



SAE
INTERNATIONAL



SAE J2012
STANDARD

REGISTER NOW
[sae.org/obd-na](https://www.sae.org/obd-na)



ON-BOARD
DIAGNOSTICS
DIGITAL SUMMIT
EUROPE

March 15-17, 2022
Online & On-Demand

Standardizing the Exchange of Data Needed by Signal Flow Analysis for OBD Compliance Reporting

Tim Felke
Engineering Fellow
Garrett Motion

Garrett
ADVANCING MOTION

Introduction

There are several use cases related to automotive emissions compliance, safety analysis, system validation and event data analysis that require an understanding of the propagation of signals within and between the vehicle's Electronic Control Units (ECUs).

Specifically -

CARB request to all OEMs in 2019 ...

(i) Certification Documentation

(2) The following information shall be submitted as “Part 1” of the certification application. ... The information must include: ...

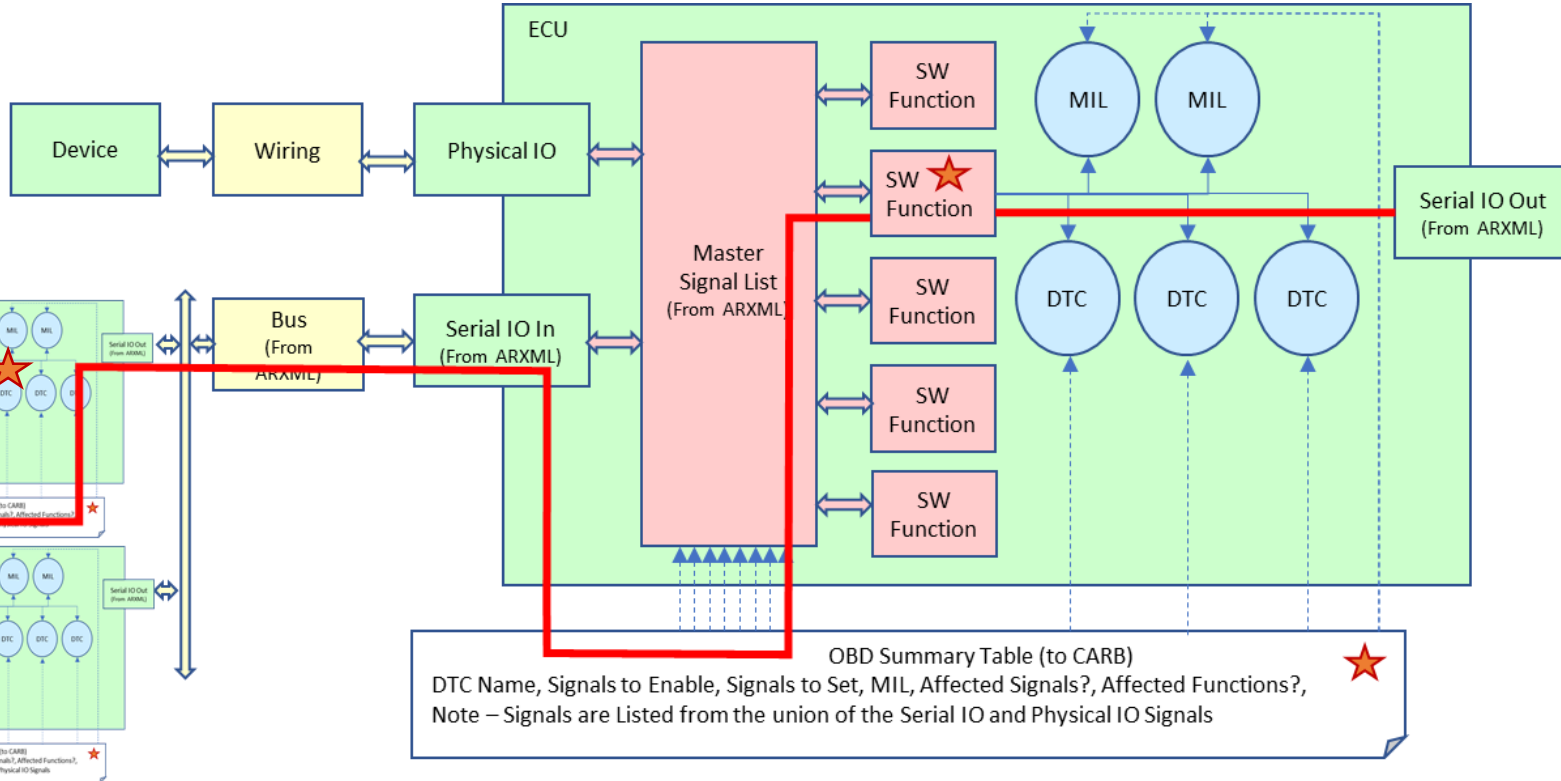
(2.8) A listing of **all electronic powertrain input and output signals** (including those not monitored by the OBD II system) that identifies which signals are monitored by the OBD II system.

This presentation will discuss the challenges of using signal flow analysis to meet this requirement and a proposal for how these challenges can be overcome.

Technical Challenge – Signal Tracing (Simplified)

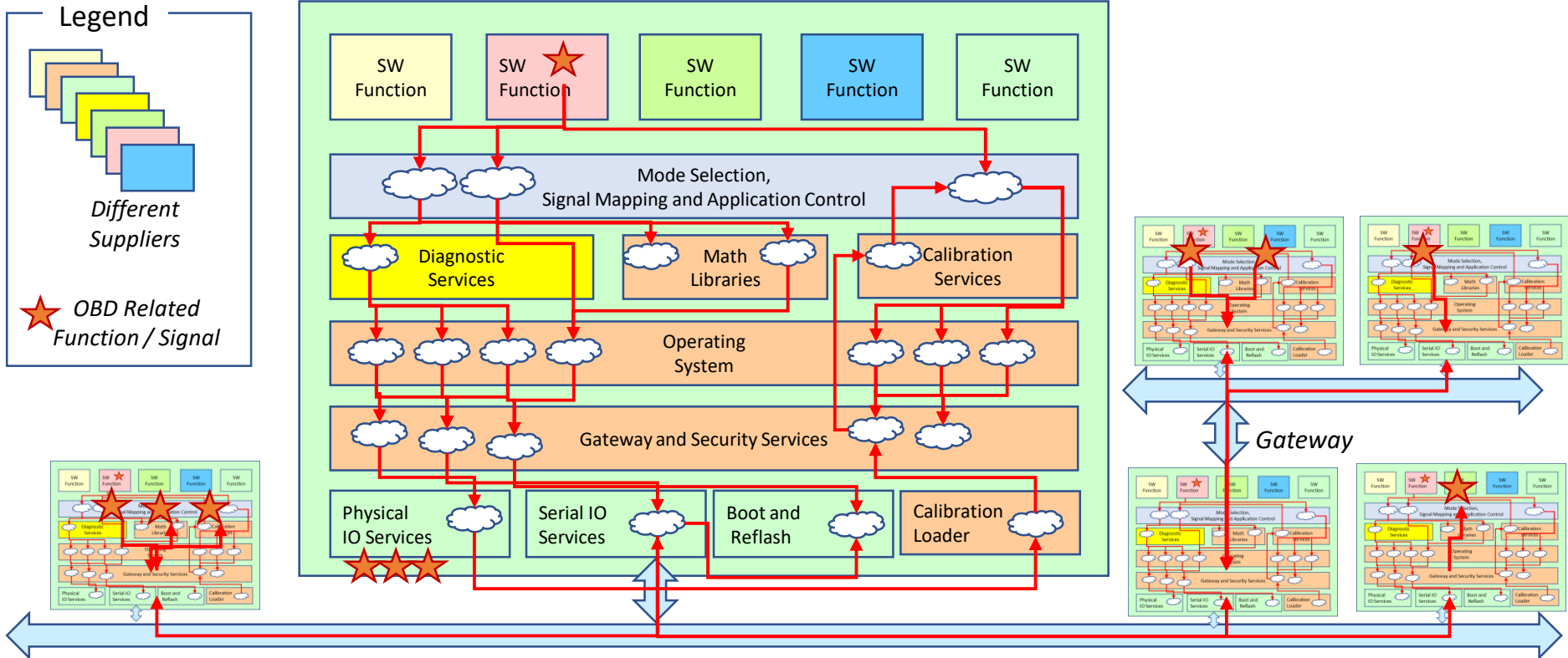
Legend

★ OBD Related Function / Signal



Intent - Ensure that all signals that enable or control an OBD related function have OBD Documented DTCs and malfunction of those signals sets the MIL.

Technical Challenge – Signal Tracing through SW Stack and Gateway Modules



Technical Challenges - Highlights

Analysis for emissions compliance from CARB require that signal flow be traced for signals derived from physical sensors as well as all signals derived from serial messages.

The signal flow for individual software modules (smallest SW entity) can be computed without difficulty but an automotive ECU may contain **several thousand modules**.

The software modules will typically be provided by **more than one supplier** with formatting and IP concerns hindering the analysis integration.

Pathways will include dependencies on **operating system, IO packages, Network and SW Services**.

Dependency pathways may be substantially modified by **calibration data**.

Utilization of physical IO ports and serial signals may be substantially modified depending on vehicle **options and regional specific equipment**.

Specifications do not exist for the exchange of required information between parties or for the methodology used.

Proposed Solution

SAE's Health Ready Components and Systems (HRCS) team proposes that we establish a team to work with industry and regulatory agencies to define the data exchange interfaces and integration processes needed by signal flow analysis for CARB compliance reporting.

HRCS is an SAE-ITC consortium established in 2020 to develop methods to facilitate the exchange and integration of exactly this type of data.

HRCS is a 501(C6) organization which allows much closer collaboration between members and faster iteration times.

HRCS invites technical experts and stakeholders from the OBD / OBM community to participate in the activity to clarify the full scope of the problem and to ensure that the resulting specifications meet the needs of all stakeholders.

Near Term Plan

1. Identify and engage stakeholders and key contributors.
2. Initiate short-term fact-finding effort with team members and CARB to understand and document requirements, timing, and scope.
3. Prepare a detailed project plan to develop and demonstrate the base concept in operation.
4. It would be scoped to only functionality related to OBD
 - Includes formalizing overall process flow and interface specifications
 - Includes user and programmer guides
5. Later stages, not addressed at this time, might cover the additional OBD requirements and application to other use-cases.

To engage in this activity or find out more ...

Please contact me, or the other HRCS leadership listed on next page.

And/Or – Visit HRCS at <https://www.sae-itc.com/programs/hrcs/presentations>

Thank You - Contact Info:

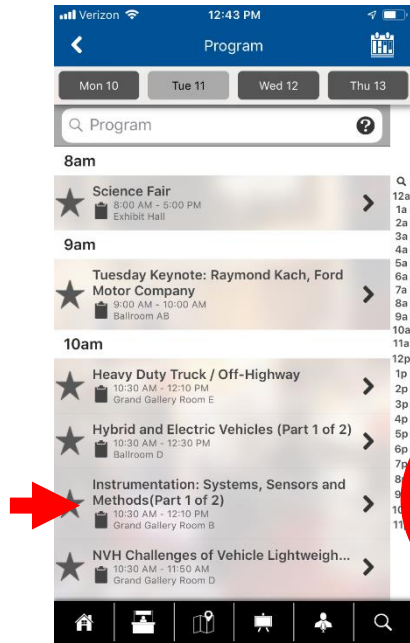
*Special thanks to BMW Powertrain Engineering group and Concentrio AG
for valuable insights and contributions*

Tim Felke
Engineering Fellow
Garrett Motion
(602) 510 3518
tim.felke@garrettmotion.com

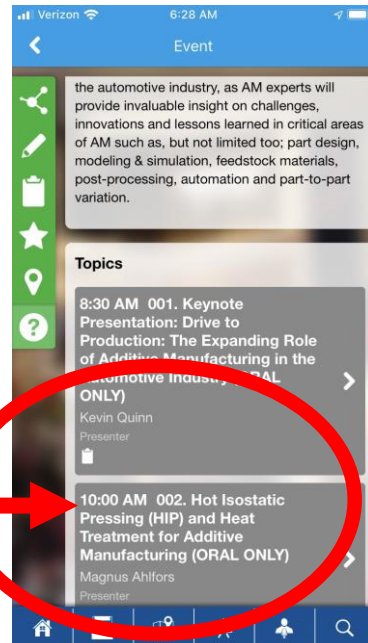
Peter Grau
Program Manager
SAE ITC
Peter.Grau@SAE-ITC.org

Steve Holland
SAE Fellow, Chairman HRCS
hollands1@comcast.net

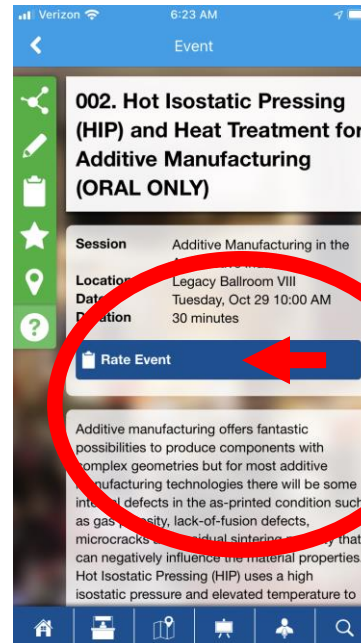
Rate My Talk in the App (if applicable)



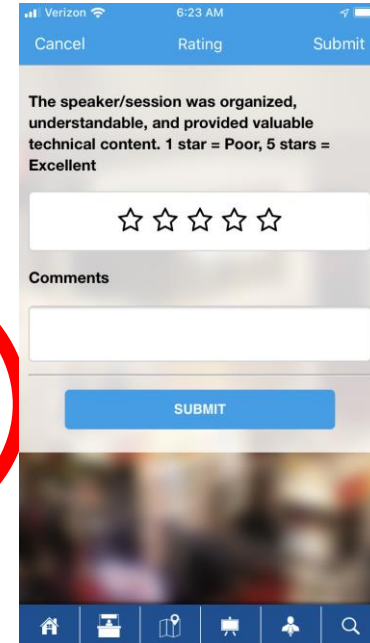
1. Navigate to session listing under Program



2. Click on individual presentation



3. Click on "Rate Event" button



4. Rate speaker