

# Services, Components, Interfaces, and Layered Architectures

## Specification, Composition and Refinement

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**Abstract.** Based on the FOCUS theory of distributed systems (see [Broy, Stølen 01]) that are composed of interacting components we introduce a formal model of services and layered architectures. In FOCUS a component is a *total* behaviour. In contrast, a service is a *partial* behaviour. We show how to describe layers by assumption/commitment specifications. A layer in a layered architecture is a service with two service interfaces, an import and an export interface. A layered architecture is a stack of several layers. For this model of services and service layers we work out specification and design techniques for layers and layered architectures. We study the application of the notions of a service and service layer and its relation to object orientation. Finally we discuss more specific aspects of layered architectures such as refinement and error handling as well as layer models in telecommunication.

**Keywords.** Service Engineering, Assumption/Commitment Specifications, Software Architectures, Layered Architecture, Protocol-Stack

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