



2016 ANNUAL REPORT

Letter from the NOCoE Chair



To the Transportation Systems Management and Operations Community:

The National Operations Center of Excellence (NOCoE) has completed its second year of providing quality products and services to empower the TSMO community. It is evident that NOCoE has become a focal point of collaboration among AASHTO, ITE, ITS America, FHWA, TRB, and TSMO practitioners working towards one of NOCoE's goals of bringing the TSMO community together.

The products and services in this annual report showcase not only the quality products and services that were planned and executed by NOCoE staff and volunteers, it highlights the increased involvement from the TSMO community. A community of inclusiveness, collaboration, and knowledge transfer increases the knowledge, skills, and abilities of our TSMO workforce allowing everyone to succeed on their own road.

As the Chair, I would like to recognize and send my gratitude to all of the volunteers that help keep NOCoE on the correct path by guiding the NOCoE staff through their time, excellent counsel, and genuine care of the TSMO community and success of the National Operations Center. It is hard to imagine NOCoE operating without its volunteer community of practitioners; from the Board of Directors to the Technical Advisory Committee, to its individual practitioners supporting the NOCoE staff and its vision to provide exceptional services to the TSMO community to save lives, reduce congestion, and enhance economic vitality.

Sincerely,

A handwritten signature in black ink, consisting of a stylized, cursive 'S' followed by a large, circular flourish that loops back to the start of the signature.

Shailen P. Bhatt

*Executive Director, Colorado Department of Transportation
Chair, NOCoE Board of Directors*

VISION

The National Operations Center of Excellence (NOCoE) will be the recognized leader in providing exceptional services to the transportation systems management and operations (TSMO) community to save lives, reduce congestion, and enhance economic vitality.

The NOCoE empowers the TSMO community to succeed by enhancing knowledge, skills, and abilities.

MISSION

Why You Should Read This

This report offers a summary of the efforts, progress, and accomplishments of the National Operations Center of Excellence for the year 2016. As a transportation professional simply interested in transportation systems management and operations, this annual report offers its reader the opportunity to learn more about the NOCoE and its offerings. From our online knowledge/resource center (offering numerous DOT documents, white papers, reports, presentations, and news items) to our TSMO-focused webinars, regional peer exchanges, and newsletter, this report gives a synopsis of the various resources visitors and members of the NOCoE can utilize for their work, research, and general information.

Who This Report is Intended For

The transportation systems management and operations community, transportation engineers and professionals, engineering and transportation students, and any individual interested in TSMO.

Origins and Stakeholder Community

The founding partners—the American Association of State Highway and Transportation Officials (AASHTO), the Institute of Transportation Engineers (ITE), and the Intelligent Transportation Society of America (ITS America) with support from the U.S. Federal Highway Administration (FHWA) established memorandums of understanding to work together to create the National Operations Center of Excellence (NOCOe) and subsequently support its launch and continued operation.

Advancing toward “excellence” in Transportation Systems Management and Operations (TSMO) requires continuous progress toward improving practice, as defined by desired performance outcomes. A “center” of excellence is commonly defined as “a team, a shared facility, or an entity that provides leadership, evangelization, best practices, research, support, and/or training for a focus area. It may also be known as a competency center or a capability center.”

The NOCoE strives to fulfill its intended vision and mission by the nature of a center of excellence by providing resources and connections to the TSMO stakeholder community.



TSMO is an emerging program that focuses on reducing transportation-related incidents by implementing strategies that prepare for and respond to specific causes such as traffic congestion, weather, construction, poorly timed signals, and special events.



on system user delay and improving reliability by im-
 s of unexpected delay and disruption—crashes, break-
 ts—not directly addressed by additional capacity.

Letter from the NOCoE Technical Advisory Committee Chair



On behalf of the Technical Advisory Committee, I am pleased to endorse this *2016 Annual Report* for the National Operations Center of Excellence (NOCoE). The accomplishments highlighted in this report demonstrate that the NOCoE is succeeding in its mission of connecting the transportation operations community to raise awareness, as well as the state of practice in Transportation Systems Management & Operations (TSMO) across the nation.

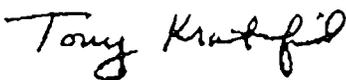
In NOCoE's second year, we have seen sustained growth in outreach as well as the achievement of some milestone undertakings. Most notably, in the past year, the NOCoE:

- ▶ Consolidated its outreach and technical service plans into a single, unified business plan; recognizing the synergies between both aspects of the center's activities.
- ▶ Expanded the content on the web-based knowledge center, improving its usefulness as a reliable resource for TSMO practitioners.
- ▶ Partnered with TSMO experts to present an even wider range of peer exchanges and webinars on topics of significant interest to the TSMO community.
- ▶ Convened the first-ever National TSMO Summit, exploring the challenges and opportunities to advance the state of play in TSMO workforce issues.

I want to thank Tom Kern for assisting the center as its interim Managing Director through July 2016. His wisdom and expertise at the helm enabled the NOCoE to remain on a steady path through a period of transition. I also want to congratulate and welcome Patrick Son as the new Managing Director. In his first few months, Patrick has brought tremendous focus and determination to deliver even higher-quality outcomes through the NOCoE's suite of technical services and communications. I am confident in his vision for the future of the center.

While there remains significant work to do, the foundation laid in these first two years puts the NOCoE and the transportation community in a strong position to see continued growth in the recognition and application of TSMO as a core function of transportation agencies and their partners in the private sector and academia. In reading this report, I hope you share my enthusiasm for the good work accomplished in 2016 and the promise of much more to come.

Regards,



Tony Kratofil, P.E.

Michigan Department of Transportation
Chair, NOCoE Technical Advisory Committee

Overview of Products and Services

The first Annual NOCoE Technical Services Plan (TSP) was published for 2015–2016 as a standalone document; the extent of its efforts to engage the TSMO community through technical services were detailed separately from NOCoE's goals and strategies to promote its own existence and vision through an outreach and engagement plan (OEP). However, the two objectives are intrinsically linked, with the programming effected by the TSP serving as a

critical OE tool to promote not only NOCoE, but the TSMO community as a whole.

The stakeholder contributions and funding support are provided for NOCoE to achieve the strategic goals identified by its Board of Directors as being in line with its stated vision and mission.

STRATEGIC GOALS

1

Educate, train, and develop transportation agency officials and other TSMO practitioners by offering reliable information and professional development opportunities.

2

Increase awareness and understanding of NOCoE.

3

Bring together the TSMO community.

4

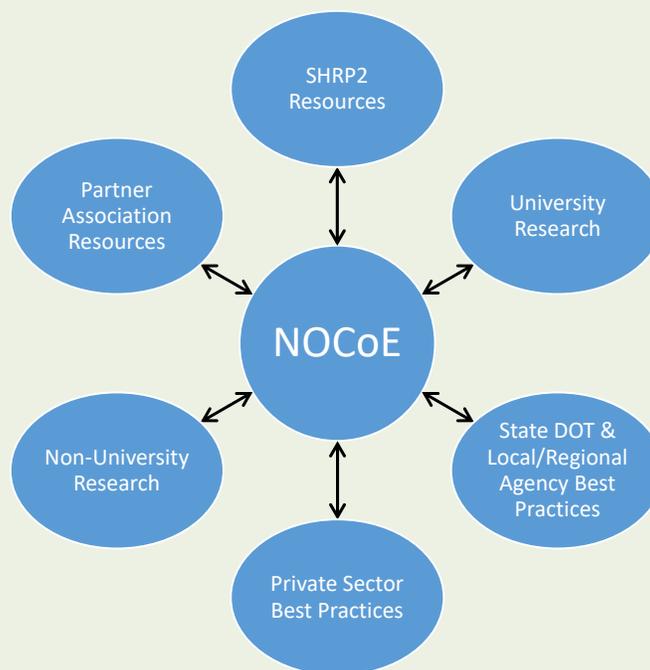
Accelerate deployment of techniques and technologies.

The following principles have been formalized to drive the development of NOCoE's products and services as developed within our business plan:

- ▶ Build on the framework and recommendation of services proposed in the first TSP as the basis for the new plan, modifying the approach as appropriate to capture more recent evaluation and listening session feedback.
- ▶ Provide services that **AMPLIFY** the good work of TSMO practitioners, by providing exposure to a broader segment of the collection of practices and activities being produced or considered within the TSMO community.
- ▶ **CONNECT** TSMO practitioners to existing tools and resources, through a hub-and-spoke model that avoids the duplication of efforts from other agencies.
- ▶ **ENGAGE** the TSMO community whenever possible in the execution of technical services, over and above making simple connections.

- ▶ The means by which NOCoE amplifies, connects, and engages in pursuit of the fulfillment of the Business Plan can be described using a "hub-and-spoke" analogy. Within the TSMO (and broader transportation) community, there are a variety of best practices, training materials, research products, etc. that are of interest to TSMO practitioners. However, in many cases, these practitioners face numerous demands in their day-to-day job functions, and lack the capacity to spend the required time and effort to reach out to the various institutions (or individuals) within which these knowledge resources are housed. Thus, there is great value for an association such as NOCoE to provide the means of facilitating these interactions, such that the disparate body of resources on TSMO can be accessed in one centralized location.

NOCoe "Hub-and-Spoke" Concept of Operations



Workforce Summit

TSMO—with its operational focus on real-time performance management—has become an increasingly vital part of agency business. However, its dependence on systems engineering, advanced information, communication, and control technologies and their effective application makes special demands on agency policy, organization, processes, and procedures, and requires new forms of collaboration. These challenges cut across the traditional planning, finance, design, construction, and maintenance practices, by which transportation agencies have typically defined and developed the skillsets needed to be successful in their historical core businesses.

Today, TSMO as a community-of-practice has matured to a point that a more systematic approach is essential to education and training, recruitment and retention, career advancement and organizational progression—based on recognition of the TSMO Profession.

To begin to address these issues, the NOCoE hosted a two-day summit on TSMO workforce development June 22–23, 2016. The goal of the summit was to identify viable actions that NOCoE can either influence or encourage the development of additional resources for TSMO workforce development. The participants included a diverse group of practitioners, agency managers, human resource specialists (HR), professional education and training specialists, and representatives of state, regional, and local transportation agencies and professional service providers. Three white papers outlining the current status and issues related to TSMO workforce were developed in advance of the Summit. The white paper topics are listed below and can be accessed on our website at transportationops.org:

- Institutional Context for TSMO in Transportation Agencies

- Professional Capacity Building Needs vs. Available Resources
- Recruitment, Retention, and Career Development

Eight priority actions that were identified during course of the two day discussions at the Summit:

1. **Convene** a forum of DOTs, private sector, and educators to discuss pre-employment education needs/solutions
2. Create a **repository** of existing **TSMO**-related course materials across all educational institutions—universities and community colleges
3. Conduct an updated systematic exploration of **knowledge, skills, and abilities** (KSA) needs vs. training materials gaps for TSMO entity-related functions and positions
4. Develop a repository of existing **position descriptions** (PD) for similar positions/functions, and create model position descriptions
5. Develop **model TSMO training program** for new hires, promotions, and transfers, including a review of current best practice for organization policies, practices, and content
6. Develop a **strategy to elevate** TSMO visibility as a core transportation function
7. Document current best **recruitment** practice in public and private entities, including targeting of non-traditional disciplines and recruitment sources, and the use of recruitment “sweeteners”
8. Document current best practices in **mentoring, succession planning**, cross training, special assignments, and individual **career planning** for public and private entities

Following the Summit, NOCoE put together a meetings summary document and an implementation plan based on the input and outcomes of the Summit that can be found on our website at transportationops.org.

Webinars

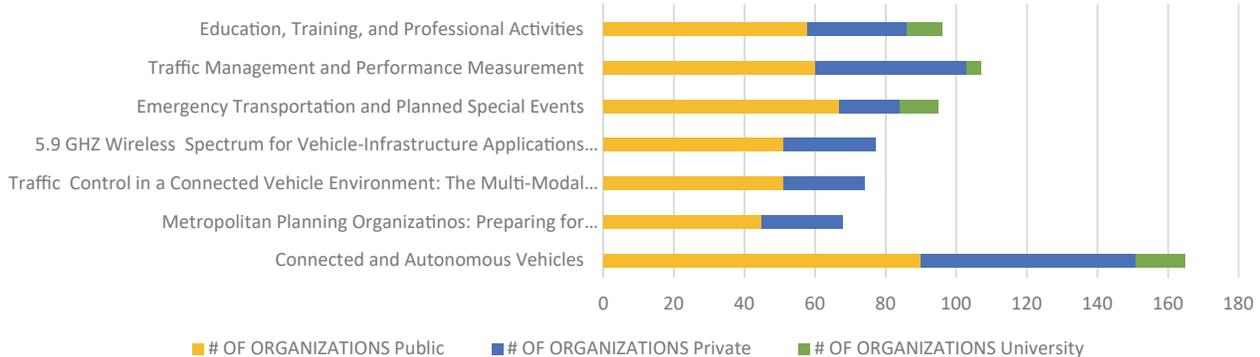
The NOCoE webinars have proven to be a useful resource in engaging the TSMO community, allowing knowledge transfer and peer-to-peer exchange in a virtual environment. These webinars have shown to be effective in NOCoE’s effort to further facilitate knowledge sharing and the dissemination of best practices. Through these webinars, NOCoE has highlighted case studies and best practices, training and

skill development, technical assistance, research news, as well as other learning opportunities to enhance the community’s knowledge of TSMO-related activities. Webinars have been recorded and posted on the NOCoE website so they may be accessed anytime, further enabling on-demand learning for the TSMO community.

15 Webinars in Four Topic Areas:

- Connected and Autonomous Vehicles
- Emergency Transportation and Planned Special Events
- Traffic Management and Performance Measurement
- Education, Training, and Professional Activities

Organizations Represented by Webinar Topic

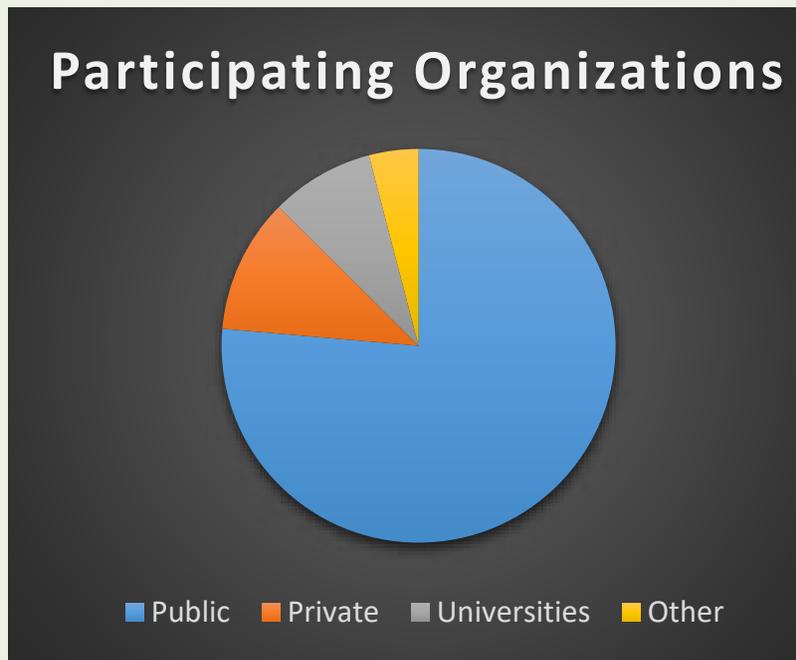


72 Registrants Per Webinar

WEBINAR TOPIC AREA	AVERAGE			# OF ORGANIZATIONS			
	Registrants	Attendees	% Attended	Public	Private	University	Total
Connected and Autonomous Vehicles	155	99	64%	90	61	14	165
Emergency Transportation and Planned Special Events	150	89	59%	67	17	11	95
Traffic Management and Performance Measurement	134	90	67%	60	43	4	107
Education, Training, and Professional Activities	73	44	60%	58	28	10	95

271 DIFFERENT Organizations Participated in Our Webinars

- 207 Public Sector agencies
- 30 Private Sector Companies
- 23 Universities



2016 Webinars

- Metropolitan Planning Organizations: Preparing for Connected/Autonomous Vehicles
- Traffic Control in a Connected Vehicle Environment: The Multi-Modal Intelligent Traffic System (MMITSS)
- TRB Annual Meeting 2017 Preview: Evolving the Next Generation of TSMO Research
- Transportation Systems Management and Operations (TSMO) Program Plan Development Roundtable
- Institute of Transportation Engineers TSMO Council Award Winners
- Performance Measurement and Monitoring in TSMO—Current Practice and Future Development
- TSMO Workforce Development
- Decision Support Systems for TSMO
- Transportation Operations Performance Measurement and Performance Management Programs
- Next Generation Aerial Video and Communications Platform Providing Safe Traffic Management and Emergency Response
- AASHTO SCOTSEM Publication Managing Catastrophic Emergencies—A Guide For Transportation Executives
- 2017 Solar Eclipse Webinar: Preparing for August 21, 2017
- Hard Shoulder Running
- 5.9 GHZ Wireless Spectrum for Vehicle-Infrastructure Applications Overview and Review of Proposed FCC Rulemaking
- DVRPC NJDOT Complete Team Initiative

Peer Exchanges

Participating agencies for all peer exchanges



2016 Peer Exchanges

Over the course of 2016, we have completed five peer exchanges with various discussion topics and participating agencies around the country. The themes of discussion below give an insight into the TSMO topics that provide the essence of what TSMO really is.

- **The Themes of Discussion**

- **The role of public agencies and the private sector:** Public agencies are increasingly becoming data providers. With increasing emphasis on TSMO and crowd-sourced traveler data, what services make sense for to keep in-house vs. handing off to the private sector?
- **Interagency cooperation:** How can transportation agencies effectively collaborate to do more with what they have (e.g., equipping state-owned vehicles with sensors to collect pavement condition data) and make their systems more responsive to changing conditions (e.g., partnerships between DOT and DPS).
- **Business Processes and Financing for TSMO:** In a post-SHRP2 environment, the business cases for TSMO investments will increasingly fall to individual public agencies. How can available data be used to more effectively demonstrate the return on investment (**ROI**) for TSMO-related interventions?
- **TSMO Culture:** Within the transportation community, TSMO cannot be considered as a separate silo—it needs to permeate all other facets of transportation engineering—from safety to planning and capital investment. This change in culture will take several forms—including an increased emphasis on TSMO concepts in the education and pre-employment training environments, in organizational structures for

public agencies, and in the day-to-day activities and project planning for an organization.

- **Regional cooperation and performance measures:** Increasing need for agencies to share data across boundaries as well as at different levels of governance.



Digital Outreach

Website

The NOCoE website (transportationops.org) is constantly evolving and growing in the number of resources that are available to the TSMO community. The website has become a focal point of how the Center has provided resources such as presentations, reports and recordings to name a few. The website is separated mainly into the following sections:

- Knowledge Center
- DiscussionCalendar
- TSMO Resources
- WHY TSMO?
- News
- Blog

- 1,280 website database items
- 1,170 registered site users as of 2016

Social Media

Twitter

@NOCoEOp1

Instagram

nocoeop1

LinkedIn

National Operations Center of Excellence



Newsletter

NOCoE delivers a biweekly e-newsletter to its subscribers;

its main focus being news and events within the realm of TSMO. It also showcases ideas and best practices with the help of original writings from state DOT leaders and other transportation industry professionals. This outreach vehicle has proven to be one of the Center’s strongest means for engaging its audience as we frequently receive comments, suggestions, and questions on the content. The newsletter currently holds a subscriber base of approximately 2,300 people with steady growth. Following are portions of the articles from our valued newsletter contributors:

- 2,300+ subscribers



What Are We Measuring?

Pat McGowan

Vice President of Business Development, Surface Transportation, Serco

“In an effort to capture all relevant performance measurements that impact

the motorist, we should look to the Incident Management Timeline. Each phase of this timeline consists of many unique processes and actions that should be documented and measured. If we are to increase our operational efficiency, our focus must be the reduction of time for each phase on the timeline.”



The Evolving Nature of TSMO

Abbas Mohaddes

CAvitas

“Strong forces and influences from the computer and communication industries have augmented our ability to manage and operate our traffic management systems. Improvement in processing speed has afforded us with real-time information.”



Guest Commentary

Bud Gruber

Chairman, Towing and Recovery Association of America, Motor Club Communication Committee

“I am curious as to why, in all of the nation’s Transportation Departments, there is not a “Towing & Recovery Advisory Committee” designated by each DOT. It seems that the Federal and state governments need to get the Towing & Recovery Industry involved. Remember this: If we, the towing professionals, don’t do our jobs quickly, safely and properly, no one is going anywhere! The lack of great qualified towing professionals would paralyze this country in a short amount of time.”

Video Outreach

YTSMO & ITS PA video

In 2016, the National Operations Center of Excellence partnered with the Transportation Research Board to sponsor a “Why Transportation Systems Management and Operations (#YTSMO)” contest for the “YoungTSMO” generation. The goal was to engage transportation students by asking them to create a 30-60 second video explaining why Transportation Systems Management and Operations matter to them as future TSMO professionals. NOCoE received video submittals from Ashley J. Kim and Travis Low from California Polytechnic State University and Dusan Jolovic from New Mexico State University. The winning duo of Ashley and Travis’ video is featured below.

<https://youtu.be/LEFRd6B-ob4>



ITS PA video

On August 30, 2016, NOCoE participated in a demonstration on how Connected Vehicle technologies will benefit emergency responders.

This demonstration, held at Penn State’s Larson Institute test track and in conjunction with the ITS Pennsylvania and Mid-Atlantic ITE Annual Meeting, featured two demonstrations: the Volvo Connected Truck and its automatic engine braking system when approaching an incident scene, and Southwest Research Institute’s Emergency Vehicle Alert application, installed on a rental car and ambulance. Skyline Technologies also provided their incident zone vehicle that produced live video stream of the demonstration with their WTI Sidewinder camera.

- More than 100 responders and transportation professionals attended the demonstration.
- The demonstration was organized and supported by Toxcel, Gannett Fleming, NOCoE, and the ITS Pennsylvania and MASITE annual meeting organizing committee.

<https://youtu.be/auuoUpjc2h0>



Visit transportationops.org and register to [subscribe](#) to the NOCoE e-newsletter.

2017 Outreach and Engagement

Over the past two years, the success of the NOCoE's outreach and engagement to the TSMO community demonstrates the relevance and validity of all of the services, products and resources provided through and by the NOCoE. 2017 will prove to be a year of growing momentum which we intend to maximize and capture.

We will start by building a stronger connection with TRB to help advance the needs of the research community, especially in areas of applied research that can be utilized by the TSMO practitioners rapidly. The TRB community and activities provide an encouraging forum to get answers to research questions that are needed in order for the TSMO practice to grow.

Utilizing a stronger foundation of resources, we will start to reach out institutionally within individual organizations. Institutional outreach allows us to reach those people within DOTs that may not be as familiar or might not know about TSMO and NOCoE even though a few select people do. This allows the discussion of TSMO to grow in its natural form of being inclusive and a connector of our peers that manage and operate our roadways. To do this, we will be engaging our active TSMO/NOCoE community to help them introduce and explain TSMO complemented by the resources of the NOCoE.

Growing our base of TSMO practitioners, we also need to engage metropolitan area practitioners. The discussion of TSMO within the metropolitan areas may be occurring but an opportunity exists within this type of geographic region to capture the needs and aspects of TSMO at the MPO, county, and local levels. Reaching out to this group of practitioners will provide the connections, discussions, and identification of resource needs that can reach the multitude of agencies that operate at this level.

The communities above are not the only areas where NOCoE will be continuing its outreach and engagement. We will continue to engage the communities that we are currently working with, including the partner associations subcommittees, councils and forums, and other industry groups such as the TIM Network, corridor coalitions, and various nonprofit associations that are partners of the TSMO movement.

This is an open invitation to all those that are a part of TSMO to contact us at NOCoE to help engage your community and elevate the practice of TSMO across our nation.



TRB TRANSPORTATION RESEARCH BOARD

The National Academies of
SCIENCES • ENGINEERING • MEDICINE

Elevating TSMO: Plotting the New Trajectory

Letter from the NOCoE Managing Director



Opportunities to improve the management and operational capabilities of our transportation system are as expansive and extensive as the roadway network which we have built. Building upon the diligent efforts that have been accomplished to get us to this inflection point of our transportation system, we must plot the trajectory of elevating TSMO across the multiple facets of our industry. From institutional processes to technical enhancements to changing our culture, the multitude of solutions provide ample opportunities to create TSMO solutions that will provide adaptable change for the future.

The trajectory that we must put ourselves on, is one of convergence and harmonization. This trajectory is enhanced by looking at and improving our community of practice. Through NOCoE, we have become a community that comes together, shares and develops resources, and constantly learns by engaging the community either through peers or the broader audience within our NOCoE and TSMO community.

The enthusiasm and results that the NOCoE community garnered in 2016 is highlighted in this annual report. It is a testament that even in a short amount of time, we are all working towards the same goal of elevating TSMO across multiple facets of our industry. What may seem like disparate and individual efforts are in actuality a community of practice that is working together.

With that goal in mind, I invite you to continually share your experiences, contact us with inquiries, identify resources that you need and participate in our TSMO community; for we must, now more than ever, plot this new trajectory collectively with a single-purpose of improving the management and operations of our transportation system.

Regards,

A stylized, handwritten signature in black ink, appearing to read 'Patrick Son'.

Patrick Son, P.E.

Managing Director, NOCoE

Appendices

Appendix I

National Operations Center of Excellence Board of Directors and Technical Advisory Committee

NOCoe's Board of Directors comprises representatives from the three partner associations and the U.S. Department of Transportation's Federal Highway Administration (the latter serving in an ex officio capacity). The Board provides strategic thinking and oversight of NOCoe and consists of members from all four partnering organizations. As of January 2016, the Board members are:

Shailen Bhatt, Chair	<i>Executive Director, Colorado Department of Transportation</i>
Jennifer Cohan	<i>Secretary of Transportation, Delaware Department of Transportation</i>
Mike Holder, P.E.	<i>Chief Engineer, Division of Highways, North Carolina Department of Transportation</i>
Greg Johnson	<i>Administrator, State Highway Administration, Maryland Department of Transportation</i>
Laurie Matkowski	<i>Manager, Office of Transportation Operations Management, Delaware Valley Regional Planning Commission</i>
Abbas Mohaddes	<i>The Mohaddes Group</i>
Harry Voccola	<i>Management Consultant</i>
Doug Wiersig, Ph.D., P.E.	<i>Director, Department of Transportation and Public Works, City of Forth Worth</i>
Jeffrey Lindley (Jan. 2016–Sept. 2016)	<i>Associate Administrator, Office of Operations, Federal Highway Administration, U.S. Department of Transportation</i>
Bob Arnold—Acting (Oct. 2016—Dec. 2016)	

NOCoe’s Technical Advisory Committee (TAC) members are a direct link to the TSMO stakeholder community through their day-to-day interactions and dedicated and planned outreach/engagement around the community. This is NOCoe’s primary committee for providing input to the Executive Director and Center staff on the needs of the stakeholder community. The TAC members have input into the selection of topics for webinars, workshops, summits, and other activities within NOCoe. A liaison from FHWA also participates in the TAC, and provides coordination between NOCoe and the FHWA Office of Operations.

As of January 2016, the following individuals comprise the NOCoe TAC:

Tony Kratofil	<i>Michigan DOT—Chair (AASHTO representative)</i>
Dean Gustafson	<i>Virginia DOT (AASHTO representative)</i>
Galen McGill	<i>Oregon DOT (AASHTO representative)</i>
Phillip “Brad” Freeze	<i>Tennessee DOT (AASHTO representative)</i>
Eric Rensel	<i>Gannett Fleming (ITE representative)</i>
Beverly Kuhn	<i>Texas A&M University (ITE representative)</i>
Patrick McGowan	<i>Serco (ITS America representative)</i>
Peter Keen	<i>Digital Traffic Systems (ITS America representative)</i>
Tracy Scriba	<i>Federal Highway Administration (FHWA representative)</i>

Appendix 2

2016 Contributing States to the Operations Pooled Fund

1. Alabama
2. Arizona
3. California
4. Colorado
5. Delaware
6. Hawaii
7. Iowa
8. Kentucky
9. Louisiana
10. Michigan
11. Missouri
12. Nebraska
13. Nevada
14. New York
15. North Carolina
16. North Dakota
17. Ohio
18. Oklahoma
19. Tennessee
20. Texas
21. Vermont
22. Virginia
23. Wisconsin

Appendix 3

NOCoe Staff and MOU Partner Liaisons

Patrick Son, Managing Director
 Steven M. Lavrenz, Ph.D., EIT, Technical Services Manager
 Deborah Rouse, Technical Communications Manager
 John Conrad, Consultant
 Carlos Alban, ITS America Liaison
 Gummada Murthy, AASHTO Liaison
 Douglas Noble, P.E., ITE Liaison



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