Standardised Architecture for UK-OFFICIAL in the AWS Cloud

Based on NCSC Cloud Security Principles

Quick Start Reference Deployment

AWS Professional Services Team
AWS WWPS Team
AWS Quick Start Reference Team

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This Quick Start supports the following guidelines:

- National Cyber Security Centre (NCSC) Cloud Security Principles
- Center for Internet Security (CIS) Critical Security Controls

This guide is also available in HTML format at https://docs.aws.amazon.com/quickstart/latest/compliance-uk-official/
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About This Guide

This Quick Start reference deployment guide discusses architectural considerations and steps for deploying security-focused baseline environments on the Amazon Web Services (AWS) Cloud. Specifically, this Quick Start deploys a standardised environment that helps organisations adhere to guidelines set out by the UK National Cyber Security Centre (NCSC) for the Cloud Security Principles implementation.

These guidelines apply to workloads classified as OFFICIAL per the United Kingdom (UK) Government Security Classifications Policy (hereafter referred to as UK-OFFICIAL in this guide). For more information about UK security classifications and using AWS in the context of the Cloud Security Principles, see the Additional Resources section.

The deployment guide includes links for viewing and launching AWS CloudFormation templates that automate the deployment, and a controls mapping matrix that includes additional recommendations and references.

The purpose of the AWS CloudFormation template is to provide an easily deployable reference architecture for evaluation and testing. Although we have strived to make the template as comprehensive as possible, it is not intended to be used for production workloads without appropriate review and validation.

Furthermore, organisations will have to consider their own risk tolerance and internal/external requirements before they can define and implement AWS multi-account strategy, connectivity with other systems, user authentication workflows, encryption methodologies, logging and auditing requirements, and similar components of the architecture. We recommend that you customise the AWS CloudFormation template to meet your own needs in order to obtain a repeatable and auditable reference architecture.

This Quick Start is part of a set of AWS compliance offerings, which provide security-focused, standardised architecture solutions to help Managed Service Providers (MSPs), cloud provisioning teams, developers, integrators, and information security teams adhere to strict security, compliance, and risk management controls. For additional Quick Starts in this category, see the Quick Start catalog.

Quick Links

If you have an AWS account that already meets the technical requirements for the UK-OFFICIAL deployment, you can launch the Quick Start to build the architecture shown in Figure 2. The template is launched in the EU (London) (eu-west-2) Region by default.
The deployment takes approximately 30 minutes. If you are new to AWS or to UK-OFFICIAL architectures on AWS, please read the overview and follow the detailed pre-deployment and deployment steps described in this guide.

If you want to take a look under the covers, you can view the main template that automates this deployment. The main template includes references to child templates, and provides default settings that you can customise by following the instructions in this guide. For descriptions of the templates and guidance for using the nested templates separately, see the Templates Used in this Quick Start section of this guide.

You can also view the security controls matrix (Microsoft Excel spreadsheet), which maps the architecture decisions, components, and configuration in this Quick Start to security requirements within the NCSC publication; indicates which AWS CloudFormation templates and stacks affect the controls implementation; and specifies the associated AWS resources within the templates and stacks.

The matrix also provides a mapping with the Center for Internet Security (CIS) Critical Security Controls (CSC), and additional recommendations and links to other AWS documents, in order to assist with the design and deployment of environments in alignment with security best practices.

The excerpt in Figure 1 provides a sample of the available information.

```
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Governance</td>
<td>The service provider should have a security governance framework that correlates the service with the security strategy and identifies the management of the service and information within it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Operational security</td>
<td>The service provider should have access and procedures in place to manage the associated security policy of the service.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1 Configuration and change management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3.8.7.1.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L2 Identity and access management</td>
<td>Users and the generated policies should ensure that knowledge of the service is secure.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L3 Information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

View main template

View security controls matrix
We’d like your feedback  After you deploy this Quick Start, please take a few minutes to fill out our [survey](#). Your response is anonymous and will help us improve this and other compliance-related reference deployments.

About Quick Starts

Quick Starts are automated reference deployments for key workloads on the AWS Cloud. Each Quick Start launches, configures, and runs the AWS compute, network, storage, and other services required to deploy a specific workload on AWS, using AWS best practices for security and availability.

Overview

AWS Compliance Architectures

AWS compliance solutions help streamline, automate, and implement secure baselines in AWS—from initial design to operational security readiness. They incorporate the expertise of AWS solutions architects, security and compliance personnel to help you build a secure and reliable architecture easily through automation.

This Quick Start includes AWS CloudFormation templates, which can be integrated with AWS Service Catalog, to automate building a standardised baseline architecture that aligns with the NCSC [Cloud Security Principles](#). It also includes a [security controls matrix](#), which maps the security controls and requirements to architecture decisions, features, and configuration of the baseline to enhance your organisation’s ability to understand and assess the system security configuration.

UK Government Private Networks Connectivity

AWS customers who require connectivity with special purpose networks such as Public Services Network (PSN) for public sector organisations, N3 for English National Health Service (NHS), and Janet for education and research, will need to implement enhanced network segmentation and isolation, because these networks are restricted to organisations that have implemented the required set of technical and legal controls as required by the network operators.

AWS has worked with the UK Government Private Networks providers to develop a set of best practices and architecture patterns for public sector organisations; please contact AWS for guidance.
Architecture for Compliance on AWS

Deploying this Quick Start builds a multi-tier, Linux-based web application in the AWS Cloud, as illustrated in Figures 2 and 3.

**Note** You can also download these diagrams in Microsoft PowerPoint format, and edit the icons to reflect your specific workload.

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**Figure 2:** Standard three-tier web architecture depicting integration with multiple VPCs (notional development VPC shown)
The sample architecture includes the following components and features:

- Basic AWS Identity and Access Management (IAM) configuration with custom IAM policies, with associated groups, roles, and instance profiles
- Standard, external-facing Amazon Virtual Private Cloud (Amazon VPC) Multi-AZ architecture with separate subnets for different application tiers and private (backend) subnets for application and database
- Amazon Simple Storage Service (Amazon S3) buckets for encrypted web content, logging, and backup data
- Standard Amazon VPC security groups for Amazon Elastic Compute Cloud (Amazon EC2) instances and load balancers used in the sample application stack
- Three-tier Linux web application using Auto Scaling and Elastic Load Balancing, which can be modified and/or bootstrapped with customer application
- A management VPC hosting a secured bastion login host to facilitate command-line Secure Shell (SSH) access to Amazon EC2 instances for troubleshooting and systems administration activities. This VPC can be used for any other centralised governance
and security tools, such as operational monitoring, long-term user credentials management, vulnerability management, configuration management source repositories, etc.

- Encrypted, Multi-AZ Amazon Relational Database Service (Amazon RDS) MySQL database
- Logging, monitoring, and alerts using AWS CloudTrail, Amazon CloudWatch, and AWS Config rules

**AWS Services**
The core AWS components used by this Quick Start include the following AWS services. (If you are new to AWS, see [Getting Started with AWS](#).)

- **AWS CloudTrail** – AWS CloudTrail records AWS API calls and delivers log files that include caller identity, time, source IP address, request parameters, and response elements. The call history and details provided by CloudTrail enable security analysis, resource change tracking, and compliance auditing.
- **Amazon CloudWatch** – Amazon CloudWatch is a monitoring service for AWS Cloud resources and the applications you run on AWS. You can use Amazon CloudWatch to collect and track metrics, collect and monitor log files, set alarms, and automatically react to changes in your AWS resources.
- **AWS Config** – AWS Config is a fully managed service that provides you with an AWS resource inventory, configuration history, and configuration change notifications to enable security and governance. AWS Config rules enable you to automatically check the configuration of AWS resources recorded by AWS Config.
- **Amazon EBS** – Amazon Elastic Block Store (Amazon EBS) provides persistent block-level storage volumes for use with Amazon EC2 instances in the AWS Cloud. Each Amazon EBS volume is automatically replicated within its Availability Zone to protect you from component failure, offering high availability and durability. Amazon EBS volumes provide the consistent and low-latency performance needed to run your workloads.
- **Amazon EC2** – The Amazon Elastic Compute Cloud (Amazon EC2) service enables you to launch virtual machine instances with a variety of operating systems. You can choose from existing Amazon Machine Images (AMIs) or import your own virtual machine images.
- **Elastic Load Balancing** – Elastic Load Balancing automatically distributes traffic across multiple EC2 instances, to help achieve better fault tolerance and availability.

- **Amazon Glacier** – Amazon Glacier is a storage service for archiving and long-term backup of infrequently used data. It provides secure, durable, and extremely low-cost storage, supports data transfer over SSL, and automatically encrypts data at rest. With Amazon Glacier, you can store your data for months, years, or even decades at a very low cost.

- **Amazon RDS** – Amazon Relational Database Service (Amazon RDS) enables you to set up, operate, and scale a relational database in the AWS Cloud. It also handles many database management tasks, such as database backups, software patching, automatic failure detection, and recovery, for database products such as MySQL, MariaDB, PostgreSQL, Oracle, Microsoft SQL Server, and Amazon Aurora. This Quick Start includes a MySQL database by default.

- **Amazon VPC** – The Amazon Virtual Private Cloud (Amazon VPC) service lets you provision a private, logically isolated section of the AWS Cloud where you can launch AWS services and other resources in a virtual network that you define. You have complete control over your virtual networking environment, including selection of your own IP address range, creation of subnets, and configuration of route tables and network gateways.

**Best Practices**

The architecture built by this Quick Start supports AWS best practices for high availability and security:

- Multi-AZ architecture intended for high availability
- Isolation of instances between private/public subnets
- Security groups limiting access to only necessary services and ports
- Network access control list (ACL) rules to filter traffic into subnets as an additional layer of network security
- Management VPC and secured bastion host instance to facilitate restricted login access for system administrator actions
- NAT gateways and proxies to manage internet access
- Standard IAM policies with associated groups and roles, exercising least privilege
- Monitoring and logging; alerts and notifications for critical events such as logging of root activity, IAM changes, and changes to logging policies
• S3 buckets (with security features enabled) for logging, archive, and application data, including custom lifecycle policies for archiving objects in Amazon Glacier and use of versioning

• Implementation of proper load balancing and Auto Scaling capabilities

• HTTPS-enabled Elastic Load Balancing (ELB) load balancers with hardened security policy (please note that a self-signed certificate is auto-generated for testing purposes)

• Amazon RDS database backup and encryption

How You Can Use This Quick Start
You can build an environment that serves as an example for learning, as a prototyping environment, or as a baseline for customisation.

Since AWS provides a very mature set of configuration options (and new services are being released all the time), this Quick Start provides security templates that you can use for your own environment. These security templates (in the form of AWS CloudFormation templates) provide a comprehensive rule set that can be systematically enforced. You can use these templates as a starting point and customise them to match your specific use cases.

The AWS CloudFormation templates are not intended to be used for production workloads without thorough review, validation, and inclusion of your own business and technical requirements.

Cost
You are responsible for the cost of the AWS services used while running this Quick Start reference deployment. There is no additional cost for using the Quick Start.

The AWS CloudFormation template for this Quick Start includes configuration parameters that you can customise. Some of these settings will affect the cost of deployment. For cost estimates, see the pricing pages for each AWS service you will be using or the AWS Simple Monthly Calculator. Prices are subject to change.

AWS CloudFormation Templates
The AWS CloudFormation templates included in this Quick Start are YAML-formatted text files that describe the AWS infrastructure needed to run an application or service along with any interconnections among infrastructure components. YAML (YAML Ain’t Markup Language) is a human-friendly data serialisation standard for all programming languages.
You can deploy a template and its associated collection of resources (called a stack) by using the AWS Management Console, the AWS Command Line Interface (AWS CLI), or the AWS CloudFormation API. AWS CloudFormation is available at no additional charge, and you pay only for the AWS resources needed to run your applications. Resources can consist of any AWS resource you define within the template. For a complete list of resources that can be defined within an AWS CloudFormation template, see the AWS Resource Types Reference in the AWS documentation.

**AWS CloudFormation Stacks**

When you use AWS CloudFormation, you manage related resources as a single unit called a stack. In other words, you create, update, and delete a collection of resources by creating, updating, and deleting stacks. All the resources in a stack are defined by the stack’s AWS CloudFormation template.

To update resources, you first modify the stack templates and then update the stack by submitting the modified template. You can work with stacks by using the AWS CloudFormation console, AWS CloudFormation API, or AWS CLI.

For more information about AWS CloudFormation and stacks, see Get Started in the AWS CloudFormation documentation.

**Templates Used in this Quick Start**

This Quick Start uses nested AWS CloudFormation templates to deploy the architecture for a multi-tier, Linux-based web application.

The Quick Start consists of a main template and seven child templates: IAM, logging, production VPC, management VPC, Config rules, NAT instance, and application. These templates are designed to deploy the architecture within stacks that align with AWS best practices and the security compliance framework. The following table describes each template and its dependencies. To view the child templates, see the GitHub repository.

<table>
<thead>
<tr>
<th>Stack and template</th>
<th>Description</th>
<th>Dependencies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main stack</strong></td>
<td>Primary template file that deploys the rest of the stacks and passes parameters between nested templates automatically.</td>
<td>None</td>
</tr>
<tr>
<td><em>(main.template)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>IAM stack</strong></td>
<td>Creates a basic IAM configuration with custom policies, groups, and roles.</td>
<td>None</td>
</tr>
<tr>
<td><em>(iam.template)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stack and template</td>
<td>Description</td>
<td>Dependencies</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td><strong>Logging stack</strong></td>
<td>Sets up baseline AWS Config rules for monitoring. Enables AWS CloudTrail, S3 buckets, and bucket policies for logging and archive data. Creates standard Amazon CloudWatch alarms for security-related CloudTrail events.</td>
<td>None</td>
</tr>
<tr>
<td>(logging.template)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Production VPC stack</strong></td>
<td>Configures a secure Amazon VPC for a public-facing application that includes subnets, NAT instances or NAT gateways, route tables, and custom network access control list (network ACL) rules.</td>
<td>None</td>
</tr>
<tr>
<td>(vpc-production.template)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Management VPC stack</strong></td>
<td>Configures a secure Amazon VPC for management functions that support the production VPC, and includes subnets, NAT, route tables, custom network access control list (network ACL) rules, and a restricted, public-facing bastion host to support a secured login path for administrator access.</td>
<td>Production VPC stack</td>
</tr>
<tr>
<td>(vpc-management.template)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Config rules stack</strong></td>
<td>Sets up baseline AWS Config rules for monitoring.</td>
<td>IAM, Production VPC, and Management VPC stacks</td>
</tr>
<tr>
<td>(config-rules.template)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NAT instance stack</strong></td>
<td>Conditionally launched by the Management and Production VPC templates to set up EC2 instances for NAT in AWS Regions where the managed NAT gateway capability is not yet available.</td>
<td>None</td>
</tr>
<tr>
<td>(nat-instance.template)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Application stack</strong></td>
<td>Sets up EC2 instances for reverse proxy and web application, an Amazon RDS database, HTTPS Elastic Load Balancing, Amazon CloudWatch alarms, and Auto Scaling groups.</td>
<td>Production VPC stack</td>
</tr>
<tr>
<td>(application.template)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The AWS CloudFormation template `main.template` is the entry point for launching the entire architecture, and also allows parameters to be passed into each of the nested stacks. The templates for those nested stacks deploy the resources for the architecture.

To deploy the entire architecture (including IAM and Amazon VPC), use `main.template` when launching the stacks. To deploy the full package, the IAM user must have permissions to deploy the resources each template creates, which includes IAM configuration for groups and roles.
You can also edit `main.template` to customise stacks or to omit stacks to be deployed. This can be useful for provisioning teams who must deploy the initial base architecture in accounts for application owners. For more information about deployment options and use cases, see Deployment Methods.

Additionally, you can deploy each stack independently. However, this requires that you pass individual parameters to each template upon launch, instead of relying on the main template to pass these values automatically.

### Managing the Quick Start Source Files

We’ve provided a [GitHub repository](https://github.com/) for the tools and templates for this Quick Start so you can modify, extend, and customise them to meet your needs. You can also use your own Git or Apache Subversion source code repository, or use AWS CodeCommit. This is recommended to ensure proper version control, developer collaboration, and documentation of updates.

The GitHub repository for this Quick Start includes the following directories:

<table>
<thead>
<tr>
<th>Directory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>assets</strong></td>
<td>Security controls matrix, architecture diagrams, and landing page assets</td>
</tr>
<tr>
<td><strong>templates</strong></td>
<td>AWS CloudFormation template files for deployment</td>
</tr>
<tr>
<td><strong>submodules</strong></td>
<td>Scripts and sub-templates used by the Quick Start templates</td>
</tr>
</tbody>
</table>

### Uploading the Templates to Amazon S3

The Quick Start templates are available in an S3 bucket for Quick Starts. If you’re using your own S3 bucket, you can upload the AWS CloudFormation templates by using the AWS Management Console or the AWS CLI, by following these instructions.

#### Using the Console

1. Sign in to the AWS Management Console and open the Amazon S3 console at [https://console.aws.amazon.com/s3/](https://console.aws.amazon.com/s3/).
2. Choose a bucket to store the templates in.
3. Choose **Upload** and specify the local location of the file to upload.
4. Upload all template files to the same S3 bucket.
5. Find the template URLs by selecting each template file, and then choosing **Properties**. Make a note of the URLs.
Using the AWS CLI
2. Use the following AWS CLI command to upload each template file:

   ```bash
   aws s3 cp <template file>.template s3://<s3bucketname>/
   ```

Updating the Amazon S3 URLs
The template for the main stack lists the Amazon S3 URLs for the nested stacks. If you upload the templates to your own S3 bucket and would like to deploy the templates from there, you must modify the Resources section of the main.template file.

Planning the Deployment

Prerequisites

Specialised Knowledge
This Quick Start requires a moderate to high level of understanding of the process to achieve and manage control requirements and compliance processes associated with UK-OFFICIAL within a traditional hosting environment.

Additionally, this solution is targeted at Information Technology (IT) assessors and security personnel, and assumes familiarity with basic security concepts in the area of networking, operating systems, data encryption, operational controls, and cloud computing services.

This deployment guide also requires a moderate level of understanding of AWS services and requires the following, at a minimum:

- Access to a current AWS account with IAM administrator-level permissions
- Basic understanding of AWS services, AWS service limits, and AWS CloudFormation
- Knowledge of architecting applications on AWS
- Understanding of security and compliance requirements in the customer organisation

AWS offers training and certification programs to help you develop skills to design, deploy, and operate your infrastructure and applications on the AWS Cloud. Whether you are just getting started or looking to deepen your technical expertise, AWS has a variety of resources
to meet your needs. For more information, see the AWS Training and Certification website, or read the AWS Training and Certification Overview.

AWS Account
If you don’t already have an AWS account, create one at https://aws.amazon.com by following the on-screen instructions. Part of the sign-up process involves receiving a phone call and entering a PIN using the phone keypad.

Additional Considerations for Production Workloads
A very important aspect of any AWS-based solution relates to the AWS accounts strategy. The previous section describes the simple process for creating a single AWS account you can use to deploy the template for testing purposes. However, for production environments, we recommend that you adopt a multi-account strategy in order to maximise operational efficiency, finance management and reporting, security, auditability, and an effective implementation of security best practices.

For example, your AWS accounts setup could include:

- Billing account (containing an Amazon S3 bucket to hold financial reporting only)
- Development account
- Production account
- Logging account (containing Amazon S3 bucket(s) to hold logs only)

And, as necessary:

- Auditing account (to provide read access to everything for auditors/accreditors)
- User account (to manage user identities)

Additionally, regardless of which setup you choose, you should configure each AWS account by following the recommendations in the CIS Foundation Benchmark for AWS, as appropriate.

User Authentication and Privileges
Whenever possible, users should be authenticated via federation (e.g., SAML) with the user’s existing identity provider (IdP), as described in the AWS IAM documentation, in order to avoid the proliferation of multiple IdPs—unless AWS identity services are used as your authoritative IdP. Furthermore, you should use temporary user credentials to control access to AWS resources, and grant users one default permission only, which is the AssumeRole permission. AWS IAM can then be used to manage users-to-roles mapping.
In this way, user identities will be managed in a consistent manner, and the credentials used to access AWS resources will be dynamically generated and limited in time, reducing the attack surface and improving the overall security posture. This is in line with the recommendations included in the CIS Foundation Benchmark for AWS and security best practices.

**Technical Requirements**

Before you launch the Quick Start, your account must be configured as specified in the following table. Otherwise, deployment might fail. For step-by-step configuration instructions, see the Pre-Deployment Steps section.

<table>
<thead>
<tr>
<th>Resources</th>
<th>Resource</th>
<th>Default</th>
<th>Used in this deployment (by default)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VPCs</td>
<td>5 per region</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>EIPs</td>
<td>5 per region</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>IAM groups</td>
<td>100 per account</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>IAM roles</td>
<td>250 per account</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Amazon EC2 Auto Scaling groups</td>
<td>20 per region</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>ELB load balancers</td>
<td>20 per region</td>
<td>2</td>
</tr>
</tbody>
</table>

**Regions**

The AWS services used in this Quick Start exist in all commercial regions, but AWS Config rules, which are used for configuration enforcement, are not. If you require this capability, you must deploy in a region where AWS Config rules are available.

It is important to be aware of what is available in the region you choose to deploy. To see the latest list of supported services per region, see AWS Regions and Endpoints in the AWS documentation.

**AWS Config and AWS Config rules**

If you deploy this Quick Start in an AWS region where AWS Config and AWS Config rules are available, the config-rules.template template will attempt to automatically use the service. However, the deployment will fail if you have not previously manually set up AWS Config in that region. Before you deploy the Quick Start, navigate to the AWS Config console, and choose the Get Started Now button.

**Amazon S3 URLs**

If you’re copying the templates to your own S3 bucket for deployment, make sure that you update the Resources section of the main.template file. Otherwise, deployment will fail.

**IAM permissions**

To deploy the Quick Start using the console, you must be logged in to the AWS Management Console with IAM permissions for the resources and actions the templates will deploy. The AdministratorAccess managed policy within IAM provides sufficient permissions, although your organisation may choose to use a custom policy with more restrictions.
S3 buckets

Unique S3 bucket names are automatically generated based on the account number and region. If you delete a stack, the logging buckets are not deleted (to support security review). If you plan to re-deploy this Quick Start in the same region, you must first manually delete the previously created S3 buckets; otherwise, the re-deployment will fail.

Deployment Methods

You can deploy the Quick Start templates by using AWS CLI commands or from the AWS Management Console. You can also deploy the template package as an AWS Service Catalog product. AWS Service Catalog enables a self-service model for deploying applications and architecture on AWS. You can create portfolios that include one or more products, which are defined by AWS CloudFormation templates. You can grant IAM users, groups, or roles access to specific portfolios, which they can then launch from a separate interface. We’ve provided step-by-step instructions for the AWS Management Console deployment option in the following sections.

Pre-Deployment Steps

Before you deploy the templates included with this Quick Start, follow the instructions in this section to confirm that your account is set up correctly:

- Review the service limits and service usage of your AWS account and request increases if required, to ensure that there is available capacity to launch resources in your account.
- Ensure that your AWS account is set up with at least one SSH key pair (but preferably two separate key pairs) in the AWS Region where you plan to deploy, for use with the bastion login host and other Amazon EC2 hosts.
- Ensure that you have manually set up AWS Config in the AWS Config console, if you are deploying into an AWS Region where AWS Config is available.

Review AWS Service Limits

To review and (if necessary) increase service limits for the resources you need for the Quick Start deployment, you use the AWS Trusted Advisor console and the Amazon EC2 console. You’ll need the resources specified in the Technical Requirements table.

Use Trusted Advisor to view the existing service limits for Amazon VPC, IAM groups, and IAM roles within your account, and ensure that there is availability to deploy additional resources:

2. In the navigation pane, choose **Performance**.

3. On the **Performance** page, scroll through the list of performance checks until you find **Service Limits**, and expand that section.

4. Scroll through the service limit names and compare the **Limit Amount** column to the **Current Usage** column, to ensure that you can allocate the following without exceeding the default limit in the AWS Region you will deploy this Quick Start into:
   - Two (2) more VPCs
   - Six (6) more IAM groups
   - Five (5) more IAM roles

   If an increase is needed, you can choose the limit name to open the limit increase request form shown in Figure 4.

![Service Limit Increase Form](image)

**Figure 4: Requesting a service limit increase**

Now use the Amazon EC2 console to check your limits for Elastic IP addresses, load balancers, and Auto Scaling groups:
1. Open the Amazon EC2 console at https://console.aws.amazon.com/ec2/.

2. In the navigation pane, under **Network & Security**, choose **Elastic IPs**.

3. Count the number of allocated Elastic IPs (if any) displayed in the list, and ensure that you can allocate five (5) more without exceeding the default limit of 5 (or the limit increase you previously requested).

4. In the navigation pane, under **Load Balancing**, choose **Load Balancers**.

5. Count the number of existing load balancers (if any) displayed in the list and ensure that you can create two (2) more without exceeding the default limit of 20 (or the limit increase you previously requested).

6. In the navigation pane, under **Auto Scaling**, choose **Auto Scaling Groups**.

7. Count the number of existing Auto Scaling groups (if any) displayed in the list and ensure that you can create two (2) more without exceeding the default limit of 20 (or the limit increase you previously requested).

### Create Amazon EC2 Key Pairs

Make sure that at least one Amazon EC2 key pair exists within your AWS account in the region you are planning to deploy the Quick Start in.

1. Open the Amazon EC2 console at https://console.aws.amazon.com/ec2/.

2. Use the region selector in the navigation bar to choose the AWS Region where you plan to deploy.

3. In the navigation pane, under **Network & Security**, choose **Key Pairs**.

4. In the key pair list, verify that at least one available key pair (but preferably two available key pairs) exist and make note of the key pair name(s). You'll need to provide a key pair name for the parameters **pEC2KeyPairBastion** (for bastion host login access) and **pEC2KeyPair** (for all other Amazon EC2 host login access) when you launch the Quick Start. Although you can use the same key pair for both parameters, we recommend that you use a different key pair for each.

If you want to create a new key pair, choose **Create Key Pair**. For additional information, see the Amazon EC2 documentation.
Figure 5: Creating a key pair

**Note** If you’re deploying the Quick Start for testing or proof of concept, we recommend that you create a new key pair instead of specifying a key pair that’s already being used by a production instance.

**Set up AWS Config**

If AWS Config has not yet been initialised in the region where you are deploying this Quick Start, follow the steps below *in the region where you are planning to deploy the Quick Start.*

1. Open the AWS Config console at https://console.aws.amazon.com/config/.
2. Use the region selector in the navigation bar to choose the AWS Region where you plan to deploy.
3. In the AWS Config console, choose **Get Started** (or **Get Started Now**).

Figure 6: AWS Config console
4. On the **Set up AWS Config** screen, you may leave all default values in place, or make modifications as you see fit, and then choose **Continue**.

![Set up AWS Config](image)

**Figure 7: AWS Config setup screen**

5. On the next screen, you are prompted to select or create an IAM role for AWS Config. You may leave all default values in place, or make modifications as you see fit, and then choose **Allow**.
6. On the **Resource Inventory** screen, you should now see **Recording is on** in the upper-right corner. This indicates that AWS Config is now active in this AWS Region.

---

**Figure 8: Specifying an IAM role for AWS Config**

**Figure 9: AWS Config activation**
Deployment Steps

Follow the step-by-step instructions in this section to sign in to your AWS account, customise the Quick Start templates, and deploy the software into your account.

What We’ll Cover

The procedure for deploying the Quick Start architecture on AWS consists of the following steps, which we’ll cover in detail in the following sections.

Step 1. Sign in to your AWS account

- Sign in to your AWS account, and make sure that it’s configured correctly.

Step 2. Launch the stacks

- Launch the main AWS CloudFormation template into your AWS account.
- Enter values for required parameters.
- Review the other template parameters, and customise their values if necessary.

Step 3. Test your deployment

- Use the URL provided in the Outputs tab for the main stack to test the deployment.
- Use the IP address for the bastion host provided by the Outputs tab for the main stack, and use your private key if you would like to connect to that host through SSH.

Step 1. Sign in to Your AWS Account

1. Sign in to your AWS account at https://aws.amazon.com with an IAM user role that has the appropriate privileges (see IAM Permissions earlier in this document).

2. Make sure that your AWS account is configured correctly. See the Technical Requirements and Pre-Deployment Steps sections for information. Note that if you plan to use an AWS Region with the AWS Config capability, you must first set up the AWS Config service manually by following the instructions in the previous section.

3. Use the region selector in the navigation bar to choose the AWS Region where you want to deploy the Quick Start architecture on AWS.

Amazon EC2 locations are composed of Regions and Availability Zones. Regions are dispersed and located in separate geographic areas. This Quick Start uses the m3.large instance type for the WordPress and Nginx portion of the deployment.
Figure 10: Choosing an AWS Region

4. Select the key pair that you created earlier. In the navigation pane of the Amazon EC2 console, choose **Key Pairs**, and then choose the key pair from the list.

**Step 2. Launch the Stacks**

This automated AWS CloudFormation template deploys the Quick Start architecture in multiple Availability Zones in VPCs. Please review the [technical requirements](#) and [pre-deployment steps](#) before launching the stacks.

1. **Launch the AWS CloudFormation template** into your AWS account.

   The template will be deployed into the UK (London) Region. You can change the region by using the region selector in the navigation bar. Note that if you select a region where AWS Config is available, make sure to manually initialise the AWS Config service in that region.

   The stacks take approximately 30 minutes to create.
Note  You are responsible for the cost of the AWS services used while running this Quick Start reference deployment. There is no additional cost for using this Quick Start. For full details, see the pricing pages for each AWS service you will be using in this Quick Start or the AWS Simple Monthly Calculator. Prices are subject to change.

You can also download the template to use it as a starting point for your customisation.

2. On the Select Template page, keep the default settings for the template URL, and then choose Next.

3. On the Specify Details page, provide the seven required parameter values for the template. These are described in the following table.

<table>
<thead>
<tr>
<th>Parameter label (name)</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Database Password (pDBPassword)</td>
<td>Requires input</td>
<td>Password for the database administrator account. This must be a complex password that’s between 8 and 28 mixed, alphanumeric characters.</td>
</tr>
<tr>
<td>Notification Email Address (pNotifyEmail)</td>
<td><a href="mailto:distlist@example.org">distlist@example.org</a></td>
<td>Notification email address for security events (you will receive confirmation email).</td>
</tr>
<tr>
<td>Existing SSH Key for the Bastion Instance (pEC2KeyPairBastion)</td>
<td>Requires input</td>
<td>The SSH key pair in your account to use for bastion host login (see pre-deployment steps).</td>
</tr>
<tr>
<td>Existing SSH Key for Other Instances (pEC2KeyPair)</td>
<td>Requires input</td>
<td>The SSH key pair in your account to use for all other host logins (see pre-deployment steps).</td>
</tr>
<tr>
<td>Support Config (pSupportsConfig)</td>
<td>Requires input</td>
<td>Select Yes if you are deploying in an AWS Region where AWS Config is available and you want to use AWS Config (see pre-deployment steps).</td>
</tr>
<tr>
<td>First Availability Zone (pAvailabilityZoneA)</td>
<td>Requires input</td>
<td>Select your desired first Availability Zone. (Note: Some Availability Zones may be restricted. If the deployment fails, you may need to use a different Availability Zone.)</td>
</tr>
<tr>
<td>Second Availability Zone (pAvailabilityZoneB)</td>
<td>Requires input</td>
<td>Select your desired second Availability Zone. (Note: Some Availability Zones may be restricted. If the deployment fails, you may need to use a different Availability Zone.)</td>
</tr>
</tbody>
</table>
### AWS Quick Start Configuration:

<table>
<thead>
<tr>
<th>Parameter label (name)</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick Start S3 Bucket Name</td>
<td>aws-quickstart</td>
<td>S3 bucket where the Quick Start templates and scripts are installed. The bucket name can include numbers, lowercase letters, uppercase letters, and hyphens, but should not start or end with a hyphen. You can specify your own bucket if you copy all of the assets and submodules into it, if you want to override the Quick Start behaviour for your specific implementation.</td>
</tr>
<tr>
<td>Quick Start S3 Key Prefix</td>
<td>quickstart-compliance-uk-official/</td>
<td>S3 key prefix used to simulate a folder for your copy of Quick Start, if you decide to customise or extend the Quick Start for your own use. This prefix can include numbers, lowercase letters, uppercase letters, hyphens, and forward slashes, but should not start or end with a forward slash (which is automatically added). This parameter enables you to override the Quick Start behaviour for your specific implementation.</td>
</tr>
</tbody>
</table>

### Other Parameters:

<table>
<thead>
<tr>
<th>Parameter label (name)</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instance Tenancy</td>
<td>default</td>
<td>Determines whether to enforce the use of Amazon EC2 dedicated tenancy within the VPC.</td>
</tr>
</tbody>
</table>

**Note**  You can also download the main template and edit it to create your own parameters based on your specific deployment scenario.

4. On the **Options** page, you can specify tags (key-value pairs) for resources in your stack and set additional options. You can use the tags to organise and control access to resources in the stacks. When you’re done, choose **Next**.

5. On the **Review** page, review the settings and select the acknowledgement check box. This simply states that the template will create IAM resources.
6. Choose **Create** to deploy the stack.

7. Monitor the status of the stack being deployed. When the status field shown in Figure 12 displays **CREATE_COMPLETE for all the stacks deployed**, the cluster for this reference architecture is ready. Since you're deploying the full architecture, you'll see eight stacks listed (for the main template and seven nested templates).

![Figure 11: IAM resource acknowledgement](image1.png)

![Figure 12: Status message for deployment](image2.png)

### Step 3. Test Your Deployment

To test your deployment, choose the link for **LandingPageURL**, as shown in Figure 13. This URL is available from the **Outputs** tab for the main stack:
Figure 13: Opening the landing page

The link should launch a new page in your browser that looks similar to Figure 14.
This deployment builds a working demo of a Multi-AZ WordPress site. To connect to the WordPress site, choose the URL provided for the WordPress application on the landing page shown in Figure 14. This URL is also available from the WebsiteURL link on the Outputs tab for the main stack.

**Note**  WordPress is provided for testing and proof-of-concept purposes only; it is not intended for production use. You can replace it with another application of your choice.

This URL brings up the page shown in Figure 15. You can install and test the WordPress deployment from here.
Figure 15: Installing WordPress

**Note**  The WordPress application included in this Quick Start deployment is for demo purposes only. Application-level security, including patching, operating system updates, and addressing application vulnerabilities, is the customer's responsibility (see the AWS Shared Responsibility Model). **For this Quick Start, we recommend that you delete the AWS CloudFormation stacks after your proof-of-concept demo or testing is complete.**

Now that you’ve deployed and tested the UK-OFFICIAL architecture on AWS, please take a few minutes to complete our survey for this Quick Start. Your response is anonymous and will help us improve these reference deployments.
Deleting the Stacks

When you’ve finished using the baseline environment, you can delete the stacks. Deleting a stack, either via CLI and APIs or through the AWS CloudFormation console, will remove all the resources created by the template for that stack. **The only exceptions are the S3 buckets for logging and backup. By default, the deletion policy for those buckets is set to “Retain,” so you have to delete them manually.**

**Important** This Quick Start deployment uses nested AWS CloudFormation templates, so deleting the main stack will remove the nested stacks and all associated resources.

Troubleshooting

If you encounter a **CREATE_FAILED** error when you deploy the Quick Start, refer to the following table for known issues and solutions.

<table>
<thead>
<tr>
<th>Error message</th>
<th>Possible cause</th>
<th>What to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>The following resource(s) failed to create: [rConfigRuleForRequiredTags, rConfigRuleForUnrestrictedPorts, rConfigRuleForSSH, rConfigRulesLambdaRole]</td>
<td>The Support Config parameter was set to Yes, but AWS Config isn’t available in the region you selected, or AWS Config has not been initialised.</td>
<td>Set the Support Config parameter to No, or select another region. Also make sure that AWS Config is set up properly, as described in the pre-deployment steps.</td>
</tr>
<tr>
<td>Maximum VPCs limit reached</td>
<td>You’ve exceeded the number of VPCs allowed in your account.</td>
<td>Delete VPCs and/or request a limit increase. Try to create the stack again. For more information, see technical requirements.</td>
</tr>
<tr>
<td>Maximum EIPs limit reached</td>
<td>You’ve exceeded the limit of Elastic IP addresses in your account.</td>
<td>Disassociate Elastic IPs or request a Elastic IP limit increase, and try to create the stack again. For more information, see technical requirements.</td>
</tr>
<tr>
<td>Other limits exceeded</td>
<td>You’ve exceeded the use of resources in your AWS account.</td>
<td>See technical requirements, and request service limit increases as necessary.</td>
</tr>
</tbody>
</table>

If the problem you encounter isn’t covered in this table, we recommend that you re-launch the template with **Rollback on failure** set to No (this setting is under Advanced in the AWS CloudFormation console, Options page) and open a support case in the AWS Support Center for further troubleshooting. When rollback is disabled, the stack’s state will
be retained and the instance will be left running, so the support team can help troubleshoot the issue.

**Important** When you set **Rollback on failure** to **No**, you’ll continue to incur AWS charges for this stack. Please make sure to delete the stack when you’ve finished troubleshooting.

## Integrating with AWS Service Catalog

You can add the AWS CloudFormation templates for this Quick Start to AWS Service Catalog as portfolios or products to manage them from a central location. This helps support consistent governance, security, and compliance requirements. It also enables users to quickly deploy only the approved IT services they need.

For complete information about using AWS Service Catalog, see the [AWS documentation](https://aws.amazon.com/documentation/servicecatalog/). The following table provides links for specific tasks.

<table>
<thead>
<tr>
<th>To</th>
<th>See</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create a new portfolio</td>
<td><a href="#">Creating and Deleting Portfolios</a></td>
</tr>
<tr>
<td>Create a new product</td>
<td><a href="#">Adding and Removing Products</a></td>
</tr>
<tr>
<td>Give users access</td>
<td><a href="#">Granting Access to Users</a></td>
</tr>
<tr>
<td>Assign IAM roles for deploying stacks</td>
<td><a href="#">Applying Launch Constraints</a></td>
</tr>
<tr>
<td>Assign tags to portfolios to track resource ownership, access, and cost allocations</td>
<td><a href="#">Tagging Portfolios</a></td>
</tr>
<tr>
<td>Perform other administrative tasks</td>
<td><a href="#">AWS Service Catalog Administrator Guide</a></td>
</tr>
<tr>
<td>Launch products from AWS Service Catalog</td>
<td><a href="#">AWS Service Catalog User Guide</a></td>
</tr>
</tbody>
</table>
Additional Resources

AWS best practices

- AWS Security Best Practices

- AWS Risk and Compliance
  https://d0.awsstatic.com/whitepapers/compliance/AWS_Risk_and_Compliance_Whitepaper.pdf

- Using AWS in the context of NCSC UK’s Cloud Security Principles

- Using AWS in the context of Healthcare IG SoC process

AWS services

- AWS CloudFormation
  https://aws.amazon.com/documentation/cloudformation/

- Amazon EC2 User Guide for Linux:

- Amazon VPC
  https://aws.amazon.com/documentation/vpc/

- AWS CloudTrail
  https://aws.amazon.com/documentation/cloudtrail/

- AWS Config
  https://aws.amazon.com/documentation/config/

- Amazon CloudWatch
  https://aws.amazon.com/documentation/cloudwatch/

- AWS Identity and Access Management
  https://aws.amazon.com/documentation/iam/

- Amazon RDS
  https://aws.amazon.com/documentation/rds/
• AWS CLI
  https://aws.amazon.com/documentation/cli/

• AWS Service Catalog
  https://aws.amazon.com/documentation/servicecatalog/

NCSC

• Implementing the Cloud Security Principles
  https://www.ncsc.gov.uk/guidance/implementing-cloud-security-principles

• Government Security Classifications

CIS

• Critical Security Controls
  https://www.cisecurity.org/critical-controls.cfm

• Security Benchmarks
  https://d0.awsstatic.com/whitepapers/compliance/AWS_CIS_Foundations_Benchmark.pdf

Quick Start Reference Deployments

• AWS Quick Start home page
  https://aws.amazon.com/quickstart/

Send Us Feedback

You can visit our GitHub repository to download the templates and scripts for this Quick Start, and to share your customisations with others.

If you haven’t filled out our survey yet, please take a few minutes to do so. Your response is anonymous and will help us improve the quality of this Quick Start and other AWS reference deployments.

For Further Assistance

If you need assistance with an enterprise implementation of the capabilities introduced through this Quick Start, AWS Professional Services can guide and assist with the related training, customisation, and implementation of deployment and maintenance
processes. Please contact your AWS Account Manager for further information, or send an inquiry to compliance-accelerator@amazon.com.

Document Revisions

<table>
<thead>
<tr>
<th>Date</th>
<th>Change</th>
<th>In sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 2017</td>
<td>Initial release</td>
<td>—</td>
</tr>
</tbody>
</table>

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