A Deep Dive on Configurable Bill of Materials

Lawrence Matusek, eLogic
Rama Gottipati, eLogic
CWG 2015
**OUR COMPANY**

16 years of proven excellence in commerce solutions for manufacturers.

We deliver industry-specific business solutions enabled by technology.

**OUR PEOPLE**

**Ecosystem of Experts:**

- 225 years of Industry
- 200 years of Commerce
- 300 years of Technology

+25% of our workforce has direct career experience within Fortune 500 Manufacturers.

SPECIALISTS not Generalists.

**OUR SOLUTIONS**

- Microsoft Cloud Productivity + CRM
- SAP Variant Configuration
- SAP Integration + Optimization
- Commerce Strategy
- Systems + Knowledge Integration

**OUR INDUSTRIES**

- Architectural
- Engineered Machines
- Flow Technologies
- Medical & Scientific
- Motors & Electrical
- Refrigeration & Cases
- Tools

---

Microsoft Dynamics CRM 2015 Winner
Manufacturing Partner of the Year

eLogic’s brand to provide a seamless commerce experience for manufacturers

**100 x 100**

100 powerful industry best practices realized through more than 100 implementations
What is a Bill of Material (BOM)?

**BOM:**
A formally structured list of the components that make up a product or assembly.
What most people know about SAP BOMs

- Material BOM
- BOM Header
- BOM Items (stock and text items)
- BOM Status
- Single Level BOM
- Multi Level BOM
Single vs. Multi-Level BOM

**SINGLE LEVEL BOM**

- Sub Assembly 1
  - Component X
  - Component Y

**MULTI-LEVEL BOM**

- Product 'A'
  - Sub Assembly 2
    - Component X
    - Component Z
  - Sub Assembly 3
    - Component D
“What is a Configurable (aka Super) BOM?”

- Contains all components that are required to manufacture the material
- Allows allocation of Variant Configuration rules (object dependencies that are evaluated during BOM Explosion.

Selection Conditions determine whether an Item is Included in the Result
- Procedures change BOM Item fields like Quantity or Description
Ex. Configurable BOM Explosion

Items marked with X are excluded from the result

- Component Y & Sub Assembly 2 are Excluded by Selection Condition
- Sub Assembly 3 is unconditionally Included in the Result
Configurable BOM can be designed using

- Materials with object dependencies assigned to them
- Classification data of material as selection condition (not recommended)
- Class items
  - With class replacement using classification data assigned to material
  - Using variant tables to replace class item with material
  - Using material variants to replace class item (via user exits)

<table>
<thead>
<tr>
<th>CHAR1 (key)</th>
<th>CHAR2 (key)</th>
<th>CHAR3 (key)</th>
<th>CHAR4 (key)</th>
<th>Material (output)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Y</td>
<td>B</td>
<td>C</td>
<td>Material1</td>
</tr>
<tr>
<td>B</td>
<td>Y</td>
<td>B</td>
<td>C</td>
<td>Material2</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>....</td>
<td>....</td>
<td>.....</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>....</td>
<td>....</td>
<td>.....</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>....</td>
<td>....</td>
<td>.....</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>....</td>
<td>....</td>
<td>.....</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>....</td>
<td>....</td>
<td>.....</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>....</td>
<td>....</td>
<td>.....</td>
</tr>
<tr>
<td>A</td>
<td>N</td>
<td>A</td>
<td>B</td>
<td>Materialn</td>
</tr>
</tbody>
</table>
Configurable BOM Design

Materials with object dependencies assigned to them

- Easy to design and develop the BOM
- BOMs can be clustered with materials based on the product
- Maintenance will be cumbersome as adding new components requires new object dependencies

<table>
<thead>
<tr>
<th>Material</th>
<th>Object Dependency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material1</td>
<td>$\text{PARENT.CHAR1} = \text{‘A’ AND ..........}$</td>
</tr>
<tr>
<td>Material2</td>
<td>$\text{PARENT.CHAR1} = \text{‘B’ AND ..........}$</td>
</tr>
<tr>
<td>.............</td>
<td>.............</td>
</tr>
<tr>
<td>.............</td>
<td>.............</td>
</tr>
<tr>
<td>.............</td>
<td>.............</td>
</tr>
<tr>
<td>.............</td>
<td>.............</td>
</tr>
<tr>
<td>.............</td>
<td>.............</td>
</tr>
<tr>
<td>.............</td>
<td>.............</td>
</tr>
<tr>
<td>.............</td>
<td>.............</td>
</tr>
<tr>
<td>.............</td>
<td>.............</td>
</tr>
<tr>
<td>.............</td>
<td>.............</td>
</tr>
<tr>
<td>.............</td>
<td>.............</td>
</tr>
<tr>
<td>Material3</td>
<td>$\text{PARENT.CHAR1} = \text{‘A’}$</td>
</tr>
</tbody>
</table>
Classification data of material as selection condition (not supported in IPC)

- Example: Material classified using class 001
- Make sure characteristics used in class are also included in type 300 variant class (to provide search criteria)
- Enter materials as BOM items and for each item define that its classification is used as a selection condition
Class items use classification data assigned to material

**Prerequisites:**
- Class 200 or 300 to be used.
- Class need to be flagged as “Allowed in BOMs”
- Material to be classified with the class being used for BOM item
- Material has plant view in every plant where class node is used in BOMs

<table>
<thead>
<tr>
<th>BOM Item</th>
<th>Material Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>K (200), Resultant Item Category L, Quantity, UoM, Resultant Item Category</td>
<td>SC: IF any required Procedure: $SELF.CHAR1 = Parent.Char1, .......... $SELF.CHAR4 = $PARENT.CHAR4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Char1</th>
<th>Char2</th>
<th>Char3</th>
<th>Char4</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Y</td>
<td>B</td>
<td>B</td>
<td>Material1</td>
</tr>
<tr>
<td>A</td>
<td>N</td>
<td>A</td>
<td>A</td>
<td>Material2</td>
</tr>
<tr>
<td>....</td>
<td>.....</td>
<td>.....</td>
<td>.....</td>
<td>..........</td>
</tr>
<tr>
<td>....</td>
<td>.....</td>
<td>.....</td>
<td>.....</td>
<td>..........</td>
</tr>
<tr>
<td>....</td>
<td>.....</td>
<td>.....</td>
<td>.....</td>
<td>..........</td>
</tr>
<tr>
<td>B</td>
<td>N</td>
<td>B</td>
<td>B</td>
<td>Material10</td>
</tr>
</tbody>
</table>
Using variant tables to replace class item with material

- Variant table consists of characteristics and material
- Class will have reference characteristic MARAMATNR
- Classify the materials also with the same class
- Classifying the materials with ref char MARAMATNR will set the right Low Level code for materials

<table>
<thead>
<tr>
<th>BOM Item</th>
<th>Variant Table</th>
</tr>
</thead>
</table>
| K (200), Resultant Item Category L, Quantity, UoM, Resultant Item Category | SC: IF any required Procedure: Table XYZ (CHAR1 = $PARENT.CHAR1, ...........................................,
........................................................................................,
........................................................................................,
MARAMATNR = $SELF.STOPIIDNRK)|

<table>
<thead>
<tr>
<th>Char1</th>
<th>Char2</th>
<th>Char3</th>
<th>Char4</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Y</td>
<td>B</td>
<td>B</td>
<td>Material1</td>
</tr>
<tr>
<td>A</td>
<td>N</td>
<td>A</td>
<td>A</td>
<td>Material2</td>
</tr>
<tr>
<td>....</td>
<td>....</td>
<td>....</td>
<td>......</td>
<td>......</td>
</tr>
<tr>
<td>....</td>
<td>....</td>
<td>....</td>
<td>......</td>
<td>......</td>
</tr>
<tr>
<td>....</td>
<td>....</td>
<td>....</td>
<td>......</td>
<td>......</td>
</tr>
<tr>
<td>....</td>
<td>....</td>
<td>....</td>
<td>......</td>
<td>......</td>
</tr>
<tr>
<td>....</td>
<td>....</td>
<td>....</td>
<td>......</td>
<td>......</td>
</tr>
<tr>
<td>B</td>
<td>N</td>
<td>B</td>
<td>B</td>
<td>Material10</td>
</tr>
</tbody>
</table>
Material variants/Configurable material to replace class item

- Class 300 to be used
- Component required flag is checked for class
- Userexit EXIT_SAPLCUDO_002 to be programmed to return material variant if found else to return a configurable material

### BOM Item

<table>
<thead>
<tr>
<th>K (200), Resultant Item Category</th>
<th>SC: IF any required Procedure: Table XYZ (CHAR1 = $PARENT.CHAR1, .........................................................., .........................................................., .........................................................., MARAMATNR = $SELF.STOPIDNRK)</th>
</tr>
</thead>
</table>

User exit will return Material E
Char1 = A, Char2 = Y, Char3 = B, Char4 = B

### Configurable Material = Material X

<table>
<thead>
<tr>
<th>Material A (Char1 = A, Char2 = Y, Char3 = A, Char4 = B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>.................</td>
</tr>
<tr>
<td>.................</td>
</tr>
<tr>
<td>.................</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Material E (Char1 = A, Char2 = Y, Char3 = B, Char4 = B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>.................</td>
</tr>
</tbody>
</table>
Configurable BOM Design

- Replacing class item with material variants or configurable materials might result in costing and MRP issues
- Results in error message “Material is Recursive”
- Error message is the result of wrong low level code established for the material
- Implement SAP pilot note to overcome the error (1833611)
- When material variants are used to replace class items, low level code of 0 is assigned for the material variant as it is not directly used in a BOM
- Note 1833611 will pass the right low level code based on the BOM structure during MRP and costing

SAP Note 1833611 - Va02: costing gives an error CK 877 even though no recursion

Note Language: English  Version: 2  Validity:  Valid Since 13.03.2013

Summary

Symptom
You are trying to cost a sales order item you get an error message ‘Sales order costing not possible for recursive configurable materials' (CK877), even though there is no recursion. This is incorrect behaviour.
• Low level code represents the low level usage of a material within all product structures; stored in field MARA-DISST
• Determines the correct sequence in which materials must be planned
• Calculated by system using various generalizations, see OSS Note 42891
  1. BOM items are considered assigned to all variants of a variant BOM or assigned to all configured materials of a configured BOM.
  2. The effectivity (date effectivity or parameter effectivity) is not taken into account.
  3. The plant is not taken into account.
  4. The usage is not taken into account.

Material HYBRIS_TEST1
Industry sector M
Material type KMAT
Low-level code 001
Created by RGOTTIPATI on 09/15/15
Last changed by RGOTTIPATI on 09/15/15
Order BOM

- Products that are complex and specific to customer cannot practically have a completely predefined BOM entirely in advance

- These scenarios will require manual changes to BOM once a sales order is created

- Order BOM is created specifically for the sales order without changing the original configurable BOM (aka Super BOM)

- Order BOM can be created as a copy of Super BOM explosion with changes using CU51 or can be created manually using transaction CS61

- Order BOM is identified by Sales Order, Item, and Material Number and Plant (more on Plant later)

- Order BOM with Results Oriented/Knowledge Base option to be selected in order to use transaction CU51
Order BOM

Note: only changes to characteristic values and not the BOM itself. If this indicator is not set, then maintenance is performed via special function such as CU51.

Used to save an order BOM for a sales order, even if no changes are made to the BOM.
Example Order BOM Explosion

Items marked with X are excluded from the result

- Component Y and Sub Assembly 2 are Excluded by Selection Condition
- Sub Assembly 3 is unconditionally Included in the Result
Example Order BOM Explosion

Make all necessary additions/changes/deletions manually

© 2015 eLogic | All Rights Reserved | Proprietary and Confidential
Example Order BOM Variant Match

- Performed in transaction CU51 on entire BOM structure (except root)
- Cannot be “unmatched” unless Order BOM not saved after matching
Order BOM Instantiation

• Make to Order product are identified in logistics by Sales Order/Item and Material

• Logistics processes cannot tell the difference if a configurable product BOM is adapted in several different ways in the same configuration structure

• Any given material can only have one Order specific BOM for a given sales order item

• To distinguish different configuration of a configurable material in a BOM, Order BOM maintenance supports instantiation

• Instantiation:
  o Creates a new instance by creating a material variant of the configurable material
  o Instantiated material is linked to super BOM or Order specific BOM
  o Instantiation is only supported for configurable materials
During Instantiation:
- Material number can be assigned manually or internally
- Material type, Industry sector and description can be specified in a special user interface

Instantiation Options:
- Selected Assemblies
- Top Down: Assembly selected and entire structure below it are instantiated
- Bottom Up: Assembly selected and all assemblies in a direct path above

Variant Matching:
- Prevents duplication of material masters
- Type matching for variants can be triggered before instantiation

Check for Identical Assemblies:
- If system finds same assemblies with same values occurring more than once, it merges them to form one material variant
- Unnecessary instantiations are automatically revoked
Instantiation Exits:

- Pre-Instantiation Exit
- Post-Instantiation Exit
- Material BOM vs Order BOM Exit
MRP can find BOMs in different categories as follows:

For Unrestricted Use Demand
1. Search for Material BOM

For Sales Order Item Demand
1. Search for Order BOM
2. Else search for Material BOM

For Project (WBS) Demand
1. Search for WBS BOM
2. Else search for Material BOM

The latter two require this MRP Parameter setting!
Configuration Profile

• Maintained for configurable objects to define central settings for configuring the object

• Several configuration profiles can be created with different settings for an object
  o To be selected manually during configuration
  o User exit with logic to select profile automatically
  o Changes to a configuration can only be made with the profile that’s selected to configure an object (system does this automatically)

• Configuration profile can be maintained for
  o Materials
  o Standard Networks
  o General maintenance task lists
  o Service Specifications

• Other Settings
  o Display options and scope of characteristics on value assignment screen
  o Interface Design
  o Assign Dependencies (constraints and procedures)
  o BOM explosion parameters
  o Settings for status in customizing
## Configuration Profile Status

<table>
<thead>
<tr>
<th>Table</th>
<th>Status</th>
<th>In prep.</th>
<th>Rel.</th>
<th>Locked</th>
<th>Chg. no. req.</th>
<th>Distr. lock</th>
<th>Prof. Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>MARA</td>
<td>0</td>
<td></td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>MARA</td>
<td>1</td>
<td></td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>MARA</td>
<td>2</td>
<td></td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>PLKOGMTL</td>
<td>0</td>
<td></td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>PLKOGMTL</td>
<td>1</td>
<td></td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>PLKOGMTL</td>
<td>2</td>
<td></td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>PLKONET</td>
<td>0</td>
<td></td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>PLKONET</td>
<td>1</td>
<td></td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>PLKONET</td>
<td>2</td>
<td></td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>TMPSPECCLST</td>
<td>0</td>
<td></td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>TMPSPECCLST</td>
<td>1</td>
<td></td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>TMPSPECCLST</td>
<td>2</td>
<td></td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
</tbody>
</table>

Status and ECM requirements and Distribution via ALE to other systems permitted or not.
## Configuration Profile

<table>
<thead>
<tr>
<th>Parent Config. Profile</th>
<th>PInd/Prod Single/Multi BOM</th>
<th>Sales Set Single/Multi BOM</th>
<th>Order BOM Knowledge-Based Single/Multi BOM</th>
<th>Order BOM Result-Oriented Single/Multi BOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plnd/Prod</td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="true" alt="Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
</tr>
<tr>
<td><strong>No BOM Explosion</strong></td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
</tr>
<tr>
<td>Plnd/Prod</td>
<td><img src="true" alt="Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
</tr>
<tr>
<td>Single/Multi BOM</td>
<td><img src="true" alt="Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
</tr>
<tr>
<td>Sales Set</td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="true" alt="Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
</tr>
<tr>
<td>Single/Multi BOM</td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="true" alt="Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
</tr>
<tr>
<td>Order BOM</td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="true" alt="Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
</tr>
<tr>
<td>Knowledge-Based</td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="true" alt="Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
</tr>
<tr>
<td>Single/Multi BOM</td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="true" alt="Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
</tr>
<tr>
<td>Order BOM</td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="true" alt="Applicable" /></td>
<td><img src="true" alt="Applicable" /></td>
</tr>
<tr>
<td>Result-Oriented</td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="true" alt="Applicable" /></td>
</tr>
<tr>
<td>Single/Multi BOM</td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="false" alt="Not Applicable" /></td>
<td><img src="true" alt="Applicable" /></td>
</tr>
</tbody>
</table>
Plan Production Order

• Used to describe that configurable materials are assembled using planned and production orders

• Requires BOM explosion indicator: None, Single Level, Multi Level
  • None: BOM explosion happens only during MRP (no subordinate instances). This setup also provides additional functionality that is discussed in further slides
  • Single Level: Configuration exploded at single level using characteristics of header material. Other configurable materials in BOM at level 1 can be configured
  • Multi Level: All configurable components can be configured individually.
  • Single/Multi Level requires Application for BOM explosion specified
## Plan Production Order

### Config Profile Settings:
- Plan/Prod Order
- Bom Explosion: None

---

**Program RCLUCK FLAT VIEW CBASE**

*Report for Viewing the Configuration Data Stored in the CBASE*

*The displayed data belong to a configuration*

**output of input data**

<table>
<thead>
<tr>
<th>check date/time</th>
<th>VBEIN</th>
<th>POSNR</th>
<th>INSTANCE (CUOBJ)</th>
<th>show single inst.</th>
<th>MATNR (MARA)</th>
<th>MATNR (MARC)</th>
<th>PLANT</th>
<th>show single char.</th>
<th>sel. charact.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/25/2015 00:00:00</td>
<td>14442</td>
<td>000010</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**output of structure and instance attributes**

<table>
<thead>
<tr>
<th>instance</th>
<th>parent</th>
<th>root</th>
<th>cuccom</th>
<th>objnr</th>
<th>owner-type</th>
<th>owner-objkey</th>
<th>klart</th>
<th>mat_variant</th>
</tr>
</thead>
<tbody>
<tr>
<td>13180</td>
<td>0</td>
<td>13180</td>
<td>0001</td>
<td>MACWG_PRESENTATION</td>
<td>VBPS</td>
<td>0000014442000010</td>
<td>300</td>
<td></td>
</tr>
</tbody>
</table>

**output of Bom Reference**

<table>
<thead>
<tr>
<th>instance</th>
<th>parent</th>
<th>root</th>
<th>ibotref-objkey (BOM-reference)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>13180</td>
<td>0</td>
<td>13180</td>
<td>root material - no BOM reference</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**output of Characteristics**

<table>
<thead>
<tr>
<th>instance</th>
<th>in_seq</th>
<th>atnam</th>
<th>atlnm</th>
<th>atwrk</th>
<th>atflv</th>
<th>atflb</th>
<th>atcod</th>
<th>ataut</th>
</tr>
</thead>
<tbody>
<tr>
<td>13180</td>
<td>0001</td>
<td>CONFIGURABLE_BOM</td>
<td>0000007532</td>
<td>Y</td>
<td>0.000000000E+00</td>
<td>0.000000000E+00</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13180</td>
<td>0002</td>
<td>ORDER_BOM</td>
<td>0000007533</td>
<td>Y</td>
<td>0.000000000E+00</td>
<td>0.000000000E+00</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13180</td>
<td>0003</td>
<td>CONFIGURATION_PROFILE</td>
<td>0000007539</td>
<td>Y</td>
<td>0.000000000E+00</td>
<td>0.000000000E+00</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Plan Production Order

Config Profile Settings:
- Plan/Prod Order
- BOM Explosion: Single Level
Plan Production Order

Config Profile Settings:
- Plan/Prod Order
- BOM Explosion: Multi Level
Sales Set

- Used to represent products that contain salable configurable materials (logical grouping)
- These products are supplied together, but are not assembled in a production order
- Only sales relevant BOM items are exploded in the sales order
- BOM explosion Has to be Single/Multi Level

Allows for changing sales relevant components of the bom in sales order. Changes are saved for the order item.
Sales Set

- Sales set with BOM items flagged as Plan/Prod Order

- Items with Plan/Prod Order settings will use configuration of header material
- Items with Plan/Prod Order cannot be configured in a sales order
- Sales Set with Manual changes allowed – Items with Plan/Prod Order or Order BOM settings can be added to BOM explosion (watch performance!)
Select the level to which a material is to be added and select + button.

Items with Plan/Prod Ord (BOM explosion NONE can be configured once added.

Items with Order BOM setting can be added and configured.
Order BOM

• Allows the creation of BOM specifically for Sales order/Item

• Involves two steps
  o Creating a sales order
  o Creation of order BOM using BOM maintenance

• Allows you change the BOM of configurable material
  o Insert extra items
  o Delete existing items

• BOM explosion has to be Single Level/Multi Level depending on BOM structure

• Order BOM can be Results Oriented/Knowledge base

• Results Oriented
  o Configuration result is saved as order BOM
  o Object dependencies are not saved
  o Instantiation is possible with Results Oriented order BOM

• Knowledge Base
  o Saves super BOM with all manual changes and object dependencies
  o Dependencies are processed dynamically during BOM explosion
Order BOM

Will allow changes to characteristic values. If this indicator is not, then possible only using special functions.

This functionality only possible with Results oriented.

Results Oriented will allow for instantiation functionality.

Maintenance in order BOM flag will allow for changes to Engineering characteristic values.
Note: Only possible with Results Oriented Order BOM.
Order BOM Changes

- Common requirement among CU51 users is to track changes made to order BOMs (i.e. missing functionality)
- Table CUBOM_CHANGE records changes made to an order BOM
  - Only records changes and deletion of BOM items
  - This table does not record manual additions to Order BOM
  - Manual additions can be determined via STOP table by looking for items where BOM category, BOM number, and BOM nodes are blank
  - A custom transaction is needed for acceptable usability
Configuration Profile (When Required)

• Configuration profile is required if the configurable material is salable

• Configuration profile is required if Constraints are to be assigned to the configurable materials

• Configuration profile is also required if material requires
  o Variant Pricing
  o Defaults to be set
  o Any calculations to be performed etc.

• Configuration profile is optional if material is not salable but part of a BOM (i.e. none of its own value assignments needed)
  o Acts as Material with Plan/Production Order
  o Useful when there are lot of configurable materials used in BOMs and does not involve the use of Order BOM functionality
  o Uses super BOM and routing which are based on the configuration of header material
  o Reduces maintenance efforts
• Depending on the items and their configuration profile settings, CUOBJ are established.

• Header and items with Plan/Prod orders will have CUOBJ established at header and item level based on Single Level/Multi Level BOM explosion.

• Sales Set with all items as Plan/Production order will only have CUOBJ established for header item and all items will use configuration of header.

• Sales set with items as Order BOM will have CUOBJ established for Header and CUOBJ established for all those items flagged as Order BOM.

• Sales set with manually added items will have CUOBJ established for header and items with Order BOM and also manual items with Plan/Prod Order and BOM explosion = NONE.

• Order BOM will always have a CUOBJ established.
Examples of CUOBJ by Profile Setting

Header and Item material with Plan/Prod Order

output of structure and instance attributes

Header - Sales Set, Items - Plan/Prod Order

output of BOM Reference

Header - Sales Set
Item - Order BOM

Header - Sales Set
Item - Order BOM, Plan/Prod Order (BOM Explosion NONE)
Materials with Plan/Production Order, BOM explosion: NONE can be used

- In Production orders: Manually drop in the production order BOM and configure it
- Networks: Manually add to the network and configure it

Configuration can be checked/changed using Component --> Characteristic Value Assignment
Enhancements

• CCUX0002 - Reaction for conflict in object search on class node
  o Reaction option to conflicts when finding objects in class nodes
  o EXIT_SAPLCUD0_002/ZXCUCO04
  o Select a material with corresponding classification when no object is returned
  o Determine the object to replace class item when several objects are returned but only one object is always required

• CCUX0003 - Parameterization of Finding Objects in Class Node
  o Parameters for finding objects for class item

• CCUXOBTY - Object Types for the Object Search for Class Nodes
  o Used to control the automatic object search when a class node is replaced (MARA, MARC etc.)

• CCUXINST - Modification for External No. Assignment for Instantiation

• CCUXIACD - Maintain Additional Data for Instantiation

• CCUXSTAT - Define BOM Status for Instantiated Materials

• CCUX0007 - Definition of BOM Category for Instantiation
“Can I Change Plants in a BOM Explosion?”

The Answer is Mostly Yes...using Special Procurement

- Root Material
  - Plant 1000

- Assembly Material
  - Plant 2000

- Subassembly Material
  - Plant 3000
BOM Explosion – Special Procurement

- Requirements:
  - CUKO Plant change BADI
  - Order BOM screen enhancement to include plant

- Special Procurement – Purchased from alternate plant
  - Involves purchase orders
  - Provides good visibility during delivery and In Transit
  - Can include plant margin if required
  - May require special procurement for costing (manufactured in alternate plant)
• Special procurement – Manufactured in Alternate plant
  - Involves Plan/Production orders
  - Stock automatically updated in receiving plant once production confirmed in manufacturing plant
  - May need to receive into Transit location (temp location) until stock is physically received into receiving plant
Alt. plant for items part of Sales Set

• Example: Sales set consists of Materials A, B, C and D

• Material B is manufactured and shipped to customer from an alternate plant of manufacture than the plant assigned to the sales set material

• Plant change userexit is required to change plant, based on certain logic
  o USEREXIT_SOURCE_DETERMINATION in INCLUDE MV45AFZB

• Requires material to be maintained in Plant of Manufacture

• Super BOM maintained in Plant of Manufacture
Ad hoc Plant change due to capacity constraints

- Ad hoc decision to manufacture subassembly in alternate plant
  - Due to capacity constraints
  - Due to material availability

- Stock transport cannot be used as it cannot be set at BOM item level
  - Only possible if the assembly is an instantiated assembly or one time use assembly
  - Can be set at material master and all corresponding master data can be extended in plant of manufacture
  - Order BOMs or materials BOMs have to be manually created or copied if already exists in previous plant

- Best option is to use “manufacture in Alternate Plant” at BOM item level
  - Master data has to be extended to alternate plant if it doesn’t exists
  - Order/material BOMs have to be copied/created in Alternate plant of manufacture
  - Does not provide proper visibility during In Transit of product

- Nice to have
  - Re-Instantiation of materials and BOMs in alternate plant, if special procurement key is assigned at BOM level
  - Stock transport can be set at BOM item level
  - Group Order BOM functionality similar to group material BOM functionality
Ask questions today & keep up the conversation tomorrow!

Connect with us on Twitter
@elogicgroup

Learn more on our blog
blog.elogic.com

Reach out to us
info@elogic.com
Bill of Materials: Multiple BOMs

<table>
<thead>
<tr>
<th>Configuration Engine</th>
<th>Variant Configuration (LO-VC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>One BOM per material.</td>
<td>A material can have several alternative BOMs for different lot sizes.</td>
</tr>
</tbody>
</table>

What it means

- If you use multiple BOM alternatives for various lot sizes, you will need to consolidate all alternatives into a single alternative and then add object dependency logic that will produce the correct explosion based on lot size.
Bill of Materials: BOM items

<table>
<thead>
<tr>
<th>Configuration Engine</th>
<th>Variant Configuration (LO-VC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objects that can be used:</td>
<td></td>
</tr>
<tr>
<td>• Materials</td>
<td></td>
</tr>
<tr>
<td>• Classes</td>
<td></td>
</tr>
<tr>
<td>Objects that can be used:</td>
<td></td>
</tr>
<tr>
<td>• Materials</td>
<td></td>
</tr>
<tr>
<td>• Classes</td>
<td></td>
</tr>
<tr>
<td>• Documents</td>
<td></td>
</tr>
<tr>
<td>• Texts and images</td>
<td></td>
</tr>
</tbody>
</table>

What it means

- Only material and class items (categories) will explode in the IPC
## Bill of Materials: Data for BOM items

<table>
<thead>
<tr>
<th>Configuration Engine</th>
<th>Variant Configuration (LO-VC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A BOM item contains:</td>
<td>A BOM item contains data that is relevant to all application areas.</td>
</tr>
<tr>
<td>• Component quantity</td>
<td></td>
</tr>
<tr>
<td>• Sales relevance indicator</td>
<td></td>
</tr>
</tbody>
</table>

### What it means

- IPC ignores all but quantity and sales relevance indicators
- LO-VC considers all BOM item fields
Bill of Materials: Key for BOM items

<table>
<thead>
<tr>
<th>Configuration Engine</th>
<th>Variant Configuration (LO-VC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOM item keys must be unique and they must not occur more than once in a BOM.</td>
<td>BOM item keys may occur several times.</td>
</tr>
<tr>
<td></td>
<td>The BOM item is identified by an internal number (the Item ID).</td>
</tr>
</tbody>
</table>

What it means

- You cannot use the same BOM item number and component in more than one item in a given BOM.
- The example at the right is not permitted in IPC and BOM items must be renumbered to avoid the duplicate key.
Bill of Materials: Creating or deleting BOM items

<table>
<thead>
<tr>
<th>Configuration Engine</th>
<th>Variant Configuration (LO-VC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not possible</td>
<td>You can create or delete BOM items belonging to an order BOM.</td>
</tr>
</tbody>
</table>

What it means

- Order BOM configuration can only be performed in the LO-VC using transaction CU51
- Transaction CS62 can also be used for non-configuration changes
Bill of Materials: Explosion of BOMs in connection with constraints

<table>
<thead>
<tr>
<th>Configuration Engine</th>
<th>Variant Configuration (LO-VC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>By default, the BOM is exploded once in a simple breadth first sequence. For this reason, selection conditions at level ( N ) that depend on constraints at explosion level ( M &gt; N ) cannot be analyzed correctly. Alternatively, the explosion strategy can be changed to depth first. See SAP Note 879202.</td>
<td>The BOM is exploded several times in a breadth first sequence in connection with constraints. Constraints that are at a lower explosion level may trigger a re-explosion of the BOM.</td>
</tr>
</tbody>
</table>

What it means

- The IPC does not explode BOMs multiple times like LO-VC may do
- If you have selection conditions at higher BOM levels that depend on constraints at lower BOM levels, you may need to refactor your model
Bill of Materials: Change of plant in BOM explosion

<table>
<thead>
<tr>
<th>Configuration Engine</th>
<th>Variant Configuration (LO-VC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The knowledge base generation ignores special procurement keys (MARC-SOBSL) or user exits for the change of plant in the BOM explosion. The plant specified for the knowledge base runtime version is used for all materials.</td>
<td>A change of plant can be controlled by maintaining a special procurement key (MARC-SOBSL) and using corresponding user exits in the function group CUKO.</td>
</tr>
</tbody>
</table>

What it means

- The IPC will explode the BOM structure in a single plant only
- If the BOMs of your configurable assemblies differ by plant, you may not get the correct BOM explosion in cross plant scenarios
Bill of Materials: Class items

<table>
<thead>
<tr>
<th>Configuration Engine</th>
<th>Variant Configuration (LO-VC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class items are only replaced automatically by materials during the configuration if a unique specialization can be found. For this purpose, the class item characteristics must be assigned a value manually, or the valuation must be derived from the original material by means of object dependencies.</td>
<td>The first material that matches the configuration query is used automatically to replace the relevant class item.</td>
</tr>
</tbody>
</table>

What it means

- Not sure what the IPC description means
- Not sure that the LO-VC description is correct (a conflict is raised if class is required and multiple matches are found)
Bill of Materials: Manual specialization of class items

<table>
<thead>
<tr>
<th>Configuration Engine</th>
<th>Variant Configuration (LO-VC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A class item cannot be replaced manually by a material (specialized).</td>
<td>Class items can be specialized manually.</td>
</tr>
</tbody>
</table>

What it means

- In LO-VC it is often desirable to manually specialize a class node when no match was found automatically (for example, to provide a higher spec component than what was requested)
- This manual specialization is most common in Order BOM processing but is not possible in IPC
Bill of Materials: Mandatory specialization of class items

<table>
<thead>
<tr>
<th>Configuration Engine</th>
<th>Variant Configuration (LO-VC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A configuration is only considered complete if every class item is replaced (specialized) by a material. Therefore, the replacement is obligatory.</td>
<td>In the case of class items, you can specify whether the specialization is optional or mandatory.</td>
</tr>
<tr>
<td>For information about removing this delta, see SAP Note 1083650.</td>
<td>If there are no specialized class items in a multi-level configuration, the configuration is only considered incomplete if there are mandatory specializations below it.</td>
</tr>
</tbody>
</table>

What it means

- You must exclude an optional class item via selection condition to avoid an incomplete class item in the IPC
- Any instance is incomplete in LO-VC if it has an unspecialized required class node; see the OSS note to get this behavior in IPC

![Image of configuration engine and variant configuration (LO-VC)]
Bill of Materials: Class nodes, searching multi-value characteristics

<table>
<thead>
<tr>
<th>Configuration Engine</th>
<th>Variant Configuration (LO-VC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specified multi-value characteristics are taken into account during the class search. If all assigned values of the characteristic in the configuration are contained in the domain of the classification, the characteristic is considered for specialization. See Note 1564395.</td>
<td>Specified multi-value characteristics are taken into account during the class search. If at least one assigned value of the configuration is contained in the domain of the classification, the characteristic is considered for specialization.</td>
</tr>
</tbody>
</table>

What it means

- Like variant matching, all values of a multi-value characteristic in a class node must be matched for IPC to consider the characteristic matched.
- In LO-VC, if any value of a multi-value characteristic in a class node is matched then the characteristic is considered matched.
Bill of Materials: Class nodes with non-valuated objects

<table>
<thead>
<tr>
<th>Configuration Engine</th>
<th>Variant Configuration (LO-VC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objects that do not have any classification values for a characteristic of the search query can be found in the class search.</td>
<td>Objects that do not have any classification values for a characteristic of the search query are filtered out of the search result.</td>
</tr>
</tbody>
</table>

What it means

- IPC can search for non-specified characteristics in classified objects (e.g. search where characteristics not specified and find object where characteristic not specified)
- LO-VC will not find objects that have a non-specified characteristic in the classification of a class node
- There are users exits in LO-VC to change the standard class node search behavior
Bill of Materials: BOM base quantity is not equal to 1 piece

<table>
<thead>
<tr>
<th>Configuration Engine</th>
<th>Variant Configuration (LO-VC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOMs with a base quantity that is not equal to one piece lead to an incorrect quantity in the Configuration Engine for the items contained. The base quantity is not taken into account.</td>
<td>The base quantity for the BOM header is taken into account for the calculation of the resulting item quantities.</td>
</tr>
</tbody>
</table>

What it means

- You must refactor any BOM with a base quantity other than 1 piece (each) to have a base quantity of 1 piece (each)
Bill of Materials: Accumulation of quantities in the configuration

<table>
<thead>
<tr>
<th>Configuration Engine</th>
<th>Variant Configuration (LO-VC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantities in multi-level BOMs are not accumulated during the configuration.</td>
<td>Quantities can be converted and accumulated.</td>
</tr>
<tr>
<td>The configuration indicates the relative quantity of a sub item as defined in the BOM. This is also the value assigned to the field STPO-MENGE.</td>
<td>In dependencies, the relative and the absolute quantity can be differentiated.</td>
</tr>
<tr>
<td><strong>Example:</strong> A vehicle with four wheels, each of which has five wheel nuts, the quantity of wheel nuts is indicated for each wheel (5), but not the total quantity of nuts that belong to the vehicle. The total quantity (20) is only shown in the order.</td>
<td>The configuration result indicates the number of subordinate objects in a multi-level BOM.</td>
</tr>
</tbody>
</table>

What it means

- IPC doesn’t “do the math” for BOM item quantities – you must set such quantities via object dependencies

<table>
<thead>
<tr>
<th>BOM</th>
<th>IPC Explosion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle</td>
<td>1 EA</td>
</tr>
<tr>
<td>Tire</td>
<td>4 EA</td>
</tr>
<tr>
<td>Wheel Nut</td>
<td>5 EA</td>
</tr>
</tbody>
</table>
Bill of Materials: Quantity number format

<table>
<thead>
<tr>
<th>Configuration Engine</th>
<th>Variant Configuration (LO-VC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only integers allowed.</td>
<td>No restrictions (e.g. an item quantity of 1.674 liters is possible)</td>
</tr>
</tbody>
</table>

What it means

- BOM item quantities must be integers in IPC (e.g. configurable dough)
- I don’t see a workaround, does anyone know one?
Bill of Materials: Selecting components by classifying materials

<table>
<thead>
<tr>
<th>Configuration Engine</th>
<th>Variant Configuration (LO-VC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not possible</td>
<td>Possible</td>
</tr>
</tbody>
</table>

What it means

- Do not use this setting with IPC
- Choose another means of selecting the item (e.g. selection condition)
Bill of Materials: Plant specific BOM explosion

<table>
<thead>
<tr>
<th>Configuration Engine</th>
<th>Variant Configuration (LO-VC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>When creating a runtime version, you must specify exactly one plant. Therefore, you can only choose a different plant-specific BOM by choosing a different runtime version.</td>
<td>Possible</td>
</tr>
<tr>
<td>There is no explicit plant field in the Configuration Engine data model. However, you can encode the plant in the version string and use that information for runtime by using the SET_KB method in Customizing for SAP CRM</td>
<td></td>
</tr>
</tbody>
</table>

**What it means**

- Like Delta #23, IPC will explode the BOM structure in a single plant only
- If the BOMs of your configurable assemblies differ by plant, you may not get the correct BOM explosion in cross plant scenarios

<table>
<thead>
<tr>
<th>BOM Explosion</th>
<th>1 EA</th>
<th>Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td>Assembly</td>
<td>1 EA</td>
<td>2000</td>
</tr>
<tr>
<td>Subassembly</td>
<td>1 EA</td>
<td>3000</td>
</tr>
</tbody>
</table>