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# Firewalls: A Balance Between Security and Accessibility

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# Firewalls: A Balance Between Security and Accessibility

Nathan Ecker

Professor Nicholas Rosasco, DSc (Advisor); Jason Kellerman, Director of IT Infrastructure (Supervisor)

## Abstract

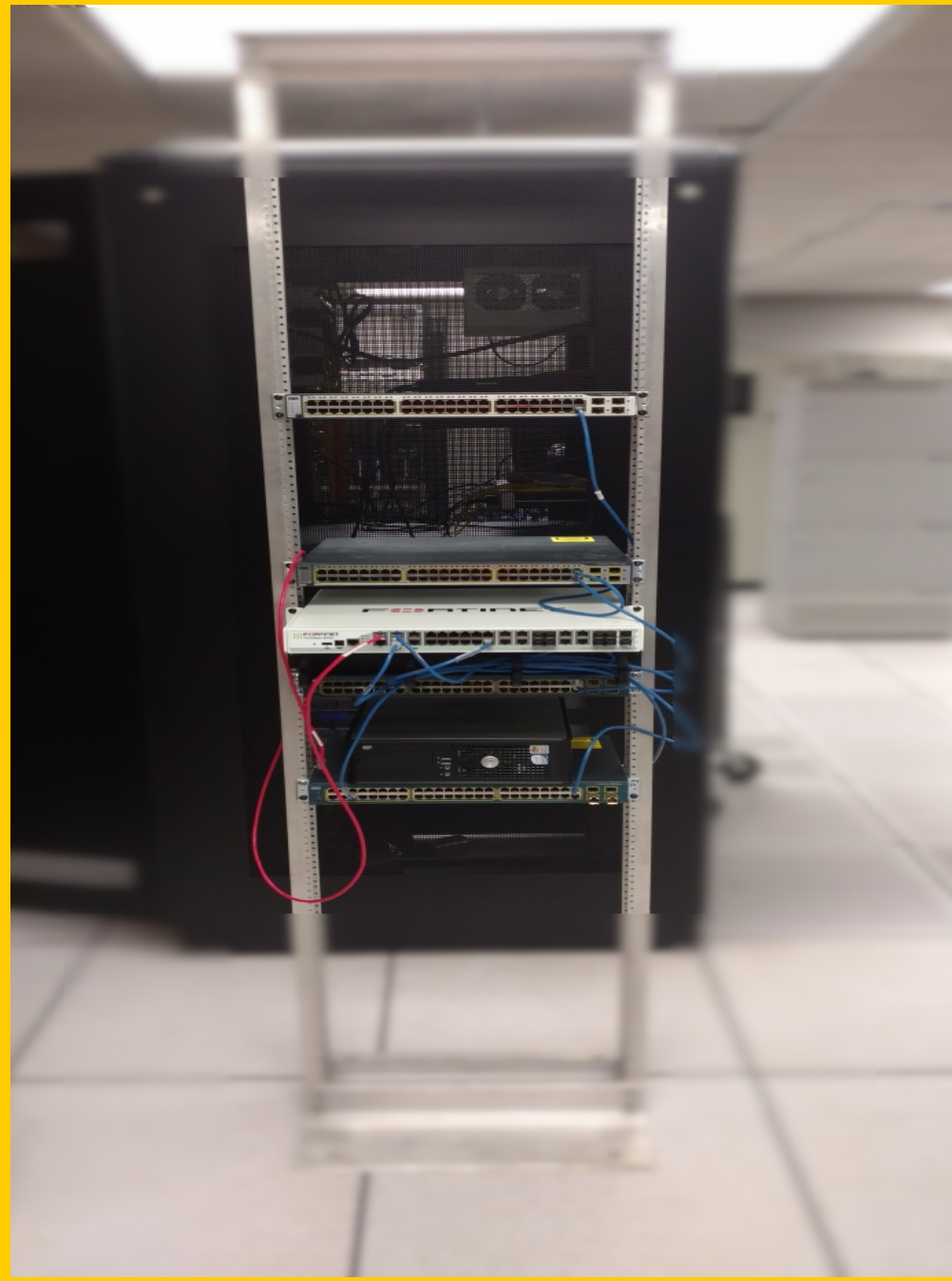
Access control lists and firewall rules are intended to prevent access to certain resources on a computer network while allowing access to other resources. Access control lists determine who has access to resources while firewall rules prevent general access to resources. The goal of this research is to find the best way to optimize a campus internet connection as well as a balance between the application of rules and lists and the accessibility of the outside world. This research is done utilizing a simulated internet and local network environment. The environment utilized simulates the set-up currently in use by an educational institution and will serve as a test environment upon completion of my research.

## Background

At any college or university, network and data security is a major concern. The goal of this research was to identify rules and policies which should be considered for implementation in a university environment. By building a test environment utilizing a (Cisco 3750) BGP ISP router, a (Cisco 3750) BGP local router, a (Fortigate 800c) firewall, a (Cisco 3560) core switch, and a (Cisco 3560) DMZ switch, I am able to simulate a university's network design, similar to that of Valparaiso University. The goal of this simulation is to have an environment in which rules, access control lists, and routing protocols may be tested in a simulated environment before allowing them to run on the production environment.

## System Set-Up & Testing

### The Test Rack



The test rack was assembled in the Kretzmann IT Data Center, utilizing retired components of our network infrastructure. This gives the test environment a comparable structure to that of the actual network infrastructure. The test environment is then kept isolated from any current equipment by keeping it offline. A simulated network is created utilizing multiple routers, switches, and a web server machine.

### What is a Firewall?

A firewall is a network security system that monitors and controls incoming and outgoing network traffic based on predetermined security rules. It is the metaphorical moat surrounding the digital castle of your networked devices.

### What is a Rule?

A rule is a policy which either allows or disallows access to certain resources.

### Test Scenario 2

Rule to Allow HTTPS traffic to specific servers  
Advantages: Preventing access to unauthorized resources while providing necessary access to authorized resources

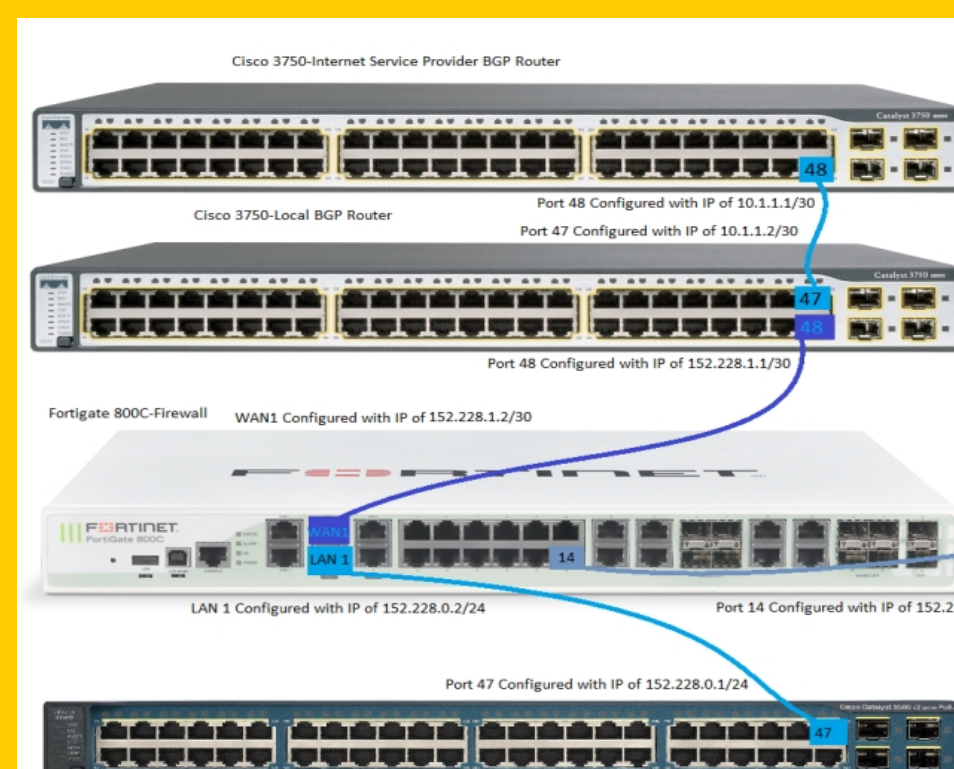
### Test Scenario 1

Rule to Disallow SMTP traffic on port 25  
Advantages: Prevent IP blacklisting by external mail providers

### Test Scenario 3

Rule to Allow SSH traffic to specific servers  
Advantages: Preventing access to unauthorized resources while providing necessary access to authorized resources

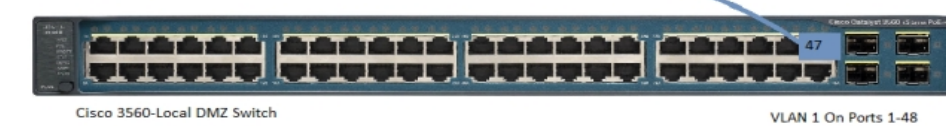
### The Network Design



The top Cisco 3750 on the rack simulates a BGP router which would normally be located on the ISPs premises.

The next Cisco 3750 on the rack simulates a BGP router which would be located on your premises to handle the communication with the BGP router at your ISP.

The Fortigate 800c firewall is where the testing of access control lists and firewall rules takes place. This is the "virtual moat" around the university's digital castle.



The next Cisco 3560 on the rack is the switch that provides access to the DMZ for any of your customer facing devices. Anything which your customers will access including webservers, ftp servers, or ssh servers should be placed in the

The top Cisco 3560 on the rack is the core switch of your local network which will be protected by your firewall and provide routing and access for all of the VLANs and devices on your local

## Challenges

- Test environment must be isolated from the Internet.
- Test environment must be isolated from current systems.
- Testing environment utilizes retired firewall without a support contract.

## Future Use

The test environment can be utilized in the future for not only firewall rule and access control list testing but also for testing of various routing protocols and configurations. The test environment could be utilized by the infrastructure department of the information technology office or by a department of the university.

## Acknowledgements

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