

Traffic Management Center Interoperability



By North Carolina DOT

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Overview

The North Carolina Department of Transportation (NCDOT) manages the second-largest roadway network in the U.S., coordinating traffic operations across 14 divisions through a Statewide Transportation Operations Center (STOC) and five regional Traffic Management Centers (TMCs). To harmonize these centers, NCDOT built interoperability into its everyday operations — shared Intelligent Transportation Systems (ITS) platforms, a single firm managing and staffing all centers, standardized training, and cloud-based phone and contact systems that let any center cover for another. This redundancy has held up under real-world tests: When Hurricane Helene forced the evacuation of the Mountain TMC in September 2024, its responsibilities transferred seamlessly to the STOC with no interruption to monitoring, incident response, or public communication, and the same design kept operations running during a month-long STOC control-room renovation in late 2025. Together these capabilities strengthen NCDOT's operational consistency, staff flexibility, and public safety across the state.

In this case study you will learn:

1. How NCDOT designed interoperability across its STOC and five regional TMCs so any center can assume another's operations.
2. Why standardized management, training, and shared technology platforms are the foundation of reliable multi-center coordination.
3. How built-in redundancy kept traffic operations uninterrupted during the Hurricane Helene evacuation and a month-long control-room renovation.

BACKGROUND

The North Carolina Department of Transportation (NCDOT) is a leader in transportation innovation, maintaining the second largest roadway network in the US. Its Transportation Systems Management & Operations (TSMO) unit supports traffic operations across 14 divisions, with a central Statewide Transportation Operations Center (STOC), and five regional Traffic Management Centers (TMCs) responsible for safe and efficient travel in North Carolina. These STOC/TMCs use over 500 message signs and 1,400 cameras to monitor road conditions, and partner with Incident Management Assistance Patrols (IMAPs) to make over 60,000 responses annually. Harmonizing these resources, systems, and agencies at scale has been a testament to the effectiveness of TSMO strategies. The NCDOT TSMO strategic plan aims to apply TSMO principles through collaboration and continuous education while guiding NCDOT's evolution and statewide approach to mature and optimize TSMO capabilities. Navigating the complexities of managing North Carolina's transportation network, lessons learned from prior disasters, the shift to remote operations during COVID-19, and the expansion of operational centers guided NCDOT TSMO to focus on the interoperability of TMCs as a central strategy to its statewide traffic management approach.

TSMO PLANNING, STRATEGIES, AND DEPLOYMENT

Statewide access to Intelligent Transportation Systems (ITS) devices, phones, logs, and radio:

The merger of data and operational management across all centers is critical. By utilizing shared technology platforms and tools, information can flow freely and efficiently, improving situational awareness and facilitating coordinated responses during crises. Centers can also conduct all ITS management, phone calls, radio dispatching, and logging remotely from any other individual center.

Single firm management of all STOC/TMCs:

Setting the NCDOT apart is the use of a single firm to staff and manage the STOC and

regional TMCs. This helps enforce uniform operational protocols, improving response times and consistency in decision-making. A standardized approach minimizes the risk of confusion during multi-agency responses to incidents and ensures all workers are trained under the same parameters. This centralized management system also enables the optimal distribution of resources and personnel based on immediate needs and operational demands across regions. This flexibility can lead to significant cost savings while ensuring a high level of service across the state.

Standardized STOC/TMC training: One of the cornerstones of effective interoperability is the standardization of employee training across all centers. Housed and conducted at the STOC, the NCDOT training program includes bringing all new hires to the STOC for their initial two weeks of training to build relationships across centers and demonstrate how classroom concepts are applied in live operations. This strategy not only enhances the individual capabilities of operators but builds a cohesive team environment across the state. This standardized training program ensures that all personnel are equipped with complementary skills and common coordination protocols that facilitate smoother interoperability.



COMMUNICATIONS PLANNING AND EXECUTION

Contact Matrix rollout: In the context of North Carolina's transportation network, efficient and reliable communication during emergencies is critical. With 14 divisions and 100 counties, a centrally housed Contact Matrix on SharePoint serves as the comprehensive tool designed to facilitate quick access to emergency contact information. The Contact Matrix allows control room operators to quickly identify the correct points of contact based on time of day, location, and incident characteristics. Through collaborative meetings, the requirements for the Contact Matrix were outlined including:

- Types of emergencies (e.g., major traffic incidents, hazardous material spills, regulatory signage, and signals)
- Contact information for designated personnel (names, roles, phone numbers, email addresses)
- Procedures for updating and maintaining contact information

This system enables all facets of traffic operations and across a range of stakeholders—from emergency responders to county maintenance and signal systems staff—to update and retrieve vital information seamlessly.

Implementation of CXOne cloud contact center platform: CXOne is a web-based platform used to manage telephone communications for NCDOT's TMCs and customer service center. CXOne can be accessed from any location, on any network connected device, enabling calls for any center to be managed from anywhere. This flexibility is crucial during times when teams may need to operate from the field or remote locations during incidents. During instances where one TMC is experiencing higher-than-normal call volumes, staff from another TMC can be assigned to receive those overflow calls, allowing for quicker responses for callers.

TMC shutdown drills: Conducting shutdown drills has allowed NCDOT to assess emergency response preparedness. The drills which simulate various scenarios, including power outages and system failures, provide a platform to test and evaluate the efficiency and effectiveness of our interoperability and redundancy protocols in real-time. Each drill serves as a learning opportunity where gaps are identified, and post-drill evaluations can lead to actionable insights for improvement.

OUTCOMES, BENEFITS, AND LEARNINGS

Redundancy = Consistency: Redundancy in TMC operations has proven invaluable in ensuring consistent coverage and uninterrupted service delivery, both during routine operations and emergencies.

- Holiday coverage – Pooling staff resources at STOC and TMCs to collectively support holiday coverage and rotating shifts across centers greatly reduced the number of personnel required on-site to maintain full operational capacity. This alleviated the burden on individual centers and afforded employees time off during holidays without sacrificing level of service.
- Routine meeting coverage - Interoperable protocols and the ability to dynamically shift coverage across centers allowed TMC staff flexibility to attend routine meetings while another center maintained operations on their behalf. This improved staff engagement, allowing leadership frequent opportunities to share information, re-emphasize best practices, and continuously refine the team's skills and understanding.
- 511/Customer service coverage - The integration of the CXOne phone system has enhanced the ability to respond to public inquiries, especially regarding traffic conditions and emergency alerts. During

periods of high call volume or when staff members at the call center are unavailable, TMCs can seamlessly take over 511 calls and customer service inquiries. This adaptability ensures that the public remains informed and confident that NCDOT is responsive to their concerns.

Be prepared for the worst: The increased redundancy and preparedness implemented across North Carolina's control rooms have led to significant improvements in service delivery, operational consistency, and public safety. The incidents described below are just two examples of how interoperable protocols allow the STOC or another TMC to take over operational duties of another center in the event of an emergency.

- **Evacuation of the Mountain TMC** – In September 2024, the staff at the Mountain TMC located in Asheville had to be evacuated by boat due to the unprecedented flooding caused by Hurricane Helene. Thanks to pre-established procedures for crisis escalation and coverage transfer, the responsibilities of the Mountain TMC

were swiftly reassigned to the STOC. This seamless transition meant that monitoring, incident response, and public communication continued uninterrupted, allowing us to manage road conditions and safety measures effectively during the storm. The lessons learned during this incident have reinforced the importance of inter-center communication and collaboration, ensuring that every TMC is not just a standalone entity but part of an interconnected, resilient network.

- **Infrastructure upgrades at STOC** – In late 2025, TSMO conducted extensive remodeling of the STOC control room by replacing the carpet and stairs, and adding a state-of-the-art video wall. These upgrades required the STOC control room operations to shift to an alternative location within the main Joint Force Headquarters building for over a month. This shift in operational location was conducted using oversight from regional TMCs during the move periods and the operation of the STOC in a new location was seamless due to the interoperability designed into everyday STOC/TMC traffic management functions.

