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A business activity real-time monitoring platform based on rule engine

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Abstract

This paper analyzes the shortages of the current enterprise business activity real-time monitoring platform. In order to overcome these shortages, the authors design a business activity real-time monitoring platform based on rule engine. The paper also introduces the function of each module in this framework, and deeply discusses the critical techniques in this platform: separating the business logic rules using rule engine, which improves the scalability of the system; processing the business data using the event mechanism, which achieves the real-time ability of business activity monitoring; protecting the secret information of enterprises using the multi-role and multi-view for customizing KPIs, which improves the security of system; achieving the trace function of error information using the early warning system, which improves the reliability of system.

*Keywords:*Rule Engine, Business Activity Monitoring, KPI, Metric, Event

1. Introduction

With the increasing scale of enterprises, an enterprise may locate in different areas. And even one single enterprise is constituted by various departments. In these enterprises, various IT service providers are required to provide the hardware and software solutions, which has placed potential problems for the sustainable development in the future. Currently, the separated business systems in enterprises and the

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separated complicated applications in one activity have produced a lot of problems for the operations and IT departments [1]:

- One productivity analysis report should be finished by gathering enterprise data from various systems, which will take a few hours. During this period, the business status has changed;
- When the inputs and outputs of different business process of the enterprise do not match with each other, it is hard to locate which application has problems;
- Currently, during the business activity processing, the design of business logic is always embedded into codes. However, the enterprise business logic has always been changing according to the real situation. And normal users have no capacity to independently modify the business rules. The modification of business always requires the software engineers to modify the business logic in the original system through a series of work including requirements analysis, designing, coding, testing and release. The work is heavy and the revision cycle is long, which has increased the instability of the system.

Real-time, scalability, security—all these properties are required for enterprises to win in such a complicated market environment. They are also the driving force of the production of the business activity real-time monitoring system. A lot of works[2-6] related with the research of the enterprise business activity are based on the thought of real-time monitoring, shortages are still existed:

- All these systems are closely combining the business logic codes with the applications systems. And after the enterprises business logic is modified, it will be hard and will take a long period of time to modify the system.
- They all do not take the enterprise security into consideration and provide no protection for the key performance indicator of the enterprises. While this part of information is the secret information of the enterprise and reflects the operating conditions of the enterprise.
- They don't provide the function which can trace errors. When exception occurs in the business activity data, it's hard to locate which monitored service generates the error in time.

Focusing on the existed problems above, the paper designs a business activity real-time monitoring platform based on rule Engine. This platform constructs the whole system according to the event-based architecture, using the role-classified multi-view customized KPI to protect the secret information of the enterprises and adopting the early warning mechanism to provide the error trace function by the early warning information. These techniques improve the real-time, scalability and security of the system.

2. RBAMP Architecture

The platform adopts the hierarchical architecture according to the requirements of real-time, scalability and security of the enterprises business activity monitoring. The overall architecture is shown in figure 1. As can be seen from the architecture, the overall framework is divided into three layers: the enterprises business data capture layer, the data management layer and the presentation layer. Events are used as the basic communication mechanism among layers and modules. The whole system is divided into the configuration process and the execution process; the curves in the figure represent the configuration process, during which friendly graphic user interfaces are used to configure the monitoring models, including the monitoring service, data models, event models and the business logic rules. The rest part is the execution process. During this process, the updates of data in the active cache drives the rule engine to execute the business logic rules, leading to the updates if enterprise KPIs which could be displayed by presentation tools. At the same time, rule engines will be adopted to judge whether early warnings should be fired.

Enterprise business data capture layer integrates monitored service through the event server which achieves the loose coupling between RBAMP and the monitored service. The monitored service notifies

the monitoring of RBAMP through the registration on event server, which achieves the “Plug and Play” of the monitoring service. During the configuration, RBAMP gets the RawData list using the point to point asynchronous request/response mechanism with the monitored service. Users can select the key data from these lists as the Metric of the monitored service. During the execution, Metric information can be captured in real time through the publish/subscribe management mechanism based on topics, which will drive the system to the execution process.

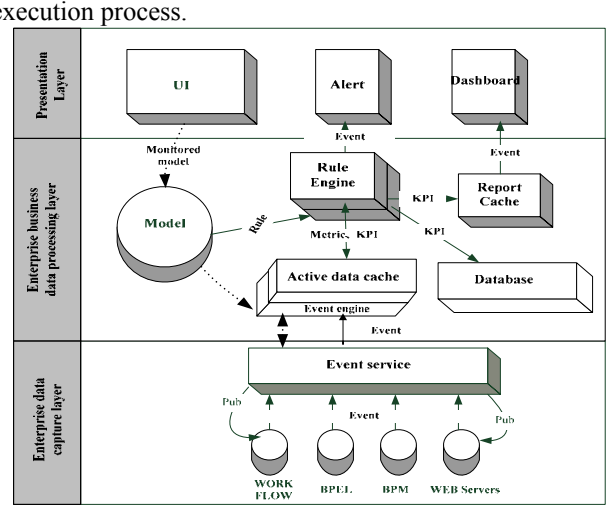

Fig.1.RBAMP Architecture

The enterprise business data process layer is the kernel of RBAMP system. The monitoring model library will store the Metric customized by users, the KPI and the business logic rules. The event processing engine will be in charge of communicating with the monitored service in the form of events, monitoring the registration of the monitored service during the execution process, handling the monitoring of the event, getting the information from it and updating the activity data cache. In the activity data cache, the latest information of all the Metric and KPI in the system is stored. The rule engine will be in charge of the process of the KPI generation rules and business logic rules. The report cache stores the latest information of the KPI customized by users. The historical data warehouse handles the persistence of KPI.

The presentation level mainly includes three modules: UI configuration module, early warning module and the instrumental panel module. The UI configuration module will be in charge of configuring the event activity monitoring information, including the monitored service, Metric, KPI, KPI generation rules, KPI early warning rules and early warning information. The early warning module notifies the administrators with the exception information by using messages and emails. The instrumental panel module shows the customized KPI by providing various image and chart components.

3. The design of key technologies

3.1. Separation of business logic rules using rule engine

This platform allows the users to define the professional logical rules by themselves through the friendly rule editor in UI; the rule editor uses the rule template method to verify the correctness of the expression through morphology and grammar analysis, and finally extract related parameter lists in the

rule expression to create rule files which can be executed by the rule engine automatically by filling the expressions and parameter lists into the rule template according to the rule language standard. The rule editor changes the current writing mode of rule files, which is completed by the software developers using complex, professional rule description language.

The rule editor is integrated into the configuration management interface in the RBAMP as a component, and is used to the generation rules and the warning rules for KPI. This platform allows users to view the configured business logic rules and allows users to change and delete existing configuration rules anytime according to the changes of the market, which improves the flexibility and scalability of the system.

3.2. Event-Based real-time processing of the data

This platform ensures the real-time processing and displaying of the data using the event mechanism. In this framework, the Metric and KPI are set as JavaBean objects, and this framework uses the properties of JavaBean to update the events and activate the rule engine to run. Metric and KPI are used as event source, which maintains an event agent to manage events; the rule engine implements the event listener interface, which registers in Metric and KPI event agents to monitor and deal with such events. Figure 2 shows the interaction among the rule engine, Metric and KPI.

The procedure is as follows:

1. The rule engine registers in Metric and KPI event agents to monitor property update events;
2. Metric in the monitored service updates and inform all the registered rule engines to execute KPI generations rules which are related to this Metric;
3. The rule engine implements KPI generation rules using matching reasoning method to update the KPI in the activity cache; at the same time, the updated KPI will be written into the report cache;
4. After the KPI update, inform all rule engines to execute KPI warning rules which are related to this KPI. If the matching is successful, then send warning information through SMS or Email.

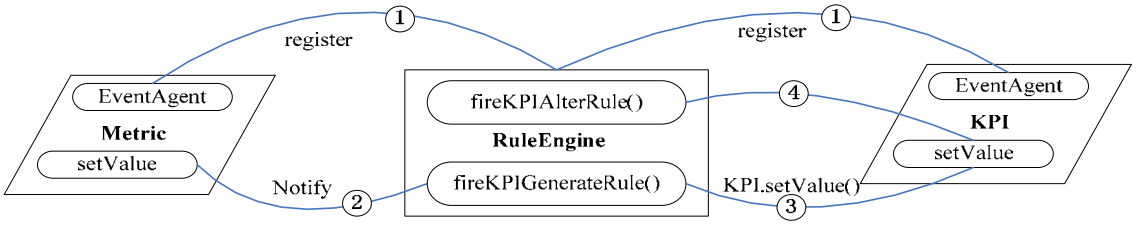

Fig2：the interaction among the rule engine、Metric、KPI

3.3. Multi-role and multi-view for customizing KPIs

KPI is the critical performance indicator for the enterprise business, and is the quantified statute of business goals in enterprises. KPI information is the secret information in an enterprise, which reflects the enterprise's real-time running condition. How to protect this information is a problem which needs to be solved in operation-action real-time monitoring systems; this paper connects the KPI access authorities with the enterprise using the KPI role custom method; roles are set to fulfill the needs of different tasks in the enterprise, and they are related to different KPI according to the users' authorities and responsibilities in the enterprise, such as: ordinary users can only see KPI information related to their own business, while the managers in the enterprise can see all of the KPI information.

The dashboard is implemented using Flex which provides a wealth of ways for displaying data as a Rich Internet Application (RIA) technology. The ways contain a variety of charts, powerful tables and flexible interaction. Users can display KPIs with rich diagram tools such as dashboards, graphs, pie charts bar charts and so on.

3.4. Error information tracing mechanisms

During the operation of business activities, the values of KPIs may be abnormal due to the value change of Metric. Business leaders often would like to receive abnormal information in time and to quickly locate the monitored service in the enterprise which has some problems. In this paper, we adopt real-time warning mechanism to send abnormal information to business administrators through Short Message Service (SMS) and Email. The early warning information contains all wrong information, including the names of monitored services, Metric names and values, KPI names and values as well as the time information. By viewing the early warning information, administrators could quickly locate the monitored service which has problematic data.

4. Conclusion

The success of enterprise business depends on the ability of implementing key business activities correctly and sustainably, which requires correct and timely presentation and feedback of business KPIs. Monitoring enterprise's KPIs using business activity monitoring platform reflects health of business, improves the overall efficiency, improves the management quality and increases the value of tangible and intangible assets, which has become the goal of most enterprise recently. In this paper, according to the requirements of real-time, scalability and security of business activity monitoring, we design a business activity monitoring platform based on rule engine. This platform constructs the whole system using event-driven architecture. It uses rule engine to separate business logic rule, adopts the way of multi-role and multi-view for customizing KPIs to protect secret information in the enterprise and adopts real-time warning system to provide early warning information and the ability of tracing errors.

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