Security Challenge and Testing

- What were you doing in the security challenge
  - Seeing if you could break other’s web sites
  - Seeing if you could break your web site
  - Fixing your code and having it checked again
- Coming up with scripts that try to break it
  - Scripts that can be reused
Testing

• When looking at security and privacy
  • We keep asking “what can go wrong”
  • What happens if a user does \( x \) when \( y \)
• You want to do this in general for your application
  • To make sure it will work
  • To make sure it will keep working
  • To eliminate potential problems
What is Testing?

- The process of running software in order to find bugs
  - Not to show that bugs are not there
  - What is the difference?
- A successful test case is one that finds a bug
- Good testers (QA) are people who
  - Can sit in front of software and break it
  - Are in the frame of mind where you want to break things
  - Are TAs grading homework assignments
- Testing won’t show what’s right, just what isn’t wrong
Regression Testing

• Testing software once is not very useful
  • You might make it work for some case then
  • But what if the software changes
  • Did you test the right case?
• Regression tests
  • Tests that are run each time the system changes
  • Rerun after each change to ensure no regression
• Test cases are permanent, not throw-away
  • How to do this for web tests?
Testing Web Applications

- You should test your web applications
  - Lots of tools and techniques exist
    - Both commercial and open source
- Testing should be done at all levels
- Testing should be considered from the start
  - Plan a test database, test users, test data, ... to facilitate
  - Have a separate server running for test purposes
  - Design the application to facilitate testing
- We’ve been doing this to some extent throughout the course
Testing Your Projects

• You will be expected to test your projects
  • Have a test plan
  • Test continuously (not just once)
• We will have two testing labs next week to get you going
  • Each person will be responsible for testing some aspects of the project in the lab
  • With continuing responsibilities until the final hand-in
• As we cover different testing methods
  • Think about how they affect your project
Question

What is **not** the purview of web site testing:

A. HTML, CSS, and Script validity
B. Determining if the SQL schema is correct
C. Vulnerability to security attacks such as XSS
D. Universal usability
E. Determining how the web application handles a large user load
What Can Be Tested

- Usability (Universal Accessibility testing)
- Front end: HTML, CSS, Links
- Back end: unit test the node.js/php/python/...
- Application testing (front + back end)
- Compatibility testing
- Performance testing
- Stress (load) testing
- Security testing
Front End Testing

- Are the HTML and CSS correct?
  - What happens if they aren’t?
- Can the site be crawled by search engines?
- Are the links correct (and active)
- Are the forms correct?
  - Are values validated correctly
  - Are default values correct
  - What happens to incorrect inputs
- Cookie testing
  - Does the application work without cookies
  - Are cookies encrypted correctly
  - Do sessions expire correctly
Front End Testing

- HTML validation
  - W3C HTML validation service (http://validator.w3.org)
- Link checkers
  - W3C HTML validation (http://validator.w3.org/checklink)
- CSS validation
  - W3C CSS validation (http://jigsaw.w3.org/css-validator)
User (Usability) Testing

- Test the effectiveness of the user interface
  - What is liked or disliked (subjective)
  - Speed and ease of use
  - What errors are made (and the error rate)
- How understandable is the interface
  - What instructions/help is required, what is obvious
- Is the content logical and easy to follow
  - Consistency of navigation and presentation
  - Spelling errors, colors and fonts, English
- Universal usability testing
  - Accessibility testing
  - Internationalization testing
Doing Usability Testing

• **User studies**
  • Watching users use the site (video taping for analysis)
  • Surveys or polls after use
  • Determining what information is needed

• **Log studies**
  • What are the navigation paths? What are the common operations? How are key pages reached?
  • Detecting errors from the logs
  • Timings
  • Using Google Analytics and similar tools

• **Tools and External Sources**
  • [http://www.youtube.com/watch?v=uLyWxXNDNbI](http://www.youtube.com/watch?v=uLyWxXNDNbI)
  • [http://www.youtube.com/watch?v=xLIBe6VWmrY](http://www.youtube.com/watch?v=xLIBe6VWmrY)
Usability Testing Tools

• UserTesting
  • http://info.usertesting.com/EduDemo.html

• Usage
  • Develop a well-thought out test first
    • What you want the user to do
    • What questions you want to ask
    • What questions you want answered
  • Sign up: https://www.usertesting.com/users/sign_up?client=true
  • Choose ORDER a TEST
  • Select no more than 3 participants
  • Use code U-BU9 in lieu of payment
A/B User Testing

• Once you have a system working
  • Want to test possible modifications
• Randomly choose a subset of your users
  • Give them the new interface
  • Give different subsets different new interfaces
  • Be consistent
• Measure effectiveness, usability, etc.
Compatibility Testing

• Browser compatibility
  • IE, Firefox, Mozilla, Safari, Opera, Chrome, ...
  • Different versions of each
  • Testing: browsershots.org
  • Testing: on-site testing

• OS Compatibility
  • What might be OS-dependent

• Mobile Compatibility
  • iPhone, Android, Blackberry, other phones
  • Different versions of each
Printing Testing

- Do the pages print correctly
  - Fonts, alignment
  - Size, layout
  - What prints, what doesn’t (frames)
- Printing from different browsers
- Printing to different types of printers
- International printing
Front End Functional Testing

• Test the JavaScript in the front end
  • Unit testing (test functions individually)

• Tools
  • Qunit, Jasmine
  • Introduction and examples: http://qunitjs.com/intro/
  • Testing tools for jQuery
  • Several other JavaScript testing frameworks exist
Back End Functional Testing

- Are requests handled correctly?
  - Are the proper pages generated
  - Are the proper actions taken
- Depends on technology used in the back end
  - Simulate front end calls through function calls
  - Tools depend on language
- Closest to standard software testing
- Tools:
  - PHP: SimpleTest
  - Python/Django: PyUnit
  - Node (Jasmine, node-unit, Expresso, mocha + chai, nemo, ...)
    - See: [http://jasmine.github.io/2.4/introduction.html](http://jasmine.github.io/2.4/introduction.html)
    - See: [http://developer.android.com/training/testing/ui-testing/espresso-testing.html](http://developer.android.com/training/testing/ui-testing/espresso-testing.html)
Interface Testing

- **What are the interfaces**
  - Web page <-> web server
  - Web server <-> database
  - Web server <-> user server

- **Check the interactions between these servers**
  - Do they do the right thing
  - Are inputs validated properly
  - Are errors handled properly
  - Is validation and security correct
  - What happens if the user interrupts a transaction
  - What happens if the web connection is reset
  - What happens if the user clicks twice

- Testing the server code through its interfaces
Interface 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**
  • Test cases with visual input and output
    • Why is this difficult?
  • Examples [https://www.youtube.com/watch?v=pWLa1kxakOs](https://www.youtube.com/watch?v=pWLa1kxakOs)
  • Tutorial: [https://www.youtube.com/watch?v=rrVHoYBknGo](https://www.youtube.com/watch?v=rrVHoYBknGo)
  • Overview: [https://www.youtube.com/watch?v=01jFl8KrEMY](https://www.youtube.com/watch?v=01jFl8KrEMY)

• **Selenium**
  • Next time
Next Time

- Testing web sites
- Homework:
  - Make sure your web site is ready for testing
    - What should this entail
    - What do you need to do
    - Prelab for Wednesday