

Implementation on Indonesian property real estate industry based on service oriented architecture

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Abstract: This study focuses on the implementation of business property in real estate market. This is due to inability of the current technology to support the property products. Some people feel uncomfortable to buy houses from the online market. Buyers need to be very careful to deal with the sellers as the houses price is considered quite expensive. On the other hand, improving real estate market is still a challenge. This business still needs a physical representation, although it can be sold from the online market. In this paper, we propose the Service Oriented Architecture (SOA) system of virtual reality and drone. We use drone to help scanning the property units and then make 3D models with visual mapping so it can be run in a virtual reality environment, video 360. In real estate, business process can be developed in various ways. Our proposed SOA in this study can be used to integrate all of them.

1. Introduction

The use of internet nowadays has increased and has been very important to support daily activities. The activities which involve the internet technology become a major aspect in our life such as browsing, chatting, online gaming, internet banking, social media, online shopping, video call, commerce business and the operational work of organizations and companies. APJII (Asosiasi Penyelenggaraan Jasa Internet Indonesia) released survey of the internet usage in 2017. It shows that the penetration of internet user based on the city/district in urban area is 72,41%. From this percentage, the proportions of rural urban is 49,49% and rural is 48,25% [1]. In 2017, 84 million people were accessing the internet in Indonesia. This figure is projected to grow to 150 million in 2023. This makes Indonesia becomes one of the biggest online markets worldwide [2]. The development of online market today encourages many businesses to develop their business through online media. Real estate is one of business sectors which have very big market. By using an online system, the buyers are allowed to find and choose their dream houses easily. Construction companies and real estate agents had started building a website, to attract potential customers through the function of online services [3]. E-business is a term that becomes very important nowadays in the

business management. E-business refers to, among other things, sending documents, exchanging data between a producer, distributor and trade partner, winning new customers, conquering markets, and holding teleconferences [4]. The real estate industry has also followed the trend in information technology by adopting e-business. They collaborate with third parties to develop new products and services to meet customer satisfaction. There are four types of real-estate internet business models i.e. diversification, web-advertising, brokerage, and virtual value-chain. It is also possible to create hybrid internet business models [5].

2. Literature Review

Service-oriented architecture (SOA) made its debut in the early 2000s as a new architecture pattern. In this pattern, software components are encapsulated as individual services (or Web APIs), and invoked from the network through standard Web protocols such as HTTP [6]. SOA is a popular solution to address the difficulties associated with tightly coupled systems. It is based on architecture of non-interdependent systems and the service that each system provides to the overall media enterprise [6]. The fundamental functionality of the service takes precedence over the standards that a system supports. Any discrete functionality in a media enterprise has the opportunity to be service-enabled in an SOA [6]. Web Services enable businesses to take advantage of connectivity and transaction processing to create loosely coupled system integration, it supports the diversification of commercial relations and transaction processing, and it can put a different cross-regional commercial relation between enterprises and linking them to deal with the needs of business [4].

3. Research Method

Data collection used in this study includes document collection, interview and observation. We process data using qualitative analysis. The study in some of document literature that related with the topics has also been performed. After that, we propose an SOA system architecture for industrial real estate in Indonesian property. We adopt some related SOA system architecture in other countries. The adjustment has been done for the SOA system architecture in order to comply with the Indonesian country that has some unique characteristics.

4. Result and Discussion

Drones or Unmanned Aerial Vehicles (UAVs) in commercial applications have the potential to dramatically change the business operations of several industries. The emergence of this technology can change our attitudes and behaviour after realizing its impact on our daily lives. It successfully reshaping the way we think and feel about our physical environment [7]. Research in the area of the products and services integrated development, designated as Product-Service Systems (PSS), is mature and the transitional phase from the traditional system to PSS in industrial sector is quite noticeable. Nevertheless, PSS development methodologies lack consistent approaches regarding the integrated validation of different PSS elements. What currently exists is a separate development and validation elements. Integrating virtual and physical prototypes is possible in a Virtual Reality (VR) [8]. JavaScript is flexible and expressive scripting language. The language is interpreted, dynamic, weakly typed. It also interacts extensively with other language [9]. VR become ubiquitous these days. A-Frame is library for creating interactive VR data visualizations on a web browser. Leap Motion enables gestural interaction by allowing users to control the parameters

of the virtual camera, gesture manipulation. It uses three.js framework to be able to do that [10].

Visual-inertial Mapping is able to localize against a prior map and obtain accurate and drift free pose estimation which can improve the applicability of such systems even further with a camera. The methods used here include localization and registration, geometric alignment, Map summarization and 3D-reconstruction [11]. We propose an SOA system to support the ecosystem and environment in property industry. In this system, the input processes of every unit that has been stored in the database must be confirmed by the administrators. The people who is interested to sell or lend their unit of property will need to follow the given procedures. In the process of confirmation, we must know the actual owner of the unit. In order to gather the useful information data about a unit, we can fly a drone and record the surrounding area from the unit to some specific areas (school, market, etc.) to show it to the potential customer. We can record every unit's perspective view (window view, road view) throughout the day and night (24 hours). Finally, real-time visual inertial mapping (angel, corner, furniture) need to be performed so that the internal software can generate a 3D model of that unit. Meanwhile, the administrator can refine the generated 3D model by using an internal software, create texturing for that 3D model, verifying unit data and put it in on sale. By using this integrated technology, we can provide better media and make sure that the transaction is secure and creditable. We will also need to build a partnership with a finance company and store the unit data as structured as possible.

Supporting Software

To perfectly run our application system, this tool may have major impact for fully working system.

- *JavaScript*, for entirely system to work including the interface, interactions, storage, etc.
- *Drone*, capturing unit environment as selling data.
- *Google daydream*, device that can make you explore VR with smartphone.
- *A Frame*, JavaScript VR environment.
- *Maplab*, capturing 3D model of inside unit as selling data.
- *Every 3D modelling software ever*, create 3D model of unit basically from Maplab.

Software Architecture Design

Almost everything can be modified in JavaScript environment. So that, any architecture can be easily changed. The model showed in here is just an example of basic software architecture. The customers and employees can use any kind of devices which has internet browsers to access the system. There is no login required if you only need to view. But, to interact with each other (commenting, asking agent, requesting things, etc.) it require the person identity. Each action is modularized to make it easier to do some part updates without clashing other functions. Each activity is then stored as data in a storage. APIs are needed for storing large type of data for example YouTube can be used for storing video, special online storage for 3D model, or maps for storing location and website analytic. All the activities are saved in a log storage. The software architecture design is shown in **Figure 1** below:

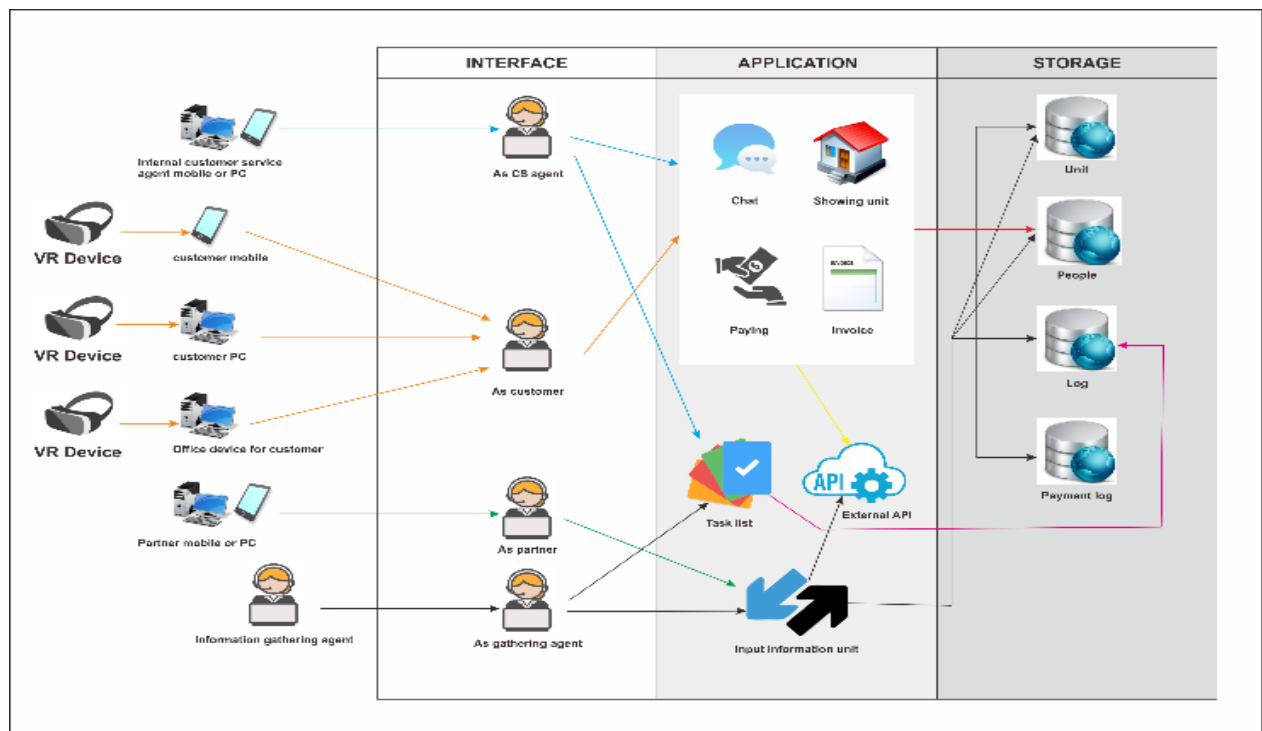


Figure 1.Software Architecture Design

Software Infrastructure Design

By just relying on internal operators to managing many hardware equipment is considered ineffective. Cloud technology is not only faster, but also easier to operate and more reliable. Even though, it is not inexpensive. Basically, Cloud has more features for a small company as an alternative for Big Data and AI. We just need to use multiple virtual machines and other add-ons such as domain, security, engine, etc. Multiple virtual machines are needed for backups and secondary access. This is also important to make the storage possible to communicate each other. The software design is shown in **Figure 2** below:

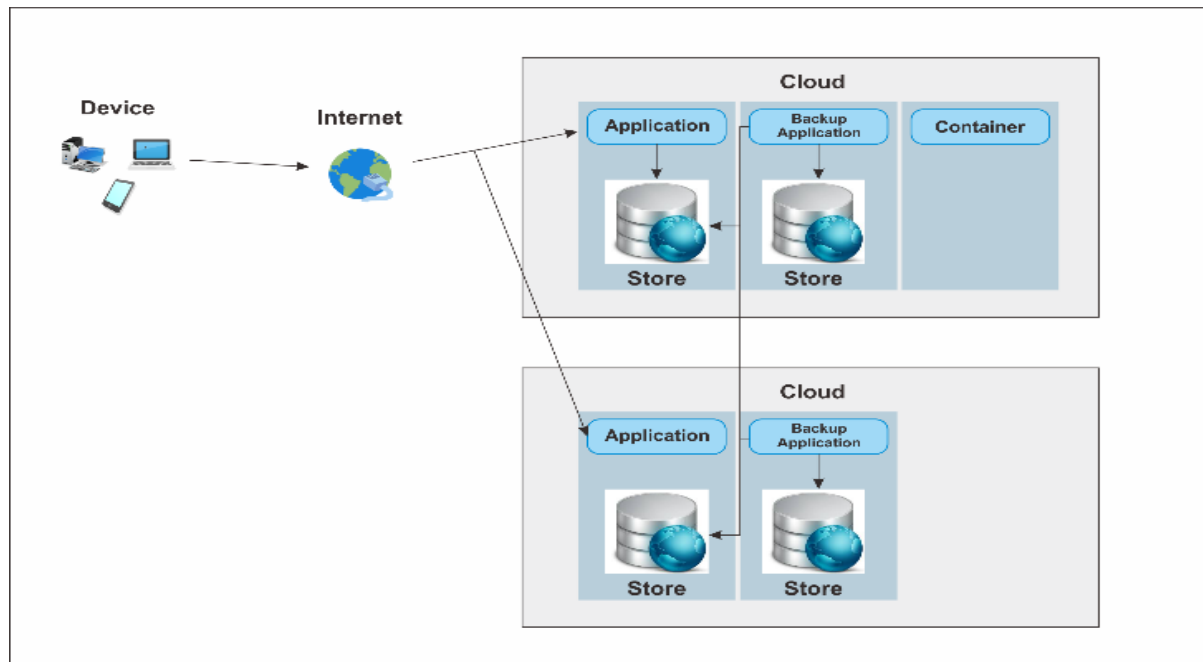


Figure 2.Software Infrastructure Design

5. Conclusion

We have explored the possibility to implement SOA in real estate industry sector by using the latest technology i.e. virtual reality, drone cinematic, cloud and visual mapping. The process is started with gathering the data by using drone to show the environment and surrounding area and also to record the inside and outside view of each unit based on different time, for example, showing a view of a room in the afternoon and a view of outside of the window. With the provided data, the system will then generate a 3D model with helping of Maplab. The process is then followed by revising the 3D model created by the system and then enter the data into the system database. A-Frame make it possible for the Virtual Reality feature to be used from an internet browser and mobile application. The users need additional tools such as virtual headset for smartphone and virtual reality goggles for computer to actually view in the Virtual Reality. The proposed implementation will be beneficial to improve selling and create a new option of the real estate business operations in the future.

References

- [1] Nabila, M., *APJII: Penetrasi Pengguna Internet Indonesia Capai 143 Juta Orang*. URL: www.dailysocial.id/post/apjii-survei-internet-indonesia-2017, access date 10 April 2018.
- [2] Statista Research Department, *Number of internet users in Indonesia from 2016 to 2023*. URL: <https://www.statista.com/statistics/254456/number-of-internet-users-in-indonesia/>, access date 09 April 2018.
- [3] Ma, Y. and L. Sun., *On Relationship Between Real Estate Enterprise E-business Model and Its Performance*. In *2010 International Conference on Web Information Systems and Mining*. 2010.
- [4] Xiong-yi, L., *Research and Application of SOA in B2B Electronic Commerce*. In *2009 International Conference on Computer Technology and Development*. 2009.
- [5] Cherif, E. and D. Grant., *Analysis of e-business models in real estate*. *Electronic Commerce Research*. **14**(1): p. 25-50. 2013.

- [6] Footen, J., Service-Oriented Architecture (SOA) in Media Systems. *SMPTE Motion Imaging Journal*. 118(2): p. 33-37. 2009.
- [7] Rao, B., Gopi, A.G. and Maione R., The societal impact of commercial drones. *Technology in Society*. 45: p. 83-90. 2016.
- [8] Exner, K. and Stark R., Validation of Product-service Systems in Virtual Reality. *Procedia CIRP*. 30: p. 96-101. 2015.
- [9] Mesbah, A., *Chapter Five - Advances in Testing JavaScript - Based Web Applications*. In *Advances in Computers*, Memon, A. M. (Ed.). Elsevier. p. 201-235. 2015.
- [10] A-Frame. URL: www.aframe.io, access date 17 April 2018.
- [11] Schneider, T., Dymczyk, M., Fehr, M., Egger, K., Lynen, S., Gilitschenski, I., Siegwart, R., Maplab: An Open Framework for Research in Visual-inertial Mapping and Localization. URL: [arXiv:1711.10250v1 \[cs.RO\]](https://arxiv.org/abs/1711.10250v1), access date 28 November 2017.