Denver Traffic Management Center - Using Technology to Increase Operational Capabilities

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• Traffic congestion in the City of Denver and throughout the metropolitan area continues to increase
  • In a 2017 report release by INRIX, Denver is ranked as the 21st most congested city in the United States
• The population in the Metro Denver area has continued to increase
  • Based upon information from the Metro Denver Economic Development Corporation, the Metro Denver area has experienced an average 1.6% annual population growth since 2010 and the population for the metro area is expected to continue to increase with a projected population of 4,000,000 by 2035
• Although many initiatives and programs have increased the usage of public transit and other forms of transportation it is expected the transportation network’s vehicle hours of delay will continue to rise
• Addressing the current and future congestion requires the combined efforts of multiple programs and initiatives which include operations and the application of technology

• Operations involves managing the transportation network with a focus upon the network’s performance which includes mobility and reliability

• Technology has been integrated into transportation agencies for decades but now there has been significant increase in new and emerging technologies

• The City of Denver has a Smart Systems group within the Transportation Division that combines operations and technology
The City of Denver’s **Smart Systems Program** works to improve conditions on the roadway network through operational and technological perspectives.

Functional groups of the program include:

- Fiber optic network
- ITS devices
- Systems
- Traffic signal infrastructure
- Denver Traffic Management Center

Managing and participating in the City’s transportation technology initiatives:

- Advanced Transportation and Congestion Management Technologies Deployment Program
- Smart Cities initiatives
- Enterprise Data Management
• The Denver TMC is responsible for real-time monitoring and management of the City’s transportation network
  • Daily operations
  • Unplanned incidents
  • Special events
  • Road work
• Since its creation in the 1990’s the Denver TMC had been an operation with a heavy focus upon traffic signal operations
  • This included managing special events and traffic associated with professional sport teams
• To address current and future traffic issues the City is looking to **enhance the operations** of the Denver TMC to **increase active management** of the transportation network
• To create a vision for the next generation Denver TMC, it was necessary to develop a Strategic Plan

• The key objectives of this plan are:
  • **Development of Denver TMC core functions**
  • **Identifying opportunities for increased operational capabilities**
  • **Development of a readiness for the absorption of new technologies**
Core Functions of the Denver TMC

- Operational Readiness
- Situational Awareness
- Information Dissemination
- Data Analysis
- Deployment of Operational Strategies
- Traffic Signal Operations
- Identification of Operational Issues
Increased Operational Capabilities

• The Denver TMC is expected to support and move forward the goal of providing safe, efficient and reliable travel

• There is a need to increase the operational capabilities to support the delivery of the core functions that would support the City’s transportation vision

• Currently staff is developing a list of functional requirements
Implementing New Technologies

• There has been a drastic increase in the availability of new technology that can be leveraged in monitoring and managing the roadway network

• Recent technological initiatives within the City
  • Smart Cities
  • Advanced Transportation and Congestion Management Technologies Deployment Program
  • Enterprise Data Management

• Denver TMC staff participate as part of the City’s project team for implementing technology related to transportation
  • This allows for operational perspectives to be included in the design stages
• As Denver TMC continues to work on long-range planning there are efforts to quickly implement operational enhancements whose levels of effort are relatively small

• There are some core functions whose existence is critical as they provide a foundation for the others
  • Operational readiness
  • Situational awareness

• Much of the current work is centered around the foundational functions
  • However, opportunities to implement in the other core functions are considered
Case Study of Denver Traffic Management Center Actions
• Integration of technology allows the Denver TMC to increase its operational capabilities and to conduct active traffic management
• As an example the Denver TMC is responding to incidents on the transportation network by monitoring and actively managing the disrupted traffic flow
  • This includes incidents on CDOT roadways with impacts to the Denver network
• On Friday, May 4th an incident that involved a full closure of a major arterial was detected
  • Efforts were taken to determine the de facto diversion routes
  • The active management included making changes to the traffic signal timing to accommodate the change in volume seen on the diversion route
• Changes to traffic signal timing were made in an iterative process by continuing to actively monitor and manage the network
• The Denver TMC was able to **visually notice improvements** to the roadway once traffic signal timing changes were implemented.

• To further understand the system performance and to quantify benefits an effort was made to analyze traffic data:
  - Initial efforts included collecting travel time data from the incident day and making comparisons to “average conditions”.
  - **Significant improvement in travel times** were seen once the Denver TMC began adjusting traffic signal timing.

• Traffic volumes were also analyzed:
  - Comparisons were made to “average conditions”.
  - There were no significant decreases in volumes.

• This is a case where technology allowed staff to **increase situational awareness, take action and then analyze afterwards**.
NBLT Santa Fe at Florida - Incident Comparison

Vehicles (15-minute Interval)

- Friday Average
- 5/4/2018
After Action Review – Strengths

• **Operational Readiness**
  • Traffic signals in the area are connected as part of the City’s communication infrastructure and can be monitored and managed from the Denver TMC
    • 1206 out of the City’s 1294 traffic signals (93%) are connected to the Denver TMC
  • Traffic cameras were available to monitor the affected intersections
    • 506 cameras maintained and operated by the Denver TMC

• **Deployment of Operational Strategies**
  • Changes were made to the traffic signal timing which accommodated the change in traffic trends related to the diversion of vehicles
After Action Review – Improvements

- **Operational Readiness**
  - Under normal operations the Denver TMC is open from 0600 to 1900 hours on weekdays only

- **Situational Awareness**
  - If the Denver TMC would have been aware of the closure the changes to signal timing could have been made earlier
  - Devices and data analytics could provide alerts to a “changed” condition on the roadway related to travel times or volumes
  - Establish communications between internal and external partners and stakeholders

- **Information Dissemination**
  - There are opportunities for the Denver TMC to push information to the traveling public using technology applications developed and managed by third parties
Thank You

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