Chapter 7
Collaboration and Interoperability within a Virtual Enterprise Applied in a Mobile Maintenance Scenario

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ABSTRACT
This chapter presents an infrastructure approach for virtual enterprises developed by the consortium of the European research project ComVantage and discusses its impact with respect to the mobile maintenance domain. The approach focuses on the core aspects of interoperability, which are data interoperability and process interoperability. Regarding the interorganisational access to enterprise data, the authors propose a semantic abstraction layer that is completely decentralised and therefore meets the key requirement of virtuality. The execution of business processes and workflows across organisational boundaries are addressed by the unique App Orchestration Concept.

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INTRODUCTION

In order to master the competition in a global market, companies do not only have to operate more efficiently but need to be much better cross-linked among each other. Moreover, agility in terms of networking and process execution is important (Kim, et al. 2006). The execution of business processes across organisational boundaries as well as cross-linking data sets of collaboration partners are key success factors and initiate the transformation of isolated individual companies towards an integrated, agile virtual enterprise.

By definition of Barnett, et al. (1994), a virtual enterprise is based on a temporary alliance of several businesses. It takes advantage of a market opportunity and dissolves, when it has passed. A virtual enterprise does not have own major resources but it consists of the resources and core competencies of its individual partners.

The European research project ComVantage, which is funded by the European Commission within the Framework Programme No. 7, has the goal to develop an architecture as well as a working prototype of a distributed infrastructure for virtual enterprises. In this chapter, the architecture and the functionality of core components is explained. Moreover, technical and organisational improvements as well as scientific and social impacts are discussed with respect to a specific application area – the domain of mobile maintenance.

CHALLENGES FOR A VIRTUAL ENTERPRISE IN A MOBILE MAINTENANCE SCENARIO

In the following section a representative use case is outlined including a description of pain points, an explanation of an application scenario, a list of aggregated high-level requirements connected with this scenario and finally a description of improvements provided by the application of our prototype.

Mobile Maintenance is a term used for performing maintenance of embedded systems (machines) remotely by using Internet technologies. Today, mobile maintenance is characterised by a couple of pain points. First, a very heterogeneous environment of different machine types and interfaces causes high training costs for service staffs. Second, the current on-site processes related to mobile maintenance are very ineffective. The main cause is an error-prone communication between the client and the maintenance service provider which is currently not well supported by a proper tooling. This often results in improper and imprecise error descriptions and leads later to a wrong pre-selection of spare parts. Regarding the high resource investment in terms of time and money of travelling engineers with high specialisation, unnecessary maintenance operations should be avoided.

As response to the listed pain points and under consideration of the capabilities of a collaboration platform for virtual enterprises using active machines, a comprehensive requirements and scenario analysis has been conducted within ComVantage. Figure 1 visualizes a scenario that describes the application of our prototype in the mobile maintenance domain. The scenario involves three different stakeholders: the manufacturer that produces the machine, the customer that purchases and runs the machine and finally a maintenance service provider.

A central aspect of the scenario is the use of active machines that are equipped with sensors and actuators to permanently monitor their operational status. Thus, active machines are able to identify problems (e.g. sensor values out of thresholds) and send a notification to the service company in order to initiate a maintenance request automatically. In a service landscape that is characterised by heterogeneous machine types, a maintenance coordinator is required to assign appropriate resources (e.g. technicians with relevant skills) to individual maintenance requests. The maintenance coordinator is able to decide on
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