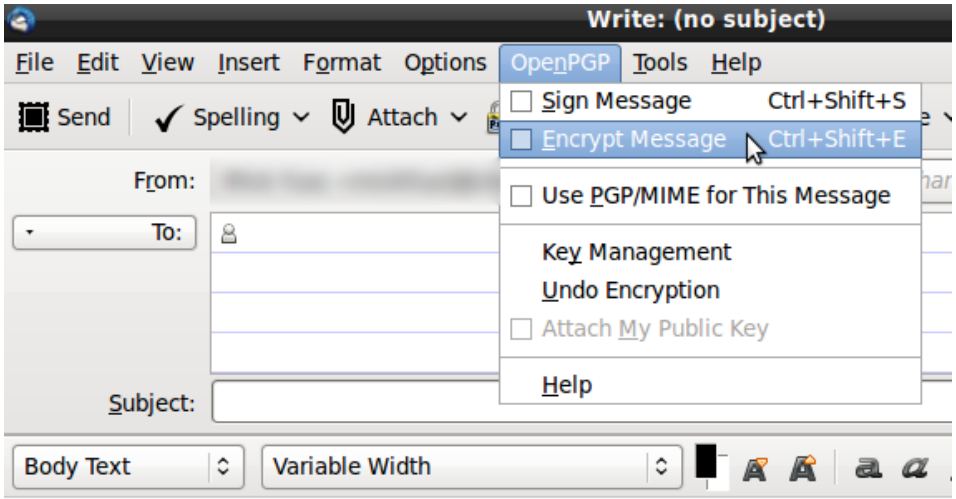
Final Project Topics

General Requirement

- You need to make sure that you can manage the technology used in the project
  - E.g., Linux system administration, browser extension programming
  - This is a challenge you need to address in the project
- Sources of information
  - Search engine is your friend
    - Tutorial and samples of a technology
  - Software and system manual pages

Topic 1: Email Security

- GnuPG provides mechanism for email signing and encryption
  - https://www.gnupg.org/documentation/
  - Key pair creation, management, trust, signing and encryption
- It can be integrated into email clients, such as Thunderbird
  - Enigmail extension of Thunderbird

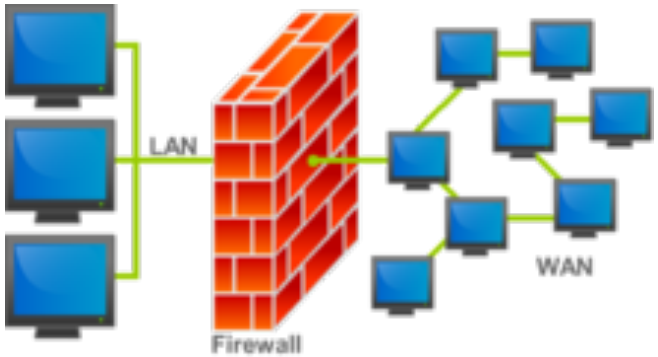


Topic 1: Tasks

- Understand the flow of messages in email secured by GnuPG
  - How do Thunderbird and the gpg program interact to sign and encrypt email? How is a user's public key and private key used?
- Configure GnuPG and Thunderbird in a virtual machine
  - Demonstrate that you can sign and encrypt emails
- (Bonus credit) Implement a browser extension (Chrome or Firefox) to enable GnuPG encryption and signing in web mail
- Report

Topic 2: Firewall

- Linux firewall is based on the Netfilter architecture
  - http://www.netfilter.org/
  - It defines locations, called chains, to enforce firewall rules
  - Chains: INPUT, OUTPUT, FORWARD, etc
- Linux firewall can be managed by the iptables command
  - It interacts with the netfilter component in the kernel to implement firewall rules



Topic 2: Tasks

- Understand the Netfilter concept
- Learn to use the iptables command
- Design an enterprise environment with various servers (e.g., mail sever, web server, etc.), and specify a set of firewall rules to secure it
  - Demonstrate it on a virtual-machine-based network
- (Bonus credit) Write your own Linux kernel module to control Netfilter, so that you will no longer need the iptables command
- Report

Topic 3: Spam detection based on deep learning

- We receive spam emails everyday
  - Select a set of spam emails from your inbox, and a set of normal emails
- Design a learning-based solution to detect spam emails
  - Example learning tools: Google Tensorflow

Topic 3: Tasks

- Understand the concept of learning-based solutions
- Select and configure the learning tool
- Generate models for detection
- Measure the accuracy and effectiveness
  - Prepare the training and testing set
  - You can ask your classmate to test your implementation using the spam emails they receive
- Report