics.com/webinars/anixter-webinar)

HUMIDITY CONTROL + ENERGY SAVING: IS THERE A SOLUTION?

Thursday, December 10, 2015, 3pm (GMT), 4pm (CET)
Speakers: Enrico Boscaro,
Application Manager, Carel Industries
Rowland Kinch
CEO, Custodian Data Centre



New ASHRAE guidelines have increased
allowances, so do we still need humidity
control? And what about CoLo providers,
with no say over the hardware in their
centers?



Join the debate as Carel's Enrico Boscaro
and Custodian Data Centre's Rowland Kinch
discuss how new adiabatic technologies
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Unless IT security is a standing item on board minutes, we will never crack the problem

Talk, Talk, Talk...

Forty-four percent of all Americans have had their confidential healthcare records breached. In the UK, the government has just declared an inquiry into the cyber security breach at telecom provider TalkTalk data, which has possibly exposed four million customer records. I could rattle off dozens of similar attacks, such as Sony and RSA, and what they all have in common is: A) a lack of attention to security from company leaders; and B) departments full of IT staff who are badly managed, poorly trained and whose morale is at an all-time low. How else can we explain a major ISP that was brought to its knees by a DDoS attack and an SQL injection? This is the equivalent of a Black Hawk attack helicopter being downed by a child with a potato gun.

A fish rots from the head down, the saying goes. At some point many years ago, all vehicle manufacturers lied about their vehicles' mileage per gallon (MPG) of fuel. No one believed the claims of car makers. In fact, my own car tells me regularly that I am achieving 10 percent more miles than I actually drive. I know - I've checked it. And don't tell me that the CEOs and board executives of those car manufacturers didn't know it was happening. But did they move to stop it? No.

The Volkswagen situation was bound to happen as teams of engineers merely moved the lie from MPG to emissions. It was a logical move in corrupt companies.

I have said for years that unless IT security is a standing item on board minutes, we will never crack the 'IT security problem'. What board would not discuss sales figures at every meeting? What would shareholders say if the board left the stewardship of all sales to 'the sales team' and only checked once a year? That is what happens to IT.

As Dido Harding, the CEO of TalkTalk UK, blithely said: "[Our data] wasn't encrypted, nor are you legally required to encrypt it." If I was the CEO of a company that has already been hacked three times this year alone, I wouldn't be keeping my customers' data in the cyber equivalent of paper sacks - I'd have encrypted the files.

Maybe Dido likes playing poker. I suggest she uses her own personal details in future and stops gambling with her customers' data. Cybersecurity is in the spotlight at Europe's largest data center gathering, DCD Converged London - be there or get hacked. Again.

•
Bill Boyle - Global Managing Editor
@billboyleDCD

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