



A Guide to SNMP for Broadcast Engineers
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deliver broadcast monitor

Using SNMP in Broadcast Facility Control – Miami Ennes conference 03/10/11



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Do more, with less

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Economic Challenges



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Do More, with Less



Do More, with Less



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Broadcasters also finding ways to Economize



Do More, with Less

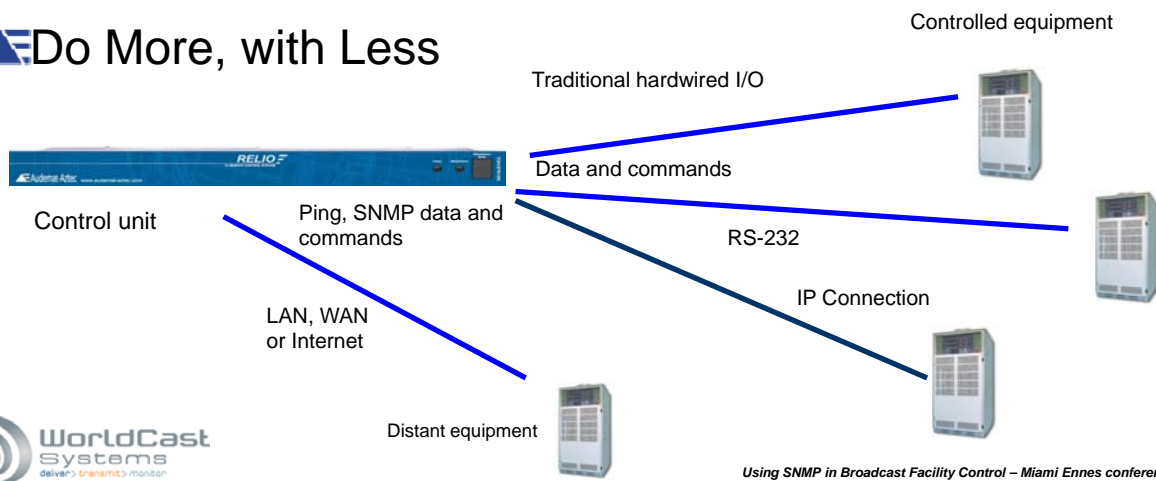


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Connectivity – new Pathways = more productivity

Do More, with Less



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Using SNMP makes life easier

Josh Hadden
CE, CC, NYC

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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.

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Switching between transmitter sites

Empire TX

4TS TX



Josh Hadden
CE, CC, NVC



- Ping, SNMP data and commands
- a. Verify coax switch positions.
 - b. Verify audio source and availability of that source.
 - c. If audio source is not okay, then select one that is.
 - d. Turn on transmitter
 - e. Verify all critical readings -TPO, VSWR, faults, etc.
 - f. Mask alarms at site going off line.
 - g. Shut off HD transmitter
 - h. Shut off FM transmitter
 - i. Contact STUDIO relio and verify presence of audio and RF.
 - j. After five minutes verify that PPM noise is still present.
 - k. Repeat for each station!
1. Connect to any Relio via phone, computer, or tablet.
 2. Enable PPM noise control (to prevent accidental button pushes)
 3. Select which station(s) to switch.

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Switching between transmitter sites

Empire TX

4TS TX



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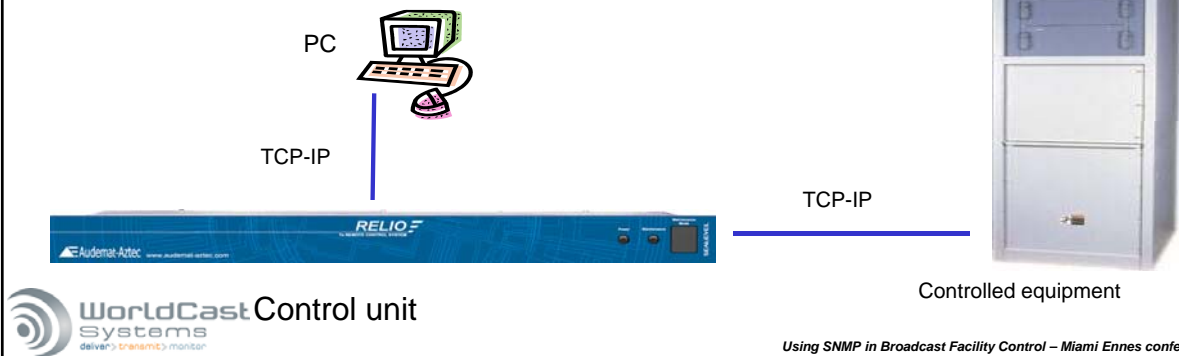


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Advanced IP connectivity

- ▲ IP from control point to control unit
- ▲ IP from control unit to controlled equipment

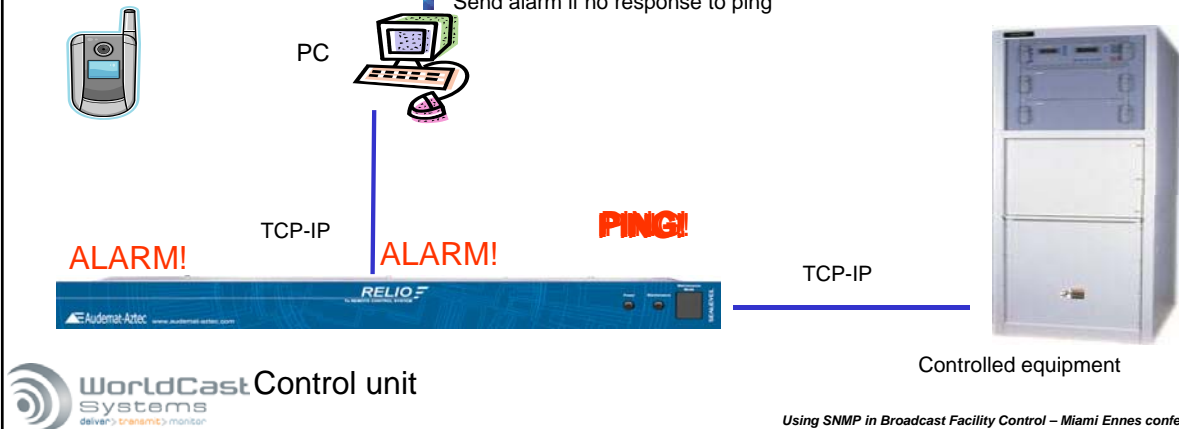


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IP Ping command

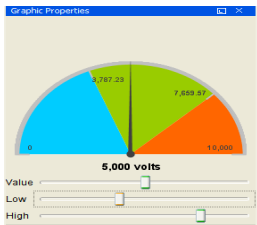
- ▲ Ping sends simple data packet to another network address
 - Check that the target unit is on line
 - Send alarm if no response to ping



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IP SNMP



TCP-IP

- 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



ALARM!

GET

TCP-IP



Controlled equipment



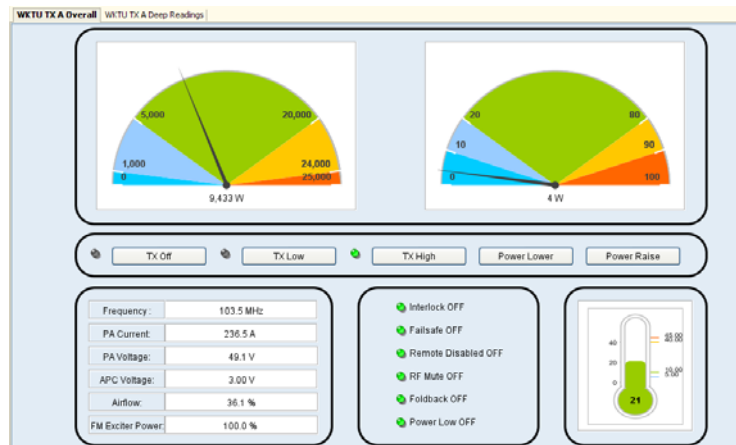
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A.P.I. Scriptlet – designing the view

- Design view / control panel to display information

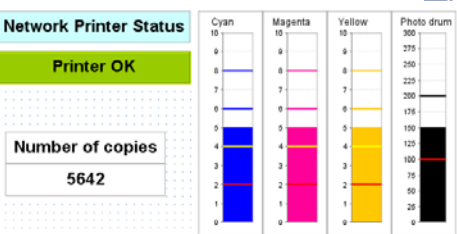
Data and control functions obtained using SNMP can be integrated with other data and controls from traditional I/O or from serial data.



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IP SNMP possibilities




Network Printer Status
Printer OK
Number of copies: 5642

SNMP enabled broadcast equipment

- Harris Platinum & Diamond ATSC
- Nautel NV and VS series
- Toshiba UPS systems

SNMP enabled office equipment

- Printers
- Servers
- Other IT equipment



Control unit (Audemat Aztec RELIO) connected to an SNMP enabled printer via TCP-IP.



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SNMP – The Simple Network Management Protocol

Simple Network Management Protocol

- Standardized protocol Created in 1988 for computerized equipment
- UDP based network protocol that defines a set of network standards including an application layer and a database
- Controlling equipment is called an SNMP 'Manager'
- Controlled equipment is called an SNMP 'Agent'
- Data Objects are each assigned a unit number called the Object Identifier, or OID

: := 1.3.6.1.4.1.5299.15.12.1.11.1.1.8



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SNMP – It's all about the OIDs

▲ **Object Identifiers** are the 'address' of each data point in the Agent

```
VALUE alarmPendingGenAlarmsalarmDescription  
Syntax: [UNIVERSAL 4] OCTET STRING  
Access: read-only  
Status: mandatory  
Description: No description  
)
```

↖ ::= 1.3.6.1.4.1.5299.15.12.1.11.1.1.8 ↗

- Written in Abstract Syntax Notation 1 (ASN1) language
- OIDs and their descriptions are collected and published in a file called a Management Information Base, or MIB



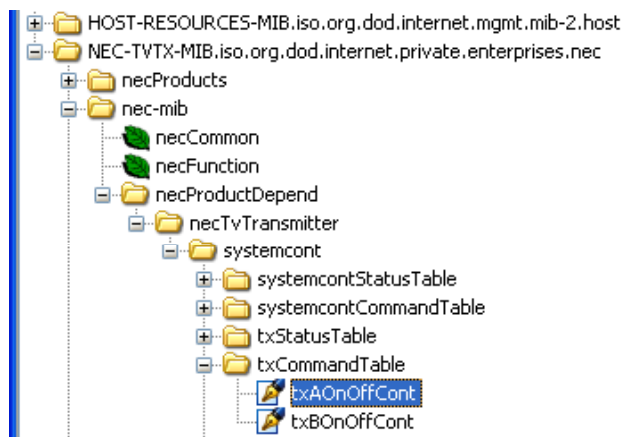
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SNMP – It's all about the OIDs

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

▲ Some of the numbers of the OID represent 'branches' of the MIB tree.



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Special OIDs – the Index value

- Some OIDs cannot be completely defined in the MIB
 - Objects created in software after unit is designed
- Example – A software button in Scripteasy
 - OID for buttons in the MIB is generic
 - To define a specific button, add the Index value



Generic button OID from MIB: 1.3.6.1.4.1.5299.15.42.1.10.3.4.1.3

OID of a specific button in the software: 1.3.6.1.4.1.5299.15.42.1.10.3.4.1.3.361

Index Value



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Truncated OIDs

- Some OIDs are only partially published in the MIB
 - Borrows structure and other elements from standard MIBs and RFC files
 - Example from MIB of Toshiba UPS

upsEstimatedMinutesRemaining OBJECT-TYPE

SYNTAX PositiveInteger

UNITS "minutes"

ACCESS read-only

STATUS mandatory

DESCRIPTION

"An estimate of the time to battery charge depletion under the present load conditions if the utility power is off and remains off, or if it were to be lost and remain off"

::= { upsBattery 3 }

OID in raw MIB text form

Name	upsEstimatedMinutesRemaining
OID	.1.3.6.1.4.1.186.1.19.2.1.2.3
MIB	TOSHIBAUPS-MIB-ADD
Syntax	PositiveInteger
Access	read-only
Status	mandatory
DefVal	
Indexes	

OID as seen in MIB browser



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MIBs that cry out for other MIBs

- ▲ Several 'standard' industry MIBs help define structure of tables, format of data, etc.
- ▲ Manufacturers can import data from a standard MIB when designing their own MIB
- ▲ Reduces the time needed to create an entire MIB from scratch
- ▲ Also reduces the chance of syntax or other errors in the OIDs

```
IMPORTS
    DisplayString, TimeStamp, TimeInterval, TestAndIncr,
    AutonomousType
    FROM SNMPv2-TC
    enterprises
    FROM RFC1155-SMI
OBJECT-TYPE
    FROM RFC-1212
TRAP-TYPE
    FROM RFC-1215;
```

← Imports from Toshiba MIB file



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Standard public MIBs

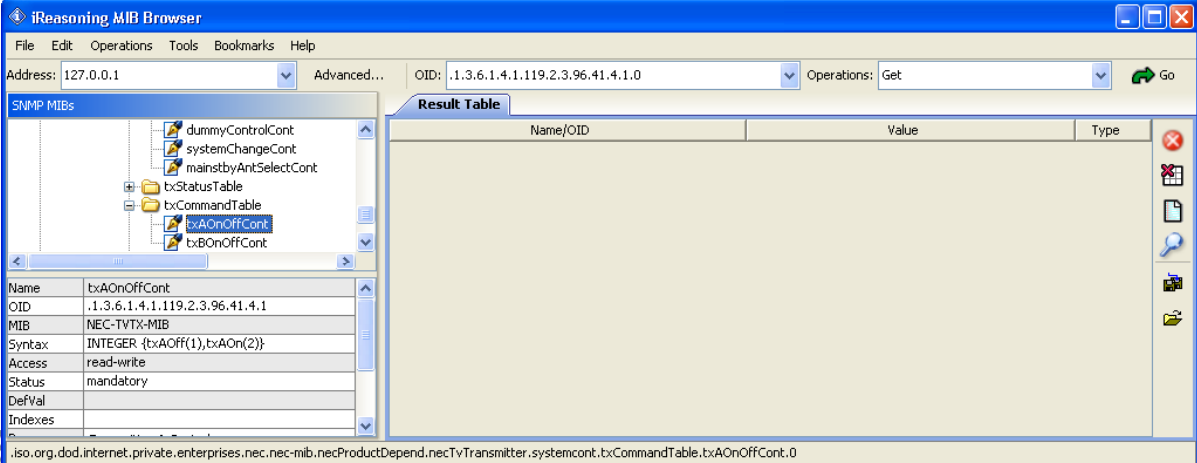
- ▲ Some of the common public MIB files used to create other MIBs
 - RFC-1155, which establishes basic syntax, object types and index structures
 - RFC-1212, type notations
 - SNMPV2-TC, textual conventions and table structures
 - SNMPV2-SMI, defines the Structure of Management Information
 - RFC-1215, updated object types
 - SNMP-FRAMEWORK, definitions and textual conventions



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Importance of a MIB browser



The screenshot shows the iReasoning MIB Browser interface. The address is 127.0.0.1 and the OID is .1.3.6.1.4.1.119.2.3.96.41.4.1.0. The operations are set to Get. The left pane shows a tree view of MIBs, with txAOnOffCont selected. The right pane shows a result table with columns for Name/OID, Value, and Type. Below the table, a detailed view of the selected object is shown:

Name	Value
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	



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When data is not just data

- ▲ Manager device sends a GET request, Agent returns a GETRESPONSE
Both contain the OID for the object
 - Many types of data could be in an Object:
 - Integer
 - Floating point number
 - String
 - OID
- ▲ So, data returned can be almost any length
 - Data returned in a GETRESPONSE is returned as a variable binding
 - First byte of response data informs Manager of length of data packet



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WTF data

- ▲ SNMP objects may return data in an atypical form
 - Example: Indicating the amount of free space on a hard drive
 - Integer 0 – 100 indicating percentage used or free
 - Integer 0 – ? indicating megabytes used or free
 - Integer 0 – ? indicating blocks used, cylinders.....
 - String
 - OID
- ▲ So, often it is necessary to shift our perspective, or perform some kind of mathematical manipulation on the data to make it comprehensible and useable in the real world

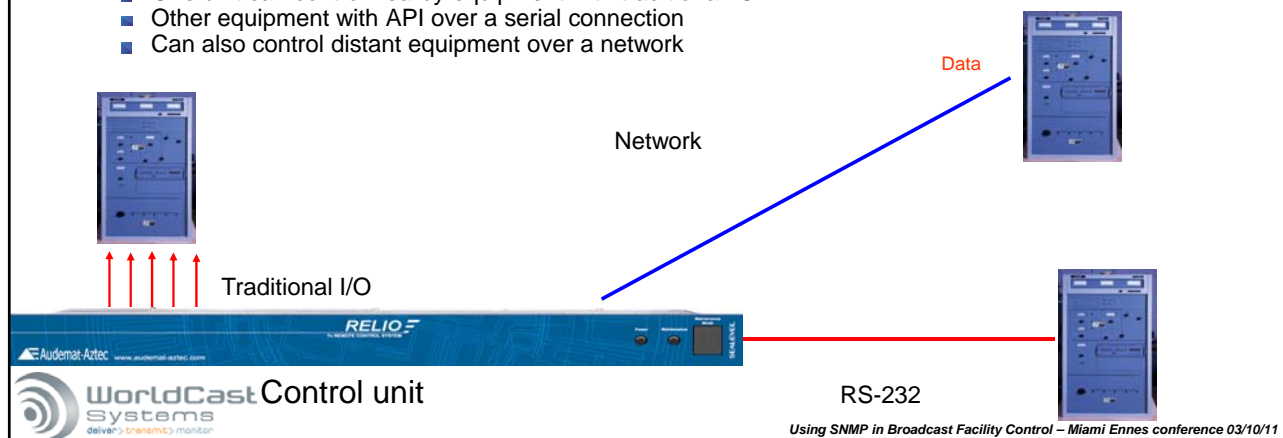


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Many paths, many possibilities

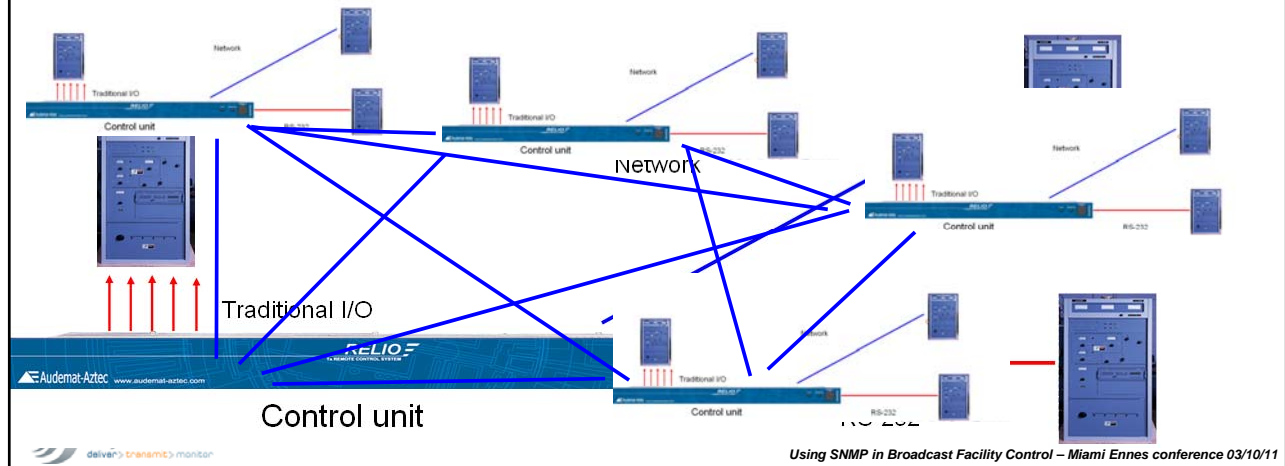
- ▲ Using advanced connections – IP and serial
 - One unit can control nearby equipment with traditional I/O
 - Other equipment with API over a serial connection
 - Can also control distant equipment over a network



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Many paths, many possibilities



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Facility Control Functions
in other equipment

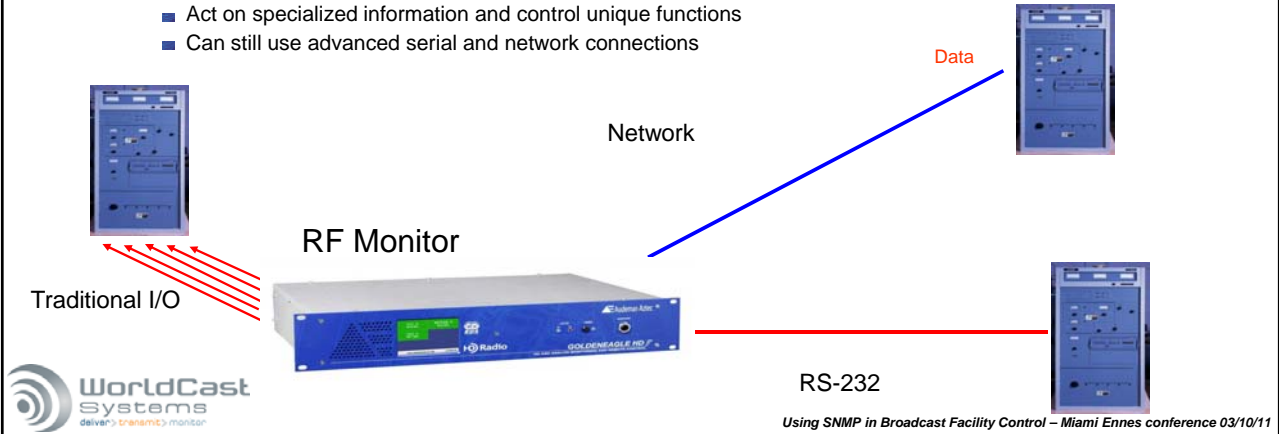


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Many paths, many possibilities

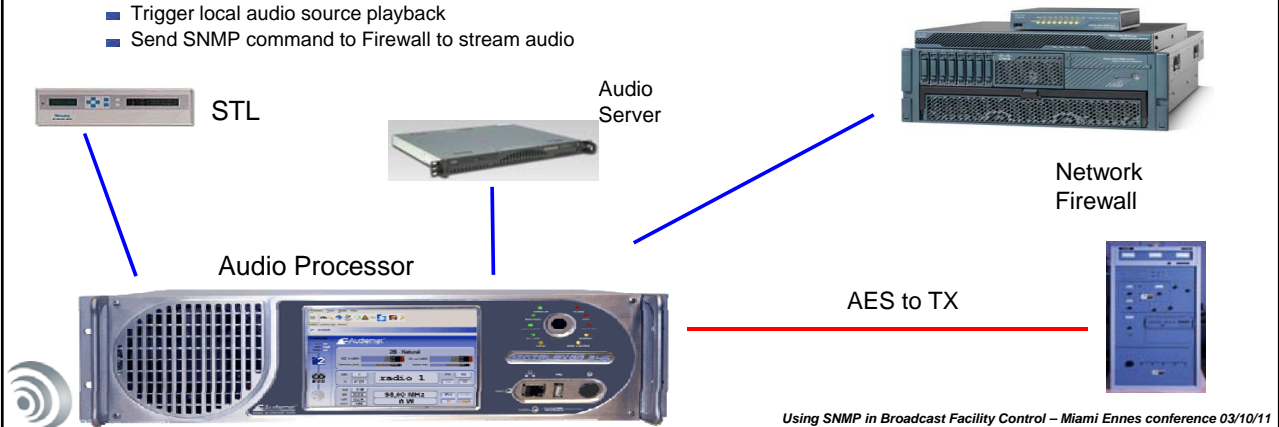
- ▲ Facility control device can be integrated into other equipment
 - Save space, energy and \$\$\$
 - Act on specialized information and control unique functions
 - Can still use advanced serial and network connections



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Many paths, many possibilities

- ▲ Facility control integrated into Audio Processor
 - Loss of audio from STL
 - Trigger local audio source playback
 - Send SNMP command to Firewall to stream audio



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EasyLink

▲ Even small devices, or ones with limited traditional I/O connections, can still be powerful parts of a facility control plan



Audio Switcher

Contact closure



ASTRAL Audio Codec

RS-232



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CONCLUSION

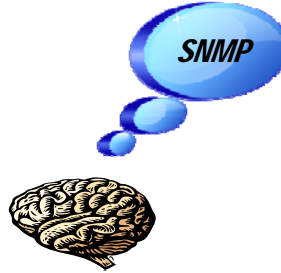


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Benefits of SNMP

- Connectivity
 - Distant Equipment
 - IT Equipment
- Depth of information
- Integration with other I/Os



Do More, with Less



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Thank you

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▲ Thanks also to
▲ Josh Hadden, Clear Channel, New York



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QUESTION AND ANSWER TIME



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