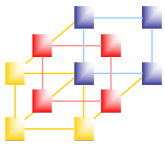
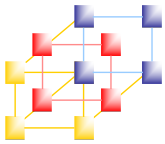
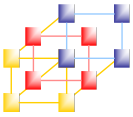


Unit 11
Network Applications



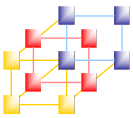
POP3 Client



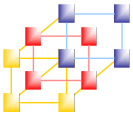
Python poplib Module

https://docs.python.org/3/library/poplib.html

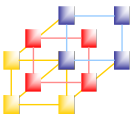
- The POP3 protocol can be used to download the messages from the e-mail server
  - RFC 1225, May 1991
  - TCP port 110
- poplib has two high-level classes
  - POP3(*host*, *port=POP3_PORT*[, *timeout*])
  - POP3_SSL(*host*, *port=POP3_SSL_PORT*, *keyfile=None*, *certfile=None*, *timeout=None*, *context=None*)



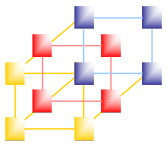
- user(username)
  - Send user command, response should indicate that a password is required.
- pass_(password)
  - Send password, response includes message count and mailbox size
  - Note: the mailbox on the server is locked until quit() is called
- stat()
  - Get mailbox status
  - Result (message count, mailbox size)



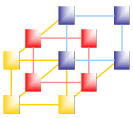
- list([*which*])
  - Request message list
  - Result is in the form (response, ['mesg_num octets', ...], octets). If *which* is set, it is the message to list
- retr(*which*)
  - Retrieve whole message number *which*, and set its seen flag
  - Result is in form (response, ['line', ...], octets)



- dele(*which*)
  - Flag message number *which* for deletion
  - On most servers deletions are not actually performed until
- rset()
  - Remove any deletion marks for the mailbox
- quit()
  - Signoff
  - commit changes, unlock mailbox, drop connection



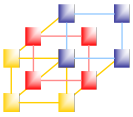
SMTP Client



Python smtplib Module

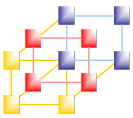
https://docs.python.org/3/library/smtplib.html

- The smtplib module defines an SMTP client session object that can be used to send mail to any Internet machine with an SMTP or ESMTP listener
  - RFC 821
  - TCP port 25
- smtplib has two high-level classes
  - SMTP(*host=''*, *port=0*, *local_hostname=None*, [*timeout*,]*source_address=None*)
  - SMTP_SSL(*host=''*, *port=0*, *local_hostname=None*, *keyfile=None*, *certfile=None*, [*timeout*,]*context=None*, *source_address=None*)

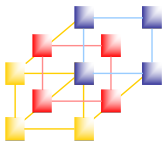


Exceptions

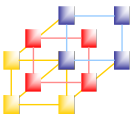
- smtplib.SMTPException
- smtplib.SMTPServerDisconnected
- smtplib.SMTPResponseException
- smtplib.SMTPSenderRefused
- smtplib.SMTPRecipientsRefused
- smtplib.SMTPDataError
- smtplib.SMTPConnectError
- smtplib.SMTPHeloError
- smtplib.SMTPNotSupportedError
- smtplib.SMTPAuthenticationError



- helo(*name=''*)
  - Identify yourself to the SMTP server using HELO. The hostname argument defaults to the fully qualified domain name of the local host.
- ehlo(*name=''*)
  - Identify yourself to an ESMTP server using EHLO.
- sendmail(*from_addr*, *to_addrs*, *msg*, *mail_options=()*, *rcpt_options=()*)
  - Send mail.
  - The required arguments are an RFC 822 from-address string, a list of RFC 822 to-address strings (a bare string will be treated as a list with 1 address), and a message string.
- quit()
  - Terminate the SMTP session and close the connection.

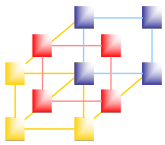


NTP Client

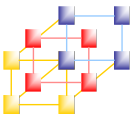


Ntplib Module

- 安裝 ntplib
  - pip3 install ntplib –user
- client = ntplib.NTPClient()
  - response = client.request(HOST_NAME)



DNS



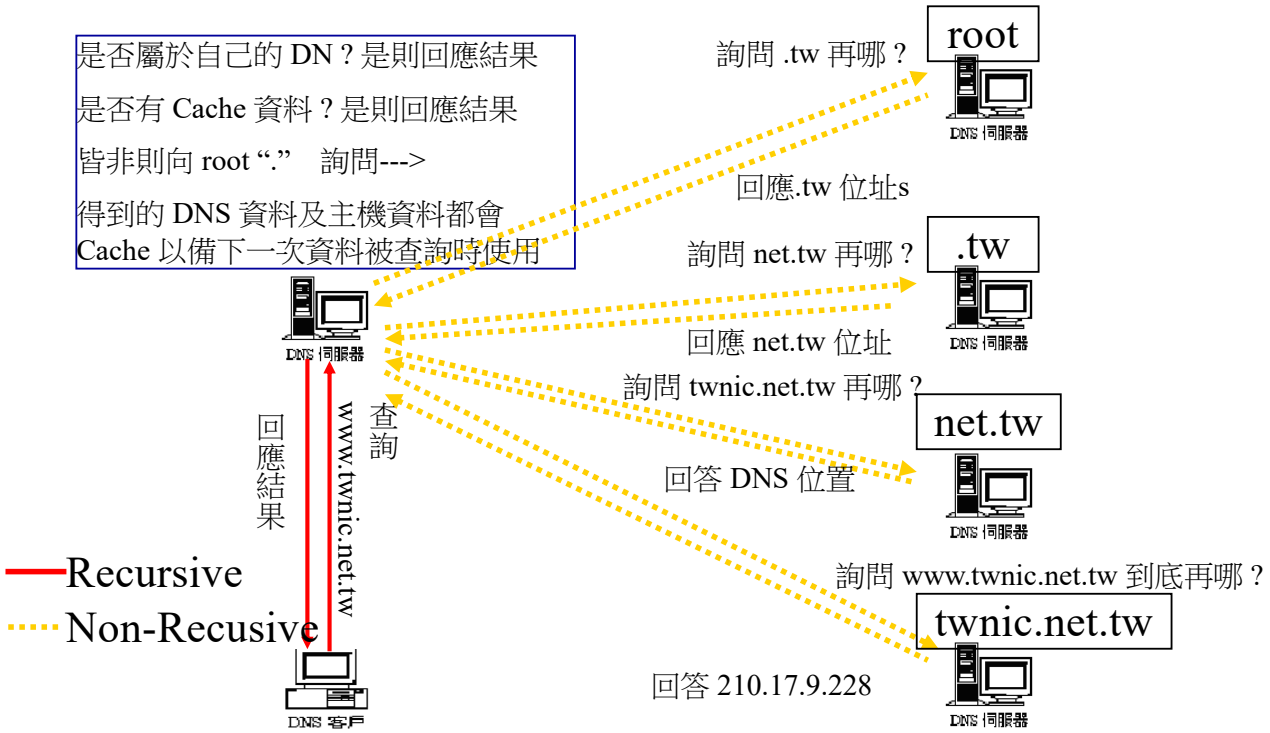
域名與Internet相關服務之關係

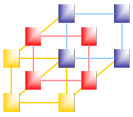
- 名稱解析服務為 Internet 服務最基礎的一環
- 名稱解析提供機器名稱與 IP 位址雙向對映的機制
  - WWW　www.hinet.net <-> 168.95.1.82
  - MAIL　msa.hinet.net <-> 168.95.4.211
- 網域名稱比 IP 容易記， 且具代表意義
- 使用網域名稱讓系統更具移值性，當 IP 變動，只需更改 DNS 設定即可，程式網頁等不需更改

DNS 運作模式

- 分散式
  - 自己的資料由自己維護，而其他人的資料則分散在全球
  - 沒有一台電腦會有全部的DNS資料
  - 全球最大的分散式資料庫系統
  - 以樹狀結構的方式找到目的位址(每個結點需要授權)
  - http://www.root-servers.org/ 目前 Root Server 分布情形
- 穩定
  - 負載平衡:可由 Master 主機自由的複製到 Slave 主機
  - 備援:一個網域名稱可有多台主機共同服務(輸流查詢)
- 樹狀結構
  - 經由全球唯一的 Root Server 達到正確搜尋的目的
  - Root Server 共十三部
- 效率
  - 使用 UDP 封包
  - 查詢速度基本上都在 100 msec 內
  - 經由 Cache 來加快 DNS 的查詢

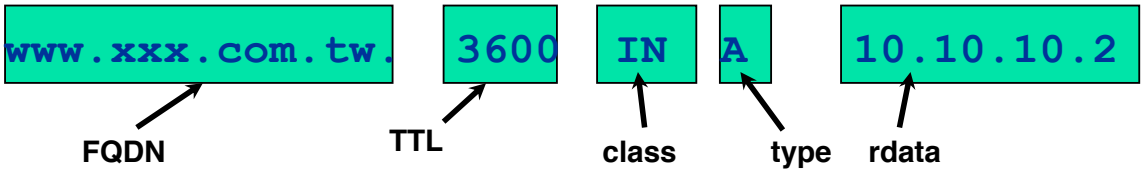
運作原理

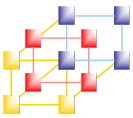




DNS資源記錄

- 資源記錄(RR， Resource Record)
  - 名稱(FQDN)
  - 快取時間 (TTL，Time to Live)
    - 是此一筆資料被別的 DNS Cache 的時間值
  - 網路類別(class)
    - IN 即是 Internet
  - 資料類型(type)
  - 答案(rdata)
- 下列為一筆資源紀錄的內容

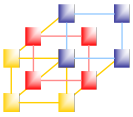




資料類型

- SOA (Start Of Authority) 記錄用於DNS自身,代表其為權威主機
  - SOA 提供此一 Zone 之基本資料及更新時間參數供 Slave DNS 更新使用
- NS (Name Server) 用於 DNS 的搜尋
  - NS 記錄之 RDATA 需接一 FQDN 記錄，不可用 IP，也不可接到一 CNAME 記錄
  - A 記錄為指出某一 FQDN 其 IP 為何
  - AAAA 為 IPv6 Address

```
xxx.com.tw.        IN   NS   ns1.xxx.com.tw.
xxx.com.tw.        IN   NS   ns2.xxx.com.tw.
ns1.xxx.com.tw.    IN   A    211.72.211.1
ns2.xxx.com.tw.    IN   A    211.72.211.2
```

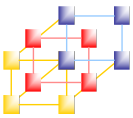


- CNAME 用於機器別名
  - 建議使用 A 記錄來替 CNAME，以避免 NS/MX 等出現問題

    www.xxx.com.tw. 3600 IN A 211.72.211.80

    ftp.xxx.com.tw. 3600 IN CNAME www.xxx.com.tw.
- MX (Mail eXchange) 記錄為 SMTP 服務所使用，其中的 10，20 表示郵件交換時的優先順序(數字小者優先)
  - 亦可使用 A 記錄來代 MX使用 (即 DN=FQDN)，但如此僅能使用一部機器當 Mail Server

```
xxx.com.tw.     86400     IN     MX     10     mail.xxx.com.tw.
xxx.com.tw.     86400     IN     MX     20     imap.xxx.com.tw.
mail.xxx.com.tw.     86400     IN     A     211.72.211.25
imap.xxx.com.tw.     86400     IN     A     211.72.211.143
```

dns.resolver Module

- 安裝 dnspython3
  - pip3 install dnspython3 – user
- 使用
  - answers = dns.resolver.resolve(name, record_type)