Effectivity Services

Sample Application

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Table of Contents

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Document Conventions

The following table highlights the document conventions used in the document:

Table 1: Document Conventions

Convention	Description
Bold	Emphasizes the names of menu items, dialog boxes, dialog box elements, and commands. Example: Click **OK**.
`Code`	Code examples appear in `courier` font. It may represent text you type or data you read.
`Yellow highlight`	Code highlighted in yellow draws attention to the code that is being indicated in the content.
`Yellow highlight with red text`	Red text highlighted in yellow indicates the code parameter that needs to be changed or replaced.
Italics	Reference to other documents.
Note:	Notes contain additional useful information.
Warning	Warnings contain important information. Pay special attention to information highlighted this way.
Successive menu choices	Successive menu choices may appear with a greater than sign (-->) between the items that you will select consecutively. Example: Navigate to **File** --> **Save** --> **OK**.

1 Overview

Effectivity Services enables you to create a single product structure that can handle numerous configurations. Effectivity identifies valid items to be used under different conditions. Managing a configurable structure is more efficient than managing structures for each unique instance.

Effectivity Services on the Aras PLM Platform provides the means to set effectivity within structures and the effectivity resolution engine that resolves structures for any given effectivity criteria.

Using Effectivity Services, a custom application can enable you to:

- Define effectivity variables (such as date, model, unit, lot, batch, and plant)
- Set effectivity conditions on relationships
- Resolve structures using effectivity to generate configured structures

In this sample application, effectivity is managed in the Part BOM structure of MakerBot Replicator, which is MakerBot's last open-source 3D printer. Differences among various configurations of the Replicator are managed via effectivity using Model, Unit and Production Date variables.

The configurable MakerBot Replicator Part BOM structure can be resolved to a specific structure by providing the desired effectivity criteria.

1.1 Purpose

This sample application aims to show technical teams how they can use Aras Effectivity Services to create custom applications to solve business requirements around effectivity management. The sample application is not a standard product, and should not be deployed to production as-is. It supplements the Aras Innovator 11.0 – Effectivity Services Programmer's Guide product documentation to provide an example of how these core services can be implemented.

To help follow this documentation, the package provides sample data, which is optional for loading.

A production quality solution for effectivity management requires the implementation of a data model, user interfaces, security, and change processes to meet specific business requirements.

1.2 Terminology

The following table defines the terms, acronyms, and abbreviations used in this document.

Table 2: Terminology

Term	Definition
Effectivity	Identification of valid uses of an item in a structure, if it is conditional.
Effectivity Variable	A Variable that influences effectivity decisions, such as date, model, unit, batch, lot, plant.
Effectivity Scope	A Built-in ItemType that represents a list of relevant Effectivity Variables. For example, a scope may contain Model, Unit and Date effectivity variables to track configuration differences in a 3D Printer product.

Effectivity Expression	An Expression that represents the effectivity condition in the Boolean Expression Language. For example: Model = “Model X” and (Unit >= 10 and Unit <=20)
Effectivity Criteria	The Criteria used for resolving a structure by effectivity. Effectivity conditions set on relationships are evaluated against the input criteria to determine the inclusion or exclusion of conditional items in the resolved structure. For example: resolve the structure for criteria: (Model = “Model X” and Unit = 15).

1.3 References

Table 3: Reference Product Documentation

Aras Innovator 11.0 – Effectivity Services Programmer’s Guide
Aras Innovator 11.0 – Query Builder Guide
Aras Innovator 11.0 – Tree Grid View Administrator Guide

2 Data Model Overview

Figure 1 shows the components of the Effectivity Data Model used in the Sample Application. For more information about the Effectivity Services data model concept, refer to sections *3.1* and *5* of the *Aras Innovator 11.0 – Effectivity Services Programmer's Guide*.

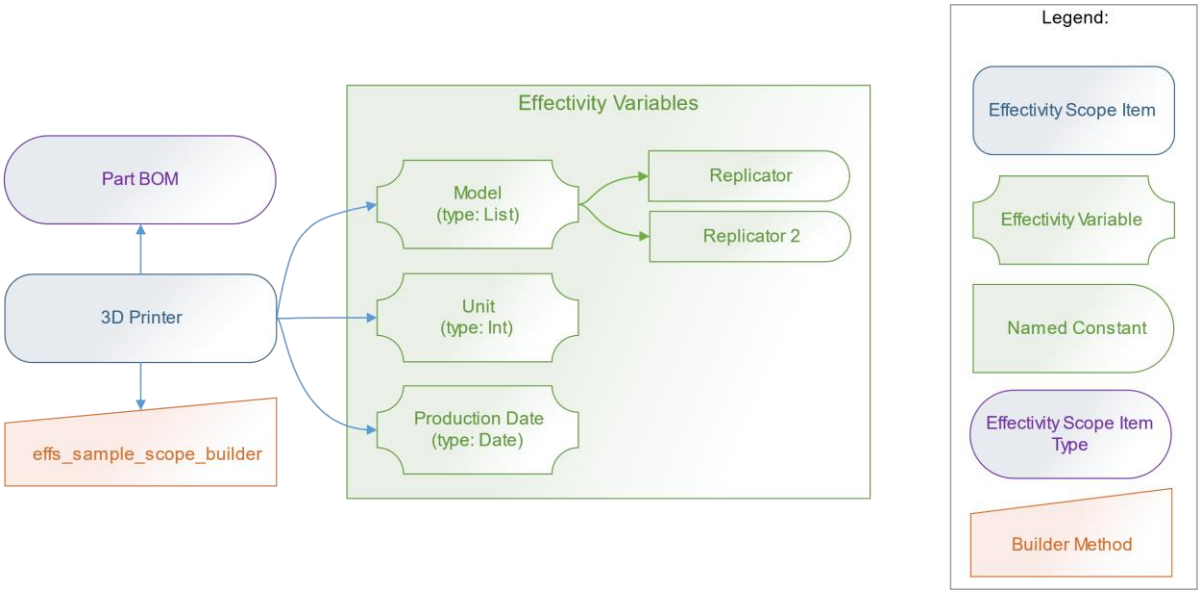


Figure 1.

The **3D Printer** Effectivity Scope defines the context for the Effectivity Resolution using the following elements:

- The Effectivity Variables specified to influence effectivity decisions:
  - **Unit**, an Integer representing an end item unit number
  - **Production Date**
  - **Model**, either **Replicator** or **Replicator 2**
- The **Part BOM** Effectivity Scope ItemType identifies that effectivity conditions will be managed for Part BOM Relationship ItemType
- The **effs_sample_scope_builder** Builder Method constructs a Scope object, which serves as the base for Effectivity Resolution.

3 Process Flow Overview

Let's take a high-level look at the Sample Application process flow for Effectivity Services:

1. The Company Management decides to manufacture a 3D Printer in two Models.
2. The Product Configuration Management Team identifies **Unit**, **Production Date**, and **Model** Effectivity Variables to determine effective **BOMs** for each mode.l
3. The Product Configuration Management Team identifies the **Part BOM** Relationship ItemType as the Effectivity Scope ItemType to resolve the Effectivity between two Models.
4. An Aras Administrator creates the **Unit**, **Production Date**, and **Model** Effectivity Variables.
5. The Administrator creates a **Part BOM** Effectivity Scope ItemType.
6. An Aras Developer creates the **effs_sample_scope_builder** Builder Method.
7. The Administrator creates the **3D Printer** Effectivity Scope using the Effectivity Variables, Effectivity Scope, and Builder Method.
8. The Responsible Innovator Users create a multi-level part BOM structure.
9. The Product Configuration Management Team sets, updates, and removes Effectivity Conditions in the Part BOM structure.
10. The Innovator Users view and resolve the structure by effectivity:
    a. A User opens a part that has a BOM
    b. The Builder Method constructs the Scope object
    c. In the Scope object, the Effectivity Resolution Engine evaluates each **Part BOM** Relationship Items against Effectivity Criteria to identify effective **BOMs**

For the internal details of the process flow for Effectivity Services, refer to sections *3.2* and *3.3* of the *Aras Innovator 11.0 – Effectivity Services Programmer's Guide*.

4 Administrative Setup

This section describes the administrative setup within the Sample Application.

4.1 Effectivity Variables

An Effectivity Variable is a construction block for Effectivity Expressions (to set effectivity conditions within a structure) and Effectivity Criteria (for structure resolution).

For this Sample Application, three (3) Effectivity Variables have been created to use in Part BOM effectivity:

1. **Unit**, an Integer
2. **Production Date**, a Date
3. **Model**, a List:
   a. Replicator
   b. Replicator 2

Use the following procedure to create the **Unit** Effectivity Variable:

1. Select **TOC** --> **Administration** --> **Effectivity Services** --> **Effectivity Variable**.
2. Click **Create a New Item**.

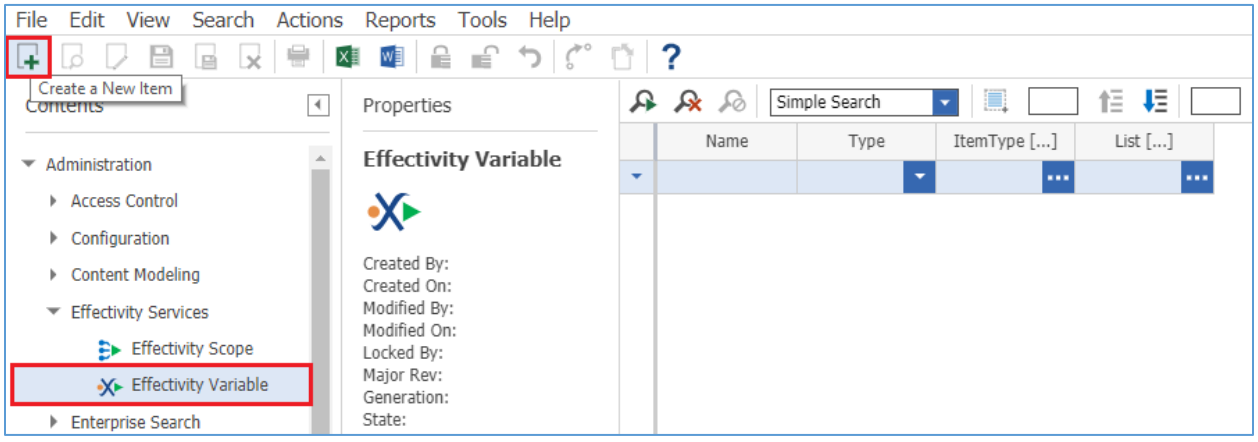


Figure 2.

A new **Effectivity Variable** form appears (see Figure 3) displaying blank text boxes and a drop-down list.

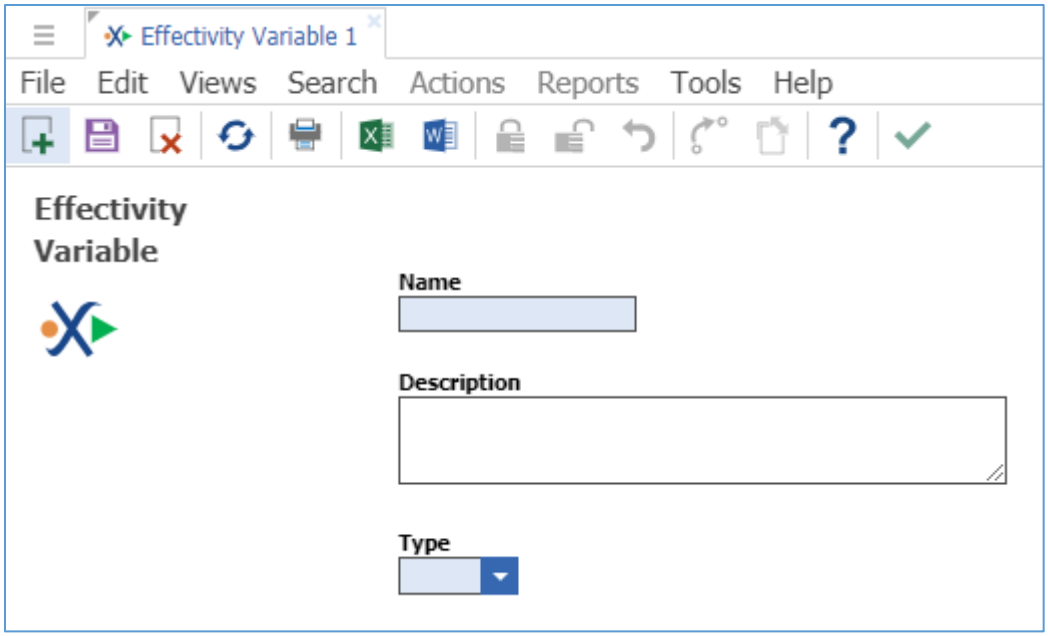


Figure 3.

3. Enter the following information in the **Effectivity Variable** form:
    a. Type **Unit** in the **Name** text box.
    b. Type **Unit Effectivity Variable** in the **Description** text box.
    c. Select **Integer** from the **Type** drop-down list.
4. Click **Save, Unlock & Close.** The **Unit** Effectivity Variable is created.

Use the same procedure to create the other two Effectivity Variables (Model and Production Date).

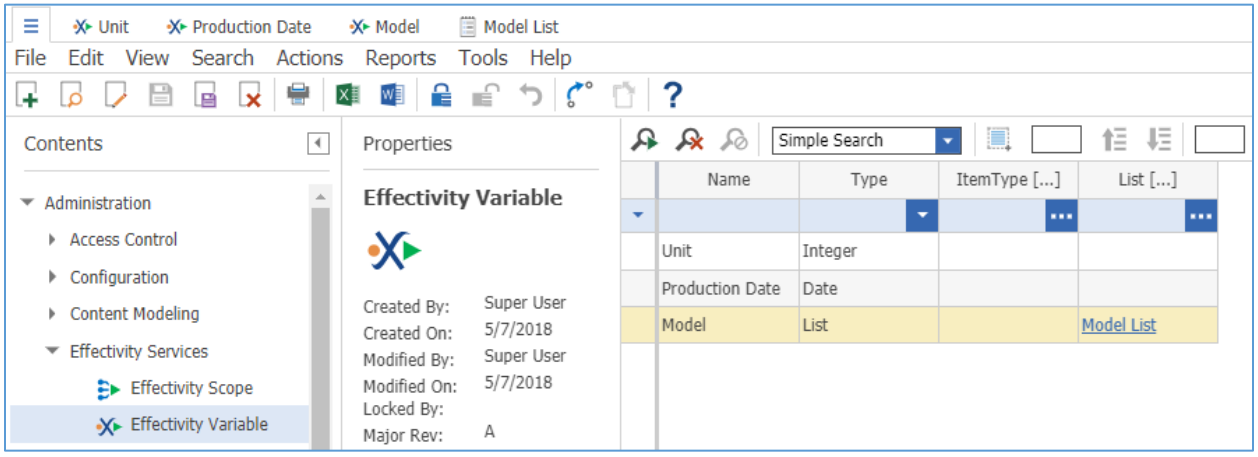


Figure 4.

4.2 Part BOM ItemType Configuration

The standard **Part BOM Relationship** ItemType is used to manage effectivity in the Sample Application.

A new property, **effectivity_string_notation**, is added to Part BOM to display user-friendly effectivity notation in various grids. This property is populated with a new server method, **effs_sample_PartBOM_OnAfterGet**.

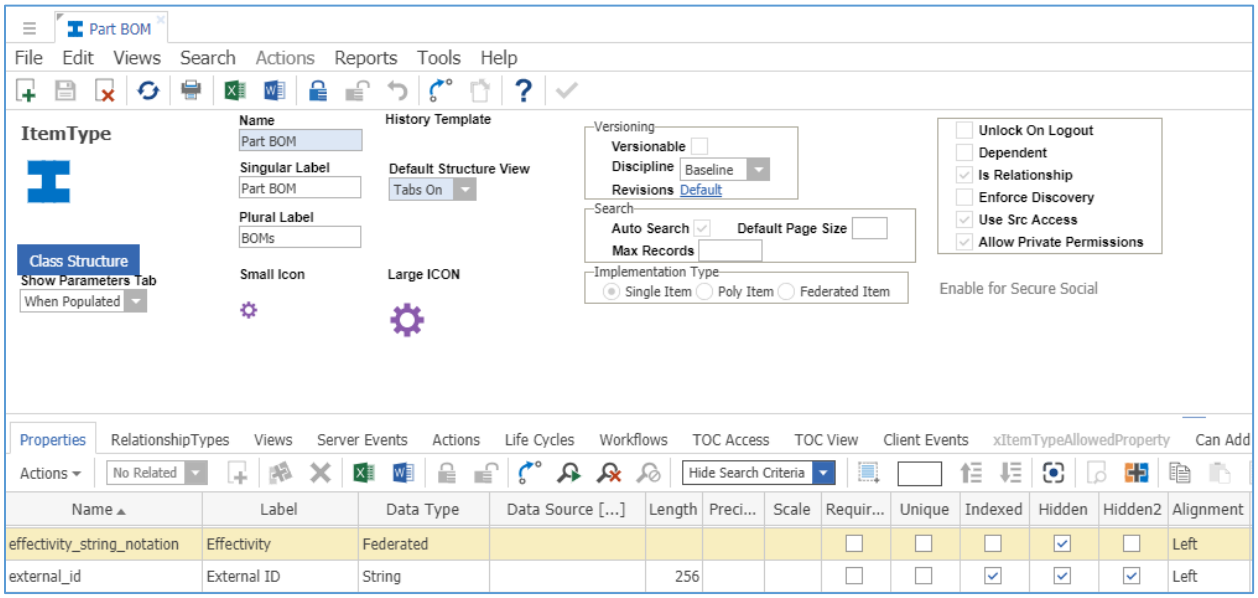


Figure 5.

4.3 Builder Method

A **Builder Method** is an item of the ItemType “Method”, which constructs the Scope object using custom business data and business logic.

The **effs_sample_scope_builder** Builder Method is implemented using the predefined CSharp:Aras.Server.Core.Configurator method template supplied with 11.0 SP14.

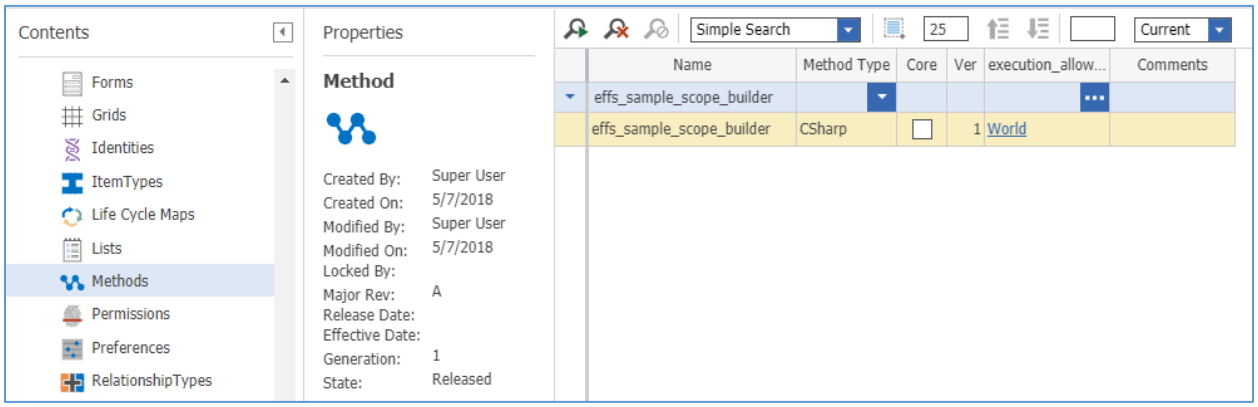


Figure 6.

The sample application provides the source code of the **effs_sample_scope_builder** Builder Method, which is implemented to work with the effectivity variables listed in the effectivity scope.

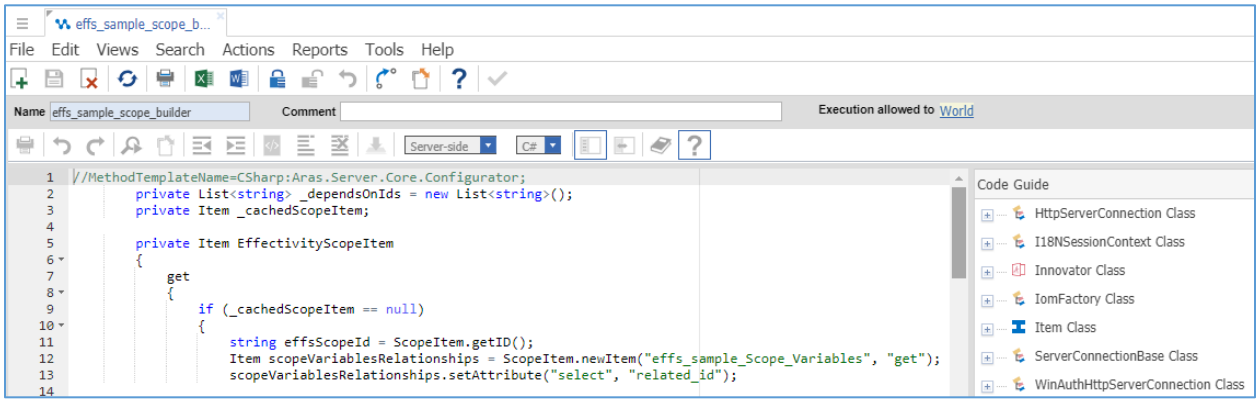


Figure 7.

For detailed information about writing a custom Builder Method, refer to section 7.*2* of the *Aras Innovator 11.0 – Effectivity Services Programmer's Guide*.

4.4 Effectivity Scope

An **Effectivity Scope** is an item of the ItemType "effs_scope" that defines the context for setting effectivity as well as effectivity resolution.

The **3D Printer Effectivity Scope** in the sample application is configured with Unit, Production Date, and Model Effectivity Variables, and Part BOM Relationship ItemType using the effs_sample_scope_builder Builder Method.

The **3D Printer** Effectivity Scope is set up using the following procedure:

1. Go to **TOC** --> **Administration** --> **Effectivity Services** --> **Effectivity Scope**.
2. Click Create a New Item.

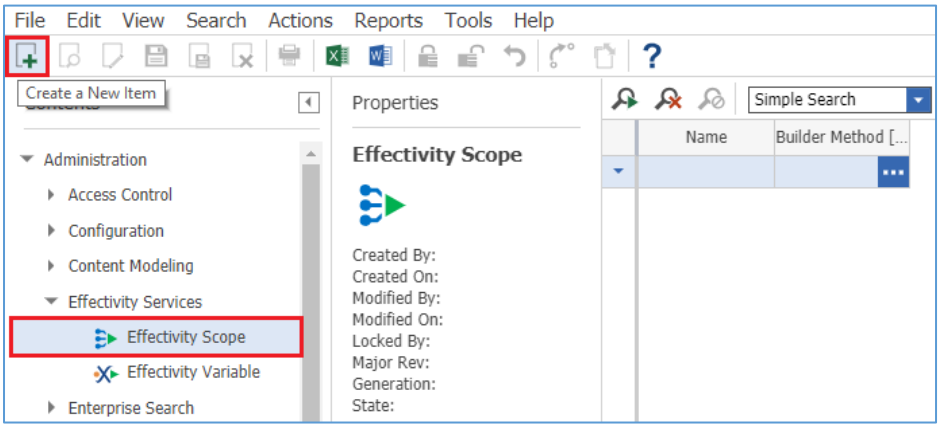


Figure 8.

A new **Effectivity Scope** form appears (see Figure 9) containing blank text boxes and empty tabs.

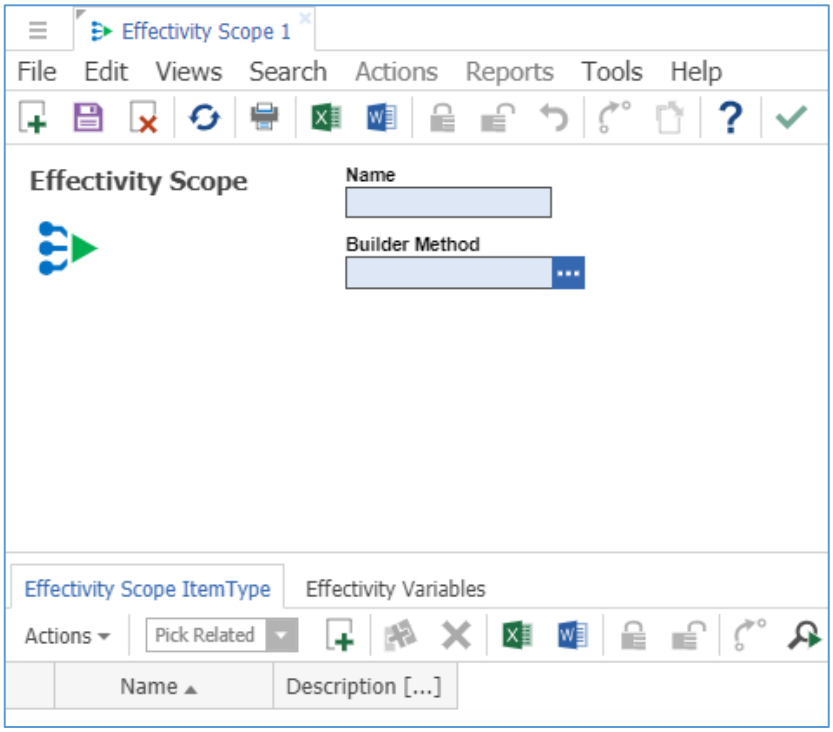


Figure 9.

3. Enter the following information in the **Effectivity Scope** form:
   a. In the **Name** text box, type **3D Printer**
   b. In the **Builder Method** text box, type the **effs_sample_scope_builder** method name

      Aras Innovator searches for the string you entered and presents a drop-down list of methods whose names contain this string (see Figure 10).

   c. Select **effs_sample_scope_builder** from the drop-down list

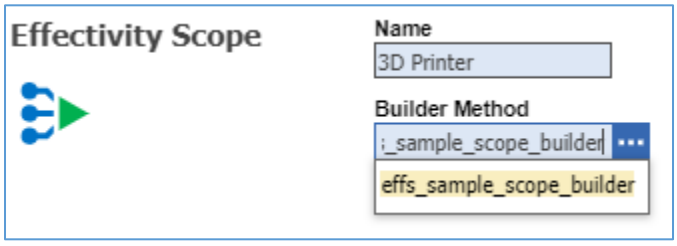


Figure 10.

Note: Another way to set the **Builder Method** is to click the **Search** button, the one with three dots right after the **Builder Method** text box. The **Search dialog – Method** appears for you to search and to select the specified method following the standard search procedures (see Figure 11).

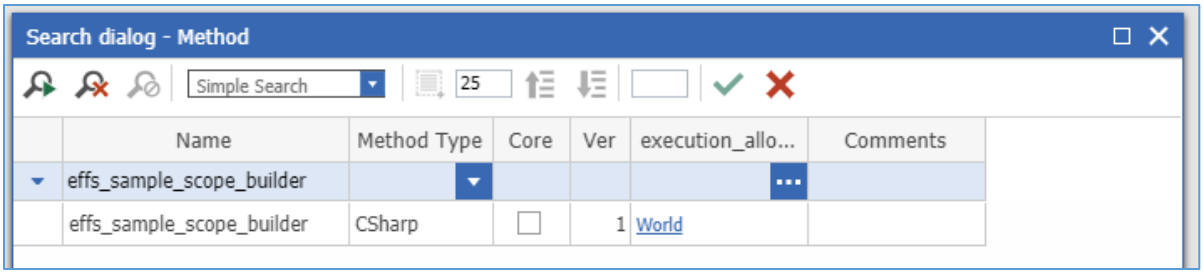


Figure 11.

4. Click **New Relationship** On the **Effectivity Scope ItemType** tab.

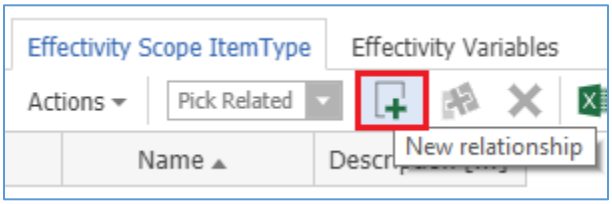


Figure 12.

The **Search dialog – ItemType** appears (see Figure 13).

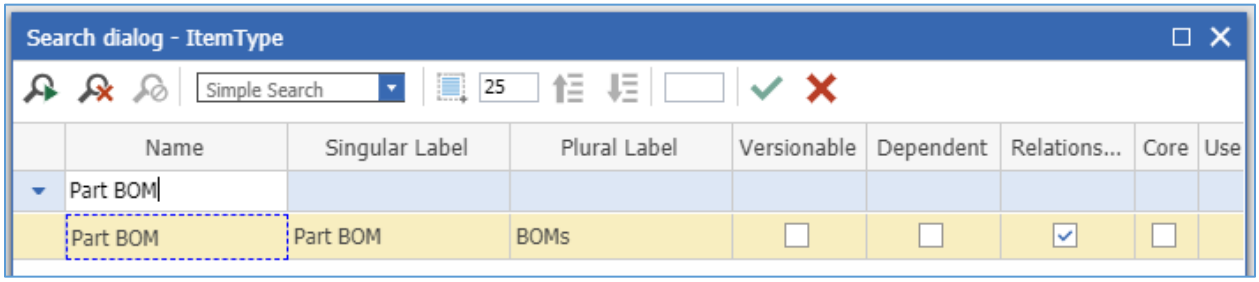


Figure 13.

5. In the **Search dialog – ItemType**, search for and select the **Part BOM** ItemType. The **Part BOM** ItemType appears in the **Effectivity Scope ItemType** tab

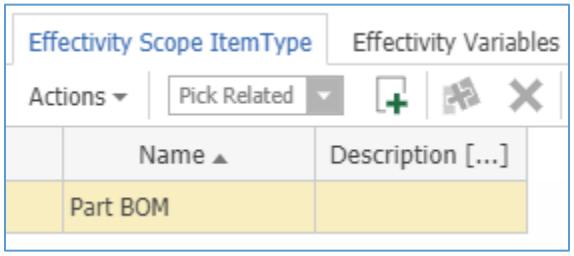


Figure 14.

6. On the **Effectivity Variables** tab, Click **New relationship**.

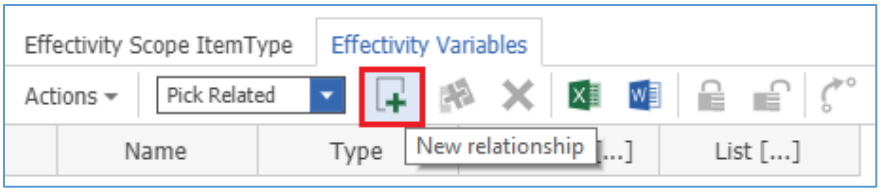


Figure 15.

The **Search dialog – Effectivity Variable** appears (see Figure 16).

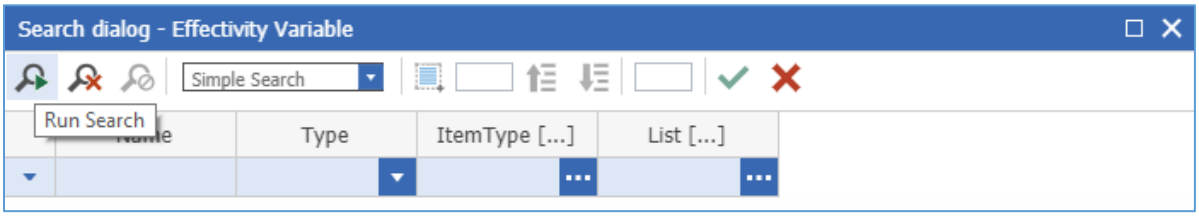


Figure 16.

7. Click **Run Search** in the Search dialog – Effectivity Variable.

   The **Unit**, **Production Date**, and **Model** Effectivity Variables appear in the **Search dialog – Effectivity Variable**.

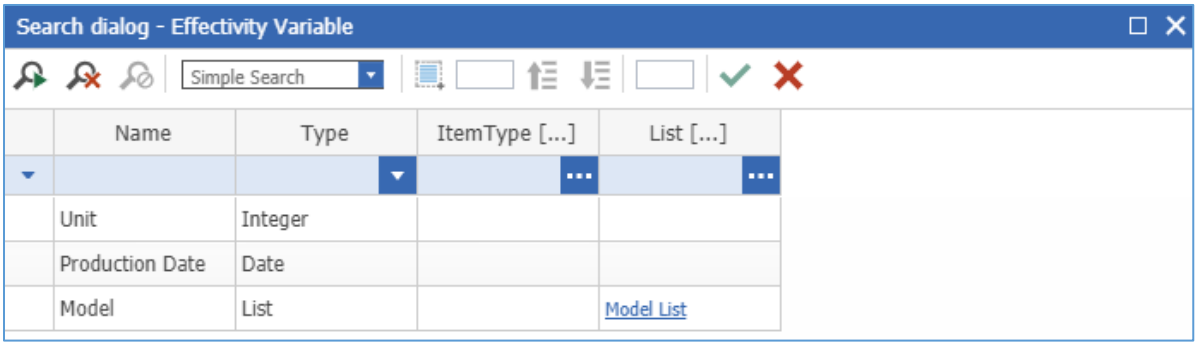


Figure 17.

8. Select the Unit, Production Date, and Model Effectivity Variables in the Search dialog – Effectivity Variable.

   The **Unit**, **Production Date**, and **Model** Effectivity Variables appear on the **Effectivity Variables** tab.

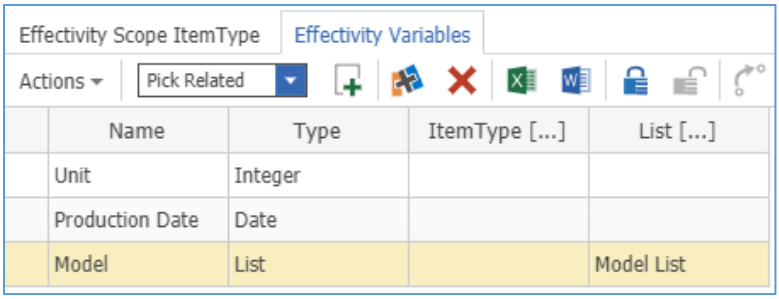


Figure 18.

9. Click **Save**, **Unlock & Close** in the **Effectivity Scope Toolbar**.

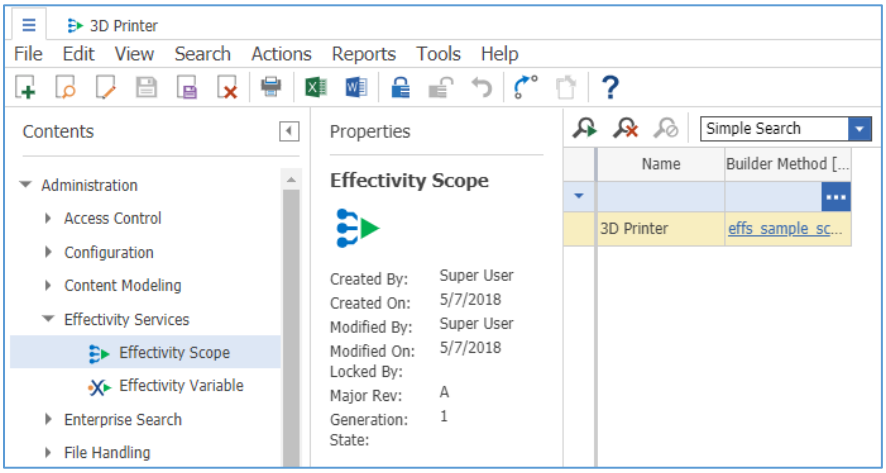


Figure 19.

The **3D Printer** Effectivity Scope is created.

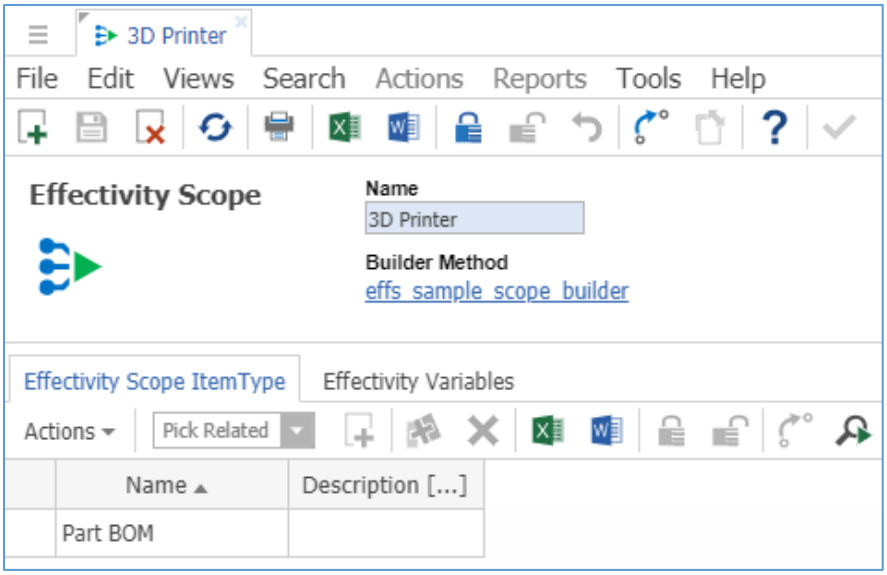


Figure 20.

4.5 Query Definition Configuration

The standard Aras Innovator feature **Query Definition** is a fundamental element for retrieving data from the server. Effectivity Services is integrated into Query Definition to retrieve data including filtering the data by effectivity. For the explanation of the process flow, refer to sections 3.*2* and 3.3 of the *Aras Innovator 11.0 – Effectivity Services Programmer's Guide*.

The **effs_sample_Part_PartBOM** Query Definition configuration is available in the sample application.

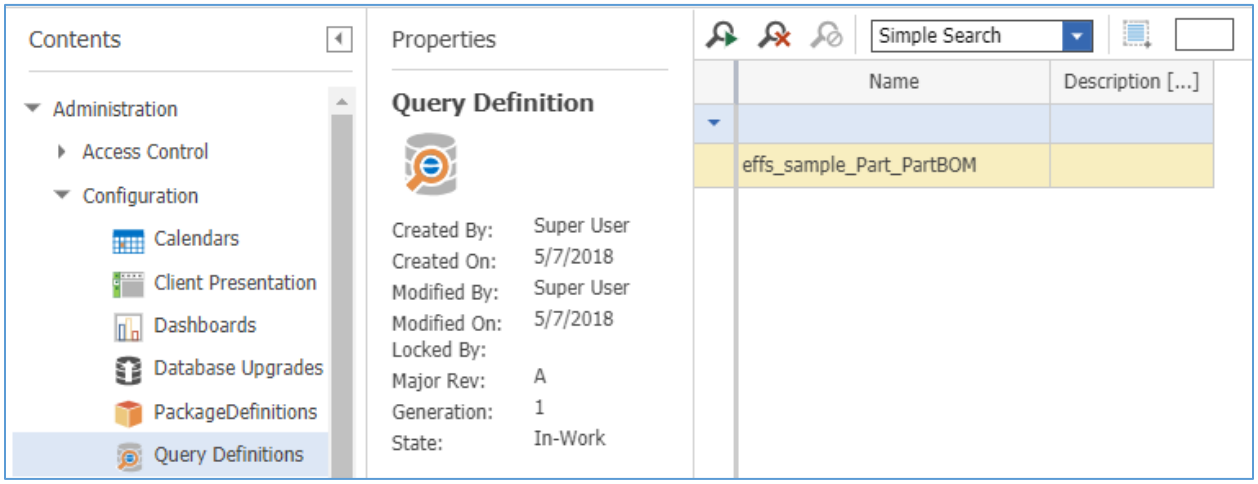


Figure 21.

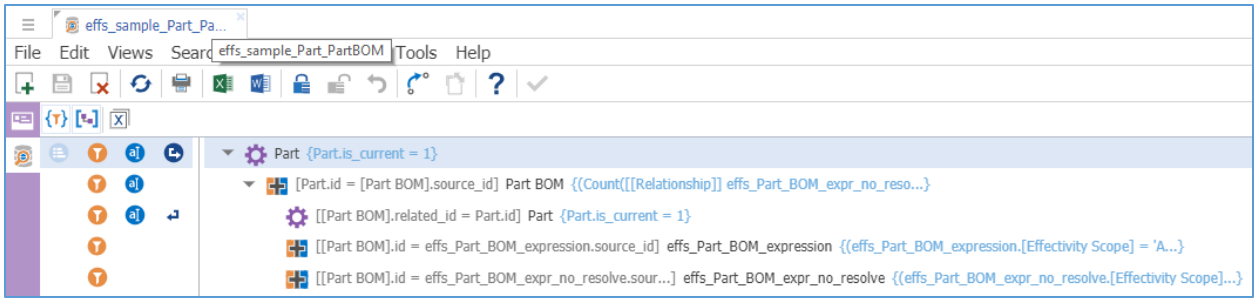


Figure 22.

For information about creating a Query Definition to filter by Effectivity, refer to section 9.*2* of the *Aras Innovator 11.0 – Effectivity Services Programmer's Guide*.

4.6 Tree Grid View Configuration

Tree Grid View is a standard Aras Innovator feature that enables you to present the visual layout of data retrieved from a Query Definition as a Relationship tab in an item view for the Users.

In the Sample Application, **effs_sample_Part_PartBOM** Tree Grid View uses data from the **effs_sample_Part_PartBOM** Query Definition to resolve the Part BOM structure and to display results in a grid.

The **effs_sample_Part_PartBOM** Tree Grid View configuration is available in the sample application.

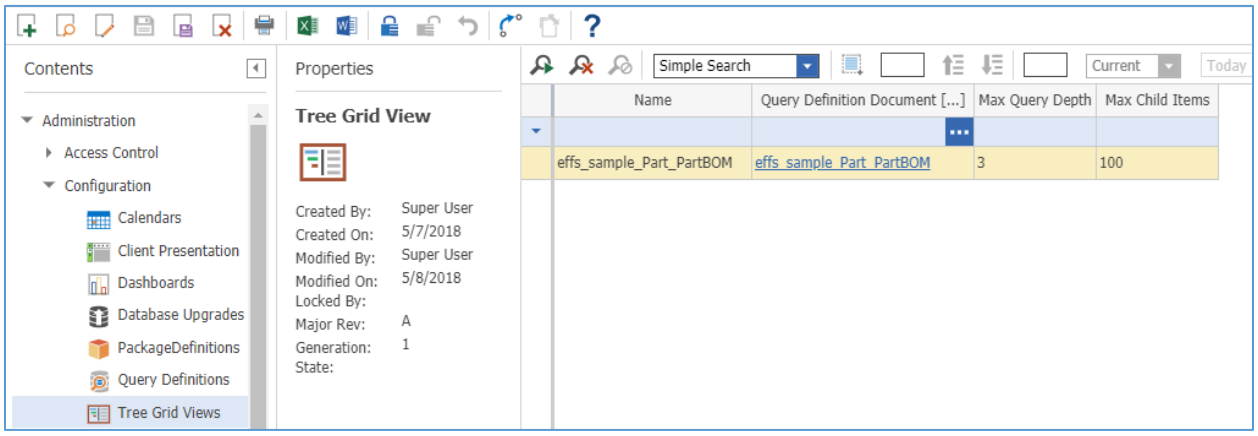


Figure 23.

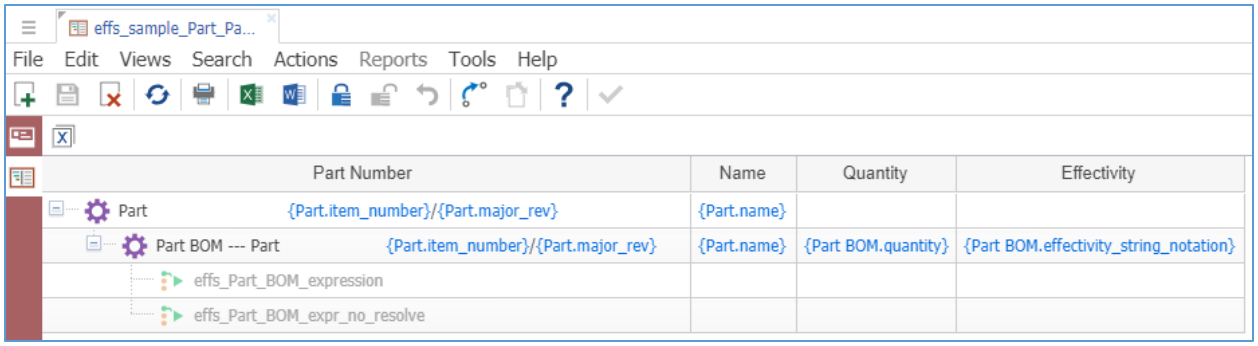


Figure 24.

For information about creating a Tree Grid View to display Effective Items, refer to section *9.3* of the *Aras Innovator 11.0 – Effectivity Services Programmer's Guide*.

5 Working with Effectivity on Part BOM

This section describes how to work with effectivity features implemented in the Sample Application.

5.1 Setting Effectivity on Part BOM

Use the following procedure to set Effectivity on a part:

1. Go to **TOC** --> **Design** --> **Parts**.
2. Search for **MP2954 Part Number** with the Name **Extruder** and lock it for editing.

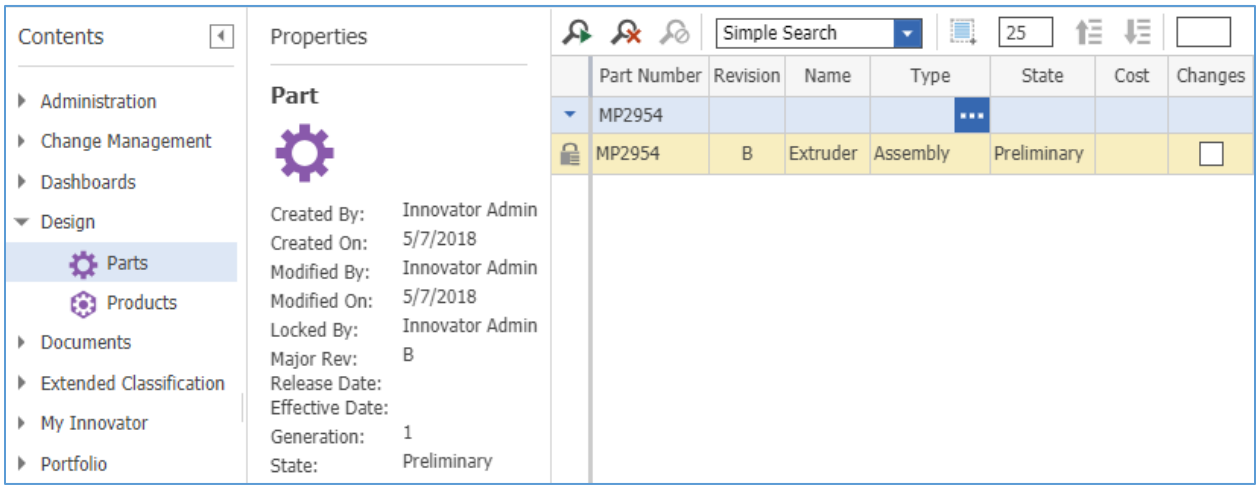


Figure 25.

3. Search for **MP2505 Part Number** with the Name **Nozzle 0.3mm** on the BOM tab of the MP2954 part,

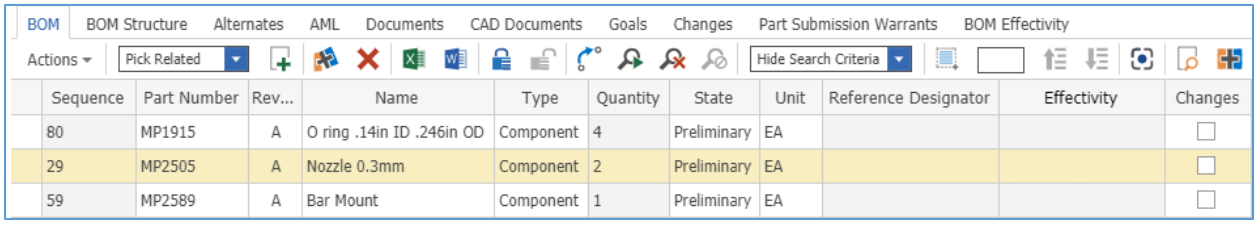


Figure 26.

4. Right-click the **MP2505** part and then click **View "BOM"**. The **Part BOM** tab appears for the **MP2505** part.

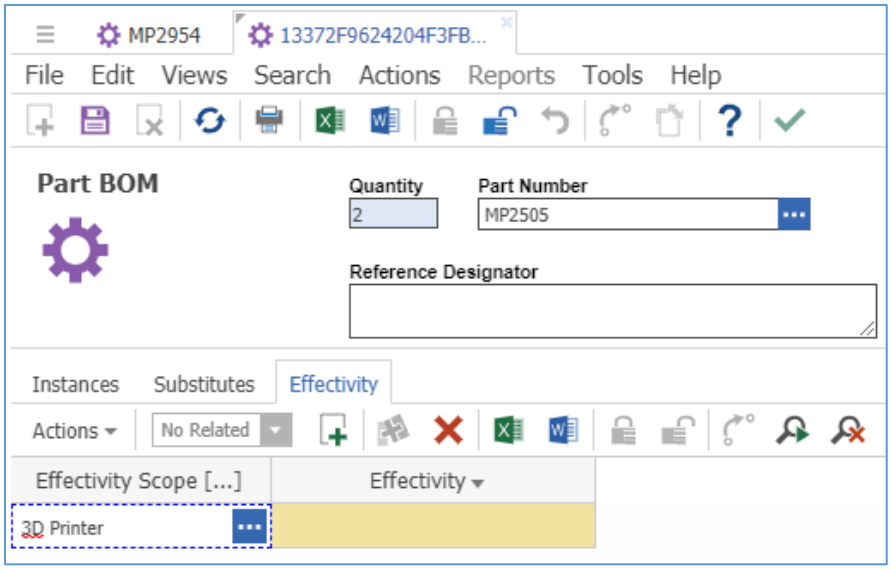


Figure 27.

5. Lock the **Part BOM** for editing

6. On the **Effectivity** tab of the **Part BOM**, create a new effectivity with 3D Printer Effectivity Scope.

7. Right-click the new item and then click **View** "**Effectivity**".

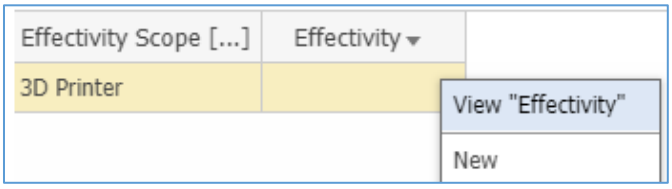


Figure 28.

The **Part BOM Effectivity** tab appears.

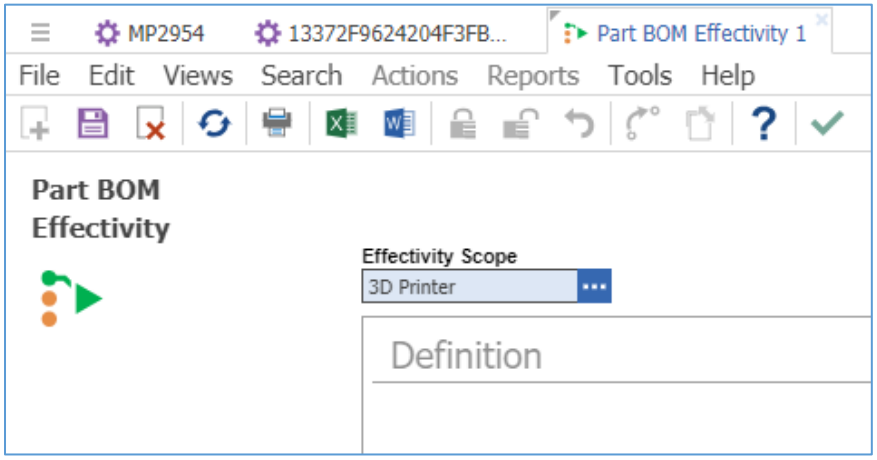


Figure 29.

8. Click **Save Item** on the Part BOM Effectivity tab toolbar.
9. Enter **Model = Replicator** in the Definition box of the Part BOM Effectivity tab.
10. Click **Save**, **Unlock & Close** on the Part BOM Effectivity tab toolbar. The **Model = Replicator** Effectivity Criteria is set on **Part BOM** relationship of the **MP2505** part.

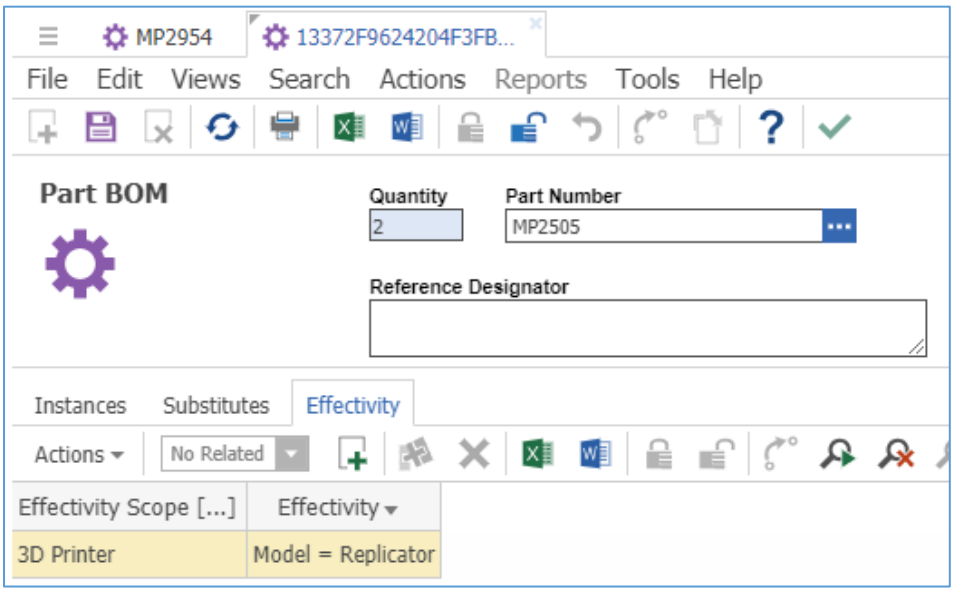


Figure 30.

11. Click **Save, Unlock & Close** on the **Part BOM** tab toolbar. The **Model = Replicator** Effectivity Condition is set between the parent **MP2954** and the child **MP2505** parts.

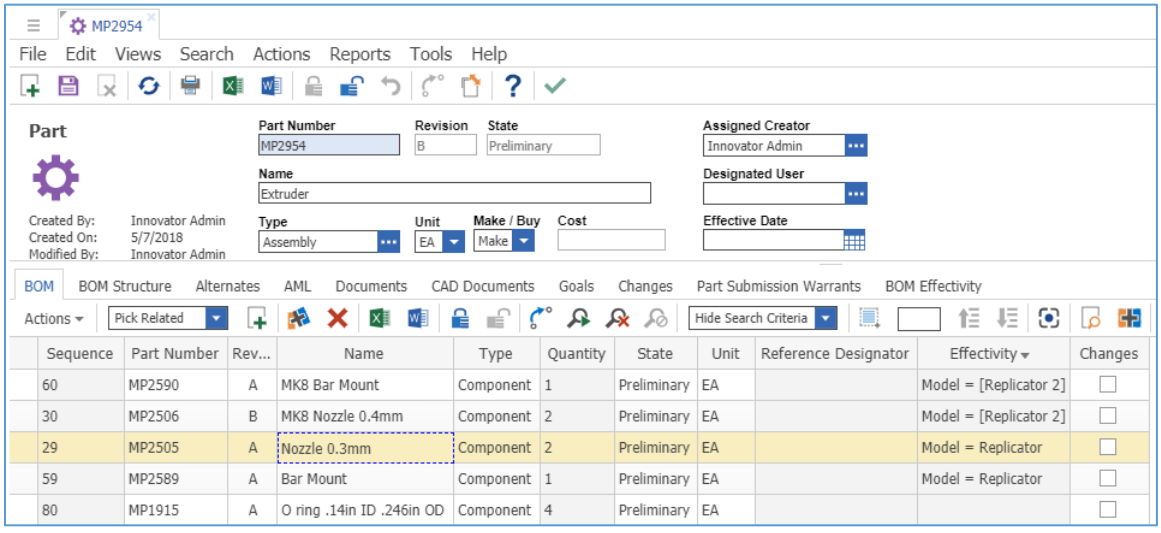


Figure 31.

12. Repeat steps 3-10 for the child parts of the **MP2954** part as specified in table 4.
13. Click **Save, Unlock, & Close** on the **MP2954** part toolbar. The Effectivity Criteria is set on the **MP2954** part structure.

Following the previous procedure, Effectivity Conditions are set on the parts as specified in table 4.

Table 4: Specifications of Effectivity Conditions within MP0101 and MP0103 part structures in the Sample Application

Part Level	Part Number	Name	Effectivity Condition
1	**MP2954**	**Extruder**	
2	MP2505	Nozzle 0.3mm	Model = [Replicator]
2	MP2506	MK8 Nozzle 0.4mm	Model = [Replicator 2]
2	MP2589	Bar Mount	Model = [Replicator]
2	MP2590	MK8 Bar Mount	Model = [Replicator 2]
1	**MP2943**	**Build Platform**	
2	MP2339	Thing-O-Matic 2 Aluminum Heat Spreader	Model = [Replicator]
2	MP2360	Replicator Aluminum Heat Spreader	Model = [Replicator 2]
1	**MP2952**	**Electronics**	
2	**MP2960**	**Storage Assembly**	
3	MP2988	Makerbot MightyBoard Software	Model = [Replicator]
3	MP2989	Makerbot MightyBoard Software v2	Model = [Replicator 2]
1	**MP2938**	**Additional Parts**	
2	MP2935	Filament Spool Holder	(Model = [Replicator]) OR ((Model = [Replicator 2] AND Unit <= 99))
2	MP2937	Filament Heavy Duty Spool Holder	Model = [Replicator 2] AND Unit >= 100
2	MP4000	Filament	[Production Date] >= [6/22/2018]

5.2 Updating Effectivity on Part BOM

In this section, we need to update the effectivity condition on **MP4000** within **MP2938.**

Use the following procedure to complete this task:

1. Go to **TOC** --> **Design** --> **Parts**.
2. Search for **MP2938 Part Number** with **Additional Parts Name** and lock it for editing.

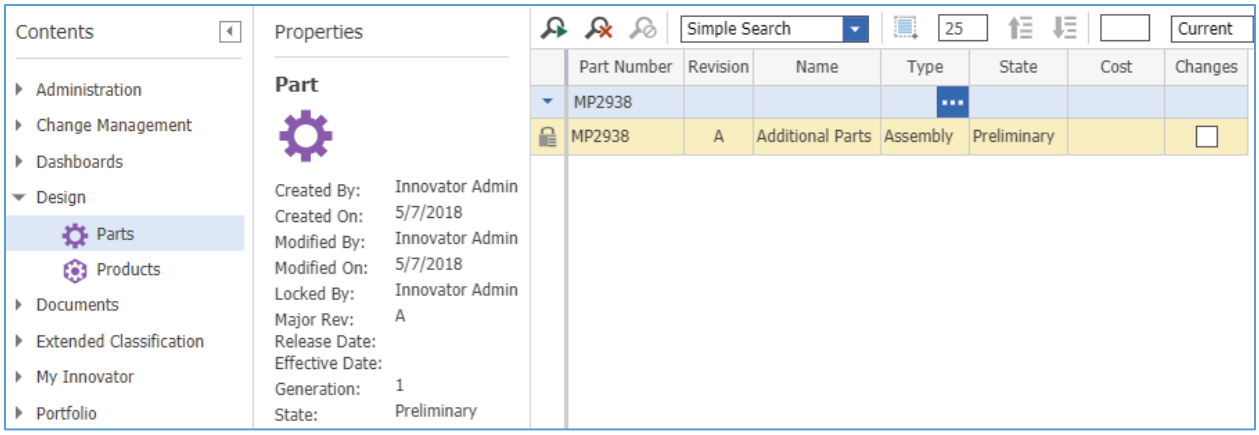


Figure 32.

3. Search for part number **MP4000** with the Name **Filament** on the **BOM** tab of the **MP2938** part.

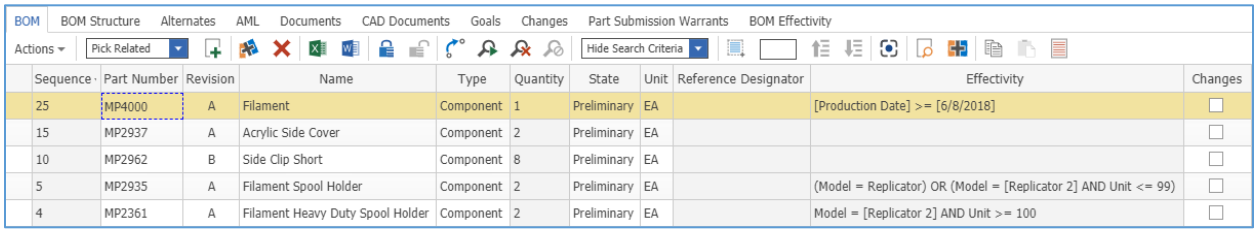


Figure 33.

4. Right-click the **MP4000** part and then click **View "BOM"**.

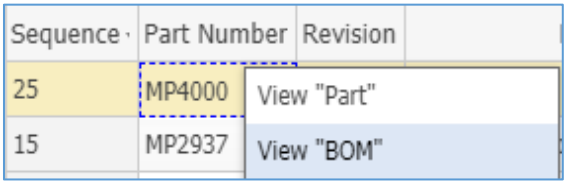


Figure 34.

The **Part BOM** tab appears for the **MP4000** part.

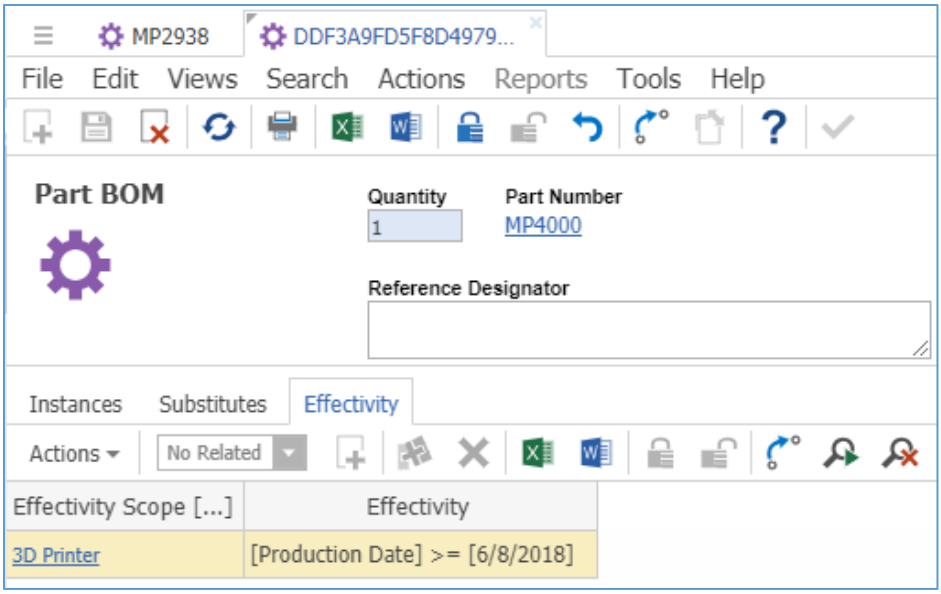


Figure 35.

5. Lock the **Part BOM** tab for editing.
6. On the **Effectivity** tab, right-click the **3D Printer** Effectivity item and then click **View** "**Effectivity**".

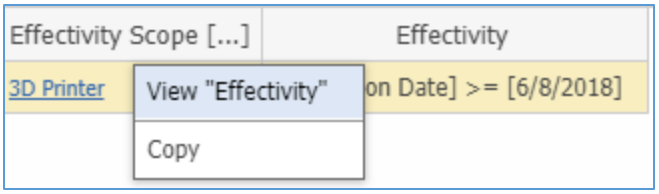


Figure 36.

The **Part BOM Effectivity** form appears.

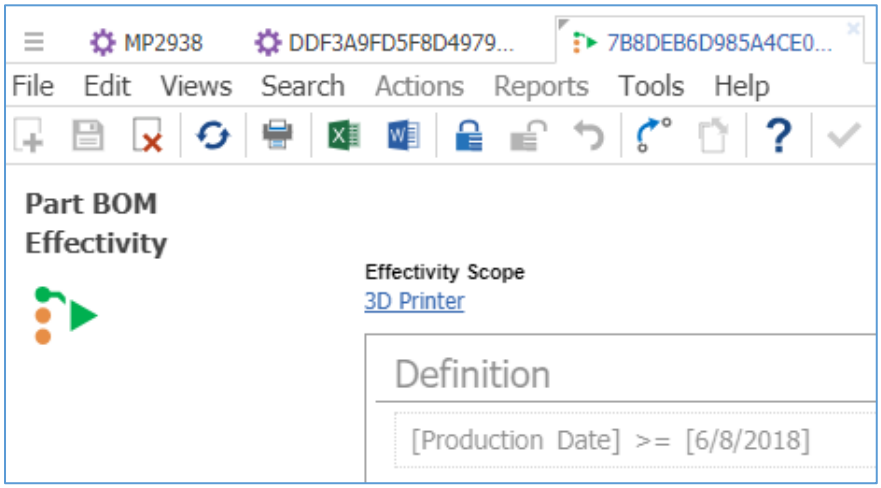


Figure 37.

7. Lock the **Part BOM Effectivity** tab for editing.

8. Change the date to **[6/15/2018]** In the **Definition** box of the **Part BOM Effectivity** tab.

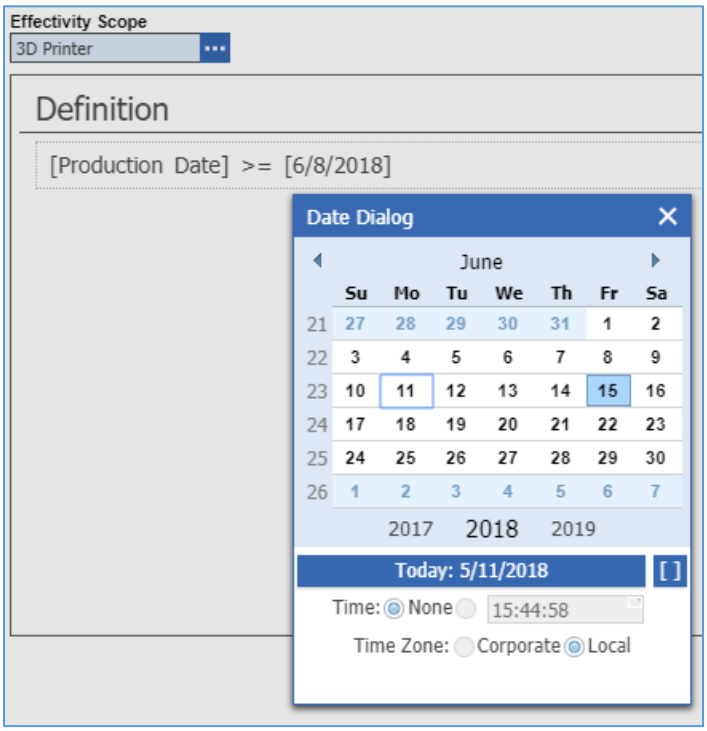


Figure 38.

9. Click **Save, Unlock, & Close** on the **Part BOM Effectivity** tab toolbar. The effectivity condition on the **MP4000** part is updated to **[Production Date] >= [6/15/2018]**.

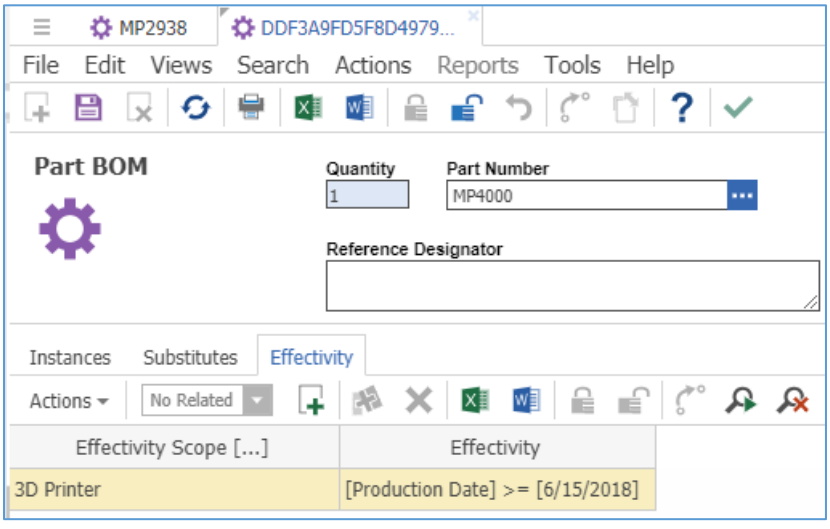


Figure 39.

10. Click **Save**, **Unlock & Close** on the Part BOM tab toolbar. The effectivity condition is updated between the parent **MP2938** and the child **MP4000** parts.

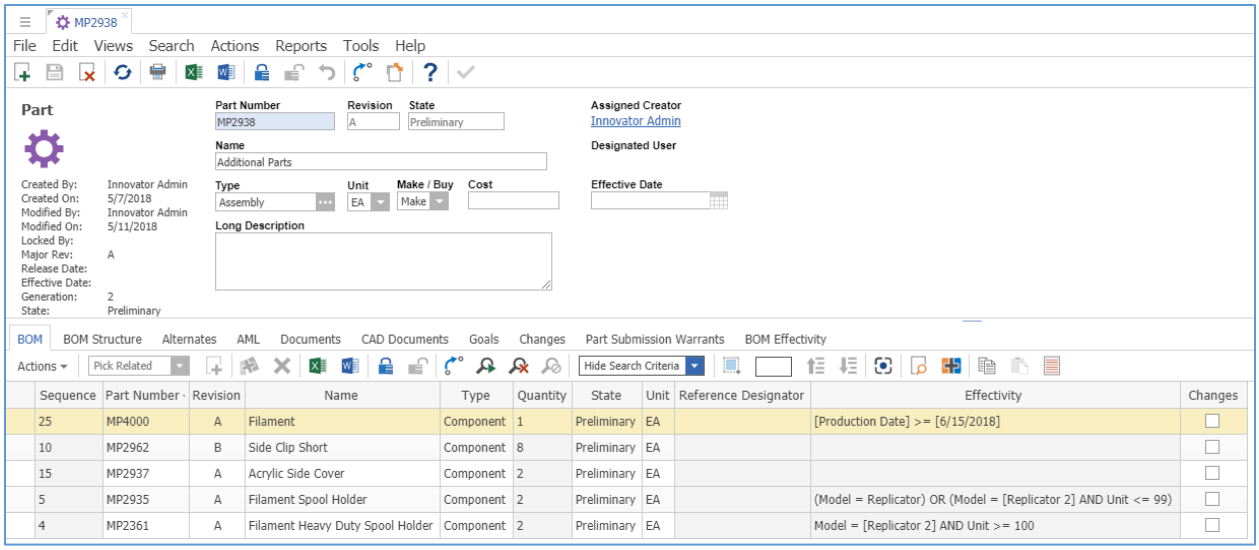


Figure 40.

11. Click **Save, Unlock & Close** on the **MP2938** part toolbar. The effectivity condition is updated on the **MP2938** part structure.

5.3 Removing Effectivity on Part BOM

This section describes the procedure for removing an existing effectivity condition on **MP4000** within **MP2977**.

1. Go to **TOC** --> **Design** --> **Parts**

2. Search for **MP2960** Part Number with **Storage Assembly** Name and open it.

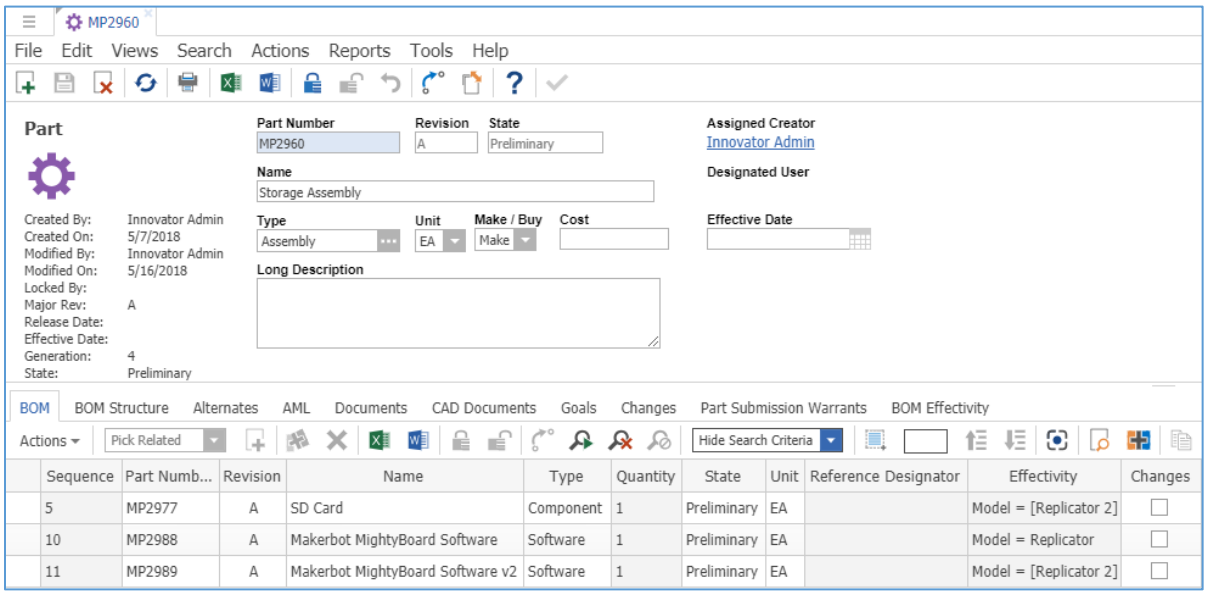


Figure 41.

3. Lock the **MP2960** part for editing.

4. Right click the **MP2977 Part Number** with **SD Card Name** and then click View "**BOM**" On the **BOM** tab.

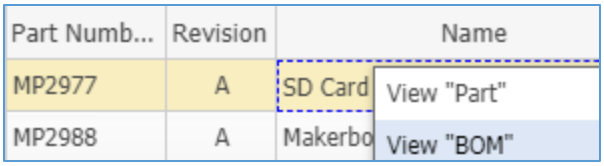


Figure 42.

The **Part BOM** tab appears for the **MP2977** part.

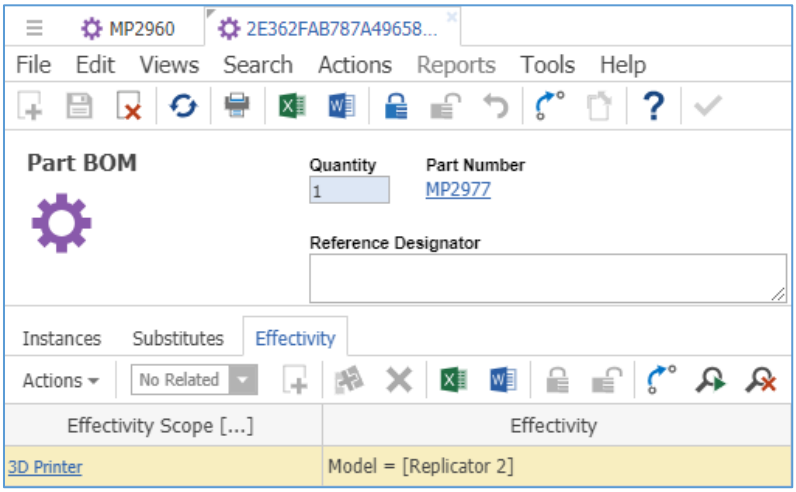


Figure 43.

5. Lock the **Part BOM** for the **MP2977** part.

6. Select the Model = [Replicator 2]Effectivity on the **Effectivity** tab.

7. Click **Delete Relationship** on the **Effectivity** tab.

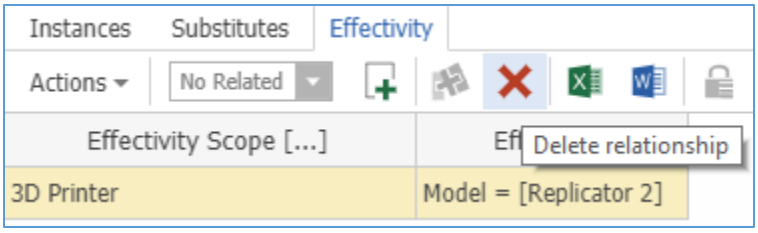


Figure 44.

8. Click **Save, Unlock, & Close** on the **Part BOM** toolbar.

9. On the **MP2960** toolbar, click **Refresh Item.** The **Model = [Replicator 2]** Effectivity is removed from the **MP2977** part.

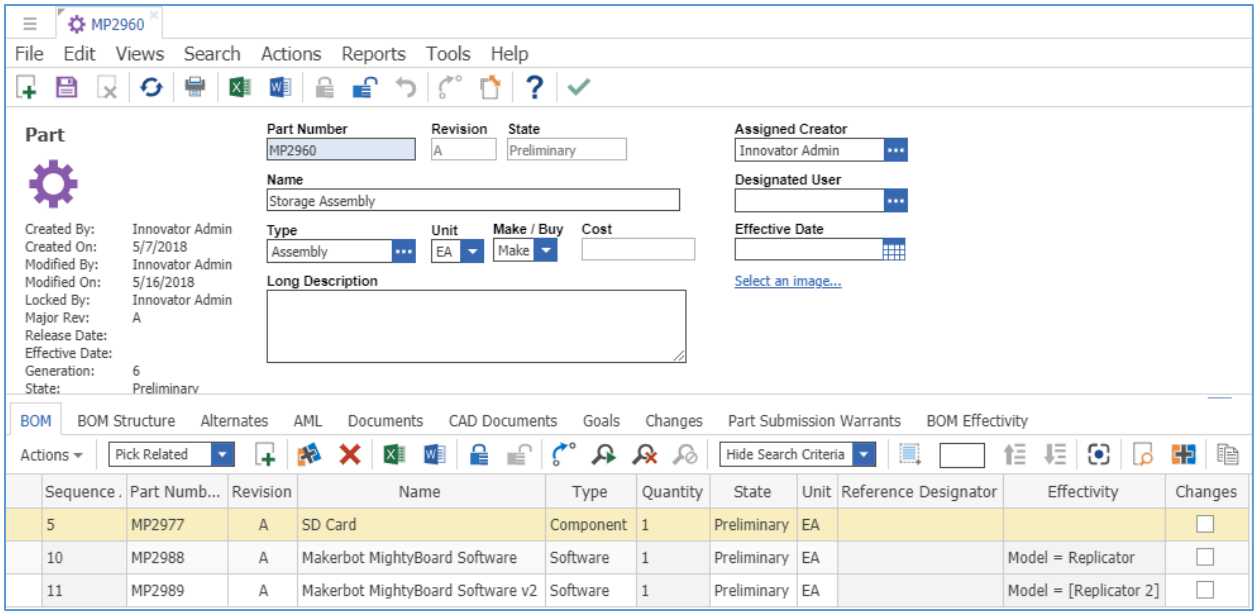


Figure 45.

10. Click **Save, Unlock, & Close** on the **MP2960** toolbar

    Output: The **Model = [Replicator 2]** Effectivity on the **MP2977** part is removed from the **MP2960 BOM Structure**.

5.4 Viewing Effectivity on Part BOM

Now that Effectivity Conditions are set up, Users can view BOM Effectivity and resolve Part BOM Structure by Effectivity.

If an Effectivity(s) is set on a Part BOM relationship at any level of the multi-level structure, this Effectivity(s) is displayed in propositional form on the corresponding child item's row.

When multiple effectivities are set on a child part, the display format is (…) OR (…) OR (…).

You can view Effectivity on three different tabs:

1. BOM
2. BOM Structure
3. BOM Effectivity

Let's have a closer look at these options.

5.4.1 Viewing Effectivity on the BOM tab

Use the following procedure:

1. Go to **TOC** --> **Design** --> **Parts**

2. Search for **MP2938** Part Number with **Additional Parts** Name and double-click it

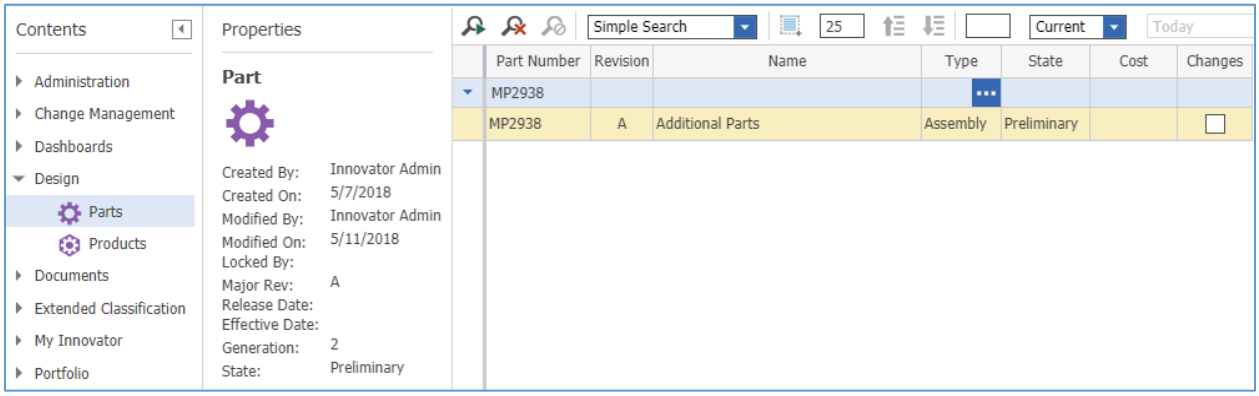


Figure 46.

The **MP2938** part tab appears.

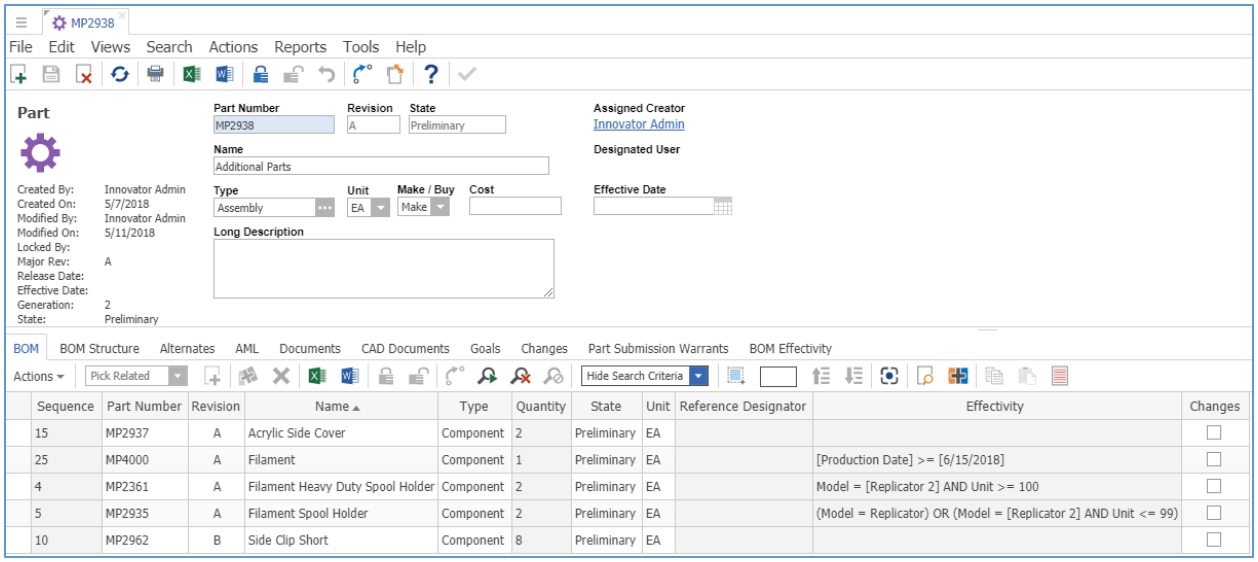


Figure 47.

3. On the **Effectivity** column, on the **BOM** tab of the **MP2938** part, view the Effectivities set on the **MP4000, MP2361** and **MP2935** parts

5.4.2 Viewing Effectivity on the BOM Structure tab

To complete this task:

1. Go to **TOC** --> **Design** --> **Parts**

2. Search for **MP2952** Part Number with **Electronics** Name and double-click it

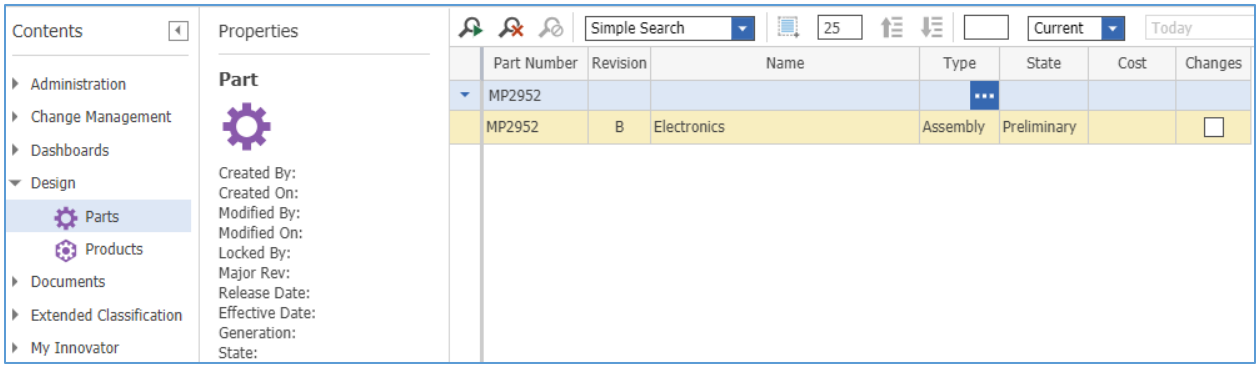


Figure 48.

The **MP2952** part tab appears.

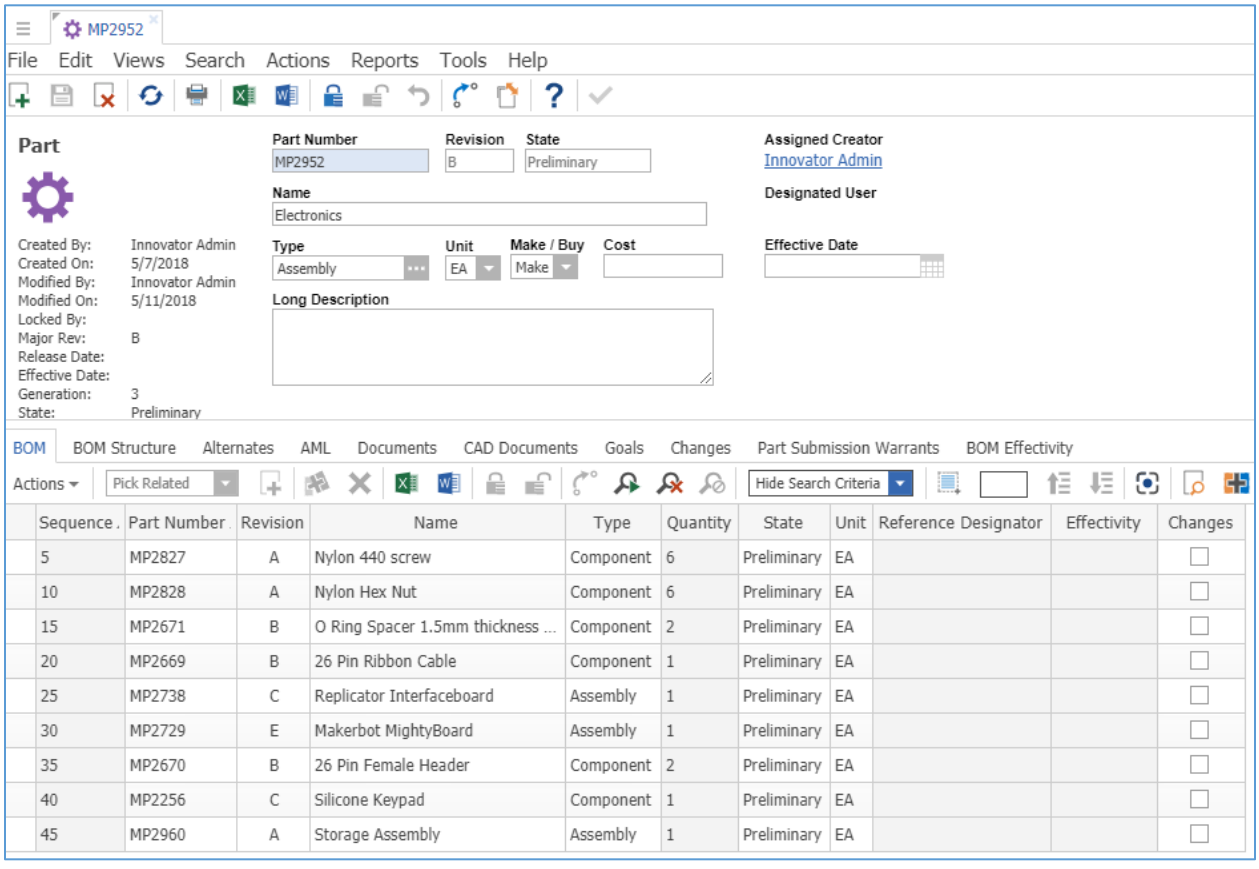
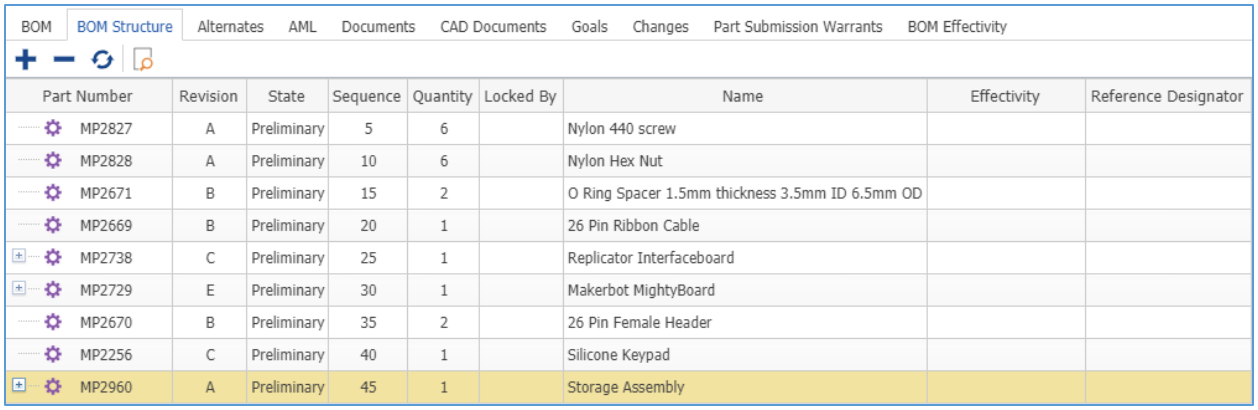


Figure 49.

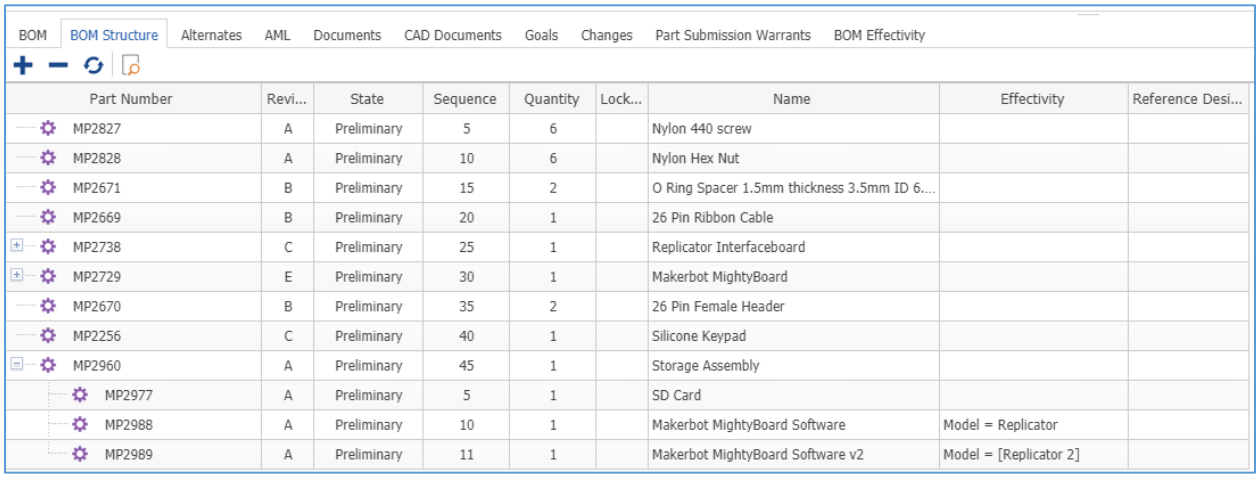
3. Click **BOM Structure** tab. The **BOM Structure** tab appears.



Part Number	Revision	State	Sequence	Quantity	Locked By	Name	Effectivity	Reference Designator
MP2827	A	Preliminary	5	6		Nylon 440 screw		
MP2828	A	Preliminary	10	6		Nylon Hex Nut		
MP2671	B	Preliminary	15	2		O Ring Spacer 1.5mm thickness 3.5mm ID 6.5mm OD		
MP2669	B	Preliminary	20	1		26 Pin Ribbon Cable		
MP2738	C	Preliminary	25	1		Replicator Interfaceboard		
MP2729	E	Preliminary	30	1		Makerbot MightyBoard		
MP2670	B	Preliminary	35	2		26 Pin Female Header		
MP2256	C	Preliminary	40	1		Silicone Keypad		
MP2960	A	Preliminary	45	1		Storage Assembly		

Figure 50.

4. Click **Expand** on the **MP2960** Part Number. The **BOM** of the **MP2960** part appears.



Part Number	Revi...	State	Sequence	Quantity	Lock...	Name	Effectivity	Reference Desi...
MP2827	A	Preliminary	5	6		Nylon 440 screw		
MP2828	A	Preliminary	10	6		Nylon Hex Nut		
MP2671	B	Preliminary	15	2		O Ring Spacer 1.5mm thickness 3.5mm ID 6....		
MP2669	B	Preliminary	20	1		26 Pin Ribbon Cable		
MP2738	C	Preliminary	25	1		Replicator Interfaceboard		
MP2729	E	Preliminary	30	1		Makerbot MightyBoard		
MP2670	B	Preliminary	35	2		26 Pin Female Header		
MP2256	C	Preliminary	40	1		Silicone Keypad		
MP2960	A	Preliminary	45	1		Storage Assembly		
MP2977	A	Preliminary	5	1		SD Card		
MP2988	A	Preliminary	10	1		Makerbot MightyBoard Software	Model = Replicator	
MP2989	A	Preliminary	11	1		Makerbot MightyBoard Software v2	Model = [Replicator 2]	

Figure 51.

5. View the Effectivities set on the **MP2988** and **MP2989** parts on the **Effectivity** column.

5.4.3 Viewing Effectivity on the BOM Effectivity tab

This option becomes available only after a **Part BOM** structure is resolved by Effectivity as described in section *5.5 Resolving Part BOM Structure by Effectivity*.

This section covers the viewing of Effectivity on the BOM Effectivity tab. For details of all features and options of Tree Grid View, refer to sections *4.5* and *4.6* of the *Aras Innovator 11.0 – Tree Grid View Administrator Guide*.

Use the following procedure:

1. Resolve **Part BOM Structure** of the **MP0101** part with **Unit = 100 AND Model = Replicator 2**, **AND Production Date = 6/15/2018** (refer to Section *5.5 Resolving Part BOM Structure by Effectivity*).

On the BOM Effectivity tab the **MP0101** part appears in the **Part BOM Structure** resolved by the Effectivity specified in step 1.

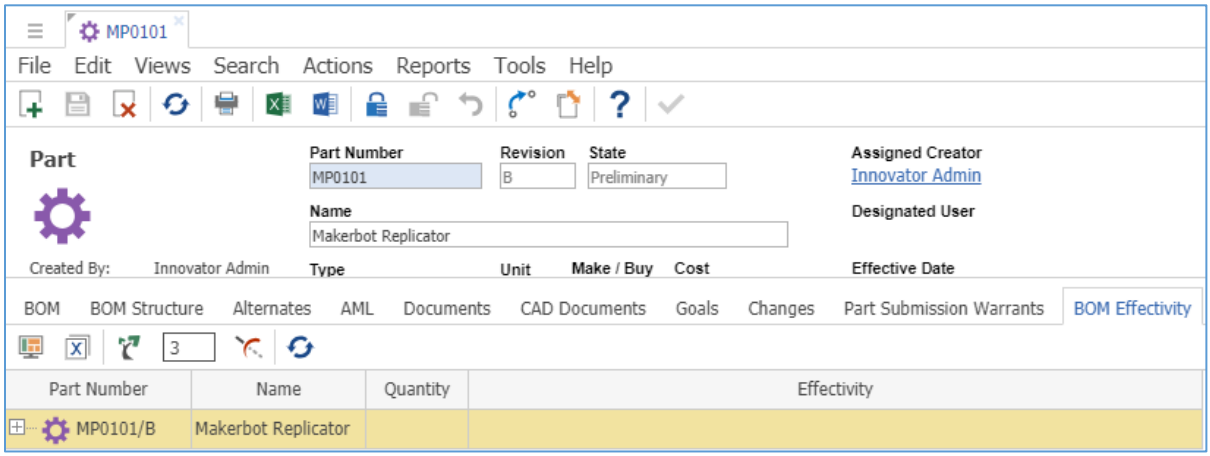


Figure 52.

2. On the **BOM Effectivity** toolbar, in the **Grow Depth** box, type **2** to set Grow depth from the selected level to two levels.

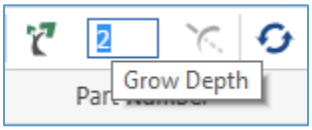


Figure 53.

3. On the **BOM Effectivity** toolbar, click **Grow** to set the Part-BOM Effectivity structure to two levels deep from the current (top) level.

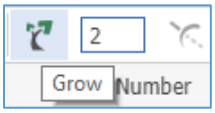


Figure 54.

The resolved Part-BOM Effectivity structure is set to two levels deep from the initial level.

Part Number	Name	Quantity	Effectivity
MP0101/B	Makerbot Replicator		
MP2942/B	Body	1	
MP2667/B	Spacer Black 5-16 in length .14in ID .25in OD	1	
MP2322/C	RGB LED Strip Common Anode	1	
MP2660/B	Spacer Black 1-2 in length .14in ID .25in OD	2	
MP2939/A	Body Fan Assembly	1	
MP2940/A	Body Hardware	1	
MP2941/B	Body Panels	1	
MP2963/A	Stepper Motor Assembly	1	
MP2453/A	Thing-O-Matic 2 Radial Ball Bearings	4	
MP2944/A	Cable Hardware	1	
MP0979/D	Mechanical Endstop	2	
MP2954/B	Extruder	1	
MP1705/B	MK7 Thermal Core	2	
MP2607/D	Cartridge Heater 40W 24V Right Angle Exit	2	
MP2966/C	Wire-Filament Extruder Guide	1	
MP2959/C	Nylon Spacer with Flange	1	
MP2506/B	MK8 Nozzle 0.4mm	2	Model = [Replicator 2]
MP1708/B	MK7 Heatsink	2	
MP2685/C	Spacer Black 16.5mm length 3.2mm ID 7mm OD	4	
MP2675/A	Tube Fitting .45in Tube	2	
MP2350/C	Fan 24V 40x40x10 Hi Performance	2	
MP2953/D	Extruder Hardware	1	
MP2590/A	MK8 Bar Mount	1	Model = [Replicator 2]

Figure 55.

4. Under the **MP2952/B** part, click the **MP2729/E** part.

MP2952/B	Electronics
MP2827/A	Nylon 440 screw
MP2828/A	Nylon Hex Nut
MP2671/B	O Ring Spacer 1.5mm thickness 3.5mm ID 6.5m...
MP2669/B	26 Pin Ribbon Cable
MP2738/C	Replicator Interfaceboard
MP2729/E	Makerbot MightyBoard

Figure 56.

5. On the **BOM Effectivity** toolbar, click **Grow**. The Part-BOM Effectivity structure is set to two levels deep from the **MP2729/E** part level.

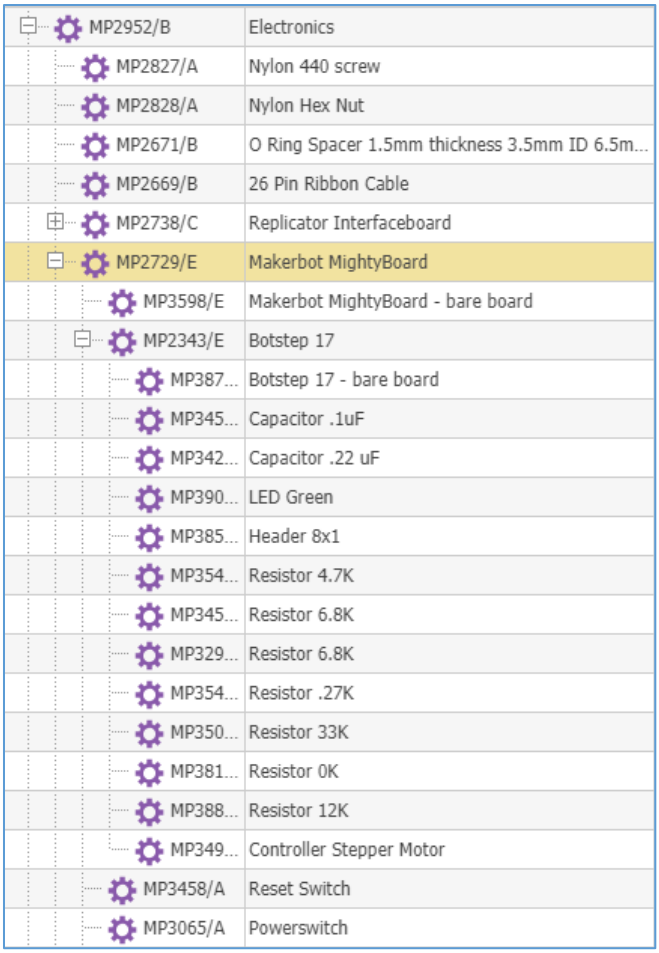


Figure 57.

6. Click **Trim** in the **BOM Effectivity** toolbar.

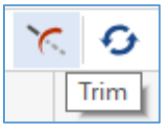


Figure 58.

The resolved Part-BOM Effectivity structure is set to two levels up to the **MP2729/E** part level.

MP2952/B	Electronics
MP2827/A	Nylon 440 screw
MP2828/A	Nylon Hex Nut
MP2671/B	O Ring Spacer 1.5mm thickness 3.5mm ID 6.5m...
MP2669/B	26 Pin Ribbon Cable
MP2738/C	Replicator Interfaceboard
MP2729/E	Makerbot MightyBoard
MP2670/B	26 Pin Female Header
MP2256/C	Silicone Keypad
MP2960/A	Storage Assembly
MP2967/A	Wiring

Figure 59.

5.5 Resolving Part BOM Structure by Effectivity

Use the following procedure to resolve Part BOM Structure by Effectivity:

1. Go to **TOC** --> **Design** --> **Parts**
2. Search for **MP0101** Part Number with **Makerbot Replicator** Name and double-click it.

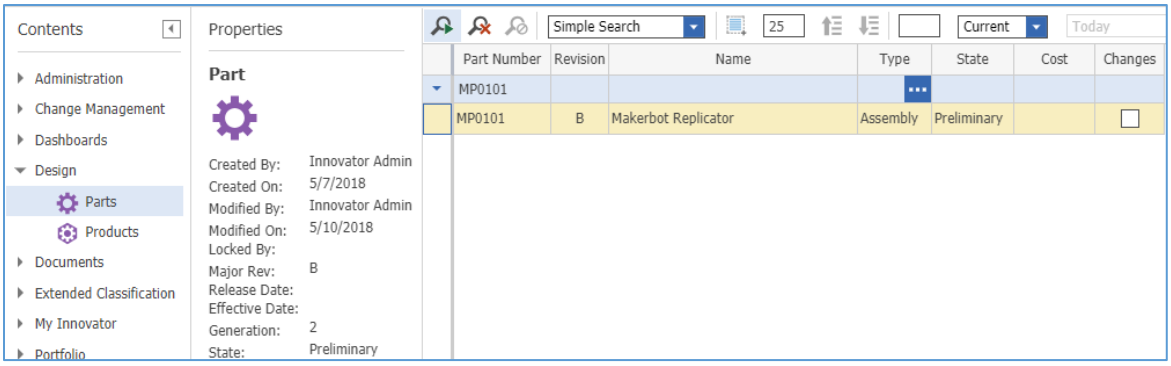


Figure 60.

The **MP0101** part appears.

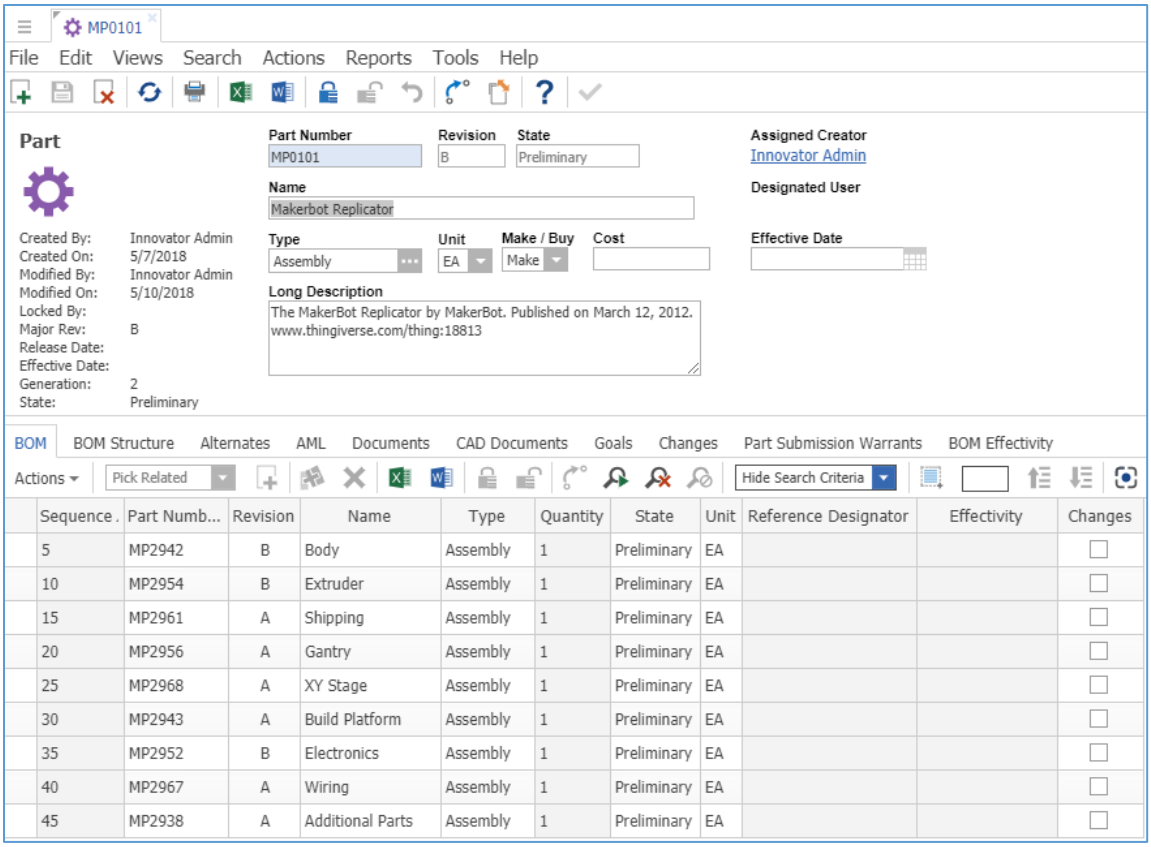


Figure 61.

3. Click Modify Parameters on the **BOM Effectivity** tab of the **MP0101** part.

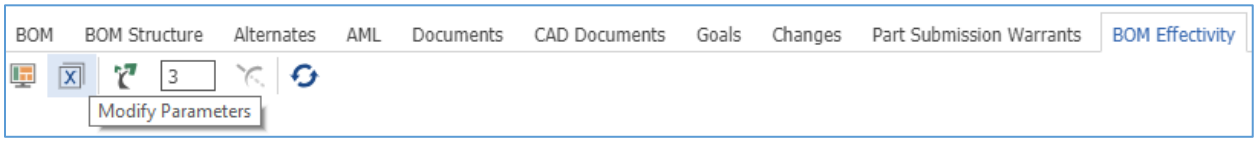


Figure 62.

The **Parameters** dialog appears.

Note: The current date is displayed for the **Production Date** variable by default. If this default is not needed, the default configuration can be removed. It is discussed later in this section.

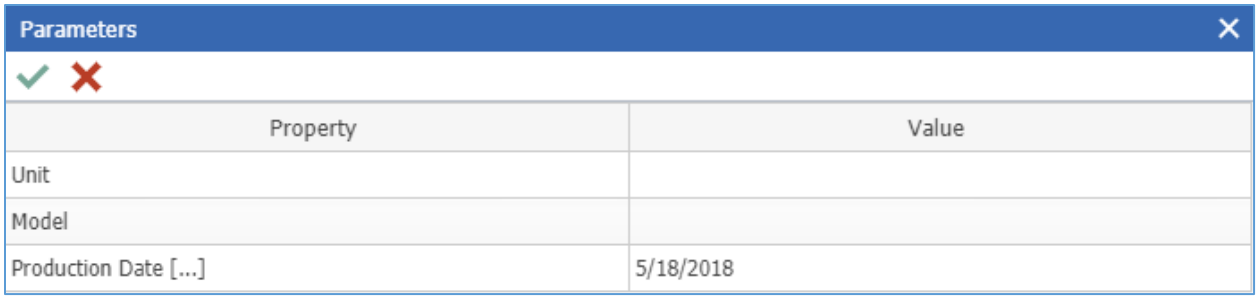


Figure 63.

4. Enter **100** in the **Value** cell of the **Unit** row In the **Parameters** dialog.

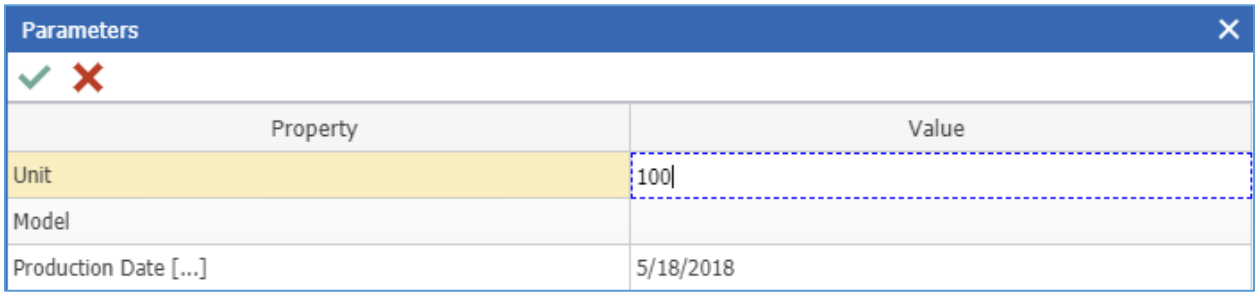


Figure 64.

5. Select **Replicator 2** in the **Value** cell in the **Model** row of the **Parameters** dialog

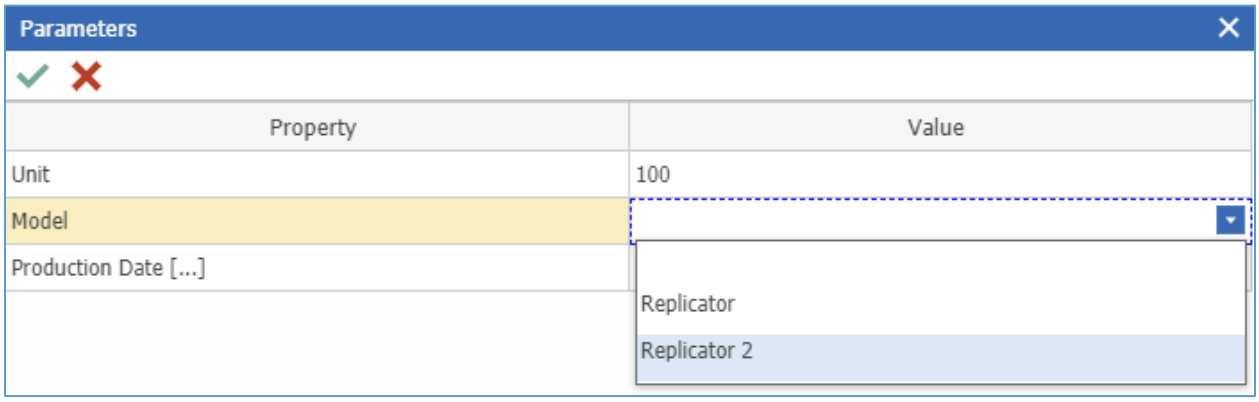


Figure 65.

6. Enter **6/15/2018** in the **Value** cell of the **Production Date** row of the **Parameters** dialog.

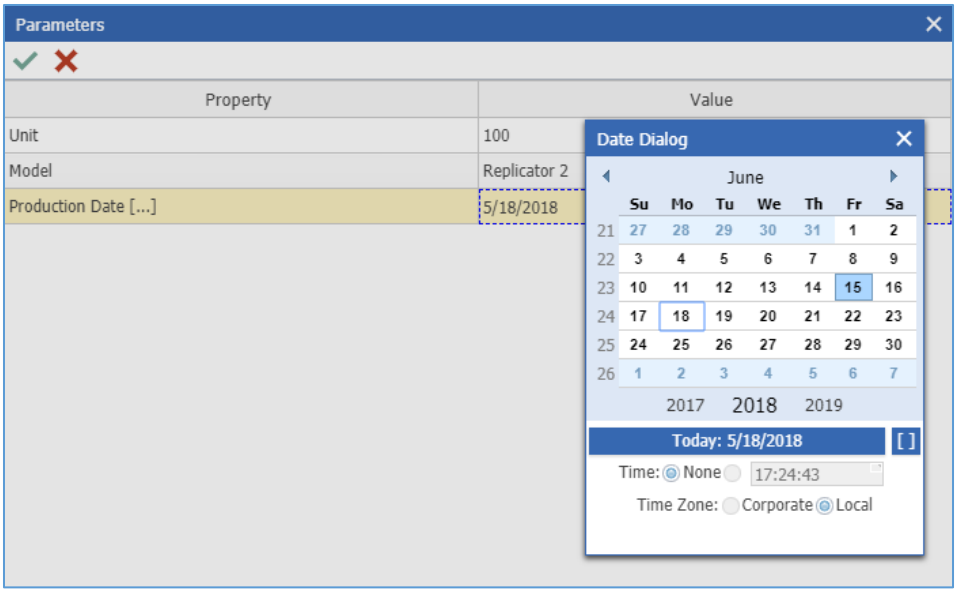


Figure 66.

7. Click **Apply** in the **Parameters** dialog,

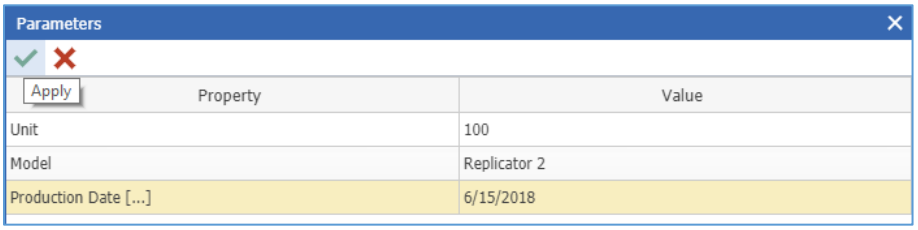
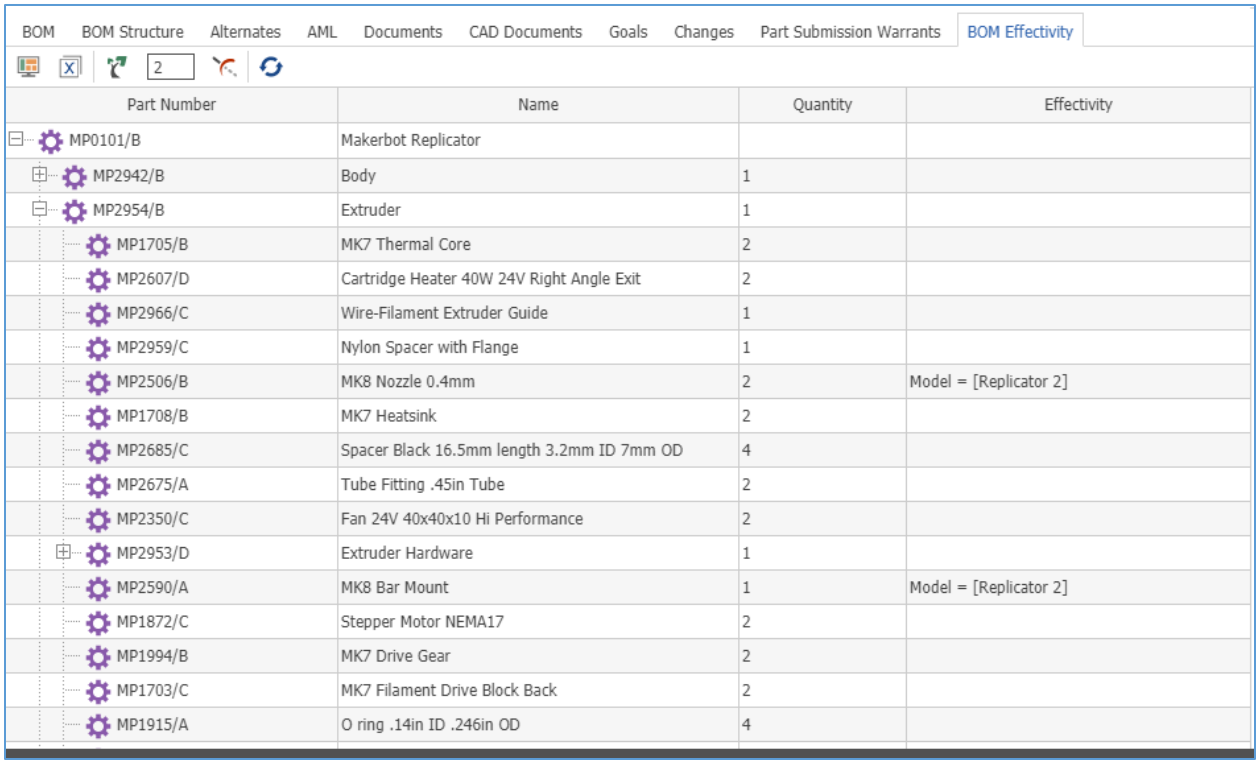


Figure 67.

Note: Using the Tree Grid View **Parameters** dialog, a value must be specified for each parameter to resolve the Structure by Effectivity.

The **Part BOM** Structure is resolved by criteria Unit = 100 AND Model = [Replicator 2] AND Production Date = [6/15/2018].



Part Number	Name	Quantity	Effectivity
MP0101/B	Makerbot Replicator		
MP2942/B	Body	1	
MP2954/B	Extruder	1	
MP1705/B	MK7 Thermal Core	2	
MP2607/D	Cartridge Heater 40W 24V Right Angle Exit	2	
MP2966/C	Wire-Filament Extruder Guide	1	
MP2959/C	Nylon Spacer with Flange	1	
MP2506/B	MK8 Nozzle 0.4mm	2	Model = [Replicator 2]
MP1708/B	MK7 Heatsink	2	
MP2685/C	Spacer Black 16.5mm length 3.2mm ID 7mm OD	4	
MP2675/A	Tube Fitting .45in Tube	2	
MP2350/C	Fan 24V 40x40x10 Hi Performance	2	
MP2953/D	Extruder Hardware	1	
MP2590/A	MK8 Bar Mount	1	Model = [Replicator 2]
MP1872/C	Stepper Motor NEMA17	2	
MP1994/B	MK7 Drive Gear	2	
MP1703/C	MK7 Filament Drive Block Back	2	
MP1915/A	O ring .14in ID .246in OD	4	

Figure 68.

Note: If a variable(s) is not available on an effectivity condition, then the criteria for that variable(s) will be ignored during the evaluation of that effectivity condition.

For example, for the previous effectivity criteria (Unit = 100 AND Model = [Replicator 2] AND Production Date = [6/15/2018]), a part with following effectivity condition will:

Effectivity Condition	**Include in resolved BOM**
Model = [Replicator 2]	Yes
Model = Replicator	No
(Model = [Replicator]) OR ((Model = [Replicator 2] AND Unit <= 99))	No
Model = [Replicator 2] AND Unit >= 100	Yes
Production Date >= 6/15/2018	Yes

Let us examine the Part BOM structure of **MP0101/B** Part Number with **Makerbot Replicator** Name resolved for the effectivity criteria: Unit = 100 AND Model = [Replicator 2] AND Production Date = [6/15/2018].

Under **MP2954/B** Part Number with **Extruder** Name, we see that two parts with the effectivity condition **Model = [Replicator 2]** appear:

- **MP2506/B** Part Number with **MK8 Nozzle 0.4 mm** Name

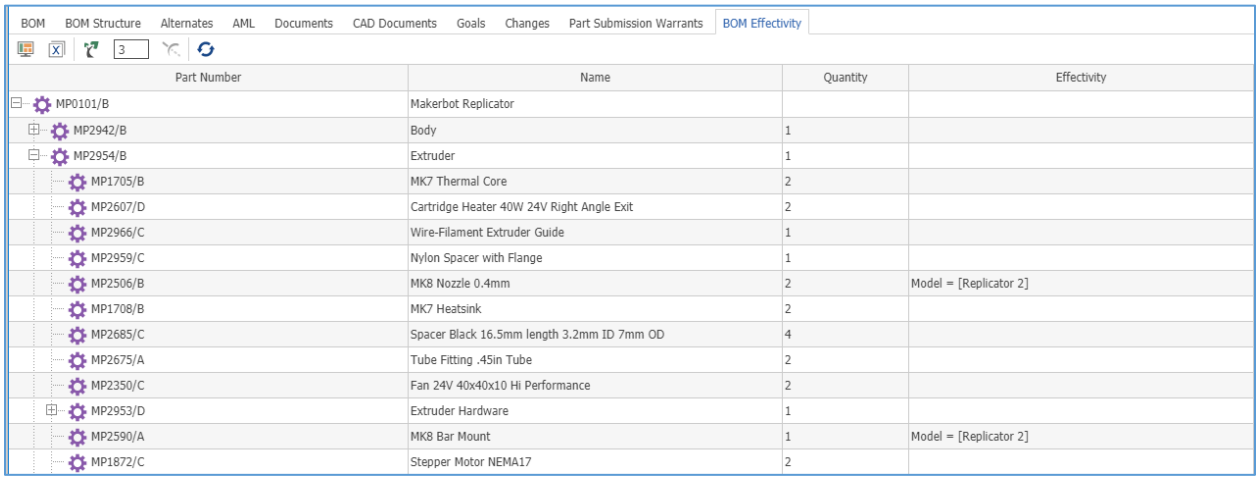
- MP2590/A Part Number with MK8 Bar Mount Name

The parts with effectivity condition **Model = [Replicator]** are not included:

- **MP2505/A** Part Number with **Nozzle 0.3 mm** Name
- **MP2589/A** Part Number with **Bar Mount** Name

The parts with no effectivity condition are displayed, for example:

- **MP1708/B** Part Number with **MK7 Heatsink** Name
- **MP1872/C** Part Number with **Stepper Motor NEMA17** Name



Part Number	Name	Quantity	Effectivity
MP0101/B	Makerbot Replicator		
MP2942/B	Body	1	
MP2954/B	Extruder	1	
MP1705/B	MK7 Thermal Core	2	
MP2607/D	Cartridge Heater 40W 24V Right Angle Exit	2	
MP2966/C	Wire-Filament Extruder Guide	1	
MP2959/C	Nylon Spacer with Flange	1	
MP2506/B	MK8 Nozzle 0.4mm	2	Model = [Replicator 2]
MP1708/B	MK7 Heatsink	2	
MP2685/C	Spacer Black 16.5mm length 3.2mm ID 7mm OD	4	
MP2675/A	Tube Fitting .45in Tube	2	
MP2350/C	Fan 24V 40x40x10 Hi Performance	2	
MP2953/D	Extruder Hardware	1	
MP2590/A	MK8 Bar Mount	1	Model = [Replicator 2]
MP1872/C	Stepper Motor NEMA17	2	

Figure 69.

Under **MP2952/B -> MP2960/A** Part Number with **Storage Assembly** Name, we see that the part with effectivity condition **Model = [Replicator 2]** is displayed:

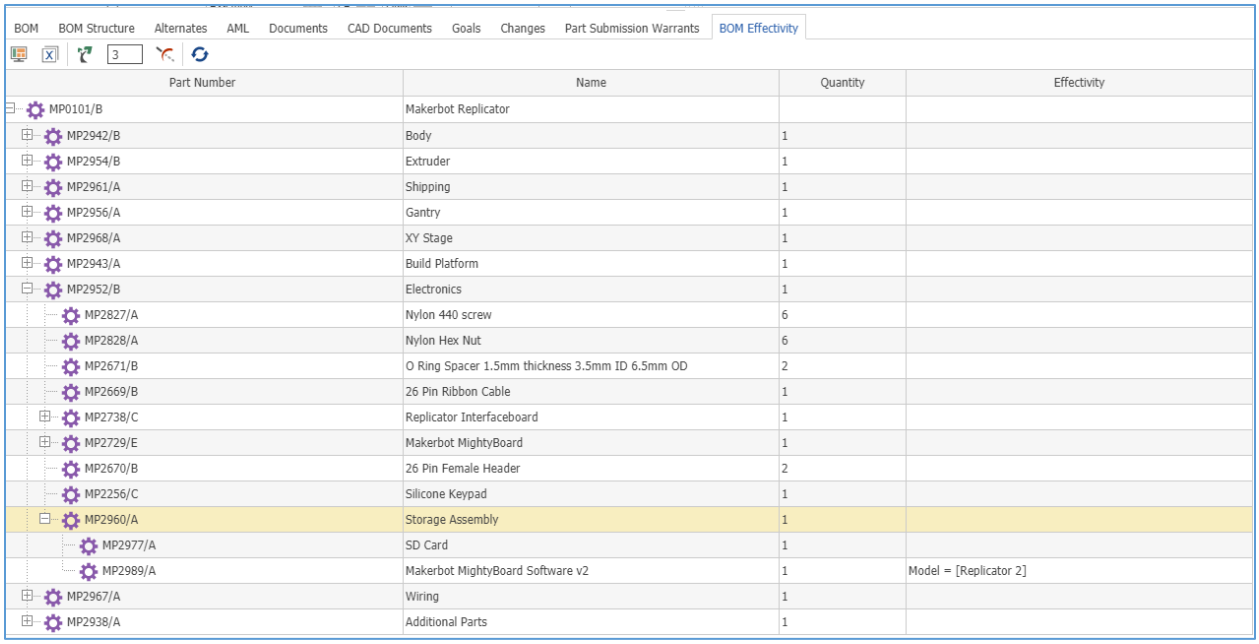
- **MP2989/A Part Number** with Makerbot MightyBoard Software v2 Name

The part with effectivity condition **Model = [Replicator]** is not included:

- **MP2988/A Part Number** with Makerbot MightyBoard Software Name

The part with no effectivity condition is displayed:

- **MP2977/A** Part Number with **SD Card** Name



Part Number	Name	Quantity	Effectivity
MP0101/B	Makerbot Replicator		
MP2942/B	Body	1	
MP2954/B	Extruder	1	
MP2961/A	Shipping	1	
MP2956/A	Gantry	1	
MP2968/A	XY Stage	1	
MP2943/A	Build Platform	1	
MP2952/B	Electronics	1	
MP2827/A	Nylon 440 screw	6	
MP2828/A	Nylon Hex Nut	6	
MP2671/B	O Ring Spacer 1.5mm thickness 3.5mm ID 6.5mm OD	2	
MP2669/B	26 Pin Ribbon Cable	1	
MP2738/C	Replicator Interfaceboard	1	
MP2729/E	Makerbot MightyBoard	1	
MP2670/B	26 Pin Female Header	2	
MP2256/C	Silicone Keypad	1	
MP2960/A	Storage Assembly	1	
MP2977/A	SD Card	1	
MP2989/A	Makerbot MightyBoard Software v2	1	Model = [Replicator 2]
MP2967/A	Wiring	1	
MP2938/A	Additional Parts	1	

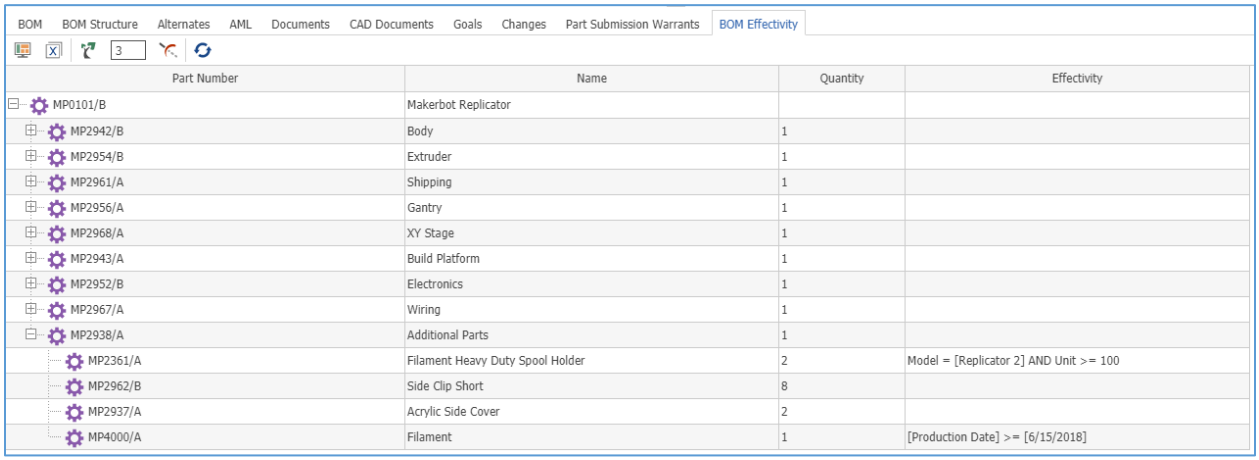
Figure 70.

Under **MP2938/A** Part Number with **Additional Parts** Name, we see that two parts with effectivity conditions that fulfill the criteria are displayed:

- **MP2361/A Part Number** with **Filament Heavy Duty Spool Holder Name — Model = [Replicator 2] AND Unit >= 100**
- **MP4000/A Part Number** with **Filament Name — [Production Date] >= [6/15/2018]**

The parts with no effectivity conditions are also displayed:

- **MP2962/B** Part Number with **Side Clip Short** Name
- **MP2937/A** Part Number with **Acrylic Side Cover** Name



Part Number	Name	Quantity	Effectivity
MP0101/B	Makerbot Replicator		
MP2942/B	Body	1	
MP2954/B	Extruder	1	
MP2961/A	Shipping	1	
MP2956/A	Gantry	1	
MP2968/A	XY Stage	1	
MP2943/A	Build Platform	1	
MP2952/B	Electronics	1	
MP2967/A	Wiring	1	
MP2938/A	Additional Parts	1	
MP2361/A	Filament Heavy Duty Spool Holder	2	Model = [Replicator 2] AND Unit >= 100
MP2962/B	Side Clip Short	8	
MP2937/A	Acrylic Side Cover	2	
MP4000/A	Filament	1	[Production Date] >= [6/15/2018]

Figure 71.

When different resolution criteria are entered via the **Parameters** dialog, the multi-level Part BOM structure is resolved differently to meet the specified criteria.

5.5.1 Default Value on Parameters dialog

As needed, a default value can be set for a variable on the Parameters dialog. If it is a static value, it can be set via standard Tree Grid View configurations.

In this sample application, we configured to set the default Value of the Production Date to the current date.

To disable the current date default in the Parameters dialog:

1. Close Aras Innovator.
2. Go to the folder where the Aras Innovator instance is installed, for example, **110SP14b7004**.
3. In this **110SP14b7004time** Innovator folder go to the **Scripts** subfolder: **…\110SP14b7004time\Innovator\Client\Modules\aras.innovator.EffectivityServicesSample\Scripts**
4. In the **Scripts** folder, open the **BomEffectivityTab** file for editing:

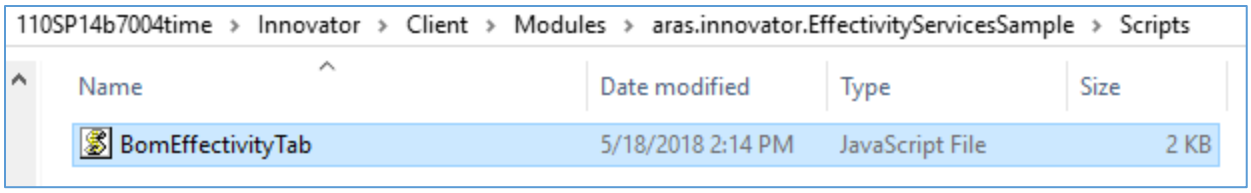


Figure 72.

5. Find the `window.CustomParametersProvider = function()` function in the **BomEffectivityTab** file. It should be at lines 20-34.

6. Delete the `this.setParameter = function(name, value)` function, which should be at lines 27-30 in the `window.CustomParametersProvider = function()` function:

```
this.setParameter = function(name, value) {
        if (name === 'ProductionDate' &&
!parameters.hasOwnProperty(name)) {
                value = window.getCurrentDate();
        }
```

BomEffectivityTab.js

```
1   window.aras = parent.aras;
2
3   window.getCurrentDate = function() {...};
19
20  window.CustomParametersProvider = function() {
21    let parameters = {};
22
23    this.getParameters = function() {...};
26
27    this.setParameter = function(name, value) {
28      if (name === 'ProductionDate' && !parameters.hasOwnProperty(name)) {
29        value = window.getCurrentDate();
30      }
31
32      parameters[name] = value;
33    };
34  };
```

Figure 73.

7. Save and close the **BomEffectivityTab** file.

8. Start Aras Innovator. The **Parameters** dialog appears without the current date set as default.

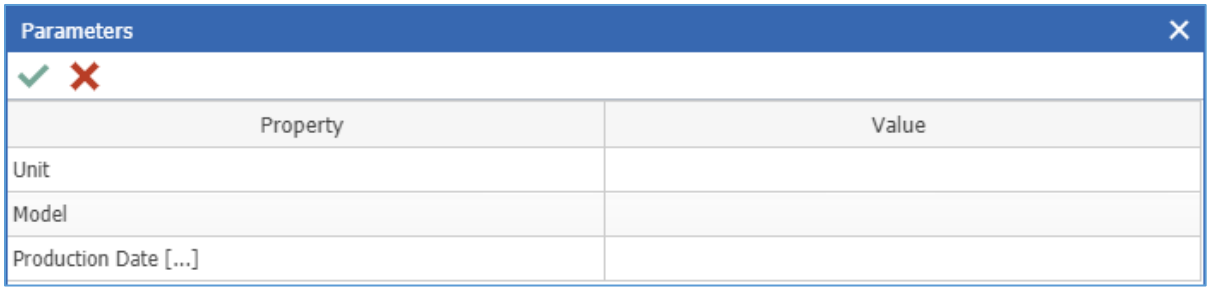


Figure 74.

To enable the current date in the **Parameters** dialog as the default, in the `window.CustomParametersProvider = function()` function, add the `this.setParameter = function(name, value)` function with body specified at step 6 in the above procedure.