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31268 Web Systems

Week 9

Networking and the Internet

Networking and the Internet

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- *Internet infrastructure*
  - *Networks, Hubs, Routers*
  - *TCP/IP*
- *Client Server network interaction*
  - *Two-tier*
  - *Three-tier*
  - *Peer-to-peer*
- *Network services*
  - *Ssh, ftp, http, Web servers, web browsers*

Contents

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1. Network Settings
2. Fiddling with HTTP
3. Examining TCP Ports
4. Binary Vs. Text Files
5. Playing with Email (SMTP)
6. MIME
7. XML and RSS
8. Moving Files Around on the Internet
9. Routing Tools
10. Name Resolution
11. Talking to Windows Machines
12. Rsync and SSH keys

Objectives

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- Use UNIX on the Internet
- Link Theory to Skills
- Understand key Internet tools and technologies, and their relationship with UNIX

A Quick Reminder

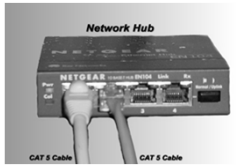
- As with using all UNIX tools:
  - Try the command with --help option
  - Read the man pages
  - Try the info command
  - Use Google
  - Post to the forums
- In that order!!!!

Last session…

- We looked at networks and network devices
  - ?? LAN, WAN, client/server, 3-tier etc
- Now let's look at how to use the network with Unix…
- 1st – need to look at the existing configuration….

Existing Network Settings?

- Use ifconfig – Interface Configuration
- May need to supply full path: /sbin/ifconfig
  - Can always add /sbin to your PATH
- E.g. ifconfig eth0 – gives information on the 1st ethernet interface only
- Use ipconfig for windows



Typical internet applications

- Some applications on Unix are for working with the network
- Eg: Telnet, SSH, web, email, file transfer
- These applications will use IP addresses and TCP ports for their **specific protocol**
- Eg: HTTP uses port 80
- Eg: network time uses port 13
- Eg: Echo uses port 7

Internet Protocols

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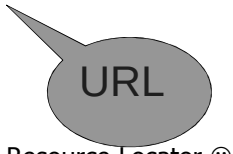
- Every client/server application as a set of
  - 'Commands'
  - and 'Responses'
  - Example: HTTP (web browsing protcol)
  - Eg: type http://www.uts.edu.au into a browser



  - URL = Uniform Resource Locator ☺

Uniform Resource Locator (URL)

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- Uniform Resource Locator (URL) – allows the identification of resources on the Internet
- *See RFC 2396: Uniform Resource Identifiers (URI)*
- http://chris@rerun.it.uts.edu.au:80/ws/index.htm?print=1
- A URL is made up of:
  - Protocol/Scheme
  - Userinfo (optional)
  - Host
  - port (optional)
  - Path (optional)
  - Query (optional)

HTTP protocol

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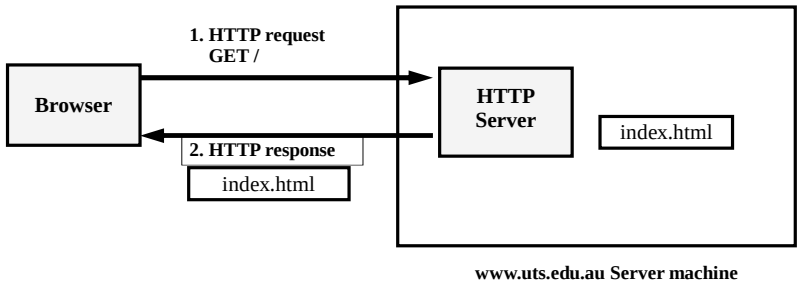
Eg: http://www.uts.edu.au/



HTTP

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- Let's type in http://www.uts.edu.au into a browser
- Browser:
  - Find out what address www.uts.edu.au is:
    - Query the internet name servers:
      - Eg: "nslookup www.uts.edu.au" → 138.25.16.22
  - Connect to 138.25.16.22 at the ***port*** specified by the **protocol** (this is 80)
  - Send the command "GET /"
- **Server**:
  - Find file **index.html** & return it

Telnet

- Allows you to login remotely to other networks on the Internet
- No encryption
  - eg: telnet rerun.it.uts.edu.au
- Runs on port 23
  - You can choose other ports explicitly
  - eg: telnet start.it.uts.edu.au 80
- Use ssh instead if available
  - We'll talk more about this shortly

HTTP

- Text based protocol
- HTML is a mark-up (not programming!) language
  - HTTP is how we get HTML to our machine
  - Web browsers render HTML to give you a pretty page
- wget and wget –r http://www.it.uts.edu.au
  - Retrieve a file or an entire site
- Lynx http://www.it.uts.edu.au
  - Web browser you can use over telnet/ssh
  - Some systems may have 'links' as alternative browser

Talking HTTP

- telnet start.it.uts.edu.au 80

  Now you are connected to a web server through port 80, and you can issue HTTP commands such as:

  GET /index.html HTTP/1.0

- Google experiment
  - telnet www.google.com.au 80

    GET http://www.google.com.au HTTP/1.0

Ports

/etc/services gives a nice listing

ftp-data 20/tcp
ssh 22/tcp
telnet 23/tcp
http 80/tcp
smtp 25/tcp
& heaps more

windows: c:\windows\system32\drivers\etc\services)

SMTP

- Allows for transfer of email between mail servers.
- Used to send mail
  - Not usually for receiving mail
- Runs on port 25
- Consists of 2 parts:
  - MTA: mail transfer agent
    - Uses smtp
    - Sendmail, Exim, etc.
  - MUA: mail user agent
    - Uses POP3, IMAP
- SMTP is a text only protocol

Conversing with a Mail Server

1. telnet marcie.it.uts.edu.au 25
2. HELO it.uts.edu.au
3. MAIL FROM: user@it.uts.edu.au
4. RCPT TO: user@hotmail.com
5. DATA
6. *Then write your message*
7. *. on a line by itself means "all done"*
8. QUIT
9. More Info: http://www.yuki-onna.co.uk/email/smtp.html

Mail box: POP3

- You can retrieve mail remotely
- Mail waits on SMTP server till you retrieve it with POP3
- telnet marcie.it.uts.edu.au 110
  user chw
  pass somepAss
  LIST
- More Info:
- http://pages.prodigy.net/michael_santovec/pop3telnet.htm

mail box: IMAP

- Leaves your mail on the server
- Manipulate email from many clients simultaneously
- The email is edited whilst actually residing on the server
- Port 143

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Character Encoding

- Many disjointed standards
- Intended to allow representation of characters as binary numbers
- ASCII
  - American Standard Code for Information Interchange
  - 7 bits
  - Extended ASCII is 8 bits
  - http://www.lookuptables.com
- Unicode
  - 16 bits
  - Not all character sets mapped
  - http://www.unicode.org/charts/

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Text Vs. Binary

- Files are often grouped in two categories
- Text
  - Bits correspond to ASCII characters
- Binary
  - Bits do not correspond to ASCII characters
  - .doc .mp3 etc.
- To read either type of file, you need the right 'filter'
  - cat understands ASCII
  - xmms and winamp understand mp3
    - Actually, they use a library which does the decoding

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Binary encoding: MIME

Multi-purpose **I**nternet **M**ail **E**xtensions

- Allows for sending of binary data in emails
  - Remember, SMTP is a text only protocol
- gmime-uuencode allows you to encode binary into ASCII (text)
  - Installed on rerun (but not on linuxgym)
- gmime-uudecode *some_file*
  - Check the difference in size of the original file and the encoded output
  - Every 3 bytes is cut into 4 lots of 6 bits, each a simple ASCII character in a byte of its own.
  - Therefore - file is 33% more bytes.
- More Info: http://www.bgamug.org/mime_article.html

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Data encoding: XML

- eXtensible Markup Language
- Share data in a structured way so it can be easily parsed without ambiguity
- XML is meant for sharing data easily
  - Not intended for displaying documents
- Format is similar to HTML – only stricter
  - HTML's lack of strictness can be problematic
  - XHTML has been created to address this issue
- Define your own tags
  - Subject to standard rules
- More Info: http://www.w3schools.com/xml

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SSH

- Secure shell
- Provides encrypted versions of common network utilities
  - ssh
    - Just like encrypted telnet
    - ssh rerun.it.uts.edu.au
  - scp
    - Securely copy files to remote servers
    - scp file1 *user*@rerun.it.uts.edu.au:/home/*user*/file1
  - sftp
    - Just like FTP (discussed on next slide) only encrypted

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FTP

- File Transfer Protocol
  - Allows you to transfer files to and from different machines
- touch testfile.txt
- ftp rerun.it.uts.edu.au (or use sftp for secure version)
  cd public_html
  get index.html
  cd ..
  put testfile.txt
  help
  quit
- http://www.uic.edu/depts/accc/network/ftp/vftp.html

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Why does it look like your rerun files are on Windows?

- Windows uses SMB protocol to share files
- SAMBA is Linux's answer
  - Reverse engineered by an Andrew Tridgell (Australian)
  - Makes a Linux box act like a windows network host
- Ports 137 and 139 (and other ports)
- Supports many other advanced features
- Some features that even windows implementation of SMB doesn't support

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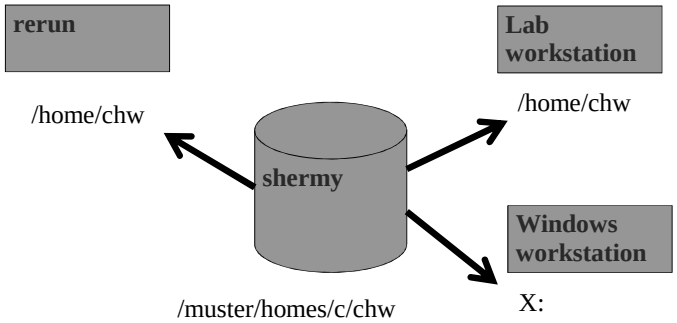
Our configuration



Don't want to remember your password? SSH Keys

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- Use public/private keys to connect to a machine with ssh
  → No need to type your password!
- Nearly all machines support SSH2
- from workstation:
  - ssh-keygen -t dsa
  - scp ~/.ssh/id_dsa.pub rerun.it.uts.edu.au:.ssh/authorized_keys2
  - ssh rerun.it.uts.edu.au

No password!

- More Info: http://www.modwest.com/help/kb20-90.html

Questions

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?

Assignment Peer Marking

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- UTS online > Assignments
- Put mouse on Assignment Peer Marking (Google Form)
  - Open in New Private Window (or Incognito Window)
  - Or open an anonymous/private browsing
  - If you see the following, logoff Google!

    You need permission
    This form can only be viewed by users in the owner's organisation.

  - You should get an UTS AAF federation login:
    - Use your student number and password to login!

Assignment exercise

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- Try judge quickly - 1st 5 minutes counts!
  - Write comments when you think of them on paper
- Only analyse later - when write your comments
- Comments are worth 50% of the peer marking !!!
- No rude or mean comments please!
- Don't forget to Submit - you *MUST* select email yourself