6POINT6

Home Office

Design & Delivery of Digital Solutions

Home Office Completes One of the UK Government's Largest Cloud Transformation Projects

Home Office

The Home Office is fundamental to the security and safety of the UK, acting as the lead government department for immigration and passports, drugs policy, crime, fire, counter-terrorism and the police.

New technology is transforming the way immigration services are delivered; making it faster and easier for members of the public to apply for visas and for Home Office staff to make millions of decisions each year.

These systems of critical national importance are dependent on a complex, cloud-based infrastructure.

Immigration Technology is the Home Office team responsible for delivering the digital future of immigration and the team identified that its existing hosting platform lacked the scalability and stability necessary to support its ambitious transformation agenda.

Faced with the need to improve delivery efficiency, test capabilities and service performance, the Home Office's Immigration Technology team selected the Amazon Web Services' (AWS) hosting platform.

With the existing architecture consisting of more than 1,400 servers containing a vast amount of data, 27 data hosts and 36 external interfaces, this was not a simple lift and shift; it involved the migration of a very large infrastructure and vast amounts of data whilst maintaining continuity of business services.

Delivering Business Benefit and Return on Investment

As a result of this careful planning and management Immigration Technology was able to successfully achieve the migration without any significant incident, scaling up to 4,500 users in five weeks, winning their approval and providing confidence that the organisation now has the agility to cope with the shifting demands being placed upon it.

The number of support incidents has dramatically reduced following the migration and those that occur can be resolved much more quickly, creating significant savings in terms of system maintenance and making it easier to action new infrastructure requests. For example, the cycle time from initial code development to launch in the integration environment has been reduced from one day to six minutes and, with new centralised operational tooling for validation, verification and testing, application code deployment has been reduced from 45 minutes to five minutes.

Security and resilience are, of course, two essential requirements of the AWS platform. To provide the necessary availability, the new architecture is built around three availability zones, meaning that a localised failure can be handled with no detrimental impact on performance. All data is encrypted both when stored and as it flows between applications, with independent security specialists having tested the system for penetration resistance to ensure that it is a robust, resilient platform for the future.

Key Benefits

35% reduction in weekly incident volume with resolution time reduced from 480 to 90 minutes

Forum Sentry no longer used for certificate management, saving **£40K per year**

On demand deployment of big data infrastructure has seen environment build times **reduced from two days to one hour**

Peak card transaction throughput of **2,000 per hour** against 1,200 with previous system

End-to-end environment build time reduced from **four weeks to two days**

New development environment built in **less than four hours** when this was previously two weeks

AWS security group used instead of licensed firewall product, **saving £60K per year**

The Result is an Innovative Platform Supporting New Services

The redesigned and simplified infrastructure has improved the stability and resilience of the Home Office's cloud environment, enhanced reliability of deployment and improved the security of the production service. It has also increased the ability to scale and to optimise infrastructure costs. This has resulted in more efficient and better protected digital services, ready and available for operational business and live services.

For example, the business can now process 5,000 priority biometric cases; 3,000 biometric travel documents; 44,000 biometric residence permits and 8,000 initial accommodation cases per month.

It has also opened up new possibilities for the Home Office, enabling greater interaction and information exchange with other government bodies. Previously a request for access from another government organisation was expected to take months to address, as any changes required significant time and resource to enact. Now, with the simplified infrastructure, boundary control design is future proof which will allow the Home Office to integrate with other departments with minimal changes. What's more, change can be delivered much more quickly as teams within the organisation have been empowered to become self-reliant for many requirements.

Today the Home Office has a much more efficient technology infrastructure, can respond to requests faster and is able to share the lessons learned across the wider government to improve collaboration and inform other transformation initiatives. For instance, auditing and logging is sent to the Home Office Central Security Operations Centre and security groups are in place to protect service access. The use of native services that are common across the major public cloud providers also reduces the risk of 'lock-in', ensuring that the system is open and flexible enough to accommodate the needs of the future.

With the move to AWS, the Home Office has undertaken one of the largest cloud transformation projects in government also placing it in the top 25 change programmes, which has delivered the objective of transforming immigration and visa services. Led by Civil Servants at the Home Office, with valuable support and partnership from 6point6 and other suppliers including AWS Professional Services, it is one of the largest UK public sector implementations of AWS technology to date. The new platform has given Immigration Technology the foundations for delivering lasting transformation that meets the needs of government and citizens in the future.

New Amazon Web Services platform deploys digital improvements for immigration services in minutes rather than days

Immigration Technology has used the migration opportunity to deliver innovations that ensure greater reliability and ability to scale, earlier integration testing and more efficient use of the Amazon Web Services (AWS) cloud resources.

1. Utilising 6point6 Core Services

6point6 played a key role in enabling and executing the move to AWS, by providing Digital Transformation, Cyber Security and Big Data services to the Home Office. Our consultants, architects and engineers have worked in partnership alongside Civil Servants and other Home Office suppliers to jointly achieve one of the largest cloud transformation projects ever across the UK Government and the largest AWS migration in Europe.

2. Digital Transformation & Architecting the Cloud

6point6 Immigration Technology Architecture team were instrumental in defining the Immigration Technology cloud strategy and the decision-making process for evaluating and moving to AWS as a target public cloud provider. We designed the overall cloud infrastructure, making best use of AWS PaaS and SaaS offerings and ensuring that it met both functional and non-functional needs. We designed the target deployment architecture for the applications and services that were to be migrated, including a sophisticated suite of containerised microservices.

We were a fundamental part of the team that built, migrated and deployed a new set of critical business services, including the Biometric Residence Permit (BRP) and the core case working services for Immigration.

To achieve a 50% reduction in environment build time, we refactored core application code so that it could exploit tools such as Terraform and containerised microservices based on Kubernetes. Through this foundation, we were able to reduce development cycle time from 1 day to 6 minutes by introducing a dynamically provisioned Docker-based build and test infrastructure. We also orchestrated the automated shutdown of nonproduction environments when they were not in use, enabling significant cost savings compared to the previous 'always on' VMware environments.

3. Securing the Cloud

The 6point6 Immigration Technology Security team defined the cloud migration strategy for the Immigration security services and the security architecture for the entire platform, taking advantage of AWS offerings to help to lower operational cost and ensure our solution was secure, accreditable and compliant.

We worked alongside infrastructure and application deployment teams to embed and uplift cyber controls across the platform and Continuous Integration pipeline. We built, migrated and deployed the core identity and access management service, allowing fine grained access control. We enhanced Home Office security posture using advanced anti-malware and monitoring capabilities, leading to the development of deeper insight into traffic flows across key AWS resources. We also exploited AWS encryption services to encrypt by default across all data stores.

Greater visibility of platform usage was achieved by utilising auto-generated audit logs from cloud native services and event based alerting for platform misuse. We also leveraged AWS account structures to restrict the regions in which resources were being consumed in order to meet European and UK data privacy obligations.

4. Big Data in the Cloud

The 6point6 Immigration Technology Big Data team defined the data architecture for the entire Immigration Technology platform, including the data migration strategy for a huge volume of relational, non-relational, document and image data to AWS. Regular performance evaluation spikes were run to test the suitability of each AWS service, including Elastic MapReduce, Elastic BeanStalk and DynamoDB. We also simulated 'disaster scenarios' to validate that services would not be disrupted by a severe event.

We delivered a robust and reliable service, reducing outages of typically 2 hours per month to zero, by imposing greater control over the underlying big data infrastructure, including an innovative Blue-Green approach to reduce release risk through near-zero downtime deployments. By leveraging tools such as Kibana and Terraform, we enriched monitoring, logging, infrastructure maintenance and configuration services.

Data migration included the transfer of 10s of terabytes of critical datasets, all with no disruption to live services. We migrated Hadoop clusters (Hortonworks) to AWS EC2, deployed across multiple AWS Availability Zones, as well as more than 100 virtual machines into AWS, ensuring that the appropriate, optimal cloud service was chosen for each component. Finally, Oracle and PostgresSQL data sets were migrated to AWS RDS equivalents, automating snapshot backup in the process.

Strong Delivery management reduces risk and accelerates transition

To achieve a smooth transition the Immigration Technology team created a consolidated migration plan that broke the technology landscape down into distinct end-to end business flows.

This allowed the team to be agile in its approach from an early stage, identifying potential problems and developing mitigation strategies. If necessary they could then make changes before testing them in a live environment, refining the process and rehearsing the actions required by each part of the organisation. This approach of continuous evaluation and improvement made it possible to make the most suitable technology choices.

By creating such a detailed migration schedule, with almost minute by minute actions, it was possible to anticipate exactly when specific internal or third party resources would be required and make sure that they would be available on time. A project command centre acted as a single point of management, maintaining a consistent approach with strong governance to provide vital support and maintain confidence throughout the process.

Following six dress rehearsals, this robust and agile delivery methodology delivered the transition in five days and integrating 10 third party applications whilst transitioning six business services. This was achieved without any disruption to the business; a testament to the planning and preparation of the Immigration Technology team and its partners. Despite the huge scope, no high priority incidents were raised by the operations team following commencement of service into the early Live Support phase. As a result early Life Support was removed after just one week instead of the planned four.

The AWS infrastructure was built using Terraform, creating hardened AWS deployment patterns in code that was then used to deploy the services.

The use of AWS native services for elements such as firewalls (moved to Security Groups); routers (moved to Routing Tables); load balancers (moved to ELBs) and managed databases (moved to RDS) not only improved the time to deliver but also made operational support of the service simpler. Building infrastructure components as a code means that new infrastructure can be delivered 50% faster than with the previous hosting provider. Core technical releases are now containerised, guaranteeing that the code will work when promoted to higher environments.

About 6point6

Integrating digital technology into your business can result in fundamental changes to how you operate and deliver value to your customers. To go digital is to reinvent yourself to the core, opening yourself and your clients to a world of possibilities.

6point6 is a technology consultancy. We bring a wealth of hands-on experience to help businesses, including financial services providers, media houses and government, achieve more with digital. Using cutting edge technology and agile delivery methods, we help you reinvent, transform and secure a brighter digital future.

Visit us at **6point6.co.uk**
Twitter: **@6point6ltd**
LinkedIn: **linkedin.com/company/6point6**

6POINT6

SIX.SIX.052