

Public Transit Optimization for Istanbul Metropolitan Municipality

Rob Pratt, Senior R&D Manager

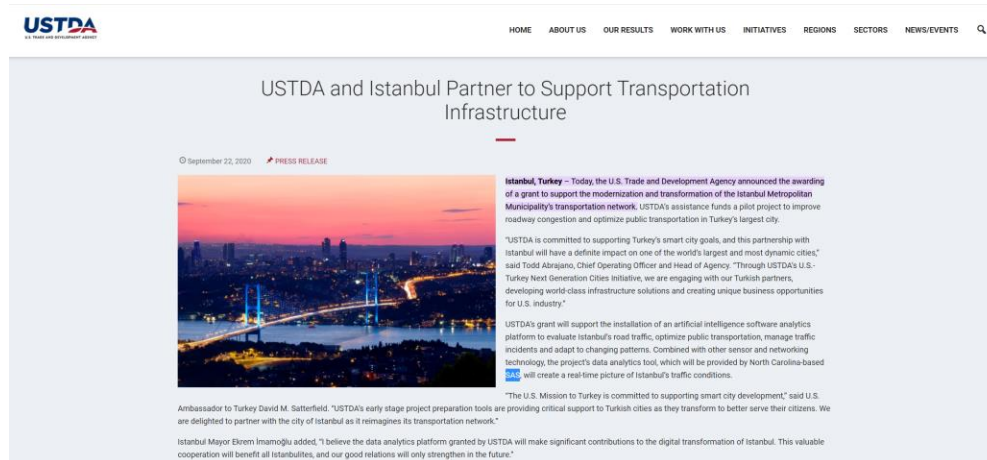
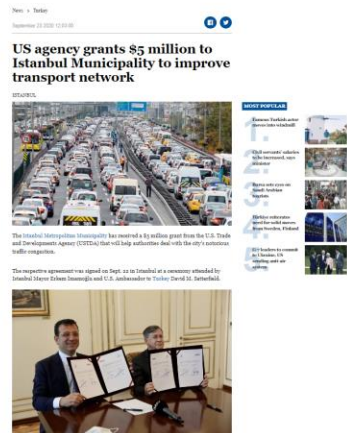
Pelin Cay, Analytics Center of Excellence Manager

Sertalp B. Cay, Senior Operations Research Specialist

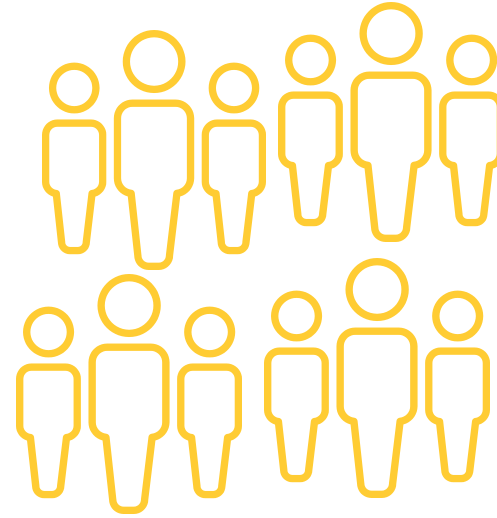
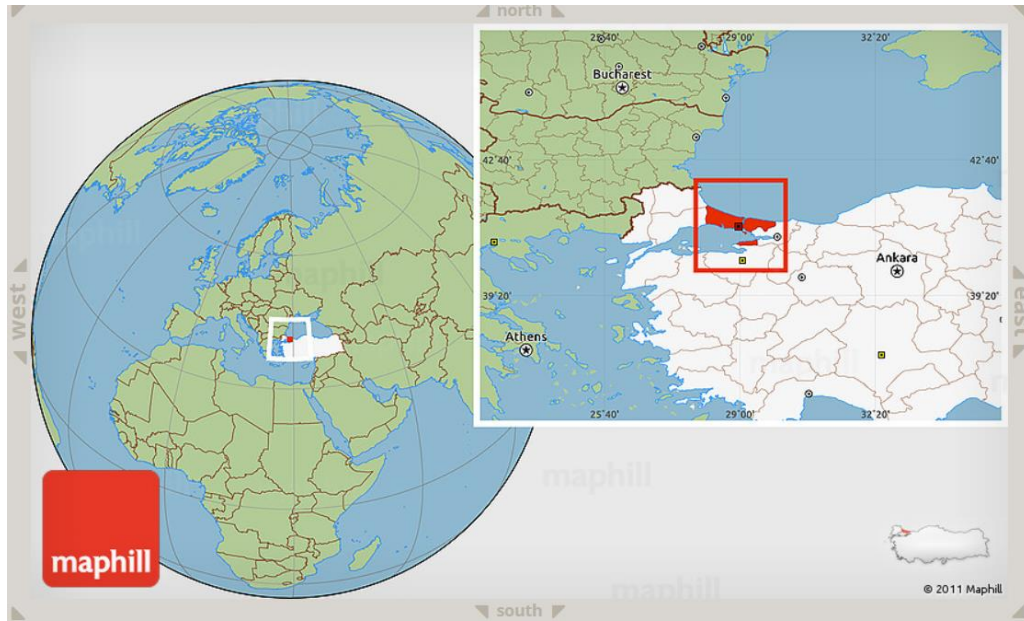
Project Overview



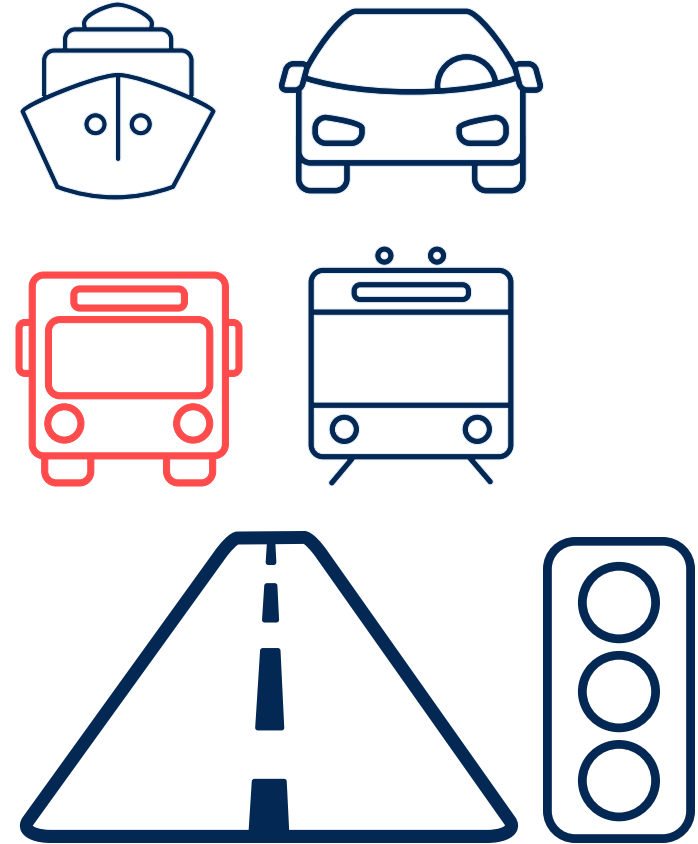
September 2020



Istanbul Metropolitan Municipality



16M

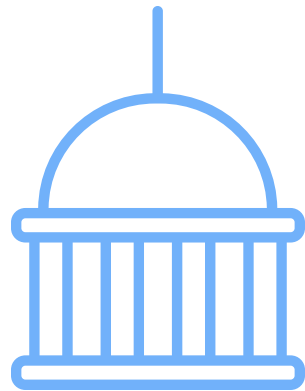


*“most congested city
in the world”*
Tomtom Traffic Report, 2021

IMM / SAS Turkey

October
2020

**Forecasting
Transportation
Demand & Traffic Flow**



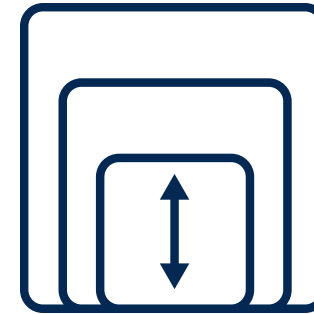
Public Sector

**Detection of
Traffic Anomalies
& Congestions**



Low risk projects

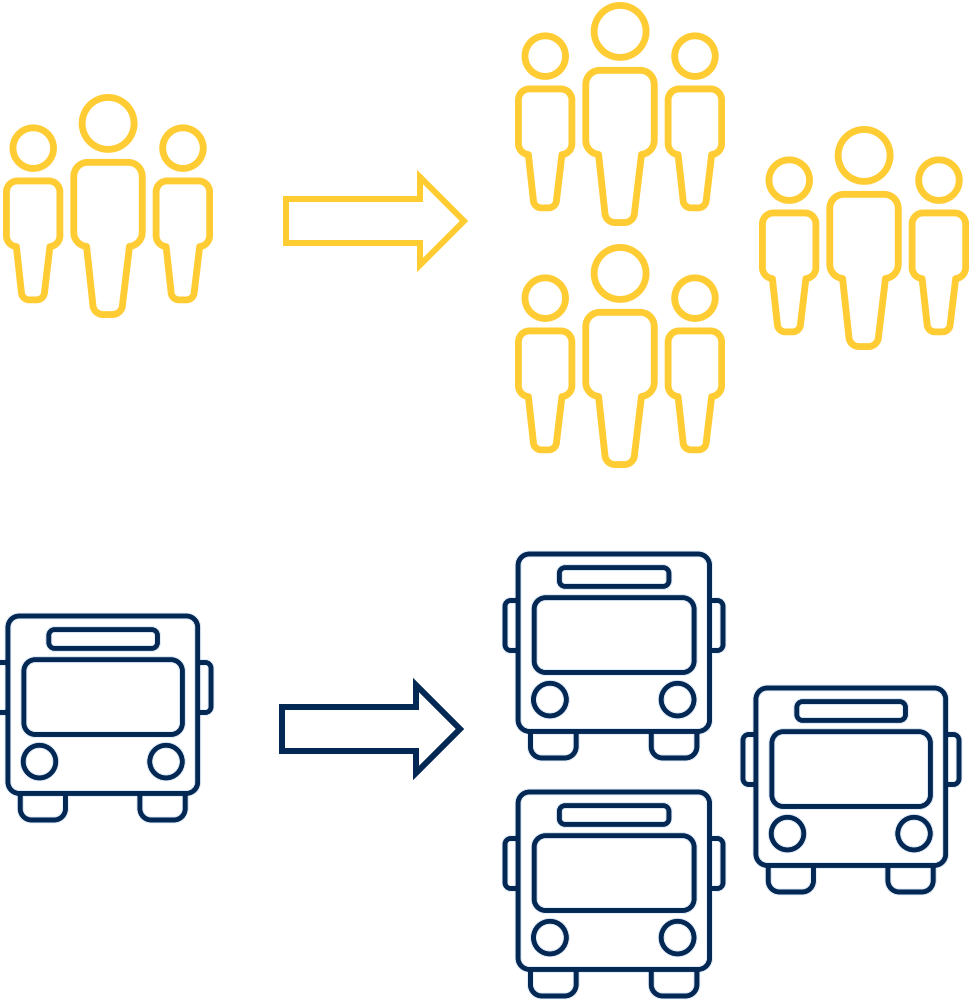
**Optimization of
Public Transportation
Systems**



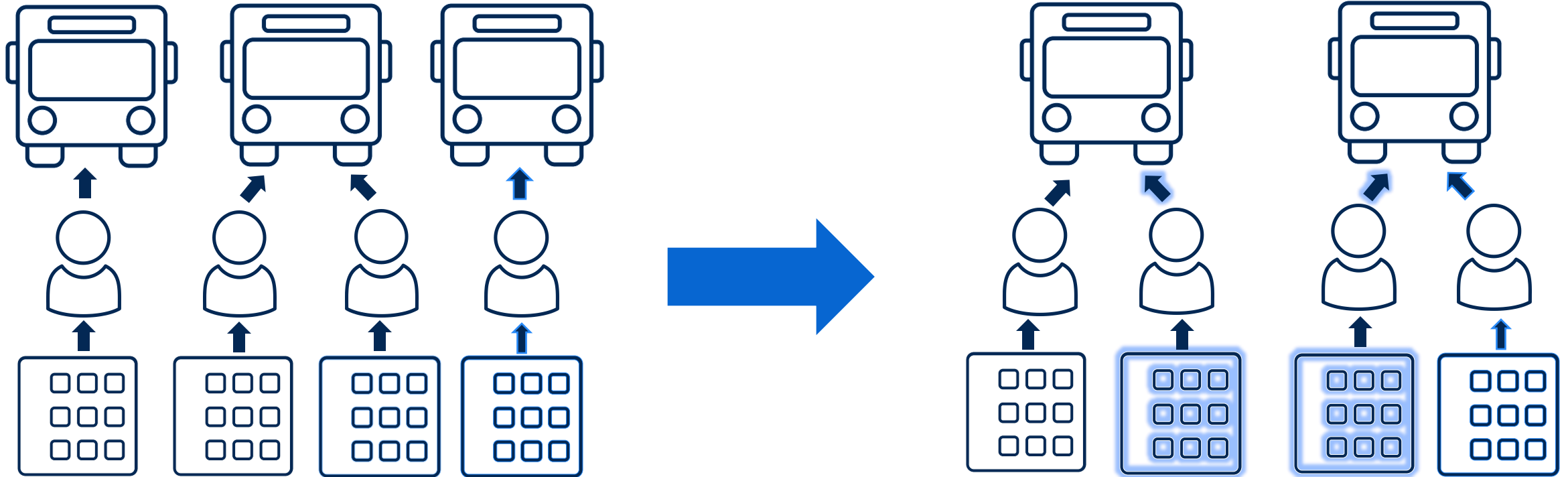
Scale of operations

March
2022

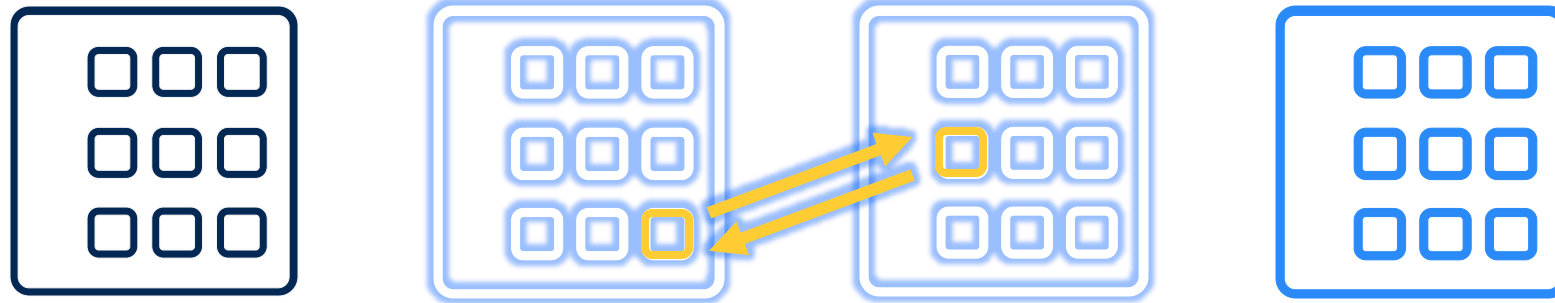
Business Problem



Project Goal



Improvement Idea



Flexible System: Allow drivers to serve in different routes

Exchange services between cycles

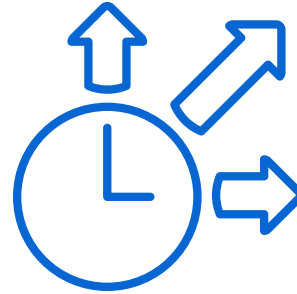
How to optimize?

Challenges



Problem Size

Over 240 billion combinations



Nonstandard Rules

Overtime
Work hours
Bus travel
Transfers
Double shifts

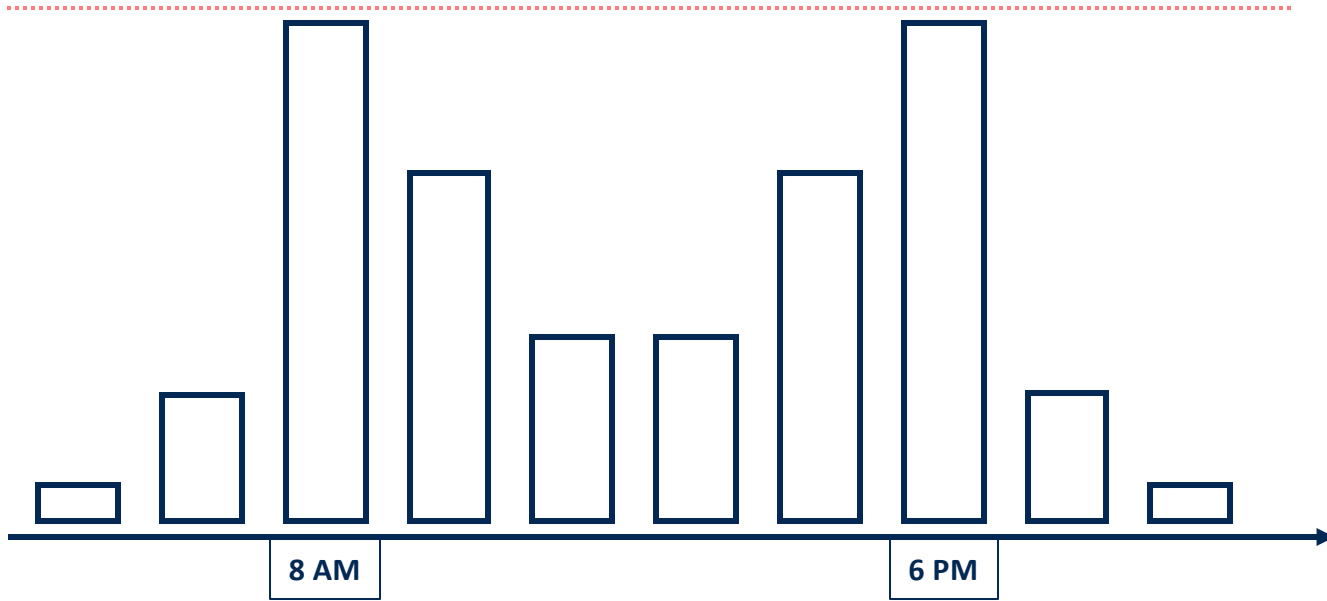


Feasible Plans

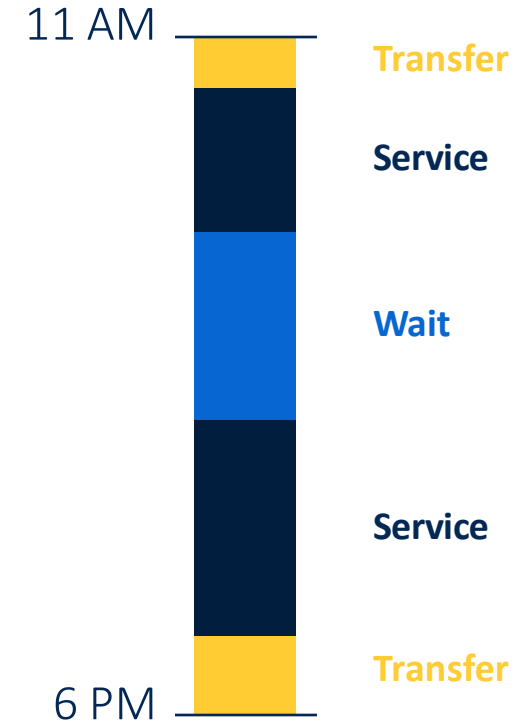
Requirement for easy-to-understand changes

Diagnostics with SAS Visual Analytics

Number of Active Buses

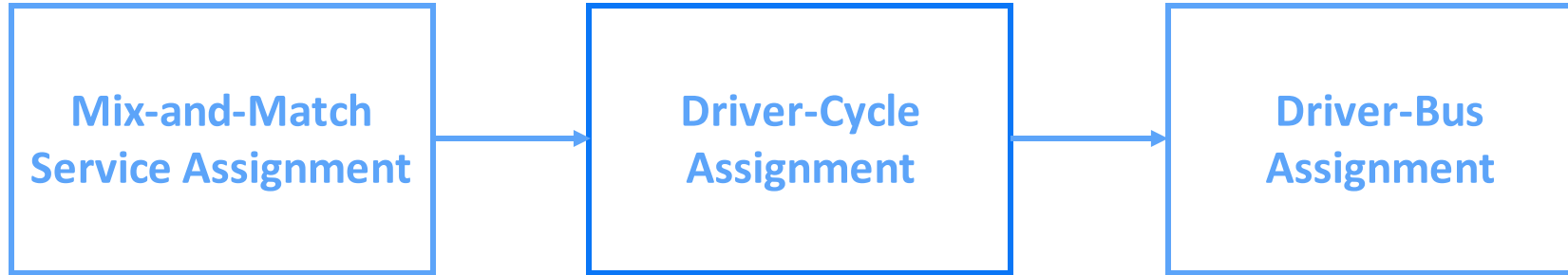


Rush Hours



Transfers
Long Waits

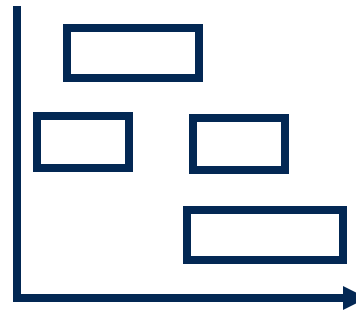
Custom Tailored Multi-Step Approach with SAS Optimization



Generate



Partial Cycles



Timetable



Final Plan

Target

Long Waits
Minimize lost time

Rush Hours
Minimize bottleneck

Transfers
Minimize cycle lengths

Improve Existing System: Applicable

Results: Sahinkaya

Success Criterion: Reduce number of buses by 1

	# Bus	# Driver	Kilometers Driven	Estimated 10-Year Net Benefit (\$)
Existing Plan	105	147	2930 / day	-
Proposed Plan	102	144	2967 / day	860K
Change	-3 -2.85%	-3 -2.04%	+37 +1.26%	+860K

Results: Anadolu

	# Bus	# Driver	Kilometers Driven	Estimated 10-Year Net Benefit (\$)
Existing Plan	241	324	7919 / day	-
Proposed Plan	237	319	7992 / day	1.28M
Change	-4 -1.65%	-5 -1.54%	+73 +0.92%	+1.28M

Summary



Advanced analytics
tools & domain
expertise



Flagship credential in
smart city area

USTDA Public Report
CIO Impact Letter

2022 Metro Area Rankings*

Rank	City	Country	Population
1	Tokyo	Japan	38M
2	Delhi	India	33M
3	Shanghai	China	29M
4	Dhaka	Bangladesh	23M
5	Sao Paulo	Brazil	23M
6	Mexico City	Mexico	23M
7	Cairo	Egypt	22M
8	Beijing	China	22M
9	Mumbai	India	21M
10	Osaka	Japan	20M
11	New York City	United States	19M
12	Chongqing	China	17M
13	Karachi	Pakistan	17M
14	Istanbul	Turkey	16M
15	Kinshasa	Republic of Congo	16M
16	Lagos	Nigeria	16M
17	Buenos Aires	Argentina	16M
18	Calcutta	India	16M
19	Manila	Philippines	15M
20	Tianjin	China	15M

Questions?

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