ThaiSarn Cache Infrastructure Project Technical Report 1

Pattara Kiatisevi
Siriphen Wikaisuksakul
Angkana Angkalukkana
Network Technology Laboratory (NTL)
National Electronics and Computer Technology Center (NECTEC)
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Content

I. Overview

The Network Technology Laboratory (NTL), National Electronics and Computer Technology Center (NECTEC), initiated the ThaiSarn Hierarchical Cache Service based on dual high capacity cache servers to serve all ThaiSarn downstream sites since October 1997 which now becomes a part of Thailand Cache Infrastructure Project [1]. These cache servers have been tested with a few major downstream sites for their usability, reliability and began providing production service since January 1998.

NECTEC cache servers are logically connected to two parent cache servers at NLANR (National Laboratory for Applied Network Research), USA and have been part of the global cache hierarchy since October 1997 [2].

According to ThaiSarn meeting 1/2541 on April 3, 1998, it was unanimously agreed that all downstream site would set up their institutional cache servers to serve their users and link them to NTL's root cache servers [3].

Additional effort to promote cache servers usage and thus discourage direct HTTP access to the outside world was also carried out in order to effectively reduce congestion in the lines linking NECTEC and each downstream site as well as ThaiSarn international gateway. The original plan to close direct HTTP access was June 30, 1998. However many institutions were not ready, the schedule was postponed to July 31, 1998.

The major purpose of setting up ThaiSarn Hierarchical Cache Service is to enable the most efficient usage of ThaiSarn international bandwidth. ThaiSarn total downstream bandwidth keeps increasing (the total bandwidth from 54 ThaiSarn members is now 20 Mbps, as of July 1998, while our international gateway bandwidth remains at 2 Mbps, therefore it is inevitable that the congestion occurs. In the statistics section, we will show how much this cache service can alleviate the congestion of our valuable bandwidth. However, we couldn't explicitly see the result from the network statistics because the incoming traffic of the international gateway continues to stay at its full utilization (2 Mbps) after we have closed direct HTTP access of all members on July 31, 1998.

NECTEC cache servers were set up and located in ThaiSarn Public Access Network, or "PubNet". PubNet was separated from ThaiSarn and had its own autonomous system number, 7588, since October 1997 [4].

Between October 1997 and July 1998, PubNet international bandwidth was kindly sponsored by Internet Thailand Company Limited at 2 Mbps giving the total international bandwidth of PubNet and ThaiSarn to be 4 Mbps (2 Mbps sponsored line of PubNet and 2 Mbps paid line of ThaiSarn). Unfortunately, due to some business reasons that Internet Thailand decided to terminate this sponsorship on July 17, 1998. PubNet international traffic was then switched back to the original 2 Mbps gateway of ThaiSarn.

Around the end of July 1998, Internet Thailand Company Limited again kindly donated additional 512kbps to the existing 2 Mbps ThaiSarn international gateway but some technical problems occurred while we tried to upgrade the link above 2 Mbps. Thus the upgrade has been postponed until the problem is solved.

At the time of this writing, ThaiSarn has
- 2 Mbps link to NACSIS, Japan (Japanese acedamic sites only).
- 100 Mbps link to Public Internet Exchange (PIE) (Thailand domestic sites).
- 100 Mbps link to PubNet (where NECTEC cache servers reside in).
- 2 Mbps link to Internet Thailand Company Limited (International traffic).

PubNet has
- 100 Mbps link to ThaiSarn.
- 100 Mbps link to Public Internet Exchange (PIE) (Thailand domestic sites).

NECTEC cache servers system and software configuration will be shown in section II and III respectively. Statistics and analysis is in section IV. Future improvement plan of the cache service is in section V. Finally, we conclude the report in section VI.

II. NECTEC cache servers hardware configuration

NECTEC runs 2 cache servers, cache1.nectec.or.th and cache2.nectec.or.th. cache.nectec.or.th is the canonical name pointing alternately to either cache1 or cache2 using DNS round-robin configuration.

Current cache servers system configuration are:
- cache1.nectec.or.th (share-load with 17 virtual web servers, 100 stream Real server)

- Digital AlphaServer 4100 2x5/466 system
- 512MB RAM
- 25 GB disk storage for cache servers
- 100 Mbps Fast Ethernet interface

- cache2.nectec.or.th (dedicated)
  - Digital AlphaServer 4100 2x5/300 system
  - 512 MB RAM
  - 15 GB disk storage for cache servers
  - 100 Mbps Fast Ethernet interface

Both machines reside in 19" rack with UPS in a 24-hour air-conditioned room.

III. NECTEC cache servers software configuration

We run Digital Unix Version 4.0B as the operating systems and Squid proxy/cache servers [5] software version 1.1.22 (at the time of writing) which is the most current stable version of Squid.

We balance the load among 2 cache servers by designating their responsible domains. Each server is the parent of another with respect to the domain they are responsible for. Cache2 is the parent of cache1 for .com domain, and cache1 is the parent of cache2 for every other domain. All downstream servers are instructed to point to both cache1 and cache2 as parent with equal priority.

For .th domain, both servers will go fetch the object direct from the source, it will not query any parent or neighbor servers.

In addition, we started sibling connections with Internet Thailand Company Limited's cache server (proxy.inet.co.th) from July 1998 to test the sharing of web data among domestic cache servers. If the test proves to be successful, we will implement it with other members of Thailand Cache Infrastructure Project.

Samart Cybernet are Asia Infonet are commercial Internet Service Providers (ISP) who joined Thailand Cache Infrastructure Project and now have sibling connections with our cache servers.

Following is the configuration file (squid.conf) of cache1.nectec.or.th

```
http_port 8080
icp_port 3130
tcp_outgoing_address cache1.nectec.or.th
udp_outgoing_address cache1.nectec.or.th

cache_host cache2.nectec.or.th parent 8080 3130 proxy-only
cache_host_domain cache2.nectec.or.th   com
cache_host proxy1.inet.co.th sibling 8080 3130 proxy-only
cache_host uc.cache.nlanr.net parent 3128 3130
cache_host bo.cache.nlanr.net parent 3128 3130

local_domain th ac.jp
hierarchy_stoplist cgi-bin ?
cache_stoplist cgi-bin ? nectec.or.th
cache_mem  10
cache_swap 15000
maximum_object_size 4096
cache_dir /cache/disk1
cache_access_log /var/adm/squid/access.log
cache_log /var/adm/squid/cache.log
cache_store_log /var/adm/squid/store.log
```

```
pid_filename /var/run/squid.pid

debug_options ALL,1

ftpget_program /usr/local/etc/squid/bin/ftpget
ftpget_options -m application/x-unknown-content-type
dns_children 32
redirect_program /usr/local/etc/squid/etc/redirector.pl
redirect_children 32

refresh_pattern      .       0 30% 8640
reference_age 3 months
quick_abort    1 80 1000
negative_ttl 1
negative_dns_ttl 1

acl manager proto cache_object
acl webmanager src 202.44.204.61
acl localhost src 127.0.0.1/255.255.255.255
acl all src 0.0.0.0/0.0.0.0

acl SSL_ports port 443 563
acl Dangerous_ports port 7 9 19
acl CONNECT method CONNECT

acl nectec srcdomain nectec.or.th
acl mtec srcdomain mtec.or.th
acl biotec srcdomain biotec.or.th
acl nlanr_mutual_parent src     192.52.106.30
acl nlanr_mutual_parent src     192.52.106.31
acl inet srcdomain proxy1.inet.co.th

acl ThaiSarn    srcdomain proxy.ku.ac.th
acl ThaiSarn    srcdomain proxy2.ku.ac.th
acl ThaiSarn    srcdomain proxy.pn.psu.ac.th
acl ThaiSarn    srcdomain guyver.chandra.ac.th
acl ThaiSarn    srcdomain proxy.intanon.nectec.or.th
acl ThaiSarn    srcdomain cache1.ripn.ac.th
acl ThaiSarn    srcdomain cache.rit.ac.th
acl ThaiSarn    srcdomain proxy.rit.ac.th
acl ThaiSarn    srcdomain pibul3.rip.ac.th
acl ThaiSarn    srcdomain pibul7.rip.ac.th

# KU
acl ThaiSarn_ip   src 158.108.7.129
# KMITL
acl ThaiSarn_ip   src 161.246.10.21
acl ThaiSarn_ip   src 161.246.10.22
# KKU
acl ThaiSarn_ip   src 202.44.199.44
acl ThaiSarn_ip   src 202.12.97.20
# TU
acl ThaiSarn_ip   src   164.115.143.10
acl ThaiSarn_ip   src   164.115.143.20
acl ThaiSarn_ip   src   192.150.249.10
acl ThaiSarn_ip   src   192.150.249.11
# IPST
acl ThaiSarn_ip   src   203.154.2.2
# Chandra
acl ThaiSarn_ip   src   203.154.218.40
# RIN
acl ThaiSarn_ip   src  202.44.227.2
# RIBR
acl ThaiSarn_ip   src  202.44.225.3
# RIUBON
acl ThaiSarn_ip   src  203.154.230.25
acl ThaiSarn_ip   src  203.150.180.21
# Burapha University
acl ThaiSarn_ip       src    203.154.83.17
acl ThaiSarn_ip       src    203.154.83.30
```

```
acl ThaiSarn_ip        src    203.150.228.198
# RIPA
acl ThaiSarn_ip        src    202.44.229.3
# SWU
acl ThaiSarn_ip        src    203.150.128.4
# PSU
acl ThaiSarn_ip        src    192.100.77.6
acl ThaiSarn_ip        src    203.150.168.6
# Rajabhat Ramphaipanni
acl ThaiSarn_ip        src    203.150.68.19
acl ThaiSarn_ip        src    203.150.68.20
# SU
acl ThaiSarn_ip        src    202.44.135.34
acl ThaiSarn_ip        src    202.44.135.38
# RINT
acl ThaiSarn_ip        src    203.154.74.2
acl ThaiSarn_ip        src    203.154.74.7
# RIS
acl ThaiSarn_ip        src    203.150.182.1
# PMK
acl ThaiSarn_ip        src    202.44.228.8
acl ThaiSarn_ip        src    202.44.228.9
# Rajabhat Institute Chiang Mai
acl ThaiSarn_ip        src    203.151.224.4
acl ThaiSarn_ip        src    203.151.224.5
# Sukothai Thammatirat
acl ThaiSarn_ip        src    202.14.117.2
acl ThaiSarn_ip        src    203.150.91.5
# Rajabhat Institute Nakhon Pathom
acl ThaiSarn_ip        src    203.150.245.1
acl ThaiSarn_ip        src    203.150.245.8
# Suranaree University of Technology
acl ThaiSarn_ip        src    203.158.4.90
acl ThaiSarn_ip        src    203.158.4.92
# KMITNB
acl ThaiSarn_ip        src    202.44.32.8
# J POR ROR
acl ThaiSarn_ip        src    202.44.224.3
acl ThaiSarn_ip        src    202.44.224.20
# RIU, Rajabhat Utraradit
acl ThaiSarn_ip        src    203.150.224.3
acl ThaiSarn_ip        src    203.150.224.4
# RIPN2
acl ThaiSarn_ip        src    202.44.218.1
# RILOEI
acl ThaiSarn_ip        src    203.44.220.1
# KMITT
acl ThaiSarn_ip        src    202.44.8.14
acl ThaiSarn_ip        src    202.44.8.17
# RIPK
acl ThaiSarn_ip        src    203.154.19.2
acl ThaiSarn_ip        src    203.154.19.3
# Bansomdej
acl ThaiSarn_ip        src    203.151.195.1
# RI Udon
acl ThaiSarn_ip        src    203.150.179.1
# RI Kampangpetch
acl ThaiSarn_ip        src    203.154.7.4
acl ThaiSarn_ip        src    203.154.7.7
# RISURAT
acl ThaiSarn_ip        src    203.151.197.1
# RICH
acl ThaiSarn_ip        src    203.154.30.6

# Triam Udom
acl schoolnet srcdomain pin.triamudom.ac.th
acl schoolnet_ip src 203.150.185.20
# Samsenwit
acl schoolnet_ip src 203.150.246.2
```

```
# School Net cache servers
acl cachek12 src 203.151.255.131

# IP networks
acl nectec_ip src 164.115.0.1-164.115.255.255/255.255.0.0
acl ntl_ip src 203.150.152.0-203.150.154.255/255.255.0.0

# Outsider cache servers (Allow for sibling only)
acl outsider srcdomain tee.samart.co.th
acl outsider_ip src 203.149.5.3
acl outsider srcdomain proxy.cs.ait.ac.th
acl outsider srcdomain proxy.asianet.co.th
acl outsider srcdomain ns2.a-net.net.th

http_access deny CONNECT !SSL_ports
http_access deny Dangerous_ports

http_access allow      nectec
icp_access  allow      nectec
http_access allow      mtec
icp_access  allow      mtec
http_access allow      biotec
icp_access  allow      biotec
http_access allow      ntl_ip
http_access allow      nectec_ip
http_access allow      nlanr_mutual_parent
icp_access  allow      nlanr_mutual_parent

http_access allow      ThaiSarn
icp_access  allow      ThaiSarn

http_access allow      ThaiSarn_ip
icp_access  allow      ThaiSarn_ip

http_access allow      schoolnet
icp_access allow       schoolnet
http_access allow      schoolnet_ip
icp_access allow       schoolnet_ip
http_access allow      cachek12
icp_access allow       cachek12

http_access allow      outsider
icp_access allow       outsider
http_access allow      outsider_ip
icp_access allow       outsider_ip

http_access allow manager
http_access deny       all
icp_access  deny       all

miss_access allow  !outsider
miss_access allow  !outsider_ip

cache_mgr cachemaster
cache_effective_user squid server
visible_hostname cache1.nectec.or.th
cache_announce 24
announce_to sd.cache.nlanr.net:3131
dns_testnames www.nectec.or.th internic.net usc.edu cs.colorado.edu mit.edu yale.edu
logfile_rotate 9

err_html_text <hr>This server is a part of
<a href="http://www.nectec.or.th/">NECTEC</a>'s National Public Servers (PubNet) services and is provided "as-is".<br>
Contact
<a href="mailto:cachemaster@nectec.or.th">cachemaster@nectec.or.th</a>

minimum_direct_hops 4
query_icmp on
```

For the configuration file of cache2, it differs a little from cache1's. Following is the difference.

```
cache_host cache1.nectec.or.th parent 8080 3130 proxy-only
cache_host_domain cache1.nectec.or.th    !.com
cache_host proxy1.inet.co.th sibling 8080 3130 proxy-only
cache_host uc.cache.nlanr.net parent 3128 3130
cache_host bo.cache.nlanr.net parent 3128 3130
```

IV. Statistics and analysis

A. Members List

| #	Institution Name	Join Date	Close Port 80
1	Burapha University	1998/06	1998/06/29
2	Chulachomklao Royal Military Academic	1998/08	1998/07/31
3	Japan Foundation Bangkok	no	1998/07/31
4	Kasetsart University	1997/10	1998/06/30
5	Khon Kaen University	1997/10	1998/07/02
6	King Mongkut's Institute of Technology	1998/08	1998/07/31
7	King Mongkut's Institute of Technology Ladkrabang	1998/03	1998/06/30
8	King Mongkut's Institute of Technology North Bangkok	1998/07	1998/07/31
9	Ministry of University Affairs	no	1998/07/31
10	Northern ThaiSarn	1997/09	1998/06/22
11	Office of Rajabhat Institute Council	1998/08	1998/07/31
12	Phramongkutklao Medical College	1998/07	1998/07/31
13	Prince of Songkla University	1997/09	1998/06/30
14	Rajabhat Institute Sakonnakhon	1998/07	1998/07/20
15	Rajabhat Institute Bansomdej Chaopraya	1998/08	1998/07/31
16	Rajabhat Institute Buriran	1998/07	1998/07/31
17	Rajabhat Institute Chachoengsao	1998/08	1998/07/31
18	Rajabhat Institute Chandrakasem	1997/09	1998/06/30
19	Rajabhat Institute Chiang Mai	1998/07	1998/07/31
20	Rajabhat Institute Dhonburi	no	1998/07/31
21	Rajabhat Institute Kamphaengphet	1998/08	1998/07/31
22	Rajabhat Institute Kanchanaburi	1998/08	1998/07/31
23	Rajabhat Institute Lampang	no	1998/07/31
24	Rajabhat Institute Loei	1998/08	1998/07/31
25	Rajabhat Institute Mahasarakham	no	1998/07/31
26	Rajabhat Institute Nakhon Si Thammarat	1998/06	1998/06/30
27	Rajabhat Institute Nakhonsawan	no	1998/07/31
28	Rajabhat Institute Nakorn Ratchasima	1998/07	1998/07/31
29	Rajabhat Institute Nakornpathom	1998/07	1998/07/31
30	Rajabhat Institute Petchburiwitayalongkorn	1998/08	1998/07/31
31	Rajabhat Institute Phetchabun	1998/08	1998/07/31
32	Rajabhat Institute Phranakorn	1998/07	1998/07/31
33	Rajabhat Institute Phuket	1998/08	1998/07/31
34	Rajabhat Institute Pibulsongkarm	1998/07	1998/07/20

35	Rajabhat Institute PranakornSri Ayutthaya	1998/06	1998/07/02
36	Rajabhat Institute Rambhaibani	1998/06	1998/06/30
37	Rajabhat Institute Surathani	1998/08	1998/07/31
38	Rajabhat Institute Thepsatri	no	1998/07/31
39	Rajabhat Institute Ubonratchathani	1998/06	1998/07/31
40	Rajabhat Institute Udon Thani	1998/08	1998/07/31
41	Rajabhat Institute Utraradit	1998/07	1998/07/31
42	Rajabhat Institute Yala	no	1998/07/31
43	Rajabhat Mooban Chombung	no	1998/07/31
44	Rajamangala Institute of Technology	1998/05	1998/07/13
45	Rajamangala Institute of Technology North Bangkok	no	1998/07/31
46	Royal Thai Air Force Academic School	1998/08	1998/07/31
47	Silpakorn University	1998/06	1998/06/30
48	Srinakharinwirot University	1998/06	1998/06/30
49	Sukhothai Thammathirat Open University	1998/07	1998/07/31
50	Suranaree University of Technology	1998/07	1998/07/31
51	Thammasat University	1998/04	1998/06/30
52	The Institute for the Promotion of Teaching Science and Technology	no	1998/07/31

Table 1: ThaiSarn Members List And Their Cache Service Status

According to Table 1,
- The "Join date" is the date that institution's cache server has successfully joined ThaiSarn Hierarchical Cache Service. If it contains "no", it can mean two things, first, that institution already has its own cache server but it doesn't connect to ThaiSarn Cache Hierarchy yet, or second, that institution doesn't implement any cache server yet. In the second case, it implies that their users are using NECTEC emergency cache server, "imf.nectec.or.th", which is offered temporarily for two months to these institutions.
- The "Close port 80" field indicates the date that institution has closed their direct web access.
- After 31 July 1998, all ThaiSarn members have closed direct web-access.
- 41 of 52 ThaiSarn members have already joined ThaiSarn Hierarchical Cache Service.

B. NECTEC Cache servers usage statistics
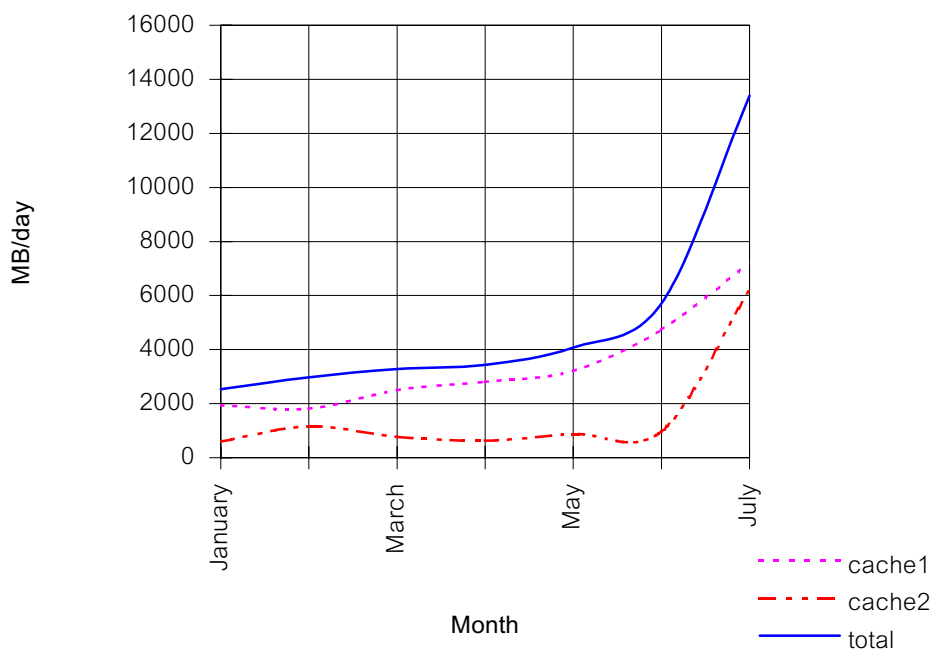
Graph 1: NECTEC Cache Server Usage Statistics from January - July 1998

According to graph 1,
- The total usage (generated from access.log of Squid) gradually increases from 2.5 GB/day in January to 5.7 GB/day June and dramatically increases to 13.4 GB/day in July which is equal to 1.24 Mbps)

Analysis,
- This may results from the promotion of cache usage and 16 ThaiSarn members have closed their direct web-access in July 1998.

Cache Servers Name	Data Request (MB)	Hit rate (%)	Bandwidth Saved (MB)
proxy2.kku.ac.th	1,017.00	12.86	130.77
khaesad.kmitl.ac.th	565.00	12.86	72.76
alpha.tu.ac.th	557.00	19.71	109.87
cache2.psu.ac.th	426.00	6.14	26.17
chaokhun.kmitl.ac.th	369.00	18.60	68.65
proxy.rit.ac.th	368.00	21.37	78.77
proxy.ku.ac.th	220.00	26.96	59.42

proxy.pn.psu.ac.th	182.00	30.25	55.2
spirit.tu.ac.th	157.00	20.57	32.49
cache2.su.ac.th	146.00	26.54	38.98
yotaga.psu.ac.th	129.00	59.61	76.9
203.150.128.4	121.00	33.04	40.08
203.150.68.20	92.00	20.29	18.86
winter.intanon.nectec.or.th	86.00	19.09	16.44
guyver.chandra.ac.th	60.00	21.20	12.87
cc-ca.buu.ac.th	57.00	25.64	14.8
203.150.182.1	49.00	23.98	11.82
proxy2.ku.ac.th	45.00	21.78	9.95
cache1.su.ac.th	37.00	22.34	8.28
spring.intanon.nectec.or.th	36.00	18.24	6.59
203.154.74.2	32.00	32.15	10.49
pibul3.rip.ac.th	32.00	31.00	10.02
203.151.224.5	32.00	33.62	11.06
202.44.229.3	28.00	31.22	8.8
203.151.224.4	19.00	29.81	5.81
proxy.ribr.ac.th	5.00	93.61	5.19
203.150.224.4	4.00	29.76	1.44
cc-ca2.buu.ac.th	3.00	25.86	0.79
203.154.74.7	1.00	41.22	0.62
203.151.197.1	-	-	0
202.44.218.1	-	-	0
khonkaen.kku.ac.th	-	12.24	0.02
203.150.245.8	-	0.79	0
Total	**4,888.83**	**19.31**	**943.91**

Table 2.1: cache1.nectec.or.th's clients list and utilization in 20 – 31 July 1998

Cache Servers Name	Data Request (MB)	Hit rate (%)	Bandwidth Saved (MB)
proxy.ku.ac.th	1,530.00	13.79	211.05
cache2.psu.ac.th	364.00	7.34	26.77
chaokhun.kmitl.ac.th	315.00	23.54	74.29
winter.intanon.nectec.or.th	313.00	19.13	59.94
proxy.rit.ac.th	298.00	25.34	75.7
alpha.tu.ac.th	284.00	24.36	69.29
khaesad.kmitl.ac.th	280.00	19.71	55.33
spring.intanon.nectec.or.th	227.00	15.95	36.26
proxy2.ku.ac.th	180.00	25.47	46
cache2.su.ac.th	142.00	27.64	39.51
203.150.128.4	137.00	29.68	40.71
proxy.pn.psu.ac.th	131.00	32.69	43.11
spirit.tu.ac.th	103.00	32.06	33.12
yotaga.psu.ac.th	96.00	58.79	56.76
khonkaen.kku.ac.th	71.00	26.03	18.66
guyver.chandra.ac.th	51.00	23.65	12.26
cc-ca.buu.ac.th	50.00	26.84	13.63
203.150.68.20	48.00	21.21	10.34
203.150.182.1	42.00	26.23	11.27
203.154.74.2	27.00	37.67	10.35
pibul3.rip.ac.th	26.00	34.48	9.28
203.150.240.2	26.00	33.92	9.07
202.44.229.3	19.00	32.20	6.31
proxy.ribr.ac.th	4.00	93.38	3.82

203.154.74.7		- 45.90	0.42
cache1.su.ac.th		- 5.76	0.01
Total	**4,779.76**	**20.36**	**973.27**

Table 2.2: cache2.nectec.or.th's clients list and utilization in 20 –31 July 1998

According to table 2.1 and 2.2,
- The average utilization, hit rate and bandwidth saved per day of ThaiSarn members' cache servers at both cache1.nectec.or.th and cache2.nectec.or.th from 20 – 31 July 1998 are shown. Please note that this does not include NECTEC, NSTDA and schools usage.

C. Hit rate statistics
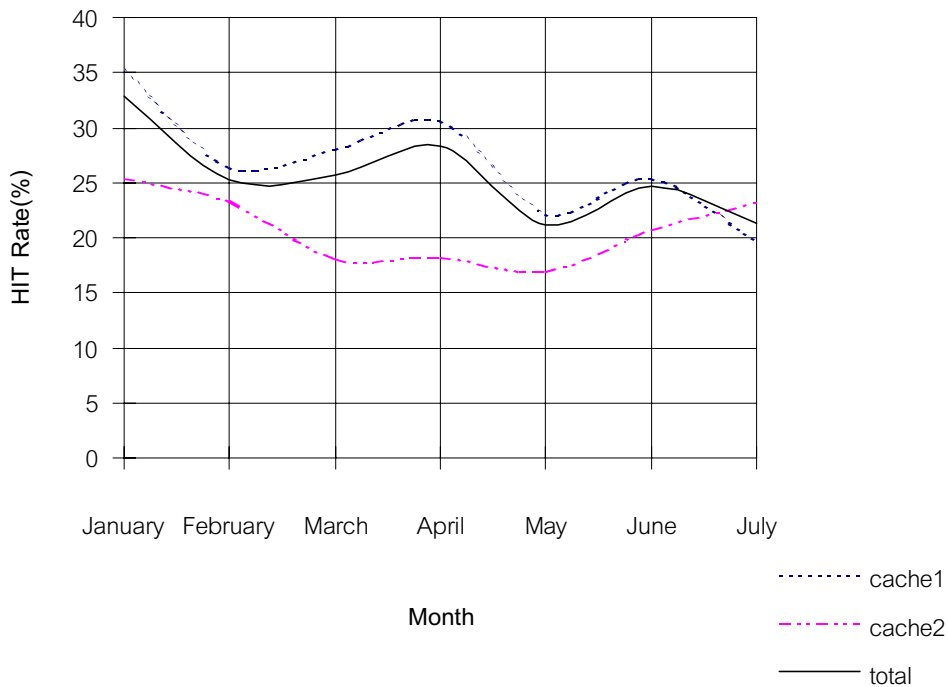
Graph 2: NECTEC Cache Server Hit Rate Statistics from January - July 1998

According to graph 2,
- cache1, cache2 and total hit rate range from 18% to 35% with the peak at 35.2% by cache1 in January 1998.
- Total hit rate, calculated from the sum of hit data of cache1 and cache2 divided by the sum of total usage of cache1 and cache2, is 24.1%.

According to graph 3,
- The amount of data saved by cache1 and cache2 is shown. In July, total data saved is up to 2.9 GB per day, which is equal to 269 kbps (kilobits per second).
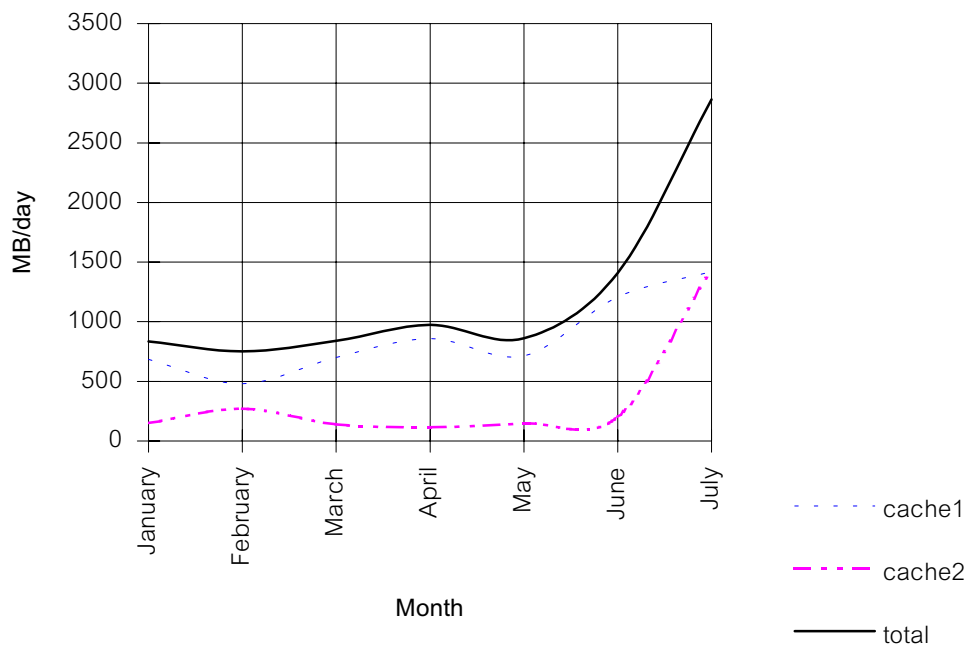
Graph 3: Amount of Data NECTEC Cache Servers have saved from January - July 1998

Analysis

- Hit rate in June and July decreased slightly from that in January because we decreased cache size from 25-35 GB in January to 15 GB in June and July. The Squid performance will degrade rapidly if the real memory is insufficient and Squid starts paging. The memory usage of Squid depends on cache size and number of connections [6]. Since June, our cache usage climbed up very rapidly, the peak rate can be up to 200,000 connections per hour so reducing cache size to maintain the performance of the server is necessary. In July, the concurrent usage for each cache1 and cache2 peaked at 2,000 – 3,000 connections.
- It is noticed that while we reduced cache size from 25-35 GB in January to 15 GB in June, the hit rate slightly decreased from 25-30% to 20-25%. We will have more analysis about the relation among cache size, connection rate and hit rate in the future to find the optimum cache size.

D. Network analysis

- A snapshot on July 31, 1998, 18:24 of ThaiSarn 2 Mbps international gateway using Cisco Router Netflow data were analyzed in 2 ways, protocol analysis and analysis of direct web traffic usage, as presented in Table 3 and Table 4.

PORT	Protocol	Bytes	Percent
3128	Proxy	13,424,343	28.20%
6667	IRC	11,404,669	23.96%
80	HTTP	9,776,298	20.54%
20	FTP	3,281,068	6.89%
1597	unknown	3,007,696	6.32%
2504	unknown	792,207	1.66%
4695	unknown	514,554	1.08%
53	DNS	345,772	0.73%
4010	unknown	329,178	0.69%
1972	unknown	254,472	0.53%
3130	ICP	107,670	0.23%
Others		4,360,669	9.17%
All ports		47,598,596	100.00%

Table 3: Protocol analysis of snapshot of ThaiSarn international gateway on July 31, 18:24

PORT (hex)	Source	Bytes	Percent/Port	Percent /All Port
80(0050)	Kasetsart University	3,974,634	40.66%	8.35%
80(0050)	PubNet	1,467,273	15.01%	3.08%
80(0050)	King Mongkut's Institute of Technology Ladkrabang	1,448,921	14.82%	3.04%
80(0050)	Prince of Songkhla University	777,446	7.95%	1.63%
80(0050)	Burapha University	369,987	3.78%	0.78%
80(0050)	NECTEC BTT	307,788	3.15%	0.65%
80(0050)	Etc.	220,024	2.25%	0.46%
80(0050)	Suranaree University	212,981	2.18%	0.45%
80(0050)	Rajabhat Institute Chandrakasem	178,523	1.83%	0.38%
80(0050)	Rajabhat Institute Buriram	135,864	1.39%	0.29%
80(0050)	Rajabhat Institute Nakhon Ratchasima	131,075	1.34%	0.28%
80(0050)	Rajamangala Institute of Technology	128,662	1.32%	0.27%
80(0050)	Rayongwit School	80,936	0.83%	0.17%
80(0050)	TIAC	74,963	0.77%	0.16%
80(0050)	Chiangmai University	74,846	0.77%	0.16%
80(0050)	Rajabhat Institute Ubon Ratchathani	73,194	0.75%	0.15%
80(0050)	Suankulab Withayalai School	52,575	0.54%	0.11%
80(0050)	Srinakharinwirot University	36,068	0.37%	0.08%
80(0050)	Rajabhat Institute Sakonnakorn	15,907	0.16%	0.03%
80(0050)	NECTEC Gypsum	14,631	0.15%	0.03%
Total port 80		9,776,298	.	**20.54%**
3128(0C38)	PubNet	13,424,343	100.00%	28.20%
Total port 3128		13,424,343	.	**28.20%**
3130(0C3A)	PubNet	95,880	89.05%	0.20%
3130(0C3A)	Etc.	10,767	10.00%	0.02%
3130(0C3A)	King Mongkut's Institute of Technology Ladkrabang	1,023	0.95%	0.00%
Total port 3130		107,670	.	**0.23%**
Total all ports		47,598,596	.	100%

Table 4: Analysis of web traffic usage of ThaiSarn international gateway on July 31, 18:24

According to table 3 and 4,
- Web traffic usage (direct port 80 and via proxy port 3128) listed in Table 4 is 48.74% (28.20% + 20.54%) of all traffic.
- The direct web traffic usage is high (20.54%), although all ThaiSarn members are using cache service. This might come from
  - Direct web accesses from PubNet and ThaiSarn members' cache servers for web pages that contain "?", "cgi-bin" in the URL as from the Squid configuration.

- Direct web accesses from ThaiSarn members' cache servers because of timeout without receiving response from NECTEC parent cache servers. This needs to be investigated further.

- IRC traffic usage (port 6667) is the second highest (23.96%) amoung all traffic.

V. Future Improvement

- Cache1 has slower response time than cache2, while its hardware specification is slightly better. This is because cache1 also serves as HTTP server for NTL' 17 web sites and 100 stream Real server. We are trying to allocate a dedicated machine to function as cache1 to improve the performance.
- While version 1.1.22 is the most stable version of Squid, we will study version 1.2 which is now in beta stage) and will upgrade to it when it is proved to be stable.
- For cache1, we use Digital Unix's Advanced File System (because we have to share disk space with web & Real servers' data, Advanced File System is easier to manage) which may not be suitable to use with Squid program [7]. We will separate a bunch of disks to be used for cache purpose only and use normal Unix File System (UFS) to improve disk performance.
- We will also focus at the response time as another point of servers' performance other than hit rate. The response time depends on the performance of the server and also the Internet network propagation delay.
- Professional flow analysis tool such as Cflowd will be implemented to get a broader and more accurate view of network analysis, rather than the analysis of a very short-interval snapshot of traffic we are using.

Conclusion

This report covers the overview, hardware and software configuration, statistics and analysis of NECTEC cache servers between January – July 1998. Potential problems and possible improvement is described in Future Improvement section.

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