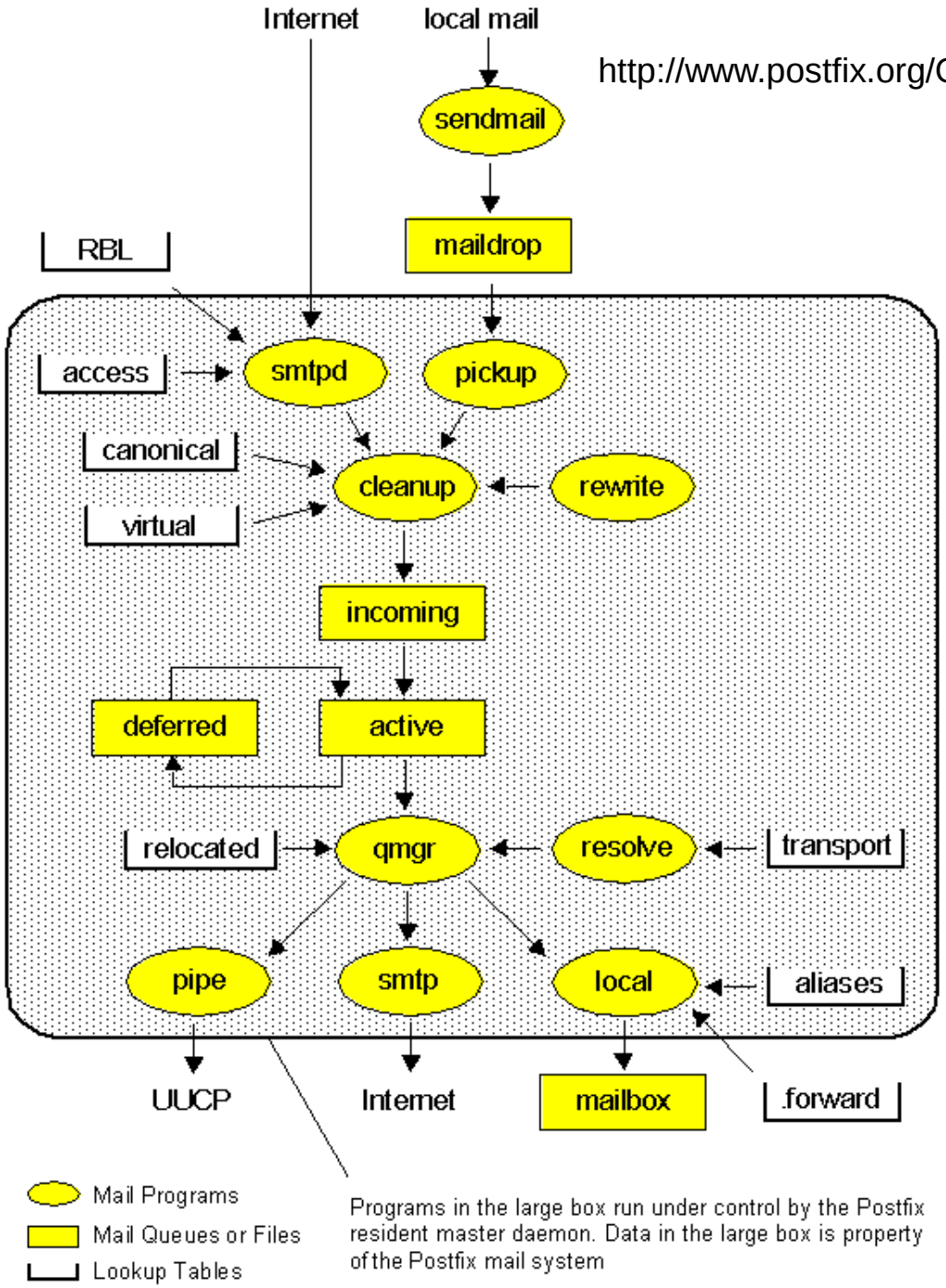
Postfix

Postfix

- Free and open source mail transfer agent (MTA)
  - For the routing and delivery of email
  - Intended as a fast, easy-to-administer, and secure alternative to the widely-used Sendmail
  - Formerly VMailer / IBM Secure Mailer
    - By Wietse Venema at the IBM Thomas J. Watson Research Center
  - IBM Public License
- First released in mid-1999
- http://www.postfix.org
  - http://www.postfix.org/documentation.html

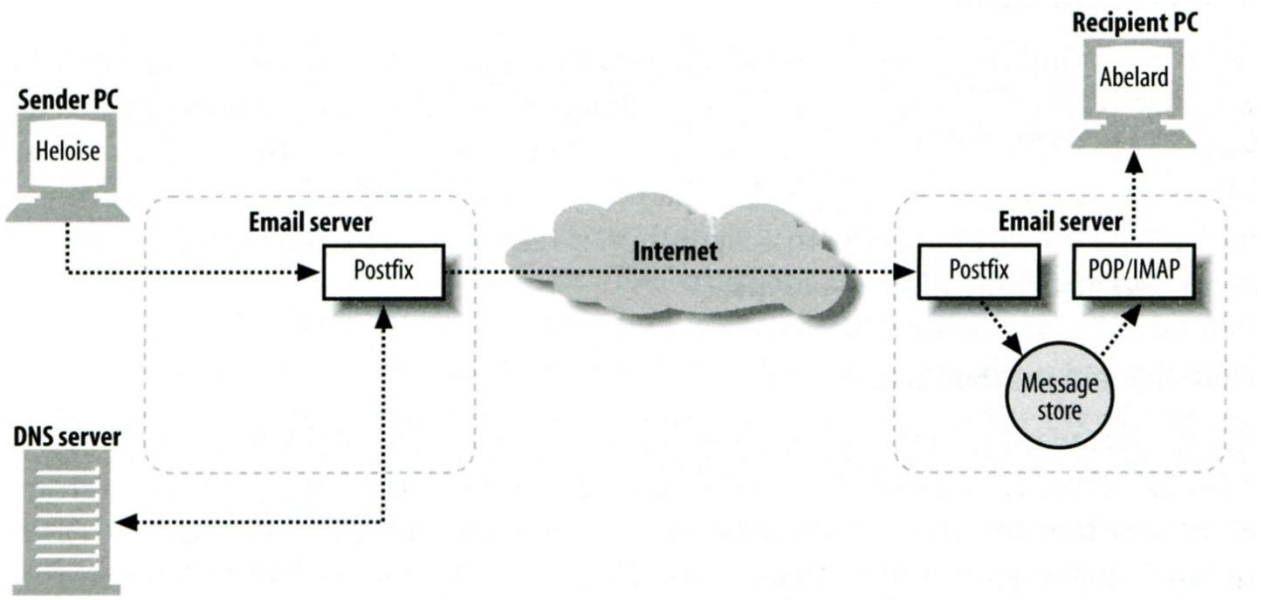
Overview

http://www.postfix.org/OVERVIEW.html



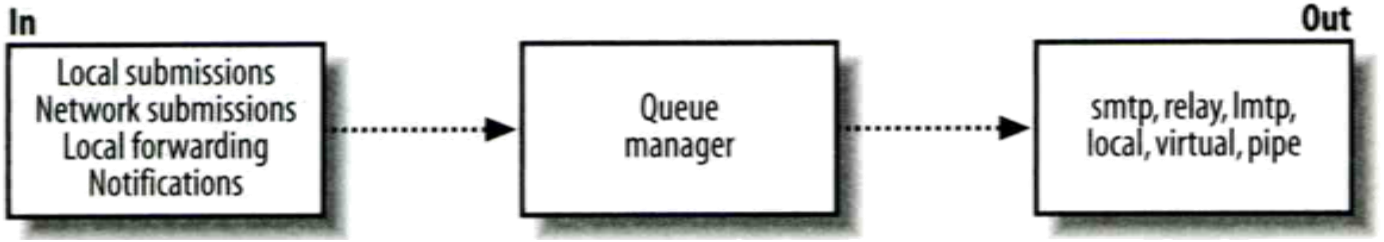
Role of Postfix

- MTA that
  - Receive and deliver email over the network via SMTP
  - Local delivery directly or use other mail delivery agent



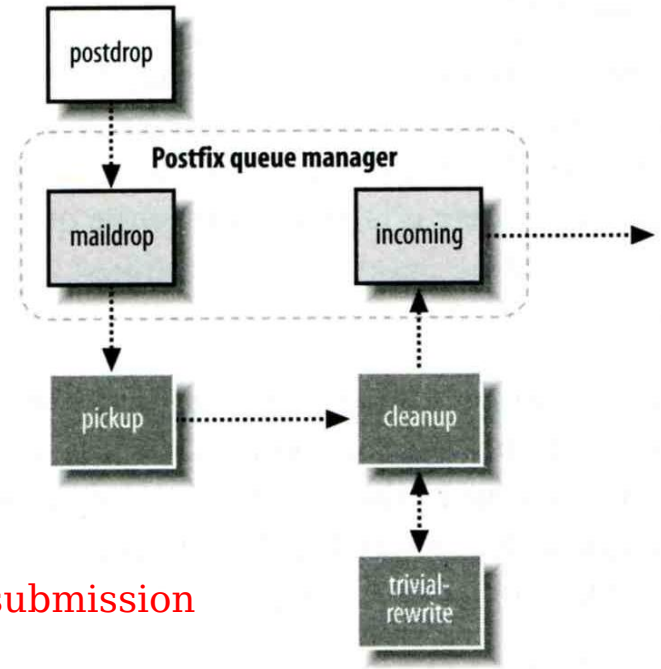
Postfix Architecture

- Modular-design MTA
  - Not like sendmail of monolithic system
  - Decompose into several individual program that each one handle specific task
  - The most important daemon: **`master`** daemon
    - Reside in memory
    - Get configuration information from master.cf and main.cf
    - Invoke other process to do jobs
- Major tasks
  - Receive mail and put in queue
  - Queue management
  - Delivery mail from queue

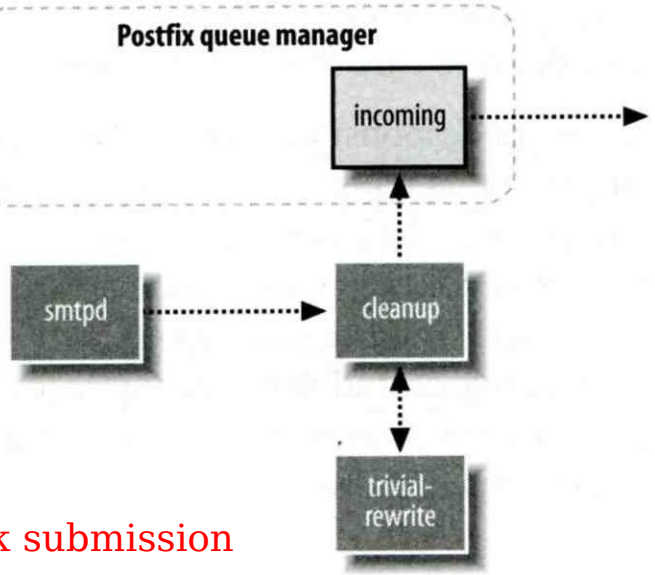


Postfix Architecture – Message IN

- Four ways
  - Local submission
    - postdrop command
    - maildrop directory
    - pickup daemon
    - cleanup daemon
      - Header validation
      - address translation
    - incoming directory
  - Network submission
    - smtpd daemon
  - Local forwarding
    - Resubmit for such as .forward
  - Notification
    - defer daemon
    - bounce daemon



Local submission



Network submission

Postfix Architecture – Queue

- Five different queues
  - incoming
    - The first queue that every incoming email will stay
  - active
    - Queue manager will move message into active queue whenever there is enough system resources
    - Queue manager then invokes suitable DA to delivery it
  - deferred
    - Messages that cannot be delivered are moved here
    - These messages are sent back either with bounce or defer daemons
  - corrupt
    - Used to store damaged or unreadable message
  - hold
    - Define "smtpd" access(5) policies, or cleanup(8) header/body checks to automatically place messages in the "hold" queue
    - Messages placed in the "hold" queue stay there until the administrator intervenes

http://www.postfix.org/QSHAPE_README.html#queues

Postfix Architecture – Message OUT (1)

- Address classes
  - Used to determine which destinations to accept for delivery
  - How the delivery take place
- Main address classes
  - Local delivery
    - Domain names in "mydestination" is local delivered
    - Ex:
      - mydestination = netadm.cs.nctu.edu.tw localhost
    - It will check alias and .forward file to do further delivery
  - Virtual alias
    - Ex:
      - virtual-alias.domain
      - user1@virtual-alias.domain address1
  - Virtual mailbox
    - Each recipient address can have its own mailbox
    - Ex:
      - virtual_mailbox_base = /var/vmail
      - /var/mail/vmail/CSIE, /var/mail/vmail/CS
  - Relay
    - Transfer mail for others to not yours domain
    - It is common for centralize mail architecture to relay trusted domain
  - Deliver mail to other domain for authorized user
    - The queue manager will invoke the smtp DA to deliver this mail

Postfix Architecture – Message OUT (2)

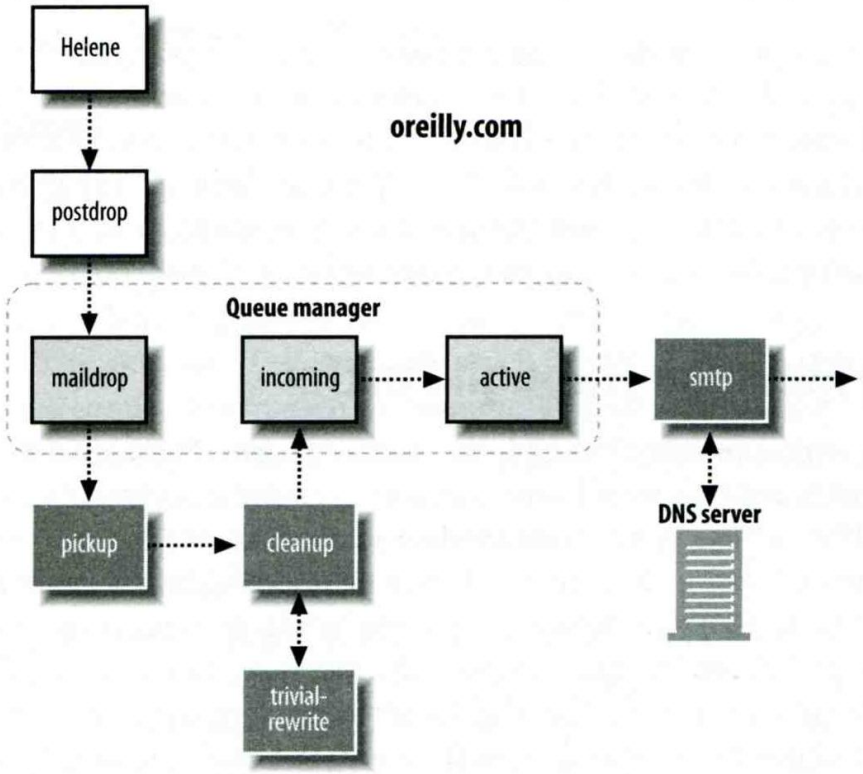
- Other delivery agent (MDA)
  - Specify in /usr/local/etc/postfix/master.cf
    - How a client program connects to a service and what daemon program runs when a service is requested

```
pickup    fifo  n       -       n       60      1       pickup
cleanup   unix  n       -       n       -       0       cleanup
bounce    unix  -       -       n       -       0       bounce
defer     unix  -       -       n       -       0       bounce
smtp      unix  -       -       n       -       -       smtp
relay     unix  -       -       n       -       -       smtp
```

  - lmtp
    - Local Mail Transfer Protocol
    - Used for deliveries between mail systems on the same network even the same host
      - Such as postfix → POP/IMAP to store message in store with POP/IMAP proprietary format
  - pipe
    - Used to deliver message to external program

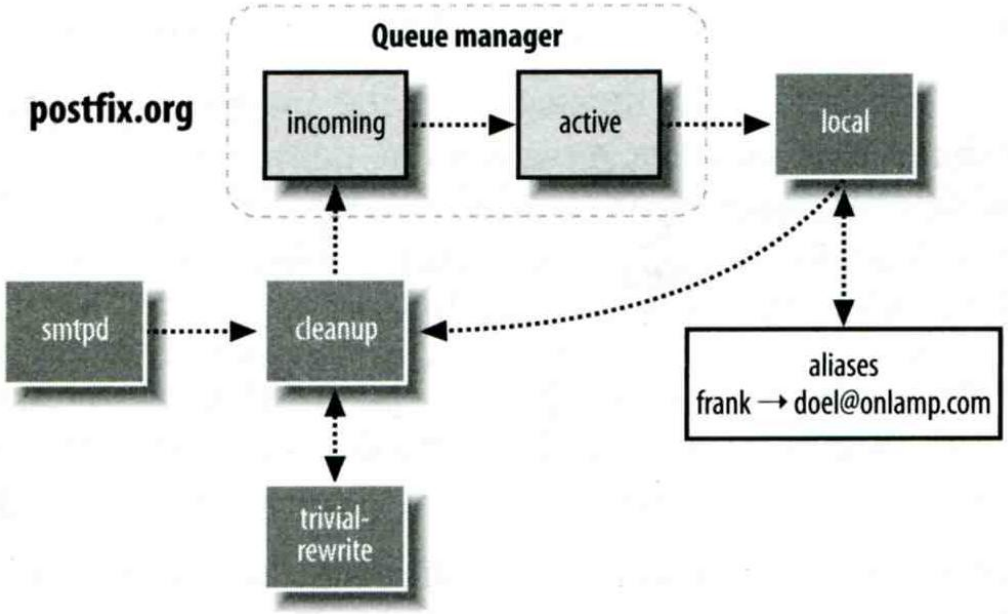
Message Flow in Postfix (1)

- Example
  - helene@oreilly.com → frank@postfix.org (doel@onlamp.com)
  - Phase1:
    - Helene compose mail using her MUA, and then call postfix's sendmail command to send it



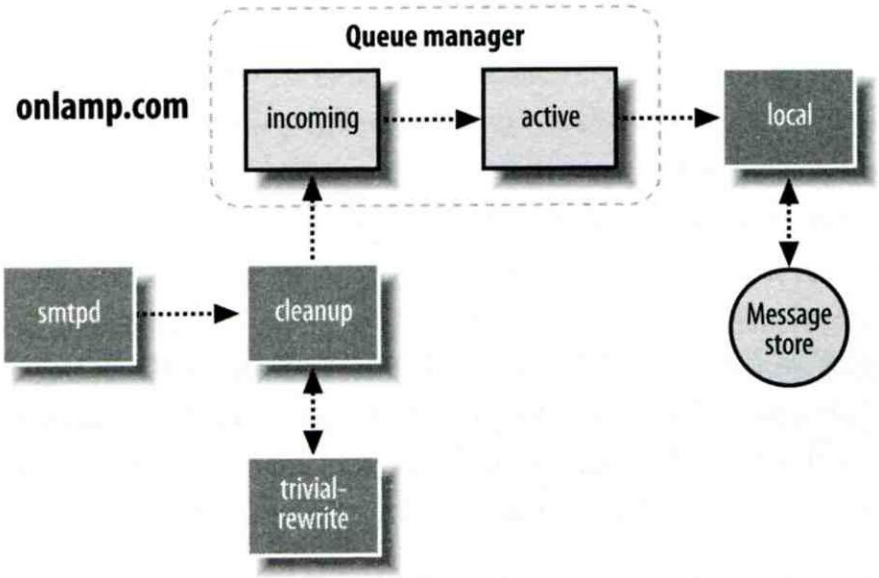
Message Flow in Postfix (2)

- Phase2:
  - The smtpd on postfix.org takes this message and invoke cleanup then put in incoming queue
  - The local DA find that frank is an alias, so it resubmits it through cleanup daemon for further delivery



Message Flow in Postfix (3)

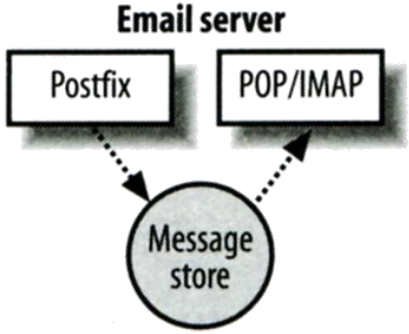
- Phase3
  - The smtpd on onlamp.com takes this message and invoke cleanup then put in incoming queue
  - Local delivery to message store



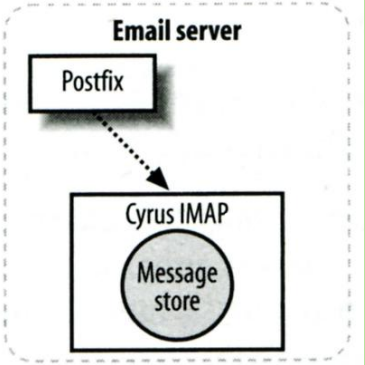
Message Store Format

- The Mbox format
  - Store messages in single file for each user
  - Each message start with “From ” line and continued with message headers and body
  - Mbox format has file-locking problem
- The Maildir format
  - Use structure of directories to store email messages
  - Each message is in its owned file
  - Three subdirectories
    - cur, new and tmp
  - Maildir format has scalability problem
    - Quick in locating and deleting
- Related parameters (in main.cf)
  - mail_spool_directory = /var/spool/mail (Mbox)
  - mail_spool_directory = /var/spool/mail/ (Maildir)

Postfix and POP/IMAP



- POP vs. IMAP
  - Both are used to retrieve mail from server for remote clients
  - POP has to download entire message, while IMAP can download headers only
  - POP can download only single mailbox, while IMAP can let you maintain multiple mailboxes and folders on server
- Cooperation between Postfix and POP/IMAP
  - Postfix and POP/IMAP must agree on the type mailbox format and style of locking
    - Standard message store
    - Unstandard message store (using LMTP)
      - Such as Cyrus IMAP / Dovecot



Postfix Configuration

- Two most important configuration files
  - /usr/local/etc/postfix/main.cf
    - Core configuration
  - /usr/local/etc/postfix/master.cf
    - Which postfix service should invoke which program
- Edit configuration file
  - Using text editor
  - postconf
    - % postconf −e myhostname=netadm.cs.nctu.edu.tw
    - % postconf −d myhostname (print default setting)
    - % postconf myhostname (print current setting)
- Reload postfix whenever there is a change
  - # postfix reload
  - # /usr/local/etc/rc.d/postfix reload

Postfix Configuration – Lookup tables (1)

- Parameters that use external files to store values
  - Such as mydestination, mynetwork, relay_domains
  - Text-based table is ok, but time-consuming when table is large
- Lookup tables syntax
  - Key values
- postmap command
  - % postmap /etc/access
    (generate database)
  - % postmap –q nctu.edu.tw /etc/access
    (query)

Postfix Configuration – Lookup tables (2)

- Database format
  - % postconf –m
    - List all available database format
  - % postconf default_database_type
- Use databased-lookup table in main.cf
  - syntax

    Parameter = type:name
  - Ex:

    check_client_access hash:/etc/access

```
% postconf -m
btree
cidr
environ
hash
pcre
proxy
regexp
static
unix
% postconf default_database_type
default_database_type = hash
```

Postfix Configuration – Lookup tables (3)

- Regular expression tables
  - More flexible for matching keys in lookup tables
  - Two regular expression libraries used in Postfix
    - POSIX extended regular expression (regexp, default)
    - Perl-Compatible regular expression (PCRE)
  - Usage
    - /pattern/ value
    - It is useful to use regular expression tables to do checks, such as
      - header_checks
      - body_checks parameters

Postfix Configuration – system-wide aliases files

- Using aliases in Postfix
  - alias_maps = hash:/etc/aliases
  - alias_maps = hash:/etc/aliases, nis:mail.aliases
  - alias_database = hash:/etc/aliases
    - Tell newaliases command which aliases file to build
- To Build alias database file
  - % postalias /etc/aliases
- Alias file format (same as sendmail)
  - RHS can be
    - Email address, filename, command, :include:
- Alias restriction
  - allow_mail_to_commands = alias, forward
  - allow_mail_to_files = alias, forward

Postfix Configuration – MTA Identity

- Four related parameters
  - myhostname
    - myhostname = netadm.cs.nctu.edu.tw
    - If un-specified, postfix will use ‘hostname’ command
  - mydomain
    - mydomain = cs.nctu.edu.tw
    - If un-specified, postfix use myhostname minus the first component
  - myorigin
    - myorigin = $mydomain (default is myhostname)
    - Used to append unqualified address
  - mydestination
    - List all the domains that postfix should accept for local delivery
    - mydestination = $myhostname, localhost.$mydomain $mydomain
    - mydestination = $myhostname, localhost.$mydomain
      - This is the CSIE situation that mx will route mail to mailgate.csie

Postfix Configuration – Relay Control (1)

- Open relay
  - A mail server that permit anyone to relay mails
  - By default, postfix is not an open relay

- A mail server should
  - Relay mail for trusted user
    - Such as smtp.cs.nctu.edu.tw
  - Relay mail for trusted domain
    - Such as smtp.csie.nctu.edu.tw trust nctu.edu.tw

Postfix Configuration – Relay Control (2)

- Restricting relay access by mynetworks_style
  - mynetworks_style = subnet
    - Allow relaying from other hosts in the same subnet
  - mynetworks_style = host
    - Allow relaying for only local machine
  - mynetworks_style = class
    - Any host in the same class A, B or C
- Restricting relay access by mynetworks
  - List individual IP or subnets in network/netmask notation
  - Ex: in /usr/local/etc/postfix/mynetworks
    - 127.0.0.0/8
    - 140.113.0.0/16
    - 10.113.0.0/16
- Relay depends on what kind of your mail server is
  - smtp.cs.nctu.edu.tw will be different from csmx1.cs.nctu.edu.tw

Postfix Configuration – master.cf (1)

- /usr/local/etc/postfix/master.cf
  - Define what services the master daemon can invoke
  - Each row defines a service
  - Each column contains a specific configuration option

```
# ==========================================================================
# service type  private unpriv  chroot  wakeup  maxproc command + args
#               (yes)   (yes)   (yes)   (never) (100)
# ==========================================================================
smtp      inet  n       -       n       -       -       smtpd
pickup    fifo  n       -       n       60      1       pickup
cleanup   unix  n       -       n       -       0       cleanup
qmgr      fifo  n       -       n       300     1       qmgr
tlsmgr    unix  -       -       n       1000?   1       tlsmgr
rewrite   unix  -       -       n       -       -       trivial-rewrite
bounce    unix  -       -       n       -       0       bounce
flush     unix  n       -       n       1000?   0       flush
127.0.0.1:10025 inet    n       -       n       -       -       smtpd
```

Postfix Configuration – master.cf (2)

- Configuration options
  - Service name and transport type
    - inet
      - Network socket
      - In this type, name can be combination of IP:Port
    - unix and fifo
      - Unix domain socket and named pipe respectively
      - Inter-process communication through file
  - private
    - Access to this component is restricted to the Postfix system
  - unpriv
    - Run with the least amount of privilege required
      - y will run with the account defined in “mail_owner”
      - n will run with root privilege

Postfix Configuration – master.cf (3)

- chroot
  - chroot location is defined in “queue_directory”
- wakeup
  - Periodic wake up to do jobs, such as pickup daemon
- maxproc
  - Number of processes that can be invoked simultaneously
  - Default count is defined in “default_process_limit”
- command + args
  - Default path is defined in “daemon_directory”
  - /usr/libexec/postfix

Postfix Configuration – Receiving limits

- Enforce limits on incoming mail
  - The number of recipients for single delivery
    - smtpd_recipient_limit = 1000
  - Message size
    - message_size_limit = 10240000
  - The number of errors before breaking off communication
    - Postfix keep a counter of errors for each client and increase delay time once there is error
    - smtpd_error_sleep_time = 1s
    - smtpd_soft_error_limit = 10
    - smtpd_hard_error_limit = 20

Postfix Configuration – Rewriting address (1)

- For unqualified address
  - To append “myorigin” to local name.
    - append_at_myorigin = yes
  - To append “mydomain” to address that contain only host.
    - append_dot_mydomain = yes
- Masquerading hostname
  - Hide the names of internal hosts to make all addresses appear as if they come from the mail gateway
  - It is often used in out-going mail gateway
    - masquerade_domains = cs.nctu.edu.tw
    - masquerade_domains = !chairman.cs.nctu.edu.tw cs.nctu.edu.tw
    - masquerade_exceptions = admin, root
  - Rewrite to all envelope and header address excepts envelope recipient address
    - masquerade_class = envelope_sender, header_sender, header_recipient

Postfix Configuration – Rewriting address (2)

- Canonical address
  - Rewrite both header and envelope recursively invoked by cleanup daemon
  - Configuration
    - canonical_maps = hash:/usr/local/etc/postfix/canonical
    - canonical_classes = envelope_sender, envelope_recipient, header_sender, header_recipient
  - /usr/local/etc/postfix/canonical

    lwhsu@cs.nctu.edu.tw lwhsu.netadm@cs.nctu.edu.tw
    lwhsu@cs.nctu.edu.tw lwhsu@netadm.cs.nctu.edu.tw
  - Simlar maps
    - sender_canonical_maps
    - recipient_canonical_maps

Postfix Configuration – Rewriting address (3)

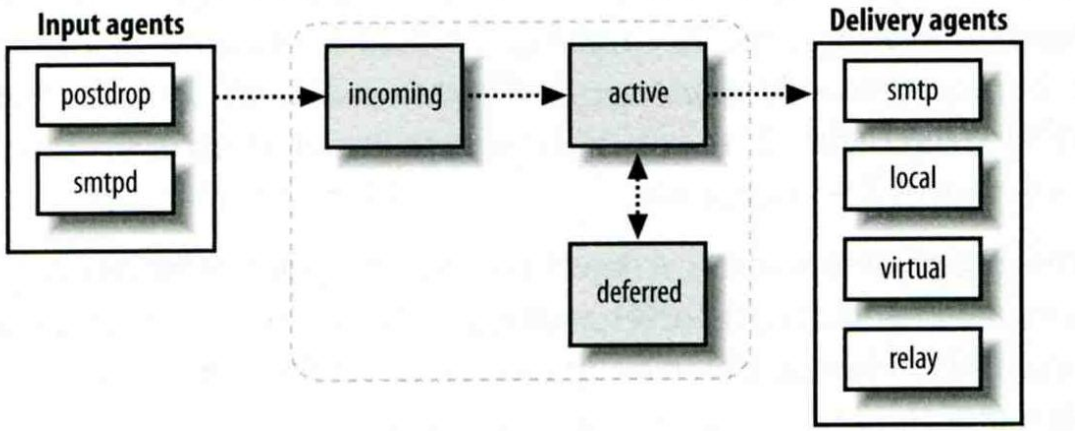
- Relocated users
  - Used to inform sender that the recipient is moved
  - relocated_maps = hash:/usr/local/etc/postfix/relocated
  - Ex:

@sysadm.cs.nctu.edu.tw	netadm.cs.nctu.edu.tw
andy@lwbsd.cs.nctu.edu.tw	andyliu@abc.com

- Unknown users
  - Not local user and not found in maps
  - Default action: reject

Queue Management

- The queue manage daemon
  - qmgr daemon
  - Queue directories (under /var/spool/postfix)
    - active, bounce, corrupt, deferred, hold
- Message movement between queues
  - Temporary problem → deferred queue
  - qmgr takes messages alternatively between incoming and deferred queue to active queue



Queue Management – Queue Scheduling

- Double delay in deferred messages
  - Between
    - minimal_backoff_time = 1000s
    - maximal_backoff_time = 4000s
  - qmgr daemon periodically scan deferred queue for reborn messages
    - queue_run_delay = 1000s
- Deferred → bounce
  - maximal_queue_lifetime = 5d

Queue Management – Message Delivery

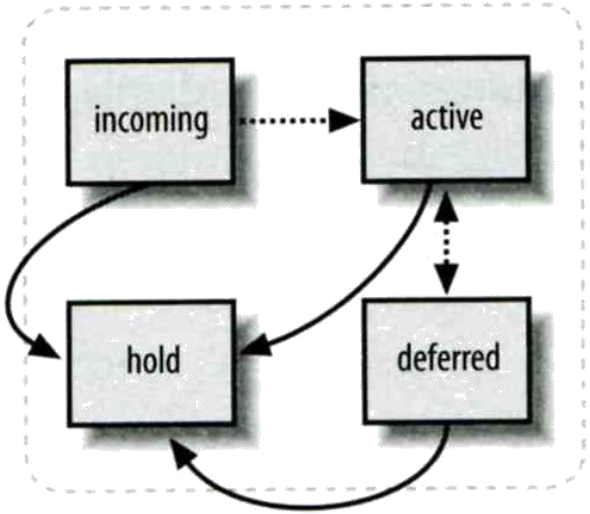
- Controlling outgoing messages
  - When there are lots of messages in queue for the same destination, it should be careful not to overwhelm it
  - If concurrent delivery is success, postfix can increase concurrency between:
    - initial_destination_concurrency = 5
    - default_destination_concurrency_limit = 20
    - Under control by
      - maxproc in /usr/local/etc/postfix/master.cf
      - default_process_limit
    - You can override the default_destination_concurrency_limit for any transport mailer:
      - smtp_destination_concurrency_limit = 25
      - local_destination_concurrency_limit = 10
  - Control how many recipients for a single outgoing message
    - default_destination_recipient_limit = 50
    - You can override it for any transport mailer in the same idea:
      - smtp_destination_recipient_limit = 100

Queue Management – Error Notification

- Sending error messages to administrator
  - Set notify_classes parameter to list error classes that should be generated and sent to administrator
    - Ex: notify_classes = resource, software
  - Error classes

Error Class	Description	Noticed Recipient (all default to postmaster)
bounce	Send headers of bounced mails	bounce_notice_recipient
2bounce	Send undeliverable bounced mails	2boucne_notice_recipient
delay	Send headers of delayed mails	delay_notice_recipient
policy	Send transcript when mail is reject due to anti-spam restrictions	error_notice_recipient
protocol	Send transcript that has SMTP error	error_notice_recipient
resource	Send notice because of resource pro.	error_notice_recipient
software	Send notice because of software pro.	error_notice_recipient

Queue Management – Queue Tools (1)



- postqueue command
  - postqueue –p
    - Generate sendmail mailq output
  - postqueue –f
    - Attempt to deliver all queued mail
  - postqueue –s cs.nctu.edu.tw
    - Schedule immediate delivery of all mail queued for site
- postsuper command
  - postsuper –d DBA3F1A9 (from incoming, active, deferred, hold)
  - postsuper –d ALL
    - Delete queued messages
  - postsuper –h DBA3F1A9 (from incoming, active, deferred)
  - postsuper –h ALL
    - Put messages "on hold" so that no attempt is made to deliver it
  - postsuper –H DBA3F1A9
  - postsuper –H ALL
    - Release messages in hold queue
  - postsuper –r DBA3F1A9
  - postsuper –r ALL
    - Requeue messages into maildrop queue

Queue Management – Queue Tools (2)

- postcat
  - Display the contents of a queue file

```
netadm [/home/lwhsu] -lwhsu- sudo postqueue -p
-Queue ID- --Size-- ----Arrival Time---- -Sender/Recipient-------
DEC003B50E2      344 Tue Apr  8 19:58:37  lwhsu@netadm.cs.nctu.edu.tw
         (connect to lwbsd.cs.nctu.edu.tw[140.113.17.212]: Connection refused)
                                        lwhsu@lwbsd.cs.nctu.edu.tw

-- 0 Kbytes in 1 Request.

netadm [/home/lwhsu] -lwhsu- sudo postcat -q DEC003B50E2
*** ENVELOPE RECORDS deferred/D/DEC003B50E2 ***
message_size:             344             252               1               0             344
message_arrival_time: Tue May  8 19:58:37 2007
create_time: Tue Apr  8 19:58:37 2007
named_attribute: rewrite_context=local
sender_fullname: Li-Wen Hsu
sender: lwhsu@netadm.cs.nctu.edu.tw
original_recipient: lwhsu@lwbsd.cs.nctu.edu.tw
recipient: lwhsu@lwbsd.cs.nctu.edu.tw
*** MESSAGE CONTENTS deferred/D/DEC003B50E2 ***
Received: by netadm.cs.nctu.edu.tw (Postfix, from userid 1001)
 id DEC003B50E2; Tue,  8 May 2007 19:58:37 +0800 (CST)
To: lwhsu@lwbsd.cs.nctu.edu.tw
Subject: Testing Mail
Message-Id: <20070508115837.DEC003B50E2@netadm.cs.nctu.edu.tw>
Date: Tue,  8 Apr 2007 19:58:37 +0800 (CST)
From: lwhsu@netadm.cs.nctu.edu.tw (Tsung-Hsi Weng)

hello
*** HEADER EXTRACTED deferred/D/DEC003B50E2 ***
*** MESSAGE FILE END deferred/D/DEC003B50E2 ***
```

Mail Relaying – Transport Maps (1)

- Transport maps
  - It override default transport types for delivery of messages
  - transport_maps = hash:/usr/local/etc/postfix/transport
  - Ex:

domain_or_address	transport:nexthop
csie.nctu.edu.tw	smtp:[mailgate.csie.nctu.edu.tw]
cs.nctu.edu.tw	smtp:[csmailgate.cs.nctu.edu.tw]
cis.nctu.edu.tw	smtp:[mail.cis.nctu.edu.tw]
example.com	smtp:[192.168.23.56]:20025
orillynet.com	smtp
ora.com	maildrop
kdent@ora.com	error:no mail accepted for kdent

Mail Relaying – Transport Maps (2)

- One usage in transport map
  - Postponing mail relay
    - Such as ISP has to postpone until customer network is online
  - Ex:

    I am an ISP, and I has a mail server that is MX for abc.com

    In /usr/local/etc/postfix/transport
    abc.com ondemand

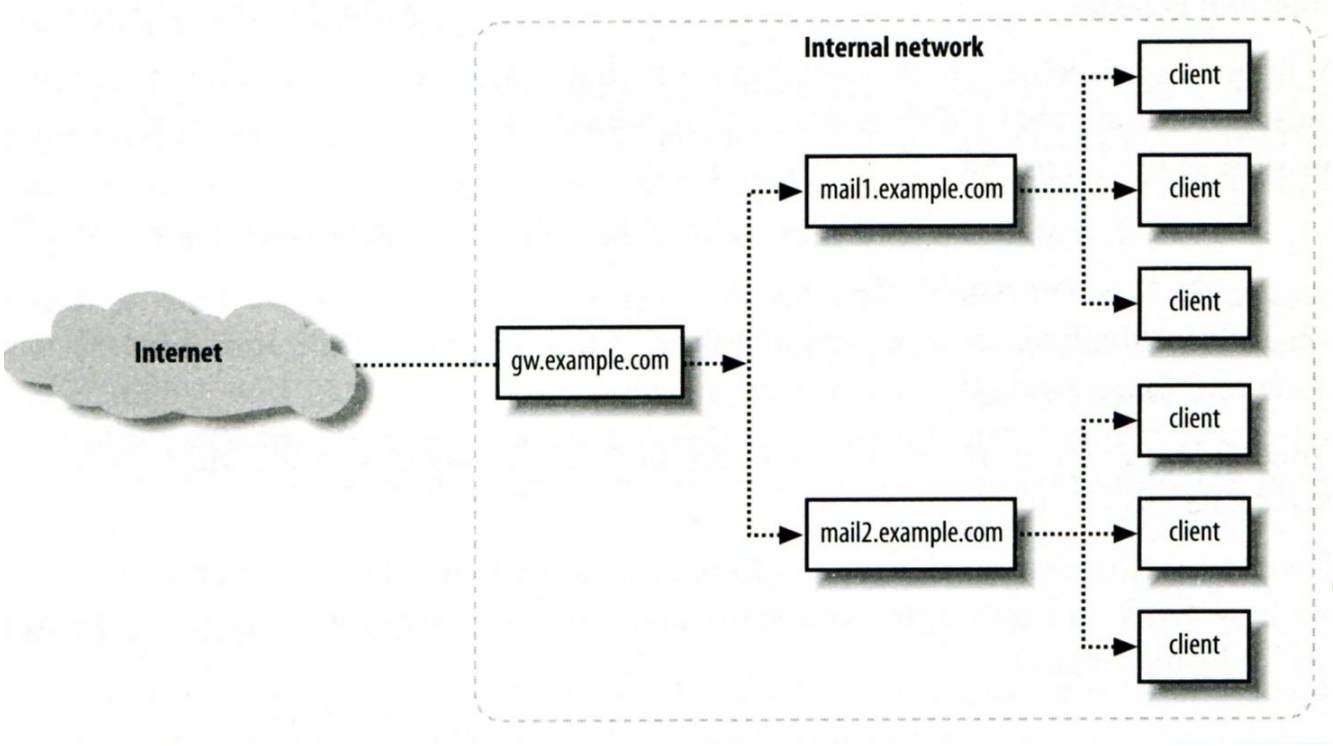
    In /usr/local/etc/postfix/master.cf
    ondemand unix - - n - - smtp

    In /usr/local/etc/postfix/main.cf
    defer_transports = ondemand
    transport_maps = hash:/usr/local/etc/postfix/transport

    Whenever the customer network is online, do
    $ postqueue –f abc.com

Mail Relaying – Inbound Mail Gateway (1)

- Inbound Mail Gateway
  - Accept all mail for a network from the Internet and relays it to internal mail systems
  - Ex:
    - csmx1.cs.nctu.edu.tw is a IMG
    - csmailgate.cs.nctu.edu.tw is internal mail system



Mail Relaying – Inbound Mail Gateway (2)

- To be IMG, suppose
  - You are administrator for cs.nctu.edu.tw
  - You have to be the IMG for secureLab.cs.nctu.edu.tw and javaLab.cs.nctu.edu.tw

1. The MX record for secureLab.cs.nctu.edu.tw and javaLab.cs.nctu.edu.tw should point to csmx1.cs.nctu.edu.tw
2. In csmx1.cs.nctu.edu.tw,

   relay_domains = secureLab.cs.nctu.edu.tw javaLab.cs.nctu.edu.tw

   transport_maps = hash:/usr/local/etc/postfix/transport

   secureLab.cs.nctu.edu.tw relay:[secureLab.cs.nctu.edu.tw]

   javaLab.cs.nctu.edu.tw relay:[javaLab.cs.nctu.edu.tw]
3. In secureLab.cs.nctu.edu.tw (and so do javaLab.cs.nctu.edu.tw)

   mydestination = secureLab.cs.nctu.edu.tw

Mail Relaying – Outbound Mail Gateway

- Outbound Mail Gateway
  - Accept mails from inside network and relay them to Internet hosts on behalf of internal mail servers
- To be OMG, suppose
  - You are administrator for cs.nctu.edu.tw
  - You have to be the OMG for secureLab.cs.nctu.edu.tw and javaLab.cs.nctu.edu.tw

1. In csmx1.cs.nctu.edu.tw
   mynetworks = hash:/usr/local/etc/postfix/mynetworks
   secureLab.cs.nctu.edu.tw
   javaLab.cs.nctu.edu.tw
2. All students in secureLab will configure there MUA (ex. outlook) to use secureLab.cs.nctu.edu.tw to be the SMTP server
3. In secureLab.cs.nctu.edu.tw,
   relayhost = [csmx1.cs.nctu.edu.tw]

Advanced Aliasing – Virtual Alias Maps

- Virtual Alias Map
  - It rewrites recipient addresses for all local, all virtual, and all remote mail destinations.
  - virtual_alias_maps = hash:/usr/local/etc/postfix/virtual
  - Ex:

```
# domain_or_address   transport:nexthop
@csie.nctu.edu.tw     @cs.nctu.edu.tw
lwhsu@csie.nctu.edu.tw  @lwbsd.cs.nctu.edu.tw
```

  - Applying regular expression
    - virtual_alias_maps = pcre:/usr/local/etc/postfix/virtual

```
/@csie\.nctu\.edu\.tw/                    @cs.nctu.edu.tw
/lwhsu@csie\.nctu\.edu\.tw/               @lwbsd.cs.nctu.edu.tw
/(\S+)\.(\S+)@netadm\.cs\.nctu\.edu\.tw/  $1@netadm.cs.nctu.edu.tw
```

Multiple Domains

- Use single system to host many domains
  - Ex:
    - We use csmailgate.cs.nctu.edu.tw to host both
      - cs.nctu.edu.tw
      - csie.nctu.edu.tw
  - Purpose
    - Can be used for final delivery on the machine or
    - Can be used for forwarding to destination elsewhere
- Important considerations
  - Does the same user id with different domain should go to the same mailbox or different mailbox ?
    - YES (shared domain)
    - NO (Separate domain)
  - Does every user require a system account in /etc/passwd ?
    - YES (system account)
    - NO (virtual account)

Multiple Domains –

Shared Domain with System Account

- Situation
  - The mail system should accept mails for both canonical and virtual domains and
  - The same mailbox for the same user id
- Procedure
  - Modify “mydomain” to canonical domain
  - Modify “mydestination” parameter to let mails to virtual domain can be local delivered
  - Ex:
    - mydomain = cs.nctu.edu.tw
    - mydestination = $myhostname, $mydomain, csie.nctu.edu.tw

    ※ In this way, mail to both lwhsu@cs.nctu.edu.tw and lwhsu@csie.nctu.edu.tw will go to csmailgate:/var/mail/lwhsu
- Limitation
  - Can not separate lwhsu@cs.nctu.edu.tw from lwhsu@csie.nctu.edu.tw

Multiple Domains –

Separate Domains with System Accounts

- Situation
  - The mail system should accept mails for both canonical and virtual domains and
  - Mailboxes are not necessarily the same for the same user id
- Procedure
  - Modify “mydomain” to canonical domain
  - Modify “virtual_alias_domains” to accept mails to virtual domains
  - Create “virtual_alias_mas” map
  - Ex:
    - mydomain = cs.nctu.edu.tw
    - virtual_alias_domains = abc.com.tw, xyz.com.tw
    - virtual_alias_maps = hash:/usr/local/etc/postfix/virtual
    - In /usr/local/etc/postfix/virtual
      - CEO@abc.com.tw andy
      - @xyz.com.tw jack
- Limitation
  - Need to maintain UNIX account for virtual domain user

Multiple Domains –
Separate Domains with Virtual Accounts (1)

- Useful when users in virtual domains:
  - Do not need to login to system
  - Only need to retrieve mail through POP/IMAP server
- Procedure
  - Modify “virtual_mailbox_domains” to let postfix know what mails it should accepts
  - Modify “virtual_mailbox_base” and create related directory to put mails
  - Create “virtual_mailbox_mas” map
  - Ex:
    - virtual_mailbox_domain = abc.com.tw, xyz.com.tw
    - virtual_mailbox_base = /var/vmail
    - Create /var/vmail/abc-domain and /var/vmail/xyz-domain
    - virtual_mailbox_maps = hash:/usr/local/etc/postfix/vmailbox

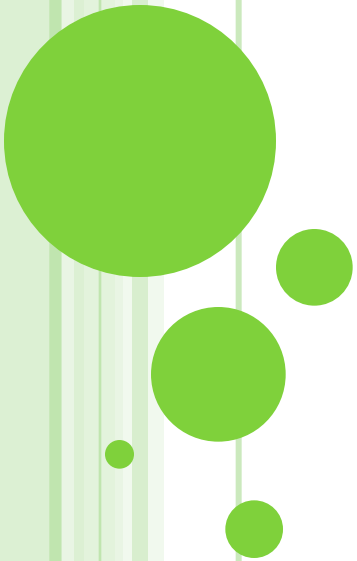
    - In /usr/local/etc/postfix/vmailbox
      - CEO@abc.com.tw abc-domain/CEO (Mailbox format)
      - CEO@xyz.com.tw xyz-domain/CEO/ (Maildir format)

Multiple Domains –
Separate Domains with Virtual Accounts (2)

- Ownerships of virtual mailboxes
  - Simplest way:
    - The same owner of POP/IMAP Servers
  - Flexibility in postfix
    - virtual_uid_maps and virtual_gid_maps
    - Ex:
      - virtual_uid_maps = static:1003
      - virtual_gid_maps = static:105

      - virtual_uid_maps = hash:/usr/local/etc/postfix/virtual_uids
      - virtual_uid_maps = hash:/usr/local/etc/postfix/virtual_uids static:1003

      - In /usr/local/etc/postfix/virtual_uids
        - CEO@abc.com.tw 1004
        - CEO@xyz.com.tw 1008



Handling Spam in Postfix

Nature of Spam

- Spam
  - UBE – Unsolicited Bulk Email
  - UCE – Unsolicited Commercial Email
- Spam
  - There is no relationship between receiver and
    - Sender
    - Message content
  - Opt out instruction
  - Conceal trail
    - False return address
    - Forged header information
  - Use misconfigured mail system to be an accomplice
  - Circumvent spam filters either encode message or insert random letters

Problems of Spam

- Cost
  - Waste bandwidth and disk space
  - DoS like side-effect
  - Waste time and false deletion
  - Bounce messages of nonexistent users
    - Nonexistent return address
    - Forged victim return address
- Detection
  - Aggressive spam policy may cause high false positive

Anti-Spam – Client-Based Detection (1)

- Client-blocking
  - Use IP address, hostnames or email address supplied by clients when they connect to send a message
  - Compared with Spammer list
  - Problems
    - IP address, hostname, email address are forged
    - Innocent victim open relay host
- DNSBL (DNS-based Blacklist)
  - Maintain large database of systems that are known to be open relays or that have been used for spam

Anti-Spam – Client-Based Detection (2)

- What DNSBL maintainers do
  - Suppose csie has a Blacklist DNS database
    - Suppose DNSBL Domain “dnsbl.cs.nctu.edu.tw”
  - If 140.112.23.118 is detected as open relay
    - There will be a new entry in cs’s blacklist DB
      - 118.23.112.140.dnsbl.cs.nctu.edu.tw
  - When we receive a connection from 140.112.23.118
    - Compose 118.23.112.140.dnsbl.cs.nctu.edu.tw
    - DNS query for this hostname
      - Successful means this IP address is suspicious
      - Failed means ok
- Using DNSBL
  - Review their service options and policies carefully

Anti-Spam – Content-Based Detection

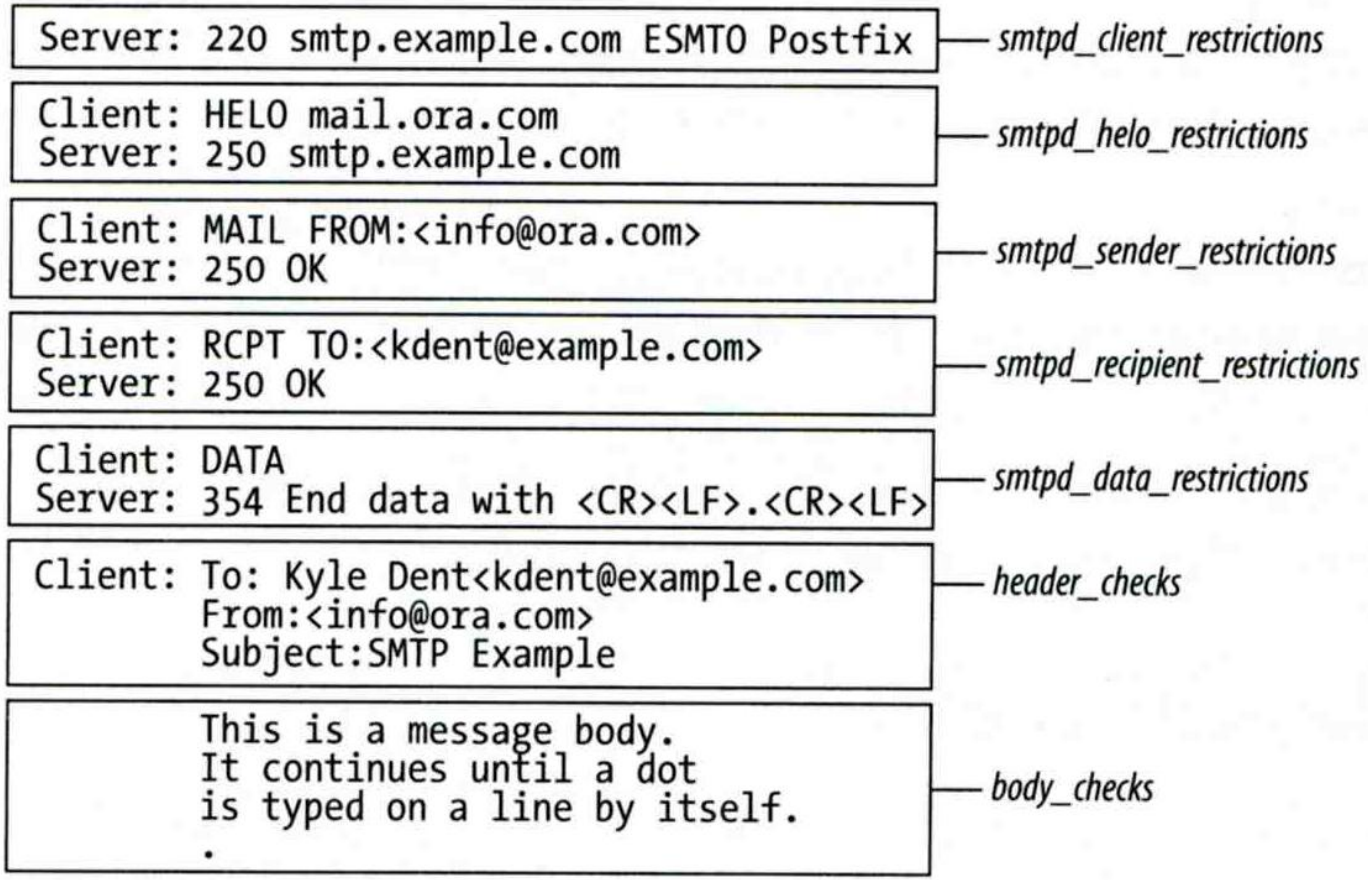
- Spam patterns in message body
- Detection difficulties
  - Embed HTML codes within words of their message to break up phrases
  - Randomly inserted words
  - Content-based detection is slower

Anti-Spam – Action

- When you detect a spam, you can:
  - Reject immediately during the SMTP conversation
  - Save spam into a suspected spam repository
  - Label spam and deliver it with some kind of spam tag
  - Ex:
    - X-Spam-Status: Yes, hits=18.694 tagged_above=3 required=6.3
    - X-Spam-Level: **********
    - X-Spam-Flag: YES

Postfix Anti-Spam configuration

- The SMTP Conversation
  - info@ora.com → smtp.example.com → kdent@example.com



Postfix Anti-Spam configuration – Client Detection Rules (1)

- Four rules in relative detection position
  - Rules and their default values
    - smtpd_client_restrictions =
    - smtpd_helo_restrictions =
    - smtpd_sender_restrictions =
    - smtpd_recipient_restrictions =
      permit_mynetworks, reject_unauth_destination
  - Each restriction check result can be:
    - OK (Accept in this restriction)
    - REJECT (Reject immediately without further check)
    - DUNNO (do next check)
  - There are 5 types of restrictions

Postfix Anti-Spam configuration – Client Detection Rules (2)

1. Access maps
   - List of IP addresses, hostnames, email addresses
   - Can be used in:

```
smtpd_client_restrictions = check_client_access hash:/etc/access
smtpd_helo_restrictions = check_helo access \
    hash:/usr/local/etc/postfix/helohost
smtpd_sender_restrictions = check_sender_access \
    hash:/usr/local/etc/postfix/sender_access
smtpd_recipient_restrictions = check_recipient_access \
    hash:/usr/local/etc/postfix/recipient_access
```

   - Actions
     - OK, REJECT, DUNNO
     - FILTER (redirect to content filter)
     - HOLD (put in hold queue)
     - DISCARD (report success to client but drop)
     - 4xx message or 5xx message

Postfix Anti-Spam configuration – Client Detection Rules (3)

- Example of access maps
  - check_client_access hash:/etc/access

    nctu.edu.twOK
    127.0.0.1 OK
    61.30.6.207 REJECT

  - check_helo access hash:/postfix/helohost

    greatdeals.example.com REJECT
    oreillynet.com OK

  - check_sender_access hash:/usr/local/etc/postfix/sender_access

    viagra.com 553 Please contact +886-3-5712121-54707.
    aaa@ 553 Invalid MAIL FROM
    sales@ 553 Invalid MAIL FROM
    hchen@ 553 Invalid MAIL FROM

  - check_recipient_access hash:/usr/local/etc/postfix/recipient_access

    bin@cs.nctu.edu.tw 553 Invalid RCPT TO command
    ftp@cs.nctu.edu.tw 553 Invalid RCPT TO command
    man@cs.nctu.edu.tw 553 Invalid RCPT TO command

Postfix Anti-Spam configuration – Client Detection Rules (4)

2. Special client-checking restrictions
   - permit_auth_destination
     - Mostly used in "smtpd_recipient_restrictions"
     - Permit request if destination address matches:
       - The postfix system's final destination setting
         - mydestination, inet_interfaces, vitual_alias_maps, virtual_mailbox_maps
       - The postfix system's relay domain
         - relay_domains
     - Found ➔ OK, UnFound ➔ DUNNO
   - reject_unauth_destination
     - Opposite to permit_auth_destination
     - Found ➔ REJECT, UnFound ➔ DUNNO
   - permit_mynetworks
     - Allow a request if interest IP match any address in "mynetworks"
       - Used in smtpd_recipient_restrictions
       - Used in smtpd_client_restrictions

Postfix Anti-Spam configuration – Client Detection Rules (5)

3. Strict syntax restrictions
   - Restrictions that does not conform to RFC

   - reject_invalid_hostname
     - Reject hostname with bad syntax
   - reject_non_fqdn_hostname
     - Reject hostname not in FQDN format
   - reject_non_fqdn_sender
   - reject_non_fqdn_recipient
     - For “MAIL FROM” and “RCPT TO” command respectively

Postfix Anti-Spam configuration – Client Detection Rules (6)

4. DNS restrictions
   - Make sure that clients and email envelope addresses have valid DNS information
   - reject_unknown_client
     - Reject if the client IP has no DNS PTR record
       - 215.17.113.140 IN PTR netadm.cs.nctu.edu.tw.
   - reject_unknown_hostname
     - Reject if EHLO hostname has no DNS MX or A record
   - reject_unknown_sender_domain
     - Reject if MAIL FROM domain name has no DNS MX or A record
   - reject_unknown_recipient_domain
     - Reject if RCPT TO domain name has no DNS MX or A record

Postfix Anti-Spam configuration – Client Detection Rules (7)

5. Real-time blacklists
   - Check with DNSBL services
   - reject_rbl_client domain.tld
     - Reject if client IP is detect in DNSBL
   - reject_rhsbl_client domain.tld
     - Reject if client hostname has an A record under specified domain
   - reject_rhsbl_sender domain.tld
     - Reject if sender domain in address has an A record under specified domain
   - smtpd_client_restrictions = hash:/etc/access, reject_rbl_client relays.ordb.org
   - smtpd_sender_restrictions = hash:/usr/local/etc/postfix/sender_access, reject_rhsbl_sender dns.rfc-ignorant.org

Postfix Anti-Spam configuration – Client Detection Rules (8)

6. Policy Service
   - Postfix SMTP server sends in a delegated SMTPD access policy request to one special service (policy serivce).
   - Policy service replies actions allowed in Postfix SMTPD access table.
   - Usage:
     - check_policy_service *servicename*
   - Example: Grey Listing (Using Postgrey)
     - Postgrey daemon runs on port:10023
     - In main.cf:

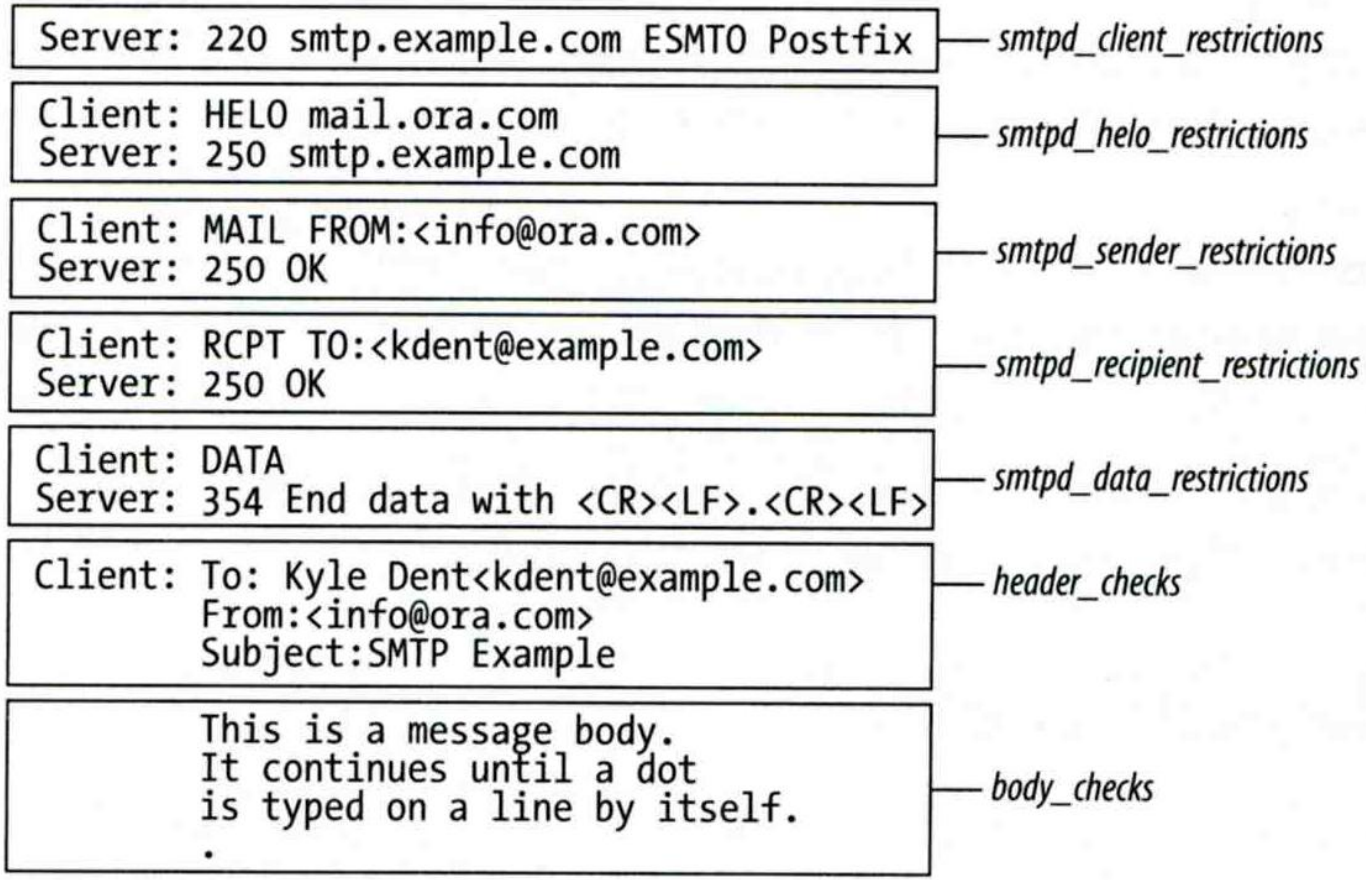
       smtpd_recipient_restrictions =
       check_policy_service inet:127.0.0.1:10023

Postfix Anti-Spam configuration – Client Detection Rules (8)

- smtpd_client_restrictions
  - check_client_access
  - reject_unknown_client
  - permit_mynetworks
  - reject_rbl_client
  - reject_rhsbl_client
- smtpd_helo_restrictions
  - check_helo_access
  - reject_invalid_hostname
  - reject_unknown_hostname
  - reject_non_fqdn_hostname
- smtpd_sender_restrictions
  - check_sender_access
  - reject_unknown_sender_domain
  - reject_rhsbl_sender
- smtpd_recipient_restrictions
  - check_recipient_access
  - permit_auth_destination
  - reject_unauth_destination
  - reject_unknown_recipient_domain
  - reject_non_fqdn_recipient
  - check_policy_service

Postfix Anti-Spam configuration

- The SMTP Conversation
  - info@ora.com → smtp.example.com → kdent@example.com



Postfix Anti-Spam configuration – Content-Checking rules (1)

- 4 rules
  - header_checks
    - Check for message headers
  - mime_header_checks
    - Check for MIME headers
  - nested_header_checks
    - Check for attached message headers
  - body_check
    - Check for message body
- All rules use lookup tables
  - Ex:

    header_checks = regexp:/usr/local/etc/postfix/header_checks

    body_checks = pcre:/usr/local/etc/postfix/body_checks

Postfix Anti-Spam configuration – Content-Checking rules (2)

- Content-checking lookup table
  - Regular_Expression Action
- Actions
  - REJECT message
  - WARN message
    - Logs a rejection without actually rejecting
  - IGNORE
    - Delete matched line of headers or body
  - HOLD message
  - DISCARD message
    - Claim successful delivery but silently discard
  - FILTER message
    - Send message through a separate content fileter

Postfix Anti-Spam configuration – Content-Checking rules (3)

- Example of header check
  - header_checks = regexp:/usr/local/etc/postfix/header_checks
  - In /usr/local/etc/postfix/header_checks
    /take advantage now/ REJECT
    /repair your credit/ REJECT
- Example of body check
  - body_checks = regexp:/usr/local/etc/postfix/body_checks
  - In /usr/local/etc/postfix/body_checks
    /lowest rates.*\!/ REJECT
    /[:alpha:]<!--.*-->[:alpha:]/ REJECT

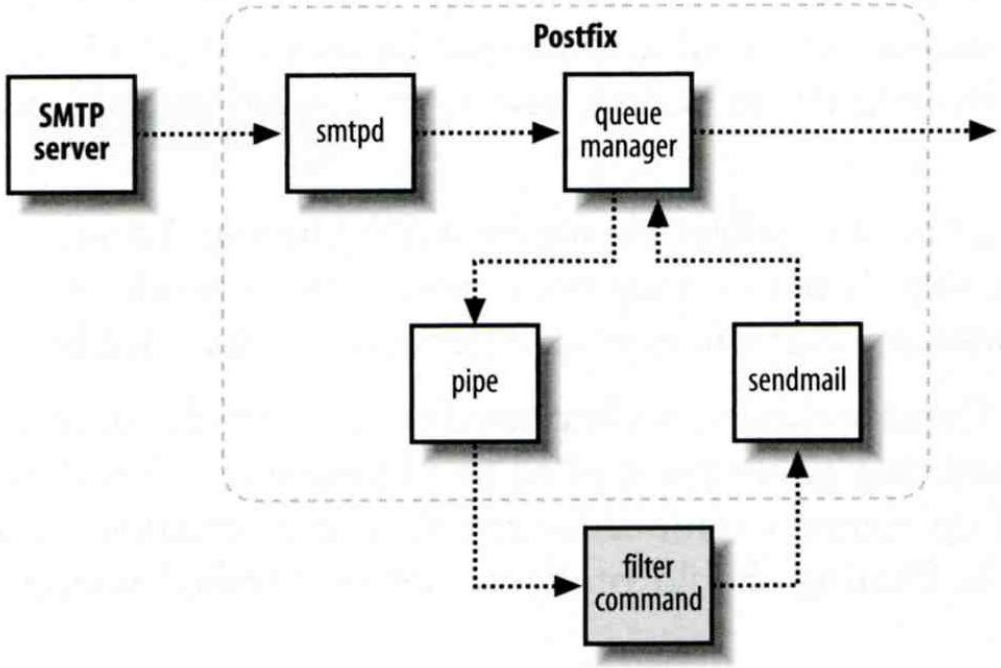
External Filters

- Filtering can be done on
  - MTA
  - MDA
  - MUA
  - ※ Combination of MTA and MUA
    - Adding some extra headers or modifying subject in MTA, and filtering in MUA.

- External filters for postfix
  - Command-based filtering
    - New process is started for every message
    - Accept message from STDIN
  - Daemon-based filtering
    - Stay resident
    - Accept message via SMTP or LMTP

Command-Based Filtering (1)

- Usage
  - Postfix delivers message to this filter via “pipe” mailer
  - Program that accepts content on its STDIN
  - Program gives the filtered message back to Postfix using the “sendmail” command



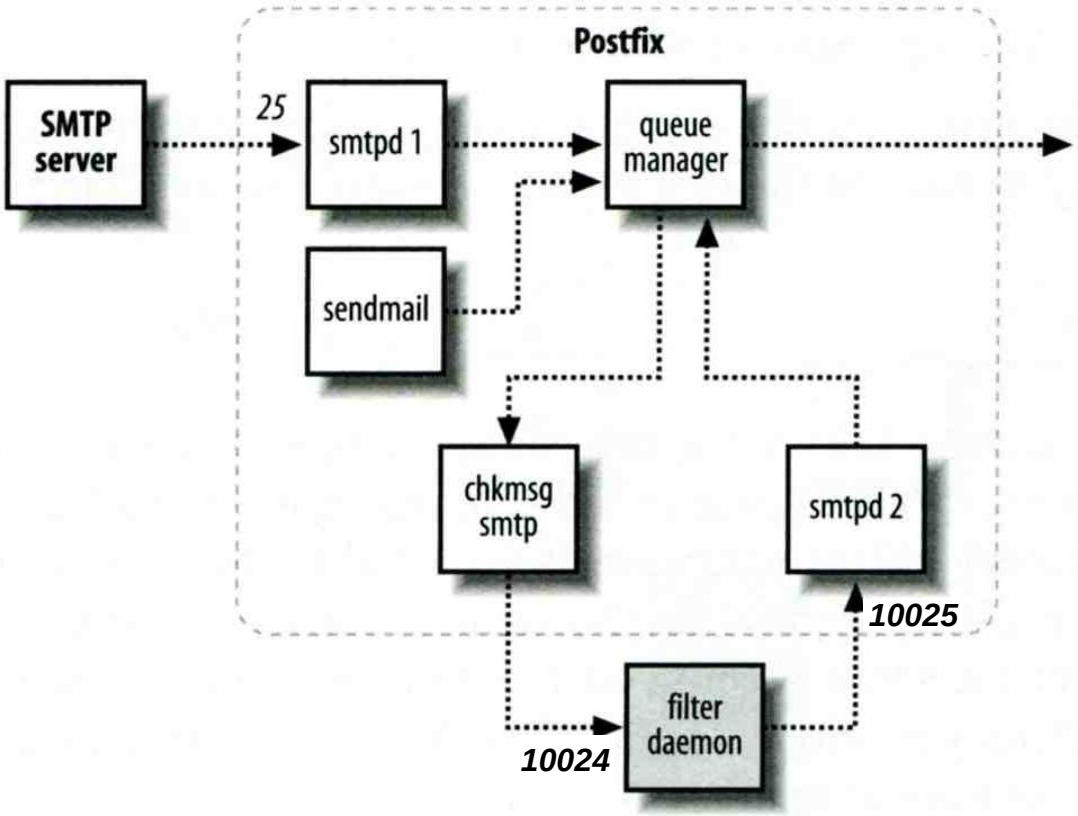
Command-Based Filtering (2)

- Configuration
  - Prepare your filter program (/usr/local/bin/simple_filt)
  - Modify master.cf

```
#==========================================================================
# service type  private unpriv  chroot  wakeup  maxproc command + args
#==========================================================================
filter  unix  -         n        n      -       -       pipe
          flags=Rq user=filter argv=/usr/local/bin/simple_filt -f ${sender} - -${recipient}
smtpd    inet  n       -        n      -       -       smtpd
          -o content_filter=fileter:
```

Daemon-Based Filtering (1)

- Usage
  - Message is passed back and forth between Postfix and filtering daemon via SMTP or LMTP



Daemon-Based Filtering (2)

- Configuration
  - Install and configure your content filter
    - /usr/ports/security/amavisd-new
    - Modify amavisd.conf to send message back
      - $forward_method = 'smtp:127.0.0.1:10025';
  - Edit main.cf to let postfix use filtering daemon

    content_filter = smtp-amavis:[127.0.0.1]:10024
  - Edit master.cf to add two additional services

```
smtp-amavis unix -      -       n       -       10       smtp
    -o smtp_data_done_timeout=1200s
    -o smtp_never_send_ehlo=yes
    -o notify_classes=protocol,resource,software
127.0.0.1:10025 inet n  -       n       -       -       smtpd
    -o content_filter=
    -o mynetworks=127.0.0.0/8
    -o local_recipient_maps=
    -o notify_classes=protocol,resource,software
    -o myhostname=localhost
    -o smtpd_client_restrictions=
    -o smtpd_sender_restrictions=
    -o smtpd_recipient_restrictions=permit_mynetworks,reject
```

Daemon-Based Filtering (3)

- Anti-virus filtering
  - amavisd-new supports lots of anti-virus scanner
  - Ex:

```
@av_scanners = (

# ['Sophie',
#   \&ask_daemon, ["{}/\n", '/var/run/sophie'],
#   qr/(?x)^ 0+ ( : | [\000\r\n]* $)/,  qr/(?x)^ 1 ( : | [\000\r\n]* $)/,
#   qr/(?x)^ [-+]? \d+ : (.*?) [\000\r\n]* $/ ],
 ['ClamAV-clamd',
   \&ask_daemon, ["CONTSCAN {}\n", "/var/run/clamav/clamd"],
   qr/\bOK$/, qr/\bFOUND$/,
   qr/^.*?: (?!Infected Archive)(.*) FOUND$/ ],

);
```