Faculty of Information and Communication Technology

HYBRID SOFTWARE ARCHITECTURE FOR DOCTOR-PATIENT CONSULTATION

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HYBRID SOFTWARE ARCHITECTURE FOR DOCTOR-PATIENT CONSULTATION

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DECLARATION

I declare that this thesis entitle “Hybrid Software Architecture for Doctor-Patient Consultation” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature	:	……
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Date	:	30 Jun 2016

APPROVAL

I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in terms of scope and quality for the award of Master of Science in Information and Communication Technology.

Signature	: ……
Supervisor Name	: Assoc. Prof. Dr Mohd Khanapi Abd Ghani
Date	: 30 Jun 2016

DEDICATION

To my beloved mother and father, Rosina bt Abd Ghani and Hambaran bin Abd Samad.

ABSTRACT

This aim of the research is to solve an inadequate performance of the conventional approach in capturing clinical finding during doctor-patient consultation, by designing and implementing the proposed hybrid software architecture. Doctor-patient consultation is a crucial process in diagnosing and capturing clinical findings of patient problem. Currently, most doctor-patient consultation used conventional ways of capturing clinical findings by using paper‟s note, note book, manually entered digital records, and so on. With these conventional ways, the number of patient to be treated properly in the consultation process is less than the number of patients that had been registered per day. This problem most probably caused by the low performance of process and system response time, system interruption, and inadequate integrated system that make patients‟ health records difficult to be accessed seamlessly across other modules in health information system. The proposed architecture incorporates hybrid technique that could operate during online and offline situation by utilizing local and central data storage. This architecture also provide fast track search using International Clinical Diseases version 10 (ICD-10) and Read Clinical Term (CTV3) for doctors to clerk in clinical findings such as diagnosis, symptoms, medication and other related clinical notes. The research was conducted through case study approach by way of structured and semi-structured interview at Health Centre of UTeM. The findings from the data collection and validation showed that the proposed architecture is suitable to be used but requires minor modification. Application of this hybrid architecture dramatically reduces the time taken and improves response time for doctor to capture patient health record during doctor-patient consultation process.

ABSTRAK

Tujuan penyelidikan adalah untuk menyelesaikan masalah prestasi yang tidak mencukupi kepada pendekatan konvensional dalam merekod penemuan klinikal semasa rundingan doktor-pesakit, dengan menghasilkan dan menghasilkan seni bina perisian yang hybrid. Perundingan doktor-pesakit adalah satu proses yang penting dalam mendiagnosis dan merekod penemuan klinikal berkenaan masalah pesakit. Sehingga kini, kebanyakan proses perundingan antara doktor dan pesakit menggunakan cara konvensional iaitu merekod penemuan klinikal dengan menggunakan kertas nota, buku nota, rekod digital yang dimasukkan secara manual, dan sebagainya. Dengan cara-cara konvensional itu, bilangan pesakit akan dirawat dengan betul dalam proses perundingan tersebut adalah kurang daripada jumlah pesakit yang telah berdaftar setiap hari. Masalah ini kemungkinan besar disebabkan oleh prestasi proses dan tindak balas sistem yang rendah, gangguan terhadap proses sistem yang banyak, dan sistem tidak bersepadu yang membuatkan rekod kesihatan pesakit tidak bergerak lancar ke mana-mana modul lain dalam sistem maklumat kesihatan. Pendekatan metodologi yang digunakan dalam penyelidikan ini adalah menggunakan kajian kes dan alat pengukur berkomputer. Seni bina yang dicadangkan dalam kajian ini menggunakan teknik hibrid dengan storan dalam dan luar talian, termasuk Carian Laju yang menggunakan Kod Penyakit Klinikal Antarabangsa versi 10 (ICD-10) bagi doktor untuk membuat carian samada simtom-simtom yang biasa atau ubat-ubatan, dan teknik yang menggunakan pengaksesan rangkaian yang lancar untuk penyelenggaraan rekod kesihatan pesakit secara berterusan dan lancar tidak mengira apa jua keadaan kejatuhan rangkaian. Penggunaan kerangka kerja hibrid ini mengurangkan masa yang diambil secara mendadak dan meningkatkan masa tindak balas untuk doktor dalam merekod rekod klinikal pesakit semasa proses perundingan doktor dan pesakit.

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First and foremost, I would like to thank Allah for the will and spirit He has given me, to further complete my study. Thank you to my family for the full support they had given me throughout my study. Thank you to my fiancé and all my lab mates that always cheering me up while my study.

Finally I would like to thank my supervisor, Assoc. Prof. Dr. Mohd Khanapi Abd Ghani who has provided excellent guidance to me throughout my research.

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LIST OF ABBREVIATIONS

HyDPC	-	Hybrid Software Architecture for Doctor-Patient Consultation
CIS	-	Clinical Information System
EMR	-	Electronic Medical Records
EHR	-	Electronic Health Records
HIS	-	Health Information System
UTeM	-	Universiti Teknikal Malaysia Melaka
PAS	-	Patient Administration System
HRMIS	-	Human Resource Management Information System
WHO	-	World Health Organization
WTO	-	World Trade Organization
ATA	-	American Telemedicine Association
HIT	-	Health Information Technology
CDS	-	Computerized Decision Support
LMIC	-	Low and Middle Income Countries
HIMSS	-	Healthcare Information and Management Systems Society
CTIA	-	Cellular Telephone Industries Association
GWAS	-	Genome-Wide Association Studies
HMN	-	Health Matrix Network
ICT	-	Information and Communication Technology
HIMS	-	Health Information Management System
PHR	-	Personal Health Records
IDE	-	Integrated Development Environment
SDK	-	Software Development Kit
ADT	-	Android Developer Tools
KM	-	Knowledge Management

IT	-	Information Technology
MOH	-	Ministry Of Health
FFeF	-	Flexible Front-end Framework

LIST OF PUBLICATIONS

Proceeding

Omar Mukhtar Hambaran, Mohd Khanapi Abd Ghani; Designing Hybrid software architecture For Capturing Clinical Findings During Doctor-Patient Consultation, E-Proceeding Of Software Engineering Postgraduates Workshop (Sepow), Pp. 47, 2013

Journal

Omar Mukhtar Hambaran, Mohd Khanapi Abd Ghani, Raja Rina Raja Ikram, Burhanuddin Mohd Aboobaider; Implementation Of Hybrid software architecture In Clinical Information System: A Case Study Of A Malaysian Clinic, Arpn Journal Of Engineering And Applied Sciences, Vol 10, Iss 20, Pp. 9891- 9895, 2015

CHAPTER 1

INTRODUCTION

1.1 Overview

Doctor-patient consultation plays a very important role in diagnosis of many clinical findings. Currently, most doctor-patient consultation used conventional ways of capturing clinical findings using paper‟s note, note book, manually entered digital records, and so on. With these conventional ways, the number of patient to be treated properly in the consultation process is less than the number of patients that had been registered per day. This research will provide a better way to fasten the process of doctor-patient consultation using a hybrid model of software architecture from different models from the literature review findings.

Currently, most patients always need to go to hospitals for consultation. Thus, because of many patients await their doctor; they need to wait till their name being called. Plus, patients who lived in rural area will suffer a lot from travelling frequently especially to have repeating consultation compare to those in urban area although those in urban area affected by other factor like traffic jam that caused the travel period became long. For the additional knowledge, the use of normal narrowband in a telemedicine system for transporting the patients‟ health records across healthcare facilities nationwide does not make sense due to issues of telecommunication reliability, speed and responsiveness. This research will provide a seamlessly solution for the doctor-patient consultation process in any condition of a network downtime.

1.2 Research Objectives

This research examines case studies of usage of computerized systems using hybrid and non-hybrid approach, and feedback from subject matter experts in the doctor-patient consultation. The objectives of the research are summarized as follows:

a. To analyze and compare Health Information System Architecture to be used as input for developing the proposed architecture.

b. To develop Hybrid System Architecture for doctor-patient consultation (HyDPC).

c. To develop, test, and validate prototype for HyDPC.

d. To compare the result between clinical information systems that uses current software architecture and the proposed hybrid system architecture.

A brief description of the research objectives are in the following subsections:-

1.2.1 To provide a critical study and comparison of the existing architecture

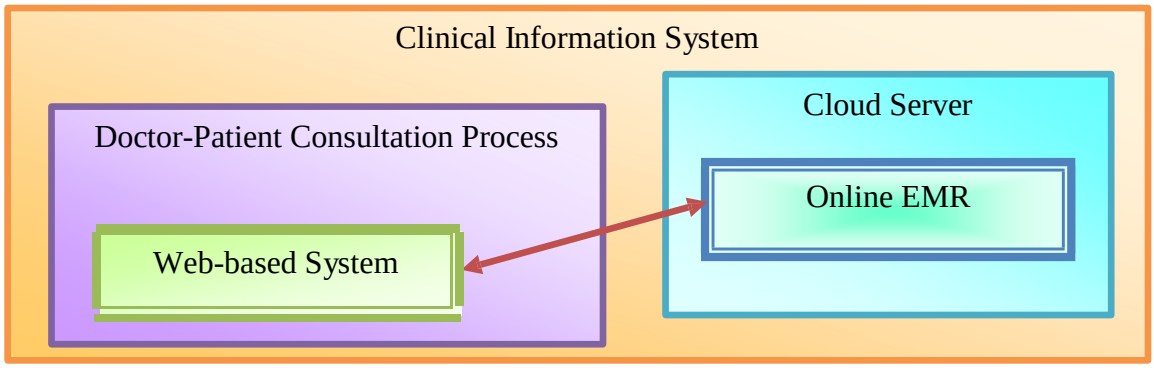

Figure 1.1: Existing architecture.

Figure shows that there exists relational between the doctor-patient consultation process and web-based cloud system requirements. However, the scope of hybrid computerized systems has yet to reduce online dependencies. This research objective is vital to provide an overview to the study and identify research issues. This section shall be addressed by a literature review of the main components of a review of doctor-patient consultation, a review of hybrid architecture, and a review of capturing clinical findings.

Key components of the existing architecture shall be identified to establish the initial architecture.

The scope of comparison analysis is based on current Health Information System such as HRS, Hospital Information System, E-Health, and EMR and EHR.

1.2.2 To develop a hybrid software architecture for doctor-patient consultation process in clinical information system.

Based upon finding and input from first objective, the architecture will be developed. Hybrid software architecture shall be developed based on a Subjective-Objective-Assessment-Plan method from the critical study of the existing architecture. The main functionality shall revolve the low response-time in the consultation process. Figure 1.2 shows the research focus area for developing the architecture. The development of architecture shall focus on the integration and harmonization of capturing patient‟s Electronic Medical Records (EMR) using hybrid approach to improve response-time in doctor-patient consultation process.

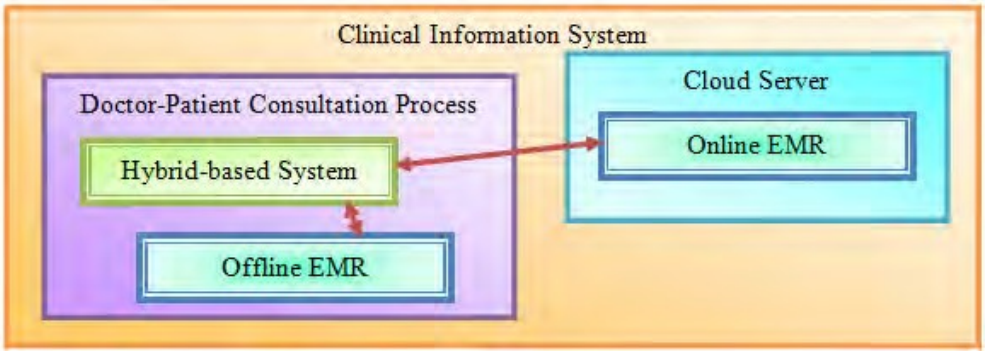

Figure 1.2: Research focuses area for developing the architecture.

1.2.3 To validate the hybrid software architecture.

After the proposed architecture has been designed and developed, a validation need to be conducted. Validation of the architecture will be performed through system prototype implemented in healthcare centre of UTeM.