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THE CLOUD MANUFACTURING – TECHNOLOGY OF THE FUTURE

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Abstract: The paper presents some general aspects of cloud manufacturing with applications in the tracking and control system. As a starting point cloud-based systems are being used. One major obstacle is the security systems required for cloud level analysis. For modeling and simulation of manufacturing systems we used distributed systems. As a distributed distribution system, petri networks were used because they are relatively easy to analyze and interpret. Layout can also be optimized during real-time system operation.
Keywords: Petri Net, Cloud Manufacturing

1. INTRODUCTION

The manufacturing process has been revolutionized by integrating artificial intelligence, automated learning and automation of the manufacturing process and the communications system. The new approach fundamentally changes the design, manufacturing and sales processes. It will improve work safety, protect the environment and lead to low incidence production. This progress in which machines communicate, decision making passes from man to evolved technical systems leads to a smarter production process. This intelligent system refers to the possibilities of development, the optimization of industrial processes to involve fewer maintenance interruptions, fewer errors and less energy consumption [1].

The manufacturing systems have been revolutionized by the rapid evolution of developed technologies, and thus have been known for several generations [1]:

—— The first generation refers to mechanical machines and energy flow,
—— The second generation of the industry deals with mass production, assembly lines and electricity,
—— The third generation, appeared at the end of the last century, and the industries operated under the control of computers and automation,
—— The fourth generation is based on physical systems connected to the Internet.

By introducing the high-tech strategy 2020, research and innovation policy focuses on projects leading to scientific and technological progress [1]. Manufacturers are faced with some important requirements that may be met by cloud systems [5]:

—— Scaling up rare resources to solve problems faster.
—— Bring new ideas to the market faster than competitors.
—— Providing new services to support customer service.
—— Preservation of intellectual property and reduction of global breaks in the supply chain.
—— Increasing the demand for reduction of energy consumption and environmental effects.

2. CLOUD COMPUTING

The cloud computing system has the potential to make big changes in the manufacturing industry. It all depends on understanding the process, asking for correct information and making decisions constructively [2].

Cloud computing has been described as an innovation in computing architecture, the core feature of which is the virtualization of computing resources and services. Cloud computing allows delivery of computing resources with the following attributes: as on-demand service; with infinite and fast elasticity and scalability; with measuring possibilities; through resources; and with access to the network [6] [7].

The most important component of cloud computing is cloud elasticity. This refers to empowering to have the ability to dynamically add computers according to needs. Scalability is particularly applicable to large production companies. Cloud computing analysis covers topics that include data confidentiality and audit capability, data transfer blocks. These include some security levels. The advantages of cloud systems are:

—— high productivity,
—— development and innovation,
—— the provision of new services,
—— risk management,
—— reducing energy consumption and environmental effects.

The cloud computing features provide flexibility, no costly investment in purchasing production equipment, maintaining the production line [2].

Cloud computing applications in the manufacturing industry can be grouped into those that greatly influence the production enterprise and those that influence the product itself. For these, this includes how products are researched, designed and developed; the manufacturing processes and production systems used to manufacture them; and how the products are used. [6] [7]

3. CLOUD MANUFACTURING

Having cloud computing, cloud manufacturing is an innovative advanced manufacturing model. Advanced cloud production in different resources, services and solutions to address a production task.

The structure of the system consists of a storage cloud that manages a data model of manufacturing [5].

Cloud manufacturing is a new network-based manufacturing paradigm. Uses network, cloud computing, service calculation, and manufacturing technologies that enable manufacturing resources and manufacturing capabilities to be transformed into manufacturing services, which in turn can be managed and operated in intelligent systems. The basic features of cloud manufacturing are based on the fact that they can provide reliable, reliable, high quality, cheap manufacturing services [3].

Cloud Manufacturing is a decentralized form of production using a network of geographically dispersed manufacturing hubs coordinated by information technology. It is a new paradigm developed by existing advanced manufacturing models and enterprise information technologies, with cloud computing support, Internet of Things (IOT) and advanced computing technologies. In the literature, the concept of manufacturing covers the entire life cycle of a product: design, design, simulation, production, testing, distribution. In Figure 2, if cloud manufacturing is considered a black box, the input is for manufacturing resources and capacity. The production resource refers to all relevant elements in the product life cycle. Resources can be divided into two categories: one is a manufacturing cell, involving machine tools, production unit, machine components, robots, etc. and the others are related to IT hardware infrastructure, such as network equipment, servers and storage.

Figure 1: The proposition of Cloud Manufacturing [3]

Some features of cloud manufacturing are derived from cloud manufacturing [2]:

—— The production enterprise can obtain shared manufacturing resources and services through access to the cloud production platform, and opposite, they can provide manufacturing resources and services to meet the requirements.

—— Customers, designers and managers play important important roles throughout the production process and actively interact with each other, cloud manufacturing can make it easier to access resources and services by using modern desktop tools.

—— Cloud computing technology is a common node of configurable and virtualized manufacturing and service resources.

Figure 2 : Architecture of cloud manufacturing system.[4]

—— Cloud development makes users quickly respond to dynamic requirements, as cloud computing technology allows cloud-maker cloud services to look for and use manufacturing resources.

—— The applications and services that join this cloud production platform are monitored, measured and reported to ensure cloud production platform quality.

4. PROBLEM ANALYSIS

The chosen system consists of several sectors. Among these, the most representative are represented schematically as follows:
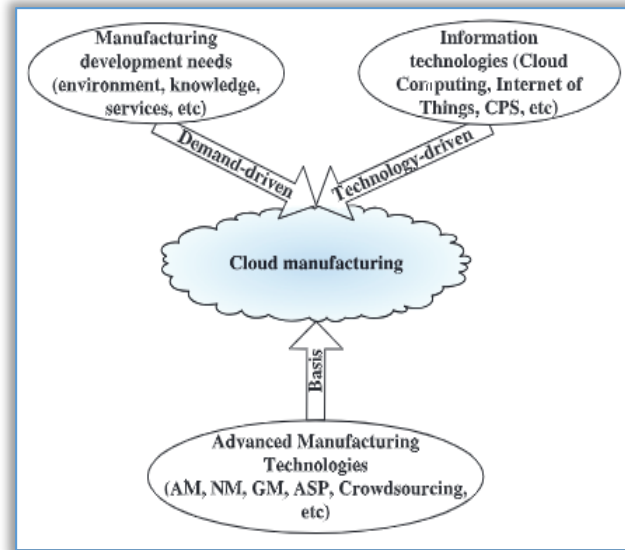
—— resources and production capacities,
—— security management,
—— layer,
—— toolbox,
—— Middleware Layer,
—— Virtual Pool Layer,
—— The level of perception of resources,
—— Knowledge and data management,
—— Service application for product lifecycle.

These sectors are linked together by robots. Each sector can be part of different levels. The organization of the level sectors depends on the characteristic of the enterprise to which the architecture applies.
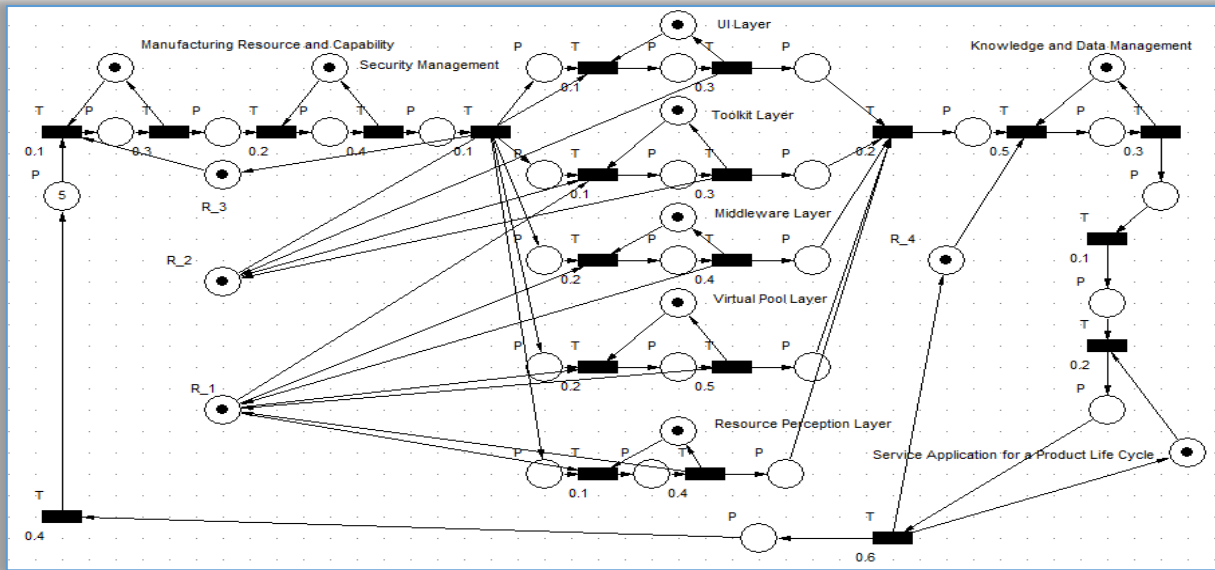

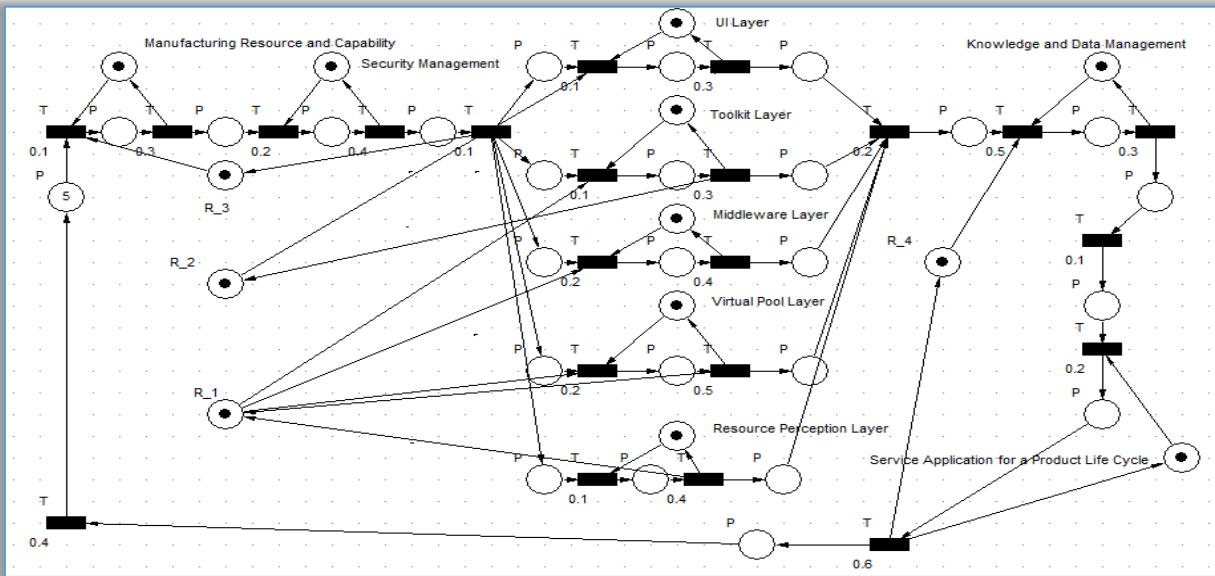Figure 3: The general model of the problem

Figure 4: The general model with highlighting the flow variation of robots 1 and 2

If the sectors:
—— layer,
—— toolbox,
—— Middleware Layer,
—— Virtual Pool Layer,
—— The level of perception of resources,

It is grouped on two levels, then the representation in the figure 4, in which the variation of the production depends on the flux determined by the robotic systems 1 and 2, is applied.

The figures below show the flow of information obtained from the robotic systems at each level, and last but not least the change in the information flow from the last level (service application for product life cycle) where the variation is linear, there are no errors or clutter.
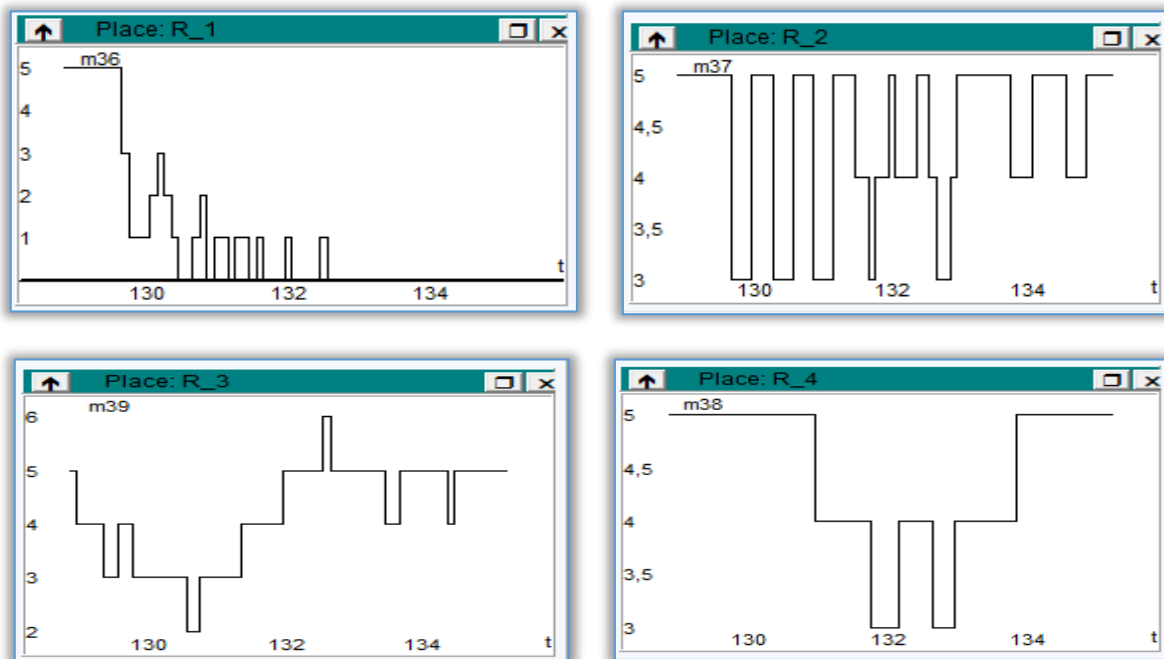

Figure 5: Representation following the flow of information corresponding to the 4 robotic points

5. CONCLUSION

With cloud manufacturing, information can be viewed, updated, and applied at any time or place.

Cloud computing allows for more productive, cost-effective and secure production operations.

Investing in a cloud platform is not just a technological decision - it's a business strategy - one that offers the agility, speed and vision that is needed. With cloud production, new facilities and support for market fluctuations can be quickly and easily started, as cloud delivery is the responsibility of managing scalability. The cloud service provider is responsible for a secure, secure, scalable, secure service.

Cloud Manufacturing is an excellent choice for companies with small IT departments and is ideal for companies that do not have any IT because the cloud provider is all about IT issues.

Such a manufacturing system should be flexible or reconfigurable in order to adapt relatively easily to dynamic environments. And it aims at improving operational performance and producing high-quality goods with fewer errors.

Cloud manufacturing has increasingly become a convincing paradigm for managing and delivering Internet-based services across industries.

References

[1]   Zeinab Kamal Aldein Mohammed, " Internet of things Applications, Challenges and Related Future Technologies", World Scientific News, WSN 67(2) (2017) 126-148
[2]   Zhenying Han, "Cloud Computing contribution to manufacturing industry", 2015, Turku, University of Turku
[3]   Lin Zhang, Yongliang Luo, Fei Tao, BoHuLi, Lei Ren, Xuesong Zhang, Hua Guo, Ying Cheng, Anrui Hu, Yongkui Liu, "Cloud manufacturing: a new manufacturing paradigm", Enterprise Information Systems, 2014 Vol. 8, No. 2, 1-1
[4]   Lei Ren, Lin Zhang, Fei Tao, Chun Zhao, Xudong Chai, Xinpei Zhao, "Cloud manufacturing: from concept to practice", Enterprise Information Systems, 2015, Vol. 9, No. 2, 186–209
[5]   A. Hassanzadeh, S. M. Razavi, A. Mohaghar, M. Houshmand, H. Safari "Cloud Manufacturing: From a Concept to a Way for Being Lean",International Journal of Research in Industrial Engineering ,Int. J. Res. Ind. Eng. Vol. 7, No. 2 (2018) 206–223
[6]   https://abm-website-assets.s3.amazonaws.com/mbtmag.com/s3fs-public/2017-cloud-computing-enables-manufacturing.pdf
[7]   How Cloud Computing Enables Modern Manufacturing. American Enterprise Institute. The Information Technology and Innovation Foundation. June 2017.