Business Processes Monitoring by Means of Real-Time Visual Dashboards

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For modern enterprise IT ecosystems it is crucial to monitor business processes in near real-time mode using powerful visualization capabilities. The implemented by the authors distributed system is based on Elastic Stack platform which ensure its scalability and high availability. The designed solution architecture offers opportunities to gain further useful insight into the collected event data employing machine-learning techniques.

Key words: business process management, BPM, BPMS, BPMN, business process, event data, process logs, Elasticsearch, Kibana.

INTRODUCTION

The primary purpose of enterprise software is to automate various kinds of business processes. In the Business Process Management (or BPM) discipline the "business process" (or simply "process") term is defined as a flow of business activities and seeing those activities as connected toward the achievement of some business transaction [1].

From the technical implementation standpoint processes are defined either implicitly or explicitly using one of industry standards BPMN or BPEL. In both cases the end users need to monitor status of the performed processes.

Current paper is devoted to the approach to visualize processes status in near real-time mode using the event data generated while execution.

The rest of paper is organized as follows: the technical task is defined in the next chapter; the designed solution architecture concept is introduced in the subsequent part; then the implementation approach is represented; we conclude in the final section.

FORMULATION OF THE TASK

Let us suppose that there is an executable process implemented by means of BPMN 2.0 and performed by a business process management system (BPMS), for example WSO2 BPS. The process orchestrates human activities and involve IT capabilities such as web services, databases etc. More than one instance of the process can be executed at the same time.

From business standpoint it is crucial to have information about status of the executed processes in near real-time mode (see the definition of "near real-time" in the next chapter, quality attribute #2). Number of the users who simultaneously monitor the processes can be big enough (see more accurate requirement definition in the next chapter, quality attribute #1).

The task is to design and implement a software system with the purpose to visualize current status of the executed processes in near real-time mode so that required number of users are able to track the status.

SOLUTION ARCHITECTURE CONCEPT

To ensure technical accuracy, additionally to the task definition above the following quality attributes are specified:

1. The system should be capable to support not less than N uses who simultaneously monitor the status of the processes.
2. The users should receive status of the monitored processes with the delay not greater than T seconds.
3. The users should be able to retrieve historical event data for the time period ΔT .
4. The system should be able to monitor not less than K simultaneously executed processes.

In the other words quality attributes above specify in a numerical form requirements to scalability of the

distributed software system. Each of the attributes means that the system should be able to ensure necessary level of load.

The designed solution architecture concept is depicted on Figure 1.

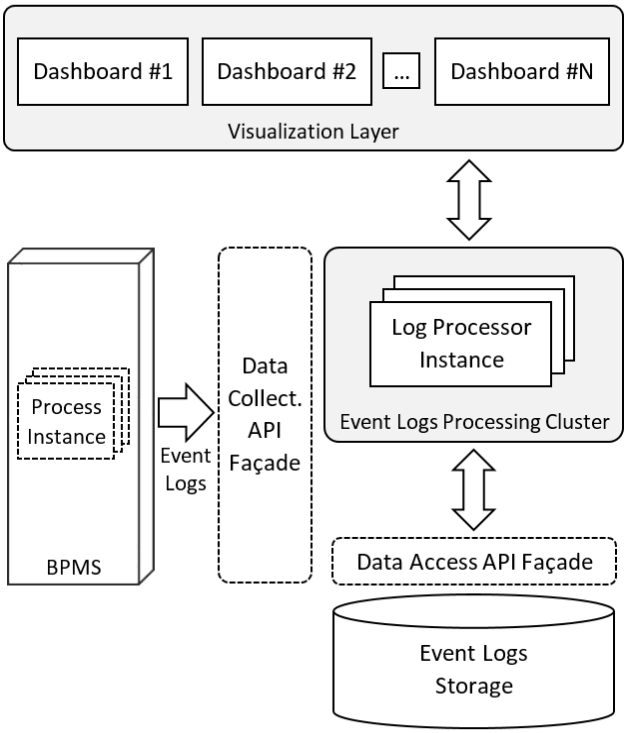

Figure 1. Solution Architecture Concept

Event Logs Processing Cluster is the primary component responsible for the scalability. The idea is to supply a cluster of the Log Processor instances. The number of the instances depends on parameter values defined by quality attributes 1-4.

According to the concept the BPMS calls the Data Collection API in order to push event data of the processes. The logs processors ensure high availability of the event data for visualization and persistence of the data to Event Logs Storage.

The architecture concept does not define any limitations regarding the Visualization Layer technological stack so that it can be implemented as a web, mobile or desktop application. Also there are no any specification for the storage, its further implementation can be based on either SQL or NoSQL platforms.

IMPLEMENTATION APPROACH

Current section describes the implementation approach of the Visualization Layer and Event Logs Processing Cluster (Figure 1).

According to the task definition and quality attributes the solution should satisfy scalability requirements providing rich visualization capabilities.

One of the software products which is able to ensure the specified needs is Elastic Search which is a core of the Elastic Stack platform. In nutshell, this software product is a fully distributed search engine designed to support near linear scalability and high availability. Elastic Search supports real-time search and analytics upon different kind of structured and unstructured data as well as JSON-based API available for any programming language.

The primary criterion of choosing Elastic Search as an event logs processing cluster is its horizontal scalability capabilities which ensure large amount of simultaneous users and monitored process instances.

To visualize processes execution status a powerful and flexible platform is necessary. Elastic Stack provides a technology called Kibana that meets the specified near real-time visualization requirements and is flexible enough to represent such complex data as processes event logs.

CONCLUDING REMARKS

Current paper mainly focuses on solution design and implementation of software with the purpose to visualize event logs generated by business processes. However, the represented approach has much more potential. One the most important further task is to get more insight from the collected event data (for example, to predict potential delays or exceptions in the observing processes). To implement such kind of tasks it is necessary to introduce machine-learning capabilities in particular, process-mining techniques can be helpful [2] in this case.

REFERENCES

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