Integrating Legacy Equipment into a Modern Infrastructure

A case study at Cumulus Media Chicago
Or… How do I marry the 1990’s with todays monitoring and control systems.

The issue at hand

WLS-AM, Chicago celebrated 100 years of broadcasting in 2024, and 86 of those years it has been transmitting from the same building in Tinley Park, IL

Much has changed...

The Challenge

- Incompatibility
  - Relays and Optos
  - Serial Data
- Limited Functionality
  - Not everything is available at the provided interface
- Cost of Replacement
  - Old but functional
  - Reality of the state of the business

Strategies for Integration

- Gateway Devices
  - Translate protocols
  - Convert signals
  - Facilitate Communications
- Protocol Conversion
  - A/D conversion
  - RS-232 VT100 Formatted Data to IP
  - Telnet to IP
- Modular Upgrades
  - Standardize on an output format
  - One step at a time

The Recent Past & Today

The Recent Past

1989 Continental 317-C3 transmitter. Doherty tube design with 24Vdc control logic tied to a 1978 custom relay based antenna switcher

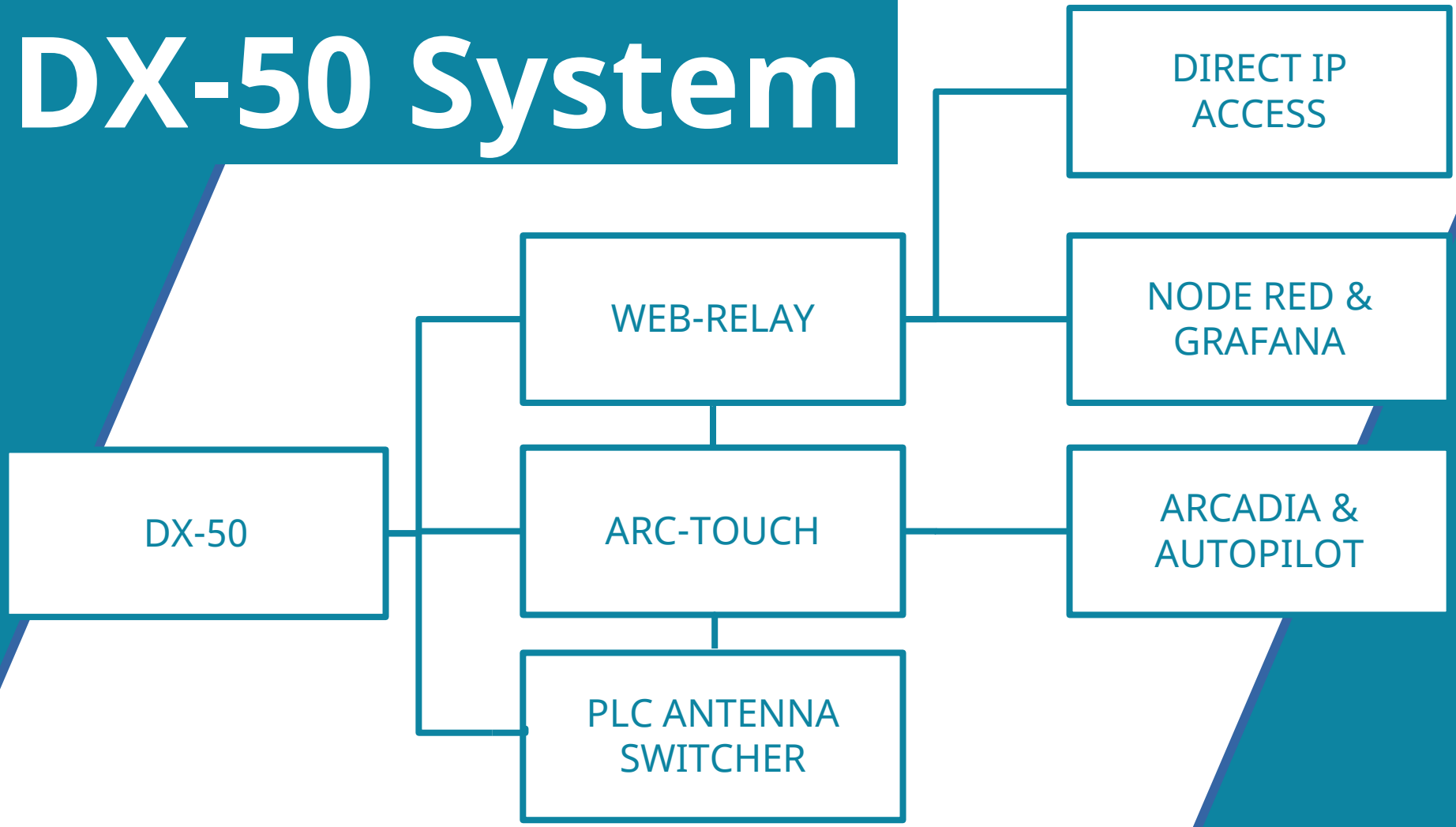
Today

Nautel NX-50 transmitter. Solid State with SNMP Control, Status and Metering tied to a PLC based antenna switcher

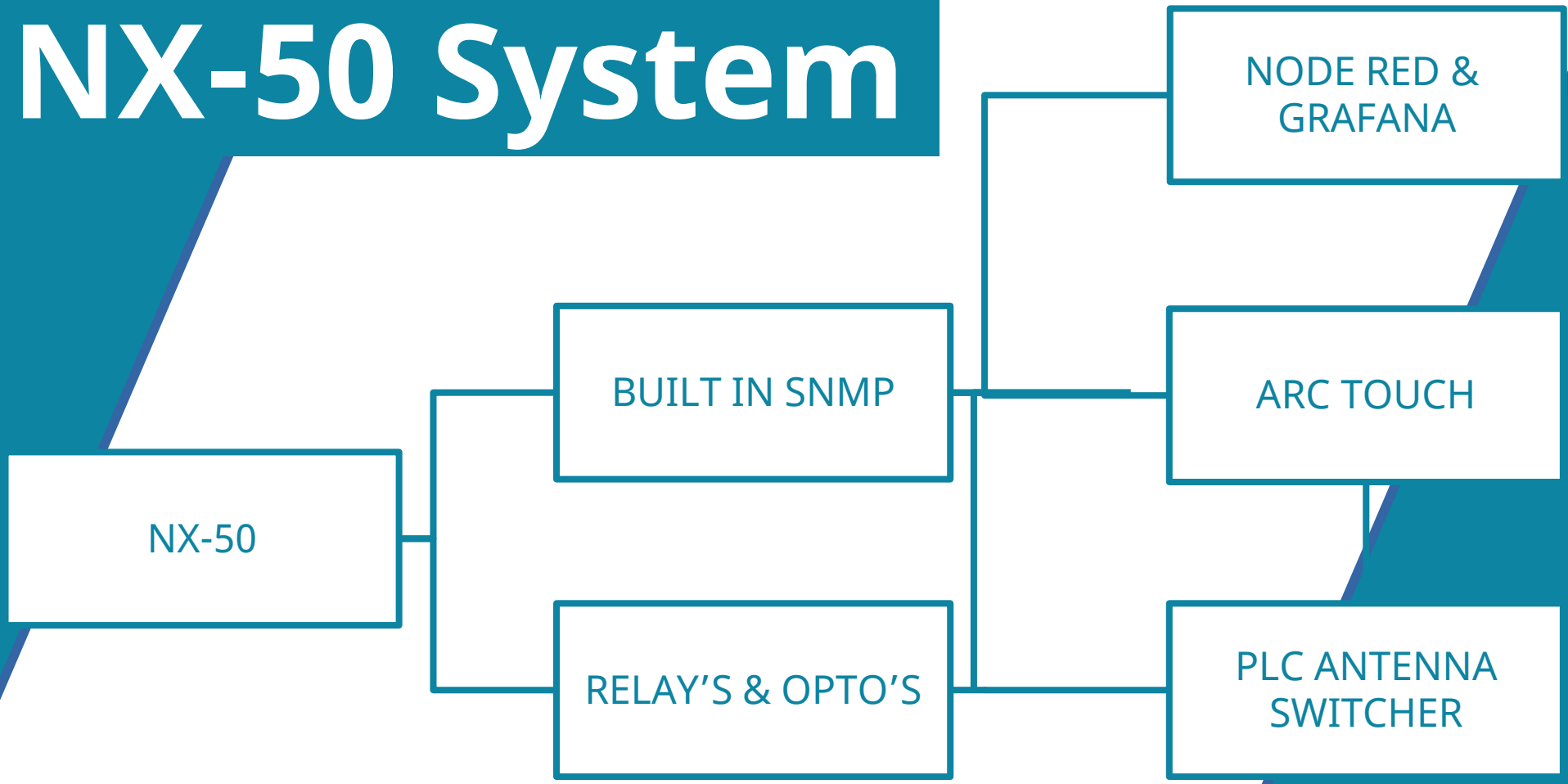
DX-50 Backup

- Installed in 1997 to replace a Harris MW-50.
- 24Vdc Conventional Control logic with Open collector Status tied to 1978 custom relay-based antenna switcher
- Critical control and status moved to new PLC based antenna switcher.
- All available status, control and metering brought out to a panel for distribution.
  - Burk ARC Touch Plus
  - Web based control and monitoring interface

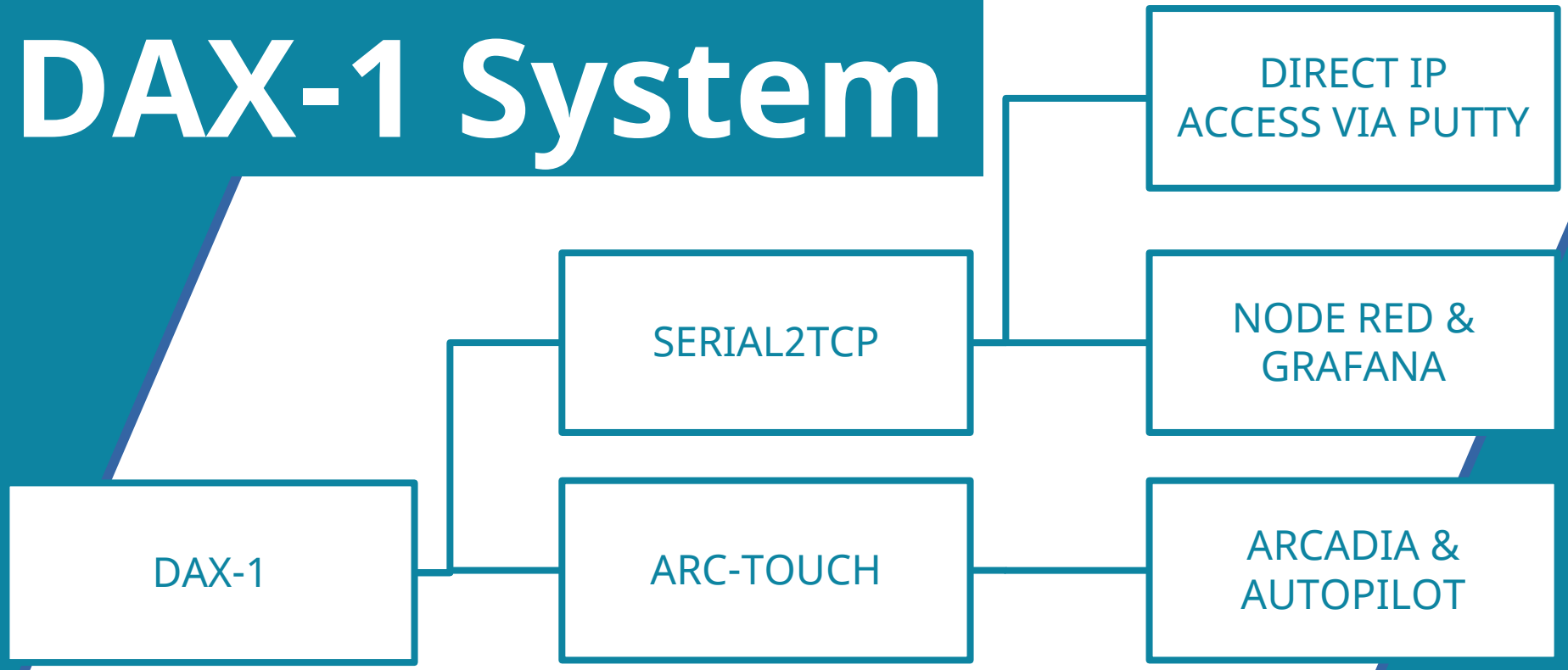
DX-50 System


DIRECT IP ACCESS
WEB-RELAY
NODE RED & GRAFANA
DX-50
ARC-TOUCH
ARCADIA & AUTOPILOT
PLC ANTENNA SWITCHER

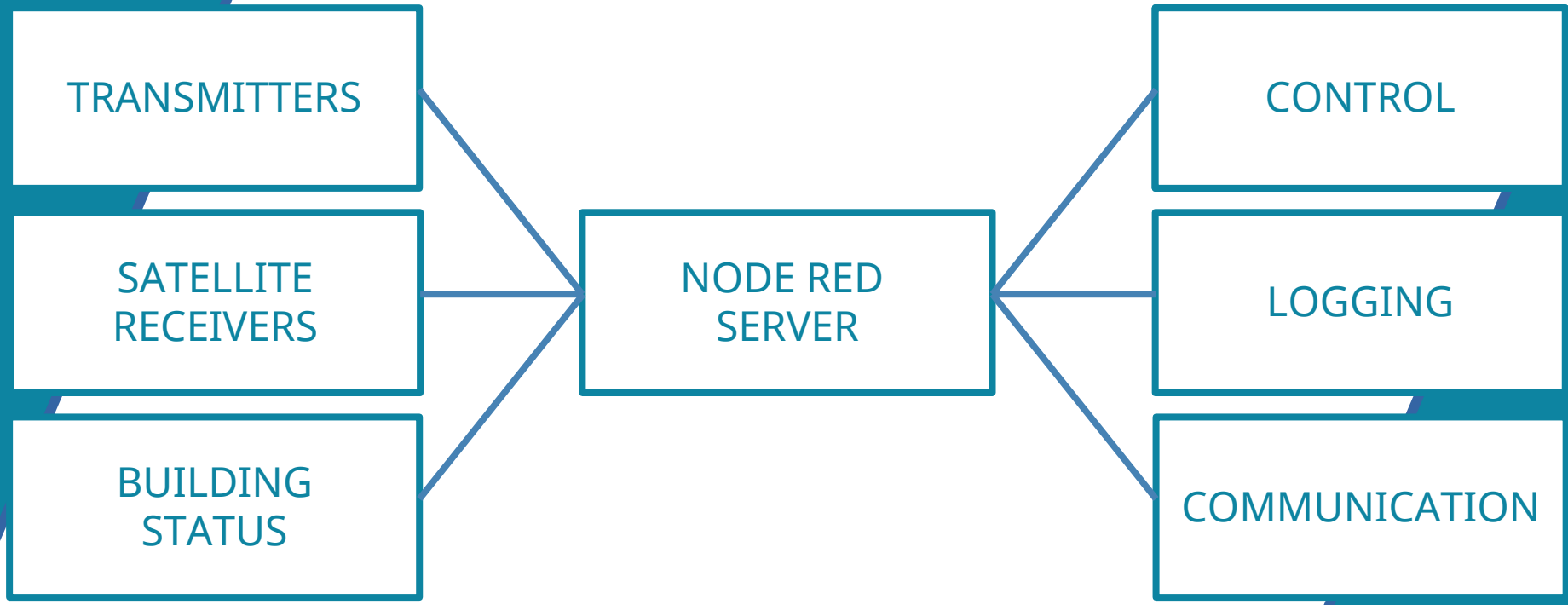
NX-50 System


NX-50
BUILT IN SNMP
RELAY'S & OPTO'S
NODE RED & GRAFANA
ARC TOUCH
PLC ANTENNA SWITCHER

DAX-1 System


DIRECT IP
ACCESS VIA PUTTY
SERIAL2TCP
NODE RED &
GRAFANA
DAX-1
ARC-TOUCH
ARCADIA &
AUTOPILOT

NODE RED System



Modules

Web I/O – Commercial product line for web-based monitor and control.

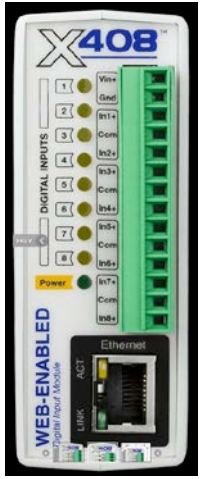
Click PLC – Industrial PLC modules for antenna and transmitter switching.

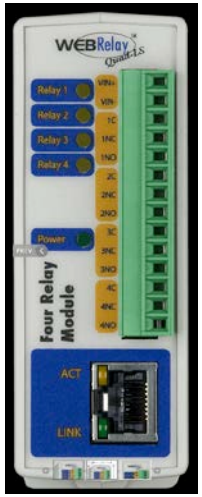
Serial2TCP - Custom RS232 to IP conversion using a Raspberry Pi with RS232 to USB dongle.

Node Red – Open Source “Swiss Army Knife” to draw the pieces together.

Web I/O

CONTROL by WEB™





http://controlbyweb.com

Click PLC

WLS Custom Antenna Switcher

http://automationdirect.com

Serial2TCP

```
[Unit]
Description=TCP to Serial

[Service]
TTYPath=/dev/ttyUSB0
ExecStartPre=/bin/stty -F
/dev/ttyUSB0 speed 57600
ExecStart=/bin/nc -k -l 4095
StandardInput=tty
StandardOutput=tty
Restart=always

[Install]
WantedBy=default.target
```

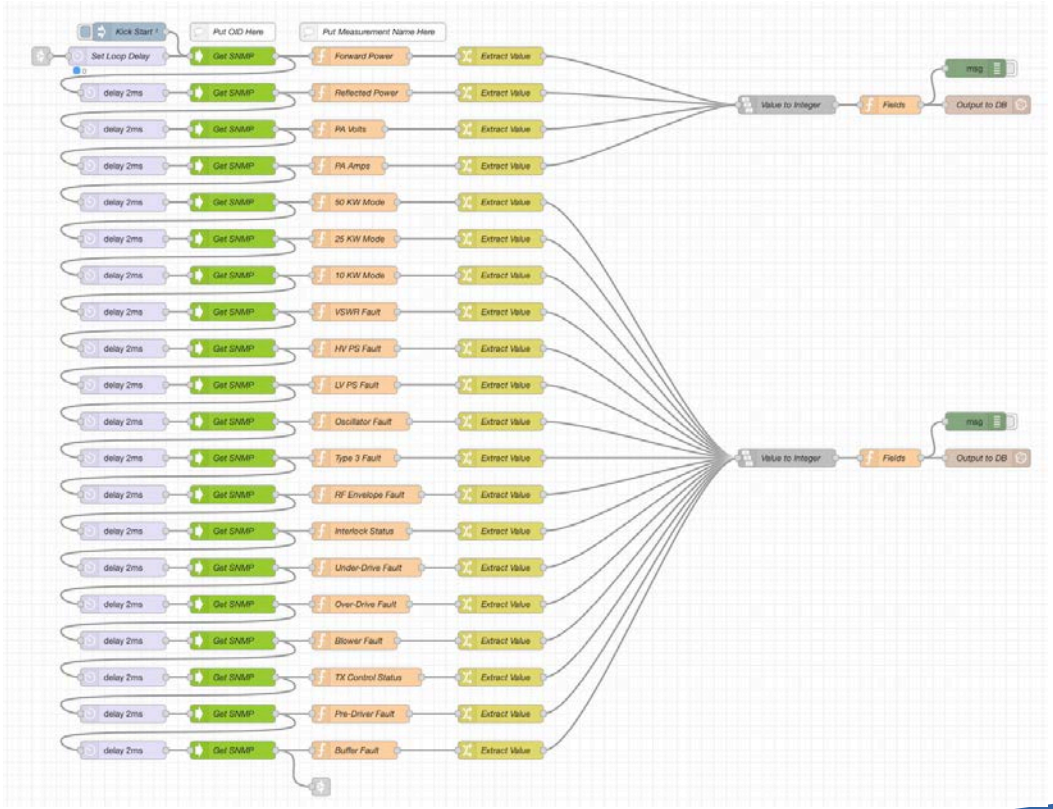
1) Using Netcat to translate COM port input to TCP

2) Can use a Raspberry Pi with RS-232 to USB Dongle

3) A GUI is not needed if you use Cockpit or Webmin

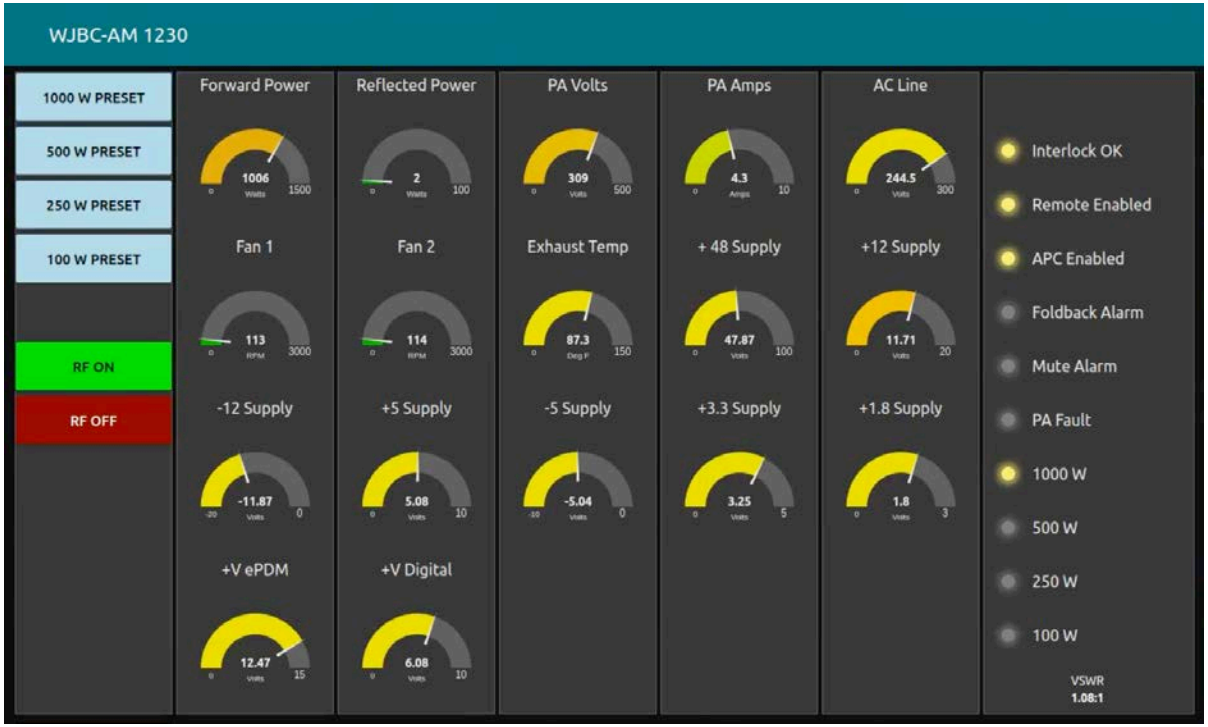
4) Put it on a UPS or a 5V battery backed supply

Node Red



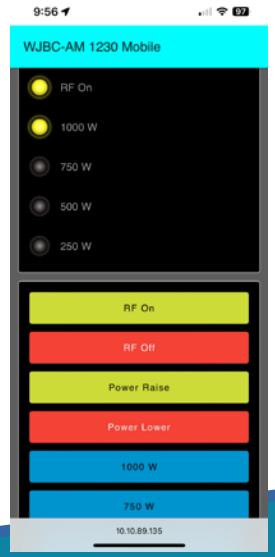
* Drag and drop interface
* Visual Logic flow
* Modular construction
* Web User Interface UI

Node Red

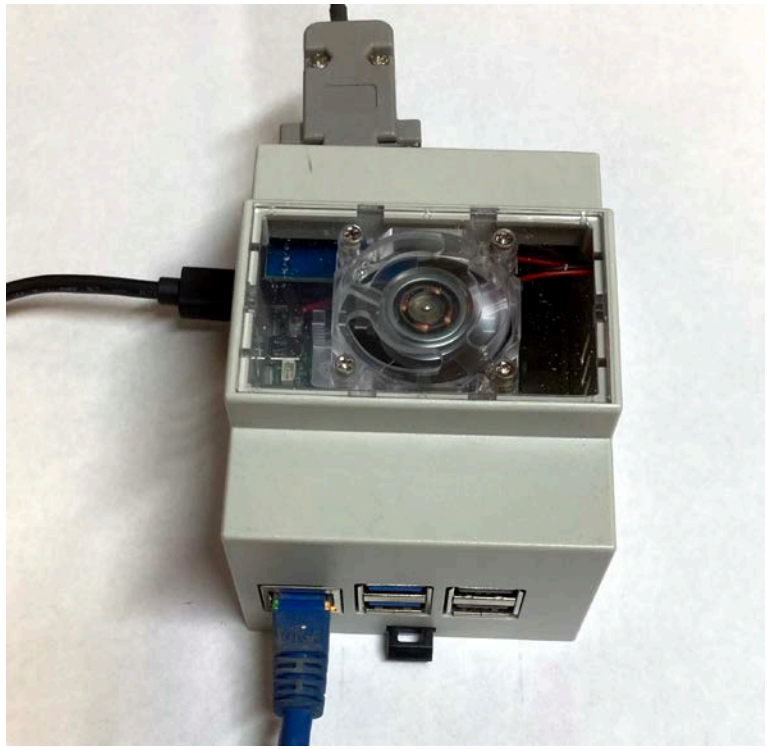


Harris DAX1 Web Interface

- Control, Status, Metering
- Fully Customizable
- Separate mobile page
- Uses the DAX 1 RS232 interface



Rpi-5



* DIN Rail case (Amazon)

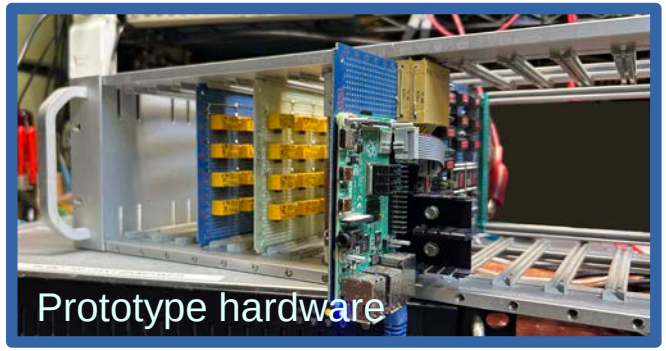
* RS-232 → TTL Interface (Amazon)

* WiFi or wired network

* Full Node-Red or just an Serial to TCP interface

in DX-50

Rpi-4 RC Unit



* Rpi 4 using 1-wire interface
* MCP23017 GPIO expansion
* ADS1115 AD conversion
* 16 channel Remote Clone

Thank you

Questions?

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https://wlsgit.dyndns.org/explore