The Past, Current, and Future of our Email Services in Kyushu University

Kasahara, Yoshiaki
Kyushu University

Shimayoshi, Takao
Kyushu University

Ito, Eisuke
Kyushu University

Fujimura, Naomi
Kyushu University

出版情報：Proceedings of the ACM SIGUCCS Annual Conference. 2018, pp.103-106, 2018-10. ACM
バージョン：
権利関係：

The Past, Current, and Future of our Email Services in Kyushu University

Yoshiaki Kasahara
Kyushu University
Fukuoka, Japan
kasahara.yoshiaki.820@m.kyushu-u.ac.jp

Takao Shimayoshi
Kyushu University
Fukuoka, Japan
simayosi@cc.kyushu-u.ac.jp

Eisuke Ito
Kyushu University
Fukuoka, Japan
ito.eisuke.523@m.kyushu-u.ac.jp

Naomi Fujimura
Kyushu University
Fukuoka, Japan
fujimura.naomi.274@m.kyushu-u.ac.jp

ABSTRACT

In Kyushu University, Information Infrastructure Initiative provides email service for students and staff members. Email services for students and staff members were started separately. For students, an email service was started as Unix accounts of "Computer System for Education" in 1995. On the other hand, an email service for staff members was started in 2009, and eventually the two mail services were merged into the current "Kyushu University Primary Mail Service" in 2014. The designs of these mail systems were affected by various operational issues and political decisions at their times. We think that running an in-house mail system is becoming less feasible due to the initial/operational cost, security issues, and our dwindling budget. For the current system, the planned 5-year lifetime ends in this fiscal year. Therefore, we are forced to migrate to a cloud-based mail service. In this presentation, we want to share our past experiences and future plans about our university email services.

CCS CONCEPTS

• **Information systems** → **Email**; Enterprise applications; Open source software; • **Social and professional topics** → *Software selection and adaptation*; Software maintenance; • **Software and its engineering** → *System administration*;

KEYWORDS

On-premise System, Public Cloud Service, Microsoft Office 365

ACM Reference Format:
Yoshiaki Kasahara, Takao Shimayoshi, Eisuke Ito, and Naomi Fujimura. 2018. The Past, Current, and Future of our Email Services in Kyushu University. In *2018 ACM SIGUCCS Annual Conference (SIGUCCS '18), October 7–10, 2018, Orlando, FL, USA.* ACM, New York, NY, USA, 4 pages. https://doi.org/10.1145/3235715.3235737

SIGUCCS '18, October 7–10, 2018, Orlando, FL, USA

ACM ISBN 978-1-4503-5582-7/18/10…$15.00
https://doi.org/10.1145/3235715.3235737

1 INTRODUCTION

Information and communication service is indispensable for education and research activities in universities. Among various services, electronic mail (email) became one of the fundamental services even before the Internet had been widely available in the world. Email has suffered from low signal-to-noise ratio due to unsolicited commercial and malicious messages for more than a decade, but there is no universal alternative which is supported by most personal digital devices.

In Kyushu University, Information Infrastructure Initiative provides email service for all students and staff members[1–3]. All email services had been operated on-premise until 2018. Email services for students and staff members were started separately. Eventually two mail services were merged into the current "Kyushu University Primary Mail Service" in 2014[3]. For the next email system, we are considering migration to a cloud-based mail service. In this paper, we want to share our past experiences with and future plans for our university email services.

2 ABOUT KYUSHU UNIVERSITY

Kyushu University is one of the national university corporations in Japan, located in Fukuoka prefecture, Kyushu island. Information Infrastructure Initiative (to which the authors belong) provides network infrastructure and services for staff members and students in Kyushu University. Table 1 shows the approximate number of users registered in the university-wide authentication system. The number also represents how many users we need to support in our email service.

Table 1: The number of IDs in Kyushu University

Role	No. of IDs
Curricular students	19,000
Non-curricular students	500
Faculty and staff members	9,000
Temporary staff etc.	1,000
Total	29,500

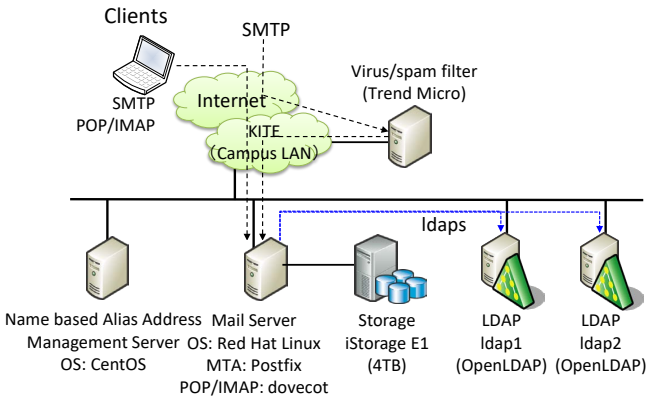

Figure 1: Mail System for Students (2011~2014)

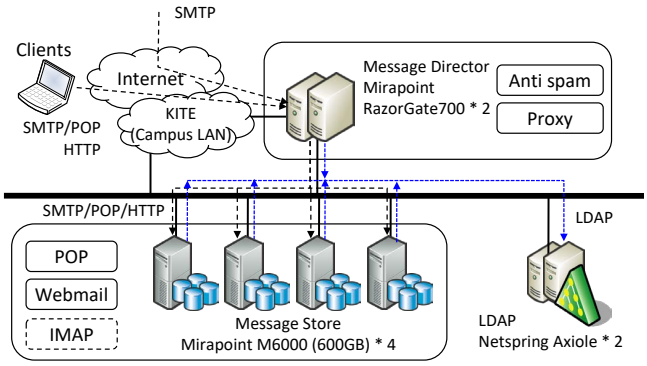

Figure 2: Mail System for Staff Members (2009~2014)

3 PAST EMAIL SERVICES FOR STUDENTS

In 1995, the email service for students was started as a part of the Unix system of "Computer System for Education" operated by Educational Center of Information Processing[1, 2]. Each student had a "Student ID" assigned by our university, and his/her Unix user name was based on that. So naturally the "Student ID" became the student's email address. The "Student ID" would change when the student proceeded from undergraduate to graduate school, or moved to another department, so such students had to migrate their data (including email messages) from the old ID to a new ID by themselves.

At first a user had to login to the server and read his/her email messages using local email clients (such as a client written in Emacs lisp). Gradually the service was expanded to include a simple web mail, SMTP/POP3 services, and expansion of the user's mailbox size. We don't have a comprehensive chronological record of system specification and modification, so we aren't sure when some of these services were introduced. Until 2008, messages were stored in each user's home directory, and the quota size in 2008 was 100MB (including other data in the home directory).

In 2009, the mail system was separated from the interactive Unix system and standard SMTP/POP3/IMAP services with TLS encryption were provided, using open-source software such as Postfix and Dovecot. User authentication was done by an external LDAP server, and there was no shell login to the mail server provided. Due to the limited storage size, the size of mailbox was 30MB/user. In addition, web mail service was discontinued because the software was no longer maintained. Due to the small mailbox size and absence of webmail service, users were encouraged to forward their email messages to an external mail service such as Gmail.

In 2011, the mail service was replaced again. We started to call it "Primary Mail Service", and it was separated from the educational system (except that it relied on the educational system's authentication server). The mailbox quota became 300MB, and started to provide name-based alias address setting service[1, 2]. Figure 1 shows the system overview.

As mentioned above, the "Student ID" would change, and it was inconvenient to use as an email address for the users. We needed something more persistent as an email address. The alias service provided such an email address by using the alphabetical name of students. The other design of the service was inherited from the previous system. The component used for LDAP authentication was especially outdated, so sometimes we experienced overload of our LDAP servers[4].

In 2014, we unified the email server for students and staff members. We explain about that in Section 5.

4 PAST EMAIL SERVICES FOR STAFF MEMBERS

There was no email service supporting all staff members until 2009. Before that, each department was expected to maintain its own mail service (most departments had their own sub-domain under "`kyushu-u.ac.jp`"). For departments which couldn't operate their own mail server, there had been mail hosting service called "mbox" from at least 1994 until 2009.

Around 2008, there was a discussion that our university should provide email service to all staff members. At that time, a bird flu pandemic was considered as a real and imminent danger, and we should have a way to to contact all staff members quickly and reliably in case of emergency. It was impossible to reliably collect all email addresses from all staff members. At that time, it also became more and more difficult to maintain email services by each department due to cost inefficiency, security risks, and lack of skills. So we decided to implement a central email server for staff members and provide email addresses to all of them in a top-down manner.

Based on these discussion, we started a central email service for staff members in 2009, called "Kyushu University Primary Mail Service"[3]. Figure 2 shows the system overview. It consisted of several Mirapoint mail appliances (two message directors, and four message servers with 600~700GB storage each) and two dedicated LDAP servers. Due to the limited capacity of the storage, we could only provide 300MB mailbox/user with a 90 day expiration period.

At that time, we had a campus-wide authentication infrastructure which assigned unique IDs (called SSO-KID) to all staff members[5]. The email address for each user was generated based on their alphabetical name and a part of SSO-KID, so we could have email addresses of all staff members. We also implemented a bulk email sending service using the list of addresses to send notification and alert messages.

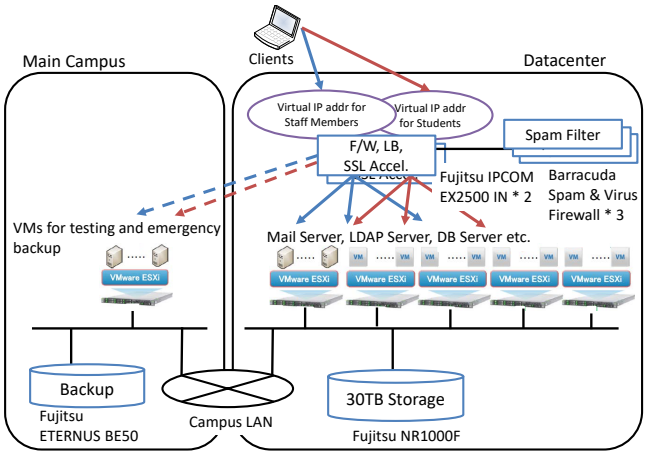

Figure 3: Current Primary Mail Service (2014~)

We decided to use Mirapoint appliances because we had to build the system within half a year and we already had some experience with the Mirapoint system. It was successful, and we were able to build a reasonable email service in time. The main drawback of the system was that all components were proprietary appliances with per-user licenses, which caused a high annual license fee and management cost. In addition, since technical details of the appliances were not open, resolving troubles took a long time to wait responses from a vendor. It influenced the design of the next system in Section 5.

As a side note, we terminated "mbox" service after we introduced this Primary Mail Service. It was hard to terminate an email service that had been operated for more than 15 years. The users remaining until the last minutes were the most difficult to convince, because they really relied on the email address provided by "mbox". Usually it is difficult to anticipate how to close a service in the beginning, but we should try to consider that when designing a new service.

In addition to that, we have been providing web/mail/DNS hosting service from 2008 to support departments/groups who want to operate their own sub-domain but don't have enough resources to run servers of their own. More and more domains had given up running their own servers and migrated to this service, and now more than 200 domains are served.

5 CURRENT KYUSHU UNIVERSITY PRIMARY MAIL SERVICE

In 2014, we merged two email services for students and staff members. Again it was called "Primary Mail Service" for staff members and students. Based on our experiences with both systems explained in Section 3 and 4, we decided to use open source software as the main component of email service (such as CentOS Linux, Postfix SMTP server, and Dovecot IMAP server) in order to avoid per-user licenses and a black box system. Still, we needed a commercial appliance for reliable spam and malware filtering, so we selected a product which didn't need per-user licenses. Figure 3 shows the overview of the entire system.

At the same time, our authentication infrastructure was also replaced to support all staff members and students, and we started to assign unique IDs (SSO-KID) to each students[6]. This new email system was the first service which fully utilized SSO-KID for students.

This time we could secure enough budget to build a system powerful enough to support all members of Kyushu Univerisity, so there were few performance issues. We had started to study how to utilize limited storage space of information services more efficiently from 2014[7], but for this system it was almost irrelevant because it had enough storage estimated to support more than 5 years worth messages for all users. This system was designed for 5-year lifetime (including 5-year hardware and spam/malware signature support), so we will need to replace the system before the end of 2018 unless we choose to extend the support.

Due to time and budget constraints, we omitted some features from the system specification, such as user-customizable server-side message filters and a central server monitoring and alert system. Technically those features could be implemented later, but we realized that it would be difficult to add major new features after the service was started because it might disrupt the service severely.

6 FUTURE PLAN FOR NEXT SERVICE

As described in Section 5, we need to replace the current mail service before the end of 2018. We discussed possible options, such as building yet-another in-house mail service or migrating to a cloud service. The estimated budget needed to build a new in-house service seemed unaffordable due to the current financial situation of Kyushu University, even if we use IaaS cloud service to reduce the initial cost. It was anticipated that our budget would be very tight for several years because of an ongoing large-scale campus migration.

Another concern was security. Email is one of the major attack vectors from adversaries, and it becomes harder to protect email users from malicious messages using limited in-house resources. We considered that public cloud-based email services should filter malicious messages better because it was analyzing far more messages. Also, major cloud-based email services support more security features such as DKIM[8] and DMARC[9] better than our current system.

We began to provide access to Microsoft Office 365 Education for all students and staff members in 2016[10]. It included Exchange Online, so we could already use a cloud-based email service. At that time, we considered that it conflicted with our current Primary Mail Service, so we didn't assign Exchange Online license to users. Later we realized that Exchange Online was tightly integrated with other Office 365 services, so we had to enable it for fully functional Office 365 services. There were other cloud email services such as Google's G Suite, but running both Office 365 and another email service might complicate the situation too much, so we decided to go for Office 365.

There were some concerns, such as data ownership and security, about migrating to a cloud service. We discussed the risk factors and concluded that the risk would be acceptable compared to an in-house system. We explained the situation to the president, CIO, and

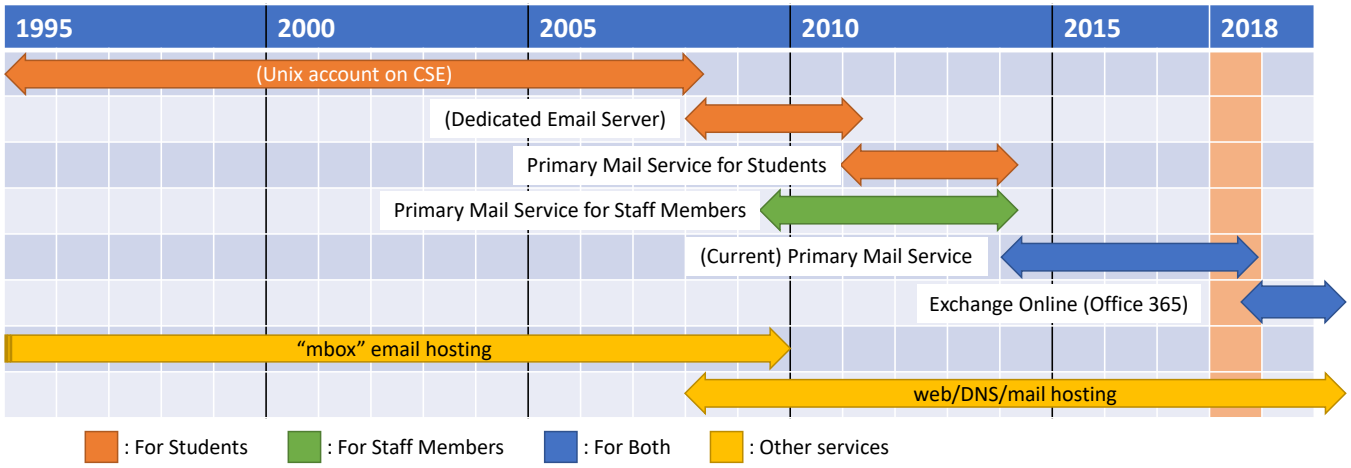

Figure 4: Summarized Timeline of Email Services in Kyushu University(1995~)

CISO of Kyushu University so that the decision would be treated as an executive decision.

Basic email services such as SMTP/IMAP/POP and a web mail (Outlook Web App) are available in Exchange Online. But we need to prepare missing features such as the name-based alias setting service provided in our current email service. This alias service is being used by more than 2,500 users now, and we want to support them even after we migrate to Exchange Online. After we are ready to provide these additional services, we will migrate our Primary Mail Service to Office 365. The planned cut-over will be in October 2018.

7 CONCLUSION

In this paper, we described our past experiences, current situation, and future plans of our university email services. Figure 4 shows the summarized timeline of various email services in Kyushu University.

All email services in Kyushu University had been operated on-premise, but now we feel that it is no longer cost-effective to operate in-house mail service. We believe that it tends to be more expensive and has less features compared to major public cloud-based services. On the other hand, we cannot control what kind of features offered by public email services, or continuity of the service we are using. We hope that the service will continue to exist for the foreseeable future. In case of the service termination, we should prepare a strategy to migrate to another service or re-implement an in-house system again.

ACKNOWLEDGMENTS

Our thanks to all users using our IT services, and staff members of the collaborative infrastructure working group and authentication infrastructure working group to develop and maintain these systems in the Information Infrastructure Initiative of Kyushu University.

REFERENCES

[1] Naomi Fujimura, Tadatsugu Togawa, Yoshiaki Kashara, and Eisuke Ito. 2011. Primary Mail Service for students based on their names. In *IPSJ SIG Technical Report*, Vol. 2011-IOT-14. Article 10, 6 pages.

[2] Naomi Fujimura, Tadatsugu Togawa, Yoshiaki Kasahara, and Eisuke Ito. 2012. Introduction and Experience with the Primary Mail Services Based on Their Names for Students. In *Proceedings of the 40th Annual ACM SIGUCCS Conference on User Services (SIGUCCS '12)*. ACM, New York, NY, USA, 11–14. https://doi.org/10.1145/2382456.2382460

[3] Yoshiaki Kasahara, Eisuke Ito, and Naomi Fujimura. 2014. Introduction of New Kyushu University Primary Mail Service for Staff Members and Students. In *Proceedings of the 42Nd Annual ACM SIGUCCS Conference on User Services (SIGUCCS '14)*. ACM, New York, NY, USA, 103–106. https://doi.org/10.1145/2661172.2662965

[4] Yoshiaki Kasahara, Eisuke Ito, and Naomi Fujimura. 2013. Gulliver's Toss: Google's Chronic Big Load to University Mail Server and Its Sudden Resolution. In *Proceedings of the 41st Annual ACM SIGUCCS Conference on User Services (SIGUCCS '13)*. ACM, New York, NY, USA, 169–174. https://doi.org/10.1145/2504776.2504815

[5] Eisuke Ito, Yoshiaki Kasahara, and Naomi Fujimura. 2013. Implementation and Operation of the Kyushu University Authentication System. In *Proceedings of the 41st Annual ACM SIGUCCS Conference on User Services (SIGUCCS '13)*. ACM, New York, NY, USA, 137–142. https://doi.org/10.1145/2504776.2504788

[6] Yoshiaki Kasahara, Naomi Fujimura, Eisuke Ito, and Masahiro Obana. 2015. Introduction of Unchanging Student User ID for Intra-Institutional Information Service. In *Proceedings of the 2015 ACM Annual Conference on SIGUCCS (SIGUCCS '15)*. ACM, New York, NY, USA, 141–144. https://doi.org/10.1145/2815546.2815578

[7] Yoshiaki Kasahara, Takuya Kawatani, Eisuke Ito, and Koichi Shimozono. 2016. An Analysis of Relationship Between Storage Usage Distribution and Per-User Quota Value. In *Proceedings of the 2016 ACM on SIGUCCS Annual Conference (SIGUCCS '16)*. ACM, New York, NY, USA, 153–158. https://doi.org/10.1145/2974927.2974936

[8] Murray Kucherawy, Dave Crocker, and Tony Hansen. 2011. DomainKeys Identified Mail (DKIM) Signatures. RFC 6376. (Sept. 2011). https://doi.org/10.17487/RFC6376

[9] Murray Kucherawy and Elizabeth Zwicky. 2015. Domain-based Message Authentication, Reporting, and Conformance (DMARC). RFC 7489. (March 2015). https://doi.org/10.17487/RFC7489

[10] Yoshiaki Kasahara, Takao Shimayoshi, Masahiro Obana, and Naomi Fujimura. 2017. Our Experience with Introducing Microsoft Office 365 in Kyushu University. In *Proceedings of the 2017 ACM Annual Conference on SIGUCCS (SIGUCCS '17)*. ACM, New York, NY, USA, 109–112. https://doi.org/10.1145/3123458.3123491