PERFORMANCE COMPARISON OF MOBILE OPERATOR NETWORK ON *HOME CARE SERVICE APPLICATION* OF ISLAMIC HOSPITAL (RSI) JEMURSARI

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Abstract

Home Care is a health service conducted in the home of patients by medical personnel, in accordance with the health department (2002). The Islamic Hospital of Jemursari Subaya already has a Home Care service such as in the decision of the director of Islamic Hospital Jemursari Number JS.A.SKR.043.02.18 but the service can not be accessed from outside the hospital. The Home Care application makes it easy for people to access health services as needed without visiting a home based care home care hospital chosen for being easier to operate. to find out how fast the operator's network access to the Home Care Service Application is done measuring network performance by paying attention to QOS such as trhoughput, Delay and packet loss. After testing using black box method, home care service application can run as expected. In addition Based on the results of measurement on some location obtained the largest delay value on the 3G network using XL operator of 0.1517s and the smallest delay using indosat operator of 0.0076s, while the largest delay 4G network using indosat operator of 0.3611s and the smallest delay using the operator 3 of 0.0273 s. for the throughput value obtained on the largest 3G network using indosat operator of 1299.817bps and the smallest Throughput value using XL operator of 199.952bps. packet loss obtained from the measurement result of 0.00%.

Keywords: Home care, QOS, Delay, Throughput, Packet Loss Introduction.

Introduction

Health is one important factor in people's lives, by utilizing the development of information technology, the community will be more easily obtain health services. especially for people who have problems such as limited time to go to hospital, elderly family or other family members who need health care at home. Based on the discussion with the father andik as the staff of IT Hospital Islam Jemursari on February 21, 2017. Islamic Hospital Jemursari Subaya already has a Home Care service as in the decision of the director of Islamic Hospital Jemursari Number JS.A.SKR.043.02.18 as the attached. The ongoing Home Care Service is accessible when the patient arrives at the hospital to register service requests. Therefore To facilitate the community in accessing health services, Islamic Hospital Jemursari Surabaya develop health services in the form of Home Care service applications that can be accessed without having to visit the hospital first.

Home Care is a health service conducted in the home of patients by medical personnel, in accordance with the health department (2002). aims to help people with elderly, assist in the recovery process of patients who have been hospitalized and provide nursing services for mothers who have just given birth, as well as other family members who need health care. so it needs a health service that can provide the type of service in accordance with community needs that can be accessed easily. Currently Home Care services that have been available in the RSI run manually, the community or the patient's family must first go to the hospital to register, after registering in the hospital then the community or family of patients get Home Care services. Home Care application makes it

easy for people to access health services as needed without visiting hospital to register. In addition, several considerations include economic considerations, patient comfort and easy access for the community.

Web-based Home Care service is chosen because it is easier to operate, web-based services are also more flexible because it can be accessed from various devices such as laptops and mobile phones. to know how fast the network access to Home Care Service Applications, then the network performance measurement with regard to QOS. The QOS parameters used in the measurement of a network of homecare service applications are trhoughput, Delay and packet loss so that you can know how fast web-based Home Care applications can be accessed using different mobile operators.

Based on the description above then it takes a Home Care service application that can be accessed easily, therefore In this thesis, the authors perform performance measurement Service Home Care RSI Jemursari Surabaya by using several different operators.

Research methods

a. State of The Art

a. History of Islamic Hospital (RSI) Jemursari

Jemursari Hospital is one business unit under Yayasan RS RS Surabaya which was built in 1992 and started its operation on 25 May 2002 which marked with soft opening. Jemursari Islamic Hospital is also a development of Surabaya Islamic Hospital A. Yani (Wonokromo). Jemursari Islamic Hospital occupies a land area of 4.6 Ha, located at Jalan Jemursari No. 51 - 57 Surabaya. When it started operating in May 2002 until the end of 2005, the number of beds is 82 beds. In 2006 Surabaya Islamic Hospital Jemursari with the new Board of Directors began to be trusted by the community, so it needs to add a bed to 96 beds. On March 9, 2007 opened Kemuning room to add third class hospitalization. The opening of class III treatment room is to meet the needs of inpatient care for poor families, other agencies that require class III facilities, and cooperation with Jamsostek. With the opening of the Kemuning room the capacity of the Jemursari Islamic hospital bed increased from 96 beds to 108 beds. On December 10, 2007 also opened VIP class in Lotus room and began to fill the patient on January 2, 2008. In addition, Islamic Hospital Surabaya Jemursari starting December 24, 2007 has been able to serve patients with Stroke Stroke integrated with the opening of the Stroke Center. The capacity of the Jemursari Islamic Hospital increased again in March 2008 to 113 beds. Alhamdulliah, on July 1, 2009 Surabaya Islamic Hospital Jemursari has a pharmacy depo in ER, so it can serve the purchase of medication from ER patient maximally and give service of UDD (Unit Dose Dispensing) for inpatient patient and in August 2009 Islamic Hospital bed Surabaya Jemursari to 116 beds. At the end of December 2010, Jemursari Islamic Hospital received recognition of being a type B hospital by the Ministry of Health. Jemursari Islamic Hospital increased its bed capacity to 200 beds [1].

b. Home Care

Jemursari According to the Department of Health (2002) Home Care is a continuous and comprehensive healthcare service provided to the individual or family in their residence in order to improve, maintain or restore health or maximize the level of independence and minimize the consequences of the disease. Sherwen (1991) defines home health care as an integral part of nursing services performed by nurses to help individuals, families, and communities achieve self-reliance in solving health problems facing them.

c. Client-Server

A web not only as a distributed storage area of a static document, the client can send information to the server, then the server will only send data required by the client, where the data storage process is done on the server computer.
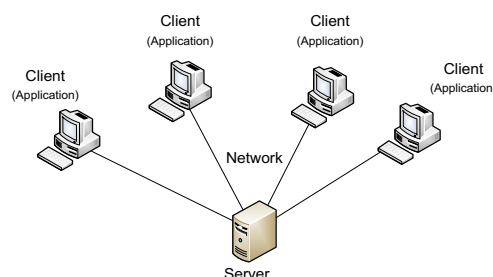

Figure 1. Client-Server Architecture

In this architecture divide the task between Client-server computer, client computer provides user interface, request (Request data) to DBMS server, and data processing. The cient computer sends a statement to the server, while the server is responsible for storing, managing, serving data access requests. the server computer is required to have high processing capability because it must serve many

client computer requests that access one or more DBMS. In this model the network load becomes lightweight because the data running on the network hannya data requested by the client. In addition, the architecture in this model is simpler and easier to implement, especially in the business in one building [6]. Page Replacement Algorithm in Proxy.

LRU, LFU, and GDSF are some page algorithm that is used as caching method in proxy server. LRU algorithm follow rules where the least used object will be sorted and the longest one will be deleted. LFU algorithm follow rules where the least object will be sorted and the object with the lowest frequency access will be deleted. GDSF algorithm follow rules where least used and the lowest frequency will be sorted and the smallest object will be deleted.

d. Web Server

A Web server is a software that has basic operating modes such as waiting for connection requests from a web client, and for each request to place correspondent documents on its file system and send them to the browser. If there is a request from the browser, then the web server will process the request, then give the results of the process of the desired data back to the browser. The software used on the server side does all the application processing on the server and only sends the HTML back to the client [5].

e. Web Client

The web client signifies a computer user using web access, or software on a computer used to access the web. Software on client sisis is also called web browser is a complex program, which has the function of requesting and receiving web pages from various servers as directed by the user and to display it. The protocol outlines the rules on how browsers are associated with the server. [5] Another important role of web browsers is to execute programs that are embedded within web pages. This program gives writers rich webpage methods to interact with users [5].

f. Database System

The DBMS database system was first developed by IBM's R & D division in the IBM company in the late 1950s to the 1960s. This development is mostly shown to meet the needs of various fields of business, military and educational institutions and governments that have an organization structure that is not simple and has complex data and information needs The database sisem is a combination of hardware and software that provides wastage and allows to perform one or more tasks that can involve handling large amounts of information. The database system has a variety of components that make up it, the component is [3]:

1. Hardware.
2. User (user).
3. Operating system.
4. Database processing system (DBMS).
5. Other application programs.
6. Database.

g. Black Box

A Black box is a testing method that involves checking the unit-unti application as an equipment that is expected to have a certain input and output, but the internal process is not known.

h. QOS System (Quality of Service)

Quality of service is a set of techniques and mechanisms that ensure the performance of computer networks (especially on the internet) on service providers to applications that exist in computer networks. QOS is viewed and measured from the service provider's perspective. The flow of data packets has an influence in computer network services, with respect to the flow of data packets in QOS with the Delay parameters, throughput and packet [8].

1. Delay

In computer networks especially for QOS also known as Delay. Delay is defined as the length of time required by the data packet to arrive at the destination. In the ITU-T REC-G.1010-2001 standard Delay on web browsing refers to the HTML component of a web page. From a user point of view, the main performance factor is how fast a page appears after being requested. Delay time is no more than about 10 seconds.The transmission delay can be found using the following equation:

$$Delay\ (sec)Tx = \frac{Received\ Time - Sent\ Time}{Total\ Packet}$$

2. Troughput

In Troughput is a measurable network performance. Throughput is also defined as the actual capability of a network in the delivery of data per unit time. To calculate Troughput can use equation:

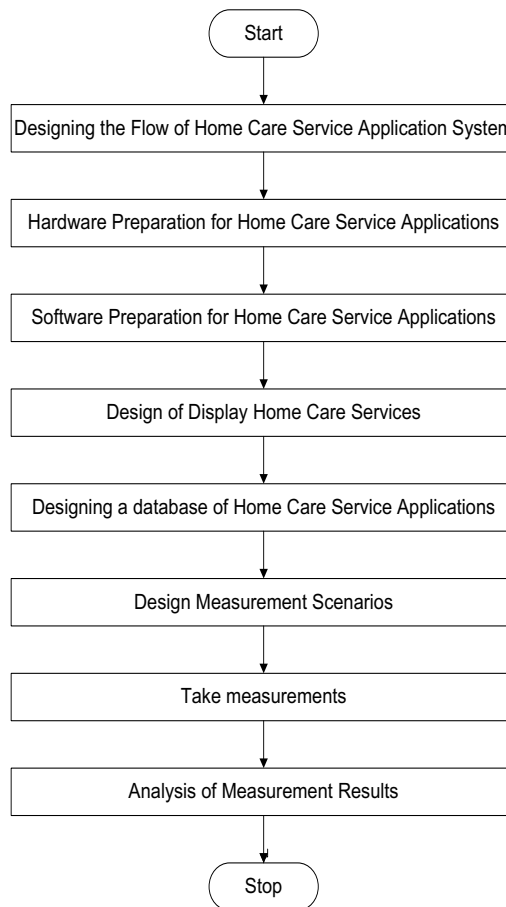$$Troughput = \frac{Total\ Packet\ Sent}{Data\ Transmition\ Time} (Bytes/sec)$$

3. Packet Loss

Packet Loss can be defined as a failure to transmit packets to their destination address causing some packets in lost or lost delivery time. Packet Loss can be calculated using the following Equation:

$$Packet\ Loss = \frac{Packet\ transmited - Packet\ received}{Packet\ transmited} \times 100\%$$

b. Modelling and Simulation

In this research there will be some steps described by Flowchart. Here is a flowchart of HomeCare application.

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                    ┌──────────┐
                    │  Start   │
                    └──────────┘
                         │
                         ▼
   ┌────────────────────────────────────────────────────────┐
   │ Designing the Flow of Home Care Service Application System │
   └────────────────────────────────────────────────────────┘
                         │
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   ┌────────────────────────────────────────────────────────┐
   │  Hardware Preparation for Home Care Service Applications  │
   └────────────────────────────────────────────────────────┘
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   │  Software Preparation for Home Care Service Applications  │
   └────────────────────────────────────────────────────────┘
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   │         Design of Display Home Care Services             │
   └────────────────────────────────────────────────────────┘
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   │  Designing a database of Home Care Service Applications   │
   └────────────────────────────────────────────────────────┘
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   ┌────────────────────────────────────────────────────────┐
   │            Design Measurement Scenarios                  │
   └────────────────────────────────────────────────────────┘
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   ┌────────────────────────────────────────────────────────┐
   │                Take measurements                        │
   └────────────────────────────────────────────────────────┘
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   ┌────────────────────────────────────────────────────────┐
   │          Analysis of Measurement Results                │
   └────────────────────────────────────────────────────────┘
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                    ┌──────────┐
                    │   Stop   │
                    └──────────┘
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Figure 2. Research Methodology Flowchart

Initial stages in this study began with the design of the system flow Home Care service applications that provide an overview of existing Home Care service system which is then applied to Home Care service applications.
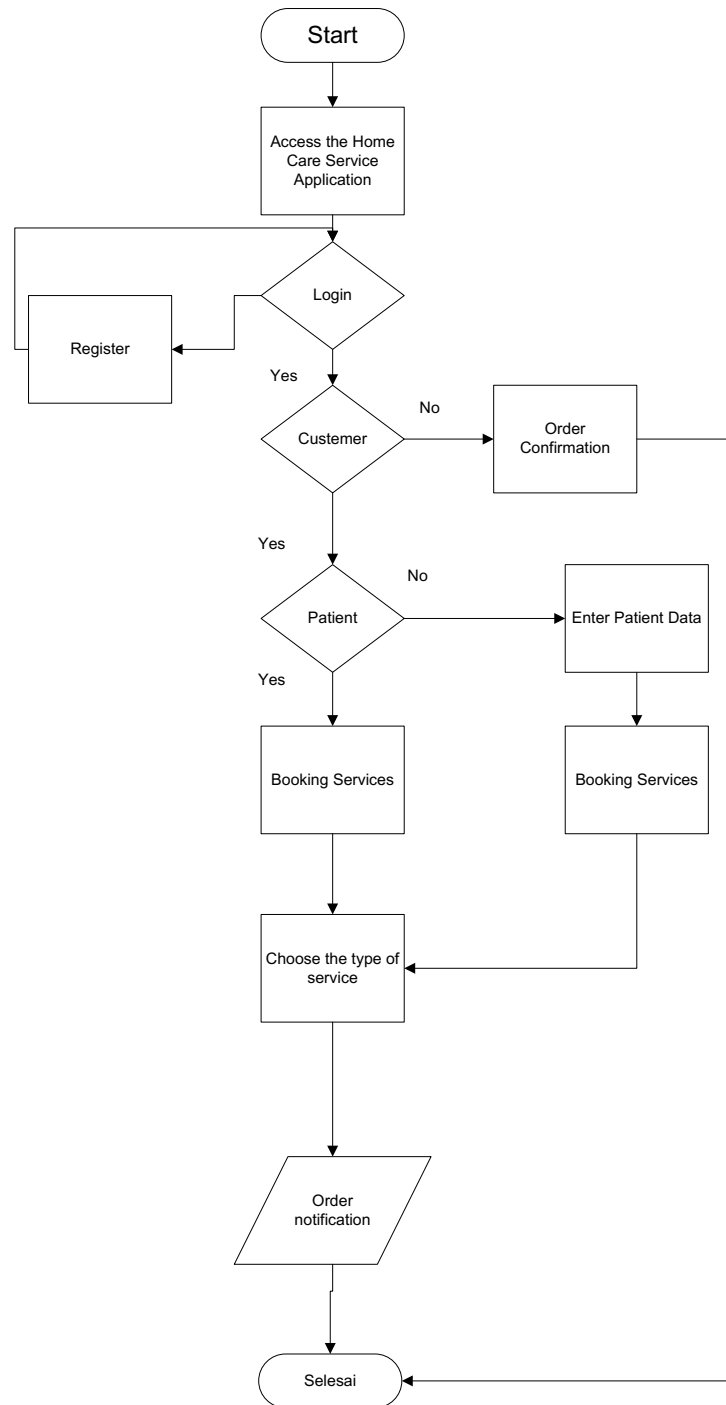
Figure 3. Home Care Application Flowchart

The design of the database in Home Care application begins with making the design of the cortex diagram and DFD (data flow digram) to be used.

The cortex diagram is a diagram consisting of a process that describes the scope of the Home Care application system. The cortex diagram illustrates all inputs into the system or output of the system which gives a picture of the whole system. In the ortect chart there is only one process in the system. the following diagram of the cortex daari sitem Home Care service applications.
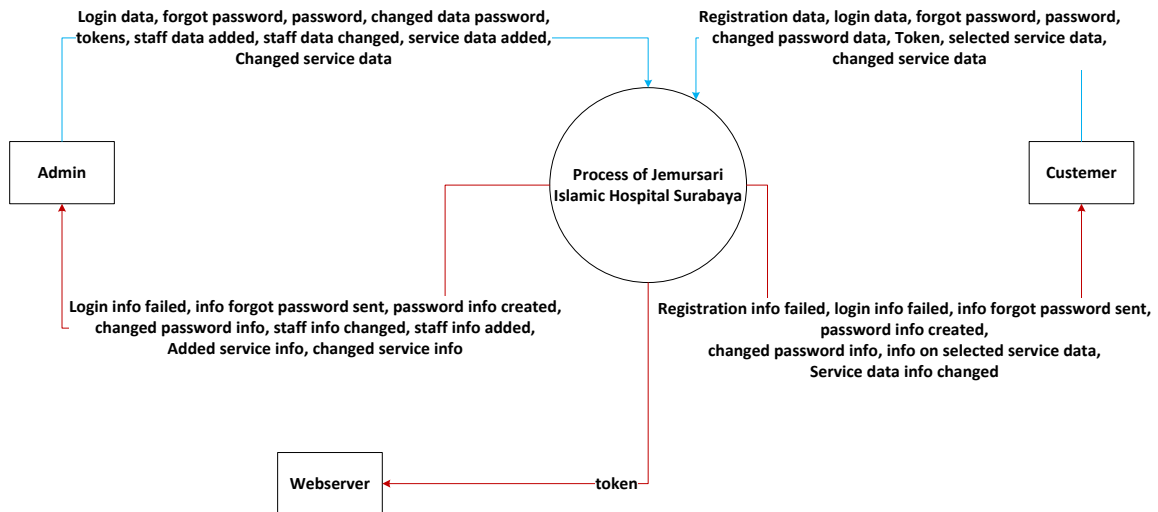
Figure 4. Cortex Diagram Flowchart

Research Results and Discussion

Testing Home care service application using black box method, as in the following table.

Table 1. Black Box Test

No.	test case	excpected result	result obtained	valid
1	Normal login	can enter login page	user can enter login page	valid
2	login with wrong password	can not login	can not login	valid
3	login with wrong username	can not login	can not login	valid
4	login with wrong username and wrong password	can not login	can not login	valid
5	admin home page	Displays a list of service order tables	Displays a list of service order tables	valid
6	input admin data	can input data	can input data	valid
7	admin profile page	can change data	can change data	valid
8	customer home page	Displays a list of service order tables	Displays a list of service order tables	valid
9	input customer data	can input data	can input data	valid
10	add patient data	can add data	can add data	valid
11	customer profile page	can change data	can change data	valid

measurement results of campuses, apartments, and housing using wireshark. In the sub-section the measurement results consist of access measurement result of Home Care web application page.
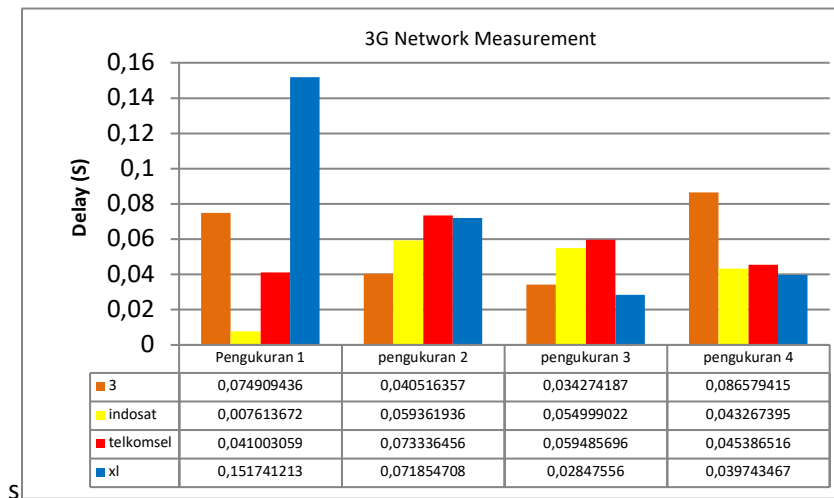

Figure 5. *Comparison Of 4g Operator Delays 3G*

Figure 5: shows the value of Delay measurement results at locations on 3G networks. The highest delay was obtained by 0.1517s on the 1st measurement using XL operator, while the smallest delay value was 0.0076s in the 1st measurement using the Indosat operator.

Table 2. Comparison of 4G Operator Delay 3G

	Delay (s)			
	3	indosat	telkomsel	XL
Average	0.0590	0.0413	0.0548	0.0729

From table 2: can be said that XL operator has the smallest Delay value among other operators when accessing Home Care application. Where in ITU-T REC-G.1010 Delay value for web browsing <10 seconds.
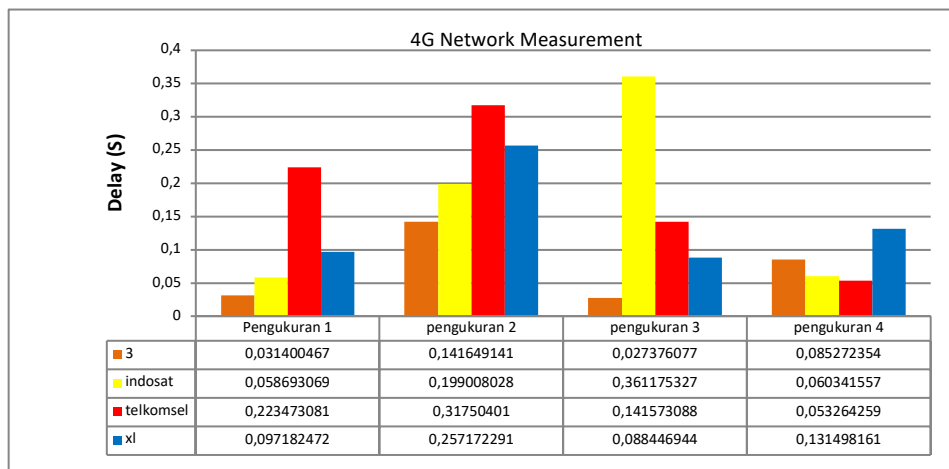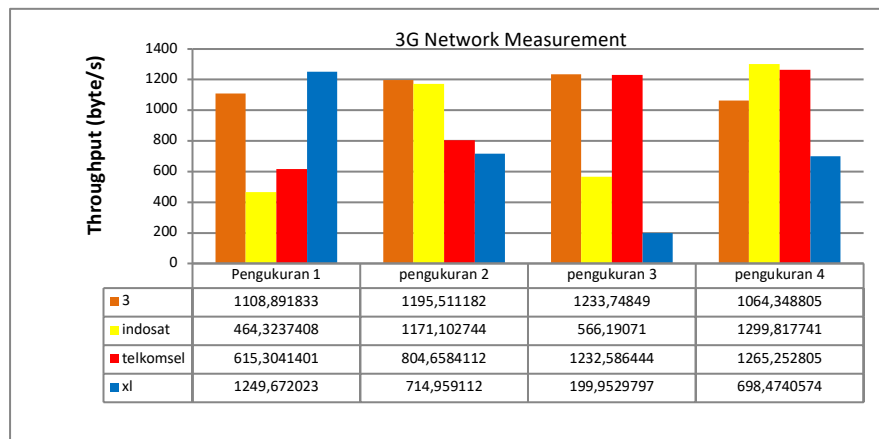

Figure 6. Comparison Of 4G Operator Delays 4G

Figure 7: shows the value of Delay measurement results at the location of the 4G network. The highest delay is obtained by 0.3611s in measurement 1 using indosat operator, while the smallest delay value is 0.0273s in measurement 2 using operator 3.

Table 3. Comparison of 4G Operator Delay 4G

	Delay (s)			
	3	indosat	telkomsel	XL
average	0.0714	0.1698	0.1839	0.1435

From table 3: can be said that operator 3 has the smallest Delay value among other operators when accessing Home Care application. Where in ITU-T REC-G.1010 Delay value for web browsing <10 seconds.

3G Network Measurement	Pengukuran 1	pengukuran 2	pengukuran 3	pengukuran 4
3	1108,891833	1195,511182	1233,74849	1064,348805
indosat	464,3237408	1171,102744	566,19071	1299,817741
telkomsel	615,3041401	804,6584112	1232,586444	1265,252805
xl	1249,672023	714,959112	199,9529797	698,4740574

Figure 7. Comparison of 4G Operator Throughputs 3G

Figure 8 shows the value of Throughput measurement at the location of the grant on the 3G network. The highest throughput was obtained at 1299.817bps on measurement 4 using the Indosat operator, while the smallest Throughput value of 199.952bps on measurement 3 using the XL operator.

Table 3 shows changes in voltage, voltage angle and stability index. System voltage, voltage angle and stability index are influenced by changes in load on the system.

Table 4. Comparison of 4G Operator Throughputs 3G

	Troughput (bps)			
	3	indosat	telkomsel	XL
Average	1150.625	875.358	979.450	715.764

From table Table 4:17 can be obtained throughput value based on the largest measurement results 1150.625bps by operator 3, while the smallest throughput value of 588.68bps by XL operator.
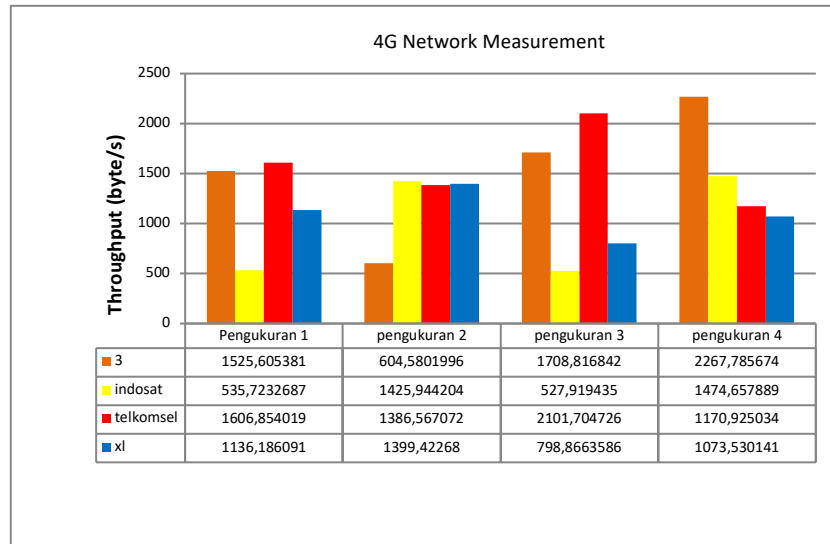
Figure 8. Comparison of 4G Operator Throughputs 4G

Throughput was obtained at 2267.785 bps on measurement 4 using operator 3, while the smallest throughput value of 527,919 bps in measurement 3 using Indosat operator.

Table 5. Comparison of 4G Operator Throughputs 4G

	Delay (s)			
	3	indosat	telkomsel	XL
Rata-Rata	1526.697	991.061	1566.512	1102.001

From table Table 4:17 can be obtained throughput value based on the largest measurement results 1566.512bps by Telkomsel operator, while the smallest throughput value 991.061bps by Indosat operators.

Conclusions and recommendations

Research of the performance of the Home Care Application Network of RSI Jemursari Surabaya, by measuring four times in different places, for each measurement scenario, some conclusions were obtained including: After testing the appearance of the user the homecare service application can function properly. But it still needs further development. In addition Based on the results of measurement on some location obtained the largest delay value on the 3G network using XL operator of 0.1517s and the smallest delay using indosat operator of 0.0076s, while the largest delay 4G network using indosat operator of 0.3611s and the smallest delay using the operator 3 of 0.0273 s. for the throughput value obtained on the largest 3G network using indosat operator of 1299.817bps and the smallest Throughput value using XL operator of 199.952bps. packet loss obtained from the measurement result of 0.00%.

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