CS1320 Creating Modern Web and Mobile Applications

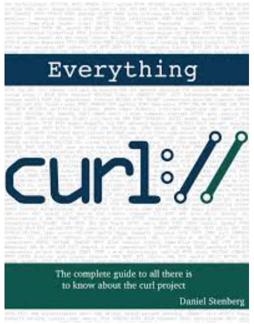
Lecture 33:

Testing II

Testing A Web Site or Mobile Application

- Want to simulate actual use cases / scenarios
- Play a sequence of actions from start to finish
  - Login through logout
  - Look at what results
- Need to generate user actions
- Need to check the results
- Need to have multiple such scenarios (lots)

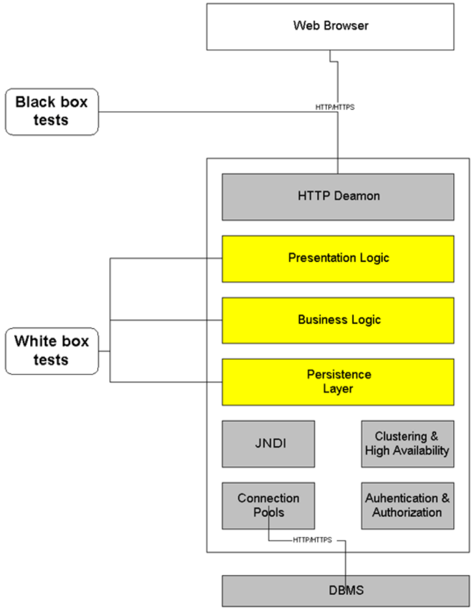
Generating User Actions


Everything
curl://
The complete guide to all there is to know about the curl project
Daniel Stenberg

- Can be done without a browser
  - Actions = URL request with proper context
    - Context = cookies, put fields, …
  - **curl** is a command-line tool that can do this
  - Lots of work however (for general scripts)
  - But you can put together scripts of curl calls to emulate tests
- Want to do it with a browser
  - Or something that acts as a browser

Web Site Testing Tools

- httpunit
  - Create test cases for calls to the server
    - Providing input, checking expected output
  - These are using a Java framework
- Generating test cases automatically
  - By analyzing on the JavaScript code
- Sikuli
- Selenium
  - Most widely used



Testing Exercise

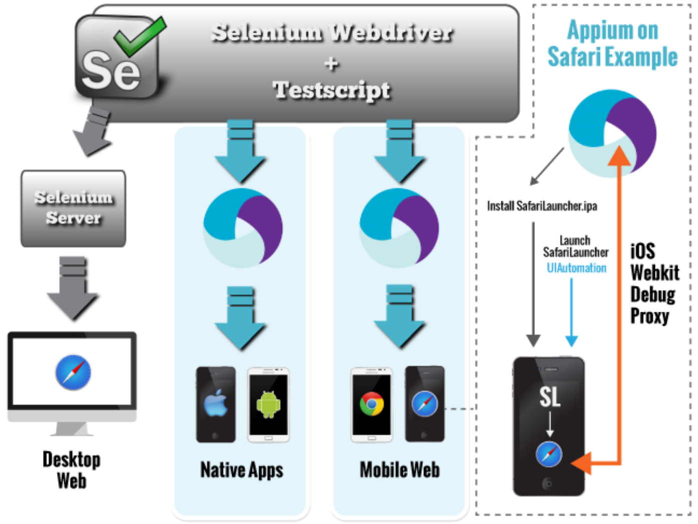
- Download Selenium IDE
  - https://www.selenium.dev/downloads
  - For either Chrome or **Firefox** (your preference)
- Click on selenium icon at top of browser to start
- Record a session
  - Either with your project or just a Google search
  - Stop the recording
- Play it back
  - Raise hand or thumbs up when done

Browser Automation: Selenium

- Example:
  - https://www.youtube.com/watch?v=gsHyDIyA3dg
- Can be done with programmable scripts
  - Makes repetitive actions (e.g. login and setup) easier
  - Makes things easier to edit and accumulate
  - Makes things easier to run in bulk
  - Can start with interactive script and convert it to runnable code
- Example of a written script
  - spheretest.js

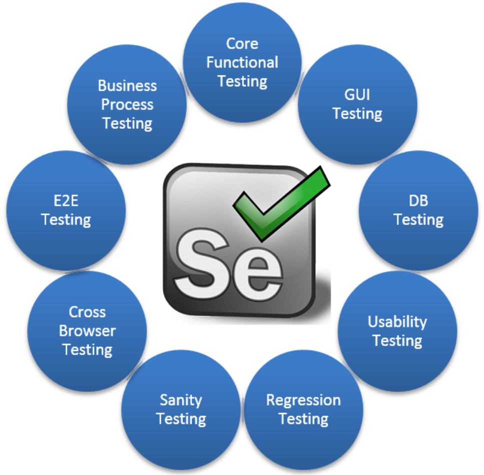
Testing Mobile Applications

- Selenium doesn't work for mobile applications
  - Although it can be used for back end testing
- But similar frameworks exist
  - Based on Selenium
  - Selendriod – for android
  - Appium – cross-platform



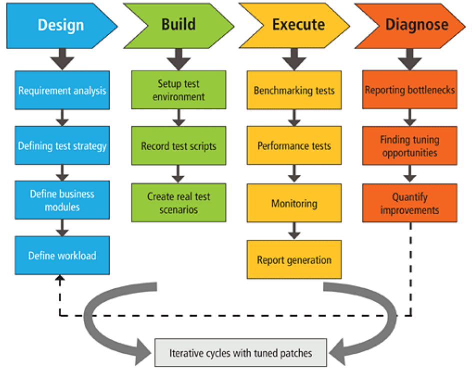
System Testing

- You should test all your major scenarios
- You should create a test
  - For each bug you find (regression)
- You should create a test suite
  - To check for invalid inputs
  - To check for invalid actions
- And have a script that runs all your tests



Performance Testing

- Importance of performance
  - 100ms makes the difference between success & failure
- What do you want to test
  - How fast the web site performs
  - Speed to undertake common actions
  - How responsive the web site is
  - What happens if …
- What are the testing circumstances
  - How many users should you have for testing?



Performance Testing

- Most developer tool sets include this for a single page:
  - Use the browser debugger (developer) network page
  - This gives timings for each page on the current load
  - But only this download and only from this browser and machine
- gtmetrix: https://gtmetrix.com
  - Can give more detailed info and suggestions
  - Can test from different locations
  - Can test under different network conditions
  - Gives a broader perspective on performance

GT METRIX

Load Testing

- How does the application behave under load
- What types of load should be considered
  - Network performance
    - How does the user's connection affect your application
    - How does overall network activity affect your application
  - Large numbers of simultaneous users
    - What happens to your server under load
    - What happens to your database under load
  - Large individual requests
    - Complex database queries
  - Heavy load on specific pages

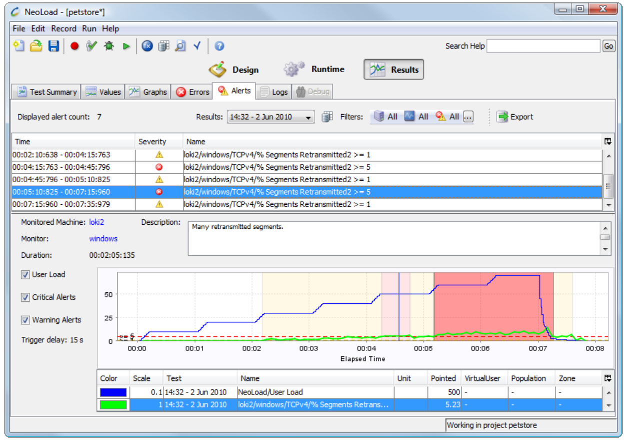
Load test your website
Start test
CAN YOUR WEBSITE HANDLE THE STRESS?
Learn more about our product

3 View your test report graphs to find out how many users your site could handle

Slow websites means lost customers and revenues. Be proactive and find out the performance limits of your website before you learn the hard way. Load Impact is an online load testing service that lets you load test your website with just a few mouse clicks.

Stress Testing

- What are the limits of your application
- What types of things to consider
  - Maximum load that can be tolerated
  - Maximum input size that can be processed
- Determine what happens when things go wrong
  - Database crash or disconnect
  - Server crash or disconnect
  - Web server crash or disconnect
  - Browser crash or disconnect
  - Network crash (server/browser stay up)
  - Gradual degradation



Displayed alert count: 7

Results: 14:32 - 2 Jun 2010

Time	Severity	Name
00:02:10:638 - 00:04:15:763	⚠	loki2/windows/TCPv4/% Segments Retransmitted2 >= 1
00:04:15:763 - 00:04:45:796	●	loki2/windows/TCPv4/% Segments Retransmitted2 >= 5
00:04:45:796 - 00:05:10:825	⚠	loki2/windows/TCPv4/% Segments Retransmitted2 >= 1
00:05:10:825 - 00:07:15:960	●	loki2/windows/TCPv4/% Segments Retransmitted2 >= 5
00:07:15:960 - 00:07:35:979	⚠	loki2/windows/TCPv4/% Segments Retransmitted2 >= 1

Monitored Machine: loki2

Monitor: windows

Duration: 00:02:05:135

Description: Many retransmitted segments.

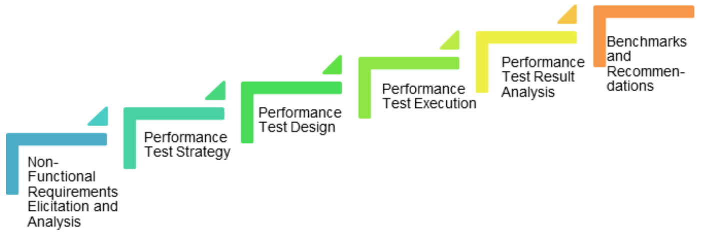
Trigger delay: 15 s

Color	Scale	Test	Name	Unit	Pointed	VirtualUser	Population	Zone
🟦	0.1	14:32 - 2 Jun 2010	NeoLoad/User Load		500	-	-	-
🟩	1	14:32 - 2 Jun 2010	loki2/windows/TCPv4/% Segments Retrans...		5.23	-	-	-

Working in project petstore

How To Do Performance/Load/Stress Testing

- What do you need to do
  - Recruit hundreds of users
  - Simulate lots of users
    - Doing normal things with the system
    - Doing particular things with the system
  - Simulate failures
- Suppose I wanted to try my app with 1000 users
  - How might you do this?


Non-Functional Requirements Elicitation and Analysis
Performance Test Strategy
Performance Test Design
Performance Test Execution
Performance Test Result Analysis
Benchmarks and Recommen-dations

Jmeter: Performance Testing

- Jmeter is an open-source web performance tester
  - http://www.youtube.com/watch?v=8NLeq-QxkSw
- Works with a set of test cases
  - Series of interactions with the back end
  - These can be specified
    - Manually by a set of HTTP requests (URLs with data)
    - By example (gathering information from sample runs)
- Will run many of these simultaneously
  - You get to specify which ones and how many
  - With random delays
  - For as long as you want

Security Testing

Who is stealing from you?
Assess. Evaluate. Resolve.
Application Security Services

- URL security
  - Ability to bypass login/security by creating a URL
  - Ability to get private pages by editing URLs
  - Passing in inputs that will make the system misbehave
    - Overly long inputs that can cause buffer overflows
- Input checking
  - Are all invalid inputs detected
  - Openness to SQL injection and Cross-browser attacks
- Are internal files, etc. in the web pages inaccessible
- Is SSL used for all appropriate pages
  - Can it be bypassed?
- Are all errors, security breach attempts, etc. logged

Security Testing

- Tools exist
  - Websecurify: www.websecuify.com
    - 14 day free trial
  - Netsparker: https://www.youtube.com/watch?v=bVpv4r1T5Ac
    - Download: http://www.netsparker.com
  - Wapiti, Websurgury, …
- Scanners that check all sites
  - Send you reports on possible problems
  - But you don't want to wait for these

Design For Testability

- Want to have a web site that is testable
  - Might not be possible to test live site
    - Don't want it to crash
    - Want to test before installing updates
    - Actions might have real-world effects
- Set up a test site
  - Separate database
    - Add test users (passwords don't affect live system)
    - Bugs don't affect the live system
  - Internal code to handle external actions
    - Based on which server is being run
  - Do it on a local machine / separate VM / separate port
  - Possibly special URLs to reset the server to a known state
  - Script to reset the test site to a known starting state

Lab Preparation

- Have an accessible test site for your project
  - Can be production site if that is safe
  - Many of the tools need a public URL to work
- Meet to determine who will test what
  - Html/CSS, Usability, Web Site, Performance, Load Testing, Security
  - Develop a testing plan for your project
    - When and what, reusable tests, testing before update, …
- Download and install the tools you need
  - Read up and learn those tools
- Think about what user tests you want to run

Lab Preparation: User Tests

- Create a user test for others in the class to try
  - Have a specific goal in mind (scenario)
  - Provide a starting point
  - Provide instructions
  - Create a survey to find out what you need to know
- You can prepare more than one
  - But only one at a time will be given out

Next Time

- Next Times: Testing Lab
- Can load a user test for your project
  - http://bdognom-v2.cs.brown.edu:5002
  - Lesson on creating or defining a user test