

CMiS: A Cloud Computing Based Management Information System

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Abstract

Cloud computing is gaining its importance in day to day business scenario because of its scalability, robustness and cost saving capabilities. Management information system is one of the major components of any business organization. It helps to adopt future operating strategy, to determine day to day operating procedure, analysis of various financial as well as operational data etc. It requires a huge investment and a complex management of the whole system. In this paper a cloud computing based management information system called CMiS is proposed. A cloud computing based management information system reduces overhead of the implementing organization. CMiS representational state transfer (REST) architecture which provides better support, specially for distributed system and increases the capability and flexibility of the proposed system.

Keyword: Management information system, REST, XML, Cloud computing, HTTP.

1. Introduction

Today digital data is an integral part of our day to day life and plays a major role in making our life more comfortable and secure. Growth of an organization depends on various decisions and strategies adopted by the management. But it is extremely difficult to adopt a strategy which will fulfill the organizational goals after analyzing various data. That's why an effective management information system is used to store and analyze a huge amount of data and help managers to adopt a strategy

In this paper we have identified various challenges regarding the management information system and proposed a content management system, namely 'Cloud

Computing based Management Information System' (CMiS) which is capable of handling various management related activities, provides accurate information to all levels of management in an organization as well as capable of analysis various data and produce automatically generated report. The proposed system is designed based on the cloud computing paradigm. Cloud computing is one of the most rapid growing area of Information Technology. It can be considered as a virtual pool of various computing resources such as storage device, CPU etc. to meet user's requirements as and when needed on pay-per-use basis. It is based on five attributes: shared resources, massive scalability, elasticity, pay as you go and self-provisioning of resources. Unlike previous computing models, which is assumed dedicated resources, cloud computing is based on a business model in which resources are shared at network level, host level and application level. Cloud computing allows the users to increase or decrease their computing resources as and when needed. Interest in the cloud computing is growing because cloud solutions helps business organizations to decrease the cost of computing resources significantly. There are three deployment models are available for cloud computing. They are (1) public cloud, (2) private cloud and (3) hybrid cloud. A public cloud is hosted, operated and managed by a third-party vendor from one or more data centers. Normally in a private cloud model the day-to-day operations including the security management are handled by the implementing organization itself or by some third party contractual SLAs. A hybrid cloud environment consisting of multiple internal and/or external providers is a possible deployment for the organizations. In a hybrid cloud environment organizations might run non-core applications in a public cloud, while maintaining core applications and sensitive data using a private cloud. In section II we have provided some major characteristics of management information system and all technical details of CMiS, in section III implementation details of CMiS has been provided and section IV deals with the conclusion and references.

2. Technical Details of CMiS

Management information system (MIS) is defined as a set of procedures that enable collection, storage and processing of data to produce and communicate relevant information to all levels of management to provide support in performing various management related activities.

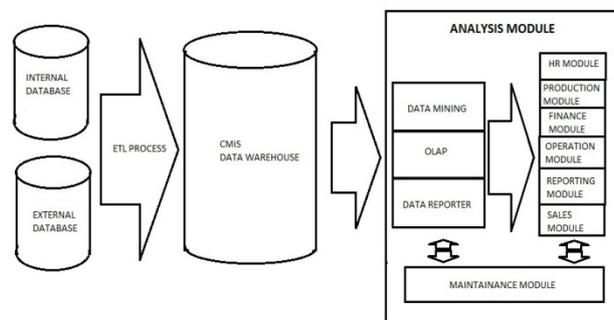


Fig. 1: Architecture of CMiS.

MIS must be (i) relevant, (ii) accurate, (iii) complete and (iv) atomic in nature. CMiS has three modules, namely (i) data source module, (ii) data warehouse module and (iii) analysis module.

2.1 Data source

Data source is the first component of the proposed system. Data source can be of two types (1) internal data source and (2) external data source. All the data regarding day to day operations, various organizational specific financial data, employee related data (such as attendance, performance etc.) can be treated as internal data and they are stored in the internal database. Various other data such as stock market related information, climate related information which might have an impact on the implementing organization, various government policies etc. can be treated as outside data, and they are stored in the external database in data source component of proposed system. We have used the hybrid model of cloud computing for the proposed system. We have used Amazon EC2 cloud computing services for our internal data source and external data source. We have also used to keep a backup of all the databases for a precautionary measure. For backup purpose also we have used Amazon EC2 services.

2.2 Data warehouse

This component is the basis of CMiS. Design and architecture of data warehouse depends upon the requirement of the implementing organization. Data warehouse is subject-oriented, that is, the data from data sources needs to be organized and stored by topic, to achieve this, the dirty, incomplete data from various data sources as well as from various databases needs to go through the pretreatment process before entering the data warehouse, this pretreatment process is called Extract-Transform-Load (ETL) process [10]. For this component we have used Amazon EC2 services.

2.3 Data Analysis Module

Data Analysis module acts as the backbone of the proposed system. It provides the interface by which users can interact with the system. This component has three sub modules (i) data analysis module and (ii) interface module and (iii) maintenance module. Data analysis module is composed of data mining component, OLAP component and data reporting component. Interface module consists of HR module, production module, finance module, operation module, sales module and reporting module. HR module provides all analytical tool and interface for HR related activities. Production module provides tools for evaluation of production related information and interface for same. Operation module provides the users the interface to analysis all day to day activities of the implementing organization. Reporting module helps us to analyze and generate report for any department and for any activities. Maintenance module is responsible for all administrative jobs of the proposed system. It provides administrator of the system the interface to maintain the data warehouses and data bases, add or remove any users and to define their roles. Users can also change any analysis procedure using this module. For the simplicity we have implemented

username-password based security mechanism, although implementation of bio-metric authentication mechanism is also possible.

For developing of CMiS, representational state transfer (REST) is used which an architectural style for building network based software as described in [6]. In this context REST becomes a resource oriented architecture where resources are exposed by servers and consumed by the clients using HTTP methods. A resource is accessed via its URL and its state is transferred using its representation. A key characteristic of a RESTful interface is the clear division of application state between the client and the server. Three major properties of REST are the use of layered client-server style, the uniform interface and the possibility to negotiate a suitable representation for a resource. The first property allows the introduction of intermediaries such as caches and gateways. The second permits a wide range of clients to utilize the system. Finally the negotiable representations allow humans and programmed clients to simultaneously use the system.

XML, XLST and Extensible Messaging and Presence Protocol (XMPP) have also been used in CMiS along with REST. XML and XLST are used for data storage, browsing, data manipulation and presentation purpose, while XMPP is a protocol designed for near-real-time and request response services streaming XML messages. XMPP and its extensions provide support for establishing presence, authentication, one-to-one and multi-party messages and notifications. These services have been used to build systems for instant messaging, systems control, and lightweight middleware [7]. CMiS facilitates users' access to the essence and the metadata of their content items that are distributed across many devices. The users can register their desktop, laptop and mobile devices to CMiS and access the system using internet, intranet as well as using vpn from any remote location.

3. Implementation of CMiS

CMiS is based on hybrid cloud computing architecture. As per the implementation is concerned only analysis module of CMiS, is implemented and maintained by the user. For backup process and database Amazon EC2 is used. For the implementation of CMiS, Ubuntu 12.04 LTS for Cloud, Apache 2 web server and Virtualbox 4.1.22 (for Linux) is used. VirtualBox for Linux (Ubuntu 12.04 LTS version) is used to achieve virtualization of resources. To deploy cloud structure we have used Xen as it is included with Ubuntu Server 12.04 LTS.

4. Conclusion

In this paper implementation and design of a low cost, cloud based management information system is proposed. This technique is suitable for any organizations who wish to implement a private cloud computing based content management system. We have used only open source software to keep the cost low as much as we can without compromising the quality of the implementation. All the tools used to develop the proposed system can be downloaded from their website. The system has good

flexibility and reliability. In future it can further be expanded to incorporate automatic process for resource allocation and more secure user authentication method.

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