



SNMP in the Real World:

Experiences of Using an Ancient Protocol in a Modern Broadcast Facility

Tony Peterle, Worldcast Systems Inc.

SNMP and Me: Questions to answer

- What is SNMP?
- How does it apply to me?
- How are others using it?
- How do I get started?

SNMP and Me: Questions to answer

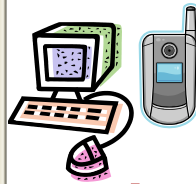
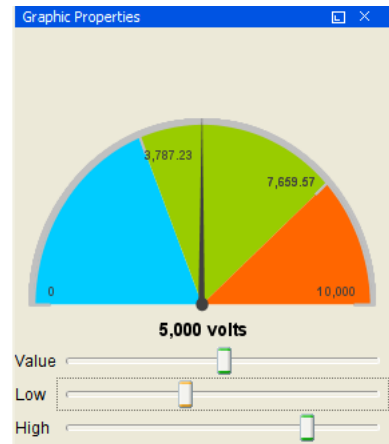
Simple Network Management Protocol

- What is SNMP?
 - Standardized protocol for query and response of data points (Objects)
 - Querying equipment is called an SNMP Manager
- How does it apply to me?
 - Target equipment is called an SNMP Agent
- How are others using it?
 - Objects are designated by a unique number called the Object Identifier, or OID
- How do I get started?

: := 1.3.6.1.4.1.5299.15.12.1.11.1.1.8

SNMP functions

- SNMP commands to retrieve and control data in target device
 - GET command to query a data point and display results
 - SET command to change a data point – control functions in target



GET



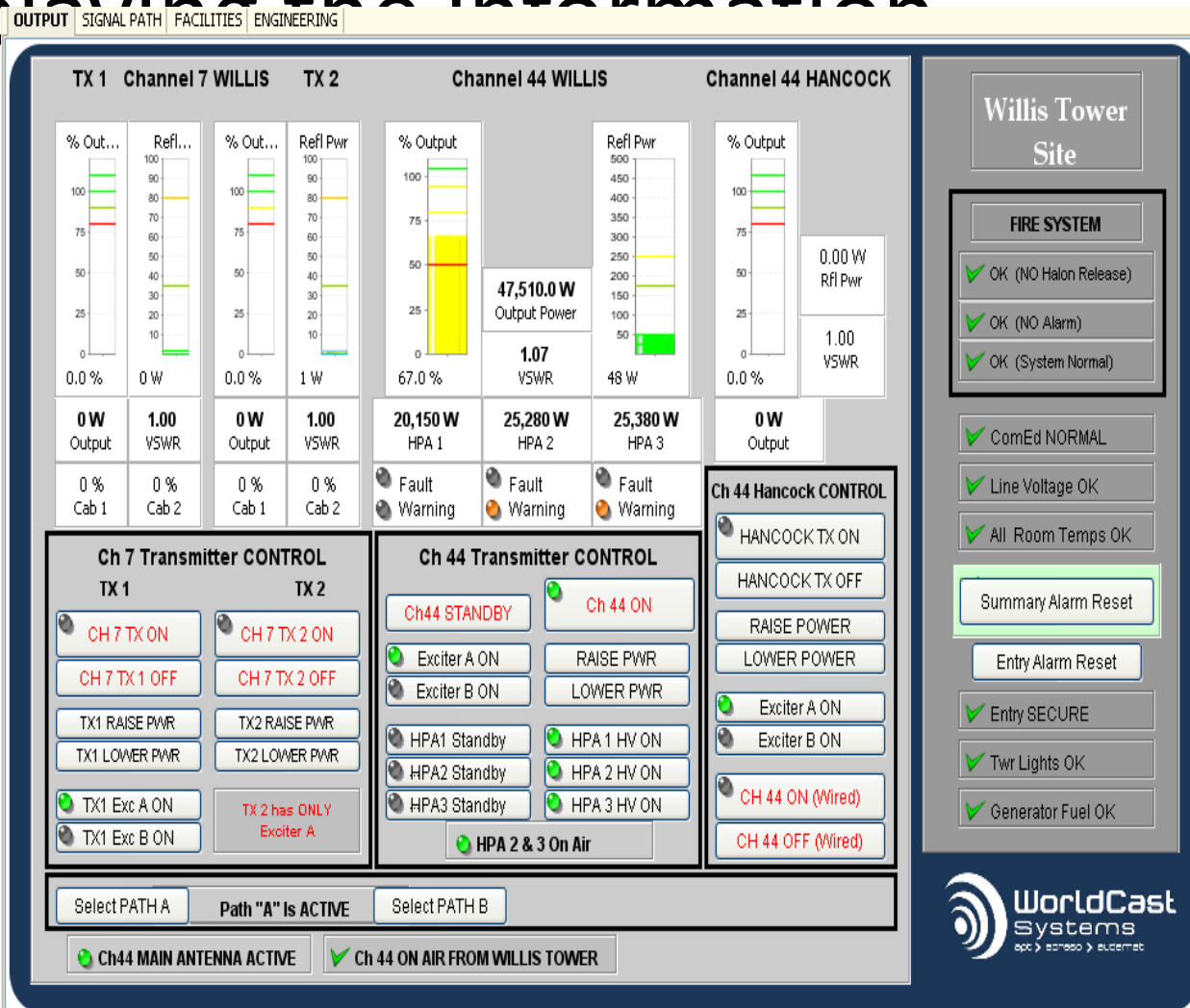
TCP-IP



Target equipment

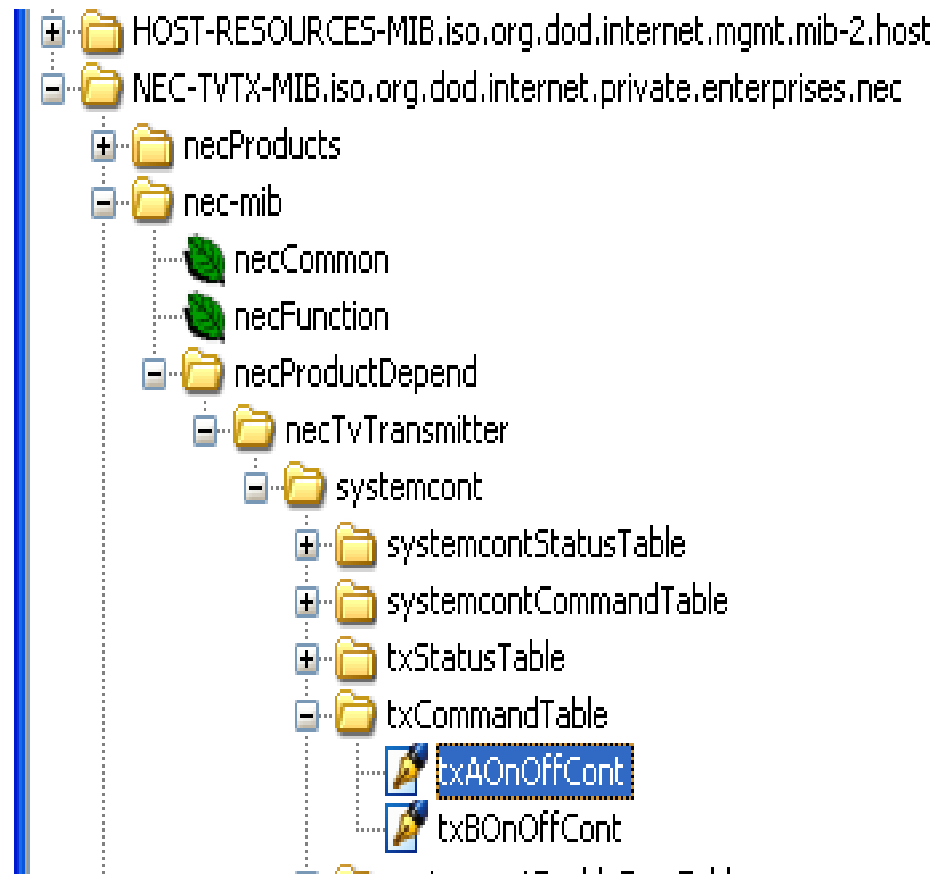
Displaying the information

Data and control functions obtained using SNMP can be integrated with other data and controls from traditional I/O or from serial data.



SNMP: Menu of Objects (MIB)

▲ The Management Information Base, or MIB, is a directory tree 'menu' of the OIDs available on a particular SNMP Agent device.



SNMP and Me: Questions to answer

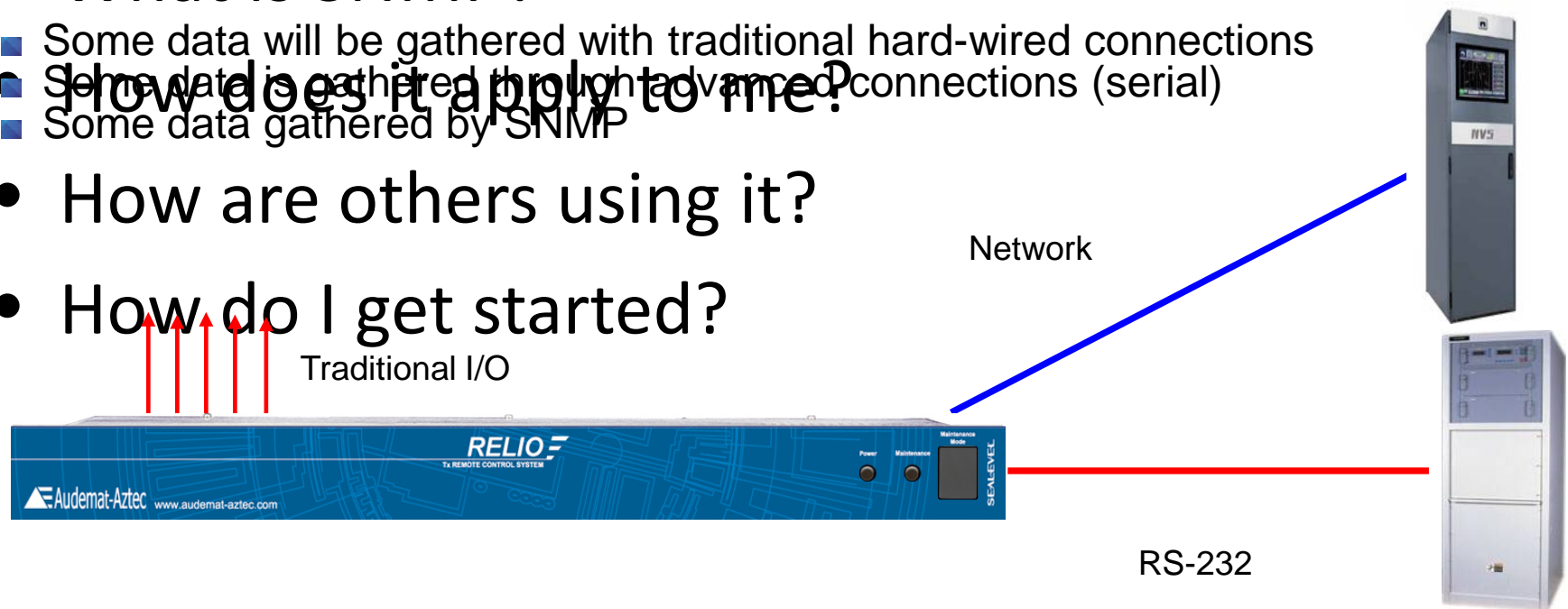
Think of SNMP as just another connection to the target gear

- What is SNMP?

- Some data will be gathered with traditional hard-wired connections
- Some data is gathered through advanced connections (serial)
- Some data gathered by SNMP

- How does it apply to me?
- How are others using it?

- How do I get started?





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deliver > transmit > monitor

Lots of things speak SNMP



Broadcast



IT Gear



UPS systems



HVAC systems



IP links



Monitors



Codecs

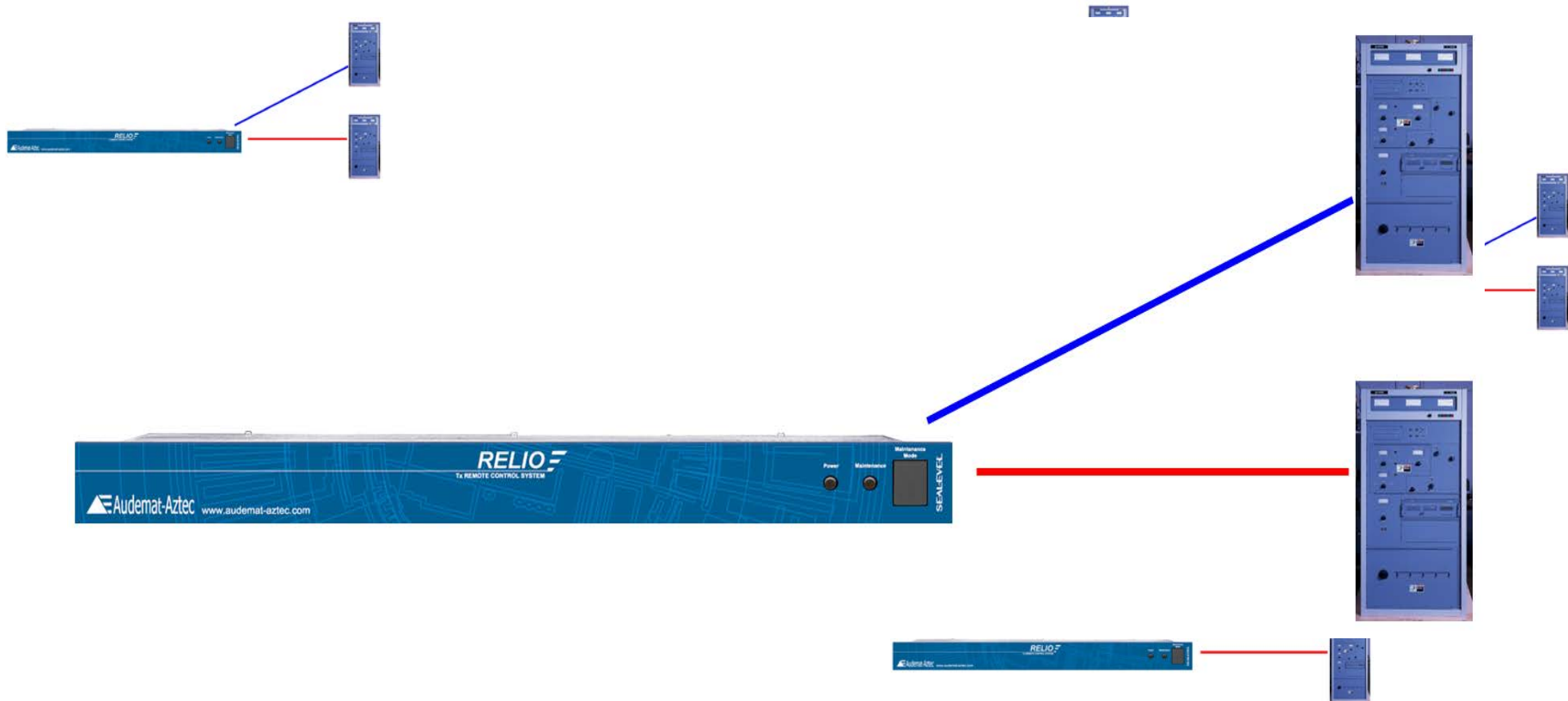


Facility Control



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Site-to-site communications

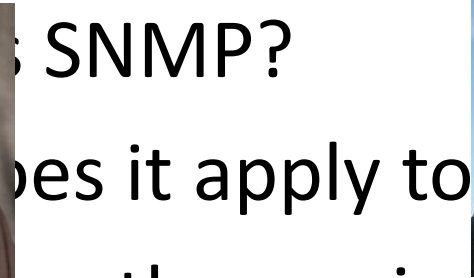


SNMP and Me: Questions to answer

- What is SNMP?
- How does it apply to my business?
- How are others using it?
- How do I get started?



Josh Hadden
Clear Channel
New York City



Steve Frick
Clear Channel
San Diego



Garry Shults
WLS-TV
Chicago



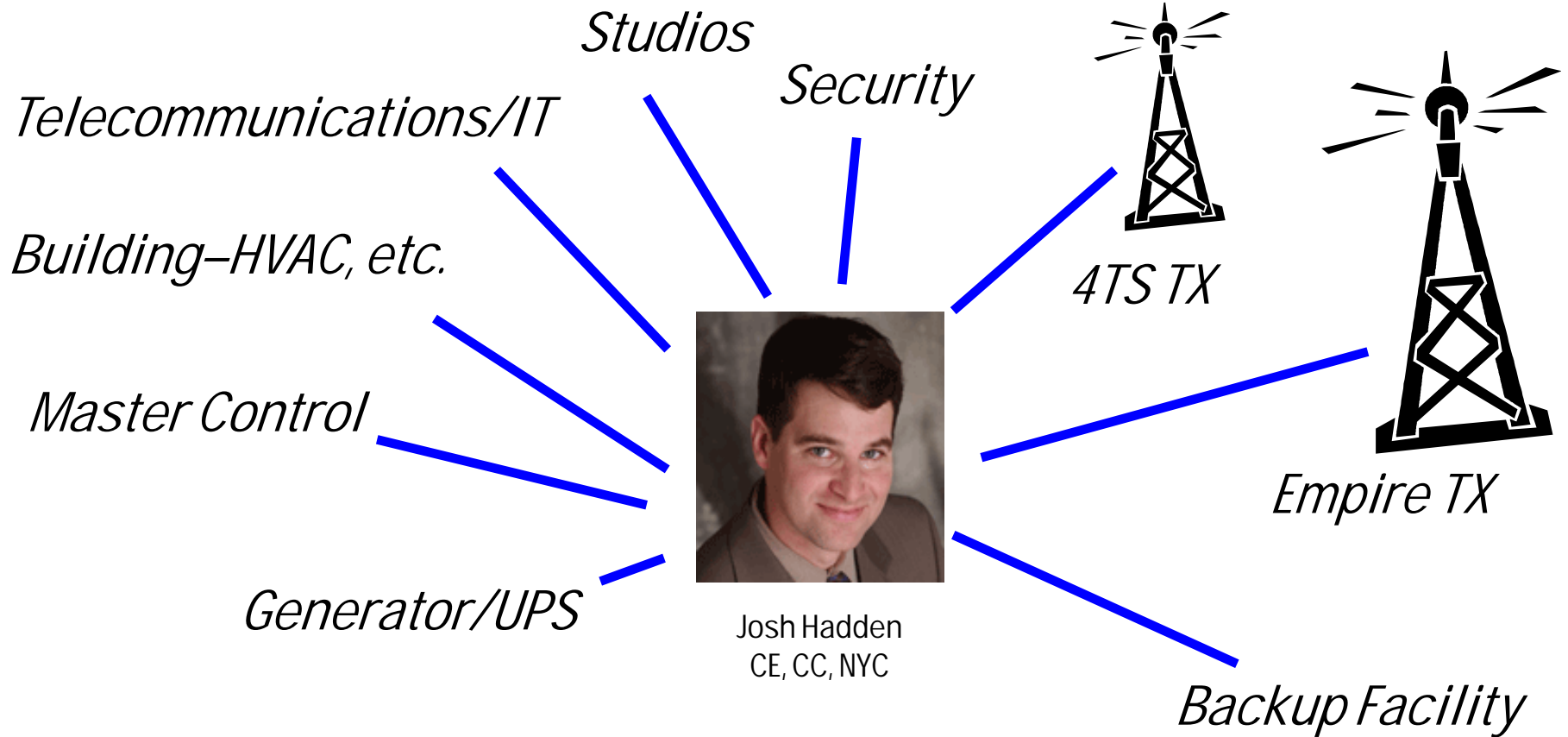
Doug Irwin
Clear Channel
Los Angeles



Brett Gilbert
Clear Channel
Tulsa

Meet the SNMP team

Real World #1





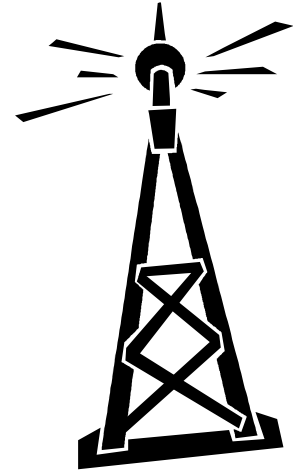
WorldCast Systems

deliver>transmit>monitor

1. Call Times Square transmitter
 - a. Ensure that coax switch is set to antenna
 - b. Ensure that an audio source is selected and okay.
 - c. Turn on transmitter
 - d. Take a set of readings to verify operation.
 - e. Hang up.
2. Call Empire transmitter
 - a. Turn off transmitter auto switch
 - b. Turn off FM transmitter
 - c. Turn off HD transmitter
 - d. Take a set of readings to verify everything is off.
 - e. Acknowledge alarms that site has no RF and audio.
 - f. Hang up
3. Repeat this for the other four stations.



4TS TX

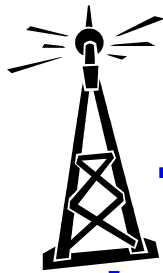


Empire TX

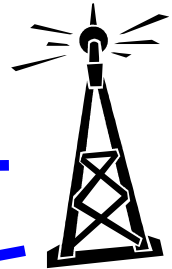
Empire TX

SNMP – an easier way

4TS TX



Ping, SNMP data and
commands

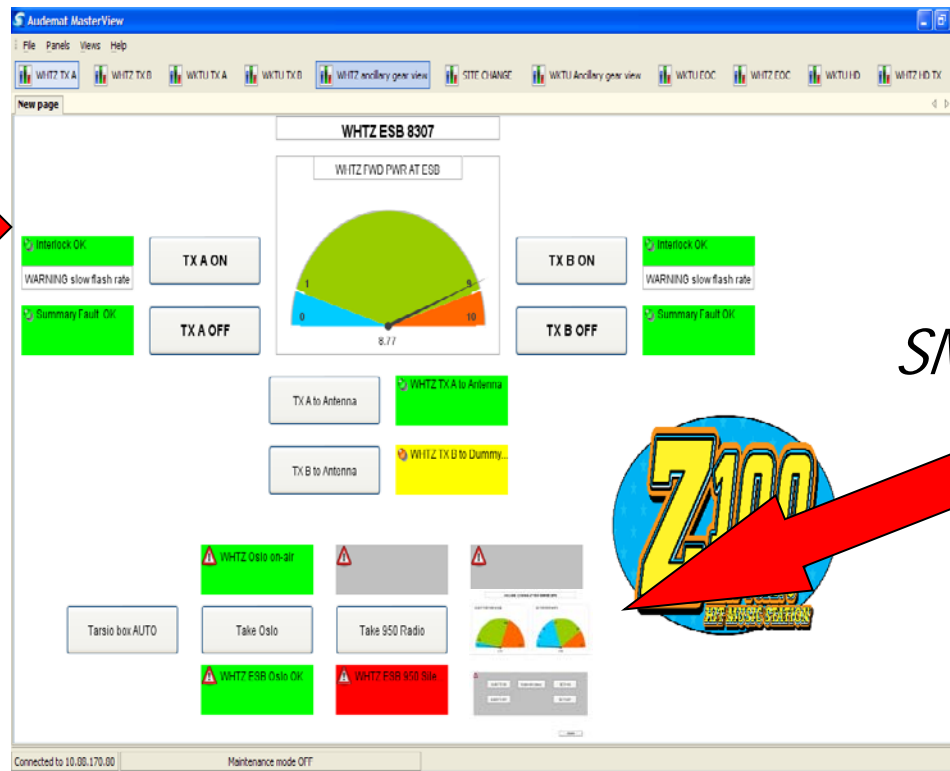
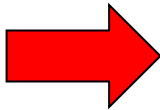
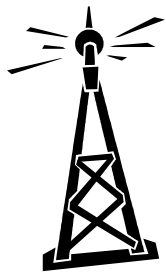


Control
point

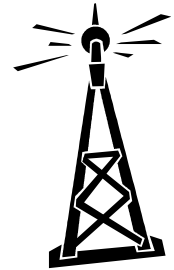
- a. Verify coax switch positions.
 - b. Turn on transmitter
 - c. Verify all critical readings - TPO, VSWR, faults, etc.
 - d. Mask alarms at site going off line.
 - e. Shut off HD transmitter
 - f. Shut off FM transmitter
 - g. Contact STUDIO relio and verify presence of audio and RF.
 - h. After five minutes verify that PPM codes are still present.
 - i. Repeat for each station.
1. Connect to any Relio
 2. Enable transmitter control
(to prevent accidental button pushes)
 3. Select which station(s) to switch.

Sharing controls between sites

Empire TX



4TS TX



SNMP

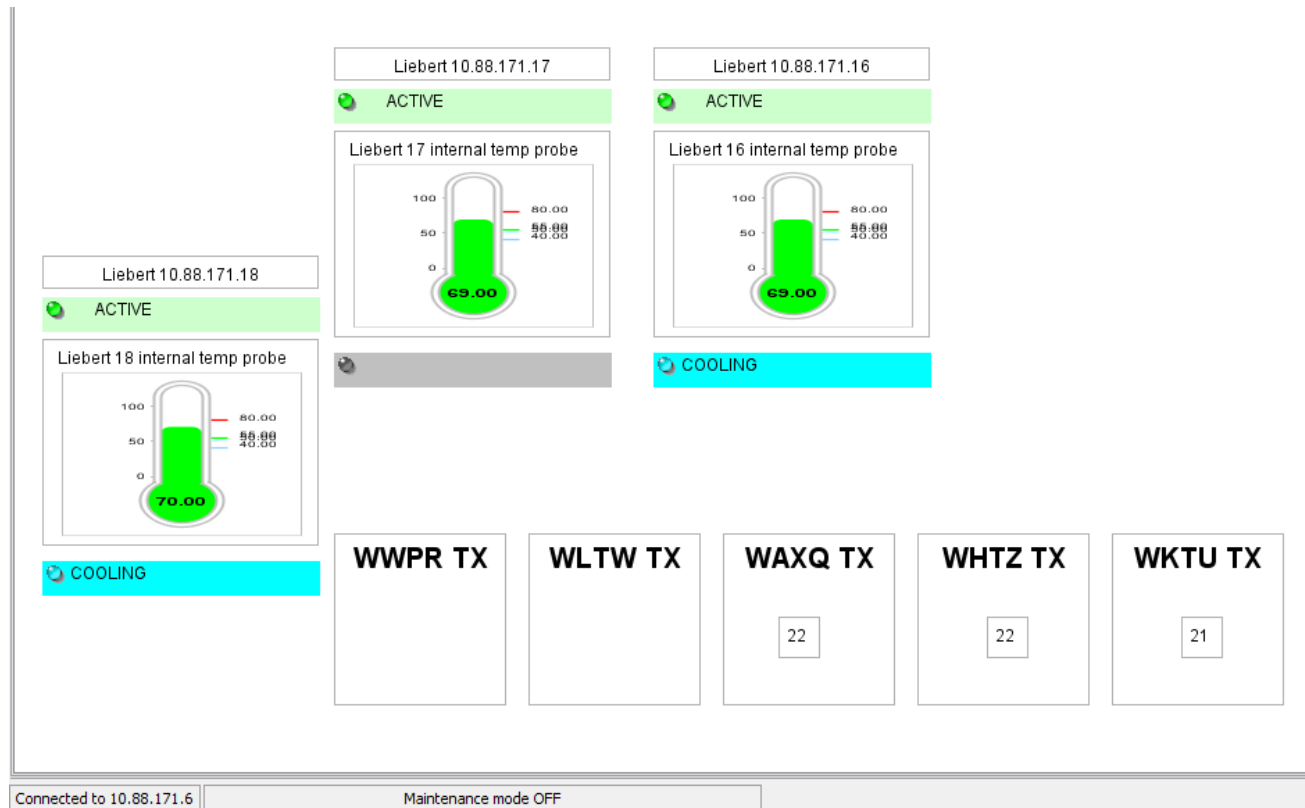




WorldCast Systems

deliver > transmit > monitor

Liebert HVAC system – data from SNMP



The Doomsday script

“So last Friday afternoon at 340 pm...I get an e-mail and phone call from one of our 4TS Relios. I interpreted its messages, somewhat incredulously...

Turns out that the Z100 transmitter on-air at ESB crashed because some water had leaked from the ceiling above it. The station was off—the ‘auto site-switch’ script running at 4TS did its thing. This was the first time it actually ever got called in to service.

No one here (aside from Engineering) even knew what happened. ”

- Doug Irwin



Doug Irwin
Clear Channel
Los Angeles



Real World #2



Garry Shults
WLS-TV
Chicago

M

OUTPUT

SIGNAL PATH

FACILITIES

ENGINEERING

WILLIS SITE CH 44 TRANSMITTER

Make certain you understand what you are doing prior to activating ANY controls on this page!

2.90 %
Exciter A EVM

36.00 %
Exciter B EVM

30.0 dB
Exciter A SNR

28.10 dB
Exciter B SNR

MODE CONTROLS

Green LED Indicates current Status

Switch To HPA 1 ONLY Online

Switch To HPA 2 ONLY Online

Switch To HPA 3 ONLY Online

Switch To HPA 1 & 2 ONLY Online

Switch To HPA 1 & 3 ONLY Online

Switch To HPA 2 & 3 ONLY Online

Switch To HPA 1 & 2 & 3 OnLine

ANTENNA CONTROLS and STATUS

Switch to Main Antenna

Switch to Aux Antenna

Operating in HPA 1&2&3 Mode is possible **ONLY** on the Main Antenna. You **MUST** switch to another HPA mode **BEFORE** switching to the Aux Antenna.

HPA ON/OFF Controls

HPA 1 Standby

HPA 2 Standby

HPA 3 Standby

HPA 1 HV ON

HPA 2 HV ON

HPA 3 HV ON

NOTE: The HPA will only stay in Standby for 20 minutes unless put into HPA HV ON (Beam ON). Otherwise it will go back into BG Heat. LED is on in "Standby" or "Hv" but not both.

HPA Warm-Up TIMER Status

HPA 1 Timer READY

HPA 2 Timer READY

HPA 3 Timer READY

HPA READY Status

HPA 1 Ready

HPA 2 Ready

HPA 3 Ready

To change modes, ALL selected HPA's which will be in the new pattern must have both TIMER and READY status LED's GREEN. Otherwise, NO SWITCH WILL OCCUR!

HPA FAULTS & ON-LINE Status

HPA 1 Shows NO Fault

HPA 2 Shows NO Fault

HPA 3 Shows NO Fault

NOTE: Faults only display for an HPA with a green LED indicating it is On-Line. An Off-Line HPA's LED is dark, does not show faults and will not trigger Summary Alarms.

Individual HPA Power Adjust

Green indicates HPA is in Remote

HPA 1 Pwr Raise

HPA 2 Pwr Raise

HPA 3 Pwr Raise

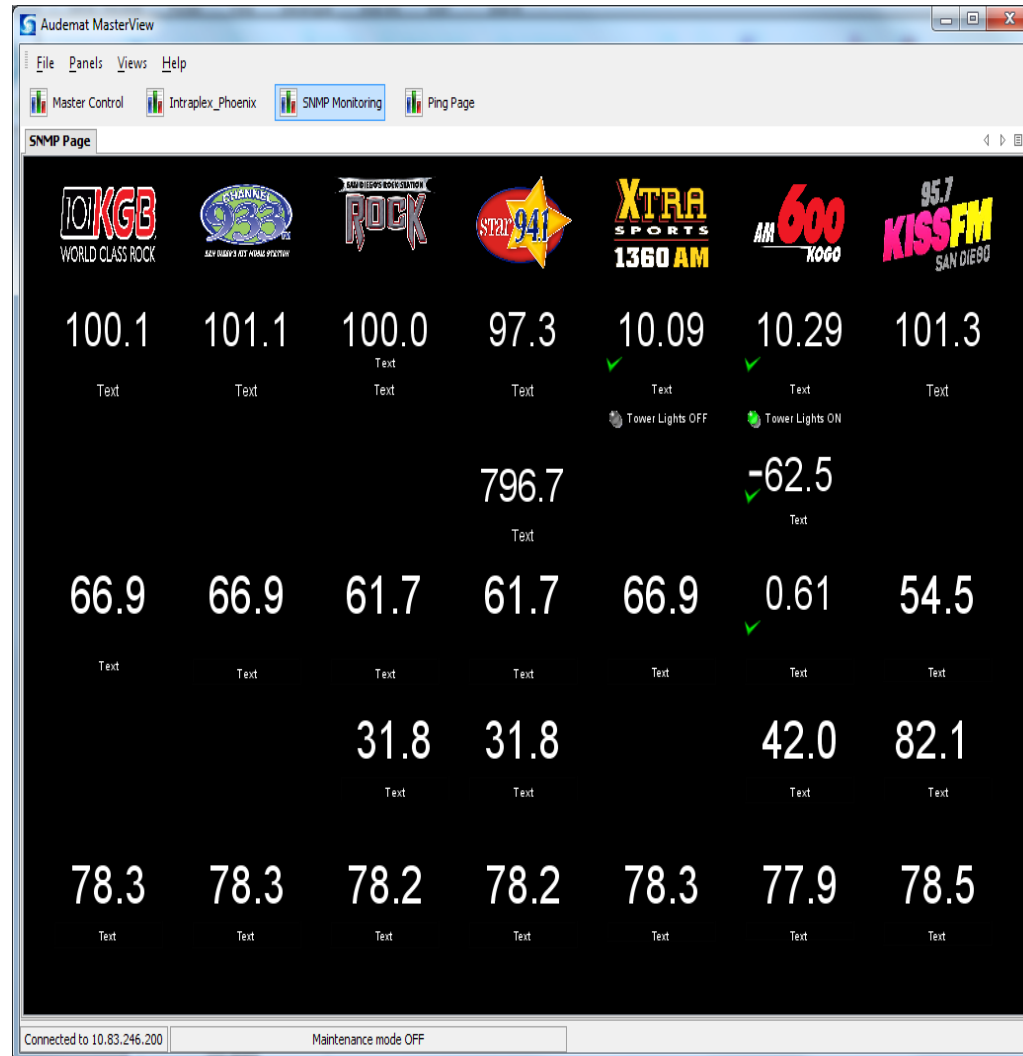


WorldCast
Systems
deliver>transmit>monitor

Real World #3



Brett Gilbert
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Tulsa




Steve Frick
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San Diego

SNMP and Me: Questions to answer

- Acquire some basic software tools
 - Advanced text editor
 - MIB browser
- How does it apply to me?
 - Identify target SNMP equipment on your network
 - Manufacturer data, brochures
- How are others using it?
 - Get the MIB file
- How do I get started?
 - Choose some Data Objects, test GET and SET commands, see what happens!

SNMP tools – Notepad++



more languages

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News

French Presidential Election - Vote for Chuck Norris!
May 02 2012

Notepad++ 6.1.2 released
Apr 26 2012

France, the future country of fascism?
Apr 22 2012

Notepad++ 6.1.1 - License (GPL) enhanced
Apr 17 2012

Notepad++ 6.1 released

About

Notepad++ is a free (as in "free speech" and also as in "free beer") source code editor and Notepad replacement that supports several languages. Running in the MS Windows environment, its use is governed by [GPL](#) License.

Based on the powerful editing component [Scintilla](#), [Notepad++](#) is written in C++ and uses pure Win32 API and STL which ensures a higher execution speed and smaller program size. By optimizing as many routines as possible without losing user friendliness, [Notepad++](#) is trying to reduce the world carbon dioxide emissions. When using less CPU power, the PC can throttle down and reduce power consumption, resulting in a greener environment.

Why do I need an “advanced” text editor?

Let’s play “Find the Imports”!

```
#####DIVICOM-EUROPA-MIB FORCE-
INCLUDE <stdio.h> FORCE-INCLUDE <types.h> FORCE-INCLUDE <wrn/wm/snmp/engine/asn1.h> FORCE-
INCLUDE <wrn/wm/snmp/engine/mib.h> FORCE-INCLUDE <wrn/wm/snmp/engine/snmpdefs.h> FORCE-INCLUDE
<wrn/wm/snmp/engine/snmp.h> FORCE-INCLUDE <wrn/wm/snmp/engine/auxfuncs.h> FORCE-INCLUDE
<wrn/wm/snmp/vxagent/europaskel.h> FORCE-INCLUDE <wrn/wm/snmp/vxagent/europaleaf.h> -- DEFAULT
get-function-async europaControl_get -- DEFAULT next-function-async europaControl_next -- DEFAULT
get-function-async europaTrapClientEntry_get -- DEFAULT next-function-async europaTrapClientEntry_next
-- DEFAULT set-function-async europaTrapClientEntry_set -- DEFAULT test-function-async
europaTrapClientEntry_test -- DEFAULT get-function-async europaLastAlarmEntry_get -- DEFAULT
next-function-async europaLastAlarmEntry_nextDEFINITIONS ::= BEGINIMPORTS enterprises, IPAddress, Counter,
TimeTicks FROM RFC1155-SMI OBJECT-TYPE -- FROM RFC 1212 FROM SNMPv2-SMI TRAP-TYPE
FROM RFC-1215;-- Define the top of this MIB (europa, reference on CDR document)divicom OBJECT IDENTIFIER ::= {
enterprises 898 }europa OBJECT IDENTIFIER ::= { divicom 9 } DisplayString ::= OCTET STRING --
This data type is used to model textual information taken -- from the NVT ASCII character set. By convention,
objects -- with this syntax are declared as having -- Size (0..255); ObjectIdentifier ::= OCTET
STRING -- It is being represented as an ObjectIdentifier rather than a -- string, with the string components
being replaced by numbers.-- Next, we will add the following section:europaControl OBJECT IDENTIFIER ::= {
europa 1 }europaCodeVersion OBJECT-TYPE SYNTAX DisplayString (SIZE(0..64)) MAX-ACCESS read-
only STATUS current DESCRIPTION "The official code version which is compiled into the code,
this is the same as the codeversion attribute in the XML" ::= { europaControl 1 }europaCodeuser OBJECT-
TYPE SYNTAX DisplayString (SIZE(0..32)) MAX-ACCESS read-only STATUS current DESCRIPTION
"This is the user who did the build (if it is a private build) or empty if it is an official build.
This is the same as the User attribute in the XML" ::= { europaControl 2 }europaMibversion OBJECT-
TYPE SYNTAX DisplayString (SIZE(0..32)) MAX-ACCESS read-only STATUS current DESCRIPTION
"This is the revision version of this mib. Because most revisions will be caused by additions to the
XML regtype or alarmId enumerations, we will actually be using the XML version here. If any non-
autogenerated components of the MIB change, we will explicitly bump the XML version in the schema
to track this. This is equivalent to the xmlversion attribute in the XML." ::= { europaControl 3 }
europaAlarmLastId OBJECT-TYPE SYNTAX INTEGER MAX-ACCESS read-only STATUS current
DESCRIPTION "This is the sequence number of the last assert, remit, or transient alarm sent,
similar to what is in CSD_Alarms in the XML. This is used to resynchronize the trap management
system with the encoder. Counters wrap at 32 bits (unsigned number)." ::= { europaControl 4 }
```


Divicom Europa MIB file in Notepad ++

```
49  
50 DEFINITIONS ::= BEGIN  
51  
52 IMPORTS  
53     enterprises, IPAddress, Counter, TimeTicks  
54     FROM RFC1155-SMI  
55     OBJECT-TYPE  
56     -- FROM RFC-1212  
57     FROM SNMPv2-SMI  
58     TRAP-TYPE  
59     FROM RFC-1215;  
60 -- Define the top of this MIB (europa, reference on CDR document)  
61 divicom OBJECT IDENTIFIER ::= { enterprises 898 }  
62 europa  OBJECT IDENTIFIER ::= { divicom 9 }  
63     DisplayString ::=  
64     OCTET STRING  
65     -- This data type is used to model textual information taken  
66     -- from the NVT ASCII character set. By convention, objects
```

SNMP books and reference material

• Net-SNMP

Current release: 5.7.1

About

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- History
- Change Log
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Related Info/SW



A composite image of images from locations that use the Net-SNMP package. [Click here for more information.](#)

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Simple **N**etwork **M**anagement **P**rotocol (**SNMP**) is a widely used protocol for monitoring the health and welfare of network equipment (eg. routers), computer equipment and even devices like UPSs. Net-SNMP is a suite of applications used to implement **SNMP v1**, **SNMP v2c** and **SNMP v3** using both IPv4 and IPv6. The suite includes:

SNMP uses a manager/agent architecture. Alarm messages (Traps) are sent by the agent to the manager.

DAVID PERKINS • EVAN MCGINNIS

MIB Browser

iReasoning MIB Browser

File Edit Operations Tools Bookmarks Help

Address: 127.0.0.1 Advanced... OID: .1.3.6.1.4.1.119.2.3.96.41.4.1.0 Operations: Get Go

SNMP MIBs

- dummyControlCont
- systemChangeCont
- mainstbyAntSelectCont
- txStatusTable
- txCommandTable
- txAOnOffCont**
- txBOnOffCont

Result Table

Name/OID	Value	Type

txAOnOffCont Details:

Name	txAOnOffCont
OID	.1.3.6.1.4.1.119.2.3.96.41.4.1
MIB	NEC-TVTX-MIB
Syntax	INTEGER {txAOff(1),txAOn(2)}
Access	read-write
Status	mandatory
DefVal	
Indexes	

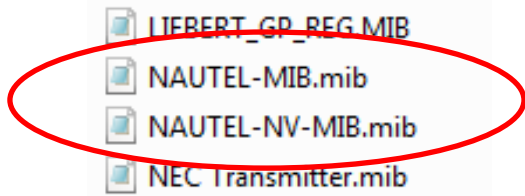
.iso.org.dod.internet.private.enterprises.nec.nec-mib.necProductDepend.necTvTransmitter.systemcont.txCommandTable.txAOnOffCont.0

SNMP tools – MIB Browser

- MIB browser CAN
 - Provide an essential window into the SNMP world
 - Examine MIB files, browse to and read about all OIDs
 - Examine MIB structure, tables, traps, imports
 - WALK the MIB – test OIDs individually and en masse
 - GET data from any specific OID – see raw values
- MIB browser can (typically) NOT
 - Automatically poll Agent for data or issue SET commands
 - Notify technical personnel of parameters that exceed thresholds
 - Integrate data and readings from traditional I/O connections

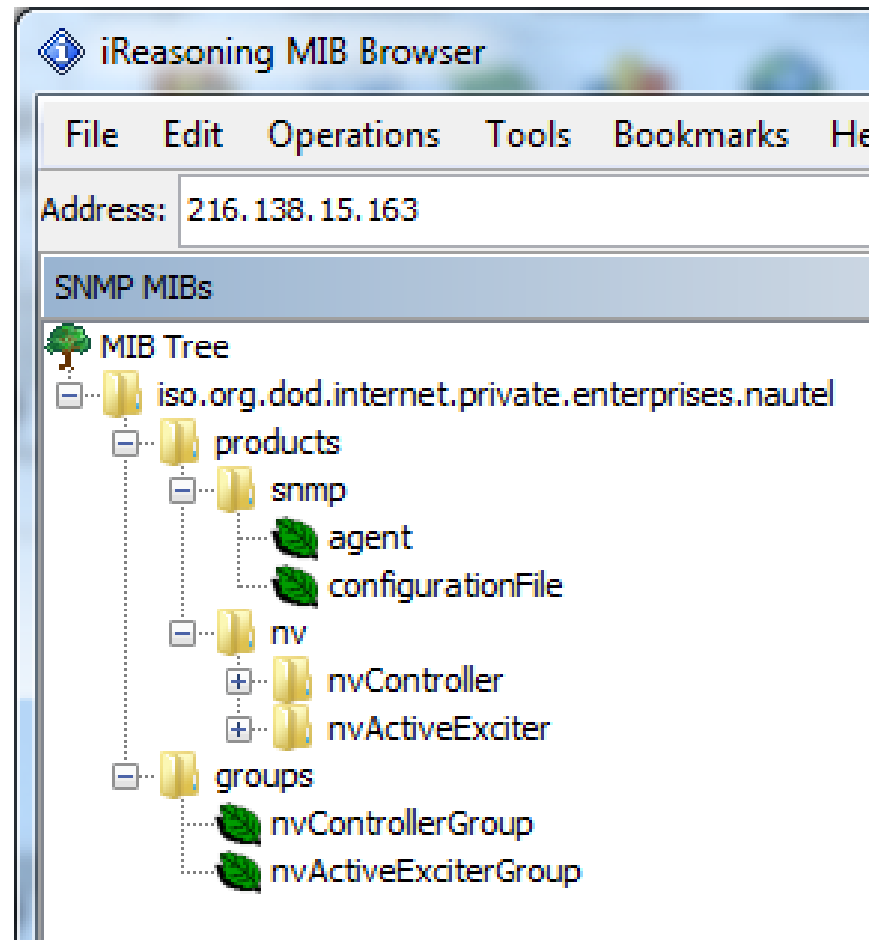
SNMP example – Nautel NV Transmitter

- SNMP ready
- Software update
- 2 MIB files
 - Nautel general
 - NV specific



Nautel NV MIB file in browser

- “Easy” MIB
 - No tables
 - No traps
- Two object groups
 - Controller
 - Active Exciter



Nautel NV transmitter – GET single OID

OID: .1.3.6.1.4.1.28142.1.200.256.311.0 Operations: Get Go

Name/OID	Value	Type	IP:Port
nvControllerTotalRMSForwardPowerMeter.0	0	Integer	216.138.15....
nvControllerTotalRMSForwardPowerMeter.0	512	Integer	216.138.15....

nvControllerActiveExciter
nvControllerAutoExciterChangeovers

Name	nvControllerRFOffOnState
OID	.1.3.6.1.4.1.28142.1.200.256.35
MIB	NAUTEL-NV-MIB
Syntax	INTEGER {off(0), on(1)}
Access	read-write
Status	current
DefVal	
Indexes	
Descr	RF On/Off state (0 =OFF, 1 =ON)

Active Preset : Preset 1 (1)

Power: **0.51 kW**

Point 0.50 kW Mode FM

ected 0.00 W Frequency 100.5MHz

AM-AM Correction

Blackm 1.00 Gain: 0.99

Active Ex FM Modulation 0%

iReasoning MIB Browser

File Edit Operations Tools Bookmarks Help

Address: 216.138.15.163 Advanced... OID: .1.3.6.1.4.1.28142.1.200.1025.1583.0 Operations: Walk Go

SNMP MIBs

Result Table

Name/OID	Value	Type	IP:Port
nvControllerExternal10MHzAlarm.0	on (1)	Integer	216.138.15....
nvControllerSummaryAlarm.0	on (1)	Integer	216.138.15....
nvControllerPlus5AMeter.0	549	Integer	216.138.15....
nvControllerPlus5BMeter.0	553	Integer	216.138.15....
nvControllerPlus15AMeter.0	151	Integer	216.138.15....
nvControllerPlus15BMeter.0	150	Integer	216.138.15....
nvControllerMinus15AMeter.0	-158	Integer	216.138.15....
nvControllerMinus15BMeter.0	-157	Integer	216.138.15....
nvControllerPlus12AMeter.0	127	Integer	216.138.15....
nvControllerPlus12BMeter.0	127	Integer	216.138.15....
nvControllerAmbientTemperature...	39	Integer	216.138.15....
nvControllerRFDriveMeter.0	0	Integer	216.138.15....
nvControllerForwardPowerMeter.0	0	Integer	216.138.15....
nvControllerReflectedPowerMeter.0	0	Integer	216.138.15....
nvControllerTotalRMSForwardPow...	0	Integer	216.138.15....
nvControllerAnalogForwardPower...	0	Integer	216.138.15....
nvControllerDigitalForwardPower...	0	Integer	216.138.15....

Name
 OID
 MIB
 Syntax: INTEGER (0..1)
 Access: read-write
 Status: current
 DefVal:

.iso.org.dod.internet.private.enterprises.nautel.products.nv.nvActiveExciter.nvActiveExciterNoExternal10MHzAlarm.0

SNMP example #1 – Ceragon Fibeair IP link

- Simple device
- Simple MIB?
- NOT
 - MIB file is 288 pages!



Advantages of using SNMP in your facility control plan

- ④ Save time and effort – connect with and control remote equipment using existing network connections
- ④ Monitor and control vital IT systems – servers, routers, firewalls, switches, etc.
- ④ Broadcast equipment increasingly supporting SNMP
 - ④ Harris ATSC transmitters, Nautel NV and VS, more on the way (ZX10)
- ④ Monitor and control a greater variety of equipment
 - ④ Include UPS, HVAC, Security systems, office equipment in your overall plan
- ④ Achieve greater detail of information
 - ④ 100s of data points, detect small failures before they become big ones
- ④ Monitor and control equipment anywhere on the network

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Thank you for your time!



Tony Peterle
Manager, Worldcast Systems Inc.
<http://www.Worldcastsystems.com>

 Do More, with Less