Intro to Node Red

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

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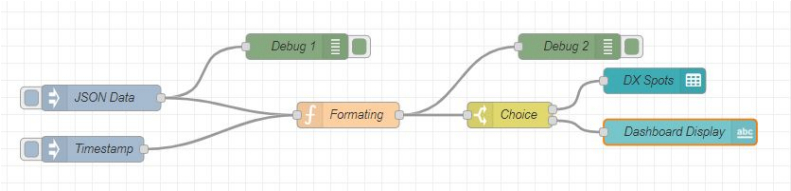
www.aaøz.com

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

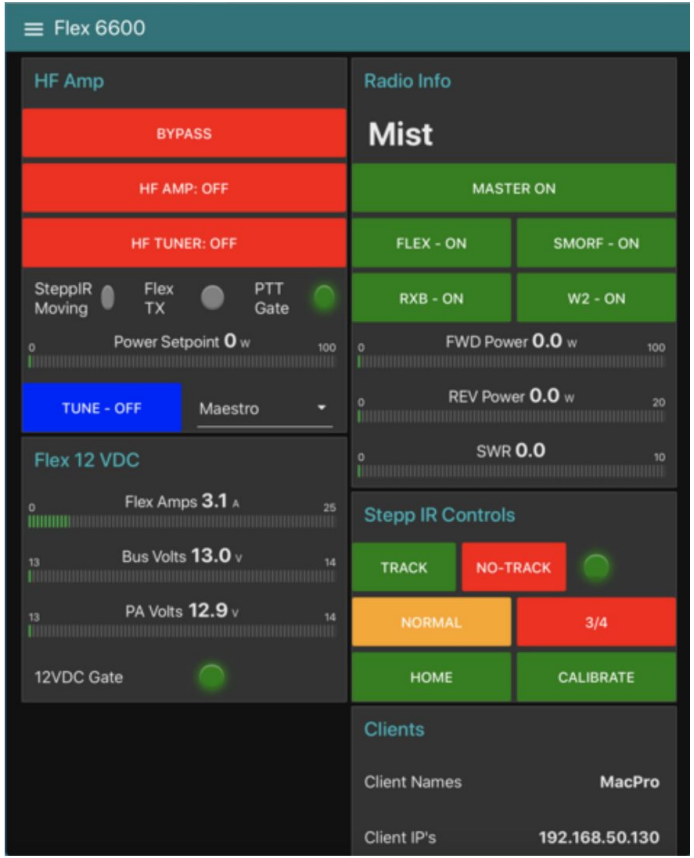
- One button click can automate changing bands, setting modes, configuring your amp and turning your rotor to a specific location on a map
- Get real time feedback from devices
- Integrate non ham radio devices into your shack
- Email or SMS you for alarms in your shack or for severe weather
- Alerts you via visual & audio for out of spec values (SWR, Temp, Pwr, etc…)

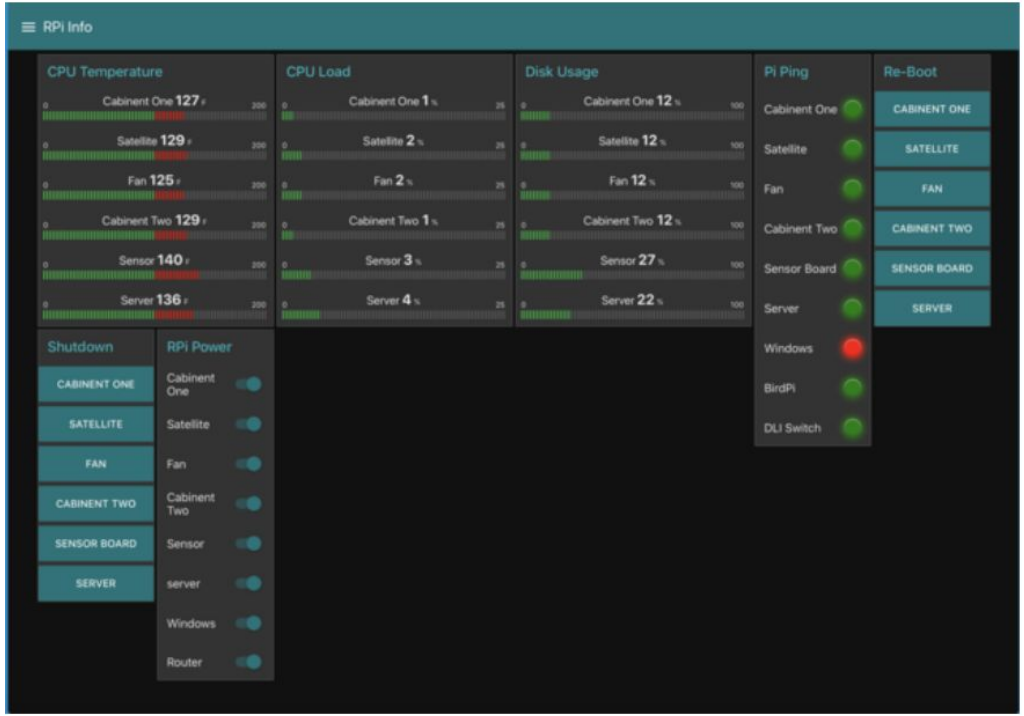
How Does This All Work?

- 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

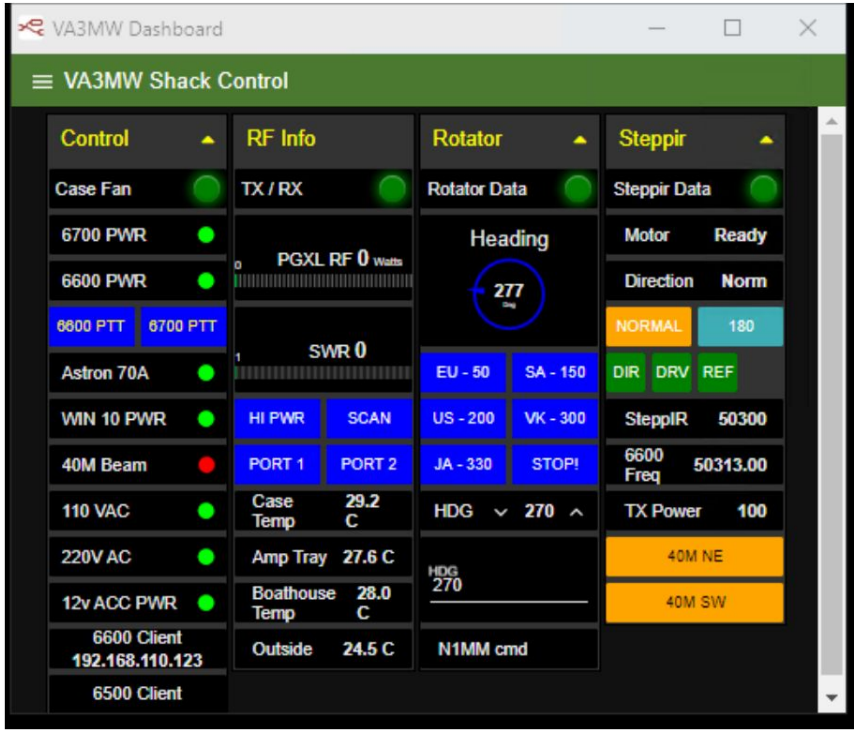
Node Red Dashboard Examples

Node Red Dashboard Examples

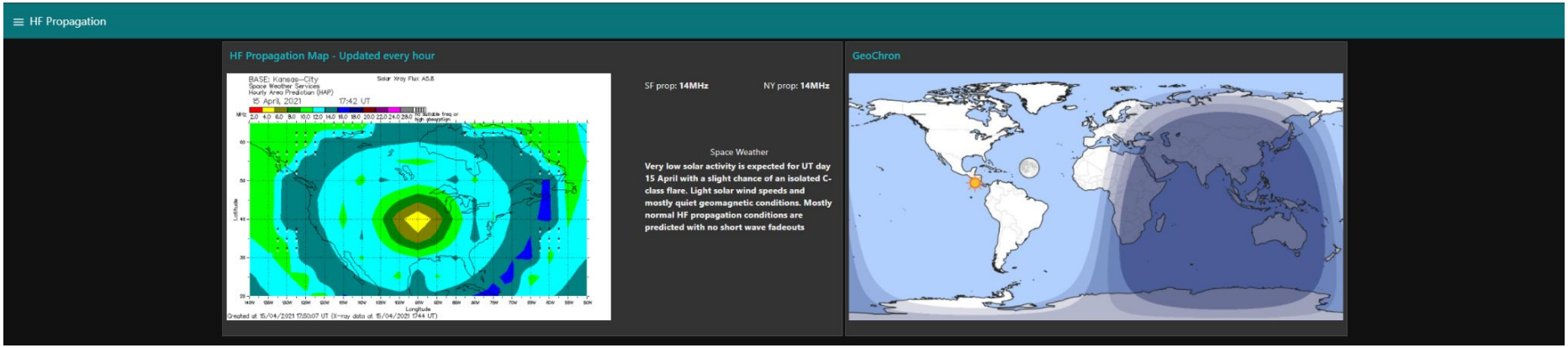


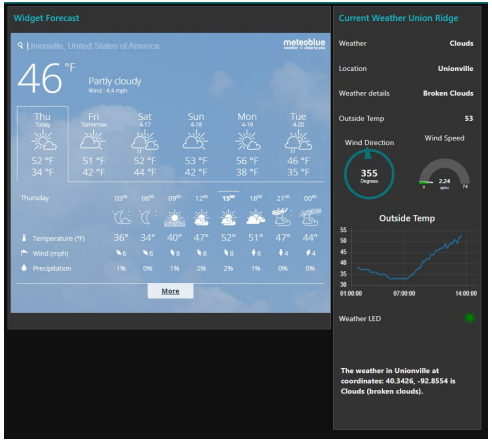


Node Red Dashboard Examples



Node Red Dashboard Examples





Node Red Dashboard Examples

DX Cluster Raw

DX Cluster Spots

K0XM Status

Freq	Call	Comment	Time
14300.0	EA5IYX	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	IK2SGF	RTTY	1225Z
14163.9	IK6LBT	USB	1225Z
14133.0	RP76OIA	USB	1225Z
7095.0	EG2MII	MVNA-0892 ULTIMAS LL...	1225Z
14091.5	IK1SOW	RTTY	1224Z
14011.0	UA4S	CW CQ-M International ...	1224Z

CONNECT K0XM DXC | KA INJECT

Human Cluster Output: **AA0Z-0 de K0XM-5 08-May-2021 1225Z CCC >**

CW Skimmer Spots

CW Skimmer Status

Freq	Call	Comment	Time
14044.2	RT5T	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	LA0CX	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	JA4MSM	CW 17 dB 22 WPM CQ	1227Z
14038.1	R4ACY	CW 10 dB 28 WPM CQ	1227Z

CONNECT SKIMMER | SPOTTERCONT = NA ONLY

KA INJECT | CLEAR ALL FILTER

Skimmer Cluster Output: **To ALL de OZ7C <1214Z> : www.ddxg.dk/oz7c QSL and MGR Database has been UPDATED !!!!!**

County Hunter & HA Spots

CH Spot Status | Ham Alert Status

Freq	Call	Comment	Time
14005.9	VE9HF	8dB 33wpm	1226Z
50313.0	VE1JBC	FT8 -21 at 1286hz	1223Z
14074.0	VE1GG	-4dB	1222Z
14056.5	N4CD	baxter, ar (k7310) CW	1221Z
50313.9	VA1WV	FT8 -13dB	1221Z
14052.1	VE1EMS	14dB 22wpm	1221Z
50314.2	VY2MI	FT8 -5dB	1215Z
10140.2	VE1INN	WSPR -3dB	1212Z
50261.5	VE1SKY	MSK144 -3dB	1216Z
21075.4	VE1CSM	FT8 -1dB	1216Z
14074.0	VE1DC	-3dB	1216Z

CONNECT CH SPOTS | CONNECT HAM ALERT

CH KA INJECT | HA KA INJECT

Ham Alert Output: **AA0Z de HamAlert >**

CH Output: **AA0Z de W6RK-2 8-May-2021 1225Z dxspider >**

Digital Spots

Digital NC7J Spot Status

Freq	Call	Comment	Time
14086.4	N6AR	16 dB 45 BPS RTTY	1227Z
7043.3	KS0AA	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	N6AR	15 dB 45 BPS RTTY	1225Z
7044.9	AI0Y/9	21 dB 45 BPS RTTY	0024Z
7044.9	AI0Y/9	21 dB 45 BPS RTTY	0024Z

CONNECT DX DIGITAL | DIGITAL KA INJECT

Digital Spot Output: **RTTY Skimmer Server v.1.3.0.432 is operated by Max NG7M, NC7J in Syracuse, Utah (DN31XB) Please enter your callsign: AA0Z de SKIMMER 2021-05-08 12:25Z RttySkimmer >**

MOQSO Cluster

Freq	Call	Comment	Time
3901	K6G	Nighttime	0125Z
3901	K6G	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
7239	K5CIP	TX	K-3503	Government Canyon Na...	Self	0722Z
14042.0	WD5GRW	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	W8SN	TX	K-3000	Cooper Lake	RBN 25 dB 19 WPM via ...	0722Z
14290	N2BTD	NJ	K-7504	Assunpink	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	WD5GRW	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	W8SN	TX	K-3000	Cooper Lake		0717Z
14290	N2BTD	NJ	K-7504	Assunpink	5/7 in Spain EU. Trx new...	0712Z
7198	KD2UWR	NY	K-8092	Carmans River Pine Barr...	Going to switch to 20m ...	0712Z

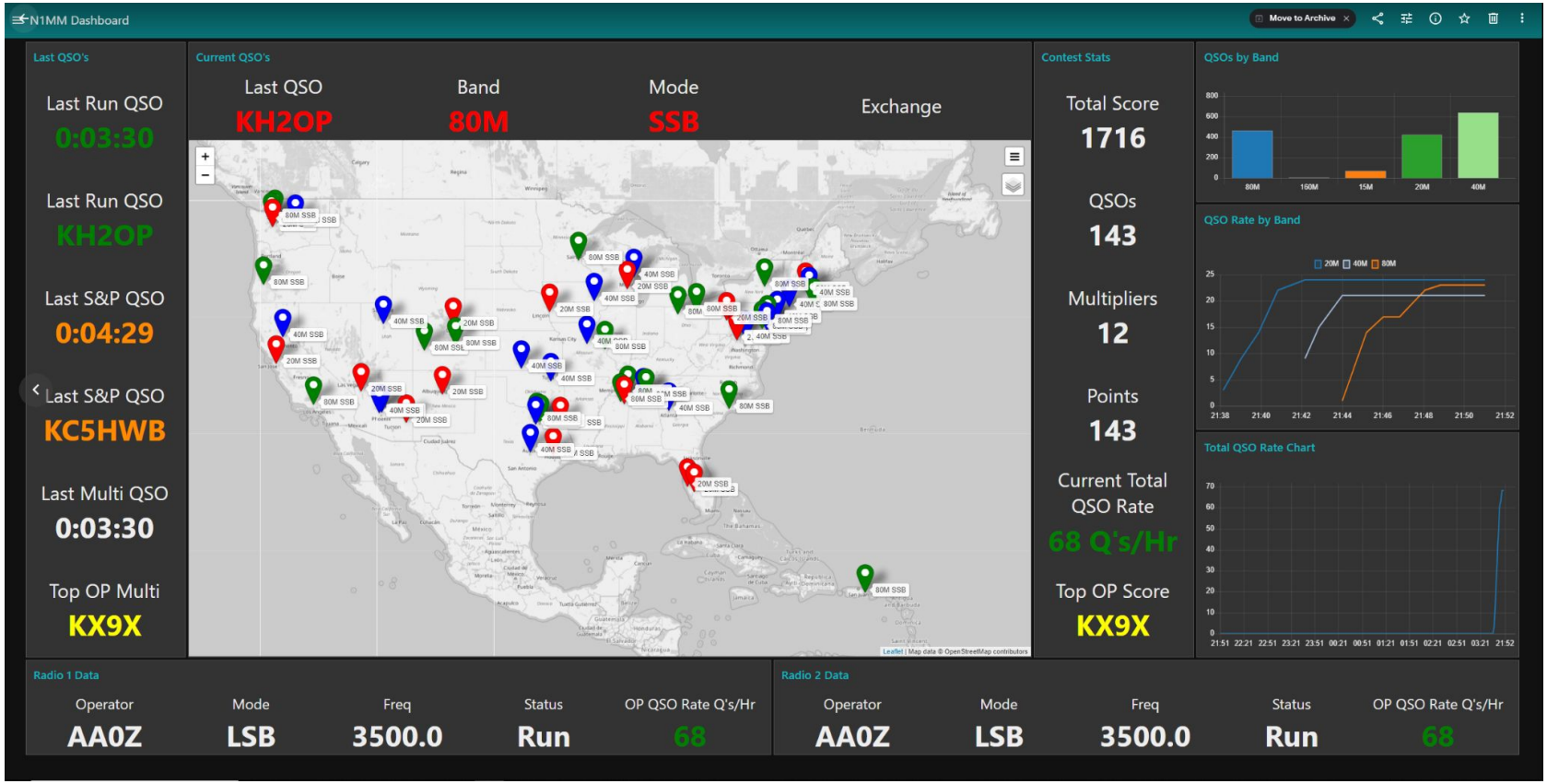
CW Skimmer Around MO

Freq	Call	Comment	Time

NC7J CONNECT SKIMMER | NC7J SET MOQSO FILTER

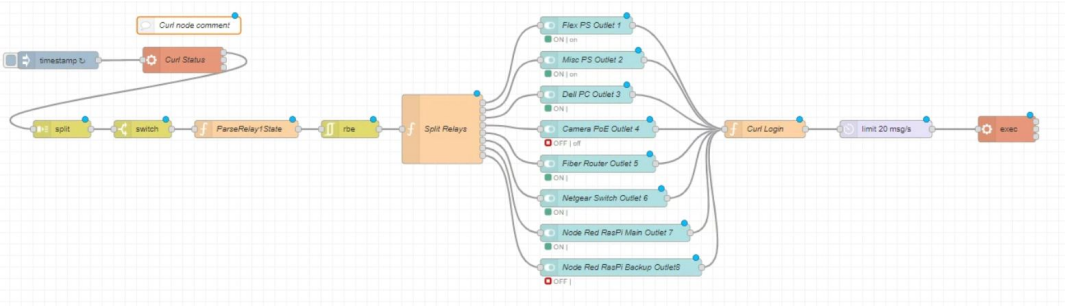
KA INJECT

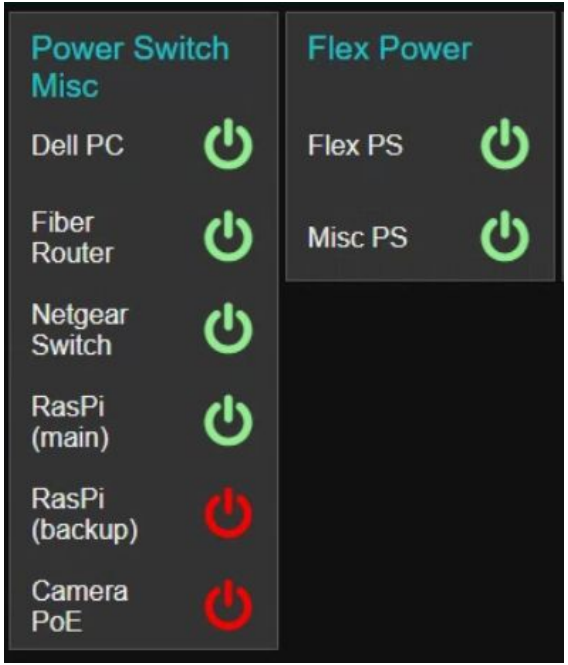
Node Red Dashboard Examples



Node Red Dashboard Examples

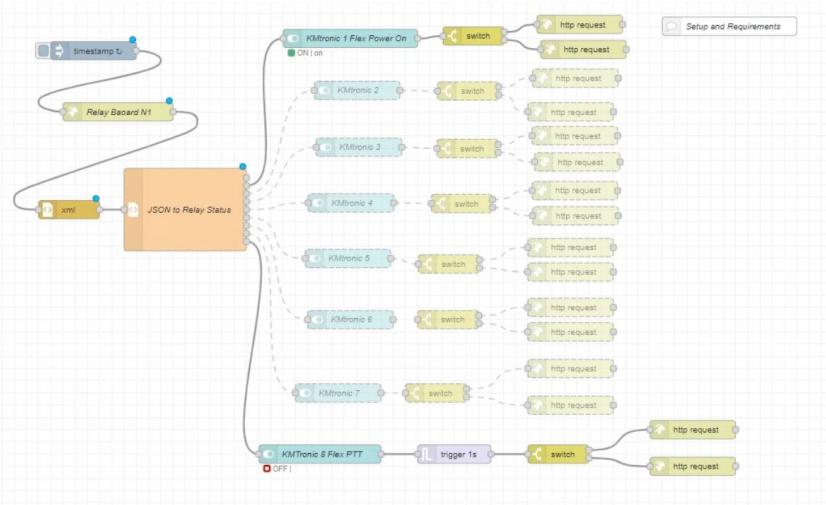
Digital Loggers Web Power Switch with Dashboard

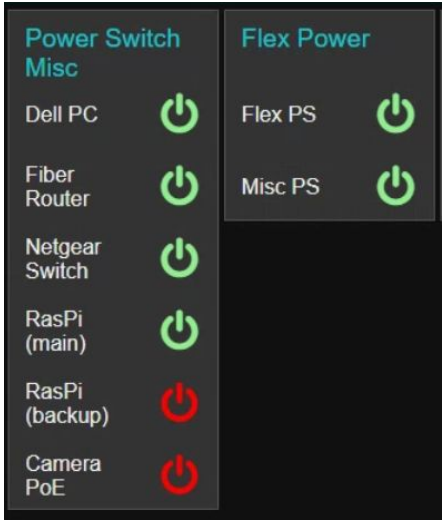




Node Red Dashboard Examples

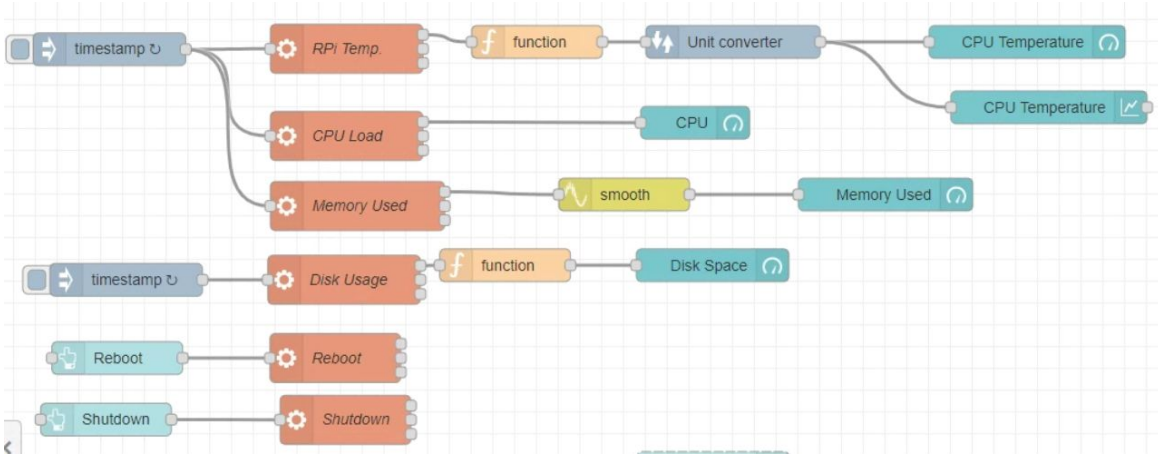
KMTronics Web Relay (turn power on, switch relay compatible items)

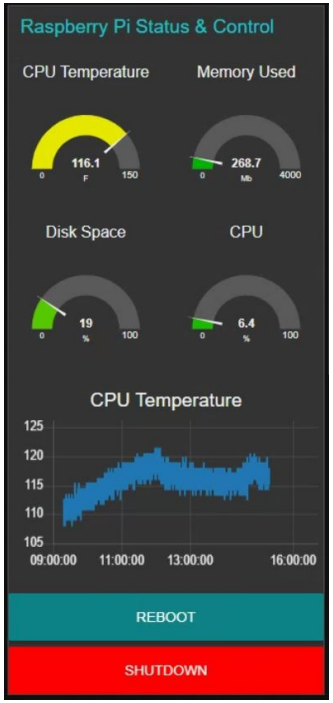




Node Red Dashboard Examples

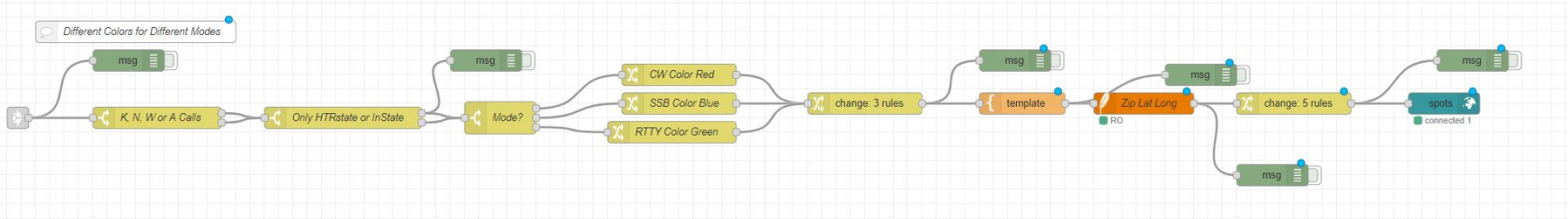
Raspberry Pi Monitor with Dashboard



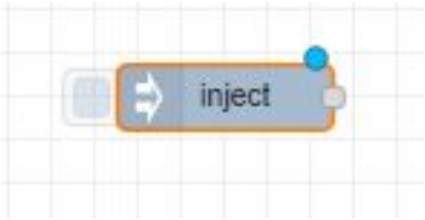


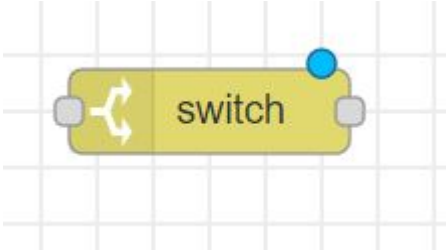
Node Red Dashboard Examples

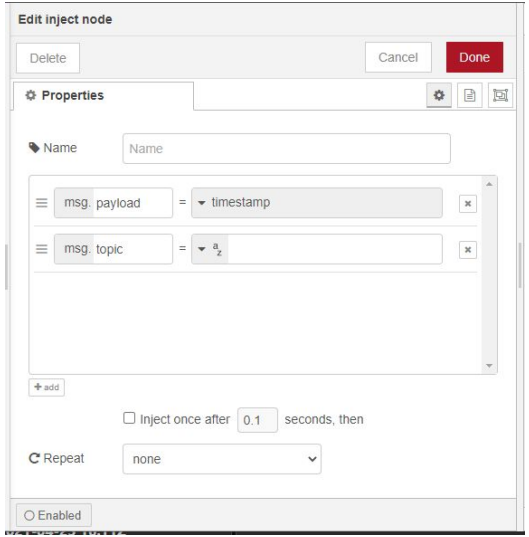
Dynamic DX Cluster Spots or QSO Map in Real Time

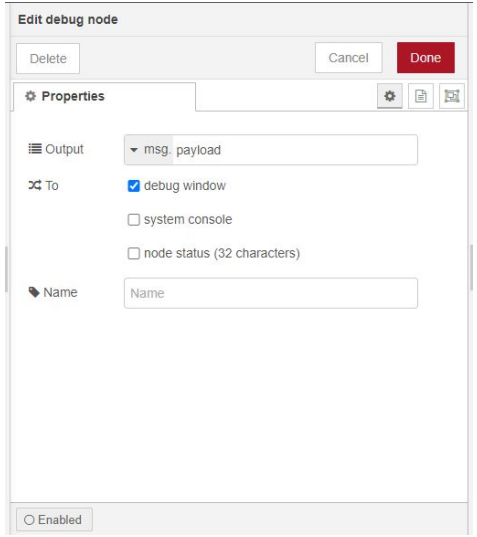


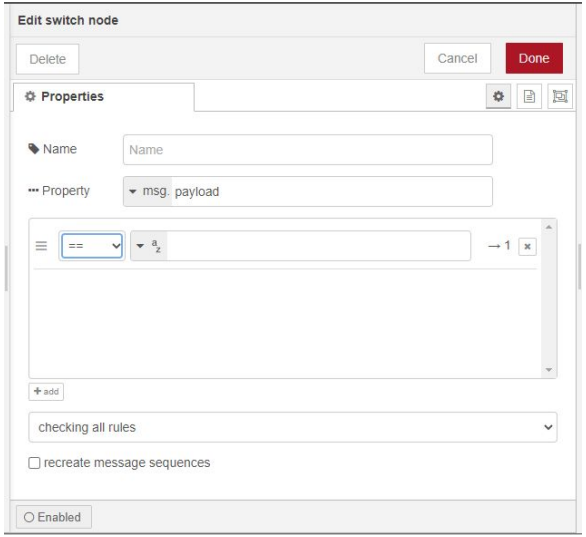
What is a “Node”?





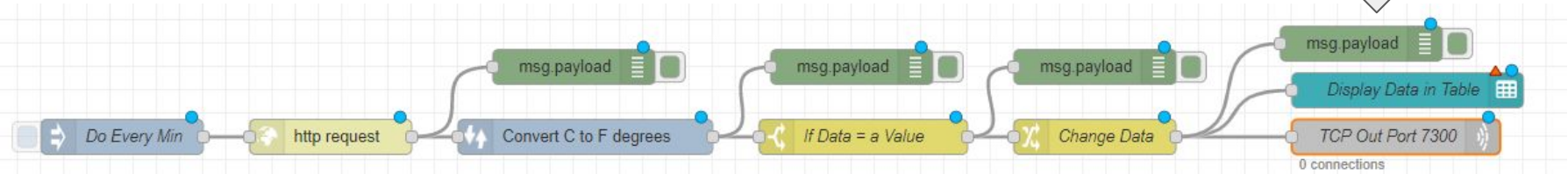






Sample Flow Breakdown

Debug nodes



Every min trigger the flow

Go get data from a website

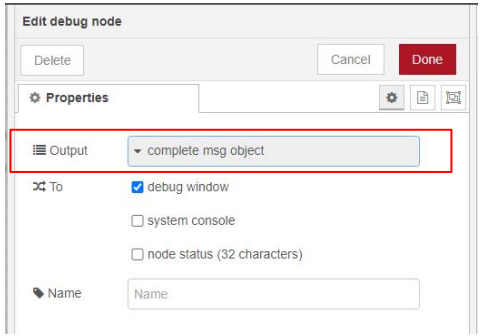
Convert that data from C to F degrees

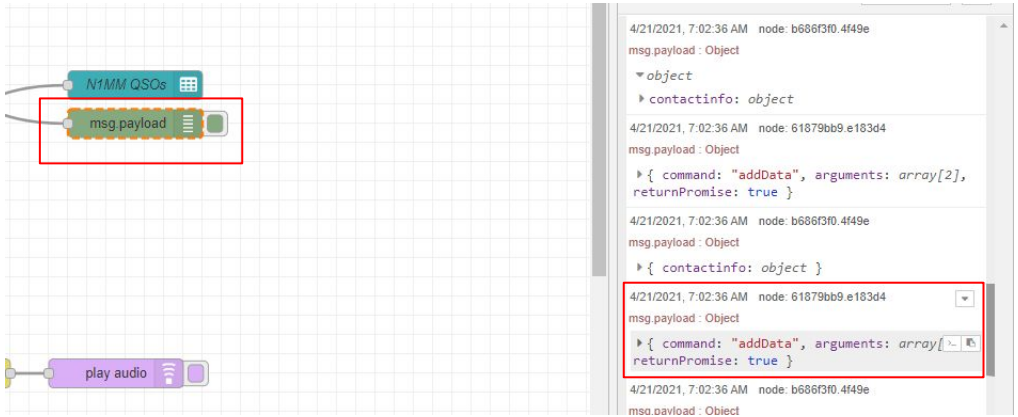
If degrees = 100F

Change the data to “Running Hot”

Display that data in a table on the dashboard and also open up a TCP outgoing server on port 7300 and send that data

Debugging Flows

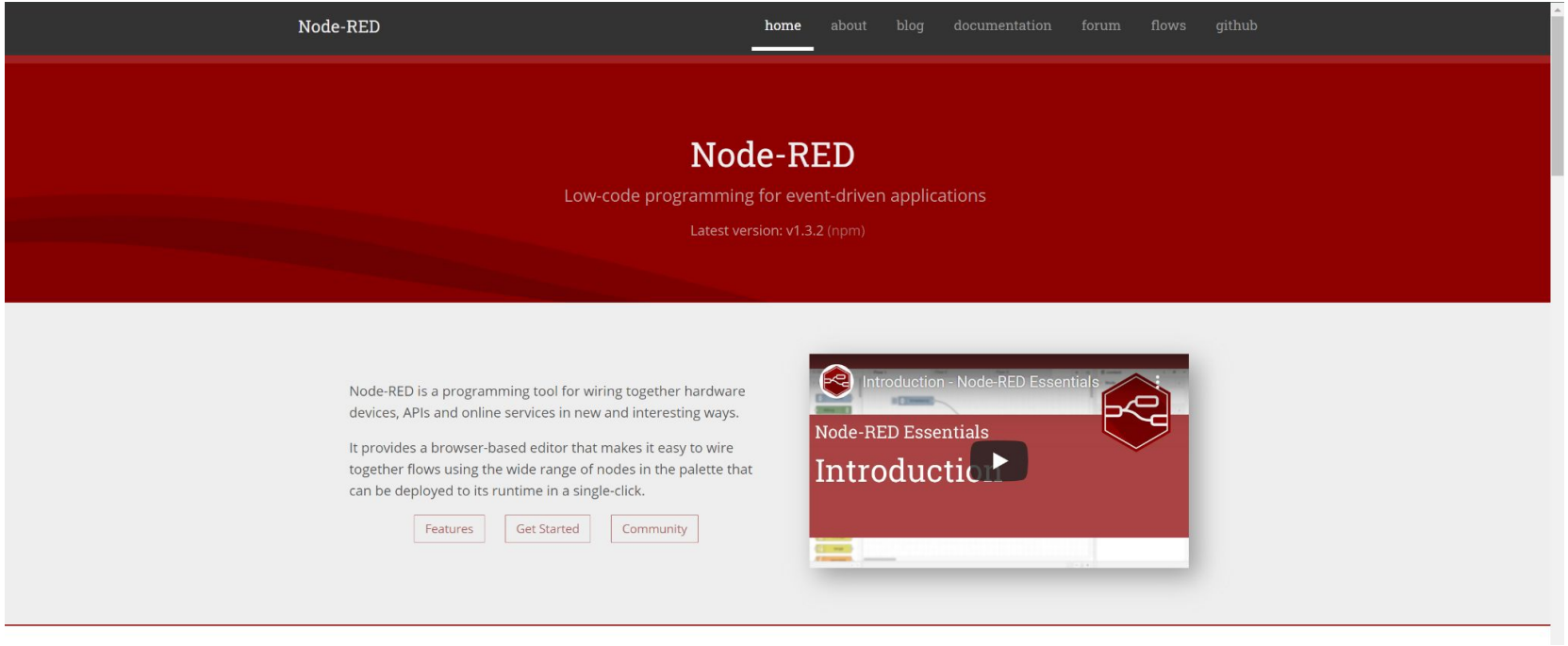




- The debug node will be your most used node - learn how to use it
  - Rename debug nodes to something useful for locating quickly
  - Change the output to “complete msg object” to see complete debug data
  - Connect debug nodes to everything
  - Make sure you turn them on to see the output
  - You can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

Where to Start?

https://nodered.org/



Installing Node Red (Windows)

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

- 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.

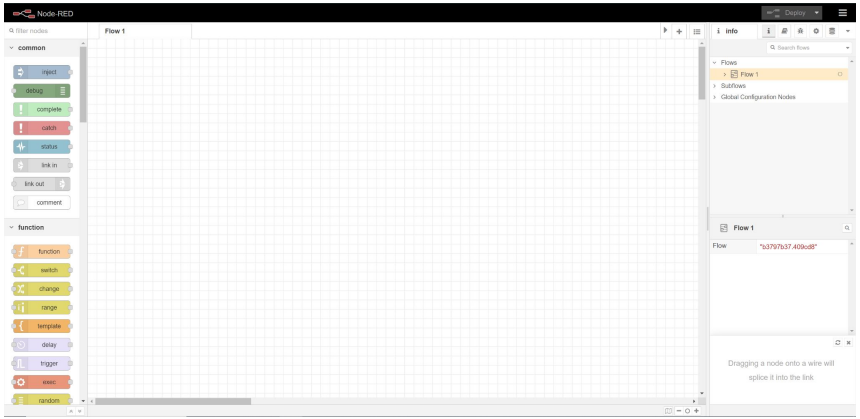
Save in the boot directory of the SD Card

Node Red Dashboard

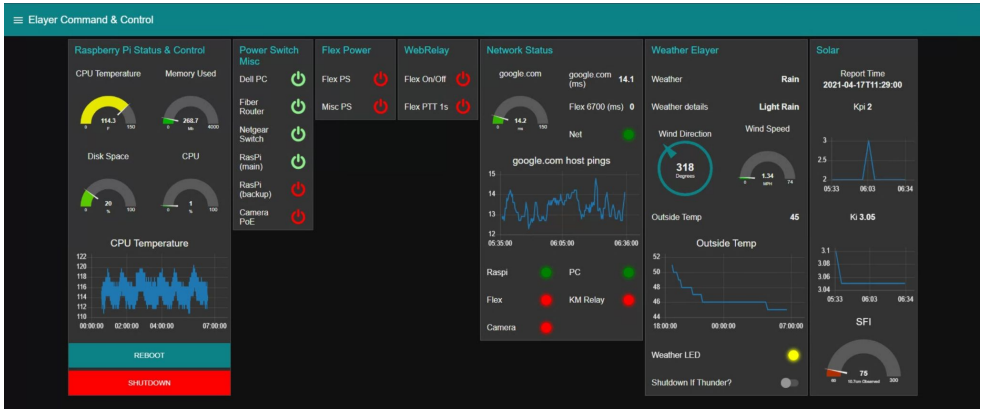
Workspace Webpage : http://localhost:1880 or http://<Raspi ip address>:1880

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

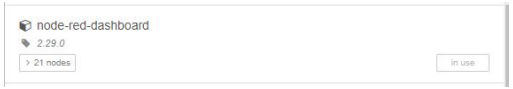
Workspace



Dashboard

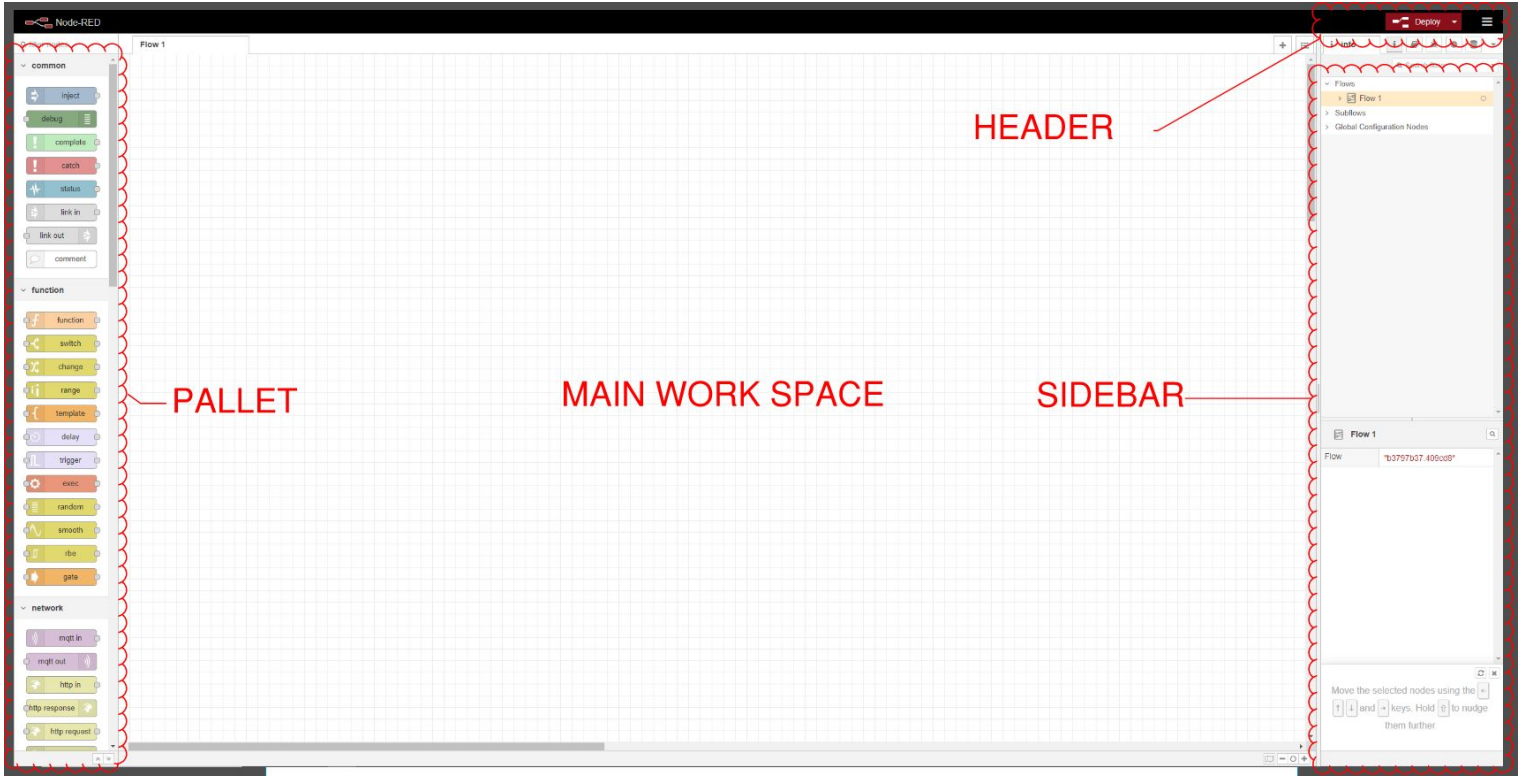


- Install the dashboard node to display flows via the dashboard



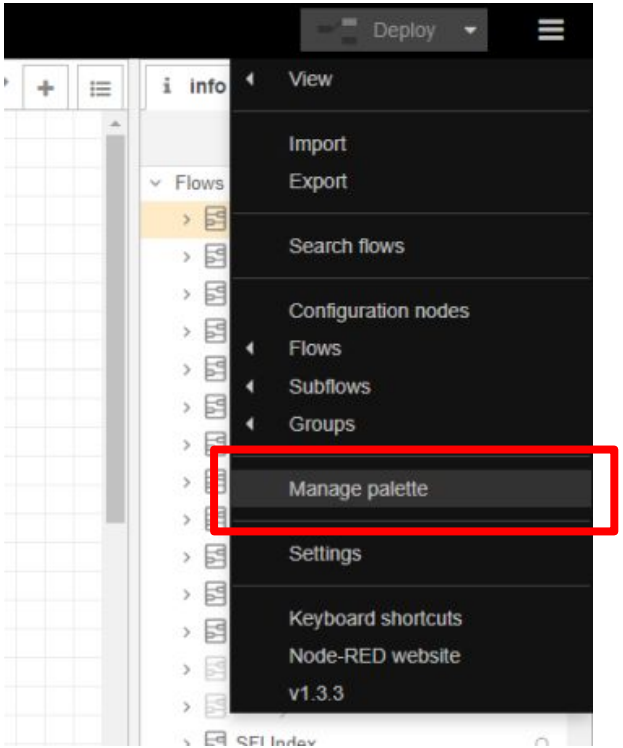
Node Red Main Screen

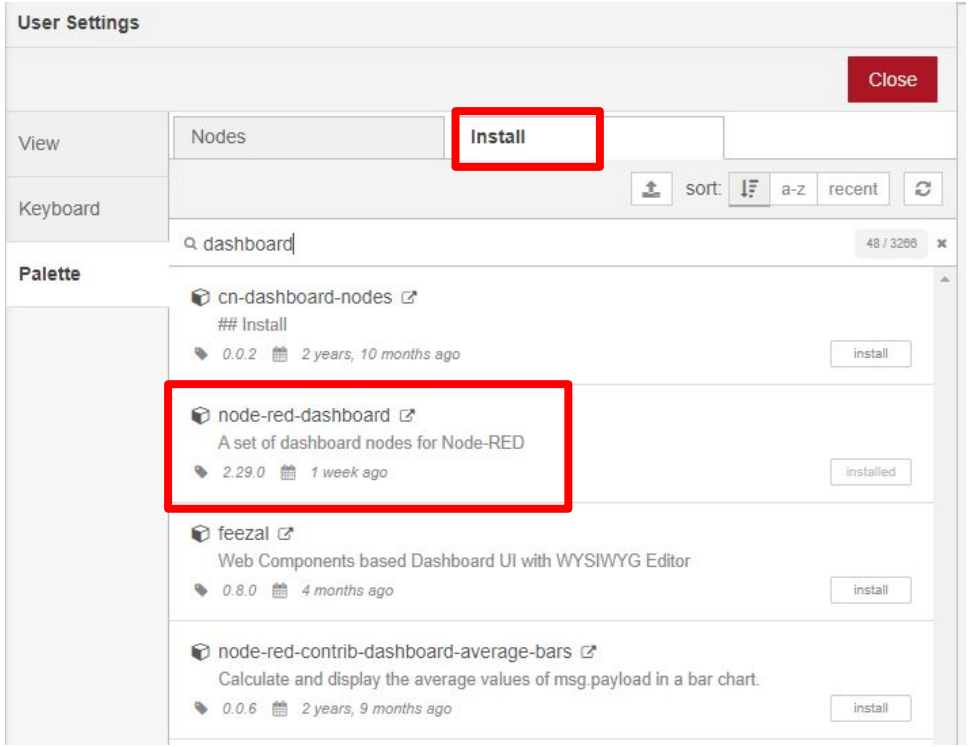
http://<ip address of your Node Red install>:1880



Node Red 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

Groups.io | Your Groups | Find or Create a Group | Help | Kyle K

- Home
- Subscription
- Messages
- Hashtags
- New Topic
- Chats
- Directory
- Calendar
- Photos
- Files
- Databases
- Wiki

nodered-hamradio@groups.io / Files /

Search

+ New

Name	Type	Uploaded By	Size	Uploaded
AB6A Flows - MacDoppler, MacLogger, Gemini HF1K and More... 11 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.	Folder		-	Feb 16
Array Solutions Stack Match With REST Commands 4 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.	Folder		-	Jan 25
Community Project - Multi-Operator TX Control for Jeff 1 Folder to hold various ideas for a WAN/LAN based multi-operator TX Control System	Folder		-	Mar 7
DJ2VA Flows Yaesu GS232, Amplitec antenna switch 2 Several flows for YAESU GS232 Rotator control, Amplitec remote antenna switch	Folder		-	Mar 26
Extra Class Frequency Alarm and TX Inhibit 3 Node-Red Flow to monitor Flex VFO Frequency for entry into Extra Class Frequency spectrum. When Extra Class Sprectrum 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	Folder		-	10/20/20
Flex Server Power Sequencer 2 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.	Folder		-	10/04/20
Flex TX Power Limiter, By Band 4 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.	Folder		-	10/10/20
G1FHY 2 My node red flows	Folder		-	Mar 16

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!

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