

Agora(w3mail) Service - Access Explosion and Its Relaxation -

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Abstract: We introduce w3mail service, called Agora(beta tester), developed at CERN in 1995. Fundamental function of the agora is to provide a way to access web files for e-mail users. Access explosion brought server to hang up because the agora has not management of multi-users requirements. We added a spool routine by considering load of the server. Furthermore we discuss function of the service by analyzing route information of many undelivered mails.

Agora(w3mail)サービス サーバへのアクセス集中とその緩和方法について

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概要: 本論文では、CERNで1995年に開発されたw3mail (Agora) サービス (β 版) を紹介する。Agoraはmailでwebサーバをアクセスするインターフェイスを提供する。Agoraの運用を開始した直後、大量のe-mailによるアクセス集中をうけてサーバーは度々復帰不能な状態に陥った。これを回避するため、サーバーの負荷を考慮したスプール機能を追加した。さらに数多い返信不能 (不達) メール分析から今後改善すべき機能について考察する。

1. Introduction

The idea of World Wide Web(WWW)[1][2] materialized by T.Berners-Lee at CERN, who were developed on the NeXT machine[3], has been popularized in the world. The WWW is indispensable to as a factor that accelerated the diffusion of the Internet. However many of the world countries connect with UUCP(Unix to Unix Copy) so that their people have only e-mail access to the Internet[4]. Various service using e-mail are provided for their convenience. FTPmail is most famous and traditional service of them, and w3mail is one of them, of which needs has been exalted.

The purpose of this paper describes how our w3mail service has been known in the world-wide networks. The w3mail service opened with no access restriction are several servers. Therefore the concentration is more serious problem than other mail servers. We introduce how e-mail access are brought and can be relaxed on our w3mail service.

2. Fundamental Function of the Agora(w3mail)

W3mail stands for "WWW by e-mail", and is a means of the accessing file of webs by e-mail. The agora[5] is one of the w3mail service, which developed by the CERN teams in 1994. The agora has syntactic analysis of e-mail and orthopedic function of web contents. To obtain contents of web, the agora makes use of the www linemode browser[5] as retrieval engine.

The fundamental function of agora are provided in prime source code (written by perl scripts) distributed by CERN as the following;

- "source" + <URL> : bring raw material on webs that you request <URL>
- "send", "www" + <URL> : has document part of contents on webs that you request <URL>
- "rsend" + <return-path> + <URL> : is same function as those of "send" but the agora reply specified <return-path> e-mail address
- "deep" + <URL> : send you all of documents that referred in requested <URL>
- "rsource" + <return-path> + <URL> : is same function as those of "source" but the agora reply specified <return-path> e-mail address

Example of obtained result when using send command is shown in figure.1. The agora has interface to read the NetNews(USENET) and can obtain binary contents with UUencode[6] that is provided on web, FTP servers, and gopher space.

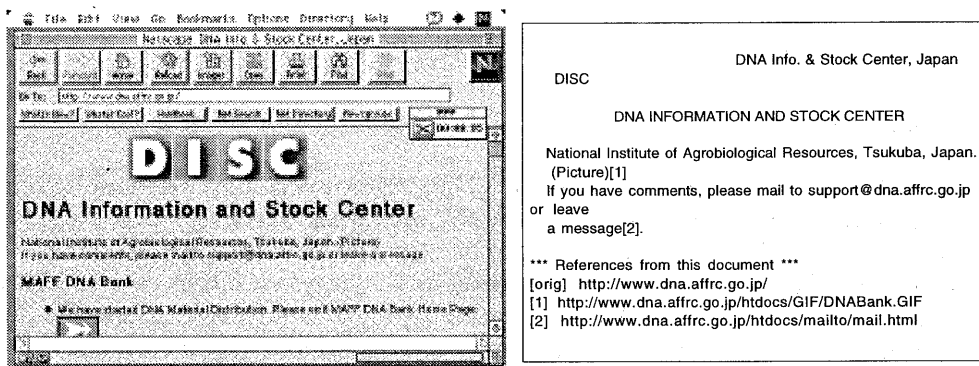


Figure 1 : comparison between ordinary web browser and its text file obtained by the agora

3. Access Explosion and Relaxation Method

We started service of the agora (*agora@kamakura.mss.co.jp*) in October, 1995. Request mails for the agora are delivered to the *mail aliases* file on Unix workstation when the mail immediately received. Therefore, a reply mail can be almost done in about three minutes if target server is not busy to connect with TCP/IP.

Announcement of our agora was post to the NetNews(USENET) one week after a beginning of the service. Request mails increased greatly after about one month. Around one month over 40000 request mails had to be fixed. It was trigger that the mail from key pearson, who Bob Rankin asked us to confirm whether our service still alive or defunct. Existence of our service was diffused by his influence as change agent[7] in the Internet, especially the usenet group of alt.answer which does not particularly ask the fields of interests.

A fatal problem occurred instantly after that. Process table on server became full. The cause is explosive amounts of request mails for short time and our system immediately execute all of them when received. It brought that shell scripts cannot fork anymore so that the system began to down frequently.

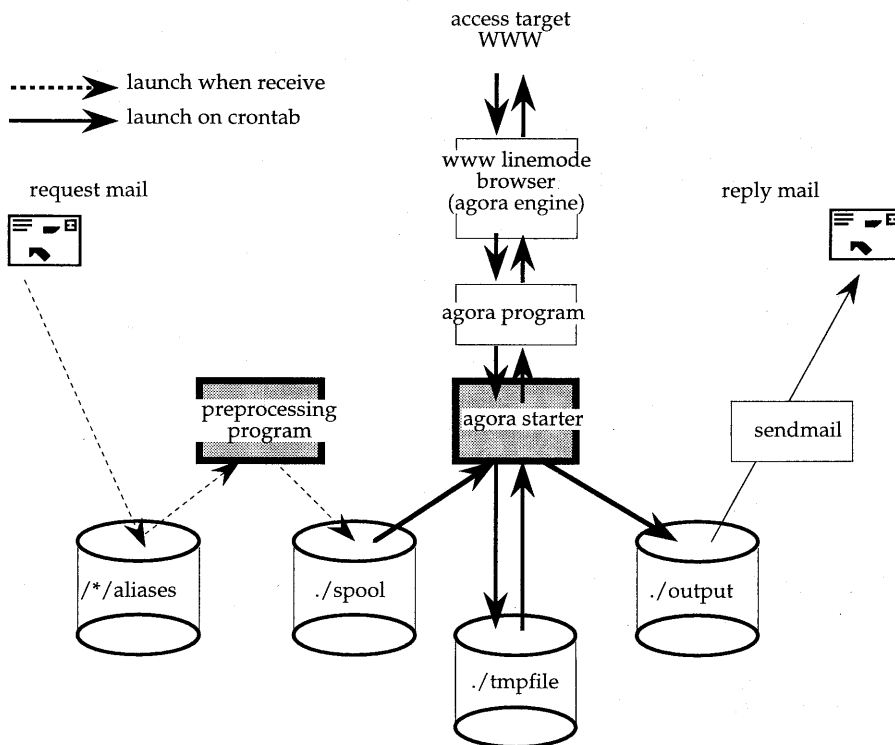


Figure 2 : general flow in our agora system

To resolve the problem, we attempt to plug original spooler in the agora flow to process request mail automatically. The general flow of process is shown in the figure 2. Preprocessing program(PP) read bodies of received mail to analyze fundamental discription of requiremant. For example, in case of requirement of help document of the agora, the PP immediately send a reply mail including help document. Another function of the PP is briefly to check the body in grammatical. When detecting syntax error in the body, the PP sends back a mail with error message from the agora in the same way at the case of help requirement.

Agora Starter(AS) is written with shell script. The AS takes files of the spooled directory, and delivers it to the agora. The priority of a file to take out is a way of FIFO(First In First Out). The AS is driven by a time scheduler table, called crontab (cron table) on Unix system. Our crontab schedule table is shown in figure 3.

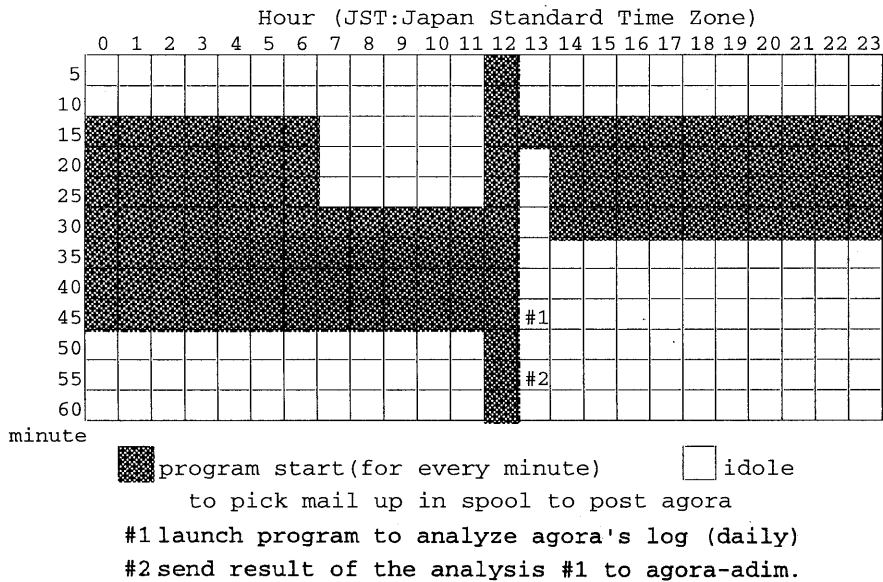


Figure 3 : crontab schedule table(to start the AS scripts)

We determined the time schedule that is shown in figure 3 by using "mean load of process" defined in the following;

$$A(t) = \sum_j \omega_j(t) \cdot P_j(t)$$

$$P_j(t) = - \exp((t - (\tau + T_{oj}) / (b \cdot P(t))))$$

$$\omega_j(t) = \frac{1}{M(t)}$$

$M(t)$: total account of the AS process lived on, if $P_j > 1$ then counts up 1 else no operation

$$P(t) = \sum_j -\exp(t - (\tau + T_{oj}) / \mathbf{b}) \text{ for } t > T_j + \tau$$

$$= 1 \text{ for } T_j \leq t \leq T_j + \tau$$

$$= 0 \text{ for } t < T_j$$

Where $A(t)$ is total load of process about AS that is derived from the total sum of each process life at time t , with including index j represents executing status on the process table. $P_j(t)$ is mean life time that expresses possibility of the j -th process still executing, then $1 - P_j(t)$ indicates that the process already finished to be purge from the table. ω_j gives correction factor as multiprocess running on the table. It means an effect of delay comparing with the finish time obtained by a single process running. T_{oj} is start time of the j -th AS which is put on the table. τ is mean time lag of the AS from T_{oj} to establishment of network connection. \mathbf{b} is mean time constant to finish the AS. τ and \mathbf{b} are strongly depend on network environment of the agora server. T_{oj} will be determined by performance of the agora server itself with constrain of a size of the process table.

As result from preliminary test on our system, we can understand parameters of $\tau=10$ seconds, $\mathbf{b} \approx 150$ seconds. Another important parameter to control load of the system is a rate of launching the AS. Table 1 summarizes mean load of process on the server with various \mathbf{b} and launch rate. We can expect maximum load of eight process with permission of our machine performance, so that we should select launch rate by 20% for $\tau=150$. This rate means 20 starts of the SA (its minimum interval one minute) are possible for one hour. Figure 4 represents theoretical diagram on load of the process in case of $\mathbf{b} \approx 150$ sec. and 20% launch rate. It can be seen that eight processes of the SA are executing in peak time.

Table 1 expected load of process
frequency of start SA (max=60 par 1 hour)

launch rate \ b	10	20	30	40	50	60
30	1.30	1.30	1.30	1.30	1.30	1.30
60	2.34	2.35	2.35	2.35	2.35	2.36
90	3.77	3.90	3.91	3.91	3.91	3.91
120	5.22	5.87	5.97	5.98	5.98	5.98
150	6.43	7.96	8.39	8.51	8.54	8.56
180	7.39	9.96	10.99	11.49	11.56	11.63
300	10.6	17.2	21.9	25.2	28.0	28.9

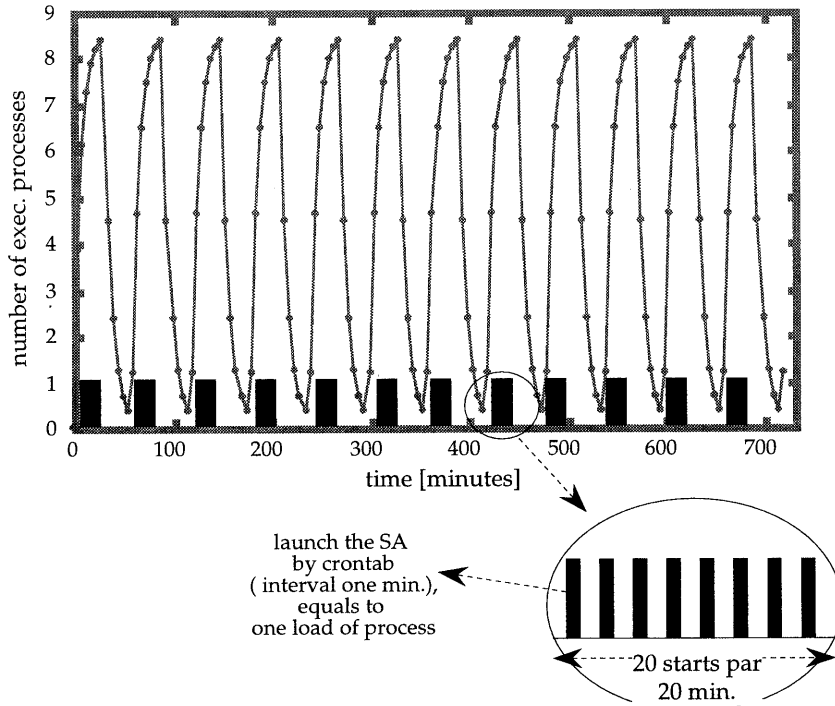


Figure 4. theoretical diagram of load of process(SA)

4. Suggestion for Revision - based on analysis of access log

The access log of the agora provide us a lot of suggestion by implication for troubleshooting on the service. Figure 5 represents recent statistics result of use of the agora. About 80 % of whole requirements are users from foreign countries, out of Japan. Particularly characteristics is that the agora are employed to get binary materials, such as pictures, zip compression and executable files on webs. Total average request for binary files reaches above 10% for all of them.

The agora turns with uuencode to send this material with reply mail in the same way as FTPmail doing. File size of the mail swells by uuencode in about four or five times in original. For example material of JPG with size of 30 kilobytes becomes 500 text lines by uuencode, and same material formatted by GIF with size of 80 kilobytes corresponding to 1400 text lines. It has been needed to reply a mail which divide it with small size and the support of base64 encoding method.

Undelivered reply mails occur everyday. The result of analysis on undelivered log said that most of users who employ a "rsend" command of the agora were applied. As for most of the causes, specified e-mail address to do a reply does not exist. Because occurrence of undelivered mail leads heavy load on mail server and networks, we should restrict making use of "rsend".

However the problem still seems to be remained as far as table 2 is seen. We have received several undelivered mails from network postmasters everyday. It can say that most of the causes are in network environment that users belong to. For examples, upper size of mail is limited in several domestic BBS(Bulletin Board Service) and the Internet providers. Other type of problems relates about management of mailbox. Typical example is "Reply mail cannot accept because of user's mail box is full". Frequency of undelivered mails are usually several copies, but sometimes reaching hundred mails a day.

Another sort of undelivered mails causes a request from imaginary network domains that cannot look up the network tables. Requirements inherited in fatal error, especially it is not able to take a traceroute, we should delete the requests. Making of a list which describe undelivered domain needs to operate the agora. This filter will plug in the PP.

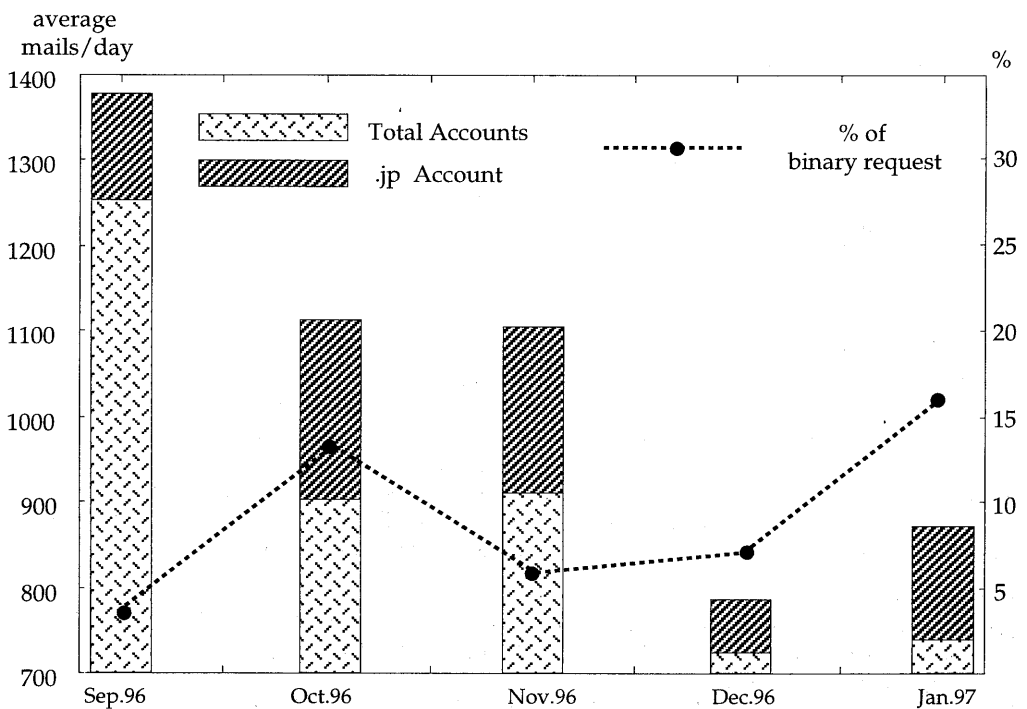


Figure5 usage statistics for the agora during recent five months

The agora can be considered as an agent for e-mail users to access to the webs. It provides anonymous and pseudonymous service to access on them. With no cryptography uses to send message from the agora, it remains on security problem. Currently user's password and ID that are described in mail body with the agora commands is sent the agora with plane(visible) text. This function can be used in the CGI(Common Gate Interface) on webs. We give limitation to use the CGI through the agora for all users.

Table 2. List of Typical Undelivered Mails Reply from Postmasters(during Dec.96-Jan.97)

code	reason	frequently
554	<ul style="list-style-type: none"> •Can't open user mailbox(pool) directory •Message is too large; 64000 bytes max •Do not send a message of more than 10000 bytes •Cannot send 8-bit data to 7-bit destination •File table overflow 	unspecified *.uunet.ve *.ucv.edu.ve osapd.cz *.ernet.in
501	<ul style="list-style-type: none"> •Data Format Error 	unspecified
550	<ul style="list-style-type: none"> •Insufficient permission; disk quota exceeded •Host unknown •User unknown 	*.ernet.in unspecified unspecified
552	<ul style="list-style-type: none"> •Message is too large; 100000 bytes max •Message is too large; 250000 bytes max •Message is too large; 30720 bytes max •Error in local delivery 	ba.pvt.sk!pilka niftyserve.or.jp *.ren.nic.in
553	<ul style="list-style-type: none"> •Host name configuration error 	unspecified
421	<ul style="list-style-type: none"> •Host *.* not found for mailer smtp 	*.ernet.in

5. Conclusion

We have been providing a service since 1995. The agora interface is useful for users only accessing to webs by e-mails. Our server running the agora frequently were down before a simple spool system is introduced. We identified that e-mail spool system is important to relax both process loads on servers and access concentration. Unresolved problems are remaining in our service that are as mentioned the previous section. We think priority of resolving the problems should decide on both performance of our server and its upper layer on network.

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References

- [1] Berners-Lee,T.,R.Cailliau,A.Luotonen,H.F.Nielsen and A.Secret: The World-Wide Web, Communication of the ACM, 37,8, 76-82.(1994) and WWW latest FAQ, <http://www.boutell.com/faq/>
- [2] Sigal,B.: A Short History of Internet Protocols at CERN, CERN PDP-NS, <http://www.wcn.cern.ch/pdp/ns/ben/TCPHIST.html>
- [3] Berners-Lee,T. : Bio, <http://www.w3.org/pub/WWW/People/Berners-Lee-Bio.html/>
- [4] Rankin,B.: Doctor Bob's Painless Guide to the Internet, 145p.(1996), See also <http://www.cs.ruu.nl/wais/html/na-dir/internet-services/access-via-email.html> and His page, <http://www1.mhv.net/~bobrankin/>.
- [5] Secret,A.: "Retrieval of documents through mail", <http://www.w3.org/pub/WWW/Agora/Help.html>,(1995) and the Libwww latest version, see <http://www.w3.org/pub/WWW/Library/>
- [6] alt.binaries.pictures.utility.archive FAQ :<http://mrcnext.cso.uiuc.edu/%7Wdeej/index.html>
- [7] Rogers,E.M.: Diffusion of Innovations 3rd Edition., Free Press, Div. of Macmillan Pub.(1982)
- [8] Presno,O. : The Online World Monitor, see <http://login.eunet.no/~presno/monitor.html>, chap.12 briefly mentioned how to use the agora.