SECTRA | Microsoft

NHS Imaging Services

How running enterprise imaging software in the public cloud will maximise benefits at scale.

Contents

Introduction

Across national health organisations, the ability to deliver fast and efficient imaging and diagnosis at scale is crucial to effective healthcare delivery. Roughly 45 million imaging tests were conducted in England alone between 2022 and 2023,[1] presenting huge potential to make significant cost savings if efficiency and productivity can be improved. With demand for imaging only growing, and renewed focus on delivering more equitable care across all regions of the UK, NHS imaging networks and regional trusts must also ensure that they put imaging technology in place that can grow and adapt affordably for tomorrow.

In this paper, we explore the specific aspects that integrated care authorities need to consider if they are to reap the full benefits of a public cloud enterprise imaging system: how such a solution can help to relieve the administrative load on regional IT teams, how it can help to better secure patient data, and how it can be used to facilitate a more sophisticated integrated care model. Enjoy the read, and join us in exploring how this innovative approach can shape the future of healthcare!

1. NHS England, Diagnostic Imaging Dataset Annual Statistical Release 2022/23, November 2023

"Public cloud enterprise imaging has the potential to transform healthcare systems by improving efficiency, reducing administrative burdens, and delivering more secure and integrated care."

Chris Scarisbrick
Customer Operations Director and
Deputy Managing Director UK at Sectra

"We encourage you to explore this paper to understand how these technologies can address the challenges faced by health organisations today—and how they can help you prepare for the future."

Kjetil Nilsen
Global Commercial Director Cloud at Sectra

Transforming NHS imaging services

Key challenges and strategy

As the NHS continues to realise its long-term transformation plans, it is looking closely at which technologies and vendors can provide the best value, both in terms of the efficiencies they create and the improvements they deliver for medical practitioners and patients.

Shared imaging networks require greater capacity

In recent years, the establishment of shared picture archiving and communication systems (PACS) has cut much of the administrative load between departments and trusts. As part of its ongoing transformation, the NHS will work to expand these networks to introduce **enterprise imaging** and offer a more integrated approach to care delivery, while also consolidating PACS to achieve far greater economies of scale.

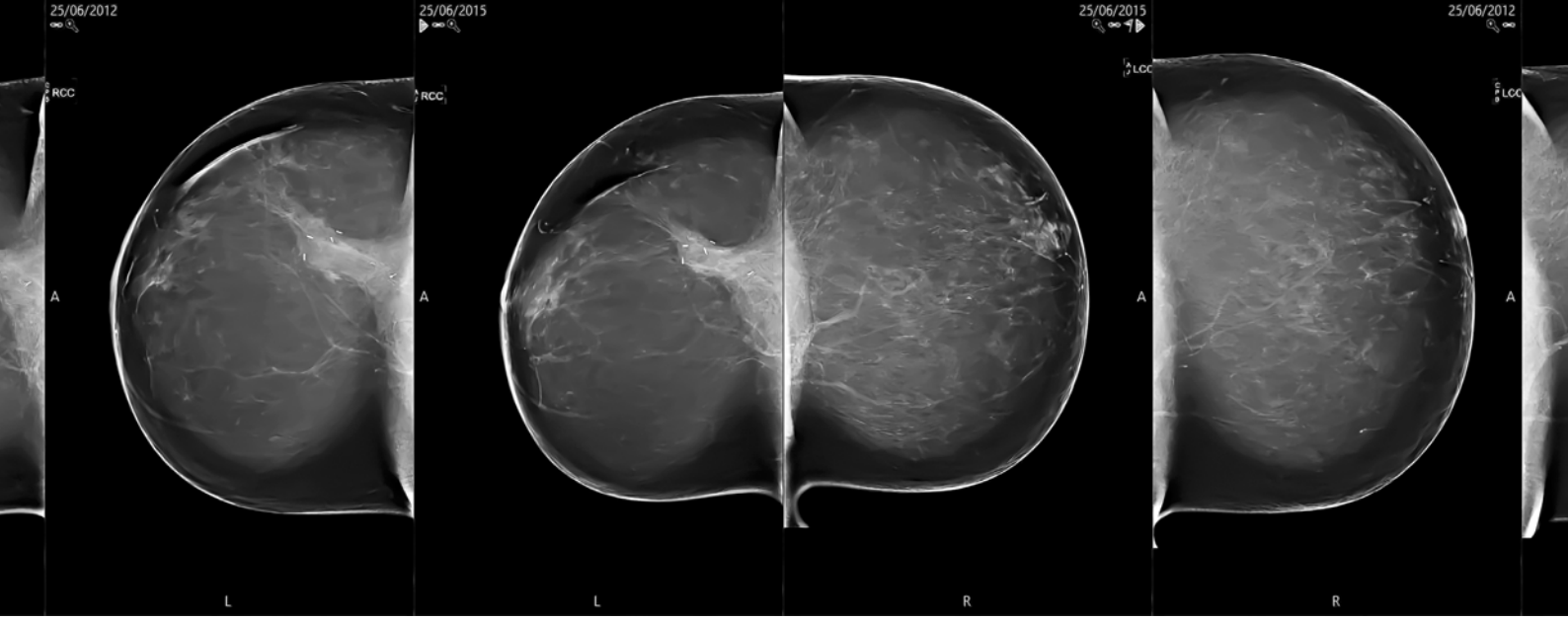
To further consolidate, Integrated Care Boards (ICBs) will need to look at how they simplify underlying infrastructure to relieve administrative burdens, prevent system delays and reduce potential points of failure.

"**Enterprise imaging**" has been defined as "a set of strategies, initiatives, and workflows implemented across a healthcare enterprise to consistently and optimally capture, index, manage, store, distribute, view, exchange, and analyse all clinical imaging and multimedia content to enhance the electronic health record".

A stretched workforce needs support

As always, managing costs will remain a key focus. Staff shortages remain a prevalent issue, not just across diagnostic disciplines but also the IT teams who deploy and maintain their underlying technology. Regional NHS teams and ICBs will need to look at how they can support the productivity of the teams they have to plug the gap. To do so, they will need consolidate; thinly spread IT teams will benefit from fewer vendors and systems to integrate, secure, maintain and upgrade. This in turn will help to ensure the fluidity of systems and software to remove friction from practitioner workflows. To enable this, ICBs may look to adopt solutions and IT that can support multiple care pathways, and which are managed by external providers.

Lastly, there is a need to future-proof the imaging infrastructure model, particularly as AI starts to yield promising results. Having a model which is at once robust and reliable to deliver the essential services of today, while also being flexible enough to support new systems as they continue to mature, is essential for managing investments and costs.



Consolidation in the public cloud

NHS imaging services have benefitted already from system consolidation on-premises, that is, using shared PACS running on hospital-owned hardware. However, maintaining hardware on-premises means having physical space to put it, as well as planning for and maintaining over-capacity to ensure the availability of computing resources and plan for growth. It also means handling the overhead costs of securing a physical IT space, and having IT specialists on-site to maintain it. If we multiply this by every diagnostic site, the burden on IT teams is high.

Historically, hospitals have tended to use on-premises hardware for the perceived control it offers over security, performance and configurability – essentially allowing them to set up systems exactly as they like. In addition, public cloud offerings haven't traditionally been tuned to the unique needs of the NHS, with one-size-fits-all pricing proving too expensive. Today, its unique needs are far better understood by cloud solution providers who can help the NHS make more efficient use of cloud resources.

The true value of public cloud

Realising the true value of public cloud requires more than a 'lift and shift' approach (where on-premises applications are simply migrated into the cloud). Solutions developed in line with cloud-native principles are more malleable and therefore more capable of harnessing the agility and scalability the public cloud makes possible – making it far easier to take advantage of the technology to save on deployment and run costs. This agility also means that new imaging systems that might take months to provision in an owned-data centre might take mere days in the cloud.

An enterprise imaging system, managed and provisioned by a single vendor in the public cloud also provides scope for a much deeper level of consolidation, offering a neutral shared resource, where the administrative burden is near-eradicated across multiple trusts at once – again vastly speeding up an entire region's ability to provision new services wherever and whenever they are needed.

For ICBs looking to create efficiencies, consolidation will be key. By utilising a full-service SaaS service for enterprise imaging in the public cloud, they can consolidate at multiple levels, while also facilitating a system that is simpler, more flexible and more future-ready.

Improving imaging workflows

Harnessing shared ownership models

To date, there are more than 8,500 IT vacancies across the NHS, compared to 6,700 for nursing.[2]

Making sure that enterprise imaging systems are stable and well-maintained will ensure workflows remain fluid, but for IT departments in high demand, this can be difficult to fulfil. NHS IT staff are thinly stretched: required patches, issue resolution and upgrades can take longer than expected and cause systems to break. Here, public cloud can be advantageous, as its shared ownership model means that the maintenance of the infrastructure and control of the data and operations within it is handled by the vendor.

For all-in-one SaaS and infrastructure like Sectra One Cloud, the vendor provides the infrastructure as a service in combination with its software components, resulting in full-stack management that places very little burden on the trust's IT team. This in turn allows skilled staff to be repurposed to more efficiently support end-users (practitioners) to improve the day-to-day delivery of imaging services, or focus on more transformative projects, rather than getting tied up in general maintenance. It also allows for extra capacity to be spun up quickly to handle extra load on the system and optimise system usage over time.

On-premises

The healthcare organisation owns and is responsible for the hardware itself, as well as control of data and operations. It is stored either on the premises of the organisation itself, or in an owned data centre.

Private Cloud

A private cloud is operated for sole use of a single organisation by either the organisation itself or a third party. The cloud provider is responsible for the infrastructure but not for the control of data. It can exist both within the hospital's network or off-premises.

Public Cloud

Cloud infrastructure is operated by a cloud provider on behalf of multiple tenants who share resources. The cloud provider is responsible for both the cloud infrastructure and the control of data and operations within the cloud. It typically exists across a series of networked data centres.

In general, the simpler the procurement of the underlying IT, the smoother and faster the workflow on the ground. Solutions such as Sectra One Cloud for enterprise imaging can provide the simplest foundation to fulfil diverse needs because the vendor – in this case Sectra – understands how to best utilise the underlying cloud infrastructure to support multiple imaging solutions and keep them both cost-effective and secure.

Additionally, this consolidation of multiple solutions into one can help to facilitate integrated diagnostics across disciplines. By utilising the scalability of the public cloud, a specialised enterprise imaging vendor can allow imaging solutions from different disciplines to be easily added to a single platform, as well as the additional capacity, needed to handle much larger images, such as those used in pathology . This allows multi-disciplinary teams to have a complete single view of a patient's imaging record, without having to retrieve images and reports from separate systems, simplifying referrals and avoiding unnecessary repeated scans.

2. Jobs.nhs.uk: https://www.jobs.nhs.uk/candidate/search/results?searchFormType=main&keyword=IT&language=en

Reference case

Homerton Healthcare NHS Foundation Trust

Having issues with the stability of its existing on-premises PACS system, Homerton Healthcare chose to explore cloud-based imaging solutions that would better support its imaging services and allow data to be shared securely across departments and partnering organisations. The Trust selected Sectra – already a well-established and trusted imaging solution provider – to deploy its Sectra One Cloud solution, for its radiology and orthopaedic imaging services.

Sectra One Cloud is a fully managed Software-as-a-Service (SaaS) solution featuring eight software modules covering a range of clinical specialties and -ologies. It runs on Microsoft Azure and can scale up as capacity grows and new modules are activated and deployed. As a true SaaS solution, ongoing maintenance, product innovation, and improvements are handled by Sectra.

Moving to such a system has yielded multiple benefits for Homerton Healthcare:

- The SaaS solution eliminates the need for Homerton's IT team to manage the solution, maintain the infrastructure, or procure more hardware when adding additional modules.
- The trust can implement additional modules and capabilities without having to look for a new solution.
- Staff have faster access to new features and upgrades.
- Images can be shared with any department using a secure web client, with cross-site reporting eventually allowing for wider sub-specialty collaboration throughout the region.

"Having a new radiology imaging solution as a fully managed cloud service relieves our IT team of management responsibilities—a significant benefit. We've also seen clinical benefits, such as faster access to new features and new technology. Choosing a scalable cloud solution moves us closer to a consolidated cloud system supporting all hospitals in our integrated care system."

Niall Canavan

Director of IT and Systems Homerton Healthcare NHS Foundation Trust

Read the full story here

System speed and stability

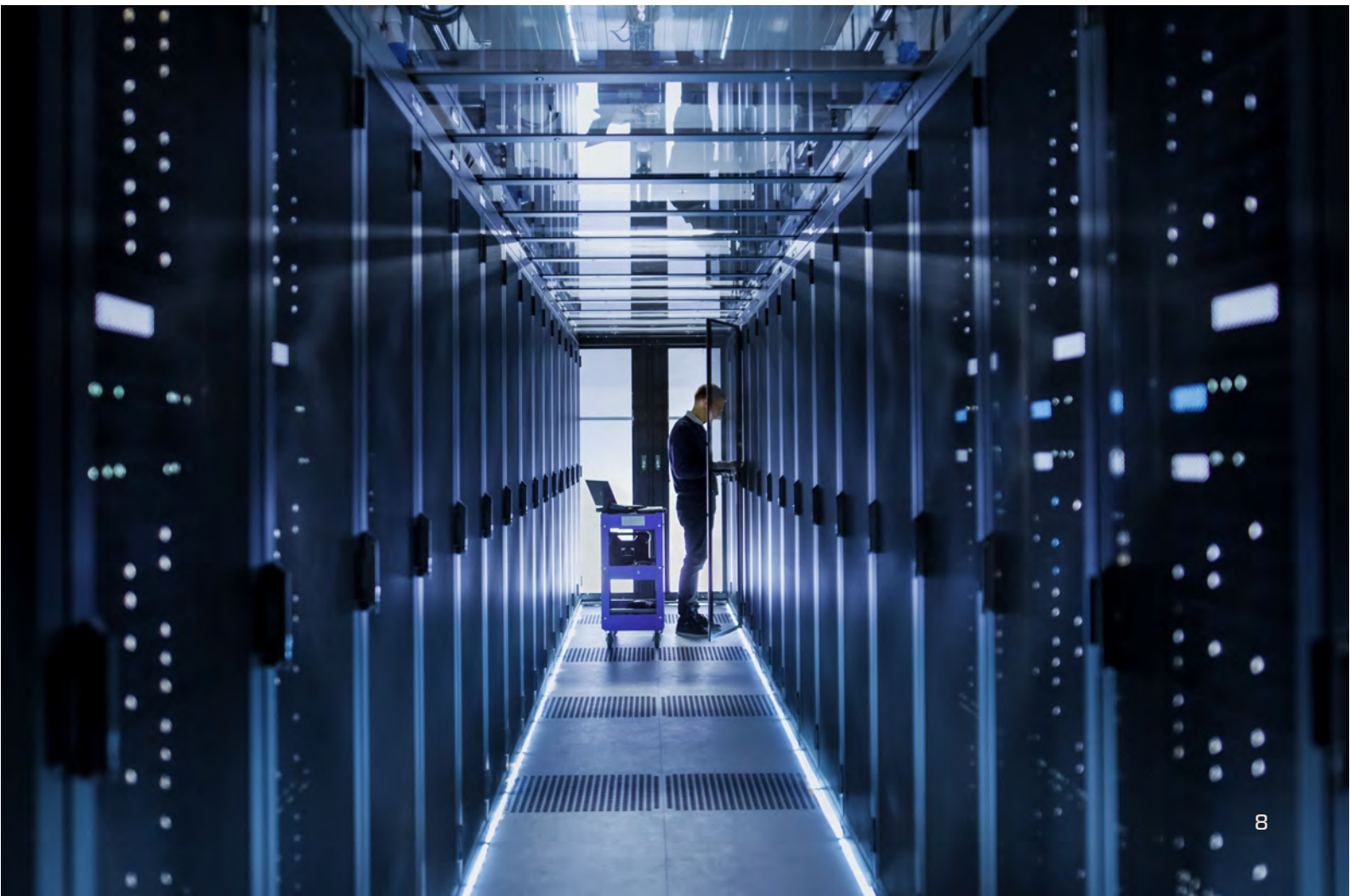
Ongoing maintenance and monitoring

In healthcare, system failure and resultant data loss expose patients to unacceptable risk. Although total system failures are rare, smaller-scale downtime or delays of sub networks or systems can cause significant disruption for patients and practitioners.

It is essential that data centres are stable, accessible and responsive, and that practitioners can access the right images exactly when they need to. This requires management of the underlying infrastructure to guarantee system uptime – ensuring loads are balanced, managing the network, operating systems, databases and storage; and responding quickly to unexpected events. In a public cloud model, the system can be set up to synchronously replicate data to several data centres at once. This means that if one data centre is compromised or lacks capacity, no data or access is lost and the system operates as normal while the issue is resolved, or data is re-routed. Public clouds are consistently monitored by providers to prevent downtime, often at a level that can be hard to match through internal staffing.

Speed is also a key consideration for imaging services, especially where the exchange of large images is the norm. By ensuring network availability, the latest cloud-based imaging solutions allow even the largest images – such as 3D exams – to be opened in just a couple of seconds, and by different parties in the network.

Beyond day-to-day system speeds, a public cloud SaaS solution also accelerates speed of deployment, as compute and storage capacity can be provisioned without the need to consider physical space or order additional hardware. As well as making system upgrades much easier, it is especially useful when establishing new community diagnostic centres (CDCs) and again allows the provision of more equitable community care even in places where there are physical IT constraints. New CDCs can now be established in just a couple of weeks as opposed to several months on-premises.



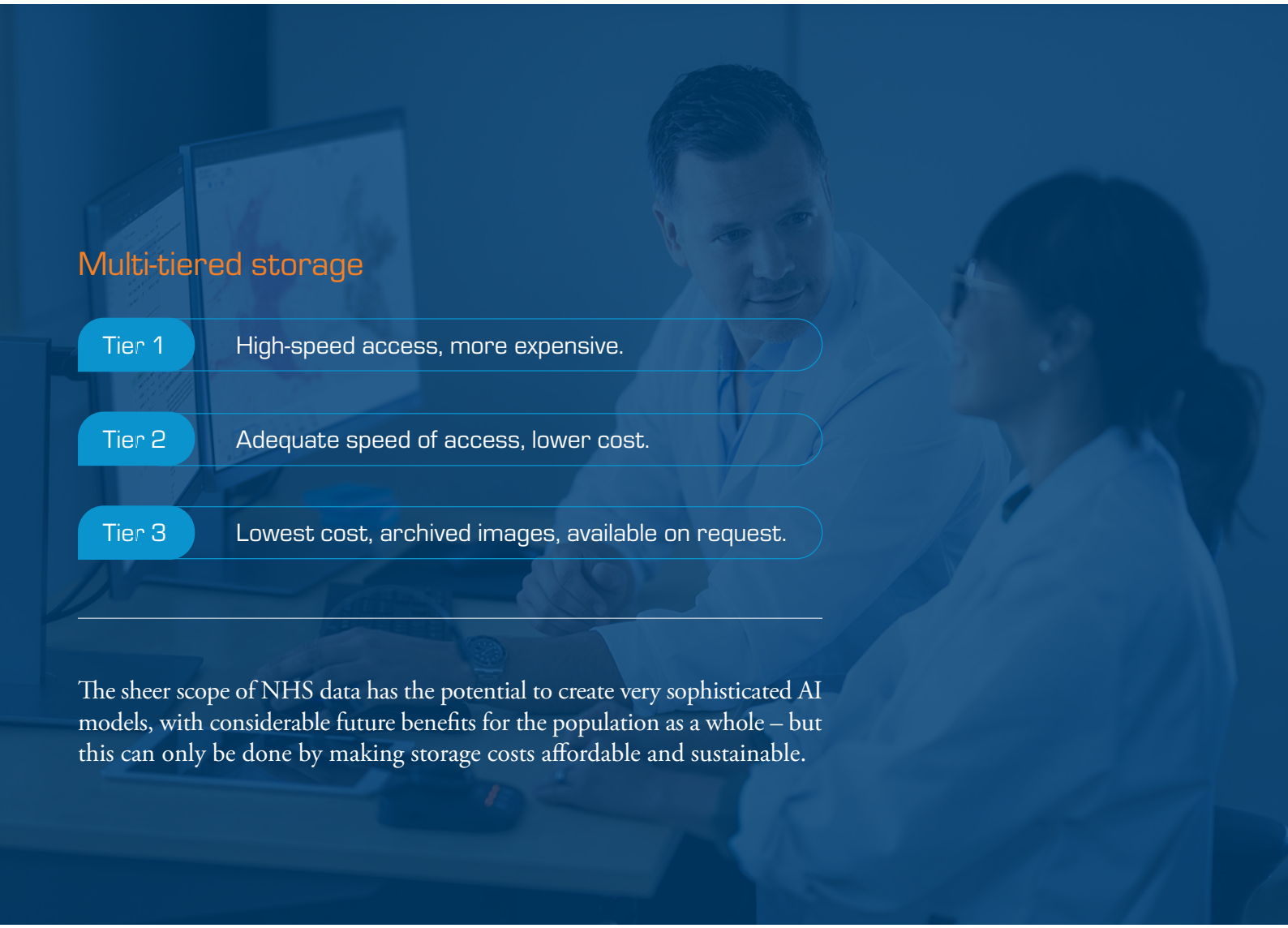
Storing images

Using tiered storage to manage costs

It is neither economical nor practical to store huge volumes of digital medical imaging on-premises. Public cloud, offering a fast and secure offsite location to store near-unlimited data, would then seem the logical place to store images, however it has historically proven too expensive, especially for large-scale images, such as those used in pathology.

Three-tiered storage can help to balance storage costs for digital pathology

Storage costs for imaging services aggregate over time. Previously, long-term storage of digital pathology (where images are scanned and interpreted digitally, rather than through microscopes) hasn't been viable due to the sheer size of the images to be stored . Sectra itself has addressed this through the introduction of a three-tiered storage option. In this model, images are held only for a short time (typically a few weeks) on a more expensive image cache, before being automatically archived to cheaper storage once they have moved beyond initial use. After a more significant period – typically after a year or so – they are effectively moved into offline 'cold' storage, again at reduced cost. These images can be easily retrieved at a later date, allowing health services to build image databases for use in research, training or AI-development – all of which would have long-term benefits for healthcare provision overall.



Multi-tiered storage

Tier 1	High-speed access, more expensive.
Tier 2	Adequate speed of access, lower cost.
Tier 3	Lowest cost, archived images, available on request.

The sheer scope of NHS data has the potential to create very sophisticated AI models, with considerable future benefits for the population as a whole – but this can only be done by making storage costs affordable and sustainable.

Reference case

NHS Laboratories, Greater Manchester

Already using a Sectra cloud-based radiology solution throughout the region, Greater Manchester took the decision to also implement a digital pathology module from Sectra at one of its laboratories in Stockport NHS Foundation Trust. The solution allows NHS pathologists across the entire of Greater Manchester to swap microscopes for digital images that can be rapidly accessed from anywhere by in-demand specialists – resulting in better utilisation of pathology specialists and in turn faster test results for patients.

By swapping out glass slides for digital images that are instantly available through the region's picture archiving and communication system (PACS) the region can move to a more integrated diagnostic record for patients, already used to share x-rays, CT scans, ultrasound, MRI scans throughout eight different trusts. Combining this with pathology imaging will provide pathologists with a more complete understanding of the patient, helping them to focus on the right areas in their reports.

Such a regional deployment is made far simpler by utilising the scalability and economy of the public cloud, with Sectra One Cloud giving trusts the agility to add additional imaging solutions, processing capacity and storage quickly, as and when it's needed.

Read the full story here

Keeping patient data safe

Adopting multi-layered security

Data security remains one of the highest priorities for healthcare organisations worldwide. In healthcare, data loss has devastating real-world consequences that put patients at risk. There is no acceptable loss of patient data: it must always be retrieved. This is possibly why healthcare organisations are so disproportionately targeted by ransomware attacks.

Ransomware attacks hit 81% of UK healthcare providers in 2022[3]

3. Rising Threat Of Malware Attacks In Ireland And United Kingdom Healthcare Sectors, KnowBe4, 2023

This was plainly illustrated by the high profile WannaCry ransomware attack in 2017, which affected at least 34% of NHS trusts in England. The subsequent shutdown of network access to prevent further spread of the computer virus resulted in sometimes dangerous impacts for patients with ambulance services, CT and MRI services, chemotherapy and GP referral services affected.[4]

In a subsequent investigation, many hospitals were found to be unknowingly running outdated and unsupported operating systems, and hadn't installed the necessary security patches to safeguard against the attack.[5] This highlighted several weaknesses in the model, most notably that it is difficult to enforce security policy across individually managed IT within trusts, and that trusts lacked the security resources to adequately patch their systems.

Ensuring good security involves building multiple layers of security at both the point where a system is installed (in the data centre), and the point where it's used (in the hospital, on devices). Any kind of hardware is a potential failure point. The more hardware, the more maintenance, and the higher the risk of maintenance being missed. The most obvious benefit of a full-stack enterprise imaging solution in this scenario is that hardware is largely secured by the vendor. Although some security aspects (such as identity and access management (IAM) and security configurations) are still handled by the customer, basic system patches and upgrades are automatically handled by the enterprise imaging provider. They also provide tools to help customers manage security, such as IAM and logging tools.

4. Investigation: WannaCry cyber-attack and the NHS, National Audit OFFICE, 2017
5. House of Commons Committee of Public Accounts, "Cyber-Attack on the NHS", 2018.

Cloud providers can help to strengthen security

Because the business model of a public cloud rides on its ability to secure its environment, providers invest heavily in security and security teams: far beyond the scope of what a healthcare organisation could invest on its own or maintain in-house. Sectra itself also leverages this investment: alongside 30 years of its own experience in cyber security for critical systems, it also takes advantage of the $1 billion of cyber security that Microsoft invests annually in its Azure public cloud to provide multi-layered security. The Azure platform is used and trusted by 95% of Fortune 500 corporations and is supported by more than 3,500 Microsoft security experts. Its data centres – leveraged as part of the Sectra One cloud solution – are built to be physically secure.

All-in-one imaging services such as Sectra One Cloud can further strengthen the security profile of healthcare organisations by offering security at the application level, for which it conducts regular code reviews, vulnerability testing, and penetration testing; encrypting network traffic and applying strong access controls. It also offers strong isolation between customer systems to make sure not data is inadvertently leaked and conducts network monitoring to both detect and trace any suspicious activity. Sectra is ISO27001 (information security), and ISO27017/18 (cloud security) certified, as well as HIPAA and GDPR compliant, ensuring that data security meets the stringent regulations of the EU.

Mitigating against ransomware attacks

Ransomware attacks work by locking down crucial data – literally 'holding it to ransom'. To prevent this, data can be automatically replicated to a separate, isolated location. Sectra One Cloud uses segmentation with a high level of redundancy. This means that pockets of data are kept separate from each other and uniquely secured, limiting the reach of an attack, while also providing a smaller amount of data to be restored.

Again, this is an area where public cloud can offer far greater affordability, scale and breadth than can be achieved on-premises or in private cloud environments. Sectra uses Microsoft Azure Availability Zones to secure backups and replicate copies of images. These zones are stretched across multiple data centres making data available in the case any of the zones are lost. These can then be quickly recovered to mitigate the effects of an attack. In Sectra One Cloud, backups of databases run every day, and data loss is minimised to a maximum of 10 minutes.

NHS Transformation

The need for flexibility with robustness

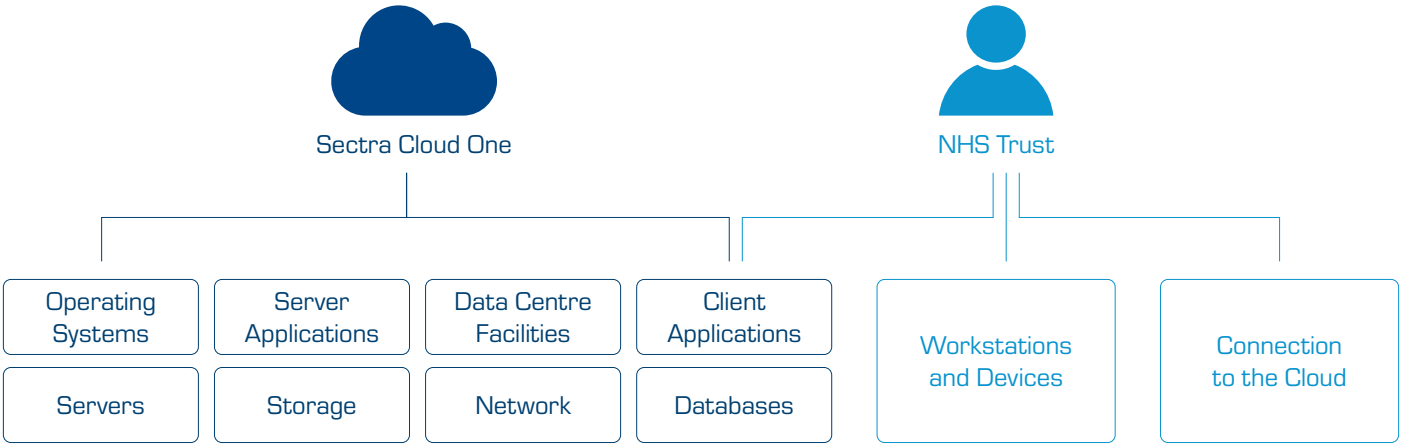
To take advantage of new technologies and make the most of technology investments, the NHS must build infrastructure that is both flexible and robust. 'Flexible' in this regard means an IT infrastructure that can adapt more readily to the immediate needs of the trusts it supports – offering easier and faster deployment and allowing new imaging technologies to be easily incorporated into existing workflows. These technologies should also have the capacity to integrate multiple imaging sites, and even multiple disciplines, onto one consolidated system to aid secure data sharing and the provision of more holistic, integrated care pathways.

However alongside this flexibility, services must also be resilient. To be effective, imaging infrastructure also needs to remain available, secure, manageable and affordable to support the practitioners who depend on it. To do so, its complexity must be minimised, and benefits must be scaled to achieve greater economy.

Sectra are aiming to fulfil this need by providing a solution that delivers not just the flexible infrastructure and scalability of public cloud, but also the robust security, availability and governance mechanisms to ensure the system remains manageable and affordable as services evolve. The Sectra One Cloud solution – offering infrastructure, imaging software, network management and security as a single packaged subscription – aims to deliver a quality of service beyond what can be achieved using existing hardware and resources, with benefits stretching far beyond basic deployment costs. With Sectra One Cloud, infrastructure is built on scalable frameworks, allowing new solutions to be deployed on standardised hardware, and allowing IT resources to be allocated and deallocated automatically through APIs. This allows a streamlined introduction of new capabilities, such as AI diagnostic tools, into existing practice workflows.

Clear division of responsibilities

The NHS Trust remains responsible for the connection to the service, its devices and the software it chooses to use. Sectra takes care of all the resources in the cloud required to provide you with the service.



In addition, Sectra One Cloud can help to expand scaled benefits by providing a neutral, managed infrastructure to which multiple hospitals and trusts can subscribe without requiring individual agreements. This may help to both cut red tape and associated procurement costs, as well as speed up future provisioning. Minimising responsibilities for IT staff through shared infrastructure models may also help to manage staffing costs, as well as free up skilled IT personnel to support more high value projects. Additionally, IT teams will no longer need to source additional compute and storage when new diagnostic centres are established.

These consolidated care systems can have huge impacts on the cost of care delivery, the retention and best use of specialist staff, and the eventual outcomes for the patient: faster diagnosis, better access to care professionals and less exposure to multi-scan risks.

Conclusion

The future is through partnership

> "By nature, a cloud solution comes with new value-added benefits and the supplier takes a bigger responsibility. Just comparing costs is not enough: the key is to understand the total value created."

Kjetil Nilsen
Global Commercial Director Cloud at Sectra

Medical imaging is a constantly evolving field with AI and enhanced imaging databases opening up new avenues to support the work of key practitioners, speed up the path to diagnosis, treatment and long-term recovery, and create more positive outcomes for patients.

Consolidation will support this transformation by helping ICBs to establish robust, flexible imaging networks that are fully-supported – and which help to streamline workflows, relieve maintenance burdens from IT teams and better protect patient data. By supplying one system, with one contract, and one gateway from which multiple hospitals can benefit, Sectra can remove both unnecessary friction and unnecessary cost.

A full-stack SaaS enterprise imaging solution, delivered by a vendor that can fully utilise the benefits of the public cloud, can enable the scale, breadth and availability needed to create a truly agile and transformed NHS. By using knowledge of the NHS workflow, alongside a deep understanding of the capabilities of the Azure platform developed from a 20-year relationship with Microsoft, Sectra can help the NHS to unleash the true power of the public cloud – in a way that is safe, economical and fit for the future.

Speak to one of our NHS experts to further explore how Sectra is already helping the NHS to achieve true economies of scale through migrating imaging services to the public cloud.

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