In [1]:
```
import pandas as pd
import numpy as np
from scipy import stats
import plotly.express as px
import plotly.graph_objects as go
from plotly.subplots import make_subplots
from tqdm.notebook import tqdm
import re
pd.set_option('max_columns', None)
pd.options.display.max_colwidth = 100
from pandas.api.types import CategoricalDtype
```

In [2]:
```
df = pd.read_csv('data.csv', index_col=0)
df.shape
```

Out[2]:
```
(6643221, 4)
```

1 Number of agents in each range

In [3]:
```
df1 = df[['agent','timestamp']].groupby(['agent']).count()
df1 = df1.rename(columns={"timestamp": "count"})
df1 = df1.reset_index()
df1.head()
```

Out[3]:

	agent	count
0	AVProMobileVideo/6.1.7.39280 (Linux;Android 10) ExoPlayerLib/2.15.0	1
1	AccompanyBot	22
2	ActionExtension/3 CFNetwork/1220.1 Darwin/20.3.0	5
3	AirPlay/2.0 (App/30.172.0) MFi_AirPlay_Device (MFiModelGroup/257872-0020)	101
4	AirPlay/2.0 (App/30.172.0) MFi_AirPlay_Device (MFiModelGroup/ElVU8BViYT0YUCNRKu1tWQNNxfpQUqz5a9U...	413

In [4]:
```
df2 = pd.DataFrame(columns = ['request_time', 'count'])

def addRow(df2, l, r):
    df_temp = df1[(df1['count'] >= l) & (df1['count'] < r)]
    c = df_temp.count()[0]
    df2 = df2.append({'request_time':'['+str(l)+','+str(r)+')', 'count':c}, ignore_index = True)
    return df2

df2 = addRow(df2, 1, 2)
df2 = addRow(df2, 2, 10)
df2 = addRow(df2, 10, 100)
df2 = addRow(df2, 100, 1000)
df2 = addRow(df2, 1000, 10000)
df2 = addRow(df2, 10000, 100000)
df2 = addRow(df2, 100000, 1000000)

df2.replace('[1,2)', '1')
df2.replace('[100000,1000000)', '[100000,+∞)')

total = df2['count'].sum()
df2['percentage'] = df2['count']/total
df2
```

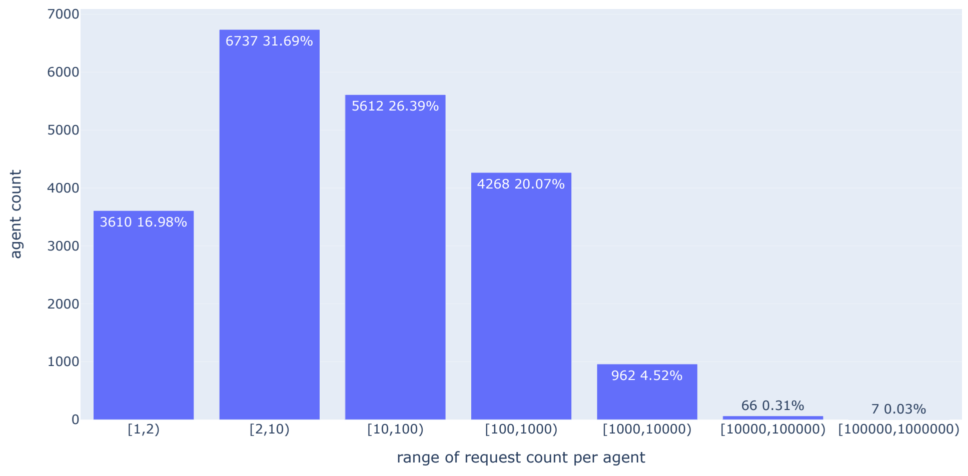
Out[4]:

	request_time	count	percentage
0	[1,2)	3610	0.169786
1	[2,10)	6737	0.316856
2	[10,100)	5612	0.263945
3	[100,1000)	4268	0.200734
4	[1000,10000)	962	0.045245
5	[10000,100000)	66	0.003104
6	[100000,1000000)	7	0.000329

In [5]:
```
fig = px.bar(df2, x='request_time', y='count', text=[str(x[0])+'\n{0:1.2f}%'.format(x[1]*100) for x in zip(df2['count'],df2['percentage'])])

fig.update_xaxes(title='range of request count per agent')
fig.update_yaxes(title='agent count')

fig.show()
```



2 Number of requests and traffic for each group of agents

In [6]:
```
df3_1 = df[['agent','timestamp']].groupby(['agent']).agg('count')
df3_1 = df3_1.rename(columns={"timestamp": "count"})
df3_1 = df3_1.reset_index()

df3_2 = df[['agent','bytes_returned']].groupby(['agent']).agg('sum')
df3_2 = df3_2.rename(columns={"bytes_returned": "size"})
df3_2 = df3_2.reset_index()

df3 = df3_1.set_index('agent').join(df3_2.set_index('agent'))
df3 = df3.reset_index()

df3.head()
```

Out[6]:

	agent	count	size
0	AVProMobileVideo/6.1.7.39280 (Linux;Android 10) ExoPlayerLib/2.15.0	1	6629429
1	AccompanyBot	22	244764
2	ActionExtension/3 CFNetwork/1220.1 Darwin/20.3.0	5	1586273
3	AirPlay/2.0 (App/30.172.0) MFi_AirPlay_Device (MFiModelGroup/257872-0020)	101	64108028
4	AirPlay/2.0 (App/30.172.0) MFi_AirPlay_Device (MFiModelGroup/ElVU8BViYT0YUCNRKu1tWQNNxfpQUqz5a9U...	413	525377961

In [7]:
```
df3['type'] = ''

def addType(l, r, name):
    df3.loc[(df3['count'] >= l) & (df3['count'] < r), 'type'] = name

addType(1, 2, '1')
addType(2, 10, '[2,10)')
addType(10, 100, '[10,100)')
addType(100, 1000, '[100,1,000)')
addType(1000, 10000, '[1,000,10,000)')
addType(10000, 100000, '[10,000,100,000)')
addType(100000, 1000000, '[100,000,1,000,000)')

df3.head()
```

Out[7]:

	agent	count	size	type
0	AVProMobileVideo/6.1.7.39280 (Linux;Android 10) ExoPlayerLib/2.15.0	1	6629429	1
1	AccompanyBot	22	244764	[10,100)
2	ActionExtension/3 CFNetwork/1220.1 Darwin/20.3.0	5	1586273	[2,10)
3	AirPlay/2.0 (App/30.172.0) MFi_AirPlay_Device (MFiModelGroup/257872-0020)	101	64108028	[100,1,000)
4	AirPlay/2.0 (App/30.172.0) MFi_AirPlay_Device (MFiModelGroup/ElVU8BViYT0YUCNRKu1tWQNNxfpQUqz5a9U...	413	525377961	[100,1,000)

In [8]:
```python
df4_1 = df3[['count', 'type']].groupby('type').agg('count')
df4_1 = df4_1.reset_index()

df4_2 = df3[['size', 'type']].groupby('type').agg('sum')
df4_2 = df4_2.reset_index()

df4 = df4_1.set_index('type').join(df4_2.set_index('type'))
df4 = df4.reset_index()

cat_order = CategoricalDtype(
    ['1', '[2,10)', '[10,100)', '[100,1,000)', '[1,000,10,000)', '[10,000,100,000)', '[100,000,1,000,000)'],
    ordered=True
)
df4['type'] = df4['type'].astype(cat_order)
df4 = df4.sort_values('type')
df4['size'] = df4['size']/pow(1024,3) #GB
df4.head()
```

Out[8]:
```
             type  count         size
0               1   3610     1.248206
6          [2,10)   6737    13.677831
3        [10,100)   5612   158.108663
5     [100,1,000)   4268  1286.671503
1  [1,000,10,000)    962  2389.261190
```

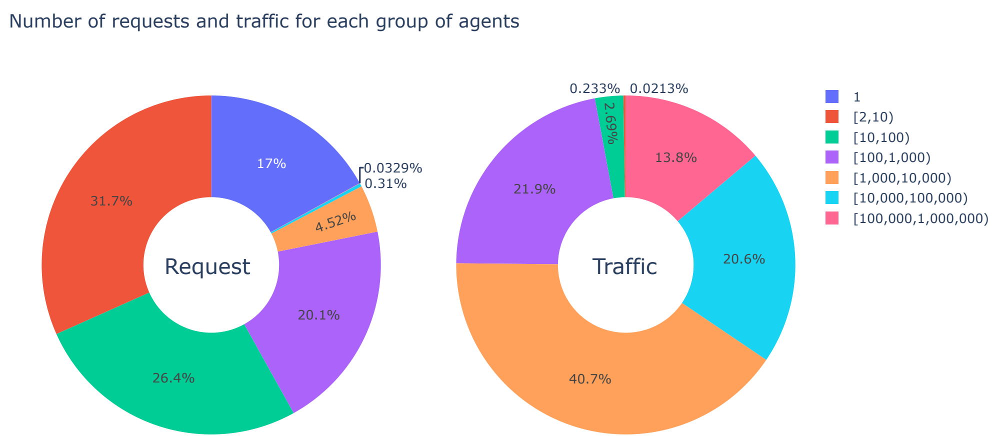
In [9]:
```python
# Create subplots: use 'domain' type for Pie subplot
fig = make_subplots(rows=1, cols=2, specs=[[{'type':'domain'}, {'type':'domain'}]])

fig.add_trace(go.Pie(
        labels=df4['type'],
        values=df4['count'],
        sort=False),1,1
    )
fig.add_trace(go.Pie(
        labels=df4['type'],
        values=df4['size'],
        sort=False),1,2
    )


# Use `hole` to create a donut-like pie chart
fig.update_traces(hole=.4, hoverinfo="label+percent+name")

fig.update_layout(
    title_text="Number of requests and traffic for each group of agents",
    # Add annotations in the center of the donut pies.
    annotations=[dict(text='Request', x=0.16, y=0.5, font_size=20, showarrow=False),
                 dict(text='Traffic', x=0.82, y=0.5, font_size=20, showarrow=False)])

fig.show()
```


Number of requests and traffic for each group of agents
Request
Traffic
[2,10)
[10,100)
[100,1,000)
[1,000,10,000)
[10,000,100,000)
[100,000,1,000,000)