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Responding to Warfighter Needs and Supporting Mission Success through Test Automation in GUI Driven Software Systems

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James Milazzo

- Software Engineer at Raytheon Technical Services Company in Indianapolis.
- Experience in software test automation and agile development methodologies working on programs in the defense industry.
- Graduated in 2011 with a Bachelor's Degree from New York University where he studied Physics, Computer Science and Mathematics.

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Brett Hanson

- Software Engineer at Raytheon Technical Services Company in Indianapolis.
- Integral part of the initial push for automated software testing at Raytheon Technical Services Company (RTSC), with experience in manual and automated test development.
- Graduated in 2010 with a Bachelor's Degree in Software Engineering and a Minor in Mathematics from Indiana Tech.

Agenda

- Explain the importance and benefits of automated testing.
- Show how automated testing fits in to an agile development process.
- Address common challenges encountered and how they can be overcome.
- Share lessons learned and best practices.
- Address questions about moving to automated testing.

Why is Automated Testing Important?

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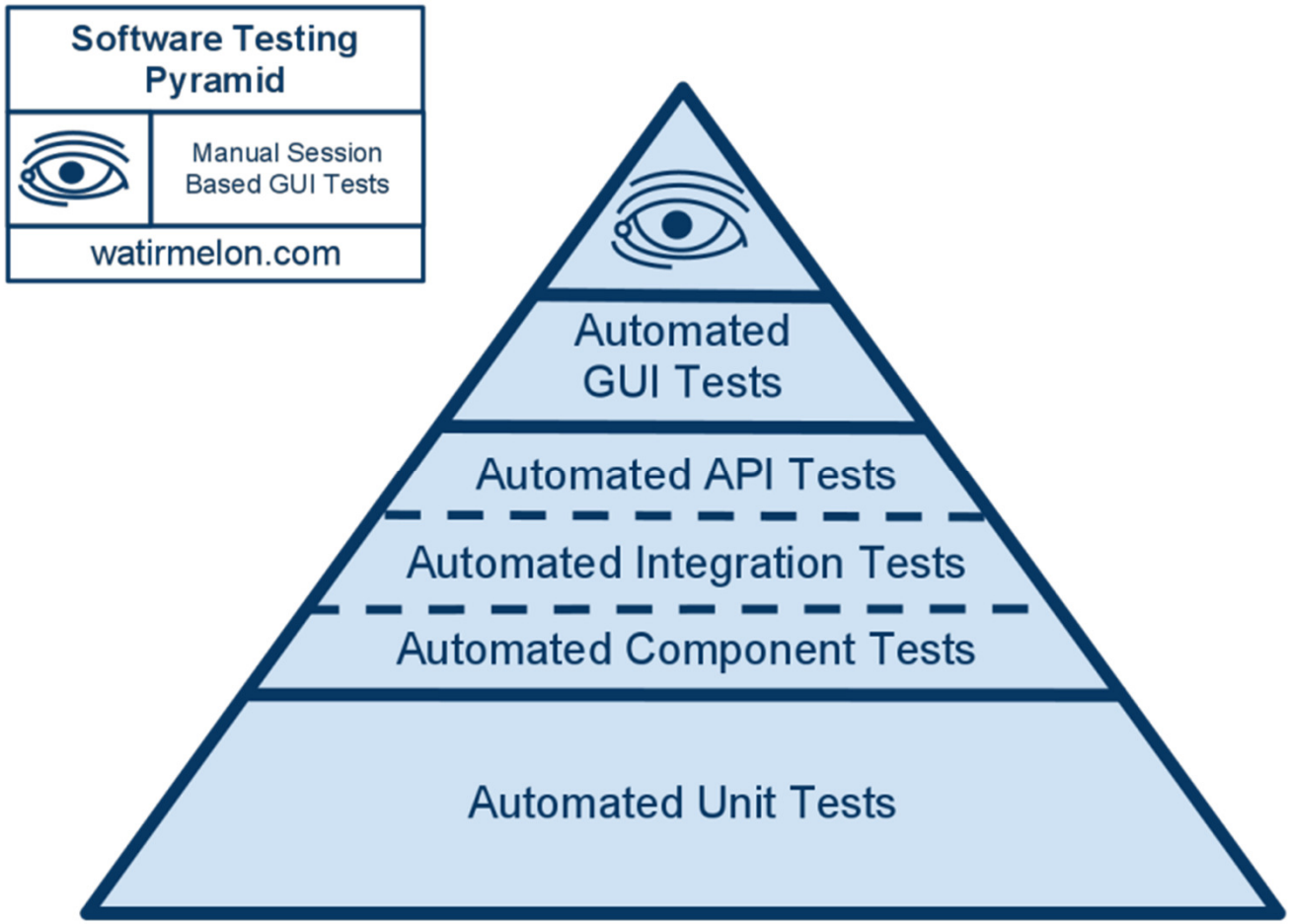
- Efficiency: Dramatically reducing execution time allows for fast response to changing warfighter needs and reduction in overall test costs.
- Scalability: Grow from one tester to a large team on a complex project.
- Granularity: Full product testing is feasible even for the smallest of code changes.
- Quality: Consistency is dramatically improved and bugs caught earlier in the development lifecycle are much less costly to fix.

What is Automated GUI Testing?

- Unmanned testing of an entire integrated software system.
- It can be used to simulate actual use of a system.
- Applicable across the entire Software Development Lifecycle.
- Various automation tools can be used to provide a common Graphical User Interface (GUI) Element Repository.

Automated Test Pyramid



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Blended Agile Process

- At RTSC we adapt agile principles to the industry standard software development process for government contracts.
- A typical project cycle is 9-12 months, divided up in to 2-3 week sprints.
- Teams consist of developers and dedicated software testers.
- Testing is done to formal requirements, not just validation of stories.
- Still on the hook for Formal Qualification Testing (FQT), in addition to sprint tests to validate completed stories.

Our Project Lifecycle

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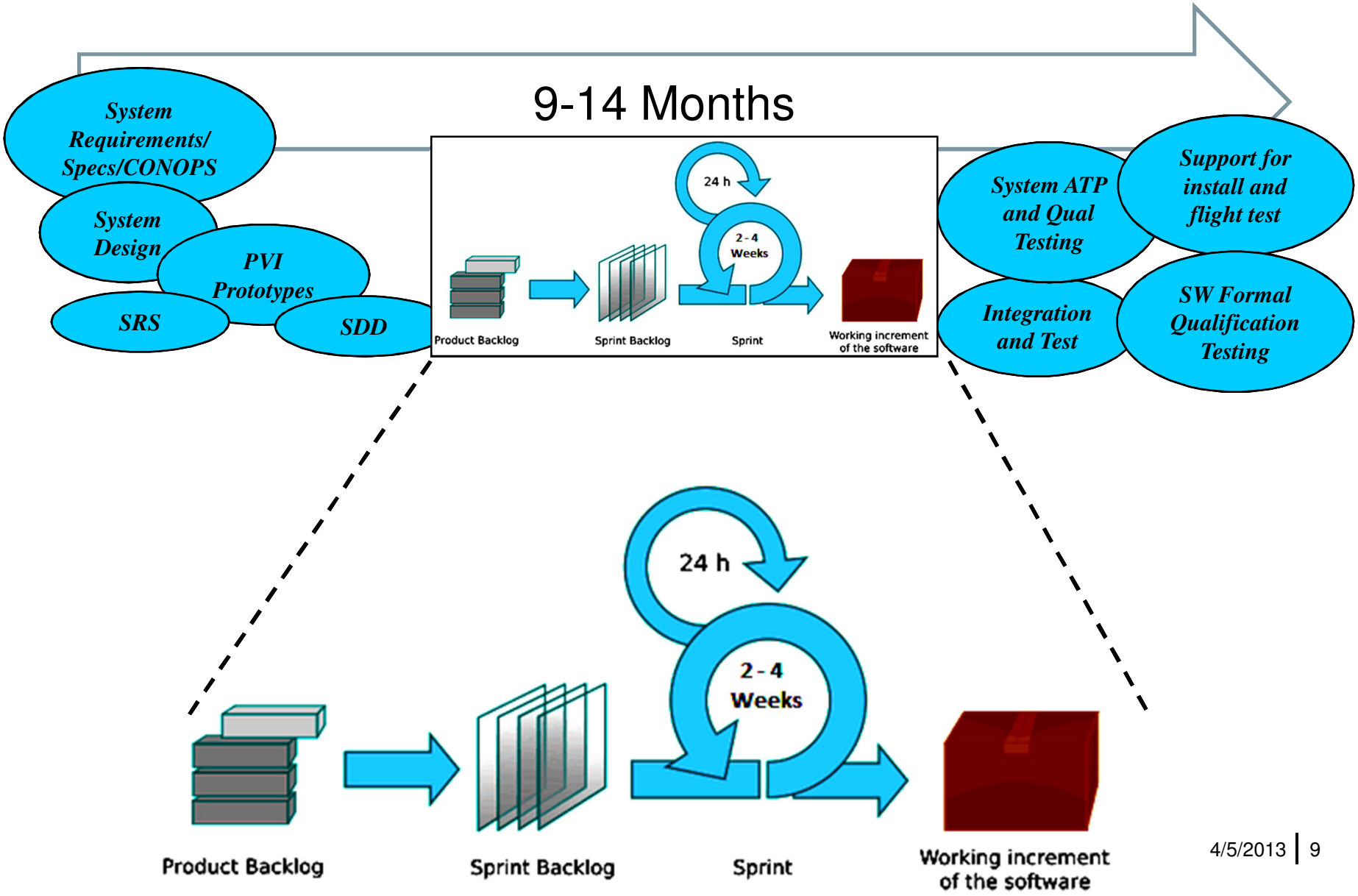

Automated Test in the Agile Process

- Agile Software Development requires additional responsibility and flexibility from test.
- Automated testing helps software testers manage the demands of the sprint process.
- An automated test suite provides cumulative coverage as additional tests are developed.
- Higher level verification can bring Systems' Testing in to the sprint process.

Automated Test and Continuous Integration (CI)

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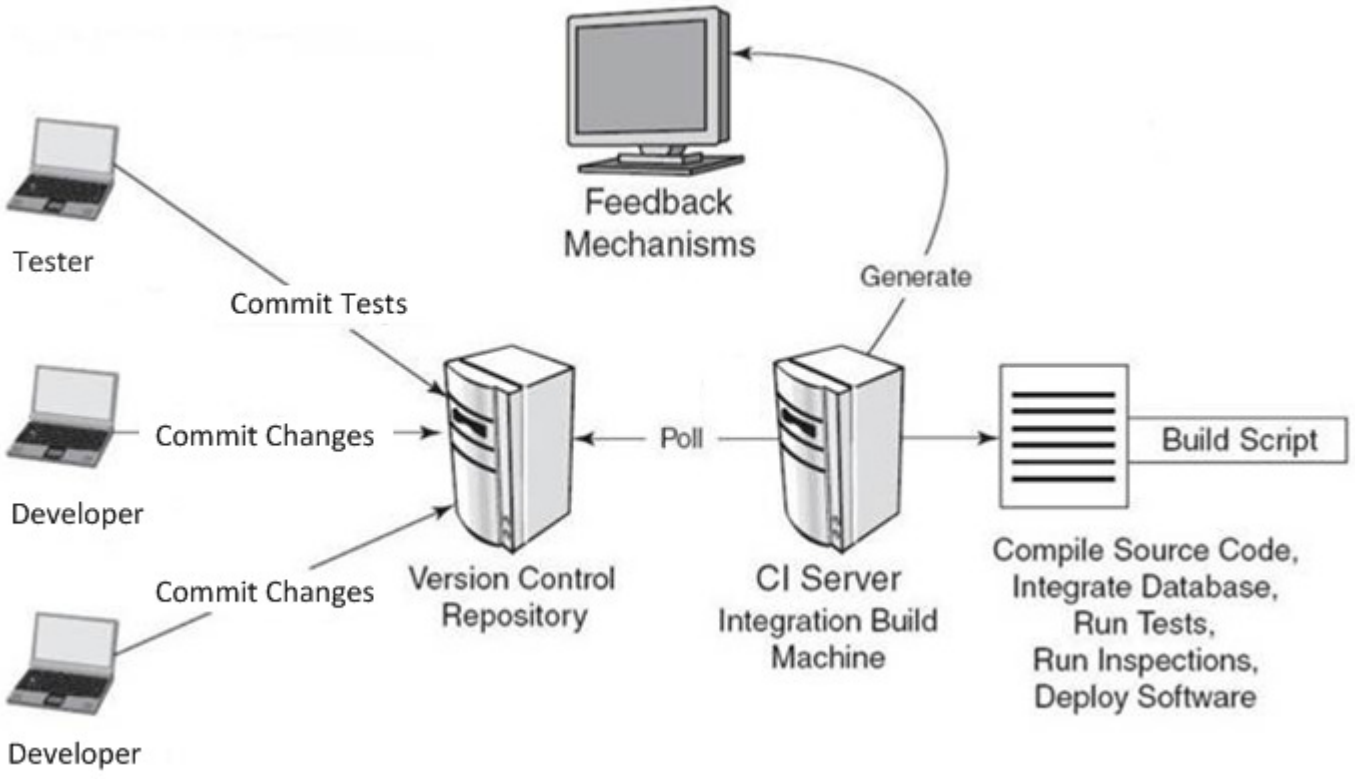
- CI is the frequent merging and validation of new or changed code.
- CI offers benefits to both productivity and quality.
- Getting started is an incremental process of automating builds and creating tests.



Common Technical Challenges

- The complexity of the GUI design and required validation can impact automated test development.
- The development team may need to adjust code to increase compatibility with the automated test tool.
- Tests often rely on interfacing with external hardware and testing tools.

Approaching Common Process Challenges

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- Create a plan for managing version control of test tool files before you begin any development.
- Establish how you will handle new artifacts produced through test automation in your review process.
- Consider your customer relationship and what they expect from your test cycle when determining the scope of your automation efforts.
- Analyze to what extent the tool can be used to produce your required deliverables.

Tool Selection

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- Your first criteria should be technical compatibility with the pilot project.
- The skill sets of your test team will also determine which tools will be feasible.
- Once you have worked out a list of potential tools, you can begin a comparative analysis on factors such as cost.
- Specific tools may also offer additional advanced functionality that would pair well with the structure of your application.

GUI Testing Framework

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- The framework is built upon a commercial test tool and its automation libraries.
- Test components are developed to coordinate communication with test utilities and drive other external system interfaces.
- A test execution harness is used to coordinate test case runs on multiple systems.
- Common GUI repositories, tests, and user code modules enable reuse across product lines.

Demo

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Test Development Considerations

- Identify areas of repetition and create a common module that can be re-used.
- Develop the automated test building blocks, such as repositories and libraries, before diving in to test cases.
- Smaller, more granular, tests are easier to compose, manage, and use for targeted regression.
- When possible, write tests in such a way that minor failures can be recovered from and do not force you to abort the entire test.

Lessons Learned

- It is important to have the development establish UI design early.
- Open communication must be established between testers and developers to ensure coordination.
- The team should establish a process to keep track of GUI changes made during development.
- Produce high level test suite design descriptions for test cases as they are being created.

Best Practices

- Start by automating existing manual test procedures as opposed to creating new automated tests from scratch.
- Continue to do exploratory testing in addition to running automated tests.
- Collect detailed metrics of time spent to develop and execute automated test procedures.

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Your Questions

- Ask away!

Acronyms

- API: Application Programming Interface
- APT: Acceptance Test Procedures
- CI: Continuous Integration
- CONOPS: Concept of Operations
- FQT: Formal Qualification Testing
- GUI: Graphical User Interface
- PVI: Pilot-Vehicle Interface
- RTSC: Raytheon Technical Services Company
- SDD: Software Design Document
- SRS: Software Requirements Specification
- SW: Software
- UI: User Interface