Teaching Network Security Using VITAL

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CISSE 2012

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Network Security at NYU-Poly

- Graduate Level *Network Security*
- Mixed class
  - Full-time and Part-time student
  - Novice and Professionals
  - Both traditional classroom and all virtual instruction

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What is VITAL?

- Virtual InformaTion Assurance Laboratory (VITAL)
  - also goes by *Virtual Lab* or *VLAB*
- Designed around classroom
  - started when other virtualization options where limited
  - not around server room like VMWare or MS Hyper-V
  - not around research like DETER or GENI
- NSF funded
  - Xen-based
  - open source from front to back

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Student Background

- Highly Varied
- Limited time spent on basics
  - not *just* because we are mean

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Teaching Offensive Attacks

- Hands-on experience is critical
- Need a safe place to play

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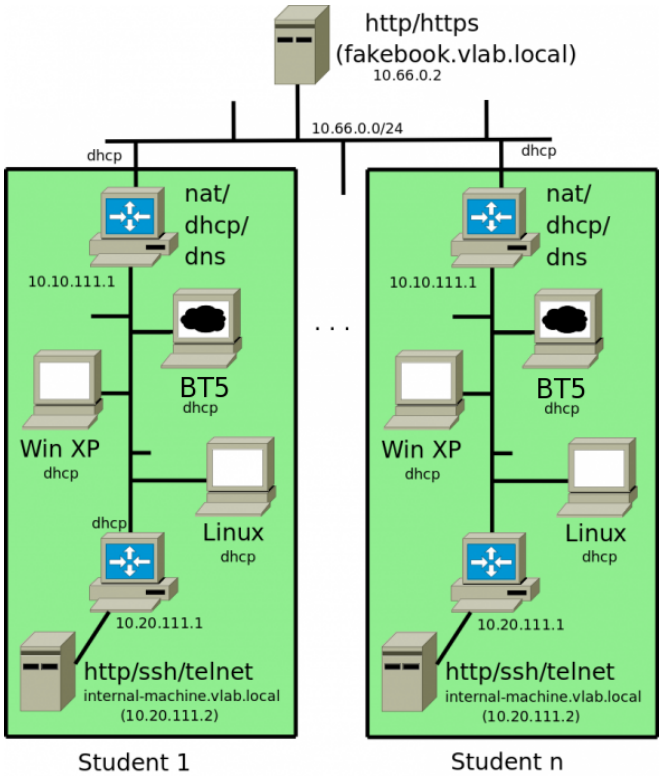
Labs

- Standard Student Network



Labs

- 8 Labs (10 hours each)
- first 4 labs focus on *Network Attack Methodology*
  1. Recon / Information Gather
  2. Scanning / Enumeration
  3. Vulnerability Identification
  4. Exploitation
  5. Post Exploitation / Keeping Access
  6. Covering Tracks

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Lab – Recon, Scanning, and Identification

- Use Backtrack 5 (nmap, Nessus, etc)
- Start to *Think like an Attacker*

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Lab – Exploitation

- Achieve remote shell
- Most will use pre-built *Metasploit* modules

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Lab – Rootkits, and Hiding

- Attack Windows XP
- Use *HackerDefender* as example rootkit

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Labs

- Last 4 labs discuss defensive technologies
- Firewalling
- IPsec / SSL
  - still focus on hands-on experience
  - use *SSLStrip* to MITM

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Why Opensource?

- Flexibility – we needed it
  - Utilize existing tools (Munin, iftop, tcpdump, etc...)
  - Ease of development

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Goals of VITAL

Overarching goals of the VITAL project are:

- Facilitate the adoption by different institutions
- Easy for faculty from different institutions to add hands-on components to their courses
- Enrich student experience in cyber security
- Attract more students to cyber security

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Goals of VITAL

Platform needed the following properties:

- Easy to install, maintain with minimal hardware
- Open source allowing users to extend its functionality
- Bundled with a set of prepackaged assignments
- Allows a community of users to contribute assignments

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VITAL Architecture

Three main components:

- Controller – Handles the processing of all management operations for the VMs (eg. start, stop, restore).
- Gateway – Provides users web access to VM consoles, using VNC, while isolating access from the internet.
- Xen Nodes – Cluster of servers used to provide virtualization service.

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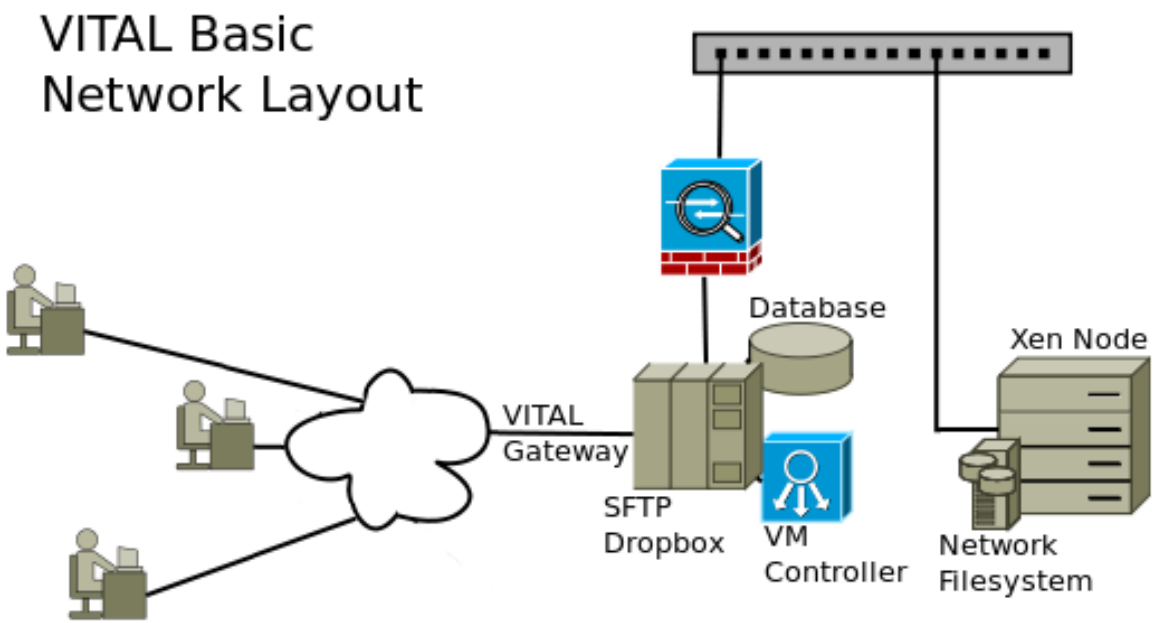
Basic Layout



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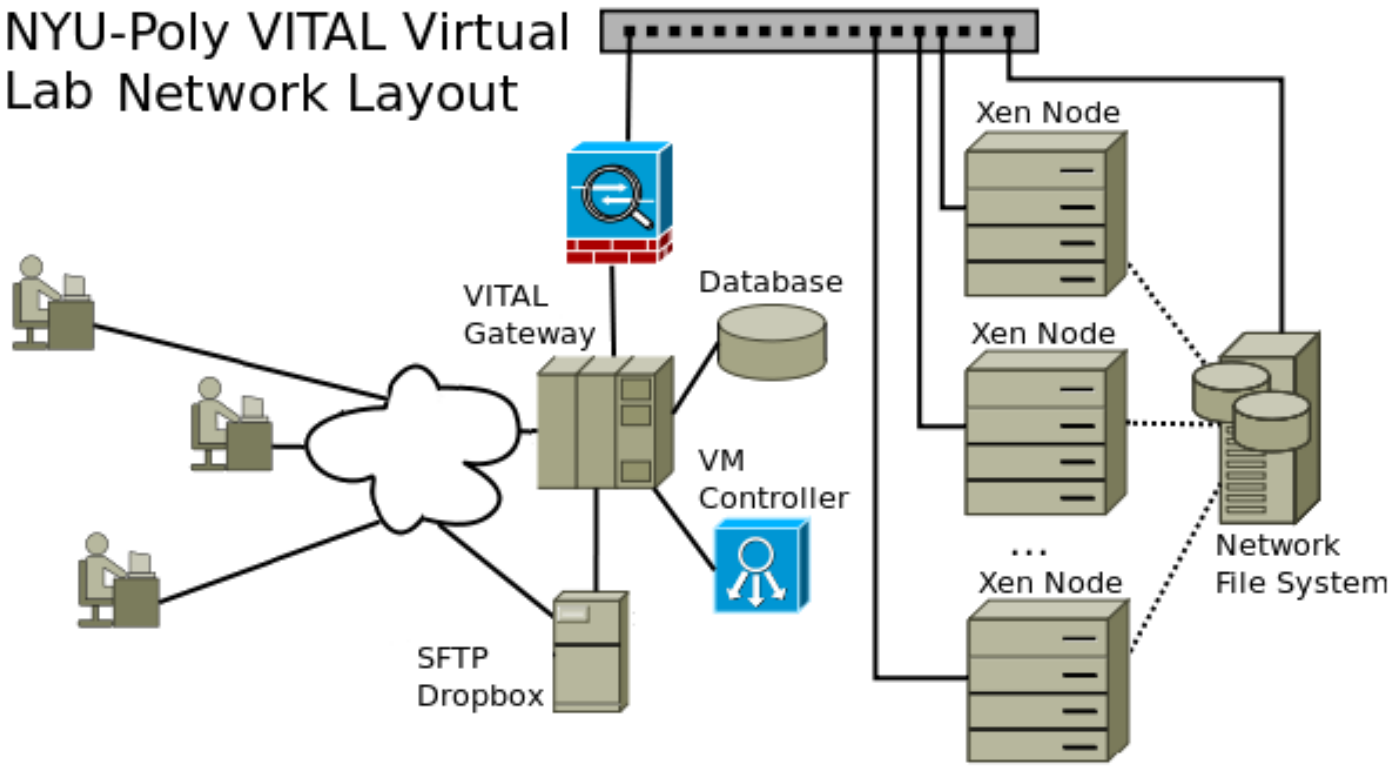
NYU-Poly Layout



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Future Work

- Expand online resources
- Move from Xen 3.x to 4.x
- HTML 5 VNC interface

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Summary

- Hands-on exercises are critical
- A safe environment is needed
- Download and contribute
  - Lessons, documentation, and downloads
  - `https://vital.poly.edu/release/`

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