In [1]:

```
# importing the required modules

import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import string
import seaborn as sns
```

Import data into Python environment

In [2]:

```
# reading the csv file storing in a dataframe and viewing

complaints_df = pd.read_csv(r'C:\Users\C. Dev\Downloads\1568699544_comcast_telecom_complaints_data\Comcast_telecom_complaints_data
.csv')
complaints_df.head()
```

Out[2]:

	Ticket #	Customer Complaint	Date	Date_month_year	Time	Received Via	City	State	Zip code	Status	Filing on Behalf of Someone
0	250635	Comcast Cable Internet Speeds	22-04-15	22-Apr-15	3:53:50 PM	Customer Care Call	Abingdon	Maryland	21009	Closed	No
1	223441	Payment disappear - service got disconnected	04-08-15	04-Aug-15	10:22:56 AM	Internet	Acworth	Georgia	30102	Closed	No
2	242732	Speed and Service	18-04-15	18-Apr-15	9:55:47 AM	Internet	Acworth	Georgia	30101	Closed	Yes
3	277946	Comcast Imposed a New Usage Cap of 300GB that ...	05-07-15	05-Jul-15	11:59:35 AM	Internet	Acworth	Georgia	30101	Open	Yes
4	307175	Comcast not working and no service to boot	26-05-15	26-May-15	1:25:26 PM	Internet	Acworth	Georgia	30101	Solved	No

In [3]:

```
# dataframe description

complaints_df.describe()
```

Out[3]:

	Zip code
count	2224.000000
mean	47994.393435
std	28885.279427
min	1075.000000
25%	30056.500000
50%	37211.000000
75%	77058.750000
max	99223.000000

In [4]:

```
# dataframe information

complaints_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2224 entries, 0 to 2223
Data columns (total 11 columns):
Ticket #                      2224 non-null object
Customer Complaint            2224 non-null object
Date                          2224 non-null object
Date_month_year               2224 non-null object
Time                          2224 non-null object
Received Via                  2224 non-null object
City                          2224 non-null object
State                         2224 non-null object
Zip code                      2224 non-null int64
Status                        2224 non-null object
Filing on Behalf of Someone   2224 non-null object
dtypes: int64(1), object(10)
memory usage: 191.2+ KB
```

Provide the trend chart for the number of complaints at monthly and daily granularity levels

In [6]:

```
# Converting the type of the attribute "Date_month_year" from object to datetime

complaints_df['Date_month_year'] = pd.to_datetime(complaints_df['Date_month_year'])
```

In [7]:

```
# Counting the number of complaints every month
```

```
monthly_compaints = complaints_df.set_index('Date_month_year').resample('M')["Customer Complaint"].count()
print(monthly_compaints)
```

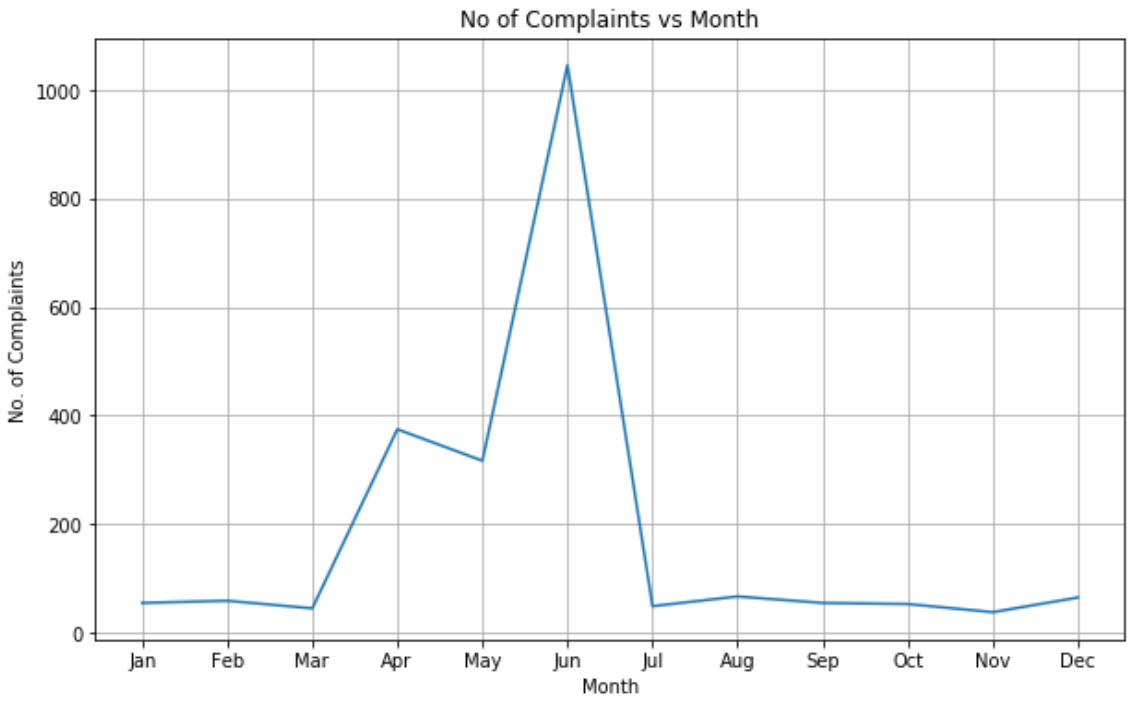
```
Date_month_year
2015-01-31      55
2015-02-28      59
2015-03-31      45
2015-04-30     375
2015-05-31     317
2015-06-30    1046
2015-07-31      49
2015-08-31      67
2015-09-30      55
2015-10-31      53
2015-11-30      38
2015-12-31      65
Freq: M, Name: Customer Complaint, dtype: int64
```

In [86]:

```
# Plotting a trend chart between the No of Complaints every month

x = ["Jan","Feb","Mar","Apr","May","Jun","Jul","Aug","Sep","Oct","Nov","Dec"]
y = monthly_compaints
plt.figure(figsize=(10,6))
plt.grid(True)
plt.xlabel("Month")
plt.ylabel("No. of Complaints")
plt.title('No of Complaints vs Month')
plt.plot(x,y)
```

Out[86]:

```
[<matplotlib.lines.Line2D at 0x23d6bdde348>]
```



In [9]:

```
# Counting the number of complaints every day

daily_complaints = complaints_df.set_index('Date_month_year').resample('D')["Customer Complaint"].count()
print(daily_complaints)
```

```
Date_month_year
2015-01-04    18
2015-01-05    12
2015-01-06    25
2015-01-07     0
2015-01-08     0
              ..
2015-12-02     0
2015-12-03     0
2015-12-04    15
2015-12-05     7
2015-12-06    43
Freq: D, Name: Customer Complaint, Length: 337, dtype: int64
```

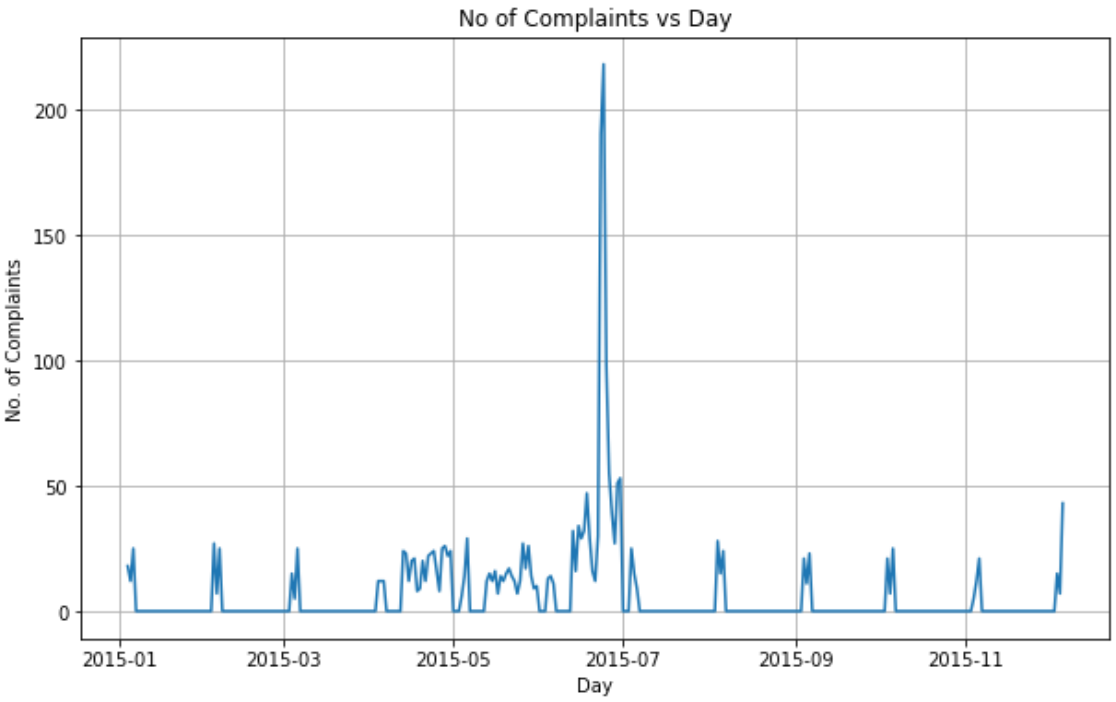
In [10]:

```
# Plotting a trend chart between the No of Complaints every day

plt.figure(figsize=(10,6))
plt.grid(True)
plt.xlabel("Day")
plt.ylabel("No. of Complaints")
plt.title('No of Complaints vs Day')
plt.plot(daily_complaints)
```

```
C:\Users\C. Dev\Anaconda3\lib\site-packages\pandas\plotting\_matplotlib\converter.py:103: FutureWarning: Using an implicitly regis
tered datetime converter for a matplotlib plotting method. The converter was registered by pandas on import. Future versions of pan
das will require you to explicitly register matplotlib converters.

To register the converters:
 >>> from pandas.plotting import register_matplotlib_converters
 >>> register_matplotlib_converters()
  warnings.warn(msg, FutureWarning)
```

Out[10]:

```
[<matplotlib.lines.Line2D at 0x23d67753b08>]
```



Provide a table with the frequency of complaint types

In [11]:

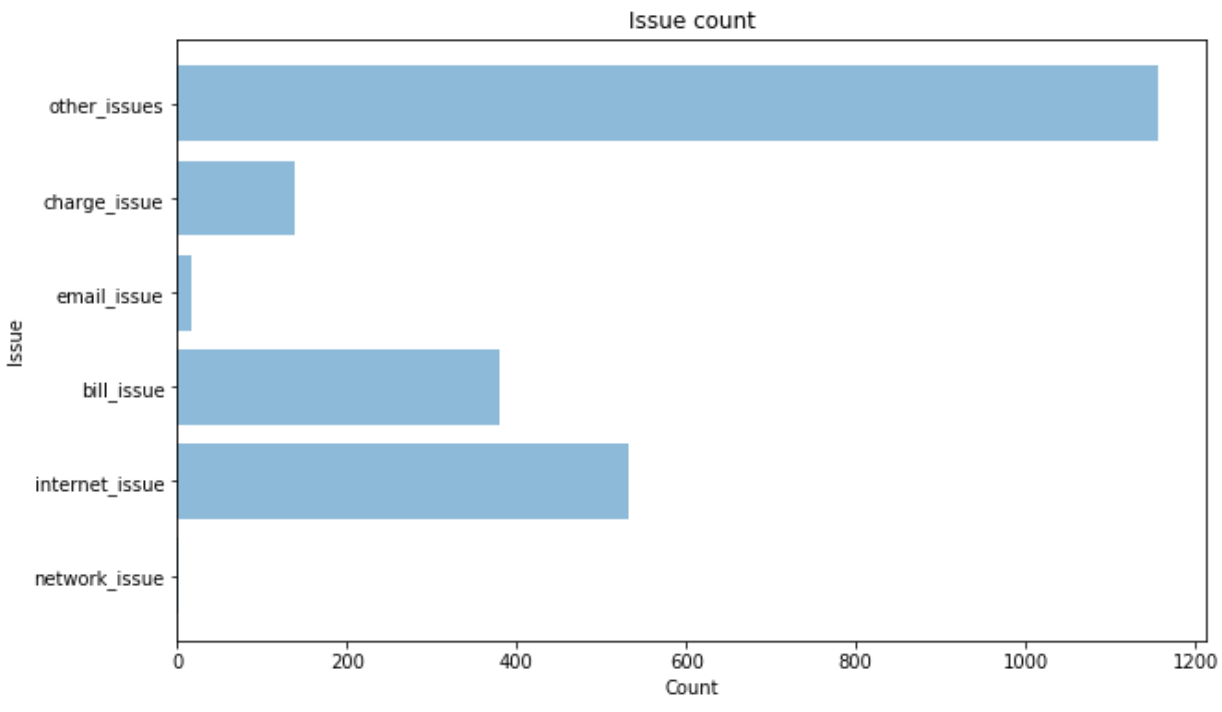
```
# Counting the frequencies of various complaint types

issue = {}
x = complaints_df['Customer Complaint'].str.contains("network",case = False).value_counts()
issue['network_issue'] = x[1]
x = complaints_df['Customer Complaint'].str.contains("internet",case = False).value_counts()
issue['internet_issue'] = x[1]
x = complaints_df['Customer Complaint'].str.contains("bill",case = False).value_counts()
issue['bill_issue'] = x[1]
x = complaints_df['Customer Complaint'].str.contains("email",case = False).value_counts()
issue['email_issue'] = x[1]
x = complaints_df['Customer Complaint'].str.contains("charge",case = False).value_counts()
issue['charge_issue'] = x[1]
issue['other_issues'] = complaints_df.shape[0] - (sum(issue.values()))
for k in issue:
    print(k,"\t",issue[k])
```

```
network_issue   2
internet_issue   532
bill_issue   379
email_issue   16
charge_issue   139
other_issues   1156
```

Which complaint types are maximum i.e., around internet, network issues, or across any other domains

In [12]:

```
# Plotting a bar chart on issue count

plt.figure(figsize=(10,6))
plt.barh(list(issue.keys()),issue.values(), align='center', alpha=0.5)
plt.title('Issue count')
plt.xlabel('Count')
plt.ylabel('Issue')
plt.show()
```



Which complaint types are maximum i.e., around internet, network issues, or across any other domains -> According to the above bar graph, complaints around the internet issues are the highest (532)

Create a new categorical variable with value as Open and Closed. Open & Pending is to be categorized as Open and Closed & Solved is to be categorized as Closed

In [13]:

In [13]:

```
# Creating a new attribute "NewStatus" and changing the status of the complaints

complaints_df["NewStatus"] = ["Open" if Status=="Open" or Status=="Pending" else "Closed" for Status in complaints_df["Status"]]
complaints_df.head(10)
```

Out[13]:

	Ticket #	Customer Complaint	Date	Date_month_year	Time	Received Via	City	State	Zip code	Status	Filing on Behalf of Someone	NewStatus
0	250635	Comcast Cable Internet Speeds	22-04-15	2015-04-22	3:53:50 PM	Customer Care Call	Abingdon	Maryland	21009	Closed	No	Closed
1	223441	Payment disappear - service got disconnected	04-08-15	2015-08-04	10:22:56 AM	Internet	Acworth	Georgia	30102	Closed	No	Closed
2	242732	Speed and Service	18-04-15	2015-04-18	9:55:47 AM	Internet	Acworth	Georgia	30101	Closed	Yes	Closed
3	277946	Comcast Imposed a New Usage Cap of 300GB that ...	05-07-15	2015-07-05	11:59:35 AM	Internet	Acworth	Georgia	30101	Open	Yes	Open
4	307175	Comcast not working and no service to boot	26-05-15	2015-05-26	1:25:26 PM	Internet	Acworth	Georgia	30101	Solved	No	Closed
5	338519	ISP Charging for arbitrary data limits with ov...	06-12-15	2015-12-06	9:59:40 PM	Internet	Acworth	Georgia	30101	Solved	No	Closed
6	361148	Throttling service and unreasonable data caps	24-06-15	2015-06-24	10:13:55 AM	Customer Care Call	Acworth	Georgia	30101	Pending	No	Open
7	359792	Comcast refuses to help troubleshoot and corre...	23-06-15	2015-06-23	6:56:14 PM	Internet	Adrian	Michigan	49221	Solved	No	Closed
8	318072	Comcast extended outages	06-01-15	2015-01-06	11:46:30 PM	Customer Care Call	Alameda	California	94502	Closed	No	Closed
9	371214	Comcast Raising Prices and Not Being Available...	28-06-15	2015-06-28	6:46:31 PM	Customer Care Call	Alameda	California	94501	Open	Yes	Open

Provide state wise status of complaints in a stacked bar chart. Use the categorized variable from Q3

In [15]:

```
# Statewise status of complaints

Status_Complaints = complaints_df.groupby(["State","NewStatus"]).size().unstack().fillna(0)
print(Status_Complaints)
```

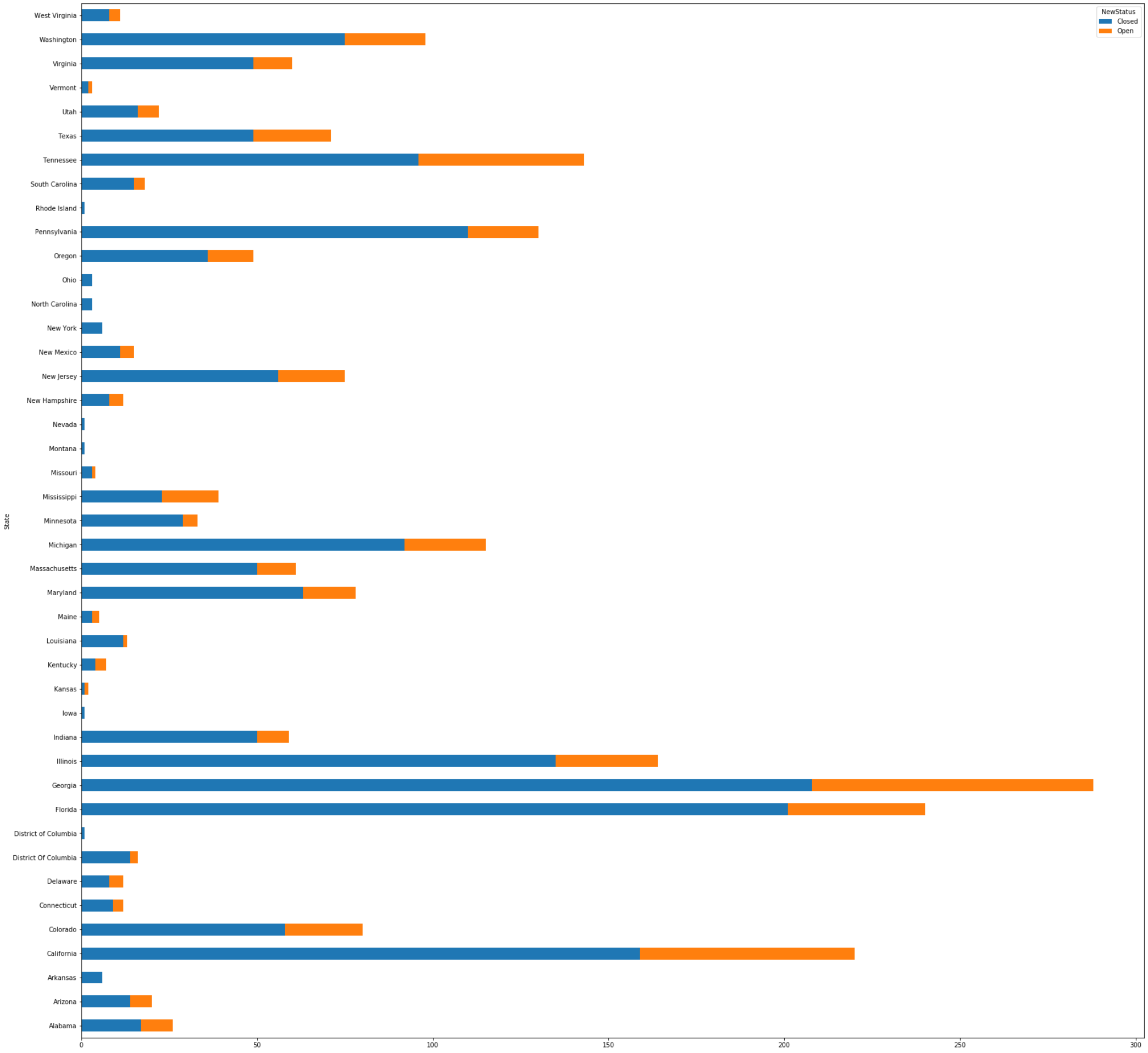
```
NewStatus             Closed  Open
State
Alabama                 17.0   9.0
Arizona                 14.0   6.0
Arkansas                 6.0   0.0
California             159.0  61.0
Colorado                58.0  22.0
Connecticut              9.0   3.0
Delaware                 8.0   4.0
District Of Columbia    14.0   2.0
District of Columbia     1.0   0.0
Florida                201.0  39.0
Georgia                208.0  80.0
Illinois               135.0  29.0
Indiana                 50.0   9.0
Iowa                     1.0   0.0
Kansas                   1.0   1.0
Kentucky                 4.0   3.0
Louisiana               12.0   1.0
Maine                    3.0   2.0
Maryland                63.0  15.0
Massachusetts           50.0  11.0
Michigan                92.0  23.0
Minnesota               29.0   4.0
Mississippi             23.0  16.0
Missouri                 3.0   1.0
Montana                  1.0   0.0
Nevada                   1.0   0.0
New Hampshire            8.0   4.0
New Jersey              56.0  19.0
New Mexico              11.0   4.0
New York                 6.0   0.0
North Carolina           3.0   0.0
Ohio                     3.0   0.0
Oregon                  36.0  13.0
Pennsylvania           110.0  20.0
Rhode Island             1.0   0.0
South Carolina          15.0   3.0
Tennessee               96.0  47.0
Texas                   49.0  22.0
Utah                    16.0   6.0
Vermont                  2.0   1.0
Virginia                49.0  11.0
Washington              75.0  23.0
West Virginia            8.0   3.0
```

In [25]:

```
# Stacked barchart on statewise status of complaints

Status_Complaints.plot(kind = "barh", figsize = (30,30), stacked = True)
```

Out[25]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x23d69c11708>
```



Which state has the maximum complaints

In [105]:

```
# Finding the state with maximum complaints

x = complaints_df.groupby(["State"]).size().sort_values(ascending=False)
print(x)
print("\n\nGeorgia has maximum complaints with a value of",x[0])
```

```
State
Georgia                 288
Florida                 240
California              220
Illinois                164
Tennessee               143
Pennsylvania            130
Michigan                115
Washington               98
Colorado                 80
Maryland                 78
New Jersey               75
Texas                    71
Massachusetts            61
Virginia                 60
Indiana                  59
Oregon                   49
Mississippi              39
Minnesota                33
Alabama                  26
Utah                     22
Arizona                  20
South Carolina           18
District Of Columbia     16
New Mexico               15
Louisiana                13
New Hampshire            12
Connecticut              12

Georgia has maximum complaints with a value of 288
```

```
Delaware                12
West Virginia           11
Kentucky                 7
New York                 6
Arkansas                 6
Maine                    5
Missouri                 4
North Carolina           3
Vermont                  3
Ohio                     3
Kansas                   2
District of Columbia     1
Rhode Island             1
Montana                  1
Iowa                     1
Nevada                   1
dtype: int64


Georgia has maximum complaints with a value of 288
```

Which state has the highest percentage of unresolved complaints

In [129]:

```
# Finding the state with highest percentage of unresolved complaints

x = Status_Complaints["Open"].sort_values(ascending = False)
print((x/x.sum())*100)
print("\n\nGeorgia has the highest percentage of unresolved complaints with percentage values of",(x[0]/x.sum())*100,"%")
```

```
State
Georgia                 15.473888
California              11.798839
Tennessee                9.090909
Florida                  7.543520
Illinois                 5.609284
Michigan                 4.448743
Washington               4.448743
Texas                    4.255319
Colorado                 4.255319
Pennsylvania             3.868472
New Jersey               3.675048
Mississippi              3.094778
Maryland                 2.901354
Oregon                   2.514507
Massachusetts            2.127660
Virginia                 2.127660
Indiana                  1.740812
Alabama                  1.740812
Utah                     1.160542
Arizona                  1.160542
Delaware                 0.773694
Minnesota                0.773694
New Mexico               0.773694
New Hampshire            0.773694
West Virginia            0.580271
South Carolina           0.580271
Kentucky                 0.580271
Connecticut              0.580271
Maine                    0.386847
District Of Columbia     0.386847
Vermont                  0.193424
Missouri                 0.193424
Kansas                   0.193424
Louisiana                0.193424
Montana                  0.000000
North Carolina           0.000000
District of Columbia     0.000000
Iowa                     0.000000
Ohio                     0.000000
Rhode Island             0.000000
Arkansas                 0.000000
Nevada                   0.000000
New York                 0.000000
Name: Open, dtype: float64


Georgia has the highest percentage of unresolved complaints with percentage values of 15.473887814313347 %
```

Provide the percentage of complaints resolved till date, which were received through the Internet and customer care calls

In [161]:

```
x = complaints_df.groupby(["Received Via","NewStatus"]).size()
print(x)
```

```
Received Via        NewStatus
Customer Care Call  Closed       864
                    Open         255
Internet            Closed       843
                    Open         262
dtype: int64
```

In [171]:

```
#Finding percentage of complaints resolved till date, which were received through the Internet and customer care calls
```

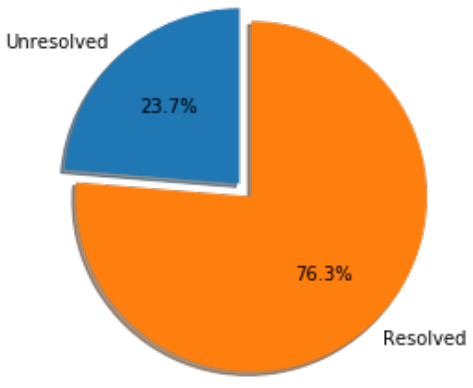
```
resolvedcomplants_internet = (x['Internet']['Closed']/(x['Internet']['Open'] + x['Internet']['Closed']))*100
resolvedcomplants_custcarecall = (x['Customer Care Call']['Closed']/(x['Customer Care Call']['Open'] + x['Customer Care Call']['Closed']))*100
unresolvedcomplaints_internet = 100 - resolvedcomplants_internet
unresolvedcomplaints_custcarecall = 100 - resolvedcomplants_custcarecall
print("Percentage of complaints resolved till date, which were received through the Internet is",resolvedcomplants_internet,"%")
print("Percentage of complaints resolved till date, which were received through the Customer Care Call is",resolvedcomplants_custcarecall,"%")
```

```
Percentage of complaints resolved till date, which were received through the Internet is 76.289592760181 %
Percentage of complaints resolved till date, which were received through the Customer Care Call is 77.21179624664879 %
```

In [178]:

```
# Plotting pie chart on resolved and unresolved complaints which were received through the Internet and customer care calls

labels = "Unresolved","Resolved"
sizes1 = [unresolvedcomplaints_internet,resolvedcomplants_internet]
explode = (0.1,0)
fig1, ax1 = plt.subplots()
ax1.pie(sizes1, explode=explode, labels=labels, autopct='%1.1f%%',
        shadow=True, startangle=90)
ax1.axis('equal')  # Equal aspect ratio ensures that pie is drawn as a circle.
plt.title("Percentage share for complaints registered via internet")
plt.show()

sizes2 = [unresolvedcomplaints_custcarecall,resolvedcomplants_custcarecall]
fig1, ax1 = plt.subplots()
ax1.pie(sizes2, explode=explode, labels=labels, autopct='%1.1f%%',
        shadow=True, startangle=90)
ax1.axis('equal')  # Equal aspect ratio ensures that pie is drawn as a circle.
plt.title("Percentage share for complaints registered via customer care call")
plt.show()
```

Percentage share for complaints registered via internet



Percentage share for complaints registered via customer care call