White Paper

Desktop Virtualization
Intel® Optane™ Persistent Memory

Bolton NHS Foundation Trust: Deploying VDI with Intel® Optane™ Persistent Memory

Helping busy clinicians save time and deliver better healthcare to patients

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Executive summary

At the Bolton NHS Foundation Trust in Greater Manchester, CTO and Head of IT Brett Walmsley and his team are pioneering a VDI rollout with Intel® Optane™ Persistent Memory that will help revolutionise UK patient care.

VDI is increasingly popular in healthcare environments, giving clinicians the ability to log into their personal workspaces from any system to securely access patient data. It can deliver significant mobility benefits too, which have proven invaluable during the Covid-19 pandemic. But VDI can also enable centralised application delivery at scale, reducing operational costs, while also offering greater security compared to stand-alone systems.

A new VDI challenge

At Bolton, they've been running virtual desktops for almost 10 years, supporting patient care across 20 clinics and healthcare centres, including the Royal Bolton Hospital. But the introduction of Allscripts Sunrise acute care EPR (Electronic Patient Record) in 2019 placed new demands upon the Trust's ageing infrastructure. As Brett Walmsley explains: "EPR requires a lot of memory and it's very well integrated. It's got all our pharmacy systems wrapped up in it. So, without EPR available, or if it's not running properly, our hospital will come to a stop. We are fully reliant on it. So, we need an infrastructure that can support it, today and into the future."

The Trust's previous infrastructure was based on 80x Dell PowerEdge R730 servers. These used Intel® Xeon® E5-2680 processors and traditional 2133MT/s memory, supporting 100 users per node. But as EPR usage increased, desktop performance began to suffer. "EPR and Windows 10 took their toll on the desktops in terms of general performance," says Walmsley. "When you start looking at minimum specifications for an EPR and everything else you want to run on top, having 4-8GB of RAM just isn't enough. Even in a virtual desktop environment."

The Intel® Optane™ Memory advantage

Fortunately, a planned technology refresh – part of the Trust's five-year Informatics Strategy[1] – enabled Walmsley and his team to look at more powerful and cost-effective solutions. They turned to their technical advisor and long-time strategic partner 4way Solutions, who they had worked with for nearly 20 years. 4way quickly identified that more RAM per user was crucial in terms of improving

VDI benefits of using Intel® Optane™ Persistent Memory*

LOWER TCO

16% Lower TCO[2]

- Support more VDI Users per node and provide headroom for future development
- Affordable / Compelling replacement for DRAM

LOWER COST

30+% better memory capacity pricing than DRAM[3]

- Using VMware approved Intel Optane PMem config supported for deployment

*in other typical VDI environments

IMPROVE UTILISATION

87% More Users[4]

- Increase Memory Size per VM demanded by Windows 10
- Optimise CPU & memory resources

performance and enhancing the user experience. But budget was a real issue.

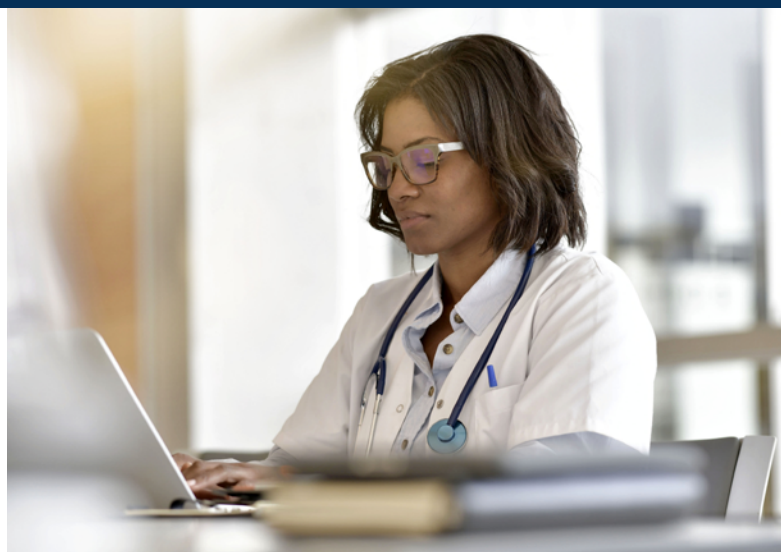
"The challenge was to maintain a count of 100 users per node and 16GB per VDI desktop. But also to keep the number of servers and data down and to keep the costs down," says 4way's Sean Robson. "To hit a sweet spot of 1.6 terabytes of RAM per node using traditional memory was proving to be cost prohibitive. You'd have to go to 128GB DIMMs, which are obviously very expensive."

As a long-term Dell partner, 4way worked with Dell Technical Pre-Sales to specify a joint solution. At this point Intel Optane Persistent Memory was suggested. The technology would deliver the memory footprint the Trust was looking for while keeping within affordability constraints.

"When researching Dell's PowerEdge R640 with Intel Optane Persistent Memory, we discovered that it didn't just bring the cost down slightly," Sean Robson adds. "It almost halved the cost of the servers. With no performance overheads, it made a compelling argument for us to look at the Optane systems quite seriously."

A compelling replacement for DRAM

Intel Optane Persistent Memory is an innovative memory solution that delivers a large and persistent memory tier at an affordable cost. Supplied in a DIMM form factor, it is available in higher capacities than traditional DRAM (up to 512 GB per DIMM). Meanwhile, it offers full data persistence and low-latency performance for memory intensive workloads.



This combination makes it an ideal choice for VDI scenarios. There's also the option of consolidating infrastructure into fewer servers or scaling out VMs to support more users.

Reducing the server footprint

In Bolton's case, 4way Solutions reduced the hardware count to 56x Dell PowerEdge R640 servers. These featured Intel® Xeon® Gold 6258R processors and 128GB 2666MT/s Intel Optane Persistent Memory modules. The new farm not only satisfies the performance and compute requirements for VDI (with room to scale up further if required), but it delivers two additional benefits worth talking about.

"The first thing is always the footprint," explains James Beaumont, Enterprise Architect at the Bolton NHS

Foundation Trust. “Space is always a premium if you're using your own data center, particularly in healthcare. As we've developed the VDIs over the number of years, we've realised that having GPUs to run extensive graphics on a VDI is just not required anymore. So, we've been able to shift from a 2U server down to a 1U server form factor. We're effectively using half the rack space now. Plus, we're saving on power and cooling because all these servers are now using solid state M2 drives as boot options on the ESX servers. With half the footprint in the data center we can easily expand out.”

And the second benefit? It’s back to budgets. The Bolton NHS Foundation Trust needs to ensure it is always getting value for money. Furthermore, any spend mustn’t take away from non-direct patient-facing services. “We have to be ultra-reliant and ultra-efficient on the desktops,” adds Brett Walmsley. “Because there's no point having all these services if people can't log in. Or if they run slow. Our clinicians could talk to us in seconds. ‘It took me 50 seconds to log in on Monday... If I multiply that by every day this week, that's 20 minutes I’ve lost... Four patients I couldn't see...’ So, it's all about making sure we get exactly the right infrastructure."

Trialling new technology

For Brett Walmsley, this new technology is a means to a much larger end. “I often remind all the team, and everybody who works here, that we're not in IT, we're in healthcare. We see ourselves as part of the patient journey. Another cog in the machine that helps patients get seen and delivers the healthcare they need.”

There's a desire to innovate at Bolton NHS Foundation Trust and to do things differently. This is evident in the engine that powers the Trust’s VDI. It’s described as a “unique blend” that meshes several different vendors together. On top of the Intel-powered hardware stack, Citrix XenDesktop acts as the broker, providing a non-persistent desktop for each user. VMware is the hypervisor, while DataCore’s SANsymphony orchestrates the flash disks that provide centralised software defined storage. On top of that, AppSense takes care of application control and, for location-aware access and security, the Trust relies on Imprivata, a healthcare-optimised digital identity framework.

Faster and more agile VDI

The speed and flexibility of the VDI not only delivers a consistent user experience, but it enables clever options for enhanced agility. Wherever staff go, their desktop follows them and, with Imprivata-enabled RFID smart cards, there are no passwords. They tap a reader and enter a PIN code to log on. The hospital even has wireless, battery-powered carts, used to transfer a clinician’s desktop to a mobile

Dell EMC – Giving VDI the PowerEdge

“Intel® Optane™ Persistent Memory is an excellent and cost effective method of getting great performance and capacity into our PowerEdge platform for applications such as VDI. The technology provides a lot of benefits in terms of high capacity PMem DIMMs, while not incurring the same cost-penalty that traditional RAM would have. Dell and Intel have been strategic partners since the very early days of the company. The development of Optane memory is a great example of Dell’s ability to leverage that relationship to engage industry experts and to ensure we get the right solution for our customers, all while providing better value and performance than more traditional approaches.”

Luke Twigger, Dell EMC Healthcare UK

3,000
The number of VDI desktops now in use at NHS Bolton Foundation Trust

80%
EPR apps can potentially load 80% to 90% quicker with Intel Optane PMem

16GB
EPR is memory-intensive, so NHS Bolton specified 16GB per desktop

56
The new infrastructure uses 56 Dell PowerEdge R640 servers

screen. These can then be moved around and rolled right up to a patient's bedside.

Staff using the new VDI are already noticing a difference. According to Walmsley, the percentage performance increase is "probably 80-90% quicker." Where it used to take 35-40 seconds for the EPR to load on a desktop, they have reduced that to around 10 seconds.

The new VDI, leveraging Intel Optane Persistent Memory, has significant maintenance benefits too. On the backend, just installing ESXi on the new servers takes five minutes where it might have taken 20 minutes on the old hardware. While the iDRAC software on the Dell PowerEdge R640 servers, reduces the time spent managing BIOS updates. In fact, the team can now perform maintenance in the new environment while the users are on. They can take half the farm down during the day, make changes and put it all back without any of the users noticing.

A blueprint for the NHS

"If you roll out a patch on a traditional desktop PC and it goes wrong, you're going to wipe out one or two people," Walmsley points out. "But if our desktops go down, that's 3,000 gone. That's our hospital community. It is A&E. Gone. So, no pressure... It's why infrastructure is so important. That has got to be right and that, in turn, goes back to the hardware. If that's not right, if it can't cope or there are issues with performance, we are in trouble."

Bolton NHS Foundation Trust -
VDI with Intel® Optane™ Persistent Memory

The success of Bolton's approach to VDI has caught the attention of the wider healthcare community. "NHS England have asked us to blueprint the primary care VDI rollout we are undertaking this year," reveals Brett Walmsley. "We scaled out our current desktop, which worked well for remote GP clinicians working remotely during Covid, and we plan to blueprint hundreds more."

The evolution of memory

The introduction of Intel Optane Persistent Memory has been so successful, that the team is keen to roll out the technology into other environments. "It's just so much performance," says Brett Walmsley. "You can't ignore that. You just cannot."

At the Bolton NHS Foundation Trust, they have evolved with Intel architecture, reinventing the desktop infrastructure to respond to changing technology trends, the deployment of new software (like Allscripts Sunrise acute care EPR) and agile patterns of use.

Or, to put it another way: each refresh must deliver more performance, more memory, and be able to cope with more memory-intensive applications. The team at Bolton is focused on providing systems that work quickly and reliably. They need to make sure that they support clinicians to give patients the best possible experience. Intel Optane Persistent Memory is proving vital in doing exactly that.

Learn More

You may find the following resources useful:

- Intel Optane Persistent Memory
- Intel® Xeon® Scalable Processors
- Virtual Desktop Infrastructure (VDI): How to Scale and Optimize for Today's Realities

[1] http://www.boltonft.nhs.uk/wp-content/uploads/2018/11/Bolton-Informatics-Strategy-5-Year-Forward-View-2016-2021.pdf
[2] https://builders.intel.com/docs/vmware-intel-vdi-solution.pdf
[3] Based on T1 OEM list price comparison of (1TB Optane PMem + 384GB DRAM) vs 1TB DRAM
[4] https://www.principledtechnologies.com/VMware/VMware-HCI-Intel-Optane-VDI-0420.pdf

Solution provided by

intel.
NHS Bolton NHS Foundation Trust
DELL Technologies
4WAY SOLUTIONS