



Projekt “Mural”

ein

Open Source Framework

für

MPI-Lösungen

TMF Workshop “ID-Management”, 15.12.2008

Heiko Lemke
Sun Microsystems

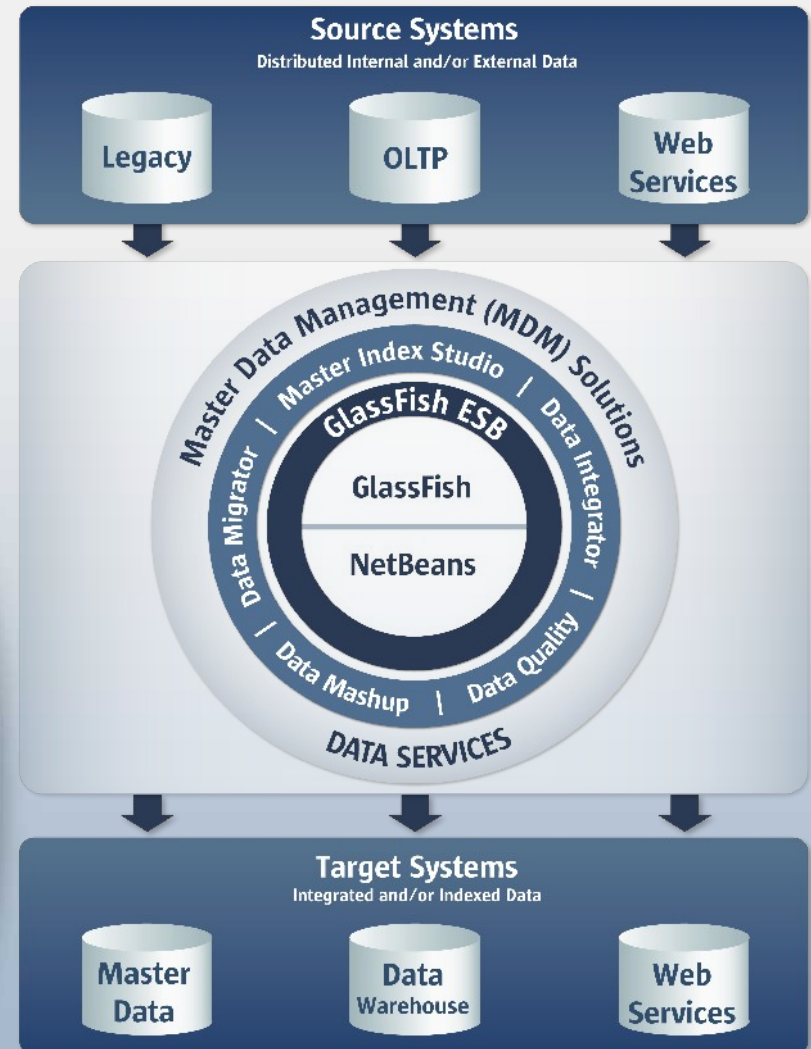


Agenda

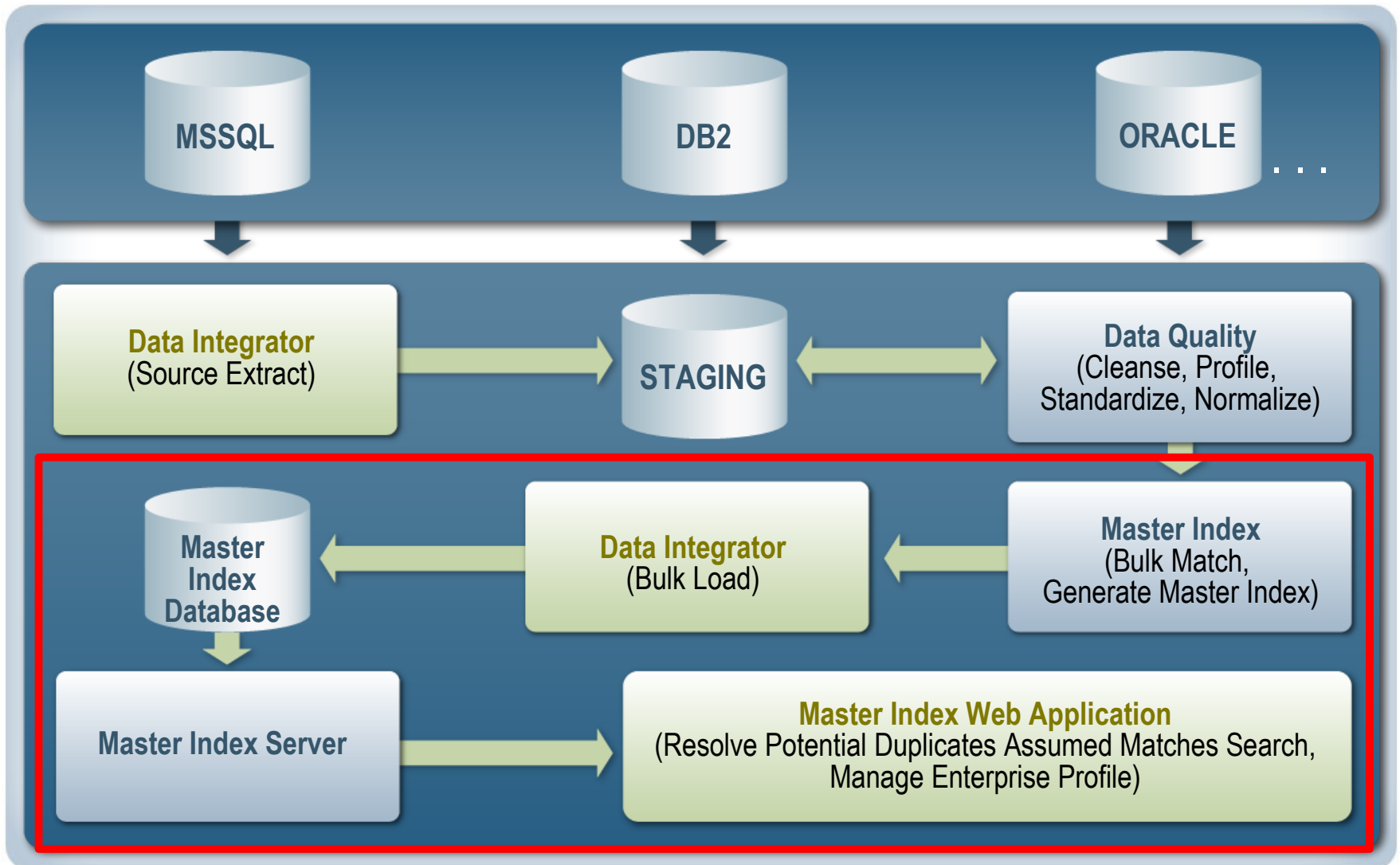
- **Überblick Projekt „Mural“**
- **Die Technologie in der Praxis**
- **Erstellung einer Master (Patient) Index Anwendung und Integration**
- **Kommerzielle und IHE konforme Optionen**

Mural – Die Open Source MDM Community

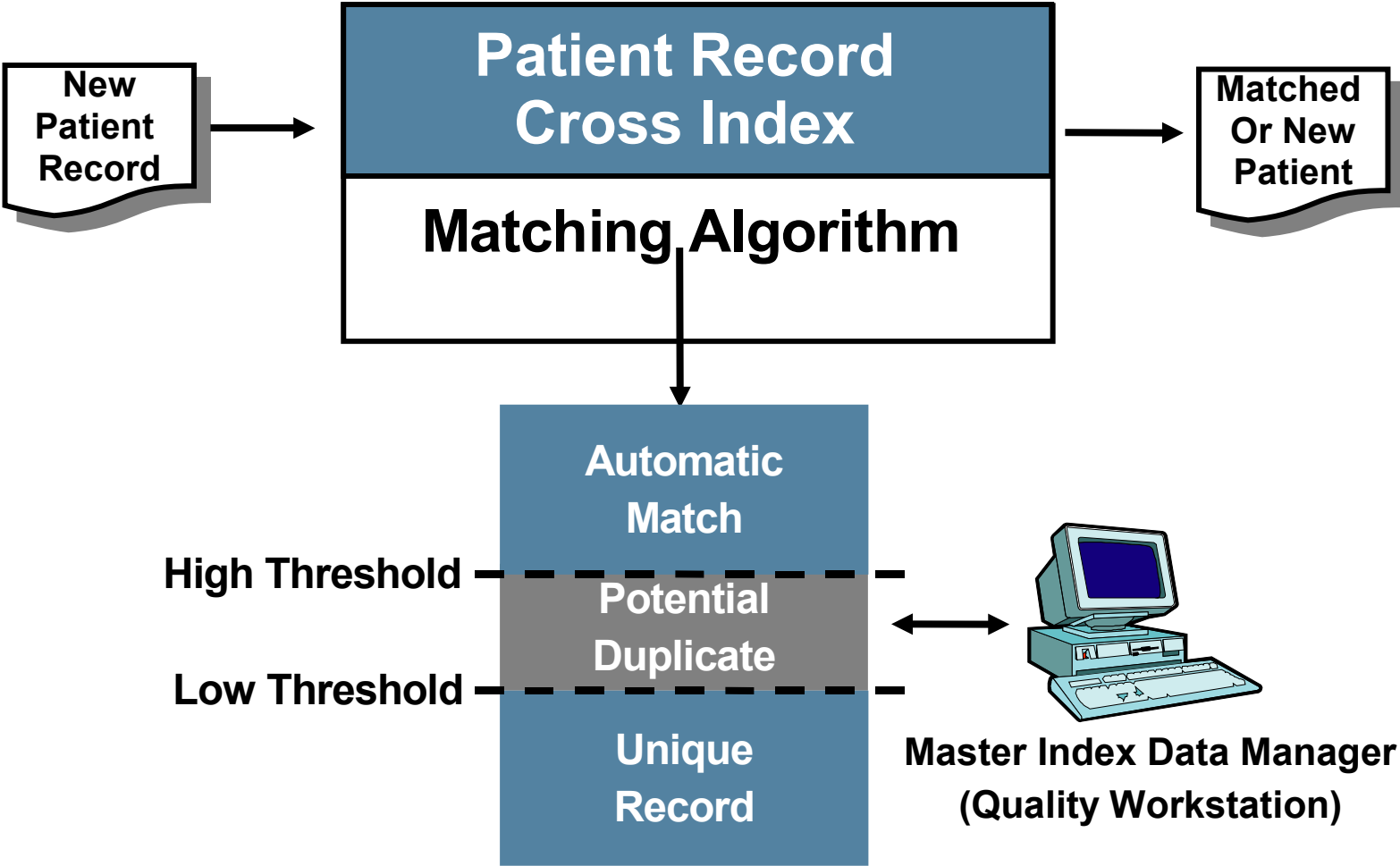
- **Master Index Studio** – Rahmen für die Definition des Modells, der Attribute und Services für die Referenz Daten
- **Data Integrator** – Bietet extract-transform-load (ETL) Funktionalität für eine Vielzahl von Datenquellen
- **Data Quality** – Matching, Standardisierung, Normalisierung und Cleansing Fähigkeiten
- **Data Mashup** – Server seitige Daten Aggregation und Komposition
- **Data Migrator** – Migration von Daten Objekten über Instanzen hinweg



Create Workflow – Unterstützung durch GUI Tools



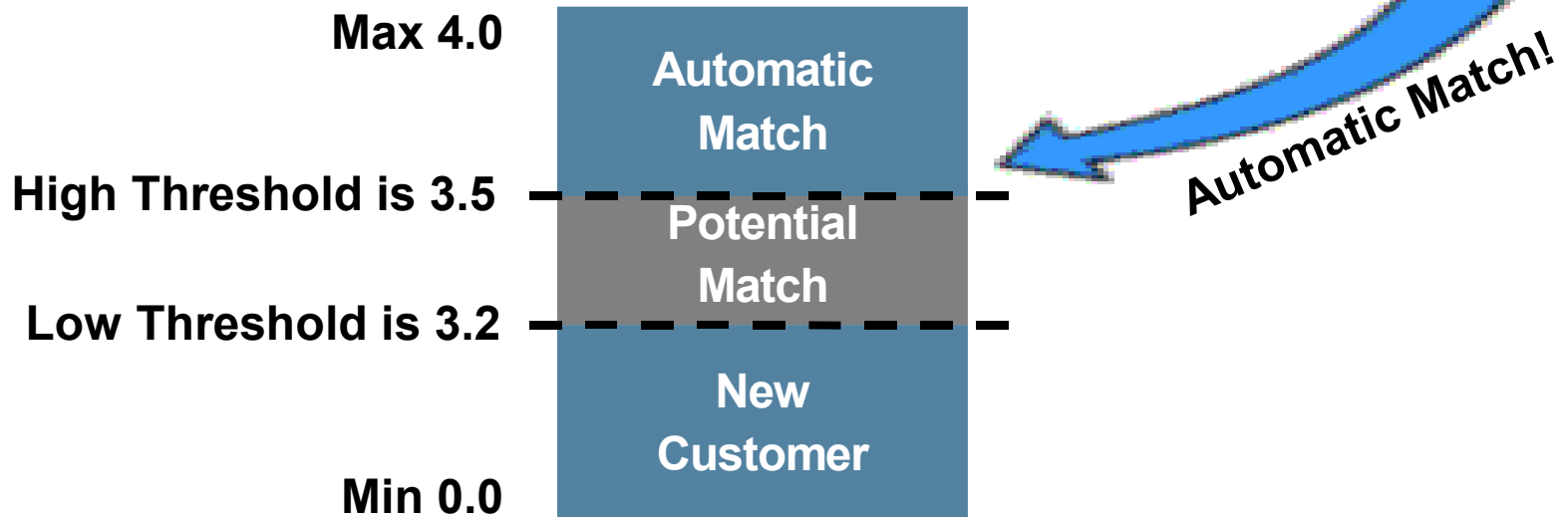
Probabilistic Matching Logic



Simplified View of the Matching

	First Name	Last Name	Date of Birth	Address Information
Record #1	<i>Harald</i>	<i>Smith</i>	<i>12/15/65</i>	<i>123 Elm Street</i>
Record #2	<i>Harold</i>	<i>Smith</i>	<i>12/15/56</i>	<i>123 Elm St.</i>

Weight (0 to 1) = 0.9 + 1 + 0.7 + 1 = 3.6 Total



Mural Master Index Highlights

- Intuitive grafische Entwicklung
- Flexible Architektur des Index-Records, Templates für Patienten u.a.
- Automatische Generierung von
 - > Laufzeitkomponenten
 - > Admin-Applikation (Web-GUI) - Enterprise Data Manager
 - > Datenbank-Schema
 - > Integrationsobjekte, Webservice-Interface, Java API
- Konfigurierbarer "Survivor Calculator"
- Vordefinierte, konfigurierbare Strategien für
 - > Standardisierung, Normalisierung, Matching
- Komplette Transaktionshistorie (inkl. Unmerge-Funktion)
- Automatische Update Notifications (Add, Update, Merge)
- Auditing
- Nahtlose Integration in Enterprise Service Bus
- ETL Massendaten-Load inkl. Nutzbarkeit der Data Quality Funktionen

Die Technologie im praktischen Einsatz

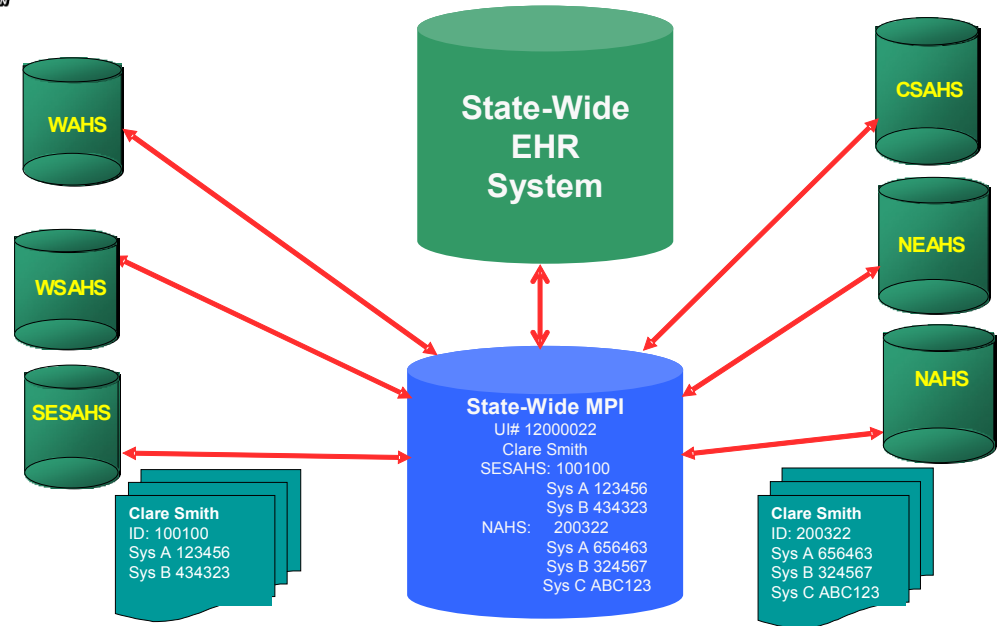
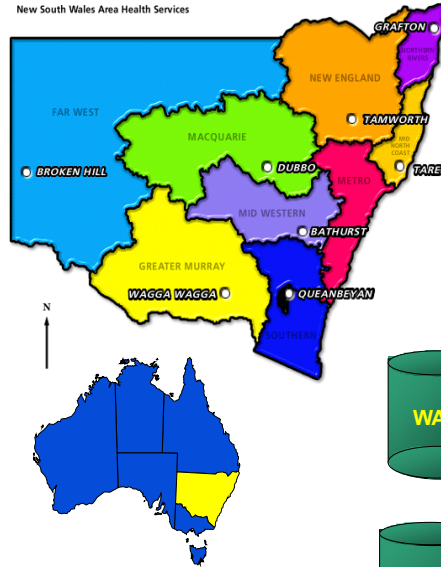
Projektbeispiele

Staatenweite Gesundheitsnetze in Australien – Beispiel: New South Wales (seit 2001)

NSW HEALTH

- Estimated population of 7,500,000 people in NSW
- 3 existing UI sites
 - (WSAHS, SESAHS, WAHS)
 - *Currently talking to NSAHS, SWSAHS*
- Proposing 20 Area Health Service UI's & 1 Corporate Statewide UI
- Includes Deaths from Births, Deaths, & Marriages Registry

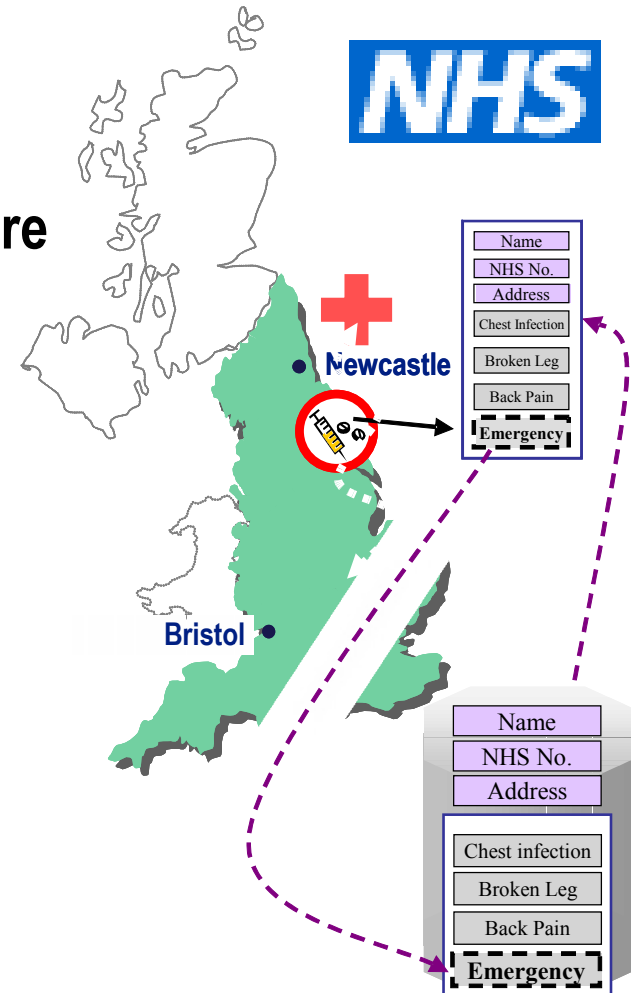
New South Wales Area Health Services



Sun Technologie unterstützt das größte Integrationsprojekt der Welt

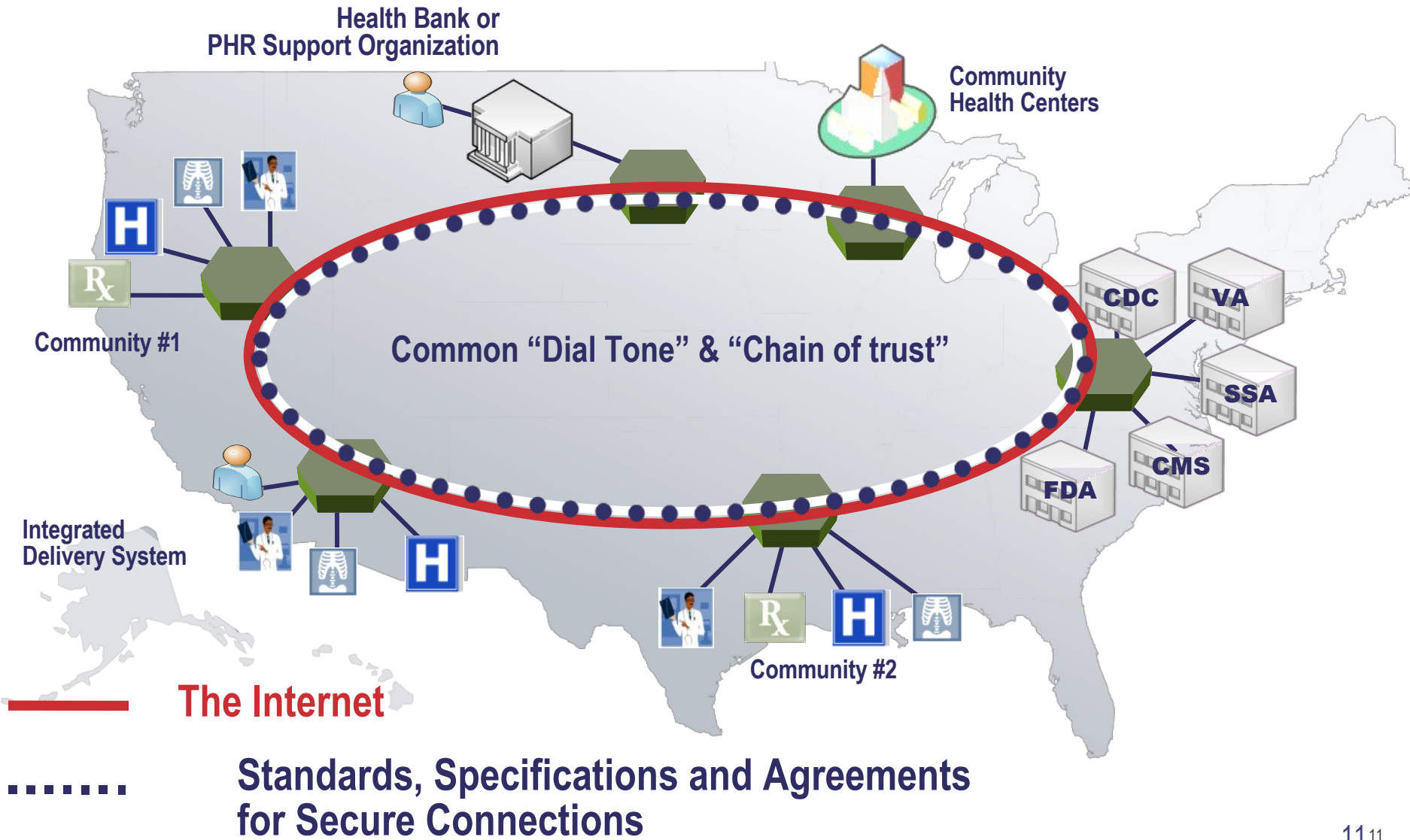
Integration-Backbone für UK National Healthcare

- **50+ Millionen Patienten** mit einer lebenslangen elektronischen Patientenakte
- **56 - 66 Milliarden Nachrichten pro Jahr**
- Anbindungen von 250 Krankenhäusern
- 600,000 Nutzer (Ärzte, Med. Personal, Wissenschaftler)
- 10,000 Systeme
- 40,000 Anwendungen
- **Zentraler Person Demographic Service**



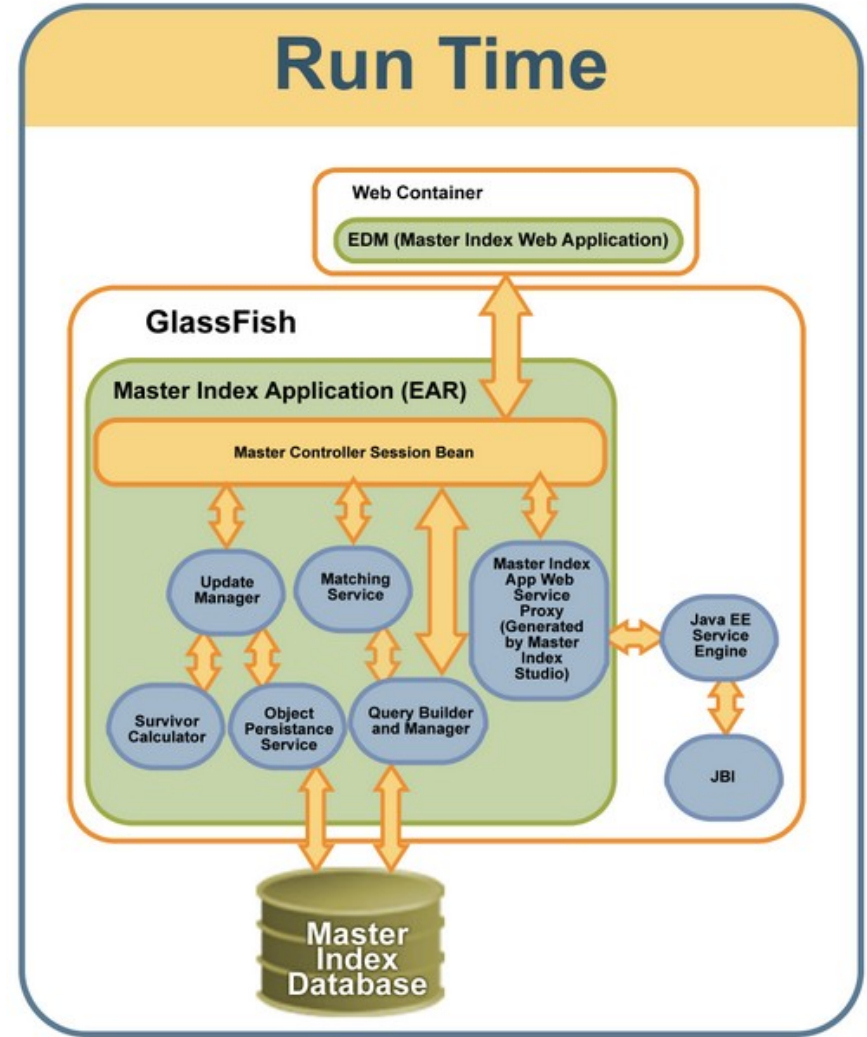
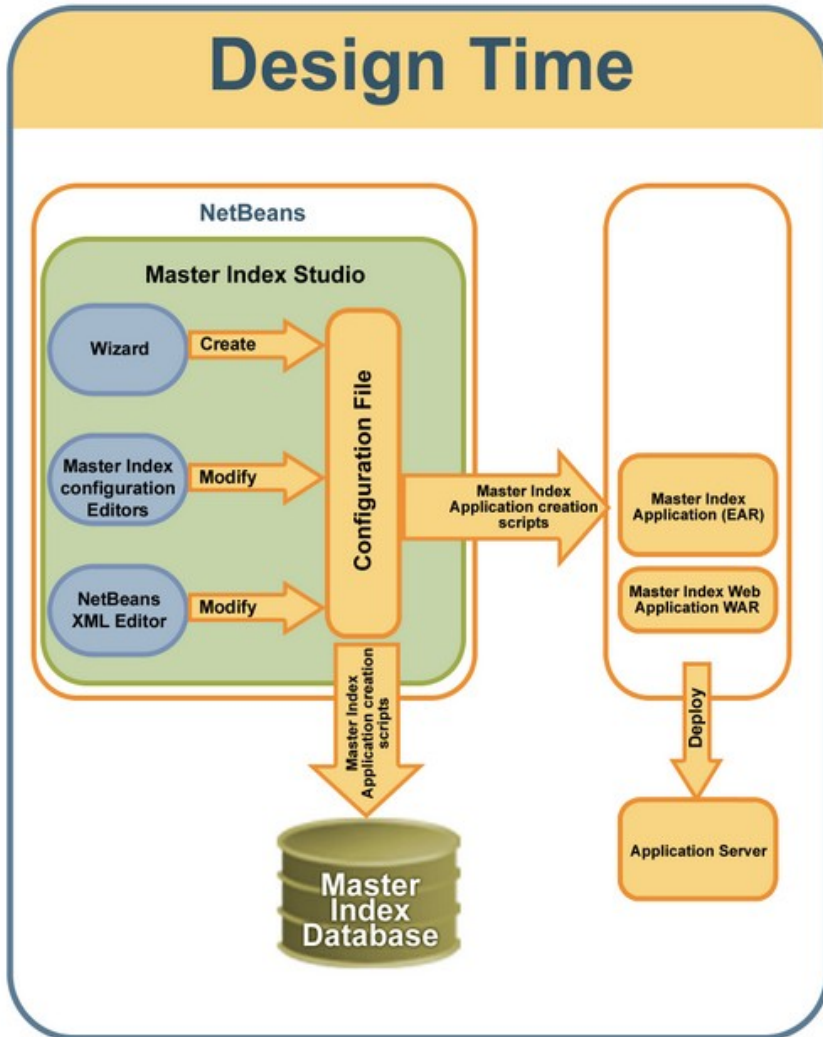
USA – NHIN The Nationwide Health Information Network

Sun's Open Source stack has been selected for NHIN-C(onnect)



Vom
Design zum
Deployment
einer individuellen
Master (Patient) Index Applikation

Master Index Komponenten



Specific Definition of Master Index Record Structure, Field Properties, Matching -> Generate Application

Object Definition

- MPI
 - ◆ FirstName
 - ◆ FirstName_Std
 - ◆ FirstName_Phon
 - ◆ MiddleName
 - ◆ LastName
 - ◆ LastName_Std
 - ◆ LastName_Phon
 - ◆ Title
 - ◆ SSN
 - ◆ DOB
 - ◆ Death
 - ◆ Gender
 - ◆ MStatus
 - ◆ Religion
 - ◆ Language
 - ◆ Maiden
 - ◆ PobjCity
 - ◆ PobjCountry
 - ◆ Status
 - ◆ Dod
 - ◆ Citizenship
 - ◆ Address
 - ◆ AddressType
 - ◆ AddressLine1
 - ◆ AddressLine1_HouseNo
 - ◆ AddressLine1_StdDir
 - ◆ AddressLine1_StdName
 - ◆ AddressLine1_StdPhon
 - ◆ AddressLine1_StdType
 - ◆ City
 - ◆ PostalCode
 - ◆ CountryCode
 - ◆ Phone
 - ◆ PhoneType
 - ◆ Phone

Matching Query Standardization Normalization Phoneticized Fields

Probability Type: Use Agree/Disagreement Weight Ranges Duplicate Threshold: 7.25

Match Threshold: 18.4

Fields with Match Type Selected

Field	Match Type
MPI.FirstName_Std	FirstName
MPI.LastName_Std	LastName
MPI.Address.AddressLine1_StdName	StreetName
MPI.Address.AddressLine1_HouseNo	HouseNumber
MPI.Address.AddressLine1_StdDir	StreetDir
MPI.Address.AddressLine1_StdType	StreetType

Matching Rules:

Match Type	Match Size	Function	Agreeme...	Disagree...
PrimaryName	30	Simplified String Comparator	13	-2
OrgTypeKeyword	25	Simplified String Comparator	8	
AssocTypeKeyword	25	Simplified String Comparator	5	
LocationTypeKeyword	20	Simplified String Comparator	5	
IndustryTypeKeyword	25	Simplified String Comparator	7	
AliasList	25	Simplified String Comparator	7	
IndustrySectorList	200	Simplified String Comparator	5	
Url	30	Simplified String Comparator	8	
StreetName	25	Simplified String Comparator	11	
HouseNumber	8	Simplified String Comparator - ...	11	
StreetDir	15	Generic String Comparator	7	
StreetType	10	Generic String Comparator	7	
FirstName	15	Simplified String Comparator - ...	10	
LastName	15	Simplified String Comparator - ...	10	
String	25	Simplified String Comparator	10	

Add R

- Build
- Clean and Build
- Clean
- Generate Master Index Files**
- Generate Loader Zip
- Generate Cleanser Zip
- Generate Profiler Zip
- Undeploy and Deploy
- Set as Main Project
- Open Required Projects
- Close
- Find... Strg+F
- Explore From Here
- Properties

Object Definition

- MPI
 - ◆ FirstName
 - ◆ FirstName_Std
 - ◆ FirstName_Phon
 - ◆ MiddleName
 - ◆ **LastName**
 - ◆ LastName_Std
 - ◆ LastName_Phon
 - ◆ Title
 - ◆ SSN
 - ◆ DOB
 - ◆ Death
 - ◆ Gender
 - ◆ MStatus
 - ◆ Religion
 - ◆ Language
 - ◆ Maiden
 - ◆ PobjCity
 - ◆ PobjCountry
 - ◆ Status
 - ◆ Dod
 - ◆ Citizenship
 - ◆ Address
 - ◆ AddressType
 - ◆ AddressLine1
 - ◆ AddressLine1_HouseNo
 - ◆ AddressLine1_StdDir
 - ◆ AddressLine1_StdName
 - ◆ AddressLine1_StdPhon
 - ◆ AddressLine1_StdType
 - ◆ City
 - ◆ PostalCode
 - ◆ CountryCode
 - ◆ Phone
 - ◆ PhoneType
 - ◆ Phone

Object

Name: LastName

Data Type: string

Match Type: None

Blocking:

Key Type:

Updateable:

Required:

Field Size: 40

Pattern:

Code Module:

User Code:

Constrained By:

EDM

Display Name: Nachname

Input Mask:

Value Mask:

Accessing the MPI Functionality

Using the WebService or Java Interfaces and default DataManager Application

MPI_Demo

- MPI_Demo-ejb
 - Enterprise Beans
 - Java Collaborations
 - Web Services
 - MPIEJBService
 - executeMatch: MatchColResult
 - executeMatchUpdate: MatchColResult
 - searchExact: SearchMPIResult[]
 - searchPhonetic: SearchMPIResult[]
 - searchBlock: SearchMPIResult[]
 - getEnterpriseRecordByEUID: EnterpriseMPI
 - getEnterpriseRecordByLID: EnterpriseMPI
 - getSBR: SBRMPI
 - getEUID: String
 - updateSystemRecord: void
 - updateEnterpriseRecord: void
 - addSystemRecord: void
 - mergeEnterpriseRecord: MergeMPIResult
 - getSystemRecord: SystemMPI
 - getSystemRecordsByEUID: SystemMPI[]
 - getSystemRecordsByEUIDStatus: SystemMPI[]
 - getLIDs: SystemMPIPK[]
 - getLIDsByStatus: SystemMPIPK[]
 - lookupLIDs: SystemMPIPK[]
 - mergeSystemRecord: MergeMPIResult
 - activateSystemRecord: void
 - activateEnterpriseRecord: void
 - deactivateSystemRecord: void
 - deactivateEnterpriseRecord: void
 - transferSystemRecord: void
 - lookupPotentialDuplicates: PotentialDuplicateResult[]

MPI_Demo-war

- Web Pages
- Configuration Files
- Server Resources
- Source Packages
- Test Packages
- Libraries
- Test Libraries

master index
data manager

Benutzername

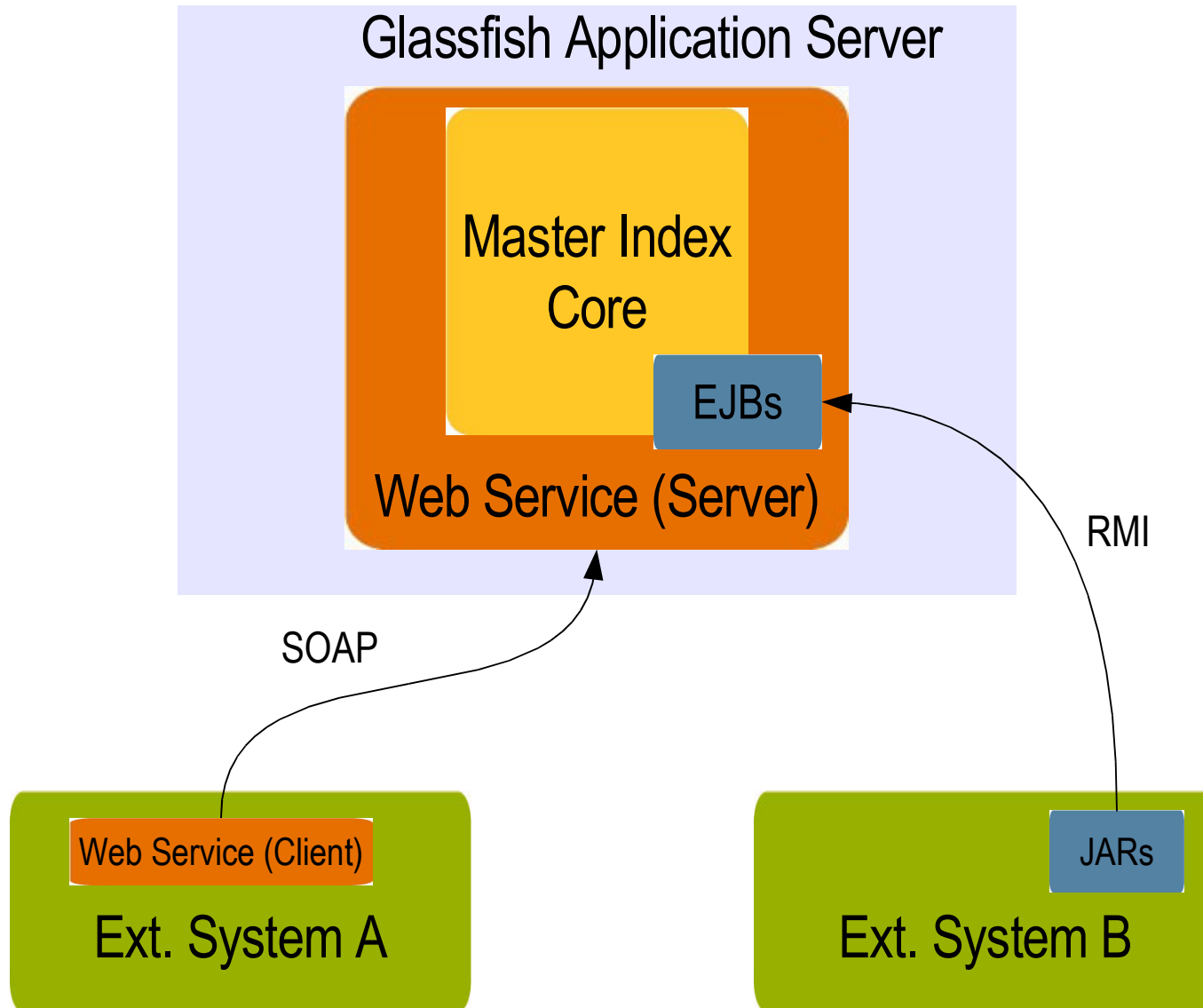
Kennwort

Anmeldung

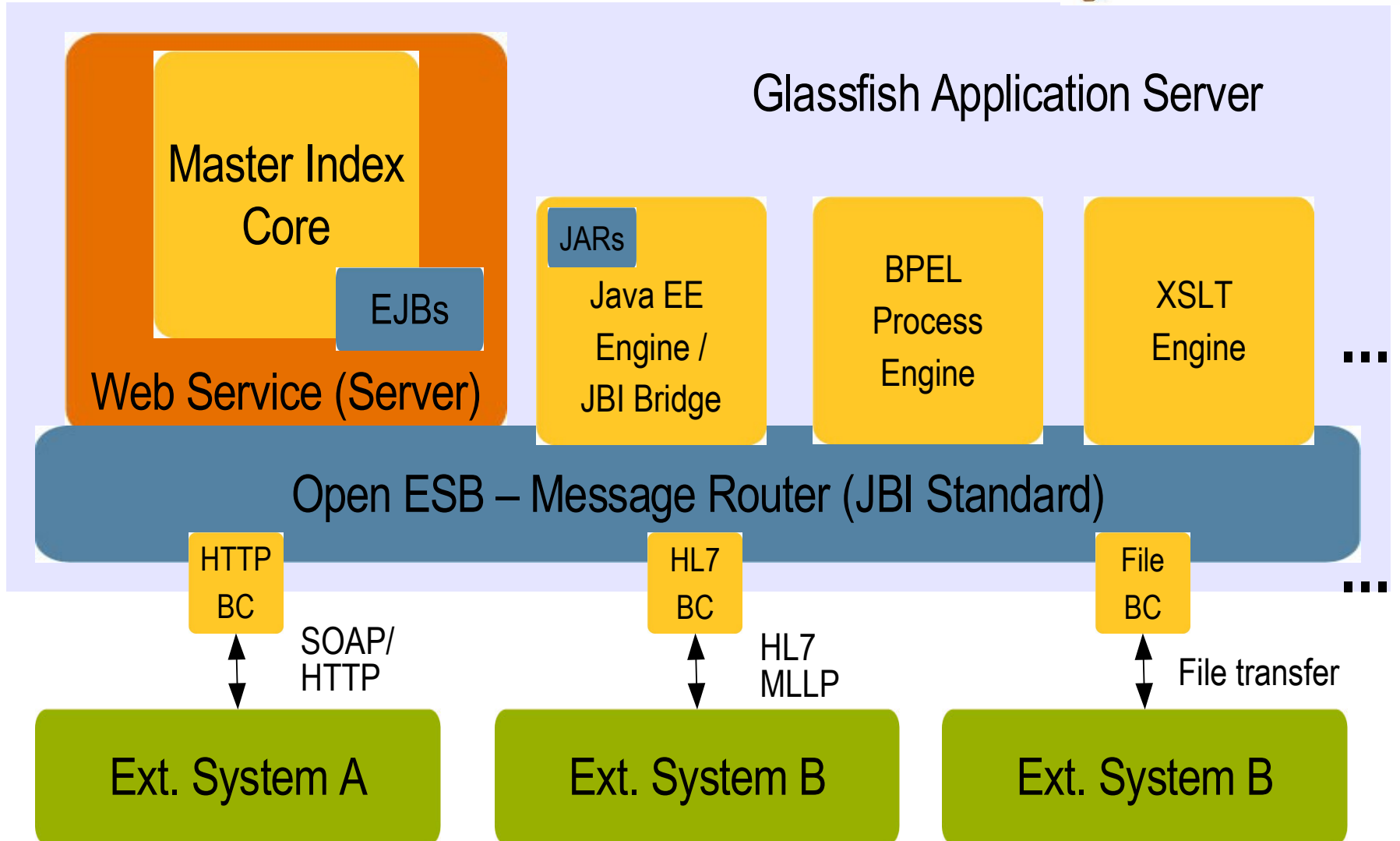
Integration

der generierten
Master-Index-Applikation
in die Systemlandschaft

Nutzung des WebService-Interfaces oder Java API



Nutzung des Open ESB als Integrationswerkzeug



Kommerzielle und IHE - konforme Optionen

Kommerzielles Produkt als MDM Suite in Sun Java CAPS

Community Contribution

Open Source

OPEN ESB
 OPEN SSO
 OPEN DS
 MURAL
 NETBEANS
 GLASSFISH
 PROJECT METRO

Sun MDM Suite

Portal

Master Data Management

Master Index

CUSTOMER | PATIENT | SUBSCRIBER | CITIZEN | IDENTIFIER

Identity Matching

Orchestration

WORKFLOW &
EXCEPTION MANAGEMENT

Data Quality

CLEANSING &
STANDARDIZATION

Data Integration

EXTRACT | TRANSFORM | LOAD

Enterprise Service Bus (f.k.a eGate)

MEDIATION | ADAPTERS | ROUTING | TRANSFORMATION

Infrastructure

MESSAGE
SERVER

APPLICATION
SERVER

DIRECTORY
SERVER

SINGLE
SIGN-ON

IHE Master Patient Index (PIX/PDQ)

Template mit Java CAPS

Lösung mit Sun ESB + Master-Index
(ehem. eGate/eView):

Definition auf Basis HL7 v2

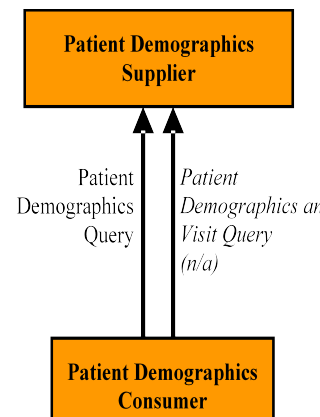
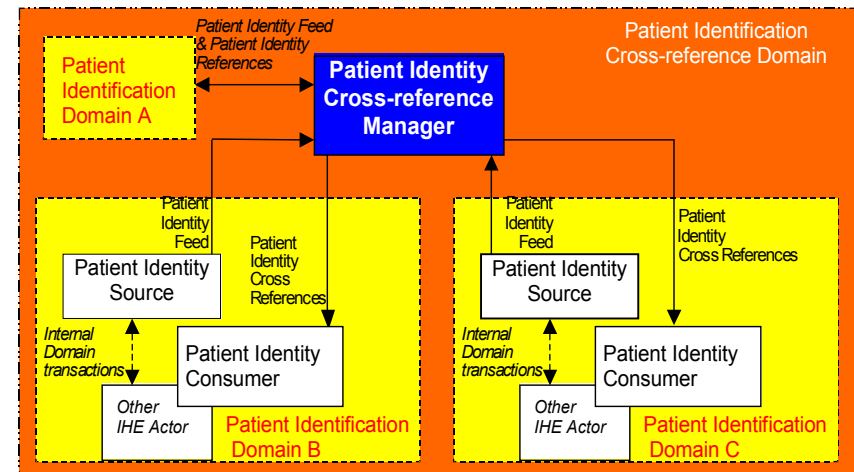
- v2.3.1 (Feeds, Updates)
 - ADT Registration and Update Trigger Events (A01,A04,A05,A08,A40)
 - Notification of Identifiers Lists Updates (ADT^A31)
- 2.5 (Queries)
 - Queries for Corresponding Demographics (ADT^Q22/K22)
 - Queries for Corresponding Identifiers (ADT^Q23/K23)

Geplant bis zum IHE NA Connectathon 2009:

- Refactoring auf Basis Open Source (OpenESB, Mural -> CAPSv6)
- Funktionserweiterungen (z.B. ATNA)

Definition auf Basis HL7 v3

- Äquivalente HL7v3 (XML) Messages
- Webservice-Kommunikation (SOAP)



Vielen Dank

Visit:

<http://openesb.dev.java.net>

<http://mural.dev.java.net>

<http://www.sun.com/mdm>





Backup Slides

Master Index Konfiguration

Matching Engine Configuration

Match-Fields/Rules, Standardization, Normalization, Phonetics

Properties

Matching Query Standardization Normalization Phoneticized Fields Deployment

Probability Type: Use Agree/Disagreement Weight Ranges Duplicate Threshold: 7.25

Match Threshold: 10.0

Fields with Match Type Selected

Field	Match Type
MPI.FirstName_Std	FirstName
MPI.LastName_Std	LastName
MPI.Address[*].AddressLine1_StdName	StreetName
MPI.Address[*].AddressLine1_HouseNo	HouseNumber
MPI.Address[*].AddressLine1_StdDir	StreetDir
MPI.Address[*].AddressLine1_StdType	StreetType

Matching Rules:

Match Type	Match Size	Function	Agreem...	Disagre...
PrimaryName	30	Condensed String Comparator	13	-2
OrgTypeKeyword	25	Condensed String Comparator	8	-6
AssocTypeKeyword	25	Condensed String Comparator	5	-3
LocationTypeKeyword	20	Condensed String Comparator	5	-3
IndustryTypeKeyword	25	Condensed String Comparator	7	-4
AliasList	25	Condensed String Comparator	7	-3
IndustrySectorList	200	Condensed String Comparator	5	-4
Url	30	Condensed String Comparator	8	-4
StreetName	25	Condensed String Comparator	11	0
HouseNumber	8	Advanced Jaro Adjusted for House...	11	0
StreetDir	15	Advanced Jaro String Comparator	7	-2
StreetType	10	Advanced Jaro String Comparator	7	-2
FirstName	15	Advanced Jaro Adjusted for First N...	10	-4
LastName	15	Advanced Jaro Adjusted for Last N...	10	-4
String	25	Condensed String Comparator	10	-10

Add Remove Edit...

Properties

Matching Query Standardization Normalization Phoneticized Fields Deployment

Standardization Types

Standardization Type	Source Field(s)
Address	MPI.Address[*].AddressLine1

Standardization Type

Data Type: Address

Domain Selector: com.sun.mdm.index.matching.impl.MultiDomainSelector

Variant Field Name: Select...

Variants

Value	Variant:
Default	US

Add... Remove Edit...

Source field(s) to be standardized

MPI.Address[*].AddressLine1

Add... Remove

Target mappings

Target Field Name	Standardization Components
MPI.Address[*].AddressLine1_HouseNo	HouseNumber;RuralRouteIdentif;BoxIdentif
MPI.Address[*].AddressLine1_StdName	MatchStreetName;RuralRouteDescript;BoxDescript
MPI.Address[*].AddressLine1_StdDir	PropDesPrefDirection;PropDesSufDirection;StreetNam...
MPI.Address[*].AddressLine1_StdType	StreetNameSufType;StreetNamePrefType;PropDesSu...

Add... Remove Edit...

Editing the Database Scripts

The screenshot displays a database script editor interface. On the left, a file tree shows the project structure under 'MPI_Demo', including folders for 'Configuration', 'Database Script', 'Standardization Engine', 'Match Engine', and 'Filter'. The 'Database Script' folder is expanded, showing files 'codelist.sql', 'create.sql', 'drop.sql', and 'systems.sql'. The main editor window shows the content of 'systems.sql', which includes SQL code for declaring variables and inserting data into the 'sbyn_systems' table.

```

1
2 declare
3     v_user varchar2(20);
4     v_date varchar2(10);
5 begin
6     select user into v_user from dual;
7     select TO_CHAR(sysdate, 'MM/DD/YYYY') into v_date from dual;
8
9
10    insert into sbyn_systems (systemcode, description, status, id_length, format, input_mask, value_mask, create_date,
11    values ('KIS1', 'KIS1', 'A', 10, '[0-9]{10}', 'DDDDDDDDDD', 'DDDDDDDDDD', TO_DATE(v_date, 'MM/DD/YYYY'), v_user);
12
13
14    insert into sbyn_systems (systemcode, description, status, id_length, format, input_mask, value_mask, create_date,
15    values ('KIS2', 'KIS2', 'A', 10, '[0-9]{10}', 'DDDDDDDDDD', 'DDDDDDDDDD', TO_DATE(v_date, 'MM/DD/YYYY'), v_user);
16
17
18    insert into sbyn_systems (systemcode, description, status, id_length, format, input_mask, value_mask, create_date,
19    values ('KIS3', 'KIS3', 'A', 10, '[0-9]{10}', 'DDDDDDDDDD', 'DDDDDDDDDD', TO_DATE(v_date, 'MM/DD/YYYY'), v_user);
20
21 end;
22 /
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42    tCode('V', 'S', 'geschieden'),
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44    -- ****      RELIGION      ****
45    tCode('L', 'RELIGION', 'module description'),
46    tCode('V', 'EV', 'evangelisch'),
47    tCode('V', 'KATH', 'katholisch'),
48    tCode('V', 'MUSL', 'moslem'),
49    tCode('V', 'N', 'keine'),
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51    -- ****      LANGUAGE      ****
52    tCode('L', 'LANGUAGE', 'module description'),
53    tCode('V', 'DEU', 'deutsch'),
54    tCode('V', 'ENG', 'englisch')
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Backup Slides

**Master Index Data Manager
Web Applikation**

Quick access to
commonly used
operations

Dashboard

Assumed Matches

Transactions

Reports

Source Record

Audit Log

Summary

Potential Duplicates For Today : 0

Assume Matches for Today : 0

Quick Search

Search EUID:

[Search](#)

[Advanced Search](#)

Reports

[Merged Records](#)

[Deactivated EUIDs](#)

[Unmerged Records](#)

[Audit Log](#)

Compare EUIDs

[Lookup EUID1](#)

[Lookup EUID2](#)

[Lookup EUID3](#)

[Lookup EUID4](#) [Compare](#)

master index data manager

adm

Dashboard

Duplicate Records

Record Details

Assumed Matches

Transactions

Reports

Source Record

A

Create Date From



To Create Date

04/30/2008



Select the search type: Basic Se

Clear

Search

Visual indication
of proximity to
reference record

Total Recd

Main EUID

0000000001

1st Duplicate

0000000000

2nd Duplicate

0000000002

Preview

First Name

Susan

Susan

Sue

Middle Name

P

Last Name

Smith

Smith

Smith

SSN

436352417

436522417

436532147

Date of Birth

11/30/1970

01/30/1975

45.09

11/30/1971

25.06

Gender

F

F

F

Address Line1

Address Line2

City

Highlight
differences from
reference record



- Dashboard
- Duplicate Records
- Record Details
- Assumed Matches
- Transactions
- Reports
- Source Record
- Audit Log

Person

First Name

Last Name

SSN

Address

Address Line1

City

Select the search Type:

Advanced Person Lookup (Phonetic)

Advanced Person Lookup (Phonetic)

Advanced Person Lookup (Alpha)

Simple Person Lookup

User configurable search fields

User configurable search screens

Total Records Found:3

<< first < prev 1 next > last >>

EUID	First Name	Middle Name	Last Name	SSN	Date of Birth	Gender	Address Line1	Address Line2	City	Weight
<input type="checkbox"/> 0000000002	Sue		Smith	436532147	11/30/1971	FEMALE				23.722221
<input type="checkbox"/> 0000000000	Susan		Smith	436522417	01/30/1975	FEMALE				21.592592
<input type="checkbox"/> 0000000001	Susan	P	Smith	436352417	11/30/1970	FEMALE				16.481482

<< first < prev 1 next > last >>

Sortable on any column, default sort on weight

Review Assumed Matches

- Dashboard
- Duplicate Records
- Record Details
- Assumed Matches**
- Transactions
- Reports
- Source Record
- Audit Log

EUID

Status

System

Local ID

Create Date From

Create Time From

To Create Date

To Create Time

Assumed match review with undo capability

Total Records Found: 1

<< first < prev 1 next > last >>

ID	EUID	Weight	System	Local ID	Create User	Create Date	First Name	Middle Name	Last Name	SSN	Date of Birth	Gender	Address Line1	Address Line2	City
00000	<u>0000000004</u>	33.72222	SYS1	1000000004	edm	03/28/2008	Jon Jonathan		Grene Green	535442354 535442355	11/12/1960 11/12/1960	MALE MALE	100 West Ave		Arcadia

<< first < prev 1 next > last >>

- Dashboard
- Duplicate Records
- Record Details
- Assumed Matches
- Transactions
- Reports
- Source Record
- Audit Log

EUID

Local ID

System

From Date

To Date

From Time

To Time

System User

Function

Filter based on multiple criteria

Review master data transactions

Total Records Found: 9

<< first < prev 1 next > last >>

Transaction Number	EUID1	EUID2	LID	Function	System Code	System User	Time Stamp
<u>00000000000000000000</u>	000000000		1000000001	Add	SYS1	edm	2008-03-28 15:07:18.203
<u>00000000000000000001</u>	000000000		2000000001	Update	SYS2	edm	2008-03-28 15:09:40.159
<u>00000000000000000002</u>	000000001		2000000002	Add	SYS2	edm	2008-03-28 15:11:29.164
<u>00000000000000000003</u>	000000002		1000000002	Add	SYS1	edm	2008-03-28 15:13:26.414
<u>00000000000000000004</u>	000000003		1000000003	Add	SYS1	edm	2008-03-28 15:15:39.719
<u>00000000000000000005</u>	000000004		2000000003	Add	SYS2	edm	2008-03-28 15:16:44.763
<u>00000000000000000006</u>	000000004		1000000004	Update	SYS1	edm	2008-03-28 15:18:22.337
<u>00000000000000000007</u>	000000005		1000000005	Add	SYS1	edm	2008-03-28 15:20:03.597
<u>00000000000000000008</u>	000000001			Update		edm	2008-03-28 15:22:28.77

<< first < prev 1 next > last >>

master index data manager

Dashboard

Duplicate Records

Record Details

Assumed Matches

Transactions

<< View List

Person Info

	Before Update	After Update
EUID	0000000000	0000000000
Person Cat Code		
First Name	Susan	Susan
Middle Name		
Last Name	Smith	Smith
Suffix		
Title	Mr	Mr
SSN	436522417	436532417
Date of Birth	01/30/1975	01/23/1975
Death		
Gender	F	F
Marital Status		
Race		
Ethnic		
Religion		
Language		
Spouse Name		
Mother Name		

Review changes
done in transaction

Generate Reports

Dashboard Duplicate Records Record Details Assumed Matches Transactions Reports Source Record

Merged Records Deactivate EUIDS Unmerged Records Update Report Activity Reports Duplicate Reports Assumed Matches

Variety of reports for analysis

From Date: To Date:

Create Time From: Create Time To:

System:

Maximum Reports Size:

Total Records Found: 6

<< first < prev 1 2 next > last >>

EUID	First Name	Middle Name	Last Name	SSN	Date of Birth	Gender	Address Line1	Address Line2	City
0000000001	Susan	P	Smith	438352417	11/30/1970	FEMALE	300 E Huntington Dr		Monrovia
0000000000	Susan		Smith	438522417	01/30/1975	FEMALE	300 Huntington		Monrovia
0000000005	Jonathan		Green	534542355	12/11/1960	MALE			
0000000004	Jonathan		Green	535442355	11/12/1960	MALE	100 West Ave		Arcadia
0000000002	Sue		Smith	438532147	11/30/1971	FEMALE			
0000000001	Susan	P	Smith	438352417	11/30/1970	FEMALE	300 E Huntington Dr		Monrovia
0000000002	Sue		Smith	438532147	11/30/1971	FEMALE			
0000000000	Susan		Smith	438522417	01/30/1975	FEMALE	300 Huntington		Monrovia
0000000005	Jonathan		Green	534542355	12/11/1960	MALE			
0000000003	John		Green	535442555	12/11/1960	MALE			

<< first < prev 1 2 next > last >>

Dashboard

Duplicate Records

Record Details

Assumed Matches

Transactions

Reports

Source Record

Audit Log

EUID

Local ID

System

From Date

To Date

From Time

To Time

System User

Function

Clear

Search

- Add
- Associated Potential Duplicates
- Assumed Match Comparison
- Assumed Match Search Result
- Auto Resolve
- EO Comparison
- EO Search Result
- EO View/Edit
- EUID Merge Confirm
- EUID Unmerge**
- EUID Unmerge Confirm
- History Comparison
- History Search Result
- LID Merge - Selection
- LID Merge Confirm
- LID Unmerge
- LID Unmerge Confirm
- Matching Review Search Result
- Merge
- Merge Tree Comparison
- Potential Duplicate Comparison
- Resolve
- Undo Assumed Match
- Unmerge Comparison
- Unresolve
- Update
- View Merge Tree

Activity based
auditing

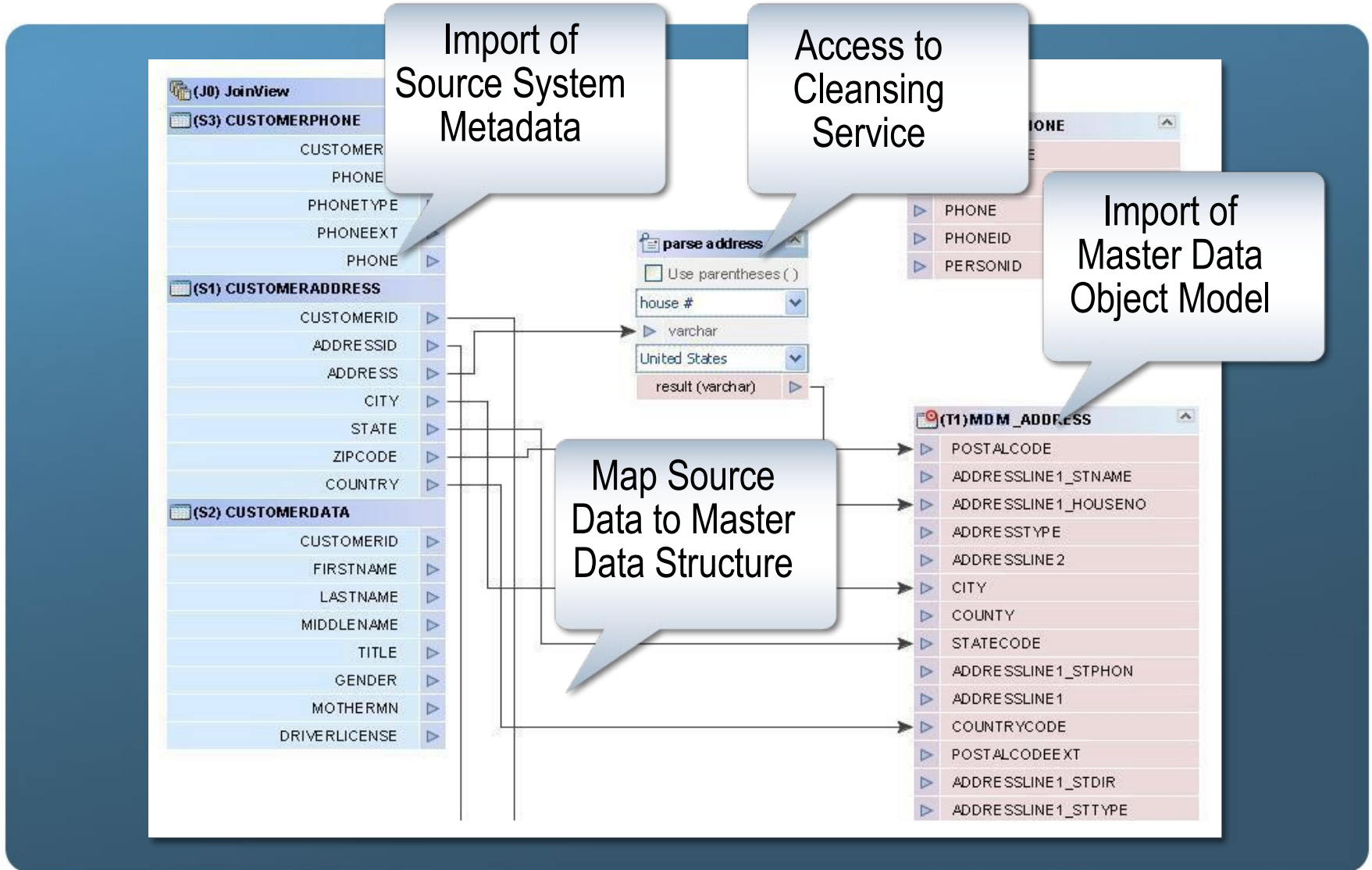
Visually and
functionally rich
data stewardship
facility



Backup Slides

**Data Integrator
ETL Funktionalität**

Source Extraction and ETL



Distributed Bulk Matcher & Loader

