Guidelines for Virtual Transportation Management Center Development

National Rural ITS Meeting
August 27, 2014
• 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)
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”.”
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
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.
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
Same multi-center architecture as distributed, but some functions are performed virtually. Capability to operate without being physically present in TMC
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

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<tr>
<th>Activities</th>
<th>2013</th>
<th>2014</th>
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<tr>
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<td>Aug</td>
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<td>Task 1 - Kickoff Meeting</td>
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<td>Final Annotated Outline</td>
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<td>Task 3 - Guidebook Development</td>
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<td>Final Guidebook</td>
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<td>Task 4 - Progress Meetings, Webinars, Teleconf.</td>
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A critical element of the Guidebook is to provide information on the likely impact of TMC virtualization on core TMC functions, including:

<table>
<thead>
<tr>
<th>Function</th>
<th>Core Functions</th>
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<tr>
<td>Traveler Information</td>
<td>Service Patrol Coordination</td>
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<tr>
<td>Records Management</td>
<td>Reversible and HOV Lane Management</td>
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<td>Congestion Management</td>
<td>Traffic Signal System Management</td>
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<tr>
<td>Failure Management</td>
<td>Transit Vehicle Monitoring</td>
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<tr>
<td>Incident Management</td>
<td>APTS System Management</td>
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<td>Special Event Management</td>
<td>Environmental and RWIS Monitoring</td>
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<tr>
<td>Traffic Flow Monitoring</td>
<td>Over Height Vehicle Management</td>
</tr>
<tr>
<td>Emergency Management</td>
<td>Rail Crossing Management</td>
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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
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
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
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 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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