Using BRFplus with a Third-Party Rules Engine

Applies to:

Business Rules Framework plus shipped with enhancement package 1 for SAP NetWeaver 7.0.

Summary

This document describes the implementation of a connection from BRFplus to a third-party rules engine via a JCo based connector. The document also explains the execution of BRFplus functions, implementation of the BRMS connector expression and the process involved in setting the third-party rules engine.

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About the Authors

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Introduction

Business Rules Framework (BRFplus) is a business rules engine written entirely in ABAP. It provides an extensible framework for business rules definition and execution. From a rules modeling perspective, sometimes, it is advantageous to use a rules engine in a non-ABAP domain. The reasons for such an approach could include the following:

- The need to utilize specific features outside of the ABAP stack, such as stack-dependent actions or data retrieval which require tight integration with Java or non-ABAP applications.
- The need to use a rules engine with very specific features like a dedicated pricing engine or a product configurator or specific modeling tools.

The document will explain the implementation of the connection and the benefits of using this approach.

Suggested Reading

If you are not familiar with BRFplus, the following documents should give you an overview of the concepts in BRFplus. To learn about expression and action types and how to use them in the UI and API, refer to the *Expression and Action Types* document.

- **BRFplus – The Very Basics**
- **Expression and Action Types**

Background

BRFplus provides business rules definition using expressions, functions, and rulesets. The richness of the framework lies in the variety of expression types which are supported.

Each expression type involves

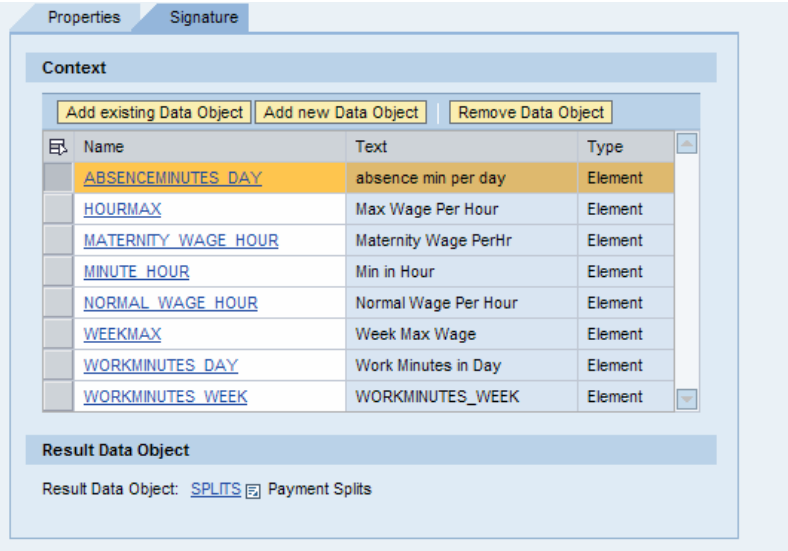
- The runtime definition of the expression type
- The user interface associated with the expression
- The persistence and administration-related aspects associated with an expression type

With NetWeaver release **7.0 EHP1** and **7.1 EHP1**, BRFplus provides a new expression type for connecting to third-party rules engines. The same expression type is also used for connecting to SAP's Java based business rules offering called **NetWeaver Business Rules Management (NW BRM)**. NW BRM is a business rules platform fully integrated with **NetWeaver Composition Environment (CE)** and the next generation Business Process Management (BPM) offering (codename **Galaxy**).

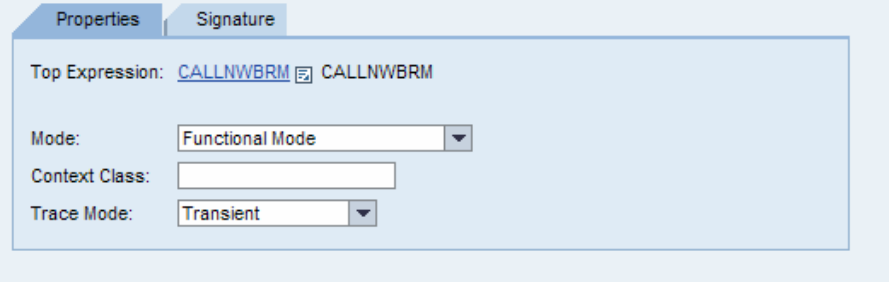
Setting up the Connection

Defining the Function

The usual starting point for business rules in BRFplus is a function (which you define in the context of an application). A function has inputs and outputs. In the BRFplus user interface, the outputs are termed result objects. For the inputs, the context (data objects) has to be specified in the signature section. The image below shows a function signature.



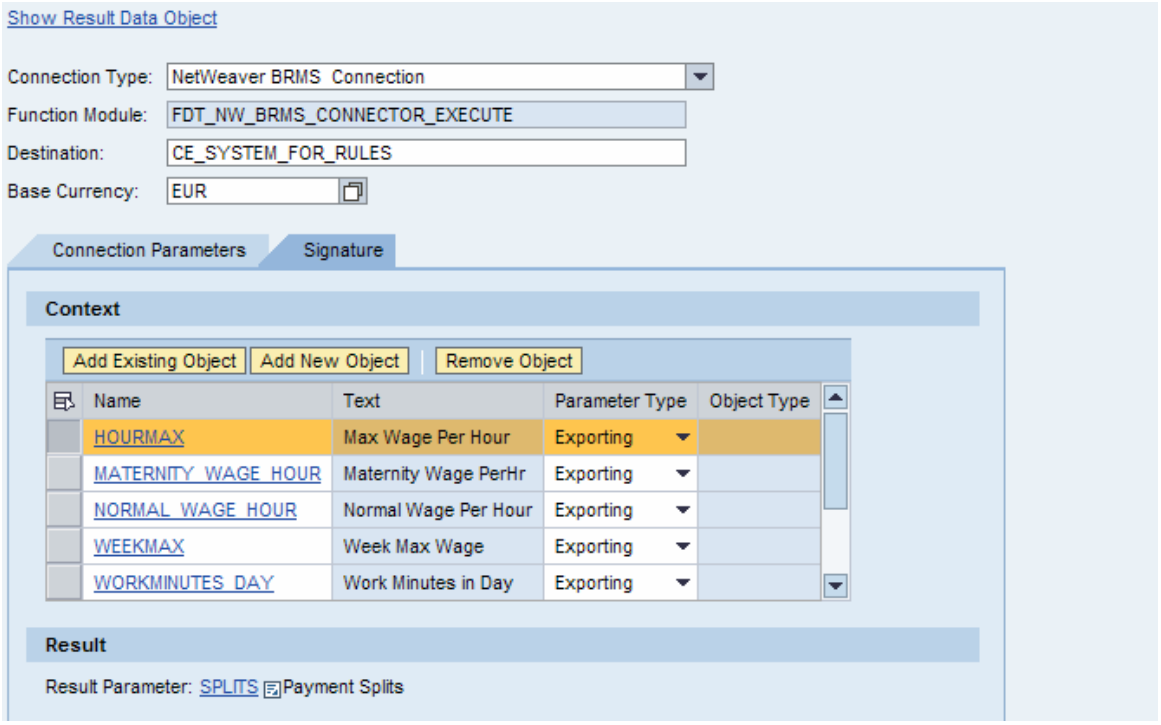
The function has to be assigned a top expression.



In the image shown above, the top expression is an expression called *CALLNWBRM*. We will see how this expression connects to NW BRM. This expression can also be used to connect to a different third-party rules engine.

Defining the Expression

A function performs its calculations by invoking the expressions with the data provided. Each expression can call other expressions to achieve the desired results. The NW BRM connector expression achieves its results by calling the external rules engine. The following image shows how this connection is specified.



The key concepts involved in defining the BRMS connector expression are as follows:

Connection Type

There are two types of connection available, *NetWeaver BRMS Connection* or *External BRMS Connection.*

Function Module

This property is preselected based on the type of connection you choose.

Destination

Create a Remote Function Call (RFC) destination (transaction SM59) in AS ABAP with connection type as *TCP/IP Connection* and configure the gateway host, gateway service name and Program ID.

Signature

The signature of the BRMS connector contains the context (input) and the result (output).

Context

The context defines the parameters that are passed to the external BRMS as input. These parameters can be of two types.

- **Exporting**

  Exporting parameters are input parameters to the external BRMS which are read only. Even if the parameters are changed in the external BRMS, these value changes will not be reflected in BRFplus after the processing of the expression.

- **Changing**

  Changing parameters are input parameters to the external BRMS whose values can be changed. The modified values are reflected in BRFplus after the processing of the expression. The input

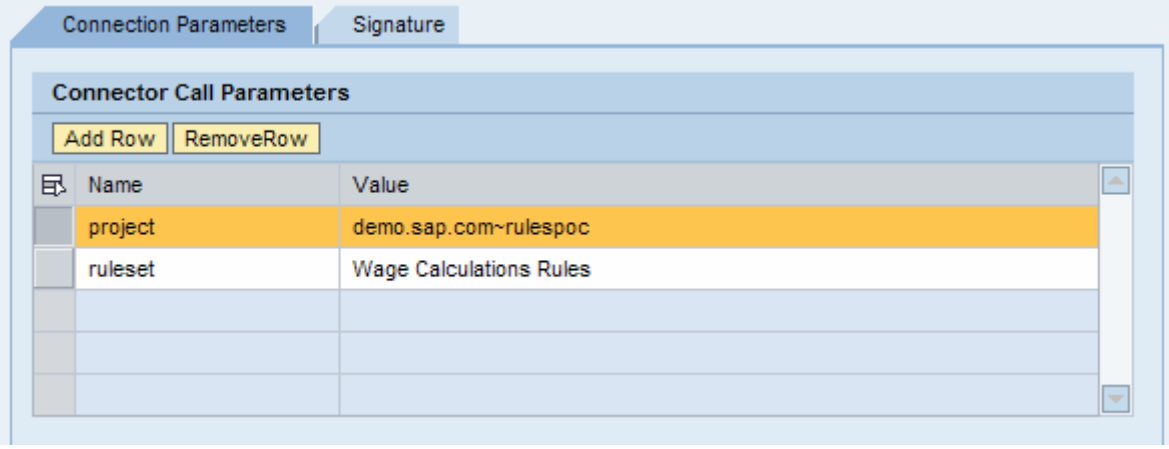
parameters whose values might change during the processing have to be identified and set as *Changing*.

Result

The expected result of the expression has to be set in the result parameter. The result can be a single element data object or a structure data object or a table data object.

Connector Call Parameters

Additional parameters can be passed to the external BRMS for processing. For example, while connecting to the NW BRM, the project name and the ruleset name have to be passed to invoke the required ruleset. The connector call parameters are the <name>/<value>, pairs where *Name* is the key and *Value* the value of the key.

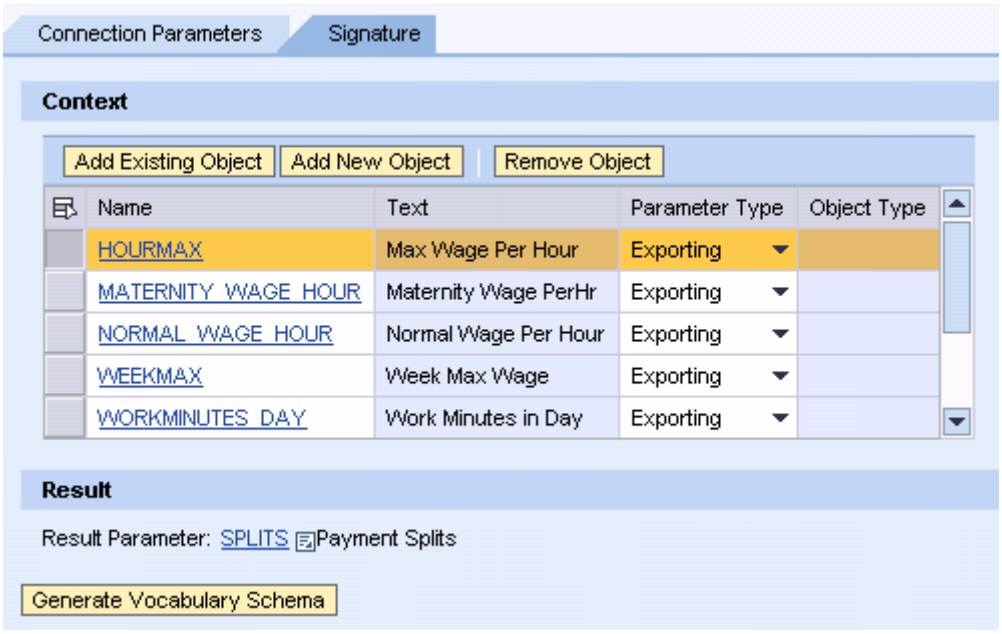


Creating the Vocabulary

After assigning the context and the result to the expression, the XML schema has to be generated. To generate the XML schema, click the *Generate Vocabulary Schema* button.

The XML schema contains the metadata associated with the expression - the context and the result data. The XML schema is relevant for execution as BRFplus sends an XML document conforming to this schema to the external rules engine.

A sample XML Schema is given below in **Appendix 1**.



BRMS Connector Execution

During the execution of the function, the BRMS connector expression communicates to the specific third-party rules engine using the connection properties. The BRMS connector expression also sends the XML document along with the context information and the expected result as a request. The external rules engine reads the context information, evaluates the result and populates the result in the response XML. The XML document is then sent back. When the request is received, corresponding mappings take place on the ABAP side.

A sample request XML and response XML document is given below in **Appendix 2** and **Appendix 3** respectively.

Java Connector (JCo) Call Parameters

BRFplus provides two Remote Enabled Function Modules (RFMs), **FDT_NW_BRM_EXECUTE** and **FDT_EXT_BRMS_EXECUTE**, for making JCo calls to the Java stack. For third-party BRMS, **FDT_EXT_BRMS_EXECUTE** should be used.

The parameters passed by BRFplus to the external BRMS are described in the table below. BRMS specific parameters (for example, ruleset name and project name for NW BRM) are passed as a table of key value pairs – **fdts_brms_call_param.**

Type	Name	Data Type	Remarks
IMPORTING	iv_input_xml	xstring	Context XML passed to BRMS
IMPORTING	its_call_parameter	fdtt_brms_call_param	BRMS specific parameters needed for execution
IMPORTING	iv_date_time_iso	/ISD/DATE_ISO	Date time for executing rules that were active at some point in time
EXPORTING	ev_output_xml	xstring	Modified XML returned by BRMS

IMPORTING indicates those parameters that are passed by BRFplus to the external BRMS.

EXPORTING indicates those parameters that are received by BRFplus from the external BRMS.

fdtt_brms_call_param is a dictionary table type whose line type is a structure of **fdts_brms_call_param.** This structure has *NAME* and *VALUE* as its components.

Exception Handling

The RFMs created for JCo communication define the following exception codes:

- **SYSTEM_FAILURE**

  Indicates system level failures

- **COMMUNICATION_FAILURE**

  Indicates RFC or network communication failures

- **INVALID_INPUT**

  Indicates invalid parameters passed to external BRMS

- **CONFIGURATION_ERROR**

  Indicates invalid configuration in external BRMS

- **PROCESSING_ERROR**

  Indicates error while processing rules

To indicate problems in the execution, the external BRMS connector implementation throws the following exception along with one of the above error codes:

- An **AbapException** in case of a standalone JCo server implementation
- A **J2EEAbapException** in case of a JCo server running on NW AS Java

BRFplus then takes appropriate action to rectify the problem.

Note: In case of an **INVALID_INPUT**, the actual input parameter name that causes the failure can be passed as the message parameter of **AbapException** or **J2EEAbapException**.

Implementation of the Third-party Connector

A JCo server program has to be written. The JCo server program should take the parameters passed from the BRFplus and should send back the modified values.

The implementation basically involves

- Extracting parameters from JCo call
- Invoking the external BRMS passing in the parameter
- Returning changed values as part of return parameters to the JCo call

There are two possible cases for a JCo server:

- A standalone JCo server
- A JCo server that is part of NW AS Java

JCo Server on NW AS Java

- JCo server must implement an EJB having a remote method **JCo.Function processFunction(JCo.Function)**
- The method should
  - Extract data from the input function instance
    - Input data will be part of **IMPORTING** parameters as defined in the JCo parameter table
  - Process XML data with BRMS by calling the external rule engine
  - Return modified XML back to JCo through the return function instance
    - Modified or output data should be part of **EXPORTING** parameters as defined in the JCo parameter table

Note: The JNDI name of the session bean should be **FDT_EXT_BRMS_CONNECTOR_PROCESS.**

The call to the external rule engine could be an EJB, Web Service or an in-process call.

A sample code snippet can be found below in **Appendix 4**.

Stand Alone JCo Server

- JCo server must implement **protected void handleRequest(JCo.Function function)** method
- The method should
  - Extract data from the input function instance
    - Input data will be part of **IMPORTING** parameters as defined in the JCo parameter table
  - Process XML data with BRMS by calling the external rule engine
  - Return modified XML back to JCo through the modified function instance
    - Output data should be part of **EXPORTING** parameters as defined in the JCo parameter table

The call to the external rule engine itself could be an EJB, Web Service or an in-process call.

A sample code snippet can be found below in **Appendix 4**.

Terminology

Appendix 1

Given below is a sample XML schema document (Vocabulary generated by BRFplus)

```
<?xml version="1.0" encoding="utf-8"?>

<!-- ========================================================================== -->
<!-- ===== BRFplus BRMS Connector Schema                          ===== -->
<!-- ========================================================================== -->
<!-- Scheme agency: BRFplus
       Scheme version: 1.0
       Schema date: 11 April 2008.
  -->
<xs:schema xmlns:FDTNS="http://sap.com/fdt/transport" xmlns:xs="http://www.w3.org/2001/XMLSchema"
elementFormDefault="qualified" targetNamespace="http://sap.com/fdt/transport">
  <!-- ========================================================================== -->
  <!-- ===== BRFplus Type Definitions                          ===== -->
  <!-- ========================================================================== -->
  <!-- ===== Number. Type                                ===== -->
  <!-- ========================================================================== -->
  <xs:simpleType name="NumberType">
    <xs:annotation>
      <xs:documentation xml:lang="en">
        <FDTNS:Definition>Numeric information that is assigned or is determined by calculation, counting,
or sequencing. It does not require a unit of quantity or unit of measure.
        </FDTNS:Definition>
        <FDTNS:PrimaryRepresentationTerm>Number
        </FDTNS:PrimaryRepresentationTerm>
      </xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:decimal">
      <xs:totalDigits value="31"/>
      <xs:fractionDigits value="10"/>
    </xs:restriction>
  </xs:simpleType>
  <!-- ========================================================================== -->
  <!-- ===== Boolean. Type                               ===== -->
  <!-- ========================================================================== -->
  <xs:simpleType name="BooleanType">
    <xs:annotation>
      <xs:documentation xml:lang="en">
        <FDTNS:Definition>A list of two mutually exclusive Boolean values that express the only possible
```

```
states of a Property
            </FDTNS:Definition>
            <FDTNS:PrimaryRepresentationTerm>Boolean
            </FDTNS:PrimaryRepresentationTerm>
          </xs:documentation>
        </xs:annotation>
        <xs:restriction base="xs:string">
          <xs:maxLength value="1"/>
          <xs:enumeration value="X"/>
          <xs:enumeration value=""/>
        </xs:restriction>
      </xs:simpleType>
      <!-- ================================================================== -->
      <!-- ===== Text. Type                              ===== -->
      <!-- ================================================================== -->
      <xs:simpleType name="TextType">
        <xs:annotation>
          <xs:documentation xml:lang="en">
            <FDTNS:Definition>A character string (i.e. a finite set of characters) generally in the form of words
of a language
            </FDTNS:Definition>
            <FDTNS:PrimaryRepresentationTerm>Text
            </FDTNS:PrimaryRepresentationTerm>
          </xs:documentation>
        </xs:annotation>
        <xs:restriction base="xs:string">
          <xs:maxLength value="255"/>
        </xs:restriction>
      </xs:simpleType>
      <!-- ================================================================== -->
      <!-- ===== Amount. Type                            ===== -->
      <!-- ================================================================== -->
      <xs:complexType name="AmountType">
        <xs:simpleContent>
          <xs:extension base="FDTNS:NumberType">
            <xs:annotation>
              <xs:documentation xml:lang="en">
                <FDTNS:Definition>A number of monetary units specified in a currency where the unit of the
currency is explicit or implied.
                </FDTNS:Definition>
                <FDTNS:PrimaryRepresentationTerm>Amount
                </FDTNS:PrimaryRepresentationTerm>
              </xs:documentation>
            </xs:annotation>
            <xs:attribute name="Currency">
              <xs:annotation>
                <xs:documentation xml:lang="en">
                  <FDTNS:Name>Amount. Currency. Identifier
                  </FDTNS:Name>
                  <FDTNS:Definition>The currency of the amount.
                  </FDTNS:Definition>
                </xs:documentation>
              </xs:annotation>
              <xs:simpleType>
                <xs:restriction base="xs:string">
                  <xs:maxLength value="5"/>
                </xs:restriction>
              </xs:simpleType>
            </xs:attribute>
          </xs:extension>
        </xs:simpleContent>
      </xs:complexType>
      <!-- ================================================================== -->
      <!-- ===== Quantity. Type                          ===== -->
      <!-- ================================================================== -->
```

```
  <xs:complexType name="QuantityType">
    <xs:simpleContent>
      <xs:extension base="FDTNS:NumberType">
        <xs:annotation>
          <xs:documentation xml:lang="en">
            <FDTNS:Definition>A counted number of non-monetary units possibly including fractions.
            </FDTNS:Definition>
            <FDTNS:PrimaryRepresentationTerm>Quantity
            </FDTNS:PrimaryRepresentationTerm>
          </xs:documentation>
        </xs:annotation>
        <xs:attribute name="Unit">
          <xs:annotation>
            <xs:documentation xml:lang="en">
              <FDTNS:Name>Quantity. Unit. Identifier
              </FDTNS:Name>
              <FDTNS:Definition>The unit of the quantity.
              </FDTNS:Definition>
            </xs:documentation>
          </xs:annotation>
          <xs:simpleType>
            <xs:restriction base="xs:string">
              <xs:maxLength value="3"/>
            </xs:restriction>
          </xs:simpleType>
        </xs:attribute>
      </xs:extension>
    </xs:simpleContent>
  </xs:complexType>
  <!-- ================================================================== -->
  <!-- ===== Timepoint. Type                              ===== -->
  <!-- ================================================================== -->
  <xs:simpleType name="TimepointType">
    <xs:annotation>
      <xs:documentation xml:lang="en">
        <FDTNS:Definition>A particular point in the progression of time together with the relevant
supplementary information
        </FDTNS:Definition>
        <FDTNS:PrimaryRepresentationTerm>Timepoint
        </FDTNS:PrimaryRepresentationTerm>
      </xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:dateTime"/>
  </xs:simpleType>
  <!-- ================================================================== -->
  <!-- ===== Begin of BRFplus BRMS Connector Runtime XML Schema Content  = -->
  <!-- ================================================================== -->
  <xs:element name="FDT">
    <xs:complexType>
      <xs:annotation>
        <xs:appinfo>FDT BRMS call elements
        </xs:appinfo>
      </xs:annotation>
      <xs:sequence>
        <xs:element name="INPUT">
          <xs:complexType>
            <xs:annotation>
              <xs:appinfo>Input Elements
              </xs:appinfo>
            </xs:annotation>
            <xs:sequence>
              <xs:element name="HOURMAX" type="FDTNS:AmountType">
                <xs:annotation>
                  <xs:appinfo>
                    <FDTNS:objectInfo>
```

```
            <FDTNS:TechnicalName>HOURMAX
            </FDTNS:TechnicalName>
            <FDTNS:Key>
              <FDTNS:ID>4858BEC7E2800D1BE10000000A4217B7
              </FDTNS:ID>
              <FDTNS:VersionID>000001
              </FDTNS:VersionID>
            </FDTNS:Key>
            <FDTNS:isChangeable>FALSE
            </FDTNS:isChangeable>
          </FDTNS:objectInfo>
        </xs:appinfo>
        <xs:documentation xml:lang="EN">Max Wage Per Hour
        </xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="MATERNITY_WAGE_HOUR" type="FDTNS:AmountType">
      <xs:annotation>
        <xs:appinfo>
          <FDTNS:objectInfo>
            <FDTNS:TechnicalName>MATERNITY_WAGE_HOUR
            </FDTNS:TechnicalName>
            <FDTNS:Key>
              <FDTNS:ID>4858BED9E2800D1BE10000000A4217B7
              </FDTNS:ID>
              <FDTNS:VersionID>000001
              </FDTNS:VersionID>
            </FDTNS:Key>
            <FDTNS:isChangeable>FALSE
            </FDTNS:isChangeable>
          </FDTNS:objectInfo>
        </xs:appinfo>
        <xs:documentation xml:lang="EN">Maternity Wage PerHr
        </xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="NORMAL_WAGE_HOUR" type="FDTNS:AmountType">
      <xs:annotation>
        <xs:appinfo>
          <FDTNS:objectInfo>
            <FDTNS:TechnicalName>NORMAL_WAGE_HOUR
            </FDTNS:TechnicalName>
            <FDTNS:Key>
              <FDTNS:ID>4858BEBBE2800D1BE10000000A4217B7
              </FDTNS:ID>
              <FDTNS:VersionID>000001
              </FDTNS:VersionID>
            </FDTNS:Key>
            <FDTNS:isChangeable>FALSE
            </FDTNS:isChangeable>
          </FDTNS:objectInfo>
        </xs:appinfo>
        <xs:documentation xml:lang="EN">Normal Wage Per Hour
        </xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="WEEKMAX" type="FDTNS:AmountType">
      <xs:annotation>
        <xs:appinfo>
          <FDTNS:objectInfo>
            <FDTNS:TechnicalName>WEEKMAX
            </FDTNS:TechnicalName>
            <FDTNS:Key>
              <FDTNS:ID>4858BECDE2800D1BE10000000A4217B7
              </FDTNS:ID>
```

```
            <FDTNS:VersionID>000001
            </FDTNS:VersionID>
          </FDTNS:Key>
          <FDTNS:isChangeable>FALSE
          </FDTNS:isChangeable>
        </FDTNS:objectInfo>
      </xs:appinfo>
      <xs:documentation xml:lang="EN">Week Max Wage
      </xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:element name="WORKMINUTES_DAY">
    <xs:annotation>
      <xs:appinfo>
        <FDTNS:objectInfo>
          <FDTNS:TechnicalName>WORKMINUTES_DAY
          </FDTNS:TechnicalName>
          <FDTNS:Key>
            <FDTNS:ID>4858BE8AE2800D1BE10000000A4217B7
            </FDTNS:ID>
            <FDTNS:VersionID>000001
            </FDTNS:VersionID>
          </FDTNS:Key>
          <FDTNS:isChangeable>FALSE
          </FDTNS:isChangeable>
        </FDTNS:objectInfo>
      </xs:appinfo>
      <xs:documentation xml:lang="EN">Working Minutes per Day
      </xs:documentation>
    </xs:annotation>
    <xs:simpleType>
      <xs:restriction base="FDTNS:NumberType">
        <xs:fractionDigits value="10 "/>
      </xs:restriction>
    </xs:simpleType>
  </xs:element>
  <xs:element name="ABSENCEMINUTES_DAY">
    <xs:annotation>
      <xs:appinfo>
        <FDTNS:objectInfo>
          <FDTNS:TechnicalName>ABSENCEMINUTES_DAY
          </FDTNS:TechnicalName>
          <FDTNS:Key>
            <FDTNS:ID>4858BED3E2800D1BE10000000A4217B7
            </FDTNS:ID>
            <FDTNS:VersionID>000001
            </FDTNS:VersionID>
          </FDTNS:Key>
          <FDTNS:isChangeable>FALSE
          </FDTNS:isChangeable>
        </FDTNS:objectInfo>
      </xs:appinfo>
      <xs:documentation xml:lang="EN">Absence minutes per day
      </xs:documentation>
    </xs:annotation>
    <xs:simpleType>
      <xs:restriction base="FDTNS:NumberType">
        <xs:fractionDigits value="10 "/>
      </xs:restriction>
    </xs:simpleType>
  </xs:element>
  <xs:element name="WORKMINUTES_WEEK">
    <xs:annotation>
      <xs:appinfo>
        <FDTNS:objectInfo>
```

```
                    <FDTNS:TechnicalName>WORKMINUTES_WEEK
                    </FDTNS:TechnicalName>
                    <FDTNS:Key>
                      <FDTNS:ID>4860547F8ABB0D11E10000000A4217B7
                      </FDTNS:ID>
                      <FDTNS:VersionID>000001
                      </FDTNS:VersionID>
                    </FDTNS:Key>
                    <FDTNS:isChangeable>FALSE
                    </FDTNS:isChangeable>
                  </FDTNS:objectInfo>
                </xs:appinfo>
                <xs:documentation xml:lang="EN">Working Minutes per Week
                </xs:documentation>
              </xs:annotation>
              <xs:simpleType>
                <xs:restriction base="FDTNS:NumberType">
                  <xs:fractionDigits value="10 "/>
                </xs:restriction>
              </xs:simpleType>
            </xs:element>
            <xs:element name="MINUTE_HOUR">
              <xs:annotation>
                <xs:appinfo>
                  <FDTNS:objectInfo>
                    <FDTNS:TechnicalName>MINUTE_HOUR
                    </FDTNS:TechnicalName>
                    <FDTNS:Key>
                      <FDTNS:ID>4860F20193660D18E10000000A4217B7
                      </FDTNS:ID>
                      <FDTNS:VersionID>000001
                      </FDTNS:VersionID>
                    </FDTNS:Key>
                    <FDTNS:isChangeable>FALSE
                    </FDTNS:isChangeable>
                  </FDTNS:objectInfo>
                </xs:appinfo>
                <xs:documentation xml:lang="EN">Working Minutes per Hour
                </xs:documentation>
              </xs:annotation>
              <xs:simpleType>
                <xs:restriction base="FDTNS:NumberType">
                  <xs:fractionDigits value="10 "/>
                </xs:restriction>
              </xs:simpleType>
            </xs:element>
          </xs:sequence>
        </xs:complexType>
      </xs:element>
      <xs:element name="OUTPUT">
        <xs:complexType>
          <xs:annotation>
            <xs:appinfo>Output Elements
            </xs:appinfo>
          </xs:annotation>
          <xs:sequence>
            <xs:element name="SPLITS">
              <xs:complexType>
                <xs:annotation>
                  <xs:appinfo>
                    <FDTNS:objectInfo>
                      <FDTNS:TechnicalName>SPLITS
                      </FDTNS:TechnicalName>
                      <FDTNS:Key>
                        <FDTNS:ID>485F30435FD20D15E10000000A4217B7
```

```
                        </FDTNS:ID>
                        <FDTNS:VersionID>000001
                        </FDTNS:VersionID>
                      </FDTNS:Key>
                      <FDTNS:isChangeable>TRUE
                      </FDTNS:isChangeable>
                    </FDTNS:objectInfo>
                  </xs:appinfo>
                  <xs:documentation xml:lang="EN">Payment Splits
                  </xs:documentation>
                </xs:annotation>
                <xs:sequence>
                  <xs:element name="FRB_DAY" type="FDTNS:AmountType">
                    <xs:annotation>
                      <xs:appinfo>
                        <FDTNS:objectInfo>
                          <FDTNS:TechnicalName>FRB_DAY
                          </FDTNS:TechnicalName>
                          <FDTNS:Key>
                            <FDTNS:ID>485F2F945FD20D15E10000000A4217B7
                            </FDTNS:ID>
                            <FDTNS:VersionID>000001
                            </FDTNS:VersionID>
                          </FDTNS:Key>
                          <FDTNS:isChangeable>TRUE
                          </FDTNS:isChangeable>
                        </FDTNS:objectInfo>
                      </xs:appinfo>
                      <xs:documentation xml:lang="EN">Reduced maternity wage paid out to the
employee
                      </xs:documentation>
                    </xs:annotation>
                  </xs:element>
                  <xs:element name="FRN_DAY" type="FDTNS:AmountType">
                    <xs:annotation>
                      <xs:appinfo>
                        <FDTNS:objectInfo>
                          <FDTNS:TechnicalName>FRN_DAY
                          </FDTNS:TechnicalName>
                          <FDTNS:Key>
                            <FDTNS:ID>485F301B5FD20D15E10000000A4217B7
                            </FDTNS:ID>
                            <FDTNS:VersionID>000001
                            </FDTNS:VersionID>
                          </FDTNS:Key>
                          <FDTNS:isChangeable>TRUE
                          </FDTNS:isChangeable>
                        </FDTNS:objectInfo>
                      </xs:appinfo>
                      <xs:documentation xml:lang="EN">Split Reduced Normal wage paid out to the
employer
                      </xs:documentation>
                    </xs:annotation>
                  </xs:element>
                </xs:sequence>
              </xs:complexType>
            </xs:element>
          </xs:sequence>
        </xs:complexType>
      </xs:element>
    </xs:sequence>
    <xs:attribute name="BRMSConnectorVersion" type="xs:string" fixed="1.00"/>
  </xs:complexType>
  <!-- ================================================================ -->
  <!-- ===== End of BRFplus BRMS Connector Runtime XML Schema Content  = -->
```

```
    <!-- ========================================================================== -->
  </xs:element>

    </xs:schema>
```

Appendix 2

Given below is a sample request XML document.

```
<?xml version="1.0" encoding="utf-8"?>
<FDTNS:FDT BRMSConnectorVersion="1.00"
xmlns:FDTNS="http://sap.com/fdt/transport">
    <FDTNS:INPUT>
        <FDTNS:HOURMAX Currency="EUR">9230.0
        </FDTNS:HOURMAX>
        <FDTNS:MATERNITY_WAGE_HOUR Currency="EUR">1519.0
        </FDTNS:MATERNITY_WAGE_HOUR>
        <FDTNS:NORMAL_WAGE_HOUR Currency="EUR">1899.0
        </FDTNS:NORMAL_WAGE_HOUR>
        <FDTNS:WEEKMAX Currency="EUR">341500.0
        </FDTNS:WEEKMAX>
        <FDTNS:WORKMINUTES_DAY>480.0
        </FDTNS:WORKMINUTES_DAY>
        <FDTNS:ABSENCEMINUTES_DAY>480.0
        </FDTNS:ABSENCEMINUTES_DAY>
        <FDTNS:WORKMINUTES_WEEK>480.0
        </FDTNS:WORKMINUTES_WEEK>
        <FDTNS:MINUTE_HOUR>60.0
        </FDTNS:MINUTE_HOUR>
    </FDTNS:INPUT>
    <FDTNS:OUTPUT>
        <FDTNS:SPLITS>
            <FDTNS:FRB_DAY Currency="">0.0
            </FDTNS:FRB_DAY>
            <FDTNS:FRN_DAY Currency="">0.0
            </FDTNS:FRN_DAY>
        </FDTNS:SPLITS>
    </FDTNS:OUTPUT>
</FDTNS:FDT>
```

Appendix 3

Given below is a sample response XML document.

```
<?xml version="1.0" encoding="UTF-8"?>
<FDTNS:FDT xmlns:FDTNS="http://sap.com/fdt/transport" BRMSConnectorVersion="1.00">
    <FDTNS:INPUT>
        <FDTNS:HOURMAX Currency="EUR">9230.0
        </FDTNS:HOURMAX>
        <FDTNS:MATERNITY_WAGE_HOUR Currency="EUR">1519.0
        </FDTNS:MATERNITY_WAGE_HOUR>
        <FDTNS:NORMAL_WAGE_HOUR Currency="EUR">1899.0
        </FDTNS:NORMAL_WAGE_HOUR>
        <FDTNS:WEEKMAX Currency="EUR">341500.0
        </FDTNS:WEEKMAX>
        <FDTNS:WORKMINUTES_DAY>480.0
        </FDTNS:WORKMINUTES_DAY>
        <FDTNS:ABSENCEMINUTES_DAY>480.0
        </FDTNS:ABSENCEMINUTES_DAY>
        <FDTNS:WORKMINUTES_WEEK>480.0
        </FDTNS:WORKMINUTES_WEEK>
        <FDTNS:MINUTE_HOUR>60.0
        </FDTNS:MINUTE_HOUR>
    </FDTNS:INPUT>
    <FDTNS:OUTPUT>
        <FDTNS:SPLITS>
            <FDTNS:FRB_DAY Currency="EUR">12152.0
            </FDTNS:FRB_DAY>
            <FDTNS:FRN_DAY Currency="EUR">3040.0
            </FDTNS:FRN_DAY>
        </FDTNS:SPLITS>
    </FDTNS:OUTPUT>

    </FDTNS:FDT>
```

Appendix 4

Given below is a sample code for extracting relevant JCo parameters. The following code snippets illustrate how to retrieve the relevant JCo parameters passed from BRFplus.

```
private void extractJCoParameters(Function function) {
ParameterList importParams = function.getImportParameterList();
// Fill up execution properties
Map<String, String> executionProperties = new HashMap<String, String>();
Table paramsMap = importParams.getTable("ITS_CALL_PARAM");
if (paramsMap == null) {
   throw new J2EEAbapException("INVALID_INPUT", "Execeution params");
} else {
   Structure paramEntry = null;
   paramsMap.firstRow();
   for (int i = 0; i < paramsMap.getNumRows(); i++) {
          String paramKey = paramsMap.getString("NAME");
          String paramValue = paramsMap.getString("VALUE");
                              // Store key and value
          tcLogger.logT(Severity.ALL, paramKey + " = " + paramValue);
          paramsMap.nextRow();
   }
}
byte[] xmlBytes = importParams.getByteArray("IV_INPUT_XML");
if (xmlBytes != null) {
   Document doc = null;
   try {
          doc = getDocumentBuilder().parse(
new InputSource(new ByteArrayInputStream(xmlBytes)));
   } catch (SAXException e) {
          //handle exception
   } catch (IOException e) {
          //handle exception
   }
} else {
   throw new J2EEAbapException("INVALID_INPUT", "Context XML");
}
```

Related Content

- BRFplus – The Very Basics
- Formula Functions
- Carsten Ziegler, About Business Rules: https://www.sdn.sap.com/irj/sdn/weblogs?blog=/pub/wlg/9713
- Carsten Ziegler, BRFplus a Business Rule Engine written in ABAP, https://www.sdn.sap.com/irj/sdn/weblogs?blog=/pub/wlg/8889
- Carsten Ziegler, Important Information for Using BRFplus

  https://www.sdn.sap.com/irj/sdn/weblogs?blog=/pub/wlg/11632
- Rajagopalan Narayanan, Business Rules and Software Requirements, https://www.sdn.sap.com/irj/sdn/go/portal/prtroot/docs/library/uuid/40aae118-42c2-2a10-fcaf-fdd9d30bcb1a
- Rajagopalan Narayanan, Seven Tips for Your First Business Rules Project, https://www.sdn.sap.com/irj/sdn/go/portal/prtroot/docs/library/uuid/201a9e3d-3ec2-2a10-85b2-ce56d276dd7a
- Rajagopalan Narayanan, Real World Return of Investment Scenarios with Business Rules Management, https://www.sdn.sap.com/irj/sdn/go/portal/prtroot/docs/library/uuid/b050905e-3cc2-2a10-979a-81a57a787f56
- Rajagopalan Narayanan, Five Reasons to Build Agile Systems Using Business Rules Management Functionality, https://www.sdn.sap.com/irj/sdn/go/portal/prtroot/docs/library/uuid/504486eb-43c2-2a10-f5a7-e84ef3fd45be
- Rajagopalan Narayanan, How Business Rules Management Functionality Helps Tariff Plans Management in Transportation and Shipping, https://www.sdn.sap.com/irj/sdn/go/portal/prtroot/docs/library/uuid/40a9cf69-40c2-2a10-8a8b-969fb311dd31
- Rajagopalan Narayanan, Getting Started with Business Rules Management, https://www.sdn.sap.com/irj/sdn/go/portal/prtroot/docs/library/uuid/70c669d8-3ac2-2a10-0e96-c7c3786168f0

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