Pyramid Analytics for the AWS Marketplace

Administration Guide

Version 2020.17

Contents

Pyramid Analytics for AWS Marketplace

Pyramid 2020 is a complete, advanced analytics platform built to scale. Pyramid drives self-service reporting, dashboards, analysis, data discovery, machine learning/data science, and business user-oriented data preparation and data virtualization. Pyramid is ideal for enterprises that want to promote collaborative analytics and data sharing in the cloud. REST and visual APIs supporting embedding, and multi-tenancy, allow Pyramid to meet the analytic needs of software/SaaS providers.

Pyramid connects with AWS and cloud data sources, including Redshift, EMR, S3, Athena, Aurora, RDS, SAP HANA, SAP BW4/HANA, Snowflake, Exasol, and more. It is used via a browser without additional desktop tools.

Getting Started, Getting Successful

This document provides the path to getting started with Pyramid Analytics for AWS Marketplace.

A overview of the offering is here on the Pyramid Analytics web site: Pyramid Analytics on AWS | BI in the Cloud

Your path to success with Pyramid Analytics for AWS Marketplace is:

1. Access the Pyramid 2020 Marketplace listing via the Pyramid Marketplace Seller page: AWS Marketplace: Pyramid Analytics BV (amazon.com)
2. Subscribe to Pyramid Analytics for AWS Marketplace
   a. This starts a 14 day free trial
   b. Pyramid's default Marketplace EULA is the Amazon SCMP
3. Register for support: see Support below
4. Launch a Pyramid Central Instance via the provided CloudFormation template on the Marketplace
5. Connect to your data and explore analytics with Pyramid
   a. Access Pyramid
   b. Pyramid v2020 - Analytics for Everyone - Video - Youtube
   c. Getting Started with Pyramid - Video - Pyramid Analytics Community Forum
   d. Workflow Overview (pyramidanalytics.com)
      i. Model – Connect to data, ETL and data science
         1. Model Tutorial Videos (pyramidanalytics.com)
         2. Model documentation (pyramidanalytics.com)
      ii. Discover – visually interact with data
         1. Discover Tutorial Videos (pyramidanalytics.com)
      iii. Present – Dashboards
         1. Present Tutorial Videos (pyramidanalytics.com)
   e. Pyramid Analytics | Resources
   f. Online Help for Pyramid Analytics
6. Understand how you want to use Pyramid
   a. Hourly or annual subscription: single instance, Standard Edition, 30 users
   b. Private Offer from Pyramid: for more users, advanced functionality, multi-server scalability, custom terms and conditions and pricing. See Pyramid Marketplace Private Offers below.
7. Pay through the AWS Marketplace

Pyramid Marketplace Private Offers

The initial Pyramid deployment for trials and Hourly/Annual use is limited by license to:

- Single Pyramid EC2 instance per deployment

- Pyramid Standard Edition functionality

- 5 "Professional" and 25 "Viewer" named users

- "Enterprise" (internal organization) use only. You cannot offer Pyramid based services outside your organization ie. to external customers.

- Pyramid Silver level (online only) Support

A Private Offer with Pyramid through the AWS Marketplace expands functional, support, deployment size, license and pricing options. See Pyramid Analytics Offerings on AWS for the differences and benefits of a Private Offer.

The Private Offer process is:

- Contact Pyramid for a Private Offer, though either your Pyramid sales representative or Contact Us (pyramidanalytics.com)
- Pyramid will create a Private Offer for a specific AWS account.
- Pyramid will send a link via email to an AWS administrator for the account to review and accept.
- Upon acceptance of the Private Offer:
  - The account will be charged through the Marketplace.
  - Pyramid will also send a custom license key that reflects the agreed Pyramid configuration and subscription time. Deploy the license key to your deployment via the Adding a license process.

There are three types of private offers.

1. If you want to extend your trial, a $0 Private Offer for a set time period can be given to you. You will not be charged for Pyramid software instance time under a $0 Private offer.

2. If the AWS account is on invoicing terms with AWS, a flexible payment schedule of dates and amounts can be offered. Also, payments for Pyramid can be under the account's EDP budget and process, if that is available.

3. If the AWS account is not on invoicing terms with AWS, the Private Offer will set an annual price for instances equal to the arranged deal cost and $0 for hourly. After acceptance of the offer, the AWS account administrator must buy an annual contract for a single instance to pay for Pyramid through the Marketplace. The payment is invoiced on the day of purchase.
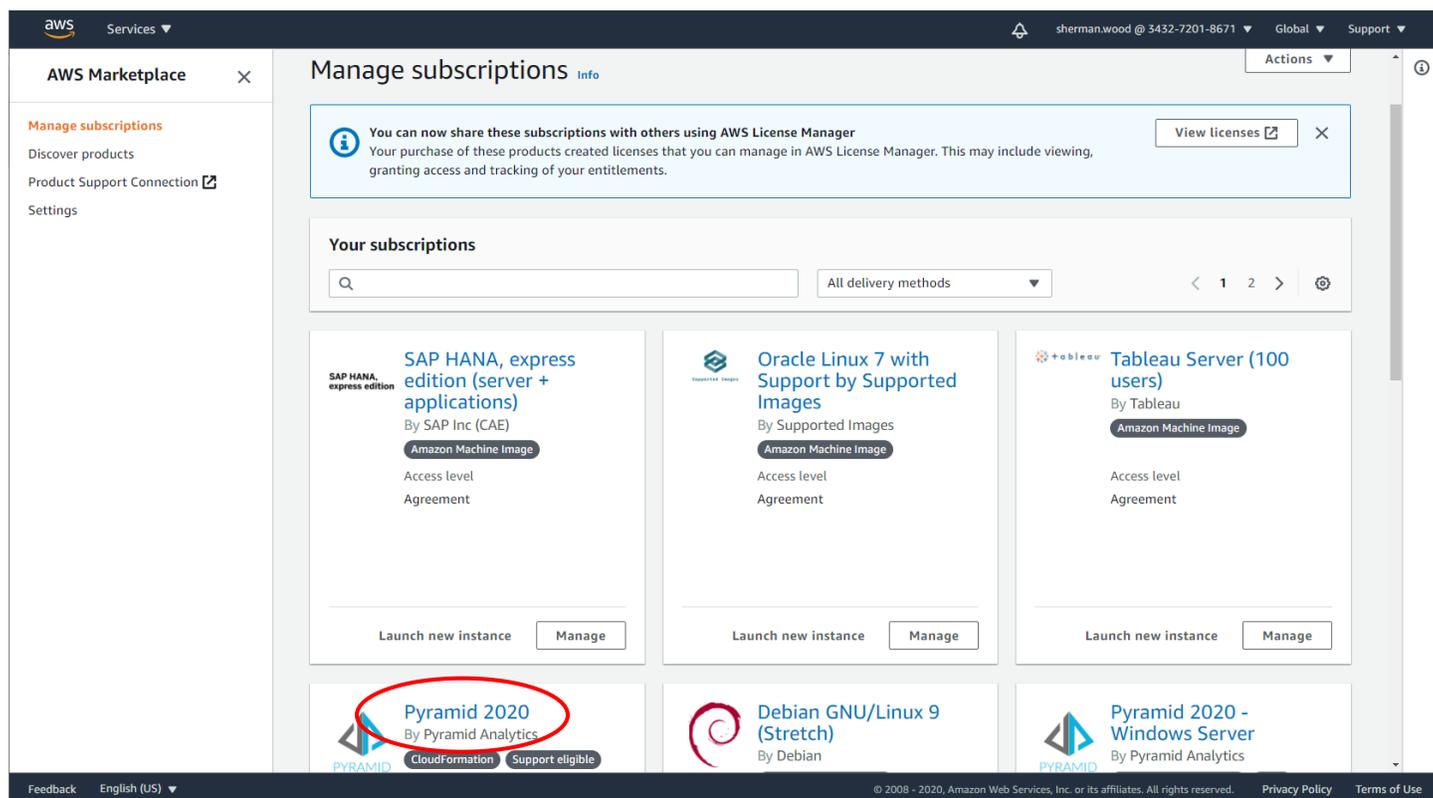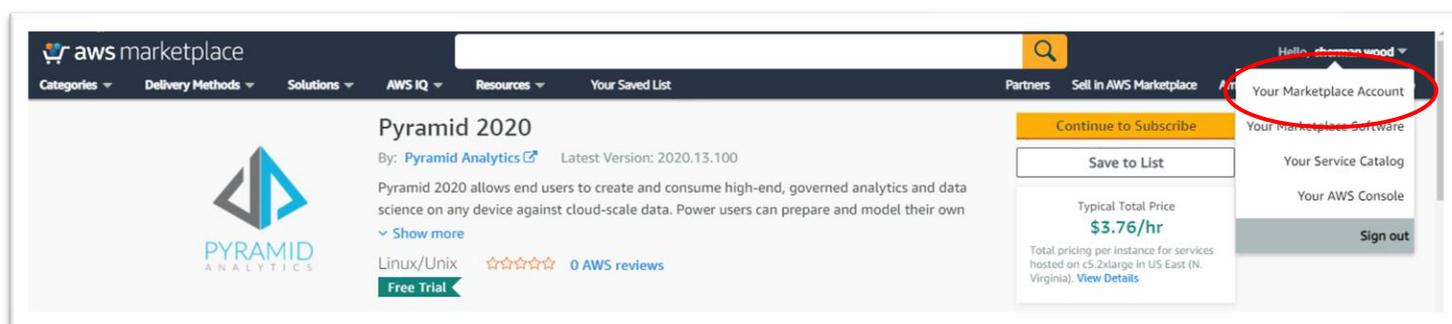
Support

All Pyramid for AWS Marketplace customers are entitled to online support from Pyramid. Register on the Getting Started page Get Started with Pyramid Analytics on AWS, which also includes this document.

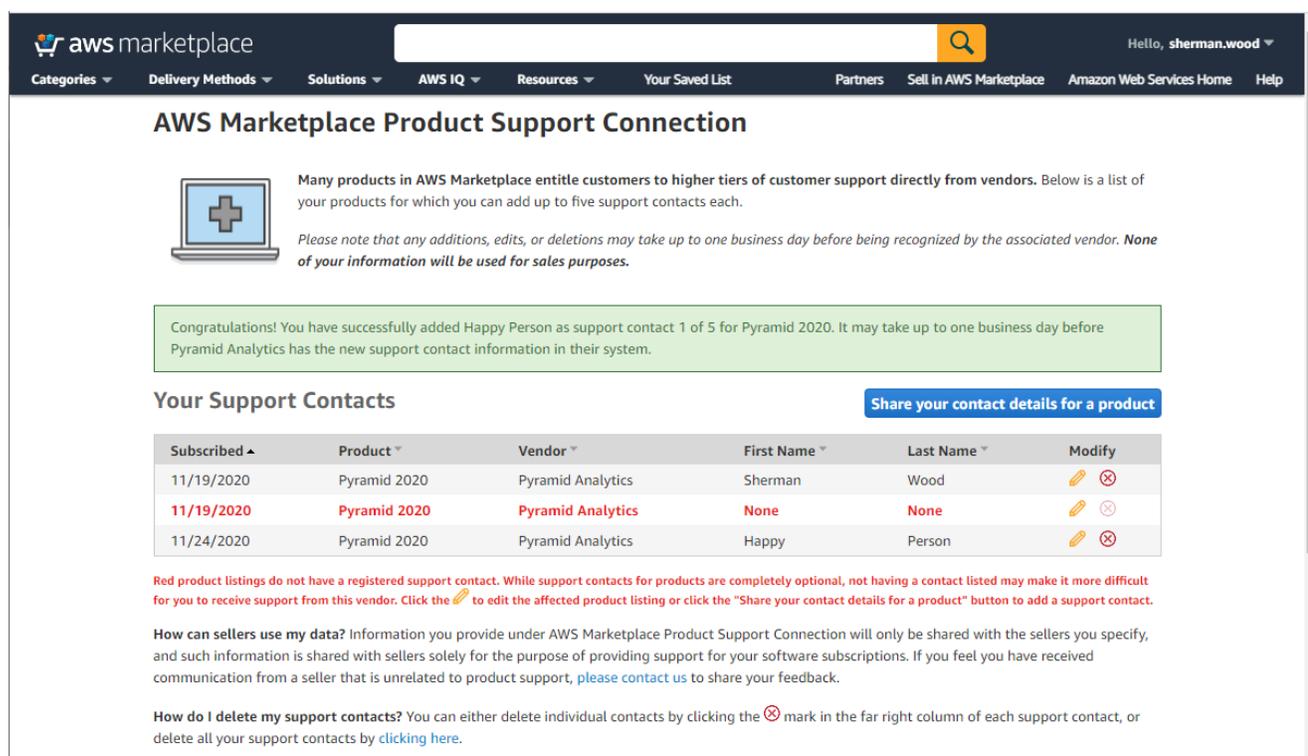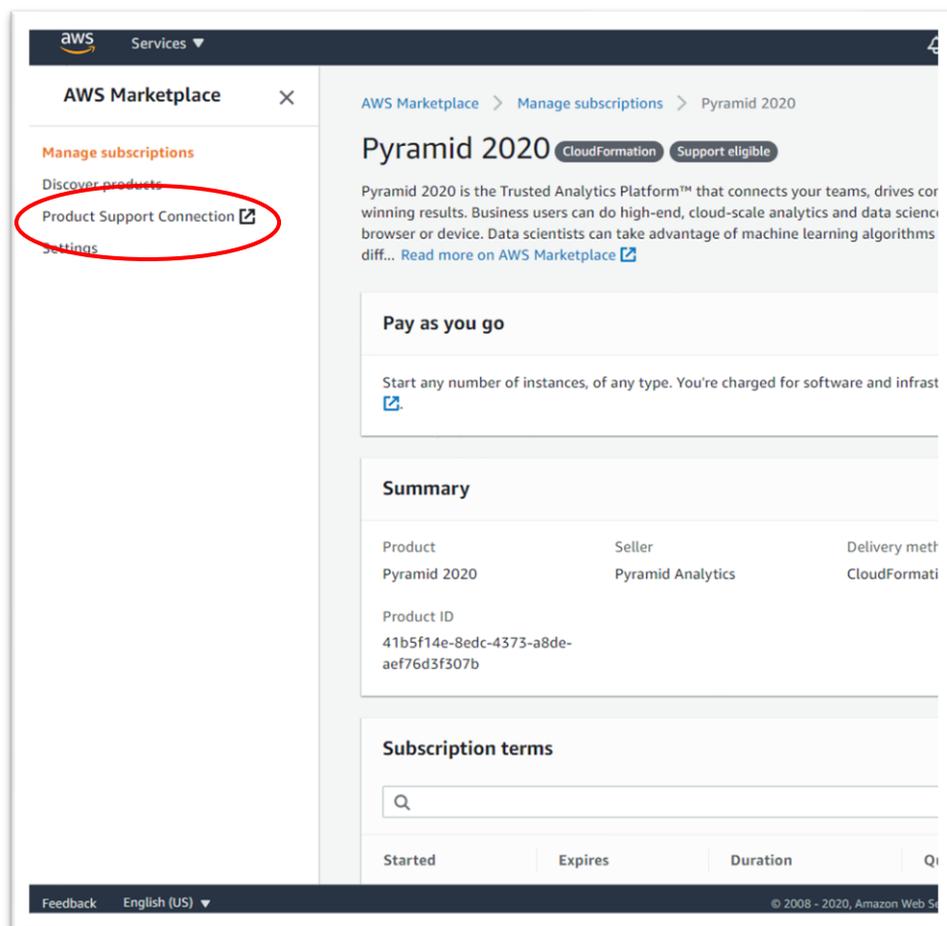Support portal: Pyramid Analytics Help Center

Product Support Connection

You can get also support for Pyramid Analytics on the Marketplace by registering support contacts via the Product Support Connection on your Pyramid Analytics Marketplace subscription.
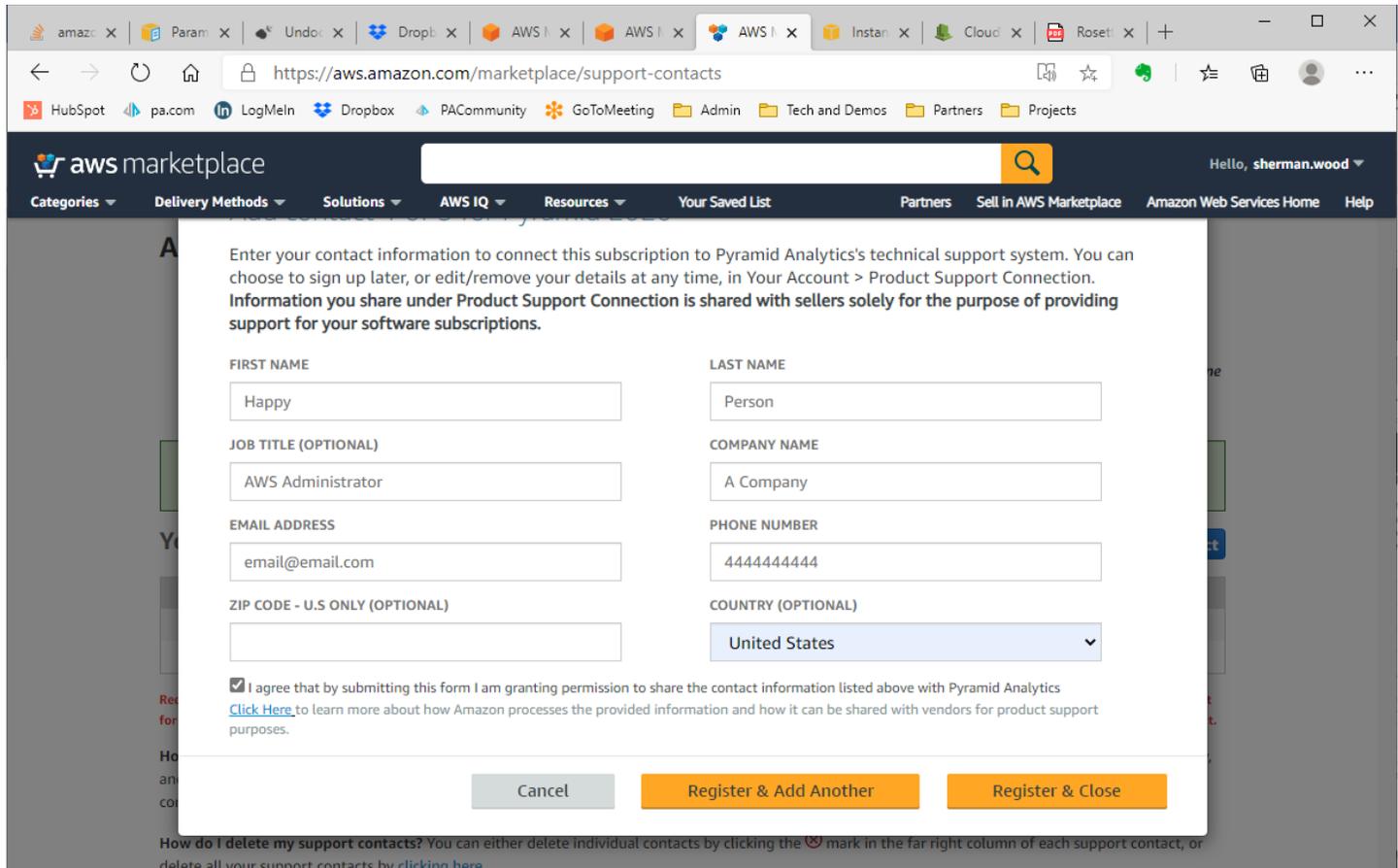
Get to your Pyramid Marketplace subscription.

Go to the Product Support Connection

Create a Support Contact

Architecture

The initial "Central" instance CloudFormation template creates:

Resource Type	Details
Amazon EC2	• Amazon Linux 2 instance • Single instance running all Pyramid Analytics engine processes • Accessible via HTTP and SSH (not required) • Instance types for Pyramid Analytics must provide at least 8 vCPUs. c5.4xlarge with 16 vCPUs is the recommended instance type.
Amazon RDS	• New Aurora PostgreSQL service, preferably serverless • Holds Pyramid Analytics repository
Amazon EFS	• Persistence for instances running the Pyramid Analytics in-memory engine (IMDB) • A shared file system for an Enterprise deployment, containing print files and uploaded data
Amazon CloudWatch Logs	• Logs start up and operations of all Pyramid Analytics instances
Amazon SSM, KMS and Secrets	• SSM Parameters for cross instance configuration • Encryption keys for RDS and EFS • Secrets for password
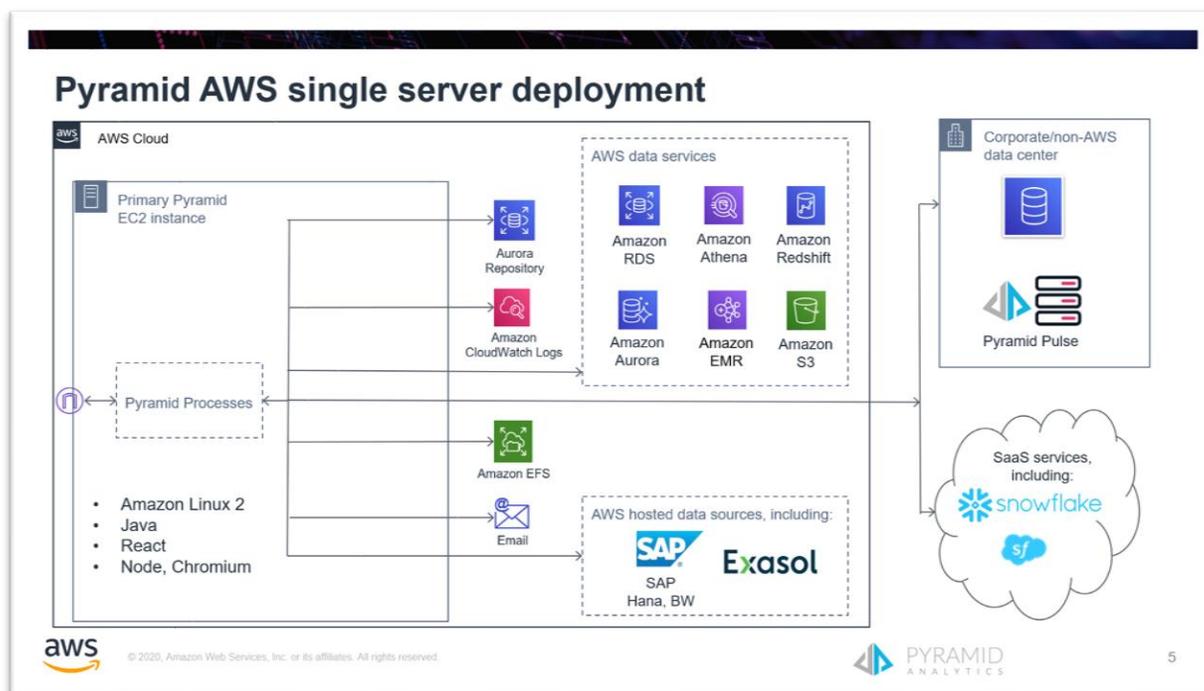
The EC2 instance contains the engines that make up Pyramid:

Engine Type	Description
Router	Inter-process communication
Web Server	Application server. React user interface, Authentication, REST APIs. Only engine type accessible by HTTP.
Runtime Engine	Interactive data access
Task Engine	Scheduled processes, including reporting and Business ETL. Uses EFS to store uploaded data and print file output.
AI Server	Python and R engines.
In-memory database	Data caching for the engines. Optional destination of Business ETL data. Backed by Amazon EFS.
File system	File storage accessible across the engines for uploaded files and generated reports.

The Pyramid Marketplace listing provides a CloudFormation template to scale an existing Pyramid deployment by selectively adding Pyramid engine instances. The multi-instance deployments are only possible with a Pyramid Enterprise license obtained through a Private offer. See "Adding Instances to a Central Instance Deployment" section below.
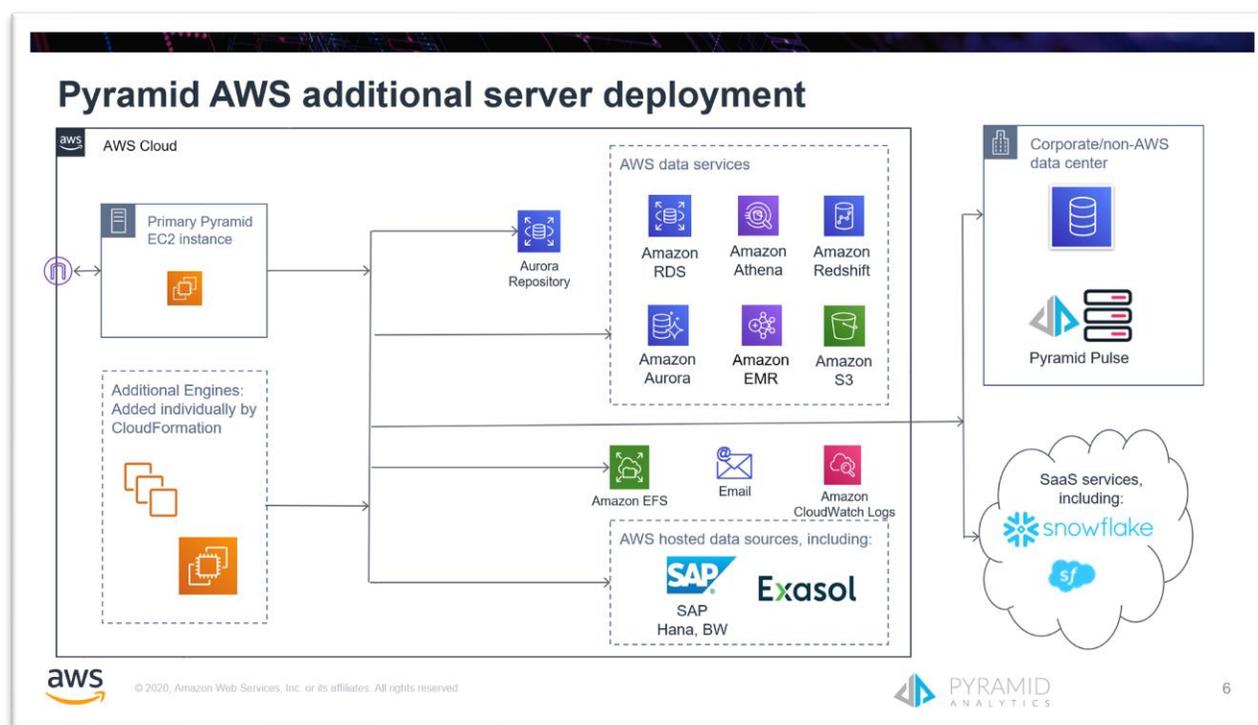
There are additional CloudFormation templates available to add to the deployment and more: CloudFormation templates for your own use

Sizing, Performance and Cost

An estimate of AWS charges for running the Pyramid Central Instance is here:

Minimum Pyramid deployment – c5.2xlarge

> https://calculator.s3.amazonaws.com/index.html#r=IAD&key=files/calc-afc4b2481660fe0ccad8805a42adca5518b6ea1a&v=ver20210120wL
>
> New calculator
>
> https://calculator.aws/#/estimate?id=66b7c13d28fe1b2a5eb90fbe2e7b84f78732da6c

c5.4xlarge

> https://calculator.s3.amazonaws.com/index.html#r=IAD&key=files/calc-7bf00f710e92a22ef1c0100d35e8eb766b3a1988&v=ver20200929tP

The c5.2xlarge EC2 instance – 8 vCPU, 16 GB RAM – will adequately support the default Hourly/Annual subscription of the maximum of 30 users receiving Pyramid Standard Edition functionality.

Moving to Pyramid Enterprise Edition via a Private Offer allows more users and servers to be added to a deployment and additional optional features such as production report distribution (bursting).

The Pyramid Scaling Guide outlines your scaling options:
https://help.pyramidanalytics.com/Content/Root/Guides/Scaling/Pyramid%202020%20Scaling%20Guide.pdf

This additional load will require additional capacity to be added into the deployment, in the form of additional EC2 instances running different combinations of Pyramid engines. These instances can be added against the original single instance for load balancing and scalability via the Adding instances process.

There will be auto-scaling options for Pyramid defined through publicly available CloudFormation templates: See CloudFormation templates for your own use.

A Pyramid deployment has monitoring built-in to identify bottlenecks and therefore where capacity of the variety of engine types needs to be added.
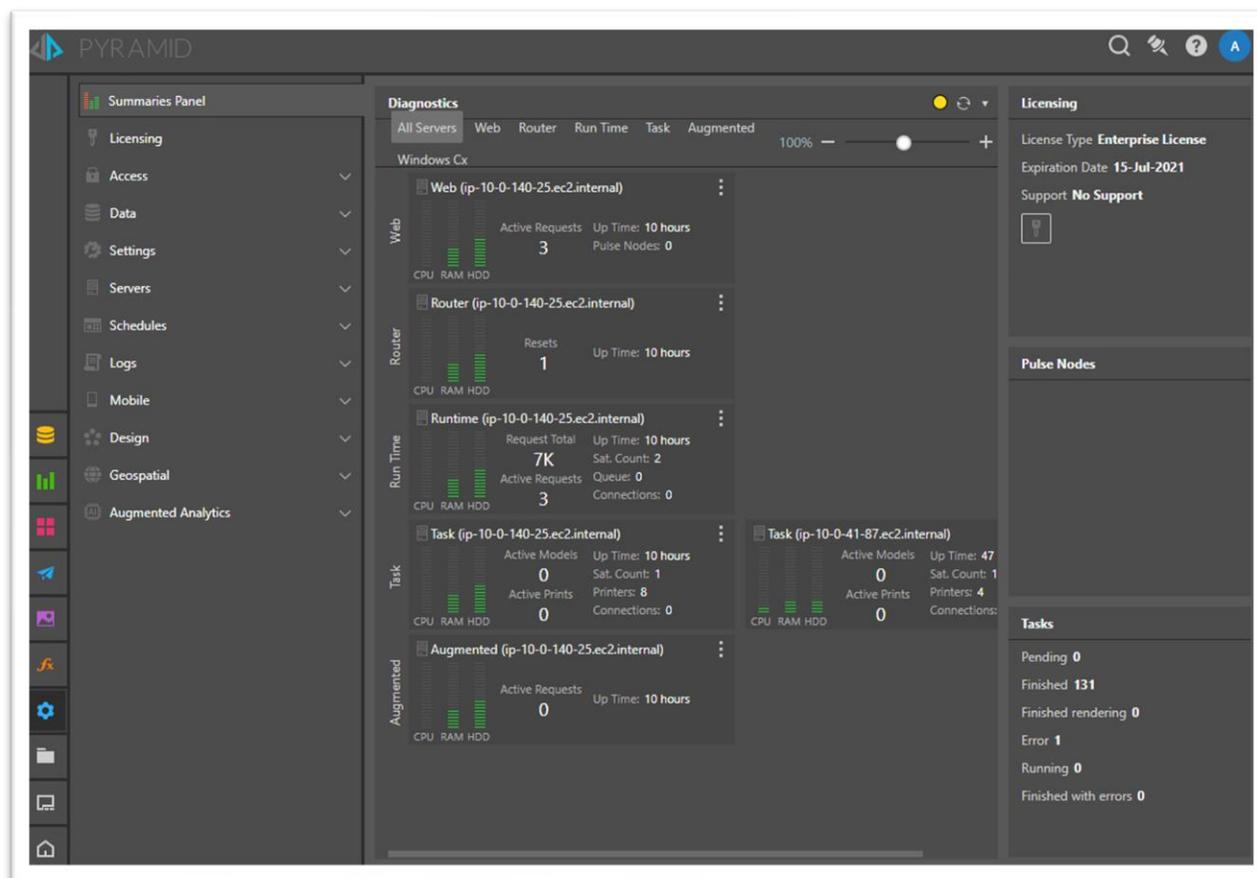
Prerequisites for Deployment

Specialized Knowledge

Before you deploy Pyramid, we recommend that you become familiar with the following AWS services. If you are new to AWS, see the Getting Started Resource Center.

- Amazon Elastic Compute Cloud (Amazon EC2)
- Amazon Virtual Private Cloud (Amazon VPC)
- Amazon Elastic File System (Amazon EFS)
- Amazon Relational Database Service (Amazon RDS)
- Amazon Secrets Manager
- Amazon System Manager (Amazon SSM): Parameters

Technical Requirements

Prerequisite	Description
AWS Account	If you don't already have an AWS account, create one at http://aws.amazon.com by following the on-screen instructions.
AWS Marketplace Subscription to Pyramid	Subscribe to Pyramid on the AWS Marketplace. This will start a 14 day free trial for a single instance.
Region	Decision on what AWS Region you will deploy Pyramid into.
Key Pair	Create a key pair in your deployment region. To do this, in the navigation pane of the Amazon **EC2** console, under **Network & Security**, choose **Key Pairs**, and then click **Create Key Pair**. Save the private key file given to you through the browser for later SSH access into the launched Pyramid instance.
VPC	Have a VPC in your deployment region. You can use the default VPC, but a best practice is to have a non-default VPC with public subnets for application servers like the Pyramid Analytics central instance and private subnets for backend services like the repository database. AWS provides a Quick Start for a VPC: https://aws.amazon.com/quickstart/architecture/vpc/ Pyramid uses EFS, so the VPC's DNS settings need to allow resolution of Amazon domain names. The VPC must have both DNS Resolution and DNS Hostnames enabled. For more information, see Viewing DNS Hostnames for Your EC2 Instance in the Amazon VPC User Guide. The VPC must be configured to use the DNS server provided by Amazon. For information about Amazon DNS server, see DHCP Options Sets in the Amazon VPC User Guide. If the VPC is using a DNS service like Active Directory or Legato, the DNS service will need to allow "DNS forwarding" to the Amazon DNS.
Windows Domain (if using Microsoft Analysis Services)	If SSAS access is required: • The VPC will need to use Active Directory, requiring the DNS configuration outlined in the VPC instructions above. • See Add a Windows Connector instance for Microsoft Analysis Services connectivity
(Optional) Bastion	Optionally, deploy a bastion into your VPC. Bastions allow SSH access into instances protected inside public and private subnets. AWS provides a Quick Start for deploying a Bastion: https://aws.amazon.com/quickstart/architecture/linux-bastion/

Launch Pyramid via CloudFormation

You have several paths to launching Pyramid Analytics via a CloudFormation template.

Launching from a subscription

During subscribing to the Pyramid Analytics AWS Marketplace listing

After subscribing, continue to Configuration.

From the list of your AWS account's AWS Marketplace Subscriptions

1. From the AWS Console, select the region you want to launch Pyramid into.

2. https://console.aws.amazon.com/marketplace/home#/subscriptions

3. Find your subscription to Pyramid 2020

4. Launch CloudFormation stack

From your Pyramid Analytics AWS Marketplace subscription above, then:
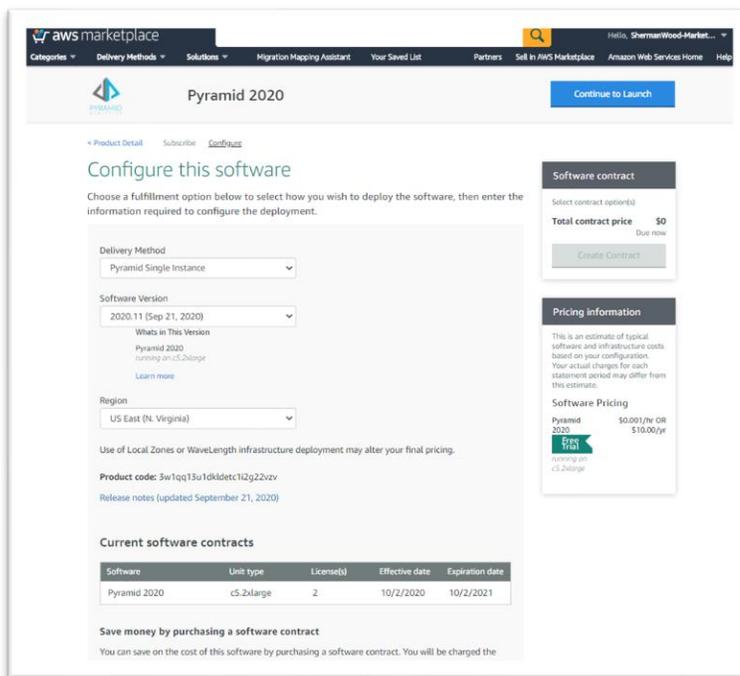
Delivery Method: Pyramid Central Instance

Software Version: default

Region: select region

Configure your software contract

- For annual subscriptions. Per instance payment.

- Used with a Private Offer when the AWS account does not have invoicing terms.

- This results in immediate invoicing through your AWS account.

Continue to Launch
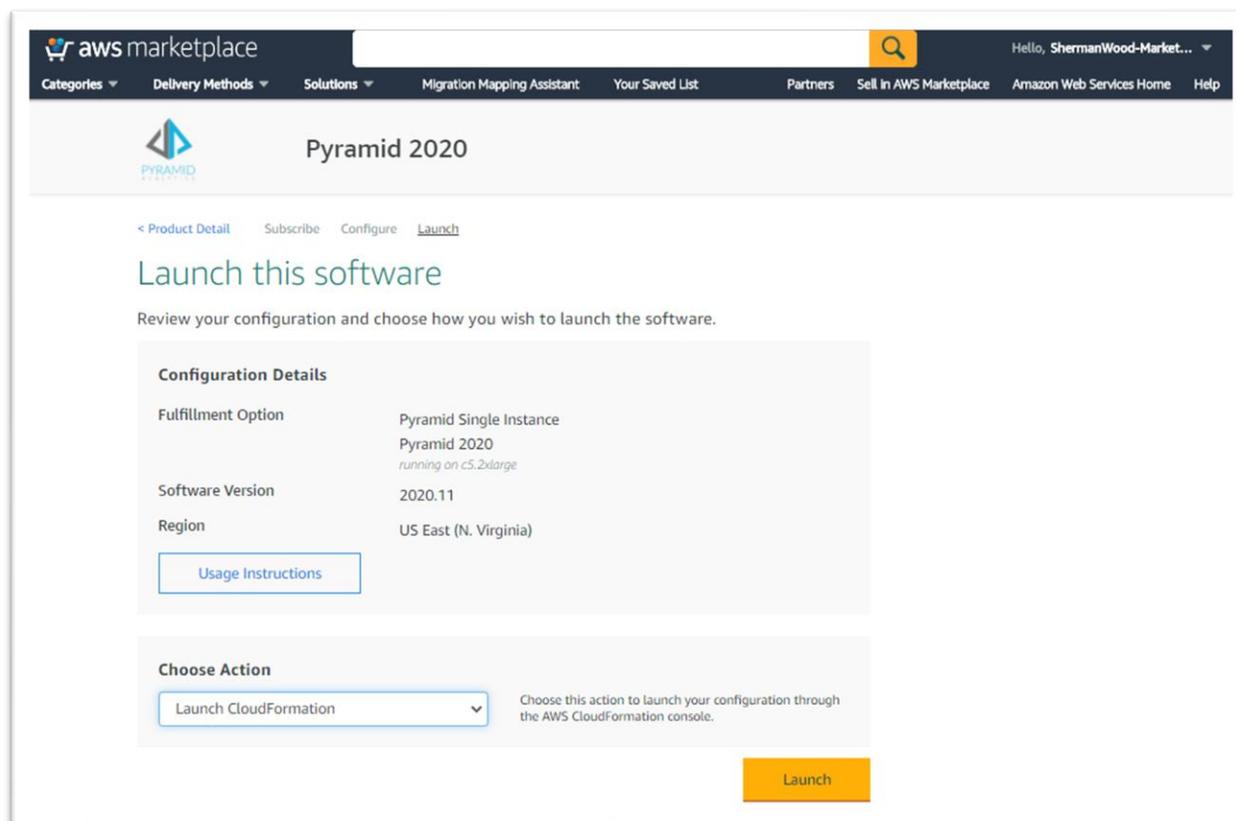
Usage Instructions

Choose Action: leave default – "Launch CloudFormation"

Launch

Launch CloudFormation stack: Goes to **Create Stack** with S3 URL filled in

Launch from the Pyramid Analytics AWS Marketplace listing

1. From the AWS Console, select the region you want to launch Pyramid into.

2. Find the current Pyramid Analytics 2020 AWS Marketplace listing from:
   https://aws.amazon.com/marketplace/seller-profile?id=c563c0ef-1e01-4826-b4bc-02dfb00c670a

3. **Usage** tab/section

4. **Pyramid Central Instance**

5. **View CloudFormation Template**

6. **View Template in CloudFormation Designer**

7. Once in the Designer, select **Create Stack**   in the menu.

Launch from a public CloudFormation template

See "CloudFormation Templates for your own use" section below.

1. From the AWS Console, select the region you want to launch Pyramid into.

2. Go to the CloudFormation console

3. **Create Stack**

4. Provide your own CloudFormation template

Creating the Central Instance Stack

This Central Instance CloudFormation stack takes approximately 35-45 minutes to create. You can also download the templates to use as a starting point for your own implementation, using the links in the Pyramid Analytics Marketplace listing.

> **Note**: You are responsible for the cost of the AWS services created by running this CloudFormation template. During the 14 day Free Trial, there is no additional software cost for using this stack. Beyond the 14 day Trial, or if you launch more than 1 instance during the 14 day Trial, you will be charged the Hourly rate for each instance.
>
> See the Sizing and Cost section above for full details.

Step 1 - Specify Template

Either:

- keep the default setting for the template URL

- provide your own S3 URL to a template

- upload a template file

View in Designer if desired.

Choose **Next**.

Step 2 - Specify Details

Enter the stack name.

Review the parameters for the template below. Enter values for the parameters that require your input. For all other parameters, you can customize the default settings provided by the template.

CloudFormation template parameters

Note that the two passwords entered below will be stored in Secrets Manager and will not be visible after deployment, so please remember/save them:

- Initial Pyramid user password (InitialUserPassword)

- RDS database password (RDSPassword)

The InitialUserPassword is required to login to Pyramid after deployment.

Pyramid Analytics Instance

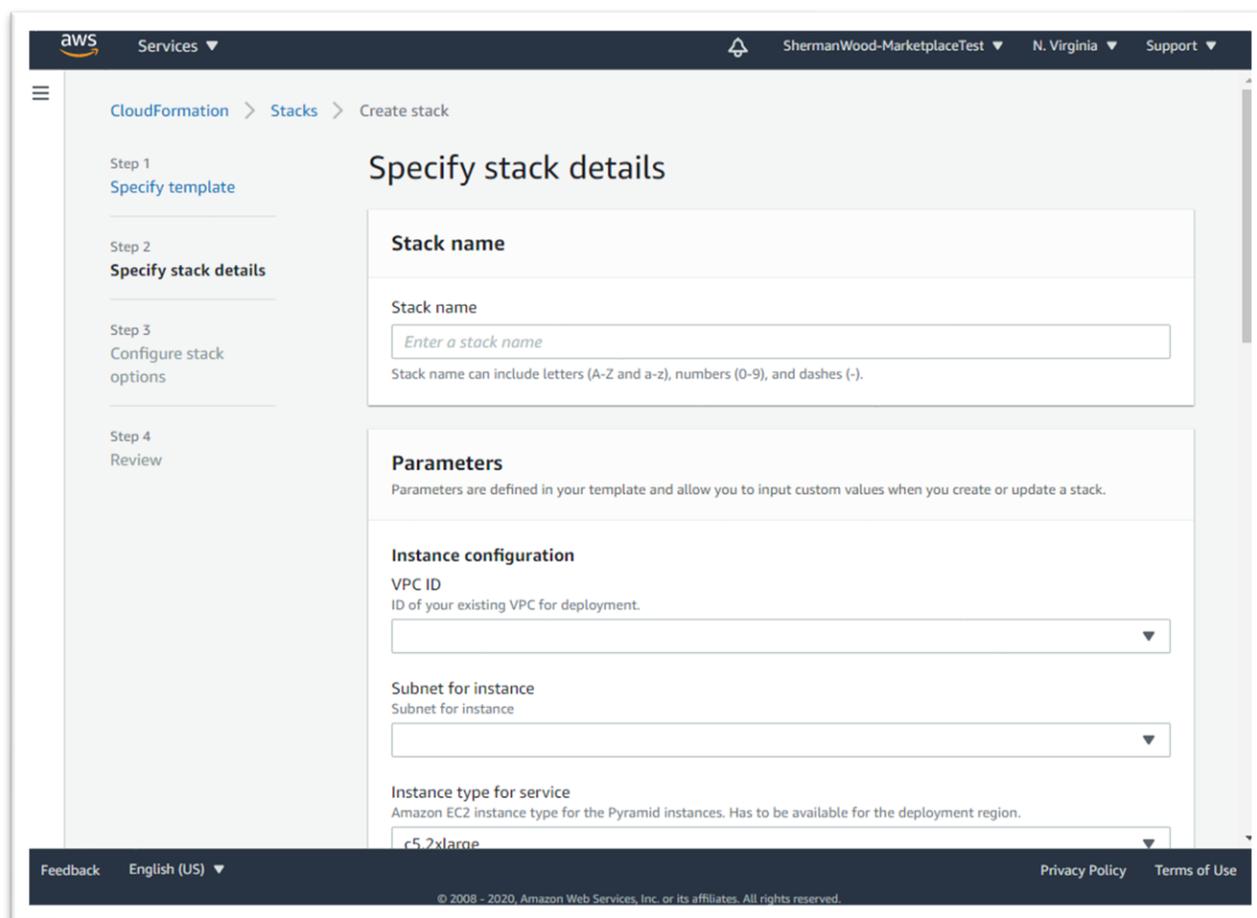| Parameter Label (name)	Default	Description
VPC ID (VPCID)	Requires input	Select an existing VPC from the list where the Pyramid instance will be deployed (e.g., vpc-0343606e).
Subnet for instance (Subnet)	Requires input	Select an existing public subnet with the VPC to deploy the Pyramid instance into. Must be within the VPC you selected.
Instance type (InstanceType)	c5.4xlarge: 16 vCPU, 32GB	EC2 Instance type for the Pyramid Analytics instance
Key pair name (KeyPairName)	Requires input	Key pair in your account in the region you are launching into. Allows you to connect securely to your instance after it launches via SSH. When you created an AWS account, this is the key pair you created in your preferred region.
Assign Public IP Address (AssignPublicIP)	false	Assign a public IP address. Set true for deployment into a public subnet and you want the instance to be publicly accessible.
HTTP/HTTPS CIDR (HTTPAccessCIDR)	Requires input	The CIDR address range from which you will connect to the instance over the Internet via HTTP and HTTPS. We recommend that you set this value to a trusted CIDR block to restrict access to IP addresses from only your network. The CIDR parameter must be in the form x.x.x.x/x. 0.0.0.0/0 gives all access.
SSH Security Group ID (AllowSSHSecurityGroup)	Optional	Security group ID (e.g. sg-0fec99734449e8888) within region to allow SSH access into the Pyramid instance. Related to bastion access.
Initial Pyramid user name (InitialUsername)	Requires input	Administrative user name. Min 5 characters. Must begin with a letter and contain only alphanumeric characters, minus and underscore.
Initial Pyramid user password (InitialUserPassword)	Requires input	Administrative user password. Min 8 characters. Must begin with a letter and contain only alphanumeric characters, minus and underscore.

New Repository Database Service

Parameter Label (name)	Default	Description
New RDS service type (RDSDeploymentType)	serverless	Type of new RDS database service if pre-existing domain name not entered. "provisioned": creates a 2 instance PostgreSQL RDS cluster. - PostgreSQLAuroraServerless - PostgreSQLAuroraProvisioned - PostgreSQL - MicrosoftSQLServer
New RDS service name (RDSServiceName)	Required	Name of new RDS database service
New RDS service subnets (NewRDSSubnets)	Requires input	Subnets within the VPC to deploy the new Aurora PostgreSQL database service into. Must always enter at least 2 subnets in different Availability Zones.
RDS database user (RDSUser)	Requires input	Master database user. Min 5 characters. Must begin with a letter and contain only alphanumeric characters, minus and underscore.
RDS database password (RDSPassword)	Requires input	Master database user password. Min 8 characters. Must begin with a letter and contain only alphanumeric characters, minus and underscore.
Repository database name (RDSName)	Requires input	Repository database name on the database service

Pyramid S3 backup to restore from

Parameter Label	Default	Description
Pyramid backup S3 bucket (BackupS3Bucket)	Optional	S3 bucket containing a Pyramid deployment backup to be restored into this new deployment. See pyramid-backup-restore-s3.yaml CloudFormation template. See After Restoration notes.
Folder within S3 bucket (BackupS3Folder)	Optional	Folder within above S3 bucket containing a Pyramid deployment backup to be restored into this new deployment. Will be of the form: optional/folder/<timestamp>

When you finish reviewing and customizing the parameters, choose **Next**.

Step 3 - Configure stack options

Optional: Enter tags for easily identifying resources created by the stack.
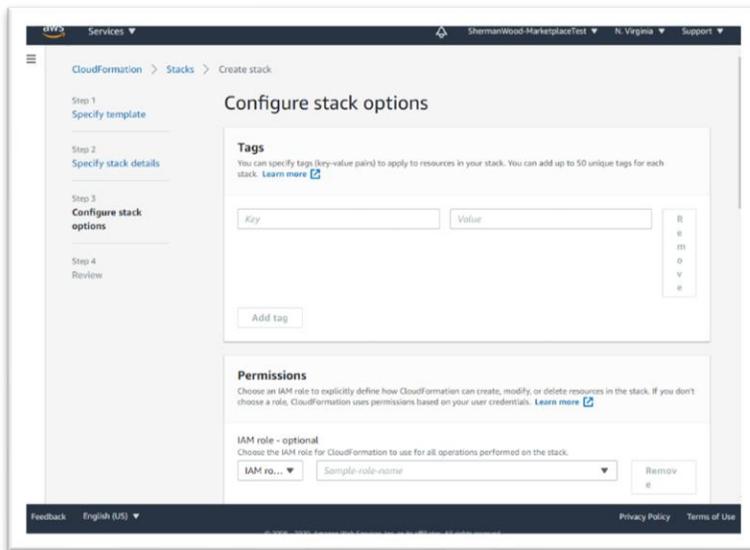
At the bottom of the page:

Required: Disable "Rollback on failure". This makes any issues with the launch easier to see and analyze.
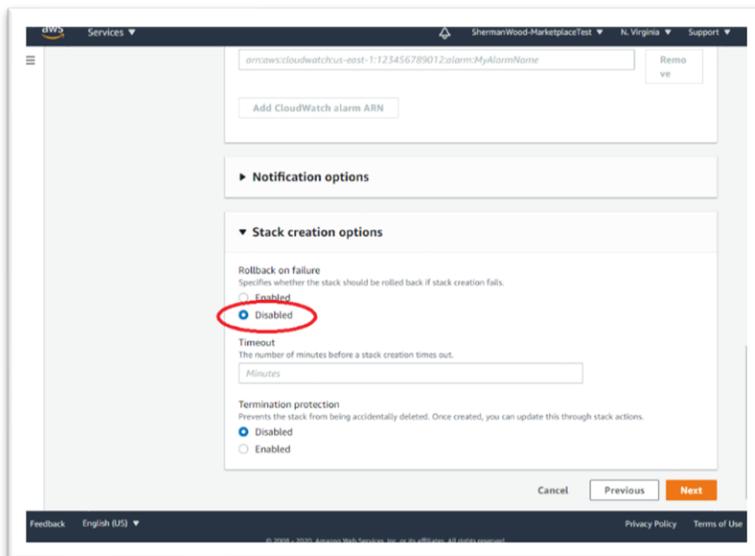
Step 4 - Review
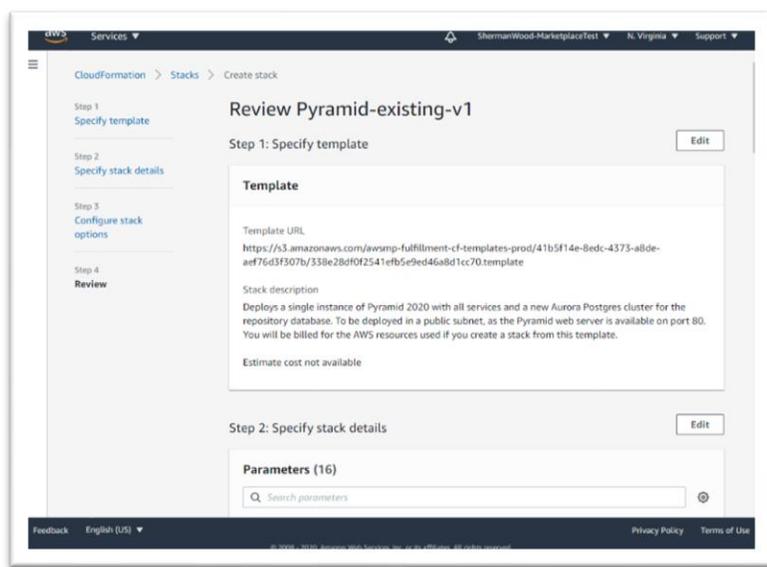
At the bottom of the page, check the 2-3 checkboxes.
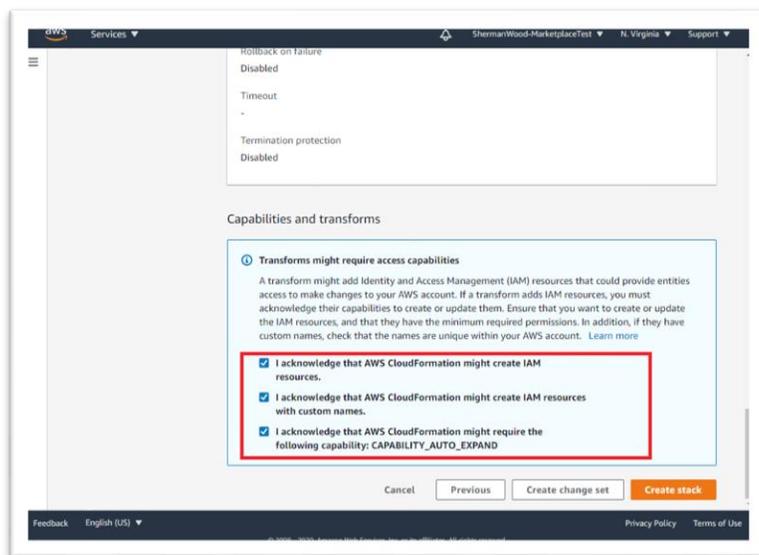
Choose **Create stack**

At this point, parameter and rule validation can fail, stopping the stack creation.

See the highlighted message below.
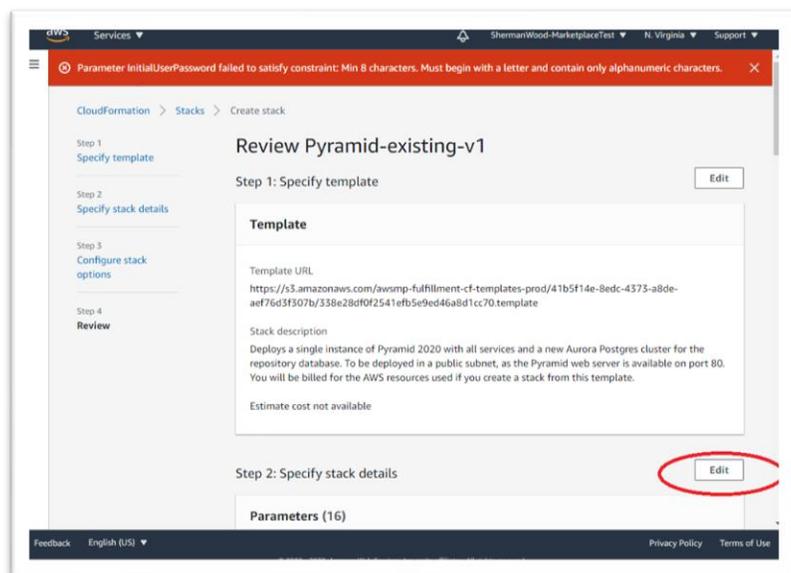
Choose **Edit** highlighted above to back to the Step 2 - Specify Details page.

Edit the parameters to correct the errors.

Choose **Next** to go to the Step 3 – Configure stack options page.

Choose **Next** to go to the Step 4 – Review page.

Choose **Create Stack** again.

Stack Creation Process

As the stack is created, the progress of the resource creation – shown as Events - is displayed in time order. Status will show event commentary, including errors.

On the left-hand side of the page, you will also see several stacks executing to make up the complete deployment: a main stack and a number of nested stacks called by the main stack.
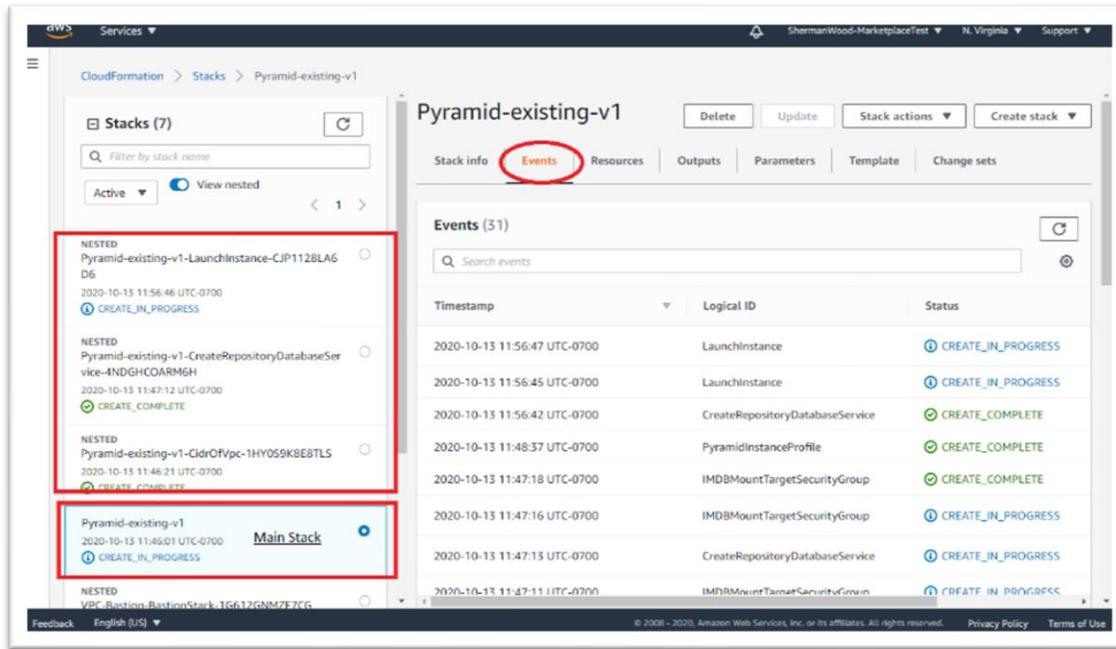
The Resources tab on a stack shows the list of resources created by the stack.
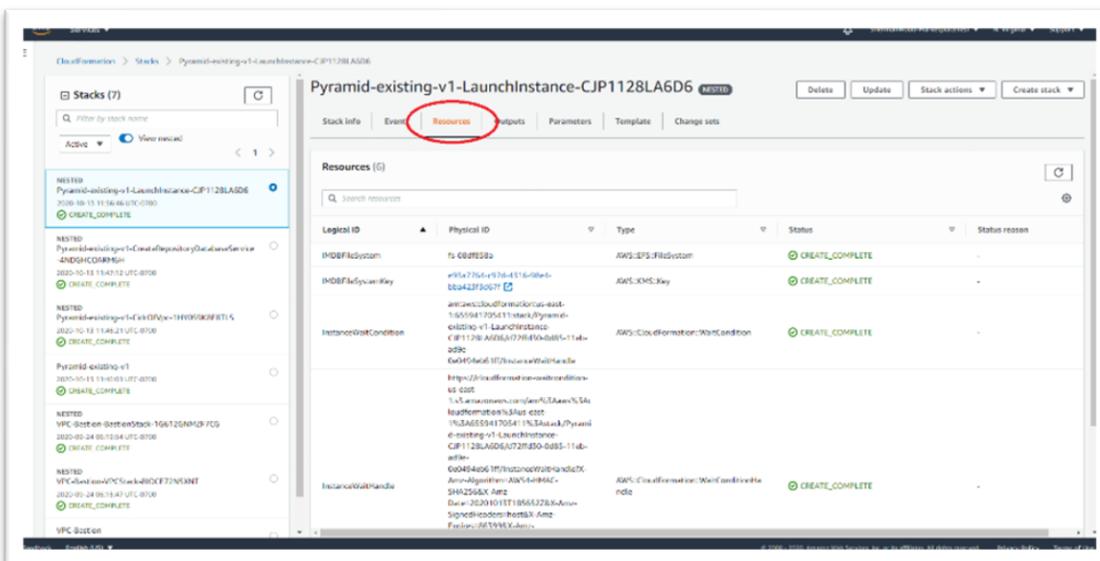
Stack Outputs

When the main Stack completes, the Outputs tab shows deployment parameters that are useful for follow-on access and control.

Note that these properties are also stored in Amazon SSM Parameters and Secrets Manager for use in multi-server deployments. There are also Outputs on the NestedStacks called by the top level stack.

Key	Description	Comments
InitialUsername	Initial user name	Administrative user name for login to Pyramid
KeyPairName	Key Pair for instances	
MountTargetSecurityGroup	Security Group for EFS Mount Targets	Security Group for instances access to the common EFS volume
PrivateDNSName	Instance Private DNS name	Private DNS name of instance
PublicDNSName	Instance Public DNS name	Public DNS name of instance. Blank if instance was not assigned a public IP
PyramidInstanceProfile	IAM Instance Profile for instances	
PyramidProcessesSecurityGroup	Security Group for Pyramid instances' internal communication	
PyramidPublicURL	Pyramid Public URL	URL to access the Pyramid web application
PyramidRole	IAM Role for instances	

Key	Description	Comments
RDSSecurityGroup	Security Group access to repository	Security group for repository database access
RepositoryDatabaseAddress	Repository database address	
RepositoryDatabaseName	Repository database schema name	Deployment schema in Repository database
RepositoryDatabasePasswordARN	Repository database Password in AWS Secrets Manager	ARN to repository database password in Secrets Manager
RepositoryDatabasePort	Repository database port	
RepositoryDatabaseServiceName	Repository database RDS service name	
RepositoryDatabaseType	Repository database type: PostgreSQL, MicrosftSQLServer	
RepositoryDatabaseUsername	Repository database user name	
SharedFileSystem	EFS file system ID	EFS file system ID for the deployment's shared file system
VPC	VPC for deployment	

Working with Pyramid on AWS

Accessing Pyramid

After the main stack is "Create Complete", go to its **Outputs** tab. The PyramidPublicURL will get you to the Pyramid login page.
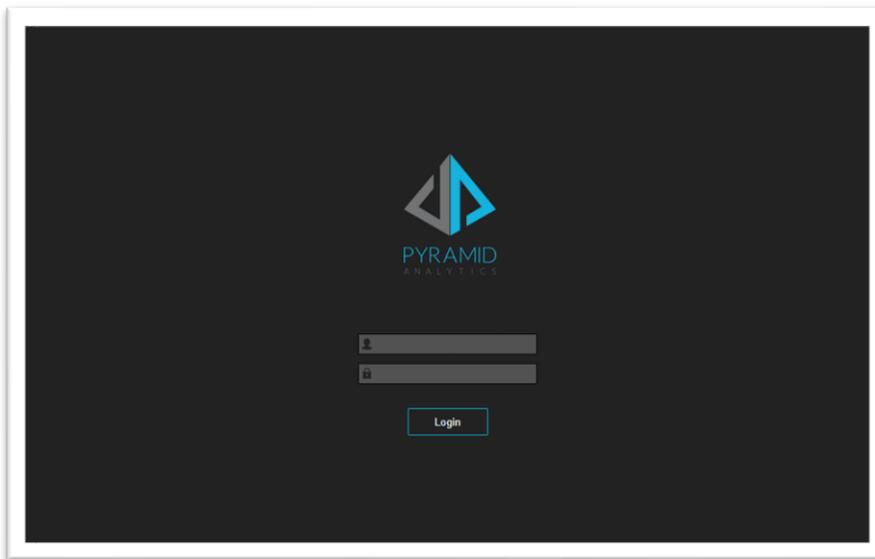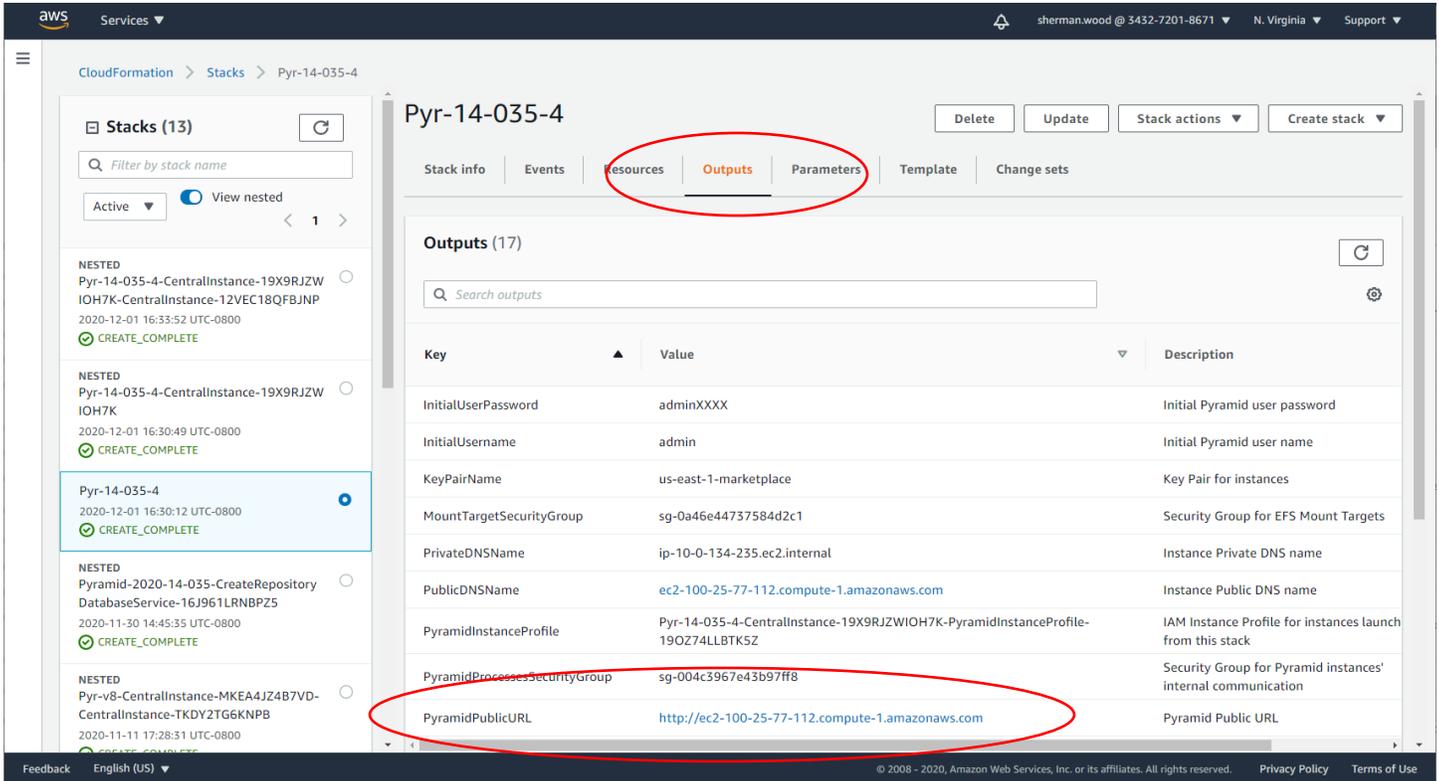
Enter the Pyramid administrator's InitialUsername and InitialPassword that you entered into the stack parameters.
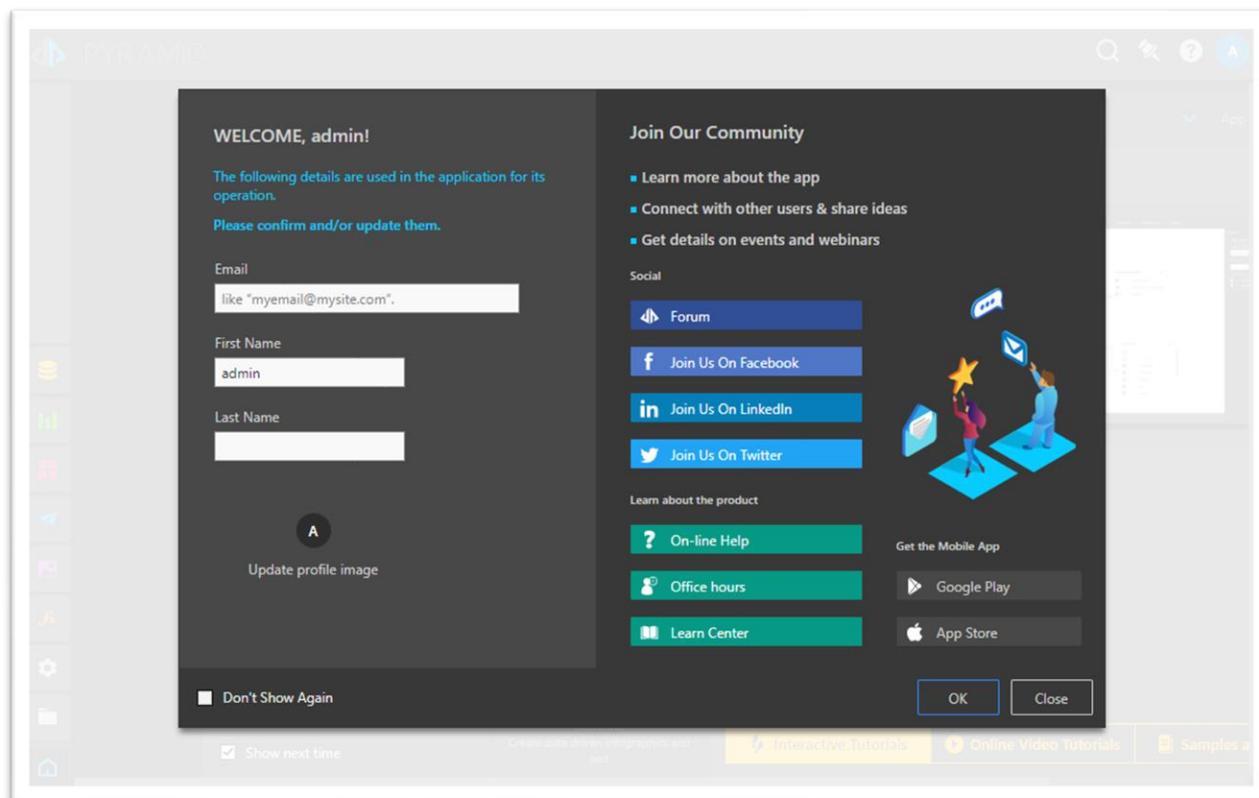
OK to continue.

You can now embark on your journey with Pyramid.

After Restoration

If you created a new deployment based on a backup of a Pyramid deployment, IPs/domain names of data sources may need to be updated in the new deployment, particularly the Pyramid in-memory databases (IMDBs). Pyramid System logs will show connection exceptions until successfully updated.

If the backup contained multiple IMDB instances, the same number of IMDB instances will need to be launched in the new deployment via the Adding instances to a Central instance deployment process to access all the backed up IMDB data.

CloudWatch

The Pyramid instances have been configured to send logs to CloudWatch Logs for debugging and monitoring purposes.

The Log groups for a launched stack are named:

/pyramid/<base stack name>
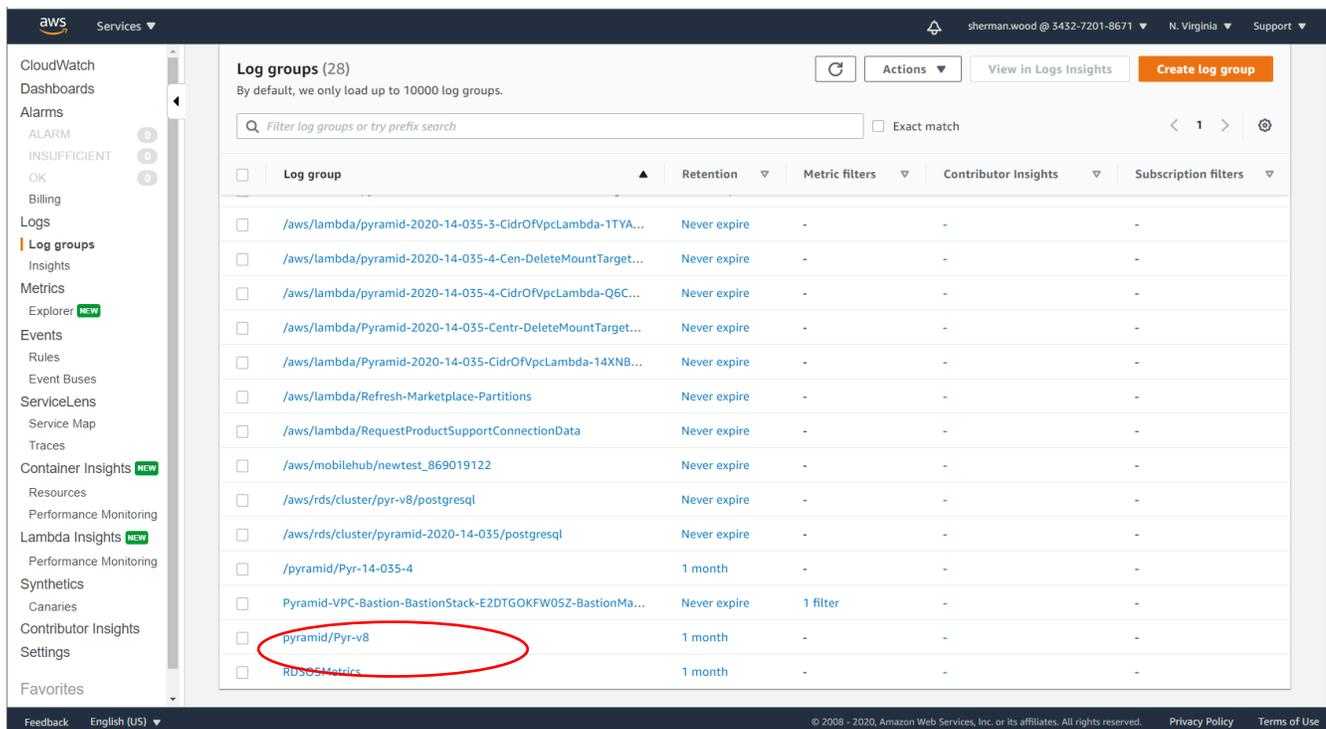
The Log streams within a Pyramid Stack Log group are named:

<u><EC2 instance id>-<Pyramid instance type>/<log type></u>

Where <Pyramid instance type> reflects the set of engines running on the instance:

- CentralInstance: the Pyramid instance that is initially created. Has all engine types.
- Router
- WebServer
- WebServerAndRouter
- RuntimeEngine
- TaskEngine
- RuntimeEngineAndTaskEngine
- RuntimeEngineAndAI
- TaskEngineAndAI
- RuntimeAndTaskEngineAndAI
- AIServer
- InMemoryDB
- Everything: all engine types
- WindowsConnector
- Nothing: repository initialization/upgrade

Where <log type> is:

- cf-init: initialization from the CloudFormation template
- installers: Pyramid installer output. Called from cf-init.
- pyramid-logs: Pyramid process logs. Ongoing logging.

Troubleshooting deployments

As specified above, set "Rollback on failure": **Disable** in the Stack Options when creating a Stack. Otherwise the Stack and its created Resources will be deleted, including CloudWatch logs, which will make it impossible to debug if there is an issue.

If the CloudFormation template launch fails, review the Events in the CloudFormation template creation.

- Note that there are main and "nested" templates. If there is a problem in a nested template, the Events in the nested template will show the exception and the main template will show that the nested template failed.
- The EC2 instances launched by the CloudFormation templates can "timeout" – taking longer than expected to complete – and cause the templates to fail. This will be due to issues installing Pyramid on the instance. Review the CloudWatch logs outlined above to see those issues.

Issues seen in CloudWatch logs

Cf-init log

"Failed to resolve "fs-2347abed354.efs.us-east-1.amazonaws.com" - check that your file system ID is correct. See https://docs.aws.amazon.com/console/efs/mount-dns-name for more detail."

This indicates a DNS problem. Update the DHCP Options and your directory service as per the VPC Technical Requirements above.

Adding a license from a Private Offer

You can see your deployment's license details as an administrator by accessing the Licensing section in the administration screens, highlighted below. The displayed license here is the default when running a trial, Hourly or Annual.
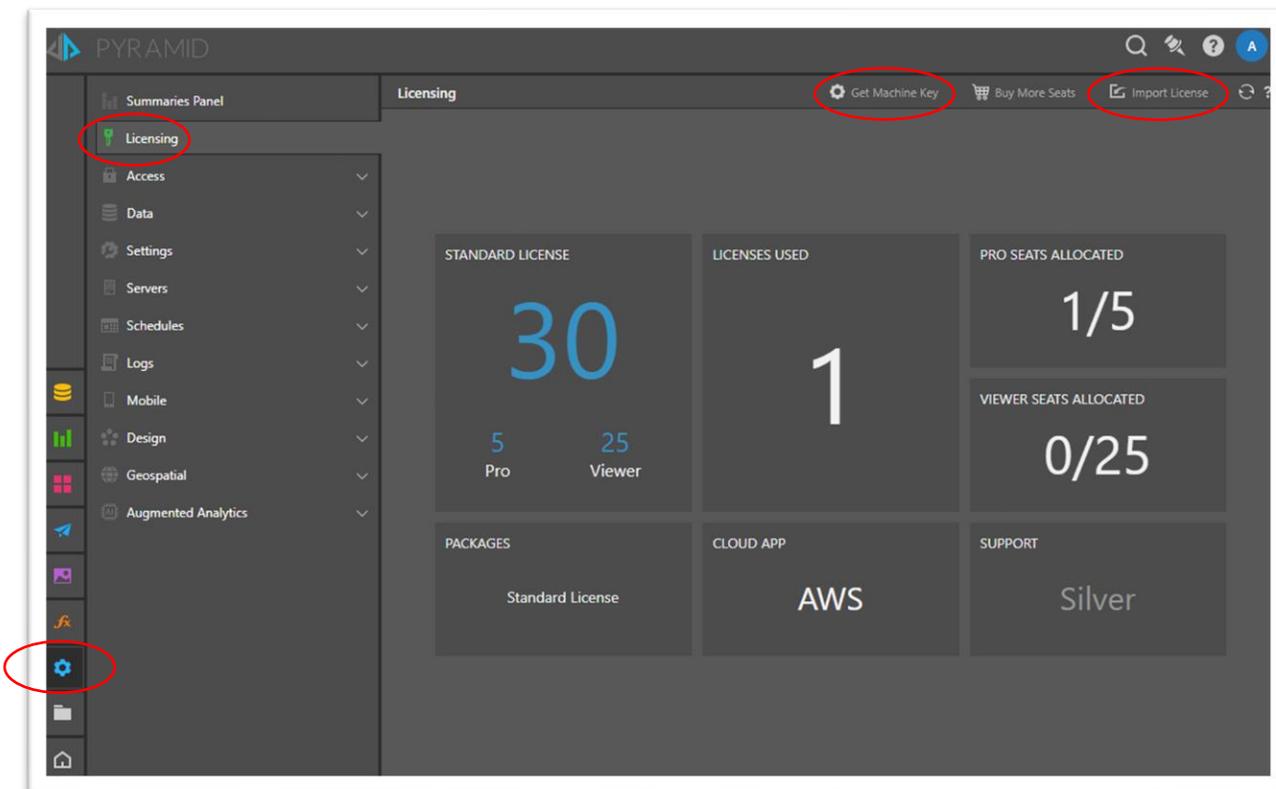
A Private Offer from Pyramid changes this license.

1. After Accepting the Private Offer in your AWS account, send an email to your Pyramid contact working with you on the Private Offer, containing:
   - The offer id you accepted
   - The "machine key" of your Pyramid deployment

   To get the machine key for your deployment, go to the Licensing screen above and hit "Get Machine Key" as highlighted.
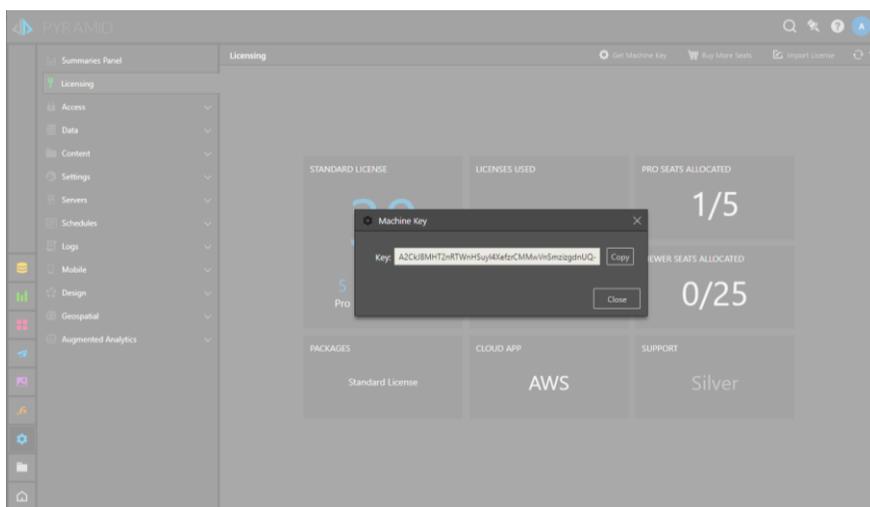
   Copy the machine key into the email.

2. A new license key file will be issued to you via email.
3. Deploy the license
   a) Go to the Licensing screen as above
   b) Select "Import License" to install the license
      a. You will be allowed to browse your local file system for the license file.
   c) If the license is accepted, the screen will refresh, and re-log you in.

An example of an updated license.
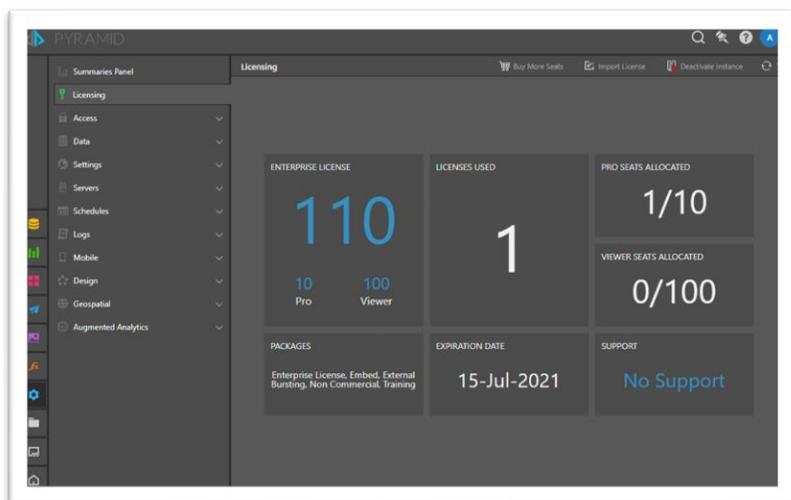
Post license upgrade tasks

The Private Offer license will enable Pyramid Enterprise Edition features. After installing the Enterprise license, an additional administrative setting must be made to enable a shared file system for all additional servers being added to make a multi-server deployment.

Set the Admin > Servers > File System > Permanent Storage Type to "Shared Folder" and set the folder to "/mnt/pyramid", as below.
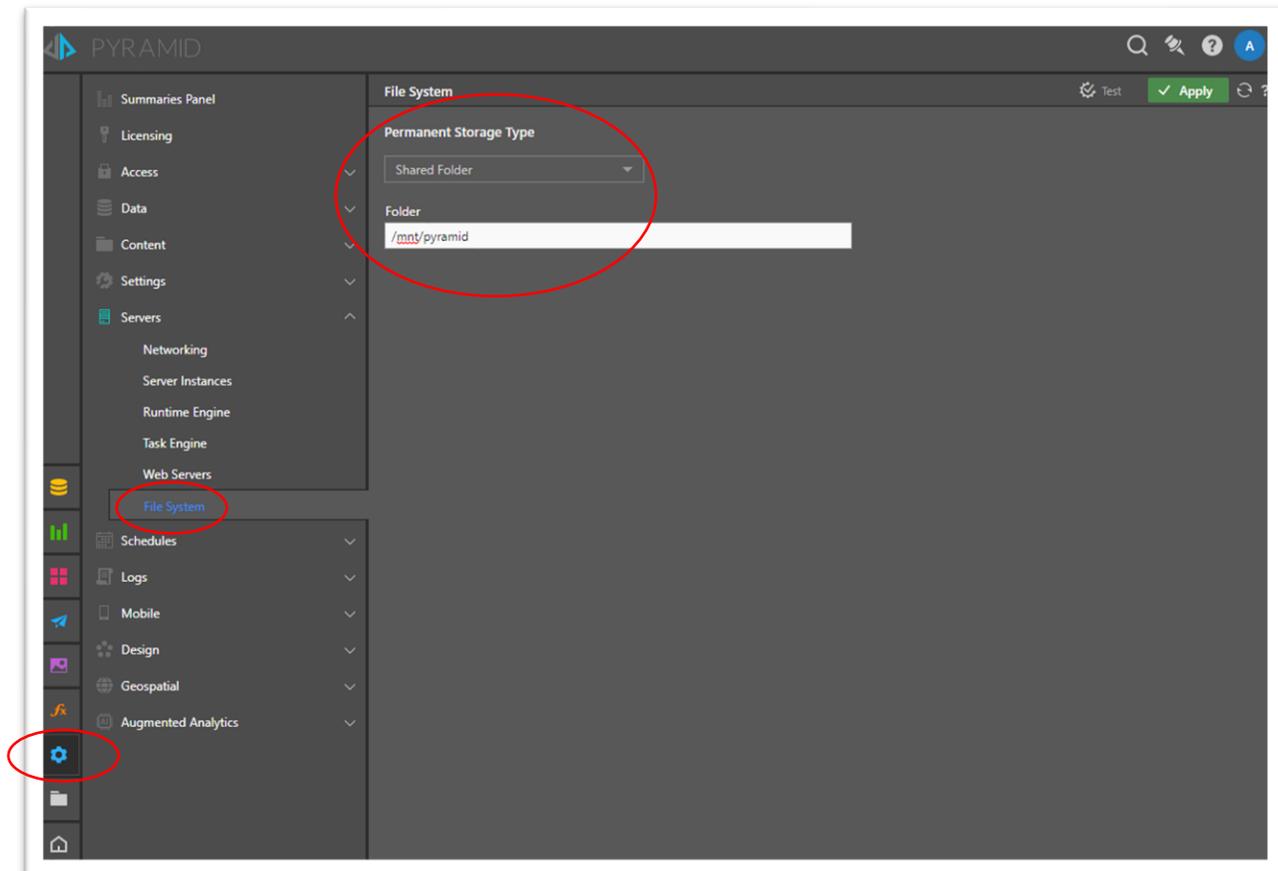
Adding instances to a Central instance deployment

An Enterprise license from a [Private Offer](#) allows multi-server deployments of Pyramid. You cannot add instances to a standalone Pyramid AWS Marketplace deployment without an Enterprise license.

With an Enterprise license installed via the process above, the "Additional Pyramid Services" CloudFormation template can be run multiple times to add servers containing selectable mixes of Pyramid engines into an existing deployment. You can also run the "pyramid-add-to-central-instance.yaml" CloudFormation template.

Launching an additional instance takes 9-11 minutes.

CloudFormation template parameters

Parameter Label (name)	Default	Description
Stack Name of base single instance stack (BaseStackName)	Requires input	Stack name of an existing "Central instance" stack.
Subnet for instance (Subnet)	Requires input	Select an existing subnet within the VPC of the "Central instance" stack to deploy the Pyramid instance into
Instance type (InstanceType)	c5.2xlarge: 8 vCPU, 16GB	Instance type for the Pyramid Analytics instance
Pyramid Process(es) to run (PyramidProcess)	Everything	Pyramid engines to deploy onto the new instance - Router - WebServer - WebServerAndRouter - RuntimeEngine - TaskEngine - RuntimeEngineAndTaskEngine - RuntimeEngineAndAI - TaskEngineAndAI - RuntimeAndTaskEngineAndAI - AIServer - InMemoryDB - Everything: all engine types ie. Central - Nothing: repository initialization/upgrade Note that InMemoryDB instances will need to be manually added as data sources within the Pyramid deployment.
Assign Public IP Address (AssignPublicIP)	false	Assign a public IP address. Set true for deployment into a public subnet and you want the instance to be publicly accessible.

Logs for the new instance are within the /pyramid/<BaseStackName> log group, in the <u><EC2 instance id>-<Pyramid instance type></u> log stream.

CloudFormation templates for your own use

There are a number of CloudFormation templates beyond those in the AWS Marketplace listing you can use to manipulate your Pyramid deployment. Download the templates from https://github.com/Pyramid-Analytics/aws-cloudformation/tree/main/marketplace or use them as is at https://pyramid-cloudformation.s3.amazonaws.com/marketplace/<version>/<entrypoint template>.yaml where version is of the form "2020-17".

These templates can be reused and/or edited for your own needs, placed in your own S3 bucket and launched through CloudFormation > Create Stack. Pyramid can provide limited support for your edited templates.

Entry point templates

These are to be launched via Create Stack.

Entry point Template	Description
pyramid-central-instance-new-repository.yaml	Create a Central Pyramid deployment based on a new PostgreSQL database. This is the "Pyramid Central Instance" template from the AWS Marketplace listing.
pyramid-central-instance-existing-repository.yaml	Create a Central Pyramid deployment based on a pre-existing RDS database.
pyramid-add-to-central-instance.yaml (details above)	Adds a single Pyramid instance into an existing Central instance deployment (Stack). This is the "Additional Pyramid Services" template from the AWS Marketplace listing.
pyramid-backup-restore-s3.yaml	Back up a Pyramid deployment to S3: repository database and EFS volumes.
pyramid-single-windows-instance.yaml (details below)	Attaches a Windows Connector instance to a deployment to allow Microsoft Analysis Services connectivity. Requires a pre-existing Windows Domain controller, Active Directory and Analysis Services security. See Technical Requirements
pyramid-s3-file-server.yaml	Web application to allow HTTP/S access to files in S3 from a Pyramid deployment. Leverages IAM to control access.
pyramid-load-balancer-with-auto-scaled-instances.yaml	Add a load balancer and auto-scaling group of instances with all processes/engines, less the In-memory database.
pyramid-auto-scale-instances.yaml	Add an auto-scaling group of instances with selected processes/engines.

Nested Templates

Called by Entry point templates. Not meant to be run with Create Stack directly.

Nested Template	Description
pyramid-base-resources-parameters.yaml	Used by the "pyramid-central-repository" entrypoint templates to create common resources and SSM parameters.
pyramid-backup-restore-s3.yaml	Used by the "pyramid-central-repository" entrypoint templates to restore a Pyramid deployment backup from S3 into a new deployment.
pyramid-single-instance.yaml	Launches a single Pyramid instance.
pyramid-repository-database.yaml	Creates a RDS database for the repository. Options: • Serverless or multi-instance PostgreSQL Aurora • Single instance PostgreSQL and Microsoft SQL Server

Add a Windows Connector instance for Microsoft Analysis Services connectivity

The pyramid-windows-single-instance.yaml launches a Pyramid Windows Connector instance and automatically connects to a Windows Domain. SSAS instances are to be accessible from the Windows Domain.

See Technical Requirements – VPC for VPC DNS requirements to support this. Particularly note the need for DNS Forwarding to the Amazon DNS in Active Directory.

CloudFormation template parameters

Parameter Label (name)	Default	Description
Stack Name of base single instance stack (BaseStackName)	Requires input	Stack name of an existing "Central instance" stack.
URL to Pyramid Windows Installer (WindowsPyramidInstallerURL)	Requires input	To download a Pyramid Windows installer executable onto the instance. Needs to match the version of the Central instance. Installers are publicly available at: https://pyramid-cloudformation.s3.amazonaws.com/content/software/Pyramid-<version>-windows-server-installer.exe like https://pyramid-cloudformation.s3.amazonaws.com/content/software/Pyramid-2020.15.046-windows-server-installer.exe
Log group identifier (InstancePurpose)	WindowsConnector	Labels log streams like: {instance_id}-${InstancePurpose}/installers
SSM Parameter for Windows AMI (LatestWindowsAmiId)	/aws/service/ami-windows-latest/Windows_Server-2019-English-Core-Base	Windows AMI to launch. Do not edit.
Instance type (InstanceType)	c5.2xlarge: 8 vCPU, 16GB	Instance type for the Pyramid Analytics instance
Run startup script and stop (RunOnce)	false	Not used.
Subnet for instance (Subnet)	Requires input	Select an existing subnet within the VPC of the "Central instance" stack to deploy the Pyramid instance into

Parameter Label (name)	Default	Description
Windows Domain Controller IP Address (DomainControllerIp)	Requires input	IP address of a Windows Domain Controller in the VPC. Must be accessible from the subnet.
Domain DNS Name (DomainDNSName)	Requires input	Root domain for the domain. ie. "example.com". Must match the "domain-name" on VPC DHCP options.
Domain NetBios Name (DomainNetBiosName)	Requires input	Netbios name for domain, ie. "example"
Domain Admin User (DomainAdminUser)	Requires input	Administrative user to connect instance to domain.
Domain Admin Password (AdminPassword)	Requires input	Password for domain administrative user.

Central instance with a pre-existing repository database

The pyramid-central-instance-existing-repository.yaml CloudFormation template allows you to deploy Pyramid using a pre-existing PostgreSQL or SQL Server RDS service.

Pyramid Analytics Instance

Parameter Label (name)	Default	Description
VPC ID (VPCID)	Requires input	Select an existing VPC from the list where the Pyramid instance will be deployed (e.g., vpc-0343606e).
Subnet for instance (Subnet)	Requires input	Select an existing public subnet with the VPC to deploy the Pyramid instance into. Must be within the VPC you selected.
Instance type (InstanceType)	c5.2xlarge: 8 vCPU, 16GB	EC2 Instance type for the Pyramid Analytics instance
Key pair name (KeyPairName)	Requires input	Key pair in your account in the region you are launching into. Allows you to connect securely to your instance after it launches via SSH. When you created an AWS account, this is the key pair you created in your preferred region.
Assign Public IP Address (AssignPublicIP)	false	Assign a public IP address. Set true for deployment into a public subnet and you want the instance to be publicly accessible.
HTTP/HTTPS CIDR (HTTPAccessCIDR)	Requires input	The CIDR address range from which you will connect to the instance over the Internet via HTTP and HTTPS. We recommend that you set this value to a trusted CIDR block to restrict access to IP addresses from only your network. The CIDR parameter must be in the form x.x.x.x/x. 0.0.0.0/0 gives all access.
SSH Security Group ID (AllowSSHSecurityGroup)	Optional	Security group ID (e.g. sg-0fec99734449e8888) within region to allow SSH access into the Pyramid instance. Related to bastion access.
Initial Pyramid user name (InitialUsername)	Requires input	Administrative user name. Min 5 characters. Must begin with a letter and contain only alphanumeric characters, minus and underscore.
Initial Pyramid user password (InitialUserPassword)	Requires input	Administrative user password. Min 8 characters. Must begin with a letter and contain only alphanumeric characters, minus and underscore.

Existing Repository Database

Parameter Label (name)	Default	Description
New RDS service type (RDSDeploymentType)	PostgreSQL	Type of RDS database service - PostgreSQL - MicrosoftSQLServer
Existing RDS domain name (RDSAddress)	Required	Domain name for an existing RDS database service to deploy the Pyramid repository database to
RDS database port (RDSPort)		RDS port to connect to.
RDS database user (RDSUser)	Requires input	Master database user. Min 5 characters. Must begin with a letter and contain only alphanumeric characters, minus and underscore.
RDS database password (RDSPassword)	Requires input	Master database user password. Min 8 characters. Must begin with a letter and contain only alphanumeric characters, minus and underscore.
Repository database name (RDSName)	Requires input	Repository database name on the database service
RDS Security group ID (RDSSecurityGroup)	Required	Security group ID attached to the RDS instance to allow repository database service access

Pyramid S3 backup to restore from

Pyramid backup S3 bucket (BackupS3Bucket)	Optional	S3 bucket containing a Pyramid deployment backup to be restored into this new deployment. See pyramid-backup-restore-s3.yaml CloudFormation template. See After Restoration notes.
Folder within S3 bucket (BackupS3Folder)	Optional	Folder within above S3 bucket containing a Pyramid deployment backup to be restored into this new deployment. Will be of the form: optional/folder/<timestamp>
Initialize Repository? (InitializeRepository)	true	Create repository database in the existing RDS database service? 'false' = database name is assumed to already exist in the service

See the Central Instance Outputs for details of the Outputs for this Stack.

If the restore from backup options were entered, review After Restoration for additional checks.

Security

The Central Instance CloudFormation template(s) creates security groups, an IAM role and instance profile specific to each deployment, to follow the "policy of least privilege" accessing of resources.

The only possibly public resource is the web server process. There is a separate security group for web access that is only attached to instances that deploy the web server.

As noted above, the following encrypted values are stored in Secrets Manager:

Initial Pyramid user password (InitialUserPassword):

Only used if the repository is initialized as part of the installation and not referred to again. Can be overridden by the initial Pyramid user within the Pyramid application. The related secret is not and does not need to be updated.

RDS database master password (RDSPassword):

In addition to being stored in a secret, this master password is saved encrypted in a configuration file on each instance. Thus, this password cannot be updated.

Sensitive data is held in:

- EFS file system: data and print files
- Repository database: data source connection parameters, passwords and keys

These are encrypted with separate keys stored in Amazon KMS.

A Pyramid deployment is into a single VPC. A multi-server deployment can have the web server in a public subnet, with any other instances in private subnets. The following security groups are created for each deployment to control access to resources:

- PyramidProcessesSecurityGroup: inter-instance communication on specific port ranges. Shared by all Pyramid EC2 instances
- MountTargetSecurityGroup: EFS access. For all EC2 instances
- WebAccessSecurityGroup: Web server access – port 80. Only for instances running a Pyramid web server process
- RDSSecurityGroup: only instances with the PyramidProcessesSecurityGroup can access the repository database service on the nominated port

SSL (HTTPS)

After installation, the Pyramid deployment is only accessed via HTTP. If you require HTTPS access, you can:

- implement an AWS Application Load Balancer
- secure the load balancer with a certificate
- redirect traffic from the load balancer to the Pyramid deployment

Operations

Backup

Pyramid persistent data is held in several stores.

Type	Number	Held in	Default Backup
Pyramid Repository	1 per deployment	PostgreSQL/SQL Server RDS	RDS snapshot
In-memory database persistent storage	1 per In-memory database instance: Everything, Central, InMemoryDatabase engine instances	Directory on Common EFS volume. Mount targets per AZ instances are deployed in	EFS backup
Shared file system	1 per deployment	Common EFS volume, mount target per AZ instances are deployed in	EFS backup

When a Pyramid CloudFormation main Stack is deleted, both the repository database nested stack and the EFS volume are retained, so they can be reused by other deployments. They have to be deleted manually.

Backup-restore-s3 CloudFormation template

Use the pyramid-backup-restore-s3 CloudFormation template from "CloudFormation templates for your own use" above, to backup the persistent data of a Pyramid deployment at a point in time to S3.

CloudFormation parameters

Backup configuration

Parameter Label (name)	Default	Description
Backup or Restore (BackupRestore)	backup	Backup or restore
Stack Name of a Central instance deployment (BaseStackName)	Requires input	Stack name of an existing "Central instance" Pyramid stack deployment to be backed up.
Bucket (BucketName)	Optional	S3 bucket name to back up ton or restore from. If left blank for a backup, a new bucket will be created.
Folder (BucketFolder)	Optional.	Defaults to no additional folder in the above bucket. A Date-timestamp folder will be created under this.

Backup Instance configuration

Parameter Label (name)	Default	Description
SSM Parameter for Latest Amazon Linux 2 AMI (LatestAmiId)	SSM reference to latest generic Amazon Linux 2 AMI	AMI Id for back up instance. Do not change.
Subnet for instance (Subnet)	Requires input	A generic Amazon Linux 2 instance is used to do the backup. Select an existing subnet within the VPC of the "Central instance" stack to deploy the instance into
Run backup and stop (RunOnce)	true	Stop the instance after completing the backup

Stack Outputs

Key	Description	Comment
BackupBucket	Backup S3 Bucket	S3 bucket destination for the backup. Will show the name of a created bucket if a backet name was not provided.
BackupPath	S3 backup path	Full S3 path to the backup. <bucket>/optional/folder/<timestamp>

Recovery

While the individual instances that make up a Pyramid Central instance deployment are not auto-scaling, and therefore do not get replaced automatically if an AZ dies, the persistent data in EFS and RDS is multi Availability Zone, so new instances can be launched against an existing deployment.

The daily backups of RDS and EFS can be reloaded and an existing deployment can be pointed to them.

The backups from the backup-to-s3 process can be loaded as part of a new deployment.

Upgrades

There will be future releases of Pyramid on the AWS Marketplace. The Pyramid platform includes automated upgrade processes that run when a later version of Pyramid is launched against an existing repository database.

The backup-to-s3 process facilitates upgrades, where a backup of a prior version can be loaded as part of a new deployment.