How-to guide: SNMP Trap Adapter

This guide explains how you can forward alerts in SAP Solution Manager 7.10 by sending SNMP Traps

Version 2.20 (March 2015)
SAP Active Global Support
TABLE OF CONTENT

1 PREREQUISITES ........................................................................................................................ 5
1.1 SAP Solution Manager 7.10 ........................................................................................................ 5
1.2 SAP Notes ................................................................................................................................... 5
1.3 System Monitoring Setup ........................................................................................................... 5

2 INSTALLING THE SNMP LIBRARY............................................................................................. 6
2.1 Download .................................................................................................................................... 6
2.2 Installation .................................................................................................................................. 6

3 SNMP ADAPTER FLAVORS ....................................................................................................... 8
3.1 Overall mechanism ..................................................................................................................... 8
3.2 [SAP-Standard] usage ................................................................................................................ 9
3.3 [Custom] usage ...........................................................................................................................11
3.3.1 Custom BAdI implementation overview ....................................................................................11
3.3.2 Steps to create the Implementing Class .....................................................................................12
3.3.3 Steps to create the BAdI entities ...............................................................................................13

4 [SAP-STANDARD] SNMP CONFIGURATION ............................................................................16
4.1 User Interface ............................................................................................................................16
4.1.1 SNMP Fields Mapping .................................................................................................................17
4.1.2 SNMP Server Configuration .........................................................................................................19

5 [CUSTOM] SNMP CONFIGURATION .........................................................................................20
5.1 User Interface ............................................................................................................................20
5.1.1 SNMP Server Configuration .........................................................................................................20
5.1.2 SNMP Fields Mapping .................................................................................................................21

6 MAI CONFIGURATION TO FORWARD ALERTS VIA SNMP TRAPS .........................................22
6.1 Enabling the Third-Party Component at Global Level .............................................................22
6.2 Enabling the Third-Party Component at Template Level .........................................................23
6.3 Enabling the Third-Party Component at Alert Level ...............................................................23

7 TROUBLESHOOTING ................................................................................................................24

8 APPENDIX ..................................................................................................................................25
8.1 MIB File extract : [SAP-Standard] SNMP Trap definition .........................................................25
8.2 MIB File extract : [Custom] SNMP Trap skeleton definition......................................................28
E2E Monitoring and Alerting Infrastructure (E2E MAI):

E2E MAI is a unique and centralized alerting approach retrieving metrics and simple events from different data providers as CCMS at managed system or Wily Introscope via push or pull mechanism. It includes:

- An Event Calculation Engine to calculate complex events and end-user alerts out of the retrieved metrics and simple events to avoid "alert flooding"
- A centralized directory for metrics, events and alerts including SAP and customer template knowledge and context information as system landscape, business process or interface information

Then end-user alerts are forwarded to several alert consumers as Alert Inbox, Incident Management and Notification Engine provided by SAP Solution Manager. In order to forward those events to third party tool an Alert Consumer Connector allows implementing standard forwarding protocols.

In this context, a consumer is implemented to forward Alert data to third party using SNMP trap protocol.
1 PREREQUISITES

1.1 SAP Solution Manager 7.10

The SNMP Adapter is available standard with SP06 and upper releases.

1.2 SAP Notes

Some additional corrections need to be applied:

For SP06:

For SP07:
https://service.sap.com.sap/support/notes/1820724

For SP08:

For SP10:
https://service.sap.com.sap/support/notes/1965064

For SP11:
https://service.sap.com.sap/support/notes/2009733

For SP12:

For SP13:

1.3 System Monitoring Setup

The System Monitoring setup (transaction solman_setup) must have been successfully completed.
2 INSTALLING THE SNMP LIBRARY

2.1 Download

You need the SNMPLIB package to send SNMP traps. This package is available on the SAP Service Marketplace:
- SAP Software Download Center
  > Support Packages and Patches
  > Search for Support Packages and Patches
  > Search Term = SNMPLIB*

According to SAPNote 585110 (https://service.sap.com/sap/support/notes/585110) : “Regardless of the kernel version you use (Unicode or non-Unicode), install the non-Unicode version of the SNMPLIB archive.
- Download the archive for your Operating System and SAP Kernel 7.20.

2.2 Installation

Decompress the archive with the following command: sapcar -xvf SNMPLIB_<version>.sar

And copy the “for_central_system” content into the Installation directory which should be "/sapmnt/<SolManSID>/exe" (or /usr/sap/<SolManSID>/SYS/exe/run) (or <Drive>:\usr\sap\<SolManSID\>\DVEBMGS<xx>\exe) for both “MIBS” folder and “trapsend” executable.

Deployed files and directories must have the following properties:
- Group: sapsys
- Owner: <SolManSID>adm
- Permissions: 776

The installation can be tested with transaction sm49 → SEND_SNMP_TRAP.
Set the following line as “Additional parameters”:

Unix SolutionManager:
-v l -m MIB:SAP-MIB -M DIR:/sapmnt/<SolManSID>/exe/MIBS -c public UDP:localhost:162 SAP-MIB::r3maiTrap localhost 6 60 ''

Windows SolutionManager:
-v l -m MIB:SAP-MIB -M DIR:<Drive>:\usr\sap\<SolManSID\>\DVEBMGS<xx>\exe\MIBS -c public UDP:localhost:162 SAP-MIB::r3maiTrap localhost 6 60 ''

and the result should be an empty bottom window.
3 SNMP ADAPTER FLAVORS

The SNMP Adapter implementation is providing two flavors usage: [SAP-Standard] or [Custom].

3.1 Overall mechanism

1. The ACC is configured to send 3rd Party Alert Information to the BAdI Implementation (see configuration details).

2. All the necessary data to be forwarded to the 3rd party is bundled in a table and passed to the SNMP Adapter.
   a. Instantiate the SNMP Adapter and pass the AlertInfo Bundle (key-value table)
   b. Call : SNMPAdapter→send_trap()
   c. This will trigger the steps 3, 4 and 5.

3. Based on the SNMP Configuration, the SNMP Executable options and parameters are built (see configuration details).

4. The configured SEND_SNMP_TRAP command is called (see configuration details).

5. The SNMP Trap is sent to the 3rd Party Tool.
3.2 [SAP-Standard] usage

Starting with Solution Manager 7.10 SP06, a [SAP-Standard] BAdI implementation is shipped:

Implementing Class is:

CL_ALERT_REACT_SNMP_TRAP (package AI_SOLMAN_ALRT_AL_REACTION_IMP)

Filter Value is:

ALES_ALERT_REACTION_OPTION = SNMP_TRAP

The provided implementation is bundling the following MAI Alert Information:

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Type</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>r3maiAlertMOName</td>
<td>Name of the ManagedObject reporting the Alert</td>
<td>Char</td>
<td>128</td>
</tr>
<tr>
<td>r3maiAlertMOType</td>
<td>T_SYSTEM, INSTANCE, HOST, DBMS…</td>
<td>Char</td>
<td>10</td>
</tr>
<tr>
<td>r3maiAlertId</td>
<td>Unique ID that identifies the Alert in MAI</td>
<td>Char</td>
<td>32</td>
</tr>
<tr>
<td>r3maiAlertDate</td>
<td>UTC Date (YYYYMMDD)</td>
<td>Char</td>
<td>8</td>
</tr>
<tr>
<td>r3maiAlertTime</td>
<td>UTC Time (hmmss)</td>
<td>Char</td>
<td>6</td>
</tr>
<tr>
<td>r3maiAlertName</td>
<td>Human readable short name of the Alert</td>
<td>Char</td>
<td>128</td>
</tr>
<tr>
<td>r3maiAlertTechnicalName</td>
<td>Technical ID of the Alert</td>
<td>Char</td>
<td>60</td>
</tr>
<tr>
<td>r3maiAlertDescription</td>
<td>Alert Description (or Custom Description)</td>
<td>Char</td>
<td>128</td>
</tr>
<tr>
<td>r3maiAlertCategory</td>
<td>AVAIL, PERFORM, EXCEPTION, CONFIGURE</td>
<td>Char</td>
<td>10</td>
</tr>
<tr>
<td>r3maiAlertRating</td>
<td>0:Unknown, 1:Normal, 2:Warning, 3:Critical</td>
<td>Integer</td>
<td>1</td>
</tr>
<tr>
<td>r3maiAlertSeverity</td>
<td>0:Low … 5:Medium … 9:Critical</td>
<td>Integer</td>
<td>1</td>
</tr>
<tr>
<td>r3maiAlertMetricName</td>
<td>Metric Name (or Metric Path for grouped metric)</td>
<td>Char</td>
<td>128</td>
</tr>
<tr>
<td>r3maiAlertMetricValue</td>
<td>Metric Value and Unit (or Metric TextValue)</td>
<td>Char</td>
<td>128</td>
</tr>
<tr>
<td>r3maiAlertMOId</td>
<td>Unique ID that identifies the ManagedObject</td>
<td>Char</td>
<td>32</td>
</tr>
<tr>
<td>r3maiAlertStatus</td>
<td>O:Open, I:In process, T:Transferred, C:Confirmed…</td>
<td>Integer</td>
<td>4</td>
</tr>
<tr>
<td>r3maiAlertReasonClosure</td>
<td>1:Re-configuration, 2:Work mode change, 3:Green alert…</td>
<td>Integer</td>
<td>1</td>
</tr>
<tr>
<td>r3maiAlertPriority</td>
<td>1:Low, 2:Medium, 3:High, 4:Very high</td>
<td>Integer</td>
<td>1</td>
</tr>
</tbody>
</table>
Here are the corresponding Value Ranges:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>r3maiAlertMOType</td>
<td></td>
</tr>
<tr>
<td>r3maiAlertCategory</td>
<td></td>
</tr>
<tr>
<td>r3maiAlertRating</td>
<td></td>
</tr>
<tr>
<td>r3maiAlertSeverity</td>
<td></td>
</tr>
<tr>
<td>r3maiAlertPriority</td>
<td></td>
</tr>
<tr>
<td>r3maiAlertStatus</td>
<td></td>
</tr>
<tr>
<td>r3maiAlertReasonClosure</td>
<td></td>
</tr>
</tbody>
</table>

The SNMP configuration “SNMP Fields Mapping” is delivered standard as well (see configuration details).
3.3 [Custom] usage

The SNMP Adapter can also be used directly in a custom BAdI Implementation. User can bundle its own Information with dedicated Trap Field Keys that have to be properly configured in the SNMP Configuration UI (SNMP Fields Mapping).

⚠️ Be aware that the MIB File describing the SNMP Trap Format must also reflect the custom format. SAP delivered MIB File contains a skeleton for such custom traps.

The overall process remains unchanged.

3.3.1 Custom BAdI implementation overview

Any listener of the Alert Inbox must implement the BAdI Definition BADI_ALERT_REACTION from the Enhancement Spot ALERT_REACTION (package AI_SOLMAN_ALRT_AL_REACTION_ENH):

BAdI filter is:

- ALERT_REACTION_OPTION (Character-Type)

The Implementing Class defines the SNMP Fields that will be forwarded to the Third-Party tool.
3.3.2 Steps to create the Implementing Class

a) Create an Implementing Class, e.g. "Z_CL_ALERT.REACT.CUST_SNMP"

b) The Implementing Class must Interface IF_BADI_INTERFACE and IF_ALERT_REACTION.

c) Implement the following methods:

a. REACT_TO_ALERTS (
   
   IPT_ALERTS : E2EA_T_ALERT_CONSM_OBJECT
   IP_XML : AC_XSTRING
   IP_FILTER_VAL : AC_REACTION_ID
   
   i. Called when a given Alert Type is triggered (once per Alert Group, when the
      Group is first created), and not on each update of a Group. In case where you
      need to react for each occurrence of an Alert, the attribute “Do not group
      individual occurrences” for the Alert Type has to be considered.
   
   ii. A set of Alerts, each with contributing Event / Metrics under it, is fed inside this
       method (ABAP Object and XML).

b. REACT_TO_CLOSED_ALERT (
   
   IO_ALERT : IF_ALERT_CONSM_OBJECT
   IV_XML : AC_XSTRING
   IV_FILTER_VAL : AC_REACTION_ID
   
   i. Called when a given Alert is closed, i.e. when its rating has changed, when its
      work-mode has changed, or when its managed object is re-configured.

c. IS_AUTO REACTION ( CV_FLAG: ABAP_BOOL )
   
   i. True → an AUTO-REACTION (i.e. effecting some actions within Solution
      Manager only).
   
   ii. False → a THIRD-PARTY COMPONENT (i.e. forwarding the Alerts to an external
        application).
   
   iii. Technically there is no difference between how ACC enables those 2 flavors, it
        is just called by MAI configuration to list down active implementations, each
        under „Auto-Reaction“ (if true) or „Third-Party Component“ (if false) sections.
3.3.3 Steps to create the BAdI entities

a) With transaction SE19, create a new Enhancement Implementation, e.g. “Z_ALERT_REACTION_IMPL” based on the existing Enhancement Spot ALERT_REACTION:
If you want to configure this new BAdI Implementation to re-use the [SAP-Standard] SNMP Implementing Class in order to forward the same SNMP Trap to multiple targets, you can set as Implementing Class “CL_ALERT_REACT_SNMP_TRAP”.

Here is the detailed view of the newly created BAdI Implementation:
Then set a dedicated BAdI Filter Value that will be used to differentiate Configurations.

After activating the implementing class and the BAdI implementation, it will be registered when the next Alert Notification is triggered by the ACC.
4 [SAP-STANDARD] SNMP CONFIGURATION

As of Solution Manager 7.10 SP06, a dedicated User Interface has been implemented to configure the SNMP Traps.

⚠️ Make sure in transaction SICF that the service “mai_snmp_trap_config” is active.

4.1 User Interface

http://<SolutionManagerHost>:<port>/sap/bc/webdynpro/sap/mai_snmp_trap_config?sap-language=EN

If this is the first time you are accessing the Configuration UI, you’ll need to create a new Configuration.

1. Expand the Panel “Create a Configuration”
2. Set Filter Value to “SNMP_TRAP_REACT” (corresponding to the [SAP-Standard] BAdI Implementation filter concatenated with “_REACT”)   
3. Check the “SAP-Standard Trap Format” checkbox.
4. Press “Create”
5. Set Filter Value to “SNMP_TRAP_REACT_CLOSE” (corresponding to the [SAP-Standard] BAdI Implementation filter concatenated with “_REACT_CLOSE”)
6. Check the “SAP-Standard Trap Format” checkbox.
7. Press “Create”
This will create 2 Configuration Entries for each type of forwarding (AlertChange & AlertClosure):
- one describing the SNMP Fields Mapping,
- one describing the SNMP Server Configuration.

It is mandatory to create those 2 configurations to react differently:
- Reacting on Alert Change → Configuration SNMP_TRAP_REACT
- Reacting on Alert Closure → Configuration SNMP_TRAP_REACT_CLOSE

### 4.1.1 SNMP Fields Mapping

The parameter name describes the SNMP Fields mapping corresponding to the MIB Definition of the Trap. The format is the following: `<FieldIndex>;<FieldName>;<FieldType>` (where `<FieldType>` is `s`tring or `i`nteger).

The parameter value is a key used for mapping with the MAI Alert information.

As we are in the [SAP-Standard] flavor of the SNMP Adapter, nothing has to be configured for this Configuration ID Entry.
Fields mapping slightly differ from SNMP_TRAP_REACT and SNMP_TRAP_REACT_CLOSE due to not relevant MAI Fields:
- `r3maiAlertReasonClosure` is not relevant for SNMP_TRAP_REACT
- `r3maiAlertMetricName` and `r3maiAlertMetricValue` are not relevant for SNMP_TRAP_REACT_CLOSE

The OS Command is limiting the concatenated length of all SNMP Trap FieldNames + FieldTypes + FieldValues to maximum 1024 chars. Please adjust your configuration accordingly to the following Table:

<table>
<thead>
<tr>
<th>SNMP FieldName</th>
<th>FieldName length</th>
<th>FieldValue max-length</th>
<th>Total max-length</th>
</tr>
</thead>
<tbody>
<tr>
<td>r3maiAlertMOName</td>
<td>20</td>
<td>128</td>
<td>20→148</td>
</tr>
<tr>
<td>r3maiAlertMOType</td>
<td>20</td>
<td>10</td>
<td>30 (fixed)</td>
</tr>
<tr>
<td>r3maiAlertId</td>
<td>16</td>
<td>32</td>
<td>48 (fixed)</td>
</tr>
<tr>
<td>r3maiAlertDate</td>
<td>18</td>
<td>8</td>
<td>26 (fixed)</td>
</tr>
<tr>
<td>r3maiAlertTime</td>
<td>18</td>
<td>6</td>
<td>24 (fixed)</td>
</tr>
<tr>
<td>r3maiAlertName</td>
<td>18</td>
<td>128</td>
<td>18→146</td>
</tr>
<tr>
<td>r3maiAlertTechnicalName</td>
<td>27</td>
<td>60</td>
<td>27→87</td>
</tr>
<tr>
<td>r3maiAlertDescription</td>
<td>25</td>
<td>128</td>
<td>25→153</td>
</tr>
<tr>
<td>r3maiAlertCategory</td>
<td>22</td>
<td>10</td>
<td>22→32</td>
</tr>
<tr>
<td>r3maiAlertRating</td>
<td>20</td>
<td>1</td>
<td>21 (fixed)</td>
</tr>
<tr>
<td>r3maiAlertSeverity</td>
<td>22</td>
<td>1</td>
<td>23 (fixed)</td>
</tr>
<tr>
<td>r3maiAlertMetricName</td>
<td>24</td>
<td>128</td>
<td>24→152</td>
</tr>
<tr>
<td>r3maiAlertMetricValue</td>
<td>25</td>
<td>128</td>
<td>25→153</td>
</tr>
<tr>
<td>r3maiAlertMOId</td>
<td>18</td>
<td>32</td>
<td>50 (fixed)</td>
</tr>
<tr>
<td>r3maiAlertStatus</td>
<td>20</td>
<td>4</td>
<td>20→24</td>
</tr>
<tr>
<td>r3maiAlertReasonClosure</td>
<td>27</td>
<td>1</td>
<td>28 (fixed)</td>
</tr>
<tr>
<td>r3maiAlertPriority</td>
<td>22</td>
<td>1</td>
<td>23 (fixed)</td>
</tr>
</tbody>
</table>
4.1.2 SNMP Server Configuration

Some configuration fields are already pre-filled and should not be modified:
- COMMUNITY
- MIB_NAME
- RETRIES
- TIMEOUT
- TRANSPORT

You’ll need to set values to:
- HOSTNAME: Target hostname of the SNMP Trap
- MIB_DIR: the deployed MIB directory on Solution Manager system
- MIB_TRAP_NAME: set to “r3maiTrap” because it is the [SAP-Standard] flavor
- PORT: provide an available UDP port
- VERSION: supported SNMP versions are “1” and “2c”

The 2 mandatory configurations are aimed to eventually react differently between an Alert Change (SNMP_TRAP.REACT) and an Alert Closure (SNMP_TRAP.REACT_CLOSE). It is however possible to deactivate one of them by setting the value “<SKIP>” to the HOSTNAME parameter.

You can specifically skip some ratings by adding the Parameter Name “RATINGS_TO_SKIP” and set the values of the ratings you want to skip, separated by the separator “;”. For example, to skip Grey and Green Alert Ratings, the value has to contain : “0;1”
5  [CUSTOM] SNMP CONFIGURATION

5.1  User Interface

The setup of a new [Custom] SNMP Configuration is also done in the User Interface as described in previous chapter.

The filter value must me identical to the [Custom] BAđI Implementation Filter Value concatenated with "_REACT" and "_REACT_CLOSE", and the checkbox must remain "unchecked". In the described procedure to create the custom BAđI Implementation (chapter 3.3.3), we have set the BAđI Filter Value to "SNMP_TRAP_CUST", therefore the 2 configurations to create are:

- SNMP_TRAP_CUST_REACT
- SNMP_TRAP_CUST_REACT_CLOSE

5.1.1  SNMP Server Configuration

The SNMP Server Configuration has to be configured similarly to the previous [SAP-Standard] chapter (see configuration details)
Some configuration fields are already pre-filled and should not be modified:
- COMMUNITY
- MIB_NAME
- RETRIES
- TIMEOUT
- TRANSPORT

You'll need to set values to:
- HOSTNAME : Target hostname of the SNMP Trap. Set it to <SKIP> if your implementing class has not implementing the method “REACT_TO_ALERTS” (resp. “REACT_TO_CLOSED_ALERT”)  
- MIB_DIR : the deployed MIB directory on Solution Manager system  
- MIB_TRAP_NAME : set to “r3customTrap” and must reflect the new [Custom] Trap name defined in the MIB File.  
- PORT : provide an available UDP port  
- VERSION: supported SNMP versions are “1” and “2c”

### 5.1.2 SNMP Fields Mapping

The Fields Mapping has to be fully described and must strictly reflect the new [Custom] Format defined in the MIB File.

The parameter name describes the SNMP Fields mapping corresponding to the MIB Definition of the Trap. The format is the following: `<FieldIndex>;<FieldName>;<FieldType>`  
( `<FieldType>` = s(tring) or i(nteger) ).

The parameter value is a key used for mapping with the MAI Alert information.

⚠️ The OS Command is limiting the concatenated length of all FieldNames + FieldTypes + FieldValues to maximum 1024 chars.
6 MAI CONFIGURATION TO FORWARD ALERTS VIA SNMP TRAPS

You need to enable the 3rd Party forwarding and this can be done at different levels:
- Global
- and/or Template
- and/or Alert.

6.1 Enabling the Third-Party Component at Global Level

Call transaction `solman_setup`
Select `Technical Monitoring > System Monitoring`
Select `Step 2: Configure Infrastructure > Step 2.4: Default Settings`
Select `Third-Party Components` tab
Add Entry: `React to Alerts by sending an SNMP Trap` with scope = `All Alerts`
Save
Jump to `Step 5: Define Scope`
Select the Managed Object to configure
Jump to `Step 6: Setup Monitoring`
Eventually assign the template and always press `Apply and Activate`
6.2 Enabling the Third-Party Component at Template Level

Call transaction solman_setup
Select Technical Monitoring > System Monitoring
Select Step 4: Template Maintenance
Select the Template and switch to Expert Mode
Select the Tab Third-Party Components
Set Dropdown to active and add Entry: React to Alerts by sending an SNMP Trap with scope = All Alerts
Save
Jump to Step 5: Define Scope
Select the Managed Object to configure
Jump to Step 6: Setup Monitoring
Eventually assign the template and always press Apply and Activate

6.3 Enabling the Third-Party Component at Alert Level

Call transaction solman_setup
Select Technical Monitoring > System Monitoring
Select Step 4: Template Maintenance
Select the Template and switch to Expert Mode
Select the Tab Alerts
Select the specific alert you want to configure and go to the Tab Third-Party Components
Set Dropdown to active and add Entry: React to Alerts by sending an SNMP Trap with scope = All Alerts
Save
Jump to Step 5: Define Scope
Select the Managed Object to configure
Jump to Step 6: Setup Monitoring
Eventually assign the template and always press Apply and Activate
7 TROUBLESHOOTING
Logs are available using the standard SLG1 transaction:

```
<ConfigurationFilterValue> _ SNMP _ <ManagedObject Name> _ <Alert Category> _ <AlertName>
```

Here are some Log extracts:
8 APPENDIX

8.1 MIB File extract : [SAP-Standard] SNMP Trap definition

[...]

r3maiAlert OBJECT IDENTIFIER ::= { r3Objects 6 }
[...]

r3maiAlertTable OBJECT-TYPE
SYNTAX SEQUENCE OF R3maiAlertEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "A list of Solution Manager MAI Alert entries"
::= { r3maiAlert 1 }

r3maiAlertEntry OBJECT-TYPE
SYNTAX R3maiAlertEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "The table-entries are the MAI Alerts which occurred. An alert is identified by a r3maiAlertM OID, r3maiAlertId, r3maiAlertDate, r3maiAlertTime."
INDEX { r3maiAlertMOId,r3maiAlertId,r3maiAlertDate,r3maiAlertTime }
::= { r3maiAlertTable 1 }

R3maiAlertEntry ::= SEQUENCE {
  r3maiAlertMOName DisplayString, r3maiAlertMOT ype DisplayString, r3maiAlertId DisplayString, r3maiAlertDate DisplayString, r3maiAlertTime DisplayString, r3maiAlertName DisplayString, r3maiAlertTechnicalName DisplayString, r3maiAlertDescription DisplayString, r3maiAlertCategory DisplayString, r3maiAlertRating INTEGER, r3maiAlertSeverity INTEGER, r3maiAlertMetricName DisplayString, r3maiAlertMetricValue DisplayString, r3maiAlertMOId DisplayString, r3maiAlertStatus DisplayString, r3maiAlertReasonClosure INTEGER, r3maiAlertPriority INTEGER
}

r3maiAlertMOName OBJECT-TYPE
SYNTAX DisplayString(SIZE (0..128))
MAX-ACCESS read-only
STATUS current
DESCRIPTION "Represents the ManagedObject Name that raised the MAI Alert."
::= { r3maiAlertEntry 1 }

r3maiAlertMOT ype OBJECT-TYPE
SYNTAX DisplayString(SIZE (0..10))
MAX-ACCESS read-only
STATUS current
DESCRIPTION "Represents the ManagedObject Type that raised the MAI Alert:

<table>
<thead>
<tr>
<th>Value</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONNECTION</td>
<td>Connection</td>
</tr>
<tr>
<td>DBMS</td>
<td>Database</td>
</tr>
<tr>
<td>HOST</td>
<td>Host (Server)</td>
</tr>
<tr>
<td>INSTANCE</td>
<td>Technical Instance</td>
</tr>
<tr>
<td>PI_DOMAIN</td>
<td>Process Integration (PI / X1) Domain</td>
</tr>
<tr>
<td>SCENARIO</td>
<td>Generic Managed Object type</td>
</tr>
<tr>
<td>SCR</td>
<td>Script</td>
</tr>
<tr>
<td>SCR_RROB</td>
<td>Script on Robot</td>
</tr>
<tr>
<td>SCR_ST_RROB</td>
<td>Script Step on Robot</td>
</tr>
<tr>
<td>TECHNIH COMP</td>
<td>Technical Component</td>
</tr>
<tr>
<td>T_SYSTEM</td>
<td>Technical System</td>
</tr>
<tr>
<td>ROB</td>
<td>Robot</td>
</tr>
<tr>
<td>NK_DEVICE</td>
<td>Active Network Device</td>
</tr>
<tr>
<td>PRINTER</td>
<td>Printer or Fax</td>
</tr>
<tr>
<td>STORAGE</td>
<td>Storage System</td>
</tr>
<tr>
<td>UNSPECIFIC</td>
<td>Unspecified Managed Object</td>
</tr>
<tr>
<td>MOBILE</td>
<td>Mobile Device</td>
</tr>
<tr>
<td>IFCHANNEL</td>
<td>Interface Channel</td>
</tr>
<tr>
<td>BPMOS_OBJ</td>
<td>Business Process Monitoring Object</td>
</tr>
</tbody>
</table>
### HOW-TO GUIDE: SENDING SNMP TRAPS

#### Job

```plaintext
JOB Job

::= { r3maiAlertEntry 2 }
```

1. **r3maiAlertId**
   - **SYNTAX**: DisplayString(SIZE (0..32))
   - **MAX-ACCESS**: read-only
   - **STATUS**: current
   - **DESCRIPTION**: "Represents the ID of the MAI Alert."

2. **r3maiAlertDate**
   - **SYNTAX**: DisplayString(SIZE (0..8))
   - **MAX-ACCESS**: read-only
   - **STATUS**: current
   - **DESCRIPTION**: "Represents the UTC Date of the MAI Alert."

3. **r3maiAlertTime**
   - **SYNTAX**: DisplayString(SIZE (0..6))
   - **MAX-ACCESS**: read-only
   - **STATUS**: current
   - **DESCRIPTION**: "Represents the UTC Time of the MAI Alert."

4. **r3maiAlertName**
   - **SYNTAX**: DisplayString(SIZE (0..128))
   - **MAX-ACCESS**: read-only
   - **STATUS**: current
   - **DESCRIPTION**: "Represents the human readable Name of the MAI Alert."

5. **r3maiAlertTechnicalName**
   - **SYNTAX**: DisplayString(SIZE (0..60))
   - **MAX-ACCESS**: read-only
   - **STATUS**: current
   - **DESCRIPTION**: "Represents the Technical Name of the MAI Alert."

6. **r3maiAlertDescription**
   - **SYNTAX**: DisplayString(SIZE (0..128))
   - **MAX-ACCESS**: read-only
   - **STATUS**: current
   - **DESCRIPTION**: "Represents the Description of the MAI Alert."

7. **r3maiAlertCategory**
   - **SYNTAX**: DisplayString(SIZE (0..10))
   - **MAX-ACCESS**: read-only
   - **STATUS**: current
   - **DESCRIPTION**: "Represents the Category of the MAI Alert."

<table>
<thead>
<tr>
<th>Value</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVAIL Availability</td>
<td></td>
</tr>
<tr>
<td>PERFORM Performance</td>
<td></td>
</tr>
<tr>
<td>EXCEPTION Exceptions</td>
<td></td>
</tr>
<tr>
<td>CONFIGURE Configuration*</td>
<td></td>
</tr>
</tbody>
</table>

8. **r3maiAlertRating**
   - **SYNTAX**: INTEGER { valueUnknown(0), valueNormal(1), valueWarning(2), valueCritical(3) }
   - **MAX-ACCESS**: read-only
   - **STATUS**: current
   - **DESCRIPTION**: "Represents the MAI Alert Rating:

<table>
<thead>
<tr>
<th>Value</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>valueUnknown</td>
<td>Unknown status</td>
</tr>
<tr>
<td>valueNormal</td>
<td>Normal operation state, green</td>
</tr>
<tr>
<td>valueWarning</td>
<td>Warning, yellow</td>
</tr>
<tr>
<td>valueCritical</td>
<td>Problem occurred, red</td>
</tr>
</tbody>
</table>

9. **r3maiAlertSeverity**
   - **SYNTAX**: INTEGER (0..9)
   - **MAX-ACCESS**: read-only
   - **STATUS**: current
   - **DESCRIPTION**: "Represents the MAI Alert Severity:

<table>
<thead>
<tr>
<th>Value</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>valueUnknown</td>
<td>Unknown status</td>
</tr>
<tr>
<td>valueNormal</td>
<td>Normal operation state, green</td>
</tr>
<tr>
<td>valueWarning</td>
<td>Warning, yellow</td>
</tr>
<tr>
<td>valueCritical</td>
<td>Problem occurred, red</td>
</tr>
</tbody>
</table>

```
### HOW-TO GUIDE: SENDING SNMP TRAPS

<table>
<thead>
<tr>
<th>Value</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Low</td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Medium</td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Critical</td>
</tr>
</tbody>
</table>

::= { r3maiAlertEntry 11 }

#### r3maiAlertMetricName OBJECT-TYPE

SYNTAX DisplayString(SIZE (0..128))

MAX-ACCESS read-only

STATUS current

DESCRIPTION "Represents the Name or Path of the MAI Metric."

::= { r3maiAlertEntry 12 }

#### r3maiAlertMetricValue OBJECT-TYPE

SYNTAX DisplayString(SIZE (0..128))

MAX-ACCESS read-only

STATUS current

DESCRIPTION "Represents the Value (and eventual Unit) of the MAI Metric."

::= { r3maiAlertEntry 13 }

#### r3maiAlertMOId OBJECT-TYPE

SYNTAX DisplayString(SIZE (0..32))

MAX-ACCESS read-only

STATUS current

DESCRIPTION "Represents the ManagedObject Id that raised the MAI Alert."

::= { r3maiAlertEntry 14 }

#### r3maiAlertStatus OBJECT-TYPE

SYNTAX DisplayString(SIZE (0..4))

MAX-ACCESS read-only

STATUS current

DESCRIPTION "Represents the Status of the MAI Alert."

<table>
<thead>
<tr>
<th>Value</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>Open</td>
</tr>
<tr>
<td>I</td>
<td>In process</td>
</tr>
<tr>
<td>T</td>
<td>Transferred</td>
</tr>
<tr>
<td>E</td>
<td>Externally Processed</td>
</tr>
<tr>
<td>C</td>
<td>Confirmed</td>
</tr>
</tbody>
</table>

::= { r3maiAlertEntry 15 }

#### r3maiAlertReasonClosure OBJECT-TYPE

SYNTAX INTEGER (0..9)

MAX-ACCESS read-only

STATUS current

DESCRIPTION "Represents the the MAI Alert:"

<table>
<thead>
<tr>
<th>Value</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Re-configuration</td>
</tr>
<tr>
<td>2</td>
<td>Work mode change</td>
</tr>
<tr>
<td>3</td>
<td>Green alert</td>
</tr>
<tr>
<td>4</td>
<td>Grey alert</td>
</tr>
<tr>
<td>5</td>
<td>Yellow alert</td>
</tr>
<tr>
<td>6</td>
<td>Red alert</td>
</tr>
</tbody>
</table>

::= { r3maiAlertEntry 16 }

#### r3maiAlertPriority OBJECT-TYPE

SYNTAX INTEGER {
  valueLow(1),
  valueMedium(2),
  valueHigh(3),
  valueVeryHigh(4)
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION "Represents the MAI Alert Priority:"

<table>
<thead>
<tr>
<th>Value</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>valueLow</td>
<td>Low</td>
</tr>
<tr>
<td>valueMedium</td>
<td>Medium</td>
</tr>
<tr>
<td>valueHigh</td>
<td>High</td>
</tr>
<tr>
<td>valueVeryHigh</td>
<td>Very High</td>
</tr>
</tbody>
</table>

::= { r3maiAlertEntry 17 }
HOW-TO GUIDE: SENDING SNMP TRAPS

r3maiAlertTraps OBJECT IDENTIFIER ::= { r3maiAlert 2 }

r3maiTrap NOTIFICATION-TYPE
OBJECTS {
    r3maiAlertMOName,
    r3maiAlertMOType,
    r3maiAlertId,
    r3maiAlertDate,
    r3maiAlertTime,
    r3maiAlertName,
    r3maiAlerttechnicalName,
    r3maiAlertDescription,
    r3maiAlertCategory,
    r3maiAlertRating,
    r3maiAlertSeverity,
    r3maiAlertMetricName,
    r3maiAlertMetricValue,
    r3maiAlertMOId,
    r3maiAlertStatus,
    r3maiAlertReasonClosure,
    r3maiAlertPriority
}

STATUS current
DESCRIPTION
"Generic SAP Solution Manager MAI Alert"
::= { r3maiAlertTraps 60 }

--

8.2 MIB File extract: [Custom] SNMP Trap skeleton definition

r3customAlert OBJECT IDENTIFIER ::= { r3Objects 7 }

-- #==========================================================================
-- # SAP SolutionManager Custom Alert Traps
-- #==========================================================================

r3customAlertTable OBJECT-TYPE
SYNTAX SEQUENCE OF R3customAlertEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"A list of Solution Manager Custom Alert entries"
::= { r3customAlertTable 1 }

R3customAlertEntry OBJECT-TYPE
SYNTAX R3customAlertEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The table-entries are the Custom Alerts which occurred.
An alert is identified by a r3customAlertXXX, r3customAlertYYY."
INDEX { r3customAlertXXX, r3customAlertYYY }
::= { r3customAlertTable 1 }

R3customAlertEntry ::= SEQUENCE {
    r3customAlertXXX DisplayString,
    r3customAlertYYY INTEGER
}

r3customAlertXXX OBJECT-TYPE
SYNTAX DisplayString(SIZE (0..512))
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Represents XXX that raised the Custom Alert."
::= { r3customAlertEntry 1 }

r3customAlertYYY OBJECT-TYPE
SYNTAX INTEGER (0..2147483647)
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Represents YYY that raised the Custom Alert."
::= { r3customAlertEntry 2 }

r3customAlertTraps OBJECT IDENTIFIER ::= { r3customAlert 2 }

r3customTrap NOTIFICATION-TYPE
OBJECTS {
    r3customAlertXXX,
    r3customAlertYYY
}

STATUS current
DESCRIPTION
"Generic SAP Solution Manager Custom Alert"
::= { r3customAlertTraps 60 }

--