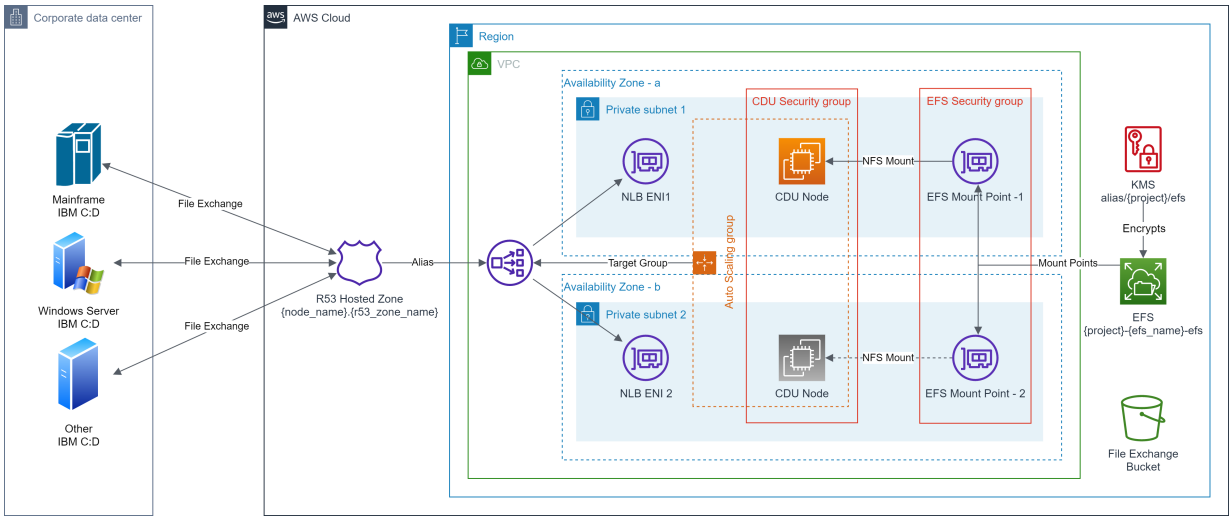
Provision IBM® Sterling Connect:Direct® for UNIX on Amazon EC2 with high-availability and resiliency enabled via Amazon EFS

This is a Terraform module that provisions IBM® Sterling Connect:Direct® (C:D) for UNIX on Amazon EC2 with high-availability and resiliency using Amazon EFS

Introduction

IBM® Sterling Connect:Direct® provides secured and high-volume point-to-point file transfers within and among enterprises. In an enterprise scenario, the IBM C:D is installed on a multiple platforms including mainframe, UNIX, or Microsoft Windows server and is used to exchange files with other IBM C:D sites.

To support the AWS Cloud strategy for an enterprise, a solution is presented where a highly-available and resilient IBM C:D Unix instance on Amazon EC2 is deployed to exchange files with Amazon S3 and other on-premises IBM C:D sites including z/OS® and OS/400®.



- High-availability is implemented via Amazon EC2 Auto Scaling Group to maintain minimum 1 IBM C:D Unix instance in the configured Availability Zone(s).
- IBM C:D Unix instance is fronted by Network Load-Balancer (NLB) to route the traffic to the available instance.
- On-premises IBM C:D sites communicate via the domain name defined at the Amazon Route 53 that is resolved to the NLB.
- Resiliency of the server state is implemented via highly-available and encrypted Amazon EFS instance with mount points in each Availability Zone.

- Security Groups are used for access control to the IBM C:D server and Amazon EFS mount points.

Features

The terraform module has following features:

- Provision a IBM C:D Unix node with high-availability and resiliency using Amazon EFS in the existing VPC and subnets identified via tags.
  - Amazon EC2 Auto Scaling Group is created (`min=1,max=1,desired=1`) to maintain minimum 1 IBM C:D Unix instance.
  - Optionally, provision the IBM C:D Unix node using Amazon EBS without resiliency of state.
- Use a shared Amazon EFS instance (identified by `efs_id`), or provision a new regional Amazon EFS instance with lifecycle management, EFS mount target(s), and Security Group in the existing VPC and subnets identified via tags.
  - Optionally encrypt the created Amazon EFS file system using an existing AWS KMS key or provision a new AWS KMS key for Amazon EFS encryption.
  - Adds necessary rules to the Amazon EFS Security Group, so that IBM C:D Unix instance can access it.
- Use an existing instance profile or provision a new instance profile with necessary access to Amazon S3 and Amazon CloudWatch.
- Install and configure the Amazon CloudWatch agent to forward the server logs to the Amazon CloudWatch logs.
- Optionally encrypt the attached Amazon EBS, Amazon CloudWatch Logs, and AWS System Manager Parameter Store using an existing AWS KMS key or provision a new AWS KMS key for the respective service.
- Optionally create a Network Load Balancer to front the network traffic and to provide consistent IP address to the client(s).
- Optionally creates a DNS record for the Network Load Balancer via providing the Route 53 private hosted zone name.
- Support well-known tag based backup using AWS Backup.
- Customize the IBM C:D Unix node by providing your own
  - node name (`node_name`)
  - server `keycert` file.
  - `netmap.cfg` file (optional).
  - `userfile.cfg` file (optional).
  - installation folder structure (optional).
  - POSIX UID/GID for the `cdadmin` user (optional)
  - extra test or process files to be copied to the server.
  - Source CIDRs to allow access to the server.
  - Amazon Machine Image (AMI) (optional)

    - Amazon EC2 Instance Type (optional)
- Uniformly name and tag the provisioned resources.
- Additional module (tls\pca) is provided for generating IBM C:D Unix compatible server `keycert` file for development and testing purpose.

Prerequisites

- The target AWS Account and AWS Region are identified.
- The AWS User/Role executing the Terraform scripts must have permissions to provision the target resources in the owner account.
- The Terraform CLI (`version = ">= 1.3.9"`) is installed.
- The AWS CLI v2 is installed.
- The Python 3.9+ is installed.
- AWS SDK for Python boto3 1.24+ is installed.
- The openssl 1.1.1+ is installed, if you are generating your own server certificate.
- Terraform backend provider and state locking providers are identified and bootstrapped.
    - A bootstrap module/example is provided that provisions an Amazon S3 bucket for Terraform state storage and Amazon DynamoDB table for Terraform state locking.
        - **The Amazon S3 bucket name must be globally unique.**
- The target VPC along with the target Subnets exist and are identified via tags.
    - A vpc example is provided that provisions VPC, Subnets and related resources with example tagging.
- Optionally, Route 53 Hosted zone exists and identified by name.
    - The vpc example also creates a private hosted zone.
- A unique project code name e.g., `cdu-x` is identified that will be used to uniformly name the key aliases.
- Uniform resource tagging scheme is identified.
    - *The examples use only two tags: `Env` and `Project`*
- An Amazon S3 bucket (`s3_bucket`), used for the IBM C:D Unix installer binary and configuration files exists and identified by name.
    - *The examples are using the same Amazon S3 bucket that is used for Terraform state.*
- IBM C:D Unix installation binary from the IBM distribution (e.g. IBM_CD_V6.2_UNIX_RedHat.Z.tar.Z) is obtained and uploaded to the `s3_bucket`.
    - Upload the installation binary to the `s3_bucket` at the prefix `/cdu`.
- IBM C:D Unix server `keycert` file is generated and uploaded to the `s3_bucket`.
    - Obtain the TLS server certificate from your enterprise certificate authority (CA) or create a private certificate authority (PCA) and server certificate.
        - *The server `keycert` file is created by concatenating the encrypted private key and the server certificate issued by the CA into a single keycert file.*

    - *A tls example is provided that creates a PCA and server `keycert` files that are automatically uploaded to the `s3_bucket`. This can be used for testing purpose only.*
    - If you are generating the server `keycert` file from key/certificate obtained from the enterprise CA.
        - Upload it to the `s3_bucket` along with the CA Certificate and the Issuer Certificate at the prefix `/cdu/node-name`.
- The server private key encryption password is stored in the AWS System Manager Parameter Store.
    - The server `keycert` file has encrypted private key which is protected by a password. This password must be stored in the AWS System Manager Parameter Store with a fixed key "`secret_key_prefix`/cert_password"
- The server Java KeyStore password is stored in the AWS System Manager Parameter Store.
    - The IBM C:D Unix installation process creates a Java KeyStore, which is protected by a password. This password must be stored in the AWS System Manager Parameter Store with a fixed key "`secret_key_prefix`/keystore_password"

Usage

- Use the module via GitHub source or copy the module into your repository.
- Incorporate the module in your infrastructure/storage CI/CD pipeline as appropriate.
- This solution uses external module aws-tf-kms to provision AWS KMS Key(s), if encryption is enabled and `cdu_encryption.*_kms_alias` is not provided.
- This solution uses external module aws-tf-efs to provision Amazon EFS, if `cdu_efs_specs.efs_id` is not provided.
- The following code block is a simple example of using this module with default values.

```
module "cdu" {
  source = "./modules/aws/cdu"
  #or
  #source = "github.com/aws-samples/aws-tf-cdu//modules/aws/cdu"

  region = "us-east-1"

  project  = "cdu-x"
  env_name = "dev"

  tags = {
    Env     = "DEV"
    Project = "cdu-x"
  }

  vpc_tags = {
```

```
    "ibm/sterling/cdu" = "1"
    "Env"              = "DEV"
  }

  subnet_tags = {
    "ibm/sterling/cdu" = "1"
    "Env"              = "DEV"
  }

  r53_zone_name = "cdu.samples.aws"

  kms_admin_roles = ["Admin"]

  cdu_params = {
    node_name      = "USLDCDUEX1"
    s3_bucket      = "cdu-x-bucket"
    server_keycert = "usldcduex1.cdu-keycert.txt"
  }
}
```

Scenarios

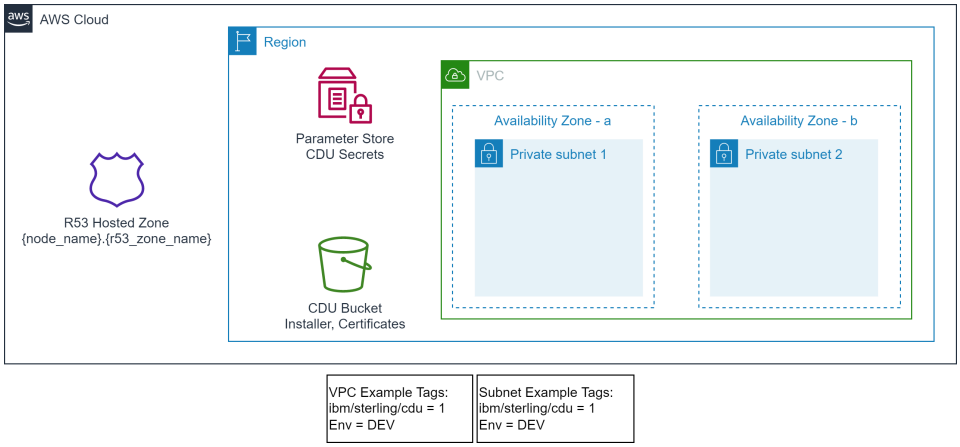
This solution primarily supports the following scenarios though many other scenarios are possible.

Scenario 1: Provision IBM® Sterling Connect:Direct® Unix solution - Owned Amazon EFS

In this scenario the lifecycle of IBM C:D Unix node and related resources such as Amazon EFS and mount target(s) are owned by the IBM C:D Unix team. This is applicable when an independent IBM C:D Unix instance is needed and storage is not shared with any other components.

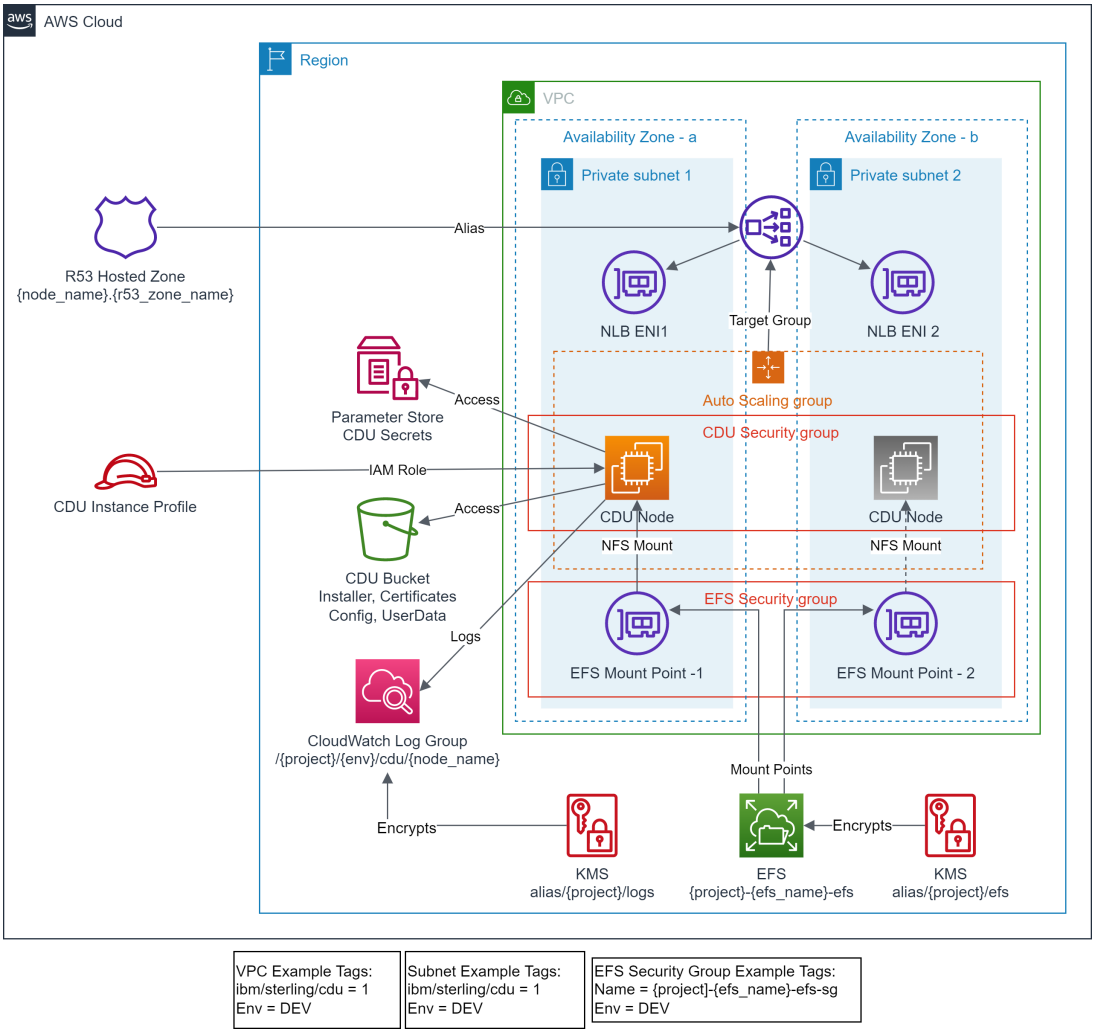
Prerequisites

- The target VPC along with the target Subnets exist and identified via tags.
- Optionally, Route 53 Hosted zone exists and identified by name.



- EFS file system does not exist.
- EFS access point does not exist.
- EFS mount targets do not exist in the target VPC Subnets.
- EFS Security Group does not exist.
- An Amazon S3 bucket (`s3_bucket`), used for the IBM C:D Unix installer binary and configuration files exists and identified by name.
- IBM C:D Unix installation binary from the IBM distribution (e.g. IBM_CD_V6.2_UNIX_RedHat.Z.tar.Z) is obtained and uploaded to the `s3_bucket`.
- IBM C:D Unix server `keycert` file is obtained and uploaded to the `s3_bucket`.
- The server private key encryption password is stored in the AWS System Manager Parameter Store.
- The server Java KeyStore password is stored in the AWS System Manager Parameter Store.

Outcome



VPC Example Tags:	Subnet Example Tags:	EFS Security Group Example Tags:
ibm/sterling/cdu = 1 Env = DEV	ibm/sterling/cdu = 1 Env = DEV	Name = {project}-{efs_name}-efs-sg Env = DEV

- Amazon EFS file system is created.
- EFS Security Group is created with default rules.
- EFS mount targets are created in the target VPC Subnets.
- Standardized EFS resource policy is created.
- No EFS access points are created.
- Encrypted Amazon CloudWatch log group is created for CDU node logs.
- IAM role and instance profile for CDU instance is created.
- Security Group for network access control to CDU instance is created.
- CDU instance is provisioned with state managed on EFS.
- Test files and scripts are copied to the CDU instance.
- Auto Scaling Group is created to manage minimum availability of CDU instance.
- NLB instances is provisioned fronting the CDU instance.
- Amazon Route 53 alias record is created pointing to NLB.

Refer examples/cdu/scenario1 to build this scenario

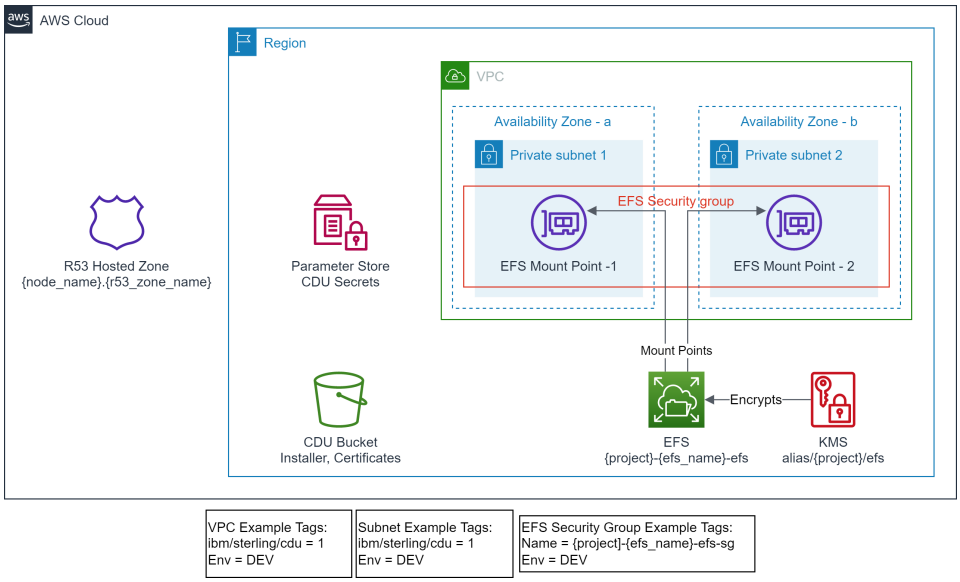
Scenario 2: Provision IBM® Sterling Connect:Direct® Unix solution - Shared Amazon EFS

In this scenario the lifecycle of a shared Amazon EFS and mount target(s) is owned by a centralized team, while the lifecycle of IBM C:D Unix node and related resources is owned by the IBM C:D Unix team. This is applicable when an IBM C:D Unix instance may share the storage with other components. For example:

- AWS Transfer family SFTP server is created that may use this shared EFS as storage backend.
- Amazon EC2 instances may mount this EFS file system to exchange files with SFTP server or IBM C:D Unix node.

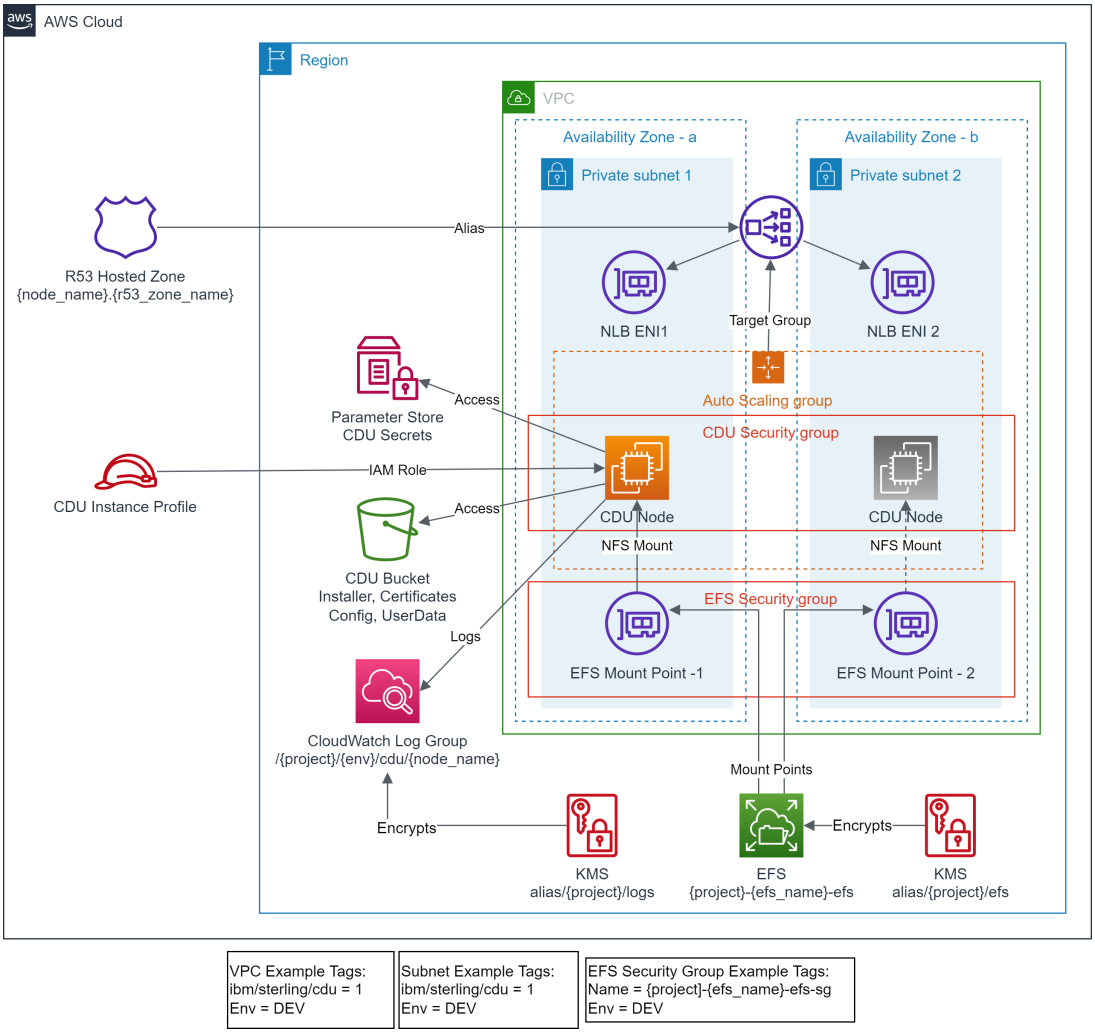
Prerequisites

- The target VPC along with the target Subnets exist and identified via tags.
- Optionally, Route 53 Hosted zone exists and identified by name.



- Amazon EFS file system exist.
- EFS mount targets exist in the target VPC Subnets.
- EFS Security Group exist and identified via tags.
- An Amazon S3 bucket (`s3_bucket`), used for the IBM C:D Unix installer binary and configuration files exists and identified by name.
- IBM C:D Unix installation binary from the IBM distribution (e.g. IBM_CD_V6.2_UNIX_RedHat.Z.tar.Z) is obtained and uploaded to the `s3_bucket`.
- IBM C:D Unix server `keycert` file is obtained and uploaded to the `s3_bucket`.
- The server private key encryption password is stored in the AWS System Manager Parameter Store.
- The server Java KeyStore password is stored in the AWS System Manager Parameter Store.

Outcome



VPC Example Tags:	Subnet Example Tags:	EFS Security Group Example Tags:
ibm/sterling/cdu = 1 Env = DEV	ibm/sterling/cdu = 1 Env = DEV	Name = {project}-{efs_name}-efs-sg Env = DEV

- Encrypted Amazon CloudWatch log group is created for CDU node logs.
- IAM role and instance profile for CDU instance is created.
- Security Group for network access control to CDU instance is created.
- CDU instance is provisioned with state managed on EFS.
- Test files and scripts are copied to the CDU instance.
- Auto scaling group is created to manage minimum availability of CDU instance.
- NLB instances is provisioned fronting the CDU instance.
- Route 53 alias record is created pointing to NLB.

Refer examples/cdu/scenario2 to build this scenario

Future Enhancements

- Support for IBM Sterling Connect:Direct Web Services can be added.

Security

See CONTRIBUTING for more information.

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