Agenda

Motivation

SAP Solution Manager as Tool for Data Consistency Management
- Transactional Correctness (TC)
- Guided Self Service Data Consistency Management (GSS DCM)
- Internal Database Comparison (IDC)
- Cross Database Comparison (CDC)
- Business Process Completeness Check (BPCC)
- Data Consistency and Interface Monitoring

Additional Information
Motivation
SAP Solution Manager as Central Platform for Business Process Operations

SAP Solution Manager

SAP Business Process Operations
- Cross-Database Comparison
- Central Job Overview
- Business Process Analytics
- Alert Inbox

Business Process Monitoring
- Proactively ensure reliable business process execution, performance and throughput

Data Consistency Management
- Proactively avoid or detect harmful data inconsistencies

Job Management
- Automate business process considering dependencies and restrictions

Business Process Improvement
- Improve business process efficiency and effectiveness

Business Process Performance Optimization
- Proactively identify improvement potential for business process execution

MUST-HAVE Day-to-Day Operations

Drive Business value through optimization
Motivation: Why is Data Consistency Management needed?

Is the data exchanged between the systems as well as the data needed for correct operation of the business process consistent?
Motivation: Domino Effect – Influenced Systems

Incorrect Sales Org in one table
Create Sales Orders in ECC
Create Invoice
Create FI-Documents
Period End Closing
Financial Reporting
Examples from SAP’s Backoffice:

- Database Crash at a customer and last backup ~12 months old
- Inconsistencies between MM and FI during goods movements with unknown Root Cause
- A custom made report has accidentally deleted parts of business objects
- Some data has been replicated multiple times between two systems
- Data storage in multiple systems using sRFC/HTTP within one business step
- …
Motivation: Why can Data Inconsistencies occur?

**User Level:** Data inconsistencies due to
- Real world operation ≠ system transaction
- Incorrect manual entry of data
- Completely missing entry of data
- Wrong usage of transaction

**Application Level:** Data inconsistencies within one system or between two systems due to
- Absence of error handling
- No clear leading system defined
- Logical inconsistencies in application integration
- Errors in application programs (transactional correctness)

**Technology Level:** Data inconsistencies due to
- Data Loss
- Initial Loads may have run into problems
- One system crashes and is reset to an earlier state
- Problems with Delta Loads
Motivation: Inconsistency Types

Type A

CRM System
Customer Smith
Address: New York City

ECC System
Customer Smith
Address: New York City

Type B

Customer Smith
Address: New York City

Type C

Customer Smith
Address: New York City

Address: Berlin
Motivation: Differences

<table>
<thead>
<tr>
<th>Time $t_1$</th>
<th>Time $t_2$</th>
<th>Time $t_3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRM System</td>
<td>CRM System</td>
<td>CRM System</td>
</tr>
<tr>
<td>Customer Smith Address: New York City</td>
<td>Customer Smith Address: Berlin</td>
<td>Customer Smith Address: Berlin</td>
</tr>
<tr>
<td>ECC System</td>
<td>ECC System</td>
<td>ECC System</td>
</tr>
<tr>
<td>Customer Smith Address: New York City</td>
<td>Customer Smith Address: New York City</td>
<td>Customer Smith Address: Berlin</td>
</tr>
</tbody>
</table>
# Data Consistency Management: Benefit / Value proposition

<table>
<thead>
<tr>
<th>Goal</th>
<th>Benefit</th>
<th>Challenge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transparency</td>
<td>Global transparency across organizational units &amp; process variants</td>
<td>...increase visibility of current data quality and consistency state.</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Reduced operating costs</td>
<td>... automate data consistency management and reduce manual process inefficiencies and human errors. Avoid systematic process exceptions.</td>
</tr>
<tr>
<td>Effectiveness</td>
<td>Higher customer satisfaction &amp; faster revenue stream</td>
<td>...avoid delayed business documents and financial losses by quick reaction to interface errors affecting data of core business processes</td>
</tr>
<tr>
<td>Clean-up</td>
<td>More accurate business reporting</td>
<td>...avoid inaccurate reporting data by ensuring consistency between systems and quicker clean up due to earlier detection</td>
</tr>
<tr>
<td>Internal Audit</td>
<td>Higher reliability of financial reporting &amp; possible detection of fraud</td>
<td>...avoid inconsistencies in FI-AP and FI-AR before PEC. Review consistency between MM &amp; FI and between systems.</td>
</tr>
</tbody>
</table>
Data Consistency Management: Handling Overview

1. **Prevent**
   - Process Design & Training

2. **Detect**
   - End-to-End Monitoring

3. **Investigate**
   - Root Cause Analysis & Business Continuity Concept

4. **Correct**
   - Reconciliation Strategy & Business Continuity Concept
Data Consistency Management: Deliverables

**Prevention**
- Review of the Process Design
- Transactional correctness check
- Setup Monitoring & Exception Handling
- Establish a suitable Change Management
- End User Training of correct system usage
- Provide Best Practices

**Correction**
- Root-Cause Analysis to determine the origin of the inconsistency
- Correction of the inconsistent data
- Data Consistency Toolbox / Guided Self-Service Data Consistency Management
- Guided Procedures in Cross Database Comparison

**Detection**
- End-to-End Consistency Check Reports
- Data Consistency and Interface Monitoring as part of Business Process Monitoring
- Internal Database Comparison (IDC)
- Cross Database Comparison (CDC)
- Business Process Completeness Check (BPCC)

**Investigation**
- Determination of the Business Impact
- Check the availability of a Fall-Back Scenario
- Data Consistency Toolbox / Guided Self-Service Data Consistency Management
- Guided Procedures in Cross Database Comparison
Overview – Data Consistency Management Tools

**Internal Database Comparison**
Are two linked tables consistent or have the correct content?

**GSS DCM**
Provide guidelines how to check and correct inconsistencies

**Cross-Database Comparison**
Is data consistent between two systems especially if one is a non-SAP system?

**BPCC**
Find problems with the process completeness

**Data Consistency and Interface Monitoring**
Proactively ensure reliable business process flow and data consistency

**TC Tools**
Find problems with transactional correctness in ABAP or Java code
Data Consistency Management: Business Justification
Example: Without DCM

Example effort estimation (as-is)

- 3 days to determine the right tools and procedures for data inconsistency determination and repair * 1 persons → 3 person days
- 7 days * 3 persons to determine and fix inconsistencies → 21 person days

- Inconsistencies last 10 days * 100 affected users * 0.2 (each user spends 20% of his day for workarounds) → 200 person days

∑ 224 person days

Possible efforts

- Effort to determine the right tools and procedures for data inconsistency determination and repair
- Effort for (constant) data inconsistency determination
- Effort for (constant) data inconsistency repair
- Effort for workarounds to determine correct and consistent data
- Effort for workarounds because business processes are not available in system

The highlighted numbers can be reduced
Example effort estimation (to-be)

- **1 days** to determine the right tools and procedures for data inconsistency determination and repair * 1 persons → 1 person days
- **4 days** * 3 persons to determine and fix inconsistencies → 12 person days

Inconsistencies last **5 days** * 100 affected users * 0.1 (each user spends 10% of his day for workarounds) → 50 person days

∑ 63 person days

Possible efforts

- Effort to determine the right tools and procedures for data inconsistency determination and repair
- Effort for (constant) data inconsistency determination
- Effort for (constant) data inconsistency repair
- Effort for workarounds to determine correct and consistent data
- Effort for workarounds because business processes are not available in system

The highlighted numbers have been improved
In Solution Manager 7.2, Data Consistency Management tools can be directly accessed via the Fiori Launchpad (transaction SM_WORKCENTER).

Each user can adjust his Fiori Launchpad and select from the available catalogue which tiles should be displayed.
Transactional Correctness (TC)

SAP Solution Manager as Tool for Data Consistency Management
Transactional Correctness (TC)

Motivation
Do my programs ensure data consistency?
What happens in case of errors?

Goal
Identify and improve programs that can lead to inconsistencies

Deliverable
A tool that helps identifying parts of programs that can possibly lead to inconsistencies
Transactional Correctness Tool for ABAP: Example

Problem
Data should be updated together in multiple tables, e.g. header and detail

Question
Is it possible that data is updated only in one table but not in the other one, e.g. in case of errors?
Is it possible that a different user or program updates the same data at the same time with conflicting changes?
In Solution Manager 7.2, the Transactional Correctness tool can be directly accessed via the Fiori Launchpad (transaction SM_WORKCENTER)
TC Tool for ABAP: Guided Procedure

The Transactional Correctness (TC) Tool for ABAP helps you to record a trace and evaluate it for Transactional Correctness

The tool offers a guided procedure to

- Record traces in a remote ABAP system
- Select trace records for TC evaluation
- View the evaluation result

![Guided Procedure Diagram](image-url)
In the first step you can start and stop traces in a remote ABAP system for the specified user.
In the second step you can select trace records for evaluation

- You can enter selection criteria and load the corresponding trace records from remote ABAP systems
- You can enter table names that should be excluded from evaluation
- You can select or deselect individual trace records for evaluation
**TC Tool for ABAP: View Evaluation Result (1)**

In the third step you can view the evaluation result. In this example the tool detects a COMMIT between the change of the header and the change of the detail data. In case of errors when changing the detail data this would lead to inconsistencies.

The tool checks more rules regarding the commit structure.
The tool also detects that there are no active enqueues during update and COMMIT that could prevent different users or programs from updating the same data at the same time with conflicting changes.

The tool checks more rules regarding enqueues.
Guided Self Service Data Consistency Management (GSS DCM)

SAP Solution Manager as Tool for Data Consistency Management
Guided Self Service Data Consistency Management (GSS DCM)

Motivation
How can I analyze and resolve detected inconsistencies?
How can I execute an ad-hoc data consistency check?
How can I structure and document very complex analysis and resolution procedures and their results?

Goal
Provide guided procedures to analyze and resolve inconsistencies and to execute an ad-hoc consistency analysis

Deliverable
A tool with the possibility to determine guided procedures to analyze and resolve inconsistencies and to store and report the results
In Solution Manager 7.2, the Guided Self Service Data Consistency Management (GSS DCM) can be accessed via the Data Consistency Management tile of the Fiori Launchpad (transaction SM_WORKCENTER)
Click the GSS Data Consistency Management hyperlink under Consistency Checks or Analysis Tools
GSS DCM: Preparation

Select events, products, modules (optional), business objects (optional) and tables (optional)
GSS DCM proposes related tasks
Purpose and procedure of each task are explained
Direct access to transactions, programs and notes needed for the task
The task can be rated and you can enter a user comment
The results of a GSS DCM session can be documented in a report

**1 GSS for Data Consistency Management**

The purpose of the guided self-service for data consistency management is to provide help regarding data consistency in different scenarios.

**Selected Events**

- Analysis for Data Consistency

**Selected Systems**

- SAP ERP
- SAP Enterprise Resource Planning

**Selected Modules**

- ERP
- PI

**2 Summary**

<table>
<thead>
<tr>
<th>Rating</th>
<th>System</th>
<th>Task ID</th>
<th>Counter</th>
<th>Description</th>
<th>Recommended task</th>
<th>User Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td>ERP</td>
<td>00050</td>
<td>10</td>
<td>FI / FI Balance Comparison</td>
<td>Recommended task: No further task needed</td>
<td>User Comment: No problems found</td>
</tr>
<tr>
<td>✔</td>
<td>ERP</td>
<td>00050</td>
<td>10</td>
<td>Consistency Check FI -&gt; CO</td>
<td>Recommended task: No further task needed</td>
<td>User Comment: No problems found</td>
</tr>
</tbody>
</table>
Internal Database Comparison (IDC)

SAP Solution Manager as Tool for Data Consistency Management
Motivation for Internal Database Comparison

**Motivation**
How can I check data within one SAP system for consistency?
How can I proceed if I face an inconsistency that cannot be detected by standard consistency check tools, but I do not want to write additional coding for each of the required checks?

**Goal**
Comparison of two tables to detect missing table entries or inconsistent field contents (any content not corresponding to predefined selection criteria) without the need to write additional coding

**Deliverable**
A tool that identifies, displays and stores inconsistencies together with detailed field content for later reference
In Solution Manager 7.2, the Guided Self Service Data Consistency Management (GSS DCM) can be accessed via the Data Consistency Management tile of the Fiori Launchpad (transaction SM_WORKCENTER).
Click the Internal Database Comparison hyperlink under Consistency Checks
Internal Database Comparison: Example

**Problem**
Sales order cannot be displayed

**Root Cause Analysis**
Custom report deleted sales order header data

**Question**
What documents are affected?
Internal Database Comparison: Example

- Possibility to save parameters as variant
- Remote connection to system where data is located
- Tables that should be compared and join conditions between tables
- Additional restrictions for data that should be compared
- Comparison result
- Use case: missing entries in one table or inconsistencies between tables
- Fields that should be displayed in result
Cross-Database Comparison (CDC)

SAP Solution Manager as Tool for Data Consistency Management
Motivation for Cross Database Comparison

**Motivation**
How can I check data between different SAP or Non-SAP systems for consistency?
How can I proceed if I face an inconsistency that cannot be detected by standard consistency check tools, but I do not want to write additional coding for each of the required checks?

**Goal**
Comparison of two sources to detect missing table entries or inconsistent field contents without the need to write additional coding

**Deliverable**
An infrastructure that facilitates data modeling and comparison as well as displays and stores comparison results for later reference
Cross Database Comparison: Features

- Built in SAP Solution Manager 7.1 SP01: no add-on needed (except for integration into Business Process Monitoring)
- Offers comparison of multiple tables between two sources
- Supports multiple access paths including RFC, remote database, OData Service and file access
- Can be enhanced for further access possibilities
- Offers easy to use graphical UI to enter data model
- Extracts data from sources and performs comparison in SAP Solution Manager
- Offers possibility to save and reuse comparison parameters and data model
- Offers functionality to save and display comparison results
- Can extract data using multiple blocks of configurable size
- Supports integration into Business Process Monitoring
Cross-Database Comparison: Technical Overview

Comparison
- Connection parameters
- Variable filter values
- Iteration settings
- Data model

Comparison Group
- Multiple comparisons logically grouped
- Correlation of results

Comparison Run

Comparison Result

BPMon Alerts

Source Type SAP ABAP System
- Extractor Function Module or Open SQL Statement for Generic Extractor Function Module
- RFC

SAP ABAP-Based System

Source Type Business Intelligence
- MDX Extractor Query
- RFC

SAP BW System

Source Type Remote Database
- Native SQL Extractor Statement
- ADBC

Database of Non-ABAP System (including HANA)

Source Type OData Service
- OData Service Extractor Query
- http

SAP or Non-SAP Cloud System

Source Types XML or CSV File on Application Server
- Files (XML, CSV)

Custom-Built Source Type

Custom-Built Data Extractor

Non-SAP System

Custom-Built Data Extractor

Non-SAP System

SAP or Non-SAP Cloud System

OData Service Extractor Query
Cross-Database Comparison in SAP Solution Manager Fiori Launchpad

In Solution Manager 7.2, Cross-Database Comparison can be directly accessed via the Fiori Launchpad (transaction SM_WORKCENTER)
Cross-Database Comparison: Central Comparison Overview

CDC starts with the central Comparison Overview which allows direct access to all actions for one or multiple comparisons.
You can use hyperlinks to directly navigate into success or error messages, comparison results and comparison definitions.
Cross-Database Comparison: Create and Run a Comparison

To create a comparison, press Create in the Central Comparison Overview.
Cross-Database Comparison: Create and Run a Comparison

All comparison parameters are defined in one screen

- Enter comparison and data model name. It is also possible to choose an already existing data model
- Enter comparison parameters
- Choose the source types and enter source type specific parameters. For easier identification you can enter descriptions for the two data sources
- Enter the data model
Cross-Database Comparison: Create and Run a Comparison

Extractors are created automatically when you save the comparison.
Back in the central Comparison Overview, the created comparison is already marked. Just press Start to start the comparison run.
Cross-Database Comparison: Comparison Result

You can use the hyperlink to navigate into the comparison result

<table>
<thead>
<tr>
<th>Run Status</th>
<th>Incon. Status</th>
<th>Comparison Name</th>
<th>Run ID</th>
<th>Progress</th>
<th>Model Name / Version (Run ID)</th>
<th>Model Name / Current Version / Max Version</th>
<th>Start Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td></td>
<td>ZCDC_DEMO_NEW</td>
<td>1</td>
<td>100.00 %</td>
<td>ZCDC_DEMO_NEW / 0001</td>
<td>ZCDC_DEMO_NEW / 0001 / 0001</td>
<td>21.10.2015 11:30:11</td>
</tr>
</tbody>
</table>
The comparison result shows the number of objects for the individual inconsistency types. Mark an inconsistency type to see the details.
Cross-Database Comparison: Integration into Business Process Monitoring

There are data collector for integration of CDC results into Business Process Monitoring

CDC comparison run and the data and data collection can be scheduled independently

The on-demand data collector starts automatically when a run of the configured comparison finishes
Business Process Completeness Check (BPCC)

SAP Solution Manager as Tool for Data Consistency Management
Business Process Completeness Check (BPCC)

Motivation
Were critical parts of my business processes executed successfully?
Were all steps executed in the correct sequence?
Were all business objects created in the correct status?

Goal
Detect interrupted executions of critical parts of business processes

Deliverable
A tool that helps identifying and restarting interrupted executions of critical parts of business processes
Motivation: Interfaces violating LUW-principles

Pain points
- No visibility of errors and interrupted executions
- High number of inconsistencies

→ Requires a simple to use instrumentation platform and evaluation framework

**System 1**
- Receive Data
- Process Data
- Send Updated Data

**System 2**
- Create Order Data
- Send Order Data
- Receive Updated Data
- Process Updated Data
- Create delivery data
- Post goods issue
- Update order data

**How to control this?**
- Error Detection
- Restartability features
Exception Management

Exception Management
• Concept for handling exceptions from occurrence through resolution until successful restart of the business process instances
• Central tool to determine the occurrence of exceptions and the need for restarting business process instances
• Definition of responsibilities and procedures for exception handling
• Definition of communication paths and escalation procedures

Business process instance
• Concrete execution of a business process, e.g. create sales order 4711 for customer 1234
• Manual restart of interrupted business process instances should be included in an overall Exception Management concept
Relationship between Business Process and Interface Monitoring and Exception Management

**Business Process and Interface Monitoring**
- Proactive monitoring of all situations critical for business process execution
- Includes general monitoring of the occurrence of exceptions within the business process execution
- Monitoring of statistical values for multiple business process instances – e.g. number of ABAP short dumps for a certain program

**Exception Management**
- Detection of all business process instances that were interrupted
- Includes instance specific monitoring of the occurrence of exceptions
- Monitoring of individual business process instances – e.g. ABAP short dump in a certain program during one execution of a business process

Business Process and Interface Monitoring and Exception Management are tightly integrated. There should be one comprehensive concept to cover both aspects.
The Business Process Completeness Check in SAP Solution Manager collects and evaluates log information that is written during execution of critical parts of a business process.

- Business processes have to be instrumented to write necessary logging information.
- BPCC is integrated into the Exception Management Cockpit.
In Solution Manager 7.2, the Business Process Completeness Check (BPCC) can be accessed via the Data Consistency Management tile of the Fiori Launchpad (transaction SM_WORKCENTER)
Click the Business Process Completeness Check hyperlink under Analysis Tools
The Exception Management Cockpit offers a central platform for managing all exceptions that occurred for a business process and within the solution landscape.
You can check details for each logged business process instance, assign a processor and create notifications, incidents or execute guided procedures.
Process Flow for Business Process Instance

For each logged business process instance you can display the process flow and context details for each step.
Data Consistency and Interface Monitoring

SAP Solution Manager as Tool for Data Consistency Management
Data Consistency and Interface Monitoring

**Motivation**
Where is data consistency checked?
When is data consistency checked?
Who checks data consistency?

**Goal**
Detect inconsistencies as early as possible

**Deliverable**
Process oriented monitoring objects for the most common data consistency reports and interface technologies
Data Consistency Monitoring: Results

Interface Errors and Data Consistency

Number of Errors

1-10 1-15 1-20 1-25 1-30

DCM Result: 15 20 25
Interface Monitoring: Results

Interface Errors and Data Consistency

Number of Errors

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Interface Monitoring vs. Data Consistency Monitoring

Long term safety net

Short term error resolution
In Solution Manager 7.2, the Alert Inbox for Data Consistency Management related alerts can be accessed via the Data Consistency Management tile of the Fiori Launchpad (transaction SM_WORKCENTER).
Alert Inbox for DCM Related Alerts in SAP Solution Manager

You can switch between Interface and Consistency Related Alerts
SAP Solution Manager as Central Tool for Business Process Monitoring

SAP Solution Manager

- Monitoring Application
- Alert Inbox
- Incidents
- Alert Emails
- Business Process Analytics
- OCC Alert Reporting
- Business Process Monitoring (on MAI)
- BPO Dashboards
- Metric Reporting

Managed Systems

- ERP
- SRM
- CRM
- Non SAP
What does Data Consistency Monitoring mean in Practice?

Data Consistency Monitoring means to answer the following questions:

- Who is responsible and checks for background job scheduling and regular monitoring of consistency check programs like LX23?
- Who monitors and checks for update errors (SM13), application log messages (SLG1)?
- Which interfaces are important for the consistency of my business data?
- Who has to be contacted in case of the occurrence of an inconsistency?
- What has to be done if a certain inconsistency arises?
- Who is responsible for transactional correctness testing of developments?
- Where can I find this information?

… and to detect inconsistencies as early as possible.
Content for Data Consistency Monitoring: Monitoring Objects related to Data Consistency

Cross-Application Monitoring Objects
   General Application Log (SLG1)
   Short Dumps
   Update Errors (Transaction-/ Program-specific)

Interface Monitoring Objects
   qRFC Alert Monitoring
   BDoc Alert Monitoring (CRM)
   ALE/IDoc Alert Monitoring per IDoc Type
   XI/PI Alert Monitoring
   Batch Input Monitoring
   File Monitoring
   CRM Middleware Monitoring

Customer Specific Monitoring Objects
   Customer Exits in Business Process Monitoring Infrastructure

- tRFC Alert Monitoring
- Workflow Monitoring
- RFC-”ping”
- bgRFC-Monitoring
- WebService-Calls (ABAP)
- …
Content for Data Consistency Monitoring: Monitoring Objects *specific for* Data Consistency

**Enterprise Resource Planning Logistics**
- Sales & Services
- Warehouse Management
- Inventory Management

**Enterprise Resource Planning Financials**

**Supply Chain Management**
- liveCache - Database
- CIF-Interface

**Extended Warehouse Management**
- Stock Information
- Further Checks

**Customer Relationship Management**

**Generic Check Functions**
- Internal Database Comparison
- Cross Database Compare
- Custom Developed Consistency Reports

**Industry-Solutions**
- Retail
- IS-OIL
- Banking
Additional Information

SAP Solution Manager as Tool for Data Consistency Management
## Data Consistency Management: Main Implementation Scenarios

<table>
<thead>
<tr>
<th>IT</th>
<th>Business</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Phase 3</strong></td>
<td>Extend consistency and interface monitoring using custom made reports</td>
</tr>
<tr>
<td>Monitor business related impact of interfaces</td>
<td>Extend consistency checks using generic check reports</td>
</tr>
</tbody>
</table>

| **Phase 2** | Identify and monitor business related aspects of inconsistencies (standard reports) |
| Monitor technical aspects of inconsistencies (interfaces) | |

| **Phase 1** | Identify interfaces (technologies) of concern |
| SAP Business Process Analysis (cross-application part) performed on SAP backend system | |
Additional Information

Detailed Information about DCM functionalities in SAP Solution Manager:

Additional monitoring related information:
Thank you