CE0973a - Issues in Network Security
8: Email Security

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E-mail Security

As well as the general security issues of any service, email presents particular risks:

- Spam
- Phishing
- Interception
- Impersonation

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- SPF
- DKIM/DomainKeys
- DMARC
- Signed Envelope Sender
- Filters

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SPF

Sender Policy Framework – RFC7208

`"v=spf1 ip4:192.0.2.0/24 a -all"`

- Version SPF1
- Mail from that IPv4 address block
- Any host matching this domain name
- Anything else is *definitely* fake, discard it
- (Alternatively, ~would imply *probably* fake)

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Domain-based Message Authentication, Reporting & Conformance – `https://dmarc.org/`

- Feedback/reporting mechanism
- "Report statistics to https://blah.com/dmarc/"
- Gives victims some feedback on impersonation/problems
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Signed Envelope Sender

- Bounce addresses are trivial to fake, so a spammer can cause a lot of backscatter.
- To avoid this, use dynamic senders on real mail – a timestamp or short signature.
- For example, fred-4371438748@example.com and treat any bounce to fred@ as junk.
- Clever, but needs *all* mail to go through such a server.

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Filters

- Simple idea, hard to get right!
- Keywords easy to trick - \/1agr4, “blue pill”...
- More elaborate schemes: Bayes filters, IP reputation
- Always some false negatives, false positives, both bad

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Hard to identify real origin, but `http://www.spamcop.net/` does for free.

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- Tracks spam to origin
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Phishing

- Common problem on low end
- Serious threat at high end: "spear-phishing"
- NSA tried at West Point: 80% click rate![1]
- Serious threat, average $\$1.6m$[2]
- Big business for pen testers

[1] http://searchsecurity.techtarget.com/definition/spear-phishing

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Email interception

- Obvious issue: you have no control over senders
- Nor recipients
- If *both* ends support it, STARTTLS helps[3]
- End-to-end: PGP, S/MIME, policy e.g. sgov.gov
- Easy on recipient end: HTTPS, IMAPS, POP3S
- SMTPS (port 587) for sending with authentication

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End to end email security

- Sign and encrypt using S/MIME or PGP
- Problem: what is fred's key?
- Tricky (PKI v webs of trust)
- Proprietary systems – GroupWise, Notes – solve *internally*, mostly

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Destination protection

- DNS spoofing: "I'm mail.example.com"
- Typos: exmaple.org
- Wrong TLD: microsoft.net
- Username on public systems: billgates v bill.gates

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CIA view

- Confidentiality: encrypt in transit and at rest, protect destination
- Integrity: sign email, DKIM, verify origins
- Availability: DoS protection, spam precautions

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Lab Work

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- Find spam, study origins, run through Spamcop
- Investigate: was it detected? Was the origin protected?

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