SAP NetWeaver
How-To Guide

How to Build Your Own UI for MDM via Java API - Limit Search Criteria

Applicable Releases:

SAP NetWeaver Master Data Management 7.1 and below

Topic Area:

Information Management

Capability:

Master Data Management

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Document History

Document Version	Description
1.00	First official release of this guide

Typographic Conventions

Type Style	Description
Example Text	Words or characters quoted from the screen. These include field names, screen titles, pushbuttons labels, menu names, menu paths, and menu options. Cross-references to other documentation
Example text	Emphasized words or phrases in body text, graphic titles, and table titles
`Example text`	File and directory names and their paths, messages, names of variables and parameters, source text, and names of installation, upgrade and database tools.
`Example text`	User entry texts. These are words or characters that you enter in the system exactly as they appear in the documentation.
`<Example text>`	Variable user entry. Angle brackets indicate that you replace these words and characters with appropriate entries to make entries in the system.
`EXAMPLE TEXT`	Keys on the keyboard, for example, `F2` or `ENTER`.

Icons

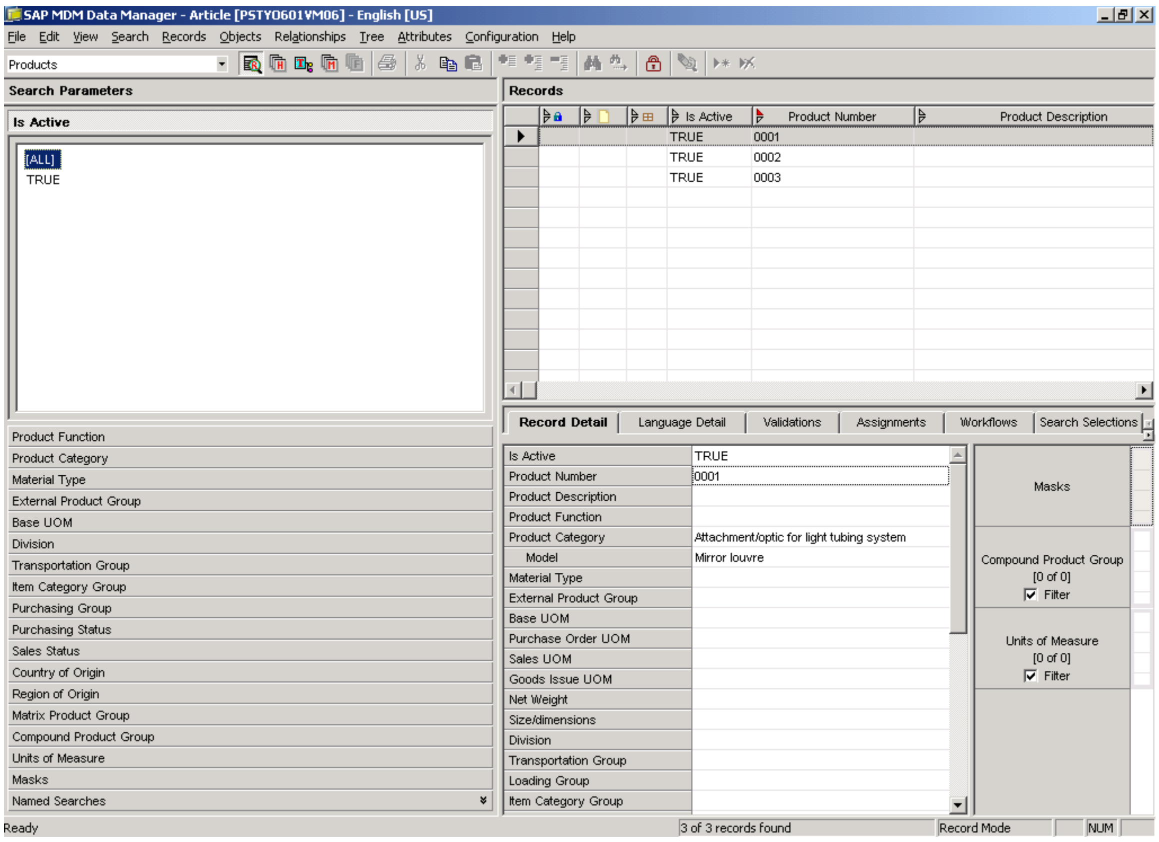
Icon	Description
⚠	Caution
💡	Note or Important
❖	Example
⬆	Recommendation or Tip

Table of Contents

1. What are we going to achieve?

There is a powerful function in MDM which is limiting the search criteria based on the existing values.

For example we have 3 records in the repository whose values for “Is Active” field are all TRUE. In this case if you take a look at MDM Data Manager’s **Search Parameters** pane on the left side, only TRUE is shown in “Is Active”. Therefore, users will be able to click on only the existing values in the **Search Parameters** pane to narrow down the search result.


SAP MDM Data Manager - Article [PSTY0601VM06] - English [US]
File Edit View Search Records Objects Relationships Tree Attributes Configuration Help
Products
Search Parameters
Records
Record Detail
Language Detail
Validations
Assignments
Workflows
Search Selections
Ready
Record Mode
NUM

Search Parameters

Is Active

[ALL]
TRUE

Product Function
Product Category
Material Type
External Product Group
Base UOM
Division
Transportation Group
Item Category Group
Purchasing Group
Purchasing Status
Sales Status
Country of Origin
Region of Origin
Matrix Product Group
Compound Product Group
Units of Measure
Masks
Named Searches

Records

Is Active	Product Number	Product Description
TRUE	0001	
TRUE	0002	
TRUE	0003	

Record Detail

Is Active	TRUE
Product Number	0001
Product Description	
Product Function	
Product Category	Attachment/optic for light tubing system
Model	Mirror louvre
Material Type	
External Product Group	
Base UOM	
Purchase Order UOM	
Sales UOM	
Goods Issue UOM	
Net Weight	
Size/dimensions	
Division	
Transportation Group	
Loading Group	
Item Category Group	

Masks

Compound Product Group
[0 of 0]
☑ Filter

Units of Measure
[0 of 0]
☑ Filter

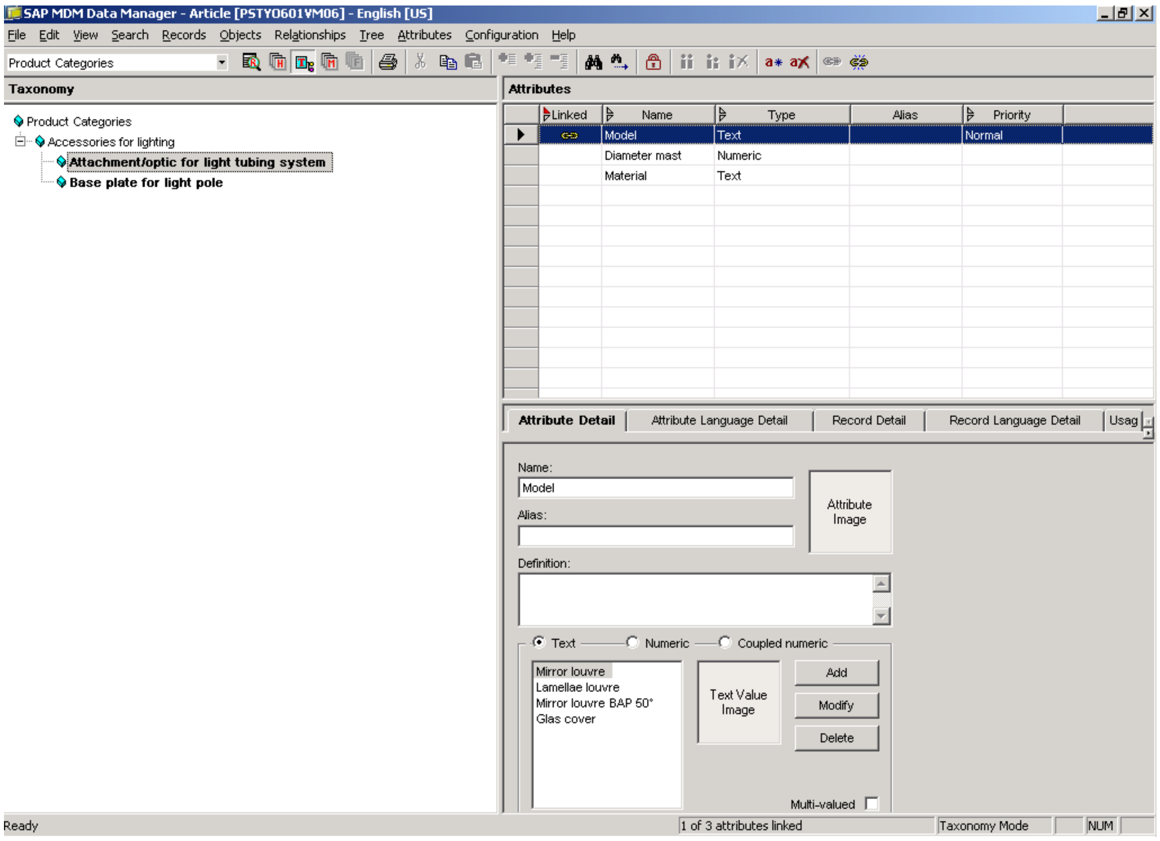
3 of 3 records found

This is possible not only on lookup field values, but also in categories and attribute values as well.

Here we have a taxonomy definition as below

Accessories for lighting (Parent Category)

- *Attachment/optic for light tubing system* (Child Category)
  - *Model* (Text Attribute)
- *Base plate for light pole* (Child Category)
  - *Diameter mast* (Numeric Attribute)
  - *Material* (Text Attribute)



SAP MDM Data Manager - Article [PSTY0601VM06] - English [US]

Product Categories

Taxonomy

- Product Categories
  - Accessories for lighting
    - Attachment/optic for light tubing system
    - Base plate for light pole

Attributes

Linked	Name	Type	Alias	Priority
⚭	Model	Text		Normal
	Diameter mast	Numeric		
	Material	Text		

Name: Model

Alias:

Definition:

[✓ Text] Numeric Coupled numeric

Mirror louvre
Lamellae louvre
Mirror louvre BAP 50°
Glas cover

Multi-valued ☐

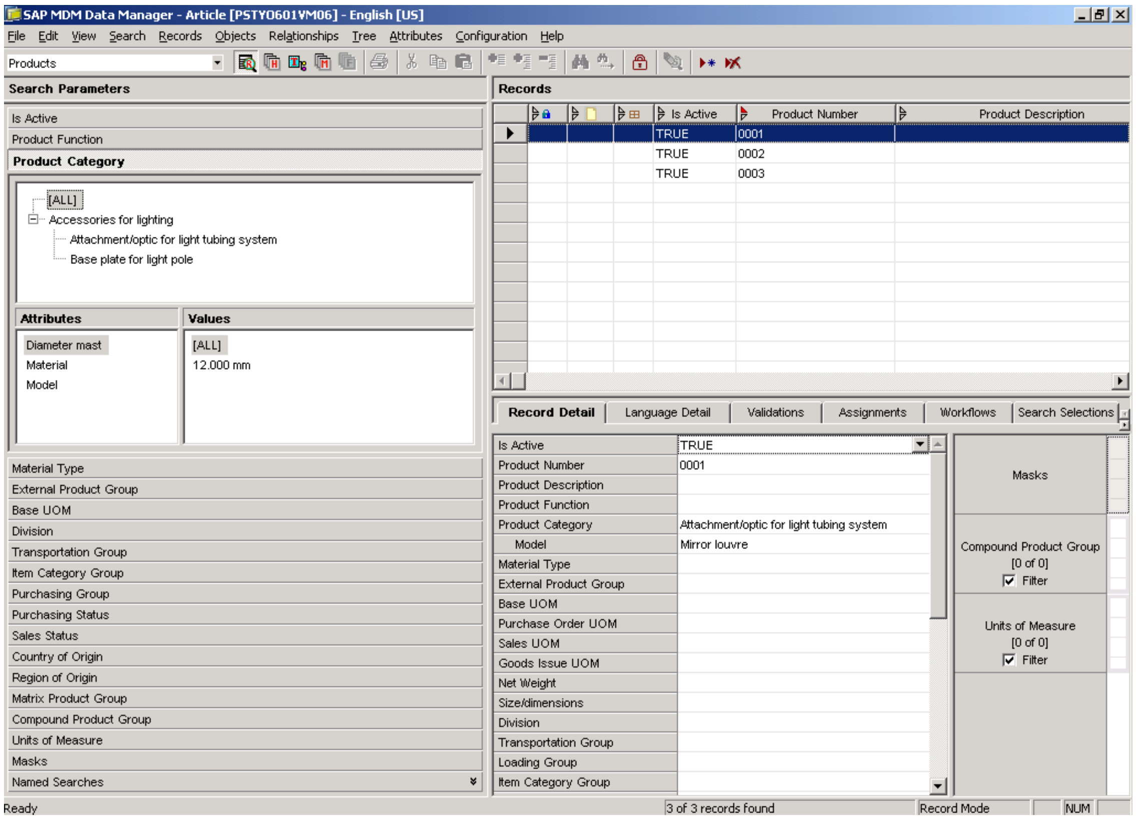
Ready | 1 of 3 attributes linked | Taxonomy Mode | NUM

We have 3 records again which have the values below

0001	*Attachment/optic for light tubing system* Model = *Mirror Louvre*
0002	*Base plate for light pole* Diameter mast = *12 mm* Material = *Aluminum*
0003	*Base plate for light pole* Diameter mast = *12 mm* Material = *Steel*

As you can see again in “Product Category” in **Search Parameters** pane, Data Manager shows the category lookup values “Attachment/optic for light tubing system” and “Base plate for light pole”, because category lookup value is not different than another lookup field value.

Below the category values, **Search Parameters** pane shows available attributes as well. Currently we have *Model*, *Material*, and *Diameter mast*. Please note that “available Attributes” doesn’t mean all the definition for Attributes, but rather, it means that these Attributes are assigned to existing records.



SAP MDM Data Manager - Article [PSTY0601VM06] - English [US]

File Edit View Search Records Objects Relationships Tree Attributes Configuration Help

Products

Search Parameters

Is Active
Product Function
Product Category

[ALL]
Accessories for lighting
Attachment/optic for light tubing system
Base plate for light pole

Attributes	Values
Diameter mast	[ALL]
Material	12.000 mm
Model	

Material Type
External Product Group
Base UOM
Division
Transportation Group
Item Category Group
Purchasing Group
Purchasing Status
Sales Status
Country of Origin
Region of Origin
Matrix Product Group
Compound Product Group
Units of Measure
Masks
Named Searches

Records

Is Active	Product Number	Product Description
TRUE	0001	
TRUE	0002	
TRUE	0003	

Record Detail | Language Detail | Validations | Assignments | Workflows | Search Selections

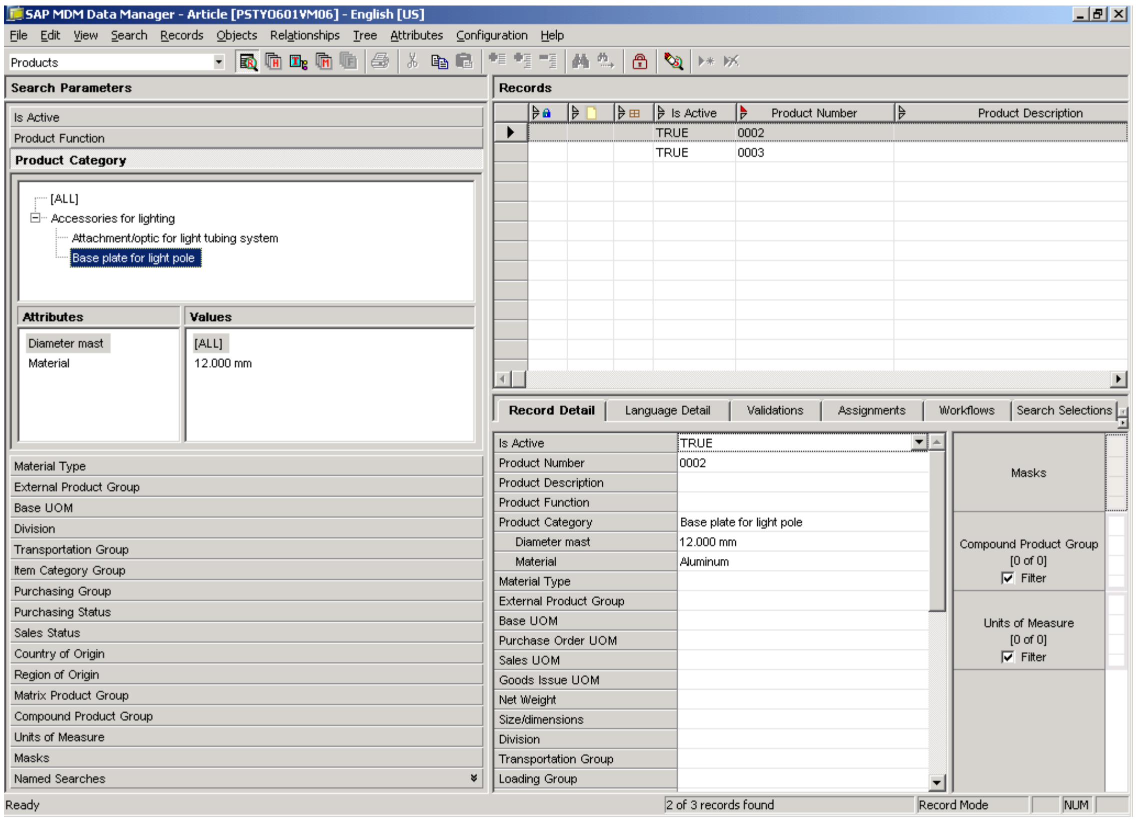
Is Active	TRUE
Product Number	0001
Product Description	
Product Function	
Product Category	Attachment/optic for light tubing system
Model	Mirror louvre
Material Type	
External Product Group	
Base UOM	
Purchase Order UOM	
Sales UOM	
Goods Issue UOM	
Net Weight	
Size/dimensions	
Division	
Transportation Group	
Loading Group	
Item Category Group	

Masks

Compound Product Group
[0 of 0]
☑ Filter

Units of Measure
[0 of 0]
☑ Filter

Ready | 3 of 3 records found | Record Mode | NUM



SAP MDM Data Manager - Article [PSTY0601VM06] - English [US]

File Edit View Search Records Objects Relationships Tree Attributes Configuration Help

Products

Search Parameters

Is Active
Product Function
Product Category

[ALL]
Accessories for lighting
Attachment/optic for light tubing system
Base plate for light pole

Attributes	Values
Diameter mast	[ALL]
Material	12.000 mm

Material Type
External Product Group
Base UOM
Division
Transportation Group
Item Category Group
Purchasing Group
Purchasing Status
Sales Status
Country of Origin
Region of Origin
Matrix Product Group
Compound Product Group
Units of Measure
Masks
Named Searches

Records

Is Active	Product Number	Product Description
TRUE	0002	
TRUE	0003	

Record Detail | Language Detail | Validations | Assignments | Workflows | Search Selections

Is Active	TRUE
Product Number	0002
Product Description	
Product Function	
Product Category	Base plate for light pole
Diameter mast	12.000 mm
Material	Aluminum
Material Type	
External Product Group	
Base UOM	
Purchase Order UOM	
Sales UOM	
Goods Issue UOM	
Net Weight	
Size/dimensions	
Division	
Transportation Group	
Loading Group	

Masks

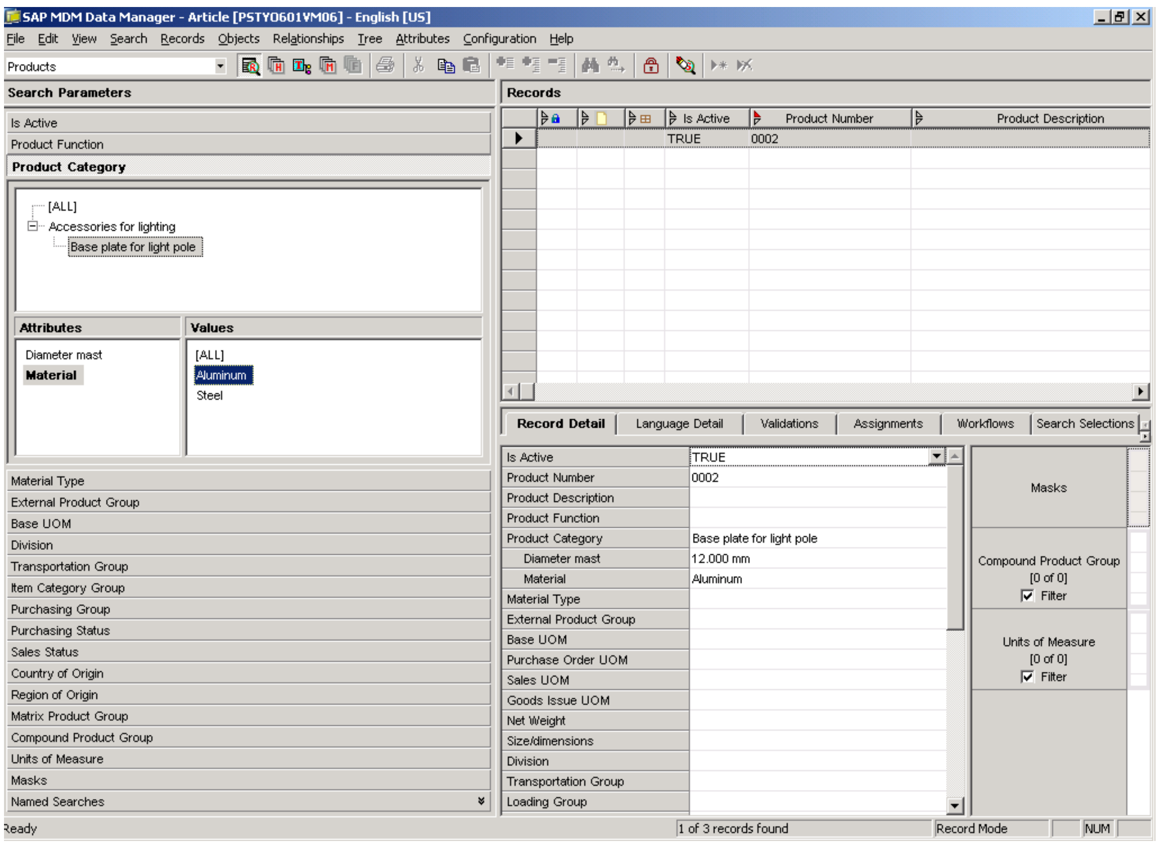
Compound Product Group
[0 of 0]
☑ Filter

Units of Measure
[0 of 0]
☑ Filter

Ready | 2 of 3 records found | Record Mode | NUM

When we click on any Attribute, e.g. *Material*, all assigned values for *Material*, e.g. *Aluminum* and *Steel*, are displayed in **Values.**

Afterward, if we would to click on any value, the search result will narrow down the search to get all the records which are assigned to this value. E.g. the screenshot below shows the records whose *Material* attribute value is *Aluminum*.



SAP MDM Data Manager - Article [PSTY0601VM06] - English [US]

File Edit View Search Records Objects Relationships Tree Attributes Configuration Help

Products

Search Parameters

Is Active
Product Function
Product Category

[ALL]
Accessories for lighting
Base plate for light pole

Attributes	**Values**
Diameter mast	[ALL]
Material	Aluminum
	Steel

Material Type
External Product Group
Base UOM
Division
Transportation Group
Item Category Group
Purchasing Group
Purchasing Status
Sales Status
Country of Origin
Region of Origin
Matrix Product Group
Compound Product Group
Units of Measure
Masks
Named Searches

Records

			Is Active	Product Number	Product Description
			TRUE	0002	

Record Detail | Language Detail | Validations | Assignments | Workflows | Search Selections

Is Active	TRUE
Product Number	0002
Product Description	
Product Function	
Product Category	Base plate for light pole
Diameter mast	12.000 mm
Material	Aluminum
Material Type	
External Product Group	
Base UOM	
Purchase Order UOM	
Sales UOM	
Goods Issue UOM	
Net Weight	
Size/dimensions	
Division	
Transportation Group	
Loading Group	

Masks

Compound Product Group
[0 of 0]
☑ Filter

Units of Measure
[0 of 0]
☑ Filter

Ready | 1 of 3 records found | Record Mode | NUM

In some cases, you will need to realize it in other UI technologies, e.g. web applications. MDM is providing strong Java API capability for this. Let's take a look at the procedure step by step.

2. How to do it with Java API?

2.1 Preparation

First as usual, we will need a connection to connect to MDM Server. As this connection requires data access, we will use UserSessionContext here.

```
context =
      new UserSessionContext(server_name, repository_name,
            username_name);
```

Log on to MDM Server.

```
SessionManager.getInstance().createSession(
      context,SessionTypes.USER_SESSION_TYPE, password);
```

In case you are building your UI on SAP Web Application System, you might need to leverage SAP's security infrastructure instead of the hard coded user and password above. Please refer to the document below on how to retrieve user and password via SAP Security API.

http://help.sap.com/javadocs/NW04S/current/se/com/sap/security/api/umap/IUserMapping.html

http://help.sap.com/javadocs/NW04S/current/se/com/sap/security/api/umap/IUserMappingData.html

We will use RepositorySchema as well, since it is taking good care of repository META data by using lazy load mechanism.

```
RepositorySchema schema =
      MetadataManager.getInstance().getRepositorySchema(context);
```

2.2 Command for lookup Pick List

Here is the command which will retrieve the result set for the search, as well as return the pick list for available lookup values.

```
final RetrieveLimitedRecordsCompoundCommand command =
      new  RetrieveLimitedRecordsCompoundCommand(context);
```

We need to create the Result Definition to tell API what field values need to be retrieved together with the search result.

```
ResultDefinition rd =
      new ResultDefinition(schema.getFieldId(MAIN_TABLE_CODE));
rd.addSelectField(schema.getFieldId(MAIN_TABLE_CODE, FIELD_CODE));
command.setResultDefinitions(new ResultDefinition[] { rd});
```

Next set the search criteria for the search.

```
Search search = …;
command.setSearch(search);
```

Performance issues will arise if we were to retrieve all records for search as many records would be hit. As such, we use the paging concept to retrieve records page by page.

```
command.setPageSize(page_size);
command.setPageIndex(page_index);
```

Here we have to define what pick lists we need to retrieve from the command. E.g. we define 3 lookup fields.

```
command.setSearchDimensions(new SearchDimension[] {
      new FieldSearchDimension(
            schema.getFieldId(MAIN_TABLE_CODE,
                  PICKLIST1_FIELD_CODE)),
   new FieldSearchDimension(
            schema.getFieldId(MDM_PRODUCTS_TABLE_CODE,
                  PICKLIST1_FIELD_CODE)),
   new FieldSearchDimension(
            schema.getFieldId(MDM_PRODUCTS_TABLE_CODE,
                  PICKLIST1_FIELD_CODE))});
```

Now we can execute the command.

```
command.execute();
```

After the command was executed successfully, we can get the result from the result set.

```
final RecordResultSet recordResultSet =
      command.getSearchTableResultSet();
for (int i = 0; i < recordResultSet.getCount(); i++) {
   final Record record = recordResultSet.getRecord(i);
   print("got result: " + record.getDisplayValue());
}
```

As mentioned previously, one command execution will retrieve only one page of results. We will need to identify the next page index and execute the command again to get different page.

Normally in web applications, we show the users how many pages existing. In order to calculate the number, we can divide the total result count by page size. We can get total result count by the method below.

```
      final int count = command.getSearchTableMatchCount();
```

Now we will have to get the pick lists for limiting available values. Remember we defined 3 lookup fields before executing the command. We get an array here for different fields.

```
      final PickList[] pickLists = command.getPickList();
```

We get the information from each PickList.

First is which field the particular pick list is about. Picklist.getSearchDimension() returns corresponding SearchDimension instance, from where we can get the field information. FieldSearchDimension.getFieldPath() returns an array of field ids. As we are not talking about tuple, we will get only one FieldId in this array.

```
      final FieldId[] fieldIds =
            ((FieldSearchDimension) pick.getSearchDimension()).
                  getFieldPath();
```

Next we get the items for the pick list.

```
      final PickListItem[] items = pick.getPickListItems();
```

There are only 2 types of pick list supported in RetrieveLimitedRecordsCompoundCommand. RecordPickListItem and BooleanPickListItem. RecordPickListItem is taking care of all the lookup types including taxonomy lookup, and BooleanPickListItem is taking care of all the boolean type fields. We can differentiate the types by the code below.

```
      switch (item.getType()) {
         case PickListItem.RECORD_PICK_LIST_ITEM:
            RecordPickListItem rItem =
                        (RecordPickListItem) item;
                  …
            break;
         case PickListItem.BOOLEAN_PICK_LIST_ITEM:
            BooleanPickListItem bItem =
                        (BooleanPickListItem) item;
```

```
                    …
                break;
            default:
                assert (false);
        }
```

In case the pick list item is lookup (referring to another record) type of pick list item, we can read the record like below.

```
        RecordPickListItem item;
        final Record record = item.getRecord();
        if (record instanceof HierNode) {
            …
        } else {
                String value = record.getDisplayValue();
        }
```

In case the lookup field is for taxonomy or hierarchy, we will get a tree type HierNode instance. Here is an example of how to show all the nodes in the entire tree.

```
        private void printTree(HierNode node, String indent) {
            if (node == null) {
                print("category: " + indent + "NULL");
            }
            else {
                print("category: " + indent + node.getDisplayValue());
                final HierNode[] children = node.getChildren();
                if (children != null) {
                    for (HierNode child : children) {
                        printTree(child, indent + "\t");
                    }
                }
            }
        }
```

In case the pick list item is Boolean type of pick list item, we can read the record like below.

```
BooleanPickListItem item;
Boolean value = item.getValue();
```

2.3 Command for Attribute Pick List

You must have noticed why only record and Boolean types are supported. Didn't we say we can support attribute or attribute values? The answer is you need another 2 commands to achieve that.

The first one is for available attributes.

```
final RetrieveLimitedAttributesCommand command =
      new RetrieveLimitedAttributesCommand(context);
```

Same as RetrieveLimitedRecordsCompoundCommand we need to set the parameters for search.

```
command.setSearch(search);
```

The difference is we need to identify which taxonomy lookup field we are going to get. In case we have multiple taxonomy lookup fields to retrieve the pick list, we will have to call the command multiple times.

```
command.setTaxonomyFieldId(taxonomyLookupFieldId);
```

Now execute the command.

```
command.execute();
```

Then we can get the available assigned attributes according to the search criteria.

```
final AttributeProperties[] attrProps =
      retrieveLimitedAttributesCommand.getAttributes();
```

And print the information accordingly.

```
print("found available attribute: " + attrProp.getName());
```

As we have different ratings for each attribute when attribute is numeric type, by the code below, we can show the rating information.

```
if (attrProp.getType() == AttributeProperties.NUMERIC_TYPE) {
   final NumericAttributeProperties nap =
            (NumericAttributeProperties) attrProp;
   if (nap.supportsRating(AttributeId.AVERAGE_RATING)) {
      print("supports rating: [average]");
   }
   if (nap.supportsRating(AttributeId.MAXIMUM_RATING)) {
      print ("supports rating: [maximum]");
   }
   if (nap.supportsRating(AttributeId.MINIMUM_RATING)) {
      print ("supports rating: [minimum]");
   }
   if (nap.supportsRating(AttributeId.NOMINAL_RATING)) {
      print ("supports rating: [nominal]");
   }
   if (nap.supportsRating(AttributeId.TYPICAL_RATING)) {
      print("supports rating: [typical]");
   }
}
```

2.4 Command for Attribute Value Pick List

Here is the command to get corresponding available attribute values for one attribute. As you have seen in the Data Manager, a good response time would not be achieved if we were to retrieve all the attributes. Therefore we just retrieve the attribute values for each attribute type via individual command. We will need to build a UI to call this command once user clicked the attribute name.

```
final RetrieveLimitedAttributeValuesCommand command =
      new RetrieveLimitedAttributeValuesCommand(context);
```

Again we set the search criteria for records.

```
command.setSearch(search);
```

We set taxonomy lookup field id.

```
command.setTaxonomyFieldId(taxonomyLookupFieldId);
```

As this command is retrieving available attribute values for only one attribute, we need to identify the attribute id. There are multiple ways to get the attribute id. As we have already got attribute property instance from RetrieveLimitedAttributesCommand, we will get id from the attribute property.

```
command.setAttributeId(attrProp.getId());
```

Now execute the command.

```
command.execute();
```

2.5 Retrieve Attribute Values

Now we have to retrieve the value from the command result.

2.5.1 Before 5.5 SP06 Patch 4 and 7.1 SP03

Before 5.5 SP06 Patch4 and 7.1 SP03, we write the code below to get the attribute values.

First we use the method below to retrieve the attribute values directly.

```
final MdmValue[] values = command.getAttributeValues();
```

In order to get the attribute values, we need to check what type of attribute it is.

```
switch (attrProp.getType()) {
case AttributeProperties.COUPLED_TYPE:
   CoupledAttributeProperties cap =
            (CoupledAttributeProperties) attrProp,
   CoupledMeasurementValue cmv =
            (CoupledMeasurementValue) value;
      …
   break;
case AttributeProperties.NUMERIC_TYPE:
   NumericAttributeProperties nap =
            (NumericAttributeProperties) attrProp;
```

```
         MeasurementValue mv = (MeasurementValue) value;
            …
            break;
      case AttributeProperties.TEXT_TYPE:
         TextAttributeProperties tap =
                  (TextAttributeProperties) attrProp;
         TextAttributeValue tav = (TextAttributeValue) value;
         …
         break;
      default:
         assert (false);
      }
```

In case of numeric type of attribute, we retrieve the value as below.

```
      NumericAttributeProperties attrProp;
      MeasurementValue value;
      final DimensionsManager dm =
            MetadataManager.getInstance().
                  getRepositoryDimensions(context);
      final UnitProperties up =
      dm.getUnit(attrProp.getMeasurement().getDimensionId(),
            value.getUnitId());
      print("got numeric attribute value: " + value.getMagnitude() +
            " " + up.getName());
```

In case of coupled type of attribute, we use the code below.

```
      CoupledAttributeProperties attrProp;
      CoupledMeasurementValue value;
      final MeasurementValue value1 = value.getPrimaryValue();
      final MeasurementValue value2 = value.getSecondaryValue();
      final UnitProperties up1 =
            dm.getUnit(attrProp.getMeasurement().getDimensionId(),
                  value1.getUnitId());
      final UnitProperties up2 =
			dm.getUnit(attrProp.getCoupledMeasurement().
				getDimensionId(), value2.getUnitId());
		print("got attribute value: " + value1.getMagnitude() + " " +
			up1.getName() + " : " + value2.getMagnitude() + " " +
			up2.getName());
```

In case of text type of attribute, we use the code below.

```
		TextAttributeProperties attrProp;
		TextAttributeValue value;
		print("got text attribute value: " +
			attrProp.getTextAttributeValue(value.getId()).getName());
```

2.5.2 After 5.5 SP06 Patch 4 and 7.1 SP03

After 5.5 SP06 Patch4 and 7.1 SP03, new AttributeValuePickListItem interface is introduced, and therefore we can write the code as per below stated.

```
	final PickList[] attributePickLists = command.getPickLists();
	for (PickList attributePickList : attributePickLists) {
	   final PickListItem[] attributePickListItems =
	            attributePickList.getPickListItems();
	   for (PickListItem attributePickListItem : attributePickListItems)
	{
	            final AttributeValuePickListItem
	      attributeValuePickListItem =
	            (AttributeValuePickListItem) attributePickListItem;
	      …
	   }
	 }
```

Here is the code to identify the item type.

```
	switch (attributeValuePickListItem.getType()) {
	case AttributeValuePickListItem.COUPLED_ATTRIBUTE_VALUE_TYPE:
	   CoupledAttributeProperties cap = (CoupledAttributeProperties)
	attrProp;
```

```
         CoupledMeasurementValuePickListItem citem =
                  (CoupledMeasurementValuePickListItem)
            attributePickListItem;
         …
         break;
      case AttributeValuePickListItem.NUMERIC_ATTRIBUTE_VALUE_TYPE:
            NumericAttributeProperties nap =
                  (NumericAttributeProperties) attrProp;
            MeasurementValuePickListItem mitem =
                  (MeasurementValuePickListItem) attributePickListItem;
            …
         break;
      case AttributeValuePickListItem.TEXT_ATTRIBUTE_VALUE_TYPE:
         TextAttributeProperties tap =
                  (TextAttributeProperties) attrProp;
         TextAttributeValuePickListItem titem =
                  (TextAttributeValuePickListItem) attributePickListItem;
         …
         break;
      default:
         // no other types existing
         assert (false);
         break;
      }
```

Here is the code for getting the value wrapper classes for each item. The concrete code for value retrieval from wrapper classes is the same as before SP06 Patch4, and therefore it is not shown here.

In case of numeric type attributes,

```
      MeasurementValuePickListItem item;
      final MeasurementValue value = item.getValue();
```

In case of coupled type of attributes,

```
      CoupledMeasurementValuePickListItem item;
      final CoupledMeasurementValue value = item.getValue();
```

In case of text type of attributes,

```
TextAttributeValuePickListItem item;
final TextAttributeValue value = item.getValue();
```

Now we got all the pick lists for lookup fields, taxonomy lookup fields, attributes, and attribute values.

2.6 How to narrow down the search more by using Pick List?

Like in Data Manager, we probably will need a UI to narrow down the search results by putting more search criteria when users clicked on one of the pick lists. We can use the code below to create new SearchParameter and then append it into Search instance which would help in narrowing down via attribute values.

2.6.1 Before 5.5 SP06 Patch 4 and 7.1 SP03

Before 5.5 SP06 Patch 4 or 7.1 SP03, you can create the search criteria from scratch as below.

In case of numeric attributes,

```
NumericAttributeProperties attrProp;
MeasurementValue value;
final PickListSearchConstraint pickListSearchConstraint = new
PickListSearchConstraint(new MdmValue[] { value});
SearchParameter par = new SearchParameter(
      new AttributeSearchDimension(taxonomyLookupFieldId,
            attrProp.getId()), pickListSearchConstraint);
```

In case of coupled attributes,

```
CoupledAttributeProperties attrProp;
CoupledMeasurementValue value;
final PickListSearchConstraint pickListSearchConstraint =
      new PickListSearchConstraint(new MdmValue[] { value});
SearchParameter par = new SearchParameter(
      new AttributeSearchDimension(taxonomyLookupFieldId,
      attrProp.getId()), pickListSearchConstraint);
```

In case of text attributes,

```
TextAttributeProperties attrProp;
TextAttributeValue value;
final PickListSearchConstraint pickListSearchConstraint =
      new PickListSearchConstraint(new MdmValue[] { value});
SearchParameter par = return new SearchParameter(
      new AttributeSearchDimension(taxonomyLookupFieldId,
            attrProp.getId()), pickListSearchConstraint);
```

2.6.2 After 5.5 SP06 Patch 4 and 7.1 SP03

As mentioned previously, from 5.5 SP06 Patch 4 or 7.1 SP03, RetrieveLimitedAttributeValuesCommand returns PickList instances.

If you have stored the PickList instances beforehand, you can reuse these instances when creating SearchParameter as below. This will make the code much simpler.

```
int selectedPickList = xxx;
PickList pickList = pickLists[selectedPickList];
int selectedPickListItem = yyy;
PickListItem pickListItem =
   pickList.getPickListItems()[selectedPickListItem];

SearchParameter par =
   new SearchParameter(pickList.getSearchDimension(),
      pickListItem.getSearchConstraint());
```

3. Appendix

Sample Code

- Sample code download
  https://www.sdn.sap.com/irj/scn/go/portal/prtroot/docs/library/uuid/b01c248f-e13a-2c10-259c-a6b3bfbca350

References

- MDM Java API Online Help:
  http://help.sap.com/saphelp_nwmdm71/helpdata/en/46/7a11f8a13c0ad6e10000000a11466f/frameset.htm
- MDM Java API javadoc:
  http://help.sap.com/javadocs/MDM71/current/API/index.html
- How to Use the Master Data Management Java API for MDM SP06 Patch 1:
  https://www.sdn.sap.com/irj/scn/go/portal/prtroot/docs/library/uuid/b02f4f88-7bbb-2a10-67ad-d435b9f0c643
- MDM Data Manager Reference Guide on SAP Service Marketplace:
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