Testing Web-based Applications

Analyzing and reproducing errors in a Web environment - Hung Q. Nguyen

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What is a web-based application?

- Is accessed via a web browser over a network such as the internet or an intranet.
- Depends on a common web browser in order to be executed.
- Could also be a computer software application hosted in a browser-controlled environment (Ex: a Java applet) or coded in a browser-supported language (Ex: JavaScript, or a combo of JS with HTML).

Examples...

- Webmail
- Online retail sales
- Online auctions
- Wikis
- ……

Testing Web-based Applications

Why do we do it?...

- To discover failures in the required services or functionality
- To verify the conformance of the application behavior with specified requirements

What does it involve?...

- Testing:
  - Functionality
  - Configuration
  - Compatibility
  - Performance
  - Usability
  - Security

What's the difference?...

- Errors seen can be caused by various parts of the system like:
  - Environments
  - Interfaces between environment & app
  - Settings
  - Configurations
  - Servers
  - Browsers
- Or by factors like:
  - The number of users trying to access the app concurrently

Which is why...

- We need to:
  - Figure out which factor caused the error
  - Or, even decide if it's an error, or a side-effect?

What do we need to focus on?

1. Is it an error or its symptom?
2. Is it environment dependent?
3. Is it in the code or in the configuration?
4. Which layer is it in? Client? Server? Or Network?
5. Is the operating environment static? Or Dynamic?

1

Is it an error or its symptom???

What does that mean?!

- When we see an error on the client side, we need to decide if it's an error or if it is something that we consider to be an error, but has a workaround, or something else??
- For example:
  - Rash vs. Chicken Pox
  - Symptom (when JS is disabled) vs. Error (when JS is enabled)

2

Is the error environment dependent?

What in the ~~world~~ environment?!

- Operating System
- Browser Type / Version
- Database Server
- Web Server
- Traffic
- Add-on Components
- Third Party Components
- Server / Client Resources
- Network Bandwidth

What in the ~~world~~ environment?!

- Lets take OPERATING SYSTEMS as an example...
- Reasons why...
- New technologies used in web development such as:
  - Graphics Designs
  - Interface Calls
- may not be available in all Operating Systems…

To depend, or not to depend??

- A bug is considered environment dependent if it can be replicated using the exact sequence of activities and environmental conditions.
- Ex: Bandwidth -- Login failure due to time-out in the authentication process...
- A bug is considered environment independent or *functionality specific* if it can be replicated in a variety of operating environments.

3...

Is it in the code or in the configuration?

Whose fault is it???

- If an issue can be resolved by editing the code, that means that the error is real, and can be fixed by debugging the code.
- If an issue is caused because the installation program failed to programmatically configure the Web server, it is considered a SOFTWARE error.
- If a system administrator fails to properly configure the web server according to specification, it becomes a USER error

4...

Which layer is it in?

Client?

Server?

Network?

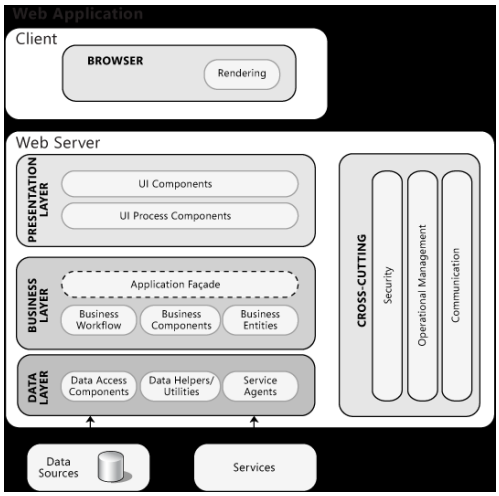
What's a client???

- A client...
  - Doesn't share any of its resources.
  - Requests a server's content or service function.
  - Initiates communication sessions with servers which wait for incoming requests.
- Typically, PCs with network software applications installed that request and receive information over the network, are clients.

How is it related to the server???

- The relation between a client and its server is called a network.
- Basically they are connected for the purpose of communication.

Layers.....



So, which layer is it?!?!?

- Typical client/server configuration and compatibility issues involve:
  - Hardware and operating system mix. Ex: UNIX-based boxes versus Windows based boxes
  - Software mix on the server side. Ex: Web server packages, database server packages, firewalls, COM objects, CORBA objects, etc.
  - Software mix on the client side. Ex: TCP/IP stacks, dialer software, helper components, browser brands, and browser versions, etc.

5...

Is the operating environment

STATIC???

DYNAMIC???

What's a STATIC Operating Environment???

- One in which incompatibility issues may exist irrespective of variable conditions like:
  - Processing Speed
  - Available Memory

STATIC Environment-Related Issues???

- Compatibility issues due to:
  - Browser types
  - Browser versions
  - Operating Systems
- Configuration issues due to:
  - Server software and hardware set-ups
  - Browser settings
  - Network Connections
  - TCP-IP Stack set-ups

Two Possible Physical Configurations...

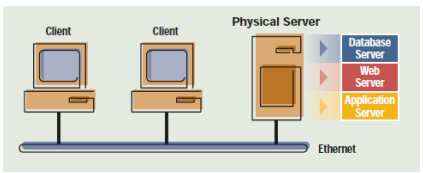


FIGURE 1 Web server, application server, and database server in one box

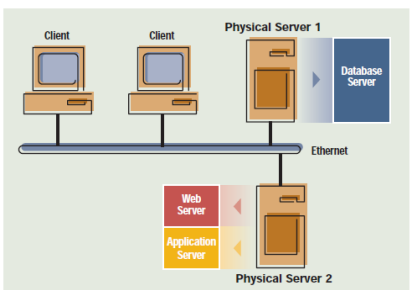


FIGURE 2 Web server and application server in one box; database server in another box

- Conditions?
  - File in the Web Server is trying to access a file in the database server.
  - Database Server is in one box.
  - Web and Application Server are in another box.
- Result?
  - CONFIGURATION ERROR!

What's a DYNAMIC Operating Environment???

- One in which components that are normally compatible show errors due to conditions like:
  - Network latency
  - RAM unavailability
  - Lack of disk space

Why???

- Diffusion of Internet
- Demand of Web-based applications
- More and more strict requirements of reliability, usability, inter-operability and security
- Market Pressure...
- Short time-to-market
- Diversity of the errors } Bugs / Defects / Issues / Problems / Failures / Mutations of these...