

DatacenterDynamics

The Business of Data Centers



**Causes
of failure**
Why so tight-lipped?



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October 2015 VOL 04 ISSUE 08

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IT + Networks
Understand the implications of IT and network transformation on data center design and architecture.



App > Cloud
Managing blended infrastructures and delivering critical ICT applications through the cloud.



Design + Strategy
The big picture: organisational strategy and design issues for on-premise data centers.



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



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DCD
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To fail is human...

Data centers are failing for no good reason. That was the shocking message of a talk at a recent DCD event. When unexpected failures produce an outage, investigations often reveal that the root cause was a fault that has happened before, and which could have been avoided (page 34).

Non-disclosure agreements are the problem. Data center operators don't want to reveal any of their secrets – even when those secrets could help their colleagues.

With years of experience in this field, Ed Ansett (page 21) is well placed to share the lessons to be learned from data center failures, and you will be hearing more on this subject in future.

There are other approaches to avoiding risk, but all of them have to accept that the majority of failures are the result of human error. Data centers run on technology, but they are run by people, and any attempt to reduce the risks involved has to address the human part of these vastly complex systems (page 23).

On the highest level, geo-politics comes into play, and then well-intentioned governments can dive in with their own attempts to reduce the risk in the sector.


This issue we see two examples where the results have been complicated, to say the least. Russia has demanded that its citizens' data remain on home soil. See page 39 for our thoughts on how that will play out.

And Brazil has made a (possibly impractical) demand that no public-sector software shall have security flaws (page 18). Can the industry work with this demand, without crippling the local market?

But while the human level has to be addressed, the technology of data centers and their deployment is still evolving. In recent months, a new sector has come to the fore, driven by customer needs and new technology. See page 30 for a look at the edge data center.

All this comes together at events, and we will spend a lot of October and November at events around the world, catching up with people and technologies from within the data center community.

I look forward to meeting you there.

•
Peter Judge – Global Editor
 @PeterJudgeDCD



75%

of failure types
have human
error as a
root cause

*Any attempt
to reduce the
risk in these
complex
systems must
address their
human side*

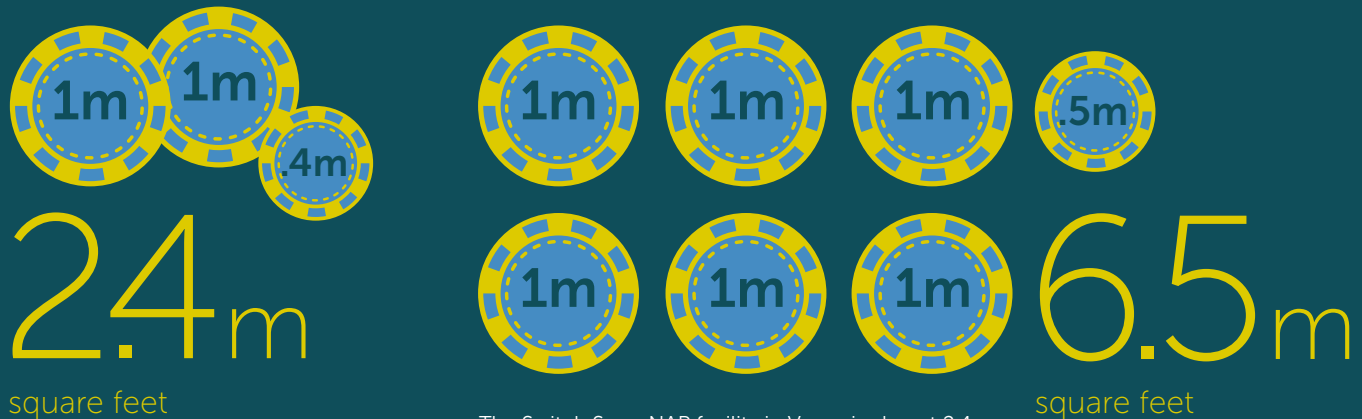
DCIM Environet: The whole picture through a single pane of glass



What's in a data center?

Facts and figures from round the world

NEVADA - SUPERNAPS



The Switch SuperNAP facility in Vegas is almost 2.4 million square feet. Switch is building another SuperNAP in Reno (see p9); at 6.5 million square feet, this could be the biggest facility in the world.

HELSINKI – USPENSKI CATHEDRAL



500

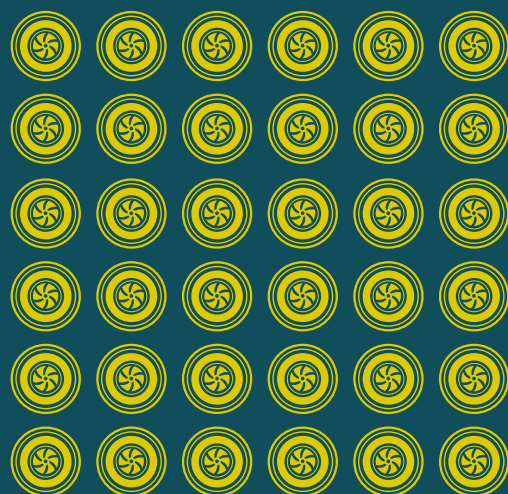
Local homes heated from the excess heat generated from the Uspenski Cathedral in Helsinki. It has a 2MW data center housed in a disused bomb shelter underneath.

CHICAGO – DIGITAL REALTY



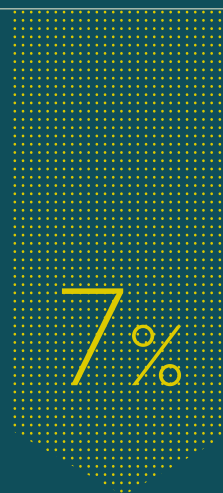
1912

The date 350 East Cermak Road in Chicago was built. Now owned by Digital Realty, the building still maintains some original Gothic features. The facility is one of the largest in the world.



= 5.4
mega watts

Vapor IO has created the industry's first hyper collapsed data center. 36 Vapor Chambers is the equivalent of 5.4MW



enterprise data center space

In the next five years, enterprise data center space in Western Europe will decrease by almost seven percent, while colocation space will increase by more than 40 percent.

colocation space

40%

Going micro...

Schneider Electric has launched a range of micro data centers that include power distribution, cooling equipment and management software in a self-contained, secure container. The range includes the IT room-style SmartBunker SX, an office-friendly SmartBunker CX, a ruggedized SmartBunker FX and a multi-rack SmartShelter.

Azure thinking

Microsoft has made its own version of Linux to handle data center networking in the Azure cloud. The Azure Cloud Switch project provides a cloud-wide, network-management platform, managing switches from vendors using APIs specified by the OCP.

OCP chair

Jason Taylor, VP of infrastructure at Facebook, has been elected chairman of the Open Compute Project, replacing Frank Frankovsky, one of the original architects of the OCP, which supports low-cost commodity hardware/software for data centers.



Switch SuperNAP in Reno: the largest data center yet?

Nevada-based data center provider Switch has revealed more details of its planned complex in Reno, which could potentially be the world's largest data center.

The Reno SuperNAP has a potential size of seven million square feet, and the first stage will be twice as large as Switch's biggest data center in its Las Vegas site. With a \$1bn initial investment, the site could grow to absorb \$3bn.

Switch's SuperNAP will be located across the street from a

huge Apple data center campus, and next to the location where Tesla is building its million-plus square foot battery manufacturing center. Well before it hits the ultimate target of seven million square feet (650,000 square meters), the first stage of the Reno SuperNAP project will be impressive. At 1.2 million square feet (111,000 square meters), Switch claims this will be the largest data center yet, built at more than double the size of the largest building at its Las Vegas data center campus.

With a 300 MVA substation and 80,000 tons of onsite cooling, the facility should be ready to meet the demands of any colocation tenant, the first of which will be ebay, which Switch says will be "taking up the entire back end of the building." The first stage is expected to be commissioned in 2016.

While there are technology benefits to the huge amount of building that Switch plans on doing, such as connections to its SuperLoop high-speed networking infrastructure with its 7ms latency to areas such as Los Angeles, the bigger benefits to the local area might well be Switch's investment in education and the local community.

The University of Nevada, Reno's Innovation Center, is "powered by Switch," which has invested in the collaborative workspace in an effort to drive innovation in the region.

<http://bit.ly/1MAX9tM>

Infrastructure
as a Platform
by Anixter

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Learn how
you can
benefit on
page 12



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6 Years R&D
4 Years Field
Deployment



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Ireland 8MW 2013



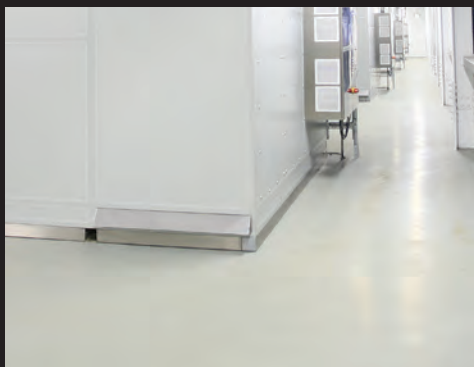
UK 3.6MW 2014



Stainless Steel
and Composite
Construction



Advanced Non-Metallic
Air to Air Heat Exchanger



UK 8MW 2014



UK 5.4MW 2015



Germany 2MW 2015

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europe
18-19 November, 2015
ExCeL, London

'Thousand-Island Lake' in China cools Aliyun data center servers

Aliyun, the cloud division of Chinese e-commerce giant Alibaba, has built a data center beside Zhejiang Province in eastern China, cooled by lake water.

Water from Qiandao Lake, also known as 'Thousand-Island Lake', allows the data center to cool its servers for free 90 percent of the year, and cuts its cooling bill by about 80 percent. The data center is designed to achieve an annual average power usage effectiveness (PUE) ratio below 1.3, as well as a water usage effectiveness (WUE) ratio below 0.2.

According to Xinhua News Agency, water at 17°C is piped up from 35 meters below the surface of the lake, where the temperature is stable. To prevent impact on the lake's wildlife, the water is cooled before being returned there. For the present, this is done by passing the water through a 2.5km central canal across Qingxi New Town, but

Aliyun plans to reuse the waste heat to warm nearby buildings.

The data center also uses renewable energy in the form of solar and hydroelectric power, as well as unspecified custom gear to squeeze more performance per square foot, according to a report in *Fortune*.

Aliyun will open a series of data centers around the world as part of a push to launch its cloud platform globally. It currently has data centers in Silicon Valley and Singapore, and plans to build in Dubai, Germany and Japan.

Qiandao's hydroelectric power is conveniently located – the 573 sq km lake was created in 1959 to feed a hydroelectric dam. It has more than 1,000 large islands, as well as several thousand smaller ones.

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

Disused bread warehouse to rise again



American data center operator 1547 Critical Systems Realty will build a facility in a historic industrial building in the south side of Chicago that once housed the Schulze Baking Company, which built the most advanced bread-making factory of its time.

Built in 1914, the Schulze Baking Company warehouse will become the Midway Technology Center – most of it occupied by servers. The first phase of the development will deliver 52,000 square feet of technical space and 10MW of power from two separate substations. It could eventually grow to 100,000 square feet, supported by 26MW of power.

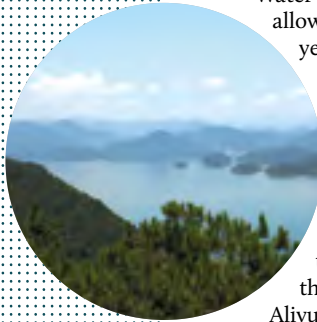
The building, at 55th Street and Wabash Avenue, is a hardened warehouse with reinforced floors and a white terracotta exterior, offering a total area of 230,000 square feet. Listed on the US National Register of Historic Places, it has hosted a number of prominent businesses in its time, including the Schulze Baking Company, the Wanzer Milk Company and eventually the Hostess brands.

"With an initial planned investment of more than \$130m, this data center will provide the much-needed capacity the Chicago market requires, as well as jobs to the area," said Todd Raymond, CEO and managing partner of 1547.

1547 currently operates data centers in three locations: Orangeburg in New York, Cheyenne in Wyoming and Kapolei in Hawaii – better known as AlohaNAP.

<http://bit.ly/1Gc6IWt>

Image © Zhart/Wikimedia



Viridian Pod container runs Singapore's birthday parade

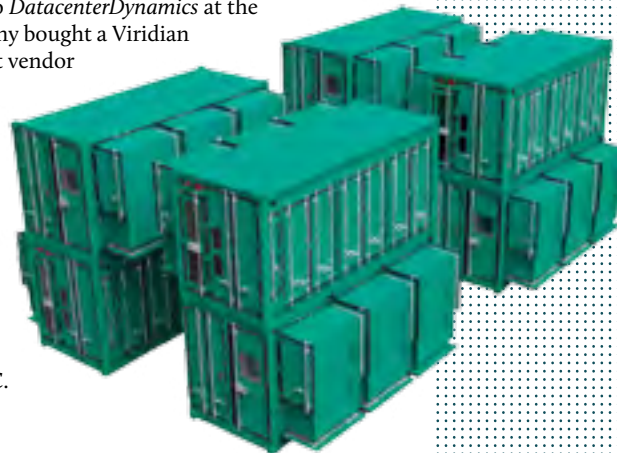
A container from Singapore's Viridian Pod played a key role in the nation-state's 50th anniversary celebrations, serving as a temporary facility to administer a giant birthday parade arranged by the government.

The company's 20ft CDC20 shipping container can be shipped with external power and cooling, or all-inclusive. In the latter formation, six racks can be rated at up to 9kVA per rack, with a total of 54kW power to the unit. Force 21 Equipment, the company behind Viridian Pod, has shipped containers to Europe and China, and works with FoxConn to build the units in Taiwan.

Even though Singapore has more than its fair share of local data centers, the anniversary parade needed a temporary data center, assistant general manager Ivan Chek explained to *DatacenterDynamics* at the DCD SE Asia event. The company bought a Viridian Pod to the DCD event – the first vendor

to park a container on the DCD Singapore show floor. "Our design conserves space and is equivalent to Tier III in reliability," Chek told us. The CDC20 uses indirect air cooling and can achieve a PUE of 1.7. It has a 4.8-minute backup time from its UPS, with 4+1 redundancy, and will operate indoors or outdoors, in temperatures from -15°C to 43°C.

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



Taking Control of Thermal Efficiency with Conditional Environmental Control

Cooling is one of the largest data center expenses. Learn how to control these costs with a few simple best practices.

If you're under pressure to reduce operational expenses in your facilities, the first place you may want to look is at energy consumption—specifically cooling. As one of the largest culprits of inefficient energy consumption in the data center, cooling consumes up to 32 percent of the total energy used by the facility, according to DCD intelligence. But there is a way to make a cooling system more efficient and it can be done by focusing on four key areas:

- Supply temperature
- Supply pressure
- Airflow segregation
- Airflow control

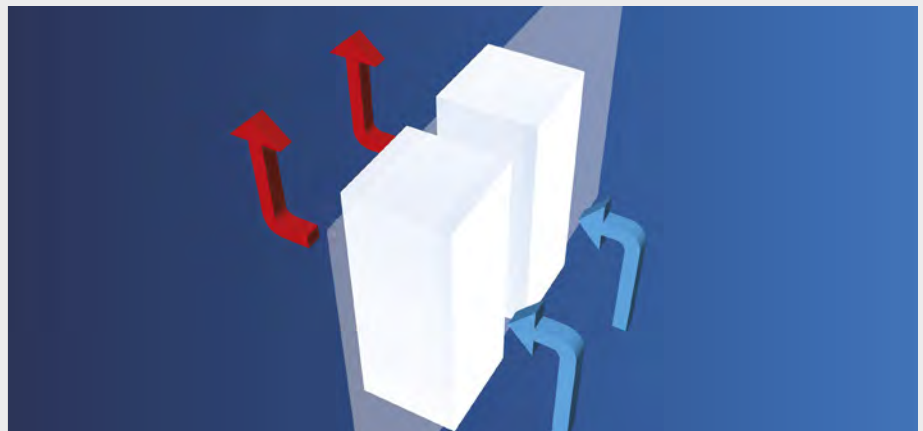
Turning Up the Heat

It might seem counterintuitive, but it's no longer required to operate your data center at the lowest possible temperature. Thanks in part to the guidelines set by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) more data centers are operating at higher temperatures and seeing a reducing in data center cooling costs. However, raising the temperature requires a bit of prep work before turning down the air conditioner.

- Collect data beforehand to understand the impact of raising the temperature throughout the data hall
- Place sensors at the equipment inlet or where cold supply air enters the servers
- Adjust the temperature in small increments and monitor the effect

Under Pressure

When there's unbalanced airflow pressure in the data center, it takes a lot of energy to deliver the cold supply air to the IT equipment and the hot return air back to the cooling unit. Two of the main culprits that create unbalanced airflow pressure are airflow leakage and the size and placement of the openings on perforated tile.



Thermal management: Aren't we all on the same side?

Plugging gaps along the airflow's path to the IT equipment and back is critical to maintaining proper under floor pressure. Placing perforated tiles only in the cold aisle and matching the number of tiles to the design of the cooling system improves airflow. Poor tile selection can lead to uneven air pressure and hotspots which can cause equipment failures.

Segregating Airflow

Separating the cold supply air from the hot return air can help to prevent airflow mixing, which leads to more stable operating temperatures and improves the efficiency of cooling equipment. A variety of different approaches can create proper airflow segregation, such as hot or cold aisle containment and vertical exhaust ducts or chimneys.

The right containment strategy will require a detailed analysis of current cooling infrastructure and actual or future operating needs.

Airflow Control

With IT equipment quickly being added or removed in the data

center, it's important to adjust the cooling system just as quickly to prevent airflow starving or over pressuring thus running more inefficiently. Older CARC/CRAH fans can be retrofitted with variable speed drives that can adjust depending on IT load through temperature and pressure data collected via sensors. This can save a significant amount of energy consumed by the cooling equipment.

Proper airflow management is a multistep process, but if done correctly, it can significantly reduce energy costs and operational expenses. For more information on data center thermal management, download the Technology Solutions Briefing Thermal Efficiency from Anixter and DatacenterDynamics.

ANIXTER

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Thomson Reuters plans move to SGX

Thomson Reuters has launched its Elektron Managed Services from the Singapore Exchange (SGX) co-location data center, providing a new option for businesses looking to access low-latency data and services.

Thomson Reuters already has its own Singapore-based data center to offer the Elektron suite of managed services, but the latest development means

that customers who are already based in the Singapore Exchange co-location site will be able to access its Elektron Real Time consolidated market data feed via a simple cross-connect.

Aside from Singapore, Thomas Reuters also provides Elektron Managed Services in data centers in Chicago, Frankfurt, Hong Kong, London, Mexico City, Mumbai, New York, São Paulo, Shanghai, Sydney, Tokyo and Toronto.

The Singapore data center market is growing in tandem with the city-state's aspiration to be a financial hub. Data centers consume 6.9 percent of the

total energy use in Singapore, far above the global average of between one and two percent. It also faces competition from Hong Kong, another financial hub in the region that is also favored by internet giants looking to establish a presence outside the firewall of China.

The SGX closed for almost three hours late last year after its system failed to cope with a voltage fluctuation caused by a lightning strike. An independent investigation determined the outage was caused by a design flaw in its electrical system.

<http://bit.ly/tKOGode>



Giants delay on Russia localization law, but Apple meets deadline

Apple has complied with the Russian data localization law that came into force at the beginning of September, while Facebook, Twitter and Google have been granted a delay until January 2016.

Roscomnadzor, the Russian telecoms authority, decreed that Russian citizens' data must be kept within Russia, but large technology firms were only given about a year's notice of the requirement.

Apple has responded by taking space in a local data center, according to sources quoted by news site Kommersant, booking into 50 IT cabinets at IXcellerate, whose carrier-neutral Moscow data center already has major players in place, including IBM, Orange Business Services and Sprint.

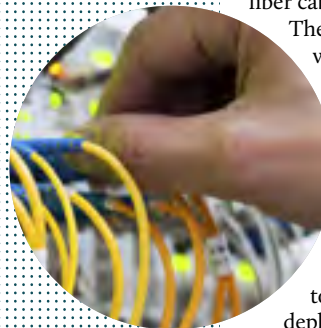
Meanwhile, the other giants have been granted until the beginning of 2016 before they have to comply with the rule, according to *The Wall Street Journal* – although they may intend to resist compliance with the rule indefinitely.

The localization law has been a big headache for service providers, although it is obviously expected to be a boon to local data center operators. Consequently, the price of Russian data center space has risen dramatically.

Among recent responses to the law, the EN+ group, owned by Russian billionaire Oleg Deripaska, is set to build a \$355m data center in Eastern Siberia. The site will be one of the largest facilities of its kind in Asia, and will benefit from Siberia's cool climate and plentiful hydroelectric power.

The delay won by the social media giants is partly pragmatic. The Russian authorities are reportedly having their own troubles getting the staff and structures in place to actually enforce the law, with some predicting they will begin the campaign by picking on SMEs that have local offices.

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



\$125bn

The amount of money Dell plans to invest in China over the next five years

SWDM Alliance backs multi-mode fiber

A new group of networking firms is promoting SWDM, a technology that extends the life of older fiber cables in data centers.

The SWDM Alliance says shortwave wavelength division multiplexing (SWDM) can allow existing multi-mode fiber (MMF) backbones, in use within vast numbers of data centers, to go beyond 10Gbps.

"Data center operators have already invested in duplex MMF infrastructure for their 10Gbps deployments," said Vladimir Kozlov, CEO of Lightcounting Market Research. "Using SWDM technology to maximize the utility of those duplex deployments is an example of how equipment providers can offer innovative, cost-effective upgrades to the higher data rates that are now required."

Generally, 10Gbps or 25Gbps has been considered the top speed for multi-mode fiber, and now data centers are demanding faster speeds. However, upgrading to single-mode fiber is a large expense, and data centers have been using multiple pairs of fibers for faster links.

Wavelength division multiplexing (WDM) uses multiple wavelengths of light to transmit more than one signal along a fiber. It's been multiplying the capacity of single-mode fiber for some time, but now the SWDM group says a shortwave version of the technology can save data center owners from having to rip out their multi-mode fiber.

The shortwave technology is supported by cost-effective vertical-cavity surface-emitting lasers (VCSELs). With SWDM, four VCSELs can send light down a single fiber pair, each operating at 10Gbps or 25Gbps in a different wavelength. A single pair can then carry 40Gbps or 100Gbps.

Founders of the SWDM Alliance include Huawei, CommScope and Juniper Networks, among others.

<http://bit.ly/1NX5ViD>



€3.3bn
Potential investment
in IT infrastructure
market in Nordic
region by 2017

image © Thinkstock

Nordic data center power to triple

The Nordic countries are expected to triple available data center power in just three years, according to a report by data center consultancy BroadGroup.

The IT infrastructure market in Iceland, Norway, Sweden, Finland and Denmark could attract as much as €3.3bn in investment by the end of 2017. “The Nordic Region is set for growth, with new demand, build and market entrants,” commented Philip Low, managing director of

BroadGroup. “Lower power costs, abundant resources of green energy, local and international investment, connectivity, taxation incentives, and natural cooling efficiencies present a formidable argument for consideration in the international IT deployment plans of any global enterprise.”

In its report, BroadGroup looked at 112 data center operators located in Northern Europe and came to the conclusion that white space

available in the region will grow by another 150 percent by 2017.

Money spent on data center expansion and new builds will total €3.3bn – almost half of this amount invested by foreign companies. And foreign companies are indeed interested: Apple is currently building a massive facility in Denmark, while Google and Yandex have chosen sites in Finland.

However, a data center being built by local player Lefdal in Norway could be the largest in Europe if all goes to plan. The facility in Måløy will open in August 2016, offering up to 120,000 square meters of server space in a disused mine, much of it provided by German infrastructure specialist Rittal.

The region is well known for cheap energy and the abundance

of renewable sources, especially hydroelectric and wind power, with prices as low as €0.03 per kWh, plus taxes.

According to the report, the lowest-priced electricity in the Nordic region is found in Luleå, Northern Sweden – a region known as the ‘Node Pole’ that already hosts two data centers by Facebook, as well as facilities owned by Bitcoin venture KnC Miner and British ‘green’ data center specialist Hydro66.

The report also mentioned government incentives for foreign investors and a highly educated workforce as factors that aid the growth of the market. It noted that most data centers in the Nordics are focused on hosting, colocation and cloud services.

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

VOX BOX / DCD VIDEO



Ed Ansett
Chairman
i3 Solutions Group

Why are data centers still not as reliable as they should be?

Despite all the efforts, you still see too many failures in resilient systems. One of the main reasons is to do with the fact that we are not good at sharing. Because incidents are shrouded in secrecy, other people don't get to benefit, and a pattern of errors will be repeated all over the globe.

<http://bit.ly/1iVPN5X>



Roger Strukhoff
Executive director
Tau Institute for Global
ICT Research

Why should we be concerned about data center power needs?

Data centers use around two or three percent of the electrical grids of nations. With data growing at 23 percent a year, in 25 years that is going to be eight iterations. It's not a linear function, but with current technology we would need the entire electrical grid of the world just to power data centers.

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

Dell puts \$125bn into China



Dell has announced a plan to invest \$125bn in China over the next five years, which includes a cloud partnership with Kingsoft.

The company will support R&D in China, and collaborate with the Chinese Academy of Sciences on advanced technologies such as artificial intelligence, while Dell Ventures will invest in Chinese startups. Dell is calling this the "In China, for China 4.0" strategy.

Dell promises this initiative will support a million jobs and produce \$175bn in imports and exports. The company will support the Chinese government's Internet+ strategy and promises "massive entrepreneurship and innovation by all."

Dell and Kingsoft will jointly offer a "Dell-Kingsoft cloud" aimed at Chinese customers, and Dell has other agreements with the Guiyang Municipal Government, China Electronics Corporation (CEC) and Tsinghua Tongfang Co.

"China and the US are among the countries where the information industry is developing the fastest, resulting in the most vibrant enterprises," said Michael Dell on a visit to China. "The internet is the new engine for China's future economic growth and has unlimited potential."

Dell Ventures will be investing particularly in innovations in data center, storage, cloud and big data. Meanwhile, Dell's own Chinese R&D employs some 2,000 senior engineers and will add a new Greater China R&D center aimed at the Chinese market. China is now Dell's second-largest market, after the US, and the company has a whole supply chain there, including R&D, production, sales and after-sales services, with a global operations base in Chengdu and an operations center in Xiamen.

<http://bit.ly/1KHP3tZ>

IBM unleashes Watson

IBM has expanded the functionality of its Watson cognitive computing platform and released a set of APIs designed to help customers build advanced text, speech and image-recognition capabilities into their software and systems.

Two years ago Watson – originally designed to win a game show – had a single API that could enable the system to research a question and give an answer. Today it has more than 25, including tools that analyze tone of voice and mathematical trade-offs. Carney Labs – among the 100-plus partners that have launched Watson-based apps – will roll out a platform for student career analysis in high schools in Virginia.

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

CA approves refrigerants

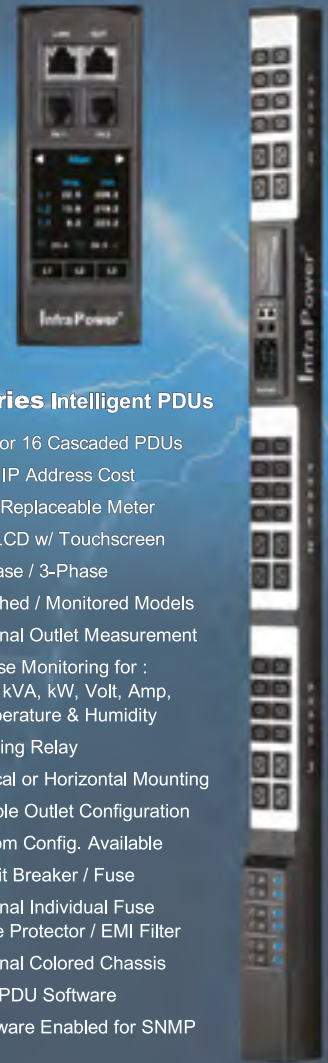
Building regulators in drought-hit California have approved the use of cooling technology that uses chemical refrigerant instead of water.

Refrigerants could allow greater efficiencies in economizers, but the state had to overcome its aversion to potential pollutants such as chemical refrigerants to save water.

The pumped refrigerant economizer technology that Emerson proposed for approval (the Leibert DSE cooling system) uses a method similar to that of water-based economizers. It makes use of outside air until a threshold criteria is met, at which point the air compressors are turned off and the refrigerant pump is brought online.

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

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OpenStack facts

Launched in 2010 by Rackspace and Nasa

Available for all major Linux versions

Modules include:

- Nova compute
- Neutron networking
- Swift object storage
- Cinder block storage
- Heat orchestration
- Trove database
- Barbican security

Users include CERN, BMW, AT&T

Latest release – Liberty (16 October 2015)

Why Huawei is betting on OpenStack

With FusionSphere, Huawei is betting a lot on the OpenStack platform, says *Paul Mah*

With version 6.0 of its FusionSphere cloud operating system, Huawei has added more enterprise features and consolidated its support for the OpenStack open-source cloud stack, which allows organizations to set up their own private cloud with a handful of servers.

Despite a relatively late start with its first code contribution to OpenStack in 2013, multinational giant Huawei has risen to the number six position in terms of code commits for the Liberty release due in October, which puts it ahead of companies such as Cisco, Intel and VMware.

But why is the Chinese networking and telecommunications company so keen on OpenStack? We asked two Huawei CTOs at the Huawei Cloud Congress (HCC2015) in Shanghai: Leung Wing Kin of the enterprise business group, and Jacky Wang of the carrier business group. Here's what they had to say:

"People are changing their attitudes towards open source," says Leung, an industry veteran who first cut his teeth in IT more than two decades ago as a network and systems integrator. Ten years ago, developers were happy with a "copy-and-paste" mentality when it came to open source, but Leung says the IT environment in China has since evolved and now cares about being able to contribute back.

Huawei Cloud Congress: "OpenStack is ideal for cloud computing," says Leung.

Leung says. Many are now trying technologies such as software-defined networking (SDN), software-defined infrastructure (SDI) and virtual extensible LAN (VXLAN).

Traditional virtualization and VMware are not out of the picture, though: "Enterprises need to think about the transition and migration and coexistence with VMware," says Leung. It is OpenStack's open source nature that makes this possible.

OpenStack has a quick development cycle, with two major releases per year and multiple minor revisions in between – and this has an effect on real-life deployments.

With this rapid change and the novelty of OpenStack, are there enough IT professionals in the market with the right skills to properly deploy and manage it?

Leung says the rapid releases are due to the sheer number of contributors and are common to other popular open-source projects. The fast change presents a golden opportunity, as large system integrators and managed services providers need partners such as Huawei to manage and differentiate their OpenStack offerings to their clients.

"There are not that many IT people who are running OpenStack installations," acknowledges Leung.

Organizations are migrating to OpenStack application by application, according to Leung. Wang says the availability of skilled OpenStack people is increasing. And in any case, it is easier to retrain IT professionals into cloud experts than train someone from scratch. Wang should know, given he

is an adjunct professor at the Beihang University in Beijing – one of the nation's top public research universities.

Initial deployment pains aside, the beauty of a standardized cloud platform such as OpenStack will be how it can

make the deployment of cloud services easier. Both CTOs admit that there is still much to be done in this area.

Leung says enterprises want feature parity compared with entrenched solutions such as VMware's vSphere, while Wang says carriers want a level of reliability, authentication support, security and audit functions, which may not be available. This is where Huawei is stepping into the gaps to deliver these capabilities by contributing to the project.

Ultimately, with its many developers, Huawei is well positioned to support customers who opt to go with OpenStack. ●

According to Leung, Huawei is simply responding to the market's consensus that OpenStack is the preferred platform for cloud deployments. Huawei currently has several OpenStack projects, including some for large banking customers, which he did not name.

"OpenStack is an ideal implementation for cloud computing. You can use it for

public and private cloud." Public cloud deployment is important, given that Huawei's carrier business still makes up the lion's share of the company's revenue.

As CTO of the carrier business

group, Wang explains that the carrier industry is changing from traditional services, with pressure to create more dividend from different areas.

"Carriers are strong in the network. They have traditional data centers; they already have customers from the enterprise," explains Wang.

In the enterprise, users are moving away from proprietary products such as those from VMware towards open infrastructure-as-a-service (IaaS) platforms and technologies such as OpenStack and KVM, says Leung.

"The primary focus is dynamic service orchestration with a quick time to market,"



"OpenStack is an ideal implementation for both public and private cloud"

**Leung Wing Kin,
Huawei**

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Created in 2014, Brazil's Interministerial Ordinance 141 demands that all IT equipment – and particularly network and communication systems – sold to the government and public enterprises should be checked and certified to be clear of backdoors and security vulnerabilities.

The federal government is pushing for this certification and wants companies to deliver the firmware and source code of their software to prove it is not compromised. International suppliers hear the demands, but they want Brazil to adopt international standards and not have its own certification system.

Ordinance 141/2014 was born from Decree 8,135/2013 which established a cybersecurity policy in response to the allegations of spying by the US National Security Administration (NSA), as revealed by former security analyst Edward Snowden in 2013. The ordinance, signed by several government ministries, demands that any public networks and hired equipment carrying government communications must go through a specific certification process.

According to Cristiano Heckert, the secretary of logistics and information technology at the Ministry of Planning, Budget and Management, implementing the Interministerial Ordinance 141/2014 will not eliminate any vulnerability in Brazil's communications. He says it is never possible to say that all vulnerabilities have been eliminated. He believes all that can be done is to identify and mitigate the possible risks that could compromise information assets.

The ordinance has been in effect since May 5, 2014, and since then the Ministry of Planning, Budget and Management has been working to define the audit criteria for software and equipment, and considering how to regulate state-provided IT services.

Brazil bolts the backdoors

Tatiane Aquim investigates a federal bid to reduce the risks to public sector data



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“It is important to note that the focus of Decree No. 8135 of November 4, 2013 is only in data communications that could compromise national security,” says Heckert. “It is expected to mitigate the risks of communications through standardization and establishing rules for activities related to government data communications.”

There is also a Normative Ruling of Logistics and Information Technology (SLTI / EO No. 4/2014, as amended by SLTI IN/ MP No. 2/2015), which aims to improve the efficiency of procurement, keeping the planning elements introduced by previous rulings (SLTI/EO No. 4/2010 and its updates) for procurement of IT solutions for the federal public administration. This encourages the use of IT resources to improve quality and productivity.

Heckert says that SLTI/EO No. 4/2014 has brought improvements, namely contract management and cutting out unnecessary paperwork in the procurement process.

The Secretariat of Logistics and Information Technology (SLTI) is responsible for procurement and public logistics activities, including transport services, vehicle fleet management and administrative support services. Heckert says the Ministry of Planning, Budget and Management always seeks to interact with the different stakeholders prior to publication of a standard, or through public hearings, consultations and meetings. The regulation of program audit criteria and equipment is being produced based on international standards,

such as ISO/IEC 15408 (information technology – security techniques – evaluation criteria for IT security).

Some feared the ordinance would reduce competitiveness and increase development costs in Brazil's public sector by making it impossible to use foreign software, but Heckert says the Ministry of Planning, Budget and Management is aware of this danger, and Ordinance 141/2014 shall not preclude the use of foreign programs and equipment, provided these can be audited as required by the document. This issue is open for discussion.

In the implementation of the ordinance, the protection of data centers

is a prerequisite, the secretary says. In this process, the federal government will deal with the issue of ‘data protection’ judiciously, adopting solutions with specific dedicated infrastructure hardware, as well as addressing specific software with an impact on data security.

Ordinance No. 141/2014 is also applied to state-owned enterprises, so the legislation will affect a wider range of bodies than just government departments, and there must be a transition period to adapt the rules.

The Brazilian government has been working on a digital governance strategy this year, using a study of five other countries as a reference: the UK, New Zealand, Estonia, Israel and South Korea. This strategy aims to simplify the provision of digital services, so they can be accessed by any device – fixed or mobile. “All this work should also focus on the security and privacy of Brazilian people,” says Heckert. ●

International suppliers want Brazil to adopt international standards



At a glance: Ordinance 141

- Brazil's response to the Snowden leaks, exposing NSA surveillance
- Requires all public sector IT in Brazil to contain no backdoors or weaknesses
- In effect since May 2014
- Implemented by the Secretariat of Logistics and IT (SLTI) at the Ministry of Planning, Budget and Management

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Causes of failure

Data centers are failing too often because the root causes of those failures are being kept secret, says *Peter Judge*



Peter Judge
Global Editor
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Data centers are engineered for high reliability, but all too often they go wrong, losing data and losing money for their customers.

The reasons aren't hard to see. The facilities are complex systems depending on both technology and human activity, and will inevitably fail at some point. In most cases, the underlying root cause is human error, and increasing data center reliability is a matter of eliminating or reducing that wherever possible.

For systems like this, there's a theoretical upper limit of reliability, which is about 200,000 hours of operation. This is because the human factor can be made smaller and smaller, but there is eventually a point when hardware will fail, whatever is done to improve the systems and procedures. ►



Illustration: angusgreig.com



► Well-established industries such as aviation are close to achieving the maximum possible reliability but, according to Ed Ansett of i3 Consulting, data centers fall short of it.

Why is this happening? According to Ansett, it's down to secrecy. Failures repeat because they aren't widely understood.

Virtually all failures in complex systems are due to errors in the design, testing, maintenance or operation of the facility. Once a failure has occurred, it should be examined to understand and determine the root cause of the problems. Once the fundamental issues are identified, then it is possible to make changes to reduce the chances of the same failure happening again.

In the case of data centers, most root causes are down to human error – whether it is in the design phase, installation, maintenance or operation. Some potential faults are obvious, or at least easy to identify, such as generators failing to start, or leaks of water. But very often failures occur through a combination of two or three faults happening simultaneously, none of which would have caused an outage on its own.

In aviation, for example, these complex faults are often uncovered because, when a plane crashes, there is a full investigation of the cause of the accident, and the results are published. This is a mandatory requirement. When a data center fails, there is an investigation, but the results are kept secret, as the investigators sign a non-disclosure agreement (NDA).

Airlines share their fault reports because they are forced to by law. Aviation is a heavily regulated industry, because when a plane crashes, lives are lost. Data centers are different. There's no obvious human injury when a data center crashes, and there are no central regulators for the industry. Any failure report would reveal technical and commercial details of a data center's operation, which its owner would want to keep as trade secrets, hence the NDAs.

When faults in data centers are investigated (see box for some recent scenarios), the analysts come up with the root cause and suggest improvements to prevent the same thing happening again. But each time the fault crops up, few people can learn from it, because the information is restricted.

As a result, when investigators are called on to investigate a mystery fault, they often know

instantly what has gone wrong – much to the shock of the data center operator.

At a recent fault investigation, Ansett only needed to know the basic details of the incident to make a guess at the root cause, which turned out to be completely accurate. It was a fault he had seen in several previous failures at data centers in other countries.

It was a failure that could have been predicted and prevented, but only if the results of previous failure investigations had been made public. Unfortunately, the information is not made widely available, which is a tragic waste of knowledge. It leaves operators designing and specifying

data centers blindly:

“Reliability is much worse than it need be, because we don't share,” says Ansett.

It's possible this may change in future, but the change might not be a pretty one. No industry welcomes regulation, and controls are normally forced on a sector in response to an overwhelming need, such as the desire to limit the loss of life in plane crashes.

Data centers are becoming more central to all parts of society, including hospitals, and the Internet of Things, which is increasingly micro-managing things

such as traffic systems, hospitals and the utility and systems delivering power and water.

As data centers are integrated into the life-support systems of society, their failure will become more critical.

“Over the course of the next few years, as society becomes more technology-dependent, it is entirely possible that failures will start to kill people,” Ansett warns. At this point, the pressure will increase for data centers to be regulated.

The only way to avoid this sort of compulsory regulation would be for the industry to regulate itself better and take steps to improve reliability before there are serious consequences of a fault.

There are some precedents within the technology industries. For instance, IT security issues and best practices are already shared voluntarily via the world's CERTs (computer emergency response teams).

In the data center world, the Uptime Institute certifies data centers for the reliability of their physical plant in its Tier system, and is also looking at the human factors in its M&O Stamp (page 23).

But the industry is still groping towards a solution to the tricky problem of how to deal with the root causes of failure. ●

Complex systems relying on technology, and human activity will inevitably fail at some point

Failure modes

Three scenarios shared by Ed Ansett of i3 Solutions Group, at the Converged SE Asia event.

DIESEL MAINTENANCE

A 7.2MW data center had four 2.5MW backup diesels, so there is one spare (N+1) in the event of a power failure. They were well fueled and maintained, except for a seal on the pneumatic starter, about the size of a 20-cent piece. When the site lost power from the grid, its diesels started, but the starter on one failed, and then another lost power because of the seal. A fuller maintenance task list could have avoided this.

OUT-OF-SYNCH FLYWHEELS

A site had two rotary UPS systems (flywheels) providing redundant backup. When a power failure occurred, the system switched to power from the flywheels. However, the frequency of mechanical flywheels can drift, and their output was combined at a static transfer switch. When the two flywheels were out of phase, the transformer coils saturated, and the site lost power. The possibility of flywheel phase issues should have been designed for.

FIRE-SUPPRESSION CRASHES DISKS

A data center featured a fire-suppression system that would flood the data hall with inert gas when a fire was detected. Unfortunately, the sudden gas discharge produces a loud sound, and the associated pressure wave is enough to damage hard drives. When a piece of IT kit emitted smoke, the fire-suppression system kicked in and prevented a fire but killed the hard drives. To avoid this, the nozzles should be baffled or placed away from the storage racks.

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M&O stamp could beat Tier ratings

The Uptime Institute's famous Tier ratings might prove less useful than a different option from the same source, says *Michael Kassner*

The Uptime Institute's well-known Tier certification scheme for reliability is well established, but the Uptime Institute has other certificates that may be more important in the long run.

The options include the Institute's Management & Operations (M&O) Stamp of Approval, or the Tier Certification of Operational Sustainability (TCOS) for those on a Tier track. It is possible these may become — or may already be — more important than the Uptime Institute's flagship Tier Certification of Constructed Facility (TCCF). Before you say it's nonsense, let's look at why that might be.

A report on outages from the Ponemon Institute in 2013 (sponsored by Emerson Network Power) stated: "Unplanned data center outages present a difficult and costly challenge for organizations. In fact, most of the respondents in this study — from senior level to rank-and-file — say they would rather walk barefoot over hot coals than have their data center go down."

The report contains a graph showing the root causes of unplanned outages experienced by the survey participants during a two-year period. Forty-eight percent selected accidental EPO (Emergency Power Off) and human error as ►



Michael Kassner
US Correspondent
@MichaelKassner

► the top cause. Even more telling was the comment: “Fifty-two percent believe all or most of the unplanned outages could have been prevented.”

When the researchers asked how organizations aimed to correct the root causes and prevent unplanned outages in the future, the response was somewhat unexpected. Instead of trying to reduce human error, the most prevalent response was: improve or purchase new equipment.

Using cost data from the Ponemon report, Emerson calculated that a data center outage costs slightly more than \$7,900 per minute – a 41 percent increase from the \$5,600 it cost in 2010. Total data center outages averaged a recovery time of 119 minutes, equating to about \$901,500 in total costs.

Around the same time, the Uptime Institute introduced the TCOS designation for Tier-rated facilities (2010) and the M&O Stamp of Approval (2012) as a way to combat human error in data centers.

Both of these new processes were industry-driven, with CBRE, Equinix, Fortune, Interxion, Morgan Stanley and Progressive contributing to the process.

With practical knowledge gleaned from the companies, and Uptime Institute’s validation experience, the consortium developed a way to assess a facility’s operation and uncover practices that would likely introduce errors in the following functions:

Staffing and organisation:

Verify that employee job responsibilities are defined, approved by management, and focused on achieving the desired Uptime objective.

Maintenance: Determine if preventive maintenance programs

and associated procedures are in place, adequate and followed.

Training: Scrutinize in-house and third-party vendor training programs to ensure employees and visitors are aware of site-specific policies and procedures.

Planning, Coordination and Management: Check the adequacy of site policies, financial-management guidelines, and infrastructure libraries, including current as-built drawings of the data center, and question personnel about their understanding of the policies.

Operating Conditions: Ensure consistent and documented management of power and cooling capacity. Specific to power, the guide says: “Load management decisions need to be established, documented, and

practiced based on electrical capacity components to ensure maximum loads are not exceeded and capacity is reserved for switching between components.”

It’s hard to deny that training and having everyone pulling in the same direction will result in immediate cost savings, a safer

operation and happier clients.

However, Lee Kirby, CTO at the Uptime Institute, says there is more to the story. As the TCOS and M&O Stamp of Approval matured, people found ancillary benefits, which might have as much impact as cost reductions.

Examples include reduced insurance costs, standardizing data center operations across multiple facilities, and the M&O Stamp of Approval being a definite marketing tool.

Joel Stone, vice president of global data center operations at CenturyLink, told the 2015 Uptime Symposium: “As owner-operators in the wholesale market, we want to differentiate ourselves.”

Uptime options

UpTier Certification of Constructed Facility: The well-established Tier I-IV Certification based on the design and implementation of your physical data center.

Management and Operations Stamp of Approval: Human error is the leading cause of data center failures, so the M&O Stamp of Approval examines your data center’s operating policies and practices.

Tier Certification of Operational Sustainability: An examination of operational practises within the Tier Certification process.

CenturyLink is serious about this, agreeing to have all 57 of its data centers obtain the M&O Stamp of Approval or TCOS if the data center already has TCCF.

AIG doesn’t want to miss out, says Herb Alvarez, director of global engineering and critical facilities: “We are making it [M&O] a requirement. What CenturyLink is doing is influencing us.”

For companies such as AIG, which owns data centers but does not run them, the Stamp of Approval has another benefit. Both AIG and Morgan Stanley, which contract out their sites to technical facilities management (TFM) companies such as Inveron and CBRE, use Uptime Institute’s M&O in contracts with their partners, and extend this to the colocation providers they lease from to ensure global consistency.

The M&O Stamp of Approval is also useful to enhance the SLAs and guarantees at legacy and smaller data center operations that cannot afford to physically meet Tier-rating specifications.

“Data centers are bespoke, complex homo-technical systems,” says Ed Ansett, chairman of i3 Solutions at DCD’s SE Asia Converged event in Singapore. “The human side and the technical side cannot be separated. An understanding of both is required to reveal what went wrong. Too often the failure is one that has been seen before.”

Secrecy is a problem, and Uptime’s bid to break this down is the Uptime Institute Network, a coalition offering peer-to-peer interaction and a confidential forum for knowledge transfer. It is also a way to source best practices and validate them before including them in company products and certifications, Kirby says.

Many say that ratings such as the M&O will become more important than Tier-rating certifications, and the reason can be summed up as follows: There are two commercial data centers in town, and their infrastructures are indistinguishable. However, only one of them has the M&O Stamp of Approval. Which one would you choose? ●

The human side and the technical side cannot be separated. An understanding of both is required to reveal what went wrong



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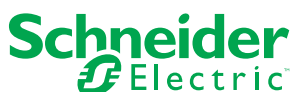
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Colocation's Eastern front

Developing countries including China will fuel colocation's next big expansion, says *Bill Boyle*



Bill Boyle
Global Managing
Editor

 @BillBoyleDCD

To get a clear picture of an industry sector, it sometimes takes an industry outsider, or an insider who has just stepped outside of the industry maelstrom, to provide a clear overview. Mike Tobin, ex-CEO of TeleCity, a company now owned by Equinix, is in just this position and gave us some interesting insights into the colocation market.

Tobin thinks that developing countries – particularly China and Africa – hold the key to the next big expansion in colocation markets. Operating in those markets will separate the losers from the long-term winners.

China's e-commerce giant Alibaba announced a cloud data center in Silicon Valley this March and launched a large cloud data center in North China.

The internet giant also has data centers in Hangzhou, Qingdao, Beijing, Shenzhen and Hong Kong, and has a 23 percent share of the domestic cloud market.

China's move to the forefront of the world's digital economy is leading to high growth in data center space, which DatacenterDynamics intelligence (DCDi) suggests will continue for the next five years.

China Telecom, the largest internet data center provider, has more than 320 commercial facilities available for lease all over the country, followed by China Unicom, with around 220. Carriers are developing the next generation of cloud data centers in the western and northern areas of China, such as Inner Mongolia and Guizhou.

China is an evolved data center market, outstripping the other markets in the BRIC bloc – Brazil, Russia and India. Globally, China now represents five percent of data center space and six percent of investment. In Asia Pacific, China accounts for one-fifth of data center space, trailing only global player Japan.

According to a notice released by the Ministry of Industry and Information



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Growth in China

According to China's Ministry of Industry and Information Technology (MIIT) of the People's Republic of China (PRC), 255 data centers were planned or built across China from the beginning of 2011 through the first half of 2013. The total figure comprises:

- 23 'mega' data centers, with a capacity of more than 10,000 racks (2.5 kilowatt/rack)
- 42 'large' data centers, with a capacity of 3,000 to 10,000 racks
- 190 'small to medium-sized' data centers, with capacity of less than 3,000 racks

Technology (MIT) of the People's Republic of China (PRC), 255 data centers were being planned or built across the country from the beginning of 2011 through the first half of 2013. Among them, 23 are deemed 'mega' data centers, with a capacity of more than 10,000 racks (2.5 kilowatt/rack); 42 are considered 'large' data centers, with a capacity of 3,000 to 10,000 racks; and 190 are categorized as 'small to medium-sized' data centers, with capacity of less than 3,000 racks.

In terms of locations, the 255 data centers are distributed in 26 provinces, autonomous regions and municipalities. Half of the 65 mega and large data centers are located in, or close to, energy-sufficient and cold-climate regions. A dozen of them are used mainly for disaster recovery.

Hawkins Hua, a South East Asia-based senior researcher with DCDi, says: "One data point we can provide regarding China data center size is that 90 percent of them are the smaller ones. In regards to the energy use, mega data centers undoubtedly consume more power, but we have no specific comparison between mega and others, since no local data is available for us to answer that question. However, overall the power consumed by data centers in China approximately accounted for 1.5 percent of total social power consumption."

As far as electricity prices are concerned, more than 70 percent of the mega and large data centers in China examined in MIIT's report are entitled to large industrial electricity or direct-supplying electricity policy support. The average price of electricity

that charges the 255 data centers is CNY0.87/kWh. The average prices of electricity of mega and large data centers are CNY0.66/kWh and CNY0.78/kWh (\$0.14). Some mega facilities can even get an electricity price of CNY0.30/kWh (\$0.05).

Generally, cloud business models are settling down and the promise of the cloud model to provide more compute power with fewer resources is proving to be a continuing threat to those colocation players that remain tethered to the physical layer.

All colocation outfits are examining their offerings in the knowledge they will have to keep investing as much as possible in superior interconnects and lower latency.

Figures from DCDi suggest that the established markets in Europe and North America will continue to fall compared with major merging markets, so the opportunities are very obvious.

Amazon Web Services has no data center in the Middle East, and neither do the Microsoft Azure and Google Compute Engine platforms, meaning that latency rates are high since their African clients end up being rerouted via Ireland, Europe or Singapore.

This research reveals there is still a high degree of hesitation (77 percent) among companies about externally located and managed cloud systems. Since the fear of private and hybrid cloud models, at respectively 73 percent and 53 percent, are lower, they indicate that colocation is still seen as a safer move for corporates.

The biggest lesson of the present period is the growth in the stream of hosting and managed services offered by providers using cloud, since cloud can replicate and abstract these higher-value services more conveniently, flexibly and cheaply than colocation can.

Once the problems are sorted out, it's time to work on Africa. ●

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The reduction of energy consumption in data centers has been a focus for almost everyone concerned with engineering and technology for nearly a decade. Better cooling systems, switched mode power supply efficiency and virtualization have yielded impressive energy benefits. There is more to be done, but solid progress in these areas has been made globally.

But the same cannot be said for fixed-platform software, for several reasons. Back in 2013, when we (i3 Solutions Group) conducted research for the Singapore Green Data Centre Technology Roadmap, we wanted to look at each aspect of engineering and technology that consumes energy. What we found was totally baffling at first.

You might think the hypervisor and application developer community would be pretty hot on energy-reduction techniques since software is often used on mobile platforms powered by batteries. Conserving battery charge through low energy use could extend platform usage time.

But in a data center, battery power is not a concern, so the impact of energy-aware language structures, low energy coding techniques and the use of hardware sleep states have largely been overlooked by software developers. That seemed pretty odd to us, but the research supported the assertion that fixed-platform developers generally aren't cognizant of energy usage in the context of software.

How significant is software energy inefficiency? It can be more important than the inefficient cooling systems affecting data centers a decade ago.

A key factor causing the problem is that energy-proportional computing is not yet a reality. To understand why this is, we need to look at typical enterprise active components, particularly processors and their idle energy consumption. At zero percent utilization, a typical processor averages 50 percent of its maximum energy consumption.

So the question is, how much time do processors spend idling? The fact is, we don't really know, because utilization varies so much among users. What we do know

Overactive software is wasting energy

Data centers have ignored the energy wasted by software, says *Ed Ansett*. To save the planet, idle software should start going to sleep

is that processors generally spend most of their time idling. Even if we assume the idle period is 50 percent, these devices are burning 50 percent of their maximum energy while doing nothing half of the time.

It gets worse! Now consider the upstream impact of being idle 50 percent of the time. We still have to power the IT devices, so there's energy wasted in each section of the power chain – from the distribution transformer all the way through to the final DC to DC converters. Furthermore, heat from this idle energy has to be removed, so there's even more energy wasted. We call this the 'energy cascade effect.'

The need for action by the software community to deal with this issue is obvious. We initially thought not much could be done about this. Surely you can't just go around switching IT hardware off, can you? No, you can't if the software is required to react instantly to a time-independent event. But business processes fall into three categories: 1) an immediate response to a time-independent event is required (an instantaneous response); 2) a less time-sensitive response to a time-independent event (a small delay response can be tolerated); and 3) a time-dependent event (process is periodic).

The drawback to using sleep states is a latency penalty due to the additional time required to wake in response to an event. This depends on the level

of sleep used – the deeper the sleep the less energy used, but it takes longer to wake.

The argument for routinely using sleep states stands up well in the second two categories. We don't need an instantaneous response to many organizational processes. Pretty much anything in category two that is time-independent, with an adequate interval between event, could benefit from using sleep states. An added complexity is the nature of IT workloads. In many instances, this technique cannot be justified, but there are many more where it can be employed.

We can't go on ignoring the issue. The energy-saving opportunity is immense, and the financial savings are too big to ignore. In a situation such as this, where most, if not all, organizations stand to significantly benefit financially, it surely is only a matter of time before the issue is addressed.

Sleep states are one important way of conserving energy; others include energy-cognizant coding of applications, application services and operating systems, also rate adaptation, energy-aware mapping of virtual machines and energy-optimized compilers.

There is much work to do, so now over to you hypervisor and application developers. Go save the planet! ●

Ed Ansett is group chairman of i3 Solutions Group






5,000
sq ft
Size of an edge data center
(EdgeConnex)

Postcards from the edge

Edge data centers are a hot topic. But *David Chernicoff* wants to know, what exactly is an edge data center?



David Chernicoff
US Correspondent
 @DavidChernicoff

Kurt Vonnegut said: “Out on the edge, you see all the kinds of things you can’t see from the center.” That could apply to edge data centers, which this year have come center stage. Vendors of all sorts have been touting their forays to the edge with their hardware, software and complete data center offerings. But acceptance of the edge data center concept has come with a question: what exactly comprises that edge?

On the one hand, you have data center operators that are opening or repurposing data centers in smaller cities, referred to as tier two and tier three markets. Smaller facilities in non-mainstream locations are being repositioned as edge data centers, providing low-latency access for local users.

On the other hand, you have hardware vendors developing equipment for what they perceive as the edge data center market. This kit is designed to allow the deployment of small, modular hardware that provides a complete, self-contained data center that can operate remotely with minimal support.

Software vendors are also providing products to enable edge data centers, however

**Expedient data center,
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you define them. Remote management, operations, orchestration and deployment tools allow data centers on almost any scale to run with little on-site support.

So what defines an edge data center? The primary concern is proximity to the user base. There is no hard and fast number of people or businesses that need to access the services provided by the facility to make it meet the definition of an edge data center. Rather, it is proximity – and therefore the reduction of backhaul, latency and potential network congestion the edge facility provides to its customers – which makes it an edge data center.

This doesn't mean that a small data center in a lightly served region is actually an edge data center. If the customer base is primarily local, and the facility is delivering services from local businesses, then what you have is a small, local data center, not an edge facility. But just to confuse the issue, that small, local data center may well provide edge services if it is being used, for example, to host hardware from a major CDN provider.

In this case, the CDN provider, which could be a company such as Netflix, deploys its own hardware, putting an edge device into the local data center in order to provide the benefits of the location to local customers. The edge

device usually acts as a cache for the streaming service, minimizing latency and backhaul traffic, giving end users a better experience and cutting the vendor's traffic costs.

A number of data center providers have specialized in providing edge data centers in smaller markets that are not served directly by major providers. A good example is the aptly named EdgeConnex, which provides technology services including data centers to smaller, localized markets. These data centers are smaller than the mega facilities we've come to expect from major providers, at around 5,000 to 10,000 sq ft (4500 to 9000 sq meters).

EdgeConnex currently has 23 of these smaller facilities across the US, with plans for up to 30 by the end of 2015, having built or acquired these facilities with the express intent of offering edge services to larger providers and state-of-the-art data center technologies, as well as local colocation customers.

While EdgeConnex has a national presence, many other providers are opening up local data centers that can provide the same services to both larger providers looking for an edge presence and local companies looking for cloud services or colocation from a local provider. These data center operators may only have a limited number of facilities, but they focus on providing the best possible service to local users. Businesses looking for cloud services and connectivity options make use of these edge data centers to be the intermediary between local and national resources, shortening the path to heavily used resources while providing access to more distantly located services, and potentially more expensive, on an as-needed basis.

On the other side of the coin is the entire concept of the micro data center that can be deployed to an edge location. In this case, we are talking about small, self-contained facilities, ranging in size from a half-rack to a large commercial refrigerator that, based on design, can be deployed anywhere – from under a desk in an office, to sitting outdoors

in almost any environment. The range of products found in this segment is quite broad. They start with vendors such as Elliptical Mobile Solutions, which specializes in small-scale, purpose-built micro-modular data centers that can be deployed to fit a range of solutions, to micro data center products offered as part of large-scale enterprise from vendors such as Huawei or HP.

In between, we find products ranging from companies such as AST Modular – recently acquired by Schneider Electric specifically to gain a presence in the edge data center market, something that Schneider wasn't seeing even with its larger modular data center designs – to vendors such as Panduit, which sells a pre-configured micro data center designed specifically for industrial network deployments. You'll even find vendors such as Rittal, known for racks and enclosures, offering combinations of products as micro data centers for the edge data center market.

The proliferation of edge services is also being driven by major content providers. In September 2015, Google announced plans to partner with four CDN providers – CloudFlare, Fastly, Highwinds and Level 3 – to cut the price for cloud services if the customer used these CDN providers to deliver data to customers in the regions they served.

This model encourages the use of edge data centers to support CDN services in order to reduce overall costs. And even Google, which has more than 70 points-of-presence worldwide, finds it less of a network burden to be able to hand off some of the traffic to CDN providers that can cache data locally within their data centers and networking infrastructure to make service delivery more cost effective for the customer.

In many ways, edge data centers are the logical outgrowth of the distributed data model. Be it via CDNs or building local infrastructure, putting data where it is most needed – and in ways that it can efficiently and effectively be accessed by those who need it – may well define the future of the data center. ●

Cloudy on the edge at DCD Europe

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to the table, enabling a unique platform for the entire ecosystem to converge on London's ExCeL in order to map out the infrastructure requirements for the next five years.

The conference's focus will be on the next wave of IT innovation for this new era of hybrid IT, including solving critical data storage challenges, avoiding hardware lock-in and continuing business-as-usual with scalable, hyperconverged infrastructure.

Present at the event will be Dimension Data, Tintri, Primary Data, Nimble Storage, Facebook, OpenStack Foundation, Open Compute Project, Sungard, Simplivity, HP, Cisco, SAP, Huawei, Infinity, VMware, Falconstor, and many more showcasing their solutions and exchanging best practice.

And this is just the tip of the iceberg! ●

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www.dcdconverged.com/converged/europe



Session highlights

MAXIMILIAN AHRENS
*Deutsche Börse
Cloud Exchange*

Will discuss how to accelerate the move to multi-cloud architectures with cloud exchanges and interconnectivity.

TEOMAN BUYAN
*CIO, Europe, Asia, Africa, and
Head of Global Infrastructure*

Will discuss Coca-Cola's journey in migrating 80 percent of its applications to cloud.

MAGNUS FALK
CTO, Cabinet Office

Will be joining a panel hosted by Crown Hosting Data Centres Limited on IT service delivery in the public sector. He is also joined by IT leaders from the Department for Work and Pensions, the Home Office and the Ministry of Defence.

DORON KEMPEL
CEO, Simplivity

Will discuss how hyperconvergence will transform the infrastructure economics of the data center.

REAZ RASUL
HP

Will explore hyperscale infrastructure elements on the StackingIT stage and the challenges with scalable hardware solutions for the delivery of cloud services.

FRANK REY
Director, Microsoft

Will be joining a debate on how colocation procurement strategy is changing in reaction to the short-term needs of dynamic and hybrid infrastructures.

Also taking the stage...

Silicon Valley's Tintri will explore the race to virtualization with its all-flash storage solutions, and Monty Taylor from the OpenStack Foundation will discuss how you can leverage unified storage infrastructures and cloud for smarter data management with SDS via OpenStack. Steve Wozniak's start-up, Primary Data, will be presenting on how virtualization can help you achieve data agility across different storage resources.

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Data moves to Mother Russia

Russia's strict data residency laws are a curse for some, a blessing for others, says *Max Smolaks*



Max Smolaks
News Editor
@MaxSmolaksDCD

In September, Federal Law No. 242-FZ came into force in Russia. In a nutshell, the law requires all foreign businesses that handle the personal data of Russian citizens to keep this data on servers located within the country.

To comply with this measure, anyone collecting or processing such data has to notify the Federal Supervision Agency for Information Technologies and Communications – Roskomnadzor – about the exact location of the servers.

The new rules apply to email services, social networks and search engines, although there are reports that the likes of Facebook and Google have been granted an extension until the end of the year.

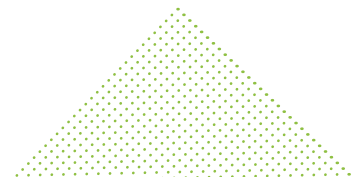
To investigate the impact of the regulation, we contacted Guy Willner, chief executive of IXcellerate – a company that owns one of the largest carrier-neutral data center campuses in Moscow and is currently planning to build another one. Willner is a British-born data center entrepreneur with decades of experience: he co-founded

IXEurope in 1999, grew the company to 14 facilities, and sold it to Equinix in 2007 for \$482m.

He told *DatacenterDynamics* that foreign businesses have been slow to comply, but the local data center market was well equipped to weather this particular storm. At the same time, the country could face a real capacity crisis soon, brought about by the economic sanctions over Russia's involvement with Ukraine.

Most Russian language websites (collectively known as Runet) are hosted offshore, in places such as Amsterdam, Helsinki or Frankfurt, so the law will send shockwaves through global markets.

It will affect any organization that stores the data of Russian customers, and according to Willner that's around 2.4 million businesses, including everyone who takes credit card payments. In accordance with the law, domain names or net addresses not registered with Roskomnadzor will be hit by fines; repeat offenders will be blacklisted and could be cut off. ►



2.4m

Number of businesses whose data is stored offshore

► Willner says many foreign firms have chosen to ‘wait and see,’ irrespective of these Draconian measures. “There’s no chaos or panic, but there’s disregard. Often when a country comes up with a law like this, the guys in head office just think, “That’s a load of bulls**t,”” he says.

“It’s only when there are problems that they realize maybe they should take it seriously.”

When the US Patriot Act came into force, most of the industry fell into line, but there were exceptions. Some notoriously secretive Swiss banks only started to comply with requests for information when the Americans started blocking their accounts.

So how does it work exactly? If the company in question maintains an official presence in Russia, Roskomnadzor is likely to send a polite letter to its registered address in order to negotiate its registration. Things could be a lot more abrupt if the company is not officially registered. If the company is not registered in Russia, then Roskomnadzor has nowhere to write to, so the site gets blocked because the company could potentially be operating illegally. “If it has no registered office in the country and is taking payments, the implication is it’s not paying any taxes, and there’s no protection [for the customer]. I think we will gradually see more and more people complying.”

Russia currently has enough capacity to satisfy the comparatively modest demands of data residency. “If you’re talking about storing some personal data, it’s a couple of servers – it’s not like moving your heavy artillery to Moscow. These are not massive installations. Even if it’s a website with 100,000 hits a day, we are talking about half a rack. This is not going to flood the system, but there is very little capacity in Russia, that’s clear. We have a couple of thousand square meters spare at the moment, and most of our competitors have between 500 and 1,000 [square] meters spare. In the whole market in Moscow, there’s probably less than 6,000-7,000 meters of available space currently,” explains Willner.

Taking advantage of the underdeveloped market is tricky. Willner says Russian banks are charging exorbitant credit fees, while getting investment from the US is simply impossible due to economic sanctions. The situation could benefit the larger industry players that don’t need to collect additional funds to build a facility – but there are no big

data center players native to Russia, and the ‘Big Five’ cloud vendors are hesitating to enter the market at the moment, though Apple is complying (see News, page 13).

“It’s difficult to find capital for expansion. It’s a strange situation, where there’s strong demand, but supply is definitely getting restricted. Pricing is not very high yet, but my guess is it will start creeping up. So the guys who turn up latest will pay the most – but it’s like that in any market.”

At the same time, businesses that already have some roots on Russian soil are flourishing due to the lack of competition. Willner’s advice? Whatever Facebook or Google might be doing, non-compliance in Russia is not an option. “I’d say get your servers in Russia: a) because it is going to get more expensive; and b) because you might end up being strapped with a fine. If you’re not registered in Russia, you might want to reconsider whether you want to do business in Russia. If you do want to do business in Russia, you might want to register your company or localize – you know, create a local office.”

Media reports have made the law look more complicated than it really is, says Willner, and some analysts predict that the Federal Law No. 242-FZ could harm the Russian economy, but the situation is not that clear.

Willner thinks the commercial fallout has been a blessing for local cloud and IT providers that are growing while

digital resources come home to Russia. “It might not have been the master plan at all,” says Willner. “But what it’s actually doing is on-shoring the internet into Russia, which means it’s going to give lots of jobs to software engineers and to hardware people. There’s going to be investment in data centers.”

Actually, maybe the unintended consequence of this is Russia taking a large step forward technologically. “If you remove the political situation, Russia is an amazing market. It’s growing faster than any other European country in terms of internet users – there are already 80 million, and the growth is in double digits,” says Willner.

“Geographically, Russia’s fantastic for finance because you’re halfway between South East Asia and Europe, and it’s got its own economic group [the BRICs]. But at the moment, it’s kind of... on hold.” ●

Maybe the unintended consequence is Russian technology taking a large step forward

Russia’s new law

Federal Law No. 242-FZ

(On Amendments to Certain Laws of the Russian Federation in Order to Clarify the Procedure for Personal Data Processing in Information and Telecommunications Networks).

Highlights

- The personal data of Russian citizens must be housed on servers within the Russian Federation.
- Those collecting data must notify the regulator, Roskomnadzor.
- Predicted effects include increased demand and raised prices for Russian data center space.
- Signed into law, July 2014. Effective from September 2015.



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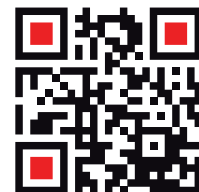
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Tomoo Misaki
*Senior Technical
Researcher, Nomura
Research Institute*
Winner of Outstanding
Contribution to the Industry
award. Misaki works in
the Center for Strategic
Management and Innovation
and has made significant
contributions to the energy-
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DCD Converged upcoming events

**DCD AS A
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Hilton Chicago
October 27–28

DCD EUROPE
ExCeL London,
Prince Regent
November 18–19

DCD SÃO PAULO
Transamerica
Expo Center
November 10–11

DCD Com

It has been a busy month. We have reports of our DCD Converged Singapore event where the Stacking IT track generated much interest. And remember folks – it's DCD Awards time!

Roger Strukhoff
*Executive Director,
Tau Institute*

The Stacking IT track at DCD Converged in Singapore was a groundbreaking event. The world of open innovation joined up with the world of data center operations in an event that was dynamic and unique. It was marvelous to hear thought leaders and real-world use cases from Southeast Asia, which is one of the most vibrant regions of the world today.



May-Ann Lim
*Asia Cloud Computing
Association*

Enterprise cloud adoption in Singapore has evolved over the years to a model which now requires cooperation and interoperability. Co-competition is the new normal.



Ed Ansett
i3 Solutions

We learn from understanding causes of failure and how to avoid them. When the data centre industry shares failure information overall reliability will improve.

community

DCD Awards

BRAZIL

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

US & CANADA

Tuesday, December 1, 2015
Capitale, New York City

EMEA

Thursday, December 10, 2015
Lancaster London Hotel,
London

Research

OUT NOW REPORT

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COMING SOON

Colocation Provider Investment:
Co-opting The Cloud For Future
Growth (October 2015)

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

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HIGH POWER DENSITY DEPLOYMENTS: OVERCOMING THE CHALLENGES

Wednesday, November 4, 2015
11am (PST), 2pm (EST)

Speakers: Henry Hsu,
VP, Products & Marketing, Raritan
Stephen Worn, CTO, DatacenterDynamics



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www.datacenterdynamics.com/webinars/raritan-webinar

OVERHEAD POWER DISTRIBUTION: BEST PRACTICE IN MODULAR DESIGN

Tuesday, November 10, 11am EDT, 4pm GMT

Speaker: Mark Swift, Director of Marketing,
UE Corporation
Steve Bornfield, Senior Data Center
Consultant, Chatsworth Products, Inc



Overhead power distribution in your data center offers many attractive possibilities but is not without its challenges.



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Adrian McPaul
Citibank

This event is always good to meet up with the old network team and also to see how new innovations are being delivered and presented at the forum.



Haifeng Qu
Alibaba

DCD Converged as a global conference organizer for the data center industry allows us to have an integrated understanding of the whole industry. Travelling to Singapore to attend this conference allowed me to really understand the market's direction.



Trouble ahead

The security landscape is rapidly evolving into something very worrying. While the security vendors were puzzling over their inability to avoid huge breaches such as those that occurred at Sony and RSA Security itself, something bigger has been brewing. And as with every other crisis, this one is constructed from a convergence of decisions with seemingly contrary motives.

North American police forces get active help to combat IT security threats, and the IT cyber security forces of the European countries have improved, but they are not keeping pace with the cyber criminals. According to a leading security specialist I spoke to this week, large groups of cyber criminals are using botnets of servers – which can only be coming from large data centers – capable of launching such powerful Distributed Denial of Service (DDoS) attacks that more European companies have caved in to blackmail pressure recently than ever before.

According to a recent report, a sample of US companies revealed they had experienced an average of 4.5 DDoS attacks per day in Q2 2015. This is a 32 percent increase on the previous quarter. What is more concerning is that these attacks are not just being done for the sake of it. Law enforcement agencies are dealing with strategically targeted attacks that are sometimes aimed at the supply chain of an organization.

Would-be blackmailers are taking out the key infrastructure systems of partner companies down the supply chain and attempting to extort money from major manufacturers. And many organizations are paying up. It cannot be left to the remnants of the IT security industry, which was, after all, born out of the need to protect the nascent PC industry from poorly written software, to protect the new, hugely sophisticated and complex global IT infrastructure from the new types of cyber crime.

Law enforcement now defines two major new threats: what can only be defined as state-funded cyber crime, and a new type of criminal enterprise organized on the scale of the corporate victims, and probably funded through the profits of selling illegal drugs.

We will be looking more closely at new security threats and how to combat them over the coming months.

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Bill Boyle – Global Managing Editor
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Q2 2015 has seen a 32 percent increase in the number of DDoS attacks in the US

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