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in collaboration with HM Revenue & Customs

HMRC's IT Platform Enables Expansion of Online Services

Disaster tolerant solution ensures online services are available for customers who choose the internet to handle their tax and benefits

The Situation

HM Revenue & Customs (HMRC) is making the internet the 'channel of choice' for customers, so new online tax services must be easy to use and always available. A reliable e-services infrastructure was needed to handle the growing number of users and to withstand problems as extreme as the total loss of a data centre.

To underwrite this commitment, HMRC chose a disaster tolerant framework instead of more traditional disaster recovery, ensuring availability and meeting budget constraints. Working with IT partner Capgemini, HMRC's new shared platform and advanced service management tools were successfully introduced for the new Self Assessment Online service. New VAT, corporation tax and PAYE web services are now being added.

The Solution

The new shared platform is an infrastructure backbone and software architecture supported by sophisticated service management. Disaster tolerance is achieved by a dual data centre deployment, which is scalable and maximises use of existing assets. 'Capacity on demand' prioritises services during critical periods when user numbers peak.

The software has been architected to securely manage and regulate user sessions across and within data centres, switching

"The level of control we had through the suite of monitoring tools was extraordinary, as too was the level of collaboration between different people across different teams."

Tim East, Deputy Director (Operations)
IMS Live Services
Talking about the Self Assessment Online filing peak in January 2010

components on and off as required. During development, intensive tuning of the end-to-end solution included performance testing of cross government infrastructure components.

Live service is monitored by system and service management capabilities that give real-time visibility of performance, availability and throughput for all system components, including external traffic dependencies. Service oriented principles guided the design and best practice processes are applied to ongoing management.

The Result

The architecture-driven solution is the backbone for the staged introduction of new web based services.

Key benefits include:

- Web services are available when customers want to use them. If the infrastructure fails users are automatically diverted to working components and the segregation of services ensures near zero loss of data.
- Potential problems are identified early so preventative measures are taken before customers are impacted. Monitoring technology allows experts in mission control to proactively spot issues.
- Value for money from the decision to implement disaster tolerance instead of more costly solutions, to the ongoing operations of streamlined systems and processes.
- Cost savings from decommissioning and consolidating platforms when new web online services are migrated to the new shared infrastructure.

The new online services IT platform was delivered on time and under budget, supporting Self Assessment Online and a range of other critical services. It was introduced in phases to minimise risk, and resilience was put through its paces by the 50 percent growth in Self Assessment Online customers in its first year increasing to 6.5 million submissions in the 2009-10 filing period. During peak filing the service handled over twelve complex submissions a second.

How Capgemini and HMRC Work Together

The new IT platform is an integral part of HMRC's IT transformation programme to make services available online and enhance the user experience. Capgemini works with HMRC to design, build, and run all aspects of the new services; and integrate the new infrastructure, new user friendly applications and the existing environment.

This is achieved by close relationships across both organisations' business, technical and commercial teams together with world class technology and processes from ecosystem partners.

Disaster Tolerant Infrastructure

Capgemini's Integrated Architecture Framework (IAF) was used for the dual data centre disaster tolerant solution. There are controls to fully manage the flow and end-to-end processing of user traffic. Intelligent load balancing across and within data centres is used in a predictive mode to assess how fast transactions will be processed and allocate users sessions to the most efficient data centre and server domain.

The architecture allows customer traffic to be allocated on the most appropriate technology components using either dynamic distribution, rate percentage or manual controls. Complete services, individual tiers and specific components can be isolated, switched off, upgraded and brought back on again with a minimum of disruption. Capacity on demand is achieved by using pools of servers that can either 'swing' between services or activated as and when they are needed.

Services are segregated across separate tiers to allow customer sessions to be distributed dynamically and

predicatively across, within and between data centres. This improves time to market for new services, enabling upgrades and enhancements to be added with only limited redesign and re-work. It reduces testing effort and minimises disruption to live systems by isolating components and redirecting traffic while changes are made. Web application firewalls and network based security protects against targeted attacks, signature recognition attack, cloaking and other threats.

Specialist IT providers were involved in different aspects of the solution:

- An application delivery controller brings security and in-depth data inspection of all user traffic to assure maximum security of information. Bespoke enhancements were developed for a throttling mechanism to effectively control traffic and manage sudden peaks in demand.
- A data replication suite is used for bi-directional data replication to ensure that there is only one master copy of the data, a single version of the truth, is maintained at all times and reassigned dependent on demand or failure scenario.
- Application and database servers with optimum system configuration tuning.
- A network routing backbone for traffic control, resilience and failover.
- Configuration and ongoing support for internet and WAN connectivity.
- A user authentication module for single sign on and session management.
- High availability storage infrastructure and real-time replication facilities.
- Software re-design, development and system testing.
- Security specialist consultancy and network management support
- Enterprise service bus, storage and forward functions for interfacing with the UK Government Gateway.

Fujitsu is the core partner for infrastructure and hosting services. The disaster tolerant framework involved heavy engineering activities for new servers; moving devices across data centres; installing and configuring network connectivity and fibre optic links; and transitioning services from old to new platforms. Fujitsu project managers and engineering architects were integral to the whole lifecycle, ensuring minimum impact and careful interlock of new infrastructure components with legacy systems.

Service Management

An IT system of this scale and flexibility can represent a real challenge for live support. Recent experience included sudden peaks in online customers and problems with a third party system that created a bottle-neck and a database that slowed down periodically. Advanced system and service management tools proactively detect unexpected events, allowing time to deal with problems before they affect services.

The service management solution is a selection of best of breed of products that provide real-time session monitoring across all tiers of the architecture from user login through to submission validation and confirmation of a successful session completion.

Specialist companies provided specific services:

- To detect unusual system behaviours, signs of service degradation and trouble shoot in data centres.
- Network management and monitoring products to packet capture all service events at the network level.
- Software-as-a-Service (SaaS) arrangements for the business availability centre and performance services, making both solutions quick and cost effective to implement. The services continuously simulate user behaviour and report any change to normal performance or availability of external facing services and load test peak volumes.

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HM Revenue & Customs (HMRC) collects tax and duties to make sure money is available to fund the UK's public services and makes payments to over seven million families, providing targeted financial support. Capgemini is HMRC's partner for IT and related services delivered through the Aspire contract. Capgemini is prime contractor for Aspire, and manages key partners and HMRC's Ecosystem of preferred suppliers.

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