University of Heidelberg
Institute for Computer Science
Working group database systems

Bachelor thesis

Messaging Architecture for Integration of Customer Self-Services

Name:	Jonas Gann
Matriculation number:	3367576
Supervisor:	Prof. Dr. Michael Gertz
Date of submission:	October 8, 2020

I assure that I have written this bachelor thesis on my own and only used the specified sources and resources and that I followed the principles and recommendations "Responsibility in Science" of the University of Heidelberg.

Date of Submission: October 8, 2020

Zusammenfassung

Abstract

Contents

1 Introduction

1.1 Motivation

1.1.1 Example(s) of CSS Problems Today

1. CSS incomplete in governmental administration
    a) identity card renewal
    b) change of home address
    c) change of residency status
2. CSS incomplete in universities
    a) transfer of profile: grades, certificates, etc. between universities
    b) applications in general (study place, semester abroad, ...)
3. CSS different for each enterprise / organization
    a) multiple identities
    b) multiple profiles => addresses, phone numbers, mail address
    c) time consuming to manage same information in all systems

1.1.2 Solution for CSS Problems

1. One CSS providing company, which integrates multiple / all EA
2. One identity, profile, address, phone number, location, ...
3. Easy management of identity used by multiple enterprises / organizations

1.1.3 Integration necessity

1. Each enterprise / organization has its own identities, profiles, etc. in multiple systems

2. The CSS providing company needs to manage those systems / data of each enterprise / organization

3. Enterprise Integration solves this Problem

1.2 Goals of the work

1.2.1 Integration Challenges

1. Heterogeneous Enterprise Architecture Systems
    a) Different Applications
    b) Different Application Vendors
    c) Different / No Application Interfaces
    d) Legacy Systems
2. Different (proprietary) data models within and between Enterprises and Organizations
    a) Different (property)name for same data objects (syntactic integration)
    b) Different meanings for same (property)name (semantic integration)
3. Stability of Integration
    a) Future Changes of EA
    b) Scalability
    c) Failure of EA or Integration Components
4. Scarce Resources
    a) Integration Development Speed
        i. Necessary Development <=> Reuse of existing Technology
        ii. Complexity / Size of Integration
    b) Maintenance of finished Integration
    c) Hardware / Software Costs of Integration
        i. Licenses for Software
        ii. Scalability of Integration => Necessary Computing Power

1.2.2 Presented Solutions

1. Messaging Integration
   a) Loose Coupling
      i. Loose Coupling simplifies adaption to changing EA => simpler Maintenance
      ii. Loose Coupling simplifies integration of new EA systems => integration of heterogeneous EA
      iii. Loose Coupling allows Reuse of "Modules" => faster development
   b) Messaging enables communication with many systems through Adapters
   c) Messaging provides mechanisms for Stability
      i. Store-and-Forward
      ii. Load Balancing
2. Integration Patterns
   a) Patterns speed up construction of Integration Architecture
   b) Patterns are proven solutions
   c) Patterns abstract from concrete technologies
      i. Simplifies understanding of integration concept
      ii. Allows implementation with different technologies

1.3 Structure of the work

2 Foundation and related work

2.1 Customer Self-Service

2.1.1 Definition

1. Definition in the context of the thesis

2.1.2 Documentation

1. How can CSS-Scenarios be documented?

2.1.3 List of Scenarios

2.1.4 Purpose in Thesis

1. Finding relevant EAPs
2. Requirement analysis of business Connector
3. Interface definition of business connector

2.2 Architecture Patterns

2.2.1 Definition

1. Definition
2. Metadata
3. Views
4. Architecture bricks
5. Data bricks
6. Business processes

2.2.2 Purpose in Thesis

1. Basis for real-life enterprise architectures
2. Provides architecture and data bricks the integration can build up on

2.2.3 Architecture- and Data bricks

1. Description of EAPs used in the thesis
2. Reasons why each EAP is relevant for CSS
    a) Derived by comparing CSS-Scenarios with business processes
3. Architecture bricks and data bricks of EAPs relevant for CSS-Scenarios
4. Documentation of resulting Architecture and data bricks

2.2.4 Requirements of Enterprise Architecture

1. List of requirements towards the integration Architecture
    a) Adapters for systems
    b) Required Format of incoming data

2.3 Business Connector

2.3.1 Definition

1. Provides functionality of "external" service provider
2. Purpose is to simplify integration
3. Can be assumed to provide sufficient interfaces

2.3.2 Purpose in Thesis

1. Provides interface for CSS functionalities
2. Should be integrated in architecture and data bricks

2.3.3 Documentation

1. How to document the business Connector in this context
2. List of provided functionalities along with their interfaces
   a) Derived from CSS-Scenarios
   b) Derived from IDAS Connector
3. List of requirements regarding the EA
   a) Access to architecture and data bricks
4. List of requirements regarding the integration Architecture
   a) Format of data
   b) Order of delivery
   c) Time relevance of data
   d) Guaranteed delivery of data

2.4 Integration Patterns

2.4.1 Definition

1. Messaging Methodology
2. Patterns describe often solved messaging problems

2.4.2 Purpose in Thesis

1. Already explained in Motivation?

2.4.3 Patterns used in Thesis

1. Description of Patterns later used in the integration architecture

3 My contribution

3.1 Overview

3.2 Requirements

3.2.1 Requirements of Enterprise Architecture

3.2.2 Requirements of Business Connector

3.2.3 Requirements of Integration System

3.3 Scenario Integrations

1. Look at integration architecture for each CSS-Scenario

3.3.1 Integration Architecture Documentation Method

1. Entity Diagram(s)
2. Flow Diagram(s)
3. etc.

3.3.2 Scenario1

1. Description of Scenario

Scenario1 Integration Architecture

1. Entity Diagram(s)
2. Flow Diagram(s)
3. etc.

System Integration

1. Explanation how the systems are integrated
2. Why was each pattern used?
3. How are requirements met?

Data Integration

1. Explanation how the data objects are integrated
2. Why was data transformed / mapped?
3. How are requirements met

3.3.3 Scenario2

Scenario2 Integration Architecture

System Integration

Data Integration

3.4 Operating Manual

4 Experimental evaluation

4.1 Customer Landscape

4.2 Customer Requirements

4.3 Integration

4.3.1 Using the Operating Manual

4.3.2 Relevant Bricks

Data Bricks

Architecture Bricks

4.3.3 Resulting Integration

Integration Documentation

System Integration

Data Integration

4.4 Evaluation

4.4.1 Satisfaction of Requirements

Enterprise Architecture Requirements

Customer Requirements

Business Connector Requirements

Integration Architecture Requirements

4.4.2 Resource-Heaviness

Required time for application

Size of Resulting System

Increasing cost due to scaling

5 Summary and outlook

Bibliography