

ARIS PROCESS PERFORMANCE MANAGER

PPM PROCESS EXTRACTORS

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1 General

This manual describes the function of the PPM SAP-2-PPM, JDBC-2-PPM and CSV-2-PPM process extractors.

From the data sets of various source system types, process extractors create XML files that can be imported into ARIS Process Performance Manager (or PPM)

Please note that this manual is not intended to replace user or customizing training. It is a source of reference containing information that supplements the information provided in the online help.

2 XML

This chapter contains basic information about XML, which is necessary to understand the subsequent chapters.

2.1 What is XML?

The abbreviation XML stands for eXtensible Markup Language. XML is a meta-language for the description of display languages such as HTML. Meta-languages provide the rules required for the definition of document types. Display languages allow documents to be output correctly.

2.2 Structure of an XML document

An XML document is always made up of two character types: the actual data and the so-called tags or markups. Tags are XML instructions, which describe the division of the document into storage units and its logical structure. The structure itself is saved in a document type definition (DTD).

Tags are always written in pairs in angle brackets. Every start tag always has a corresponding end tag.

XML attributes are used within the tags. An attribute may only occur once within a tag.

XML documents consist of elements. An element is made up of two XML tags and the enclosed text. Blank elements consist of only one tag and always end with a slash (/) before the final bracket.

You can create simple XML documents with a text editor. In the following example, the DTD is specified in square brackets in the XML file:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE memberlist
[
  <!ELEMENT memberlist (no, name, age)>
  <!ELEMENT no (#PCDATA)>
  <!ELEMENT name (#PCDATA)>
  <!ELEMENT age (#PCDATA)>
]>
<memberlist>
  <no>001</no>
  <name>Doe, John</name>
  <age>27</age>
</memberlist>
```


If you save this document under the name of your choice with the extension .xml, Internet Explorer can display the document in a structured form.

2.3 PPM and XML

PPM uses XML as a universal data format. The entire configuration of the PPM system is provided by XML files.

The PPM process extractors extract data from different source systems and save it in PPM compatible XML files.

3 Overview

This chapter provides an overview of the extraction of data from application systems for use in ARIS Process Performance Manager. The extracted data can be imported into ARIS Process Performance Manager with no changes using the PPM XML import interface and processed by using suitable fragment and mapping definitions. The XML import interface is described in detail in the PPM Data import manual.

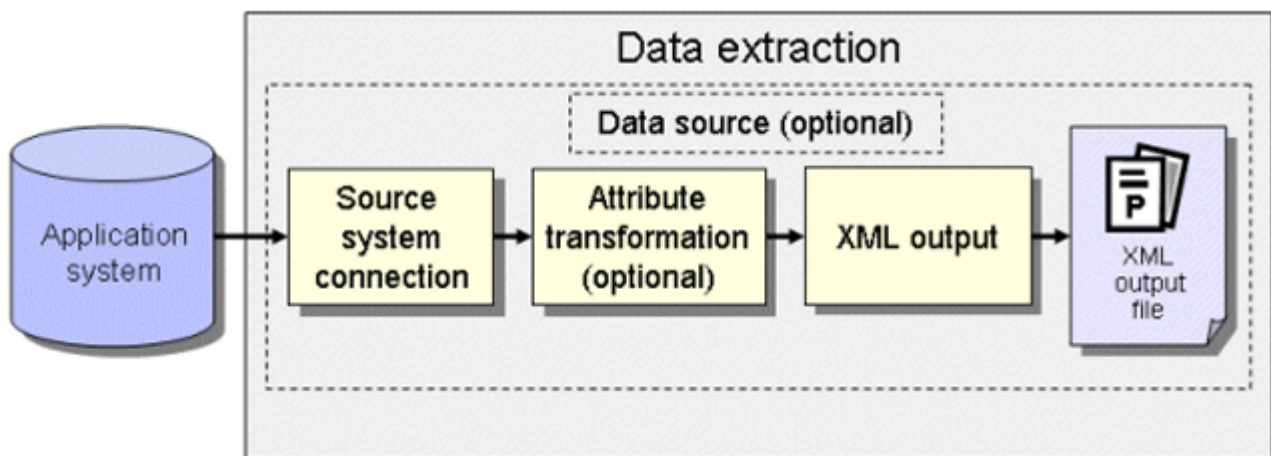
Via XML configuration files, the PPM CSV-2-PPM, SAP-2-PPM and JDBC-2-PPM process extractors are adapted to the source system from which the data is to be extracted.

3.1 Data extraction

This chapter provides an overview of the extraction of data from application systems for use in ARIS Process Performance Manager. The extracted data can be imported into ARIS Process Performance Manager with no changes using the PPM XML import interface and processed by using suitable fragment and mapping definitions. The XML import interface is described in detail in the PPM Data import manual.

Via XML configuration files, the PPM CSV-2-PPM, JDBC-2-PPM and SAP-2-PPM process extractors are adapted to the source system from which the data is to be extracted.

The following general representation illustrates the basic functioning of data extraction from source systems, the subsequent data transformation and the output in XML output files.



SOURCE SYSTEM CONNECTION

The source system connection is created by specifying a system configuration containing the required access data for the source system to be extracted, for example, system number, access type, and access password of the source system user.

You need to ensure that the specified source system user has appropriate access authorization to extract the relevant data fields.

ATTRIBUTE TRANSFORMATION (OPTIONAL)

If required, source system attributes can be modified before being imported into the PPM system and attribute types can be added and transformed. An appropriate XML configuration needs to be created for attribute transformation.

XML OUTPUT

The extracted data is written to output files in a PPM-compatible XML format.

DATA SOURCE (OPTIONAL)

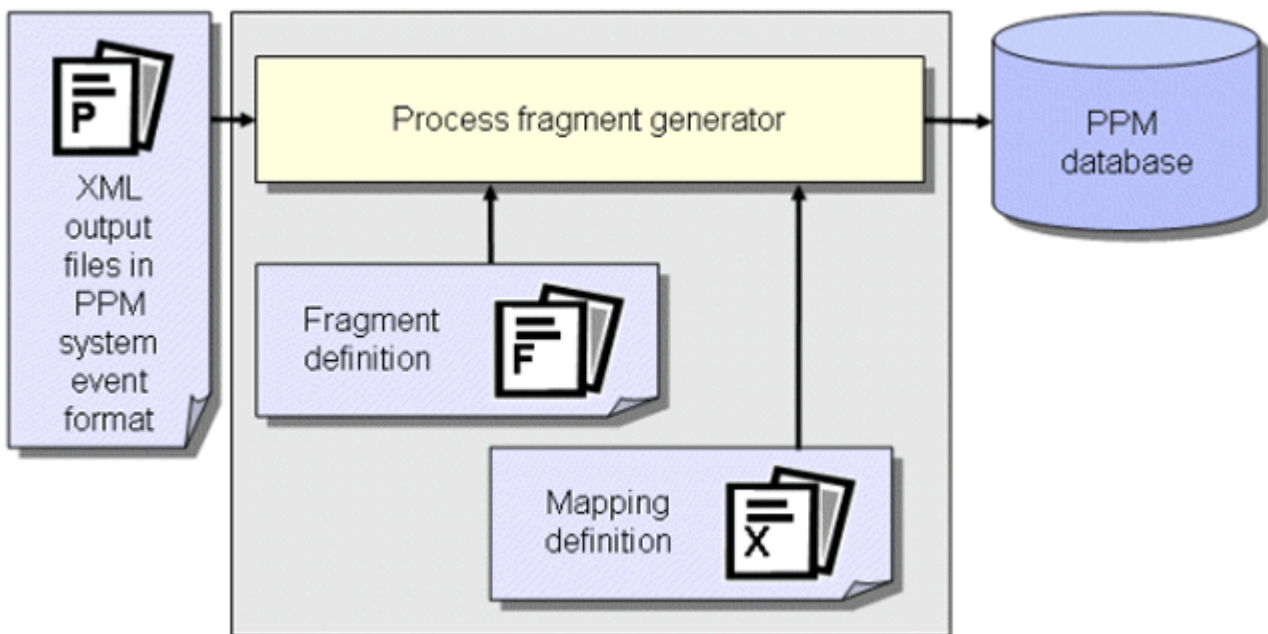
All XML files required for the extraction as well as the output file(s) can be specified in an XML file.

3.2 Data import

In addition to the XML output file in PPM system event format, a file in process instance-independent measure format or in dimension data format can also be output and imported into a PPM system. Only the import of the XML output files in PPM system event format is dealt with here.

Each system event in the XML output file generated is assigned a fragment definition when imported and is instantiated in the PPM database. The source system attributes specified in the mapping are copied to the objects in this fragment instance. The fragment instances are then saved in the PPM database.

Schema: Data import in PPM system event format



In a further work step, the fragment instances imported into the database are compiled into process instances using the `runppmimport PPM` command and assigned to process types. After measure calculation, the process instances are available for detailed analyses.

Tip

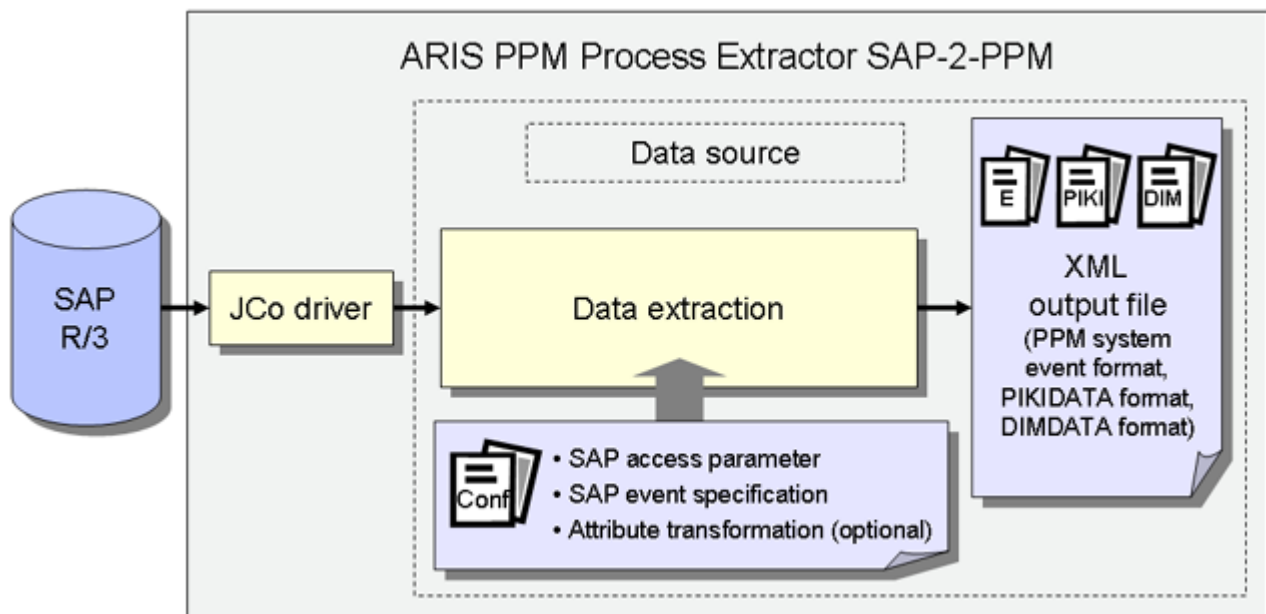
- For further information about the configuration of the XML import please refer to the PPM Data Import manual.
- The configuration of all files relevant for `runppmimport` is described in detail in the PPM Customizing manual.

4 PPM Process Extractor SAP-2-PPM

This chapter provides an overview of the architecture, functioning and configuration of PPM Process Extractor SAP-2-PPM.

4.1 Architecture

The figure below illustrates the functionality of PPM Process Extractor SAP-2-PPM:



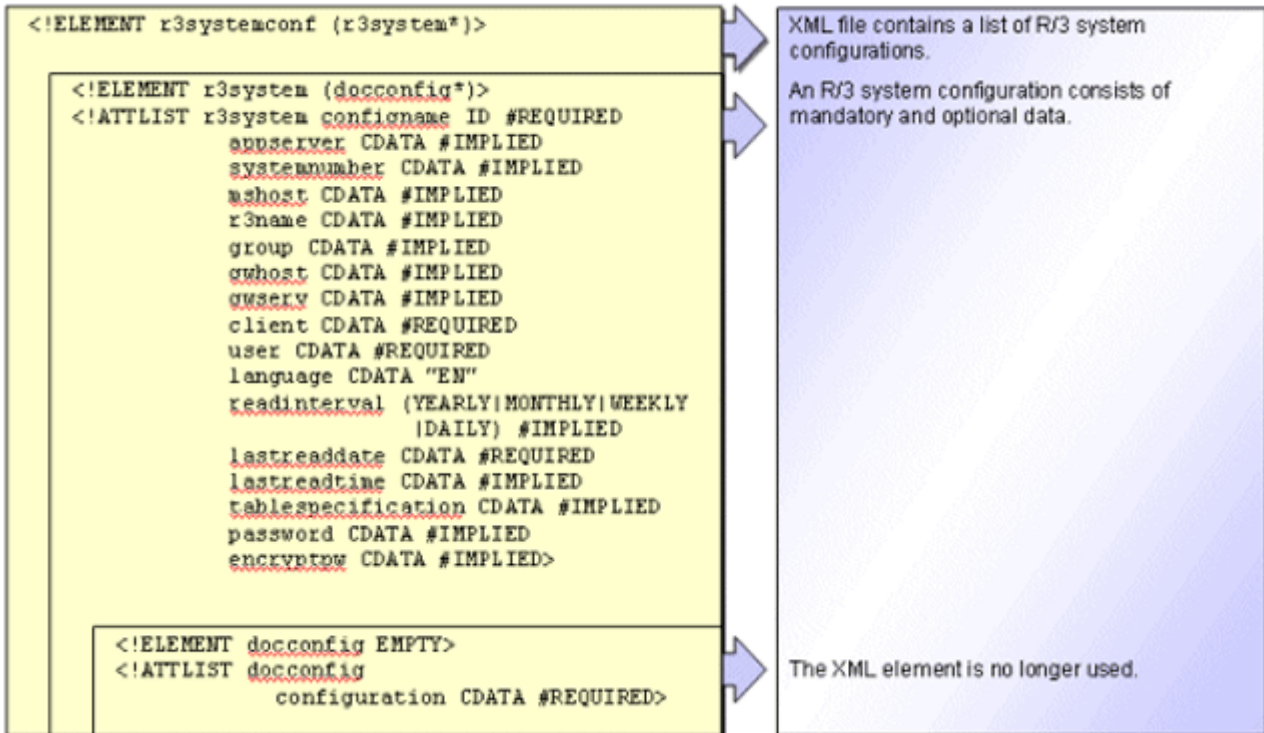
The Java Connector driver (JCo) is used to create a connection to the SAP R/3 system with the access data for the R/3 system configuration. Data is then extracted from the tables in the R/3 system with the R/3 table configuration and an optional attribute transformation using the data extraction (page 4) module and is written to XML files in a PPM-compatible output format.

You need to ensure that the specified source system user has appropriate access authorization to extract the relevant data fields and that the requirements for the R/3 source system are met. If you have any doubts or concerns, please contact your SAP administrator.

4.2 R/3 system configuration

The access data for the R/3 system is specified in an XML file. The name of this XML file is transferred to the command line tool as an argument.

The format of the XML file is specified by the following DTD:



XML attribute name	Description	Example
configname	Unique name of the configuration	ides_doc_vdap
appserver	Computer name or IP address of source system computer	172.20.210.21
systemnumber	SAP system number	00
mshost	Name of the SAP message host	/H/154.37.28.6/S/4435
r3name	R/3 system name	A20
group	Name of application server group	A20_ALL

XML attribute name	Description	Example
gwhost	Computer name of R/3 gateway	172.20.210.32
gwserv	Service number of the R/3 gateway	6789
client	Name of the SAP client	100
user	Name of the SAP system user	sapuser
language	Language of text fields extracted	DE
readinterval	No longer used. Still included for compatibility reasons.	YEARLY
lastreaddate	Date from which data is extracted. Not applicable when using a data source (page 160), format: yyyyymmdd	19700101
lastreadtime	Time from which data is extracted. Not applicable when using a data source (page 160), format: hhmmss	125708
tablespecification	No longer used. Still included for compatibility reasons.	
password	Access password for R/3 system	mypassword
encryptpw	Access password for R/3 system in encrypted form	

The first time you enter an R/3 system into the system configuration or change the password, specify the password in the password XML attribute. The first time the R/3 system is accessed (for example, connection test, starting extraction), the password is encrypted and saved in the encryptpw XML attribute. The value of the password XML attribute is deleted.

The type of access to an R/3 system is determined by specifying the value of XML attributes.

R/3 system type	XML attributes	Example
Application server	appserver systemnumber	... configname="..." appserver="192.168.102.100" systemnumber="01" mshost="" r3name="" group="" gwhost="" gwserv="" ...
Message Host	mshost r3name group	... configname="test_group_sd" appserver="..." systemnumber="03" mshost="/H/156.243.123.6/H/154.34.37.2/S/4435/H/saprouter/test/H/112.4.3.2" r3name="A20" group="A20_ALL" gwhost="" gwserv="" ...
Gateway server	appserver systemnumber gwhost gwserv	... configname="..." appserver="172.20.212.232" systemnumber="01" mshost="" r3name="" group="" gwhost="172.20.212.240" gwserv="6789" ...

Example

```
...
<r3system configname="ides_doc_vbap" appserver="172.20.210.211"
  systemnumber="00" client="100" user="sapuser"
  language="DE" readinterval="YEARLY"
  lastreaddate="19700101" password="testpassword">
  <docconfig configuration="SD_VBAP"/>
  <docconfig configuration="SD_MSEG"/>
</r3system>
...
```


4.3 R3 table configuration (system event specification)

The R/3 table configuration specifies which table fields are extracted from the R/3 system and written to the system events as source system attributes. You can save several table configurations with unique names in the XML file.

The R/3 table configuration consists of the following components:

GLOBAL TABLES

Global tables are used to extract information that is written for all system events.

FOREIGN KEY TABLES

The `docreftable` XML element contains the name of the foreign key table. It specifies how the data area to be extracted from the system event table is limited. The primary key fields specified in the `pkfield` XML element link the foreign key table to the system event table and other foreign key tables.

SYSTEM EVENT TABLE

The `doctable` XML element contains the name of the system event table. It specifies the documents to be extracted for a document flow. Each data record extracted from the system event table generates a system event in the output file (event XML element).

DATA TABLES

The information in the system event table can be supplemented by extracting additional data fields from any other data tables (for example, the material number is extracted from the system event table and the descriptive text relating to this number is extracted from a data table).

The following XML file framework illustrates the configuration of the tables from which data is to be extracted. The chapter on table access configuration (page 101) describes which XML elements and attributes are optional.

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE r3systemconffields SYSTEM 'xmlextractor_tableconfiguration.dtd'>

<xmlextractor_tableconfiguration>
  <configuration name="..." printname="..." classtouse="...">
    <globaltable name="..." tablename="..." classtouse="...">
      <fieldtoread name="...">
        <textref tablename="..." reffieldname="..."
          textfieldname="..." langfieldname="..."/>
      </fieldtoread>
      ...
    </globaltable>
  </docspec>
</xmlextractor_tableconfiguration>
```

```

<docreftable name="..." tablename="..."
                classtouse="...">
  <condition fieldname="..."
                logicaloperator="..." >
    <value>...</value>
  </condition>
  <pkfield name="..." fktablename="..."
                fkfieldname="..." logicaloperator="...">
    <fkpart readfrom="..." startposition="..."
                length="..."/>

    <prefix>
      <value>...</value>
    </prefix>
    <postfix>
      <value>...</value>
    </postfix>
  </pkfield>
  ...
</docreftable>
...
<doctable name="..." tablename="..."
                classtouse="..." >
  <condition fieldname="..." logicaloperator="..." >
    <value>...</value>
  </condition>
  <pkfield name="..." fktablename="..."
                fkfieldname="..." logicaloperator="...">
    <fkpart readfrom="..." startposition="..."
                length="..."/>

    <prefix>
      <value>...</value>
    </prefix>
    <postfix>
      <value>...</value>
    </postfix>
  </pkfield>
  ...
  <fieldtoread name="...">
    <textref tablename="..." reffieldname="..."
                textfieldname="..." langfieldname="..."/>
  </fieldtoread>
  ...
</doctable>
</docspec>
<table name="..." tablename="..."
                classtouse="...">
  <condition fieldname="..." logicaloperator="...">
    <value>...</value>
  </condition>
  <pkfield name="..." fktablename="..."
                fkfieldname="..." logicaloperator="...">
    <fkpart readfrom="..." startposition="..."
                length="..."/>

    <prefix>
      <value>...</value>
    </prefix>

```

```

        <postfix>
          <value>...</value>
        </postfix>
      </pkfield>
    ...
    <fieldtoread name="...">
      <textref tablename="..." reffieldname="..."
        textfieldname="..." langfieldname="..."/>
    </fieldtoread>
    ...
  </table>
  ...
</configuration>
...
</xmlextractor_tableconfiguration>

```

4.3.1 Global meta data

The globaltable XML element can be used to transfer meta data from the PPM SAP-2-PPM and JDBC-2-PPM process extractors to the output file as global system event attributes. Typical data for global system event attributes include the names of the configurations that were used to extract the data. The data itself is determined from the argument values specified in the command line. For arguments that are not specified in the command line, the default value is determined.

The identification of keywords is case-sensitive.

Global system event attributes apply to all system events in the current output file.

Keyword	Value from command line argument
SYSTEM_CONFIG_FILE_NAME	-systemconfig <filename> ...
SYSTEM_CONFIG_NAME	-systemconfig ... <configname>
TABLE_CONFIG_FILE_NAME	-tableconfig <filename> ...
TABLE_CONFIG_NAME	-tableconfig ... <configname>
BEGIN_DATE,	-begindate <dd.MM.yyyy>
BEGIN_TIME	-begintime <hh:mm:ss>
END_DATE	-enddate <dd.MM.yyyy>
END_TIME	-endtime <hh:mm:ss>
CPD	-cpd <int>
OUT_FILE_NAME	-outfile <file name>

Keyword	Value from command line argument
PIKI_DATA_MAPPING_FILE_NAME	-pikidatamapping <filename>...
PIKI_DATA_MAPPING_NAME	-pikidatamapping ... <pcname>
DIM_DATA_MAPPING_FILE_NAME	-dimdatamapping <filename> ...
DIM_DATA_MAPPING_NAME	-dimdatamapping ... <dimname>

If no value can be determined for a keyword, the keyword itself will be written to the output file. In this way you can transfer constants to the output file.

Example

The file extract below shows the configuration that is used to create global system event attributes.

```
<globaltable name="INFO">
  <fieldtoread name="SYSTEM_CONFIG_NAME"/>
</globaltable>
```

The configuration name specified in the command line using -systemconfig <configname>, for example, sapppm is written to the output file as the INFO-SYSTEM_CONFIG_NAME global system event attribute:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
  <attribute type="INFO-SYSTEM_CONFIG_NAME ">
    sapppm
  </attribute>
  ...
<event>
  ...
</event>
  ...
</eventlist>
```

By specifying a suitable Java class in the classtouse XML attribute, data can also be extracted from any other source system table.

4.3.2 Sort system events

You can sort the system events in the XML output in ascending alphanumeric order based on the content of fields you define as sorting criteria. It is possible to specify multiple fields as sorting criteria. When sorting, the fields are prioritized from the first specified to the last

specified, that is, the data is first sorted based on the content of the first field specified, then by the content of the second field specified and so on.

Tip

You can use the sorting option to create a more efficient XML import of the extracted data into the PPM system. The fact that system events belonging to a process instance follow each other immediately due to sorting in the XML output files means that they can be imported directly into an EPC using the process key during the XML import.

In the table configuration, in the parameter XML element, fields are specified as sorting criteria for the system event table (doctable) and the referenced foreign key tables (docreftable).

Example (extract from table configuration)

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE xml extractor_tableconfiguration SYSTEM
    'xml extractor_tableconfiguration.dtd'>
<xml extractor_tableconfiguration>
  <configuration name="BANF">
    <docspec>
      <doctable name="EBAN">
        <parameter name="ORDER_BY">
          <value>BNFPO</value>
          <value>BANFN</value>
        </parameter>
        <condition fieldname="ERDAT"
          logicaloperator="creationtimestamp">
          <value>yyyyMMdd</value>
        </condition>
        <pkfield name="BANFN"/>
        <pkfield name="BNFPO"/>
        <pkfield name="ERDAT"/>
        <fieldtoread name="BSART"/>
        <fieldtoread name="KONNR"/>
        <fieldtoread name="KTPNR"/>
        <fieldtoread name="LIFNR"/>
        <fieldtoread name="MFRNR"/>
      </doctable>
    </docspec>
  </configuration>
</xml extractor_tableconfiguration>
```

As specified in the BANF configuration (parameter XML element), the system events are written to the output file(s) sorted in ascending order by the item number in the purchase requisition number (BNFPO field) and, as a second priority, by the purchase requisition number (BANFN field).

The table below shows all of the configuration options:

XML element/attribute	Description
parameter	Specifies a sorting parameter for a system event table (doctable) or a foreign key table (docreftable).
name	Parameter name. It is essential to specify ORDER_BY.
value	Specifies a sorting field. The field must be specified as a primary key field (pkfield).

You can set the sorting parameter in PPM Customizing Toolkit. To do this, activate the System event tab in the Data extraction module of the Process merge module group. Switch to editing mode and select Edit system event from the pop-up menu of the system event table. In the Specify parameter step, you can specify your settings.

4.3.3 Add up values of a field

Depending on the data type, you can add up the values of a field either as integers or decimals by specifying parameters in the relevant table element in the table configuration. A separate class must be used to do this.

Example

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE xml extractor_tableconfiguration SYSTEM
        'xml extractor_tableconfiguration.dtd'>
<xml extractor_tableconfiguration>
  <configuration name="SUM">
    <docspec>
      <do creftable name="...">
        ...
      </do creftable>
      <doctable name="...">
        ...
      </doctable>
    </docspec>
    <table name="VBEP"
      classtouse="com.idsscheer.ppm.xml extractor tools.
        extractor.sap2ppm.ZNumberOperation_sap2ppm">
      <parameter name="FIELDS">
        <value>BMENG</value>
        <value>WMENG</value>
      </parameter>
      <parameter name="OPERATION">
```

```

    <value>SUM_DECIMAL</value>
  </parameter>
  <pkfield name="VBELN" fktablename="VBAP"
            fkfieldname="VBELN"/>
  <pkfield name="POSNR" fktablename="VBAP"
            fkfieldname="POSNR"/>
</table>
</configuration>
</xmlextractor_tableconfiguration>

```

The example configuration specifies that for each of the floating point number fields BMENG and WMENG, the total of several values belonging to a sales document item (POSNR) in a sales document (VBELN) is calculated and written to a new system event attribute. The name of the new attribute is made up of <tablename>-<operator><fieldname>, for example, VBEP-SUM_DECIMALWMENG. The com.idsscheer.ppm.xmlextractortools.extractor.sap2ppm.ZNumberOperation_sap2ppm class is used for adding up field values.

The following item numbers exist in the SAP system for the sales document 5696:

VBELN	POSNR	WMENG	BMENG
5696	10	353,000	103,000
5696	10	215,000	52,000
5696	10	127,000	313,000
5696	20	89,000	79,000
5696	20	456,000	29,000
5696	30	23,000	269,000
5696	30	87,000	159,000
5696	30	124,000	256,000
5696	30	59,000	237,000

When extracting using the example configuration, for each item number the decimal sums are calculated for the BMENG and WMENG fields and the following system events are generated:

```

<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
<event>
  <attribute type="VBAP-POSNR">000010</attribute>
  <attribute type="VBAP-VBELN">0000005696</attribute>
  <attribute type="VBEP-SUM_DECIMALBMENG">468.000</attribute>
  <attribute type="VBEP-SUM_DECIMALWMENG">695.000</attribute>

```

```

</event>
<event>
  <attribute type="VBAP-POSNR">000020</attribute>
  <attribute type="VBAP-VBELN">0000005696</attribute>
  <attribute type="VBEP-SUM_DECIMALBMENG">108.000</attribute>
  <attribute type="VBEP-SUM_DECIMALWMENG">545.000</attribute>
</event>
<event>
  <attribute type="VBAP-POSNR">000030</attribute>
  <attribute type="VBAP-VBELN">0000005696</attribute>
  <attribute type="VBEP-SUM_DECIMALBMENG">921.000</attribute>
  <attribute type="VBEP-SUM_DECIMALWMENG">293.000</attribute>
</event>
</eventlist>

```

4.3.4 Extract multi-valued fields

Appropriate configuration of the relevant table element in the table configuration enables all different values of a field to be extracted (fieldtoread) to be written to a system event. A separate class must be used to do this.

Example

```

<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE xmlextractor_tableconfiguration SYSTEM
  'xmlextractor_tableconfiguration.dtd'>
<xmlextractor_tableconfiguration>
  <configuration name="MULTIPLE_VALUES">
    <docspec>
      <docreftable name="...">
        ...
      </docreftable>
      <doctable name="...">
        ...
      </doctable>
    </docspec>
    <table name="VBEP" classtouse="com.idsscheer.ppm.
      xmlextractortools.extractor.sap2ppm.
      ZTableMultipleValues_sap2ppm">
      <pkfield name="VBELN" fktablename="VBAP"
        fkfieldname="VBELN"/>
      <pkfield name="POSNR" fktablename="VBAP"
        fkfieldname="POSNR"/>
      <fieldtoread name="WMENG"/>
      <fieldtoread name="EDATU"/>
    </table>
    <table name="VBAK" classtouse="com.idsscheer.ppm.
      xmlextractortools.extractor.sap2ppm.
      ZTableMultipleValues_sap2ppm">
      <pkfield name="VBELN" fktablename="VBEP"
        fkfieldname="VBELE"/>
      <fieldtoread name="VBTYP"/>
    </table>

```



```

    </configuration>
</xmlextractor_tableconfiguration>

```

In the example configuration, using the

`com.idsscheer.ppm.xmlextractortools.extractor.sap2ppm.`

`ZTableMultipleValues_sap2ppm` class for all data tables (table elements) specifies that all fields to be extracted (fieldtoread elements) are extracted with multiple values if multiple values exist for a field in the source system database. In the XML output file, the extracted field with multiple values appears as an attribute with the same name in a system event:

```

<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
  <event>
    <attribute type="VBAP-POSNR">000010</attribute>
    <attribute type="VBAP-VBELN">0000004969</attribute>
    <attribute type="VBEP-EDATU">19970103</attribute>
    <attribute type="VBEP-EDATU">19970107</attribute>
    <attribute type="VBEP-WMENG">138.000</attribute>
    <attribute type="VBEP-WMENG">317.000</attribute>
    <attribute type="VBEP-WMENG">496.000</attribute>
  </event>
</eventlist>

```

4.3.5 Concatenate new attribute values from extracted attribute values

The `com.idsscheer.ppm.xmlextractortools.extractor.`

`sap2ppm.ZTableConcatFKs_sap2ppm` class can be used when extracting data from an SAP system to generate new system event attributes by concatenating the values of attributes already extracted. The new system events created can be referenced in other data table configurations (table XML element).

Example

```

<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE xmlextractor_tableconfiguration SYSTEM
    'xmlextractor_tableconfiguration.dtd'>
<xmlextractor_tableconfiguration>
  <configuration name="SD">
    <docspec>
      <doctable name="RBKP">
        <condition logicaloperator="eq" fieldname="GJAHR">
          <value>2005</value>
        </condition>
        <pkfield name="BELNR"/>
        <pkfield name="GJAHR"/>
      </doctable>
    </docspec>
  </configuration>
</xmlextractor_tableconfiguration>

```

```

<table name="RBKP_NEW" classtouse="com.idsscheer.ppm.
        xmlextractortools.extractor.
        sap2ppm.ZTableConcatFKs_sap2ppm">
  <pkfield name="BELNR" fktablename="RBKP"
            fkfieldname="BELNR"/>
  <pkfield name="GJAHR" fktablename="RBKP"
            fkfieldname="GJAHR"/>
  <fieldtoread name="AWKEY_GENERATED"/>
</table>
</configuration>
</xmlextractor_tableconfiguration>

```

If you are using the ZTableConcatFKs_sap2ppm class, you must specify exactly one fieldtoread element. The element contains the name of the system event attribute to be created. In the example, a new system event attribute with the name RBKP_NEW-AWKEY_GENERATED is created. The value of the attribute consists of the values of the pkfield elements specified.

The normal fkpart, prefix and postfix operations can be used for the pkfield elements.

A system event created with the above configuration could look like this:

```

...
<event>
  <attribute type="RBKP-BELNR">5105601204</attribute>
  <attribute type="RBKP-GJAHR">2005</attribute>
  <attribute type="RBKP_NEW-AWKEY_GENERATED">51056012042005
  </attribute>
</event>
...

```

Special case

In the table configuration, the special pkfield element CLIENT can be used to automatically add the number of the SAP client when extracting data. The name, fktablename and fkfieldname XML attributes must have the value CLIENT.

Example (including postfix element)

```

<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE xmlextractor_tableconfiguration SYSTEM
        'xmlextractor_tableconfiguration.dtd'>
<xmlextractor_tableconfiguration>
  <configuration name="SD">
    <docspec>
      <doctable name="RBKP">
        <condition logicaloperator="eq" fieldname="GJAHR">
          <value>2005</value>
        </condition>
        <pkfield name="BELNR"/>
        <pkfield name="GJAHR"/>
      </doctable>
    </docspec>
    <table name="RBKP_NEWER" classtouse="com.idsscheer.

```

```

                ppm.xmlextractortools.extractor.
                sap2ppm.ZTableConcatFKs_sap2ppm">
    <pkfield name="CLIENT" fktablename="CLIENT"
                fkfieldname="CLIENT">
        <postfix>
            <value> test </value>
        </postfix>
    </pkfield>
    <pkfield name="BELNR" fktablename="RBKP"
                fkfieldname="BELNR"/>
    <pkfield name="GJAHR" fktablename="RBKP"
                fkfieldname="GJAHR"/>
    <fieldtoread name="AWKEY_GENERATED"/>
</table>
</configuration>
</xmlextractor_tableconfiguration>

```

A system event that is created when extracting data from client 800 could look like this:

```

...
<event>
  <attribute type="RBKP-BELNR">5105601204</attribute>
  <attribute type="RBKP-GJAHR">2005</attribute>
  <attribute type="RBKP_NEWER-AWKEY_GENERATED"
            >800 test 51056012042005</attribute>
</event>
...

```

The new attribute - RBKP_NEWER-AWKEY_GENERATED - can then be referenced in other table configurations in the same way as every other SAP table field.

Example

```

<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE xmlextractor_tableconfiguration SYSTEM
        'xmlextractor_tableconfiguration.dtd'>
<xmlextractor_tableconfiguration>
  <configuration name="SD">
    <docspec>
      <doctable name="RBKP">
        <condition logicaloperator="eq" fieldname="GJAHR">
          <value>2005</value>
        </condition>
        <pkfield name="BELNR"/>
        <pkfield name="GJAHR"/>
      </doctable>
    </docspec>
    <table name="RBKP_NEW" classtouse="com.idsscheer.
                ppm.xmlextractortools.extractor.
                sap2ppm.ZTableConcatFKs_sap2ppm">
      <pkfield name="BELNR" fktablename="RBKP"
                fkfieldname="BELNR"/>
      <pkfield name="GJAHR" fktablename="RBKP"
                fkfieldname="GJAHR"/>
      <fieldtoread name="AWKEY_GENERATED"/>
    </table>

```

```

<table name="BKPF">
  <pkfield name="AWKEY" fktablename="RBKP_NEW"
          fkfieldname="AWKEY_GENERATED"/>
  <fieldtoread name="BELNR"/>
</table>
</configuration>
</xmlextractor_tableconfiguration>

```

A system event created with this configuration could look like this:

```

...
<event>
  <attribute type="RBKP-BELNR">5105601204</attribute>
  <attribute type="RBKP-GJAHR">2005</attribute>
  <attribute type="RBKP_NEW-AWKEY_GENERATED"
            >51056012042005</attribute>
  <attribute type="BKPF-BELNR">5100004691</attribute>
</event>
...

```

4.3.6 Link tables

The header, document, and data tables are linked to one another by primary key relations, which are specified in the pkfield XML element.

XML element	XML attribute	Description
pkfield	name	Name of the primary key (table column name)
	fktablename	Identifier of the table referenced by a foreign key relation
	fkfieldname	Name of the foreign key (table column name)
	logicaloperator	Valid values: eq, neq, gt, geq, lt, leq. Default value: eq
prefix		String inserted before the extracted foreign key value
postfix		String inserted after the extracted foreign key value

XML element	XML attribute	Description
fkpart	readfrom (optional)	Direction of the substring forming the foreign key Valid values: left, right Default value: left
	startposition	Position from which the substring is formed
	length (optional)	Length of substring Default value: Start or end of string, depending on the value of the readfrom XML attribute
value		Value specified for conditions, prefixes, and postfixes

Example

The file extract below shows the configuration that is used to extract the VBELN and POSNR database fields from the VBAP table. The foreign key relations are established by the content of the TABKEY field in the CDPOS table.

The first ten characters in the TABKEY field contain the value that is assigned to the VBELN field in the VBAP table and the following six characters contain the value that is assigned to the POSNR field in the VBAP table.

```
<table name="VBAP">
  <pkfield name="VBELN" fktablename="CDPOS"
           fkfieldname="TABKEY">
    <fkpart startposition="0" length="10"/>
  </pkfield>
  <pkfield name="POSNR" fktablename="CDPOS"
           fkfieldname="TABKEY">
    <fkpart startposition="10" length="6"/>
  </pkfield>
  <fieldtoread name="VBELN"/>
  <fieldtoread name="POSNR"/>
</table>
```

4.3.6.1 Comparison of foreign key relations

By default, the foreign key relations specified in the pkfield XML element are checked for equality (default value: logicaloperator="eq"). This applies to the corresponding definitions in the document table (doctable), the document header table (docreftable) and the data

table (table).

You can perform other comparisons by specifying the following operators:

- neq (not equal to)
- lt (less than)
- gt (greater than)
- geq (greater than or equal to)
- leq (less than or equal to)

The comparisons are performed lexicographically in line with the Unicode character list, that is, the value 00999 is less than the value 9. Alphanumeric text values can also be compared.

Example

The associated reference period for each EEINV-EINZDAT date value is to be determined.

This value represents a time interval with a start and end date. All three date fields (EEINV-EINZDAT, EANLH-VON, EANLH-BIS) are to be extracted. The file extract below shows the corresponding configuration with the foreign key comparisons less than or equal to or greater than or equal to for extracting field values from the EANLH table:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE xmlextractor_tableconfiguration SYSTEM
           'xmlextractor_tableconfiguration.dtd'>
<xmlextractor_tableconfiguration>
  <configuration name="ISU">
    <docspec>
      <doctable name="EEINV">
        <pkfield name="EINZBELEG"/>
        <pkfield name="VERTRAG"/>
      </doctable>
    </docspec>
    <table name="EEINV">
      <pkfield name="EINZBELEG" fktablename="EEINV"
              fkfieldname="EINZBELEG"/>
      <pkfield name="VERTRAG" fktablename="EEINV"
              fkfieldname="VERTRAG"/>
      <fieldtoread name="ANLAGE"/>
      <fieldtoread name="EINZDAT"/>
    </table>
    <table name="EANLH">
      <pkfield name="ANLAGE" fktablename="EEINV"
              fkfieldname="ANLAGE"/>
      <pkfield name="VON" fktablename="EEINV"
              fkfieldname="EINZDAT" logicaloperator="leq"/>
      <pkfield name="BIS" fktablename="EEINV"
              fkfieldname="EINZDAT" logicaloperator="geq"/>
      <fieldtoread name="VON"/>
      <fieldtoread name="BIS"/>
      <fieldtoread name="TARIFTYP"/>
    </table>
  </configuration>
</xmlextractor_tableconfiguration>
```

A system event extracted with this configuration could look like this:

```
<event>
  <attribute type="EEINV-EINZBELEG">000000800002</attribute>
  <attribute type="EEINV-VERTRAG">00012532</attribute>
  <attribute type="EEINV-ANLAGE">00045678</attribute>
  <attribute type="EEINV-EINZDAT">20041015</attribute>
  <attribute type="EANLH-VON">20041001</attribute>
  <attribute type="EANLH-BIS">20050930</attribute>
  <attribute type="EANLH-TARIFTYP">YELLOW-PRIVAT</attribute>
</event>
```

4.3.7 Extraction using conditions

Extracting data from the tables can be limited by the use of conditions. For example, you can use conditions to ensure that when extracting data from a table, only rows corresponding to a particular date field will be extracted. The conditions are specified directly in the configuration of the table specification in the `booleancondition` or `condition` XML element and only apply to the associated table.

A condition contains the name of the data field, the comparison operator, and a concrete value. Conditions can be linked with any degree of complexity (`booleancondition` XML element).

XML element	XML attribute	Description
<code>booleancondition</code> (optional)	<code>logicaloperator</code>	Logical operators: AND, OR, NOT Default value: AND
<code>condition</code> (optional)	<code>logicaloperator</code>	Comparison operators: eq, neq, in, notin, num_gt, num_geq, num_lt, num_leq, like Operators for restricting the data range to be extracted: creationtimestamp, valueconstraint Default value: eq
	<code>fieldname</code>	Table field name

The `docbooleancondition` and `doccondition` XML elements enable conditional extraction from a data table depending on table fields already extracted. They are configured in a similar way to `booleancondition` and `condition`. The table name and the name of the column

containing the data fields already extracted are specified in the tablename and fieldname XML attributes.

XML element	XML attribute	Description
docbooleancondition (optional)	logicaloperator	Logical operator: AND, OR, NOT Default value: AND
Doccondition (optional)	logicaloperator	Comparison operator: eq, neq, in, notin, exists, notexists Default value: eq
	tablename	Name of the table containing the table fields already extracted
	fieldname	Column name

4.3.7.1 Condition operators

Common operators

The following comparison operators are supported by the condition and doccondition XML elements:

Operator	Description
eq	The field content is equal to the specified value. (Case-sensitive Java string comparison)
neq	The field content is not equal to the specified value. (Case-sensitive Java string comparison)
in	Field content is equal to a specified value from a set of values. (Case-sensitive Java string comparison)
notin	Field content is not equal to a specified value from a set of values. (Case-sensitive Java string comparison)

Condition operators

Operator	Description
num_gt	Field content is greater than specified value.
num_geq	Field content is greater than or equal to the specified value.
num_lt	Field content is less than specified value.
num_leq	Field content is less than or equal to the specified value.
like (for alphanumeric R/3 data types only, that is, ACCP, CHAR, CLNT, CUKY, LCHR, NUMC, UNIT, VARC, TIMS, or DATS dictionary types)	<p>Comparison of field values with a variable string</p> <p>The following placeholders are permitted:</p> <ul style="list-style-type: none"> * No or any number of characters ? Any single character \ Masking character for searching for placeholders or masking characters in the form: \\ or * or \? <p>Example:</p> <pre><condition fieldname="OBJECTID" logicaloperator="like"> <value>*10?0\\20?0*</value> </condition></pre> <p>The search is performed for values such as 5551050\20106667 or 1080\204044 but not 34510550\2030*</p>
creationtimestamp	<p>Time stamps (date and time) are extracted from R/3 fields with times. Their values form the basis for restricting the data range to be extracted with the -begindate (-begintime) or -enddate (-endtime) command line parameters [see chapter Source system-specific arguments (page 65)].</p> <p>Multiple fields are separated by the character combination #-#. For each field,</p>

Operator	Description
	<p>the format descriptions of the source system fields are specified in the value XML elements.</p> <p>Example (for VBAP table):</p> <pre><condition fieldname="ERDAT#-#ERZET" logicaloperator="creationtimestamp"> <value>dd.MM.yyyy</value> <value>HH:mm:ss</value> </condition></pre>
valueconstraint	<p>Specifies an R/3 field with integer values that are used to delimit the data range to be extracted with the -valueconstraint command line parameter [see chapter Source system-specific arguments (page 65)].</p> <p>The field to be extracted must be of the NUMC or INT4 data type.</p> <p>Example (for VBAP table):</p> <pre><condition fieldname="POSNR" logicaloperator="valueconstraint" /></pre>

doccondition operators

Operator	Description
exists	Field exists.
notexists	Field does not exist.

4.3.7.2 Complex conditions

The file extract below illustrates nested conditions using the example of the document header table:

...

```

<docreftable tablename="VBAK" >
  <booleancondition logicaloperator="AND">
    <condition fieldname="ERDAT#-#ERZET"
      logicaloperator="creationtimestamp">
      <value>yyyyMMdd</value>
      <value>HHmmss</value>
    </condition>
    <condition fieldname="VBTYP" logicaloperator="in">
      <value>C</value>
      <value>K</value>
    </condition>
  </booleancondition logicaloperator="OR">
    <booleancondition logicaloperator="AND">
      <condition fieldname="VKORG" logicaloperator="eq">
        <value>1000</value>
      </condition>
      <condition fieldname="VKBUR" logicaloperator="eq">
        <value>0041</value>
      </condition>
    </booleancondition >
    <booleancondition logicaloperator="AND">
      <condition fieldname="VKORG" logicaloperator="eq">
        <value>2000</value>
      </condition>
      <condition fieldname="VKBUR" logicaloperator="neq">
        <value>0060</value>
      </condition>
    </booleancondition >
  </booleancondition >
  ...
</docreftable>
...

```

In terms of propositional logic, the file extract shown corresponds to the following condition:

ERDAT and ERZET contain the creation time

and

VBTYP is C or V

and

((VKORG is equal to 1000 and VKBUR is equal to 0041) or (VKORG is equal to 2000 and VKBUR is not equal to 0060)).

4.3.8 Extract database fields

The database fields in the document table and the linked data tables, from which values are to be extracted, are specified in the fieldtoread XML element. For each fieldtoread XML element, a line of the form

```
<attribute type="Type">Value</attribute>
```

is written to the XML output file.

Type is made up of the table name, the data field name, and an optional text field name.

Value is the value extracted from the corresponding data field. All values are written in text form.

Optionally, instead of the direct data field value, the value of the referenced table (textref XML element) can be extracted. The optional langfieldname specification extracts the language-specific text of the data field.

Supplementary information is extracted from the data tables using primary key relations.

XML element	XML attribute	Description
fieldtoread	name	Name of the table column containing the data field to be extracted
textref	tablename	Table name of the referenced data table
	reffieldname	Name of foreign key
	textfieldname	Name of the table column containing the data field to be extracted
	langfieldname (optional)	Name of the table column containing the language-specific data field to be extracted
fkpart	readfrom (optional)	Direction of the substring forming the foreign key Valid values: left, right Default value: left
	startposition	Position from which the substring is formed
	length (optional)	Length of substring Default value: Start or end of the string (readfrom XML attribute)

Before data is actually extracted, a check is run as to whether the configured tables and data fields exist and whether the specified system user has appropriate access authorization.

Example

The extracted field values are written to the XML output file as attributes of a system event.

Unlocalized table fields:

```
...
  <attribute type="VBAP-WERKS">SB</attribute>
...
```

Localized table fields:

```
...
  <attribute type="VBAP-WERKS-NAME">Saarbrücken</attribute>
...
```

4.3.9 Example: XML configuration and output file

This chapter uses a practical example to illustrate the table configuration for extracting data from an SAP system and shows an extract from the XML output file generated.

4.3.9.1 Table configuration

The file extract below shows the SD_C table configuration for extracting data from an SAP SD system:

```
...
<xmlextractor_tableconfiguration>
  <configuration name="SD_C">
    <docspec>
      <docreftable name="VBAK">
        <booleancondition>
          <condition fieldname="ERDAT#-#ERZET"
            logicaloperator="creationtimestamp">
            <value>yyyyMMdd</value>
            <value>HHmmss</value>
          </condition>
          <condition fieldname="VBTYP"
            logicaloperator="eq">
            <value>C</value>
          </condition>
        </booleancondition>
        <pkfield name="VBELN" />
      </docreftable>
      <doctable name="Orders" tablename="VBAP">
        <pkfield name="VBELN" fktablename="VBAK"
          fkfieldname="VBELN"/>
        <pkfield name="POSNR" />
        <fieldtoread name="ERDAT"/>
        <fieldtoread name="ERZET"/>
        <fieldtoread name="MATNR">
          <textref tablename="MAKT" reffieldname="MATNR">

```

```

        textfieldname="MAKTX" langfieldname="SPRAS"/>
</fieldtoread>
<fieldtoread name="KONDM">
  <textref tablename="T178T" reffieldname="KONDM"
    textfieldname="VTEXT" langfieldname="SPRAS"/>
</fieldtoread>
<fieldtoread name="SPART">
  <textref tablename="TSPAT" reffieldname="SPART"
    textfieldname="VTEXT" langfieldname="SPRAS"/>
</fieldtoread>
<fieldtoread name="WERKS">
  <textref tablename="T001W" reffieldname="WERKS"
    textfieldname="NAME1"/>
</fieldtoread>
<fieldtoread name="CHARG"/>
<fieldtoread name="PSTYV"/>
<fieldtoread name="ERNAM"/>
<fieldtoread name="NETWR"/>
</doctable>
</docspec>
<table name="VBAK">
  <pkfield name="VBELN" fktablename="Orders"
    fkfieldname="VBELN"/>
  <fieldtoread name="VTWEG">
    <textref tablename="TVTWT" reffieldname="VTWEG"
      textfieldname="VTEXT" langfieldname="SPRAS"/>
  </fieldtoread>
  <fieldtoread name="VKORG">
    <textref tablename="TVKOT" reffieldname="VKORG"
      textfieldname="VTEXT" langfieldname="SPRAS"/>
  </fieldtoread>
  <fieldtoread name="VDATU"/>
  <fieldtoread name="VKBUR">
    <textref tablename="TVKBT" reffieldname="VKBUR"
      textfieldname="BEZEI" langfieldname="SPRAS"/>
  </fieldtoread>
  <fieldtoread name="VKGRP">
    <textref tablename="TVGRT" reffieldname="VKGRP"
      textfieldname="BEZEI" langfieldname="SPRAS"/>
  </fieldtoread>
  <fieldtoread name="VBTYP"/>
  <fieldtoread name="AUART"/>
</table>
<table name="MARA">
  <pkfield name="MATNR" fktablename="Orders"
    fkfieldname="MATNR"/>
  <fieldtoread name="MATNR"/>
  <fieldtoread name="MTART">
    <textref tablename="T134T" reffieldname="MTART"
      textfieldname="MTBEZ" langfieldname="SPRAS"/>
  </fieldtoread>
</table>
</configuration>
</xmlextractor_tableconfiguration>

```

The SD_C table configuration contains the following tables:

DOCUMENT HEADER TABLE

```

...
<docreftable name="VBAK">
  <booleancondition>
    <condition fieldname="ERDAT#-#ERZET"
      logicaloperator="creationtimestamp">
      <value>yyyyMMdd</value>
      <value>HHmmss</value>
    </condition>
    <condition fieldname="VBTYP"
      logicaloperator="eq">
      <value>C</value>
    </condition>
  </booleancondition>
  <pkfield name="VBELN" />
</docreftable>

```

...

The identifier and name of the document header table from the R/3 system is VBAK. All order document headers (VBTYP=C) for the period specified in the command line are read. The value elements of the creationtimestamp condition operator specify the format of the specified time stamp.

The name of the primary key table column is VBELN. For each different VBELN field value, data records are extracted from the linked document table for which VBELN has the same value as in the document header table.

DOCUMENT TABLE

```

...
<doctable name="Orders" tablename="VBAP">
  <pkfield name="VBELN" fktablename="VBAK"
    fkfieldname="VBELN"/>
  <pkfield name="POSNR" />
  <fieldtoread name="ERDAT"/>
  <fieldtoread name="ERZET"/>
  <fieldtoread name="MATNR">
    <textref tablename="MAKT" reffieldname="MATNR"
      textfieldname="MAKTX" langfieldname="SPRAS"/>
  </fieldtoread>
  <fieldtoread name="KONDM">
    <textref tablename="T178T" reffieldname="KONDM"
      textfieldname="VTEXT" langfieldname="SPRAS"/>
  </fieldtoread>
  <fieldtoread name="SPART">
    <textref tablename="TSPAT" reffieldname="SPART"
      textfieldname="VTEXT" langfieldname="SPRAS"/>
  </fieldtoread>
  <fieldtoread name="WERKS">
    <textref tablename="T001W" reffieldname="WERKS"
      textfieldname="NAME1"/>
  </fieldtoread>
  <fieldtoread name="CHARG"/>

```

```

    <fieldtoread name="PSTYV"/>
    <fieldtoread name="ERNAM"/>
    <fieldtoread name="NETWR"/>
  </doctable>

```

...

The document table VBAP is assigned the identifier Orders. The foreign key relation specified in the line

```
<pkfield name="VBELN" fktablename="VBAK" fkfieldname="VBELN"/>
```

links the table to the document header table. Unless otherwise specified, foreign key relations are created based on equal field values (see chapter Comparison of foreign key relations (page 23)). In this example, only those table rows for which the comparison of the VBAP-VBELN and VBAK-VBELN field values returns equal values will be extracted. The primary key consists of the VBELN and POSNR columns.

For each table row extracted, a system event (event XML element) is created in the XML output file. For each fieldtoread XML element, a line of the form

```
<attribute type="...">...</attribute>
```

is written to the output file.

The primary key fields (pkfield) specified in the doctable definition are extracted automatically. You do not have to specify fieldtoread elements for them.

For some fieldtoread elements, the value extracted from the referenced table (textref XML element) is written in addition to the extracted data field value. The optional langfieldname extracts the language-specific text of the data field.

The complete source system attribute type is made up of the identifier of the document header table (doctable name), the field name (fieldtoread name) and the name of the referenced text field (textref ... textfieldname). The source system attribute type for the first extracted fieldtoread element with a referenced table looks like this:

```
<attribute type="Orders-MATNR-MAKTX">...</attribute>
```

DATA TABLES

...

```

<table name="VBAK">
  <pkfield name="VBELN" fktablename="Orders"
           fkfieldname="VBELN"/>
  <fieldtoread name="VTWEG">
    <textref tablename="TVTWT" reffieldname="VTWEG"
            textfieldname="VTEXT" langfieldname="SPRAS"/>

```



```

</fieldtoread>
<fieldtoread name="VKORG">
  <textref tablename="TVKOT" reffieldname="VKORG"
    textfieldname="VTEXT" langfieldname="SPRAS"/>
</fieldtoread>
<fieldtoread name="VDATU"/>
<fieldtoread name="VKBUR">
  <textref tablename="TVKBT" reffieldname="VKBUR"
    textfieldname="BEZEI" langfieldname="SPRAS"/>
</fieldtoread>
<fieldtoread name="VKGRP">
  <textref tablename="TVGRT" reffieldname="VKGRP"
    textfieldname="BEZEI" langfieldname="SPRAS"/>
</fieldtoread>
<fieldtoread name="VBTPP"/>
<fieldtoread name="AUART"/>
</table>

<table name="MARA">
  <pkfield name="MATNR" fktablename="Orders"
    fkfieldname="MATNR"/>
  <fieldtoread name="MATNR"/>
  <fieldtoread name="MTART">
    <textref tablename="T134T" reffieldname="MTART"
      textfieldname="MTBEZ" langfieldname="SPRAS"/>
  </fieldtoread>
</table>

```

...

The foreign key relations to the VBELN and MATNR primary key fields in the Orders table are used to extract supplementary information from the VBAK and MARA data tables.

4.3.9.2 XML output file (PPM system event format)

The file extract below shows a range of system events from the XML output file generated using the configuration file specified in the chapter on Table configuration (page 31):

```

<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
<event>
  <attribute type="Orders-CHARG"></attribute>
  <attribute type="Orders-ERDAT">20000214</attribute>
  <attribute type="Orders-ERNAM">HDM</attribute>
  <attribute type="Orders-ERZET">143616</attribute>
  <attribute type="Orders-KONDM"></attribute>
  <attribute type="Orders-MATNR">P-100</attribute>
  <attribute type="Orders-MATNR-MAKTX">
    Thread rod M'8 DIN '8895' without tolerance
  </attribute>
  <attribute type="Orders-NETWR">28.70</attribute>
  <attribute type="Orders-POSNR">000010</attribute>
  <attribute type="Orders-PSTYV">TAN</attribute>

```

```

<attribute type="Orders-SPART">01</attribute>
<attribute type="Orders-SPART-VTEXT">Product category 01
</attribute>
<attribute type="Orders-VBELN">0000000001</attribute>
<attribute type="Orders-WERKS">1000</attribute>
<attribute type="Orders-WERKS-NAME1">Plant 1000 (Hamburg)
</attribute>
<attribute type="MARA-MATNR">P-100</attribute>
<attribute type="MARA-MTART">HAWA</attribute>
<attribute type="MARA-MTART-MTBEZ">Trading goods
</attribute>
<attribute type="VBAK-AUART">TA</attribute>
<attribute type="VBAK-VBTYP">C</attribute>
<attribute type="VBAK-VDATU">20000214</attribute>
<attribute type="VBAK-VKBUR"></attribute>
<attribute type="VBAK-VKGRP"></attribute>
<attribute type="VBAK-VKORG">1000</attribute>
<attribute type="VBAK-VKORG-VTEXT">Germany Frankfurt
</attribute>
<attribute type="VBAK-VTWEG">10</attribute>
<attribute type="VBAK-VTWEG-VTEXT">Consumer sales
</attribute>
</event>
<event>
  <attribute type="VBAK-VKORG-VTEXT">Germany Frankfurt
  </attribute>
  <attribute type="VBAK-VTWEG-VTEXT">Consumer sales
  </attribute>
  <attribute type="Orders-SPART">01</attribute>
  <attribute type="Orders-PSTYV">TAD</attribute>
  <attribute type="Orders-MATNR">SERVICE</attribute>
  <attribute type="Orders-ERDAT">20000214</attribute>
  <attribute type="VBAK-VKBUR"></attribute>
  <attribute type="VBAK-VTWEG">10</attribute>
  <attribute type="Orders-SPART-VTEXT">Product category 01
  </attribute>
  <attribute type="Orders-ERZET">143616</attribute>
  <attribute type="VBAK-VKORG">1000</attribute>
  <attribute type="Orders-POSNR">000020</attribute>
  <attribute type="MARA-MTART-MTBEZ">Service
  </attribute>
  <attribute type="Orders-WERKS-NAME1">Plant 1000 (Hamburg)
  </attribute>
  <attribute type="Orders-CHARG"></attribute>
  <attribute type="Orders-WERKS">1000</attribute>
  <attribute type="VBAK-VDATU">20000214</attribute>
  <attribute type="Orders-MATNR-MAKTX">Repair
  </attribute>
  <attribute type="Orders-VBELN">0000000001</attribute>
  <attribute type="VBAK-AUART">TA</attribute>
  <attribute type="VBAK-VKGRP"></attribute>
  <attribute type="Orders-NETWR">179.00</attribute>
  <attribute type="MARA-MTART">DIEN</attribute>
  <attribute type="VBAK-VBTYP">C</attribute>
  <attribute type="Orders-ERNAM">HDM</attribute>
  <attribute type="MARA-MATNR">SERVICE</attribute>

```

```

  <attribute type="Orders-KONDM"></attribute>
</event>
<event>
  <attribute type="VBAK-VKGRP-BEZEI">GR. F2 Mr. Mayer
  </attribute>
  <attribute type="VBAK-VKORG-VTEXT">Germany Frankfurt
  </attribute>
  <attribute type="VBAK-VTWEG-VTEXT">Consumer sales
  </attribute>
  <attribute type="Orders-SPART">01</attribute>
  <attribute type="Orders-PSTYV">TAN</attribute>
  <attribute type="Orders-MATNR">P-100</attribute>
  <attribute type="Orders-ERDAT">20000214</attribute>
  <attribute type="VBAK-VKBUR">1000</attribute>
  <attribute type="VBAK-VTWEG">10</attribute>
  <attribute type="Orders-SPART-VTEXT">Product category 01
  </attribute>
  <attribute type="Orders-ERZET">131257</attribute>
  <attribute type="VBAK-VKBUR-BEZEI">Frankfurt office
  </attribute>
  <attribute type="VBAK-VKORG">1000</attribute>
  <attribute type="Orders-POSNR">000010</attribute>
  <attribute type="MARA-MTART-MTBEZ">Trading goods</attribute>
  <attribute type="Orders-WERKS-NAME1">Plant 1000 (Hamburg)
  </attribute>
  <attribute type="Orders-CHARG"></attribute>
  <attribute type="Orders-WERKS">1000</attribute>
  <attribute type="VBAK-VDATU">20000214</attribute>
  <attribute type="Orders-MATNR-MAKTX">
    Thread rod M'8 DIN '8895' without tolerance
  </attribute>
  <attribute type="Orders-VBELN">0000000002</attribute>
  <attribute type="VBAK-AUART">TA</attribute>
  <attribute type="VBAK-VKGRP">101</attribute>
  <attribute type="Orders-NETWR">28.70</attribute>
  <attribute type="MARA-MTART">HAWA</attribute>
  <attribute type="VBAK-VBTYP">C</attribute>
  <attribute type="Orders-ERNAM">HDM</attribute>
  <attribute type="MARA-MATNR">P-100</attribute>
  <attribute type="Orders-KONDM"></attribute>
</event>
...
</eventlist>

```

4.3.10 Block extraction

You can influence the relationship between the execution and memory efficiency of the extraction operation.

The value of the `-cpd` command line argument determines the number of system events that

are simultaneously held in the system memory. The maximum possible number depends on the size of the available system memory.

The actual system memory used depends on the following factors:

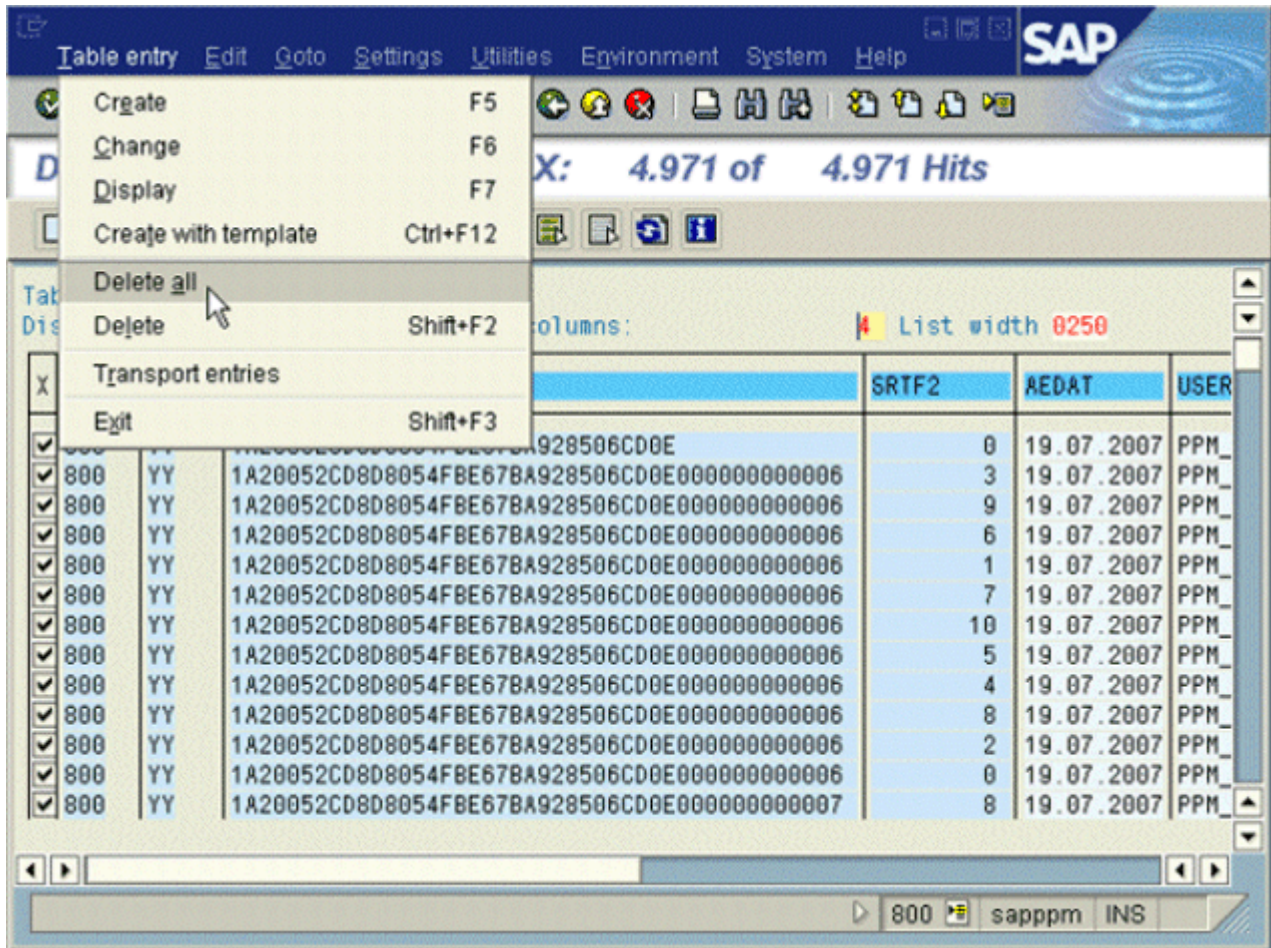
- Total number of system events to be extracted in the defined analysis period
- Number of system events held in parallel in the system (concurrently processed documents)
- Number of data fields to be extracted (fieldtoread and reftext XML elements).
- Memory requirements of extracted data fields

4.3.10.1 Block extraction of large data volumes

During the extraction, all data of an RFC call is transferred at once to the Java client using SAP JCo. However, large data volumes can result in memory overflow (OutOfMemoryError). For example, this happens when the primary keys for the document tables and document header tables are being determined. In this case, the data must first be buffered in the R/3 system and then transferred to the Java client a block at a time. The block size is specified by the -cpd parameter. There are three different block modes, which differ in terms of the way in which the data is buffered in the R/3 system.

BLOCK MODE D

Mode D is recommended for block extraction of large data sets from the R/3 system. The selected data is stored in the /IDS/INDX database table. If the connection to the Extractor fails or the extraction operation is aborted manually, the data is not automatically deleted from the database table. You need to delete the buffered data manually. To do this, display the content of the /IDS/INDX table using transaction SE16. Then select all the relevant entries and delete them using the Delete all... option in the main Table entry menu.



Example

You want to extract more than a million entries from the CPDOS table (change document items). If you do not use block extraction, the Java memory will overflow and extraction will be aborted.

Executing the following command line extracts the data in blocks (block parameter in bold):

```
runsap2ppm -systemconfig Systemconfig.xml -tableconfig TableconfigCDPOS.xml
-outfile eventsCDPOS -nozip -begindate 19700101 -rfc_blockmode D -cpd 1000
```

By specifying the -rfc_blockmode parameter with the D argument, you start block extraction, which writes all data from the CPDOS database table to the output file. You use

the `-cpd` parameter to specify the size of the blocks to be processed. In the example, 10000 documents are processed simultaneously. The default value is 5000.

The progress of the block extraction is logged as specified, for example:

```
I: 09.05.06 11:30:38: [XML] Extracting data from...
...
...
I: 09.05.06 11:32:30: [XML]      "CDPOS" table:
      10,000 of 1,036,995 rows extracted.
I: 09.05.06 11:32:30: [XML] Extracting attributes for
      10000 source system events...
I: 09.05.06 11:32:39: [XML]      "CDPOS" table:
      20,000 of 1,036,995 rows extracted.
I: 09.05.06 11:32:39: [XML] Extracting attributes for
      10000 source system events...
...
```

By specifying `-progress no`, you can suppress the additional log messages for the block modes, which show the progress of the block extraction.

BLOCK MODE G

The selected data is stored in an internal table of the function group. The data is held in the R/3 server memory. If the connection to the Extractor fails or the extraction is aborted manually, the data is automatically deleted in the R/3 system. These specifications apply from SAP Release 4.7, that is, from SAP Kernel Release 6.10.

BLOCK MODE M

The selected data is stored in the ABAP memory using export to memory id. The data is held in the R/3 server memory. If the connection to the Extractor fails or the extraction is aborted manually, the data is automatically deleted in the R/3 system. These specifications apply from SAP Release 4.7, that is, from SAP Kernel Release 6.10.

4.3.11 Extract change documents

Change documents represent a special document type in the SAP R/3 system. These documents are stored in the CDHDR (change header) and CDPOS (change item) tables. As these tables are structured in the same way as the other document header and document tables in the R/3 system, the configuration structure can be used to extract data from the change document tables with no changes.

The configuration for extracting data from the change document tables must be designed in such a way that data is extracted from the CDHDR change header table before any other tables.

There are two ways to extract change documents.

4.3.11.1 Create source system events from individual changes

A system event is created for each change document.

Example

The changes for January 2003 that meet the following conditions are to be extracted from the change document table:

- The object class is VERKBELEG.
- The changed table is VBAK.
- The changed field is VKGRP.
- The new field value is 4711 or 4712.

The conditions can be formulated in the XML configuration file below:

```
...
<configuration name="OneEventForEveryChangeDoc">
  <docspec>
    <docreftable name="CDHDR">
      <booleancondition logicaloperator="AND">
        <condition fieldname="OBJECTCLAS"
                    logicaloperator="eq">
          <value>VERKBELEG</value>
        </condition>
        <condition fieldname="UDATE#-#UTIME"
                    logicaloperator="creationtimestamp">
          <value>yyyyMMdd</value>
          <value>HHmmss</value>
        </condition>
      </booleancondition>
      <pkfield name="OBJECTCLAS"/>
      <pkfield name="OBJECTID"/>
      <pkfield name="CHANGENR"/>
    </docreftable>

    <doctable name="CDPOS">
      <booleancondition logicaloperator="AND">
        <condition fieldname="TABNAME"
                    logicaloperator="eq">
          <value>VBAK</value>
        </condition>
        <condition fieldname="FNAME"
                    logicaloperator="eq">
          <value>VKGRP</value>
        </condition>
        <condition fieldname="VALUE_NEW"
                    logicaloperator="in">
          <value>4711</value>
          <value>4712</value>
        </condition>
      </booleancondition>

```

```

    <pkfield name="OBJECTCLAS" fktablename="CDHDR"
              fkfieldname="OBJECTCLAS"/>
    <pkfield name="OBJECTID" fktablename="CDHDR"
              fkfieldname="OBJECTID"/>
    <pkfield name="CHANGENR" fktablename="CDHDR"
              fkfieldname="CHANGENR"/>
    <pkfield name="TABNAME"/>
    <pkfield name="TABKEY"/>
    <pkfield name="FNAME"/>
    <pkfield name="CHNGIND"/>
    <fieldtoread name="TABNAME"/>
    <fieldtoread name="CHNGIND"/>
    <fieldtoread name="VALUE_NEW"/>
    <fieldtoread name="VALUE_OLD"/>
  </doctable>
</docspec>

<table name="CDHDR">
  <pkfield name="OBJECTCLAS" fktablename="CDPOS"
            fkfieldname="OBJECTCLAS"/>
  <pkfield name="OBJECTID" fktablename="CDPOS"
            fkfieldname="OBJECTID"/>
  <pkfield name="CHANGENR" fktablename="CDPOS"
            fkfieldname="CHANGENR"/>
  <fieldtoread name="UDATE"/>
  <fieldtoread name="UTIME"/>
  <fieldtoread name="CHANGENR"/>
  <fieldtoread name="USERNAME"/>
</table>
</configuration>
...

```

4.3.11.2 Extract system events including changes

Information on change documents from the SAP tables CDPOS and CDHDR is stored in special source system attributes of system events using a particular class.

Change documents are extracted using a suitable configuration of a data table. The `com.idsscheer.ppm.xmlextractortools.extractor.sap2ppm.ZChangeDocTable_sap2ppm` class is used to extract the change documents.

If there are no change documents for an extracted system events, only the configured table fields are transferred as source system attributes.

In the configuration of the data table from which the change documents are to be extracted, the following conditions must be specified:

```

<table name="..." classtouse="com.idsscheer.ppm.
  xmlextractortools.extractor.sap2ppm.
  ZChangeDocTable_sap2ppm">
  <booleancondition>
    <condition fieldname="OBJECTCLAS" ...>

```



```

    ...
</condition>
<condition fieldname="OBJECTID" ...>
    ...
</condition>
<condition fieldname="TABNAME" ...>
    ...
</condition>
<booleancondition logicaloperator="OR">
  <condition fieldname="TABKEY" ...>
    ...
  </condition>
  <condition fieldname="TABKEY" ...>
    ...
  </condition>
</booleancondition>
</booleancondition>
...
</table>

```

Please do not specify any other conditions.

The following table displays the source system attributes that are created from the extracted change document information. CH_DOCS has been specified as the identifier of the data table in the configuration.

Source system attribute	Description
CH_DOCS-SUM_OF_CHANGES	Total number of changes in the extracted document (number of saving operations).
CH_DOCS-FIRST_CHANGE_DATE CH_DOCS-FIRST_CHANGE_TIME	Date of the first change Time of the first change
CH_DOCS-LAST_CHANGE_DATE CH_DOCS-LAST_CHANGE_TIME	Date of the last change Time of the last change
CH_DOCS-CHANGE_USER_<x>	Name of the processor that has created change documents. The attribute is created for every processor.<x> is the consecutive number of the processor.

Source system attribute	Description
CH_DOCS-NUM_OF_CHANGES_ USER_<x>	Total number of changes made by the processor.<x> is the consecutive number of the processor.

Example

The file extract below illustrates the configuration for extracting the changes in the VBAK and VBAP tables:

```
<configuration name="SD_CHANGE_DOC_SUM">
  <docspec>
    <docreftable name="VBAK">
      <condition fieldname="ERDAT#-#ERZET"
        logicaloperator="creationtimestamp">
        <value>yyyyMMdd</value>
        <value>HHmmss</value>
      </condition>
      <pkfield name="VBELN" />
    </docreftable>
    <doctable name="VBAP">
      <pkfield name="VBELN" fktablename="VBAK"
        fkfieldname="VBELN"/>
      <pkfield name="POSNR" />
      <fieldtoread name="VBELN"/>
      <fieldtoread name="POSNR"/>
      <fieldtoread name="ERDAT"/>
      <fieldtoread name="ERZET"/>
      <fieldtoread name="ERNAM"/>
    </doctable>
  </docspec>
  <table name="CH_DOCS" classtouse="com.idsscheer.ppm.
    xmlextractortools.extractor.
    sap2ppm.ZChangeDocTable_sap2ppm">
    <booleancondition>
      <condition fieldname="OBJECTCLAS">
        <value>VERKBELEG</value>
      </condition>
      <condition fieldname="OBJECTID"
        logicaloperator="eq_concatEventAttrValues">
        <value>VBAP-VBELN</value>
      </condition>
      <condition fieldname="TABNAME" logicaloperator="in">
        <value>VBAK</value>
        <value>VBAP</value>
      </condition>
      <booleancondition logicaloperator="OR">
        <condition fieldname="TABKEY"
          logicaloperator="eq_concatEventAttrValues">
          <value>CLIENT#-#</value>
          <value>VBAP-VBELN#-#</value>
          <value>VBAP-POSNR</value>
        </condition>
      </booleancondition>
    </table>
</configuration>
```

```

    </condition>
    <condition fieldname="TABKEY"
      logicaloperator="eq_concatEventAttrValues">
      <value>CLIENT#-#</value>
      <value>VBAP-VBELN</value>
    </condition>
  </booleancondition>
</booleancondition>
<pkfield name="VBELN" fktablename="VBAP"
  fkfieldname="VBELN"/>
<pkfield name="POSNR" fktablename="VBAP"
  fkfieldname="POSNR"/>
</table>
</configuration>

```

The eq_concatEventAttrValues operator compares the content of the specified field with combined attribute values from the specified fields. The values specified in the value XML elements are interpreted as the identifiers of source system attributes already extracted.

Note on the values of the OBJECTID and TABKEY fields

The individual field values (<value>...</value>) are concatenated using the specified separator string #-# between the individual field values. In the example, the values of the fields OBJECTID and TABKEY contain the following:

OBJECTID

Value	Description	Example value
VBAP-VBELN	The value already extracted from the field VBELN in the table VBAP must match as a condition for the field OBJECTID.	0000004972

TABKEY

Value	Description	Example value
CLIENT	Parameter that is replaced by the number of the SAP client from which you extract.	800
VBAP-VBELN	Value of the extracted field VBELN of the table VBAP.	0000004972

Value	Description	Example value
VBAP-POSNR	Value of the extracted field POSNR of the table VBAP.	000020

Based on the example values in the above configuration, the concatenated values 800#-#0000004972#-#000020 and 800#-#0000004972 are the result for the field TABKEY (key of the changed table row).

The output file extract below illustrates a possible system event:

```
<event>
  <attribute type="CH_DOCS-CHANGE_USER_1">
    sapuser
  </attribute>
  <attribute type="CH_DOCS-CHANGE_USER_2">
    ANFEL
  </attribute>
  <attribute type="CH_DOCS-FIRST_CHANGE_DATE">
    20030919
  </attribute>
  <attribute type="CH_DOCS-FIRST_CHANGE_TIME">
    181020
  </attribute>
  <attribute type="CH_DOCS-LAST_CHANGE_DATE">
    20030930
  </attribute>
  <attribute type="CH_DOCS-NUM_OF_CHANGES_USER_1">
    1
  </attribute>
  <attribute type="CH_DOCS-NUM_OF_CHANGES_USER_2">
    3
  </attribute>
  <attribute type="CH_DOCS-SUM_OF_CHANGES">
    4
  </attribute>
  <attribute type="VBAP-ERDAT">20030919</attribute>
  <attribute type="VBAP-ERNAM">ANFEL</attribute>
  <attribute type="VBAP-ERZET">174938</attribute>
  <attribute type="VBAP-POSNR">000010</attribute>
  <attribute type="VBAP-VBELN">0000007500</attribute>
</event>
```

4.3.11.3 Extract the first change document of a table field

Use the class `com.idsscheer.ppm.xmlextractortools.extractor.sap2ppm.ZFirstFieldChange_sap2ppm` to extract information on the first change of a table field from an SAP system. Specify the class with the XML attribute `classtouse` in the table configuration in the XML element `table`.

CALCULATION

For some documents in the SAP system, there is only one field for the last change date. The initial value of this field in the first change document is interpreted as the creation date of the document. This value is extracted with the class to be used from the change document tables `CDHDR` and `CDPOS`.

THE CONDITIONS FOR USING THE CLASS MUST BE AS FOLLOWS:

```
<table name="name" classtouse="com.idsscheer.ppm. ↵
                                xmlextractortools. ↵
                                extractor.sap2ppm. ↵
                                ZFirstFieldChange_sap2ppm">
  <booleancondition>
    <condition fieldname="OBJECTCLAS" ...>
      ...
    </condition>
    <condition fieldname="OBJECTID" ...>
      ...
    </condition>
    <condition fieldname="TABNAME" ...>
      ...
    </condition>
    <condition fieldname="TABKEY" ...>
      ...
    </condition>
    <condition fieldname="FNAME" ...>
      ...
    </condition>
  </booleancondition>

  <pkfield name="OBJECTCLAS"/>
  <pkfield name="OBJECTID"/>
  <pkfield name="CHANGENR"/>
  <pkfield name="TABNAME"/>
  <pkfield name="TABKEY"/>
  <pkfield name="FNAME"/>
  <pkfield name="CHNGIND"/>

  <pkfield name="<Field that is used in the tabkey>" ↵
    fktablename="<Foreign key table, ↵ from
                which the field is extracted>" ↵
    fkfieldname="<Foreign key table field>"/>
  ... Other fields used in the tabkey
  <fieldtoread name="CDPOS-VALUE_OLD"/>
```

```

... Other fields from the CDPOS table
<fieldtoread name="CDHDR-UDATE"/>
... Other fields from the CDHDR table
</table>

```

The combination of values specified in the OBJECTID and TABKEY fields is the same as for the com.idsscheer.ppm.xmlextractortools.extractor.sap2ppm. ↵
ZChangeDocTable_sap2ppm (see chapter Extract system events incl. changes (page 42)).

Example (of an SAP configuration)

With this configuration, you want to extract data as to who last changed the field containing the approval status of purchase requisitions and when:

```

<table name="ORIGINAL_ERDAT" classtouse="com.idsscheer.ppm. ↵
        xmlextractortools.extractor.sap2ppm. ↵
        ZFirstFieldChange_sap2ppm">
  <booleancondition>
    <condition fieldname="OBJECTCLAS" logicaloperator="eq">
      <value>EINKBELEG</value>
    </condition>
    <condition fieldname="OBJECTID" ↵
      logicaloperator="eq_concatEventAttrValues">
      <value>EKPO-EBELN</value>
    </condition>
    <condition fieldname="TABNAME" logicaloperator="eq">
      <value>EKPO</value>
    </condition>
    <condition fieldname="TABKEY" ↵
      logicaloperator="eq_concatEventAttrValues">
      <value>CLIENT#-#EKPO-EBELN#-#EKPO-EBELP</value>
    </condition>
    <condition fieldname="FNAME" logicaloperator="eq">
      <value>AEDAT</value>
    </condition>
  </booleancondition>

  <pkfield name="OBJECTCLAS"/>
  <pkfield name="OBJECTID"/>
  <pkfield name="CHANGENR"/>
  <pkfield name="TABNAME"/>
  <pkfield name="TABKEY"/>
  <pkfield name="FNAME"/>
  <pkfield name="CHNGIND"/>

  <pkfield name="EBELN" fktablename="EKPO" ↵
    fkfieldname="EBELN"/>
  <pkfield name="EBELP" fktablename="EKPO" ↵
    fkfieldname="EBELP"/>

  <fieldtoread name="CDPOS-VALUE_OLD"/>
</table>

```

The result of the value extraction with this table configuration could be as follows in a created system event:

```
<event>
  ...
  <attribute type="ORIGINAL_ERDAT-VALUE_OLD">
    20010402
  </attribute>
  ...
</event>
```

4.3.11.4 Extract the last change document of a table field

Use the class `com.idsscheer.ppm.xmlextractortools.extractor.sap2ppm.ZLastFieldChange_sap2ppm` to extract information on the last change of a document from an SAP system. Configuration and calculation of the class are the same as for the class `com.idsscheer.ppm.xmlextractortools.extractor.sap2ppm.ZFirstFieldChange_sap2ppm` (see chapter Extract the first change document of a table field (page 47)), only with the difference that the last change document instead of the first is used for determining the data.

4.3.11.5 Extract the last change document from multiple table fields

Information about change documents is stored in the CDHDR (change document header) and CDPOS (change document items) change document tables. This information can be extracted by carrying out the corresponding configuration for the relevant data table (table XML element). Please use the `com.idsscheer.ppm.xmlextractortools.extractor.sap2ppm.ZChangeDocTableNew_sap2ppm` class to do this.

Example (extract from table configuration, general file framework)

A configuration with conditions that need to be specified in a table element could look like this:

```
...
<table name="tablename" classtouse="com.idsscheer.ppm.
      xmlextractortools.extractor.sap2ppm.
      ZChangeDocTableNew_sap2ppm">
  <booleancondition>
    <condition fieldname="OBJECTCLAS" logicaloperator="...">
      ...
    </condition>
    <condition fieldname="OBJECTID" logicaloperator="...">
      ...
    </condition>
```

```

    <condition fieldname="TABNAME" logicaloperator="...">
        ...
    </condition>
    <condition fieldname="TABKEY" logicaloperator="...">
        ...
    </condition>
    <condition fieldname="FNAME" logicaloperator="in">
        ...
    </condition>
</booleancondition>

<pkfield name="OBJECTCLAS"/>
<pkfield name="OBJECTID"/>
<pkfield name="CHANGENR"/>
<pkfield name="TABNAME"/>
<pkfield name="TABKEY"/>
<pkfield name="FNAME"/>
<pkfield name="CHNGIND"/>

<pkfield name="<Field that is used in TABKEY>"
    fktablename="<Foreign key table, from
        which the field is extracted>"
    fkfieldname="<Foreign key table field>"/>
... Other fields used in TABKEY
<fieldtoread name="CDPOS-VALUE_OLD"/>
... Other fields from the CDPOS table
<fieldtoread name="CDHDR-UDATE"/>
... Other fields from the CDHDR table
</table>
...

```

The combination of values specified in the OBJECTID and TABKEY fields is the same as for the com.idsscheer.ppm.xmlextractortools.extractor.

sap2ppm.ZChangeDocTable_sap2ppm class. A more concrete example is shown below.

Example (extract from a table configuration from the PPM4MM configuration package)

The example configuration is intended to extract the time at which one of the fields for the reasons for blocking logistical invoices was changed:

```

...
<table name="CDPOS" classtouse="com.idsscheer.ppm.
    xmlextractortools.extractor.sap2ppm.
        ZChangeDocTableNew_sap2ppm">
    <booleancondition>
        <condition fieldname="OBJECTCLAS" logicaloperator="eq">
            <value>INCOMINGINVOICE</value>
        </condition>
        <condition fieldname="OBJECTID"
            logicaloperator="eq_concatEventAttrValues">
            <value>RSEG-BELNR#-#RSEG-GJAHR</value>
        </condition>
        <condition fieldname="TABNAME" logicaloperator="eq">
            <value>RSEG</value>
        </condition>
        <condition fieldname="TABKEY"

```



```

        logicaloperator="eq_concatEventAttrValues">
    <value>    #-#RSEG-BELNR#-#
                RSEG-GJAHR#-#RSEG-BUZEI</value>
</condition>
<condition fieldname="FNAME" logicaloperator="in">
    <value>SPGRP</value>
    <value>SPGRM</value>
    <value>SPGRT</value>
    <value>SPGRG</value>
    <value>SPGRV</value>
    <value>SPGRQ</value>
    <value>SPGRS</value>
    <value>SPGRC</value>
</condition>
</booleancondition>
<pkfield name="OBJECTCLAS"/>
<pkfield name="OBJECTID"/>
<pkfield name="CHANGENR"/>
<pkfield name="TABNAME"/>
<pkfield name="TABKEY"/>
<pkfield name="FNAME"/>
<pkfield name="CHNGIND"/>
<pkfield name="BELNR" fktablename="RSEG"
                fkfieldname="BELNR"/>
<pkfield name="GJAHR" fktablename="RSEG"
                fkfieldname="GJAHR"/>
<pkfield name="BUZEI" fktablename="RSEG"
                fkfieldname="BUZEI"/>
</table>

```

...

A system event generated with this example configuration could look like this:

```

...
<event>
  <attribute type="CDPOS-CHANGE_USER_1">HUETT</attribute>
  <attribute type="CDPOS-FIRST_CHANGE_DATE">20010220
</attribute>
  <attribute type="CDPOS-FIRST_CHANGE_TIME">154943
</attribute>
  <attribute type="CDPOS-LAST_CHANGE_DATE">20010220
</attribute>
  <attribute type="CDPOS-LAST_CHANGE_TIME">154943
</attribute>
  <attribute type="CDPOS-NUM_OF_CHANGES_USER_1">1
</attribute>
  <attribute type="CDPOS-SUM_OF_CHANGES">1</attribute>

```

...

<event>

...

4.3.12 Extract the first or last line in a sorting

The `com.idsscheer.ppm.xmlextractortools.`

`extractor.sap2ppm.ZSortWithInteger_sap2ppm` Java class to be used extracts data records from tables, sorts them using the specified sorting criteria, and writes either the first or last data record to the system events to be generated. The class must be specified in the `classtouse` attribute of the table XML element.

Example

Status history documents represent a special document type in the SAP R/3 system. These documents are stored in the JCDS table. The class is to determine the last change relating to a particular status type and to write this change to the corresponding system events. To do this, all order numbers are extracted from the AUFK table. In addition, for each order number with status information, all entries for that order number with the OR prefix and the status I0043 (STAT field) are extracted from the JCDS table. These are to be sorted by creation time (UDATE, UTIME) and the last data record created is to be extracted. All field values pertaining to this data record are to be written to the relevant system event.

The file extract below illustrates the configuration for extracting status information from the JCDS table under the above conditions:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE xmlextractor_tableconfiguration SYSTEM
        'xmlextractor_tableconfiguration.dtd'>
<xmlextractor_tableconfiguration>
  <configuration name="AUFK_JCDS">
    <docspec>
      <doctable name="AUFK">
        <pkfield name="AUFNR"/>
      </doctable>
    </docspec>
    <table name="JCDS_I0043" tablename="JCDS"
          classtouse="com.idsscheer.ppm.
            xmlextractortools.extractor.
            sap2ppm.ZSortWithInteger_sap2ppm">
      <parameter name="SORTCRITERION">
        <value>UDATE</value>
        <value>UTIME</value>
      </parameter>
      <parameter name="USE">
        <value>MAX</value>
      </parameter>
      <condition fieldname="STAT"
                logicaloperator="eq">
        <value>I0043</value>
      </condition>
      <pkfield name="OBJNR" fktablename="AUFK"
                fkfieldname="AUFNR">
        <prefix>
          <value>OR</value>
        </prefix>
      </pkfield>
    </table>
  </configuration>
</xmlextractor_tableconfiguration>
```

```

    </prefix>
  </pkfield>
  <fieldtoread name="CDTCODE"/>
  <fieldtoread name="CHGNR"/>
  <fieldtoread name="CHIND"/>
  <fieldtoread name="INACT"/>
  <fieldtoread name="OBJNR"/>
  <fieldtoread name="STAT"/>
  <fieldtoread name="TCODE"/>
  <fieldtoread name="USNAM"/>
</table>
</configuration>
</xmlextractor_tableconfiguration>

```

A system event extracted with this configuration could look like this:

```

<event>
  <attribute type="AUFK-AUFNR">000000800002</attribute>
  <attribute type="JCDS_I0043-CDTCODE"></attribute>
  <attribute type="JCDS_I0043-CHGNR">002</attribute>
  <attribute type="JCDS_I0043-CHIND">U</attribute>
  <attribute type="JCDS_I0043-INACT">X</attribute>
  <attribute type="JCDS_I0043-OBJNR">
    OR000000800002
  </attribute>
  <attribute type="JCDS_I0043-STAT">I0043</attribute>
  <attribute type="JCDS_I0043-TCODE">KOK2</attribute>
  <attribute type="JCDS_I0043-UDATE">19961217</attribute>
  <attribute type="JCDS_I0043-USNAM">MUELLERJ</attribute>
  <attribute type="JCDS_I0043-UTIME">192122</attribute>
</event>

```

The sorting criteria (in this case UDATE, UTIME) are automatically included in the system event specification.

The template for creating the configuration shown looks like this (the XML elements and attributes that are optional is outlined in the table below):

```

<table name="..." tablename="..." classtouse=
  "com.idsscheer.ppm.
  xmlextractortools.extractor.
  sap2ppm.ZSortWithInteger_sap2ppm">
  <parameter name="SORTCRITERION">
    <value>...</value>
    <value>...</value>
    ...
  </parameter>
  <parameter name="USE">
    <value>...</value>
  </parameter>
  ...
  See chapter
  R3 table configuration (system event specification) (page 11)
  ...
</table>

```

The table below reiterates the most important configuration entries for the above table definition:

XML element/attribute	Value: Description
name	The specified name is added to the extracted source system attributes as a prefix
tablename (optional)	Table from which the information is to be extracted. Default value: Value from name XML attribute
classtouse	com.idsscheer.ppm.xmlextractortools.extractor.sap2ppm.ZSortWithInteger_sap2ppm: Java class to be used
parameter name	
SORTCRITERION	First parameter to be specified. At least one value XML element must be specified (field name of sorting criterion). The specified fields may only contain integer values. If several sorting criteria are specified, they are prioritized from top to bottom, that is, the data records are first compared against the first (top) criterion and then against the second criterion if no complete sorting has been created, and so on.
USE	Second parameter to be specified. A single value XML element must be specified. Valid values: MIN (the data record with the lowest integer value for the sorting criterion is selected) MAX (the data record with the highest integer value for the sorting criterion is selected) Either the first or last data record from the list generated based on the specified sorting criteria is selected to be extracted.

You should use this class for extracting the first or last line of a sorting sparingly, as the sorting and selection operations result in a loss of performance and memory.

4.3.13 Create attributes with inverted date

You can use the Java class `com.idsscheer.ppm.xmlextractortools.extractor.sap2ppm.ZTableInvertDates_sap2ppm` to create new system event attributes with inverted dates when extracting data from an SAP system. Values of already extracted date attributes will be inverted. An inverted date is calculated by extracting the value of the date in SAP format, for example, 20110529 for July 29, 2011 from 99999999. The new system events created can be referenced in other data table configurations (table XML element).

Example

```
<docspec>
  <doctable name="VBAP">
    <pkfield name="VBELN" />
    <pkfield name="POSNR" />
    <pkfield name="ERDAT"/>
    <pkfield name="AEDAT"/>
    <pkfield name="ABDAT"/>
  </doctable>
</docspec>
<table name="VBAP_DATES_INVERTED" tablename="VBAP_DATES_INVERTED"
classtouse="com.idsscheer.ppm.xmlextractortools.extractor.sap2ppm.ZTableI
nvertDates_sap2ppm">
  <pkfield name="ERDAT" fktablename="VBAP" fkfieldname="ERDAT" />
  <pkfield name="AEDAT" fktablename="VBAP" fkfieldname="AEDAT" />
</table>
```

If you are using the `ZTableInvertDates_sap2ppm` class, you do not need to specify a `fieldtoread` element. Any specified `fieldtoread` elements will be ignored. The new system event attributes consist of the value of the name attribute of the table element and the value of the name attribute of the `pkfield` element. In the example, two new system event attributes are created, `VBAP_DATES_INVERTED-ERDAT` and `VBAP_DATES_INVERTED-AEDAT`.

You can use the regular `fkpart`, `prefix`, and `postfix` operations for the `pkfield` elements.

Example

A system event created with the above configuration could look like this:

```
...
<event>
  <attribute type="VBAP-ABDAT">00000000</attribute>
  <attribute type="VBAP-AEDAT">19970127</attribute>
  <attribute type="VBAP-ERDAT">19970121</attribute>
```

```

    <attribute type="VBAP-POSNR">000010</attribute>
    <attribute type="VBAP-VBELN">0000004974</attribute>
    <attribute type="VBAP_DATES_INVERTED-AEDAT">80029872</attribute>
    <attribute type="VBAP_DATES_INVERTED-ERDAT">80029878</attribute>
</event>
...

```

You can use the class `ZTableInvertDates_sap2ppm` to convert an inverted date back to a normal date in SAP format.

Example

```

<docspec>
  <doctable name="VBAP">
    <pkfield name="VBELN" />
    <pkfield name="POSNR" />
    <pkfield name="ERDAT"/>
    <pkfield name="AEDAT"/>
    <pkfield name="ABDAT"/>
  </doctable>
</docspec>
<table name="VBAP_DATES_INVERTED" tablename="VBAP_DATES_INVERTED"
classtouse="com.idsscheer.ppm.xmlextractortools.extractor.sap2ppm.ZTableI
nvertDates_sap2ppm">
  <pkfield name="ERDAT" fktablename="VBAP" fkfieldname="ERDAT" />
  <pkfield name="AEDAT" fktablename="VBAP" fkfieldname="AEDAT" />
</table>
<table name="VBAP_DATES_INVERT_AGAIN" tablename="VBAP_DATES_INVERTED"
classtouse="com.idsscheer.ppm.xmlextractortools.extractor.sap2ppm.ZTableI
nvertDates_sap2ppm">
  <pkfield name="ERDAT" fktablename="VBAP_DATES_INVERTED"
fkfieldname="ERDAT" />
  <pkfield name="AEDAT" fktablename="VBAP_DATES_INVERTED"
fkfieldname="AEDAT" />
  <pkfield name="ABDAT" fktablename="VBAP_DATES_INVERTED"
fkfieldname="ABDAT" />
</table>

```

Returns the following result:

```

...
<event>
  <attribute type="VBAP-ABDAT">00000000</attribute>
  <attribute type="VBAP-AEDAT">19970127</attribute>
  <attribute type="VBAP-ERDAT">19970121</attribute>
  <attribute type="VBAP-POSNR">000010</attribute>
  <attribute type="VBAP-VBELN">0000004974</attribute>
  <attribute type="VBAP_DATES_INVERTED-AEDAT">80029872</attribute>
  <attribute type="VBAP_DATES_INVERTED-ERDAT">80029878</attribute>
  <attribute type="VBAP_DATES_INVERT_AGAIN-AEDAT">19970127</attribute>
  <attribute type="VBAP_DATES_INVERT_AGAIN-ERDAT">19970121</attribute>

```

```
</event>
...
```

4.3.14 Multiplication of system events in tables

When extracting from an SAP system you have the option of creating additional system events based on a system event table.

At the source system level, a 1:n relationship may exist that cannot be resolved when determining the system events. Use the class `com.idsscheer.ppm.xmlextractortools.extractor.sap2ppm.ZTableMultiplyEvents_sap2ppm` to create multiple system events from a system event and thus resolve the 1:n relationship.

Example

```
<configuration name="MultiplyEvents">
  <docspec>
    <doctable name="VBAK" tablename="VBAK">
      <condition fieldname="VBELN" logicaloperator="in">
        <value>0000006662</value>
        <value>0000006741</value>
      </condition>

      <pkfield name="VBELN" />
    </doctable>
  </docspec>

  <table name="VBAP"
  classtouse="com.idsscheer.ppm.xmlextractortools.extractor.sap2ppm.ZTableMultiplyEvents_sap2ppm">
    <pkfield name="VBELN" fktablename="VBAK" fkfieldname="VBELN"/>
    <fieldtoread name="POSNR"/>
    <fieldtoread name="MATNR"/>
  </table>

  <table name="MAKT">
    <condition fieldname="SPRAS" logicaloperator="eq">
      <value>de</value>
    </condition>

    <pkfield name="MATNR" fktablename="VBAP" fkfieldname="MATNR"/>
    <fieldtoread name="MAKTX"/>
  </table>
</configuration>
```

This is the associated system event output file:

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

```

<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
<event>
  <attribute type="VBAK-VBELN">0000006662</attribute>
</event>
<event>
  <attribute type="MAKT-MAKTX">Flatscreen MS 1460 P</attribute>
  <attribute type="VBAK-VBELN">0000006741</attribute>
  <attribute type="VBAP-MATNR">M-06</attribute>
  <attribute type="VBAP-POSNR">000010</attribute>
</event>
<event>
  <attribute type="MAKT-MAKTX">Flatscreen MS 1775P</attribute>
  <attribute type="VBAK-VBELN">0000006741</attribute>
  <attribute type="VBAP-MATNR">M-10</attribute>
  <attribute type="VBAP-POSNR">000020</attribute>
</event>
<event>
  <attribute type="MAKT-MAKTX">MAG PA/DX 175</attribute>
  <attribute type="VBAK-VBELN">0000006741</attribute>
  <attribute type="VBAP-MATNR">M-14</attribute>
  <attribute type="VBAP-POSNR">000030</attribute>
</event>
<event>
  <attribute type="MAKT-MAKTX">Jotachi SN4500</attribute>
  <attribute type="VBAK-VBELN">0000006741</attribute>
  <attribute type="VBAP-MATNR">M-18</attribute>
  <attribute type="VBAP-POSNR">000040</attribute>
</event>
</eventlist>

```

The following example (excluding the class described) explains the procedure during extraction:

```

<configuration name="MultiplyEvents_Doctable_Only">
  <docspec>
    <doctable name="VBAK" tablename="VBAK">
      <condition fieldname="VBELN" logicaloperator="in">
        <value>0000006662</value>
        <value>0000006741</value>
      </condition>

      <pkfield name="VBELN" />
    </doctable>
  </docspec>

  <table name="VBAP" >
    <pkfield name="VBELN" fktablename="VBAK" fkfieldname="VBELN"/>
    <fieldtoread name="POSNR"/>
    <fieldtoread name="MATNR"/>
  </table>

  <table name="MAKT">
    <condition fieldname="SPRAS" logicaloperator="eq">

```



```

    <value>de</value>
  </condition>

  <pkfield name="MATNR" fktablename="VBAP" fkfieldname="MATNR"/>
  <fieldtoread name="MAKTX"/>
</table>
</configuration>

```

Since multiple entries in the VBAP table are assigned to an entry in the VBAK table only one random row is extracted from the VBAP table.

This is the associated system event output file:

```

<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
<event>
  <attribute type="VBAK-VBELN">0000006662</attribute>
</event>
<event>
  <attribute type="MAKT-MAKTX">Flatscreen MS 1775P</attribute>
  <attribute type="VBAK-VBELN">0000006741</attribute>
  <attribute type="VBAP-MATNR">M-10</attribute>
  <attribute type="VBAP-POSNR">000020</attribute>
</event>
</eventlist>

```

4.3.15 Extract fields of individual tables for Data analytics

To enable easy data extraction for Data analytics, you can extract the entire contents of a source system table into a file in event format, which can then be imported into a Data analytics analysis realm.

You can also restrict the data to be extracted (page 62) by defining conditions for data extraction.

The table to be extracted is not configured using the table configuration but in the data source file itself. For this, the file `datasource.dtd` contains the following entries:

XML element/attribute	Description
<code>analysistype</code>	XML attribute: Must have the value <code>DATA_ANALYTICS</code> .
<code>realmtable</code>	Comprehensive XML element for configuring the Data analytics data source.
<code>tablename</code>	XML attribute of the <code>realmtable</code> element: Name of the table in the source system

XML element/attribute	Description
sourcetable	Comprehensive XML element for configuring the Data analytics data source table. Must include at least one sourcefield element.
tablename	XML attribute of the sourcetable element: Name of the table in the source system
sourcefield	Contains the name of the field of the source system table.

The `analysistype` attribute of the XML element `datasource` must have the value `DATA_ANALYTICS` if the `<realmtable>` element specifies an analysis realm table (default value: `PROCESS`).

The `tablename` attribute of the `<realmtable>` element indicates the table name of the target table in the analysis realm configuration. The table name does not affect extraction itself, but is evaluated only by the PPM import.

Further information on data import for Data analytics is available in the PPM Data Analytics user guide.

The XML element `<realmtable>` contains the optional element `<sourcetable>` that specifies the table to be extracted. The columns to be extracted from this table must be specified in the `<sourcefield>` element. The element `<sourcetable>` is optional. For the JDBC or SAP Extractor, a single source table and at least one source column must be specified. Otherwise, an error message will be output during the parsing of the data source file.

A data source definition can only have a maximum of one table. It is impossible to restrict the number of rows. All rows are extracted, including all rows with identical values at the columns to be extracted. For example, if the columns `First name` and `Last name` are to be extracted and the table contains ten entries `Peter` and `Schmidt`, ten events with identical attribute values will be generated.

The following example explains the configuration:

```
<realmtable tablename="COMPANY_EMPLOYEE">
  <sourcetable tablename="EMPLOYEE">
    <sourcefield>EMPLOYEE_ID</sourcefield>
    <sourcefield>NAME</sourcefield>
  </sourcetable>
  ...
</realmtable>
<dataextraction>
  <outputfilename>..\custom\testclient\data\employee.xml</outputfilename>
</dataextraction>
...
```

```
<systemconfig>..\custom\testclient\SourceSystemConfig.xml</systemconfig>
```

In contrast to the behavior of the conventional JDCB or SAP Extractor, attributes no longer receive a table name as a prefix in the event output file. For example, if the table EMPLOYEE was extracted, the extractor usually generated events of the type <table name>-<column name>:

```
<event>
  <attribute type="EMPLOYEE-EMPLOYEE_ID">4711</attribute>
  <attribute type="EMPLOYEE-NAME">Schmidt</attribute>
</event>
```

Extracting a table using the <realmtable> element, however, creates only events without table names:

```
<event>
  <attribute type="EMPLOYEE_ID">4711</attribute>
  <attribute type="NAME">Schmidt</attribute>
</event>
```

NULL VALUES IN THE DATA ANALYTICS MODE

If the value of a column is null at the time an analysis realm table is extracted, this value is not written to the event. If a row EMPLOYEE_ID = 4712 exists without last name, the extractor creates the following events.

```
<event>
  <attribute type="EMPLOYEE_ID">4711</attribute>
  <attribute type="NAME">Schmidt</attribute>
</event>
<event>
  <attribute type="EMPLOYEE_ID">4712</attribute>
</event>
```

However, if all column values to be extracted are null, the event is written with empty attributes:

```
<event>
  <attribute type="EMPLOYEE_ID">4711</attribute>
  <attribute type="NAME">Schmidt</attribute>
</event>
<event>
  <attribute type="EMPLOYEE_ID"></attribute>
  <attribute type="NAME"></attribute>
</event>
```

If multiple such rows exist they will be – in contrast to the common extraction procedure (analysistype=PROCESS) – transferred accordingly so that as many <event> elements exist in the event file as there are rows in the data table of the source system.

4.3.15.1 Restrict data extraction

If you want to extract only a specific part of the table content, you can define data extraction conditions. You can limit the data volume to be extracted using a time stamp or integer value (for example, a sequence).

To do so, specify the required conditions in the data source configuration using the condition element and the dataextractiontype attribute.

```
<datasource name="VBAP" type="JDBC" analysistype="DATA_ANALYTICS"
dataextractiontype="TIME_BASED">
  <realmtable tablename="VBAP">
    <sourcetable tablename="VBAP2">
      <condition logicaloperator="char_creationtimestamp"
fieldname="AEDAT">
        <value>yyyy-MM-dd</value>
      </condition>
      <sourcefield>AEDAT</sourcefield>
      <sourcefield>ERDAT</sourcefield>
      <sourcefield>ERNAM</sourcefield>
      <sourcefield>ERZET</sourcefield>
      <sourcefield>MATKL</sourcefield>
      <sourcefield>MATNR</sourcefield>
      <sourcefield>WERKS</sourcefield>
    </sourcetable>
  </realmtable>
  ...
</datasource>
```

The dataextractiontype attribute can have the following values in Data analytics data sources:

- COMPLETE: Extraction is executed with a time criterion from the date 01.01.1990 00:00:00 and with an integer criterion from the value 0. This is also the default setting if the attribute does not exist.
- TIME_BASED: A data extraction based on a time stamp is to be run.
- VALUE_BASED: A data extraction based on a value is to be run.

There is no check whether the data extraction condition used matches the data extraction type configured (dataextractiontype=). If the configuration is created using CTK, CTK ensures correct values. If the file is configured manually and a condition that does not match is used, an error may occur during data extraction.

4.3.16 Extract tables with key/value columns

You can use a special extraction class to extract tables that contain cells with keys/value pair. A new event attribute is created for each extracted key of an event.

The following example shows a table in the source system that contains key value attributes for an event.

Table "WF_ITEMS" (system event table, header table for work items)

ID (key)	TYPE	TEXT	CREATOR	STAT	...
000000532657	F	Create a benefit adjustment reason for employee 00001448 due to any event.	Creating an adjustment reason due to event...	COMPLETED	...
...

For each of these work items (that is, for each line of the "WF_ITEMS" table), there are arbitrary attributes that are stored in the table "WF_ITEM_ATTRIBUTES" as key/value:

Table "WF_ITEM_ATTRIBUTES"

ID (key)	ATTRIBUTE (key)	VALUE	...
000000532657	DATEOFVALIDITY	20020101	...
000000532657	EMPLOYEEENUMBER	00001448	...
000000532657	EVENT	CREATED	...
000000532657	OBJECTTYPE	FAMILY	...
000000532657	_WF_INITIATOR	USWF-BATCH	...
000000532657	_WF_PRIORITY	5	...
...

EXTRACTION CLASS

`com.idsscheer.ppm.xmlextractortools.extractor.sap2ppm.ZTableKeyValueFieldsToAttributes_sap2ppm`

This extraction class creates a new attribute for the source system event from each key value found, and the value becomes the value of the attribute. For this class, you must specify the names of the key and value column as parameters separated by "#-#".

All key and value fields must be specified as fields to be read (XML element `fieldtoread`). Additional fields to be read are not allowed.

The following configuration refers to the JDBC extraction class mentioned above:

```
<xmlextractor_tableconfiguration>
  <configuration name="workflow">
    <docspec>
      <doctable name="WF_ITEMS" tablename="WF_ITEMS">
        <pkfield name="ID" />
        <pkfield name="TYPE" />
        <pkfield name="CREATOR" />
        <pkfield name="TEXT" />
      </doctable>
    </docspec>
    <table name="WF_ITEM_ATTRIBUTES" tablename="WF_ITEM_ATTRIBUTES" classtouse="com.idsscheer.ppm.xmlextractortools.extractor.sap2ppm.ZTableKeyValueFieldsToAttributes_sap2ppm">
      <parameter name="KEYVALUEFIELDS">
        <value>ATTRIBUTE#-#VALUE</value>
      </parameter>
      <pkfield name="ID" fktablename="WF_ITEMS" fkfieldname="ID" />
      <fieldtoread name="ATTRIBUTE" />
      <fieldtoread name="VALUE" />
    </table>
  </configuration>
</xmlextractor_tableconfiguration>
```

The following example event was read out with the above configuration:

```
<event>
  <attribute type="WF_ITEMS-ID">000000532656</attribute>
  <attribute type="WF_ITEMS-CREATOR">Creating an adjustment reason due to
event...</attribute>
  <attribute type="WF_ITEMS-STAT">COMPLETED</attribute>
  <attribute type="WF_ITEMS-TEXT">Create a benefit adjustment reason for
employee 00001448 due to any event.</attribute>
  <attribute type="WF_ITEMS-TYPE">F</attribute>
  <attribute type="WF_ITEM_ATTRIBUTES-DATEOFVALIDITY ">20020101</attribute>
  <attribute type="WF_ITEM_ATTRIBUTES-EMPLOYEEENUMBER
">00001448</attribute>
  <attribute type="WF_ITEM_ATTRIBUTES-EVENT ">CREATED</attribute>
  <attribute type="WF_ITEM_ATTRIBUTES-OBJECTTYPE ">FAMILY</attribute>
  <attribute type="WF_ITEM_ATTRIBUTES-_WF_INITIATOR
">USJOSWIGT</attribute>
  <attribute type="WF_ITEM_ATTRIBUTES-_WF_PRIORITY ">5</attribute>
</event>
```

SPECIAL CHARACTERS IN KEYS

The values of the key columns are used in the type XML attribute of the attribute XML elements. These values can contain characters that must not be used in this XML attribute. For this reason, the values of the type attribute of the attribute XML element are checked for invalid XML characters and such characters are filtered out if necessary.

4.4 Command line program

You create the XML output file(s) using the runsap2ppm.bat command line program.

Calling up the program without parameters or with -h or -? outputs the online help on the console, describing all available options.

4.4.1 Command line program arguments

4.4.1.1 General arguments

-VERSION

Outputs the version number of the PPM process extractor used. Other arguments specified are ignored.

-INFORMATION YES|NO

Specify whether information is to be output (yes) or not (no) during the import. The default is yes.

-WARNING YES|NO

Specify whether warning messages are to be output (yes) or not (no) during the import. The default is yes.

-ERROR YES|NO

This is where you specify whether error messages are to be output (yes) or not (no) during the import. The default is yes.

-PROTOCOLFILE <FILE NAME>

Specify the log file to which all messages are written during the import. If you specify a file, only critical error messages resulting in program abortion will be output on the screen.

-LANGUAGE <ISO CODE>

Specify the language in which the log information is to be output.

4.4.1.2 Source system-specific arguments

-DATASOURCE <FILE NAME> (OPTIONAL)

Specify the data source you want to use for the extraction. The XML file contains specifications of all files to be used for extraction and XML output. Make sure that you use this parameter instead of and not in combination with the `-datasourcelist`, `-systemconfig`, `-tableconfig`, `-calconfig`, `-outfile`, or `-nozip` parameters.

-DATASOURCELIST <FILE NAME>

Multiple data sources can be extracted simultaneously by means of the `-datasourcelist` argument. This corresponds to multiple consecutive extraction using the `-datasource` argument. Only SAP data sources are extracted.

See chapter Extract multiple data sources (page 71).

-SYSTEMCONFIG <FILENAME> <CONFIGNAME>

This is where you specify the name of the XML file containing the system configuration(s). The content of the file is source system-specific and can contain several configurations. The name of the configuration to be used is specified in the second argument. If the XML file contains only one configuration, this is used automatically. In this case you do not need to specify a configuration name.

-TABLECONFIG <FILE NAME> <CONFIG NAME>

Specify the name of the XML file containing the table configuration(s). The content of the file is source system-specific and can contain several configurations. The name of the table configuration is specified in the second argument. If the XML file contains only one configuration, this is used automatically. In this case you do not need to specify a configuration name.

-CALCCONFIG <FILE NAME> (OPTIONAL)

Specify the name of the XML file with which you can change attributes of the XML output file or add attributes including attribute transformations.

-BEGINDATE <DD.MM.YYYY> (OPTIONAL)

Specify the date from which data is to be extracted from the source system. If you do not use this parameter, the value of the `lastreaddate` XML attribute from the specified system configuration or data source is used. The SAP format `yyyymmdd` is supported.

-BEGINTIME <HH:MM:SS> (OPTIONAL)

Specify the time from which data is to be extracted from the source system. If you do not use this parameter and `-begindate`, the value of the `lastreadtime` XML attribute from the specified system configuration or data source is used. If you do not use the parameter but you do use `-begindate`, the default value `000000` is set.

-ENDDATE <DD.MM.YYYY> (OPTIONAL)

Specify the date up to which data is to be extracted from the source system. If you do not use this parameter, the current date is used. The SAP format `yyyymmdd` is supported.

-ENDTIME <HH:MM:SS> (OPTIONAL)

Specify the time up to which data is to be extracted from the source system. If you do not use the parameter but use

-enddate, 235959 is set as the default value. If you use neither this parameter nor -enddate, the current time is used.

If PPM Process Extractor SAP-2-PPM is started without specifying a period of time, the start time is extracted from the specified configuration file. The current date and time are used as the end time.

-VALUECONSTRAINT <PARAMETER1> ... <PARAMETER4> (OPTIONAL)

Use this parameter to delimit the data volume to be extracted using an integer criterion. The "<", "<=", ">" and ">=" comparison operators are allowed. You can compare the corresponding field value with one or two (interval) values. If a last extracted value (lastreadvalue) has already been saved in the system configuration or data source, you can also use this value for the comparison (see chapter Continuous automated extraction (page 69)).

Examples

```
-valueconstraint 25000020 "<="
```

Only data records are extracted whose integer value for the field specified in the event specification is smaller than or equal to the value 25000020.

```
-valueconstraint 15000020 ">" 25000020 "<"
```

Interval: Only data records are extracted whose integer value for the field specified in the system event specification is smaller than the value 25000020 and greater than the value 15000020.

-SAVE_VALUE_MINIMUM (OPTIONAL)

Use this parameter to specify that with -valueconstraint, the smallest value last read is saved as lastreadvalue in the configuration file used (system configuration or data source) when extracting with restrictions. Default value: Saving the largest value

-CPD <INT> (OPTIONAL)

This parameter is used to specify the number of system events to be extracted simultaneously (concurrently processed documents). The specified value gradually extracts the primary key fields from the table referenced using the doctable XML element in the table configuration, and stores them in the extractor's Java memory. Specifying a higher value results in improved extraction performance and more efficient memory usage.

If you do not specify the parameter, the recommended default value of 1000 is used.

-PING (OPTIONAL)

This parameter is used to test the connection to the specified source system. No data is extracted.

-RFC_BLOCKMODE {G|D|M} (OPTIONAL)

This parameter enables you to use block data extraction (see chapter Block extraction of large data volumes (page 38)). Specify the appropriate mode as an argument. Available block modes:

G (internal table of the function group)

M (ABAP memory)

D (database table)

-PROGRESS {YES|NO} (OPTIONAL)

You use this parameter to specify whether or not you want to output additional log messages about the progress of block data extraction. Default value: yes

-RFC_CALLRETRYS <NUMBER> (OPTIONAL)

You use this parameter to specify the number of times that queries to the R/3 system are repeated if an error occurs or the connection fails. When using block modes G and M, the specified number must be 0. The parameter is effective globally, not just for block extraction. Default value: 0

-RFC_DELIMITER <CHARACTER> (OPTIONAL)

You use this parameter to specify the character to be used to separate the extracted values. The character may not be contained in the actual extracted values themselves. Default value: ;

-REMOVEEMPTY (OPTIONAL)

You use this parameter to remove extracted attributes with no values before the attribute transformation.

-REMOVEZERODATES (OPTIONAL)

Use this parameter to remove the values of SAP date fields, that is, SAP table fields of the DATS or D type containing only zeros. The values will be removed from the events right after data extraction.

Example

```
<attribute type="VBAP-ABDAT">00000000</attribute>
```

4.4.1.3 Output file-specific arguments

-OUTFILE <FILE NAME>

You use this parameter to specify the name of the XML output file. The file extension is added automatically. By default, the file is output as a ZIP file.

-OUTFILEENCODING <ENCODING> (OPTIONAL)

You use this parameter to specify the encoding of the XML output file. Default value: UTF-8

-NOZIP (OPTIONAL)

You use this parameter to specify that the output file is to be output as an XML file rather than as a ZIP file.

-PIKIDATAMAPPING <FILE NAME> <PC NAME> (OPTIONAL)

You use this parameter to specify the name of the XML file containing the mapping in the first argument. In the second argument, you specify the name of the measure series in which the process instance-independent measure series are to be saved.

-DIMDATAMAPPING <FILE NAME> <DIM NAME> (OPTIONAL)

You use this parameter to specify the name of the XML file containing the mapping in the first argument. In the second argument, you specify the name of the dimension for which the extracted values are subsequently to be imported.

-SORTEVENTATTRIBUTES (OPTIONAL)

You use this parameter to sort the source system attributes in the system events in alphanumeric order using the attribute type. For large data volumes, this parameter can have a negative impact on the extraction speed.

4.4.1.4 Continuous automated extraction

You can extract data in full and automatically by eliminating the `-begindate`, `-begintime`, `-enddate`, `-endtime` parameters in the command line or by using `-valueconstraint` with no value for the first comparison operator. If the data range to be extracted is restricted using integer values, either the smallest or largest of the last values extracted is saved or updated in the configuration file used. If there are time restrictions on the data range to be extracted, the time of the last data extraction is saved or updated in the configuration file.

The following conditions must be met:

- A correct configuration for `creationtimestamp` and `valueconstraint` for the data to be extracted is specified in the system event specification (see chapter Condition operators (page 26))
- You always use the same command line call for continuous automated extraction, for example:

```
runsap2ppm -datasource datasource.xml -valueconstraint ">"
```

- When you use the `-valueconstraint` parameter, make sure that you either save the greatest of the last values extracted for all extraction operations (default), or the smallest of the last values extracted by specifying `-save_value_minimum`. The value of `lastreadvalue` in the configuration file is only updated if the greatest of the last values extracted is greater than the value currently saved when running the command line without the `-save_value_minimum` parameter, or if the smallest of the last values extracted is smaller than the value currently saved when using `-save_value_minimum`.

Example 1 (`lastreadvalue` with default value "0")

```
-valueconstraint ">="
```

Only those data records are extracted whose integer value for restricting the data range to be extracted is greater than or equal to the value saved as the last value extracted (`lastreadvalue`) in the system configuration or data source. If no value is saved, the default value 0 is used (in the example, all data records with integer criterion values ≥ 0 would be extracted). The greatest of the last values extracted (300 in this example) is saved as `lastreadvalue` according to the default setting (see `-save_value_minimum` parameter).

Example 2 (`lastreadvalue="40"`)

```
-valueconstraint ">=" 270 "<="
```

All data records are extracted that have an integer value of ≥ 40 and ≤ 270 for restricting the data range to be extracted. After the extraction, the value for `lastreadvalue` is updated, for example, to 270 if this is really the greatest of the last values extracted.

Example 3 (`lastreaddate="19971231" lastreadtime="155959" lastreadvalue="270"`)

By calling up

```
runsap2ppm -datasource datasource.xml -valueconstraint ">"
```

again all data records are extracted whose integer value for delimiting the data range to be extracted is greater than 270 and whose time stamp is as old as or more recent than the start time of the data extraction (31.12.1997 15:59:59).

The start time of data extraction is entered as `lastreaddate/lastreadtime` in the configuration file.

If you eliminate the `-begindate/-begintime` parameters, you always extract the data records whose time stamps are more recent (greater) than the ones specified and last extracted using `lastreaddate/lastreadtime`. The current date and time are entered as `lastreaddate/lastreadtime` if you do not use the `-enddate` and `-endtime` parameters.

4.5 Extract multiple data sources

You can use a data source list to extract multiple data sources simultaneously. The data source list is specified in a separate configuration file.

Each new SAP data source created in CTK is automatically added to the end of the list of data sources of the current client. During extraction using the command line option `-datasourcelist <file name>` the data of these data sources is extracted consecutively as if data extraction was called multiple times using the option `-datasource <file name>`. The sequence of the data source extraction is specified in the configuration file. Data sources of a type other than MYSAP in the list are ignored during extraction.

The following applies to trouble shooting:

- If the extraction is called via a valid data source list that does not contain any matching data sources the extraction ends without outputting an error message.
- If the extraction is called using a data source list containing multiple matching data sources, and if an error occurs during the extraction of one of these data sources resulting in extraction cancelation, the procedure continues with the next data source. This means that cancelation of the extraction of one data source does not lead to cancelation of the entire procedure.
- If an error occurs in at least one data source, which would have led to an exit error status during the single extraction of this data source, the last exit error status will be returned by the overall data source extraction process.

4.6 SAP Secure Network Communication

SAP-2-PPM supports SAP Secure Network Communication (SNC).) SAP SNC is a proprietary protocol from SAP to safeguard RFC connections.

You can use CTK to configure the required settings for importing data from data sources with SNC. Further information can be found in the CTK help.

4.6.1 Prerequisites

To enable SAP-2-PPM to read SAP data sources with SNC, the following requirements have to be met.

- Configure the SAP application server for SNC, including setting up appropriate SNC users.
- Install appropriate SAP-certified encryption software that is compatible with GSS API v2. We recommend using SAP Common Cryptolib, with which PPM has been tested.
- Configure the security environment as specified by the manufacturer of the installed encryption software. By default, this involves exchanging security certificates with the SAP application server.
- Use SAP JCo 3.0.14 or higher. We recommend using the latest version of JCo. Define the environment variables SNC_LIB and SECUDIR in your operating system environment. The RFC library embedded in JCo requires these variables to find the SNC layer and the required credentials.

Detailed information about SAP Common Cryptolib and SAP JCo can be found in the corresponding SAP documentation.

4.6.2 XML configuration of SAP data sources

The definition of the system configuration (R3Config.dtd) for a SAP data source with SNC is extended with the following attributes:

```
<!ATTLIST r3system
...
snc_mode (true|false) "false"
  snc_sso (true|false) "true"
  snc_qop (1|2|3|8|9) "9"
  snc_partnername CDATA #IMPLIED
snc_myname CDATA #IMPLIED
...
>
```

Attribute	Description
snc_mode	Enable/disable SNC Default: Disabled
snc_sso	SNC logon with user name and password (without single sign-on) Default: Use SSO

Attribute	Description
snc_qop	SNC service quality 1: Authentication only 2: Integrity protection 3: Confidentiality protection 8: Default specified by application server 9: Highest available security setting (default)
snc_partername	SNC name of the application server (for example, p:CN=R3, O=XYZ-INC, C=US)
snc_myname	SNC name of the RFC client (for example, p:CN=Smith, O=XYZ-INC, C=EN)

The user attribute previously required is now optional. Specifying the user name and password is not required for SNC unless it is specifically set using the snc_sso=false attribute.

The SNC configuration for PPM-2-SAP extractor data sources and for SAP data sources for PPM Data Analytics is identical.

Here is an example of a complete configuration when using SNC:

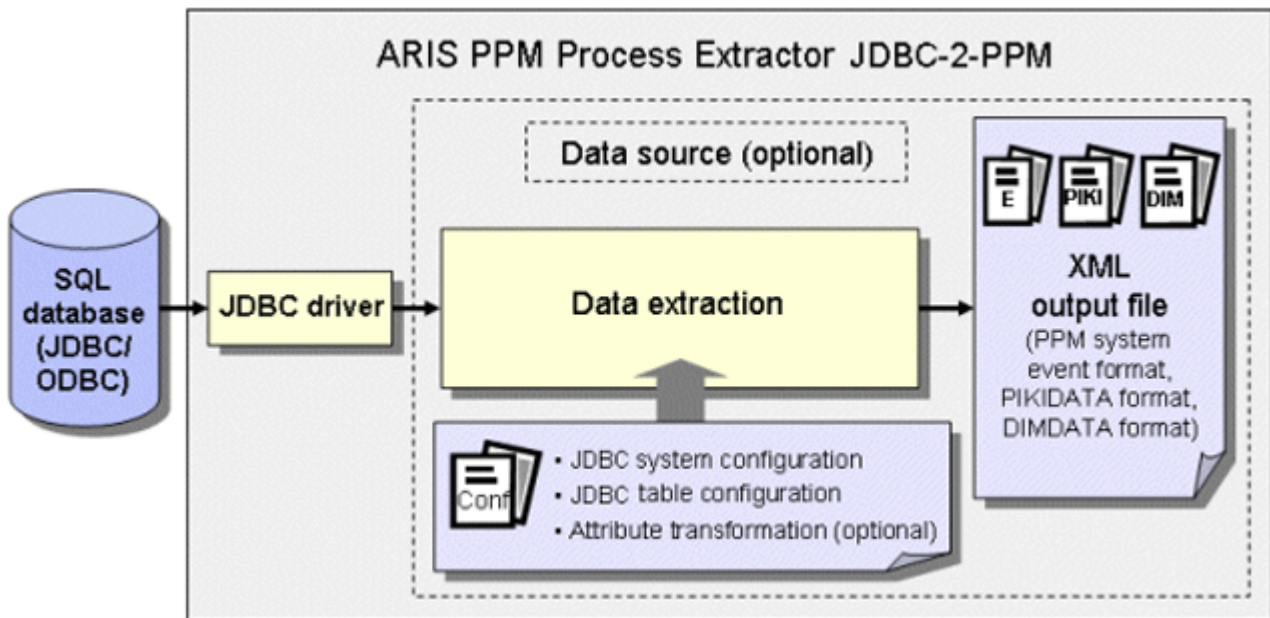
```
<?xml version="1.0" encoding="iso-8859-1"?>
<!DOCTYPE r3systemconf SYSTEM "R3Config.dtd">
<r3systemconf>
  <r3system configname="snc_connection"
    appserver="xyz.com" systemnumber="00"
    client="777" user="" snc_mode="true" snc_sso="true" snc_qop="9"
    snc_partername="p:CN=R3, O=XYZ-INC, C=US"
    snc_myname="p:CN=Smith, O=XYZ-INC, C=DE"
    language="" lastreaddate="19700101" lastreadtime="000000"
    encryptpw="" />
</r3systemconf>
```

5 PPM Process Extractor JDBC-2-PPM

This chapter provides an overview of the architecture, functioning and configuration of PPM Process Extractor JDBC-2-PPM.

5.1 Architecture

The figure below illustrates the functionality of PPM Process Extractor JDBC-2-PPM:



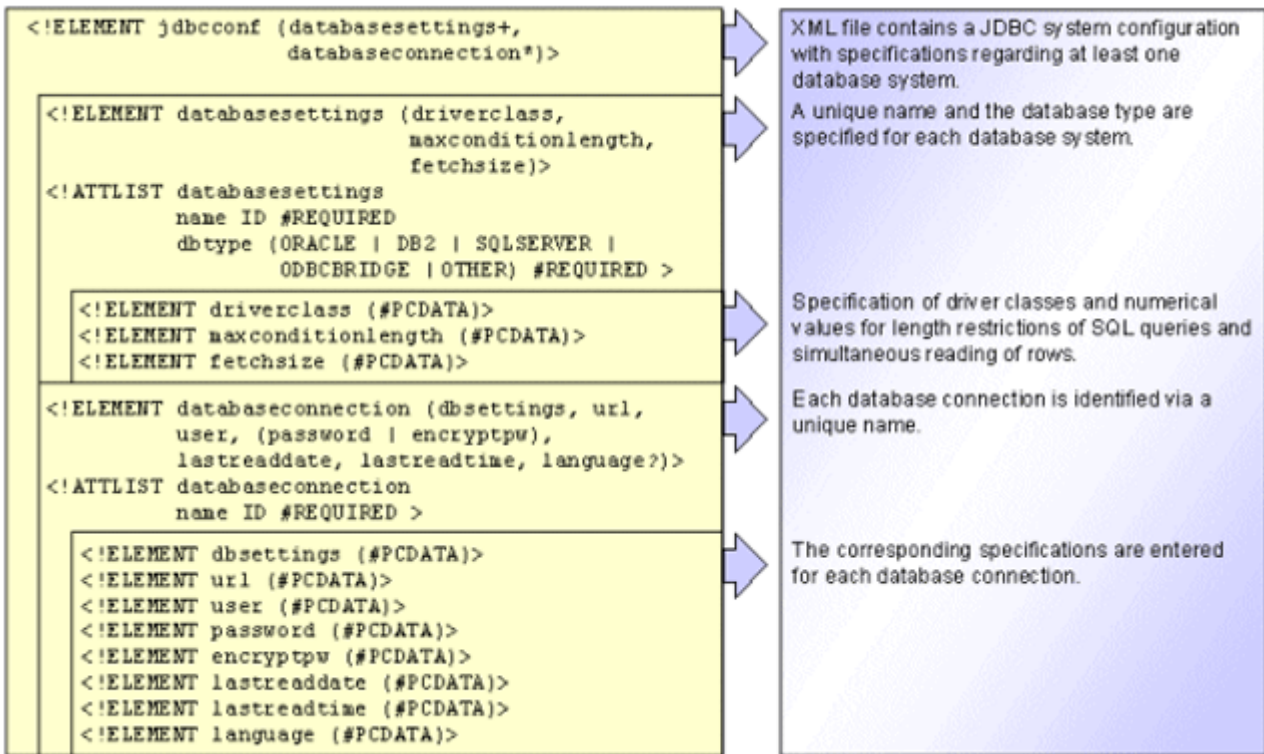
The JDBC driver is used to create a connection to the SQL source database with the access data for the JDBC system configuration. Data is then extracted from the tables in the source database system using the JDBC table configuration and an optional transformation using the data extraction (page 4) module and is written to an XML file in a PPM-compatible output format.

You need to ensure that the specified source system user has appropriate access authorization to extract the relevant data fields.

5.2 JDBC system configuration

The access data for the SQL database system is specified in an XML file. The name of this XML file is transferred to the command line tool as an argument.

The format of the XML file is specified by the following DTD:



XML element or attribute	Description	Example
jdbcconf	JDBC system configuration specifying the database systems and database connections to be used	-
databasesettings	General settings for the database system used	-
name	Unique name of the general database system settings	setting_oracle
dbtype	Database type used; valid values: ORACLE DB2 SQLSERVER OTHER	ORACLE
driverclass	Driver class to be used for the database system	oracle.jdbc.driverOracleDriver

XML element or attribute	Description	Example
maxconditionlength	The specified figure limits the length of the WHERE component of an SQL query	1000
fetchsize	Number of data records transferred simultaneously from the DB server to the Java client. For most database systems, the default value is 10. Recommended value: 1000	1000
databaseconnection	Information on the database connection	-
name	Unique name of the database connection	oracle_connection1
dbsettings	Unique name of the general database system settings	setting_oracle
url	URL of the database connection	See file extract below
user	Name of the database user	ppmoracle
password	Password of the database user	ppmoracle
encryptpw	Encrypted password as a combination of figures after evaluation of the <password> element	62 -62 -56
lastreaddate	Date from which data is extracted. Not applicable when using a data source (page 160), format: yyyyymmdd	20050131
lastreadtime	Time from which data is extracted. Not applicable when using a data source (page 160), format: hhmmss	152917

XML element or attribute	Description	Example
language	Language of text fields extracted	EN

The database type can be one of the preset values for Oracle, IBM DB2, or MS SQL Server database systems. The OTHER value should be used if you want to extract data from a database of a type other than those listed above.

The maxconditionlength parameter enables you to specify a figure that limits the length of the WHERE component of an SQL query to the specified value. This is necessary to comply with any length restrictions in the different database systems. If the SQL query is longer than the specified maximum length, it is split into several smaller queries that are executed separately.

The fetchsize parameter enables you to specify how many lines of data will be simultaneously transferred from the database to the JDBC extractor per read operation.

The password of the database user must be specified in unencrypted form and plain text in the password XML element. After evaluation during the following extraction, the password is written back to the JDBC system configuration in encrypted form in the encryptpw XML element. The password entry is then deleted. At any time, the system configuration may only include one of the two entries.

To change an existing password, add a new password entry to the current configuration file and delete the encryptpw entry. The new password is encrypted as part of the next extraction.

The language parameter is optional. If you specify a value for it, this is compared with the field name from the table configuration (langfieldname) (see chapter JDBC table configuration (page 78)). For example, if langfieldname="LANG" is specified in a table and <language>EN</language> is specified in the JDBC system configuration, only those data records for which LANG has the value EN will be extracted.

The following file extract shows an example JDBC system configuration:

```
<jdbcconf>
  <databasesettings name="setting_sqls" dbtype="SQLSERVER">
    <driverclass>com.microsoft.jdbc.sqlserver.SQLServerDriver
    </driverclass>
    <maxconditionlength>1000</maxconditionlength>
    <fetchsize>1000</fetchsize>
  </databasesettings>
  <databasesettings name="setting_oracle" dbtype="ORACLE">
    <driverclass>oracle.jdbc.driver.OracleDriver</driverclass>
    <maxconditionlength>1000</maxconditionlength>
```

```

    <fetchsize>1000</fetchsize>
</databasesettings>
<databaseconnection name="sqls_connection">
  <dbsettings>setting_sqls</dbsettings>
  <url>jdbc:microsoft:sqlserver:
    //PC3:1433;SelectMethod=Cursor;
      DatabaseName=ppmdb
  </url>
  <user>ppmuser</user>
  <password>ppmuser</password>
  <lastreaddate>20050228</lastreaddate>
  <lastreadtime>000000</lastreadtime>
  <language />
</databaseconnection>
<databaseconnection name="oracle_connection1">
  <dbsettings>setting_oracle</dbsettings>
  <url>jdbc:oracle:thin:@pcppm:1521:orappm_test
  </url>
  <user>ppmoracle</user>
  <password>ppmoracle</password>
  <lastreaddate>20051231</lastreaddate>
  <lastreadtime>235959</lastreadtime>
</databaseconnection>
<databaseconnection name="oracle_connection2">
  <dbsettings>setting_oracle</dbsettings>
  <url>jdbc:oracle:thin:@pcppm:1521:orappm_produkktiv</url>
  <user>ppmoracle2</user>
  <encryptpw>48 -62 -76 -60 -108 -57 -92</encryptpw>
  <lastreaddate>20050228</lastreaddate>
  <lastreadtime>000000</lastreadtime>
</databaseconnection>
</jdbcconf>

```

For PPM Process Extractor JDBC-2-PPM to be able to use the configuration data to connect to the database, you need to copy the JDBC drivers (JAR and/or ZIP files) to the following directory of your installation.

<PPM installation directory>\ppm\server\bin\work\data_ppm\drivers

5.3 JDBC table configuration

The JDBC table configuration (system event specification) specifies which table fields are extracted from the SQL database system and written to the system events as source system attributes. You can save several table configurations with unique names in the XML file.

The JDBC table configuration consists of the following components:

GLOBAL TABLES

Global tables are used to extract information that is written for all system events.

FOREIGN KEY TABLES

The docreftable XML element contains the name of the foreign key table. It specifies how the data area to be extracted from the system event table is limited. The primary key fields specified in the pkfield XML element link the foreign key table to the system event table and other foreign key tables.

SYSTEM EVENT TABLE

The doctable XML element contains the name of the system event table. It specifies the documents to be extracted for a document flow. Each data record extracted from the system event table generates a system event in the output file (event XML element).

DATA TABLES

The information in the system event table can be supplemented by extracting additional data fields from any other data tables (for example, the material number is extracted from the system event table and the descriptive text relating to this number is extracted from a data table).

Some database systems allow table names that do not comply with the SQL standard. Extracting such tables with PPM Process Extractor JDBC-2-PPM results in an error message. You can extract contents by creating a view for each table to be extracted that contains names that are not SQL-compliant, and then use the view for extracting with PPM Process Extractor JDBC-2-PPM.

The following XML file framework illustrates the configuration of the tables from which data is to be extracted. For details about which XML elements or attributes are optional, please refer to the explanatory table in chapter Table access configuration (page 81).

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE r3systemconffields SYSTEM
    'jdbc_tableconfiguration.dtd'>
<jdbc_tableconfiguration>
  <configuration name="..." printname="..." classtouse="...">
    <globaltable name="..." tablename="..." classtouse="...">
      <fieldtoread name="...">
        <textref tablename="..." reffieldname="..."
          textfieldname="..." langfieldname="...">
      </fieldtoread>
      ...
    </globaltable>
  <docspec>
    <docreftable name="..." tablename="..."
      classtouse="...">
      <condition fieldname="..." logicaloperator="...">
        <value>...</value>
      </condition>
      <pkfield name="..." fktablename="..."
        fkfieldname="...">
```

```

        <fkpart readfrom="..."
                startposition="..." length="..."/>
        <prefix>
            <value>...</value>
        </prefix>
        <postfix>
            <value>...</value>
        </postfix>
    </pkfield>
    ...
</docreftable>
...
<doctable name="..." tablename="..."
                classtouse="...">
    <condition fieldname="..." logicaloperator="...">
        <value>...</value>
    </condition>
    <pkfield name="..." fktablename="..."
                fkfieldname="...">
        <fkpart readfrom="..." startposition="..."
                length="..."/>

        <prefix>
            <value>...</value>
        </prefix>
        <postfix>
            <value>...</value>
        </postfix>
    </pkfield>
    ...
    <fieldtoread name="...">
        <textref tablename="..." reffieldname="..."
                textfieldname="..." langfieldname="..."/>
    </fieldtoread>
    ...
</doctable>
</docspec>
<table name="..." tablename="..." classtouse="...">
    <condition fieldname="..." logicaloperator="...">
        <value>...</value>
    </condition>
    <pkfield name="..." fktablename="..."
                fkfieldname="...">
        <fkpart readfrom="..." startposition="..."
                length="..."/>

        <prefix>
            <value>...</value>
        </prefix>
        <postfix>
            <value>...</value>
        </postfix>
    </pkfield>
    ...
    <fieldtoread name="...">
        <textref tablename="..." reffieldname="..."
                textfieldname="..." langfieldname="..."/>
    </fieldtoread>

```

```

    ...
  </table>
  ...
</configuration>
...
</jdbc_tableconfiguration>

```

5.3.1 Table access configuration

XML element	XML attribute	Description
jdbc_table-configuration		List of table configurations
configuration	name	Unique identifier of the table configuration
	printname (optional)	Switch. yes means that the configuration name is output as a prefix to the field names. Default value: no
	classtouse (optional)	Name of the Java class that is used for editing the configuration Default value: Standard implementation
globaltable (optional)	name	Identifier of the table from which global system attributes are extracted
	tablename (optional)	Name of the table in the source system Default value: Specified in the name XML attribute
	classtouse (optional)	Name of the Java class that is used for extracting data from the table Default value: Standard implementation
docspec	-	Grouping of the specifications of all foreign key tables and the system event table

XML element	XML attribute	Description
do creftable	name	Identifier of a foreign key table
	tablename (optional)	Name of the table in the source system Default value: Specified in the name XML attribute
	classtouse (optional)	Name of the Java class that is used for extracting data from the table Default value: Standard implementation
doctable	name	Identifier of the system event table. Each line extracted creates a system event in the XML file.
	tablename (optional)	Name of the table in the source system Default value: Specified in the name XML attribute
	classtouse (optional)	Name of the Java class that is used for extracting data from the table Default value: Standard implementation
table (optional)	name	Identifier of the data table from which supplementary information is extracted
	tablename (optional)	Name of the table in the source system Default value: Specified in the name XML attribute
	classtouse (optional)	Name of the Java class that is used for extracting data from the table Default value: Standard implementation

Each table may only be referenced once in the configuration. In order to be able to extract a table multiple times, reference the same table (tablename XML attribute) using different identifiers.

Example

You want to extract the VBAP-MATNR_1 and VBAP-MATNR_2 fields from the PRODH table. The file extract below illustrates the configuration:

```
<table name="PROD_HIER_1" tablename="PRODH"
      classtouse="ZTable">
  <pkfield name="HNUM" fktablename="VBAP"
          fkfieldname="MATNR_1"/>
  <fieldtoread name="HVAL"/>
</table>

<table name="PROD_HIER_2" tablename="PRODH"
      classtouse="ZTable">
  <pkfield name="HNUM" fktablename="VBAP"
          fkfieldname="MATNR_2"/>
  <fieldtoread name="HVAL"/>
</table>
```

5.3.2 Global meta data

The globaltable XML element can be used to transfer meta data from the PPM SAP-2-PPM and JDBC-2-PPM process extractors to the output file as global system event attributes. Typical data for global system event attributes include the names of the configurations that were used to extract the data. The data itself is determined from the argument values specified in the command line. For arguments that are not specified in the command line, the default value is determined.

The identification of keywords is case-sensitive.

Global system event attributes apply to all system events in the current output file.

Keyword	Value from command line argument
SYSTEM_CONFIG_FILE_NAME	-systemconfig <filename> ...
SYSTEM_CONFIG_NAME	-systemconfig ... <configname>
TABLE_CONFIG_FILE_NAME	-tableconfig <filename> ...
TABLE_CONFIG_NAME	-tableconfig ... <configname>
BEGIN_DATE,	-begindate <dd.MM.yyyy>

Keyword	Value from command line argument
BEGIN_TIME	-begintime <hh:mm:ss>
END_DATE	-enddate <dd.MM.yyyy>
END_TIME	-endtime <hh:mm:ss>
CPD	-cpd <int>
OUT_FILE_NAME	-outfile <file name>
PIKI_DATA_MAPPING_FILE_NAME	-pikidatamapping <filename>...
PIKI_DATA_MAPPING_NAME	-pikidatamapping ... <pcname>
DIM_DATA_MAPPING_FILE_NAME	-dimdatamapping <filename> ...
DIM_DATA_MAPPING_NAME	-dimdatamapping ... <dimname>

If no value can be determined for a keyword, the keyword itself will be written to the output file. In this way you can transfer constants to the output file.

Example

The file extract below shows the configuration that is used to create global system event attributes.

```
<globaltable name="INFO">
  <fieldtoread name="SYSTEM_CONFIG_NAME"/>
</globaltable>
```

The configuration name specified in the command line using `-systemconfig <configname>`, for example, `sapppm` is written to the output file as the `INFO-SYSTEM_CONFIG_NAME` global system event attribute:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
  <attribute type="INFO-SYSTEM_CONFIG_NAME ">
    sapppm
  </attribute>
  ...
</event>
  ...
</event>
  ...
</eventlist>
```

By specifying a suitable Java class in the `classtouse` XML attribute, data can also be extracted from any other source system table.

5.3.3 Sort system events

You can sort the system events in the XML output in ascending alphanumeric order based on the content of fields you define as sorting criteria. It is possible to specify multiple fields as sorting criteria. When sorting, the fields are prioritized from the first specified to the last specified, that is, the data is first sorted based on the content of the first field specified, then by the content of the second field specified and so on.

Tip

You can use the sorting option to create a more efficient XML import of the extracted data into the PPM system. The fact that system events belonging to a process instance follow each other immediately due to sorting in the XML output files means that they can be imported directly into an EPC using the process key during the XML import.

In the table configuration, in the parameter XML element, fields are specified as sorting criteria for the system event table (doctable) and the referenced foreign key tables (docreftable).

Example (extract from table configuration)

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE xmlextractor_tableconfiguration SYSTEM
    'xmlextractor_tableconfiguration.dtd'>
<xmlextractor_tableconfiguration>
  <configuration name="BANF">
    <docspec>
      <doctable name="EBAN">
        <parameter name="ORDER_BY">
          <value>BNFPO</value>
          <value>BANFN</value>
        </parameter>
        <condition fieldname="ERDAT"
          logicaloperator="creationtimestamp">
          <value>yyyyMMdd</value>
        </condition>
        <pkfield name="BANFN"/>
        <pkfield name="BNFPO"/>
        <pkfield name="ERDAT"/>
        <fieldtoread name="BSART"/>
        <fieldtoread name="KONNR"/>
        <fieldtoread name="KTPNR"/>
        <fieldtoread name="LIFNR"/>
        <fieldtoread name="MFRNR"/>
      </doctable>
    </docspec>
  </configuration>
</xmlextractor_tableconfiguration>
```

As specified in the BANF configuration (parameter XML element), the system events are written to the output file(s) sorted in ascending order by the item number in the purchase

requisition number (BNFPO field) and, as a second priority, by the purchase requisition number (BANFN field).

The table below shows all of the configuration options:

XML element/attribute	Description
parameter	Specifies a sorting parameter for a system event table (doctable) or a foreign key table (docreftable).
name	Parameter name. It is essential to specify ORDER_BY.
value	Specifies a sorting field. The field must be specified as a primary key field (pkfield).

You can set the sorting parameter in PPM Customizing Toolkit. To do this, activate the System event tab in the Data extraction module of the Process merge module group. Switch to editing mode and select Edit system event from the pop-up menu of the system event table. In the Specify parameter step, you can specify your settings.

5.3.4 Concatenate new attribute values from extracted attribute values

The `com.idsscheer.ppm.xmlextractortools.extractor.jdbc2ppm.ZTableConcatFKs_jdbc2ppm` class can be used when extracting data from an JDBC system to generate new system event attributes by concatenating the values of attributes already extracted. The new system events created can be referenced in other data table configurations (table XML element).

Example

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE xmlextractor_tableconfiguration SYSTEM
    'xmlextractor_tableconfiguration.dtd'>
<xmlextractor_tableconfiguration>
  <configuration name="SD">
    <docspec>
      <doctable name="RBKP">
        <condition logicaloperator="eq" fieldname="GJAHR">
          <value>2005</value>
        </condition>
        <pkfield name="BELNR"/>
        <pkfield name="GJAHR"/>
      </doctable>
    </docspec>
  </configuration>
</xmlextractor_tableconfiguration>
```

```

    </doctable>
</docspec>
<table name="RBKP_NEW" classtouse="com.idsscheer.ppm.
        xmlextractortools.extractor.
        jdbc2ppm.ZTableConcatFKs_jdbc2ppm">
  <pkfield name="BELNR" fktablename="RBKP"
        fkfieldname="BELNR"/>
  <pkfield name="GJAHR" fktablename="RBKP"
        fkfieldname="GJAHR"/>
  <fieldtoread name="AWKEY_GENERATED"/>
</table>
</configuration>
</xmlextractor_tableconfiguration>

```

If you are using the ZTableConcatFKs_jdbc2ppm class, you must specify exactly one fieldtoread element. The element contains the name of the system event attribute to be created. In the example, a new system event attribute with the name RBKP_NEW-AWKEY_GENERATED is created. The value of the attribute consists of the values of the pkfield elements specified.

The normal fkpart, prefix and postfix operations can be used for the pkfield elements.

A system event created with the above configuration could look like this:

```

...
<event>
  <attribute type="RBKP-BELNR">5105601204</attribute>
  <attribute type="RBKP-GJAHR">2005</attribute>
  <attribute type="RBKP_NEW-AWKEY_GENERATED">51056012042005
  </attribute>
</event>
...

```

The new attribute – RBKP_NEWER-AWKEY_GENERATED – can then be referenced in other table configurations in the same way as every other JDBC table field.

Example

```

<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE xmlextractor_tableconfiguration SYSTEM
        'xmlextractor_tableconfiguration.dtd'>
<xmlextractor_tableconfiguration>
  <configuration name="SD">
    <docspec>
      <doctable name="RBKP">
        <condition logicaloperator="eq" fieldname="GJAHR">
          <value>2005</value>
        </condition>
        <pkfield name="BELNR"/>
        <pkfield name="GJAHR"/>
      </doctable>
    </docspec>
    <table name="RBKP_NEW" classtouse="com.idsscheer.
            ppm.xmlextractortools.extractor.
            jdbc2ppm.ZTableConcatFKs_jdbc2ppm">

```

```

    <pkfield name="BELNR" fktablename="RBKP"
              fkfieldname="BELNR"/>
    <pkfield name="GJAHR" fktablename="RBKP"
              fkfieldname="GJAHR"/>
    <fieldtoread name="AWKEY_GENERATED"/>
  </table>
  <table name="BKPF">
    <pkfield name="AWKEY" fktablename="RBKP_NEW"
              fkfieldname="AWKEY_GENERATED"/>
    <fieldtoread name="BELNR"/>
  </table>
</configuration>
</xmlextractor_tableconfiguration>

```

A system event created with this configuration could look like this:

```

...
<event>
  <attribute type="RBKP-BELNR">5105601204</attribute>
  <attribute type="RBKP-GJAHR">2005</attribute>
  <attribute type="RBKP_NEW-AWKEY_GENERATED"
              >51056012042005</attribute>
  <attribute type="BKPF-BELNR">5100004691</attribute>
</event>
...

```

5.3.5 Extraction using conditions

Extracting data from the tables can be limited by the use of conditions. For example, you can use conditions to control that, when extracting table fields, only document flows of one document type in a particular period are extracted.

The conditions are specified directly in the table configuration in the `booleancondition` or `condition` XML element and only apply to the associated table.

A condition contains the name of the table field, the comparison operator, and a concrete value. Conditions can be linked with any degree of complexity (`booleancondition` XML element).

XML element	XML attribute	Description
<code>booleancondition</code> (optional)	<code>logicaloperator</code>	Logical operators: AND, OR, NOT Default value: AND

XML element	XML attribute	Description
condition (optional)	logicaloperator	Comparison operators: eq, neq, in, notin, num_gt, num_geq, num_lt, num_leq, is_null, is_not_null, timestamp_eq, timestamp_geq, timestamp_gt, timestamp_leq, timestamp_lt, time_eq, time_geq, time_gt, time_leq, time_lt, date_eq, date_geq, date_gt, date_leq, date_lt, num_eq, num_neq, num_in, num_notin Operators for restricting the data range to be extracted: char_creationtimestamp, date_creationtimestamp, valueconstraint Default value: eq
	fieldname	Table field name

The docbooleancondition and doccondition XML elements enable conditional extraction from a data table depending on table fields already extracted. They are configured in a similar way to booleancondition and condition. The table name and the name of the column containing the data fields already extracted are specified in the tablename and fieldname XML attributes.

XML element	XML attribute	Description
docbooleancondition (optional)	logicaloperator	Logical operators: AND, OR, NOT Default value: AND
doccondition (optional)	logicaloperator	Comparison operators: eq, neq, in, notin, exists, notexists, is_null, is_not_null, Default value: eq

XML element	XML attribute	Description
	tablename	Name of the table containing the table fields already extracted
	fieldname	Column name

5.3.5.1 Condition operators

Common operators

The following comparison operators are supported by the condition and doccondition XML elements:

Operator	Description
eq	Field content is equal to the specified value.
neq	Field content is not equal to the specified value.
in	Field content is equal to a specified value from a set of values.
notin	Field content is not equal to a specified value from a set of values.
is_null	Checks whether the field content is NULL
is_not_null	Checks whether the field content is not equal to NULL

Condition operators

Operator	Description
num_gt	Field content is greater than specified value.
num_geq	Field content is greater than or equal to the specified value.
num_lt	Field content is less than specified value.
num_leq	Field content is less than or equal to the specified value.
num_eq	Field content is equal to the specified value.

Operator	Description
num_neq	Field content is not equal to the specified value.
num_in	Field content is equal to a specified value from a set of values.
num_notin	Field content is not equal to a specified value from a set of values.
timestamp_eq	Checks whether the time stamp of the field corresponds to the specified comparison value (value). The comparison value must be specified in dd.MM.yyyy HH:mm:ss format – this also applies to all other timestamp_* operators.
timestamp_geq	Checks whether the time stamp of the field is greater than or equal to the comparison value.
timestamp_gt	Checks whether the time stamp of the field is greater than the comparison value.
timestamp_leq	Checks whether the time stamp of the field is less than or equal to the comparison value.
timestamp_lt	Checks whether the time stamp of the field is less than the comparison value.
time_eq	Checks the field's time for equality. The comparison value must be specified in HH:mm:ss format – this also applies to all other time_* operators.
time_geq	Checks whether the time of the field is greater than or equal to the comparison value
time_gt	Checks whether the time of the field is greater than the comparison value
time_leq	Checks whether the time of the field is less than or equal to the comparison value
time_lt	Checks whether the time of the field is less than the comparison value

Operator	Description
date_eq	Checks whether the date of the field is equal to the comparison value. The comparison value must be specified in dd.MM.yyyy format – this also applies to all other date_* operators.
date_geq	Checks whether the date of the field is greater than or equal to the comparison value
date_gt	Checks whether the date of the field is greater than the comparison value
date_leq	Checks whether the date of the field is less than or equal to the comparison value
date_lt	Checks whether the date of the field is less than the comparison value
like (only with string database fields, for example, CHAR, VARCHAR)	<p>Comparison of field values with a variable string The following placeholders are permitted:</p> <ul style="list-style-type: none"> * No or any number of characters ? Any single character \ Masking character for searching for placeholders or masking characters in the form: \\ or * or \? <p>Example:</p> <pre><condition fieldname="OBJECTID" logicaloperator="like"> <value>*10?0\\20?0*</value> </condition></pre> <p>The search is performed for values such as 5551050\20106667 or 1080\204044 but not 34510550\2030*</p>
char_ creationtimestamp	<p>Extracts time stamps (date and time) from source database fields of the CHAR/VARCHAR type. Their values form the basis for restricting the data range to be extracted with the -begindate (-begintime) or -enddate (-endtime) command line parameters [see chapter Source database specific arguments (page 124)].</p> <p>Multiple fields are separated by the character combination #-#. For each field, the time stamp</p>

Operator	Description
	<p>format is specified in the value XML element. This format contains the values in the corresponding source database field.</p> <p>Example:</p> <pre data-bbox="427 456 1118 685"><condition fieldname="VC_DATE#-#VC_TIME" logicaloperator="char_creationtimestamp"> <value>yyyyMMdd</value> <value>HHmmss</value> </condition></pre> <p>When using the char_creationtimestamp operator, be aware of possible effects of certain source database field time formats on data sorting and extraction. The database fields in a time format are extracted in alphabetical order. For example, if the date field values in the database are saved in ddMMyyyy format, the date 23021999 would be extracted when extracting the time period between 15.01.2000 - 31.12.2000 because in alphabetical terms, this date lies between the start and end date. However, the date 09122000 is not in this range because it is interpreted as earlier than the start date.</p>
date_creationtimestamp	<p>Time stamps (date and time) are extracted from source database fields with times that are of a database system-dependent time data type. Their values form the basis for restricting the data range to be extracted with the -begindate (-begintime) or -enddate (-endtime) command line parameters [see chapter Source database specific arguments (page 124)].</p> <p>Multiple fields are separated by the character combination #-#. For each field to be extracted, the value XML elements are used to specify the one of the three time data types corresponding to the source database fields. Only the following data types in the specified combinations are permitted:</p>

Operator	Description
	<p>DATE/TIME or TIME/DATE or TIMESTAMP or DATE</p> <p>Example:</p> <pre><condition fieldname="CHG_DATE#-#CHG_TIME" logicaloperator="date_creationtimestamp "> <value>DATE</value> <value>TIME</value> </condition></pre>
valueconstraint	<p>Specifies a source database system field with integer values that are used for delimiting the data range to be extracted with the -valueconstraint command line parameter [see chapter Source database specific arguments (page 124)]. The field to be extracted must be of an integer data type.</p> <p>Example:</p> <pre><condition fieldname="INTEGERFIELD" logicaloperator="valueconstraint"/></pre>

When using the timestamp_*, time_* and date_* operators from the above table, you need to know which data type in which format the value extracted from the corresponding database system (Oracle, IBM DB2, MS SQL Server) is based on.

The following tables provide an overview of the different DB data types and DB formats and show some examples of formats generated in the XML output file.

Oracle/TIMESTAMP data type

Value format written to database (example)	Resulting format in XML output file (example)	Note
07.05.2005 04:02:36	07.05.2005 04:02:36	-
07.05.2005	07.05.2005 12:25:11	Time = Creation time of database field value

Value format written to database (example)	Resulting format in XML output file (example)	Note
04:02:36	21.12.2005 04:02:36	Date = Creation date of database field value

Oracle/DATE data type

Value format written to database (example)	Resulting format in XML output file (example)	Note
07.05.2005 04:02:36	07.05.2005 04:02:36	-
07.05.2005	07.05.2005 12:25:11	Time = Creation time of database field value
04:02:36	21.12.2005 04:02:36	Date = Creation date of database field value

The Oracle DATE data type saves time stamp values exclusively in dd.MM.yyyy HH:mm:ss format. To extract the required data from an Oracle database, you need to configure the extract conditions accordingly when using date_* operators.

Example

You want to extract all data records with the date 16.09.2004, regardless of the time. If you specify the following condition in the table configuration:

```
<condition fieldname="TACT_TDATE" logicaloperator="date_eq">
  <value>16.09.2004</value>
</condition>
```

only data records with the 16.09.2004 00:00:00 time stamp are extracted. To ensure that all records of the specified date are extracted, you need to re-write the condition as follows:

```
<booleancondition logicaloperator="AND">
  <condition fieldname="TACT_TDATE"
    logicaloperator="date_geq">
    <value>16.09.2004</value>
  </condition>
  <condition fieldname="TACT_TDATE"
    logicaloperator="date_lt">
    <value>17.09.2004</value>
  </condition>
</booleancondition>
```

With the specified condition, all data records with the date 16.09.2004 and any time are extracted.

IBM DB2/TIMESTAMP data type

Value format written to database (example)	Resulting format in XML output file (example)	Note
07.05.2005 04:02:36	07.05.2005 04:02:36	-

IBM DB2/DATE data type

Value format written to database (example)	Resulting format in XML output file (example)	Note
07.05.2005	07.05.2005	-

IBM DB2/TIME data type

Value format written to database (example)	Resulting format in XML output file (example)	Note
04:02:36	04:02:36	-

MS SQL Server/DATETIME data type

Value format written to database (example)	Resulting format in XML output file (example)	Note
07.05.2005 04:02:36	07.05.2005 04:02:36	-
07.05.2005	07.05.2005 00:00:00	Time is always 00:00:00
04:02:36	01.01.1900 04:02:36	Date is always 01:01:1900

MS SQL Server/SMALLDATETIME data type

Value format written to database (example)	Resulting format in XML output file (example)	Note
07.05.2005 04:02:36	07.05.2005 04:02:00	Time only correct to the minute
07.05.2005	07.05.2005 00:00:00	Time is always 00:00:00
04:02:36	01.01.1900 04:02:00	Date is always 01.01.1900 and time is correct to the minute

doccondition operators

Operator	Description
exists	Field exists.
notexists	Field does not exist.

5.3.5.2 Complex conditions

The file extract below illustrates nested conditions using the example of the foreign key table:

```

...
<docreftable tablename="VBAK" classtouse="ZDocRefTable">
  <booleancondition logicaloperator="AND">
    <condition fieldname="ERDAT#-#ERZET"
      logicaloperator="char_creationtimestamp">
      <value>yyyyMMdd</value>
      <value>HHmmss</value>
    </condition>
    <condition fieldname="VBTP" logicaloperator="in">
      <value>C</value>
      <value>K</value>
    </condition>
  </booleancondition logicaloperator="OR">
    <booleancondition logicaloperator="AND">
      <condition fieldname="VKORG" logicaloperator="eq">
        <value>1000</value>
      </condition>
      <condition fieldname="VKBUR" logicaloperator="eq">
        <value>0041</value>
      </condition>
    </booleancondition logicaloperator="AND">
  </docreftable>

```

```

    </booleancondition >
    <booleancondition logicaloperator="AND">
      <condition fieldname="VKORG" logicaloperator="eq">
        <value>2000</value>
      </condition>
      <condition fieldname="VKBUR" logicaloperator="neq">
        <value>0060</value>
      </condition>
    </booleancondition >
  </booleancondition >
</booleancondition >
  ...
</docreftable>

```

In terms of propositional logic, the file extract shown corresponds to the following condition:

ERDAT and ERZET contain the creation time

and

VB Typ is C or V

and

((VKORG is equal to 1000 and VKBUR is equal to 0041) or (VKORG is equal to 2000 and VKBUR is not equal to 0060)).

5.3.6 Extract database fields

The database fields in the system event table and the linked data tables, from which values are to be extracted, are specified in the fieldtoread XML elements. For each fieldtoread XML element, a line of the form

```
<attribute type="Type">Value</attribute>
```

is written to the output file.

Type is made up of the table name, the data field name, and an optional text field name.

Value is the value extracted from the corresponding data field. All values are written in text form.

Optionally, instead of the direct data field value, the value of the referenced table (textref XML element) can be extracted. The optional langfieldname specification extracts the language-specific text of the data field.

Supplementary information is extracted from the data tables using primary key relations.

XML element	XML attribute	Description
fieldtoread	name	Name of the table column containing the data field to be extracted
textref	tablename	Table name of the referenced data table
	reffieldname	Name of foreign key
	textfieldname	Name of the table column containing the data field to be extracted
	langfieldname (optional)	Name of the table column containing the language-specific data field to be extracted
fkpart	readfrom (optional)	Direction of the substring forming the foreign key Valid values: left, right Default value: left
	startposition	Position from which the substring is formed
	length (optional)	Length of substring Default value: Start or end of the string (readfrom XML attribute)

Before data is actually extracted, a check is run as to whether the configured tables and data fields exist and whether the specified system user has appropriate access authorization.

Example

The extracted field values are written to the output file as attributes of a system event.

Unlocalized table fields:

```
...
  <attribute type="VBAP-WERKS">SB</attribute>
...
```

Localized table fields:

```
...
  <attribute type="VBAP-WERKS-NAME">Saarbrücken</attribute>
...
```

5.3.6.1 Handling of NULL values

When handling null values during extraction, it is important to distinguish whether the NULL value or an empty string is extracted. Not every database system used supports differentiation between NULL and empty strings:

- The Oracle database system does not differentiate between no value (NULL) and an empty string. In both cases, no system attribute is created when corresponding database fields are extracted.
- The IMB DB2 and SQL Server database systems do differentiate between NULL and an empty string. If a database field returns NULL as a value during extraction, no system event attribute is created. By contrast, if the system extracts a database field containing an empty string the corresponding system event attribute is created in the XML log file without value:

```
...
<attribute type="AT_EXAMPLE"></attribute>
...
```

If you want to use default values such as Not specified instead of extracted null values after import into the PPM system, you can define default values (defaultvalue XML element) in the calculation of the corresponding attribute (see PPM Customizing manual).

5.3.6.2 Extract multi-valued fields

Appropriate configuration of the relevant table element in the table configuration enables all different values of a field to be extracted (fieldtoread) to be written to a system event. A separate class must be used to do this.

Example

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE jdbc_tableconfiguration SYSTEM
           'jdbc_tableconfiguration.dtd'>
<jdbc_tableconfiguration>
  <configuration name="MULTIPLE_VALUES">
    <docspec>
      <docreftable name="...">
        ...
      </docreftable>
      <doctable name="...">
        ...
      </doctable>
    </docspec>
    <table name="VBEP" classtouse="com.idsscheer.ppm.
      xmlextractortools.extractor.jdbc2ppm.
      ZTableMultipleValues_jdbc2ppm">
      <pkfield name="VBELN" fktablename="VBAP"
```

```

                fkfieldname="VBELN"/>
        <pkfield name="POSNR" fktablename="VBAP"
                fkfieldname="POSNR"/>
        <fieldtoread name="WMENG"/>
        <fieldtoread name="EDATU"/>
</table>
<table name="VBAK" classtouse="com.idsscheer.ppm.
        xmlextractortools.extractor.jdbc2ppm.
                ZTableMultipleValues_jdbc2ppm">
        <pkfield name="VBELN" fktablename="VBEP"
                fkfieldname="VBELE"/>
        <fieldtoread name="VBTYP"/>
</table>
</configuration>
</jdbc_tableconfiguration>

```

In the example configuration, using the

`com.idsscheer.ppm.xmlextractortools.extractor.jdbc2ppm.`

`ZTableMultipleValues_jdbc2ppm` class for all data tables (table elements) specifies that all fields to be extracted (fieldtoread elements) are extracted with multiple values if multiple values exist for a field in the source system database. In the XML output file, the extracted field with multiple values appears as an attribute with the same name in a system event:

```

<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
  <event>
    <attribute type="VBAP-POSNR">000010</attribute>
    <attribute type="VBAP-VBELN">0000004969</attribute>
    <attribute type="VBEP-EDATU">19970103</attribute>
    <attribute type="VBEP-EDATU">19970107</attribute>
    <attribute type="VBEP-WMENG">138.000</attribute>
    <attribute type="VBEP-WMENG">317.000</attribute>
    <attribute type="VBEP-WMENG">496.000</attribute>
  </event>
</eventlist>

```

5.3.7 Table access configuration

XML element	XML attribute	Description
xmlextractor_table-configuration		List of R/3 table configurations
configuration	name	Unique identifier of the table configuration

XML element	XML attribute	Description
	printname (optional)	Switch. yes means that the configuration name is output as a prefix to the field names. Default value: no
	classtouse (optional)	Name of the Java class that is used for editing the configuration Default value: Standard implementation
globaltable (optional)	name	Identifier of the table from which global system attributes are extracted
	tablename (optional)	Name of the table in the source system Default value: Specified in the name XML attribute
	classtouse (optional)	Name of the Java class that is used for extracting data from the table Default value: Standard implementation
docspec	-	Grouping of the specifications of all document header tables and the document table
docreftable	name	Identifier of a document header table
	tablename (optional)	Name of the table in the source system Default value: Specified in the name XML attribute
	classtouse (optional)	Name of the Java class that is used for extracting data from the table Default value: Standard implementation

XML element	XML attribute	Description
doctable	name	Identifier of a document table. Each line extracted generates a system event in the XML output file.
	tablename (optional)	Name of the table in the source system Default value: Specified in the name XML attribute
	classtouse (optional)	Name of the Java class that is used for extracting data from the table Default value: Standard implementation
table (optional)	name	Identifier of the data table from which supplementary information is extracted
	tablename (optional)	Name of the table in the source system Default value: Specified in the name XML attribute
	classtouse (optional)	Name of the Java class that is used for extracting data from the table Default value: Standard implementation

Each SAP table may only be referenced once in the configuration. In order to be able to extract a table multiple times, reference the same table (tablename XML attribute) using different identifiers.

Example

You want to extract the VBAP-MATNR_1 and VBAP-MATNR_2 fields from the PRODH table. The file extract below illustrates the configuration:

```
<table name="PROD_HIER_1" tablename="PRODH" >
  <pkfield name="HNUM" fktablename="VBAP"
          fkfieldname="MATNR_1"/>
```

```

    <fieldtoread name="HVAL"/>
</table>

<table name="PROD_HIER_2" tablename="PRODH" >
  <pkfield name="HNUM" fktablename="VBAP"
          fkfieldname="MATNR_2"/>
  <fieldtoread name="HVAL"/>
</table>

```

5.3.8 Example: XML configuration and output file

This chapter illustrates the table configuration of an SQL database system by means of a practical example and shows a possible XML output file.

5.3.8.1 Table configuration

The file below shows the SD_C configuration for an SQL database system:

```

...
<configuration name="SD_C">
  <docspec>
    <docreftable name="VBAK">
      <booleancondition>
        <condition fieldname="ERDATCHAR#-#ERZETCHAR"
                  logicaloperator="char_creationtimestamp">
          <value>yyyyMMdd</value>
          <value>HHmmss</value>
        </condition>
        <condition fieldname="ERDAT#-#ERZET"
                  logicaloperator="date_creationtimestamp">
          <value>DATE</value>
          <value>TIME</value>
        </condition>
        <condition fieldname="VB Typ" logicaloperator="eq">
          <value>C</value>
        </condition>
      </booleancondition>
      <pkfield name="VBELN" />
    </docreftable>
    <doctable name="Orders" tablename="VBAP">
      <pkfield name="VBELN" fktablename="VBAK"
              fkfieldname="VBELN"/>
      <pkfield name="POSNR" />
      <fieldtoread name="VBELN"/>
      <fieldtoread name="POSNR"/>
      <fieldtoread name="ERDAT"/>
      <fieldtoread name="ERZET"/>
      <fieldtoread name="MATNR">
        <textref tablename="MAKT" reffieldname="MATNR"

```

```

        textfieldname="MAKTX" langfieldname="SPRAS"/>
</fieldtoread>
<fieldtoread name="KONDM">
  <textref tablename="T178T" reffieldname="KONDM"
    textfieldname="VTEXT" langfieldname="SPRAS"/>
</fieldtoread>
<fieldtoread name="SPART">
  <textref tablename="TSPAT" reffieldname="SPART"
    textfieldname="VTEXT" langfieldname="SPRAS"/>
</fieldtoread>
<fieldtoread name="WERKS">
  <textref tablename="T001W" reffieldname="WERKS"
    textfieldname="NAME1"/>
</fieldtoread>
<fieldtoread name="CHARG"/>
<fieldtoread name="PSTYV"/>
<fieldtoread name="ERNAM"/>
<fieldtoread name="NETWR"/>
</doctable>
</docspec>
<table name="VBAK">
  <pkfield name="VBELN" fktablename="Orders"
    fkfieldname="VBELN"/>
  <fieldtoread name="VTWEG">
    <textref tablename="TVTWT" reffieldname="VTWEG"
      textfieldname="VTEXT" langfieldname="SPRAS"/>
  </fieldtoread>
  <fieldtoread name="VKORG">
    <textref tablename="TVKOT" reffieldname="VKORG"
      textfieldname="VTEXT" langfieldname="SPRAS"/>
  </fieldtoread>
  <fieldtoread name="VDATU"/>
  <fieldtoread name="VKBUR">
    <textref tablename="TVKBT" reffieldname="VKBUR"
      textfieldname="BEZEI" langfieldname="SPRAS"/>
  </fieldtoread>
  <fieldtoread name="VKGRP">
    <textref tablename="TVGRT" reffieldname="VKGRP"
      textfieldname="BEZEI" langfieldname="SPRAS"/>
  </fieldtoread>
  <fieldtoread name="VBTYP"/>
  <fieldtoread name="AUART"/>
</table>
<table name="MARA">
  <pkfield name="MATNR" fktablename="Orders"
    fkfieldname="MATNR"/>
  <fieldtoread name="MATNR"/>
  <fieldtoread name="MTART">
    <textref tablename="T134T" reffieldname="MTART"
      textfieldname="MTBEZ" langfieldname="SPRAS"/>
  </fieldtoread>
</table>
</configuration>

```

FOREIGN KEY TABLE

```

...
<docreftable name="VBAK">
  <booleancondition>
    <condition fieldname="ERDATCHAR#-#ERZETCHAR"
      logicaloperator="char_creationtimestamp">
      <value>yyyyMMdd</value>
      <value>HHmmss</value>
    </condition>
    <condition fieldname="ERDAT#-#ERZET"
      logicaloperator="date_creationtimestamp">
      <value>DATE</value>
      <value>TIME</value>
    </condition>
    <condition fieldname="ERDAT_DATE"
      logicaloperator="date_geq">
      <value>05.12.2001</value>
    </condition>
    <condition fieldname="ERZET_TIME"
      logicaloperator="time_gt">
      <value>22:27:13</value>
    </condition>
    <condition fieldname="VBTYP"
      logicaloperator="eq">
      <value>C</value>
    </condition>
  </booleancondition>
  <pkfield name="VBELN" />
</docreftable>

```

...

The identifier and name of the foreign key table from the SQL database system is VBAK. All order documents of the VBTYP=C type are extracted. The value elements of the char_creationtimestamp condition operator specify the format of the time stamp to be generated from the corresponding database fields. The value elements of the date_creationtimestamp condition operator specify the data types of the fields extracted. The values in the ERDAT table column are of the DATE type and those in the ERZET column are of the TIME type.

Only those rows in the table in which the values of the ERDAT_DATE and ERZET_TIME attributes are greater than/equal to or greater than the values specified with value (05.12.2001 or 22:27:13).

The name of the primary key table column is VBELN. For each different VBELN field value, data records are extracted from the linked system event table for which VBELN has the same value as in the foreign key table.

SYSTEM EVENT TABLE

...

```
<doctable name="Orders" tablename="VBAP">
```



```

<pkfield name="VBELN" fktablename="VBAK"
          fkfieldname="VBELN"/>
<pkfield name="POSNR" />
<fieldtoread name="VBELN"/>
<fieldtoread name="POSNR"/>
<fieldtoread name="ERDAT"/>
<fieldtoread name="ERZET"/>
<fieldtoread name="MATNR">
  <textref tablename="MAKT" reffieldname="MATNR"
            textfieldname="MAKTX" langfieldname="SPRAS"/>
</fieldtoread>
<fieldtoread name="KONDM">
  <textref tablename="T178T" reffieldname="KONDM"
            textfieldname="VTEXT" langfieldname="SPRAS"/>
</fieldtoread>
<fieldtoread name="SPART">
  <textref tablename="TSPAT" reffieldname="SPART"
            textfieldname="VTEXT" langfieldname="SPRAS"/>
</fieldtoread>
<fieldtoread name="WERKS">
  <textref tablename="T001W"
            reffieldname="WERKS" textfieldname="NAME1"/>
</fieldtoread>
<fieldtoread name="CHARG"/>
<fieldtoread name="PSTYV"/>
<fieldtoread name="ERNAM"/>
<fieldtoread name="NETWR"/>
</doctable>
...

```

The VBAP system event table is assigned the Orders identifier. The foreign key relation specified in the line

```

<pkfield name="VBELN" fktablename="VBAK"
          fkfieldname="VBELN"/>

```

links the table to the VBAK foreign key table. The primary key consists of the VBELN and POSNR columns.

For each table row extracted, a system event (event XML element) is created in the XML output file. For each fieldtoread XML element, a line of the form

```
<attribute type="...">...</attribute>
```

is written to the output file. For some fieldtoread elements, the value extracted from the referenced table (textref XML element) is written in addition to the extracted data field value.

The optional langfieldname extracts the language-specific text of the data field.

The complete source system attribute type is made up of the identifier of the system event table (doctable name), the field name (fieldtoread name) and the name of the referenced

text field (textref ... textfieldname). The source system attribute type for the first extracted fieldtoread element with a referenced table looks like this:

```
<attribute type="Orders-MATNR-MAKTX">...</attribute>
```

DATA TABLE

```
...
<table name="VBAK">
  <pkfield name="VBELN" fktablename="Orders"
           fkfieldname="VBELN"/>
  <fieldtoread name="VTWEG">
    <textref tablename="TVTWT" reffieldname="VTWEG"
            textfieldname="VTEXT" langfieldname="SPRAS"/>
  </fieldtoread>
  <fieldtoread name="VKORG">
    <textref tablename="TVKOT" reffieldname="VKORG"
            textfieldname="VTEXT" langfieldname="SPRAS"/>
  </fieldtoread>
  <fieldtoread name="VDATU"/>
  <fieldtoread name="VKBUR">
    <textref tablename="TVKBT" reffieldname="VKBUR"
            textfieldname="BEZEI" langfieldname="SPRAS"/>
  </fieldtoread>
  <fieldtoread name="VKGRP">
    <textref tablename="TVGRT" reffieldname="VKGRP"
            textfieldname="BEZEI" langfieldname="SPRAS"/>
  </fieldtoread>
  <fieldtoread name="VBTYP"/>
  <fieldtoread name="AUART"/>
</table>
<table name="MARA">
  <pkfield name="MATNR" fktablename="Orders"
           fkfieldname="MATNR"/>
  <fieldtoread name="MATNR"/>
  <fieldtoread name="MTART">
    <textref tablename="T134T" reffieldname="MTART"
            textfieldname="MTBEZ" langfieldname="SPRAS"/>
  </fieldtoread>
</table>
...
```

The foreign key relations to the VBELN and MATNR primary key fields in the Orders table are used to extract supplementary information from the VBAK and MARA data tables.

5.3.8.2 XML output file (PPM system event format)

The file extract below shows a range of system events from the XML output file generated using the configuration file specified in the chapter on Table configuration (page 104):

```

<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
  <event>
    <attribute type="Orders-CHARG"/>
    <attribute type="Orders-ERDAT">20000214</attribute>
    <attribute type="Orders-ERNAM">HDM</attribute>
    <attribute type="Orders-ERZET">143616</attribute>
    <attribute type="Orders-KONDM"/>
    <attribute type="Orders-MATNR">P-100</attribute>
    <attribute type="Orders-MATNR-MAKTX">
      Thread rod M'8 DIN '8895' without tolerance
    </attribute>
    <attribute type="Orders-NETWR">28.70</attribute>
    <attribute type="Orders-POSNR">000010</attribute>
    <attribute type="Orders-PSTYV">TAN</attribute>
    <attribute type="Orders-SPART">01</attribute>
    <attribute type="Orders-SPART-VTEXT">Product category 01
    </attribute>
    <attribute type="Orders-VBELN">0000000001</attribute>
    <attribute type="Orders-WERKS">1000</attribute>
    <attribute type="Orders-WERKS-NAME1">
      Plant 1000 (Hamburg)
    </attribute>
    <attribute type="MARA-MATNR">P-100</attribute>
    <attribute type="MARA-MTART">HAWA</attribute>
    <attribute type="MARA-MTART-MTBEZ">
      Trading goods
    </attribute>
    <attribute type="VBAK-AUART">TA</attribute>
    <attribute type="VBAK-VBTYP">C</attribute>
    <attribute type="VBAK-VDATU">20000214</attribute>
    <attribute type="VBAK-VKBUR"/>
    <attribute type="VBAK-VKGRP"/>
    <attribute type="VBAK-VKORG">1000</attribute>
    <attribute type="VBAK-VKORG-VTEXT">Germany Frankfurt
    </attribute>
    <attribute type="VBAK-VTWEG">10</attribute>
    <attribute type="VBAK-VTWEG-VTEXT">Consumer sales
    </attribute>
  </event>
  <event>
    <attribute type="VBAK-VKORG-VTEXT">Germany Frankfurt
    </attribute>
    <attribute type="VBAK-VTWEG-VTEXT">Consumer sales
    </attribute>
    <attribute type="Orders-SPART">01</attribute>
    <attribute type="Orders-PSTYV">TAD</attribute>
    <attribute type="Orders-MATNR">SERVICE</attribute>
    <attribute type="Orders-ERDAT">20000214</attribute>
    <attribute type="VBAK-VKBUR"/>
    <attribute type="VBAK-VTWEG">10</attribute>
    <attribute type="Orders-SPART-VTEXT">Product category 01
    </attribute>
    <attribute type="Orders-ERZET">143616</attribute>
    <attribute type="VBAK-VKORG">1000</attribute>
  </event>
</eventlist>

```

```

    <attribute type="Orders-POSNR">000020</attribute>
    <attribute type="MARA-MTART-MTBEZ">Service
  </attribute>
  <attribute type="Orders-WERKS-NAME1">
Plant 1000 (Hamburg)
  </attribute>
  <attribute type="Orders-CHARG"/>
  <attribute type="Orders-WERKS">1000</attribute>
  <attribute type="VBAK-VDATU">20000214</attribute>
  <attribute type="Orders-MATNR-MAKTX">
      Repair
  </attribute>
  <attribute type="Orders-VBELN">0000000001</attribute>
  <attribute type="VBAK-AUART">TA</attribute>
  <attribute type="VBAK-VKGRP"/>
  <attribute type="Orders-NETWR">179.00</attribute>
  <attribute type="MARA-MTART">DIEN</attribute>
  <attribute type="VBAK-VBTYP">C</attribute>
  <attribute type="Orders-ERNAM">HDM</attribute>
  <attribute type="MARA-MATNR">SERVICE</attribute>
  <attribute type="Orders-KONDM"/>
</event>
<event>
  <attribute type="VBAK-VKGRP-BEZEI">GR. F2 Mr. Mayer
  </attribute>
  <attribute type="VBAK-VKORG-VTEXT">Germany Frankfurt
  </attribute>
  <attribute type="VBAK-VTWEG-VTEXT">Consumer sales
  </attribute>
  <attribute type="Orders-SPART">01</attribute>
  <attribute type="Orders-PSTYV">TAN</attribute>
  <attribute type="Orders-MATNR">P-100</attribute>
  <attribute type="Orders-ERDAT">20000214</attribute>
  <attribute type="VBAK-VKBUR">1000</attribute>
  <attribute type="VBAK-VTWEG">10</attribute>
  <attribute type="Orders-SPART-VTEXT">Product category 01
  </attribute>
  <attribute type="Orders-ERZET">131257</attribute>
  <attribute type="VBAK-VKBUR-BEZEI">Frankfurt office
  </attribute>
  <attribute type="VBAK-VKORG">1000</attribute>
  <attribute type="Orders-POSNR">000010</attribute>
  <attribute type="MARA-MTART-MTBEZ">
      Trading goods
  </attribute>
  <attribute type="Orders-WERKS-NAME1">
Plant 1000 (Hamburg)
  </attribute>
  <attribute type="Orders-CHARG"/>
  <attribute type="Orders-WERKS">1000</attribute>
  <attribute type="VBAK-VDATU">20000214</attribute>
  <attribute type="Orders-MATNR-MAKTX">
      Thread rod M'8 DIN '8895' without tolerance
  </attribute>
  <attribute type="Orders-VBELN">0000000002
  </attribute>

```

```

    <attribute type="VBAK-AUART">TA</attribute>
    <attribute type="VBAK-VKGRP">101</attribute>
    <attribute type="Orders-NETWR">28.70</attribute>
    <attribute type="MARA-MTART">HAWA</attribute>
    <attribute type="VBAK-VBTYP">C</attribute>
    <attribute type="Orders-ERNAM">HDM</attribute>
    <attribute type="MARA-MATNR">P-100</attribute>
    <attribute type="Orders-KONDM"/>
  </event>
  ...
</eventlist>

```

5.3.9 Block extraction

You can influence the relationship between the execution and memory efficiency of the extraction operation.

The value of the `-cpd` command line argument determines the number of system events that are simultaneously held in the system memory. The maximum possible number depends on the size of the available system memory.

The actual system memory used depends on the following factors:

- Total number of system events to be extracted in the defined analysis period
- Number of system events held in parallel in the system (concurrently processed documents)
- Number of data fields to be extracted (fieldtoread and reftext XML elements).
- Memory requirements of extracted data fields

5.3.10 Extract the first or last line in a sorting

The Java class to be used `com.idsscheer.ppm.xmlextractortools.extractor.jdbc2ppm.ZSortWithInteger_jdbc2ppm` sorts records in a data table by means of the specified sorting criterion, and either writes the first or last record to the system events to be generated. The class must be specified in the `classtouse` attribute of the table XML element.

Example

With this class, you can use an integer criterion (amount of items) to sort data records that are referenced via foreign key relations in the ORDER ITEM table. The sort criterion is the AMOUNT field. From the data sorted, the data record with the largest sorting criterion value (for ITEM AMOUNT_MAX) and the data record with the smallest sorting criterion value (for ITEM AMOUNT_MIN) is written to the generated system events, each with the corresponding

item number. The following file extract illustrates the extraction configuration under the conditions described above:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE jdbc_tableconfiguration SYSTEM ↵
    'jdbc_tableconfiguration.dtd'>
<jdbc_tableconfiguration>
  <configuration name="SortWithInteger">
    <docspec>
      <doctable name="ORDER HEADER">
        <pkfield name="NUMBER"/>
      </doctable>
    </docspec>
    <table name="ITEM AMOUNT_MAX" ↵
      tablename="ORDER ITEM" ↵
      classtouse="com.idsscheer.ppm.xmlextractortools. ↵
        extractor.jdbc2ppm. ↵
        ZSortWithInteger_jdbc2ppm">
      <parameter name="SORTCRITERION">
        <value>AMOUNT</value>
      </parameter>
      <parameter name="USE">
        <value>MAX</value>
      </parameter>
      <pkfield name="NUMBER" fktablename="ORDER HEADER" ↵
        fkfieldname="NUMBER"/>
      <fieldtoread name="ITEM"/>
      <fieldtoread name="AMOUNT"/>
    </table>
    <table name="ITEM AMOUNT_MIN" ↵
      tablename="ORDER ITEM" ↵
      classtouse="com.idsscheer.ppm.xmlextractortools. ↵
        extractor.jdbc2ppm. ↵
        ZSortWithInteger_jdbc2ppm">
      <parameter name="SORTCRITERION">
        <value>AMOUNT</value>
      </parameter>
      <parameter name="USE">
        <value>MIN</value>
      </parameter>
      <pkfield name="NUMBER" fktablename="ORDER HEADER" ↵
        fkfieldname="NUMBER"/>
      <fieldtoread name="ITEM"/>
      <fieldtoread name="AMOUNT"/>
    </table>
  </configuration>
</jdbc_tableconfiguration>
```

A system event extracted with this configuration could look like this:

```
<event>
  <attribute type="ORDER HEADER NUMBER">
    4711
  </attribute>
  <attribute type="ITEM AMOUNT_MAX-ITEM">
    20
```

```

</attribute>
<attribute type="ITEM AMOUNT_MAX-AMOUNT">
  100000
</attribute>
<attribute type="ITEM AMOUNT_MIN-ITEM">
  50
</attribute>
<attribute type="ITEM AMOUNT_MIN-AMOUNT">
  470
</attribute>
</event>

```

The sorting criterion (in this case AMOUNT) is automatically included in the system event specification.

The template for creating the shown configuration looks like this:

```

<table name="..." tablename="..." ↵
  classtouse="com.idsscheer.ppm.xmlextractortools. ↵
    extractor.jdbc2ppm. ↵
    ZSortWithInteger_jdbc2ppm">
  <parameter name="SORTCRITERION">
    <value>...</value>
  </parameter>
  <parameter name="USE">
    <value>...</value>
  </parameter>
  ...
  See chapter
  JDBC table configuration (page 78)
  ...
</table>

```

The table below reiterates the most important configuration entries for the above table definition:

XML element/attribute	Value: Description
name	The specified name is added to the extracted source system attributes as a prefix
tablename (optional)	Table from which the information is to be extracted. Default value: Value from name XML attribute
classtouse	com.idsscheer.ppm.xmlextractortools. extractor. jdbc2ppm.ZSortWithInteger_jdbc2ppm: Java class to be used

XML element/attribute	Value: Description
parameter name	
SORTCRITERION	<p>First parameter to be specified.</p> <p>A single value XML element must be specified (field name of sorting criterion). The specified field may only contain integer values.</p>
USE	<p>Second parameter to be specified.</p> <p>A single value XML element must be specified. Valid values:</p> <p>MIN (the data record with the lowest integer value for the sorting criterion is selected)</p> <p>MAX (the data record with the highest integer value for the sorting criterion is selected)</p> <p>Either the first or last data record from the list generated based on the specified sorting criterion is selected to be extracted.</p>

You should use this class for extracting the first or last line of a sorting sparingly, as the sorting and selection operations may result in a loss of performance and memory.

5.3.11 Extract the first or last row using a time stamp

You can use the Java class `com.idsscheer.ppm.xmlextractortools.extractor.jdbc2ppm.ZSortWithTimestamp_jdbc2ppm` to extract data by time stamp (for example, Oracle data type `TIMESTAMP`) in a sorted manner. The first or last record extracted is written to an event. The class is specified in the XML element table of the XML attribute `classtouse`. The two required parameters are specified in the corresponding XML elements:

- Parameter name="SORTCRITERION" with an XML element value whose value determines the field name of the table to be extracted.
- Parameter name="USE" with an XML element value that must have either the value `MAX` (record with the latest value is transferred) or `MIN` (record with the earliest record is transferred).

The following example shows an extract from such a table configuration.

```
<table ...
classtouse="com.idsscheer.ppm.xmlextractortools.extractor.jdbc2ppm.ZSortW
ithTimestamp_jdbc2ppm">
  <parameter name="SORTCRITERION">
    <value>...</value>
  </parameter>
  <parameter name="USE">
    <value>...</value>
  </parameter>
  ... conditions ...
  ... pkfields ...
  ... fieldstoread ...
</table>
```

The specified sort criterion is automatically added to the event output.

Example

Fields of the last process step status on each process step are to be extracted from the table DBO.WMPROCESSSTEP (status history of process steps). Depending on the value of the field AUDITTIMESTAMP (Oracle data type TIMESTAMP), the latest entry (MAX) is to be transferred.

```
<configuration name="AUFK_JCDS_AUFK">
...
  <table name="WMPROCESSSTEP_END" tablename="DBO.WMPROCESSSTEP"
classtouse="com.idsscheer.ppm.xmlextractortools.extractor.jdbc2ppm.ZSortW
ithTimestamp_jdbc2ppm">
  <parameter name="USE">
    <value>MAX</value>
  </parameter>
  <parameter name="SORTCRITERION">
    <value>AUDITTIMESTAMP</value>
  </parameter>
  <pkfield name="INSTANCEID" fktablename="WMPROCESSSTEP"
fkfieldname="INSTANCEID" />
  <pkfield name="INSTANCEITERATION" fktablename="WMPROCESSSTEP"
fkfieldname="INSTANCEITERATION" />
  <pkfield name="STEPID" fktablename="WMPROCESSSTEP" fkfieldname="STEPID"
/>
  <pkfield name="STEPITERATION" fktablename="WMPROCESSSTEP"
fkfieldname="STEPITERATION" />
  <fieldtoread name="AUDITTIMESTAMP" />
  <fieldtoread name="INSERTTIMESTAMP" />
  <fieldtoread name="STATUS" />
</table>
...
</configuration>
```

An event extracted with this configuration could look like this:

```
<event>
...
  <attribute type="WMPROCESSSTEP_END-AUDITTIMESTAMP">24.08.2010
09:51:13.477</attribute>
  <attribute type="WMPROCESSSTEP_END-INSERTTIMESTAMP">24.08.2010
09:51:13.550</attribute>
```

```

  <attribute type="WMPROCESSSTEP_END-STATUS">2</attribute>
  ...
</event>

```

EXTRACT DATA INCL. MILLISECONDS OR NANOSECONDS

By default, time stamps are extracted and sorted to the second. If several records with identical time stamp value exist one of them is randomly selected and used for value determination.

If time stamps are saved to the millisecond or to the nanosecond in the database, they can be extracted and sorted to the millisecond respectively nanosecond. To implement this, you can specify the value MILLISECOND or NANOSECOND in the precisionoftime attribute of the XML element databasesettings of the JDBC configuration file. The default value is SECOND. With the value SECOND, all time stamps or times are extracted in the format MM/dd/yyyy HH:mm:ss or HH:mm:ss and written to the event file. The data is sorted to the second according to the time stamp.

With the value MILLISECOND, time stamps or times are extracted in the format MM/dd/yyyy HH:mm:ss.SSS or HH:mm:ss.SSS and written to the event file. The data is sorted to the millisecond according to the time stamp.

With the value NANOSECOND, time stamps or times are extracted in the format MM/dd/yyyy HH:mm:ss.nnnnnnnnnn or HH:mm:ss.SSS and written to the event file. The data is sorted to the nanosecond according to the time stamp.

The default value is SECOND, that is, times are extracted to the second after upgrading an existing client configuration.

The following example shows an extract from the XML JDBC configuration file:

```

<jdbcconf>
  <databasesettings name="jdbc_oracle" dbtype="ORACLE"
precisionoftime="MILLISECOND">
    <driverclass>oracle.jdbc.driver.OracleDriver</driverclass>
    <maxconditionlength>2000</maxconditionlength>
    <fetchsize>1000</fetchsize>
  </databasesettings>
  <databaseconnection name="jdbc_oracle10_connection">
    <dbsettings>jdbc_oracle</dbsettings>
    <url>...</url>
    <user>...</user>
  ...
  </databaseconnection>
</jdbcconf>

```

5.3.12 Multiplication of system events in tables

When extracting from a JDBC database you have the option of creating additional system events based on a system event table.

At the source system level, a 1:n relationship may exist that cannot be resolved when determining the system events. Use the class `com.idsscheer.ppm.xmlextractortools.extractor.jdbc2ppm.ZTableMultiplyEvents_jdbc2ppm` to create multiple system events from a system event and thus resolve the 1:n relationship.

Example

```
<configuration name="MultiplyEvents">
  <docspec>
    <doctable name="VBAK" tablename="VBAK">
      <condition fieldname="VBELN" logicaloperator="in">
        <value>0000006662</value>
        <value>0000006741</value>
      </condition>

      <pkfield name="VBELN" />
    </doctable>
  </docspec>

  <table name="VBAP"
  classtouse="com.idsscheer.ppm.xmlextractortools.extractor.jdbc2ppm.ZT
  ableMultiplyEvents_jdbc2ppm">
    <pkfield name="VBELN" fktablename="VBAK" fkfieldname="VBELN"/>
    <fieldtoread name="POSNR"/>
    <fieldtoread name="MATNR"/>
  </table>

  <table name="MAKT">
    <condition fieldname="SPRAS" logicaloperator="eq">
      <value>de</value>
    </condition>

    <pkfield name="MATNR" fktablename="VBAP" fkfieldname="MATNR"/>
    <fieldtoread name="MAKTX"/>
  </table>
</configuration>
```

This is the associated system event output file:

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
<event>
  <attribute type="VBAK-VBELN">0000006662</attribute>
</event>
```

```

<event>
  <attribute type="MAKT-MAKTX">Flatscreen MS 1460 P</attribute>
  <attribute type="VBAK-VBELN">0000006741</attribute>
  <attribute type="VBAP-MATNR">M-06</attribute>
  <attribute type="VBAP-POSNR">000010</attribute>
</event>
<event>
  <attribute type="MAKT-MAKTX">Flatscreen MS 1775P</attribute>
  <attribute type="VBAK-VBELN">0000006741</attribute>
  <attribute type="VBAP-MATNR">M-10</attribute>
  <attribute type="VBAP-POSNR">000020</attribute>
</event>
<event>
  <attribute type="MAKT-MAKTX">MAG PA/DX 175</attribute>
  <attribute type="VBAK-VBELN">0000006741</attribute>
  <attribute type="VBAP-MATNR">M-14</attribute>
  <attribute type="VBAP-POSNR">000030</attribute>
</event>
<event>
  <attribute type="MAKT-MAKTX">Jotachi SN4500</attribute>
  <attribute type="VBAK-VBELN">0000006741</attribute>
  <attribute type="VBAP-MATNR">M-18</attribute>
  <attribute type="VBAP-POSNR">000040</attribute>
</event>
</eventlist>

```

The following example (excluding the class described) explains the procedure during extraction:

```

<configuration name="MultiplyEvents_Doctype_Only">
  <docspec>
    <doctype name="VBAK" tablename="VBAK">
      <condition fieldname="VBELN" logicaloperator="in">
        <value>0000006662</value>
        <value>0000006741</value>
      </condition>

      <pkfield name="VBELN" />
    </doctype>
  </docspec>

  <table name="VBAP" >
    <pkfield name="VBELN" fktablename="VBAK" fkfieldname="VBELN"/>
    <fieldtoread name="POSNR"/>
    <fieldtoread name="MATNR"/>
  </table>

  <table name="MAKT">
    <condition fieldname="SPRAS" logicaloperator="eq">
      <value>de</value>
    </condition>

    <pkfield name="MATNR" fktablename="VBAP" fkfieldname="MATNR"/>
    <fieldtoread name="MAKTX"/>
  </table>

```

```

    </table>
</configuration>

```

Since multiple entries in the VBAP table are assigned to an entry in the VBAK table only one random row is extracted from the VBAP table.

This is the associated system event output file:

```

<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
<event>
  <attribute type="VBAK-VBELN">0000006662</attribute>
</event>
<event>
  <attribute type="MAKT-MAKTX">Flatscreen MS 1775P</attribute>
  <attribute type="VBAK-VBELN">0000006741</attribute>
  <attribute type="VBAP-MATNR">M-10</attribute>
  <attribute type="VBAP-POSNR">000020</attribute>
</event>
</eventlist>

```

5.3.13 Extract fields of individual tables for Data analytics

To enable easy data extraction for Data analytics, you can extract the entire contents of a source system table into a file in event format, which can then be imported into a Data analytics analysis realm.

You can also restrict the data to be extracted (page 62) by defining conditions for data extraction.

The table to be extracted is not configured using the table configuration but in the data source file itself. For this, the file `datasource.dtd` contains the following entries:

XML element/attribute	Description
<code>analysistype</code>	XML attribute: Must have the value <code>DATA_ANALYTICS</code> .
<code>realmtable</code>	Comprehensive XML element for configuring the Data analytics data source.
<code>tablename</code>	XML attribute of the <code>realmtable</code> element: Name of the table in the source system
<code>sourcetable</code>	Comprehensive XML element for configuring the Data analytics data source table. Must include at least one <code>sourcefield</code> element.

XML element/attribute	Description
tablename	XML attribute of the sourcetable element: Name of the table in the source system
sourcefield	Contains the name of the field of the source system table.

The `analysistype` attribute of the XML element `datasource` must have the value `DATA_ANALYTICS` if the `<realmtable>` element specifies an analysis realm table (default value: `PROCESS`).

The `tablename` attribute of the `<realmtable>` element indicates the table name of the target table in the analysis realm configuration. The table name does not affect extraction itself, but is evaluated only by the PPM import.

Further information on data import for Data analytics is available in the PPM Data Analytics user guide.

The XML element `<realmtable>` contains the optional element `<sourcetable>` that specifies the table to be extracted. The columns to be extracted from this table must be specified in the `<sourcefield>` element. The element `<sourcetable>` is optional. For the JDBC or SAP Extractor, a single source table and at least one source column must be specified. Otherwise, an error message will be output during the parsing of the data source file.

A data source definition can only have a maximum of one table. It is impossible to restrict the number of rows. All rows are extracted, including all rows with identical values at the columns to be extracted. For example, if the columns First name and Last name are to be extracted and the table contains ten entries Peter and Schmidt, ten events with identical attribute values will be generated.

The following example explains the configuration:

```
<realmtable tablename="COMPANY_EMPLOYEE">
  <sourcetable tablename="EMPLOYEE">
    <sourcefield>EMPLOYEE_ID</sourcefield>
    <sourcefield>NAME</sourcefield>
  </sourcetable>
  ...
</realmtable>
<dataextraction>
  <outputfilename>..\custom\testclient\data\employee.xml</outputfilename>
</dataextraction>
...
<systemconfig>..\custom\testclient\SourceSystemConfig.xml</systemconfig>
```

In contrast to the behavior of the conventional JDBC or SAP Extractor, attributes no longer receive a table name as a prefix in the event output file. For example, if the table EMPLOYEE was extracted, the extractor usually generated events of the type <table name>-<column name>:

```
<event>
  <attribute type="EMPLOYEE-EMPLOYEE_ID">4711</attribute>
  <attribute type="EMPLOYEE-NAME">Schmidt</attribute>
</event>
```

Extracting a table using the <realmtable> element, however, creates only events without table names:

```
<event>
  <attribute type="EMPLOYEE_ID">4711</attribute>
  <attribute type="NAME">Schmidt</attribute>
</event>
```

NULL VALUES IN THE DATA ANALYTICS MODE

If the value of a column is null at the time an analysis realm table is extracted, this value is not written to the event. If a row EMPLOYEE_ID = 4712 exists without last name, the extractor creates the following events.

```
<event>
  <attribute type="EMPLOYEE_ID">4711</attribute>
  <attribute type="NAME">Schmidt</attribute>
</event>
<event>
  <attribute type="EMPLOYEE_ID">4712</attribute>
</event>
```

However, if all column values to be extracted are null, the event is written with empty attributes:

```
<event>
  <attribute type="EMPLOYEE_ID">4711</attribute>
  <attribute type="NAME">Schmidt</attribute>
</event>
<event>
  <attribute type="EMPLOYEE_ID"></attribute>
  <attribute type="NAME"></attribute>
</event>
```

If multiple such rows exist they will be – in contrast to the common extraction procedure (analysisistype=PROCESS) – transferred accordingly so that as many <event> elements exist in the event file as there are rows in the data table of the source system.

5.3.13.1 Restrict data extraction

If you want to extract only a specific part of the table content, you can define data extraction conditions. You can limit the data volume to be extracted using a time stamp or integer value (for example, a sequence).

To do so, specify the required conditions in the data source configuration using the condition element and the `dataextractiontype` attribute.

```
<datasource name="VBAP" type="JDBC" analysistype="DATA_ANALYTICS"
dataextractiontype="TIME_BASED">
  <realmtable tablename="VBAP">
    <sourcetable tablename="VBAP2">
      <condition logicaloperator="char_creationtimestamp"
fieldname="AEDAT">
        <value>yyyy-MM-dd</value>
      </condition>
      <sourcefield>AEDAT</sourcefield>
      <sourcefield>ERDAT</sourcefield>
      <sourcefield>ERNAM</sourcefield>
      <sourcefield>ERZET</sourcefield>
      <sourcefield>MATKL</sourcefield>
      <sourcefield>MATNR</sourcefield>
      <sourcefield>WERKS</sourcefield>
    </sourcetable>
  </realmtable>
  ...
</datasource>
```

The `dataextractiontype` attribute can have the following values in Data analytics data sources:

- **COMPLETE:** Extraction is executed with a time criterion from the date 01.01.1990 00:00:00 and with an integer criterion from the value 0. This is also the default setting if the attribute does not exist.
- **TIME_BASED:** A data extraction based on a time stamp is to be run.
- **VALUE_BASED:** A data extraction based on a value is to be run.

There is no check whether the data extraction condition used matches the data extraction type configured (`dataextractiontype=`). If the configuration is created using CTK, CTK ensures correct values. If the file is configured manually and a condition that does not match is used, an error may occur during data extraction.

5.3.14 Extract tables with key/value columns

You can use a special extraction class to extract tables that contain cells with key/value pair. A new event attribute is created for each extracted key of an event.

EXTRACTION CLASS

com.idsscheer.ppm.xmlextractortools.extractor.jdbc2ppm.ZTableKeyValueFieldsToAttributes_jdbc2ppm

The behavior and configuration of this extraction class is identical to the corresponding extraction class of an SAP system, except for the different class name. For details, see the corresponding chapter Extract tables with key/value columns (page 62).

The following configuration refers to the JDBC extraction class mentioned above:

```
<xmlextractor_tableconfiguration>
  <configuration name="workflow">
    <docspec>
      <doctable name="WF_ITEMS" tablename="WF_ITEMS">
        <pkfield name="ID" />
        <pkfield name="TYPE" />
        <pkfield name="CREATOR" />
        <pkfield name="TEXT" />
      </doctable>
    </docspec>
    <table name="WF_ITEM_ATTRIBUTES" tablename="WF_ITEM_ATTRIBUTES" classtouse="
com.idsscheer.ppm.xmlextractortools.extractor.jdbc2ppm.ZTableKeyValueFieldsToAttributes_jdbc2ppm">
      <parameter name="KEYVALUEFIELDS">
        <value>ATTRIBUTE#-#VALUE</value>
      </parameter>
      <pkfield name="ID" fktablename="WF_ITEMS" fkfieldname="ID" />
      <fieldtoread name="ATTRIBUTE" />
      <fieldtoread name="VALUE" />
    </table>
  </configuration>
</xmlextractor_tableconfiguration>
```

5.4 Command line program

You create the XML output file(s) using the runjdbc2ppm.bat command line program.

Calling up the program without parameters or with -h or -? outputs the online help on the console, describing all available options.

5.4.1 Command line program arguments

5.4.1.1 General arguments

-VERSION

Outputs the version number of the PPM process extractor used. Other arguments specified are ignored.

-INFORMATION YES|NO

Specify whether information is to be output (yes) or not (no) during the import. The default is yes.

-WARNING YES|NO

Specify whether warning messages are to be output (yes) or not (no) during the import. The default is yes.

-ERROR YES|NO

This is where you specify whether error messages are to be output (yes) or not (no) during the import. The default is yes.

-PROTOCOLFILE <FILE NAME>

Specify the log file to which all messages are written during the import. If you specify a file, only critical error messages resulting in program abortion will be output on the screen.

-LANGUAGE <ISO CODE>

Specify the language in which the log information is to be output.

5.4.1.2 Source database specific arguments

-DATASOURCE <FILE NAME> (OPTIONAL)

Specify the data source you want to use for the extraction. The XML file contains specifications of all files to be used for extraction and XML output. Make sure that you use this parameter instead of and not in combination with the `-datasourcelist`, `-systemconfig`, `-tableconfig`, `-calconfig`, `-outfile`, or `-nozip` parameters.

-DATASOURCELIST <FILE NAME>

Multiple data sources can be extracted simultaneously by means of the `-datasourcelist` argument. This corresponds to multiple consecutive extraction using the `-datasource` argument. Only JDBC data sources are extracted.

See chapter Extract multiple data sources (page 129).

-SYSTEMCONFIG <FILENAME> <CONFIGNAME>

This is where you specify the name of the XML file containing the system configuration. The content of the file is source database-specific and can contain several configurations. The name of the configuration to be used is specified in the second argument. If the XML file contains only one configuration, this is used automatically. In this case you do not need to specify a configuration name.

-TABLECONFIG <FILE NAME> <CONFIG NAME>

This is where you specify the name of the XML file containing the table configuration. The content of the file is source database-specific. The file must contain all table configurations specified in the table configurations. The name of the table configuration is specified in the second argument. If the XML file contains only one configuration, this is used automatically. In this case you do not need to specify a configuration name.

-CALCCONFIG <FILE NAME> (OPTIONAL)

This is where you specify the name of the XML file with which you can change attributes of the XML output file or add attributes including attribute calculations.

-BEGINDATE <DD.MM.YYYY> (OPTIONAL)

This is where you specify the date from which data is to be extracted from the source database. If you do not use this parameter, the value of the lastreaddate XML attribute from the specified system configuration or data source is used. The yyyyymmdd format is supported.

-BEGINTIME <HH:MM:SS> (OPTIONAL)

Specify the time from which data is to be extracted from the source system. If you do not use this parameter and -begindate, the value of the lastreadtime XML attribute from the specified system configuration or data source is used. If you do not use the parameter but you do use -begindate, the default value 000000 is set.

-ENDDATE <DD.MM.YYYY> (OPTIONAL)

This is where you specify the date up to which data is to be extracted from the source database. If you do not use this parameter, the current date is used. The yyyyymmdd format is supported.

-ENDTIME <HH:MM:SS> (OPTIONAL)

This is where you specify the time up to which data is to be extracted from the source database. If you do not use the parameter but use -enddate, 235959 is set as the default value. If you use neither this parameter nor -enddate, the current time is used.

If PPM Process Extractor JDBC-2-PPM is started without specifying a period of time, the start time is extracted from the specified configuration file. The current date and time are used as the end time.

-VALUECONSTRAINT <PARAMETER1> ... <PARAMETER4> (OPTIONAL)

Use this parameter to delimit the data volume to be extracted using an integer criterion. The "<", "<=", ">" and ">=" comparison operators are allowed. You can compare the corresponding field value with one or two (interval) values. If a last extracted value (lastreadvalue) has already been saved in the system configuration or data source, you can also use this value for the comparison (see chapter Continuous automated extraction (page 127)).

Examples

```
-valueconstraint 25000020 "<="
```

Only data records are extracted whose integer value for the field specified in the event specification is **smaller than** or **equal to** the value **25000020**.

```
-valueconstraint 15000020 ">" 25000020 "<"
```

Interval: Only data records are extracted whose integer value for the field specified in the event specification is smaller than the value 25000020 and greater than the value 15000020.

-SAVE_VALUE_MINIMUM (OPTIONAL)

Use this parameter to specify that with -valueconstraint, the smallest value last read is saved as lastreadvalue in the configuration file used (system configuration or data source) when extracting with restrictions. Default value: Saving the largest value

-CPD <INT> (OPTIONAL)

This parameter is used to specify the number of system events to be extracted simultaneously (concurrently processed documents). The specified value gradually extracts the primary key fields from the table referenced using the doctable XML element in the table configuration, and stores them in the extractor's Java memory. Specifying a higher value results in improved extraction performance and more efficient memory usage.

If you do not specify the parameter, the recommended default value of 20000 is used.

-PING (OPTIONAL)

This parameter is used to test the connection to the specified source database. No data is extracted.

-REMOVEEMPTY (OPTIONAL)

You use this parameter to remove extracted attributes with no values before the attribute transformation.

5.4.1.3 Output file-specific arguments

-OUTFILE <FILE NAME>

You use this parameter to specify the name of the XML output file. The file extension is added automatically. By default, the file is output as a ZIP file.

-OUTFILEENCODING <ENCODING> (OPTIONAL)

You use this parameter to specify the encoding of the XML output file. Default value: UTF-8

-NOZIP (OPTIONAL)

You use this parameter to specify that the output file is to be output as an XML file rather than as a ZIP file.

-PIKIDATAMAPPING <FILE NAME> <PC NAME> (OPTIONAL)

You use this parameter to specify the name of the XML file containing the mapping in the first argument. In the second argument, you specify the name of the measure series in which the process instance-independent measure series are to be saved.

-DIMDATAMAPPING <FILE NAME> <DIM NAME> (OPTIONAL)

You use this parameter to specify the name of the XML file containing the mapping in the first argument. In the second argument, you specify the name of the dimension for which the extracted values are subsequently to be imported.

-SORTEVENTATTRIBUTES (OPTIONAL)

You use this parameter to sort the source system attributes in the system events in alphanumeric order using the attribute type. For large data volumes, this parameter can have a negative impact on the extraction speed.

5.4.1.4 Continuous automated extraction

You can extract data in full and automatically by eliminating the `-begindate`, `-begintime`, `-enddate`, `-endtime` parameters in the command line or by using `-valueconstraint` with no value for the first comparison operator. If the data range to be extracted is restricted using integer values, either the smallest or largest of the last values extracted is saved or updated in the configuration file used. If there are time restrictions on the data range to be extracted, the time of the last data extraction is saved or updated in the configuration file.

The following conditions must be met:

- A correct configuration for `char_creationtimestamp` or `valueconstraint` or `date_creationtimestamp` for the data to be extracted is specified in the event specification (see chapter on Condition operators (page 90)).
- You always use the same command line call for continuous automated extraction, for example:

```
runjdbc2ppm -datasource datasource.xml -valueconstraint ">"
```

- When you use the `-valueconstraint` parameter, make sure that you either save the greatest of the last values extracted for all extraction operations (default), or the smallest of the last values extracted by specifying `-save_value_minimum`.
The value of `lastreadvalue` in the configuration file is only updated if the greatest of the last values extracted is greater than the value currently saved when running the command line without the `-save_value_minimum` parameter, or if the smallest of the last values extracted is smaller than the value currently saved when using `-save_value_minimum`.

Example 1 (`lastreadvalue` with default value "0")

```
-valueconstraint ">="
```

Only those data records are extracted whose integer value for restricting the data range to be extracted is greater than or equal to the value saved as the last value extracted (`lastreadvalue`) in the system configuration or data source. If no value is saved, the default value 0 is used (in the example, all data records with integer criterion values ≥ 0 would be extracted). The greatest of the last values extracted (300 in this example) is saved as `lastreadvalue` according to the default setting (see `-save_value_minimum` parameter).

Example 2 (`lastreadvalue="40"`)

```
-valueconstraint ">=" 270 "<="
```

All data records are extracted that have an integer value of ≥ 40 and ≤ 270 for restricting the data range to be extracted. After the extraction, the value for `lastreadvalue` is updated, for example, to 270 if this is really the greatest of the last values extracted.

Example 3 (`lastreaddate="19971231" lastreadtime="155959" lastreadvalue="270"`)

By calling up

```
runjdbc2ppm -datasource datasource.xml -valueconstraint ">"
```

again all data records are extracted whose integer value for delimiting the data range to be extracted is greater than 270 and whose time stamp is as old as or more recent than the start time of the data extraction (31.12.1997 15:59:59).

The start time of data extraction is entered as `lastreaddate/lastreadtime` in the configuration file.

If you eliminate the `-begindate/-begintime` parameters, you always extract the data records whose time stamps are more recent (greater) than the ones specified and last extracted using `lastreaddate/lastreadtime`. The current date and time are entered as `lastreaddate/lastreadtime` if you do not use the `-enddate` and `-endtime` parameters.

5.5 Extract multiple data sources

You can use a data source list to extract multiple data sources simultaneously. The data source list is specified in a separate configuration file.

Each new JDBC data source created in CTK is automatically added to the end of the list of data sources of the current client. During extraction using the command line option `-datasourcelist <file name>` the data of these data sources is extracted consecutively as if data extraction was called multiple times using the option `-datasource <file name>`. The sequence of the data source extraction is specified in the configuration file. Data sources of a type other than JDBC in the list are ignored during extraction.

The following applies to trouble shooting:

- If the extraction is called via a valid data source list that does not contain any matching data sources the extraction ends without outputting an error message.
- If the extraction is called using a data source list containing multiple matching data sources, and if an error occurs during the extraction of one of these data sources resulting in extraction cancelation, the procedure continues with the next data source. This means that cancelation of the extraction of one data source does not lead to cancelation of the entire procedure.
- If an error occurs in at least one data source, which would have led to an exit error status during the single extraction of this data source, the last exit error status will be returned by the overall data source extraction process.

5.6 Extract data of BIT data type

You can extract data of BIT data type from SQL server databases. A value extracted from a BIT-data field can be mapped to a value of BOOLEAN data type.

Example of extracted BIT data fields

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
  <metadata>
    <attr_desc type="DATATYPE_BIT-ID">
      <ppmdatatype>LONG</ppmdatatype>
    </attr_desc>
    <attr_desc type="DATATYPE_BIT-VALUE_BIT_2">
      <ppmdatatype>BOOLEAN</ppmdatatype>
    </attr_desc>
    <attr_desc type="DATATYPE_BIT_2-VALUE_BIT_1">
      <ppmdatatype>BOOLEAN</ppmdatatype>
    </attr_desc>
    <attr_desc type="DATATYPE_BIT_2-VALUE_BIT_3">
      <ppmdatatype>BOOLEAN</ppmdatatype>
    </attr_desc>
    <attr_desc type="DATATYPE_BIT_2-VALUE_INT">
      <ppmdatatype>LONG</ppmdatatype>
    </attr_desc>
  </metadata>
  <event>
    <attribute type="DATATYPE_BIT-ID">1</attribute>
    <attribute type="DATATYPE_BIT-VALUE_BIT_2">>false</attribute>
    <attribute type="DATATYPE_BIT_2-VALUE_BIT_1">>false</attribute>
    <attribute type="DATATYPE_BIT_2-VALUE_BIT_3">>true</attribute>
    <attribute type="DATATYPE_BIT_2-VALUE_INT">1</attribute>
  </event>
</eventlist>
```

You can use table fields of BIT data type also in conditions to restrict data extraction. The value can be true (respectively 1) or false (respectively 0).

Example of an extraction configuration

```
<jdbc_tableconfiguration>
  <configuration name="BitConfig">
    <docspec>
```



```

    <doctable name="DATATYPE_BIT">
      <condition fieldname="VALUE_BIT_1" logicaloperator="eq">
        <value>true</value>
      </condition>
      <pkfield name="ID"/>
    </doctable>
  </docspec>

  <table name="DATATYPE_BIT">
    <pkfield name="ID" fktablename="DATATYPE_BIT" pkfieldname="ID"/>
    <fieldtoread name="VALUE_BIT_2"/>
  </table>

  <table name="DATATYPE_BIT_2" tablename="DATATYPE_BIT">
    <pkfield name="VALUE_BIT_2" fktablename="DATATYPE_BIT"
fkfieldname="VALUE_BIT_2"/>
    <fieldtoread name="VALUE_BIT_1"/>
    <fieldtoread name="VALUE_BIT_3"/>
    <fieldtoread name="VALUE_INT"/>
  </table>
</configuration>
</jdbc_tableconfiguration>

```

5.7 Appendix

5.7.1 Supported data types

The supported database systems include numerous data types that are not contained in all database systems or that have other names or different semantics there.

To avoid undesired behavior, the list below indicates data types that have been tested successfully with PPM Process Extractor JDBC-2-PPM.

Database system	Data types	Note
Oracle	CHAR, VARCHAR2, NCHAR, NVARCHAR2, NUMBER, LONG, DATE, TIMESTAMP	The CLOB, NCLOB, BINARY_FLOAT, and BINARY_DOUBLE data types are not supported.
IBM DB2	VARCHAR, CHAR, BIGINT, REAL, DOUBLE, FLOAT, DATE, TIME, TIMESTAMP	The LONG VARCHAR and CLOB data types are not supported.
Microsoft SQL Server	CHAR, VARCHAR, NCHAR, NVARCHAR, INT, TINYINT, SMALLINT, BIGINT, REAL, FLOAT, DECIMAL, DATETIME, SMALLDATETIME, BIT	The LONG VARCHAR and CLOB data types are not supported.

5.7.2 Special characters and capitalization

From version 9.9, PPM Process Extractor JDBC-2-PPM supports the usage of special characters and case-sensitive capitalization in schema, table, and field names in SQL databases.

SQL expressions must be in brackets so that database systems can process them if they contain special characters in schema, table, and column names and case-sensitive spelling, for example like in the following SQL statement for an SQL server database.

```
SELECT [column with space] FROM [USER.1].[table $%&]
```

Depending on the database system, the syntax may differ. For example, under Oracle and DB2, names must be set in apostrophes, and under SQL server, square brackets can be used.

To support special characters and case-sensitive spelling, the system configuration `JdbcConfig.dtd` contains the `non-standard-sql-identifiers` (true | false) attribute. If the `non-standard-sql-identifiers` attribute has the value true, the schema, table, and column names will be set in limiting characters suitable for the relevant database type.

```
<!ATTLIST databasesettings
  name ID #REQUIRED
  dbtype (ORACLE | DB2 | SQLSERVER | OTHER) #REQUIRED
```

```
precisionoftime (SECOND|MILLISECOND) "SECOND"
non-standard-sql-identifiers (true | false) "false"
```

In the database systems, limiting characters must not be part of database identifiers, such as schema, table, and column names.

BACKWARDS COMPATIBILITY

To ensure compatibility with existing configurations, the value `false` is assigned to the attribute `non-standard-sql-identifiers` in CTK when opening and saving or migrating a configuration. An existing value is not automatically overwritten, but can be changed manually in CTK.

When creating a new configuration, CTK sets this value to `true` by default.

5.7.2.1 Special case: Schema and table name

Extraction of tables located in a database schema other than that of the user logged in is possible in the JDBC extractor only via a prefix of the table name. The prefix is separated by a period from the table name in the `tablename` attribute in the various elements of the table configuration (`jdbc_tableconfiguration.dtd`).

Example

```
<doctable name="customer" tablename="USER1.CUSTOMER ">
```

Since the period can also occur as a special character in schema and table names, each period that is part of the schema or table name must be masked with a backslash `\`. To recognize backslashes that are part of the name they must be masked by a double occurrence.

Schema and table names can be unambiguously differentiated in the following example configurations.

Schema name	Table name	Syntax for tablename attribute
USER	1.CUSTOMER	USER.1\CUSTOMER
USER.1.1	ORDER.DE	USER\1\1.ORDER\DE
USER.	ORDER	USER\..ORDER
USER\2	ORDER.DE	USER\\2.ORDER\DE
USER\1	ORDER\44	USER\\1.ORDER\\44
USER	1.TABLE.1	USER.1.TABLE.1

If more than one period occurs in a schema and table name (see example in the last table row) which is not masked by the backslash, the first period is interpreted as a schema separator

and the other periods are seen as parts of the table name. This corresponds to version pre-9.9 behavior and is kept for compatibility reasons. It is still recommended to mask all periods except the schema separator with a prefix backslash.

Masking any other character than period or backslash is not allowed.

When defining foreign keys it is important to observe that the value in the <fktablename> XML attribute refers to the <name> XML attribute and not to <tablename>.

Example

```
<jdbc_tableconfiguration>
  <configuration name="Example">
    <docspec>
      <doctable name="USER.1.CUSTOMER" tablename="USER\1.CUSTOMER">
        <condition fieldname="SEQUENCE" logicaloperator="in">
          <value>001</value>
          <value>099</value>
        </condition>
        <pkfield name="SEQUENCE"/>
      </doctable>
    </docspec>
    <table name="FK_TABLE">
      <pkfield name="SEQUENCE"
        fktablename="USER.1.CUSTOMER" fkfieldname="SEQUENCE"/>
      <fieldtoread name="FK_COLUMN1"/>
      <fieldtoread name="FK_COLUMN2"/>
    </table>
  </configuration>
</jdbc_tableconfiguration>
```

If the tablename is missing, the contents of the name attribute is used as a table name to access the database. The two attribute values for the name and fktablename attributes are interpreted as pure character strings and therefore not evaluated in terms of separators and masking characters.

For example, if the table is specified only with the name attribute like this:

```
<doctable name="USER\1.CUSTOMER">
```

this means that

```
<doctable name="USER\1.CUSTOMER" tablename="USER\1.CUSTOMER">
```

The extractor would thus extract the table USER.CUSTOMER from the database.

If special characters occur in the table name we recommend to specify the table name always with the tablename attribute.

6 PPM Process Extractor CSV-2-PPM

This chapter provides an overview of the architecture, functioning and configuration of PPM Process Extractor CSV-2-PPM.

6.1 CSV

A file in CSV (Comma Separated Values) format consists of the actual data records and an optional header containing the column headings. The column headings in the header and the data fields for the data records are separated by the same separator, normally a semicolon. A data field may only contain the separator if it is used within a masked value. PPM Process Extractor CSV-2-PPM implements the column headings as attribute types, that is, the values of the data records as attribute values.

Example

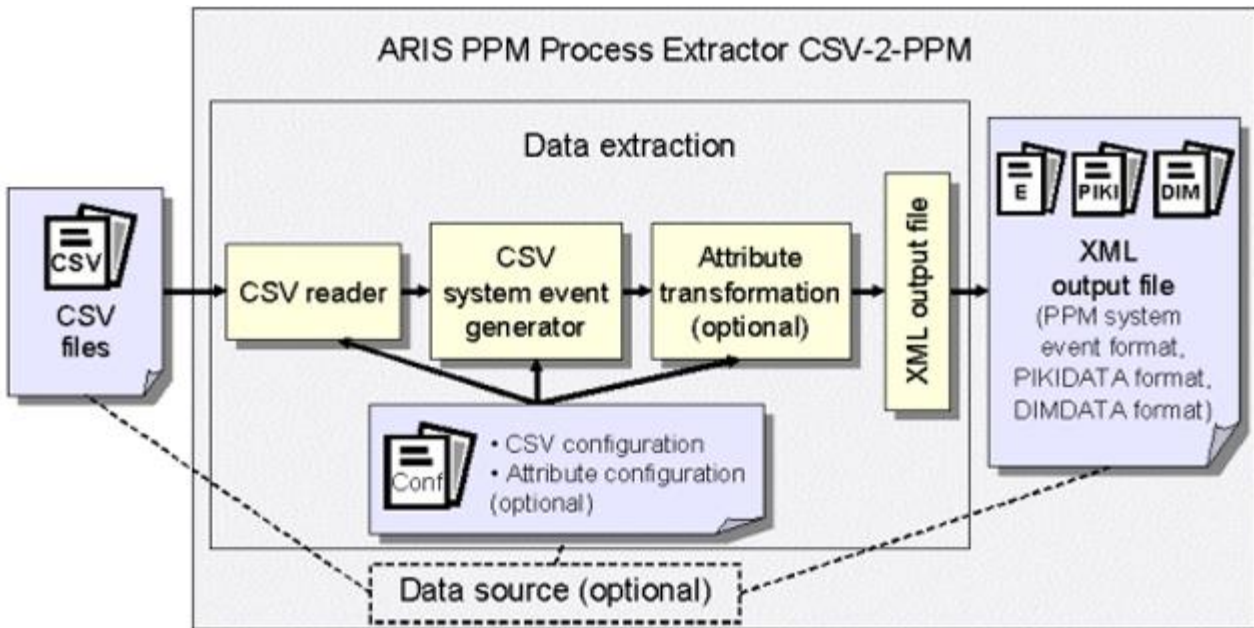
```
ORDER NUMBER, POSITION, RECORDED BY, MATERIAL, QUANTITY
4711,10, "Harry, ""A"" Williams", Mobile 6600, 3
4811,23, "Ben, ""B"" Snyder", Mobile 6601, 2
4911,15, "George, ""C"" Nyland", Mobile 6602, 1
```

The example CSV file contains a header with the column headings for five data columns and three data records.

The comma is used as the separator and double apostrophes are used as the masking character. The masking character is used within a masked data field value by doubling the masking character used. The values in the RECORDED BY column may contain the separator, as they are masked.

6.2 Architecture

The figure below illustrates the functionality of PPM Process Extractor CSV-2-PPM:



The CSV files are read using the CSV reader, based on the CSV configuration. The CSV system event generator and, if applicable, the attribute transformation transfer the information extracted into either PPM system event format, PIKIDATA, or DIMDATA format. The XML output writes the data to the corresponding XML output file.

6.3 CSV reader and CSV system event generator

The CSV reader is used to read CSV files. To import CSV files with a header, you must include an appropriate specification in the CSV configuration file, so that the first line of the CSV file is interpreted as a header (see chapter on CSV configuration (page 139)).

Capitalization in the column headings and data field values is transferred unchanged from the CSV files.

The following chapters describe the behavior of the CSV reader and the CSV system event generator using simple examples. In the examples, the CSV file is compared to the corresponding XML output file in PPM system event format. A CSV data record and column headings are transformed into a system event in the XML output file in PPM system event format.

6.3.1 Example 1: Complete header

ENTRY IN CSV FILE

```
ORDER NUMBER;POSITION;RECORDED BY;MATERIAL;QUANTITY
4711;10;"Harry, "A" Williams";Mobile 6600;3
```

ENTRY IN XML OUTPUT FILE

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
  <event>
    <attribute type="ORDER NUMBER">4711</attribute>
    <attribute type="POSITION">10</attribute>
    <attribute type="RECORDED BY">Harry, "A" Williams</attribute>
    <attribute type="MATERIAL">Mobile 6600</attribute>
    <attribute type="QUANTITY">3</attribute>
  </event>
  ...
</eventlist>
```

If you specify a masking character in the CSV configuration file, all values are unmasked when generating the XML output file.

6.3.2 Example 2: Header with missing column heading

If a column heading is missing in the CSV files, it is automatically added in the XML output file. By default, the column name assigned is made up of the prefix FIELD_ and the position number of the column. The first column has the position 1.

ENTRY IN CSV FILE

```
ORDER NUMBER;POSITION;;MATERIAL;QUANTITY
4711;10;"Harry, "A" Williams";Mobile 6600;3
```

ENTRY IN XML OUTPUT FILE

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
  <event>
    <attribute type="ORDER NUMBER">4711</attribute>
    <attribute type="POSITION">10</attribute>
    <attribute type="FIELD_3">Harry, "A" Williams
  </attribute>
    <attribute type="MATERIAL">Mobile 6600</attribute>
    <attribute type="QUANTITY">3</attribute>
  </event>
  ...
</eventlist>
```

The column heading FIELD_3 is automatically generated in place of the missing column heading in the CSV files.

6.3.3 Example 3: Header with several missing column headings

If several column headings are missing in the CSV files, they are automatically added in the XML output file. If the missing column headings are located at the end of the header, the separators do not need to be present between the missing column headings.

ENTRY IN CSV FILE

```
ORDER NUMBER;POSITION;;;
4711;10;"Harry, ""A"" Williams";Mobile 6600;3
```

or

```
ORDER NUMBER;POSITION
4711;10;"Harry, ""A"" Williams";Mobile 6600;3
```

ENTRY IN XML OUTPUT FILE

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
  <event>
    <attribute type="ORDER NUMBER">4711</attribute>
    <attribute type="POSITION">10</attribute>
    <attribute type="FIELD_3">Harry, "A" Williams</attribute>
    <attribute type="FIELD_4">Mobile 6600</attribute>
    <attribute type="FIELD_5">3</attribute>
  </event>
  ...
</eventlist>
```

The column headings FIELD_3, FIELD_4 and FIELD_5 are automatically created in place of the missing column headings in the CSV files. The same entry is generated in the XML output file regardless whether the separator appears between the missing column headings.

6.3.4 Example 4: No header

If the CSV files do not contain a header, a column heading is generated automatically for each data column.

ENTRY IN CSV FILE

```
4711;10;"Harry, ""A"" Williams";Mobile 6600;3
```

ENTRY IN XML OUTPUT FILE

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
```



```

<event>
  <attribute type="FIELD_1">4711</attribute>
  <attribute type="FIELD_2">10</attribute>
  <attribute type="FIELD_3">Harry, "A" Williams</attribute>
  <attribute type="FIELD_4">Mobile 6600</attribute>
  <attribute type="FIELD_5">3</attribute>
</event>
...
</eventlist>

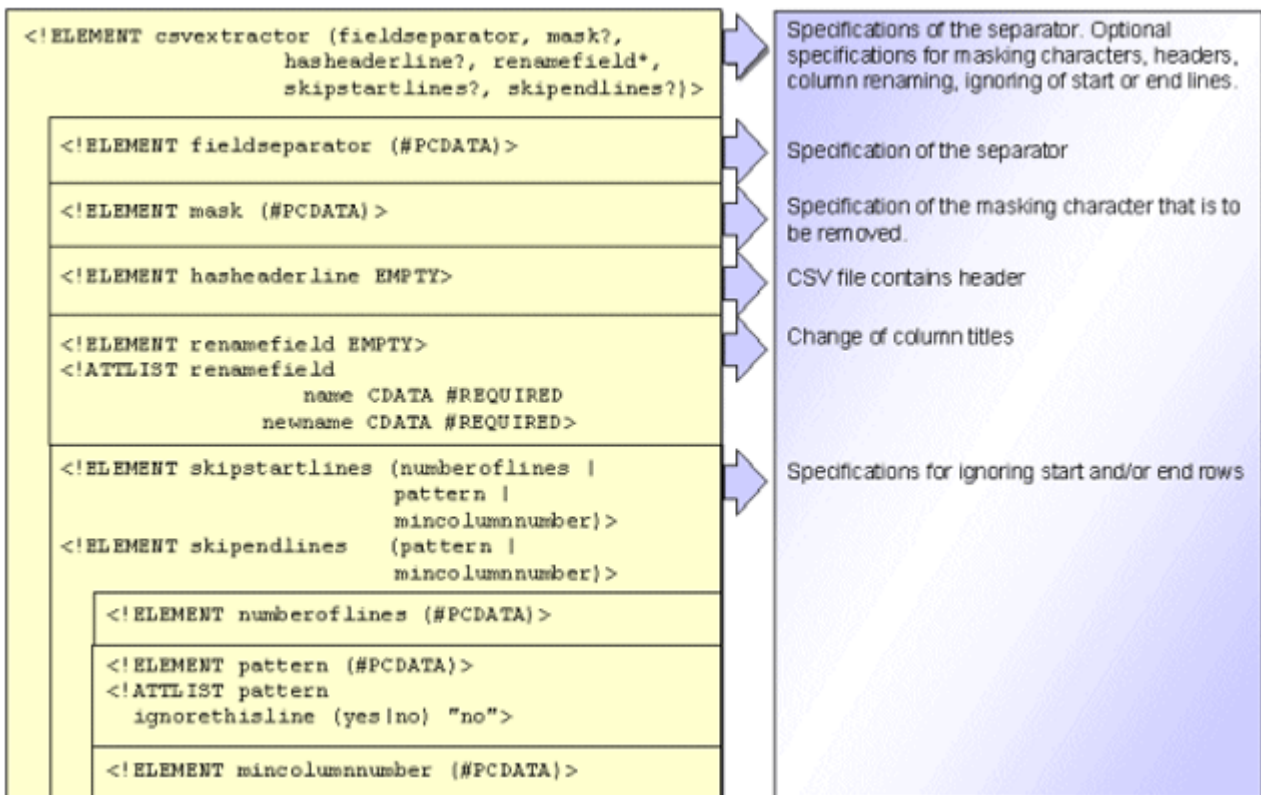
```

6.4 CSV configuration

The way in which the CSV data is processed when it is imported is specified in an XML configuration file. The name of this file is transferred to the `runcsv2ppm` command line program as an argument.

In the configuration file, you can specify the separator or rename column headings.

The format of the XML file is specified by the following DTD:



XML element or attribute	Description	Example
csvextractor	Configuration of CSV import process	See below

XML element or attribute	Description	Example
fieldseparator	Separator	,
mask	Masking character (values imported are unmasked)	"
hasheaderline	CSV files include header	
renamefield	Rename a data column	See below
name	Name of a data column generated from CSV files	MATERIAL or FIELD_3
newname	New name of data column	Item designation
skipstartlines	Start lines to be ignored	
skipendlines	End lines to be ignored	
numberoflines	Number of start lines to be ignored. Counting begins from the first line.	10
pattern	<p>Character pattern for locating a data line from which lines are to be extracted (skipstartlines: by default, the line found is also extracted) or up to which lines are to be extracted (skipendlines: line found including all following lines are not extracted)</p> <p>The following placeholders are permitted:</p> <ul style="list-style-type: none"> * No or any number of characters ? Any single character \ Masking character for searching for placeholders or masking characters in the form: \\ or * or \? <p>The first line from the top that matches the specified pattern is selected.</p>	<p>For example , the expression *10?* 269 searches for values such as 555108*2 69 or 104*269 but not 104\\5 55269.</p>

XML element or attribute	Description	Example
ignorethisline (only with pattern in skipstartlines)	Ignore (yes) or do not ignore (no) the data line containing the desired pattern in the extraction. Default value: no	yes
mincolumn number	Specifies a minimum number of columns to define the start and/or end of the data range to be extracted. skipstartlines: Lines are extracted from (inclusive) the first line found with at least the specified number of columns. skipendlines: Lines are extracted up to (exclusive) the first line found with less than the specified number of columns.	4

EXAMPLE CONFIGURATION (CSVCONFIG.XML)

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE csvextractor SYSTEM 'csvextractor.dtd'>
<csvextractor>
  <fieldseparator>;</fieldseparator>
  <mask>"</mask>
  <hasheaderline/>
  <renamefield name="FIELD_3" newname=
    "Order item recorded by"/>
  <renamefield name="MATERIAL" newname="Item designation"/>
  <skipstartlines>
    <pattern ignorethisline="yes">###*</pattern>
  </skipstartlines>
  <skipendlines>
    <pattern>5???*;*;*;*</pattern>
  </skipendlines>
</csvextractor>
```

CSV FILE TO BE IMPORTED (EXAMPLE.CSV)

The file consists of a comment line, a header, and five data records:

```
### Order data 03/25/2006 ###
ORDER NUMBER;POSITION;;MATERIAL;QUANTITY
4711;10;"Harry, "A" Williams";Mobile 6600;3
4811;23;"Ben, "B" Snyder";Mobile 6601;2
4911;15;"George, "C" Nyland";Mobile 6602;1
5011;6;"George, "C" Nyland";Mobile 5405;2
```

```
5211;23;"George, "C" Nyland";Mobile 5410;1
```

OUTPUT FILE IN PPM SYSTEM EVENT FORMAT (EVENT.XML)

The CSV system event generator uses the example CSV configuration to generate the following XML output file:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
  <event>
    <attribute type="ORDER NUMBER">4711</attribute>
    <attribute type="POSITION">10</attribute>
    <attribute type="Order item recorded by"
      >Harry, "A" Williams</attribute>
    <attribute type="Item designation">Mobile 6600
    </attribute>
    <attribute type="QUANTITY">3</attribute>
  </event>
  <event>
    <attribute type="ORDER NUMBER">4811</attribute>
    <attribute type="POSITION">23</attribute>
    <attribute type="Order item recorded by"
      >Ben, "B" Snyder</attribute>
    <attribute type="Item designation">Mobile 6601
    </attribute>
    <attribute type="QUANTITY">2</attribute>
  </event>
  <event>
    <attribute type="ORDER NUMBER">4911</attribute>
    <attribute type="POSITION">15</attribute>
    <attribute type="Order item recorded by"
      >George, "C" Nyland</attribute>
    <attribute type="Item designation">Mobile 6602
    </attribute>
    <attribute type="QUANTITY">1</attribute>
  </event>
</eventlist>
```

In accordance with the specifications in the CSV configuration file, the following command line call generates one system event in the XML output file from each data record in the CSV data:

```
runcsv2ppm -i example.csv -csvconfig csvconfig.xml -outfile event -nozip
```

When importing, for all system events the name FIELD_3 assigned to the third data column is automatically replaced with Order item recorded by and the MATERIAL data column is renamed Item designation. The masked values of the Order item recorded by attribute type are unmasked. The comment line is ignored in the extraction as specified for skipstartlines. The last two lines in the data range are ignored as specified for skipendlines (order numbers 5011, 5211).

6.4.1 CSV configuration extension

You can specify the CSV input file(s) and the encoding of the input file(s) in the CSV source system configuration. The XML element `csvextractor` can contain the following two XML elements:

XML element/attribute	Description
<code>inputfile</code>	Contains the path of the input file(s)
<code>encoding</code>	Contains the encoding of the input file(s)

Example

```
<csvextractor>
  <inputfile>../testclient/data/customers.csv</inputfile>
  <encoding>ISO-8859-15</encoding>
  <fieldseparator>,</fieldseparator>
  <mask>"</mask>
  <hasheaderline/>
</csvextractor>
```

The value for the XML element `inputfile` can be the path to the CSV file. If you specified the path, the command line parameter (page 144) `-i` will be ignored. The same applies to the XML element `encoding` and the command line parameter (page 144) `-encoding`.

If you specified the path to the CSV file (`inputfile`) in the CSV configuration, the path data in the data source will be ignored.

6.5 Command line program

The XML output file is created with the `runcsv2ppm.bat` command line program.

Calling up the program without parameters or with `-h` or `-?` outputs the online help on the console. This describes all available options.

6.5.1 Command line program arguments

6.5.2 General arguments

-VERSION

Outputs the version number of the PPM process extractor used. Other arguments specified are ignored.

-INFORMATION YES|NO

Specify whether information is to be output (yes) or not (no) during the import. The default is yes.

-WARNING YES|NO

Specify whether warning messages are to be output (yes) or not (no) during the import. The default is yes.

-ERROR YES|NO

This is where you specify whether error messages are to be output (yes) or not (no) during the import. The default is yes.

-PROTOCOLFILE <FILE NAME>

Specify the log file to which all messages are written during the import. If you specify a file, only critical error messages resulting in program abortion will be output on the screen.

-LANGUAGE <ISO CODE>

Specify the language in which the log information is to be output.

6.5.3 CSV-specific arguments

-DATASOURCE <FILE NAME> (OPTIONAL)

Specify the data source you want to use for the extraction. The XML file contains specifications of all files to be used for extraction and XML output. Make sure that you use this parameter instead of and not in combination with the `-datasourcelist`, `-csvconfig`, `-i`, `-calconfig`, `-outfile`, or `-nozip` parameters.

-DATASOURCELIST <FILE NAME>

Multiple data sources can be extracted simultaneously by means of the `-datasourcelist` argument. This corresponds to multiple consecutive extraction using the `-datasource` argument. Only CSV data sources are extracted.

See chapter Extract multiple data sources (page 146).

-I <CSVFILENAME> [<CSVFILENAME> ...]

This is where you specify the CSV file(s) to be used for generating an XML output file.

If the path to the CSV input file is specified in the CSV configuration file, the command line parameter `-i` will be ignored.

`-CSVCONFIG <FILE NAME>`

This is where you specify the name of the CSV configuration file containing the information for generation of the XML output file from the CSV files.

`-ENCODING "<ENCODINGNAME>" (OPTIONAL)`

This is where you specify the encoding of the CSV files. If you do not specify anything, ISO-8859-15 is used.

If the encoding is specified in the CSV configuration file, the command line parameter `-encoding` will be ignored.

`-CALCCONFIG <FILE NAME> (OPTIONAL)`

This is where you specify the name of the XML configuration file with which you can change attributes of the XML output file or add attributes including attribute transformations.

`-REMOVEEMPTY (OPTIONAL)`

You use this parameter to remove extracted attributes with no values before the attribute transformation.

6.5.4 Output file-specific arguments

`-OUTFILE <FILE NAME>`

You use this parameter to specify the name of the XML output file. The file extension is added automatically. By default, the file is output as a ZIP file.

`-OUTFILEENCODING <ENCODING> (OPTIONAL)`

You use this parameter to specify the encoding of the XML output file. Default value: UTF-8

`-NOZIP (OPTIONAL)`

You use this parameter to specify that the output file is to be output as an XML file rather than as a ZIP file.

-PIKIDATAMAPPING <FILE NAME> <PC NAME> (OPTIONAL)

You use this parameter to specify the name of the XML file containing the mapping in the first argument. In the second argument, you specify the name of the measure series in which the process instance-independent measure series are to be saved.

-DIMDATAMAPPING <FILE NAME> <DIM NAME> (OPTIONAL)

You use this parameter to specify the name of the XML file containing the mapping in the first argument. In the second argument, you specify the name of the dimension for which the extracted values are subsequently to be imported.

-SORTEVENTATTRIBUTES (OPTIONAL)

You use this parameter to sort the source system attributes in the system events in alphanumeric order using the attribute type. For large data volumes, this parameter can have a negative impact on the extraction speed.

6.6 Extract multiple data sources

You can use a data source list to extract multiple data sources simultaneously. The data source list is specified in a separate configuration file.

Each new CSV data source created in CTK is automatically added to the end of the list of data sources of the current client. During extraction using the command line option `-datasourcelist <file name>` the data of these data sources is extracted consecutively as if data extraction was called multiple times using the option `-datasource <file name>`. The sequence of the data source extraction is specified in the configuration file. Data sources of a type other than CSV in the list are ignored during extraction.

The following applies to trouble shooting:

- If the extraction is called via a valid data source list that does not contain any matching data sources the extraction ends without outputting an error message.
- If the extraction is called using a data source list containing multiple matching data sources, and if an error occurs during the extraction of one of these data sources resulting in extraction cancelation, the procedure continues with the next data source. This means that cancelation of the extraction of one data source does not lead to cancelation of the entire procedure.
- If an error occurs in at least one data source, which would have led to an exit error status during the single extraction of this data source, the last exit error status will be returned by the overall data source extraction process.

7 Functionalities of all extractors

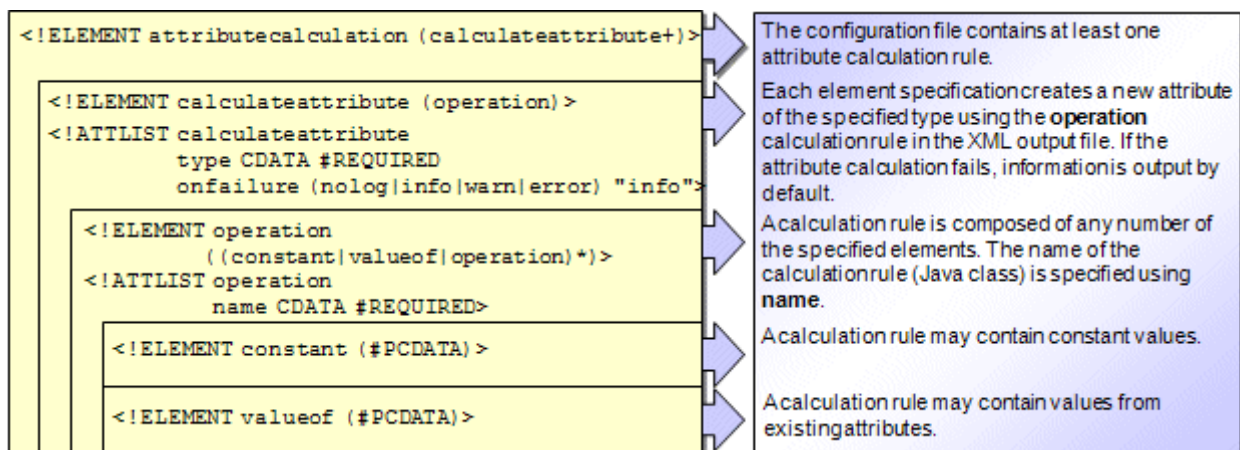
This chapter describes the program features that all of the process extractors have in common.

7.1 Attribute transformation

To change the values of particular attribute types in the output files or to create additional attribute types, you need to specify this in an XML configuration file. The name of this XML configuration file is transferred to the command line program as an argument.

This configuration file contains the settings for processing existing attribute types and for generating and transforming new attribute types when creating the XML output file(s).

The format of the XML file is specified by the following DTD:



XML element or XML attribute	Description
attributecalculation	Configuration of attribute transformation
calculateattribute	Generation of a system event attribute type for successful execution of the transformation rule (operation)
type	Name of the system event attribute type generated

XML element or XML attribute	Description
onfailure	Cancelation behavior if transformation fails. Valid values: nolog (no log output) info (output as information) warn (output as warning) error (output as error message) Default value: info
operation	Transformation rule that is implemented by a Java class. Each operation has a single return value in the form of a string. If the operation fails, nothing is returned.
name	Name of operation
constant	Constant value to be used in the transformation
valueof	Value of an existing or already transformed source system attribute type

The calculateattribute elements are processed in the order in which they are specified in the configuration file. Nesting of the operation XML elements is processed outwards or from top to bottom.

For reasons of efficiency, during an attribute transformation only those arguments that are essential for the transformation are evaluated. For example, in the if_then_else operation, after the truth of the first argument is checked, only the second argument (then) or the third argument (else) is processed. The attribute transformation is canceled with an error message as soon as a required element cannot return a value.

If the onfailure XML element in the attribute transformation file has the value error, unsuccessful attribute generation results in the corresponding system event being assigned the EVENT_HAS_ATTRIBUTE_ERRORS=true attribute in the XML output file. In addition, an error message is generated in the log file.

If the onfailure XML attribute has the value warn, unsuccessful attribute generation results in the corresponding system event being assigned the EVENT_HAS_ATTRIBUTE_WARNINGS=true attribute in the XML output file. In addition, a warning is generated in the log file.

Warning

`calculateattribute` allows the values of existing attribute types to be overwritten after successful execution of the corresponding transformation rules (operation). No warning is output. If necessary, ensure that the values of existing attribute types are not accidentally overwritten by performing a conditional existence check with a suitable transformation rule. You can use the `exists` operation (see chapter Operations (page 150)) for this purpose.

If the entire transformation for an attribute is canceled, the existing attribute value remains unchanged. Depending on what you have specified for the `onfailure` option, a corresponding message is output with a reference to the system event generated. For `nolog`, no log is output.

Example

The extraction of source system data from the R/3 system and the subsequent processing by the XML Generator have created the following entry in the `event.xml` XML output file:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
  <event>
    <attribute type="VBAP-VBELN">3866</attribute>
    <attribute type="VBAP-POSNR">20</attribute>
    <attribute type="VBAP-ERNAM">SCHMIDT</attribute>
    <attribute type="VBAP-MATNR-MAKTX">100038</attribute>
    <attribute type="VBAP-KWMENG">3</attribute>
  </event>
</eventlist>
```

Using the following specifications in the `attributetransform.xml` attribute transformation file, you can change the display of the values of the `VBAP-ERNAM` attribute type so that the concatenation of the original value with a constant string will be used as the new value.

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE attributecalculationsystem SYSTEM
  "attributetransformation.dtd">
<attributecalculationsystem>
  <calculateattribute type="VBAP-ERNAM">
    <operation name="concat">
      <constant>Walter, "A" </constant>
      <valueof>VBAP-ERNAM</valueof>
    </operation>
  </calculateattribute>
  ...
</attributecalculationsystem>
```

The following command line call creates the desired XML output file from the original XML output file using the attribute transformation file discussed above.

```
runjdbc2ppm -systemconfig SysConfig.xml ides_doc_vdap -tableconfig
TableConf.xml SD_C -begindate 01.01.2005 -enddate 31.01.2005 -calconfig
attributetransform.xml -outfile event -outfileencoding ISO-8859-1 -nozip
```

The same entry as the one above then looks like this:

```

<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
  <event>
    <attribute type="VBAP-VBELN">3866</attribute>
    <attribute type="VBAP-POSNR">20</attribute>
    <attribute type="VBAP-ERNAM">Walter, "A" SCHMIDT
  </attribute>
    <attribute type="VBAP-MATNR-MAKTX">100038</attribute>
    <attribute type="VBAP-KWMENG">3</attribute>
  </event>
</eventlist>

```

7.1.1 Operations

The PPM process extractors provide the operations outlined in the following chapters for transformation or modification of attribute types.

For the sake of simplicity, the syntax examples shown for the operation XML element exclusively use constants. However, the valueof and operation elements can also be specified in an operation.

If a value cannot be determined with a transformation rule, the transformation of the attribute type is only canceled if the value not determined is essential for the subsequent transformation. Depending on what is specified for the onfailure option, a corresponding message may be output in this case.

The return value of the operations is generally an alphanumeric string.

7.1.1.1 unmask

Description:	Removes the masking of a value
Syntax:	Two parameters: <ol style="list-style-type: none"> 1. Masking character 2. Value to be unmasked
Example:	<pre> <operation name="unmask"> <constant>\</constant> <constant>\C:\\ppm3\\ppm320\\build3714\\dt d\ </constant> </operation> </pre>

Return value:	C:\ppm3\ppm320\build3714\dtd If no value can be determined for one of the parameters, nothing is returned.
---------------	---

The value to be unmasked must begin and end with the specified masking character.

7.1.1.2 trim

Description:	Removes the spaces at the beginning and end of a value
Syntax:	One parameter: Value for which the spaces at the beginning and end are to be removed
Example:	<code><operation name="trim"> <constant> PPM </constant> </operation></code>
Return value:	<code><...>PPM<...></code> If no value can be determined for one of the parameters, nothing is returned.
Note:	The number of spaces at the beginning and end of the field value is unimportant.

7.1.1.3 concat

Description:	Concatenation of any number of values
Syntax:	One to n parameters
Example:	<code><operation name="concat"> <constant>Order processing</constant> <constant>/</constant> <constant>Cash sales</constant> </operation></code>

Return value:	Order processing/Cash sales If no value can be determined for one of the parameters, nothing is returned.
---------------	--

7.1.1.4 substring

Description:	Identifies a substring of a value
Syntax:	Two to three parameters: 1. Value (string) from which a substring is to be determined 2. Start position: 1 = First character from left -1 = First character from right 3. Number of characters to be extracted (optional). If this is not specified, a substring running from the specified start position to the end of the value is extracted.
Example:	<pre><operation name="substring"> <constant>Order processing/Cash sales </constant> <constant>-1</constant> <constant>10</constant> </operation></pre>
Return value:	Cash sales If no value can be determined for one of the parameters or if integers are not specified for the start position and/or number of characters, nothing is returned.

7.1.1.5 if_then_else

Description:	Conditional attribute transformation
--------------	--------------------------------------

Syntax:	Two to three parameters: <ol style="list-style-type: none"> 1. Value to be checked for equality 2. Value returned in case of equity 3. Value returned in case of inequality
Example:	Value to be checked for equality using the string true: <pre><operation name="if_then_else"> <constant>not true</constant> <constant>Condition is met</constant> <constant>Condition is not met </constant> </operation></pre>
Return value:	Condition is not met <p>If the first value is equal to the string true (not case sensitive), the second value is returned, otherwise (if available) the third value.</p> <p>If no value can be determined for the first parameter (condition) or the third parameter if the condition is not met, nothing is returned.</p>

7.1.1.6 `set_with_default`

Description:	Sets a value to a default value
Syntax:	Two parameters: <ol style="list-style-type: none"> 1. Value to be returned, if it exists 2. Value to be returned if no value can be determined for the first parameter.
Example:	<pre><operation name="set_with_default"> <constant>42</constant> <constant>1</constant> </operation></pre>
Return value:	42 <p>If no value can be determined for both parameters, nothing is returned.</p>

7.1.1.7 integer_plus

Description:	Addition of integer parameters
Syntax:	Two to n parameters: Values to be added
Example:	<pre><operation name="integer_plus"> <constant>1</constant> <constant>4</constant> <constant>37</constant> </operation></pre>
Return value:	<p>42</p> <p>If no value can be determined for one of the parameters or if one of the parameters has a non-integer value, nothing is returned.</p>

7.1.1.8 integer_minus

Description:	Subtraction of integer parameters from another integer parameter
Syntax:	<p>Two to n parameters:</p> <ol style="list-style-type: none"> 1. Value from which the other values are to be subtracted 2. Value to be subtracted ... n. Value to be subtracted
Example:	<pre><operation name="integer_minus"> <constant>1</constant> <constant>4</constant> <constant>37</constant> </operation></pre>
Return value:	<p>-40</p> <p>If no value can be determined for one of the parameters or if one of the parameters has a non-integer value, nothing is returned.</p>

7.1.1.9 `string_equal`

Description:	Compares strings: Returns the string true if all values are equal, otherwise the string false.
Syntax:	Two to n parameters: Values to be compared
Example:	<pre><operation name="string_equal"> <constant>42</constant> <constant>42</constant> <constant>37</constant> </operation></pre>
Return value:	<p>false</p> <p>As soon as a value is found, which does not match the first value checked, false is returned even if more values are to follow. If no value can be determined for one of the parameters checked, nothing is returned.</p>

7.1.1.10 `string_in`

Description:	Compares a string with a list of strings. Returns the string true if the string is identical to at least one of the other strings, otherwise the string returned is false.
Syntax:	Three to n parameters: Values to be compared
Example:	<pre><operation name="string_in"> <constant>42</constant> <constant>42</constant> <constant>37</constant> <constant>42</constant> </operation></pre>
Return value:	<p>true</p> <p>As soon as a string is found, which is identical to the string to be compared, true is returned even if more values are to follow. If no value can be determined for the first parameter, nothing is returned.</p>

7.1.1.11 `boolean_not`

Description:	Returns the string false if the parameter is equal to true (not case sensitive), otherwise returns the string true.
Syntax:	One parameter: Boolean value to be negated
Example:	<pre><operation name="boolean_not"> ..<constant>this is not true</constant> </operation></pre>
Return value:	true If no value can be determined for the parameter, nothing is returned.

7.1.1.12 `boolean_and`

Description:	Returns the string true if all parameters are equal to true (not case sensitive), otherwise the string false.
Syntax:	Two to n parameters: Boolean values to be linked with the Boolean AND
Example:	<pre><operation name="boolean_and"> ..<constant>truE</constant> ..<constant>True</constant> ..<constant>TRUE</constant> </operation></pre>
Return value:	true As soon as a value is found that is not true, false is returned. Any subsequent values are not checked. If no value can be determined for one of the parameters checked, nothing is returned.

7.1.1.13 boolean_or

Description:	Returns the string true if one of the parameters is equal to true (not case sensitive), otherwise returns the string false.
Syntax:	Two to n parameters: Boolean values to be linked with the Boolean OR
Example:	<pre><operation name="boolean_or"> <constant>>false</constant> <constant>True</constant> <constant>this is not true</constant> </operation></pre>
Return value:	<p>true</p> <p>As soon as a value is found that is true, true is returned. Any subsequent values are not checked. If no value can be determined for one of the parameters checked, nothing is returned.</p>

7.1.1.14 exists

Description:	Existence check
Syntax:	One to n parameters: Values whose existence is to be checked
Example:	<pre><operation name="exists"> <constant>>false</constant> <constant>Order volume</constant> <constant>Turnover</constant> </operation></pre>
Return value:	<p>true</p> <p>Returns true if a value could be retrieved for all parameters, otherwise false.</p>

7.1.1.15 `get_null`

Description:	Returns nothing. If the outermost operation in a transformation rule returns nothing, the attribute type is not transferred to the XML output file.
Syntax:	No parameters
Example:	<code><operation name="get_null"/></code>
Return value:	None

7.1.1.16 `getCurrentTimestamp`

Description:	Returns a current time stamp. The format is specified in the first parameter. It includes all date and time formats specified by the <code>java.text.SimpleDateFormat</code> class (like the <code>creationtimestamp</code> condition operator), as described in the Data import technical reference in the Transformations section. If you only specify one parameter, the same time stamp - corresponding to the first time the operation is called - will be generated as the attribute value in all system events in the output file(s). If you specify two parameters, the time of the operation call is written to the system event as a time stamp attribute. This means the values can differ depending on the selected format and extraction duration. There is no plausibility check of the second parameter, it just needs to exist. If no value can be determined for the first parameter, nothing is returned.
Syntax:	One to two parameters

Example:	<pre><operation name="getCurrentTimestamp"> <constant>dd.MM.yyyy HH:mm:ss</constant> <constant/> </operation></pre>
Return value:	for example, 20.07.2006 15:45:08, otherwise various values for different system events depending on extraction duration.

7.1.2 Example of attribute transformation

Importing source system data has generated the following entry in the XML output file:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
  <event>
    <attribute type="VBAP-VBELN">3866</attribute>
    <attribute type="VBAP-POSNR">20</attribute>
    <attribute type="VBAP-ERNAM">SCHMIDT</attribute>
    <attribute type="VBAP-MATNR-MAKTX">100038</attribute>
    <attribute type="VBAP-KWMENG">3</attribute>
  </event>
</eventlist>
```

You want to link the value of the VBAP-ERNAM attribute type with a constant string and write it to the new Order item recorded by attribute type. In addition, you want to create the Note on order recording attribute type, which extracts the first name and last name from the VBAP-ERNAM attribute type and creates the following string:

```
<First name>< ><Last name>< has recorded the item ><VBAP-POSNR>< of the
order ><VBAP-VBELN>< .>
```

The information in angle brackets represents attribute values that are extracted or transformed from existing attribute types or constants. You can specify the necessary information in the XML attribute transformation file:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE attributecalculationsystem SYSTEM
      "attributetransformation.dtd">
<attributecalculationsystem>
  <calculateattribute type="Order item recorded by">
    <operation name="concat">
      <constant>Walter, "A" </constant>
      <valueof>VBAP-ERNAM</valueof>
    </operation>
  </calculateattribute>
```

```

<calculateattribute type="Note on order recording">
  <operation name="concat">
    <operation name="substring">
      <valueof>Order item recorded by</valueof>
      <constant>1</constant>
      <constant>6</constant>
    </operation>
    <constant> </constant>
    <operation name="substring">
      <valueof>Order item recorded by</valueof>
      <constant>-1</constant>
      <constant>7</constant>
    </operation>
    <constant> recorded item</constant>
    <valueof>VBAP-POSNR</valueof>
    <constant> in order </constant>
    <valueof>VBAP-VBELN</valueof>
    <constant>.</constant>
  </operation>
</calculateattribute>
</attributecalculatation>

```

When you call up the relevant command line program again, this time with the `-calconfig` `<XML attribute transformation file>` parameter, the following XML output file is generated:

```

<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
  <event>
    <attribute type="VBAP-VBELN">3866</attribute>
    <attribute type="VBAP-POSNR">20</attribute>
    <attribute type="VBAP-ERNAM">SCHMIDT</attribute>
    <attribute type="Order item recorded by">
      Walter, "A" SCHMIDT
    </attribute>
    <attribute type="VBAP-MATNR-MAKTX">100038</attribute>
    <attribute type="VBAP-KWMENG">3</attribute>
    <attribute type="Note on order recording">
      Walter SCHMIDT recorded item 20 in order 3866.
    </attribute>
  </event>
</eventlist>

```

7.2 Data source

All configuration files required for extraction and the output file can be specified together in a data source file. The XML file is specified by the `-datasource` parameter on the console. This parameter is used instead of the `-systemconfig`, `-tableconfig`, `-csvconfig`, `-i`, `-calconfig`, `-outfile` and `-nozip` parameters.

The format of the XML file is specified by the `datasource.dtd` DTD:

XML element	XML attribute	Description
datasource	name type lastreaddate lastreadtime	A data source has a unique name, is of exactly one of the EVENT, GRAPH, MYSAP, JDBC or CSV types and contains the last time of extraction.
dataextraction (see chapter Configuration of multiple output files (page 162))		Specifies the XML output file(s). The file extension (.zip or .xml) must be explicitly specified. Either a zipped or unzipped XML file is generated depending on the file extension.
systemconfig		Specifies the system configuration file. The file may only contain one system access configuration.
eventspec		Specifies the table configuration file (event specification). The file may contain only one table configuration (configuration XML element).
attribute transformation (optional)		Specifies the attribute transformation file

If you transfer the data source file to the command line program with the `-datasource` parameter, the last time of extraction (`lastreaddate`, `lastreadtime`) is used and updated only in this file. The time in the system configuration used is no longer adjusted.

Example

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE datasource SYSTEM "datasource.dtd">
<datasource name="BILLING" type="MYSAP"
  lastreaddate="19700101" lastreadtime="000000">
  <description name="desc_de" language="de">
    (Cancelation) invoice,
    (Cancelation) credit memo,
    Internal credit memo,
    Internal allocation,
    Debit memo, pro forma invoice
```

```

</description>
<description name="desc_en" language="en">
    (Cancelation) invoice,
    (Cancelation) credit memo,
    Internal credit memo,
    Internal allocation,
    Debit memo, pro forma invoice
</description>
<dataextraction> see chapter
    Configuration of multiple output files (page 162)
</dataextraction>
<systemconfig>C:\Programs\jdbc2ppm\xml\Systemconfig.xml
</systemconfig>
<eventspec>C:\Programs\jdbc2ppm\xml\TableConfiguration.xml
</eventspec>
<attributetransformation>C:\Programs\jdbc2ppm\xml\
    attributecalculatation.xml
</attributetransformation>
</datasource>

```

7.2.1 Configuration of multiple output files

If very large data volumes are extracted and written to a single output file as system events, the file may become difficult to handle. In such cases, it is possible to configure the data source used in such a way that the extracted data is written to any number of XML output files. All you need to do is specify the maximum number of system events per output file and the output file name in the dataextraction XML element.

Example (for a CSV data source, same procedure for JDBC and SAP types)

```

<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE datasource SYSTEM "datasource.dtd">
<datasource name="BILLING" type="CSV">
  <dataextraction>
    <outputfilename>..\custom\<clientname>\data\
      BILLING_data_$EXTRACTIONDATE$_$EXTRACTIONTIME$.zip
    </outputfilename>
    <numberofeventsperxmlfile>
      100000
    </numberofeventsperxmlfile>
  </dataextraction>
  ...
<systemconfig>...</systemconfig>
<eventspec>...</eventspec>
  ...
</datasource>

```

For the BILLING data source, the numberofeventsperxmlfile XML element specifies that each XML output file is to contain 100000 system events, with the last output file generated containing all remaining events.

The outputfilename XML element specifies the path and name of the output files. These settings generate XML files with names in the form

BILLING_data_\$EXTRACTIONDATE\$_\$EXTRACTIONTIME\$.zip in the specified output directory. The \$EXTRACTIONDATE\$ name variable contains the extraction date, while \$EXTRACTIONTIME\$ contains the extraction time. The output files generated are numbered by placing __<x> at the end of the name, where x is a consecutive number and the first output file generated is not numbered.

If 369000 system events were extracted on 23 June 2007 at 11:36:45 using the example configuration shown, the following output files would be created:

- BILLING_data_20070623_113645.zip
(with 100000 system events)
- BILLING_data_20070623_113645_1.zip
(with 100000 system events)
- BILLING_data_20070623_113645_2.zip
(with 100000 system events)
- BILLING_data_20070623_113645_3.zip
(with 69000 system events)

The table below lists all configuration options:

XML element	Description
numberofeventspxmlfile	Fixed number of system events written to an output file. The last output file created contains the remaining number of events. If this element is missing, all system events are written to one output file.
outputfilename	Path and naming pattern of output files. XML and ZIP formats are supported. A ZIP output file contains an XML output file with the same name. The output files for an extraction are consecutively numbered by __<x> at the end of the name, although the first file created is not numbered.

The following variables are permitted in the output file name (outputfilename) and can be used in any combination:

Variable (data source type)	Description
\$EXTRACTIONDATE\$ (CSV, SAP, JDBC)	Extraction date (format: yyyyMMdd)
\$EXTRACTIONTIME\$ (CSV, SAP, JDBC)	Extraction time (format: HHmmss)
\$BEGINDATE\$ (SAP, JDBC)	Start date of extract period (format: yyyyMMdd)
\$BEGINTIME\$ (SAP, JDBC)	Start time of extract period (format: HHmmss)
\$ENDDATE\$ (SAP, JDBC)	End date of extract period (format: yyyyMMdd)
\$ENDTIME\$ (SAP, JDBC)	End time of extract period (format: HHmmss)
\$VALUECONSTRAINT\$ (SAP, see chapter Condition operators (page 26) and JDBC, see chapter Condition operators (page 90))	Output format: <Operator>_Value1 or <Operator>_Value1_<Operator>_Value2 Output of operators and integer comparison values used to restrict the volume of data extracted. The name of the output file could be: outfile_gt_230_le_300_<x>.xml, where x is the consecutive number. Operator representation: greater than: gt greater than or equal to: ge less than: lt less than or equal to: le

You can conveniently set the distribution of the extracted data sets to multiple output files in PPM Customizing Toolkit in the Data source management of the client, via Additional settings... in the Data extraction area.

7.2.2 Configuration of an offset extraction in terms of time or value

The functions described in this chapter are supported only by the two process extractors PPM Process Extractor JDBC-2-PPM and PPM Process Extractor SAP-2-PPM and only when using a data source configuration.

For the time-based extraction, you can specify a time value in the data source configuration. The value is subtracted from the current execution time as the end time when executing the corresponding command line program without end time parameters (-enddate or -endtime). Data extraction will end earlier by the specified value (in seconds).

Without specifying a time offset value, data records that have been created but not written explicitly to the database to be extracted might not be extracted in any of two subsequent extraction operations due to their offset time stamp (see Continuous automated extraction (page 69)). This can be prevented by specifying an offset value.

Example (SAP data source)

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE datasource SYSTEM "datasource.dtd">

<datasource name="SAP" type="MYSAP" lastreaddate="19700101"
            lastreadtime="000000" readoffset="86400">
  <description name="default_description" language="en"/>
  <description name="default_description" language="de">
    SAP
  </description>
  ...
</datasource>
```

The readoffset XML attribute indicates an offset value of 86400 seconds. When calling the command line program with

```
runjdbc2ppm -datasource SAP.xml
```

the extraction operation ends one day (86400 seconds) before the current execution time. If the program execution time is 11.08.08 9:48:05, the extraction operation ends on 10.08.08 at 9:48:05.

```
...
I: 11.08.08 09:48:06: [XML] Reading data with start date/time 19700101/000000
and end date/time 20080810/094805...
...
```

The offset value of the last extraction time is written to the data source file as the start time for the next data extraction.

For the conditional extraction using an integer criterion (logical operator valueconstraint, see Extraction using conditions (page 88)), you can similarly specify an offset value that is subtracted from the start value (lastreadvalue from the data source file) when running the

program. If the result of your data is a negative value for the integer criterion, this value is handled like a positive value.

An offset value specified in the data source configuration is included in data extraction only if the end time or the lower limit of the integer criterion is not explicitly specified.

Tip

You can easily configure offset values in PPM Customizing Toolkit in the Client module group under Data source management. Enter the value as additional information for the last extraction time or the last value extracted in the components of the relevant data source.

SPECIFY A TIME ZONE

If you have not specified the end time in the command line (-enddate or -endtime arguments) the current time of the local computer is used as end time by default. This end time is used for the creationtimestamp, date_creationtimestamp, or char_creationtimestamp operators to restrict the data volume to be extracted. If the data field referenced in the operators contains time stamps assigned to a different time zone, you can specify this time zone in the sourcefieldtimezone XML attribute (for example, Australia/Canberra). In the subsequent data extraction, the local computer time is converted to the time zone specified, and after successful extraction the time is saved as last time of extraction (lastreaddate and lastreadtime XML attributes) in the data source.

If no valid time zone or the attribute itself is not specified in the sourcefieldtimezone XML attribute, a time zone conversion of the end time will not be carried out. With CTK, the time zone can be easily selected using the interface.

Time zone examples

Africa/Dakar, Africa/Johannesburg, Australia/Sydney, America/Denver, America/Los_Angeles, America/Mexico_City, Canada/Central, Europe/Berlin, Europe/London, Mexico/General, US/Central, US/Hawaii

7.3 XML output file (formats)

By default, data extracted using the PPM process extractors is written to an XML output file in PPM system event format.

By specifying one of the optional command line parameters -pikidatamapping or -dimdatamapping, you can also have the extracted data written to the output file(s) in process instance-independent measure data format or dimension data format.

The different output formats are described in detail in the PPM Data import manual.

7.3.1 PPM system event format

Default format of the XML output file(s) if neither of the `-pikidatamapping` and `-dimdatamapping` command line parameters is used (see chapter XML output file (PPM system event format) (page 35)).

7.3.2 PIKIDATA format

The data extracted is to be written as process instance-independent measures (PIKI) to an XML output file for the PPM import using the `runpikidata.bat` command line program.

The XML configuration file has the following basic structure:

```

...
<pikidatamapping>
  <pikicube name="...">
    <pikicolmapping>
      <datacol name="..."/>
      <keyspec key="..."/>
    </pikicolmapping>
    ...
  </pikicube>
  ...
</pikidatamapping>

```

XML element	XML attribute	Description
pikidatamapping		Root element of mapping definition. Contains a list of PPM measure series to be configured.
pikicube	name	Identifier of PPM measure series (corresponds to the value of the name XML attribute for the measure series configuration in PPM)
pikicolmapping		Groups configuration elements for a data column
datacol	name	Name of the data column in which the PIKI values are saved (corresponds to the internal name of the PIKI in the measure configuration)

XML element	XML attribute	Description
	format (optional)	Format string for transformation of data value
keyspec	key	Name of the key for the key-value assignment
	desckey	Name of the key for the key-description assignment
value		Value of the process instance-independent measure

The file extract below shows the existing PCA Import PPM measure series:

```

...
<pikicube name="PIKICUBE_TURNOVER">
  <description language="de" name="PCA-Import"/>
  <description language="en" name="PCA Import"/>
  <pikidef name="TURNOVER" retrievertype="NUM_KEYINDICATOR"
    dimreferring="LOOSE" kigroup="KI_GROUP_COST">
    <description language="de" name="Umsatz">
      Umsatz
    </description>
    <description language="en" name="Sales revenues">
      Sales revenues
    </description>
    <datatype name="COST"/>
  </pikidef>
  <refdim name="VKORG"/>
  <refdim name="DIVISION"/>
  <refdim name="TIME" refinement="BY_MONTH"/>
</pikicube>
...

```

Example

The following key-value pairs are the expected result of the extraction in the XML output file in PPM system event format:

```

<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
  <event>
    <attribute type="MARA-TURNOVER">225489 EUR</attribute>
    <attribute type="MARB-VKORG_ID">1000</attribute>
    <attribute type="MARB-VKORG_DESC">Germany Hamburg</attribute>
    <attribute type="DIM_ROUGH_ID">01</attribute>
    <attribute type="DIM_ROUGH_DESC">Product category 01</attribute>
  </event>
</eventlist>

```

```

    <attribute type="DIM_DETAILED_ID">8112</attribute>
    <attribute type="DIM_DETAILED_DESC">8112 description
  </attribute>
  <attribute type="CAL-TIME">January 2002</attribute>
</event>
<event>
  <attribute type="MARA-TURNOVER">135699 EUR</attribute>
  <attribute type="MARB-VKORG_ID">4000</attribute>
  <attribute type="MARB-VKORG_DESC">Austria Vienna
</attribute>
  <attribute type="DIM_ROUGH_ID">01</attribute>
  <attribute type="DIM_ROUGH_DESC">Product category 01
</attribute>
  <attribute type="DIM_DETAILED_ID">8112</attribute>
  <attribute type="DIM_DETAILED_DESC">8112 description
</attribute>
  <attribute type="CAL-TIME">January 2002</attribute>
</event>
<event>
  <attribute type="MARA-TURNOVER">363521 EUR</attribute>
  <attribute type="MARB-VKORG_ID">1000</attribute>
  <attribute type="MARB-VKORG_DESC">Germany Hamburg
</attribute>
  <attribute type="DIM_ROUGH_ID">07</attribute>
  <attribute type="DIM_ROUGH_DESC">High Tech</attribute>
  <attribute type="DIM_DETAILED_ID">9128</attribute>
  <attribute type="DIM_DETAILED_DESC">9128 description
</attribute>
  <attribute type="CAL-TIME">January 2002</attribute>
</event>
</eventlist>

```

The mapping file below transfers the key-value pairs into the PPM-compatible XML format for importing PIKI values:

```

...
<pikidatamapping>
  <pikicube name="PIKICUBE_TURNOVER">
    <pikicolmapping>
      <datacol name="TURNOVER"/>
      <keyspec key="MARA-TURNOVER"/>
    </pikicolmapping>
    <pikicolmapping>
      <datacol name="VKORG"/>
      <keyspec key="MARB-VKORG_ID"
        desckey="MARB-VKORG_DESC"/>
    </pikicolmapping>
    <pikicolmapping>
      <datacol name="DIVISION"/>
      <keyspec key="DIM_ROUGH_ID"
        desckey="DIM_ROUGH_DESC"/>
    </pikicolmapping>
    <pikicolmapping>
      <datacol name="DIVISION"/>
      <keyspec key="DIM_DETAILED_ID"
        desckey="DIM_DETAILED_DESC"/>
    </pikicolmapping>
  </pikicube>
</pikidatamapping>

```

```

    </pikicolmapping>
  <pikicolmapping>
    <datacol name="TIME" format="MMM yyyy"/>
    <keyspec key="CAL-TIME"/>
  </pikicolmapping>
</pikicube>
</pikidatamapping>

```

Using this mapping file generates the following XML output file when you run the program:

```

...
<pikidata>
  <pikicube name="PIKICUBE_TURNOVER">
    <datacols>
      <datacol name="TURNOVER"/>
      <datacol name="VKORG"/>
      <datacol name="DIVISION"/>
      <datacol name="DIVISION"/>
      <datacol name="TIME" format="MMM yyyy"/>
    </datacols>
    ...
    <datarow>
      <value>225489 EUR</value>
      <value>1000{Germany Hamburg}</value>
      <value>01{Product category 01}</value>
      <value>8112{8112 description}</value>
      <value>January 2002</value>
    </datarow>
    <datarow>
      <value>135699 EUR</value>
      <value>4000{Austria Vienna}</value>
      <value>01{Product category 01}</value>
      <value>8112{8112 description}</value>
      <value>January 2002</value>
    </datarow>
    <datarow>
      <value>363521 EUR</value>
      <value>1000{Germany Hamburg}</value>
      <value>07{High Tech}</value>
      <value>9128{9128 description}</value>
      <value>January 2002</value>
    </datarow>
    ...
  </pikicube>
</pikidata>
...

```

7.3.3 DIMDATA format

The data extracted by the relevant PPM process extractor is to be written to the XML output file in the special import format for one, two or multi-level dimensions. XML output files in this format can be imported into PPM using the rundimdata.bat command line program (see PPM Data import technical reference).

To extract data correctly, the relevant process extractor requires a mapping file that assigns the keys (and any descriptions) for the individual dimension levels to the correct extracted field values. This XML configuration file has the following structure:

```

...
<dimdatamapping>
  <dimension name="...">
    <dimcolmapping>
      <datacol name="..."/>
      <keyspec key="..."/>
    </dimcolmapping>
    ...
  </dimension>
</dimdatamapping>
...

```

XML element	XML attribute	Description
dimdatamapping		Root element of mapping definition. Contains a list of PPM dimensions to be configured.
dimension	name	Identifier of the PPM dimension (corresponds to the value of the name XML attribute from the dimension configuration in the PPM system)
dimcolmapping		Groups configuration elements for a data column.
datacol	name	Name of the data column, in which the dimension values are saved.
	format (optional)	Format string for transformation of the data value for use in the PPM system
keyspec	key	Name of the key for the extracted key-value assignments
	desckey	Name of the key for the extracted key-description assignments

XML element	XML attribute	Description
value		Specification of a constant dimension value

Example

The following key-value pairs are the expected result of the extraction in the XML output file in PPM system event format:

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!DOCTYPE eventlist SYSTEM "event.dtd">
<eventlist>
  <event>
    <attribute type="MAT1_ID-MATNR">1000</attribute>
    <attribute type="MAT1_DESC-HTEXT">Motor44</attribute>
    <attribute type="MAT2_ID-MTART">32</attribute>
    <attribute type="MAT2_DESC-MTBEZ">Components</attribute>
  </event>
  <event>
    <attribute type="MAT1_ID-MATNR">1001</attribute>
    <attribute type="MAT1_DESC-HTEXT">Wrench77</attribute>
    <attribute type="MAT2_ID-MTART">45</attribute>
    <attribute type="MAT2_DESC-MTBEZ">Tools</attribute>
  </event>
  <event>
    <attribute type="MAT1_ID-MATNR">1002</attribute>
    <attribute type="MAT1_DESC-HTEXT">Pump43</attribute>
    <attribute type="MAT2_ID-MTART">33</attribute>
    <attribute type="MAT2_DESC-MTBEZ">Trade goods</attribute>
  </event>
</eventlist>
```

The mapping file below transfers the key-value pairs into the PPM-compatible XML format for importing dimension values:

```
...
<dimdatamapping>
  <dimension name="MATERIAL">
    <dimcolmapping>
      <datacol name="LEVEL1_ID"/>
      <keyspec key="MAT1_ID-MATNR"/>
    </dimcolmapping>
    <dimcolmapping>
      <datacol name="LEVEL1_DESC"/>
      <keyspec key="MAT1_DESC-HTEXT"/>
    </dimcolmapping>
    <dimcolmapping>
      <datacol name="LEVEL2_ID"/>
      <keyspec key="MAT2_ID-MTART"/>
    </dimcolmapping>
  </dimension>
</dimdatamapping>
```

```

    <datacol name="LEVEL2_DESC"
    <keyspec key="MAT2_DESC-MTBEZ"/>
  </dimcolmapping>
</dimension>
</dimdatamapping>

```

The names of the data columns for a PPM dimension level are fixed (LEVEL1_ID, LEVEL1_DESC, LEVEL2_ID, LEVEL2_DESC, etc.) and must not be changed.

The table below illustrates the assignment of the data columns to the keys and descriptions of the individual dimension levels:

dimdata configuration	Dimension configuration
LEVEL1_ID	Identifier of first dimension level
LEVEL1_DESC	Description of first dimension level
LEVEL2_ID	Identifier of second dimension level
LEVEL2_DESC	Description of second dimension level
LEVELn_ID	ID of the n-th dimension level
LEVELn_DESC	Description of the n-th dimension level

The XML output file generated in DIMDATA format has the following content:

```

<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE dimdata SYSTEM "dimdata.dtd">
<dimdata>
  <dim name="MATERIAL">
    <datacols>
      <datacol name="LEVEL1_ID"/>
      <datacol name="LEVEL1_DESC"/>
      <datacol name="LEVEL2_ID"/>
      <datacol name="LEVEL2_DESC"/>
    </datacols>
    <datarow>
      <value>1001</value>
      <value>Motor44</value>
      <value>32</value>
      <value>Components</value>
    </datarow>
    <datarow>
      <value>1002</value>
      <value>Wrench77</value>
      <value>45</value>
      <value>Tools</value>
    </datarow>
    <datarow>
      <value>1003</value>

```

```
<value>Pump43</value>  
<value>33</value>  
<value>Trade goods</value>  
</datarow>  
</dim>
```

8 Data pseudonymization

You can pseudonymize the data extracted by the SAP, JDBC, and CSV, extractors. The extracted data is pseudonymized before it is written to the output file as a source system event.

You can pseudonymize the source data using CTK. The Use pseudonymization during data extraction option is disabled by default but you can enable the option in the client properties in CTK. If you enable this option, CTK provides the Pseudonymization tab in the Data extraction component in the Process merge module. On this page, you can specify for each available source system attribute whether its value is to be pseudonymized or not.

Open a client in CTK -> Client properties -> Data sources -> Enable Use pseudonymization during data extraction.

For the data pseudonymization, CTK creates a required key and stores it in the pseudonymization.key file in the .../custom/<client>/keyfiles directory. The created pseudonymization.key file is of binary type.

Note that you must enable pseudonymization before any data for a source system attribute is extracted. Already imported cleartext data cannot be pseudonymized.

Warning

We recommend that you create a backup of the pseudonymization.key file. The key file cannot be restored and you cannot use another pseudonymization key instead.

8.1 Scaled systems

If pseudonymization is to be used for scaled systems, all sub-servers must use the same pseudonymization key, that is, you must ensure that the same key file exists on all sub-servers.

Therefore, if pseudonymization is activated on sub-server or master, copy the key file from this PPM client to all other sub-servers and to the master of this scaled scenario in the .../custom/<client>/keyfiles directory. This must be done before the first data extraction of pseudonymized attributes on the respective client.

8.2 Configuration of pseudonymized attributes

The datasource.dtd DTD is adapted for pseudonymization as follows:

```
<!ELEMENT datasource (description*, realmtable?, dataextraction?, data, archive?, fragments?, mapping?, systemconfig?, tables?, eventspec?,
```

```
attributetransformation?, eventattributetypes?, attributesettings?,
edaeventtype?, pseudonymization?)>
```

```
<!ELEMENT eventattribute (#PCDATA)>
<!ELEMENT pseudonymization (eventattribute+)>
```

The optional element pseudonymization must contain at least one eventattribute sub-element. A eventattribute element contains the name of the Source System attribute to be pseudonymized, expressed as the attribute type that appears in the event in the output file.

Example

The following example shows the pseudonymization of BSEG-ERNAME and LAST_USER.

- Output file without pseudonymization

```
<event>
    <attribute type="BSEG-ERNAME">Test User</attribute>
    <attribute type="CARDNO">308342023837750</attribute>
    <attribute type="CONTACT_REASON">Bonus not
received</attribute>
    <attribute type="FIELD_2">Phone</attribute>
    <attribute type="LAST_USER">Second user</attribute>
    <attribute type="SR_CLOSED_DATE">11.06.2003
18:07:52</attribute>
</event>
```

- Configuration of pseudonymization

```
<pseudonymization>
    <eventattribute>BSEG-ERNAME</eventattribute>
    <eventattribute>LAST_USER</eventattribute>
</pseudonymization>
```

- Output file with pseudonymization

```
<event>
    <attribute
type="BSEG-ERNAME">WReKoRCNHVdJF6FZ8oLqFGg==</attribute>
    <attribute type="CARDNO">308342023837750</attribute>
    <attribute type="CONTACT_REASON">Bonus not
received</attribute>
    <attribute type="FIELD_2">Phone</attribute>
    <attribute
type="LAST_USER">+XMLplip51d++gfVWvA+bQ==</attribute>
    <attribute type="SR_CLOSED_DATE">11.06.2003
18:07:52</attribute>
</event>
```

8.3 Dimensions of pseudonymized data

All pseudonymized data are of data type TEXT. This means the data must have the data type TEXT in PPM, including data that was, for example, of data type NUMERICAL before pseudonymization.

Therefore, you must ensure that the values are assigned to PPM text attributes during XML import and are only used for text dimensions.

The length of the pseudonymized value (cipherLength) depends on the length of the value before pseudonymization (clearLength).

You must create dimensions in which pseudonymized data are to be stored with a dimension length of 1000. Unencrypted plain text data must not exceed 200 characters, otherwise the pseudonymization algorithm may generate values longer than 1000. This would make conversion back into plain text impossible.

The PPM import logs an error message for every dimension value which is too long.

8.4 PPM pseudonymization tool

The PPM pseudonymization tool pseudonymizes a clear text value or converts a pseudonymized value to clear text value.

You must add the credentials of a PPM user with system administration rights to the following command line examples:

- "runppmpseudonymize -in <file> [-encoding <encoding>]..." generates a pseudonymized value.
- "runppmpseudonymize -reverse <pseudonymized value> -out <file> [-encoding <encoding>]..." generates a cleartext value.

```
runppmpseudonymize -user <username> -password <password> [-client <name>]
  {-in <filename>} | {-reverse <pseudonymized value> -out <filename>}
  [-encoding <encoding>]
  [-version]
  [-language <ISO code>][protocoloptions]
```

Parameter	Description
-in <filename>	Name of the file which contains the cleartext value which should be pseudonymized
-reverse <pseudonymized value>	If this parameter is specified, then this pseudonymized value will be converted to cleartext value.

Parameter	Description
-out <filename>	Name of the file to which the cleartext value should be written.
-encoding <encoding>	Encoding of the in- or out-file (Default: UTF-8)
-language <ISO code>	Language
-version	Version number of the application and the database schema
protcoloptions	protcoloptions can consist of the following instructions: <ul style="list-style-type: none"> -protocolfile <filename> Logging to file <file name> -information {yes no default} Logging of information -warning {yes no default} Logging of warnings -error {yes no default} Logging of errors

If the -reverse <pseudonymized value> parameter is specified, the plain text value is output to the file -out <filename> in the specified encoding. If the file filename already exists, it will be overwritten.

If the -in <filename> parameter is specified, the value in the file <filename> is interpreted as a plain text value and the pseudonymized value is output directly on the standard output, that is, not in the protocol. The file is read in the specified encoding.

The key file pseudonymization.key used for encryption/decryption is expected in the following directory: <PPM installation>\server\bin\work\data_ppm\custom\

Note that the user used for (de-) pseudonymization with this tool must have system administration rights in PPM.

8.5 Adding new encrypted attributes

In the Data import module of CTK, you must set the TEXT data type for the attribute before the first mapping so that the correct data type is assigned to the PPM attributes automatically created during mapping.

If you specified in the data extraction configuration for the source system event attribute "VDARL-RERF", which actually has the data type DOUBLE in source system, that it is to be

encrypted, you must now select the data type TEXT, since the values of encrypted source system event attributes are texts.

- The maximum length of 200 of clear text value of source system attribute must not be exceeded.
- If a pseudonymized value is to be used as a dimension value, you must ensure that the dimension length is set to 1000.
- Also for integer and double values, the maximum length of the values must not be exceeded.

9 Legal information

9.1 Documentation scope

The information provided describes the settings and features as they were at the time of publishing. Since documentation and software are subject to different production cycles, the description of settings and features may differ from actual settings and features. Information about discrepancies is provided in the Release Notes that accompany the product. Please read the Release Notes and take the information into account when installing, setting up, and using the product.

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