T H E E L E C T R O N

N E W S L E T T E R O F T H E I N S T I T U T I O N O F E L E C T R O N I C S

Issue 28: Winter 2015

IP EXPO EUROPE

IP Expo Europe, Europe's leading IT event, celebrated its tenth anniversary in 2015 at London's ExCel Centre on 7th. and 8th. October.

This event featured six sub-events in combination, namely Cloud and Infrastructure Europe, Cyber Security Europe, Data Centre Europe, Data Analytics Europe, DevOps Europe, and Unified Communications Europe. Cloud and Infrastructure Europe showcased the next generation of cloud and infrastructure solutions for enterprises whilst Cyber Security Europe offered valuable security insight for both IT managers and security specialists. Data Centre Europe showcased solutions and strategies for the construction of efficient, future-proof infrastructures whilst Unified Communications showcased the latest UC best practices and technologies.

Data Analytics Europe and DevOps Europe were both new for 2015 with Data Analytics Europe aiming to assist heads of IT, data analysts and CRM managers to obtain greater insights from big data, whilst DevOps Europe provided the only free-to-attend opportunity for DevOps practitioners.

Within Data Centre Europe another new feature for 2015 was 'The Colo', the Colocation and Managed Hosting Zone, a dedicated space for those looking into colocation and hosting, which provided an opportunity to compare different services and learn from the experts.

Another new feature for 2015 was the IP Expo Europe LIVE lounge where new technologies across enterprise IT could be tested and questions answered by a panel of IT experts. The main subject areas were augmented reality technologies, data visualisation technologies and 3D printing.

There were around 220 seminar presentations at IP Europe covering a broad selection of topics including six dedicated panel sessions covering The Future of the Data Centre, The Future of Data Analytics, The Future of Cyber Security, The Future of Colocation, The Future of Hadoop, and The Future of the Cloud. This is in addition to the 281 exhibiting organisations.

Among the distinguished panel of Headline Keynote Speakers was notably Mark Russinovich, Chief Technology Officer for Microsoft Azure, Microsoft's cloud platform, who is recognised as one of Microsoft's most valued software engineers and an expert in distributed systems, as well as being the driving force behind Azure and instrumental in leading Microsoft to becoming the biggest code distributor to Docker.

He was paired alongside Wikipedia Founder Jimmy Wales, who is also Chairman of The People's Operator, a mobile virtual network in which he has invested. In his speech he warned about the dangers of government snooping and the importance of encryption. He is notably critical of the European Court of Justice's "right to be forgotten" ruling, believing that the authorities have no right to censor truthful, non-defamatory information that is obtained legally. He also notably filed a lawsuit against the NSA to prevent them from collecting information on Wikipedia users, and is recommending governments to introduce "end-to-end encryption everywhere".

The third Headline Keynote was delivered by Jim Zemlin, Executive Director of the Linux Foundation, whose career spans three of the largest technology trends to emerge over the last decade, namely mobile computing, cloud computing and open source software. He is currently working to accelerate innovation in technology through the use of open source and Linux.

In this issue of *The Electron* a range of developments related to the six themes of the exhibition that have taken place during 2015 will be presented.

THE ZADARA CLOUD: A VALIDATION ITS USE, CASES AND ECONOMIC BENEFITS

IT organisations are being increasingly challenged to operate more efficiently and the cost to deliver a unit of compute to business users, however that unit may be measured, is under increasing scrutiny by executives. They are aware of the comparatively low cost of computing offered by the now well-known cloud providers such as Amazon Web Services and Microsoft Azure and are comparing this with the cost of delivering IT services internally.

Many IT organisations are not receiving the budget increases that will allow them to keep up with demand and paying for the infrastructure that could support the expected services is simply not possible. Consequently business user groups are tending to go outside of centralised IT in order to obtain the needed application services, either by going directly to cloud service providers or by creating their own departmental IT environments otherwise known as 'shadow IT'.

The resulting challenge has brought about a need to transform the storage environment and in the White Paper 'The Zadara Storage Cloud: A Validation of its Use, Cases and Economic Benefits' (July 2015) John Webster of The Evaluator Group provides a review of a new storage acquisition and deployment model introduced by Zadara Storage.

Features of Zadara

Zadara offers a new enterprise storage acquisition and consumption model that combines the features of cloud storage with the ability to locate and manage the storage environment either within the four walls of the enterprise data centre or within a public cloud environment such as Amazon Web Services.

In practice Zadara is actually one storage platform with different deployment options as follows:

* On-Premises as a Service (OPaaS) storage arrays

*Cloud-based Storage as a Service (STaaS) from major service provider/colocation facilities worldwide

* Hybrid deployments that combine on-premises and cloud-based deployments of the Zadara platform

From the outset the Zadara Storage Cloud was designed to be deployed in a cloud computing, IT as a service, environment. This makes it different from a traditional storage array with the following attributes:

(i) Scalable CPU and data transport

(ii) Native multi-tenancy and workload isolation with the individual tenant administration

(iii) Encryption for data in motion at rest with encryption keys kept with the user (not with Zadara)

(iv) Accessibility via REST APIs for openness and portability

(v) Cost control features accessible by administrators

The Zadara Storage Cloud software-defined appliance currently consists of interlinked storage nodes - commodity servers with embedded flash and disk storage running Linux and using 40GbE for internode and external server connectivity. A minimum configuration consists of at least two nodes for redundancy and can currently scale up to 600 nodes. Each of the major computing components - CPU, node storage and connectivity - can be scaled upward and downward as needed. Storage Cloud can be scaled in three dimensions independently:

(a) CPU and memory resources for storage controllers

(b) Drive resources for raw storage

(c) Internal and external connectivity

RAID groups are built from flash and/or spinning disk drives spread across nodes rather than by creating three copies of data for protection as is common among the open source storage platforms.

In order to address the potential for internal I/O latency Zadara implements iSCSI Extensions for RDMA (iSER) for 40Gb per second connectivity among nodes. NFS and CIFS/SMB protocols are supported and rather than using a pair of clustered storage controllers for failure tolerance, Zadara implements controllers as pairs of KVM-based virtual machines that are managed by Open Stack.

Initially Zadara introduced a fully turnkey SAN or NAS storage solution consisting of Virtual Private Storage Array (VPSA) software pre-loaded onto commodity hardware (Dell and SuperMicro presently supported) and located at cloud data centres(Amazon Web Services and Microsoft Azure). Now, however, VPSAs can also be located in a customer's data centre as On-Premises as a Service, that is to say OPaaS).

The VPSA is created by an administrator who assigns a number of dedicated CPU cores, RAM and storage devices (SSD for cache, SSD and/or HDD for capacity) and the associated interconnections to the VPSA. It has the attributes of a traditional enterprise storage array with dual high-availability controllers, SSD cache, and the advanced data management and protection features such as snapshots, cloning and remote replication, including the ability to replicate data from on-premises storage into the global public Zadara deployments (Amazon Web Services and Microsoft Azure) or among these public cloud deployments.

Each VPSA can be assigned, for example, to individual applications or business user groups. Also, as a key management and cost control attribute of the VPSA, dedicated physical resources can be non-disruptively added or subtracted in real-time. This ability allows the Zadara VPSA user to be charged only for the resources used on a per-hour basis.

The Study

The study aimed to determine the viability of Zadara's new approach in real IT settings. Three Zadara users were selected from different sectors as follows:

(i) A public university

(ii) A large supplier of application software solutions developed for specific industries

(iii) An on-line printing service

Each of these users used the Zadara VPSAs for primary storage supporting critical applications, with one in the process of migrating a petabyte of data to Zadara to support customer-facing applications.

It was found that "all reported better performance with Zadara versus what they had previously experienced".

Storage Immortality

A significant management capability that comes with the Zadara Storage Cloud is what is referred to as "storage immortality". Zadara will automatically, and for the life of the storage cloud, replace and upgrade hardware or software without application impact. Zadara manages storage node replacement and data migration from the obsolete node to the new node. The only thing required of the customer is racking of the new equipment and unracking of the old. In particular node replacement does not incur additional charges over and above the normal monthly usage fee.

The report states:

'This is a critical cost saving and management simplification aspect of the Storage Cloud when compared with the way storage array replacement is typically handled. IT administrators no longer have to plan for, acquire and migrate data from old to new in three-year cycles.'

This has two major economic benefits that increase if the number of traditional arrays replaced is increased:

(i) Elimination of storage system refresh cycles

(ii) Elimination of data migration costs

The first case arises because technology and capacity refreshes involving the replacement of an entire storage system are no longer required when performance and capacity are added non-disruptively on a module-by-module basis. This then eliminates the costs associated with technology refresh cycles and the need to manage data migrations and capital asset amortisation schedules. The ability to non-disruptively add or replace modules as new technology emerges and enters mainstream usage (such as SSD and higher performance I/O ports) also helps to ensure the long-term quality of service delivery.

The second cost saving arises because the significant costs associated with migrating data from an obsolete system to a new system are also eliminated. These costs include those related to system downtime and a corresponding loss in productivity, as well as an extension of lease terms at premium rates when the replaced system is leased and not returned on schedule.

Evaluator Group Assessment

The report concludes:

'Zadara has generated traction both with smaller start-up companies and well-established large enterprises for roughly the same reason - both can have highly variable needs for storage. Small companies can start with entry configurations and grow capacity quickly without a large up-front commitment to overprovisioning storage. If business conditions change, capacity can be scaled back without financial penalty. Likewise, a large data centre may have an immediate need for storage to support a new project where capacity usage may be small at first but grow rapidly once the project gets off the ground. Again, a small configuration could be used to get started immediately and scaled upward on demand and scaled back or eliminated entirely at the end of the project.

Based on our total cost of ownership analysis we find that the Zadara Storage Cloud is a very economical enterprise solution for storage in both public and private cloud environments. And based on our customer interviews, it is clear that Zadara storage can be deployed as scalable, lower cost primary storage for critical applications versus traditional enterprise arrays or the storage services offered by CSPs.'

About Evaluator Group

Evaluator Group Inc. is a technology research and advisory company covering Information Management, Storage and Systems. Executives and IT managers frequently call on the Group to make informed decisions regarding the architecting and purchasing of systems to support their systems.

Copies of the full White Paper may be obtained from www.evaluatorgroup.com

THE ENTERPRISE IMMUNE SYSTEM

Another White Paper published in 2015 is 'The Enterprise Immune System' by exhibitors Darktrace, whose Director of Technology, Dave Palmer, also gave a presentation entitled 'Are you immune? Machine-learning Technologies for countering advanced Insider and External Threats' in 'The Future of Threat Intelligence' seminar stream which Darktrace sponsored.

Essentially Darktrace has pioneered a fundamentally new approach to the cyber challenge with cutting-edge technology that is capable of learning 'self' within an organisation on an adaptive real-time basis that can understand when abnormal behaviour starts to manifest itself:

'Like viral DNA, which constantly mutates and evolves to ensure its survival within the human body, cyber attackers are sophisticated and constantly change and tweak their behaviours in order to avoid detection. Fortunately for us, the immune system is just as clever as viral DNA - it is continually learning and understanding what constitutes a threat.'

Darktrace's innovative approach is based on a breakthrough in probabilistic methods made at the University of Cambridge:

'Bayesian theory is known for its ability to draw meaning from large sets of data, and a new branch of this field of mathematics, named Recursive Bayesian Estimation (RBE) is central to the development of Darktrace's founding technological innovation.

By mathematically characterising what constitutes "normal" behaviour, based on the analysis of multiple data sources, RBE mathematics succeeds in identifying changing attack behaviours where conventional signature-based methods fall down. Powered by RBE, Darktrace's mathematical models are constantly adapting themselves in real-time according to the new information that it processes, and continually providing calculations of threat levels.'

Darktrace also uses 'Sequential Monte Carlo' or particle filter techniques so as to maintain a distribution over the probable state variable. This distribution is constructed from a complex set of low-level host network and traffic observations or "features", which are recorded iteratively and processed in real-time on the platform:

'A plausible representation of the relational information among entities in dynamic systems in general, such as an enterprise network, a living cell or a social community, or indeed the entire internet, is a stochastic network that is topologically rewiring and semantically evolving over time.'

In many high-dimensional structured I/O problems, such as the observation of packet traffic and host activity within an enterprise LAN or WAN, where both input and output can contain tens of thousands, sometimes even millions, of inter-related features (data transport, host-web client dialogue, log change and rule trigger etc.), learning a sparse and consistent structured predictive function is challenged by a lack of normal distribution.

In this context Darktrace has pioneered the most advanced, large-scale computational approach to learn sparse structured I/O models by extending the L1-regularised regression model (known as the lasso method) to a family of sparse "structured" regression models. This allows for the discovery of true associations between linked malware and C2 events (inputs) and data egress (outputs), which can be cast as efficiently solvable convex optimisation problems and yield parsimonious models.

Acute methods for estimating and analysing varying coefficient models with structural changes occurring at unknown times or locations are required for Enterprise Immune Technology. Instances of such models are frequently encountered in social and biological problems where data is structured and longitudinal, and the IID assumptions on samples being generated from an invariant underlying model no longer hold.

For example, at a given time point, the observations (such as a snapshot of the social state of all actors) are distributed according to a model (such as a network) specific to that time, and therefore cannot be directly used for estimating models corresponding to other time points.

Darktrace has pioneered Bayesian methods for tracking the changing model structures and parameters, incorporating structural changes, the change times and unknown variables. These methods are essential when observing subtle variations in machine events to determine pivotal features within a behavioural history that may determine compromise.

In addition the new mathematics provides Darktrace with a non-frequentist architecture for inferring and testing causal links between explanatory variables, observations and feature sets. Granger causality, Bayesian belief networks and the new approaches based upon Convergent Cross Mapping (CCM) permit high degree confidence in causal linkage to be drawn without the need for protracted and repeated observation.

The core of Darktrace's mathematical processing is thus the determination of normative behaviour, pivoting on Recursive Bayesian Estimation, Particle Filters and Sequential Monte Carlo Techniques. This core incorporates a series of adaptive change point detectors (Mean and Variance, Sequential Point Estimation and General Linear Change Point Detector) to resolve a probable threat sequence.

Enterprise Immune System Technology therefore iteratively learns a pattern of life for every network, device and individual user, correlating this information in order to establish an overview pattern of life and thereby spot deviations that indicate live, in-process threats.

Darktrace state:

'Organisations that have implemented an Enterprise Immune System into the core of their information systems are now benefitting from the world's leading advances in machine learning and mathematics to protect against insidious and persistent threats from within their networks, while maintaining the flexibility and interconnection that we all thrive on. An Enterprise Immune System sits at the heart of a new approach that accepts the complexity of our systems and the threats within them.'

About Darktrace

Darktrace is one of the world's fastest growing cyber threat defence companies and the leader in Enterprise Immune System Technology. Darktrace detects previously unknown threats in real-time using advanced machine learning and mathematics to analyse the behaviour of every device, user and network within an organisation. Some of the world's largest corporations rely on Darktrace's self-learning appliance in sectors including energy and utilities, financial services, telecommunications, healthcare, manufacturing, retail and transport.

Darktrace was founded in 2013 by leading machine learning specialists and government intelligence experts, and has its headquarters in Cambridge.

Darktrace may be contacted on 01223 350 653 or email: Info@darktrace.com

HMIC LAUNCH NATIONAL RESPONSE TO CYBER CRIME

Cyber crime is now estimated to be costing the UK £27 billion a year and according to police figures seven out of ten scams now involve an IT or cyber element.

The total number of fraud offences reported to police nearly doubled in 2013-2014 from 122,240 to 230,845 and the number of 'pure' cyber crimes reported (such as computer virus attacks on companies) rose from 11,523 to 23,315 in the same period. There were also 494 cases of companies reporting that their computer servers had been hacked.

In response Her Majesty's Inspectorate of Constabulary (HMIC) called for a coordinated, national response by police, and towards this end City of London Police have partnered with Kaspersky Lab to deliver the first comprehensive cyber security programme to train police officers and large businesses to be able to identify potential threats and take the necessary counter measures.

Adrian Leppard, City of London Police Commissioner, states:

"City of London Police, the UK National Police lead for Fraud and Economic Crime, is partnering with cyber security industry leader Kaspersky to take advantage of its expert malware analysis training and intelligence services in a bid to reduce cyber crime and other on-line threats."

Containing both hands-on and practical elements, the intensive week-long training sessions teach participants how to inspect network traffic, analyse hard drive images and decompile malicious software using specialised training tools and methodologies developed by Kaspersky.

Police forces nationwide are now required by HMIC to demonstrate that they are taking the necessary steps to increase their capacity and capability to tackle cyber crime.

At IP Expo Europe Deputy Director of Global Research and Analysis for Kaspersky, Sergey Novikov, gave a presentation on 'The Security Threat, Landscape and Predictions for the Future' in 'The Future of Threat Intelligence' seminar stream.

Further information may be obtained from Kaspersky Lab UK Limited, 1st. Floor, 2 Kingdom Street, London W2 6BD. Email: info@kaspersky.co.uk

LONDON DIGITAL SECURITY CENTRE OFFICIALLY LAUNCHED

On October 1st. 2015 London's Deputy Mayor, Stephen Greenhalgh, formally launched the London Digital security Centre (LDSC) as a non-profit organisation working to secure and protect London's small to medium sized businesses(SMEs) against cyber risks and threats.

The head of the organisation is Patrick Nuttall, who explains in the Autumn 2015 Issue of *SC Magazine* how the organisation was set up in response to a survey by the Mayor's Office for Policing and Crime (Mopac) which indicated a lack of confidence among SMEs in police handling of cyber crime.

He states:

"London SMEs (249 staff and below) didn't feel they were getting the support from police or industry that they needed. It was decided (by Mopac) to create an independent non-profit centre whose services don't compete with commercial services currently available. Initial pricing for commercial services is so high many of these companies would not use them."

The organisation is also supported by the London Metropolitan Police FALCON team, the City of London Police, the National Crime Agency and industry partners including KPMG, who seconded CISP qualified Patrick Nuttall as the organisation's head.

Mr. Nuttall adds:

"We will have analysts from City of London Police, RBS and BTI to give a macro view of what crime is looking like in London, quantitative data, and SEO trends, and the FALCON team will look at more of the individual cases and give a criminology perspective of what we are seeing and socialise the messaging."

Mopac is funding the LDSC for two years with costs expected to reach £1 million p.a. It will then become self-funding. It is targeting £50,000 of revenue by the end of March 2016.

A security assessment, described as less than a full CREST penetration test, but incorporating elements such as vulnerability scanning, will be priced at £350 per day per tester and will primarily be delivered by paid graduate students from the University of Bournemouth with London area universities later to be added.

For policy deployment LDSC will produce five policy templates that meet the twenty controls incorporated in Cyber Essentials. These are available free from the website London.DSC.co.uk. LDSC analysts will walk companies through them and then validate the implementation.

Cooperation with CERT UK is planned, including facilitation of a regional CISP for London to launch in the Spring as one of a series of launches rolling out.

CONSORTIUM OF ON-BOARD OPTICS

In March 2015 leading network and processor vendors such as Microsoft and Cisco formed the Consortium of On-Board Optics, or COBO, with the objective of 'immediately beginning to collaborate on a set of industry standards that define electrical interfaces, management interfaces, thermal requirements and pinouts to permit the development of interchangeable and interoperable optical modules that can be mounted or socketed on a network switch or adaptor motherboard.'

A further stated objective is 'to enable the development of optical modules that can be placed closer to the network integrated circuits to decrease the power required to interface to the modules while also increasing faceplate bandwidth density and airflow'.

In the article 'Stay Cool' in *Network Communications News* (October 2015) Bryce Kleen, Sales Engineering Manager for Nebraska-based data centre infrastructure provider Geist, explains the significance of this in relation to data centre design.

He states:

'In the technology industry, companies have become increasingly aware of issues with switch cooling as the servers become more physically dense. It seems that as data centre density grows, the current design of switches may in fact have a negative impact on further growth. The key issue is the optical module, the place where the fibre cable is plugged in - this area has become so physically dense that it is now at a point where cooling the switch is difficult.

The Consortium is basically asking: What small changes can be made to network switch design to make a big difference in cooling efficiency in the long run?

Products such as the SwitchAir deliver cool air directly to network devices regardless of where they are located, including at the rear of the rack. This means that the switch receives cool air directly with no risk of air becoming contaminated by hot exhaust air coming from the servers. This solution allows pretty much any configuration of switches and can be retrofitted meaning there is no network disruption.

Density has always been an issue in networking inside and outside data centres, but it is now becoming increasingly critical in the data centre environment. As technology advances, more pressure is put on every element of data centre design and it is evident that switch cooling is of paramount importance. So much so that switch design is currently undergoing a major rethink.'

DATA CENTRE CASE STUDY: CARDIFF UNIVERSITY

Cardiff University's High Performance Computing (HPC) data centre fulfils a number of disparate roles from having the servers that provide applications and storage for the University's general IT needs through to hosting a high-performance computing cluster known as Raven. This cluster is operated by the Advanced Research Computing at Cardiff (ARCCA) division and supports computationally intensive research projects across several Welsh universities, as well as housing the Cardiff hub of the distributed High Performance Computing Wales service (HPC Wales).

The differing computing needs of the Cardiff data centre impose challenges on its support infrastructure including the power supplies and their backup UPS systems, the necessary cooling equipment and the racks containing IT and networking equipment.

In *Datacentre Solutions* (October 2015) the article 'Cardiff University completes Energy Efficiency Upgrade' describes how advanced energy efficiency management software from IP Expo Europe exhibitors Schneider Electric, known as StruxtureWare for Data Centres (DCIM), has been deployed to tightly monitor all of the elements of its infrastructure so as to ensure maximum efficiency:

'In use DCIM gives insight into the power use by the data centre and the cooling capacity utilisation, allowing management to respond to changes and also to calculate metrics such as Power Usage Effectiveness (PUE) in real-time.'

PUE is the ratio of the total power consumed by the data centre to that consumed by the IT equipment alone and the closer it is to 1.0 the more efficient the data centre is.

This investment quickly paid off as, shortly after opening, this data centre became part of the HPC Wales initiative, which meant that ARCCA was required to take on additional computing equipment which saw the utilisation of the two contained server racks in the data centre increase from 40 per cent to 80 per cent of their capacity. The cooling systems were upgraded at the same time.

The article quotes Hugh Beedie, Chief Technology Officer for ARCCA and the General IT Services Department at Cardiff University, as follows:

"We originally had three identical 120kW chillers outside which provided us with a well-balanced cooling system. With the first power and cooling upgrade we replaced one of the original chillers with a high-efficiency 300kW cooling unit. While this increased the overall cooling capacity to the data centre, it seemed to cause an operational imbalance in the system."

Subsequent to the upgrade operators noted from their initial energy monitoring that the PUE was deteriorating, and a compounding problem was that there was insufficient insight to ascertain how each element of the system was performing in order to establish the cause of the decline in efficiency.

There was insufficient instrumentation to be able to observe whether the component parts of the cooling system were operating well or poorly.

Mr. Beedie states:

"The ISX's instrumentation inside the room monitored the power feeds to the main pumps, but we had very little instrumentation outside the room. So we didn't know what was happening in the chillers, or about coolant flow rates or water temperatures. The instruments monitoring these were part of an entirely separate Building Management System and there was no link between that and what we could see with the DCIM."

The prospect of yet further multi-million pound research projects coming to the University was going to generate even greater compute requirements, and the case was therefore made for a second upgrade with improved monitoring and analysis of all elements of the infrastructure.

Mr. Beedie adds:

"The data centre had an estimated annual PUE between 1.7 and 1.8 at that time, but they weren't precise numbers and they certainly weren't being generated in real-time. We were just making calculations based on performance over selected periods."

For the second upgrade Schneider Electric's Data Centre Operation: Energy Efficiency Module was deployed as an additional component to the previously installed StruxtureWare for Data Centres. This provided a much more comprehensive picture of power and cooling consumption throughout the data centre infrastructure and presented it on a centralised console where it could be easily viewed and analysed.

The article states:

'It allowed much deeper, more granular insights into energy usage not just at overall site level but also at subsystem level and, critically, it did so in real-time. This enabled Cardiff to, for example, monitor the effects on energy consumption of changing fan speeds, or of CPU utilisation on a server rack, or of raising the temperature of the chilled water supply.'

The three existing chillers were replaced with new high-efficiency 300kW models to provide a symmetrical system, and a secondary cooling circuit was introduced. Individual high-efficiency Variable Speed Drive (VSD) pumps were also fitted to each chiller to provide better 'turn down' ratios.

Mr. Beedie is quoted as follows:

"Originally we had a primary circuit which pumped cold water from the chillers directly into Schneider Electric's InRow RC units. With this upgrade a primary circuit connected the chillers to a large heat exchanger and another set of pumps drove water in the secondary circuit from there into the room. The new pipework and pumps allowed the extra degree of control needed to make the system more efficient in practice.

The additional information about energy consumption has enabled me to see the real-time effect of warm weather as the day heats up. As the day starts, our PUE figure is running at about 1.2, but by the end of a hot afternoon it's up to about 1.25, 1.27 and then drops down again as the evening cools. This degree of detail enables me to be confident that we are adopting an appropriate operating regime for the cooling system."

The article states:

'Monitoring in real-time the effects of small changes to operations enables clarity about the interaction of the control of the chillers and the operation of the HPC servers. For example, if the chillers are running below maximum power, it can be seen immediately whether it is more efficient to run all three at reduced load, or turn one off and run the remaining two at part load.'

WINDOWS 10 LAUNCHED BY MICROSOFT

In July 2015 Microsoft launched its new operating system, Windows 10, in 190 countries and 111 languages.

For the first time Windows 10 is offered to customers as a service such that once bought it will be automatically upgraded to the latest version of the operating system throughout the lifetime of the device. Customers currently running on the Windows 7 or Windows 8.1 operating systems have until July 2016 to take advantage of the opportunity to download Windows 10 free of charge.

Unlike with previous versions, Microsoft has dropped its Windows Phone Operating System in favour of having one operating system for all devices. Microsoft is, however, still making different Windows 10 'editions' available, such as Windows 10 Home, Windows 10 Education, Windows 10 Pro, Windows 10 Enterprise and Windows 10 Mobile, each tailored for different device families and set up to address the specific needs of different types of user.

In addition to running PCs, mobiles, tablets and two-in-one devices, Windows 10 will also power the new Microsoft Surface Hub, a large-screen enterprise collaboration device that is available to order in 24 markets.

Available as either a 55-inch or 84-inch screen, Surface Hub is capable of detecting 100 multi-touch points and up to three simultaneous pen inputs to allow multiple users to simultaneously edit content. It also features built-in WiFi, Bluetooth 4.0 connectivity, dual 1080p front-facing video, cameras and a four-element microphone array that enables users to connect with colleagues via Skype for Business, Office 365 and more.

In order to help Microsoft achieve its aim of having one billion active Windows 10 devices within the next two to three years, Microsoft is providing developers with toolkits to port existing iOS and Android apps onto the new operating system with minimal code modification. For Android, developers will be able to build Windows 10 apps using Java/C++ code, while iOS developers will be able to use their existing Objective-C code.

Microsoft is also releasing 'bridge' toolkits to bring classic Windows desktop applications and PC games into the Windows store, as well as web apps.

IAM CLOUD WINS MICROSOFT PUBLIC SECTOR EDUCATION PARTNER OF THE YEAR

UK-based company IAM Cloud has been named as the 2015 Public Sector: Education Microsoft Partner of the Year.

Selected from more than 2,000 businesses globally, IAM Cloud offers affordable cloud-based storage and IT management services to large educational organisations such as universities, as well as tight budget limitations such as schools.

Currently around 14 per cent of organisations in the UK's education sector and hundreds of institutions worldwide use the IAM Cloud IT Management System. Some of these organisations have saved up to 90 per cent on data storage costs by migrating to IAM Cloud's services.

MIMECAST LARGE FILE SEND

Sending and receiving large files by email has become a problem and a battleground between users and IT departments as end users routinely attempt to work around the limitations that are placed on their productivity. Users want to seamlessly integrate sending large files into their day-to-day activities and the business wants to limit exposure to risk through the uncontrolled sharing of enterprise content over shadow IT solution, such as third party file sharing services.

As file sizes have continued to grow users have become frustrated with email attachment limits that prevent them from easily sharing content with both internal and external collaborators. As a result users inevitably seek out ways to bypass corporate gateways, turning to consumer services to share large file content. These services, however, frequently lack policy enforcement or content checking, and even fewer of them archive emails and attachments for discovery and retrieval at a later date. This compromises enterprise compliance and exposure to risk.

IT teams, on the other hand, are under pressure to deliver technology that allows users to be more productive and efficient, including the ability to seamlessly yet securely share large files. At the same time they are required to protect overall email system stability and performance and take account of email recipient file size limitations. The IT team challenge is to ensure that users can securely send and receive large files without resorting to consumer services that bypass the corporate gateway.

In response to this challenge IP Expo Europe exhibitors Mimecast have developed Large File Send, a cloud-based service that enables users to seamlessly send and receive large files to help maintain optimum productivity and efficiency. At the same time it allows organisations to support compliance, apply data leak prevention policies, and remove the impact of large attachments on the email infrastructure. The service also allows users to receive large files from external contacts,

providing users with a bi-directional sharing mechanism that overcomes size limitations of both the internal and external participants' infrastructure.

Large File Send supports both PC and Mac users ensuring that large files are transferred securely outside of the standard mail flow so that mail server message size limitations do not prevent delivery of the messages.

Sending Large Files securely

1. Attachments are securely uploaded from Microsoft Outlook or Mimecast for Mac to the Mimecast cloud, where they are scanned for viral content and DLP policy compliance before being stored in a secure AES encrypted archive.

2. Once scanned, an optional access key is generated and the message is sent to the recipient with an attachment containing instructions on how to access the files being shared.

3. The recipient clicks the link in the attachment and is directed to a secure web portal where, if required, the recipient requests the access key to download the file. The key will only ever be sent to the recipient's email addressso as to ensure that the files can only be accessed by the intended recipient or recipients.

4. The service notifies the sender when the file has been downloaded, should the sender choose the notification option.

5. The sender may elect to set expiration options while administrators retain full control over the user experience.

Receiving Large Files securely

1. Users can invite people outside of their organisation to securely send them files of up to 2Gb, with or without the added security of an access key.

2. Those invited to send a file are provided with a link to a secure web portal where they can upload files individually or in bulk with a simple drag and drop. A message can be added before submitting the files to be sent back to the requestor.

3. Files are uploaded to the Mimecast cloud where they are scanned according to security policies and stored in a secure AES encrypted archive and are available for download.

In support of Large File Send, Mimecast state:

'Mimecast Large File Send simplifies large file sharing for users by removing the complexity and frustration associated with large file attachments. While keeping corporate information safe and secure, it enables end users to remain productive, sending and receiving large files via a secure cloud-based service that integrates with desktop Outlook and Mac apps, that helps enterprises support compliance with enterprise policy without interrupting existing business workflow.'

Further Information

At IP Expo Europe Mimecast sponsored the Keynote sessions and were represented by their Director of Product Marketing Orlando Scott-Cowley who gave presentations on 'Office 365: Risk or Reward? Or both?' and 'What's stopping you being the next Big Data Breach?'.

Details may be obtained from www.mimecast.com

COULD HACKERS SEIZE CONTROL OF YOUR CAR?

Research has shown that it is now possible for criminals to obtain remote code execution on the electronic control units in vehicles via interfaces such as the Bluetooth interface and the telematics interface.

In the September/October 2015 Issue of *Computing Security* a paper is referenced entitled 'Adventures in Automotive Networks and Control Units' in which IOActive Inc., worldwide leaders in research-driven security services, along with Twitter, which demonstrates how it is possible to take control of steering, braking, acceleration and display.

The demonstration shows how, for two different automobiles, physical changes to the function of the automobile, including safety implications, can occur when arbitrary CAN packets can be sent on the CAN bus (vehicle bus standard designed to allow microcontrollers and devices to communicate with each other in applications without a host computer).

The paper, by Chris Valasek, Director of Vehicle Security for IOActive, and Charlie Miller, Security Researcher for Twitter, is quoted as follows:

'When electronic networked components are added to any device, questions of the robustness and reliability of the code running on those devices can be raised. When physical safety is in question, as in the case of an automobile, code reliability is an even more important and practical concern. In typical computing environments, like a desktop computer, it is possible to easily write scripts or applications to monitor and adjust the way the computer runs. Yet, in highly computerised automobiles, there is no easy way to write applications capable of monitoring or controlling the various embedded systems.'

This means that drivers and passengers are at the mercy of the code that is running in their vehicles and academic research has shown that malicious code can be introduced through physical access to the vehicle or remotely over Bluetooth or the telematics unit.

Particular reference is made to the weakness of Uconnect, an internet-connected computer feature in hundreds of thousands of Fiat-Chrysler cars. This controls entertainment and navigation, enables phone calls, and even offers a WiFi hot spot, but is vulnerable in that its cellular connection allows anyone who knows the car's IP address to gain access from anywhere in the country.

The article is particularly keen to stress, however, that the problem is not confined to Fiat-Chrysler. Many car manufacturers are using in-car electronics for real-time information and management of automotive systems with internet connection that can lead to a vehicle's operating system being seriously compromised.

The article quotes Mark James, Security Specialist for IT security firm ESET (who presented at IP Expo Europe) as follows:

"A zero day exploit is or has been downloaded or installed into the internal operating system of the vehicles. It will then enable someone else over the internet to gain complete control of their systems. These new systems have the ability to report their location back, using GPS Navigation voice commands and direct control over certain areas of the vehicle's operation, including acceleration, braking and many auxiliary systems. Once the exploit has taken hold, in theory anyone anywhere could tamper with those controls."

ONLINE VIDEO STREAMING UNDER STRAIN

Online streaming has become the primary way to view live events such as boxing and the Rugby World Cup, with many new and traditional broadcast content providers adopting some combination of cloud, third-party services and on-premise approach to delivering video. These methods, however, are limited when there are spikes in customer demand or technical disruption to service. Service outages were reported around the Mayweather-Pacquiao fight in May 2015, rugby fans had their viewing of the Rugby World Cup interrupted when NBC Universal Sports had to switch its pay-per-view customers to its main free site during the first weekend of games as a result of problems with NBC's infrastructure and Amazon Web Services cloud-based delivery for live streaming video, whilst in March millions of people were unable to purchase digital music, books or apps for almost twelve hours from the Apple iTunes and App Store.

In order to address these types of problems IP Expo Europe exhibitors Kemp Technologies have devised an innovative alternative based on using the latest network virtualisation technology for content and application delivery with SDN (Software Defined Networking) and NFV (Network Function Virtualisation).

Kemp state:

'By intelligently and proactively managing the flow of content and applications across an SDN environment of networks and data centres, viewers are guaranteed a consistent quality of service without disruptive latency or breakup - even when demand surges.'

Traditionally Quality of Experience (QoE) has been delivered by means of a static and manually configured approach to manage queues in switches throughout the network, but the Kemp approach uses a dynamic solution which directly influences QoE policies by providing instructions within the network in real-time based on changing conditions and application needs.

Kemp's new SDN adaptive QoE technology integrates network infrastructure level intelligence with application centric load balancing and quality of service controls to prioritise the flow traffic through the SDN network.

About Kemp Technologies

With over 26,000 worldwide deployment offices in America, Europe, Asia and South America, Kemp Technologies is the industry leader in advanced Layer 2-7 Application Delivery Controllers (ADCs) and application-centric load balancing. As one of the fastest growing technology companies in North America (499.1 per cent growth rate verified by Deloitte), Kemp is changing the way modern enterprises and service providers are building cloud-enabled application delivery infrastructure. Over the past decade Kemp has been a consistent leader in innovation achieving a number of industry firsts, notably high performance ADC appliance virtualisation, application-centric SDN and NVF integration, innovative pricing and licensing models, and true platform ubiquity that can scale to support enterprises of every size and workload requirement.

EUROPE'S FIRST PoE LIGHTING SYSTEM UNVEILED

UK tech company amBX has been working with Cisco at the University of Strathclyde Technical Innovation Centre to develop software that delivers high-performance lighting control without the need for expensive programming and complex technical interfaces.

The Lighting as a Service (LaaS) project is part of a two-year innovation project co-funded by Innovate UK (the Government's innovation agency).

Project partners include Edinburgh-based pureLiFi, which has developed visible light communications that deliver high-speed, bi-directional networked, mobile communications in a similar manner to WiFi.

The article in the October 2015 Issue of *Networking* states:

'LaaS aims to bring market lighting that is powered, connected and controlled by digital networks. Those involved in the project say it will create "vast capabilities" to manage smart loads, reduce costs and carbon emissions and create new user cases for lighting. LaaS will serve as a pilot to demonstrate the IoT for power networks in commercial building management.

Cisco's involvement includes developing core protocols and integration, as well as providing feedback to standards bodies. The company's Energywise systems will be used to automatically discover all devices connected to the network, manage their energy usage and report the savings in terms of costs, carbon and energy. Cisco will also consider how third-party end devices can be connected to the intelligent network.'

While PoE has existed for about 15 years, originally it only offered 15W of power, but Cisco has demonstrated capabilities of around 60W.

The article quotes amBX CEO John Niebel as follows:

"Standard LED lighting takes around 35 to 40W so using PoE lighting systems in buildings makes sense as you can use power and data down the same cable. There's no need for skilled electricians. Lighting really is the last analogue domain and is next to be digitised. With PoE systems, lighting becomes part of the network rather than the building services' domain."

The new system is envisaged to "enable a wide range of control capabilities for user interfaces, such as PDAs, smart devices, tablets and wall controls".

Commercial products based on this technology are expected to be released later in 2016.

HGST DISKS CAPTURE BLACK HOLES

The Event Horizon Telescope (EHT) project is using HGST Ultrastar HelioSeal hard disk drives (HDDs) to store imaging data from the supermassive black hole Sagittarius A.

These HGST HDDs are the first and only helium-filled HDDs in the world and offer both higher capacity and lower power consumption than ordinary air-filled HDDs. They are hermetically sealed and the proprietary HelioSeal technology enables the storage arrays created by the EHT to capture information at high altitudes where traditional HDDs would fail.

Some 34 observatories and universities around the world are collaborating on the EHT project, which aims to create the first ever image of a black hole boundary. The black hole boundary is termed the 'event horizon' and represents the point at which the force of gravity is so great that even light cannot escape.

The project aims to enable astronomers to study space-time in the most extreme environment in the universe, but as black holes are so distant and span such a small area of the night sky the telescope needs to have the very highest magnifying power possible and for this it requires an array of telescopes in ten different geographic locations each recording data at 64 gigabits per second.

The article 'HGST Disks capture Black Holes' in *Storage Magazine* , Volume 15 Issue 5, September/October 2015, states:

'When the resulting petabytes of data are processed at a central location, the EHT becomes a virtual radio dish as large as the Earth that can resolve objects 2,000 times finer than the Hubble Space Telescope.'

Further Information

The EHT project is directed by Professor Shep Doeleman of the Harvard-Smithsonian Center for Astrophysics/Massachusetts Institute of Technology and more information may be obtained from www.hgst.com