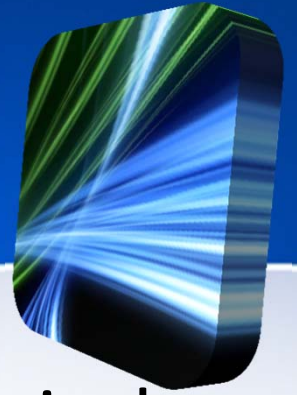


Guidelines for Virtual Transportation Management Center Development

National Rural ITS Meeting
August 27, 2014

Project Purpose - Overview



- To develop a guidebook that provides technical guidance on planning and development of a Virtual TMC
- Virtual TMC Guidebook will serve as a key resource for developing a virtual TMC, including:
 - Examples of various TMC models
 - Guidance for business planning
 - Procedures for addressing common technical, operational, and institutional issues (e.g., data needs, communications, collaboration agreements)

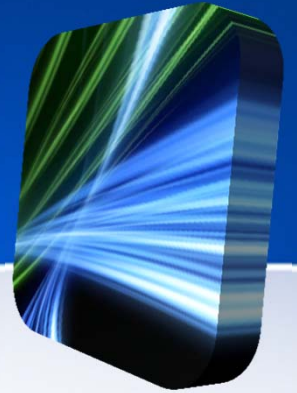
Introduction & Background



Definition of “Virtual”

- Per the Merriam-Webster’s dictionary, one definition of the word virtual is *“Being such in essence or effect though not formally recognized or admitted”*.
- Other definitions in the computing world context include:
 - *“Created, simulated, or carried on by means of a computer or computer network.”*
 - *“Performing the functions of something that really is not there”*
 - *“.....simulated by a computer system as a convenient way to manage access to shared resources”*.

Introduction and Background

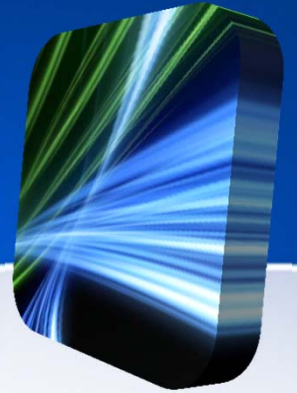


Definition of a “Virtual TMC”:

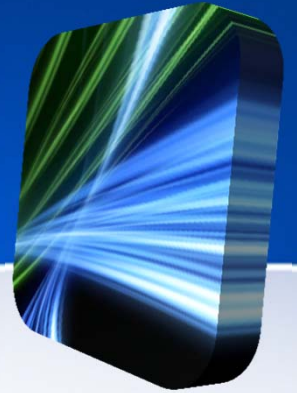
*A Virtual TMC is the function of monitoring, controlling and managing the functional elements of a transportation management system through the use of computers and computer networks **without being present at a physical nerve center or without the existence of such a physical nerve center.** This includes the functions of monitoring, collecting, processing and fusing transportation system data; disseminating transportation information to outside entities; implementing control strategies that affect changes in the transportation system; and coordinating responses to traffic situations and incidents.*

TMC Model Shift

- Less Emphasis on physical facilities (very expensive)
- More emphasis on data communications (decreasing in costs)
- More use of advanced web-based software solutions, cloud computing and Software as a Service (SaaS)
- Not constrained geographically



TMC General Definition

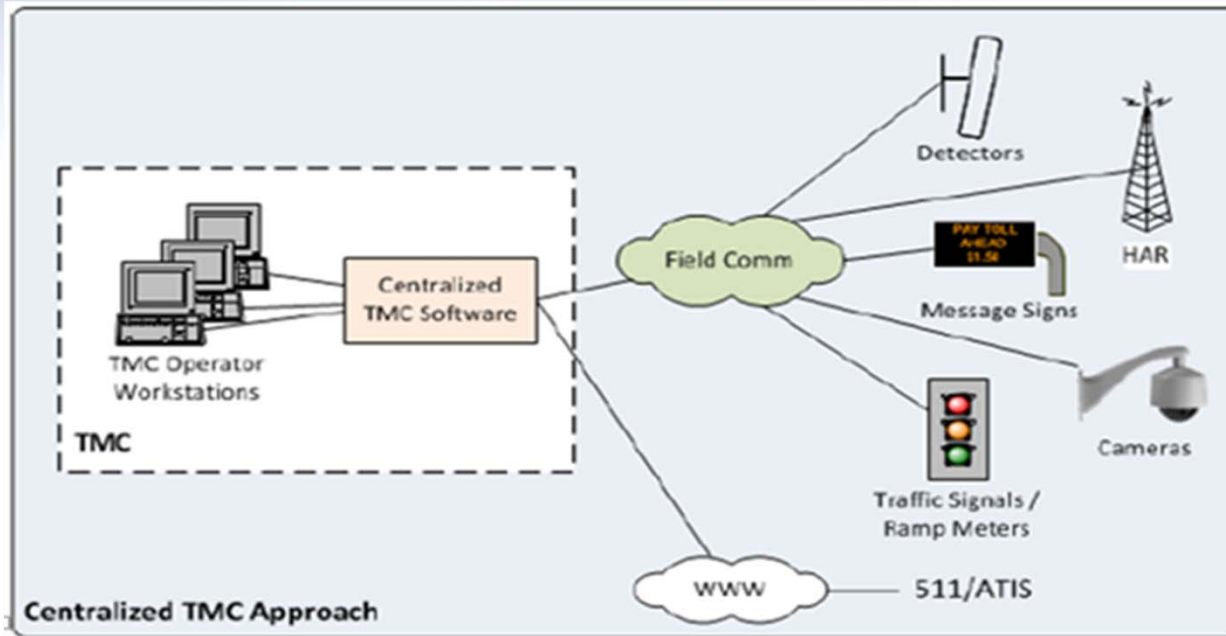


- Transportation Management Center (TMC)
 - The nucleus for collecting, monitoring, verifying, and responding to traffic conditions
 - Disseminating important information to other agencies and the public
 - Staffing: TMC operators and emergency responders (highway patrol, etc.)
 - Typically a single or multi-agency facility
 - Physical/operational model:
 - Centralized
 - Distributed
 - Virtual
 - Hybrid of the above



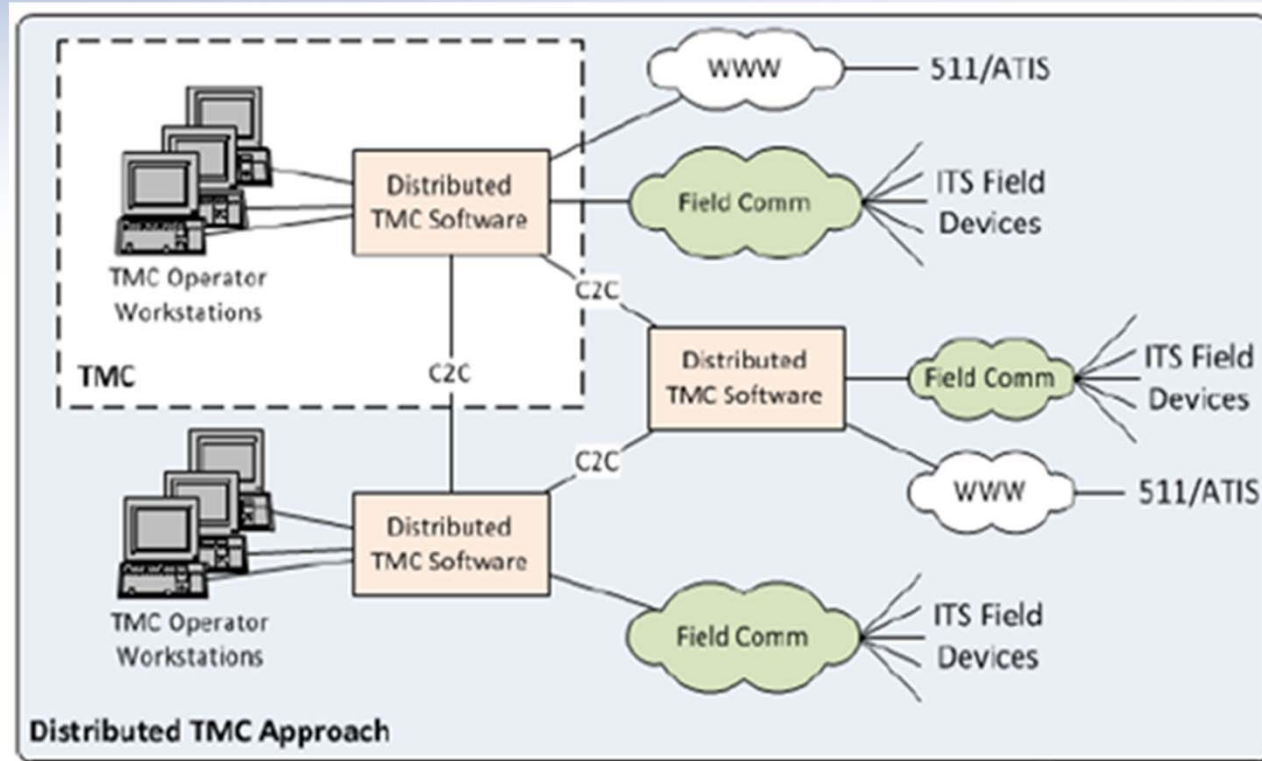
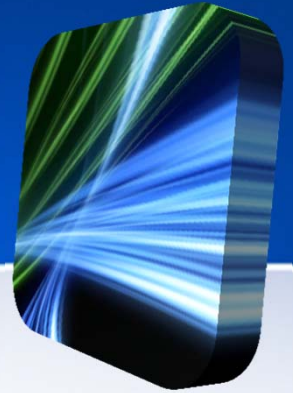
Most prevalent current models

Centralized



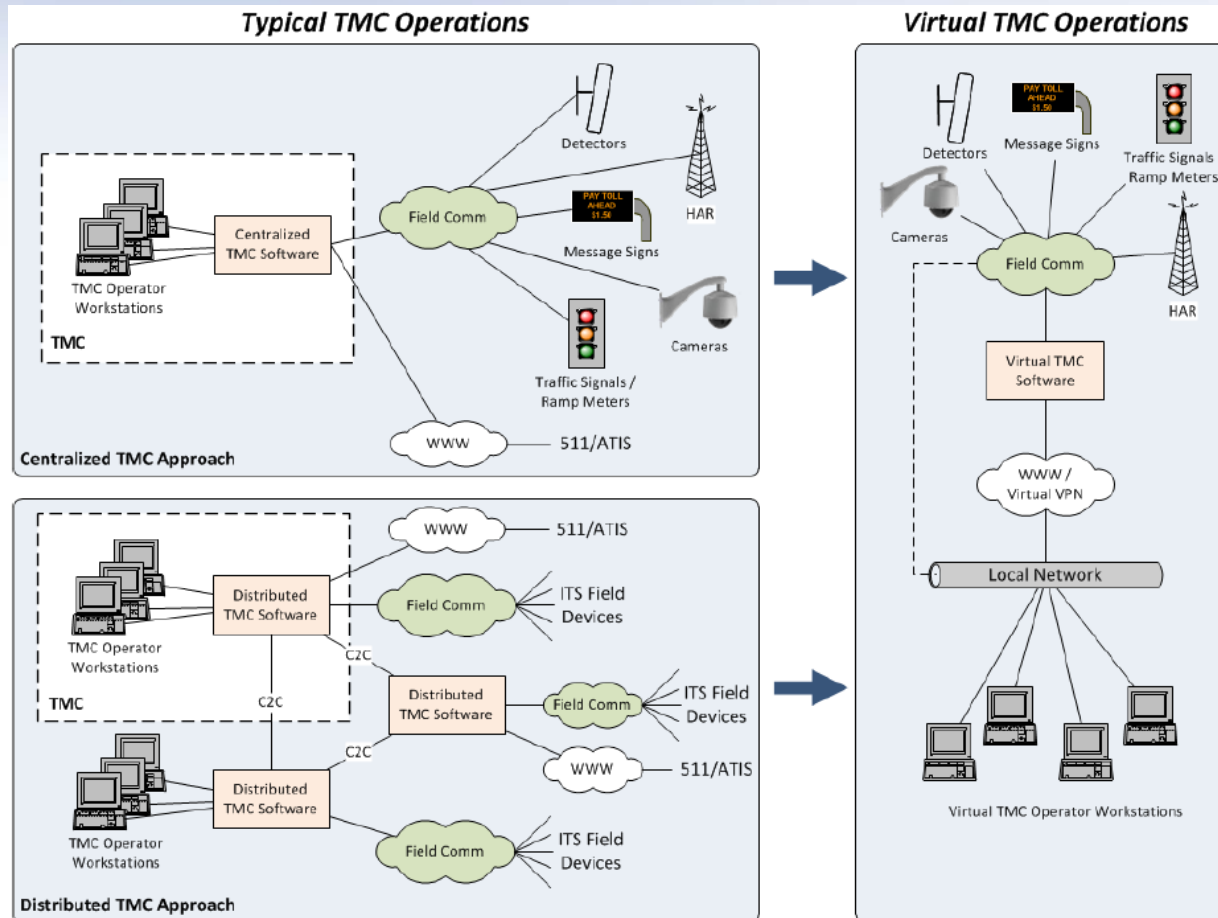
TMC Operations focused around a physical TMC facility staffed by TMC operators present in these facilities. C2F communications is based with the TMC as the nucleus.

Distributed-Decentralized



TMC Operations focused around multiple physical TMC facilities staffed by TMC operators present in these facilities. TMC's are often physically connected and exchange information.

Virtual TMC Model

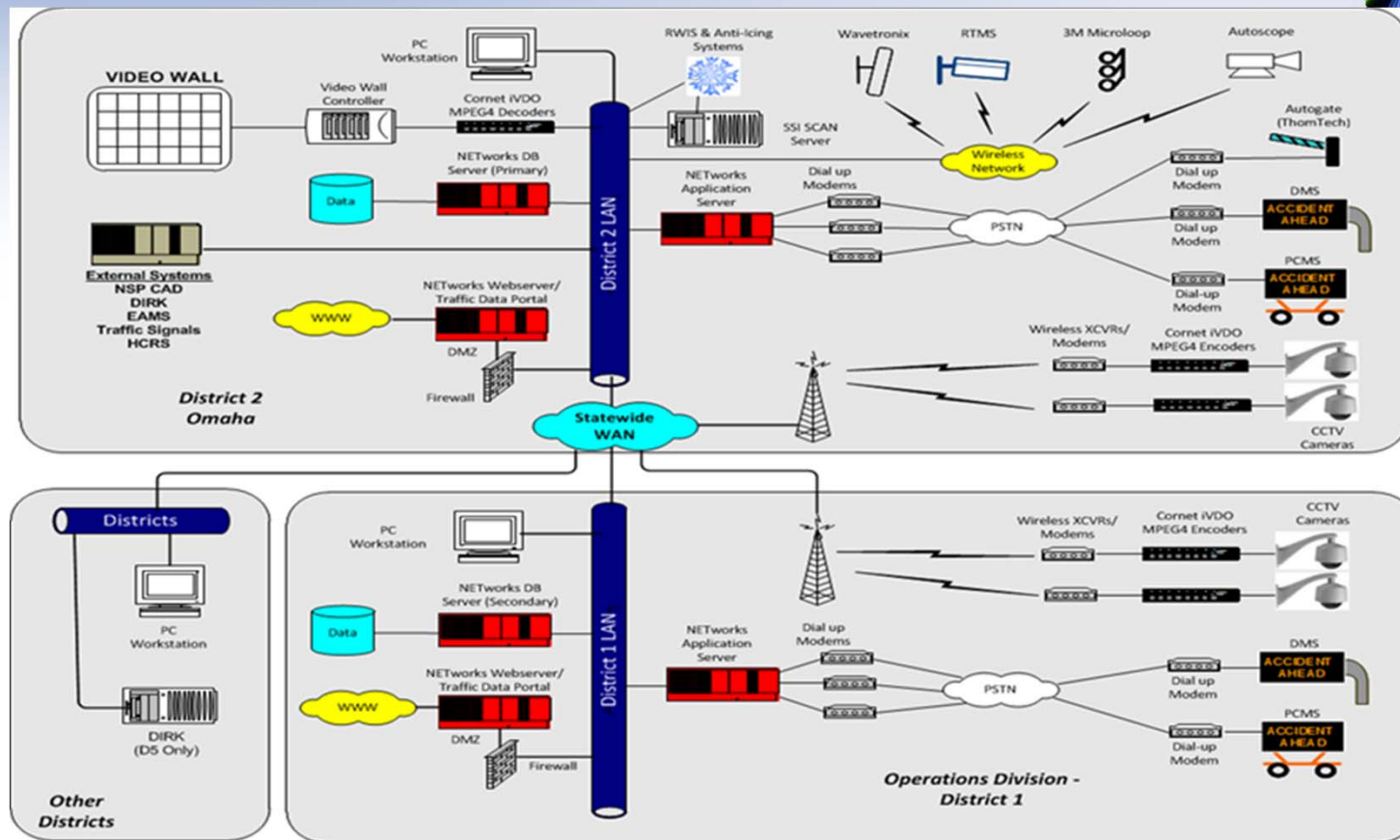


No specific requirement on a physical TMC to operate.

TMC Operators can be anywhere.

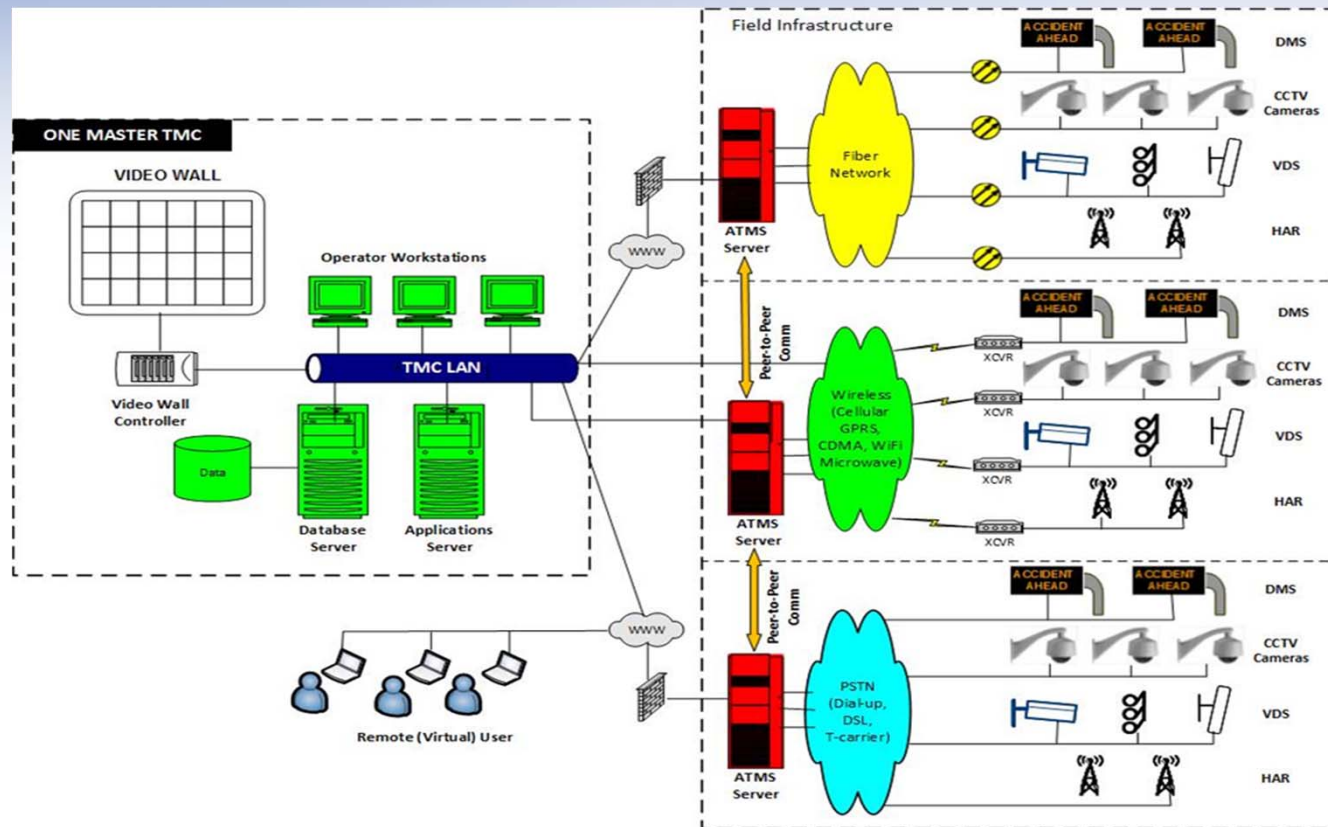
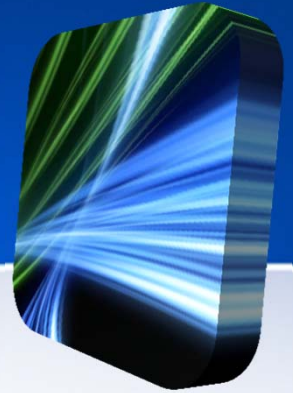
More flexible and accessible C2F communication Architecture.

Hybrid Virtual - Centralized



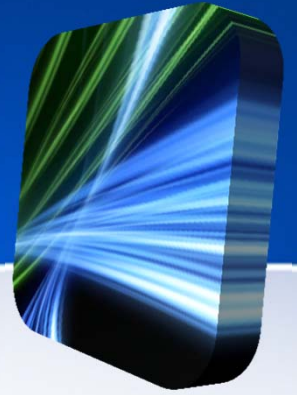
Some capabilities for virtual operations.
Not all operations must be performed from physical TMC

Virtual - Distributed



Same multi-center architecture as distributed, but some functions are performed virtually. Capability to operate without being physically present in TMC

The Project



- A TMC Pooled Fund Study Project
- The TMC PFS members have expressed considerable interest in the topic of Virtual TMC Development
- Project purpose is to develop a guidebook that provides technical guidance on planning and development of a virtual TMC

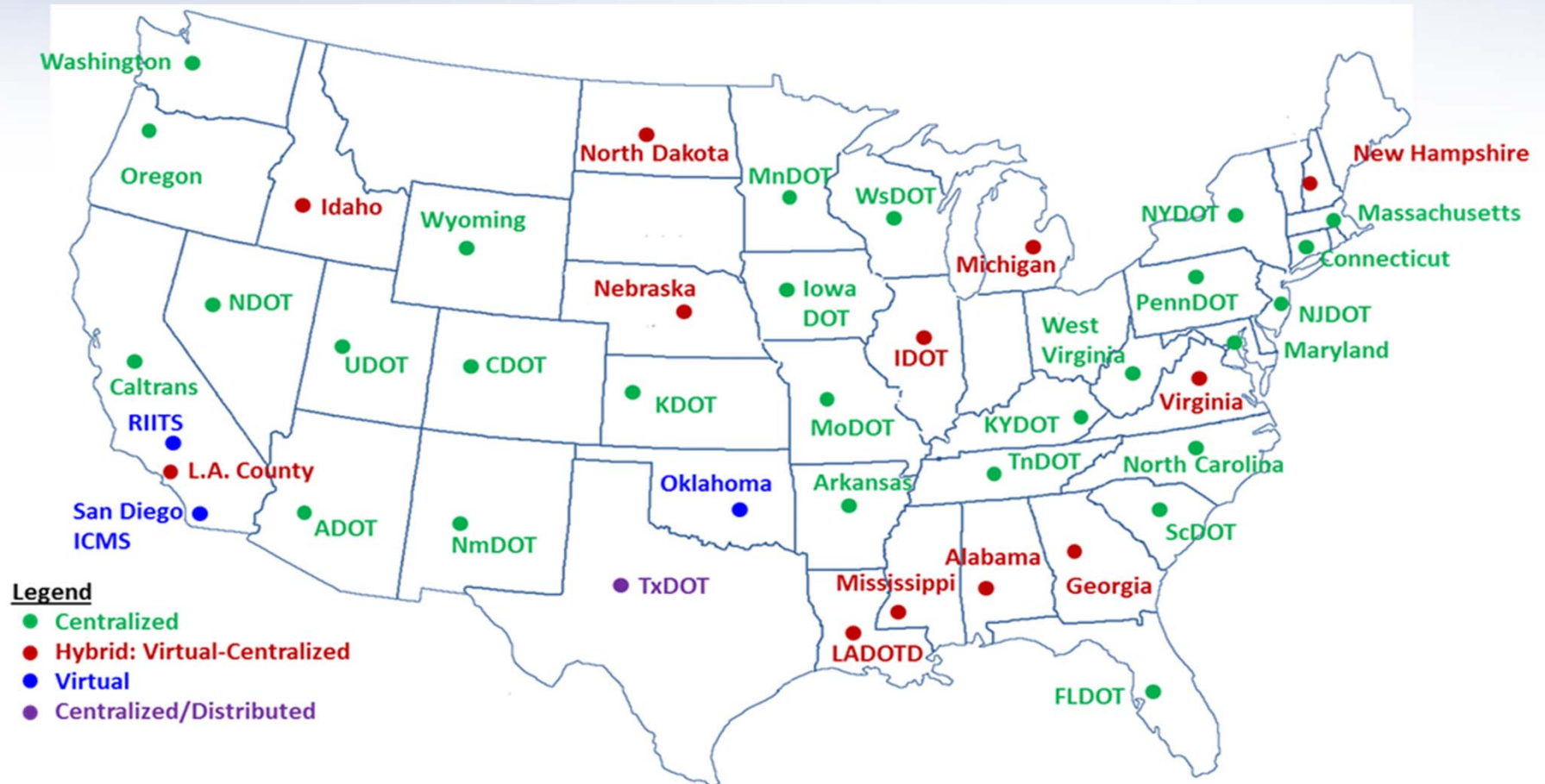
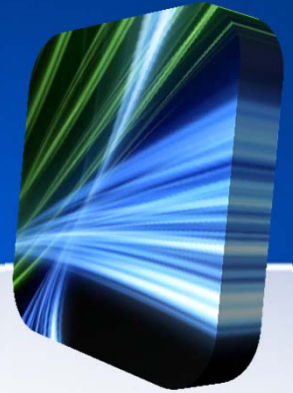
Project Schedule - Status



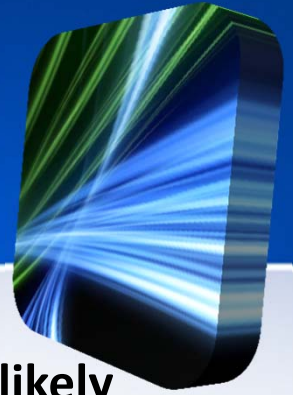
Activities	2013					2014						
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Task 1 - Kickoff Meeting	■											
Task 2 - Annotated Outline												
Draft Annotated Outline	■	■	■	■	■							
Review Period					■							
Final Annotated Outline					■	■						
Task 3 - Guidebook Development												
Draft Guidebook						■	■	■	■			
Review Period										■		
Revised Draft Guidebook										■	■	
Review Period											■	
Final Guidebook											■	■
Task 4 - Progress Meetings, Webinars, Teleconf.	■	■	■	■	■	■	■	■	■	■	■	■

Now
↓

TMC Deployments



Task 3: Guidebook Development – Core Functions



A critical element of the Guidebook is to provide information on the likely impact of TMC virtualization on core TMC functions, including:

Traveler Information	Service Patrol Coordination
Records Management	Reversible and HOV Lane Management
Congestion Management	Traffic Signal System Management
Failure Management	Transit Vehicle Monitoring
Incident Management	APTS System Management
Special Event Management	Environmental and RWIS Monitoring
Traffic Flow Monitoring	Over Height Vehicle Management
Emergency Management	Rail Crossing Management

Guidebook Overview (1)



Executive Summary

1. Introduction and Background

1.1. Purpose

1.2. Intended Audience

1.3. Document Overview

1.4. Background

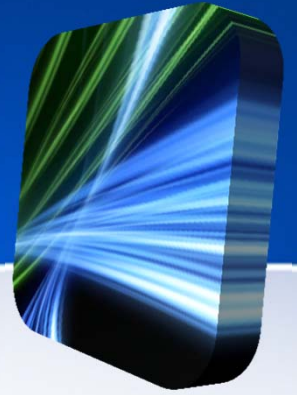
1.4.1. Definitions

1.4.2. Virtual TMC Definition

1.4.3. Traffic Management Functions

1.5 Selecting the Virtual TMC Model

Guidebook Overview (2)



2. Current TMC Operational Practices

2.1. TMC Deployment Models

2.2. Geographic Area Covered

2.2.1. Single Jurisdiction TMC

2.2.2. Multiple Jurisdictions TMC

2.2.3. Regional or District TMC

2.2.4. Statewide TMC

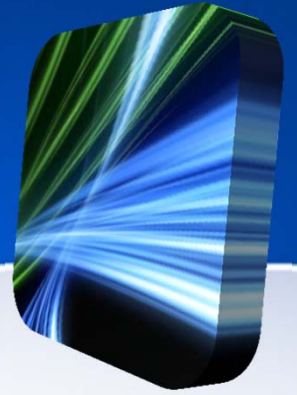
2.3. Number and Type of Agencies Involved

2.4. Interview of Current Deployed Models

2.5. Profile of the Agencies Reviewed

2.6. Current TMC Deployments

Guidebook Overview (3)



3. Virtual TMC Implementation Guidelines

3.1. Virtual TMC Implementation Steps

3.2. The Planning Process

- 3.2.1. Objectives
- 3.2.2. Operational Considerations
- 3.2.3. Organizational Considerations
- 3.2.4. Business Models for a Virtual TMC
- 3.2.5. Planning for a Virtual TMC vs. a Centralized TMC
- 3.2.6. Relevant Factors to Virtual TMC Planning
- 3.2.7. Establishing a Core Management Team
- 3.2.8. Implementing Data Storage and Archiving
- 3.2.9. Determining a Financial Model

3.3. Security

3.4. Developing a Training Program

Guidebook Overview (4)



4. Virtual TMC Benefits and Challenges

4.1. Benefits

4.1.1. Cost Savings

4.2. Challenges

4.2.1. Regional Stakeholder Buy-In

4.2.2. Legacy Systems

4.2.3. Servicing Agreements

4.2.4. Lines of Communication

4.2.5. Security

4.2.6. Risk

5. Case Studies

Benefits of the Virtual TMC



Virtual TMCs can better provide:

- Shared access to information gathering
- Interpretation and dissemination of traffic and roadway conditions information
- Efficient, timely, and accurate implementation of operations strategies
- Agency flexibility to adhere to own codes of conduct and boundaries
- Streamlined “on-call” staffing
- Multi-stakeholder control
- Operational authority transfer to 24/7 centers (e.g., 911, EOC)
- Reduced capital and O&M costs

VTMC Implementation Steps



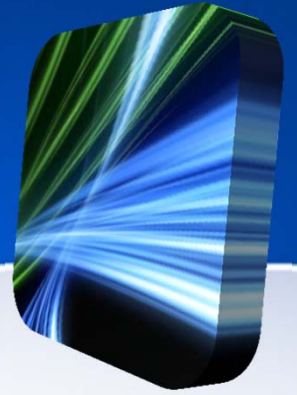
1. VTMC Needs Assessment
2. Concept of Operations
3. System Security Design
4. Communication Architecture
5. ATMS Implementation Plan
6. Standard Operation Procedures
7. Modify Staffing Plan
8. Training Plan
9. Risk Assessment
10. O&M Plan

Commonalities



- Commonalities among agencies interviewed/researched to date:
 - Many have a Browser Based ATMS only accessible within the agency's network
 - VPN access available yet challenging due to comm issues
 - District Offices have access to view and to input own data
 - Shared servers (e.g. State DOT) = Firewall restrictions
 - Desire to have separate / stand-alone server to take full advantage of browser based functionality
 - **ALL** looking/wanting to virtualize some aspect(s) of their operations

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