Aalto University
School of Science

T-110.5102 Laboratory Works in Networking and Security

Course Arrangements
10.9.2013 Otaniemi

Course Personnel

Responsible teacher: **Miika Komu**

Assistants: **Tuomas Penttilä**
Markus Palonen
Kimmo Ahokas
Juho Haarnoja

Use T-110.5102@list.aalto.fi to contact the course staff!

Material and Contact Information

Course material and news:

http://noppa.aalto.fi/noppa/kurssi/t-110.5102/

Course personnel mailing list:

T-110.5102@list.aalto.fi

Official IRC Channel

!dcslabcourses @ IRCNet

Contents of the Course

- **Get your hands dirty!**
  - Try the things that you've learned in practice

- **Learn the basics of:**
  - Configuring, monitoring and diagnosing computer networks and services
  - Configuration and inspection of network security
  - Linux networking and general administration tools

What's new?

- **Router simulator assignment replaced with OpenFlow/SDN assignment**
- **Minor improvements in all assignments**
- **New appointment reservation system**
  - Exact URL to be announced later in Noppa news
- **New virtualization environment**
  - Take your own back ups!
- **If you have completed any of the former lab courses before or have completed some assignments from previous years, contact the course staff for arrangements**

Prerequisites

- **Highly recommended**
  - T-110.4100 Computer networks, or
  - S-38.2188 Communication networks

- **Very useful**
  - Basics of UNIX/Linux system administration
    - *Command line*
    - *System commands*
  - Otherwise more work for you!
  - Next lecture is a brief primer on UNIX basics
    - *During the course, we assume you can do UNIX!*

Enrollment for the Course

Please register for the course in Oodi as soon as possible!

- Even if you are not sure to participate
- You can unregister later
- **Choose which path (or both) you take in Oodi**

If you register later...

- There will be more delay in setting up a virtual machine for you
- You will have less time for the assignments

- **Hard** deadline for course registration is Tue 17.9.
- Do you have a working email address in Oodi (course news)?

Material

- **Google**
- **Various RFCs at the IETF**
- **Linux man pages (man –k keyword)**
- **O'Reilly's Safari books at http://nelliportaali.fi/**
- **Linux documentation page**
- **Debian and Ubuntu resources**
  - *http://debian-handbook.info*
  - *http://wiki.debian.org*
  - *http://www.debian-administration.org*
  - *http://wiki.ubuntu.com*

Assignments

Path A

1. Network tools
2. Email server
3. IPv6
4. Encrypted filesystems
5. Firewall
6. Extra: LDAP

Path B

1. Network tools
2. Web server
3. DNS
4. Network filesystems
5. VPN
6. Extra: OpenFlow

Schedule

Week	Date(s)	Action	Path A	Path B
38	17.9.	Unix lecture		
39	23.-27.9.	Round 1 demos	Network Tools	Network Tools
41	7.-11.10.	Round 2 demos	Email server	Web server
43	21.-25.10.	Exam week		
44	28.10.-1.11	Round 3 demos	IPv6	DNS
46	11.-15.11.	Round 4 demos	Encrypted FS	Network FS
48	25.-29.11.	Round 5 demos	Firewall	VPN
50	9.-13.12.	Extra demos	LDAP	OpenFlow
51	16.-20.12.	Exam week		

- Before each demo week is a reception week to get help and discuss about the assignments

Environment for the Assignments

- **Course provides you with…**
  - Three virtual Ubuntu servers
  - Each virtual machine has 2-3 network interfaces
  - **Do not touch interface eth0**
  - Course personnel will send you accounts by email

- **You are allowed to use your own virtual machines, but…**
  - Bring your laptop to the sessions!
  - Course assistants are not required to help you with the problems with your own virtual machines

Passing the Course

T-110.5102 Laboratory Works in Networking and Security

- Path A: five (5) ECTS
- Path B: five (5) ECTS
- Path A+B: ten (10) ECTS
- 5cr: 1 intro + 4 mandatory assignments (+ 1 extra)
- 10cr: 1 intro + 8 mandatory assignments (+ 1 extra)

- **You have to demostrate each assignment to an assistant to be graded**

Passing the Course 2 of 2

- **First assignment shared between the courses**
  - Completed only once (even if you take two paths)
- **Optional extra assignment**
  - Missed one of the mandatory assignments? Do the extra assignment to pass the course
  - Can be used to increase your total score
  - Extra assignment is mandatory if you're targeting for grade 5
  - If you take two paths (10 cr), choose only a single assignment
- **Points published in Noppa**
  - Each round is graded separately
  - To pass the assignment, you need to get 30% of the points
  - See Noppa for the complete grading information and grade limits
- **Course feedback in December is mandatory**

Demo and Reception Sessions

- **Weekly schedule for demo and reception sessions**
  - Reservation of session times to avoid overlapping
  - Session room at A120 (Playroom) at the CS building
  - Reservation system will be announced in Noppa news
- **Reception session is face-to-face time with assistant**
  - Troubleshoot difficult obstacles with assistant
  - The assistant will not do the exercise for you
  - Ask your questions during the reception week, not demo!
- **Demo sessions**
  - Demonstrate your solution for the assignment face-to-face
  - Do not ask help from the assistant, he asks the questions!
  - Thinking aloud is encouraged!

Frequently asked questions

Can I bring paper notes? Or can I use electronic notes?

- Yes, but you should leave all material you brought to course personnel

Can I script?

- You can, but it is not often useful since you have to explain the script to the assistant

Can I work with a pair?

- Yes, but you will have to demo with your own virtual machines without your pair!

Can I just reuse the work of some other student?

- Zero tolerance; plagiarism will lead to failing of the whole course
- The course personnel will ask you additional questions that they see you understand **what** you were doing and **why**
- **Plagiarism cases are always notified to the department**

First Laboratory Assignment: Network tools

- **Basic UNIX-tools for networking**
  - ip, netstat, dig, ping, traceroute…
- **Configure network interfaces with static addresses**
- **Simple client-server communication with netcat and telnet**
- **Learn the use of man pages!**

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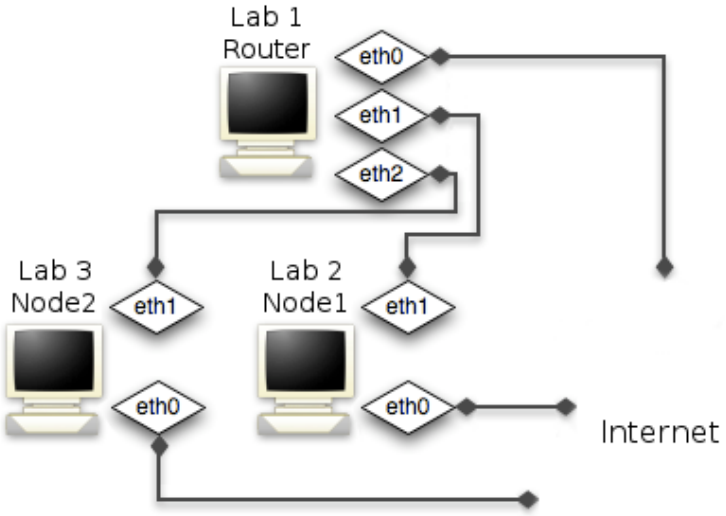
Path A

A2: Email Server

- **Setup an e-mail server**
- **Configure *Postfix***
- **Fight against spam with *procmail* and *spamassassin***
- ***Procmail* used also for non-spam filtering**

A3: IPv6

- **Build a small network with IPv6**
- **Routing with static or advertised routes**
- **Connect to global IPv6 using Teredo tunneling**



A4: Encrypted Filesystems

- **Simulation of encryption of an external memory (such as an USB memory stick)**
- **Two different schemes:**
  - Encrypted loopback device with *dm_crypt*
  - Encryption layer for an existing filesystem with *encFS*
- ***Truecrypt* also used to create a hidden volume inside another encrypted volume → "plausible deniability"**

A5: Firewall

- **Firewalling basics**
- **Packet filtering with *netfilter/iptables***
- ***Squid* as web proxy to control traffic**

Extra A6: LDAP

- **Lightweight Directory Access Protocol**
- **In this assignment LDAP is used for authentication**
  - LDAP is very versatile and can be used for many other things

- **Implement LDAP server**
- **Create database**
- **Setup client**

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Path B

B2: Web server

- ***Apache* configurations**
- **A basic *Node.js* application**
- **Encryption using SSL/HTTPS**
- **Using *nginx* as a reverse proxy**

B3: DNS

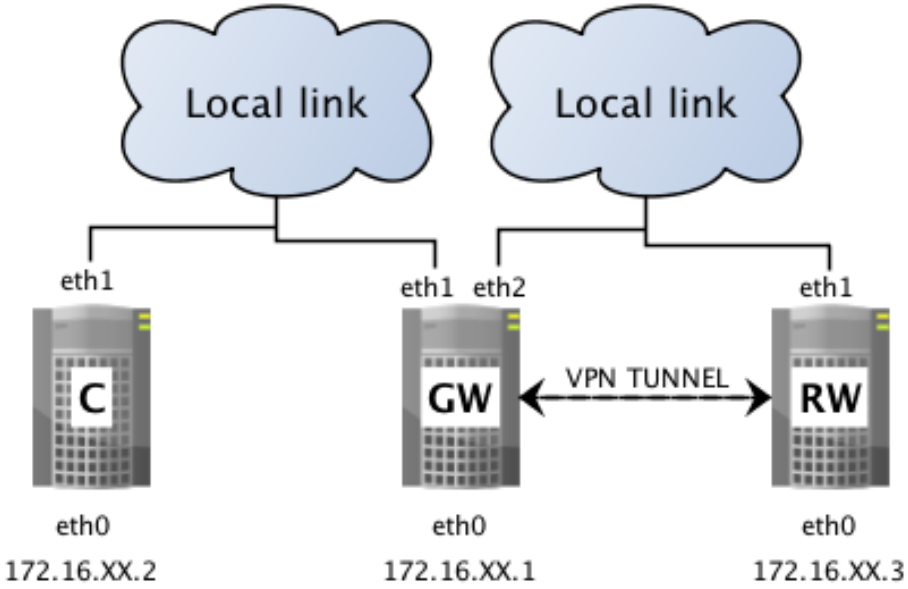
- **Create caching-only name server with *BIND9***
- **Create own DNS domain .insec**
- **Configure subdomains**
- **Secure the server with DNSSEC**

B4: Network Filesystems

- **Setup and compare various network filesystems**
  - NFS
  - Samba
  - sshfs
  - WebDAV

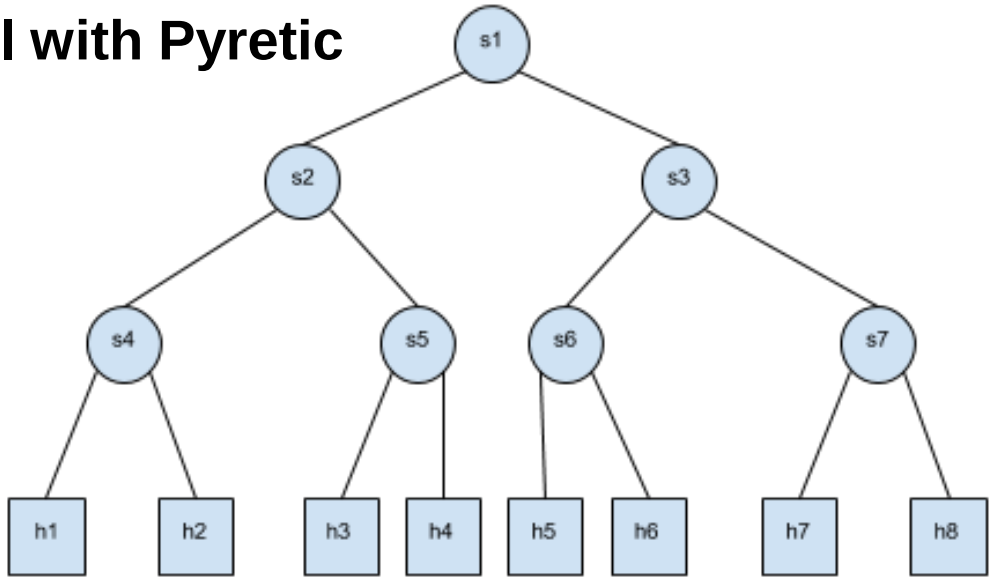
B5: VPN

- **Introduction to Virtual Private Network (VPN) concept**
- **OpenVPN used to establish a host-to-net VPN scenario**



Extra B6: OpenFlow

- Familiarize yourself with OpenFlow basics
- Build custom topologies with Mininet
- Control switches remotely using POX
- Create a Layer-2 firewall with Pyretic



Requires basic knowledge of python programming

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Questions?