Wireless Security Lab & OpenBTS

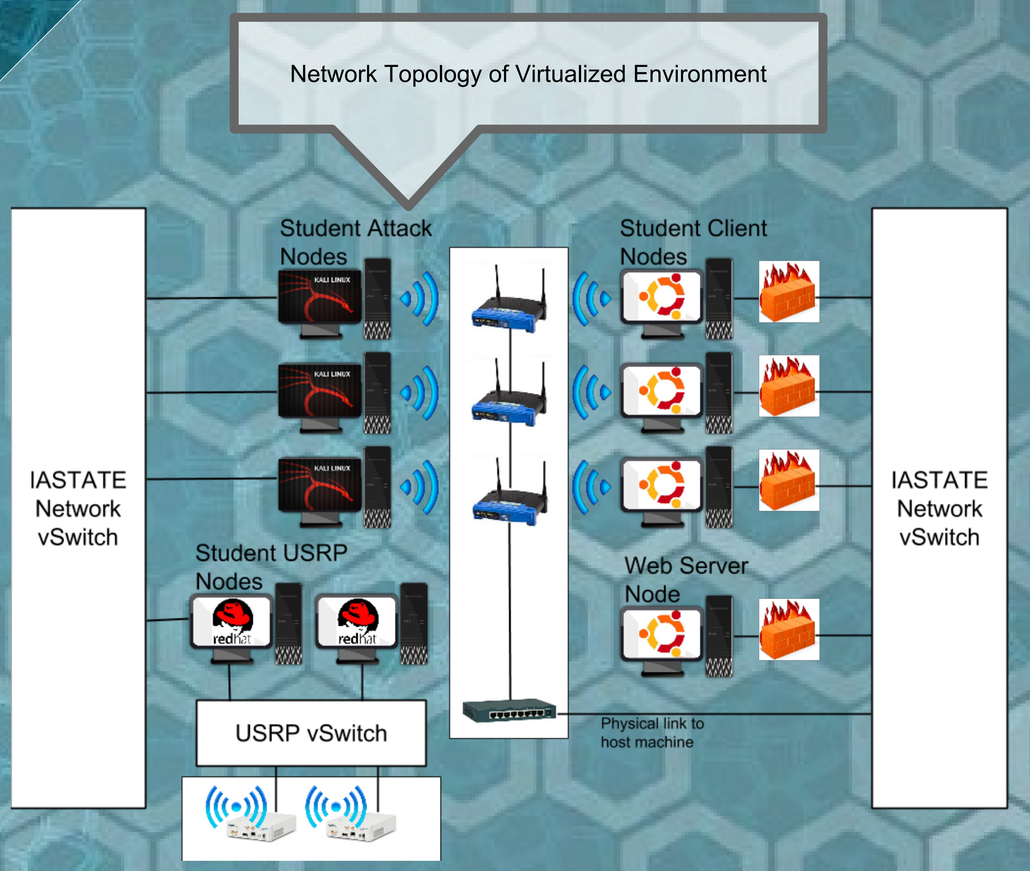
Dec 13-14

Introduction

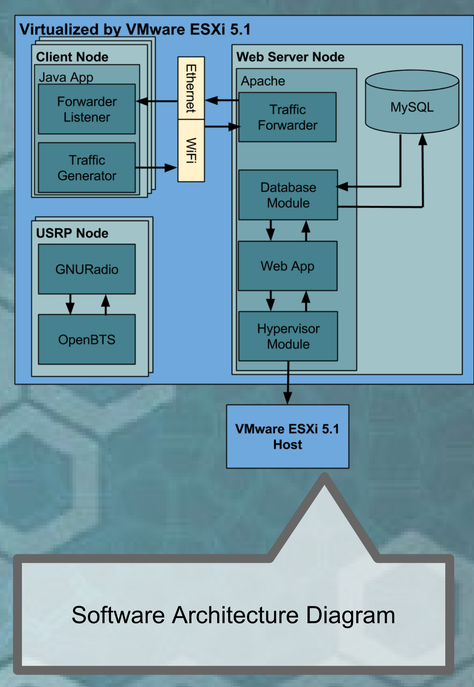
The purpose of this project is to provide students enrolled in Computer Engineering 537: Wireless Network Security at Iowa State University with an environment in which they can carry out various experiments involving different wireless communication protocols.

Our goal is to build a sandbox style environment capable of supporting four simultaneous users with the tools and hardware needed to carry out a multitude of different experiments, and make this environment accessible from anywhere in the world to support the needs of both on and off-campus users.

OpenBTS (Open Base Transceiver Station) is an open source software allowing a USRP (Universal Software Radio Peripheral) to act as a GSM (Global System for Mobile Communications) network access point. The end goal for the hardware portion of the project is to make a phone call through the USRP.



Network Topology of Virtualized Environment



Software Architecture Diagram

Requirements

Functional

- ❏ The system consists of a web server, OpenBTS client, and attack/defend clients shall be made functional.
- ❏ The system shall be remotely accessible.
- ❏ The system shall implement a functioning OpenBTS sub-system using the USRP as communication hardware.

Non-functional

- ❏ Design actions shall be taken to prevent end-user students from breaking the law by any means of illicit activity.
- ❏ System shall conform to any and all operational and environmental requirements and regulations.
- ❏ Overall system user experience shall not be learning prohibitive.

Summary

Problem Statement

- ❏ Students may find it difficult to construct an environment for wireless security experiments
- ❏ Results in inability to expand knowledge or temptation to run exploits unlawfully against a public network

Solution

- ❏ Design and build a website to automate the process of setting up laboratory environments
- ❏ Implement the necessary software to apply OpenBTS on the USRP

Operating environment

- ❏ Individual with internet access
- ❏ Operating system with Mac OS X, Windows, and Linux

Intended users and uses:
Students enrolled in CprE 537 for laboratory exercises

Approach

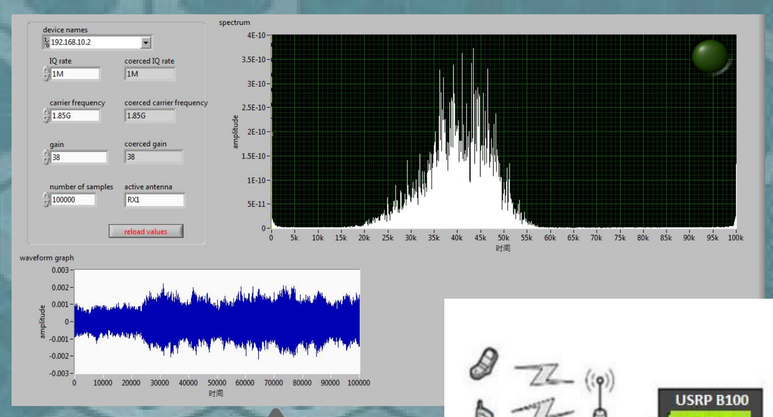
- ❏ All nodes will be allocated through a website interface
- ❏ VMware ESXi 5.1 hypervisor will allocate virtual machines
- ❏ Client Nodes running Ubuntu will send information to routers
- ❏ Attack Nodes running Kali Linux will be able to view/intercept signals
- ❏ USRP Nodes running Windows 7 will have LabVIEW for signal information viewing
- ❏ Network will be contained behind a firewall, only allowing traffic through internal virtual network

Technologies Considered

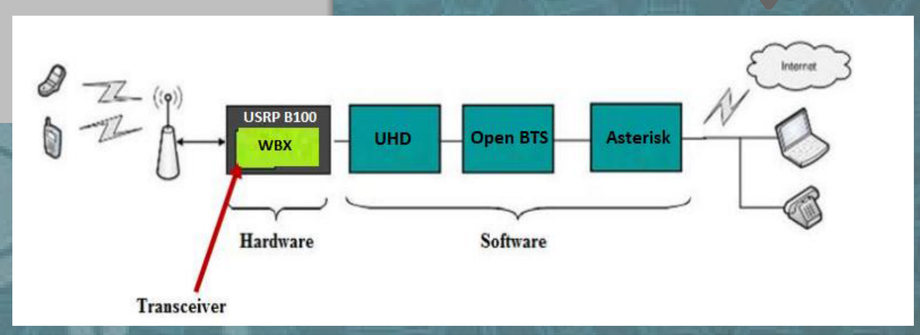
- ❏ Virtual Machine Managers
- ❏ Operating Systems
- ❏ Front-end and Back-end Implementations

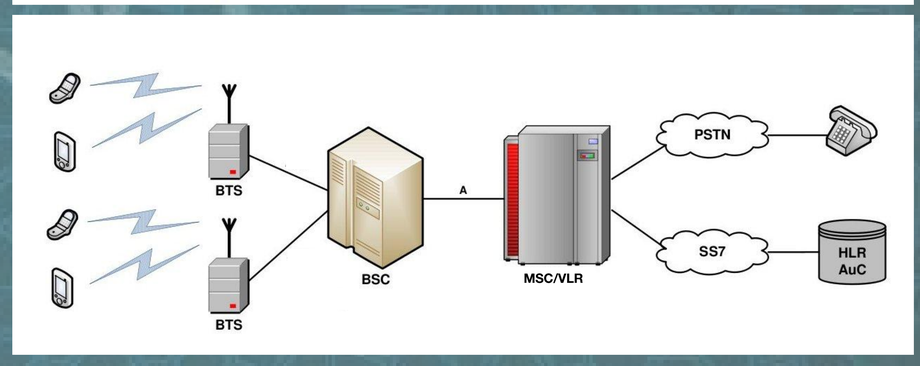
Testing Considerations

- ❏ Functional Verification User Testing
- ❏ System Infrastructure Testing
- ❏ System Integration Testing



Observing the GSM Spectrum with LabVIEW and USRP





OpenBTS GSM Network Architecture (Top), and Traditional GSM Network Architecture (Bottom)

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