# Wireless Cloud Storage using IoT device

Norharyati Harum*, Nurul Azma Zakaria and Zaheera Zainal Abidin

Fakulti Teknologi Maklumat dan Komunikasi, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia

*Corresponding e-mail: norharyati@utem.edu.my

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**ABSTRACT** – This paper presents the development of portable wireless cloud storage (PWCS) using IoT technology. PWCS is developed by using an IoT device, Raspberry Pi which is also popular because of its small size, high portability function and low cost microprocessor. Those characteristics ensure a low cost and high portability of PWCS. The performance of the developed PWCS is compared with existing cloud storage software based on transfer rate and response time.

## 1. INTRODUCTION

Cloud storage is the storage of data online in the cloud, where data is stored in and accessible from multiple distributed and connected resources that comprise a cloud. It has been reported in [1] that the utilization of cloud storage has been exponentially growth since 2014, and will be continued in future. To fulfill the demand, lots of free open source software has been developed such as OwnCloud [2] and Seafile [3].

On the other hand, raspberry Pi has been introduced by Eben Upton is one example of high potential IoT device to empower cloud storage technology [4]. The idea of developing Raspberry Pi Wireless Cloud storage is firstly done in [5], where it uses a cluster of Raspberry Pi to store data, computing processing, and a way of simulating supercomputer using microcomputer compared to actual supercomputer in term of network pattern and visualization. It a massive scale project where several number of Raspberry Pi is stacked to provide a large scale of cloud storage, known as PiCloud. However, the Pi Cloud is too expensive and the hardware physical is massive and offers zero portability for small community cloud storage service.

In this project, portable wireless cloud storage was developed, named as Portable Wireless Cloud Storage (PWCS), for a personal access network and small community such as classroom and home. The next section shows design and procedures of the developed project. Section III describes about performance evaluation and Section IV shows results and discussions of the performance evaluation. The paper is finally concluded in Section V.

## 2. PROTOTYPE DESIGN

Figure 1 shows the overview of the PWCS, a Raspberry Pi unit is connected to storage disk which contain three cloud software mainly ownCloud, Seafile and PWCS. Note that Seafile and ownCloud are shown in the figure for performance evaluation purpose.

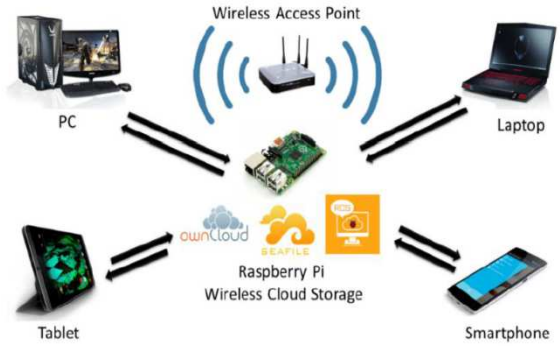


Figure 1 System Architecture of the Proposed System

The IP, port and access method used for the cloud software is summarized in Table 1.

Table 1: Summary for Network Configuration

| | Proposed Cloud | OwnCloud | Seafile |
|---|---|---|---|
| IP Address | 192.168.1.101 | 192.168.1.101 | 192.168.1.101 |
| Port | 1212 | 80 | 8000 |
| Access Method | Java client application | web | web |
| Access Site | Java Cloud | http://192.168.1.101/owncloud/ | http://192.168.1.101:8000 |

Figure 2 shows the side and top view of PWCS without mouse and keyboard implementation. This figure show the basic wiring and cable setup for the project, 500GB hard disk are connected to SATA-USB converter which are directly connected to Raspberry Pi via microUSB to USB converter cable. Power source for Raspberry Pi can be provided using a battery pack or from power source adapter. Wireless dongle in Raspberry Pi will allow it to connect to wireless access point via wireless medium. HDMI output to either regular computer monitor or HDTV.

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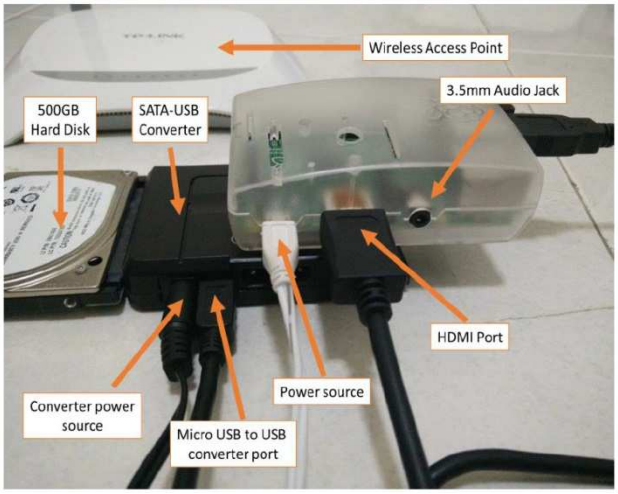


Figure 2 Portable Wireless Cloud Storage hardware

## 3. RESULT AND DISCUSSION

Performance analysis has been done for the developed PWCS and other two cloud software; OwnCloud and Seafile based on two performance parameter; data transfer rate and response time.

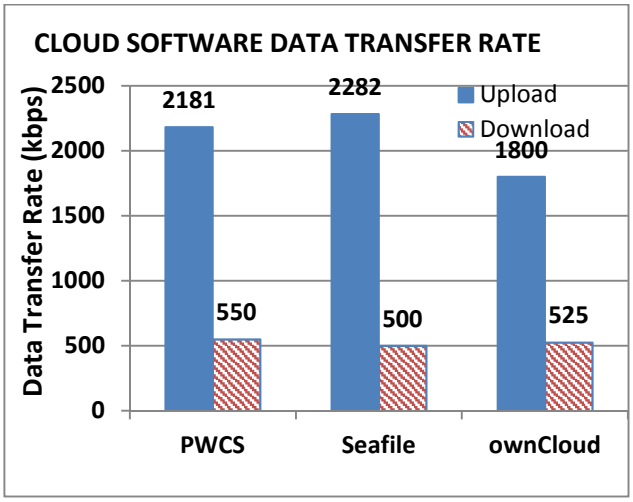


Figure 3 Data Transfer Rate Comparison

Figure 3 shows the average data transfer rate for three cloud software for transferring 5MB file. Seafile has the highest maximum upload speed at 7300Kbps due to simple interface and local area network but low average of 2700Kbps. PWCS provides the highest average upload transfer rate with 3000Kbps. OwnCloud has the lowest upload speed at 2500Kbps due the fancy interface that require higher bandwidth to load but has the highest download speed at 71Kbps with PWCS come in second and Seafile at the lowest speed.

Figure 4 shows the average response times for three cloud software. User issues a query request to access the file on the cloud servers, and the server will response to the query by the user. PWCS take an average of 800ms to response to the user request, which is the fastest cloud software compared to Seafile and ownCloud. TCP direct connection in a local area network is the main strength for the cloud software that allows it to skip or use small fraction of response time making it the fastest cloud software of all the three. ownCloud take about 1700ms average time to response, the fastest among cloud software that utilize web page interface. Seafile required 2200ms to response making it the slowest off all three cloud software. Web interface cloud software such as ownCloud and Seafile take a longer time to response because of http load time. PWCS is the best cloud software among the three softwares in term of lowest response times. For the web based software, ownCloud performs lower response time compared to Seafile .

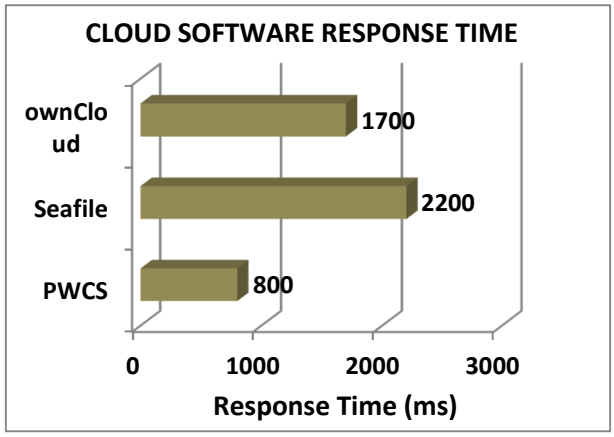


Figure 4 Comparison of Average Response Time

## 4. CONCLUSIONS

In this paper, a design of portable wireless cloud storage with software; named as PWCS is discussed. The developed product can support cloud service that can be used at small community such as classroom and at home. The developed product can be used without internet connection, thus can realize low cost cloud service with high portability function. We are then compared the developed software performance with another two open cloud software; OwnCloud and Seafile. We found that the PWCS outperforms both open software on average upload data transfer and response time.

## ACKNOWLEDGEMENT

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## REFERENCES

[1] www. Nasuni.com/2015cloudreport accessed at January 2015
[2] https://owncloud.org/ accessed at January 2015
[3] https://www.seafile.com/en/home/ accessed at January 2015
[4] C. Severance, Raspberry Pi IEEE Journals & Magazines, 2013, Vol. 46, Issue. 10, Pp: 14 – 16
[5] Iskren Kandov . "Experimental model of Low Power NAS and Cloud drive based on Raspberry Pi" Balkan Journal of Electrical & Computer Engineering 2015, Vol.3, No.1.

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