PUBLIC TRANSPORTATION ANALYSIS

TEAM MEMBER

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TEAM MEMBERS

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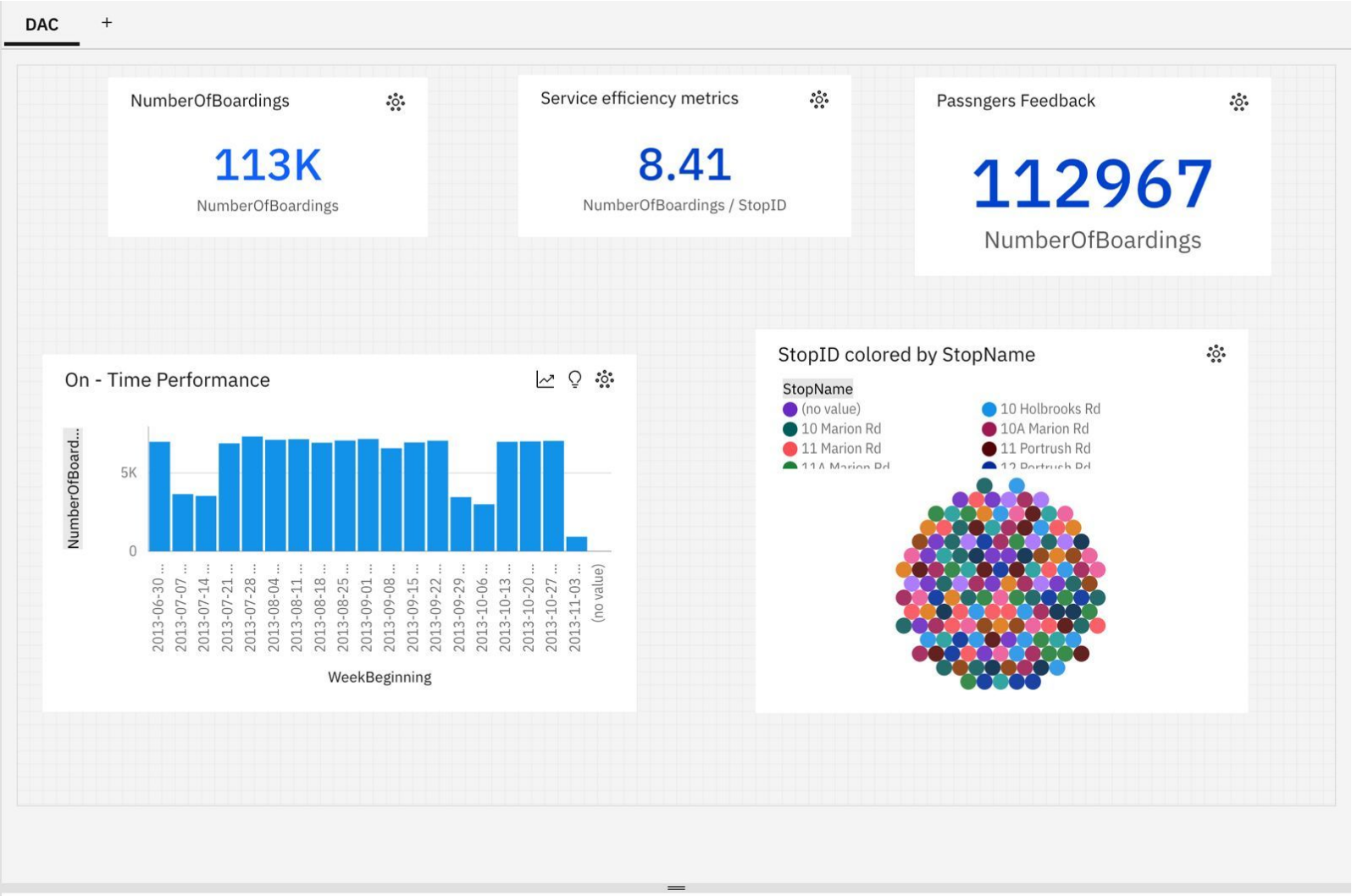
4. **B.S.ATHISH**

Phase 4: **Development Part 2**

PROBLEMS DEFINITION:

The project involves analyzing public transportation data to assess service efficiency, on time performance, and passenger feedback. The objective is to provide insights that support transportation improvement initiatives and enhance the overall public transportation experience. This project includes defining analysis objectives, collecting transportation data, designing relevant visualizations in IBM Cognos, and using code for data analysis.

Dashboards and reports in IBM Cognos to visualize on-time perform -ance, passenger feedback, and service efficiency metrics:



Code for data analysis in plain text formate:

```
import pandas as pd


# Step 2: Data Exploration
print(df.head())
print(df.isnull().sum())
print(df.describe())

# Step 3: Service Punctuality Rates (Example)
punctual_services = df[df['NumberOfBoardings'] > 2]  # Example threshold for punctuality
punctuality_rate = len(punctual_services) / len(df) * 100
print(f"Punctuality Rate: {punctuality_rate}%")

# Step 4: Sentiment Analysis on Passenger Feedback (If available)
# You provided the column names but no feedback column was mentioned.
# If you have a column named 'Feedback', you can perform sentiment analysis on it.

# Step 5: Further Analysis and Visualization (Optional)
# Add additional analysis or visualization code here based on your project requirements.

# Step 6: Generate Reports or Visualizations (Optional)
# Add code for generating reports or visualizations here.

# Save the modified DataFrame if needed
# df.to_csv('modified_dataset.csv', index=False)  # Replace 'modified_dataset.csv' with desired file name
```

python code execution for public transportation analysis:

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Run Code

In [7]:
```
import pandas as pd

# Sample Data
data = {
    'TripID': [23631, 23631, 23632, 23633, 23633, 23634, 23634, 23634, 23634, 23634, 23635, 23635, 23635, 23635, 236
    'RouteID': [100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100],
    'StopID': [14156, 14144, 14132, 12266, 14147, 13907, 14132, 13335, 13875, 13045, 13335, 13383, 13586, 12726, 138
    'StopName': ['181 Cross Rd', '177 Cross Rd', '175 Cross Rd', 'Zone A Arndale Interchange', '178 Cross Rd', '9A M
    'WeekBeginning': ['2013-06-30 00:00:00']*15,
    'NumberOfBoardings': [1, 1, 1, 2, 1, 1, 1, 1, 1, 1, 1, 1, 2, 1, 1]
}

df = pd.read_csv('dac.csv')

# Convert 'WeekBeginning' to datetime
df['WeekBeginning'] = pd.to_datetime(df['WeekBeginning'])

# Calculate punctuality rate for RouteID 100
route_id = 100
total_trips = df[df['RouteID'] == route_id]['TripID'].nunique()

if total_trips > 0:
    on_time_trips = df[(df['RouteID'] == route_id) & (df['NumberOfBoardings'] > 0)]['TripID'].nunique()
    punctuality_rate = (on_time_trips / total_trips) * 100
    print(f"Punctuality Rate for Route {route_id}: {punctuality_rate:.2f}%")
else:
    print(f"No trips found for Route {route_id}. Unable to calculate punctuality rate.")
```

```
/var/folders/02/46lb236j1kg80kd4py6242cr0000gn/T/ipykernel_3457/748210925.py:13: DtypeWarning: Columns (1) have mix
ed types. Specify dtype option on import or set low_memory=False.
  df = pd.read_csv('dac.csv')

No trips found for Route 100. Unable to calculate punctuality rate.
```

In [9]:
```
pip install textblob
```

```
Requirement already satisfied: textblob in ./anaconda3/lib/python3.11/site-packages (0.17.1)
Requirement already satisfied: nltk>=3.1 in ./anaconda3/lib/python3.11/site-packages (from textblob) (3.8.1)
Requirement already satisfied: click in ./anaconda3/lib/python3.11/site-packages (from nltk>=3.1->textblob) (8.0.4)
Requirement already satisfied: joblib in ./anaconda3/lib/python3.11/site-packages (from nltk>=3.1->textblob) (1.2.
0)
```

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Run Code

```
# df.to_csv('modified_dataset.csv', index=False)  # Replace 'modified_dataset.csv' with desired file name
```

```
   TripID RouteID  StopID                   StopName WeekBeginning  \
0   23631     100   14156                 181 Cross Rd    2013-06-30
1   23631     100   14144                 177 Cross Rd    2013-06-30
2   23632     100   14132                 175 Cross Rd    2013-06-30
3   23633     100   12266  Zone A Arndale Interchange    2013-06-30
4   23633     100   14147                 178 Cross Rd    2013-06-30

   NumberOfBoardings
0                  1
1                  1
2                  1
3                  2
4                  1
TripID               0
RouteID              0
StopID               0
StopName             0
WeekBeginning        0
NumberOfBoardings    0
dtype: int64
              TripID        StopID                 WeekBeginning  \
count  1.085723e+07  1.085723e+07                      10857234
mean   2.952100e+04  1.366132e+04  2014-01-01 19:10:50.311710720
min    7.900000e+01  1.000100e+04            2013-06-30 00:00:00
25%    1.191700e+04  1.231100e+04            2013-09-29 00:00:00
50%    2.747900e+04  1.334600e+04            2014-01-05 00:00:00
75%    4.885800e+04  1.491600e+04            2014-04-06 00:00:00
max    6.553500e+04  1.871500e+04            2014-07-06 00:00:00
std    1.960938e+04  1.971760e+03                            NaN

       NumberOfBoardings
count       1.085723e+07
mean        4.743737e+00
min         1.000000e+00
25%         1.000000e+00
50%         2.000000e+00
75%         4.000000e+00
max         9.770000e+02
std         9.382286e+00
Punctuality Rate: 41.71575375459348%
```

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Run Code

In [11]:

```
### Task 1: Service Punctuality Analysis by Route


# Assuming you have a DataFrame 'df' with columns: TripID, RouteID, StopID, StopName, WeekBeginning, NumberOfBoardin

# Calculate punctuality rates for each route
route_punctuality = df.groupby('RouteID')['NumberOfBoardings'].apply(lambda x: (x > 2).mean() * 100)

# Display the punctuality rates by route
print(route_punctuality)


### Task 2: Passenger Flow and Transfer Analysis


# Assuming you have a DataFrame 'df' with columns: TripID, RouteID, StopID, StopName, WeekBeginning, NumberOfBoardin

# Group by StopID and count boardings and alightings
passenger_flow = df.groupby('StopID')[['NumberOfBoardings']].sum()

# Display the passenger flow data
print(passenger_flow)


### Task 3: Stop Efficiency Analysis


# Assuming you have a DataFrame 'df' with columns: TripID, RouteID, StopID, StopName, WeekBeginning, NumberOfBoardin

# Calculate the average number of boardings and alightings per stop
stop_efficiency = df.groupby('StopID')[['NumberOfBoardings']].mean()

# Display the stop efficiency data
print(stop_efficiency)
```

```
RouteID
117     42.226021
118     37.553318
140     53.757814
141     49.653699
```

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```
No trips found for Route 100. Unable to calculate punctuality rate.
```

In [9]:
```
pip install textblob
```

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Requirement already satisfied: textblob in ./anaconda3/lib/python3.11/site-packages (0.17.1)
Requirement already satisfied: nltk>=3.1 in ./anaconda3/lib/python3.11/site-packages (from textblob) (3.8.1)
Requirement already satisfied: click in ./anaconda3/lib/python3.11/site-packages (from nltk>=3.1->textblob) (8.0.4)
Requirement already satisfied: joblib in ./anaconda3/lib/python3.11/site-packages (from nltk>=3.1->textblob) (1.2.
0)
Requirement already satisfied: regex>=2021.8.3 in ./anaconda3/lib/python3.11/site-packages (from nltk>=3.1->textblo
b) (2022.7.9)
Requirement already satisfied: tqdm in ./anaconda3/lib/python3.11/site-packages (from nltk>=3.1->textblob) (4.65.0)
Note: you may need to restart the kernel to use updated packages.
```

In [10]:
```
import pandas as pd


# Step 2: Data Exploration
print(df.head())
print(df.isnull().sum())
print(df.describe())

# Step 3: Service Punctuality Rates (Example)
punctual_services = df[df['NumberOfBoardings'] > 2]  # Example threshold for punctuality
punctuality_rate = len(punctual_services) / len(df) * 100
print(f"Punctuality Rate: {punctuality_rate}%")

# Step 4: Sentiment Analysis on Passenger Feedback (If available)
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# Save the modified DataFrame if needed
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```

```
   TripID RouteID  StopID                  StopName WeekBeginning  \
0   23631     100   14156                181 Cross Rd    2013-06-30
1   23631     100   14144                177 Cross Rd    2013-06-30
```

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```
RouteID
117     42.226021
118     37.553318
140     53.757814
141     49.653699
142     52.111678
          ...
W90     38.620694
W90C    17.647059
W90M    22.034355
W91     36.049254
W91C    49.770503
Name: NumberOfBoardings, Length: 619, dtype: float64
        NumberOfBoardings
StopID
10001                 641
10002                  64
10003                 455
10004                  66
10005                  25
...                   ...
18688                  67
18690                 118
18711                 503
18712                  46
18715                  30

[7397 rows x 1 columns]
        NumberOfBoardings
StopID
10001            1.453515
10002            1.333333
10003            1.417445
10004            1.609756
10005            1.136364
...                   ...
18688            1.367347
18690            1.594595
18711            8.112903
18712            2.000000
18715            2.307692
```

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Run Code

```
18711            8.112903
18712            2.000000
18715            2.307692

[7397 rows x 1 columns]
```

In [13]:

```python
#Task 4: Time Series Analysis for Boardings
 # Assuming you have a DataFrame 'df' with columns: TripID, RouteID, StopID, StopName, WeekBeginning, NumberOfBoardi

# Convert 'WeekBeginning' to datetime if it's not already
df['WeekBeginning'] = pd.to_datetime(df['WeekBeginning'])

# Set 'WeekBeginning' as the index for time series analysis
df.set_index('WeekBeginning', inplace=True)

# Resample data by a specific time frequency (e.g., weekly)
boardings_weekly = df['NumberOfBoardings'].resample('W').sum()

# Display the time series data for boardings
print(boardings_weekly)
```

```
WeekBeginning
2013-06-30     953666
2013-07-07     844649
2013-07-14     817407
2013-07-21     989840
2013-07-28    1092189
2013-08-04    1097360
2013-08-11    1085623
2013-08-18    1071188
2013-08-25    1107250
2013-09-01    1106079
2013-09-08    1110689
2013-09-15    1087957
2013-09-22    1041899
2013-09-29     823998
2013-10-06     782873
2013-10-13    1057597
2013-10-20    1065733
2013-10-27    1057517
2013-11-03    1033023
2013-11-10    1017056
2013-11-17    1021994
```

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Run Code

WeekBeginning
2013-06-30 953666
2013-07-07 844649
2013-07-14 817407
2013-07-21 989840
2013-07-28 1092189
2013-08-04 1097360
2013-08-11 1085623
2013-08-18 1071188
2013-08-25 1107250
2013-09-01 1106079
2013-09-08 1110689
2013-09-15 1087957
2013-09-22 1041899
2013-09-29 823998
2013-10-06 782873
2013-10-13 1057597
2013-10-20 1065733
2013-10-27 1057517
2013-11-03 1033023
2013-11-10 1017056
2013-11-17 1021994

```
2013-11-24     988742
2013-12-01     976629
2013-12-08     917751
2013-12-15     807043
2013-12-22     487486
2013-12-29     530361
2014-01-05     752939
2014-01-12     685016
2014-01-19     827511
2014-01-26     711652
2014-02-02    1027907
2014-02-09     895665
2014-02-16    1006685
2014-02-23    1066336
2014-03-02    1137952
2014-03-09     779027
2014-03-16    1107118
2014-03-23    1108318
2014-03-30    1087889
2014-04-06    1077274
2014-04-13     722579
```

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Run Code

```
2013-12-08     917751
2013-12-15     807043
2013-12-22     487486
2013-12-29     530361
2014-01-05     752939
2014-01-12     685016
2014-01-19     827511
2014-01-26     711652
2014-02-02    1027907
2014-02-09     895665
2014-02-16    1006685
2014-02-23    1066336
2014-03-02    1137952
2014-03-09     779027
2014-03-16    1107118
2014-03-23    1108318
2014-03-30    1087889
2014-04-06    1077274
2014-04-13     722579
2014-04-20     629291
2014-04-27    1067463
2014-05-04    1084224
2014-05-11    1104650
2014-05-18    1099327
2014-05-25    1073632
2014-06-01    1079884
2014-06-08     894252
2014-06-15    1000415
2014-06-22     947120
2014-06-29     974288
2014-07-06     581846
Freq: W-SUN, Name: NumberOfBoardings, dtype: int64
```

In [ ]:

DAC +

NumberOfBoardings

113K

NumberOfBoardings

Service efficiency metrics

8.41

NumberOfBoardings / StopID

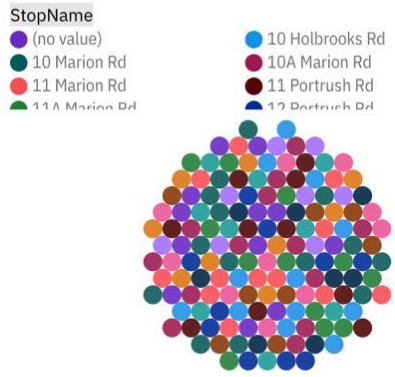
Passngers Feedback

112967

NumberOfBoardings

On - Time Performance

StopID colored by StopName



Real-Time Data Integration:
Include real-time data feeds for bus/train locations, estimated arrival times, and service disruptions. This data is crucial for both operators and passengers.

Route and Schedule Information:
Display route maps, schedules, and route-specific information to help passengers plan their journeys.

Service Alerts and Notifications:
Provide notifications about delays, service disruptions, or important announcements to keep passengers informed.

Crowd Monitoring:
Use data to estimate passenger loads on different routes or vehicles. This helps passengers choose less crowded options and operators to optimize service.

Performance Metrics:
Display key performance indicators like on-time performance, average travel times, and ridership trends for different routes.

Route Efficiency Analysis:
Analyze routes for efficiency, looking at factors like bus frequency, capacity utilization, and energy consumption.

Safety and Security:
Integrate data on safety and security measures, such as surveillance cameras, emergency buttons, and response times.

Fare Information:
Show ticket prices, payment options, and real-time updates on fare validation.

Accessibility Information:
Highlight accessibility features for passengers with disabilities, including wheelchair access, ramps, and elevators.

User Feedback:
Collect and display passenger feedback on the quality of service, cleanliness, and other aspects of the public transport system.

Environmental Impact:
Show data related to the environmental impact of public transport, such as emissions reductions, energy efficiency, and green initiatives.

Financial and Operational Data:
Provide financial data related to revenue, operating costs, and budgeting for public transport agencies.