Enabling Automated & Connected Infrastructure Through Public-Private Partnerships July 30, 2024



Opening Remarks

Ghassan T. Kridli, Ph.D.

Dean

College of Engineering and Computer Science University of Michigan-Dearborn



Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

July 30, 2024





Welcome to the University of Michigan-Dearborn

Ghassan Kridli Dean of Engineering and Computer Science July 2024



About UM-Dearborn

The University of Michigan-Dearborn is a caring, inclusive, student-focused institution. We are committed to excellence in teaching, learning, research and scholarship, as well as access, affordability and community impact. We emphasize practice-based learning, small class sizes, engaged faculty and a commitment to making a lasting impact in southeast Michigan, the nation and the world.



A UM-Dearborn Education Transforms Lives

- 8037 Total students enrolled in Fall 2023
- **3.7** Average High School GPA of incoming first year students
- 47% First-generation college students
- 46% Pell eligible
- 31% Students of color
- 4 Colleges: Arts Sciences and Letters; Business; Education, Healthand Human Service; and Enginneering and Computer Science (*CECS*)



The College of Engineering and Computer Science is a Key Supplier of Talent and Resource for Economic Development





3,479 students

2,145 Undergraduate 1,224 Master's 110 Doctoral 4th

- Largest Engineering and Computer Science College in Michigan
 - 1,033 Engineering and Computer Science degrees awarded in 2022/23
 - 25.6% Women

2nd Largest graduate student enrollment in Michigan

Safe campus in a great community



Research Areas Focused on Contemporary Challenges



Cybersecurity



Sustainability



Advanced Mobility



Design Innovations



Robotics and AI



Electrification





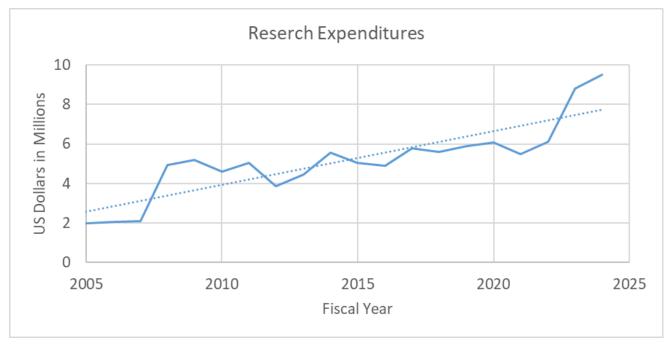
Power Generation & Distribution Bio

Bioengineering

UM-Dearborn is a Key Supplier of Talent and Resource for Economic Development



- \$9.7M in Research expenditures in 2023/2024
- 50% done with local industry





Inventions and Patents

 Increasing with an expanded focus on student generated IP

DEARBORN





Practice-Based Learning infused with Entrepreneurially-Minded Learning

- Practice-based learning (PBL) is a hallmark of a UM-Dearborn education.
- Characterized by courses that are interdisciplinary and collaborative, and where the student work has real-life applications
- Often results in outcomes relevant to campus and community stakeholders
- PBL takes many forms across our campus





Our Undergraduate Degree Programs Evolve to Meet the Changing Needs of Industry and the Region

Computer and Information Science

- B.S. in Computer and Information Science
- B.S. in Cybersecurity & Information Assurance
- B.S. in Data Science
- B.S. in Software Engineering

Industrial and Manufacturing Systems Engineering

- B.S.E. in Industrial & Systems Engineering
- B.S.E. in Human-Centered Engineering Design
- B.S.E. in Manufacturing Engineering

Electrical and Computer Engineering

- B.S.E. in Computer Engineering
- B.S.E. in Electrical Engineering
- B.S.E. in *Robotics Engineering*

Mechanical Engineering

- B.S.E. in Bioengineering
- B.S.E. in Mechanical Engineering

Graduate Programs are Aligned with Michigan's Talent Needs and the Flexibility Supports an Evolving Workforce



Master of Science *

- Artificial Intelligence
- Computer & Information
 Science
- Cybersecurity and Information Assurance
- Data Science
- Engineering Management
- Human-Centered Design & Engineering
- Information Systems & Technology
- Program & Project Management
- Software Engineering

Master of Science in Engineering *

- Automotive and Mobility Systems Engineering
- Bioengineering
- Computer Engineering
- Electrical Engineering
- Energy Systems Engineering
- Industrial & Systems Engineering
- Manufacturing Systems Engineering
- Material Science and Engineering
- Mechanical Engineering
- Robotics Engineering

MSE/MBA dual degrees:

 Industrial & Systems Engineering and Business Administration

Doctoral Programs

Rackham Ph.D. Programs

- Electrical, Electronics, & Computer Engineering
- Computer & Information Science
- Industrial & Systems Engineering
- Mechanical Sciences & Engineering

Doctor of Engineering (D.ENG) Program

- Automotive Systems & Mobility
- Electrical & Computer Engineering

* All these masters programs can be completed online (asynchronously) except for Bioengineering





Welcome to our Campus

Best wishes for a productive meeting



1,8

Brainstorming Session Objectives

Enabling Automated and Connected Infrastructure Through Public-Private Partnerships | July 30, 2024

Event Logistics

Recording

- ANSI is recording this session for internal purposes only.
- No references to specific individuals will be made in the final report.

Internet Access

- Network: MGuest
- Click I AGREE to the terms of use

Facilities (Thank you UM-Dearborn!)

- Emergency Exit
- Food, Beverage, and Trash
- Restrooms

In-Room Participation

- Raise your hand to speak
- Always use a mic
- Name / Company Share this each time you speak
- Slido for polls throughout the event

Online Participation

- Verbal Discussion:
 - 1. Raise your hand
 - 2. Christine will call on you
 - 3. Zoom Support will request you unmute, accept to speak
- Online Discussion:
 - Zoom Chat: Only for connectivity questions
 - Slido Q&A will serve as event discussion board
- Change your name on Zoom (First / Last Name)

Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

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Background

- ANSI is gathering input to inform the NIST implementation plan for the USG NSS CETs
 - USG National Standards Strategy for CETs issued May 2023
 - Draft Roadmap for USG National Standards Strategy for CET (comment period closed July 12th)
- ANSI coordinating private-sector to:
 - Identify existing and past public-private partnerships (PPPs)
 - Learn approaches, best practices and lessons learned
 - Learn different mechanisms for how PPPs convene stakeholders
 - Discuss what role PPPs can play to support CETs
 - Determine if there are stages where a PPP is appropriate based on maturity of standards development
 - Effort is supported through a cooperative agreement with NIST

Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

Session Objectives

- Explore the use of public-private partnerships (PPPs) to share information and identify priority standards development activities
- Today's discussion-based session will focus on Automated and Connected Ground Vehicles and Aircraft
 - opportunities and challenges associated with automated and connected ground vehicles and aircrafts;
 - how PPPs could enable / accelerate automated and connected infrastructure general and application-specific standards development and technology integration into the marketplace;
 - the relationship between standards readiness and relevant types of PPPs

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SESSION 1: TECHNOLOGY CONVERGENCE AND STANDARDS READINESS BRIEFINGS	
9:30 – 10:15 am	Presentations
SESSION 2	2: CHALLENGES, OPPORTUNITIES, AND STANDARDS READINESS DISCUSSION
10:15 – 10:30 am	Automated and Connected Earthmoving & Mining Vehicles Briefing
10:30 – 10:40 am	Discussion Preparation: Challenges, Opportunities, and Standards Readiness
10:40 – 11:00 am	Networking Break
11:00 – 12:00 pm	Automated and Connected Ground Vehicles Discussion
12:00 – 12:45 pm	Break - Catered Lunch Provided and tours
12:45 – 1:45 pm	Automated and Connected Aircraft and the Infrastructure Ecosystem Discussion
SESSION 3: STANDARDS DRIVEN PUBLIC-PRIVATE PARTNERSHIPS (PPPS)	
1:45 – 1:55 pm	Discussion Preparation: PPP Enabling CETs
1:55 – 2:25 pm	Standards Driven Public-Private Partnership Models Briefings
2:25 – 3:15 pm	Public-Private Partnerships: Enabling CETs Discussion
3:15 – 3:30 pm	Networking Break
SESSION 4: INI	FORMATION SHARING NECESSARY TO SUPPORT CET STANDARDS DEVELOPMENT
3:30 – 4:00 pm	Current State of Information Sharing Briefings
4:00 – 4:45 pm	Future State of Information Sharing Discussion
4:45 – 5:00 pm	Key Takeaways & Closing Remarks
5:15 – 6:30 pm	UM-Dearborn Driving Simulator and ImpLi-Fi Demo
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Contributing to Today's Discussion

How to engage in discussion?

- ALL ATTENDEES: Slido Polls / surveys for targeted questions
- IN PERSON ATTENDEES: Raise your hand (primary), Wait for Mic, Say Name/Company
- ONLINE ATTENDEES:
 - 1. Slido Q&A for Discussion
 - 2. Raise Zoom Hand and Staff will request you unmute, Christine will cue you up

How to I find the Slido?

- QR Code found on most discussion slides
- Event link is on the Agenda in my Wednesday, 7/23 Email
- On the A&C event webpage

What can everyone see?

- First and Last Name (Company) OR Anonymous
- Have something more sensitive in nature to share? Participants can change this setting based on each response



S Passcode: PPPs4INF

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Slido: Your Name OR Anonymous

On Q&A **On Slido Profile** 💭 Q&A || Polls MN 3 Example පී My profile 153 Q My questions 8 Your name (optional) Send My profile × 💭 Q&A || Polls 8 My name 3 Type your question A Your company 160 Your email Send MN My name ~ English (US) Stay as My name EDIT 1 question Switch to Anonymous 0 凸 Delete my profile | Cookie Settings Example

Join at slido.com #2153 297 Passcode: PPPs4INF



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UM-Dearborn Tours

Tours Over Lunch

- Digital Engineering Laboratory:
 - The laboratory develops data-driven frameworks and technologies that connect information about product lifecycle, from design to disposal, to provide insights into system behavior and performance.
- Power Engineering Simulator Lab:
 - The laboratory supports researchers/students by providing a combination of emulation, simulation, and real hardware to realize a large-scale, virtual environment that is measurable, repeatable, flexible, and adaptable to emerging technology while maintaining integration with legacy equipment.

Tours After Meeting

- Driving Simulator:
 - The Driving Simulator Lab houses a motion-based driving simulator to support faculty and students for advanced research and education in automotive systems, human factor and ergonomics, human-machine interaction, and driver behavioral studies.
- ImpLi-Fi Demo:
 - ImpLi-Fi technology is a light-based ad hoc physical layer communication protocol, developed with a focus on ease of setup and secure data transfer, with characteristically low susceptibility to interference and interception.



Questions?

Session
Agenda

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Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

Session 1: Technology Convergence & Standards Readiness Briefings

Technology conversion points

- Timothy Klein, U.S. Department of Transportation

Standards Readiness Considerations

- Clare Allocca, NIST

Standards Readiness Phases

- Christine Bernat, ANSI



Technology Convergence

Timothy Klein

Director, Technology Policy and Outreach

Office of the Assistant Secretary for Research & Technology

U.S. Department of Transporation (DOT)





Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

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Questions?

Standards Readiness Considerations

Clare Allocca

Senior Advisory for Standardization National Institute of Standards and

Technology (NIST)





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Standardization Readiness and its Application

Clare M. Allocca National Institute of Standards and Technology



30 July 2024

Today



- Introductions
- Standardization Readiness Concept
- Elements Description
- Standardization Strategy

Note: Standardization Readiness is an evolving concept—your input will be most welcome!

Standardization Readiness Concept



- Standardization Readiness (SR): a tool to inform evaluation of whether current and potential products based on an aspect of a given technology would benefit from standardization activities
- Reflects principles of standardization
 - Provides considerations for all requirements to develop a standard
 - Structures a framework for evaluation and prioritization of standardization projects and work programmes
 - Informs roadmapping and strategic initiatives
 - Provides a structured and logical means to explain standardization and evaluate ideas

How are Standards Developed?

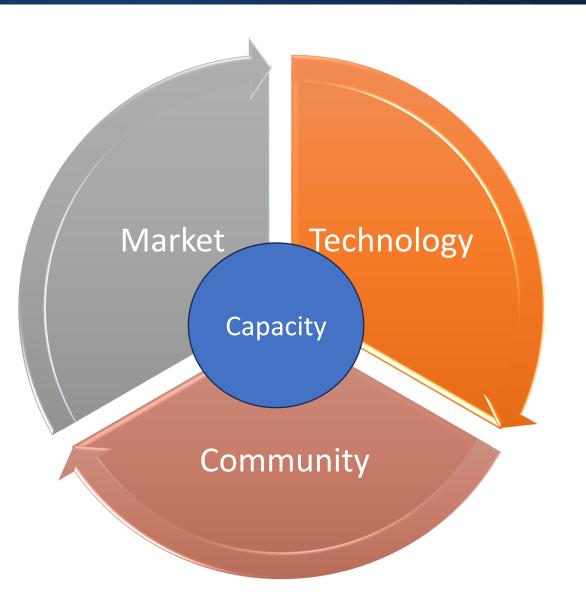
THIS (per ISO/IEC):



NOT THIS: DID YOU CONVINCE HOW DID THE CANI OR ARE YOU 83 COMPANIES TO INDUSTRY STANDARDS HEAR A COMPLETE ADOPT STANDARDS MEETING GO? THOSE FAILURE? THAT BENEFIT ONLY US CHOICES WHILE DOOMING THE AGAIN? ENTIRE INDUSTRY IN THE LONG RUN? ER

http://dilbert.com/strip/2009-09-02

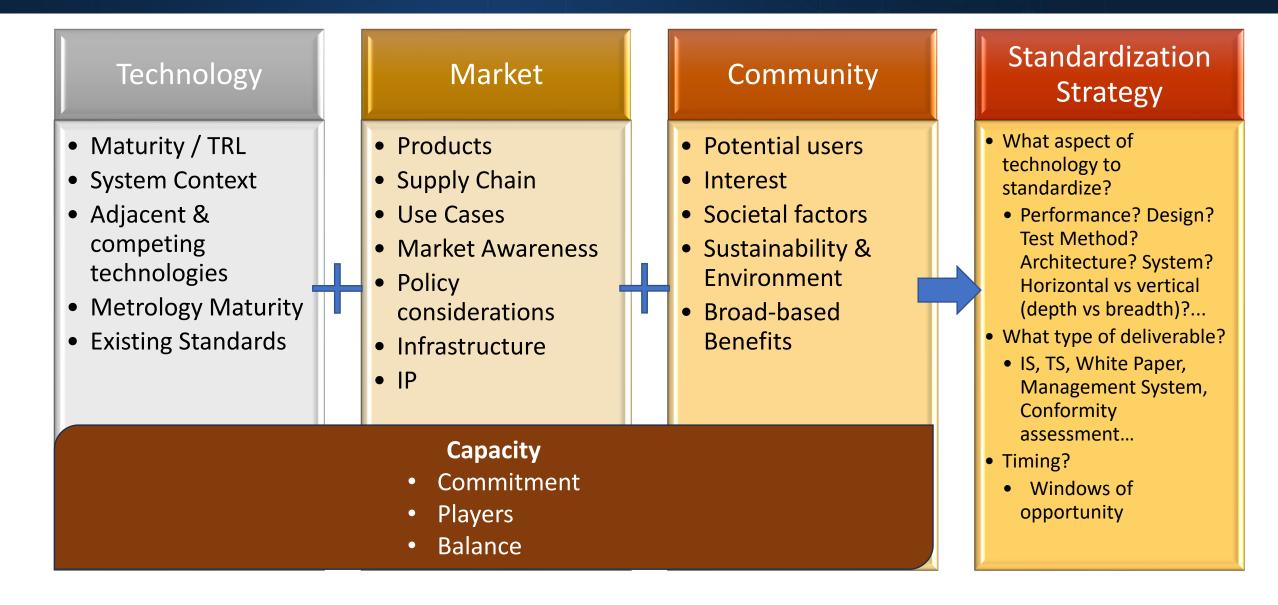
Standardization Readiness Level (SRL) Dimensions



NIST

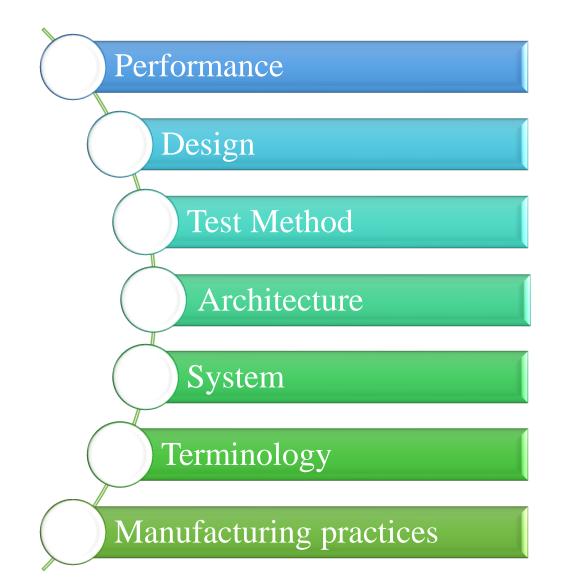
SRL Dimensions Inform a Standardization Strategy





Informing a Standardization Strategy / Roadmap: What to Standardize?





- Value Proposition Considerations:
 - Is it appropriate to develop a technology agnostic standard that could apply to competing technologies?
 - Horizontal vs vertical standard (broad usage or specific?)
 - Are there gaps (business or technical) that would prevent usefulness of the standard(s) under consideration?



Possible responses may include, but are not limited to, System Performance; Device Design; Performance Characterization and Benchmarking; Architecture; Systems, Components, or Interfaces; Terminology and Definitions; Manufacturing Practices...

Informing a Standardization Strategy / Roadmap: In what form?



- Value Proposition Considerations:
 - How extensive are requirements?
 - Consensus level required for approval?
 - Intended Use?
 - Life limit / review cycle?
 - What level of user assurance is needed?
 - How mature and stable is the technology?

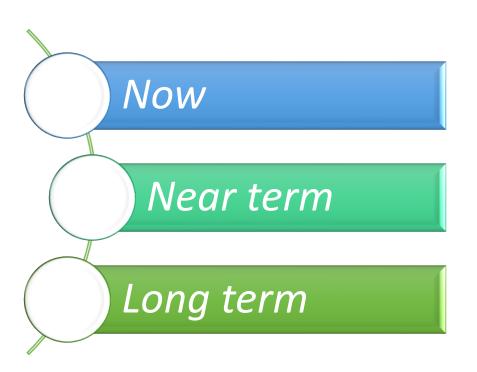
Note: In ISO/IEC, the only "standard" is an international standard (IS)

Standardization = standards and related deliverables



Normative (Requirements) or Informative (No Requirements)?

Informing a Standardization Strategy / Roadmap: When?



- Value Proposition Considerations:
 - Windows of opportunity
 - Timing for standardization initiation and/or engagement
 - Availability of experts, interested parties



Normative (Requirements) or Informative (No Requirements)?



Thank you

Any Questions?

SRL Dimension: Technology Considerations

Technology Value Proposition: Is the technology sufficiently mature for the type of standard or related deliverable you would be recommending? For example, is the relationship between a characteristic of the technology and performance in a product understood? Does any needed metrology exist and will it enable distinctions among performance?

What impact would the development of a standard (or other deliverable) have on the future of technology development/innovation in this area? How would this encourage the development of further standards?

Maturity/TRL Adjacent & competing **Existing Standards** (Technology Readiness **Systems Context** Metrology technologies Level) • Is the technology intended • Has the technology • Are there alternate Is there a consensus on • Do any relevant to be part of a system of been proven, and in technologies that might standards already exist, what properties need to technologies? what setting (ie: overtake this be measured to support or that can be modified • If so, what is the maturity *technology, or co-exist* the technology? to accommodate the laboratory, test level and forecast for with it? technology? environment, • Does the measurement system-level technologies? operational • Does this technology science exist, is it If the technology is at the environment, fielded as rely on other proven, and is it system level itself, how a product)? technologies, accessible? mature are the components or systems, • Can you measure the component technologies? and how mature are properties that will • What potential risks might they? differentiate be associated with performance in a • Is it possible to create a developing standards at this technology maturity technology-agnostic meaningful way, that *level(s)?* standard to allow might warrant being interoperability across included in a standard?

competing technologies?

SRL Dimension: Market



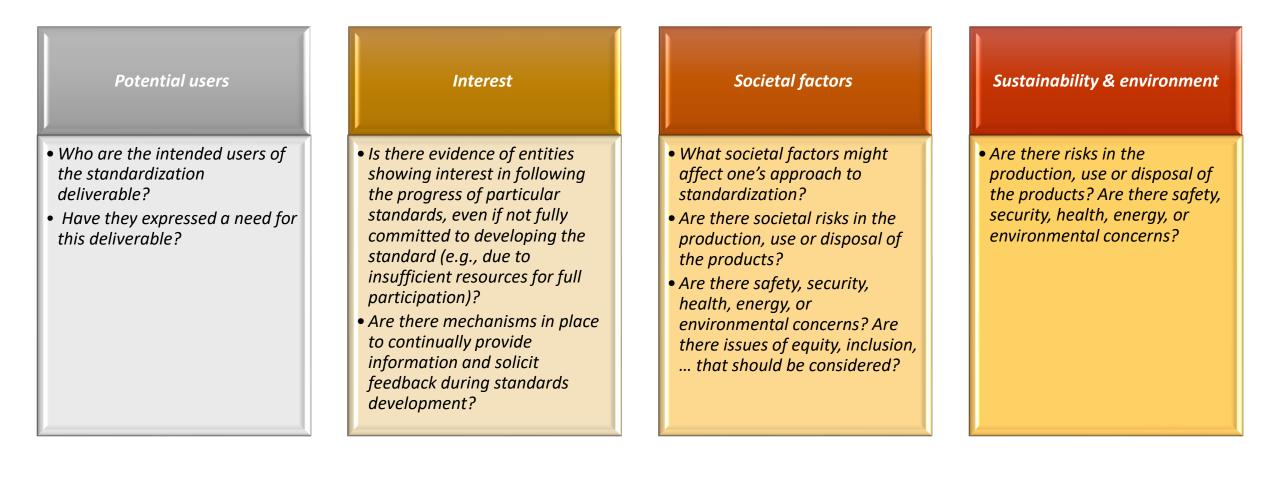
Market Value Proposition: Is there a sufficient business case to justify the pursuit of a standard? Keep in mind that the purpose of standards is to provide for equitable access to the global marketplace, while stimulating innovation.

Products	Supply chain	Use cases	Market awareness	Policy considerations	Infrastructure	IP (Intellectual Property)
 How many products from how many companies exist, and how mature are they? Are there competing technologies? Would standards support competition or down-selection? How confident are consumers? What risks do consumers face in product adoption? 	 How many suppliers exist? How secure and robust is the supply chain? Where are they geographically? Are there single points of failure? Is there adequate end user demand to support the suppliers? Does the supply chain support the full product space and multiple product generations? 	 Have use cases been defined? How relevant are they to what sectors? What is the status of the needed enabling technologies for these use cases? 	 Have market forecasts been conducted, and has consensus emerged? Are there technology and/or commercializati on roadmaps, in the public & private sectors? 	 Is the sector regulated? Are there national and/or international compliance requirements? What are the regulatory requirements that need to be met for market entry? 	 Does the infrastructure exist to support products in the field (e.g., do charging stations exist to support electric cars?) Can products be maintained and repaired? Are there means to support access and storage needs? 	• Are there IP issues that need to be considered?

SRL Dimension: Community



Community Value Proposition: Are all of the interests of the stakeholders sufficiently understood (and are they aligned with the project idea) to pursue a standard?



All SRL Dimensions: Capacity

Capacity Value Proposition: Are there enough experts representing the globe (in the case of an international deliverable) who cover the competencies needed to develop the standard, and are they committed to actually working on it?

Commitment

- Is there committed and available global expertise? and who are the experts?
- Are these experts willing and available to develop the standard(s)? How can they be engaged?
- Are the committed experts representative of all aspects of the technology / standardization effort?

Players

- Who are the players in the standardization landscape?
- What has been their level / direction of commitment?
- Are there organizations already developing standards in this area?

Balance

- Is the participation in standardization appropriately distributed across a number of countries / regions and stakeholder communities?
- Is it specific to a region? market sector? part of a supply chain?

Test Case Project Information



Test Case Project Information					
Primary Category	Secondary Category	Project Area Idea/Title	Project Area Idea/ Description		
(SEG14 category: select	(In format		(1-2 sentences)		
from drop-down list)	"category_type:category",				
	e.g., "hardware:cold atoms"				
	or "metrology:gate noise"				
	or "end user apps:QML &				
	AI" refer to tables for				
	examples)				

Quantum benchmarks metrology:metrics

Definition of metrics

Compile definitions of metrics for fundamental quantum technologies

SRL Considerations and Minimum Gate Assessments: Technology & Market



Standardization Readiness Level (SRL) Considerations and Minimum Gate Assessments

Technology (qualitative assessment, including Yes/No minimum gate assessment)	Technology: what is still needed? If minimum gate has not yet been met, what is still needed?	Market (qualitative assessment, including Yes/No minimum gate assessment)	Market: Gaps If minimum gate has not yet been met, what is still needed?
Characteristics of fundamental quantum technologies (eg qubits, single-photon sources) are well understood. Where possible, measurement cechnology exists, is proven and		Testing facilities, mainly in national metrology institutes, are developing testing services for fundamental quantum technologies. Some services already exist. In the future a transfer of this facilities to a broader range of independent service providers is planned/expected. Yes, gate met.	
accessible through NMIs and other laboratories. As a step cowards unbiased and neutral cest methods, the important metrics for each technology	while the gate has been met for many metrics broadly, it has not been met for others -	multi-layer: direct customers, e.g., NMIs who would use to build instruments, testing labs, measurement services etc - both products and services	
nave to be agreed/defined. Yes, gate met.	be careful that specific scope addresses aspects that are technically ready	indirect: those who could use the standard to develop other standards, instrument manufacturers, researchers	NA

SRL Considerations and Minimum Gate Assessments: Community & Capacity



SRL Considerations and Minimum Gate Assessments (cont.)

SRL/Operational Capacity

CommunityCommunity: Gaps(qualitative assessment, including Yes/NoIf minimum gate has not yet been met, what is
minimum gate assessment)still needed?

Capacity (qualitative assessment)

NMIs and other test facilities are ready to participate in this and further standard test method development. The quantum technology suppliers have sought device characterisation. Governments are keen to see a rapidly developed ecosystem of quantum suppliers with assurance for their products and services. Yes, gate met.

indirect: those who could use the standard to develop other standards, researchers, those who use the metrics for technology development, those who will facilitate market growth for the wider technology,

Experts from NMIs around the world are ready to get involved, e.g., Germany, UK, USA, Canada, Japan, South Korea. Partly also academia.

Formulation of Standardization Roadmap

Formulation of Standardization Roadmap

What might be standardized, if anything?

(Use one spreadsheet row per distinct activity type identified: e.g., for "quantum computing->metrology:qubit decoherence", could identify both "measurement procedures" and "known noise models"); fine to suggest multiple potential standards ideas

Who is the intended audience

(sphere of engagement)?

(For each identified standardization activity in previous column) quantum community, suppliers, end users, workforce, wider community

In what form? (What kind of ous standards deliverable? e, Select from dropdown list: Normative, Informative)

Overall Value Proposition: Summary assessment

(What is the case for or against the identified standardization activity, based on the technology, market and community dimensions, not including capacity?)

When?

(Based on the overall value proposition summary assessment, when should the standardization activity be undertaken? Select from drop-down list: "now", "nearterm" or "long-term")

now

For: rapidly developing market for assurance services. Stepping-stone to development of neutral and unbiased test methods. Highly important for establishing a world-wide QT industrial supply-chain. This could potentially be an umbrella over others

Definition of metrics for quantum tech

NMIs (suppliers), Quantum tech manufacturers (buyers), later normative standards developers, researchers (requirements)

Quantum Technologies: Moving Forward

- Result: Approval of formation of JTC-Q!
- Package for transfer to JTC-Q, including
 - Background information on research, market, and standardization landscapes
 - Methodology for Standardization Evaluation of Potential Projects
- Does this yield a roadmap? No; necessary, but not sufficient

CHIPS Template Development



	S	RL Element	S	Standardization Strategy				
Project Idea	Technology	Market	Community	What to Standardize?	In what form (how) to Standardize?	When to Standardize?		
Title / Description	address va	ant sub-eler is for consid lue proposi lement leve	leration; tion at the	Examples: Terminology / Methods / Architecture 	Normative vs Informative	Now / Near term / Long term		

Standards Readiness Phases

Christine DeJong Bernat

Associate Director, Standards Facilitation American National Standards Institute (ANSI)





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	PRE-STANDA	ARDIZATION	STANDARDS DI	EVELOPMENT	IMPLEMENTATION		
		STANDARDS READINESS PHASES					
	PREMATURE	EXPLORATORY	PLANNING	DEVELOPMENT	IMPLEMENTATION		
Standardization Activity	- No discussions/interest in standardization	 Identification & evaluation of existing related standards & conformity assessment programs of similar technologies Benchmarking 	 Landscape & gap analysis Roadmapping Terminology development Soliciting stakeholder engagement 	 Standards committee(s) formed Soliciting leadership and stakeholder engagement Standards drafted, approved & maintained 	 Standards approved, maintained & utilized Conformity assessments Referenced in law or regulation, as applicable 		
Information Sharing & Awareness	 Internal prototyping/research has begun Stakeholders working independently Consortia/Association discussions not taking place, or do not exist for a particular technology 	 Collaborative research takes place Like-minded stakeholders sharing minimal information Consortia/Association discussions & evaluation begin 	 Research is being strategized Like-minded stakeholders collaborating & sharing minimal information more broadly Consortia/Association position/issue papers developed 	 Research is ongoing Balanced representation of stakeholders collaborating Stakeholders investing resources to draft & vote on standards Consortia/Association recommendations issued 	 Research is ongoing Balanced representation of stakeholders collaborating & doing business Stakeholders investing resources to draft & vote on standards Consortia/Association advocating for standards adoption 		

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Standardization Activity	PR - No disc in stand			PREMATU		5)	IMPLEMENTATION IMPLEMENTATION - Standards approved, maintained & utilized
		Standards Activity Information		cussions/interest in star	ndardization	nd nt d	 Conformity assessments Referenced in law or regulation, as applicable
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					IMPLEMENTATION
Standardization Activity	PR - No disc in stanc		EXPLORATORY	JT æ(s)	IMPLEMENTATION - Standards approved, maintained & utilized
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Standardization Activity	PRI - No disc in stand		PLANNING	Image: Market of the second
		Standards Activity	-Roadmapping	formity assessments erenced in law or lation, as applicable
Information Sharing &	- Internal prototyp		-Soliciting stakenolder engagement	earch is ongoing inced representation of
Awareness		Awareness	sharing minimal information more broadly -Consortia/Association position/issue	eholders collaborating & g business eholders investing urces to draft & vote on dards sortia/Association ocating for standards ption

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Standardization Activity	PR - No disc in stand		IMPLEMENTATION	NTATION NTATION oved, tilized
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Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

Automated and Connected Earthmoving & Mining Vehicles Briefing

Eric Moughler

Engineering Fellow ISO/TC 127 Earth Moving Machinery Chair



Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

July 30, 2024

Earthmoving and Mining Industries Presentation to Enabling Automated and Connected Infrastructure Brainstorming Session

Eric Moughler <u>Moughler_eric_a@cat.com</u>

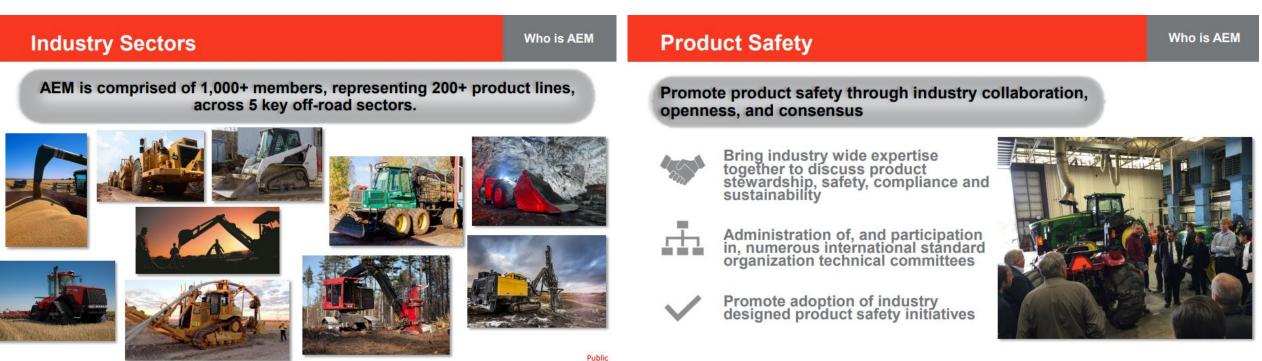
July 30, 2024

Agenda

- ➤Introduction
- Industry Activity
- Differences in Industries
- Standards Activity
- Recent Products

Industry Activity

• Association of Equipment Manufacturers



Differences in Industries

We are not automobiles	Who we are not	We are not automated man	ufacturing machinery	Who we are not
 An automobile's main purpose is to transport people and goods Automobile infrastructure is standardized Access is unhindered Interactions with bystanders 		 Fixed machinery Assembly lines Machining of parts Factory setting Static indoor, enclosed 		
	Public	environment		Public

Industry Differences

We are Construction

- Fully autonomous equipment has been deployed in certain applications
- Focused on greenfield settings, specifically infrastructure projects
- Applications involve independent machines working on their own
- Basic, repetitive tasks over large quantities of earth



We are Mining

- Controlled Access
- Machines perform work
- Machines do not transport people









Industry

Sector







Public

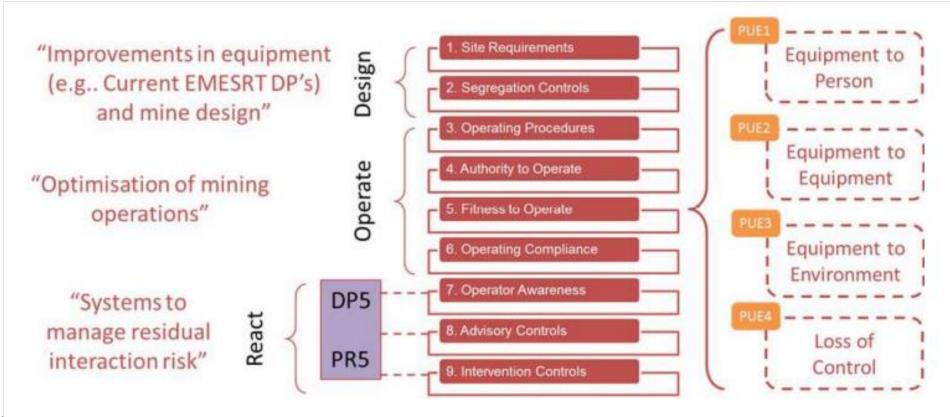
Industry

Sector

Industry Activity



- EMESRT Earthmoving Equipment Safety Round Table
 - Basically.....Get L1-L6 right....then look at your ability to address potential unwanted events to address residual risk through L7-L9 -<u>More information</u>







SURFACE VEHICLE INTERACTION SCENARIOS



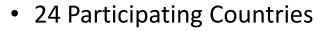
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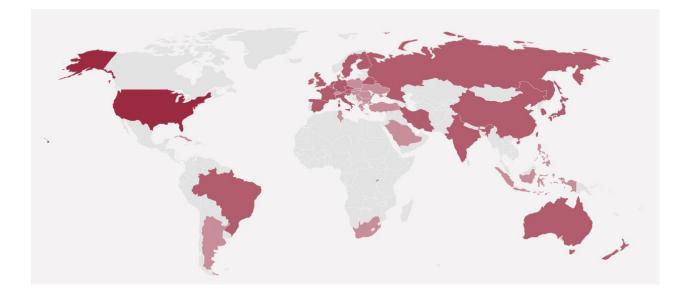
Caterpillar: Non-Confidentia

ISO TC 127 Earth-moving machinery



• 19 Observing Countries

- 184 Standards Published
- 18 Standards Under Development



Earth Moving & Mining Standards (Under Development or Recently Published)

Augmentation			
ISO 21815 Parts 1-5	Collision Avoidance		
ISO/AWI 22543	Bystander awareness		
Communication			
ISO 23870 Multiple Parts	High Speed Network		
Autonomous			
ISO 23724	Emergency remote stop		
ISO 23725	Fleet Management System Interoperability		
ISO 3502	Reference framework		
ISO 3510	Interoperability of teleoperated and autonomous		
ISO 17757	Autonomous safety		
ISO 7334	Taxonomy and vocabulary		
Electronic Control Safety			
ISO 19014 Parts 1-5	Functional Safety		

Caterpillar: Non-Confidential

Alternative Power Gap

Existing Standards that still need to be reviewed	28
Standards with known issues	22
Standards that could need to be created	4

Other things on the plate

Cyber security, data privacy, AI

Recently Introduced Products

Description	How it works	Results
Operator Fatigue & Distraction Management Systems Nearly 80 percent of crashes and 65 percent of near-crashes involved some form of driver inattention within three seconds before the event NHTSA/DOT 2003 Report	Monitors eye-closure duration and head pose. Detects fatigue and distraction events utilizing AI Alarm for Operator Notifies 7/24/365 central monitoring center	97% REDUCTION in most significant fatigue events 91% REDUCTION in distraction in distraction events
Smart Cameras	Object Classification utilizing AI Detection of People vs Detection of Objects	Reduction of False Alarms Reduction of Operator Fatigue
Electronic Fences/Avoidance Zones	Prevents operating machines from entering or reaching into restricted areas	Limits operation to approved areas Internal Traffic Control Plans (ITCPs) with Engineering Controls
 Autonomous machines (ISO 7334) Haul Trucks (Level 4) Dozers (Level 3) Blast Hole Drills (Level 3) LHDs (Level 3) Excavators (Level 3) 	Eliminate the operator and reduce human error	 Data from one OEM 600 autonomous haul trucks operating 25 customer sites around the world surpassing 5.9 billion tonnes of hauled material 99,000 miles driven daily (equivalent of 4 times around the earth) >127 Million miles (equivalent distance to Mars) 7x24x365 No lost time injury

Questions?

Session Agenda

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Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

July 30, 2024

Discussion Preparation:

Challenges, Opportunities, and Standards Readiness

Establishing a Baseline

- What are the challenges and opportunities presented by automated and connected (A&C) ground vehicles and aircraft and is there sufficient public and private stakeholder awareness on these fronts?
- What role do stakeholders see standards playing in overcoming challenges?
- What concerns have been raised about existing standards efforts?
- Does the sector need to see A&C vehicle standards development accelerated?
- What approaches could be taken to help align/maintain the pace of A&C vehicle standards and technology development?
- What is the role of **industry vs government** to maximize opportunities?
- What regulation, policy and/or conformity assessment frameworks might be needed to enable or accelerate technology uptake?
- What is the role of government to maximize opportunities? To support standards development?



Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

Questions?



7**B**

BREAK

10:50 - 11:00 AM

Enabling Automated and Connected Infrastructure Through Public-Private Partnerships | July 30, 2024

SESSION 2: CHALLENGES, OPPORTUNITIES, AND STANDARDS READINESS DISCUSSION Automated and Connected Ground Vehicles Discussion 11:00 – 12:00 pm 12:00 – 12:45 pm **Break - Catered Lunch Provided and tours** 12:45 – 1:45 pm Automated and Connected Aircraft and the Infrastructure Ecosystem Discussion SESSION 3: STANDARDS DRIVEN PUBLIC-PRIVATE PARTNERSHIPS (PPPS) **Discussion Preparation: PPP Enabling CETs** 1:45 – 1:55 pm 1:55 – 2:25 pm **Standards Driven Public-Private Partnership Models Briefings Public-Private Partnerships: Enabling CETs Discussion** 2:25 – 3:15 pm 3:15 – 3:30 pm **Networking Break** SESSION 4: INFORMATION SHARING NECESSARY TO SUPPORT CET STANDARDS DEVELOPMENT 3:30 – 4:00 pm **Current State of Information Sharing Briefings** 4:00 – 4:45 pm **Future State of Information Sharing Discussion** 4:45 – 5:00 pm **Key Takeaways & Closing Remarks** 5:15 – 6:30 pm **UM-Dearborn Driving Simulator and ImpLi-Fi Demo**



Session

Agenda

Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

Session 2: Ground Vehicles Challenges, Opportunities, and Standards Readiness

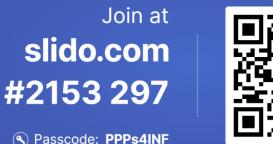
Moderator

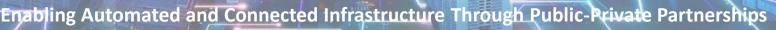
Dr. Miles Johnson Executive Engineer Toyota North America

Enabling Automated and Connected Infrastructure Through Public-Private Partnerships



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- What role do stakeholders see standards playing in overcoming challenges?
- What is the role of industry vs government to maximize opportunities?
- What concerns have been raised about existing standards efforts?
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 Join at
- What is the role of government to maximize opportunities? To development?





A&C Infrastructure for Ground Vehicles Challenges, Opportunities, and Standards Readiness

Opportunities

- Use-case based standardize coupler interface;
 - CCS and MCS being the most broadly adopted, visa-vis Europe
- Cooperation & collaboration between roadway infrastructure and ADS development
- Improve performance and safety

Challenges

- Fear of change
- Lack of use-case based standardized coupler interface New technology will not immediately be perfect
- Infrastructure (automated/connected) will take a lot of time, money & resources to implement and standardize
- Inadequate
 - sensor output validation
 - behavior anomaly detection (high level & subsystem)
 - safeguards against adverse system behavior
- Requirements (State regulatory, environmental)



July 30, 2024



Join at

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Passcode: PPPs4INF

- What is the role of industry vs government to maximize opportunities?
 - Conducting R&D
 - Landscape analysis and standards roadmaps
 - Determining technology readiness for standards development
 - Setting the scope of standards activities
 - Convene stakeholders to write standards
 - Increase awareness about research, standards, regulation/policy
 - Gap assessment: Determining what policies apply to AI or are needed
 - Setting requirements / policy
 - Conformity assessment
 - Workforce development
 - Standards adoption





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Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

- What concerns have been raised about existing standards efforts?

- Participation: Need industry engagement
- Participation: Need government engagement
- Resources: Stakeholders attending several SDO activities
- Resources: Budgets do not support travel
- Duplication: Content across standards organizations conflict
- Duplication: Content across standards organizations poorly align
- Expertise: Technical expertise and data not widely available
- Expertise: Differing perspectives result in challenges to reach consensus
- Awareness: A landscape of existing supporting activities is needed.
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- None: It is too early for standards development
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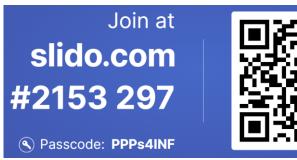
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S Passcode: PPPs4INF

- What regulation, policy and/or conformity assessment frameworks might be needed to enable / accelerate technology uptake?
 - Safety education and SOPs
 - Emergency response requirements
 - Inspection/revalidation schemes better than that for existing infrastructure operations
 - Expanded guidance for new construction and maintenance requirements
 - Regulators should include industry-developed standards and best practices into their policies and regulations when appropriate (Especially for CETs)
 - EPA regulations, ISO 14001, ISO 27001, SOX compliance
 - Enterprise Risk Management Frameworks





Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

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Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

UM-Dearborn Tours

Tours Over Lunch

- Digital Engineering Laboratory:
 - The laboratory develops data-driven frameworks and technologies that connect information about product lifecycle, from design to disposal, to provide insights into system behavior and performance.
- Power Engineering Simulator Lab:
 - The laboratory supports researchers/students by providing a combination of emulation, simulation, and real hardware to realize a large-scale, virtual environment that is measurable, repeatable, flexible, and adaptable to emerging technology while maintaining integration with legacy equipment.

Tours After Meeting

- Driving Simulator:
 - The Driving Simulator Lab houses a motion-based driving simulator to support faculty and students for advanced research and education in automotive systems, human factor and ergonomics, human-machine interaction, and driver behavioral studies.
- ImpLi-Fi Demo:
 - ImpLi-Fi technology is a light-based ad hoc physical layer communication protocol, developed with a focus on ease of setup and secure data transfer, with characteristically low susceptibility to interference and interception.





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LUNCH

12:10 - 1:00 PM

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Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

Session 2: Aircraft Challenges, Opportunities, and Standards Readiness

Moderator

Jonathan Archer Manager, Aerospace Standards Business Development & Outreach SAE International





Enabling Automated and Connected Infrastructure Through Public-Private Partnerships



Automated and Connected Aircraft

Develop validated AAM System Architectures that define a safe, certifiable, and scalable system

41/5

DEARBORN

- What are the challenges and opportunities presented by automated & connected ground vehicles and is there sufficient public and private stakeholder awareness on these fronts?
- What role do stakeholders see standards playing in overcoming challenges?
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Passcode: PPPs4INF

Automated and Connected Infrastructure for Aircraft

Challenges, Opportunities, and Standards Readiness

Opportunities

- Introduction of new operational models to move people and products
 - E.g., eVTOLs
- Improve performance and safety
- Enabling automated responses, most efficient resource scheduling and predictive analytics across airport operations.

Challenges

- Fear of change
- New technology will not immediately be perfect
- Infrastructure (automated/connected) will take a lot of time, money & resources to implement and standardize
- Siloed systems, shared cybersecurity vulnerability
- Inadequate
 - sensor output validation
 - behavior anomaly detection (high level & subsystem)
 - safeguards against adverse system behavior
- Requirements (State regulatory, environmental, FAA)



Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

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Passcode: PPPs4INF

Automated and Connected Infrastructure for Aircraft

Challenges, Opportunities, and Standards Readiness

- What is the role of industry vs government to maximize opportunities?

- Conducting R&D
- Landscape analysis and standards roadmaps
- Determining technology readiness for standards development
- Setting the scope of standards activities
- Convene stakeholders to write standards
- Increase awareness about research, standards, regulation/policy
- Gap assessment: Determining what policies apply to AI or are needed
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- Workforce development
- Standards adoption





Passcode: PPPs4INF

Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

Automated and Connected Infrastructure for Aircraft

Challenges, Opportunities, and Standards Readiness

- What concerns have been raised about existing standards efforts?

- Participation: Need industry engagement
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Passcode: PPPs4INF

- What regulation, policy and/or conformity assessment frameworks might be needed to enable / accelerate technology uptake?
 - FAA regulation and policy assessments and guidance (operational rules, landing facility design, personnel related training and certification)
 - Safety education and SOPs -
 - Emergency response requirements -
 - Regulators should include industry-developed standards and best practices into their policies and regulations when appropriate (especially for CETs)
 - FAA regulations, EPA regulations, ISO 14001, ISO 27001 -
 - **Risk Management Frameworks** _





- What are the challenges and opportunities presented by automated & connected ground vehicles and is there sufficient public and private stakeholder awareness on these fronts?
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Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

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Session Agenda

ANSI DEARBORN Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

Standards-Driven Public-Private Partnerships

Christine DeJong Bernat

Associate Director, Standards Facilitation American National Standards Institute (ANSI)





Enabling Automated and Connected Infrastructure Through Public-Private Partnerships



Session 3 Discussion Preparations

Public-private partnerships (PPPs) are collaborations between a government agency and a private-sector organization for the purposes of delivering a project or service, and which involve the sharing of resources, responsibility, risks, and benefits.

ANSI

Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

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Standards-Driven Public-Private Partnerships

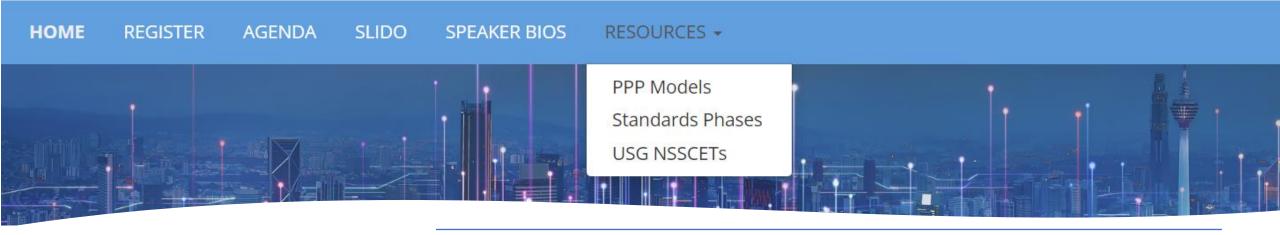
Standards-driven PPPs (SD-PPPs) are a type of PPP where resources invested are directly impacting consensus-based standards development.

- SD-PPPs may or may not involve contractual agreements, financial support, or formal relationships between public and private representatives.
- SD-PPPs may prove more effective when private-sector technology and innovation synergizes with public-sector priorities and incentives.
- Common work products of SD-PPPs are:
 - **Pre-standardization activities**: Roadmaps, gap analysis, research and development, etc.
 - **Standards development**: Support for the proposal and/or formation of new committees, identifying and convening technical experts, content development, etc.
 - Implementation: Increasing awareness, technical training, workforce development, conformity assessment, etc.

Actual SD-PPP use cases often include the characteristics of more than one model. For example, a SD-PPP may be a "standards acceleration" and a "funded participation model."



Enabling Automated and Connected Infrastructure Through Public-Private Partnerships



Direct-Participation

Standards Acceleration

SD-PPP Models

Funded Participation

Funded Standards Development

Policy and Conformance Driven



Enabling Automated and Connected Infrastructure Through Public-Private Partnerships



SD-PPP: Direct Participation

Public and private sector directly participates in the standards development process alongside to any other stakeholder at the table. As with any other participant, they represent their organization and follow any policies set forth by their employer as well as the regulations/bylaws of the SSO supporting the standards development activity. Policies and guidance about federal government participation can be found in Public Law 104-113, National Technology Transfer and Advancement Act of 1995, and OMB Circular A-119, Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities.

Objectives	- Support the development of standards		
	 Provide insight about what role standards would play in relation to existing or future government regulations/policy 		
	 Gather information to inform potential government regulations/policy 		
Work Products	- Pre-standardization: technical reports, strategic plans		
	- Standardization: Standards development		
	 Implementation: Increasing awareness, technical training, workforce 		





SD-PPP: Standards Acceleration

Primarily focused on convening stakeholders to discuss opportunities, challenges, and needs for a given technology and applicable sectors. The primary objective of this SD-PPP activities may not be to develop standards but instead support pre-standardization efforts. Ultimately, the desired outcome is to determine if there is consensus about the need for standards and to help advance decision-making and therefore accelerate subsequent standards development.

Objectives	 To accelerate the development of standards by convening experts to increase awareness about existing and needed research and standards
Work Products	 Pre-standardization: Technical workshops and symposia, standards road mapping (landscaping and gap analyses), and other research and technology reports





SD-PPP: Funded Participation

Utilized to **increase participation** of subject matter experts in the standards development process. Often, startups, small or medium companies in new or niche technology areas, have **limited resources** to travel and participate in standards, or the sector has not yet established enough resources to have as many subject matter experts who have longstanding knowledge and experience both in the field and in standards development. Both resource constraints can delay standards development or impact a balance of representation. For this to be a PPP, some funding for individuals to participate would need to come from the government but may also come from the private sector.

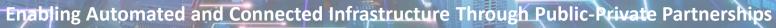
Objectives	- Support increased participation to balance the representation of stakeholders in an activity including
	small and medium organizations, startups or key technical experts without the resources to pay
	participation (membership/event) fees or travel
Work Products	 N/A, this supports standards development, but the objective is not a tangible work product



SD-PPP: Funded Standards Development

Utilized when stakeholders need resources to conduct **research**, **testing**, **or data gathering** to help inform and develop standards. The activities may result in content development (such as test methods, best practices or design requirements), technical presentations at a SSO meeting, or help with anonymizing information so industry data can be shared without revealing IP. In some cases, funding is allocated to an organization or to an individual with the objective of drafting a standard(s).

Objectives	 Accelerate standards development by funding initial research
Work Products	- Pre-standardization: Research, research reports, databases, statistics
	 Pre-standardization: Formation of a new standards developing committee or SDO
	- Standards Development: Draft proposed test methods, design specification, best practices
	 Implementation: Increasing awareness, technical training, workforce development on standards



SD-PPP: Policy & Conformance Driven

Utilized when the public and private sector collaborate to **develop standards** specifically to meet a new regulation, policy, or conformity assessment requirement. Initiation of this SD-PPP may also be the result of an emergency situation (e.g., pandemic or incident involving fatalities). This SD-PPP stands out as its own model solely because it requires rapid development of one or more standards and the **dedication of resources to** accomplish this in a specific timeline. This scenario typically involves a combination of characteristics described in the Direct Participation, Standards Acceleration and Funded Participation SD-PPP models.

Objectives	 Enable or accelerate standards development to support an anticipated new regulation or certification requirement. The standards are expected to be incorporated by reference.
Work Products	 Pre-standardization: Strategic plans and roadmaps
	- Standards Development: Standards (1 or more standards)
	 Implementation: Increasing awareness, technical training, workforce development on standards



SD-PPP Models and Phases of Standardization



	STANDARDS READINESS PHASES				
	PREMATURE	EXPLORATORY	PLANNING	DEVELOPMENT	IMPLEMENTATION
Standardiza- tion Activity	 No discussions / interest in standardization 	 Identification & evaluation of existing related standards & conformity assessment programs of similar technologies Benchmarking 	 Landscape & gap analysis Roadmapping Terminology development Soliciting stakeholder engagement 	 Standards committee(s) formed Soliciting leadership and stakeholder engagement Standards drafted, approved & maintained 	 Standards approved, maintained & utilized Conformity assessments Referenced in law or regulation, as applicable
Potential SD-PPP Model(s)	 No drivers for SD- PPP exist yet 	 Standards Acceleration Policy & Conformance Driven 	 Standards Acceleration Funded Standards Development Policy & Conformance Driven 	 Direct Participation Funded Standards Development Funded Participation Policy & Conformance Driven 	 Direct Participation Funded Standards Development Funded Participation Policy & Conformance Driven
Potential SD-PPP Activities	- N/A	 Focus groups Technical workshops Landscape analyses Regulatory/conformity assessment review 	 Gathering critical mass & establishing balance of experts Focus groups Technical workshops Technical/research reports Landscape analyses Standards roadmaps Strategic plans (R&D/standards) Regulatory gap assessments 	 Sustain balance of experts & critical mass Technical workshops Technical/research reports Continued R&D Coordination on standards & policy development priorities Continued strategic planning Workforce development 	 Sustain balance of experts & critical mass Technical training / workshops to increase awareness & adoption Workforce development Continued R&D Evaluation of standards impact along with refinements and expanding on portfolios
Information Sharing & Awareness	 Internal prototyping / research begun Stakeholders work independently Consortia/Associatio n discussions not taking place, or do not exist 	 Collaborative research takes place Like-minded stakeholders sharing minimal information Consortia/Association discussions & evaluation begin 	 Research is being strategized Like-minded stakeholders collaborating & sharing minimal information more broadly Consortia/Association position/issue papers developed 	 Research is ongoing Balanced representation of stakeholders collaborating Stakeholders investing resources to draft & vote on standards Consortia/Association recommendations issued 	 Research is ongoing Balanced representation of stakeholders collaborating & doing business Stakeholders investing resources to draft & vote on standards Consortia/Association advocating for standards adoption

Questions?

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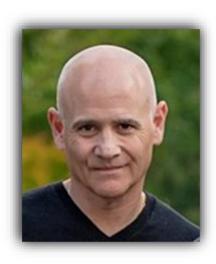




Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

Session 3: Standards-Driven PPP Briefings





Government Perspective

Natalia Globus Martin Deputy Director for National Cybersecurity Center of Excellence (NCCoE) National Institute of Standards and Technology (NIST)

Standards Development Organization Perspective

Pat Picariello Director, Developmental Operations ASTM International



Enabling Automated and Connected Infrastructure Through Public-Private Partnerships



NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY U.S. DEPARTMENT OF COMMERCE

Standards and Technology Driven Public-Private Partnership Models

Natalia Globus Martin National Institute of Standards and Technology



U.S. Standardization "System"



Public-private **Reflects U.S.** Let by private Voluntary, partnership culture and decentralized, sector public-private and market-Differs from sector driven *centralized* dynamics standards systems

in other countries

Relies on cooperation, communication, and parity among diverse stakeholders

Innovation Stakeholders



U.S. leadership in the U.S. innovation ecosystem requires collaboration among a diverse set of participants.

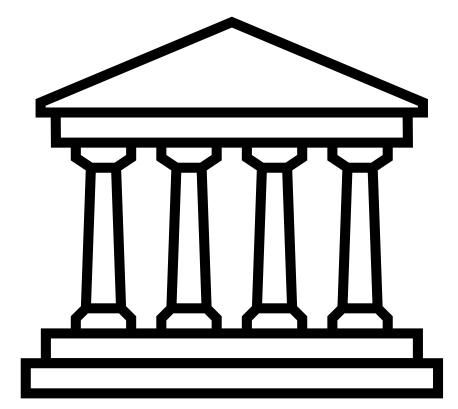


USG Standards Mandate



USG law and policy requires Federal agencies to use **international**, **voluntary**, **consensus** standards in their procurement and regulatory activities, except where inconsistent with law or otherwise impractical

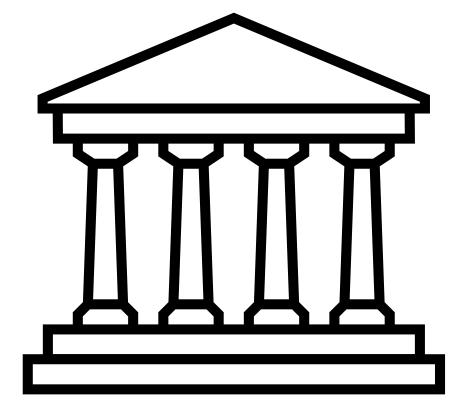
- <u>National Technology Transfer and</u>
 <u>Advancement Act (NTTAA)</u>
- OMB Circular A-119
- Trade Agreements Act (TTA) of 1979
- M-12-08, Principles for Federal Engagement in Standards Activities to Address National Priorities (memo from three EOP offices: OSTP, OMB/OIRA and USTR)



USG Technology Transfer Mandate

Federal Technology Transfer is transfer of knowledge developed by Federal agencies concerning tools, materials, application techniques and problem-solving methods, to the private sector for commercialization

- <u>Stevenson-Wydler Technology Transfer Act of</u>
 <u>1980</u>
- Bayh–Dole Act or Patent and Trademark Law Amendments Act, December 12, 1980
- <u>CRADA Statute 15 USC 3710a (tech transfer)</u>



How does USG get Technology to Transfer?

- By-products of mission-oriented R&D at Federal labs
- Developed at universities and private sector firms through Federally funded collaborations and contract projects
- Developed through non-R&D mission-related engineering and technical activities, e.g., equipment maintenance, performance testing, regulatory compliance, enforcement investigations
- Clever people working on routine technical problems often come up with innovative solutions and discoveries having commercial value

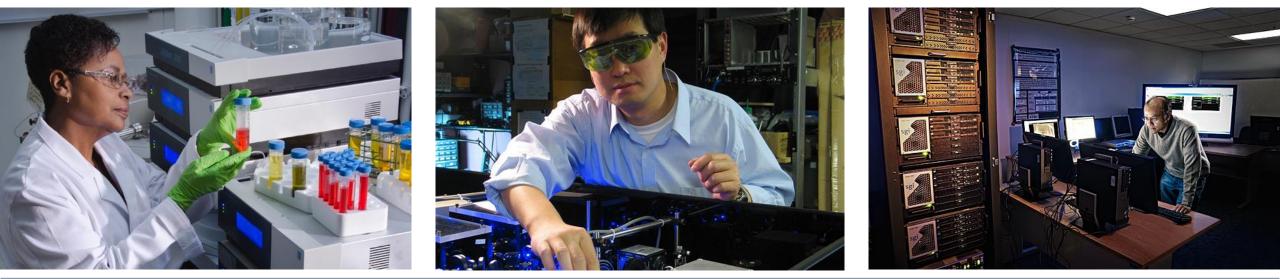




NIST Mission

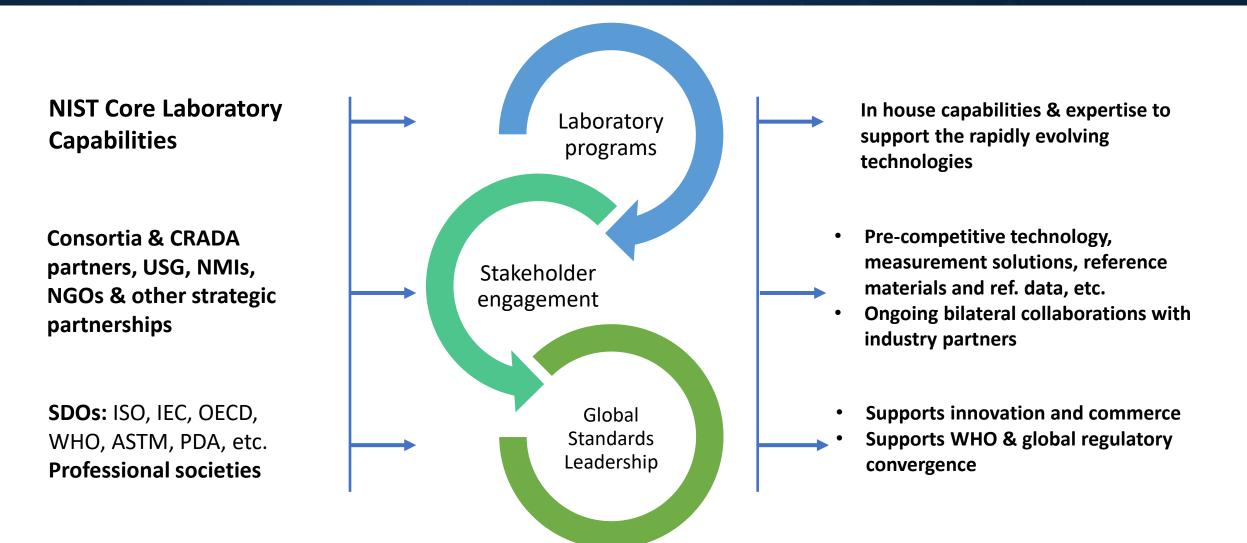


To promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life



NIST is the US Government's premier agency for measurement, research, and standards development

From Laboratory Programs to Standards NIST





A consortia CRADA allows to work with multiple industry partners at once on a single project with benefit to all parties. Consortia are particularly useful for developing standards/references and addressing issues that affect an entire industry sector.

- Ease of entering into a formal arrangements
- Access to Federal laboratories' expertise, capabilities, and technologies to foster innovation and improve the Unites States' economic, environmental, and social well-being
- Access to IP resulting from the CRADA effort
- Reduced costs, time, and risk of R&D to achieve mission and/or commercial goals by leveraging external expertise, ideas, investment, and resources

Examples Various Models of PPP that enable standards development at NIST



	Mechanism	Stakeholders	Drivers for partnering
<u>Quantum Economic Development</u> Consortium (QED-C)	Consortium under Other Transaction Authority	SRI International, DOE, 180 companies	Support the emerging quantum-based industry
National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL)	Cooperative Agreement	USA Bio Consortium (150 members), University of Delaware	Accelerating innovation in biopharmaceutical manufacturing industry sector
National Cybersecurity Center of Excellence (NCCoE)	FFRDC + CRADA + MOU	MITRE, industry and academia participants in projects, corporation of technology partners	Address industry's most pressing cybersecurity issues
<u>The Center for Statistics and</u> <u>Applications in Forensic Evidence</u> (CSAFE)	Cooperative Agreement	Led by Iowa State University with partners Carnegie Mellon University, University of Virginia, and University of California-Irvine.	Establish scientific foundation for analytical techniques used in forensics
IBBR	Cooperative Agreement, MOU	University of Maryland, College Park; and University of Maryland, Baltimore	Advance measurement science in biotechnology

Questions?

Session 3: Standards-Driven Public-Private Partnerships (PPPs)

Standards Development Organization Perspective

Pat Picariello Director, Developmental Operations ASTM International



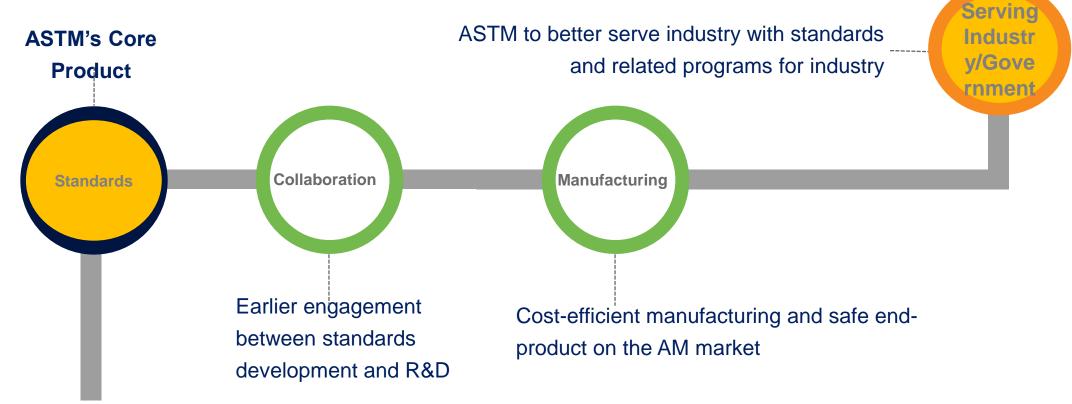


Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

Why ASTM Created the AM CoE?



- Standardization in general is not a fast process
- Critical need to develop globally accepted AM standards and close standardization 2. gaps
- Critical to facilitate transitioning R&D into standards development 3.
- Critical need to educate the next generation of AM professionals 4.



ASTM AM CoE Background



Formed in 2018, the AM CoE is a **collaborative partnership** among ASTM International and organizations from industry, government, and academia, that conduct strategic R&D to advance standards across all aspects of AM technologies. The center aims to accelerate the development and adoption of robust, game-changing technologies by supporting:

- Standardization and its acceleration,
- Developing training and certification programs,
- Providing market intelligence, business strategy, and
- Advisory services via Wohlers Associates, powered by **ASTM International.**





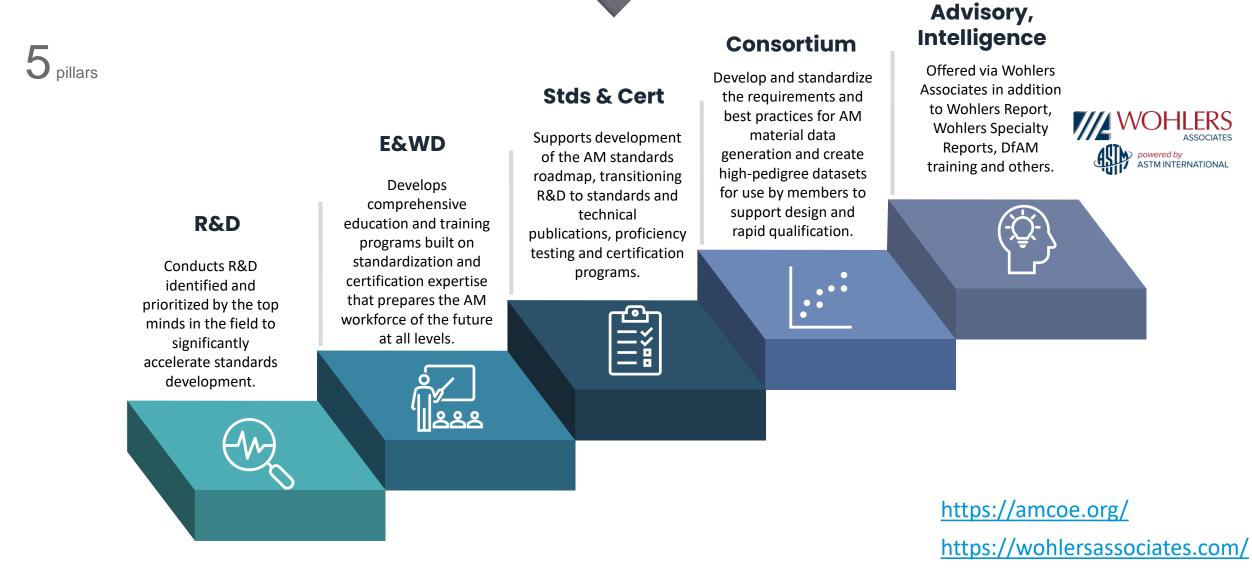


ASTM Global AMD Pillars



EXCELLENCE Research to Standards

ADDITIVE MANUFACTURING



Innovation in Standards Development (R2S)

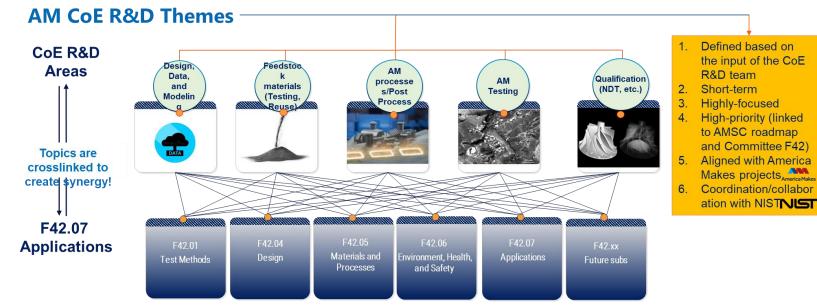
CENTER of EXCELLENCE Research to Standards

ADDITIVE MANUFACTURING

R2S – Solidifying ASTM's Thought Leadership: Identifying Gaps and Guiding Research

- Various tools and approaches have been developed to gain insights on Research and standardization needs.
- Findings have been publicly disseminated through the development of strategic guides and roadmaps.



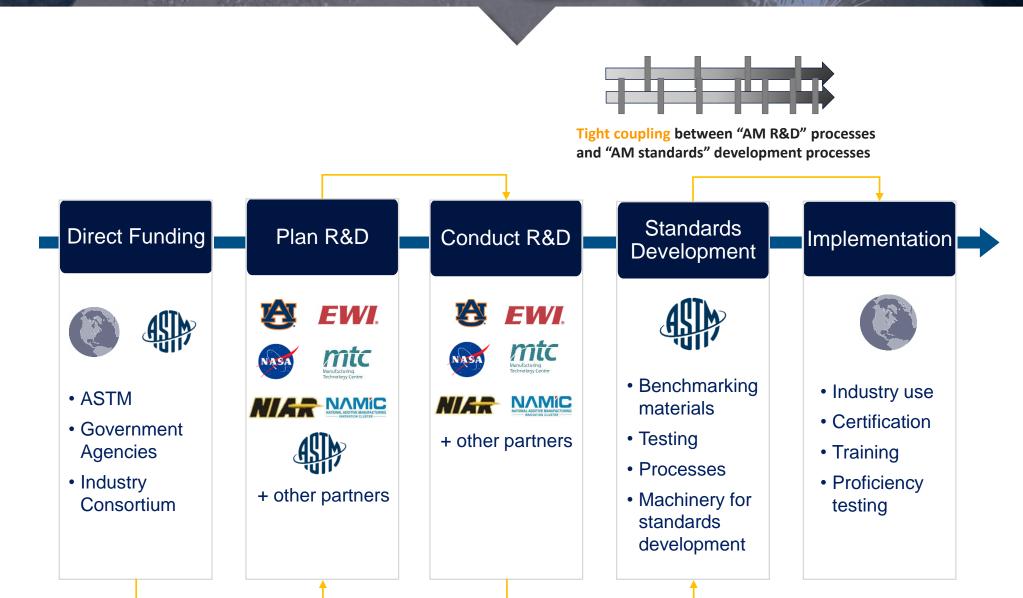


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AM CoE R&D: How it works



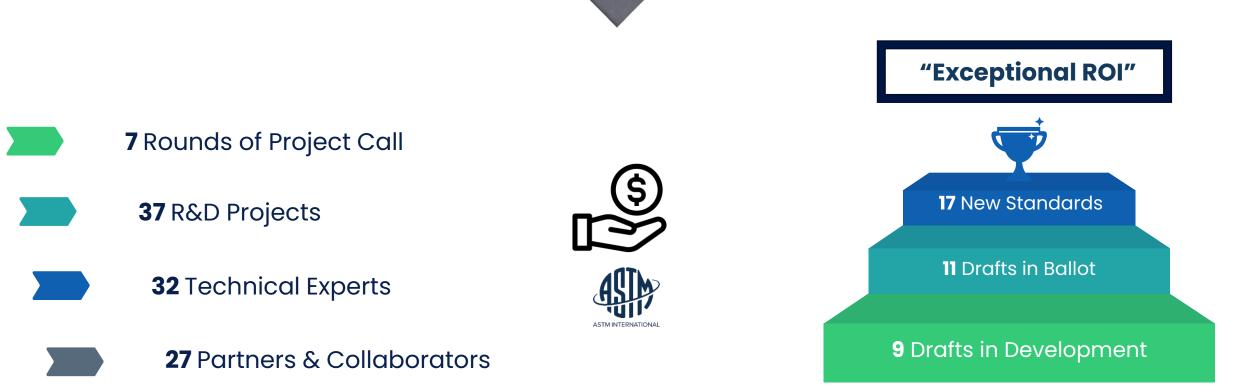
EXCELLENCE Research to Standards ADDITIVE MANUFACTURING



R2S Statistics



EXCELLENCE Research to Standards



As a benefit of R2S, partners and collaborators provide cost shares (e.g. \$3.7M from NAMIC)

* ~\$55K / Project (\$48K/project excluding Round 1)



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Questions?

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Session Agenda

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Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

Session 3: Standards-Driven Public-Private Partnerships (PPPs)

Moderator

Ted Sienknecht Principal Architect, Public-Private Partnerships The MITRE Corporation





Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

- What benefits or challenges do you see with a PPP for these technologies?
- What role can various types of stakeholder organizations play in PPPs for these technologies?
 - e.g., consortia, trade associations, academia, standards organizations, centers of excellence
- What PPP short-term and long-term goals would have the broadest impact on success?
 - e.g., standards focused R&D, workforce development, research and standards roadmaps, strategic planning

Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

- What type of PPP model or models could benefit these technologies?
- At what (if any) point would an organized PPP activity be most advantageous?
- Does a PPP require a formal agreement to be able to realize its purpose?





SD-PPPs for A&C Infrastructure

Benefits

- Mitigate risk for public & private sector
- Advance funded proof of concepts that test real world scenarios
- Prepare end users to use new technologies
- Enable timely rollout of new technologies
- Spur neutral R&D and broader industry acceptance
- Draw on variety of perspectives
- Incentivize participating companies
- Deliver long-term impact analysis & cost justification of automated solutions
- Share KPIs & best practices across stakeholders
- Achieve greater impact together than what any individual entity could accomplish on their own

Challenges

- Align diverse objectives & priorities
- Mitigate data/information sharing concerns
 - Intellectual property protection
 - Sharing with government or competitors
 - Privacy, attribution, and appropriate use
- Obtain funding & resources
- Address governance & management
- Ensure adequate & balanced representation of stakeholders
- Operate at speed of collaboration/trust
- Balance short-term profit and long-term technical goals





Join at

slido.com

#2153 297

Passcode: PPPs4INF

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Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

 What PPP <u>short-term</u> and <u>long-term</u> goals would have the broadest impact on success?

Consider various options such as...

- Benchmarking studies / development
- Organizing experts to gather industry positions
- Convening technology workshops to explore technologies
- Research and standards landscape analyses and roadmaps
- Standards focused R&D
- Regulatory gap assessments
- Drafting standards content
- Workforce development
- Conformity assessment programs
- Inform policy / regulation





Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

ATS

DEARBORN

What type of PPP model or models could benefit these technologies?

SD-PPP Models	Work Products
Direct-Participation	- Pre-standardization: technical reports, strategic plans
	- Standardization: Standards development
	- Implementation: Increasing awareness, technical training, workforce development on standards
Standards Acceleration	 Pre-standardization: Technical workshops and symposia, standards road mapping (landscaping and gap analyses), and other research and technology reports
Funded Participation	- N/A, this supports increased participation to balance the representation of stakeholders in standards development
Funded Standards Development	- Pre-standardization: Research, research reports, databases, statistics
	- Pre-standardization: Formation of a new standards developing committee or SDO
	- Standards Development: Draft proposed test methods, design specification, best practices
	- Implementation: Increasing awareness, technical training, workforce development on standards
Policy and	- Pre-standardization: Strategic plans and roadmaps
Conformance Driven	- Standards Development: Standards (1 or more standards)
	- Implementation: Increasing awareness, technical training, workforce development on standards

Enabling Automated and Connected Infrastructure Through Public-Private Partnerships July 30, 2024



Join at

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(Passcode: PPPs4INF



- At what point (if any) would an organized PPP activity be most advantageous?

	STANDARDS READINESS PHASES				
	PREMATURE	EXPLORATORY	PLANNING	DEVELOPMENT	IMPLEMENTATION
Standardiza- tion Activity	 No discussions / interest in standardization 	 Identification & evaluation of existing related standards & conformity assessment programs of similar technologies Benchmarking 	 Landscape & gap analysis Roadmapping Terminology development Soliciting stakeholder engagement 	 Standards committee(s) formed Soliciting leadership and stakeholder engagement Standards drafted, approved & maintained 	 Standards approved, maintained & utilized Conformity assessments Referenced in law or regulation, as applicable
Potential SD-PPP Model(s)	 No drivers for SD- PPP exist yet 	 Standards Acceleration Policy & Conformance Driven 	 Standards Acceleration Funded Standards Development Policy & Conformance Driven 	 Direct Participation Funded Standards Development Funded Participation Policy & Conformance Driven 	 Direct Participation Funded Standards Development Funded Participation Policy & Conformance Driven
Potential SD-PPP Activities	- N/A	 Focus groups Technical workshops Landscape analyses Regulatory/conformity assessment review 	 Gathering critical mass & establishing balance of experts Focus groups Technical workshops Technical/research reports Landscape analyses Standards roadmaps Strategic plans (R&D/standards) Regulatory gap assessments 	 Sustain balance of experts & critical mass Technical workshops Technical/research reports Continued R&D Coordination on standards & policy development priorities Continued strategic planning Workforce development 	 Sustain balance of experts & critical mass Technical training / workshops to increase awareness & adoption Workforce development Continued R&D Evaluation of standards impact along with refinements and expanding on portfolios
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Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

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Enabling Automated and Connected Infrastructure Through Public-Private Partnerships



140

BREAK

3:45 - 3:55 PM

Enabling Automated and Connected Infrastructure Through Public-Private Partnerships | July 30, 2024

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Session Agenda



Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

Session 4: Information Sharing Necessary to Support Standards Development

Current State of Information Sharing Briefings *30 minutes*

Future State of Information Sharing Discussion *45 minutes*



Session 4: Current State of Information Sharing **Briefings**





What information is being shared today?

Mary Saunders Senior Vice President for Government Relations and Public Policy American National Standards Institute (ANSI)

What did industry suggest in RFI responses and past listening sessions?

Maria Knacke

Acting Group Lead for the Standards and Conformity Assessment Services Group National Institute of Standards and Technology (NIST)

ANSI

Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

What information is being shared today?

Mary Saunders

Senior Vice President for Government Relations and Public Policy

American National Standards Institute (ANSI)



Information Resources

- SDO Standards Portfolios
 - Overviews by technology area (existing and planned standards)
 - How to participate
- Standards Landscapes
 - By technology area compilation of current activities
 - Produced by the private sector, government agencies
- Assessments/Studies
 - Private sector- and government-authored
 - Collection/synthesis of standards-related data
- Standards Coordination Roadmaps
 - to assess and address standardization needs in a particular industry or technology area
 - identify existing standards and standards in development
 - define where standards gaps exist
 - intended to inform resource allocation, avoid duplication of effort, and coordinate standards actions



ANSI Standards Action

- *Standards Action* provides timely, accurate information about current standards development work in which ANSI plays a role.
- The publication is designed to facilitate participation in the <u>American</u> <u>National Standards (ANS) development process</u> as well as other domestic, regional, and international standardization activities advanced by ANSI.
 - Includes current work underway at the <u>International Organization for</u> <u>Standardization (ISO)</u>, the <u>International Electrotechnical Commission (IEC)</u>, and <u>ISO/IEC Joint Technical Committee (JTC) 1</u>, through U.S. Technical Advisory Groups (TAGs)
- Each weekly edition available by download or free email subscription comprises a round-up of the latest information available to help all interested parties get informed and engaged in standards.



ANSI Standardization Collaboratives

Advance crosssector coordination

in the standards and conformance programs needed to support and grow emerging technologies and markets

Active Collaboratives:





Previous Collaboratives:



2013: ANSI Network: Smart and Sustainable Cities



2012: ANSI Energy Efficiency Standards



2010: ANSI-NIST Nuclear **Energy Standards** Coordination Collaborative



620





2010: The Financial Management of Cyber Risk

2011: ANSI

Electric Vehicles

Standards Panel

Standards Panel

2004: Nanotechnology

- 2007: ANSI Network on Chemical Regulations
- 2007: Biofuels Standards **Coordination Panel**



2003: Homeland Defense and Security Standardization Collaborative



2006: ID Theft Prevention and ID Management Standards Panel

2005: Healthcare Information Technology Standards Panel



1994: Information Infrastructure Standards Panel



Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

Electric Vehicles Standardization Panel (EVSP)

EVs@Scale Roadmap of Codes & Standards

Government Partner: Argonne National Lab (DOE)

Identifies: EV issues, standards, codes, guides, and related policies that exist (e.g., NEVI Final Rule) or that are in development

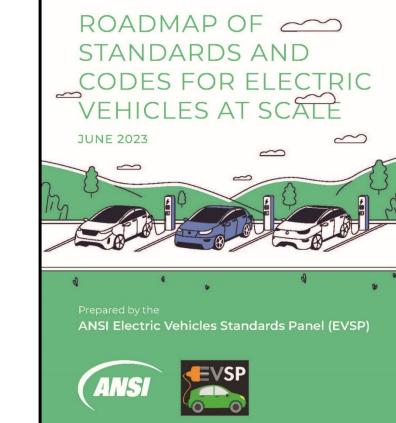
-Core Areas: Vehicle Systems, Charging Infrastructure, Grid Integration, Cybersecurity

37 "Gaps": Recommend new or revised standards, codes, guides (etc.) as well as related priorities and organizations that can do the work

–14 high priority, 20 medium priority, 3 low priority, 23 require
 R&D

Approximately 130 individuals from 80 organizations contributed

Focus is U.S. market with international harmonization issues noted



Free download at <u>www.ansi.org/evsp</u>



UAS Standardization Collaborative (UASSC)

Government Partner: FAA UAS Integration Office

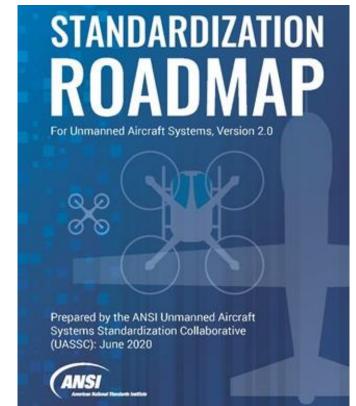
Mission: To coordinate and accelerate the development of the standards and conformity assessment programs needed to facilitate the safe integration of unmanned aircraft systems (UAS) into the national airspace system (NAS) of the United States, with international coordination and adaptability

Technical Areas:

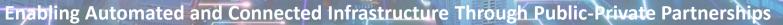
- Airworthiness Standards
- Flight Operations Standards
 - General Concerns and Personnel Training, Qualifications, and Certification Standards
 - Infrastructure Inspections, Environmental Applications, Commercial Services, and Workplace Safety
 - Public Safety

Total Gaps: 71

Participation: Approximately 400 individuals from 250 organizations



Roadmap v2.0 (2020)



ANSI UASSC Timeline

DEARBORN



Objectives for Standards Engagement

- Scientifically sound standards that are accessible and amenable to adoption
- Standards that reflect the needs and input of diverse global stakeholders
- Standards that are developed in a process that is open, transparent, and driven by consensus
- International relationships that are strengthened by engagement on standards



Private Sector Priorities

- Regular government engagement with private sector stakeholders on both technical issues and broader standards and policy discussions
- Government recognition that many priority interactions will depend on private-sector leadership and joint efforts from the global technology and standards communities.
- Consideration of the full standards lifecycle—including research and related technical activities—as well as the full range of issues, both technical and societal, associated with standards for automated and connected infrastructure applications



Enabling Automated and Connected Infrastructure Through Public-Private Partnerships



Contact Information

A&C Infrastructure Brainstorming Session | July 30, 2024

Mary Saunders

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Questions?



NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY U.S. DEPARTMENT OF COMMERCE

Information Sharing Necessary to Support CET Standards Development



USG NSSCET Overview



- Greater Investment in Pre-Standardization Research
- Increase R&D funding for CETs
- Support development of standards that address risk, security, and resilience
- Participation in Standards Development
- Remove and prevent barriers to private sector participation
- Improve communication between public and private sector
- Enhance USG representation and influence in international standards governance and leadership
- Workforce Development
- Ensuring Integrity in Standards Development
- Deepen standards cooperation with partners and allies
- Facilitate broad representation in standards development
- View the Strategy: www.nist.gov/standardsgov/usg-nss

UNITED STATES GOVERNMENT NATIONAL STANDARDS STRATEGY FOR CRITICAL AND EMERGING TECHNOLOGY

MAY 2023

Implementation Planning: Stakeholder Input



The U.S. Government National Standards Strategy for Critical and Emerging Technology (USG NSSCET) was released in May 2023

Published a request for Information (RFI)

- Input on how to best implement the Strategy
- Input on investment, participation, workforce, and integrity, and inclusivity
- Responses submitted by December 22, 2023

Held listening sessions and stakeholder engagements

• 100+ events

Established a Subcommittee on U.S. International Standards Development Activity

 Under the NIST Visiting Committee on Advanced Technology

Key Findings: RFI and Listening Sessions

Public-private sector coordination

- work effectively in consortia and communities of practice
- develop and promote adoption of sector-specific standards including those critical to national security, public safety, security, health and environmental health and resilience

Federal Government coordination

- coordinate pre-standardization R&D investments
- coordinate activities, proposals, leadership opportunities, and engagement
- support the integrity of the international standards system
- promote WTO TBT Committee principles

Foreign government coordination

- work with likeminded partners and allies to ensure CET standards are developed to support U.S. interests
- advocate for a commitment to free and fair market competition
- advance trade policy and agreements that are technology neutrality and promote technology adoption

Standards funding opportunities

• target academia and small- and medium-sized enterprises (SMEs)

Key Findings: RFI and Listening Sessions - cont

Standards education

- enhance educational efforts and leverage academia as a critical partner to increasing U.S. engagement and training the next generation of standards professionals
- renew a commitment by academia to teaching the value and use of standards in a range of career fields

Standards communications

- explain the role of U.S. government and academia in our system
- provide education and awareness for senior leaders in industry, government, and academia
- understand the value of our system with regards to competitiveness and innovation in a range of career fields
- engage a wide range of market participants in standards efforts
- engage Congress to bolster support for R&D in CET and increase investment in pre-standardization research

Real and perceived barriers

- reduce visa wait times
- identify and eliminate knowledge gaps between U.S. policymakers and technical program leaders
- enhance government participation where government is the member (e.g., ITU)
- facilitate engagement by providing standards information, education, and to raise awareness among underrepresented stakeholders

Pathway to standards information



The Standards Information Center provides a gateway to navigating the dynamic U.S. and international standards landscape





The USA Enquiry Point for the World Trade Organization (WTO)



www.Standards.gov

Questions?

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Session

Agenda

Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

Session 4: Future State of Information Sharing to Enable Standards Development

Moderator

Christian Thiele Director, Global Ground Vehicle Standards





Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

- What communication standards challenges does this sector face? What could be done to improve it?
- During the pre-standardization phases of technology, it is important to begin educating about the value and benefits of standards. How can we amplify this messaging to ensure it reaches the appropriate stakeholders?
- During the standards development phases, it is important to get the right information in front of the broadest group of stakeholders. How can stakeholders best socialize the standards development activity to get diverse and targeted stakeholders?
- During the implementation phases, can we increase the adoption of a standard once published? Think about this from a market adoption, regulatory acceptance, and/or conformity assessment standpoint.
- What information is critical to support effective bilateral communications between the public and private sector?



Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

What communication standards challenges does this sector face? What could be done to improve communications?

Challenges Communicated During Preregistration

- Public perception of data security and privacy risk

- IP

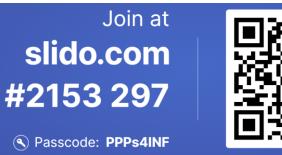
- Competitiveness
- Linking all industry associations to this effort, and encouraging participation
 - Several organizations impacted
- Different organizations have different goals



- Varying terminology & definitions
- Lack of standards driven by NGO's cause imbalance party involvement and result in one side "standards"
- Startups lack resources, networks, experience w/SDOs



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Enabling Automated and Connected Infrastructure Through Public-Private Partnerships July 30, 2024

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Join at slido.com #2153 297



Passcode: PPPs4INF

Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

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Enabling Automated and Connected Infrastructure Through Public-Private Partnerships July 30, 2024

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Session Agenda



Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

What is next?

SD-PPP Use Case Development

- Literature Review
- Complete Interviews
- August 1st August 15th draft use-cases under review
- Interested parties can submit a use-case to ANSI using template

ANSI to Develop Report

- Issue findings, general considerations, and best practices
- Targeted end of August
- Publicly available in September

Thank you!

Moderators and Presenters

- Ghassan T. Kridli, Ph.D.
- Timothy Klein, U.S. DoT
- Clare Allocca, NIST
- Eric Moughler, Caterpillar
- Dr. Miles Johnson, Toyota Motor North America
- Jonathan Archer, SAE International
- Natalia Globus Martin, NIST
- Pat Picariello, ASTM International
- Ted Sienknecht, MITRE
- Maria Knake, NIST
- Christian Thiele, SAE International

Attendees and UM-Dearborn

- Attendees who completed the pre-registration questions
- Participants throughout today
- UM-Dearborn for hosting us
- UM-Dearborn staff for their hospitality

ANSI Project Team

- Rachel Hawthrone
- Sarah Katz
- Michelle Deane
- Sally Seitz
- Kristen Califra

Enabling Automated and Connected Infrastructure Through Public-Private Partnerships



Contact Information

A&C Infrastructure Brainstorming Session | July 30, 2024

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scan to add phone contact

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Enabling Automated and Connected Infrastructure Through Public-Private Partnerships

UM-Dearborn Tours

Tours After Meeting

- Driving Simulator:
 - The Driving Simulator Lab houses a motion-based driving simulator to support faculty and students for advanced research and education in automotive systems, human factor and ergonomics, humanmachine interaction, and driver behavioral studies.
- ImpLi-Fi Demo:
 - ImpLi-Fi technology is a light-based ad hoc physical layer communication protocol, developed with a focus on ease of setup and secure data transfer, with characteristically low susceptibility to interference and interception.



Enabling Automated and Connected Infrastructure Through Public-Private Partnerships