MTA's Development of EAM Analytics

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The Metropolitan Transportation Authority (MTA)

- We operate the largest public transportation agency in North America and one of the largest in the world. **In 2022, the subway had total ridership of 52.5 million customers, increasing +50% above 2021's 35.0 million**.

- The MTA's operating agencies are New York City Transit, Long Island Rail Road, Metro-North Railroad, and Bridges and Tunnels.

- Our system includes:
  - More than 6,455 subway cars
  - Collectively traveled about 331 million miles in 2022
  - 472 subway stations
  - 665 miles of track
  - 5,780 vehicles in our bus fleet, all of which are 100% accessible to riders with disabilities
  - 234 local bus routes, 20 Select Bus Service routes, and 73 express bus routes in the five boroughs
  - 9 bridges and tunnels facilities (7 bridges and 2 tunnels)

- 74,000 employees
- Annual operating budget of $19.4 billion
- Our workforce manages and maintains **over $1 trillion in physical assets**

NYC Transit/Buses & Subways

1.3 billion ridership
67,087 employees

Subways

6,455 subway cars
472 subway stations

Buses

5,780 vehicles in our bus fleet trains

Metro-North Railroad

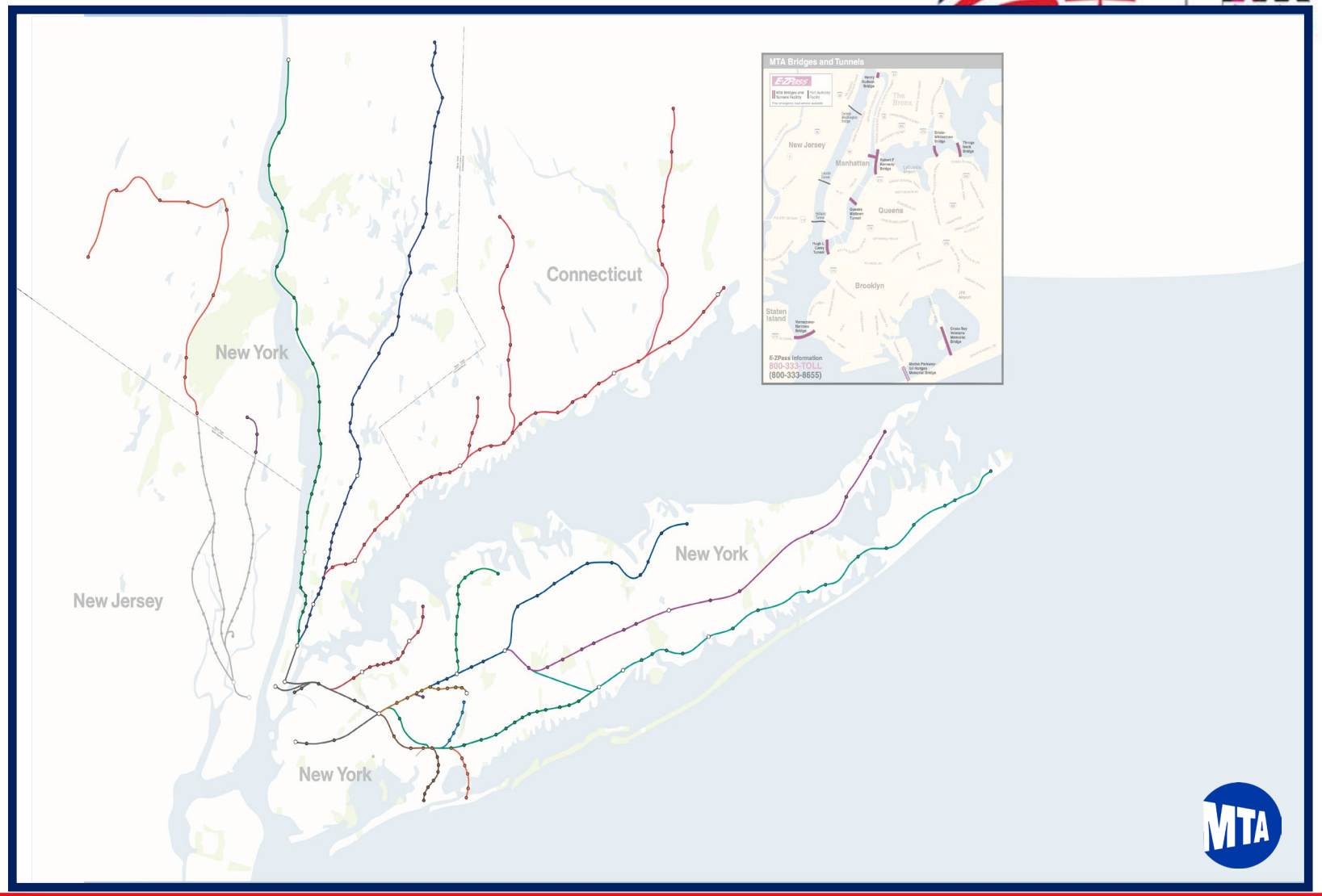
4.7 million ridership
700 trains
124 stations
900 miles of track
19 shops and yards
5,912 employees

Bridges and Tunnels

329 million vehicle crossings each year
Operates **7** toll bridges & **2** tunnels
1,589 employees

Long Island Rail Road

5.3 million ridership
700 trains
125 stations
700 miles of track
27 shops and yards
7,126 employees



MTA Strategic Priorities

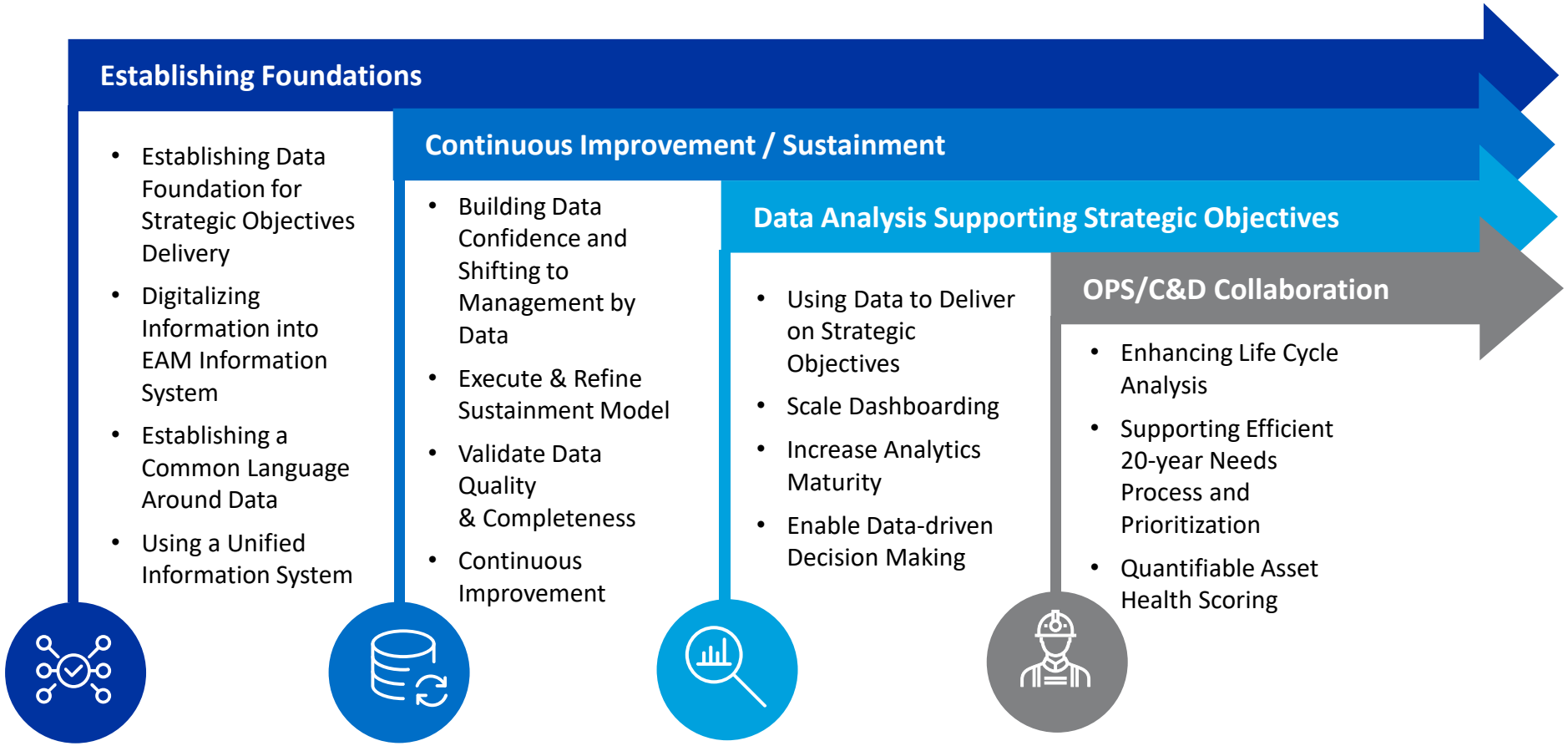
1) Deliver Better Service
2) Provide 21st-Century Bus Service
3) Promote Safety and Respect
4) Increase Appeal for Customers
5) Strengthen and Expand the Network
6) Achieve Financial Stability and Viability
7) Revive the Talent and Culture

MTA's EAM Vision & Mission

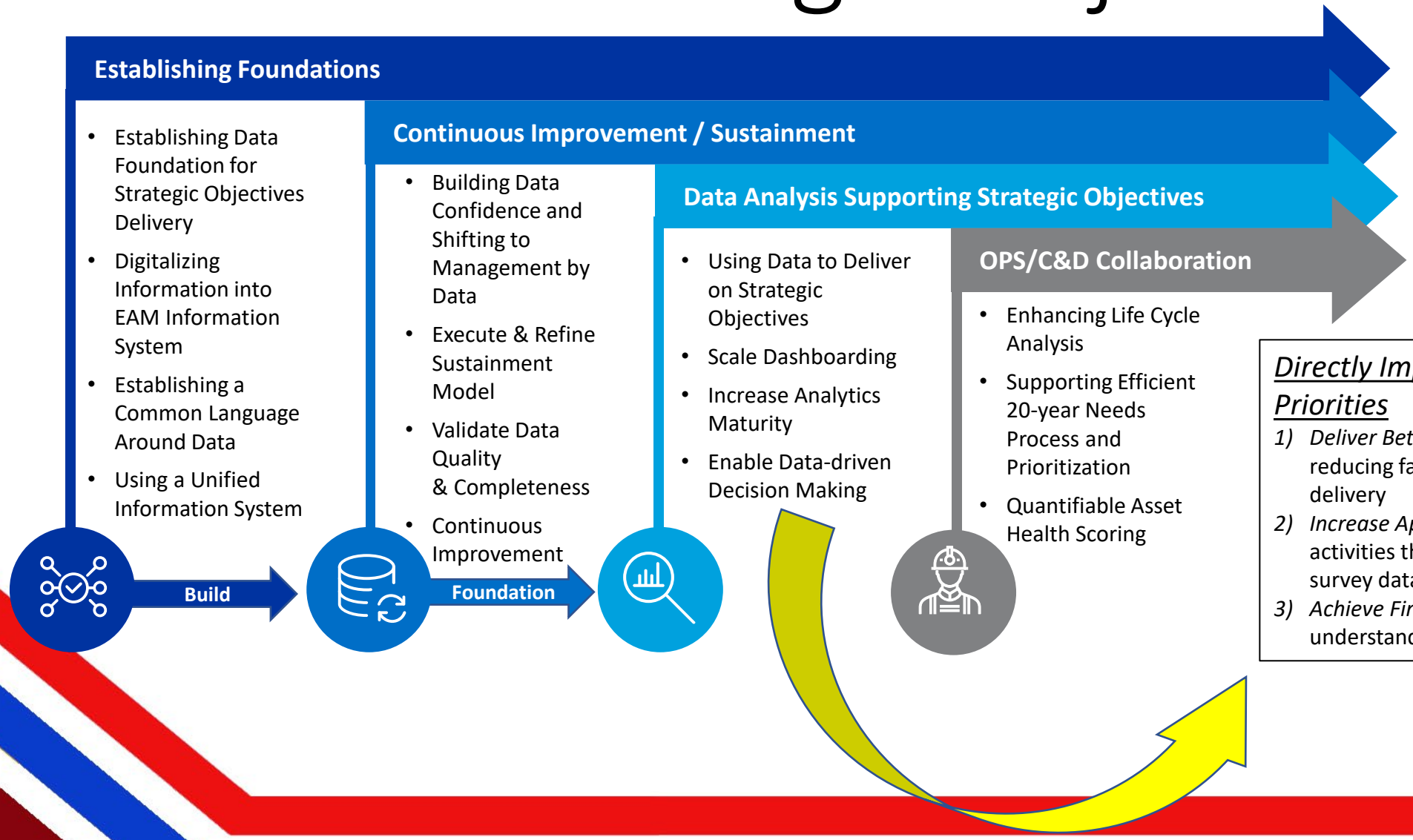
Vision To become the industry leader in Enterprise Asset Management and Maintenance Management

Mission To enable effective communication, collaboration, and decision making through the digitalization of asset information in support of life cycle management

The EAM Strategic Objectives



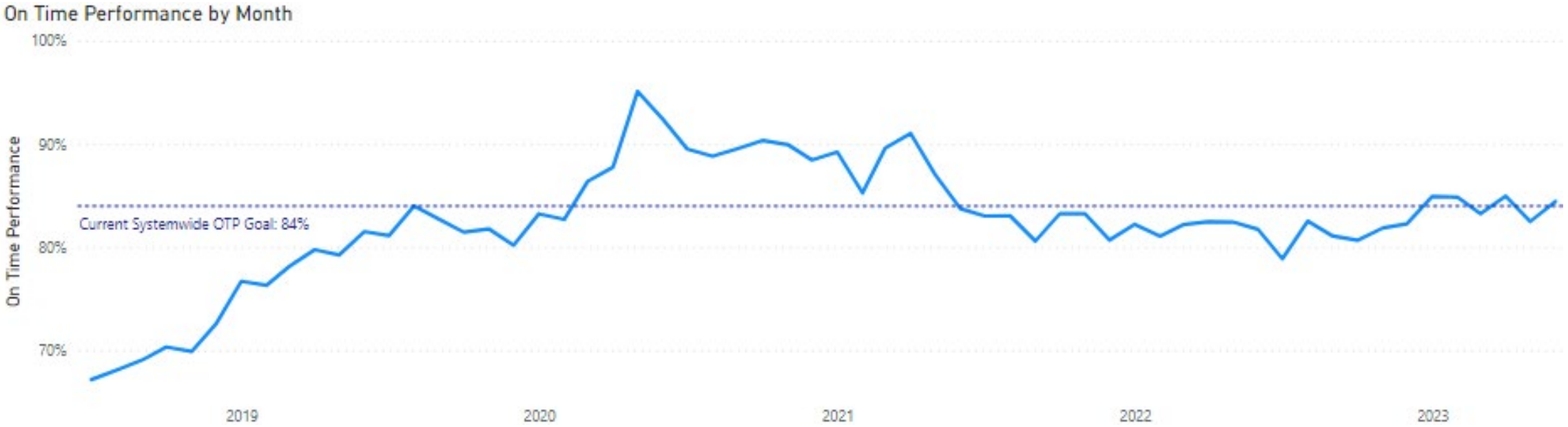
The EAM Strategic Objectives



Directly Impacts Several Strategic Priorities

1) *Deliver Better Service:* Identifying, predicting, and reducing failures, translates to better service delivery
2) *Increase Appeal for Customers:* Monitoring activities that improve customer experience and survey data
3) *Achieve Financial Stability:* Providing the ability to understand high value-added activities

Data Analysis – Switch Machines



Data Analysis – Switch Machines

Daily Delays

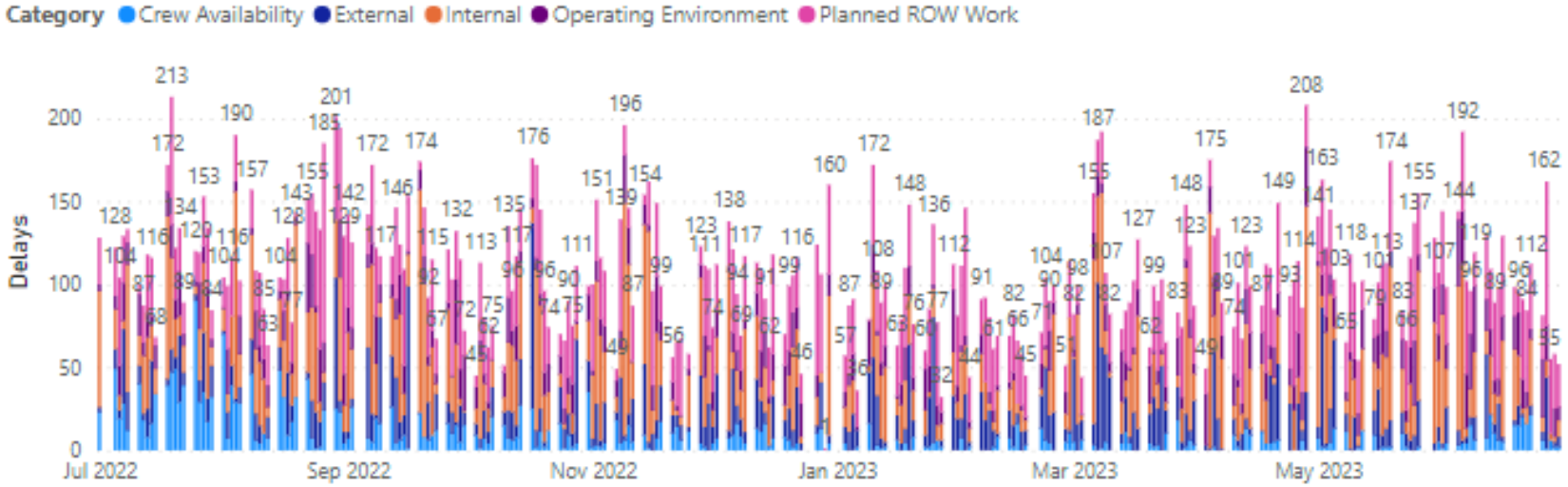
Prepared by DOS Performance Analysis Unit | Send questions to PerformanceAnalysisUnit@nyct.com

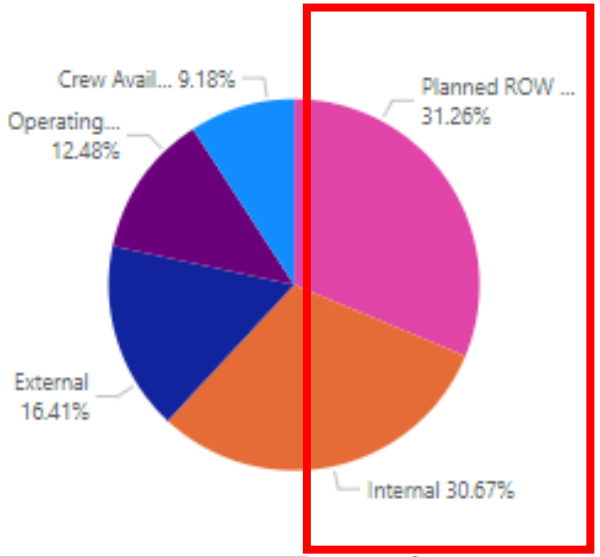
Schedule: Weekday

Date: Last 12 Months (Calendar)

7/1/2022 - 6/30/2023

Delays, Incidents and % Trips Delayed by Date and Category

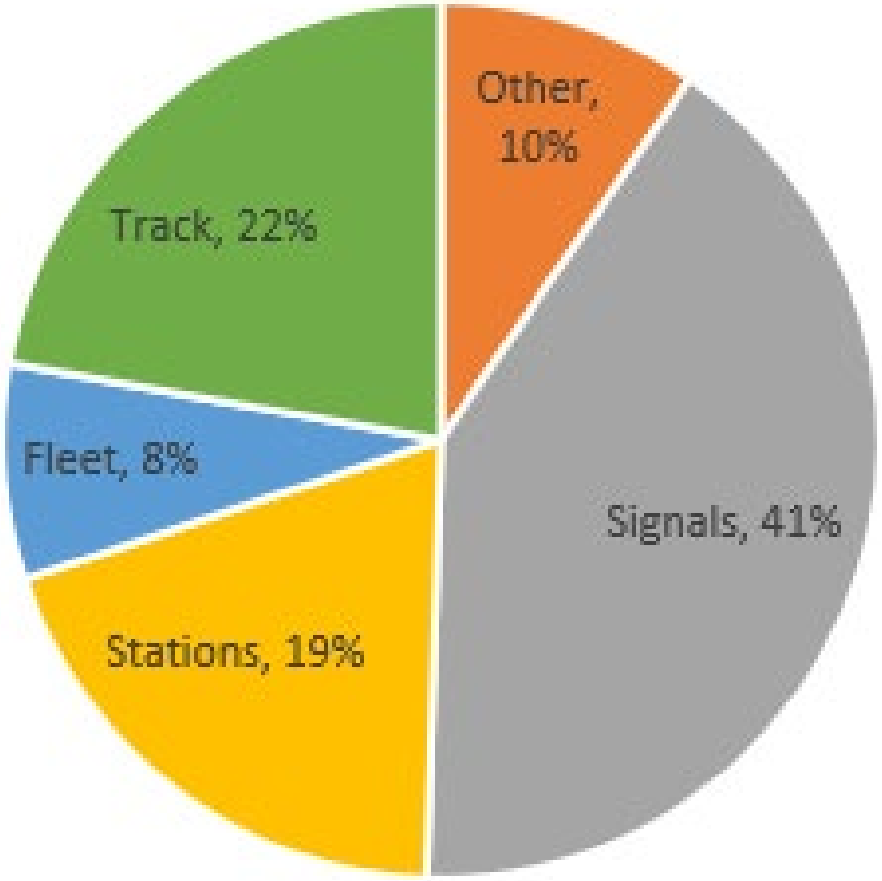




Potential Physical Asset Issues

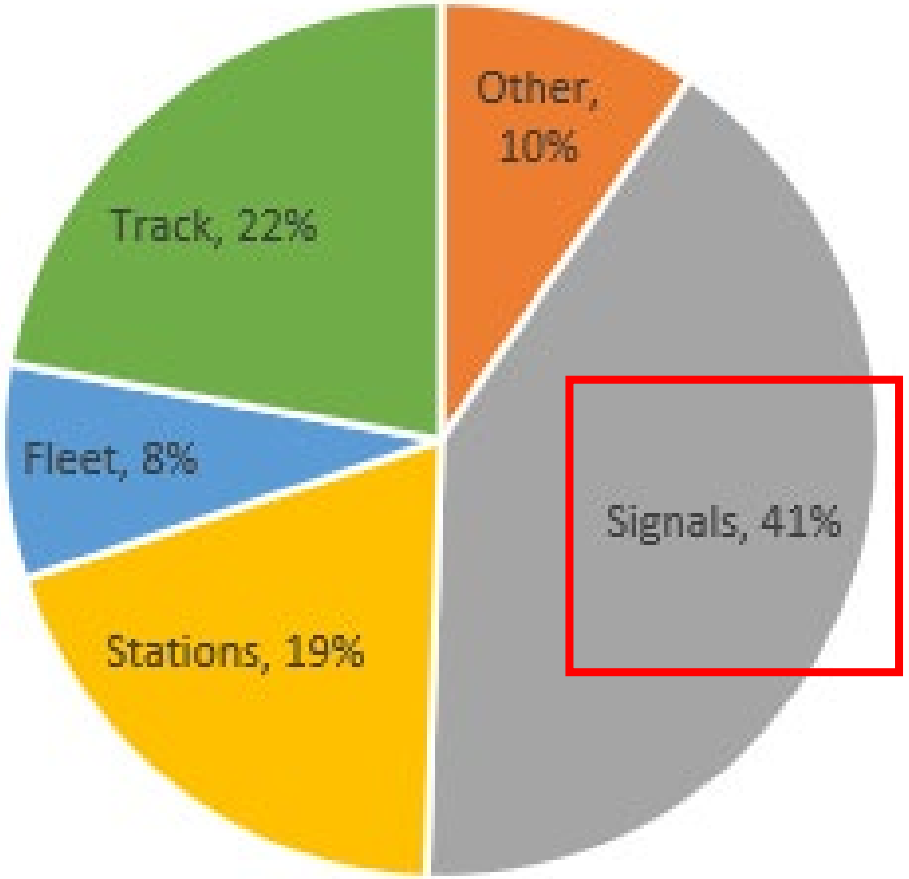
Data Analysis – Switch Machines

% of Delays by Category



Data Analysis – Switch Machines

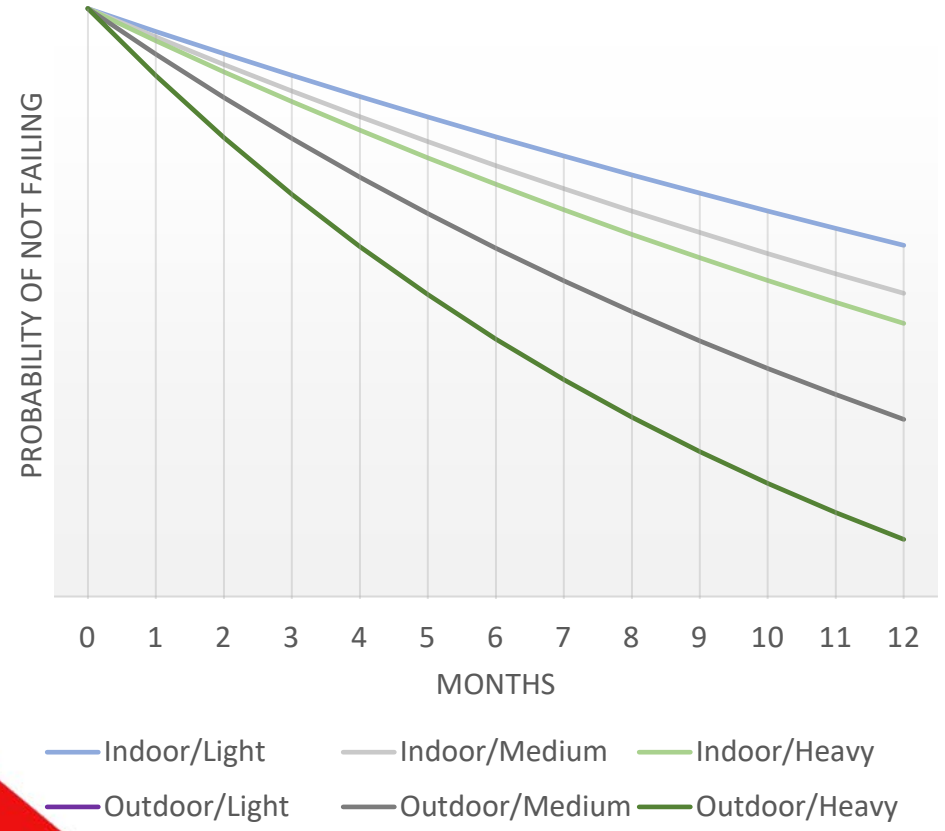
% of Delays by Category



We broke this down further to Switch Machines and analyzed failures

Data Analysis – Switch Machines

Initial Results of the Analysis – “The What”

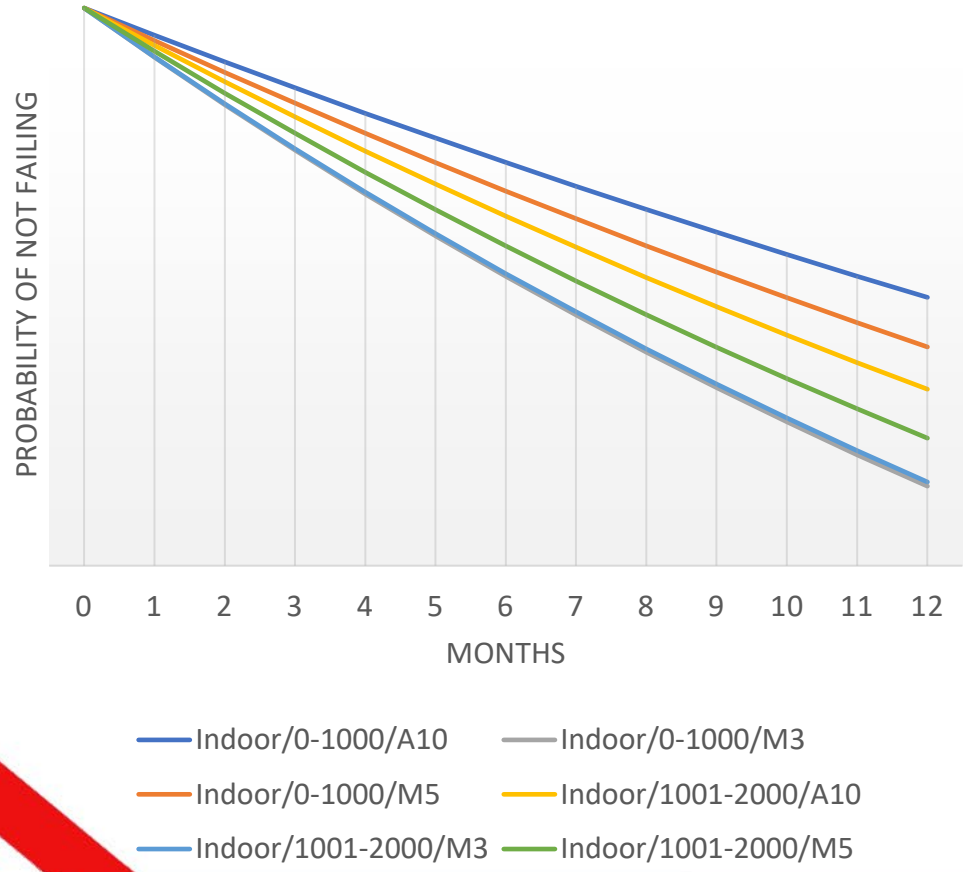


Probability of Not Failing %	Sample Size (No. of SWM)	Delta 12 Months
Δ (Indoor/Light - Outdoor/Light)	177/ 195	9.6%
Δ (Indoor/Medium - Outdoor/Medium)	179 / 406	15.0%
Δ (Indoor/Heavy - Outdoor/Heavy)	16 / 64	25.7%

Interesting Fact: Mainline outdoor switch machines with heavy usage are nearly twice as likely to fail as mainline indoor switch machines with light usage

Data Analysis – Switch Machines

Initial Results of the Analysis – "The What"

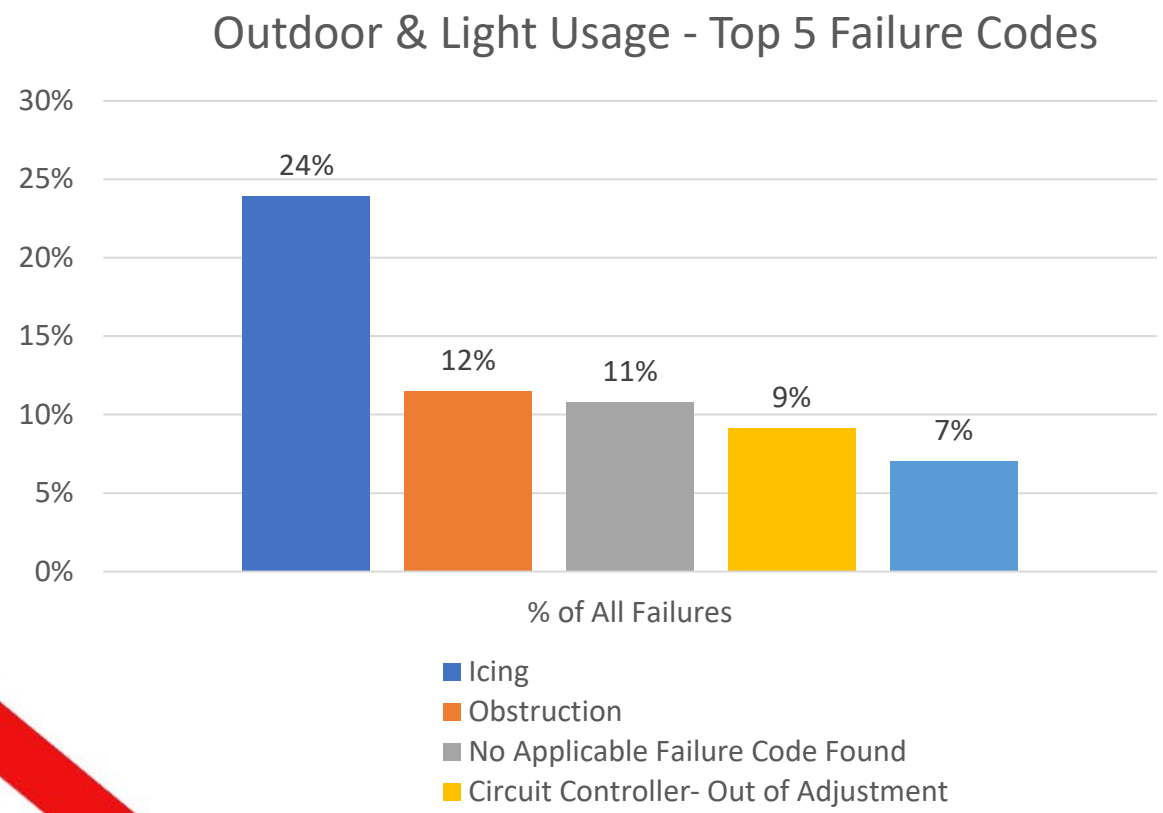


Probability of Not Failing %	Sample Size (No. of SWM)	12 Months
Δ (Indoor/Light/A-10 - Indoor/Light/M5)	33 / 138	4%
Δ (Indoor/Light/A-10 - Indoor/Light/M3)	33 / 24	**15.2%**
Δ (Indoor/Light/M5 - Indoor/Light/M3)	138 / 24	**11.2%**
Δ (Indoor/Medium/A-10 - Indoor/Medium/M5)	156 / 178	3.9%
Δ (Indoor/Medium/A-10 - Indoor/Medium/M3)	156 / 72	**7.5%**
Δ (Indoor/Medium/M5 - Indoor/Medium/M3)	178 / 72	3.6%
Δ (Indoor/Light/A-10 - Indoor/Medium/A-10)	33 / 156	7.4%
Δ (Indoor/Light/M5 - Indoor/Medium/M5)	138 / 178	7.3%
Δ (Indoor/Light/M3 - Indoor/Medium/M3)	24 / 72	**-0.3%**

Interesting Fact: Mainline indoor M3 switch machines with light and medium usage are more likely to fail than their A10 and M5 counterparts.

Data Analysis – Switch Machines

Initial Results of the Analysis – "The Why"



Preliminary analysis of seasonal weather variations

- Icing is the main failure cause across SWM clusters
- Icing-related failures highly concentrated on specific winter days
- Preliminary assessments point at wind speed and humidity as significant factors

Other ongoing analyses includes

- Assessment of failure code by SWM mode
- Effect of maintenance type and frequency
- Performance of recently-installed SWMs

Data Analysis – Switch Machines

Initial Results of the Analysis

- Location, Structure, Usage, and Model were found to have the greatest influence on the failure rate of subway SWMs
- Interaction effects found between factors—e.g., M3 machines perform in line with their A-10 and M5 counterparts except for indoor SWMs
- Findings from this analysis can be used to revise maintenance schedules, specify preventive maintenance, and other process improvements
- SWMs data assessments allowed for identifying gaps in the data, recommended improvements to data collection protocols, and other data improvements

Data Analysis – Switch Machines

Next Steps…

1) Complete “Tier 2” analysis to further explore “The Why”

2) Monitor results to validate performance outcomes

3) Work with the Operations and Maintenance teams to use the Tier 2 analysis in day-to-day activities

Questions?