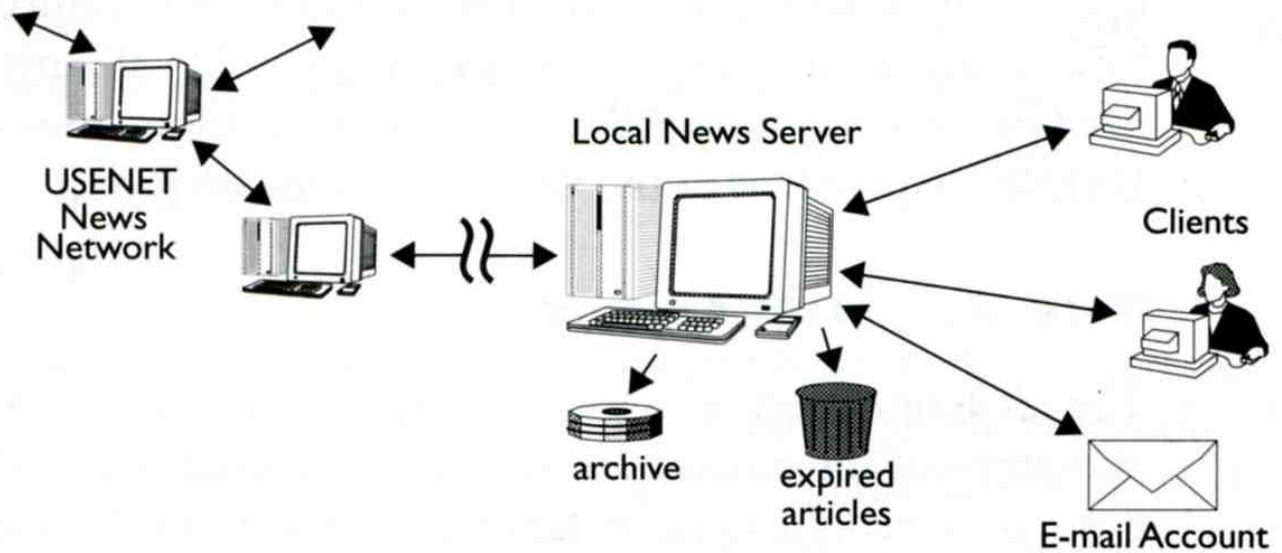


# News

## Usenet · NetNews



# News outline

---

## ❑ Introduction

- History of netnews
- History of newsgroups
- News operations

## ❑ Transfer protocol

- NNTP – Network News Transfer Protocol

## ❑ News softwares

- Reader: tin
- Server: INN – InterNet News



# Introduction to News

---

# Introduction to news (1)

---

- ❑ Usenet is a worldwide distributed Internet discussion system.
  - The initial Internet community
  - Like bulletin board systems (BBS)
  - Hybrid between e-mail and web forums
  - Absence of a central server and dedicated administrator
    - PTT – Error 37
  
- ❑ The format and transmission of Usenet articles is similar to that of Internet e-mail messages.
  
- ❑ Usenet has significant cultural importance in the networked world
  - FAQ, spam.

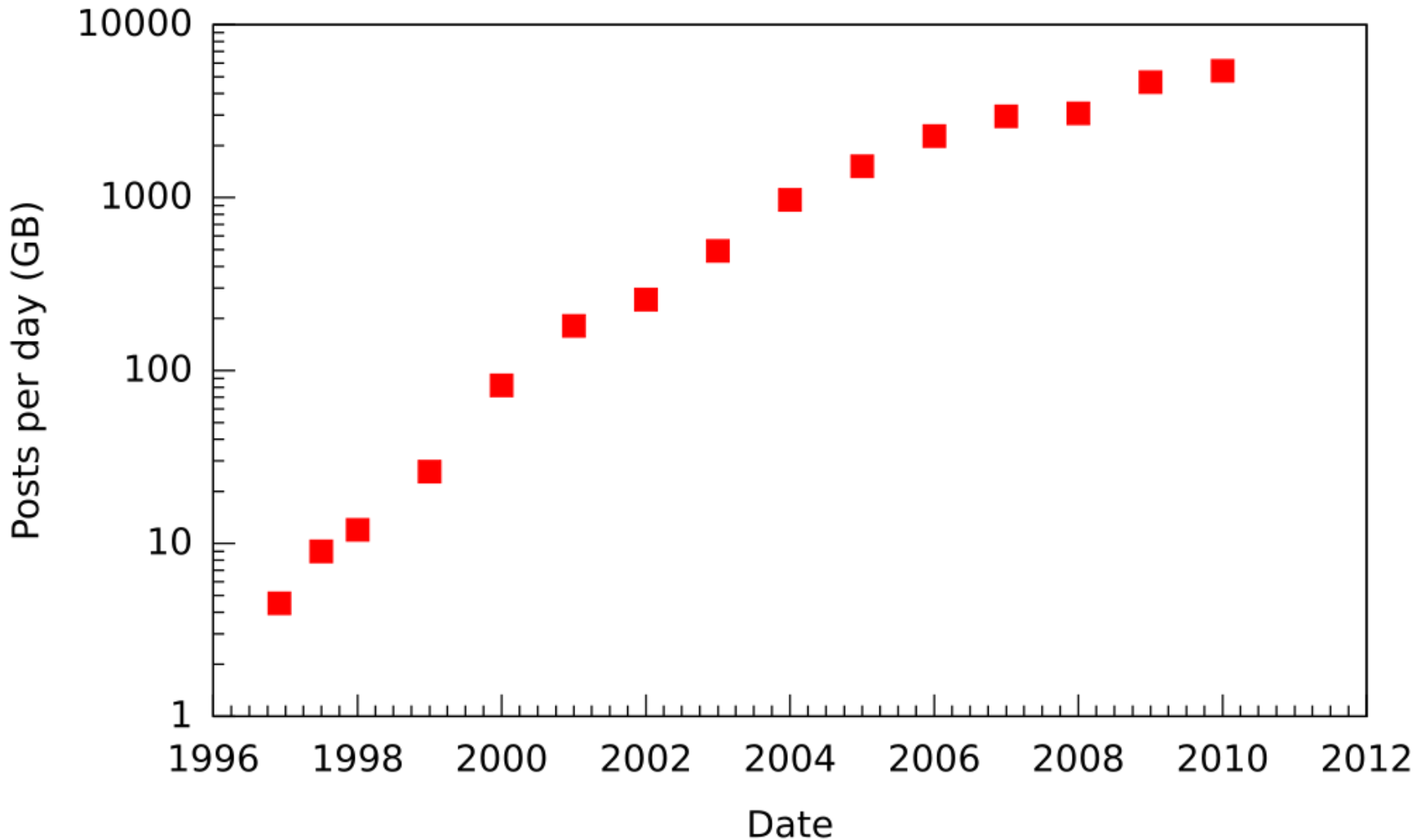
## Introduction to news (2)

- ❑ Spaming: In 1994, advertisers began broadcasting messages to all newsgroups at once.
- ❑ Usenet has diminished in importance with respect to Internet forums, blogs, and mailing lists.
- ❑ Google made efforts to buy archive of Usenet newsgroups to attempt to create a complete one. Google has a web search interface and also allows newsgroup posting.
  - <http://groups.google.com>
- ❑ Usenet is a “must-have” resource?
  - Altopia.com

Year	1996	1997	1998	1999	2000	2001	2002	2003	
Daily Vol. (GB)	4.5	9	12	26	82	181	257	492	
Year	2004	2005	2006	2007	2008	2009	2010	2011	2012
Daily Vol. (TB)	1	1.52	2.27	2.95	3.07	4.65	5.42	7.52	9.29

# Introduction to news (3)

Usenet Traffic Per Day (Source: altopia.com)



# History (1)

---

## ❑ Origins

- Tom Truscott and Jim Ellis conceived the idea in 1979
- Steve Bellovin assisted with writing Bourne shell scripts
- The first “netnews” program
- UUCP as its transport protocol

## ❑ A News

- The public release of “netnews” in 1980
- Rewritten in C by Tom Truscott, Steve Daniel

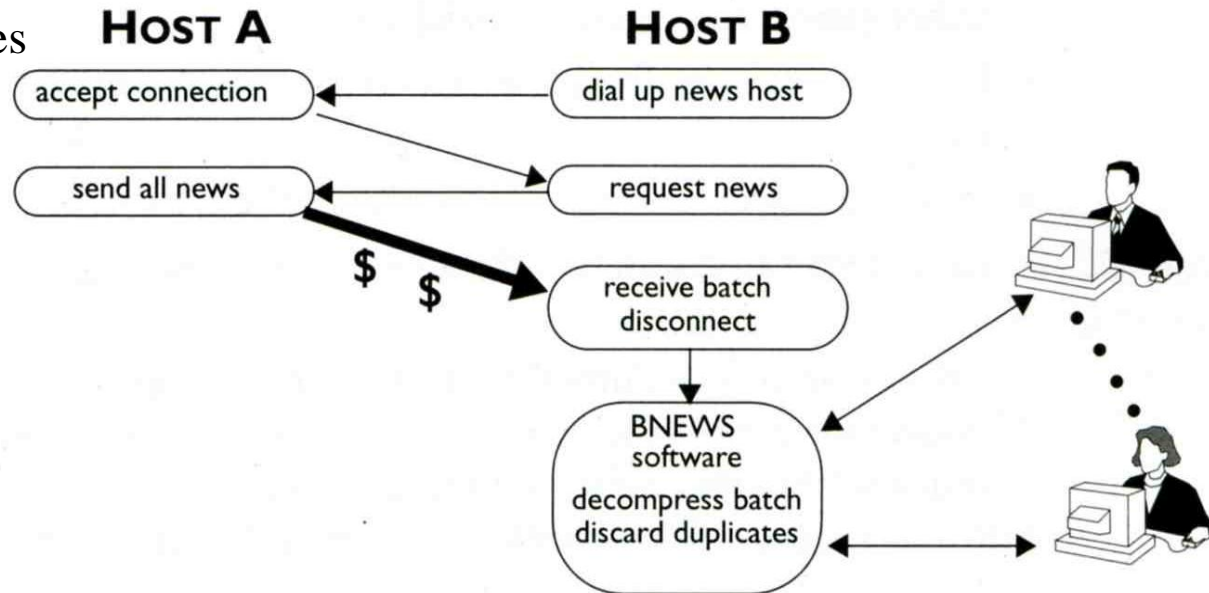
## ❑ B News

- Written by Mark Horton and Matt Glickman in 1981
- Development was passed on to Rick Adams in 1983 ~ 1989
- With a message format compatible with Internet mail
- Better performance for the grown news traffic

# History (2)

## □ UUCP

- Unix-to-Unix Copy Protocol
- Mostly commonly used over dial-up connections
- Replaced by the TCP/IP protocols SMTP for mail and NNTP for news
- Bang path are still use within the news network to record the nodes through which a message has passed
- Store-and-forward batch
- Duplicate articles

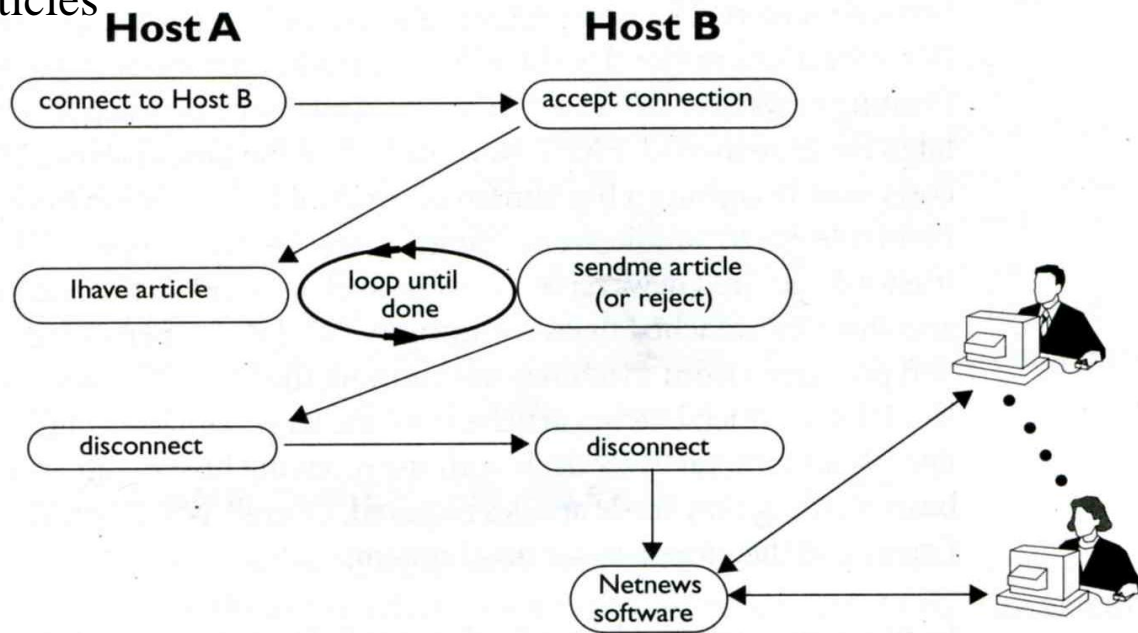




# History (3)

## □ NNTP

- Network News Transfer Protocol
- Introduced in 1985 to distribute netnews articles over TCP/IP network
- Specification is created by Phil Lapsley and Brian Kantor in 1986
- TCP port 119 for NNTP and TCP port 563 for NNTPS
- NNRP(Network News Reader Protocol)
- Sending required articles



# History (4)

---

## ❑ The CNEWS version

- Developed by Henry Spencer and Geoff Collyer in 1987
- Rewrite the code of B News to result in a cleaner, faster program
- The creation of a news index function in 1992
- NNTP XOVER command
- Allow news readers to rapidly retrieve header and threading information

## ❑ INN (InterNet News)

- Released by Rich Salz in 1991
- The first news server package to fully integrate NNTP functionality
- NNTP and UUCP support
- The most commonly used news server package now
- Still actively developed by ISC(Internet Systems Consortium)

# newsgroups (1)

- ❑ The articles are organized into topical categories called newsgroups.
- ❑ Newsgroups are organized into hierarchies, theoretically making it simpler to find related groups.
  
- ❑ A usenet newsgroup is a repository, a discussion group.
- ❑ Newsgroups
  - Types: text or binary.
  - Like the public message boards on BBS.
  - Over 100000 Usenet newsgroups



# newsgroups (2)

---

## ❑ Great Renaming

- July 1986 ~ March 1987
- Before this
  - fr.\* for groups gatewayed from ARPANET
  - mod.\* for moderated discussions
  - net.\* for unmoderated groups
- Primary reason: the difficulty of maintaining a list of all the existing groups.
- Alternative explanation:
  - European networks refuse to pay for some of the high volume and low content groups such as religion and racism.
  - The suggested category was talk.\*

# newsgroups (3)

---

## ❑ Great Renaming

- Initiated by Rick Adams
- Gene Spafford organized the “Backbone Cabal”
- Big 7 in 1987
  - comp.\* for computer related discussions
  - news.\* for discussions and announcements about netnews
  - rec.\* for discussions of recreational activities
  - sci.\* for science related discussions
  - soc.\* for socializing and discussions of social issues
  - talk.\* for discussions about various controversial topics
  - misc.\* for miscellaneous discussions
- Big 8 in 1995
  - humanities.\* for discussions of the humanities

# newsgroups (4)

---

- ❑ After the Great Renaming, the creation and organization of new newsgroups became an automated voting process.
  - Post an RFD (Request for Discussion) into news.announce.newgroups
  - Discuss in news.groups.proposals
  - The proposal is formalized with a name, description, charter.
  - Big-8 management board will vote on whether to create the group.
  
- ❑ There was a great controversy over what newsgroups should be allowed.
  - Drugs, and sex were not allowed.
  
- ❑ Brain Reid suggested the alt.\* hierarchy as an alternative to talk.\*
  - Dissatisfied with mod.gourmand → rec.food.recipies
  - Created in May 1987.

# newsgroups (5)

---

## ❑ alt.\* hierarchy

- It is ‘alternative’ to the mainstream Big-7.
- The first alt.\* newsgroups were alt.config, alt.gourmand, and alt.drugs
- Most newsgroups follow an informal procedure involving a public discussion in alt.config before created.
- Not confined to newsgroups of any specific subject or type.
- Because of the anarchistic nature with which the groups sprung up, some jokingly referred to ALT standing for “Anarchists, Lunatics and Terrorists”

## ❑ Two major sections of alt.\*

- alt.sex.\*: fearing the major news may be prevented from widely distributed.
- alt.binaries.\*: often of extremely large size.

## newsgroups (6)

---

- ❑ The language of preference in the “original” Usenet hierarchies, including alt.\*, is English.
  - Other language hierarchies have later been created in parallel to the existing English ones.
    - de.\*, fr.\*, ...
  - tw.\*, tw.bbs.\* (innbbsd)
  
- ❑ Some access providers also create their own versions, prefixing the newsgroups names with their own name in a similar way.
  - Messages posted in there “private” newsgroups are generally not passed to the other providers or the Internet in general.
  
- ❑ Some users prefer to use “Usenet” to refer only to the Big-8 hierarchies, and to use “netnews” to incorporate the entire medium.



# newsgroups (7)

---

## ❑ Binary newsgroups

- Binaries are posted in alt.binaries.\*
- Usenet was originally created to distribute text content encoded in ASCII.
- Encoded binaries by uuencode, Base64, Quoted-Printable MIME, or yEnc.
- The binaries might be split into pieces by means of RAR and PAR.

## ❑ Moderated newsgroups

- A moderated newsgroup has one or more individuals as moderators.
- Messages submitted by readers are not distributed to Usenet, but are emailed to the moderators for approval, instead.
- Moderators receive submitted articles, review them, and inject approved articles. Such articles must bear the “Approved:” header line.

# News operations (1)

---

## ❑ Articles and posts

- Binary content: split among multiple articles, reassembled into a single unit by the news reader
- Plain text: majority of the articles are responses to some other article.
  - Articles which can be traced to one single non-reply article is called a thread.

## ❑ Headers and overviews

- The overview is a list of the most frequently used headers, and additional information such as article sizes.

## ❑ newsfeeds

- When a user posts an article, it is initially only available on that user's news server. Each news server talks to one or more other servers(peers) and exchanges articles with them.

# News operations (2)

---

## □ News Reader

- Read and post articles
- In early news implementations: news server and news reader were a single program suite.
- Mail clients or “communication suites” commonly have an integrated news reader.
  - However, these integrated clients are of low quality: incorrectly implementing Usenet protocols, standards and conventions.
- A user subscribes to a newsgroup, the news reader software keeps track of which articles that user has read.
- With the rise of the World Wide Web, web front-ends have become more common.
- Common text-based news reader: tin (chinese/tin 、 news/tin)

# News operations (3)

---

## □ News Server

- Continually increasing storage
- Network capacity requirements
  
- Completion: the ability of a server to successfully receive all traffic
- Retention: the amount of time articles are made available to readers
- Overall system performance
  
- Split into
  - Transit server: handle the basic articles exchange.
  - Numbering server: insert the “Xref:” header line into each article
  - Back end server: data storage
  - Front end server: a user would actually connect to. Only store overviews, and carry the heaviest CPU load

# News operations (4)

---

## □ Spools

- A disk storage for the body of an article
- Types:
  - One file per article
    - Oldest storage scheme
    - Performance relates to OS's ability to create, remove and locate files within a dictionary
  - Cyclical storage
    - Since 1990s
    - Articles are appended serially to large indexed container files
    - When the end of the file is reached, new articles are written at the beginning of the file, overwriting the oldest entries.
    - Traditional text manipulation tools are less well-suited to analyze the files
- Flexibility to retention and space used.

# News operations (5)

---

## ❑ Storage management

- Article sizes
  - The maximum article size varies from site to site
- Retention
  - How long the server keeps articles
  - Text and binary

## ❑ Speed

- How quickly a server can deliver an article to the user

# News operations (6)

---

## ❑ Control messages (RFC5537)

- newgroup messages
  - Create a new newsgroup
- rmggroup messages
  - Remove a newsgroup
- checkgroup messages
  - Lists all groups of a hierarchy
- cancel messages
  - Delete a article specified by Message-ID
  - In cases where unsuitable content has been posted, Usenet has support for automated removal of a posting from the whole network by creating a cancel message.

# News operations (7)

---

## ❑ Spam filter

- Cancel message
  - 40% spams 、 40% cancel messages 、 20% useful information
  - There is no authentication in cancel messages
- Cleanfeed
  - Written by perl
  - Count by md5(body) 、 Ph/l(Posting-host/lines) 、 F/s/l(From/subject/lines)
  - Specific strings such as binary post 、 (mime) html post 、 MMF
- NoCeM
  - No see 'em
  - Cancel-Key = hash(password, Message-ID) 、 Cancel-Challenge
  - All notices must be public key signed to be accepted using PGP
  - innbbsd patch by leeym



# Take a break – nonsense

---

- ❑ NCTU\_Talk
- ❑ tw.bbs.comp.linux ↔ ptt
- ❑ tw.bbs.campus.nctu ↔ nctu.talk
- ❑ Group.NCTU.edu.tw



NNTP

---

RFC 3977

Interact with INN news server

# NNTP (1)

---

## ❑ Command and response

- Response codes
  - 1xx - Informative message
  - 2xx - Command completed OK
  - 3xx - Command OK so far; send the rest of it
  - 4xx - Command was syntactically correct but failed for some reason
  - 5xx - Command unknown, unsupported, unavailable, or syntax error
  
  - x0x - Connection, setup, and miscellaneous messages
  - x1x - Newsgroup selection
  - x2x - Article selection
  - x3x - Distribution functions
  - x4x - Posting
  - x8x - Reserved for authentication and privacy extensions
  - x9x - Reserved for private use (non-standard extensions)

# NNTP (2)

## □ NNTP vs. NNRP

- For your peers

```
liuyh@csnews$ telnet csnews2 433
Trying 140.113.235.121...
Connected to csnews2.cs.nctu.edu.tw.
Escape character is '^]'.
200 csnews2 InterNetNews server INN 2.4.6 ready
```

```
liuyh@bsd5$ telnet csnews2 433
Trying 140.113.235.121...
Connected to csnews2.
Escape character is '^]'.
502 Permission denied
```

- For your readers

```
liuyh@bsd5$ telnet csnews2 119
Trying 140.113.235.121...
Connected to csnews2.
Escape character is '^]'.
200 csnews2 InterNetNews NNRP server INN 2.4.6 ready (posting ok).
```

# NNTP (3)

---

## ❑ LIST (find the newsgroups)

- AVTIVE

### **list active cs.\***

```
215 Newsgroups in form "group high low flags".  
cs.computer-center 0000000509 0000000071 m  
cs.course.netadmin 0000000505 0000000131 y  
cs.course.object-oriented-programming.a 0000000284 0000000108 y
```

- NEWSGROUPS

### **list newsgroups cs.\***

```
215 Descriptions in form "group description".  
cs.computer-center [系計中公告] (Moderated)  
cs.course.netadmin [課程] 計算機網路管理.  
cs.course.object-oriented-programming.a [課程] 物件導向程式設計 A 班
```

# NNTP (4)

---

- ❑ LIST (overview format)
  - OVERVIEW.FMT

## **list overview.fmt**

**215 Order of fields in overview database.**

**Subject:**

**From:**

**Date:**

**Message-ID:**

**References:**

**Bytes:**

**Lines:**

**Xref:full**

.

# NNTP (5)

---

- ❑ GROUP (select a newsgroup)

```
group cs.course.netadmin  
211 359 131 505 cs.course.netadmin
```

- ❑ LISTGROUP (select a newsgroup)

```
listgroup cs.course.netadmin  
211 359 131 505 cs.course.netadmin  
131  
132  
134  
138  
141  
...  
504  
505  
.
```

# NNTP (6)

---

- ❑ STAT [ MessageID | Number ]

```
stat
223 131 <f1sej8$2dev$1@csnews2.cs.nctu.edu.tw> status
stat 123
423 Bad article number
```

- ❑ NEXT
- ❑ LAST

```
stat 131
223 131 <f1sej8$2dev$1@csnews2.cs.nctu.edu.tw> status
stat 500
223 500 <CS-NetAdmin$A15S3QN9@bbs.cs.nctu.edu.tw> status
next
223 501 <CS-NetAdmin$A15S8UDD@bbs.cs.nctu.edu.tw> Article retrieved; \
request text separately.
last
223 500 <CS-NetAdmin$A15S3QN9@bbs.cs.nctu.edu.tw> Article retrieved; \
request text separately.
```



# NNTP (7)

Subject:  
From:  
Date:  
Message-ID:  
References:  
Bytes:  
Lines:  
Xref:full

- ❑ XOVER [ range ] (retrieve the overview)

## xover 131-135

224 131-135 fields follow

```
131 [HW3] Sendmail sjwu <sjwu@cs.NCTU.edu.tw> Wed, 9 May 2007 \
    12:25:12 +0000 (UTC) <f1sej8$2dev$1@csnews2.cs.nctu.edu.tw> \
    70 Xref: csnews.cs.nctu.edu.tw cs.course.netadmin:131
132 ...
134 ...
.
```

- ❑ XHDR header [ range | MessageID ] (retrieve the specific header)

## xhdr subject 131-135

221 subject matches follow (NOV)

```
131 [HW3] Sendmail
132 Re: [HW3] Sendmail
134 ...
.
```

## xhdr newsgroups 131-135

221 newsgroups matches follow (art)

```
131 cs.course.netadmin
132 cs.course.netadmin
134 cs.course.netadmin
.
```

# NNTP (8)

❑ ARTICLE [ MessageID | Number ]

## article 499

**220** 499 <hpkccf\$283t\$1@csnews2.cs.nctu.edu.tw> article  
**Path:** csnews2!csnews.cs.nctu.edu.tw!news.cs.nctu.edu.tw!not-for-mail  
**From:** Yung-Hsiang Liu <liuyh@cs.NCTU.edu.tw>  
**Newsgroups:** cs.course.netadmin  
**Subject:** Re: 上課講解手release  
**Date:** Thu, 8 Apr 2010 10:49:51 +0000 (UTC)  
**Organization:** College of Computer Science, National Chiao Tung University  
**Lines:** 1  
**Sender:** liuyh@NCTUCSCC  
**Message-ID:** <hpkccf\$283t\$1@csnews2.cs.nctu.edu.tw>  
**References:** <CS-NetAdmin\$A15R07EB@bbs.cs.nctu.edu.tw> \  
<hphpk6\$1sli\$1@csnews2.cs.nctu.edu.tw>  
**NNTP-Posting-Host:** bsd5.cs.nctu.edu.tw  
**X-Trace:** csnews2.cs.nctu.edu.tw 1270723791 73853 140.113.235.135 ...  
**X-Complaints-To:** usenet@csnews2.cs.nctu.edu.tw  
**NNTP-Posting-Date:** Thu, 8 Apr 2010 10:49:51 +0000 (UTC)  
**User-Agent:** tin/1.8.3-20070201 ("Scotasay") ...  
**Xref:** csnews.cs.nctu.edu.tw cs.course.netadmin:499

上課講解手檔案已放到網頁上。

# NNTP (9)

---

- ❑ HEAD [ MessageID | Number ]
- ❑ BODY [ MessageID | Number ]

## head 499

```
221 499 <hpkccf$283t$1@csnews2.cs.nctu.edu.tw> head
Path: csnews2!csnews.cs.nctu.edu.tw!news.cs.nctu.edu.tw!not-for-mail
From: Yung-Hsiang Liu <liuyh@cs.NCTU.edu.tw>
Newsgroups: cs.course.netadmin
Subject: Re: 上課講解手release
Date: Thu, 8 Apr 2010 10:49:51 +0000 (UTC)
Organization: College of Computer Science, National Chiao Tung University
Lines: 1
Sender: liuyh@NCTUCSCC
Message-ID: <hpkccf$283t$1@csnews2.cs.nctu.edu.tw>
```

...

```
Xref: csnews.cs.nctu.edu.tw cs.course.netadmin:499
```

.

## body 499

```
222 499 <hpkccf$283t$1@csnews2.cs.nctu.edu.tw> body
上課講解手檔案已放到網頁上。
```

.

# NNTP (10)

---

- ❑ POST (posting an article used by news clients)

```
post
340 Ok, recommended ID <hs8pdf$162r$1@csnews2.cs.nctu.edu.tw>
From: liuyh@cs.nctu.edu.tw
Newsgroups: cs.test
Subject: test telnet NNTP post

ha~ test
.
240 Article posted <hs8pdf$162r$1@csnews2.cs.nctu.edu.tw>
```

- 2xx - Command completed OK
- 3xx - Command OK so far; send the rest of it
- x4x - Posting

# NNTP (11)

---

- ❑ I HAVE (exchange articles with peers)

```
ihave <hs8pdf$162r$1@csnews2.cs.nctu.edu.tw>  
435 Duplicate  
ihave <fjaowiejfmavoewifjaefarwvoijesfr@bsd5.cs.nctu.edu.tw>  
335  
Path: bsd5.cs.nctu.edu.tw!liuyh  
From: liuyh@cs.nctu.edu.tw  
Newsgroups: cs.test  
Subject: post from ihave  
Date: 10 May 2010 19:28:01 GMT  
Message-ID: <fjaowiejfmavoewifjaefarwvoijesfr@bsd5.cs.nctu.edu.tw>  
  
test  
.  
235
```

➤ x3x - Distribution functions

- RFC 5536

# NNTP (12)

- ❑ NEWGROUPS [YY]YYMMDD hhmmss

```

newgroups 100401 000000
231 New newsgroups follow.
alt.binaries.movies.hdtv.russian 0 1 y
cs.u99 8 1 y
sci.physics.acoustics 47 1 y
alt.tv.channels.syfy 9 1 y
alt.comp.lang.lua 2 2 y
alt.fr.agence.notation.alteferienne 25 1 y
.

```

- ❑ NEWNEWS newsgroups [YY]YYMMDD hhmmss

```

newnews cs.course.netadmin 100222 000000
230 New news follows
<CS-NetAdmin$A15ONVSO@bbs.cs.nctu.edu.tw>
<CS-NetAdmin$A15OVOGR@bbs.cs.nctu.edu.tw>
...
<CS-NetAdmin$A15UCP60@bbs.cs.nctu.edu.tw>
<CS-NetAdmin$A15UDBNR@bbs.cs.nctu.edu.tw>
.

```



tin

---

A Usenet news reader

# Install (1)

---

- ❑ Two versions in ports
  - news/tin (default: US-ASCII)
  - chinese/tin (default: Big5)
- ❑ In RFC 3977
  - This specification extends NNTP from US-ASCII [ANSI1986] to UTF-8 [RFC3629]
  - Implementations **MUST NOT** use any other encoding.
  - The character set of article bodies **SHOULD** be indicated in the article headers
  - The newsgroup description **SHOULD** be in US-ASCII or UTF-8
  - 8-bit encodings other than UTF-8 **SHOULD NOT** be used
  - But...
  - IMHO, what is the hope?



# Install (2)

---

- ❑ Back to install tin
  - 'make install' is ok
  - TIN\_EDITOR
- ❑ Environment Variables
  - VISUAL
  - EDITOR
  - TINRC='-r'
  - NNTPSERVER=csnews2.cs.nctu.edu.tw

# Start

- ❑ First execution
  - Generate ~/.tin/ and ~/.newsrc
- ❑ Connect

```
tin 1.8.3 release 20070201 ("Scotasay") [UNIX] (c) Copyright 1991-2006 Iain Lea.  
csnews.cs.nctu.edu.tw InterNetNews NMRP server INN 2.4.6 ready (posting ok).  
Reading keymap file...  
Reading input history file...  
Reading groups from active file.../  
Reading groups from newsrc file...-  
Reading global attributes file...  
Reading attributes file...  
Reading newsgroups file.../  
Reading newsrc file...
```

- ❑ Edit ~/.tin/tinrc

```
# Charset used for MIME (Content-Type) header in postings.  
mm_network_charset=Big5
```

- ❑ Second execution
  - If you use UTF-8 environment
    - Screen: encoding big5 utf8
    - env LC\_ALL=zh\_TW.Big5 tin (This is for post)

# Search and subscribe newsgroups

- ❑ Show some default subscribed newsgroups

```

Group Selection (news 6)                                You have mail
M 1 3 news.announce.newusers Explanatory postings for new users. (M
M 2 14 news.newusers.questions Q & A for new users of Usenet. (Modera
3 166 misc.test For testing of network software. Very
M 4 misc.test.moderated Testing of posting to moderated groups
M 5 72 news.announce.newgroups Calls for newgroups & announcements of
M 6 542 news.answers Repository for periodic USENET article

```

- ❑ y (yank): list all newsgroups
- ❑ /?: search forwards/backwards for a group name
- ❑ s: subscribe to chosen group
- ❑ u: unsubscribe from chosen group

```

Group Selection (news 2)                                You have mail
1 484 cs.course.netadmin [課程] 計算機網路管理.
2 1442 cs.course.sysadmin [課程] 計算機系統管理.

```

# Read and post

---

- ❑ Just like what you do in BBS
  - h: help
- ❑ Browse in a newsgroup
  - /?: search for articles by Subject line forwards/backwards
  - aA: search for articles by author forwards/backwards
  - r: toggle display of all/unread articles
  - <TAB>: display next unread article
  - w: post an article to current group
- ❑ Read an article
  - /?: search forwards/backwards within this article
  - f: post followup to current article
  - D: cancel (delete) or supersede (overwrite) current article
  - r: reply through mail to author
  - ^H: show article in raw-mode (including all headers)

# newsrc

---

- ❑ After you quit tin or save configuration
  - ~/.newsrc will keep
    - newsgroups you subscribed/unsubscribed
    - articles you have read

```
liuyh@NASA$ cat ~/.newsrc
news.announce.newusers! 1-4466
news.newusers.questions! 1-675699
misc.test! 1-546806,546808,546823,546885,546908
misc.test.moderated! 1-646
news.announce.newgroups! 1-4441
news.answers! 1-230198
cs.course.netadmin: 1-505
cs.course.sysadmin: 1-644,648,652,656-658,661-664,668-669,687-
688,694,698,703,707,799,831,868,903,913-914,923,930-
932,968,983,1023,1054,1115,1131,1142-1145,1164,1186-
1187,1190,1192,1252,1323,1337,1433,1444,1451,1475,1489,1512,152
0,1523,1536,1559,1572,1614,1619,1647,1687,1757-1758,1766-
1768,1772,1781,1795,1818-
1819,1906,1918,1988,1997,2012,2028,2057,2059,2142
```

# A crosspost example

## ❑ Before posting

```
From: TA Wanted <newcsta@cs.nctu.edu.tw>  
Newsgroups: cs.u97,cs.u98,cs.u99,cs.g100,cs.computer-center,cs.course.netadmin,c  
s.course.sysadmin,cs.talk,nctu.talk  
Subject: [系計中公告] 資工系計算機中心招考100學年度助教 (大學部+碩士班)  
Followup-To: cs.talk
```

資工系計算機中心招考100學年度助教 (大學部+碩士班)

## ❑ After posting

```
Path: csnews.cs.nctu.edu.tw!news.cs.nctu.edu.tw!not-for-mail  
From: TA Wanted <newcsta@cs.nctu.edu.tw>  
Newsgroups: cs.u97,cs.u98,cs.u99,cs.g100,cs.computer-  
center,cs.course.netadmin, cs.course.sysadmin,cs.talk,nctu.talk  
Subject: [系計中公告] 資工系計算機中心招考100學年度助教 (大學部+碩士班)  
Followup-To: cs.talk  
Xref: csnews.cs.nctu.edu.tw cs.u97:4453 cs.u98:2529 cs.u99:1934  
cs.g100:4 cs.computer-center:803 cs.course.netadmin:557  
cs.course.sysadmin:2479 cs.talk:3528 nctu.talk:1541391
```