An overview of Elastic-Business Process Management in Cloud Environment

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Abstract: As internet and computing resources have become cheaper, more powerful and available everywhere which lead to quick development of processing and storage technology. These technological trends enabled the recognition of a new computing model called cloud computing CC. The organizations are shifting their core business functions onto cloud platforms. The complete business process, as well as individual applications, is hosted on virtual cloud infrastructure. This permits the recognition of an elastic process which is accomplished using flexible cloud methods in organization. There are numerous benefits of the elastic process in the organizations but still, there is a lack of solutions supporting them. In this paper, we are recognizing the state of elastic business process management with the focus on infrastructural challenges.

This paper presents the cloud service and metadata framework of elastic BPMs and considers the existing approach on scheduling, resource allocation, controlling and state management for the elastic process. Based on our analysis, we recognize the problems and challenges in proximate research directions for the recognition of E-BPM process.
Keywords: Cloud Computing, Business process management, Elastic Business Process Management.

I. INTRODUCTION

Business Process Management (BPM) allows an adaptable and independent structure for the execution of services which is totally opposite to the system in a readymade software which in an encrypted form. In this process measurement of computational resources is a big challenge to visualize the production and development of the inter-institutional process. [1] Cloud Computing (CC) is executing and high performance elastic multitenant environment that provides promising solution and service delivery system for business process, business services and their contents in an environment that should faster adaption and innovation. Therefore combing the BPM with cloud services to offer flexible and affordable service environment. Cloud computing involves provisioning of dynamically measuring the essential resources over the internet as a service. [2]
Currently, this is very less information on resources elasticity and BPM software to run your own cloud enables BPM system.
This paper is structured as follows: Firstly we present a background work on BPM and cloud computing; secondly we introduce BPMS for an elastic process; thirdly an overview of the current state and recognizing the infrastructural challenges, review process findings and their investigation.

BPM Life Cycle
It is defined as a collection of tools and methods for managing and improving an enterprise process portfolio. [3] In organizations BPM is on the top priority first to services in the comparative markets. It includes methods, techniques, and tools to support the design enactment, management and to analyze the business process. [4]

BPM is a universal management approach which promotes business effectiveness and efficiency. Which is aiming for innovation, flexibility and combining with technology?
It assigns to the activities performed by organizations to design (capture process and document their design in terms of process maps), model (define business process in a computer language) implement the software which enables the process, monitor, and optimize the process for improvement.

Therefore it is an operational business process by using a combination of model, methods, techniques, and tools. [2]
BPM considered designing, regulating and observing inter-organizational process in current practical classification and formation of the constant continuous way for the organizing. [5]
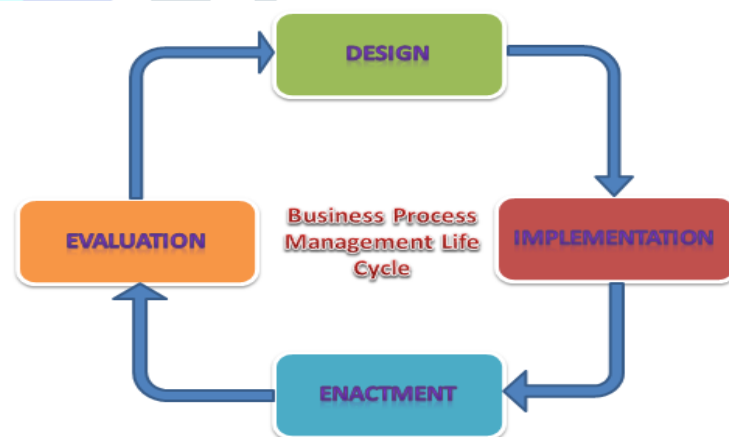

Figure 1: Schematic representation of the Business Process Management Life Cycle (BPMLC) [6]

As fig.1 represent the BPMLC comprises of subsequent stages: Strategy, Implementation, Performance, and Assessment.

- Strategy

It consists of analyzing the current procedure and apprehending the business process in process models.

- Implementation

In this phase, the designed process is implemented in a feasible member who can be extended in the form of BPMS.

- Performance

It is the runtime phase of the lifecycle. The business is displayed and monitored by BPMS.

- Assessment

In this phase, the observed information is collected by BPMS and is used to analyze the business process.

Cloud Service Model

Cloud computing denotes procurement of dynamically scalable and virtualized resources over the internet as a service. It involves pay-per-use service to extend its existing capabilities as the internet is available everywhere.

CC is a significant and high-performance multitenant environment which serves as an accumulator and delivery system for business process, business services in an environment which fosters environment. It is a model which is advantageous for on-demand network access to a shared pool of configurable computing resources which is quickly arranged and released with minimum management efforts. It is a system that provides computing software and data access services without requiring user and knowledge or dependence of system physical location. Cloud computing allows to expand and contract the costs through direct coherence of needs. [2]

Clouds are divided into three different models.

i.　　　　Software as a Service
ii.　Platform as a Service
iii. Infrastructure as a Service

Software as a Service (SaaS): - It is a model in which software is offered as a service to the user. It is hosted on service and users access the software by using a web browser.

Platform as a Service (PaaS):- It offers a computing platform as a service. They are able to install the applications on a platform. The platform offers secondary functions such as web servers, database, and load balancing, etc.

Infrastructure as a Service (IaaS):- The cloud offers platform virtualization to the customer. A user is offered virtual machine with some storage instead of buying resources they just hire it. [7]
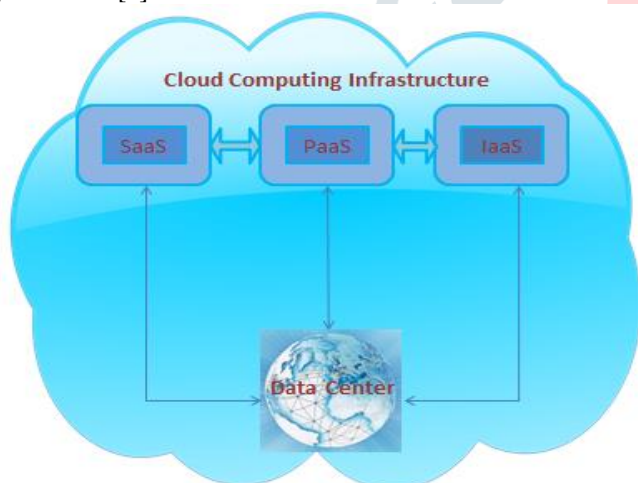

Figure 2: Cloud Computing Service Model

To survive with the workload cloud services that on-demand arrangement of infrastructure resources which is considered to be available in unlimited number. Cloud elasticity has the ability to scale computing, storage, and network capacity. Elasticity requirements arise from the application components or programming level. A business process which is perceived on a flexible framework that called elastic process. [7]

II. ELASTIC BPMS ARCHITECTURE

Elasticity is a feature which helps to increase or decrease the processing capacity of a system. The elasticity helps in the virtualization of the computation unit. The virtualization of the machine is used through CC. The E-BPM architecture is presented through a meta-model which uses virtual machines for interaction between computing units. [8]

The elastic process involves light and quick movement in BPMS to inbuilt the changes in the cloud environment. This inspires to recreate in elastic BPMS from the traditional

BPMS architecture. In this part, we analyze high level E-BPMS architecture and studied its essential elements. At this stage, it is mentioned that elastic BPM is not an industrial problem with a technological services solution, as BPM operated by manually; therefore, cloud services are integrated to enhance BPM performance and productivity. This paper mainly focuses on the business process challenges and their solutions with the integration of CC with proposed in fig.3 elastic meta-data framework.

We discuss in this architecture of E-BPMS in the form of meta-model which describes the relationships among the objects. [9]
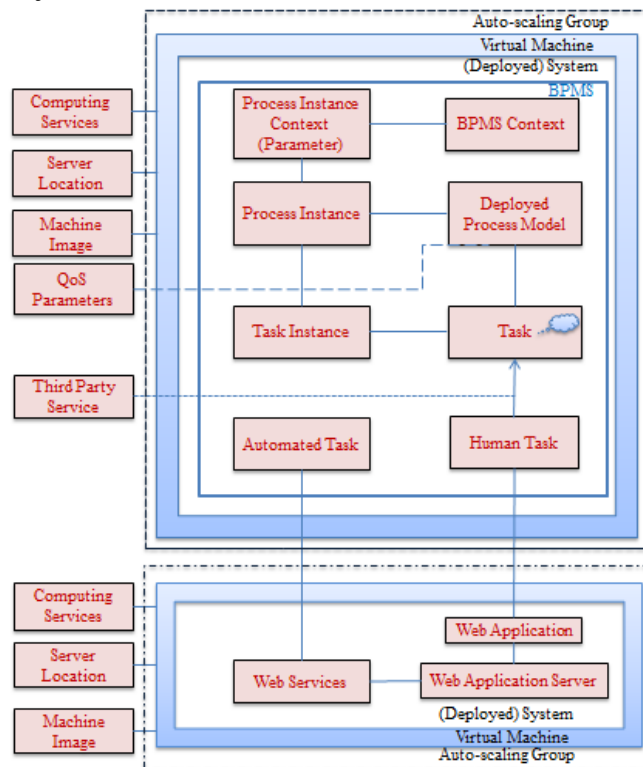

Figure: 3 Deployed Meta-Model Architecture for E-BPMS [10]

As fig 3 shown, the individual item surrounding and E-BPMS setup in Virtual Machine (VM) environment. On the basis of VM which has a geographical location across the world and provide by computing services like (AWS, Google Cloud, IBM Azure, etc.). The main element of VM is to enable elasticity by using their infrastructure from the same VM clone, for the same purpose. VM performing the same function can be ended due to less requirement of VMs. Itself VM has many operating systems that can perform for the E-BPMS. A system contains different servers, for example, Web, Database, Application servers which contain a web, DB and application services for BPMS. It's the main element in our architecture. BPMS has many conductions and collection of establishing process model. If BPMS acquire online services to continuously process and receive their result. BPMS needs to complete the process life cycle for supporting the capabilities of an elastic process. This involves function to request process instances, schedule steps, lease, and release and allocate cloud- based computational resources. The implementation of the process in order to find the faults and VM perform a similar function which is grouped into Auto-Scaling Groups (ASG), which controls the number of functions equal to VM. That is an essential portion for the task execution and completion. Therefore this motivates us to rethink process monitoring in BPMS.

III. INFRASTRUCTURE CHALLENGES FOR E-BPMS

The agility of cloud infrastructure helps the system to meet its resource demand. The first issue would be the scheduling of work in the execution of the business process. Elasticity presence new opportunities in modifying the task schedule and help to speed of process up to the process without any additional cost. Therefor elasticity introduces a lookout to handle scheduling or execution of the business process. This leads to the allocation of resources to the task.

Resource elasticity influences huge differences in design and state of E-BPMS architecture. To perceive an elastic BPMS which leads to infrastructure challenges, namely scheduling, resource allocation, process monitoring, decentralized coordination, and state management.

• Elastic Process Scheduling

Business process scheduling is defined as a problem in which a proper arrangement or a queue so that its task can be finished under given limitations or restrictions. Example: timing, barriers, resource limitation. Especially unexpected volume demand, time constraints have a major research topic in the recent era, while recent research show resource constraints is a new topic. A scheduling algorithm for an elastic process is responsible for finding a workflow execution plan which makes sure that all workflows are carried out under the given constraints. [11][12] Arranging under limited resources explain the purpose of analyzing functions that queue of process or tasks execution that high demanding for computational resources and allotment of the task to these resources. [13] The basic goal of process scheduling is a description of how the task will be executed and at what point of time using computational resources. In an elastic BPM scenario, the process queue can be changed quickly due to the new process request. Hence it might be necessary to quickie adopt the schedule.

➢ Resource Allocation

As already been discussed in section 2, In BPM generally uses a less volume of computational resources for the exaction environment time when integrates with cloud and gets satisfaction from the ascendable cloud resources that can strongly use it as resources which are needed. Processes with high computational requirements can be executed on demand service as pay per consumption manner for virtualized infrastructure. Business process meets the task or service as a request in structured procedural trends. It is an available subsidiary figure which is used for forecasting demand and present framework scaling mechanisms are not considered to elasticity. Therefore the preexisting information present in E-BPMS can be used to upgrade infrastructure through the arrangement of procedures and availability of computational resources with their specific demand.

➢ Study of Business Process and Data Requirement

It emphasizes the arranging application and process through events which emerge from external sensors to external business. The basic idea is to allow system on the basis reaction related to the usual and unusual occasion and to adopt implementation of business process easily. Data object gives us the proof of a task which has already happened or occurring throughout the system. The event needs to be correlated to the complex event which requires ascendable processing technology. Complex Event Processing (CEP) which comprises of a set of techniques which drive high-level knowledge to a lower level system of events. Recently event-driven BPM approaches have emerged. [14] In EBPMS the most important things is to define business rule dynamically and correlate the event from a variety of sources. The events organized in BPM come from the IT systems which are not accessible by consumers but combined with multiple entities. Complex event processing is a valuable instrument for analyzing BPM and other infrastructure related event.

Complex Event Processing (CEP) is a part of elastic BPM which controls and monitors the elastic process during its actual time. This helps to extend, the elastic BPM into its actual concept of business activities by overseeing and influencing the ability of CEP which involves decision making, structures for service network and other systems. Therefore CEP manages all the parts rather than observing implementation of network services.

➢ Decentralize Coordination for Process Enactment

BPMS is components which determine the model for execution of a business process and task. It organizes the tasks according to the available resources and monitors their implementation. A centralized BPM shows power capabilities which lead to failure and conjunction in the network. [15] It is not able to handle data intensive applications in business process. As cloud is a dynamic system in which workload and resource conditions are changing simultaneously therefor as centralize component doesn't react to the changing conduction due to a large number of resources. Therefore they are not able to take advantage of rapid elasticity in the cloud platform. This leads to research on decentralizing process management in recent years. [16]

➢ State Management

There is a different condition associated with the implementation of the business process which is related to the process life cycle. The layout of the state comprises of the structure of BPMS and occurrence of service. That means to easily handle all the attributes and parameter of a business management process. The process enactments state includes current status of the task under implementation, list of the tasks which are waiting to be accomplished and dataflow which rein progresses. This correlates the data collected and maintained by the process scheduler during process enactments. In centralized BPMS data is maintained in a constant way such as a database in a single location. When BPMS has decentralized each component maintain own individual database. In this case, the performance state determines the data store in the database as well as messages sent between the components. Each of the service instances has its own state maintain in a database.

IV. PROPOSED SOLUTION

Recently BPM is playing a very important role for a company. To recreate the traditional BPM we have introduced an elastic BPM with the help of the cloud. Due to the implementation of cloud environment in E-BPM it will reduce the maintenance cost and improves the elasticity in the various business process such as planning, controlling, operation and management of human resources in an organization.

The approaches to improve the E-BPM system in the cloud environment:-

- It reduces the cost of entry for the smaller firms to enter into large corporations.
- It gives quick access to hardware resources.
- It decreases IT barriers to innovation.
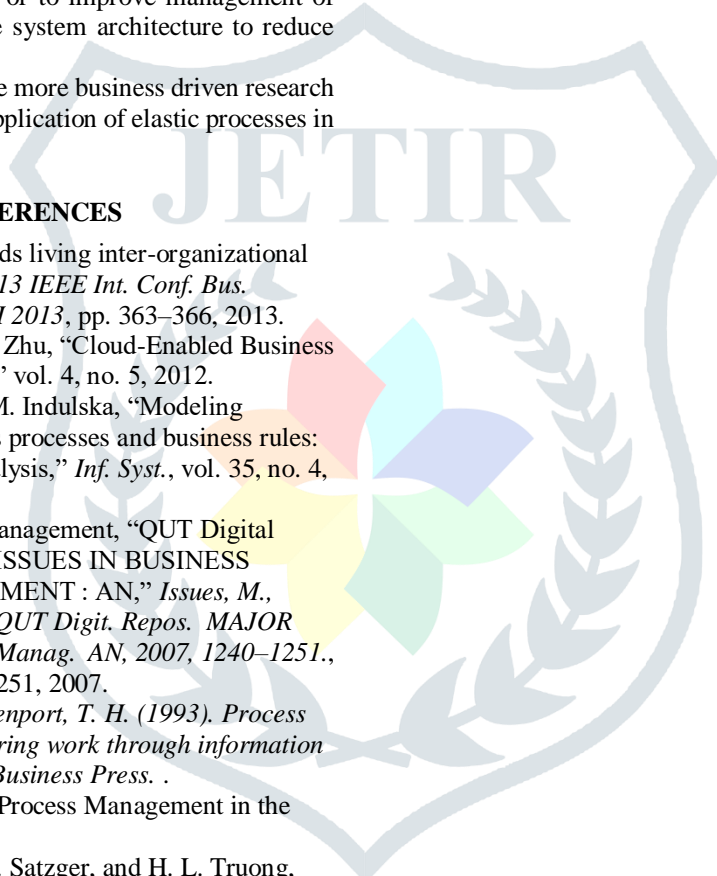- Makes easier for companies to scale their services.

Nowadays companies are managing their data through the cloud. EBPMS helps the companies to carry out their processes in a well-planned manner which becomes feasible for the employees to work in an environment. The researches of EBPM are on the basis of the performance of the systems in the cloud to overcome the infrastructural challenges. The researches cover a number of categories but its main focus is on improving the design and security of the business processed in the cloud. Therefore is concluded that elastic BPM helps in improving the adoption of business process through CC services and reduce the cost of business process, and enhance service agility.

V. CONCLUSION

As elastic BPM is an optimal solution to perceive scalable and agility business process in economical, operational and managerial feasibility mannered. The research approached and solution of research is elastic BPM is still small because it is a new field of research. Through this paper, we have analyzed the challenge of elastic BPM and elastic process such as; scheduling, resource allocation, process monitoring, decentralization, and state management. We hope that elastic BPM has a major impact on BPM and CC research communities which helps them to cope up with the infrastructural challenges of elastic BPM. The searches of E-BPMS are to focus on the performance to overcome infrastructural challenges while developing systems in cloud. Moreover, BPM as a service includes a number of categories to improve the design and security of the business process, in the cloud. On the basis of the literature review relates to business process it is concluded that E-BPMS and business process as a service helps to improve the adaptation of the business process in the cloud or to improve management of the business process, improve system architecture to reduce cost.

In future research, there will be more business driven research questions and to analyze the application of elastic processes in different areas of BPMS.

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