Five Keys to Agile Test Automation for Government Programs

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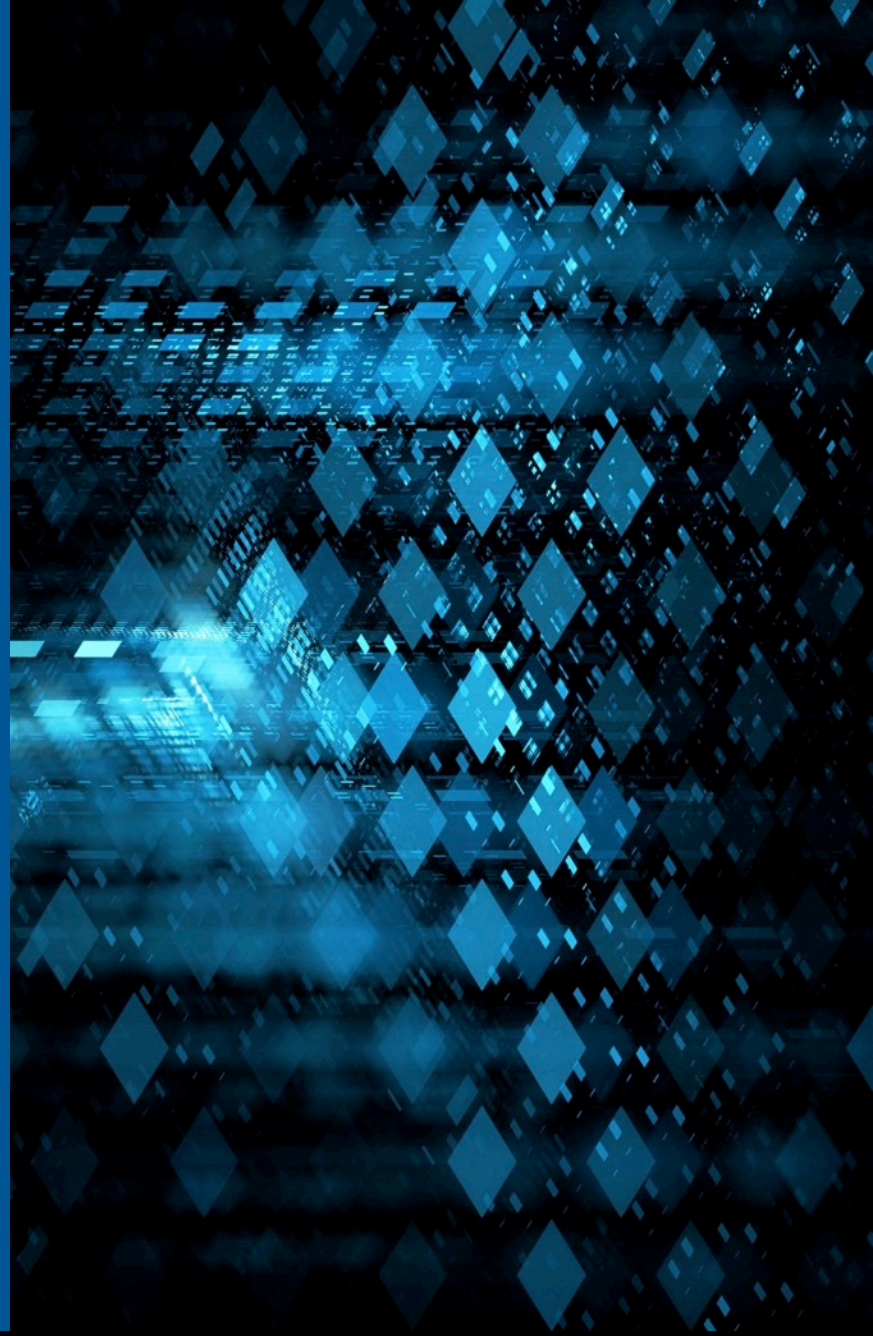

Notices

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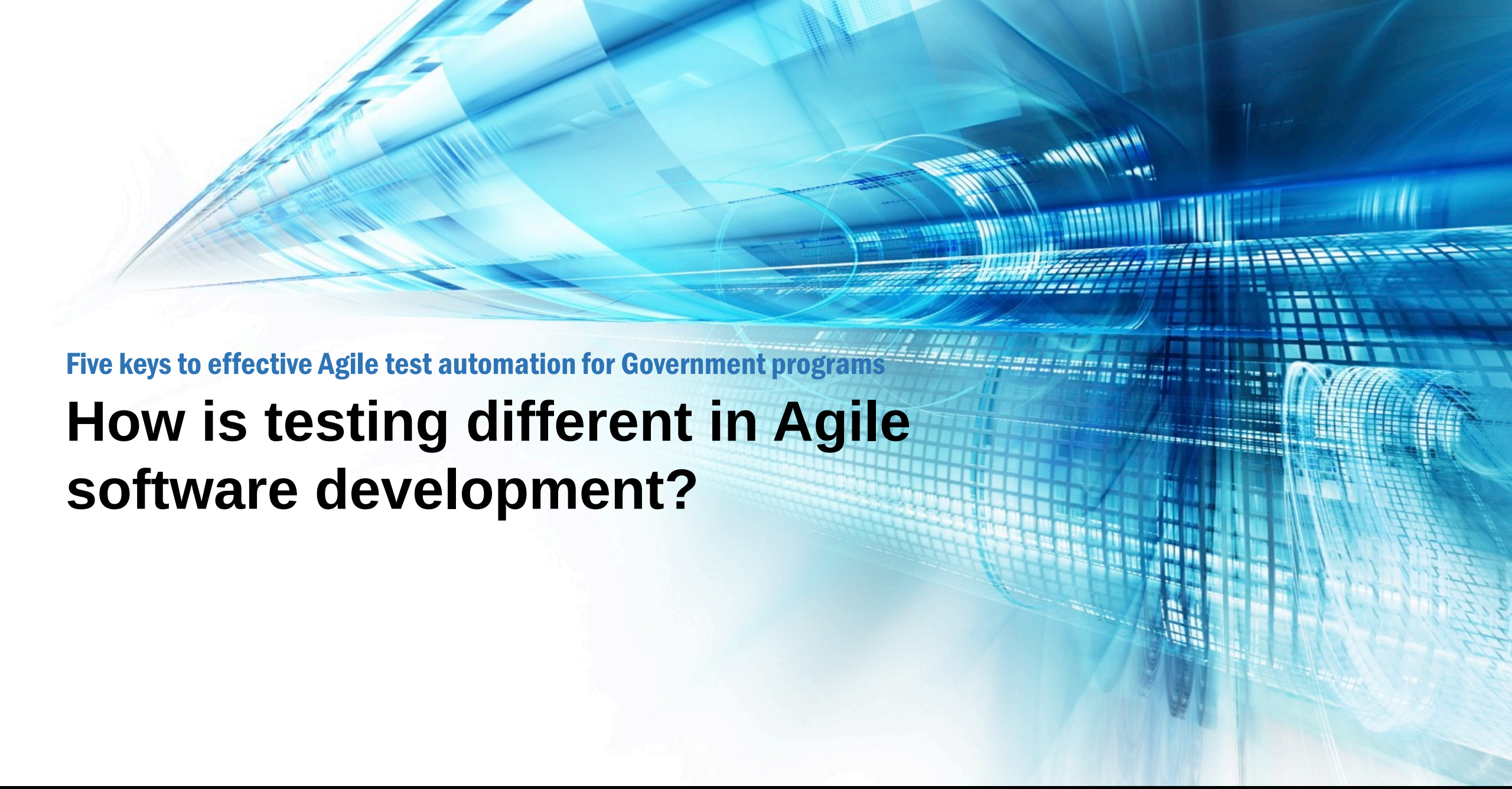
Overview

1) How is testing different in Agile software development?
2) What kind of testing should/should not be automated for Agile software development?
3) Who should develop automated tests?
4) What kind of tool chain do I need to support automated testing?
5) What are some ways that DoD acquisition programs can successfully adopt Agile/Automated testing?



Five keys to effective Agile test automation for Government programs

How is testing different in Agile software development?

Testing is development, development is testing

Phased

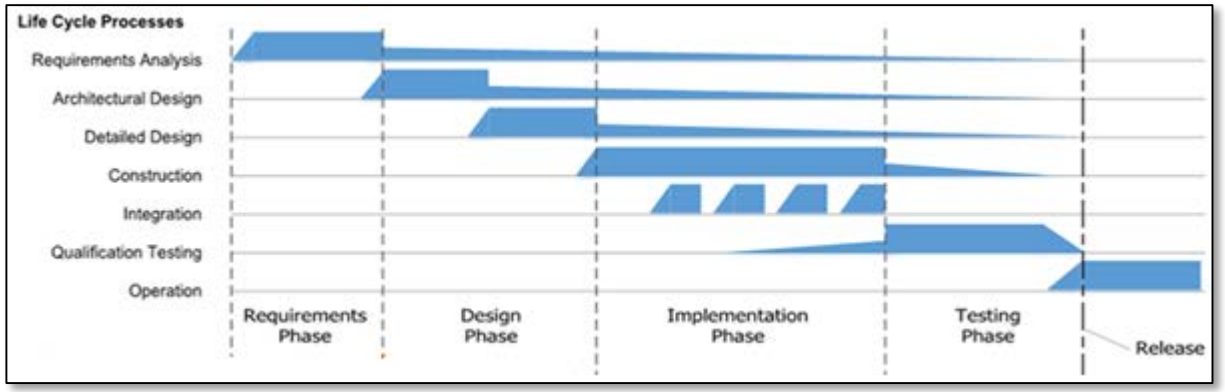
- Design, Code, Test, Test, Test
- Release

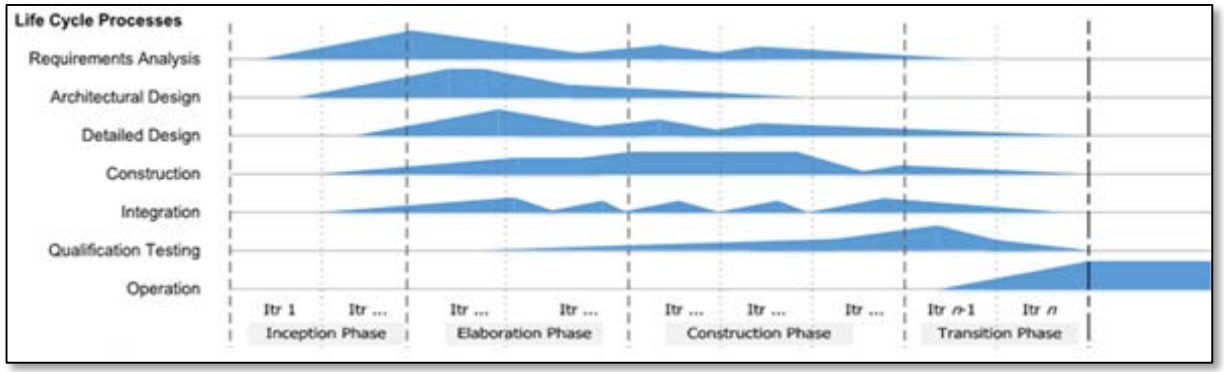
Incremental

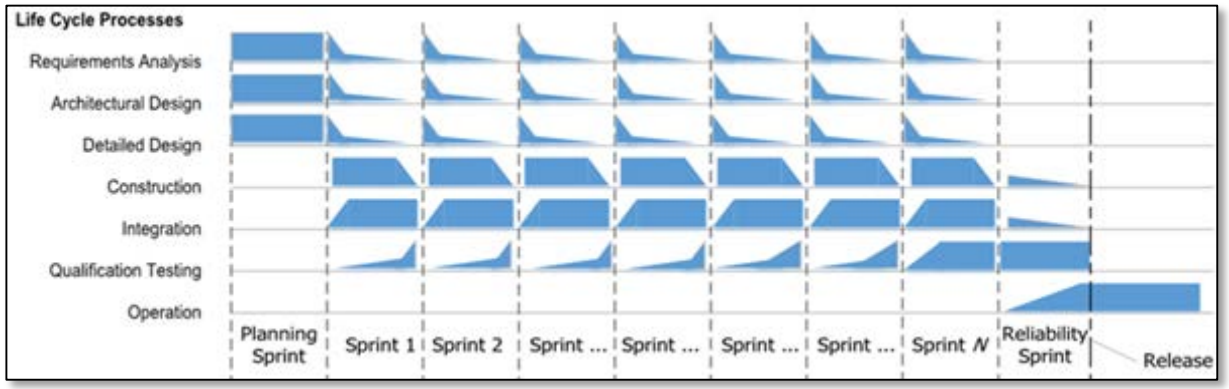
- Design a little, code a little, test a little…
- Test, Test, Test
- Release

Agile

- Test, fail, code, test, pass …
- Test, fail, code, test, pass …
- Test, fail, code, test, pass …
- Release







Source: IEEE Standard 1633P, *Recommended Practices for Software Reliability Engineering*

Early and repeatable testing is Agile key to quality

Agile Quality Practices

- **Voice of the customer**
- **Commitment management**
- **Definition of Done**
- **Demos**
- **Retrospectives**
- **Test Driven Development**
- **Exploratory Testing**
- **Living Tests**
- **Find and fix within sprint**

Test Driven Development

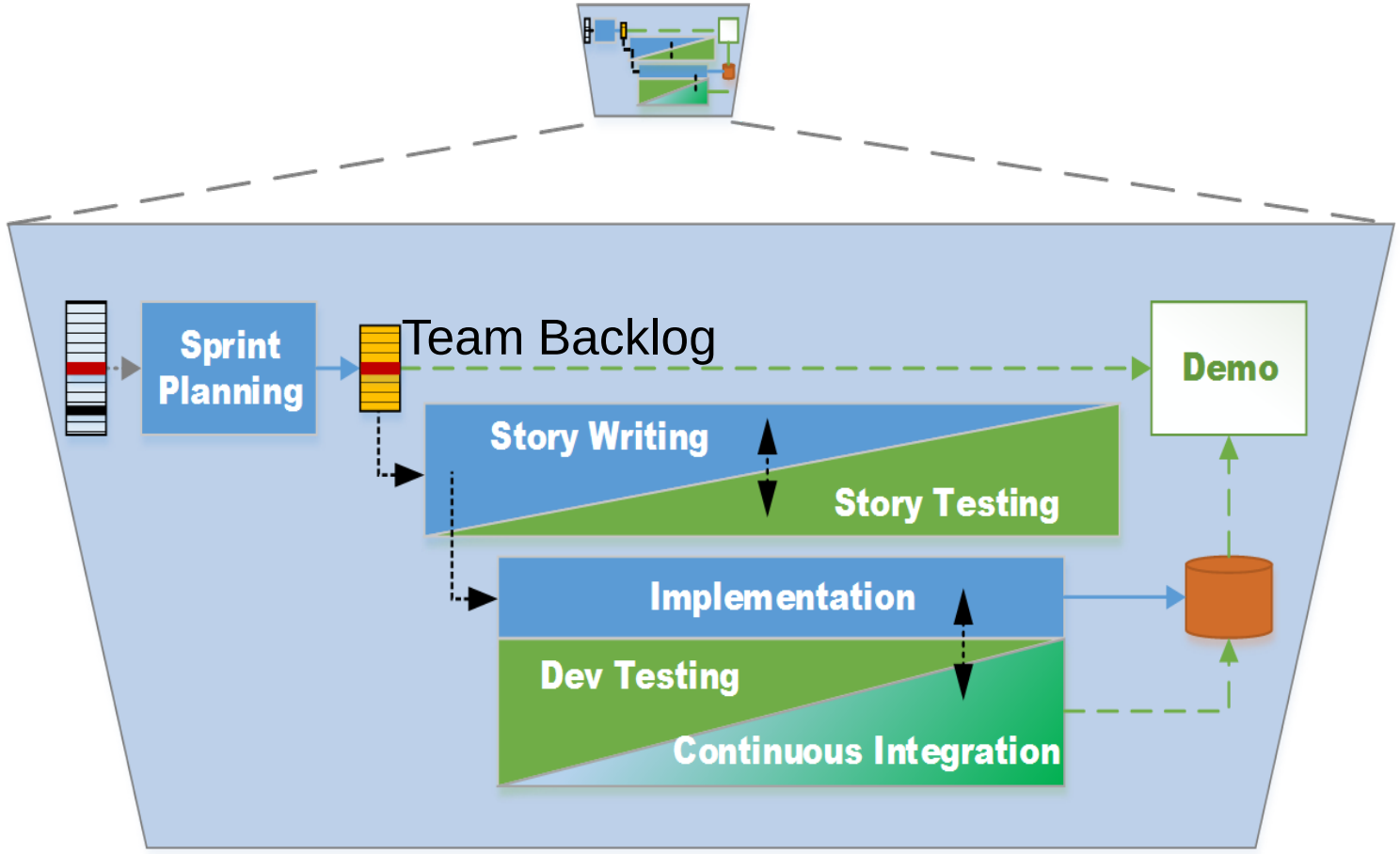
- **TDD – Test Driven**
- **BDD – Behavior Driven**
- **ATDD – Acceptance Test Driven**

Typical Agile Testing Tool Chain

- Component/API testing: Junit, Nunit…
- BDD/ATDD: Cucumber, SpecFlow…
- GUI testing: Selenium, Ranorex…
- Continuous Integration: Jenkins, Hudson …
- DevOps: Chef, Docker, Puppet…

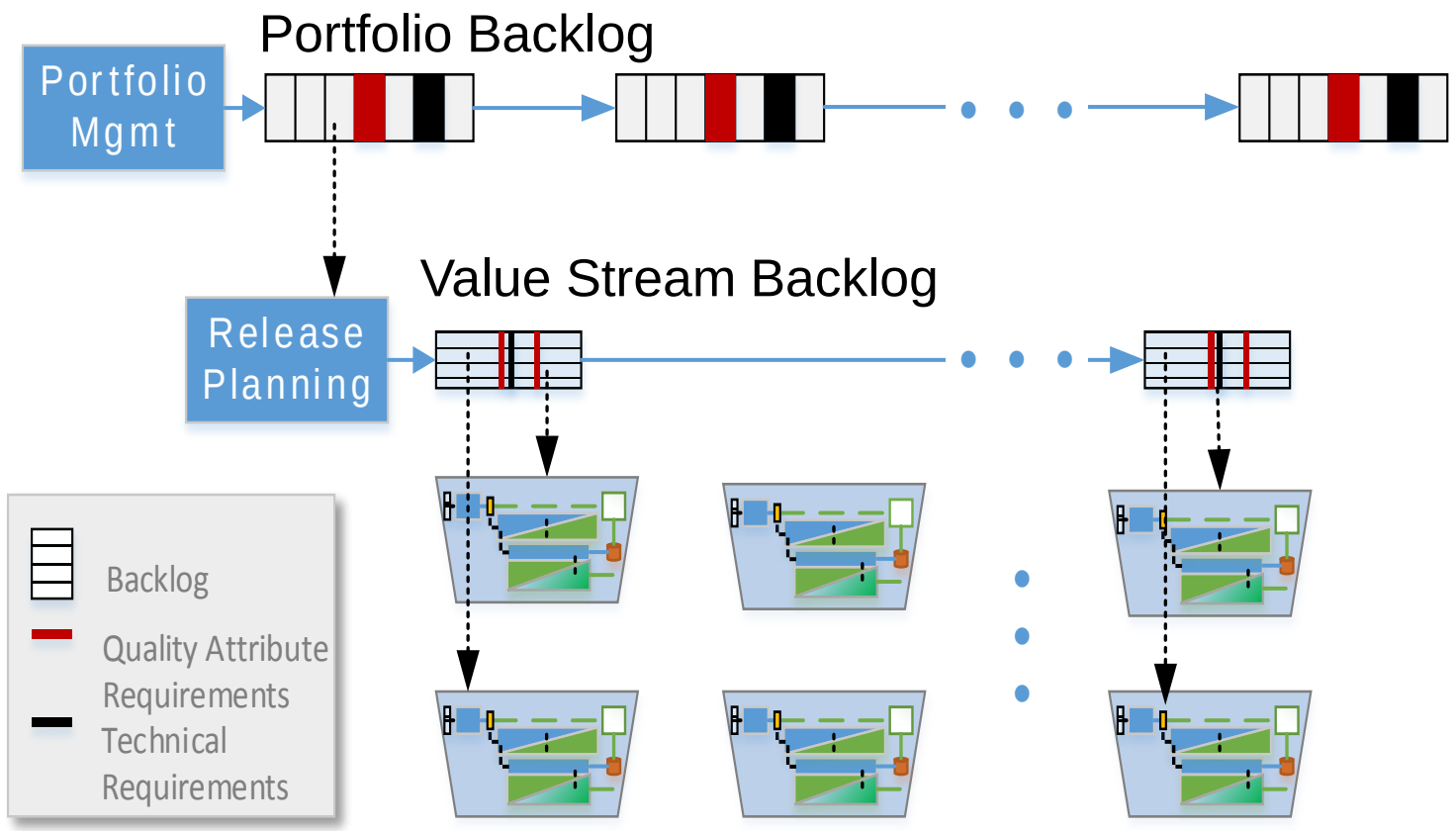
Agile “Inter-twingles” Development and Test

- Development and test are not separate or standalone
- Tests are added to a repeatable test suite
- Test suite is repeated for each change
- Demos ***not*** a replacement for testing



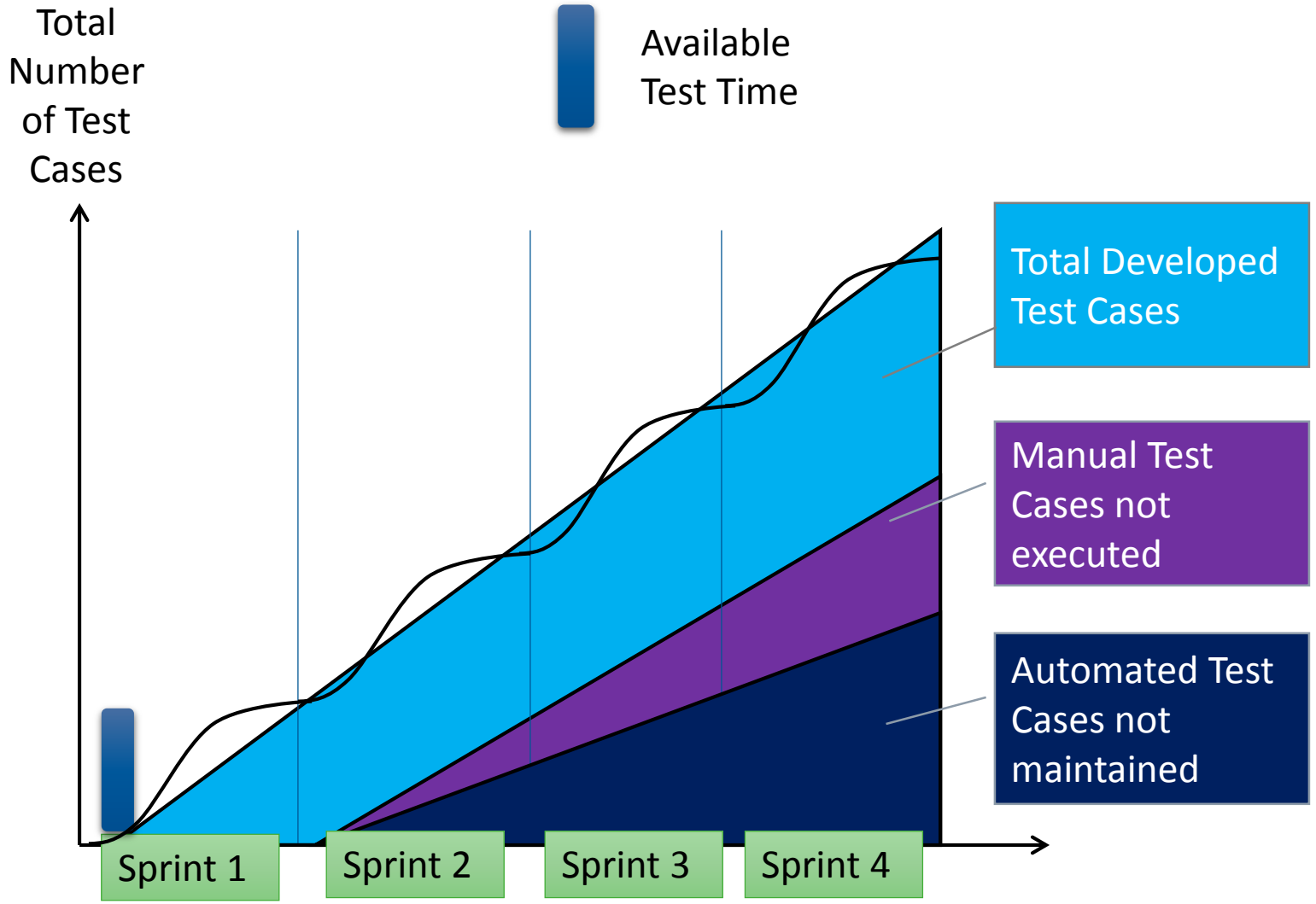
Agile iteration relies on more testing earlier

- Testing used for rapid refinement of loosely understood requirements, architecture, and design
- Requirements and implementation are finely sliced
- Each slice is tested immediately and repetitively



No Automation? *The Backblob is going to get you!*

- The extent of manual testing is limited to the capacity of testers
- The extent of automated testing is limited to the capacity of test scripters
- Total number of tests increases as project progresses
- Typically, only the newest features are tested



DoD Acquisition requirements are unique

DoD requires large programs to plan for and undergo independent Operational Test & Evaluation

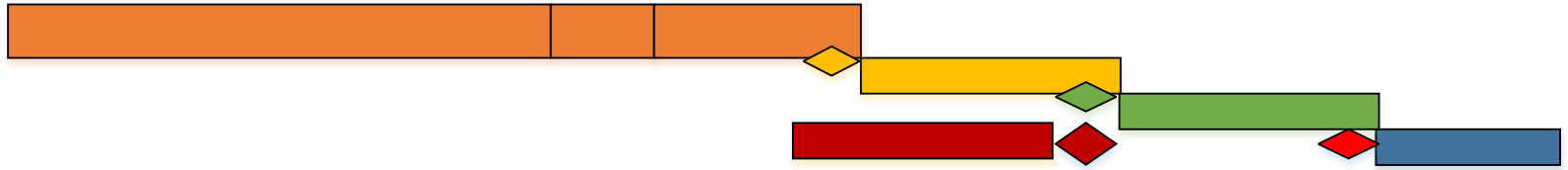
- Planned and executed by a different organization than the Program Office acquiring the software system
- Requires a very early Test and Evaluation Strategy more compatible with a “big bang” delivery than the incremental delivery typical in Agile

USAF guidance (AF99-103) now aligns independent testing with a more incremental approach

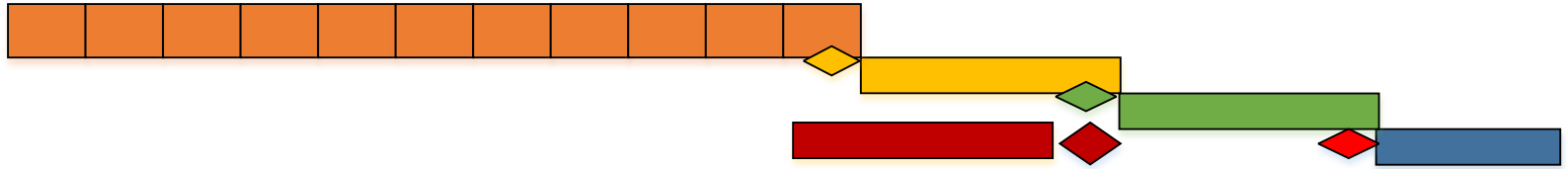
- Integrated testing and integrated test teams are a specific strategy called out
- Incremental testing is specifically discussed and encouraged prior to full operational testing of a deployed capability

Left-shift with Agile Testing

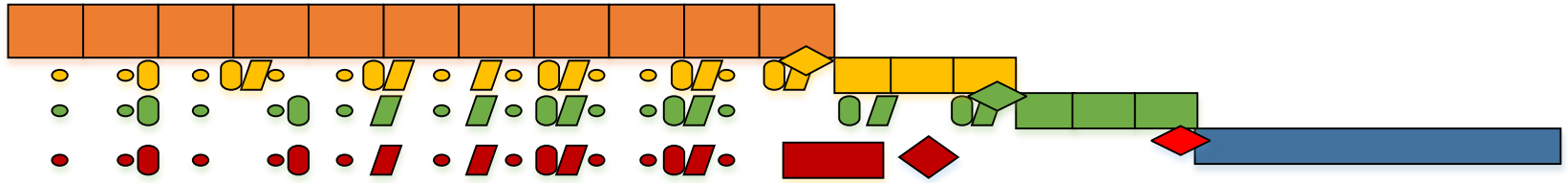
Traditional Vee-process



Agile development with traditional DT and OT (Hybrid)



Agile development with traditional DT and OT, early integration synch points



Moving from phased and siloed testing to Agile testing is the "Big Deal"

Integrating Agile cadence with DT/OT is a key challenge

OEM Dev | Developmental Testing (DT) | Cyber | Operational Testing (OT) | Deployment

Poll 1

A: What software life cycle do you use?

A. Phased, “waterfall”
B. Incremental
C. Evolutionary, “Agile”
D. Hybrid

B: Is a different life cycle:

A. Being evaluated
B. Being piloted
C. Active rollout
D. No change anticipated

Five keys to effective Agile test automation for Government programs

Who should develop automated tests?

Some factors to consider

Test automation is a specialty: the software development engineer in test (SDET)

SDET skill set versus functional tester skill set

- Writing automated tests IS writing software
- Not all functional testers come from a software development background

Organic or Outsource?

- For some types of testing, there are consulting groups that will convert manual to automated tests
- Works best with well understood systems with well-documented tests and sufficient subject matter experts to answer the myriad questions that will come up

OEM or government engineering or test staff?

OEMs with active Agile practices typically use local automated testing for component testing and local integration testing

- Contracting to obtain those tests as part of software delivery increases the test base for regression testing
  - Be sure to ask for the test environment as well, so the OEM tests can be run by others!

DT&E (Development Test & Engineering) government staff can interact with Agile OEMs via Iteration, System, and Release Demos and the activities that lead up to them

- Leveraging automated tests from early activities can build confidence in the accumulation of evidence related to the system's robustness

Poll 2

Who is responsible for automating tests in your project?

A. We don’t automate

B. Non-technical testers or QA staff

C. Application developers

D. Test engineers

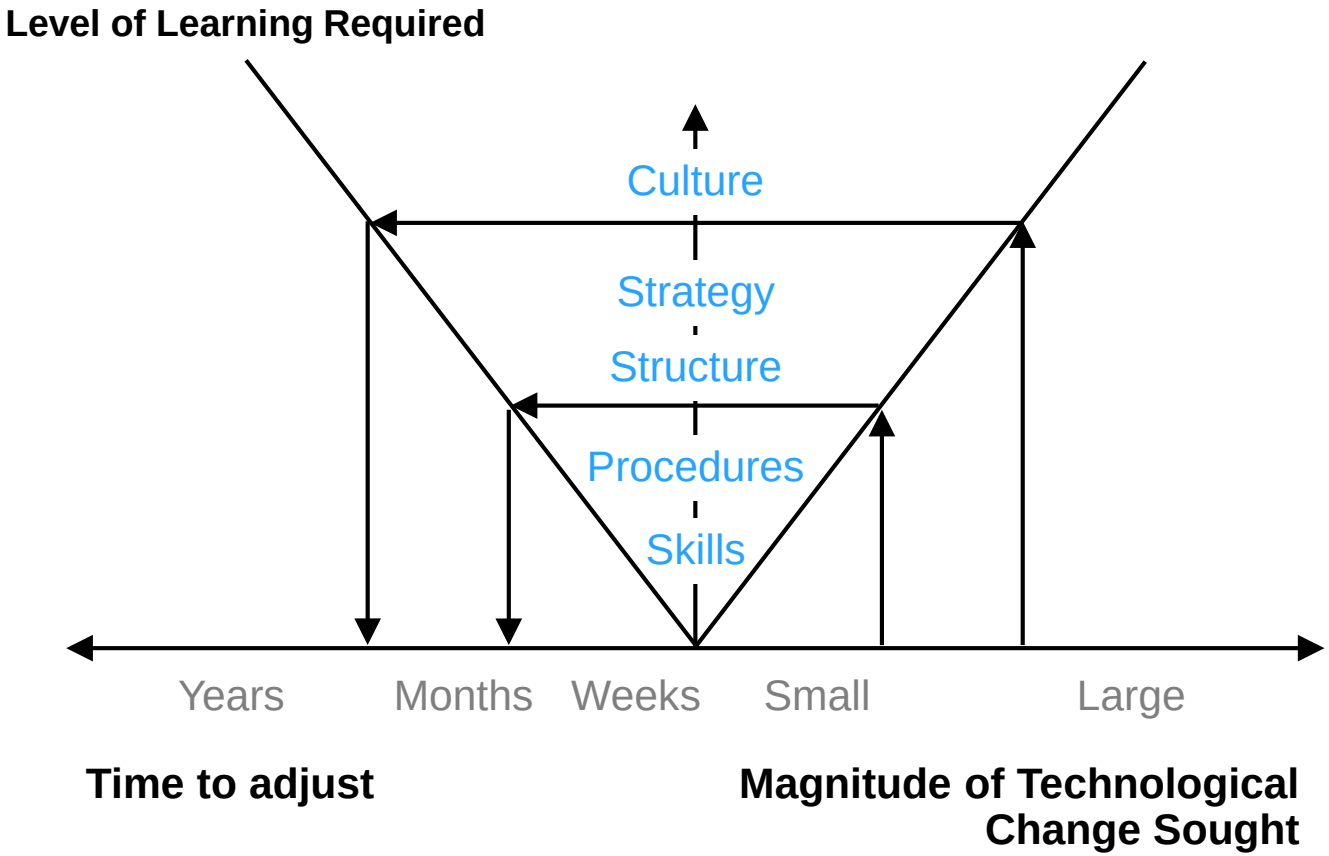
E. Software development engineer in test (SDET)

Five keys to effective Agile test automation for Government programs

How can my program successfully adopt Agile/Automated testing?

Automated Testing = Structure and Strategy Change

- Scope of change is similar to automating a manual business or operational process
- Requires many behavioral changes
- Not plug-and-play
- Learning curve



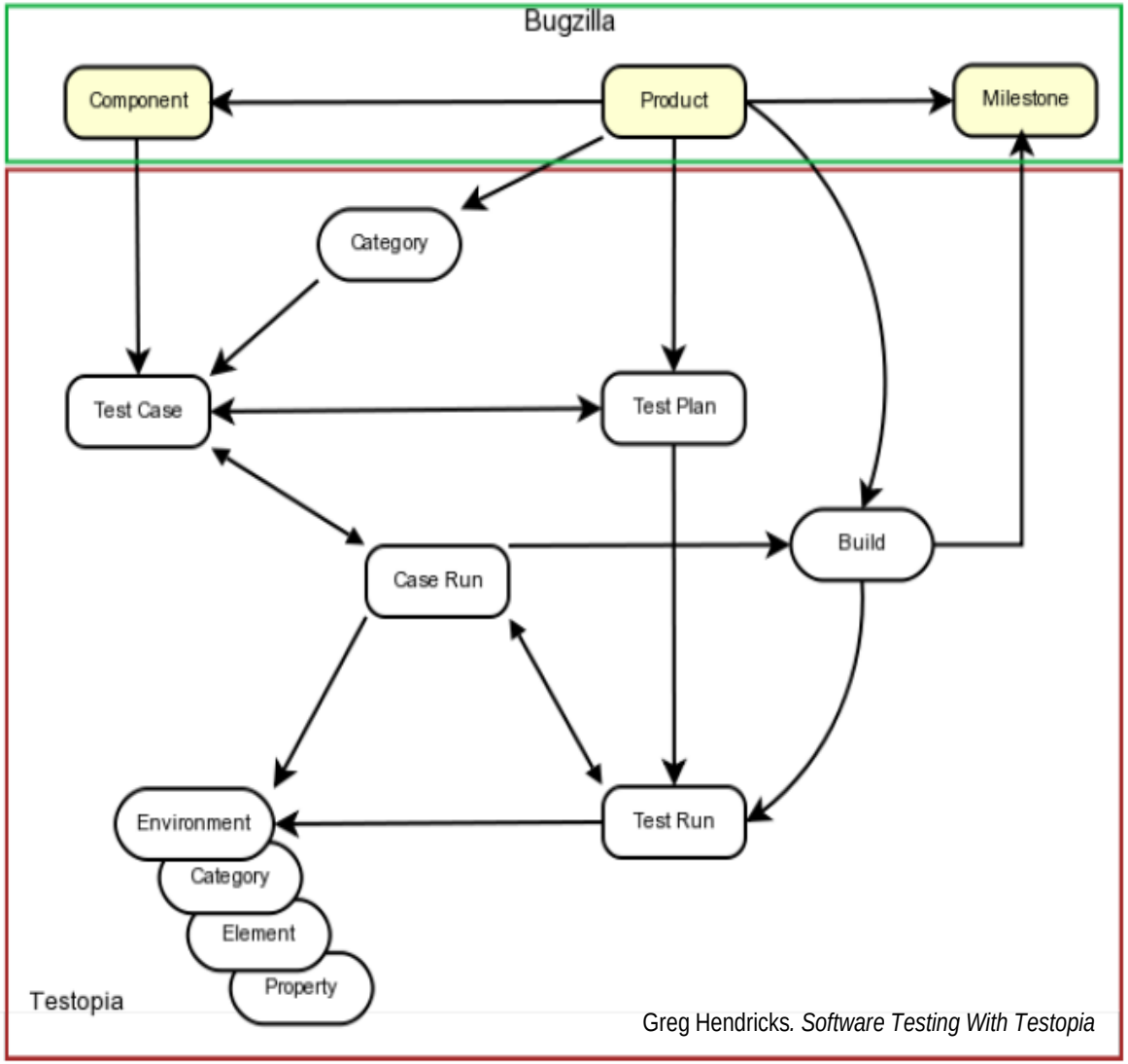
Ensuring Test Automation Success

- Treat development and operationalization of your test automation system like any other critical operational system
  - Agile development of test infrastructure & assets
  - Rollout support: deconfliction, training, socialization, funding of maintenance
- Grow or hire Software Development Engineers in Test (SDETs)
- The payoff of automation is repeatability and consistency
- Automation doesn't eliminate the need for manual testing (and testers)
- Training and support for tools is critical

19

Program-Wide Test Asset Management System

- Team-wide repository, test meta-data
- Tool chain interfaces
  - Test harness(es)
  - Bug tracking
  - Requirements
  - Version control
  - Continuous integration
- Part of all leading Application Lifecycle Management (ALM) systems
- Several open source systems
- *Can track status of **all** test activity*



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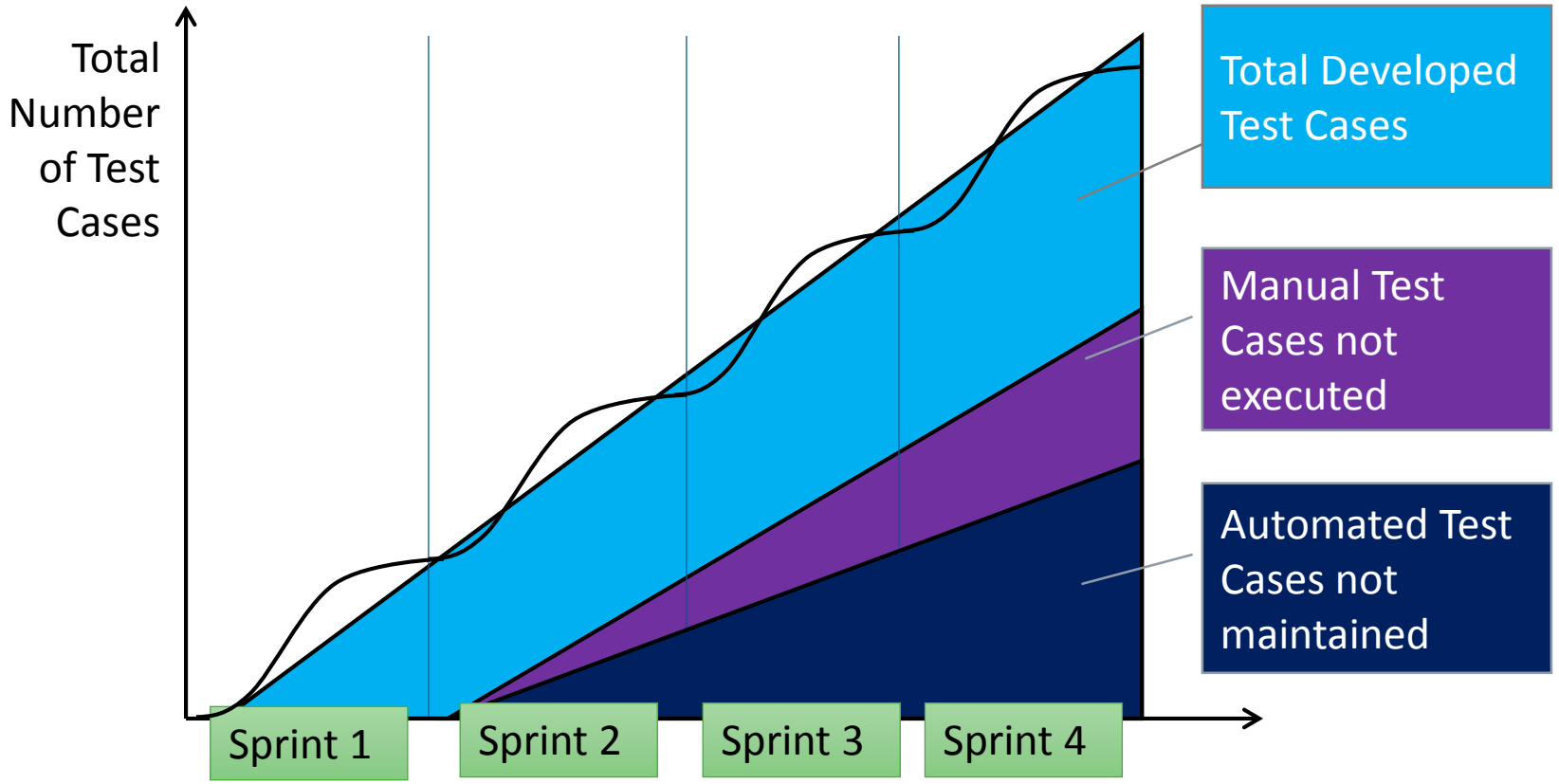
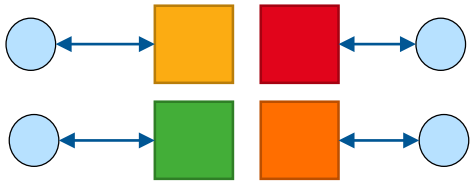
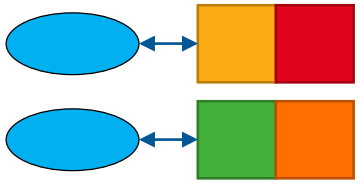
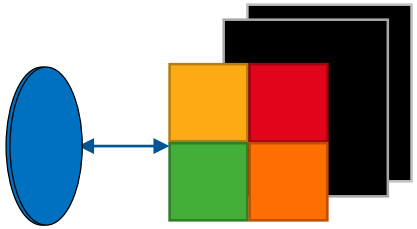


Five keys to effective Agile test automation for Government programs

What kind of tool chain do I need to support automated testing?

Testing scope, lanes, focus, tooling

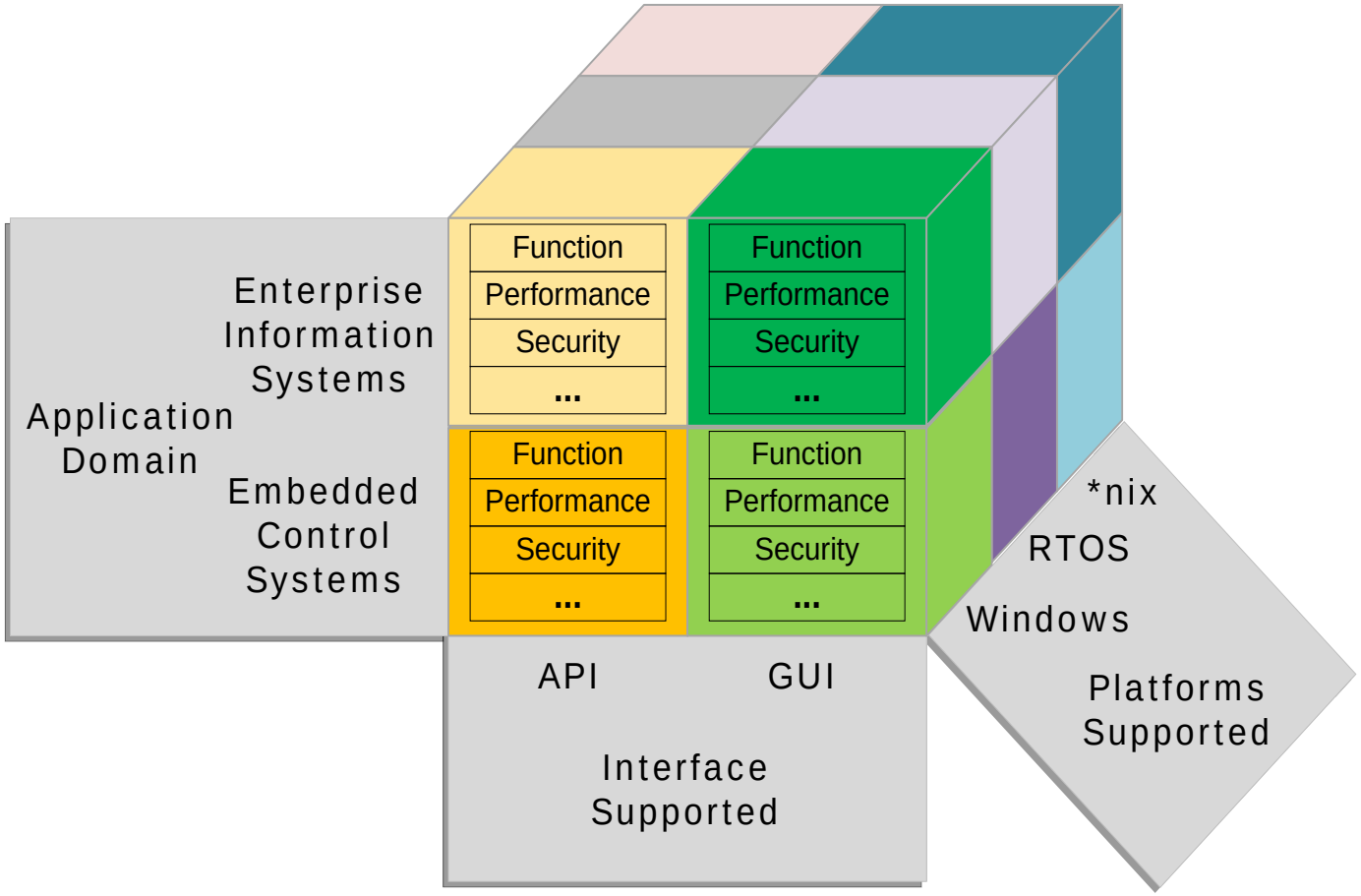
Scope		OEM/ Dev	PO FAT	DTO	OTO	Focus	Example Tool
Unit, CSCI		✓				Functions	Junit SonarCube
Component, Subsystem		✓	✓			Features, User stories	Selenium SOAP UI
System, SoS			✓	✓	✓	Use cases, Performance Mission threads,	Jmeter

Tools for Test Automation

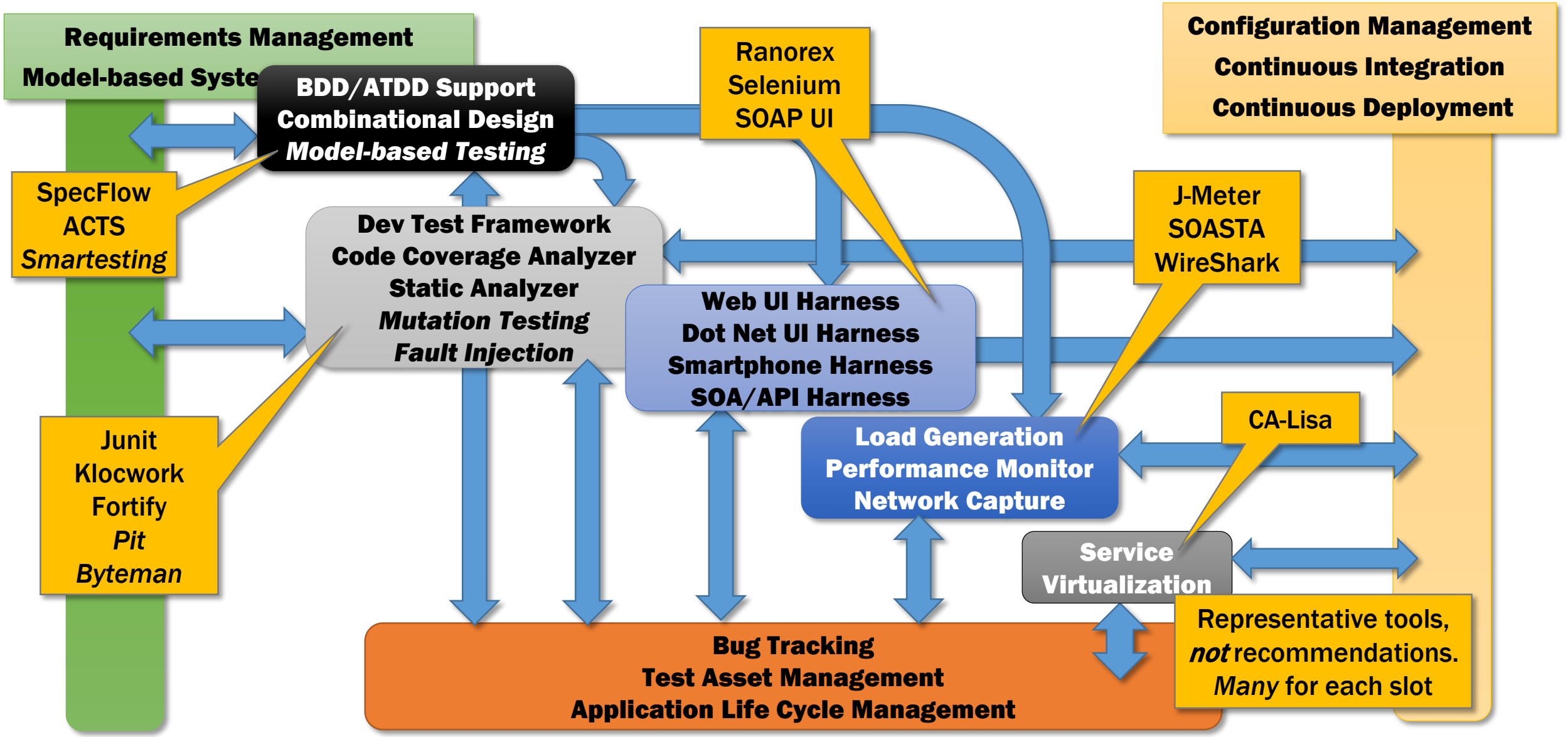
- There are *hundreds* of COTS, FOSS, and GOTS software testing tools

Tools for Test Automation

- There are *hundreds* of COTS, FOSS, and GOTS software testing tools
- Each tool is specialized for a certain kind of testing
- Each tool is specialized for a tool stack, target stack, and target interface



Test Automation Reference Architecture



Poll 3

What kinds of testing are automated in your project?

A. Unit/CSCI testing

B. User interface functional testing (desktop, mobile, web page)

C. APIs, web services

D. Software/Hardware in-the-loop testing

E. Performance testing

F. Robustness testing

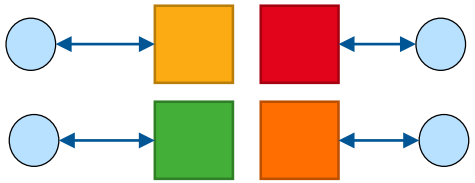
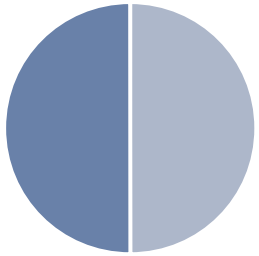
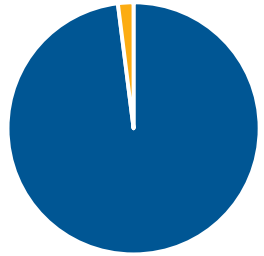
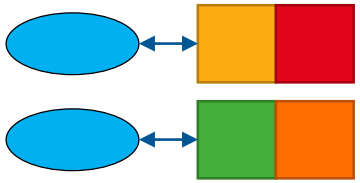
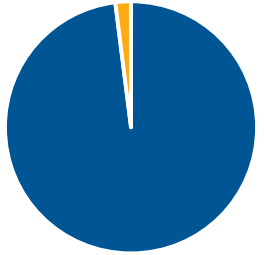
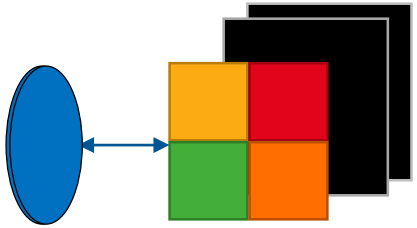
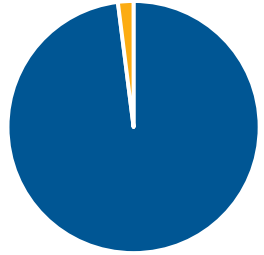
G. Other

Five keys to effective Agile test automation for Government programs

What kind of testing should/should not be automated for Agile software development?

Testing scope, focus, automation

Notional proportion of automated and manual test cases

Scope		*Focus*	*User Interface*	*SW Interface*
Unit, CSCI		Functions		
Component, Subsystem		Features, User stories		
System, SoS		Use cases, Mission threads, Performance		

Avoid test automation gotchas

- Much more work converting manual to automated testing than expected
- Don’t automate tests for unstable interfaces
- Do use exploratory testing
- Do automate tests for APIs, stable user interfaces
- Tools don’t automate test design and judgement
- Capture/replay usually results in breakage and/or test script re-recording
- Set expectations for test asset maintenance
- Automate performance testing incrementally
- Follow test automation design patterns

Poll 4

What kinds of testing are routinely done in your project?

A. All manual

B. Mostly manual, some automated

C. About same manual and automated

D. Mostly automated, some manual

E. All automated

Five keys to effective Agile test automation for Government programs

Summary

No Magic!

When done skillfully, test automation can deliver strong benefits to support organizations in delivering high-quality software at a faster pace.

When done badly, it creates more problems than it solves.

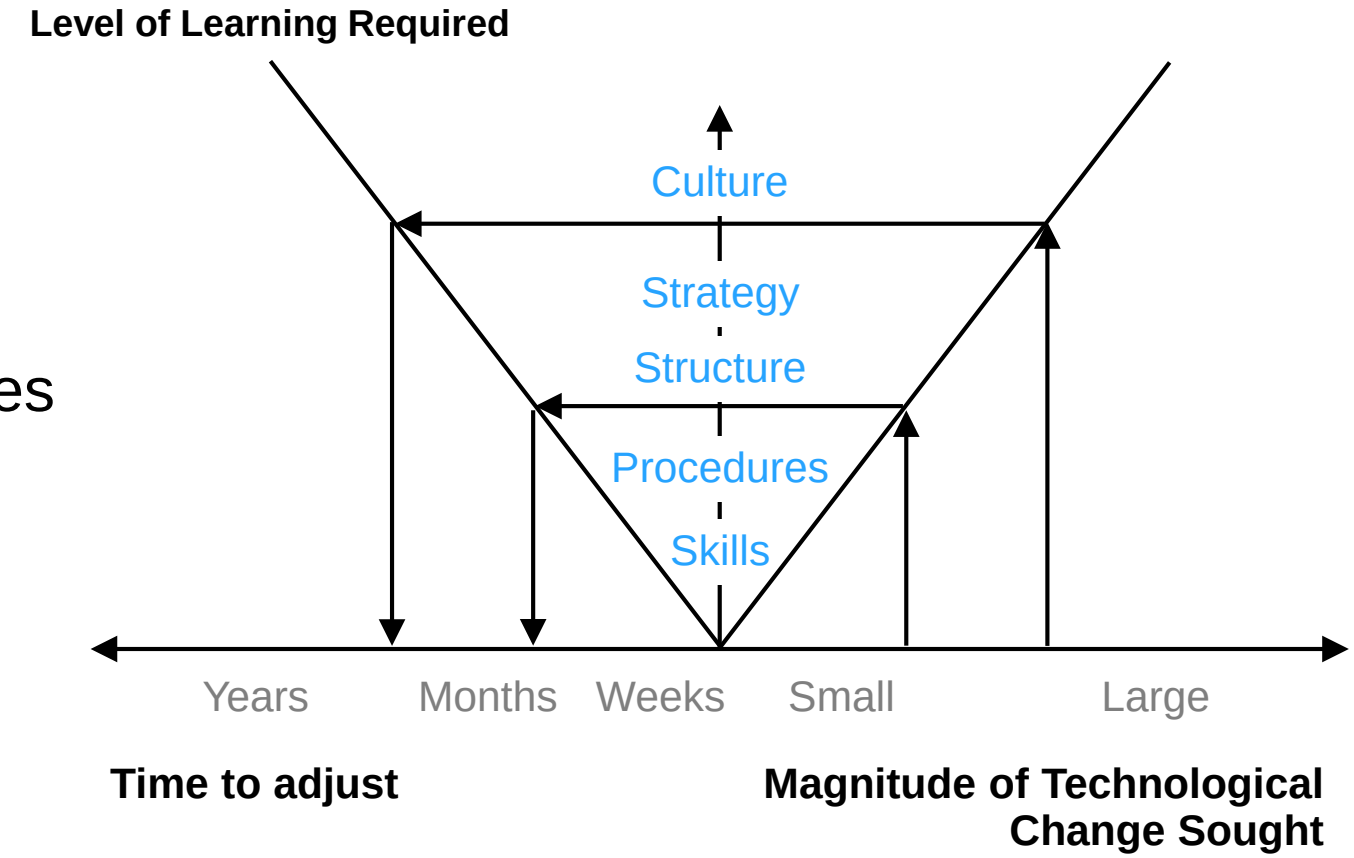
Sobejana and Herschmann, "The Eight Essentials When Moving to Automated Software Testing," Gartner Inc., 2016.

Reasons Automated Test Investment is Often Delayed in Agile Adoption

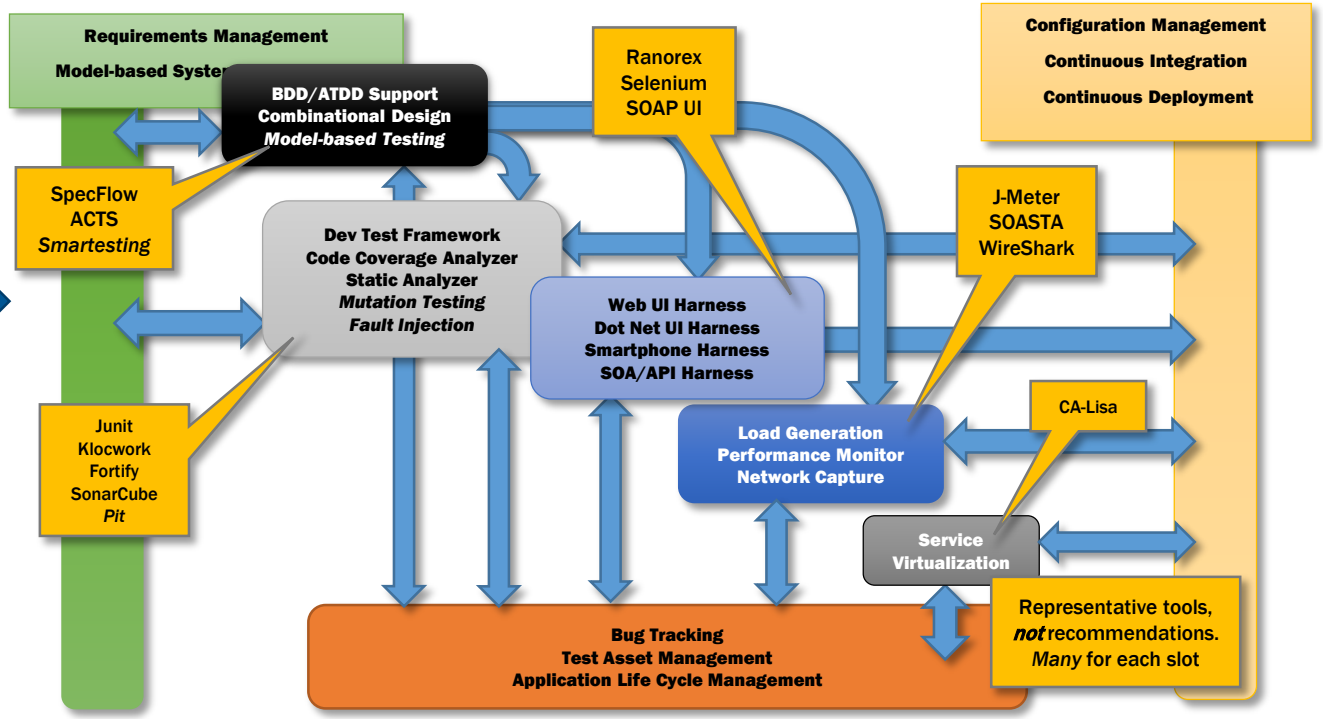
- Testers aren’t included in initial adoption strategy
- Difficulties in obtaining required tooling to support
- Some can be bought, but some has to be built from scratch
- Training test personnel in tooling/approach while executing their normal activities
- Hard to pause ongoing work to establish a new capability going vs build it piecemeal
- Organizational challenges related to dev/test structures
- Using automated mechanisms to do things that used to require human governance
- This isn't just "throwing a switch"
- Evolutionary implementation means incremental utility, so monetary benefit won't be seen right away, even though risk reduction might be

Remember: Automated Testing = Structure and Strategy Change

- Scope of change is similar to automating a manual business or operational process
- Requires many behavioral changes
- Not plug-and-play
- Learning curve



Start early, keep at It!



Modernizing legacy testing is just like modernizing legacy operations!

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Q & A