

# Traffic Signal Benchmarking & State of the Practice Report

2018 ITS Carolinas Annual Meeting  
Charlotte, NC  
February 13, 2018

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FHWA Office of Operations



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# Overview

- Background
- Traffic Signal Programs
  - Goals, Context, Objectives, Strategies, Tactics (GcOST)
- Traffic Signal Performance Measures
- Pulling it all Together
  - 2018 Traffic Signal Benchmarking and State of the Practice Report

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# Traffic Signals

Number of signals:  
(1/1000 capita)

U.S. (Est.)  
323,000

Value of traffic signal infrastructure assets:  
(\$265K/int)

\$85.9B

Annual operating/maintenance program cost:  
(\$3,858/int)

\$1.2B

Annual capital program cost:

\$859M



# Areas of Practice - Assessed

- Management
- Traffic Signal Operations
- Signal Timing Practices
- Traffic Monitoring & Data Collection
- Maintenance

A vertical report card titled "National Traffic Signal Report Card" with a blue background. It lists five categories with their corresponding grades: Proactive Management (F), Signal Operation in Coordinated Systems (D-), Signal Operation at Individual Intersections (C-), Detection Systems (F), and Maintenance (D+). An overall grade of D- is shown at the bottom. Red ovals highlight the Proactive Management and Detection Systems categories.

Category	Grade
Proactive Management	F
Signal Operation in Coordinated Systems	D-
Signal Operation at Individual Intersections	C-
Detection Systems	F
Maintenance	D+
<b>OVERALL</b>	<b>D-</b>

A vertical report card titled "National Traffic Signal Report Card 2007" with a blue background. It lists five categories with their corresponding grades: Management (D-), Signal Operation at Individual Intersections (C), Signal Operation in Coordinated Systems (D), Signal Timing Practices (C-), and Traffic Monitoring and Data Collection (F). An overall grade of D is shown at the bottom. Red ovals highlight the Management and Traffic Monitoring and Data Collection categories.

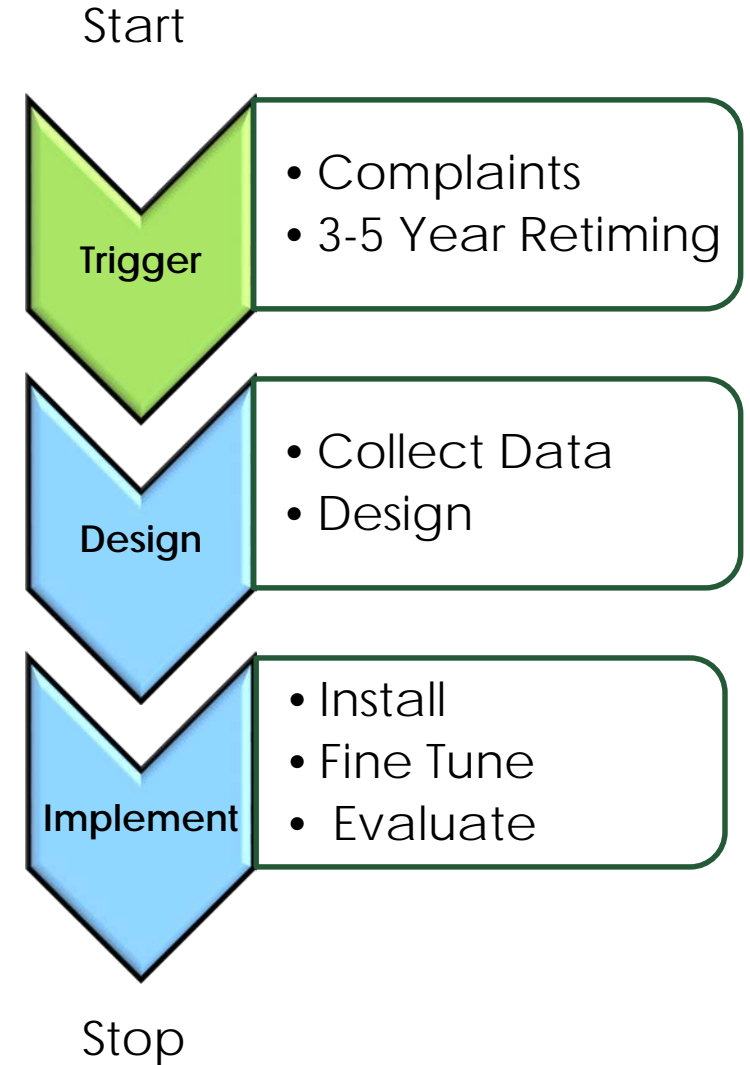
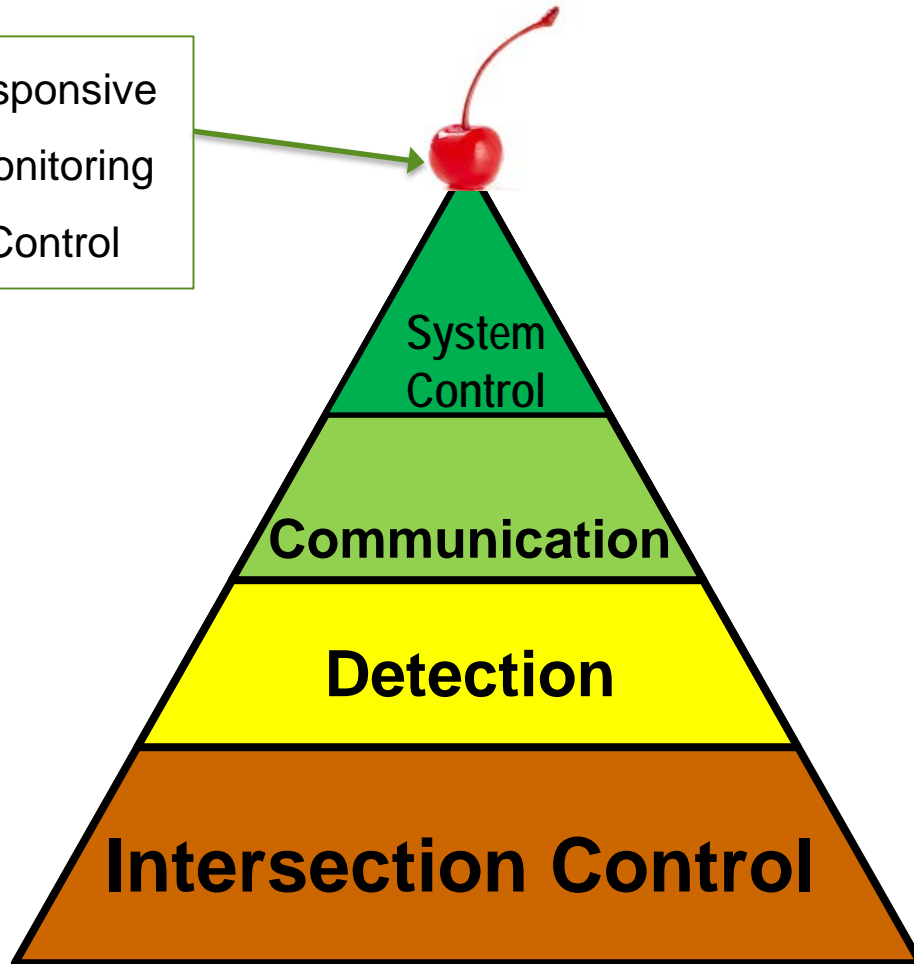
Category	Grade
Management	D-
Signal Operation at Individual Intersections	C
Signal Operation in Coordinated Systems	D
Signal Timing Practices	C-
Traffic Monitoring and Data Collection	F
Maintenance	C-
<b>OVERALL</b>	<b>D</b>

A vertical report card titled "National Traffic Signal Report Card 2012" with a green background. It lists five categories with their corresponding grades: Management (D), Traffic Signal Operations (C), Signal Timing Practices (C), Traffic Monitoring and Data Collection (F), and Maintenance (C). An overall grade of D+ is shown at the bottom. Red ovals highlight the Management and Traffic Monitoring and Data Collection categories.

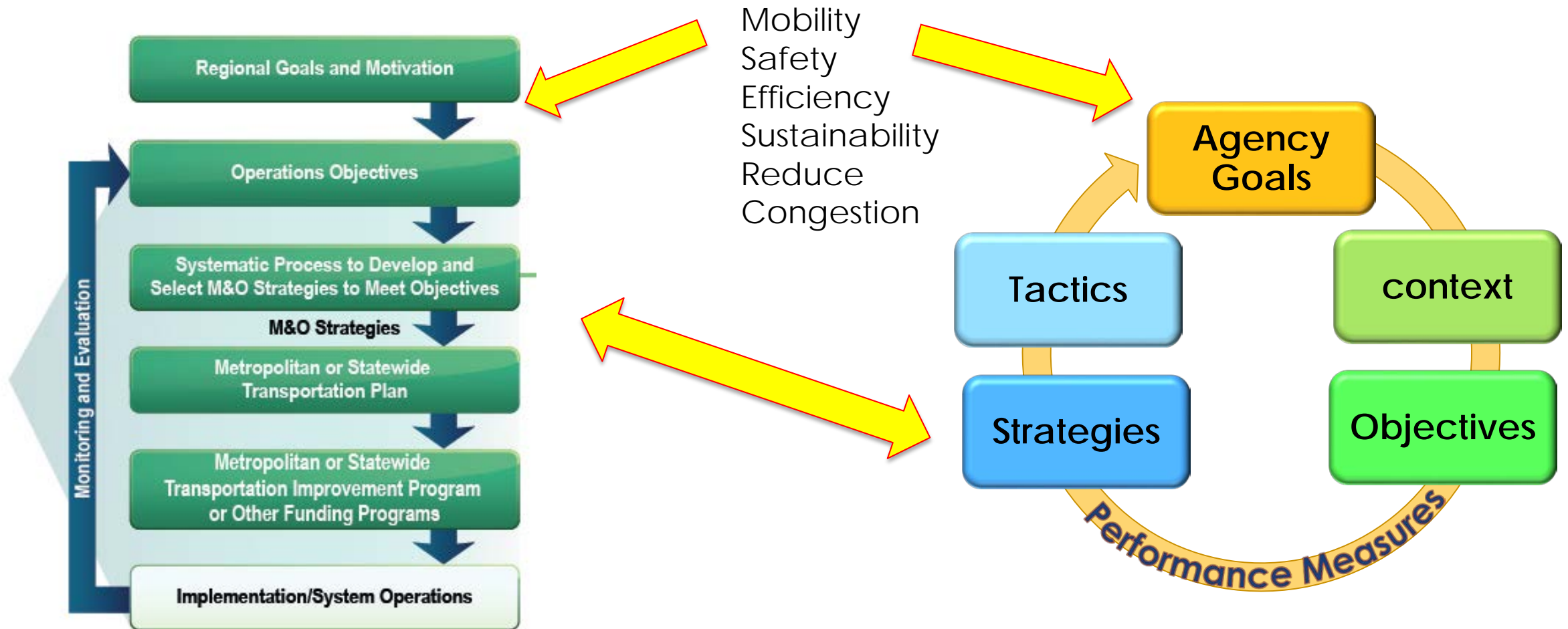
Category	Grade
Management	D
Traffic Signal Operations	C
Signal Timing Practices	C
Traffic Monitoring and Data Collection	F
Maintenance	C
<b>OVERALL</b>	<b>D+</b>

# Assumptions

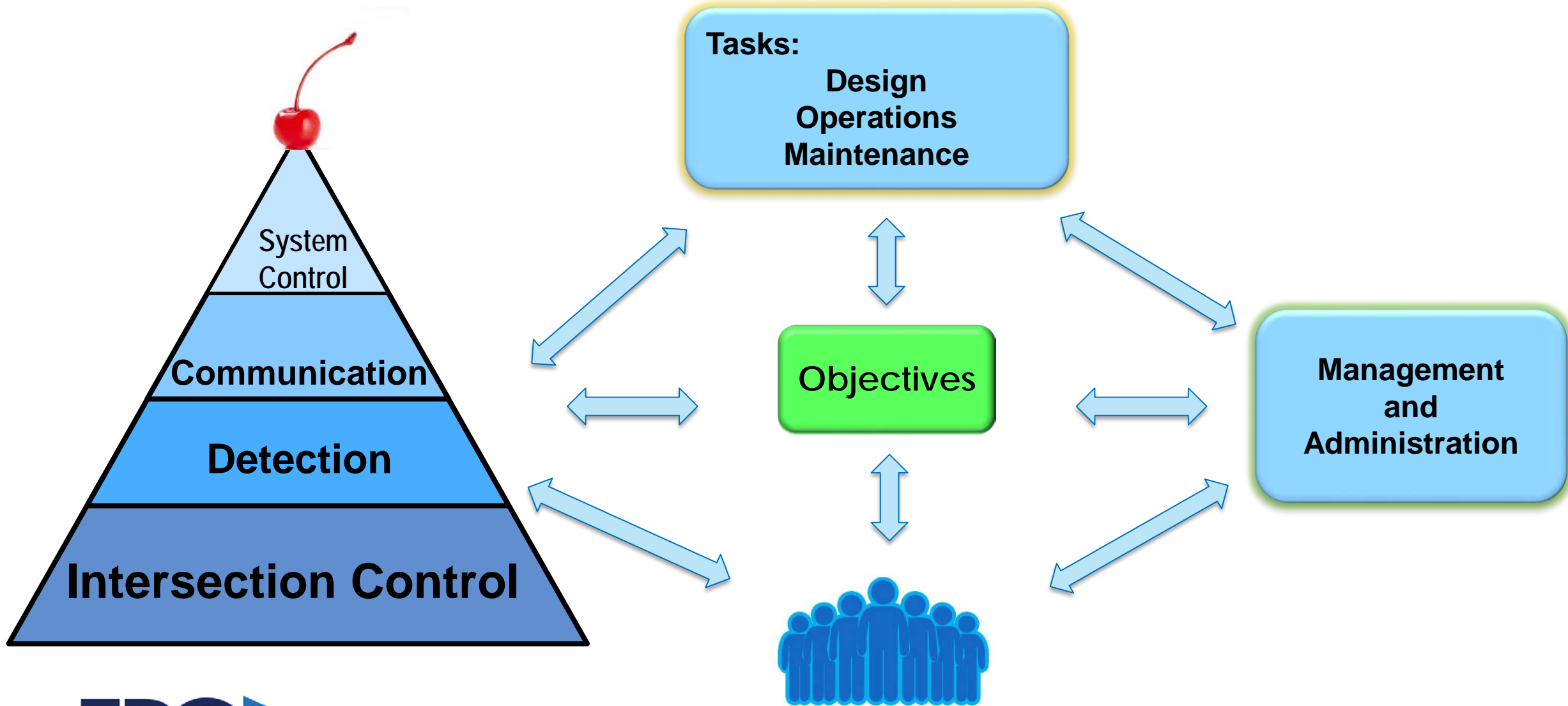
- Traffic Responsive
- Central Monitoring
- Adaptive Control



# Planning and Funding Operations



# Traffic Signal Program



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# Traffic Signal Benchmarking and State of the Practice Report

## Benchmarking

### Systems and Technology

- Infrastructure & Systems

## Organizational

Capability Maturity 5min  
Assessment

## Business Processes

- Design / Ops / Maintenance

## Organization and Staffing

## Management and Administration



# Survey

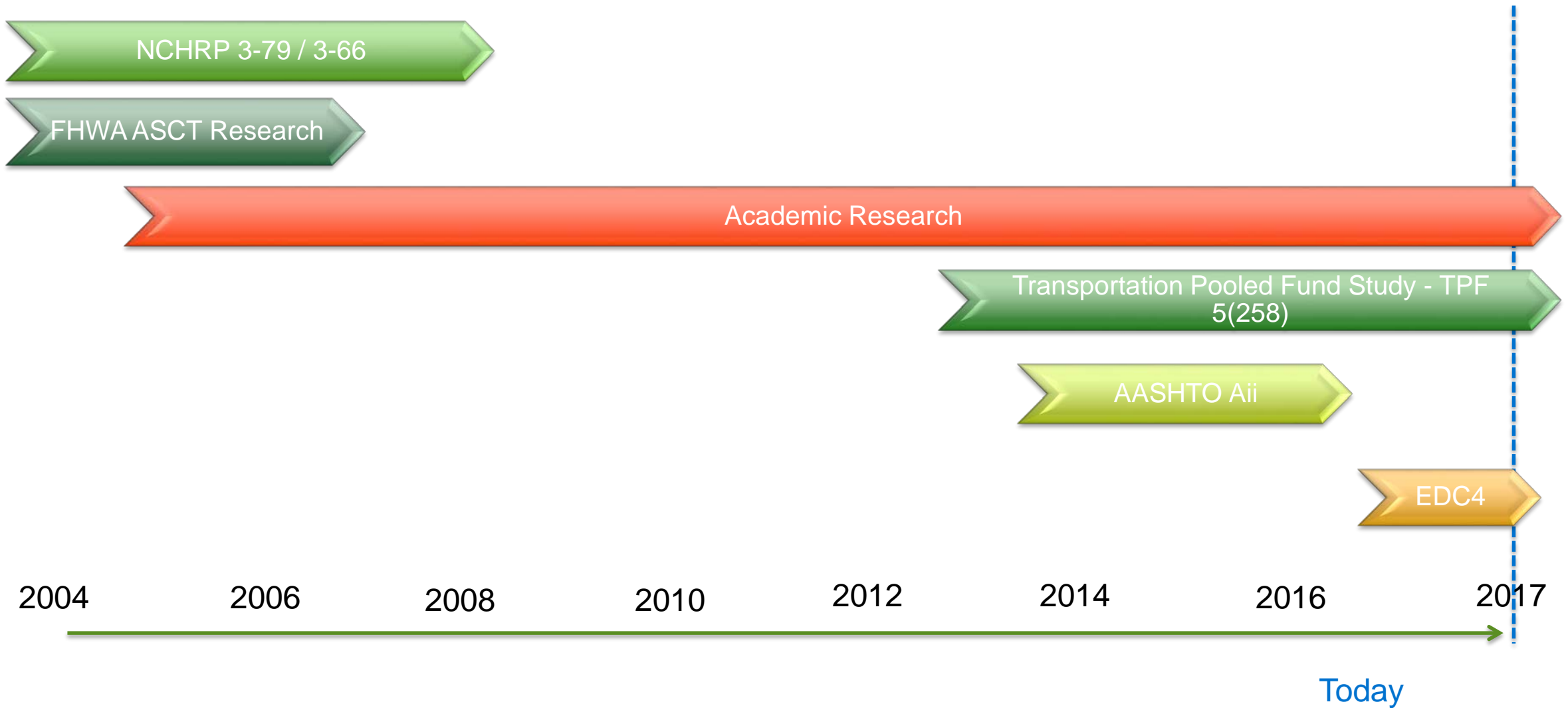


<http://www.ite.org/tsbenchmarking>

# Performance Measures



# Advancing Implementation of ATSPMs



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# What is “*Every Day Counts*”(EDC)?

**State-based** model to identify and rapidly deploy proven but underutilized innovations to:

- ✓ shorten the project delivery process
- ✓ enhance roadway safety
- ✓ reduce congestion
- ✓ improve environmental sustainability

- EDC Rounds: two year cycles
- Initiating 4<sup>th</sup> Round (2017-2018) - 11 innovations
- To date: 3 Rounds, 35 innovations

*FAST Act, Sec.1444*



## Automated Traffic Signal Performance Measures

A suite of performance measures, High Resolution Data collection tools, and data analysis tools to support an objectives and performance based approach to managing a traffic signal program.

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# Data Collection and Analysis Tools

- High Resolution Data Collection
  - Equipped Traffic Signal Controllers
- Supplemental Processors
- SDLC Bus Monitoring
- Monitoring of Cabinet Input and Output File
- UDOT ATSPMs Open Source Software
- Live Traffic Data
- Miovision
- Trafficware
- Intelight
- Econolite
- EDI
- Other solutions

## Performance Measures

### Yellow and Red Actuations

**Split Failures**

**Green Occ Ratio**

**Red Occ Ratio**

**% Arrivals on Red**

**% Arrivals on Green**

**Purdue Coordination Diagram**

**Queue Length**

**Detector Failures**

**Communication Failures**

# GcOST Framework

## Goals

**Mobility**

**Good State of Repair**

**Quality Customer Service**

**Fiscal Responsibility**

## Performance Measures

**Yellow and Red Actuations**

**Split Failures**

**Green Occ Ratio**

**Red Occ Ratio**

**% Arrivals on Red**

**% Arrivals on Green**

**Purdue Coordination Diagram**

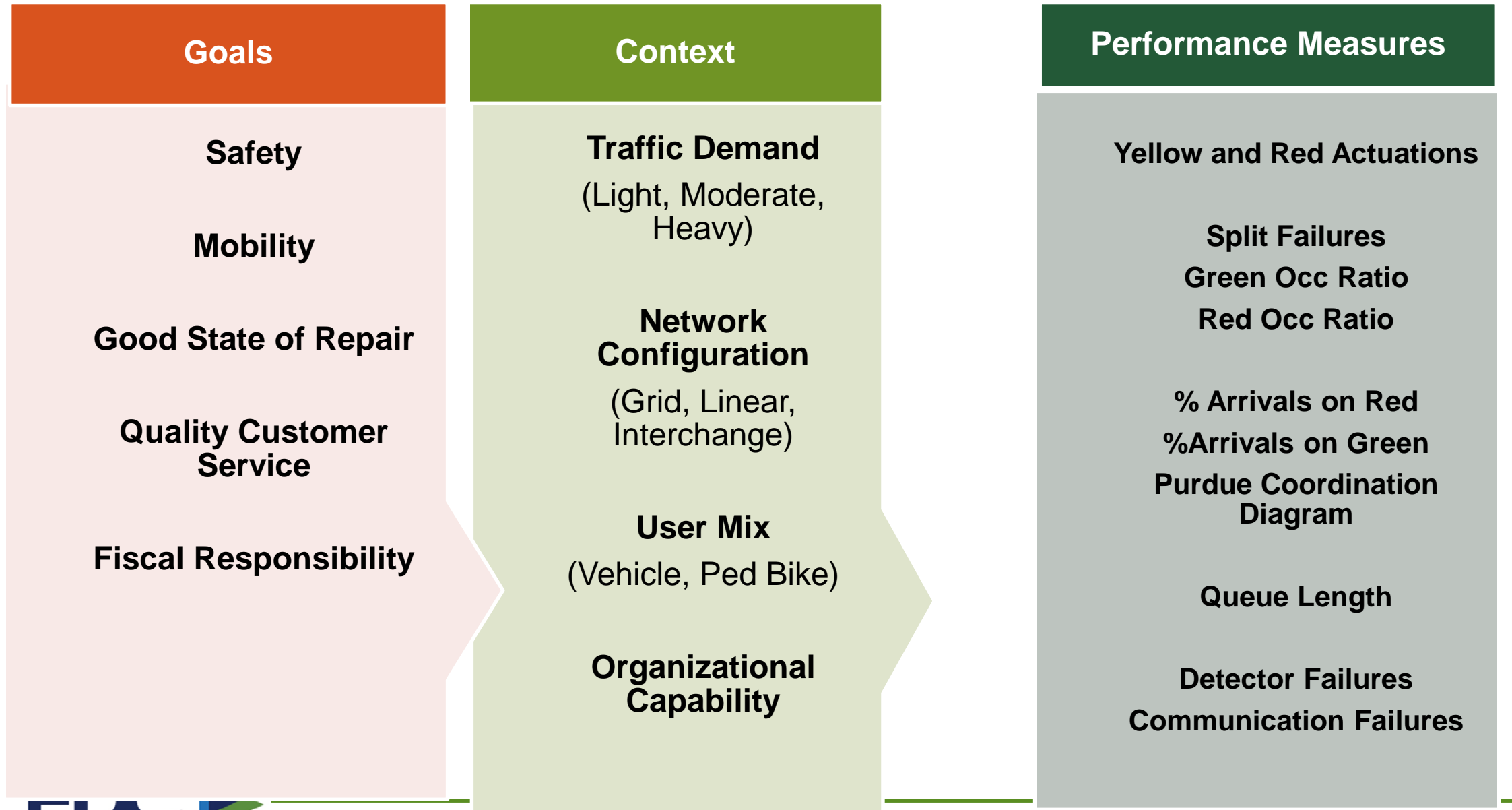
**Queue Length**

**Detector Failures**

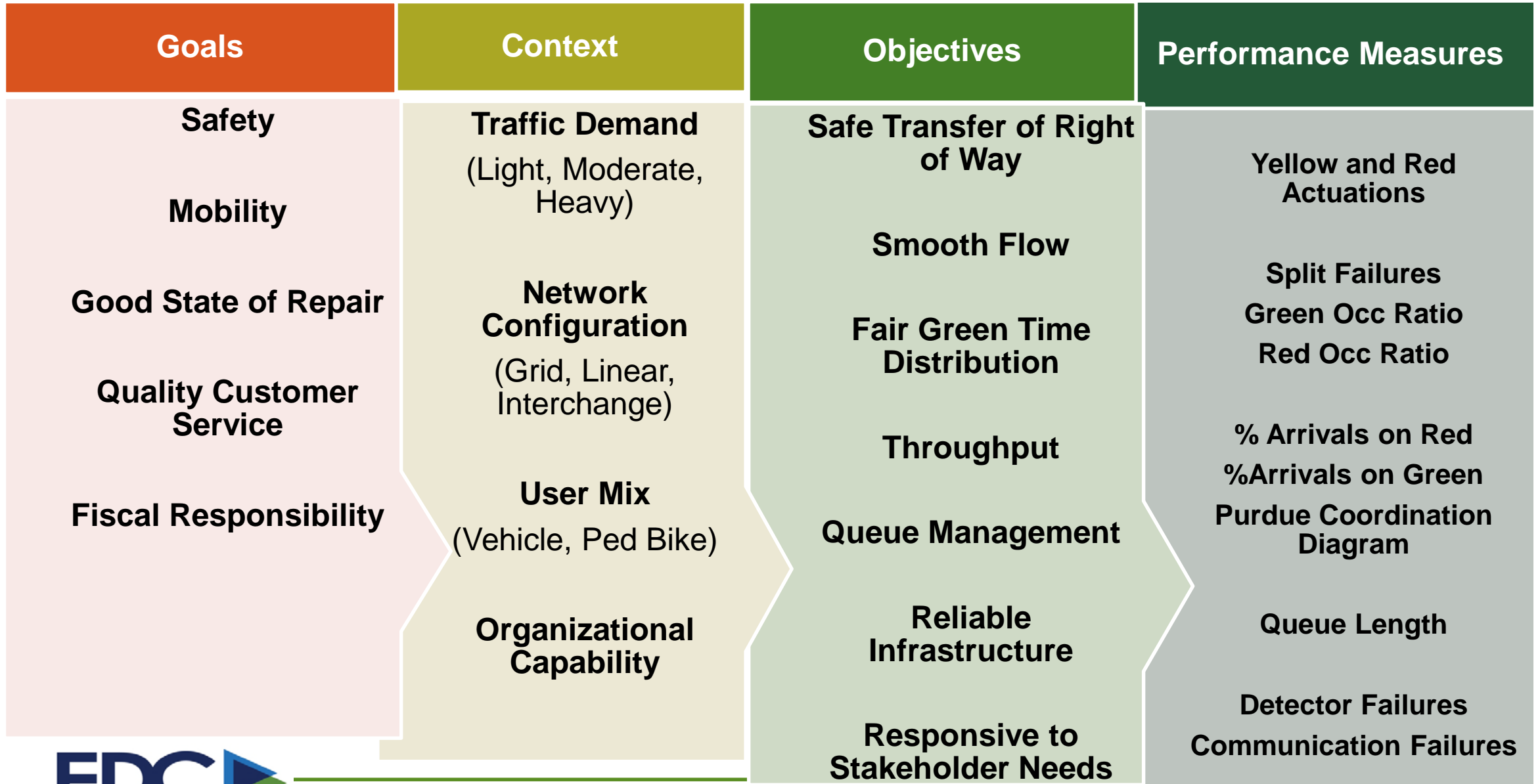
**Communication Failures**



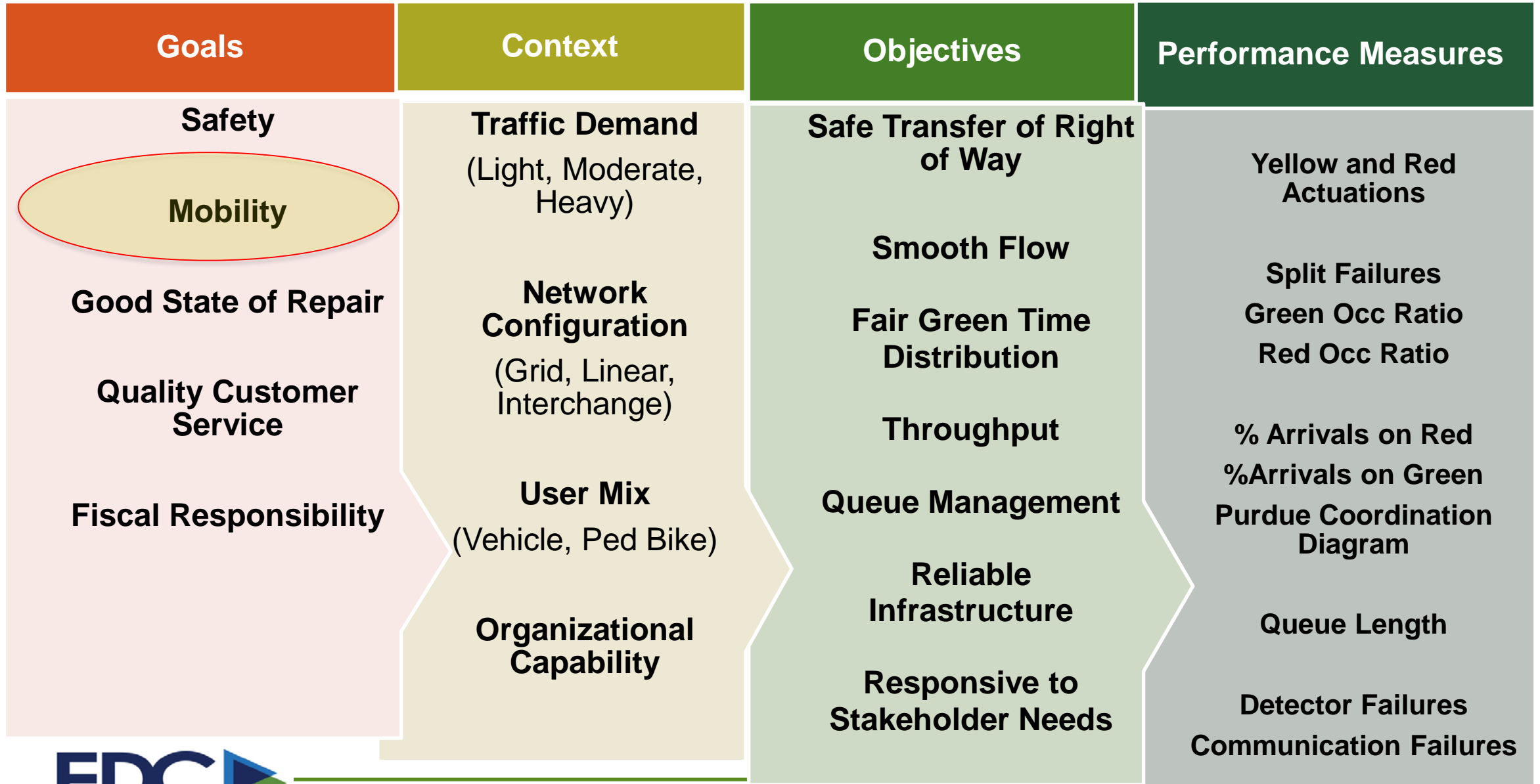
# GcOST Framework



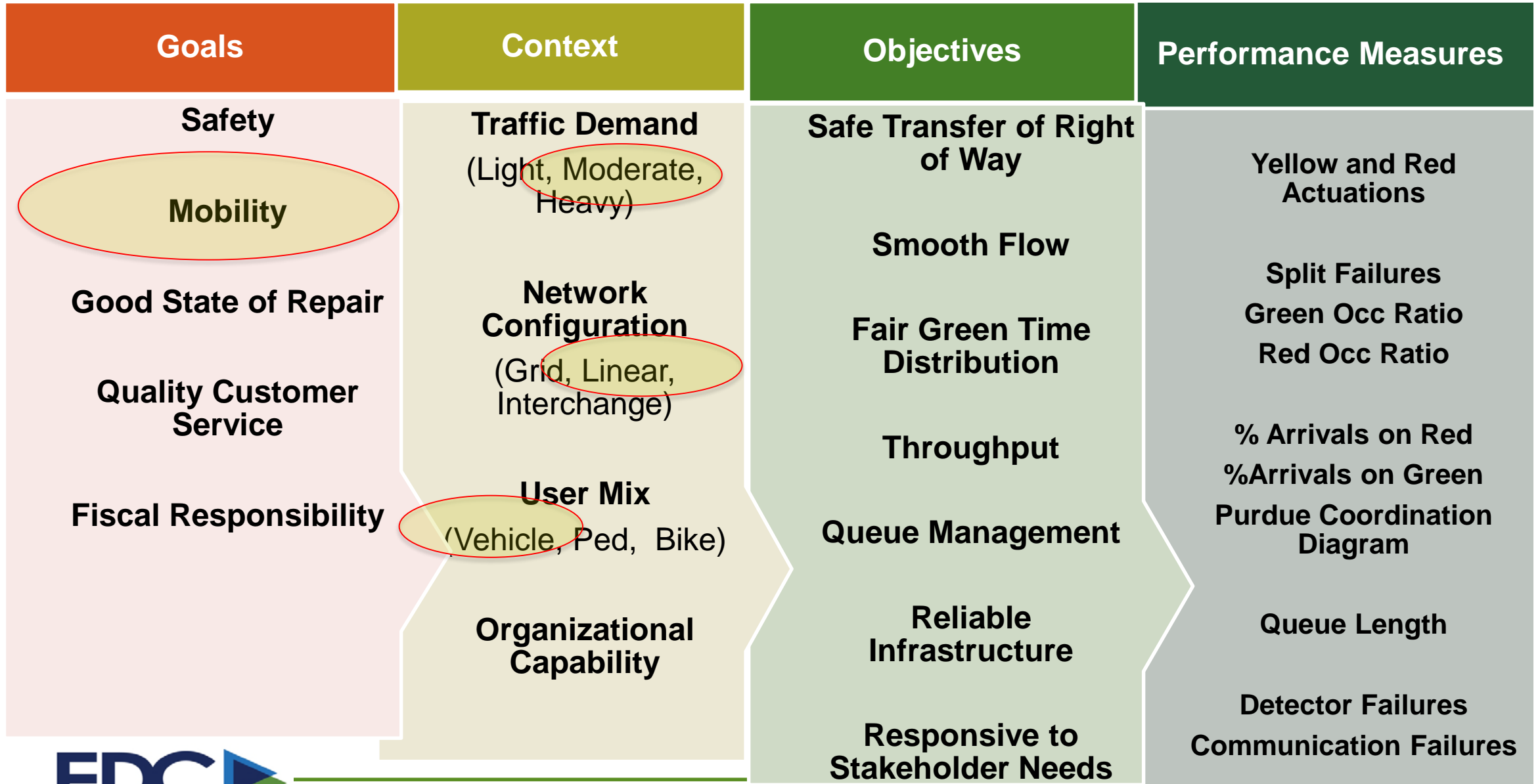
# GcOST Framework



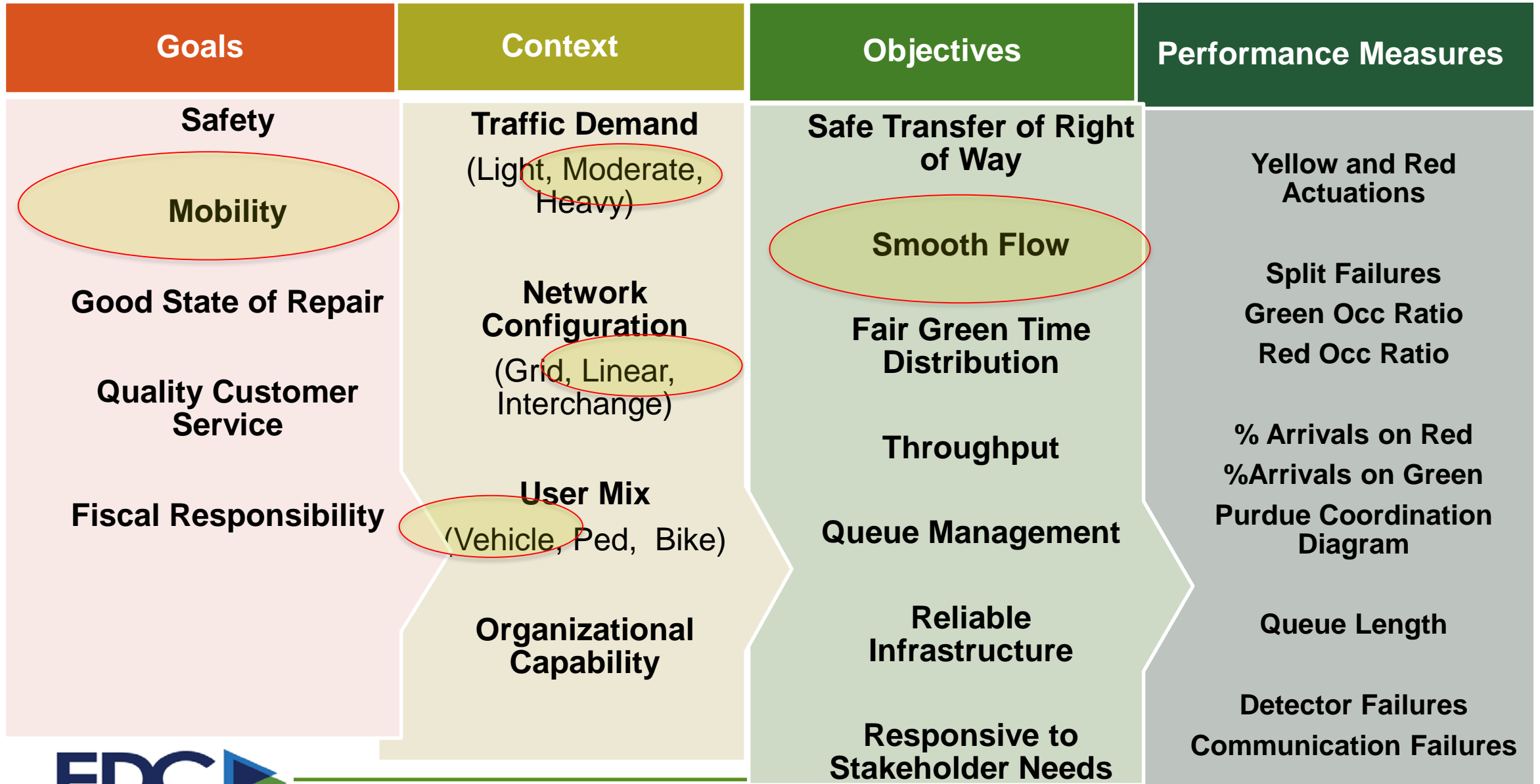
# GcOST Framework



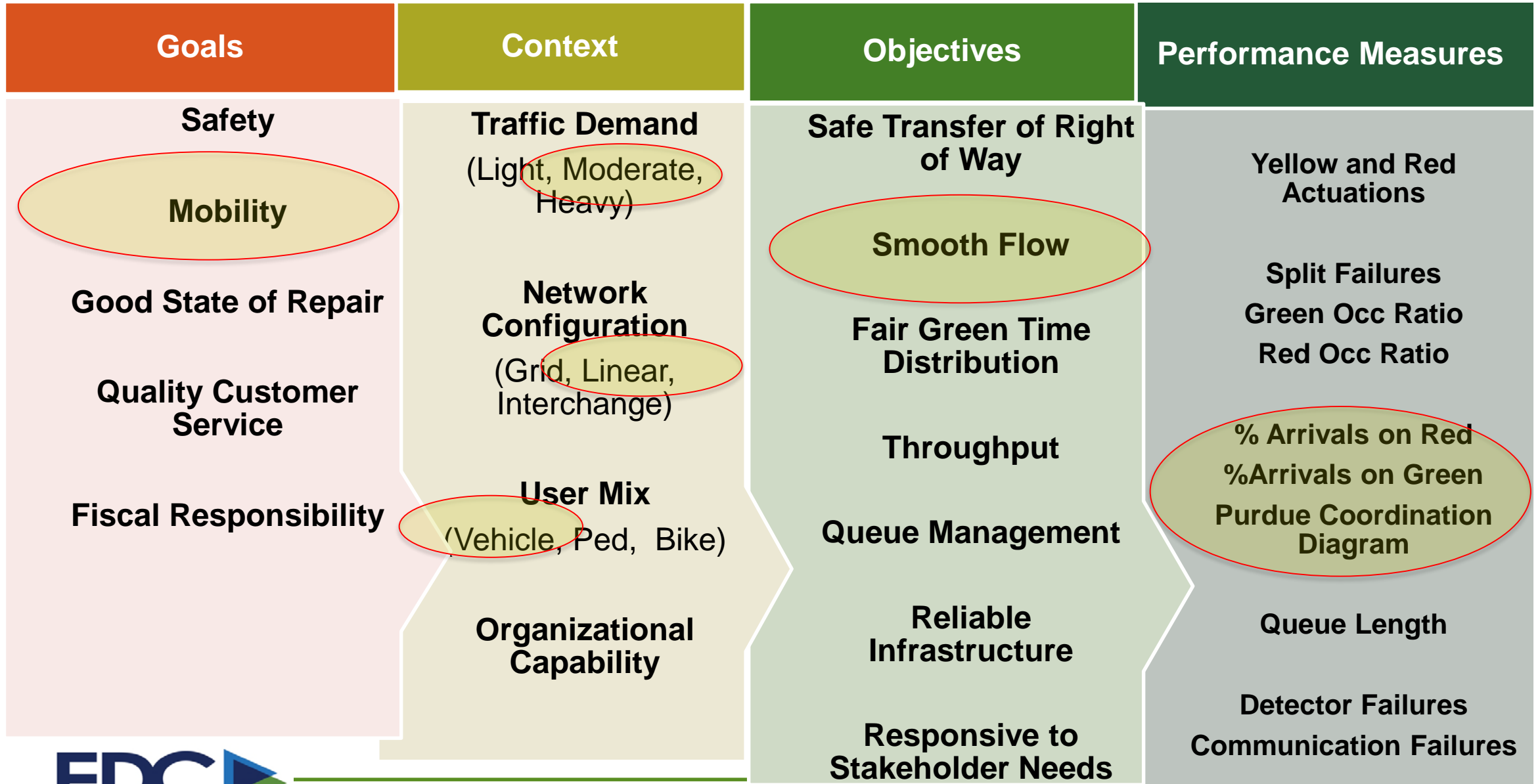
# GcOST Framework



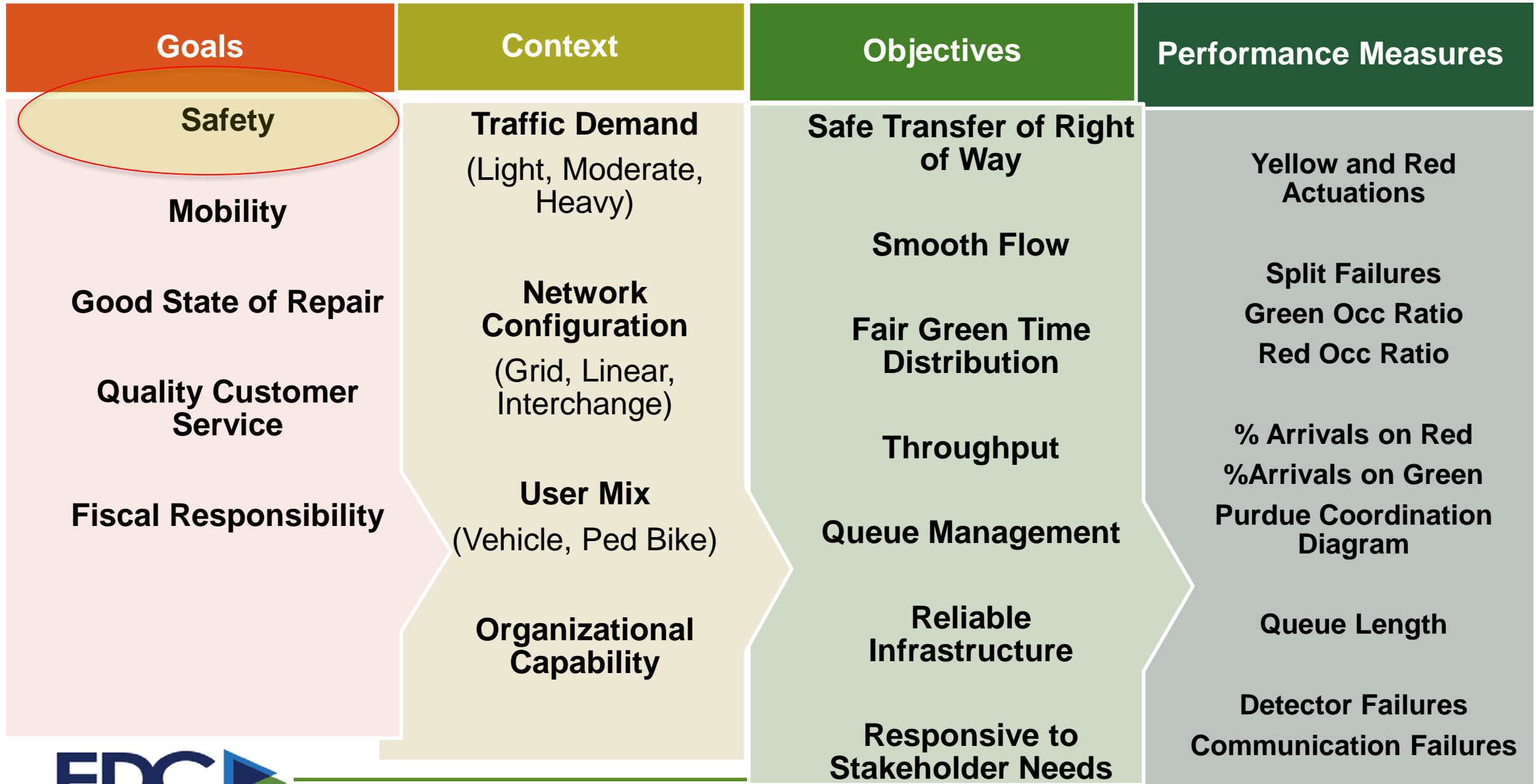
# GcOST Framework



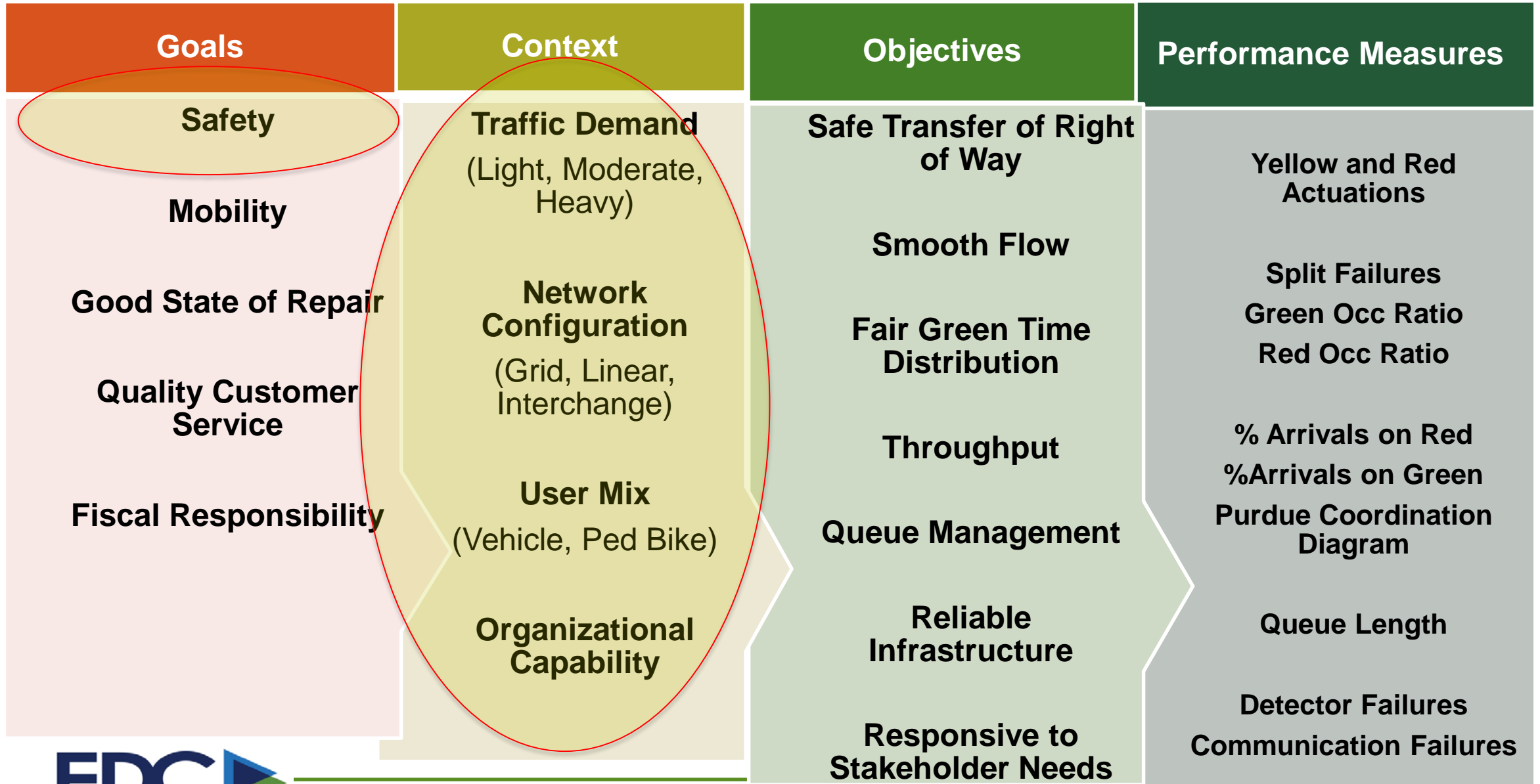
# GcOST Framework



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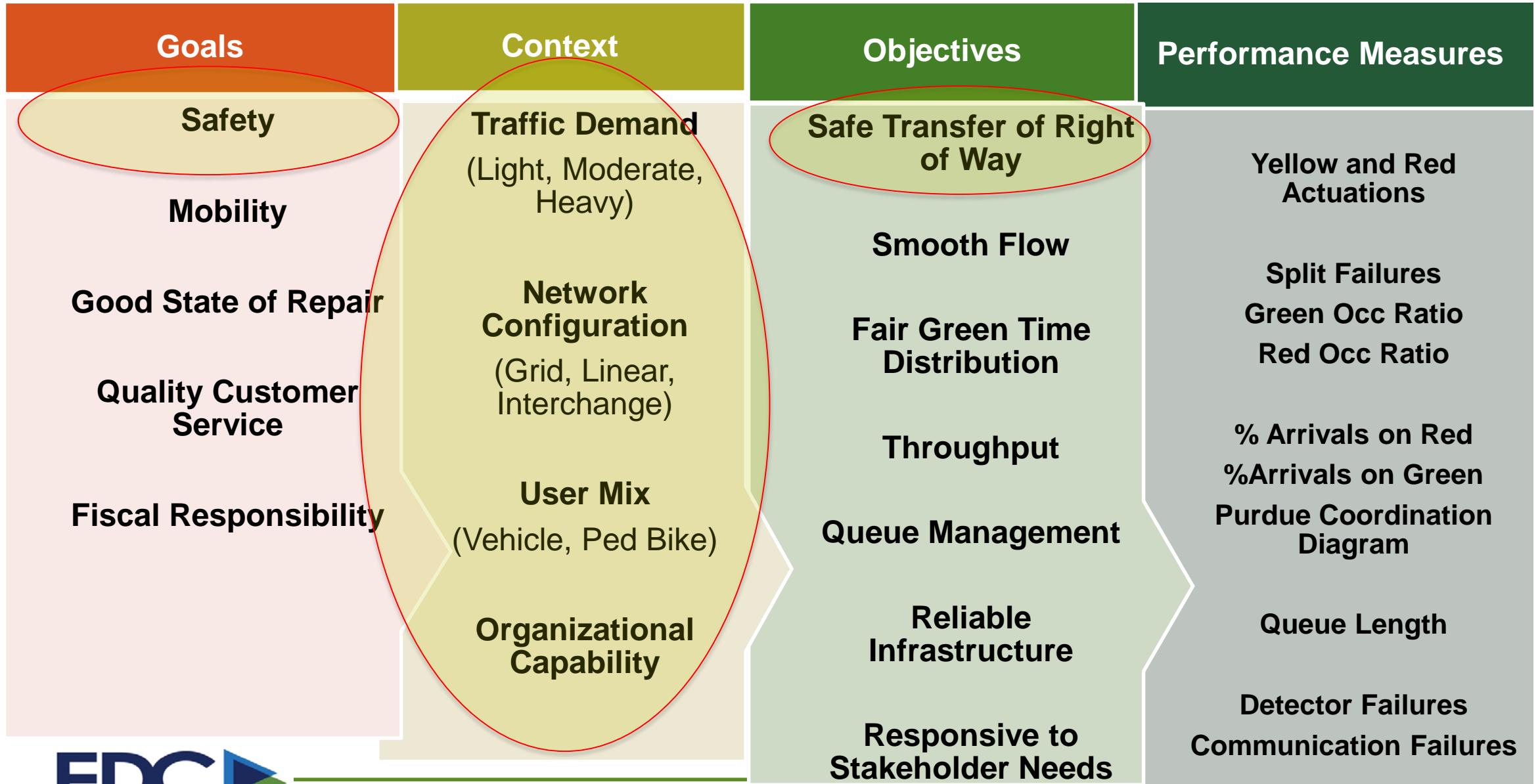


# GcOST Framework

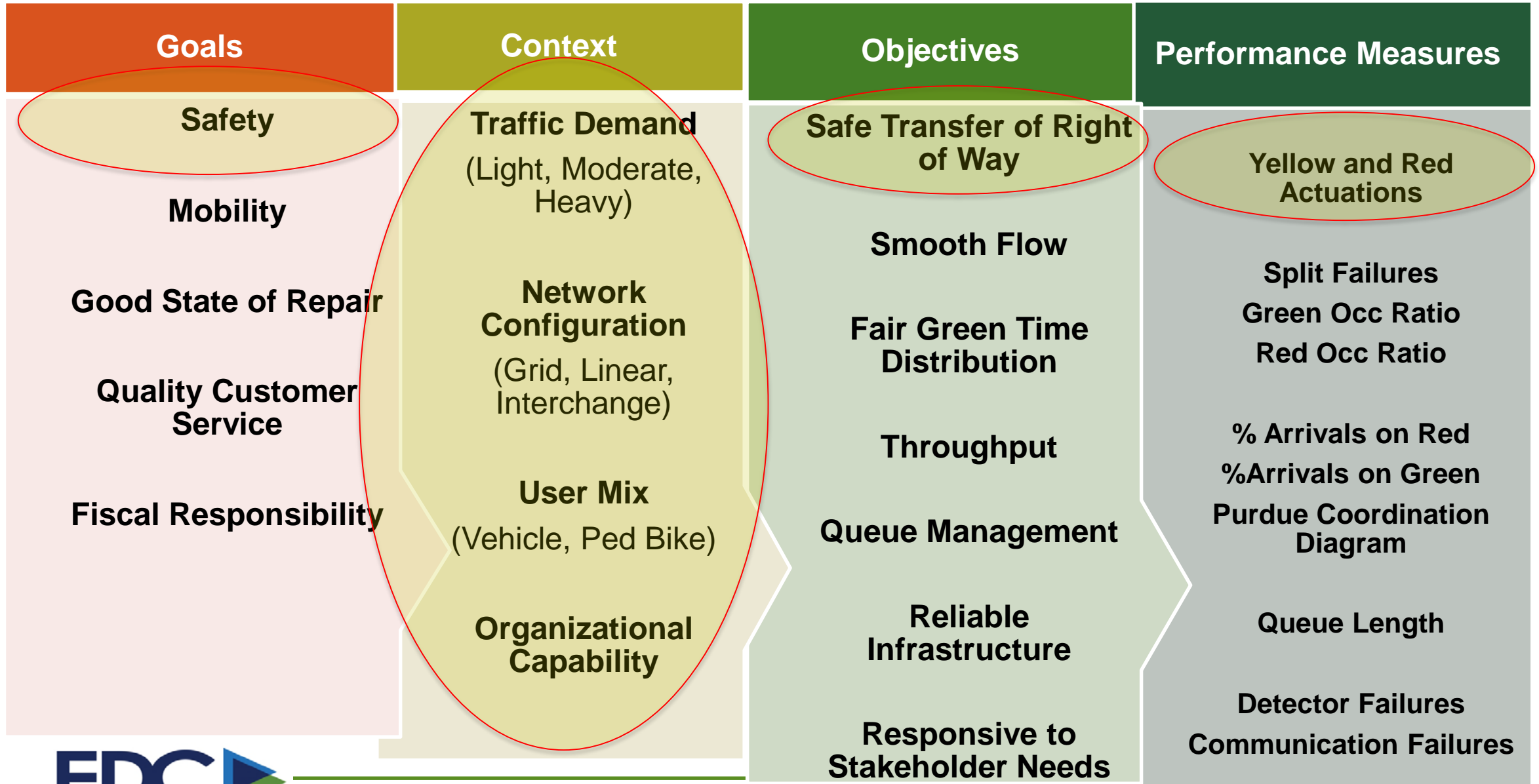




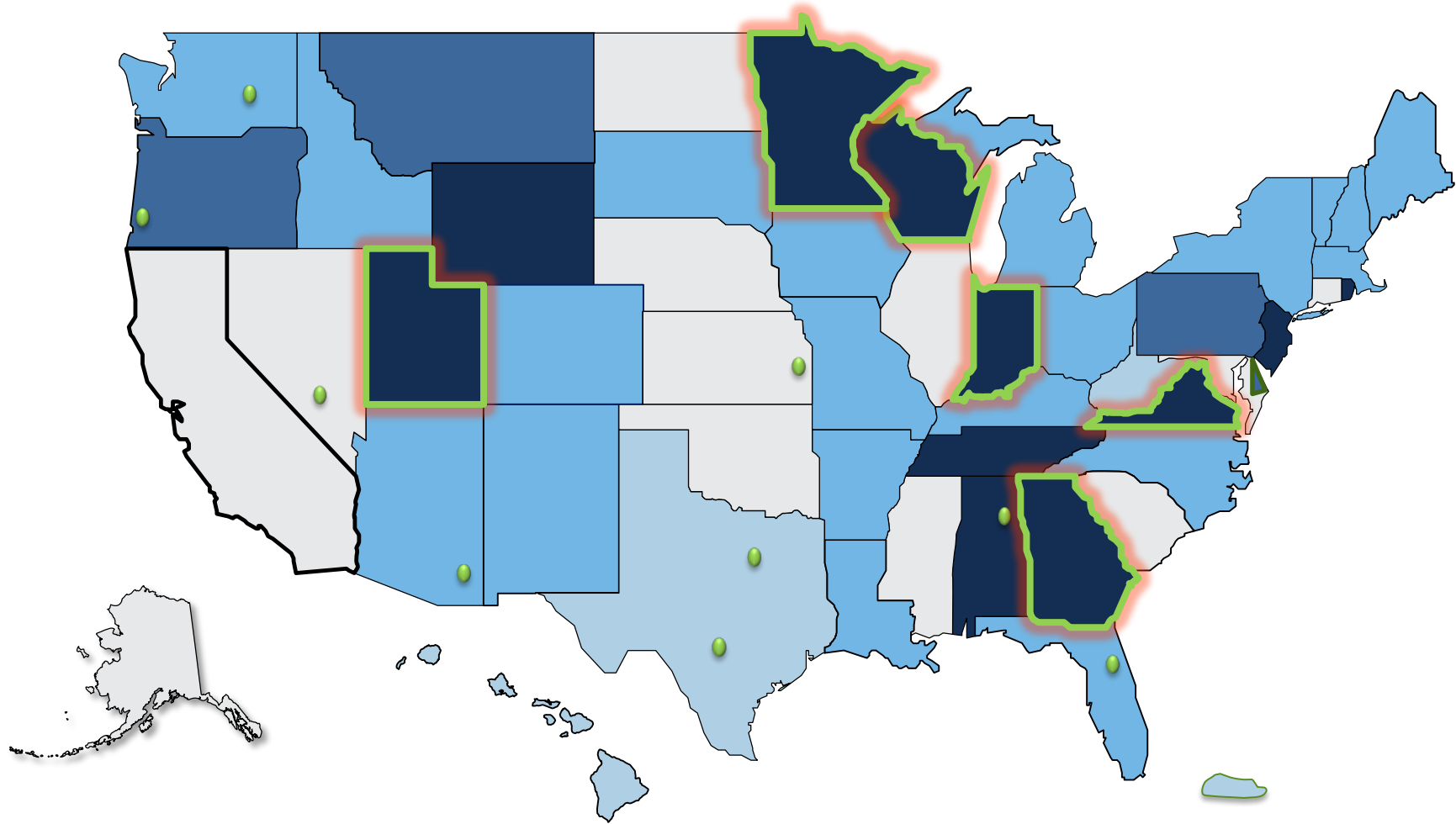
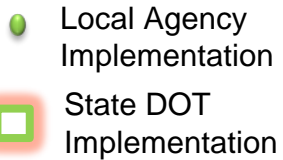
# GcOST Framework



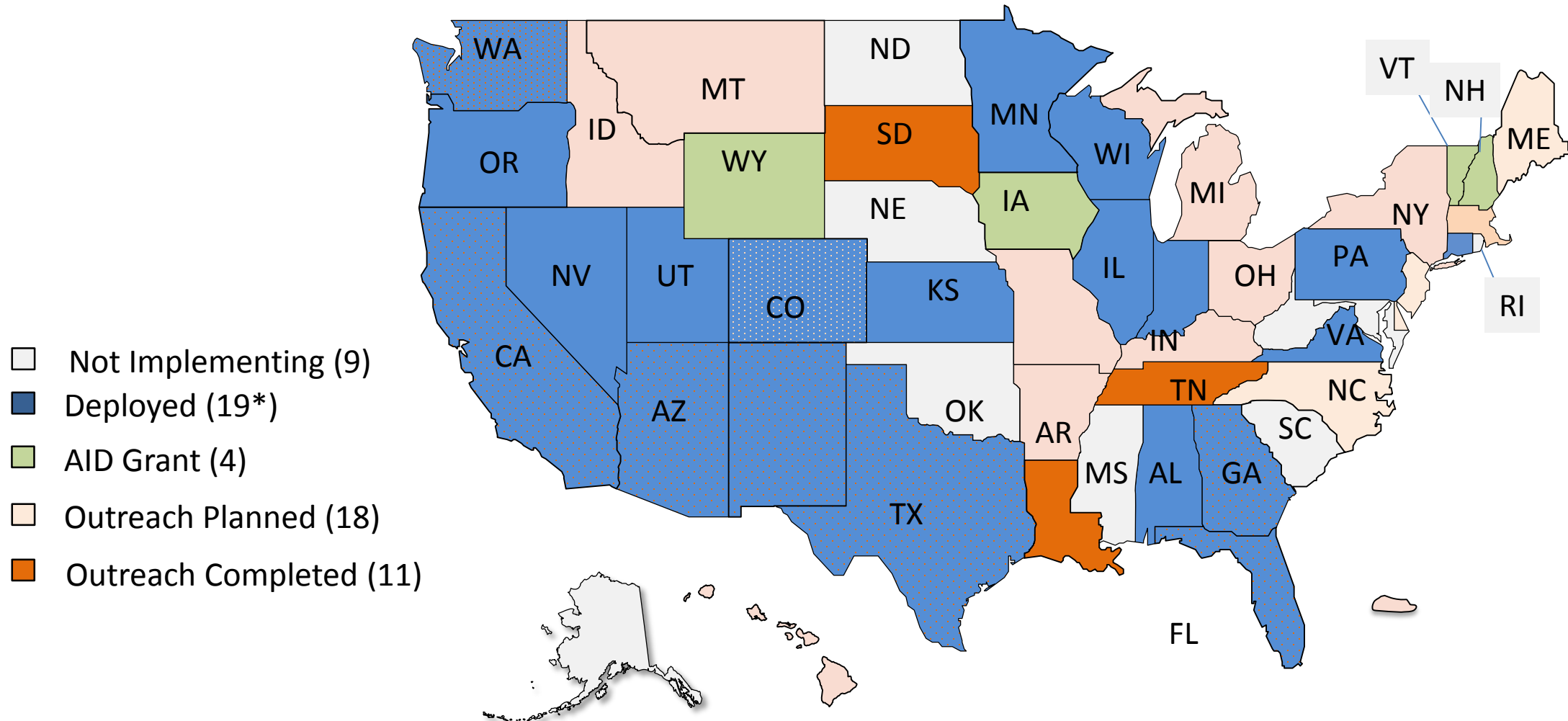
# GcOST Framework



# EDC-4 Implementation Goals



# EDC-4 ATSPM Implementation, AID and Outreach Summary



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# Implementation Resources

## Workshops

- In Depth Technical Discussion
- Agency Experience
- Private Sector Solutions
- CMM

## Peer 2 Peer Support

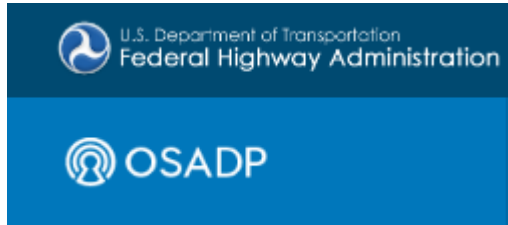
- Share Knowledge, Experience, Good Practices

## Technical Assistance

- OSADP / Configuration
- National Operations Center of Excellence
- Consultants

**START BY CONTACTING YOUR LOCAL FHWA DIVISION OFFICE**

# FHWA Open Source Application Development Portal



<https://www.itsforge.net/>



## Automated Traffic Signal Performance Measures (ATSPM) 4.0.1

Published: 2017-04-20 00:00:00

Downloads: 237

STABLE

Categories

Overview

Description

Release Notes

Documentation

Discussion

Similar Applications

The the most current version of Automated Traffic Signal Performance Measures (ATSPM) and all future versions are now available on GitHub:

<https://github.com/udotdevelopment/ATSPM>

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# Upcoming Events

## Bi-Monthly Webinar Series

Next Topic: Funding Local Agency Traffic Signal Programs

February 22<sup>nd</sup> 1:00 – 2:30pm EDT

<https://collaboration.fhwa.dot.gov/dot/fhwa/WC/Lists/Seminars/DispForm.aspx?ID=1618>

## Monthly Webinar

ATSPM Open Source Software Developer & User Forum

3<sup>rd</sup> Monday of Each Month\*

Next: Feb 26<sup>th</sup> 11:00 – 12:30 EDT

<https://connectdot.connectsolutions.com/atspm/>

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# EDC-4 Funding Opportunities:

- ❑ ***Accelerated Innovation Deployment (AID) Demonstration***
  - ✓ \*New\* Notice of Funding Opportunity (NOFO) under FAST Act > GOAL: \$10million per year [23 U.S.C. 503(c)(2)(B)]
  
- ❑ ***State Transportation Innovation Council (STIC) Incentive***
  - ✓ Up to \$100,000 per STIC per year [*under AID*]
  
- ❑ ***Increased Federal-share for Project-level Innovation***
  - ✓ Increase federal share of the total project cost [23 U.S.C. 120(c)(3)]
  
- ❑ ***Advanced Transportation and Congestion Management Technologies***
  - ✓ FAST Act § 6004; 23 U.S.C. 503(c)(4)
  
- ❑ ***Federal Aid Program***
  - Surface Transportation Program / Congestion Mitigation and Air Quality*

*FAST Act, Sec.1444 & 6003*





# Questions?



U.S. Department of Transportation  
Federal Highway Administration

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The unexamined traffic signal is not worth operating.

~ Curtis