The New Requirements of the Signal Priority System in a Smart City Future

ITS Washington, December 3, 2019

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The Opportunity

- Enabling the Transportation System to be Part of a Collective Smart City Solution

- Enhanced Safety & Response Times

- Increased Ridership & Reliable Transit

- Harmonious balancing of vehicle priorities

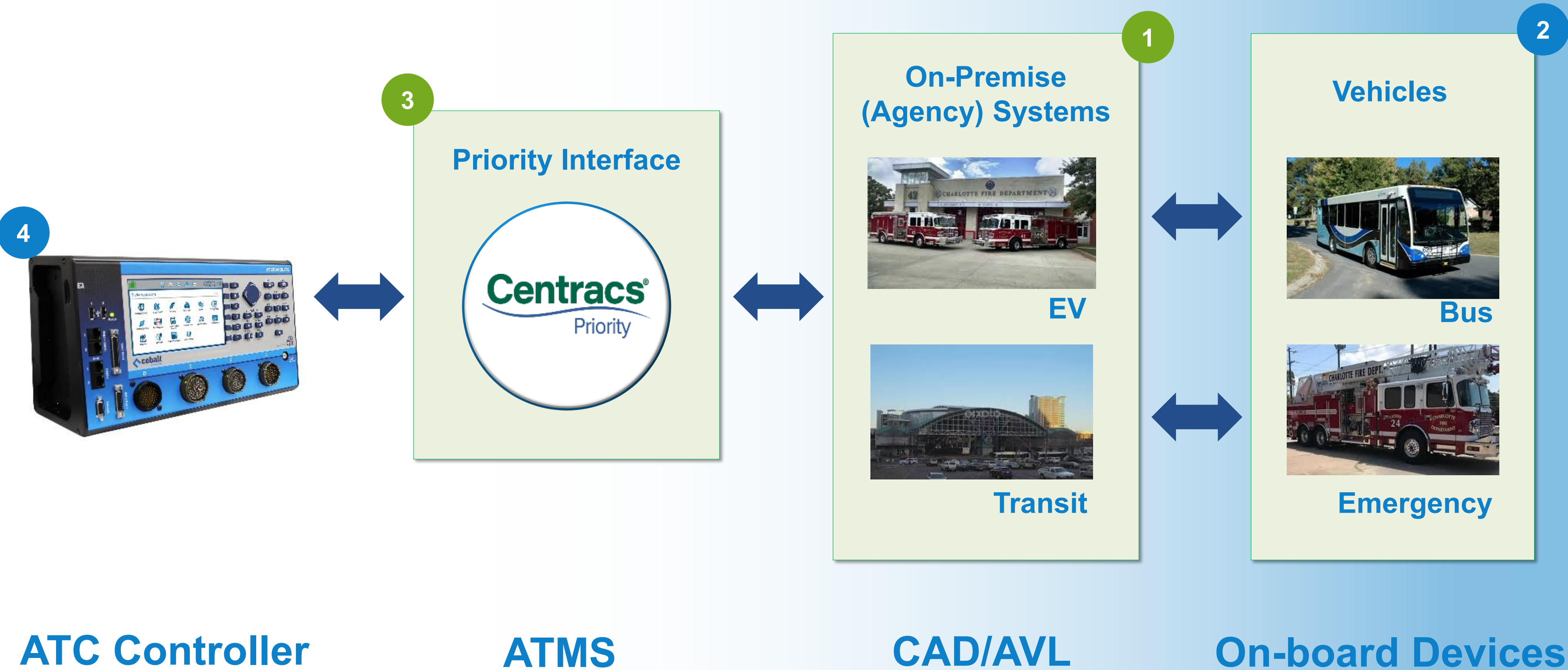- Reduce Maintenance Overhead

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Smart City Benefits

- Next Generation of Traditional Preemption and TSP services
  - Look at a complete route for greatly improved efficiency
  - Handles each vehicle class by user-defined priority
  - Reduce infrastructure in the field
  - Center-to-Center connections
    - CAD, Transit, freight, etc.
  - Manage multiple requests at a single intersection

Network Architecture

ATC Controller

ATMS

CAD/AVL

On-board Devices

Priority Interface

Centracs® Priority

On-Premise (Agency) Systems

EV

Transit

Vehicles

Bus

Emergency

Priority Examples

- Miami-Dade County, FL
  - US-1 Busway: 36 intersections
  - Operates in coordination with US-1 signals
  - Clever Devices Transit System

- Charlotte, NC
  - 700 signals
  - 50% active with Priority
  - Goal is to activate all signals
  - Trapeze Transit System
  - Tri-Tech EV System

- Nashville, TN (in process)
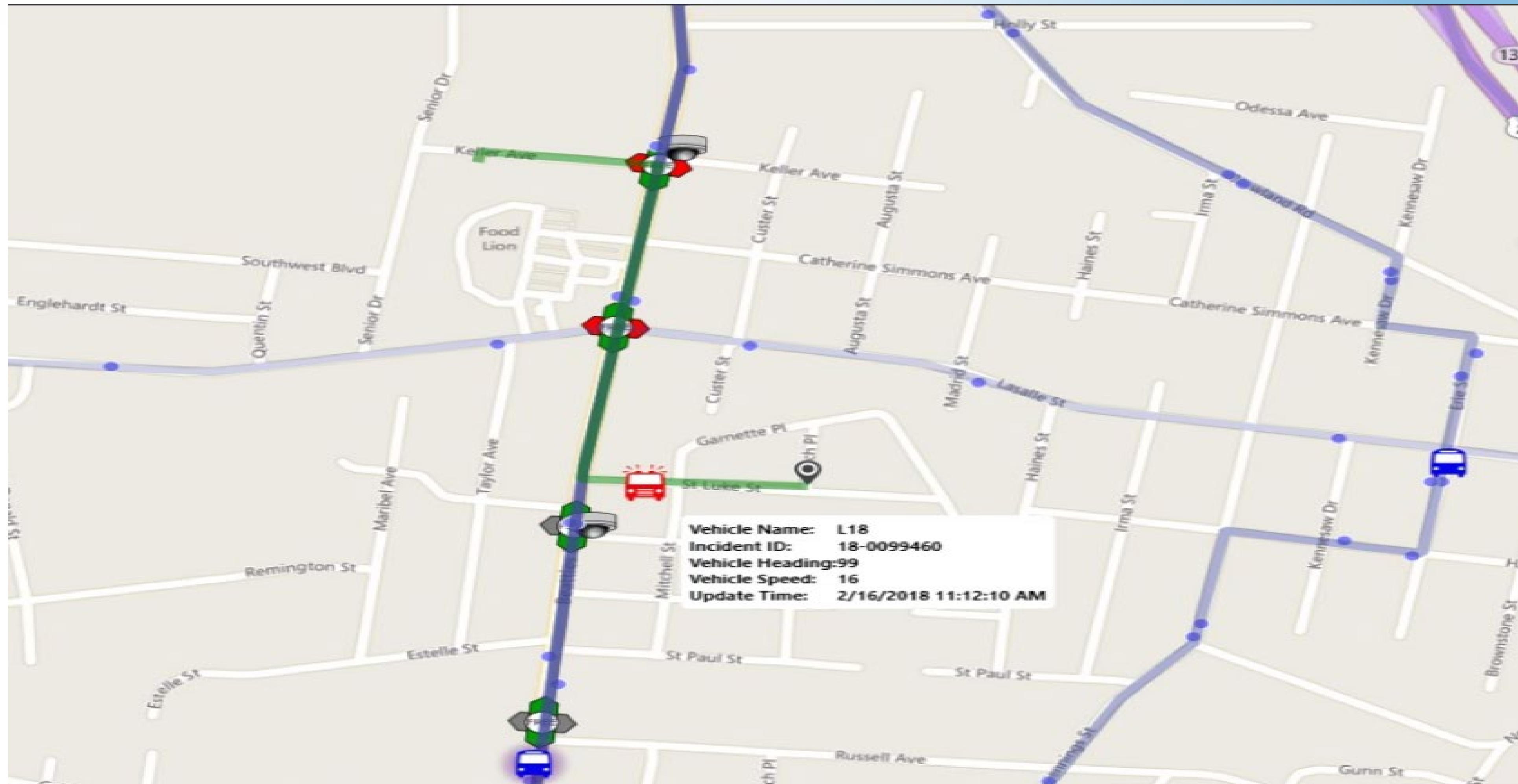 - Initial deployment: 41 signals
  - Trapeze Transit System

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System Understands the Route

Vehicle Name: L18
Incident ID: 18-0099460
Vehicle Heading:99
Vehicle Speed: 16
Update Time: 2/16/2018 11:12:10 AM

Balance Priorities

- Transit
- Police
- Fire
- Ambulance
- Freight
- Snow Plows

- Fire
  - Ladder Truck
  - Battalion Truck
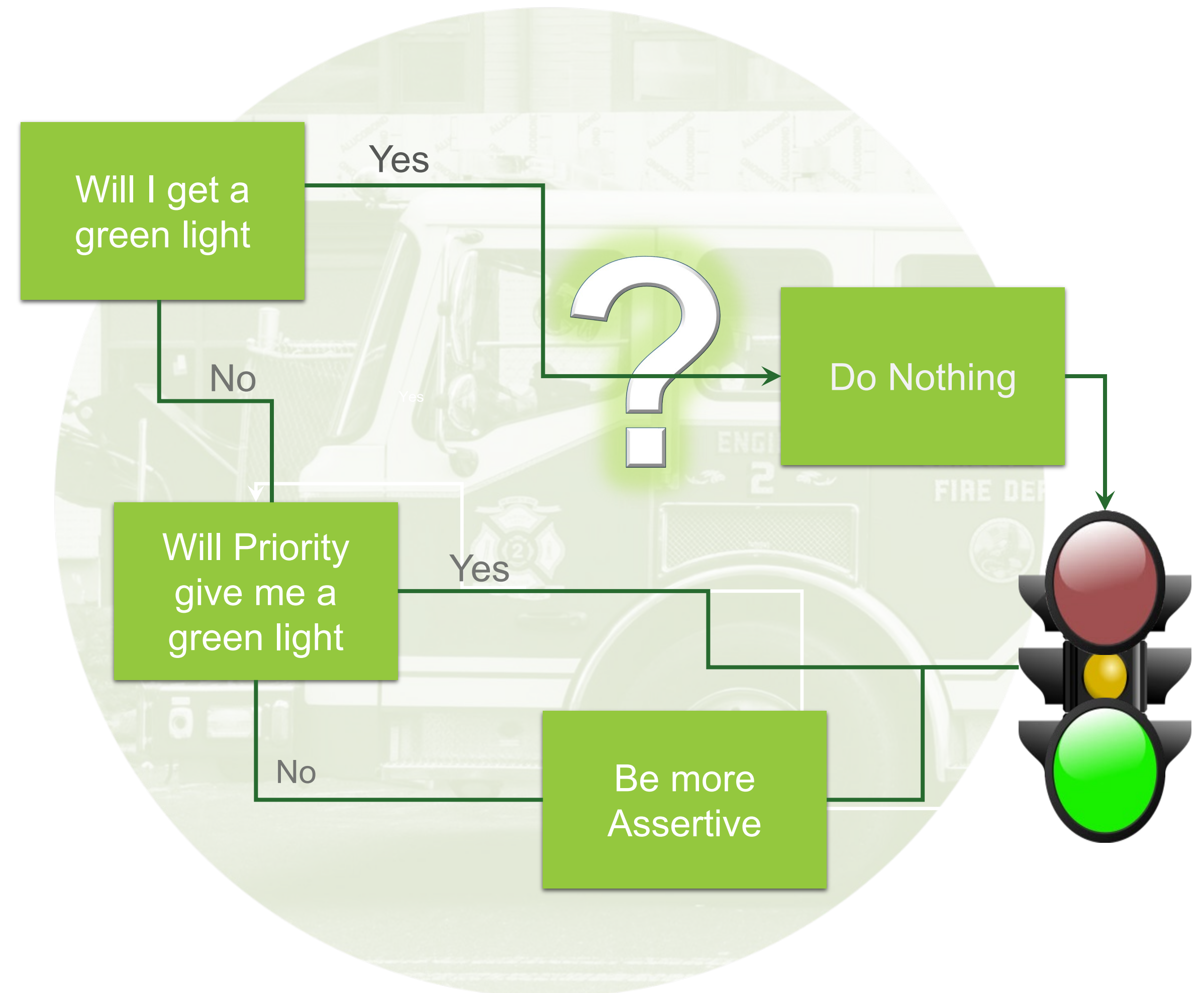 - Etc.
- Transit
  - Express
  - Behind Schedule
  - Etc.
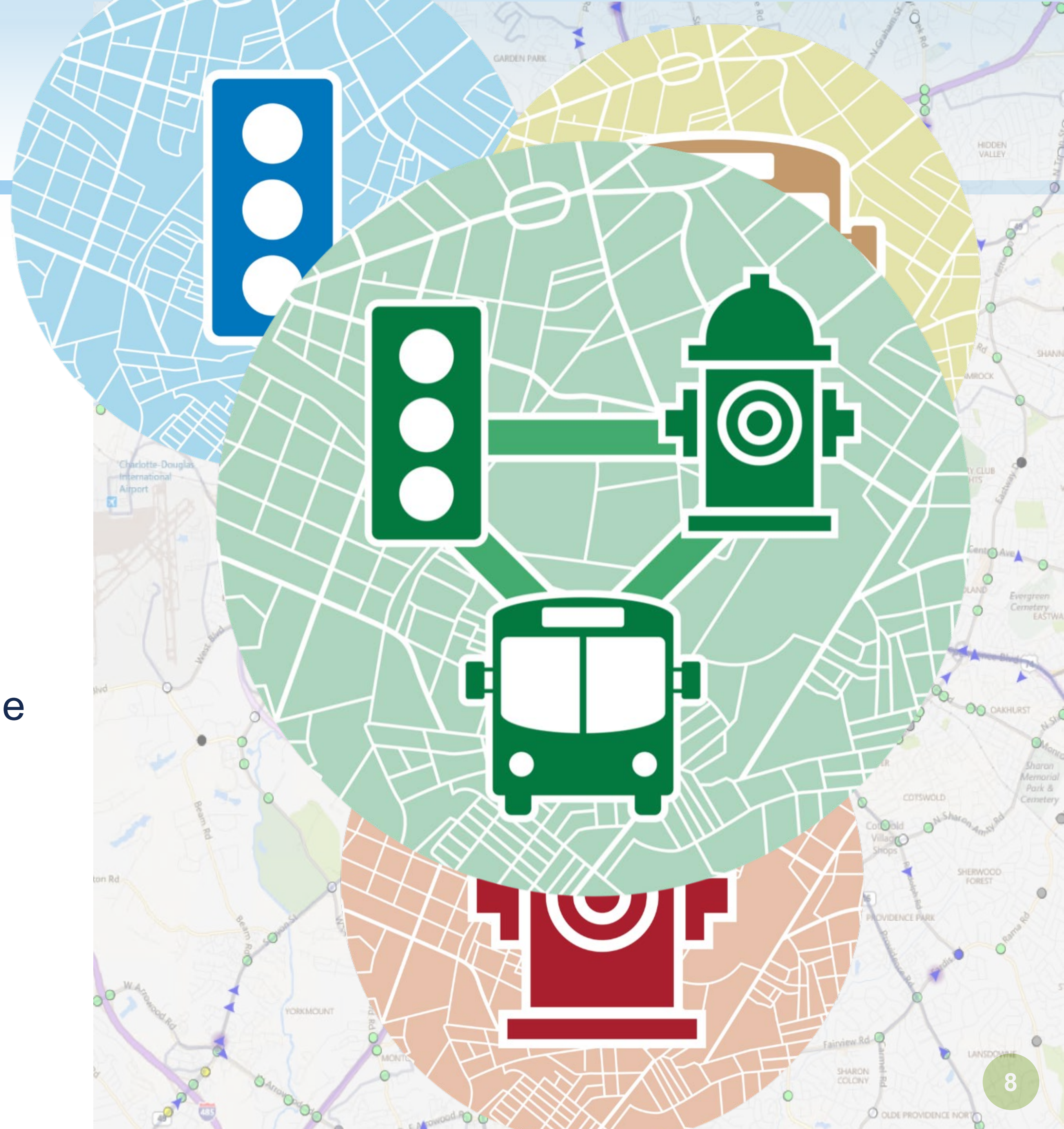
Flexible Priority: Configurable class levels

- Classes 1-2
  - Skips/omits any vehicle phase as well as pedestrian service.
  - May dwell in EVP phases beyond max split extension.
  - May cause coordination transition.
  - Not subject to recovery cycle inhibit.
  - If pedestrian service is not skipped/omitted, pedestrian walk time may be truncated to guaranteed walk time.

- Class 3
  - Skips/omits any vehicle phase as well as pedestrian service.
  - May dwell in EVP phases beyond max split extension.
  - May cause coordination transition.

- Class 4
  - May not skip/omit vehicle phases.
  - Is bounded by configured min and max splits reductions.
  - May skip/omit pedestrian service.
  - May cause coordination transition.

- Class 5
  - May not skip/omit vehicle phases.
  - Is bounded by configured min and max split reductions.
  - May skip/omit pedestrian service on requested phase.
  - May skip/omit pedestrian service on non-requested phase to accommodate min/max split reductions.

- Class 6
  - May not skip/omit vehicle phases.
  - Is bounded by configured min and max split reductions.
  - May skip/omit pedestrian service on non-requested phases to accommodate min/max reductions.

- Classes 7-10
  - May not skip/omit vehicle phases.
  - May not skip/omit pedestrian service.
  - Is bounded by configured min and max split reductions.
  - Will not allow adjustments that causes coordination transition.

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9

# EV Dispatch: Achieve Goals & Improve Safety

- **"Sense" of the entire route**
  - Advance signal notification
  - Flush standing vehicles
- **CAD**
  - Leverage your existing system
  - AVL & Position
  - Route Prediction
- **Achieve**
  - Faster response times
  - More reliable response times
  - <4 minutes goals

Will I get a green light — Yes → ? → Do Nothing

Will I get a green light — No

Will Priority give me a green light — Yes

Will Priority give me a green light — No → Be more Assertive

Transit: Achieve Goals with Flexible Rules

- **Leveraging Existing System**
  - AVL & Position
  - Routes
  - Schedules

- **Control Priority with:**
  - Active Revenue Route
  - Behind Schedule
  - Passengers
  - Designated Routes
  - Off-Route Checks

- **Achieve**
  - On-Time Schedules
  - Travel Time Reduction
  - Improved Ridership!

Will I get a green light

Yes

No

?

Do Nothing

Execute Priority
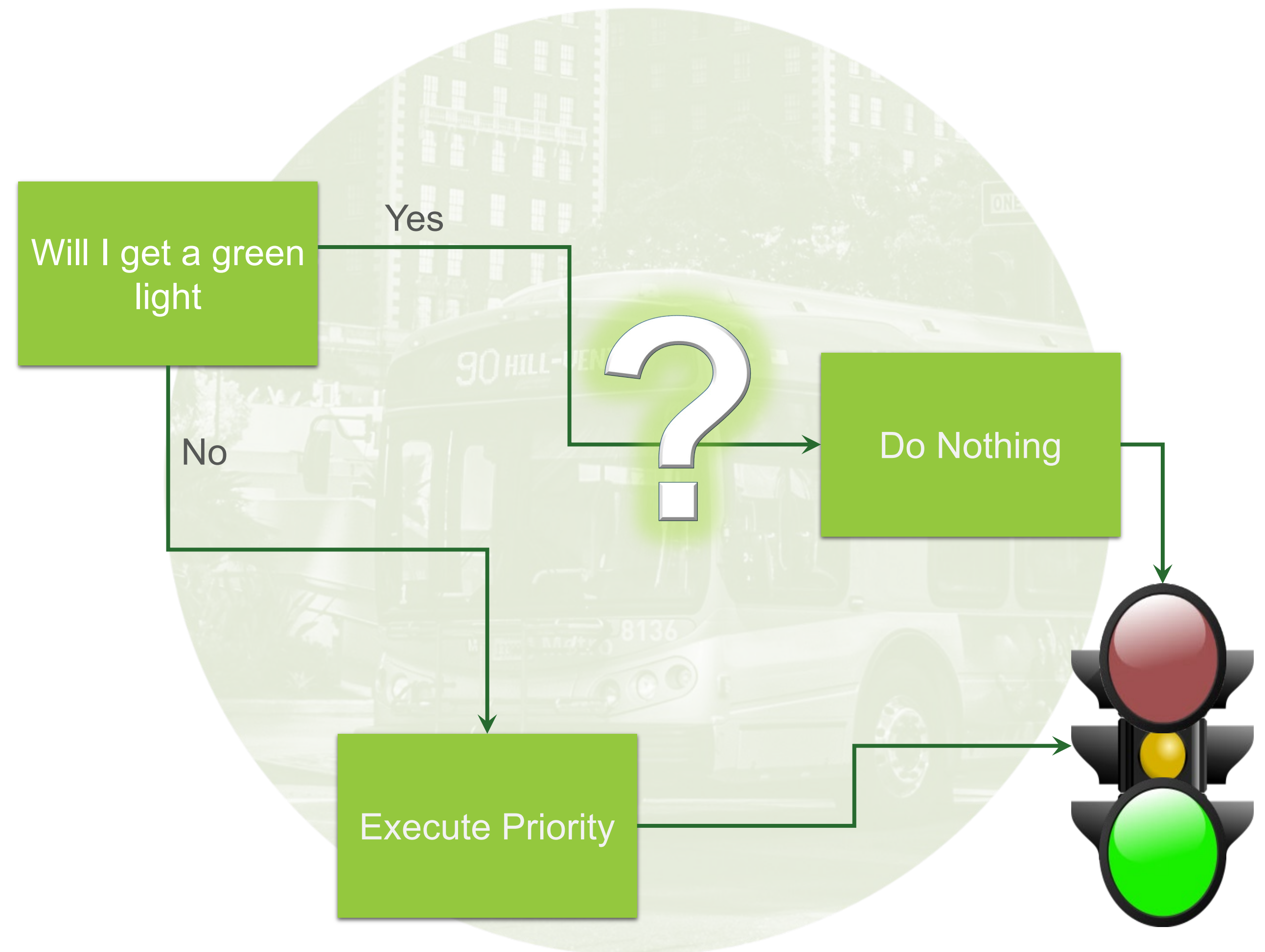
Results

- Enhanced Mobility

- Better Performance

- Improved Safety

- Greater Flexibility Across Stakeholders

- Reduction in Maintenance

- Deeper Operation Insights

TransitWay Smart Signals Test Ride
South Miami-Dade County

- Results:
  - Bus route travel time reduction from 64 to 50 minutes. (Miami)
  - 7 second reduction EV in response times (Charlotte)

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Conclusion

- Smart City Applications are here!

- The benefits are compelling
  - Maximizing use of the transportation system
  - Enhance Mobility for users
  - Meet the needs seamlessly across stakeholders (transit, fire, freight, ambulance, police, show plows, other connected vehicles…)

- The Requirements: focus on…
  - Interoperability through Standards
  - Means of integration with APIs
  - Security & Reliability
  - Leverage latest enabling technology (communications, GPS…)