Packing

Estimated time to read: 13 minutes

Overview

A **Package** is created from one or more **Products**. The **Product Type** of which must be **Packaging**. And although associated to a **Product**, a package hierarchy can have various **Materials**.

In Critical Manufacturing MES, packing is understood to be any type of box, package or container used for the purposes of transportation or shipping. Additionally, packing can take place at many levels as shown in the example below:

```
flowchart LR
subgraph Product
  direction LR
  subgraph Packing["Protective Packaging for every level"]
    direction LR
      A1[Transportation Packaging] -.->|Pallet| N1[Level 4]
      A2[Warehouse Packaging] -.->|Corrugated Box| N2[Level 3]
      A3[Secondary Packaging] -.->|Box| N3[Level 2]
      A4[Primary Packaging] -.->|Plastic Bag| N4[Level 1]
  end
      A5[Finished Product Materials] -.-> Packing
end

classDef mermaid_title color:#000, fill:#fafafa, stroke:#fafafa, stroke-width:0x, font-size:100%,
font-weight:200;
classDef mermaid_start color:#000, fill:#fafafa, stroke:#fafafa, color:#fafafa, stroke-width:0x,
font-size:100%, visibility: hidden;
classDef mermaid_businessdata color:#000, fill:#65CDE8, stroke:#65CDE8, stroke-width:0px, font-
size:100%;
classDef mermaid_nonbusinessdata color:#000, fill:#B7DEE8, stroke:#B7DEE8, stroke-width:0px, font-
size:100%;
classDef mermaid_entity color:#000, fill:#FB9F53, stroke:#FB9F53, stroke-width:0px, font-size:100%;
classDef mermaid_entitylinked color:#000, fill:#FCD5B5, stroke:#FCD5B5, stroke-width:0px, font-
size:100%;
classDef mermaid_context color:#000, fill:#B9CDE5, stroke:#B9CDE5, stroke-width:0px, font-
size:100%;
classDef mermaid_optional color:#000, fill:#B7DEE8, stroke:#65CDE8, stroke-width:1px, font-
size:100%, stroke-dasharray: 5 5;
classDef mermaid_state color:#000, fill:#d7e4bd, stroke:#000, stroke-width:1px, font-size:100%,
font-weight:300;
class Main mermaid_entity
class Start mermaid_start
class A1,A2,A3,A4,A5,A6,A7,A8,A9,A10,A11,A12 mermaid_state
class L1,L2,L3,L4,L5,L6 mermaid_state
class C1,C2,C3,C4,C5,C6 mermaid_context
class N1,N2,N3,N4,N5,N6 mermaid_nonbusinessdata
```

Note

This tutorial will focus on Level 1 and Level 2 packaging, but many more levels are possible in Critical Manufacturing MES.

Packing levels

Critical Manufacturing MES distinguishes between two levels of packing as shown in the table below:

Level	Description	Driven by	Comments
Level 1 Primary (Product)	Packaging of the main product, which is typically a **Manufacturing Process**. This includes all the Materials that make up an individual Product Package. The contents of Packages at this level consist always of Materials.	A BOM.	1. Requires only one Product of Product Type Packaging in the BOM. 2. Supports Trackable (has a unique Id) and Non-Trackable Packages.
Level 2 and Above Secondary, Tertiary, and above (Package)	Packing of packages of Level 1 or above into other packages of a higher level (multiple level packaging), which is typically a **Logistics Process**. The contents of Packages at this level consist always of other Packages.	A Step level configuration together with a Packing Context Smart Table.	1. Will resolve to one Product of Product Type Packaging per level. 2. Multiple level packing is possible. 3. Level 2 Packages are always Trackable.

Table: Different Packing levels

Primary Packing

Primary packing consists of creating the packages of the first level - Level 1 packages. These are the packages that directly contain the WIP.

Secondary and Above Packing

Secondary and above packing consists of packing packages of Level 2 or above in other packages. This operation is referred to as multiple level packing.

Package

The **Package** entity is part of the **Material Logistics** module, which must be properly licensed in the system, and it can be accessed from the **Business Data** menu of Critical Manufacturing MES.

> **Note**
>
> The **Package** entity will only contain information if a packing operation has been executed.

Product

A **Product** is where packing begins, and a **Product** is always associated to a **Material**.

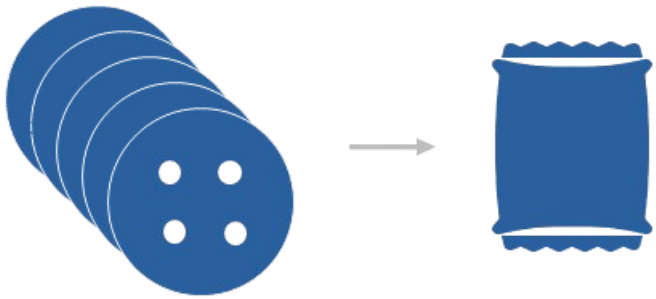
As every manufactured product needs to be shipped, it also needs to be packed. However, there are different packing processes depending on the immediate outcome of what is packed.

Critical Manufacturing MES caters for various packing processes and has related them to levels, as seen above.

In this tutorial we will understand how Level 1 and Level 2 are configured, and we will use a basic scenario with non-trackable packages for Level 1.

Packing Material - Level 1

Level 1 is also called product packing and it is typically created on the shop floor. Remember that the contents of packages at this level is always a **Material**. Therefore, for the purpose of this tutorial, for Level 1, we will pack cookies into individual plastic bags:



Setting up Packing Level 1

To have a functioning **Packing** module, you have to set up Critical Manufacturing MES entities as shown in the following table:

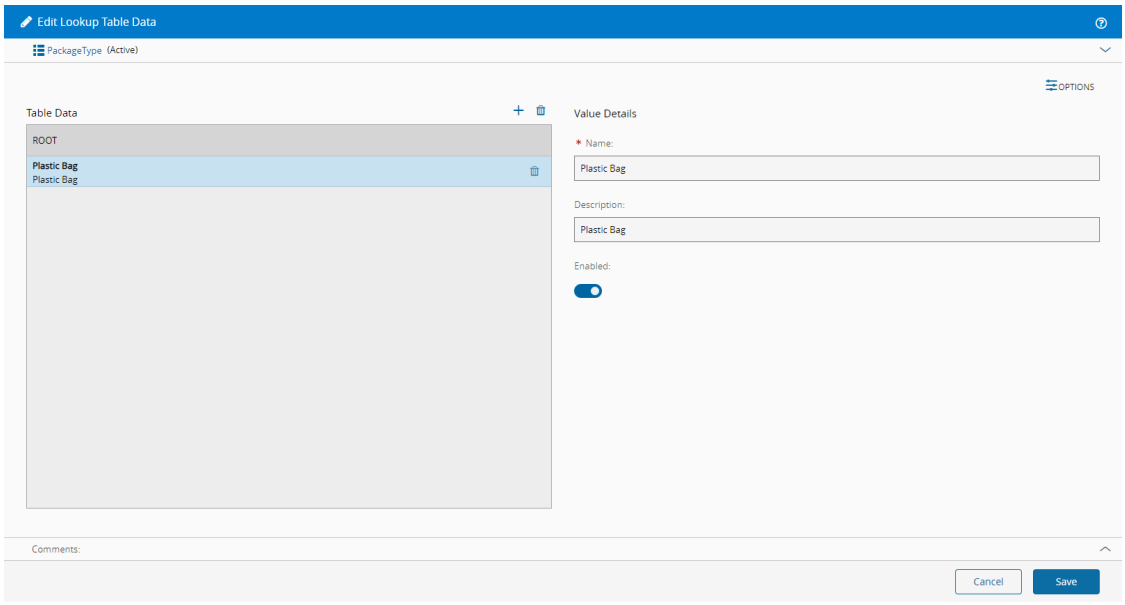
Step Number	Step	Description
1	**Lookup Table**	Edit the PackageType Lookup Table to create the needed package type.
2	**Service**	Create the needed **Services**.
3	**Resource**	Create the needed **Resources**.
4	**Step**	Create the needed **Steps**.
5	**Flow**	Create the needed **Flows**.
6	**Product**	Create the needed **Products**.
7	**BOM**	Create a **BOM**.
8	**BOM Context**	Define the **BOM Context**.

Table: Steps to set up Level 1 Packing

The next sub-sections will cover the required configuration steps in more detail.

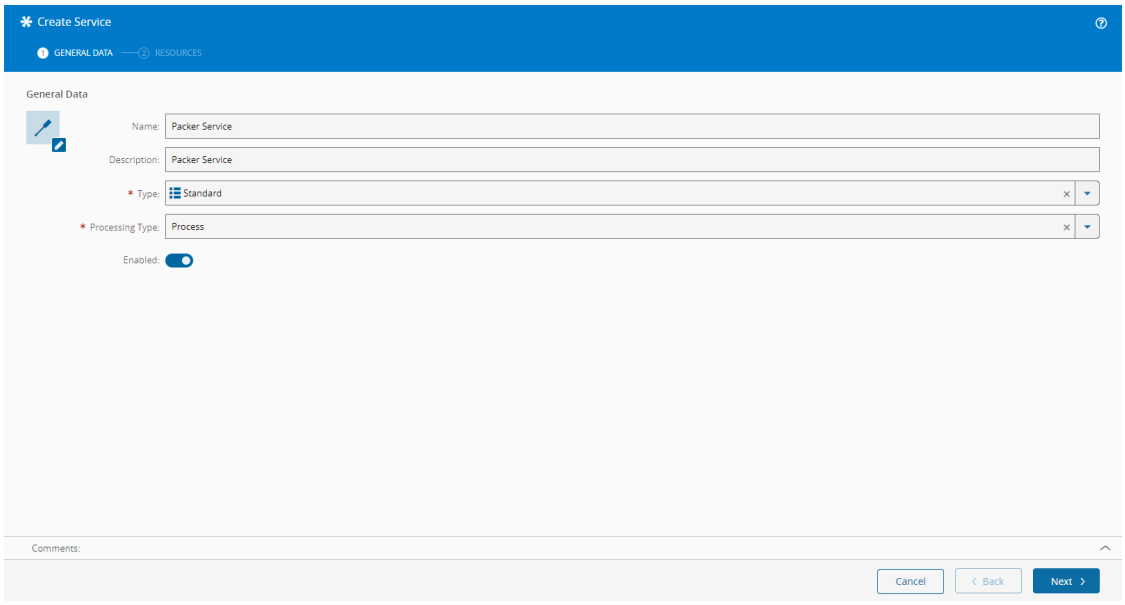
Step 1: Lookup Table

1. Edit the PackageType Lookup Table to add the package type we will need. For Level 1 packing we will be using plastic bags:



Step 2: Service

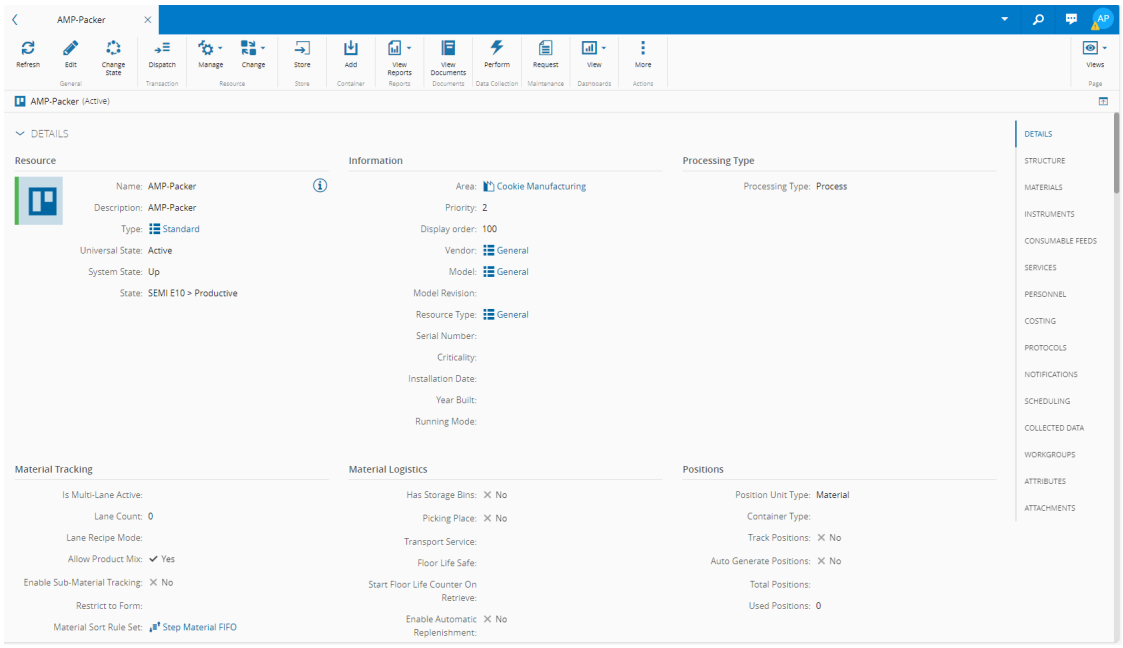
1. Create a **Service** of Processing Type **Process**:



2. Create a **Service** of Processing Type **Consumable Feed**:

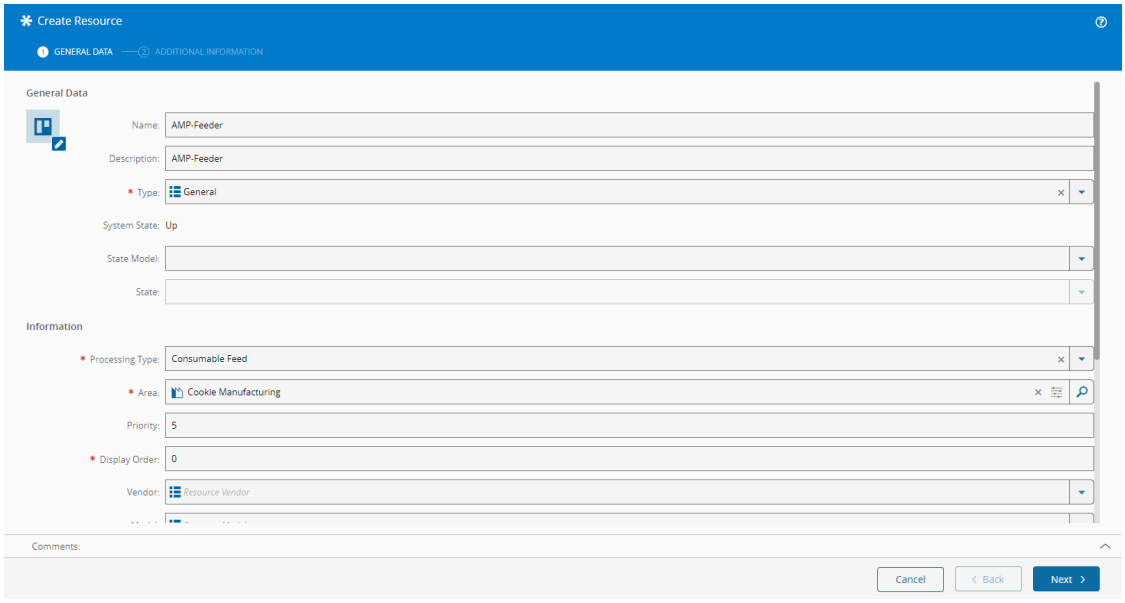
Step 3: Resource

1. Create a **Resource** of Processing Type **Process**. This is our main **Resource**, and we will configure it to have **Number of Consumable Feeds Positions** equal to 1:

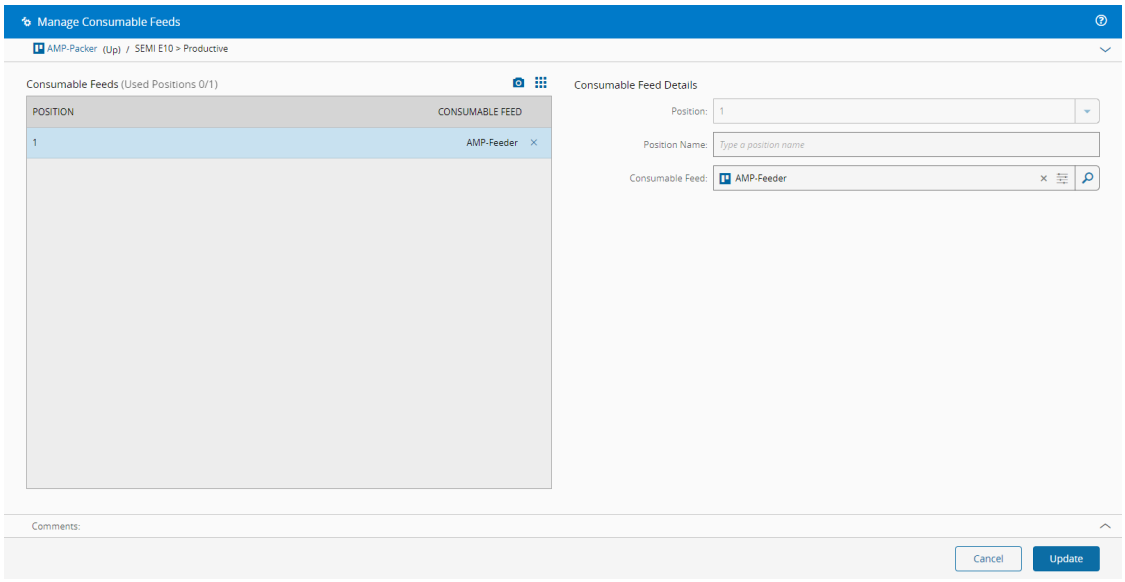


> **Note**
>
> A **Resource** must have the same Number of Consumable Feeds Positions as **Products** in the **BOM**. For this tutorial we only need one.

2. Create a **Resource** of Processing Type **Consumable Feed**:



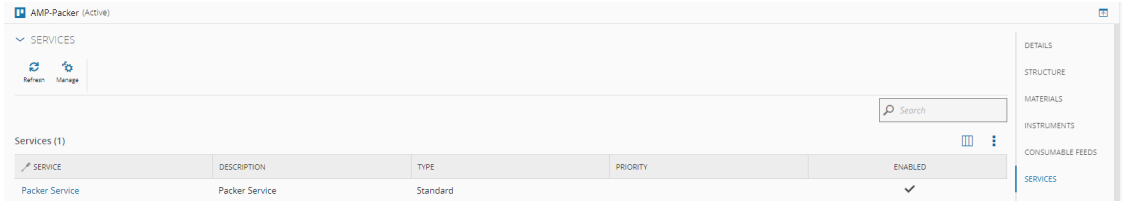
3. Manage Consumable Feeds of **Resource** of Processing Type **Process** to attach the **Resource** of Processing Type **Consumable Feed**:



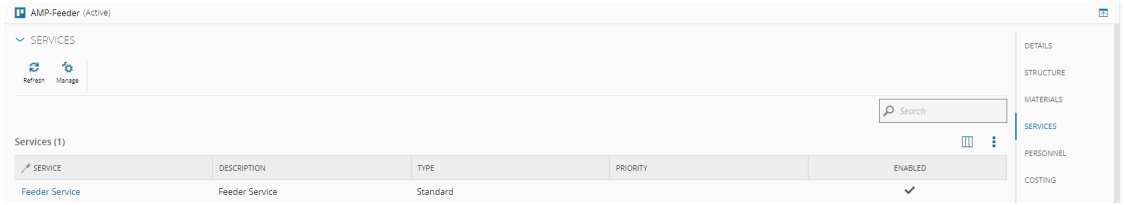
Note

Remember that **Resources** of Processing Type **Consumable Feed** are needed for the consumption of raw materials according to the **BOM**. Therefore, they need to be attached to the packing station where we are doing the packing.

4. Manage Services of **Resource** of Processing Type **Process** to add the previously created **Service** (Step 2 above):

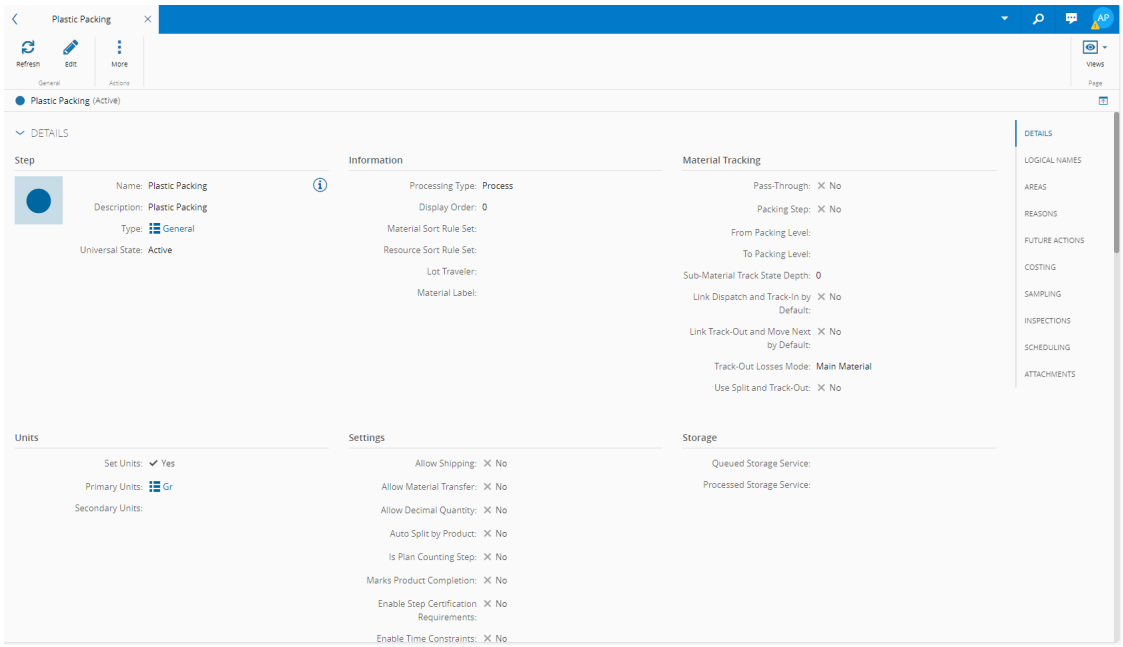


5. Manage Services of **Resource** of Processing Type **Consumable Feed** to add the previously created **Service** (Step 2 above):

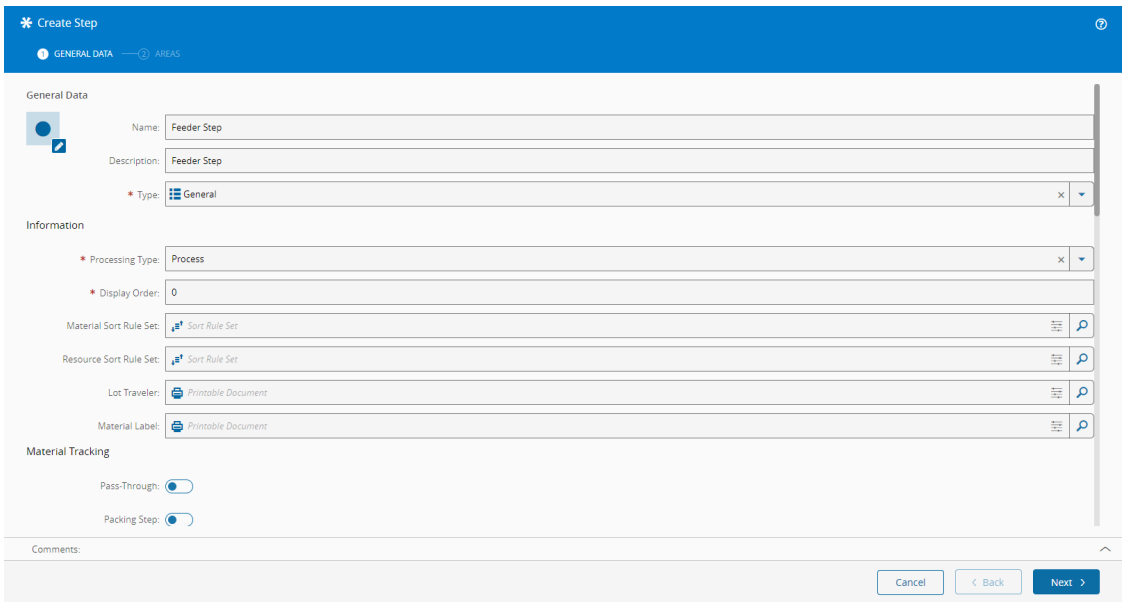


Step 4: Step

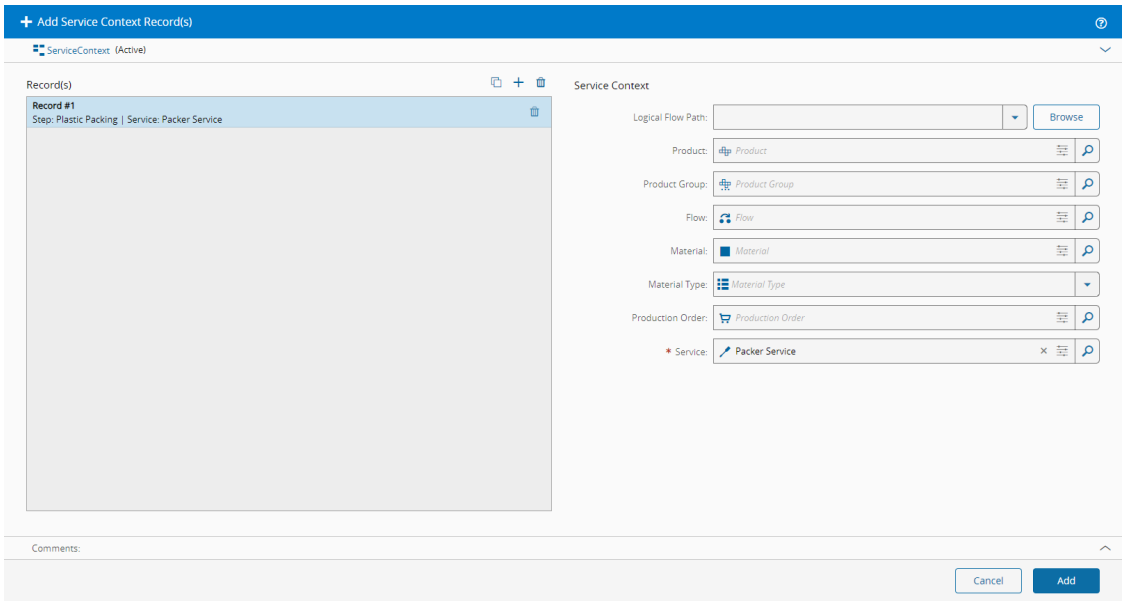
1. Create a **Step** of Processing Type **Process**. We will be using **Grams** as the Primary Units, and **Cookie Manufacturing** for the Area:

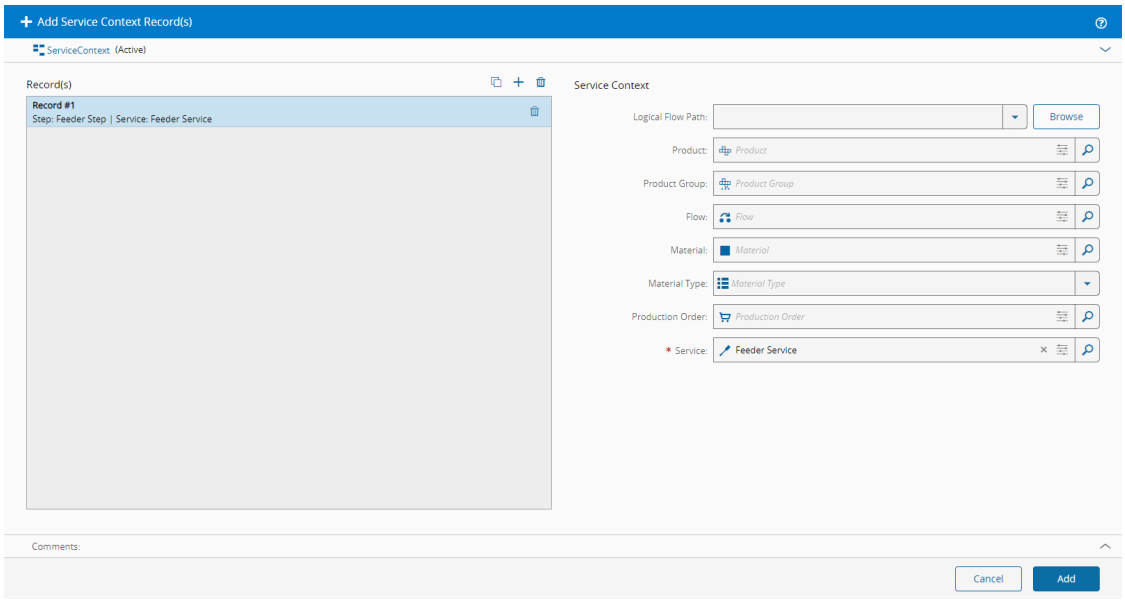


2. Create another **Step** with the same configurations as above but with a different name:

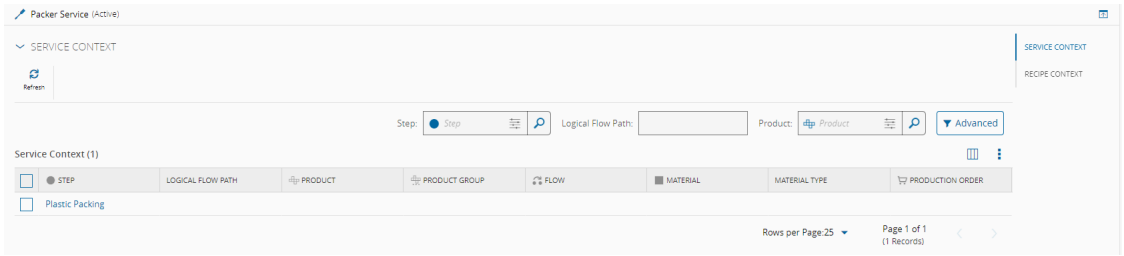


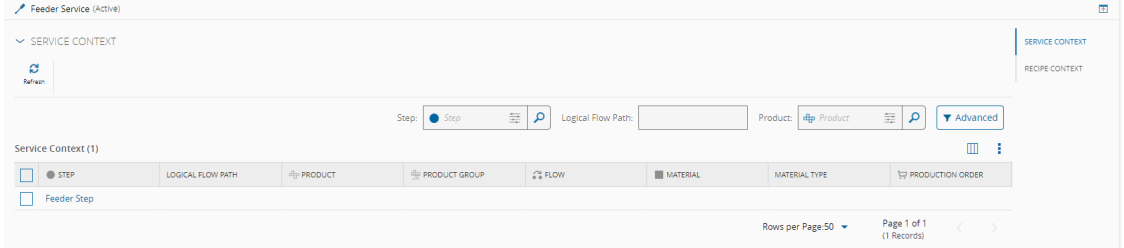
3. In the **Service Context** view of the **Steps** we just created, add the previously created **Services** (Step 2 above):





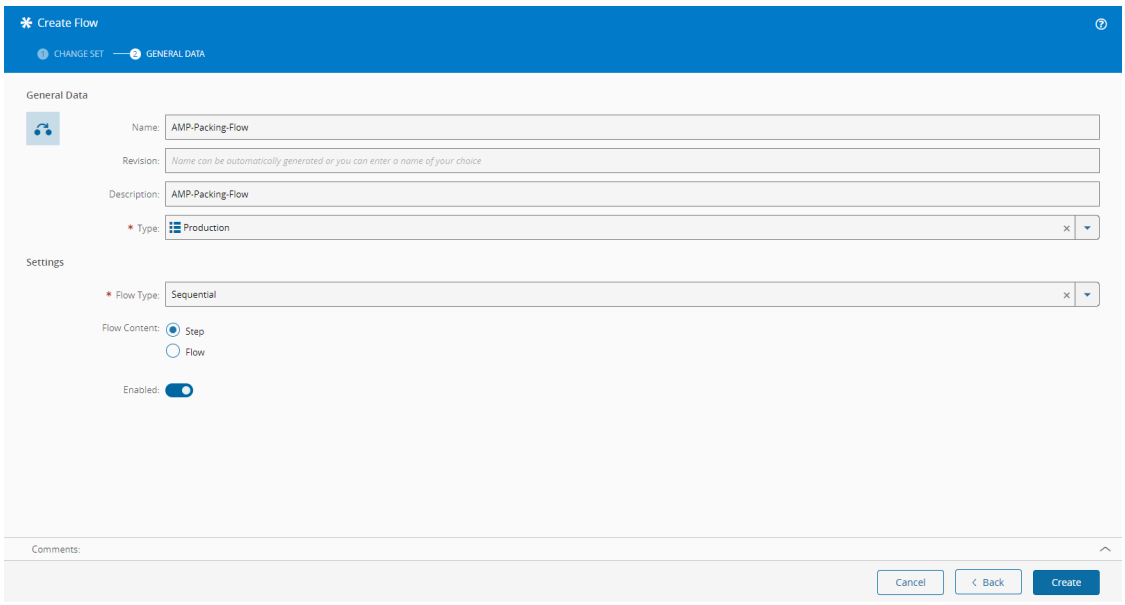
4. If we now **Refresh** the Service Context of the created **Services**, the corresponding **Steps** will be available:



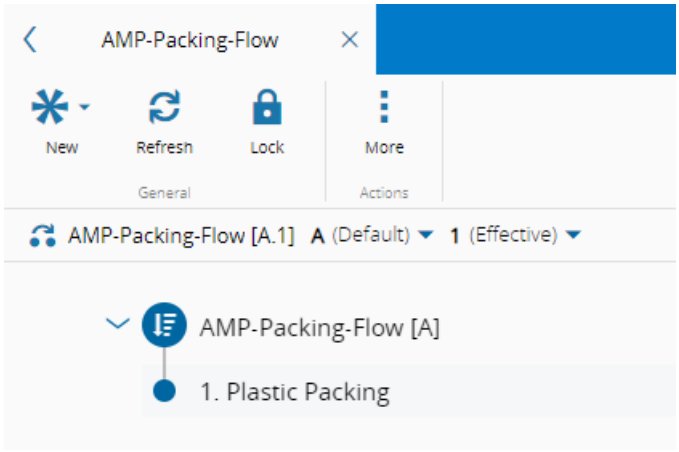


Step 5: Flow

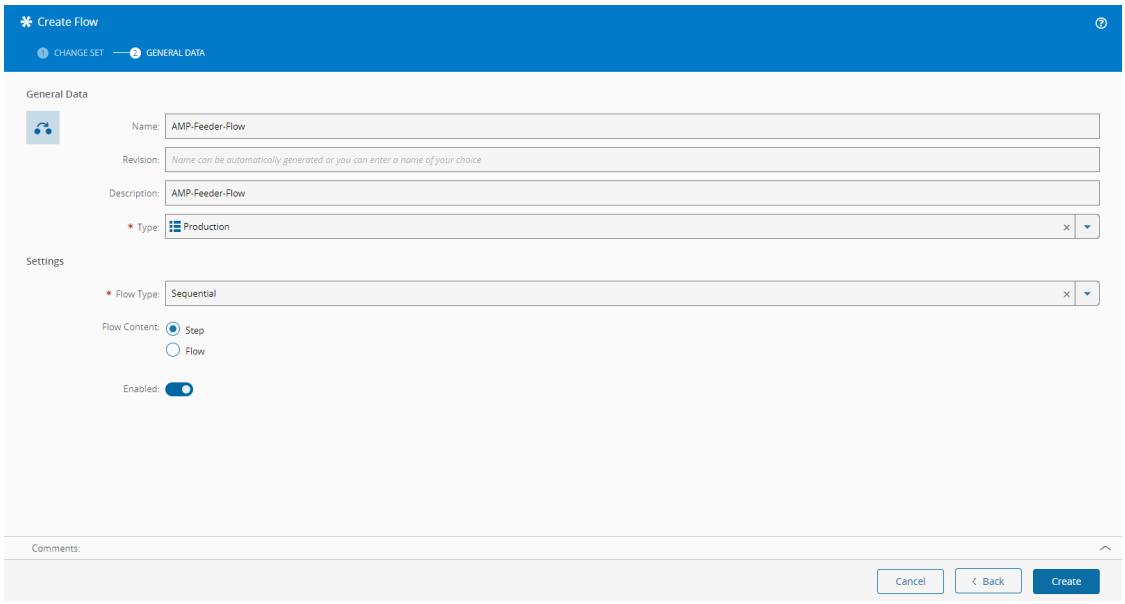
1. Create a **Flow**. For this tutorial we will use **Production** for the Type and **Sequential** for the Flow Type:



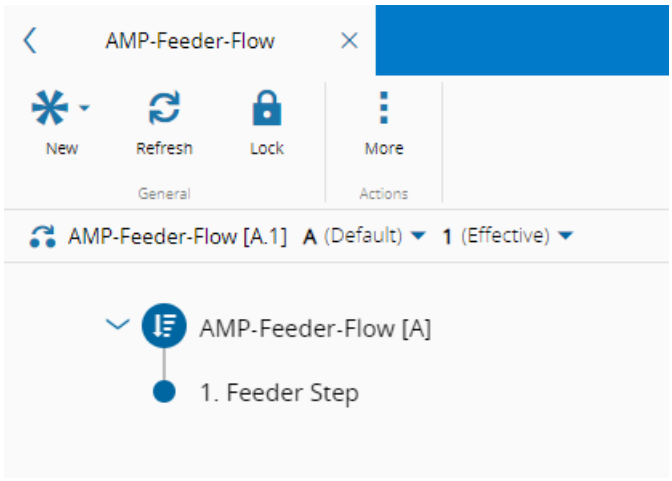
2. Edit the **Flow**, add the **Step** Plastic Packing, **Save**, and set Effective:



3. Create another **Flow** with the same configurations as above but with a different name:

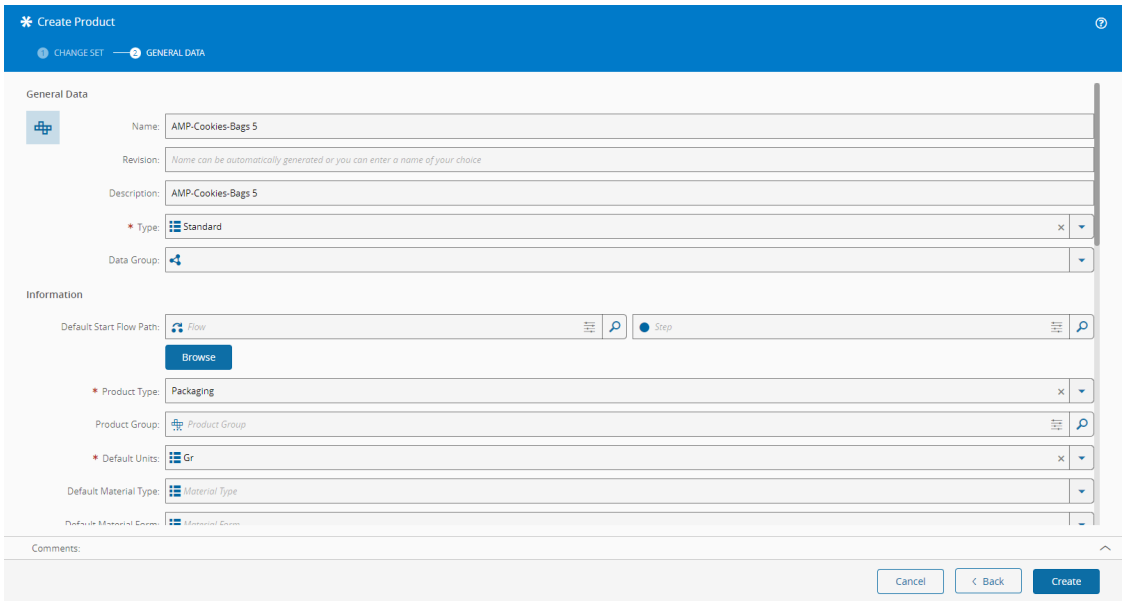


4. Edit the **Flow**, add the **Step** Feeder Step, **Save**, and set Effective:



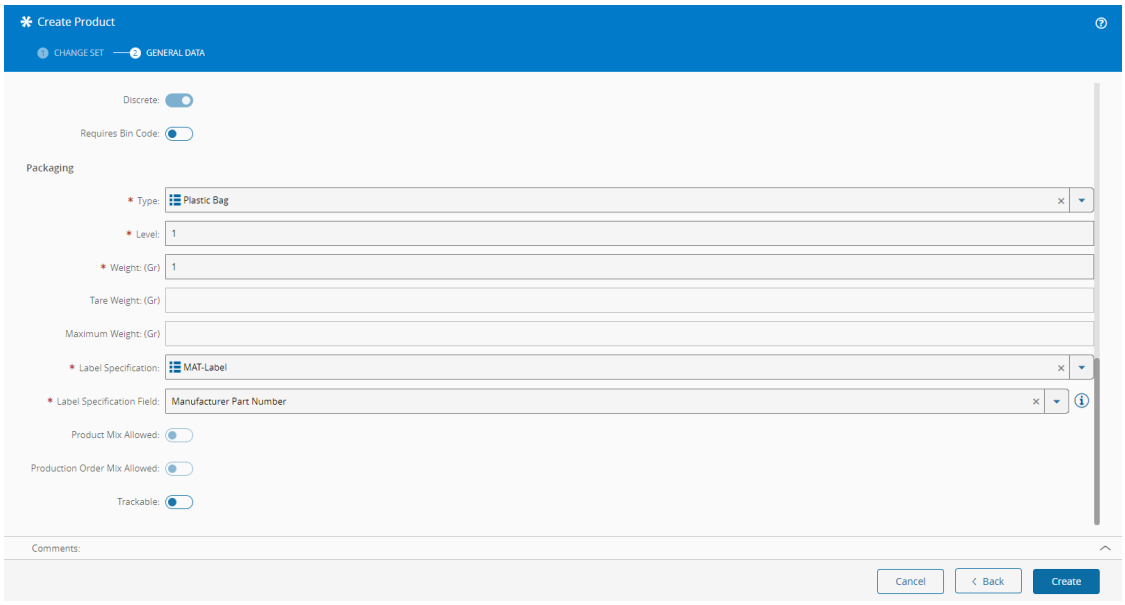
Step 6: Product

1. Create a **Product** that must have **Packaging** as its **Product Type**, and remember that this is the **Product** we will use to pack our cookies - the one that will be in our **BOM**. The **Default Units** is Grams (Units Lookup Table):



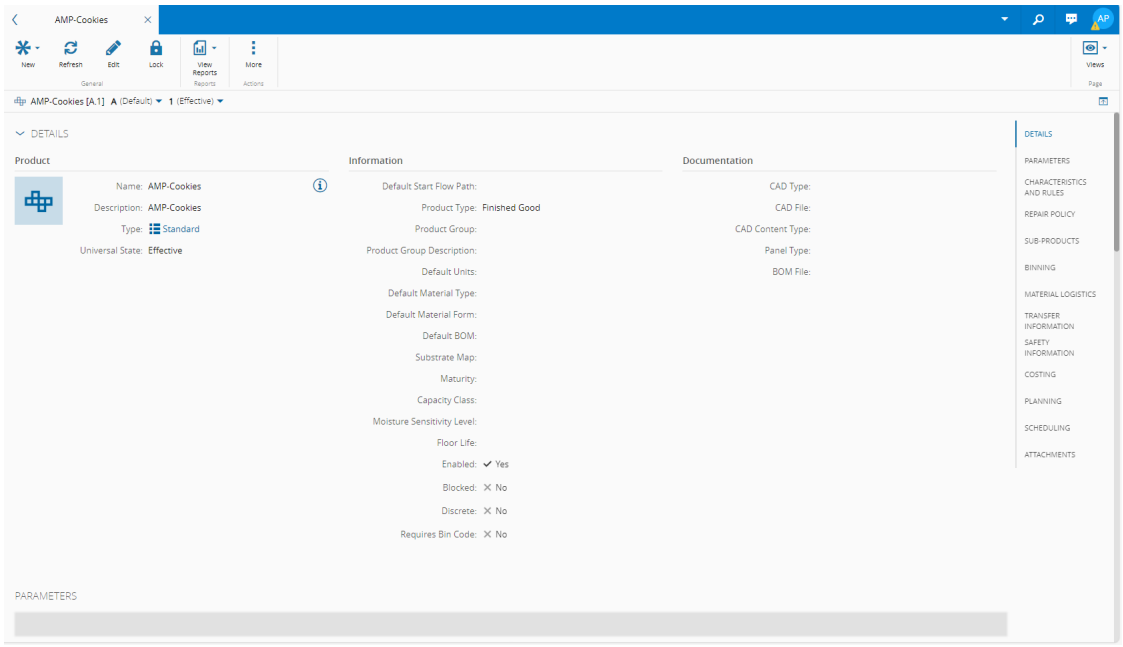
In the **Packing** section of this wizard remember to enter the **Type** as previously defined in the PackageType Lookup Table, the **Level**, and the **Weight** (this weight refers to the plastic bag).

We will also have to enter **Label Specification** (LabelSpecification Generic Table) and **Label Specification Field** (LabelSpecificationField Generic Table) information. We need these fields because the packing process frequently uses barcode scanning, and we need to be able to read the package when, for example, we are adding a package of Level 1 into a package of Level 2.



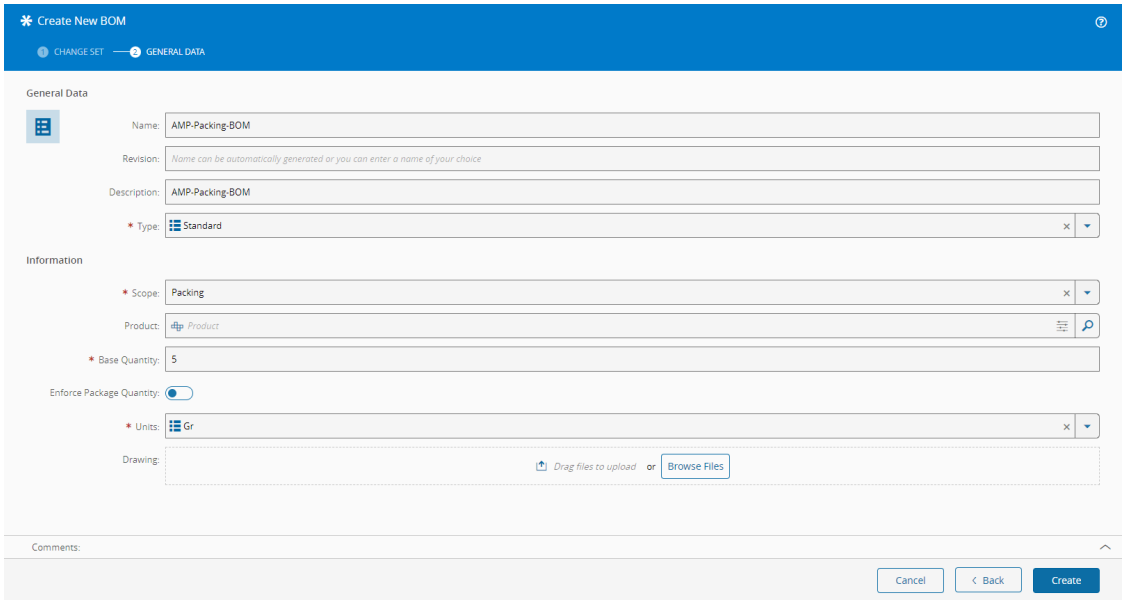
> **Note**
>
> Remember that because we are not tracking Level 1 packages, the **Label Specification** defined here will then also be used for Level 2.

2. Create a **Product** of Type **Finished Good**. This will be part of our **Material** to pack:



Step 7: BOM

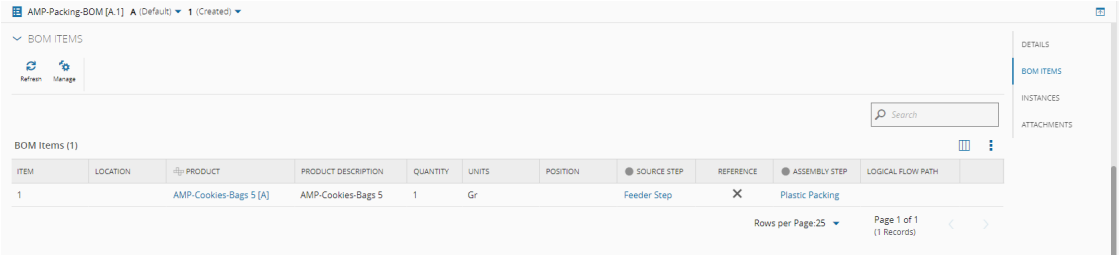
1. Create a **BOM** that must have **Packing** as its **Scope**, and the **Units** are as before:



   A **BOM** of this scope must only contain one **Product** of **Packaging** type, which is used as the reference to calculate the contents of the plastic bags. We could have other **Products** as **BOM Items** in this **BOM**, such as stickers for the outside of the bags (informative or fun) or small gifts to go with the cookies in the bags, but their **Product Type** would have to be other than **Packaging**.

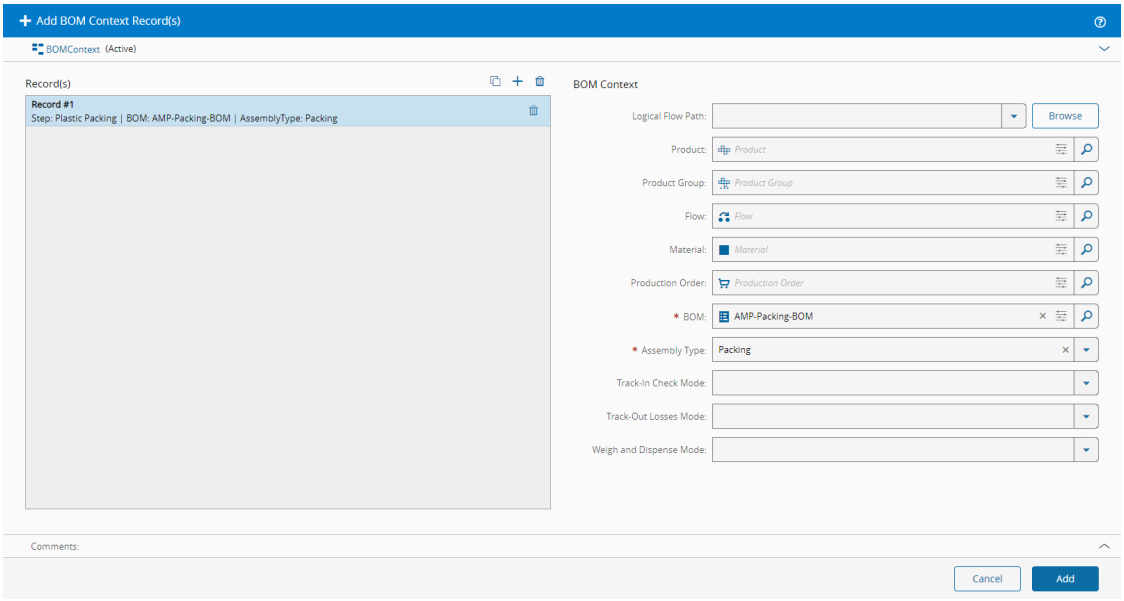
   For the purpose of this tutorial our **BOM** will contain only the one necessary **Packaging** type **Product**.

2. Manage **BOM Items** and add the previously created **Product**:

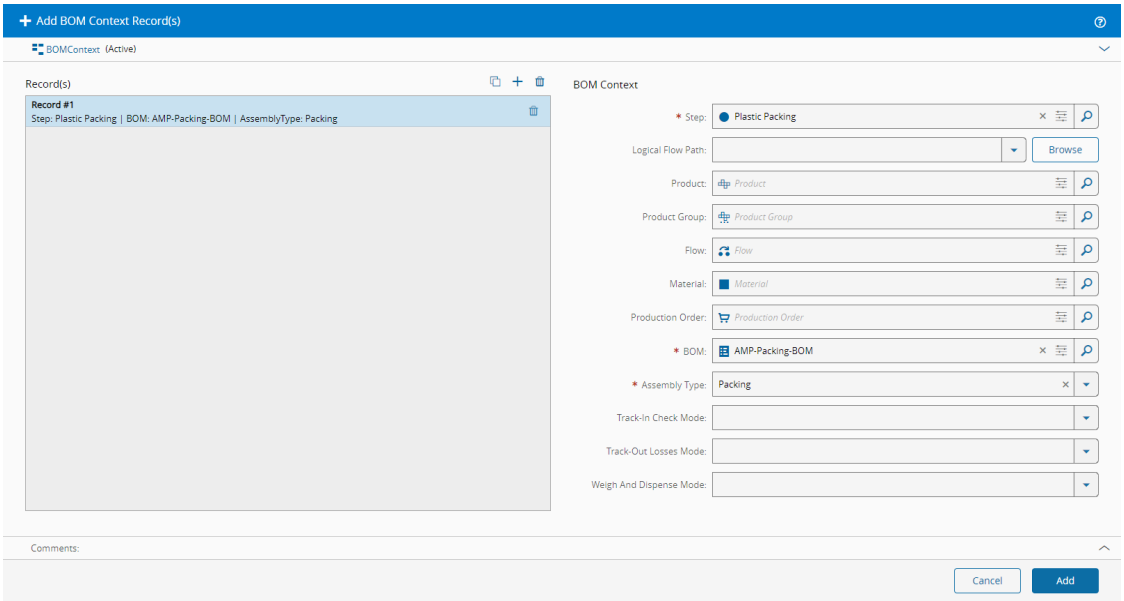


Step 8: BOM Context

1. Configure the **BOM Context** in the packing step, which for this example is **Plastic Packing**:

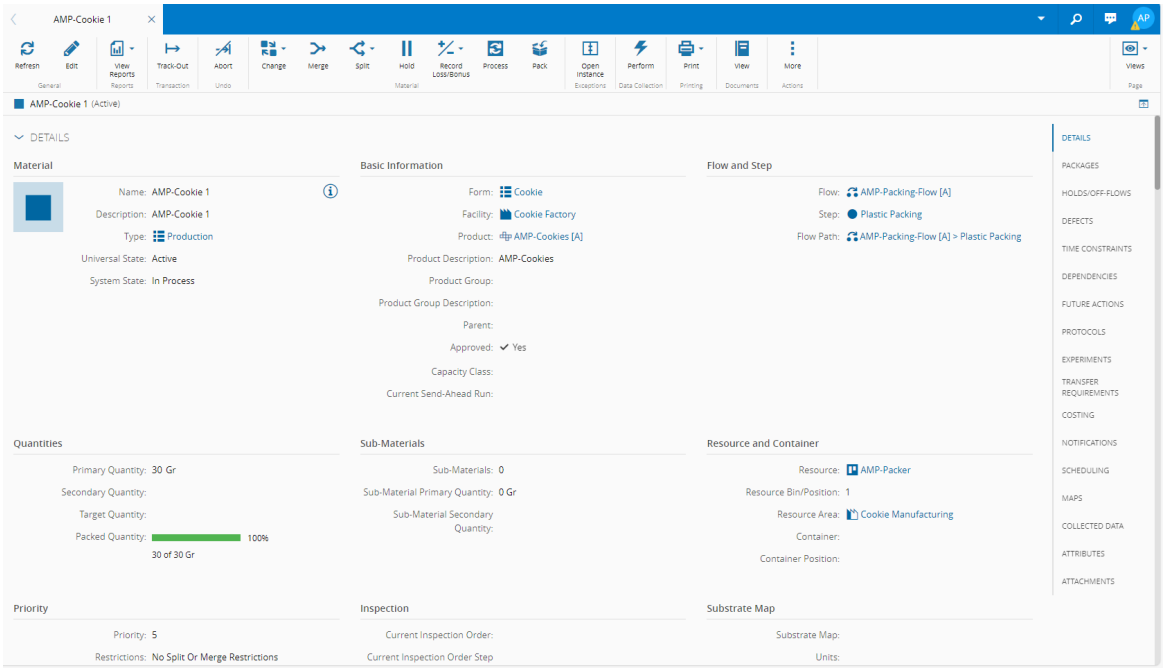


2. We can also configure the **BOM Context** by using the BOMContext Smart Table. In this case, **Step** information has to be entered:



Level 1 Packing Test

To test that Level 1 packing is working we should create a **Material** with the cookies **Product**, we need to make sure we have created a **Material** containing the cookies bag **Product**, and it is attached to the feeder **Resource**, or we can attach this consumable **Material** inside the packing wizard using the Insert Barcode function. Then Dispatch and Track-In our cookie **Material**. At this point the **Pack** button should be available in the top ribbon:



We are now ready to pack our cookie **Material** following the instructions provided in Pack Material.

> **Note**
>
> In the image above we have already packed our cookie **Material** at Level 1. This is, the **Packed Quantity** is 100%, and we can see its details by selecting the **Packages** section of this page.

Packing Material - Level 2

Level 2 is also called logistics packing, and it relates to multiple levels of packing that is required for transportation and distribution. It consists of packing packages of Level 2 or above into other packages. Remember that the packages of Level 2 are always trackable, and that the contents of packages at this level are always other packages. Moreover, for the purpose of this tutorial, we will be packing our plastic bags, into a Level 2 box package:

Setting up Packing Level 2

To have a functioning **Packing** module, you have to set up Critical Manufacturing MES entities as shown in the following table:

Step Number	Step	Description
1	**Lookup Table**	Edit the PackageType Lookup Table to create the needed package type.
2	**Service**	Create a **Service**.
3	**Resource**	Create a **Resource**.
4	**Step**	Create a **Step**.
5	**Flow**	Create version of previous **Flow**.
6	**Product**	Create a **Product**.
7	**Smart Table**	Edit the MaterialPackingContext Smart Table to create the needed package type.

Table: Steps to set up Level 2 Packing

The next sub-sections will cover the required configuration steps in more detail.

Step 1: Lookup Table

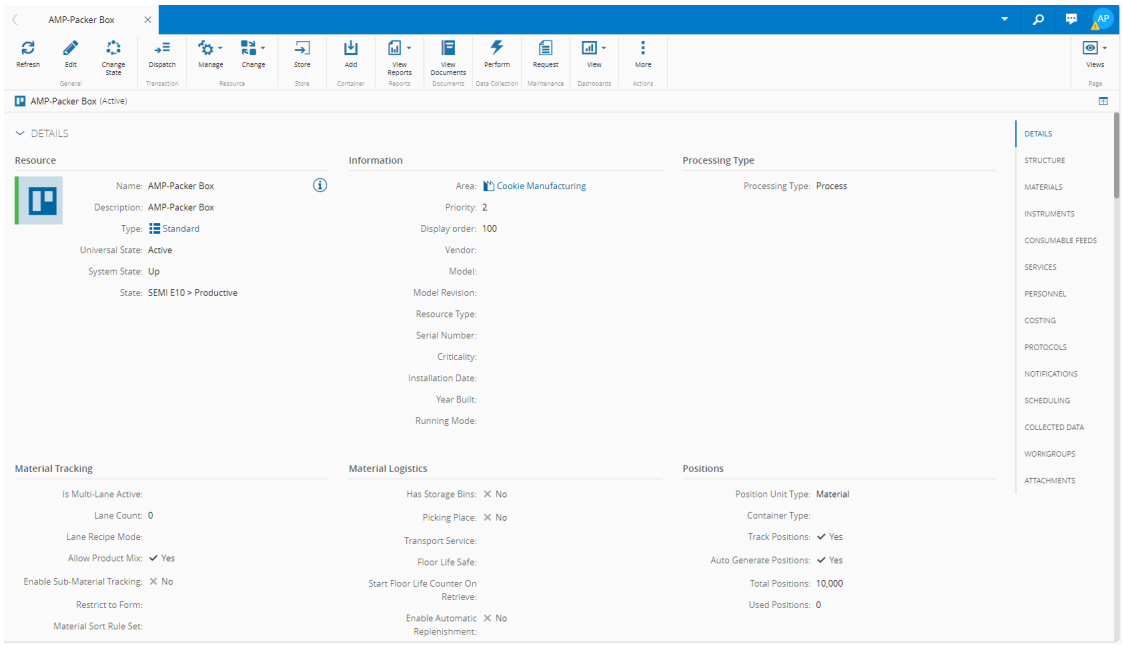
1. Edit the PackageType Lookup Table to add the package type we will need. For Level 2 packing we will be using boxes:

Step 2: Service

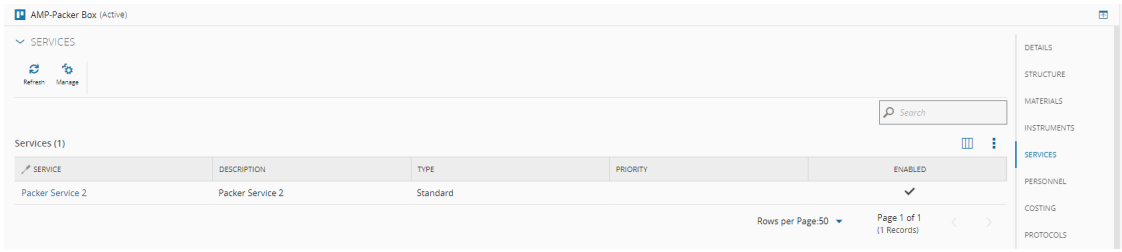
1. Create a **Service** of Processing Type **Process**:

Step 3: Resource

1. Create a **Resource** of Processing Type **Process**:

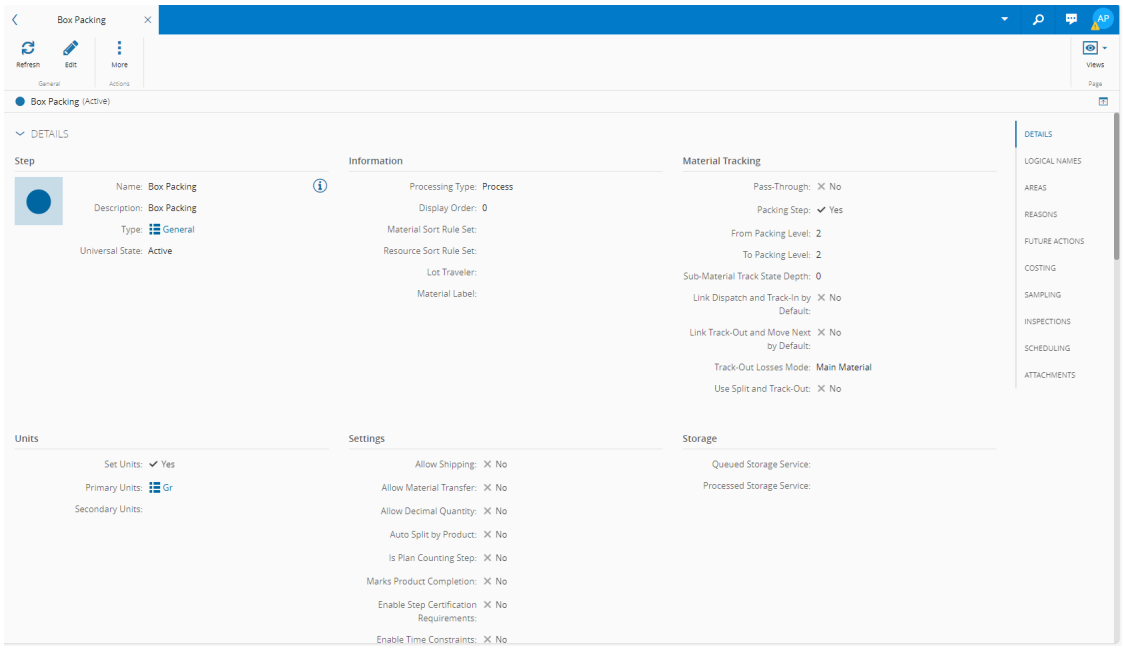


2. Associate the **Service** we just created (Step 2 above) to this **Resource**.



Step 4: Step

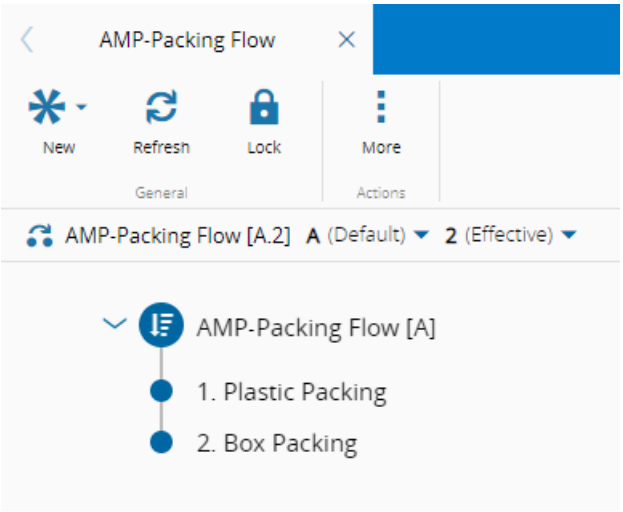
1. Create a **Step** of Processing Type **Process**. At this level we have to mark the **Packing Step** field as `True` and define the **From Packing Level** and **To Packing Level**:



> **Note**
>
> The **From Packing Level** and the **To Packing Level** must be defined with a value greater than 1. The **To Packing Level** must be greater or equal to the **From Packing Level**. For the purpose of this tutorial these values will be the same.

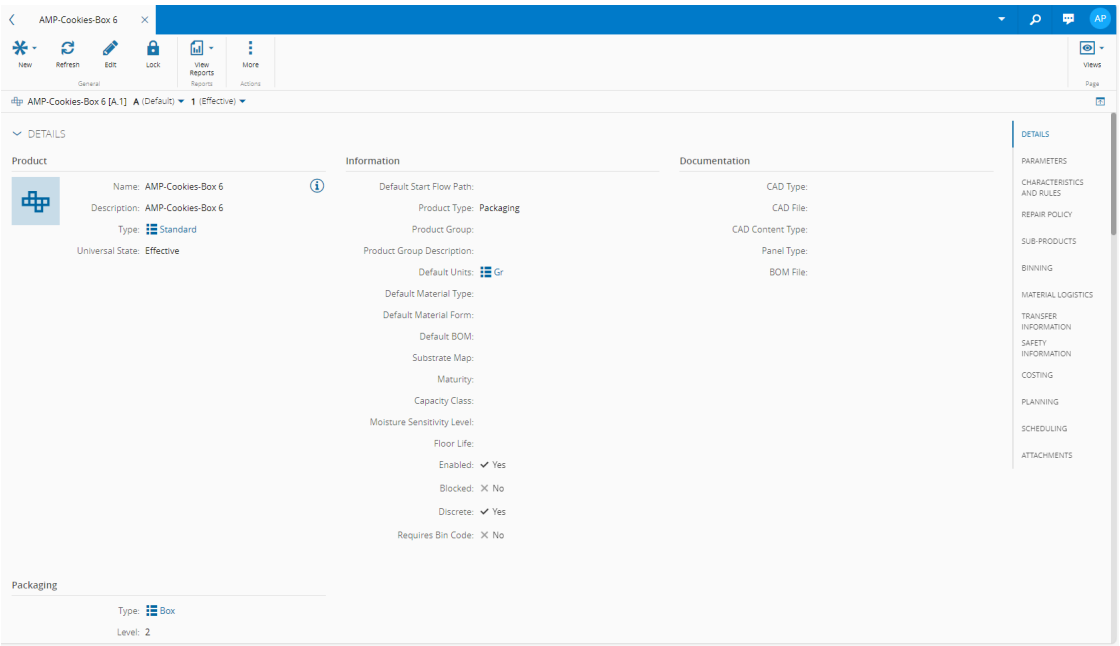
Step 5: Flow

1. Use the **Flow** created for Level 1, create a new **Version**, add the Box Packing **Step**, **Save**, and set Effective:



Step 6: Product

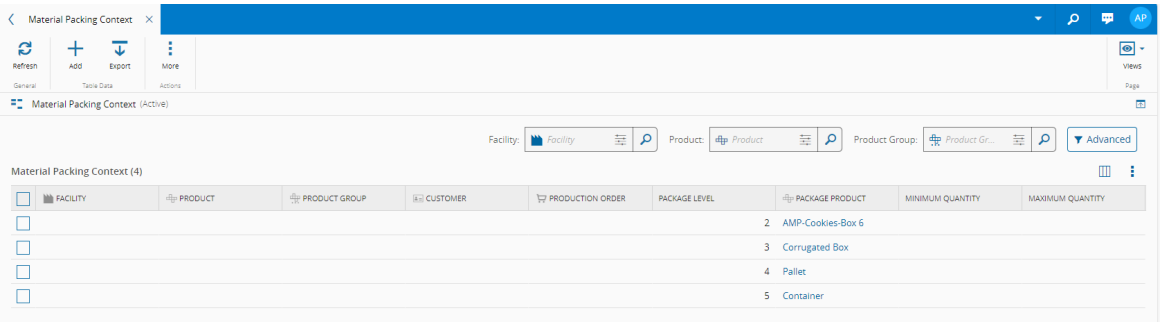
1. Create a **Product** that must have **Packaging** as its **Product Type**, and remember that this is the **Product** we will use to pack our cookie packs:



> **Note**
>
> We can already see that Level 2 is a hierarchy of packages (multiple level packing) where we pack smaller packages into larger packages, and we can do this at various levels, whereas Level 1 is a simple packing operation.

Step 7: Smart Table

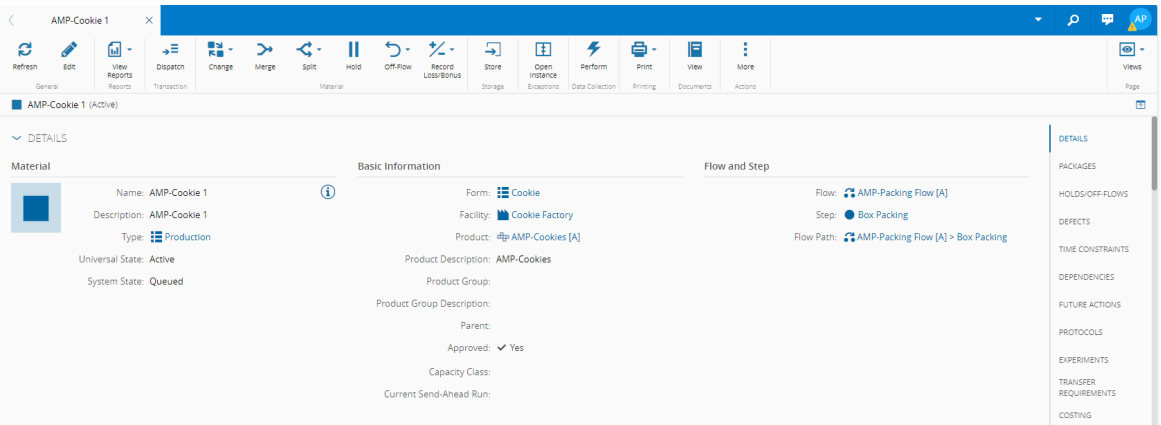
1. Level 2 uses a Step Level Configuration (Step 4 above).
2. Configure the MaterialPackingContext Smart Table to establish the **Package Product** that will tell us for a certain material context and packing level what is the specific box/package product to be used:



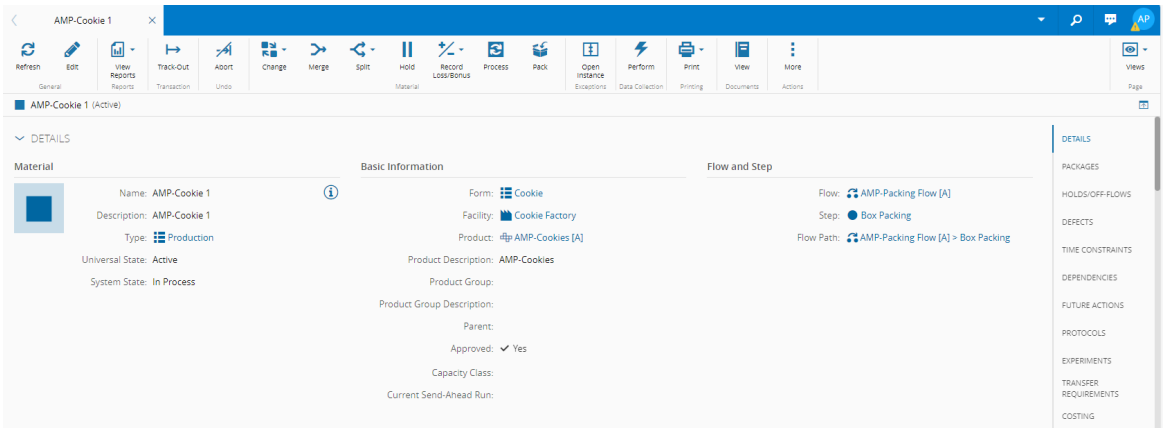
> **Note**
>
> For this tutorial we will only use **Package Level 2**, but the image above provides examples of other possible levels. Moreover, in Level 1, we know what package to use because it is part of the **BOM**. For Level 2 and above we resolve the package to use by configuring the MaterialPackingContext Smart Table.

Level 2 Packing Test

To test that Level 2 packing is working, we can use the **Material** we packed in Level 1. Track out the Level 1 **Material** and Move-Next to the Box Packing **Step**:



Then Dispatch and Track-In the **Material** at which point the **Pack** button is available in the top ribbon:



We are now ready to pack our cookie **Material** following the instructions provided in Pack Material Packages.