

Live Webinar

Oct 2, 2024 | 8AM PT | 11AM ET | 5PM CET

# Driving the Future: Aligning Automotive Innovation with USCAR Standards



# Speakers

## Michael King

CoFounder, LHP Analytics & IoT, Chief Product Officer, LHP Engineering

Program Leader & Principal Investigator, USCAR Industrial Communication

## Ravi Subramanyan

Director of Industry Solutions, HiveMQ

# Industrial Data Communication Standard: Background and Problem Statement

- Smart Manufacturing requires a high degree of automation and integration of systems deliver optimal performance and Return on Investment
- These systems have evolved over decades in a highly proprietary, closed manner by the companies who design and sell them
- The resulting landscape of incompatible machine communication creates costly delays and complexity in product launches for USCAR companies
- To solve this problem, USCAR has created the **first of its kind** Industrial Data Communications standard that meets the requirements of the Automotive Industry



# Industrial Data Communication Standard: Problems We Need to Solve



## Stovepipe Architectures

Data is trapped within applications focused on specific manufacturing processes

## Propriety, Closed Protocols

Vendors restrict access to raw machine data in efforts to monetize access and vendor-specific analytics

## No Application Portability

Proprietary protocols require custom applications for each vendor, increasing costs and creating additional data silos

## Difficult to Scale

Legacy Plant floor applications limit the scale and speed of smart manufacturing deployments, driving up costs, and limits the ability of IT staff to provide functional support/upgrades

## Vendor Lock-in

Many equipment vendors developed their own proprietary software that are incompatible with other vendors

## No Interoperability

Proprietary protocols and vendor-specific software blocks plug-and-play equipment deployments

## Data Silos

Manufacturing data is trapped in factory-specific applications, minimizing the use of advanced analytics

## Lack of cross-OEM Ownership

This is an industry-wide issue that no one company by themselves can solve



# Background: USCAR: 2019-2023

## Manufacturing TLC Industrial Data Communication Standard

### Project Description

- Develop and Deploy an Industrial Data Communication standard that provides the foundation for Smart Manufacturing across the entire Automotive Industry worldwide.

### Project Status:

**SAE-USCAR-53: Released  
June 1<sup>st</sup>, 2023**

### Project Timeline



# Industrial Data Communication Standard: Value to USCAR & OEM Members



## Reduce Cost, Maximize Scale

Deploy common Smart Factory solutions worldwide, accelerate asset utilization efforts

## Enable Dynamic Manufacturing

Leverage open protocols to enable plug-and-play equipment deployment, automate line configurations

## Minimize Equipment Downtime

Extended predictive maintenance analysis & machine learning algorithms worldwide

## Improve Quality

Leverage extensive predictive analytics, AI, and accelerate feedback loops to engineering

## Compress Product Launch

Expand simulations, deployment of Digital Twins to accelerate feedback to engineering, stabilize line configurations

## Optimize Performance

Accelerating feedback loops throughout the entire manufacturing process to monitor quality and supplier flow

## Ensure Security & Traceability

Seamless large-scale systems integration portal ensures company data is safe, secure, and fully auditable.



# The Business Case for SAE/USCAR 53

FAST PACED PROGRESS ON STRATEGIC TRANSFORMATION

DARE  
FORWARD  
2030

C/ CARBON NET ZERO BY 2038

## CARE

**-50%** vs 2021  
2030 Carbon Footprint<sup>(1)</sup>  
**#1**  
Customer Satisfaction

- ✓ 11% carbon footprint reduction<sup>(2)</sup>
- ✓ ~30% reduction y-o-y in vehicle defect rates 3 months after customer delivery
- ✓ 27% of leadership positions held by women, targeting 30% by 2025
- ✓ 100% of key HR processes aligned with diversity and inclusion commitments

## TECH

**100%** BEV EU<sup>(3)</sup>  
**50%** BEV U.S.<sup>(3)</sup>  
**DIGITAL REVOLUTION**  
Software, AI & Autonomous Driving

- ✓ Global BEV sales up 41% y-o-y  
23 BEVs in market, 47 by end of 2024
- ✓ Hydrogen fuel cell front-runner
- ✓ 3 world class software & AI partnerships and aiMotive acquisition
- ✓ 10 start-up investments with Stellantis Ventures; 3 projects launch in 2023

## VALUE

**7 ACCRETIVE BUSINESSES**  
with their own P&L  
**>25%**  
Net Revenues from regions outside growing EE & NA

- ✓ U.S. Finco operations expanding
- ✓ 7 accretive businesses prioritized to complement core, with y-o-y<sup>(4)</sup> growth
- ✓ All regions growing and delivering record profitability
- ✓ +34% Net Revenues growth y-o-y<sup>(4)</sup> outside EE and NA

## Investing in the Next Generation of Full-Size Trucks and SUVs



### Flint, Michigan

\$1B+ to produce the next generation of heavy-duty trucks

### Arlington, Texas

\$0.5B+ to produce the next generation of full-size SUVs

### Fort Wayne, Indiana

\$0.6B to produce the next generation of light-duty trucks

Investments will strengthen our industry-leading full-size truck and SUV business



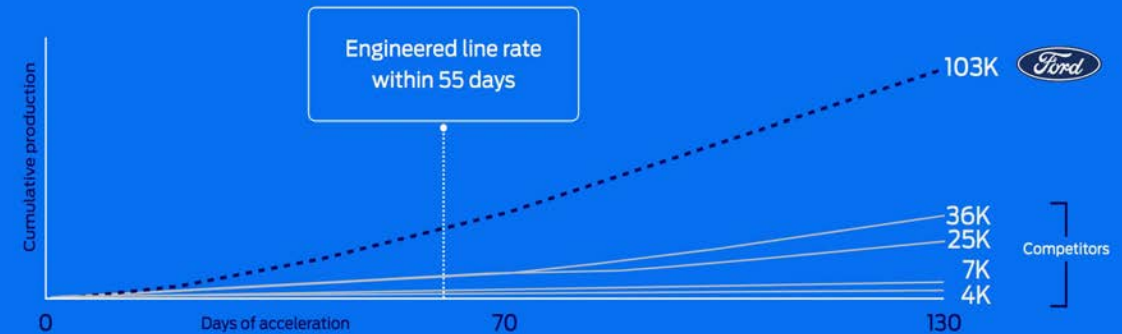
Increased number of launch vehicles tested

Drove millions of miles in launch vehicles

Tested and held launch vehicles 3X longer than prior launches



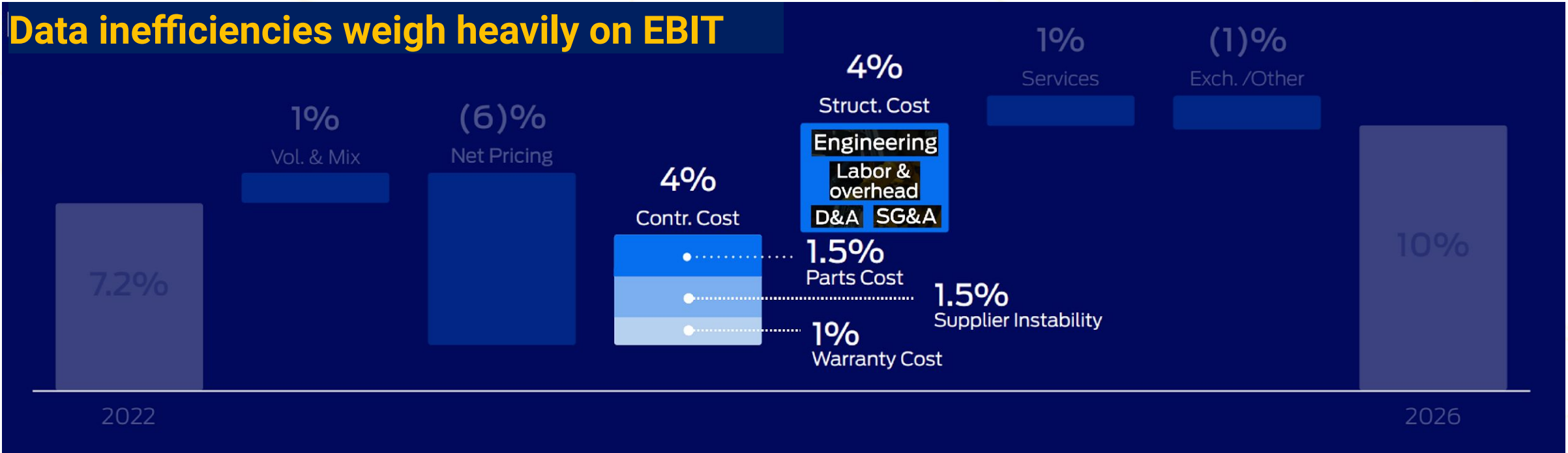
## The Ford launch standard



Industrial Data feeds more than just OEE and Predictive Maintenance

# The Business Case for SAE/USCAR 53

## Data inefficiencies weigh heavily on EBIT



## Financial

- 3-6% EBIT Savings per OEM
- \$40M - \$160M savings annually

## Operational

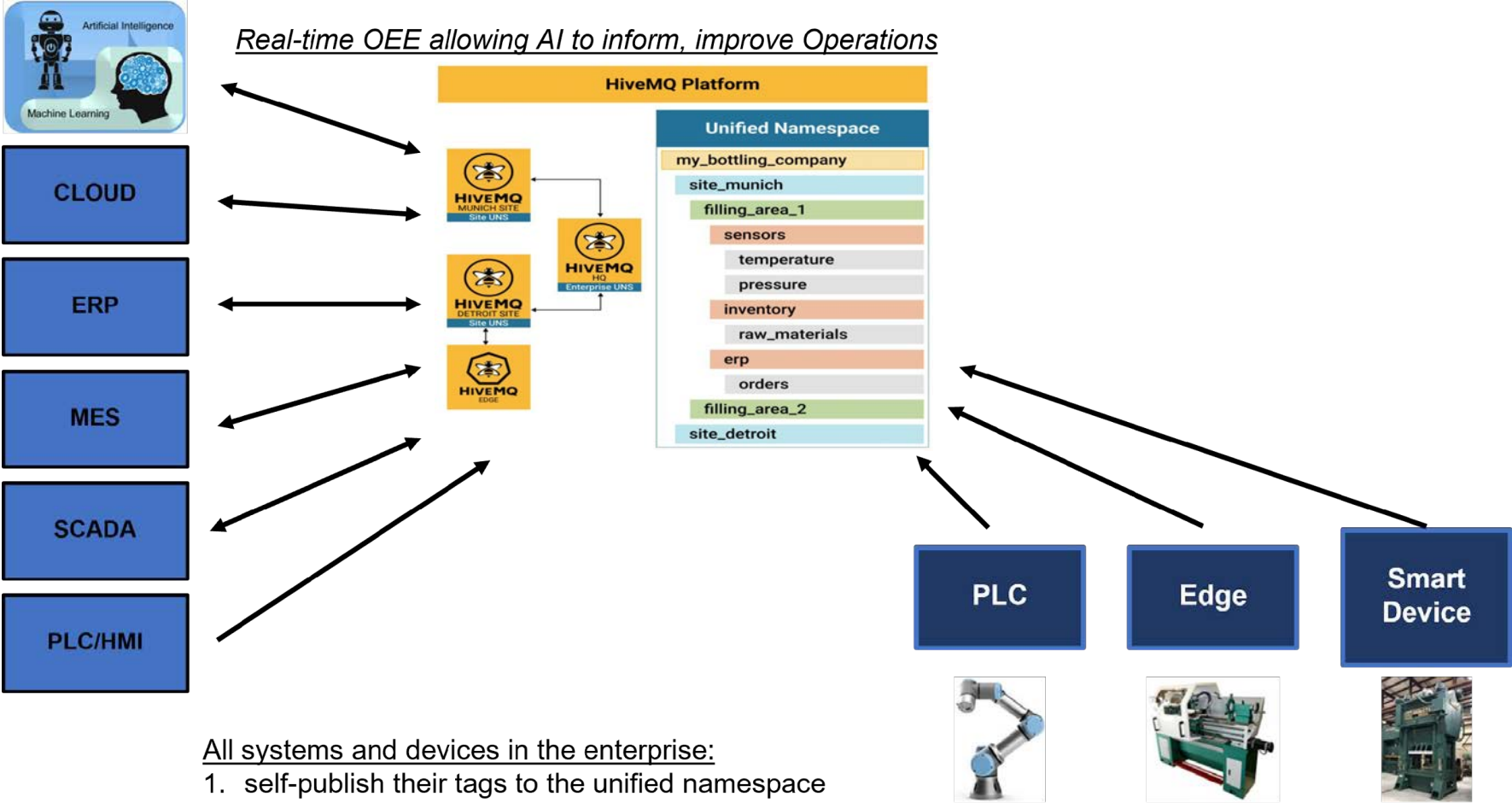
- Significantly faster than OPCUA (50ms vs 250ms)
- Less manual effort than legacy or OPCUA
- Less Complexity than legacy or OPCUA
- Significantly less expensive than OPCUA
  - (\$300/400 licensing per device)





# Industrial Machine Communication

## Emerging Best Practice Architecture

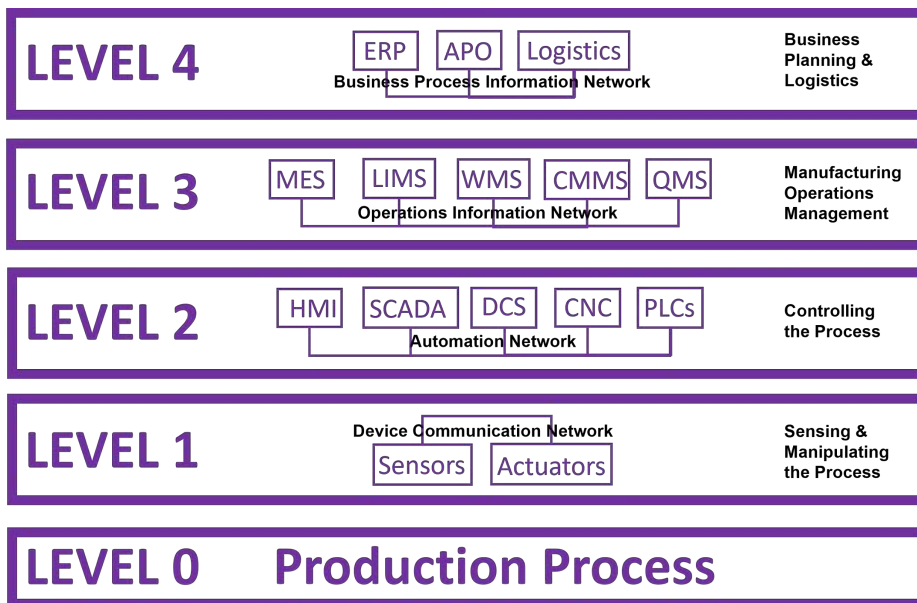


- All systems and devices in the enterprise:
1. self-publish their tags to the unified namespace
  2. report by exception (only when a value changes)
  3. communicate via open standard protocols (plug-n-play)



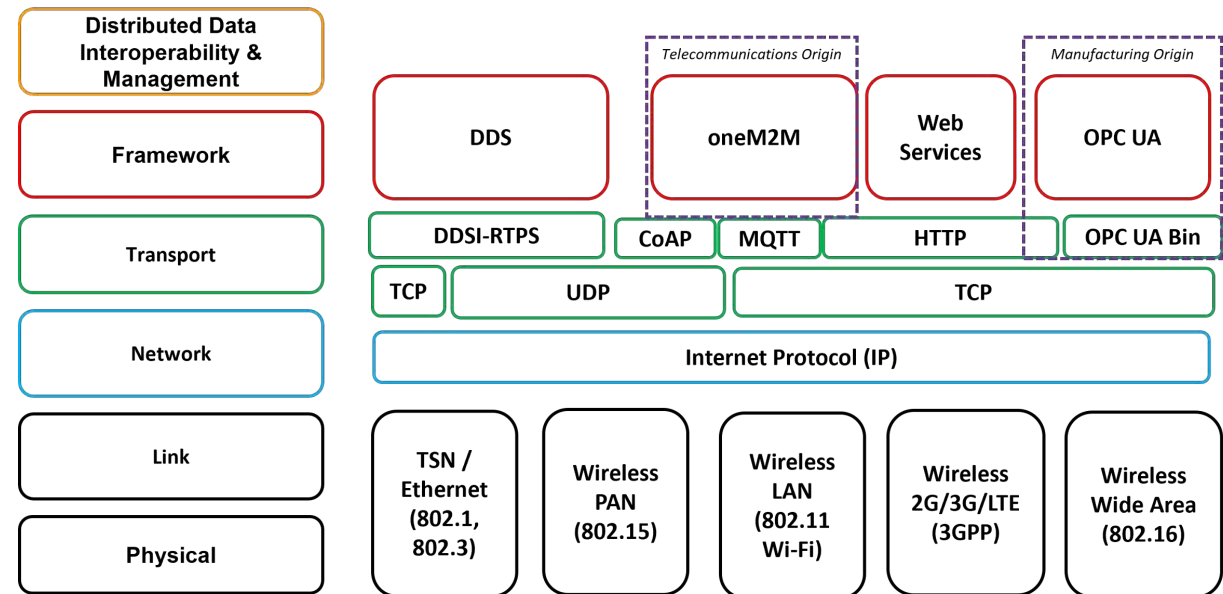
# Industrial Data Communication ISA 95 Model & Automation Protocols

## IA95 Model & Automation Protocols



*Industrial Data is siloed, horizontal*

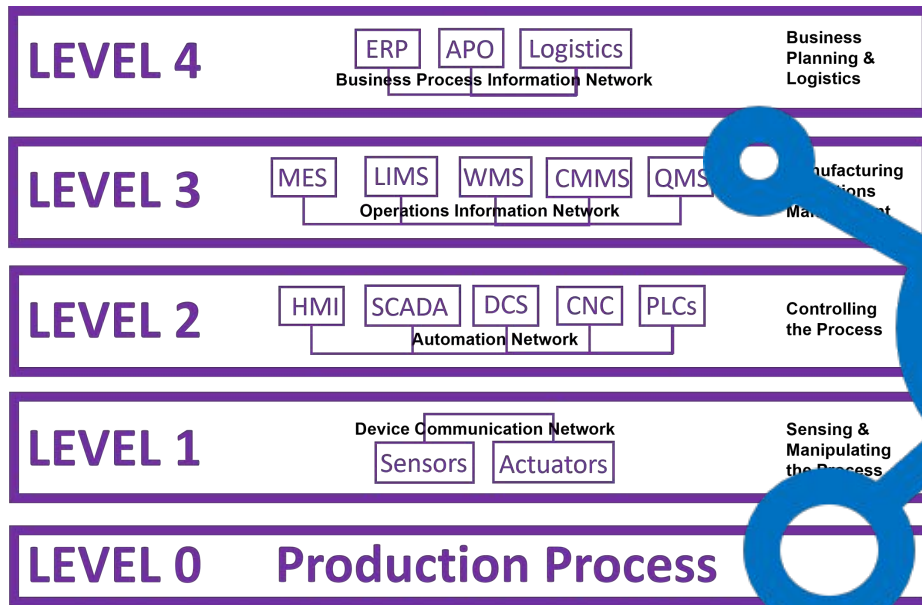
## Major IIoT Connectivity Standards



*Existing Standards focused on horizontal layers*

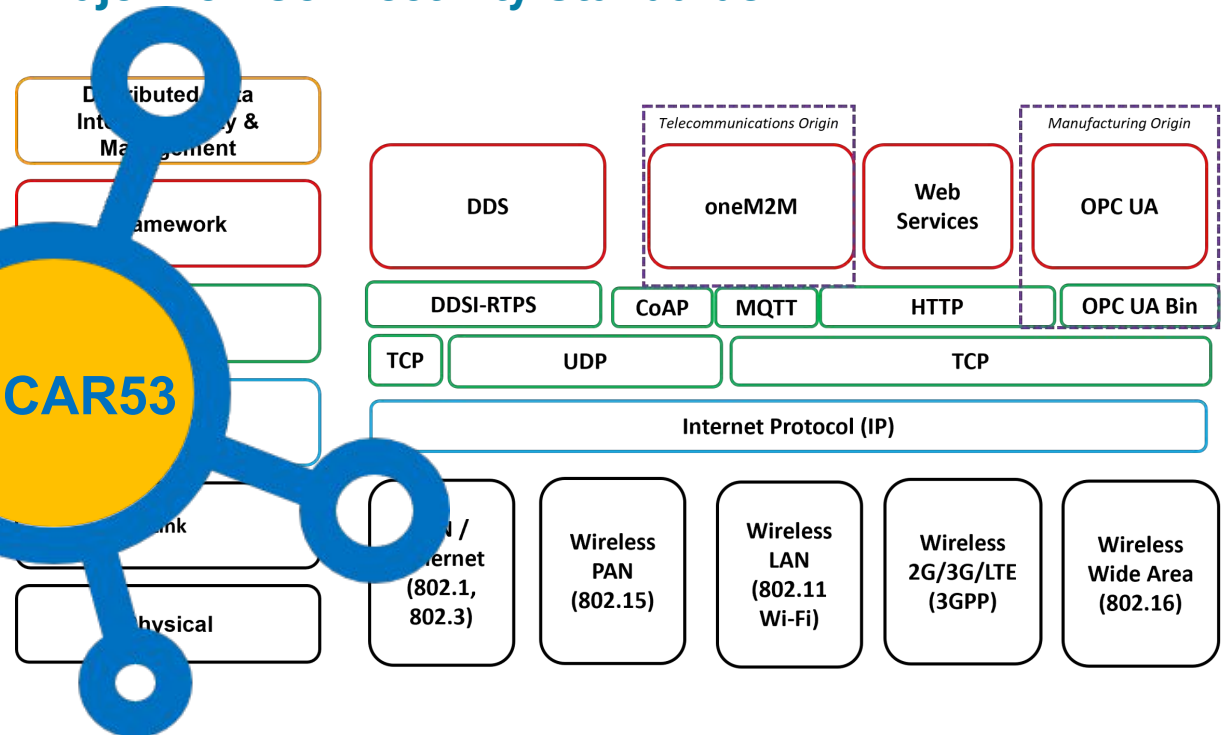
# USCAR 53: Connecting All Levels of the Factory

## IA95 Model & Automation Protocols



*Industrial Data is siloed, horizontal*

## Major IIoT Connectivity Standards

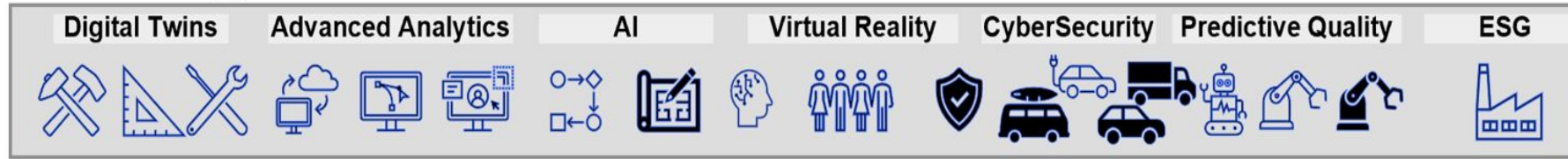


*Existing Standards focused on horizontal layers*

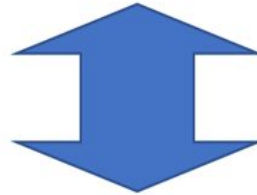
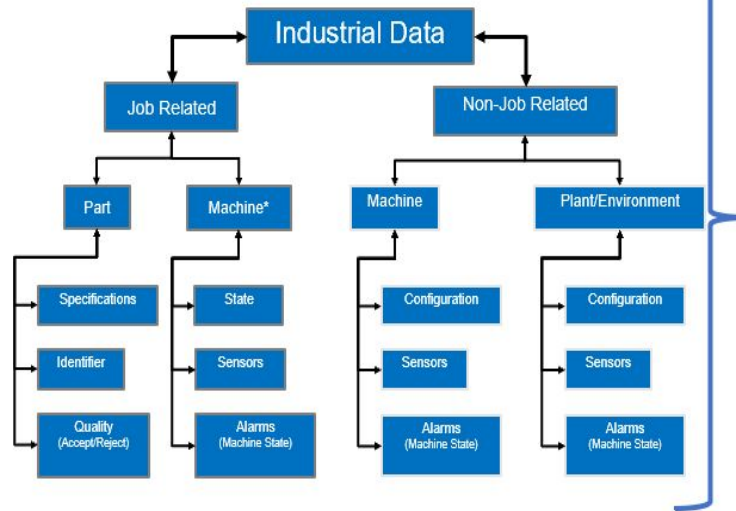


# USCAR53: Industrial Data at Scale, Worldwide

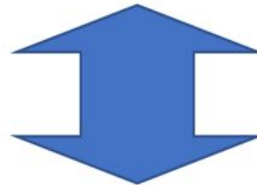
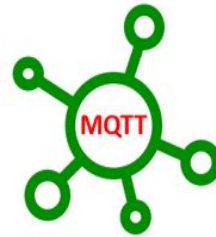
## Smart Factory Solutions



## Industrial Data Communication Architecture



**INDUSTRIAL DATA**

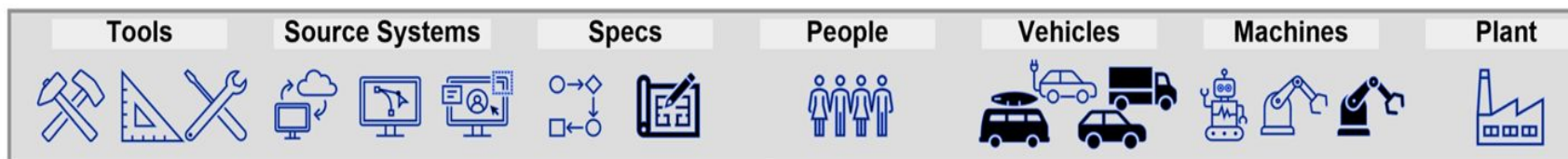


## Industrial Data Communication Framework

Industrial Control System Devices, including Automation Controllers, Process Controllers, and Sensor Networks shall support the following:

- **Native Support for Open IIoT Protocols:**
  - Pub/Sub; MQTT (Preferred)
  - Client/Server; OPCUA (By Exception)
- **Native Support for Encoding Dynamic Message Payload Formats**
  - JSON
  - XML (By Exception)
- **Configuration Support for Customer Namespace**
  - Tools to Import Customer specified Namespaces
  - Tools for Mapping Device Namespace to Customer Namespace
- **Asset Hierarchy and Topic Structure**
  - Asset Hierarchy following ISA95
  - Topic Structure following Asset Hierarchy
  - Tools for Mapping Device Namespace to Topic Structure

## Industrial Data Sources



# USCAR53: MQTT vs OPCUA

- Here are some data points that drove the decision for USCAR53 to MQTT:
  1. OPCUA: significantly slower than MQTT (250ms vs 50ms)
  2. OPCUA: added costs for less performance. (\$300/400 licensing per device)
  3. OPCUA: more manual than MQTT (Requires a DB structure or knowledge of NodeIDs)
  4. OPCUA: more complexity. Until recently, RW didn't have a start on a proper OPCUA (on PLC) server like Siemens has
    - a. Required work arounds with containerized OPCUA on an ipc to substitute.

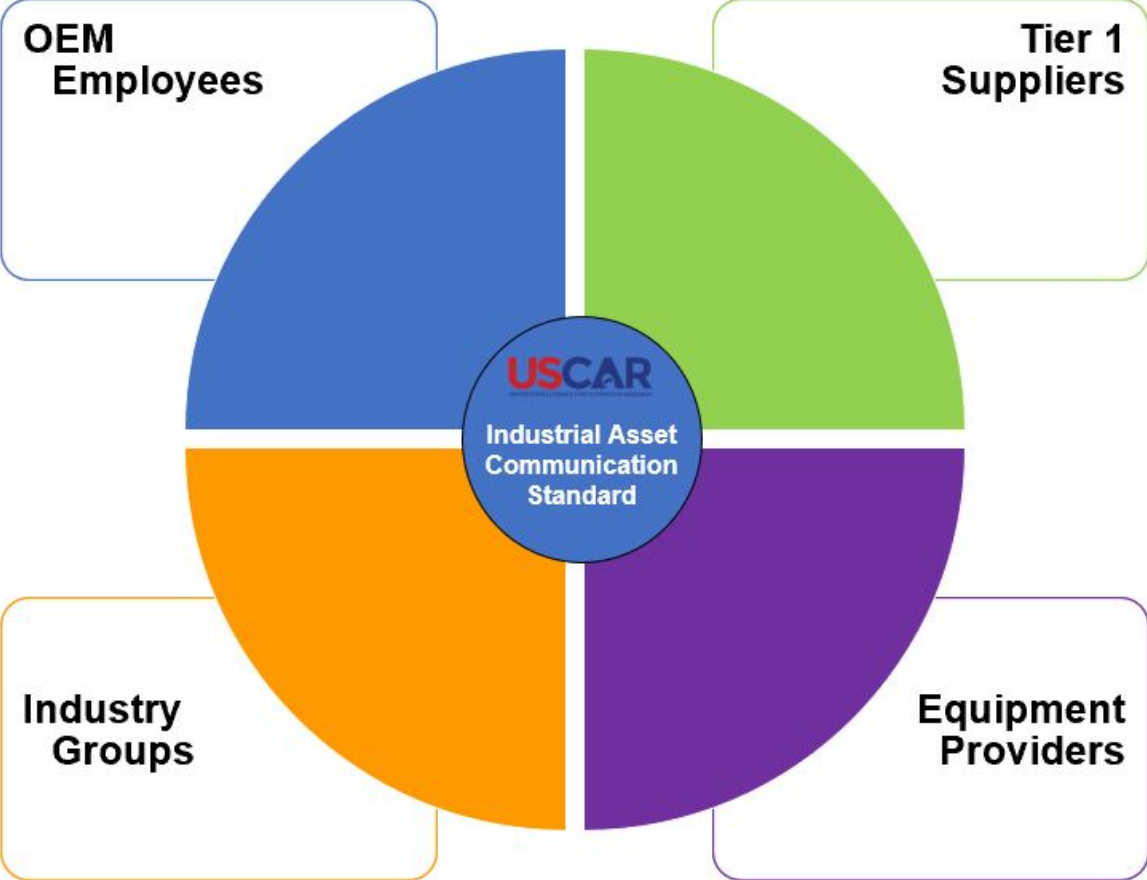


# Industrial Data Communication Standard Release 1 Scope Considerations

- USCAR will provide ownership/stewardship for the standard
- Partner OEMs will leverage this standard to drive change into Equipment OEMs through their respective Capital budgeting and purchasing mechanisms
- USCAR will lead Communication, Marketing, & Training for the Standard
- USCAR will provide recurring change management and revision release plan
- Expect non-USCAR OEMs and Tier 1s to sign on to the standard

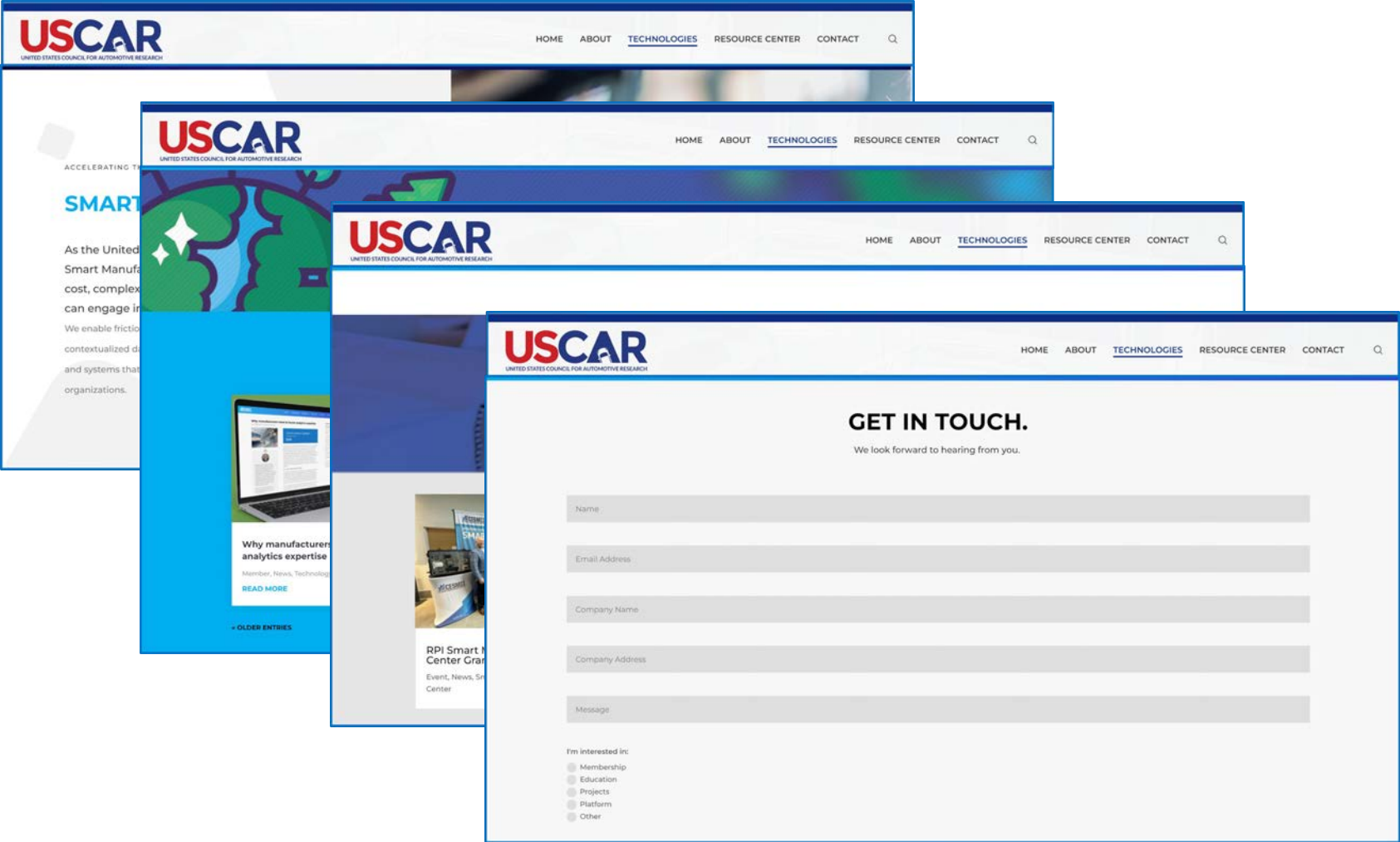


# Roll-Out Plan: Key Stakeholders Groups



Communication - Marketing - Training - Support - Pilot Projects

# Marketing Plan – Web Content Creation, User Support





# Marketing Plan – Awareness, Events



## Smart Manufacturing Workshop Agenda

April 15, 2024  
Renaissance Center Conference Center  
Detroit, MI



**USCAR** (United States Council for Aut...  
977 followers  
3w • Edited •

Thanks to everyone who joined USCAR on Monday, April 15 for USCAR's Smart Manufacturing Workshop! Special thanks to our keynote speakers for their support of USCAR Collaboration: Former US Congresswoman Brenda Lawrence, General Motors' Dan Nicholson and U.S. Department of Energy (DOE) AMMTO Director, Christopher Saldaña.

Special thanks also to our colleagues at CESMII and LHP Engineering Solutions for providing their support and expertise as well.

Additional thanks to our Manufacturing Technical Leadership Council, Mike Bastian (Ford), Jeffrey Abell (GM), and Joe Weber (Stellantis), and John McKenzie (Stellantis) for their guidance and participation in our expert panel.

#USCAR #smartmanufacturing #collaboration



# Marketing Plan – Awareness, Events

You can catch Michael's segment on How the Big 3 are Focusing on Digital Transformation Standards and How This Can Benefit the RV Manufacturing Industry on Thursday, May 2nd from 1 pm - 2 pm

To register for tickets, visit: [elkhartcountybiz.com](http://elkhartcountybiz.com)

LHP Analytics & IoT #AutomationExpo #DataInsights #KeynoteSpeaker #IndustrialAutomation #m

1) Utility data (often times quickest payback)  
 2) Critical assets  
 3) Supply chain

### How HiveMQ and MQTT Support USCAR

by Ravi Subramanyan AUG 7, 2024 18 min read

The automotive industry is rapidly evolving, with smart manufacturing practices becoming essential for efficiency and competitiveness. The United States Council for Automotive Research (USCAR) plays a key role in promoting collaboration and standardization among major automakers through its USCAR-53 goals. However, manufacturers face challenges in data communication and interoperability, which are critical for meeting the USCAR standards, particularly USCAR-53.

In this blog post, we will walk you through how **HiveMQ's MQTT platform** can help manufacturers tackle several data communication challenges and help accelerate industrial data communication proposed by USCAR-53. Let's dive in.

#### Introduction to United States Council for Automotive Research (USCAR)

- Introduction to United States Council for Automotive Research (USCAR)
- Challenges in Industrial Data Communication
- How MQTT Enables Industrial Data Communication
- Unified Namespace (UNS)
- HiveMQ: Accelerating the Industrial Data Communication Proposed by USCAR
- HiveMQ: Enabling the Promised USCAR Industrial Data Communication Standard

Excited to join as a Panelist for **BYTES & BARRELS**  
 May 2nd, 2024 | 5:00 PM to 7:30 PM  
 Westfork Whiskey, 10 E 191st St. Suite A.

Michael King  
 Co-Founder @ LHP  
 Analytics & IoT

Join me with technology thought leaders to explore the future of data



### HiveMQ Supports the USCAR Roadmap

The United States Council for Automotive Research LLC (USCAR) is an automotive technology consortium made up of major US automotive companies Ford, General Motors, and Stellantis. Established to advance automotive technologies, USCAR is developing a Roadmap for Automotive Manufacturing to standardize processes, enhance interoperability, and improve the efficiency of automotive manufacturing.

#### Industrial Data Communication Standard: SAE/USCAR-53

USCAR has developed an Industrial Data Communication Standard to address significant challenges in automotive manufacturing by promoting open protocols and reducing costs, thus facilitating seamless integration, enhancing system security, traceability, and operational efficiency.

The challenges automotive manufacturers face include:

### USCAR-53: Implications for the RV Industry

- Best Practice:** Leverage the new standard and program structure to a RV Industry adoption of Smart Factory
- Similar Industry-level challenges:** Work together with USCAR OEMs, suppliers on priorities, training, pilot-projects, and standards development
- Community of Experts:** Work directly with your counterparts at all levels organization, and across Technical domains
- Pilot Projects:** Learn by doing, share knowledge & expertise

Industrial Data is more than just Machine Data

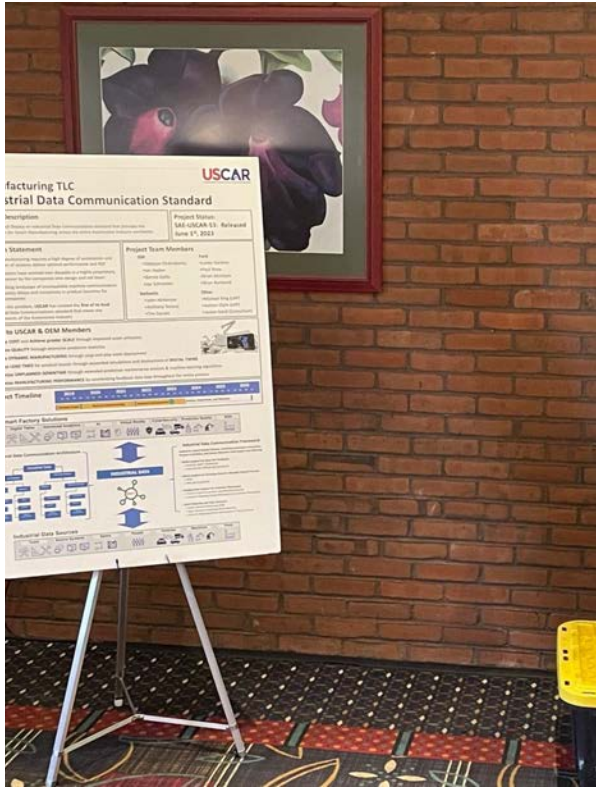


# Pilot Projects Update & Next Steps

- **Desktop Pilot:** to include small demo at June 1st USCAR IDEA event
- **Community-based Pilot:** leverage facility such as LIFT (LIFT | Manufacturing USA) to demo standard on functioning equipment
- **Tier 1 Pilot:** Utilize common Tier 1 to demo standard in production environment
- **OEM pilots:** Led by OEM teams for internal employees only



# Pilot Projects Update & Next Steps



# Resources

[Case Studies: Driving Smart Manufacturing Standards for USCAR](#)

[BLOG: How HiveMQ and MQTT Support USCAR](#)

[USCAR MQTT Data Sheet](#)

[USCAR Resource Center](#)

[USCAR-53 Communication Specification](#)

[MQTT Essentials - All Core Concepts Explained](#)

[Unified Namespace \(UNS\) Essentials for IIoT](#)

[MQTT Sparkplug Essentials for IIoT | HiveMQ](#)



# Questions?

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