Business Intelligence as a service in a cloud environment

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Abstract— **Business Intellligence should be described as a way of managing our company more than a set of functionalities in a computer software. Acquiring a real profit requires enterprise management to understand the value of the data and the way data describe business processes. Being aware of the business and measuring its performance we are able to improve the processes and make whole the business more effective. To achieve business improvement we require efficient Business Intelligence system as a combination of a software, hardware, the communication infrastructure and services regarding data preparation, integration and delivery to the system.**

In this paper author considers if the service oriented approach and cloud computing can make BI implementation more efficient.

I. INTRODUCTION

BUSINESS INTELLIGENCE for sure is the way for the enterprise to make the business more efficient. BI systems are fed by a big volumes of data coming from the transactional systems working inside company. That is why the BI systems are most often on-premise software which mean they are hosted on the servers inside the building the company is located.

Another way of using software is called software as a service or cloud computing which can bring the significant benefits for a company. Are these benefits strong enough to make BI implementation in cloud environment more efficient than on-premise?

II. BI IMPLEMENTATION

Different definitions show that the components of business intelligence software are inter ailia[1]:

- Data warehousing
- Multidimensional analysis, for example OLAP
- Data mining
- Business analysis
- Visualization
- Querying, reporting and charting (including just-in-time and agent-based alerts)
- Geospatial analysis

The software is supplied by the following categories of data:

- Operational data (regarding financial, logistics, sales, orders, personnel, billing)
- Private data (mainly spreadsheets prepared by business analysts, knowledge workers, statisticians and managers regarding analysis and reports)
- External data (purchased from vendors specializing in collecting industry-specific information such as: Health care statistics, customer profile information, customer credit reports, trends, currency fluctuations, stock prices demographic data and many more)

Operational data in most cases come from the transactional systems hosted inside the company. They are the biggest data volumes from all mentioned categories. Operational data is probably the most important data category because the data describe directly our business.

In a current situation most of BI systems are implemented basing on the following assumptions:

- BI system is located in the same LAN as the main transactional systems, because it collects the huge amount of data from transactional systems,
- Data loading is performed once a day at the time when users do not access the systems,
- The internal structure of the data warehouse is unique for every implementation (because every enterprise has unique combination of transactional systems that they use).
- The user interfaces are usually typical for business analytics, reporting, visualizations, charting and manager dashboards
- BI system needs a lot of resources, mainly: disk storage because of the volumes of data, network capacity during data loading, processor and memory during data processing.

We have to admit, that BI is evolving. The new possibilities of use appear what implies new challenges for Business Intelligence. We can find among them [3],[8]:

- Big Data analytics

- Mobile BI
- In memory BI
- Self service BI
- Consumerization of Enterprise Software

III. SERVICE ORIENTED ARCHITECTURE

Service oriented architecture of software is not a new technology [4]. It is rather the idea of creating software as a set of modules called services that collectively provide the complete functionality of a large software application. The services should cooperate by exchanging data and information with other services without any human interaction. The services should be treated as black boxes with precisely defined input parameters and output results. For the architect of enterprise application consisted of services the algorithms implemented inside the service are not so important. The services can have various types. We can have:

- business service – simple IT component responsible for a part of business,
- Web Service – as a method of communication between 2 programs based on World Wide Web protocol
- IT Service – as a business process of supplying benefits to the recipient by a supplier

In order to build efficient SOA solutions the services must meet following requirements:

- Interoperability between different programming languages, systems that allow integration of services
- Federation of resources that allows transparently mapping multiple autonomous resources to be treated by users as one federated resource

Cloud is becoming more and more popular environment for hosting business applications. All greatest IT vendors in the world provide their software as a service available in the cloud. It means the systems are hosted in the vendor's environment on vendor's severs and the systems are available by Internet connection. To the most popular IT systems provided in cloud belong:

- Enterprise email systems together with tools regarding workgroup like shared calendars, resources reservation and applications improving employees' productivity,
- Document management systems,
- Content management systems,
- Databases (like Google Cloud SQL or Windows Azure SQL),
- Business applications like CRM, ERP,
- Application hosting services with programmers API allowing customer to build his own software and host it in the cloud.

The main assumption of cloud services according to Forrester's definition is supplying standardized IT capacity over Internet in a pay-per-use and self-service way [7]. We can understand, that it is suitable way of using IT for all systems that works in a standard way. It we have to use dedicated software the cloud can be too limited for us. According to the Internet technologies – cloud is supporting the standards prevalent in mobile devices. Most of the standardized cloud services can be run at any devices with any operating systems.

What are the main benefits or using cloud services in business[6]?

- It lowers the costs of entry for smaller companies who are trying to use the same software and technologies as the big corporations.
- If the IT solution needs a large amount of computing power for relatively short time the cloud can provide us the resources dynamically what is financially available even for small companies.
- It provides immediate access to hardware resources without any upfront investments. It shortens the time to market for many IT solutions.
- Even for large enterprises cloud can allow to scale their applications in a simpler way. The company has an easy access to the new computer resources whenever then are necessary.
- Cloud computing requires payments only for the resources the company really utilizes. In many cases it is more effective financially than investing the money on the start.

When we compare the characteristics of the cloud environment and the benefits with the assumptions of BI implementations and challenges of BI we can observe that they match each other. Many of those benefits concerning cloud are suitable for Business Intelligence solutions. The features of BI Systems and cloud are summarized in table 1. As we can observe there are some features that do not fit each other. The basic problem concern the huge data transfer from transactional systems hosted mainly on-premise to the solution kept in cloud. The second issue is about dedicated integration procedures and unique data warehouse structure what do not match the standardization of the cloud solutions. We have to admit that those issues will not occur when we have transactional systems hosted also in the cloud – the cloud BI system is a very natural solution because:

- data during the loading stay in the same environment and do not overload the network connection
- the procedures of integration will be typical because the cloud transactional systems must be implemented in a common way

TABLE I.
BI SYSTEMS AND CLOUD CHARACTERISTICS

BI Characteristics and challenges\ cloud features	Standardized solutions	Internet technologies	Pay-for-use	Dynamic allocation of resources	Hosting in the vendor environment
Huge data transfer from transactional systems					-
Data loading once a day				+	
Unique data warehouse structure and unique integration	-				
Typical user interfaces	+				
Needs a lot of resources in various part of time			+	+	
Big data analysis					
Mobile BI	+	+			
In memory BI					
Self service BI	+				

If we have most common architecture of transactional systems and they are hosted on-premise we have to elaborate the solution for the indicated issues.

One of the solutions may be an adoption of a hybrid BI environment consisting of:

- the data integration layer which is stored on premise
- the business logic layer stored in the cloud

IV. CONCLUSION

This paper presents the idea of cloud BI system. There are some cases that may inhibit such model of BI software functioning, but author presents how to manage them and what advantages gives combining features of a cloud environment with user expectations regarding BI systems.

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