

Intro to Node Red

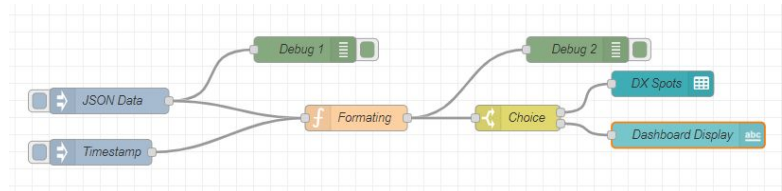
Build a Ham Radio Dashboard & Control Web Page
For Your Shack

Kyle AA0Z
www.aa0z.com



What is Node Red

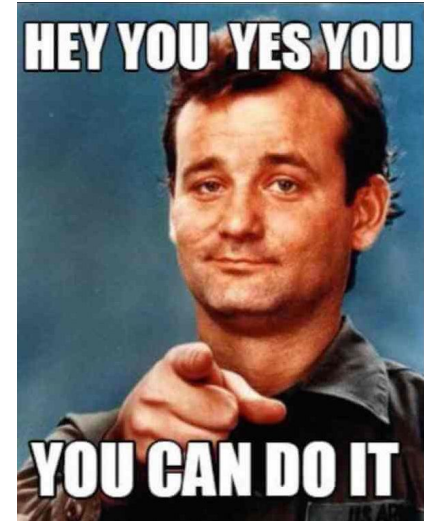
- Developed by IBM in 2013 - version 2.2.0 is the latest as of this presentation
- Built on Node.JS (javascript) and open source
- Used heavily in the IoT world for controlling smart devices
- Easily build web based dashboards for device command and control
- Create automations for complex tasks
- Programming is completed in a web browser
- Server runs on basically anything, Windows, Mac, Linux, Raspberry Pi, etc.
- Dashboard can run in any any web browser or smartphone
- Hides all the high level “boilerplate” code to allow quick programming





But...I'm Not A Programmer!

- I'm not a programmer either. If I can program in Node Red, you can program in Node Red!
- You just need logic and common sense skills
 - What is the end goal? What major tasks do I need to accomplish?
 - If A and B are equal do C.
 - I have A, but I need to get B, what steps are necessary to obtain B?
 - I am seeing A but I need B, how can I change or get the data I need?
- Node Red hides all of the high level code and makes programming easy - it's a drag and drop and configuration
- Pre-programmed nodes do all the heavy lifting
- Many "ready to go" flows are ready for importing
- If you get stuck, there are many resources available on the net
- Hundreds of pre-programmed flows ready to be loaded
- Debug nodes are your best friend





What Can Node Red Control?

- Almost anything with an input or output (Ethernet, Serial, USB, etc)
- Radios (seamless Flex 6000 radio integration)
- Amplifiers
- Tuners
- Rotors
- Antenna switches
- Relays
- Antenna disconnects
- Power supplies
- Home automation devices
- Weather stations





Why Use Node Red?

- Allows one location to control everything in your shack in one place
- Your eyes only have to look one place when operating (your computer screen)
- Eliminates errors when performing complex tasks by automation
 - Band opens to JA on 40M CW (alerting can be done via NR also)
 - Turn beam to JA (beam heading)
 - Select 40M antenna
 - Turn radio to CW on 40M to 7.040
 - Turn on amp
- One button click can automate changing bands, setting modes, configuring your amp and turning your rotor to a specific location on a map
- Get real time feedback from devices
- Integrate non ham radio devices into your shack
- Email or SMS you for alarms in your shack or for severe weather
- Alerts you via visual & audio for out of spec values (SWR, Temp, Pwr, etc...)





How Does This All Work?

- Load Node Red on a computer, preferably a Raspberry Pi so it runs 24/7
- Configure nodes and connect them together for the basic logic
- Configure the dashboard to display the logic you just programmed
- Continue to tweak
- Build more flows as you gain more experience
- Give back to the community
 - Build a node for equipment
 - Share your flows
 - Answer questions on a mailing list
 - Promote the hobby while using Node Red





Node Red Dashboard Examples

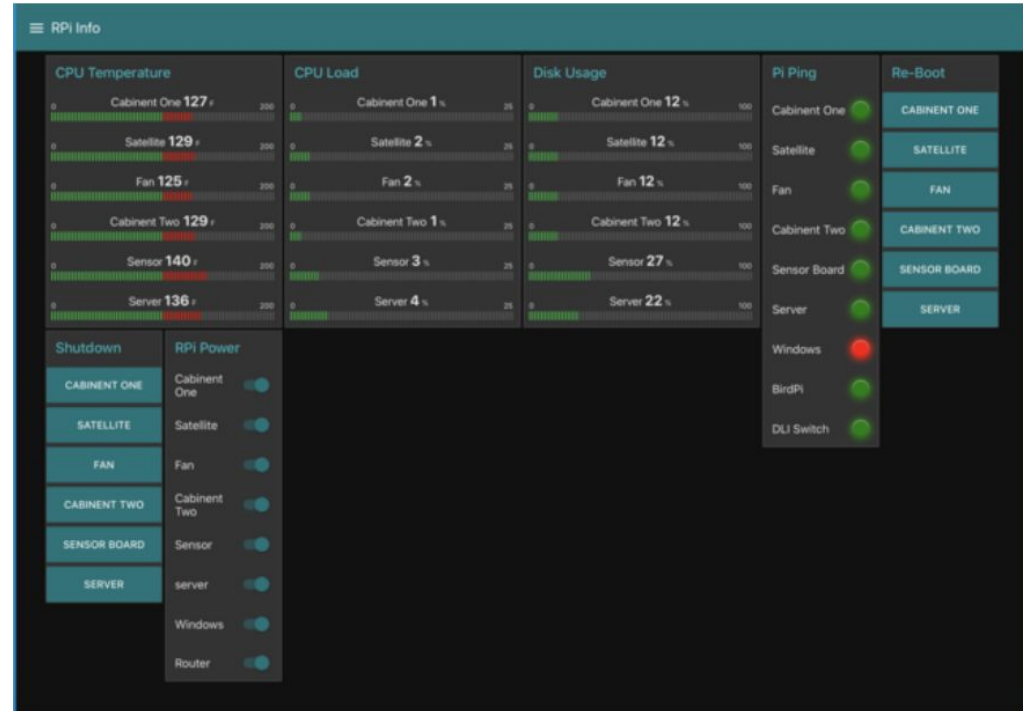
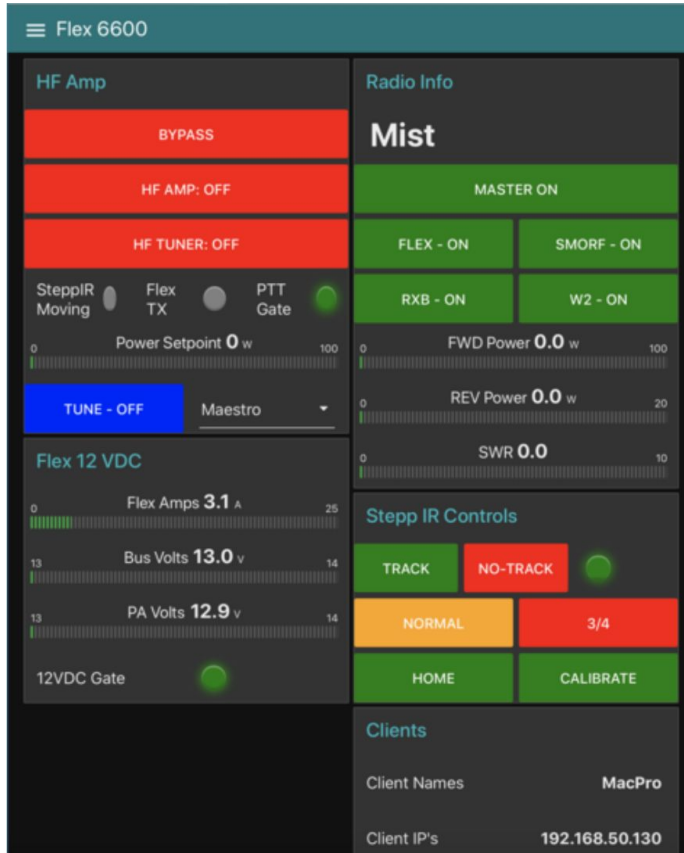
The dashboard is titled "WO2X Shack Control" and is divided into several functional panels:

- Flex Radio:** Shows radio model (Flex Radio 6600M), call sign (WO2X), client names (DESKTOP-IQBGQT7), and client IPs (10.0.0.119). It includes a "Flex TX" button and a "READY" indicator.
- Power Genius XL:** Displays "IDLE" status, PGXL FWD 2w, PG XL SWR 1.00, PA Temperature 37 c, Harmonic Load 31 c, VAC 243, VDD 0.0, ID peak 0, Fan Speed, and Band A/B settings (20 and 0 b).
- Tuner Genius:** Shows "OPERATE" status, TG XL Peak Output 0 watts, TG XL SWR 1.00, and C1/L/C2 settings. It includes "RADIO 1" and "RADIO 2" buttons, a "TUNE" button, and Frequency A/B (14.210 and 0.000).
- Antenna Genius:** Displays "Radio Antenna 1 | Radio Antenna 2" (20m | None), antenna types (5 B YAGI, 30/6 DIPOL, 30/6 DIPOL), and GSRV settings. It includes "Flex Meters" for Input voltage (14.4), PA Voltage (14.2), 6600M Fan Speed (1080), and PA Temp (30.3).
- Beam:** Features a world map with a heading of 280 and a "MANUAL" button.
- Rotor & Power Switch:** Lists various rotors (0 NORTH, 50 EU, 120 AF, 160 CARIB, 210 SO PAC, 240 ZL, 280 HI, 330 JA) and power outlets (PC, RT21 Rotor, Outlet 3, 12 Volts, Node Red Server, Outlet 6, Radio PTT, 6600m Power On). It includes a "STOP" button and a "LOG CONTACT" button.
- Hosts Pings:** Shows ping status for Flex 6600m, PC, Raspi, and Internet with corresponding gauges.

Below the dashboard is a screenshot of the FlexRadio software interface, showing a spectrum analyzer with a frequency of 14.210.000, a power level of +8dB, and various control buttons (RX, TNF, Band, ANT, DAX). The interface also displays "POWER GENIUS XL" status and "STATION: DESKTOP-IQBGQT7".



Node Red Dashboard Examples

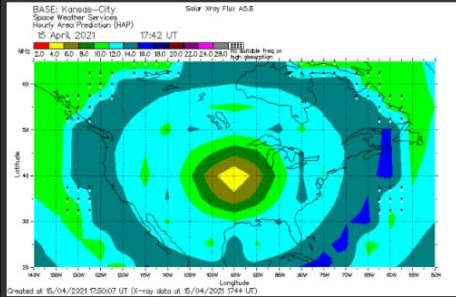




Node Red Dashboard Examples

☰ HF Propagation

HF Propagation Map - Updated every hour



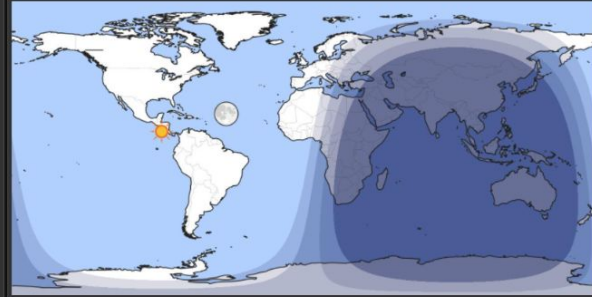
SF prop: 14MHz

NY prop: 14MHz

Space Weather

Very low solar activity is expected for UT day 15 April with a slight chance of an isolated C-class flare. Light solar wind speeds and mostly quiet geomagnetic conditions. Mostly normal HF propagation conditions are predicted with no short wave fadeouts

GeoChron



Widget forecast

meteoibus

46°F Partly cloudy
wind: 4.4 mph

Thu	Fri	Sat	Sun	Mon	Tue
52°F / 34°F	51°F / 42°F	52°F / 44°F	53°F / 42°F	56°F / 38°F	56°F / 35°F

Thursday

03 ⁰⁰	06 ⁰⁰	09 ⁰⁰	12 ⁰⁰	15 ⁰⁰	18 ⁰⁰	21 ⁰⁰	00 ⁰⁰
☁	☁	☁	☁	☁	☁	☁	☁
36°	34°	40°	47°	52°	51°	47°	44°
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1%	0%	1%	2%	2%	1%	0%	0%

More

Current Weather Union Ridge

Weather Clouds

Location Unionville

Weather details Broken Clouds

Outside Temp 53

Wind Direction 355 Degrees

Wind Speed 2.24 mph

Outside Temp

Weather LED

The weather in Unionville at coordinates: 40.2476, -92.8554 is Clouds (broken clouds).



Node Red Dashboard Examples

DX Cluster Raw

DX Cluster Spots

KOXM Status ●

Freq	Call	Comment	Time
14300.0	EASVX	calling CQ DX	1227Z
7035.0	R2EC/M		1226Z
14094.1	EA1B	RTTY	1226Z
7154.0	DL/SP6K	Florian	1226Z
14159.5	RP76ZKS		1226Z
14093.2	K2SGF	RTTY	1225Z
14163.9	IK6LBT	USB	1225Z
14133.0	RP760IA	USB	1225Z
7095.0	EG2MI	MVNA-0892 ULTIMAS LL...	1225Z
14091.5	IK1SDW	RTTY	1224Z
14011.0	UM45	CW CQ-M International ...	1224Z

CONNECT KOXM DXC KA INJECT

CW Skimmer Spots

CW Skimmer Status ●

Freq	Call	Comment	Time
14044.2	RTST	CW 26 dB 34 WPM CQ	1227Z
7018.5	NASC	CW 7 dB 24 WPM CQ	1227Z
14041.6	WK2G	CW 21 dB 34 WPM CQ	1227Z
14017.0	9A1CRT	CW 17 dB 35 WPM CQ	1227Z
14062.9	KP4YO	CW 9 dB 17 WPM CQ	1227Z
14030.8	LADCX	CW 10 dB 34 WPM CQ	1227Z
14024.8	E74X	CW 5 dB 29 WPM CQ	1227Z
7014.5	RT3F	CW 25 dB 36 WPM CQ	1227Z
14087.7	CO2VE	RTTY +24 dB CQ	1227Z
3516.1	JNMEM	CW 17 dB 22 WPM CQ	1227Z
14038.1	RAACY	CW 10 dB 28 WPM CQ	1227Z

CONNECT SKIMMER SPOTTERCONT = NA ONLY

KA INJECT CLEAR ALL FILTER

County Hunter & HA Spots

CH Spot Status ● Ham Alert Status ●

Freq	Call	Comment	Time
14005.9	VE9HF	8dB 33wpm	1226Z
50313.0	VE1BC	FTB -21 at 1286hz	1223Z
14074.0	VE1GG	-4dB	1222Z
14056.5	N4CD	baxter, ar (K7310) CW	1221Z
50313.9	VA1WV	FTB -13dB	1221Z
14052.1	VE1EM5	14dB 22wpm	1221Z
50314.2	VE1ZMI	FTB -5dB	1215Z
10140.2	VE1INN	WSPR -3dB	1212Z
50261.5	VE1SKY	MSK144 -3dB	1216Z
21075.4	VE1CSM	FTB -1dB	1216Z
14074.0	VE1DC	-3dB	1216Z

CONNECT CH SPOTS CONNECT HAM ALERT

CH KA INJECT HA KA INJECT

Ham Alert Output AAOZ de HamAlert >

CH Output AAOZ de W6RK-2 8-May-2021 1225Z despider >

Digital Spots

Digital NCTJ Spot Status ●

Freq	Call	Comment	Time
14086.4	NSAR	16 dB 45 BPS RTTY	1227Z
7043.3	K30AA	49 dB 45 BPS RTTY	1226Z
7040.4	JA1PVX	17 dB 45 BPS RTTY	1225Z
14086.0	WB0WIV	7 dB 45 BPS RTTY	1225Z
14088.6	NSAR	15 dB 45 BPS RTTY	1225Z
7044.9	AIDY/9	21 dB 45 BPS RTTY	0024Z
7044.9	AIDY/9	21 dB 45 BPS RTTY	0024Z

CONNECT DX DIGITAL DIGITAL KA INJECT

MOQSO Cluster

Freq	Call	Comment	Time
3901	K5G	Nighttime	0125Z
3901	K5G	Nighttime	0125Z

PULL LAST 5 CW FUN SPOTS PULL LAST 10 CW FUN SPOTS

Top Spot

2nd Spot

POTA Spots

Freq	Call	State	Ref#	Park	Comment	Time
7213	W3SPC	SC	K-3879	Lake Hartwell	Good signal down the r...	0722Z
14287	KD2UWR	NY	K-8092	Carmans River Pine Barr...	Just starting on 20m	0722Z
7299	K5CP	TX	K-3503	Government Canyon Na...	Self	0722Z
14042.0	WDSGRW	TX	K-4423	Spring Creek Forest	RBN 16 dB 20 WPM via ...	0722Z
7197	KD5PCK	LA	K-4071	Pearl River	Free donuts with every ...	0722Z
7236	N4MTE	AL	K-3681	Blowing Springs Cave Pr...		0722Z
14056.5	N4CD	AR	K-7310	Norfolk Lake	RBN 3 dB 24 WPM via V...	0722Z
7060.0	WBSN	TX	K-3000	Cooper Lake	RBN 25 dB 19 WPM via ...	0722Z
14290	N28TD	NJ	K-7504	Assumpink	5/7 in Spain EU. Trx new...	0717Z
7198	KD2UWR	NY	K-8092	Carmans River Pine Barr...	Going to switch to 20m ...	0717Z
7213	W3SPC	SC	K-3879	Lake Hartwell	Good signal down the r...	0717Z
14042.0	WDSGRW	TX	K-4423	Spring Creek Forest	RBN 12 dB 16 WPM via ...	0717Z
7236	N4MTE	AL	K-3681	Blowing Springs Cave Pr...	4-3 North of Fargo ND	0717Z
7060.0	WBSN	TX	K-3000	Cooper Lake		0717Z
14290	N28TD	NJ	K-7504	Assumpink	5/7 in Spain EU. Trx new...	0712Z
7198	KD2UWR	NY	K-8092	Carmans River Pine Barr...	Going to switch to 20m ...	0712Z

NCTJ CONNECT SKIMMER NCTJ SET MOQSO FILTER

KA INJECT

CW Skimmer Around MO

Freq	Call	Comment	Time
------	------	---------	------



Node Red Dashboard Examples

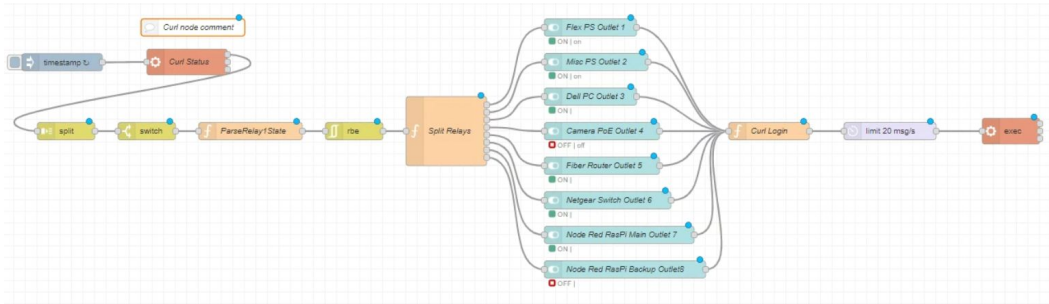
← N1MM Dashboard
Move to Archive

<p>Last QSO's</p> <p>Last Run QSO 0:03:30</p> <p>Last Run QSO KH2OP</p> <p>Last S&P QSO 0:04:29</p> <p>Last S&P QSO KC5HWB</p> <p>Last Multi QSO 0:03:30</p> <p>Top OP Multi KX9X</p>	<p>Current QSO's</p> <table style="width: 100%; text-align: center;"> <tr> <td>Last QSO KH2OP</td> <td>Band 80M</td> <td>Mode SSB</td> <td>Exchange</td> </tr> </table>	Last QSO KH2OP	Band 80M	Mode SSB	Exchange	<p>Contest Stats</p> <p>Total Score 1716</p> <p>QSOs 143</p> <p>Multipliers 12</p> <p>Points 143</p> <p>Current Total QSO Rate 68 Q's/Hr</p> <p>Top OP Score KX9X</p>	<p>QSOs by Band</p> <p>QSO Rate by Band</p> <p>Total QSO Rate Chart</p>						
Last QSO KH2OP	Band 80M	Mode SSB	Exchange										
<p>Radio 1 Data</p> <table style="width: 100%; text-align: center;"> <tr> <td>Operator AA0Z</td> <td>Mode LSB</td> <td>Freq 3500.0</td> <td>Status Run</td> <td>OP QSO Rate Q's/Hr 68</td> </tr> </table>		Operator AA0Z	Mode LSB	Freq 3500.0	Status Run	OP QSO Rate Q's/Hr 68	<p>Radio 2 Data</p> <table style="width: 100%; text-align: center;"> <tr> <td>Operator AA0Z</td> <td>Mode LSB</td> <td>Freq 3500.0</td> <td>Status Run</td> <td>OP QSO Rate Q's/Hr 68</td> </tr> </table>		Operator AA0Z	Mode LSB	Freq 3500.0	Status Run	OP QSO Rate Q's/Hr 68
Operator AA0Z	Mode LSB	Freq 3500.0	Status Run	OP QSO Rate Q's/Hr 68									
Operator AA0Z	Mode LSB	Freq 3500.0	Status Run	OP QSO Rate Q's/Hr 68									



Node Red Dashboard Examples

Digital Loggers Web Power Switch with Dashboard

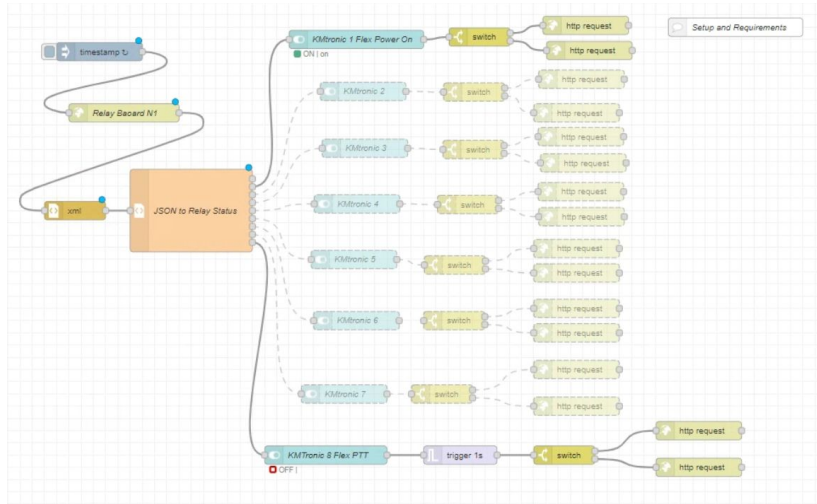


Power Switch Misc		Flex Power	
Dell PC		Flex PS	
Fiber Router		Misc PS	
Netgear Switch			
RasPi (main)			
RasPi (backup)			
Camera PoE			



Node Red Dashboard Examples

KMTronics Web Relay (turn power on, switch relay compatible items)

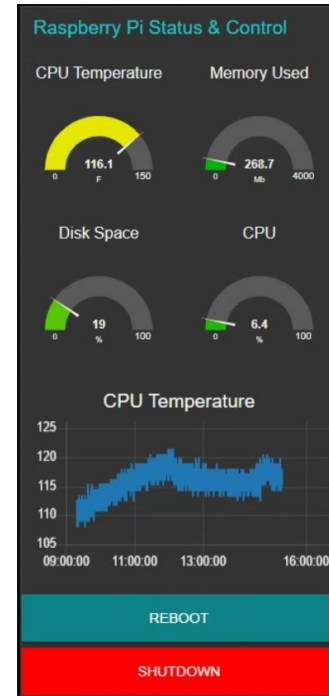
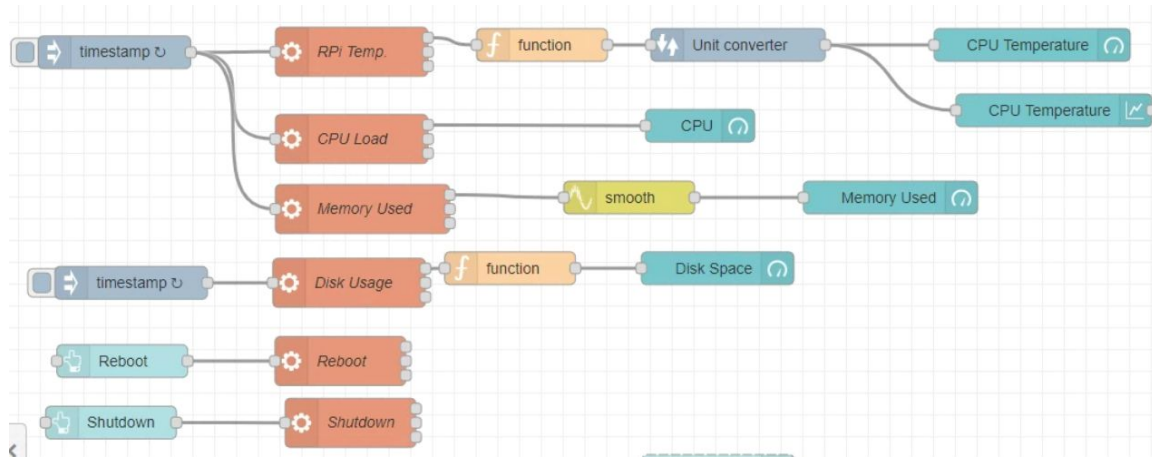


Power Switch Misc		Flex Power	
Dell PC		Flex PS	
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Netgear Switch			
RasPi (main)			
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Camera PoE			



Node Red Dashboard Examples

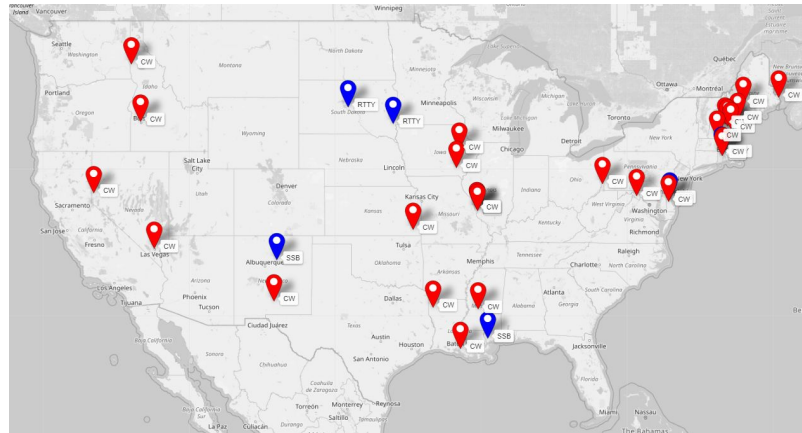
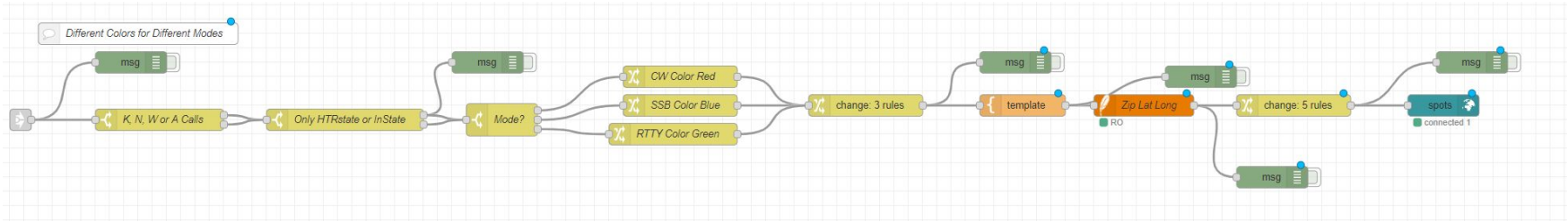
Raspberry Pi Monitor with Dashboard





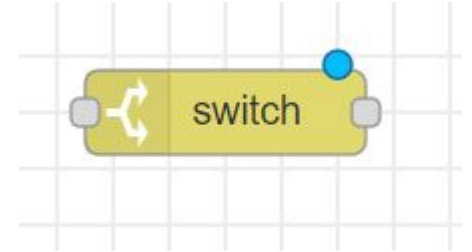
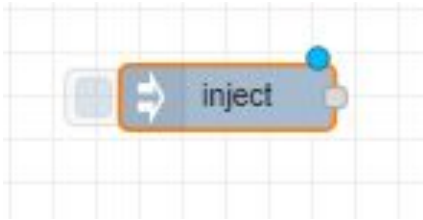
Node Red Dashboard Examples

Dynamic DX Cluster Spots or QSO Map in Real Time





What is a “Node”?



Edit inject node

Delete Cancel Done

Properties

Name

msg.payload = timestamp

msg.topic = a_z

+ add

Inject once after 0.1 seconds, then

Repeat none

Enabled

Edit debug node

Delete Cancel Done

Properties

Output msg.payload

To debug window

system console

node status (32 characters)

Name

Enabled

Edit switch node

Delete Cancel Done

Properties

Name

Property msg.payload

== a_z → 1

+ add

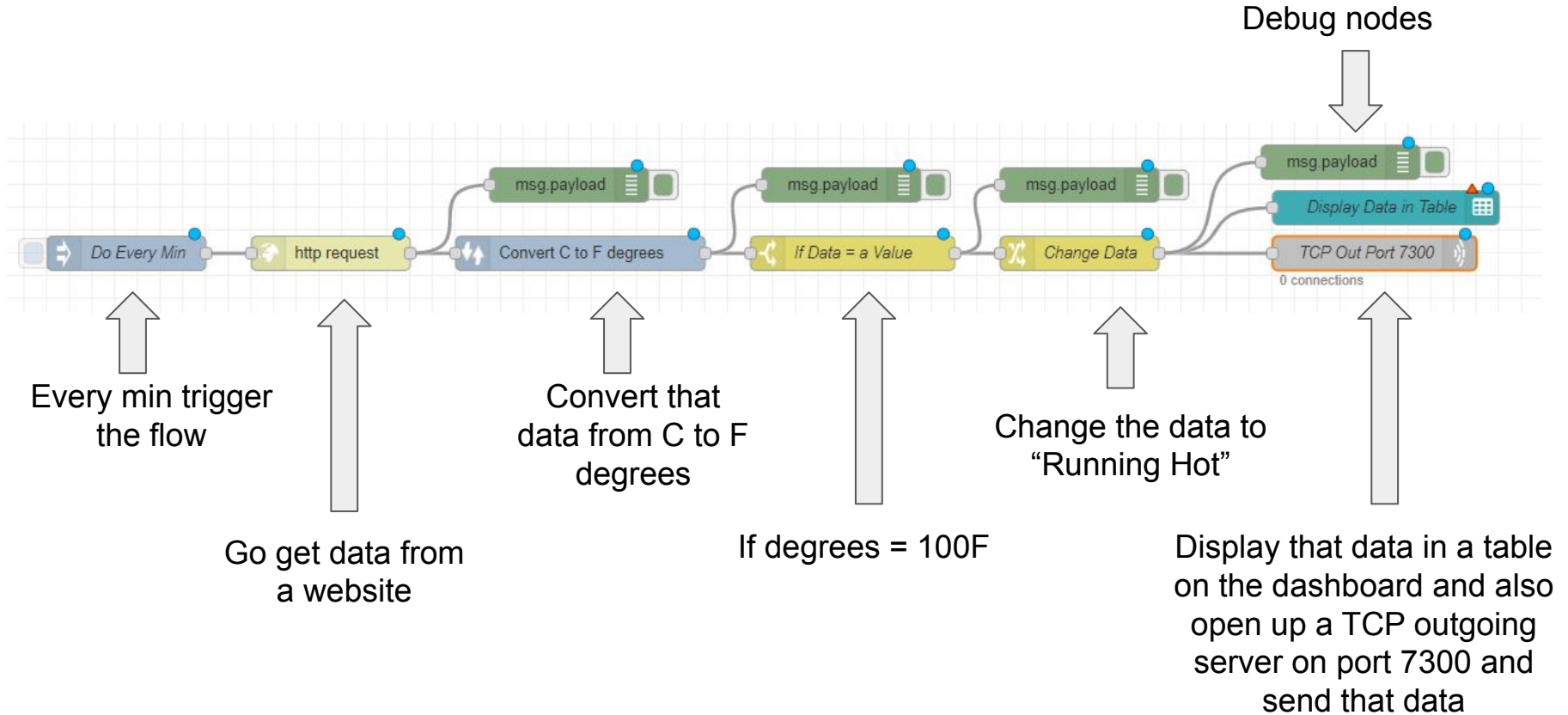
checking all rules

recreate message sequences

Enabled

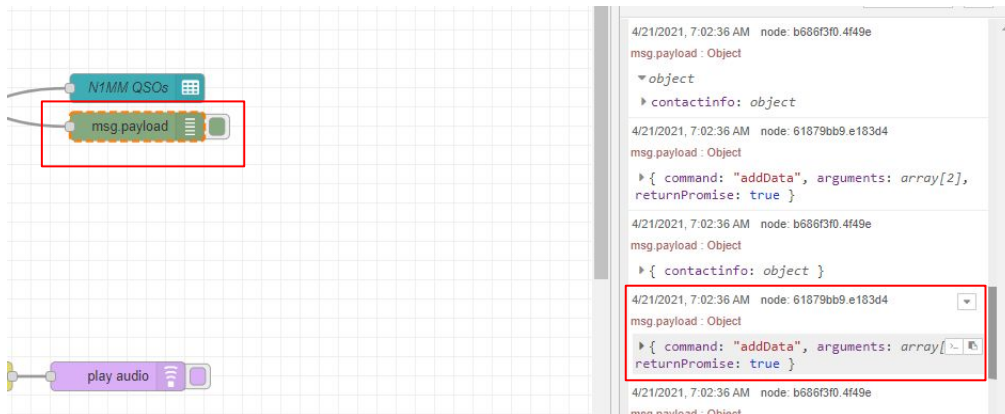
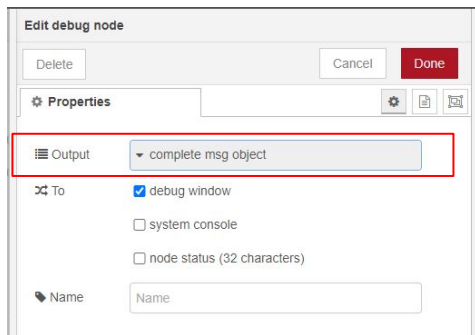


Sample Flow Breakdown





Debugging Flows



- The debug node will be your most used node - learn how to use it
 - Rename debug nodes to something useful for locating quickly
 - Change the output to “complete msg object” to see complete debug data
 - Connect debug nodes to everything
 - Make sure you turn them on to see the output
 - You can leave them connected but turn off the output



Where to Start?

<https://nodered.org/>

A screenshot of the Node-RED website homepage. The page has a dark red header with the "Node-RED" logo on the left and a navigation menu with links for "home", "about", "blog", "documentation", "forum", "flows", and "github". The main content area has a dark red background with the "Node-RED" title in white, followed by the tagline "Low-code programming for event-driven applications" and "Latest version: v1.3.2 (npm)". Below this, there is a white section with descriptive text and three buttons: "Features", "Get Started", and "Community". On the right side of this section, there is a video player thumbnail for "Introduction - Node-RED Essentials" with a play button icon.

Node-RED

home

about

blog

documentation

forum

flows

github

Node-RED

Low-code programming for event-driven applications

Latest version: v1.3.2 (npm)

Node-RED is a programming tool for wiring together hardware devices, APIs and online services in new and interesting ways.

It provides a browser-based editor that makes it easy to wire together flows using the wide range of nodes in the palette that can be deployed to its runtime in a single-click.

Features

Get Started

Community





Installing Node Red (Windows)

<https://nodered.org/docs/getting-started/windows>

Quick Start

1. Install Node.js
2. Install Node-RED
3. Run Node-RED

Alternative Installations on Windows

npm on Windows

Sharing Node-RED between Users

Installing Node.js Windows Build Tools

Running on Windows

Using PM2

Run Node-RED on Startup

- Install Node.js
 - <https://nodejs.org/en/> (latest version)
- Install Node Red
 - `npm install -g --unsafe-perm node-red`
- Run Node Red
 - `c:>node-red`

Consult the Node Red Windows Install website for additional parameters needed for install and starting Node Red on boot up



Installing Node Red (Raspi)

<https://nodered.org/docs/getting-started/raspberrypi>

```
bash <(curl -sL https://raw.githubusercontent.com/node-red/linux-installers/master/deb/update-nodejs-and-nodered)
```



Raspberry Pi (4Gb) - \$35
SD Card (16Gb) - \$10
Power Supply - \$7
Case - \$10

Optional
Mini HDMI cable - \$20
Keyboard - \$10



Enabling SSH & WiFi on RasPi First Boot

<https://www.raspberrypi.org/documentation/remote-access/ssh/README.md>

3. Enable SSH on a headless Raspberry Pi (add file to SD card on another machine)

For headless setup, SSH can be enabled by placing a file named `ssh`, without any extension, onto the boot partition of the SD card from another computer. When the Pi boots, it looks for the `ssh` file. If it is found, SSH is enabled and the file is deleted. The content of the file does not matter; it could contain text, or nothing at all.

If you have loaded Raspberry Pi OS onto a blank SD card, you will have two partitions. The first one, which is the smaller one, is the boot partition. Place the file into this one.

For a headless (no keyboard/mouse/monitor) setup, place a blank file named `ssh` in the root of the SD card after you flash the image. On first boot, SSH will be enabled.

You will need to look at your router to find out what DHCP address the Raspi was configured with.

Use a program like Putty to SSH into your Pi.

<https://www.raspberrypi.org/documentation/configuration/wireless/headless.md>

wpa_supplicant.conf file example:

```
ctrl_interface=DIR=/var/run/wpa_supplicant GROUP=netdev
update_config=1
country=<Insert 2 letter ISO 3166-1 country code here>

network={
    ssid="<Name of your wireless LAN>"
    psk="<Password for your wireless LAN>"
}
```

Create a text file named `wpa_supplicant.conf`

Copy the info to the left & replace your country code (US), SSID and WPA password.

Save in the boot directory of the SD Card

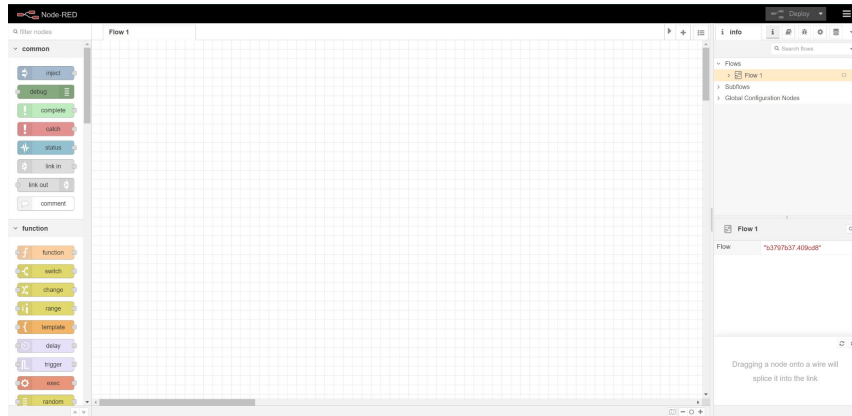


Node Red Dashboard

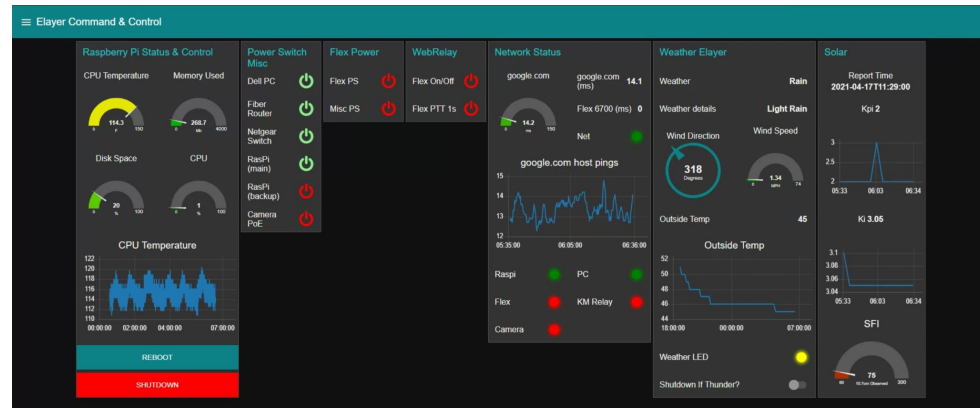
Workspace Webpage : <http://localhost:1880> or <http://<Raspi ip address>:1880>

Dashboard : <http://localhost:1880/ui> or <http://<Raspi ip address>:1880/ui>

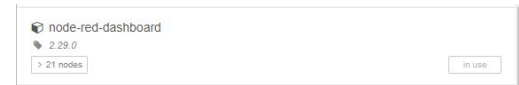
Workspace



Dashboard



- Install the dashboard node to display flows via the dashboard





Node Red Main Screen

<http://<ip address of your Node Red install>:1880>

Node-RED

Flow 1

common

- inject
- debug
- complete
- catch
- status
- link in
- link out
- comment

function

- function
- switch
- change
- range
- template
- delay
- trigger
- exec
- random
- smooth
- throttle
- gate

network

- mqtt in
- mqtt out
- http in
- http response
- http request

HEADER

PALLET

MAIN WORK SPACE

SIDEBAR

Flows

- Flow 1
- Subflows
- Global Configuration Nodes

Flow 1

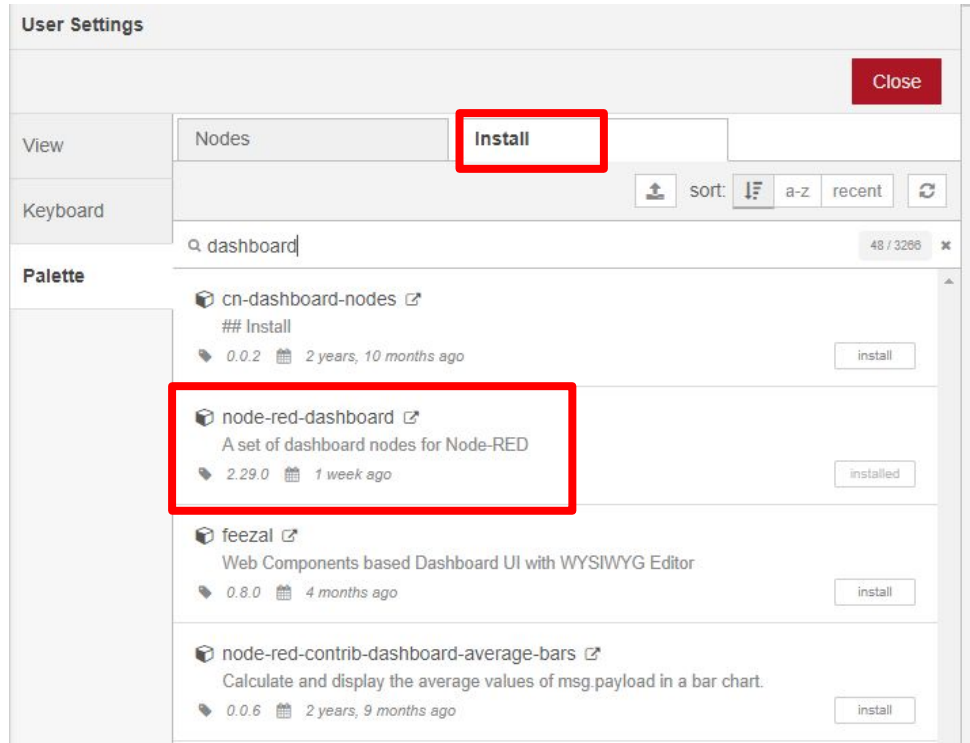
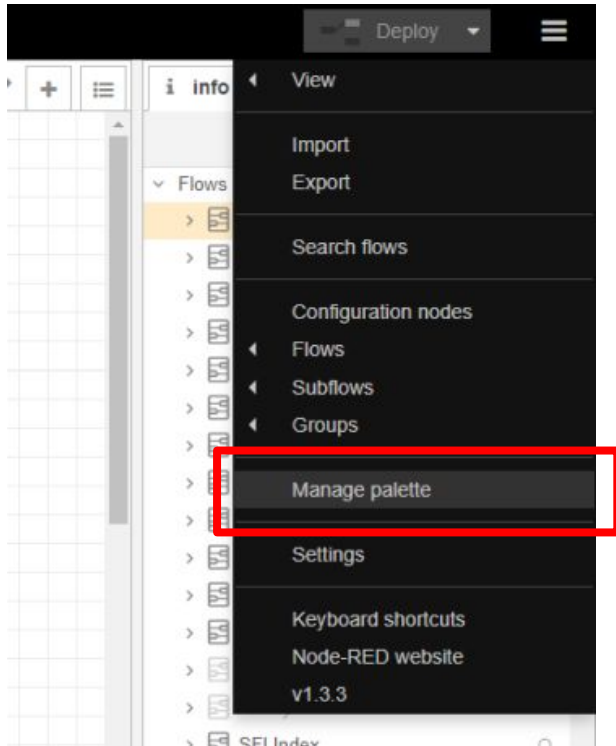
Flow "137579d7-409c08"

Move the selected nodes using the [←] [→] and [↔] keys. Hold [⇧] to nudge them further.



Node Red First “To Do”

<http://<ip address of your Node Red install>:1880>





Resources

- Node Red Website, Examples, Cookbooks & Forums
 - <https://nodered.org/>
- Node Red YouTube Page
 - <https://www.youtube.com/channel/UCQaB8NXBEPod7Ab8PPCLLAA>
 - Getting Started Playlist
- Opto Video (industrial automation, but good info)
 - <https://www.youtube.com/channel/UCu4VaBjPynEA8mn9Gf2KKYQ>
- Node Red on Reddit
 - <https://www.reddit.com/r/nodered/>

Groups I/O Node Red for Ham Radio

<https://groups.io/g/nodered-hamradio>

Examples, Ready to Load Flows, Mailing List, Getting Started



Node Red Pre-Programmed Flows

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Name	Type	Uploaded By	Size	Uploaded
AB6A Flows - MacDoppler, MacLogger, Gemini HF1K and More... 11	Folder	-	-	Feb 16
I wrote a python script last year to take Mac Doppler UDP Rotator output and send to a Goto telescope mount. It works great but now I want to rewrite in Node-Red. Original code here: https://github.com/djsincla/goto Associated with this are other flows I am working on.				
Array Solutions Stack Match With REST Commands 4	Folder	-	-	Jan 25
Node-Red Flow to control five relays per the logic given by Scott, W5WZ, to control an Array Solutions Stack Match. May be controlled via Dashboard buttons or via REST commands. The folder includes the Node-Red flow, a StreamDeck Profile to build each button in your StreamDeck, and the Stack Match Logic Documentation.				
Community Project - Multi-Operator TX Control for Jeff 1	Folder	-	-	Mar 7
Folder to hold various ideas for a WAN/LAN based multi-operator TX Control System				
DJ2VA Flows Yaesu GS232, Amplitec antenna switch 2	Folder	-	-	Mar 26
Several flows for YAESU GS232 Rotator control, Amplitec remote antenna switch				
Extra Class Frequency Alarm and TX Inhibit 3	Folder	-	-	10/20/20
Node-Red Flow to monitor Flex VFO Frequency for entry into Extra Class Frequency spectrum. When Extra Class Spectrum is entered the flow will: 1- Inhibit Flex TX, 2- Sound an audio Alarm, 3- Show an Alarm Flag for ten seconds on the Dashboard, and 4- Change the background color of a dashboard tile to red. When VFO frequency is returned to General Class Frequency Spectrum, TX Inhibit is turned off, a "General" alarm flag is shown for ten seconds, and the tile background changes to green				
Flex Server Power Sequencer 2	Folder	-	-	10/04/20
Node-Red Flow "Pings" the Flex Server to determine the current state and then sets up the correct sequence to either startup or shutdown the Server with the next button push. The current Flex Server State is indicated by changing the background color and text of the sequencer button. "Boot Relay" and "Power Relay" status indication tiles show the sequencer in motion. A two-minute countdown timer is provided for reference. The flow provides Boolean outputs (true/false) for the user to wire into their specific relay control application. Two files are included in this folder, the Node-Red flow, and instructions.				
Flex TX Power Limiter, By Band 4	Folder	-	-	10/10/20
Node-Red flow to provide three ranges, High, Medium, and Low, of TX Power Limit. Uses PG-XL amp mode status and Flex Server Frequency as inputs. Three files, including "Band Plan", "Band Send", and Instructions. Uses FRStack to input necessary variables. (WA9WUD FRS Files) The user can enter power limit values for each band and for each range. The power limiter has an on/off button along with mode input from the PG-XL amp to allow the limiter to control the Flex TX Power when the PG-XL is in "Operate and no limit with PG-XL in "Standby. Works along with the FRStack PG-XL in Operate Power Limit feature. (if you do this, be sure the FRS setting is set above the Node-Red Power Limiter settings. If Flex TX power is less then the Power Limiter, the Flex TX power will be used. Does not integrate with SPE2K amp power limiter. Perhaps in the future.				
G1FHY 2	Folder	-	-	Mar 16
My node red flows				



What's Next? - Call to Action

- **Join the Groups.IO mailing list (search Node Red Ham Radio Groups I/O)**
- Install Node Red and get it up and running
- Install additional nodes in the pallet
- Configure and deploy your first flow
- Start small (timestamp and debug), learn what it's doing
- Learn how to use the debug node (it's your best friend)
- Load an existing flow and deploy
- Program a flow for your radio or ham radio peripheral
- Share your flow on Groups.IO



Questions In the Comments!



Kyle - AA0Z
2.29K subscribers

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<p>INSTALLING NODES & IMPORTING/EXPORTING FLOWS Node-Red - Installing Nodes & Importing/Exporting Flows 392 views • Streamed 1 month ago</p>	<p>POTA WASHINGTON DC POTA Ham Radio POTA - Washington DC National Ma... 314 views • 2 months ago</p>	<p>HAM RADIO TRIVIA Ham Radio Trivia Live - Nov 19th 8PM CST - Come Play! 145 views • Streamed 2 months ago</p>	<p>POTA NAVIGATING THE POTA WEBSITE Ham Radio POTA - Navigating the POTA Website 200 views • 2 months ago</p>	<p>MOQSO PARTY W0W EXPEDITION OPERATION 2021 MOQSO Party W0W Expedition Operation ... 179 views • 2 months ago</p>	<p>POTA HOW TO POTA FROM WASHINGTON DC How to POTA in Washington DC - After Action Report on... 279 views • Streamed 3 months ago</p>
<p>HAM RADIO TRIVIA Ham Radio Trivia Live - Oct 15th 8PM CDT - Come Play! 1:08:25</p>	<p>A SOTA CONVERSATION A Conversation with Christian Claborne (N1CLC) and SOTA! 1:13:17</p>	<p>REVIEW BEST MINI CW PADDLES Ham Radio Mini CW Paddle - N0SA SOTA vs SSP Paddle 9:38</p>	<p>POTA SEPT 2021 UPDATE September 2021 POTA Update 2:52</p>	<p>HOW TO THE BEST CASE!! Ham Radio Hard Shell Case - Best Case for the MTR4B 6:56</p>	<p>HAM RADIO TRIVIA Ham Radio Trivia Live - Sept 17th 7PM CDT - Come Play! 1:01:27</p>

