GOING DIGITAL: WHERE IS OUR DATA?

AN INTRODUCTION TO DATA CENTRES
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We live in a digital world. Eighty three per cent of the UK population is online and the demand for virtual services is growing at an ever-quickening pace. So when the question “Where is our data?” was posed at a New Statesman-hosted round table earlier in the summer, there was both a simple answer to the question and some complexities to untangle.

The simple answer is that most of our data is housed in data centres. To proponents, including former cabinet minister Steven Norris (see interview on page 28), data centres are the factories of the digital age. This supplement acts in part as a beginner’s guide: the schematic overleaf, explains how they work while the jargon buster on page 30 provides some essential definitions.

The complexity surrounds security, privacy, energy supply, power consumption and a looming skills shortage – and these themes are addressed across the following pages.

Despite the centrality of data centres to much of the nation’s cultural, social and economic activity, awareness remains limited. Government remains confused, says Norris. This supplement is a contribution to the demystification process.
How a data centre works

A bluffer’s guide to the complex world of data hosting – from power stations to blade servers

1. **Power generating station**
Could be coal, gas, nuclear or renewable. A medium-sized data centre requires 10 megawatts (MW) of power; larger ones need 100MW or more. That’s the equivalent of one tenth the output of a generating station like Sizewell B.

2. **Power distribution network**
Power is transmitted from the generating station – usually on a distant coast or river far from the data centre – typically located in London, Manchester or other major cities around the UK, close to where telecommunications fibre cables provide connectivity to the internet. Up to 6 per cent of the generated power is lost over the long distances involved.

3. **Substation**
The National Grid operates at 400,000 volts. Big substations bring the voltage down before connecting to the data centre’s own substation where it is converted into the 440 volts and 240 volts needed to operate the equipment inside the data centre.

4. **Data centre**
Often the size of many football pitches these giant data factories live in anonymous industrial buildings hidden away on industrial estates or in ordinary-looking office blocks in cities.

5. **Standby generator**
Often rated at half a megawatt each, the generators keep the data centre alive if both its primary power sources fail. Another system (not shown) inside the data centre called UPS (uninterruptible power supplies) can keep the facility running on battery power for around ten minutes, long enough to get the generators running smoothly and ready to take over.

6. **Chillers**
Most of the energy that goes into running a data centre ends up as heat. Massive industrial chillers, or refrigeration units, create very cold water which is pumped inside the data centre to equally massive Cracs (computer room air conditioning units) which flood the data centre with cold air to be sucked through the servers to keep the chips cool.

7. **A 19in rack**
Where the servers and other electronic equipment are located. The mounting width of all electronic equipment is a standard 19 inches and equipment height is measured in terms of its “U” height. One “U” is about 1.75 inches and is the height of a pizza box server.

8. **Pizza box server**
The data centre workhorse – an industrial version of a desktop computer but built to a much higher specification. Contains processor(s), hard disks, two power supplies (so that one can fail) and lots of RAM.

9. **Blade server**
The new darlings of the data centre industry, these are far smaller than the pizza box server. The size reduction is achieved by stripping out elements like the power supplies and mounting them in a chassis or shelf into which 16 or so smaller server cards or blades are plugged. Blade servers squash so much processing power into a small space that one chassis can consume 16 kilowatts.
2. Power distribution network

3. Substation

4. Data centre

5. Standby generator

6. Chillers

7. A 19in rack

8. Pizza box server
Put digital first, minister

by Simon Campbell-Whyte

While governments around the world are choosing to embrace and invest in their data centre industries, here at home there is no support and little strategic thinking. It is less than 20 years since the very first e-commerce websites came into being; yet today we rely on data centres to operate and control just about every aspect of our lives – from tweets and Facebook updates to emails, airline booking systems, online shopping, iTunes, on-demand video and catch-up TV, the health service and even the sequencing of traffic lights to reduce gridlock.

The UK is today one of the world’s main data centre hubs, alongside the United States, Netherlands and Germany, but it is in danger of losing that status. Why? Because the UK government that depends on these massive data factories to make real its “digital by default” strategy is strangling the data centre industry when it should be helping it to develop and prosper.

Meanwhile, governments around the world are choosing to embrace data centres as the massive economic opportunity and future that they represent. The Middle East, Far East and South American are all energetically building new data centres and recruiting skilled staff, many of whom are being brain-drained from the UK.

Here, however, data centres don’t fall neatly into the remit of any UK government department. Consequently no department supports them and there is no strategic approach to what is probably the UK’s most valuable industry.

The Data Centre Alliance (DCA) was formed two years ago with the mission to represent the entire industry around the world – data centre operators, suppliers, academics and individual data centre professionals – to drive up standards and share best practice knowledge. One aim is to reduce the possibilities of data centre outages which all too regularly bring companies, mobile networks and public services to a grinding halt. Another is to provide a much needed level playing field for data centre customers and users by producing regulated benchmarks.

Data centres are highly complex integrated facilities – often the size of five or ten football pitches – and covered by up to 26 different (and often conflicting) standards, guidelines and metrics. But the vast majority of these are voluntary and, before the DCA launched its recent certification scheme, 99 per cent of data centres were self assessed meaning they could make more or less any claim they wished with no regulation.

Data centres process transactions worth billions of pounds every second. DCA launched its recent certification scheme, 99 per cent of data centres were self assessed meaning they could make more or less any claim they wished with no regulation.

Great progress has been made on this front with over two hundred DCA members agreeing to the DCA-regulated certification scheme. This scheme will enable customers to judge these highly complex facilities accurately, one against another. This will take out much of the guesswork currently involved in buying data centre and cloud services.

Knowledge transfer activities are sorely needed. Most of the people who keep data centres working are aged fifty-something and did not learn their trade at university. The DCA is already actively engaged in helping its members deal with the problem. Earlier this summer we piloted the first of many special training “boot camps” at the University of East London in Docklands in conjunction with data centre operators CNet (see page 9 for more on this project).

At the boot camp, graduates from across the London area endured two weeks of intensive training designed to instil the critical thinking required to work in a mission critical data centre.

The efficient use of energy in data centres is a daily agenda item and the UK government has already identified emerging markets, lack of trusted information, the under-valuing of energy and misaligned financial incentives as the main barriers the country must overcome if it is to have any hope of achieving energy efficiency targets. It is encouraging that, as a result of a recent meeting with energy minister Greg Barker, the data centre industry is, at last, recognised as suffering from all four.

Now we can begin a programme to work together to find world leading solutions and build on the expertise established here at home. We are, after all, world leaders in information technology.

Let’s embrace it, not penalise it.

Simon Campbell-Whyte is executive director of the Data Centre Alliance
The best things in life really are free

The spiralling cost of energy consumption to organisations and the planet is one of the greatest challenges facing business leaders.

By 2020, it is estimated that the IT sector will be the world’s most energy consuming industry. Data traffic is set to grow 30 times over the next ten years and energy costs continue to rise year on year. Add the introduction of Government legislation such as the Carbon Reduction Commitment scheme (CRC), and data centre managers have a lot to consider.

“Data centres use vast amounts of energy and generate massive heat loads that must be controlled to make sure IT systems work efficiently and reliably,” comments Paul Griffiths, Technical Director of Weatherite Group. “The problem is that some cooling systems can account for over 40% of a data centre’s total energy costs. The dilemma for data centre professionals is how to reduce overall energy consumption and PUE, while maintaining effective, safe climate control. It seems surprising then, that there is an alternative solution which many data centre professionals have yet to recognise and capitalise on. Even more remarkable is the fact that, as a resource, this solution is ‘free’.

Substantial Savings

The Weatherite Group has been cooling IT critical environments using direct, free outside air systems for over 20 years. These systems are an energy efficient, low carbon and environmentally sensitive solution that can deliver significant energy cost savings without compromising operational performance in any way. Until relatively recently, the cooling of many data centres has been achieved using Computer Room Air Conditioning systems (CRAC systems) which maintain close tolerances in temperature and relative humidity – yet demand vast amounts of energy. However, this is changing.

“Today’s IT equipment is far more tolerant to wider ranges of temperature and humidity and the latest servers are rated for much higher operating conditions – enabling the use of more energy efficient cooling technologies, such as free outside air cooling,” says Paul Griffiths.

Effective

The Green Grid, a highly respected, not for profit organisation, whose aims are to improve energy efficiency within data centres, released updated free cooling maps in March 2012 showing that free cooling can be used year round in over 75 percent of North America and over 97 percent of Europe. ASHRAE, the EU Code of Conduct for Data Centres and major server manufacturers all back the widening of operating temperature and humidity parameters in data centres. Facebook, ebay and Google have also switched to outside air cooling to regulate the temperature of some of their data centres. Ebay is operating its data centre in Phoenix, Arizona with free cooling year round - even on days when air temperatures reach 46°C. In the UK, this process can be effective for well over 90% of the year, 24 hours a day, and 7 days a week.

Free outside air cooling is excellent news for both the environment and business as mechanical cooling - and therefore energy costs, are significantly reduced. The lifetime of cooling equipment is increased substantially, service intervals are extended, on-going maintenance costs are reduced, and the savings made deliver a significant improvement to the businesses bottom line!

Free-Cooling Packages

Weatherite manufactures packaged direct free data cooling systems for data centre customers such as O2, EE and Virgin Media.

Free cooling is usually suitable for the vast majority of IT mission critical applications, from a replacement cooling system for a small comms room, additional cooling for the expansion of a data hall or the building of a large, high density data centre housing rows of server racks. Weatherite offers free site surveys, with highly experienced technical staff who can provide advice on achieving the optimum cooling solution for customers.

With over 40 years experience of cooling technology, Weatherite is one of the UK’s leaders in the development of high efficiency, energy saving data centre cooling solutions. From our state-of-the-art UK manufacturing facility in the heart of the Midlands, we design, manufacture, test and pre-commission all our ‘Free Cooling’ solutions – combining maximum server cooling efficiency with low operational costs.

For further information, please contact Paul Griffiths, Technical Director of Weatherite Group at pgriffiths@weatheritegroup.com, call 0121 665 2266 or visit www.datacentre-cooling.com
FACTS & FIGURES

The UK Data Centre Market by Numbers

- 3rd LARGEST GLOBALLY
- 3m SQUARE METRES
- 2.85GW ANNUAL POWER REQUIREMENT
- £15bn ANNUAL INVESTMENT

Energy & Environment

- 80% of organisations monitor energy usage continuously
- 37% of organisations monitor carbon emissions continuously

Outsourcing

- 18.3% OF ALL DATA CENTRE SERVERS ARE OUSTROURED (UP FROM 14.1% IN 2011)
- RATE OF GROWTH FORECAST BETWEEN NOW AND 2016: 15-20%

Key Reasons for Using Data Centres

- REDUCE COST
- INCREASE IT CAPACITY
Data centre facilities are the building blocks of the economy, they are vital to the integrity of public services and the competitiveness of businesses. The industry provides employment for over 15,000 people in the UK and provides livelihood for millions more. All sectors from banking to professional services and retail are greatly dependent on data centres to run their business. Our national security and economic wellbeing depend on them.

But here’s the problem. So far, the expertise and skills required to support this vital industry have largely been developed from specific technical areas and through years of on-the-job experience. There has been little or no interface or skills transference to, or from, academic institutions. In addition, due to its diverse nature, the data centre straddles and draws from a wide range of scientific and vocational disciplines such as computer science and informatics, mechanical, electronic, mechatronics, building design, thermo fluids and heat transfer, building management, telecommunications, information sciences, security, and project management.

Many engineers in those areas have become, over time, highly specialised. As a result, areas of expertise are not aligned to the broader data centre environment. This in turn has created silos of expertise. It has also meant complex management of skills and business requirements.

In short, the data centre industry is suffering from skills shortages and the situation will become exacerbated as more experienced professionals reach retirement age.

There is no structured system in place to educate their successors. There is urgent need for professionals who can design and operate energy efficient sites that are reliable, secure and cost effective. Professionals with a broader range of skills such as data centre architecture and design, power management, servers, security software, crisis management and storage management are required. So too is experience in overseeing mergers and acquisition, and administering management applications. The industry needs a global professional accreditation, such as a postgraduate specialisation, authenticated by universities.

Recent studies including those coming out of the 2012 Data Centre Alliance (DCA) summit recommended a set of strategic steps. It was recognition that resource efficient data centres require new design, construction, operational methods and technology. These cannot be implemented without acquiring new skills and techniques. Hence the development of a co-ordinated strategy developed by academia and the data centre industry.

Telecity, Telehouse and training company CNet funded their own pilot plan: a two week “boot camp” was organised earlier this summer by the DCA and the University of East London. It featured bespoke training and it was free to attend. The portfolio of training courses covered essential skills such as critical thinking, physical infrastructure, how to work with multi-disciplinary teams and effective operational processes. Among the specific topics addressed were data centre standards and measurements, power, cooling, security, access, regulations, cabling, energy efficiency and disaster recovery.

The list serves to illustrate the breadth of training on offer but also the need for such a course. In addition, the DCA and UEL are leading the way in building a strategy for securing research and development funding. The result has been a €1.7m budget from the European Union to fund an 18-month project. The UK-led initiative involves four universities drawn from data centre hotspot areas in UK, Netherlands and Germany.

This is the first European project focused solely on the data centre industry. But more is needed to even begin to match the R&D budgets of other industries of similar size and importance. Take the aerospace industry for instance which has budgets worth $500bn.

Why do we need more investment for projects like these? Because if we really want to maintain competitive advantage over fast developing overseas markets and to leverage world-leading UK expertise and skills built within the data centre industry, we have no other option.

Hassan Abdalla is the dean of the School of Architecture, Computing and Engineering at the University of East London. For more data-central.org/?page=bootcamp

Why it’s time for boot camp
by Hassan Abdalla

If the industry is to prosper it needs formal training and qualifications to fill the looming skills gap
Operating a data centre is a big commitment. Getting the very best out of such vast mechanical and electrical infrastructure should be a business priority. But are you looking closely enough and asking the right questions?

**Efficiency**

Energy efficiency is not just a cost saving exercise but an environmental responsibility. However, maximising energy efficiency can save you money on your annual power bills as well as improving your capacity to deliver excellent customer service.

The need for data centre services is growing. Constantly changing business requirements and technology innovation means customers now demand value for money and prioritise efficiency when it comes to data centre services. Improving your efficiency and reducing your costs allows you to be more competitive and position your data centre to handle future business changes.

**Expertise**

Colt own and operate 20 data centres across Europe. With 15 years of industry experience and managing 30,000sqm of data centre facility, our Data Centre Services division have the expertise to make the kind of strategic improvements required in order to ensure maximum energy efficiency.

While we provide some of the most efficient data centres on the market for either Colt-owned sites or customer sites, we understand that not everyone is in a position to move to new facilities.

Before you make that move, you need to ensure that you are maximising the efficiency of your legacy data. Based on our learnings from an extensive energy efficiency programme across all of our data centres over the last 3 years, we have created some straightforward measures that you can start to implement today.

1. **Measure**

Starting to measure, record and track power use on a regular basis is the first step to a more efficient data centre. Put yourself in a position to benchmark your existing energy usage against a comparable timeframe. Continue to measure energy usage consistently and regularly — but avoid snap judgements based on short term results.

2. **Regulate air flow - prevent hot and cold mixing**

A data centre is essentially a structure that manages the flow of cold air in, and extracts hot air. If the airflow process is not managed correctly, mixing will occur. Controlling airflow and limiting mixing is always a priority.

3. **Align hot and cold aisles**

Take steps to ensure all servers within the racks and rows are facing the same direction. Then separate the rows into hot and cold aisles with the front of the servers facing one way and the back the other this ensures colder air is directed to the front of the servers and hotter air flows from
Creating clear airflow makes the data centre much easier to control and plan.

4 Reduce airflow leaks: blanking plates
Install blanking plates to fill the gaps where no equipment is present. These can stop air escaping between equipment within racks.

5 Check flooring
Check your flooring for gaps allowing air to escape; behind and beneath air cooling units or through revising the position of air vents in floor tiles. The goal is to direct the cold air in one direction, through the racks and out the other side. Mixing of hot and cold air within the data centre is inefficient.

6 Introduce aisle containment
Aisle containment can be introduced to further separate hot and cold air and improve the direction of airflow. Introducing roofs and in particular doors to the end of aisles can result in a major improvement.

7 Control air temperature
The average data centre runs at 21 degrees, but with extended ASHRAE standards, server manufacturers are happy with DC temperatures from 18 – 27 degrees. Steps to regulate air temperature such as turning off cooling units, where excess redundancy exists, or increasing the supply air temperature to the room can lead to further savings.

8 Regulate humidity
Maintaining humidity within a data hall within tight bands is like permanently boiling a kettle. Server manufacturers are willing to accept wider humidity bands as per ASHRAE. By operating to a wider banding; between 20 – 80%, air is able to shift a little more and vapour production can be significantly decreased—reducing energy consumption.

9 Check transformer voltage
Regularly check the voltage of your electricity transformers to ensure they match exactly the supply voltage requirement for your equipment. A higher voltage than required means an unnecessary use of power, increasing costs.

10 Remove isolation transformers
Isolation transformers were a design preference from the 1990s. A legal requirement in some countries at the time, these can drain on your resources but are usually no longer required.

11 Turn off redundant equipment
Switching off or changing redundant equipment is a simple, yet an often overlooked step to significant energy savings. A single new server can now do the job of multiple older servers, saving energy and lowering your system cooler requirements – a compelling reason to change/upgrade your servers. Take the long term view when considering whether to upgrade sooner rather than later.

12 Measure again
Regular meter readings will help you understand trends and eliminate any seasonal spikes or oddities to introduce energy saving measures immediately. At the end of a 12-month period you should have enough data to benchmark against and get a clearer picture of your overall efficiency.

Summary
Whether your priority is power saving, reducing costs or internal environmental objectives, data centre efficiency is a valuable priority to focus on. It drives efficiency on a broader business level and can be a source of competitive advantage.

Our energy efficiency programme incorporating many of the steps outlined above has resulted in significant savings across our data centres—18% reduction in energy use over the last three years—equating to an impressive saving of €4 million to date.

Our efforts in this area have also been recognised within the industry as Colt became the first data centre operator in Europe to be awarded the M&O Stamp of Approval for operational excellence, and also claimed the Energy Efficiency and Environmental Sustainability award at the 2013 International Data Centre Cloud Awards.

Our key findings can be a useful starting point for any organisation looking to do the same and we would welcome the opportunity to offer any interested parties a tour of our facilities and delve further into how to make your data centre more efficient.

Simply contact us at +44 (0)800 358 8401 or dcsinfo@colt.net

About Colt
We bring together expert people, tailored solutions and world-class network and data centre assets to make it easy for our customers to buy and manage the communication and technology solutions they need. With a 22-country, 43,000km network and 20 Colt data centres across Europe, everything we do is driven towards making things simple, making things seamless and making things work for our customers.

This is what makes Colt the Information Delivery Platform.

Visit www.colt.net/dcs
For those on the outside the data centre industry is little understood, rarely occupying their thoughts despite the fact it underwrites many of the activities of everyday life from banking to tax returns, from email and Facebook to tap dancing dogs (more of the dogs later). For those on the inside there’s a feeling that theirs is an industry largely misunderstood – sometimes wilfully so – and that policy makers are among those who have little grasp of its impact.

For an industry that invests £15bn a year, where the UK ranks third in the world and where issues such as security, privacy, energy supply, power consumption and skills shortages hit directly against the policy concerns of multiple government departments, this is a curious state of affairs.

In an effort to shed a little light on the sector and debate a number of these topics, the New Statesman convened a roundtable earlier this summer. Among the invited were those who run or represent data centres, lawyers, analysts and assorted industry watchers. The principal guest was Andrew Miller, Labour MP for Ellesmere Port and Neston, and chair of the House of Commons science and technology committee.

In a wide-ranging opening, Miller reflected on the inexorable growth of data (“do people ever throw out their rubbish anymore?”) and the effort to move all government processes online, or to use the strategy parlance, “to go digital by default”. “It’s a great idea, there is no party politics, it makes an awful lot of sense but there are some challengers,” Miller observed.

Confidence

Among the challenges of going digital by default, Miller said, is the need to preserve people’s privacy (his committee won’t, for example, switch over to the iCloud when conducting business using Apple iPads because “it is under the jurisdiction of Patriot Acts”) and the need to provide certainty when transacting in the digital space. “How do we engender public confidence?” he asked.

James Dodsworth, head of the global data centre practice at law firm White & Case said the answer lay in educating the public, making people aware that data centres are “already an integral part of business infrastructure in this country”. While acknowledging that there is a legitimate “issue around transparency”, Dodsworth said it was understandable that “people don’t want the data centres whereabouts to be known, [or] how the system works.”

Dennis Kehoe, chief executive of AIMES Grid Services, said the best way to engender confidence is to learn from the airline industry. “One of the things that has transformed the perception and acceptance of air travel, and the confidence of its consumers and regulators, has been brands like Rolls Royce,” said Kehoe. “Now where did that brand come from? Partly from a great deal of policy support over many years because we understood the structural, political and economic impact of the aerospace industry. I think we’ve got to wake up to that … Politicians in my view don’t really understand the infrastructure industry, and they certainly don’t understand the internet.”

Dennis Layton, partner at McKinsey, agreed. “If you included data centres in your definition of national infrastructure, critical national infrastructure, and had policies around that, [then it creates] confidence in security but also confidence in the value proposition for investing in the UK. I think that argument is being undersold.”

While Miller said the there was a better
understanding of the issues in the Cabinet Office than before, he acknowledged that it “doesn’t percolate right through the system”. Asked to identify where it hadn’t, Miller said the benefits side of the Department of Work and Pensions was “probably the weakest link”, where multiple agencies were failing to share data effectively.

Security

Security is a catch all term that can be applied in at least three ways. First there is the physical security where the role of the data owner is to prevent the servers being stolen or sabotaged. Second there is what might be defined as geo-political security: around resilience and guarantee of supply. Finally there is data security, the possibility of hacking on an industrial and/or a state-sponsored scale.

It is the final category that tends to generate the most headlines but, said Layton, it is the first that matters most to those who run technology departments within UK plc. “Physical security is, to CIOs, much more important than cyber security because it is a bigger risk, a more likely risk,” he said. It was a point echoed by Huw Owen, chief executive of Ark Continuity. “If you think of bringing down the nuclear programme in Iraq, it was most likely someone interfering in a physical sense with the hardware.”

And security had a further meaning, Owen said. “Resilience to me in a data centre sense begins with tenure of land so how do you hold that land? Is it freehold? Is it sold? Who else can control what you’re doing?”

Power consumption

In September 2012, the New York Times published a now notorious article by James Glanz entitled “Power, Pollution and the Internet”. In it Glanz accuses the data centre industry of being “incongruously wasteful”. He wrote: “Online companies typically run their facilities at maximum capacity around the clock, whatever the demand. As a result, data centers can waste 90 percent or more of the electricity they pull off the grid.”

Rob Coupland, UK managing director of TelecityGroup, mounted the case for the defence. The purpose-built data centre, he said, is far more efficient than the alternative: servers distributed “in individual offices and server rooms that weren’t really designed for purpose”.

The common measure of efficiency within a data centre is PUE (power usage efficiency). Specifically, this is the amount of energy that is used for computation – the processing and storage of data – divided by the total amount of power used by the data centre for cooling, back-up and so on. In modern data centres a PUE of 1.5 or below is not uncommon; twenty years ago it was far higher.

Coupland pointed to a paradox that has accompanied the rise of the state-of-the-art data centre. “You’ve taken what is an awful lot of distributed power, albeit in fairly small chunks, that nobody sees and put it in one place, and that’s the challenge. So actually driving the right behaviour to optimise efficiency and minimise the use of carbon makes it look like a big ugly consumer of power.”

Owen said there were examples of wasteful energy use out there, suggesting that some systems integrators and government departments were guilty of not thinking about consumption. “Government department’s won’t be staring at a data centre’s inefficiencies” He contrasted that “purpose-built, highly efficient” data centres. “Just taking a stick to all data centres, including ours and...
other round the table is stupid.”

Dennis Kehoe said that regardless of perceptions of an energy hungry industry the imperative is to move those 80 per cent of companies storing their data inefficiently – registering a far higher PUE – to where the 20 per cent are today. In fact, he said, the NYT article was “exceptionally useful” in raising the issue.

Andrew Miller said that to contemplate going back to the way we managed data in the past is “utterly absurd” while Emma Fryer, associate director of climate change programmes at industry body Intellect, said “even rubbish data centres use less power than something in-house.”

There’s more, however, from the New York Times, more criticism of the industry. The article refers to what it calls “comatose servers”, those bits of hardware that are effectively out of commission but no one dares turns them off (because no one unplugs a server, ever). According to Glanz, when the energy output of these low, or zero, utilisation machines is combined with the power required to cool and back-up the data centre “the energy wasted is as much as 30 times the amount of electricity used to carry out the basic purpose of the data center.”

Again the criticism was met with defiance. Fryer queried the use of the word “wasted”.

“Wasting 90 per cent of the energy is exactly the same as using a car, where 90 per cent of the energy that the car uses is for moving the car about not the person sitting in it. But he doesn’t go on about cars. He doesn’t go on about old light bulbs which lose 95 per cent of the energy in heat.”

Bernard Geoghegan, managing director, EMEA of Digital Realty argued that a useful analogy for the data centre was with the automotive industry where tax breaks are offered for hydrogen cars but “just because cars are designed to be efficient doesn’t mean you emit less carbon than that car because you may not drive it properly.” He said the neglected server was the equivalent of “a poor driver of a car”. “The data centre community now provides [help to] drive your car.”

Given the issues raised by the NYT, is PUE the best measure of efficiency or merely the best measure we have? Rob Coupland again: “PUE has the advantage of being something that is relatively easy for everybody who operates the data centre to get hold of that as a measure and do something with it. Where it becomes slightly tricky is that you end up in an arms race.”

Regulation and incentives

Coupland’s concern is that all data centre owners – of “well-built, well-managed sites that minimise the impact of carbon” – are being punished for the inefficiencies of others and for a general misunderstanding of their role. This, he and his peers believe, is exemplified by articles like that in the New York Times. (It is a theme picked up by Steven Norris, former cabinet minister and now chairman of the Data Centre Alliance; see page 28).

Optimising efficiency has made us look like big, ugly consumers of power

As a result the incentives put in place by successive governments and based on the carbon reduction commitment (CRC) energy efficiency scheme are misconceived and, Coupland argued, run against the intended aim.

Why? Because it acts as a “counter incentive” for someone who is sitting on their data in a small but inefficient server room to bring it into a large but efficient data centre. “You actually get penalised for doing that,” Coupland said. “That degree of uncertainty plays against us when people are deciding whether they should go to the UK or whether they should go to the Netherlands, or Germany, or other places.”

So what is the answer? A line in the sand – based on an agreed PUE rate – above which companies will be punished but below which they will be rewarded by means of a sliding scale of exemptions. “CRC is a fairly blunt instrument,” Coupland said. “There is fairly large amount of inefficient use out there and that’s what we should be focusing on.”

Miller pointed out that other industries are developing some useful metrics to measure their overall carbon emissions. He cited the transportation industry which uses a “wells to wheels” measure to assess the energy consumption over the life cycle of a vehicle.

Ed Cooke, partner at legal firm Bird and Bird and specialist in complex real estate, said it was time Parliament demonstrated a proper understanding of the industry. “I would like to see the data industry not be used as a whipping boy,” Cooke said.

“If policy makers really understood the data centre industry and could bring consistency to their policy-making across all the different areas in which policy affects data centres markets, then that would be a great step forward.”

Bernard Geoghegan added: “I believe the data centre industry is the most efficient industry that’s there.”

Economic model

“Information Technology is a derived demand,” said Emma Fryer. “You don’t look at zeros and ones for the joy of looking at zeros and ones, you design IT like you design transport to do something, and therefore you want to look at IT in terms of what is delivered. What’s the net outcome?”

“So if the net outcome is lots of videos of tap dancing dogs well I don’t think that’s particularly useful in terms of emissions or in terms of our economy. If the net outcome is actually massive improvements in efficiency, in either logistics or putting in processes systems carbon or doing things like improving telecommunications, you can gradually make the infrastructure better or more intensive, then those things are great.”

Ah, tap dancing dog, the other player in the energy and economic debates. Not the dogs themselves but the viewers of videos.
of tap dancing dogs (and cute cats). If the incentives are misaligned for the data centre providers then there are arguably no incentives at all driving the general public to limit their consumption.

**Energy supply**
Fryer identified the freemium model, beloved by digital companies, as a major part of the problem. As a business model, freemium works because revenues come from a small percentage of the audience who pay for a premium service, while the cost of providing a basic (and free) service to the rest is marginal. As Fryer points out that means there is “no price signal” for the majority of users. Moreover, “people have absolutely no concept of the energy impact of these activities because a lot of that energy is invisible.”

Dennis Layton, echoed this point. “There is no model in place so if you watch 50 dancing dogs it costs you the same [as watching one]: nothing.”

Both James Dodsworth and Dennis Keohoe raised the spectre of scarcity of supply during the conversation. “Just as we talk about the capacity and the context of our other infrastructure, whether it is airports or roads, we need to talk about data centres and capacity and focus in the same way,” said Dodsworth.

Meanwhile, Keohoe asserted: “If you plotted the current projections, the best case apparently is that if the trend continues it will consume all this country’s electricity by 2020. And the worst case is that it will be nearer 2016. So the lights are going to go out shortly because of the dancing dogs.”

Fryer disagreed. “The dancing dogs will have to meet the market” Meaning? “The market will change. If I’m going to upload a video of tap dancing dogs and I’ve got to pay 50p to do that so I might think, ‘Hmmm shall I do that?’ I don’t think the freemium model is sustainable.”

Despite this market solution to a pending problem, the view shared among many attendees was that there needed to be greater assurances around future power supply. Rob Coupland pointed out that building and running a data centre is “a capital investment where the business cycle is maybe 15 to 20 years. These are not short-term investments, they are infrastructure investments that pay out over the very long term, so having visibility and certainty around supply is absolutely critical.”

**Skills gap**
Another topic of concern for the data centre industry is the lack of skilled and qualified people coming through. For Simon Campbell-Whyte of the Data Centre Alliance the question is who is going sustain this part of the knowledge economy given “there’s more than one grey-headed person in this industry”. He believed data centres have “fallen between the cracks of traditional engineering and scientific vocations” when it comes to attracting a younger generation.

Keohoe of AIMES Grid Services agreed it was a pressing issue. He said: “Two and a half million cloud engineers are required worldwide between now and 2015, the US needs one and a half million. BT alone needs 50,000 over the next two years. How many did the universities produce this year to the nearest thousand? Zero. We have a really major problem about how we are going to develop that in the UK but we need to prioritise it and to see it as an opportunity.”

In an effort to plug the skills gap, the DCA has joined forces with the University of East London and the University of Leeds to create a data centre “boot camp” (see page 9). This will feature data centre training and suitability assessment with the aim of giving graduates the additional knowledge they need to successfully apply for data centre related jobs.

As the debate drew to a close a succession of data centre insiders pleaded for the better understanding of their industry while acknowledging that part of the responsibility was their own.

**Conclusions**
Gabriel Harris, director of CBRE Data Centres, said: “The United Kingdom and London in particular is one of the largest data centre markets in the world and certainly the largest in Europe and so we have a real opportunity now right to show real leadership from the government that we are going to put proper policies in place to deal with this.”

For Dennis Layton the focus should be on three areas: first, relaxing regulatory breaks; second, enabling the conditions for success; and thirdly ensuring the talent is in place.

Campbell-Whyte said people should recalibrate how they think of data centres. It was, he said, more accurate to think of them as “the digital factories of the digital revolution, something that they should be looking at as a good thing.”

Emma Fryer added that she wanted politicians to start making informed decisions but conceded that the industry had a role to play in this. “I’m not after special pleading for data centres,” she said. “I’d just like intelligent policy making. The obvious conclusion of that is that we need to do the informing so I think the priority is to make sure we explain our sector in words that people can understand and so that is actually my key priority.”

Andrew Miller agreed. “You’ve got to go out and educate policy makers about it,” he said before suggesting a rather unexpected approach. “My challenge for you is to go and see your own MP so that they … understand it. During busy surgeries when you are dealing with people with lots of problems, MPs actually quite like someone coming to them and telling them a good news story. I love it.”

The round table took place on 11 July 2013 at Portcullis House adjoining the Palace of Westminster. For a full list of participants, see page 2
The power paradox

by Emma Fryer

Every time a physical process is replaced by a digital one, the emissions change sector and IT picks up the tab. This is a perverse way to look at carbon productivity.

We need energy targets. We need them to help us achieve our emissions reduction targets and we need emissions reduction targets in the UK because international climate change negotiations are moving at glacial speed. So in the short- to medium-term at least, the policy initiative has to be taken either at national or regional level. This creates some thorny issues.

Rolling out unilateral constraints on carbon is always going to be problematic when the organisations subject to them operate in a global market that is not similarly constrained. While some data centre operations are location-specific, the majority of data centre services can be located anywhere in the world. Data is, after all, the most mobile commodity in existence. Moreover, many of the organisations using these services are themselves location agnostic.

It is easy to see that applying constraints in one jurisdiction can have negative consequences. UK businesses are placed at a competitive disadvantage compared to their counterparts overseas. Secondly it discourages inward investment. Why pay carbon taxes in the UK when you can go to the US and pay none?

There is a third problem relating to our global market. All carbon and energy targets for the UK relate to production rather than consumption. So we are measured by what we emit in the UK not what we import as embedded emissions in goods and services. It might appear at first glance that we have decarbonised our economy but we haven’t. We have just shifted the carbon intensive activity elsewhere. If you add consumption emissions to our tally, emissions are rising, not falling.

Restricting production emissions without addressing imported emissions can drive activity to other, more carbon intensive, regimes. This is known as carbon leakage.

So the global market is one issue. The next issue is the conflict between absolute emissions reductions and the need for growth. By their nature, almost all targets and accompanying legislation are focused on net reductions. This is a particular problem for data centres for two reasons.

Firstly, the sector is growing quickly and it is creating a rapidly expanding ecosystem of high value-add jobs and services. Although efficiency (in terms of processing power) is increasing very fast too, it can’t quite keep pace with the explosion in demand. Policy tools like CRC (the carbon reduction commitment) or other “polluter pays” mechanisms penalise this growth.

Secondly, the purpose of data centres is to concentrate computing functions into specialised, purpose built facilities. By doing so they replace inefficient “distributed” computing (which was the traditional approach) with a far more efficient alternative. However, current legislation punishes them for doing this because the emissions associated with the computing resource (which had previously been hidden in office buildings) become transparent and accountable for the first time— even though they are lower.

Net emissions decrease, but data centre emissions increase— and so do their carbon taxes. Instruments like CRC with an energy threshold are particularly damaging here because they encourage inefficient distributed computing, which remains below the radar, rather than consolidation.

This is true of IT generally: computing underpins every industry sector so every time an energy intensive, physical process is replaced by a digital one, the emissions change sector: if a logistics software solution saves fuel for a truck company the transport sector benefits from the emissions reduction but the IT sector picks up the additional, albeit minimal, carbon. Policy tools often don’t recognise that our economy is not a series of unconnected sectors but a complex ecosystem.

So what is the answer?

Achieving our 80 per cent reduction targets by offshoring all our energy intensive activity and destroying our own economy would not represent a successful policy outcome. We need to focus on energy efficiency and carbon productivity as well as...
All human endeavour

by David Snelling

The more resource efficient (and cheaper) data storage becomes, the greater the demand; often for uses that didn’t exist before.

The UK data centre industry faces a particular challenge in becoming more energy efficient. London was one of the major global centres of data centre development in the mid-1990s with the advent of the commercial internet. Many of these data centres need to be upgraded and seriously lag in energy efficiency terms when compared to new facilities being built today. We could halve the energy consumption of the UK data centre estate through a wholesale improvement programme.

The good news is that the data centre industry, through organisations like The Green Grid, recognises the challenge. A range of efficiency metrics and tools have been developed that help identify how energy consumption can be improved. These metrics also help improve transparency and allow customers to choose data centre suppliers with a more sustainable carbon footprint.

Cloud computing has also improved power usage as it allows lots of different organisations to store their data together in larger and more energy efficient data centres rather than in their own computer rooms.

Public policy can play a vital role in guiding the improved energy efficiency of data storage. Within the EU, data centre efficiency is primarily driven through broader energy saving initiatives and policies to improve product and building design. These policies apply equally to data centres as to factories.

The EU Emissions Trading Scheme (ETS) also presents data centres with an uncertain indirect cost that might have to be passed onto their customers. Other financial costs and incentives have also been put in place to encourage greater environmental responsibility.

However, while measures like this will improve the energy efficiency of the data centre estate itself, it does not address the impact on the environment of all the human activity that increased data is bringing. Efficiency will be massively improved but total energy consumption will still continue to rise.

Data centres are not an isolated piece of infrastructure but an enabler in nearly every human endeavour. The environmental impact of data centres therefore stretches into every discussion of environmental sustainability. These bigger questions about controlling our environmental impact and limiting what we do and why we do it in the context of near-limitless data storage, has barely even begun to be considered.

David Snelling is research project manager for Fujitsu and a member of The Green Grid (thegreengrid.org).
Data centres come in a variety of shapes and sizes. A disused mine in Eid Municipality, 15 miles from Maloy, Norway, is the site for a large colocation site. It lies beside a deep, cold fjord, has a reliable power supply and good access to carbon-neutral energy such as hydropower and wind power.
FLEXIBLE DATA CENTRE SOLUTIONS
THE POSSIBILITIES ARE INFINITE...

WHO IS DIGITAL REALTY?
As data continues to fuel global economic growth, we work alongside our customers as a strategic data centre partner. We support organisations with a range of tailored data centre solutions, while maximising any existing infrastructure and unlocking growth potential. Companies large and small around the world trust Digital Realty to help them realise their digital ambitions. They need effective data centre options, which we are able to design, fund, deliver and operate – wherever they are or want to be across the world.

DESIGN PARTNER
Digital Realty has shaped data centre solutions for some of the most diverse, complex and challenging organisations in the world. In total we’ve built over 22.7 million sq ft of data centre facilities across 32 markets throughout North America, Europe, Asia and Australia. No other data centre company has more experience in designing and building facilities than us.

FUNDING PARTNER
From large-scale bespoke facilities to smaller flexible turn-key locations, our investment and development programmes are aimed at helping customers to drive competitive advantage from their data. Our strong and unmatched financial backing means that we can offer a commercial approach that reduces risk whilst at the same time maximising return on investment.

DELIVERY PARTNER
Digital Realty has the broadest and most comprehensive data centre portfolio across the globe, including Europe. We’re constantly innovating to ensure that our customers can house their data the way they want, wherever they want. We’re striving to ensure that organisations can take advantage of new and emerging technologies by providing them with a low latency network backbone that enables them to transport terabytes of data at lightning quick speed.

OPERATIONS PARTNER
Digital Realty, and its management team, has decades of experience in site selection, design, construction, engineering and onsite services. All of those factors combine to make our facilities the best in the world. To ensure they stay that way we undertake annual customer satisfaction surveys and provide dedicated 24/7 support. We continue to develop our services to ensure that we’re providing a secure and efficient home for our customers’ data, not just for today but also for tomorrow.
FINDING THE RIGHT PARTNER FOR DATA ADVANTAGE

Data has become more valuable than ever before and as a global community we’re creating more of it than previous generations. A jaw dropping 90% of the world’s data was generated in the last two years alone. More applications, more channels, more users and more image-rich content means that data has become something of a phenomenon in its own right, as businesses around the world come to realise how it can drive innovation, uncover insight for competitive advantage and create a more personalised customer experience.

This reliance on data is in turn creating more demand than ever for data centre space. Selecting the right facility to house your most prized business asset can be confusing. Data centres have evolved from big warehouses where IT is simply stored to be viewed as strategically important. To help businesses adapt to the rapidly changing environment around them and to take advantage of new technologies such as Cloud and flexible approaches like BYOD, data centres have had to become smarter and better connected. They are the engine room fueling a nexus of mega trends. Choosing the right outsourced data centre for your company’s needs has never been more important.

With the explosion of data, there now comes the need to capture it and access it, from multiple locations via varying devices. After all, data is no good if it can’t be utilised. The continued creation of such vast volumes of Information is leading organisations to fast outgrow their infrastructure footprint. As a result, Digital social and economic agendas, interconnected data centre provisioning models are needed to support society’s growing requirement for access to content and information. To achieve this, we must embrace the concept of seamless network connectivity. It is essential that data centres, as well as their interconnecting networks, are well suited, reliable and secure. Should the connectivity of a data centre not be up to scratch, then no matter how much a company or government may invest in the supporting infrastructure technology, such investments will be in vain. That is why Digital Realty has put connectivity at the heart of its next generation data centre innovation, as we believe it will provide a long term solution to the issue of multi-site connectivity, in and around London – and soon across Europe and beyond.

Our data centre locations in the UK are centred around Greater London. Digital Woking, Digital Cheshingdon and Digital Redhill all provide customers with connection opportunities to a fast, reliable and secure network, just a stone’s throw away from one of the world’s economic command centres and foremost Internet Exchanges. The facilities form part of a highly scalable and high availability network ring. It is central to Digital Realty’s business practice that customers have access to a diverse range of connectivity options. This is to ensure that they can take full advantage of peripheral geography facilities, coupled with a network rolling from an inner city data centre.

With both data and connectivity fast rising up the corporate and social agenda, data centres have become the backbone of a highly performing IT infrastructure, crucial for delivering a seamless end user experience. At the heart of this is connectivity. Does your data centre have the connectivity credentials to power growth? It’s a question that all forward-thinking businesses and governments are asking themselves as they seek to implement growth strategies and socioeconomic policies. The answer may well determine their future success.

BERNARD GEOGHEGAN
Senior Vice President and Managing Director, EMEA - Digital Realty

Bernard Geoghegan joined Digital Realty in April 2013 as Managing Director, EMEA, and is responsible for managing and driving the growth of the Company’s operations in EMEA. Previously, Mr. Geoghegan served as executive vice president of Colt Data Centre Services and was instrumental in developing its modular data centre offerings. Prior to joining Colt, Mr. Geoghegan served as senior vice president of International Operations at Digital Realty from 2008 through 2010 after joining the company in 2000 as vice president, Europe.

FURTHER INFORMATION

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Colin Rees knows more than most about other people’s eating habits, their takeaway habits at least. As IT director for Domino’s he can tell, for example, that the most popular time to order a pizza across the week is between 7pm and 9pm on a Friday, Saturday and Tuesday night (Tuesday is special offer night). That’s the pattern that can be guaranteed across the UK. In Germany, where Domino’s has recently opened stores and where Sunday lunchtimes prove popular for pizza, the pattern is different but no less consistent. These peak times are up to 20 times busier than the rest of the week, says Rees who knows not only when people order but how. Specifically, that over 50 per cent of business comes from online sources, more than 20 per cent from mobile channels and that iPad and iPhone users are more likely to use their devices to order than those with other makes of tablets and smartphones.

Domino’s has over 800 stores in the UK and Ireland, in addition to those recently opened in Switzerland and Germany. The ability to deal with peak traffic is what shapes Domino’s technology strategy and what led Rees to the conclusion that the company’s needs would be best served by housing office-based, as well as customer-facing IT in an external data centre.

“I joined Domino’s three years ago now and the plan when I arrived was to build our own data centre. We changed tack,” Rees explains. The existing unreliability of Domino’s technology infrastructure and the opportunity to take advantage of an established colocation market drove that change in thinking.

“In the nicest possible way, feeding and watering the computers doesn’t really drive any commercial advantage. So things like the iPhone app which actually grow the business forward.”

“Feeding and watering computers doesn’t drive commercial advantage” of Domino’s technology infrastructure and the opportunity to take advantage of an established colocation market drove that change in thinking.

“I was running a very small team who were spending an awfully large amount of their time trying to keep our systems running … and so going for an external data centre allowed me to instantly to address the reliability,” says Rees of his decision to collocate his servers with Rackspace. “It allowed me to get a very competitive price … and it allowed me to focus more of my team’s resources internally on things that really gave us competitive advantage. So things like the iPhone app which actually grow the business forward.”

“In the nicest possible way, feeding and watering the computers doesn’t really drive any commercial advantage. It’s what you do with them that counts.”

Feeding and watering computers as a description of what a data centre can provide resonates with Tim Jones, chief information officer of Trader Media. As a publishing house Trader Media is best known for Auto Trader magazine. Today, the key marketplace for buying and selling new and used cars is most definitely digital. The Auto Trader website is visited by over ten million readers a month with peaks in the run up to the change of registration plate each spring and autumn; weekly traffic spikes on Fridays and Sunday and ad hoc spikes when BBC’s Top Gear covers the second hand market.

As with Domino’s, Jones’s initial incli-
nation was to build an in-house data centre but an ever increasing demand for “compute capacity” made a third party option more appealing. “The demand for the internet outstripped our ability to do it on premise,” he says. Four million users now access the site via mobile (“often using it on dealer forecourts to price compare what’s in front of them”) and those that are accessing via 3G make additional demands on the network. “It takes up a disproportionate amount of infrastructure in the data centre,” Jones explains. Trader Media chose Telecity’s Kilburn House facility in Manchester to house its server in part as a “location play” given the publisher’s technology team, 300 engineers strong, is based in the north-west. It has allowed them to remain “hands on”. In addition to dealing with expanding capacity, Jones wanted to avoid hiring staff with engineering disciplines “just to do the physical things like cooling and managing power”. He now leaves that to his data centre host. In the future he would like to pass more over, he says.

A major concern for BFK, which outsourced the data centre and cloud management to Fordway, is ensuring guaranteed connectivity at the capacity required, historically a difficult thing to achieve in London. Bandwidth of 50-100Mbps is typical, says Bull. “Because of the mobility of the projects getting connections in time is always one of the things we struggle with. The cloud is a way of solving this.”

Barnsley Metropolitan Borough Council chose a different approach. Having

*BFK chose to outsource its data centre because of the transient nature of what we do*
 traditionally housed and managed its IT infrastructure in-house, the council looked for a variety of outsourcing alternatives. As part of a deal it signed with Bull Information Systems in 2008, Bull built a £1.5m Tier 1 data centre within an existing council building. According to Kathy Clark, head of ICT business performance at Barnsley council, the nature of the deal, which sees Bull hosting other customers on that site – including Danske Bank, and Coventry University – meant the data centre effectively costs the council nothing to build.

Taking this route, she says, has allowed the council to reduce costs and create jobs. “Barnsley is quite socially deprived so it was important to us that any jobs created stayed in Barnsley.” The data centre currently employs 120 people and, says Clark, a clause in the contract obliges Bull to create an additional number of jobs, 42 in all, for the duration of the contract.

Had the council gone with a colocation data centre – a serious consideration at one time – Clarke fears jobs would have been lost from the area. But did housing a large data centre within Barnsley lead to any resistance from the local population? “We stayed in Barnsley.” The data centre currently employs 120 people and, says Clark, a clause in the contract obliges Bull to create an additional number of jobs, 42 in all, for the duration of the contract.

In common with other data centre users, Morrison’s has adopted virtualisation as a means of making its use of technology more efficient, and cost effective. Where physical servers were running at just 15 per cent capacity, running multiple virtual servers on a single piece of hardware means far more of that capacity is getting used today.

One of the implications of virtualisation is the increased processing power within a reduced space. This in turn requires more sophisticated cooling systems to ensure the hardware doesn’t overheat. And here is one of the major conundrums for data centre users and operators. Not only do data centres require an enormous amount of power to run the servers that support UK business, they require an enormous amount of power to keep those servers cool and to provide instant back-up should the primary source of power fail.

Historically, it has taken as much, if not more, power to provide these auxiliary services as it has to provide power for processing and storing data. As expressed by the power usage effectiveness (PUE) measure, the most efficient data centre is 1.0 where no excess power is used.

Advances in technology have brought those PUE ratios down significantly and energy considerations – cost and environ-
The estate agent: Foxtons

The business of selling houses has been transformed by the internet. Today would-be buyers want to access in-depth information, interactive floor plans, virtual tours and slide shows. Foxtons Estate Agents serves London and parts of the south-east and its website is hosted at a colocation data centre run and managed by Timico. Two key requirements were to deliver high speed access to potential customers and to enable Foxtons staff to upload large files, including high resolution images of the properties for sale.

Context, however, is everything and for a construction-based business, where energy-intensive equipment are the tools of the trade, data centre power usage is not a major consideration. “Bearing in mind what the project is,” says BFK’s Geoff Bull, referring to his Crossrail involvement, “energy consumption of IT is very low down the list. Our installed capacity is about 10-11MW because of the tunnelling equipment, so the IT usage is minimal.”

Another issue that is likely to be near the top of an IT director’s priority list is security, both physical security and the protection of the data held. Many data centre providers make a big play of their Payment Card Industry Data Security Standard (PCI DSS) certification – necessary for any company that stores, processes or transmits cardholder data – for example, or their compliance with ISO 27001:2005 standard for security management. And while there is nothing to stop an organisation obtaining both for an in-house data centre, convenience appears to be a major selling point.

“It’s vital for our business to have it but do I really need people on the payroll all the time who can do it?” asks Auto Trader’s Tim Jones rhetorically. “So [using a third party data centre] enables you to take advantage of people who do this all day, every day.”

While not a pre-requisite, a third party data centre also provides a platform from which to move into the cloud, letting users add capacity by drawing on shared infrastructure across networks.

It is something that appeals to Jones because it allows his company to concentrate more and more on the application of the technology and less on the plumbing. “Further and further up the ecosystem you are finding that more and more points of technology and less on the application of the technology and less on the plumbing. “Further and further up the ecosystem you are finding that more and more points of differentiation are falling away and become commoditised.” For Trader Media the cloud is used to deliver services to remote countries, for disaster recovery and to handle “unpredictable workloads”.

It also appeals to Domino’s Colin Rees, the man who knows what time you order pizza. “For us that’s an opportunity for the cloud. We currently have to pay fundamentally for a set infrastructure that is designed to support our busiest day. Actually we’d only like to pay for that on the days we do that trade.”

Jon Bernstein was deputy editor of New Statesman between 2009 and 2012. He is a freelance editor and writer.

The supermarket: Morrisons

Supermarket chain Morrisons owns, runs and manages its own data centres. It has two in the basement of its Bradford headquarters and a disaster recovery data centre three miles away. The data centres serve all its data processing, data storage and network communications needs; as well as applications from warehouse management software to finance to word processing, databases and spreadsheets.

Energy-intensive equipment are the tools of the trade, data centre power usage is not a major consideration. “Bearing in mind what the project is,” says BFK’s Geoff Bull, referring to his Crossrail involvement, “energy consumption of IT is very low down the list. Our installed capacity is about 10-11MW because of the tunnelling equipment, so the IT usage is minimal.”

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The media company: Trader Media

Trader media is best known for Auto Trader, a one-time print-only magazine through the pages of which people bought and sold used cars. Today it is a predominantly online business; an online marketplace according to the company itself, with its service available on the web but also via smartphone and tablet apps. For reasons of resilience, security, speed and more reliable connectivity it decided to stop hosting its data in-house. Instead it now uses a data centre based in Manchester and run by Telecity.

Barnsley Council’s Kathy Clark says her team spent a lot of time discussing energy efficiency and believes they have done much to address it. This includes introducing virtualisation, sophisticated hot aisle containment cooling systems and multi-speed air conditioning fans. “We also made Bull responsible for the energy costs,” she adds. PUE is now around 1.5 where it was nearer 2.3 in the old, in-house data centre.

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Driving data centre efficiency through innovation and optimisation

Who are Keysource

Keysource specialises in the design, build, optimisation and ongoing management of data centres. The company delivers technical excellence and world-class solutions to support the latest high-density IT technology and highest levels of efficiency.

Driving Innovation & Change

Keysource is known for delivering innovative, high performance and award winning industry-leading data centre solutions for some of the biggest and most established brands and organisations in the UK, Europe and globally.

Key Expertise

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- Design and build
- M&E engineering
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Mike West, Managing Director of Keysource, has more than 20 years experience in the data centre sector. A passionate believer in engineering excellence he has been involved in many industry initiatives such as the data centre council at Intellect and has been the driving force behind Keysource’s achievements in designing and building modern high performing and efficient data centres.

What have Keysource done to meet customer's drivers such as efficiency?

The efficiency agenda has come about for two main reasons. Most corporate agendas require organisations to be ‘green’ but in reality it is also very much about saving money. With power by far the biggest cost of any facility when you look at the full lifecycle, most new development and focus has been around the cooling. Back in 2008, we developed our own innovative approach to data centre cooling the principles of which we now offer as an integrated product called EcoFris. There are lots of options for organisations to consider but our aim was to make it simple and provide as much flexibility to the customer as possible.

And what about reducing capex?

Efficiency certainly helps with ongoing opex but there is no getting away from the fact that data centres require a lot of capex. We see a shift for most organisations with a medium to large data centre requirement moving to a professional operator or colocation provider partly so they do not have to build their own. However, our approach is based on Modular Data Centre Infrastructure (MDCI) that delivers a standardised high performance facility. With these design blueprints you can achieve optimum efficiency and resilience.
throughout the lifecycle of the data centre and add capacity when it is needed. Whilst not new, the modular approach is now much more standardised and is the way most of our customers are now looking to go.

So does that mean people will be putting data centres in containers?

Put simply no. Yes containers and specialist engineered modules have a place in the market but there is much more to consider. One key consideration we see is flexibility. With IT refreshes every couple of years data centres do have to last and give choice over IT hardware. Customers still want high levels of flexibility and the more you standardise the less choice you give the customer. In addition, many companies have to utilise existing real estate which might require an upgrade or fit out and so a prefabricated design often does not suit. You have to look at each project individually and we would consider all options, but whichever way a company opts for we always try and keep it simple.

Isn’t there increased risk working in live data centres adding additional capacity with this modular approach?

It depends on how you approach the design and what systems you have for managing your operational environment, but if approached properly there should be little if no impact. What we are seeing is that by matching capacity with demand, businesses now require much better management information.

You need to know where to put your equipment or what your workload is doing so you can be proactive and manage your infrastructure. The cheapest data centre is the one you do not have to build so maximising capacity and sweating existing assets is an important part of any strategy.

What do you see being the trends moving forward?

The management and monitoring piece is still only really in its infancy. We’ve had Data Centre Infrastructure Management (DCIM) around for a number of years now but the interesting opportunities happen when this is integrated through the full stack from facility into the IT and application layer. No-one is willing to compromise on resilience yet there is a massive opportunity to build this into the application layer. That way physical data centres with their multiple standby and backup systems become less important and workloads can be moved around automatically to achieve a huge range of benefits. What most people want is improved service and reduced cost, so that is what we have to strive to deliver, and fast!

A Customer View

In 2008 oil exploration surveyor Petroleum Geo-Services (PGS) teamed up with Keysource to design and build a highly efficient and resilient data centre, using the Ecofans cooling solution, to save costs, minimise environmental impact and enable the use of high density IT equipment.

The facility, designed for 600kW of IT from day one and scalable to 1.8MW, has delivered an annualised PUE of 1.15 since becoming operational. The efficient design and ongoing optimisation has saved over six million kWh in annual power consumption when compared to the company’s previous facility, so these savings have paid for the whole project in under three years.

Due to business growth and changing requirements, the next phase of expansion is now needed. Despite already possessing a world class award winning facility, PGS and Keysource have worked together to further innovate and engineer an upgrade to surpass the success of the first phase.

This latest development is due for completion at the beginning of 2014 and will increase the capacity to 2.7MW of IT load, 50 per cent more than the original design. It will deliver increased performance to accommodate 30kW racks and will incorporate an innovative chillerless design with 100 per cent indirect free cooling to reduce the project capital expenditure and ongoing operational expenditure without compromising on availability or performance.

Mike Turf, Global Compute Resources Manager commented: “Having worked with Keysource for the past five years they fully understand our business and operational needs. The initial project received numerous awards which was a fantastic achievement and recognises the drive we have for innovation. This second phase demonstrates that you don’t just have to do what was done before, even if it was highly successful. Technology changes rapidly and we wanted to use the best, so Keysource’s flexibility and energy to always look for improvement along with their ongoing management and support has given us significant benefits in how we will grow our IT operations in this data centre.”
“Government has a rather confused idea about us”

by Jon Bernstein

Former cabinet minister and mayoral wannabe Steven Norris proves a passionate campaigner for the data centre industry

For those in Westminster and Whitehall circles, Steven Norris is best known as the mid-1990s Transport Secretary under John Major and for his, ultimately failed, bids to become London Mayor in 2000 and again in 2004.

Since leaving frontline politics – he stood down as an MP in 1997 prior to his mayoral flirtations – perhaps his most surprising move has been into the data centre industry, first as an owner and latterly as the president of the Data Centre Alliance (DCA), the industry association. It’s surprising because the data centre is a highly complex – and faintly obscure – arena for a high profile public figure.

Indeed during our meeting we are joined by a more technically-minded member of the DCA in case he trips up over some of the technical details. In the event the “minder” (Norris’s term) is barely required to interject as the former Conservative politician is able to talk with some passion and knowledge about his new specialist subject.

His involvement began when he became part-owner of Virtus which has two data centres serving the London market. It was a “property play”, he says (“most of my commercial life was in property”) but he soon realised that it was actually a piece of infrastructure (“you buy a £3m shed but you put about £30m worth of kit inside it”). In December 2010 Norris, now 68, became president of the DCA in part to help make the industry less obscure, especially to policy makers who he says have much to learn about the sector.

“I have found the level of awareness of what data centres are, what they do, what their impact is on society, what their impact is on our energy policy is just simply not on most politicians radar screens let alone in a form that would be recognisable as policy,” he tells me from an office meeting room not far from Piccadilly Circus.

“We are entirely passive players in the great data explosion”

“Are you using now?” Norris inquired. “Ah, yes data centres. Tell me how much energy are you using these days? It seems to go up by leaps and bounds every time I hear.”

Norris concedes that Barker’s question demonstrates “a rather intelligent view in that at least he understood that data centres are large energy consumers. But what he hadn’t got his head around – and it’s our job as an industry to get the message across – is that a good data centre is optimising the energy consumption of that data in a way that really does mean that it advantages our energy policy and that it advantages the UK.”

Norris believes this focus on energy consumption, rather than an acknowledgement that an efficient data centre will result in an aggregate reduction in power use, needs to be addressed. And quickly.

The challenge for his industry remains, however, because energy efficiency does-
n’t necessarily lead to the consumption of less energy. Indeed, the more readily available you make data-derived services, the more people are going to use them. I suggest that it’s like adding an extra lane to the M25; that as soon as you open the new lane it fills up with additional traffic.

“That’s quite unfair,” Norris says. “Why? “Because it implies that our job as data centres is to encourage people to use data. That’s simply not the case.” He adds: “We’re entirely passive players in the great data explosion.

“The data centre as a piece of infrastructure is not of itself encouraging people to use more data. Far from it. We have no re-mit to do so nor is it in our particular interest to do so. Our interest is in managing the data that’s currently being serviced by so many facilities that are so inefficient.”

But isn’t it in the owner’s interest to get more and more customers to put more and more of their servers in his data centre? “You’re guilty of stigmatising the data centre industry when actually you should really be doing is talking to the people who make Angry Birds.”

A “we are where we are” argument, perhaps? “It’s very much a ‘we are where we are’ argument. But of course it has a much more serious implication because those zetabytes of data are not really about Angry Birds.”

So if there is a misconception about the role of the data centre within the energy debate, how does this manifest itself in policy terms? “Lots of misaligned incentives,” replies Norris. “Government isn’t clear whether data centres are ‘a good thing’ or ‘a bad thing’.

“It manifests itself in a rather confusing set of standards by which data centres are judged – nobody is quite clear how you actually assess the value of a data centre particularly when it comes to energy efficiency. And the result of both things is that government has a rather confused idea about what it should be doing with data centres.”

“Government ought to see the efficient data centre as something that is desirable for the economy to move towards.”

In terms of future policy, Norris says data centres that can demonstrate their energy efficiency should be exempted from paying the climate change levy (CCL), or at least pay it at a reduced level. The CCL is designed to encourage busi-ness to reduce energy consumption or use energy from renewable sources.

“We are treated as large energy users rather than large energy savers,” Norris says. “When the data centre is full and operating at optimum capacity it is consuming a very large amount of energy. But it will actually be saving the country a very large amount of energy that will otherwise have been expended in your rather inefficient office.”

All of which means, there needs to be a consistent measure that will allow policy makers to distinguish between energy efficient data centres and those that are not. In other words, a distinction between those that have earned an exemption and those that haven’t.

“Full data centres are not the problem. They are the solution”

Within the industry the de facto measure of efficiency is PUE (power usage effec-tiveness) which compares the amount of energy used to store and process data and the energy overhead required to keep those servers cool, backed-up and secure. (As an equation, divide the total amount of energy used by the amount used specifically for computing.) An ideal measure of PUE would be 1.0 where there is no resid-ual power requirement but historically PUE has been closer to 2.0 where as much energy is required in overheads as it is in computation. Norris says that thanks to developments in cooling and ventilation, modern data centres can attain a PUE of 1.2, even 1.1. Policy makers would need to define a cut-off point below which exemptions would be granted.

Norris admits that while PUE provides the best metric the industry has, it is not perfect. A data centre operating at capacity is likely to have a far more flattering PUE than one that has just opened, houses just a couple of customers and has lots of empty space that still needs cooling. “My PUE then will look pretty horrible,” he notes.

Sometimes it takes someone not immersed in the technology industry to ask the seemingly obvious question. During the interview, Norris wonders aloud: “Why don’t you make the servers operate at much higher temperatures?”

Whichever measure is used to dictate carbon levies paid, the effect will surely be more regulation and more red tape, anathema to most Conservative politicians, or in this case a former Conservative political. “It’s certainly going to require realigned incentives and trusted information. [But] once you’ve got that, it doesn’t have to add up to more red tape.”

Given he rejected my M25 analogy out of hand, what does he see as more appropriate comparison for the industry in which he is now immersed?

“It’s more of a factory. Out there everybody is making their own motorcar in their own front drive and they are doing it incredibly inefficiently. Give it to us and we’ll make it on a modern production line and you’ll get your car better made, more securely made and at significantly lower energy cost. What I can’t express enough is that the energy is not generated by us. The energy is generated by users.

“As long as government sees the data centre that’s full as the problem then they are missing the point. It’s not the problem, it’s the solution. Treasury and BIS understand the benefit of big data; DECC is under-standably concerned about the implications of big energy consumption.

“But data centres occupy this interesting space where they are servicing the market much more efficiently than if those servers were housed disparately. The more energy we consume, the more energy we save.”
**CDN (content delivery network)**
A large distributed network of servers deployed in multiple data centres across the internet. The goal of a CDN is to serve content as near to the user as possible, ensuring fast and reliable downloads. A CDN operator gets paid by the likes of media and ecommerce companies for delivering their content to their audience.

**Chillers**
These are industrial-scale refrigeration systems similar to (but many times the size of) those seen on company roofs to power the air conditioning. Often these units are capable of providing half a megawatt of cooling. They chill water which is transported via lagged pipework to Crac units inside the data centre.

**Cloud (private and public)**
The Cloud has become a colloquial expression used to describe a variety of concepts that involve computing which, as far as most users are concerned, is simply “somewhere out there”.

There are now a wide and growing range of cloud services all provided by server equipment running in various data centres around the globe. Among the best known are iTunes and Microsoft’s i360 cloud version of Microsoft Office.

A private cloud is one operated and ring-fenced for the benefit of one company or organisation. This is usually on dedicated hardware so that it is easily secured. In a public cloud all users share the same hardware and also the same software in the case of SaaS.

**Data centre**
A data centre, computer centre or server farm is a facility used to house computer systems and associated components, such as telecommunications and storage systems plus cooling systems which extract heat produced by the electronic equipment. Large data centres are industrial scale operations using as much electricity as a town or small city.

**Free cooling**
In many data centres there is a move away from relying on energy hungry chillers and Crac units. Servers can now operate at higher temperatures than before and in some countries, the UK included, the outside temperature is low enough most days of the year to provide adequate cooling without the need to run chillers.

**Colocation**
A colocation data centre (also spelled collocation, colocation, or colo) is a type of data centre where racks are available for rental to retail customers. Colos provide space, power, cooling, and physical security for the racks, servers, storage area networks, and networking equipment of many firms.

Significant benefits of scale (large power and mechanical systems, the operational systems and staff) result in some very large colocation facilities with much lower PUEs than average.

**Crac units**
Computer room air conditioning units are very large fan-based units within the data centre’s operational area or data hall. They force hot air through a heat exchanger fed with very cold water from the external chillers, removing the excess heat and providing cool air back into the data hall. Air is circulated through the servers to cool down internal electronics.

**Network operations centre**
This is usually a centralised office with multiple massive display screens and specialised control software monitoring the condition of a data centre, set of data centres or wide-area networks. It is staffed 24 hours a day, 365 days a year.

**Outsourcing**
IT outsourcing occurs when a customer
contracts an outside vendor to provide IT services that the customer would otherwise deliver in-house. Services include disaster recovery, data storage or other IT functions through web-hosting, server-hosting in colocation facilities to the provision, operation and maintenance of an entire data centre.

**PaaS (Platform as a service)**
In the PaaS model, the cloud operators provide a complete computing platform, typically including the operating system, the programming language execution environment, database and web server in addition to the virtual machines and physical hardware. Customers can develop and run software solutions on a PaaS cloud platform without the cost and complexity of buying and managing the underlying hardware and software layers.

**PUE**
Power usage effectiveness (PUE) is a measure of how efficiently a data centre uses its power. It compares the power used by the computing and related electronics with that needed for cooling, lighting and other ancillary systems. PUE is calculated as the total power used by the data centre divided by the power used by the IT servers and networking electronics. The ideal (but unachievable) PUE would be 1:0 where the IT equipment uses 100 per cent of the energy and other services use zero. Older server rooms and data centres have PUEs of 2.0, 2.7 or even more. Modern, large-scale data centres have PUEs of 1.3 or less.

**Remote hands**
When a company has its IT servers and hardware remotely located in a colocation data centre, there are times when a physical re-start, a change of connections or the insertion of a program DVD is needed. Colocation centres have technical staff who can carry out these tasks on behalf of the firm’s IT department. The IT person guides or instructs the colocation technician to do exactly what he/she needs – hence the term remote hands.

**Rack**
The 19-inch rack is an internationally standard frame or cabinet for mounting multiple equipment modules. Each module has a front panel that is 19 inches (482.6mm) wide. The height of the electronic modules is 1.75 inches (44.45 mm), also known as one rack unit or ‘1U’. The most common rack or cabinet is 42U tall. 19-inch racks hold most equipment in modern data centres, ISP facilities and server rooms. They allow for dense hardware configurations without occupying excessive floor space.

**Tier**
Data centre availability is related to the provision of redundancy within its systems. Tier 1 is basic with no redundant components and statistically has an availability of 99.671 per cent (an annual downtime of 28.8 hours). The majority of data centres are being built now at Tier 3 with 99.982 per cent availability or 1.6 hours annual downtime. Tier 4 requires every system component to be fully duplicated plus a spare and so is very expensive but achieves 99.995 per cent availability or just 24 minutes of downtime per year.

**SaaS (Software as a service)**
With SaaS (formerly known as hosted applications) users are provided access to application software and databases without having to give any consideration to the installation and maintenance of the software, operating systems, servers, networking, or any of the physical and security aspects of the data centres in which the physical equipment is housed. SaaS is sometimes referred to as “on-demand software” and is usually priced on a pay-per-use basis. SaaS providers generally price applications using a subscription fee. Examples of SaaS include Google Apps, Microsoft’s Office 365, and Salesforce.com.

**Server virtualisation**
Studies in the IT industry a few years ago found that many of the servers in companies’ server rooms and data centres were operating on average at 5 to 15 per cent of their processing capabilities making them both expensive and inefficient. A new type of software called the Hypervisor enables one physical server to run maybe a dozen or more virtual machines where each has its own operating system and a guaranteed share of the physical RAM, hard disk storage and processor. Often, as well as the guaranteed share of these common resources, a particular virtual machine can use a bit more when the other virtual machines are not busy making the whole even more efficient and effective. Despite the fact that virtual machines share a common hardware host they are completely isolated from each other and can only share information via a network as discrete servers would.

**UPS (uninterruptible power supplies)**
Should the mains power ever fail, most data centres have massive diesel generators standing by to take over. However, because these can take a few minutes to get started and settle down, a battery-based system is also provided that will keep all the servers, systems and cooling running at full power for around ten minutes until the generators are ready to take over. These systems also step in to smooth out the power supply when, for example, a heavy load on the national grid causes a power dip or “brown-out”.

**Web hosting**
An internet hosting service (a pre-cloud term) that runs internet servers, allowing organisations and individuals to serve web content to the Internet. There are various levels of service and various kinds of services offered. Most hosting providers offer a combination of services; e-mail hosting, for example. DNS (domain name system) hosting are usually bundled with domain name registration.

**White space**
A term used to describe the area within a data centre available for the siting of racks to contain the server and networking equipment. It is typically, though not always, an area of raised computer-room flooring covered in white floor tiles (hence the name) and is usually expressed in square metres or square feet. Non-white space in the data centre houses heavy plant like cooling units, uninterruptible power supplies, electricity transformers and sub-stations, generators and diesel storage tanks.

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