Security introduction

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Main Security Concerns

Confidentiality

Keeping our data safe from prying eyes

Integrity

Protecting our data from loss or unauthorised alteration

Authentication and Authorisation

Is this person who they claim to be?

Is this person allowed to do this?

Availability

Are our systems working when we need them? (Denial of Service, backups, proper configs)

Security Implications of connecting to the Internet

- The Internet lets you connect to millions of hosts
  - but they can also connect to you!
- Many points of access (e.g. telephone, cybercafes, wireless nets, university, work...)
  - Even if you can trace an attack to a point on the Internet, the real source may be untraceable
  - Many "0wned" machines or "bots" from which further attacks are launched
- Your host runs many Internet services
  - Many potential points of vulnerability
  - Many servers run as "root"! (buffer overflows)

Network-based attacks

Passive attacks

e.g. packet sniffers, traffic analysis

Active attacks

e.g. connection hijacking, IP source spoofing, exploitation of weaknesses in IP stack or applications (e.g. Internet Explorer)

Denial of Service attacks

e.g. synflood

Attacks against the network itself

e.g. smurf

Other common attacks

Brute-force and Dictionary attacks (password guessing, password too complex)

Viruses

Spyware

Trojan horses

Humans are often the weakest link

"Hi, this is Bob, what's the root password?"

Opening infected E-mails

Authentication: Passwords

Can be guessed

If too complex, users tend to write them down

If sent unencrypted, can be "sniffed" from the network and re-used (pop, imap, telnet, webmail)

Choosing good passwords

- Combinations of upper and lower-case letters, numbers and symbols
  - 'brute force' attacker has to try many more combinations
- Not in any dictionary, including hackers dictionaries

  $40&yc4f
  "Money for nothing and your chicks for free"

  wsR!vst?
  "workshop students aRe not very sleepy today ?"

Authentication: Source IP address

- Not verified by the network (since not used in datagram delivery)
- Datagrams are easily forged
- TCP 3-way handshake gives some degree of protection, as long as you can't guess TCP sequence numbers
  - Legitimate example: controlling SMTP relaying by source IP address
- Any UDP protocol is completely vulnerable
  - e.g. NFS

Authentication: Host name

Very weak

DNS is easily attacked (e.g. by loading false information into cache)

Slight protection by ensuring that reverse and forward DNS matches

e.g. Connection received from 80.248.72.254
Lookup 80.248.72.254 -> noc.ws.afnog.org
Lookup noc.ws.afnog.org -> 80.248.72.254

This is why many sites won't let you connect unless your forward and reverse matches

Cryptographic methods

Can provide REALLY SECURE solutions to authentication, privacy and integrity

Some are hard to implement, many different tools, usually requires special clients

Export and usage restrictions (less of a problem these days)

Take care to understand where the weaknesses lie

Simple combinations

The lock on your front door can be picked

Two locks are better than one

The thief is more likely to try somewhere else

IP source address AND password authentication

Most applications have password authentication, but some also include their own IP-based access controls

Some applications link to "libwrap" (also known as "tcp wrappers")

- /etc/hosts.allow
- All services which are started by inetd are covered

For info and examples: man 5 hosts_access

Most essential steps

Disable all services which are not needed

Apply security patches promptly; join the announcement mailing lists

Good password management

Take special care with 'root' access

Combine passwords with IP access controls where appropriate

Use cryptographic tools where possible

And don't forget these...

Make sure you have current backups!

- How else will you recover from a break-in?

Make sure your machine is physically secure!

- If someone can walk off with the machine, they can walk off with your data

Log files are valuable!

- May want to consider software which watches them, e.g. swatch, logwatch, logsurfer:
  - tail -f /var/log/messages
- http://www.nsrc.org/security/#logging

More advanced steps

Scan your machines from outside
- nmap, nessus

Firewalls
- apply policy at the network edge
- assert control at a small number of places
- very difficult to build a really GOOD firewall of your own
- not effective if your own users violate security (by downloading viruses, for example)

Intrusion Detection Systems (IDS)

Token-based authentication

UNDERSTAND what you're doing

A bad security solution is worse than no security at all

Know what you're doing

- Read all the documentation
- Read sample configurations
- Build test machines
- Ask questions
- Join the announcements mailing list for your O/S and applications

Test what you've done

- Try connecting from outside your network
- Try circumventing your own rules

Some helpful guides

The FreeBSD handbook at www.freebsd.org

Chapter 14 on security

"Practical Unix & Internet Security" (O'Reilly)

http://nsrc.org/security/

Security alert mailing lists, including:

http://www.securityfocus.com/ ("Bugtraq")
http://www.cert.org/
http://www.rootshell.com/