The research and implementation of ERP-based Mobile Business Intelligence system

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Abstract

With the development of enterprise information technology, enterprise's demands for the real-time of information and data are increasing. Along with the continuous improvement of Internet and mobile terminal technology, this paper proposes a concept called ERP-based Mobile Business Intelligence (MBI) which is based on the existing ERP system and business intelligence system, and uses android and web technology to implement the MBI system. MBI has many features, such as mobility, real-time and initiative. It can access and query the data of ERP and BI systems in real time. By using the tools of BI, data analysis and data mining, it can process data in real time, and then transmit the processed data to the mobile terminals in real time with the mobile networks. It is a good way for managers to make a wise decision because of the real time information.

Keywords: Mobile Business, Intelligence system, Enterprise Resource Planning

1. Introduction

With the development of Enterprise Resource Planning (ERP), it has been able to provide better services for enterprise to process a variety of transactions. However, there are some flaws, such as there is not enough support for the manager's decision-making, low utilization of information and data, and lack of support for the data analysis and data mining. The Business Intelligence (BI) that is based on ERP can effectively use its capabilities of data analysis and data mining in multiple dimensions and multiple levels, providing a scientific basis for decision-making. But most ERP-based BI systems are based on PCs, which is not suitable when workers are away from network. It is difficult for workers to communicate with the outside world and cannot respond quickly to the market changes because of lacking of real-time information and data. With the rapid development of Android, iOS and other smart mobile terminal technology, ERP-based Mobile Business Intelligence becomes more and more powerful. With the convenience of mobile networks, MBI can access the data of ERP and BI anywhere, anytime. By calling the Web server tools, such as BI tools, data analysis and mining tools, it can process data quickly, and the results will be transmitted to the managers in real time in order to control and response to the market changes timely.

2. The comparison between MBI and traditional BI

Traditional BI is a comprehensive application of data warehouse, online analytical processing and data mining. It can process the history and non-real-time data, such as data analysis and mining. However, it cannot respond to the rapidly changing market very well and prevent unexpected events occur. MBI is based on the traditional BI, combine the traditional BI with mobile terminal technology. By using the mobile networks, it can transmit the result which is processed by online analytical processing and data mining technology to the mobile terminals, thus providing a reference for the managers to make a scientific decision. MBI has the following advantages that the traditional BI doesn't have:

(1) Mobility

This is the biggest difference between MBI and traditional BI. MBI users can access data of enterprise anywhere, anytime and receive the processed result with mobile terminals, which overcomes the limitation of working time and working place. And avoids delays of significant opportunities because of the real-time information, as well as improves the efficiency of management and decision making.

(2) real-time

MBI users can take advantage of the convenience of mobile networks to access ERP and BI data in real time, which minimizing information latency and maximize the business value of information. For example, business

managers can only obtain business information by phone or PC on a trip in the traditional BI case. But it allows business managers can grasp business information at real time in MBI case, which overcomes time and geographical constraints. Besides, the mobile terminals are much easier to carry and operate than PCs.

(3) Initiative

MBI can push some important information initiatively, such as changed plan, alarm data and updated data, which allows users to be informed for the first time and take actions to avoid delays of important events.

(4) Lightweight

The traditional BI extracts large amounts of data from multiple data sources, obtains the needed data with the ETL or other methods, and transforms the data into decision-making support information for the managers of scientific management and decision making through rational and effective data analysis and mining tools. MBI by calling the Web server tools, such as BI tools, data analysis and mining tools to process data, and then transmits the processed result to the mobile terminals via the mobile networks, which can significantly reduce the payload of mobile terminals.

(5) customizable

The mobile terminals are much more convenient than PCs to use, and MBI can provide more personalized service information for users, enabling enterprise can carry out different marketing campaigns according to different customers.

(6) Safety

The processed results processed by web server are crucial business information for enterprise. They are transmitted to the mobile terminals via the mobile networks. And mobile terminals are very close to personal information, therefore the security of MBI data requires much higher.

3. The overall system architecture of MBI

The overall system architecture of MBI shown in Figure 1. There are 5layers in the MBI system. They are data layer, business layer, Web server layer, Web service layer and client layer. Each layer is separated from another one, thus improving the system's scalability and flexibility.

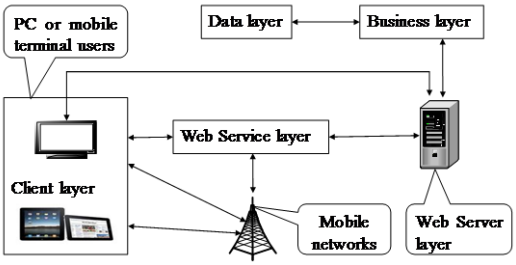

Figure 1. The overall system architecture of MBI

1). Data layer

Data layer is at the bottom of whole system, which contains all the necessary data resources, such as ERP, data warehouses, data markets and other data resources. Meanwhile, the data layer and the business layer are separated from each other, which to a certain extent improves the safety and reliability of MBI system.

2). Business layer

The business layer is the core of MBI system, which is closely linked to the data layer and Web service layer. Its main purpose is to manage and control the business logic of MBI system. It contains user authentication, data analysis and data mining, data query, report generation and query, warn messages send, information display. The design of business layer follows the Service-Oriented Architecture (SOA) rule, which can divide the system into different modules according to different user requests, thus effectively reducing the correlation between each

module and enhancing the system's scalability and flexibility. Meanwhile, there is very low impact on the entire system to increase or decrease business operations.

3). Web server layer

Web server layer is the middle layer of MBI system, its main role is to get the separated layers closely linked.

4). Web Service Layer

Web Service layer is located between the business layer and client layer, its main role is to ensure the two layers can communicate with each other, pass parameters and call the function modules of business layer.

5). Client Layer

Client layer is the top layer of MBI system, its main role is to display the processed results in front of users in the way of charts, tables, etc. MBI users can access the system with mobile terminals, browsers or desktop applications.

4. Key technologies and system implementation

The MBI system data layer uses SQL server data warehouse; business layer uses Java for development; Web server layer uses Apache Tomcat 7.0.29 as server , and use Mondrian OLAP technology for data processing; Web Service layer uses Hessian protocol for communication. The server-side uses hessian.jar package and the client-side uses hessdroid.jar package which is suitable for mobile terminals; client layer can be divided into Web client and mobile terminals. Web client uses JPivot technology to display the results processed by Mondrian technology, mobile terminals uses Android for development.

4.1 Multidimensional query of Mondrian

This paper uses <jp:mondrianQuery> label of JPivot to support Multidimensional query of Mondrian. For example, the code shown below is to query monthly sales.

```
<%@ page session="true" contentType="text/html; charset=UTF-8" %>
<%@ taglib uri="http://www.tonbeller.com/jpivot" prefix="jp" %>
<%@ taglib prefix="c" uri="http://java.sun.com/jstl/core" %>
<jp:mondrianQuery id=" queryMonthSales "
      catalogUri="/WEB-INF/queries/queryMonthSales.xml"
      jdbcDriver="net.sourceforge.jtds.jdbc.Driver"
      jdbcUrl="jdbc:jtds:sqlserver://localhost:1433/ERPDW;user=sa;password=123456">
      select {[Measures].[ sales quantity],[Measures].[ Unit Sales Price],[Measures].[ Total
      sales],[Measures].[ taxes payable],[Mesures].[profits]} ON
      columns,{[time].[ monthString]}
      ON rows from [MonthSales]
</jp:mondrianQuery>
<c:set var=" title " scope="session"> MonthSales </c:set>
```

4.2 MBI's chart implementation in mobile terminals

Currently, there are four kinds of open source chart plugins in Android. They are Java4Less, aiCharts, Chart4J and aChartEngine. Due to aChartEngine has rich examples and powerful features, so this paper uses aChartEngine as display diagram.

```
public GraphicalView executeView(Context context, JSONObject jsonResult1) {
            List<double[]> yvalues = new ArrayList<double[]>();
            List<double[]> xvalues = new ArrayList<double[]>();
            yvalues.add(…); // data from database
            xvalues.add(…); // data from database
            int[] colors = new int[] { Color.BLUE };
            PointStyle[] styles = new PointStyle[] { PointStyle.TRIANGLE };
            XYMultipleSeriesRenderer renderer = buildRenderer(colors, styles);
            GraphicalView mChartView =    ChartFactory.getLineChartView(context,
buildDateDataset(xvalues,yvalues), renderer); //delcare an instance of GraphicalView named
mChartView
            return mChartView;
      }
protected void onCreate(Bundle savedInstanceState) {
          super.onCreate(savedInstanceState);
          setContentView(R.layout.sale_kpi);
          …
          LinearLayout    mLinearLayout = (LinearLayout)findViewById(R.id.salezzchart);
          GraphicalView mChartView = executeView(this,null);
          //form a line chart in the way of view
          mLinearLayout.addView(mChartView,    new
LayoutParams(LayoutParams.FILL_PARENT,
                        LayoutParams.FILL_PARENT));
        …
      }
```

4.3 System display

This paper uses a database from Yongyou ERP, and chooses 4 years' business sales data as test data. Figure 2 is the the sales KPI index, Figure 3 is the monthly sales between 2012 and 2013.

Figure 2. The sales KPI index

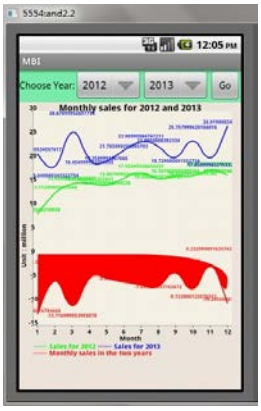

Figure 3. The monthly sales between 2012 and 2013

5. Conclusion

Mobile Business Intelligence is a new research field of enterprise's informatization. With the development of knowledge management, data analysis and mining and mobile communication, the traditional business intelligence

has faced greater challenges. Real-time business intelligence and mobile business intelligence have become one of the major trends in business intelligence. This paper proposes a concept called ERP-based mobile business intelligence, designs a mobile business intelligence system architecture, and uses Android and Web development tools to implement the system. With the upgrade of the mobile terminal and development of new technology, the next phase of work will be: analyses and compares the BI chart in different mobile-phone operating systems, and studies the real-time communication between the mobile terminal and enterprise applications.

References

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