Cyber Secure Innovation
… an Oxymoron?

Method Park
Process Insights - October 2018

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AGENDA

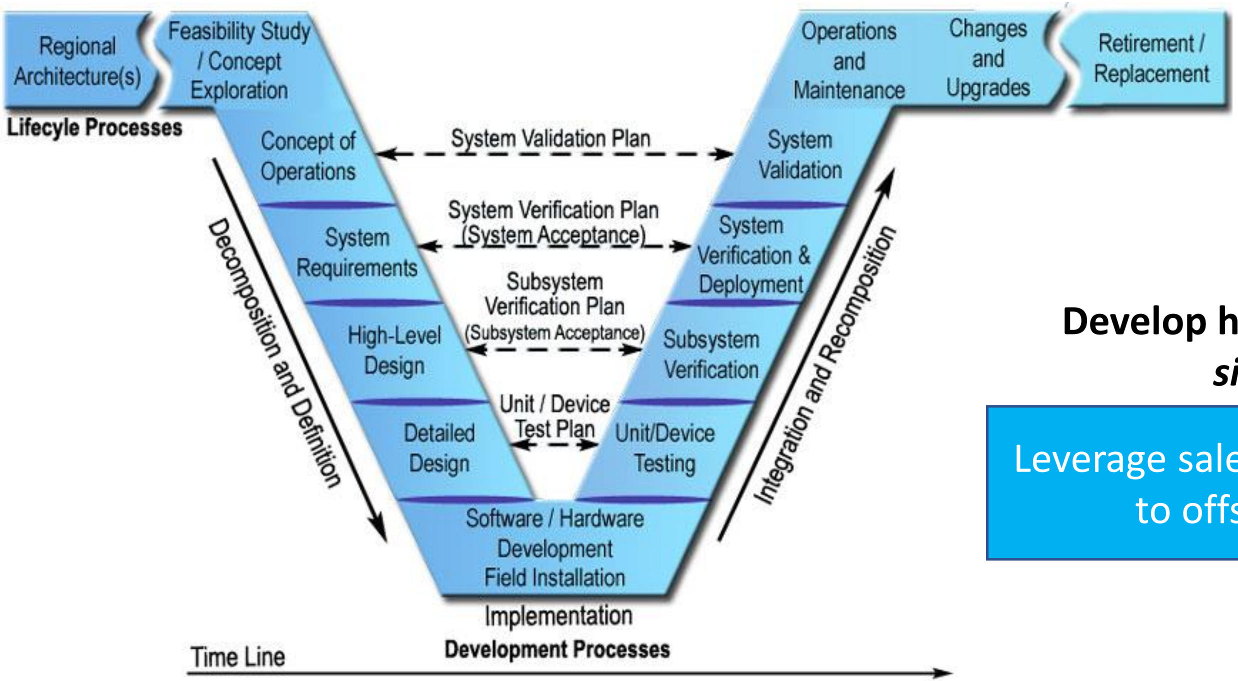
1. Product Development and Innovation

2. Embedded System Development

3. Automotive Cyber Security

4. Conflicts between Innovation & Cyber Security

Automotive Vehicle Development



2 - 3 year cycle

Develop hardware and software *simultaneously*

Leverage sales revenue of new models to offset validation costs

Executive & Investor **Expectations**

”Silicon Valley” speed of development

Almost immediate integration of consumer electronics technology into vehicles
(a year is too long)

Automotive Engineer

Approach to Innovation Today

Quickest path to a minimum viable product “MVP”

Prototype / quickly code something to demonstrate the idea → **Acquire funding for people and parts to make it to next milestone**

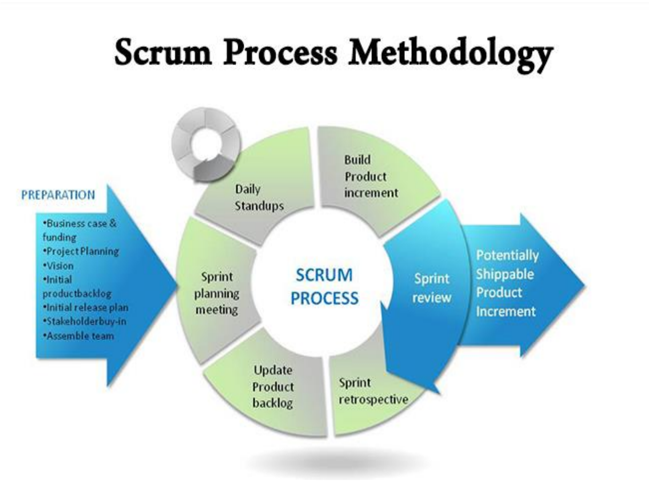
Innovation is often “fueled” by start-up companies
(or acquisitions of start-ups)

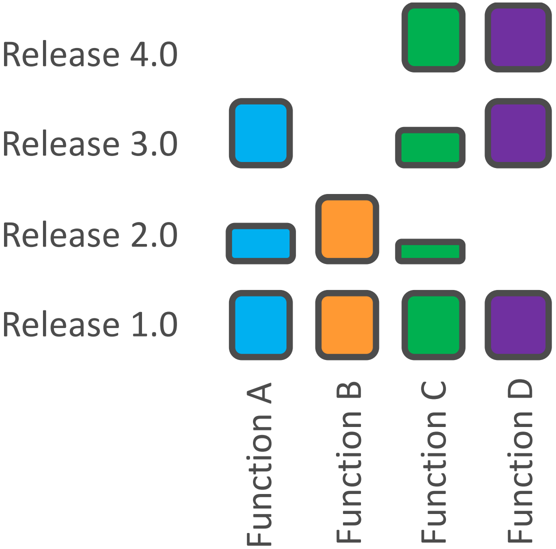
Little experience with, or appreciation for
process discipline, product maintenance or liability

Typical Approach to Embedded Software Development

Distribute the coding across different teams globally
Develop functions simultaneously

Integrate new content and release bi-weekly





Embedded Software Validation

Software is tested:

- Model in the Loop
- Software in the Loop
- Hardware in the Loop
- Component Dynos
- Development Vehicles

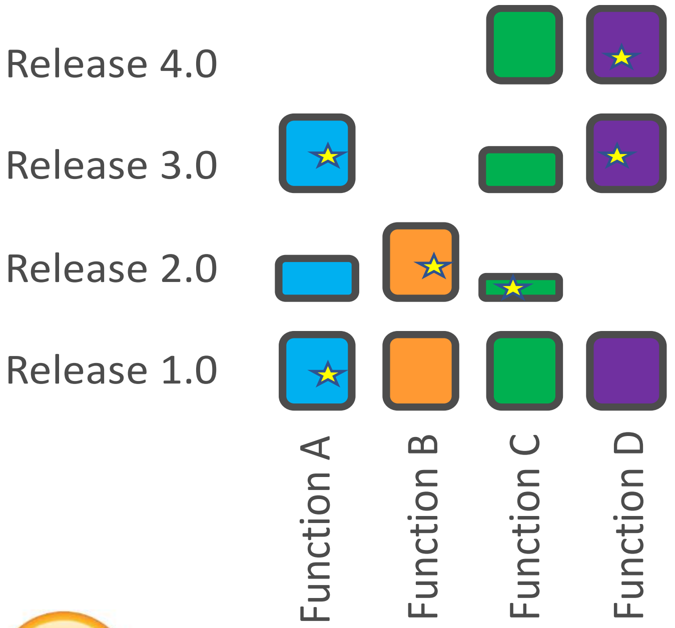
Bugs are identified ★

… but not all

Fixes developed and implemented

… asynchronously

and sometimes the fixes have bugs 😢



Release 4.0

Release 3.0

Release 2.0

Release 1.0

Function A

Function B

Function C

Function D

Embedded Software Reality

Consumer Electronics Attitude

“There are always bugs in software”

My perspective:

Bugs can cause recalls

A component to break

A customer to be stranded

IMPORTANT SAFETY RECALL INFORMATION

U.S. Department of Transportation

Issued in Accordance With Federal Law

NHTSA www.nhtsa.gov

Embedded Software Update Strategy

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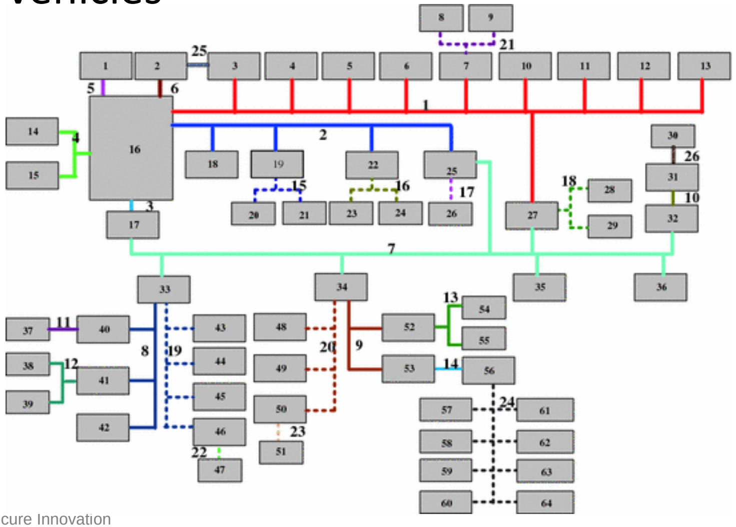
Today, Automotive product differentiation relies on software

- ➢ Bring new / improved features to production quickly !!!!
- ➢ Fix quality issues and security vulnerabilities quickly !

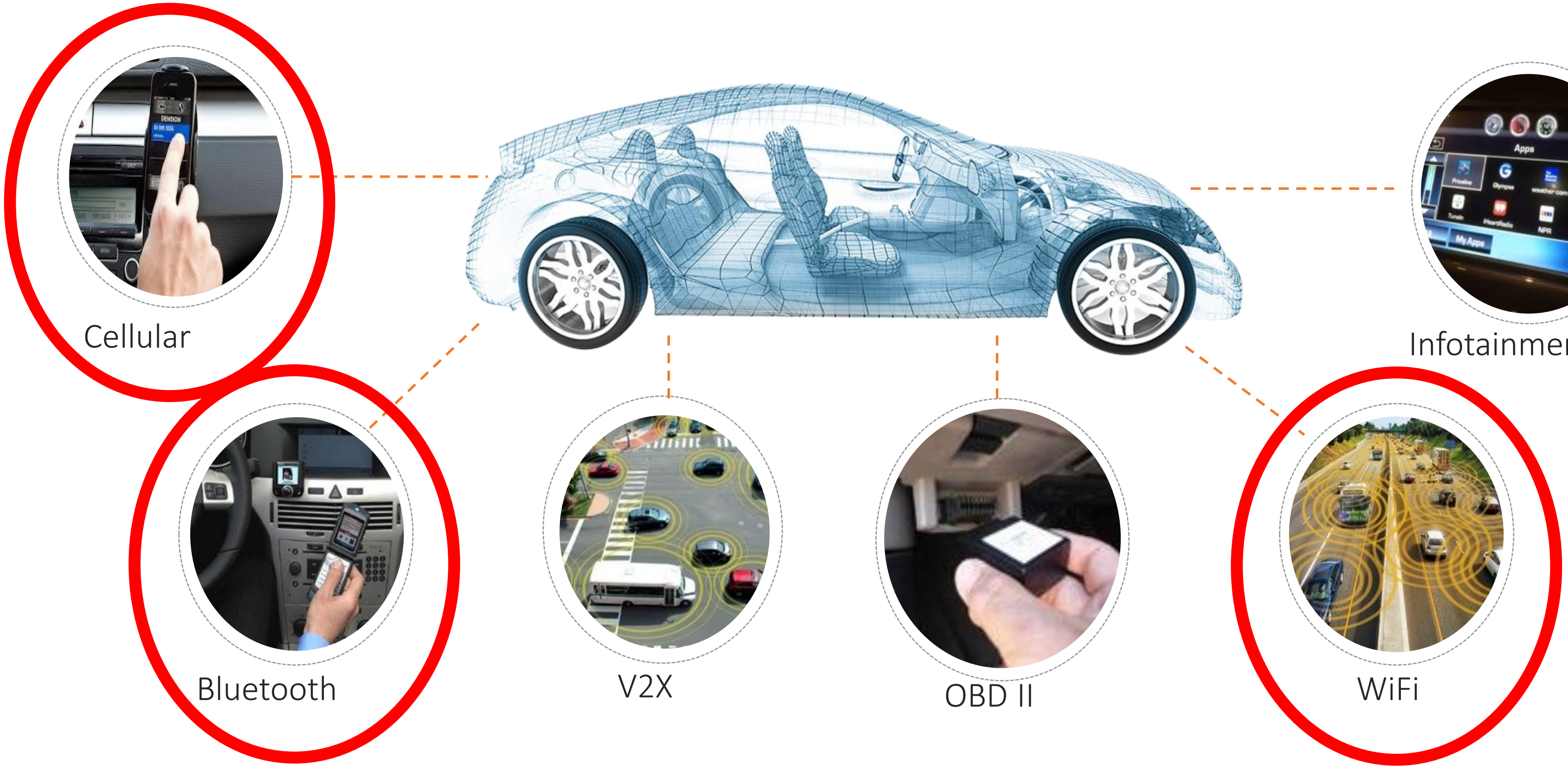
Over 100M lines of code in highest-content vehicles

Over-the-Air software updates are being applied to more and more systems

- ➢ Infotainment
- ➢ EV functions
- ➢ Cybersecurity
- ➢ ADAS & Powertrain



Automotive Threat Surface



Cellular

Infotainment

Bluetooth

V2X

OBD II

WiFi

Potential Automotive Exploits

- Unlock doors
- Prevent ignition
- Turn radio to maximum volume

- Eavesdrop through microphones
- Track GPS location, alter navigation

- Turn off the engine
- Accelerate vehicle, disable brakes
- Control steering wheel
- Inflate airbags

Targeted Attack

Mass Attack

Threat Scenarios

Warranty and Insurance Fraud owner claims hacking caused accident or vehicle theft

Theft of vehicle or personal property

Ransomware applied to vehicle owners – dealers – fleet owners - automaker

Brand Reputation Harm hacktivists sensationally disclosing vulnerabilities

hacker claiming that an accident was caused by a hack

Cyber Security Best Practices

NHTSA

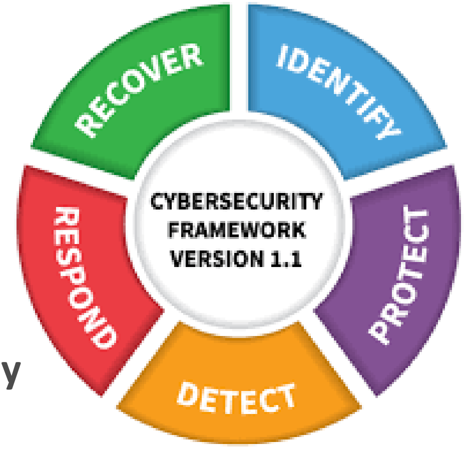
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

1. A **risk-based prioritized identification and protection** process for **safety-critical** vehicle control systems;

2. Timely **detection and rapid response** to potential vehicle cybersecurity incidents on America's roads;

3. Architectures, methods, and measures that **design-in cyber resiliency** and **facilitate rapid recovery from incidents** when they occur; and

4. Methods for effective **intelligence and information sharing** across the industry to facilitate quick adoption of industry-wide lessons learned (Auto ISAC).



CYBERSECURITY FRAMEWORK VERSION 1.1

IDENTIFY

PROTECT

DETECT

RESPOND

RECOVER

NIST

Cyber Secure Embedded Software Development

Hackers (ethical and otherwise) like challenges

- ➢ They develop new ***techniques*** to get into systems and exploit them
- ➢ They identify vulnerabilities
  - ➢ Coders **not following** best practices
  - ➢ Weaknesses in **existing** coding practices

Product manufacturers are responsible to have a process to:

- ➢ review vulnerability lists
- ➢ be alerted for “Zero Day” vulnerabilities
- ➢ quickly mitigate them
- ➢ protect existing product in the market

Innovation & Cyber Conflicts

CYBER SECURITY MEASURES

Code coming in from around the world

- Can't "talk" to every coder involved on the team
- Significant amount of legacy code
- Open source code

How ensure everyone has cybersecurity training and knows the policies?

Who tests legacy features?

Verify no known vulnerabilities

- ➢ At key milestones prior to production
- ➢ For every production release

Constantly evolving content

- add features
- abandon unused paths
- add branches to support product variants

Remove unused code!
Who tests unused features?

Make it easy for developers to

- get system data for analysis
- make quick fixes and evaluate the effectiveness

Eliminate "back doors" in the code

Close ports when release for production!

Innovation & Cyber Conflicts

GO FAST!!

Lean teams

Scan for vulnerabilities
Perform Penetration Tests

Develop product enhancements

Fix quality problems

Address vulnerabilities

Leverage all info on vehicle
for new feature innovation

Suppliers and Special Equipment manufacturers
typically develop new features on their own

System integrators develop specialty vehicles

Secure Gateways block or control access.

Authentication required to request
information and to run executables.

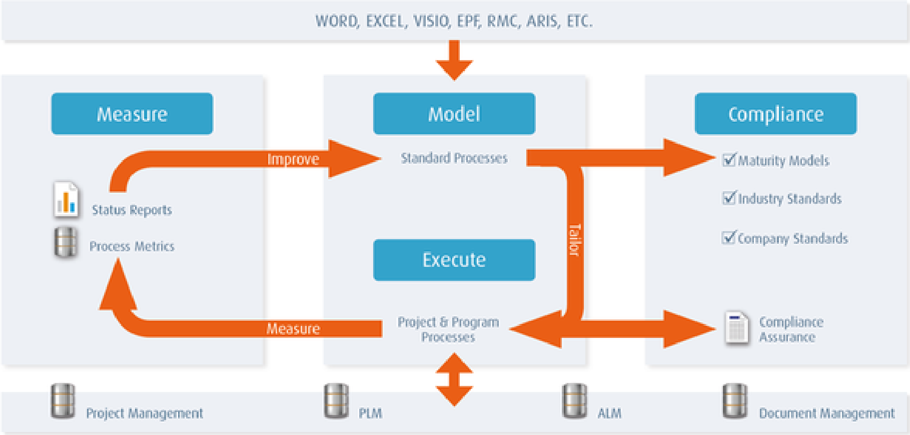
What can we do?

Recognize and appreciate the conflicting objectives

Develop policies and integrate into enterprise-wide processes

TRAIN Team members

Leverage tools that provide a framework for the whole team to follow the process



Questions?