



Automated Test Outlook 2018

A GUIDE TO SMART TEST TRENDS

Remco Krul

Test and RF Marketing

ni.com/ato

Securing Your
Test System

Secrets of
High-Performing
Test Teams

Testing Sensor
Fusion for
Autonomous Vehicles

Standardizing
the Test Lab

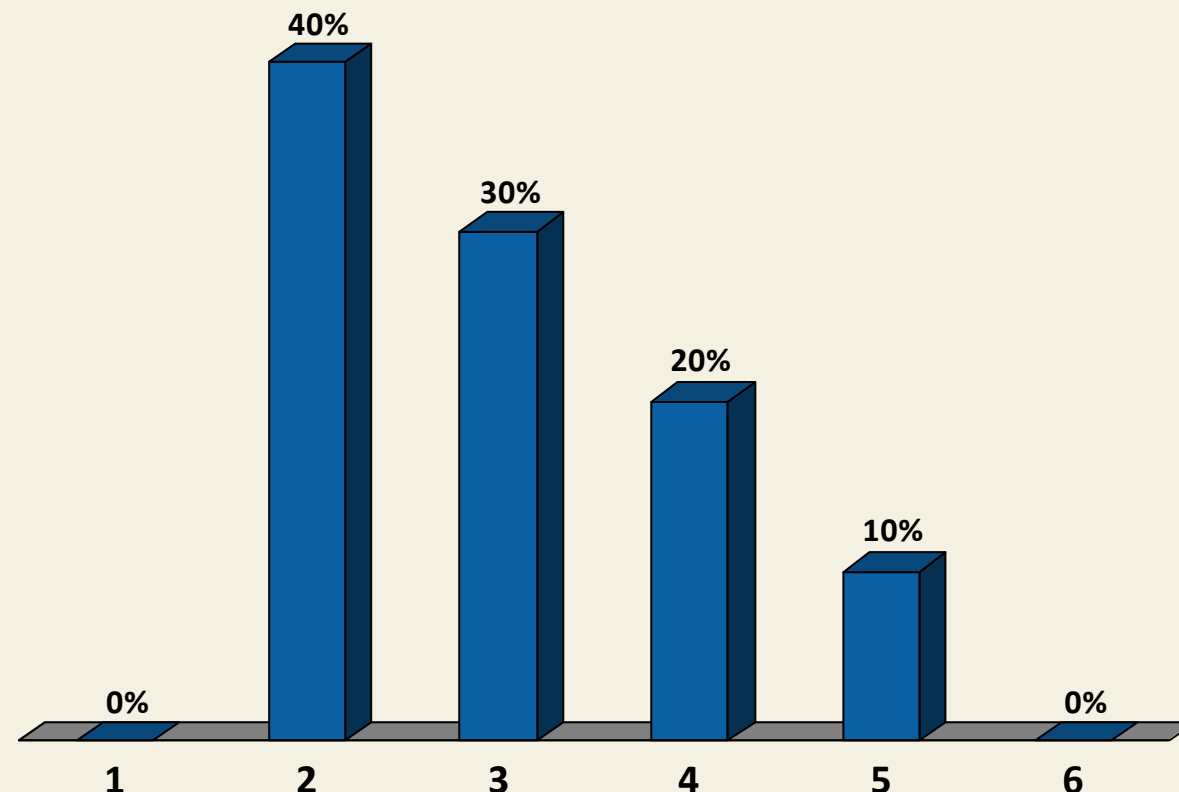
Testing Before
the Standard

The Test Implications
of Packaging Innovation



Which topic would you like to know more about?

1. Securing Your Test System
2. Secrets of High-Performing Test Teams
3. Testing Sensor Fusion for Autonomous Vehicles
4. Standardizing the Test Lab
5. Testing Before the Standard
6. The Test Implications of Packaging Innovation

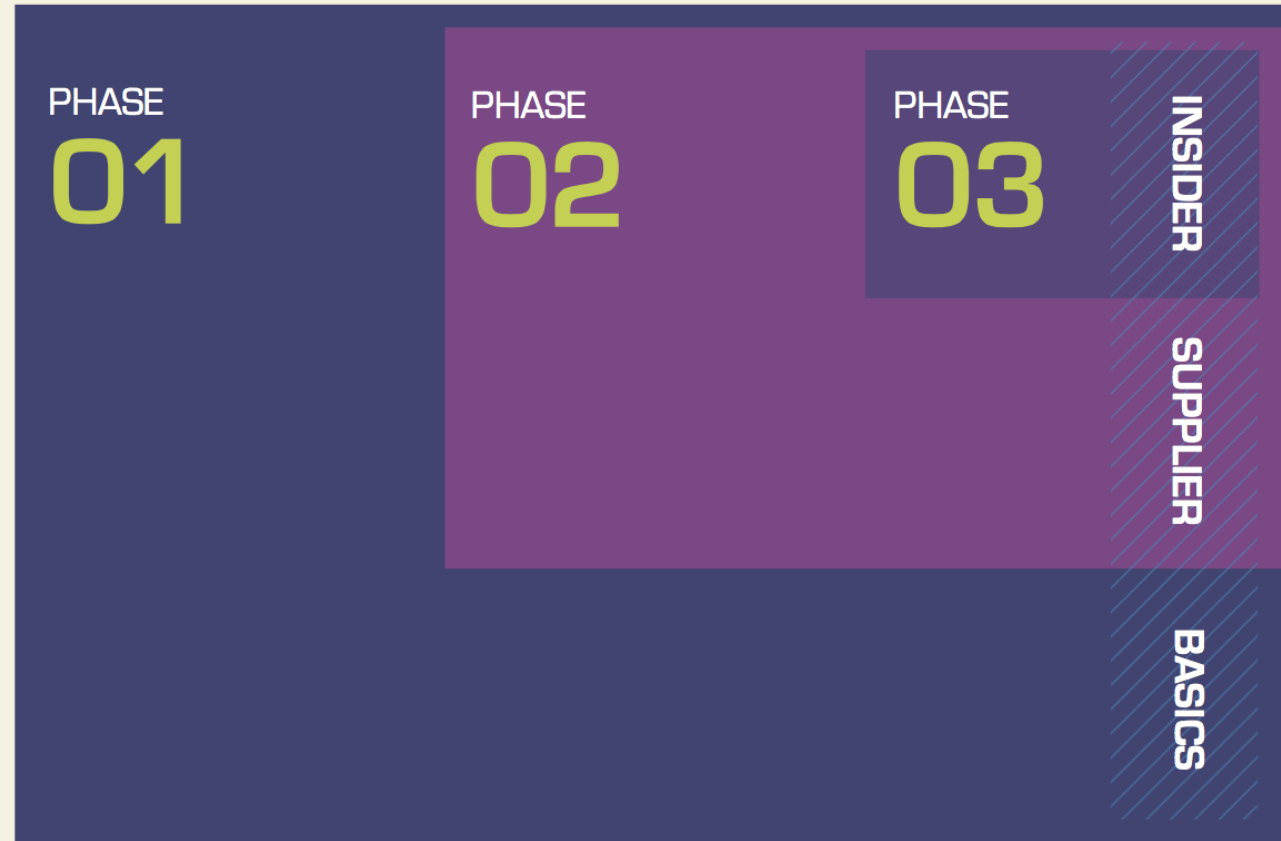


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Securing Your Test System



Structure Your Approach by Threat Likelihood



Phase 1: Carefully Apply IT Practices

- Patch test systems strategically
 - Reduce patch needs:
 - Remove extra software
 - Filter out patches for low-risk issues
 - Address risk of unpatched systems:
 - Deploy on separate network
 - Enable OS security features
- Address the unique needs of test systems:
 - Calibration integrity
 - File integrity monitoring

Case Study: IT Practices

In 2016, a multi-billion dollar manufacturing company lost millions due to test system downtime caused by overnight IT security scans.

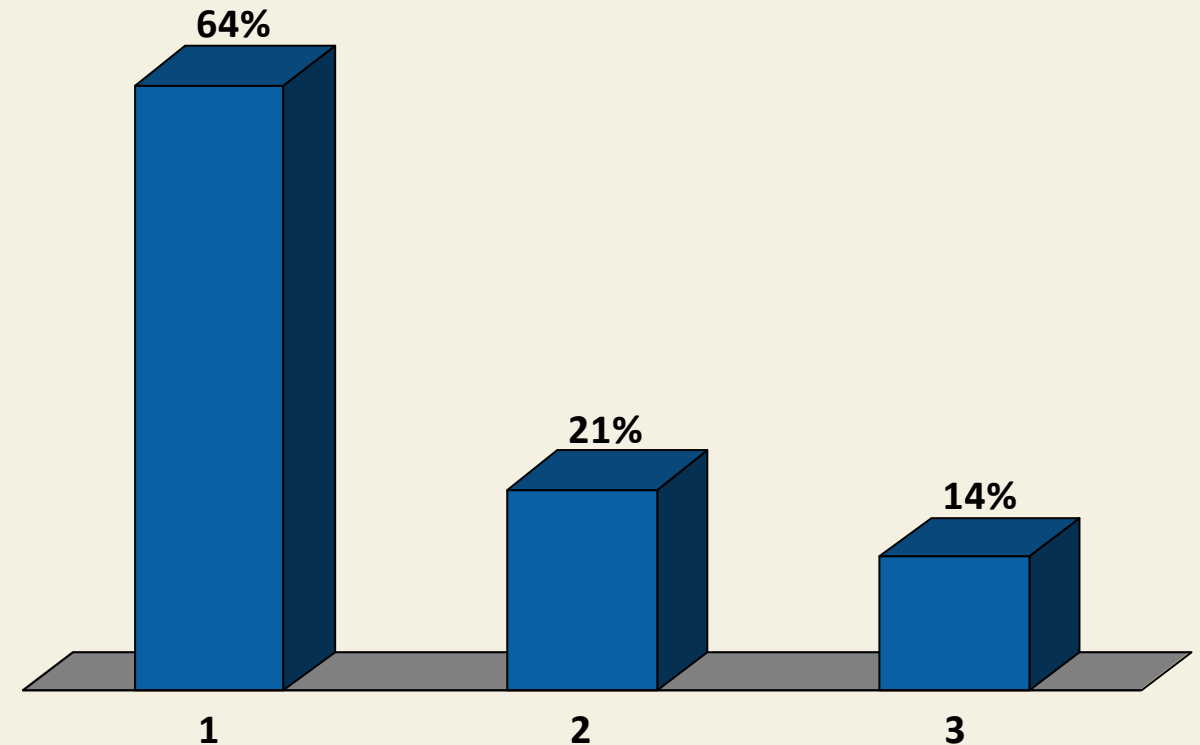
Lesson Learned

Understand a technology's side effects (e.g., anti-virus, vulnerability scans) before using it on test systems.



Have you faced challenges with respect to patching test systems?

1. Yes, I have
2. No, I have not
3. We do not patch our test systems



Phase 2: Evaluate Your Supply Chain

- Risk areas:
 - Hardware and software sources
 - Software infected with malware
 - Hand-offs
 - Web downloads
 - Order fulfillment
- Talk with your vendor about how their internal processes and solutions protect you.

Case Study: Supply Chain

In 2014, Energetic Bear hackers attacked three vendors' websites to infect the industrial control system software available for download.

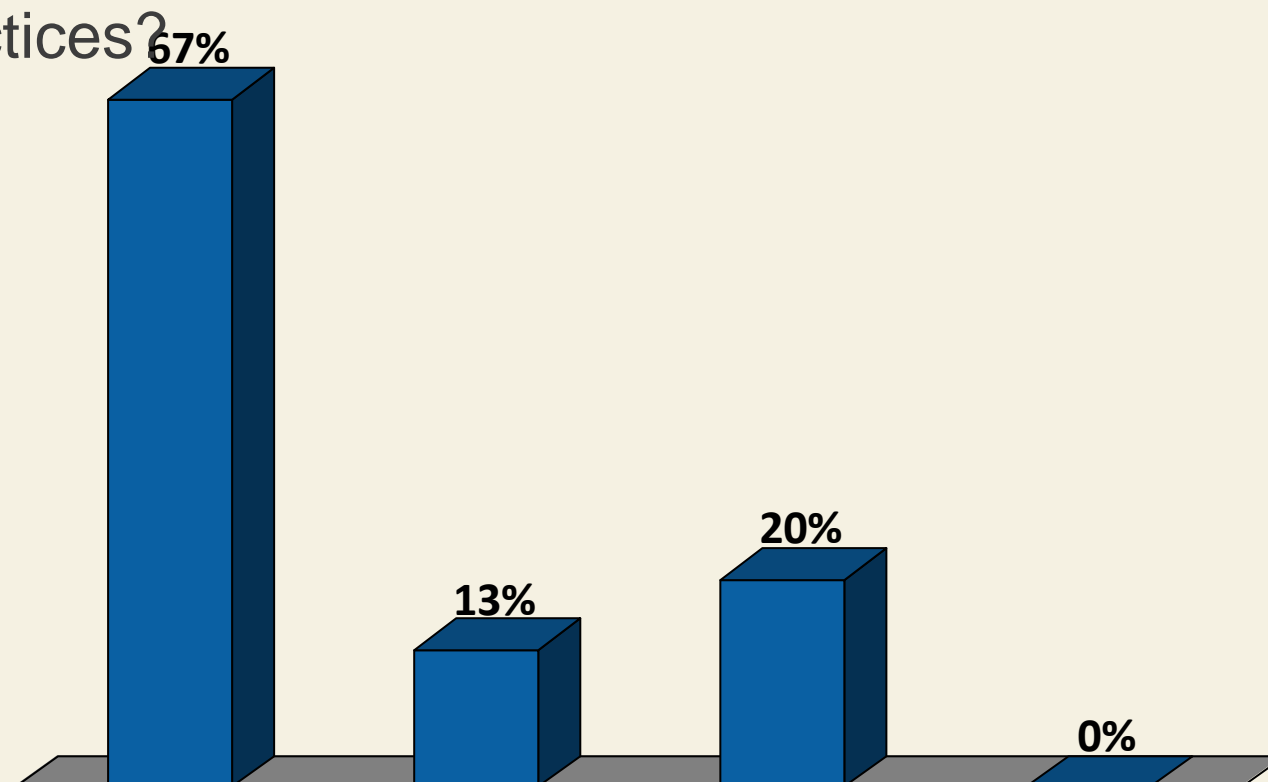
Lesson Learned

Choosing the right suppliers who take security seriously is paramount to maintaining your own security.

Phase 2: Evaluate Your Supply Chain

Have you already begun discussions with your vendors about their security practices?

1. No, I have not
2. No, but I should probably start
3. Yes, with some vendors
4. Yes, with all vendors



Phase 3: Protect Against Insider Threats

- Characteristics:
 - Low-probability, high-impact events
 - Most attacks are by someone working alone
- The most important step is to separate authority for critical test system functions.
- Download whitepaper “Impact of Security Trends on Test Equipment” from ni.com to learn more

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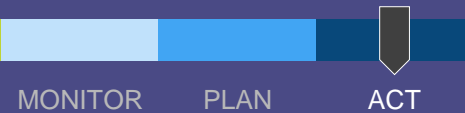
Case Study: Insider Threats

Timothy Lloyd of Omega Engineering became infamous when he installed a software time bomb that systematically deleted all the manufacturing software after being dismissed in 1996.

Lesson Learned

Place limitations on insider access and revoke privileges swiftly when personnel leave/transfer.

Secrets of High-Performing Test Teams



Engineer Good Software	Engage in Community Learning	Ensure Technical Leadership



Engineer Good Software	Engage in Community Learning	Ensure Technical Leadership
Requirements Gathering & Tracking		
Design & Code Reviews		
Standard Libraries & Templates		
Architecture Design		
Software Testing & Release		



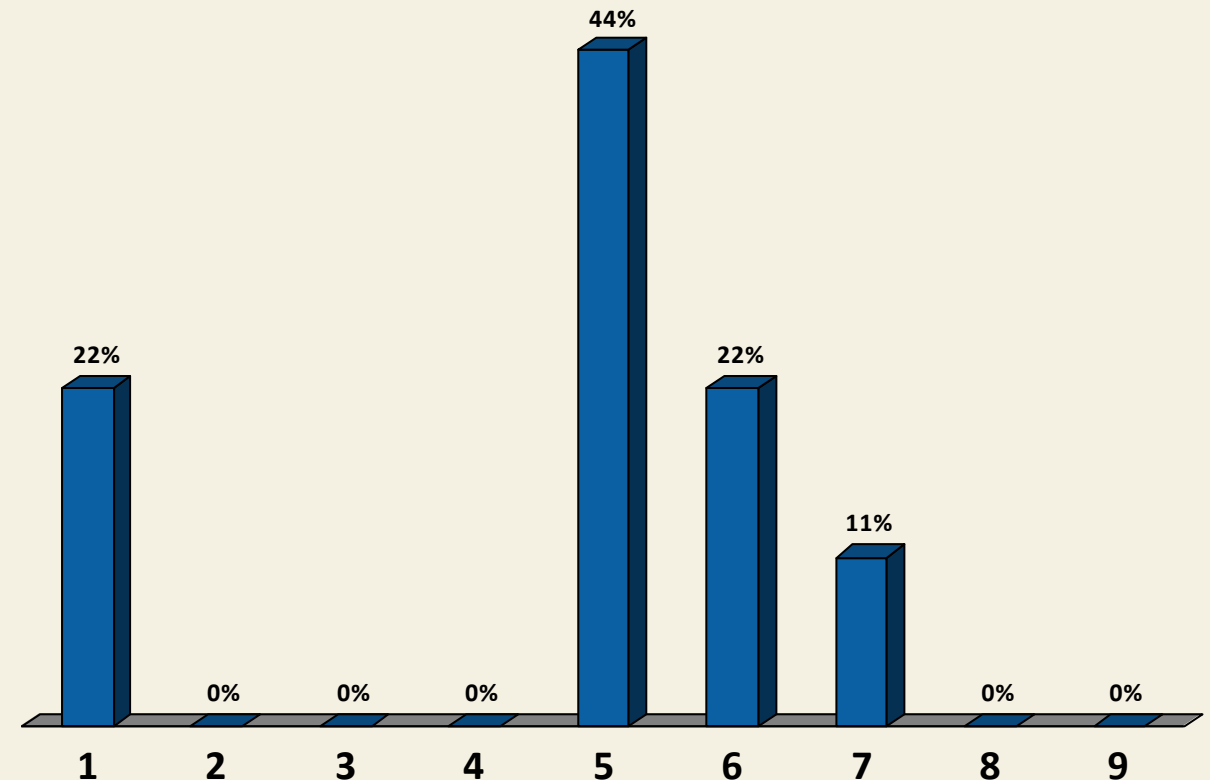
Engineer Good Software	Engage in Community Learning	Ensure Technical Leadership
	Organizational Proficiency Plan	
	Internal Onboarding	
	Internal User Group	
	Learning & Development Plan	
	External & Global Community	

Engineer Good Software	Engage in Community Learning	Ensure Technical Leadership
		Designated Technical Lead
		Development Environment & Core Concepts
		Developer Mastery
		Architecture Mastery
		Software Deployment & Distribution

Engineer Good Software	Engage in Community Learning	Ensure Technical Leadership
Requirements Gathering & Tracking	Organizational Proficiency Plan	Designated Technical Lead
Design & Code Reviews	Internal Onboarding	Development Environment & Core Concepts
Standard Libraries & Templates	Internal User Group	Developer Mastery
Code Management	Learning & Development Plan	Architecture Mastery
Software Testing & Release	External & Global Community	Software Deployment & Distribution

How would you rate your test team in the adoption of these software best practises?

1. *Not applicable*
2. Very low
3. Low
4. Pretty low
5. Average
6. Pretty high
7. High
8. Very high
9. Excellent





Visit ni.com/labviewcoe for more information.

Align on a plan to integrate new techniques into your unique workflow

Undertake an iterative process of learning about new skills and techniques

Execute a self-assessment across all team-based proficiency areas to identify gaps in process and skills

Case Study: COE Implementation at Valeo

“The Center of Excellence provided a forum for all engineers to contribute to the process improvements we were making, as well as a learning opportunity to quickly adopt those improvements. The program also gave us a structure and a platform to go through the change process. We received input and direction on specific topics, which gave us more confidence to make decisions along the way.”



Chris Forristal
Software Team Leader
Valeo

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Case Study: Team Proficiency at L3 Technologies

↑ 9X
Improvement in
Development Times

↑ 80%
Code Reuse Across
Similar Products

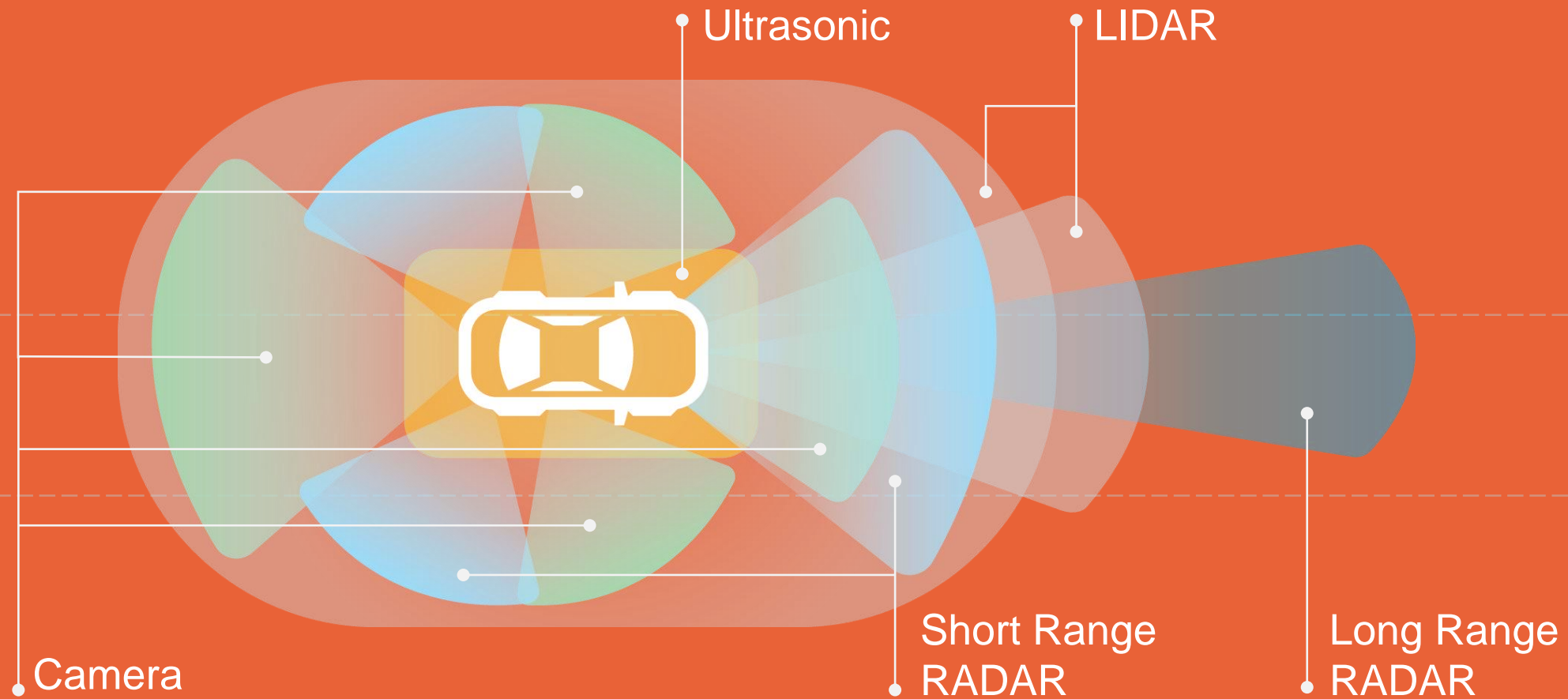
↓ 50%
Reduction of Beta
Test Downtime

L3 has seen a tremendous improvement in the modularity and scalability of test code.

Testing Sensor Fusion for Autonomous Vehicles

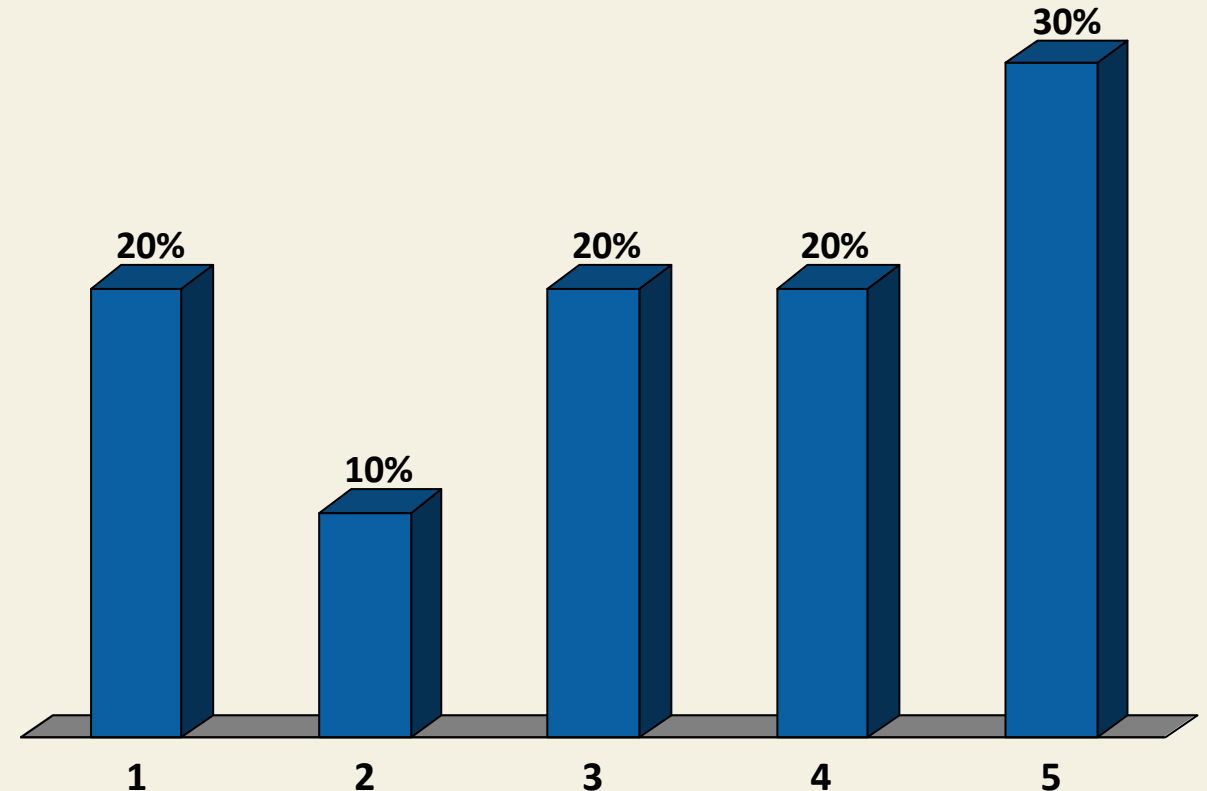


Sensor Fusion is Key to Autonomous Driving



Are you or your colleagues working on a project that involves sensor fusion?

1. No, we are not
2. I'm not, but I'm not sure about my colleagues
3. Not currently, but we will probably do so.
4. Yes we are. We work on autonomous vehicles.
5. Yes we are. We work on other projects where sensor fusion is used

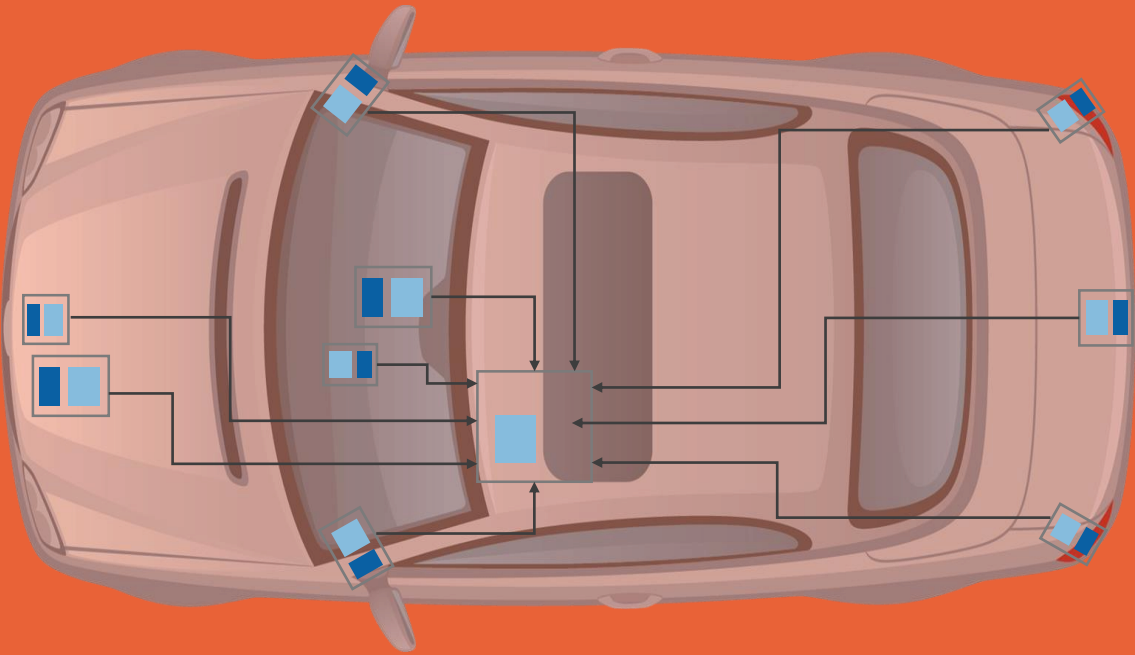


Testing Challenges: Changing Sensors



Sensor Type	Perception	Outlook
Radar	<ul style="list-style-type: none">Weather agnosticComplex technology	<ul style="list-style-type: none">Increasing sensor bandwidth means higher resolution
Lidar	<ul style="list-style-type: none">Unreliable weather performanceExpensive	<ul style="list-style-type: none">New research shows promising performanceSolid-state technology reducing cost

Testing Challenges: Synchronization



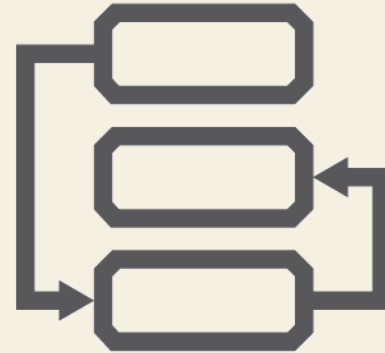
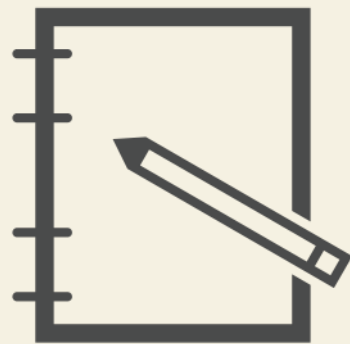
- Sensor data is not inherently time stamped
- Timing information deduced from sensor data and specifications
- HIL testing needs synchronization between the model and sensors
- Sensors may be running on different platforms

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Standardizing the Test Lab

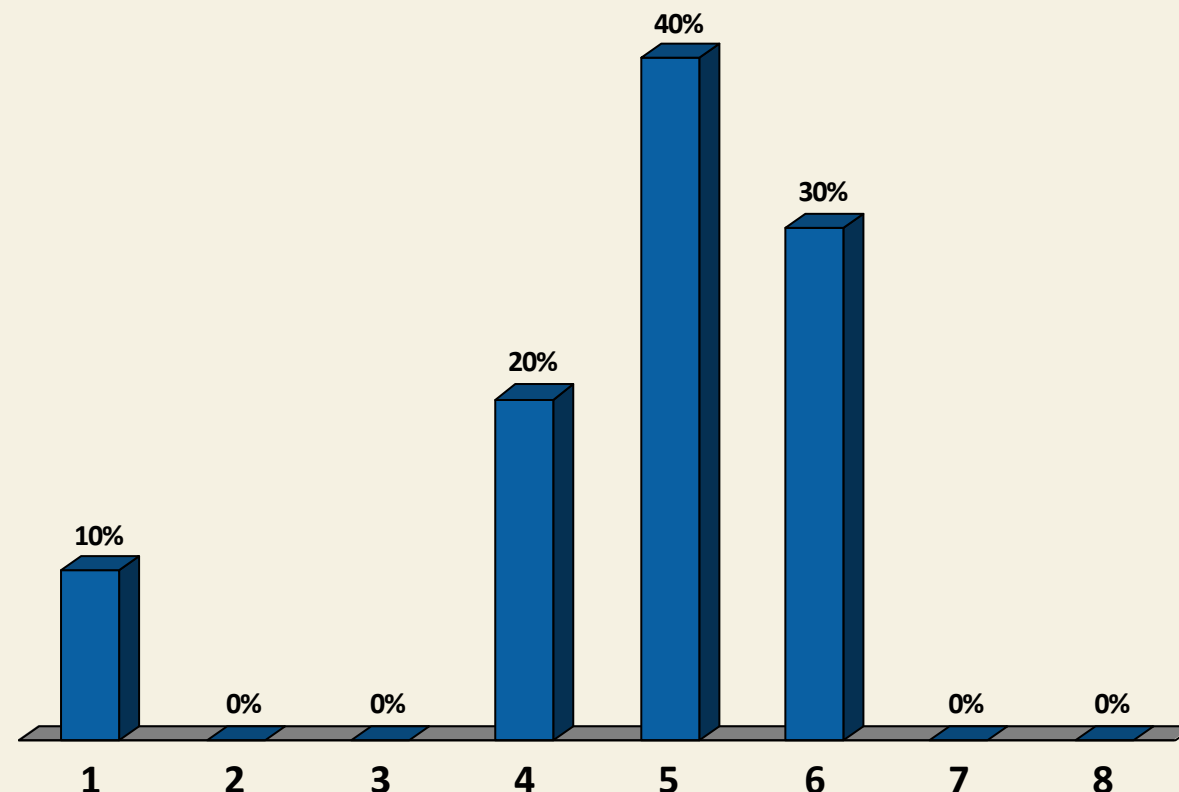


R&D Engineering Test Labs Are Becoming More Automated



The test in our characterization/validation departments...

1. *Not applicable*
2. Would not benefit from automation
3. Might benefit from automation
4. Is considering more automation
5. Is adopting automation
6. Is expanding the automation
7. Is fully automated
8. Other



Save Time and Increase Repeatability with a Standardized Device Fixture



Improve Repeatability

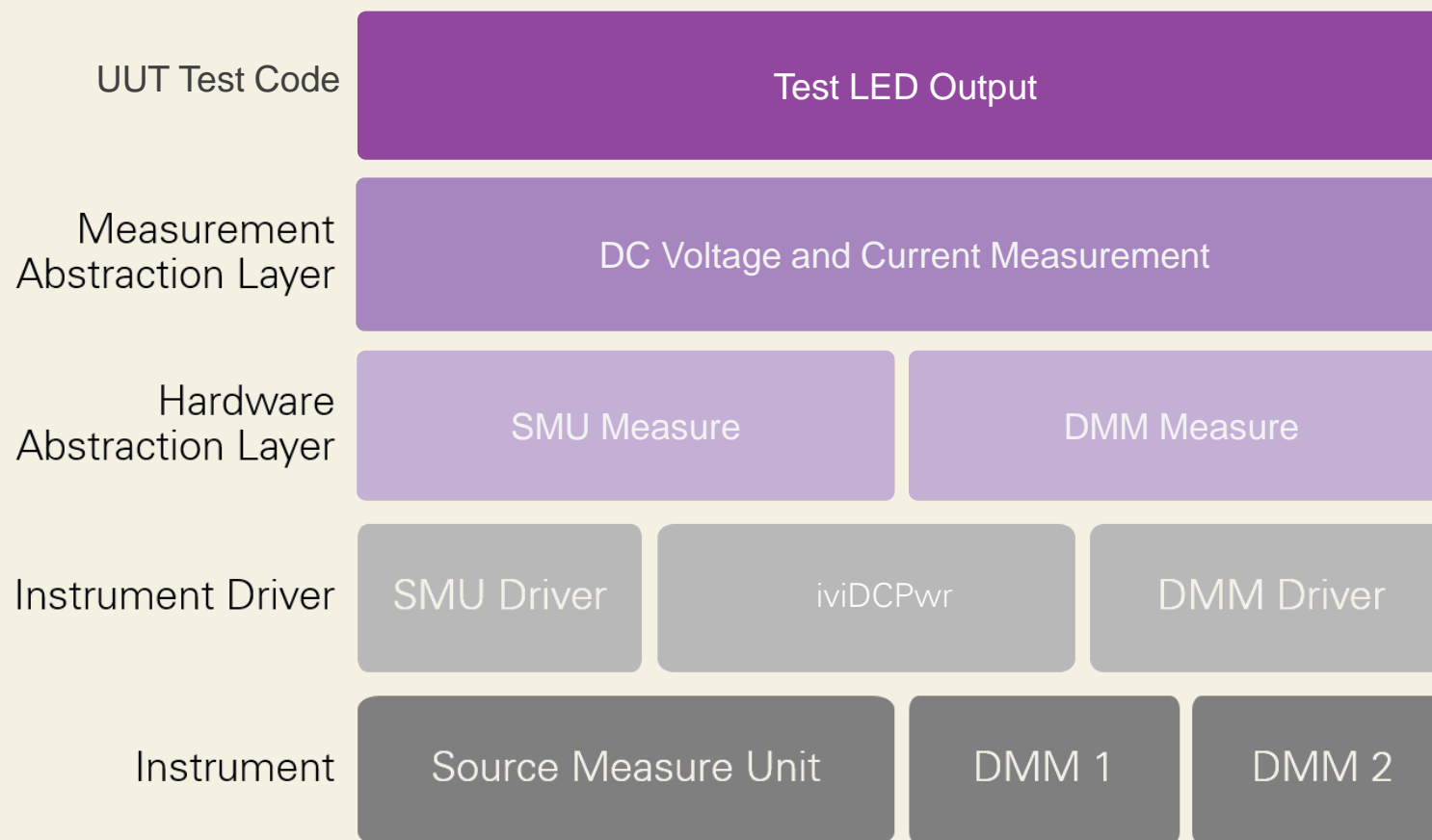


Common Test Points
For Debugging

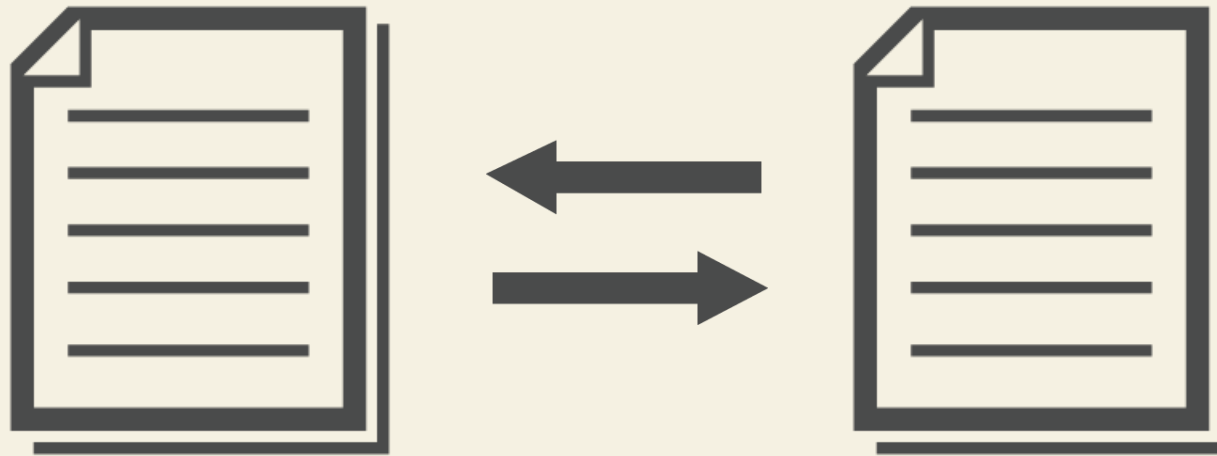


Spend More Time Improving
Device Under Test

Employ Abstraction Layers to Mitigate Risk

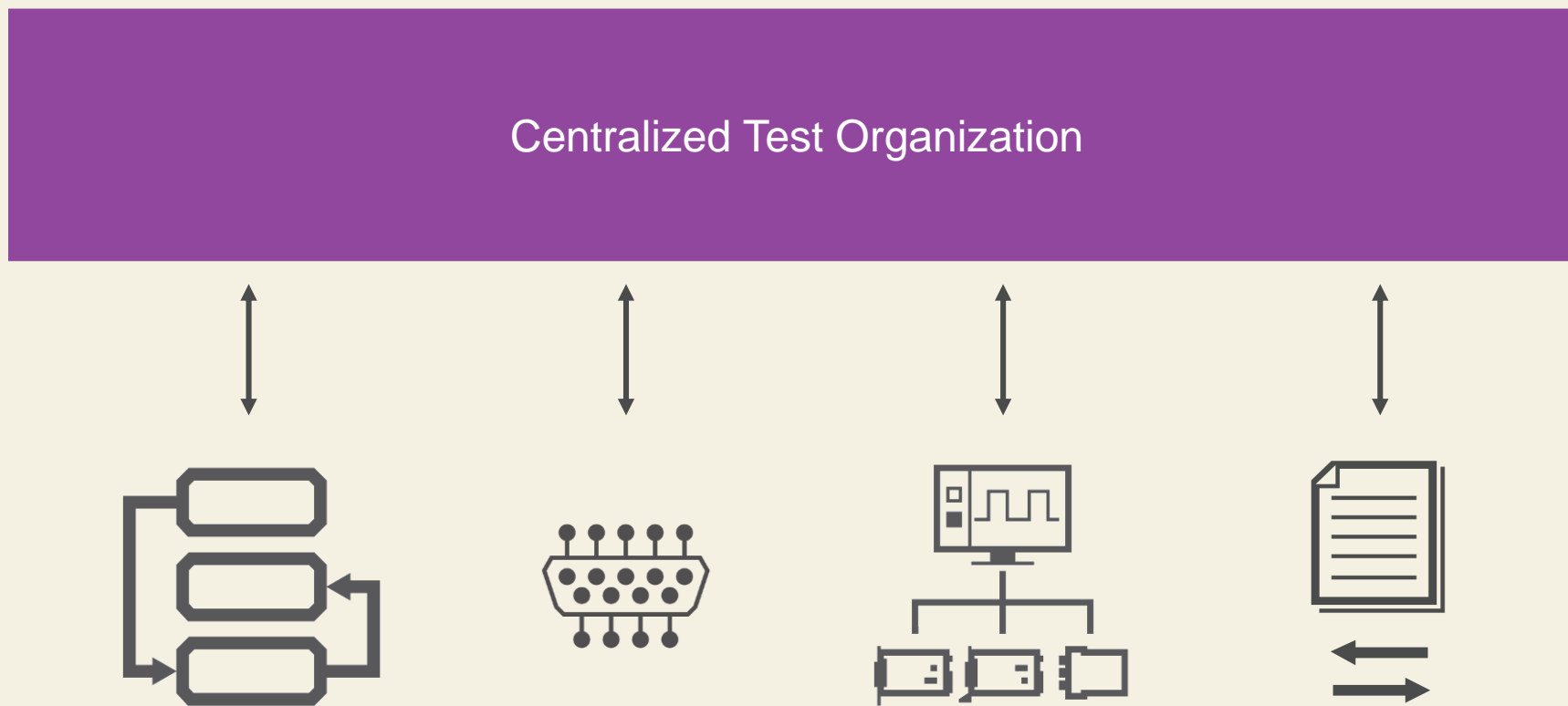


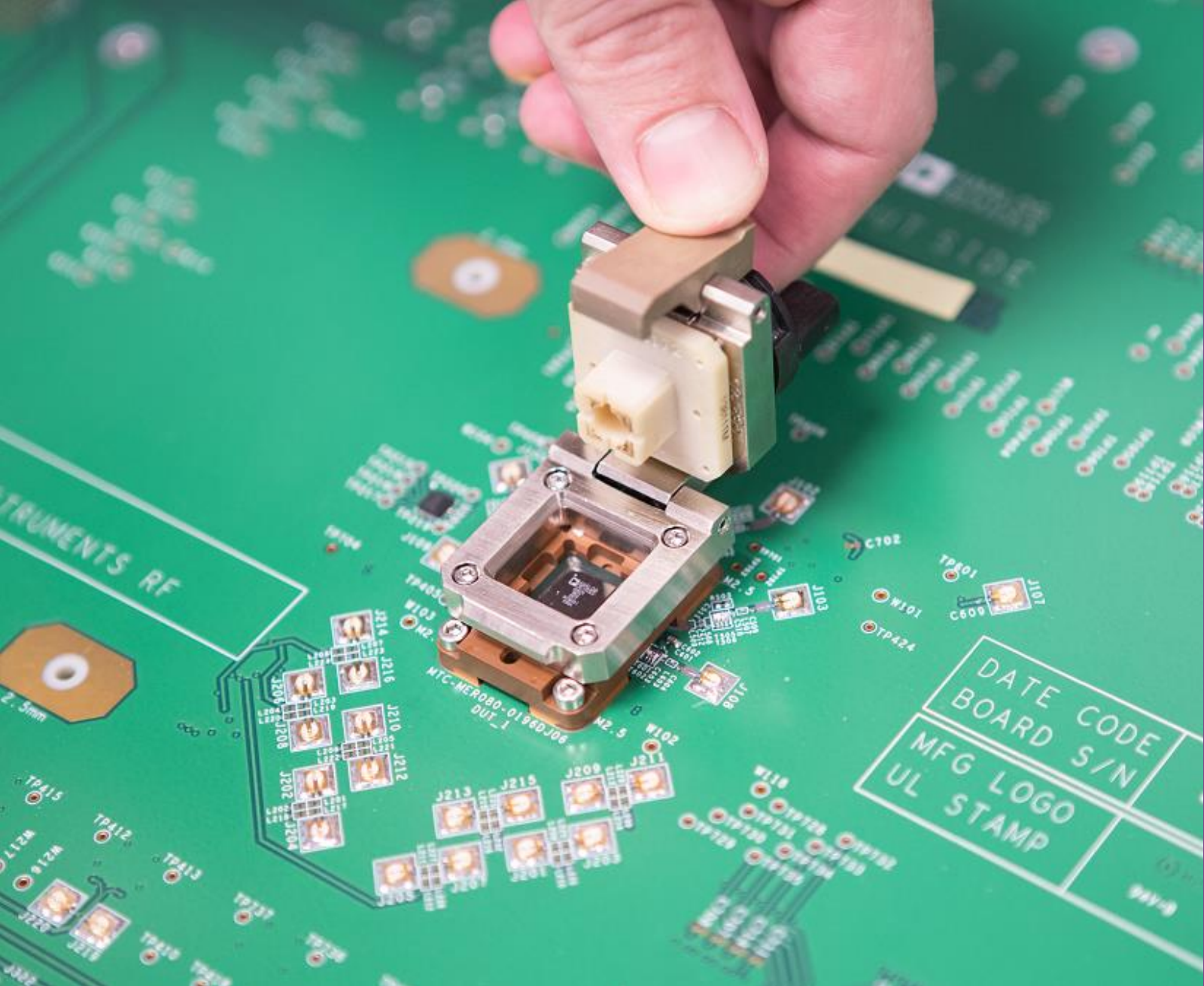
Increase Code Reuse with Shared Software Libraries



White-box vs black-box code reuse

Drive Efficiency Through Centralization





Case Study: Standardization of V&V Test

“By optimizing our labor pool and capital equipment pool through a centralized engineering test organization, we were able to increase our test output, improve our test efficiency, and lower our capital costs.”

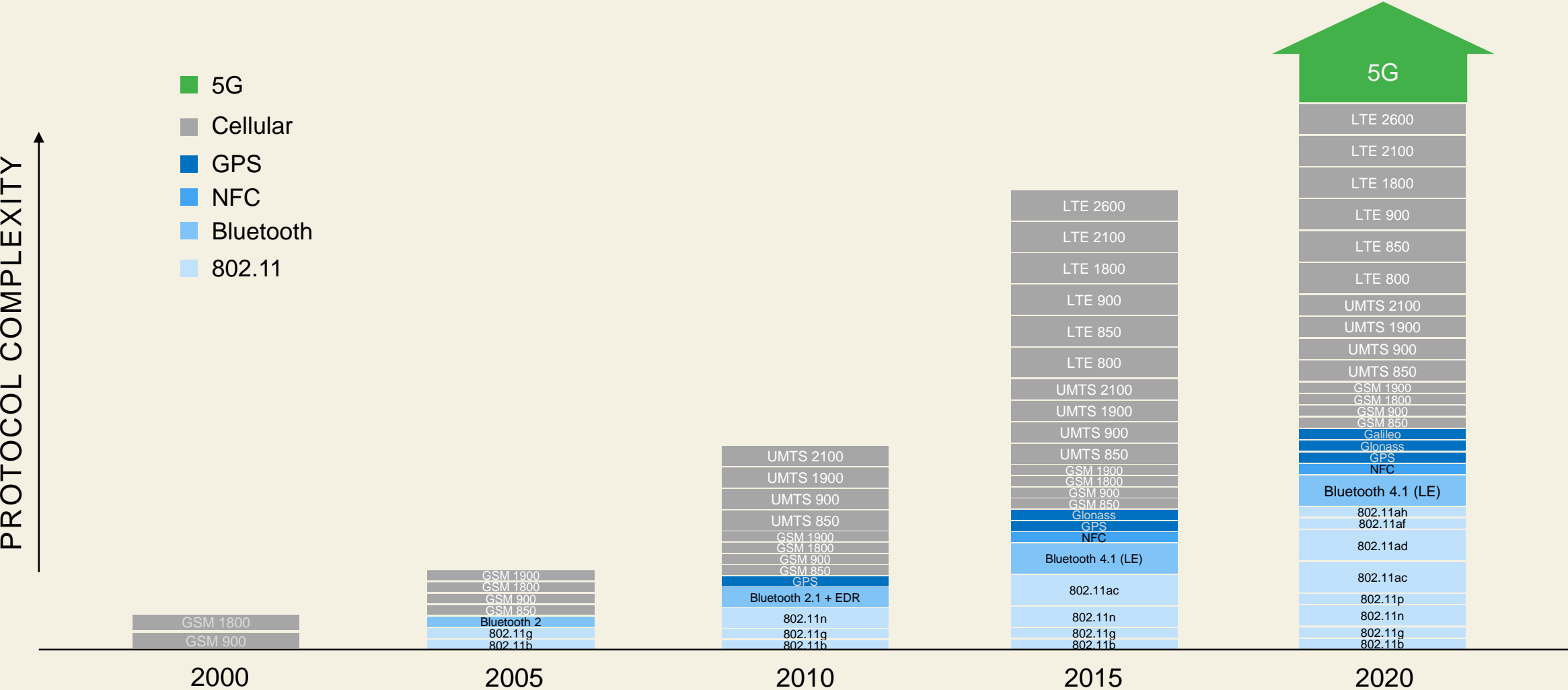
Neil Craig
Senior Engineering Manager
Qorvo, Inc.



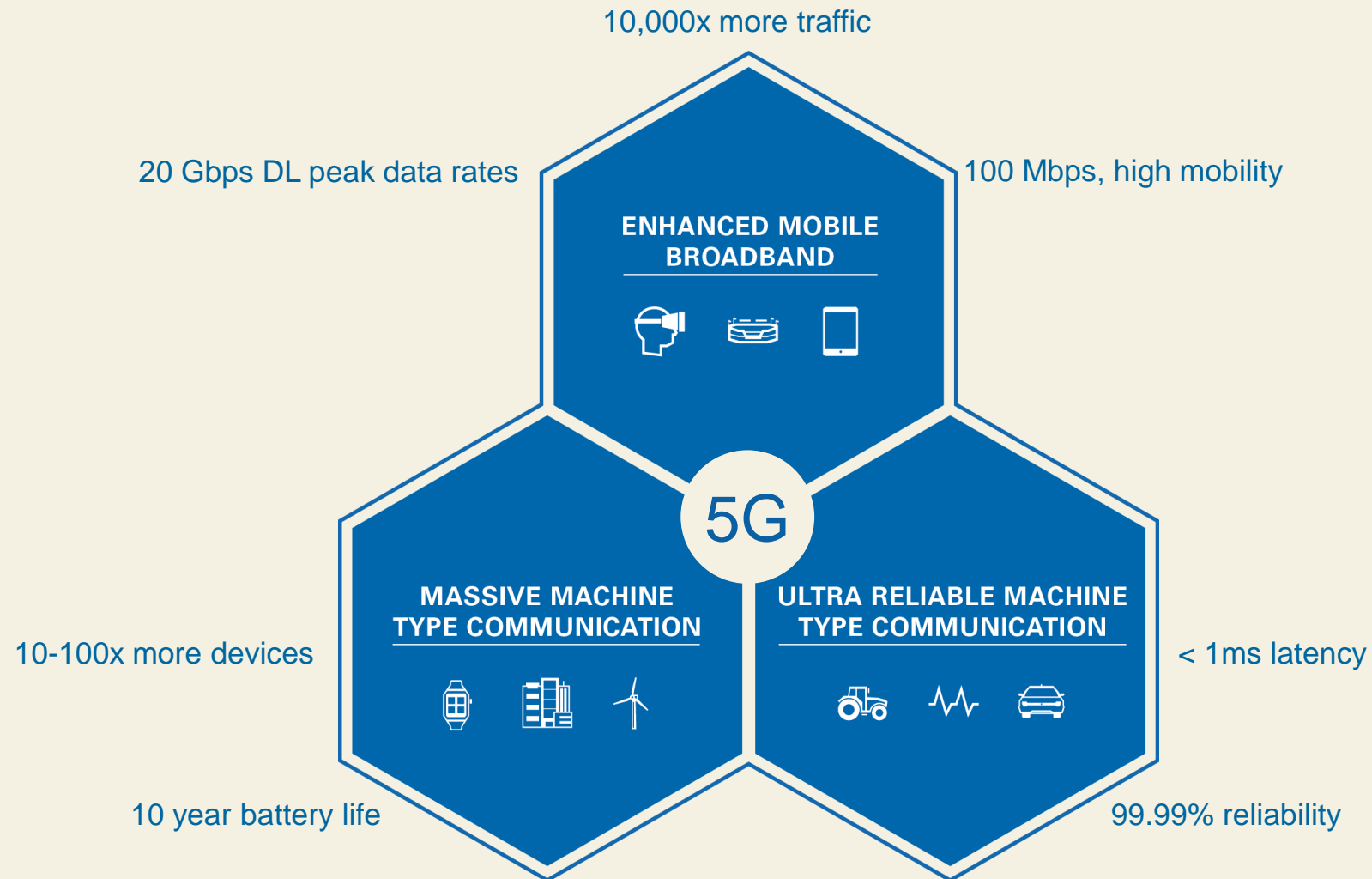
Testing Before the Standard



Wireless Needs are Constantly Changing



5G Use Cases and Requirements



5G is a Classic Example of Accelerating Timelines

Deutsche Telekom

Europe's first 5G antennas are transmitting in Berlin

CNET

Verizon to Be First to Field-Test Crazy Fast 5G Wireless

S. CHINA MORNING POST

China to Roll Out 5G Broadband Mobile Equipment Trial Across 100 Cities

YAHOO FINANCE

Ericsson Conducts First 5G Demonstration in Indonesia

WIRELESS WEEK

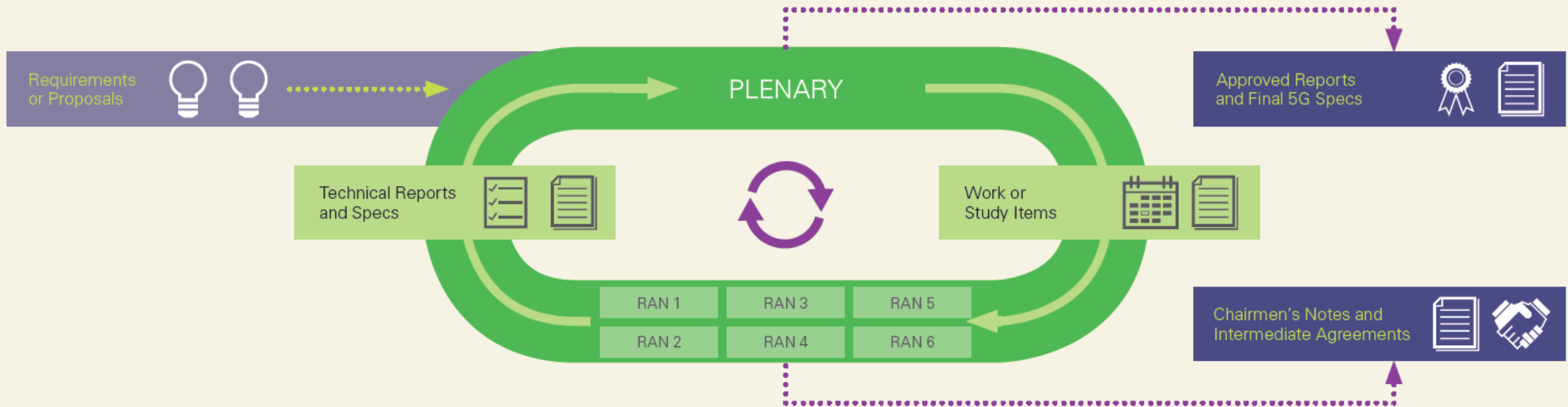
40-Company Coalition Agrees to Accelerate 3GPP 5G NR Specs for 2019 Deployments

CNET

T-Mobile Wants to Build the First Nationwide 5G Network

Standardization is an Iterative Process

Example 3GPP





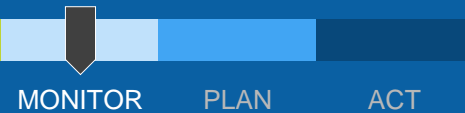
Case Study: Obtaining Information About In-Development Standards

“When preparing to test a prestandard product, talking to committee members from the standardization body often reveals key details about the physical layer that you might not find in written documentation.”

Shardul Velapure
Senior RF Engineer
Qualcomm



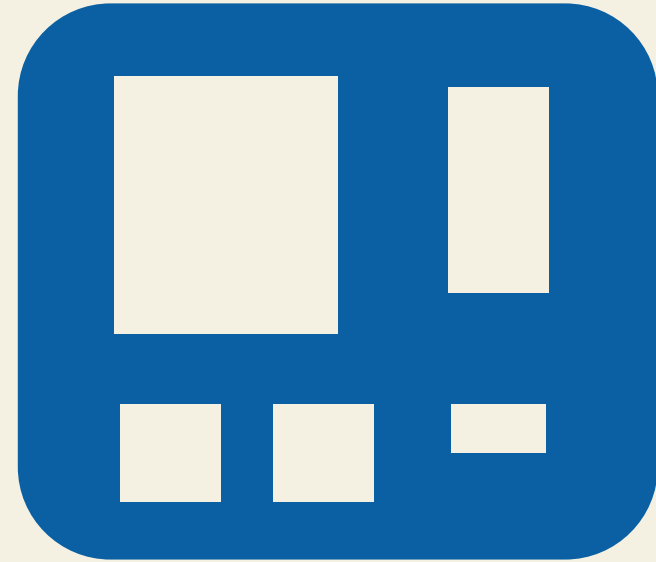
The Test Implications of Packaging Innovations



System in Package (SiP) Combines Multiple Dies in A Single Package

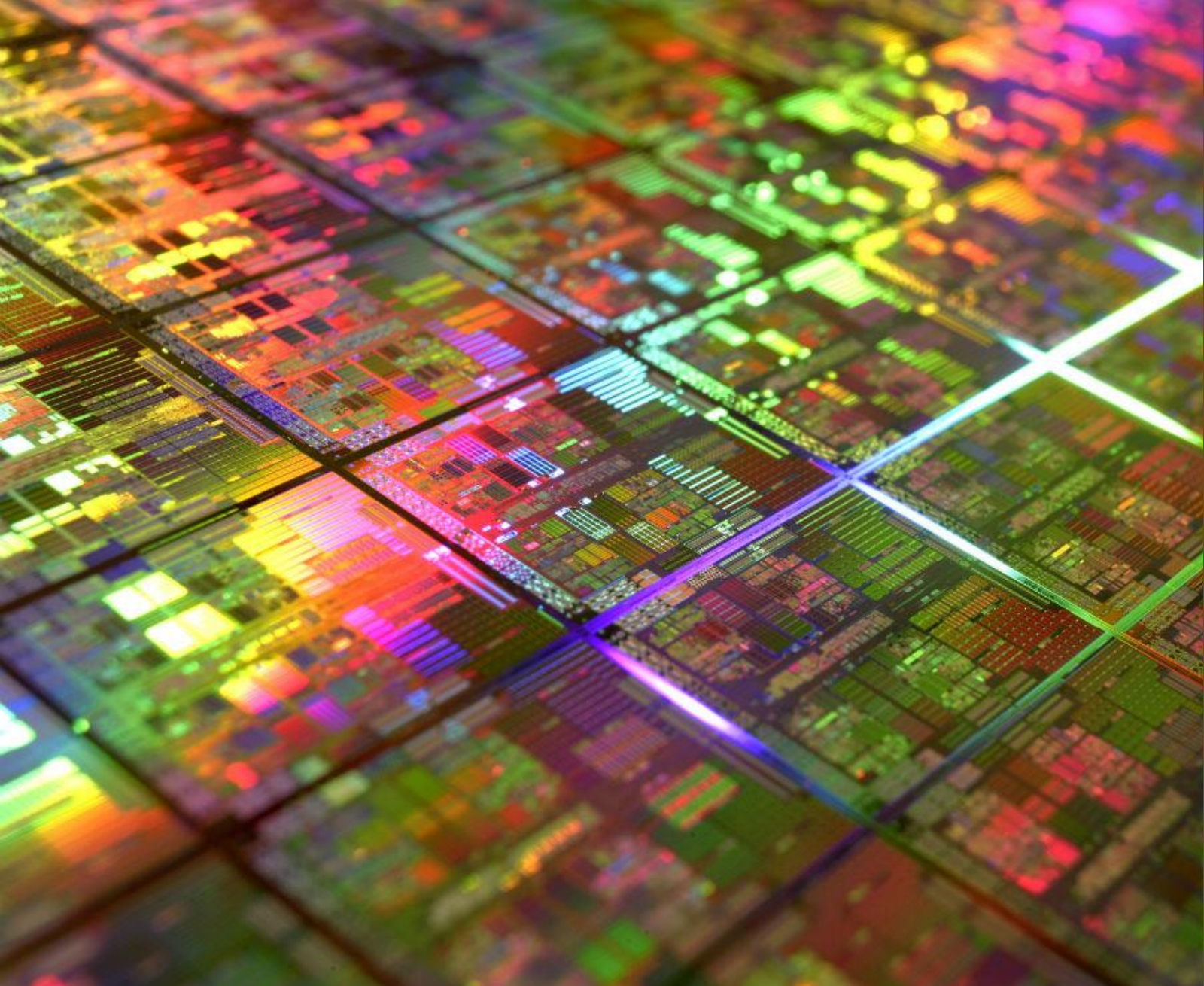


Traditional Single-Die IC Package



System in Package (SiP)





Case Study: SiPs Challenge Traditional Test Approaches

“Testing of SiPs can be challenging and design for test is important. SiPs often include multiple functions and features that may not lend themselves well to traditional test approaches.”

E. Jan Vardaman
President and Founder
TechSearch International Inc.



Challenges with System Level Test (SLT)

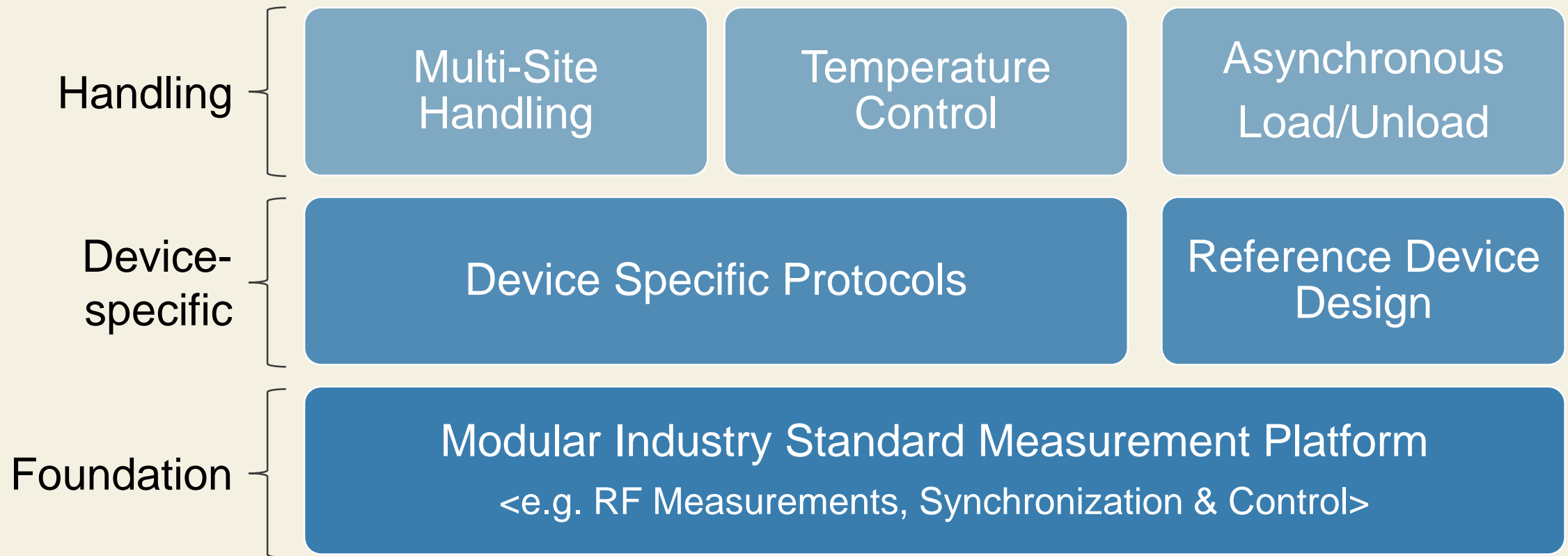
Device Handling

Application Load Boards

High-Level Communication

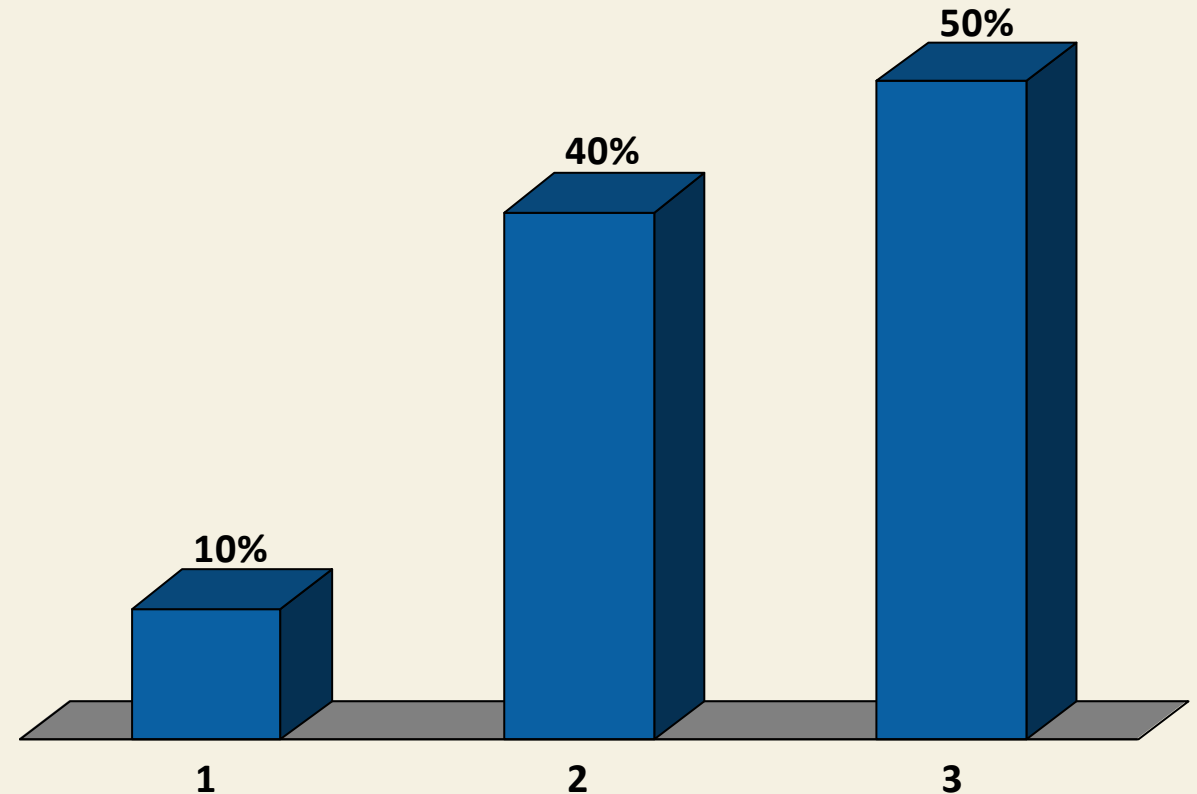
RF & Analog
Measurements

Modular Platform Provides Foundation for Addressing Emerging Needs



How valuable was the interactive element of this session?

1. Not valuable at all
2. Interesting
3. Very valuable.



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Thank you