Oracle® Agile Product Lifecycle Management for Process
Extended Attribute Calculation Guide

Feature Pack 4.3

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Agile Product Lifecycle Management for Process

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Preface

Audience

This guide is intended for client programmers involved with integrating Oracle Agile Product Lifecycle Management for Process. Information about using Oracle Agile PLM for Process resides in application-specific user guides. Information about administering Oracle Agile PLM for Process resides in the *Oracle Agile Product Lifecycle Management for Process Administrator User Guide*.

Variability of Installations

Descriptions and illustrations of the Agile PLM for Process user interface included in this manual may not match your installation. The user interface of Agile PLM for Process applications and the features included can vary greatly depending on such variables as:

- Which applications your organization has purchased and installed
- Configuration settings that may turn features off or on
- Customization specific to your organization
- Security settings as they apply to the system and your user account

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Software Availability

Oracle Software Delivery Cloud (OSDC) provides the latest copy of the core software. Note the core software does not include all patches and hot fixes. Access OSDC at:

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Chapter 1—Overview

Calculated Extended Attributes allow you to create a read-only extended attribute (EA) that displays results of a calculation to the user. The calculation logic, specified in the Data Admin user interface for Extended Attributes, is written as a script which can access data from other extended attributes, custom sections, nutrients, and additional data of the owning business object (e.g., specifications). Additionally, the script can execute calls to custom classes to return additional data to the script.

Calculation scripts are written in a scripting language (such as JavaScript) and executed *server-side* by a script interpreter engine.

This document details the process of creating calculation scripts, accessing data from various available sources, and leveraging custom classes for the calculation.

Reference implementation code is also available in the Extensibility Pack release that provides guidelines and example implementations of creating custom calculation class extension points.

Chapter 2—Calculation Scripting

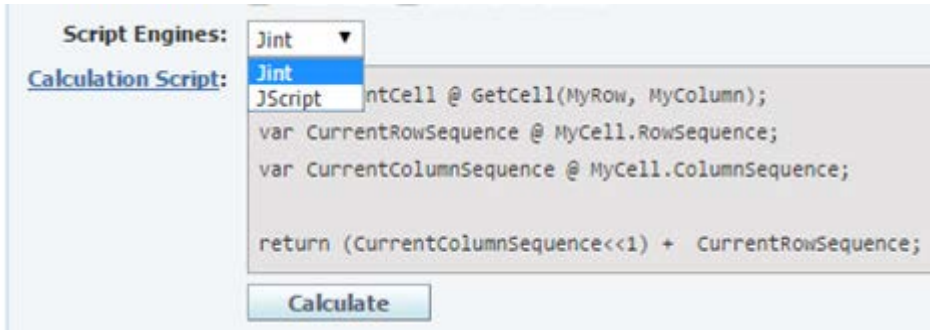
All Calculated EAs (Calculated Numeric, Calculated Text, and Calculated Boolean) must implement a calculation using JScript or JavaScript. However, most calculations require data available on the business object (specification, sourcing approval, etc.). Therefore, PLM for Process allows for ways to extend the scripting feature set by exposing many predefined PLM for Process functions and properties that give access to specific data. Additionally, scripts can execute custom classes and get a return value to aid in the calculation.

Script Engines

There are two script engines available for calculation scripts.

1. **JScript Engine** - This is the default scripting engine. Scripts are written in JScript (an interpreted, object-based scripting language that is the Microsoft implementation of the ECMA 262 language specification (ECMAScript Edition 3)), and must *use a slightly modified syntax* for variable assignment and comparison operators. All examples in this document are using JScript and the modified syntax.
2. **Jint Engine** – A new script engine introduced in the 6.2 release allows scripts to be written in traditional JavaScript, with no need to modify the syntax for variable assignment and comparison operators. Scripts written for the Jint engine can leverage all of the existing helper methods and functions defined in this document, and have a more intuitive and effective management and use of custom classes and methods.

The script engine is selected from the Data Admin Screen:



Configuration

Script Engines are configured in the CustomScriptEvaluationConfig.xml file in the config\Extensions directory. ScriptEngine entries are nodes within the Usage node for EACalculation. The JScript engine is configured as the default, but can be changed to the Jint engine using the attribute *default*. The ScriptEngines defined here are the ones available in the EA calculation screen in Data Admin.

Each Script Engine can use Script Helper classes to define new helper methods that can be called from the calculation script. See the Custom Calculation Classes section below for details.

Here is a sample configuration entry for EA Calculation, using an out-of-the-box helper class:

```
<ScriptEngine default="false" name="Jint"
FactoryURL="Class:Oracle.PLM4P.ScriptEvaluation.ScriptEngine.JintScriptEngineFactory,ScriptEva
luationLib" LogErrorsToUser="true">
      <ScriptHelper name="CoreHelper" UseInApps="*"
FactoryURL="Class:Xeno.Prodika.ExtendedAttributes.Calculation.Hosts.HostBasedScriptEvaluationF
acadeFactory,ProdikaLib">
      </ScriptHelper>
</ScriptEngine>
```

Script Results

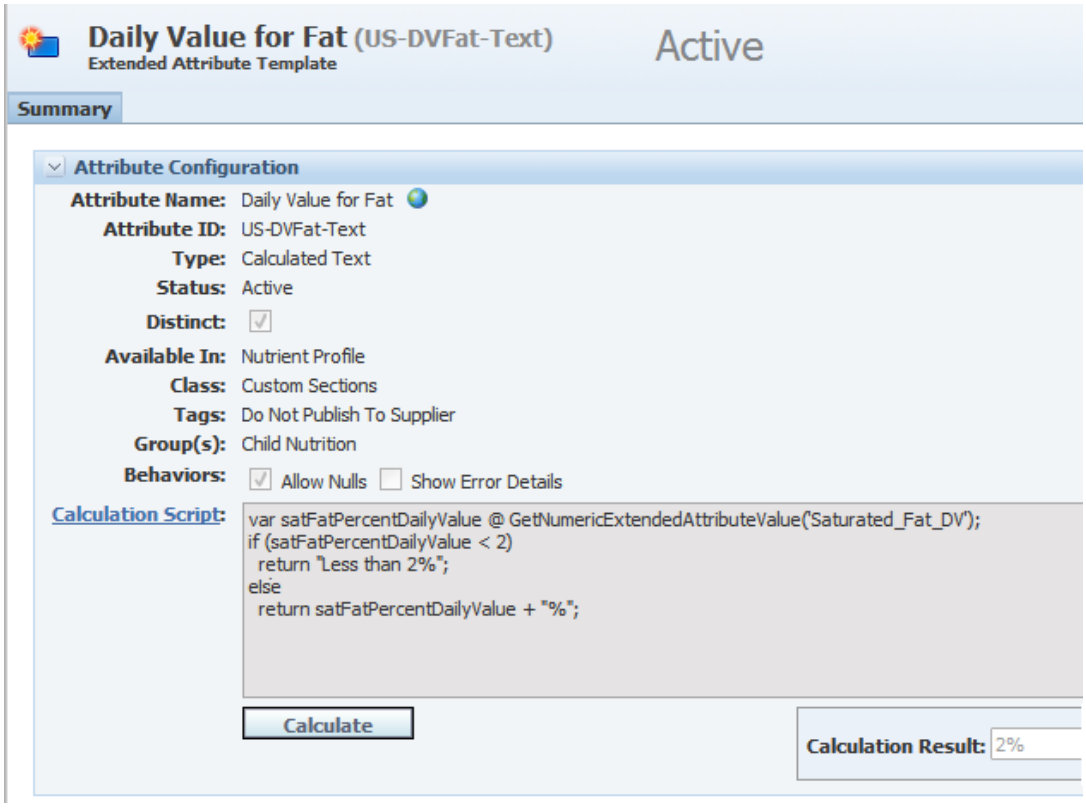
The basic calculation script requirement is to return a value that can be converted to the relevant .NET type.

- Calculated Boolean – must return a Boolean, or NULL
- Calculated Numeric – must return an integer, double, or float
- Calculated Text – must return a string.

For example:

```
var x @ GetNutrientPer100g('PROCNT');
return x/2;
```

The following screenshot demonstrates a Calculated Text extended attribute that uses JScript to determine if the daily value for fat is less than 2%. If it is it returns “Less than 2%”, otherwise it returns the daily value for fat, followed by a % symbol.



JScript Syntax Changes

When creating a *JScript* calculation script, there are several special syntactical modifications required for PLM for Process that differ from JScript.

Variable Assignment

You must use the '@' sign for assignment, which will get converted to an equals (=) sign when the script is being interpreted. For example:

```
var x @ 3.75; //declare variable x to be 3.75
```

Comparison Operators

When comparing values, use a single equals (=) sign, which will get converted to a double equals (==) sign when the script is being interpreted. For example:

```
if (x = y) //checks to see if x is equal to y
{ \\ do something . . . }
```

Likewise, use the <@ and @> signs for *less than or equal to* and *greater than or equal to*, respectively.

To test inequality, use !@ for *not equals* (!=). The following table lists the syntax changes required for JScript scripts.

Operation	Use this	Instead of this
Variable assignment	@	=
Equals	=	==
Not equals	!@	!=
Less than or equal to	<@	<=
Greater than or equal to	>@	>=

This sample JScript calculation shows how to do use conditional logic, variable assignment, and comparison with the required syntax changes for PLM for Process scripts.

```
var x @ 3; //declare variable x to be 3
var y @ 7; //declare variable y to be 7
var z @ 6; //declare variable z to be 6
var result; //declares a variable called result
result @ GetNutrientPer100g('PROCNT'); //assigned the Protein amount per 100g to result variable
if ( x = y ) //checks to see if x is equal to y
{
  if (z<y && y>x) //checks to see if z is less than y and y is greater than x
    result@result+1; //adds one to the result
  else
    result@result+2; //adds two to the result

}
else if ( x <@ y ) //checks to see if x is less than or equal to y
{
  if (z<y || y>x) //checks to see if z is less than y or y is greater than x
    result@result+10; //adds ten to the result
  else
    result@result+12; //adds twelve to the result
}
else // x is greater than y
{
  result @ 100; //set the result to 100
}
return result;
```

Other JScript Syntax

All other syntax rules can be found in the Microsoft JScript documentation available online:

http://msdn.microsoft.com/en-us/library/z688wt03(VS.80).aspx

Available PLM for Process Functions and Properties

One of the major features available to EA calculation scripts is the ability to access many out of the box PLM for Process functions and properties. These functions and properties provide access to various data elements of the business object that the EA is added to, such as nutrition information, compliance values, custom section and extended attribute values, and more.

Referencing the name of the function or property in the script will allow it to be called.

For example, the following script would return the value of the numeric extended attribute with a unique attributeID of “HeatIndex.” This is an example of how to set up a calculated attribute that references another extended attribute.

```
var heat @ GetNumericExtendedAttributeValue('HeatIndex');
return heat;
```

In the following example, a property called BeginningBatchSize, which returns the beginning batch size of a formulation specification, is used to evaluate the Protein per Batch calculation. The GetNutrientPer100g function is passed “PROCNT”, a nutrient id (see InFoods IDs in the Appendix) representing Protein. This script simply returns the result of dividing the protein amount per 100g by beginning batch size.

```
return BeginningBatchSize/GetNutrientPer100g('PROCNT');
```

A detailed listing of all available functions and properties is available in Available Properties and Functions**.**

Calculation Warnings and Errors

When calling some of the predefined functions, warning messages may get generated under certain conditions. For instance, when trying to retrieve a specific EA that is not on the business object, a warning is created and would be viewable to the user. Turning calculation warnings off prior to the EA retrieval would prevent that warning message from being displayed.

You can control calculation warnings and errors using the following techniques:

- **TurnWarningsOff()** — Turns warnings off in the following lines of code until it is turned back on or the script ends
- **TurnWarningsOn()** — Turns warnings on in the following lines of code until it is turned off explicitly. Warnings are on by default
- **AddErrorMessage(<string>)** — Displays an error message within quotes
  ex: AddErrorMessage('Error in running this script')

For example:

```
TurnWarningsOff();
var override @ GetNumericExtendedAttributeValue('FPCalciumOverride','ME', -1, -1);
TurnWarningsOn();

var roundedCalciumPerServing @ GetNumericExtendedAttributeValue('FPCalciumRounded', -1234567890, -
1234567890);

if (roundedCalciumPerServing = -1234567890)
{
  AddErrorMessage('Please correct this problem by adding Calcium to the Nutrition Panel.');
}
else
{
  if(override > -1)
  {
    return override;
  }
}
return roundedCalciumPerServing;
```

In this example, if the FPCalciumOverride extended attribute is not found it will *not* display a warning icon, however if it cannot find FPCalciumRounded it *will* display the warning. In addition, if FPCalciumRounded is null (-1234567890) then it will also display the additional error message. You could also turn warnings off here and just display your added error message.

Calculation Dependencies

If your custom calculation script is leveraging other calculated extended attributes, retrieving their value will force them to be calculated too, unless they have already been calculated. This occurs regardless of in which order the extended attributes are located in the UI.

Processing Results Returned by an Enumerator

When results are returned as an enumerator by functions such as GetCells (see Available Properties and Functions), a loop structure is used to iterate through it in order to access a particular cell data. Two methods are used to access each item in an enumerator:

Method 1

```
var item;
var cellsInRow @ GetCells(MyRow,,, 'LEFT');
while(cellsInRow.MoveNext())
{
        item @ cellsInRow.Current;
        // at this point your item variable is a cell object
}
```

Method 2

```
var item;
var cellsInRow @ GetCells(MyRow,,, 'LEFT');
for(;cellsInRow.MoveNext();)
{
        item @ cellsInRow.Current;
        // at this point your item variable is a cell object
}
```

Chapter 3—Available Properties and Functions

Note that example scripts provided in this section are based on the JScript modified syntax. However, these properties and functions are also available to the Jint engine (except without the "@"syntax changes).

Variables of Current Business Object

Any variables that are not defined on a business object will return a zero (0).

Variable Name	Return value
`BeginningPercentTS`	The beginning % total solids value from the specification
`FinalPercentTS`	The final % total solids value from the specification
`TotalSolids`	The total solids value from the specification
`FinalPercentTSOverride`	The final % total solid override value from the specification
`Density`	The density value from the specification
`FinalDensity`	The final density value from the specification
`FinalDensityOverride`	The final density override value from the specification
`AmountPerServing`	The amount per service value from the specification
`ReferenceAmount`	The reference amount value from the specification
`BeginningBatchSize`	The beginning batch size value from the specification
`ApproximateYield`	The approximate yield value from the specification

Note: All values in the database are stored as % solid values even if your system is configured to display % moisture.

Nutrient Functions

Function	Definition	Common Parameters and Definitions
`GetNutrientItemRoundedValue`	Returns the rounded value of the Nutrient declared.	• <infoodsID>—String value representing the ID of the nutrient to obtain • <returnValIfNotDeclared>—Optional, numeric value to be returned if the nutrient is not declared • <returnValIfNotDefined>—Optional, numeric value to be returned if the nutrient is not defined
`GetNutrientPer100g`	Returns the declared value of the Nutrient declared Per 100 grams.	
`GetNutrientPer100mL`	Returns the declared value of the Nutrient declared Per 100 ml.	
`GetNutrientValuePerServing`	Returns the per-serving value of the Nutrient declared.	

Tare Weight Functions

Function	Definition	Common Parameters and Definitions
GetTareWeight	Returns the Tare Weight information from the specification.	• <uomISOCode>—Optional, string value representing the ISO code of the UOM the extended attribute is expressed • <returnValIfNotDefined>—Optional, numeric value to be returned if the tare weight additive is not defined
GetTareWeightReferenceWeight	Returns the Reference Weight information from the specification.	

Tare Weight Properties

Function	Definition	Common Parameters and Definitions
TareWeightPer	Returns the value from the Tare Weight Per field as described on the specification.	

Total Cost

Function	Definition	Common Parameters and Definitions
`GetSpecTotalCost`	Returns the sum total of cost on the trade and/or formulation specification. When used on the trade, this function sums the cost of directly associated lower level trade specifications, packaging specifications and the material specification (if applicable). When used on the formulation, this function sums the cost of directly associated packaging and material inputs.	• <currencyISOCode>—Optional, string value representing the ISO code of the currency the extended attribute is expressed. If not specified, we will use the spec preferred currency as default. • <returnValIfNotDefined>—Optional, a string value to be returned if the method is not defined.
`GetMatSpecTotalCost`	Returns the total cost of the directly associated material specification(s) on the trade and/or formulation specification.	
`GetPkgSpecTotalCost`	Returns the total cost of the directly associated packaging specification(s) on the trade and/or formulation specification.	

Compliance Functions

Function	Definition	Common Parameters and Definitions
GetAdditiveKTCMax100g	Returns the declared value of the Known To Contain Additive.	• <ComplianceID>—String value representing the ID of the compliance item to obtain • <uomISOCode>—Optional, string value representing the ISO code of the UOM the extended attribute is expressed • <returnValIfNotDeclared>—Optional, numeric value to be returned if the compliance item is not declared • <returnValIfNotDefined>—Optional, numeric value to be returned if the compliance item is not defined
GetAdditiveMCMax100g	Returns the declared value of the May Contain Additive.	
GetAllergenKTCMax100g	Returns the declared value of the Known To Contain Allergen.	
GetAllergenMCMax100g	Returns the declared value of the May Contain Allergen.	
GetSensitivityKTCMax100g	Returns the declared value of the Known To Contain Intolerances/Sensitivity.	
GetSensitivityMCMax100g	Returns the declared value of the May Contain Intolerances/Sensitivity.	

Extended Attribute Functions

Distinct Extended Attribute Value Functions

Note that when retrieving EAs by the attribute ID, **the EA must be configured as Distinct** in Data Admin.

Function	Definition	Common Parameters and Definitions
GetMaxRangeExtendedAttributeValue	Returns the declared value of the extended attribute	▪ <extAttrID>—String value representing the Attribute ID of the extended attribute to obtain for use in the calculation ▪ <uomISOCode>—Optional, string value representing the ISO code of the UOM in which the extended attribute is expressed ▪ <returnValIfNotDeclared>—Optional, numeric value to be returned if the extended attribute is not declared ▪ <returnValIfNotDefined>—Optional, numeric value to be returned if the extended attribute is not defined, or if the extended attribute has been defined but is not of type Numeric
GetMinRangeExtendedAttributeValue		
GetNumericExtendedAttributeValue		
GetTargetRangeExtendedAttributeValue		

Distinct Extended Attribute Boolean Functions

Function	Definition	Common Parameters and Definitions
IsBooleanExtendedAttributeSet	Each of these functions returns true if the <extAttrID> exists and a value is set; otherwise false.	<extAttrID>—String value representing the Attribute ID of the extended attribute to obtain for use in the calculation
IsExtendedAttributeMinValueSet		
IsExtendedAttributeMaxValueSet		
IsExtendedAttributeTargetValueSet		
IsNumericExtendedAttributeSet		
IsQualitativeExtendedAttributeValueSet		
IsQualitativeLookupExtendedAttributeSet		

Custom Section Functions

Custom Section Cell Properties

Property	Definition	Return Value	Example
MyCell	A property that identifies a cell of a current extended attribute.	A cell object value	`var selfCell @ MyCell;`
MyColumn	A property that identifies an Agile handle of a column that extended attribute is located on.	String value that represents column Agile handle	`var currentCollumn @ MyColumn;`
MyRow	A property that identifies an Agile handle of a row that extended attribute is located on.	String value that represents row Agile handle	`var currentRow @ MyRow;`

Custom Section Cell Retrieval Functions

Function	Definition	Return value	Common Parameters and Definitions
GetCell Example: `var x @ GetCell(MyRow,MyColumn);`	A function that identifies a cell specified by a row and a column.	A cell object	<rowHandle>—An Agile handle of a row <columnHandle>—An Agile handle of a column

GetCells
 	
`var typeFilter @ new Array(2);`
`typeFilter[0] @ 'Boolean';`
`typeFilter[1] @ 'Numeric';`
`var allCellsInTestColumn @ GetCells(`
`,'Test',,);`
`var allFilteredCellsInLeftToMyCell @`
 	
`GetCells(MyRow,,typeFilter,'LEFT');`
	A function that identifies list of cells specified by a combination of row, column, EA type, and direction. It may include current cell as a part of the result. If both <rowID> and <columnID> are null parameters, returns an empty enumeration.	A list of cell objects	<rowID>—User-defined row ID or an Agile handle of a row. If a null parameter, it acts as all rows.
			
			<columnID>—User-defined column ID or an Agile handle of a column. If a null parameter, it acts as all columns
			
			<typeFilter>—An array of string values that represent extended attribute types that needs to be filtered. If a null parameter, it ignores this filtering. Valid values are:
			
			- Boolean
			- Calculated Boolean
			- Calculated Numeric
			- Calculated Text
			- Date
			- Free Text
			- Long Free Text
			- Long Multi-lingual Free Text
			- Multi-lingual Free Text
			- Numeric
			- Qualitative Lookup
			- Qualitative
			- Quantitative Range
			- Quantitative Tolerance
			- Referenced Item Collection
			
			<directionFilter>—A string that represents a location of cells relative to the current extended attribute. If a null

Function	Definition	Return value	Common Parameters and Definitions
			parameter, it ignores this filtering. Valid values are: - UP - DOWN - LEFT - RIGHT
GetCellInMyColumnByRowID Example: `var x @ GetCellInMyColumnByRowID ('XY');`	A function that identifies a cell in a current extended attribute column specified by a row. If more than one cell matches, returns the first cell in the result.	A cell object	<rowID>—User-defined row ID or an Agile handle of a row
GetCellInMyRowByColumnID Example: `var x @ GetCellInMyRowByColumnID('B');`	A function that identifies a cell in a current extended attribute row specified by a column.	A cell object	<columnID>—User-defined column ID or an Agile handle of a column
GetCellsByRow Example: `var x @ GetCellsByRow(MyRow)`	A function that identifies an enumeration of cells in a specified row. Can return cells from multiple rows if they are bounded by the same ID. It may include current cell as a part of the result.	A list of cell objects	<rowID>—User-defined row ID or an Agile handle of a row
GetCellsByColumn Example: `var x @ GetCellsByColumn('Test')`	A function that identifies an enumeration of cells in a specified column. It may include current cell as a part of the result.	A list of cell objects	<columnID>—User-defined column ID or an Agile handle of a column

Cell Object Properties

Property	Return value
ColumnHandle	String value representing a column's Agile handle
ColumnId	String value representing the user-defined column ID
ColumnSequence	Integer representing a cell column sequence
RowHandle	String value representing a row's Agile handle
RowId	String value representing the user-defined row ID
RowSequence	Integer representing a cell row sequence
Type	Extended attribute type. Possible types are: 'Boolean' 'Calculated Boolean' 'Calculated Numeric' 'Calculated Text' 'Date' 'Free Text' 'Long Free Text' 'Long Multi-lingual Free Text' 'Multi-lingual Free Text' 'Numeric' 'Qualitative Lookup' 'Qualitative' 'Quantitative Range' 'Quantitative Tolerance' 'Referenced Item Collection'
Value	A property that lets you retrieve the extended attribute value of a cell object. ex: var numValue @ GetCellInMyRowByColumnID('Test').Value.GetNumericValue()

Cell Object Value Functions

Function	Definition	Return value	Parameters and Definitions
GetBooleanValue Example: var x @ GetCellInMyRowByCol umnID('Test').Value.GetBooleanValue()	Retrieves boolean value of an extended attribute.	integer 0 is false, 1 is true, -1 if not set	none
GetDateValue Example: var x @ GetCellInMyRowByCol umnID('Test').Value.GetDateValue()	Retrieves datetime value of an extended attribute.	dateTime	none
GetFreeTextExtendedAttributeValue Example: var x @ GetCellInMyRowByCol umnID('Test').Value.GetFreeTextExten dedAttributeValue()	Retrieves string value of a free-text extended attribute.	String	none
GetMultipleValues Example: var x @ GetCellInMyRowByCol umnID('Test').Value.GetMultipleValues()	Retrieves selected qualitative values that are on an extended attribute.	Array of strings	none
GetNumericValue Example: var x @ GetCellInMyRowByCol umnID('Test').Value.GetNumericValue	Retrieves numeric value of an extended attribute. Reports an error if it	numeric	<ISOCode>—An optional parameter, specifying a UOM. If specified, the extended

Function	Definition	Return value	Parameters and Definitions
() var x @ GetCellInMyRowByCol umnID('Test').Value.GetNumericValue ('KG')	is unable to convert to the specified UOM, returns -123456789.		attribute's value is firstly converted from the extended attribute's default UOM to this UOM, then that value is returned.
GetQualitativeExtendedAttributeValue Example: var x @ GetCellInMyRowByCol umnID('Test').Value.GetQualitativeExtendedAttributeValue()	Retrieves string value of a qualitative extended attribute.	A comma-delimited string that represents the selected extended attribute value(s)	none
GetQualitativeLookupExtended AttributeValue Example: var x @ GetCellInMyRowByCol umnID('Test').Value.	Retrieves string value of a qualitative-lookup extended attribute.	A comma-delimited string that represents the selected extended attribute value(s)	none
GetRangeValue Example: var x @ GetCellInMyRowByCol umnID('Test').Value. .GetRangeValue('max') var x @ GetCellInMyRowByCol umnID('Test').Value.GetRangeValue('min','KG')	Retrieves numeric value of an extended attribute based on a property type provided. Reports an error if it is unable to convert to specified UOM, returns -123456789.	numeric	<rangeType>—A string value that specifies type of property to retrieve; case insensitive. Valid values are 'min', 'max', 'target'. <ISOCode>—An optional parameter, specifying a UOM. If specified, the extended attribute's value is firstly converted from the extended attribute's default UOM to this UOM, then that value is returned.
GetStringValue Example: var x @ GetCellInMyRowByCol umnID('Test').Value.GetStringValue()	Retrieves the string value of an extended attribute.	String If EA has multiple selected values, returns comma-delimited string of those values	none

Chapter 4—Custom Calculation Classes

Clients wishing to have more control over calculations, consolidate their calculation logic, or access other data not directly available through the script properties and functions listed above, may call out to custom classes from their scripts. The custom classes get executed and return a result back to the script. They may optionally receive parameter data from the script.

JScript Custom Classes (aka Dynamic Script Methods)

Note that while Dynamic Script Methods are fully functional and supported for JScript, an improved implementation option is available that does not restrict the helper class to one method. See the Creating Custom Helper Methods section below for details.

Dynamic script methods allow customers to call to a specific class to invoke a helper method. Customers create a class, add the class to a configuration to make it accessible to the EA Calculation, and use a predefined PLM for Process function, called **MethodInvoke**, to call out the desired class. Most of the functions that are available in JScript are also available to the custom class, albeit with some slight differences in naming and parameters required. Additionally, the business object attached to the EA can be accessed.

The **MethodInvoke** JScript call takes two parameters:

1. The key that references your custom class. This key/name is added to the CustomerSettings.config file. See below for more details.
2. An array of data to pass into your custom class. See example below.

For example:

```
var params @ new Array(1);
params(0) @ GetNumericExtendedAttributeValue('BOX_LENGTH');
var emptyVol @ MethodInvoke('MySampleEmptyVolumeCalculator', params);
```

Class Structure

A custom calculation class must implement the interface `Xeno.Prodika.ExtendedAttributes.Calculation.IDynamicScriptMethod`, referencing the ProdikaLib.dll assembly.

Figure 1. IDynamicScriptMethod interface

Your custom business logic is coded in this Invoke method, and must return an object, which can be used as needed by the script that receives the result. JScript can then convert the returned object to the required data type.

The Invoke method takes the following arguments:

1. Parameters: an object array that is passed in from the JScript, which clients can use to pass relevant information to the custom calculation class.

2. Context: an `IDynamicScriptMethodContext` object. See below.

Figure 2. iDynamicScriptMethodContext object

The `IDynamicScriptMethodContext` object provides:

- Errors: Access to the Errors collection.
- WarningsOff: A property to allow for turning Warnings on/off.
- AddErrorMessage(): method that only adds an error if Warnings are set to Off
- DynamicScriptVariableResolver: returns a utility class (`IDynamicScriptExtendedAttributeVariableResolver`) that provides many of the same method calls and variables that are available in the JScript functions.
    - The Entity property gives access to the ***in-memory*** business object that holds the EA (e.g., a trade specification).
    - **Note: If your custom calculation class is leveraging *other* calculated extended attributes, use the DynamicScriptVariableResolver to retrieve their values, which will ensure they get calculated. Do not retrieve them from the Entity directly, as they may not be calculated yet.**
- VariableResolver – obsolete – do not use

Example

The following example demonstrates a simple custom calculation class that calculates the empty volume in a product package. For illustration purposes, it receives two values directly from the JScript, length and width, as input parameters. It then retrieves (with Warnings off) extended attribute values for two

EAs, calculates and returns the volume, and adds a warning message if the calculated result is less than 0.

```
using Xeno.Prodika.ExtendedAttributes.Calculation;

namespace CalculationExtensions.ExtendedAttributes
{
    public class SampleEmptyVolumeCalculator : IDynamicScriptMethod
    {
        public object Invoke(object[] parameters, IDynamicScriptMethodContext context)
        {
            double volume = 0.0;
            double length = double.Parse(parameters[0].ToString());
            double width  = double.Parse(parameters[1].ToString());

            context.WarningsOff = true;
            double height = GetExtendedAttribute(context,"BOX_HEIGHT", "IN"); // inches
            double fill   = GetExtendedAttribute(context, "FILL", "CI"); //cubic inches
    context.WarningsOff = false;

            volume = (length * width * height) - fill;
            if (volume < 0)
            {
                // this adds errors to the UI when calculation is triggered, if the calculated value is ne
gative.
                context.AddErrorMessage("Empty Volume has returned a negative number");
            }
            return volume;
        }

        private double GetExtendedAttribute(IDynamicScriptMethodContext context
                    , string attributeID, string UOM)
        {
            return context.DynamicScriptVariableResolver.GetExtendedAttributeValue(attributeID,
                    UOM, -1, -1);
        }
    }
}
```

The JScript for the EA would look like the following:

```
var result;
var params @ new Array(2);

params(0) @ GetNumericExtendedAttributeValue('BOX_LENGTH');
params(1) @ GetNumericExtendedAttributeValue('BOX_WIDTH');

result @ MethodInvoke('MySampleEmptyVolumeCalculator', params);

return result;
```

Configuration

To enable your custom class for EA calculations, you must add it to the CustomerSettings.config file:

Find the <Extended Attributes><DynamicScriptMethods> section and add a new entry for your custom class:

```
<add key="YourCustomFunctionName"
  value="Class:<Fully qualified namespace.classname>,<DLLName>" />
```

Example:

```
<add key="MySampleEmptyVolumeCalculator"
value="Class:CalculationExtensions.ExtendedAttributes.SampleEmptyVolumeCalculator,CalculationE
xtensions" />
```

Deployment

Build your class library and copy the DLL to the bin folders of each module that will need to access it.

- {PRODIKA_HOME}\Web\gsm\bin (For GSM)
- {PRODIKA_HOME}\Web\scrm\bin (For SCRM)
- {PRODIKA_HOME}\Web\pqm\bin (For PQM)
- {PRODIKA_HOME}\Web\reg\bin (For ADMIN)

Reset IIS for configuration changes to take effect.

Example 2

The following example demonstrates a custom calculation class that calculates the total costs for a trade specification. We also created another class for formulation specification, the usage of them are all the same. This method will receive a parameter from Jscript(abbreviation of currency), this parameter also can be set to ‘’, then it will try to convert context.DynamicScriptVariableResolver.Entity to ITradSpecBO, if it works then continue to calculate the total cost for the spec, if any errors occur it will add a warning message and return 0.

FUNCTION LIST

Function Name in JScript	Parameter	Return value (assume USD is the preferred currency)
TradeTotalCostsCalculator	‘USD’	10.00
TradeTotalCostsCalculator	‘CNY’	60.00
TradeTotalCostsCalculator	‘’	10.00 USD
FormulationTotalCostsCalculator	‘USD’	10.00
FormulationTotalCostsCalculator	‘CNY’	60.00
FormulationTotalCostsCalculator	‘’	10.00 USD

Code

```
namespace CalculationExtensions.ExtendedAttributes
{
    class TradeSpecTotalCostsCalculator : IDynamicScriptMethod
    {
        public object Invoke(object[] parameters, IDynamicScriptMethodContext context)
        {
            string abbr = parameters[0].ToString();
            var currency =
CommonCostHelper.CurrencyService.GetCurrencyByAbbriviation(abbr);
            var specBo = context.DynamicScriptVariableResolver.Entity as ITradeSpecBO;
            if (specBo == null) return 0;
            var specDo = (IGSMTradeSpecDO)specBo.DataObject;
            var sourceCost = CommonCostHelper.CreateCost(specDo.TheoreticalCost);
            var targetCurrencyId = currency != null ? currency.PKID :
specBo.PreferredCurrency.PKID;
            var targetCost = CommonCostHelper.CreateDefaultCost(targetCurrencyId, 1,
TradeSubComponentCostHelper.RollupCostPerValueUOM.PKID);
            if (CommonCostHelper.TryConvertCostExceptUOM(sourceCost, ref targetCost))
            {
                if (currency != null)
                {
                    return targetCost.Price;
                }
                return targetCost.Price + " " +
specBo.PreferredCurrency.CurrencyML.Abbreviation;
            }
            context.AddErrorMessage("An errors occurred during conversion.");
            return 0;
        }
    }
}
```

Deployment

Build your class library and copy the DLL to the bin folders of each module that will need to access it
{PRODIKA_HOME}\Web\gsm\bin
{PRODIKA_HOME}\Web\reg\bin

Configuration

Find the <Extended Attributes><DynamicScriptMethods> section in CustomerSettings.config file and add a new entry for the custom class,

<add key="TradeSpecTotalCostsCalculator"
value="Class:CalculationExtensions.ExtendedAttributes.SpecTotalCostsCalculator,CalculationExtensions" />

Calculation Script

Create a Calculated Text EA to invoke this new function, the JScript for the EA would look like the following:

```
var result;
var params @ new Array(1);
params(0) @ 'USD'
result @ MethodInvoke('TradeTotalCostsCalculator', params);

return result;
```

Reset IIS for configuration changes to take effect

Determining Calculation Location

Calculation scripts must be tested in Data Admin as well as when on an actual business object. However, when running the script in Data Admin, you will not have access to other EAs that may be required in when on the business object. This may lead your script to return an invalid result in Data Admin, but a valid result on a specification. Therefore, you can determine in your script whether or not you are executing the script on a real business object or not, and modify the script, if needed. For instance, you could turn warnings off when the script is running in Data Admin.

The following code will return *true* if you are running this for an actual business object, or false if running this in Data Admin:

```
if (context.DynamicScriptVariableResolver.Entity is IXUniqueObject) {…}
```

Performance Considerations

Be aware that having a large number of calculated EAs on a business object may have a negative effect on performance. If utilizing many custom classes to perform calculations, try to limit their impact as much as possible by minimizing the scope of their work, using caching (if applicable), and consolidating classes if possible.

Creating Custom Helper Methods

Customer script helper classes can be used to provide multiple methods and properties to the calculation script. These helper classes are specified in the config\extensions\CustomScriptEvaluationConfig.xml configuration file. The helper class is specified as a ScriptHelper node to the /ScriptEvaluationUsages/Usage[name="EACalculation"]/ScriptEngine element.

```
<ScriptEvaluationUsages configChildKey="name">
	<Usage name="EACalculation" configChildKey="name">
		<ScriptEngine name="Jint"
FactoryURL="Class:Oracle.PLM4P.ScriptEvaluation.ScriptEngine.JintScriptEngineFactory,ScriptEva
luationLib" LogErrorsToUser="true">
			<ScriptHelper name="CoreFacade" UseInApps="*"
FactoryURL="Class:Oracle.PLM4P.ScriptEvaluation.ScriptEvaluationHelpers.CoreScriptEvaluationHe
lperFacadeFactory,ScriptEvaluationLib"></ScriptHelper>
			<ScriptHelper name="MyCustomScriptHelper" UseInApps="*"
FactoryURL="Class:Examples.ScriptEvaluationHelpers.EACalculation.EvaluationHelperFacadeFactory
,MyCustomUtils"></ScriptHelper>
			<ScriptHelper name="MyGSMCustomScriptHelper" UseInApps="GSM"
FactoryURL="Class:Examples.ScriptEvaluationHelpers.EACalculation.GSMEvaluationHelperFacadeFact
ory,MyCustomUtils"></ScriptHelper>
		</ScriptEngine>
	</Usage>
```

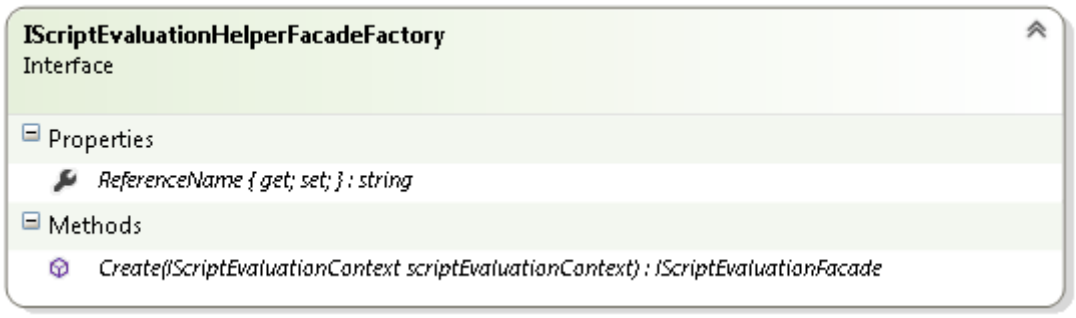
The **name** attribute is used to refer to the helper class inside your scripts (e.g., MyGSMCustomScriptHelper.IsSpecApproved()).

The **UseInApps** attribute specifies which application (or comma delimited a list of applications) this helper is available for (e.g., “GSM,SCRM,NPD”). The asterisk (*) is used to indicate that it is available to all applications.

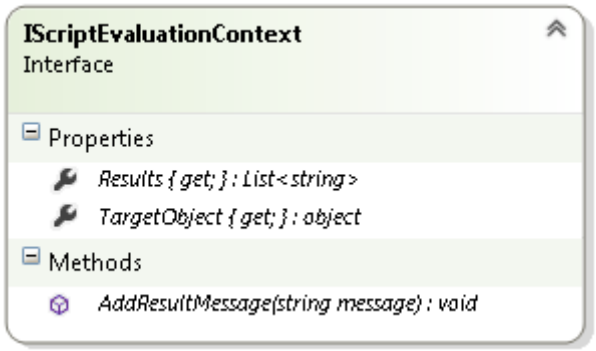
The **FactoryURL** attribute specifies the class you will be using, using the ObjectLoaderURL syntax. See the Extensibility Guide Appendix for more details.

The script helper class must be designed as follows:

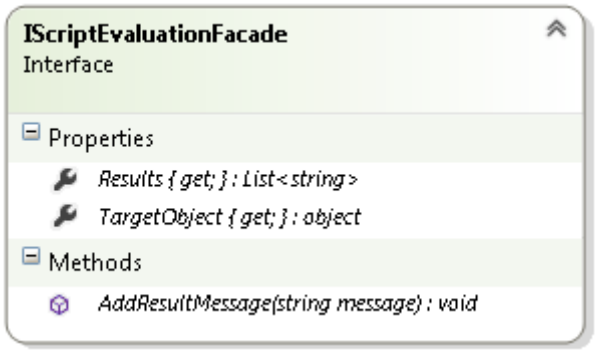
A factory class that implements Oracle.PLM4P.ScriptEvaluation.ScriptEvaluationHelpers.IScriptEvaluationHelperFacadeFactory from the ScriptEvaluationLib.dll, and implements a simple Property for the ReferenceName and a Create method that returns a ScriptEvaluatrionHelperFacade class.



The Create method receives a scriptEvaluationContext as a parameter, which contains IScriptEvaluationContext interface which contains a list of Results (for EA Calculation, this represents the list of calculation errors) and TargetObject which holds the current object being validated.



The implementation of IScriptEvaluationHelperFacade is the class that will be providing your helper methods.



Extending the existing CoreScriptEvaluationFacade will simplify you class, as you will not have to implement the Properties and Methods defined above. This lets your class focus on the helper methods you want to add.

Appendix A—In Foods IDs and UOM ISO Codes

InFoods IDs

Run the following SQL query to retrieve the list of InFoods IDs:

```
select ml.Name, p.InFoodsID, p.UNID, p.SequenceNumber
from
       comStandardNutrientProperties p
       inner join comStdNutrientPropertiesML ml
       on ml.fkStandardNutrientProperties = p.pkid
          and langID = 0 and Status = 1
order by ml.name
```

Some common InFoods IDs:

Name	InFoods ID	UNID	Sequence
Calcium	CA	CA	350
Calories	ENERC_KCAL	ENERC_KCAL	10
Carbohydrate (Available)	CHOAVL	CHOAVL	45
Carbohydrates	CHOCDF	CHOCDF	40
Cholesterol	CHOLE	CHOLE	190
Dietary Fiber	FIBTS	FIBTS	50
Energy kJ	ENERC_KJ	ENERC_KJ	20
Iron	FE	FE	370
Polyunsaturated Fat	FAPU	FAPU	150
Potassium	K	K	400
Protein	PROCNT	PROCNT	30
Protein (Nx6.25)	PROCNT_NX625	PROCNTx625	32
Saturated Fat	FASAT	FASAT	130
Sodium	NA	NA	410
Total Fat	FAT	FAT	120
Total solids	TTLSOLID	TTLSOLID	205
Total Sugar	SUGAR	SUGAR	70
Trans Fatty Acid	FATRN	FATRN	180
Vitamin A - IU	VITA_IU	VITA_IU	223
Vitamin A - Total	VITA-	VITA-	220
Vitamin C	VITC	VITC	290
Vitamin D	VITD-	VITD-	300
Vitamin E	VITE	VITE	310
Vitamin K	VITK	VITK	330
Zinc	ZN	ZN	420

Unit of Measure ISO Codes

Run the following SQL query to retrieve the list of UOMs:

```
SELECT Name, Abbreviation, id, ISOCode, Status
FROM UOM a INNER JOIN UOMML ml
      ON ml.fkUOM = a.pkid AND ml.langID = 0
ORDER BY name
```