

StepStream[®] Integration Server

A lean framework for system integration

Summary: Increased demands on communication are resulting in an ever-increasing interconnectedness. Linking systems via classic point-to-point connections leads to complex system environments, which are difficult to maintain. Business process modelling helps to visualize the requirements and reengineering helps to optimize the processes, but the overall complexity of system landscapes can hardly be reduced by these techniques.

A solution to the problem is Application Integration (AI) with a software that decouples systems by acting as a hub. The total number of interfaces is reduced and the system complexity decreases from square to linear, resulting in shorter implementation times and lower cost of operation.

To achieve this reduction in system complexity, it is not sufficient to support technical features only like good connectivity concerning protocols and data formats, scalability, high availability, load balancing, etc.: a concept is needed, that supports logical decoupling by terms of the business regarded.

StepStream Integration Server (IS) fulfils the requirements of such an AI-System. It supports the design of business specific formats and mapping rules. During runtime it provides transparency of data, monitoring of processes and assists in error tracing and error correction. As a result of its platform independence, IS easily blends in with existing infrastructures and adapts to increasing requirements.

StepStream IS is therefore particularly suited in environments where information in different representations has to be exchanged between systems.

Point of Departure

In a globalized world, increasing communication requirements together with the need for shorter reaction time, lead to an ever-increasing interconnectedness. This development has led to a confusing multitude of differing formats, concepts and concept definitions.

The vision of an all-encompassing, standardized software to bridge this diversity of formats and concepts may never come true: Different business units request specialized software solutions for their tasks, which develop at different rates or are replaced by new systems.

Especially the IT is affected by this trend, and is being torn in the triangle of low budgets, project deadlines and its own demand for high quality. Business knowledge has to be acquired quickly, lessening the time to build up sustainable IT solutions.

Heavyweight J2EE based integration servers with high pre-requisites for hardware and personnel are as little a resort, as tackling the problem along the way with Data Warehouses, which mostly cover only part of the problem and rather increase the need for communication, data transformation and straight through processing.

StepStream IS – Approach

With an increasing number of systems involved, the traditional method of point-to-point connections induces a high interconnection complexity. The number of connections can significantly be reduced by introducing a central distributor (hub).

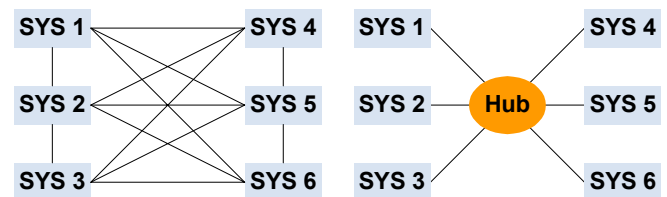


Fig. 1: System coupling and System decoupling

Besides technical decoupling it is important to delegate business tasks to the hub to achieve a certain degree of business decoupling. Thus, the hub should handle common business data transformations and enforce communication standards. StepStream IS is an AI-Software, that allows the efficient coupling and decoupling of systems in the described way. The following features stand out:

- Support for Business Functionality
- Transparency
- Ease of Integration
- Modularity

Support for Business Functionality

In contrast to other AI-Systems StepStream IS supports the modelling of business functionality to a much larger extend. Characteristics:

- Business system dependent and independent formats (neutral format)
- Technical and business transformation rules allowing for multi-stage mappings
- Definable error and correction processes

StepStream IS is therefore particularly suited in environments where translation of information and problems in data quality are issues.

Transparency

Transparency within data processing lessens the workload in operations and allows to improve the often fluctuating quality of data. Characteristics:

Comprehensibility of data via:

- The use of legible formats (XML)
- A Business Repository incl. neutral formats
- Extensive preservation of source and target representations through translation (mapping)

Monitoring of the processing progress and status by means of comprehensive logging:

- Active – notification on errors
- Passive – protocol and data analysis

Traceability and Reproducibility of data and transports by means of systematic:

- Archiving of processed data
- Reprocessing of incorrect data after necessary corrections

Ease of Integration

StepStream IS smoothly fits in heterogeneous system landscapes and allows the use of existing technical infrastructure and personnel by:

- Platform-independent implementation
- The use of common open standards
- Avoiding close integration with systems in favour of message-passing
- The use of message queuing systems for buffered message transmission.

Modularity

The component based architecture offers substantial advantages over monolithic approaches:

- Easy maintenance by using only the necessary components
- High availability of the entire system even when parts thereof fail due to maintenance or external influence
- Good scalability
- Extensibility – incorporating new components without influencing the entire system

StepStream IS – Architecture

StepStream IS consists of multiple independent processes that are largely configurable. This, in conjunction with the multithreaded process architecture, guarantees optimal load distribution on Multiprocessor servers. Additionally, StepStream can be almost linearly scaled over multiple servers by duplicating or distributing components that may induce bottlenecks.

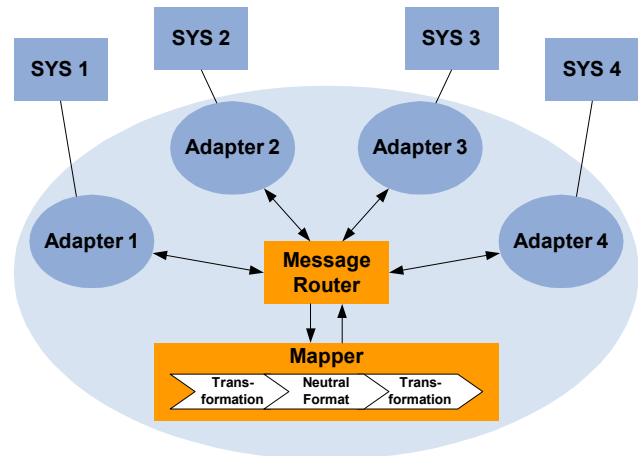


Fig. 2: Independent processes

All StepStream components are implemented in Pure Java and are thus able to operate on a wide variety of systems (Unix, Windows).

Data is transported as XML-messages, making it easily readable to users and software.

Inter-component communication is usually done via JMS, although other techniques are available. Existing message queuing systems provide technical transaction security. Thus, even the failure of a component would not be critical, since the data is buffered by the underlying queuing system and remains there until the component is available again.

StepStream works asynchronously¹ and consists of numerous components. The desired transports are achieved by combining them in the required manner. Typical messaging modes are: Produce-Consume, Request-Reply

Components can be monitored (e.g. SNMP, email messaging).

Server

The server is responsible for handling the data transports at runtime. It provides mechanisms for controlling, monitoring and analysis.

- Router – transports data from source to target
- Mapper – converts to/from neutral format
- Archiver – archives messages (data)

¹ Synchronous communications can be simulated by means of non-blocking acknowledgements in the adapter.

- LogServer – records the status and errors
- Planner – ensures the data delivery sequence
- Scheduler – initiates timed transports
- Redoer – supports error handling

Connectivity

Technical adapters connect to external data sources or do technical data conversions.

- Protocols: FTP, SMTP, POP3, IMAP, HTML
- APIs: JMS², JDBC, Filesystem, SAP JCO
- Formats: XML, CSV, flatfile, special formats

Technical Adapters are often combined with each other to achieve a special purpose, e.g.:

- JMS → flatfile → XML
- XML → CSV → FTP

Business Connectivity and Repository

The repository contains neutral and system-similar source and target formats, as well as information about structure and value mapping.

Business Adapters are implemented on top or in conjunction with Technical Adapters and maintain a system-similar representation of the business data as far as possible. Often it is possible to implement the complete business logic by simply customizing data in the repository.

StepStream IS – Development

While it is often possible to create new business solutions by plugging together some components and do some customizing, software development is rarely plug-and-play.

Main emphasis in software development with StepStream IS is to relieve the IT professional of technical tasks. That way he can focus on business issues, which finally leads to shorter time to production.

Besides extensive usage of well known open standards and open source (e.g. XML, Java, Apache tools), this is achieved by:

- StepStream Framework
- StepStream Libraries

Framework

The Framework is a container where all technical and business components plug in. It introduces an abstraction layer for resources and other features like:

- Communication channels
- Database connections
- Threading granularity
- Logging granularity and surveillance

² JMS allows communication via common message-queuing systems (e.g. IBM MQSeries®).

- Exception handling
- many more

A developer simply implements special interfaces within this framework and doesn't have to take care of the environment, since resources are typically configured during deployment or runtime.

The framework is configured via an easy to read XML configfile and controls an instance of a JVM, called a Steplet. A Steplet implements either an adapter in StepStream IS or a technical or business component.

Libraries

Not all functionality has to be developed from scratch. Instead a developer can fall back on a rich library of components and converters.

StepStream IS – Operations

StepStream is a lean message oriented middleware. Although typically used in hub scenarios, it is scalable from simple single process up to clustered multi machine configurations.

Due to its platform independent implementation it easily fits into existing infrastructures.

Since most of the features are configurable - even during runtime - StepStream IS features a high availability and is easy to maintain, resulting in lower cost of operation.

- Surveillance / notification (SNMP, email, etc.)
- Communication channels (JMS queues, filesystem, sockets, FTP, etc.)
- Logging granularity and destination (files, messages, NT eventlog, unix syslog, etc.)
- Performance tuning and load balancing
- Format converters and mapping

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