UNIVERSITI TUNKU ABDUL RAHMAN FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY

UCCD3113 DISTRIBUTED COMPUTER SYSTEMS

Bachelor of Information Technology (Hons) Communications and Networking

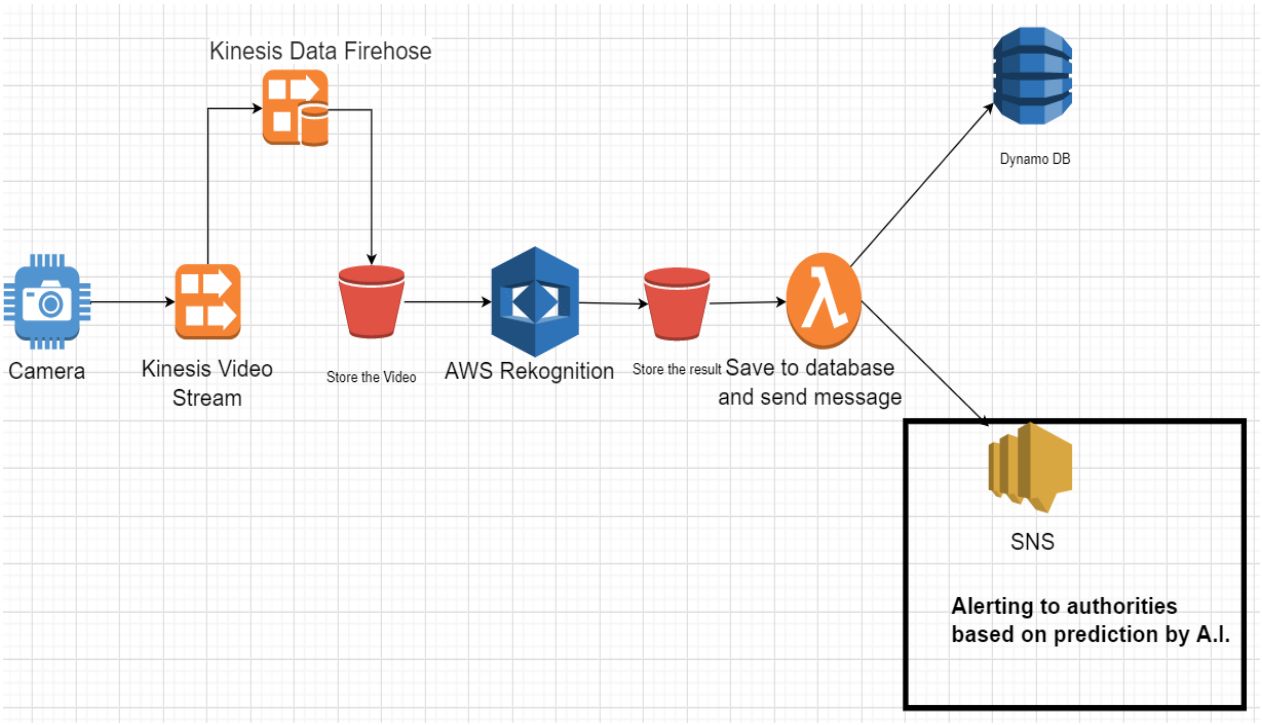
May 2020 Session

Lecturer: Ts Dr. Cheng Wai Khuen

Configuration Manual: Smart Street Light Camera

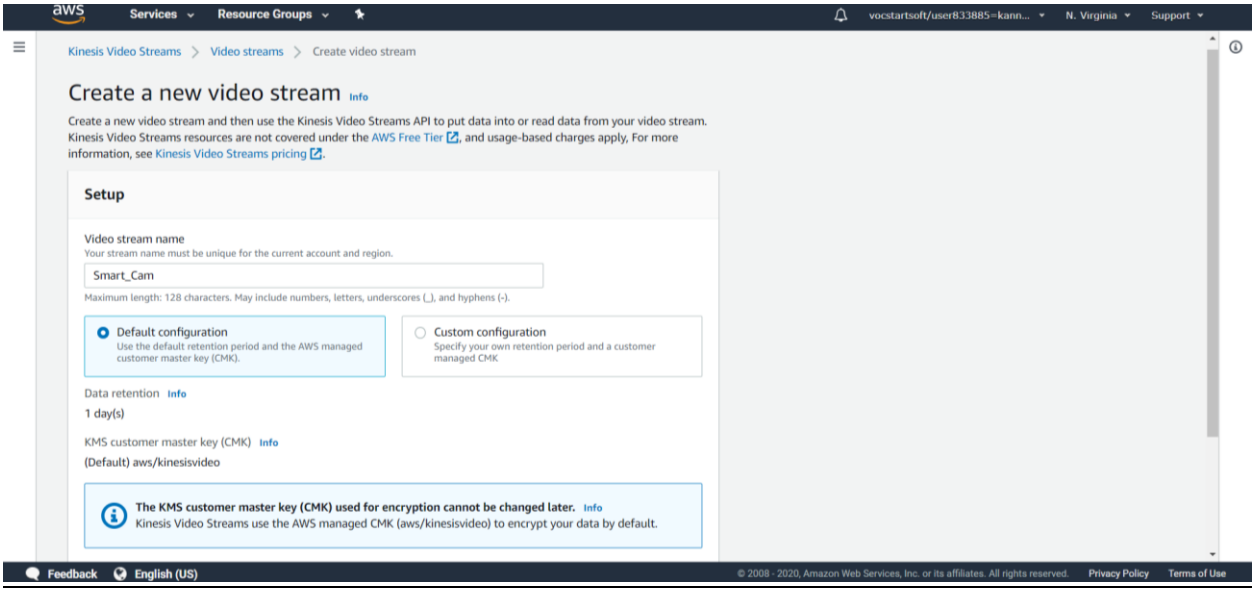
Name:	ID:	Course
KANNAN A/L DORAJ	1904781	CN
LEE SONG YAO	1905829	CN
VINCENT YIP KAR FAI	1904844	CN
WAN KAR HOU	1607221	CS

Architecture Diagram

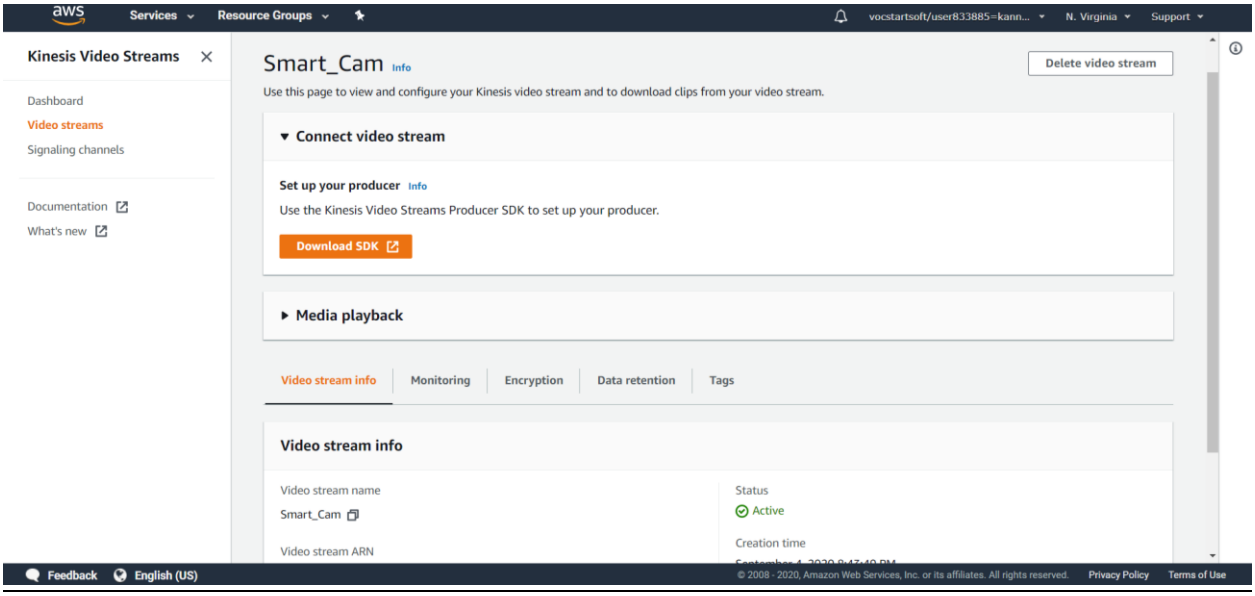


Kinesis Video Stream

- Create a Kinesis video stream using the default setting, with the name “Smart_Cam”

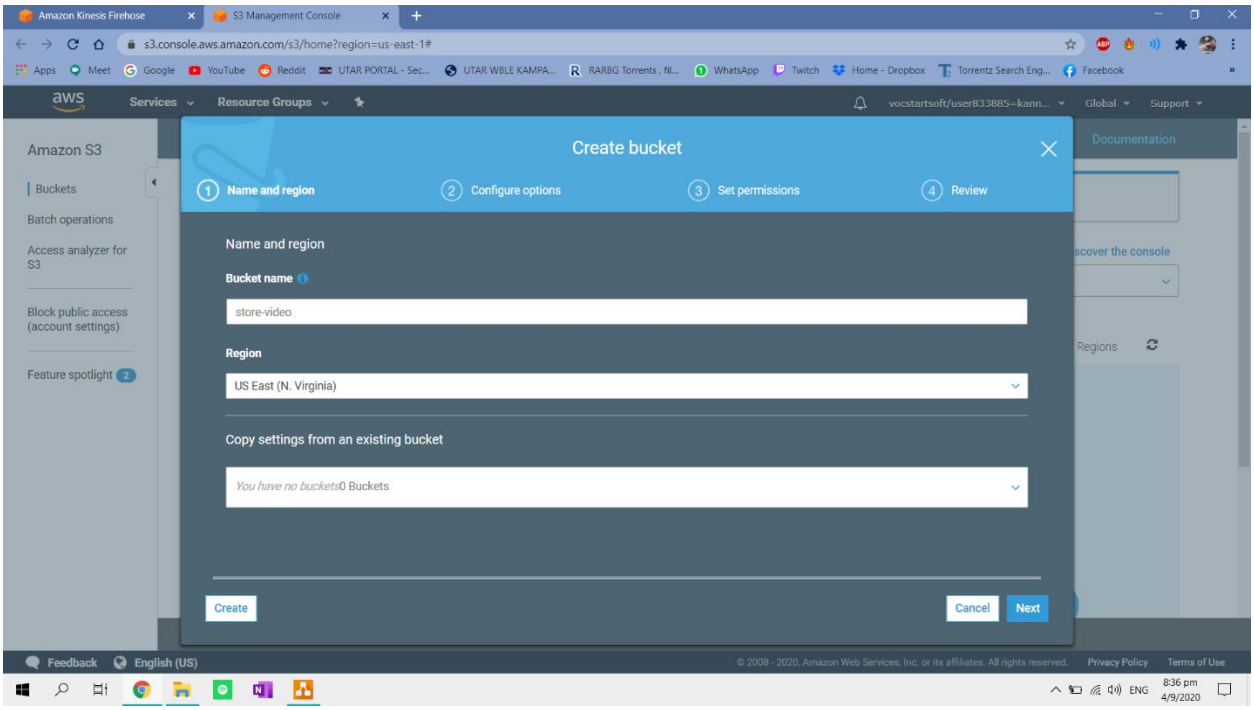


- For the prototype, we use the webcam as our smart camera

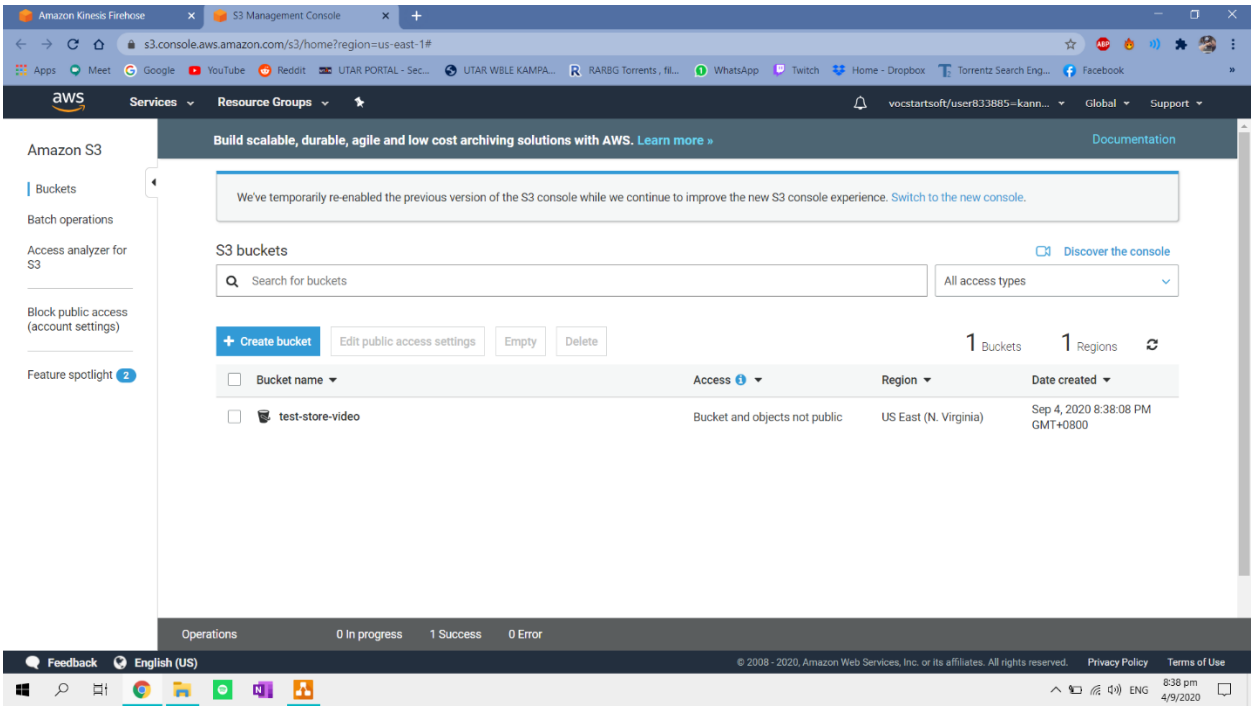


Amazon S3 Bucket (Store the Video)

- Using the default settings and naming the S3 bucket as store-video

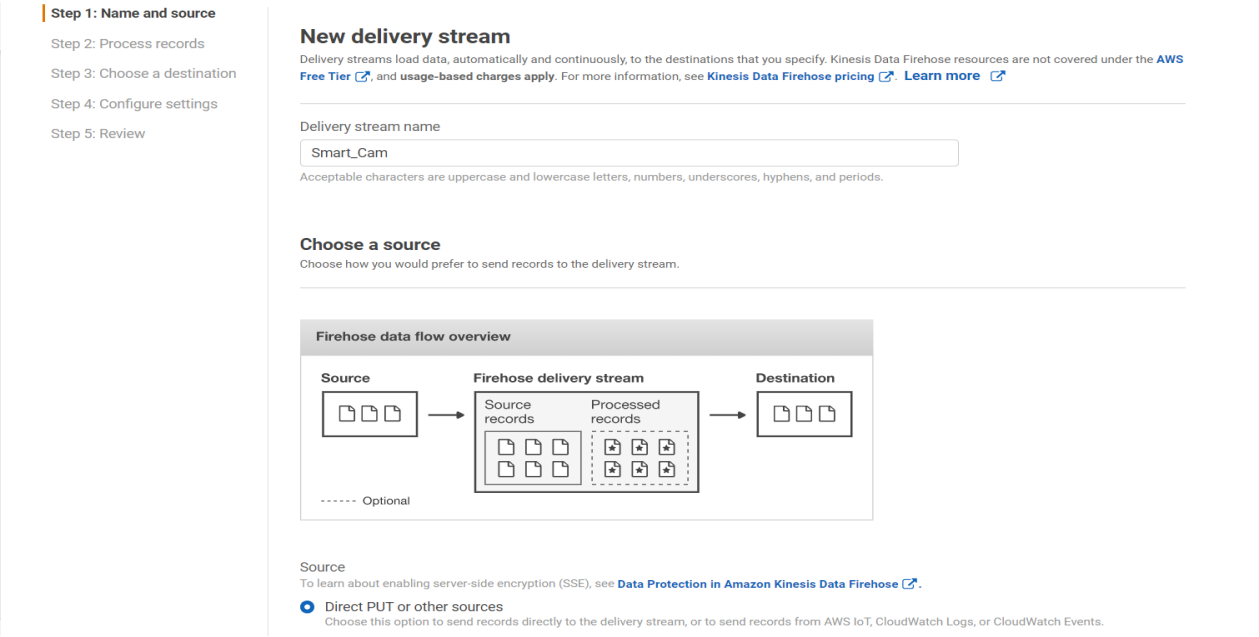


- The S3 bucket after its created

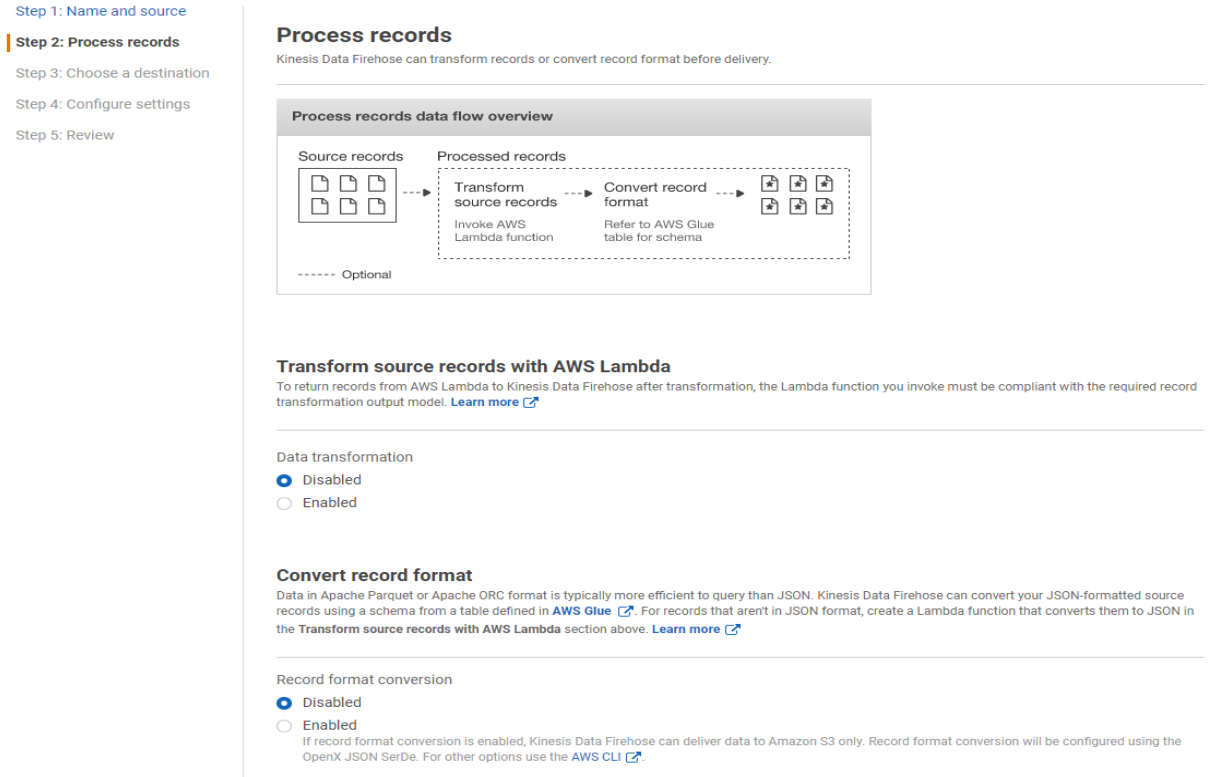


Kinesis Data Firehose

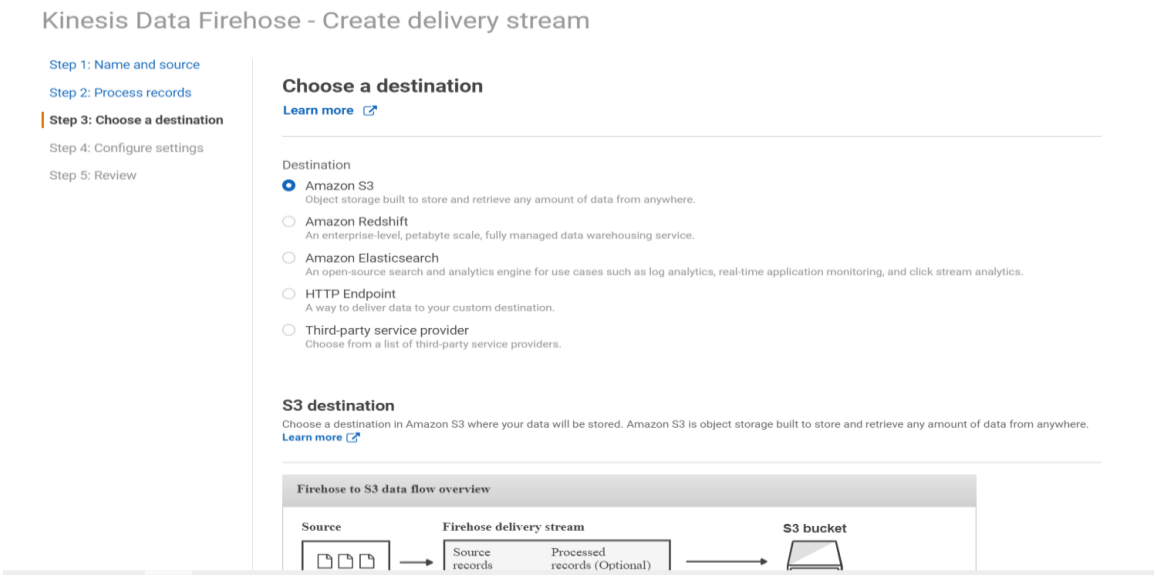
- Using Firehose as our delivery system to transfer the video files to s3. Using the same name “Smart_Cam”. And select Direct PUT as the source.



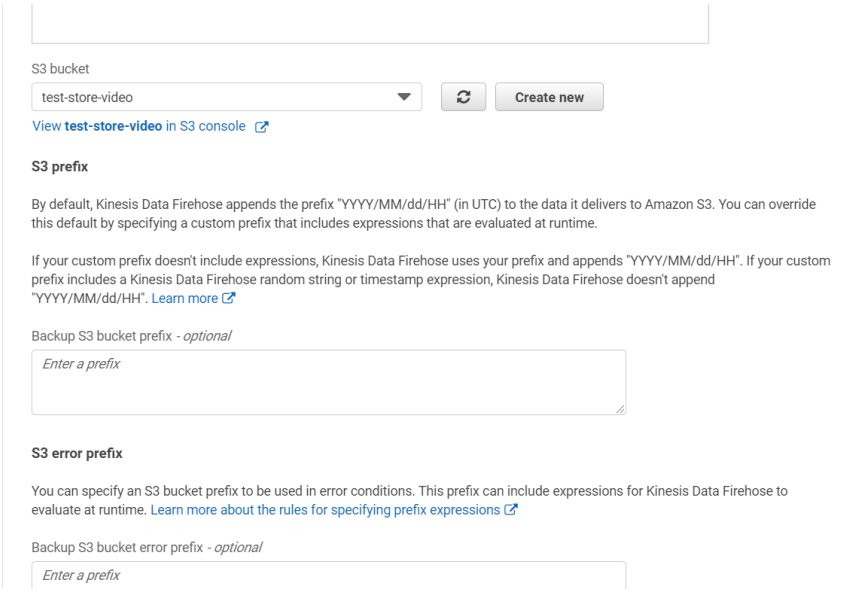
- Using standard options given by the AWS firehose



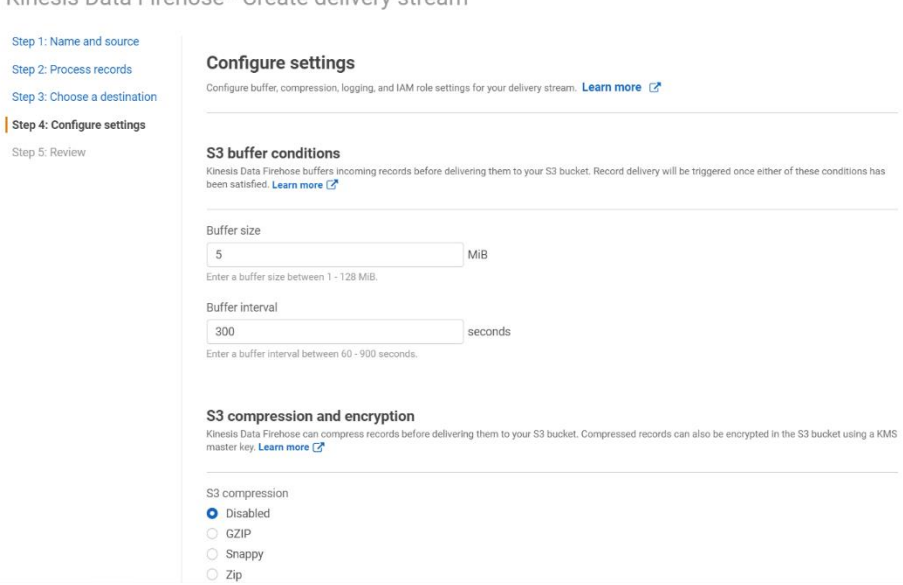
- Select the destination for the files to be transported to, in our case it’s a Amazon s3 storage

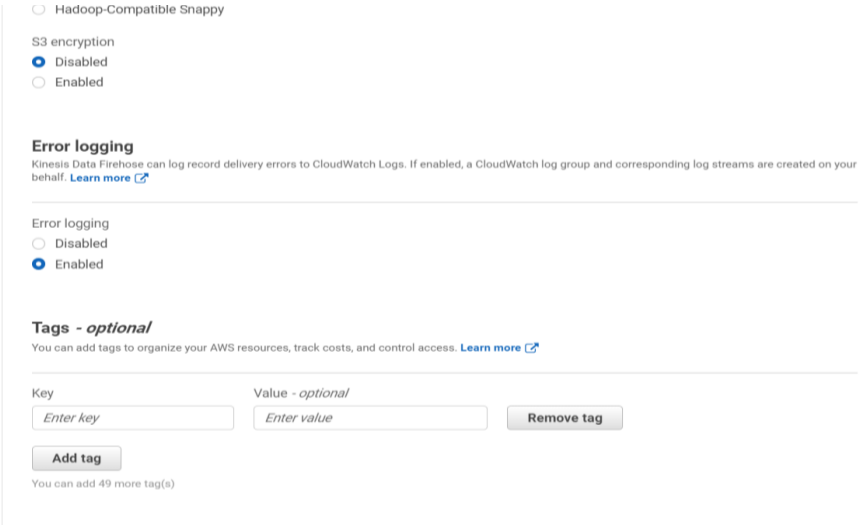


- And select the Amazon S3 storage that have been created

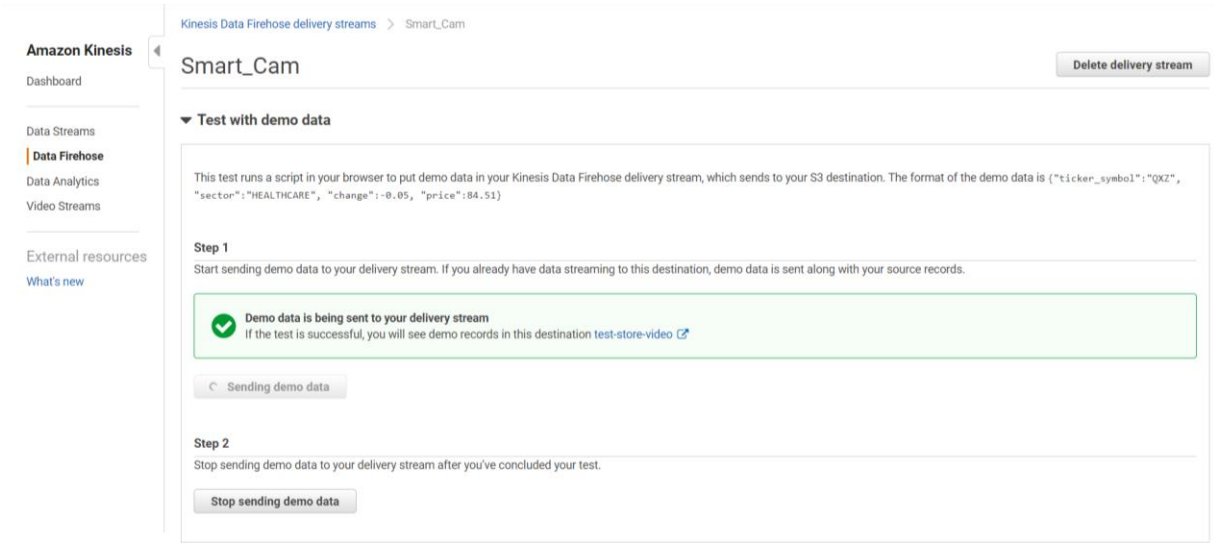


- The configure settings will be set to default as given by the Kinesis firehose

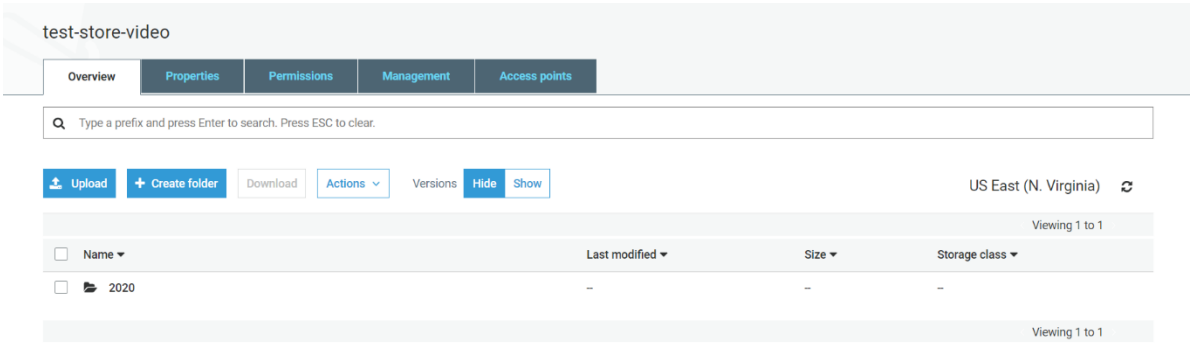




- Testing the Kinesis Firehose and the S3 by sending demo file

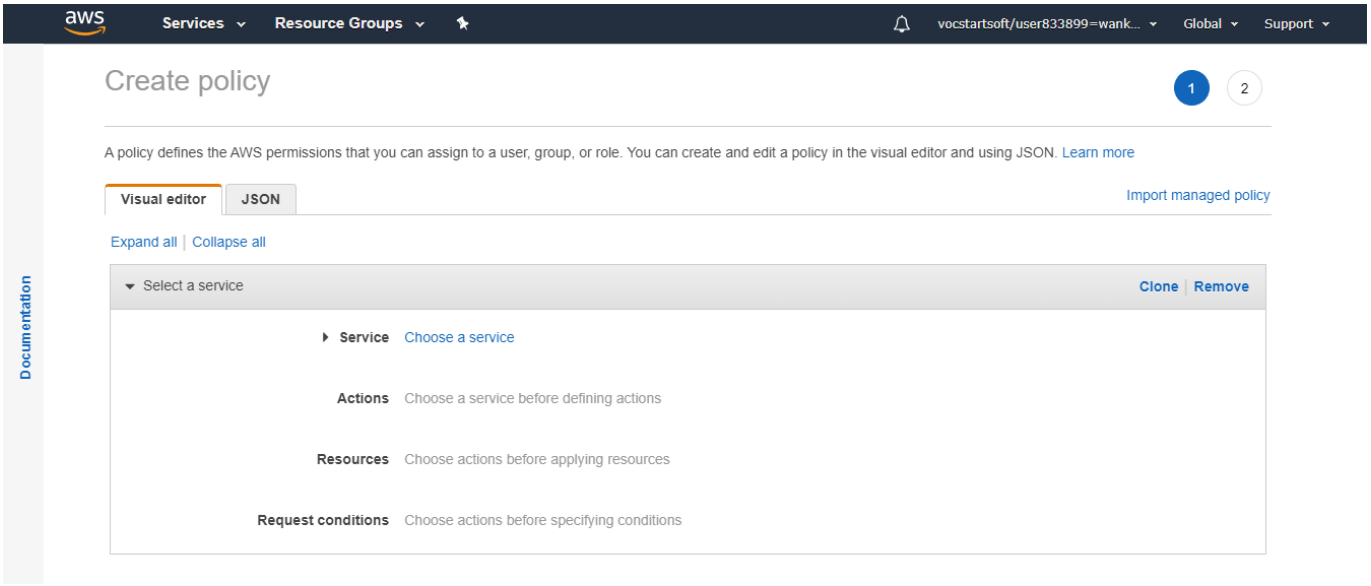


- The demo file from the Kinesis Firehose in S3 bucket

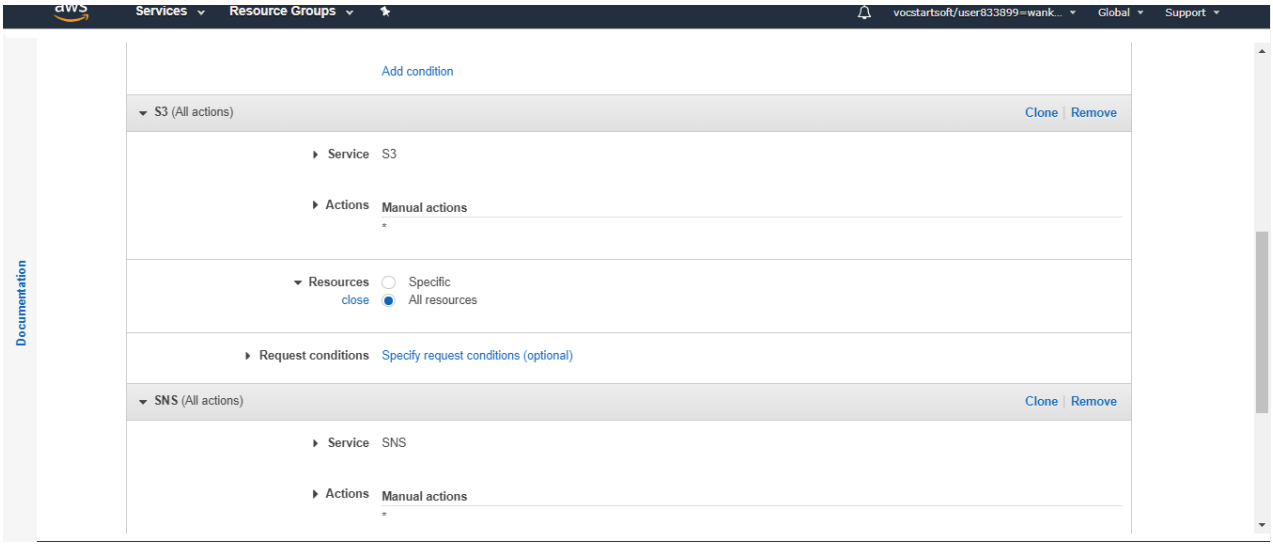


Identity and Access Management

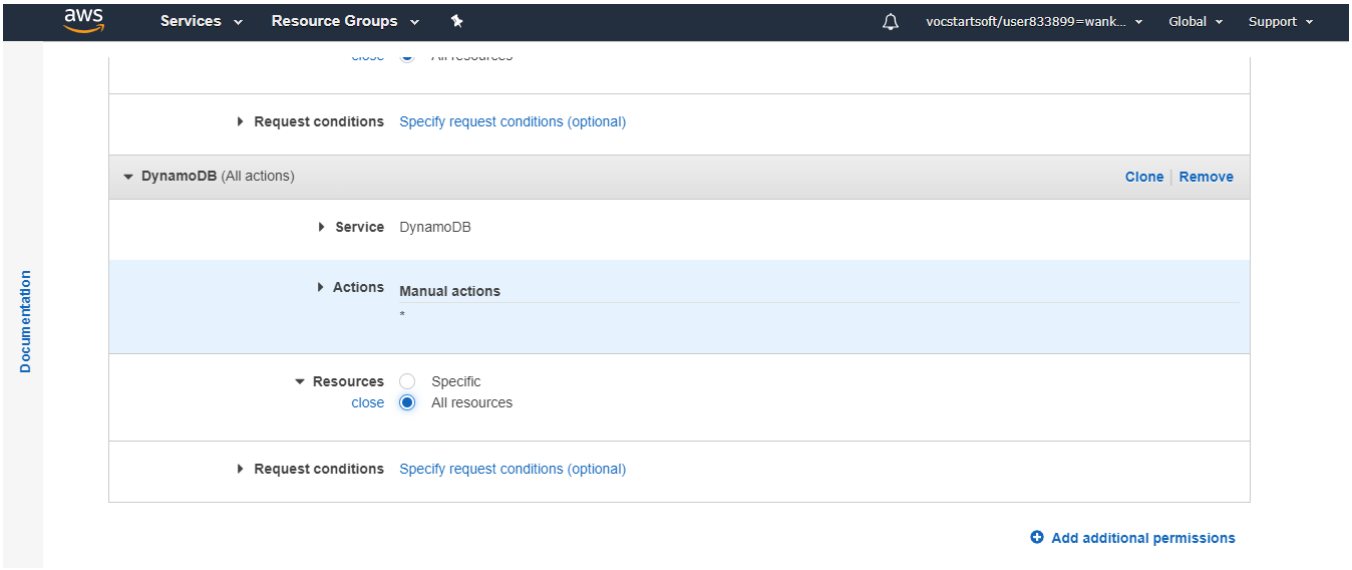
- Create new policy for certain services in IAM



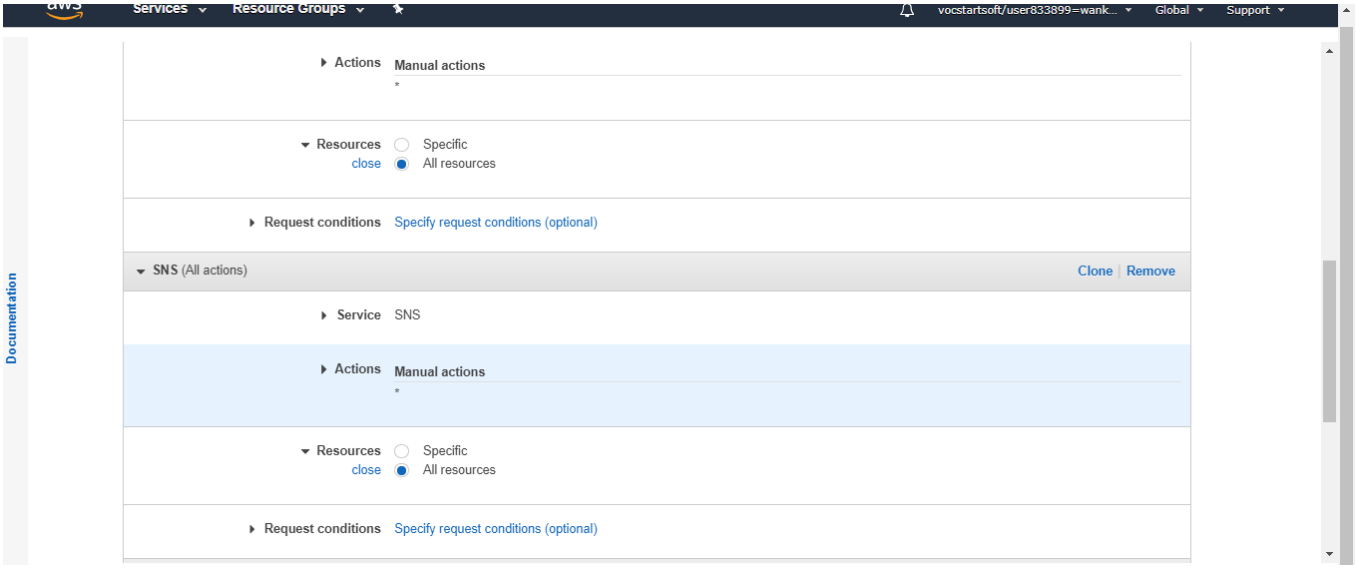
- Allow access to all resources in Amazon S3 in the policy



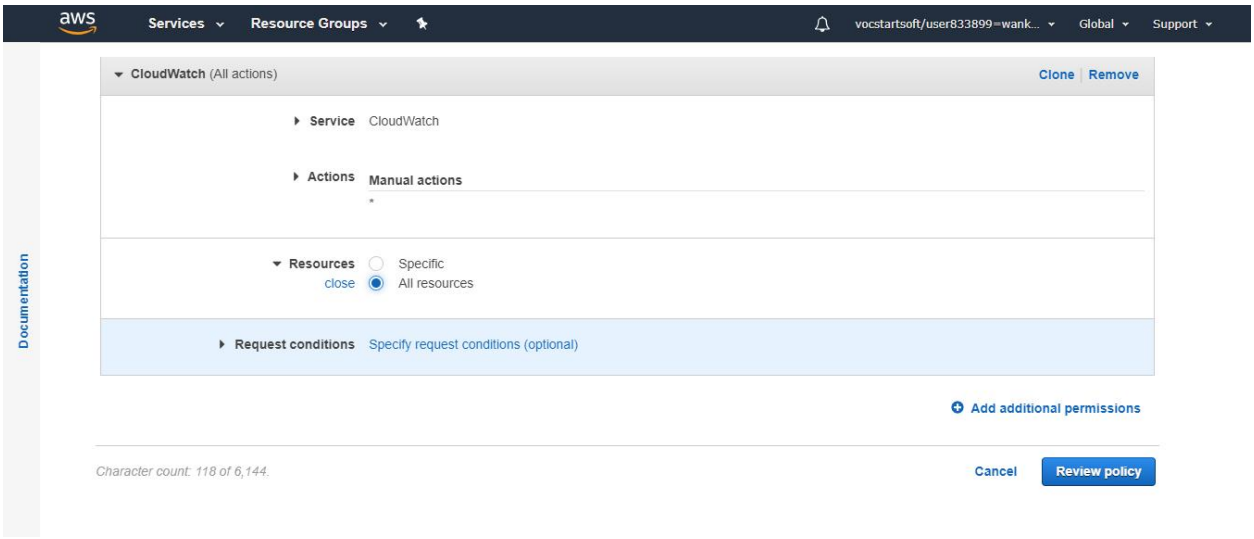
- Allow access to all resources in Dynamo DB for the policy



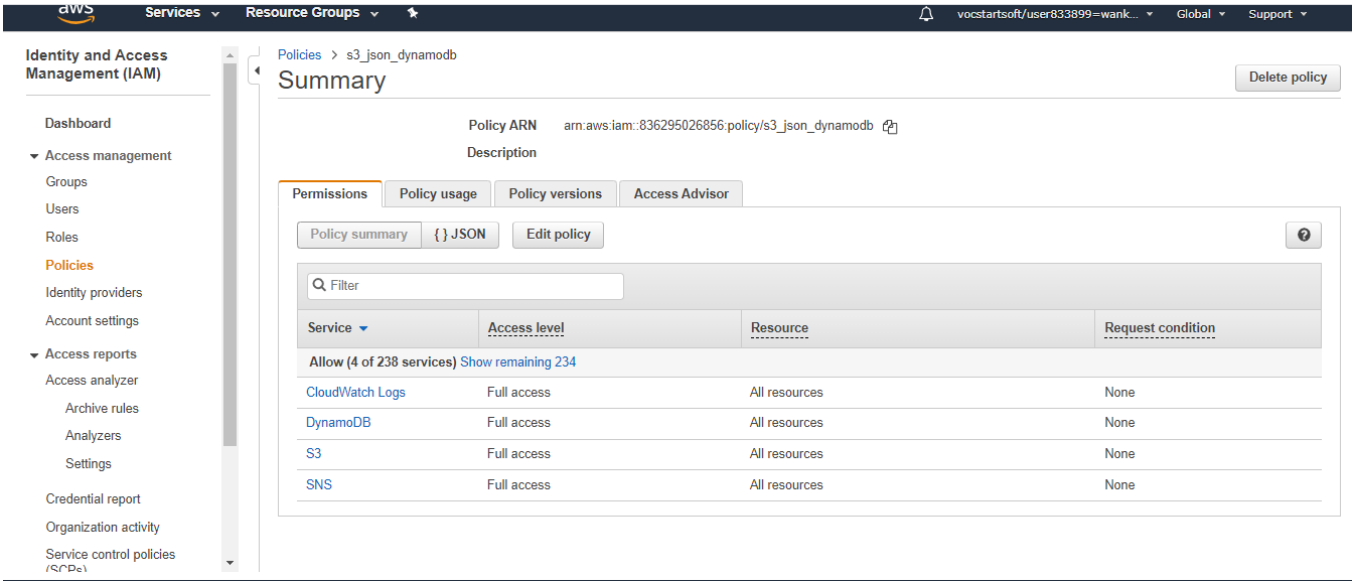
-Allow access to all resources in Amazon SNS for the policy



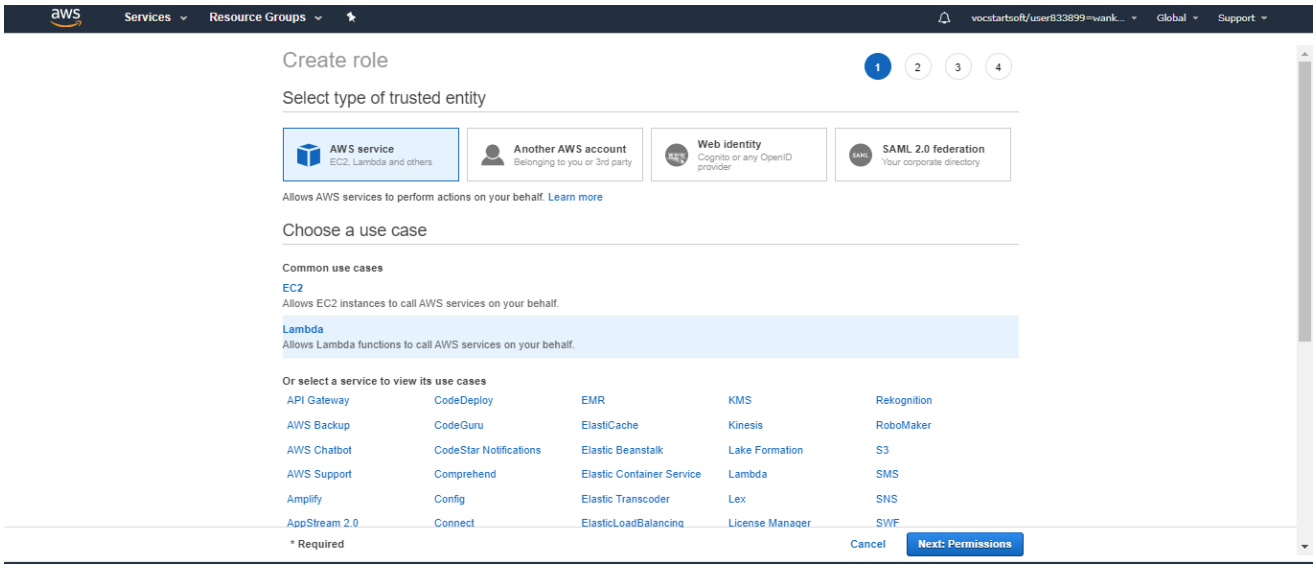
- Allow access for all resources in CloudWatch for the new Policy, and press “Review policy “button, skip the add tags, enter “s3_json_dynamodb” as the name of policy and press “Create policy” button



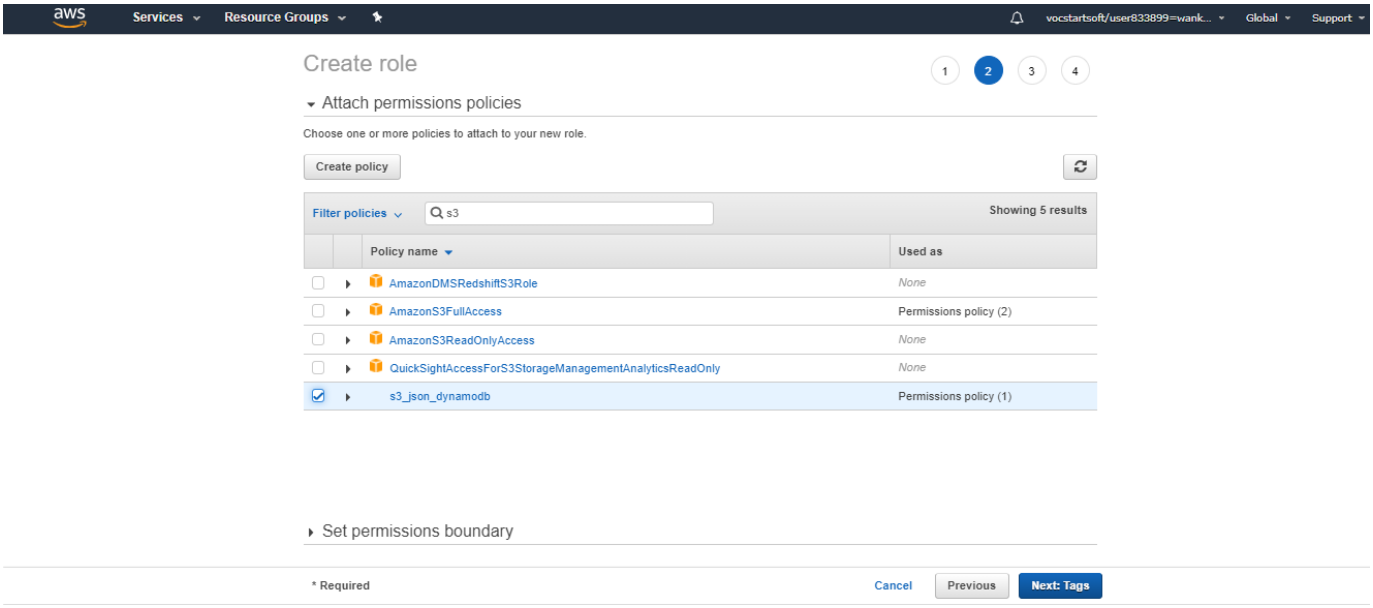
- “s3_json_dynamodb” successfully created



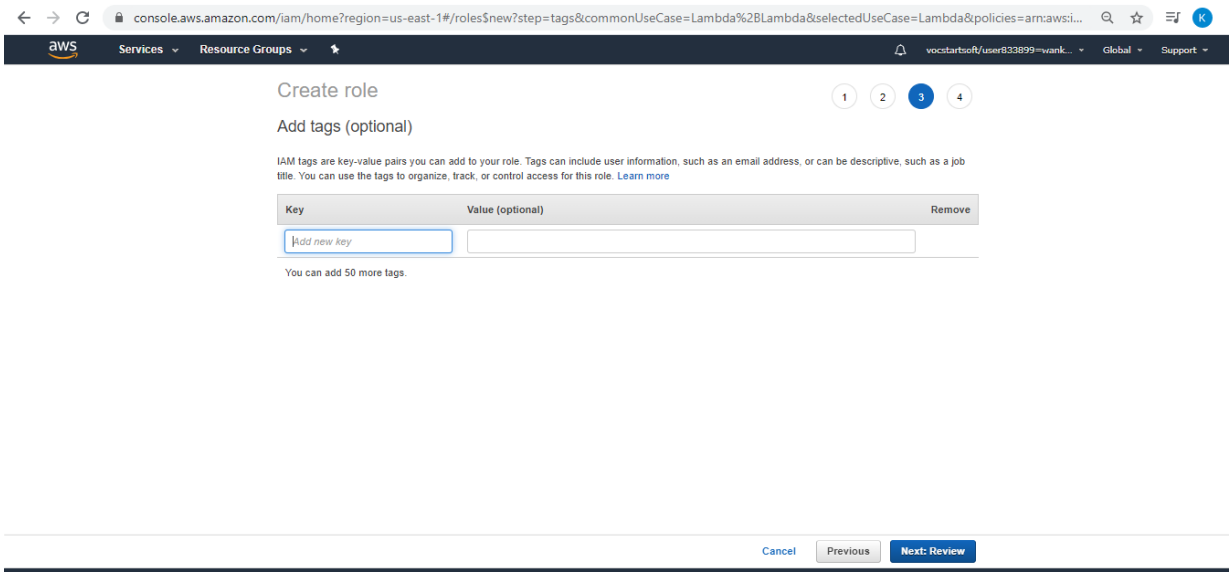
- To create Role for Lambda, go to “Role” under the “access management”, to select Lambda and press “Next Permission” button.



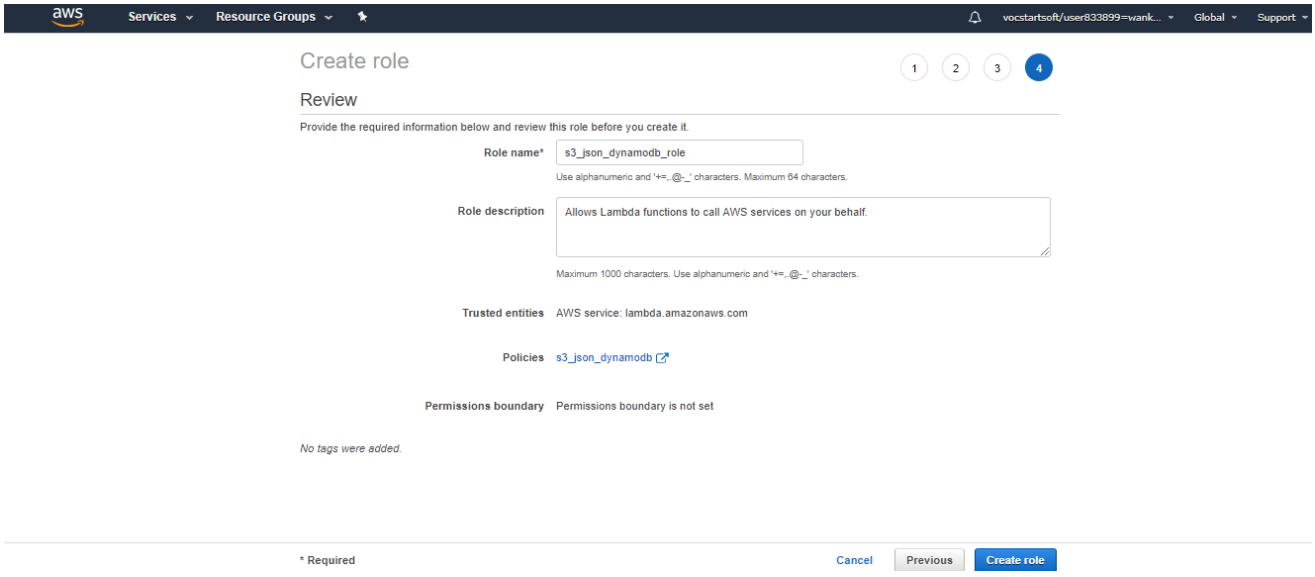
- Select “s3_json_dynamodb “created as the policy of the role, then press “Next: Tags” button.



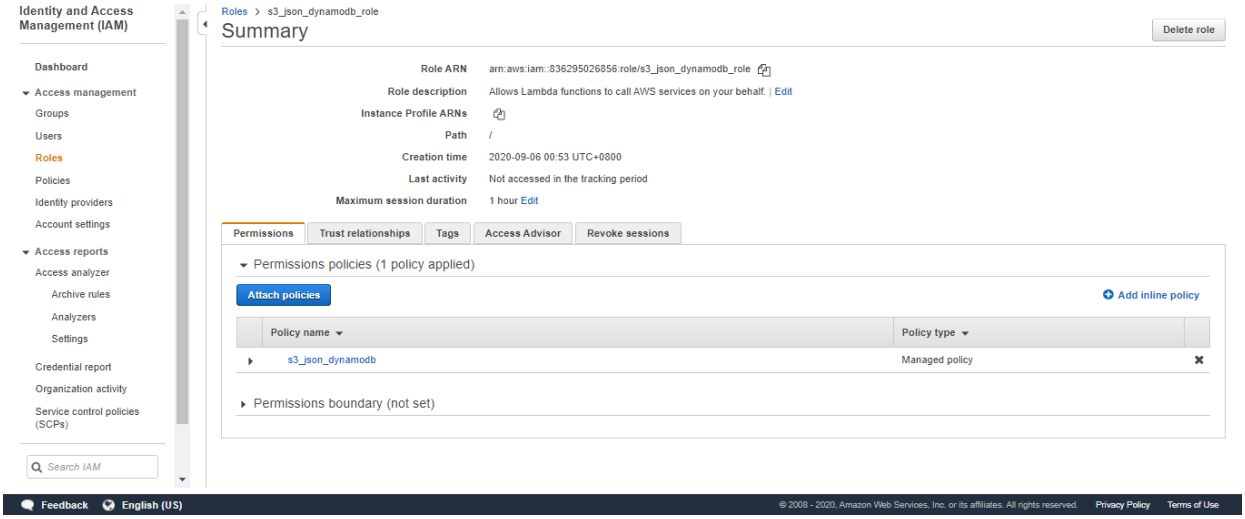
- Ignore this part as it is optional, press “Next: Review” button



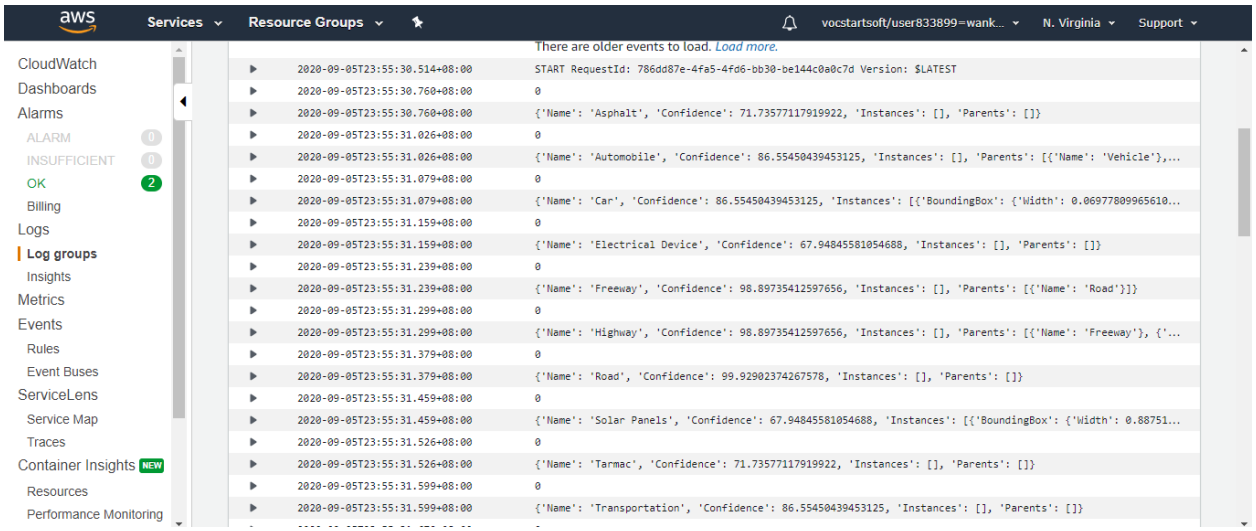
- Enter role name “s3_json_dynamodb_role” as Role name and press “Create role” button



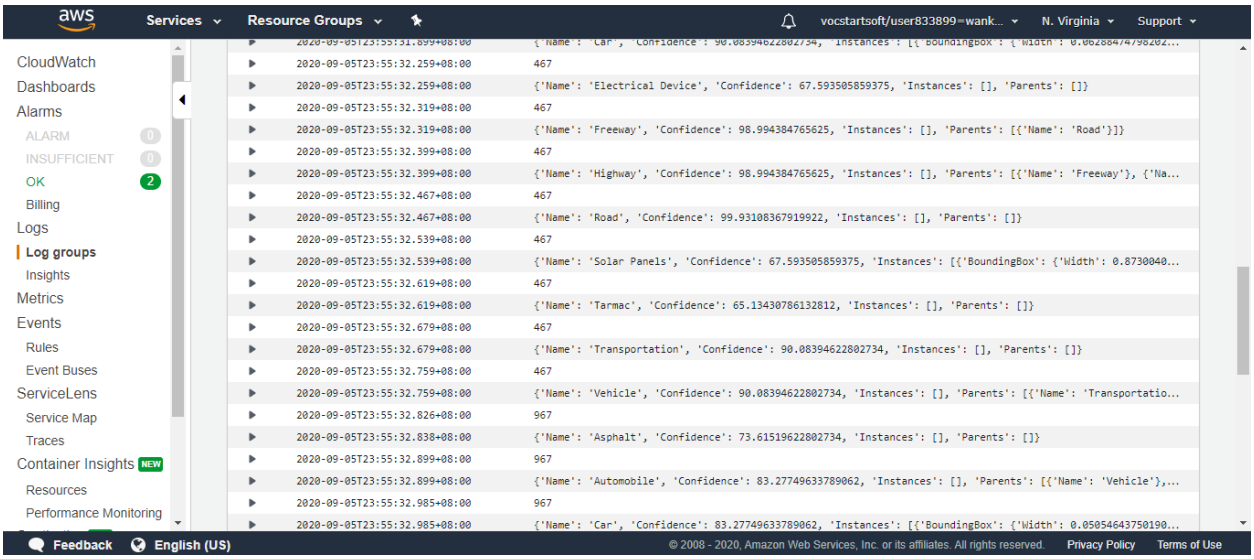
- Role successfully creates



- When json output file of amazon Rekognition passed from amazon Rekognition to s3 bucket and processed by lambda. You can go to Log-groups and select “s3-json-dynamodb” to check for status of it. (Part 1)

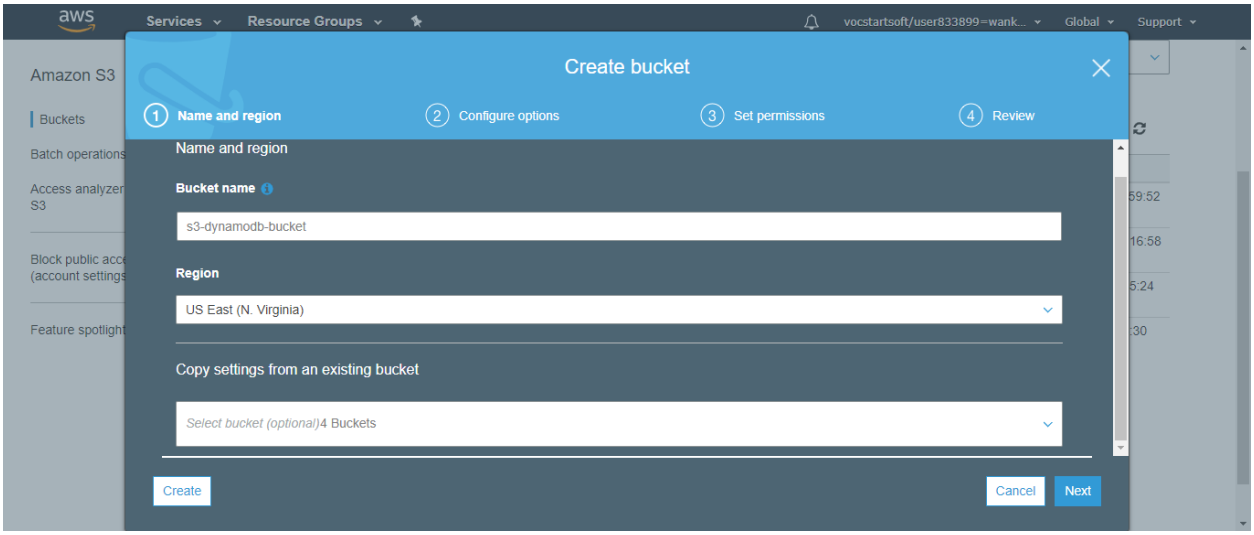


- When json output file of amazon Rekognition passed from amazon Rekognition to s3 bucket and processed by lambda. You can go to Log-groups and select “s3-json-dynamodb” to check for status of it. (Part 2)

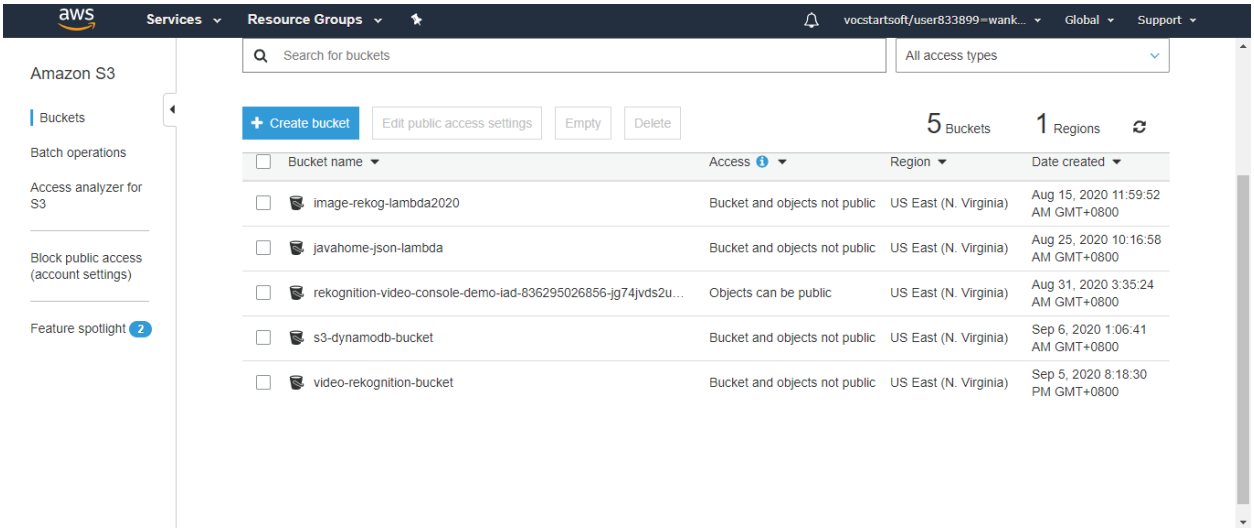


Amazon S3 Bucket (Store the Results)

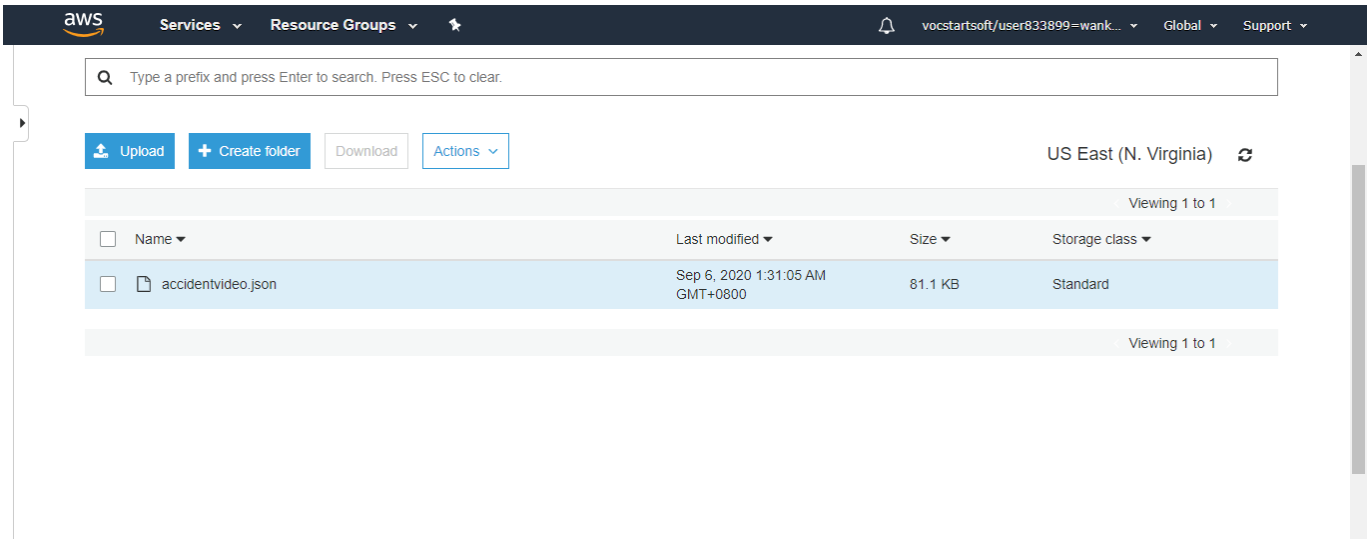
- Create a bucket with name “s3-dynamodb-bucket”



- “s3-dynamodb-bucket” successfully created



- After Amazon Rekognition video finish analyzing the video of accident, it will pass the output of it, which is in json format to “s3-dynamodb-bucket”



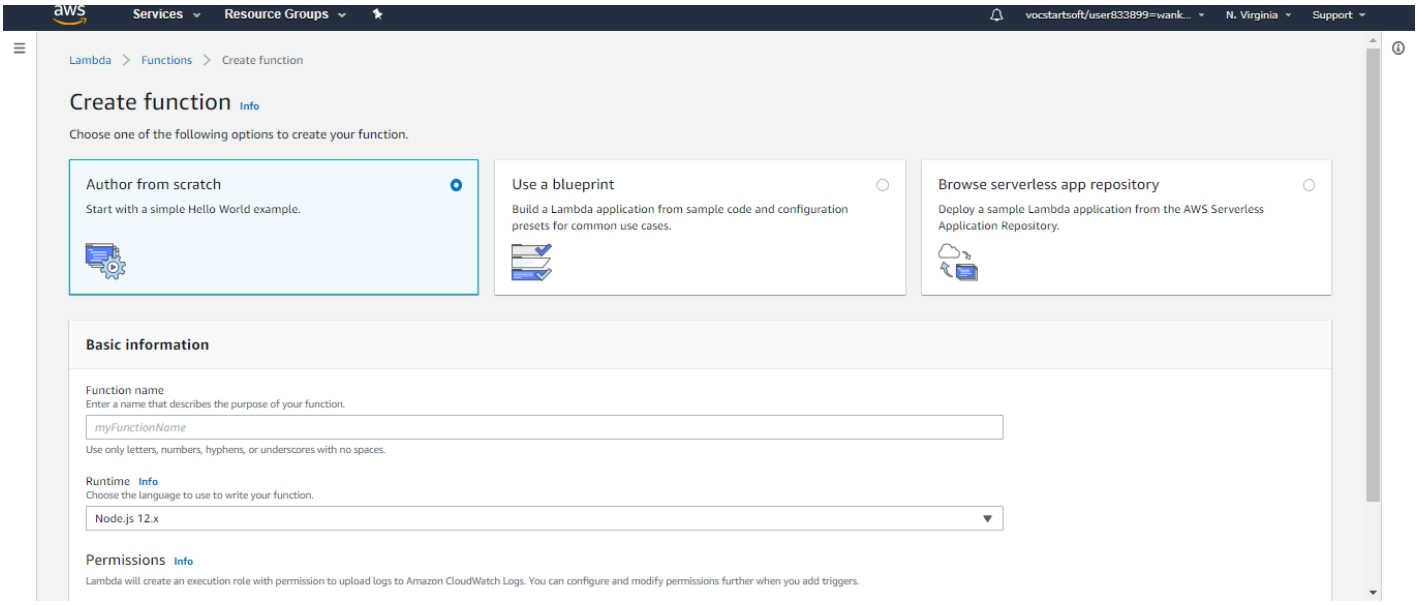
- Top view for the complete json output of amazon Rekognition.

- Bottom view for the complete json output of amazon Rekognition.

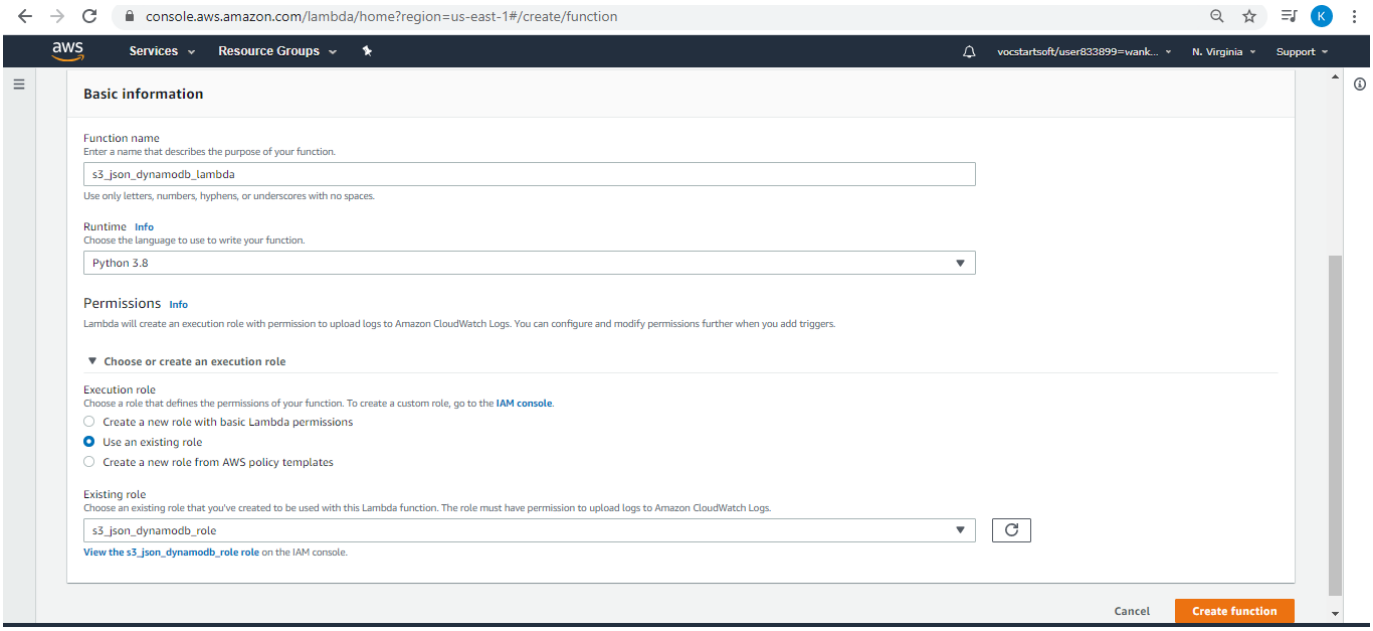

```
{"Name":"Tarmac","Confidence":73.67108154296875,"Instances":[],"Parents":[]}},{"Timestamp":28495,"Label":{"Name":"Trailer
Truck","Confidence":67.05509948730469,"Instances":[],"Parents":[{"Name":"Truck"},{"Name":"Vehicle"},{"Name":"Transportation"}]}},{"Timestamp":28495,"Label":
{"Name":"Transportation","Confidence":75.09610748291016,"Instances":[],"Parents":[]}},{"Timestamp":28495,"Label":
{"Name":"Truck","Confidence":71.2304916381836,"Instances":[{"BoundingBox":
{"Width":0.28215572237968445,"Height":0.5335927605628967,"Left":0.03306322917342186,"Top":0.20724649727344513},"Confidence":57.938514709472656}],"Parents":
[{"Name":"Vehicle"},{"Name":"Transportation"}]}},{"Timestamp":28495,"Label":{"Name":"Vehicle","Confidence":74.87419128417969,"Instances":[],"Parents":
[{"Name":"Transportation"}]}},{"Timestamp":28995,"Label":{"Name":"Asphalt","Confidence":77.51483917236328,"Instances":[],"Parents":[]}},{"Timestamp":28995,"Label":
{"Name":"Automobile","Confidence":68.29138946533203,"Instances":[],"Parents":[{"Name":"Vehicle"},{"Name":"Transportation"}]}},{"Timestamp":28995,"Label":
{"Name":"Car","Confidence":68.29138946533203,"Instances":[{"BoundingBox":
{"Width":0.16644534468650818,"Height":0.14850907027721405,"Left":0.47972798347473145,"Top":0.30837637186050415},"Confidence":68.42882537841797}],"Parents":
[{"Name":"Vehicle"},{"Name":"Transportation"}]}},{"Timestamp":28995,"Label":{"Name":"Freeway","Confidence":89.65359497070312,"Instances":[],"Parents":
[{"Name":"Road"}]}},{"Timestamp":28995,"Label":{"Name":"Highway","Confidence":86.51390838623047,"Instances":[],"Parents":[{"Name":"Freeway"},{"Name":"Road"}]}},
{"Timestamp":28995,"Label":{"Name":"Moving Van","Confidence":67.7796401977539,"Instances":[],"Parents":[{"Name":"Van"},{"Name":"Vehicle"},
{"Name":"Transportation"}]}},{"Timestamp":28995,"Label":{"Name":"Road","Confidence":99.26083374023438,"Instances":[],"Parents":[]}},{"Timestamp":28995,"Label":
{"Name":"Tarmac","Confidence":77.51483917236328,"Instances":[],"Parents":[]}},{"Timestamp":28995,"Label":{"Name":"Trailer
Truck","Confidence":70.8980941772461,"Instances":[],"Parents":[{"Name":"Truck"},{"Name":"Vehicle"},{"Name":"Transportation"}]}},{"Timestamp":28995,"Label":
{"Name":"Transportation","Confidence":84.6530532836914,"Instances":[],"Parents":[]}},{"Timestamp":28995,"Label":
{"Name":"Truck","Confidence":73.35515594482422,"Instances":[{"BoundingBox":
{"Width":0.30639034509658813,"Height":0.2911651432514907,"Left":0.4716954529285431,"Top":0.15339703857898712},"Confidence":77.86387634277344},{"BoundingBox":
{"Width":0.30444779992103577,"Height":0.5680103302001953,"Left":0.005747565999627113,"Top":0.18205480277538 3},"Confidence":72.7531967163086}],"Parents":
[{"Name":"Vehicle"},{"Name":"Transportation"}]}},{"Timestamp":28995,"Label":{"Name":"Van","Confidence":67.7796401977539,"Instances":[],"Parents":[{"Name":"Vehicle"},
{"Name":"Transportation"}]}},{"Timestamp":28995,"Label":{"Name":"Vehicle","Confidence":84.50978088378906,"Instances":[],"Parents":[{"Name":"Transportation"}]}},
{"Timestamp":29496,"Label":{"Name":"Asphalt","Confidence":79.80045318603516,"Instances":[],"Parents":[]}},{"Timestamp":29496,"Label":
{"Name":"Automobile","Confidence":72.97946166992188,"Instances":[],"Parents":[{"Name":"Vehicle"},{"Name":"Transportation"}]}},{"Timestamp":29496,"Label":
{"Name":"Bumper","Confidence":54.60045623779297,"Instances":[],"Parents":[{"Name":"Vehicle"},{"Name":"Transportation"}]}},{"Timestamp":29496,"Label":
{"Name":"Car","Confidence":72.97946166992188,"Instances":[],"Parents":[{"Name":"Vehicle"},{"Name":"Transportation"}]}},{"Timestamp":29496,"Label":
{"Name":"Freeway","Confidence":79.87896728515625,"Instances":[],"Parents":[{"Name":"Road"}]}},{"Timestamp":29496,"Label":
{"Name":"Highway","Confidence":70.45426940917969,"Instances":[],"Parents":[{"Name":"Freeway"},{"Name":"Road"}]}},{"Timestamp":29496,"Label":{"Name":"Moving
Van","Confidence":74.12775421142578,"Instances":[],"Parents":[{"Name":"Van"},{"Name":"Vehicle"},{"Name":"Transportation"}]}},{"Timestamp":29496,"Label":
{"Name":"Road","Confidence":97.65773010253906,"Instances":[],"Parents":[]}},{"Timestamp":29496,"Label":{"Name":"Tarmac","Confidence":79.80045318603516,"Instances":
[],"Parents":[]}},{"Timestamp":29496,"Label":{"Name":"Trailer Truck","Confidence":58.25628662109375,"Instances":[],"Parents":[{"Name":"Truck"},{"Name":"Vehicle"},
{"Name":"Transportation"}]}},{"Timestamp":29496,"Label":{"Name":"Transportation","Confidence":88.20211791992188,"Instances":[],"Parents":[]}},
{"Timestamp":29496,"Label":{"Name":"Truck","Confidence":63.37394332885742,"Instances":[{"BoundingBox":
{"Width":0.41914063692092896,"Height":0.3379736840724945,"Left":0.45683905482292175,"Top":0.15388596057891846},"Confidence":53.25258255004883},{"BoundingBox":
{"Width":0.3171365261077881,"Height":0.5624922513961792,"Left":0,"Top":0.1804323047399521},"Confidence":53.15729522705078}],"Parents":[{"Name":"Vehicle"},
{"Name":"Transportation"}]}},{"Timestamp":29496,"Label":{"Name":"Van","Confidence":74.12775421142578,"Instances":[],"Parents":[{"Name":"Vehicle"},
{"Name":"Transportation"}]}},{"Timestamp":29496,"Label":{"Name":"Vehicle","Confidence":87.92950439453125,"Instances":[],"Parents":
[{"Name":"Transportation"}]}}],"Persons":[]}
```

AWS Lambda

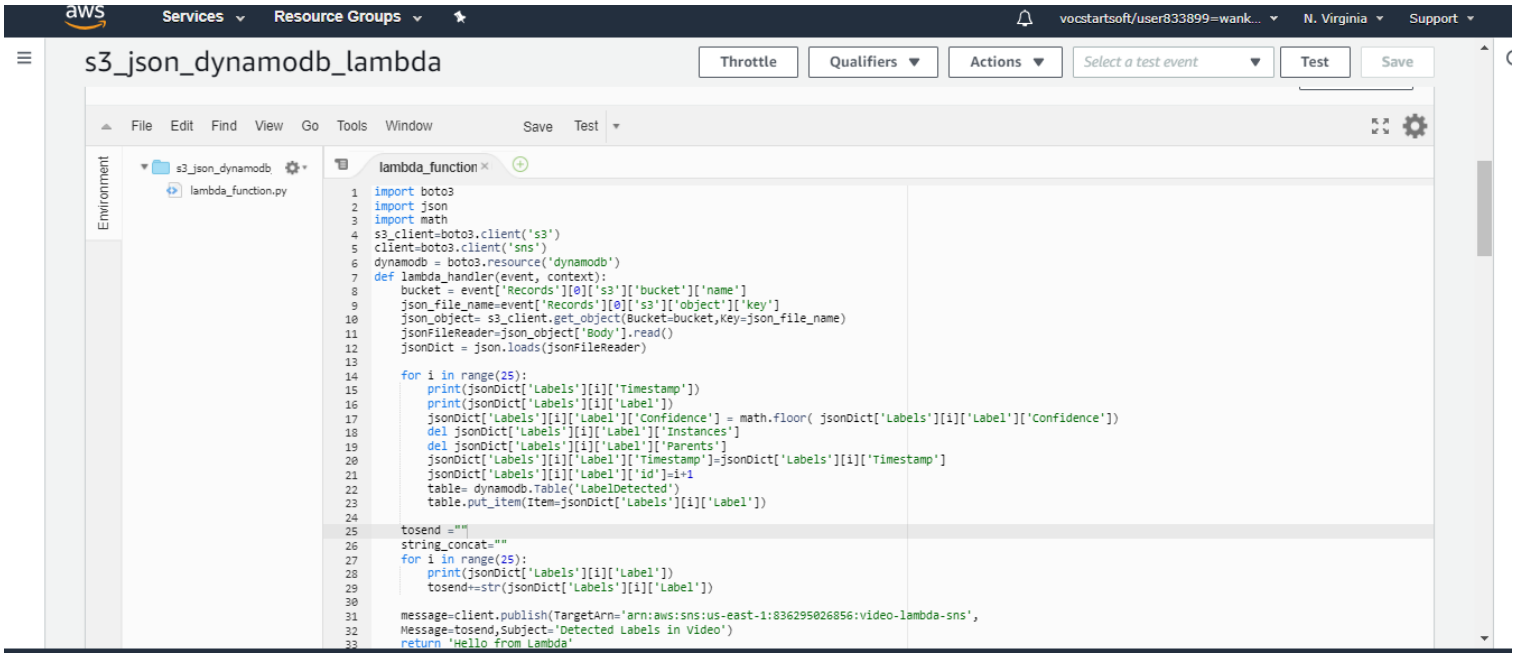
- Select “Author from scratch “to create lambda



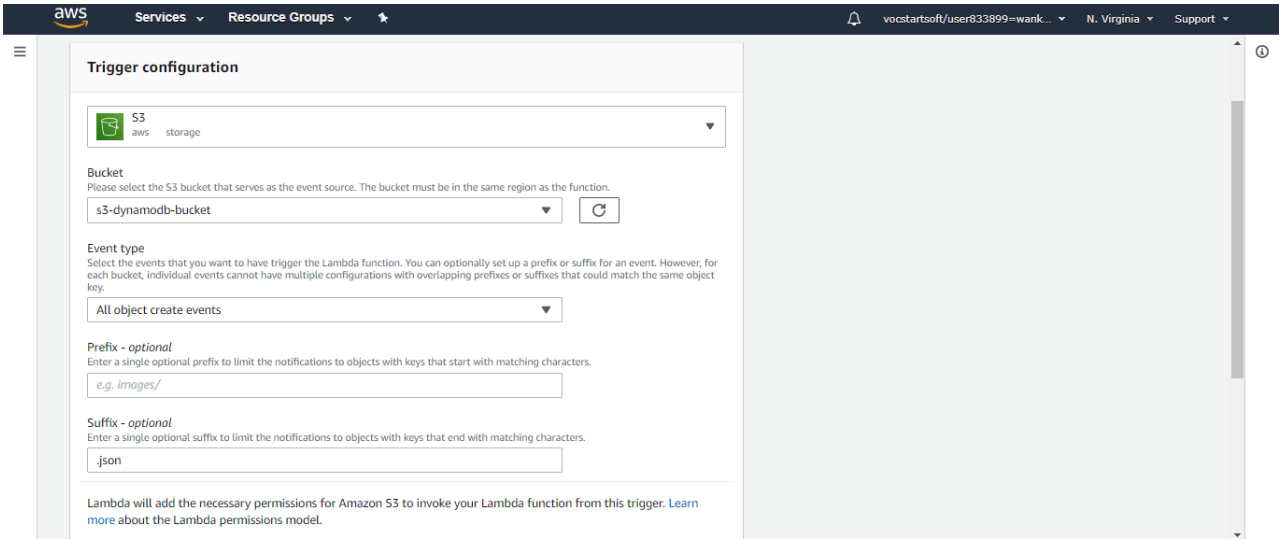
- Enter function name “ s3-json-dynamodb-lambda “, select “Python 3.8 “ as runtime , click “ use existing role “ and select “ s3-json-dynamodb-role “ as the existing role , then press “Create function “ button to create lambda function.



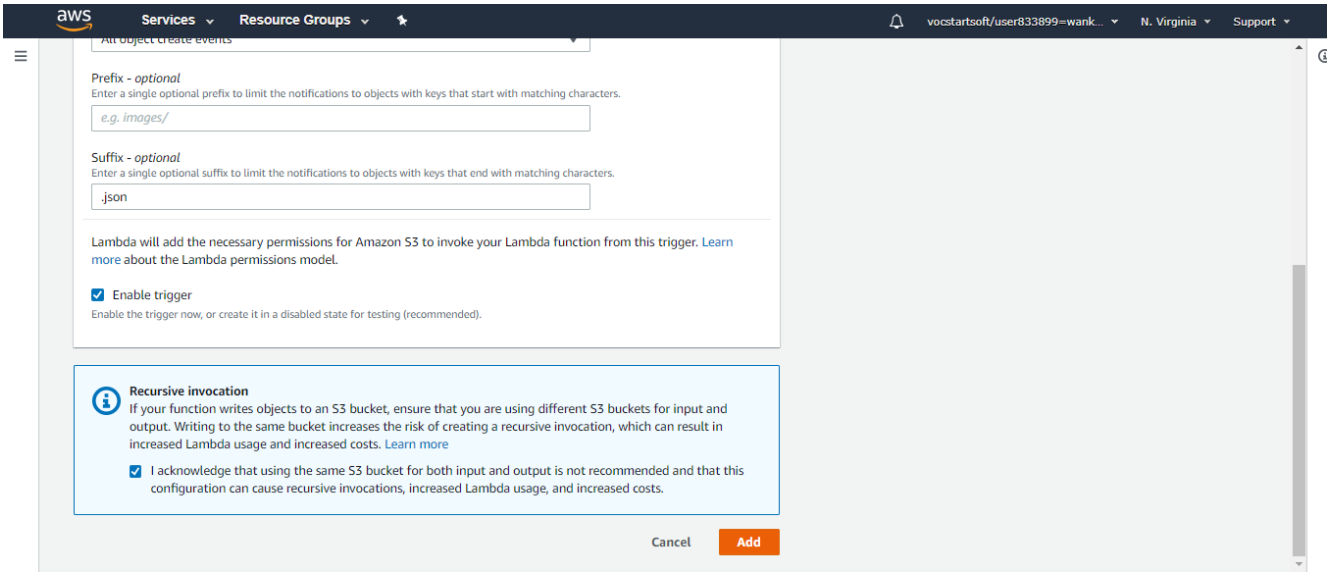
- Code configuration in lambda. Firstly, get the json output file of amazon Rekognition from the s3-dynamodb-bucket, convert it to python dictionary. After that, remove ‘Instances ‘and ‘Parents’ from the ‘Labels’ in the python dictionary, and add in ‘Timestamp’ and ‘id’ to the ‘Labels’. At this point, there are ‘id’, ‘Name’, ‘Label’, ‘Timestamp’ at the ‘Labels’. Store all ‘Labels’ to DynamoDB- ‘LabelDetected’. Finally, all these ‘Labels’ data will be sent to specific email via SNS.



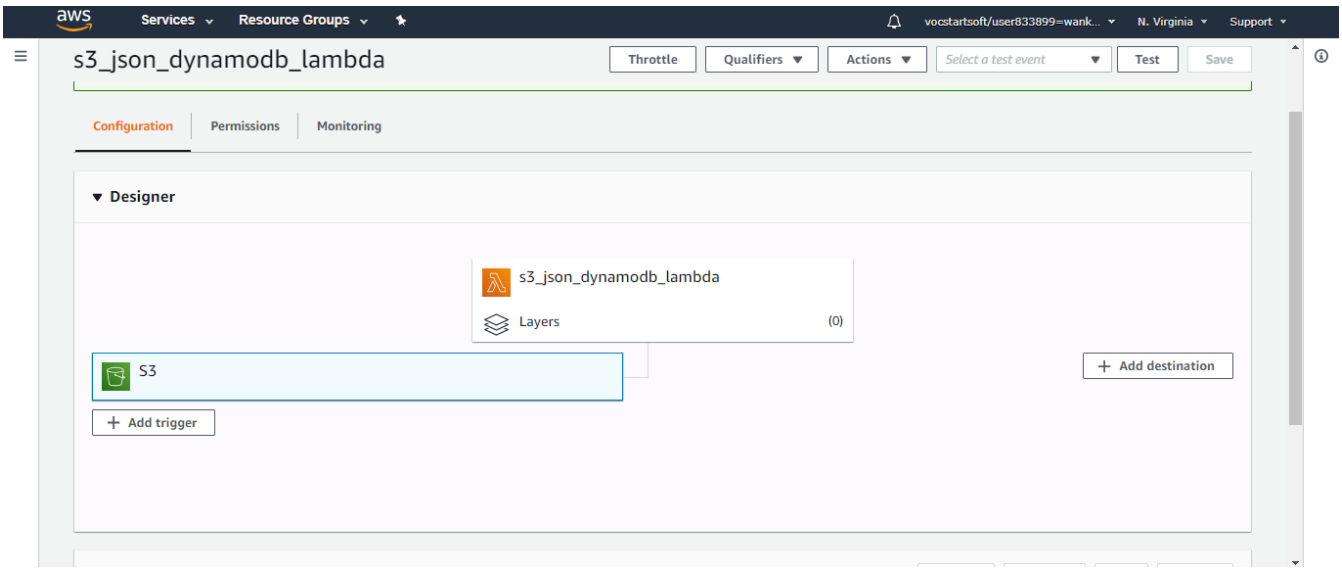
- Add in Amazon s3 bucket – “s3-dynamodb- bucket” as trigger for “s3-json-dynamodb-lambda”, select “All object creates events “and input “. json “for Suffix-optional.



- Tick the Recursive invocation and press “Add” button to create the trigger

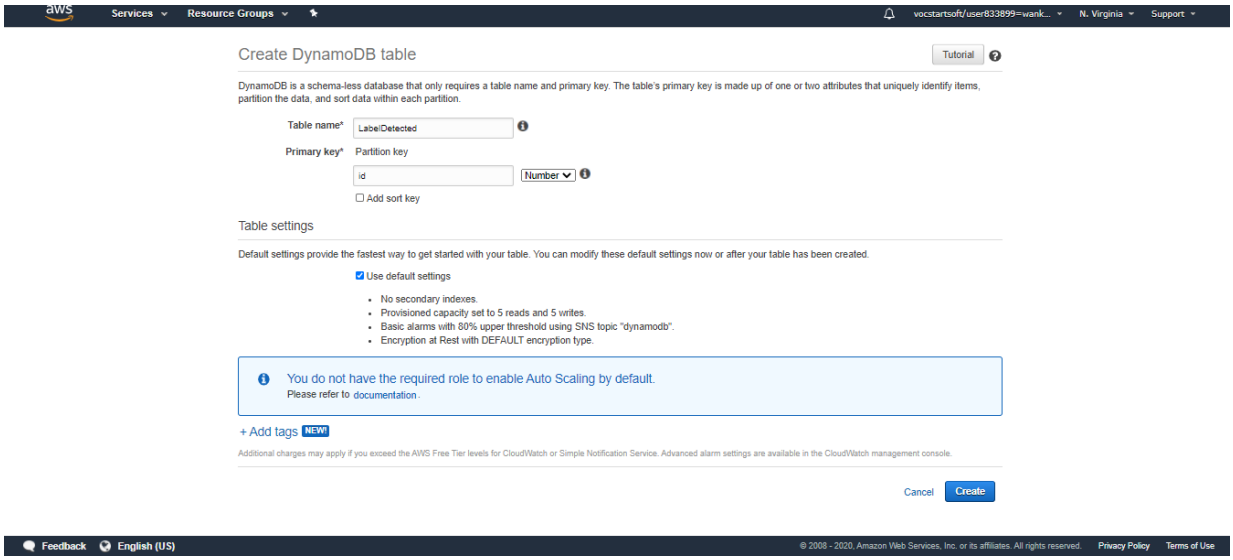


- The trigger was successfully created.

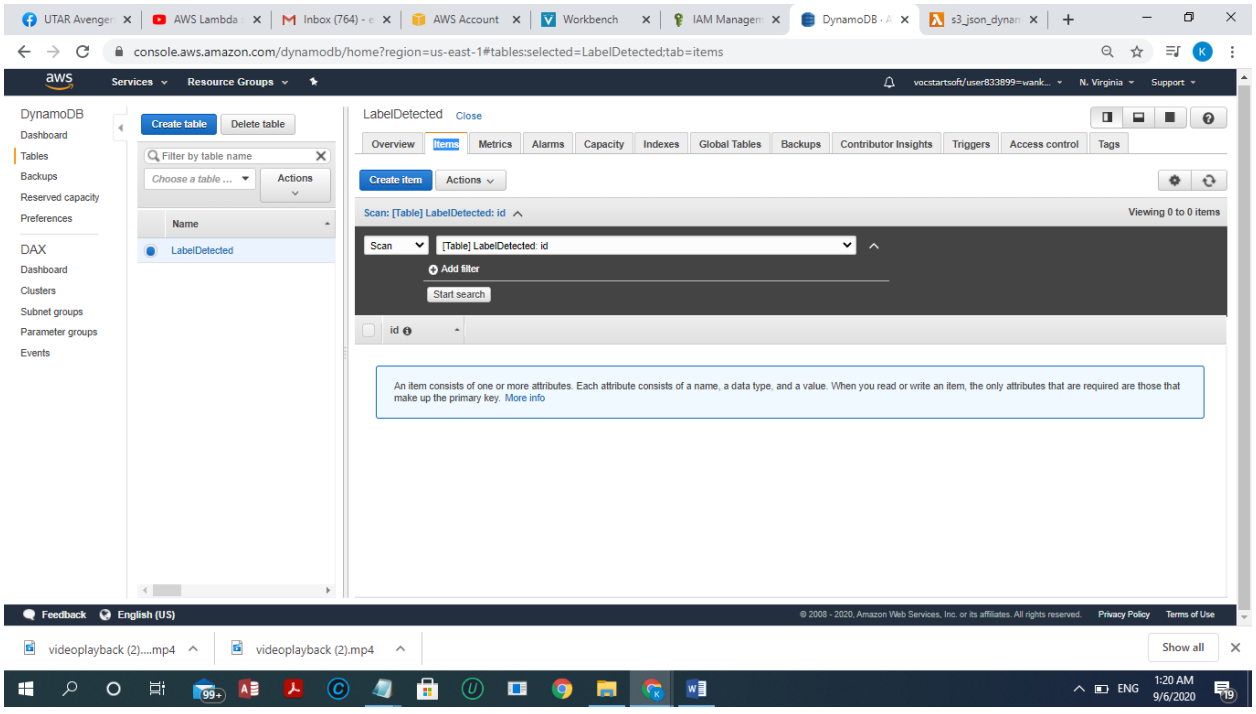


DynamoDB

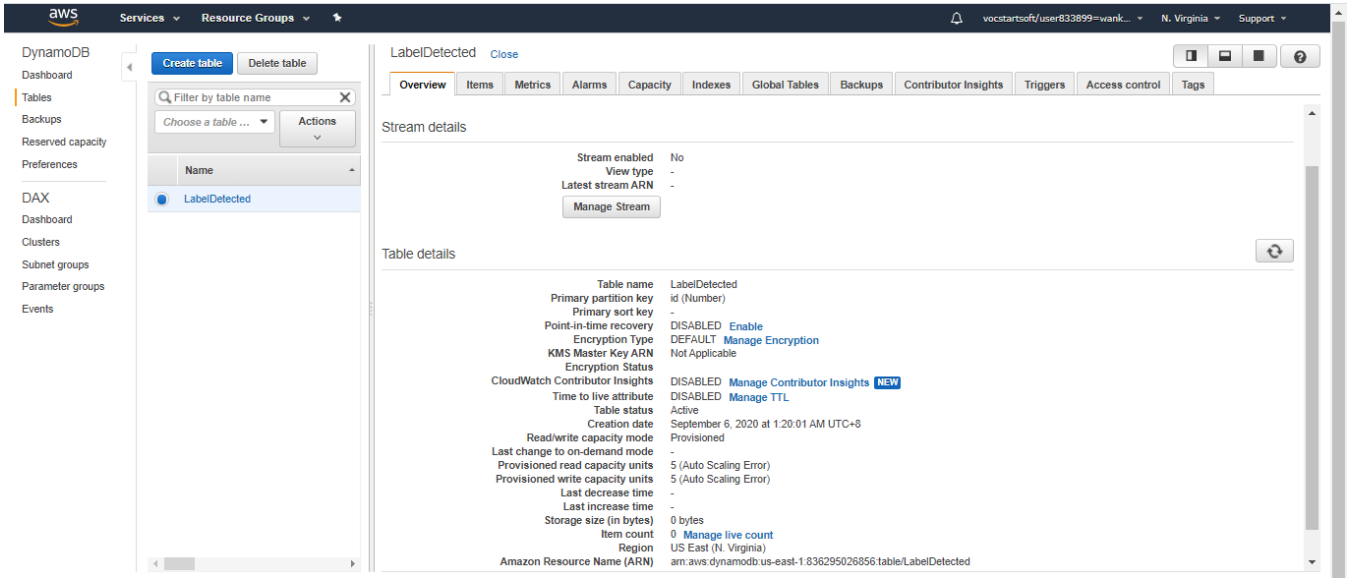
- Create Table ‘’LabelDetected” with id (Number) as primary key in DynamoDB, press “Create “button to create the table.



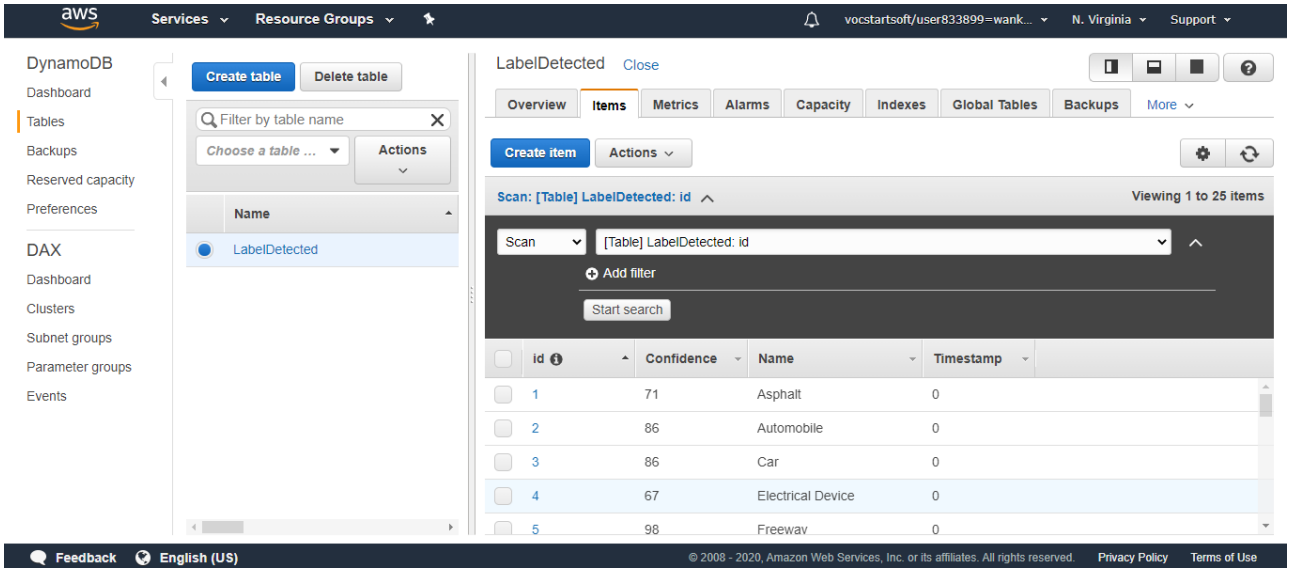
- “LabelDetected” table successfully created (PART 1)



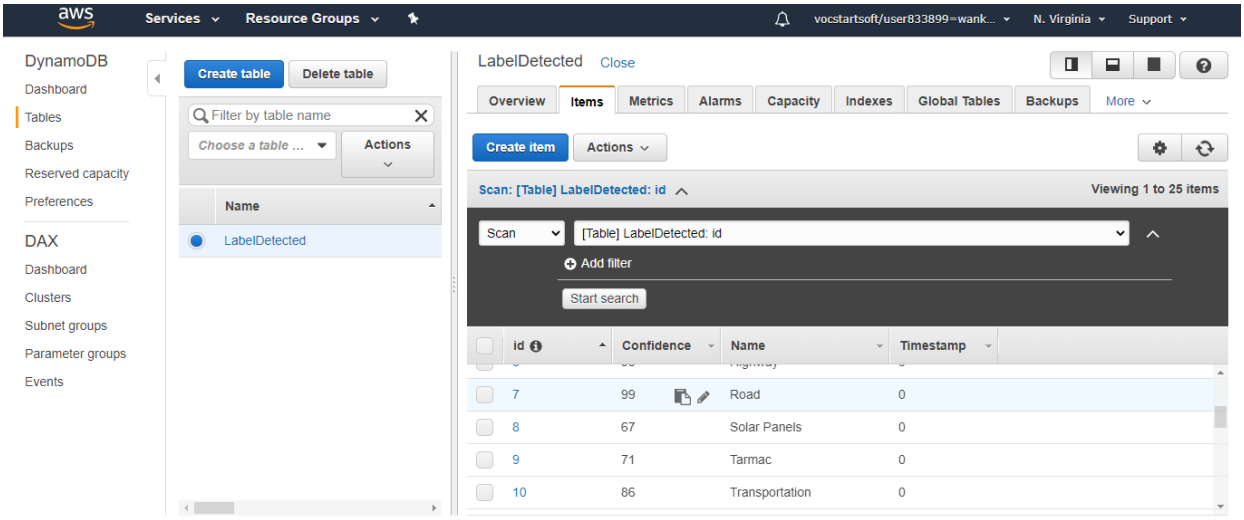
- “LabelDetected” table successfully created (PART 2)



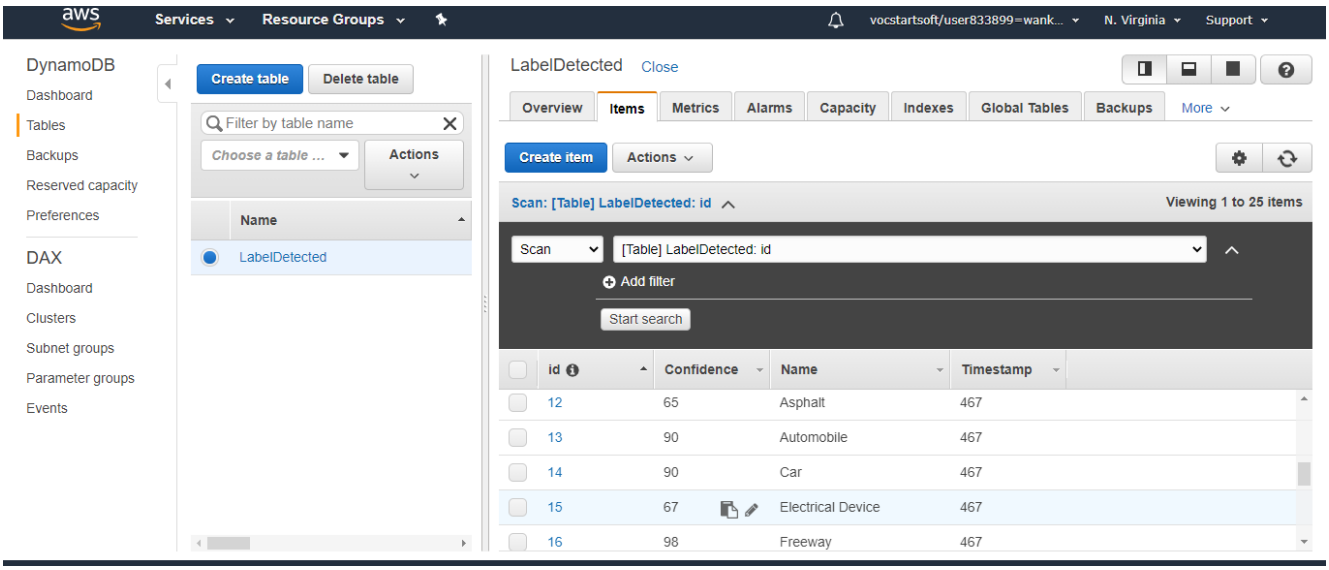
- After the lambda finish extract important data from json output file of amazon Rekognition, it will store it in the DynamoDB table – “LabelDetected”. (PART 1)



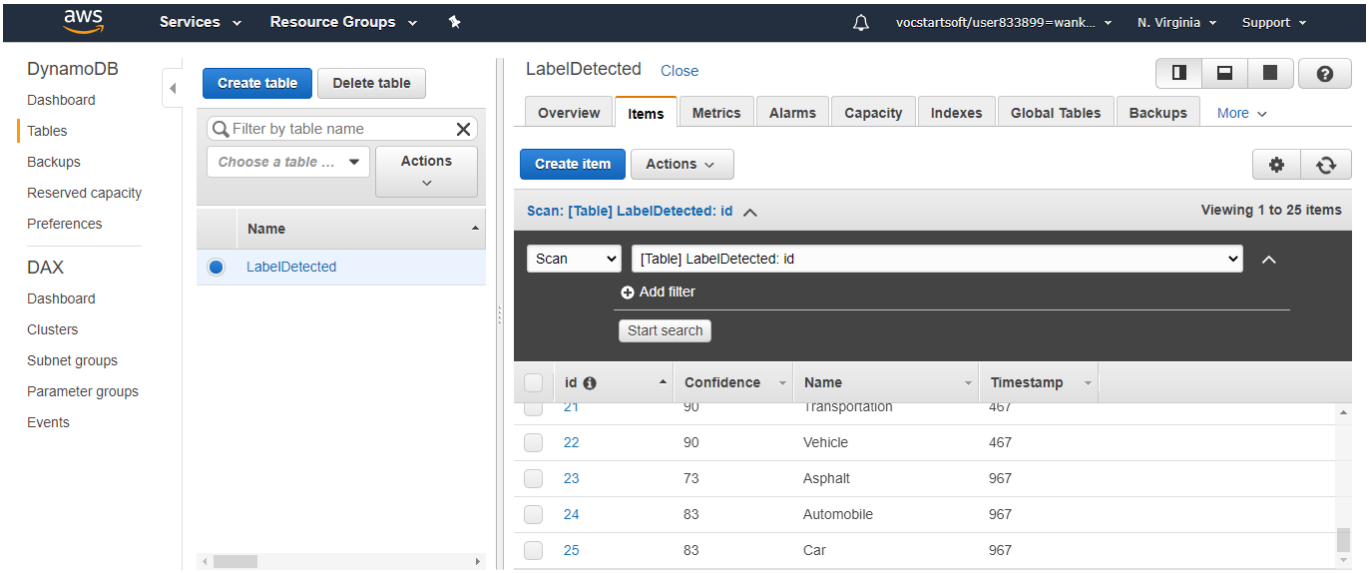
- After the lambda finish extract important data from json output file of amazon Rekognition, it will store it in the DynamoDB table – “LabelDetected”. (PART 2)



- After the lambda finish extract important data from json output file of amazon Rekognition, it will store it in the DynamoDB table – “LabelDetected”. (PART 3)

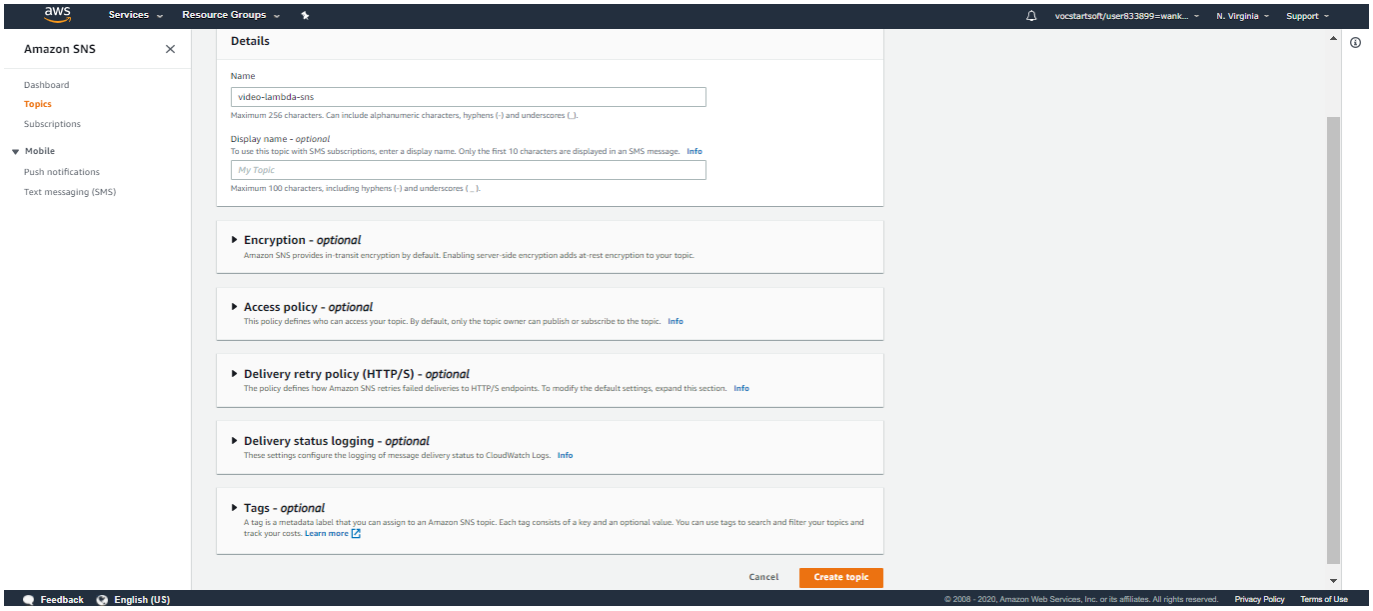


- After the lambda finish extract important data from json output file of amazon Rekognition, it will store it in the DynamoDB table – “LabelDetected”. (PART 4)

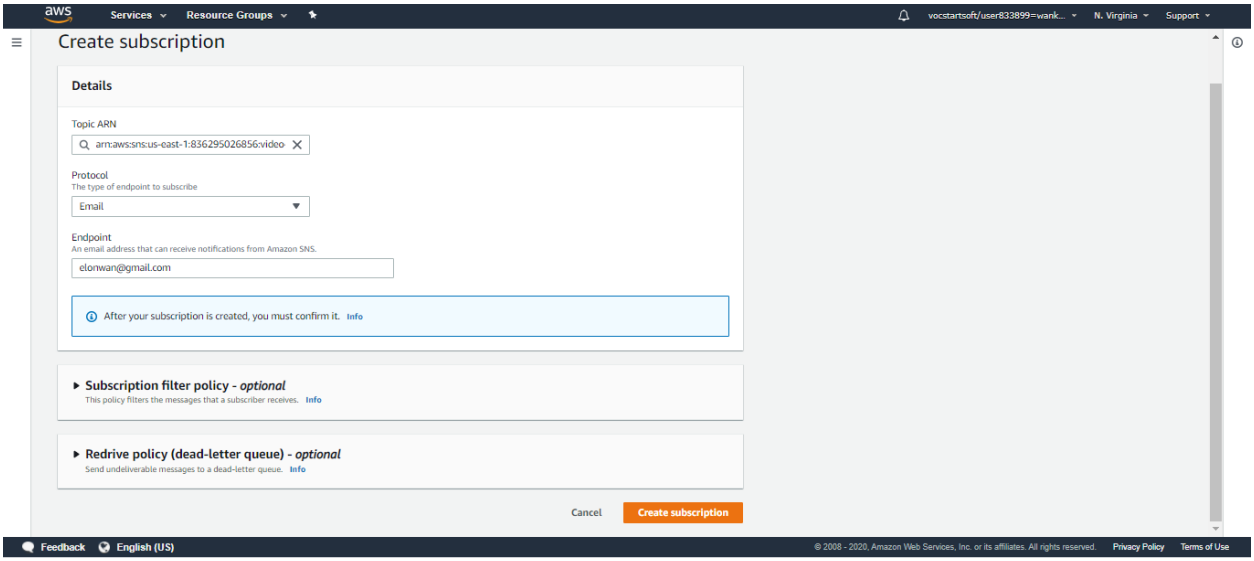


Amazon Simple Notification Services (Amazon SNS)

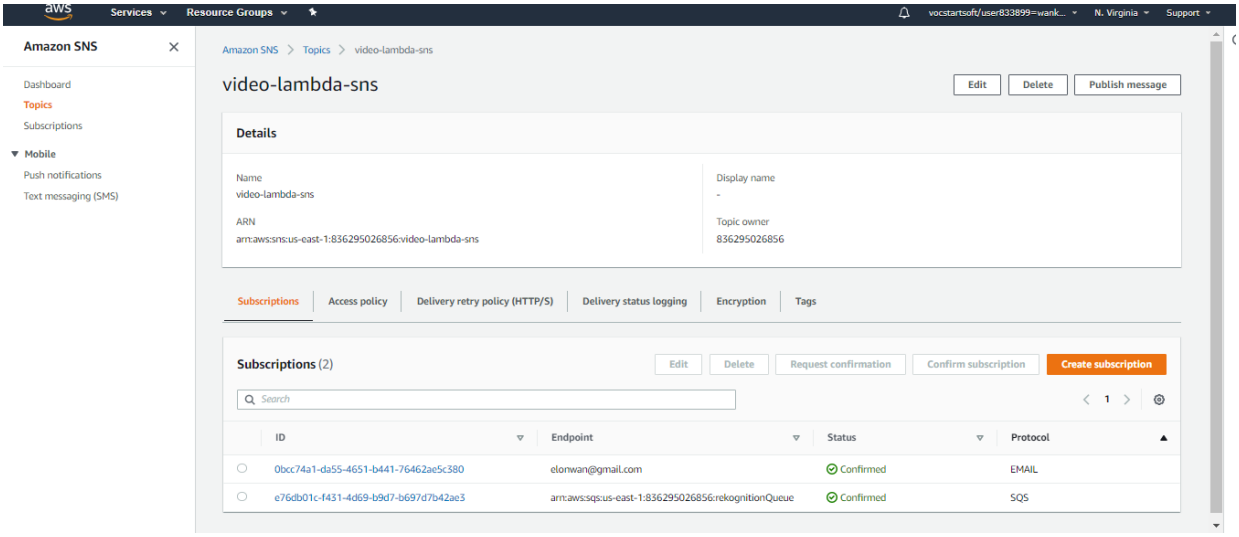
- Create Topic in Amazon SNS. Enter “video-lambda-sns “as name, press the “Create topic “button to create the topic.



- Create subscription for topic “ video-lambda-sns” , select the ARN for video-lambda-sns for Topic ARN , select “Email” as protocol , and input specific email“ elonwan@gmail.com” as Endpoint . Finally press “Create subscription “button to create subscription for the topic.



- Topic “video-lambda-sns “and Subscription successfully created.



- After lambda extract important data from json output file of amazon Rekognition , it will send those data to specific email- elonwan@gmail.com via SNS