

SOA as A Possible Way to Heal Manufacturing Industry

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Abstract—Article discusses the use of SOA approaches in solving some problems in production. There are also requirements for industrial production as well as brief description of SOA. According to the requirements of manufacturing will try to point out some possibilities of SOA architecture that could solve some of them. Finally, there is described model situation of problem that may arise in the manufacturing plant. Example consist of classical and SOA solution of concrete problem and consecutive conclusion of determined information.

Index Terms—SOA, services, manufacturing industry, information flow.

I. INTRODUCTION

Nowadays manufacturing companies faced with problems that arise from the rapidly changing market demand. Demand for various goods change too rapidly. Because of this, manufacturing companies to maintain their market position, and of course their profits, they must be able to flexibly respond to such changes. Nature of production is very difficult to change due to used architectures, the diversity of used equipment and technologies in enterprises. Therefore, if enterprises don't want have big loss such change must take place as soon as possible and with minimal a financial cost. This evolution requires considerably more flexibility and adaptability to change than present-day manufacturing systems can afford.

Currently, one third of the total cost of a manufacturing plant over its lifetime is spent on installation and setup. Maintenance downtime accounts for another substantial portion of the operating costs [3].

II. FUTURE REQUIREMENTS OF MANUFACTURING

As has been indicated in previous section, future manufacturing needs will lead to:

- Reduction of costs and time needed for adaptation to market requirements.
- Support of heterogeneous yet interoperable hardware and software environments.
- Cross-enterprise cooperation.
- Scalability by adding resources without disrupting operations.
- A device shall be readily reusable at various

architecture levels.

- It shall be possible to connect devices together without extensive installation procedures (plug-and-play connectivity).
- Interactions shall be made predictable (real-time demands).

III. SOA (SERVICE ORIENTED ARCHITECTURE)

Service-Oriented Architecture (SOA) is an IT architectural style that supports the transformation of your business into a set of linked services, or repeatable business tasks that can be accessed when needed over a network. This may be a local network, it may be the Internet, or it may be geographically and technologically diverse, combining services in New York, London, and Hong Kong as though they were all installed on your local desktop. These services can coalesce to accomplish a specific business task, enabling your business to quickly adapt to changing conditions and requirements.

When SOA implementation is guided by strategic business goals, you ensure the positive transformation of your business and can realize the chief benefits on an SOA, as follows:

- Alignment of IT with the business
- Maximal reuse of IT assets.

Together, these help assure that investment in expensive IT projects result in lasting value to the business [1].

A. Common tangible benefits of SOA

1) Improved integration (and intrinsic interoperability)

SOA can result in the creation of solutions that consist of inherently interoperable services. Utilizing solutions based on interoperable services is part of service-oriented integration (SOI) and results in a service-oriented integration architecture. [2]

2) Inherent reuse

Service-orientation promotes the design of services that are inherently reusable. Designing services to support reuse from the get-go opens the door to increased opportunities for leveraging existing automation logic [2].

3) Streamlined architectures and solutions

The concept of composition is another fundamental part of SOA. It is not, however, limited to the assembly of service collections into aggregate services. The WS-* platform is based in its entirety on the principle of composability [2].

4) Organizational agility

Agility is a quality inherent in just about any aspect of the enterprise. A simple algorithm, a software component, a solution, a platform, a process all of these parts contain a measure of agility related to how they are constructed, positioned, and leveraged [2].

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IV. EXAMPLE USE OF SOA

Following examples shows the differences between classical (used by now) ways and possible advantages of using SOA entry point in manufacturing industry.

A. Model example in nowadays manufacturing

Production line functions certain time without problems. After some time disturbance of some part can appear - for example disturbance of welding arm. After failure is shown with abortion of production, operators which analyze the reasons why and how failure originated are called. Correction of failure is made then - what can in this case means change of welding arm. This change can takes few hours. Production is activated again after elimination of failure.

Problem appears after 2 days when manager, who was

informed by customer about production abortion, comes to production. Customer complains on late delivery of his order.

This problem could have been prevented if manager have knew about abortion of production line. Manager could have placed this production to another production line or could have contacted customer and informed him about possible late delivery or about other solutions.

Prevention of this problem may also be in fact that service engineers know about possible failure forwardly. They are then able to come and solve failure without abortion of production line.

As main problem we can consider communication gap between concrete levels in company but also in individual lays. Figure 1 shows whole process.

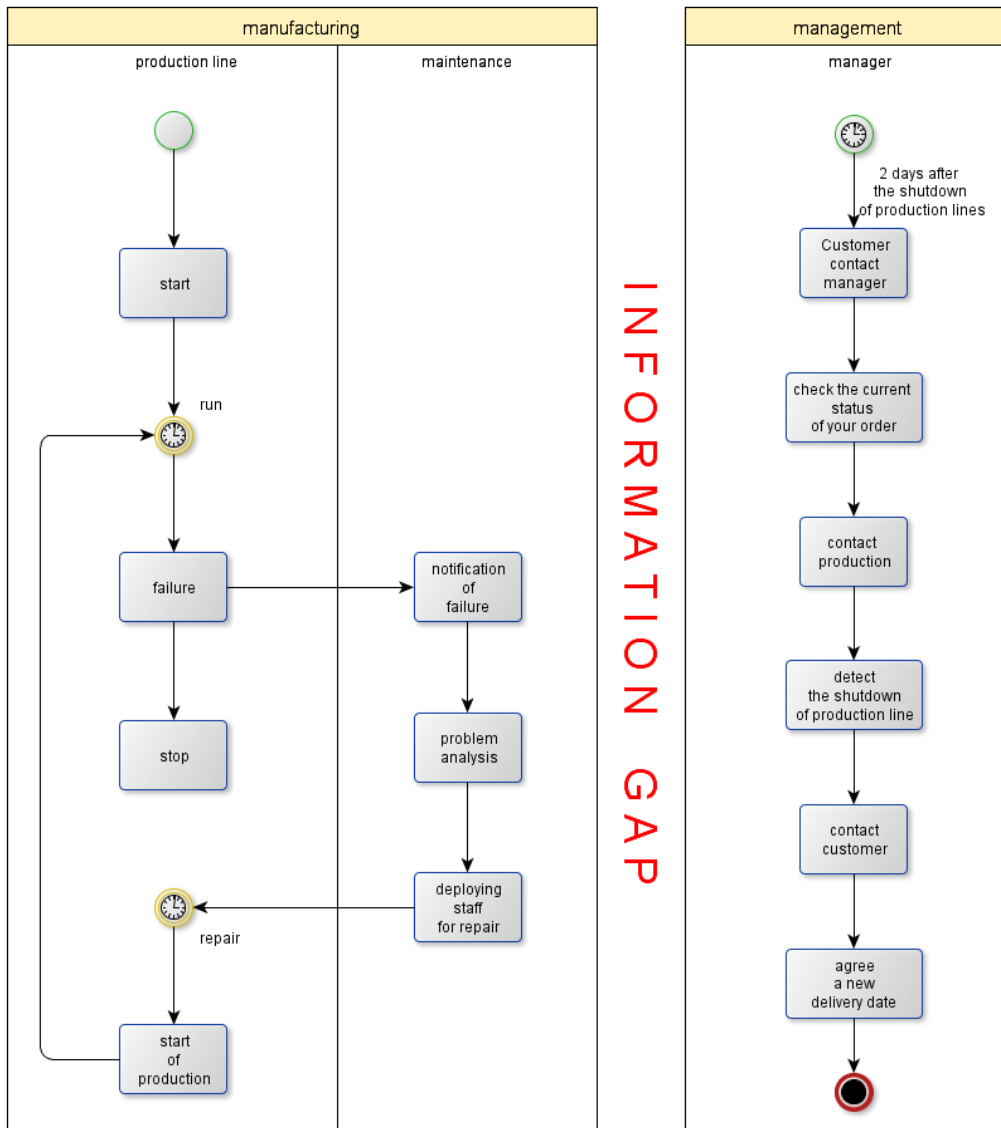


Fig. 1. Model example of production failure in nowadays manufacturing

B. Model example with SOA

The main problem is in information flow between manufacturing and management layer of production business. This may be due to non-existent flow of information between this layers or poor integration process.

The problem in manufacturing layer can be solved through better analysis of production processes. The result of this

analysis would be a list of operations that occur at this level. For such an operation can be regarded as a welding arm information, start and stop the production line, the operation of individual workers and the like. In service-oriented architecture (SOA), these operations (production logic) are transformed to services. Services may be represented by one of the production logic or can also group several operations.

This means a service which will have as name monitorTemperature will consist of the following operations drillTemperature, armTemperature. Service overheatingCount will contain the logic for counting the

overheating of arm. This way it is possible to transform the operations of the production line or the whole production layer.

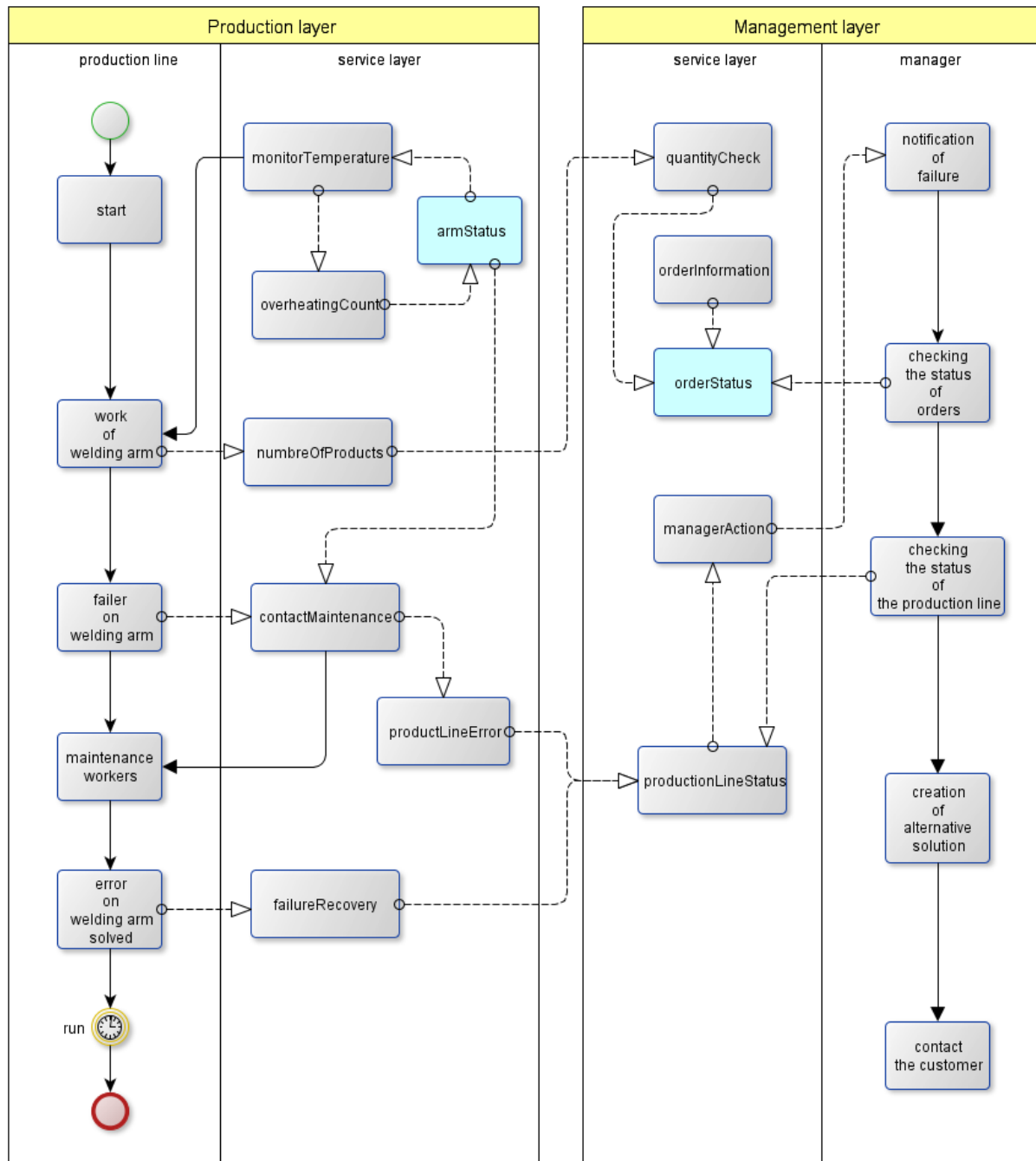


Fig. 2. Model example of production failure when are used services and SOA

The logical arrangement of the various services such as monitorTemperature and overheatingCount can be done by orchestration process. The orchestration create process called armStatus, this process logic will be either represented by a generated UI or it become logic for another service.

Thanks to the service layer in production, management layer get necessary information at the same time as failure on production line appear. Manager can get information about production problem from service productionLineStatus and status of the order from service orderStatus.

With this information a manager needs to develop alternative solutions and contact the customer.

In this case, the information gap between different layers of the manufacturing plant is resolved by individual services (Figure 2.). These provide the necessary flow of information between these layers.

V. CONCLUSION

Article describes the problem on production line when failure of welding arm appears. Production interruptions resulted in a delay in submission order. The big problem is not the delay in submission, but in that accountable manager don't have sufficient information to resolve this situation. Article is

trying through SOA to point out the advantages arising from this architecture. With analysis of the various processes in manufacturing enterprises is possible to create a list of operations that can be transformed into services. These are then available throughout the enterprise thanks to their defining characteristics provided by SOA (reusability, autonomy, loose coupling, ...). Advantages are better flow of information between individual branches included, simpler addition of other services in to system and easier integration - integration not only in one of the enterprise layers but in whole enterprise. Individual services are accessible from particular levels of enterprise because of open standard using's and advantages which brings SOA.

Enterprises like this can better react on market requirements and then easily keep its competitive on market. This may be reached by faster reactions on clients demands and by shorter periods of operation changes, better flow of

information in whole company etc.

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