Continuous delivery for AWS-based digital services

Continuous delivery automates the path to production in AWS cloud. Code is tested and automated throughout the deployment pipeline from initial requirement to live. Enabling responsiveness to change, user feedback and new security vulnerabilities – in a rapid, repeatable way. From 'big bang' to smaller incremental releases, with zero downtime.

Organisations that currently struggle to respond to the pace of change in today's fast-moving market – or who seek to reduce the time to market for new features and products – will particularly benefit from a move to continuous delivery as they transition to Amazon Web Services (AWS) based technologies and services.

However, the approach is recommended for any organisation seeking to maximise the benefits of digital delivery. Continuous delivery can be transformative for an organisation, enabling rapid response to changing situations and user needs. It reduces the risk of deploying to the cloud by releasing small changes more frequently, that are easy to roll back in a repeatable and reliable process. It also provides opportunities for organisations to automate and streamline their internal release processes.

By removing waste in this way, the cost of releasing features and the time to market can be reduced for new digital products and services. Our continuous delivery approach has successfully met Government Digital Service standards in the deployment of multiple services to the cloud.

Features

- Migration of environments to Amazon Web Services (AWS) infrastructure
- Can deliver a combined approach of AWS and existing infrastructure
- Delivered by AWS Advanced Partner with Public Service Competence
- Server automation expertise in Ansible, Puppet, Terraform and Chef
- Continuous integration expertise in Jenkins, TeamCity and Travis
- TDD and BDD expertise in jUnit, NUnit and xUnit frameworks
- Expertise in Java, Scala, NET, Ruby, Python, Go and Docker
- Automated functional frameworks including Selenium and Webdriver
- Support from EE's Continuous Delivery and DevOps teams
- Delivered independently or collaboratively with an existing client team

Benefits

- Improves time to market for new features and functionality
- Decreases risk for deployment (zero downtime)
- Greater responsiveness to change, for example mitigating new security vulnerabilities
- Automated configuration of all environments across the deployment pipeline
- No single points of failure in the cloud infrastructure
- Faster roll-back of changes
- Resilient set-up to minimise cost
- Auto scaling of new infrastructure resources, as required
- Built-in disaster recovery can respond within seconds
- Automated security patches included in the EE Continuous Delivery service

Our approach to continuous delivery

Equal Experts works with client organisations to automate their path to production by ensuring that all code is fully tested and automated throughout the deployment process – from initial requirement or feature to live. This ensures the organisation can respond to changes, user feedback, market conditions, and new security vulnerabilities in a rapid, repeatable way.

To ensure that continuous delivery is safe, secure, efficient and has the requisite level of buy-in throughout the organisation, Equal Experts uses its 10-step continuous delivery approach at the start of a new or existing initiative. Conducted in close collaboration with the client organisation our approach ensures we quickly get to agreement on the customer objectives and our proposed solution. These steps are:

1. Understand deployment objectives – including desired release cycles and deployment confidence levels. For example, once everything has been tested, is the organisation comfortable releasing to live?
2. Analyse the current path to production to understand the "As Is" build pipeline and deployment processes (including use of existing or desired tools), and identify current pain-points.
3. Investigate potential blockages in the current process – considering adequate automated test coverage, commitment of code to source control, code packaging, automation of deployment processes and architecture constraints.

4. Investigate the test approach and automation – including unit testing, static analysis, integration testing, smoke testing, performance testing, security testing, packaging, deployment scripting, versioning, and source control.
5. Investigate ways to reduce unnecessary waiting time between steps in the process, via automation.
6. Investigate moving from large releases to incremental ones – from complex, disruptive 'big bang' releases to smaller incremental releases, with reduced risk.
7. Investigate deployment confidence via the use of like-environments and automated tests.
8. Establish the development iteration duration – is the current one sufficient to provide adequate feedback?
9. Identify redundant or duplicate tasks throughout the deployment process.
10. Define a "To Be" vision for automated deployment to cloud within the organisation – including pragmatic recommendations for improvement and implementation.

Following this initial analysis and planning, we will work with client delivery teams to implement the agreed "To Be" vision for automated deployment and continuous delivery within the organisation, ensuring code is tested and automated throughout the deployment pipeline (from initial requirement to live). We aim for the following practices to start demonstrating tangible benefits as soon as possible:

- Continuous improvement in deployment process and practices
- Reductions in cycle times for new features and increased throughput
- Improved quality of fit-for-purpose software
- Automated build and deployment – with zero downtime releases of new features into production where possible

Continuous delivery ensures cost-effective responsiveness to change, user feedback, market conditions, and new security vulnerabilities in a rapid, repeatable way, and allows frequent, incremental code releases – with zero downtime.

We seek to encourage teams to do as many small releases as possible, for the following reasons:

- Smaller releases mean fewer changes in each release – which translates to fewer opportunities for error, reduced time to identify any issues and consequently less risk
- Practice makes perfect - if things are hard, they should be repeated more often, to make them simpler and more reliable
- It is easier to roll back small changes than big ones, should issues occur

- We want users to benefit from added value as quickly as possible
- We want to maximise opportunities for frequent feedback

Skills & Technologies

These are some of the skills and technologies that we use to implement Continuous Delivery:

Server Configuration Management: Puppet, Ansible, Chef, Terraform, CloudFormation, SaltStack	**Virtualisation/ Containers:** Docker, VMware, Openstack, Rancher.	**PaaS:** Cloud Foundry, Heroku	**Continuous Integration:** Jenkins, TeamCity, Travis, AppVea, Bamboo, GoCD.
Build Scripts and Automation: Maven, Gradle, MSBuild, Python, Ruby	**Test Driven Development and Behaviour Driven Development:** Junit, Nunit, DBunit, HTTPUnit, Cucumber,	**Databases:** MongoDB, Neo4J, AWS Relational Database Services,	**Automated Functional Testing:** Selenium, WebDriver, White (for .NET thick client), Appium
Languages: Java, .Net, Ruby, Python, Scala, Go	**Cloud:** AWS, Azure, Google Cloud Platform, UKCloud	**Logging, Monitoring, and Notification:** Elasticsearch, Logstash, Kibana, Graphite, Fluentd, Kibana, Prometheus, Grafana. Sensu, Nagios, StackDriver	**Orchestration:** Kubernetes, GKE, ECS, KOPS

Examples of continuous delivery in action

Equal Experts has worked with many different organisations, including HMRC, to implement continuous delivery services. The path to production is one of the first things we

look at on any engagement, with a view to determining how it can be achieved in an automated fashion.

At HMRC, Equal Experts has been the key programme delivery partner for the Multi-channel Digital Tax Platform from its outset, at the start of 2013. The aim of the platform is to move approximately 600M+ transactions a year, across 50M+ customers, from traditional channels to digital. Integrated transactional services provide seamless end-to-end experiences for business and individual customers, with self-service applications 'bundled' together to provide services based around life events (eg. a customer setting up a business), and address tax risks.

The sheer scale of the programme – with so many services to provide, so many customers to look after – means the value of continuous delivery has been obvious to all those involved. Our approach at HMRC means services and tools can be tested and deployed independently within a continuous delivery environment, without impacting other production services. Teams are able to release multiple times each week across each of their digital services. We practice zero downtime deployments driven from Jenkins and can rollback using the same mechanism.

To successfully create this continuous delivery environment, a dedicated platform team of WebOps engineers has iteratively built the Platform as a Service, across multiple cloud providers (to provide resilience and disaster recovery). We have provided build, test and live environments that meet stringent security and data compliance regulations, and the monitoring and deployment pipelines that allow an automated, repeatable path to production. This allows over 60 feature teams, spread across multiple locations in different delivery centres, to iteratively release new features.

This example – using best engineering practices to identify and eliminate inefficiencies, and laying the foundations for smoother, more frequent delivery – shows how our approach to continuous delivery can unlock the real potential of delivery teams. It is an ideal way to put real, measurable improvements in customers' hands, on a more frequent basis.

Team

We are different. Equal Experts is a global community of 500 permanent staff and 4000+ associates, including ~800 active independent consultants and ~1200 alumni, many of whom are happy to return when we have projects and our clients need them.

We have grown organically, mostly via personal referrals, looking for quality, experience and cultural fit above all else. After a rigorous selection process, experts are added to our network, whether we need them immediately or in the future.

90% of our consultants have >12 years of experience (average >18 years) in development, delivery, operation and maintenance of digital services using agile methods. Many have significantly more and in some cases are global influencers. Their maturity and pragmatism means they are highly collaborative, happy to transfer knowledge and keen to help clients build internal capability.

Our standard working model for teams is hybrid remote first/onsite, with a core generally located in proximity to client offices, minimising travel costs and environmental impact. This ensures they can be onsite for workshops, meetings, and onboarding activities, and can work collaboratively with client team members, stakeholders and other suppliers. In the words of one client 'your consultants leave their Equal Experts badges at the door'.

Roles

Collectively, our consultants have the multi-disciplinary experience and expertise needed for successful transformation to cloud-first delivery, live service maintenance and new operating models. Our network means we have fast and flexible access to the skills our clients need. We have specialists in all areas needed for digital success, including:

- Delivery managers
- Change managers
- Product managers
- Engagement managers
- Strategic advisors
- Security specialists
- Data scientists
- Data engineers
- Data architects
- Technical leads
- Technical architects
- DevOps consultants
- Developers
- Testers
- Business and performance analysts
- Accessibility experts
- Service designers

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- User experience designers
- Content designers
- User researchers

If a client needs other specialists or niche skills, we can rapidly and confidently engage with other organisations in our established ecosystem of proven partners. Each consultant is interviewed by EE to ensure a high level of knowledge before we provide them to clients.

Public sector clients

We know what it takes to implement and support cloud-based applications within complex public sector organisations and across large multi-vendor programmes. We understand and adhere to the GDS digital service standards for delivering solutions and handling and securing data within critical national systems. We have experience in consulting, deploying and supporting solutions that are security accredited and have passed many standard GDS assessments. Many of our consultants have active SC clearance level (some have DV) as they have previously worked with public sector clients.

Equal Experts has helped implement digital services to government digital service standards (including passing many formal GDS service standard assessments) for:

- His Majesty's Revenue and Customs (HMRC)
- Ministry of Justice and His Majesty's Prisons and Probations Service (HMPPS)
- Department for Work and Pensions (DWP)
- His Majesty's Passport Office (HMPO)
- Department of Health and Social Care (DHSC)
- Department for Environment, Food & Rural Affairs (DEFRA)
- Department for Business, Energy & Industrial Strategy (BEIS)
- Home Office
- Border Force
- Department for Education (DfE)
- Registers of Scotland
- Office for National Statistics (ONS)
- Civil Service Recruitment
- Coal Authority
- Intellectual Property Office (IPO)
- His Majesty's Courts and Tribunals Service (HMCTS)
- States of Guernsey
- Cabinet Office

- Government Digital Service (GDS)
- Valuation Office Agency

Why choose Equal Experts?

Equal Experts' diverse teams of talented, experienced software consultants bring maturity, pragmatism and passion to software products and services of all shapes and sizes. We support end-to-end delivery, deployment, migration and maintenance of elegant, bespoke applications to the cloud and provide all the services that making them entails. This includes everything from mobile apps to enterprise-level technology platforms and digital transformation to client capability building.

Since our inception in 2007, we have sought out quality above all else. We are adept in all agile and lean practices, for example:

- close collaboration
- rapid feedback loops
- keeping it simple
- empowered teams
- test automation
- continuous integration and delivery
- pairing
- refactoring
- constant learning and improvement
- learning by doing
- continuous improvement

Our focus on senior talent means that all our consultants have the skills and experience required to thrive in dynamic, challenging client environments. It means we can focus on work that adds real value, rather than micro-managing more junior consultants. Our non-hierarchical structure also allows us to operate with lower overheads.

For our teams, this creates a mature, pragmatic and innovative working environment, somewhere they can implement the best solutions of their already distinguished careers. And for our clients, it translates to better services, delivered faster and at lower overall cost. We were ranked 4th in Glassdoor's Best Places to Work 2024 and 15th in Newsweek's Most Loved Workplaces 2022.

It also means our people have the expertise and consultancy skills to help transfer knowledge of new ways of working to our client's team members, helping to build their internal delivery competency and capability.

Equal Experts' approach has a successful track record of delivery across the private and public sectors. Our award-winning deliveries include HMRC's Multi-channel Digital Tax Platform, chosen as the British Computer Society's Digital Project of the Year, and the Home Office Visa Application service, Computer Weekly's Best Public Sector Project.

Equal Experts has Business Units in the UK (London and Manchester), USA, South Africa, EU (Germany), Australia, and India.

We're proud to be one of the top suppliers to the public sector via the G-Cloud and DOS frameworks. Our services are also available through RM6100 Technology Services (Lots 1, 3d) and RM6263 Digital Programmes and Specialists (Lot 1), RM6195 Big Data and Analytics (the only supplier on all 6 capabilities) and RM6335 DALAS (Lot 2a), and various DPS Frameworks, including RM6094 Spark, RM6173 Automation Marketplace and RM3764 Cyber Security.

For more information and case studies, please visit https://www.equalexperts.com/ or contact us at solutions@equalexperts.com.

Planning

To build detailed knowledge of the context and domain for any project, an initial phase of planning, definition and knowledge transfer will generally take place at the start of an engagement.

We have found that this takes place most effectively through a short time-bound inception to develop a shared understanding and agreement on vision and objectives across a broad stakeholder group. This covers the business, technical and user aspects of the project and the outputs may include user personas and scenarios, key user journeys, as-is and desired business processes, a prioritised backlog of user stories, technical constraints and vision, and a release roadmap and plan. The techniques and principles applied are also used on an ongoing basis throughout the course of delivery, to ensure the solutions developed are fit for purpose and meet real and changing user needs.

This initial inception phase can be contracted separately if required.

Setup and migration

In addition to ongoing development and operation of live cloud-based services, we can help with the initial set up and migration as part of a transition to cloud. We look for opportunities to automate processes (for example, test, deploy) that will yield real benefit and high ROI. Our approach helps to address integration, dependencies and risk early. We capture actionable metrics to measure and manage progress towards meeting the agreed success criteria and KPIs identified for building and operating the service. The highly collaborative, interactive processes we follow foster continual learning and improvement of services. They help to establish and evolve the overarching service design, management processes and the team capabilities.

We can ensure projects hit the ground running through our experience in designing, configuring and setup of many continuous delivery and automated cloud deployment environments. These techniques allow software to be repeatably and reliably deployed and tested through each stage into production on the cloud. We have substantial experience when it comes to the tooling required for continuous delivery and automated software deployment, greatly facilitating the software set up, build and migration process, which increases programme productivity and reduces project risk and cost.

Quality assurance and performance testing

All our consultants have extensive experience of both manual and automated testing, including performance testing, continuous integration and delivery into production environments at scale. With all clients we actively encourage the adoption of robust and meaningful automated test coverage, delivery and test techniques, to reduce risk and safely increase delivery velocity. We are happy to work with a clients existing quality management system (QMS) where appropriate.

Security services

We hold ISO9001:2015 Quality Management System, ISO27001:2017 Information Security Management System, Cyber Essentials (IASME-CE-018168) and Cyber Essentials Plus (IASME-CEP-003763) certifications.

We can provide the following security services if required:

- Security strategy
- Security risk management
- Security design

- Security incident management
- Security audit services

Training

For every client, we aim to transfer and embed knowledge of technology and process innovation. Our consultants help improve our clients' internal competencies and build long-term sustainable capability, as they migrate to modern cloud-based products and services. We tailor particular practices to address specific organisational constraints – we recognise that every organisation is different and there is no "one size to fit all".

The depth of experience of our consultants means they are mature, pragmatic, and have an approach grounded in hands-on digital experience. This is key to our ability to help with training, upskilling and building knowledge of new ways of working within client team members. All our consultants are selected based on their demonstrated understanding of how intelligent and innovative uses of technology are being put to work to provide competitive advantage across industries. Passing this expertise and understanding to our client team members is a key, and unique, advantage and value provided throughout our engagements.

We tend not to offer classroom-based training as our consultants are happy to share their knowledge throughout a project. They take responsibility for helping individual client team members adopt new practices and ways of working.

Ongoing support

Our operational philosophy is "you build it, you run it'". The delivery team responsible for the development of a live service usually also takes responsibility for its operation. We have found that development teams which support their own products are motivated to deliver higher quality, more robust and maintainable code.

When a service is live with real users we expect the delivery team to provide 2nd line (infrastructure, in conjunction with hosting support agreements) and 3rd line (applications) support during business hours. We can agree an appropriate model for 24/7 on-call coverage if required - see our G-Cloud On-Call Support offering for details. We typically establish an on-call rota with delivery team members assigned on a weekly basis.

Our experience is that digital services are never really finished and that it is important to retain some level of investment to allow the addition of new features as the needs of customers (both internal and external) change. Our design of the end-to-end service can

include establishing Service Level Agreements for ongoing service evolution and operational support (ensuring agreed levels of service availability).

User support

We provide an engagement manager on all G-Cloud engagements with responsibility for ensuring customer objectives are met, and for addressing any issues with service delivery. Our engagement managers act as an escalation point, and can be reached via phone or email, to respond to issues beyond the control of the team providing the service. Engagement management is included within our service pricing.

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Social Value

Tackling economic inequality   Theme 2 MAC2,3

ENTREPRENEURSHIP AND TRAINING
For GCloud contracts, we will:
- Flow ~65% of revenues to our Associate supplier network (small, entrepreneurial businesses).
- Expand and assign consultants from EE's Evolve programme, which mentors technology practitioners to become expert consultants.
- Work with specialist partners (eg. SigmaLabs, NorthCoders) to develop skills for under-represented and early-career candidates, assigning them to our teams and using our expert consultants to coach and train them.
- Provide retraining and return opportunities, mentoring, development of technical skills which address skills gaps, training through mock-up interviews, provision of CV and careers guidance.
- Where possible, provide opportunities to employ and develop more people with protected characteristics in new skills relevant to the contract.
- Share knowledge and experience publicly via ExpertTalks and Open-Source Playbooks to develop disadvantaged groups' skills.
- Partner with leading diverse communities, networks and ambassadors to identify suitable candidates eg. SigmaLabs, Coding Black Females.

- Continue hosting events for minority and under-represented groups, for example, 10 Digital Ladies and Women Who Code.

DIVERSE SUPPLY CHAINS

Our partnering model directly supports SMEs and SEs, which we engage as specialist subcontractors. We identify new businesses, entrepreneurs, start-ups, SMEs, VCSEs and mutuals that can participate in our supply chain and those of our clients.

For G-Cloud contracts, we will:

- Procure in a fair and open, PCR2015 manner.
- Establish innovation programmes to identify and onboard new micro businesses.
- Encourage suppliers to diversify their supply chain in line with our goal to increase supply chain resilience.
- Increase supply chain governance using recognised bodies such as sedex.com.
- Measure and increase staff characteristics and success in our associate/supplier diversity (eg. %spend with each supply group across micro, SME and collectives; %of start-up suppliers still in business after three years).

Fighting climate change   Theme 3 MAC4

Equal Experts has a robust Environmental Policy, aligned with PPN06/20 Theme 4, PPN06/21 and the UN Sustainable Development Goals, which details commitments to reduce our environmental impact holistically across the organisation. We have published and updated our plans annually since 2019, meeting the government's Streamlined, Energy and Carbon Reporting legislation (SECR), initially reporting Scope 1 and 2 emissions. Our Carbon Reduction Plan is published on our website and has been certified to meet PPN06/21 requirements by CCS.

EE is committed to achieving net-zero Carbon emissions by 2030. We are actively exploring investments in innovative, effective carbon-offsetting initiatives to achieve this target. Our internal Carbon Net-Zero Governance working group advises the Exec Team on meeting the 2030 net-zero target.

For G-Cloud contracts, we will:

- Build systems making extensive use of cloud services. Most systems we build use automated scaling of resources to ensure we minimise both cost and environmental impact of operation. We migrate to more efficient resources and operational practices as cloud providers introduce them.
- Encourage and support remote and hybrid working, and provide access to tools like Zoom, Lucidchart and Miro to encourage and facilitate this and thereby reduce our carbon footprint. We have written an open-source Remote Working Playbook which is available to anyone via our website.

- Assign local staff to client engagements whenever possible, to reduce travel impact.
- Use flexible co-working spaces with high BREEAM ratings.
- Reduce office material consumption and waste eg. printers and paper, recycle and reuse wherever practical.
- Reduce energy and water consumption.
- Consider the environment in our branded merchandise used at events and promotional activities, particularly reducing plastic use and local sourcing.
- Improve our recycling efforts, particularly IT equipment (our largest relevant expenditure in this area), and deliver social benefits through reuse wherever possible.

Equal opportunity   Theme 4 MAC5,6

EQUAL OPPORTUNITIES
Equal Experts has a longstanding commitment to advancing diversity, equality and inclusion. We operate in ways that support clients to deliver their Public Sector Equality duty under section 149 of the Equality Act 2010. We are Level 1: Disability Confident Committed and members of the Business Disability Forum.

For G-Cloud contracts, we will:
- Run monthly team psychological safety surveys, share results with teams, help teams identify and support improvement actions.
- Invest in workshops and training to help teams improve safety and inclusion.
- Host events for minority groups, such as 10 Digital Ladies and Women Who Code.
- Provide family-friendly and dignity-at-work policies (we were placed 4th in Glassdoor's Best Places to Work 2024).
- Continuously evolve recruitment processes to improve diversity, equality and inclusion, and provide unconscious bias training for our recruitment team.
- Engage Druthers, executive search specialists in building inclusive teams, to broaden our team diversity.
- Where possible, provide opportunities to employ and develop more people with protected characteristics in new skills relevant to the contract.
- Make appropriate adjustments where practical to support and develop individuals with physical, mental and hidden disabilities.
- Regularly monitor our performance (eg. Cabinet Office CAESER, B Impact Assessments) to help develop annual improvement plans.

MODERN SLAVERY
EE is covered by the Modern Slavery Act 2015. Our published policy statement, processes and procedures are reviewed and updated annually (eg. Employee Team Charter, Whistleblowing Policy, Code of Conduct for Suppliers).

We will undertake due diligence when considering taking on new suppliers and regularly review existing suppliers. This includes evaluating modern slavery risks. We are members of Sedex Global and will use their services to review our extended supply chains and provide confidence to our clients.

Wellbeing   Theme 5 MAC7,8

HEALTH AND WELLBEING

Equal Experts promotes psychological safety, trust, inclusion and a "grown-up" culture throughout our workforce. We work closely with our clients to support the health and wellbeing of our team members, establishing onboarding practices and developing local team charters to ensure new team members are welcomed and made to feel safe. We support the six standards of the Mental Health at Work Commitment and the Race at Work Charter and encourage our supply chain to do the same.

For G-Cloud contracts, we will:
- Run monthly team psychological safety surveys, share results with teams, help teams identify and support improvement actions.
- Promote inclusive and accessible recruitment and retention practices to ensure people feel valued (Equal Experts was placed 4th in Glassdoor's Best Places to Work 2024).
- Offer flexible and remote working and encourage staff to take regular breaks, "Movement Snacks" (workstation exercises), holidays, online team-events.
- Provide awareness training and guidance through our policies, ExpertTalks and playbooks.
- Offer private medical cover for our UK employees and their families, including encouraging exercise and other preventative measures.
- Host public online ExpertTalks on Health and Wellbeing, eg. "Avoiding Burnout".

INTEGRATED COMMUNITIES

For G-Cloud contracts, we will:
- Foster an open, inclusive working culture eg. 'no-blame' retrospectives to help us learn from each other's perspectives.
- Hold socials and lean coffee sessions to ensure a welcoming culture that leads to better team bonding and working relationships.
- For physical health, hold our annual Walkathon competition for staff and family members, clients and partners, which encourages physical activity and raises money for charity (1200 participants, £136k raised in 2023).

- Encourage companies in our supply chain to implement measures to improve employees' physical and mental health and wellbeing, and implement standards in the Mental Health at Work commitment.