Washington Metropolitan
Area Transit Authority

April 2025

Next Generation Transit Signal Priority

RD OR SV BL YL GR metrobus metro access

Why do we need Bus Priority?

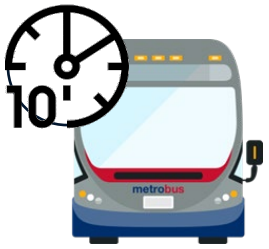
In the last year, **122.5 million trips** (almost 50% of all Metro trips) **were on Metrobus**

- Average Metrobus speed has declined **7%** between FY2010 and FY2024
- Average scheduled speed of the 10 highest ridership routes in FY 2024 was **8.4 mph**
- Traffic congestion delays costs Metro **$70 million** annually
- Slow buses → fewer riders

When congestion makes buses slower, we need more buses to run the same service

To keep buses running every…

10 minutes



On a route that takes…

50 minutes

Metro needs to provide…

5 buses and operators

When that service becomes **10 minutes slower** because of congestion...

60 minutes

+20% time penalty for customers

6 buses and drivers

+1 bus to purchase and maintain, additional bus operator to hire

Priority treatments improve bus speed and reliability

Traffic Congestion

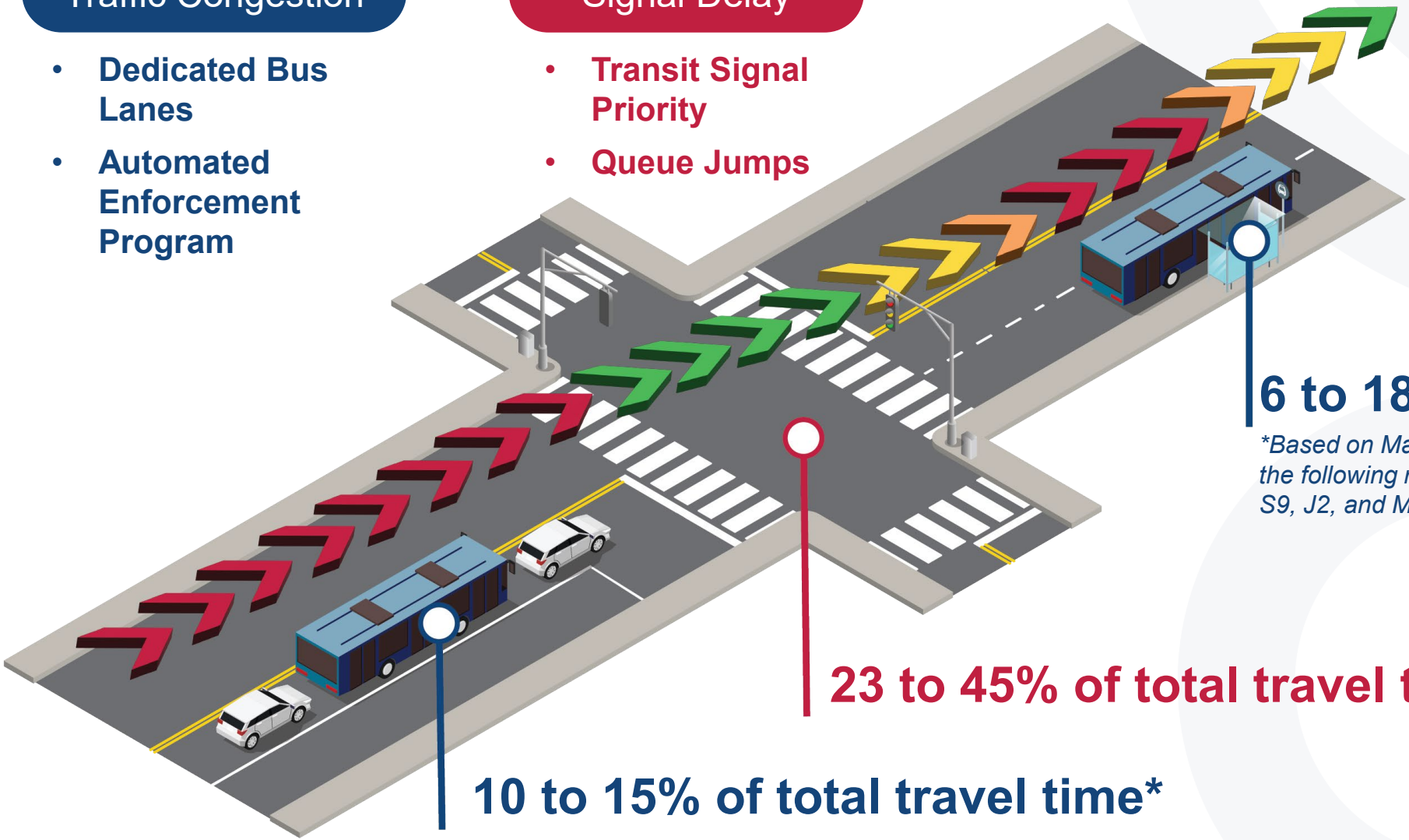
- Dedicated Bus Lanes
- Automated Enforcement Program

Signal Delay

- Transit Signal Priority
- Queue Jumps

Dwell Time

- All-Door Boarding
- Bus Islands
- Stop Consolidation



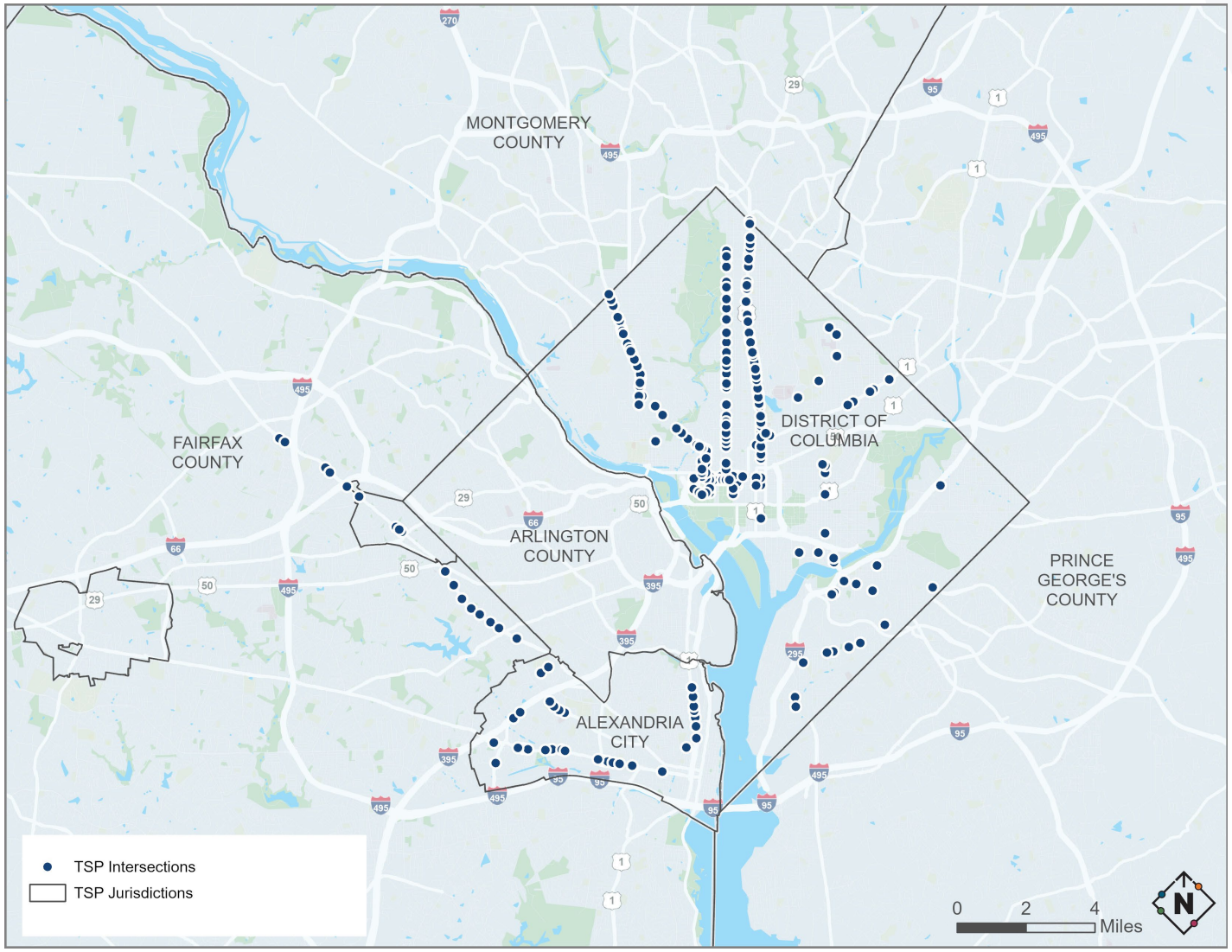
6 to 18% of total travel time*

23 to 45% of total travel time*

10 to 15% of total travel time*

**Based on May 2023 weekday data from the following routes: 70, 79, 52, 54, S2, S9, J2, and MW1.*

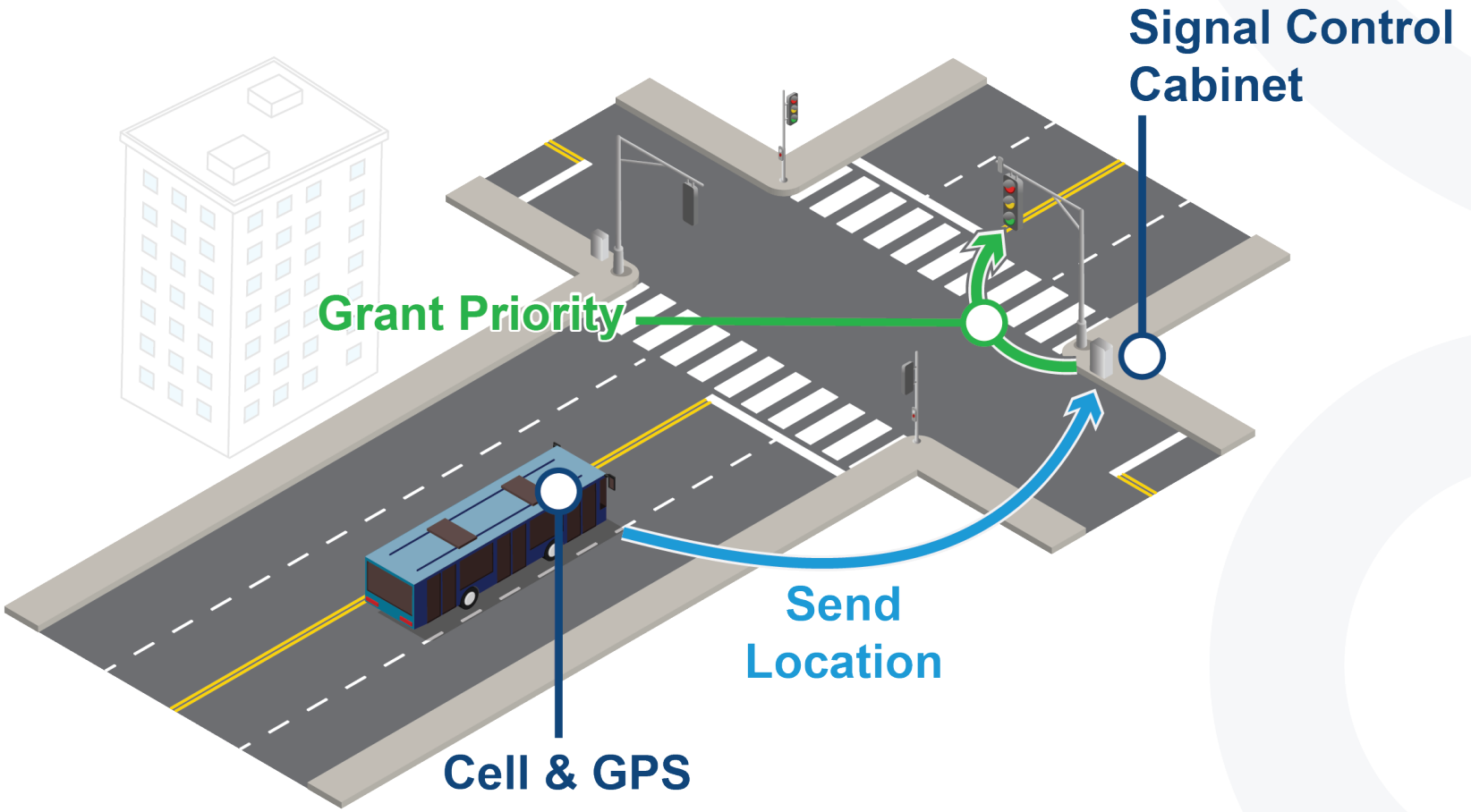
Transit Signal Priority in the Region



- WMATA's TSP technology deployed in 2015 to reduce bus delays and improve reliability.
- Currently, there are approximately 250 signals providing TSP to WMATA buses throughout DC and Virginia.
- Initially best in class, TSP in the region is now outdated due to advancing technology and aging equipment.

Current Transit Signal Priority System

Vehicle-to-Infrastructure Communication



Existing TSP System Challenges and Limitations

Bus Technology Limitations

- Infrequent bus updates
- Inaccurate and static Estimate Time of Arrivals (ETAs)

+

Signal Systems Limitations

- Varying signal systems across jurisdictions limit TSP application
- Aging equipment with limited TSP strategies

=

Resultant Operational and Maintenance Challenges

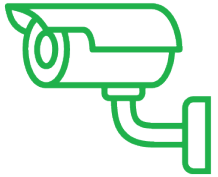
- Rigid TSP business rules
- No performance tracking
- Frequent maintenance needs without a guaranteed outcome

Emerging Trends for Next-Gen TSP

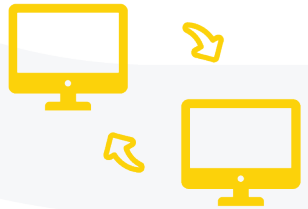
Early and Frequent Notice of Bus Location

Dynamic ETA Estimation Powered by Cloud-Based TSP

Advanced Multimodal Video Detection

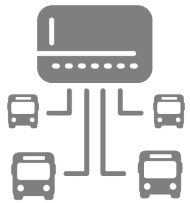


Customized Controller Program with Remote Access



Low-Cost, High-Resolution Data Analysis for Decision-Making

Scalability and Interoperability



Feedback from controllers to bus operators

Cybersecurity

Next Generation Transit Signal Priority

Collaborate with all regional partners to build a scalable and interoperable TSP system that integrates cutting-edge technologies, tracks performances, and supports long-term enhancement and expansion to improve overall transit efficiency.

Goals for the Region's Next-Gen TSP System

Faster, reliable, and cost-effective buses for customers by reducing intersection delays

Flexible, Cloud-Based System

Support **centralized** and **decentralized** architectures with **no extra onboard hardware**

Dynamic Prioritization

Provide **frequent ETA updates** and prioritize based on route, ridership, and schedule adherence

Seamless Integration & Open Architecture

Integrate with any CAD/AVL system and support legacy WMATA TSP equipment and local bus providers

Performance Monitor and Optimization

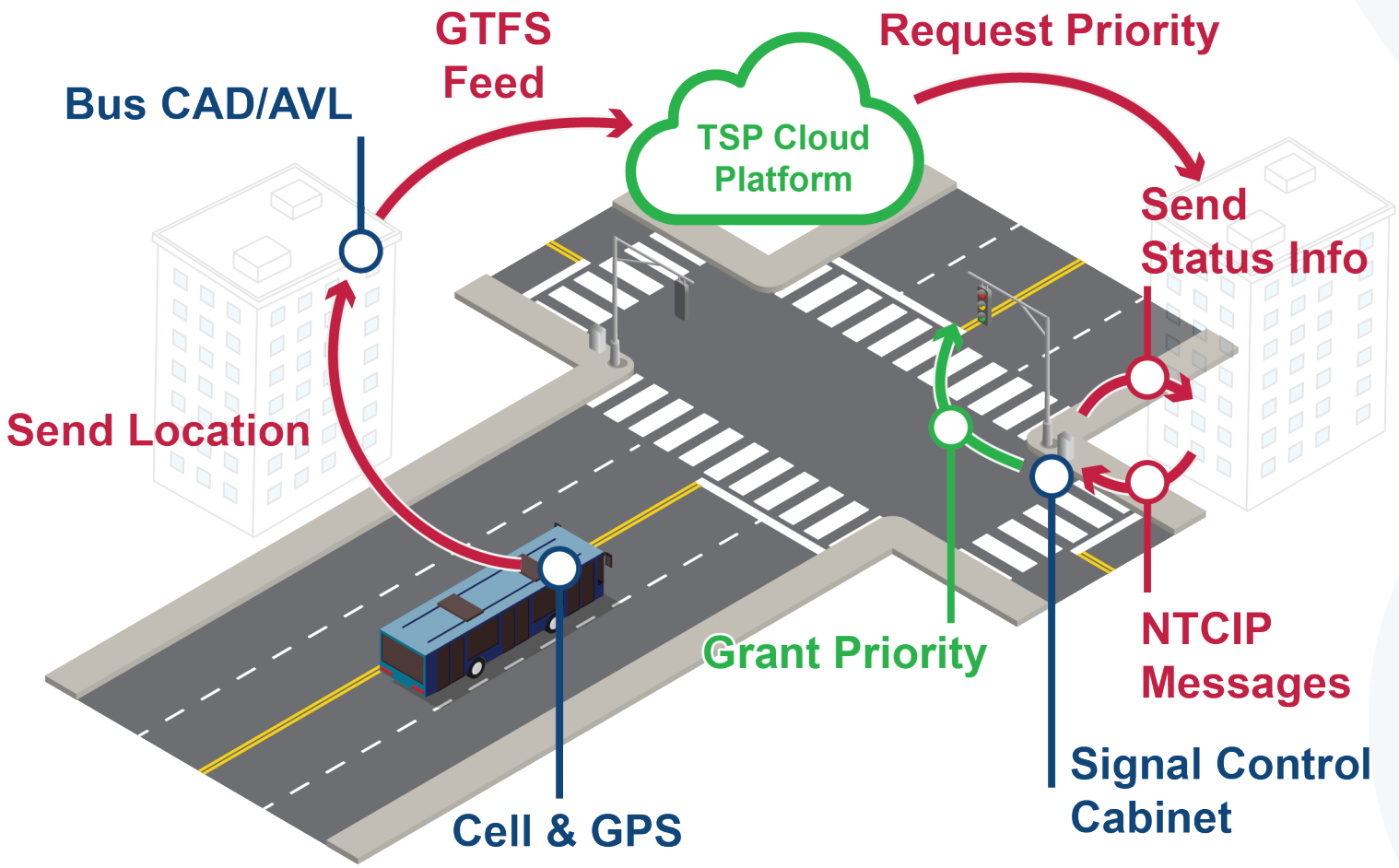
Track system performance *and establish* ***efficient TSP business rules*** *for higher transit benefits*

Scalable & Cost-Effective

Easily redeploy TSP assets and **expand deployment affordably**

Next Generation TSP

Vehicle and Infrastructure both communicate with the server (Cloud)



Up to 20% Travel Time Reduction

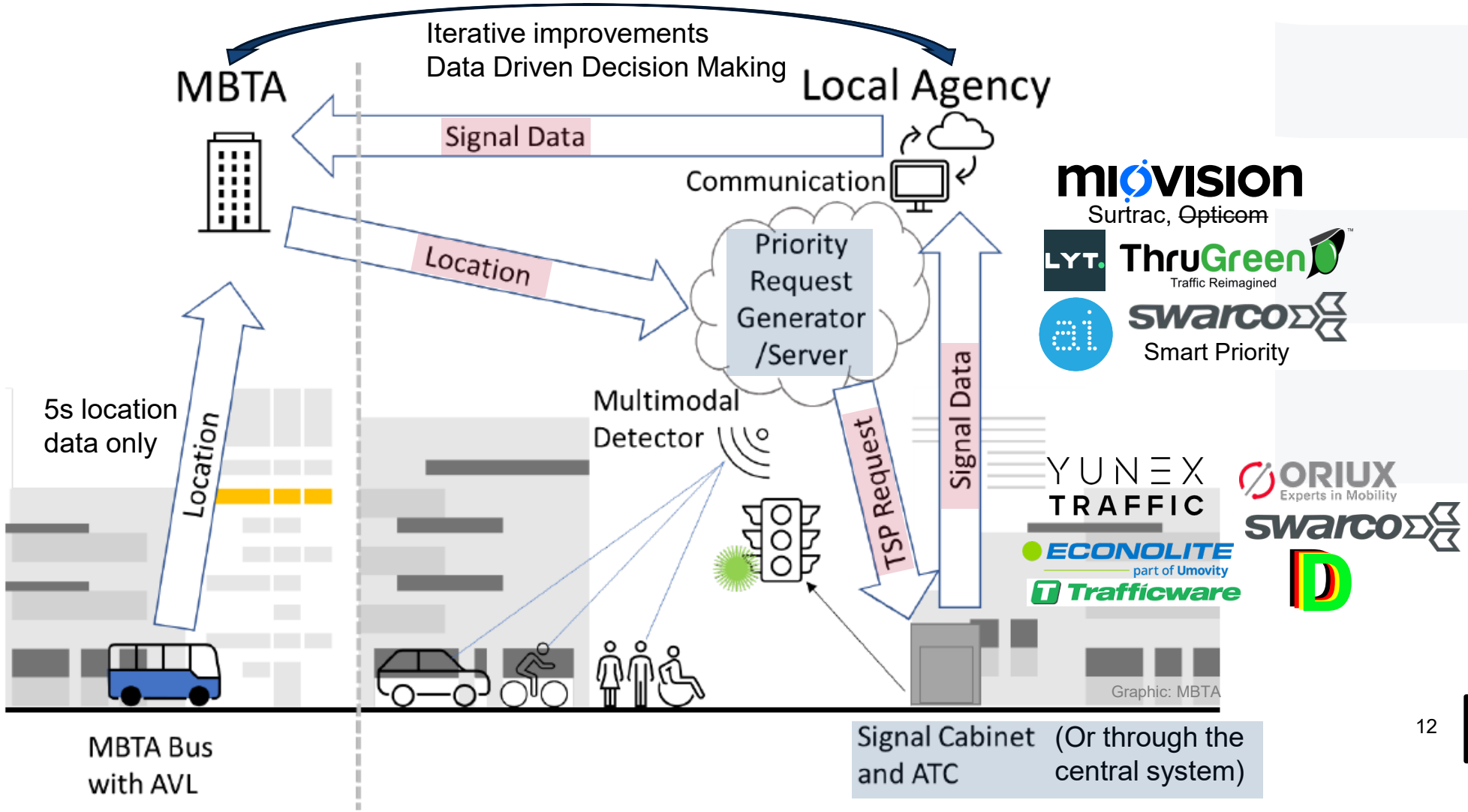
Boston, Los Angeles, Portland, Seattle.

Up to 70% Arrival on Green Increase

Atlanta, Portland, Boston, Seattle.

MBTA - Massachusetts

Unconditional TSP with vendor-agonistic open architecture



MBTA - Massachusetts

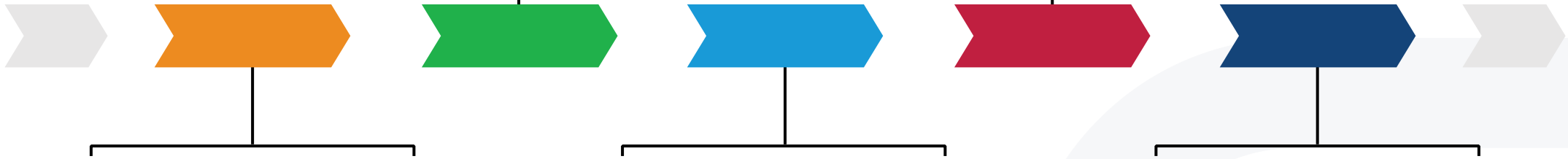
Quick-build with immediate feedback loop, continuous monitoring and improvements

Determine TSP rules

- Standard TSP rules: Unconditional 24/7 TSP with green extension & early return to green that maintain min green time and pedestrian phases.
- Additional preferential treatments: phase skipping and rotation.

Tweak Parameters

- Refine TSP treatments and signal timing based on real time information from vendor dashboard portal, camera feed, and citizen complaints.



Define Scope

- Select corridors based on frequency, bus delays, demographics, and planned bus and signal improvements.
- Signal IQ for existing delay

Implement TSP

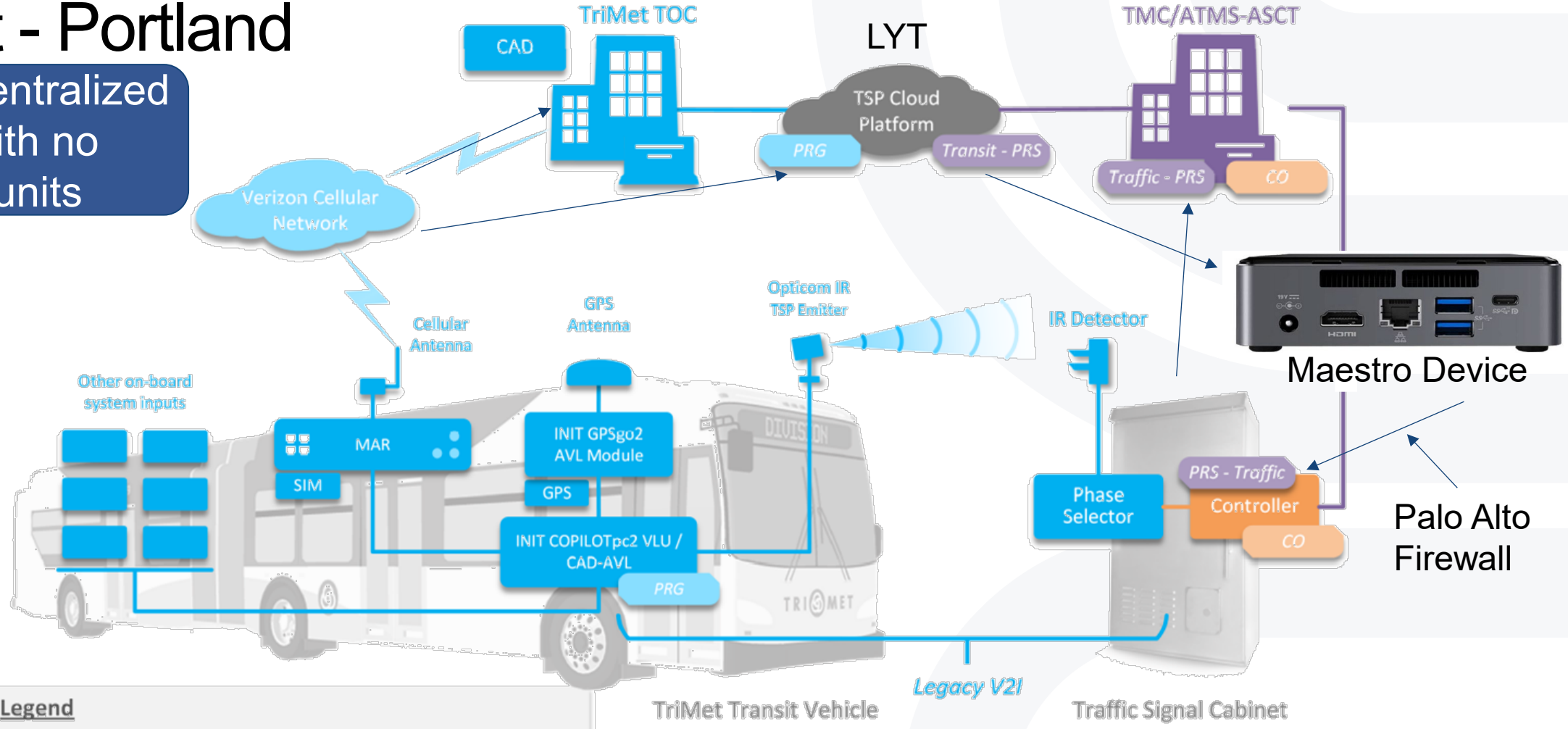
- Upgrade cabinet, controller (firmware), video detections to meet MBTA specs
- Implement TSP and send ATSPM data (with bus locations) to MBTA hourly.

Monitor Long Term

- MBTA and the jurisdictions decided the TSP metrics and track them through the dashboard that updates based on the ATSPM data hourly.

TriMet - Portland

Secure centralized system with no roadside units



Legend

CAD/AVL	Computer-Aided Dispatch/Automatic Vehicle Location
MAR	Mobile Access Router
CO	Coordinator (*priority implementer*)
PRG	Priority Request Generator *(priority requesting logic)*
PRS	Priority Request Server *(priority granting logic)*
SIM	Subscriber Identity Module

Key

PRG Component

PRS Component

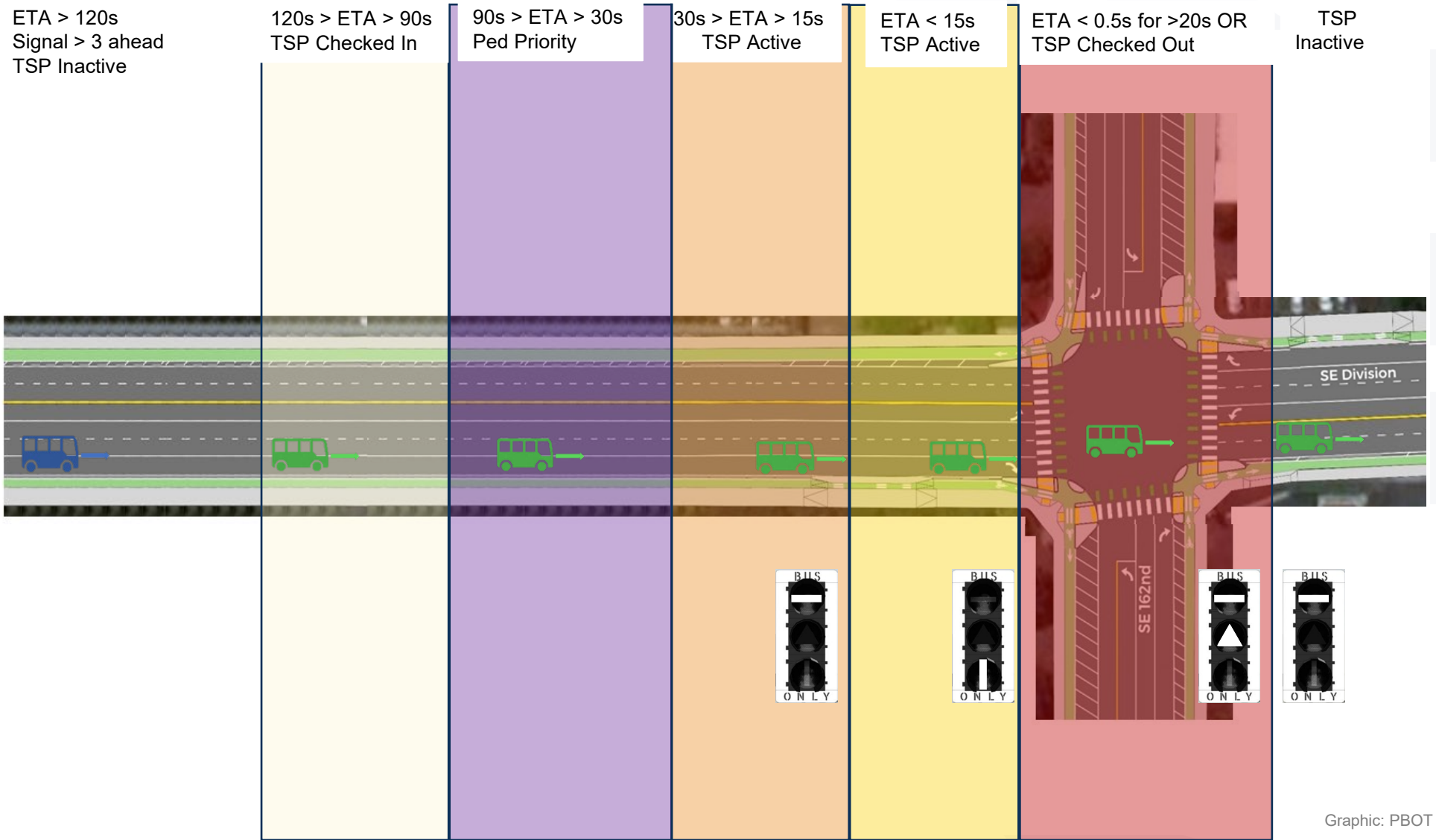
CO Component

PRG Logical Object

Graphic: PBOT

TriMet - Portland

Innovative TSP strategies possible due to partnership with Portland Bureau of Transportation



Graphic: PBOT

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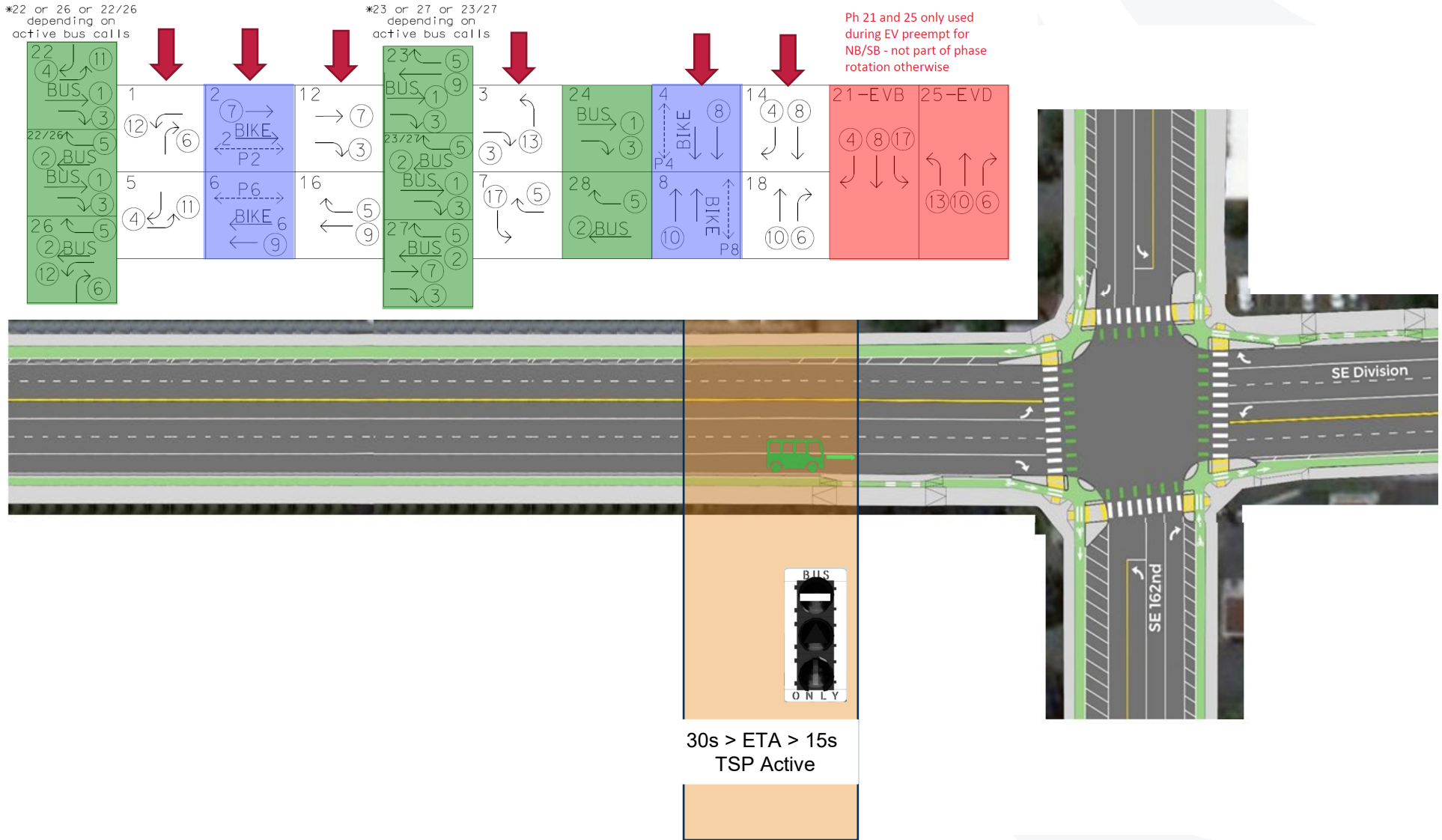

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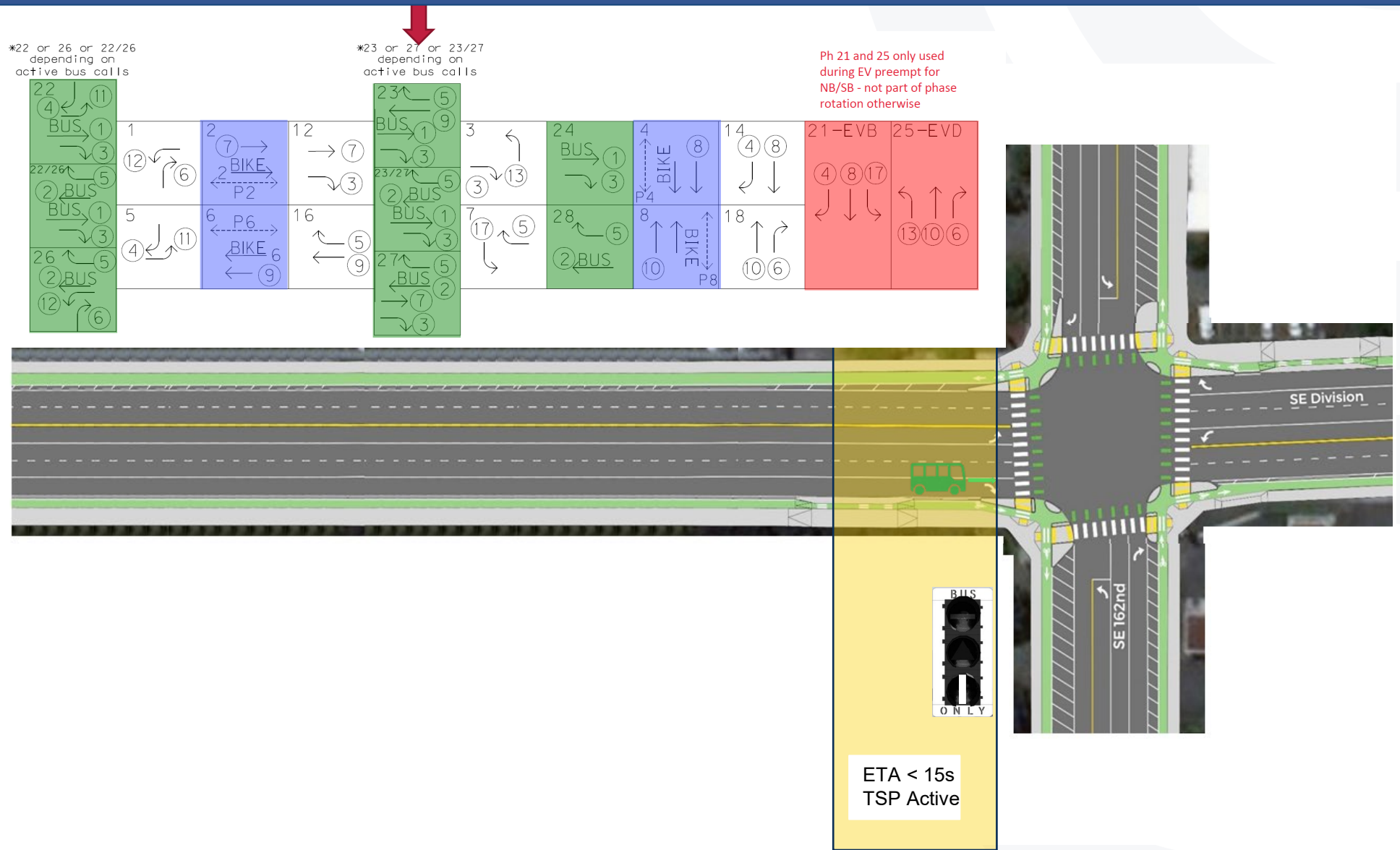
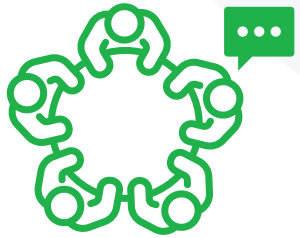


Strategies to Deliver Next-Gen TSP

Improve Bus Polling Rate

Upgrade to Cloud-Based TSP

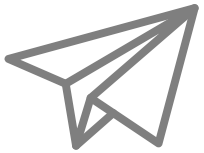
Engage Internal and External Stakeholders Regularly



Monitor TSP Performance

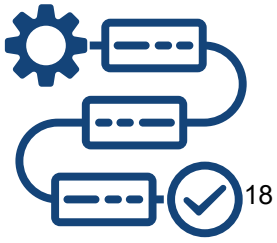
Identify Corridors for Funding Sources Proactively

Implement Next-Gen TSP Pilot



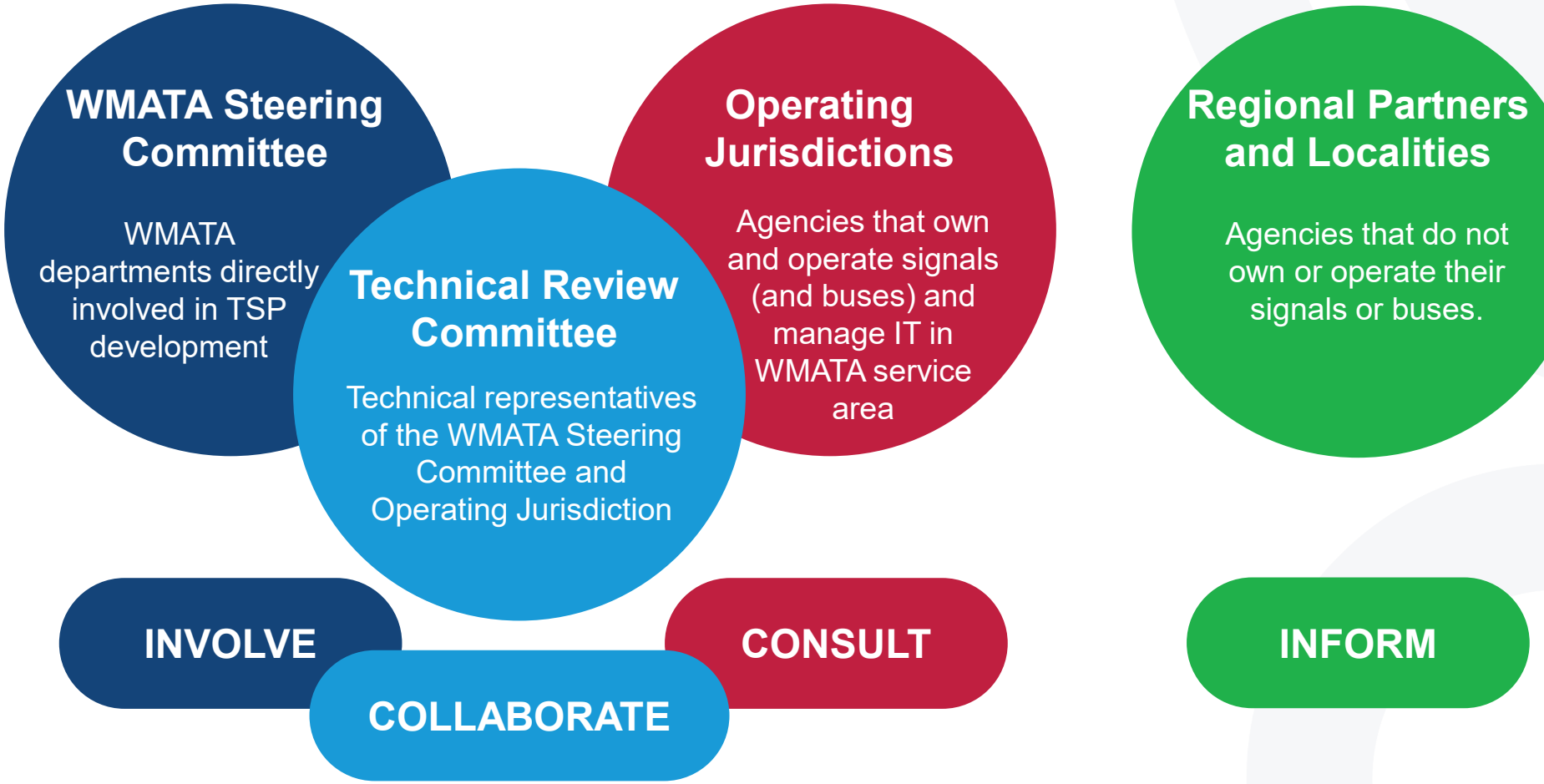
Create Better Visibility for Internal and External Partners

Establish Workflow for Improvements and Maintenance



Regional Partnership is Key to Success

Next-Gen TSP Engagement Overview



Next-Gen TSP Engagement Activities

WMATA Steering Committee

- ***Interviews***
- ***Monthly meetings***
- *Involvement in developing the* ***concept of operations****,* ***technical requirements****,* ***scope of work,*** *and* ***vendor selection****.*

Technical Review Committee

- ***Project status updates***
- ***Bi-monthly meetings***
- *Involvement in developing* ***concept of operations****,* ***technical requirements****,* ***scope of work,*** *and* ***vendor selection****.*

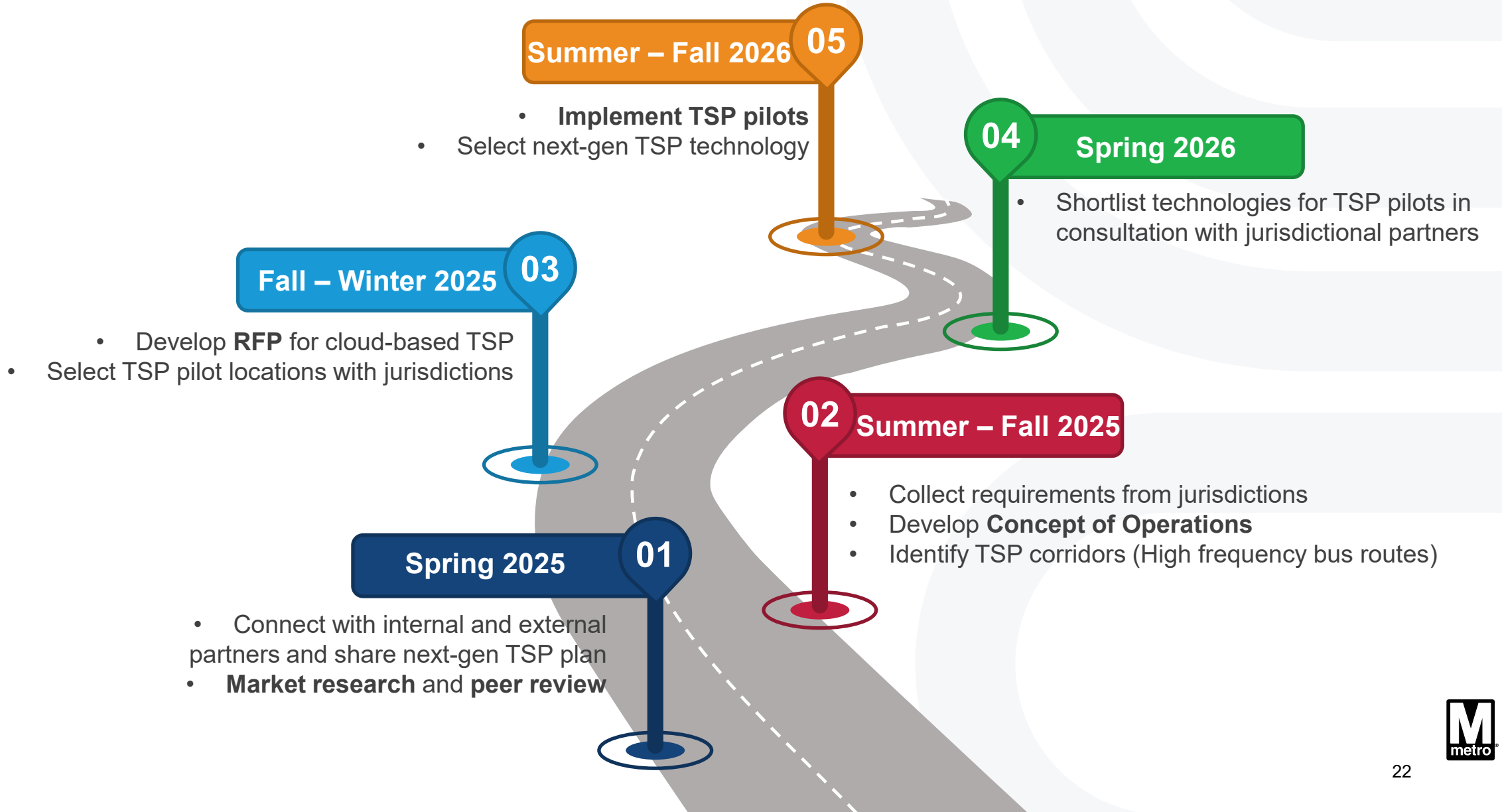
Operating Jurisdictions

- ***One-on-one Interviews*** *to collect background information and requirements.*

Regional Partners

- ***Policy guidance*** *in developing* ***concept of operations****.*
- ***Periodic presentations*** *at key points of the project*

Next Steps for Next Gen TSP Implementation



Thank you!

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