Postfix

lctseng

Postfix

❑ Postfix v3.5.0

- /usr/ports/mail/postfix
- pkg install postifx

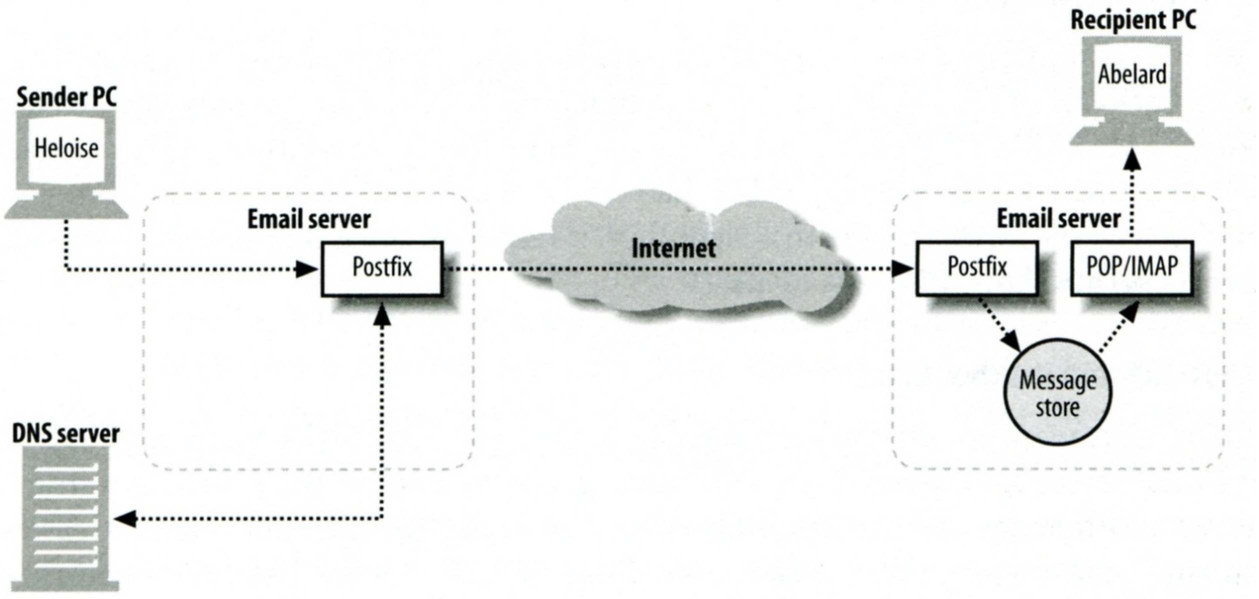
❑ http://www.postfix.org

- http://www.postfix.org/documentation.html

Role of Postfix

❑ MTA that

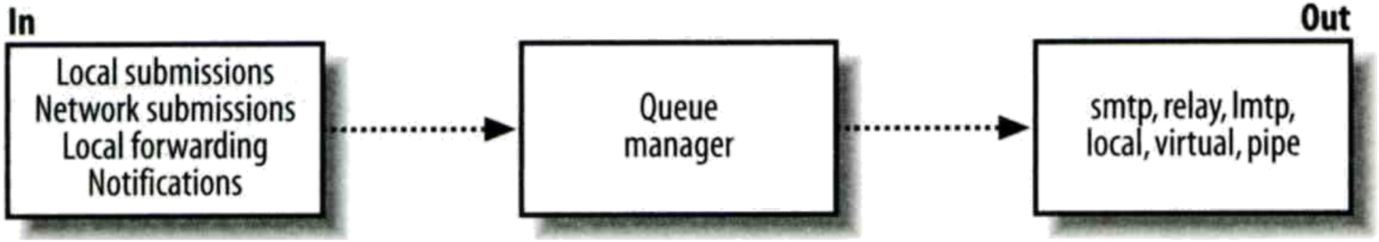
- Receive and deliver email over the network via SMTP
- Local delivery directly or use other mail delivery agent



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

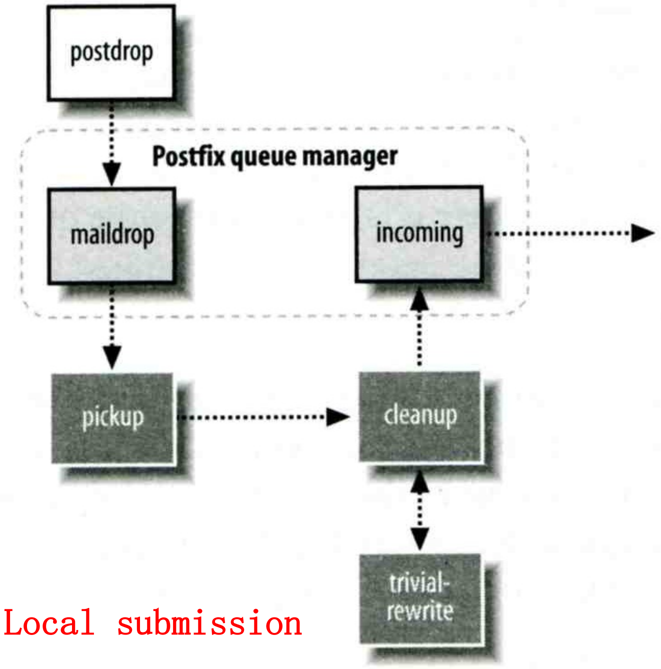
Postfix Architecture

- ❑ 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

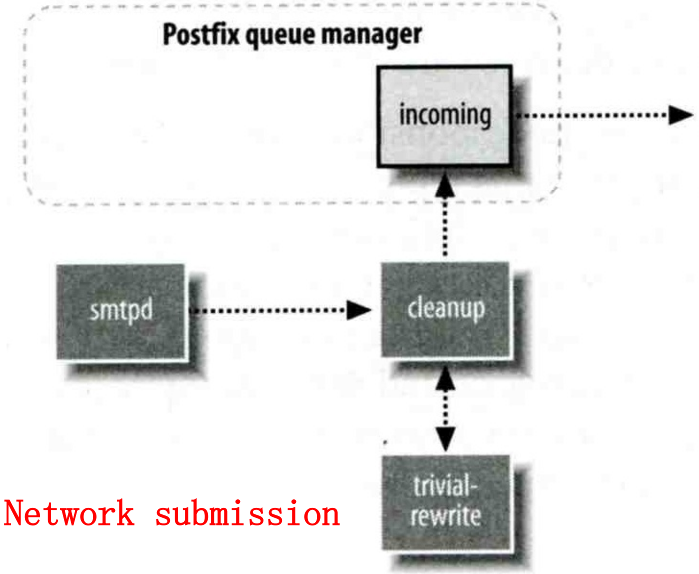


Postfix Architecture – Message IN

- ❑ Four ways
  - Local submission
    - ➢ postdrop command
    - ➢ maildrop queue
    - ➢ pickup daemon
    - ➢ cleanup daemon
      - – Header validation
      - – address translation
    - ➢ incoming queue
  - Network submission
    - ➢ smtpd daemon
  - Local forwarding
    - ➢ Resubmit for such as .forward
    - ➢ Envelope “to” is changed
  - Notification
    - ➢ Notify admin when error happens



Local submission



Network submission

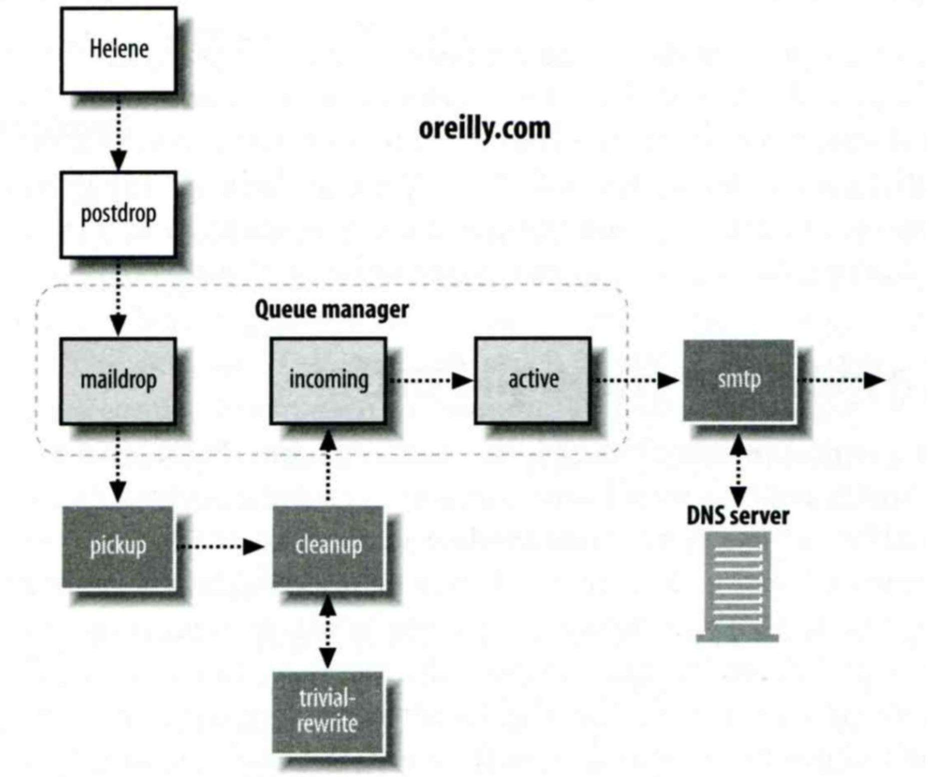
Postfix Architecture – Queue

- ❑ 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
    - ➢ Requested by admin (manually or automatically)
    - ➢ Stay in queue until admin intervenes

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

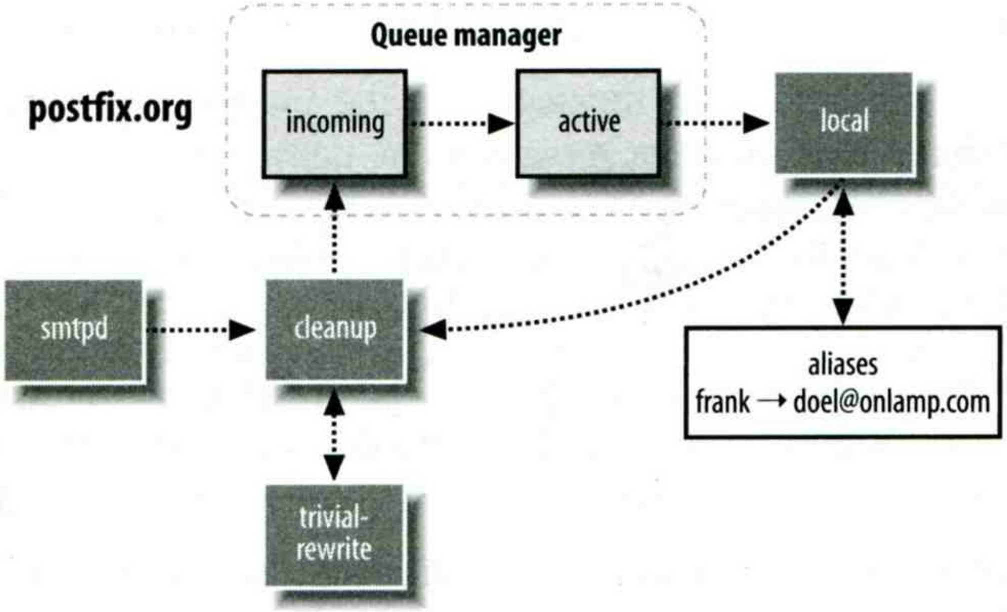
Message Flow in Postfix (1)

- ❑ Example
  - alias
  - 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



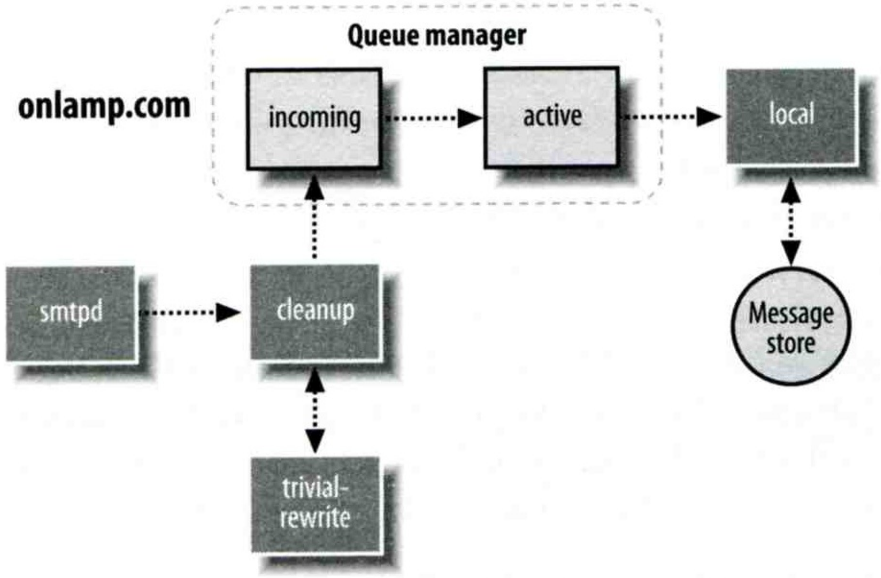
Message Flow in Postfix (2)

- ❑ Example
  - frank@postfix.org → doel@onlamp.com
  - 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)

- ❑ Example
  - frank@postfix.org → doel@onlamp.com
  - Phase3
    - The smtpd on onlamp.com takes this message and invoke cleanup then put in incoming queue
    - Local delivery to message store



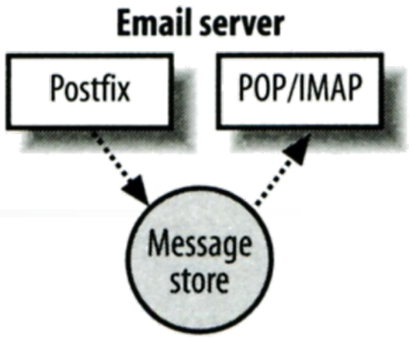
Message Store Format

- 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 (performance)
- 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
    - locate and delete mails quickly, but waste amounts of fd, inodes, space
    - Problems of quota and backup
- Related parameters (in main.cf)
  - mail_spool_directory = /var/mail (Mbox)
  - mail_spool_directory = /var/mail/ (Maildir)

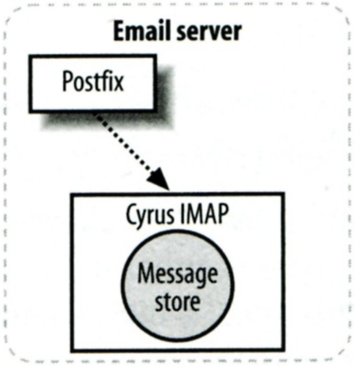
Read your mail from terminal

- ❑ To read mails, you must login via ssh
  - Built-in command to read mail: “mail”
  - Friendly command-line MUA: “mutt”
    - ➢ Pkg: mutt
    - ➢ Port: mail/mutt
- ❑ To read from remote host
  - Supports MUA like Outlook, Thunderbird, or even Gmail
  - You need MAA (supports IMAP/POP3)
  - Dovecot
    - ➢ Pkg: dovecot
    - ➢ Port: mail/dovecot

Postfix & POP3/IMAP



- POP3 vs. IMAP
  - Both are used to retrieve mail from server for remote clients
  - POP3 has to download entire message, while IMAP can download headers only
  - POP3 can download only single mailbox, while IMAP can let you maintain multiple mailboxes and folders on server
- Postfix works together with POP3/IMAP
  - Postfix and POP3/IMAP must agree on the type of mailbox format and style of locking
    - Standard message store
    - Non-standard message store (using LMTP)
      - Such as Cyrus IMAP or Dovecot



Postfix Configuration

- ❑ Two most important configuration files
  - /usr/local/etc/postfix/main.cf – postconf(5)
    - ➢ Core configuration
  - /usr/local/etc/postfix/master.cf – master(5)
    - ➢ Which postfix service should invoke which program
- ❑ Edit main.cf
  - Using text editor
  - postconf
    - ➢ % postconf [-e] "myhostname=nasa.cs.nctu.edu.tw"
    - ➢ % postconf -d myhostname(print default setting)
    - ➢ % postconf myhostname (print current setting)
- ❑ Reload postfix whenever there is a change
  - # 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
- ❑ Database format
  - % postconf -m
    - ➢ List all available database format
  - In main.cf
    - ➢ default_database_type

```
% postconf  default_database_type
default_database_type = hash
% postconf  -h default_database_type
hash
```

```
% postconf -m
btree
cidr
environ
hash
internal
proxy
regexp
static
tcp
texthash
unix
```

- http://www.postfix.org/DATABASE_README.html

Postfix Configuration – Lookup tables (2)

- ❑ Use databased-lookup table in main.cf
  - syntax

    parameter = type:name
  - Ex:
    - ➢ In main.cf

      canonical_maps = hash:/usr/local/etc/postfix/canonical
    - ➢ After execute postmap

      /usr/local/etc/postfix/canonical.db

- ❑ postmap command
  - Generate database
    - ➢ $ postmap hash:/usr/local/etc/postfix/canonical
  - Query
    - ➢ $ postmap -q nctu.edu.tw hash:/usr/local/etc/postfix/canonical

↑

don’t need to add “.db” here

Postfix Configuration – Lookup tables (3)

❑ Regular expression tables

- More flexible for matching keys in lookup tables
  - ➢ Sometimes you cannot list all the possibilities
- Two regular expression libraries used in Postfix
  - ➢ POSIX extended regular expression (regexp, default)
  - ➢ Perl-Compatible regular expression (PCRE)
- Usage
  - ➢ /pattern/ value
  - ➢ Do some content checks, such as
    - – header_checks
    - – body_checks
  - ➢ Design some features
    - – /(\S+)\.(\S+)@cs\.nctu\.edu\.tw/ $1@cs.nctu.edu.tw

Postfix Configuration – Categories

- ❑ Categories
  - Server identities
    - ➢ my...
  - Mail rewriting
    - ➢ for incoming/outgoing mails
  - Access control
    - ➢ restrictions
  - Mail processing
    - ➢ filter
  - Operation details
    - ➢ …

Postfix Configuration – MTA Identity

- Four related parameters
  - myhostname
    - myhostname = nasa.cs.nctu.edu.tw
    - If un-specified, postfix will use ‵hostname′ command
  - mydestination
    - List all the domains that postfix should accept for local delivery
    - mydestination = $myhostname, localhost.$mydomain $mydomain
      - This is the CS situation that MX will route mail to mailgate
    - mydestination = $myhostname www.$mydomain, ftp.$mydomain
  - mydomain
    - mydomain = cs.nctu.edu.tw
    - If un-specified, postfix use myhostname minus the first component
  - myorigin
    - myorigin = $mydomain (default is $myhostname)

Postfix Configuration – System-wide aliases files

❑ Using aliases in Postfix (first-matching)

- alias_maps = hash:/etc/aliases
- alias_maps = hash:/etc/aliases, nis:mail.aliases
- alias_database = hash:/etc/aliases

❑ alias_map vs alias_database

- alias_map
  - ➢ Which map to use (lookup table)
  - ➢ Not all of them is controlled by Postfix
    - – E.g. nis
- alias_database
  - ➢ Which (local) database files are built by "newaliases"

Postfix Configuration – System-wide aliases files

- ❑ To Build alias database file
  - $ postalias /etc/aliases
    - Can be used on other files
  - $ newaliases
    - For /etc/aliases
- ❑ Alias file format (same as sendmail)
  - Value can be
    - Email address, filename, |command, :include:
- ❑ Alias restriction
  - allow_mail_to_commands = alias, forward
  - allow_mail_to_files = alias, forward

Postfix Configuration – Virtual Alias Maps

❑ Virtual Alias Map

- It recursively rewrites envelope recipient addresses for all local, all virtual, and all remote mail destinations.
- virtual_alias_domains = $virtual_alias_maps (default)
- virtual_alias_maps = hash:/usr/local/etc/postfix/virtual

➢ src-address	dst-address
lctseng@csie.nctu.edu.tw	@chbsd.cs.nctu.edu.tw
lctseng	ch0nsi@gmai1.com
@csie.nctu.edu.tw	@cs.nctu.edu.tw

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

```
/^root(\..+)?@(t)?(cs|np)?bsd\d*\.cs\.nctu\.edu\.tw$/     bsdta@cs.nctu.edu.tw
/^root(\..+)?@(t)?(cs|np)?linux\d*\.cs\.nctu\.edu\.tw$/   linuxta@cs.nctu.edu.tw
/^root(\..+)?@(t)?csmail\w*\d*\.cs\.nctu\.edu\.tw$/       mailta@cs.nctu.edu.tw
```

Postfix Configuration – Virtual Alias Maps vs Alias Map

❑ alias_map

- Used by local(8) delivery
- Key must be local recipients
- Value can be email/file/command/…

❑ virtual_alias_maps

- Used by virtual(5) delivery
- Higher priority than alias_map
- Key can be
  - ➢ user@domain
  - ➢ user
  - ➢ @domain
- Value must be valid email addresses or local recipients

Postfix Configuration – Relay Control (1)

❑ Open relay

- A mail server that permit anyone to relay mails
  - ➢ Neither originates or ends with a user from its domain
  - ➢ Spam
- By default, postfix is not an open relay

❑ A mail server should

- Relay mail for trusted user
  - ➢ Such as lctseng@smtp.cs.nctu.edu.tw
- Relay mail for trusted domain
  - ➢ Ex. *smtp.cs.nctu.edu.tw* trusts *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, configured in this machine
  - mynetworks_style = host
    - ➢ Allow relaying for only local machine
  - mynetworks_style = class
    - ➢ Any host in the same class A, B or C
    - ➢ Usually we don’t use this - your server may trust the whole subnet from your provider

Postfix Configuration – Relay Control (3)

- ❑ Restricting relay access by mynetworks (override mynetworks_style)
  - 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 the type of your mail server
  - smtp.cs.nctu.edu.tw will be different from csmx1.cs.nctu.edu.tw
    - Outgoing: usually accepts submission from local domain
    - Incoming: may relay mails for trusted domains

Postfix Configuration – Rewriting address (1)

❑ For unqualified address

- To append "myorigin" to local name
  - lctseng → lctseng**@nasa.cs.nctu.edu.tw**
  - append_at_myorigin = yes
- To append "mydomain" to address that contain only host.
  - lctseng@nasa→ lctseng@nasa**.cs.nctu.edu.tw**
  - append_dot_mydomain = yes

Postfix Configuration – Rewriting address (2)

❑ Masquerading hostname

- Hide the names of internal hosts to make all addresses appear as if they come from the same mail server
- It is often used in out-going mail gateway
  - ➢ masquerade_domains = cs.nctu.edu.tw
    - – lctseng@subdomain.cs.nctu.edu.tw → lctseng@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 (the default)
  - ➢ masquerade_class = envelope_sender, header_sender, header_recipient
  - ➢ This allows incoming messages can be filtered based on their recipient address

Postfix Configuration – Rewriting address (3)

❑ Canonical address – canonical(5)

- Rewrite both header and envelope recursively invoked by cleanup daemon
- In main.cf
  - ➢ canonical_maps = hash:/usr/local/etc/postfix/canonical
  - ➢ canonical_classes = envelope_sender, envelope_recipient,
    header_sender, header_recipient
- In canonical

```
/^(.*)@(t)?(cs)?(bsd|linux|sun)\d*\.cs\.nctu\.edu\.tw$/    $1@cs.nctu.edu.tw
```

- Simlar configurations
  - ➢ sender_canonical_maps、sender_canonical_classes
  - ➢ recipient_canonical_maps、recipient_canonical_classes

Postfix Configuration – Rewriting address (4)

- ❑ Relocated users
  - Used to inform sender that the recipient is moved
  - In main.cf
    - ➢ relocated_maps = hash:/usr/local/etc/postfix/relocated
  - In relocated

```
andy@nasa.cs.nctu.edu.tw      andyliu@abc.com
lctseng                       EC319, NCTU, Hsinchu, ROC
@nabsd.cs.nctu.edu.tw         zfs.cs.nctu.edu.tw
```

Value can be anything: phone number, street address, …

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

Postfix Configuration – master.cf (1)

- /usr/local/etc/postfix/master.cf (master(5))
  - Define services that **master** daemon can invoke
  - Each row defines a service and
  - 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    unix  n       -       n       60      1       pickup
cleanup   unix  n       -       n       -       0       cleanup
rewrite   unix  -       -       n       -       -       trivial-rewrite
smtp      unix  -       -       n       -       -       smtp
local     unix  -       n       n       -       -       local
virtual   unix  -       n       n       -       -       virtual
relay     unix  -       -       n       -       -       smtp
        -o smtp_fallback_relay=
lmtp      unix  -       -       n       -       -       lmtp
maildrop  unix  -       n       n       -       -       pipe
  flags=DRhu user=vmail argv=/usr/local/bin/maildrop -d ${recipient}
```

Postfix Configuration – master.cf (2)

- ❑ Configuration options
  - Service name
  - Service type
    - inet, unix, fifo (obsolete), or pass
  - Private
    - Access to this component is restricted to the Postfix system
      - "inet" type cannot be private
  - Unprivileged
    - Run with the least amount of privilege required
      - y will run with the account defined in "mail_owner"
      - n will run with root privilege
        - local, pipe, spawn, and virtual

Postfix Configuration – master.cf (3)

- ❑ Configuration options
  - Chroot
    - ➢ chroot location is defined in “queue_directory”
  - Wake up time
    - ➢ Automatically wake up the service after the number of seconds
  - Process limit
    - ➢ Number of processes that can be executed simultaneously
    - ➢ Default count is defined in “default_process_limit”
  - command + args
    - ➢ Default path is defined in “daemon_directory”
      - – /usr/libexec/postfix

Postfix Architecture – Message OUT

- ❑ Local delivery
- ❑ Relay to the destinations
- ❑ 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
  - lmtp
    - ➢ Local Mail Transfer Protocol (Limited SMTP)
      - – No queue
      - – One recipient at once
    - ➢ Used to deliver to mail systems on the same network or even the same host
  - pipe
    - ➢ Used to deliver message to external program

Mail Relaying – Transport Maps (1)

❑ Transport maps – transport(5)

- It override default transport method to deliver messages
- In main.cf
  - ➢ transport_maps = hash:/usr/local/etc/postfix/transport
- In transport file
  - ➢ domain_or_address transport:nexthop

“Service” defined in master.cf

```
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)

- ❑ Usage in transport map
  - MX → Local delivery mail server
  - mailpost to bbs/news
  - Postponing mail relay
    - ➢ Such as ISP has to postpone until customer network is online
    - ➢ In transport map:

      ```
      abc.com            ondemand
      ```

    - ➢ In /usr/local/etc/postfix/master.cf

      ```
      ondemand   unix   -   -   n   -   -   smtp
      ```

    - ➢ In /usr/local/etc/postfix/main.cf

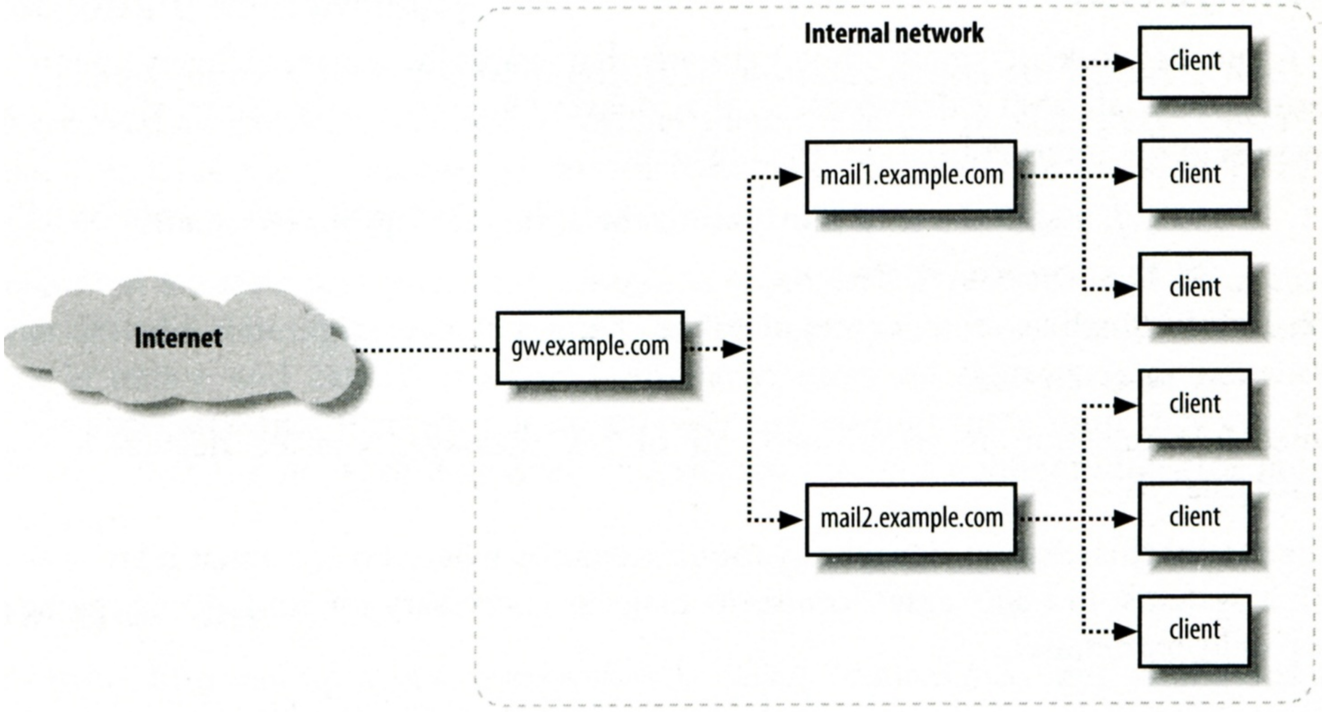
      ```
      defer_transports = ondemand
      transport_maps = hash:/usr/local/etc/postfix/transport
      ```

      "ondemand" transport should trigger by postqueue

    - ➢ Whenever the customer network is online, do
      - # postqueue -s abc.com

Mail Relaying – Inbound Mail Gateway (1)

- Inbound Mail Gateway (IMG, MX)
  - 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
  - Hostname is csmx1.cs.nctu.edu.tw
  - You have to be the IMG for secureLab.cs.nctu.edu.tw and javaLab.cs.nctu.edu.tw
    - Firewall only allow outsource connect to IMG port 25

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

❑ To be OMG, suppose

- You are administrator for cs.nctu.edu.tw
- Hostname is csmailer.cs.nctu.edu.tw
- You have to be the OMG for secureLab.cs.nctu.edu.tw and javaLab.cs.nctu.edu.tw

1. In main.cf of csmailer.cs.nctu.edu.tw

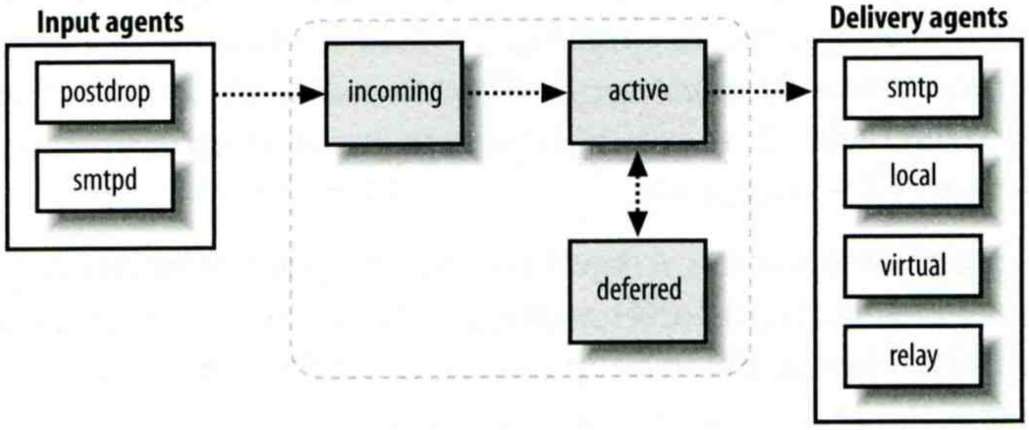
   ```
   mynetworks = hash:/usr/local/etc/postfix/mynetworks
       secureLab.cs.nctu.edu.tw
       javaLab.cs.nctu.edu.tw
   ```

2. All students in secureLab/javaLab will configure their MUA to use secureLab/javaLab.cs.nctu.edu.tw to be the SMTP server
3. In main.cf of secureLab/javaLab.cs.nctu.edu.tw,

   ```
   relayhost = [csmailer.cs.nctu.edu.tw]
   ```

Queue Management

- ❑ The queue manage daemon
  - qmgr daemon
  - Unique queue ID
  - Queue directories (/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 = 300s
    - ➢ maximal_backoff_time = 4000s
  - qmgr daemon periodically scan deferred queue for reborn messages
    - ➢ queue_run_delay = 300s
- ❑ 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
    - ➢ 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

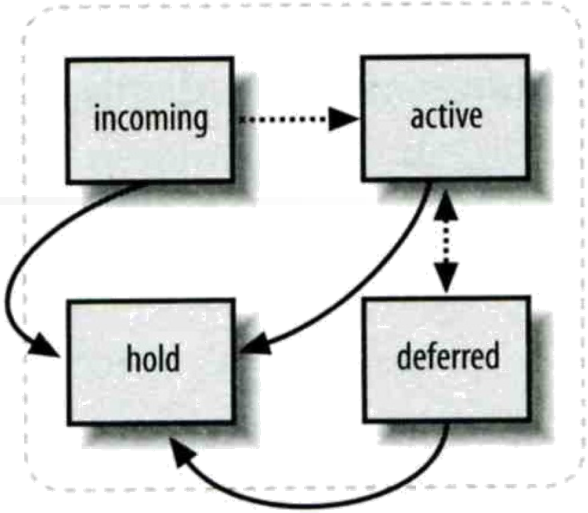
Queue Management – Error Notification

❑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	2bounce_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 problem	error_notice_recipient
software	Send notice because of software problem	error_notice_recipient

Queue Management – Queue Tools (1)



- ❑ postqueue command
  - postqueue –p
    - ➢ Generate sendmail mailq output
  - postqueue –f
    - ➢ Attempt to flush(deliver) all queued mail
  - postqueue –s cs.nctu.edu.tw
    - ➢ Schedule immediate delivery of all mail queued for site
- ❑ postsuper command
  - Delete queued messages
    - ➢ postsuper –d E757A3428C6 (from incoming, active, deferred, hold)
    - ➢ postsuper –d ALL
  - Put messages "on hold" so that no attempt is made to deliver it
    - ➢ postsuper –h E757A3428C6 (from incoming, active, deferred)
  - Release messages in hold queue
    - ➢ postsuper –H ALL
  - Requeue messages into maildrop queue (maildrop → pickup → cleanup → incoming)
    - ➢ postsuper –r E757A3428C6
    - ➢ postsuper –r ALL

Queue Management – Queue Tools (2)

- ❑ postcat
  - Display the contents of a queue file

```
nasa [/home/lctseng] -lctseng- mailq
-Queue ID- --Size-- ----Arrival Time---- -Sender/Recipient-------
3314234284A      602 Sat May 19 04:16:20  root@nasa.cs.nctu.edu.tw
    (connect to csmx1.cs.nctu.edu.tw[140.113.235.104]:25: Operation timed out)
                                           lctseng@cs.nctu.edu.tw

nasa [/home/lctseng] -lctseng- sudo postcat -q 3314234284A
*** ENVELOPE RECORDS deferred/3/3314234284A ***
message_size:            602             214               1              0            602
message_arrival_time: Sat May 19 04:16:20 2012
create_time: Sat May 19 04:16:20 2012
sender: root@nasa.cs.nctu.edu.tw
named_attribute: rewrite_context=local
original_recipient: root
recipient: lctseng@cs.nctu.edu.tw
*** MESSAGE CONTENTS deferred/3/3314234284A ***
Received: by nasa.cs.nctu.edu.tw (Postfix)
        id 3314234284A; Sat, 19 May 2012 04:16:20 +0800 (CST)
Delivered-To: root@nasa.cs.nctu.edu.tw
Received: by nasa.cs.nctu.edu.tw (Postfix, from userid 0)
        id 2CB713427A5; Sat, 19 May 2012 04:16:20 +0800 (CST)
To: root@nasa.cs.nctu.edu.tw
Subject: nasa.cs.nctu.edu.tw weekly run output
Message-Id: <20120518201620.2CB713427A5@nasa.cs.nctu.edu.tw>
Date: Sat, 19 May 2012 04:16:20 +0800 (CST)
From: root@nasa.cs.nctu.edu.tw (NASA Root)

Rebuilding locate database:

Rebuilding whatis database:
   …
```

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 lctseng@cs.nctu.edu.tw and lctseng@csie.nctu.edu.tw will go to csmailgate:/var/mail/lctseng

❑ Limitation

- Can not separate lctseng@cs.nctu.edu.tw from lctseng@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_maps" 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_maps" 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
```

Step by Step Examples

Let’s learn from examples

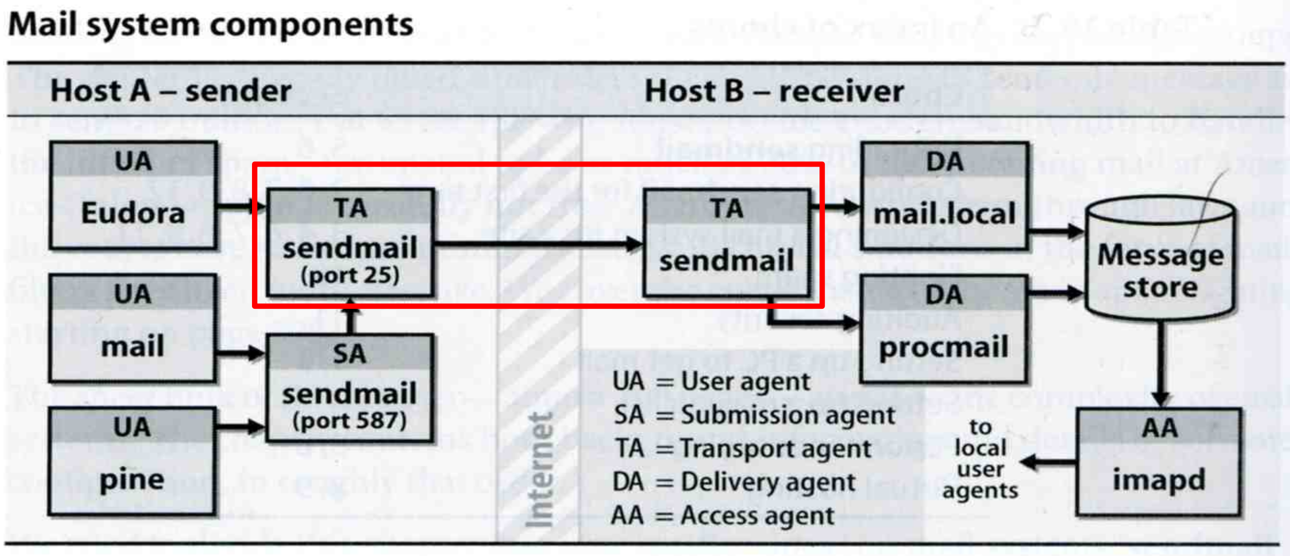
Step by Step Examples

- ❑ Build a Basic MTA
  - Send test mails to verify your MTA
  - Check whether your mail is sent or not
- ❑ MTA Authentication
- ❑ MTA Encryption
- ❑ MAA for POP3 and IMAP

- ❑ Note
  - In this example, we assume you have public IP/domain

Build a Basic MTA

Can send mails to other domain



Mail system components

Build a basic MTA(1)

- ❑ Can send mails to other domain
- ❑ Install Postfix
  - Pkg: postfix
  - Port: mail/postfix
- ❑ After installation
  - Disable "sendmail" program
    - ➢ service sendmail stop
    - ➢ In /etc/rc.conf

```
sendmail_enable="NONE"
```

    - ➢ In /etc/periodic.conf (create if not exists)

```
daily_clean_hoststat_enable="NO"
daily_status_mail_rejects_enable="NO"
daily_status_include_submit_mailq="NO"
daily_submit_queuerun="NO"
```

Build a basic MTA(2)

❑ Replace sendmail by Postfix modified version

- Edit /etc/mail/mailer.conf

```
Sendmail    /usr/local/sbin/sendmail
send-mail   /usr/local/sbin/sendmail
Mailq       /usr/local/sbin/sendmail
newaliases  /usr/local/sbin/sendmail
```

Build a basic MTA(3)

❑ After installation

- Enable postfix
  - ➢ Edit /etc/rc.conf

```
postfix_enable="YES"
```

  - ➢ service postfix start

❑ Set up DNS records

- Some domains will reject mails from hosts without DNS record
- Suppose the hostname is “demo1.nasa.lctseng.nctucs.net”
- Set up these records
  - ➢ (A record) demo1.nasa.lctseng.nctucs.net
  - ➢ (A record) nasa.lctseng.nctucs.net
  - ➢ (MX record) nasa.lctseng.nctucs.net
    - – Points to “demo1.nasa.lctseng.nctucs.net”

Build a basic MTA(4)

❑ Set up MTA identity

- See Postfix Configuration: MTA identity
- In main.cf

```
myhostname = demo1.nasa.lctseng.nctucs.net
mydomain = nasa.lctseng.nctucs.net
myorigin = $myhostname
mydestination = $myhostname, localhost.$mydomain,
          localhost, $mydomain
```

❑ Reload or restart postfix to apply changes

- postfix reload

Send test mails to verify your MTA(1)

- ❑ “telnet” or “mail” command

```
> telnet localhost 25
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.
220 demo1.nasa.lctseng.nctucs.net ESMTP Postfix
EHLO localhost
250-demo1.nasa.lctseng.nctucs.net
250-PIPELINING
250-SIZE 10240000
250-VRFY
250-ETRN
250-ENHANCEDSTATUSCODES
250-8BITMIME
250 DSN
MAIL FROM: lctseng@nasa.lctseng.nctucs.net
250 2.1.0 Ok
RCPT TO: lctseng@cs.nctu.edu.tw
250 2.1.5 Ok
DATA
354 End data with <CR><LF>.<CR><LF>
Subject: This is test mail

DATA
.
250 2.0.0 Ok: queued as 3C868150
```

telnet

Send test mails to verify your MTA(2)

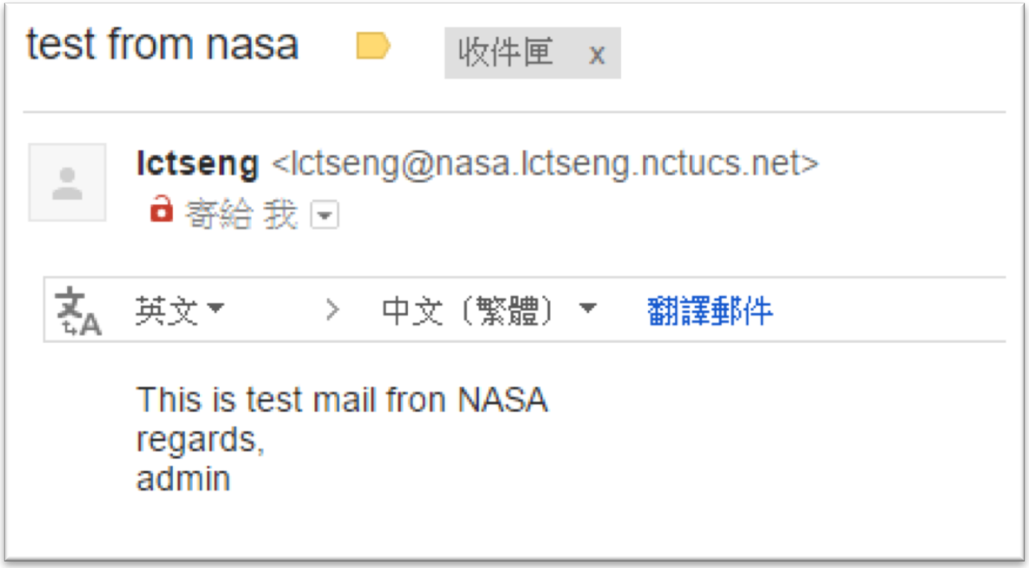
- ❑ The “mail” command

```
> mail -s "test from nasa" lctseng@gmail.com
This is test mail from NASA
regards,
admin
(Press Ctrl+D)
```

mail

- See man page for more details

- ❑ Result (gmail)



test from nasa

lctseng <lctseng@nasa.lctseng.nctucs.net>

This is test mail fron NASA
regards,
admin

Send test mails to verify your MTA(3)

- Mail source text of last example

```
Delivered-To: lctseng@gmail.com
Received: by 10.129.125.135 with SMTP id y129csp874822ywc;
        Sun, 6 Mar 2016 02:39:22 -0800 (PST)
X-Received: by 10.98.87.90 with SMTP id l87mr25639644pfb.70.1457260762400;
        Sun, 06 Mar 2016 02:39:22 -0800 (PST)
Return-Path: <lctseng@nasa.lctseng.nctucs.net>
Received: from demo1.nasa.lctseng.nctucs.net …(omitted)
        by mx.google.com with ESMTP id bz6si20406744pad.30.2016.03.06.02.39.21
        for <lctseng@gmail.com>;
        Sun, 06 Mar 2016 02:39:21 -0800 (PST)
Received-SPF: neutral (google.com: 140.113.168.238 is neither permitted …(omitted)
Authentication-Results: mx.google.com;
       spf=neutral (google.com: 140.113.168.238 is neither permitted …(omitted)
Received: by demo1.nasa.lctseng.nctucs.net (Postfix, from userid 1001)
         id 6D916162; Sun,  6 Mar 2016 18:38:04 +0800 (CST)
To: lctseng@gmail.com
Subject: test from nasa
Message-Id: <20160306103804.6D916162@demo1.nasa.lctseng.nctucs.net>
Date: Sun,  6 Mar 2016 18:38:04 +0800 (CST)
From: lctseng@nasa.lctseng.nctucs.net (lctseng)

This is test mail from NASA
regards,
admin
```

Check whether your mail is sent or not (1)

- ❑ Sometimes, we do not receive mails immediately
- ❑ There may be some errors when your MTA sending mails to other domain
- ❑ Mails will stay in queues
  - Contain information about each mail
- ❑ Tools to management mail queues
  - See Postfix Configuration: Queue Management - Queue Tools

Check whether your mail is sent or not (2)

❑ Example for rejected mails

```
-Queue ID- --Size-- ----Arrival Time---- -Sender/Recipient-------
3C868150        377 Sun Mar  6 18:23:11  lctseng@nasa.lctseng.nctucs.net
(host csmx3.cs.nctu.edu.tw[140.113.235.119] said: 450 4.1.8
<lctseng@nasa.lctseng.nctucs.net>: Sender address rejected: Domain not found
 (in reply to RCPT TO command)) lctseng@cs.nctu.edu.tw

-- 0 Kbytes in 1 Request.
```

- Problem
  - ➢ The destination MX cannot verify the domain of sender host
- Reason
  - ➢ You may forget to set up correct DNS record
- This mail will NOT be delivered until you set up your DNS record

Check whether your mail is sent or not (3)

❑ Example for deferred mails

```
-Queue ID- --Size-- ----Arrival Time---- -Sender/Recipient-------
3C868150        377 Sun Mar  6 18:23:11  lctseng@nasa.lctseng.nctucs.net
(host csmx1.cs.nctu.edu.tw[140.113.235.104] said: 450 4.2.0
<lctseng@cs.nctu.edu.tw>: Recipient address rejected: Greylisted,
 see http://postgrey.schweikert.ch/help/cs.nctu.edu.tw.html
 (in reply to RCPT TO command))    lctseng@cs.nctu.edu.tw

-- 0 Kbytes in 1 Request.
```

- Problem
  - ➢ The mail is deferred for a short time
- Reason
  - ➢ Destination host wants to examine our server is a spamming host or not
- The mail will be delivered after a short time
  - ➢ Generally within 30 minutes

MTA Authentication

We don’t want unauthorized user to access our MTA

MTA authentication(1)

- In previous example, only localhost can send mail to other domain
- If you try telnet on other host, when you try to send mails to other domain, you will get:

```
> telnet demo1.nasa.lctseng.nctucs.net 25
Trying 140.113.168.238...
Connected to demo1.nasa.lctseng.nctucs.net.
Escape character is '^]'.
220 demo1.nasa.lctseng.nctucs.net ESMTP Postfix
MAIL FROM: lctseng@demo1.nasa.lctseng.nctucs.net
250 2.1.0 Ok
RCPT TO: lctseng@gmail.com
454 4.7.1 <lctseng@gmail.com>: Relay access denied
```

- That is because you have following lines in main.cf

```
mynetworks_style = host
```

  - So Postfix only trust clients from localhost
  - See Postfix Configuration: Relay Control

MTA authentication(2)

- ❑ How to let SMTP clients outside from trust networks get the same privileges as trusted hosts?
  - Can send mails to other domain, not only `$mydestination`
  - We need authentication (account and password)
- ❑ SASL Authentication
  - Simple Authentication and Security Layer
  - RFC 2554, RFC 4954
- ❑ To configure SASL for Postfix, we need another daemon
  - Dovecot SASL (we use it in our example)
  - Cyrus SASL (need to enable it by port)
- ❑ References
  - http://wiki2.dovecot.org/
  - http://www.postfix.org/SASL_README.html

MTA authentication(3) - Dovecot SASL

- ❑ Installation
  - Pkg: dovecot
  - Port: mail/dovecot
- ❑ Enable Dovecot SASL daemon
  - In /etc/rc.conf

```
dovecot_enable="YES"
```

  - Copy configuration files

```
cp -R /usr/local/etc/dovecot/example-config/* \
                /usr/local/etc/dovecot
```

  - Create SSL keys for Dovecot (self-signed or use Let’s Encrypt)
    - ➢ Change path for SSL files in /usr/local/etc/dovecot/conf.d/10-ssl.conf
    - ➢ In fact, these are mainly for POP3s and IMAPs, not SASL in Postfix
  - service dovecot start

MTA authentication(4) - Postfix with Dovecot SASL

□ Set up Dovecot SASL authenticate (using system account)

- In /usr/local/etc/dovecot/conf.d/10-master.conf:

```
service auth {
  ...
  # Postfix smtp-auth
  unix_listener /var/spool/postfix/private/auth {
    mode = 0666
  }
  ...
}
```

- In /usr/local/etc/dovecot/conf.d/10-auth.conf

```
auth_mechanisms = plain login
```

MTA authentication(5) - Postfix with Dovecot SASL

❑ Set up Dovecot SASL in Postfix

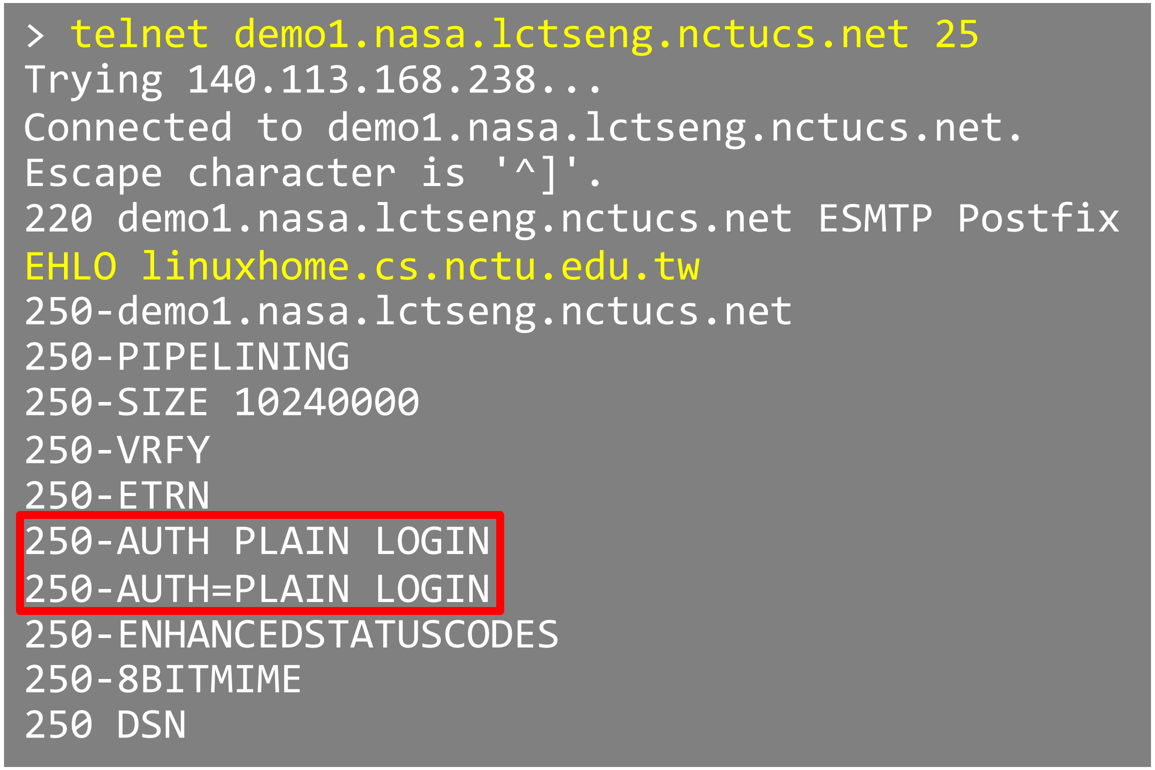
- In main.cf

```
# Set SASL to Dovecot
smtpd_sasl_type = dovecot
# Specify the UNIX socket path
smtpd_sasl_path = private/auth
# Enable SASL
smtpd_sasl_auth_enable = yes
# For client capability
broken_sasl_auth_clients = yes
# Allow SASL authenticated clients
smtpd_recipient_restrictions = permit_mynetworks,
                               permit_sasl_authenticated,
                               reject_unauth_destination
```

❑ Restart/Reload Dovecot and Postfix

MTA authentication(6)

❑ Now you can authenticate your identity in SMTP



```
> telnet demo1.nasa.lctseng.nctucs.net 25
Trying 140.113.168.238...
Connected to demo1.nasa.lctseng.nctucs.net.
Escape character is '^]'.
220 demo1.nasa.lctseng.nctucs.net ESMTP Postfix
EHLO linuxhome.cs.nctu.edu.tw
250-demo1.nasa.lctseng.nctucs.net
250-PIPELINING
250-SIZE 10240000
250-VRFY
250-ETRN
250-AUTH PLAIN LOGIN
250-AUTH=PLAIN LOGIN
250-ENHANCEDSTATUSCODES
250-8BITMIME
250 DSN
```

MTA authentication(7)

- The account and password are encoded in Base64
  - If you have perl installed, suggest your account is test and password is testpassword

```
perl -MMIME::Base64 -e 'print encode_base64("\000test\000testpassword");'
```

  - It will generate encoded account and password
    - For example: AHRlc3QAdGVzdHBhc3N3b3Jk

MTA authentication(8)

- Use the encoded account and password to authenticate it

```
> telnet demo1.nasa.lctseng.nctucs.net 25
Trying 140.113.168.238...
Connected to demo1.nasa.lctseng.nctucs.net.
Escape character is '^]'.
220 demo1.nasa.lctseng.nctucs.net ESMTP Postfix
AUTH PLAIN AHRlc3QAdGVzdHBhc3N3b3Jk
235 2.7.0 Authentication successful
MAIL FROM: lctseng@nasa.lctseng.nctucs.net
250 2.1.0 Ok
RCPT TO: lctseng@gmail.com
250 2.1.5 Ok
DATA
354 End data with <CR><LF>.<CR><LF>
To: lctseng@gmail.com
Subject: This is authenticated client
Message-Id: <20160307120109.861A9154@demo1.nasa.lctseng.nctucs.net>
Date: Mon,  7 Mar 2016 15:01:09 +0800 (CST)
From: lctseng@demo1.nasa.lctseng.nctucs.net (lctseng)

Test Mail
.
250 2.0.0 Ok: queued as F3D59171
```

MTA Encryption

The Internet is dangerous.
We need to protect ourselves from sniffing.

MTA encryption(1)

- In previous example, all SMTP sessions are in plain text
    - Your encoded authentication information is in danger!
- We need encryption over SSL/TLS
    - Like HTTP can be enhanced to HTTPs
    - Postfix supports two kinds of encryption
        - SMTP over TLS
        - SMTPs
- Before we enable SMTP over TLS (or SMTPs), you need SSL keys and certificates
    - Again, just like HTTPs
    - Self-signed or use Let’s Encrypt
    - You can use the same certificates/keys as Dovecot’s
        - In main.cf

```
smtpd_tls_cert_file = /path/to/cert.pem
smtpd_tls_key_file = /path/to/key.pem
```

MTA encryption(2-1) - Set up SMTP over TLS

❑ Recommended for SMTP encryption

❑ Use the same port as SMTP (port 25)

❑ No force encryption

- Client can choose whether to encrypt mails or not
- But server can configured to force encryption

❑ In main.cf

- No force encryption

```
smtpd_tls_security_level = may
```

- Force encryption

```
smtpd_tls_security_level = encrypt
```

❑ Reload Postfix

MTA encryption(2-2) - Set up SMTP over TLS

❑ Now your server supports SMTP over TLS

```
 > telnet demo1.nasa.lctseng.nctucs.net 25
Trying 140.113.168.238...
Connected to demo1.nasa.lctseng.nctucs.net.
Escape character is '^]'.
220 demo1.nasa.lctseng.nctucs.net ESMTP Postfix
EHLO linuxhome.cs.nctu.edu.tw
250-demo1.nasa.lctseng.nctucs.net
250-PIPELINING
250-SIZE 10240000
250-VRFY
250-ETRN
250-STARTTLS
250-ENHANCEDSTATUSCODES
250-8BITMIME
250 DSN
```

❑ If you use force encryption, you must STARTTLS before sending mails

```
MAIL FROM: lctseng@nasa.lctseng.nctucs.net
530 5.7.0 Must issue a STARTTLS command first
```

MTA encryption(2-3) - Set up SMTP over TLS

❑ Send mail with STARTTLS

- You cannot use telnet (plain-text client) anymore
- Connection becomes encrypted after STARTTLS
- telnet cannot read encrypted text

❑ OpenSSL client

```
openssl s_client -connect demo1.nasa.lctseng.nctucs.net:25 -starttls smtp
```

MTA encryption(3-1) - Set up SMTPs

❑ Alternative way to encrypt SMTP sessions

❑ Use different port: 465

❑ Force encryption

❑ Can coexist with SMTP over TLS

❑ In master.cf

- Uncomment these lines

```
smtps     inet  n        -       n        -       -       smtpd
   -o syslog_name=postfix/smtps
   -o smtpd_tls_wrappermode=yes
```

- This will open port 465 for SMTPs and use “smtps” as syslog name

❑ Reload Postfix

MTA encryption(3-2) - Set up SMTPs

❑ Now you can use SSL clients to use SMTPs

- telnet may not work in encrypted sessions
- SSL client:

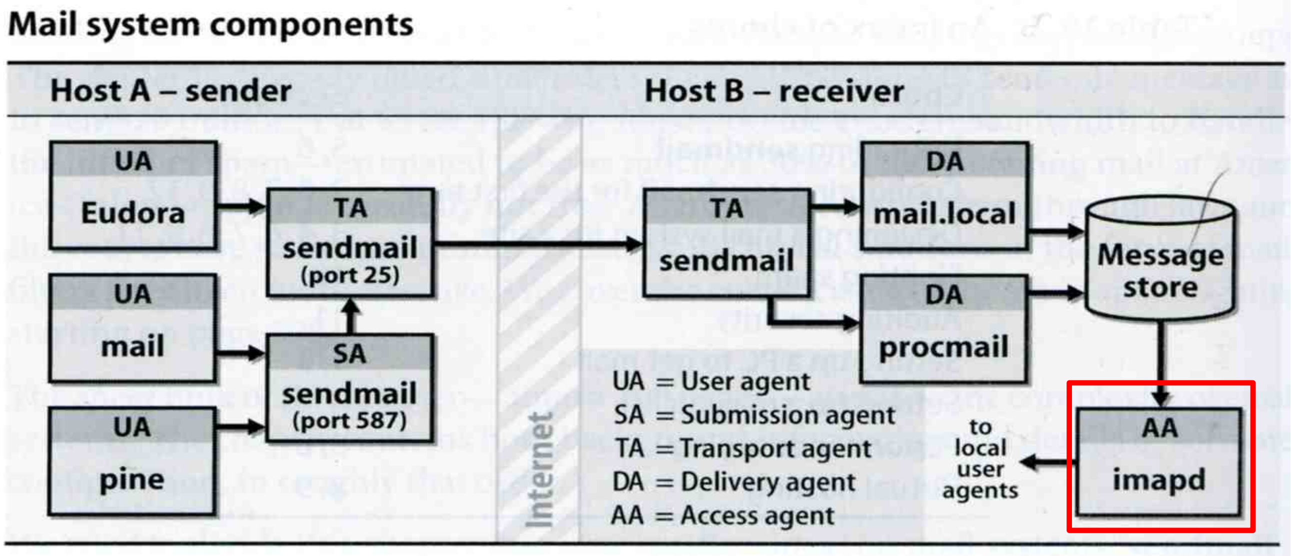
```
openssl s_client -connect host:port
```

- Important note
  - ➢ In openssl s_client, DO NOT use capital character “R”
    - – “R” is a special command in openssl s_client (for renegotiating)
  - ➢ So use “mail from/rcpt to” instead of “MAIL FROM/RCPT TO”
    - – For SMTP, they are all the same
  - ➢ If you use “R”, you will see following output (NOT a part of SMTP)

```
RENEGOTIATING
depth=2 O = Digital Signature Trust Co., CN = DST Root CA X3
verify return:1
depth=1 C = US, O = Let's Encrypt, CN = Let's Encrypt Authority X1
verify return:1
depth=0 CN = nasa.lctseng.nctucs.net
verify return:1
```

MAA for POP3 and IMAP

Read mails from remote host



MAA for POP3 and IMAP (1)

- ❑ Dovecot already provides POP3 and IMAP services
  - Include SSL versions: POP3s, IMAPs
    - ➢ That why we need SSL certificates and keys for Dovecot
- ❑ When you activate Dovecot service, these MAA services are also brought up.
- ❑ But you cannot access mail directly, you need some configuration
  - Configuration files are in : /usr/local/etc/dovecot/
  - There are many files included by dovecot.conf
    - ➢ In conf.d directory
    - ➢ Splitting configuration files is easier to management
  - Reference: https://doc.dovecot.org/configuration_manual/quick_configuration/

MAA for POP3 and IMAP (2) - Dovecot Configuration

- □ Allow GID = 0 to access mail (optional)
  - By default, Dovecot do not allow users with GID = 0 to access mail. If your users are in wheel group, you need following settings
  - In dovecot.conf

```
first_valid_gid = 0
```

- □ Specify the mail location (must agrees with Postfix)
  - In conf.d/10-mail.conf

```
mail_location = mbox:~/mail:INBOX=/var/mail/%u
```

- □ Add authenticate configuration to use PAM module
  - Dovecot use system PAM module to authenticate
  - Allow system users to access mails
  - Create a new file: /etc/pam.d/dovecot

```
auth    required        pam_unix.so
account required        pam_unix.so
```

MAA for POP3 and IMAP (3)

- ❑ After restart Dovecot, your MAA is ready
- ❑ To check these services, you can use “telnet” or “openssl s_client”
  - POP3: 110
  - POP3s: 995
  - IMAP: 143
  - IMAPs: 993

MAA for POP3 and IMAP (4)

- ❑ IMAP + STARTTLS

```
openssl s_client -connect host.example.com:143 -starttls imap
```

- ❑ POP3 + STARTTLS

```
openssl s_client -connect host.example.com:110 -starttls pop3
```

- ❑ IMAPs

```
openssl s_client -connect host.example.com:993
```

- ❑ POP3s

```
openssl s_client -connect host.example.com:995
```

- ❑ Sample message from Dovecot when succeed
  - POP

    ```
    +OK Dovecot ready.
    ```

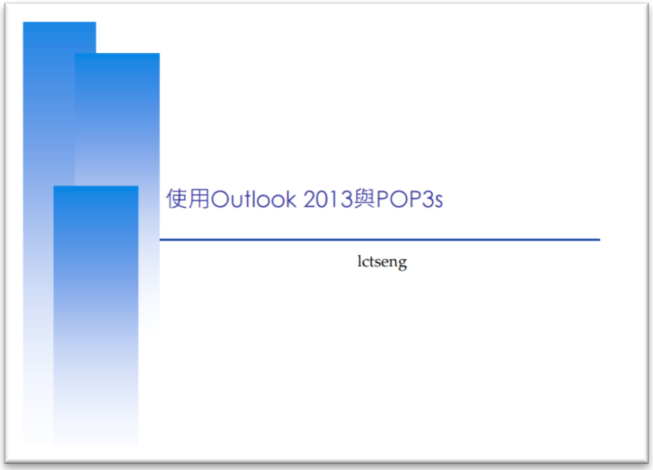
  - IMAP

    ```
    * OK [CAPABILITY IMAP4rev1 LITERAL+ SASL-IR LOGIN-REFERRALS
      ID ENABLE IDLE AUTH=PLAIN AUTH=LOGIN] Dovecot ready.
    ```

MAA for POP3 and IMAP (5)

❑ Set up MUAs like Outlook or Thunderbird

- You can see the tutorial in CS mail server, they should be similar to set up your server
- Settings for Gmail is also available
- https://mail.cs.nctu.edu.tw/



使用Outlook 2013與POP3s

lctseng

使用Gmail

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範例Gmail取樣日期：2014-10-31