실시간 헬스케어 서비스를 위한
스트림 데이터 시스템 프레임워크의 설계

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The Framework of Stream Data Processing System for
Realtime Health Care Service

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● Abstract ●

The growth of using smartphone and tablet pc has enabled variety kinds of realtime applications. In these applications, the data which we called data stream is multidimensional, continuous, rapid, and time-varying. However the traditional Database Management System (DBMS) suffers from processing the real time and complex application, in this paper we proposed the framework for CCR Data Stream Server's design and implementation that compiled with Data Stream Database Management System (DSMS) and DBMS in EMR system. The system enables users not only to query stored CCR information from DBMS, but also to execute continues query for the real-time CCR Data Stream.

Keyword: Continuity of Care Record(CCR, 연속적 케어 레코드), Data Stream Process(데이터 스트림 처리), DSMS(데이터스트림 관리 시스템)

I. Introduction

The development of the electronic devices(like smartphone) has enabled many new realtime application services, such as Electronic Medical Record (EMR), supply chain management, industrial production, etc. In these applications, the data which we called data stream is multidimensional, continuous, rapid, and time varying, which should not only meet the needs of traditional ad-hoc query, but also continuous.

As the EMR system for example, there is multiple healthcare providers(HCPs) in a country and due to the health insurance coverage, cost and quality of care, the patients often be cared from different HCPs, and at a period time like daytime there would be generated a large of Continuity of Care Record (CCR) data, that would be form a kinds of stream data to the server. To solve the traditional DBMS's serious design bottlenecks problem, many researchers put forward to Data Stream Management System (DSMS) which focusing on supporting continuous queries over massive data streams.

II. Related Work

For the importance of the correct and continuity of care record [1], the Healthcare Informatics committee of the American Standard for Testing and Materials (ASTM) standards development organization developed the Continuity of Care Record (CCR) standard in order to improve continuity of patient care [2].

The data stream model is the big difference between a traditional DBMS and a DSMS. Instead of processing a static query over a set of data that stored in advance on the disk, the DSMS process a continue query over the data stream which data elements arrive real-line and stay only for a limited time period in memory. some major research prototypes system include STREAM, Aurora, TelegraphCQ[3][4] and so on.

III. The Framework of CCR Stream Data System

A CCR Stream Data System is designed to manage the large data from multiple clients with many kinds of operation. The system not only enable user to query the stored data

from database, but also enable user to execute continue query from real-time. As shown in the following figure, which divided the system into three layers: the data access layer, business layer and data presentation layer.

1) Data Access Layer

This layer is designed for processing the coming CCR Data Stream.

- Adapter is used to get CCR Data Stream and analyse the spatial information;
- The DSMS will process CCR Data Stream with high-effect and provide Continue Query;
- The DBMS will store the result from DSMS for the next time query or export.

2) Business Layer

This layer is designed for processing Continue Query.

- Filter Configure receives the filter condition from Listener component;
- Query Modify is used to modify query information that in QEI;
- Dispatch Unit is a query schedule unit, it will decide the query information for DSMS and DBMS by schedule the query request;
- QEI is used to store the query information, and the data structure is called Query Data Structure;

3) Data Presentation Layer

This layer provide the GUI user interface for the patients, doctor, HCPs.

- Receive Query Module is designed receives the query request, change request context, and user information and then send to Query Manager.
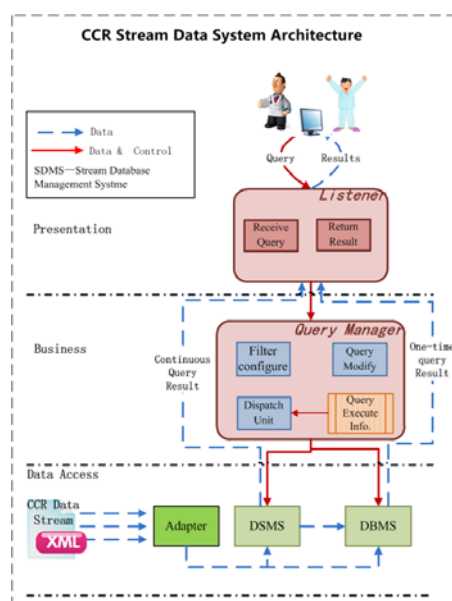- Return Module is designed to return data process result from DSMS and DBMS.

Figure.1 CCR Data stream System Architecture

IV. Conclusion

This paper discusses the framework of CCR Data Stream System's, which is processes CCR data from multiple clients at the same period, to integrate the different clinical records in one system.

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