A Generic Functional Architecture for Operational BI System

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ABSTRACT

In recent years, Operational Business Intelligence has emerged as an important trend in the Business Intelligence (BI) market. Majority of BI application architectures are bespoke in nature which have several architectural limitations like tightly coupled, static, historic, subjective, no performance measurement of business processes, limited user access, limited analytical processing, querying and reporting features. In this article, a generic functional architecture for Operational BI systems based on software architecture principles is presented. All functional modules of the system are derived from the key features of the system and by using top down approach of software design principles. The similar functional modules are grouped into sub-systems and a set of these sub-systems constitutes overall functional architecture. The proposed architecture overcomes the limitations of traditional BI architectures.

KEYWORDS

Business Intelligence, Conceptual Architecture, Functional Architecture, Key Features, Operational Business Intelligence

INTRODUCTION

In recent years, Operational Business Intelligence is emerged as an important trend in the Business Intelligence (BI) market (Ulrich Christ, 2009). Modern business demands proliferation of decision making into low level operational users in the organization for smooth running of business operations whereas in the past, BI was used for strategic and tactical decision-making purposes (Watson, 2005). Operational BI refers to the application of BI methods and technology to the vast number of low-level decisions to be taken in the daily operations of a business (Colin White, 2006). In early 2000s Operational BI was considered as a part of enterprise data warehouse system that merely loading operational data into data warehouse and used for operational reporting. Nowadays, the usage of Operational BI is rapidly increasing and continues their usage further two more decades. Developing a generic functional architecture for Operational BI using software architectural design principles is found open research area which motivates us to write this paper.

Most of the reported BI architectures (Liya, Barashl & Bartolini, 2006; An, Yan & Tong, 2007; Bhensadia & Kosta, 2010; Akbay, 2006; Auth, Von Maur & Helfert, 2002; Melchert, Schwinn, Herrmann & Winter, 2005; Rajesh & Ramesh, 2016; Passlick, Lebek, & Breitner, 2017) were mainly
dealt traditional architectural aspects and less-focused on Operational BI functionality. Traditional BI software architectures have found several limitations like tightly coupled which means no functional decomposition of modules because of cohesiveness, and functionality mostly confined to Data warehouse architectures and their paraphernalia. Second, they are historic that means does not provide decision making from real time data and subjective in nature. Third, lack of business processes and services performance measurements. Fourth, accessible to very limited number of users in the organizations for strategic decision making. Finally, support limited functional features of modules like data mining, analytical processing, querying and reporting. Operational BI systems are dynamic in nature, event centric, include both functional as well as subjective features which supports real time BI for all types of users in the organization for decision making.

In this paper, we adopt the definitions of software architectures (IEEE, 2000; Bass, Clements & Kazman, 2003; Gorton, 2010; Passlick, Lebek, & Breitner, 2017) for developing functional architecture of the proposed system. According to IEEE Standard 1471 (IEEE, 2000), architecture is defined as “the fundamental organization of a system embodied in its components, their relationships to each other and to the environment and the principles guiding its design and evolution”. According to (Ian Sommerville, 2011) “architectural design is concerned with understanding how a system should be organized and designing the overall structure of that system”. According to (Bass, Clemenets & Kazam, 2003) software architecture defined as “a structure that comprises software components, properties of these components, and relationships among them”. According to (Gortaon, 2010) “the application is divided into a set of components and how these components communicate data and control information”. The term structure is described as how to sensibly partition an application into a set of inter-related components, modules, objects or unit of software partitioning that works to meet the final goals of the system whereas the term component communication is described as how these components communicate data and control information. A body of work known collectively as architectural patterns or styles has catalogued a number of successfully used structures that facilitate certain kinds of component communication. These patterns are essentially reusable architectural blueprints that describe the structure and interaction between collections of the components.

The aim of this paper is to present a generic functional architecture for Operational BI system using software architectural principles to support high modularity and scalability. The various functional modules within the system are derived from the key features of the system. Top down architectural approach is adopted for decomposing the system into various functional modules. The similar functional modules are grouped into sub-system and set of several sub-systems which constitutes a holistic architectural system. The proposed functional architecture addresses the limitations of traditional BI architecture.

The rest of the paper is organized as follows. Section 2 deals relevant work. Section 3 presents key features of the system. Section 4 presents conceptual architecture. Section 5 describes proposed functional architecture and how various functional modules fulfill the key features. Section 6 covers discussion on the proposed architecture. Finally, Section 7 contains conclusion.

RELATED WORK

Lot of work has been reported on BI architecture (Christ, 2009; Liya, Barashl, & Bartolini, 2006; Ariyachandra & Watson, 2006; An, Yan, & Tong, 2007; IEEE, 2000; Rajesh & Ramesh, 2016) and their implementations (Imhoff, 2006; Auth, Von Maur, & Helfertm, 2002; Melchert, Schwinn, Herrmann & Winter, 2005; Inmon, Imhoff & Battas, 1999) in the literature. It was proposed by (Christ, 2009) that an integrated operational BI architecture which fits into Data Warehouse environment and uses the concept of W.H. Inmon’s Corporate Information Factory and Operational Data Stores as part of architectural entities. In this architecture, Operational BI has seen as an enterprise data warehouse system which includes features of both decision support and Operational transaction processing.
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