

# **The Smart Data Server**

## **New Concepts and Practical Usage of a Middleware-Architecture**

**Dissertation**

**Dipl.-Inform. Uwe Roth**

**Faculty IV  
Computer Science Department  
University of Trier**

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## **Abstract**

The history of distributed systems and applications has brought out various technologies: Client-server-architectures, peer-to-peer-networks and component-systems are only some representatives. The presented work is settled in the field of middleware-architectures, a currently strong attended branch of distributed applications. As an intermediary between applications on the one side and databases, eMail-systems or other kind of servers on the other side, middleware-systems bridge those two worlds to a heterogeneous IT-environment. It hides details and changes of the environment and creates a transparent access to it.

Research has created a lot of technologies in the field of middleware and focuses on different points. One view on middleware focuses on developers and tries to support them during the development of applications and solutions. For that reason, interfaces to the server and to the server-infrastructure and the embedding of services to the middleware come to the fore. The internal structure and the internal data flows of the middleware-architecture serve only to satisfy these aims.

Another view targets the inner structure in the center of research. The aim is the creation of flexible and extendable server-structures as the efficiency to inner process-flows and data-flows. With it is an easy adaption to different environments possible is and the ability to adapt to different performance characteristics of clients.

The middleware-architecture "Smart Data Server (SDS)" that has been created during the work of this thesis implements concepts that combines those both these views.

One main focus aside the creation of new concepts was the ability of practical usage of the developed middleware. The work shows that the Smart Data Server can proof the usability

of its concepts under real practical conditions. Furthermore, it displays which aspects are really needed for a practical mission.

A second main focus was the creation of mechanisms to process requests on streaming-basis. Normally one transmits a request to the server, which then calculates an answer and transmits the answer after that. Requests on streaming-basis transfer aside parameters a continues data stream with an unknown dimension. The server starts its calculations if possible before the data transmission ends and retransmits results as soon as possible to the client. The demand of memory inside the server can now be optimized because only the amount of data that is actually needed to start and continue calculations has to be allocated and not the entire request.

The development of a streaming-mechanism has demands in the structure of the requests as in the architecture of the middleware. The Smart Data Server fulfills these pre-conditions with the introduction of a streaming-based RPC. Additionally, there must be a server-architecture that is able to process streaming-RPCs.

Here lies the third main focus of the thesis: The creation of flexible and extensible server-structures as efficient processing of internal workflows and data-flows under the restriction of the requirements of streaming-based RPCs. These requirements can be fulfilled with the new technology of inner workflow-programs. These kinds of workflow-programs represent networks of highly independent server-components. While changing these networks, new server-structures are possible to adapt to different environments. Aside static networks of server-components, a pipeline of data-streams can be created to get the ability to process streaming-based-RPCs.