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System Integration Based on SOA: MedicForMe

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Abstract*: The progress of information system in health sector has provided benefits in health service. Indonesia as one of the most densely populated countries in the world is in dire need of adequate health service. Various demographic, geographical, and economic conditions lead to incomprehensive health service potentials. This research is to propose integration concept for the existing health service platforms in Indonesia based on SOA (Service Oriented Architecture). The Smart healthcare system integration is called MedicForMe. This research was conducted using Systematic Literature Review (SLR) method with the results of research in the form of a rich picture concept, a SOA layer diagram consisted of 8 services including: hospital, pharmacy, health ministry, delivery service, payment gateway, online healthcare platform, location mapping, and insurance

Keywords* : Service Oriented Architecture (SOA), Healthcare system, integration.

I. INTRODUCTION

The development of technology and information system has brought a change in running human activities. An activity can be performed quickly, easily and precisely. This changing in activity also unconsciously changes the lifestyle of millennium people who are responsive to technological changes. Active lifestyles and hectic routines demand people to always be healthy and look good. Health service comes in various types to facilitate public in obtaining information and accessing adequate health. The quick, affordable, and accurate health service is the solution for today's society. These facilities can be realized through the incorporation of existing health platforms into a structured, informative and flexible Web-based information system. Indonesia that has a population projection of 271 million in 2020 [1] requires an integrated and comprehensive health service. The general form of health service can be seen from the development factors of hospital and the availability of medical personnel such as doctors. The number of hospitals based on ownership in 2013-2015 in Indonesia increased around 2% [2]. Whereas the availability of medical personnel such as Doctors in Indonesia until 31 December 2016 was 180,481 people with diverse qualifications [3]. Both factors are crucial foundations in an effort to provide comprehensive health service. The question that arises later is how health service can reach and contribute more to society today. This process can be Overcome by using technology and information system. Many approaches and processes are conducted to improve the quality of health service through the technology and information system. Several approaches appear, such as [4] that introduces e-Health Cloud as a concept of health service integration with Cloud Computing (CC) trend as an economic solution for the development of IT infrastructure. In addition, there is also the approach of by [5] that describes the process of Internet development as a tool in helping patients, hospitals and medical personnel to process patient data as well as diagnose and monitor patient progress. Basically, Internet of Thing concept combines all health platforms (hospitals, rehabilitation centers, medical personnel, ambulances) with patients or users through the internet. Various emerging platforms can be combined through the architectural design of SOA (Service Oriented Architecture). The application of SOA concept in various fields of health can be used for patients' remote treatment or sensors utilization to record and transmit information about patient's condition. In the world of health, especially in Indonesia, various applications were built by connecting user data service with medical personnel. However, the existing systems or applications have not been able to accommodate the needs of public health as a whole. Several points that could be identified as the problems were as follows: (1).The existing applications/systems are SILO or standalone, so they are not integrated with all health service. (2). Service facilities are not varied enough. Generally, they are online consultation service and medication purchase

II. RELATED WORKS

According to [4], it reviews the concept of Cloud Computing (CC) as an alternative for companies to reduce IT infrastructure costs. Various obstacles or limitations in building a health system nowadays become a trigger for the presence of Cloud Computing (CC) which is considered more economical for the health industry. "e-Health Cloud" could connect health applications from different sources.

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As a concept of information technology development, the concept of e-health cloud also had its own challenges to mitigate the emerging risks. In addition, [5] explain that the process of Internet development as a tool in helping patients, hospitals and medical personnel to process patient data as well as diagnose and monitor patient progress. Basically, Internet of Thing concept combines all health platforms (hospitals, rehabilitation centers, medical personnel, ambulances) with patients or users through the internet. According to [6], Service Oriented Architecture (SOA) is a service-oriented approach in the system development. By definition, SOA is different with web services, which means that SOA does not equal with web services. SOA approach can overcome the dynamic and fast-changing business environment with its flexibility. This condition can minimize effort, cost and time to adapt on changes whenever an adjustment between the system and the needs is required. SOA can produce loosely coupled and stateless architectures because the system architecture is service oriented. SOA can facilitate the mechanism of breaking down business processes into atomic money services. SOA also provides a mechanism for combining services in orchestration and choreography manners. Thus, SOA is a solution for the effectiveness of system development and maintenance.

III. RESEARCH METHOD

This research is to propose integration concept for the existing health service platforms in Indonesia based on SOA (Service Oriented Architecture). This research was conducted using Systematic Literature Review (SLR) method

IV. RESULTS AND DISCUSSION

Based on the identification of the existing problems, we would like to propose a concept of health service platforms integration using SOA concept, which is adapted to the demographic condition of Indonesia people. By using SOA concept, it will be possible for health service providers to integrate data or information that previously is only stored for the company to be connected with services of Hospitals, Pharmacies, Doctors or transportation. The rise of diverse health service applications leads to the rise of many options for the platform. The selection of existing health services is a reflection of the current behavior of community (users) in maintaining health. In general, communities use smartphones actively to search for any information, including the symptoms of illness or health information. An accurate source of information that we can recommend is the Ministry of Health of Republic of Indonesia. After the information is obtained, users tend to find certainty or further confirmation to the doctor. This process can be performed through online consultation. If a direct examination is required at the Hospital, users can reserve the checkup queue number at the intended hospital. After the inspection is complete, users or patients can buy medication or use medication delivery service. Insurance participant cardholders can claim the insurance on medication. Regarding this behavior of community, a proposal to integrate several health service platforms with Rich Picture emerged as figure 1 below. In figure 1 below, this platform is an application that connects users with the existing health service. The flow of data communication is administered directly to the platform of Hospital partners, Ministry of Health of Republic of Indonesia, Pharmacies, online consultation, inter-service and health insurance. As a supporting feature, a location map of the nearest hospitals/pharmacies is provided to facilitate users as well as payment gateways as the payment media for medication purchasing service. The change of the platform will be more easily adjusted because it is open and can interact with each other freely.

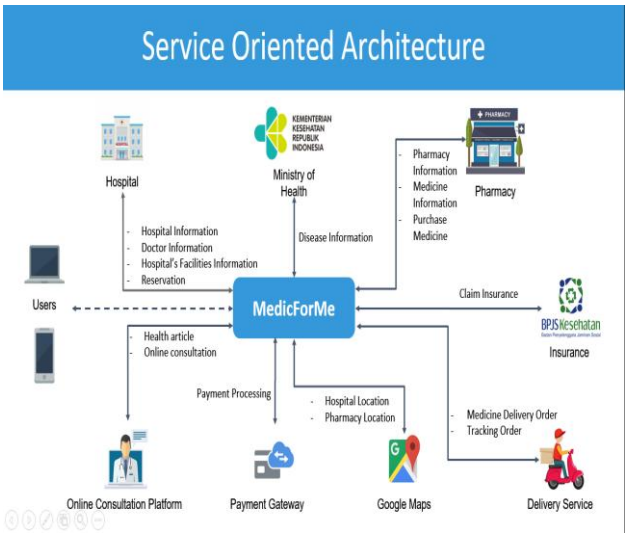

Figure 1. Rich Picture MedicForMe based on SOA

Therefore, this platform uses the orchestration process as its integration mechanism which also serves as a coordinator that coordinates the diversity of available services to be able to interact, communicate and coordinate. The processes that occur between the orchestration and the existing web service are invoke, receive and reply. By using an orchestration mechanism, users will obtain the desired information only through this platform easily. The design of resulting SOA concept is established from a collection of services from each existing platform to meet user needs. The SOA layer MedicForMe shown in figure 2 below:

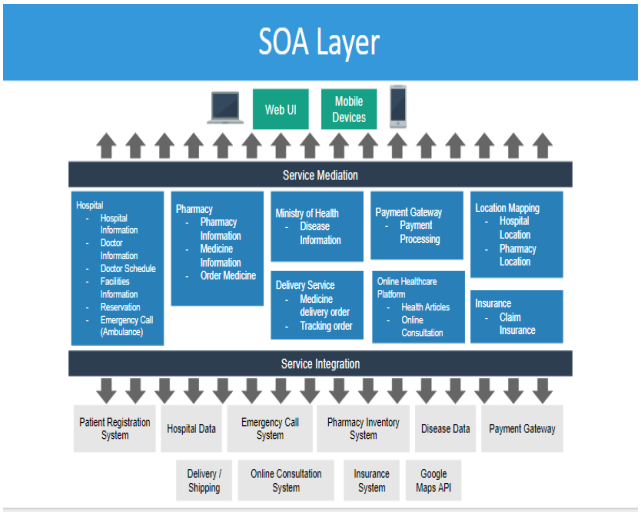

Figure 2. SOA Layer MedicForMe

This SOA Layer Design consists of 3 layers, namely:

Layer 1, Delivery channels

This position acts as the interaction service and also the platform output.

This platform is built on the basis of web and applications, so users can access them via desktop PC or Mobile device.

Layer 2, Core Services

In this position, there are services taken from the API provided by various existing service partners, it can be classified as category and inquiry:

a. **Category Service Hospital,** service that contains options of partner hospitals with the following inquiry support services: (a). Inquiry Hospital Information: Service containing information of hospital in general, such as: history, vision, mission and contact , (b). Inquiry Doctor Information: Service containing information of doctor names in the hospital, job specialization and contact number, (c). Inquiry Doctor Schedule: Service containing information of doctor practice schedule and working hours at the hospital, (d). Inquiry Facilities Information: Service containing information of facilities at the hospital, (e). Inquiry Reservation: Online service for check-up number reservation, and (f). Inquiry Emergency Call: Online service for Ambulance call

b. **Category Service Pharmacy**, service that contains a selection of partner pharmacies with the following inquiry support services: (a). Inquiry Pharmacy Information: Service containing information of pharmacy in general, such as: history, contact, (b). Inquiry Medicine Information: Service containing information of types of available medication, and (c). Inquiry Order Medicine: Service for online medication purchase

c. **Category Ministry of Health**, service from the Ministry of Health platform with the following inquiry support services: Inquiry Disease Information: Service containing information of types of diseases and emerging symptoms.

d. **Category Online Healthcare Platform**, service that provides online doctor consultation platform with the following inquiry support services: (a).Inquiry Health article: Service containing information of health articles, and (b).Inquiry Online consultation: Online consultation service with available doctors

e. **Category Insurance**, service for insurance participants with the following inquiry support service: Inquiry Claim Insurance: Service for medication payment through insurance

f. **Category Delivery Service**, Online inter-service service with the following inquiry support services: (a).Inquiry Medicine delivery order: Service for medication purchase and delivery through online transportation, and (b).Inquiry Tracking Order: Service containing information of ordered medication tracking

g. **Category Location Mapping,** service that is connected to map location provider platform with the following support services: (a).Inquiry Hospital Location**:** Service for hospitals location selection that is desired or nearby the user, and (b).Inquiry Pharmacy Location**:** Service for pharmacies location selection that is desired or nearby the user

V. CONCLUSION

The utilization of SOA concept in health service can help information technology in developing a comprehensive health care platform for the community. MedicForMe platform is an idea to overcome the problems of health service applications that have not been comprehensive in Indonesia. By this idea/solution, it is expected to help the community in obtaining accurate, real-time health information as well as fast and precise health service. In addition, the use of SOA concept in the field of health will certainly depend greatly on IT infrastructure, human resources, and user data security. Further research is required to develop the SOA concept in health sector, mainly in Indonesia

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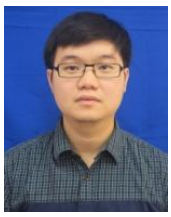

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