CIS 4560 Term Project Tutorial

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Lab Tutorial

NYC Ticket Analysis using Apache Hive

Objectives

In this hands-on lab, you will learn to:

- Set up a Hadoop cluster using Google Computing Services
- Set up authentication for cluster using SSH keys
- Move data from nodes into Hadoop file systems and back
- Hive commands to perform analysis
- Visualization

Platform Specifications

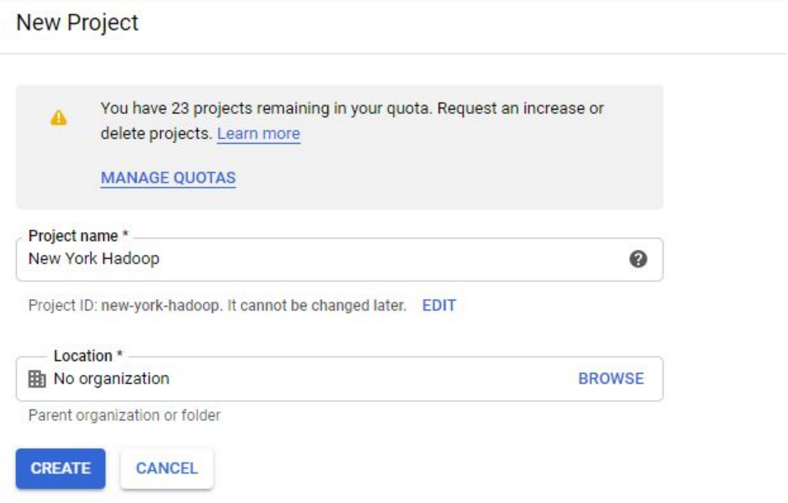
Google Dataproc

Master node
Standard (1 master, N workers)
Machine type
n1-standard-4 (4 vCPU, 15.0 GB memory)
Primary disk type
pd-standard
Primary disk size
500 GB
Worker nodes
2
Machine type
n1-standard-4 (4 vCPU, 15.0 GB memory)
Primary disk type
pd-standard
Primary disk size
500 GB
Local SSDs
0

PART 1: Setting Up Cluster with Google Dataproc

1.Sign up for an account at https://cloud.google.com/

2.Upon logging in, create a project and name it accordingly



New Project

You have 23 projects remaining in your quota. Request an increase or delete projects. Learn more

MANAGE QUOTAS

Project name *
New York Hadoop

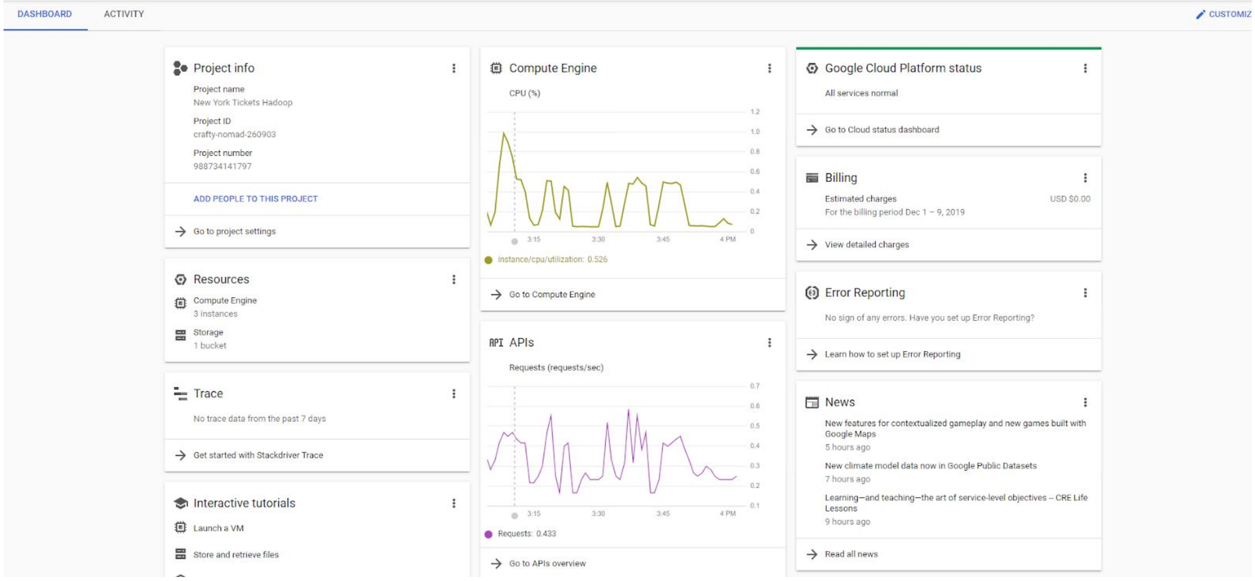
Project ID: new-york-hadoop. It cannot be changed later. EDIT

Location *
No organization BROWSE

Parent organization or folder

CREATE CANCEL

3.You will be greeted with a dashboard containing a lot of information



Project info

Project name
New York Tickets Hadoop

Project ID
crafty-nomad-260903

Project number
988734141797

ADD PEOPLE TO THIS PROJECT

→ Go to project settings

Resources

Compute Engine
3 instances

Storage
1 bucket

Trace

No trace data from the past 7 days

→ Get started with Stackdriver Trace

Interactive tutorials

Launch a VM

Store and retrieve files

Compute Engine

instance/cpu/utilization: 0.526

→ Go to Compute Engine

APIs

Requests: 0.433

→ Go to APIs overview

Google Cloud Platform status

All services normal

→ Go to Cloud status dashboard

Billing

Estimated charges USD $0.00
For the billing period Dec 1 – 9, 2019

→ View detailed charges

Error Reporting

No sign of any errors. Have you set up Error Reporting?

→ Learn how to set up Error Reporting

News

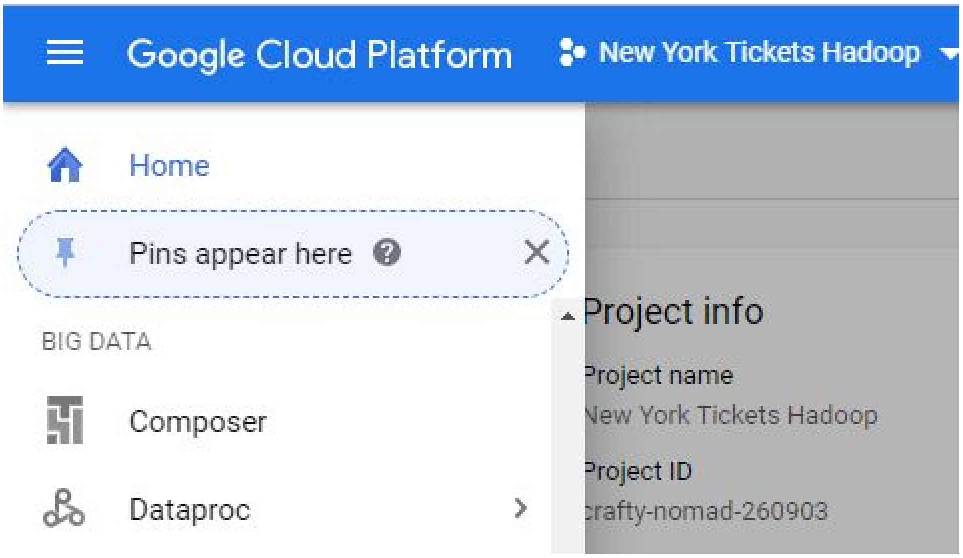
New features for contextualized gameplay and new games built with Google Maps
5 hours ago

New climate model data now in Google Public Datasets
7 hours ago

Learning—and teaching—the art of service-level objectives – CRE Life Lessons
9 hours ago

→ Read all news

4.Using the navigation menu at the top left, access the Dataprocs tab

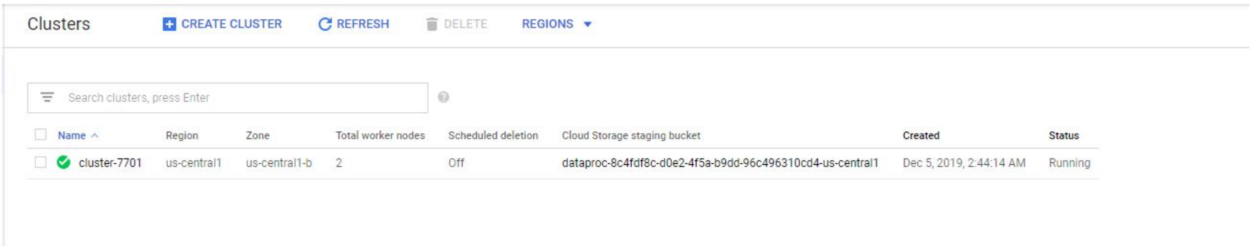


Project info

Project name
New York Tickets Hadoop

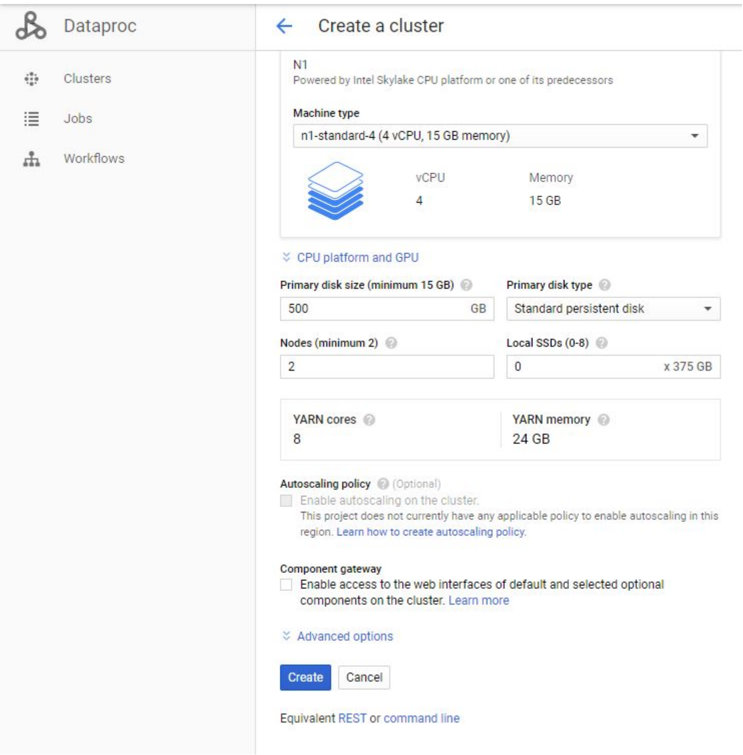
Project ID
crafty-nomad-260903

5. Create a cluster using the [Create Cluster] button



□	Name	Region	Zone	Total worker nodes	Scheduled deletion	Cloud Storage staging bucket	Created	Status
□	✓ cluster-7701	us-central1	us-central1-b	2	Off	dataproc-8c4fdf8c-d0e2-4f5a-b9dd-96c496310cd4-us-central1	Dec 5, 2019, 2:44:14 AM	Running

6.You can rename the cluster however you want and set hardware specifications on this page, when finished, click the [Create] button at the bottom



N1
Powered by Intel Skylake CPU platform or one of its predecessors

Machine type
n1-standard-4 (4 vCPU, 15 GB memory)

vCPU
4

Memory
15 GB

CPU platform and GPU

Primary disk size (minimum 15 GB): 500 GB

Primary disk type: Standard persistent disk

Nodes (minimum 2): 2

Local SSDs (0-8): 0 x 375 GB

YARN cores
8

YARN memory
24 GB

Autoscaling policy (Optional)
□ Enable autoscaling on the cluster.
This project does not currently have any applicable policy to enable autoscaling in this region. Learn how to create autoscaling policy.

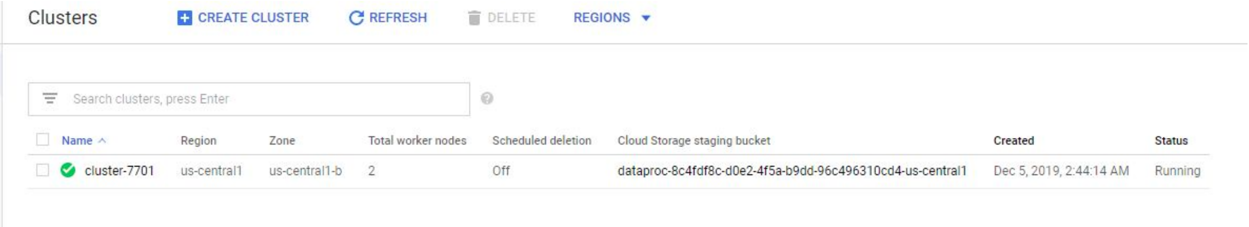
Component gateway
□ Enable access to the web interfaces of default and selected optional components on the cluster. Learn more

Advanced options

Create Cancel

Equivalent REST or command line

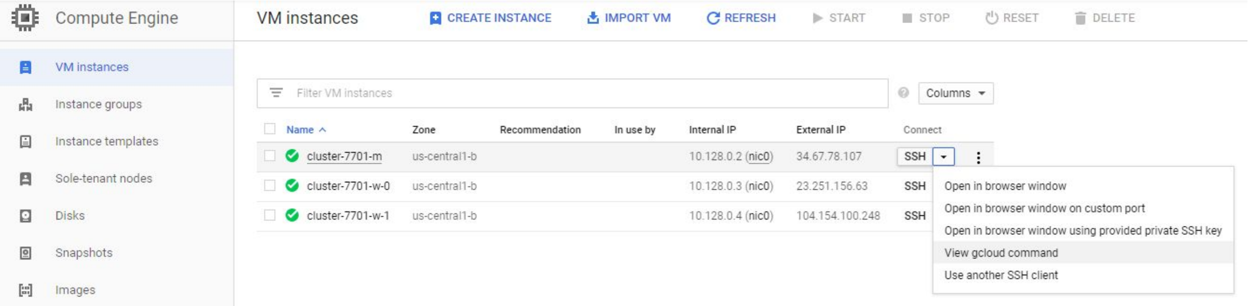
7.You now have set up a cluster and it is ready to use!



Name	Region	Zone	Total worker nodes	Scheduled deletion	Cloud Storage staging bucket	Created	Status
cluster-7701	us-central1	us-central1-b	2	Off	dataproc-8c4fdf8c-d0e2-4f5a-b9dd-96c496310cd4-us-central1	Dec 5, 2019, 2:44:14 AM	Running

PART 2 : Setting up SSH Authentication

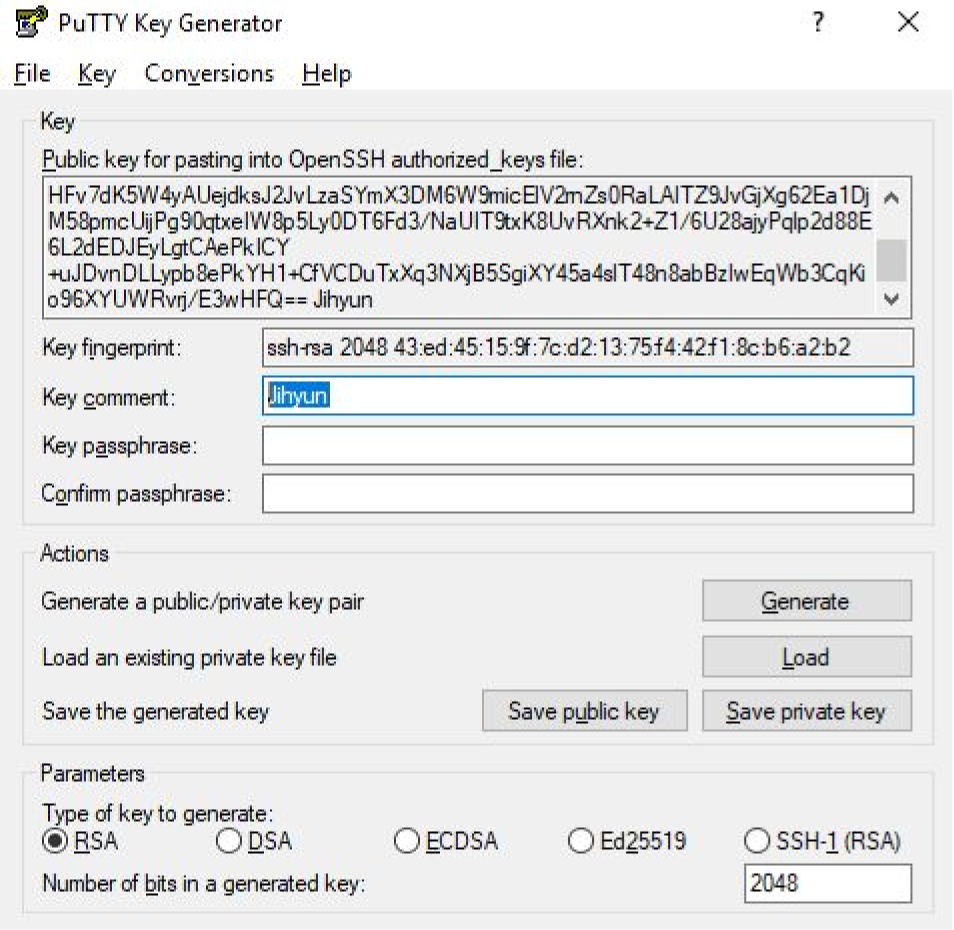
If you are setting this cluster up for use with others, you will need to set up SSH , if you are using this alone, you can just connect using the GCP console by navigating to Compute Engine>VM Instances>Connect



Name	Zone	Recommendation	In use by	Internal IP	External IP	Connect
cluster-7701-m	us-central1-b			10.128.0.2 (nic0)	34.67.78.107	SSH
cluster-7701-w-0	us-central1-b			10.128.0.3 (nic0)	23.251.156.63	SSH
cluster-7701-w-1	us-central1-b			10.128.0.4 (nic0)	104.154.100.248	SSH

1. In order to connect using SSH, we will need to add the public keys into the metadata of the project. For this tutorial, we will be adding the keys on a project wide level and not an instance wide level.
2. Download and run puttygen.exe
   https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html

3. Fill in the key comment as the username you will create to ssh into and press the generate button and save the private key in another location.



Public key for pasting into OpenSSH authorized_keys file:

```
HFv7dK5W4yAUejdksJ2JvLzaSYmX3DM6W9micEIV2mZs0RaLAITZ9JvGjXg62Ea1Dj
M58pmcUijPg90qtxeIW8p5Ly0DT6Fd3/NaUIT9txK8UvRXnk2+Z1/6U28ajyPqlp2d88E
6L2dEDJEyLgtCAePkICY
+uJDvnDLLypb8ePkYH1+CfVCDuTxXq3NXjB5SgiXY45a4slT48n8abBzIwEqWb3CqKi
o96XYUWRvrj/E3wHFQ== Jihyun
```

Key fingerprint: ssh-rsa 2048 43:ed:45:15:9f:7c:d2:13:75f4:42f1:8c:b6:a2:b2

Key comment: Jihyun

Key passphrase:

Confirm passphrase:

Generate a public/private key pair

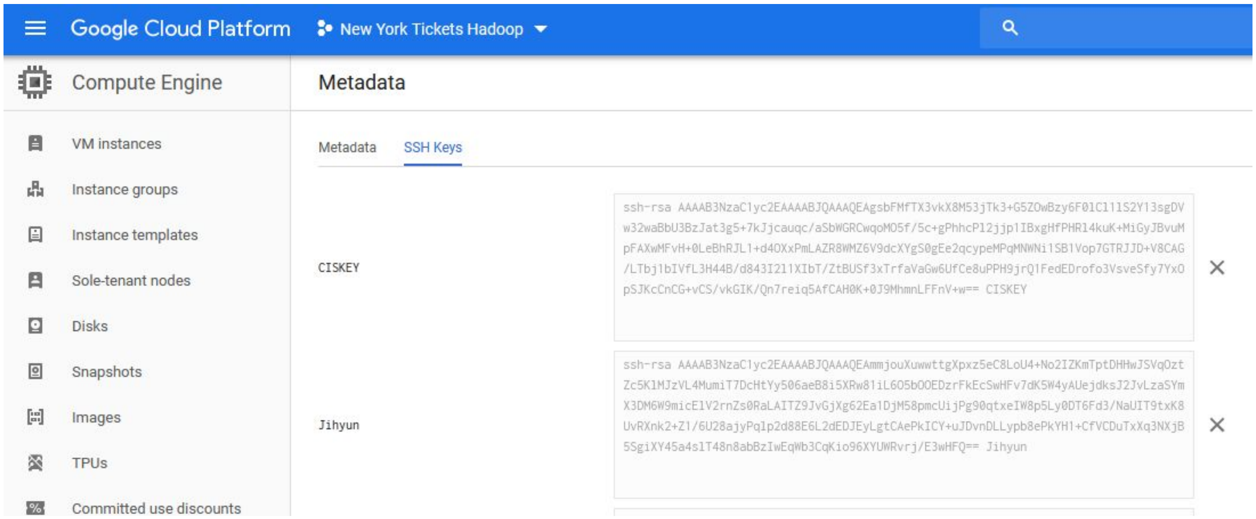
Load an existing private key file

Save the generated key

Type of key to generate:
● RSA ○ DSA ○ ECDSA ○ Ed25519 ○ SSH-1 (RSA)

Number of bits in a generated key: 2048

4. Copy and paste the public key above into Google Compute Engine under Metadata>Add SSH Keys



CISKEY

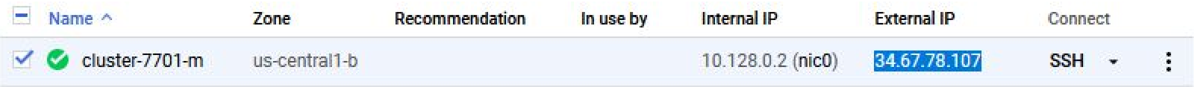
```
ssh-rsa AAAAB3NzaC1yc2EAAAABJQAAAQEAgsbFMfTX3vkX8M53jTk3+G5ZOwBzy6F01C11lS2Y13sgDV
w32waBbU3BzJat3g5+7kJjcauqc/aSbWGRCwqoMO5f/5c+gPhhcP12jjp1IBxgHfPHR14kuK+MiGyJBvuM
pFAXwMFvH+0LeBhRJL1+d4OXxPmLAZR8WMZ6V9dcXYgS0gEe2qcypeMPqMNWNi1SB1Vop7GTRJJD+V8CAG
/LTbj1bIVfL3H44B/d843I211XIbT/ZtBUSf3xTrfaVaGw6UfCe8uPPH9jrQ1FedEDrofo3VsveSfy7YxO
pSJKcCnCG+vCS/vkGIK/Qn7reiq5AfCAH0K+0J9MhmnLFFnV+w== CISKEY
```

Jihyun

```
ssh-rsa AAAAB3NzaC1yc2EAAAABJQAAAQEAmmjouXuwwttgXpxz5eC8LoU4+No2IZKmTptDHHwJSVqOzt
Zc5KlMJzVL4MumiT7DcHtYy506aeB8i5XRw81iL6O5bOOEDzrFkEcSwHFv7dK5W4yAUejdksJ2JvLzaSYm
X3DM6W9micElV2rnZs0RaLAITZ9JvGjXg62Ea1DjM58pmcUijPg90qtxeIW8p5Ly0DT6Fd3/NaUIT9txK8
UvRXnk2+Z1/6U28ajyPqlp2d88E6L2dEDJEyLgtCAePkICY+uJDvnDLLypb8ePkYH1+CfVCDuTxXq3NXjB
5SgiXY45a4slT48n8abBzIwEqWb3CqKio96XYUWRvrj/E3wHFQ== Jihyun
```

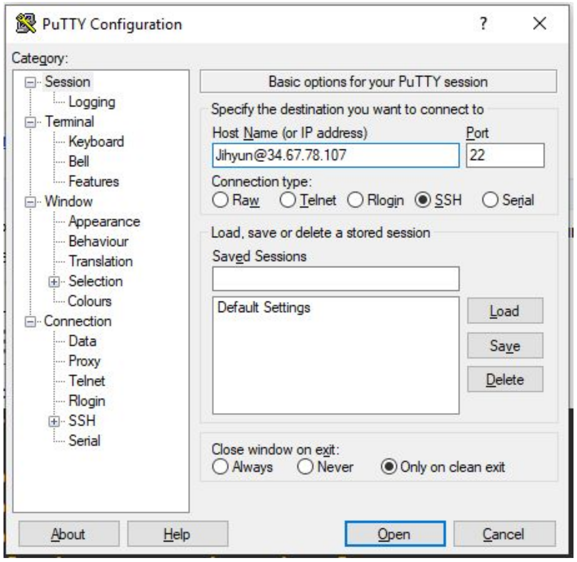
PART 3: Connect to Master Node using PUTTY

Download and open up putty.exe from
https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html



Name ^	Zone	Recommendation	In use by	Internal IP	External IP	Connect
☑ cluster-7701-m	us-central1-b			10.128.0.2 (nic0)	34.67.78.107	SSH ▾

Using the External IP from the Compute Engine>VM Instances, use Putty to connect to your master node with the private key you saved earlier.



Basic options for your PuTTY session

Specify the destination you want to connect to

Host Name (or IP address): Jihyun@34.67.78.107
Port: 22

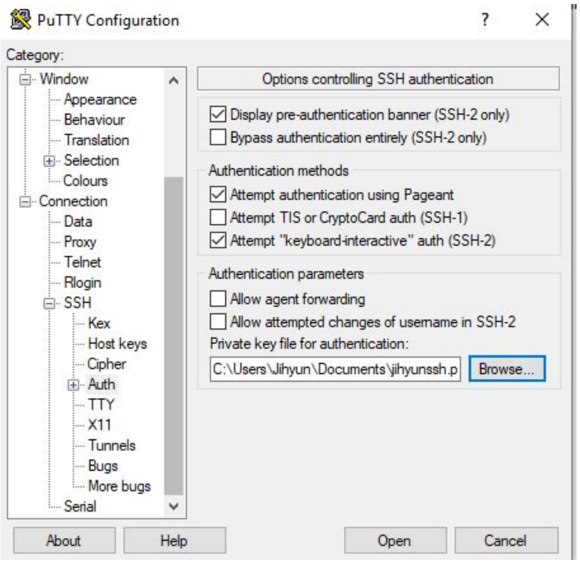
Connection type: ○ Raw ○ Telnet ○ Rlogin ● SSH ○ Serial

Load, save or delete a stored session

Saved Sessions

Default Settings

Close window on exit: ○ Always ○ Never ● Only on clean exit



Options controlling SSH authentication

☑ Display pre-authentication banner (SSH-2 only)
□ Bypass authentication entirely (SSH-2 only)

Authentication methods

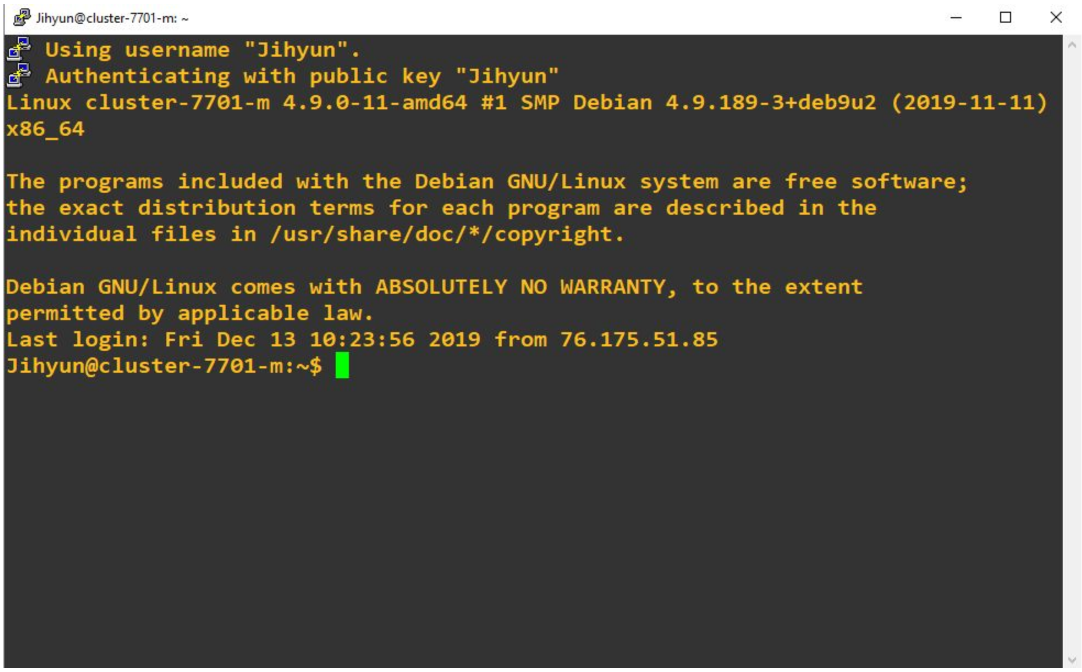
☑ Attempt authentication using Pageant
□ Attempt TIS or CryptoCard auth (SSH-1)
☑ Attempt "keyboard-interactive" auth (SSH-2)

Authentication parameters

□ Allow agent forwarding
□ Allow attempted changes of username in SSH-2

Private key file for authentication: C:\Users\Jihyun\Documents\jihyunssh.p

The host name should follow : [username]@externalip
Set the private key from above under Connection>SSH>Auth and connect by clicking [Open]



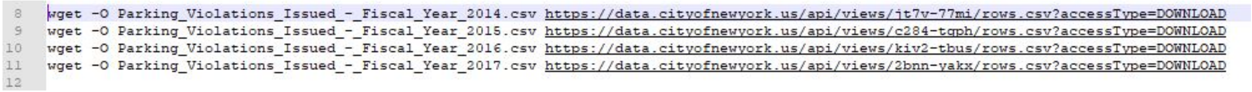
```
Using username "Jihyun".
Authenticating with public key "Jihyun"
Linux cluster-7701-m 4.9.0-11-amd64 #1 SMP Debian 4.9.189-3+deb9u2 (2019-11-11)
x86_64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Fri Dec 13 10:23:56 2019 from 76.175.51.85
Jihyun@cluster-7701-m:~$
```

PART 4: Download data and set up for hdfs

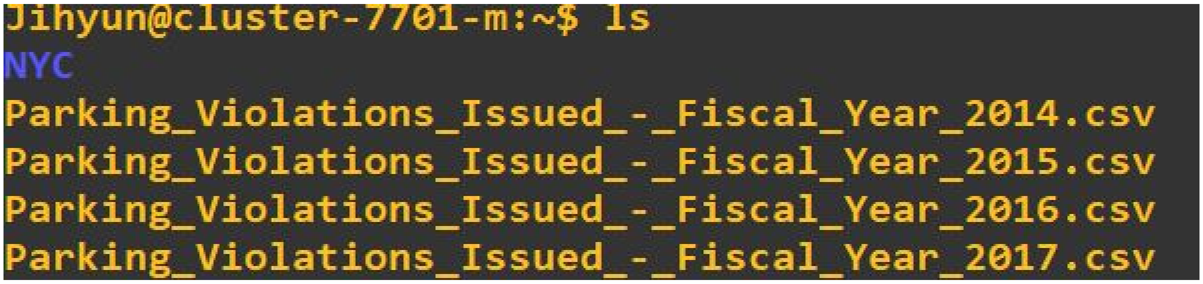
Download datasets using the wget command



```
wget -O Parking_Violations_Issued_-_Fiscal_Year_2014.csv https://data.cityofnewyork.us/api/views/jt7v-77mi/rows.csv?accessType=DOWNLOAD
wget -O Parking_Violations_Issued_-_Fiscal_Year_2015.csv https://data.cityofnewyork.us/api/views/c284-tqph/rows.csv?accessType=DOWNLOAD
wget -O Parking_Violations_Issued_-_Fiscal_Year_2016.csv https://data.cityofnewyork.us/api/views/kiv2-tbus/rows.csv?accessType=DOWNLOAD
wget -O Parking_Violations_Issued_-_Fiscal_Year_2017.csv https://data.cityofnewyork.us/api/views/2bnn-yakx/rows.csv?accessType=DOWNLOAD
```

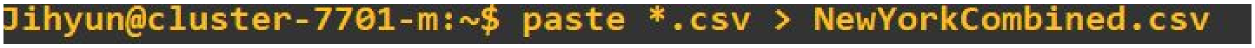
```
wget -O Parking_Violations_Issued_-_Fiscal_Year_2014.csv
https://data.cityofnewyork.us/api/views/jt7v-77mi/rows.csv?accessType=DOWNLOAD
wget -O Parking_Violations_Issued_-_Fiscal_Year_2015.csv
https://data.cityofnewyork.us/api/views/c284-tqph/rows.csv?accessType=DOWNLOAD
wget -O Parking_Violations_Issued_-_Fiscal_Year_2016.csv
https://data.cityofnewyork.us/api/views/kiv2-tbus/rows.csv?accessType=DOWNLOAD
wget -O Parking_Violations_Issued_-_Fiscal_Year_2017.csv
https://data.cityofnewyork.us/api/views/2bnn-yakx/rows.csv?accessType=DOWNLOAD
```

Check files are in local machine with the -ls command



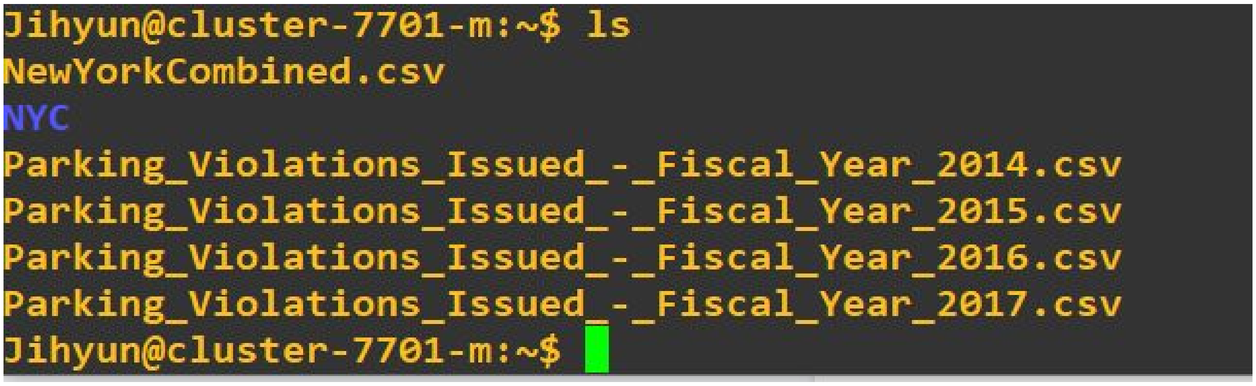
```
Jihyun@cluster-7701-m:~$ ls
NYC
Parking_Violations_Issued_-_Fiscal_Year_2014.csv
Parking_Violations_Issued_-_Fiscal_Year_2015.csv
Parking_Violations_Issued_-_Fiscal_Year_2016.csv
Parking_Violations_Issued_-_Fiscal_Year_2017.csv
```

Merge all csv files into one using Paste and the wildcard *



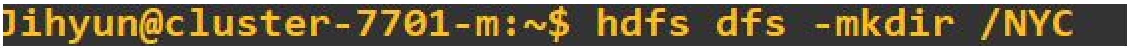
```
Jihyun@cluster-7701-m:~$ paste *.csv > NewYorkCombined.csv
```

Double check that merged file exists using -ls



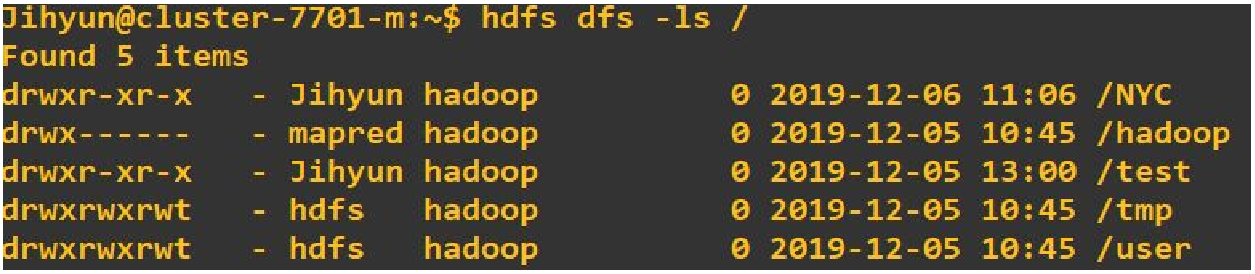
```
Jihyun@cluster-7701-m:~$ ls
NewYorkCombined.csv
NYC
Parking_Violations_Issued_-_Fiscal_Year_2014.csv
Parking_Violations_Issued_-_Fiscal_Year_2015.csv
Parking_Violations_Issued_-_Fiscal_Year_2016.csv
Parking_Violations_Issued_-_Fiscal_Year_2017.csv
Jihyun@cluster-7701-m:~$
```

Create a folder in hdfs using -mkdir



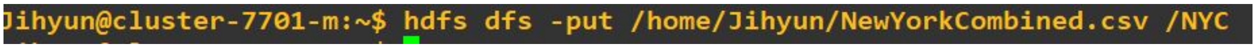
```
Jihyun@cluster-7701-m:~$ hdfs dfs -mkdir /NYC
```

Double check to see it is created using -ls



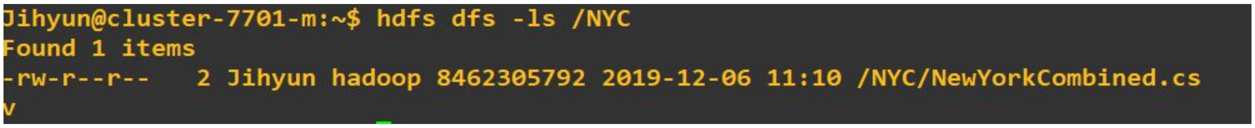
```
Jihyun@cluster-7701-m:~$ hdfs dfs -ls /
Found 5 items
drwxr-xr-x   - Jihyun hadoop          0 2019-12-06 11:06 /NYC
drwx------   - mapred hadoop          0 2019-12-05 10:45 /hadoop
drwxr-xr-x   - Jihyun hadoop          0 2019-12-05 13:00 /test
drwxrwxrwt   - hdfs   hadoop          0 2019-12-05 10:45 /tmp
drwxrwxrwt   - hdfs   hadoop          0 2019-12-05 10:45 /user
```

Move the combined csv file into hdfs using the -put command



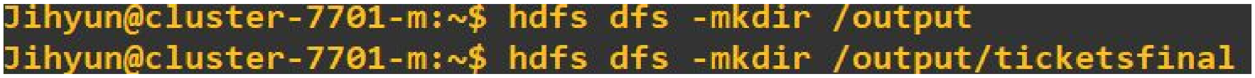
```
Jihyun@cluster-7701-m:~$ hdfs dfs -put /home/Jihyun/NewYorkCombined.csv /NYC
```

Double check to see -put command went through successfully using -ls



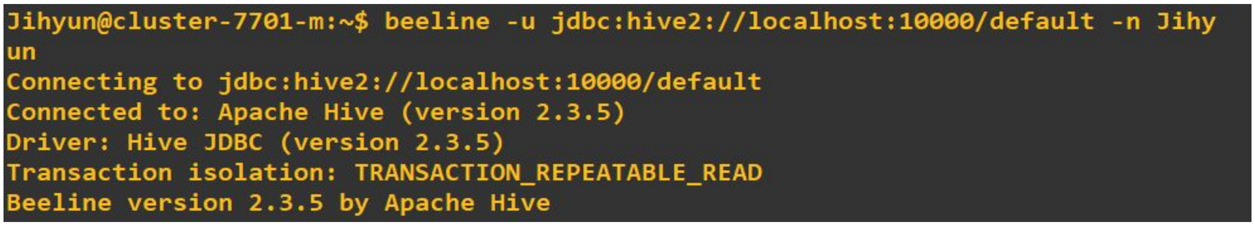
```
Jihyun@cluster-7701-m:~$ hdfs dfs -ls /NYC
Found 1 items
-rw-r--r--   2 Jihyun hadoop 8462305792 2019-12-06 11:10 /NYC/NewYorkCombined.cs
v
```

Also create two more directories in hdfs called /Output/ and /Output/ticketsfinal/



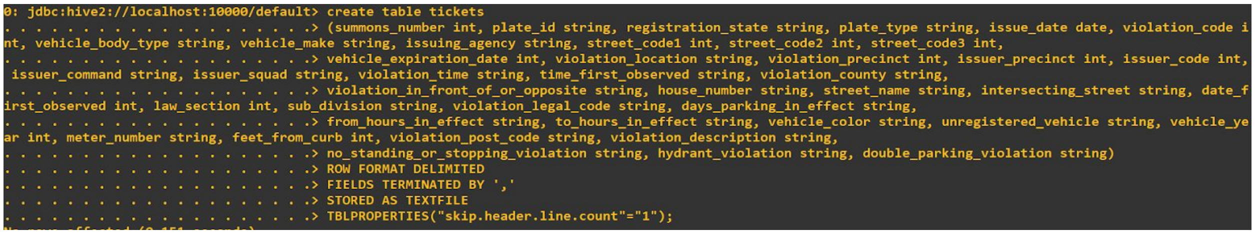
```
Jihyun@cluster-7701-m:~$ hdfs dfs -mkdir /output
Jihyun@cluster-7701-m:~$ hdfs dfs -mkdir /output/ticketsfinal
```

Access apache hive by using the beeline command:
beeline -u jdbc:hive2://localhost:10000/default -n [username]



```
Jihyun@cluster-7701-m:~$ beeline -u jdbc:hive2://localhost:10000/default -n Jihy
un
Connecting to jdbc:hive2://localhost:10000/default
Connected to: Apache Hive (version 2.3.5)
Driver: Hive JDBC (version 2.3.5)
Transaction isolation: TRANSACTION_REPEATABLE_READ
Beeline version 2.3.5 by Apache Hive
```

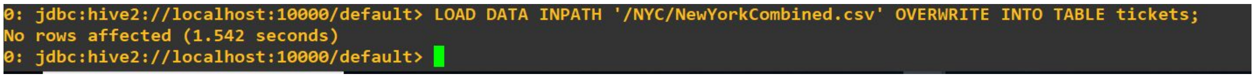
Create a table from the combined csv file using a hive query



```
0: jdbc:hive2://localhost:10000/default> create table tickets
. . . . . . . . . . . . . . . . . . . . .> (summons_number int, plate_id string, registration_state string, plate_type string, issue_date date, violation_code i
nt, vehicle_body_type string, vehicle_make string, issuing_agency string, street_code1 int, street_code2 int, street_code3 int,
. . . . . . . . . . . . . . . . . . . . .> vehicle_expiration_date int, violation_location string, violation_precinct int, issuer_precinct int, issuer_code int,
 issuer_command string, issuer_squad string, violation_time string, time_first_observed string, violation_county string,
. . . . . . . . . . . . . . . . . . . . .> violation_in_front_of_or_opposite string, house_number string, street_name string, intersecting_street string, date_f
irst_observed int, law_section int, sub_division string, violation_legal_code string, days_parking_in_effect string,
. . . . . . . . . . . . . . . . . . . . .> from_hours_in_effect string, to_hours_in_effect string, vehicle_color string, unregistered_vehicle string, vehicle_ye
ar int, meter_number string, feet_from_curb int, violation_post_code string, violation_description string,
. . . . . . . . . . . . . . . . . . . . .> no_standing_or_stopping_violation string, hydrant_violation string, double_parking_violation string)
. . . . . . . . . . . . . . . . . . . . .> ROW FORMAT DELIMITED
. . . . . . . . . . . . . . . . . . . . .> FIELDS TERMINATED BY ','
. . . . . . . . . . . . . . . . . . . . .> STORED AS TEXTFILE
. . . . . . . . . . . . . . . . . . . . .> TBLPROPERTIES("skip.header.line.count"="1");
```

```
create table tickets
(summons_number int, plate_id string, registration_state string, plate_type string, issue_date string, violation_code int, vehicle_body_type string, vehicle_make string, issuing_agency string, street_code1 int, street_code2 int, street_code3 int,
vehicle_expiration_date int, violation_location string, violation_precinct int, issuer_precinct int, issuer_code int, issuer_command string, issuer_squad string, violation_time string, time_first_observed string, violation_county string,
violation_in_front_of_or_opposite string, house_number string, street_name string, intersecting_street string, date_first_observed int, law_section int, sub_division string, violation_legal_code string, days_parking_in_effect string,
from_hours_in_effect string, to_hours_in_effect string, vehicle_color string,
unregistered_vehicle string, vehicle_year int, meter_number string, feet_from_curb int,
violation_post_code string, violation_description string,
no_standing_or_stopping_violation string, hydrant_violation string, double_parking_violation
string)
ROW FORMAT DELIMITED
FIELDS TERMINATED BY ','
STORED AS TEXTFILE
LOCATION "/Output/"
TBLPROPERTIES("skip.header.line.count"="1");
```

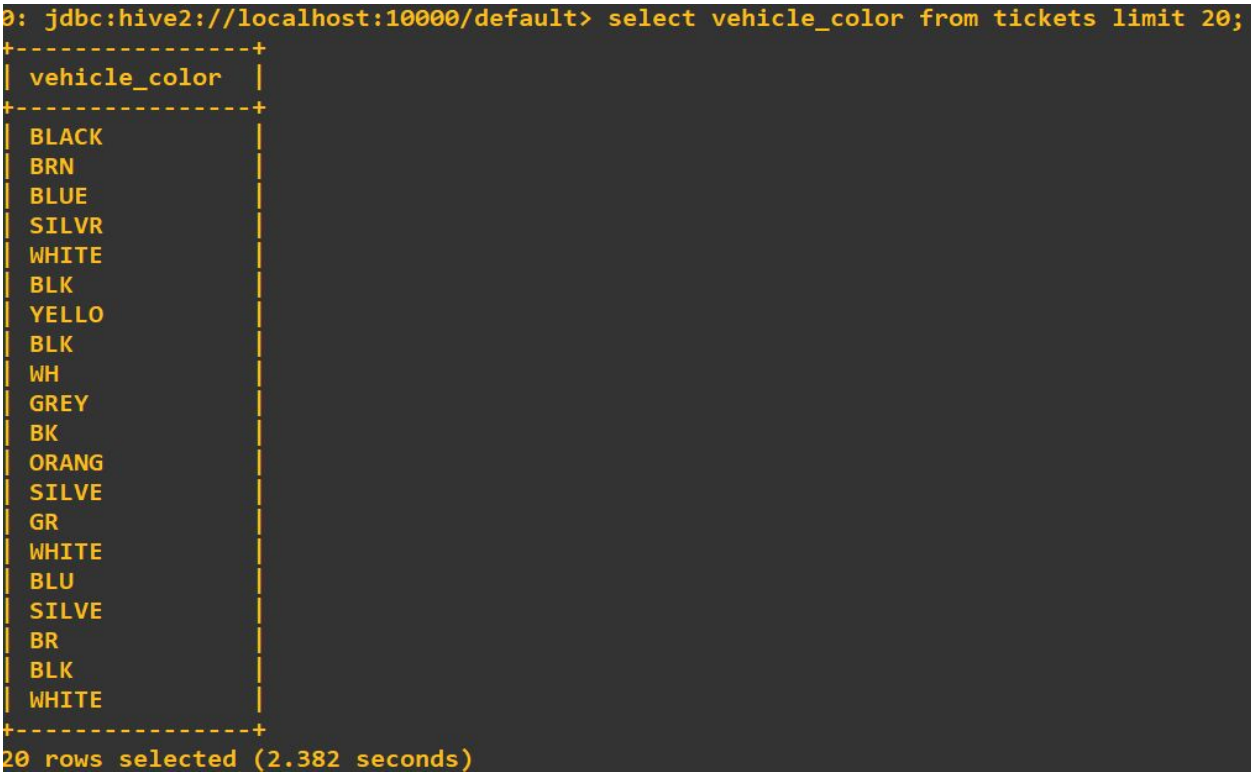
Load data into table using the command LOAD



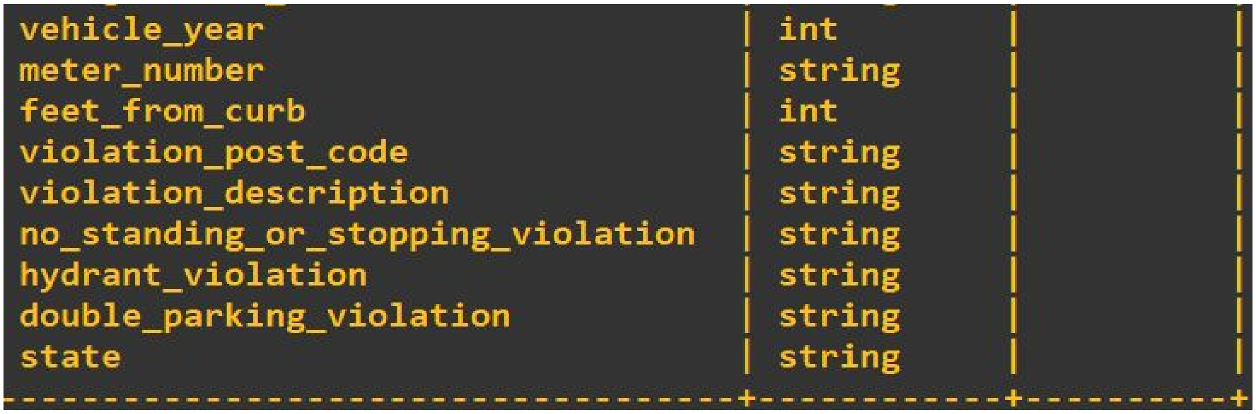
```
0: jdbc:hive2://localhost:10000/default> LOAD DATA INPATH '/NYC/NewYorkCombined.csv' OVERWRITE INTO TABLE tickets;
No rows affected (1.542 seconds)
0: jdbc:hive2://localhost:10000/default>
```

```
LOAD DATA INPATH '/NYC/NewYorkCombined.csv' OVERWRITE INTO TABLE tickets;
```

Run a test command (select first 20 records of vehicle colors)

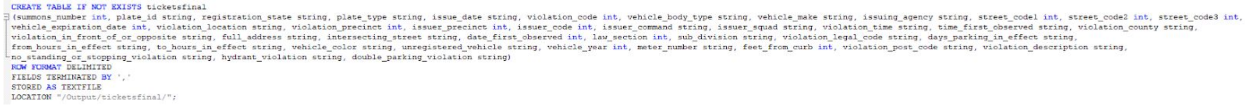


```
0: jdbc:hive2://localhost:10000/default> select vehicle_color from tickets limit 20;
+----------------+
| vehicle_color  |
+----------------+
| BLACK          |
| BRN            |
| BLUE           |
| SILVR          |
| WHITE          |
| BLK            |
| YELLO          |
| BLK            |
| WH             |
| GREY           |
| BK             |
| ORANG          |
| SILVE          |
| GR             |
| WHITE          |
| BLU            |
| SILVE          |
| BR             |
| BLK            |
| WHITE          |
+----------------+
20 rows selected (2.382 seconds)
```



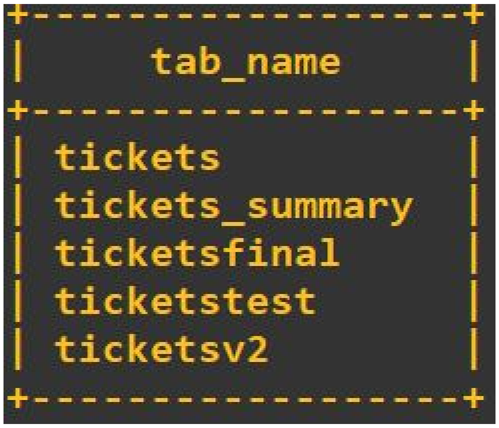
```
vehicle_year                       | int         |          |
meter_number                       | string      |          |
feet_from_curb                     | int         |          |
violation_post_code                | string      |          |
violation_description              | string      |          |
no_standing_or_stopping_violation  | string      |          |
hydrant_violation                  | string      |          |
double_parking_violation           | string      |          |
state                              | string      |          |
-----------------------------------+------------+----------+
```

Create a second table called ticketsfinal using CREATE TABLE that will hold concatenation and fill the new column with data and we will save the file in hdfs in a folder called Output/ticketsfinal/
check to see table is made using SHOW TABLES;



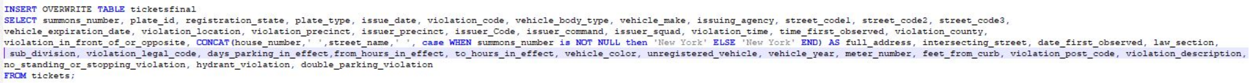
```
CREATE TABLE IF NOT EXISTS ticketsfinal
(summons_number int, plate_id string, registration_state string, plate_type string, issue_date string, violation_code int, vehicle_body_type string, vehicle_make string, issuing_agency string, street_code1 int, street_code2 int, street_code3 int,
vehicle_expiration_date int, violation_location string, violation_precinct int, issuer_precinct int, issuer_code int, issuer_command string, issuer_squad string, violation_time string, time_first_observed string, violation_county string,
violation_in_front_of_or_opposite string, full_address string, intersecting_street string, date_first_observed int, law_section int, sub_division string, violation_legal_code string, days_parking_in_effect string,
from_hours_in_effect string, to_hours_in_effect string, vehicle_color string, unregistered_vehicle string, vehicle_year int, meter_number string, feet_from_curb int, violation_post_code string, violation_description string,
no_standing_or_stopping_violation string, hydrant_violation string, double_parking_violation string)
ROW FORMAT DELIMITED
FIELDS TERMINATED BY ','
STORED AS TEXTFILE
LOCATION "/Output/ticketsfinal/";
```

```
CREATE TABLE IF NOT EXISTS ticketsfinal
(summons_number int, plate_id string, registration_state string, plate_type string, issue_date
string, violation_code int, vehicle_body_type string, vehicle_make string, issuing_agency
string, street_code1 int, street_code2 int, street_code3 int,
vehicle_expiration_date int, violation_location string, violation_precinct int, issuer_precinct int,
issuer_code int, issuer_command string, issuer_squad string, violation_time string,
time_first_observed string, violation_county string,
violation_in_front_of_or_opposite string, full_address string, intersecting_street string,
date_first_observed int, law_section int, sub_division string, violation_legal_code string,
days_parking_in_effect string,
from_hours_in_effect string, to_hours_in_effect string, vehicle_color string,
unregistered_vehicle string, vehicle_year int, meter_number string, feet_from_curb int,
violation_post_code string, violation_description string,
no_standing_or_stopping_violation string, hydrant_violation string, double_parking_violation
string)
ROW FORMAT DELIMITED
FIELDS TERMINATED BY ','
STORED AS TEXTFILE
LOCATION "/Output/ticketsfinal/";
```



```
+------------------+
|     tab_name     |
+------------------+
| tickets          |
| tickets_summary  |
| ticketsfinal     |
| ticketstest      |
| ticketsv2        |
+------------------+
```

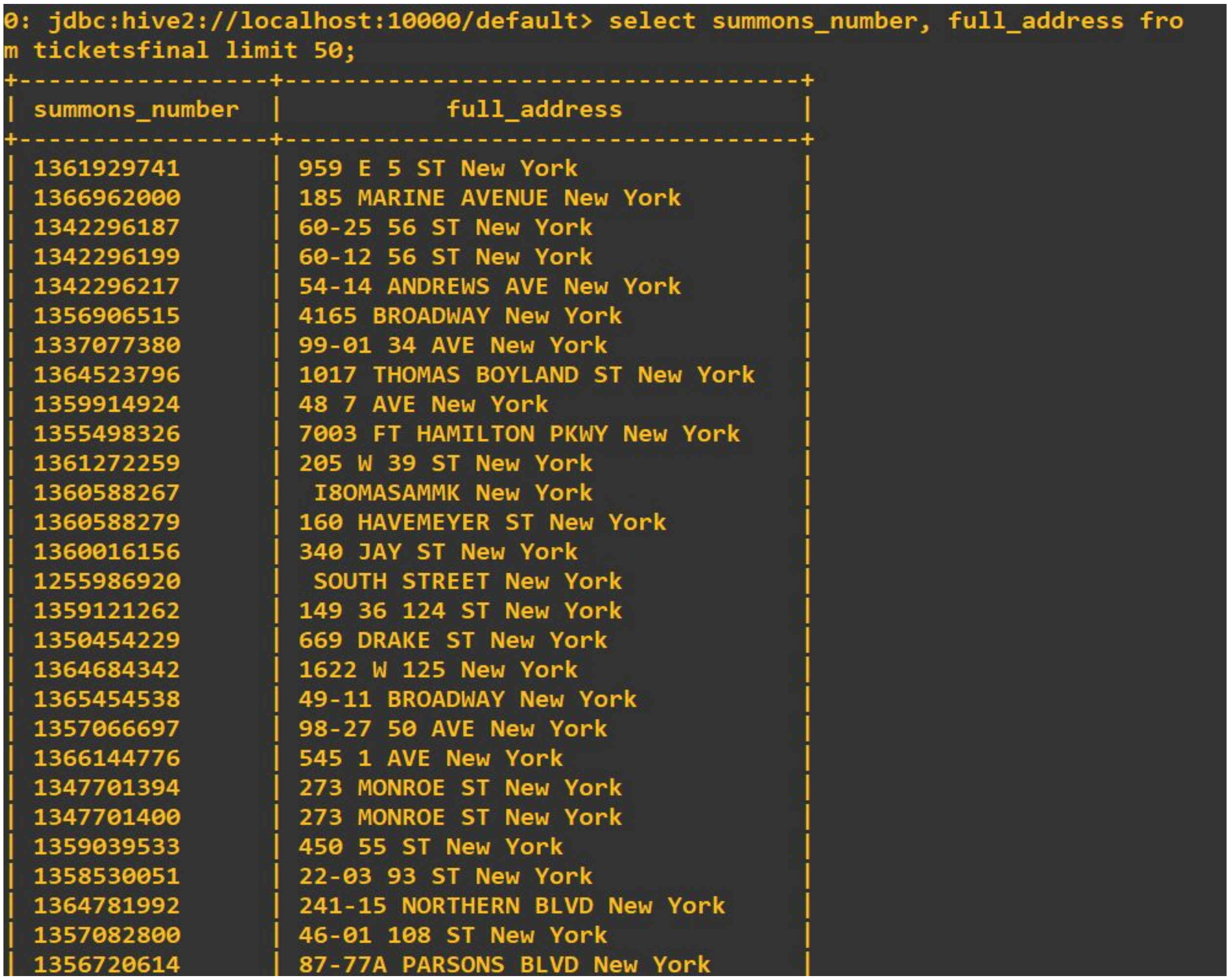
Insert data into ticketsfinal using data from tickets with the INSERT OVERWRITE TABLE



```
INSERT OVERWRITE TABLE ticketsfinal
SELECT summons_number, plate_id, registration_state, plate_type, issue_date, violation_code, vehicle_body_type, vehicle_make, issuing_agency, street_code1, street_code2, street_code3,
vehicle_expiration_date, violation_location, violation_precinct, issuer_precinct, issuer_Code, issuer_command, issuer_squad, violation_time, time_first_observed, violation_county,
violation_in_front_of_or_opposite, CONCAT(house_number,' ',street_name,' ', case WHEN summons_number is NOT NULL then 'New York' ELSE 'New York' END) AS full_address, intersecting_street, date_first_observed, law_section,
 sub_division, violation_legal_code, days_parking_in_effect,from_hours_in_effect, to_hours_in_effect, vehicle_color, unregistered_vehicle, vehicle_year, meter_number, feet_from_curb, violation_post_code, violation_description,
no_standing_or_stopping_violation, hydrant_violation, double_parking_violation
FROM tickets;
```

```
INSERT OVERWRITE TABLE ticketsfinal
SELECT summons_number, plate_id, registration_state, plate_type, issue_date,
violation_code, vehicle_body_type, vehicle_make, issuing_agency, street_code1,
street_code2, street_code3,
vehicle_expiration_date, violation_location, violation_precinct, issuer_precinct, issuer_Code,
issuer_command, issuer_squad, violation_time, time_first_observed, violation_county,
violation_in_front_of_or_opposite, CONCAT(house_number,' ',street_name,' ', case WHEN
summons_number is NOT NULL then 'New York' ELSE 'New York' END) AS full_address,
intersecting_street, date_first_observed, law_section,
 sub_division, violation_legal_code, days_parking_in_effect,from_hours_in_effect,
to_hours_in_effect, vehicle_color, unregistered_vehicle, vehicle_year, meter_number,
feet_from_curb, violation_post_code, violation_description,
no_standing_or_stopping_violation, hydrant_violation, double_parking_violation
FROM tickets;
```

Check to see that the street names are concatenated with the state name using SELECT.

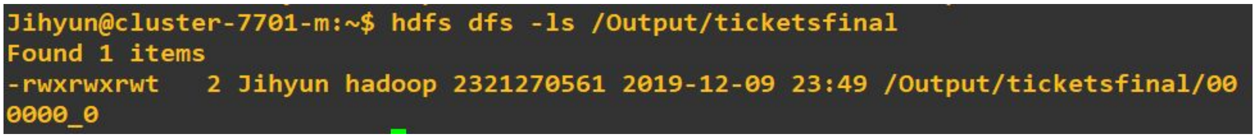


```
0: jdbc:hive2://localhost:10000/default> select summons_number, full_address fro
m ticketsfinal limit 50;
+-----------------+-----------------------------------+
| summons_number  |           full_address            |
+-----------------+-----------------------------------+
| 1361929741      | 959 E 5 ST New York               |
| 1366962000      | 185 MARINE AVENUE New York        |
| 1342296187      | 60-25 56 ST New York              |
| 1342296199      | 60-12 56 ST New York              |
| 1342296217      | 54-14 ANDREWS AVE New York        |
| 1356906515      | 4165 BROADWAY New York            |
| 1337077380      | 99-01 34 AVE New York             |
| 1364523796      | 1017 THOMAS BOYLAND ST New York   |
| 1359914924      | 48 7 AVE New York                 |
| 1355498326      | 7003 FT HAMILTON PKWY New York    |
| 1361272259      | 205 W 39 ST New York              |
| 1360588267      |  I8OMASAMMK New York              |
| 1360588279      | 160 HAVEMEYER ST New York         |
| 1360016156      | 340 JAY ST New York               |
| 1255986920      |  SOUTH STREET New York            |
| 1359121262      | 149 36 124 ST New York            |
| 1350454229      | 669 DRAKE ST New York             |
| 1364684342      | 1622 W 125 New York               |
| 1365454538      | 49-11 BROADWAY New York           |
| 1357066697      | 98-27 50 AVE New York             |
| 1366144776      | 545 1 AVE New York                |
| 1347701394      | 273 MONROE ST New York            |
| 1347701400      | 273 MONROE ST New York            |
| 1359039533      | 450 55 ST New York                |
| 1358530051      | 22-03 93 ST New York              |
| 1364781992      | 241-15 NORTHERN BLVD New York     |
| 1357082800      | 46-01 108 ST New York             |
| 1356720614      | 87-77A PARSONS BLVD New York      |
```

Exit hive by pressing CTRL+Z

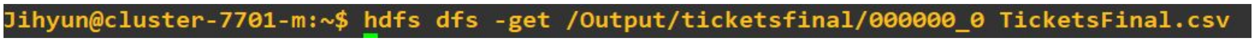
PART 5 : DOWNLOAD FILE

Hdfs to find the file located in the saved location from the code in Output/ticketsfinal



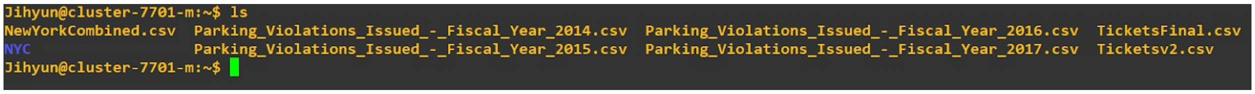
```
Jihyun@cluster-7701-m:~$ hdfs dfs -ls /Output/ticketsfinal
Found 1 items
-rwxrwxrwt   2 Jihyun hadoop 2321270561 2019-12-09 23:49 /Output/ticketsfinal/00
0000_0
```

Move the file into the master node as a csv file using hdfs dfs -get



```
Jihyun@cluster-7701-m:~$ hdfs dfs -get /Output/ticketsfinal/000000_0 TicketsFinal.csv
```

-ls to verify the csv file is there

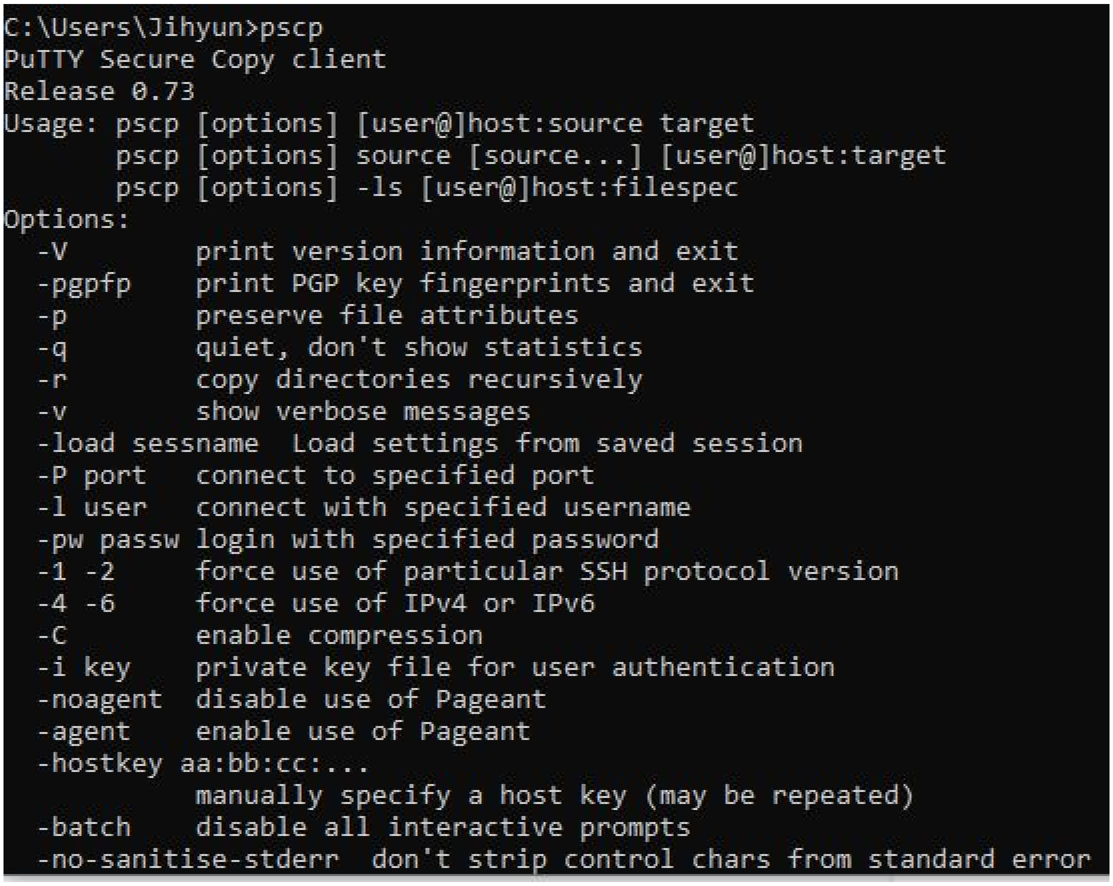


```
Jihyun@cluster-7701-m:~$ ls
NewYorkCombined.csv  Parking_Violations_Issued_-_Fiscal_Year_2014.csv  Parking_Violations_Issued_-_Fiscal_Year_2016.csv  TicketsFinal.csv
NYC                  Parking_Violations_Issued_-_Fiscal_Year_2015.csv  Parking_Violations_Issued_-_Fiscal_Year_2017.csv  Ticketsv2.csv
Jihyun@cluster-7701-m:~$
```

Download PSCP: https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html

1. Open up a fresh instance of command prompt (cmd.exe)

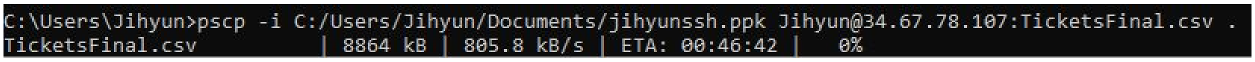
2. Verify that pscp works by typing pscp in the command line



```
C:\Users\Jihyun>pscp
PuTTY Secure Copy client
Release 0.73
Usage: pscp [options] [user@]host:source target
       pscp [options] source [source...] [user@]host:target
       pscp [options] -ls [user@]host:filespec
Options:
  -V        print version information and exit
  -pgpfp    print PGP key fingerprints and exit
  -p        preserve file attributes
  -q        quiet, don't show statistics
  -r        copy directories recursively
  -v        show verbose messages
  -load sessname  Load settings from saved session
  -P port   connect to specified port
  -l user   connect with specified username
  -pw passw login with specified password
  -1 -2     force use of particular SSH protocol version
  -4 -6     force use of IPv4 or IPv6
  -C        enable compression
  -i key    private key file for user authentication
  -noagent  disable use of Pageant
  -agent    enable use of Pageant
  -hostkey aa:bb:cc:...
            manually specify a host key (may be repeated)
  -batch    disable all interactive prompts
  -no-sanitise-stderr  don't strip control chars from standard error
```

3. Download the csv file from the master node onto your machine using the syntax

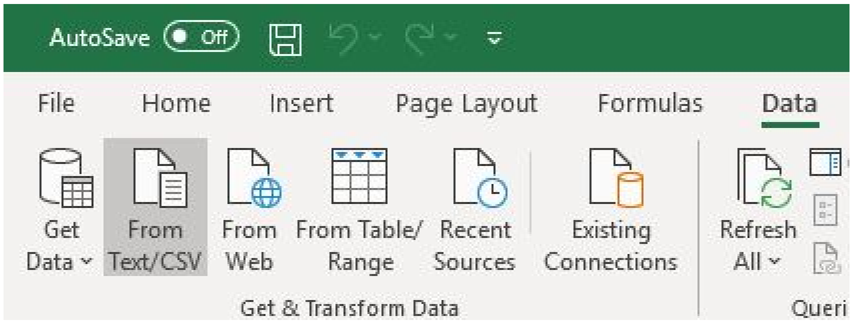
Pscp -i [location of private key] [username]@(host ip):[source destination] (download destination)



```
C:\Users\Jihyun>pscp -i C:/Users/Jihyun/Documents/jihyunssh.ppk Jihyun@34.67.78.107:TicketsFinal.csv .
TicketsFinal.csv          | 8864 kB | 805.8 kB/s | ETA: 00:46:42 |   0%
```

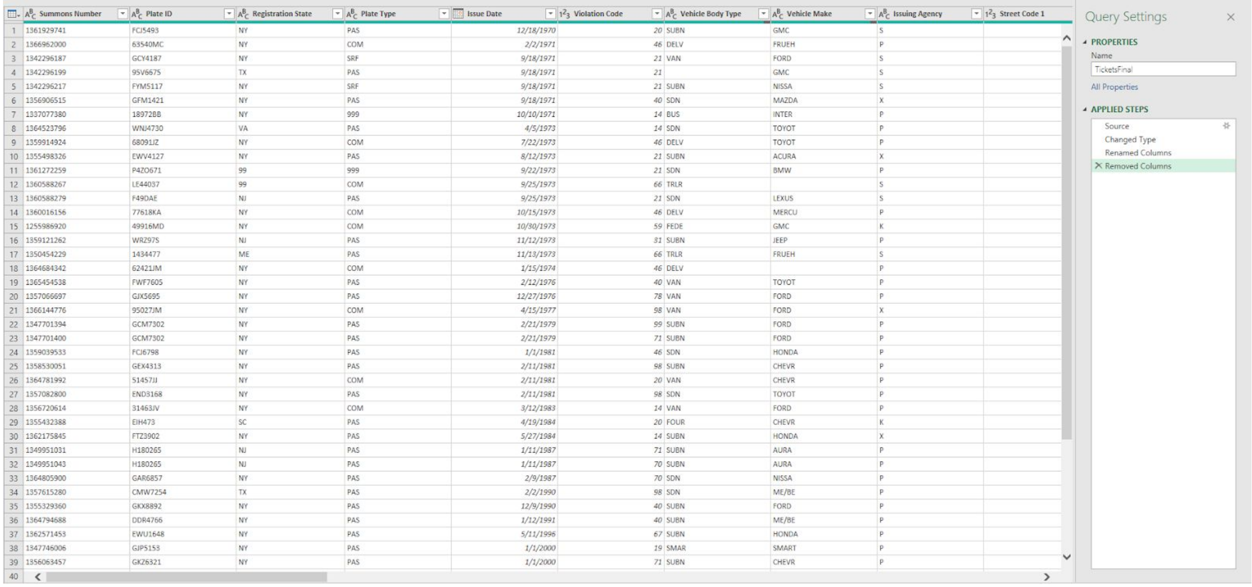
PART 6: Visualize using software

Import and Transform Data using Excel under Data>From Text/CSV



-Rename the columns appropriately

-Remove columns will null values or no value



	Summons Number	Plate ID	Registration State	Plate Type	Issue Date	Violation Code	Vehicle Body Type	Vehicle Make	Issuing Agency	Street Code 1
1	1361929741	FCJ5493	NY	PAS	12/18/1970	20	SUBN	GMC	S	
2	1366962000	63540MC	NY	COM	2/2/1971	46	DELV	FRUEH	P	
3	1342296187	GCY4187	NY	SRF	9/18/1971	21	VAN	FORD	S	
4	1342296199	95V6675	TX	PAS	9/18/1971	21		GMC	S	
5	1342296217	FYM5117	NY	SRF	9/18/1971	21	SUBN	NISSA	S	
6	1356906515	GFM1421	NY	PAS	9/18/1971	40	SDN	MAZDA	X	
7	1337077380	18972BB	NY	999	10/10/1971	14	BUS	INTER	P	
8	1364523796	WNJ4730	VA	PAS	4/5/1973	14	SDN	TOYOT	P	
9	1359914924	68091JZ	NY	COM	7/22/1973	46	DELV	TOYOT	P	
10	1355498326	EWV4127	NY	PAS	8/12/1973	21	SUBN	ACURA	X	
11	1361272259	P4ZO671	99	999	9/22/1973	21	SDN	BMW	P	
12	1360588267	LE44037	99	COM	9/25/1973	66	TRLR		S	
13	1360588279	F49DAE	NJ	PAS	9/25/1973	21	SDN	LEXUS	S	
14	1360016156	77618KA	NY	COM	10/15/1973	46	DELV	MERCU	P	
15	1255986920	49916MD	NY	COM	10/30/1973	59	FEDE	GMC	K	
16	1359121262	WRZ97S	NJ	PAS	11/12/1973	31	SUBN	JEEP	P	
17	1350454229	1434477	ME	PAS	11/13/1973	66	TRLR	FRUEH	S	
18	1364684342	62421JM	NY	COM	1/15/1974	46	DELV		P	
19	1365454538	FWF7605	NY	PAS	2/12/1976	40	VAN	TOYOT	P	
20	1357066697	GJX5695	NY	PAS	12/27/1976	78	VAN	FORD	P	
21	1366144776	95027JM	NY	COM	4/15/1977	98	VAN	FORD	X	
22	1347701394	GCM7302	NY	PAS	2/21/1979	99	SUBN	FORD	P	
23	1347701400	GCM7302	NY	PAS	2/21/1979	71	SUBN	FORD	P	
24	1359039533	FCJ6798	NY	PAS	1/1/1981	46	SDN	HONDA	P	
25	1358530051	GEX4313	NY	PAS	2/11/1981	98	SUBN	CHEVR	P	
26	1364781992	51457JJ	NY	COM	2/11/1981	20	VAN	CHEVR	P	
27	1357082800	END3168	NY	PAS	2/11/1981	98	SDN	TOYOT	P	
28	1356720614	31463JV	NY	COM	3/12/1983	14	VAN	FORD	P	
29	1355432388	EIH473	SC	PAS	4/19/1984	20	FOUR	CHEVR	K	
30	1362175845	FTZ3902	NY	PAS	5/27/1984	14	SUBN	HONDA	X	
31	1349951031	H180265	NJ	PAS	1/11/1987	71	SUBN	AURA	P	
32	1349951043	H180265	NJ	PAS	1/11/1987	70	SUBN	AURA	P	
33	1364805900	GAR6857	NY	PAS	2/9/1987	70	SDN	NISSA	P	
34	1357615280	CMW7254	TX	PAS	2/2/1990	98	SDN	ME/BE	P	
35	1355329360	GKX8892	NY	PAS	12/9/1990	40	SUBN	FORD	P	
36	1364794688	DDR4766	NY	PAS	1/12/1991	40	SUBN	ME/BE	P	
37	1362571453	EWU1648	NY	PAS	5/11/1996	67	SUBN	HONDA	P	
38	1347746006	GJP5153	NY	PAS	1/1/2000	19	SMAR	SMART	P	
39	1356063457	GKZ6321	NY	PAS	1/1/2000	71	SUBN	CHEVR	P	
40										

Query Settings

PROPERTIES

Name

TicketsFinal

All Properties

APPLIED STEPS

Source

Changed Type

Renamed Columns

Removed Columns

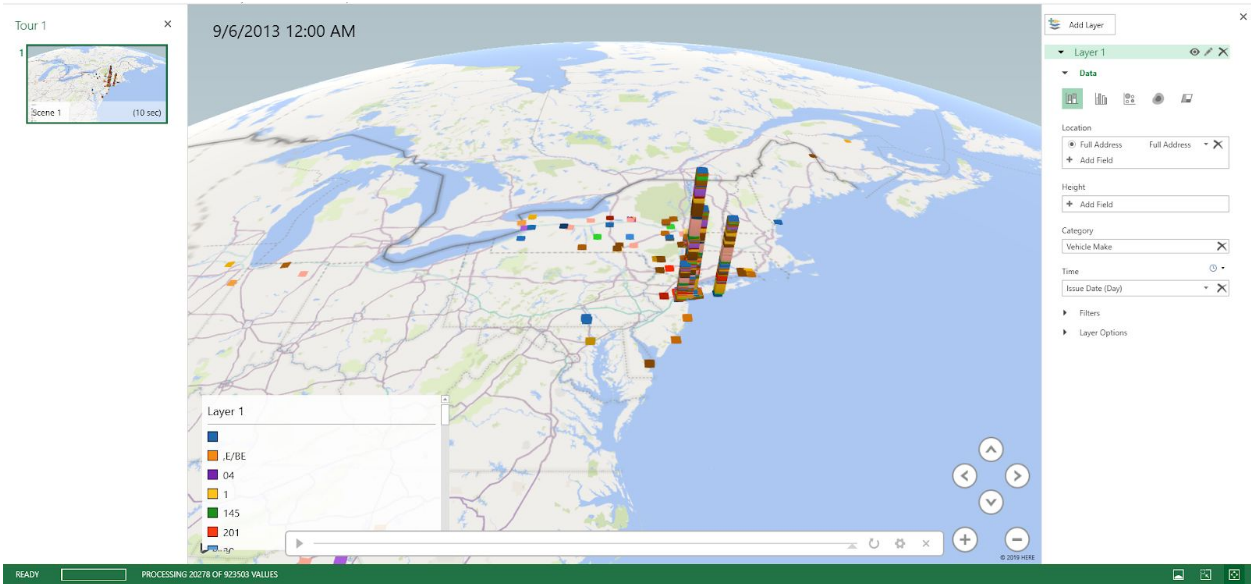
-Creating the visualization

Open up 3d Maps

Set location to [full_address]

Set category to [vehicle_make]

And time as issue_date (Day)



Tour 1

Scene 1 (10 sec)

9/6/2013 12:00 AM

Layer 1

Location: Full Address — Full Address

Height: Add Field

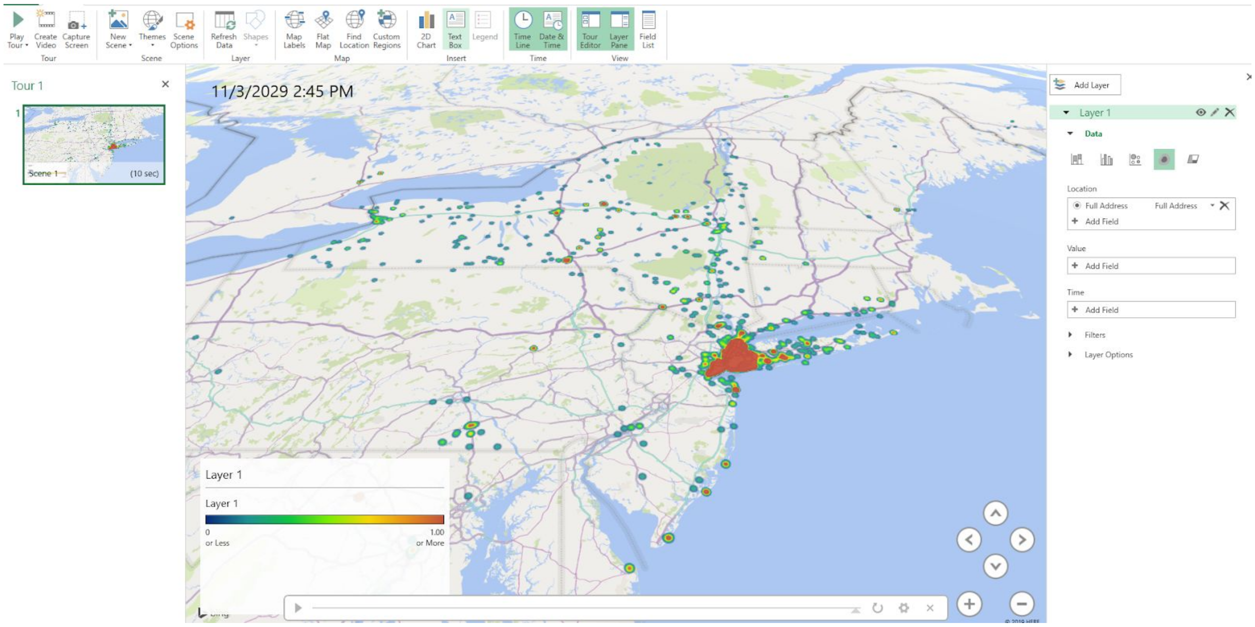
Category: Vehicle Make

Time: Issue Date (Day)

READY

PROCESSING 20278 OF 923503 VALUES

Change to a heat map to get a better idea of where tickets are being issued



Layer 1

Data

Location

Full Address Full Address

Add Field

Value

Add Field

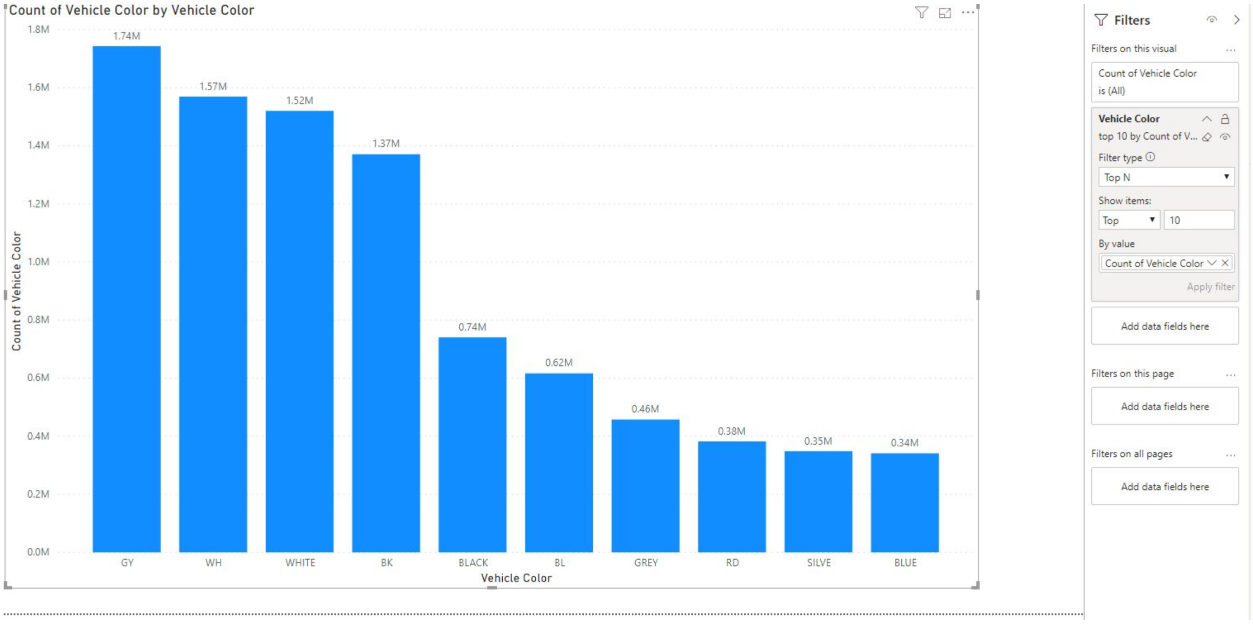
Time

Add Field

Filters

Layer Options

Using Power BI, we can use a bar chart and filter it to get a more in-depth view on the data



Filters on this visual

Count of Vehicle Color is (All)

Vehicle Color

top 10 by Count of V...

Filter type

Top N

Show items:

Top 10

By value

Count of Vehicle Color

Apply filter

Add data fields here

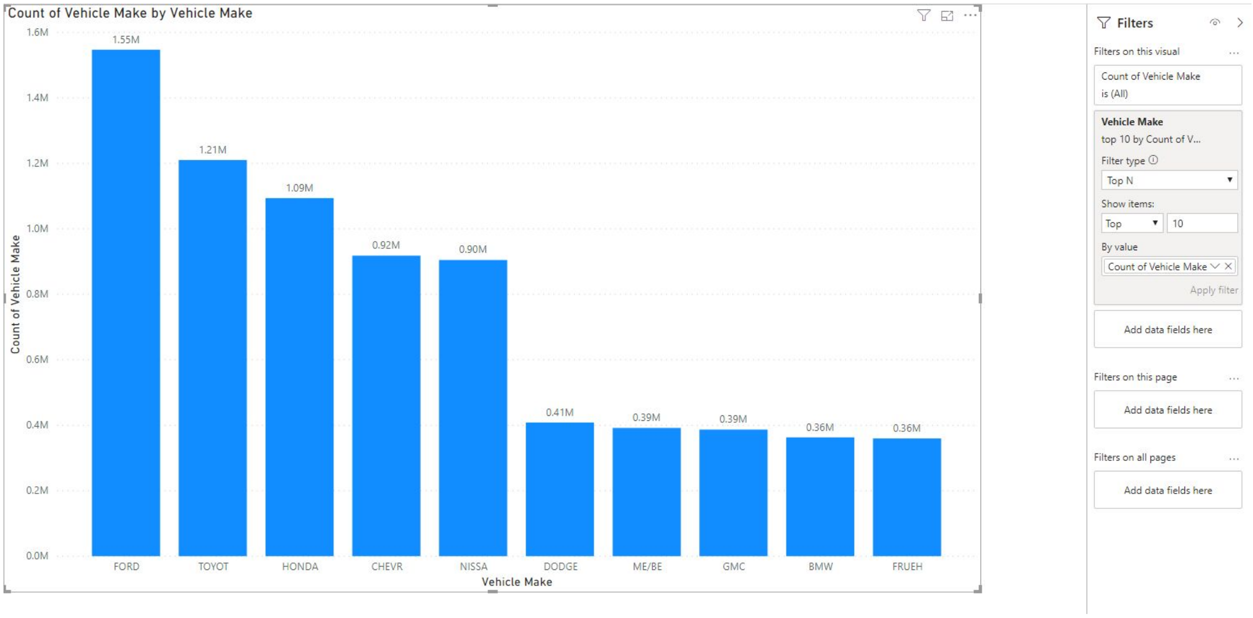
Filters on this page

Add data fields here

Filters on all pages

Add data fields here

Set the x-axis as the vehicle color and the y-axis as the count for vehicle color. Then set a filter with the vehicle color to only show the top 10 occurences.



Filters on this visual

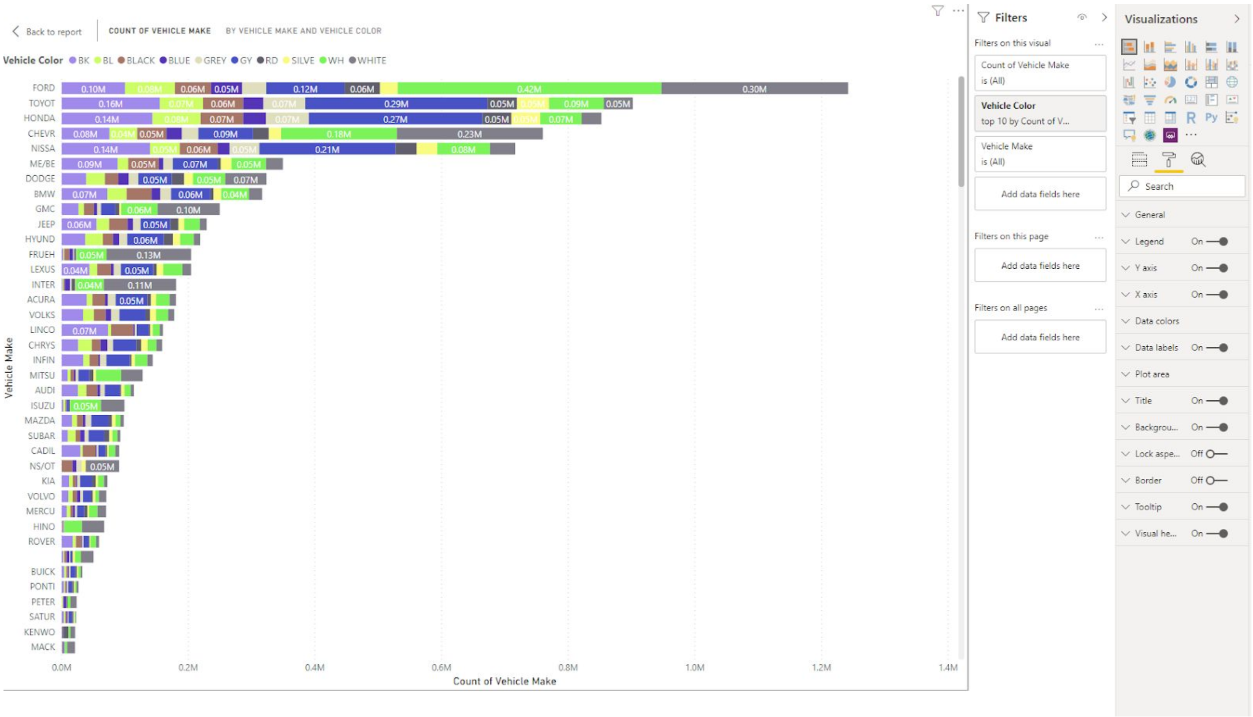
Count of Vehicle Make
is (All)

Vehicle Make
top 10 by Count of V...
Filter type: Top N
Show items: Top 10
By value: Count of Vehicle Make

Filters on this page

Filters on all pages

Do the same as above but instead of vehicle color, use the vehicle make field.



Filters on this visual

Count of Vehicle Make
is (All)

Vehicle Color
top 10 by Count of V...

Vehicle Make
is (All)

Filters on this page

Filters on all pages

Using both fields from the above graph, we can use vehicle color and vehicle make to determine which vehicle make had the most amount of occurences filtered with the color of the vehicle.

References

1. Data Source, https://data.cityofnewyork.us/City-Government/Parking-Violations-Issued-Fiscal-Year-2014/jt7v-77mi
2. Github, https://github.com/jhm916/new-york-ticket