Prototyping manufacturing in the cloud

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Abstract. This paper attempts a theoretical approach to cloud systems with impacts on production systems. I call systems as cloud computing because form a relatively new concept in the field of informatics, representing an overall distributed computing services, applications, access to information and data storage without the user to know the physical location and configuration of systems. The advantages of this approach are especially computing speed and storage capacity without investment in additional configurations, synchronizing user data, data processing using web applications. The disadvantage is that it wants to identify a solution for data security, leading to mistrust users. The case study is applied to a module of the system of production, because the system is complex.

1. Introduction
The paper wishes to shape a Cloud system monitoring and control system that optimizing material and information flows of the company. Production system proposed for simulation analysis provides the ability to track and control the process in real time. Using simulation models be understood: the influence of changes in system structure, commands influence on the general condition of the manufacturing process conditions influence the behavior of some system parameters. Practical character consists of tracking and real-time control of the technological process. It is based on a modular systems analyzed using mathematical models, graphic-analytical sizing, configuration, optimization and simulation.

Manufacturing industrial grade in the cloud systems are designed to increase global competitiveness, which will require between domains the integration of systems, hierarchical limits and stages of life. Many factors contribute to determining the future of industrial grade, but based on consensus standards are essential in this process. In this paper I wish to present a way of acceptance by using cloud systems and the manufacture.

Manufacturing cloud is a modern concept that appeals to computing and informatics, representing an overall distributed computing services, applications, access information and storing data without the user needing to know the location and physical configuration of systems providing these services.

Further on want to outline groups of experiments to evaluate the proposed mechanisms and physical systems. Achieve a theoretical approach using parameters determined by repeated simulations. This approach examines resource availability and demand scenarios and cloud management software system.

The objective is to examine the impact of mechanisms designed on the cloud's performance, such as equipment used, productivity, and cost and delay production[6].
It will assess how well the proposed mechanisms that can adapt to sudden changes in the cloud, such as the availability of resources acquired deposits. While a complete set of experiments will be carried out, will draw conclusions such that the manufacturing system to be as efficient cloud.

2. Presentation of the System
The following is a simple schematic analysis of a cloud system at an industrial enterprise. This system can be adapted to the type of organization and according to the needs and requirements [4] [5]. Shape to this system have left a cloud computing system which may extend. So the next stage of processing dedicated software and appropriate steps can include system monitoring and control and manufacturing system analysis.

![Cloud Manufacturing System Diagram](image)

**Figure 1.** Cloud manufacturing system.

Step (Fig. 1) tracking and control system, the layer resource identification and analysis, distributed production resources can be detected intelligently and connected in cloud manufacturing systems using advanced information and communication technologies. Production resources refers to various equipment to support production activities throughout the production depending on requirements. These elements underpin manufacturing in the cloud and can be divided into financial resources, technical resources, equipment resources, human resources, software, resources, logistics and warehouse resources.

This system aims to provide an overview of information for various applications.

Information resource production takes two forms, information on physical resources and information capacity.

Information describing natural resource production facilities static.

Production capacity information is a set of physical resources provided by various operations.

This can be considered as natural resource behavior of conducting production activities with certain constraints. Constraints to manufacturing capacity are related parameters, such as precision machining,
organizing equipment in a particular branch that defines the time of transport, processing temperature, duration of processing on equipment that can be automatic or semi-automatic, the system robotic or with blades, etc.

Production resources can be divided into different results depending on capacity obtained at enterprise-level workshop at the cellular level, and the device. Each resource can be seen as a combination of features non-functional and functional characteristics.

Based on object-oriented methodologies, each resource inherits all the attributes of its superclass can have its own attributes and new demand.

A appropriate model of manufacturing resources include both functional and non-functional characteristics of production resources based on consideration of supplier resources and the resources of the applicant.

Based modeling approach, production resources and capabilities are combined into production cloud service layer processing service dedicated software. By this way, production resources are managed and exploited in a service-oriented manner is a flexible system. They can be found, selected and arranged functionally via the cloud manufacturing.

Manufacturing cloud providers are motivated to manage such activities as md opportunity to get quick and correct information is grouped into stage is advantageous.

Manufacturing cloud service consumers requesting information from all stages of the lifecycle of the system.

In this paper, a cloud manufacturing system is defined as a global activity of an enterprise holding activities for both manufacturing resources, resources that can be one or more manufacturing resources.

Manufacturing the cloud service is dedicated to implement semantic interoperability between manufacturing enterprises.

The major advantage of this type of manufacturing is that depending on the flexibility of the system, describing the proposed model each resource manufacturing can be customized.

3. Petri Networks in Cloud
A Petri net is a tool for modeling and analysis system. Help analysis of a system with Petri nets can provide information about its structural properties and dynamic behavior that is useful to improve the system for verification and testing.

Petri nets models the relationships and interactions can capture events with a strong mathematical basis, so they were used in manufacturing systems and management for a long time.

Petri net literature describes the problem of data integration threefold [4]:
- The first part provides mechanisms for data management and data control distributed systems. Petri nets have been used for building metamodel describing life activities data. Based on the model proposed program is designed to automate and improve data management.
- Petri nets models were used to simulate multi agent systems as a tool for system validation. Such web design services have been used for process analysis intelligent agents and the use of combinations of models of Petri nets to ensure that users objectives were met. Petri nets model extends the object-oriented technology to describe the type mobile agent system secure. The model supports not only mobility but also mechanisms for detecting malware attacks.
- Thirdly, Petri stochastic simulations are popular tools for distributed computing. Known web service composition model based on dynamic role in development of vital elements of the model. These models are based on probabilities systems. Tried development of analytical methods deterministic measures trust with explicit routing based on probability theory. These tools are used to model simulations and measurements.

Petri is a generic model for integration of data flow and describes the interaction and collaboration between agents.

These three aspects were founded during 1989 in Murata, 1995 Dosrochers and Al-Joar and 2014 to Nematzadeh and Simonet et al and 2015.
A Petri net type Location / Transition is form \([1][2][3]\),
\[\sum = (P, T, F, W)\]
where:
- \(P, T\) are two non-empty sets, which represents the set of places and transitions respectively
crowd,
\[P \cap T = \emptyset\]
- \(F \subseteq (P \times T) \cup (T \times P)\)
is a binary relation, called the relation of the network flow,
- \(W : F \rightarrow N\) is the function of the network share \(\sum (W(f))\) is called the weight of the element \((f)\).

If \(\sum = (P, T, F, W)\) a network location type / transition is called the marking network \(\sum\) any function \(M : P \rightarrow N\) with the property \(M(p) \leq K(p)\), for any \(p \in P\), where \(K : P \rightarrow N \cup \{\infty\}\) is the function of network capacity \(\sum\).

If your network has infinite capacity only when \(N^P\) coincides with the set of applications from \(P\) to \(N\).

A network \(P / T\) is marked by a pair \(\gamma = (\sum, M_0)\), where \(\sum\) is a network of support network \(\gamma\), and \(M_0\) is marking the initial network \(\gamma\).

Network transitions \(\sum\) is considered functions \(t^-, t^+ : P \rightarrow N\) and \(\Delta t : P \rightarrow Z\) defined by:
\[t^-(p) = W(p, t)\]
\[t^+(p) = W(t, p)\]
\[\Delta t(p) = t^+(p) - t^-(p), \text{ for any } p \in P\]
The dynamic evolution of a network known three types of semantics [1]:
1. sequential evolution of the network \(\gamma\) is given by the rule of transition, which consists of:
   - (RA – applicability rule), transition \(t\) it is possible to mark \(M\) in \(\sum\) and note \(M[t]_\Sigma^t\) if there is the relation:
     \[W(p, t) \leq M(p) \quad \text{ and } \quad M(p) + W(t, p) \leq K(p), \forall p \in P\]
   - (RC – calculation rule), marking \(M^t\) is produced by the appearance transition \(t\) marking \(M\) and note \(M[t]_\Sigma^tM^t\), if \(M[t]_\Sigma^t\) and \(M(p) = (M + \Delta t(p)), \forall p \in P\) or \(M^t = M + O(t) - I(t)\)
2. concurrent developments relative to a lot is the easiest way to capture the look of concurrent application of a transition. This method consists in generalizing the concept of "step" through the transition from a transition to a lot of transitions that can be applied competitor of labels.
3. type evolution process [1], type subset does not capture aspects of the concurrent application of competition that transitions herself. This process introduces the concept of a network using network appearances lined.

In many areas of research, studying the behavior of real system not directly, but indirectly, by using the model. The model is characterized by the fact that meet desirable properties of the object or the system under consideration.
Figure 2. Cloud suggestive representation system using Petri.

Figure 2 highlights the entire system manufacturing steps cloud in the ideal case. All the elements used in the simulation are discreet, needle cee difficult to obtain in practice.

In the charts below you can see the change workflow. These activities were carried out at the same time without constraints. Not observed rows of waiting because we are in the ideal case, considered since the beginning of the activity.

Figure 3. Variation in flow in the center of the cloud very active.

Figure 4. Variation in flow in Tracking and control system.

Figure 5. Variation in flow in Description of the elements.

Figure 6. Variation activities within a department.
The intense activity that can be observed is in the collection of information. Here the flow repeat defined beforehand intervals to avoid overlap. It is a dynamic system that must be followed carefully in order to notice errors before starting the manufacture of products required.

![Figure 7. Variation in flow when passing information to the processing center.](image)

4. Conclusions
In this paper was dotted cloud security systems manufacturing. Since the concept of cloud manufacturing is still in an early stage, the investigation focuses on the situation and exploration research problems for different approaches. Errors that may appear to be mitigated since the planning stage. Thus the future to outline a prototype system platform.

The paper is not particularly manufacturing system with centralized resources. Thus manufacturing resource model approached manage production resources based on production capacity. The proposed mechanism is flexible because cloud services are decoupled from production manufacturing resources. Production resources can be located and obtained by production capacities and constraints, which contributes to defining and shaping the dynamic services and automated system that relies cloud.

5. References
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