Replication Mechanism of ZEMIS Ref

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ZEMIS

What is ZEMIS?

Zentrales Einwohner Migrations-System

- Manages immigrant data
- Lots of interfaces

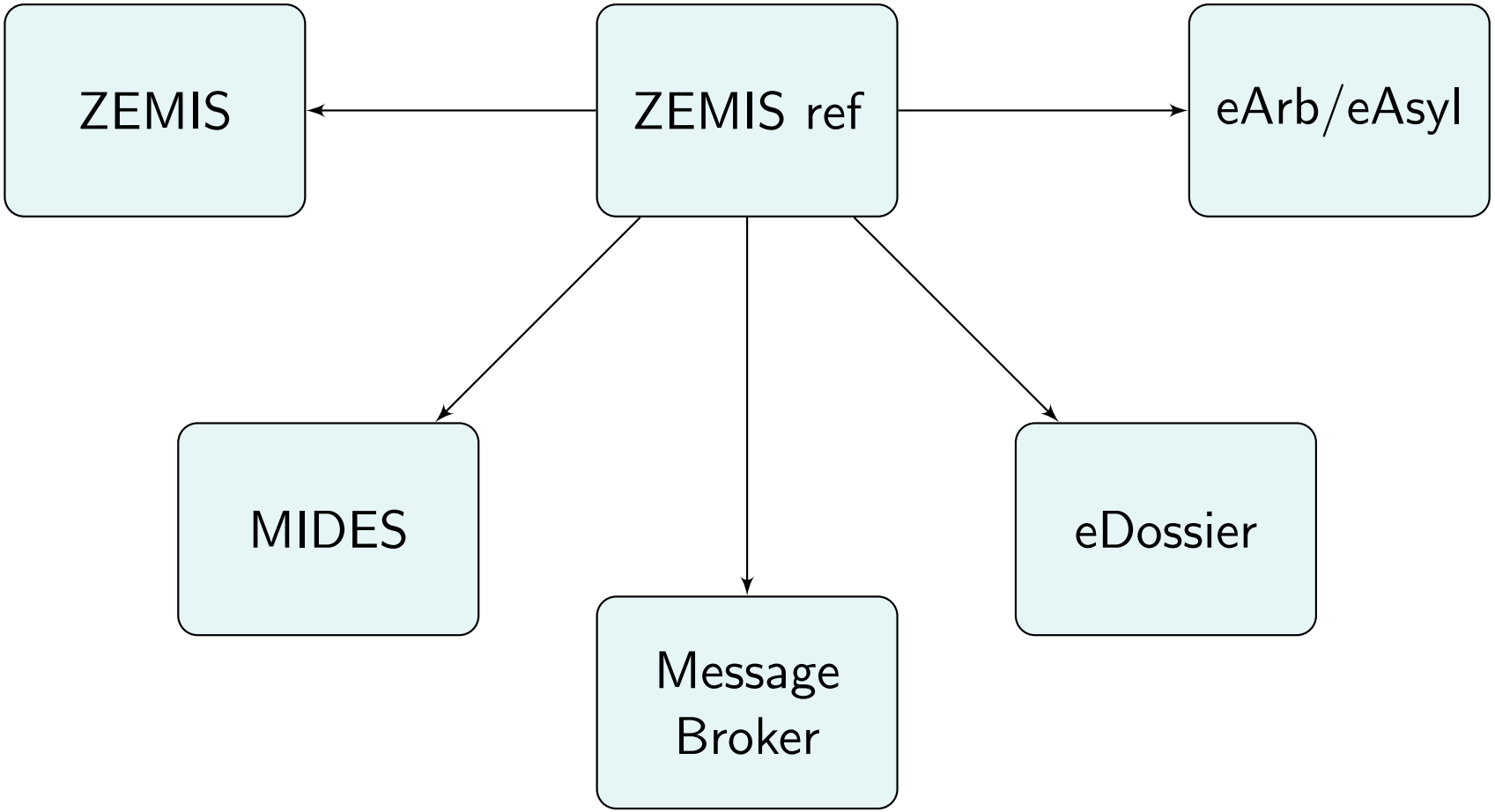
ZEMIS Ref

What is ZEMIS Ref?

"ZEMIS Referenzdatenverwaltung"

- Administration application for so called 'reference data'
- About 380 tables with relational dependencies
- Several applications use the data

ZEMIS Ref - Overview



Reference Data

What is reference data?

Data in the ZEMIS application landscape which ...

- is shared among applications
- supports multi-lingual text content
- controls application behaviour
- is used to interpret data from ZEMIS (e.g. nation codes)
- changes only occasionally

Problems

- Replication issue: Direct database access to clients
- New applications outside scope of project ZEMIS
- Web framework End-Of-Life since 2013 $\Rightarrow$ security risks
- Business logic integrated into web layer $\Rightarrow$ rewrite required

Replication: Current State

Push architecture with direct database access

ZEMIS Ref replicates changes directly into the client's db

- Direct database access
- Client - data mapping
- Database connection and schema
- ZEMIS Ref release required to add new clients
- Tight coupling - makes changing the schema complex
- Robust, no synchronization issues, failures are detected, no heavy workload

Replication: Variant 1

Push architecture with web service

ZEMIS Ref pushes changes via web service

- Client - data mapping
- No direct database access
- Coupling loosend, schema can be changed
- Dynamic subscriber list
- Clients need to provide web service
- Robust, no synchronization issues, failures are detected, no heavy workload

Replication: Variant 2

Direct pull architecture (on the go)

Clients pull each time they need information

- Always up do date
- Permission and authentication instead of mapping
- No direct access to database
- No need to store the ref data
- Robustness low, heavy workload possible $\Rightarrow$ performance requirements

Replication: Variant 3

Pull architecture with caching

ZEMIS ref offers web service, clients pull and cache the data

- No direct access to database
- Deltas can be pulled
- Loose coupling, clients can be added easily, schema can be changed
- Clients can have differing data $\Rightarrow$ conflicts
- Robustness medium high

Replication: Variant 4

Push notify to pull architecture with web services

ZEMIS ref pushes notifications about updates, clients pull if needed

- No direct access to database
- Loose coupling: Easy to add new clients, schema can be changed
- No heavy workload, responses can be scheduled
- Clients need to know whether to pull or not
- Robustness good, no differing data
- What if one client doesn't get a notification?

Replication: Variant 4

Push notify to pull architecture with web services

ZEMIS ref pushes notifications about updates, clients pull if needed

- Publish-subscribe pattern
- Web service for ZEMIS ref and clients $\rightarrow$ overkill?
- Use real publish subscribe like JMS or RabbitMQ instead

Current Work

- Data is sent via SOAP as XML
- Basic XSD and WSDL are done
- Building prototypes to test the variants

XML Request Example (Variant 1)

```xml
<?xml version="1.0" encoding="UTF-8" standalone ="yes"?>
<x:multipleTablesRefDataRequest xmlns:x="http://ejpd.admin.ch/sem/zemis/refdataservice/types/v1">
    <x:clientName>MIDES</x:clientName>
    <x:startDate>2017-06-13T09:00:00</x:startDate>
    <x:requestedTable>
        <x:tableName>Gemeinde</x:tableName>
        <x:modifiedOrNew>true</x:modifiedOrNew>
    </x:requestedTable>
</x:multipleTablesRefDataRequest>
```

XML Response Example (Variant 1)

```xml
<?xml version="1.0" encoding="UTF-8" standalone ="yes"?>
<x:refDataResponse xmlns:x="http://ejpd.admin.ch/sem/zemis/refdataservice/types/v1">
    <x:table name = "Adressdaten">
        <x:row index = "1" status="new">
            <x:active>true</x:active>
            <x:entry column = "last name" dataType="alphanumerisch">DJ</x:entry>
            <x:entry column = "first name" dataType= "alphanumerisch">Bobo</x:entry>
            <x:entry column = "adress line 1" dataType="alphanumerisch">Hauptstrasse 33</x:entry>
            <x:entry column = "adress line 2" dataType="alphanumerisch">4108 Witterswil</x:entry>
            <x:entry column = "phone number" dataType="numerisch">0610123456</x:entry>
            <x:entry column = "swissJN" dataType="boolean">J</x:entry>
            <x:entry column = "birth date" dataType="datum">08.08.1988</x:entry>
        </x:row>
        <x:row index = "2" >
            <x:active>true</x:active>
            <x:entry column = "last name" dataType="alphanumerisch">Doe</x:entry>
            <x:entry column = "first name" dataType= "alphanumerisch">John</x:entry>
            <x:entry column = "adress line 1" dataType="alphanumerisch">Münstergasse 14</x:entry>
            <x:entry column = "adress line 2" dataType="alphanumerisch">4053 Basel</x:entry>
            <x:entry column = "phone number" dataType="numerisch">0790123456</x:entry>
            <x:entry column = "swissJN" dataType="boolean">N</x:entry>
            <x:entry column = "birth date" dataType="datum">09.09.1999</x:entry>
        </x:row>
        <x:row index = "3" >
            <x:active>false</x:active>
            <x:entry column = "last name" dataType="alphanumerisch">Dupont</x:entry>
            <x:entry column = "first name" dataType= "alphanumerisch">Pierre</x:entry>
            <x:entry column = "adress line 1" dataType="alphanumerisch">Maienweg 11</x:entry>
            <x:entry column = "adress line 2" dataType="alphanumerisch">4055 Basel</x:entry>
            <x:entry column = "phone number" dataType="numerisch">0760123456</x:entry>
            <x:entry column = "swissJN" dataType="boolean">J</x:entry>
            <x:entry column = "birth date" dataType="datum">09.09.1999</x:entry>
        </x:row>
    </x:table>
</x:refDataResponse>
```

Future Work

- Test the prototypes
- Determine which variant to use
- Define next steps

Challenges

- Variants are quite complex
- Several stakeholders with different views
- Government reference architecture has to be met

Summary

- ZEMIS ref administrates reference data shared among applications
- Decapsulation of ZEMIS ref and its clients
- Developed several approaches to solve the issue