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CLOUD COMPUTING AND VALIDATED LEARNING FOR ACCELERATING INNOVATION IN IOT

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ABSTRACT

Innovation in Internet of Things (IoT) requires more than just creation of technology and use of cloud computing or big data platforms. It requires accelerated commercialization or aptly called go-to-market processes. To successfully accelerate, companies need a new type of product development, the so-called validated learning process. Furthermore, the development of the IoT paradigm has advanced the research on Machine to Machine (M2M) communications and has enabled novel acceleration platforms. However, there is a need for converging currently decentralized cloud systems, general software for processing big data and IoT systems. The paper describes a cloud platform that will bring together several services and instruments that the companies usually rely on in their go-to-market process. The main contribution of this paper consists in the integration of several services in the platform. The proposed platform will allow companies to bring their products to market faster and in a more successful manner, will be accessed via the Internet and will host the tools and virtual environments needed for the go-to-market accelerated process. Finally, is presented the acceleration results of a Cloud IoT architecture for processing big data from M2M telemetry.

KEYWORDS

Cloud computing; telemetry, M2M, validated learning, IoT.

1. INTRODUCTION

Cloud Computing represents a relatively new concept that refers to an integrated service offered as a whole application, which offers access to information and data storage without the user having to know the physical location and configuration of the systems providing these services.

Additionally, cloud computing is a general term for anything that involves delivering services over the Internet. Research currently in progress is extending the advances of M2M to Internet of Things (IoT) and cloud computing, by developing highly innovative and scalable service platforms that enable secure-, smart- and partly-virtualised-services (Bonomi, 2012).

Validated learning is the practice of effectively measuring the accuracy of assumptions and using the results of the validation to understand whether the assumption was correct and if so, continue onto the next test (Munch, 2012). If assumption was not accurate, then it will be decided whether the strategy, assumption or feature needs to be improved or to change direction. The concept of learning cycles in platforms for social learning (Shabalina, 2013) must also be mentioned. A learning cycle is a concept of how people learn from experience. A learning cycle will take a number of steps or phases, the latter being followed by first.

The paper is structured as follows: Section 2 presents the literature review in the field of virtual collaboration spaces, describing learning cycles and Validated Learning. Section 3 describes the approach of existing training methods and presents the proposed acceleration platform for innovation in industry. Section 4 describes a Cloud IoT architecture of a platform for processing big data from M2M telemetry. The conclusion summarizes the contributions of this paper.

2. VIRTUAL ACCELERATION SPACES

Collaboration is essential in accelerating innovation, because this is where the need for tools that support the dedicated collaboration arises. Research topics in this area include support simulations for business model learning. A serious simulation will help the development of business model learning solution. This will be coupled with an engine that will analyze the results of new ICT product and expert system releases and will propose some adjustments. The real key to accelerating business is validated learning, such as the validation of methods for a business model (Blank, 2013).

The adoption of a validated learning method requires new ways of measuring the accelerated innovation process. Experiments for validated learning are pilot services and tools can be developed iteratively. The aim of the technological infrastructure is to support the achievement of these experiments. The existing infrastructure allows a quick start for each new experiment, which will be used for developing the new infrastructure.

2.1 Validated Learning

The validated learning process represents the systematical search for matches between technology and market by validating the mechanics of a business model. Consequently, validated learning consists in iterating rapidly between experiments, data collection and informed decision making. Each company must install its own version of a validated learning process focused on the context of its business and industry to which it belongs.

The validated learning process is not just about learning a skill. It is about learning whether assumptions about the business model are correct or not. Adoption of validated learning process requires new ways of measuring progress on acceleration.

Therefore, the validated learning process is defined as a process that is learned by applying initial ideas and measuring them to validate the effect. Each test of an idea is a single iteration of a wider process consisting of several iterations, in which one learns something and then successive tests are applied. Furthermore, to perform quality evaluation for e-learning environments a method has been proposed to build the quality tree by selecting the quality characteristics from a list of common characteristics applicable to the whole e-learning experience (Militaru, 2012).

2.2 Learning Cycle

Using the learning cycle methods, the marketing innovation can be carried out by different companies from a modular unit that can be used in different stages of the go-to-market cycle. Learning cycles are social learning platforms. New players are involved in a less formal context to promote creative thinking and innovation.

Diverse perspectives, ideas, interests and local knowledge are taken into account in order to find alternative solutions that are optimal in comparison with the established approaches. The resulting solutions can be tested in small-scale pilot programs and patented (Siroker, 2013). If they succeed, new approaches can be adopted in the official management cycle.

Learning styles include a number of theories that suggest systematic differences in natural or usual pattern of individuals for the acquisition and processing of information in learning situations. A basic concept is that individuals differ in the way they learn.

3. PROPOSED CLOUD ACCELERATION PLATFORM FOR INNOVATION IN IOT

To acquire knowledge and qualified persons, IT&C system developers rely heavily on consultants, advisors and other providers of domain specific knowledge and can provide training and coaching programs [5]. Thus, they seek processes that ensure quality installation and maintenance services at limited costs. Market requirements are constantly growing and it is a challenge for providers to accelerate knowledge, but IT&C

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technologies can represent a major role in enabling industrial stakeholders to expand their businesses and innovate.

The several services that will be integrated in the platform are: awareness creation services, trainings, seminars, online courses, coaching and mentoring services, software tools that support specific parts of the acceleration process, services that provide access to data needed to speed up go-to-market, services to look for partners, project management tools (Figure 1).

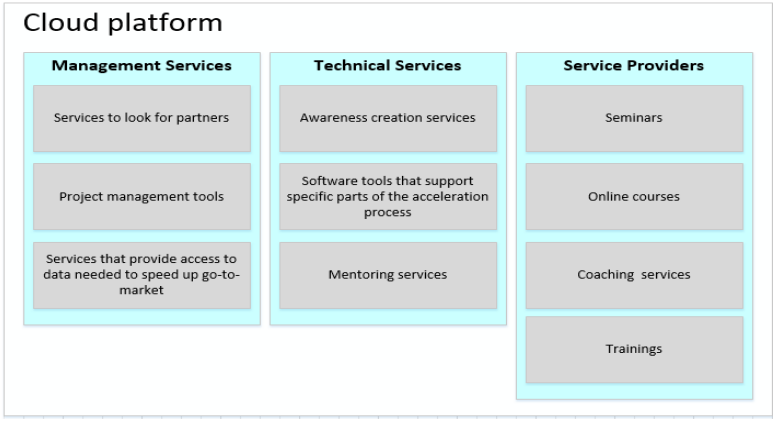

Figure 1. Services integrated in the platform

We will briefly describe each of them:

Service to look for partners is a management service that lets the users take a hands-on approach to a wide range of activities related to getting support, building projects and finding opportunities.

Project management tools is a service that offers support for task management, resource allocation, tracking, Gantt charts, and much more.

Services that provide access to data needed to speed up go-to-market are search based services. With these services SEO optimization on start-ups' websites can be achieved and in this way the acceleration of go-to-market process can be obtained.

Awareness creation services are the most effective and least expensive channels for online advertising and building a positive reputation.

Software tools that support specific parts of the acceleration process provide a scientific approach to creating and managing start-ups and getting a desired product in the customers' hands faster.

Mentoring service helps the users to refine their business strategy, map out the direction that their business should be taking and assist in setting goals for their business to succeed.

Seminars are meetings in which people can learn about a topic. They are usually interactive sessions where the participants engage in discussions about the delineated topic.

Online course is an electronic learning method. The platform for online courses provides functions such as: controlled access to educational materials, systematic consultation or searching large volumes of text and multimedia content, creating content through embedded HTML editors, editing tests and tutorials, editing glossaries / dictionaries, importing and exporting of educational content in popular formats such as MS PowerPoint files, MS Word, HTML, PDF, RTF or pictures and movies; creating archives / directories of the whole resources.

Coaching service is distinct from other forms of training because it focuses on the method of learning. Business coaching includes principles from sports coaching such as teamwork, personal excellence, and "going for the goal". A business coach focuses on helping an individual "learn what it takes" for him or her to improve existing capabilities, set meaningful goals, and be accountable for his or her results. A coach helps an individual understand and eliminate barriers to more effective performance.

Trainings are organized activities aimed at imparting information and/or instructions to improve the recipient's performance or to help him or her attain a required level of knowledge or skill.

4. RESULTS FOR M2M TELEMETRY AND CLOUD IOT ARCHITECTURE

In this section we present the acceleration results for an IoT architecture composed by a M2M telemetry system and cloud web servers (Figure 2).

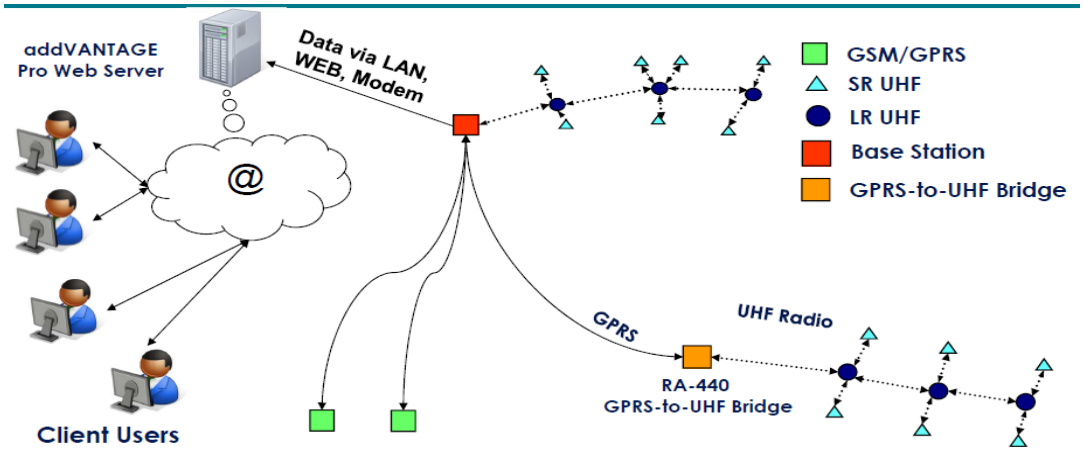

Figure 2. Architecture of the M2M telemetry system

The addVANTAGE Pro software (Adcon, 2014), which is based on a client/server architecture, collects data from one or several Telemetry Gateways (receivers) and makes it available for viewing or for specialized analysis. The server is that part of the software where all the actual processing takes place. It is responsible for downloading data from the Telemetry Bridge, storing data into the database, starting and stopping extensions, and servicing clients as they connect. The software and telemetry devices work together to form the telemetry system, which can be defined as a system that allows the user to:

- measure certain parameters over a predefined area;
- send those parameters over relatively large distances to a central point;
- process the parameters as needed for various applications such as agriculture, meteorology, irrigation control, water management, and environmental analysis.

The electrically converted parameters are first stored in the memory of a remote telemetry unit (RTU). An RTU has its own intelligence in the form of a built-in microcontroller, which periodically performs several tasks, such as: interrogating the sensors, storing the measured data, checking the radio channel, checking the local battery status, and so forth. It is part of a remote station, which consists of the RTU, its assembly parts, and its sensors. The RTU is equipped with a radio module or a GSM modem, which allows for real-time wireless communication with a base station.

The base station consists of a Telemetry Gateway (or receiver) and user PC. The Gateway acts as a network controller—at regular intervals (typically 15 minutes, but this can be changed) it requests data via radio or modem from the RTUs in the network.

The receiver stores the incoming data in its memory, thus allowing the receiver to supervise a large number of RTUs and keep their data for a period of time without the need to download the data to the PC. The number of controlled RTUs depends on the receiver type, and some receiver models can handle over 1000 units.

Cloud IoT is represented by SlapOS, a decentralized Cloud Computing system. It can automate the deployment and configuration of applications in a heterogeneous environment. SlapOS supports IaaS, PaaS and SaaS applications (Saad, 2014).

Big Data is typically considered to be a data collection that has grown so large it can't be effectively or affordably managed (or exploited) using conventional data management tools: classic relational database management systems (RDBMS) or conventional search engines, depending on the task at hand. Today, classic RDBMS are complemented by a rich set of alternative DMS specifically designed to handle the

volume, variety, velocity and variability of Big Data collections (the so-called "4Vs" of Big Data). These DMS include NoSQL, NewSQL and Search-based systems.

5. CONCLUSIONS

To successfully accelerate, companies need a new type of product development, the so called validated learning process. A validated learning process systematically searches the fit between technology and market, by validating the mechanics of a business model.

In this paper we describe how acceleration can be performed using a cloud computing platform, validated learning processes and learning cycles for innovation in IoT. Validated learning systematically searches for matches between technology and market by validating the mechanics of a business model and consists in iterating rapidly between experiments, data collection and informed decision making.

Learning cycles are social learning platforms. New players are involved in a less formal context to promote creative thinking and innovation. As future work we will take into account perspectives, ideas, interests and local knowledge in order to find alternative cloud computing solutions that are optimal in comparison with established approaches.

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