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The Software Delivery Experts

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A Software Delivery Solutions Company

Effectively Combining Functional & Performance Testing

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Objectives

This presentation will explore three techniques to achieve optimal combinatorial test results:

1. Conceptual framework design patterns
2. Common modeling techniques for systems (functional and load)
3. Methodology for combining both aspects including tool usage

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Key Concepts

The following concepts will be covered as a part of this presentation:

- Specific framework design patterns that lend themselves to efficient combination testing
- Effective techniques designed to deliver optimal results
- Using appropriate tools such as JMeter and WebDriver to facilitate testing
- Benefits of combining varied types of testing

Testing Process

- Developed 1185 manual test cases
- Automated 75% of test cases
- Established automated run schedule
- Wanted to leverage existing functional automation for load testing

Selenium for Load Testing?

Question: How do you do load testing with a functional test tool like Selenium?

Short Answer: Well…You really shouldnt, but ...

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Functional vs. Performance

How does a functional test tool work compared to a performance test tool?

- GUI-based test tools programmatically control the user interface through direct interactions with each on-screen element such as input fields, buttons, links and etc.
- Protocol-based test tools captures request/response (i.e. http) and simulates user interface communication with web/ application servers

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Planning

Designing a load testing model involves:

- Transactional mix
  - Combination of transactions identified to represent real-world usage
- Workload distribution
  - User load distribution across identified scenarios
- User load and data strategy
  - Ramp-up
  - Ramp-down
  - Sustained load duration

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Transactional Mix Example

Online Banking

Scenario	Avg Daily Total	Pages	Think Time
View Balance	3000	Login, Dashboard (50% exit)	15 secs
Bil Pay	750	Login, Dashboard, Payments, Confirm (75% exit)	20 secs
Transfer Funds	155	Login, Dashboard, Transfers, Confirm (25% exit)	10 secs
Deposit Check	225	Login, Dashboard, Deposits, Confirm (10% exit)	10 secs

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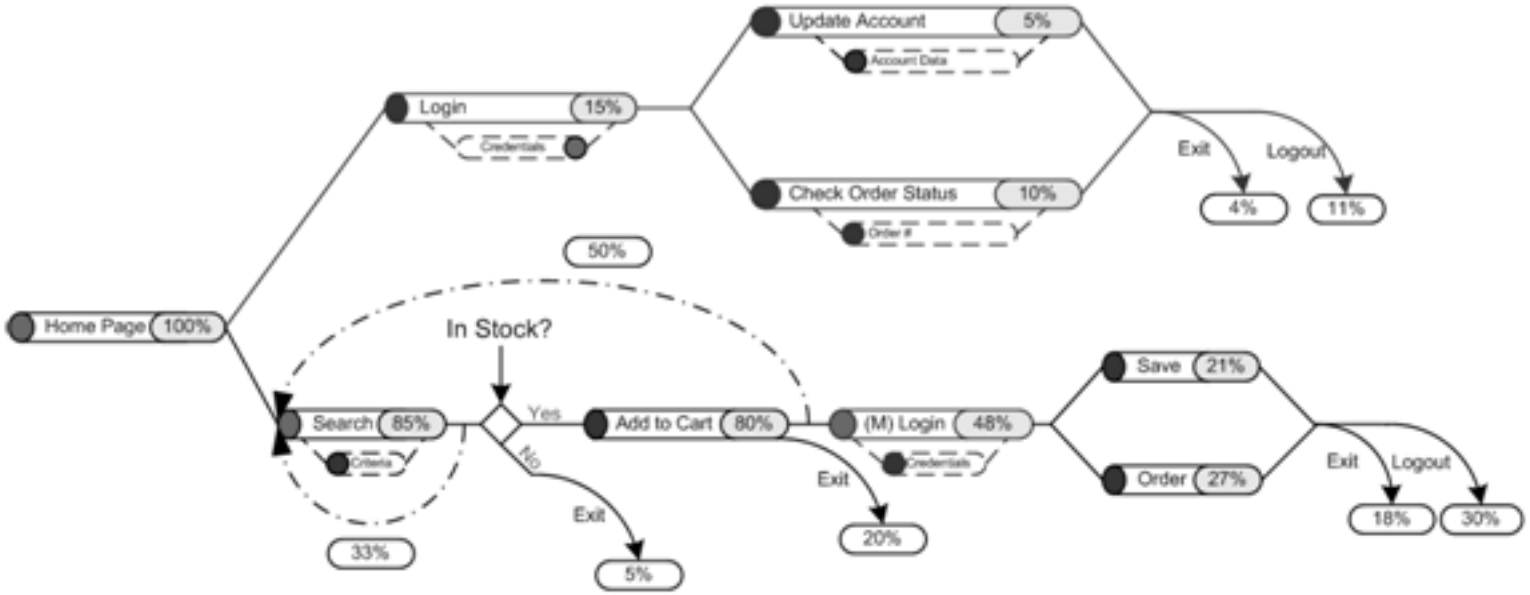
Workload Distribution Example



~ MSDN: Performance Testing Guidance for Web Applications

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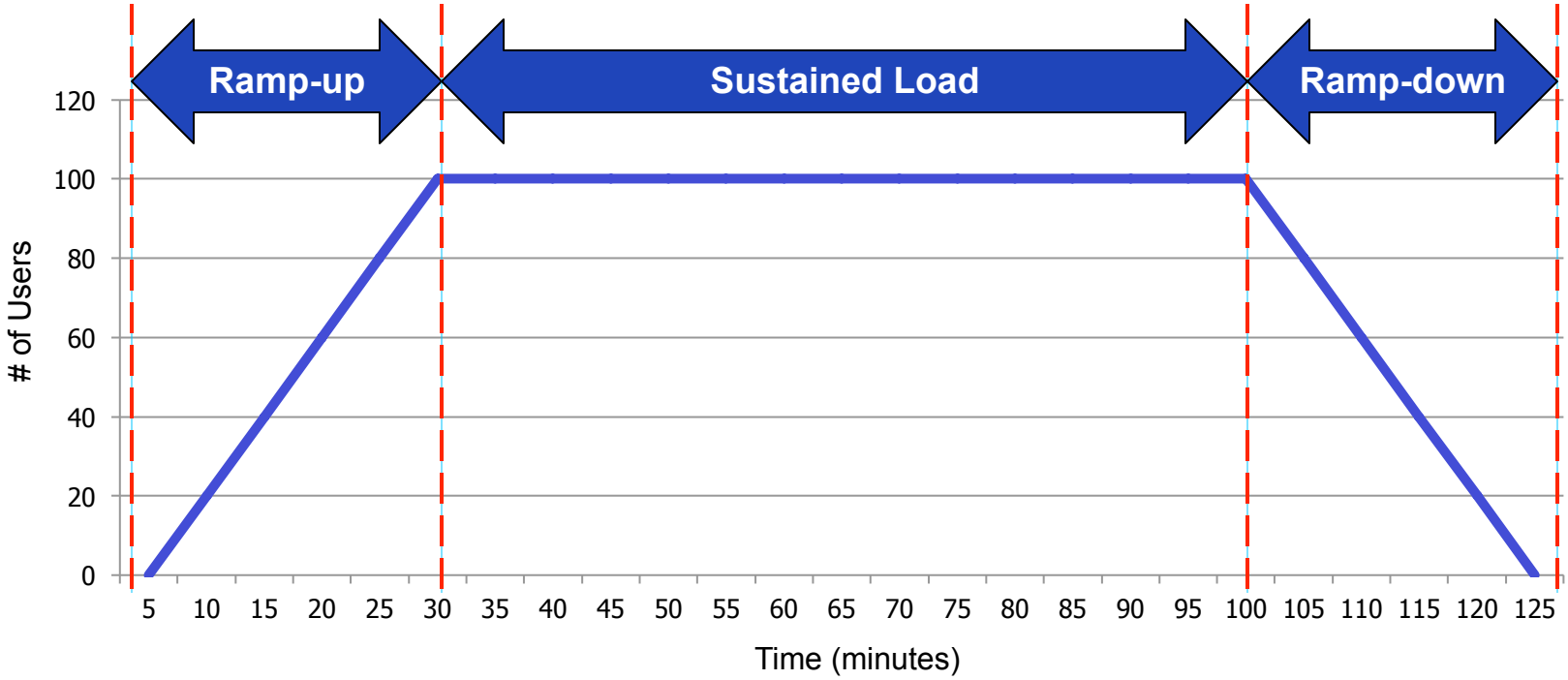
User Load Model Example



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Load Model

The following items are required in order to develop an effective load model:

- Number of concurrent users
- Total transactions to be achieved
- Scenarios with corresponding transactions
- % of total users for each scenario

Automated Testing Inventory

What exactly does your regression suite do and how does it do it?

- Understand test coverage using matrices or heat maps
- Identify scripts that are representative of a typical workload
- Target transactions that will produce meaningful data
- Instrument targeted scripts as agents

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Functional Automation

Instrument specific script(s) to become an agent that will run within a determined interval schedule and report results while the application is under load.

- Add a simple timer wrapper around specific business process flows and instrument it to be an agent for capturing responsiveness

```
@BeforeMethod
public void setUp() {
    long start = System.currentTimeMillis();
    driver = new FirefoxDriver();
    driver.get(TEST_URL);
    long timeToLoad= (System.currentTimeMillis()-start);
    System.out.println(timeToLoad);
}
```

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Results Tracking

- Keeping track of and collating run-time data via a functional test tool is tedious and laborious
- Minimalist tracking approach but with enough sampling to make results statistically significant is key
- Page loading time is an important measure to determine user experience
- Monitoring tools can be used separately to collect machine data for graphing and trend analysis

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Test Execution

Executed test suite distributed across test grid:

- Selenium Grid orchestrated test execution
- Utilized 25 virtualized test nodes
- Each test node ran 5 browser instances
- Generated sustained load of 100+

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Results Data

Transaction response time info output to Excel each time instrumented agent script executes:

- Transaction name
- Transaction response time (Y axis)
- Actual system time when response time was reported (X axis)

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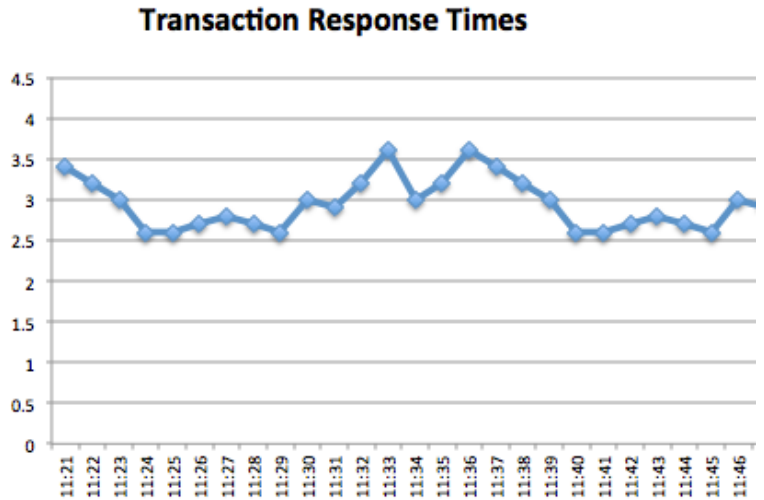
Results Analysis

Raw Excel data calculated and charted to show overall performance during test execution for each transaction response time:

- Minimum
- Maximum
- Average
- Standard Deviation



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Next Steps

Question: Now that we have all this raw data what do we do with it?

Answer: Analyze, synthesize and "actionize" it…but how?

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Results Report Out

Managers and stakeholders need more that just data produced from tests – they need conclusions based on test results data that support those conclusions.

- Keep it simple but informative
- Intuitive and visually meaningful
- Summarize data effectively and efficiently
- Tell the complete story by using concise written and verbal summaries
- Avoid excessive wording and data

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Scalability

Question: How well does this concept scale for higher user loads, increased transactions and monitoring?

Short Answer: Well…It really doesn't, but ...

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Scalability Options

This quasi load testing solution has many limitations but can be gradually overcome by introducing actual performance test tools over time:

- Instead of generating load with a GUI-based functional test tool like Selenium, consider generating load with a protocol-based performance test tool like JMeter
- Continue to utilize existing instrumented agent script to capture and analyze data

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Scalability Options (cont.)

Functional test tool agent script could be eventually replaced by capturing and analyzing test results within a performance test tool like JMeter, which is better suited for capturing test results data and subsequent analysis:

- Continue to utilize existing instrumented functional test tool script combined with other automated functional regression tests for in-line actual browser testing to determine if application functionality is impacted by load

Combinatorial Testing Benefits

- Ability to do some level of load testing on limited budget and tight timeline to uncover potential performance issues
- Gradually develop a load testing practice over time without impacting project schedules and budgets
- Detect functional defects that can only be found when application and environment is under load

Questions?

- Final questions or discussion?

Thank you!

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