COMPARATIVE STUDY OF EMAIL APPLICATIONS PERFORMANCE FOR MULTI-PROTOCOLS ON WIRELESS NETWORK

Gorakh Laxman Wakhare
Asst. Professor,
Jayawant Institute of Management Studies,
Research Student at IndSearch affiliated to S.P.P.U, Pune.

Dr. Ajay Kumar
Director,
JTC Jayawant School of Computer Applications, Pune.,

ABSTRACT

In today's world, the email is most frequently used application for communication through internet for heavy data usages.There is a need to use the appropriate applications with cost effective solution. In this paper,the end-to-end data usages are measured for email application on wireless network. The comparative study is done between the web (browser based) and desktop application using a Gmail account. The success story of result shows that high Bandwidth data usagesis consumed in Browser (web based) email as compared to Desktop based email application. The bandwidth requirement forDesktop email Application is 40% lesser compare to Web based Application.

Key words: Email, application, bandwidth, cost-effective, Internet usage.

I. INTRODUCTION

Electronic mail (e-mail) is one of the most used Internet services, both in terms of popularity and amount of traffic generated.The total number of worldwide email accounts is expected to increase from 3.3 billion accounts in 2012 to over 4.3 billion accounts by year-end 2016. This represents an average annual growth rate of 6% over the next four years.Nearly half of worldwide email users are in the Asia Pacific region [10].

The rapid changes in the technology is observed in the communication field in past years. The Wireless Communication technology has grown exponentially in the past decades. The wireless user subscriber was 268 million compared to 346 millionon wired in 2007, whereas it has become 2096 million on wireless and 696 million on wired in 2013 as per table-1. The wireless broadband subscribers are increasing almost 40%+ in every year (Figure-1) compared to the wired network 6-8% every year [5].

Table-1: Yearly growth on Wireless and wired broadband subscribers

	2007	**2008**	**2009**	**2010**	**2011**	**2012***	**2013***
A	268	422	615	778	1155	1556	2096
B	346	411	468	527	588	638	696

A - Active mobile-broadband subscriptions
B - Fixed (wired)-broadband subscriptions

Figure 1. Comparative growth of Wireless and Wired Broadband Subscribers from 2007 to 2013. Source: ITU_Key_2005-2013_ICT_data [5]
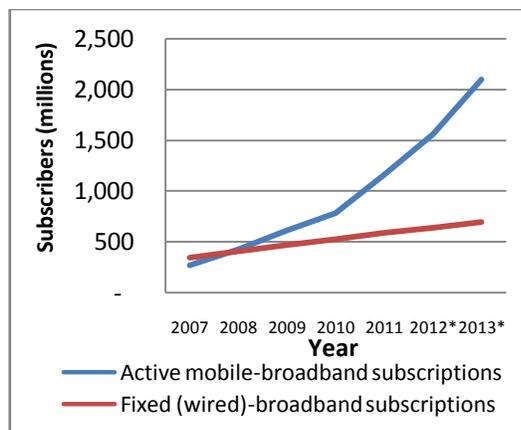
The need of Internet bandwidth requirement has changed on wireless communication technology because email like applications are remain the go-to form of communication in the business world.In 2012, consumer email accounts represent 75% of worldwide mailboxes, while corporate (i.e. business) email accounts represent 25% of worldwide mailboxes. Over the next four years, it is expected that corporate email accounts to increase at a faster pace than consumer email accounts, as

organizations continue to extend email services to employees who may not have had access to email in the past[10].

A study revealed top engagement times for email usage on internet inbetween 8 a.m. to 4p.m., thus it gives the load increase on bandwidth consumption in working hours [11].

The shift paradigm of wired network to wireless network has enormous effect on the application need. In this paper,electronic mail, messages are viewed in two parts, an envelope and contents. The envelope contains whatever information is needed to accomplish transmission and delivery to the destination. The contents comprise the object to be delivered to the recipient. This standard applies only to the format and message contents. It contains no specification of the information in the envelope[1].

The comparative study is done between the web (browser based) and desktop (outlook) applications using a Gmail account. The end-to-end bandwidth is measured using experimental setup for multiscale data and different email protocols.

The email service providers has given variety of protocols for using emailcommunication such as pop3, imap, http, https, etc. These protocols are used with different applications such as web based, desktop, mobile apps, etc. on wireless network also to give cost effective process.

II. EMAIL APPLICATION PROCESS:

The email application has following stages to access email:
a. Email Account Login Process (EALP): the client machine communicates with the server for authentication using username and password.
b. Email downloading after successful authentication (EDSA): As per the user setup the email application shows no. of emails per page, headers of messages, sender details, time of arrival in message box.
c. Email account Log-off Process (EALOP): The applications gives the user a log-off process from the server.
d. Second time Re-login with no new email (STRNE): As per the user setup the email application shows no. of emails per page, headers of messages, sender details, time of arrival in message box with no new email.
e. Second time Re-login withnew email (STRE): As per the user setup the email application shows no. of emails per page, headers of messages, sender details, time of arrival in message box with new email of 100KB Size.

Figure 2. Stages of Email Application Process
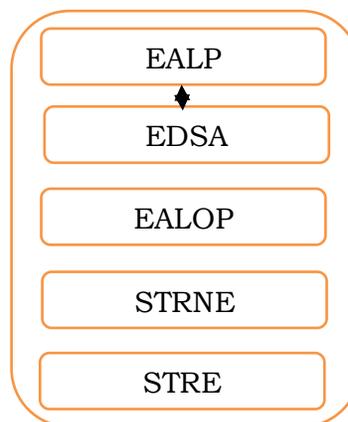
III. EXPERIMENTAL PROCEDURE:

In this setup, email account is created on Gmail and its bandwidth data usage is measured using browser application and desktop application (Outlook) respectively. First the email login and logout bandwidth data usage is measured for browser application and desktop application (Outlook). Second, the bandwidth data usage is measured with single new email arrival for browser and desktop application(Outlook) respectively for same mail box. Third, the bandwidth data usage is measured with no new email arrival for browser and desktop application (Outlook) respectively.The bandwidth data usage comparative is analyzed and the message retrieval time performance is measured.

IV. **PERFORMANCE ANALYSIS AND COMPARISON**:

The experimental setup was carried out with the testing of desktop and browser applications by sending and receivingemails. 25 emails per process aretransferred using wireless network. Bandwidth is measured on EALIP, EDSA, EALOP, STRNE, STREProcessesfor both the applications - desktop and browser and the average consumed bandwidth are tabulated in the table-2.

*Table-2:*Average Bandwidth Utilisation for alltested Process of Email Application.

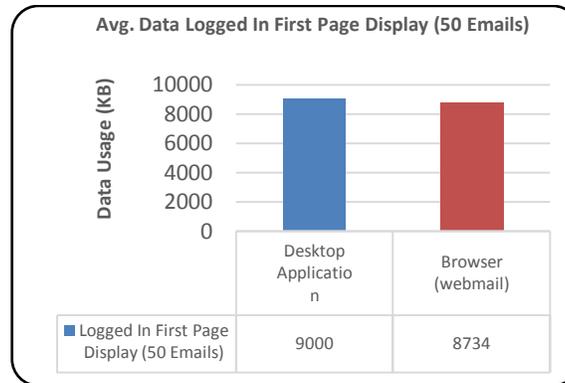| *Process*	*Average Data Utilization*	
	Desktop Application	**Browser Application**
EALIP	9 KB	73 KB
EDSA	9 MB	8.73 MB
EALOP	12 KB	121 KB
STRNE	10 KB	8.80 MB
STRE	112 KB	8.96 MB

As measured value of Email account login process (EALIP) indicates that browser application takes 8 times more Data Usage than the desktop application (Figure-3).
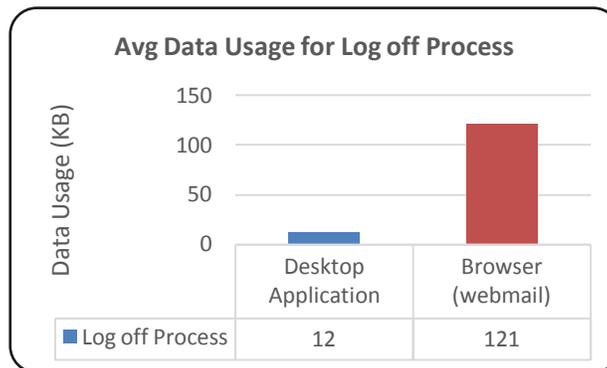
Figure-3: Average Data Usage for Login Process
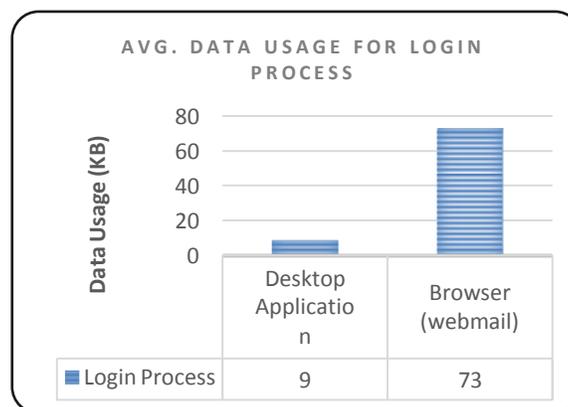
Email downloading after successful authentication (EDSA) Process shows that approx. same bandwidth is utilized by both the applications (Figure-4).

Figure 4: Average Data Logged In First Page Display (50Emails)

Avg. Data Logged In First Page Display (50 Emails)

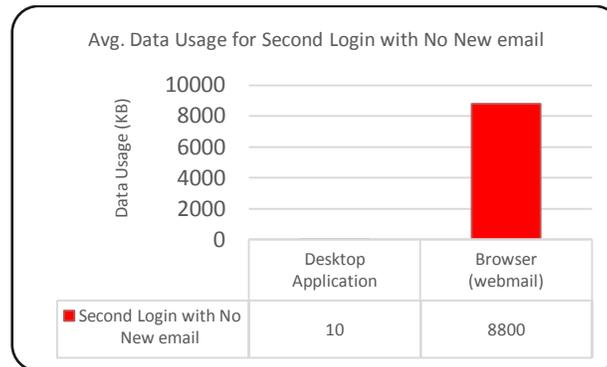|	Desktop Application	Browser (webmail)
■ Logged In First Page Display (50 Emails)	9000	8734

Email account Log-off Process (EALOP): This process shows that Desktop Application utilizes only 10% of data usage compared to Browser Application (Figure-5).

Figure 5: Average Data Usage for Log off Process.

Avg Data Usage for Log off Process

	Desktop Application	Browser (webmail)
■ Log off Process	12	121

Second time Re-login with no new email (STRNE) process give us clear indication that Browser Application downloads again all 50 emails and utilization is more than 99% compared to desktop application(Figure-6).

Figure 6: Average Data Usage for Second Login with No New email

Re-login withnew email (STRE) Process shows us that only new email is downloaded in case of desktop application and in case of browser application new email + 49 new emails are downloaded again, which utilizes more than 95% data usage than desktop application (Figure-7).

Figure 7: Average Data Usage for New Email (100KB Size)
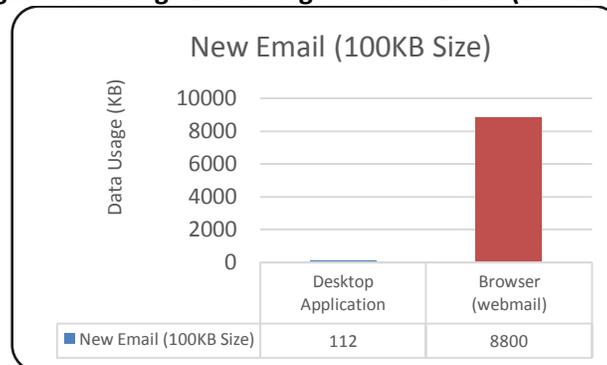
Observations: The comparative analysis shows better performance with respect to data usage of Desktop Application. The few observations in favor of desktop application as follows:

  i.   User can access to email offline.
 ii.   User can apply advanced filtering and mail rules.
iii.   Frequent Email application Users can save better on data usage charges.
iv.   User can access multiple email accounts with different domains.
 v.   User need not wait for replying the emails they can go off-line and after having the access the emails can be sent.
vi.   If a user checks email account daily, then its monthly usage on webmail is Average min. 390 MB and Desktop Application is 23 MB for one Email daily of 100 KB Size.

V. CONCLUSION:

The wireless communication is gaining very much popularities and its adoptability growth exponential. There is a need to find effective and cost-effective solution on Wireless network.

The desktop application is an appropriate option and cost effective solution for users who has less data packs and limited bandwidth. The desktop application is 7-8 time faster than Browser Application.

VI. REFERENCES:

[1] P. Resnick "Internet Message Format" RFC 2822, April 2001.

[2] J. Myers, M. Rose "Post Office Protocol- version 3" RFC 1939, May 1996.

[3] Huffman, D. A. (1951). A method for the construction of minimum redundancy codes. In the Proceedings of the Institute of Radio Engineers 40, pp. 1098-1101.

[4] CAPON, J. (1959). A probabilistic model for run-length coding of pictures. IRE Trans. On Information Theory, IT-5, (4), pp. 157-163.

[5] ITU_Key_2005-2013_ICT_data

[6] J.Charzinski "Observations in E-Mail Performance" ITC Specialist Seminar. Wilrzburg, Germany, Jul. 2002 , pp. 133-142

[7] M. H. Haggag "enhanced delivery through a smart SMTP client" .the international journal on intelligent cooperative Information, vol. 4, no. I, january 2004.

[8] Ait Ali, A., Michaut, F., Lepage, F.: End-to-End Available Bandwidth Measurement Tools: A Comparative Evaluation of Performances. In: Proceedings of the 4th International Workshop on Internet Performance, Simulation, Monitoring andMeasurements IPS-MoMe 2006, pp. 1–14 (2006)

[9] Hussein Al Bazar :A New Approach to Enhance E-mail Performance through POP3 Protocol, International Conference on Network Applications, Protocols and Services 2 00 8 (Net Apps 2008) 21 - 22 November 2008 Executive Development Center , University Utara Malaysia

[10] Editor: Sara Radicati, PhD; Principal Analyst: Quoc Hoang, Email-Statistics-Report-2012-2016-Executive-Summary, the radicati group, inc.

[11]   "email   marketing"PowerProdirect   firm   Statistics   –
2012,http://www.powerprodirect.com/statistics?start=5