EAS Text Messages Via Radio

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Introduction

This paper describes Wisconsin Public Radio's project to transmit Emergency Alert System text information to the front panel displays of HD and FM-RDS receivers.

Definitions

Program Associated Data (PAD), also known as Program Service Data (PSD), is text information related the content of programming being broadcast.

Emergency Alert System (EAS) is the warning system used by broadcasters to deliver important emergency information to listeners and viewers. Messages are targeted by location.

Stimulus for Action

As described at this conference last year, WPR has been successfully transmitting PAD text to HD and FM-RDS receivers. The metadata we are sending includes callsigns, slogans, music title / composer / artist, talk show topics, names of shows and program hosts, weather reports and station promotional information.

It would be a useful public service to also transmit information about any emergency situations.

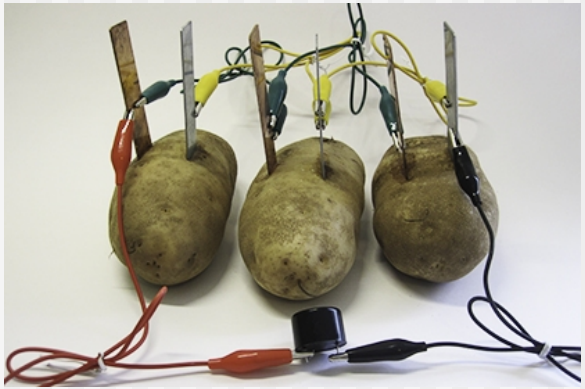
Stimulus for Action

Define the Problem

From a kids' website "Science Buddies" comes wisdom…

Engineers solve problems by creating new devices and systems. Before designing something, it is very important to define the problem. Otherwise, you might build something only to find that it does not meet the original goal!

- *Who has a problem or need?*
- *What is the problem or need?*
- *Why is it important to solve it?*



Define the Problem

The question arose, should this emergency metadata also go to our web-streams? No - for the same reason that audio EAS messages should not be on our web-streams.

Occasionally an observant listener will point out that they are not hearing EAS messages on our web-streams. This is by design – EAS alerts are targeted to specific geographical regions and should only be heard on broadcast outlets in the area of the emergency. Our internet streams are used worldwide, so it would be inappropriate to put EAS messages on these services.

Getting Started

What would be our source of the emergency alert information?

Given the geographically-coded nature of the EAS system, the WPR EAS encoder/decoder in each region of the state should be the source of the EAS text for the PAD data system for that region. EAS becomes another input source in the PAD system.

Getting Started

It seemed wise to shake out any kinks in this project using our flagship station as the guinea pig – especially since the equipment involved would all be found in our Radio Operations Center just down the hall from my office!

So the first stage of the project would be to put EAS on the HD PAD for AM WHA and the RDS for its FM translators.

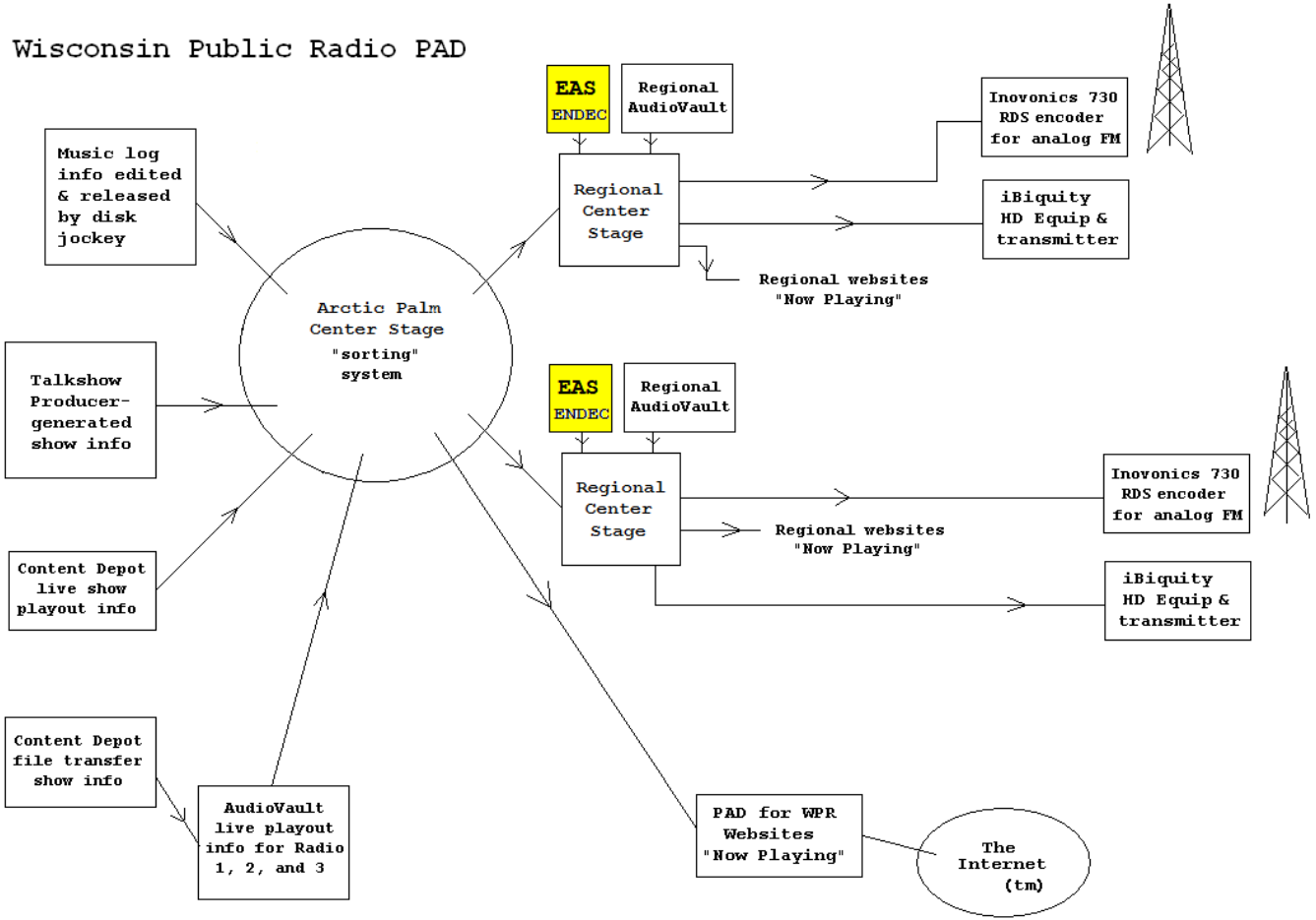
Define the Problem

Wisconsin Public Radio is a statewide radio service with 3 networks airing on 34 stations.

We determined that our listeners could benefit if text information for serious EAS alerts (not tests or weather watches) were visible on FM receivers with RDS capability as well as AM/FM HD-Radios.

The goal: If a listener hears the alert tones but misses the audio message, a glance at the radio display would provide the important info.

Wisconsin Public Radio PAD



All interconnections are by ethernet.

Getting Started

In many cases our EAS equipment is not located in the same room or even the same building as the PAD server.

I noticed that all the devices involved had ethernet ports. Wouldn't it be nice if the emergency information could move from the EAS encoder/decoder to the PAD sorting system by TCP/IP on the local area network?

Getting Started

Harold Price at Sage Alerting indicated that the ENDEC could send a file by FTP, and there are hopes for RDS encoders and HD gear to use that data directly. This concept would bypass our use of the Center Stage software for PAD.

Getting Started

But the Sage ENDEC unit has long been able to be programmed to send basic info from the EAS message out the serial port – a feature originally intended for TV captioning and crawls. This looks promising…

Getting Started

Stu Buck of Arctic Palm Technology confirmed that his Center Stage Live software was in beta test for handling EAS data. He had modified the CSWeather program to create a new module to handle serial EAS metadata, and thought it likely in future he could do so for IP connections as well.

So the only current option is a serial connection - only convenient if the EAS box and the computer are near each other.

Making the Connection

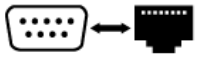
Since IP network connectivity was available near each system, I next envisioned using tunneling devices to carry the serial data via ethernet.

A serial-to-ethernet converter device would connect to the serial port on the Sage EAS unit which will make the serial data available via the existing LAN.

At the other end, the mating ethernet-to-serial converter could be used to send the data into the PAD server.

Serial to Ethernet

Grid Connect has a huge selection of best in class Serial to Ethernet Adapters. Whether you have a serial port that is external or embedded, RS232, RS422, or RS485, 9 Pins, 25 Pins, or a Terminal Block, we have the way for you to get your Serial to Ethernet. Don't see exactly what you need? Contact us about our Custom Serial to Ethernet Hardware Solutions.



Modules for Serial to Ethernet are located under Components/Chips.

FILTER PRODUCTS BY

CATEGORY:
NET485 (1)

PRICE:
$0.00 - $99.99 (6)
$100.00 - $199.99 (5)
$200.00 - $299.99 (2)
$300.00 and above (5)

MANUFACTURER:
ATC (3)
ChiYu (3)
Grid Connect (5)
Lantronix (7)

SERIAL TYPE(S):
RS232 (17)
RS422 (14)
RS485 (15)
TTL (1)

SERIAL INTERFACE(S):
DB25 Female (DCE) (2)
DB9 Female (DCE) (4)
DB9 Male (DTE) (10)
RJ45 (3)
Terminal Block (11)

GRID VIEW | LIST VIEW

ITEMS PER PAGE 32 SORT BY BEST SELLING

NEW

NET232+ Serial to Ethernet Intelligent Cable Adapter

From: $99.95

VIEW DETAILS

Compare

NET485 - RS485 Ethernet Adapter

From: $99.95

VIEW DETAILS

Compare

NetDirect - Serial to Ethernet Cable

From: $79.95

VIEW DETAILS

Compare

NetDirect - Serial to Power Over Ethernet (PoE) Cable

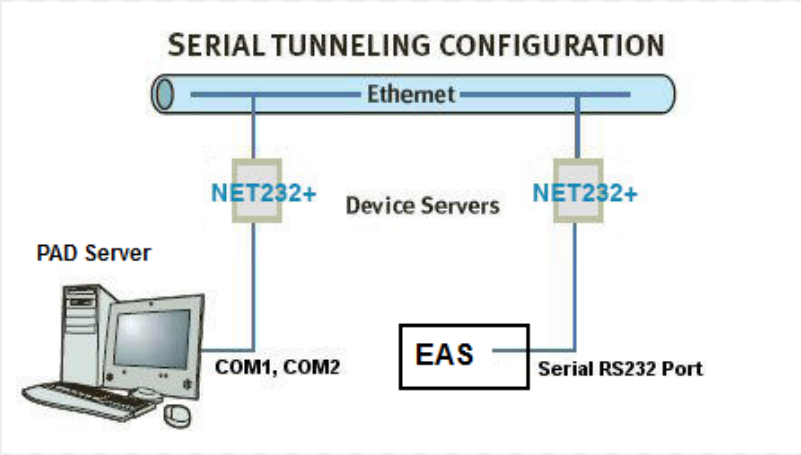
From: $119.95

VIEW DETAILS

Compare

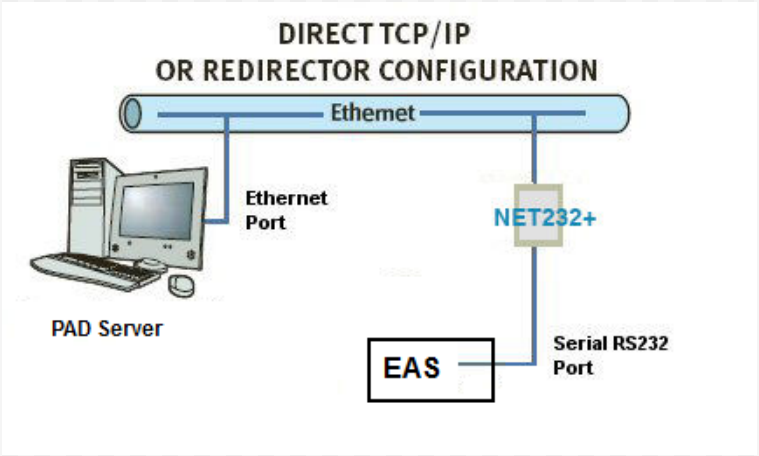
Making the Connection

GridConnect is marketing the Lantronics line of serial/ ethernet products. The example configuration of the model NET232+ looked like it would do the job…



Making the Connection

But then I saw that the NET232 could also be used to reach a "virtual serial port" in the server, eliminating one of the converters…

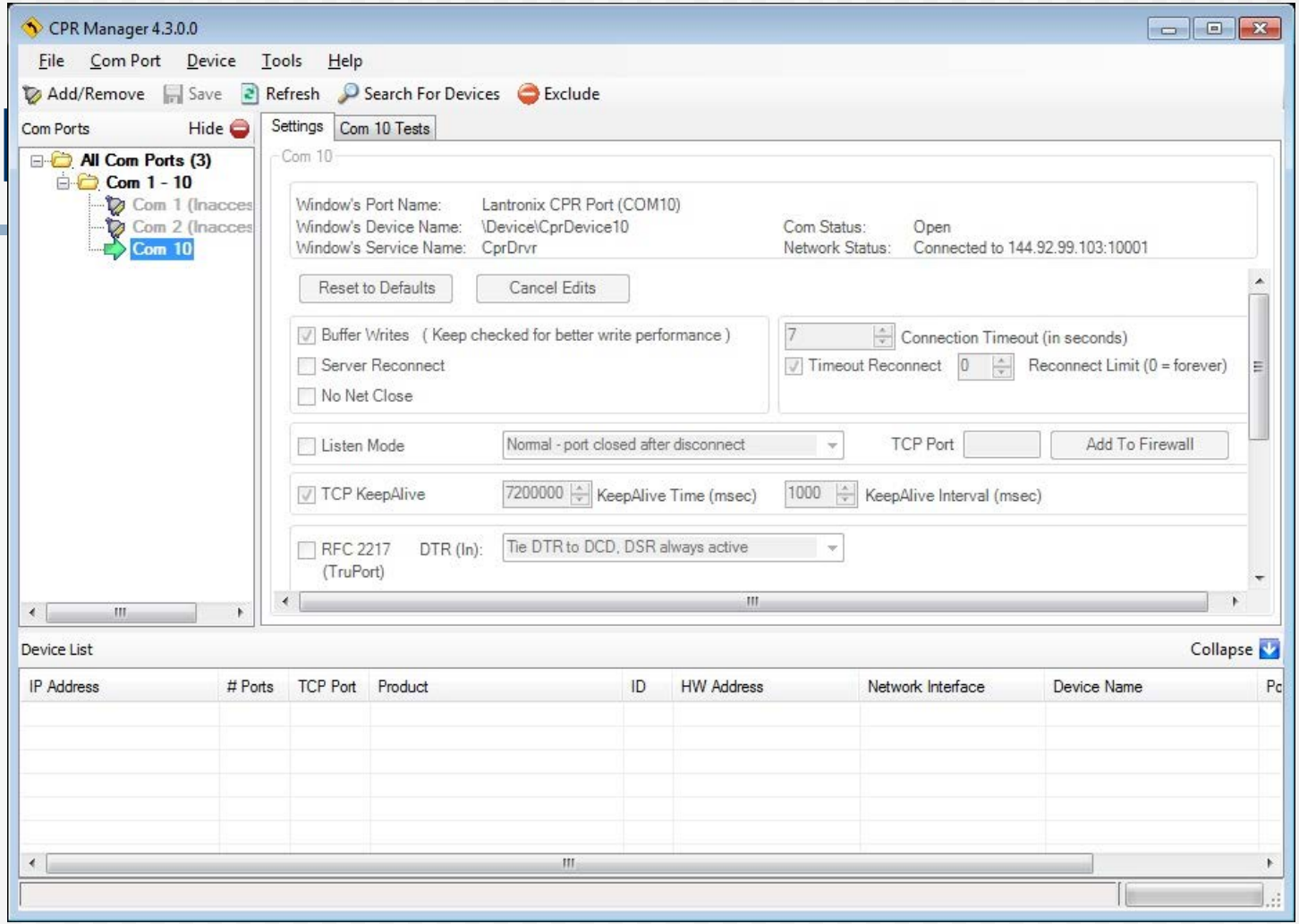


Refine the Design

“Com Port Redirector” is a free software utility available to send and receive serial data between a virtual Windows com port and a NET232 device server.

Most application programs won’t know the difference between a real, hardware com port and the virtual port.

But beware - some programs expect instant responses. “Com Port Redirector” can be set to keep the IP connection open even when the com port is closed, reducing latency and soothing these picky programs.


CPR Manager 4.3.0.0
File
Com Port
Device
Tools
Help
Add/Remove
Save
Refresh
Search For Devices
Exclude
Com Ports
Hide
All Com Ports (3)
Com 1 - 10
Com 1 (Inacces
Com 2 (Inacces
Com 10
Settings
Com 10 Tests
Com 10
Window's Port Name: Lantronix CPR Port (COM10)
Window's Device Name: \Device\CprDevice10
Window's Service Name: CprDrvr
Com Status: Open
Network Status: Connected to 144.92.99.103:10001
Reset to Defaults
Cancel Edits
Buffer Writes (Keep checked for better write performance)
Server Reconnect
No Net Close
7
Connection Timeout (in seconds)
Timeout Reconnect
0
Reconnect Limit (0 = forever)
Listen Mode
Normal - port closed after disconnect
TCP Port
Add To Firewall
TCP KeepAlive
7200000
KeepAlive Time (msec)
1000
KeepAlive Interval (msec)
RFC 2217 (TruPort)
DTR (In):
Tie DTR to DCD, DSR always active
Device List
Collapse
IP Address
Ports
TCP Port
Product
ID
HW Address
Network Interface
Device Name

Devil in the Details

Lots of details are important in setting both ends of the link: The Sage EAS unit's serial port must be selected and configured – baud rate, data format, etc.

Likewise for the various settings for the virtual serial port in the server, and the static IP addresses assigned to the network side of the link.

Devil in the Details

The Sage EAS unit's serial port must be selected and configured – baud rate, device format, etc.

To assign a device type to a com port, use **MENU.DEVICES.PORT.DEVICE TYPES**.

I selected "Generic Character Generator"

To change the baud rate of the variable baud rate ports, use **MENU.DEVICES.PORT.BAUD.**

I choose COM4 and 9600 baud.

12.50 MENU.DEVICES.PORT.DEVICE TYPE

Use this menu to assign devices to serial ports. Select a serial port, then select device type. Use the up and down buttons to scroll the list of devices. The device types are:

CODI CGEN	Chyron CODI character generator. See section 8.4, "Chyron CODI Character Generator".
CONSOLE	Obsolete.
Decoder	EAS message output. See section 9.1, "Raw EAS input and output".
ENDECSET	The ENDECSETD program interface device. Select this device and attach a PC to the port to use the ENDECSETD parameter save/restore program.
Encoder	EAS message input and output. See section 9.1, "Raw EAS input and output".
ENDEC PRO	Used for the ENDEC PRO and ENDEC DJ products. These products provide a point and click interface for sending and relaying alerts.
GENERIC CGEN	Generic alert text output. See section 9.3, "Alert Text Output (Generic Character Generator)"
Hand Control	Hand held remote control. See section 8.1, "Hand Control".
LED SIGN	LED marquee sign. See section 8.2, "LED Sign". Not valid for computer or com3 ports.
Modem	Use when using a modem to connect to ENDEC DJ or PRO

News Feed	Used for newsroom software that can parse serial data and route text to files or screens. All messages that are normally printed to the serial printer or the internal thermal printer are sent to this device. All messages are prefaced by <ENDECSTART> and followed by <ENDECEND>, allowing software to find the start and end of each alert in the data stream. See section 9.4.
None	Use None to disable the device.
RECON	Use for the Statmon RECON program
Serial Printer	Serial printer output. See section 9.2, "Serial Printer".
Sony	Not used for Broadcast Applications.
STAR-8	The STAR-8 Character Generator
VDS CGEN	VDS840EAS Character Generator. See section 8.3, "VDS Character Generator"
VDS MC	VDS Multi-Channel character generator.

Devil in the Details

The Sage ENDEC’s character generator serial output precedes each message with a number representing the “severity” of the emergency.

Level 1 message are direct threats to life and property like weather warnings, Level 2 are informational, like weather watches, and Level 3 messages are tests.

9.3 Alert Text Output (Generic Character Generator)

The ENDEC offers an output format suitable for use with devices that want to format alert data for display. The most common use is for character generators other than those directly supported by the ENDEC (vds840 and Chyron CODI). The format is :

<STX><sev><text><ETX>

Where:

STX	0x02
sev	The severity of the alert. For the VDS and Chyron character generators, and the ENDEC LED signs, the severity is used to set the color of the message. '1' - 0x31 is most severe (tornado warning, EAN, etc.) '2' - 0x32 is less severe (tornado watch, etc.) '3' - 0x33 is not severe (weekly test, etc.)
text	The expanded text of the message, length is dependent on the number of location codes in the alert, the length could be 2000 characters if both English and Spanish output is selected.
ETX	0x03

Devil in the Details

I decided to configure the CSWeather-EAS software to pass along only EAS Level 1 messages, and edit the text down to the bare facts. Radio displays are limited in the number of characters displayed.

So a EAS text message on WPR stations would appear:

TORNADO WARNING FROM 4:30PM to 6:00PM
FOR OUR LISTENING AREA.

Testing 1, 2, 3…

First and foremost, I patched the Sage ENDEC out of the WHA program path so I could generate test messages without annoying the listeners.

Don’t forget this step. I speak from painful experience back when we were first testing EAS gear in the 1990s.

Testing 1, 2, 3…

With the redirector software installed on the PAD server computer and everything connected, I first used Windows own “HyperTerminal” program running on the PAD server computer to make the first connection and troubleshoot. There I was able to see test messages from the EAS unit.

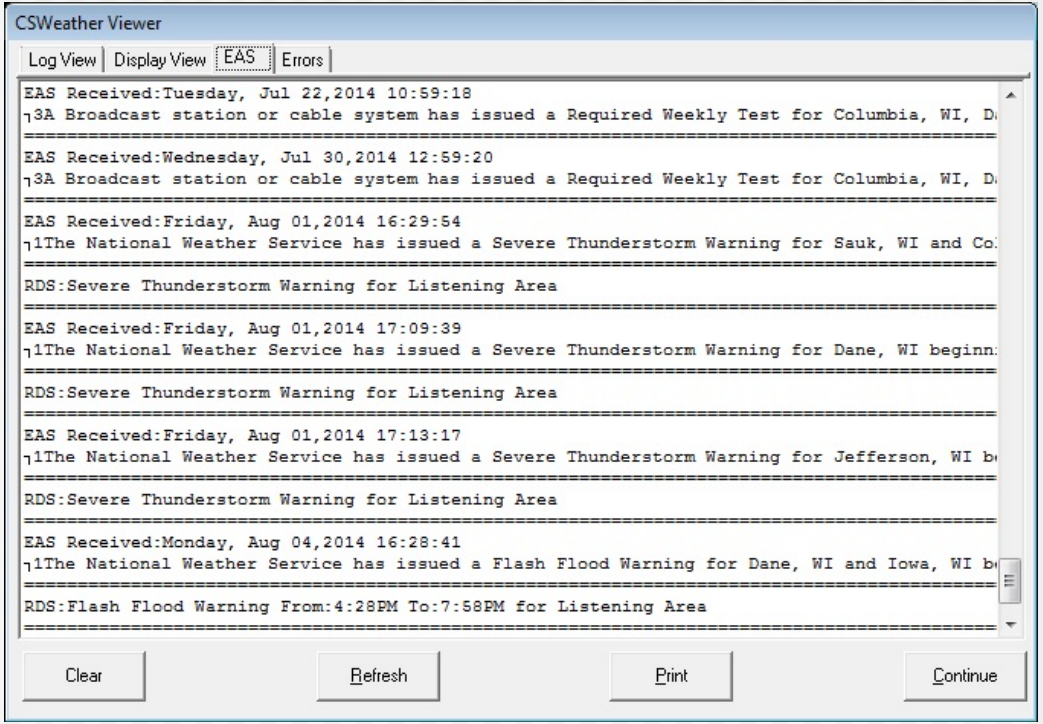
Then I configured the CSWeather-EAS program to look to the same COM port and confirmed EAS test messages were being logged.

Testing 1, 2, 3…

Next I configured the CS-Weather-EAS software program to forward warning-level 1 alerts, but not watches or tests, to the associated stations.

For this first stage of the project this destination is the HD PAD for AM WHA and RDS for its FM translators.

Results


CSWeather Viewer
Log View
Display View
EAS
Errors
EAS Received:Tuesday, Jul 22,2014 10:59:18
┐3A Broadcast station or cable system has issued a Required Weekly Test for Columbia, WI, D
EAS Received:Wednesday, Jul 30,2014 12:59:20
┐3A Broadcast station or cable system has issued a Required Weekly Test for Columbia, WI, D
EAS Received:Friday, Aug 01,2014 16:29:54
┐1The National Weather Service has issued a Severe Thunderstorm Warning for Sauk, WI and Co
RDS:Severe Thunderstorm Warning for Listening Area
EAS Received:Friday, Aug 01,2014 17:09:39
┐1The National Weather Service has issued a Severe Thunderstorm Warning for Dane, WI beginn
RDS:Severe Thunderstorm Warning for Listening Area
EAS Received:Friday, Aug 01,2014 17:13:17
┐1The National Weather Service has issued a Severe Thunderstorm Warning for Jefferson, WI b
RDS:Severe Thunderstorm Warning for Listening Area
EAS Received:Monday, Aug 04,2014 16:28:41
┐1The National Weather Service has issued a Flash Flood Warning for Dane, WI and Iowa, WI b
RDS:Flash Flood Warning From:4:28PM To:7:58PM for Listening Area
Clear
Refresh
Print
Continue

Level 3 Test -
No PDS and PAD sent.

```
EAS Received:Tuesday, Jul 22,2014 10:59:18
┐3A Broadcast station or cable system has issued a Required Weekly Test
```

Level 3 Test -
No PDS and PAD sent.

```
EAS Received:Wednesday, Jul 30,2014 12:59:20
┐3A Broadcast station or cable system has issued a Required Weekly Test
```

Level 1 Warning -

RDS and PAD sent.

```
EAS Received:Friday, Aug 01,2014 16:29:54
┐1The National Weather Service has issued a Severe Thunderstorm Warning
RDS:Severe Thunderstorm Warning for Listening Area
```

Level 1 Warning -

RDS and PAD sent.

```
EAS Received:Friday, Aug 01,2014 17:09:39
┐1The National Weather Service has issued a Severe Thunderstorm Warning
RDS:Severe Thunderstorm Warning for Listening Area
```

Level 1 Warning -

RDS and PAD sent.

```
EAS Received:Friday, Aug 01,2014 17:13:17
┐1The National Weather Service has issued a Severe Thunderstorm Warning
RDS:Severe Thunderstorm Warning for Listening Area
```

Level 1 Warning -

RDS and PAD sent.

```
EAS Received:Monday, Aug 04,2014 16:28:41
┐1The National Weather Service has issued a Flash Flood Warning for Dane
RDS:Flash Flood Warning From:4:28PM To:7:58PM for Listening Area
```

Results

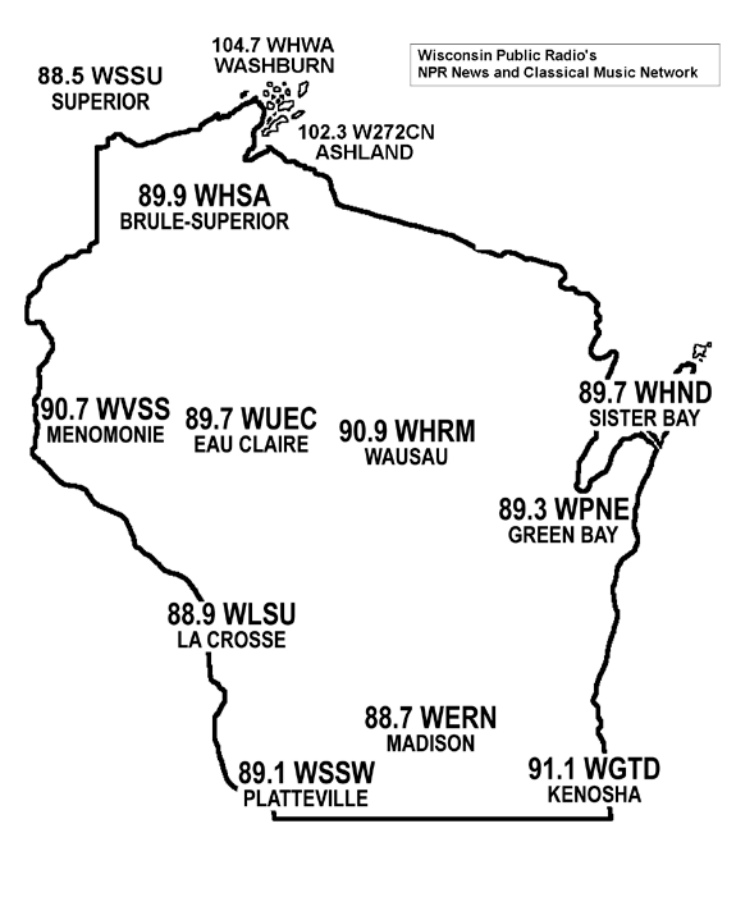
It is very satisfying to see thunderstorm and tornado warning EAS alerts appearing on the RDS and HD-PAD displays of radios tuned to WHA and its FM translators. The software has proven stable with no crashes in several months of operation.

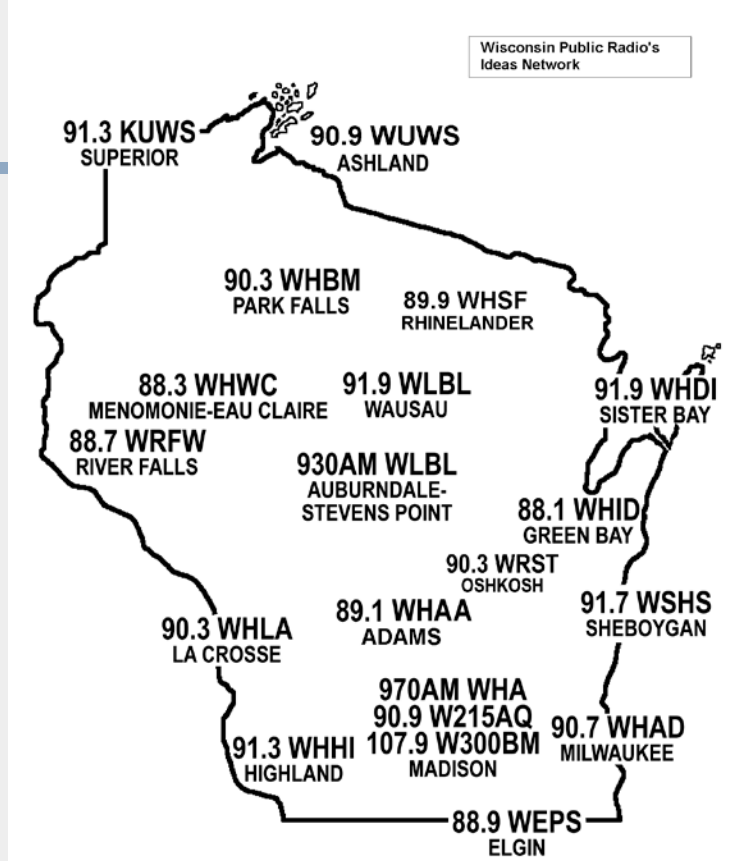
Hopefully this system is useful to listeners – if they hear the alert tones but miss the audio message, a glance at the radio display will provide the important info.

Next Steps

With the success of EAS text messaging on WHA and its translators, I configured the system to also drive our other Madison station, WERN and its HD multicast channels.

Next we will tackle our other regional groups of stations as time allows. Some will likely have unique challenges to be overcome – EAS encoders at transmitter sites versus PAD servers in bureau offices, network connectivity issues, and so on.


Wisconsin Public Radio's
NPR News and Classical Music Network
88.5 WSSU
SUPERIOR
104.7 WHWA
WASHBURN
102.3 W272CN
ASHLAND
89.9 WHSA
BRULE-SUPERIOR
90.7 WVSS
MENOMONIE
89.7 WUEC
EAU CLAIRE
90.9 WHRM
WAUSAU
89.7 WHND
SISTER BAY
89.3 WPNE
GREEN BAY
88.9 WLSU
LA CROSSE
88.7 WERN
MADISON
89.1 WSSW
PLATTEVILLE
91.1 WGTD
KENOSHA


Wisconsin Public Radio's
Ideas Network
91.3 KUWS
SUPERIOR
90.9 WUWS
ASHLAND
90.3 WHBM
PARK FALLS
89.9 WHSF
RHINELANDER
88.3 WHWC
MENOMONIE-EAU CLAIRE
91.9 WLBL
WAUSAU
91.9 WHDI
SISTER BAY
88.7 WRFW
RIVER FALLS
930AM WLBL
AUBURNDALE-
STEVENS POINT
88.1 WHID
GREEN BAY
90.3 WRST
OSHKOSH
89.1 WHAA
ADAMS
91.7 WSHS
SHEBOYGAN
90.3 WHLA
LA CROSSE
970AM WHA
90.9 W215AQ
107.9 W300BM
MADISON
91.3 WHHI
HIGHLAND
90.7 WHAD
MILWAUKEE
88.9 WEPS
ELGIN

Questions? Thank you.

Steve Johnston started taking apart radios as a youngster and became a ham radio operator at age 13. His professional career in broadcast engineering started at age 19 with Susquehanna Radio Corporation. Steve served Susquehanna for 20 years in several markets.

In 2000, Steve shifted to public radio when he became Director of Engineering and Operations for Boise State Radio. In 2005 he moved to Wisconsin Public Radio as Director of Engineering & Operations.

Steve is an SBE Certified Senior Radio Engineer, holds both FCC Radiotelephone and Radiotelegraph licenses, network engineering certifications, and has a BA in History and MBA in Business Administration. He and his wife Christy have two theoretically grown children.