The slide features a dark blue background with a light blue grid pattern. At the top, there is a horizontal banner with a blurred image of traffic lights and the text "NATIONAL TRANSPORTATION OPERATIONS COALITION" and the "NTOC" logo. The main title "NTOC: Performance Management" is centered in large white font. Below it, the subtitle "Program Management for Traffic Signals Systems" and "Professional Development Series" are centered in smaller white font, followed by the date "January 18, 2012". At the bottom, the speaker's name "Gary B. Thomas" and title "Research Engineer" are centered in white font.

NATIONAL TRANSPORTATION OPERATIONS COALITION  
NTOC

# NTOC: Performance Management

Program Management for  
Traffic Signals Systems  
Professional Development Series  
January 18, 2012

Gary B. Thomas  
Research Engineer

## Seminar Information

- Target Audience:
  - Directors of traffic engineering, traffic operators
  - Practitioners responsible for day-to-day operation of signal systems
  - Decision makers responsible for budgeting decisions regarding signal systems

## Your Instructor

- Gary Thomas
  - Research Engineer, Texas Transportation Institute (College Station, Texas)
  - Certified instructor for the National Highway Institute
  - Fellow at the Institute of Transportation Engineers

## Learning Outcomes

1. Identify the elements of a performance management system and describe the benefits that can be gained from using one
2. Explain how a performance management system can be applied to traffic signal operations
3. Identify measures and supporting data sources for traffic signal management and operations
4. Explain ways to integrate performance measures into the agency processes

## What is Performance Management

- Goals are being met
- Effective and efficiently
- Focus can be broad or narrow
- Can be a product, service, process, etc.

*Learning Outcome #1*

## What is Performance Measurement

The process whereby an organization establishes the parameters within which programs, investments, and acquisitions are reaching the desired results.

Simple: A way to quantify how well a transportation system is working.

FHWA: The use of statistical evidence to determine progress toward specific defined organizational objectives.

*Learning Outcome #1*

## Roadblocks

- Lack of clear guidelines
- Lack of documented objectives and standards
- Funding geared towards projects, not O&M
- Governance structure
- Proprietary nature of existing systems
- Tort liability
- Equipment issues

*Learning Outcome #1*

## Why use a Performance Management System

- Legislative mandates
- Planning processes
- Quality initiatives
- Congestion management systems and evaluation
- ITS operations and evaluations
- Safety management systems

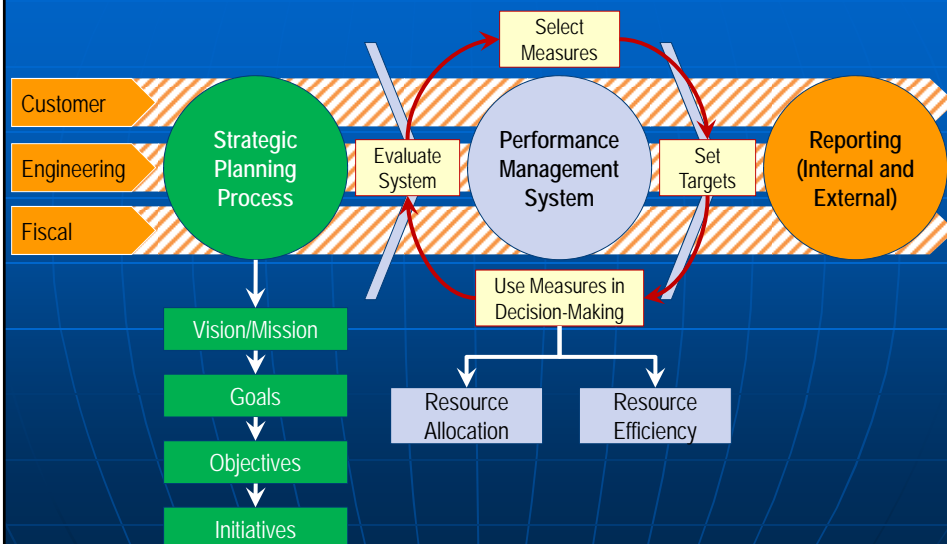
*Learning Outcome #1*

## Benefits

- Agency leaders set a strategic agenda and motivate staff
- Agency managers improve business processes
- Improve accountability to funding grantors and external stakeholders
- Better customer service
- Develop tools to predict future performance
- Transform public images and reduces risk

Learning Outcome #1

## Performance Management Structure



Learning Outcome #1

From NCHRP Report 660

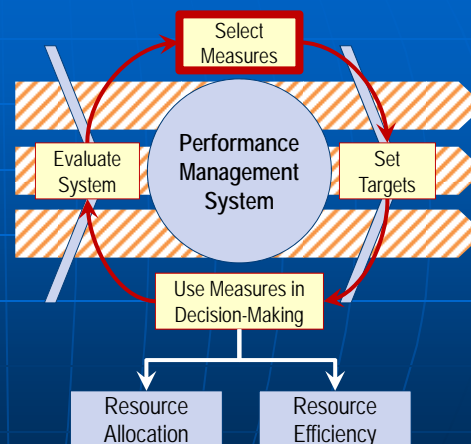
## Selecting Measures

- Strategic plan is the guiding document
- Measures are specific enough to address objectives
- Measures are relevant
- Measures can be tracked incrementally
- Consistency in measurement and evaluation
- Desire to improve measures over time

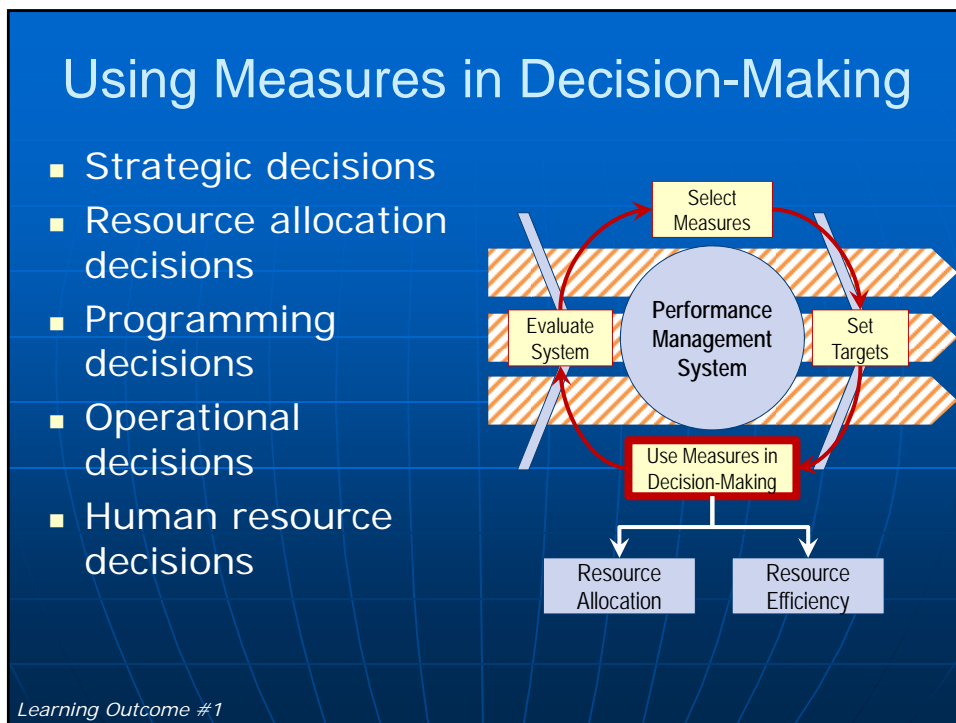
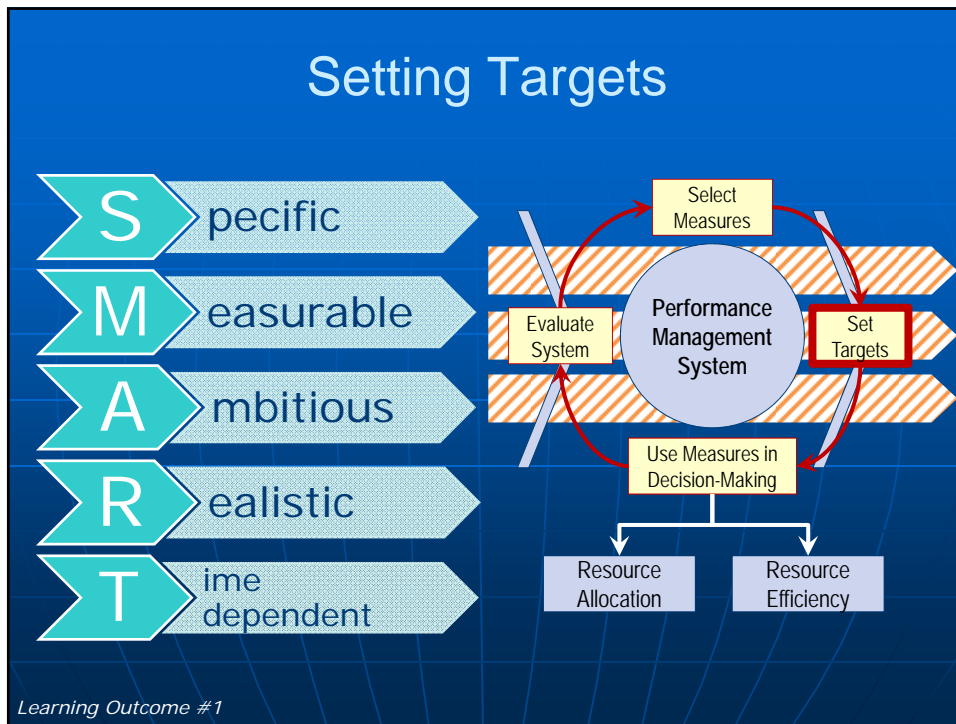
Learning Outcome #1

## Selecting Measures

- Convene stakeholders
- Identify data currently being collected
- Identify data not currently being collected
- Assess equipment needs to collect data

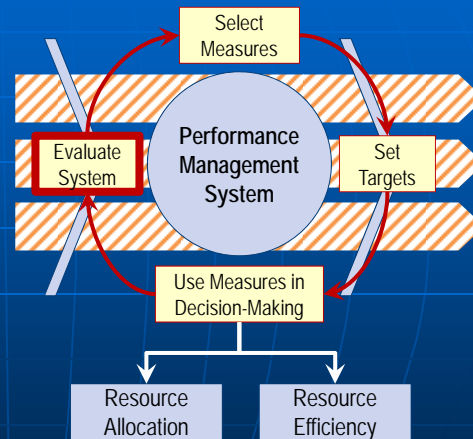


Learning Outcome #1



## Evaluating the System

- Regularly updated
- Technological advances
- Feedback from employees
- Regular O&M



*Learning Outcome #1*

## TRAFFIC SIGNAL MANAGEMENT PLANS

## Traffic Signal System Performance

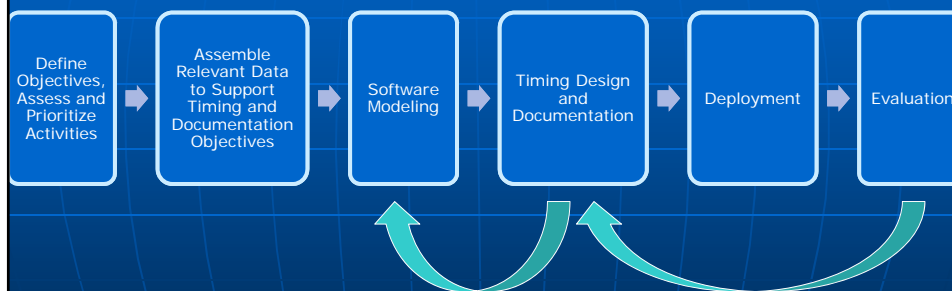
- Improper timing accounts for 5-10% of all delay (295 million vehicle-hours)
- Average peak-period traveler delayed 38 hours by congestion

### Sources:

- Temporary Losses of Highway Capacity and Impacts on Performance: Phase 2
- 2007 Urban Mobility Report

*Learning Outcome #1*

## Typical Signal Operations



*Adapted from Outcome-oriented Performance Measures for Management of Signalized Arterial Capacity, Day et al.*

*Learning Outcome #2*

*From TRR 2192*

## National Report Card

- *Traffic Monitoring and Data Collection* received an "F"
- Greatest potential for improvement
- 43% reported "little to no" regular, ongoing program for collecting and analyzing traffic data for signal timing
- Half of agencies do not assess the quality of data collected

Source: National Traffic Signal Report Card, 2007

Learning Outcome #2

## Principles

Attainable  
performance  
evaluation

Standards of  
Performance

Resource  
requirements

Clear  
Objectives

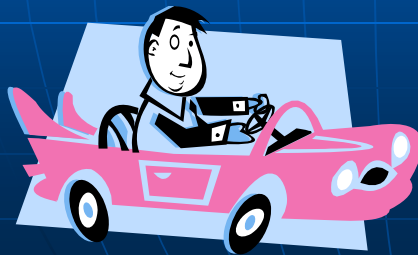
Clear and consistent communication

Systems engineering in thought and deed

Learning Outcome #2

## Customer Expectation

*I want to drive to my destination at my desired speed with the minimum of attention. Or at least I want to be treated fairly and predictably so that I can plan my day with the minimum of uncertainty.*



Learning Outcome #2

## Agency Objective

*We will do our best to avoid making drivers stop, and when we must make them stop, we will delay them as little as possible, within the context of safe operation.*



Learning Outcome #2

TTI Photo

## Objectives

What are some of your objectives?

*Learning Outcome #2*

## Setting Performance Measures

1. Must be linked to the objective(s)
2. Must be "SMART"

Signal  
Systems

Agency  
Objective

Performance  
Measure

Systems  
Engineering

User Need

Functional  
Requirement

*Learning Outcome #2*

## Example

Performance Measure	S	M	A	R	T
Reduce travel time					
Reduce travel time for normal traffic conditions	☑				
Reduce travel time by 25% for normal traffic conditions	☑	☑	☑		
Reduce travel time by 1% for normal traffic conditions	☑	☑		☑	
Reduce travel time by 3% for normal traffic conditions when signals are retimed	☑	☑	☑	☑	☑

*Learning Outcome #2*

## What Do We Need to Measure

- Reduce travel time by 3% for normal traffic conditions when signals are retimed
- Travel time

*Learning Outcome #2*

## How Do We Measure

- Manually collected data
- Automatically collected data
- Simulated data
- Observation

*Learning Outcome #3*

## What Resources Do We Need

- People?
  - Manual collection of license plates and time stamps
  - Employees driving routes
- Equipment?
  - Automated collection of license plates and time stamps
  - Probe vehicle(s) instrumented with GPS
  - Bluetooth readers at key intersections

*Learning Outcome #3*

Method	Advantages	Disadvantage
Manually collected		
Automatically collected		
Simulated data		
Observation		

*Learning Outcome #3*

## Manual Data Sources

- Test runs
- Citizen complaints
- Traffic studies
- Trouble calls

*Learning Outcome #3*

## Automated Data Sources

- Loop detectors
- Video detectors
- Traffic signal controllers
- Probe vehicles
- Bluetooth technologies
- Connected vehicles (in the future)

*Learning Outcome #3*

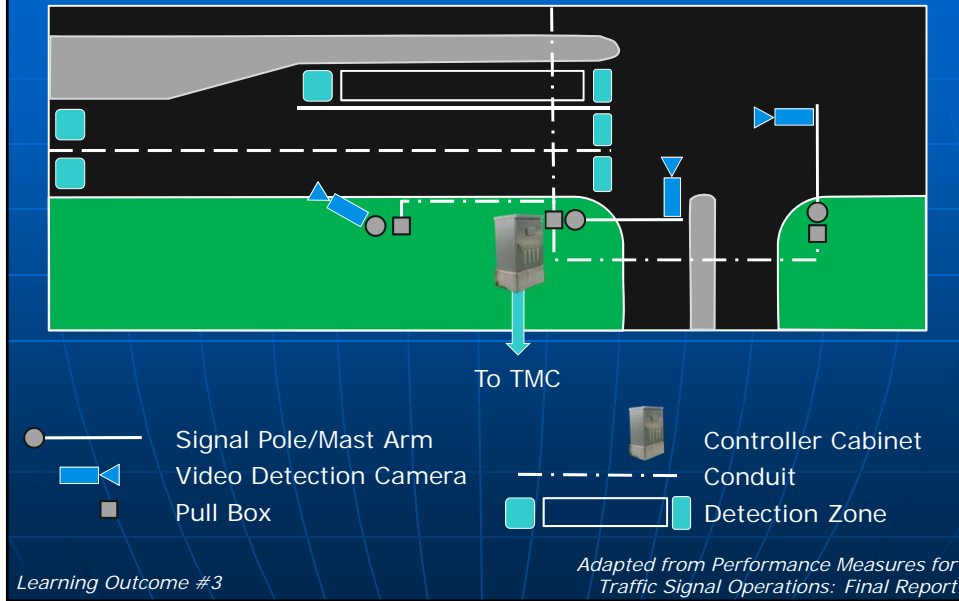
## Collecting v/c Ratios

- Arizona research project
- Used existing video detection
- Additional equipment required
- Collected v/c ratios cycle-by-cycle

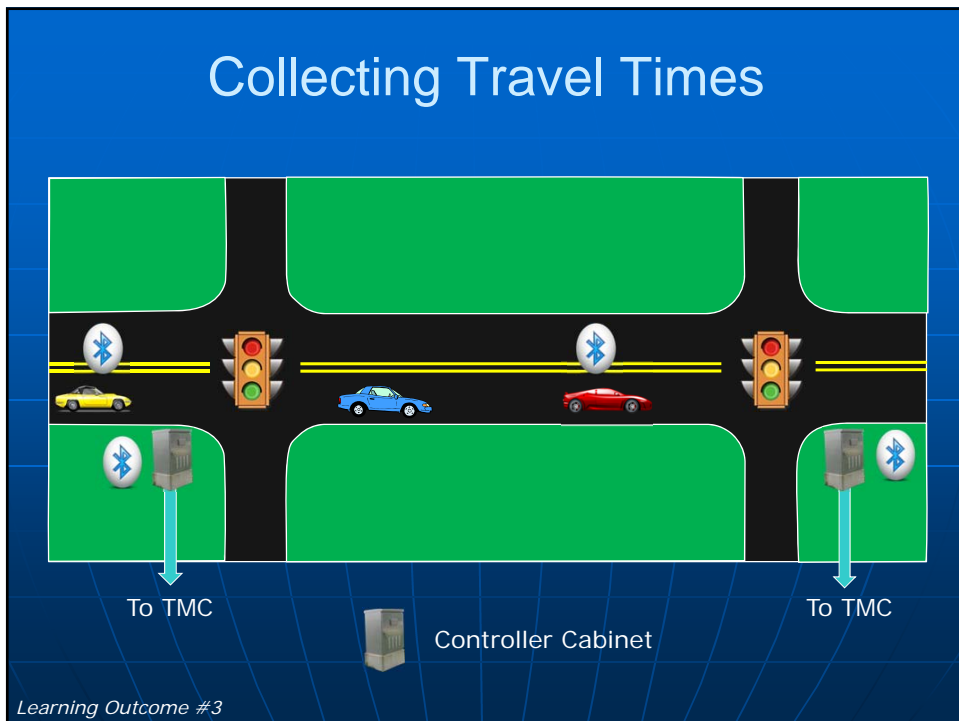
For more info see TRR 2192: *Supplementing Signalized Intersection Infrastructure to Provide Automated Performance Measures with Existing Video Detection Equipment*, Smaglik et al.

*Learning Outcome #3*

## Collecting Queue Lengths



## Collecting Travel Times



## Factors for Success

- Focusing on the challenges
- Include managers and employees
- Expand over time
- Focus on customer needs
- Ensure the program is not connected to an individual
- Distribute performance data

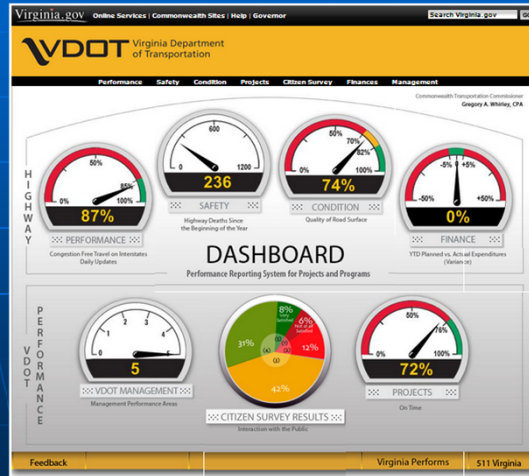
*Learning Outcome #4*

## Reporting

- Building credibility, accountability and trust
- Strengthening support for budget
- Promoting friendly competition
- Creating an expectation

*Learning Outcome #4*

# Reporting



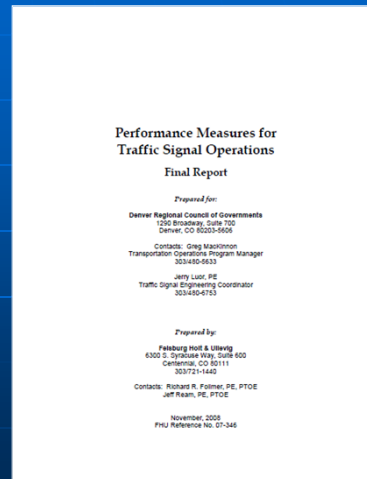
Learning Outcome #4

<http://dashboard.virginiadot.org>

## CASE STUDY

## Denver Regional Council of Governments

- 2008 Study
- Review of performance measures being recorded
- Steering committee of local agency volunteers
- Initial study will lead to pilot implementation



<http://ops.fhwa.dot.gov/publications/fhwahop09046/>

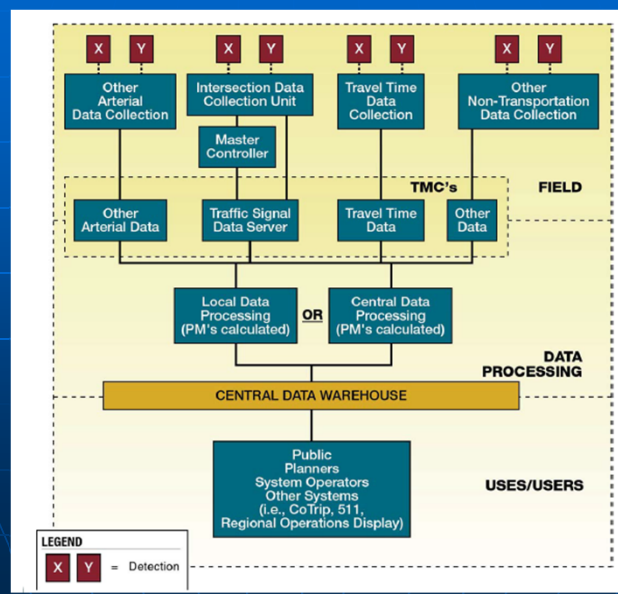
## DRCOG – Key Questions

- What types of data should be collected?
- What will be the storage approach?
- What frequency of data collection?
- How will the information be disseminated?
- What information will be provided to the public?

## DRCOG – Issues and Challenges

- Capability to store recorded data for longer periods of time
- Good communication to field devices
- Educating the public
- Possible unrealistic performance measures
- Difficulty in field-verifying problems
- Manual data collection is labor-intensive
- Manual data collection represents only a snapshot

## DRCOG – Concept of Operations



## Review of Learning Outcomes

1. Identify the elements of a performance management system and describe the benefits that can be gained from using one
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## Resources for More Information

- Transportation Research Record 2192

