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?

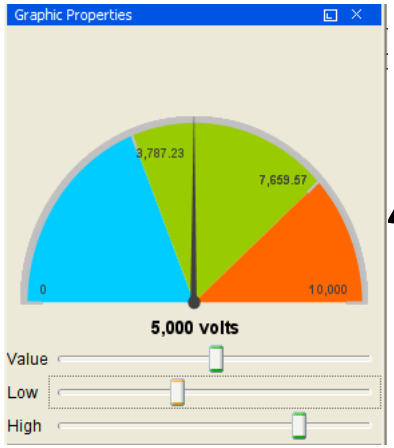
SNMP and Me: Questions to answer

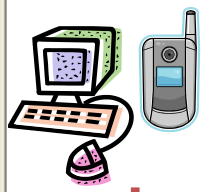
- What is SNMP?
  - Simple Network Management Protocol
    - Standardized protocol for query and response of data points (Objects)
    - Querying equipment is called an SNMP Manager
    - Target equipment is called an SNMP Agent
    - Objects are designated by a unique number called the Object Identifier,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





SET

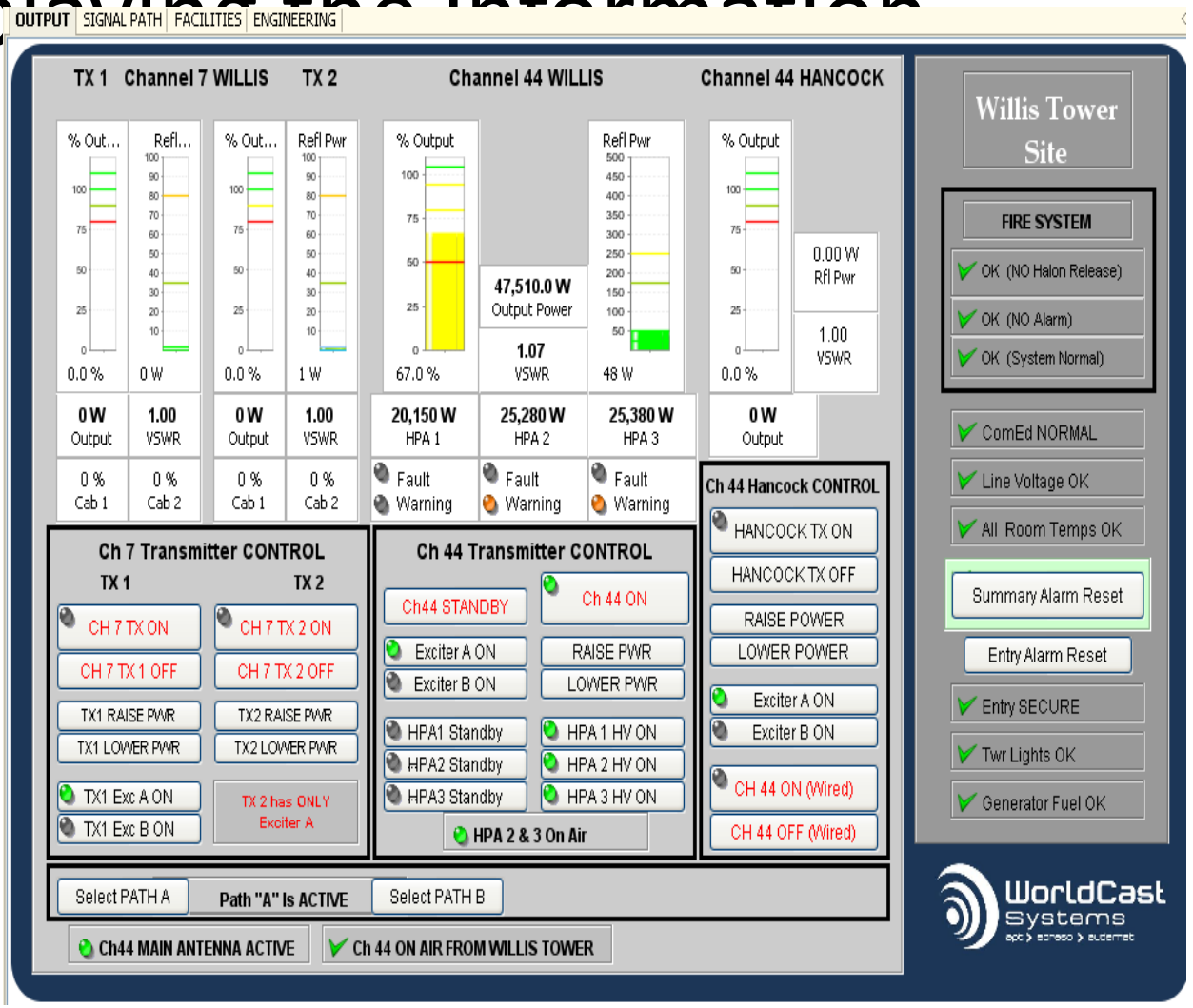
TCP-IP

Target equipment

WorldCast Systems
deliver > transmit > monitor

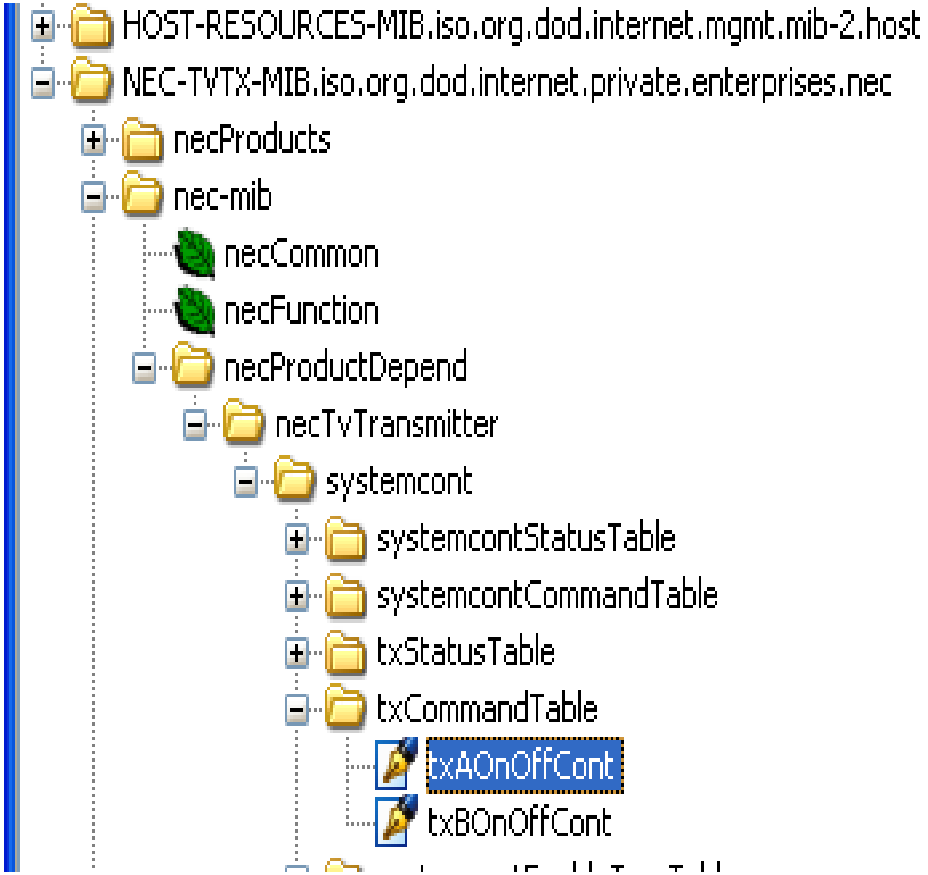
Displaying the information

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)

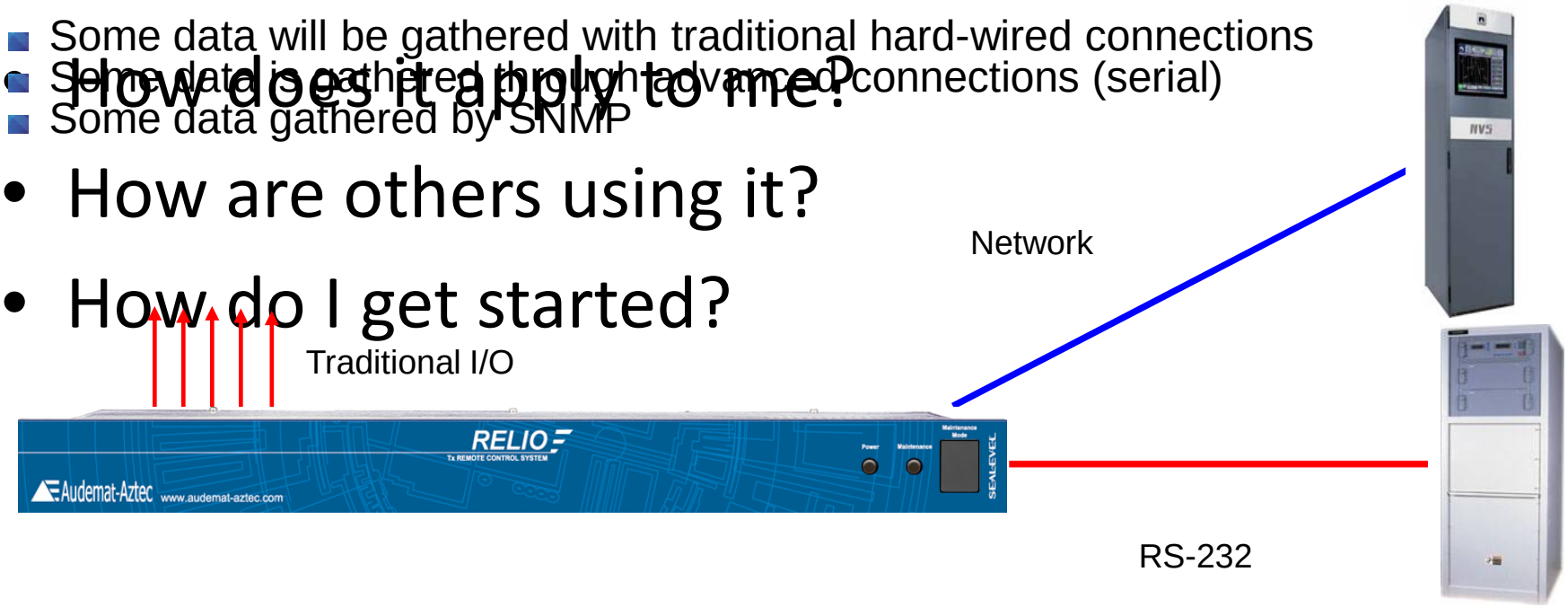
- The Management Information Base, or MIB, is a directory tree ‘menu’ of the OIDs available on a particular SNMP Agent device.



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?



WorldCast Systems
deliver > transmit > monitor

Lots of things speak SNMP

Broadcast

IT Gear

UPS systems

HVAC systems

IP links

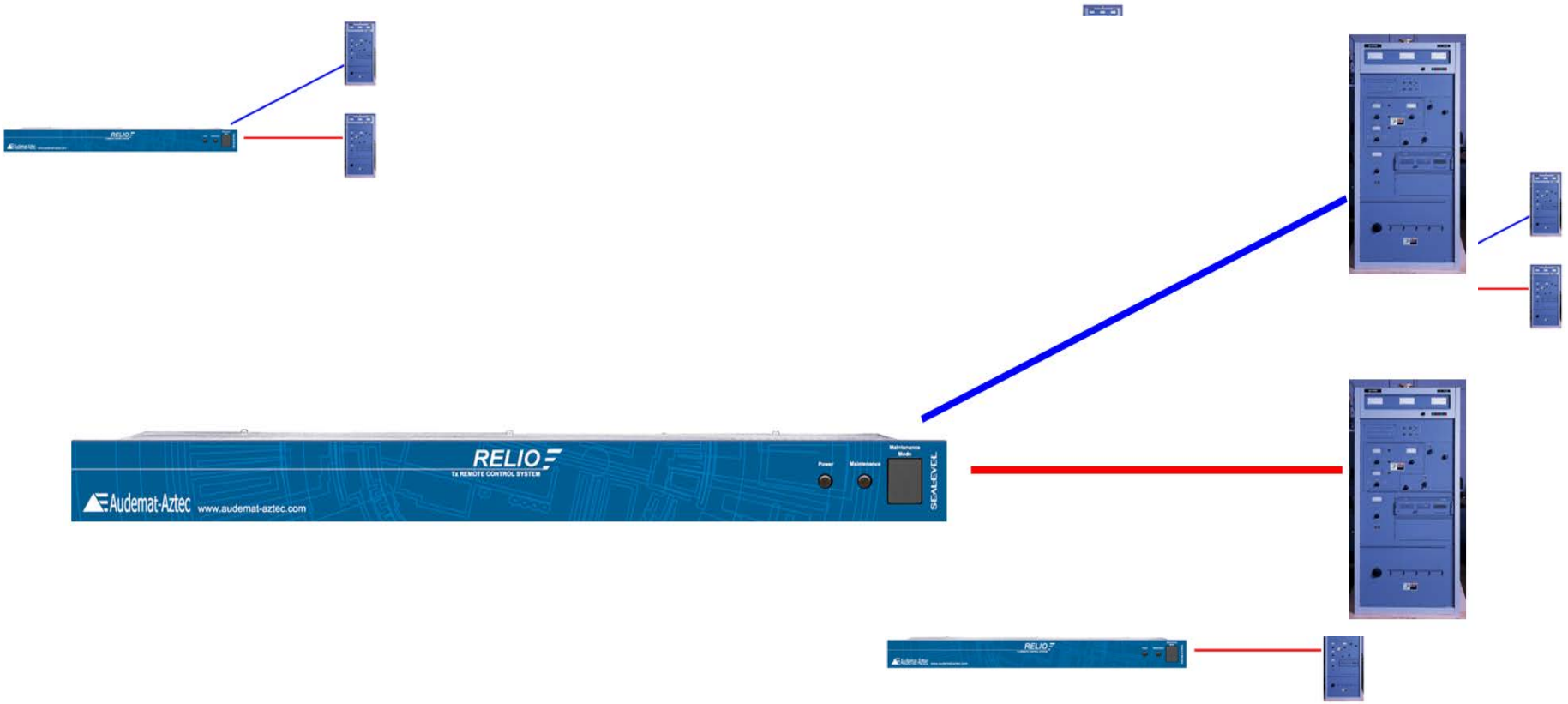
Monitors

Codecs

Facility Control

WorldCast Systems
deliver > transmit > monitor

Site-to-site communications



SNMP and Me: Questions to answer

- s SNMP?
- oes it apply to
- 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

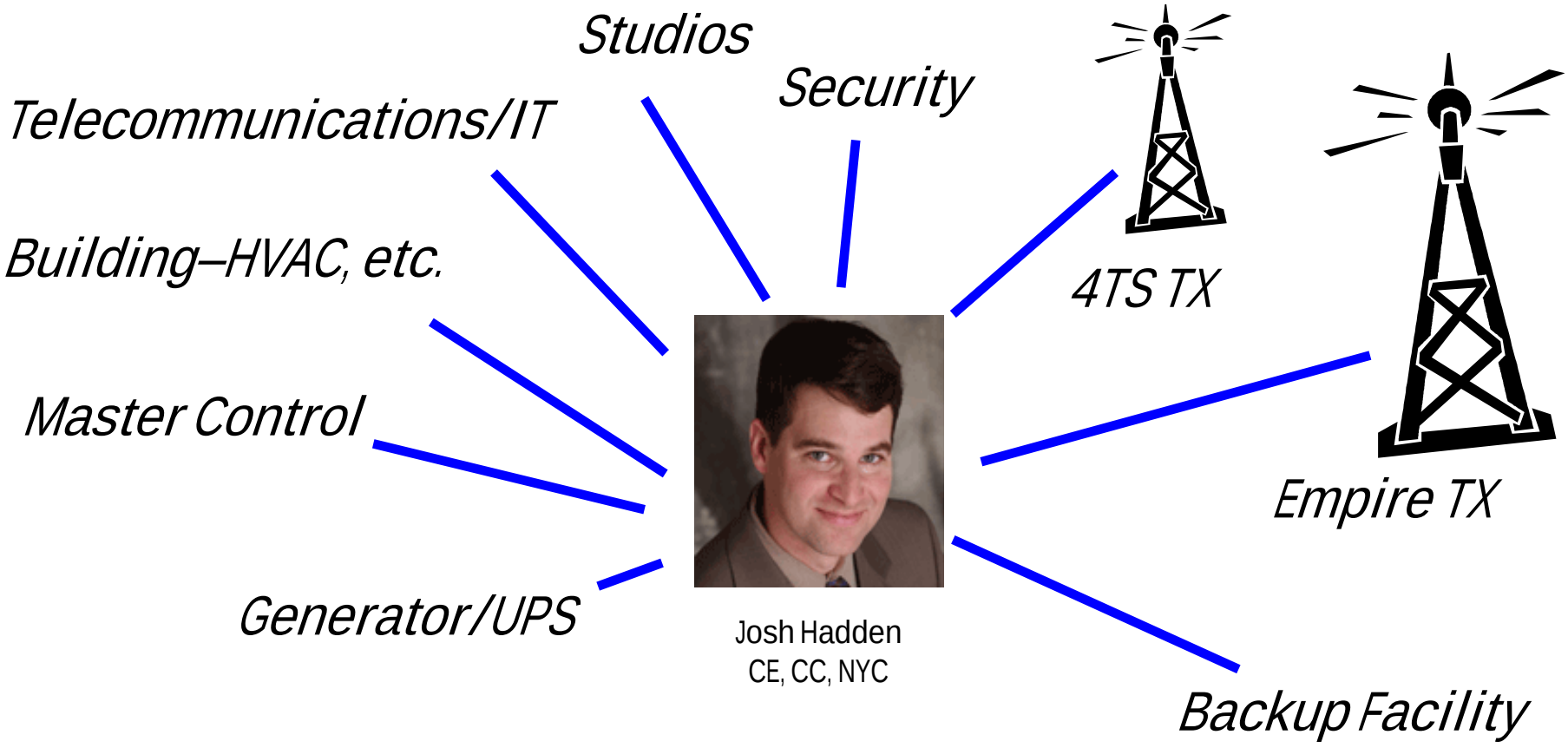
Doug Irwin
Clear Channel
Los Angeles

Brett Gilbert
Clear Channel
Tulsa

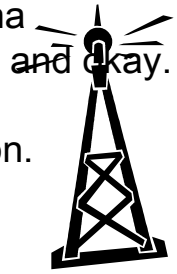
Meet the SNMP team

WorldCast Systems
deliver > transmit > monitor

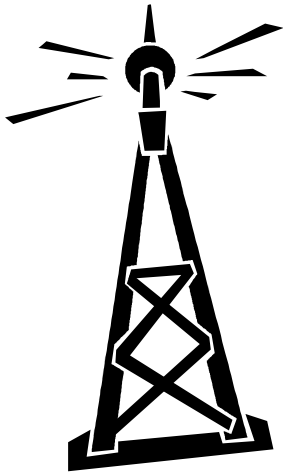
Real World #1



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

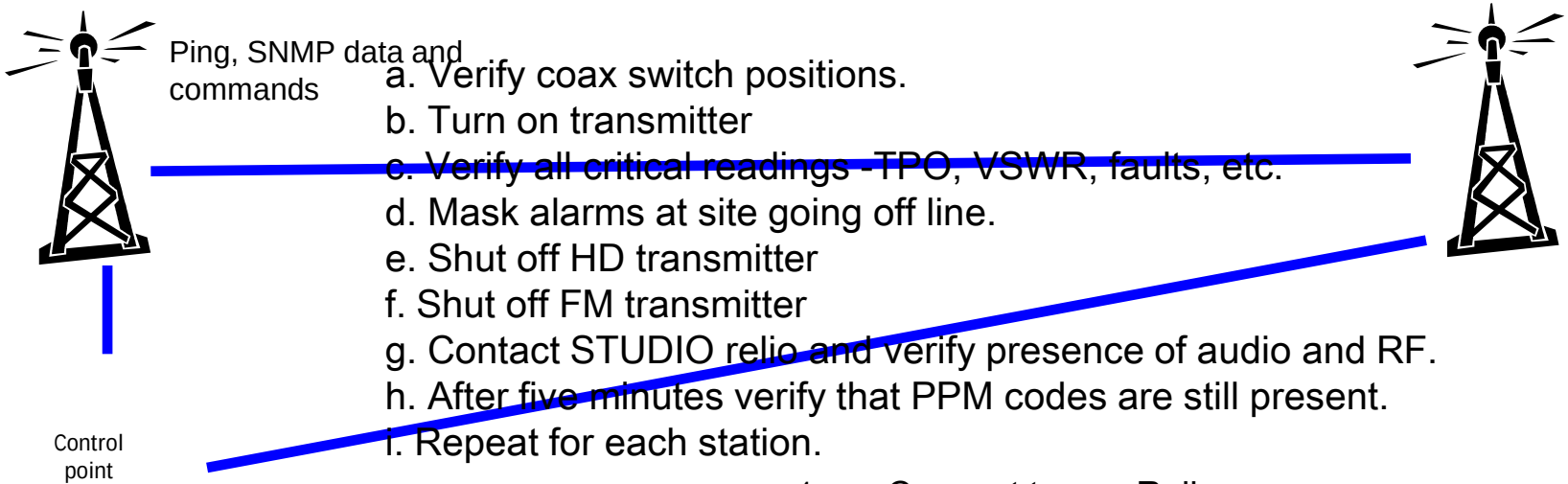


Empire TX

SNMP – an easier way

Empire TX

4TS TX



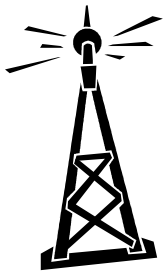
a. Verify coax switch positions.
b. Turn on transmitter
c. Verify all critical readings -TPO, VSWR, faults, etc.
d. Mask alarms at site going off line.
e. Shut off HD transmitter
f. Shut off FM transmitter
g. Contact STUDIO relio and verify presence of audio and RF.
h. After five minutes verify that 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.

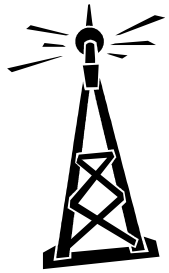
WorldCast Systems
deliver > transmit > monitor

Sharing controls between sites

Empire TX

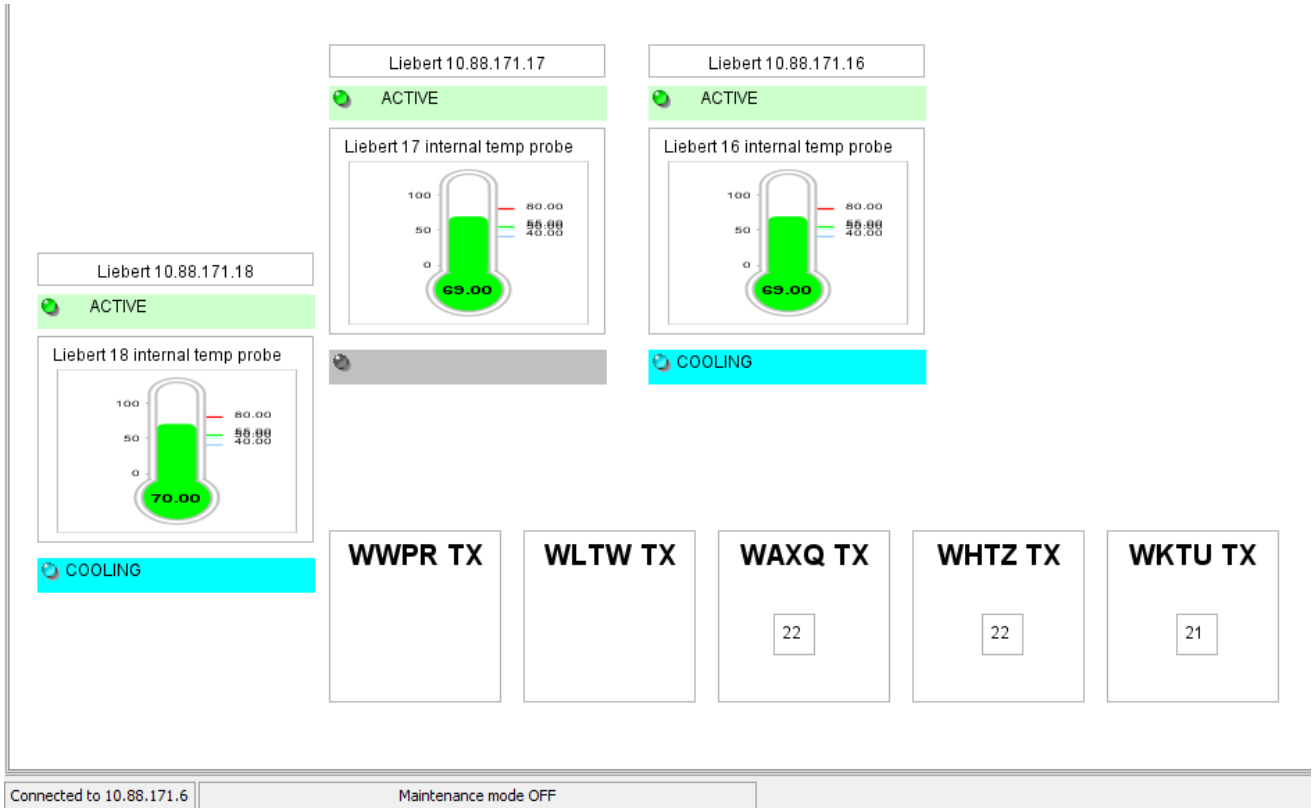


4TS TX



SNMP

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

WorldCast Systems
deliver > transmit > monitor

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

HPA ON/OFF Controls

HPA 1 Standby	HPA 1 HV ON
HPA 2 Standby	HPA 2 HV ON
HPA 3 Standby	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 READY Status
HPA 1 Timer READY	HPA 1 Ready
HPA 2 Timer READY	HPA 2 Ready
HPA 3 Timer 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.

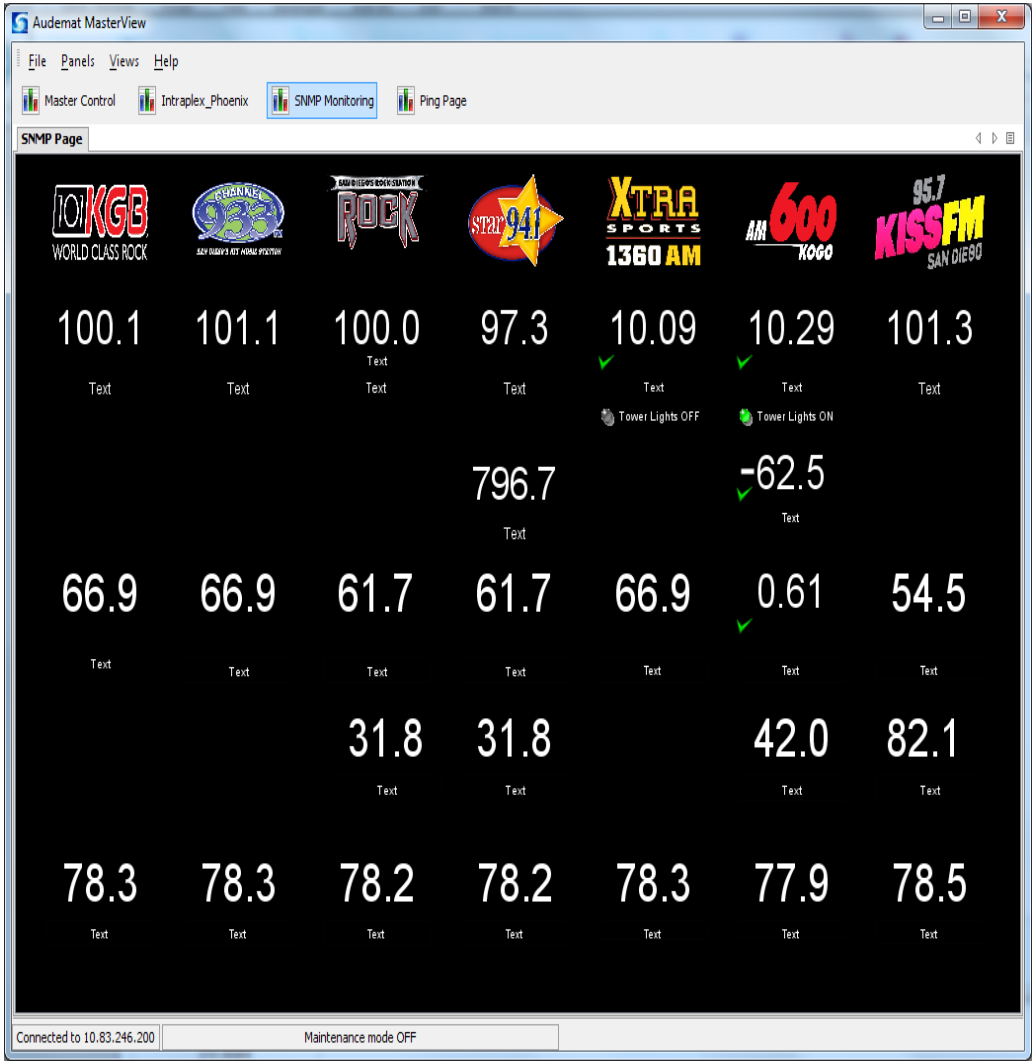
Operating in HPA 1&2&3 Mode is possible **ONLY** on the Main Antenna. You **MUST** switch to another HPA mode **BEFORE** switching to the Aux Antenna.

Individual HPA Power Adjust
Green indicates HPA is in Remote

HPA 1 Pwr Raise | HPA 2 Pwr Raise | HPA 3 Pwr Raise

Real World #3

Brett Gilbert
Clear Channel
Tulsa



Steve Frick
Clear Channel
San Diego

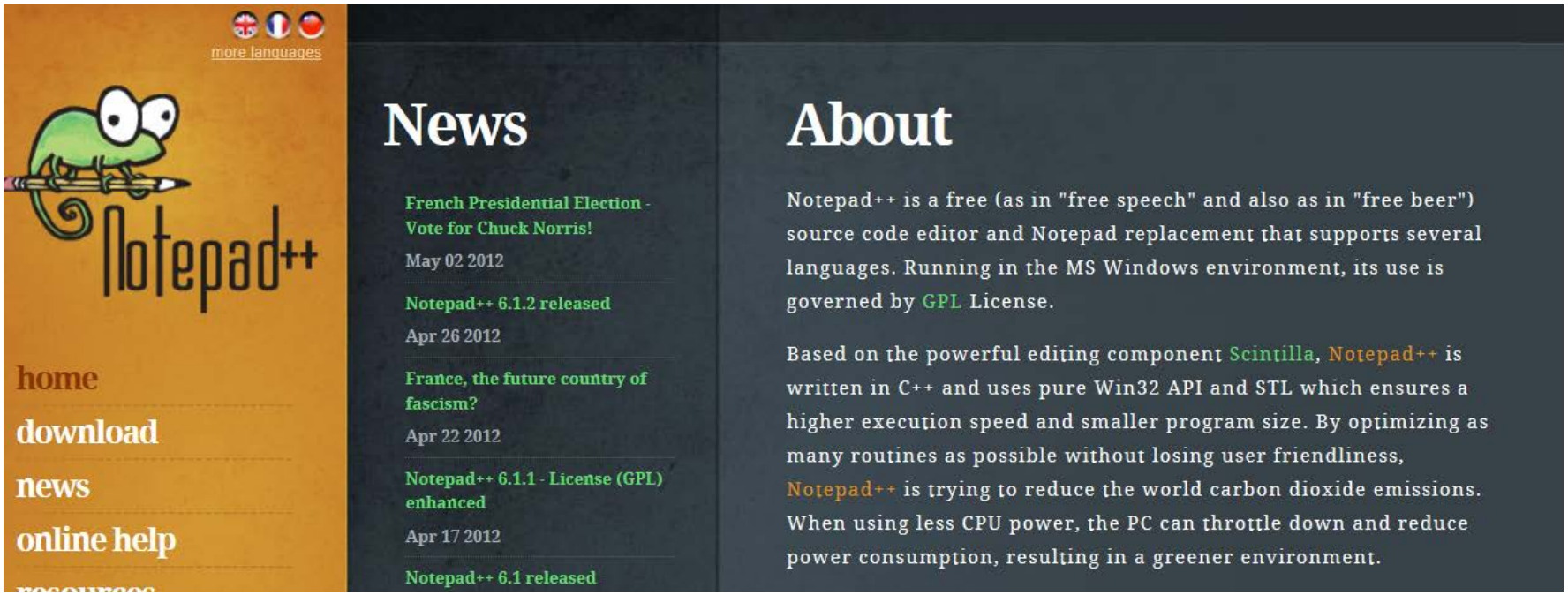
SNMP and Me: Questions to answer

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

- Acquire some basic software tools
  - Advanced text editor
  - MIB browser
- Identify target SNMP equipment on your network
  - Manufacturer data, brochures
- Get the MIB file
- Choose some data objects, test GET and SET commands, see what happens!

WorldCast Systems
deliver > transmit > monitor

SNMP tools – Notepad++



WorldCast Systems
deliver > transmit > monitor

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 enropaLastAlarmEntry_get          -- DEFAULT
next-function-async enropaLastAlarmEntry_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 ++

```
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
  · News
  · History
  · Change Log
  · License
  Download
  Tutorials
  Documentation
  Wiki
  Support
  Development
  Related Info/SW

  Archive Search:
  Users
  Search

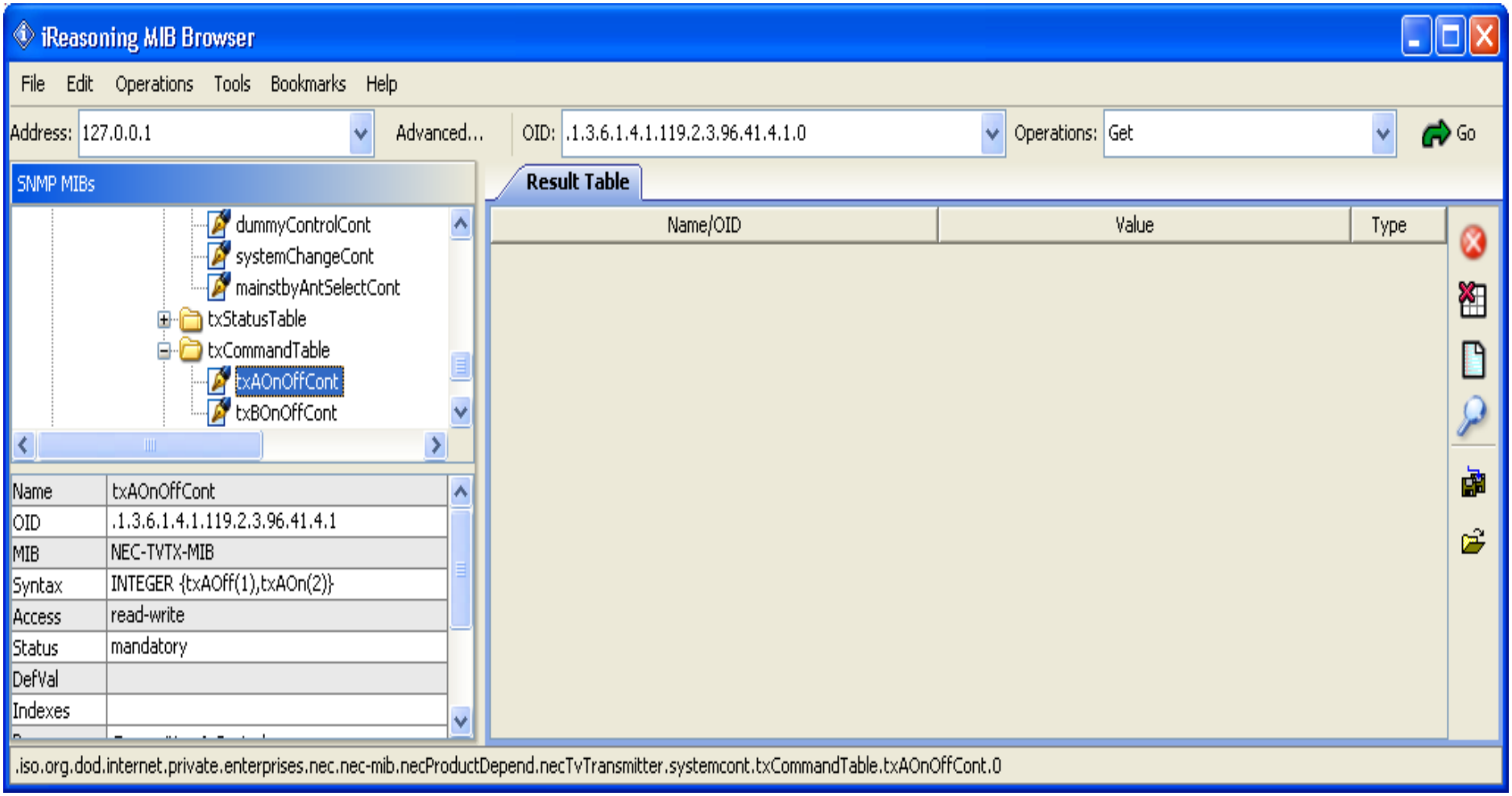
  A composite image of images from locations that use the Net-SNMP package. **Click here for more information.**

  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.

WorldCast Systems
deliver > transmit > monitor

MIB Browser

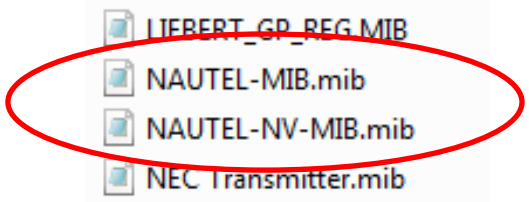


SNMP tools – MIB Browser

- 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

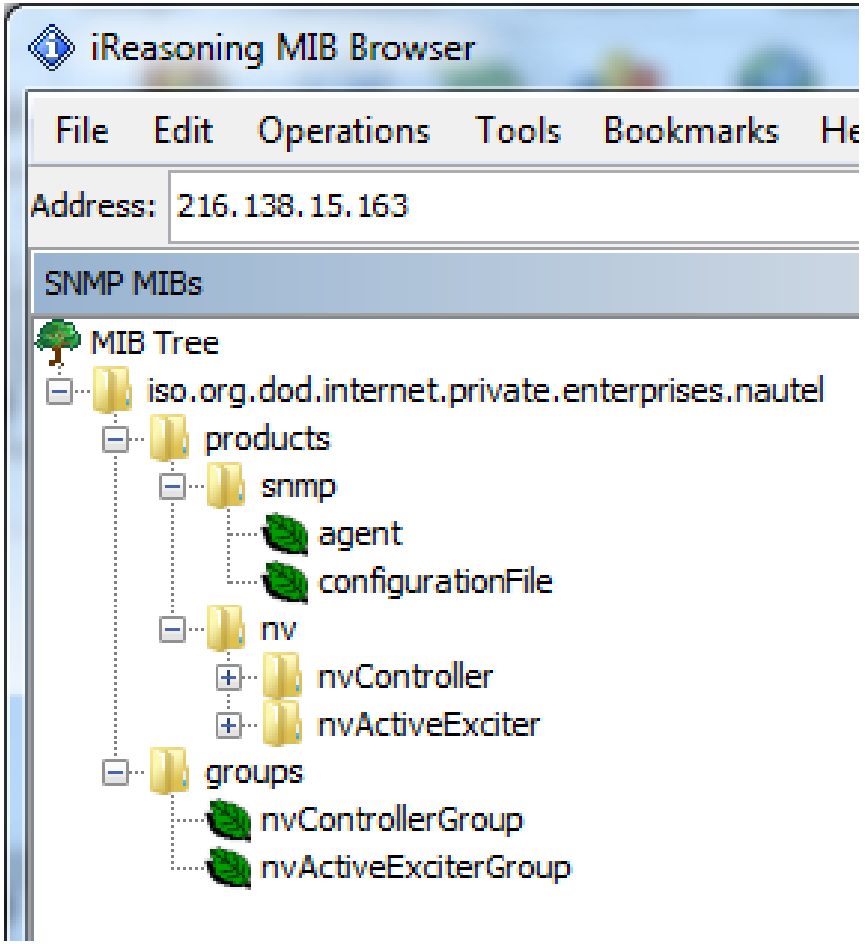
SNMP example – Nautel NV Transmitter

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

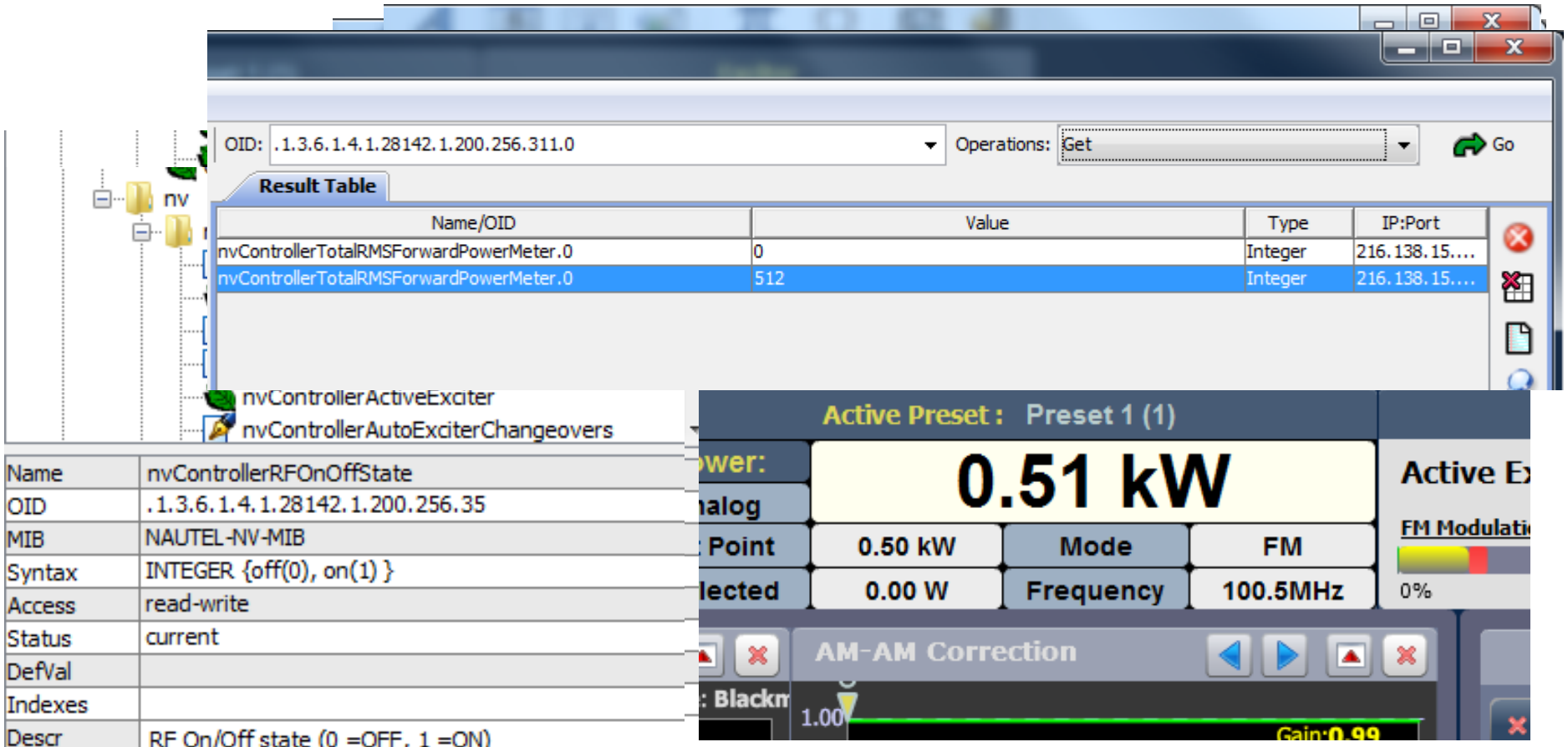


Nautel NV MIB file in browser

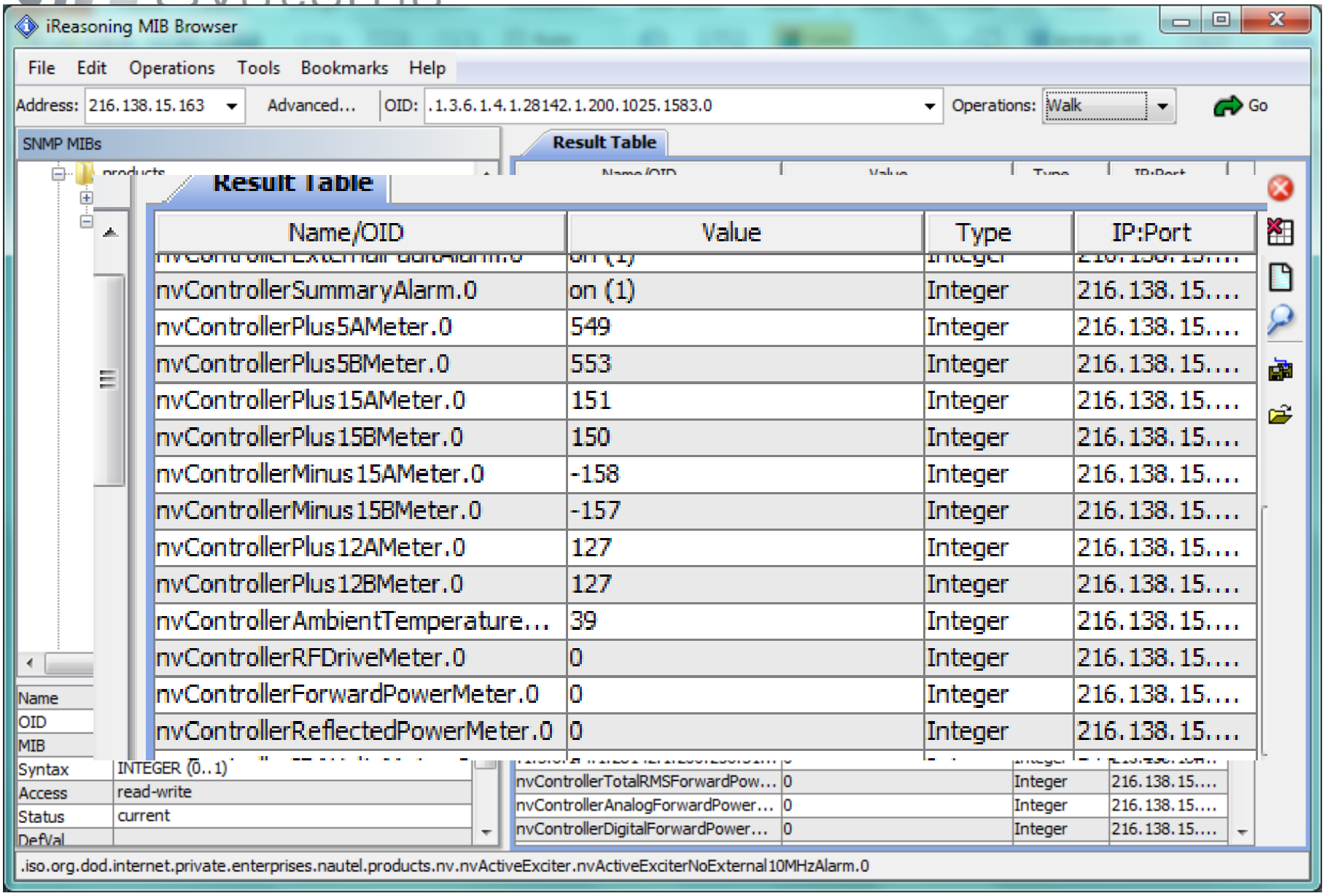
- "Easy" MIB
  - No tables
  - No traps
- Two object groups
  - Controller
  - Active Exciter



Nautel NV transmitter – GET single OID



WorldCast Systems



WorldCast Systems
deliver > transmit > monitor

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

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

Advantages of using SNMP in your facility control plan

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

Thank you for your time!

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

Do More, with Less