

# AWS – Amazon Quantum Ledger Database (QLDB) – Hands-on guide/ Case Study/ Use Case.

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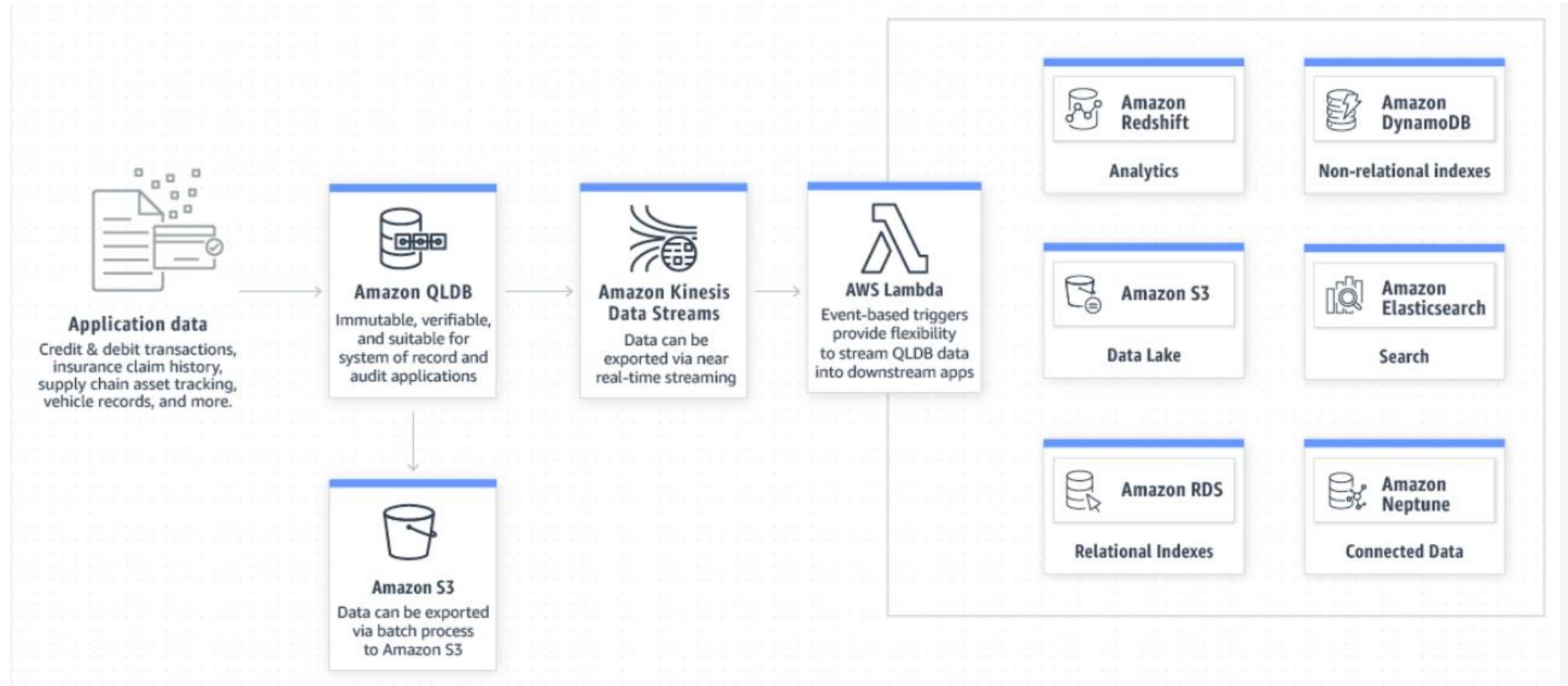
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# QLDB Features:

- **Immutable and Transparent:** Append-only journal and Easy access to change history.
- **Cryptographically Verifiable:** Allows to verify the changes, through the History called as Digest.
- **Serverless:** Easy to Scale, Easy setup and Easy Monitoring and metrics.
- **Easy to Use:** Uses, PartiQL as SQL for querying. Which is a Document-oriented data model with the Transactional Consistency and ACID Semantics.
- **Streaming Capability:**

# QLDB Architecture: Streaming Capability.



# Details of the Case Study:

1. An Insurance company.
2. Schema with three tables (Customers, Policies and Claims), indexes and with sample data.
3. Claims table will be having multiple Claims. Chosen **Claim904**, for our case study. Necessary update statements will be ran on the Claim904 of the samples to create the History.
4. Scripts are available in my GitHub branch,  
<https://github.com/subbugh/aws-qldb>

# Steps, Hands-on activity:

1. Create a Ledger.
2. Create Tables.
3. Create Indexes on the tables.
4. Insert Sample data.
5. Query the tables on the ledger.
6. Modify the data on the Ledger.
7. Download a couple of Digest's after set of Modify transactions.
8. Verify the blockAddress's of the transactions of a document in the Ledger.

# Step-1: Go to QLDB AWS services:

The screenshot shows the AWS Management Console search interface. The URL in the address bar is `console.aws.amazon.com/qldb/home?region=us-east-1#first-run`. The search bar at the top contains the query `qldb`. The results list `Amazon QLDB` as the top result, described as a "Fully managed ledger database". The sidebar on the left includes sections for **Favorites** (Resource Groups & ...), **Recently visited** (Amazon QLDB, EC2, Console Home, Secrets Manager, CloudFormation, VPC, Cloud9, IAM, EMR, Data Pipeline, Elasticsearch Service, Billing), and **Storage** (S3, EFS, FSx). The main content area displays a grid of AWS services, with `Amazon QLDB` highlighted.

Category	Service	Description
Customer Enablement	EC2	AWS RoboMaker
	Lightsail	Amazon SageMaker
	Lambda	Amazon Augmented AI
	Batch	Amazon CodeGuru
	Elastic Beanstalk	Amazon Comprehend
	Serverless Application ...	Amazon Forecast
	AWS Outposts	Amazon Fraud Detector
	EC2 Image Builder	Amazon Kendra
	S3	Amazon Lex
	EFS	Amazon Personalize
Blockchain	Customer Enablement	Amazon Managed Bloc...
	AWS IQ	Amazon Polly
	Support	Amazon Rekognition
	Managed Services	Amazon Textract
	Amazon Managed Bloc...	Amazon Transcribe
	Amazon Managed Bloc...	Amazon Lex
	Amazon Managed Bloc...	Amazon Personalize
	Amazon Managed Bloc...	Amazon Polly
	Amazon Managed Bloc...	Amazon Rekognition
	Amazon Managed Bloc...	Amazon Textract
Application Integration	Amazon Managed Bloc...	Amazon Transcribe
	Amazon Managed Bloc...	Amazon Lex
	Amazon Managed Bloc...	Amazon Personalize
	Amazon Managed Bloc...	Amazon Polly
	Amazon Managed Bloc...	Amazon Rekognition
	Amazon Managed Bloc...	Amazon Textract
	Amazon Managed Bloc...	Amazon Transcribe
	Amazon Managed Bloc...	Amazon Lex
	Amazon Managed Bloc...	Amazon Personalize
	Amazon Managed Bloc...	Amazon Polly
Step Functions	Amazon Managed Bloc...	Amazon Rekognition
	Amazon Managed Bloc...	Amazon Textract
	Amazon Managed Bloc...	Amazon Transcribe
	Amazon Managed Bloc...	Amazon Lex
	Amazon Managed Bloc...	Amazon Personalize
	Amazon Managed Bloc...	Amazon Polly
	Amazon Managed Bloc...	Amazon Rekognition
	Amazon Managed Bloc...	Amazon Textract
	Amazon Managed Bloc...	Amazon Transcribe
	Amazon Managed Bloc...	Amazon Lex
Amazon AppFlow	Amazon Managed Bloc...	Amazon Personalize
	Amazon Managed Bloc...	Amazon Polly
	Amazon Managed Bloc...	Amazon Rekognition
	Amazon Managed Bloc...	Amazon Textract
	Amazon Managed Bloc...	Amazon Transcribe
	Amazon Managed Bloc...	Amazon Lex
	Amazon Managed Bloc...	Amazon Personalize
	Amazon Managed Bloc...	Amazon Polly
	Amazon Managed Bloc...	Amazon Rekognition
	Amazon Managed Bloc...	Amazon Textract
Amazon EventBridge	Amazon Managed Bloc...	Amazon Transcribe
	Amazon Managed Bloc...	Amazon Lex
	Amazon Managed Bloc...	Amazon Personalize
	Amazon Managed Bloc...	Amazon Polly
	Amazon Managed Bloc...	Amazon Rekognition
	Amazon Managed Bloc...	Amazon Textract
	Amazon Managed Bloc...	Amazon Transcribe
	Amazon Managed Bloc...	Amazon Lex
	Amazon Managed Bloc...	Amazon Personalize
	Amazon Managed Bloc...	Amazon Polly
Amazon MQ	Amazon Managed Bloc...	Amazon Rekognition
	Amazon Managed Bloc...	Amazon Textract
	Amazon Managed Bloc...	Amazon Transcribe
	Amazon Managed Bloc...	Amazon Lex
	Amazon Managed Bloc...	Amazon Personalize
	Amazon Managed Bloc...	Amazon Polly
	Amazon Managed Bloc...	Amazon Rekognition
	Amazon Managed Bloc...	Amazon Textract
	Amazon Managed Bloc...	Amazon Transcribe
	Amazon Managed Bloc...	Amazon Lex
Simple Notification Ser...	Amazon Managed Bloc...	Amazon Personalize
	Amazon Managed Bloc...	Amazon Polly
	Amazon Managed Bloc...	Amazon Rekognition
	Amazon Managed Bloc...	Amazon Textract
	Amazon Managed Bloc...	Amazon Transcribe
	Amazon Managed Bloc...	Amazon Lex
	Amazon Managed Bloc...	Amazon Personalize
	Amazon Managed Bloc...	Amazon Polly
	Amazon Managed Bloc...	Amazon Rekognition
	Amazon Managed Bloc...	Amazon Textract
Simple Queue Service	Amazon Managed Bloc...	Amazon Transcribe
	Amazon Managed Bloc...	Amazon Lex
	Amazon Managed Bloc...	Amazon Personalize
	Amazon Managed Bloc...	Amazon Polly
	Amazon Managed Bloc...	Amazon Rekognition
	Amazon Managed Bloc...	Amazon Textract
	Amazon Managed Bloc...	Amazon Transcribe
	Amazon Managed Bloc...	Amazon Lex
	Amazon Managed Bloc...	Amazon Personalize
	Amazon Managed Bloc...	Amazon Polly
AWS Cost Explorer	Amazon Managed Bloc...	Amazon Rekognition
	Amazon Managed Bloc...	Amazon Textract
	Amazon Managed Bloc...	Amazon Transcribe
	Amazon Managed Bloc...	Amazon Lex
	Amazon Managed Bloc...	Amazon Personalize
	Amazon Managed Bloc...	Amazon Polly
	Amazon Managed Bloc...	Amazon Rekognition
	Amazon Managed Bloc...	Amazon Textract
	Amazon Managed Bloc...	Amazon Transcribe
	Amazon Managed Bloc...	Amazon Lex

# Create Ledger:

The screenshot shows the Amazon QLDB console interface. The top navigation bar includes links for Services, SubbuAWSCG, N. Virginia, and Support. The main content area displays a list of ledgers under the heading "Ledgers (1)". A search bar labeled "Search ledgers" is present. The table lists one ledger entry:

Name	Status	Creation time (UTC)
QLDBLedger	Active	7/28/2020, 11:43:24 AM

Actions available for each ledger include "Query ledger", "Get digest", "Delete", and "Create ledger".

# Fill in the details:

The screenshot shows the AWS QLDB console interface for creating a new ledger. The URL in the browser is `console.aws.amazon.com/qldb/home?region=us-east-1#create-ledger`. The top navigation bar includes the AWS logo, Services dropdown, SubbuAWSCG profile, N. Virginia region, and Support dropdown. The left sidebar shows the navigation path: Amazon QLDB > Ledgers > Create ledger. The main content area is titled "Create ledger" and contains a "Ledger information" section. In the "Ledger name" field, the value "SubbuAWSQLDBInsurance" is entered. Below the input field is a list of validation rules:

- Must contain from 1 to 32 alphanumeric characters or hyphens.
- Must contain at least one non-numeric character.
- First and last characters must be a letter or number.
- Must not contain two consecutive hyphens.
- Must not already exist in the current AWS account and Region.

# Ledger created:

The screenshot shows the AWS QLDB service page in the AWS Management Console. The URL in the browser is `console.aws.amazon.com/qldb/home?region=us-east-1#ledger-list`. The top navigation bar includes the AWS logo, Services dropdown, SubbuAWSCG profile, N. Virginia region, and Support dropdown. On the left, a sidebar menu lists 'Getting started', 'Ledgers' (which is selected and highlighted in orange), 'Query editor', 'Streams', 'Export', and 'Verification'. The main content area has a green success banner at the top stating 'Successfully created ledger SubbuAWSQLDBInsurance.' with a link to 'Getting started'. Below the banner, the breadcrumb navigation shows 'Amazon QLDB > Ledgers'. A table titled 'Ledgers (2)' lists two entries: 'SubbuAWSQLDB' (Active, created 9/29/2020, 5:21:01 AM) and 'SubbuAWSQLDBInsurance' (Active, created 9/30/2020, 7:17:31 AM). The table includes columns for Name, Status, and Creation time (UTC), and features buttons for Create ledger, Query ledger, Get digest, and Delete.

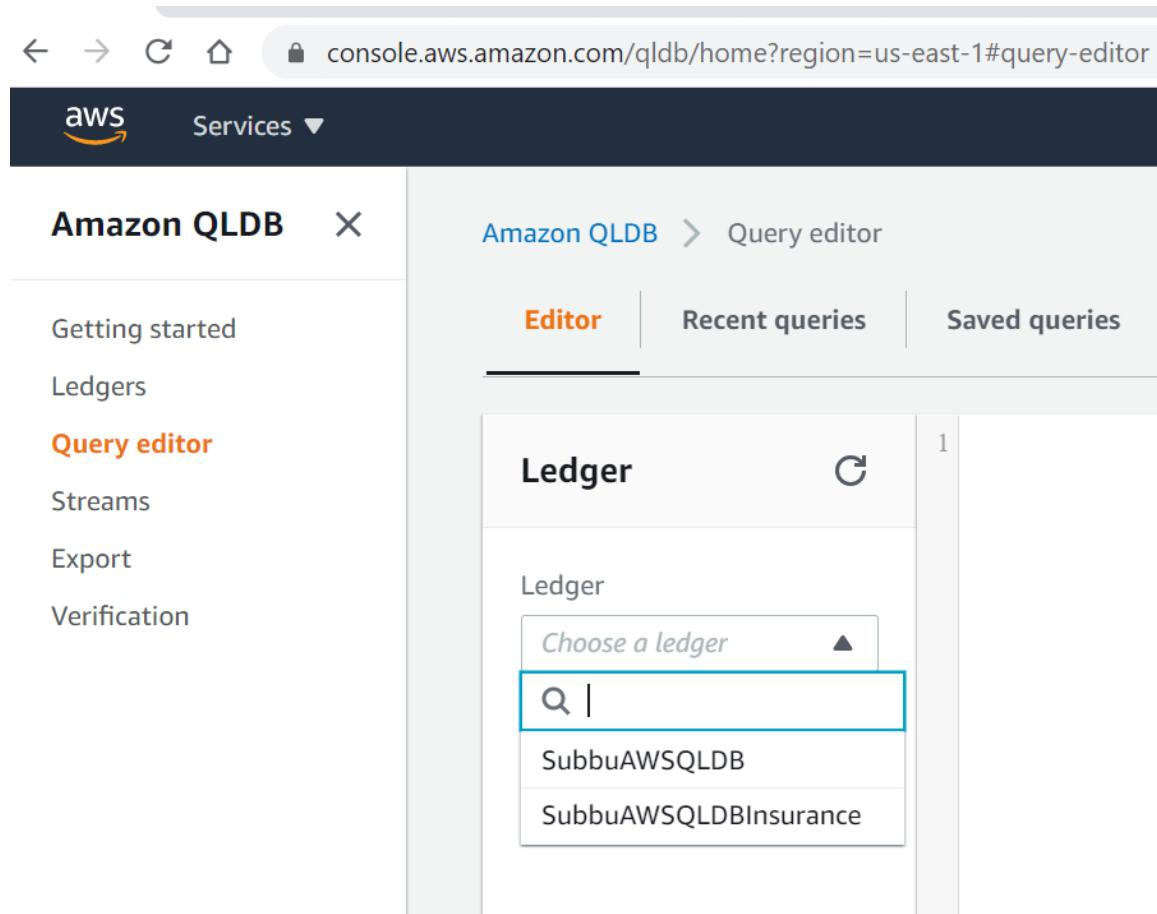
Name	Status	Creation time (UTC)
SubbuAWSQLDB	Active	9/29/2020, 5:21:01 AM
SubbuAWSQLDBInsurance	Active	9/30/2020, 7:17:31 AM

# View of the Created Ledger:

The screenshot shows the AWS QLDB console interface. The top navigation bar includes links for Services, SubbuAWSCG, N. Virginia, and Support. On the left, a sidebar menu lists options: Getting started, **Ledgers** (which is selected and highlighted in orange), Query editor, Streams, Export, and Verification. The main content area displays the details for a ledger named "SubbuAWSQLDBInsurance". The breadcrumb navigation shows "Amazon QLDB > Ledgers > SubbuAWSQLDBInsurance". The page title is "SubbuAWSQLDBInsurance". On the right, there are three buttons: "Query ledger", "Get digest", and "Delete". The "Summary" section contains the following information:

ID	Status	Region
SubbuAWSQLDBInsurance	Active	us-east-1
Journal storage size	Creation time (UTC)	Amazon Resource Name (ARN)
0 Bytes	9/30/2020, 7:17:31 AM	<a href="#">arn:aws:qldb:us-east-1:112253241392:ledger/SubbuAWSQLDBInsurance</a>
Index storage size		
0 Bytes		

# Step-2: Go to Query Editor – choose the Ledger:



# Query executed, Customers table is created:

The screenshot shows the Amazon QLDB Query editor interface. On the left, a sidebar menu includes options like Getting started, Ledgers, Query editor (which is selected and highlighted in orange), Streams, Export, and Verification. The main area displays a ledger named "SubbuAWSQLDBInsur...". Under the ledger, a table named "Customers" is listed. A query history panel on the right shows a single entry: "create table Customers". Below the ledger details, there are "Run", "Save", and "Clear" buttons. The "Output" section shows the result of the query, which is a table with one row. The table has two columns: "tableId" and a value "FskdyzMuOqpGdRR8gqlkT4". There is also a "Rows (1)" summary and a "Search rows" input field.

Feedback English (US) ▾

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# Query executed, Policies table is created:

The screenshot shows the Amazon QLDB Query editor interface. On the left, a sidebar menu includes options like Getting started, Ledgers, Query editor (which is selected), Streams, Export, and Verification. The main area displays a ledger named "SubbuAWSQLDBInsur...". Under "Ledger details", there are links for "Customers" and "Policies". The "Editor" tab is active, showing a list of recent queries:

```
1 create table Customers
2
3 create table Policies
4
5 create table Claims
```

Below the query list are "Run", "Save", and "Clear" buttons. The "Output" tab is selected, showing the results of the last query. The results table has one row, labeled "Rows (1)", with a "tableId" column containing the value "3WF7qM0HdI4CqALnEN3Xfa".

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# Query executed, Claims table is created:

The screenshot shows the Amazon QLDB Query editor interface. On the left, a sidebar menu includes options like Getting started, Ledgers, Query editor (which is selected and highlighted in orange), Streams, Export, and Verification. The main area displays a ledger named "SubbuAWSQLDBInsur...". Under "Ledger details", there are three expandable sections: Claims, Customers, and Policies. In the center, the "Editor" tab is active, showing five numbered SQL statements in the query pane:

- 1 create table Customers
- 2
- 3 create table Policies
- 4
- 5 create table Claims

Below the queries are "Run", "Save", and "Clear" buttons. The "Output" tab is selected, showing the results of the last query. The results table has one row, labeled "Rows (1)", with a "Search rows" input field and a "View as Ion" button. The single row contains two columns: "tableId" and its value, which is a string of characters: "6Ltw3xRZct1Hw2aDo5P6n5".

# Step-3: Create Indexes on all the tables:

The screenshot shows the AWS QLDB Query Editor interface. The left sidebar lists navigation options: Getting started, Ledgers, **Query editor**, Streams, Export, and Verification. The main area has tabs for Editor, Recent queries, and Saved queries, with the Editor tab selected. The Editor panel displays a ledger named "SubbuAWSQLDBInsu...". Under "Ledger details", there are links for Claims, Customers, and Policies. To the right, a query history window shows the following SQL statements:

```
1 create table Customers
2
3 create table Policies
4
5 create table Claims
6
7 create index on Customers (CustomerID)
8
9 create index on Policies (PolicyID)
10
11 create index on Claims (ClaimID)
```

At the bottom of the editor panel are buttons for Run, Save, and Clear.

# Create Index on the Customers table:

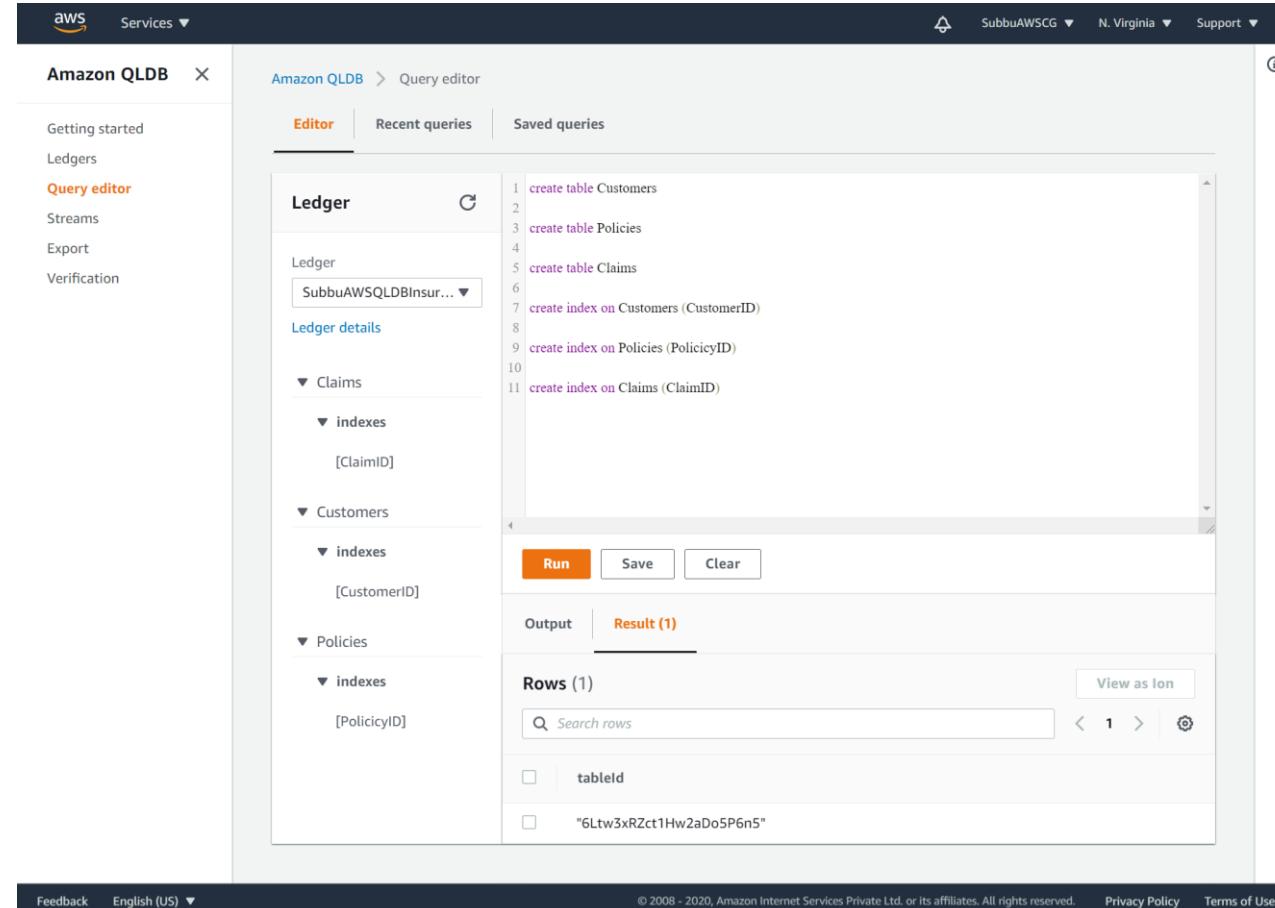
The screenshot shows the AWS Lambda interface with the following details:

- Left Sidebar:** Shows the "Amazon QLDB" service with options like "Getting started", "Ledgers", "Query editor" (which is selected), "Streams", "Export", and "Verification".
- Top Bar:** Displays the AWS logo, "Services ▾", user name "SubbuAWSCG", region "N. Virginia", and "Support ▾".
- Central Area:**
  - Ledger:** SubbuAWSQLDBInsur... (selected)
  - Ledger details:** Shows sections for "Claims", "Customers" (selected), and "Policies".
  - Indexes:** Under "Customers", there is an entry for "[CustomerID]".
- Query Editor:** The main area contains the following SQL-like code:

```
1 create table Customers
2
3 create table Policies
4
5 create table Claims
6
7 create index on Customers (CustomerID)
8
9 create index on Policies (PolicyID)
10
11 create index on Claims (ClaimID)
```
- Buttons:** "Run", "Save", and "Clear".
- Output:** Shows "Result (1)" and "Rows (1)".

tableId
"FskdyzMuOqpGdRR8gqlkT4"
- Bottom Bar:** Includes "Feedback", "English (US) ▾", copyright information ("© 2008 - 2020, Amazon Internet Services Private Ltd, or its affiliates. All rights reserved."), and links to "Privacy Policy" and "Terms of Use".

Create Index on the Policies table as below:  
Similarly create the index on the Claims table.

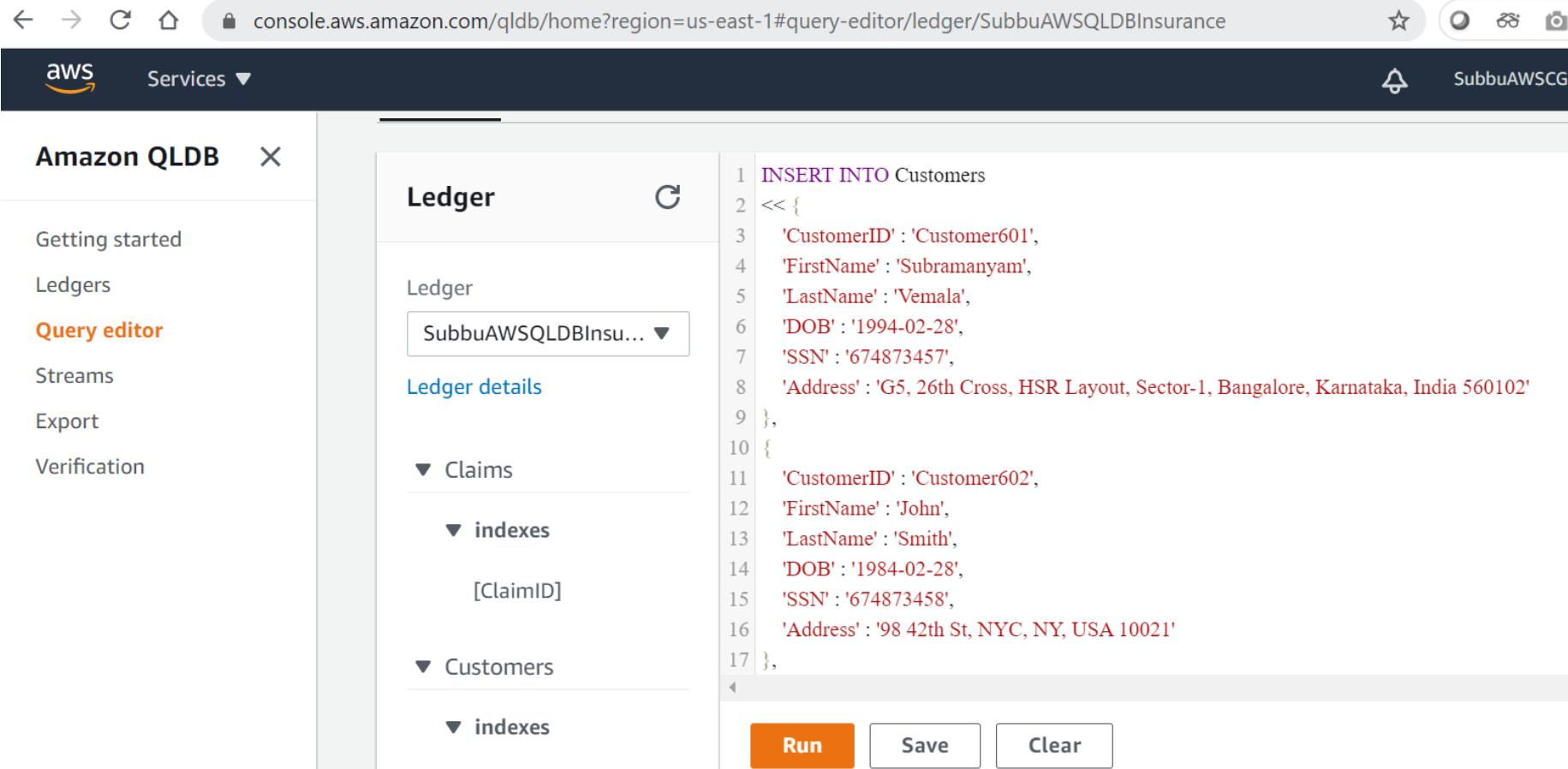


The screenshot shows the Amazon QLDB Query editor interface. The left sidebar lists navigation options: Getting started, Ledgers, Query editor (which is selected), Streams, Export, and Verification. The main area displays a hierarchical tree structure under the 'Ledger' node, showing 'Claims', 'Customers', and 'Policies' tables, each with an 'indexes' node. To the right of the tree, a code editor window contains the following SQL queries:

```
1 create table Customers
2
3 create table Policies
4
5 create table Claims
6
7 create index on Customers (CustomerID)
8
9 create index on Policies (PolicyID)
10
11 create index on Claims (ClaimID)
```

Below the code editor are 'Run', 'Save', and 'Clear' buttons. The 'Output' tab is selected, showing the results of the last query: 'Rows (1)'. The result table has two columns: 'tableId' and a single row with value '"6Ltw3xRZct1Hw2aDo5P6n5"'. There is also a 'Result (1)' tab and a 'View as Ion' button.

**Step-4:** Insert the sample data on all the three tables. Scripts are pushed in my github branch  
[https://github.com/subbugh/aws-qldb:](https://github.com/subbugh/aws-qldb)



The screenshot shows the AWS QLDB Query Editor interface. The left sidebar lists navigation options: Getting started, Ledgers, Query editor (which is selected), Streams, Export, and Verification. The main area displays a ledger named "SubbuAWSQLDBInsurance". The "Customers" table is selected, showing its schema and data. A query script is pasted into the editor:

```
1 INSERT INTO Customers
2 << {
3   'CustomerID' : 'Customer601',
4   'FirstName' : 'Subramanyam',
5   'LastName' : 'Vemala',
6   'DOB' : '1994-02-28',
7   'SSN' : '674873457',
8   'Address' : 'G5, 26th Cross, HSR Layout, Sector-1, Bangalore, Karnataka, India 560102'
9 },
10 {
11   'CustomerID' : 'Customer602',
12   'FirstName' : 'John',
13   'LastName' : 'Smith',
14   'DOB' : '1984-02-28',
15   'SSN' : '674873458',
16   'Address' : '98 42th St, NYC, NY, USA 10021'
17 }
```

At the bottom of the editor are three buttons: Run, Save, and Clear.

# Sample data is inserted into the Customers table and three DocumentID's are created:

The screenshot shows the Amazon QLDB Query editor interface. On the left, the navigation pane lists 'Getting started', 'Ledgers', 'Query editor' (which is selected), 'Streams', 'Export', and 'Verification'. The main area has tabs for 'Editor', 'Recent queries', and 'Saved queries'. The 'Editor' tab is active, displaying a ledger named 'SubbuAWSQLDBinsur...'. The ledger details section shows 'Claims', 'indexes', and 'Customers'. Under 'Customers', there is an 'indexes' section with '[CustomerID]' and a 'Policies' section with '[PolicyID]'. The query editor itself contains the following SQL code:

```
1 INSERT INTO Customers
2 << {
3   'CustomerID' : 'Customer601',
4   'FirstName' : 'Subramanyam',
5   'LastName' : 'Venala',
6   'DOB' : '1994-02-28',
7   'SSN' : '674873457',
8   'Address' : 'G5, 26th Cross, HSR Layout, Sector-1, Bangalore, Karnataka, India 560102'
9 },
10 [
11   'CustomerID' : 'Customer602',
12   'FirstName' : 'John',
13   'LastName' : 'Smith',
14   'DOB' : '1984-02-28',
15   'SSN' : '674873458',
16   'Address' : '98 42th St, NYC, NY, USA 10021'
17 ],
18 }
```

Below the code are buttons for 'Run', 'Save', and 'Clear'. The results section shows 'Output' and 'Result (3)'. The 'Rows (3)' table displays three rows with checkboxes and document IDs:

documentId
"HrCsJ82PpKB7EKIHR57V2"
"1SUXJuuG5P98BojwXLFUwZ"
"EAIAxXn9527POhKb94OK6"

At the bottom, there are links for 'Feedback', 'English (US)', 'Privacy Policy', and 'Terms of Use'.

# Sample data is inserted into the Policies table and relevant DocumentID's are created:

The screenshot shows the AWS QLDB Query editor interface. On the left, a sidebar lists navigation options: Getting started, Ledgers, Query editor (which is selected), Streams, Export, and Verification. The main area has tabs for Editor, Recent queries, and Saved queries. The Editor tab is active, displaying a query window with the following content:

```
1 INSERT INTO Policies
2 << {
3   'CustomerID' : 'Customer601',
4   'PolicyID' : 'Policy201',
5   'PolicyType' : 'Auto',
6   'StartDate' : '1992-03-12',
7   'EndDate' : '2019-10-7'
8 },
9 {
10  'CustomerID' : 'Customer602',
11  'PolicyID' : 'Policy202',
12  'PolicyType' : 'Life',
13  'StartDate' : '2001-10-1',
14  'EndDate' : '2019-10-7'
15 },
16 {
17  'CustomerID' : 'Customer602',
```

Below the query window are Run, Save, and Clear buttons. The Output tab is selected, showing the Result (7) section with a table titled Rows (7). The table contains a single column labeled documentid, listing seven generated DocumentIDs:

documentid
"LtMNVbaVT85LF846ahb6sr"
"BIFTw739JKw1p1U9jBFPYE"
"0QcF3hiN0OibtQpN8UqkVO"
"2UMpa8WW26WGfZe6KbxiaY"
"KQrxecy4bP370PpulOK8Ei"
"6hC29MmTBKU1pLWEhrMPII"
"LeOlwYBUDmCJhLgeyrJSLF"

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# Sample data is inserted into the Claims table and relevant DocumentID's are created:

The screenshot shows the Amazon QLDB Query editor interface. On the left, a sidebar lists navigation options: Getting started, Ledgers, Query editor (which is selected and highlighted in orange), Streams, Export, and Verification. The main area is titled "Amazon QLDB > Query editor". It features tabs for "Editor", "Recent queries", and "Saved queries". The "Editor" tab is active, displaying a code editor with the following SQL query:

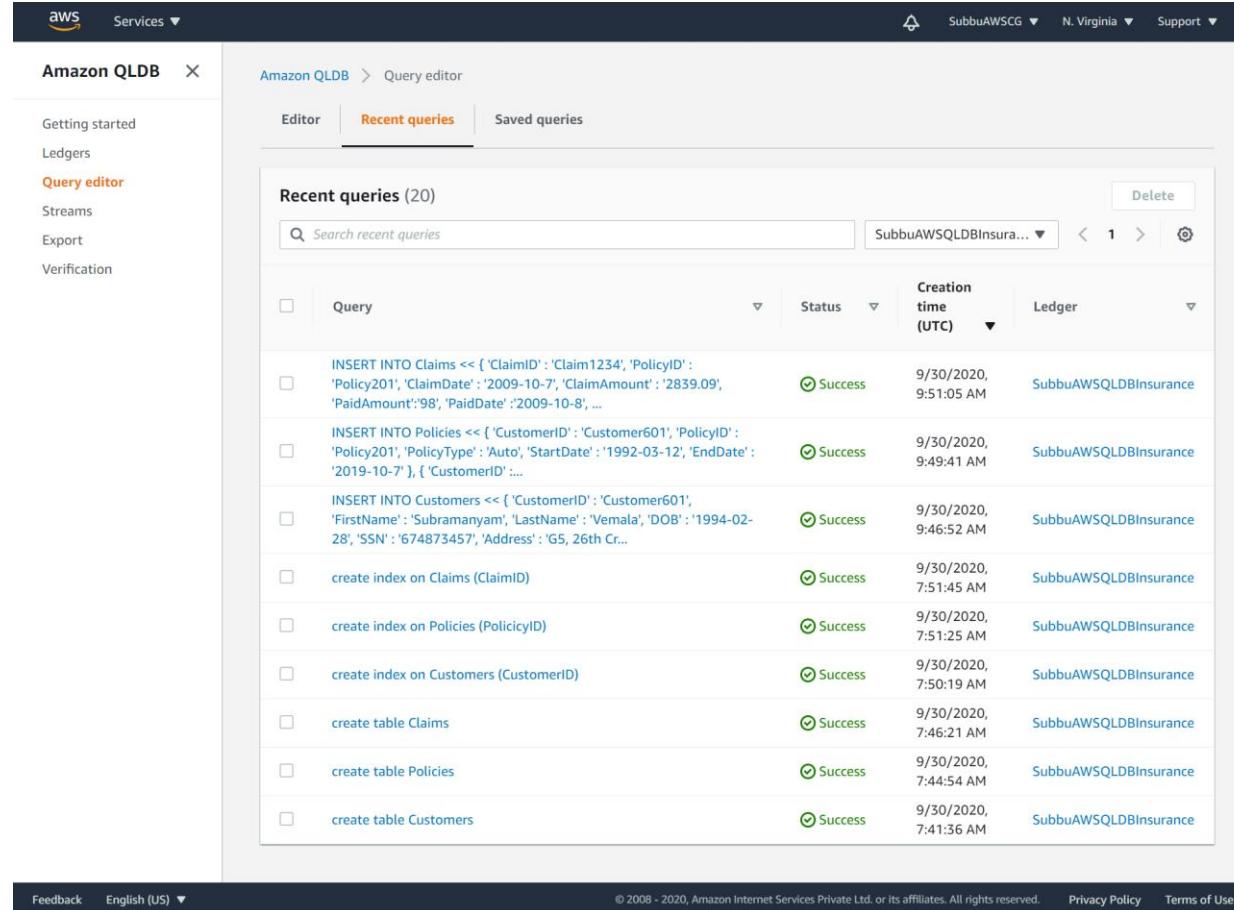
```
1 INSERT INTO Claims
2 << {
3   'ClaimID' : 'Claim1234',
4   'PolicyID' : 'Policy201',
5   'ClaimDate' : '2009-10-7',
6   'ClaimAmount' : '2839.09',
7   'PaidAmount' : '98',
8   'PaidDate' : '2009-10-8',
9   'Status' : 'Processed'
10 },
11 {
12   'ClaimID' : 'Claim904',
13   'PolicyID' : 'Policy202',
14   'ClaimDate' : '2019-09-7',
15   'ClaimAmount' : '792.03',
16   'PaidAmount' : '0',
17   'PaidDate' : ''
```

Below the code editor are three buttons: "Run", "Save", and "Clear". The "Output" tab is selected, showing the results of the query. The results are listed under "Rows (3)" and include the following document IDs:

- documentId
- "A2mzV51n6t5liOyJFN5p6Q"
- "5PLFK5lTW6qENDYq1I8Llib"
- "6xA6iQBa1SjFir3RQHHqpR"

At the bottom of the page, there are links for "Feedback", "English (US)", "Privacy Policy", and "Terms of Use".

# View the list of Recent Queries:



The screenshot shows the Amazon QLDB Query editor interface. The left sidebar has links for Getting started, Ledgers, Query editor (which is selected), Streams, Export, and Verification. The main area has tabs for Editor, Recent queries (which is selected), and Saved queries. Below is a table titled "Recent queries (20)".

Query	Status	Creation time (UTC)	Ledger
INSERT INTO Claims << { 'ClaimID': 'Claim1234', 'PolicyID': 'Policy201', 'ClaimDate': '2009-10-7', 'ClaimAmount': '2839.09', 'PaidAmount': '98', 'PaidDate': '2009-10-8', ... }	Success	9/30/2020, 9:51:05 AM	SubbuAWSQLDBInsurance
INSERT INTO Policies << { 'CustomerID': 'Customer601', 'PolicyID': 'Policy201', 'PolicyType': 'Auto', 'StartDate': '1992-03-12', 'EndDate': '2019-10-7' }, { 'CustomerID': ... }	Success	9/30/2020, 9:49:41 AM	SubbuAWSQLDBInsurance
INSERT INTO Customers << { 'CustomerID': 'Customer601', 'FirstName': 'Subramanyam', 'LastName': 'Vemala', 'DOB': '1994-02-28', 'SSN': '674873457', 'Address': 'G5, 26th Cr...' }	Success	9/30/2020, 9:46:52 AM	SubbuAWSQLDBInsurance
create index on Claims (ClaimID)	Success	9/30/2020, 7:51:45 AM	SubbuAWSQLDBInsurance
create index on Policies (PolicyID)	Success	9/30/2020, 7:51:25 AM	SubbuAWSQLDBInsurance
create index on Customers (CustomerID)	Success	9/30/2020, 7:50:19 AM	SubbuAWSQLDBInsurance
create table Claims	Success	9/30/2020, 7:46:21 AM	SubbuAWSQLDBInsurance
create table Policies	Success	9/30/2020, 7:44:54 AM	SubbuAWSQLDBInsurance
create table Customers	Success	9/30/2020, 7:41:36 AM	SubbuAWSQLDBInsurance

At the bottom, there are links for Feedback, English (US), © 2008 - 2020, Privacy Policy, and Terms of Use.

# View the list of Saved queries:

The screenshot shows the Amazon QLDB Query editor interface. The top navigation bar includes the AWS logo, Services dropdown, SubbuAWSCG profile, N. Virginia region, and Support links. On the left, a sidebar menu lists: Getting started, Ledgers, **Query editor** (which is selected and highlighted in orange), Streams, Export, and Verification. The main content area has a breadcrumb trail: Amazon QLDB > Query editor. Below this, there are three tabs: Editor, Recent queries, and **Saved queries**. The Saved queries tab is active, showing a table titled "Saved queries (1)". The table has columns: Query, Description, Creation time (UTC), and Ledger. A search bar at the top of the table allows searching for saved queries. The single entry in the table is:

Query	Description	Creation time (UTC)	Ledger
INSERT INTO Claims << { 'ClaimID' : 'Claim1234', 'PolicyID' : 'Policy201', 'ClaimDate' : '2009-10-7', 'ClaimAmount' : '2839.09', 'PaidAmount': '98', 'PaidDate' : '2009-10-8', ... }	Claims Queries..	9/30/2020, 10:19:27 AM	SubbuAWSQLDBInsurance

At the bottom of the page, there are links for Feedback, English (US) dropdown, Privacy Policy, and Terms of Use.

**Step-5:** Query the tables on the ledger.

**Step-6:** Modify the data on the Ledger.

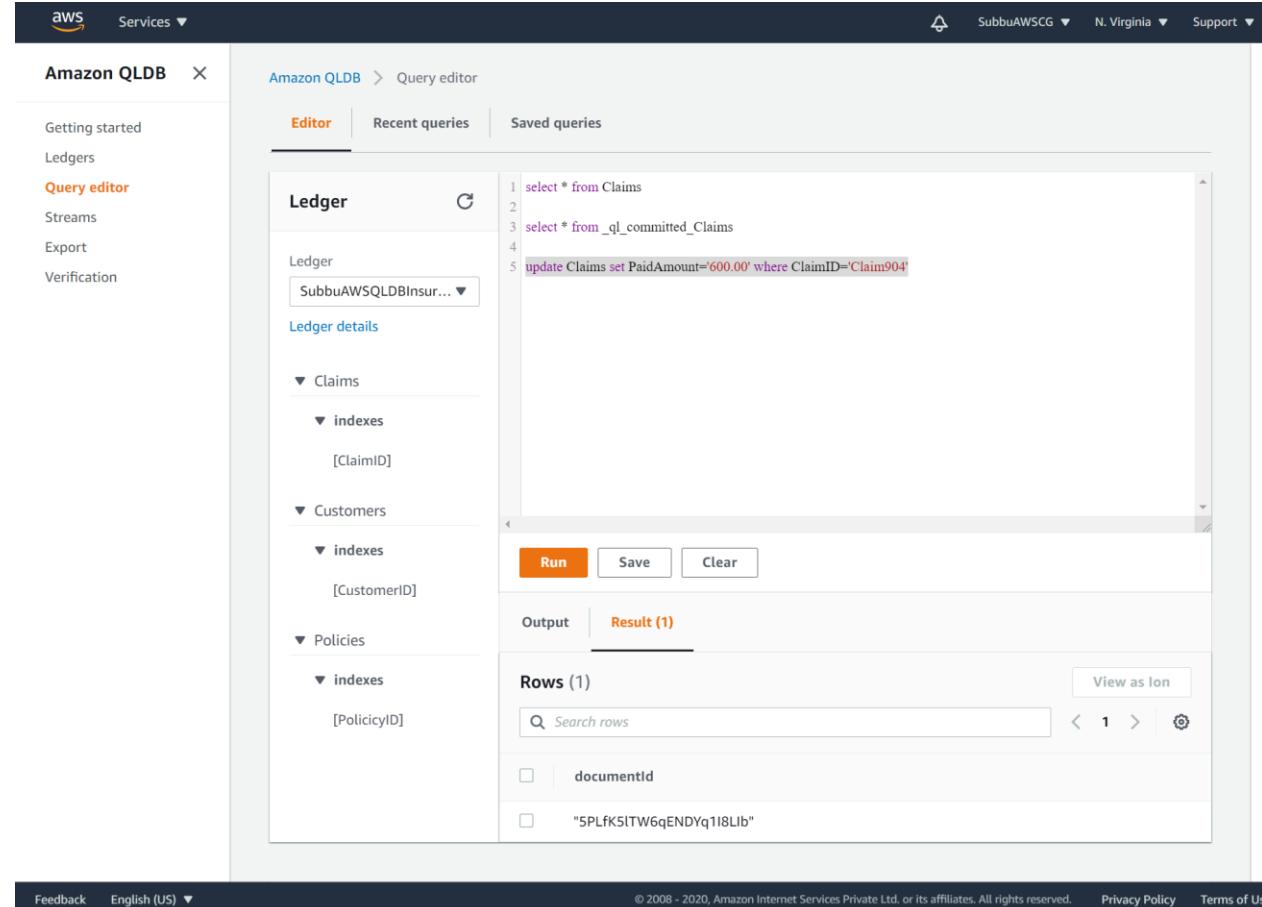
**Step-7:** Download a couple of Digest's after set of Modify transactions.

The steps 5,6 and 7 are repeated, to generate the sufficient Data for validating the blocks of the transactions.

**SetOfUpdates-1** on the Claims table for the ClaimsID='Claim904'

# SetOfUpdates-1:

update Claims set PaidAmount='600.00' where ClaimID='Claim904'.



The screenshot shows the AWS Lambda interface with the QLDB service selected. The left sidebar lists 'Getting started', 'Ledgers', 'Query editor' (which is selected), 'Streams', 'Export', and 'Verification'. The main area is titled 'Amazon QLDB > Query editor' and shows the 'Editor' tab selected. On the left, a tree view under 'Ledger' shows 'SubbuAWSQldbInsur...' with expanded sections for 'Claims' (containing '[ClaimID]'), 'Customers' (containing '[CustomerID]'), and 'Policies' (containing '[PolicyID]'). The query editor pane contains the following code:

```
1 select * from Claims
2
3 select * from _ql_committed_Claims
4
5 update Claims set PaidAmount='600.00' where ClaimID='Claim904'
```

Below the code, there are 'Run', 'Save', and 'Clear' buttons. The 'Output' tab is selected, showing 'Result (1)' and a table with one row. The table has columns 'documentId' and 'PaidAmount'. The single row is:

documentId	PaidAmount
"5PLfk5lTW6qENDYq1i8LIB"	600.00

At the bottom, there are links for 'Feedback', 'English (US)', 'Privacy Policy', and 'Terms of Use'.

# SetOfUpdates-1:

update Claims set Status='In Review' where ClaimID='Claim904':

The screenshot shows the AWS Lambda interface with the QLDB service selected. The left sidebar lists 'Getting started', 'Ledgers', 'Query editor' (which is selected), 'Streams', 'Export', and 'Verification'. The main area is titled 'Amazon QLDB > Query editor' and shows the 'Editor' tab selected. A ledger named 'SubbuAWSQldbInsur...' is chosen. The query editor contains the following SQL-like code:

```
1 select * from Claims
2
3 select * from _ql_committed_Claims
4
5 update Claims set PaidAmount='600.00' where ClaimID='Claim904'
6
7 update Claims set Status='In Review' where ClaimID='Claim904'
```

Below the code, there are 'Run', 'Save', and 'Clear' buttons. The 'Output' tab is selected, showing the result of the query: 'Result (1)'. The 'Rows (1)' section displays a single row with the following data:

documentId
"5PLfk5lTW6qENDYq1i8LIB"

At the bottom of the page, there are links for 'Feedback', 'English (US)', 'Privacy Policy', and 'Terms of Use'.

## SetOfUpdates-1:

select \* from Claims: See the updated values of PaidAmount and the Status.

The screenshot shows the Amazon QLDB Query editor interface. On the left, there's a navigation sidebar with options like Getting started, Ledgers, Query editor (which is selected), Streams, Export, and Verification. The main area has tabs for Editor, Recent queries, and Saved queries. In the Editor tab, the ledger is set to "SubbuAWSQLDBInsur...". The query window contains the following SQL code:

```
1 select * from Claims
2 update Claims set PaidAmount='700.00' where ClaimID='Claim904'
```

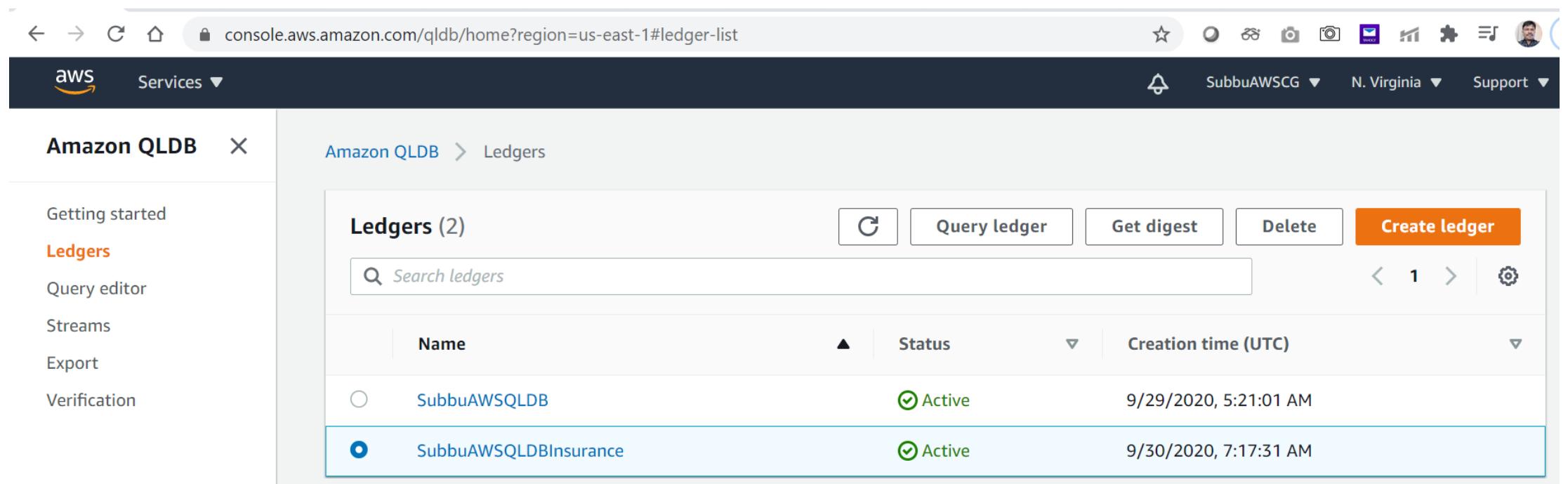
Below the code are buttons for Run, Save, and Clear. The Results tab is selected, showing a table titled "Rows (3)". The table has columns: PolicyID, ClaimDate, ClaimAmount, PaidAmount, PaidDate, and Status. The data is as follows:

PolicyID	ClaimDate	ClaimAmount	PaidAmount	PaidDate	Status
"Policy201"	"2009-10-7"	"2839.09"	"98"	"2009-10-8"	"Processed"
"Policy203"	"2019-09-7"	"8929.00"	"0"	--	"Pending"
"Policy202"	"2019-09-7"	"792.03"	"600.00"	--	"In Review"

At the bottom, there are links for Feedback, English (US), © 2008 - 2020, Privacy Policy, and Terms of Use.

Get the Digest-1, after performing the SetOfUpdates-1 statements as above

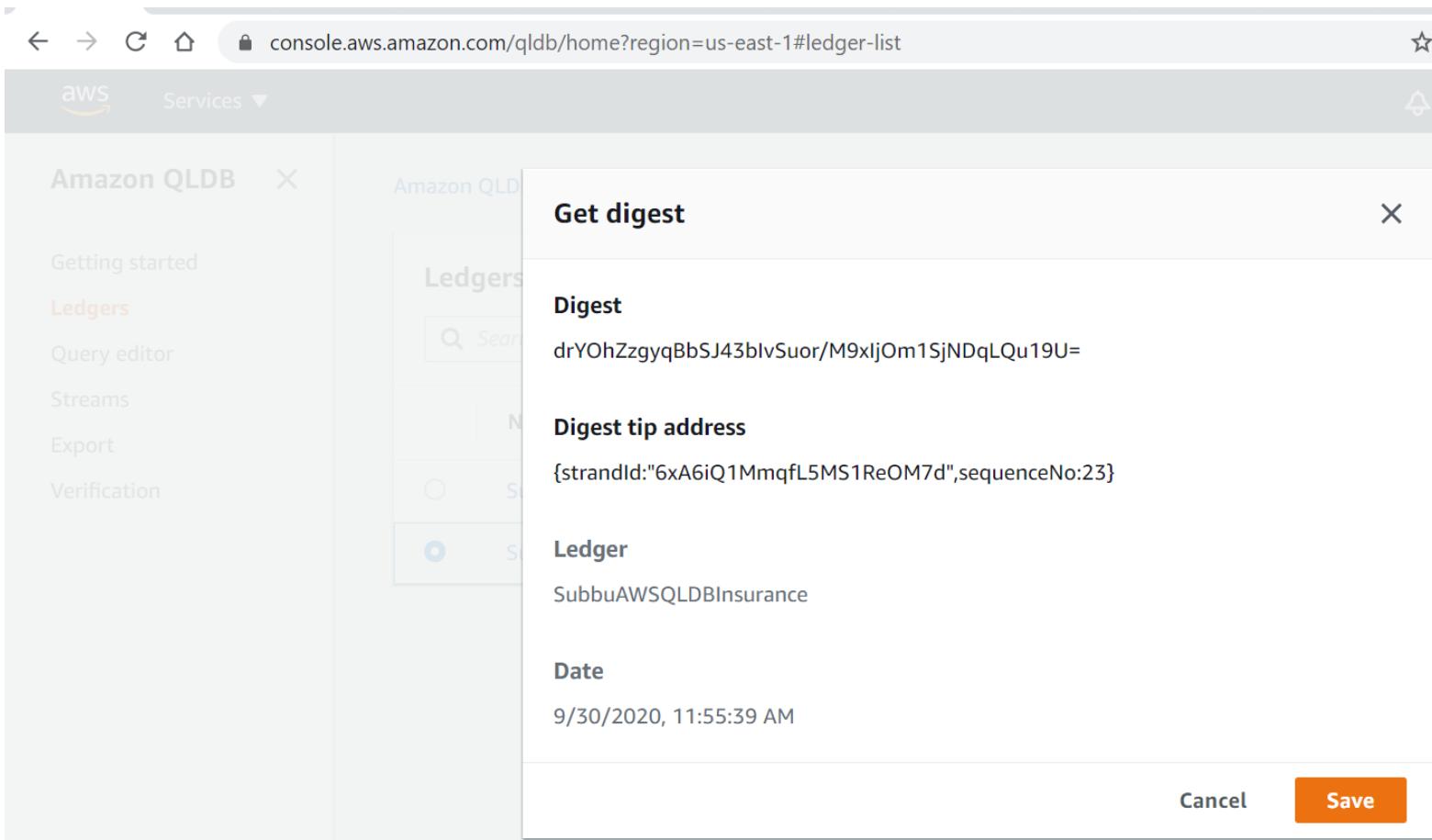
# Get Digest-1: Choose the Ledger and Click on the Digest.



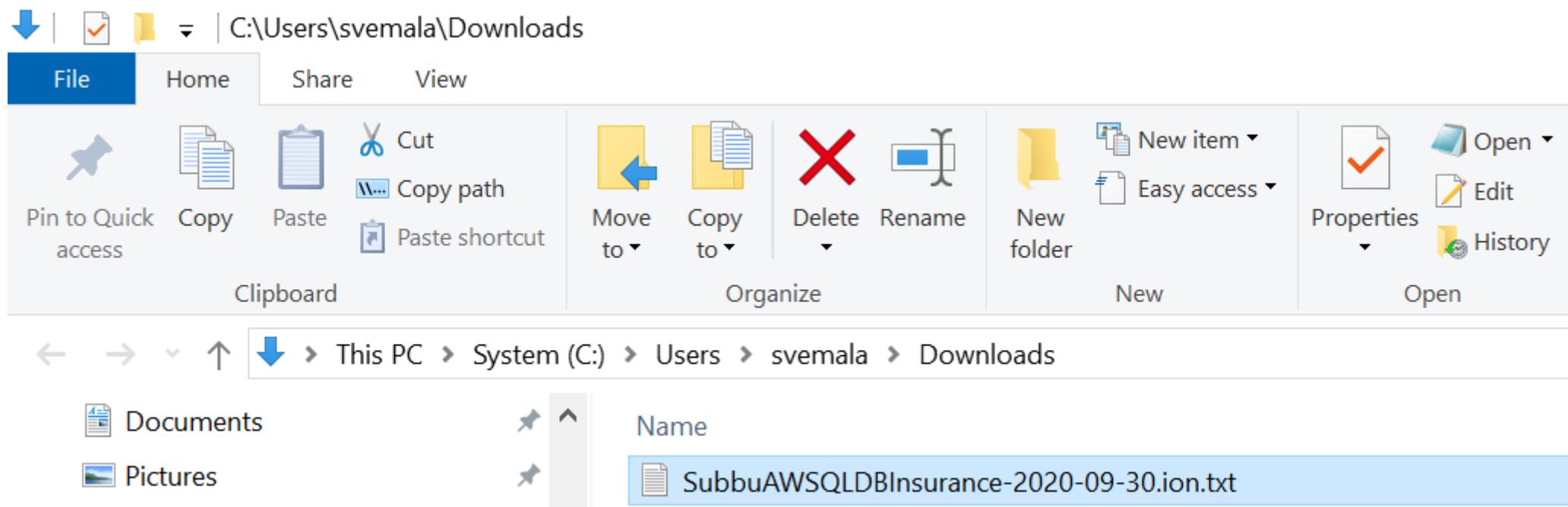
The screenshot shows the AWS QLDB console interface. The left sidebar has links for Getting started, **Ledgers**, Query editor, Streams, Export, and Verification. The main area title is "Amazon QLDB > Ledgers". It displays a table titled "Ledgers (2)" with columns: Name, Status, and Creation time (UTC). Two ledgers are listed: "SubbuAWSQLDB" (Active, 9/29/2020, 5:21:01 AM) and "SubbuAWSQLDBInsurance" (Active, 9/30/2020, 7:17:31 AM). Action buttons include "C" (Create), "Query ledger", "Get digest" (highlighted in orange), "Delete", and "Create ledger". A search bar and pagination controls are also present.

Name	Status	Creation time (UTC)
SubbuAWSQLDB	Active	9/29/2020, 5:21:01 AM
SubbuAWSQLDBInsurance	Active	9/30/2020, 7:17:31 AM

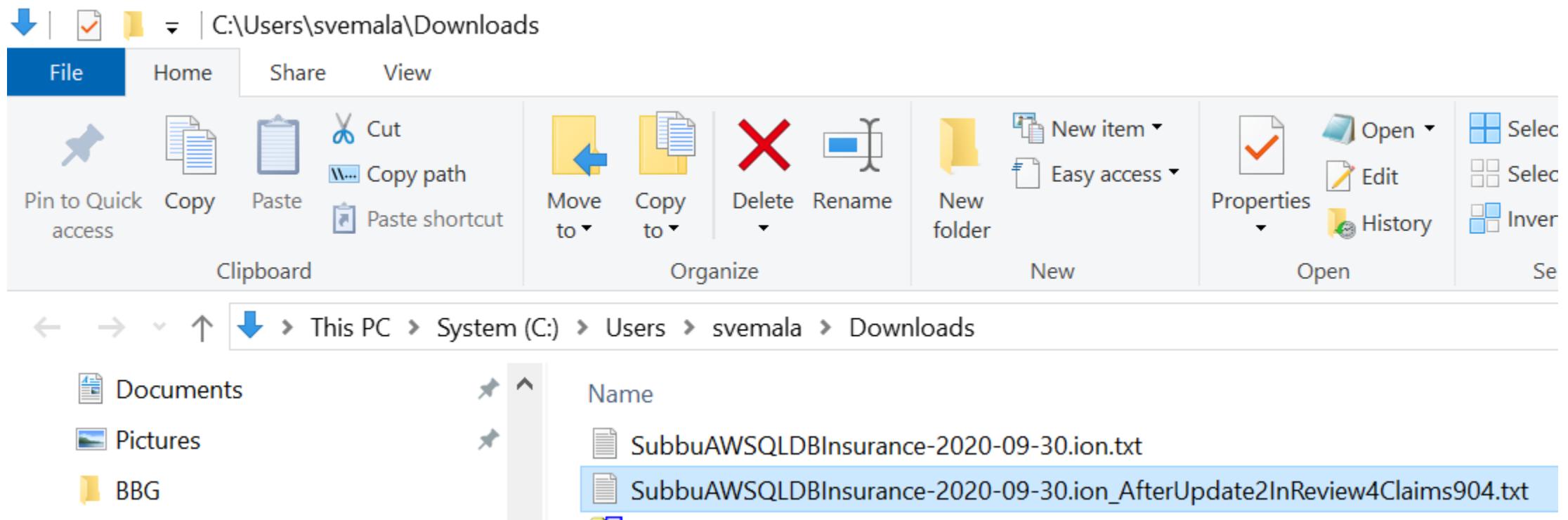
# Specify the path to Save the Digest on your system:



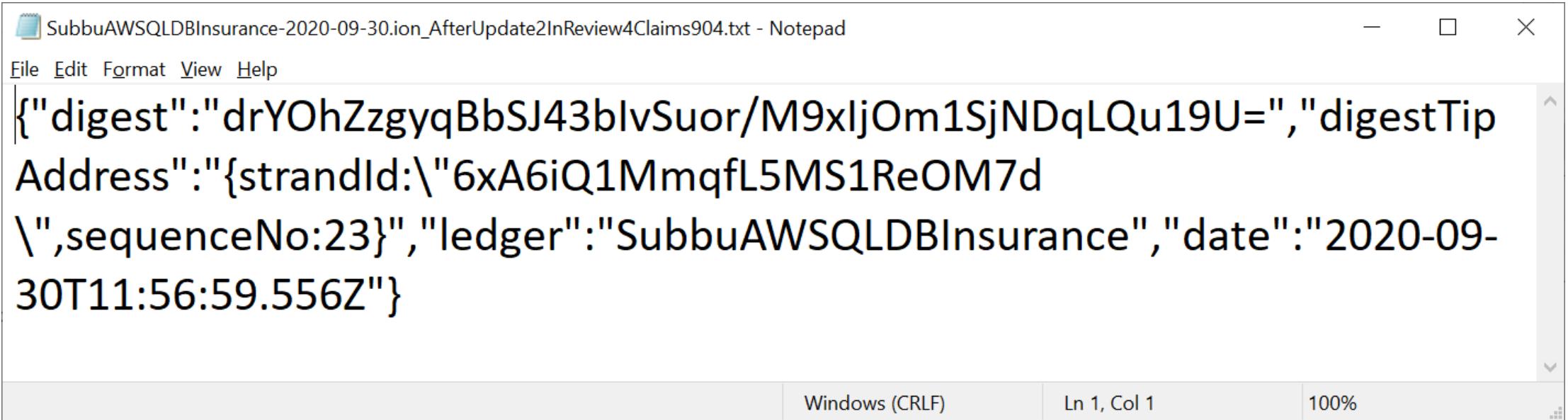
# Digest-1, is downloaded:



Rename the Digest-1, downloaded to a meaningful name, so that which will be easy to verify in the Step-8.



# View of a downloaded Digest-1:



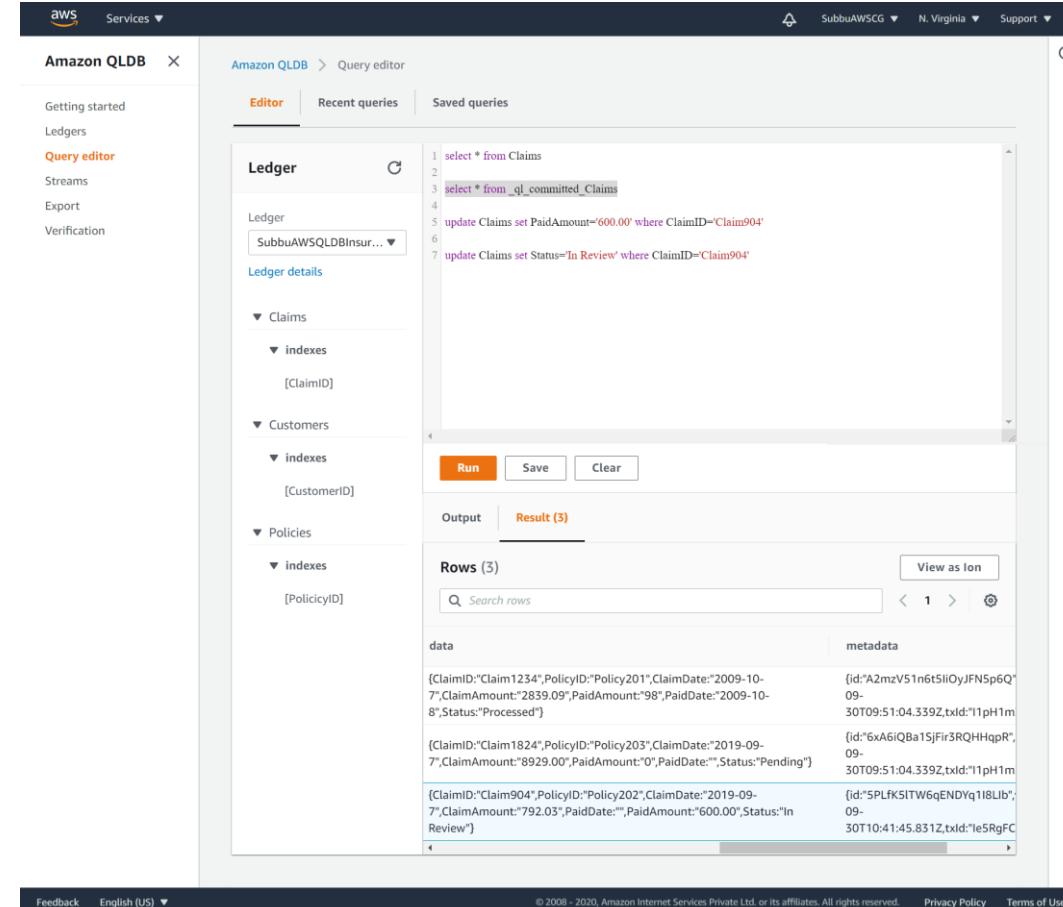
The screenshot shows a Windows Notepad window titled "SubbuAWSQLDBInsurance-2020-09-30/ion\_AfterUpdate2InReview4Claims904.txt - Notepad". The window contains the following JSON data:

```
{"digest":"drYOhZzgyqBbSJ43blvSuor/M9xljOm1SjNDqlQu19U=","digestTipAddress":"{strandId:\"6xA6iQ1MmqfL5MS1ReOM7d\\",sequenceNo:23}","ledger":"SubbuAWSQLDBInsurance","date":"2020-09-30T11:56:59.556Z"}
```

The Notepad interface includes standard menu options (File, Edit, Format, View, Help) and status bar information (Windows (CRLF), Ln 1, Col 1, 100%).

Get metadata of Claims table

# Get metadata of Claims table: select \* from \_ql\_committed\_Claims



The screenshot shows the AWS QLDB Query editor interface. The left sidebar lists the ledger structure: Ledger (SubbuAWSQLDBInsurance), Claims (with [ClaimID] index), Customers (with [CustomerID] index), and Policies (with [PolicyID] index). The main area displays a query editor with the following SQL code:

```
1 select * from Claims
2
3 select * from _ql_committed_Claims
4
5 update Claims set PaidAmount='600.00' where ClaimID='Claim904'
6
7 update Claims set Status='In Review' where ClaimID='Claim904'
```

Below the code, there are 'Run', 'Save', and 'Clear' buttons. The 'Output' tab is selected, showing 'Result (3)' with a table titled 'Rows (3)'. The table has columns 'data' and 'metadata'. The data is as follows:

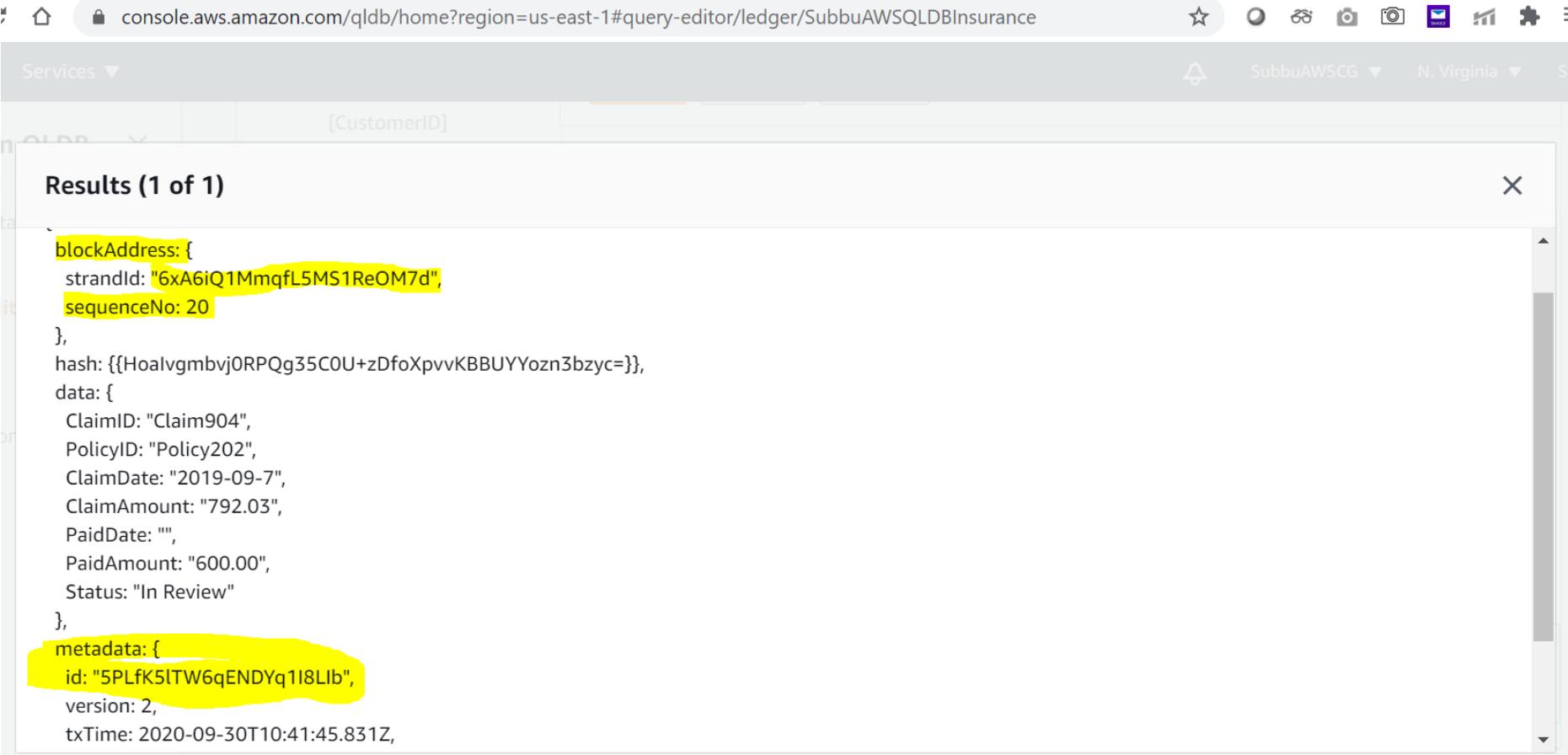
data	metadata
[ClaimID:"Claim1234",PolicyID:"Policy201",ClaimDate:"2009-10-07",ClaimAmount:"2839.09",PaidAmount:"98",PaidDate:"2009-10-08",Status:"Processed"]	{id:"A2mzV51n6t5liOyJFN5p6Q",09-30T09:51:04.339Z,txId:"I1pH1m}
[ClaimID:"Claim1824",PolicyID:"Policy203",ClaimDate:"2019-09-07",ClaimAmount:"8929.00",PaidAmount:"0",PaidDate:"",Status:"Pending"]	{id:"6xA6lQBa1SjFir3RQHHqprR",09-30T09:51:04.339Z,txId:"I1pH1m"}
[ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-07",ClaimAmount:"792.03",PaidAmount:"",PaidDate:"2019-09-09",Status:"In Review"]	{id:"5PLfK5ITW6qENDYq1IBLib",09-30T10:41:45.831Z,txId:"le5RgFC"}

# View as Ion for a specific ClaimsID:

The screenshot shows the AWS QLDB Query editor interface. The left sidebar has 'Amazon QLDB' selected under 'Query editor'. The main area shows a query result for 'CustomerID' and 'PolicyID'. The 'Result (3)' tab is active, displaying three rows of data. A yellow box highlights the 'View as Ion' button. The data rows show policy details like ID, ClaimDate, PaidAmount, and PaidDate, along with their corresponding metadata objects.

Row	CustomerID	PolicyID	Metadata
1	[CustomerID]	ID:"Policy201",ClaimDate:"2009-10-09",PaidAmount:"98",PaidDate:"2009-10-09T09:51:04.339Z",txId:"l1pH1mXKtbq1kfovAgGunM"	{id:"A2mzV51n6t5liOyJFN5p6Q",version:0,txTime:2020-09-30T09:51:04.339Z,txId:"l1pH1mXKtbq1kfovAgGunM"}
2		ID:"Policy203",ClaimDate:"2019-09-01",PaidAmount:"0",PaidDate:"",Status:"Pending"	{id:"6xA6iQBa1SjFir3RQHHqpR",version:0,txTime:2020-09-30T09:51:04.339Z,txId:"l1pH1mXKtbq1kfovAgGunM"}
3		ID:"Policy202",ClaimDate:"2019-09-01",PaidDate:"",PaidAmount:"600.00",Status:"In"	{id:"5PLfK5lTW6qENDYq1I8Llb",version:2,txTime:2020-09-30T10:41:45.831Z,txId:"le5RgFCPoLm7oRME7oJafI"}

# Get the metadata ID for a specific ClaimsID:



The screenshot shows the AWS Lambda console interface with the URL `console.aws.amazon.com/qldb/home?region=us-east-1#query-editor/ledger/SubbuAWSQLDBInsurance`. The query editor displays a single result row for a customer with ID 'CustomerID'. The result object contains a 'blockAddress' field with a yellow box around its value, which includes a 'strandId' and a 'sequenceNo'. It also contains a 'hash' field, a 'data' object with various claim details like 'ClaimID', 'PolicyID', and 'Status', and a 'metadata' object with an 'id' field. The 'id' field is highlighted with a yellow box.

```
blockAddress: {
  strandId: "6xA6iQ1MmqfL5MS1ReOM7d",
  sequenceNo: 20
},
hash: {{Hoalvgmbvj0RPQg35C0U+zDfoXpvvKBBUYYozn3bzyc=}},
data: {
  ClaimID: "Claim904",
  PolicyID: "Policy202",
  ClaimDate: "2019-09-7",
  ClaimAmount: "792.03",
  PaidDate: "",
  PaidAmount: "600.00",
  Status: "In Review"
},
metadata: {
  id: "5PLfK5lTW6qENDYq1I8Llb",
  version: 2,
  txTime: 2020-09-30T10:41:45.831Z,
```

**Check the history of ClaimID using metadataID**

Check the history of a ClaimsID, using its metadata ID:  
select \* from history(Claims) as c where  
c.metadata.id='5PLfK5ITW6qENDYq1I8LIB'

The screenshot shows the Amazon QLDB Query editor interface. The left sidebar lists 'Getting started', 'Ledgers', 'Query editor' (which is selected), 'Streams', 'Export', and 'Verification'. The main area has tabs for 'Editor', 'Recent queries', and 'Saved queries'. In the 'Editor' tab, the query is:

```
1 select * from Claims
2
3 select * from _ql_committed_Claims
4
5 update Claims set PaidAmount='600.00' where ClaimID='Claim904'
6
7 update Claims set Status='In Review' where ClaimID='Claim904'
8
9 5PLfK5ITW6qENDYq1I8LIB
10
11 select * from history(Claims) as c where c.metadata.id='5PLfK5ITW6qENDYq1I8LIB'
```

Below the query are 'Run', 'Save', and 'Clear' buttons. The 'Output' tab is selected, showing 'Result (3)' with 'Rows (3)'. The results are:

blockAddress	hash
{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:16}	{}(IGP2MdT49nNCpW392kPjs+M9Xd"
{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:19}	{}(pVSi25CaaRvmvyH9rbYAkQ/QqME
{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:20}	{}(Hoalvgmbyj0RPQg35C0U+zDfoXp

At the bottom, there are links for 'Feedback', 'English (US)', '© 2008 - 2020, Amazon Internet Services Private Ltd. or its affiliates. All rights reserved.', 'Privacy Policy', and 'Terms of Use'.

# Claims table history for a specific ClaimsID:

The screenshot shows the AWS QLDB Query Editor interface. The URL in the address bar is `/s.amazon.com/qldb/home?region=us-east-1#query-editor/ledger/SubbuAWSQLDBInsurance`. The top navigation bar includes a star icon, a refresh icon, a double arrow icon, a camera icon, an envelope icon, a chart icon, a gear icon, and a help icon. The account name is "SubbuAWSCG" and the region is "N. Virginia". The main area has tabs for "Run", "Save", and "Clear", with "Run" being the active tab. On the left, there is a sidebar with sections for "[CustomerID]", "[PolicyID]", and "[PolicyIndex]". The main content area shows the results of a query with three rows. The "Output" tab is selected, showing "Result (3)". Below that is a "Rows (3)" section with a search bar and a "View as Ion" button. The results are displayed in two columns: "data" and "metadata". The "data" column contains JSON objects representing claims, and the "metadata" column contains their respective IDs and transaction details.

data	metadata
{ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-07",ClaimAmount:"792.03",PaidAmount:"0",PaidDate:"",Status:"Pending"}	{id:"5PLfK5lTW6qENDYq09-30T09:51:04.339Z,txId:"I...}
{ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-07",ClaimAmount:"792.03",PaidDate:"",Status:"Pending",PaidAmount:"600.00"}	{id:"5PLfK5lTW6qENDYq09-30T10:39:31.310Z,txId:"I...}
{ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-07",ClaimAmount:"792.03",PaidDate:"",PaidAmount:"600.00",Status:"In Review"}	{id:"5PLfK5lTW6qENDYq09-30T10:41:45.831Z,txId:"I...}

Repeat the process of performing update the data on the tables and downloading the Digest's.

**SetOfUpdates-2**, as below.

## SetOfUpdates-2:

update Claims set PaidAmount='700.00' where ClaimID='Claim904':

The screenshot shows the Amazon QLDB Query editor interface. On the left, a sidebar lists navigation options: Getting started, Ledgers, Query editor (which is selected and highlighted in orange), Streams, Export, and Verification. The main area is titled "Amazon QLDB > Query editor". It has tabs for "Editor", "Recent queries", and "Saved queries". The "Editor" tab is active. In the "Editor" section, there is a "Ledger" panel on the left showing "SubbuAWSQLDBInsur..." and a "Ledger details" section with "Claims", "Customers", and "Policies" listed. The main query editor area contains the following SQL code:

```
1 select * from Claims
2
3 update Claims set PaidAmount='700.00' where ClaimID='Claim904'
```

Below the code, there are "Run", "Save", and "Clear" buttons. The "Output" tab is selected, showing the results of the query. The results table has a header "Rows (1)" and a search bar. Two rows are listed:

documentId
"5PLfk5iT...8LIB"

At the bottom of the page, there are links for "Feedback", "English (US)", "Privacy Policy", and "Terms of Use".

# Validate the changes:

The screenshot shows the AWS QLDB Query Editor interface. The left sidebar lists various options: Getting started, Ledgers, **Query editor**, Streams, Export, and Verification. The main area displays a ledger named "SubbuAWSQLDBInsurance". The "Result (3)" tab is active, showing the following data:

	ClaimID	PolicyID	ClaimDate	ClaimAmount	PaidAmount	PaidDate
<input type="checkbox"/>	"Claim1234"	"Policy201"	"2009-10-7"	"2839.09"	"98"	"2009-10-8"
<input type="checkbox"/>	"Claim1824"	"Policy203"	"2019-09-7"	"8929.00"	"0"	""
<input checked="" type="checkbox"/>	"Claim904"	"Policy202"	"2019-09-7"	"792.03"	"700.00"	""

## SetOfUpdates-2:

update Claims set PaidDate='2020-09-29' where ClaimID='Claim904':

The screenshot shows the Amazon QLDB Query editor interface. On the left, a sidebar lists navigation options: Getting started, Ledgers, Query editor (which is selected and highlighted in orange), Streams, Export, and Verification. The main area is titled "Amazon QLDB > Query editor". It has tabs for "Editor", "Recent queries", and "Saved queries". The "Editor" tab is active. In the "Editor" section, there's a "Ledger" dropdown set to "SubbuAWSQLDBInsur...", a "Ledger details" sidebar with sections for "Claims", "Customers", and "Policies", and a query editor pane containing three numbered statements:

- 1 Select \* from Claims
- 2
- 3 update Claims set PaidDate='2020-09-29' where ClaimID='Claim904'

Below the query editor are "Run", "Save", and "Clear" buttons. The "Output" tab is selected, showing a table titled "Rows (1)". The table has one row with two columns: "documentId" and its value, which is a string enclosed in quotes: "5PLfk5lTW6qENDYq1i8LIB". There are also "Search rows" and "View as Ion" buttons.

# Validate the changes:

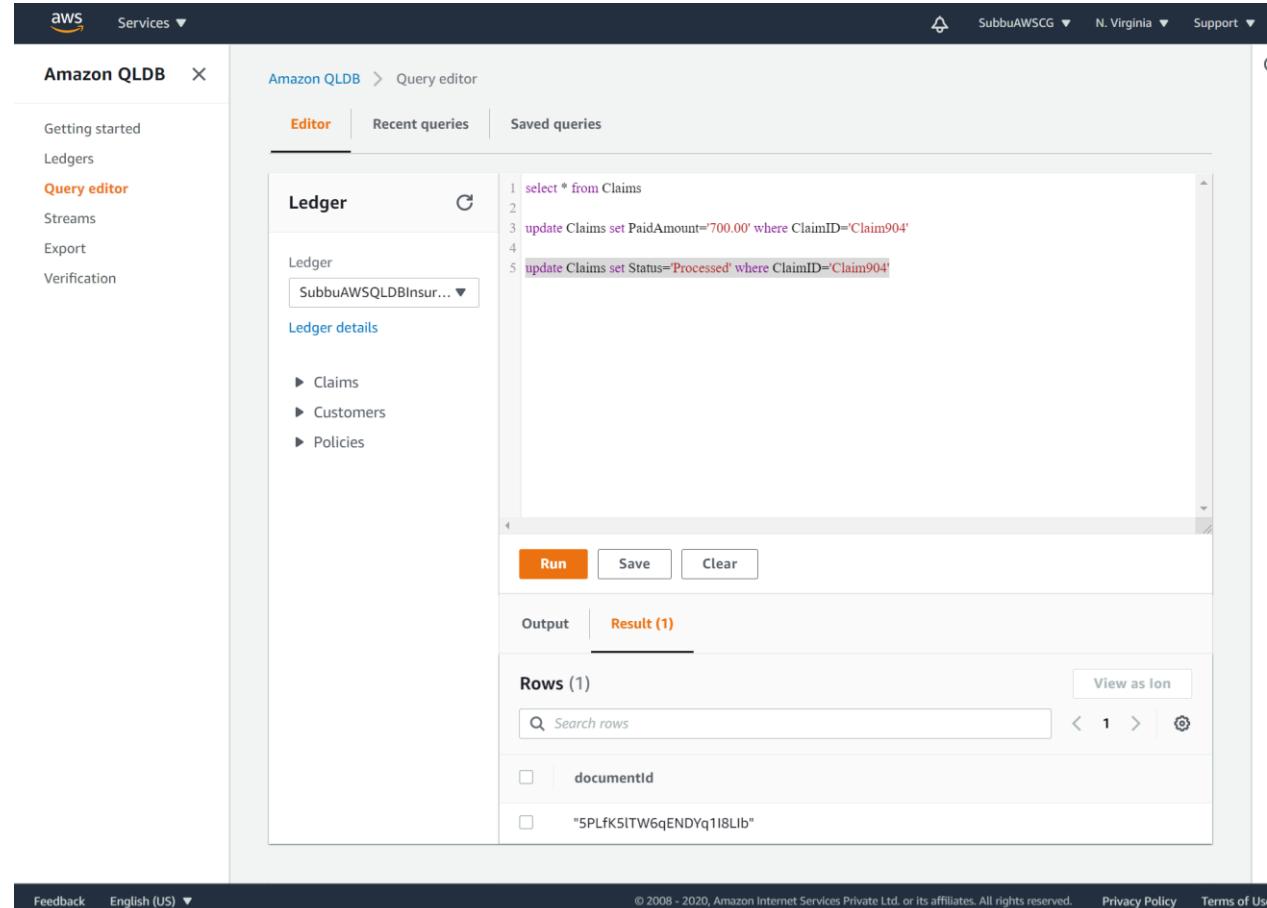
The screenshot shows the Amazon QLDB Query editor interface. On the left, a sidebar lists navigation options: Getting started, Ledgers, Query editor (which is selected and highlighted in orange), Streams, Export, and Verification. The main area is titled "Amazon QLDB > Query editor". It has tabs for "Editor", "Recent queries", and "Saved queries", with "Editor" currently selected. In the "Editor" tab, there is a code editor window containing the following SQL-like query:

```
1 Select * from Claims
2
3 update Claims set PaidDate='2020-09-29' where ClaimID=Claim904
```

Below the code editor are three buttons: "Run", "Save", and "Clear". The "Output" tab is selected, showing the results of the query. The results are titled "Rows (3)" and include a search bar and navigation buttons. The data is presented in a table with columns: ClaimID, PolicyID, ClaimDate, ClaimAmount, PaidAmount, and PaidDate. The rows are:| ClaimID | PolicyID | ClaimDate | ClaimAmount | PaidAmount | PaidDate |
| --- | --- | --- | --- | --- | --- |
| "Claim1234" | "Policy201" | "2009-10-7" | "2839.09" | "98" | "2009-10-8" |
| "Claim1824" | "Policy203" | "2019-09-7" | "8929.00" | "0" | "" |
| "Claim904" | "Policy202" | "2019-09-7" | "792.03" | "700.00" | "2020-09-29" |

## SetOfUpdates-2:

update Claims set Status='Processed' where ClaimID='Claim904':



The screenshot shows the AWS Lambda interface with the QLDB service selected. On the left, the navigation pane lists 'Getting started', 'Ledgers', 'Query editor' (which is highlighted in orange), 'Streams', 'Export', and 'Verification'. The main area is titled 'Amazon QLDB > Query editor'. It displays a 'Ledger' section with a dropdown menu set to 'SubbuAWSQLDBInsurance'. Below this is a 'Ledger details' sidebar with links to 'Claims', 'Customers', and 'Policies'. The main workspace contains a query history with the following content:

```
1 select * from Claims
2
3 update Claims set PaidAmount='700.00' where ClaimID='Claim904'
4
5 update Claims set Status='Processed' where ClaimID='Claim904'
```

At the bottom of the workspace are 'Run', 'Save', and 'Clear' buttons. The 'Output' tab is selected, showing 'Result (1)' and a table titled 'Rows (1)'. The table has one row with the following data:

documentId
"5PLfk5iTW6qENDYq1i8LIB"

Below the table are 'Search rows' and 'View as Ion' buttons, along with navigation controls for the result set.

# Crosscheck the updated value in the Claims table:

The screenshot shows the Amazon QLDB Query editor interface. On the left, the navigation menu includes 'Getting started', 'Ledgers', 'Query editor' (which is selected), 'Streams', 'Export', and 'Verification'. The main area displays a query titled 'Select \* from Claims' against the 'SubbuAWSQLDBInsur...' ledger. The results section shows three rows of data:

PolicyID	ClaimDate	ClaimAmount	PaidAmount	PaidDate	Status
"Policy201"	"2009-10-7"	"2839.09"	"98"	"2009-10-8"	"Processed"
"Policy203"	"2019-09-7"	"8929.00"	"0"	""	"Pending"
"Policy202"	"2019-09-7"	"792.03"	"700.00"	"2020-09-29"	"Processed"

# Crosscheck the updated value in the Claims table:

The screenshot shows the AWS QLDB Query Editor interface. The left sidebar lists navigation options: Getting started, Ledgers, **Query editor**, Streams, Export, and Verification. The main area displays the results of a query on the 'SubbuAWSQLDBInsurance' ledger. The results are shown in a table with the following columns: PolicyID, ClaimDate, ClaimAmount, PaidAmount, PaidDate, and Status. There are three rows of data.

PolicyID	ClaimDate	ClaimAmount	PaidAmount	PaidDate	Status
"Policy201"	"2009-10-7"	"2839.09"	"98"	"2009-10-8"	"Processed"
"Policy203"	"2019-09-7"	"8929.00"	"0"	""	"Pending"
"Policy202"	"2019-09-7"	"792.03"	"700.00"	""	"Processed"

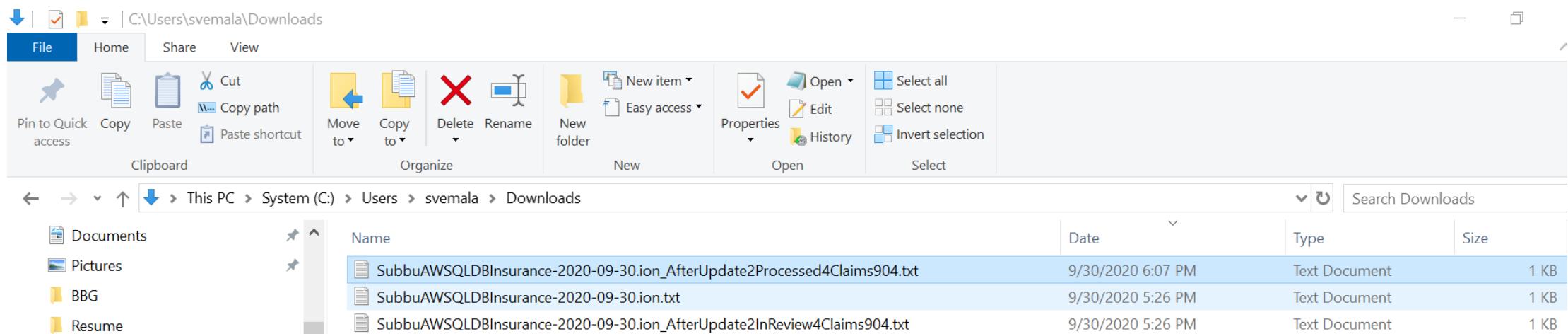
Get the Digest-2, after the **SetOfUpdates-2** (updating the PaidAmount='700.00', PaidDate='2020-09-29' and ClaimStatus='Processed' for the ClaimID='Claims904') is executed.

# “Get Digest-2”, after the SetOfUpdates-2.

The screenshot shows the AWS QLDB console interface. The top navigation bar includes links for Services, SubbuAWSCG, N. Virginia, and Support. On the left, a sidebar menu lists options: Getting started, **Ledgers** (which is selected and highlighted in orange), Query editor, Streams, Export, and Verification. The main content area is titled "Amazon QLDB > Ledgers". It displays a table titled "Ledgers (2)" with columns for Name, Status, and Creation time (UTC). Two ledgers are listed: "SubbuAWSQldb" and "SubbuAWSQldbInsurance". The "Get digest" button in the toolbar above the table is highlighted with a yellow box. The table rows for both ledgers have a blue border, indicating they are selected or active.

Name	Status	Creation time (UTC)
SubbuAWSQldb	Active	9/29/2020, 5:21:01 AM
SubbuAWSQldbInsurance	Active	9/30/2020, 7:17:31 AM

Rename the downloaded Digest-2 text file to proper name as below:



Perform the 3<sup>rd</sup> Set of Updates, as **SetOfUpdates-3** for the Claim904

# SetOfUpdates-3:

update Claims set Status='Paid' where ClaimID='Claim904'

The screenshot shows the Amazon QLDB Query editor interface. The left sidebar lists navigation options: Getting started, Ledgers, **Query editor**, Streams, Export, and Verification. The main area has tabs for Editor, Recent queries, and Saved queries, with the Editor tab selected. A sub-header "Amazon QLDB > Query editor" is present. The central workspace displays a query in the Editor pane: "update Claims set Status='Paid' where ClaimID='Claim904'". Below the query, the "Ledger" dropdown is set to "SubbuAWSQLDBInsur...". The "Ledger details" section shows three categories: Claims, Customers, and Policies. At the bottom of the editor pane are "Run", "Save", and "Clear" buttons. The "Output" tab is active, showing the result of the query in the "Result (1)" section. The result table has one row labeled "Rows (1)". The "documentId" column contains the value "5PLfk5iT...". A search bar and pagination controls are also visible.

# Select \* from Claims:

The screenshot shows the Amazon QLDB Query editor interface. On the left, the navigation pane includes links for Getting started, Ledgers, Query editor (which is selected), Streams, Export, and Verification. The main area displays a query editor with the following content:

```
1 update Claims set Status="Paid" where ClaimID="Claim904"
2
3 select * from Claims
```

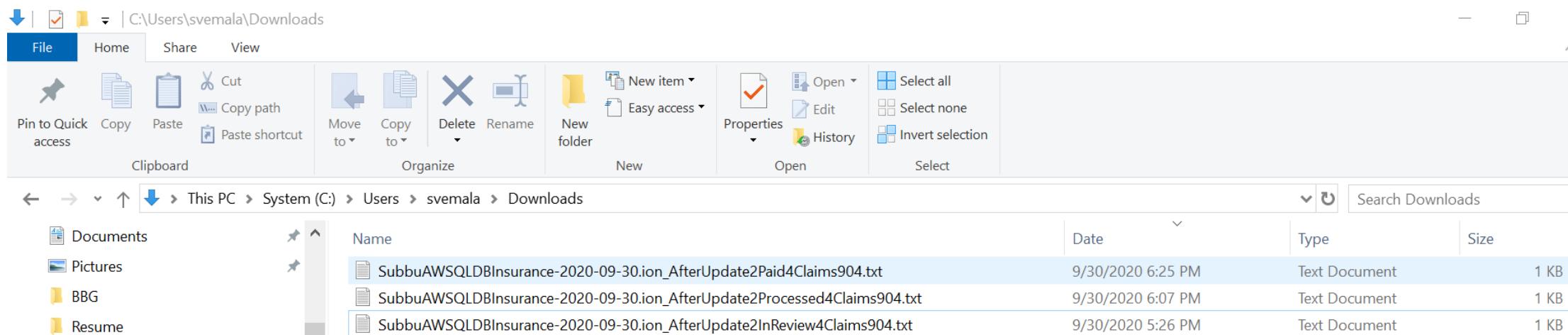
The results section shows a table titled "Rows (3)" with the following data:

PolicyID	ClaimDate	ClaimAmount	PaidAmount	PaidDate	Status
"Policy201"	"2009-10-7"	"2839.09"	"98"	"2009-10-8"	"Processed"
"Policy203"	"2019-09-7"	"8929.00"	"0"	""	"Pending"
"Policy202"	"2019-09-7"	"792.03"	"700.00"	"2020-09-29"	"Paid"

At the bottom, there are links for Feedback, English (US), © 2008-2020, Privacy Policy, and Terms of Use.

Get the Digest-3, after SetOfUpdates-3 (changing the ClaimStatus to Paid)

# Get Digest-3, after the claim status updated to Paid for the Claim904:



The screenshot shows a Windows File Explorer window with the following details:

- Path:** C:\Users\svemala\Downloads
- Toolbar:** Includes File, Home, Share, View, and various file operations like Cut, Copy, Paste, Move to, Copy to, Delete, Rename, New item, Open, Select all, Select none, Invert selection.
- Search Bar:** Search Downloads
- Left Sidebar:** Shows folder navigation (This PC, System (C:), Users, svemala, Downloads) and links to Documents, Pictures, BBG, and Resume.
- Table View:** Displays three text files in the Downloads folder.

Name	Date	Type	Size
SubbuAWSQLDBInsurance-2020-09-30/ion_AfterUpdate2Paid4Claims904.txt	9/30/2020 6:25 PM	Text Document	1 KB
SubbuAWSQLDBInsurance-2020-09-30/ion_AfterUpdate2Processed4Claims904.txt	9/30/2020 6:07 PM	Text Document	1 KB
SubbuAWSQLDBInsurance-2020-09-30/ion_AfterUpdate2InReview4Claims904.txt	9/30/2020 5:26 PM	Text Document	1 KB

Check the History for the ClaimsID, Claim904 in the Claims tables and list down all the Revisions performed for a specific Claims ID as below.

select \* from history(Claims) as c where  
c.metadata.id='5PLfK5ITW6qENDYq1I8L1b'

The screenshot shows the Amazon QLDB Query Editor interface. The top navigation bar includes the AWS logo, Services dropdown, SubbuAWSSCO account, N. Virginia region, and Support link. The main area has tabs for Editor, Recent queries, and Saved queries, with Editor selected. On the left, a sidebar titled 'Ledger' shows 'SubbuAWSQLDBInsurance' is selected under 'Ledger'. Below it are sections for Claims, Customers, and Policies. The central panel contains a code editor with the query: 'select \* from history(Claims) as c where c.metadata.id='5PLfK5ITW6qENDYq1I8L1b''. Below the code editor are 'Run', 'Save', and 'Clear' buttons. The 'Output' tab is selected, showing 'Result (7)' and 'Rows (7)'. The results table has columns for 'blockAddress' and 'hash'. Each row is a JSON object representing a claim with its metadata and hash.

blockAddress	hash
{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:16}	[[IGP2MdT49nNCpW592Pj+M9xdtTNm4tTp]VHYAK+H
{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:19}	[[pVSI25CaaRvmvyH9rbY4kQ/QqMESh5R9gS4i/2xjAvQ=
{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:20}	[[Hoalvgmbvj0RPQg35COU+zDloXpvvKBBUYYoZn3bzyc=
{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:26}	[[Fk9wfInNU7cnLjVje0uByvk7cEEklv3wV/ykOVxe9gk+]]
{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:27}	[[BdDrZzV/G+q0WmcxwpOesFbY1chl6N15zzC2o9dcZM+
{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:31}	[[gdjUQHimurLoYMXpONELWmqCRWjFPGjZOizOMJehz"
{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:34}	[[h33oTmbaNvJbv/dPGp9LG4zs6wCo6ghk82VOGiLKQ

# Blockaddress and hash, for a metadata ID='5PLfK5ITW6qENDYq1I8L1b':

blockAddress	hash
{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:16}	{{IGP2MdT49nNCpW392kPjs+M9XdTTNm4tTpjVHYAK+Hw=}}
{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:19}	{{pVSI25CaaRvmvyH9rbYAkQ/QqMESh5R9gS4i/2xjAvQ=}}
{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:20}	{{Hoalvgmbvj0RPQg35C0U+zDfoXpvvKBBUYYozn3bzyc=}}
{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:26}	{{Fk9wfIINNU7cnLjVje0uBYvk7cEEklv3wV/ykOVxe9gk=}}
{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:27}	{{BdDrZzV/G+q0WmcxwpOesFbY1jcIh6N15zzC2o9dcZM=}}
{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:31}	{{gdjUQHImuRLoYMxpONELWmqCRWjFPGjZOizOMJehzYs=}}
{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:34}	{{h33ofTmbaNJVbv/dPGp9LG4zs6wCo6ghk82VOGiLKFQ=}}

# Data and metadata for a metadata ID='5PLfK5ITW6qENDYq1I8L1b':

The screenshot shows the AWS QLDB Query Editor interface. The top navigation bar includes the AWS logo, Services dropdown, SubbuAWSSCO account, N. Virginia region, and Support link. The main area has tabs for Editor, Recent queries, and Saved queries, with Editor selected. On the left, a sidebar titled 'Ledger' shows 'SubbuAWSQLDBInsurance' is selected. Below it are sections for Claims, Customers, and Policies. The main content area contains a query editor window with the following code:

```
select * from history(Claims) as c where c.metadata.id='5PLfK5ITW6qENDYq1I8L1b'
```

Below the query is a 'Run' button and a 'Result (7)' link. The results are displayed in a table with two columns: 'data' and 'metadata'. There are seven rows of data, each showing a JSON object with fields like ClaimID, PolicyID, ClaimDate, PaidDate, Status, and various IDs. The 'metadata' column shows the same JSON object with additional fields for version and txid.

data	metadata
{ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-07",ClaimAmount:"792.03",PaidAmount:"0",PaidDate:"",Status:"Pending"}	{id:"5PLfK5ITW6qENDYq1I8L1b",version:0,09-30T09:51:04.339Z,txid:"1pH1mXKtbq1kf
{ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-07",ClaimAmount:"792.03",PaidDate:"",Status:"Pending",PaidAmount:"600.00"}	{id:"5PLfK5ITW6qENDYq1I8L1b",version:1,09-30T10:59:31.310Z,txid:"GZK9ny7t4fC
{ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-07",ClaimAmount:"792.03",PaidDate:"",PaidAmount:"600.00",Status:"In Review"}	{id:"5PLfK5ITW6qENDYq1I8L1b",version:2,09-30T10:41:45.831Z,txid:"leSRgfCPoLm7oF
{ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-07",ClaimAmount:"792.03",PaidDate:"",Status:"In Review",PaidAmount:"700.00"}	{id:"5PLfK5ITW6qENDYq1I8L1b",version:3,09-30T12:15:57.650Z,txid:"9MCnKGm39JXP
{ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-07",ClaimAmount:"792.03",PaidDate:"",PaidAmount:"700.00",Status:"Processed"}	{id:"5PLfK5ITW6qENDYq1I8L1b",version:4,09-30T12:17:45.877Z,txid:"9mouw1mX3sh5I
{ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-07",ClaimAmount:"792.03",PaidAmount:"700.00",Status:"Processed",PaidDate:"2020-09-29"}	{id:"5PLfK5ITW6qENDYq1I8L1b",version:5,09-30T12:32:56.736Z,txid:"LiKSuA1W6XEok
{ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-07",ClaimAmount:"792.03",PaidAmount:"700.00",PaidDate:"2020-09-29",Status:"Paid"}	{id:"5PLfK5ITW6qENDYq1I8L1b",version:6,09-30T12:49:51.080Z,txid:"fNQSeek9v9y"

At the bottom, there are links for Feedback, English (US), and legal notices: © 2008 - 2020, Amazon Internet Services Private Ltd. or its affiliates. All rights reserved., Privacy Policy, and Terms of Use.

# Data and metadata for a metadata ID='5PLfK5lTW6qENDYq1I8LIB':

data	metadata
{ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-7",ClaimAmount:"792.03",PaidAmount:"0",PaidDate:"",Status:"Pending"}	{id:"5PLfK5lTW6qENDYq1I8LIB",version:09-30T09:51:04.339Z,txId:"I1pH1mXKtbq1k
{ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-7",ClaimAmount:"792.03",PaidDate:"",Status:"Pending",PaidAmount:"600.00"}	{id:"5PLfK5lTW6qENDYq1I8LIB",version:109-30T10:39:31.310Z,txId:"GZKr9ny7t4f
{ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-7",ClaimAmount:"792.03",PaidDate:"",PaidAmount:"600.00",Status:"In Review"}	{id:"5PLfK5lTW6qENDYq1I8LIB",version:209-30T10:41:45.831Z,txId:"le5RgFCPoLm7o
{ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-7",ClaimAmount:"792.03",PaidDate:"",Status:"In Review",PaidAmount:"700.00"}	{id:"5PLfK5lTW6qENDYq1I8LIB",version:309-30T12:15:57.650Z,txId:"9MCnKGm39JXII
{ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-7",ClaimAmount:"792.03",PaidDate:"",PaidAmount:"700.00",Status:"Processed"}	{id:"5PLfK5lTW6qENDYq1I8LIB",version:409-30T12:17:45.877Z,txId:"9mouw1mX3sh5
{ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-7",ClaimAmount:"792.03",PaidAmount:"700.00",Status:"Processed",PaidDate:"2020-09-29"}	{id:"5PLfK5lTW6qENDYq1I8LIB",version:509-30T12:32:56.736Z,txId:"LiiKSuA1W6XEol
{ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-7",ClaimAmount:"792.03",PaidAmount:"700.00",PaidDate:"2020-09-29",Status:"Paid"}	{id:"5PLfK5lTW6qENDYq1I8LIB",version:609-30T12:49:51.080Z,txId:"FnQeSetkD9V

**Revisions listed:** blockAddress and Data for the metadataID= '5PLfK5ITW6qENDYq1I8L1b', whose ClaimID= 'Claim904'.  
Multiple revisions on the original value, for the Claim904.

blockAddress: {strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:16} –

Data: {ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-7",ClaimAmount:"792.03",PaidAmount:"0",PaidDate:"",Status:"Pending"}

**Revision1** - blockAddress: {strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:19} –

Data: {ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-7",ClaimAmount:"792.03",PaidDate:"",Status:"Pending",PaidAmount:"600.00"}

**Revision2** - blockAddress: {strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:20} –

Data: {ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-7",ClaimAmount:"792.03",PaidDate:"",PaidAmount:"600.00",Status:"In Review"}

**Revision3** - blockAddress: {strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:26} –

Data: {ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-7",ClaimAmount:"792.03",PaidDate:"",Status:"In Review",PaidAmount:"700.00"}

**Revision4** - blockAddress: {strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:27} –

Data: {ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-7",ClaimAmount:"792.03",PaidDate:"",PaidAmount:"700.00",Status:"Processed"}

**Revision5** - blockAddress: {strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:31} –

Data: {ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-7",ClaimAmount:"792.03",PaidAmount:"700.00",Status:"Processed",PaidDate:"2020-09-29"}

**Revision6** - blockAddress: {strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:34} –

Data: {ClaimID:"Claim904",PolicyID:"Policy202",ClaimDate:"2019-09-7",ClaimAmount:"792.03",PaidAmount:"700.00",PaidDate:"2020-09-29",Status:"Paid"}

# Downloaded Digests, after sets of different blocks of transactions:

The screenshot shows a Windows File Explorer window with the following details:

- Toolbar:** Includes icons for Pin to Quick access, Copy, Paste, Cut, Copy path, Move to, Copy to, Delete, Rename, New folder, New item, Open, Properties, Select all, Select none, Invert selection.
- Address Bar:** Shows "This PC > Downloads".
- Left Navigation:** Shows folder structure: Desktop, Downloads (selected), Documents, Pictures, BBG, CapGeminiIT, Corsera\_week3\_Agile\_Assignment, SubbuJava.
- File List:** Displays files in the Downloads folder, sorted by Date (newest at top).

Name	Date	Type	Size
SubbuAWSQLDBInsurance-2020-09-30/ion_AfterUpdate2Paid4Claims904_Tampered.txt	10/1/2020 3:07 PM	Text Document	1 KB
eLectaScreenRecorder.msi	9/30/2020 11:05 PM	Windows Installer Pa...	15,368 KB
SubbuAWSQLDBInsurance-2020-09-30/ion_AfterUpdate2Paid4Claims904.txt	9/30/2020 6:25 PM	Text Document	1 KB
SubbuAWSQLDBInsurance-2020-09-30/ion_AfterUpdate2Processed4Claims904.txt	9/30/2020 6:07 PM	Text Document	1 KB
SubbuAWSQLDBInsurance-2020-09-30/ion_AfterUpdate2InReview4Claims904.txt	9/30/2020 5:26 PM	Text Document	1 KB

**Step-8: Verifying a Transaction** - Verify the blockAddress's of the transactions of a document in the Ledger.

# Go to QLDB Verification:

The screenshot shows the Amazon QLDB Verification page in the AWS Management Console. The URL in the browser is `console.aws.amazon.com/qldb/home?region=us-east-1#verification`. The page title is "Verification" under the "Amazon QLDB" navigation bar. On the left, there's a sidebar with links: "Getting started", "Ledgers", "Query editor", "Streams", "Export", and "Verification". The "Verification" link is highlighted in orange. The main content area has a heading "Prerequisites" with a "Info" link. It contains instructions: "To verify that a document exists and is unchanged, you need the following:". There are two sections: "1. Document ID and block address" and "2. Digest". The "1. Document ID and block address" section says to use a sample query to find the ID and block address of the document to verify. The "2. Digest" section explains what a digest is: "A digest is a hash that represents your ledger's entire history of document revisions as of a point in time. You can save a digest at any time and use it later to verify previously committed transactions." A "Get digest" button is located at the bottom of this section.

← → ⌂ ⌄ console.aws.amazon.com/qldb/home?region=us-east-1#verification

aWS Services ▾ SubbuAWSCG ▾ N. Virginia ▾ Su

Amazon QLDB X

Amazon QLDB > Verification

## Verification Info

You can use cryptographic hashing (SHA-256) in Amazon QLDB to verify that your data hasn't been altered relative to a previously saved digest. [Learn more](#)

### Prerequisites Info

To verify that a document exists and is unchanged, you need the following:

**1. Document ID and block address**

Use this [sample query](#) to find the ID and block address of the document that you want to verify. Copy these fields from the [Query editor](#) and paste them into the form below.

**2. Digest**

A digest is a hash that represents your ledger's entire history of document revisions as of a point in time. You can save a digest at any time and use it later to verify previously committed transactions.

**Get digest**

# Choose the Ledger, DocumentID, Block address and the Digest, which we need to verify:

The screenshot shows the AWS QLDB console at `console.aws.amazon.com/qldb/home?region=us-east-1#verification`. The left sidebar has a 'Verification' section highlighted in orange. The main area is titled 'Verify a document' with an 'Info' link. It contains two sections: 'Specify the document that you want to verify' and 'Specify the digest to use for verification'. The 'Document ID' field contains '5PLfK5lTW6qENDYq1I8LIB'. The 'Block address' field contains '{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:16}'. The 'Choose digest' button is visible, and below it, the file path 'SubbuAWSQLDBInsurance-2020-09-30/ion\_AfterUpdate2InReview4Claims904.txt' and 'File size in kilobytes: 0.2' are shown.

Verify a document [Info](#)

Specify the document that you want to verify.  
Query your ledger and get your document ID and block address.

Ledger

SubbuAWSQLDBInsurance

Document ID

5PLfK5lTW6qENDYq1I8LIB

Block address

{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:16}

Specify the digest to use for verification.  
Choose a digest .ion.txt file that you previously saved, or enter the values.

Choose digest

SubbuAWSQLDBInsurance-2020-09-30/ion\_AfterUpdate2InReview4Claims904.txt

File size in kilobytes: 0.2

# Scenario-1: Block address is less than the Sequence number of the Digest. A +ve scenario.

Verify a document [Info](#)

 Specify the document that you want to verify.  
Query your ledger and get your document ID and block address.

Ledger

Document ID

Block address

 Specify the digest to use for verification.  
Choose a digest .ion.txt file that you previously saved, or enter the values.

SubbuAWSQLDBInsurance-2020-09-30.ion\_AfterUpdate2InReview4Claims904.txt  
File size in kilobytes: 0.2  
File last modified: 9/30/2020, 11:56:59 AM

Digest

Digest tip address

# Long screenshot for more details:

The screenshot shows the AWS Lambda Verification interface. At the top, it says "Amazon Lambda > Verification". Below that, there's a section titled "Prerequisites" with a link to "Learn more". It lists the requirements: "Document ID and block address" and "2. Digest".

The "Verify a document" section contains fields for "Document ID" (SubAccountInsurance) and "Block address" (1PwCnQ1HdQqQcTgJ...). Below these, there's a "Specify the digest to use for verification" section with a dropdown menu showing a previous digest entry.

The "Verification results" section at the bottom shows a green success message: "Document successfully verified as of 10/1/2020, 7:45:56 AM. Read response blocks and digest successfully matched". It includes sections for "Proof", "Hash calculator", and "Digest calculated".

At the very bottom, there's a footer with links to "Feedback", "English (US)", "© 2020-2021, Amazon Web Services, Inc. or its Affiliates. All rights reserved.", "Privacy Policy", and "Terms of Use".

# Successfully verified:

→ ⌂ ⌂ console.aws.amazon.com/qldb/home?region=us-east-1#verification

aws Services ▾ SubbuAWSCG ▾ N. Virginia ▾ S...

Document successfully verified as of 10/1/2020, 7:40:36 AM  
Proof complete (hashes and digest successfully recalculated).

**Proof** | Block

**Revision hash**  
`IGP2MdT49nNCpW392kPjs+M9XdTTNm4tTpjVHYAK+Hw=`

Document ID: 5PLfK5lTW6qENDYq1I8Lb  
Version: 0  
Block address:  
`{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:16}`

**Hash calculations**

```
graph TD; A["IGP2MdT49nNCpW392kPjs+M9XdTTNm4tTpjVHYAK+Hw="] --> B["803TCtyo0G..."]  
A --> C["RUMenlw5HAuPjCxJ2BnuEESyK9RinFYI6ZP8uC7NXVc"]  
A --> D["VyK7dNGtvKadhmNOFZqekuatm4RTLSyxKunakBdTPY0"]  
A --> E["40FEXPnTJ809LijJyR/1KK5ZCtm7mlckSHD+BCnwDOY"]  
A --> F["rsN3Smt3XSoz81YRuiKONnBXShn8uiN4NahSd/7KCGLn4"]
```

**Proof hashes**

- 803TCtyo0G...  
RUMenlw5HAuPjCxJ2BnuEESyK9RinFYI6ZP8uC7NXVc  
VyK7dNGtvKadhmNOFZqekuatm4RTLSyxKunakBdTPY0  
40FEXPnTJ809LijJyR/1KK5ZCtm7mlckSHD+BCnwDOY  
rsN3Smt3XSoz81YRuiKONnBXShn8uiN4NahSd/7KCGLn4

# Scenario-2: Block address is higher than the Sequence number of the Digest. A –ve scenario.

The screenshot shows the 'Verify a document' page in the AWS QLDB console. The left sidebar has 'Verification' selected. The main form has the following fields:

- Specify the document that you want to verify.**: Includes a note: "Query your ledger and get your document ID and block address."
- Ledger**: Set to "SubbuAWSQLDBInsurance".
- Document ID**: Set to "SPLfk5lTW6qENDYq1I8Llb".
- Block address**: Set to "[strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:26]". This field is highlighted with a red border, indicating an error.
- Warning message**: "⚠ The sequence number of the block address must be less than or equal to the sequence number of the digest tip address."
- Specify the digest to use for verification.**: Includes a note: "Choose a digest .ion.txt file that you previously saved, or enter the values."
- Choose digest**: A button to select a digest file.

At the bottom, the file path "SubbuAWSQLDBInsurance-2020-09-30.ion\_AfterUpdate2InReview4Claims904.txt" is shown.

# Scenario-3: Block address is less than the Sequence number of the Digest (A +ve scenario, with different BlockID and within the Sequence number of the digest).

The screenshot shows the AWS QLDB console at `console.aws.amazon.com/qldb/home?region=us-east-1#verification`. The left sidebar has 'Verification' selected. The main area is titled 'Verify a document' with an 'Info' link. It contains two sections: 'Specify the document that you want to verify.' and 'Specify the digest to use for verification.' In the first section, 'Ledger' is set to 'SubbuAWSQLDBInsurance', 'Document ID' is '5PLfK5lTW6qENDYq1I8L1b', and 'Block address' is '{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:31}'. In the second section, 'Choose digest' points to 'SubbuAWSQLDBInsurance-2020-09-30/ion\_AfterUpdate2Paid4Claims904.txt' (File size in kilobytes: 0.2).

Verify a document [Info](#)

Specify the document that you want to verify.  
Query your ledger and get your document ID and block address.

Ledger  
SubbuAWSQLDBInsurance

Document ID  
5PLfK5lTW6qENDYq1I8L1b

Block address  
{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:31}

Specify the digest to use for verification.  
Choose a digest .ion.txt file that you previously saved, or enter the values.

Choose digest  
SubbuAWSQLDBInsurance-2020-09-30/ion\_AfterUpdate2Paid4Claims904.txt  
File size in kilobytes: 0.2

# Successfully verified:

The screenshot shows the AWS QLDB console interface. The top navigation bar includes the AWS logo, a Services dropdown, and user information for SubbuAWSCG in the N. Virginia region. The left sidebar has a 'Verification' section highlighted in red, containing links for Getting started, Ledgers, Query editor, Streams, Export, and Verification. The main content area displays a green success message: 'Document successfully verified as of 10/1/2020, 7:57:39 AM' with the note 'Proof complete (hashes and digest successfully recalculated)'. Below this, there are tabs for 'Proof' and 'Block', with 'Block' selected. Under the 'Block' tab, it shows a Transaction ID (LiiKSU...), a Transaction time (2020-09-30T12:32:56.751Z), a Block hash (gdjUQH...), and a Block address (Strand ID: 6xA6iQ1MmqfL5MS1ReOM7d, Sequence number: 31). At the bottom, there's a 'Document ID' dropdown set to '5PLfK5lTW6qENDYq1I8Llib (revision 5)', a 'Statements' section with a single update query, and a 'Document entries' section showing the start of a JSON object definition.

console.aws.amazon.com/qldb/home?region=us-east-1#verification

SubbuAWSCG ▾ N. Virginia ▾

Amazon QLDB X

Getting started

Ledgers

Query editor

Streams

Export

Verification

Document successfully verified as of 10/1/2020, 7:57:39 AM

Proof complete (hashes and digest successfully recalculated).

Proof Block

Transaction ID

LiiKSUA1W6XEok4WlvXI3T

Block hash

gdjUQHImuRLoYMXpONELWmqCRWjFPGjZOizOMJehzYs=

Transaction time

2020-09-30T12:32:56.751Z

Block address

Strand ID: 6xA6iQ1MmqfL5MS1ReOM7d

Sequence number: 31

Document ID

5PLfK5lTW6qENDYq1I8Llib (revision 5)

Statements

1 update Claims set PaidDate='2020-09-29' where ClaimID='Claim904'

Document entries

1 {

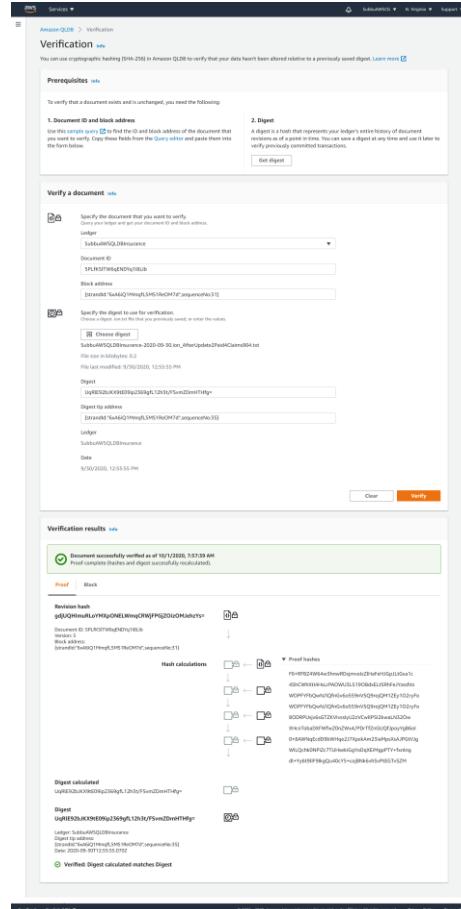
2 blockAddress:{

# Identified the given blockAddress as revision5 on the Claim904:

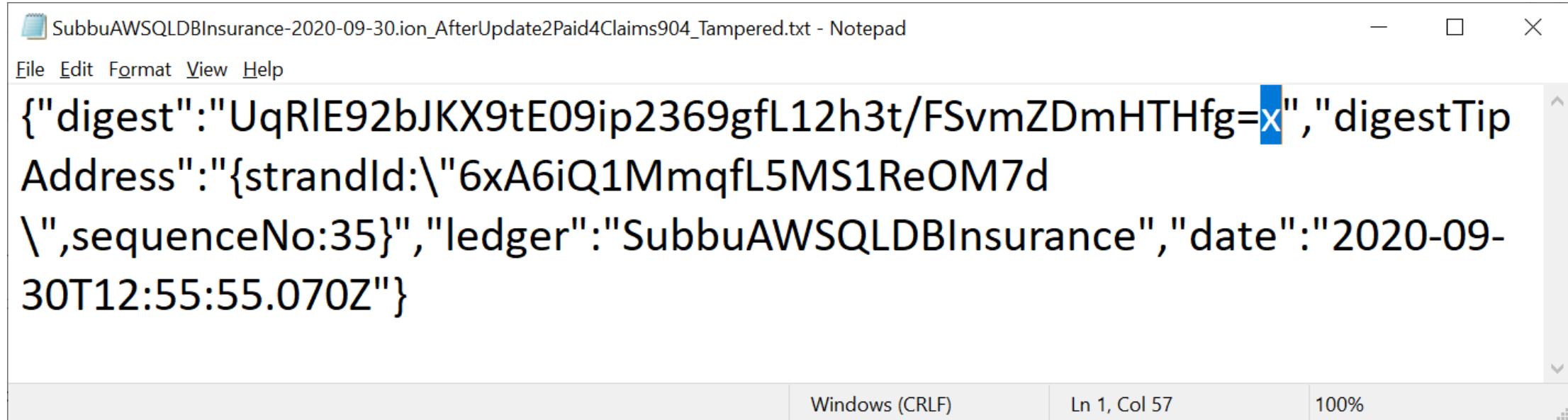
The screenshot shows the AWS QLDB console at `console.aws.amazon.com/qldb/home?region=us-east-1#verification`. The left sidebar has a 'Verification' section selected. The main area shows a 'Document ID' dropdown set to '5PLfK5lTW6qENDYq1I8Llb (revision 5)'. Below it, the 'Statements' section contains the query: '1 update Claims set PaidDate='2020-09-29' where ClaimID='Claim904''. To the right, the 'Document entries' section displays the JSON document structure with line numbers 1 through 18.

```
1 {
2   blockAddress: {
3     strandId: "6xA6iQ1MmqfL5MS1ReOM7d",
4     sequenceNo: 31
5   },
6   hash: {{gdjUQHImuRLoYMXpONELWmqCRWjFPGj}},
7   data: {
8     ClaimID: "Claim904",
9     PolicyID: "Policy202",
10    ClaimDate: "2019-09-7",
11    ClaimAmount: "792.03",
12    PaidAmount: "700.00",
13    Status: "Processed",
14    PaidDate: "2020-09-29"
15  },
16  metadata: {
17    id: "5PLfK5lTW6qENDYq1I8Llb",
18    version: 5,
```

More details in the long screenshot:



## Scenario-4: Tampered hash in the Digest, with correct blockAddress. A –ve scenario.

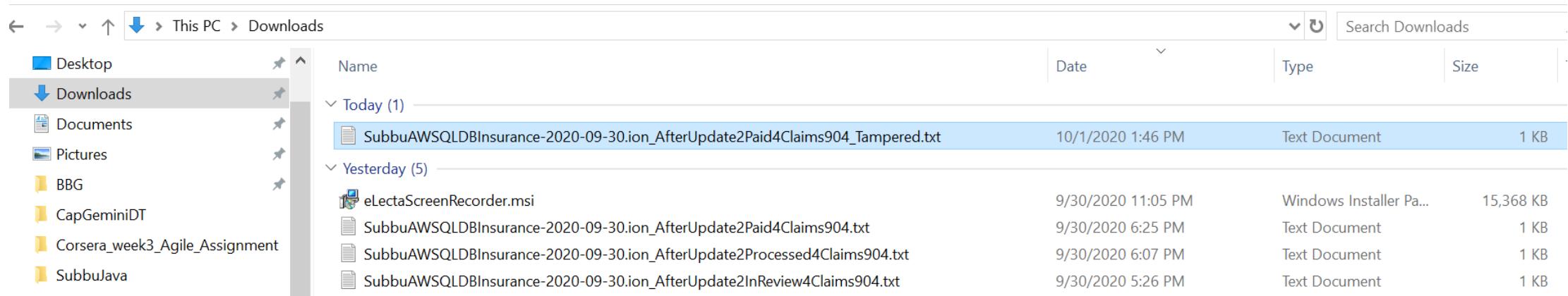


The screenshot shows a Notepad window with the title "SubbuAWSQLDBInsurance-2020-09-30/ion\_AfterUpdate2Paid4Claims904\_Tampered.txt - Notepad". The content of the file is a JSON object:

```
{"digest":"UqRIE92bJKX9tE09ip2369gfL12h3t/FSvmZDmHTHfg=x","digestTip  
Address":{"strandId:\\"6xA6iQ1MmqfL5MS1ReOM7d  
\",sequenceNo:35}","ledger":"SubbuAWSQLDBInsurance","date":"2020-09-  
30T12:55:55.070Z"}
```

The "digest" field contains a value where the last character 'x' is highlighted in blue, indicating it has been tampered with. The Notepad interface includes standard menu options (File, Edit, Format, View, Help) and status bar information (Windows (CRLF), Ln 1, Col 57, 100%).

Chosen the latest Digest and tampered the hash and renamed the downloaded Digest file:



Downloads				
	Name	Date	Type	Size
Desktop				
Downloads				
Documents				
Pictures				
BBG				
CapGeminiDT				
Corsera_week3_Agile_Assignment				
SubbuJava				
Today (1)				
	SubbuAWSQLDBInsurance-2020-09-30/ion_AfterUpdate2Paid4Claims904_Tampered.txt	10/1/2020 1:46 PM	Text Document	1 KB
Yesterday (5)				
	eLectaScreenRecorder.msi	9/30/2020 11:05 PM	Windows Installer Pa...	15,368 KB
	SubbuAWSQLDBInsurance-2020-09-30/ion_AfterUpdate2Paid4Claims904.txt	9/30/2020 6:25 PM	Text Document	1 KB
	SubbuAWSQLDBInsurance-2020-09-30/ion_AfterUpdate2Processed4Claims904.txt	9/30/2020 6:07 PM	Text Document	1 KB
	SubbuAWSQLDBInsurance-2020-09-30/ion_AfterUpdate2InReview4Claims904.txt	9/30/2020 5:26 PM	Text Document	1 KB

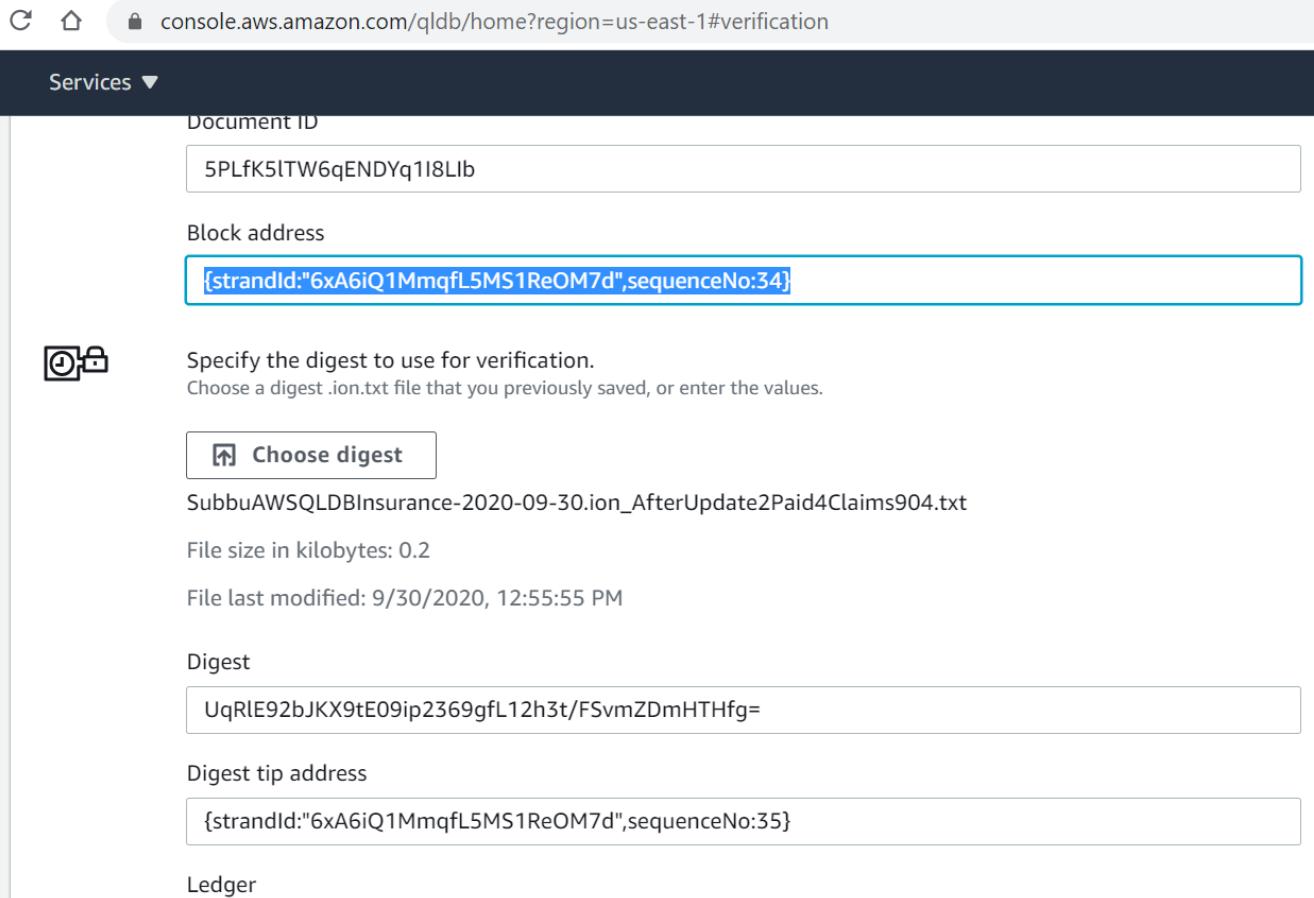
# Tampered hash will get auto validated and will not allow to Verify:

The screenshot shows the AWS QLDB Verification interface. On the left, a sidebar lists navigation options: Getting started, Ledgers, Query editor, Streams, Export, and **Verification**. The main area displays a ledger named "SubbuAWSQLDBInsurance". It shows a "Document ID" field containing "5PLfK5lTW6qENDYq1I8Llb" and a "Block address" field containing "{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:27}". Below these fields, there is a section titled "Specify the digest to use for verification." with the sub-instruction "Choose a digest .ion.txt file that you previously saved, or enter the values." A "Choose digest" button is present. Underneath, a file is listed: "SubbuAWSQLDBInsurance-2020-09-30.ion\_AfterUpdate2Paid4Claims904\_Tampered.txt", with details: "File size in kilobytes: 0.2" and "File last modified: 10/1/2020, 9:37:29 AM". At the bottom, a "Digest" input field contains the value "UqRlE92bJKX9tE09ip2369gfL12h3t/FSvmZDmHTHfg=x", which is highlighted with a red border. A warning message below the input field states: "⚠ The digest must be a 256-bit hash value encoded in base64."

# Scenario-5: Invalid blockAddress with correct Digest. A –ve scenario.

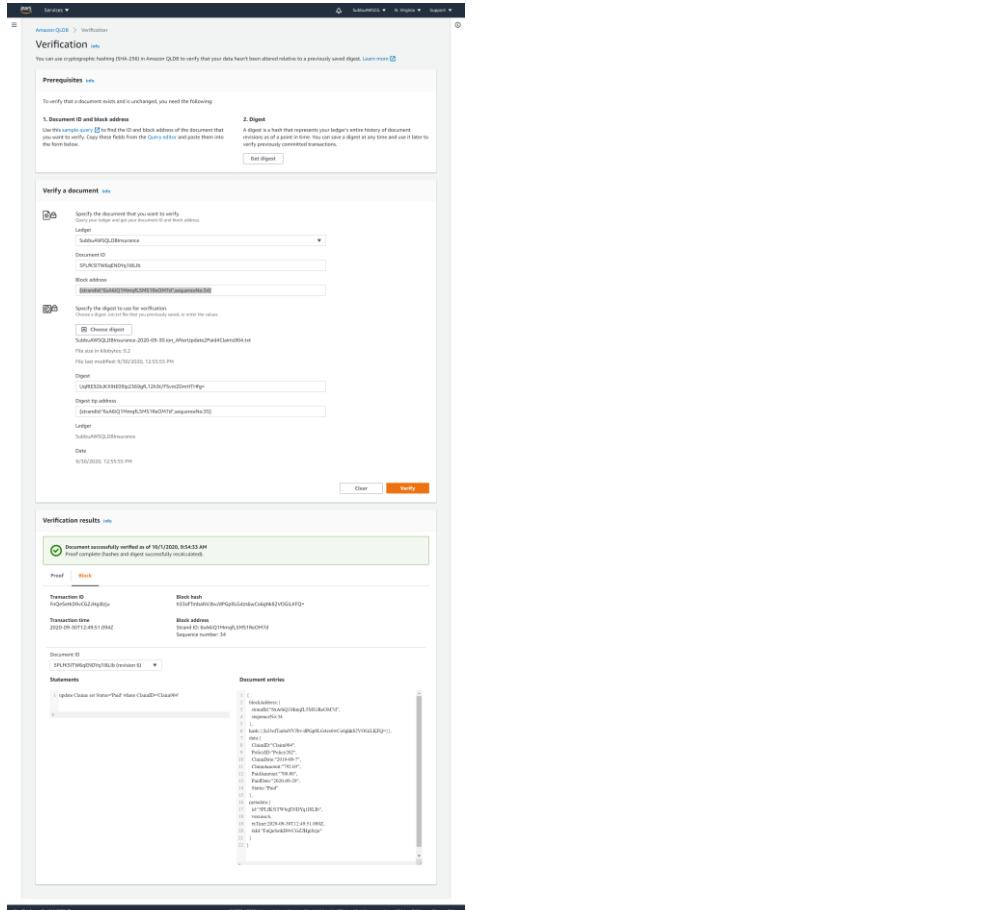
The screenshot shows the Amazon QLDB Verification interface. The top navigation bar includes 'Amazon QLDB' and 'Verification'. The main section is titled 'Verification' with a 'Prerequisites' link. It explains that to verify a document, you need a Document ID and block address, and a Digest (a hash of the ledger's history). Below this, there are two tabs: 'Verify a document' and 'Get digest'. In the 'Verify a document' tab, the user has entered a Ledger ('SubbuAWSQLDBInsurance'), a Document ID ('SPLN31WigEDNDq1BLb'), and a Block address ('[strandId:"6a46Q1MengfLSHS1ReOH7d",sequenceNo:32]'). Under 'Digest', they have chosen a file ('Choose digest') named 'SubbuAWSQLDBInsurance-2020-09-30/ion\_AfterUpdate2Paid4ClaimsR04.txt'. The 'Verify' button is highlighted in orange at the bottom. A red error message box states: 'invalid document ID/block address combination' and 'Document ID SPLN31WigEDNDq1BLb could not be found in the block at block address [strandId:"6a46Q1MengfLSHS1ReOH7d",sequenceNo:32]. Enter a different block address and document ID combination.' At the bottom, there is a 'Verification results' section with a note: 'No verification results' and 'Specify a document to verify.'

# Scenario-5: Block address should be lower than the Digest tip address, in a +ve scenario. This is the 6<sup>th</sup> Revision for the Claim904.



The screenshot shows the AWS QLDB verification interface. The URL in the browser is `console.aws.amazon.com/qldb/home?region=us-east-1#verification`. The 'Services' dropdown is open. The 'Document ID' field contains the value `5PLfK5ITW6qENDYq1I8Llb`. The 'Block address' field contains the value `{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:34}`, which is highlighted with a blue border. Below this field is a section titled 'Specify the digest to use for verification.' It includes a note: 'Choose a digest .ion.txt file that you previously saved, or enter the values.' A 'Choose digest' button is present. Below this, the file information is shown: 'SubbuAWSQLDBInsurance-2020-09-30.ion\_AfterUpdate2Paid4Claims904.txt', 'File size in kilobytes: 0.2', and 'File last modified: 9/30/2020, 12:55:55 PM'. The 'Digest' field contains the value `UqRIE92bJKX9tE09ip2369gfL12h3t/FSvmZDmHTHfg=`. The 'Digest tip address' field contains the value `{strandId:"6xA6iQ1MmqfL5MS1ReOM7d",sequenceNo:35}`. At the bottom, there is a 'Ledger' tab.

Successfully verified, and identifies the given  
blockAddress as revision6:



# Appendix:

<https://github.com/subbugh/aws-qldb>

<https://aws.amazon.com/qldb/>

<https://docs.aws.amazon.com/qldb/index.html>

<https://aws.amazon.com/qldb/features/>

<https://docs.aws.amazon.com/qldb/latest/developerguide/what-is.html>

<https://docs.aws.amazon.com/qldb/latest/developerguide/ql-reference.docs.html>

<https://docs.aws.amazon.com/qldb/latest/developerguide/getting-started.java.tutorial.html>

<https://partiql.org/tutorial.html>

<https://aws.amazon.com/qldb/features/>

<https://aws.amazon.com/qldb/faqs/>