Cloud-based Architecture of the Business Process Monitoring Information Technology

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Abstract. Cloud-based architecture of the business process monitoring information technology is proposed. The represented solution has been designed in the serverless fashion relying on AWS cloud. The advantages brought by the taken approach are achieving the elasticity requirement as well as decreasing efforts spent on maintenance of the deployment infrastructure.

Key words: serverless architecture, elasticity, AWS, business activities monitoring, process mining.

INTRODUCTION

Nowadays, digital transformation has become a global trend. In essence, this is nothing else as business processes automation by means of various kind of information technologies (under the "business process" term it is understood a sequence of operations necessary to achieve goals of an organization [1]). An important part of business processes automation is monitoring of their execution (such kind of tasks belong to the business activity monitoring field [2,3]).

Current paper is devoted to a cloud-based architecture of the business process monitoring information technology [4]. The main reason behind designing cloud-based version (the cloud-agnostic solution has already been implemented [4]) is to achieve the ability to automatically vary capacity of the computing infrastructure depending on the load so that the actually utilized resources are paid only.

The rest of the paper is organized as follows: basic information about the information technology; task statement; then, the cloud-based solution architecture; and conclusions in the final section.

CONTEXT

The monitoring task becomes challengeable if a business process does not have a predefined model (like a BPMN-based one) and is automated by means of more than one software system. In such cases, the process mining task of discovering a process model from event logs is relevant [5].

The monitoring procedure implemented by the information technology [4] consists of the following steps: (a) collecting the initial amount of event data; (b) generating the business process model by running the batch process discovery method against the entire event data set; (c) monitoring of the business process by reading the event data stream; (d) repeating of step "b" with certain frequency (e.g. once per day).

Another challenge is the ability to adapt the computing infrastructure capacity to the amount of processing data which can vary widely (e.g. amount of data is greater in the peak load time than in the normal operation mode). In the cloud computing field, such characteristic is named "elasticity" [6].

TASK STATEMENT

The task is to modify the solution architecture of the information technology from [4] so that the elasticity requirement is satisfied.

SOLUTION ARCHITECTURE

To achieve the elasticity requirement the new version of the solution architecture is designed in the so-called "serverless" fashion [7]. Amazon Web Services (AWS) cloud is chosen as a deployment infrastructure.

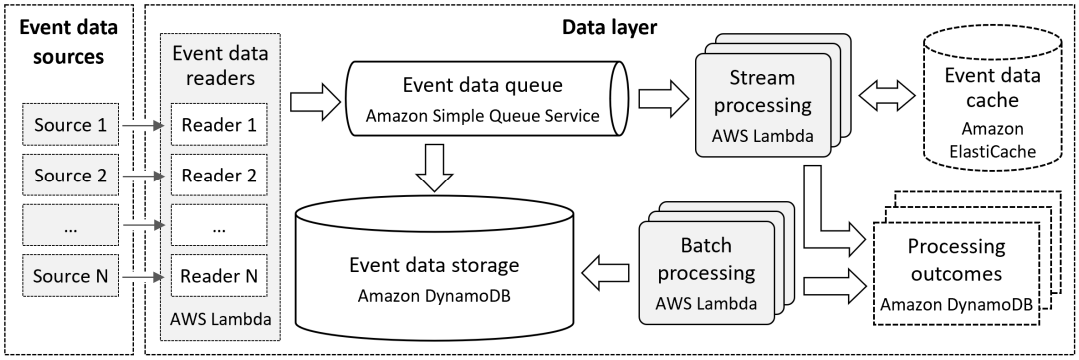

Рис. 1. AWS-based data layer of the information technology

The data processing procedures as well as API services are implemented with AWS Lambda functions. Java is chosen as primary programming language since significant amount of process mining algorithms have been written with it. As the message queue, Amazon Simple Queue Service (SQS) is used. Data persistency is built upon Amazon DynamoDB. And, Amazon ElastiCache is employed as an in-memory cache.

The data layer of the proposed solution architecture is depicted on Fig. 1. No conceptual modifications have been made in comparison with the previous version [4]. The two solutions mainly differ in the technology stack.

CONCLUSIONS

The represented serverless version of the information technology [4] has a few advantages in comparison with its cloud agnostic predecessor. First of all, this is the ability to automatically adjust computing infrastructure capacity depending on the actual load upon the system; consequently, it is not necessary to pay for the unutilized services when the load is lower. Another benefit is that there is no need to take of care of the computing infrastructure (e.g. deployment and maintenance of virtual machines) since this is supplied by the cloud provider.

It should be noted that the proposed serverless solution has some weaknesses. One of them, which may hurt performance or even reliability of the system, is so-called the “cold start” issue of AWS Lambda functions. In the context if this issue, it worth saying that NodeJS-based lambda functions demonstrate better performance than Java-based ones. Another potential disadvantage is that the system is tightly integrated with AWS; consequently, significant changes in the source code are required in case of migration to another deployment infrastructure (e.g. Azure).

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