

# Mobile Networks for Mobile Learning Tools

*By* Edy Budiman

# Mobile Networks for Mobile Learning Tools

Edy Budiman<sup>1</sup>, Ummul Hairah<sup>1</sup>, Haeruddin<sup>2</sup> and Abbas Saudek<sup>3</sup>

<sup>1</sup>Department of Computer Science and Information Technology, Universitas Mulawarman.

<sup>2</sup>Department of Mathematics Education, Universitas Mulawarman.

<sup>3</sup>School of Informatics and Computer Management Samarinda, Samarinda 75127, Indonesia.

edy.budiman@fkti.unmul.ac.id

**Abstract**—Utilization of mobile learning in teaching brings the benefits of the availability of teaching materials that can be accessed at any time and interesting material visualization, in its implementation, it needs the availability of supporting devices such as network availability, smartphone devices, and mobile learning software. The paper examines the availability of mobile networks and develops mobile learning software. its app is then implemented directly in the teaching, performing measurement and performance testing on the parameters the quality of service metrics internet service providers in locations of research object. The results of measurement and application testing, have given conclusion and contribution, that in the planning and development of a mobile learning should pay attention to the usability factors, i.e. Ease for access applications in networks, ease of use applications, and ease of the understanding of teaching materials. other than that, the amount of data used when access, packaging of teaching materials that is simple, attractive, and interactive. The failure of mobile learning applications during testing is generally due to the problem of network availability, the development of mobile learning app must be adapted to the capabilities of existing network performance.

**Keywords**—quality-of-service; mobile-learning; network; tools; education.

## I. INTRODUCTION

Development of information and communication technology (ICT) has affected the learning system [1-5]. The rapid advancement of technology makes the ICT on education has become a necessity. Implementation of ICT can be one indicator of the progress of the school's success. Other than that, also considered to support educators in delivering learning materials making it easier for learners to receive material that is conveyed. Given this, the educators should "aware" of the technology.

To implement of the learning process with online learning system, certainly needed a network infrastructure and electronic media which will support the use of online learning [6-8]. Learning with the using of electronic media such as computers and based on online learning known as the electronic learning (e-Learning) and has evolved into a system of mobile learning (m-Learning) using the portable media such as mobile phones, smartphones, Tablet PC, iPhone, portable

media devices and other moves that can easily be taken anywhere.

Some of the important capabilities that should be provided by the learning device m-Learning in [9] is the ability to connect to other devices, the ability to present information about learning and the ability to realize the communication between teacher and learner interaction. Learning system using m-Learning in Kalimantan, Indonesia, which is still relatively new makes us to study and learn more about the application of m-Learning system. Related to this issue, the purpose of this study:

- Ensuring network availability, for the application m-Learning with measuring performance quality of service (QoS) the mobile network.
- Development a mobile learning devices (m-Learning), as media tools interaction and communication to support teaching and learning students

## II. RELATED WORK

### A. Architecture System

Generally, the architectural design in the development of mobile learning system as in "Fig. 1", which is divided into three 3 key elements that must be provided, i.e. an availability of network, smartphone devices, and application software.

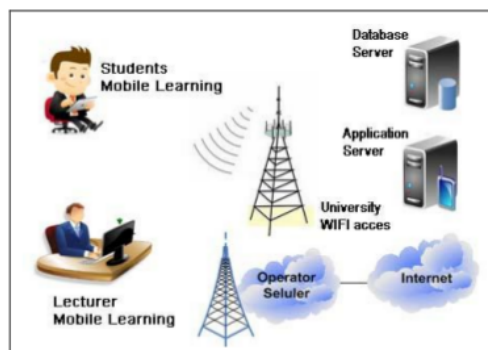


Fig. 1. Network architectures for mobile learning

### 1) An availability of mobile network

One of the research goals is to ensure the availability of the mobile network before implementing the system of mobile learning online. Therefore, the initial stage of the study was the field observation with measuring performance mobile networks to multiple locations as the research object, i.e. a place to stay prospective users of the system, which in this case is a student residence and lecturer.

Refers to the study [10], the architectural design for quality of service measurements mobile network as shown in "Fig. 2", which is divided into three subsystems; mobile client devices, mobile network from internet service provider (ISP), and mobile server.

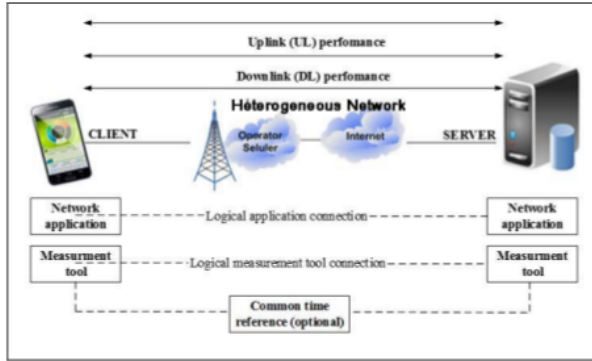


Fig. 2. An architecture for mobile network measurements

a) *Mobile client devices*: mobile connection quality measurement tools using nPerf [11] application and 4Gmark [12], is a tool offering a comprehensive and reliable benchmark of the quality of service for smartphones. It allows to test and compare smartphones, networks or places on every technologies 2G (Edge, Gprs), 3G (UMTS, HSDPA, H+, Dual-carrier), 4G (LTE) and Wifi. both applications supports for iPhone, iPad, Android devices and Windows Phone [12].

b) *Mobile network internet service provider (ISP)*: is a service provider networks that has a data plan that is in the object of research, and is generally used by students and lecturers in the internet connection.

c) *Mobile server*: is the central access subsystem applications, each process a request or response data transmission will be recorded and stored into database server.

### 2) Smartphones Device

Mobile devices, the number of internet users and the network connection to use mobile devices in Indonesia is very large and massive [13-15]. Specifically, for students in University of Mulawarman as potential users, and all students have a smartphone that supports mobile learning system.

### 3) Application Software of Mobile Learning

For the availability of software applications, we design and develop of mobile learning for the data structures course that can support learning students for undergraduate Degree Programs at University of Mulawarman.

### B. Quality of Service (QoS)

According to [16-18] broadband Quality of Service Experience (QOSE) testing standard from LIRNEasia, defines comprehensive set of six performance metrics that should be measured in each experiment, as shown in TABLE I.

TABLE I. METRIC QOSE STANDARD OF LIRNEASIA[16-18]

Metric	Method	Benchmarks
download speed (kbps)	file size 1 megabyte; time	
upload speed (kbps)	mb file	
latency: round trip-time	The average of 10 pings (each ping provides 3 sets of results).	<300 ms
jitter (ms)		<50 ms
packet-Loss (in %)		<3%
availability (in %)	Availability = $(1 - F/T) \times 100\%$ .	>98%

## III. METHODOLOGY

The paper uses approach methodology of Research and Development (R & D) [19], with conduct research on an availability of the mobile network for readiness of implementation mobile learning, and to develop a media that will be used as communication tools between students and lecturer interaction in learning.

### A. Methodology for ensure the network availability

#### 1) Data Sources and Collection Methods

Data source is divided into two, primary and secondary data. Primary data for performance analysis of network availability is a result of measurement quality of service that using mobile network measurement tools, while secondary data is a data packet of internet connection (the card service package featured from ISP), quality of service parameter metric and other references related of research.

The field data collection arranged in 4 session measurement time, i.e. the morning session (07:00 to 11:00), daylight session (12:00 to 15:00), afternoon session (15:00 to 18:00), and the evening session (18:00 to 22:00).

#### 2) Network Availability Testing Methods

According to [16-18] the methodology for broadband QOSE testing is defines a comprehensive set of six performance metrics that should be measured in each experiment, one of which is measuring network availability. In [16-18], explains this measures the number of times we are able to access the Broadband services. If T attempts are made to connect to the Internet, and if F attempts fail, then  $Availability = (1 - F/T) \times 100\%$ .

The mobile learning app contains multimedia teaching materials, presenting and combining various applications such as text, sound, images, animation, audio, video, and etc. Therefore, sufficient networking is required to implement the application. The metric, parameter quality of service, and measurement object presented in TABLE II.

TABLE II. APPLICATION QOS METRICS

Metric	Parameter quality of service and measurement object					
Browsing test	Time (s)	Weight (kb)	Website: visualgo.net	Performance rate (PR) (%)	Availability (%)	Reference module
Streaming test	Location	Resolution: 240p 360p	Initial loading (s)	Performance rate (PR) (%)	Data used (kb)	Visual module
Speed test	Download (kbps)	Upload (kbps)	Latency (ms)	Jitter (ms)	Packet loss (%)	App

B. Methodology for Mobile Learning Application

1. Data Structures Course

Data structures is an important subject for 2nd-year students in dept. of ICT University of Mulawarman, but it is difficult to work with them due to their abstract nature [20], the failure to learn [21], and understand this course lead to significantly lower student learning outcomes at the final semester [22]. The best way to understand complex data structures-algorithm is to see them in action [23]. Therefore, interactive mobile learning tools are created to make data structures learning easy and interesting, and teaching materials in mobile learning app provides visualization materials for data structures course in accordance with curricula-syllabus and course learning outcomes.

2. Software Analysis and Design

Analysis and design software for development of mobile learning system using object-oriented Unified Modeling Language (UML) [24]. Furthermore, the use case diagram design presented in “Fig. 3” for lecturer and “Fig. 4” for students.

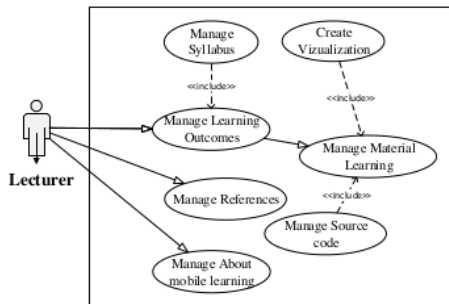


Fig. 3. Use case diagram for lecturer

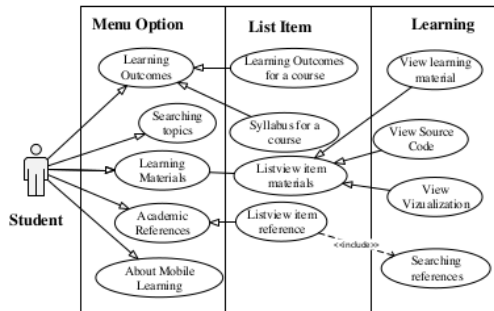


Fig. 4. Use case diagram for students

3. Framework for Mobile Learning System

In general, the framework architectural design and teaching materials to be presented in the mobile learning applications are shown in “Fig. 5”. The teaching materials will be presented visually in the form of text, images, and moving animations.

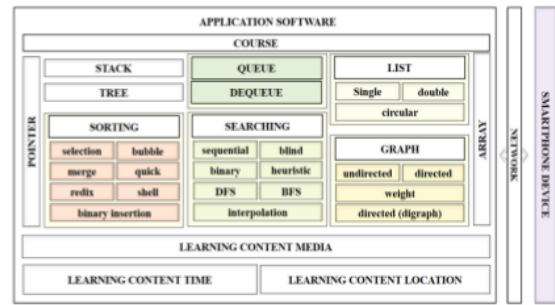


Fig. 5. Framework architectural design for mobile learning app

IV. RESULT AND DISCUSSION

A. Result

1) Testing Session and Measurement

The Measurement Approach is testing from the user experience side to some point where potential users are located. Data clustering is divided into six location of measurement points, with different time sessions; morning, daylight, afternoon, and evening. In each time session, the measurement process is done as much as 10 times test for each the card service packs from ISP. We using data service packs from ISP A and ISP B alternately in one session. The measurement process is carried out continuously for 21 days (three weeks), this is done to ensure the availability of mobile networks in the location.

TABLE III. NETWORK PERFORMANCE QOSE FOR ISP A

Location	Speed (kbps)		Sensitivity to			Availability (%)
	Download	Upload	Latency (ms)	Jitter	Packet-loss (%)	
L1	2958	622	69	23,3	0,13	92,86
L2	1270	1032	106	33,7	1,48	72,86
L3	2581	1045	70	58,02	1,02	87,14
L4	1490	1035	108	32,11	1,17	77,14
L5	2960	1628	88	23,82	0,84	88,57
L6	2584	1047	94	18,29	1,33	85,71

Based on the measurement results presented in TABEL III and TABLE IV, it is explained that for the parameter values of network service quality metrics generally have been in accordance with existing benchmarks, except on the network availability level metric that must be with a benchmark >98%, this has not reached the standard presented in TABLE I, is still below average, and only 87.025% (9/70), or the internet connection failure rate is 9 times out of 70 attempts to internet connection.



TABLE IV. NETWORK PERFORMANCE QOSE FOR ISP B

Location	Speed (kbps)		Sensitivity to			Availability (%)
	Download	Upload	Latency (ms)	Jitter	Packet-loss (%)	
L1	3060	866	269	44,03	1,1	81,43
L2	2849	3100	109	15,67	2,4	78,57
L3	1490	743	243	43,22	1,8	75,71
L4	3052	862	130	12,81	3,1	94,29
L5	2844	3095	119	14	0,9	84,29
L6	1482	3052	318	27,56	4,4	71,43

The frequent occurrence of failures in the internet connection in the measurement location is influenced by the geographical condition of the region in Kalimantan. The number of trees, tall, and bushy. In addition, the current network density of internet access at the measurement site is an area of education which of course the users are very much.

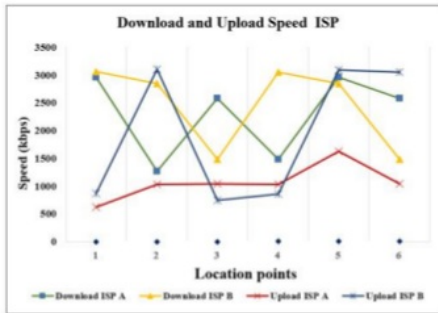


Fig. 6. Download and upload speeds of ISP data packet

In "Fig. 6", is the average graph of the download and upload speeds of data packets from each internet service provider at each point of measurement locations.

2) Development of Mobile Learning App

Implementation is the realization of an application, In the implementation phase, the application of mobile learning data structures course is run to see how the system was built and worked in practice.

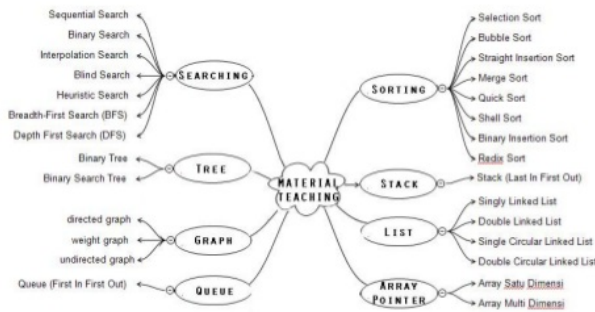


Fig. 7. Mind-map diagram material teaching of data structures course

The mobile learning app which can be installed on Android system was one of the ultimate production of this study. It is conceived as a learning system with a base on mobile android, utilizing smartphone a student's for learning, and organizing the students' learning process anytime and anywhere. In general, hierarchical information about the content of the material teaching on the mobile learning can be seen in the mind map diagram in "Fig. 7".

The main material contained in the teaching module of mobile learning app includes the material subjects of arrays, pointer, list, stack, queue, tree, sort, search, and graphs. This material is packed in the form of text, images, and animation visually, each teaching material described its presentation in 3 menus, i.e. theory menu, code samples and visualizations of code, it's can be setting of values based on input. Some menu user interface displays from the mobile learning application shown in "Fig. 8".



Fig. 8. Screenshots interfaces for teaching materials of data structures course

3) Measurement of Network Capabilities in Testing Mobile Learning App

Testing and measurement of mobile learning applications are used directly in the learning of the 2nd-year students of Information and Communication Technology University of Mulawarman. The location point of the test is done randomly in six districts where mobile learning application users live. To ensure the mobile learning system works well, the test is done on the content of teaching materials divided into 3 test sessions, i.e. browser testing, streaming test, and application speed test.



Fig. 9. Screenshots the references module for browser test app

a) *Browsing test*: Browser testing is done on the reference menu, this menu has been linked in some online sources, and can perform other material searches in various reference sources on the internet online. "Fig. 9" is a reference module used as an example to test the browsing capabilities of a mobile learning application.

Based on the results of testing browsing sub menu search reference online teaching, with a test on the sample site: [visualgo.net/](http://visualgo.net/), and [google.co.id](http://google.co.id), obtained the average value of measurement results as presented in TABLE V.

TABLE V. BROWSING TEST FOR SUB-MENU REFERENCES

Location	Google			Availability (%)	Visualgo.net			Availability (%)
	Time (s)	Weight (kb)	PR (%)		Time (s)	Weight (kb)	PR (%)	
L1	3,21	592	83,75	100	7,64	1053	67,94	90
L2	7,71	645	74,35	100	5,47	1328	70,25	80
L3	5,01	700	93,75	80	8,47	1978	68,86	80
L4	2,98	329	89,92	100	7,39	1115	73,12	90
L5	3,66	127	72,97	90	3,11	1331	63,44	80
L6	4,23	163	90,68	100	6,57	1965	74,96	90

The browsing test on sub menu reference is done repeatedly 10 times, and the frequency of failure to connect an average of 85% or about 1-2 time out in each session.

b) *Streaming test*: Mobile learning app built containing sub-material that is visualized in animated moves. For that test is done based on 2 categories of quality visual resolution, i.e. resolution 240p and 360p. In "Fig. 10" is a menu app visual animated code and measured the value of performance rate (PR), initial loading and the amount of data packets used.

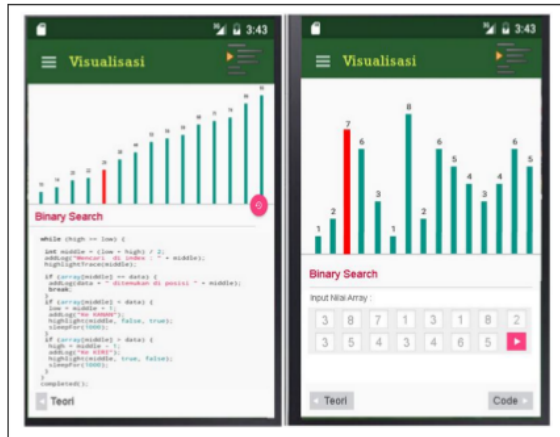


Fig. 10. Screenshots the visualization module for streaming test ap

In TABLE VI is the result of measurement of network capabilities in the implementation of mobile learning applications for sub-menu material visual running code.

TABLE VI. STREAMING TEST FOR SUB-MENU VISUALIZATION

Location	240p			360p		
	PR (%)	Initial loading (s)	Data used (kb)	PR (%)	Initial loading (s)	Data used (kb)
L1	81,70	2,297	3610	83,40	2,116	6586
L2	78,50	1,355	3790	60,90	3,403	5625
L3	69,90	2,337	3016	58,88	4,095	5554
L4	77,80	1,705	5623	62,70	2,516	6012
L5	83,62	3,022	3660	75,40	5,466	6620
L6	93,93	3,287	2784	88,20	6,012	6959

c) *Speed test app*: Speed testing for application performance with metric quality of service parameters, measurement results on TABLE VII.

TABLE VII. SPEED TEST FOR SUB-MENU VISUALIZATION

Location	Download (Mb/s)		Upload (Mb/s)		Latency (ms)		Jitter (ms)	Packet-loss (%)
	Max	Avg	Max	Avg	max	min		
L1	1,5	0,65	0,54	0,47	214	178	275	1,78
L2	5,01	4,49	1,13	0,39	280	139	126	0,27
L3	3,8	3,13	1,84	1,57	227	112	201	0,63
L4	4,11	3,57	0,61	0,24	205	101	167	0,22
L5	7,26	6,34	0,71	0,32	477	256	328	2,4
L6	4,66	2,28	1,29	0,89	172	102	92	0

### B. Discussions

Difficulties of students in learn of data structures course have encouraged teachers to develop a learning tool that utilizes a smartphone device owned by students to become a media for teaching, a mobile learning media that can be used as a means of presenting lecture materials outside the classroom that can be used anytime and anywhere.

The implementation of online mobile learning requires resources capabilities and the availability of mobile networks from the Internet Service Provider is sufficient, and for that we do the measurement and testing of existing network performances.

Based on the results of measurements at 6 points of research location obtained of performance rate that is in accordance with standard parameters broadband QOS LIRNEasia, but, for performance rate of network availability still less than benchmark value that is >98%, only 87.025%, (9/70) 9 times a failure from of 70 times the total internet connection effort made. The failure of internet connection caused by geographical location of Samarinda City which is at altitude 7-25 m, problem of network traffic density, the number of trees around the location also affect the failure of connection to internet.

Improvement and development of further mobile learning applications is still needed for optimization of connections to

the Internet network, Various methods and technology approaches in the study were conducted [25-28] can be a reference. In the mobile learning that we have developed, efforts and approaches to reduce the extent of connection failure rate, will be improved by using Domain Name Server Dynamic (DDNS). Provide settings for alternative DNS selection in order to use or utilize DNS servers from other ISPs mobile operators.

### 3 V. CONCLUSIONS

From the teaching work in these years, we deeply feel that the data structures course is so important for students in the study of computer science and technology. How to turn this course from a difficult and boring course into an interesting course is Becomes an urgent an issue. The Student teaching experience from previous years into an evaluation that this year is much better. This paper has discussed how the implementation of a mobile learning system in the data structures course, various methods and technology approaches used in its development, including measuring and testing network availability.

Based on measurement and implementation of mobile learning application then:

- 1) Planning and development of mobile learning should pay attention to factors:
  - a) Usability, Ease for access applications in networks, ease of use applications, and ease of the understanding of teaching materials. These three things greatly affect the success of mobile learning.
  - b) Efficiency, the amount of data used to access app and packaging of materials teaching that attractive and interactive
- 2) The failure of mobile learning applications during testing is generally due to the problem of network availability, the development of mobile learning app must be adapted to the capabilities of existing network performance.

### 9 REFERENCES

- [1] M. Pérez-Sanagustín, M. Nussbaum, I. Hilliger, C. Alario-Hoyos, R. S. Heller, P. Twining, C.C. Tsai CC, "Research on ICT in K-12 schools-A review of experimental and survey-based studies in computers & education 2011 to 2015," *Computers & Education*, 104(C):A1-5, Jan 2017.
- [2] G. Biesta, "ICT and Education Beyond Learning," in *Digital Expectations and Experiences in Education*, pp. 29-43, SensePublishers, 2016.
- [3] T. Mantoro, E. M. Fitri, W. Usino, "The Impact of Information and Communication Technology (ICT) Toward Learning Process and Students' Attitudes," *Advanced Science Letters*, vol. 23(2), pp.844-7, Feb 2017.
- [4] A. Salim, Impact of Higher Learning Institutions Expansion on the Adequacy of Network Infrastructure in Developing Countries: A Case of ICT Planning at the University of Dodoma, Doctoral dissertation, The Open University of Tanzania, 2016.
- [5] M. Turner-Cmunchal, and S. Aitken, "ICT as a Tool for Supporting Inclusive Learning Opportunities. In *Implementing Inclusive Education: Issues in Bridging the Policy-Practice Gap*, pp. 159-180, Emerald Group Publishing Limited, 2016.
- [6] F. Alturise, P.R. Calder, B. Wilkinson, "A comparison of ICT infrastructure in Saudi Arabian and Gulf states universities," in *SAI Computing Conference (SAI) 2016*, pp. 764-769, IEEE, Jul 2016
- [7] S.S. Ovelere, J. Suhonen, E. Sutinen, "M-Learning: A new paradigm of learning ICT in Nigeria," *iJIM*, vol 10(1), pp. 35-44, Jan 2016.
- [8] J. Gil-Flores, J. Rodríguez-Santero, and J.J. Torres-Gordillo, "Factors that explain the use of ICT in secondary-education classrooms: The role of teacher characteristics and school infrastructure," *Computers in Human Behavior*, vol. 68, 2017, pp.441-449.
- [9] S. Baccari, F. Mendes, C. Nicolle, J. Soualah-Alila, M. Neji, Comparative Study of the Mobile Learning Architectures. In: Vincenti G., Bucciero A., Helfert M., Glowatz M. (eds) *E-Learning, E-Education, and Online Training. Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering*, vol 180. Springer, Cham, 2017.
- [10] E. Budiman and O. Jacksonso, "Measuring quality of service for mobile internet services," *2016 2nd International Conference on Science in Information Technology (ICSITech)*, Balikpapan, 2016, pp. 300-305. doi: 10.1109/ICSITech.2016.7852652
- [11] <https://www.nperf.com/en/nperf-applications/>
- [12] <http://www.mark.com/the-software>
- [13] S. Kemp, 2017 *Digital Yearbook: Internet, Social Media, And Mobile Data For 239 Countries Around The World*, Report: Hootsuite and We Social, 2017.
- [14] ATSI, *Summary Report: Building a Digital Indonesia a Snapshot of the Indonesian Telecommunication Industry 2015*, ATSI, Jakarta, 2016
- [15] P. Marius and S. Anggoro, *Profil Pengguna Internet Indonesia 2014*, APJII, Jakarta, 2015.
- [16] LIRNEasia, *Broadband Quality of Service Experience (QoSE) Indicators*, Annually in March 2014. URL: <http://lirneasia.net/>
- [17] LIRNEasia, *Methodology: Fixed Broadband Quality Of Service (QoS) Testing*, Annually in March 2014. URL: <http://lirneasia.net/>
- [18] T. J. Research, *Standar Kualitas Layanan Data Pada Jaringan Bergerak (Mobile Data)*, BadanLitbang SDM, KEMKOMINFO, 2016.
- [19] J. J. Randolph, "Multidisciplinary methods in educational technology research and development," *HAMK Press/Justus Randolph*, Aug, 2007.
- [20] L. Alzubaidi, and A. El Hassan, "Data Structures Learning-A Visually Assisted Approach. In *Proceedings of the International Conference on Computer Graphics and Virtual Reality (CGVR)*," Jan 2013, p. 37.
- [21] J. A. Crowe, T. Silva, and R. Ceresola, "The Effect of Peer Review on Student Learning Outcomes in a Research Methods Course", *Teaching Sociology*, vol. 43(3), 2015, pp. 201-213.
- [22] ICT, *Evaluation of Odd Semester Learning of Academic Year 2015/2016 Student of ICT Programs of Mulawarman University*, Semester Report, ICT CSIT UNMUL, 2016.
- [23] K. Musumbu, "Algorithms Visualization Tool for Students and Lectures in Computer Science," *arXiv preprint arXiv:1403.4423*, 2014.
- [24] A. Dennis, B. H. Wixom, and D. Tegarden, "Systems analysis and design: An object-oriented approach with UML," *John Wiley & Sons*, Mar 2015.
- [25] S. Peng, J.O. Fajardo, P. S. Khodashenas, B. Blanco, F. Liberal, C. Ruiz, C. Turagyenda, M. Wilson, and S. Vadgama, "QoE-Oriented Mobile Edge Service Management Leveraging SDN and NFV," in *Mobile Information Systems*, 2017.
- [26] A. Boukerche, A. Magnano, and N. Aljeri, "Mobile IP Handover in Vehicular Networks: Methods, Models, and Classifications," *ACM Computing Surveys (CSUR)*, 49(4), 2017, p.73.
- [27] M. F. Tuysuz, and M. Ucan, "Energy-aware network/interface selection and handover application for android-based mobile devices," *Computer Networks*, 113, 2017, pp.17-28.
- [28] H. Liu, F. Eldarrat, H. Alqahtani, A. Reznik, X. de Foy, and Y. Zhang, "Mobile Edge Cloud System: Architectures, Challenges, and Approaches," *IEEE Systems Journal*, 2017.



# Mobile Networks for Mobile Learning Learning Tools

---

## ORIGINALITY REPORT

---

8%

### SIMILARITY INDEX

---

#### PRIMARY SOURCES

---

1	<a href="http://lirneasia.net">lirneasia.net</a> Internet	72 words — 2%
2	Edy Budiman, Oki Wicaksono. "Measuring quality of service for mobile internet services", 2016 2nd International Conference on Science in Information Technology (ICSITech), 2016 Crossref	48 words — 1%
3	Zhi Liu. "Research on the Teaching Method of Combining the Theory and Practice in Data Structure Course", 2008 The 9th International Conference for Young Computer Scientists, 11/2008 Crossref	42 words — 1%
4	<a href="http://mobilehere.net">mobilehere.net</a> Internet	40 words — 1%
5	<a href="http://girtel.upct.es">girtel.upct.es</a> Internet	23 words — 1%
6	<a href="http://wap.rdg.ac.uk">wap.rdg.ac.uk</a> Internet	22 words — 1%
7	<a href="http://www.slideshare.net">www.slideshare.net</a> Internet	15 words — < 1%
8	<a href="http://cs.joensuu.fi">cs.joensuu.fi</a> Internet	15 words — < 1%
9	<a href="http://dblp.dagstuhl.de">dblp.dagstuhl.de</a> Internet	14 words — < 1%



10	<a href="http://icsitech.org">icsitech.org</a> Internet	11 words — < 1%
11	<a href="http://scholar.lib.vt.edu">scholar.lib.vt.edu</a> Internet	10 words — < 1%
12	<a href="http://www.european-agency.org">www.european-agency.org</a> Internet	10 words — < 1%
13	Pramana Yhoga Chandra Kusuma, Surya Sumpeno, Adhi Dharma Wibawa. "Social media analysis of BPS data availability in economics using decision tree method", 2016 1st International Conference on Information Technology, Information Systems and Electrical Engineering (ICITISEE), 2016 Crossref	9 words — < 1%
14	<a href="http://edepot.wur.nl">edepot.wur.nl</a> Internet	8 words — < 1%
15	<a href="http://www.et.iitb.ac.in">www.et.iitb.ac.in</a> Internet	7 words — < 1%
16	<a href="http://www.academicjournals.org">www.academicjournals.org</a> Internet	7 words — < 1%
17	<a href="http://portal.acm.org">portal.acm.org</a> Internet	4 words — < 1%

EXCLUDE QUOTES    ON  
EXCLUDE            OFF  
BIBLIOGRAPHY

EXCLUDE MATCHES    OFF