

CASE STUDY

Successful implementation of a virtualised datacentre from Comtec Power

Cardiff University Supercomputing Datacentre Project chooses Comtec to deliver on 'green' power and cooling objectives.

When a leading UK university wished to implement and operate one of the UK's most powerful new supercomputers within strict energy efficiency parameters, Comtec provided an advanced APC datacentre environment to provide power, cooling and resilience.

To extend Cardiff University's position as a global centre for research, an ambitious project was conceived in 2005 to invest significant SRIF-3 funding to create a HPC (high performance computing) facility capable of supporting extensive research activities for Cardiff University.

The project, called ARCCA (Advanced Research Computing @ Cardiff) established a dedicated team of research computing professionals responsible for specifying and managing the required infrastructure components and providing a support and coordination role for researchers across the twenty-nine schools/faculties of the university.



Professor Martyn Guest is Director of ARCCA



“ ARCCA was designed to guide and assist researchers in their use of computing resources, from distributed/grid systems such as Condor through to support for departmental clusters and – at its furthest extent – the development of a standalone HPC facility. We want to reach out to non-traditional adopters of HPC facilities as well as traditionally 'heavy' users such as astrophysics and materials sciences. Our aim is to benefit all areas of research with capabilities that push the boundaries of supercomputing in international academia.”

The supercomputer cluster and its underlying datacentre infrastructure needed to be of sufficient magnitude and scalability to cope with extraordinary demands. Provided by Bull, and codenamed 'Merlin', the cluster was designed to facilitate the advanced research requirements of all 29 University schools/faculties, as well as potentially the requirements of private/industry third parties.

“ The facility has a theoretical capacity of 24 teraflops per second, and in Linpack benchmark testing achieved exactly 20.00 teraflop/s. This places it firmly at the top end of UK academic institutions, and among the most powerful supercomputers in the country. With the computational elements very dense and of extremely high specification, we needed a datacentre environment that could underpin the required power and cooling considerations and an exceptional level of resilience.”

In order to operate the ARCCA infrastructure in line with the University’s overall commitment to environmental sustainability, ARCCA specified that the supporting datacentre environment take fullest advantage of available technologies and techniques to minimise energy consumption and – in so doing – its environmental impact.

The critical question of providing a resilient, harmonised, efficient and scalable datacentre solution to meet these needs was answered by Comtec Enterprises, using components from the APC InfraStruXure® datacentre solutions range.

“ Cardiff University has an ongoing commitment to sustainability and environmental policy that covers all of its operations, not only those related to computing/IT. To fulfil our aim to maximise the efficiency of the datacentre, we were clear from the outset that ‘close-coupled’ water-based cooling and containment were key strategies, and this led us toward APC technology.”



Best and Latest Technology

A key component of the APC InfraStruXure® architecture is its close-coupled cooling design principle which locates cooling equipment close to the heat source ensuring that heat removal can be more efficient and predictable.

ARCCA worked with APC Gold Partner Comtec to create a design that would coordinate power, cooling, rack, protection, management and services within a dense footprint, using APC’s standardised and modular approach to datacentre design and installation. The advantages of APC technology include the quick deployment of additional cooling which can be achieved allowing the datacentre’s physical layer to adapt to change and expansion. Greater efficiency can therefore be achieved through rightsizing cooling to the IT load.

Specifically, Comtec enabled ARCCA to capitalise upon:

- Precise scalability and total resilience; by utilising the UK’s first deployment of APC Symmetra® PX 160 UPS’s, ARCCA enjoy high availability safeguards that are continually ‘right-sized’ to their evolving uninterrupted power requirements.
- Intelligent, contained design; APC Hot Aisle Containment System incorporating In-Row™ RCs served by chilled water are capable of supporting high density environments of c. 20kW per cabinet.
- Highly efficient cooling; Carbon Trust Energy Technology List compliant chillers situated outside the datacentre are configured to provide chilled water for ‘free’ during periods when the outside ambient temperature is sufficient cool/cold.

- Total control and manageability; the nature of the APC InfraStruXure® datacentre components used and the deployment of sensitive probes allows ARCCA to remain in full control over the conditions within its computing environment, and to adapt to change and capacity requirements rapidly.

The 'free cooling' aspect of the overall solution was of particular interest to ARCCA, as it validated their original desire to seek a highly-efficient water based cooling system.

Where the need for cooling continues during colder ambient temperatures and when the ambient temperature is lower than the return liquid temperature, there is a large potential to reduce the energy consumption of the liquid chiller by utilising the benefit of these lower ambient temperatures for substantial proportions of the year. Comtec recommended purpose-designed free-cooling chillers capable of providing low energy consumption.

During periods where free-cooling cannot completely satisfy the cooling load, the solution chosen will also operate on partial free-cooling which is topped up with an element of mechanical cooling to meet the cooling demand. This feature means that the solution only needs to operate completely on mechanical cooling for about 38% of the year and typically saves 35% of the energy consumed by a conventional air cooled liquid chiller.

In addition to its choice of technology components, Comtec also employed an open and progressive approach with fellow suppliers on the project that no previous relationship existed with. A good working understanding between Comtec and Bull was critical so that the milestones of project delivery could be accomplished without unnecessary delay.

Successful Launch

The completion of the ARCCA datacentre project culminated in its official launch on the 2nd June 2008. However, the full extent of the project's impact in relation to its original goals and the wider objectives of Cardiff University are already emerging.

“ According to ARCCA's own calculations, Comtec and APC's overall 'power and cooling' solution delivers a far higher level of energy efficiency than traditional approaches that– when equated into direct cost savings – represents a comparative return on investment of three years. This demonstrates that while the most advanced approach may require a larger investment, the net benefits outweigh this and are very positive.”

As ARCCA extends the application of HPC to non-traditional research areas (e.g. language studies, the arts etc.) the scalability and capacity to manage change within the core aspects of ARCCA's datacentre infrastructure provide a constant state of preparedness, perfectly right-sized to its energy consumption needs.

Comtec will continue to provide ongoing maintenance and technical support to ARCCA, as well as consulting on how to continually evaluate the benefits of their approach, and to explore future approaches toward greater environmental sustainability.



“ This has been an ambitious project geared towards reaffirming Cardiff’s position as a leading European centre for research, and involving exciting new technologies that advance our computational capacity far beyond most other institutions. Comtec has delivered an outstanding contribution to this achievement, particularly in terms of helping us comply with the University’s policies and commitments to environmental sustainability by providing uniquely qualified advice and implementing truly cutting-edge APC datacentre technology.

By leveraging the very latest technology breakthroughs, Comtec and APC have demonstrated how even the most advanced supercomputing projects can be supported within tight energy efficiency and other controls”

Comtec coped admirably with the project by meeting our deadlines and overcoming our organisational challenges with tremendous flexibility and creativity. It is rare to encounter a technology supplier you can honestly describe as a ‘partner’, but Comtec fit the bill in that respect by being open, collaborative and committed to our goals.”



About Comtec

Comtec Power specialises in the design, build, maintenance and ongoing management of comms rooms, networking closets and datacentres. Our work encompasses new builds as well as the refurbishment and upgrade of live facilities. Our goal is to create technically excellent facilities which are scalable and efficient to meet the power and cooling demands of latest generation IT equipment.

Comtec has a thorough and experienced knowledge of the IT industry and is perfectly positioned to deliver highly resilient solutions for high density IT deployments including blade servers and HPC installations. Our ongoing maintenance and inventory management services help to reduce the threat of downtime, mitigate the risk of thermal shutdown, and keep facilities operating optimally.



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