AWS Big Data Blog

Build, Test and Deploy ETL solutions using AWS Glue and AWS CDK based CI/CD pipelines

by Puneet Babbar, Justin Kuskowski, and Suvojit Dasgupta | on 03 OCT 2022 | in Advanced (300), Analytics, AWS Big Data, AWS CodeBuild, AWS CodeCommit, AWS CodePipeline, AWS Glue, Serverless, Technical How-To | Permalink | Comments | Share

AWS Glue is a serverless data integration service that makes it easy to discover, prepare, and combine data for analytics, machine learning (ML), and application development. It's serverless, so there's no infrastructure to set up or manage.

This post provides a step-by-step guide to build a continuous integration and continuous delivery (CI/CD) pipeline using AWS CodeCommit, AWS CodeBuild, and AWS CodePipeline to define, test, provision, and manage changes of AWS Glue based data pipelines using the AWS Cloud Development Kit (AWS CDK).

The AWS CDK is an open-source software development framework for defining cloud infrastructure as code using familiar programming languages and provisioning it through AWS CloudFormation. It provides you with high-level components called *constructs* that preconfigure cloud resources with proven defaults, cutting down boilerplate code and allowing for faster development in a safe, repeatable manner.

Solution overview

The solution constructs a CI/CD pipeline with multiple stages. The CI/CD pipeline constructs a data pipeline using COVID-19 Harmonized Data managed by Talend / Stitch. The data pipeline crawls the datasets provided by `neherlab` from the public Amazon Simple Storage Service (Amazon S3) bucket, exposes the public datasets in the AWS Glue Data Catalog so they're available for SQL queries using Amazon Athena, performs ETL (extract, transform, and load) transformations to denormalize the datasets to a table, and makes the denormalized table available in the Data Catalog.

The solution is designed as follows:

- A data engineer deploys the initial solution. The solution creates two stacks:
  - **cdk-covid19-glue-stack-pipeline** – This stack creates the CI/CD infrastructure as shown in the architectural diagram (labeled Tool Chain).
  - **cdk-covid19-glue-stack** – The `cdk-covid19-glue-stack-pipeline` stack deploys the `cdk-covid19-glue-stack` stack to create the AWS Glue based data pipeline as shown in the diagram (labeled ETL).
- The data engineer makes changes on `cdk-covid19-glue-stack` (when a change in the ETL application is required).
- The data engineer pushes the change to a CodeCommit repository (generated in the `cdk-covid19-glue-stack-pipeline` stack).
- The pipeline is automatically triggered by the push, and deploys and updates all the resources in the `cdk-covid19-glue-stack` stack.

At the time of publishing of this post, the AWS CDK has two versions of the AWS Glue module: @aws-cdk/aws-glue and @aws-cdk/aws-glue-alpha, containing L1 constructs and L2 constructs, respectively. At this time, the `@aws-cdk/aws-glue-alpha` module is still in an experimental stage. We use the stable `@aws-cdk/aws-glue` module for the purpose of this post.

The following diagram shows all the components in the solution.

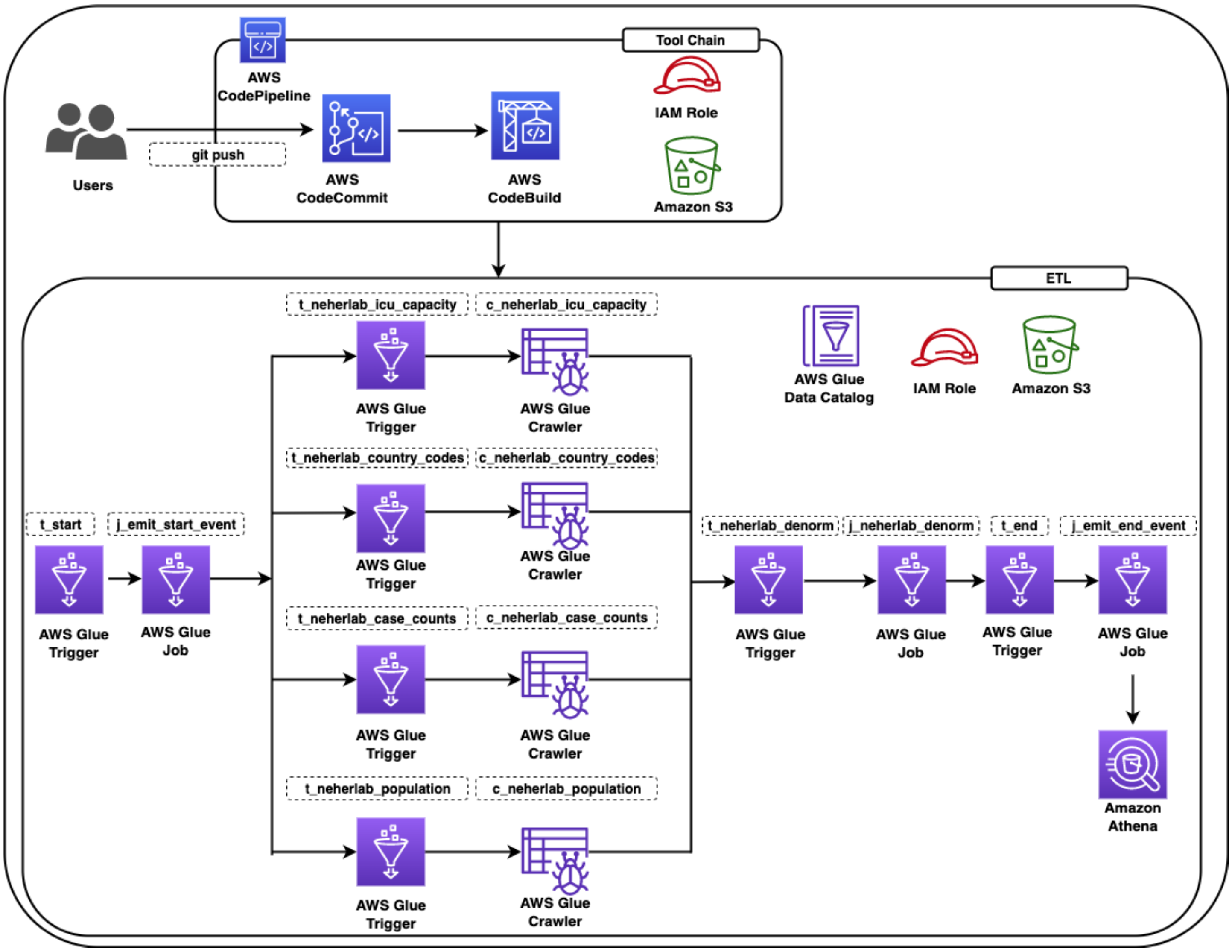


Figure 1 – Architecture diagram

The data pipeline consists of an AWS Glue workflow, triggers, jobs, and crawlers. The AWS Glue job uses an AWS Identity and Access Management (IAM) role with appropriate permissions to read and write data to an S3 bucket. AWS Glue crawlers crawl the data available in the S3 bucket, update the AWS Glue Data Catalog with the metadata, and create tables. You can run SQL queries on these tables using Athena. For ease of identification, we followed the naming convention for triggers to start with `t_*`, crawlers with `c_*`, and jobs with `j_*`. A CI/CD pipeline based on CodeCommit, CodeBuild, and CodePipeline builds, tests and deploys the solution. The complete infrastructure is created using the AWS CDK.

The following table lists the tables created by this solution that you can query using Athena.

Table Name	Description	Dataset Location	Access	Location
`neherlab_case_counts`	Total number of cases	s3://covid19-harmonized-dataset/covid19tos3/neherlab_case_counts/	Read	Public
`neherlab_country_codes`	Country code	s3://covid19-harmonized-dataset/covid19tos3/neherlab_country_codes/	Read	Public
`neherlab_icu_capacity`	Intensive Care Unit (ICU) capacity	s3://covid19-harmonized-dataset/covid19tos3/neherlab_icu_capacity/	Read	Public
`neherlab_population`	Population	s3://covid19-harmonized-	Read	Public

		dataset/covid19tos3/neherlab_population/		
`neherla_denormalized`	Denormalized table that combines all the preceding tables into one table	s3://*<your-S3-bucket-name>*/neherlab_denormalized	Read/Write	Reader's AWS account

Anatomy of the AWS CDK application

In this section, we visit key concepts and anatomy of the AWS CDK application, review the important sections of the code, and discuss how the AWS CDK reduces complexity of the solution as compared to AWS CloudFormation.

An AWS CDK app defines one or more stacks. Stacks (equivalent to CloudFormation stacks) contain constructs, each of which defines one or more concrete AWS resources. Each stack in the AWS CDK app is associated with an environment. An environment is the target AWS account ID and Region into which the stack is intended to be deployed.

In the AWS CDK, the top-most object is the AWS CDK app, which contains multiple stacks vs. the top-level stack in AWS CloudFormation. Given this difference, you can define all the stacks required for the application in the AWS CDK app. In AWS Glue based ETL projects, developers need to define multiple data pipelines by subject area or business logic. In AWS CloudFormation, we can achieve this by writing multiple CloudFormation stacks and often deploy them independently. In some cases, developers write nested stacks, which over time becomes very large and complicated to maintain. In the AWS CDK, all stacks are deployed from the AWS CDK app, increasing modularity of the code and allowing developers to identify all the data pipelines associated with an application easily.

Our AWS CDK application consists of four main files:

- app.py – This is the AWS CDK app and the entry point for the AWS CDK application
- pipeline.py – The `pipeline.py` stack, invoked by app.py, creates the CI/CD pipeline
- etl/infrastructure.py – The `etl/infrastructure.py` stack, invoked by pipeline.py, creates the AWS Glue based data pipeline
- default-config.yaml – The configuration file contains the AWS account ID and Region.

The AWS CDK application reads the configuration from the `default-config.yaml` file, sets the environment information (AWS account ID and Region), and invokes the PipelineCDKStack class in `pipeline.py`. Let's break down the preceding line and discuss the benefits of this design.

For every application, we want to deploy in pre-production environments and a production environment. The application in all the environments will have different configurations, such as the size of the deployed resources. In the AWS CDK, every stack has a property called `env`, which defines the stack's target environment. This property receives the AWS account ID and Region for the given stack.

Lines 26–34 in `app.py` show the aforementioned details:

Python
```python
# Initiating the CodePipeline stack
PipelineCDKStack(
app,
"PipelineCDKStack",
config=config,
env=env,
stack_name=config["codepipeline"]["pipelineStackName"]
)
```

The `env=env` line sets the target AWS account ID and Region for `PipelieCDKStack`. This design allows an AWS CDK app to be deployed in multiple environments at once and increases the parity of the application in all environment. For our example, if we want to deploy `PipelineCDKStack` in multiple environments, such as development, test, and production, we simply call the `PipelineCDKStack` stack after populating the `env` variable appropriately with the target AWS account ID and Region. This was more difficult in AWS CloudFormation, where developers usually needed to deploy the stack for each environment individually. The AWS CDK also provides features to pass the stage at the command line. We look into this option and usage in the later section.

Coming back to the AWS CDK application, the PipelineCDKStack class in `pipeline.py` uses the aws_cdk.pipeline construct library to create continuous delivery of AWS CDK applications. The AWS CDK provides multiple opinionated construct libraries like aws_cdk.pipeline to reduce boilerplate code from an application. The `pipeline.py` file creates the CodeCommit repository, populates the repository with the sample code, and creates a pipeline with the necessary AWS CDK stages for CodePipeline to run the CdkGlueBlogStack class from the `etl/infrastructure.py` file.

Line 99 in `pipeline.py` invokes the `CdkGlueBlogStack` class.

The `CdkGlueBlogStack` class in `etl/infrastructure.py` creates the crawlers, jobs, database, triggers, and workflow to provision the AWS Glue based data pipeline.

Refer to line 539 for creating a crawler using the CfnCrawler construct, line 564 for creating jobs using the CfnJob construct, and line 168 for creating the workflow using the CfnWorkflow construct. We use the CfnTrigger construct to stitch together multiple triggers to create the workflow. The AWS CDK L1 constructs expose all the available AWS CloudFormation resources and entities using methods from popular programing languages. This allows developers to use popular programing languages to provision resources instead of working with `JSON` or `YAML` files in AWS CloudFormation.

Refer to etl/infrastructure.py for additional details.

Walkthrough of the CI/CD pipeline

In this section, we walk through the various stages of the CI/CD pipeline. Refer to CDK Pipelines: Continuous delivery for AWS CDK applications for additional information.

- **Source** – This stage fetches the source of the AWS CDK app from the CodeCommit repo and triggers the pipeline every time a new commit is made.
- **Build** – This stage compiles the code (if necessary), runs the tests, and performs a `cdk synth`. The output of the step is a cloud assembly, which is used to perform all the actions in the rest of the pipeline. The `pytest` is run using the `amazon/aws-glue-libs:glue_libs_3.0.0_image_01` Docker image. This image comes with all the required libraries to run tests for AWS Glue version 3.0 jobs using a Docker container. Refer to Develop and test AWS Glue version 3.0 jobs locally using a Docker container for additional information.
- **UpdatePipeline** – This stage modifies the pipeline if necessary. For example, if the code is updated to add a new deployment stage to the pipeline or add a new asset to your application, the pipeline is automatically updated to reflect the changes.
- **Assets** – This stage prepares and publishes all AWS CDK assets of the app to Amazon S3 and all Docker images to Amazon Elastic Container Registry (Amazon ECR). When the AWS CDK deploys an app that references assets (either directly by the app code or through a library), the AWS CDK CLI first prepares and publishes the assets to Amazon S3 using a CodeBuild job. This AWS Glue solution creates four assets.
- **CDKGlueStage** – This stage deploys the assets to the AWS account. In this case, the pipeline deploys the AWS CDK template `etl/infrastructure.py` to create all the AWS Glue artifacts.

Code

The code can be found at AWS Samples on GitHub.

Prerequisites

This post assumes you have the following:

- An AWS account
- The AWS Command Line Interface (AWS CLI) installed
- The GIT Command Line Interface (GIT CLI) installed
- The AWS CDK Toolkit (cdk command) installed
- Python 3 installed
- Permissions to create AWS resources

Deploy the solution

To deploy the solution, complete the following steps:

- Download the source code from the AWS Samples GitHub repository to the client machine:

Bash
```bash
$ git clone git@github.com:aws-samples/aws-glue-cdk-cicd.git
```

- Create the virtual environment:

Bash
```bash
$ cd aws-glue-cdk-cicd
$ python3 -m venv .venv
```

This step creates a Python virtual environment specific to the project on the client machine. We use a virtual environment in order to isolate the Python environment for this project and not install software globally.

- Activate the virtual environment according to your OS:
    - On MacOS and Linux, use the following code:

Bash
```bash
$ source .venv/bin/activate
```

- On a Windows platform, use the following code:

```
% .venv\Scripts\activate.bat
```

After this step, the subsequent steps run within the bounds of the virtual environment on the client machine and interact with the AWS account as needed.

- Install the required dependencies described in requirements.txt to the virtual environment:

Bash
```bash
$ pip install -r requirements.txt
```

- Bootstrap the AWS CDK app:

Bash
```bash
cdk bootstrap
```

This step populates a given environment (AWS account ID and Region) with resources required by the AWS CDK to perform deployments into the environment. Refer to Bootstrapping for additional information. At this step, you can see the CloudFormation stack `CDKToolkit` on the AWS CloudFormation console.

- Synthesize the CloudFormation template for the specified stacks:

Bash
```bash
$ cdk synth # optional if not default (-c stage=default)
```

You can verify the CloudFormation templates to identify the resources to be deployed in the next step.

- Deploy the AWS resources (CI/CD pipeline and AWS Glue based data pipeline):

Bash
```bash
$ cdk deploy # optional if not default (-c stage=default)
```

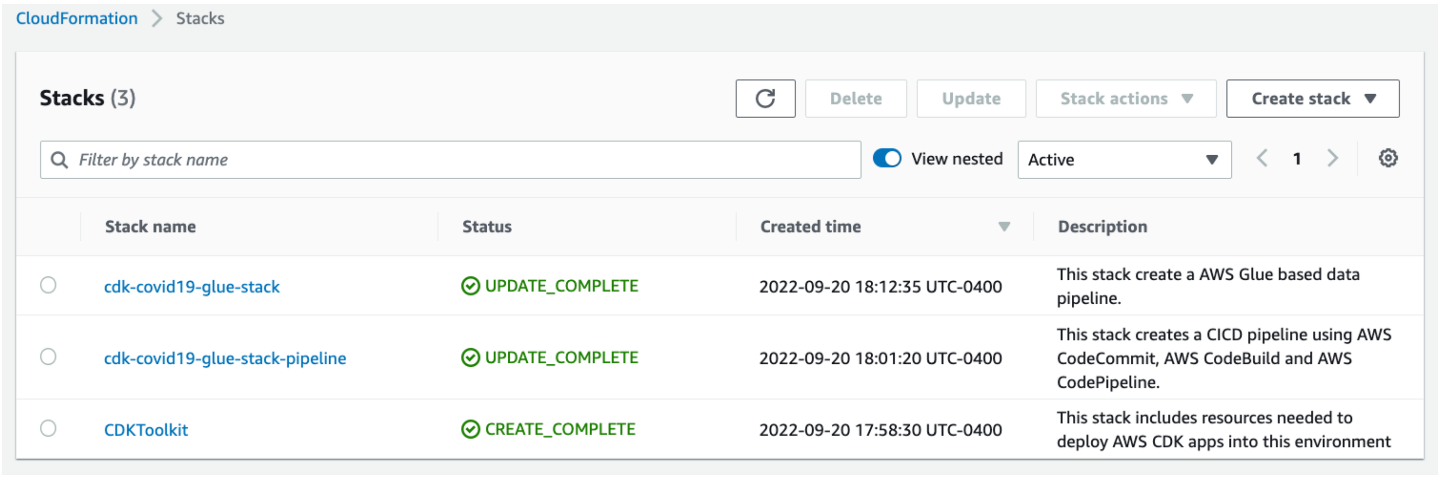
At this step, you can see CloudFormation stacks `cdk-covid19-glue-stack-pipeline` and `cdk-covid19-glue-stack` on the AWS CloudFormation console. The `cdk-covid19-glue-stack-pipeline` stack gets deployed first, which in turn deploys `cdk-covid19-glue-stack` to create the AWS Glue pipeline.

Verify the solution

When all the previous steps are complete, you can check for the created artifacts.

CloudFormation stacks

You can confirm the existence of the stacks on the AWS CloudFormation console. As shown in the following screenshot, the CloudFormation stacks have been created and deployed by `cdk bootstrap` and `cdk deploy`.

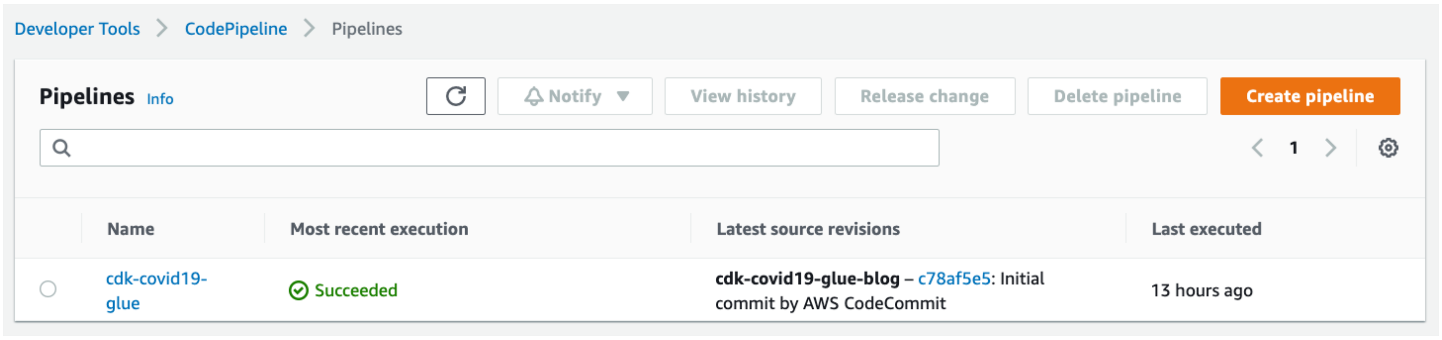


Stack name	Status	Created time	Description
cdk-covid19-glue-stack	UPDATE_COMPLETE	2022-09-20 18:12:35 UTC-0400	This stack create a AWS Glue based data pipeline.
cdk-covid19-glue-stack-pipeline	UPDATE_COMPLETE	2022-09-20 18:01:20 UTC-0400	This stack creates a CICD pipeline using AWS CodeCommit, AWS CodeBuild and AWS CodePipeline.
CDKToolkit	CREATE_COMPLETE	2022-09-20 17:58:30 UTC-0400	This stack includes resources needed to deploy AWS CDK apps into this environment

Figure 2 – AWS CloudFormation stacks

CodePipeline pipeline

On the CodePipeline console, check for the `cdk-covid19-glue` pipeline.

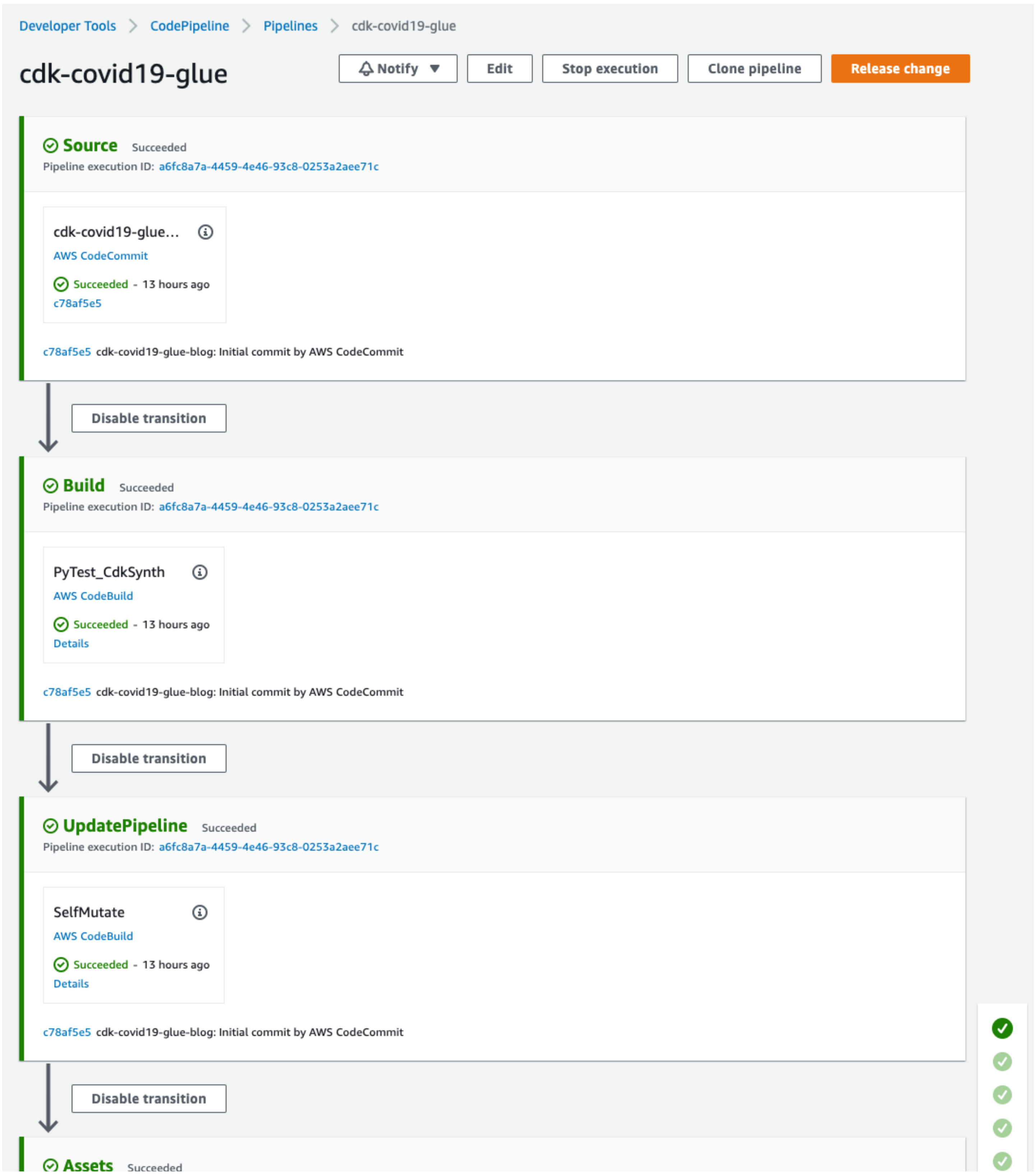

Developer Tools > CodePipeline > Pipelines

Pipelines Info

	Name	Most recent execution	Latest source revisions	Last executed
○	cdk-covid19-glue	✓ Succeeded	cdk-covid19-glue-blog – c78af5e5: Initial commit by AWS CodeCommit	13 hours ago

Figure 3 – AWS CodePipeline summary view

You can open the pipeline for a detailed view.


Developer Tools > CodePipeline > Pipelines > cdk-covid19-glue

cdk-covid19-glue

Source Succeeded
Pipeline execution ID: a6fc8a7a-4459-4e46-93c8-0253a2aee71c

cdk-covid19-glue...
AWS CodeCommit
Succeeded - 13 hours ago
c78af5e5

c78af5e5 cdk-covid19-glue-blog: Initial commit by AWS CodeCommit

Build Succeeded
Pipeline execution ID: a6fc8a7a-4459-4e46-93c8-0253a2aee71c

PyTest_CdkSynth
AWS CodeBuild
Succeeded - 13 hours ago
Details

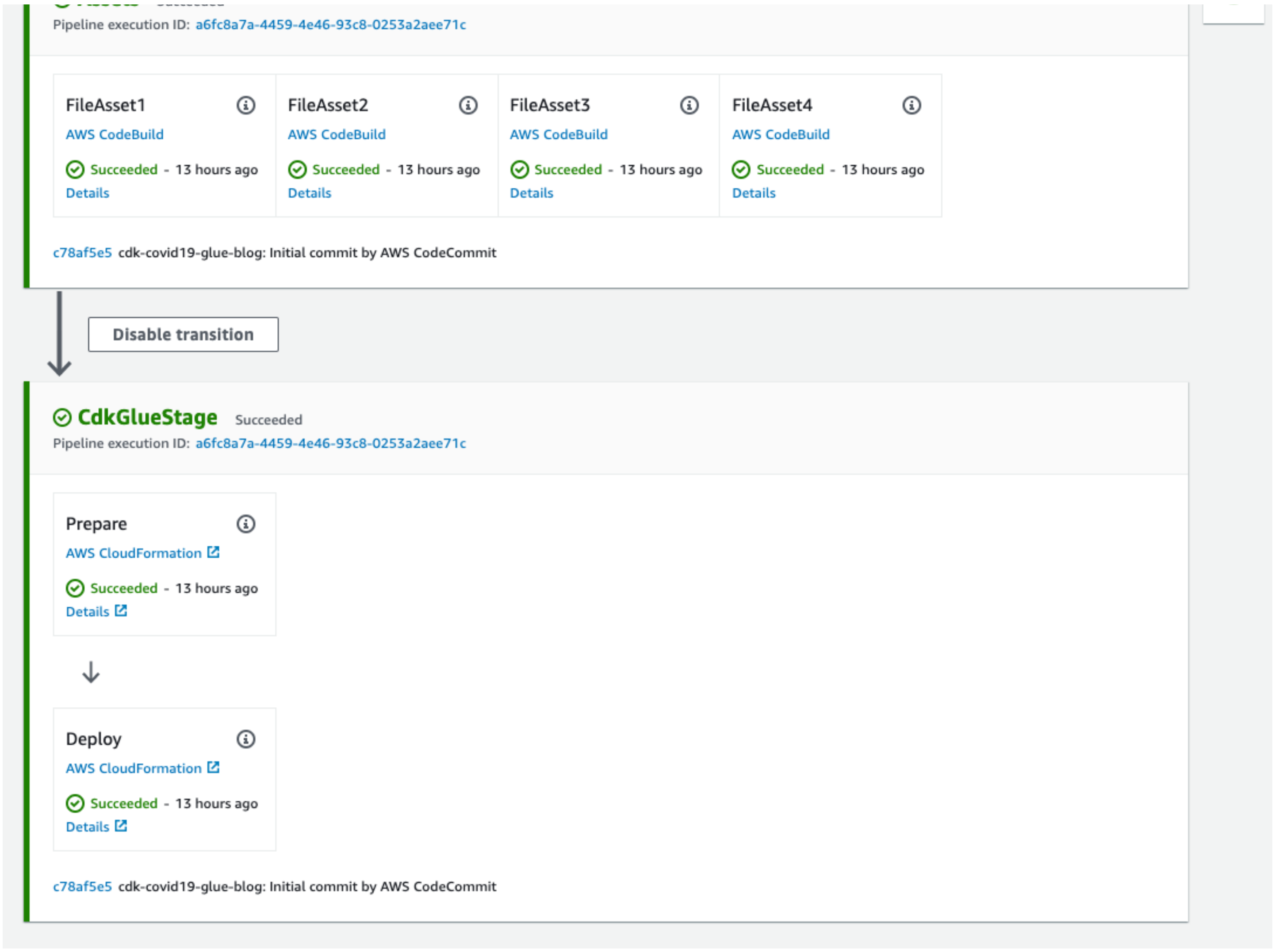
c78af5e5 cdk-covid19-glue-blog: Initial commit by AWS CodeCommit

UpdatePipeline Succeeded
Pipeline execution ID: a6fc8a7a-4459-4e46-93c8-0253a2aee71c

SelfMutate
AWS CodeBuild
Succeeded - 13 hours ago
Details

c78af5e5 cdk-covid19-glue-blog: Initial commit by AWS CodeCommit

Assets Succeeded


Pipeline execution ID: a6fc8a7a-4459-4e46-93c8-0253a2aee71c

FileAsset1	FileAsset2	FileAsset3	FileAsset4
AWS CodeBuild	AWS CodeBuild	AWS CodeBuild	AWS CodeBuild
Succeeded - 13 hours ago	Succeeded - 13 hours ago	Succeeded - 13 hours ago	Succeeded - 13 hours ago
Details	Details	Details	Details

c78af5e5 cdk-covid19-glue-blog: Initial commit by AWS CodeCommit

CdkGlueStage Succeeded
Pipeline execution ID: a6fc8a7a-4459-4e46-93c8-0253a2aee71c

Prepare
AWS CloudFormation
Succeeded - 13 hours ago
Details

Deploy
AWS CloudFormation
Succeeded - 13 hours ago
Details

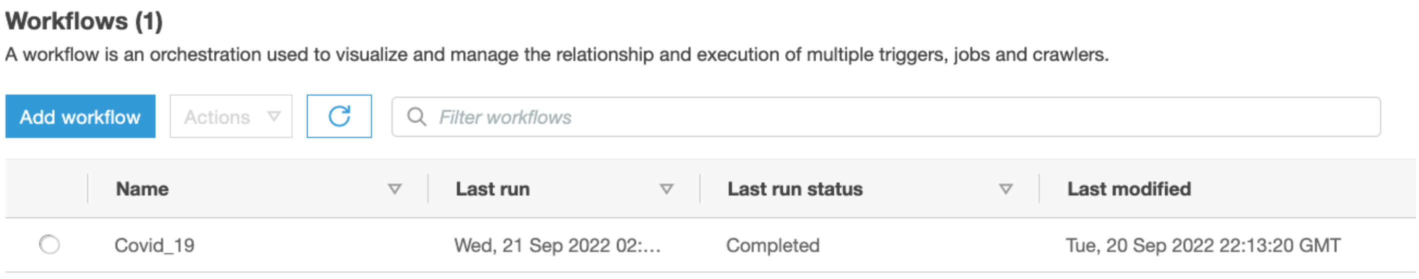
c78af5e5 cdk-covid19-glue-blog: Initial commit by AWS CodeCommit

Figure 4 – AWS CodePipeline detailed view

AWS Glue workflow

To validate the AWS Glue workflow and its components, complete the following steps:

- On the AWS Glue console, choose **Workflows** in the navigation pane.
- Confirm the presence of the `Covid_19` workflow.


Workflows (1)
A workflow is an orchestration used to visualize and manage the relationship and execution of multiple triggers, jobs and crawlers.

Name	Last run	Last run status	Last modified
Covid_19	Wed, 21 Sep 2022 02:...	Completed	Tue, 20 Sep 2022 22:13:20 GMT

Figure 5 – AWS Glue Workflow summary view

You can select the workflow for a detailed view.

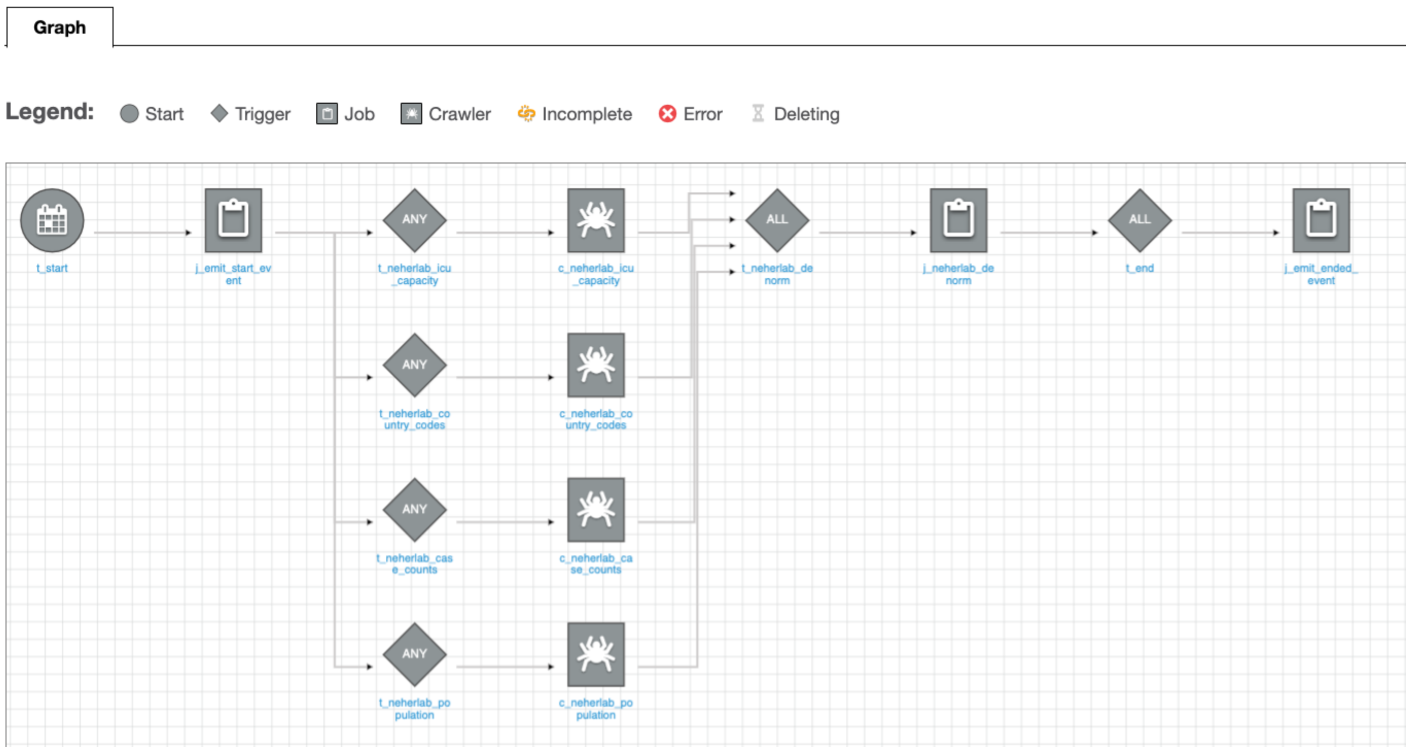
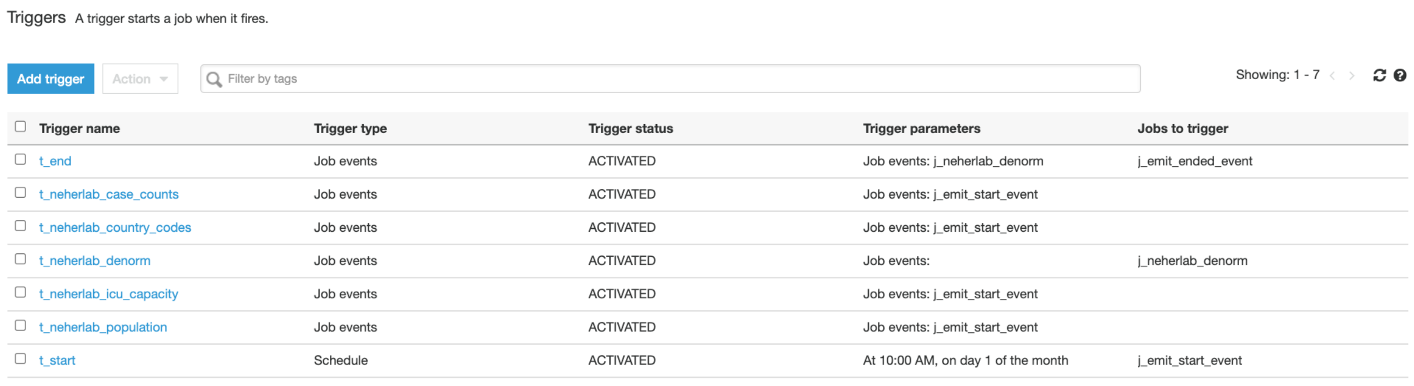


Figure 6 – AWS Glue Workflow detailed view

- Choose **Triggers** in the navigation pane and check for the presence of seven `t-*` triggers.



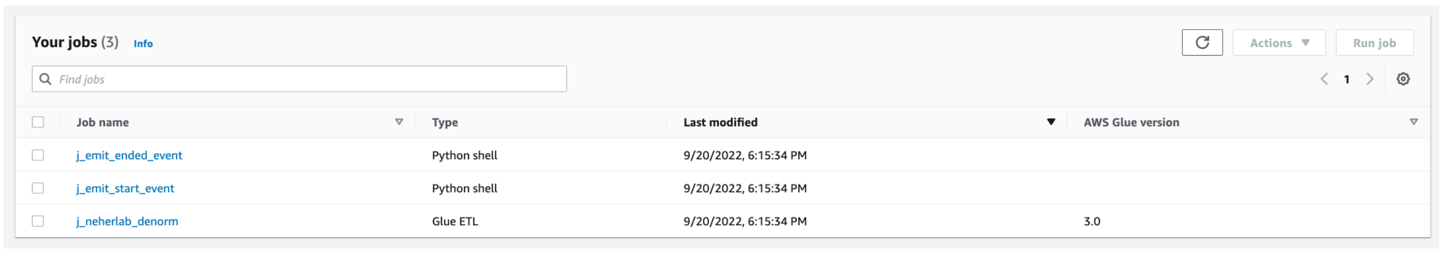
Triggers A trigger starts a job when it fires.

Add trigger | Action | Filter by tags | Showing: 1 - 7

Trigger name	Trigger type	Trigger status	Trigger parameters	Jobs to trigger
t_end	Job events	ACTIVATED	Job events: j_neherlab_denorm	j_emit_ended_event
t_neherlab_case_counts	Job events	ACTIVATED	Job events: j_emit_start_event	
t_neherlab_country_codes	Job events	ACTIVATED	Job events: j_emit_start_event	
t_neherlab_denorm	Job events	ACTIVATED	Job events:	j_neherlab_denorm
t_neherlab_icu_capacity	Job events	ACTIVATED	Job events: j_emit_start_event	
t_neherlab_population	Job events	ACTIVATED	Job events: j_emit_start_event	
t_start	Schedule	ACTIVATED	At 10:00 AM, on day 1 of the month	j_emit_start_event

Figure 7 – AWS Glue Triggers

- Choose **Jobs** in the navigation pane and check for the presence of three `j_*` jobs.



Your jobs (3) Info | Actions | Run job

Find jobs

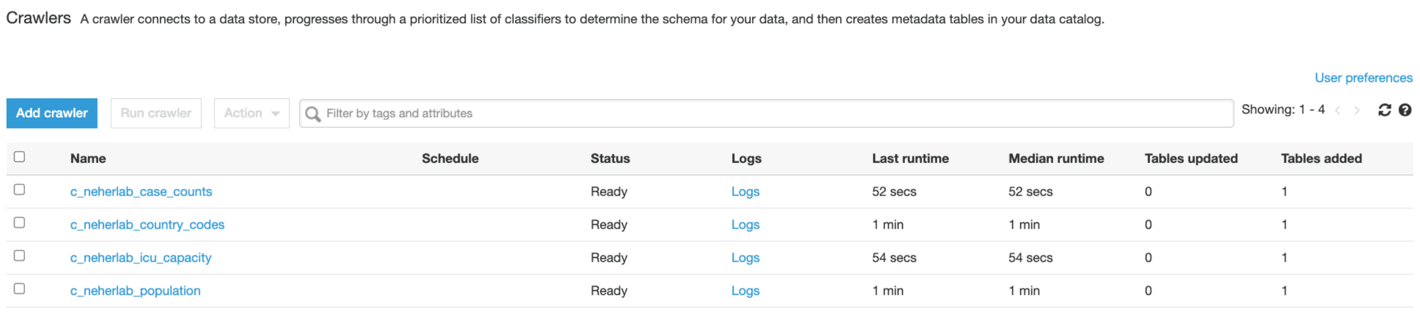
Job name	Type	Last modified	AWS Glue version
j_emit_ended_event	Python shell	9/20/2022, 6:15:34 PM	
j_emit_start_event	Python shell	9/20/2022, 6:15:34 PM	
j_neherlab_denorm	Glue ETL	9/20/2022, 6:15:34 PM	3.0

Figure 8 – AWS Glue Jobs

The jobs perform the following tasks:

- **etlScripts/j_emit_start_event.py** – A Python job that starts the workflow and creates the event
- **etlScripts/j_neherlab_denorm.py** – A Spark ETL job to transform the data and create a denormalized view by combining all the base data together in Parquet format
- **etlScripts/j_emit_ended_event.py** – A Python job that ends the workflow and creates the specific event

- Choose **Crawlers** in the navigation pane and check for the presence of five `neherlab-*` crawlers.


Crawlers A crawler connects to a data store, progresses through a prioritized list of classifiers to determine the schema for your data, and then creates metadata tables in your data catalog.

Name	Schedule	Status	Logs	Last runtime	Median runtime	Tables updated	Tables added
c_neherlab_case_counts		Ready	Logs	52 secs	52 secs	0	1
c_neherlab_country_codes		Ready	Logs	1 min	1 min	0	1
c_neherlab_icu_capacity		Ready	Logs	54 secs	54 secs	0	1
c_neherlab_population		Ready	Logs	1 min	1 min	0	1

Figure 9 – AWS Glue Crawlers

Execute the solution

- The solution creates a scheduled AWS Glue workflow which runs at 10:00 AM UTC on day 1 of every month. A scheduled workflow can also be triggered on-demand. For the purpose of this post, we will execute the workflow on-demand using the following command from the AWS CLI. If the workflow is successfully started, the command returns the `run ID`. For instructions on how to run and monitor a workflow in Amazon Glue, refer to Running and monitoring a workflow in Amazon Glue.

Bash
```bash
aws glue start-workflow-run --name Covid_19
```

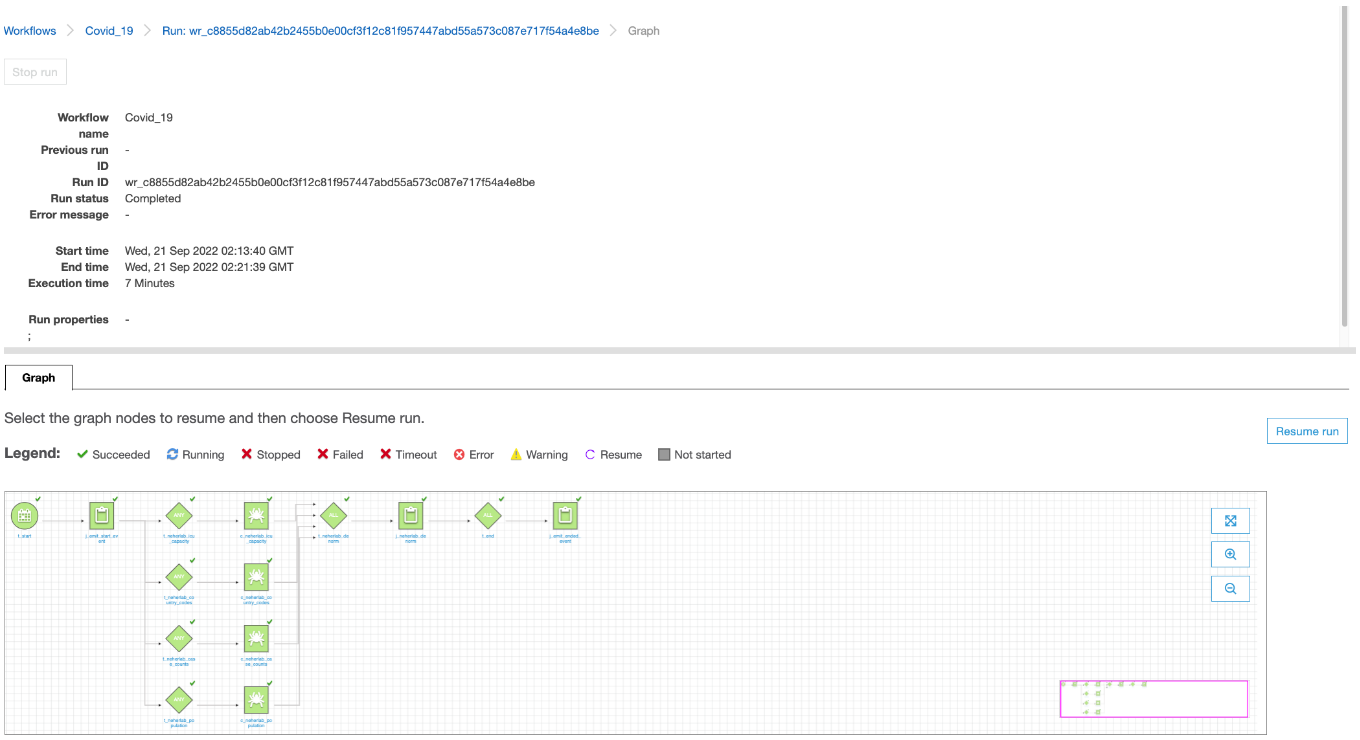
- You can verify the status of a workflow run by execution the following command from the AWS CLI. Please use the `run ID` returned from the above command. A successfully executed `Covid_19` workflow should return a value of `7` for `SucceededActions` and `0` for `FailedActions`.

Bash
```bash
aws glue get-workflow-run --name Covid_19 --run-id <run_ID>
```

- A sample output of the above command is provided below.

JSON
```json
{
"Run": {
"Name": "Covid_19",
"WorkflowRunId": "wr_c8855e82ab42b2455b0e00cf3f12c81f957447abd55a573c087e717f54a4e8be",
"WorkflowRunProperties": {},
"StartedOn": "2022-09-20T22:13:40.500000-04:00",
"CompletedOn": "2022-09-20T22:21:39.545000-04:00",
"Status": "COMPLETED",
"Statistics": {
"TotalActions": 7,
"TimeoutActions": 0,
"FailedActions": 0,
"StoppedActions": 0,
"SucceededActions": 7,
"RunningActions": 0
}
}
}
```

- (Optional) To verify the status of the workflow run using AWS Glue console, choose Workflows in the navigation pane, select the `Covid_19` workflow, click on the History tab, select the latest row and click on View run details. A successfully completed workflow is marked in green check marks. Please refer to the Legend section in the below screenshot for additional statuses.


Workflows > Covid_19 > Run: wr_c8855d82ab42b2455b0e00cf3f12c81f957447abd55a573c087e717f54a4e8be > Graph

Stop run

Workflow name	Covid_19
Previous run ID	-
Run ID	wr_c8855d82ab42b2455b0e00cf3f12c81f957447abd55a573c087e717f54a4e8be
Run status	Completed
Error message	-
Start time	Wed, 21 Sep 2022 02:13:40 GMT
End time	Wed, 21 Sep 2022 02:21:39 GMT
Execution time	7 Minutes
Run properties	-

;

Graph

Select the graph nodes to resume and then choose Resume run.

Resume run

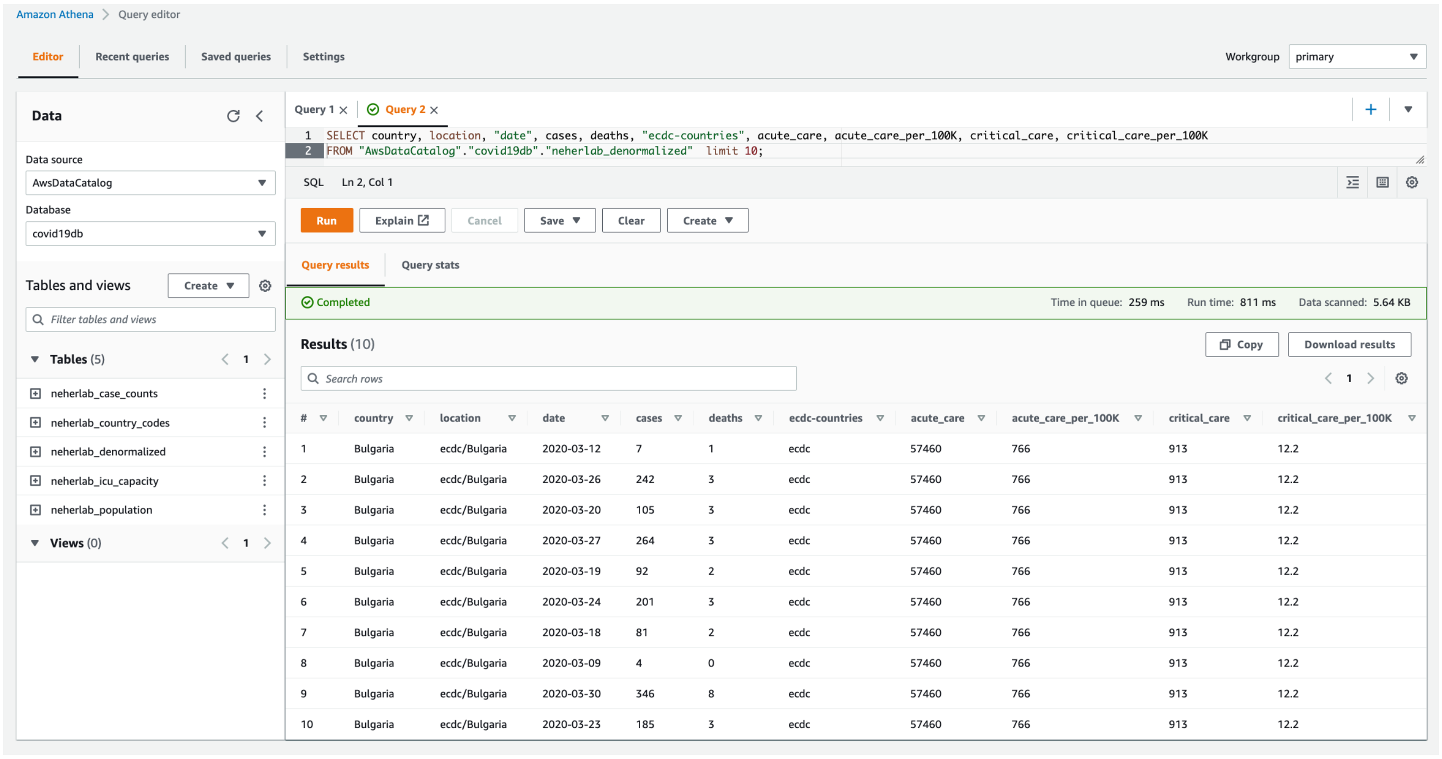
Legend: ✓ Succeeded ⟳ Running ✗ Stopped ✗ Failed ✗ Timeout ⊗ Error ⚠ Warning C Resume ■ Not started

Figure 10 – AWS Glue Workflow successful run

Check the output

- When the workflow is complete, navigate to the Athena console to check the successful creation and population of `neherlab_denormalized` table. You can run SQL queries against all 5 tables to check the data. A sample SQL query is provided below.

SQL
```sql
SELECT "country", "location", "date", "cases", "deaths", "ecdc-countries",
        "acute_care", "acute_care_per_100K", "critical_care", "critical_care_per_100K"
FROM "AwsDataCatalog"."covid19db"."neherlab_denormalized"
limit 10;
```



```
SELECT country, location, "date", cases, deaths, "ecdc-countries", acute_care, acute_care_per_100K, critical_care, critical_care_per_100K
FROM "AwsDataCatalog"."covid19db"."neherlab_denormalized"  limit 10;
```

Completed   Time in queue: 259 ms   Run time: 811 ms   Data scanned: 5.64 KB

Results (10)

#	country	location	date	cases	deaths	ecdc-countries	acute_care	acute_care_per_100K	critical_care	critical_care_per_100K
1	Bulgaria	ecdc/Bulgaria	2020-03-12	7	1	ecdc	57460	766	913	12.2
2	Bulgaria	ecdc/Bulgaria	2020-03-26	242	3	ecdc	57460	766	913	12.2
3	Bulgaria	ecdc/Bulgaria	2020-03-20	105	3	ecdc	57460	766	913	12.2
4	Bulgaria	ecdc/Bulgaria	2020-03-27	264	3	ecdc	57460	766	913	12.2
5	Bulgaria	ecdc/Bulgaria	2020-03-19	92	2	ecdc	57460	766	913	12.2
6	Bulgaria	ecdc/Bulgaria	2020-03-24	201	3	ecdc	57460	766	913	12.2
7	Bulgaria	ecdc/Bulgaria	2020-03-18	81	2	ecdc	57460	766	913	12.2
8	Bulgaria	ecdc/Bulgaria	2020-03-09	4	0	ecdc	57460	766	913	12.2
9	Bulgaria	ecdc/Bulgaria	2020-03-30	346	8	ecdc	57460	766	913	12.2
10	Bulgaria	ecdc/Bulgaria	2020-03-23	185	3	ecdc	57460	766	913	12.2

Figure 10 – Amazon Athena

Clean up

To clean up the resources created in this post, delete the AWS CloudFormation stacks in the following order:

- `cdk-covid19-glue-stack`
- `cdk-covid19-glue-stack-pipeline`
- `CDKToolkit`

Then delete all associated S3 buckets:

- `cdk-covid19-glue-stack-p-pipelineartifactsbucketa-*`
- `cdk-*-assets-<AWS_ACCOUNT_ID>-<AWS_REGION>`
- `covid19-glue-config-<AWS_ACCOUNT_ID>-<AWS_REGION>`
- `neherlab-denormalized-dataset-<AWS_ACCOUNT_ID>-<AWS_REGION>`

Conclusion

In this post, we demonstrated a step-by-step guide to define, test, provision, and manage changes to an AWS Glue based ETL solution using the AWS CDK. We used an AWS Glue example, which has all the components to build a complex ETL solution, and demonstrated how to integrate individual AWS Glue components into a frictionless CI/CD pipeline. We encourage you to use this post and associated code as the starting point to build your own CI/CD pipelines for AWS Glue based ETL solutions.

About the authors

Puneet Babbar is a Data Architect at AWS, specialized in big data and AI/ML. He is passionate about building products, in particular products that help customers get more out of their data. During his spare time, he loves to spend time with his family and engage in outdoor activities including hiking, running, and skating. Connect with him on LinkedIn.

Suvojit Dasgupta is a Sr. Lakehouse Architect at Amazon Web Services. He works with customers to design and build data solutions on AWS.

Justin Kuskowski is a Principal DevOps Consultant at Amazon Web Services. He works directly with AWS customers to provide guidance and technical assistance around improving their value stream, which ultimately reduces product time to market and leads to a better customer experience. Outside of work, Justin enjoys traveling the country to watch his two kids play soccer and spending time with his family and friends wake surfing on the lakes in Michigan.

TAGS: AWS CDK, AWS CloudFormation, AWS CodeBuild, AWS CodeCommit, AWS CodePipeline, AWS Glue, CI/CD, DataOps, DevOps

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