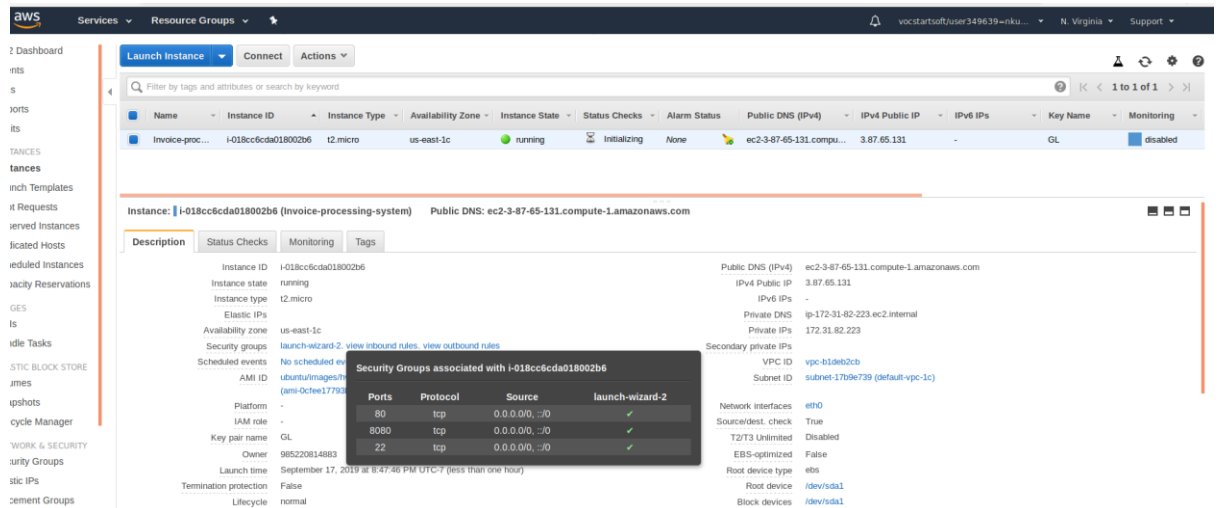


Creating an event triggered business process leveraging multiple managed services from AWS

1. Create EC2 instance which receives the notification when an invoice is placed in S3 with Python



2. Python-pip installation

```
64 packages can be upgraded. Run 'apt list --upgradable' to see them.
ubuntu@ip-172-31-82-223:~$ sudo apt install python-pip -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  binutils build-essential cpp cpp-5 g++ g++-5 gcc gcc-5 libalgorithm-diff-perl libalgorithm-diff-xs-perl libalgorithm-merge-perl libasan2 libatomic1 libc-dev-bin libc6-dev libc6-i386
  libcilkrts5 libdpkg-perl libexpat1 libexpat1-dev libfakeroot libfile-fcntllock-perl libgcc-5-dev libgomp1 libisl15 libitm1 liblsan0 libmpc3 libmpx0 libpython-all-dev libpython-dev libpython-stdlib
  libpython2.7 libpython2.7-dev libpython2.7-minimal libpython2.7-stdlib libquadmath0 libstdc++5-dev libstdc++6 libubsan0 libubsan0-dev make nanpages-dev python python-all python-all-dev python-dev
  python-minimal python-pip-whl python-pkg-resources python-setuptools python-wheel python2.7 python2.7-dev python2.7-minimal
Suggested packages:
  binutils-doc cpp-doc gcc-5-locales debian-keyring g++-multilib g++-5-multilib gcc-5-doc libstdc++6-5-dbg gcc-multilib autoconf automake libtool flex bison gdb gcc-doc gcc-5-multilib libgcc1-dbg
  libstdc++6-dbg
ubuntu@ip-172-31-82-223:~$ python -m pip install --upgrade pip setuptools
Collecting pip
  Downloading https://files.pythonhosted.org/packages/30/db/9e38760b32e3e7f40c46dd5fb107b8c73840df38f0046d8e6514e675a1/pip-19.2.3-py2.py3-none-any.whl (1.4MB)
    100% |#####| 1.4MB 933kB/s
Collecting setuptools
  Downloading https://files.pythonhosted.org/packages/b2/86/095d2f7829badc207c8b93dd4c767e871f6cd547145df797ea26baea4e2e/setuptools-41.2.0-py2.py3-none-any.whl (576kB)
    100% |#####| 583kB 2.1MB/s
Installing collected packages: pip, setuptools
Successfully installed pip-8.1.1 setuptools-20.7.0
You are using pip version 8.1.1, however version 19.2.3 is available.
You should consider upgrading via the 'pip install --upgrade pip' command.
ubuntu@ip-172-31-82-223:~$

ubuntu@ip-172-31-82-223:~$ sudo apt install virtualenv -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  python3-virtualenv
The following NEW packages will be installed:
  python3-virtualenv virtualenv
0 upgraded, 2 newly installed, 0 to remove and 63 not upgraded.
Need to get 47.6 kB of archives.
After this operation, 171 kB of additional disk space will be used.
Get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu xenial-updates/universe amd64 python3-virtualenv all 15.0.1+ds-3ubuntu1 [43.2 kB]
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu xenial-updates/universe amd64 virtualenv all 15.0.1+ds-3ubuntu1 [4,342 B]
Fetched 47.6 kB in 0s (3,459 kB/s)
Selecting previously unselected package python3-virtualenv.
(Reading database ... 57724 files and directories currently installed.)
Preparing to unpack .../python3-virtualenv_15.0.1+ds-3ubuntu1_all.deb ...
Unpacking python3-virtualenv (15.0.1+ds-3ubuntu1) ...
Selecting previously unselected package virtualenv.
Preparing to unpack .../virtualenv_15.0.1+ds-3ubuntu1_all.deb ...
Unpacking virtualenv (15.0.1+ds-3ubuntu1) ...
Processing triggers for man-db (2.7.5-1) ...
Setting up python3-virtualenv (15.0.1+ds-3ubuntu1) ...
Setting up virtualenv (15.0.1+ds-3ubuntu1) ...

ubuntu@ip-172-31-82-223:~$ virtualenv ~/virtualenvs/djangodev
Running virtualenv with interpreter /usr/bin/python2
New python executable in /home/ubuntu/virtualenvs/djangodev/bin/python2
Also creating executable in /home/ubuntu/virtualenvs/djangodev/bin/python
Installing setuptools, pkg_resources, pip, wheel...done.
ubuntu@ip-172-31-82-223:~$
```

```

ubuntu@ip-172-31-82-223:~$ source ~/virtualenvs/djangodev/bin/activate
(djangodev) ubuntu@ip-172-31-82-223:~$ pip install django
DEPRECATION: Python 2.7 will reach the end of its life on January 1st, 2020. Please upgrade your Python as Python 2.7 won't be maintained after that date. A future version of pip will drop support for Python 2.7. More details about Python 2 support in pip, can be found at https://pip.pypa.io/en/latest/development/release-process/#python-2-support
Collecting django
  Downloading https://files.pythonhosted.org/packages/3a/c1/dbd77256695f4b4e12b5d2c917a35963db11ce5df19c8eacd136b2ed54d/django-1.11.24-py2.py3-none-any.whl (6.9MB)
    7.0MB 26.4MB/s
Collecting pytz (from django)
  Downloading https://files.pythonhosted.org/packages/87/76/46d697698a143e05f77bec5a526b74e56a0be61d63452b68f74ba53b51f2/pytz-2019.2-py2.py3-none-any.whl (508kB)
    512kB 47.4MB/s
Installing collected packages: pytz, django
Successfully installed django-1.11.24 pytz-2019.2
(djangodev) ubuntu@ip-172-31-82-223:~$
(djangodev) ubuntu@ip-172-31-82-223:~$ pip install boto3
DEPRECATION: Python 2.7 will reach the end of its life on January 1st, 2020. Please upgrade your Python as Python 2.7 won't be maintained after that date. A future version of pip will drop support for Python 2.7. More details about Python 2 support in pip, can be found at https://pip.pypa.io/en/latest/development/release-process/#python-2-support
Collecting boto3
  Downloading https://files.pythonhosted.org/packages/54/47/779a4f24ccf1ea8ca8deba580b2ae3e1e804b12eca8f4d5eafb620f60c6/boto3-1.9.230-py2.py3-none-any.whl (128kB)
    128kB 22.3MB/s
Collecting s3transfer<0.3.0,>=0.2.0 (from boto3)
  Downloading https://files.pythonhosted.org/packages/16/8a/1fc3dba8c4923c2a76e1ff0d52b305c44606da63f718d14d3231e21c51b0/s3transfer-0.2.1-py2.py3-none-any.whl (70kB)
    71kB 29.7MB/s
Collecting jmespath<1.0.0,>=0.7.1 (from boto3)
  Downloading https://files.pythonhosted.org/packages/83/94/7179c3832a0d45b266db2aac329e101367fbd11f425f13771d27f225bb/jmespath-0.9.4-py2.py3-none-any.whl
Collecting botocore<1.13.0,>=1.12.230 (from boto3)
  Downloading https://files.pythonhosted.org/packages/13/73/8cb67ed4e5526f070a9fc79cc6b224d8fcc6f3be8363ce50b4b951c63df/botocore-1.12.230-py2.py3-none-any.whl (5.7MB)
    5.7MB 41.8MB/s
Collecting futures<4.0.0,>=2.2.0; python_version == "2.6" or python_version == "2.7" (from s3transfer<0.3.0,>=0.2.0->boto3)
  Downloading https://files.pythonhosted.org/packages/d8/a6/f46ae3f1da8cd4361c344888f59ec2f5785e09c87e175a748ef6071cd5/futures-3.3.0-py2.py3-none-any.whl
Collecting docutils<0.16,>=0.10 (from botocore<1.13.0,>=1.12.230->boto3)
  Downloading https://files.pythonhosted.org/packages/3a/dc/bf2b15d1fa15a6f79e77a61b74ecbbae7258558fcd8affc9a6638a6b327/docutils-0.15.2-py2.py3-none-any.whl (548kB)
    552kB 51.0MB/s
Collecting python-dateutil<3.0.0,>=2.1; python_version == "2.7" (from botocore<1.13.0,>=1.12.230->boto3)
  Downloading https://files.pythonhosted.org/packages/41/17/c22faccbfbd13c7f57f3844689e3a78baef403648a6af1d0866d87fbb/python-dateutil-2.8.0-py2.py3-none-any.whl (226kB)
    235kB 45.5MB/s
Collecting urllib3<1.26,>=1.20; python_version == "2.7" (from botocore<1.13.0,>=1.12.230->boto3)
  Downloading https://files.pythonhosted.org/packages/73/fb/00a976f728dddfecfe98238ce23f502a721c0ac0cfed80e0d88c64e9/six-1.12.0-py2.py3-none-any.whl (150kB)
    150kB 49.0MB/s
Collecting six>=1.5 (from python-dateutil<3.0.0,>=2.1; python_version == "2.7"->botocore<1.13.0,>=1.12.230->boto3)
  Downloading https://files.pythonhosted.org/packages/73/fb/00a976f728dddfecfe98238ce23f502a721c0ac0cfed80e0d88c64e9/six-1.12.0-py2.py3-none-any.whl
Installing collected packages: futures, docutils, jmespath, six, python-dateutil, urllib3, botocore, s3transfer, boto3

```

3. Copy .pem file to /opt

```

lost connection
(djangodev) ubuntu@ip-172-31-82-223:~$ sudo chown ubuntu:ubuntu -R /opt
chown: invalid user: 'ubuntu:ubuntu'
(djangodev) ubuntu@ip-172-31-82-223:~$ sudo chown ubuntu:ubuntu -R /opt
(djangodev) ubuntu@ip-172-31-82-223:~$ cd /opt/
(djangodev) ubuntu@ip-172-31-82-223:/opt$

nkumar@ubuntu:~/Downloads$ scp -i GL.pem -r /home/nkumar/Downloads/docproc_new ubuntu@3.83.246.15:/opt/
admin.py          100% 128      0.5KB/s  00:00
views.py          100% 7865     15.0KB/s  00:00
__init__.py       100% 0        0.0KB/s   00:00
apps.py           100% 146      0.6KB/s   00:00
__init__.py       100% 0        0.0KB/s   00:00
tests.py          100% 125      0.5KB/s   00:00
models.py         100% 122      0.5KB/s   00:00
db.sqlite3        100% 37KB     72.2KB/s  00:00
settings.py       100% 3129     6.0KB/s   00:00
wsgi.py           100% 392      1.5KB/s   00:00
urls.py           100% 798      3.1KB/s   00:00
__init__.py       100% 0        0.0KB/s   00:00
manage.py         100% 805      3.1KB/s   00:00
nkumar@ubuntu:~/Downloads$

(djangodev) ubuntu@ip-172-31-82-223:/opt$ ls
docproc docproc_new
(djangodev) ubuntu@ip-172-31-82-223:/opt$ cd docproc_new/
(djangodev) ubuntu@ip-172-31-82-223:/opt/docproc_new$ ls
api db.sqlite3 docproc manage.py
(djangodev) ubuntu@ip-172-31-82-223:/opt/docproc_new$

```

4. Running program on 8080

```
ubuntu@ip-172-31-82-223: /opt/docproc_new
File Edit View Search Terminal Help
lib/python2.7/site-packages (from boto3<1.13.0,>=1.12.233->boto3) (0.15.2)
Requirement already satisfied: python-dateutil<3.0.0,>=2.1; python_version >= "2.7" in ./virtualenvs/djangodev/lib/python2.7/site-packages (from boto3<1.13.0,>=1.12.233->boto3) (2.8.0)
Requirement already satisfied: urllib3<1.26,>=1.20; python_version == "2.7" in ./virtualenvs/djangodev/lib/python2.7/site-packages (from boto3<1.13.0,>=1.12.233->boto3) (1.25.5)
Requirement already satisfied: six>=1.5 in ./virtualenvs/djangodev/lib/python2.7/site-packages (from python-dateutil<3.0.0,>=2.1; python_version >= "2.7"->boto3) (1.12.0)
(djangodev) ubuntu@ip-172-31-82-223:~$ python manage.py runserver 0:8080
python: can't open file 'manage.py': [Errno 2] No such file or directory
(djangodev) ubuntu@ip-172-31-82-223:~$ cd /opt
(djangodev) ubuntu@ip-172-31-82-223:/opt$ cd docproc_new/
(djangodev) ubuntu@ip-172-31-82-223:/opt/docproc_new$ python manage.py runserver 0:8080
Performing system checks...

System check identified no issues (0 silenced).
September 22, 2019 - 11:03:27
Django version 1.11.24, using settings 'docproc.settings'
Starting development server at http://0:8080/
Quit the server with CONTROL-C.
```

5. Verifying the endpoint access

```
3.83.246.15:8080/sns
Server time: Sun, 22 Sep 2019 11:08:35 +0000

Traceback Switch to copy-and-paste view

/home/ubuntu/.virtualenvs/djangodev/local/lib/python2.7/site-packages/django/core/handlers/exception.py in inner
41. response = get_response(request)
    ► Local vars

/home/ubuntu/.virtualenvs/djangodev/local/lib/python2.7/site-packages/django/core/handlers/base.py in _get_response
187. response = self.process_exception_by_middleware(e, request)
    ► Local vars

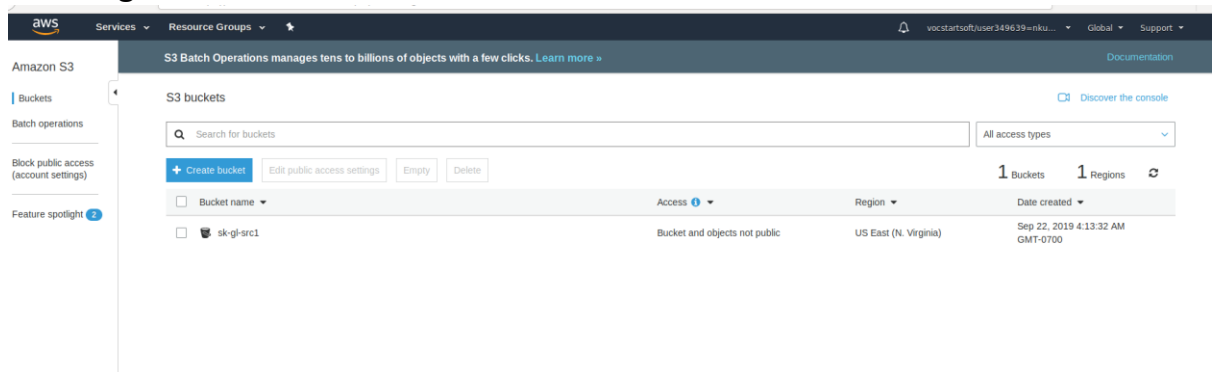
/home/ubuntu/.virtualenvs/djangodev/local/lib/python2.7/site-packages/django/core/handlers/base.py in _get_response
185. response = wrapped_callback(request, *callback_args, **callback_kwargs)
    ► Local vars

/home/ubuntu/.virtualenvs/djangodev/local/lib/python2.7/site-packages/django/views/decorators/csrf.py in wrapped_view
58. return view_func(*args, **kwargs)
    ► Local vars

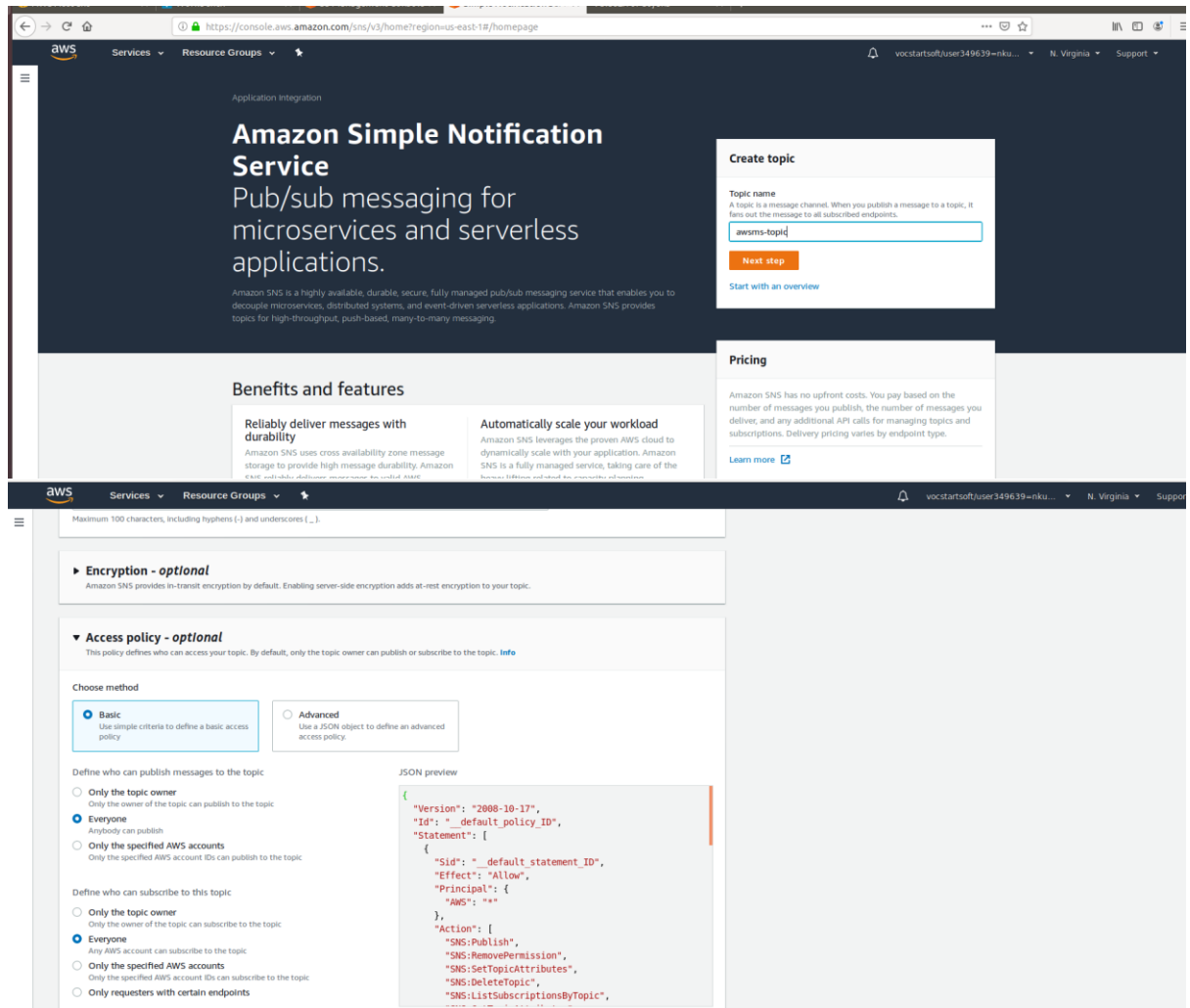
/opt/docproc_new/api/views.py in message
33. process_document(request.body)
    ► Local vars

/opt/docproc_new/api/views.py in process_document
```

6. Creating Source bucket in S3



7. Create SNS



8. Generate the events in S3 bucket

The screenshot shows the AWS S3 console interface. The top navigation bar includes 'Services', 'Resource Groups', and a search bar. The main content area displays several service cards: 'Object lock', 'Tags', 'Transfer acceleration', 'Events', 'Keep multiple versions of an object in the same bucket', 'Set up access log records that provide details about access requests', 'Host a static website, which does not require server-side technologies', 'Record object-level API activity using the CloudTrail data events feature (additional cost)', and 'Automatically encrypt objects when stored in Amazon S3'. The 'Events' card is selected, and the 'New event' dialog is open. The dialog shows the following settings:

- Name:** gen-invoice-event
- Events:**
 - ☒ PUT
 - ☒ POST
 - ☐ COPY
 - ☐ Multipart upload completed
 - ☐ All object create events
 - ☐ Object in RRS lost
 - ☐ Permanently deleted
 - ☐ Delete marker created
 - ☐ All object delete events
 - ☐ Restore initiated
 - ☐ Restore completed
- Prefix:** e.g. images/
- Suffix:** e.g. .jpg
- Send to:** SNS Topic
- SNS:** awsms-topic

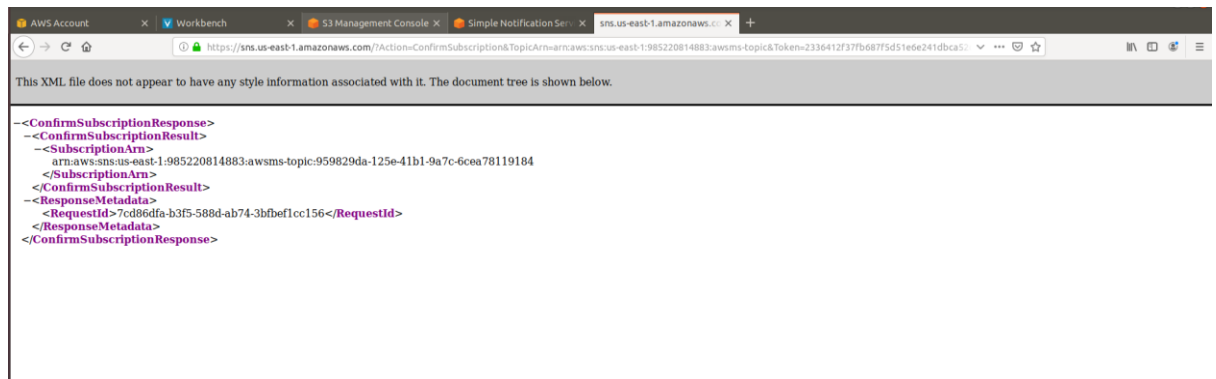
9. Create the subscription in SNS

The screenshot shows the AWS SNS console interface. The top navigation bar includes 'Services', 'Resource Groups', and a search bar. The main content area displays the 'Create subscription' page. The 'Details' section shows the following settings:

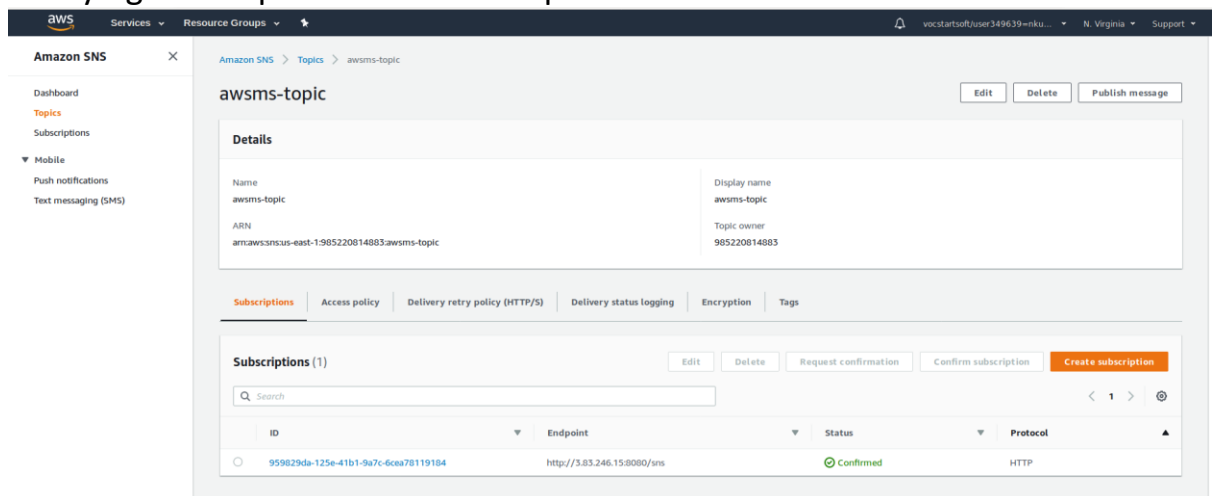
- Topic ARN:** arn:aws:sns:us-east-1:965220814883:awsms
- Protocol:** HTTP
- Endpoint:** http://3.83.246.15:8080/sns
- ☐ Enable raw message delivery

A note states: "After your subscription is created, you must confirm it. info". The 'Subscription filter policy - optional' section is also visible.

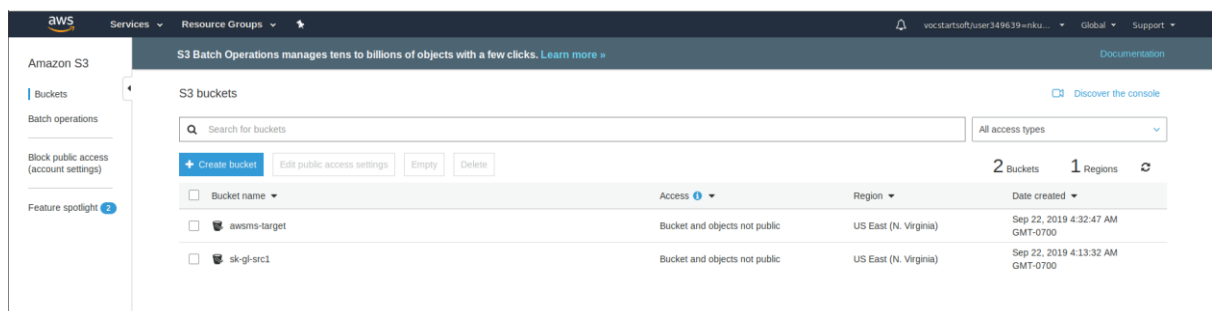
10. SNS Subscribe confirmation



11. Verifying subscription under SNS topic



12. Create the destination confirmation



13. Create role to access Dynamo-DB and S3

1 2 3 4

Create role

Review

Provide the required information below and review this role before you create it.

Role name*
Use alphanumeric and "+, @, _" characters. Maximum 64 characters.

Role description
Maximum 1000 characters. Use alphanumeric and "+, @, _" characters.

Trusted entities AWS service: ec2.amazonaws.com

Policies [AmazonDynamoDBFullAccess](#) [AmazonS3FullAccess](#)

Permissions boundary Permissions boundary is not set

No tags were added.

* Required Cancel Previous Create role

AWS Account x Workbench x S3 Management Console x Attach/Replace IAM Role x IAM Management Console x

<https://console.aws.amazon.com/ec2/home?region=us-east-1#AttachReplaceIAMRole>

Instances > Attach/Replace IAM Role

Attach/Replace IAM Role

Select an IAM role to attach to your instance. If you don't have any IAM roles, choose Create new IAM role to create a role in the IAM console. If an IAM role is already attached to your instance, the IAM role you choose will replace the existing role.

Instance ID **i-018cc6cda018002b6** (Invoice-processing-system) ⓘ

IAM role* ⓘ Create new IAM role ⓘ

* Required Cancel Apply

14. Upload invoice to Source bucket

Upload

1 2 3 4

1 Files Size: 410.0 B Target path: sk-gl-src1

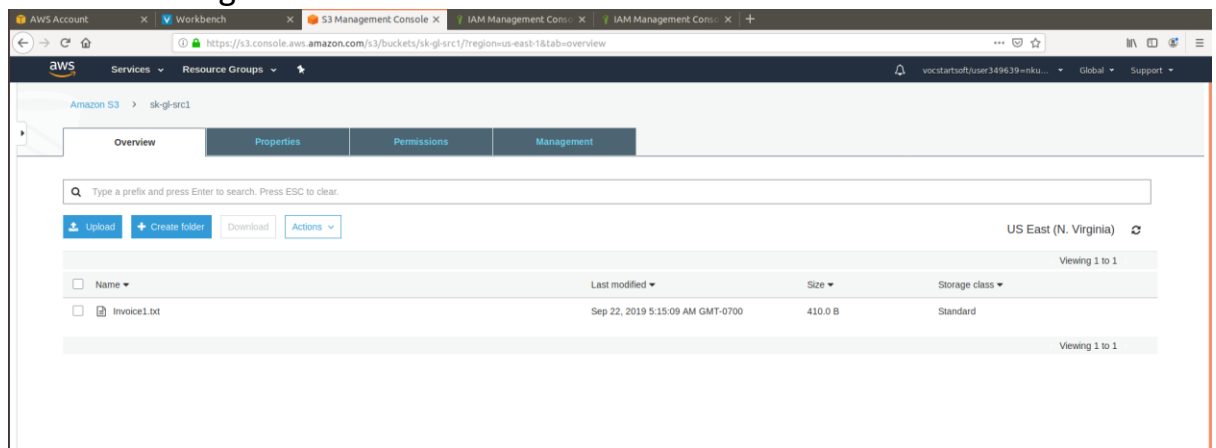
To upload a file larger than 160 GB, use the AWS CLI, AWS SDK, or Amazon S3 REST API. [Learn more](#)

[Add more files](#)

Name	Size	Actions
Invoice1.txt	410.0 B	x

Upload Next

15. Invoice in Target Bucket



16. Invoice table inserted in Dynamo-DB Table

