Handling unwanted email

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What are the main sources of junk email?

- Spam
  - Unsolicited, bulk email
  - Often fraudulent – penis enlargement, lottery scams, close relatives of African presidents, etc.
  - Low response rate => high volume sent
- Viruses, Trojan horses
  - Infected machine sends out mails without the owner's knowledge
- Malicious bounces
  - These are called ''collateral spam'' or ''Joe-jobs''
  - Junk mail is sent with forged MAIL FROM
  - Accepted by some intermediate MTA, but later it bounces
  - Bounces go to innocent third party

What are the costs?

- Important messages can be accidentally discarded
  - The more junk, the higher the risk
- Wasted time
  - Deleting junk
  - Setting up and maintaining filters
  - Checking discarded mail for false positives
- Wasted bandwidth and disk space
  - Especially for users on modems
  - Viruses and spam attachments can be large
- Annoyance, offence, even fraud

There are no easy answers!

Where can you filter?

- At the end-user hosts
  - ✓ Each client has full control and customization
  - ✓ Distributes the processing cost
  - ✗ Client must still download each message
- On the ISP's mail server
  - ✓ Easier for users
  - ✓ Sometimes can be rejected before receiving the body
  - ✓ Saves disk space on the server
  - ✗ Hard to make flexible for users to customize

The Joe-job problem

- Don't accept a message and then bounce it later
  - If its sender is forged, we are creating a Joe-job
- Much better to reject at RCPT or DATA stages
  - A real MTA sender will create a bounce
  - Spamware will ignore the rejection
- For content filtering, we have to reject at DATA time
  - If there are multiple recipients, that rejects it for all
  - This makes individual opt-in/opt-out difficult
- What about accepting and just discarding junk?
  - Risky because of false positives
  - If a real message is rejected by mistake, nobody knows

Legal problems with filtering

- Some customers may be upset because
  - You are making value judgements on their mail
  - You are looking at the contents
- Make sure your customer contract allows you to do this
- Or allow individual customers to opt in or opt out of filtering
- Filtering is never 100% correct
  - Make sure you are not liable if the filter makes the wrong decision

Viruses in email

- The volume of virus mail is now huge
  - It is amazing how innocent some users are
  - Cambridge University rejects over 80% of the email it is offered
  - See **http://canvas.csi.cam.ac.uk/stats/ppsw/index.html**
  - That excludes spam, which is tagged, not rejected
- Like spam, current viruses have forged senders and headers
- Naive implementation blocks all executable extensions
  - Can block some legitimate messages
  - Some viruses come in *.zip* files
- The only sure test is to use a virus scanner
  - Commercial solutions are expensive, may charge per-user
  - Free solutions such as *clamav* are pretty good
- New viruses are being written all the time
  - Frequent updating of the signatures is important
  - *clamav* can do this automatically

Spam: identifying by source IP address

- As soon as the sending host connects, you know the IP address
- You can check the IP address against ‘‘blacklists’’ in real time
  - Blacklists of IP ranges assigned to known spammers
  - Blacklists of IP addresses of open relays or open proxies
  - Blacklists of IP addresses that have sent spam recently
- There are some public blacklists in the DNS
- Advantages
  - ✓ Easy to configure
  - ✓ DNS lookups are relatively quick and cheap
  - ✓ Somebody else maintains the list
  - ✓ Mail is rejected before the body has been sent
- Disadvantages
  - ✗ Will not catch all spam
  - ✗ Not effective against viruses or collateral spam
  - ✗ The lists come and go (legal threats from spammers)

Which blacklists to use?

- Some are not free
  - e.g. **mail-abuse.com**
- Some are not good
  - Policies are too draconian; you lose mail you want
  - Someone else’s policy may not be good for you
- Try these:
  - **sbl.spamhaus.org** (known spammers)
  - **bl.spamcop.net** (dynamic spam sources)

Spam: identifying by content

- Spammers are sad and predictable
- A human can recognize spam very easily
  But it's harder to do it automatically
- Look for phrases that typically occur in spam
- Look for phrases type typically *do not* occur in spam
  This helps reduce false positives
- The ratio of the two indicates the likelihood of spam
  ... and how sure we are

Disadvantages of content filtering

- Spammers use many tricks to disguise their spam
  MIME base64 encoding, HTML mails, breaking up words, misspelling, etc, etc...
- It is an arms race
  As filters evolve, spammers change what they do
- Computationally expensive
- Liable to false positives
  Unless rules are customized for each user
  This is hard to do for a server-side solution

Whitelists

- Accept mail only from people we already know
  - Effective at blocking spam and some viruses
  - Start-up problem (see next slide)
- Actually, spammers could forge messages so that they appear to come from people we already know
- For now, they don't seem to be collecting information about who we associate with
- But viruses and Trojans often use local address books

Handling mail from people not on the whitelist

- By password: e.g. a magic word in the **Subject:** header
- By content filter: e.g. a low spam score
- By challenge-reponse system
  - Put mail in a hold queue and send back a message
  - If the sender responds, they are whitelisted
- Challenge-response systems are not recommended
  - ✗ Adds to the collateral spam problem
  - ✗ Interacts badly with mailing lists
  - ✗ Some people get very annoyed
  - ✗ Difficult to deploy in a scalable way

Disadvantages of whitelists

- Difficult/annoying for people to contact for the first time
- Difficult for a server-side solution
  - Each user needs a separate list and a way to edit it
  - Automatically whitelisting addresses we send to isn't easy
- Filtering at the MAIL FROM stage is getting harder
  - Envelope sender may differ from **From:** in headers
  - It could even be different for every message someone sends
- Whitelists do not help with collateral spam (joe-jobs)
  - ...because they are bounce messages

Handling unwanted bounce messages

- All bounces have an empty envelope sender
  - `MAIL FROM:<>`
  - Not any use for filtering
- Joe-job bounces are genuine MTA bounce messages
  - ...but for messages that we did not send
  - Content filtering to identify a bounce does not help
- Discarding all bounces is not an option
  - Many users mistype email addresses
  - Mailboxes are often down or over quota
  - The bounce is the only way the user learns of a problem
- Sites that block all bounces are broken
  - There is a DNS black list that records them: **dsn.rfc-ignorant.org**

Associating bounces with messages we sent

- Bounce messages are not standardised in a way that allows this
- Only thing you can rely on is that bounces go to MAIL FROM
- One solution is to rewrite MAIL FROM

```
MAIL FROM:<user=ac7546dc@example.com>
```

- Change the magic value every day or so
- Check that incoming bounces quote a recent value
- If spammers collect the address, it is not valid for long
- Or use a cryptographic ‘‘cookie’’ (very hard to guess)
  - Work is being done to refine these ideas
- This is not a spam solution; it’s a Joe-job solution
  - ...though it does kill spam sent with MAIL FROM:<>

Disadvantages of rewriting MAIL FROM

- Interacts badly with mailing list software and whitelists
  - ...if they look at MAIL FROM rather than the *From:* header
- This could be lessened if there were an agreed standard
  - Several proposals are being discussed
- Your users *must* send outgoing email through your MTA
  - Otherwise the rewriting won’t happen and bounces will be lost
- Generates long local parts
  - RFC2821 requires only 64 characters
- Another possibility is to rewrite the domain instead
  - This gives you up to 255 characters
  - But now there are DNS implications

People are trying to find solutions

- BATV (Bounce Address Tag Validation)
  - A scheme for adding tags to local parts: IETF draft
- CSA (Client SMTP Authorization)
  - DNS lists which machines are permitted to send email
- SPF (Sender Policy Framework)
  - Sender-ID is Microsoft's version of SPF
  - DNS lists which hosts may use which envelope senders
  - Completely breaks email forwarding
  - Claims that it will kill all spam are exaggerations
- Domainkeys (Yahoo!) and Identified Internet Mail (Cisco)
  - Now amalgamated into DKIM (**http://www.dkim.org/**)
  - IETF proposed standard (RFC 4871, May 2007)
  - Digitally sign messages with a per-domain private key
  - The signature is placed in a header

Many options: what should you do?

- Use DNS blacklists
  - Surprisingly effective
  - Very easy to implement
  - Low maintenance
- Consider implementing virus scanning and content filtering
  - Opt-in users agree to let you do this
  - Just tagging spam lets the user decide what to do
- Think about the resource costs
  - These services are expensive to scale and manage
  - Opt-in users pay extra?
- Advise users about client-side spam filters
  - Bayesian filters and whitelists are more easily handled there
  - Find those that work well with your client's software
  - *bogofilter* (**http://bogofilter.sourceforge.net/**) works well for me

Consider outsourcing

- There are companies that will handle the whole thing
  - Example: **www.messagelabs.co.uk**
- Point your MX at their servers
  - They filter for spam and viruses
  - They forward only clean mail to your servers
  - You reject mail from all other servers
- No investment in hardware, software, management, or maintenance
- May be more cost-effective for small organizations