CENTRAL TEXAS REGIONAL
MOBILITY AUTHORITY

INNOVATION TEAM
WHITE PAPER

COMBINED REGIONAL TRAFFIC MANAGEMENT CENTER

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AUTHORS

Joseph Snyder,
WSP TMC Program Director

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The Mobility Authority established the Innovation Team in Fall 2018 to stay informed on emerging mobility and transportation technology and introduce opportunities for these emergent technologies and ideas through projects, programs, partnerships and policies. The purpose of these white papers is to provide a high-level of examination into emerging technologies and their case studies to support decision-making for solutions to the problems we face today and tomorrow.

JEFF DAILEY
Deputy Executive Director
jdailey@ctrma.org

MIA ZMUD
mzmud@ctrma.org

STEVE PUSTELNYK
spustelnyk@ctrma.org

3300 N IH-35, Suite 300
Austin, TX 78705
MobilityAuthority.com

Executive Summary

As part of its Innovation and Technology Roadmap, the Mobility Authority is pursuing a migration of its Transportation Management Center platform to LoneStar which is currently used by the Austin District Texas Department of Transportation. An objective of this migration is to facilitate regional sharing of data and real-time information between agencies. With this migration due to be completed by Summer 2020, this white paper provides high-level information on integrating and sharing real-time traffic management and operational data between regional agencies. It also offers recommendations for regional sharing of such data based on best practices established in Houston Texas and the experience of subject matter experts.

Today, the ability to share data in real-time between transportation partners is critical. Although electronically available data exists, there are gaps in that data between the various agencies responsible for transportation, and there is no system in place to fuse this data into a single regional transportation operations picture. Some information sources, such as traffic cameras, require interpretation of the information by operators. Additionally, no data fusion system can replace people when it comes to coordinating responses to traffic congestion and incidents. The only way to bridge this gap is to combine all the transportation partners in one facility where staff and systems can be shared between agencies in real time. The focus of this combined Traffic Management Center (TMC) within the Central Texas region would be:

- Act as a regional transportation operations hub focused on improving day-to-day and incident/event congestion.
- Provide an enabling environment for the region's partners to plan and collaborate in real-time to manage the region's transportation network – the freeways, express lanes, toll roads and arterials will work together.
- Implement data collection and communications linkages where needed to provide a complete regional transportation operating picture.
- Coordinate and bring together staff and systems across the region's transportation operations agencies.
- Develop a data fusion system that will provide a regional transportation shared operating picture in real-time across Central Texas.
- Share resources via agreement to make the systems more robust and redundant.

By implementing this combined approach within Central Texas, the transportation partners could be realizing a cost benefit (20 to 1)[1] similar to Houston TranStar.

Introduction/Background

A Traffic Management Center (TMC) acts as the nucleus for collecting, monitoring,

verifying, and responding to traffic conditions often disseminating important information to other agencies and the public. Traditionally, a TMC encompasses a physical building, which may be part of a single agency or multiple agencies and managed by the agency's or agencies' TMC operators and emergency responders (e.g. Safety Service Patrols). Nevertheless, with the introduction of newer communications, Intelligent Transportation System (ITS) devices, electronics and software technologies it is possible for local agencies to leverage each other's resources quickly and efficiently. There are three different types of TMC approaches as defined below:

- **Standalone TMC** – Operated by a single agency focused only on the agency's goals. Disconnected from other agencies and providing limited sharing of information.
- **Co-located TMC** – Shared location by two or more agencies working in one building but not necessarily aligned with the same common goals. Each agency typically works in a silo with limited interaction.

- **Combined TMC** – Shared location by two or more agencies governed by a combined agency committee. The agencies work toward common goals and have an established mission statement. The agencies are willing to share data and coordinate effectively to meet their common goals.

Each of these TMC approaches include monitoring, collecting, processing transportation system data, disseminating transportation information, ITS device control and operations, and responding to traffic situations and incidents. This white paper addresses the pros and cons of standalone, co-located, and combined TMCs with a recommendation on the approach for the Central Texas region.

Discussion of TMC Types

Adoption of the Transportation Systems Management and Operations (TSMO) approach would be beneficial to further evolve the TMCs within the region. TSMO is an integrated process that looks at ways to optimize the performance of new and existing multimodal infrastructure through implementation of systems, services and projects to maximize cooperating agencies' existing capacity and improve the security, safety, and reliability of our transportation system. By applying the TSMO process, regional partners and stakeholders will benefit from a structured approach that provides the following:

1. One system meeting common goals and mission
2. Collaboration with transportation partners and key stakeholders
3. Project process cycle for evolution, growth and innovation
4. Monitor goals and objectives on a quarterly and annual basis

Below is a discussion of the three approaches for TMC deployment defined above, including highlighting the pros and cons of each.

Standalone TMC

A standalone TMC is a single agency-operated center that is typically located within the agency's facilities and only performs traffic management for the agency's facilities. See below for pros and cons related to this TMC Approach.

Pros	Cons
✓ Agency has full control of the facility	✓ Single agency funds the full cost
✓ Focused only on the agency goals and missions	✓ Disconnected incident management from external regional partners
✓ Agile and can change quickly	✓ Primarily focused on agency goals and mission
✓ Agency has full control of its devices and software	✓ Unable to leverage common resources with other agencies
✓ Lower start-up cost.	
✓ Smaller facility and located in agency space	

Co-Located TMC

A co-located TMC is a facility occupied by two or more agencies that are not necessarily aligned with the same common goals. Each agency essentially works in a silo with limited interaction. For example, the TMC might be shared between a law enforcement agency and transportation staff that work independently with little or no cooperation. See below for the pros and cons with this approach.

Pros	Cons
✓ Shared funding of facility	✓ Each agency is focused on their own goals and missions
✓ Typically, can see each other's devices	✓ Each agency controls its own devices and software
✓ Easier to coordinate and communicate with each agency co-located in the facility	✓ Disconnected incident management from external regional partners
✓ Some external agency involvement and interaction	✓ Does not leverage common resources
✓ Agile but may require co-located partner buy-in	✓ Duplication of effort between agencies
	✓ Limited agency interaction
	✓ Difficulty achieving partnering agencies support
	✓ Agency complaints due to standard procedures not in alignment
	✓ Difficulty finding the right partnering agency wanting to co-locate
	✓ Needs facility partner to agree on facility changes

Combined TMC

A combined TMC is a facility shared by multiple agencies and governed by a combined agency committee. The member agencies work toward common goals and have an established mission statement. The agencies typically coordinate closely, share data and leverage each other's resources and technology to improve trip reliability and safety. This approach embraces the TSMO approach and enables each agency to work together for one common goal.

Pros	Cons
✓ Shared agency funding	✓ Not as agile due to need to obtain partner agency buy-in
✓ Working towards a common mission and goals	✓ Potential for increased bureaucracy and conflicting goals between agencies
✓ Sharing of resources and central point for data fusion	✓ Must obtain governing board approval for facility changes and purchases
✓ High agency involvement and interaction	✓ Facility space issues can result if new partners are added after establishment of initial plan
✓ Achieving better agency buy-in and support	
✓ Governing board represented by all partners	
✓ More innovation and drive for change through interaction of member agencies	
✓ Working towards the same Traffic Incident Management (TIM) performance measures	
✓ Leverage existing agency agreements (i.e. resources, technology, software) to reduce capital expenses	
✓ Less duplication of effort	

Current State of the Region

Central Texas currently has two different types of TMCs, standalone and co-located, which are described below.

Co-Located TMC

The Combined Transportation, Emergency and Communication Center (CTECC) is a co-located TMC made up of the following agencies. There is no additional capacity at the CTECC to add new transportation partners.

- TxDOT Traffic Operations
- City of Austin and Travis County
  - Law Enforcement
  - Fire and Emergency Medical Services
  - Emergency Management
- Local 911 that provides 24/7/365 operation.

Standalone TMCs

Several agencies have fully or partially standalone TMCs as described below:

- **City of Austin Transportation Department (ATD)** is currently planning on staffing one or two team members with the CTECC operations floor during designated hours of operation but will maintain all supporting and operations of existing tasks at their City of Austin TMC.
- **Capital Metro** was co-located on the operations floor of the CTECC with limited, fixed routes. However, due to the lack of space to house their dispatch operations staff at the CTECC, Capital Metro has relocated the fixed route positions back to their main dispatch center or TMC.
- **Central Texas Regional Mobility Authority (CTRMA)** is operating a standalone TMC in the region but is exploring ways to combine all transportation partners into one single TMC.
- **City of Round Rock** is operating a standalone TMC.
- **San Marcos Traffic Operations** is operating a standalone TMC.

Combined TMC Case Study

A great example of a combined TMC is Houston TranStar. TranStar is a well-established partnership of agencies from the City of Houston, Harris County, METRO and TxDOT plus other private and public partners (i.e. media and local tolling agencies). The participants share resources and provide a shared data fusion application under one roof to keep motorists informed and roadways clear. It promotes safe, quick clearance initiatives like Motorist Assistance Program (MAP), Tow and Go and a roadway flood warning system. TranStar's partnerships have eliminated costly duplication, facilitates sharing of the latest transportation management technologies and allows for more efficient response to regional transportation and emergency management problems.

Cost-Benefit Advantages of TMC Operations

Other than intrinsic efficiency realizations due to the implementation of TMC, significant positive cost-benefits can be realized. The Texas A&M Transportation Institute (TTI) utilizes the following approach to calculate the cost-benefit of a TMC (**Figure 1**).

Figure 1: TTI Process for Calculating TMC Cost-Benefit

- Utilize Bluetooth data
- Aggregate and determine Travel Time within defined segments
- Consider Delay average speed limit
  - Delay is defined as any segment below 60 mph on a 15 minute average

- Determine the ADT (use previous year)
- Toll Road operators can use transaction information from gantries
  - If only one gantry exists, then that information shall apply to the entire roadway.

- Delay number factors come up how much delay without TMC
- Follows FHWA cost benefit calculation model
- Determine benefit number with TMC

- For new service or advancement, the annual cost is spread across 10 years

In the 2018 Annual Report for Houston TranStar, the cost benefit calculation resulted in substantial benefits for the region. In 2018, the travel time savings attributable to TranStar's operation were estimated at more than 19.0 million vehicle-hours. This is worth nearly $431 million in road user cost savings and an additional $86 million (approximately 35.6 million gallons) in reduced fuel consumption. The total estimated benefits of TranStar operation in 2018 were over $517 million. Comparing these benefits to the annualized TranStar operating cost estimate of $25.2 million yields an estimated benefit/cost ratio for Houston TranStar center operation of 20.5 for 2018. In other words, for every dollar spent on Houston TranStar's operations, the region realizes a benefit of $20.50.

Typical TMC Facility Configurations

Below are some facility configurations for other TMCs around the country:

- **Houston TranStar – Building Information:**
  - A 26,000-square-foot addition was added to the 11,000 square feet existing TranStar Building (37,000 square feet)
  - Annual Cost (Operating 2018) – $25.2 million
  - Co-located or Combined – Combined with State, County, City and Transit.
- **FDOT District Six Sunguide TMC (Miami Dade and Monroe County) 2018 Annual report – Building Information**
  - 32,000 square feet
  - Capital Cost of Facility Construction: Approximately $10 million (2003 – 2004)
  - Annual Cost (Operating) – $70.3 million
  - Co-located or Combined – Co-located with FDOT TMC, MDX TMC and FHP
- **NYSDOT Hudson Valley TMC – Building Information**
  - 101,520 square feet
  - Co-located or Combined – Co-located with NYSDOT TMC, NYPD, EOC
  - Note: Additional information for the NYSDOT Hudson Valley TMC is not available due to emergency activation of the facility as a result of COVID-19.

Figure 2 is an example of a typical staff complement of a TMC from the FDOT TMC above.

Table 1: FDOT TMC Staff

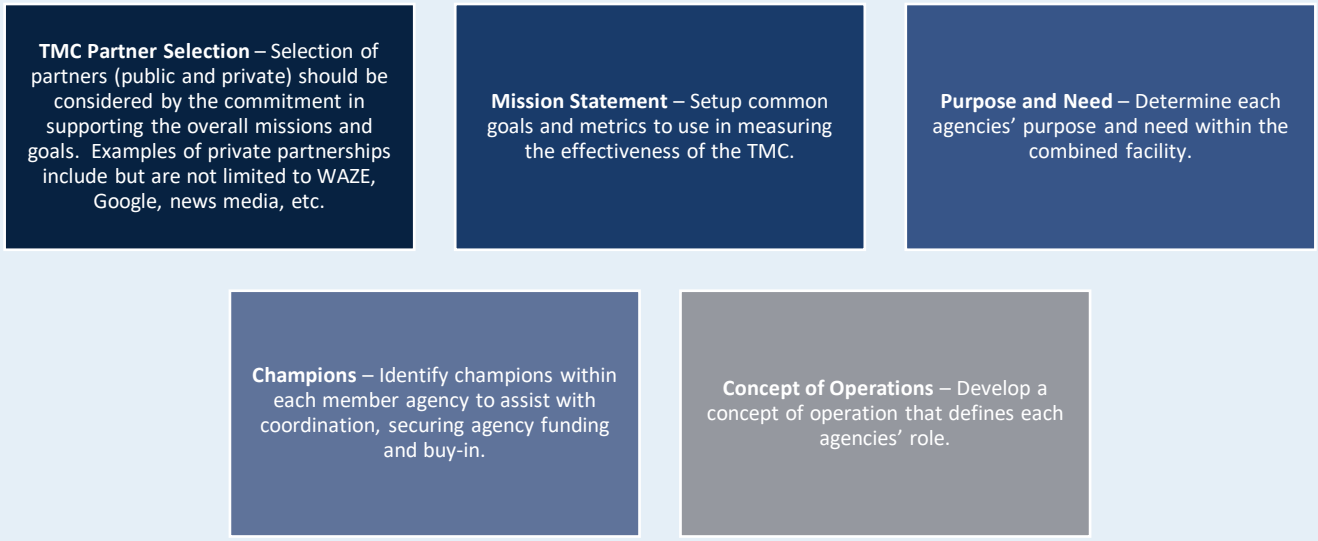
FDOT	Consultant Staff	ITS Maintenance	MDX	Other Consultant Staff	FHP (All State Employees)
• 6 FDOT Staff	• 1 PM • 1 Operations Manager • 1 Analysts • 2 Program Manager • 10 Express Lane Operator • 10 Ramp Signaling Operators • 5 Shift Supervisor • 10 Freeway Operators • 1 Signal Timing Engineer • 2 Arterial Operators • 1 PIO • 1 Part-time PIO Assistant • 1 Senior IT Manager • 1 Senior IT Analysts • 1 Senior Network Specialist • 3 IT Techs • 2 ITS Locate Staff	• 1 PM • 1 Deputy PM • 1 Administrative assistant • 1 Senior Tech • 8 Techs • Several off site labor staff supporting the maintenance activities	• 1 MDX PM	• 1 CEI or Operation Manager (Separate Consultant Contract) • 1 Part-time PM • 1 Senior Shift Supervisor (Consultant Operation Manager) • 1 Shift Supervisor • 8 TMC Operators	• 1 Lieutenant • 1 Sergeant • 5 senior dispatchers • 20 dispatchers and call takers

Recommendations

The recommendation is for the establishment of a combined TMC within Central Texas that is centrally located within Travis County. The combined TMC would facilitate a central data fusion center housing all transportation and performance data. This recommendation is supported by the pros and cons listed above, and the cost benefit realized by Houston TranStar on a consistent basis. In the last four years, Houston TranStar has consistently achieved a cost benefit between 15 to 1 and 20 to 1[2]. The Houston TranStar cost benefit could only be realized by the implementation of a combined TMC with all regional partners working towards a common mission within their region.

Prior to the implementation of a Combined TMC within Central Texas, the following activities should be performed during the early stages of development by the lead agencies sponsoring the combined TMC approach[3] (**Figure 3**)

Figure 2: Combined TMC Approach



Conclusions

This white paper provides high-level information and recommendations based on best practices established in Houston, Texas and the experience of subject matter experts. Additional research and outreach will need to be performed prior to implementation to clearly define an implementation strategy and obtain buy-in from member agencies within Central Texas.

SOURCES

1. Houston TranStar 2018 Annual Report (www.houstontranstar.org/about_transtar).
2. Houston TranStar 2015, 2016, 2017, and 2018 Annual Reports (www.houstontranstar.org/about_transtar).
3. ITS Florida Regional Transportation Management Center Co-Location White Paper July 2005.