

# Chapter 95

## Event–Driven Service–Oriented Architectures for E–Business

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### INTRODUCTION

E-Business research and practice can be situated on following multiple levels: applications, technological issues, support and implementation (Ngai and Wat 2002). Here we consider technological components for realizing business processes and discuss their foundation architecture for technological enabling. The article provides an introduction to the terms, techniques and realization issues for event-driven and service-oriented architectures. We begin with a definition of terms and propose a reference architecture for an event-driven service-oriented architecture (EDSOA). Possible applications in the area of E-Business and solution guidelines are considered in the second part of the article.

Service-oriented Architectures (SOA) have gained momentum since their introduction in the last years. Seen as an approach to integrate heterogeneous applications within an enterprise architecture they are also used to design flexible and adaptable business processes. An SOA is designed as a distributed system architecture providing a good integration possibility of already existing application systems. Furthermore, SOA is mostly suitable for complex and large system landscapes.

As no single agreed-upon definition of SOA exists, we will use here the SOA understanding as stated in (Schröpfer and Schönherr 2008): “SOA is an architecture style that combines elements of software and enterprise architectures. Its main components are services that are autonomous as well as interoperable and provide re-usable functions via a technically standardized interface. Services can

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interoperate and exist on all layers of an application system like business process, presentation, business logic, data management layers. Services can be aggregated or coupled based on lower-level services. These can be derived from existing IT systems but also designed and implemented from scratch.” This definition already provides the important SOA characteristics such as:

- Service encapsulation: the functionality presented by the service is not visible. Only the interface describing service behavior is stated
- Loose coupling: Services are designed and can work individually, so that they do not rely on each other’s functionality
- Service autonomy: a service can be managed independently from other components
- Reusability: a service may be reused within other business process of several enterprises
- Service composition: services can be combined to more complex processes or to a complete business process
- Service discovery: services need to be described and stored for future search and reuse.

A service is encapsulated business functionality, that can’t be decomposed without harming its functionality. Further SOA definitions are provided by OASIS and OpenGroup including reference designs (OASIS 2006, OpenGroup 2006).

SOA can be realized using different technologies. Web Services ((W3C)) are often associated with service-orientation and are one of the technologies a SOA can be built upon. Intensely discussed in industry and research, SOA is often seen as an IT revolution. In these discussions the context of already existing distributed architectures based on object-orientation (Erl 2008) or agent technology is often overseen. Thus, SOA is an evolution towards distributed, business process- oriented

architectures considering the steady development towards distributed approaches to software and application integration architectures. Also seen as an integration technology, Enterprise Service Bus (ESB) (Erl 2008) is often used to combine existing applications. It allows an integration of already existing enterprise applications making the communication structures more simple and transparent.

Event-driven architecture is often regarded in the context of SOA. Even the term SOA 2.0 is used to describe the combination of service- and event-orientation. Event-driven architecture (EDA) is based on the publish/subscribe principle and therefore enables loose coupling of the architectural components. Elements of an EDA are triggered by incoming events and are not necessary aware of the existence of further components.

Electronic communication and IT-supported implementation of business processes are the main issues in electronic business (E-Business). A fast and transparent order and request processing are essential elements of the business success and are important elements of the competitive advantage of the enterprise. Since a significant number of requests need to be processed by the enterprise, a high automation level needs to be considered. This business environment is often characterized by a distributed and complex IT-structure, high number of incoming requests, need for nearly real-time reaction and multiple interaction partners (e.g. customers, suppliers, etc.) that are linked to each other by the E-Business enterprise itself. Bundling and processing these activities requires not only well defined business processes but also a strong support from the IT architecture-side.

EDA provides a suitable structure to spread and handle numerous incoming events. Instances interested in an event can subscribe for notification, therefore the addressee does not need to be identified or searched for. Complex Event Processing (CEP) (Luckham and Frasca 1998) tools allow for event combination and interpretation. This technology enables correlation and analysis

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