Business Process Monitoring
Set-up and User Guide

BPMon Data Collector
Generic Table Entry Counter

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1 The monitor “Table Entry Counter” (BOTABCNT)

1.1 Purpose
The generic Table Entry Counter provides the possibility to run dynamic database queries to count the number of entries (or the number of distinct values) in any database table of a managed ABAP system. It supports a flexible filtering based on select-options on three fields of a table.
This monitor is therefore a substitute or workaround for areas, where no specific application monitor is available. Furthermore, this monitor can help to avoid implementing the application monitoring customer-exit, if the collector result can be calculated by a simple SELECT statement.
This application monitor is part of the Business Process Monitoring framework within SAP Solution Manager.

1.2 Technical Prerequisites
The Table Entry Counter is delivered with the add-on ST-A/PI since release 01L. The technical name of this monitor is BOTABCNT.

All SAP Basis (NetWeaver ABAP) releases starting from 6.10 and later are supported.

This Monitor is meant to access tables in an SAP ABAP database schema only, using Remote Function Calls to the managed system and reading the data via the ABAP stack with OpenSQL.
If you intend to read data from a non-ABAP database schema, there is special version of this Monitor, called “Generic Table Entry Counter for remote DB” (NATABCNX), using a direct database connection with native SQL.
1.3 Setup Procedure

1.3.1 Example use-case
To demonstrate the setup of the Table Entry Counter we choose a simple use-case: Goal is to count the total number of short dumps (runtime errors) in the managed system. Additionally we want to know the number of affected users. For simplicity reasons we do not filter by date, so we always get total numbers.

1.3.2 Simulate data collector result in managed system
You can use transaction SE16 to clarify the selection parameters (like table name and filter criteria). In our example, the short dumps are stored in table SNAP. As every single dump can have multiple lines in table SNAP, we need to filter on the first entry only, which is sequence number SEQNO='000'.

![Data Browser: Table SNAP Selection Screen](image1)

Data Browser: Table SNAP: Selection Screen

![Data Browser: Table SNAP Select Entries 837](image2)

Data Browser: Table SNAP Select Entries 837

So we get 837 short dumps from different users (field UNAME). Unfortunately, SE16 does not allow counting the distinct values in column UNAME, but if you are interested you could do it with transaction TAANA.
1.3.3 Setup Procedure for the Table Entry Counter

For setting up this application monitor in the Business Process Monitoring Setup, choose the monitor “Table Entry Counter” (technical name BOTABCNT) from Application Area “Cross Application”.

In the following description, there are screenshots from the BPMon Setup and actual Monitoring, for SAP Solution Manager 7.1 with its WebDynpro-based user interface for classic BPMon.

Note: If you use SAP Solution Manager 7.2 with MAI (Monitoring and Alerting Infrastructure), the user interface looks different!

The Table Entry Counter can be assigned to a business process step or an interface step. It is not enabled for Business Process Analytics.

![Setup in Solution Manager 7.1]
Please specify the following selection criteria:

- **Table Name** for the entries to be counted (it can also be a database view)
- **Field Name** for filtering and corresponding select-options for the actual **Filter Values**
  - this is available three times and will be used to generate a WHERE clause
  - as of ST-A/PI release 01M there are five filters available
  - always use a pair of Field Name plus Filter Value(s)

1. As first parameter, enter the **Table Name**. The search help displays tables for a certain wildcard pattern, which you need to input mandatorily.

As second parameter, enter the **Field Name** for the first filter, which obviously must be a valid field of the selected database table. Also here a value help is available, which shows all fields of the selected table. In our example this is field ‘SEQNO’.

In the third line, enter the **select-options** for the first filter. In our example, this is just one single value ‘000’, but could also be a more complex selection, including patterns, ranges, etc. When you have already entered the table name and the field name for filtering, the system tries to determine an entry help from the Data Dictionary. If no search help dialog exists, the system tries to select distinct values from the respective database table column and offers them as entry help. If this also fails, you must enter the filter value(s) manually. Please note to enter all values in the database format, for example the date 2008/09/24 must be entered as 20080924. Be careful when looking at values with an Application UI or with transaction SE16, as there might be some output conversion, which does not reflect the real storage format on the database. The Table Entry Counter is not able to apply conversion exits (e.g. material number patterns or alpha conversions), user-specific conversions like date and time formats or time zone calculations.

⇒ Repeat these steps for further filters if required.

Please see the appendix on how to implement a relative date filtering, using calculated dates instead of absolute values.

[Setup in Solution Manager 7.1]
2. On tab strip ‘Monitoring Schedule’: enter the data for the scheduling of the collector job in the managed system, i.e. weekdays, collection period or fixed start time.

3. Choose the key figure(s) you would like to collect. There are two key figures available.

[Setup in Solution Manager 7.1]
4. After selecting them, you can do additional customizing on key figure level.
   - “Number of Counted Entries” (with given filter criteria)
   - “Number of Distinct Values” (on single field name and with given filter criteria)
     a. Enter the parameter “Distinction Fieldname”, which is the name of the table field for which the different values are to be counted. Please make use of the value help, which only displays valid fields of the selected.

   - For each key figure, you can customize an alternative alert text, using certain placeholder variables.
     a. The standard key figure alert texts return a rather technical alert message
        - “Number of entries in table <table> = <counter>”
        - “Number of distinct values in field <field> of table <table> = <counter>”
        This is automatically proposed if you leave the parameter “Alternative Alerttext” empty.

     b. You can use any free text together with the following placeholders to overwrite the standard alert text with your own alert text:
        - $COUNT returns the measured value from the selection
        - $TABLE returns the database table name
        - $FIELD returns the table’s field name

        Example for our use-case
        - “There are $COUNT short dumps stored in table $TABLE”
        - “There are $COUNT users affected by short dumps”

        ![Parameter Sets for Key Figure "Number of Distinct Values"]

[Setup in Solution Manager 7.1]
For each key figure set the thresholds for calculating “yellow” and “red” alert.

a. There are two rating strategies available:
   i. “Two-step rating” with thresholds for yellow and red alert, to compare whether the measured value exceeds those thresholds.
   ii. “Four-step rating” with minimum and maximum thresholds for yellow and red alert, to compare whether the measured value falls below (or is equal to) the minimum thresholds or whether the measured value exceeds the maximum thresholds.

b. The thresholds are named
   “YELLOW, if more than” / ”RED, if more than” (maximum)
   “RED, if less/equal” / “YELLOW,if less/equal” (minimum)

c. For the “Two-step rating” just fill in the maximum thresholds only and leave the minimum thresholds empty.
   i. Note: In ST-A/PI releases earlier than 01M, those two thresholds are called “Threshold for YELLOW” and “Threshold for RED”.

d. To enable the “Four-step rating”, fill in both two pairs of maximum and minimum thresholds.

5. At node 'Analysis & Monitoring Tools' select a transaction code as analysis tool, e.g. SE16. Choose call type "Transaction".

6. Once you have entered all relevant information for the monitor, generate the monitoring customizing and activate the monitoring within the 'Business Process Monitoring' setup.
1.4 Result in Monitoring

1.4.1 Alert Display in SAP Solution Manager

Alert display for key figure “Number of Counted Entries”:

![Alert display in Solution Manager 7.1](image1)

The column alert message shows the alert text, which was in this case assembled from the customized alternative alert text template. The suffix “(filtered)” indicates that a WHERE-clause was applied. In addition, there are some additional columns filled, like Client (where to data collector ran), Table (just repeats where the selection was done) and Runtime (which shows how long it took for the data collector to query the key figure).

Alert display for key figure “Number of Distinct Values”:

![Alert display in Solution Manager 7.1](image2)

The column alert message shows the alert text, which was in this case also assembled from the customized alternative alert text template. The suffix “(filtered)” indicates that a WHERE-clause was applied. In addition, there are some additional columns filled, like Client (where to data collector ran), Table-Field (just repeats which field was used for the distinction) and Runtime (which shows how long it took for the data collector to query the key figure).
1.4.2 Detail Display call into the managed system

Mark an alert and press push button “Detail Info”. This navigates you into the managed system and displays detail information, depending on the selected key figure. Please note that you always see the current selection result, even if you have selected an older alert. Reason is that the selection result for the regular key figure calculation is not stored, but rather re-selected during the detail display call. If in the meantime the entries in the monitored table have changed, the detail info will show some result different to the alert!

Detail information for key figure “Number of Counted Entries”

The detailed info for the number of counted entries just displays an SE16-like table rows display with the affected entries (applying the same filtering as the data collector). Please note that a maximum of 10,000 rows is shown.

Detail information for key figure “Number of Distinct Values”

The detailed info for the number of distinct values displays an overview with each distinct field value and its number of occurrences (applying the same filtering as the data collector). Obviously, the sum of all occurrences should be equal to the value of key figure “Number of Counted Entries”.

![Image of table]

![Image of table]
1.5 Appendix

1.5.1 Performance Warning

Because the data collector can query any table, it is in the responsibility of the user to avoid selections on large tables. Keep in mind that the necessary SQL selection aggregates for COUNT and DISTINCT create expensive database selects, including full table scans and bypassing SAP buffering!

Using this application monitor without care, can cause severe performance degradation on the managed system.

Please consider your setup carefully and follow these golden rules:

- Avoid using this application monitor on large database tables
- Avoid running the data collection with a high monitoring frequency
- Avoid complex filtering, especially with patterns, ranges and exclusions
- Avoid filters on fields which are not supported by an index.

If you are in doubt, try to simulate the query with transaction SE16, to get an idea about the possible runtime. Furthermore, monitor the data collection runtime which is logged into a special column of the alert list (see chapter “Alert Display”).

1.5.2 Technical Information on the SQL Queries

The key figure "Number of Counted Entries" creates an SQL query in the following format:

```sql
SELECT COUNT(*)
FROM table
WHERE field1 IN filtrange1
    AND field2 IN filtrange2
    AND field3 IN filtrange3...
```

The key figure "Number of Distinct Values" creates an SQL query in the following format:

```sql
SELECT COUNT( DISTINCT field )
FROM table
WHERE field1 IN filtrange1
    AND field2 IN filtrange2
    AND field3 IN filtrange3...
```

This key figure does not work with Pooled and Cluster Tables, because they do not support a DISTINCT aggregate in the SELECT-clause! At data collection, you would get an error message "Error: Dynamic database selection failed" (due to exception CX_SY_DYNAMIC_OSQL_SEMANTICS with SAPSQL_ILLEGAL_DISTINCT).
1.5.3 Relative Date Filtering

There are many use cases, where the result of a table count is time-dependent. For our used example, we might be interested only in the number of short dumps created on the current day. However, inside the BPMon Setup there are only static filter values available, like a fixed day entry for a date field. To achieve a relative date filtering, which means calculating relative dates instead of absolute dates, the Table Entry Counter provides a special syntax on how define fix points and offsets for relative dates.

Syntax for Relative Dates

Instead of a fixed (absolute) date, you can enter a special keyword for the start date (prefixed by a $ character) and optionally an additional offset as difference in days.

Syntax = <StartDate>[<Difference>]

For <StartDate> the following keywords are available:

<table>
<thead>
<tr>
<th>Keyword for &lt;StartDate&gt;</th>
<th>Description</th>
<th>Example for 2013/04/25</th>
<th>Minimum ST-A/PI release</th>
</tr>
</thead>
<tbody>
<tr>
<td>$TODAY</td>
<td>current date today</td>
<td>2013/04/25</td>
<td>01L</td>
</tr>
<tr>
<td>$FDOCW</td>
<td>first day of current week</td>
<td>2013/04/22</td>
<td>01Q SP1</td>
</tr>
<tr>
<td>$LDOCW</td>
<td>last day of current week</td>
<td>2013/04/28</td>
<td>01Q SP1</td>
</tr>
<tr>
<td>$FDOCM</td>
<td>first day of current month</td>
<td>2013/04/01</td>
<td>01L</td>
</tr>
<tr>
<td>$LDOCM</td>
<td>last day of current month</td>
<td>2013/04/30</td>
<td>01L</td>
</tr>
<tr>
<td>$FDOCQ</td>
<td>first day of current quarter</td>
<td>2013/04/01</td>
<td>01Q SP2</td>
</tr>
<tr>
<td>$LDOCQ</td>
<td>last day of current quarter</td>
<td>2013/06/30</td>
<td>01Q SP2</td>
</tr>
<tr>
<td>$FDOCY</td>
<td>first day of current year</td>
<td>2013/01/01</td>
<td>01L</td>
</tr>
<tr>
<td>$LDOCY</td>
<td>last day of current year</td>
<td>2013/12/31</td>
<td>01L</td>
</tr>
<tr>
<td>$FDOPW</td>
<td>first day of previous week</td>
<td>2013/04/15</td>
<td>01Q SP1</td>
</tr>
<tr>
<td>$LDOPW</td>
<td>last day of previous week</td>
<td>2013/04/21</td>
<td>01Q SP1</td>
</tr>
<tr>
<td>$FDOMM</td>
<td>first day of previous month</td>
<td>2013/03/01</td>
<td>01L</td>
</tr>
<tr>
<td>$LDOMM</td>
<td>last day of previous month</td>
<td>2013/03/31</td>
<td>01L</td>
</tr>
<tr>
<td>$FDOPQ</td>
<td>first day of previous quarter</td>
<td>2013/01/01</td>
<td>01Q SP2</td>
</tr>
<tr>
<td>$LDOPQ</td>
<td>last day of previous quarter</td>
<td>2013/03/31</td>
<td>01Q SP2</td>
</tr>
<tr>
<td>$FDOPY</td>
<td>first day of previous year</td>
<td>2012/01/01</td>
<td>01L</td>
</tr>
<tr>
<td>$LDOPY</td>
<td>last day of previous year</td>
<td>2012/12/31</td>
<td>01L</td>
</tr>
<tr>
<td>$FDONW</td>
<td>first day of next week</td>
<td>2013/04/29</td>
<td>01Q SP1</td>
</tr>
<tr>
<td>$LDONW</td>
<td>last day of next week</td>
<td>2013/05/05</td>
<td>01Q SP1</td>
</tr>
<tr>
<td>$FDONM</td>
<td>first day of next month</td>
<td>2013/05/01</td>
<td>01L</td>
</tr>
<tr>
<td>$LDONM</td>
<td>last day of next month</td>
<td>2013/05/31</td>
<td>01L</td>
</tr>
<tr>
<td>$FDONQ</td>
<td>first day of next quarter</td>
<td>2013/07/01</td>
<td>01Q SP2</td>
</tr>
<tr>
<td>$LDONQ</td>
<td>last day of next quarter</td>
<td>2013/09/30</td>
<td>01Q SP2</td>
</tr>
<tr>
<td>$FDONY</td>
<td>first day of next year</td>
<td>2014/01/01</td>
<td>01L</td>
</tr>
<tr>
<td>$LDONY</td>
<td>last day of next year</td>
<td>2014/12/31</td>
<td>01L</td>
</tr>
<tr>
<td>$CWEK</td>
<td>current calendar week (offset in weeks)</td>
<td>2013/17</td>
<td>01T</td>
</tr>
<tr>
<td>$FIPEC</td>
<td>Fiscal Period (current)</td>
<td>004.2013</td>
<td>01T</td>
</tr>
<tr>
<td>$FIPEP</td>
<td>Fiscal Period (previous)</td>
<td>003.2013</td>
<td>01T</td>
</tr>
</tbody>
</table>
These additional keywords are meant for full timestamps only:

<table>
<thead>
<tr>
<th>Keyword for &lt;StartDate&gt;</th>
<th>Description</th>
<th>Example for 2013/04/25 at 08:21:47 with offset -2</th>
<th>Minimum ST-A/PI release</th>
</tr>
</thead>
<tbody>
<tr>
<td>$TIMES</td>
<td>timestamp now (offset in seconds)</td>
<td>2013/04/25 08:21:45</td>
<td>01Q SP1</td>
</tr>
<tr>
<td>$TIMEM</td>
<td>timestamp now (offset in minutes)</td>
<td>2013/04/25 08:19:47</td>
<td>01Q SP1</td>
</tr>
<tr>
<td>$TIMEH</td>
<td>timestamp now (offset in hours)</td>
<td>2013/04/25 06:21:47</td>
<td>01Q SP1</td>
</tr>
<tr>
<td>$TIMED</td>
<td>timestamp now (offset in days)</td>
<td>2013/04/23 08:21:47</td>
<td>01Q SP1</td>
</tr>
<tr>
<td>$HOURA</td>
<td>absolute hour (+=today / -=yesterday)</td>
<td>2013/04/24 02:00:00</td>
<td>01Q SP2</td>
</tr>
<tr>
<td>$HOURRR</td>
<td>current full hour (offset in hours)</td>
<td>2013/04/25 06:00:00</td>
<td>01Q SP2</td>
</tr>
<tr>
<td>$DELTA</td>
<td>delta mode (timestamp of last run, optional offset in seconds)</td>
<td>n/a</td>
<td>01Q SP1</td>
</tr>
</tbody>
</table>

(these keywords are also available as value help, if you enter a $ into the filter field before)

The optional <Difference> is entered as positive or negative offset in days

- using ‘+’ increments days (= move start date into the future)
- using ‘-’ decrements days (= move start date into the past)

Note: On certain frontend UIs, entering a ‘+’ (plus sign) may be interpreted as a wildcard character. This can even change the selection option from ‘equal’ to ‘contains pattern’. To avoid this, you can also use the ‘#’ (number/hash sign) instead of ‘+’.

Examples:
- $TODAY-2 = day before yesterday
- $TODAY+2 = day after tomorrow

The relative date selection can be combined in ranges (using the LOW and HIGH fields of the selection criteria), e.g. to define "between" intervals.
Example: You want to count the number of documents which have a creation date in last month. The selection criteria would be <FieldName> = $FDOPM to $LDOPM.
Back to our example: With the following setting, you would select short dumps that have been created since yesterday only (note the operator “Greater Equal” to select on yesterday and later).

**Supported Data Types**

Filter fields of the following data types can respond to this special syntax:

<table>
<thead>
<tr>
<th>DDic Data Type</th>
<th>ABAP Data Type</th>
<th>Date Format</th>
<th>Minimum ST-A/PI release</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATS</td>
<td>D</td>
<td>YYYYMMDD</td>
<td>01L</td>
</tr>
<tr>
<td>CHAR 10</td>
<td>C 10</td>
<td>YYYYMMDD</td>
<td>01L (NUMC since 01Q SP2)</td>
</tr>
<tr>
<td>NUMC 10</td>
<td>N 10</td>
<td>YYYYMMDD</td>
<td>01L (NUMC since 01Q SP2)</td>
</tr>
<tr>
<td>CHAR 14</td>
<td>C 14</td>
<td>YYYYMMDDhhmmss</td>
<td>01L (NUMC since 01Q SP2)</td>
</tr>
<tr>
<td>NUMC 14</td>
<td>N 14</td>
<td>YYYYMMDDhhmmss</td>
<td>01L (NUMC since 01Q SP2)</td>
</tr>
<tr>
<td>CHAR 15</td>
<td>C 15</td>
<td>0YYYYMMDDhhmmss</td>
<td>Available since 01R SP1</td>
</tr>
<tr>
<td>NUMC 15</td>
<td>N 15</td>
<td>YYYYMMDDhhmmss00</td>
<td>Available since 01S SP1</td>
</tr>
<tr>
<td>DEC 15</td>
<td>P 8</td>
<td>YYYYMMDDhhmmss</td>
<td>01L</td>
</tr>
<tr>
<td>DEC 21</td>
<td>P 11</td>
<td>YYYYMMDDhhmmss,mmmmuun</td>
<td>01L</td>
</tr>
<tr>
<td>TIMS*</td>
<td>C 6</td>
<td>hhmmss</td>
<td>01L</td>
</tr>
</tbody>
</table>

*Legend:* YYYY = year, MM = month, DD = day  
  hh = hour, mm = minute, ss = second, mmmuuun = milliseconds/microseconds/nanoseconds  
  * TIMS can store the time portion only and is not suitable for date calculations* 

Please note: In data types that include time ("hhmmss"), these are defaulted with zeros ("000000"), except for the start date keywords using a "Last day" option, which sets a maximum time ("235959"). For keywords $TIMEx and $DELTA such time stamps are populated with exact time values.

**Working with exact timestamps**  
(available with ST-A/PI 01Q or later)

For the keywords $TIMEx and $DELTA the Table Entry Counter calculates an exact time, not only a date.

*This only works for full timestamps, combining date and time in one single field, for instance a CHAR 14 or DEC 15 data type with format YYYYMMDDhhmmss!*

$TIMEx just takes the current system timestamp at the time of data collection.  
$DELTA uses the stored timestamp of the previous run of the data collector.  
Both also support an additional <Difference> offset.
The timestamp calculation is always based on UTC time! If the used database table stores the timestamp in some local time zone format, you may use the <Difference> operator to adjust it. If the stored timestamp is in system time, you can use the appendix _SYSTEM to convert UTC into system time (e.g. $TIMEH-2_SYSTEM), according to the setting in table TTZCU.

- **$TIMES, $TIMEM, $TIMEH, $TIMED** ("Time now") calculate exact timestamps. They work for real timestamps (=combined date and time fields) with data types like DEC15 and DEC21. You can easily use different time units for the offset, like Seconds, Minutes, Hours, Days, depending on the chosen relative date keyword.

- **$HOURA, $HOURR ("full hour buckets")** allow to work with exact time buckets of full hours. For example, if the current time is 08:21, the low value is set to 08:00:00 and the high value is set to 08:59:59. $HOURR allows specifying a relative time offset in hours, e.g. $HOURR-2 would change above example into 06:00:00 to 06:59:59. $HOURA allows specifying an absolute number of the wished hour, e.g. $HOURA+2 would be 02:00:00 to 02:59:59 (today) and $HOURA-2 would be 02:00:00 to 02:59:59 (yesterday). Please note that the +/- sign has a different meaning here, as it just affects the date belonging to the hour bucket to be either today or yesterday.

- **$DELTA ("delta mode")** stores the timestamp of each data collector run, and at next run you can select everything since that last run, by simply putting a >=$DELTA in your timestamp field filter. An additional offset in seconds (+-<Difference>) is possible as well, however, does not make much sense here.

### Parameters on Object Level

![Parameters on Object Level](image)

1.5.4 Required Authorizations

The usage of the Table Entry Counter requires additional authorizations, which may not be part of the general BPMon users for setup and runtime. Please see also SAP Note 784752.

<table>
<thead>
<tr>
<th>BPMon Action</th>
<th>Used RFC type</th>
<th>Authorization type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value Help</td>
<td>LOGIN or TRUSTED</td>
<td>DDIC</td>
</tr>
<tr>
<td>Validation Check</td>
<td>LOGIN or TRUSTED</td>
<td>DDIC</td>
</tr>
<tr>
<td>Data Collection</td>
<td>READ</td>
<td>DATA</td>
</tr>
<tr>
<td>Detail Information</td>
<td>LOGIN or TRUSTED</td>
<td>DATA</td>
</tr>
</tbody>
</table>

Authorization type “DDIC”

- Within the BPMon Setup this monitor offers search helps for database table names and table fields. Therefore, the dialog user needs authorization for the ABAP Data Dictionary transaction SE12 in the managed system, during remote logon via a trusted or login RFC destination.
- Checked Authorization Object = S_TCODE with value TCD = SE12
Authorization type “DATA”

- At runtime, the monitor accesses data from database tables. Therefore, it needs to check whether the user has authorization for transaction SE16 and the corresponding table authorization group of the customized table name.

- In case of the data collection for alerting, “user” refers to the logon user maintained in the Read RFC destination, and in case of the detail information display, “user” refers to the dialog user during remote logon via a Trusted or Login RFC destination.

- Starting ST-A/PI 01S, this authorization check is exclusively performed by calling the standard function module VIEW_AUTHORITY_CHECK. Internally it will check for
  - S_TABU_CLI, if table is client-independent
  - S_TABU_DIS, if authorizations are assigned via table authorization groups
    - You can find out the used table authorization group in transaction SE11 (menu “Utilities -> Assign Authorization Group”) or by looking up table TDDAT.
  - S_TABU_NAM, if authorizations are assigned via individual table names