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 files in each size range

In [3]:

```
df1 = df[['cid','bytes_returned']].groupby('cid').agg(['count','mean'])
df1.columns = df1.columns.get_level_values(1)
df1 = df1.reset_index()
df1['mean'] = df1['mean'].astype(int)
df1 = df1.rename(columns={"mean": "size"})
df1 = df1.sort_values(by=['size'])
df1.head()
```

Out[3]:

	cid	count	size
135800	QmZiZPaXaT4kSJq6gP3GJ8geNSHxEay8U8EigDhr4x39Gb	1	0
106116	QmXEg9JT6dVPMbmYpY8gWKbeD5fJHdUgcZWTHNLPXM9Vxx	1	0
106115	QmXEfjr121xgyXzU7Uu9U3kFeZh8tmThUvzQXtB94pfuAW	1	0
106105	QmXEdbeckJMpEQbpmsANxK7fPQ8LjYjQJA7ZJFRRPQ24ps	1	0
106103	QmXEc8dmxfTBXrUJaYJJEkiwpGXUDifnKQkrkPwv4cUgkY	1	0

In [4]:

```
df1.shape
```

Out[4]:

```
(254573, 3)
```

In [5]:

```
df1['size'] = df1['size']/1024
df1.describe()
```

Out[5]:

	count	size
count	254573.000000	2.545730e+05
mean	26.095544	8.049844e+02
std	625.841787	7.575891e+03
min	1.000000	0.000000e+00
25%	1.000000	4.121094e-01
50%	1.000000	1.076953e+01
75%	2.000000	2.827988e+02
max	101717.000000	2.702699e+06

In [6]:

```python
df2 = pd.DataFrame(columns = ['size', 'count'])

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

df2 = addRow(df2, 0, 1, '<1KB')
df2 = addRow(df2, 1, 4, '1~4KB')
df2 = addRow(df2, 4, 64, '4~64KB')
df2 = addRow(df2, 64, 256, '64KB~256KB')
df2 = addRow(df2, 256, 1024, '256KB~1MB')
df2 = addRow(df2, 1024, 1024*16, '1MB~16MB')
df2 = addRow(df2, 1024*16, 10000000, '>16MB')

# df2.replace('[1,2)', '1')
# df2.replace('[10000,100000)', '[10000,+∞)')

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

Out[6]:

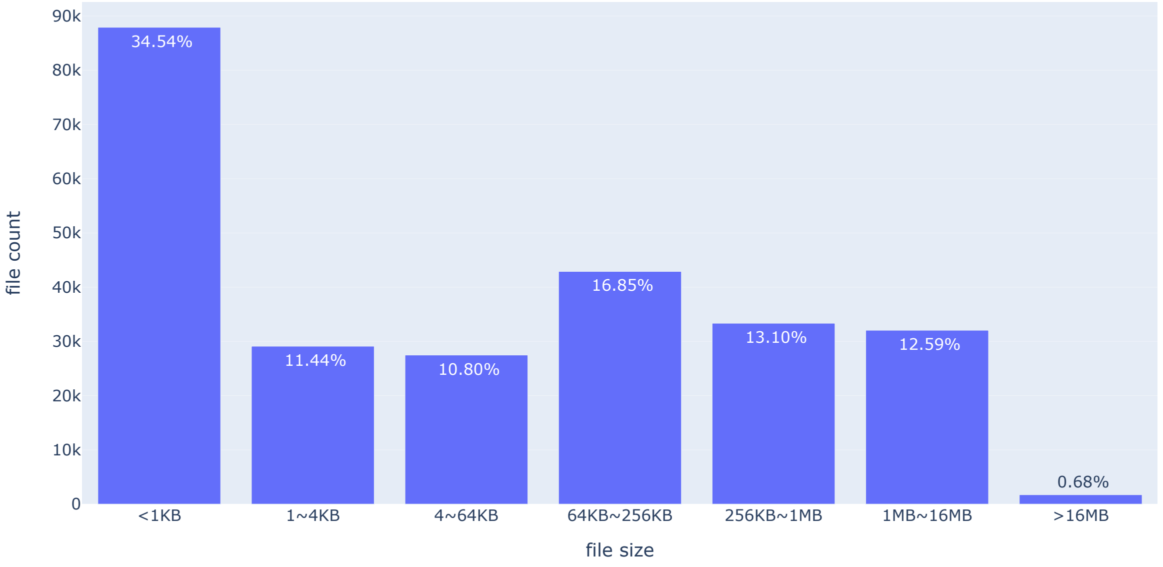
	size	count	percentage
0	<1KB	87919	0.345359
1	1~4KB	29117	0.114376
2	4~64KB	27490	0.107985
3	64KB~256KB	42902	0.168525
4	256KB~1MB	33350	0.131004
5	1MB~16MB	32060	0.125936
6	>16MB	1735	0.006815

In [7]:

```python
fig = px.bar(df2, x='size', y='count', text=['\n{0:1.2f}%'.format(x*100) for x in df2['percentage']])

fig.update_xaxes(title='file size')
fig.update_yaxes(title='file count')

fig.show()
```



2 Number of requests and traffic in each size range

In [8]:

```
df3 = df[['cid','bytes_returned']]
df3 = df3.rename(columns={"bytes_returned": "size"})
df3['size'] = df3['size']/1024 #KB
df3.head()
```

Out[8]:

	cid	size
0	QmewCrTqsMECeYcX2etcuRAi2G37yNrL1QBsjxjAgZSwfy	0.413086
1	QmSoLuCB7xeFD5vf8pYnzoBhRFfnnM41nPy4zBnSqmjH7J	181.578125
2	bafybeifyvews52mcsuqfbeoxxlzv5lewk37jc43b5tpbd3gzs3rvcktpaa	453.484375
3	bafybeifqhn5mwknicly5hb72bgs4m2674xu24kxjt7j25ebw2tej5wiiqy	1592.687500
4	QmewCrTqsMECeYcX2etcuRAi2G37yNrL1QBsjxjAgZSwfy	0.402344

In [9]:

```
df3['size_type'] = ''

def addSizeType(l, r, name):
    df3.loc[(df3['size'] >= l) & (df3['size'] < r), 'size_type'] = name

addSizeType(0, 1, '<1KB')
addSizeType(1, 4, '1~4KB')
addSizeType(4, 64, '4~64KB')
addSizeType(64, 256, '64KB~256KB')
addSizeType(256, 1024, '256KB~1MB')
addSizeType(1024, 1024*16, '1MB~16MB')
addSizeType(1024*16, 1024*1024*16, '>16MB')

df3.head()
```

Out[9]:

	cid	size	size_type
0	QmewCrTqsMECeYcX2etcuRAi2G37yNrL1QBsjxjAgZSwfy	0.413086	<1KB
1	QmSoLuCB7xeFD5vf8pYnzoBhRFfnnM41nPy4zBnSqmjH7J	181.578125	64KB~256KB
2	bafybeifyvews52mcsuqfbeoxxlzv5lewk37jc43b5tpbd3gzs3rvcktpaa	453.484375	256KB~1MB
3	bafybeifqhn5mwknicly5hb72bgs4m2674xu24kxjt7j25ebw2tej5wiiqy	1592.687500	1MB~16MB
4	QmewCrTqsMECeYcX2etcuRAi2G37yNrL1QBsjxjAgZSwfy	0.402344	<1KB

In [10]:

```
df4_1 = df3[['size','size_type']].groupby('size_type').agg('sum')
df4_1['size'] = df4_1['size']/pow(1024,2) # GB
df4_1 = df4_1.reset_index()

df4_2 = df3[['cid','size_type']].groupby('size_type').agg('count')
df4_2 = df4_2.reset_index()
df4_2 = df4_2.rename(columns={"cid": "count"})

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

cat_size_order = CategoricalDtype(
    ['<1KB', '1~4KB', '4~64KB', '64KB~256KB', '256KB~1MB', '1MB~16MB', '>16MB'],
    ordered=True
)
df4['size_type'] = df4['size_type'].astype(cat_size_order)
df4 = df4.sort_values('size_type')
df4.head()
```

Out[10]:

	size_type	size	count
5	<1KB	0.228333	1283298
1	1~4KB	0.267443	122601
3	4~64KB	6.692936	306100
4	64KB~256KB	109.824447	756815
2	256KB~1MB	1158.624712	1995383

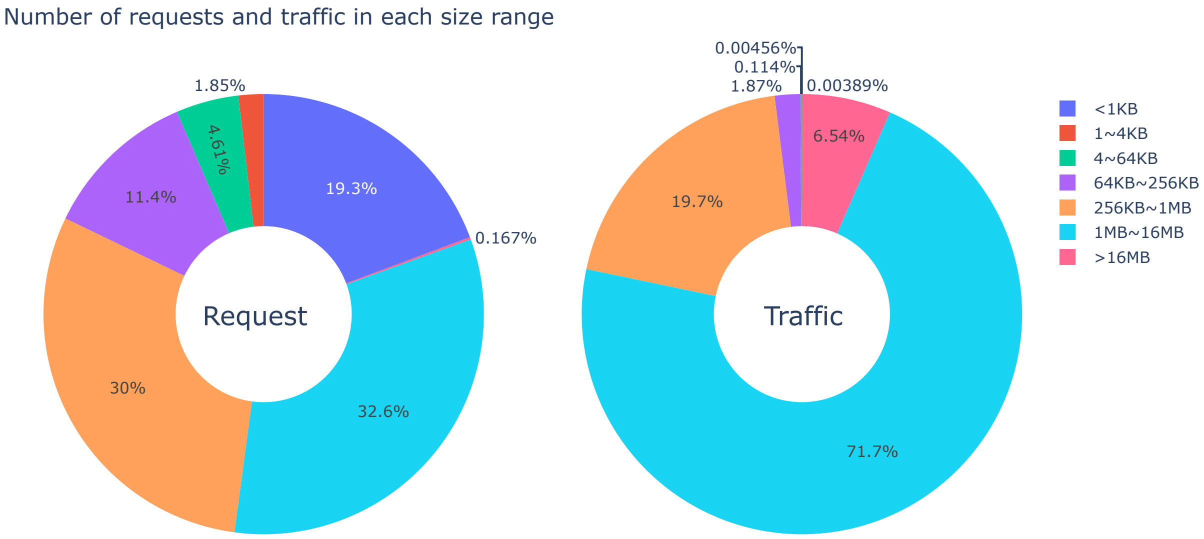
```
In [11]: # create subplots: use 'domain' type for Pie subplot
         fig = make_subplots(rows=1, cols=2, specs=[[{'type':'domain'}, {'type':'domain'}]])

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


         # 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 in each size range",
             # 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 in each size range
Request
Traffic
<1KB
1~4KB
4~64KB
64KB~256KB
256KB~1MB
1MB~16MB
>16MB