

Utilization of Cloud Computing Service for Smart City Development of Medan City

Muryanto Amin¹, Muhammad Anggia Muchtar², Ikhsan Siregar³, Tigor Hamonangan Nasution⁴

¹Faculty of Social Science and Political Science, Universitas Sumatera Utara, Medan, Indonesia

²Department of Information Technology, Universitas Sumatera Utara, Medan, Indonesia

³Department of Industrial Engineering, Universitas Sumatera Utara, Medan, Indonesia

⁴Department of Electrical Engineering, Universitas Sumatera Utara, Medan, Indonesia

Abstract. The existence of technology, especially information technology is growing up rapidly currently. Medan City government at this time have to utilize advances information technology to process, manage, distribute and information distribute and public services. Thus, the development of Smart City is needed, where the concept aims to accommodate and improve the quality of public services. In this study was done planning of smart city development Medan city by utilizing Cloud Computing Service technology. By the main priority of realizing the population with proper health and educated, any aspects of Smart City equipped with security server or centralized security system. Cloud Computing Service Design for Medan Smart City Development is designed for next 3, it is the most considering method to be applied. Thus, three agencies were taken of direct contact by the community and the most experiencing obstacles in the field. The result of this work is a Masterplan Smart City design Medan city for the development of the next five years.

1 Introduction

The existence of technology, especially information technology is growing up rapidly currently. Information Technology is a technology used to process data, including processing, obtaining, compiling, storing, manipulating data in various ways to produce quality information, i.e. relevant, accurate and timely information, used for personal, business, and governance and is a strategic information to decision-making [1]. This technology uses a set of computers to process data, network systems to connect one computer with another computer based on need, and telecommunication technology is used for data to spread and access globally.

Medan City government at this time have to utilize advances information technology to process, manage, distribute and information distribute and public services. Thus, the development of Smart City is needed, where the concept aims to accommodate and improve the quality of public services. In this study was done planning of smart city development Medan city by utilizing Cloud Computing Service technology. The use of Cloud Service can be utilized for the development of Information Systems in various fields [2]–[4].

In previous research there are studies that discuss the concept of smart city that connects aspects between technology, human and institutions[5]. In addition there are also studies that provide reference for smart city development in planning and conceptualization of smart

city innovation[6]. This research also takes reference research about big data relation and smart urbanism in building smart city[7], [8]. In addition, this research is also conducted based on previous research on the use of cloud technology that supports the development of smart city[9]–[11]. This study was conducted based on several previous studies. Besides, special study also conducted at Medan government by conducting Forum Group Discussion (FG).

2 Method

2.1 Strategic issue

Strategic issue of Medan City is grouped into three sections: social, economic, and physical. From the three sections above, it can be concluded (in Fig. 1) that the main strategic issue in Medan City is the decrease of coordination between SKPD (Local Government Units) and related parties, and the necessity for development in various sectors. The development covers all areas, such as education, health, culture, the environment, and etc.

The large number of development towards the resolution of strategic issue, requires a comprehensive and comprehensive urban development solution. The concept of 'Smart City' city considers able to answer the challenge of developments towards strategic issue solution currently in Medan city currently happening.

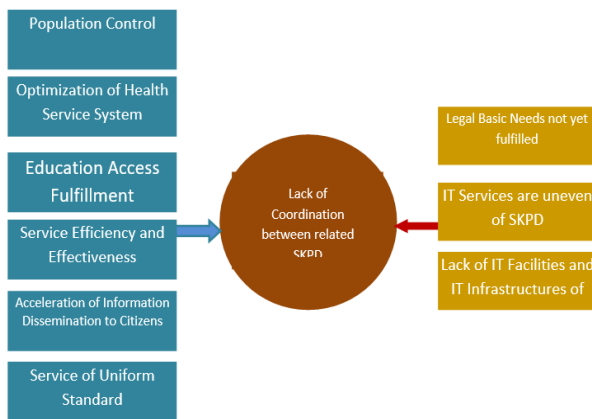


Figure 1. Strategic issue of smart city needs Medan City.

2.2 Foundation of Medan smart city

The concept of a smart city includes a digital city and wireless city, illustrating an integrated management of information that can create added value by applying advanced technology to search, access, transfer, and process information. The term intelligent here refers more to the quality of the infrastructure. In this model, each service and process of relationship between the public and the public or private sectors is done separately or individually and some are still done face-to-face or visits to the institution where the service is provided. There is no relationship or integration of information or services between sectors, as well as the provision of services in government carried out by their respective work units. This of course will make the service process less efficient and effective, because to get one service, the community must go to some service institutions. The city government will also have difficulty in controlling the transaction process that occurs between the community and the business community or other communities.

The concept and framework of Medan Smart City development plans can be seen in Fig. 2. By the main priority of realizing the population with proper health and educated, any aspects of Smart City equipped with security server or centralized security system.



Figure 2. Concept of Medan Smart City.

Based on the Fig. 2, Smart City development needs to pay attention of application infrastructure; human resources; network infrastructure; information infrastructure, network integration, information and applications; funding; organizational structure, management system and work process; maintenance; regulation, stages of e-Government development, development stages, infrastructure, stages of e-Government implementation, stages of development and / or development of support systems; and change management.

Various Smart City applications (Smart Economy, Smart People, Smart Living and Smart Disaster Management) build and / or developed must be Sensible, Connectable, Ubiquitous, Sociable, Shareable, and Visible / Augmented. Sensible provides applications capable of performing sensors, e.g. via WSN; Connectable develops applications with sensors connects to various applications and users over a computer network; Ubiquitous build applications can be accessed anytime and anywhere based on mobile; Sociable presents applications connected to each other, e.g. social media based applications and social networks; Shareable shows that apps can share information to social networks; and Visible / Augmented illustrates that the information presented by applications is physically accessible, e.g. augmented reality.

Smart city infrastructure must fulfill of Service Level Agreement (SLA) on network management aspects including network availability, back-up system/redundancy system, disaster recovery system, network security device, and network reliability assurance.

The information presented by various Smart City applications requires privacy / confidentiality, integrity, authentication, availability, non-repudiation, and access / access rights (access control). In that case, safeguarding of information security is required through security procedures; network security (e.g. using firewall, intrusion detection system, anti-virus, or virtual private network; access security (e.g. using a password); authentication of data transmission (e.g. using encryption, certification of authority, and public key infrastructure); documents secured; and room safeguards.

2.3 Cloud computing service topology of Medan smart city

The development of e-government, basically the policy integration of applications and databases means establishing functional interconnection according to the main tasks and functions of work unit. The database generated by single unit will affect the database of other work units. Similarly, the information generated by local government units, should be the data for e-government applications operated by other government units. To integrate the entire system, Cloud Computing Service design topology is designed as shown in Fig. 3. It shows Cloud Computing Service is done by designing API (Application Programming Interface) means data exchange among SKPD in internet network.

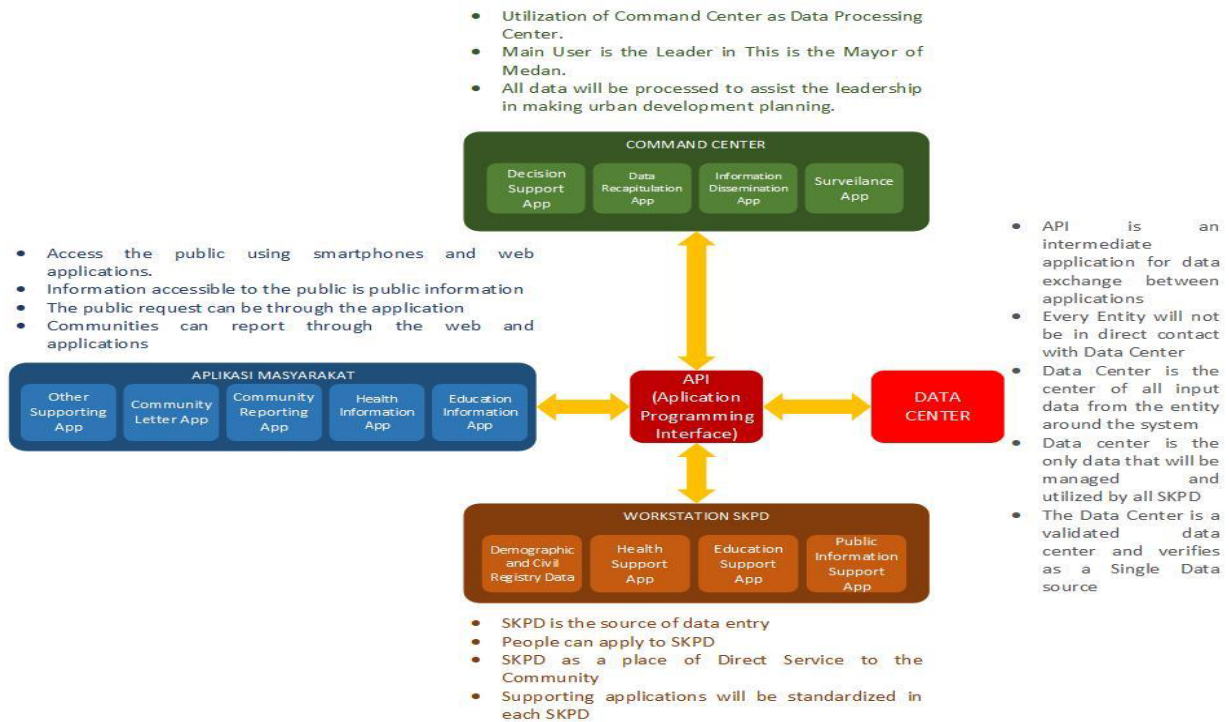


Figure 3. Cloud computing service topology of Medan smart city.

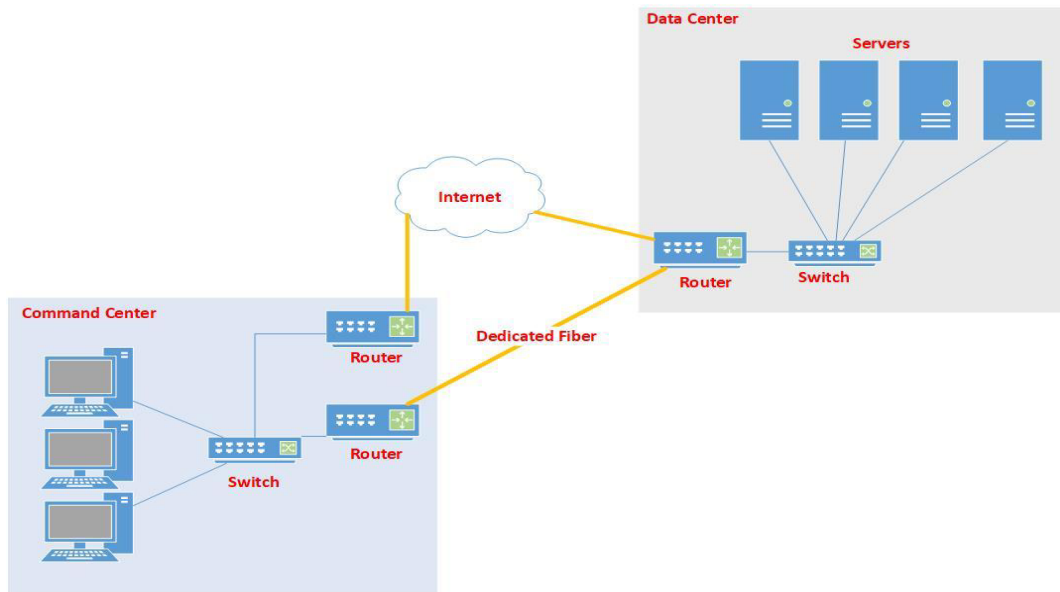


Figure 4. Data Center infrastructure.

2.4 Data center development

Data Center or NOC (Network Operation Center) is the place to consolidate (centralize) the server's application Web server, communication equipment, security system, system administrator, support personnel, and the others or human resources to provides various data services. Data Center have roles to management centralization, support provider, backup systems, power management, security systems, and etc. [12]. Data Center can be placed in a special space designed or building. Special equipment usually installs to overcome power supply failures or

power sources, natural disasters, and various security disturbances. Data center infrastructure of Medan Smart City shown in Fig. 4.

To build a good Data Center, it is necessary to arrange concept of designing good facilities. Some Data Center facilities require;

- Physical security needs
- Cooling problem or environment factors
- Availability of power source
- Floor planning to overcome loading problem
- Fire detection/suppression
- Growth/floor planning

The Data Center is designed with a power source supplied by two different electrical power feeds, several generators (generators), UPS (Un interrupt Power Supply) and heating, ventilation and air conditioning units (HVAC: Heating, Ventilation, Air Conditioning), which has a backup or redundant, double pipe system for fire extinguishers, iris scans, laser grids or human traps, facial recognition devices, and other advanced technologies or procedures that may be implemented. To carry out the mission-critical of an organization then the construction of the Data Center should pay attention to operating costs, business strategies and effective methods.

3 Result and Discussions

Cloud Computing Service Design for Medan Smart City Development is designed for next 3, it is the most considering method to be applied. Because it is impossible to implement all existing services in an integrated in a short time. Then it is having realistic stages. Thus, three agencies were taken of direct contact by the community and the most experiencing obstacles in the field. Besides that, we need a solution to create comfortable in public services received by citizens.

Smart City model using an approach with the concept of citizen centric utilizes Cloud Service in providing services to the citizens. Each member of service providers group from both public and private sectors connected and integrated. The main purpose of this service providers group is to provide services to citizens more easily, quickly, effectively, efficiently and accountably and 24 hours accessible. This thing involves a closer interaction between the citizens and the service provider- purer, more personal, two-way process and stronger recognition and responses to the interdependence of different services. This model also encourages active participation and participation of citizens in the development of services in particular and the process of urban management generally

4 Conclusion

Realizing of Medan Smart City requires Cloud Service development to cover all areas both in terms of service and work patterns. Cloud Service development should have planned well to capture integrated and standardized systems. Cloud Computing Service design for Development Medan Smart City designed for next 3 years, it is considering to be the most realistic applied. Because it is impossible to implement all integrated existing services in a short time. Then it is having realistic stages. Thus, three agencies were taken of direct contact by the community and the most experiencing obstacles in the field. Besides that, we need a solution to create comfortable in public services received by citizens. The result of this work is a Masterplan Smart City design Medan city for the development of the next five years.

The next work is to undertake long-term planning for smart city development in Medan. Long term planning will cover all SKPD existing in Medan city so that the

concept of smart city in Medan City will have an impact in all aspects of community life of Medan city.

References

1. W. Is, H. Telematics, W. I. S. E-health, and W. I. S. Telemedicine, "Information Technology," *Educ. Train.*, vol. 9, no. 2, pp. 1–2, (2003).
2. W.-T. Tsai, X. Sun, and J. Balasooriya, "Service-Oriented Cloud Computing Architecture," in *2010 Seventh International Conference on Information Technology: New Generations*, pp. 684–689, (2010)
3. Cloud Strategy Partners, "Cloud Service and Deployment Models," *IEEE Educ. Act. IEEE Cloud Comput.*, pp. 1–15, (2016).
4. F. Fahmi, T. H. Nasution, and Anggreiny, "Smart cloud system with image processing server in diagnosing brain diseases dedicated for hospitals with limited resources," *Technol. Heal. Care*, vol. 25, no. 3, (2017).
5. T. Nam and T. A. Pardo, "Conceptualizing smart city with dimensions of technology, people, and institutions," in *Proceedings of the 12th Annual International Digital Government Research Conference on Digital Government Innovation in Challenging Times - dg.o '11*, p. 282, (2011).
6. S. Zygiaris, "Smart City Reference Model: Assisting Planners to Conceptualize the Building of Smart City Innovation Ecosystems," *J. Knowl. Econ.*, vol. 4, no. 2, pp. 217–231, (2013).
7. R. Kitchin, "The real-time city? Big data and smart urbanism," *GeoJournal*, vol. 79, no. 1, pp. 1–14, (2014).
8. A. Enayet, M. A. Razzaque, M. M. Hassan, A. Alamri, and G. Fortino, "A Mobility-Aware Optimal Resource Allocation Architecture for Big Data Task Execution on Mobile Cloud in Smart Cities," *IEEE Commun. Mag.*, vol. 56, no. 2, pp. 110–117, (2018).
9. T. Clohessy, T. Acton, and L. Morgan, "Smart City as a Service (SCaaS): A Future Roadmap for E-Government Smart City Cloud Computing Initiatives," in *2014 IEEE/ACM 7th International Conference on Utility and Cloud Computing*, pp. 836–841, (2014).
10. N. K. Beigi, B. Partov, and S. Farokhi, "Real-time cloud robotics in practical smart city applications," in *2017 IEEE 28th Annual International Symposium on Personal, Indoor, and Mobile Radio Communications (PIMRC)*, pp. 1–5, (2017)
11. S. S. Samant, M. B. Chhetri, Q. B. Vo, R. Kowalczyk, and S. Nepal, "Towards Quality-Assured Data Delivery in Cloud-Based IoT Platforms for Smart Cities," in *2017 IEEE 3rd International Conference on Collaboration and Internet Computing (CIC)*, pp. 291–298, (2017)
12. W. Xia, P. Zhao, Y. Wen, and H. Xie, "A Survey on Data Center Networking (DCN): Infrastructure and Operations," *IEEE Commun. Surv. Tutorials*, vol. 19, no. 1, pp. 640–656, (2017).