Best Practice

Test Scope Reduction via Business Process Change Impact Analysis for Regression Testing

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1. Executive Summary

This best practice document was established as part of the SAP Max Attention Workstream for Test Scope Reduction via Business Process Change Analysis for Regression Testing in 2013 and 2014 by BMW AG, Bayer Business Services GmbH, Procter & Gamble, and SAP SE. It will provide a brief overview and summary of SAP Business Process Change Analyzer (BPCA) and SAP Scope and Effort Analyzer (SEA) for different change events and SAP solutions. In addition it contains key BPCA and SEA uses cases which were evaluated and validated by the different companies named before.

This document lists the key activities and design decisions required to successfully implement BPCA and SEA considering different starting points and use cases in an enterprise, e.g. test management tool architecture, business process documentation granularity and completeness, SAP value release strategy, etc.

2. Test Management Process embedding BPCA and SEA Overview

2.1 Business Process Change Analyzer (BPCA)

The Business Process Change Analyzer (BPCA) is a versatile tool during the Test Scope Identification for different kinds of Change Impact Analysis.

1. Select your Impact Analysis Type

- Support Packages / Support Package Stacks
- Enhancement Packages
- Planned Business Function Activation
- Transport Requests
- Object List
- Change Transaction

It identifies business processes affected by a change and recommends a risk-based regression testing. A created test plan can be used for the execution of manual and automated tests during the test phase.

In contrast to SEA, BPCA requires that customizing changes and / or code developments exist in the system and are assigned to transport requests or deployed Enhancement / Support Packages. Two exceptions are:

- the “object list” function, where you can enter objects that you plan to adapt.
- the option ‘Planned Business Function Activation’, which allows an impact analysis for the activation of available Business Functions.
2.2 Scope and Effort Analyzer (SEA)

The Scope and Effort Analyzer (SEA) provides transparency about the change impact of implementing an Enhancement package before a physical installation. The tool delivers a lot of useful information like a list of impacted modifications (SPDD and SPAU) together with an estimation of the required adjustment effort for custom code.

![Bar chart showing adjustment efforts by impact categories](chart.png)

Additional information like the “number of custom code objects with syntax errors after upgrade” are estimations based on SAP's experience.

Information about used and unused code is based on reliable usage statistics (UPL data).

The integrated Test Scope Optimization of BPCA predicts the project effort for testing based on impacted business processes.
All this information is very helpful during the project preparation phase. It delivers reliable data on which to base resource planning for developers and testers for an Enhancement implementation project. In addition it makes recommendations for missing test cases and process traces.

It is important to keep in mind, that the results are reliable for an update of standard SAP Software components only. A consideration of 3rd party plug-ins is technically not possible. If third party software components are implemented, a further impact analysis with BPCA should be processed as soon as the enhancements have been implemented on a system.

3. Technical Prerequisites

Essential information about the technical prerequisites of BPCA and SEA is provided in SAP Solution Manager Wiki section Test Management which can be accessed via the following link: http://scn.sap.com/docs/DOC-47361 --> Test Management

The following documents should be consulted when setting up BPCA and/or SEA:

- “Getting Started with BPCA in 10 easy steps” provides a good overview about the overall setup required for running a BPCA analysis
- BPCA How-to-Guide “How to guide of Business Process Change Analyzer” contains the detail description of BPCA setup and configuration
- SEA How-To-Guide contains all relevant setup and execution information
In order to use BPCA successfully you need to ensure that the following technical prerequisites are in place:

**a. Preparations on Solution Manager**

**Release**
Solution Manager 7.1 SP10 (or higher)

**Authorizations for BPCA**
Solution Manager Authorization for BPCA (e.g. create project, create business blueprint, TBOM generation, etc.)
Refer to Chapter 2.3 in BPCA How-to Guide.

**MDX Parser**
RFC connection from productive Solution Manager client to the MDX parser is required. Refer to SAP note 1261507 for more information.

**Managed system setup**
Create RFCs and logical components for each managed system.
Refer to Chapter 2.1 in BPCA how to guide

**Usage Procedure Logging (UPL)**
UPL extraction framework setup has to be completed.
Refer to Chapter 7 in BPCA How-to Guide.

**Applying BPCA notes**
1902895 - Dump during BPCA analysis

**b. Preparations on managed system**

**Release**
Software component ST-PI 2008_1_x (700 or 710) SP8 or higher is needed on managed system.

**Authorizations for BPCA**
Authorization for TBOM traces etc.
Refer to Chapter 2.3 in BPCA How-to Guide.

Data collections:
For specific BPCA scenarios data collections (workload, UPL) need to be set up in advance in order to provide the data when performing the analysis.

Relevant system: Production (in order to provide the real usage information)

1. Workload data (ST03n)
   Required when generating SAP module oriented business blueprint based on usage data.
   
The retention period should be setup properly in order that the workload data is collected over at least 2 months.

2. UPL data
   This is required when using semi dynamic TBOMs.
   
   UPL has to be activated and should be running for at least 2 months in order to assure that the semi dynamic TBOMs represent the used processes.
   
   When using Netweaver 7.01 the size of the used shared memory should be checked according to the SAP recommendations (see SAP note 1916616) and chapter.

C. Verifying setup

Solution Manager and managed system setup can be verified by running report AGS_BPCA_SELF_CHECK on Solution Manager (available from 7.1. SP11). The report is accessible via SAP Solution Manager Work Center “Test Management” — View “Administration” – TBOM Utilities.
4. SAP Solution Manager Project Setup

In this chapter test options 1 and 2 are presented regarding Project Setup. In test option 1 SAP Solution Manager acts as test management application, in test option 2, test cases and results are managed in the HP ALM / HP Quality Center.

4.1 Test Option 1: Solution Manager for Test Management

This chapter gives recommendations for the number of projects / solutions you should use to document your SAP systems. The right answer depends on the business organization of your company. If your enterprise consists of individual business areas with completely different fields of activities, it might be reasonable to have one Solution Manager for each business area in place. This ensures secure access to the individual documentation together with a specific customizing. On the other hand the cost for hardware and support is high.

Therefore many companies have one Solution Manager for Documentation and Change Management, and one for System Operation in place. This segmentation has the advantage of individual release cycles. This reflects the requirement in the operations area to stay near the highest SP level, whereas the need for upgrades in the Documentation and Change Management area is much lower. Another advantage is to run the Solution Manager for Documentation and Change Management at a higher operational security level (e.g. required in pharmaceutical industry for documentation).

Within one Solution Manger it is good practice to create one documentation project for every system strand. Important exceptions are sets of systems with high degree of interaction e.g. ERP together with SCM and CRM.

Use projects instead of solutions since the authorization concept is much more specific than for solutions. In addition a comprehensive reporting is available via reporting transaction SOLAR_EVAL for projects only.

Define customer specific documentation types based on office templates (Word, Excel) for all needed documentation e.g. for user requirements, functional specification, development specification, test case, test notice and process descriptions. Use the related standard-tabs in a project structure for storing them.

Think about status values (draft – under review – approved – outdated) together with signature strategies to authorize a status change in documents.

Make it as simple as possible to keep the support effort small.

Now let’s come to some prerequisites on object level to use the project related documentation for Test management:
- Assign logical components as representatives of all related system strands to the project.
- Store transactions / reports which are used to perform a process / process step in the transactions tab, and all test cases in the test case tab of the project.
- If more than one transaction is assigned to a project structure element, assign the related transaction to the test case as well (as test object).

  ![Diagram](image)

- Maintain the criticality attribute to Business Processes or Process Steps (see chapter 6.8 and 8.2)

Setup guidelines are provided in chapter 6.

### 4.2 Test Option 2: HP ALM / HP Quality Center for Test Management

Companies who decided to leverage HP ALM / HP Quality Center for Test Management need to decide on the right project architecture and its integration for SAP Solution Manager and HP ALM / HP Quality Center. The key driver for the architecture design are the **maintenance efforts** of assets like business process documentation and test documentation as well as the **reusability** of those assets across different SAP change events.

In the picture below you find the recommended approach for medium to large size companies where reusable documentation is stored centrally in a library and is reused by multiple projects at the appropriate time.
In this approach you will have one SAP Solution Manager Project where you store your Business Process documentation (Business Process Library). This SAP Solution Manager Project is integrated with an HP ALM / HP QC project which contains the reusable test documentation (Test Library) linked to the Business Processes (step 1).

Each project (or even smaller changes) will reuse existing assets from the library through copying (step 2 and 3) the content into a new SAP Solution Manager and HP ALM / HP QC project (note: link between solution manager project processes and process steps and HP ALM / HP QC requirements need to be recreated > step 4).

Step 5 will enable the project to generate the recommended test plan based on the BPCA/ SEA results and your individual project specific Test Scope Optimization (Risk Based Testing) in HP ALM / HP QC.

5. User Segmentation

The following roles are involved for change impact analysis and test related activities:

**Quality Manager (QM):** Oversees all quality aspects in the organization. The QM provides framework definitions, tools and guidance and assures keeping the same level of quality in the organization.
Test Manager: Is responsible to organize all test activities, quality reporting and final sign-off from a quality perspective.

Test Coordinator: Coordinates all test setup and test execution activities for a specific project or test cycle. Execution of BPCA in SAP Solution Manager for test scope optimization. Ensures availability of correct test data.

Key User: Interface between IT and business. Deep domain expertise of specific software solutions. Provides the test scope together with the test coordinator.

Tester: Executes the test cases and documents the results.


System Administrator: Assists in technical setup utilities, e.g. UPL activation.

6. Business Blueprint Setup

The Business Blueprint is the prerequisite for BPCA and SEA. It includes information about single transactions (process steps) as well as chain of transactions (business processes). This is the entry point to link test documentation against individual transactions as well as chain of transactions. At the same time it is the entry point to link technical objects behind those.

This Chapter starts with the available tools to generate a business process documentation from scratch, continues with the aspects for modeling E2E business process and business process variants, and finally provides options to validate and complete an existing Business Blueprint.

6.1 Alternative 1: Solution Documentation Assistant (SoDocA)

With the Business Process Repository (BPR), SAP provides a structured collection of preconfigured business scenario and business process structure elements as a base to set up a customer specific Business Blueprint.
There are two options available: setup as a project (solar_project_admin) or a solution (solman_directory). With the focus on system documentation we recommend to use a project of type ‘Implementation project’ since the authorization concept is very detailed and a lot of standard reports are available via transaction solar_eval.

In the solar_project_admin transactions, import the related Scenarios of the BPR to get a first project for the Solution Documentation Assistant.

A subsequent SoDocA analysis based on workload and UPL data will deliver a detailed information about used processes (based on assigned objects like transaction, report, …)
and not used and not documented objects:

This is an ideal base which then can be extended by adding missing processes and to identify documented but unused ones.

This approach works fine if BPR processes are similar to your business processes. If not, have a look at other methods to create a Business Process Documentation.

6.2 Alternative 2: Generated SAP Module oriented Blueprint (Process Step Library)

The Scope and Effort Analyzer application (in Solution Manager 7.1.SP11) introduced another option for automatic generation of a SAP module oriented Blueprint based on usage data. This function is also available for SAP Solution Manager 7.1 SP10 if you download a standalone ABAP program via SAP Note 2061626

The functionality automatically creates a Business Blueprint with process steps and assigned executables (transactions, reports) based on customer usage statistics, which is called “process step library”. The generated blueprint can be used as-is, or used as starting point to compose additional end to end business processes.
Creation of initial module-oriented blueprints:

Generated SAP module-oriented blueprints are based on the application component hierarchy (ACH). They have the advantage that all SAP standard transactions and reports which have been used by the customer are taken into consideration. The generated blueprint also includes custom-built transactions and reports.

Excluded are executables belonging to $TMP, without TADIR entry, or manually excluded ACH components such as SAP Basis (BC).

The first level of this hierarchy is used for the scenario level. The development packages generates the Business Process Level. The transactions are assigned on process step level.

All customer transactions with an Application Component node assigned are integrated automatically:
All other custom transactions and reports which are not assigned to an Application Component can be found either in the ‘CUSTOMER’ section or in the ‘SAP_NO_SCENARIO’.

This Blueprint fulfills the technical requirements to run BPCA as well as Scope and Effort Analysis, but it can’t reflect any business processes.

Furthermore the Blueprint can be used as Process Step Library for creating an E2E Business Blueprint as described in chapter 6.3.

Maintaining of existing blueprints:

The Blueprint generation function can also be used to build a delta blueprint in regard to an existing one. That means the generated blueprint only contains executables that are not part of the existing blueprint. This is an efficient option to keep an existing blueprint up to date which is a necessary task to make sure that it keeps an reliable basis for future BPCA analysis. For further information please see chapter 6.6.
6.3 Modeling E2E business process and business process variants

There are many ways to document end to end business processes. We recommend to first creating a Process Step Library, which contains process steps with assigned executables such as transaction codes and report names. The library can be created manually, via file upload or generated via program as outlined above.

After the Process Step Library is available, end to end business processes can be composed from Process Steps in the library in E2E Business Processes based on process know-how in your company.

Figure: from PSL to E2E Business Processes

6.3.1 Steps to create an E2E Business Process based on Executables in the Process Step Library

The following chapter explains how to create Business Processes in SAP Solution Manager transaction “Business Blueprint” (transaction code SOLAR01).

Step 1: Create Business Process
In the first step, a new Business Process is defined in section “E2E Processes”
Step 2: Copy Process Step to Business Process

Navigate to the first process step that shall be included in the Business Process. Use the context menu to copy this process step.
Step 3: Insert copied Process step in Business Process

After navigation to the Business Process, the Process Step can be inserted as copy (alternative 1) or as shortcut (alternative 2). The second approach has the advantage that the text of the process step shows up directly without the prefix “copy of”, but requires in Step 4 that the shortcut gets disbanded, since the use of shortcuts is generally not recommended.

Step 4: Disband shortcut

Please eliminate the shortcut afterwards using the context menu using action “disband shortcut”, with options

- Refer to documents
- Copy TBOM

With this, you can document generic executables in the Process Step Library and still use them in E2E Business Processes, reusing the documentation of the single steps.
Summary:
The Process Step Library (PSL) contains all process steps and assigned executables that are important and used by your organization. The Business Blueprint section “E2E Business Processes” is composed out of process steps of the PSL. The generic documentation of process steps is available via reference in the Business Process. Additional documentation can be added for the Business Process, especially in those cases where process steps are used in a specific fashion.

Variants of Business Processes
Multi-purpose transactions such as “Create Sales Order” (VA01) are often used in various Business Processes. Variants of Business Processes can be modeled and documented in the same way. The first E2E Business Processes acts as starting point for a copy into a second Business Process. Now it is possible to rename the Business Process and the relevant process steps. Example: process step “rushed order” replacing the process step “standard order” in the business process “Order to Cash Variant 2”.

6.4 Import Business Blueprint from external source

SAP Solution Manager is offering an interface to migrate business process information into SAP Solution Manager structured by a 3 tier hierarchy (business scenario, business process and business process step). In case your Business Process Library is located in a different repository (e.g. ARIS or Sharepoint), you need to transfer it to a SAP Solution Manager Business Blueprint structure in order to use BPCA. Depending on the expected level of detail for the BPCA run, your Business Blueprint needs to be setup accordingly. Your custom defined business
blueprint process should have transactions at process step level which can be aggregated and assembled to a business process. See detailed information on upload of Business Blueprint and transactions, mentioned in the appendix.

6.5 Generate Business Blueprint based on HP QC / HP ALM Test Plan

Use Cases

- There is no business process documentation available.
- Test Scripts are managed in a process oriented structure in HP Quality Center (HP QC) test plan module that accurately reflects the customer's understanding of their own business processes.

Preparations:

Since HP QC test plans usually don’t match the Solution Manager blueprint model a mapping has to be setup. This can be done as described below:

1. All QC folders directly below a selected test plan level are mapped to business scenarios in Solution Manager.
2. Following test plan levels until the test steps are merged and mapped to business processes in Solution Manager.
3. Finally QC test steps are mapped to the process steps in the Solution Manager.

<table>
<thead>
<tr>
<th>No</th>
<th>Quality Center Test Plan</th>
<th>Solution Manager Business Blueprint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Folders directly below the selected test plan</td>
<td>Business Scenario</td>
</tr>
<tr>
<td>2</td>
<td>Folders till test steps. There are often several levels and which therefore get merged via concatenation of the names.</td>
<td>Business Process</td>
</tr>
<tr>
<td>3</td>
<td>Test Steps</td>
<td>Process Steps</td>
</tr>
</tbody>
</table>

The following screenshot shows an example of an business blueprint (right part) which was created based on a test plan (left part) and illustrates the mapping.
Export and blueprint generation:

An automatic test plan data export and blueprint generation can be performed with help of the SAP Test Planning Automation (TPA) tool provided by SAP.

SAP Contact: Stephane Gimeno (stephane.gimeno@sap.com, AGS COE EMEA)

Step by step SAP Solution Manager Template files are filled with data that was exported from a HP Quality Center (QC) test plan before. After uploading the Template files to Solution Manager a business blueprint based on the test plan is available.

Furthermore the TPA tool can be used to help preparing a business blueprint for synchronization to HP Quality Center (with SAP Solution Manager Adapter). Prerequisite is that the business blueprint was created with TPA tool before; otherwise you’re not able to use the offered functionalities like ‘Map Test Cases’ etc.
6.6 Validate and complete existing Business Blueprint

There are two options for keeping Blueprint documentation up to date:

Alternative 1: Delta Blueprint Generation

As a prerequisite a SAP Solution Manager project with a business blueprint already exist, e.g. EHPSCOPE. The structure of the Blueprint does not matter (e.g. module oriented or process oriented).

An additional project using the blueprint generation program (see chapter 6.2) can be created with reference to the existing business blueprint.

<table>
<thead>
<tr>
<th>F_TITLE</th>
<th>Generated Blueprint Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOGLEVEL</td>
<td>1</td>
</tr>
<tr>
<td>EXCL_ACH</td>
<td>BC SV WP</td>
</tr>
<tr>
<td>USE_REPS</td>
<td>X</td>
</tr>
<tr>
<td>WL_FROM</td>
<td></td>
</tr>
<tr>
<td>WL_R_L</td>
<td>L</td>
</tr>
<tr>
<td>REF_PROJ</td>
<td>EHPSCOPE</td>
</tr>
</tbody>
</table>

As a result only those executables are listed in the generated Blueprint project, which are not included in the existing reference project yet.

The business processes of these executables has to be included in the existing Blueprint project. Use the described technique of chapter 6.3.1 (via shortcuts).

Alternative 2: Maintaining Blueprint with SoDocA

Use the Solution Documentation Assistant to verify your business process structure based on usage frequency and self-defined rules. Use SQL check steps in an Analysis project to distinguish variants of multi-purpose transactions.
Structure nodes flagged as red shows, that the assigned objects are not executed during the selected period of time. Flag those nodes as ‘out of scope’.
Use the analysis results to update the documentation project.

6.7 Business Blueprint - Customer Attributes

In order to classify Business Processes or Process Steps as "mission critical" or of high priority, it is possible to define customer attributes and assign them to the appropriate Business Blueprint nodes. The following sections explain how to define and use customer attributes. Within BPCA and SEA you can use these customer attributes for selecting business processes or to give preference to these processes when using the BPCA “must include area” in Test Scope Optimization.
Custom Attribute – “Business Process Priority”

Step 1:
- Go to SPRO transaction -> “SAP Reference IMG”
- Navigate to “Object Attributes” for “Blueprint and Configuration”
- Click on “Definition of Customer Attributes for Object Types”

![Diagram showing steps for creating custom attributes](image)

Custom Attribute – “Business Process Priority”

Step 2:
- In the overview screen, go to edit mode and click on “New Entries”
- Enter a new “Customer Attribute Name” and “Attribute Description” as “BP_PRIO” and “Business Process Priority” respectively
- Click “Save” Button
Custom Attribute – “Business Process Priority”

Step 3:
- Go back to SPRO screen
- Click on “Assign Customer Attributes to Object”
- Click on “New Entries”
- Select “Project and Solution Node”
- If entry already exist, skip this step

Step 4:
- Select the entry “Project and Solution Node”
- Double click on “Assign Attributes”
- Click on “New Entries”
- Enter Attribute name as “BP_PRIO” (from previous step)
- Click Save
7. Technical Bill of Material (TBOM) Types and Use Cases

7.1 TBOM Types

What is a TBOM and what is its purpose?
The Technical Bill of Material (TBOMs) is the list of technical objects (function modules, customizing settings, etc.) that are used to run a transaction or program. Typically it is a list of those types of objects in the accordant level of detail that could be part of a transport, when creating a change in a SAP system. Picture 1 shows the call hierarchy of all objects that from a theoretical point of view could be executed or touched by executing a transaction no matter if they are actually used or not.

ABAP call hierarchy

![ABAP call hierarchy diagram]

Picture 1: TBOM: List of objects used in a Transaction

BPCA compares the list of technical objects of any kind of change of a SAP System with the TBOMs that are related to process steps to identify those test cases that should be tested to safeguard a change.
The entity relationship model for the BPCA functionality is shown in Picture 2.

3 types of TBOMs are available to be used for BPCA. They differ in the way of generating, differ in the accuracy of the prediction that results from the BPCA analysis and they differ in the effort for the initial setup of TBOMs.

**Static TBOM:**
The Static TBOM is the result of the collection of all objects (except the customizing) of the call hierarchy of objects behind a transaction. As this type of TBOM generation collects objects in all paths of the call hierarchy even if the objects are not used, an enormous number of objects could become part of this TBOM, depending on the complexity of a transaction.
If the path of red highlighted objects would be the list of those objects that are actually executed within the specific use of a transaction, you can see that this static TBOM contains additional objects that are not related to the specific use of the transaction.

It is possible to reduce the ABAP call stack analysis (default max of 999 levels) to reduce the number of collected ABAP objects in the static TBOM. In prior Support Packages of SAP Solution Manager 7.1 the generation of static TBOMs was restricted to 4 levels, which is not the case any longer with SP11 onward. Four levels are not sufficient in order to track the whole calling hierarchy of a transaction (see blue frame in the picture above).

It is to be expected that static TBOM generation method leads to a low accuracy of a BPCA analysis, and is therefore not recommended to use!

**Semi Dynamic TBOM:**

The method of generating Semi Dynamic TBOMS collects the objects up to a call hierarchy level of 999. It is based on existing UPL data from the productive system and collects all objects (except customizing) of those paths in the call hierarchy of a transaction that have been executed at least once during the daily business of a reference SAP system. However, it does not specify ignoring the path that is used for each specific execution of the transaction.
If the path of red highlighted objects is the list of those objects that are actually touched within the specific use of a transaction, you can see that this TBOM contains some additional objects that are not directly linked to the executed transaction. From a point of view of completeness it is important that this collection contains as a subset all objects of the specific use of a transaction.

This TBOM generation method leads to a medium accuracy of a BPCA analysis. The main reason for this is that BPCA will also detect a test case for a specific use of a transaction if an object of the TBOM is changed, that is actually not part of the specific use of the transaction but this root causing object is in use by another transaction or another specific use of this transaction. So with a semi-dynamic TBOM, BPCA will show some potential impacts that do not exist, i.e. the test case does not actually call the changed object.

Dynamic TBOM:
This method is collecting all objects (including the customizing) of those paths in the call hierarchy of a transaction that are really in use during the specific use of a transaction, for this the transactions have to be executed in dialog and the TBOM is being generated in the background automatically. The method of recording dynamic TBOMS is collecting the objects of the complete call hierarchy.

The accuracy of dynamic TBOMs for the usage of BPCA is higher than the two other methods. The effort for dynamic TBOM generation is much higher since this method requires manual execution of transaction (although if test cases have been automated using SAP TAO, the effort can be minimized). With a dynamic TBOM, BPCA only shows impacted test cases where an object that has been changed is actually called.
7.2 When to use which TBOMs

Balancing up the two criteria of effort for the initial setup of TBOMs versus the accuracy of the BPCA analysis will lead you to a first decision on which TBOM generation method will fit to your system environment, blueprint/process documentation and budget.

### BPCA - TBOM Generation
Dynamic, Static and Semi-Dynamic TBOM

<table>
<thead>
<tr>
<th></th>
<th>Static</th>
<th>Semi-Dynamic</th>
<th>Dynamic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creation Effort</td>
<td>Low</td>
<td>Low</td>
<td>High if not combined with test execution</td>
</tr>
<tr>
<td>Contained Objects</td>
<td>All objects in the call hierarchy of a transaction</td>
<td>All objects in the call hierarchy of a transaction which have been used in the productive system during specified period</td>
<td>Exact the list of objects that are used when executing a transaction in the context of a specific business process</td>
</tr>
<tr>
<td>Dynamic calls</td>
<td>Not supported</td>
<td>Not supported</td>
<td>Supported</td>
</tr>
<tr>
<td>Branching levels</td>
<td>Unlimited (up to 999), user defined</td>
<td>Unlimited (up to 999), user defined</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Table keys</td>
<td>Not supported</td>
<td>Not supported</td>
<td>Supported</td>
</tr>
<tr>
<td>Variants of same executable</td>
<td>Not supported</td>
<td>Not supported</td>
<td>Supported</td>
</tr>
<tr>
<td>Precision of BPCA results</td>
<td>Low</td>
<td>Medium</td>
<td>Very High</td>
</tr>
</tbody>
</table>

To distinguish between process variants of so called multi purpose transactions like VA01 the use of dynamic TBOMS is a must. Since just one TBOM can be assigned to a specific node of the blueprint, each variant needs it’s own node.
This leads to the decision tree above and the following use cases:

**When to use ‘dynamic’ TBOM…**

**Use Case**
- Dynamic TBOMs should be used if you expect BPCA Run result details for Dynamic Calls, Table Keys (e.g. different customizing) and Variants of the same executable (e.g. variants same transaction).

**Prerequisite**
- In order to get to the expected detailed BPCA run results, the corresponding Business Blueprint has to have a level of detail where process variants are separately documented.

**Creating a dynamic TBOM**
Dynamic TBOM creation requires either manual or automated execution of a particular business process or business process steps in either a productive or non productive system. In order to minimize the efforts for reoccurring TBOM recreation the following approach is suggested:

1. Automated TBOM-recording during the manual execution of tests out of the Tester Worklist in Production
2. Automated TBOM-recording during the creation of automated Tests in non productive systems.
In case you don’t do Test Automation today, the proposal is to start establishing the automated tests while creating the dynamic TBOMs initially.

When to use ‘semi-dynamic’ TBOM…

Use Cases

- Automatically created ‘semi-dynamic’ TBOMs is a good starting point for BPCA. Nevertheless a smooth transition to dynamic TBOMs will improve quality of the BPCA result.
- Blueprint contains mainly single transaction types (no multipurpose transaction types like VA01).

Requirements:

The following is required when using semi-dynamic TBOMs (see also chapter “Technical Prerequisites”).

1. UPL data

   Should be available from productive managed system and transferred to SAP Solution Manager.

2. Where-used list

   Relevant system: development or integration system

   Where-used list must be built up on the system where the semi-dynamic TBOM is created. It’s necessary to create this list for SAP objects as well since this does not exist usually. For more information see SAP Notes 18023 (Jobs EU_INIT, EU_REORG, EU_PUT) and 28022 (Customer system: Where-used list for SAP Objects).

   To check whether the where-used list for SAP objects is built up open e.g. ‘SUSR_USER_MAINT_WITH_DIALOG’ in SE37 and click on the button ‘Where used’. Since this is a SAP standard module there should be any results. If not, the where-used list for SAP objects has not been created yet.

Creating semi-dynamic TBOMs:

It’s recommended to schedule report AGS_BPCA_TBOM_STATIC_GEN in the background. The runtime for a blueprint with 2.000 transaction and programs is more than one day.
Please note the following regarding the system setup:

1. In the selection screen of the semi-dynamic TBOM report the option “Project only” has to be chosen.

2. Managed system used for creating semi-dynamic TBOMs:

   For this purpose a development or integration system should be used. It’s important that the where-used list for SAP and custom objects is built up in this system.

   There is no selection field in the report to define the SID. The SID for this is determined by the system role set in SOLAR02.

3. System Role for Usage and Procedure Logging:

   Please note: This system is not the same as the one which provides the UPL data (see next point).
Choose “P” for production system. By this the UPL data from the productive system is used as filter for the generation.

General:
- It is also necessary to update TBOMs after major changes of existing functionality, but with the approach to do the dynamic TBOM update while performing the change related test this is possible without additional effort. For static and semi-dynamic TBOMs the update can be easily performed by a background job.

7.3 TBOM Criticality Settings

Use Case
- Influence the test optimization ranking by setting TBOM criticalities in order to make sure specific coding / customizing is always in test scope when affected.

Preparations

The following table shows general recommendations what to prioritize.

<table>
<thead>
<tr>
<th>What to prioritize</th>
<th>Criticality setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Custom code</td>
<td>Object Name = customer name space, Y* or Z*</td>
</tr>
<tr>
<td></td>
<td>User Name = *</td>
</tr>
<tr>
<td></td>
<td>Criticality = 9 Very Critical</td>
</tr>
</tbody>
</table>
When to refresh TBOMs?

TBOMs need to be refreshed periodically to ensure that they are still up to date and include recent developments. The TBOM utilities offer different functions to evaluate which TBOM exist and which need to be refreshed since they are outdated. Prior starting a BPCA or SEA analysis run you should verify that semi dynamic or dynamic TBOMs are up to date. For outdated TBOMs appropriate steps need to be taken to ensure that they are current again.

BPCA Self Check Program

To lower the hurdle of using BPCA, SAP has developed a BPCA self check program which lists the status of all setup steps after starting a simple ABAP report available with SAP Solution Manager 7.1 SP11 (please contact Marcus Wefers in case you need this program for SP10)

Access to the program via Workcenter Test Management – view “Administration” and sub-view “TBOM Utilities”.

<table>
<thead>
<tr>
<th>Classification Type = * All Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical customizing tables</td>
</tr>
<tr>
<td>Object Name = &lt;Table Name&gt;</td>
</tr>
<tr>
<td>Object Type = TABU or VDAT</td>
</tr>
<tr>
<td>User Name = *</td>
</tr>
<tr>
<td>Criticality = 9 Very Critical</td>
</tr>
<tr>
<td>Classification Type = * All Types</td>
</tr>
</tbody>
</table>
You can select the last entry of the popup to launch the BPCA Self Check program.

On the selection screen you can enter the SID of the managed system where the TBOMs shall be generated, e.g. SAP ERP test system. In addition you specify a second system from where the UPL information is collected. This will be the production system in most cases. The SAP Solution Manager project that contains the Business Blueprint, executables and potentially already the TBOMs shall be entered as well.
Result of the BPCA Self Check program

Header information
This section lists the date user and the selected systems.

Check – Section 1
This section performs all necessary checks in the SAP Solution Manager system including

- SAP Solution Manager project,
- Logical Components,
- User authorizations,
- and provides information about standard roles delivered by SAP
Check – Section 2

This section performs all necessary checks to reach the managed systems including:

- all required RFC types
- whether the managed system can be reached using the RFCs (system ping)
- User authorizations for selected function modules,
- and provides information about standard roles delivered by SAP

Check – Section 3

This section performs all relevant checks about UPL activation and UPL data flows to SAP Solution Manager
Check – Section 4

This sections lists the BPCA parameters for the user that started the BPCA Self Check program.

Section 4: Available User Parameter

- RGS_BPCA_OBJUPDATE_HLP X BPCA Object list upload quick help
- RGS_BPCA_TDBM_EXPERI 9 Expert Settings for RGS_BPCA_TDBM (Values: 1-9)
- RGS_BPCA_TR_FR_TWRL X Allow TDBM generation from tester Worklist? (X=true)
- RGS_BPCA_TST_SC_DA OA_3 Test Scope Optimization Approach
7.6 All TBOM Utility Programs

SAP Solution Manager offers different utilities for TBOMs. Below an overview of the key ones and when they should be used:

- **Static or semi-dynamic TBOM creation:** this function allows you to generate either static or in case of UPL data is available also semi dynamic TBOMs. See previous chapter for different TBOM types and their benefits.

- **TBOM Obsolescence Check:** this function allows you to assess if TBOMs for a solution or projects are no longer up to date due changes to existing objects.

- **Evaluate Transactions/TBOMs/Test Cases for Projects, Evaluate Transactions/TBOMs/Test Cases for Solutions:** this function is used for reporting purposes to get an overview which business processes or process steps do have TBOMs assigned.

- **TBOM Mass Deletion:** you can use the mass deletion to delete multiple TBOMs at the same time in order to recreate them.

- **BPCA Self Check:** this function is used to verify that all prerequisites are in place in order to use BPCA or SEA (available as of SP11).

More details on how to use the different functions is available in the BPCA how to guide.

8. Business Process Change Analyzer (BPCA)

8.1 Software Change Events

8.1.1 Enhancement Packages/ Support Packages Stacks

**Use Case**

- EHP or support package upgrade including custom transports to be analyzed.
- No separate analysis for support packages or transport requests needed.

BPCA provides separate options for analyzing support packages, EHP or transport requests. When doing an EHP upgrade project it usually includes implementing support packages and custom transports as well. Therefore an efficient way is, to analyze all together via the “Transport Request “ option (see screenshot) instead of running separate analysis for support package, EHP and transport requests.
Preparations

It’s required to identify the date range in which the EHP, support packages and transport requests have been imported into SID which has to be analyzed.

Perform Change Impact Analysis

Create new change impact analysis and choose “Transport Requests” as impact analysis type. Enter the system in which the transport requests have been imported and which should be analyzed. Then open the search help of the first “Request

Then enter the transport request period which has been identified before in preparation phases and select all found transport requests.
The selected transports requests should now cover the EHP, support packages and the custom transports.

Then enter the Project ID to be analyzed and provide an analysis description. Enter SCENARIO, PROCESS and PROCESS_SETP as node type (in order to cover all possible executables in the business blueprint) and schedule the analysis.

8.1.2 Planned Business Function Activations

Use Case
With the implementation of an Enhancement Package a lot of Enterprise Business Functions are provided. With BPCA it is possible to determine impacted business
processes before the Business Function activation. This provides test recommendations and reliable information to prepare for example end-user training.

8.1.3 Transport Requests

Use Case

- Change impact identification of own developments / customizing when all objects have been assigned to a created transport request

This provides an impact analysis based on all objects of a finished development / customizing.
The results can verify an impact analysis which might have been performed as a prerequisite for the approval of the related change request. The expected test scope can be adapted based on the BPCA results if needed.

### 8.1.4 Object Lists

**Use Case**
- Change impact identification before implementation
- Possible for customizing and / or workbench objects

This option allow to run impact analysis on changes that have not been implemented yet. For this the list of the to be modified objects only need to be known. Based on this the BPCA will perform an impact analysis. The result will show the impact of the potential changes.
Integration with “System Recommendations”:
The “System Recommendation” application does use this functionality (available from Solution Manager 7.1 SP05) in order to calculate the impact of notes before they are implemented in the systems. See document “Business Process Change Analyzer How-to guide” for more information regarding this integration.
https://service.sap.com/~sapidb/0110003587000000043712014E
8.1.5 Change Transactions

Use Case
- Change Request Management (ChaRM) of Solution Manager is used
- Specify changes by requests for change or change requests

This BPCA option should be used when Change Request Management (ChaRM) is activated and used for the system landscape in which the changes are implemented. By this only a request for change or change request must be known in order to specify the change to be analyzed. Based on this an analysis against all associated transport requests will be performed.

There are two entry points for such BPCA analysis:
1. BPCA start screen of test management workcenter
2. SAP Solution Manager IT Service Management CRM UI

Option 1:
Select “Change Transaction” from BPCA Analysis Type. Then select “Request for Change” or “Change Document” and provide the request / document.

Then proceed the same way as for other analysis types (e.g. transport request, object list).

Option 2:
Open an existing change request or document in the SAP Solution Manager IT Service Management CRM UI (transaction CRM_UI). Switch to edit mode and then select “Actions” → “Create BPCA analysis” from menu.
Then the BPCA analysis screen appears with type “Change Transaction” and the change request /change document preselected.

Proceed the same way as for other analysis types (e.g. transport request, object list) in order to get the impact analysis started.

8.2 Test Scope Optimization (Risk Based Testing)

Use Case

- Each changed object should only be tested once (maximum).
- Generate risk based test plan alternatives having less than 100% test coverage.

Configuration

When using no Solution Manager Adapter for Quality Center then activate “Include transactions without test cases” option.

Check that criticalities are considered.
In the standard optimization the test coverage is always set to 100%.

Furthermore it’s shown how the number of executables is changing when having a coverage of 95%, 90%, 85%, 80% and 75%.

The screenshot above shows that the no. of executables is decreasing strongly when lowering the coverage from 100% to 95%

Then calculate test coverage of 99%. For this just change the coverage from 100% to 99% and press Enter.

The result will (probably) be that lowering the test coverage about 1% will (still) strongly decrease the no. of executables to test. As shown in the next screenshot it decreased from 2211 (100%) to 130 (99%).
Therefore a risk based test scope optimization based on 99% coverage provides a high coverage while strongly reducing the test scope.

9. Scope and Effort Analyzer (SEA)

Scope and Effort Analyzer (SEA) is a new SAP Solution Manager functionality available with SAP Solution Manager 7.1 SP11. It allows identification and analysis of the impact of SAP software changes on ABAP-based SAP systems triggered by Support Packages or SAP Enhancement Package deployments even before the physical installation.

The typical use cases are:

- You are in the planning phase of a maintenance project and want to know what the scope and effort will be for development changes and what tests to run to cover all changes.
- You need to estimate the related costs and effort (project budget) in order to decide whether or not to start an SAP software update project.
- You need advice on project scoping: for example how much extra effort does it mean to install the latest SAP Enhancement Package as part of your maintenance event.
- You want to reduce modifications and move closer to SAP standard.
- You want to reduce maintenance costs and efforts on a long term basis.
- You want to invest in Test Management / Solution Documentation (e.g. creation of automated test cases) to reduce the manual test effort on a long term basis.
- Any further use case where transparency and the change impact of software changes are needed.
9.1 SEA prerequisites

The following setup activities must be performed before creating the first SEA analysis:

1. Start Work Center “SAP Solution Manager Configuration” (or run transaction SOLMAN_SETUP for…)
   a. System Preparation
   b. Basic Configuration
   c. Managed Systems Configuration (for all systems to be analyzed)
2. Activate UPL, if not already done. Please check SAP Note 1828848.
3. Start Work Center “SAP Solution Manager Configuration” (or run transaction SOLMAN_SETUP for…)
   a. Custom Code Management – steps 1-6
   b. Ensure extractors for “CC_Gen, CC_Ref and UPL” are activated in Step 6

Details can be found in the How-To-Guide for SEA available in the SAP Solution Manager Wiki – section Test Management (see chapter further information)

9.2 Create a SEA analysis

With reference to Chapter 2.2 the following use case is described:
Determine the change impact of implementing Enhancement package 7 in an ERP system where Enhancement package 6 is implemented.

First of all, if possible activate the UPL data collection in the related P-system about 3 months in advance to have most of the used objects available (including those only used for monthly and quarterly closing as well) in the Solution Manager. The UPL data is then included in the SEA and can be used to generate a business blueprint if none is available or it is out-of-date, making the BPCA part of SEA accurate. If no UPL data is available then the usage data cannot be included in SEA, and especially the BPCA part may be less meaningful.

Start the SEA analysis via test management workcenter or change management workcenter, for example:
The important step when system documentation is available in Solution Manager is to assign an existing project / solution where all executables are covered.

As an alternative let SEA create an application component based additional project (See chapter 6.2) for you, where all executables are included which are not covered in the assigned project / solution yet.

Use the included online help to get detailed information about the requested entries.

In step 4, we have a differentiation whether we use test option 1 or 2.
In case of test option 1, you have to mark SAP Solution Manager as test management application. When you are using HP ALM / HP QC please mark Partner Test Management Application and select HP ALM / HP QC in the field below.

After you have completed the first guided procedure, the Maintenance Optimizer guided procedure can be started.

The started Maintenance Transaction must be processed in the same way as for the productive upgrade. Best is to take the created Maintenance Transaction for downloading the software components as well.

Finally SEA starts a large number of jobs to perform the analysis. They are listed in the processing log.
9.3 Interpretation of SEA analysis results

The SEA analysis includes various dashboards summarizing all findings to plan, optimize and set up the project. Result views are divided into

1. **Overview** for assessment by the entire project team and
2. **Details** for the Development Manager and Test-/Quality Manager

**Development Management:**
Identification of affected custom code and modifications, required adjustments in the SAP system, since software updates come with updates or deletions of SAP standard objects. Detailed effort estimation for custom code and modification adjustments. Details about Modifications and Custom Developments can be downloaded to MS Excel enabling easy object sharing.

**Impact to Modifications and corresponding Efforts**

**Test Management:**
Identification of required test scope, test planning, recommendations for creation of missing test cases and execution of manual tests. Detailed effort estimation for regression tests and recommendations based on test scope optimization.

Scope and Effort Analyzer provides a guided procedure to collect relevant information on your planned change event. All analysis steps of the Scope and Effort
Analyzer are performed in the background after you have entered the necessary input data. The impact on your modifications, custom code objects and business processes are calculated automatically.

A result report in SAP Solution Manager presents all findings and information to plan your project, to exactly define the scope and to decide on required skill sets for the project team. With Scope and Effort Analyzer it becomes possible to reduce the overall project effort by focusing on used functionality only.

Recommendations on missing test cases, valuable automated test scenarios and identification of unused modifications are just some highlighted areas where investments can lead to long term savings and optimization of recurrent maintenance activities to implement software changes faster and with significantly reduced cost and effort.
Test Case Recommendations

Current Situation with TSO

Number of Test Cases with TSO

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual Test Cases</td>
<td>27</td>
<td>72.57 %</td>
</tr>
<tr>
<td>Automated Test Cases</td>
<td>7</td>
<td>18.92 %</td>
</tr>
<tr>
<td>Missing Test Cases</td>
<td>3</td>
<td>8.51 %</td>
</tr>
<tr>
<td>Total</td>
<td>37</td>
<td>100 %</td>
</tr>
</tbody>
</table>

Test Case Recommendations

Recommendation 1: Creation of missing tests
- Number of missing test cases: 3
- Creation of automated test cases selected for effort calculation
- Creation of automated test cases up to 68 %

Test Case Creation Effort (Hours)

Test Execution Effort (Hours)

<table>
<thead>
<tr>
<th>Category</th>
<th>Effort (Hours)</th>
<th>Number of Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>New manual test</td>
<td>2.00</td>
<td>5</td>
</tr>
<tr>
<td>New automated test</td>
<td>9.00</td>
<td>7</td>
</tr>
<tr>
<td>Replacement with new automated test</td>
<td>12.00</td>
<td>4</td>
</tr>
<tr>
<td>Total test case creation effort</td>
<td>23.00</td>
<td>7</td>
</tr>
<tr>
<td>Total test case execution effort gain</td>
<td>6.00</td>
<td></td>
</tr>
</tbody>
</table>
## 10. Further Information

<table>
<thead>
<tr>
<th>Topic</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blueprint generation program</td>
<td>SAP Note 2061626</td>
</tr>
</tbody>
</table>