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A Sierra Monitor Company

Driver Manual

(Supplement to the FieldServer Instruction Manual)

FS-8704-09 SNMP Version 1

APPLICABILITY & EFFECTIVITY

Effective for all systems manufactured after September 2008

Driver Version:	**1.03**
Document Revision:	**8**

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1. SNMP Description

The SNMP driver allows the FieldServer to transfer data to and from devices over Ethernet using the **SNMP version 1** protocol. The FieldServer can emulate either a Server (SNMP Agent) or Client.

Max Nodes Supported:

FieldServer Mode	Nodes	Comments
Client	25	Each Node is specified by a unique IP address
Server	1	As a Server the SNMP driver can act as a single Node only

The Client can be configured to read values specified by their SNMP Object Identifiers (OID's), which are defined in the MIB file (Management Information Base) of the target device. When acting as an SNMP Agent (Server), the driver makes the contents of specified integer data arrays available to any SNMP Client. The FieldServer MIB file sets out the OIDs to use.

The current version of the driver can send and receive SNMP traps. The following SNMP data types are supported:

- INTEGER
- OCTET_STREAM
- TIMER_TICKS
- STRING

The maximum number of traps currently supported is **255.**

The FieldServer Enterprise ID is 6347. MIB files are generated automatically from the FieldServer configuration files. A selection of standard MIB-2 OIDs are supported to allow interaction with popular Network Management packages.

2. Driver Scope of Supply

2.1. Supplied by FieldServer Technologies for this driver

FieldServer Technologies PART #	Description
FS-8915-10	Ethernet cable, 7 foot, RJ45
FS-8704-09	Driver Manual.
FS-8704-09	mb8sim.exe. SNMP utility for generating MIB files

2.1.1. Required 3rd Party Hardware

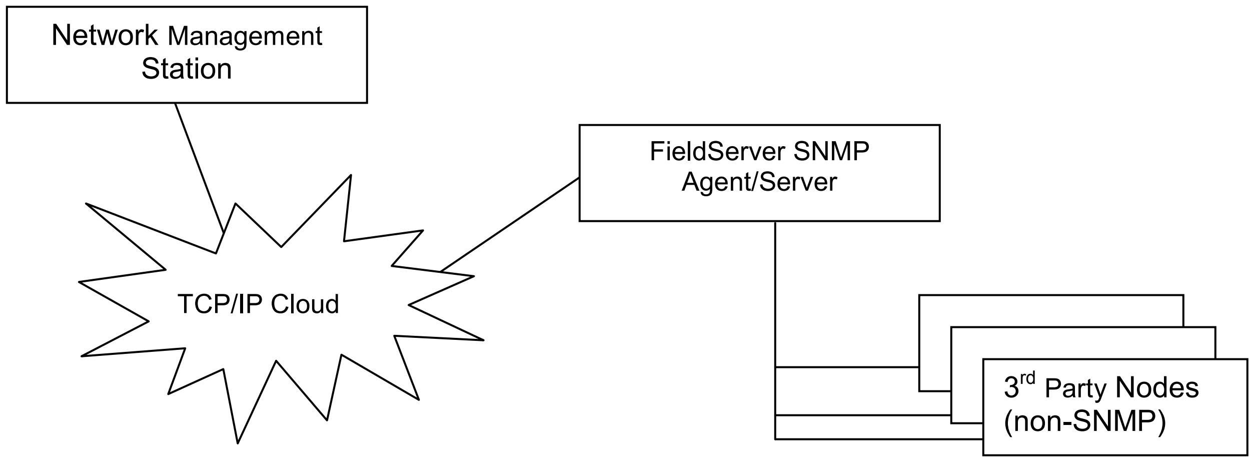
Part #	Description
	Ethernet 10/100 BaseT hub[1]

[1] Not all FieldServer models support 100BaseT. Consult the appropriate instruction manual for details of the Ethernet speed supported by specific hardware.

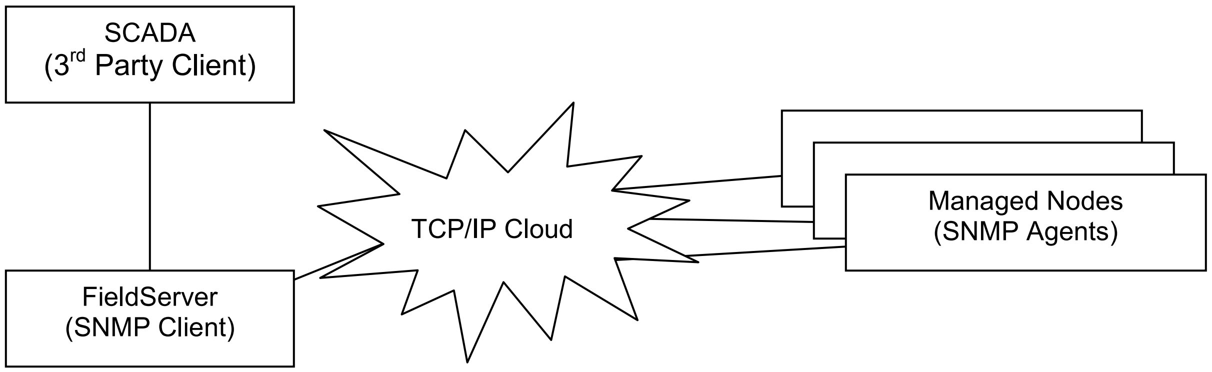
3. Hardware Connections

The FieldServer is connected to the Ethernet using the UTP cable supplied. Two typical hardware configurations are shown below:

1. FieldServer as SNMP Agent (Server)


Network Management Station
FieldServer SNMP Agent/Server
TCP/IP Cloud
3rd Party Nodes (non-SNMP)

2. FieldServer as SNMP Client



3.1. Hardware Connection Tips / Hints

The FieldServer utility program Ruinet will connect to the FieldServer even if the Netmask setting on the PC differs from the setting on the FieldServer. SNMP will only work between Nodes for which these settings correspond, however, thus all Nodes required to communicate using SNMP must have the same Netmask setting.

4. Configuring the FieldServer as a SNMP Client

For a detailed discussion on FieldServer configuration, please refer to the FieldServer Configuration manual. The information that follows describes how to expand upon the factory defaults provided in the configuration files included with the FieldServer (See ".csv" sample files provided with the FieldServer).

This section documents and describes the parameters necessary for configuring the FieldServer to communicate with a SNMP Agent/Server. Please refer to Appendix A: for a discussion of how to receive SNMP TRAPS.

4.1. Data Arrays/Descriptors

The configuration file tells the FieldServer about its interfaces, and the routing of data required. In order to enable the FieldServer for SNMP communications, the driver independent FieldServer buffers need to be declared in the "Data Arrays" section, the destination device addresses need to be declared in the "Client Side Nodes" section, and the data required from the servers needs to be mapped in the "Client Side Map Descriptors" section. Details on how to do this can be found below.

Note that in the tables, * indicates an optional parameter, with the bold legal value being the default.

Section Title		
Data_Arrays		
Column Title	**Function**	**Legal Values**
Data_Array_Name	Provide name for Data Array	Up to 15 alphanumeric characters
Data_Array_Format	Provide data format. Each Data Array can only take on one format.	Float, Bit, UInt16, SInt16, Packed_Bit, Byte, Packed_Byte, Swapped_Byte
Data_Array_Length	Number of Data Objects. Must be larger than the data storage area required by the map descriptors for the data being placed in this array.	1-10,000

Example

```
//    Data Arrays

Data_Arrays
Data_Array_Name,              Data_Format,            Data_Array_Length
DA_AI_01,                     UInt16,                 200
DA_AO_01,                     UInt16,                 200
DA_DI_01,                     Bit,                    200
DA_DO_01,                     Bit,                    200
```

4.2. Client Side Connection Descriptors

Section Title		
Adapter		
Column Title	**Function**	**Legal Values**
Adapter	Adapter Name	N1, N2[2]
Protocol	Specify protocol used	SNMP
Length_Encode_Method	If this parameter is omitted or set to 0 the short form of encoding length will be used. If the parameter is set to 1 (and the Length is ≤ 127) the long form of encoding length will be used. For Length >127 short form will be used regardless of the setting. **Long form:** an extra byte will be inserted to indicate the number of following bytes which indicates the length of the following section in message. **Short form**: only length value will be inserted.	**0 (default),** 1
SNMP_Community*	This parameter can be configured if it is required that "Community" be a different name in order to receive traps.	Any string up to 255 characters**, Public**

Example

```
//    Client Side Connections

Adapters
Adapter,              Protocol,             Length_Encode_Method
N1,                   SNMP,                 1
```

[2] Not all ports shown are necessarily supported by the hardware. Consult the appropriate Instruction manual for details of the ports available on specific hardware.

4.3. Client Side Node Descriptors

Section Title		
Nodes		
Column Title	**Function**	**Legal Values**
Node_Name	Provide name for Node	Up to 32 alphanumeric characters
Node_ID*	Identifies Node; needed only if Node Online/Offline monitoring is used.	1-255
Protocol	Specify protocol used	SNMP
Adapter	Specify network adapter	N1, N2[2]
IP_Address	IP Address of remote Agent. Refer to Appendix A.1 for more information.	Legal 4 byte IP address on the same subnet.
MIB_Style	Controls how MIB file is formatted. Refer to Appendix A.3 for more info.	'**Standard**'; 'Custom'; 'NuDesign'
MIB_Style_for_Traps	Controls how traps are reported in MIB file. Refer to Appendix A.3 for more info.	**Style1**; Style2; Style3
Do_not_MIB_this_Node	Controls whether a Node's traps contribute to the MIB file. Where duplicate traps are sent to more than one Node, second and subsequent Nodes will not contribute to the MIB file. Review the example MIB files and configuration file in Appendix A.3. 0 – Node's traps contribute to MIB File. 1 – Node's traps do not contribute to MIB file.	**0**; 1
SNMP_Read_Method*	If this parameter is set it is possible for the FieldServer to sequentially read (walk) the SNMP Server in the same way as the snmpwalk parameter works on SNMP.	Walk, **-**

Example

```
//    Client Side Nodes

Nodes
Node_Name,      Node_ID,    Protocol,   Adapter,   IP_Address,        SNMP_Read_Method
Agent 1,        1,          SNMP,       N1,        192.168.1.174,     Walk
```

4.4. Client Side Map Descriptors

4.4.1. FieldServer Related Map Descriptor Parameters

Section Title		
Map Descriptors		
Column Title	**Function**	**Legal Values**
Map_Descriptor_Name	Name of this Map Descriptor	Up to 32 alphanumeric characters
Data_Array_Name	Name of Data Array where data is to be stored in the FieldServer	One of the Data Array names from "Data Array" section above
Data_Array_Offset	Starting location in Data Array	0 to maximum specified in "Data Array" section above
Function	Function of Client Map Descriptor	RDBC, WRBC, WRBX

4.4.2. Driver Related Map Descriptor Parameters

Section Title		
Map Descriptors		
Column Title	**Function**	**Legal Values**
Node_Name	Name of Node to fetch data from	One of the Node names specified in "Client Node Descriptor" above
Length	Length of Map Descriptor	1
SNMP_OID	Specify the Object ID to be read/written	Refer to the MIB file of the particular SNMP Agent
SNMP_Write_as_Trap	Used to send non COV (Change of Value) Traps	Yes, No
Data_Type	Used to send non COV Traps. Tells the Driver to send a trap containing numeric or Ascii data.	Ascii, numeric

4.4.3. Timing Parameters

Section Title		
Map Descriptors		
Column Title	**Function**	**Legal Values**
Scan_Interval	Rate at which data is polled	≥0.001s

4.4.4. Map Descriptor Example

```
//   Client Side Map Descriptors

Map Descriptors
Map_Descriptor_Name,  Data_Array_Name,  Data_Array_Offset,  Function,  Node_Name,  SNMP_OID,                       Length,  Scan_Interval
A1,                   DA_AI3,           0,                  RDBC,      Agent 1,    1.3.6.1.4.1.6347.1.1.0,   1,       5
A2,                   DA_AI3,           1,                  WRBX,      Agent 1,    1.3.6.1.4.1.6347.1.1.0,   1,       -
```

The Data Array to which the Read Data will be stored, or from which Write Data will be fetched, at the location specified by Data_Array_Offset

Read functions are implemented as SNMP Get Requests. Write functions are implemented as SNMP Set Requests.

The OID is derived from the MIB file of the Node you are talking to. It is easiest to load the MIB file in a MIB browser (e.g. MG-Soft) which converts the text name to the OID format

Specifies how often to perform this transaction, in seconds.

5. Configuring the FieldServer as a SNMP Server/Agent

For a detailed discussion on FieldServer configuration, please refer to the FieldServer Configuration Manual. The information that follows describes how to expand upon the factory defaults provided in the configuration files included with the FieldServer. (See ".csv" sample files provided with the FieldServer).

This section documents and describes the parameters necessary for configuring the FieldServer to communicate with a SNMP Client such as a Network Management application. Please refer to Appendix A: for a discussion of how to configure SNMP TRAPS.

The configuration file tells the FieldServer about its interfaces, and the routing of data required. In order to enable the FieldServer for SNMP communications, the driver independent FieldServer buffers need to be declared in the "Data Arrays" section, the FieldServer virtual Node(s) needs to be declared in the "Server Side Nodes" section, and the data to be provided to the clients needs to be mapped in the "Server Side Map Descriptors" section. Details on how to do this can be found below.

Note that in the tables, * indicates an optional parameter, with the **bold** legal value being the default.

5.1. Server Side Data Arrays

A special Data Array naming convention is used to map FieldServer Data Arrays into the SNMP OID addressing scheme. Any data arrays that are to be visible via SNMP have to be named in the following way:

```
Data_Arrays
Data_Array_Name,      Data_Format,                   Data_Array_Length
SNMP_DA_1,            Int,                           20
SNMP_DA_2,            Float,                         20
```

The Data_Format and Data_Array_Length may be freely chosen, but the name has to be in the format SNMP_DA_x, where x is sequential from one Data Array to the next. The corresponding entries in the automatically generated MIB file would appear as shown below.

SNMP_DA_1 appears in the MIB thus:

```
dataArray1 OBJECT IDENTIFIER ::= { snmp_server_v1_00a 1 }
```

The first data value in SNMP_DA_1 appears in the MIB thus (note Integer Data Type):

```
dataValue1_0 OBJECT-TYPE
SYNTAX INTEGER
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"Data value."
::= { dataArray1 0 }
```

The resulting OID for this data value is 1.3.6.1.4.1.6347.1.1.0.

5.2. Server Side Connection Descriptors

Section Title		
Adapter		
Column Title	**Function**	**Legal Values**
Adapter	Adapter Name	N1, N2[3]
Protocol	Specify protocol used	SNMP
SNMP_Community*	This parameter can be configured if it is required that "Community" be a different name in order to receive traps.	Any string up to 255 characters, **Public**

Example

```
//   Server Side Connections

Adapters
Adapter,                                        Protocol
N1,                                             SNMP
```

5.3. Server Side Node Descriptors

Section Title		
Nodes		
Column Title	**Function**	**Legal Values**
Node_Name	Provide name for Node	Up to 32 alphanumeric characters
Protocol	Specify protocol used	SNMP

Example

```
//   Server Side Nodes

Nodes
Node_Name,                      Protocol
Agent 1,                        SNMP
```

5.4. Server Side Map Descriptors

No Server Side Map Descriptors are required by SNMP for Get or Set requests, since the mapping of FieldServer Data Arrays into the SNMP OID addressing scheme follows the method outlined in Section 5.1 above. Server Side Map Descriptors are required to configure SNMP TRAPS as outlined in Appendix A.

Scaling on Client side is per normal model but on Server side, normal model only applies if a Map Descriptor is used.

[3] Not all ports shown are necessarily supported by the hardware. Consult the appropriate Instruction manual for details of the ports available on specific hardware.

Appendix A. Advanced Topics

Appendix A.1. Receiving SNMP TRAPS

A trap can reveal the causal event in two ways:

- The cause can be indicated by the OID number inside the trap with the event state reported by the associated data value.
- The cause can be indicated by the value of one OID field and the event state by the value of another OID field.

Appendix A.1.1. Trap Source IP Address

When a trap is received it contains its source IP address information within the UDP packet header. It is possible for a trap to reveal its source IP address by coding an IP_ADDRESS field inside the trap.

To catch a trap it is necessary to define Map Descriptors containing the OID's of the trap. Map Descriptors are associated with a Node. A Node is defined by its IP address amongst other parameters. When a trap is received the source of the IP address must match the IP address of the Node associated with the Map Descriptor.

A trap may originate from one IP address, and contain an alternative source IP Address within the message. In this case, the FieldServer will use the IP_Address contained within the message as the source rather than the IP address of the sending device. When this situation occurs the driver prints a message to the error log so that you know why, perhaps, the trap was ignored/processed differently from your expectations."

Appendix A.1.2. Receiving SNMP TRAPs using the SNMP Client

In order to receive Traps, the SNMP Client requires a Map Descriptor to be configured for each OID that is to be updated via a Trap. Note that a single Trap message may contain multiple OID's, depending on the Agent originating the Trap. Each OID of interest requires its own Map Descriptor. The Map Descriptor Function must be set to Passive_Client.

Example:

```
//    Server Side Map Descriptors

Map Descriptors
Map_Descriptor_Name,    Data_Array_Name,    Data_Array_Offset,    Function,         Node_Name,    SNMP_OID
A1,                     DA_AI3,             0,                    Passive_Client,   Agent 1,      1.3.6.1.4.1.6347.1.1.0,
A2,                     DA_AI3,             1,                    Passive_Client,   Agent 1,      1.3.6.1.4.1.6347.1.1.1,
```

Traps can only be received by Map Descriptors with the Function set to Passive_Client.

The OID specifies the value that will be stored by this Map Descriptor following a TRAP update.

Appendix A.1.3. Receiving SNMP Traps – Storing using a Lookup Table

Some devices send trap messages with the same OID's irrespective of the causal events. The OID contents provide event specific information such as event origin and state. Consider a trap containing 3 OID's. One has an integer value (event state) and the other two have strings reporting the event source. The SNMP driver is capable of using the two string OID's to form a search string to search a lookup table. The driver uses the index value associated with a matching entry to determine a Data Array location to store the event state. Thus a single trap message can be used to populate a Data Array in such a way that the location in the DA indicates the event source and the value found at that location indicates the event state.

Example:
In the trap below ;

- 1.3.6.1.4.1.290.1.0 contains the event state
- 1.3.6.1.4.1.290.2.0 contains the 1st part of identifier of the event source
- 1.3.6.1.4.1.290.3.0 contains the 2nd part of identifier of the event source

```
Simple Network Management Protocol
    Version: 1 (0)
    Community: public
    PDU type: TRAP-V1 (4)
    Enterprise: 1.3.6.1.4.1.290 (SNMPv2-SMI::enterprises.290)
    Agent address: 10.32.6.3 (10.32.6.3)
    Trap type: ENTERPRISE SPECIFIC (6)
    Specific trap type: 70000000
    Timestamp: 0
    Object identifier 1: 1.3.6.1.4.1.290.1.0 (SNMPv2-SMI::enterprises.290.1.0)
    Value: INTEGER: 4
    Object identifier 2: 1.3.6.1.4.1.290.2.0 (SNMPv2-SMI::enterprises.290.2.0)
    Value: STRING: "CROSSTWN_KDA"
    Object identifier 3: 1.3.6.1.4.1.290.3.0 (SNMPv2-SMI::enterprises.290.3.0)
    Value: STRING: "EMS_84_900MHZ_RADIO_B"
    Object identifier 4: 1.3.6.1.4.1.290.4.0 (SNMPv2-SMI::enterprises.290.4.0)
    Value: STRING: "EMS 84 900MHZ RADIO B"
    Object identifier 5: 1.3.6.1.4.1.290.5.0 (SNMPv2-SMI::enterprises.290.5.0)
    Value: INTEGER: 0
```

When configured correctly the driver will concatenate the values of the two source OID's to form a search string for a lookup table. An offset value extracted from a matching entry is used to determine the location to store the event state value.

The example below illustrates how to configure the FieldServer to achieve this:

Step 1: Define the Lookup Table

The driver loads the table into memory and uses it when a new trap is received. If the search string is formed by concatenating two OID Sting fields then the driver places a colon, thus a colon should be placed between the two substrings. If the search string formed from the trap contents does not match an entry in the table the driver prints a message in the error log at an offset of zero. For this reason you cannot use a value of zero for the parameter called 'SNMP_Lookup_Table_Offset'.

In the configuration file create a Driver Table section.

```
Driver_Table
SNMP_Lookup_Table_Offset,     SNMP_Lookup_Table_String,                  Protocol
1,                            Sandhill_KDA:24V_CHARGER,                  SNMP
2,                            BIG_BEND_DVA_02_102:AC_POWER_FAILURE,      SNMP
3,                            CROSSTWN_KDA:EMS_84_900MHZ_RADIO_B,        SNMP
```

Storage Offset:
If the lookup string matches a row in the table then the value of the parameter called 'SNMP_Lookup_Table_Offset' is used as an offset into the Data Array
Do not use values of zero. Take care to ensure that the offset will not result in an offset that is beyond the end of the Data Array.

Lookup String:
The String contents of up to two OID's are concatenated to form a search string. Place a colon ':' between each part of the search string if two OID's are used to form the string.
Searches are case insensitive

There are some limitations to the table:

- it can hold a maximum of 200 entries.
- Each string entry can be a maximum of 59 characters.
- When the driver searches the table looking for a match it ignores the case of the entries.

Step 2 : Create a Map Descriptor (MD) to catch the Trap

Pay special consideration to the following parameters;

- SNMP_OID: Specify the OID of the event state. The field must contain an integer value which is the value that will be stored. When the trap is received the driver extracts the contents and takes the 1st OID in the message and looks for a MD whose 'SNMP_OID' matches. If it doesn't find one then the trap is discarded.
- SNMP_Trap_Store_Method: Set the value of this parameter to 'Lookup'. This tells the driver to use the lookup table and also to use the following two parameters;
  - SNMP_OID_Index1: Specify the OID of the field that contains the 1st part of the search/lookup string. Once the driver sees that a 'Lookup' store is to be done it extracts the string contents of this OID to form the 1st part of the search string.
  - SNMP_OID_Index2: Specify the OID of the field that contains the 2nd part of the search/lookup string. Once the driver sees that a 'Lookup' store is to be done it extracts the string contents of this OID to form the search string by adding a colon to the 1st part and then appending the string found in this OID.

```
Map_Descriptor_Name,  Data_Array_Name,  Data_Array_Offset,  Function,         Node_Name,  SNMP_OID,              SNMP_Trap_Store_Method,  SNMP_OID_Index1,     SNMP_OID_Index2
MD1,                  DA_TRAPS,         0,                  Passive_Client,   Agent 1,    1.3.6.1.4.1.290.1.0,   Lookup,                  1.3.6.1.4.1.290.2,   1.3.6.1.4.1.290.3
```

The following notes refer to the decoded SNMP trap message shown above in this section.

- Driver receives trap and starts extracting data from the message
- Driver finds OID= 1.3.6.1.4.1.290.1, extracts the Integer value=4 and searches for an MD with SNMP_OID= 1.3.6.1.4.1.290.1
- The MD specifying Storage Method=Lookup and Data Array Name = DA_TRAPS is found. (If not found, the message is discarded.)
- Driver finds IOD = 1.3.6.1.4.1.290.2 and extracts a string = CROSSTWN_KDA
- Driver compares the extracted OID to the OID specified by 'SNMP_OID_Index1'. If it matches then it forms the 1st fragment of the search string, otherwise the driver continues extracting OID's from the trap.
- Driver finds IOD = 1.3.6.1.4.1.290.3 and extracts a string = EMS_84_900MHZ_RADIO_B
- Driver compares the extracted OID to the OID specified by 'SNMP_OID_Index2'. If it matches then it forms the 2nd fragment of the search string, otherwise the driver continues extracting OID's from the trap.
- Once a complete search string is formed, the driver starts searching the lookup table defined in step1. The search is case insensitive. A match is made with offset 3 and the driver stores the value 4 at offset 3 in DA_TRAPS. (If the search fails – there is no matching entry then the driver uses offset zero). The offsets are relative to the offset specified by 'Data_Array_Offset'.

Appendix A.2. Sending SNMP TRAPS using the SNMP Server/Agent

There are two ways to send traps using the driver

- A rule based appoach – COV (Change of Value): Driver watches a data point. If the data changes and meets the condition of some rule then the trap is generated.
- Non-rule – Driver sends the trap uncondionally based on a time interval or whenever the source data point is udpated (even if there is no change.)

Change of Value (COV) Traps

Rules determine when to send an SNMP Trap. These rules are configured in Server Side Map Descriptors, and are applied to the data whenever it changes. Traps are sent on a Change of State (COS) of the relevant Data Array value, as determined by the following configurable criteria:

COS_Hi_Alm	High Alarm threshold, applies to numerical values
COS_Hi_Warning	High Warning threshold, applies to numerical values
COS_Lo_Warning	Low Warning threshold, applies to numerical values
COS_Lo_Alm	Low Alarm threshold, applies to numerical values
COS_Deadband	Deadband value which must be crossed for Alarm or Warning states to toggle (prevents chatter)
COS_Normal	Normal value for a digital point (1 or 0) – when the value changes to or from Normal, a Trap is sent. For an analog point set the 'COS_Normal' parameter = 'COS_Server_Event' and then specify the dead band. Each time the the analog value changes by at the deadband or more (absolute change) then a trap will be sent

Each Trap Map Descriptor must specify the destination of the Trap by configuring a Remote_Client_Node_Descriptor, as shown in the example below. The OID to which the data value is to be bound in the Trap message is specified in the Map Descriptor.

First, the Trap destination Node is set up as follows:

```
Remote_Client_Node_Descriptors
Node_Name,   Node_ID,   Protocol,   Adapter,   IP_Address
NM_1,        1,         SNMP,       N1,        192.168.1.174
```

The Trap Map Descriptors are then configured as below, using the desired COS rule parameters:

```
//    Server Side Map Descriptors

Map_Descriptors
Map_Descriptor_Name,   Data_Array_Name,   Data_Array_Offset,   Function,     Node_Name,   SNMP_OID,                    COS_Hi_Alm,   COS_Lo_Alm,   COS_Deadband
PSU_Voltage_Alarm,     DA_AI3,            0,                   SNMP_TRAP,    NM_1,        1.3.6.1.4.1.6347.1.1.0.0,    10.5,         7.3,          0.2
```

Appendix A.2.1. COV Map Descriptor Example

In this example each time the value found in Data Array 'DA_AI3' at offset 0 changes by at least 0.2 (COS_Deadband) then a trap will be sent.

```
//    Server Side Map Descriptors

Map_Descriptors
Map_Descriptor_Name,  Data_Array_Name,  Data_Array_Offset,  Function,    Node_Name,  SNMP_OID,                COS_Normal,        COS_Deadband
PSU_Voltage_Alarm,    DA_AI3,           0,                  SNMP_TRAP,   NM_1,       1.3.6.1.4.1.6347.1.1.0.0, COS_Server_Event,  0.2
```

Content of Trap Messages:

Each trap has 3 OID's. THE OID of the trap itself and OID of the two bound variables (the payload). Systems that use traps are typically set up to watch for OID's in the payloads and the Trap's OID is therefore not relevant. The driver allocates trap OID's as follows:
The 1st trap found in the configuration file is allocated OID=1.3.6.1.4.1.6347.6.6. Subsequent traps are allocated ...6347.6.7   ...6347.6.8 etc.

Each COS trap contains two bound variables. The first bound variable has its OID equal to the OID specified in the configuration file. It contains an Integer reporting the value of the variable at the time the trap is generated. The second bound variable's OID is determined by adding '.0' to the OID specified in the configuration file. It contains a string reporting the Map Descriptor name (Thus use the variable/tag name to name the Map Descriptor) and a short report on the event type.
The following are possible descriptions;

Status: HI ALARM
Status: HI WARNING
Status: LO ALARM
Status: LO WARNING
Status: ALARM
Status: DELTA EVENT
Status: NORMAL

The actual states that can be reported depend on the COS states defined in the MD's

e.g. Where a Map Descriptor has COS_Normal defined then possible states are
STATUS: NORMAL
STATUS: ALARM

e.g. Where a Map Descriptor has COS_Hi_Alm, COS_Lo_Alm defined then possible states are
STATUS: NORMAL
STATUS: LO ALARM
STATUS: HI ALARM

Example of a Trap Sent:

In this example the trap was the 1st trap defined in the configuration. That is why the Trap OID = 6. The MD name was 'ambTemp'. Its name begins with a lower case character to meet validation requirements. The configuration file definition for the trap had the OID set to 1.3.6.1.4.1.6347.1.1.1.0. When the trap was produced the value was 120 and the trap was produced because the value was above the Hi Alarm threshold specified by the COS_HI_Alarm parameter in the configuration file.

TrapOID: 1.3.6.1.4.1.6347.6.6 (Generic Trap 6 (enterprise), specific trap 6) So most likely from the MIB it would compile as 1.3.6.1.4.1.6347.0.6

Varbinds:

```
OID                         Format   Contents
1.3.6.1.4.1.6347.1.1.1.0.0  String   ambTemp Status: HI ALARM
1.3.6.1.4.1.6347.1.1.1.0    Integer  120
Trap OID's
```

Appendix A.2.2. Polling for Integer bound Data

It is possible for the remote SNMP Client to poll for the data as well as listen for the traps. This is achieved by setting the OID to a value that corresponds to a pollable point in a 'SNMP_DA_xx' Data Array.

In the example below, the Data Array name is SNMP_DA_02. This means that its points can be polled by polling for 1.3.6.1.4.1.6347.1.2.x.0 where x is the offset in the Data Array. When a trap is generated because of the COS event, the integer bound variable gets its OID from the configuration and thus is equal to 1.3.6.1.4.1.6347.1.2.1.0 . This corresponds to the OID for SNMP_DA_2:0 (DA:Offset). Thus if the remote client wanted to poll for the data as well as listen for the traps it could poll 1.3.6.1.4.1.6347.1.2.1.0 and it would be served the same data as contained in the integer bound variable.

Example:

```
Map_Descriptors
Map_Descriptor_Name,  Data_Array_Name,  Data_Array_Offset,  Function,    Node_Name,  SNMP_OID,                   COS_Normal
WaterHA,              SNMP_DA_2,        01,                 SNMP_TRAP,   Trap_1,     1.3.6.1.4.1.6347.1.2.1.0,   0
```

Non-COV Traps

The FieldServer can be configured to send a trap periodically or when a data is updated. A data update occurs when one protocol reads data from a remote device and the data is stored in a Data Array regardless of whether the data has changed or not. Each Trap Map Descriptor must specify the destination of the Trap by configuring a Remote_Client_Node_Descriptor, as shown in the example below. The OID to which the data value is to be bound in the Trap message is specified in the Map Descriptor.

First, the Trap destination Node is set up as follows:

```
Remote_Client_Node_Descriptors
Node_Name,         Node_ID,      Protocol,   Adapter,   IP_Address
NM_1,              1,            SNMP,       N1,        192.168.1.174
```

The Trap Map Descriptors are then configured as below:

```
Map_Descriptors
Map_Descriptor_Name,   Data_Array_Name,   Data_Array_Offset,   Function,   Node_Name,   SNMP_OID,                    SNMP_Write_as_Trap,   Data_Type,   Length
PSU_Voltage_Alarm,     DA_AI3,            0,                   Wrbx,       NM_1,        1.3.6.1.4.1.6347.1.1.0.0,    Yes,                  Integer,     1
```

Wrbx to write on update.

Use Wrbc and add a Scan_Interval to have the trap send periodically.

This is what tells the driver that this is not a normal write and that the message should be sent as a trap.

Integer value or ASCII strings may be sent. If sending an ASCII string keep the length as one but note that the driver starts at the specified location and proceeds element by element of the Data Array building the string until it finds a zero which it regards as the marker for the end of string. If using Wrbx as the function the message is only sent when the 1st element is updated.

Appendix A.3. MIB File Generation for the SNMP Server/Agent

It is necessary to create an updated MIB file corresponding to the available Data Arrays and Traps configured in the Server configuration (*.csv) file. To create this MIB file, run the mb8sim.exe utility supplied with the FieldServer in a DOS command window as follows:

- mb8sim –cmy_config.csv
  where my_config.csv is the newly created configuration file.
- hit 'Q' to quit. The program will have created a file called FServer.MIB, which may be compiled into the SNMP Management application of choice.

When the MIB File is created the driver prints a message to the Error log.

The "MIB_Style" parameter specified in Section 4.3 provides three options for creating the MIB file.

- Standard - this is the same as omitting the parameter
- NuDesign the MIB file produced is suitable for compilation by the NuDesign Browser.
- Custom - the file MIBhead.ini is used in preparing the MIB file.

```
Adapters
Adapter,      Protocol,        MIB_Style
N1,           SNMP,            Standard
                               NuDesign
                               Custom
```

Appendix A.3.1. Customizing the MIB File Header:

Use the ‘Custom’ MIB_Style.

The MB8Sim.exe application looks for a file called ‘MIBhead.ini”. If the file is absent or cannot be opened then a standard MIB file is produced. If the file can be opened then the application inserts the contents of the file into the header. In the example below the section in blue italics would be replaced with the contents of the MIBhead.ini file.

```
FIELDSERVER-MIB DEFINITIONS ::= BEGIN

IMPORTS
enterprises, OBJECT-TYPE, MODULE-IDENTITY
FROM SNMPv2-SMI
TRAP-TYPE
FROM RFC-1215;

fieldserver_technologies MODULE-IDENTITY
LAST-UPDATED "200308121338Z"
ORGANIZATION
"FieldServer Technologies"
CONTACT-INFO
"info@fieldserver.com"
DESCRIPTION
"FieldServer Technologies"
::= { enterprises 6347 }

snmp_server_v1_00a OBJECT IDENTIFIER ::= { fieldserver_technologies  1 }

dataArray1 OBJECT IDENTIFIER ::= { snmp_server_v1_00a 1 }

dataValue1_0 OBJECT-TYPE
SYNTAX INTEGER
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"Data value."
::= { dataArray1 0 }


…………………………………… remainder of file omitted from this example …
```

Appendix A.4. Controlling how a MIB file reports traps

The connection parameter 'Do_not_MIB_this_Node' controls whether a Node's traps contribute to the MIB file. This parameter is useful where duplicate traps are being sent to more than one destination.

Some aspects of how traps are reported in the MIB file may be controlled with a Node parameter called 'MIB_Style_for_Traps'

Adapters			
Adapter,	Protocol,	Poll_Delay,	MIB_Style_for_Traps
N1,	SNMP,	0.1s,	Style1

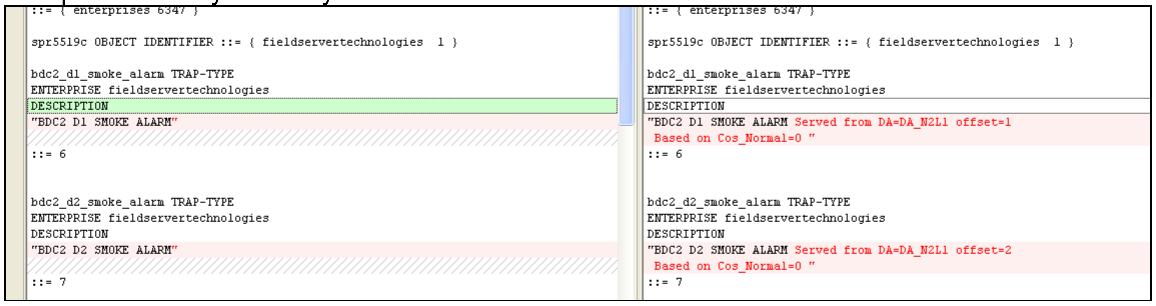
Permitted Values for the parameter are:

Style1 (Default)
Style2
Style3

Style2 and 3 add information to the trap description on the trap origin.
Style3 defines the parameters contained in each trap and assigns these parameters hard coded OID's which are fixed for all traps. In Style 1 and 2, the parameters are not reported in the MIB file and the parameter OID's are based on the trap OID. Thus style 3 changes the structure and data of the MIB from Style1&2.

Trap reporting Style	**Style 1**	**Style 2**	**Style 3**
Trap Descriptions.	Description is the Map Descriptor Name	Description is the Map Descriptor Name and also contains information on the data source and the originating event.	Same as Style 2
Trap Parameters	Not defined in MIB File	Same as Style 1	Trap Parameters defined in MIB File.
Trap Parameters OID's	Based on trap OID Two parameters per trap. BaseOID.	Same as Style 1	Fixed hard coded trap parameters. 1.2.6.1.4.1.6347.1.1 (Parameter contains a string that describes event) 1.2.6.1.4.1.6347.1.21 (Parameter contains a numeric that contains data point value).

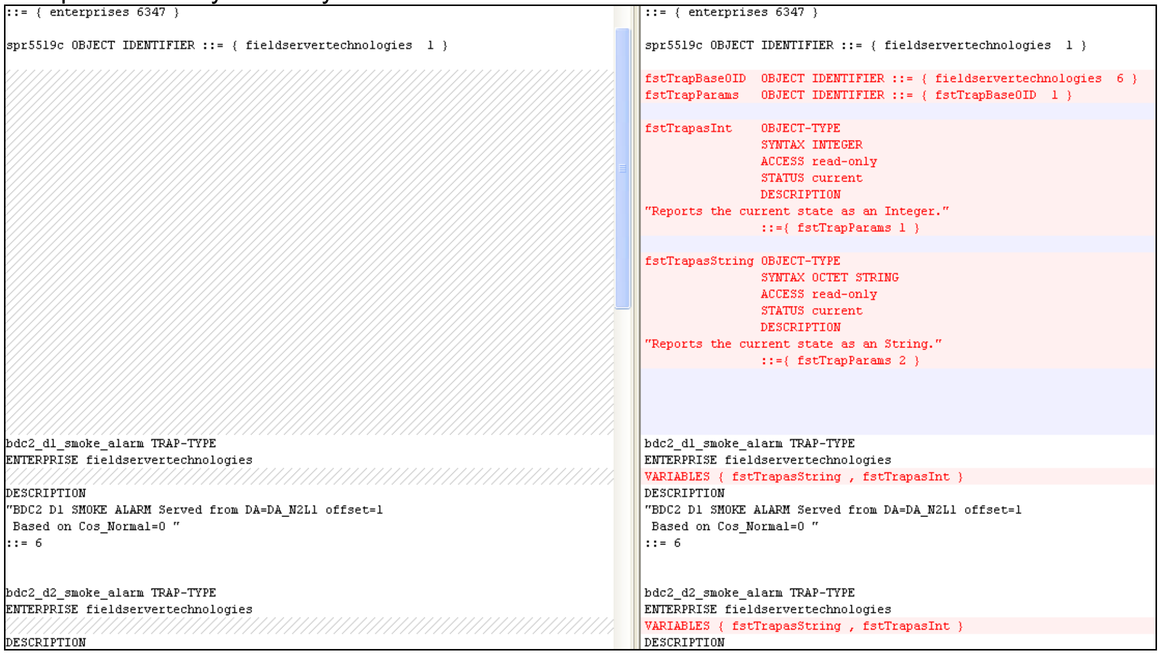
Comparison of Style1 to Style2



```
::= { enterprises 6347 }

spr5519c OBJECT IDENTIFIER ::= { fieldservertechnologies  1 }

bdc2_d1_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
DESCRIPTION
"BDC2 D1 SMOKE ALARM"

::= 6


bdc2_d2_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
DESCRIPTION
"BDC2 D2 SMOKE ALARM"

::= 7
```

```
::= { enterprises 6347 }

spr5519c OBJECT IDENTIFIER ::= { fieldservertechnologies  1 }

bdc2_d1_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
DESCRIPTION
"BDC2 D1 SMOKE ALARM Served from DA=DA_N2L1 offset=1
 Based on Cos_Normal=0 "
::= 6


bdc2_d2_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
DESCRIPTION
"BDC2 D2 SMOKE ALARM Served from DA=DA_N2L1 offset=2
 Based on Cos_Normal=0 "
::= 7
```

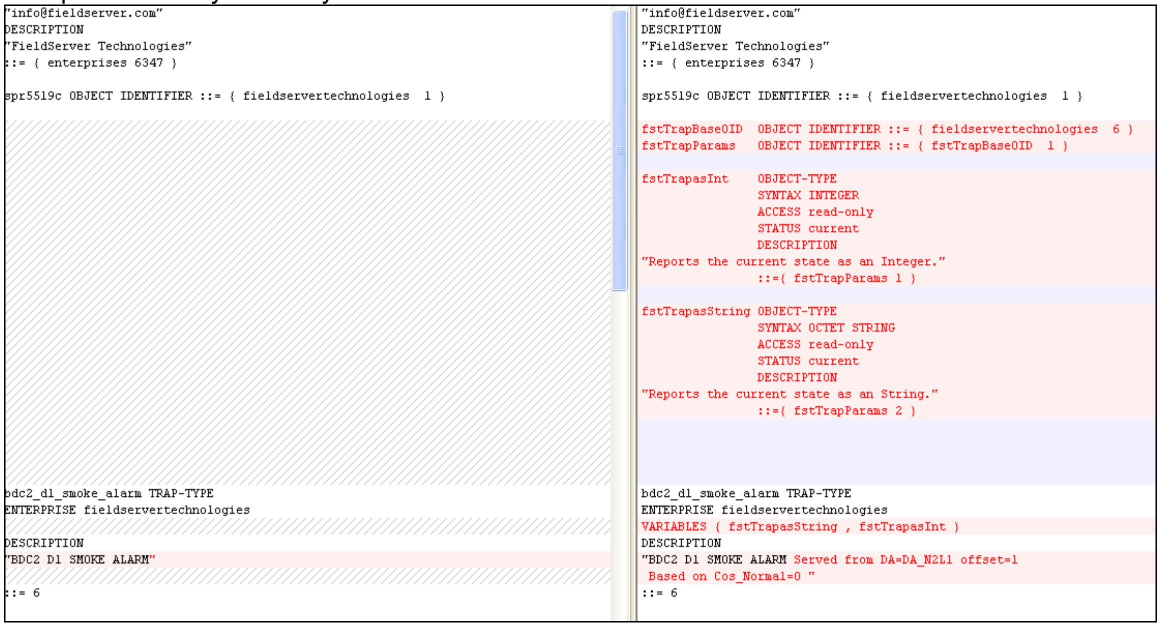
Comparison of Style2 to Style3



```
::= { enterprises 6347 }

spr5519c OBJECT IDENTIFIER ::= { fieldservertechnologies  1 }

bdc2_d1_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies

DESCRIPTION
"BDC2 D1 SMOKE ALARM Served from DA=DA_N2L1 offset=1
 Based on Cos_Normal=0 "
::= 6


bdc2_d2_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies

DESCRIPTION
```

```
::= { enterprises 6347 }

spr5519c OBJECT IDENTIFIER ::= { fieldservertechnologies  1 }

fstTrapBaseOID  OBJECT IDENTIFIER ::= { fieldservertechnologies  6 }
fstTrapParams   OBJECT IDENTIFIER ::= { fstTrapBaseOID  1 }

fstTrapasInt    OBJECT-TYPE
                SYNTAX INTEGER
                ACCESS read-only
                STATUS current
                DESCRIPTION
"Reports the current state as an Integer."
                ::={ fstTrapParams 1 }

fstTrapasString OBJECT-TYPE
                SYNTAX OCTET STRING
                ACCESS read-only
                STATUS current
                DESCRIPTION
"Reports the current state as an String."
                ::={ fstTrapParams 2 }



bdc2_d1_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
VARIABLES { fstTrapasString , fstTrapasInt }
DESCRIPTION
"BDC2 D1 SMOKE ALARM Served from DA=DA_N2L1 offset=1
 Based on Cos_Normal=0 "
::= 6


bdc2_d2_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
VARIABLES { fstTrapasString , fstTrapasInt }
DESCRIPTION
```

Comparison of Style1 to Style3



Style1:

```
"info@fieldserver.com"
DESCRIPTION
"FieldServer Technologies"
::= { enterprises 6347 }

spr5519c OBJECT IDENTIFIER ::= { fieldservertechnologies  1 }

bdc2_d1_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies

DESCRIPTION
"BDC2 D1 SMOKE ALARM"

::= 6
```

Style3:

```
"info@fieldserver.com"
DESCRIPTION
"FieldServer Technologies"
::= { enterprises 6347 }

spr5519c OBJECT IDENTIFIER ::= { fieldservertechnologies  1 }

fstTrapBaseOID  OBJECT IDENTIFIER ::= { fieldservertechnologies  6 }
fstTrapParams   OBJECT IDENTIFIER ::= { fstTrapBaseOID  1 }

fstTrapasInt    OBJECT-TYPE
                SYNTAX INTEGER
                ACCESS read-only
                STATUS current
                DESCRIPTION
"Reports the current state as an Integer."
                ::={ fstTrapParams 1 }

fstTrapasString OBJECT-TYPE
                SYNTAX OCTET STRING
                ACCESS read-only
                STATUS current
                DESCRIPTION
"Reports the current state as an String."
                ::={ fstTrapParams 2 }

bdc2_d1_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
VARIABLES { fstTrapasString , fstTrapasInt }
DESCRIPTION
"BDC2 D1 SMOKE ALARM Served from DA=DA_N2L1 offset=1
 Based on Cos_Normal=0 "
::= 6
```

Sample Configuration File

```
//    Data Arrays
//
Data_Arrays
Data_Array_Name,                    Data_Format,                        Data_Array_Length
DA_N2L1,                            Float,                              3500
DA_N3L1,                            Float,                              3500
DA_N4L1,                            Float,                              3500
DA_N5L1,                            Float,                              3500
DA_SYS_N2,                          UINT16,                             1000
DA_SYS_N3,                          UINT16,                             1000
DA_SYS_N4,                          UINT16,                             1000
DA_SYS_N5,                          UINT16,                             1000
```

```
//    Active Server - Connection
//
Adapters
Adapter,                  Protocol,                 Poll_Delay,               MIB_Style_for_Traps
N1,                       SNMP,                     0.1s,                     Style3
```

```
//    Active Server - Remote Destination Node for Traps
//
Remote_Client_Node_Descriptors,
Node_Name ,                   Node_ID,   Protocol,  Adapter,  IP_Address,    Max_Trap_Count,  Do_not_MIB_this_Node
SNMP1,                        11,        SNMP,      N1,       192.168.1.81,  Extended,        0(Ok to MIB)
```

```
//    Active Server - Map Descriptors
//
Map_Descriptors
Map_Descriptor_Name,   Data_Array_Name,  Data_Array_Offset,  Function,    Node_Name,  Length,  COS_Deadband,  Cos_Hi_Warn,  COS_Hi_Alm,  COS_Normal,  SNMP_OID
BDC2 D1 SMOKE ALARM,   DA_N2L1,          1                   SNMP_TRAP,   SNMP1,      1        - ,            - ,           - ,          0,           1.3.6.1.4.1.6347.6
BDC2 D2 SMOKE ALARM,   DA_N2L1,          2                   SNMP_TRAP,   SNMP1,      1        -,             - ,           - ,          0,           1.3.6.1.4.1.6347.7
BDC2 D3 SMOKE ALARM,   DA_N2L1,          3                   SNMP_TRAP,   SNMP1,      1        -,             - ,           - ,          0,           1.3.6.1.4.1.6347.8
BDC2 D4 SMOKE ALARM,   DA_N2L1,          4                   SNMP_TRAP,   SNMP1,      1        -,             - ,           - ,          0,           1.3.6.1.4.1.6347.9
BDC2 D5 SMOKE ALARM,   DA_N2L1,          5                   SNMP_TRAP,   SNMP1,      1        -,             - ,           - ,          0,           1.3.6.1.4.1.6347.10
BDC2 D6 SMOKE ALARM,   DA_N2L1,          6                   SNMP_TRAP,   SNMP1,      1        -,             - ,           - ,          0,           1.3.6.1.4.1.6347.11
BDC2 D7 SMOKE ALARM,   DA_N2L1,          7                   SNMP_TRAP,   SNMP1,      1        -,             - ,           - ,          0,           1.3.6.1.4.1.6347.12
BDC2 D8 SMOKE ALARM,   DA_N2L1,          8                   SNMP_TRAP,   SNMP1,      1        -,             - ,           - ,          0,           1.3.6.1.4.1.6347.13
BDC2 D9 SMOKE ALARM,   DA_N2L1,          9                   SNMP_TRAP,   SNMP1,      1        -,             - ,           - ,          0,           1.3.6.1.4.1.6347.14

BDC2 D1 SMOKE ALARM,   DA_N2L1,          1                   SNMP_TRAP,   SNMP2,      1        -,             - ,           - ,          0,           1.3.6.1.4.1.6347.6
BDC2 D2 SMOKE ALARM,   DA_N2L1,          2                   SNMP_TRAP,   SNMP2,      1        -,             - ,           - ,          0,           1.3.6.1.4.1.6347.7
BDC2 D3 SMOKE ALARM,   DA_N2L1,          3                   SNMP_TRAP,   SNMP2,      1        -,             - ,           - ,          0,           1.3.6.1.4.1.6347.8
BDC2 D4 SMOKE ALARM,   DA_N2L1,          4                   SNMP_TRAP,   SNMP2,      1        -,             - ,           - ,          0,           1.3.6.1.4.1.6347.9
BDC2 D5 SMOKE ALARM,   DA_N2L1,          5                   SNMP_TRAP,   SNMP2,      1        -,             - ,           - ,          0,           1.3.6.1.4.1.6347.10
BDC2 D6 SMOKE ALARM,   DA_N2L1,          6                   SNMP_TRAP,   SNMP2,      1        -,             - ,           - ,          0,           1.3.6.1.4.1.6347.11
BDC2 D7 SMOKE ALARM,   DA_N2L1,          7                   SNMP_TRAP,   SNMP2,      1        -,             - ,           - ,          0,           1.3.6.1.4.1.6347.12
BDC2 D8 SMOKE ALARM,   DA_N2L1,          8                   SNMP_TRAP,   SNMP2,      1        -,             - ,           - ,          0,           1.3.6.1.4.1.6347.13
BDC2 D9 SMOKE ALARM,   DA_N2L1,          9                   SNMP_TRAP,   SNMP2,      1        -,             - ,           - ,          0,           1.3.6.1.4.1.6347.14
```

Style1 MIB File based on above configuration

```
FIELDSERVER-MIB DEFINITIONS ::= BEGIN

IMPORTS
enterprises, OBJECT-TYPE, MODULE-IDENTITY
FROM SNMPv2-SMI
TRAP-TYPE
FROM RFC-1215;

fieldservertechnologies MODULE-IDENTITY
LAST-UPDATED "200308121338Z"
ORGANIZATION
"FieldServer Technologies"
CONTACT-INFO
"info@fieldserver.com"
DESCRIPTION
"FieldServer Technologies"
::= { enterprises 6347 }

spr5519c OBJECT IDENTIFIER ::= { fieldservertechnologies  1 }

bdc2_d1_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
DESCRIPTION
"BDC2 D1 SMOKE ALARM"
::= 6


bdc2_d2_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
DESCRIPTION
"BDC2 D2 SMOKE ALARM"
::= 7


bdc2_d3_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
DESCRIPTION
"BDC2 D3 SMOKE ALARM"
::= 8


bdc2_d4_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
DESCRIPTION
"BDC2 D4 SMOKE ALARM"
::= 9


bdc2_d5_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
DESCRIPTION
"BDC2 D5 SMOKE ALARM"
::= 10


bdc2_d6_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
DESCRIPTION
"BDC2 D6 SMOKE ALARM"
::= 11


bdc2_d7_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
DESCRIPTION
"BDC2 D7 SMOKE ALARM"
::= 12


bdc2_d8_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
DESCRIPTION
"BDC2 D8 SMOKE ALARM"
::= 13


bdc2_d9_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
DESCRIPTION
"BDC2 D9 SMOKE ALARM"
::= 14


END
```

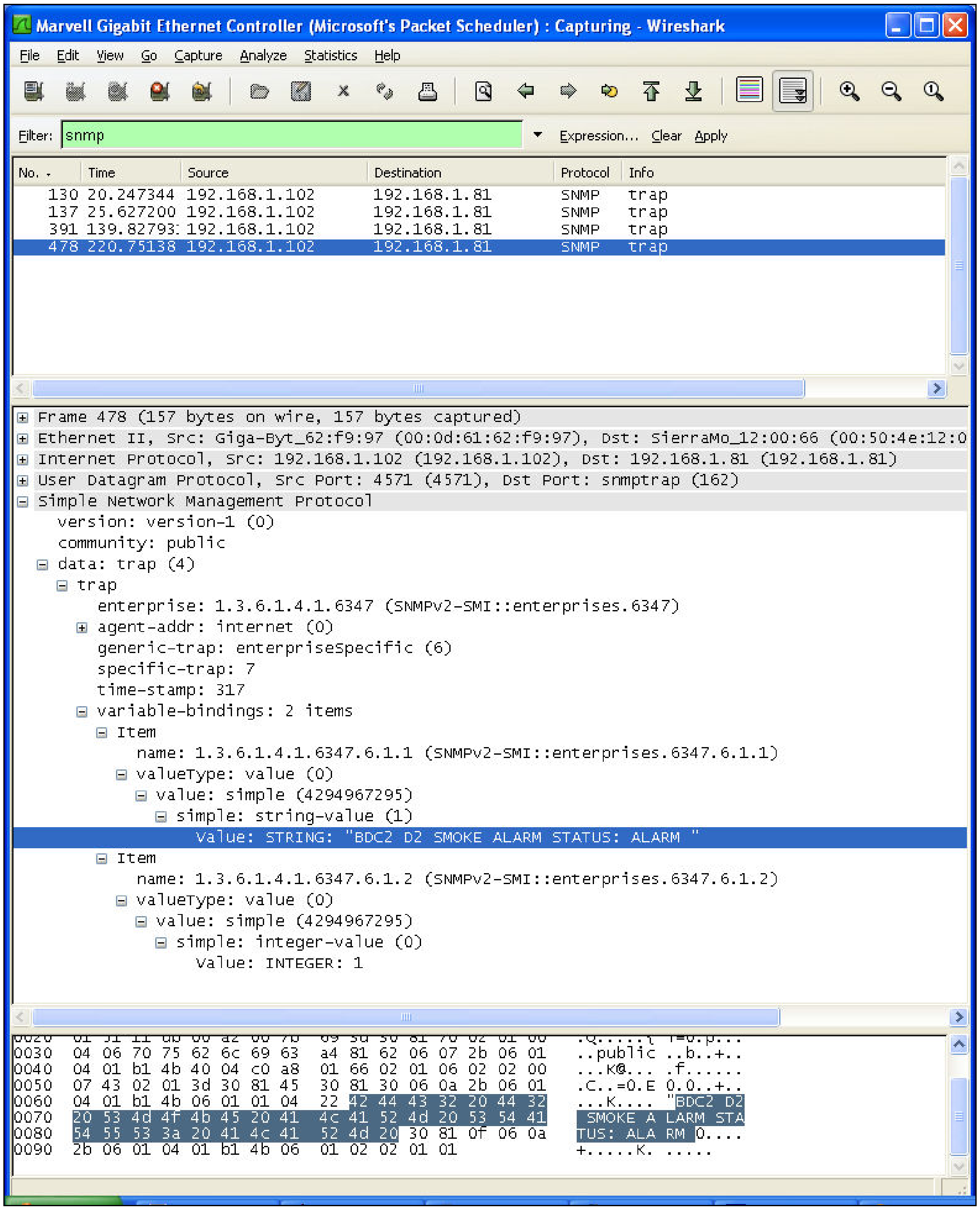
Style2 MIB File based on above configuration

```
FIELDSERVER-MIB DEFINITIONS ::= BEGIN

IMPORTS
enterprises, OBJECT-TYPE, MODULE-IDENTITY
FROM SNMPv2-SMI
TRAP-TYPE
FROM RFC-1215;

fieldservertechnologies MODULE-IDENTITY
LAST-UPDATED "200308121338Z"
ORGANIZATION
"FieldServer Technologies"
CONTACT-INFO
"info@fieldserver.com"
DESCRIPTION
"FieldServer Technologies"
::= { enterprises 6347 }

spr5519c OBJECT IDENTIFIER ::= { fieldservertechnologies  1 }

bdc2_d1_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
DESCRIPTION
"BDC2 D1 SMOKE ALARM Served from DA=DA_N2L1 offset=1
 Based on Cos_Normal=0 "
::= 6

bdc2_d2_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
DESCRIPTION
"BDC2 D2 SMOKE ALARM Served from DA=DA_N2L1 offset=2
 Based on Cos_Normal=0 "
::= 7

bdc2_d3_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
DESCRIPTION
"BDC2 D3 SMOKE ALARM Served from DA=DA_N2L1 offset=3
 Based on Cos_Normal=0 "
::= 8

bdc2_d4_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
DESCRIPTION
"BDC2 D4 SMOKE ALARM Served from DA=DA_N2L1 offset=4
 Based on Cos_Normal=0 "
::= 9

bdc2_d5_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
DESCRIPTION
"BDC2 D5 SMOKE ALARM Served from DA=DA_N2L1 offset=5
 Based on Cos_Normal=0 "
::= 10

bdc2_d6_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
DESCRIPTION
"BDC2 D6 SMOKE ALARM Served from DA=DA_N2L1 offset=6
 Based on Cos_Normal=0 "
::= 11

bdc2_d7_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
DESCRIPTION
"BDC2 D7 SMOKE ALARM Served from DA=DA_N2L1 offset=7
 Based on Cos_Normal=0 "
::= 12

bdc2_d8_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
DESCRIPTION
"BDC2 D8 SMOKE ALARM Served from DA=DA_N2L1 offset=8
 Based on Cos_Normal=0 "
::= 13

bdc2_d9_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
DESCRIPTION
"BDC2 D9 SMOKE ALARM Served from DA=DA_N2L1 offset=9
 Based on Cos_Normal=0 "
::= 14


END
```

Style3 MIB File based on above configuration

```
FIELDSERVER-MIB DEFINITIONS ::= BEGIN

IMPORTS
enterprises, OBJECT-TYPE, MODULE-IDENTITY
FROM SNMPv2-SMI
TRAP-TYPE
FROM RFC-1215;

fieldservertechnologies MODULE-IDENTITY
LAST-UPDATED "200308121338Z"
ORGANIZATION
"FieldServer Technologies"
CONTACT-INFO
"info@fieldserver.com"
DESCRIPTION
"FieldServer Technologies"
::= { enterprises 6347 }

spr5519c OBJECT IDENTIFIER ::= { fieldservertechnologies  1 }

fstTrapBaseOID  OBJECT IDENTIFIER ::= { fieldservertechnologies  6 }
fstTrapParameters   OBJECT IDENTIFIER ::= { fstTrapBaseOID  1 }

fstTrapasInt    OBJECT-TYPE
                SYNTAX INTEGER
                ACCESS read-only
                STATUS current
                DESCRIPTION
"Reports the current state as an Integer."
                ::={ fstTrapParameters 1 }

fstTrapasString OBJECT-TYPE
                SYNTAX OCTET STRING
                ACCESS read-only
                STATUS current
                DESCRIPTION
"Reports the current state as an String."
                ::={ fstTrapParameters 2 }

bdc2_d1_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
VARIABLES { fstTrapasString , fstTrapasInt }
DESCRIPTION
"BDC2 D1 SMOKE ALARM Served from DA=DA_N2L1 offset=1
 Based on Cos_Normal=0 "
::= 6

bdc2_d2_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
VARIABLES { fstTrapasString , fstTrapasInt }
DESCRIPTION
"BDC2 D2 SMOKE ALARM Served from DA=DA_N2L1 offset=2
 Based on Cos_Normal=0 "
::= 7

bdc2_d3_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
VARIABLES { fstTrapasString , fstTrapasInt }
DESCRIPTION
"BDC2 D3 SMOKE ALARM Served from DA=DA_N2L1 offset=3
 Based on Cos_Normal=0 "
::= 8

bdc2_d4_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
VARIABLES { fstTrapasString , fstTrapasInt }
DESCRIPTION
"BDC2 D4 SMOKE ALARM Served from DA=DA_N2L1 offset=4
 Based on Cos_Normal=0 "
::= 9

bdc2_d5_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
VARIABLES { fstTrapasString , fstTrapasInt }
DESCRIPTION
"BDC2 D5 SMOKE ALARM Served from DA=DA_N2L1 offset=5
 Based on Cos_Normal=0 "
::= 10

bdc2_d6_smoke_alarm TRAP-TYPE
ENTERPRISE fieldservertechnologies
VARIABLES { fstTrapasString , fstTrapasInt }
DESCRIPTION
"BDC2 D6 SMOKE ALARM Served from DA=DA_N2L1 offset=6
 Based on Cos_Normal=0 "
::= 11
```

Style3 Traps


Marvell Gigabit Ethernet Controller (Microsoft's Packet Scheduler) : Capturing - Wireshark
File Edit View Go Capture Analyze Statistics Help
Filter: snmp
Expression... Clear Apply

```
No.   Time         Source          Destination    Protocol  Info
  130 20.247344    192.168.1.102   192.168.1.81   SNMP      trap
  137 25.627200    192.168.1.102   192.168.1.81   SNMP      trap
  391 139.82793    192.168.1.102   192.168.1.81   SNMP      trap
  478 220.75138    192.168.1.102   192.168.1.81   SNMP      trap
```

```
⊞ Frame 478 (157 bytes on wire, 157 bytes captured)
⊞ Ethernet II, Src: Giga-Byt_62:f9:97 (00:0d:61:62:f9:97), Dst: SierraMo_12:00:66 (00:50:4e:12:0
⊞ Internet Protocol, Src: 192.168.1.102 (192.168.1.102), Dst: 192.168.1.81 (192.168.1.81)
⊞ User Datagram Protocol, Src Port: 4571 (4571), Dst Port: snmptrap (162)
⊟ Simple Network Management Protocol
    version: version-1 (0)
    community: public
  ⊟ data: trap (4)
    ⊟ trap
        enterprise: 1.3.6.1.4.1.6347 (SNMPv2-SMI::enterprises.6347)
      ⊞ agent-addr: internet (0)
        generic-trap: enterpriseSpecific (6)
        specific-trap: 7
        time-stamp: 317
      ⊟ variable-bindings: 2 items
        ⊟ Item
            name: 1.3.6.1.4.1.6347.6.1.1 (SNMPv2-SMI::enterprises.6347.6.1.1)
          ⊟ valueType: value (0)
            ⊟ value: simple (4294967295)
              ⊟ simple: string-value (1)
                  Value: STRING: "BDC2 D2 SMOKE ALARM STATUS: ALARM "
        ⊟ Item
            name: 1.3.6.1.4.1.6347.6.1.2 (SNMPv2-SMI::enterprises.6347.6.1.2)
          ⊟ valueType: value (0)
            ⊟ value: simple (4294967295)
              ⊟ simple: integer-value (0)
                  Value: INTEGER: 1
```

```
0030  04 06 70 75 62 6c 69 63  a4 81 62 06 07 2b 06 01   ..public ..b..+..
0040  04 01 b1 4b 40 04 c0 a8  01 66 02 01 06 02 02 00   ...K@... .f......
0050  07 43 02 01 3d 30 81 45  30 81 30 06 0a 2b 06 01   .C..=0.E 0.0..+..
0060  04 01 b1 4b 06 01 01 04  22 42 44 43 32 20 44 32   ...K.... "BDC2 D2
0070  20 53 4d 4f 4b 45 20 41  4c 41 52 4d 20 53 54 41    SMOKE A LARM STA
0080  54 55 53 3a 20 41 4c 41  52 4d 20 30 81 0f 06 0a   TUS: ALA RM 0....
0090  2b 06 01 04 01 b1 4b 06  01 02 02 01 01            +.....K. .....
```

Appendix A.4.1. Mib_Style_for_Traps' = 'Style2' – Trap Descriptions

Where the Node parameter 'Mib_Style_for_Traps' = 'Style2' then the driver will produce trap descriptions which indicate what will cause the trap to be generated. The examples below illustrate the kind of information provided in the trap description.

```
delta1 TRAP-TYPE
ENTERPRISE fieldserver_technologies
DESCRIPTION
"delta1 Served from DA=SNMP_DA_1 offset=0
 Based on COS_Normal='COS_Server_Event' with COS_Deadband=1.000000"
::= 6
```

```
temp_out_of_range TRAP-TYPE
ENTERPRISE fieldserver_technologies
DESCRIPTION
"temp out of range Served from DA=SNMP_DA_1 offset=1
 Based on COS_HI_Alarm=4.0000 COS_Deadband=0.0000
 Based on Cos_Hi_Warn=3.0000 COS_Deadband=0.0000"
::= 7
```

Appendix B. Troubleshooting Tips

Appendix B.1. HP Openview:

If the FieldServer is running and is not visible in the network topology, try restarting the network discovery as described in the HP Openview Network Node Manager User Manual.

Appendix C. Driver Error Messages

Message	Description/Action
SNMP:#01 Err. Response report err=%d	A response from the remote device reports an error. The message is good but inside the message there is a field reporting an error. Consult the vendor for the meaning of the printed SNMP error number.
SNMP:#02a/b Err. Could not read SNMP response version	The driver found an error in the message structure preventing it from extracting the SNMP version number. See msg #05 for follow up actions.
SNMP:#03a/b Err. Version. Expected=1 Rcvd=%d	This driver only supports SNMP version #1. See msg #05 for follow up actions
SNMP:#04a Err. Extract Int Failed. Index=%d	The driver is extracting an integer value from the SNMP message but the field was incorrectly formatted. Formatting can be checked using Ethreal[4]
SNMP:#04b Err. Expected INT. Found NULL. Index=%d	
SNMP:#05 Err. Parse Failed. MD=%s Msg Buffer	The driver is attempting to process a SNMP message that is not correctly formatted; contains an error or contains unsupported SNMP elements. Immediately after the message has been printed the driver does a hexadecimal dump of the message. If you see this message rarely and data is being transferred correctly then ignore it. If it is repeated or affects data transfer then take a log and call tech Support. This message is usually preceded by a message which provides a more specific clue as to why the parse failed.[4]
SNMP:#10 FYI. NuDesign MIB File=%s created. (Tier=%d)	These messages do not require any corrective action provided that they report what you expected. They are printed for confirmation only.
SNMP:#10 FYI. Custom MIB File=%s created. (Tier=%d)	
SNMP:#10 FYI. MIB File=%s created. (Tier=%d)	
SNMP:#11 Err. Can't open MIBHead.ini. Producing std MIB file	The configuration has told the driver to build a customized MIB file. This requires that a file called MIBHead.ini is present on the FieldServer. Refer to the configuration manual and Appendix A.3 for more information.
SNMP:#12 Err. Bad MD length - defaulting to 1	A MD was found where the length was not specified or specified as zero. Specify the length setting it to one. [5]
SNMP:#13 Err. Max=255 number of TRAP map descriptors exceeded	The default maximum number of trap Map Descriptors is 255.
SNMP:#14 Err. SNMP_TRAP map descriptor must have OID specified	You must specify the 'SNMP_OID" parameter on a Map Descriptor used for a trap. Read Appendix A for more information on Traps[5]
SNMP:#15 Err. Passive_Client map descriptor must have OID specified	
SNMP:#16 unknown SNMP_Read_Method value: %s	The only permitted value for the SNMP_Read_Method is 'walk'**Error! Bookmark not defined.**
SNMP:#17 Err. Diagnostic 1	The driver has executed an internal diagnostic. If this message is printed please call Tech Support.

[4] Refer to Enote 63 on the Website for more information.

[5] Edit the configuration file, downloaded the modified file to the FieldServer and restart the FieldServer for the changes to take effect.

Message	Description/Action
SNMP:#18 Err. Bad Send IP=%s	The IP address for a remote SNMP server (agent) has probably been incorrectly specified. Check the configuration file.[5]
SNMP:#19 Err. Can't send to Agent/Trap Dest. %s at %s	The FieldServer cannot reach the specified remote Node. The message prints the Node name and the IP address. This message is most commonly printed when: • The wrong IP address has been specified. • The remote Node is off or in an error state[6]
SNMP:#20 Err. Received set/get/getnext request	The Client side of the driver has received a request. It should only receive responses.[6]
SNMP:#21 Err. Bad community string	The SNMP message contains a badly formatted community string or the community string is absent. Read notes for msg#23
SNMP:#22 Err: Cant parse msg: found %#x at %d	A response to a poll from the FieldServer contains a bound variable that is not supported or expected. For example an IP_ADDRESS and OPAQUE variable or a TRAP. Immediately after this message the driver prints a hex dump of the offending message. Ensure that the remote SNMP server is correctly configured. Review the Driver fact Sheet for supported features. If you are confident that the FS should process the message correctly then capture a log and call tech Support. [5]
SNMP:#23 Err. Invalid Msg	The Server side of the driver has received a message from a SNMP client which is not correctly formatted or which contains bound variables/features not supported by the driver. This particular error message is printed when the SNMP message does not begin with 0x30. [5]
SNMP:#24 Err. Message length error	The SNMP message indicates that a message length is different to the number of bytes received. [5]
SNMP:#25 Err. Could not get Request ID	The SNMP message number is badly formatted or absent. [5]
SNMP:#26 Could not get Error Status	The SNMP error status field is badly formatted or absent. [5]
SNMP:#27 Could not get Error Index	The SNMP error id field is badly formatted or absent[5]
SNMP:#28 Expected SNMP_TYPE_SEQ	The message header is correctly formatted but as the driver continues parsing the message it can't find the bound variables. [6]
SNMP:#29 ERR. Couldn't respond to Get Request for OID	Immediately after this message the driver prints the value of the offending OID. The driver can only serve data for configured OID points. The OID must correspond to a FST system OID. 1.3.6.1.4.1.6347 and there must be a data array to serve the point (read Appendix A for more information). To resolve this problem you will have to reconfigure the remote client or the FS. [5]
SNMP:#30 FYI Int IP=%d.%d.%d.%d.%d Ext=%s	The Server side of the FieldServer can discover the IP address of the source Node from the IP packet header. The source Node IP address can also be reported inside the SNMP portion of the Ethernet message. This message is pronted if the tow IP addresses are different and is for information only. The driver uses the IP address contained in the SNMP portion of the message to locate a matching Node in the configuration. You may need to edit the configuration and change the IP address of the Node which sends

[6] Edit the configuration file, downloaded the modified file to the FieldServer and restart the FieldServer for the changes to take effect.

Message	Description/Action
	the traps for the FS to catch the traps. The driver only catches traps for configured Nodes. [5]
SNMP:#31 Err Couldnt parse msg: found %#x at %d	The server side of the driver could not complete parsing a message. Immediately after this message the driver prints a hex dump of the offending message. The driver prints this error when the SNMP message contains a field that is not supported by the driver.[7]
SNMP:#33 Err. Too many DA's to validate for SNMP. Max=%d	If the driver is configured as a Server agent then a remote Client may try and walk the FieldServer. To do this the driver requires one or more specially named Data Arrays. DA_SNMP_n where n=1,2,3,4 etc • DA_SNMP_1 corresponds to 1.3.6.1.4.1.6347.1 • 1.3.6.1.4.1.6347.1.0 corresponds to the 1st element of DA_SNMP_1; 1.3.6.1.4.1.6347.1.1 corresponds to the 2nd element of DA_SNMP_1, etc. • DA_SNMP_2 corresponds to 1.3.6.1.4.1.6347.2 • The length of the DA determines how many OID's correspond to each DA. To allow a walk the FS must, have at least DA_SNMP_1. There is a maximum limit of 1000 on the number of these DA's. The DA's must be numbered sequentially.**Error! Bookmark not defined.**
SNMP:#34 FYI. No DA's for walk by remote browser	If the FieldServer is configured as a SNMP Client you may ignore this message, If you have configured the FieldServer is configured as a Server then any attempt by a remote client to 'walk' the FieldServer will fail because there are none of the specially named Data Array's required to respond to the walk. Read the notes for Msg #33.
SNMP:#35 FYI. DA 'SNMP_DA_1' is missing. Walk will fail	
SNMP:#36 FYI. 'SNMP_DA_%d' is missing. Walk will fail	
SNMP:#37 FYI. No SNMP DA's for walk by remote browser.	Read the notes for Msg #33. There are no DA's suitable for a walk by a remote client.
SNMP:#38 FYI. DA names suitable for walk by remote browser	If the FieldServer is configured as a SNMP client, ignore the message. If the driver is configured as a Server then read MSg #33.
SNMP:#39 FYI. Use an array called <%s> to expose diagnostic info	Read 0
SNMP:#40 Err. Bad Node_ID - forcing to 11	If you allocate a Node_ID to the SNMP Node it must be a number in the range 1-255 inclusive. The driver has changed the Node_ID to 11. Node_ID's are used when Node_Status bits are prepared. Refer to Enote43 on the FST Web Site.
SNMP:#41 Err Undefined SNMP_OID_Index1	The driver has rejected a Map Descriptor because the parameter called 'SNMP_Trap_Store_Method' has been set to indexed/lookup and the driver requires that the parameter 'SNMP_OID_Index1' is defined. Refer to Appendix A.2[8]
SNMP:#42 Err Undefined SNMP_OID_Index2	The driver has rejected a Map Descriptor because the parameter called 'SNMP_Trap_Store_Method' has been set to indexed/lookup

[7] Refer to Enote 63 on the Website for more information

[8] Edit the configuration file, download the modified file to the FieldServer and restart the FieldServer for the changes to take effect

Message	Description/Action
	and the driver requires that the parameter 'SNMP_OID_Index2' is defined. Refer to Appendix A.2
SNMP:#43 Err Undefined SNMP_Trap_Store_Method	The driver found a Map Descriptor parameter heading 'SNMP_Trap_Store_Method' but could not find a value for it.. Refer to Appendix A.2[8]
SNMP:#44 Err Undefined SNMP_Write_as_Trap	The driver found a MD parameter heading 'SNMP_Write_as_Trap' but could not find a value for it. Refer to Appendix A.2Refer to Appendix A.2[8]
SNMP:#45 Err. Undefined SNMP_Read_Method	The driver found a MD parameter heading 'SNMP_Read_Method' but could not find a value for it. Refer to Appendix A.2[8]
SNMP:#46 FYI. Duplicate state=<%s>	Refer to Appendix A.2. When adding entries to the driver lookup table a duplicate lookup string was found. You probably did not intend this. [8]
SNMP:#47 Err. No space. Driver rejects value state=<%s> value=%d	Refer to Appendix. You are adding entries to the driver lookup table and the driver has run out of space. If you need more entries contact the FST sales group.
SNMP:#48 FYI. Added state=<%s> value=%d	This message is for information only. The driver prints it each time a new entry is added to the lookup table. Refer to Appendix A.2
SNMP:#49 Err. Cant find lookup table entry below	Refer to Appendix A.2. The driver has been told to store data from a trap using the lookup method. The search string was extracted from the trap but a matching entry could not be found in the table. If the data is required, a new entry for the table will need to be created. [8]
SNMP:#50 Err. Found non-string data while extracting string	Refer to Appendix A.2. The driver is building the search string by extracting data from the trap. The search string is built by extracting data from two OID fields which should be formatted as strings. A non-string has been found. To resolve this issue you will need to reconfigure the agent that produced the trap.
SNMP:#51 Err Indexed Store. Offset too big to store DAOffset=%d IndexOffset=%d Off=%d DA=%s Len=%d	Refer to Appendix A.2. The driver is storing data using the lookup method. The offset into the data Array that corresponds to the search string points beyond the end of the Data Array. You may need to increase the length of the Data Array or change the offset value associated with the search string. [8]
SNMP:#52 FYI. Lookup=%s:%s Value=%d DA:Off=%s:%d	This message is for information only. Each time the driver stores data using the lookup method this message is printed so that you can see the effect of the trap.
SNMP:#53 FYI Cant send trap with null string. DA=%s Off=%d	You are trying to send a trap with Ascii string data but the when the Data Array was inspected for data to form the string it found a zero in the 1st location and hence it thinks the string is empty. Make sure the data array has some data to form the string.
SNMP:#54 Err. Diagnostic DIAG_USER_1 - Bad TRAP Length	An internal diagnostic has been generated. Take a log and call Tech Support.[9]
SNMP:#55 Err. Multiple Objects Rquested.	The server can respond to polls for multiple objects in one SNMP message. Re-configure your SNMP client.
SNMP:#56 Err. Needs Data Array with name=%s	The server has received a poll for data. The polled OID corresponds to the named Data Array. The driver can't find the Data Array. Either reconfigure the remote client to poll for an appropriate point. Read Appendix A or correct the configuration adding the new Data Array.

[9] Refer to Enote 63 on the Website for more information

Message	Description/Action
SNMP:#57 Err. Data offline/expired. DA=%s Off=%d	A remote client has polled for data. The data at the location specified it 'too old' to serve. This usually means that the Client Node is offline and hence the FieldServer cannot update the data. A parameter called 'Cache_Age_Timeout' controls how old the data can be before the FieldServer refuses to serve it. Check the connection used to obtain the original data.
SNMP:#58 Err. Needs Data Array with name %	The server side of the driver has received a message which requires data to be stored in the named Data Array but the Data Array cannot be found. Check the configuration of the FieldServer vs. the configuration of the remote client.
SNMP:#59 Err. Store index %d exceeds Data Array %s length	The server side of the driver has received a message which requires data to be stored in the named Data Array at the specified offset. The Data Array is too short. Check the configuration of the FieldServer vs. the configuration of the remote client.
SNMP:#60 Err. Index Storage can only store Integer Values	Refer to Appendix A.2. The driver is storing data using the lookup method. The data that is stored is the data associated with the 'SNMP_OID" parameter in the configuration file. This OID must be bound to integer data. Check and correct the configuration of the FieldServer or the remote agent that produces the trap.
SNMP:#61 FYI Store Int. DA=%s:%d value=%d gen=%d	The driver is storing data. This message is for information only. The message tells you where the data was stored. It is intended as a debugging tool.
SNMP:#61 FYI Store ! String DA=%s:%d value=%d	
SNMP:#62 Err. Unsupported data_type: 0x%x	The driver is storing data but the data type is not supported. Check the Driver fact sheet to see what data types are supported and then correct the configuration of the remote client/agent that produced the trap.
SNMP:#63a Err. Cant open %s	These messages should only be printed during the execution of QA script. If you see this message call tech Support.
SNMP:#63b FYI. Response was sent from %s (Hex file)	
SNMP:#63b FYI. Response was sent from %s (Hex file)	
SNMP:#63c FYI. Looking for file=<%s> for response.	
SNMP:#64 Err. Could not free socket handle %x	Take a log including an ethereal log. Then restart the FieldServer with the log running. If the error is repeated then stop the log. If the error doesn't repeat let the log run for 5 minutes and then stop. Now call Tech support.
SNMP:#65a/b Err. Diagnostic 5 - Response suppressed.	If this message is printed, please take a log and contact tech support. The driver has executed a diagnostic that should only occur during factory testing. The a/b in the message indicate the reason the response was suppressed
SNMP:#66 FYI. Writing traps to Mib file using 'style2'	This message is for your information only. If it confirms your expectation then ignore this message. The message is printed each time a MIB file is produced and 'style2' is used to document the trap section of the Mib File. Refer to Appendix A.4 for more information.

Appendix C.1. Exposing Driver Statistics

In addition to the standard FieldServer operating statistics the driver exposes certain key statistics in a Data Array if required. A Server device can then monitor these stats.

Add the following to your configuration file to activate these statistics if the driver is configured as a Client.

```
// Expose Driver Operating Stats.

Data_Arrays
Data_Array_Name,                                  Data_Format,          Data_Array_Length
snmp-stats,                                       UINT32,               200
```

The following statistics are exposed. The table below provides the offset into the Data Array where you will find the statistic.

Offset	Stat
1	There are Server Data Arrays suitable for a walk. The driver sets this offset non-zero if this is true. Read Error message #33 in Appendix C
2	Increments each time a lookup store tries to store at an index > DA length
3	Counts the number of bytes sent by FS in the form of non-COV traps
4	Counts the number of messages sent by FS in the form of non-COV traps
5	Counts the number of bytes sent by FS in the form of COV traps
6	Counts the number of messages sent by FS in the form of COV traps
7	Counts the number of bytes sent by FS in the form of polls
8	Counts the number of messages sent by FS in the form of reads
9	Counts the number of messages sent by FS in the form of writes
10	Counts the number of bytes received by the server. (Excludes Traps)
11	Counts the number of messages received by the server. (Excludes Traps)
12	Counts the number of tap message bytes received by the server.
13	Counts the number of trap messages received by the server.
14	Counts the number of server messages that were received and parsed without error
15	Counts the number of server messages that were received and parsed with error (excludes multiples object requests)
16	Counts the number of server messages that were received and parsed and rejected because they requested multiple objects
17	Counts the number of client side responses that were parsed without error