



Aftermarket Testing and OEM Build Information Integration

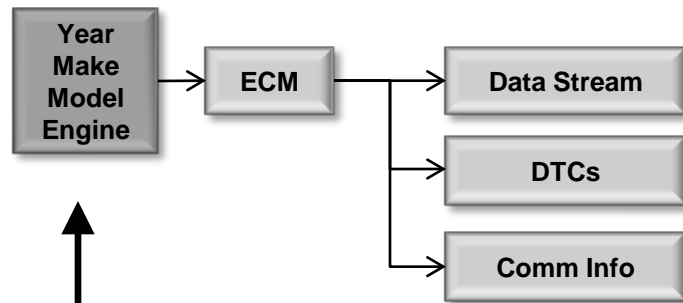
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Aftermarket Testing and OEM Build Information Integration



Simple data was stored in a simple format



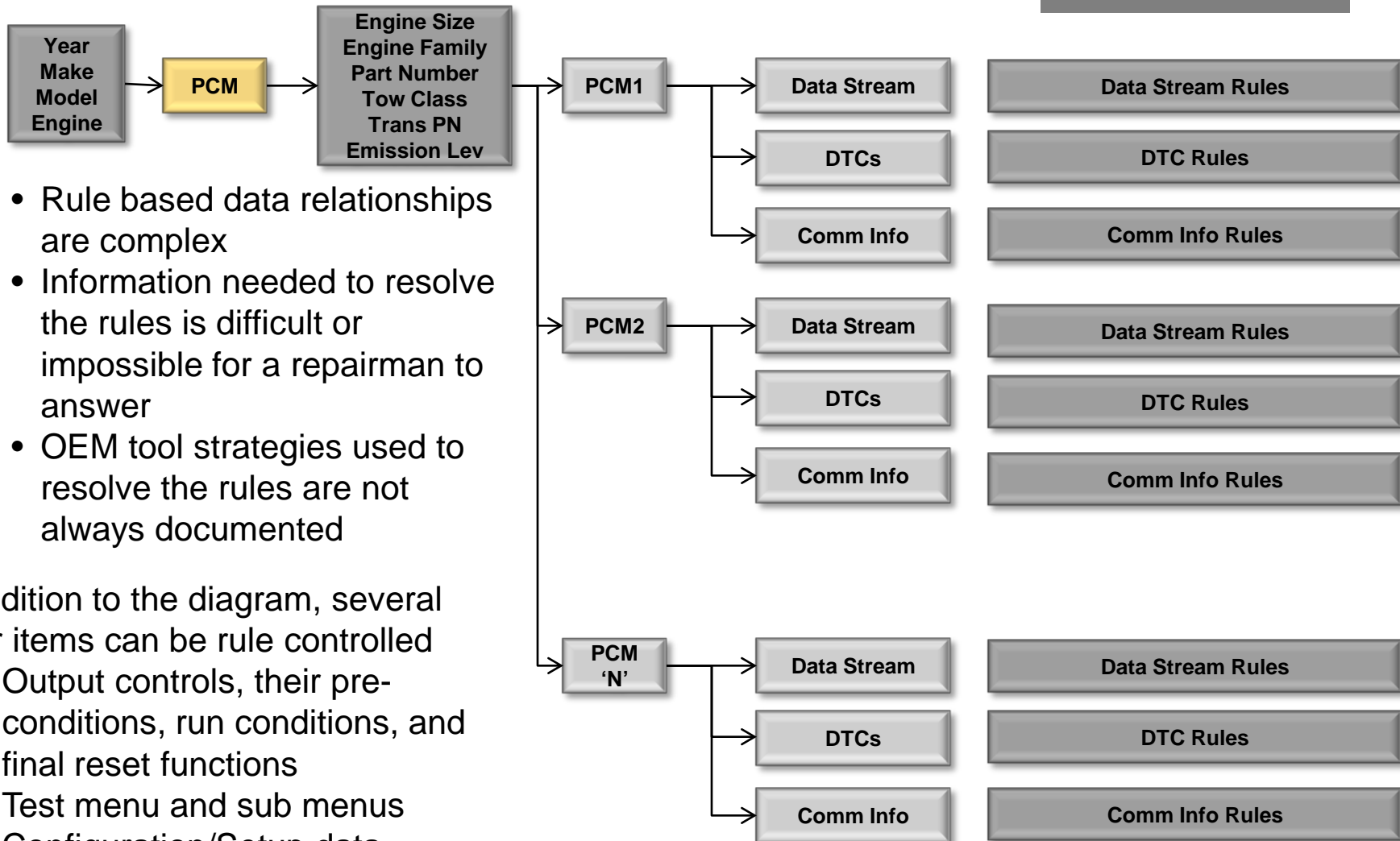
All information needed to identify the correct set of information for a vehicle could be derived from the VIN or from asking the repairman



- Year?
- Make?
- Model
- Engine Size?
- Auto or Manual?



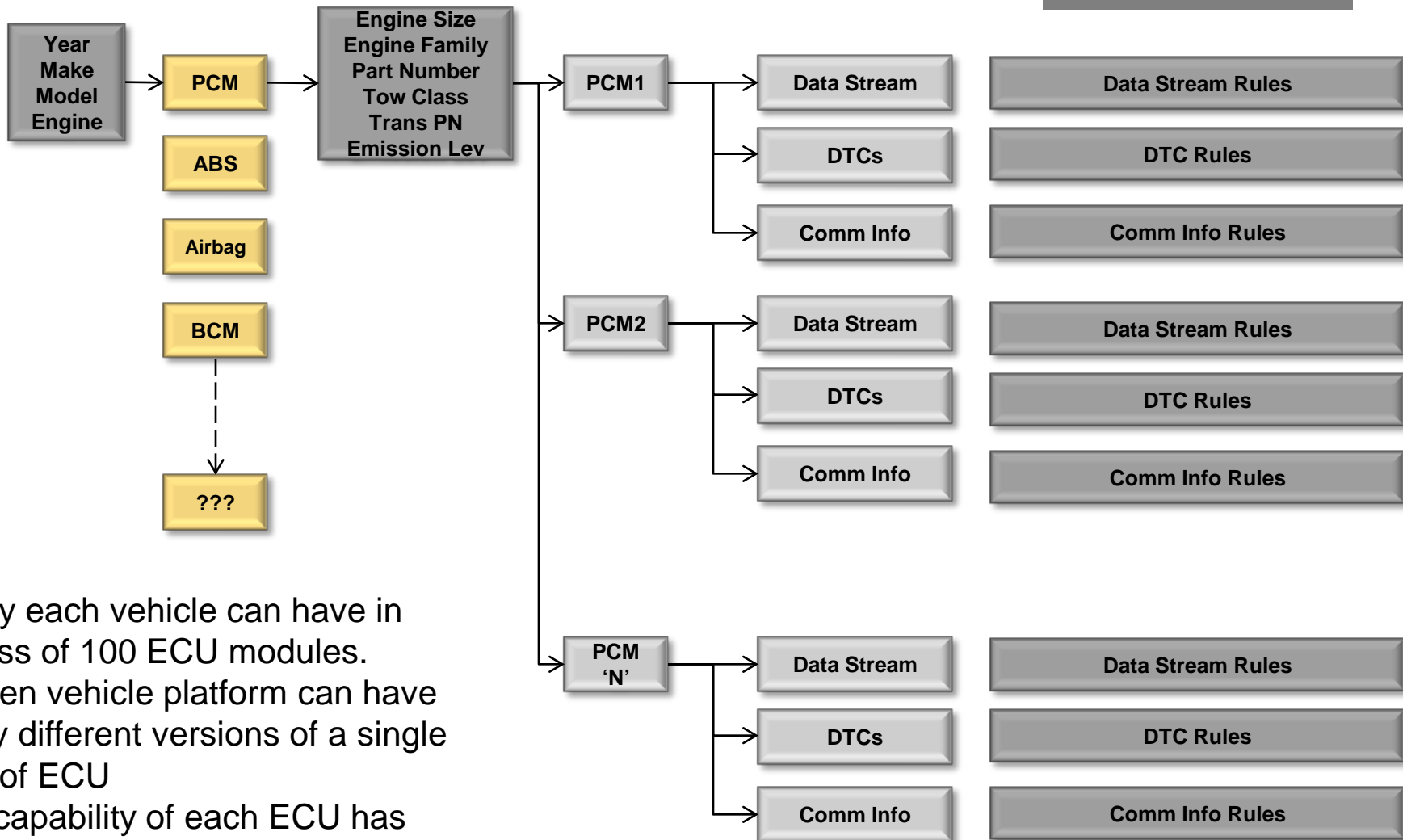
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- Rule based data relationships are complex
- Information needed to resolve the rules is difficult or impossible for a repairman to answer
- OEM tool strategies used to resolve the rules are not always documented

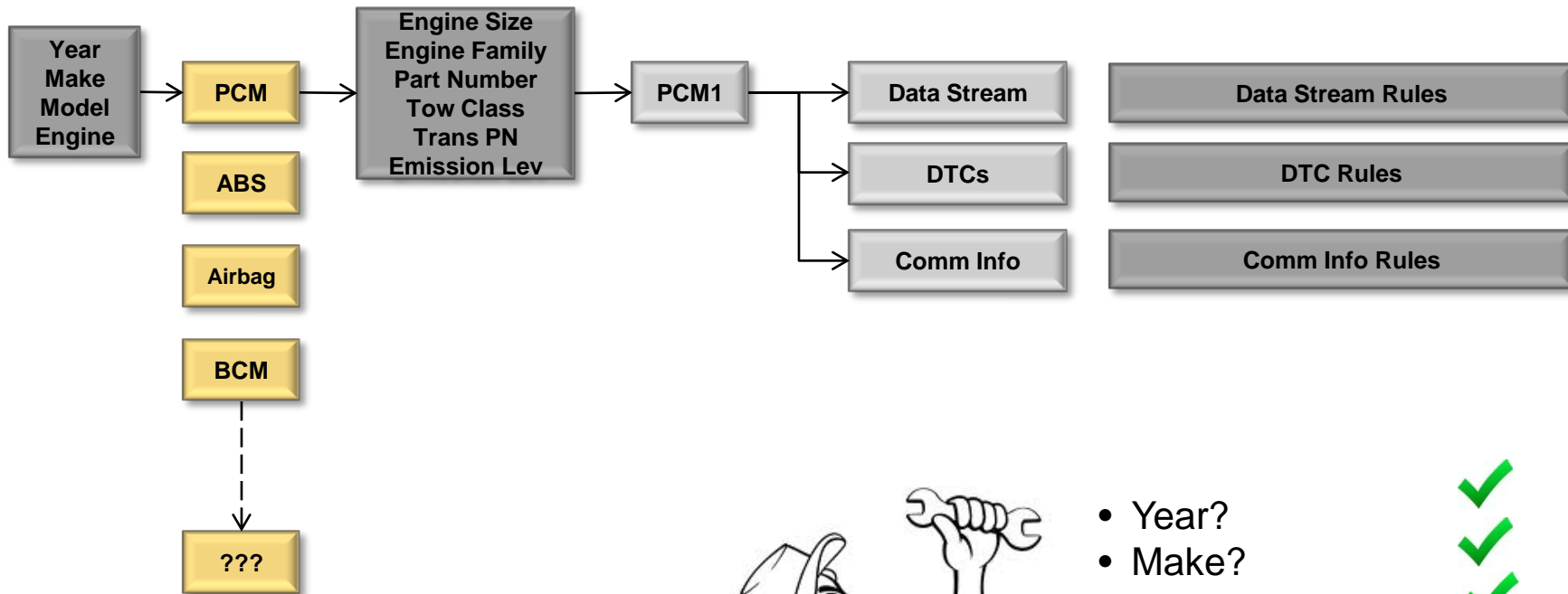
- In addition to the diagram, several other items can be rule controlled
 - Output controls, their pre-conditions, run conditions, and final reset functions
 - Test menu and sub menus
 - Configuration/Setup data

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- Today each vehicle can have in excess of 100 ECU modules.
- A given vehicle platform can have many different versions of a single type of ECU
- The capability of each ECU has greatly increased

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- No possible way to determine vehicle options from VIN
- Operator has no visible way to answer questions to determine vehicle options



- Year? ✓
- Make? ✓
- Model? ✓
- Engine Size? ✓
- Auto or Manual? ✓
- Tow Class? ✗
- Trans PN? ✗
- Emission Level? ✗



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Information Sources to Identify Vehicle Options Today



- Year, Make, Model, Engine, Body Style
- Year, Make, Model, Engine, Body Style, Auto/Manual, 4wd/2wd/awd, etc
- HW Part Number, Diagnostic ID, SW Part Number, Codes Supported, Pid Supported, etc, etc

Problems arise when tricks are used to derive the vehicle identification through ECU inquisition:

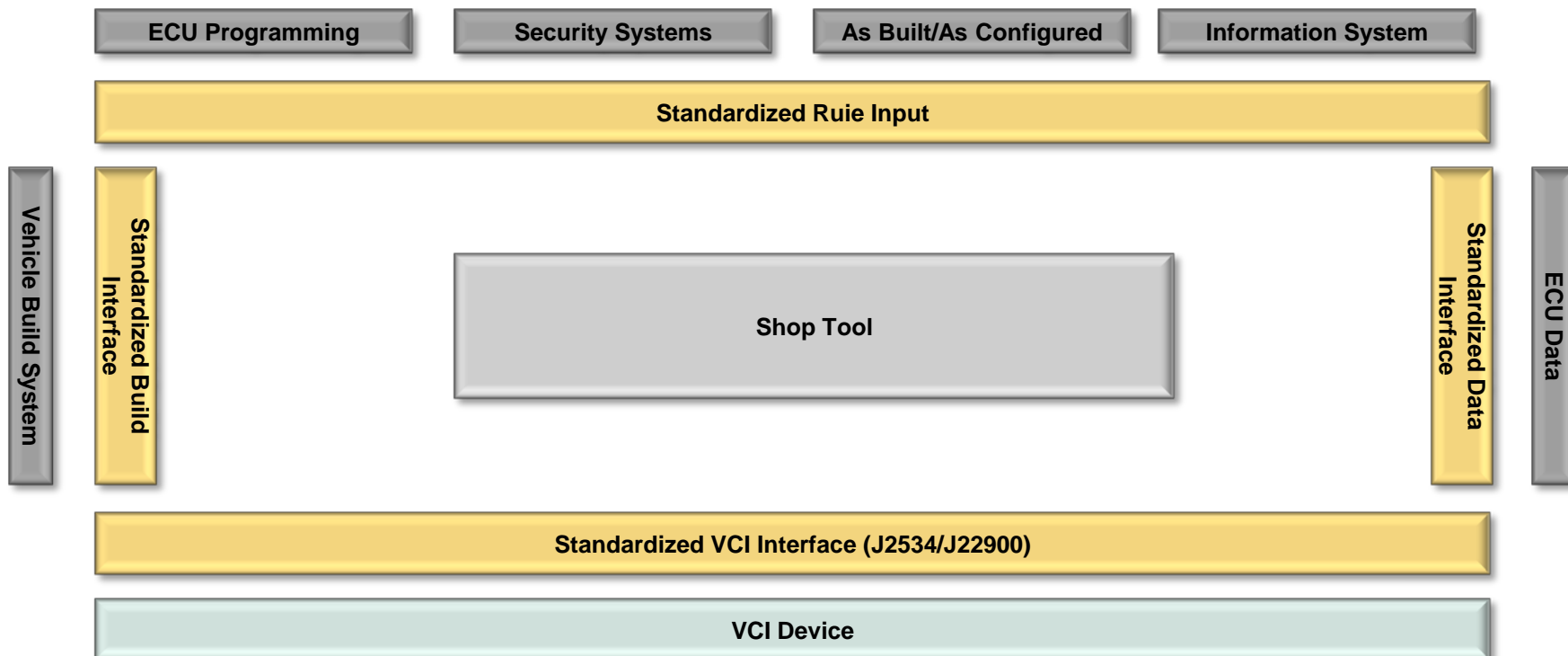
- The method of getting the ECU information necessary to identify a vehicle content is not standard. This generates lots of complexity in the design of the diagnostic tool.
- Reporting the method of vehicle content identification to the aftermarket becomes nearly impossible
- **If the automatic mechanisms of determining vehicle content fail, there is no way to ask the operator questions that can be answered by visual inspection of the vehicle.**

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The shop tool (both OEM and Aftermarket) is surrounded by a set of support interfaces

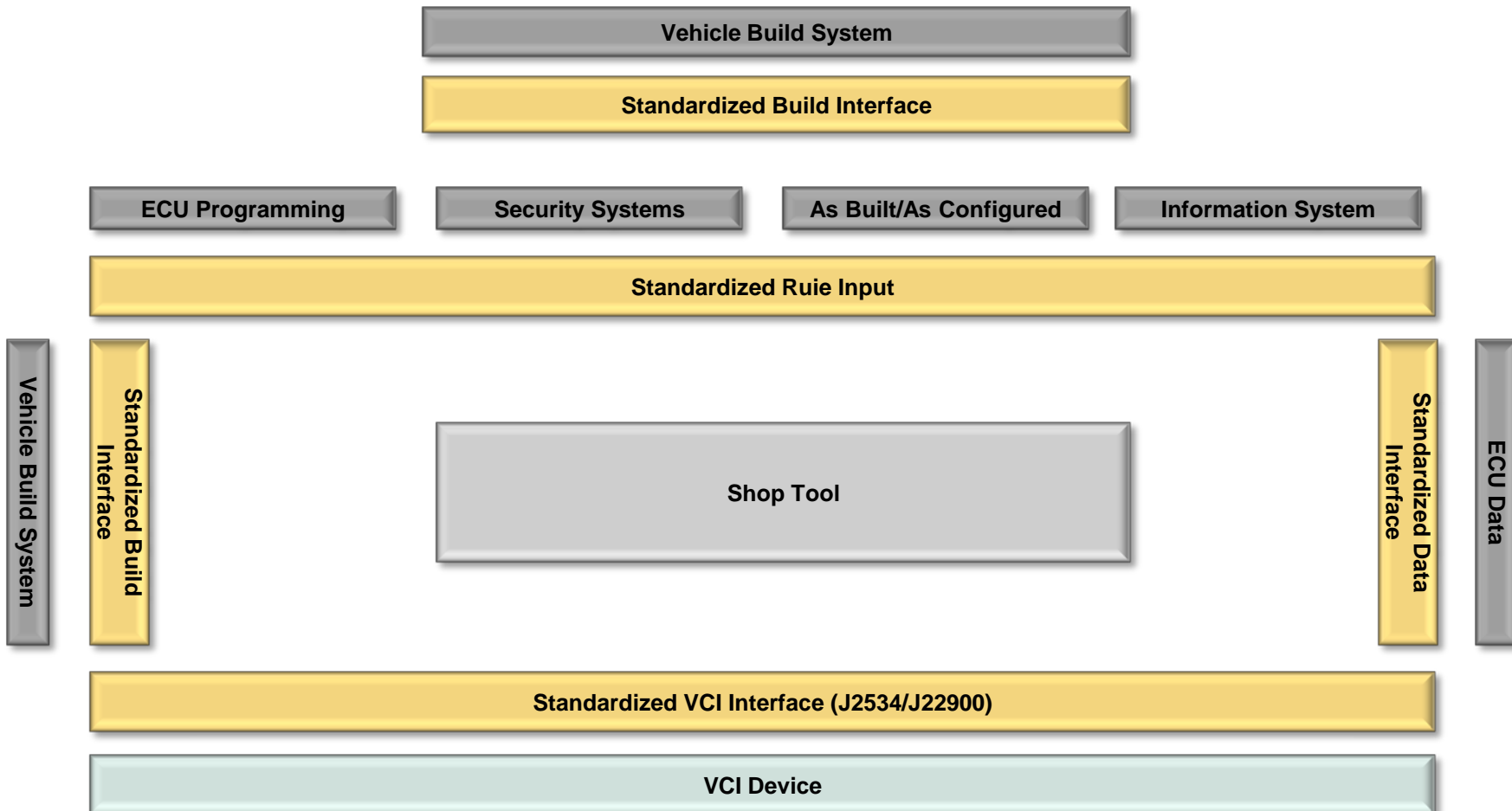
- Vehicle Communication Interface (VCI) interface through J2534 or J22900
- ECU and other vehicle data is currently not defined in format or content
- Rules input and vehicle options needed to determine the correct vehicle for other OEM systems not currently defined.
- Build interface (Topic of this presentation)



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Vehicle Build Interface



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What is the vehicle build information?

- OEM created data that completely defines every aspect of the vehicle so it can be built in the assembly plant
- Format is encoded and not human readable
- Magic decoder ring is created by the OEM to interpret the compact build information
- Information is created and saved for every vehicle built in the assembly plant

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Other sources of vehicle build information:



- Bar code on Vehicle



- Text printed in vehicle



- Stored in ECU

- Requires Scanner on Tool
- May be damaged
- May be difficult to locate
- Can not be updated

- May be damaged
- May be difficult to locate
- Can not be updated
- Can be mis-read or mis-entered when entered manually

- Unavailable if there is no ECU communications
- Location and method of retrieval not standardized.

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Vehicle Build Info Sources (ISSUES)

- **ECU Memory**

- Only a couple OEM's store the build information in the ECU
- The method of requesting the build info is not standard
- Would require changes to the OBDII specification for emissions related information

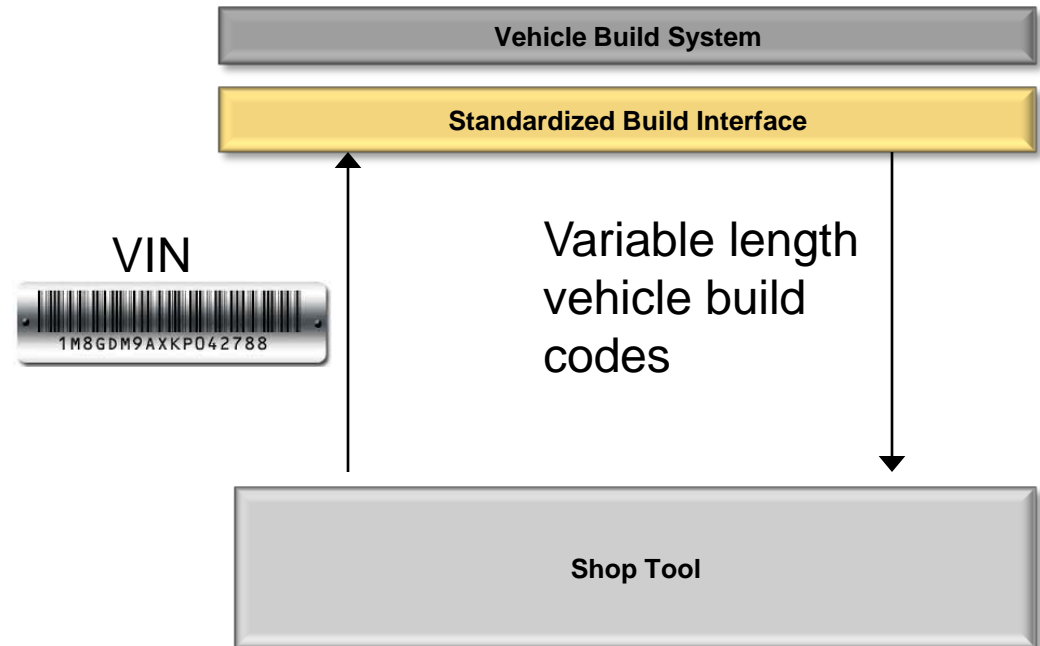
- **OEM "As Built" database**

- Not all OEM's currently have such a database
- This interface is not currently published

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1. Sole input to the interface is the VIN (ie ask for the build information for this VIN).
2. Variable length message is returned containing the entire build information for this vehicle.
3. Format and content of the returned message is OEM specific.



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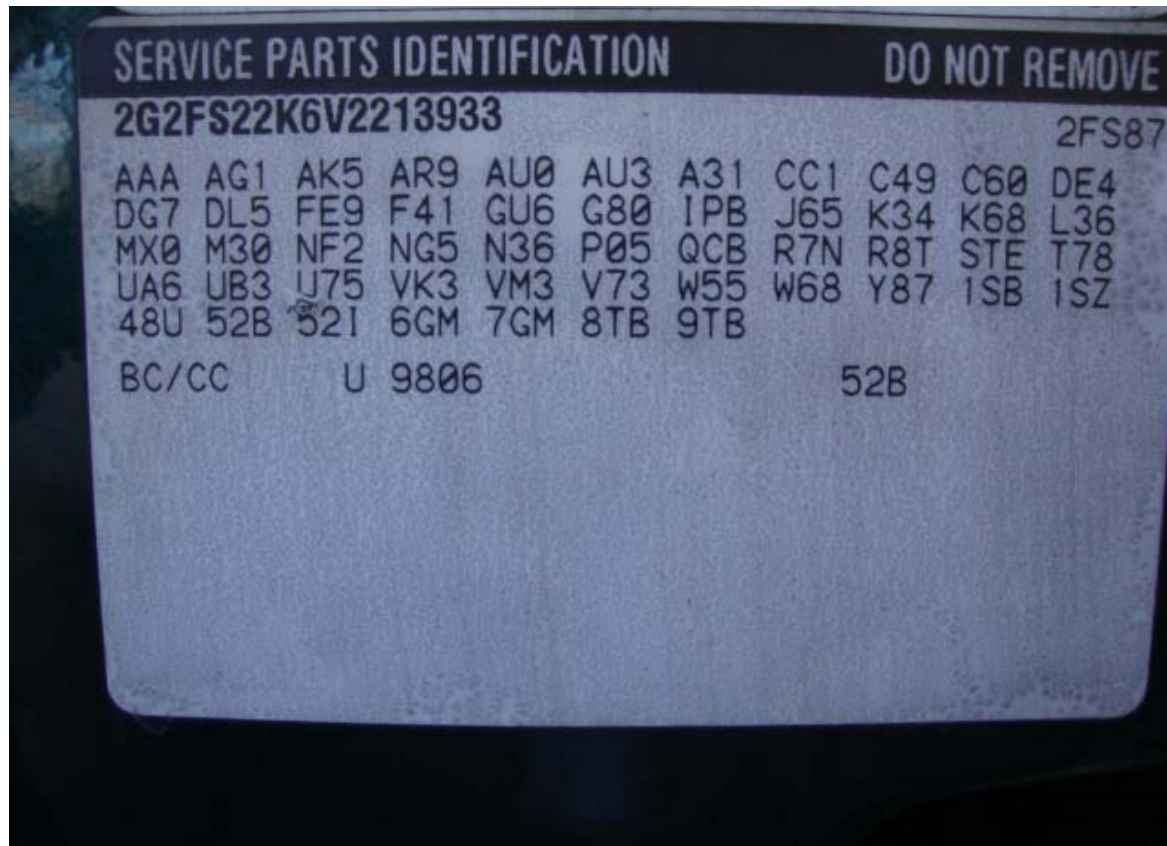
Pop Quiz!

```
[BROADCAST ,20090310,071835,20090310,061804]
LINEA=10-MAR-0907:18:0494486FPAAAJGAT9M36070JGAT9M
LINEB=36070>A**SALES INFORMATION*JGEP9U36070 7DH
LINEC=CWAJ V 2A Z A AB A C PASEG1C3P9 2
LINED=30>B W F 72H 1CDKBCH T07YCCB U WTB 1 7 CL
LINEE=1 T 3 H 442 BP 3999 C 020209 >C 6FPAAAJGA
LINEF=T9M36070 36070 415098 38927 H W
LINEG= EG C3 55 3 >D C 2 2 6 2 8W
LINEH=4CEB 2 X 2W AS R N
LINEI= Y >E CK F E6B9DF4 4 R 8 P 2S1 S W MB731
LINEJ=RXV1ARO 5 R 9HX B 7 R 7 V T5
```

What size engine is in this vehicle?



Pop Quiz (2)!



What radio package is in this vehicle?

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This is a partial (very partial) list of decodes for GM RPO codes
(R egular P roduction O ptions)

There are over 3300 of them in total (and this is just GM)

00L : SECONDARY COLOR, EXTERIOR, PRIME
00U : PRIMARY COLOR, EXTERIOR, PRIME
01L : SECONDARY COLOR, EXTERIOR, SPECIAL (91)
01U : PRIMARY COLOR, EXTERIOR, SPECIAL, (91)
02A : STRIPE COLOR, ACCENT, TWO TONE, BEIGE/GARNET (93)
02L : SECONDARY COLOR, EXTERIOR, SPECIAL, CHART NOT
02U : PRIMARY COLOR, EXTERIOR, SPECIAL, CHART NOT
04U : PRIMARY COLOR, EXTERIOR, FLAX PEARL, (92)
05P : WHEEL COLOR, ARGENT (91)
06P : WHEEL COLOR, BLACK/SILVER (91)
07A : STRIPE COLOR, ACCENT, TWO TONE, WHITE/MED BEECHWOOD**
07P : WHEEL COLOR, GRAY/RED (91)
08Q : MOLDING COLOR , MARY KAY PINK (91)
08U : PRIMARY COLOR, EXTERIOR, MARY KAY PINK (91)
09A : STRIPE COLOR, ACCENT, TWO TONE, WHITE/DK SAPPHIRE
09U : PRIMARY COLOR, EXTERIOR, OPAQUE WHITE (91)
1.0 : TRIM COMBINATION, LEATHER, MED SLATE GRAY (2) (3t1

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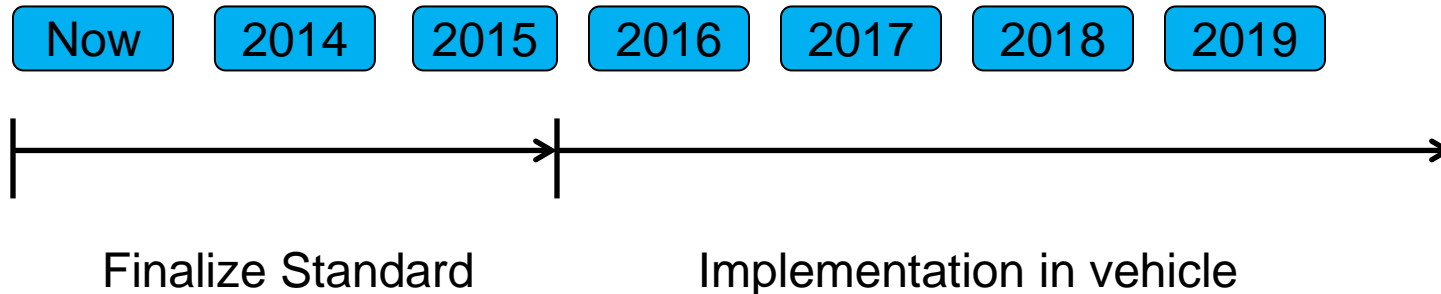


Why do we need Multiple sources of Build Information?

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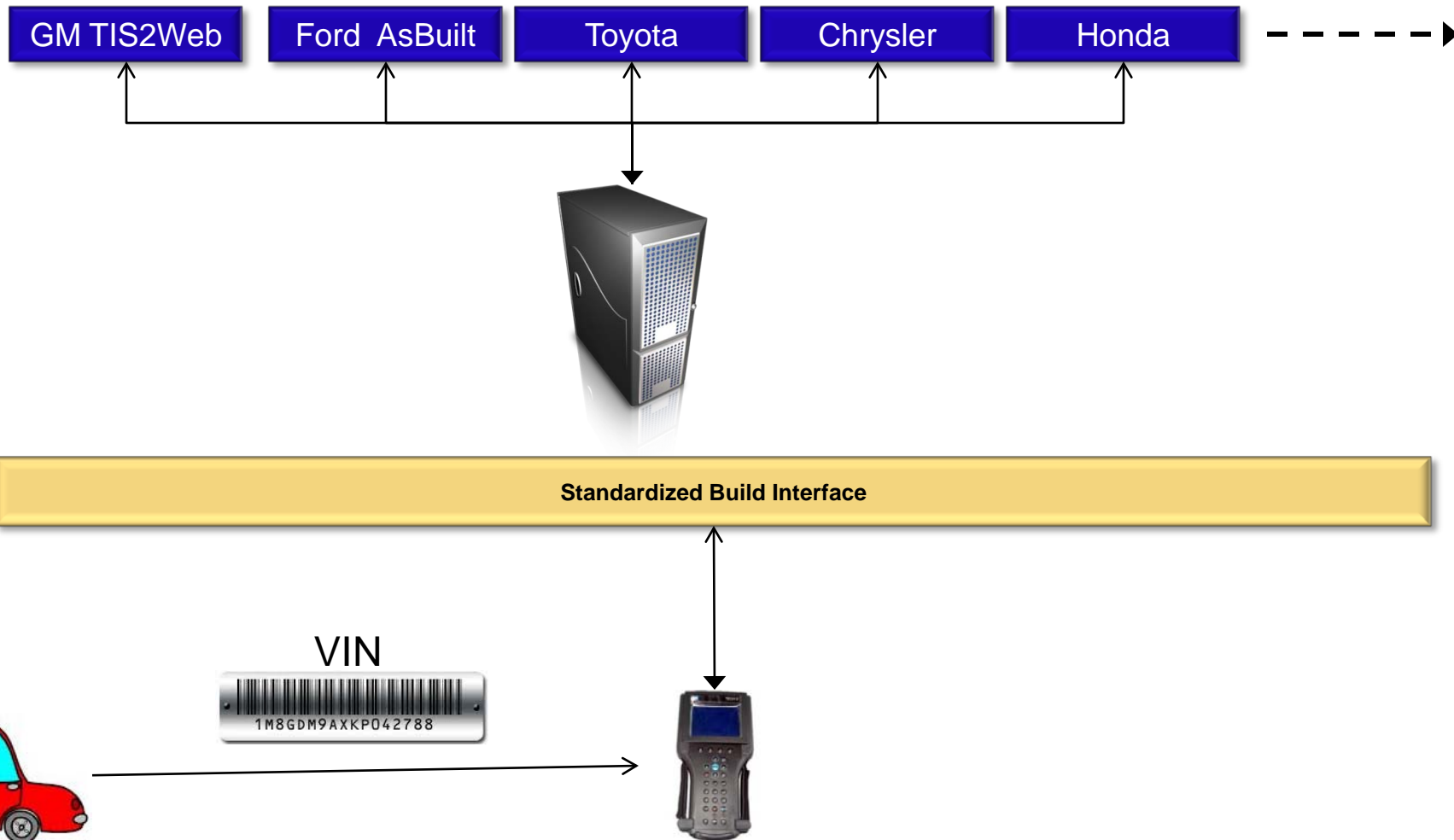


Implementing a standardized build information interface to ECM



Vehicle communications changes are very time consuming to implement

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Advantages of the approach

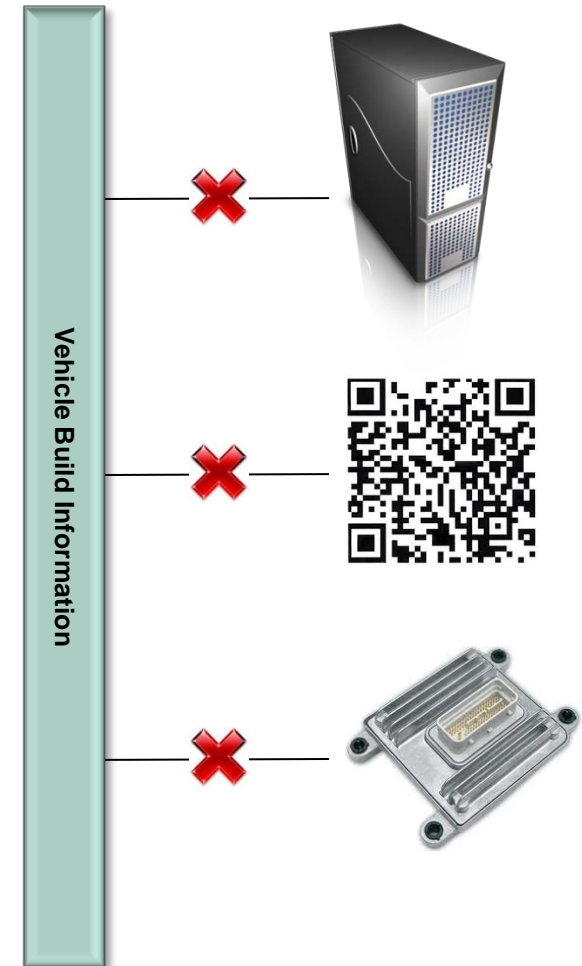
- Utilizes the existing OEM vehicle build infrastructure
- Can be implemented without changes to the vehicle communication protocol
- Provides a single unified mechanism of integrating vehicle build information into the aftermarket scan tools (and potentially OEM tools in the future)

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Failure Modes

- Network Unavailable
 - Backup is ECU or bar code
- Bar code is unreadable or missing
 - Backup is ECU or server
- ECM can not communicate
 - Backup is server or bar code



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What is needed?

1. **VIN input**
 1. User
 2. Scan
 3. ECM Query through OBDII mode 9
2. **SAE Standard which requires build information to be stored in ECM**
 1. Standard location for the build information to reside
 2. Standard OBDII call to retrieve the build information
3. **Vehicle build information decode must be published for tool integration**
 1. ETI Tool Tech?
4. **SAE Standard which defines the interface to request the vehicle build information from the internet**
5. **Development of the middleware server software and deployment of the hardware.**

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Who Benefits?

- Manufacturing Test Group
- Service Diagnostic Scan Tool Group including “As Configured”
- Service Information
- Parts Ordering

Both OEM and Aftermarket groups

Aftermarket Testing and OEM
Build Information Integration



Thank You!