Business Process Completeness Check
with
SAP Solution Manager 7.1 SP09/SP12 and
ST-PI 2008_1_700 SP09

July 2014
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1 General Information for Business Process Completeness Check (BPCC)

1.1 Motivation

Some business processes use transactions that span several systems or synchronous step sequences across several systems. For such transactions or step sequences it can be difficult to identify whether all steps were successfully executed and whether all objects were correctly created on the different systems. In cases of incomplete instances (an instance is a run of the business process e.g. Order-to-Cash), it also needs to be known which objects (sales order documents, IDOCs, Bills, …) were already created so that the instances can be correctly restarted.

For each execution of one instance of the business process, the questions are:
- Did that instance run through successfully?
- Was every object created in the correct status?
- If exceptions occurred, was the data rolled back correctly and completely? If not which objects now exist on the database?

1.2 Overview

The BPCC in SAP Solution Manager collects and evaluates log information that is written during the business process execution. Business processes have to be instrumented (coding changed - this means
code enhancements to standard SAP and/or custom code, with many modularization units affected) to write the necessary logging information. The BPCC is integrated into the Exception Management Cockpit.

2 Configuration of Exception Management Cockpit (EMC) for BPCC

The following configurations need to be executed in Solution Manager:
1. Definition of a business process category and subcategory.
2. Assignment of category and subcategory to business process type.
3. Enabling of the Exception Management Instrumentation Platform (EM-IP) as data source
4. Activating the journal mode for the managed system

The following configurations need to be executed on the managed systems:
1. Instrumentation of step sequence within business processes to log the correct information

Attention: For SAP ABAP-based systems, the managed system needs to be on SAP Basis release 7.02 or higher in case the extended passport should be passed cross system. In case the process runs locally on one system SAP Basis release 7.00 is sufficient.

2.1 Access the EMC Configuration in Solution Manager

To configure the EMC for BPCC go to the Exception Management Cockpit via the work center “Root Cause Analysis” (can be accessed via transaction SM_WORKCENTER or SOLMAN_WORKCENTER) → “Exception Management”. There, select “Configuration”.

Start the configuration embedded or in a new window.

2.1.1 Business Process Category, Subcategory and Type definition / assignment.

You need to be able to identify the business process instances once their logged steps have been collected by SAP Solution Manager in order to answer questions like: “Which business process does this data belong to?” To do so, you need to define a business process category and subcategory and assign both to a business process type.

The category can be a business process ID from the solution directory.

The business process type ID has to be used in the enhancement of the coding to correctly identify the logged data on SAP Solution Manager.
Go to tab “Repository” → “General Settings” to maintain business process categories and subcategories and to assign combinations of both to business process types. Select “Edit” on the Business Process Category tray to maintain business process categories.

Choose “Append from Solution Directory” to use an existing business process from the solution directory as category.

Select “Append” to create a new Business Process Category from scratch. Scroll to the end of the table. Enter an ID and a description and save.
Typically, the business process category should represent the entire business process. Only parts of the business process are usually instrumented. For details refer to chapter 2.2.4 (single transactions or specific step sequences within the business process). These parts are identified via sub-categories.

Example:
- Category: Order to Cash
- Sub-Category: Order Creation

To define a subcategory, choose “Edit” and “Append” on the Business Process Subcategory tray, enter a subcategory ID and a description and save.

The business process category and subcategory are not used in the instrumentation, but only in the display of the results in SAP Solution Manager. In the instrumentation on the managed system you use the business process type ID instead. Therefore you have to define a business process type ID and assign it to a combination of a category and subcategory.

On the Business Process Type tray, choose “Edit” and afterwards “Append”. Create a business process type ID and assign the category and subcategory via value help.
### 2.1.2 How the Business Process Type ID is used in the Instrumentation

The business process type ID needs to be set in the instrumentation of the business process once during initialization at the beginning of the step sequence.

Example:

Report Z_CREATE_SALES_ORDERS

*CALL FUNCTION 'GUID_CREATE' -the GUID can be created by this function call or taken from a table
* IMPORTING field e.g. Order GUID
*   ev_guid_32 = l_instance_id.

/sdf/cl_em_ipa_write=>initialize_process(
   i_bpi_id = l_instance_id
   i_bpt_id = 'OC00'). "Example for business process type ID OC00"

### 2.1.3 Enabling the EM-IP as Data Source for BPCC

The Exception Management Instrumentation Platform which is the prerequisite for BPCC is provided with add-on ST-PI SP06 and SAP Basis >= 7.00 on the managed ABAP systems.

The Instrumentation Platform provides methods for the instrumentation of business processes and the persistence of the logged data.

The data persistence in the EM-IP needs to be activated before data will be stored in its log tables and from there can be picked up by Solution Manager. Different levels of logging can be activated.

The data collection by Solution Manager needs to be activated as well.

To do it, Exception Management needs to be enabled in Solution Manager Setup (Transaction solman_setup → Managed Systems Configuration → „Configure System“ for SID)
Business Process Completeness Check in SAP Solution Manager

SAP Solution Manager Configuration: Managed Systems Configuration

Help

In this step, you configure technical systems, technical scenarios (ABAP-Java Duet-Stack, SharePoint), standalone you must complete the system information.

Prerequisites

- An automatic data supplier is active for each system and sends data to the System Landscape Directory (SLD). Solution Manager displays the technical system.

- The connection between SLD and Landscape Management Database (LMD) is working. (See SAP Solution Manager User Guide for more information.)

- If a system is missing because no automatic data supplier can be used, you have created it manually in transaction ALM/AD.

Table: Technical Systems

<table>
<thead>
<tr>
<th>Extended System ID</th>
<th>System Type</th>
<th>Display Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>3RD</td>
<td>Unspecified Standalone</td>
<td>Application System</td>
</tr>
<tr>
<td>ABC</td>
<td>Unspecified Standalone</td>
<td>Application System</td>
</tr>
<tr>
<td>E2E</td>
<td>Application Server ABAP</td>
<td>E2E on ncesvm</td>
</tr>
<tr>
<td>E2S000001</td>
<td>Application Server Java</td>
<td>E2E on ncesvm</td>
</tr>
<tr>
<td>EPC</td>
<td>Application Server Java</td>
<td>EPO on ncesvm</td>
</tr>
<tr>
<td>IS</td>
<td>Microsoft Internet Services</td>
<td>IIS on ncesv0000028a</td>
</tr>
<tr>
<td>IS500001</td>
<td>Microsoft Internet Services</td>
<td>IIS on lvdvon3525</td>
</tr>
<tr>
<td>LOT</td>
<td>Unspecified Cluster System</td>
<td>LOTUSNOTES on ncesv0000028a</td>
</tr>
<tr>
<td>OTO</td>
<td>Application Server ABAP</td>
<td>OTO on ncesv0000028a</td>
</tr>
</tbody>
</table>
In EM cockpit, there are several extractors available. As a prerequisite, the “Exception Management IPA Extractor” needs to be scheduled.

In tab “Overview”, mark the line for the relevant managed system and chose “Setup IPA”. On the popup choose the clients for which the data pickup should be done.
2.1.4 Activating Journal Mode for the managed system

In tab “Instrumentation Platform”, flag “Journal Mode” for your managed system in order to enable the writing of the log-information on the managed system. This information is replicated to the managed system.

You can check in table /SDF/EM_CFG on the managed system. The entry for JOURNAL_MODE should contain value ‘X’ if the logging information for the business process steps and units should be persisted on the system.
2.2 Steps to execute on the managed system

In order for the logging information to be written, the respective business process steps need to be instrumented, using the methods provided by the EM-IP in ST-PI.

The decision on whether the instrumentation is to be done in customer coding or in SAP coding, e.g. via implicit enhancements should be done case by case.

Customer coding (SAP coding is covered in chapter 2.2.3) should be instrumented directly in the following way:

1. Initialize the passport
2. Per "step" → instrument start of step and end of step
3. Within a step → instrument relevant units.
   Important: The units have to be executed on the same system as the business process step. This means calls to another system have to be instrumented as steps before unit entries are created.
4. Save data at end of business process (only necessary if no COMMIT_WORK occurred at the end of the business process instance) or at the end of the instrumentation on a called system.

2.2.1 Details for Customer Instrumentation

1. Initialize the passport
2. Per "step" → instrument start of step and end of step
3. Within a step → instrument each unit (each important function call)
4. Save data at end of business process or at the end of function call (LUW)
   When the process stretch across different systems at least one save data should exist before the another system is called, if not the data won’t be logged.
2.2.2 Data Declaration for Instrumentation

* Declaration for EM/BPCC Instrumentation
TYPE-POOLS abap.
DATA: p_ptype(4) TYPE c.
DATA l_instance_id TYPE /sdf/em_bpi_id.
DATA: lt_msg   TYPE bapirettab.
DATA: lt_param TYPE /sdf/em_parameter_tt.

1. Initialize Passport
   Creates a GUID as unique identifier for business process instance

   * Create Business Process Instance ID
   CALL FUNCTION 'GUID_CREATE'
   IMPORTING
   ev_guid_32 = l_instance_id.

   Writes this GUID to the extended passport.
The process type (proc_type) here is the business process type that has been maintained in the repository of the EMC on Solution Manager.
* Initially write the instance ID to the passport
/sdf/cl_em_ipa_write=>initialize_process(
  i_bpi_id = l_instance_id
  i_bpt_id = p_ptype).

2. Instrument the Start of the Step

   Creates an entry in the logging tables that the step called ‘Step 1’ was started. You can use a speaking step name.

   ** EM Instrumentation: create start step via EM-IPA
   /sdf/cl_em_ipa_write=>start_step(
     i_step_name = ’Step 1’).

2. Instrument End of a Step

   Writes a time stamp for the end of the step into the logging tables. The step is now considered to be closed. Name of the step does not have to be provided. The last open step is closed.

   ** create end step via EM-IPA
   /sdf/cl_em_ipa_write=>end_step( ).

3. Instrument Unit

   Within a step (between start step and end step), the call of function calls or methods can be instrumented via UNITs.

   A unit has to be assigned to a step.

   /sdf/cl_em_ipa_write=>create_unit_entry(
     i_unit_name  = ’ZFM_ORDER_UPDATE’
     i_unit_type  = ’ABAP Function Module’
     it_parameter = lt_param
     it_bapiret   = lt_msg ).

   Possible unit types are:
   - ’ABAP Function Module’
   - ’ABAP Form Routine’
   - ’BAPI’
   - ’Web Service Call’
   - ’ABAP Class Method’
   As defined in /SDF/CL_EM_IPA_CONSTANTS.

   LT_MSG can be filled with messages you want to raise during the business process execution.
   LT_DOC can contain the payload (values of the parameters) of the function call or method execution.
   It has to be filled explicitly in your instrumentation.

4. Instrument Saving of Data

   The data written during the instrumentation is stored in memory. Several things can trigger the writing of this information to the tables of the instrumentation platform. They include:

   - Explicit COMMIT
   - Explicit ROLLBACK
- Method /sdf/cl_em_ipa_write=>save_data( ).

Important is that the content of the memory is only available, as long the same LUW is being processed. This means that with an implicit COMMIT, the memory is cleared. The save therefore has to happen before the LUW is finished. This means that within synchronous RFCs for instance the save has to happen at the end of the FM execution before the coding returns to the calling system. It also always has to happen when you go over to another system, before you go back again to the calling system.

2.2.3 Instrumentation of SAP Standard Coding via Implicit Enhancements

At the moment, SAP applications do not write into the EM Infrastructure. To instrument a business process (or parts of a business process), two options are possible:

- Modifications
- Implicit Enhancements

Since implicit enhancements are not considered as modifications, they should be used wherever possible. It is recommended to use simple instrumentation of the EM via implicit enhancements (possible are both simple and extended instrumentation).

Non-SAP systems can provide their exception information to feed BPCC, this scenario should be covered with project based approach in cooperation with SAP Active Global Support.

In ABAP programs, implicit enhancement options are predefined at the following places:

- At the end of an include. There are some restrictions, for example, not at the end of a method include.
- At the end of a PUBLIC-, PROTECTED-, PRIVATE-SECTION of a class.
- At the end of the implementation part of a class (before the ENDCLASS, which belongs to CLASS ... IMPLEMENTATION).
- At the end of an interface definition (before the ENDINTERFACE).
- At the end of a structure definition (before TYPES END OF, DATA END OF, CONSTANTS END OF, and STATICS END OF).
- At the beginning and at the end of a procedure (FORM, FUNCTION, METHOD). That is, after commands FORM, FUNCTION, and METHOD, and before statements ENDFORM, ENDFUNCTION, and ENDMETHOD.
At the end of the CHANGING-, IMPORTING-, EXPORTING-parameter list of a method. These enhancement options are located in the middle of a statement. Implicit enhancement options always exist and no enhancement spot is assigned to them.

**Activities**

The implicit enhancement options can be displayed in the ABAP Editor by following the path: *Edit → Enhancement Operations → Show Implicit Enhancement Options*, and then enhanced using source code plug-ins.

### 2.2.4 How to choose relevant Steps and Units

Not all units or steps need to be instrumented. Here are a few guidelines regarding the modelling.

- Units cannot span several systems. RFC calls to other systems have to be instrumented as steps.
- Error messages can only be raised for units.
- To get the correct sequence of the steps, the calling system should be instrumented as well as the called system (nested instrumentation).
- Explicit COMMITS should not occur within a step, but outside of the step.

### 2.3 Sample Reports in ST-PI

With EM-IP a sample report `/SDF/EM_IPA_TEST_PROCESS` is available, as an example for instrumentation. The report creates logging entries for business process type ‘9999’. The report executes 2 local steps with 2 unit calls and also includes an example for a simple instrumentation.

The sample business process is simulated with report `/SDF/EM_IPA_TEST_PROCESS`. Within this process, “documents” are created and stored in tables:

- `/SDF/EM_TEST_HDR` (header data)
- `/SDF/EM_TEST_ITM` (item data)
- `/SDF/EM_TEST_FLW` (document flow)
The business process executes three steps that are triggered on the orchestration layer (System A). You can choose on which systems the steps will be executed by selecting the respective RFC destination in the selection screen. The called systems must have the SP09 for ST-PI implemented. Instrumentation includes logging of objects.

2.4 ST-PI 2008_1_700 SP09: What happens in Report /SDF/EM_IPA_TEST_PROCESS

2.4.1 Selection Screen for /SDF/EM_IPA_TEST_PROCESS

Call transaction SE38 and execute report /SDF/EM_IPA_TEST_PROCESS. In the following selection screen, enter:

- Business Process Type ID as defined in EMC in Solution Manager
- RFC destinations for the creation of document 1, 2 and 3.
  Default is “NONE” (documents created on the same system where the report is executed). You can select other RFC destinations via the value help. If you do so, observe:
  - The user in the RFC destination needs to have authorization for the execution of the /SDF/* function modules. READ-destinations from Solution Manager usually do not have enough authorization. Use the LOGIN-destinations or TMW destinations.
  - The called system must have the report /SDF/EM_IPA_TEST_PROCESS available.

Afterwards, execute.
Once the report has been executed, the entries in tables /SDF/EM_TEST* have been created and the steps, units and objects have been logged.

3 How to use the Business Process Completion Check

The BPCC status is part of the aggregation for the overall status in the EMC Monitoring screen. In the initial screen, the instances are summarized per category. If you mark the line for the category, all instances for this category are displayed. The results of the BPCC are displayed in column “Completeness” in the panel “Instance Group”.

3.1 Display the Results for a Single Instance

Mark an instance and choose “Detail”. This opens a new window with the instance details.

3.2 Details for the Business Process Instance – Instance Information

The instance information contains the instance status and the used instance ID.
3.3 Details for the Business Process Instance – Instance Flow

In panel “Instance Flow” the sequence of the executed steps with the related units are displayed. Per step the completeness status is part of the display.

Attention: Only steps have a completeness status. Units do not have a completeness status assigned.

The completeness for a step is calculated as follows:
- Green if the step was completed (i.e. has an end time stamp)
- Red if the step is not completed (i.e. does not have an end time stamp)

3.4 Step Information

Per selected step the step information is displayed, particularly the context information such as the call stack.

3.5 Unit Information

The unit information may contain error messages that were created for the unit.
Additionally, the payload of the unit is displayed (values of the parameters the function module or method were called with).

4 What’s new

With SP9/10 some new functions are available within the BPCC:

- Extended Instrumentation platform to log the creation of objects (delivered with ST-PI)
- Graphical View of Business Process Instance

4.1 Extended Instrumentation Platform

As of ST-PI 2008_1 700 SP09, the instrumentation platform was extended to also cover the logging of objects that were created in the execution of the business process instance.

Example: If a sales order was created during the business process instance, this information (including the key fields to identify the sales order) can be logged in the Extended Instrumentation Platform.

4.2 Why was the logging of objects introduced?

BPPC should be able to tell if a business process instance was correctly and completely executed. In order to determine this, we need to know:
Business Process Completeness Check in SAP Solution Manager

1. Were all steps executed in the correct sequence?
2. Were all objects created in the databases with the correct status?
   → We need to know which objects were created during the execution of the business process instance.
   → Evaluation of these objects (were the right objects created) via the Rule Evaluation.

4.3 How to log Objects

Extended Instrumentation: logging via new method create_object_entry
/sdf/cl_em_ipa_write=>create_object_entry( it_object_key = lt_object ).
In it_object_key you can provide:
- OBJECT_TYPE e.g. ‘SO’ for Sales Order
- OBJECT_NO e.g. the sales order number
- KEY_NO number of the key field
- KEY_NAME e.g. ‘DOC_TYPE’ for the document type
- KEY_VALUE e.g. ‘TA’ as the document type for the created sales order
- TIMESTAMP Timestamp

In the simple instrumentation, the object is logged via the method end_simple_step (via optional parameter it_object_key):
/sdf/cl_em_ipa_write=>end_simple_step( it_object_key = lt_object ).

OBJECT_TYPE can be named according to your needs. It’s recommended to choose a “speaking name”.

4.4 : Graphical Display of Business Process Instance

Display of the flow of steps across the components is available.
Inclusion of status per step (status type is revealed per tooltip help).