ABP Data Model Design Considerations (for supply allotment)

Applicable To: All releases

Synopsis

The attributes in Attribute Based Planning (ABP) are custom data model elements.

It is a best practice to plan out and design the data flows and the structure of the data model for ABP prior to setting it up in RapidResponse. This Best Practice aims to maintain a simplified design that eases the understanding and analysis of RapidResponse's demand and supply allotment decisions that concern ABP.

- Plan out the ABP rules to understand the complexity.

- Identify meaningful and differentiated supply and demand attributes.

- Consider if users should have the ability to edit the values assigned as attributes.

Benefits & Impacts

- Be able to discern between demand attribute signals and supply attribute signals on calculated tables when using the expression "Attribute<*>". See appendix for a broad explanation.

- Avoid attribute rules being triggered unintentionally from a field which was planned to be used as a supply attribute field in tables where both demand and supply attributes exist. For example, the PartSource or ScheduledReceipt tables frequently contain the two types of attribute fields.

- Easier to control the override or 'handoff' of demand attribute requirements coming from a higher level on the supply network to a rule encountered for the same FromAttributeName on a PartSource record for a level lower item (a subassembly/semifinished part that acts as a component of the higher one). See the Pro-Tips section below.
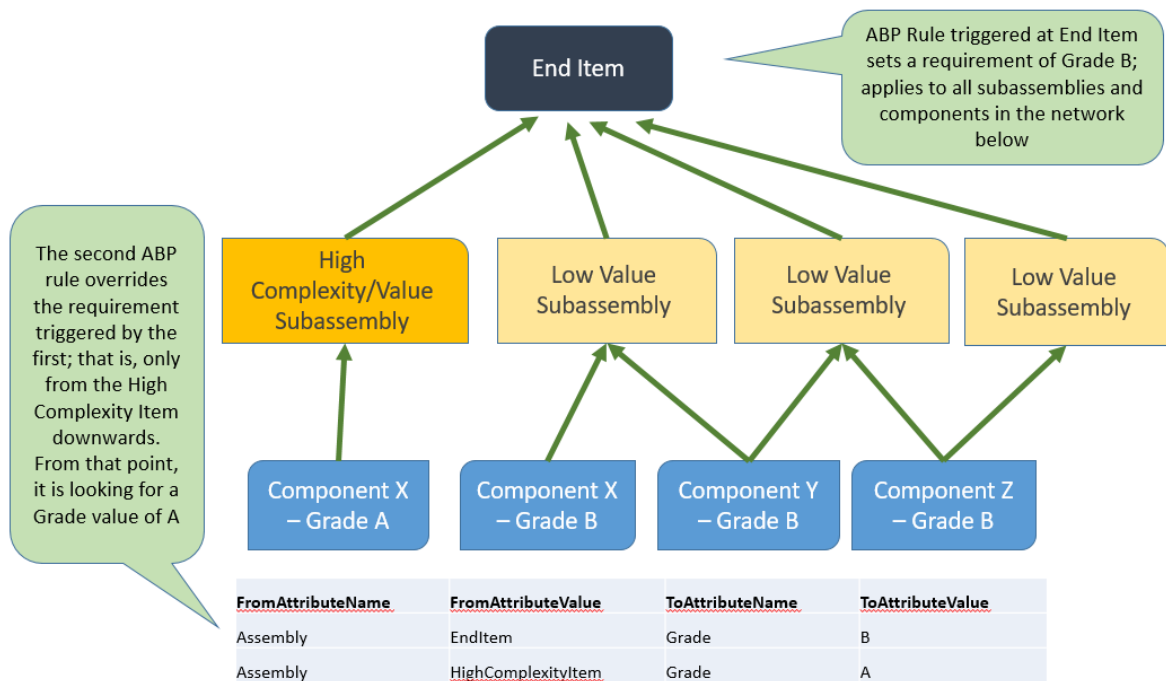
Steps to Execute

1. Have a clear idea of the what the contents of the AttributeMap table will look like before you start creating fields, take the following guidelines into consideration before you begin:

   - **FromAttributeName**: This name value can be used to identify the criteria used for supply restriction on demand lines. A good practice is to name these values, for example in the Life Sciences industry: "Region", "Customer", "Jurisdiction", "Policy", etc. This will allow ABP to be used for different purposes that are clearly defined.
   - **FromAttributeValue**: This is the mapped value that must exist on the demand line for the ABP rule to be enabled. The actual value for region, customer, jurisdiction, policy, etc. This field can be used to distinguish subsets of demands so different rules can apply

depending on the value of the demand line. Also, because this value is passed through the network, when analyzing calculated table results, it can be used to know from which demand the attribute requirement is coming from.

- **ToAttributeName**: This value should be used to identify the type of attribute that is being looked for. This means that users will know what characteristic of supply is used to determine eligibility for demand allotment. An example used in Life Sciences is "Grade".
- **ToAttributeValue**: The actual attribute value that needs to be associated with the supply in order to be used for demands on the ABP rule. Normally these attribute fields get their values from referenced fields, they can also be constructed values and/or input fields that users maintain. An example for the "Grade" attribute would be a value of "High", "A" or "4.3".

2. After planning out the ABP rules needed for the solution, you can begin the configuration in RapidResponse. On the Data Model main window, click on the 'Attributes' button. Create attributes for demand and for supply.
3. Following, you will need to define attribute fields on demand tables (any of: IndependentDemand, PartSource, ScheduledReceipt, ForecastDetail and TimePhasedSafety) where you want to enable any ABP rule(s). To populate the value on such fields, you will need to use an expression. There are two options: use a value from an input or calculated field which has data from the company's ERP (can be a reference to another table where the relationship is 1:1 or many:1), or use a field specially created to enable users to edit the FromAttributeValue.
4. Same as the Demand attribute fields, you'll need to define Supply attribute fields in the tables where you'd like supply to be checked for eligibility (such as PartSource, ScheduledReceipt or OnHand). Define attribute fields and their expression considering the same two options as the step above (step 3). An example of a supply attribute field in the Pharma industry is "Grade" and its value can be alphanumeric.
5. Apply the data model changes and restart the system.

Pro-Tips

- If you create input fields for users, do it for the same namespace as the Attributes. This will allow you to easily manage all the fields created for the ABP solution.
- The Attributes button in the Data Model window, you can see which tables attributes are used. This can be useful when verifying the complete ABP data model design.
- Use Quantity or Date type fields for demand attribute fields that have rules looking for a range instead of a discrete value. Use String for discrete attribute types.
- It is possible to override or 'handoff' a demand attribute requirement coming from an assembly level if, at some point in the supply network, it needs a PlannedOrder created. When RapidResponse finds an attribute field with the same FromAttributeName on the PartSource table, it can restart the ABP requirement there (e.g., looking for a different ToAttributeValue). This means that from that point downwards a new attribute requirement overrides the one from a demand in a level above (i.e., with a lower LLC). An example of when this would be useful is when a subassembly down in the network (higher LLC) restricts its supply of components to a certain attribute which means it is of higher quality. Once such subassembly is made, it can be used freely in all End Items, however, the End Item also needs other subassemblies with a lesser restriction of quality in their components. See example below.

ABP Rule triggered at End Item sets a requirement of Grade B; applies to all subassemblies and components in the network below

The second ABP rule overrides the requirement triggered by the first; that is, only from the High Complexity Item downwards. From that point, it is looking for a Grade value of A

FromAttributeName	FromAttributeValue	ToAttributeName	ToAttributeValue
Assembly	EndItem	Grade	B
Assembly	HighComplexityItem	Grade	A

- A large number of rules on the AttributeMap table can impact performance, so consider consolidating rules when possible. You can achieve this by designing the attribute field on demand tables more efficiently. For example, the following rules exist on the AttributeMap table:

FromAttributeName	FromAttributeValue	ToAttributeName	ToAttributeValue
Country	Belgium	Grade	>10
Country	France	Grade	>10
Country	Germany	Grade	>10

Instead of this, use a different expression on the demand Attribute field which references the Region and not the Country, and create one rule for all countries in the region:

FromAttributeName	FromAttributeValue	ToAttributeName	ToAttributeValue
Region	Europe	Grade	>10

Another example is by making an expression contain a conditional statement. Therefore, all demand lines that fulfill a condition get a demand attribute value that is referenced in the AttributeMap table. This means that only one rule is necessary.

New Attribute Field

Table:	IndependentDemand (Mfg)
Attribute:	PolicyY (Attributes)
Field name:	PolicyY (Attributes)
Field namespace:	Attributes
Type:	String

Expression:
```
IF( OrderPriority.PlanningPriority < 2
OR (Status.Value = 'Government' AND
Left(Order.ID, 1) = 'Y'), 'PolicyY', '')
```

Expression Builder...   Validate Expression

Description:
Identifier of demands that need to fulfill Policy Y

Save and Close   Save   Close   Help

FromAttributeName	FromAttributeValue	ToAttributeName	ToAttributeValue
PolicyY	PolicyY	Grade	>10

- When looking at Netting and CTP table-based worksheets, use the wildcard **Attribute<*>** to see demand attribute requirement that are in effect, while for Supply attributes add the actual attribute fields on the worksheet, when possible.

Watch-Outs

- The ScheduledReceipt table does not automatically propagate ABP requirements, i.e., even if a ScheduledReceipt record is satisfying a demand that has an attribute requirement. The ScheduledReceipt will not have such requirement for any dependent demand originating from it. Demand attributes for components of a ScheduledReceipt need their own AttributeMap rules. Both Allocation and NewAllocation records will use the Demand attribute requirement triggered at the ScheduledReceipt when an AttributeMap record is found.

- Blank values on Supply attributes are considered eligible for any demand. If you need to have a more selective ABP setup, consider setting an expression on the supply attribute field on such tables that defaults to a hardcoded value that means it is not widely eligible, e.g. "Undefined" or "0", so that the value is no longer blank.
A very simple example of how not to have blank values is: IF(GradeInput = '', 'Undefined', GradeInput*).

Requirements & Dependencies

- Attribute Based Planning licensing.
- A desire or need to understand ABP influenced decisions made during Netting and CTP passes.

FAQs

Q. In which case should I create an input field and in which case should I use an existing field to populate attribute fields?

A. Use input fields if there is a need for users to be able to edit attribute values, e.g. when users are maintaining data in RapidResponse or when What-If simulations are needed with the ABP solution.

Q. How can we make Scheduled Receipts propagate Attribute requirements?

A. One way is to create additional AttributeMap rules with the same FromAttrbuteName and FromAttributeValue as the triggering demand line higher on the network (lower LLC) but that are triggered at the ScheduledReceipt line. This would work if the intent were to have all Scheduled Receipts that are supplied for a certain demand to also have the same attribute requirement that those demands have. Have an attribute field on the ScheduledReceipt table that is populated with the same identifier as the demands had (FromAttributeValue), for example, the Region. Another approach is to have an automation (workbook command) that reads ScheduledReceipt's attribute supply values and convert them into an AttributeMap rule that triggers when the ScheduledReceipt generates dependent demand. All components of the ScheduledReceipt (Allocations and New allocations) will need to have the same supply attribute that the ScheduledReceipt has been assigned (frequently in the ERP source system).

Additional Resources

- RapidResponse Data Model and Algorithm Guide, section on Attribute-Based Planning
- Best Practice: Attribute Based Planning with Safety Stock
- Best Practice: Model Unit Pool Vs Attribute Based Planning

Appendix

**Demand attribute requirements VS. supply attributes.**
Supply or demand attribute fields are no different when created, they can be used for either purpose depending on the table where they reside, i.e., an attribute field can be used to trigger a requirement attribute rule (normally when used on demand tables) or to declare a supply attribute on a supply table. When a demand and supply attribute fields are named exactly the same, they could even be used as both things, on the same table. This, evidently, makes ABP's decisions difficult to follow when reading calculated table's "*Attribute<*>*" expression.

The AttributeMap table also plays a crucial role when defining the use of attributes. If you take, for example, the attribute **Grade**. When used on the PartSource table, it could be a supply declaration, i.e., material from such source has a certain **Grade**. It can also mean, in case of a Make PartSource, that supply components required for such assembly part must meet the **Grade** requirement value that is associated to an AttributeMap rule.

The same is true for the ScheduledReceipt table, which may have dependent demand originating from it in the form of Allocations or NewAllocations. The following diagram shows a case in which both the demand and the supply attribute are called the same.
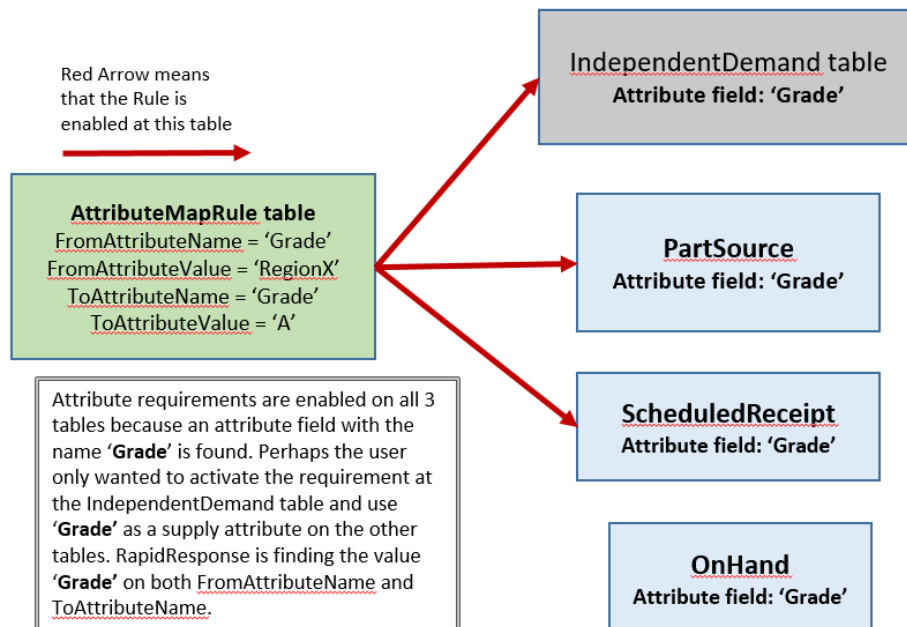
Using attributes both as demand and as supply is actually not considered an error, nor does it necessarily render problems for RapidResponse's analytics; the results can be correct if it is designed well. However, in the next diagram, we see the attribute demand requirement propagation, and how ABP will look for ('probe' in the diagram) the attribute supply values. This diagram shows what happens when **Grade** is both used as a supply and as a demand attribute. The analysis of such signals becomes quite complex because the connections are happening at the same time for demand and for supply (look for red and blue arrows coming and going from/to the same boxes).
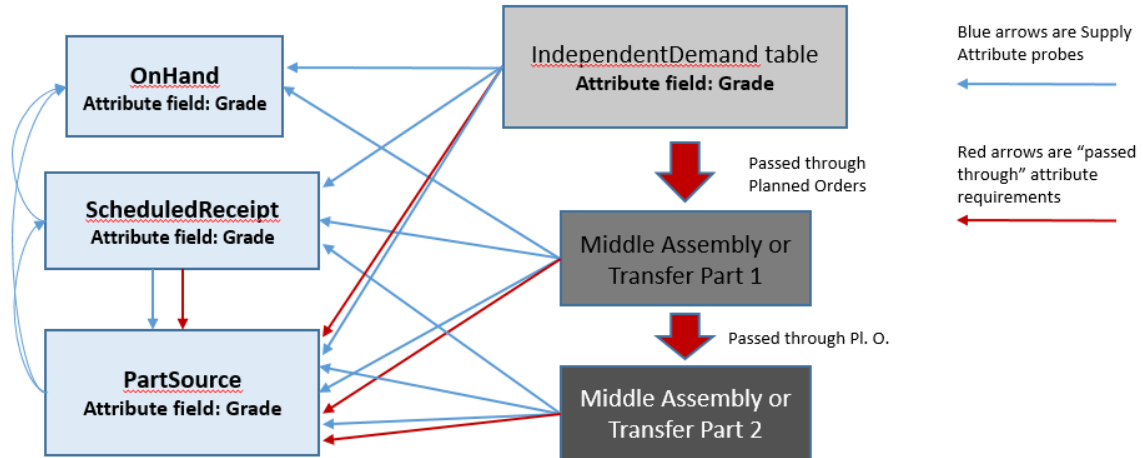
All lines on the diagram above represent a signal with the same attribute name '**Grade**' when using the expression *"Attribute<*>"*, therefore making it be very hard to differentiate from one another.