

Introduzione a Node-RED

Flow-based programming for the Internet of Things

<https://nodered.org/>

Node-red: un po' di storia

Creato nel 2013 da Nick O'Leary e Dave Conway-Jones del settore IBM's Emerging Technology Services group.

Quello che è iniziato come proof-of-concept per visualizzare e manipolare le mappature tra i topic MQTT, è diventato rapidamente uno strumento molto più generale che poteva essere facilmente esteso in qualsiasi direzione.

La prima versione stabile dopo 6 anni è stata rilasciata il 30 settembre 2019 dopo aver iniziato a preparare queste slides!

<https://www.npmjs.com/package/node-red>

Node-red: un po' di storia

La JS Foundation, di cui IBM è membro fondatore, è stata creata per favorire l'adozione diffusa e il continuo sviluppo di soluzioni JavaScript chiave e delle relative tecnologie.

Node-red viene inserito tra i progetti open source supportati da JS Foundation per avere un bacino di collaborazione più ampio.

<https://nodered.org/blog/2016/10/17/js-foundation>

Quiz!

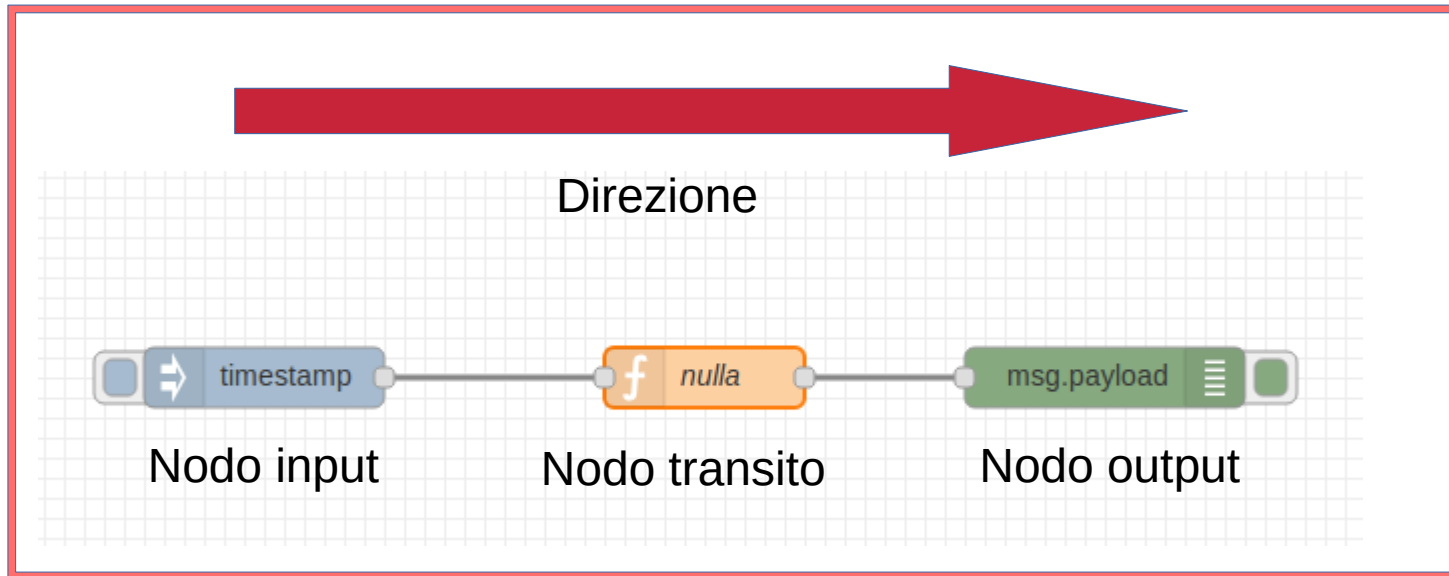
Facciamo un piccolo quiz assieme

Perchè usare Node-Red?

- Può essere utile per fare domotica.... (Domotica nel 2019?)
- Evito di installare qualche app sul telefono
- Evito di usare alcuni servizi in cloud
- Posso interagire con hardware
- Ho a disposizione tante “librerie”

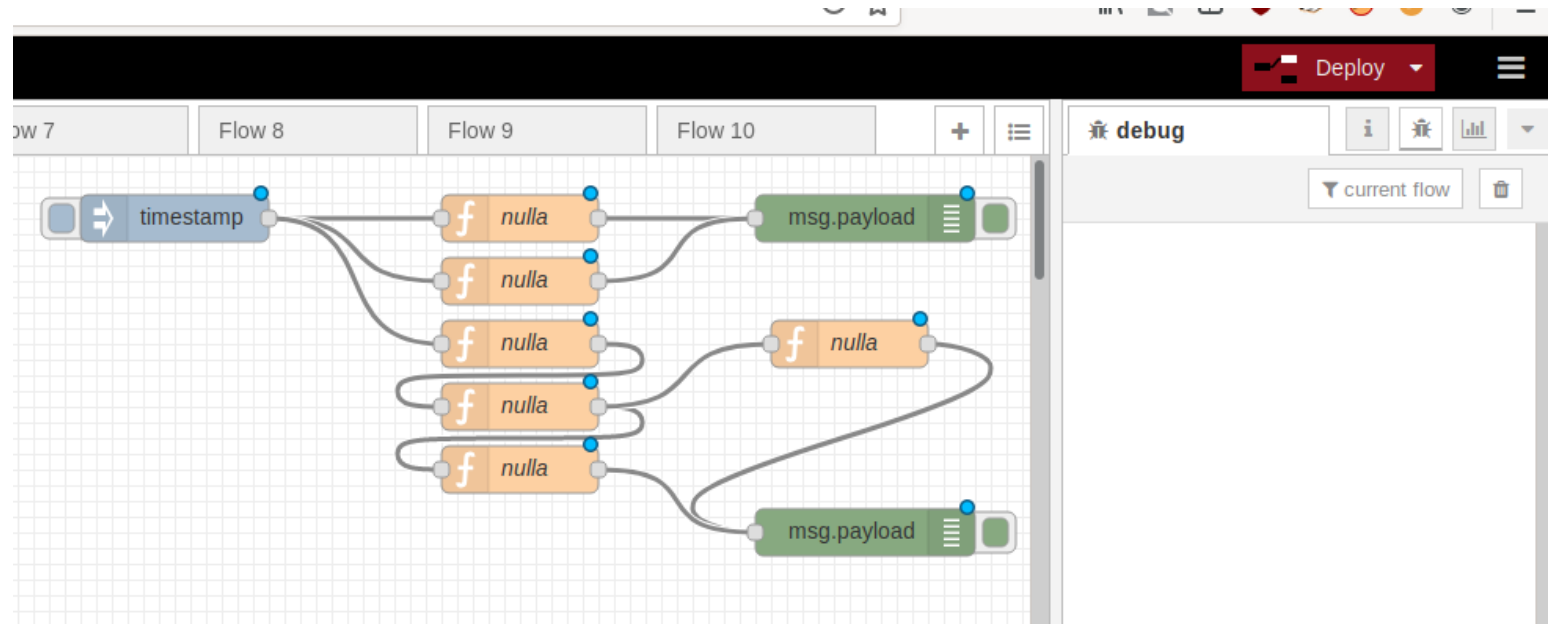
Flussi

Node-red uno strumento di programmazione basato sui flussi di dati tra blocchi (nodi).



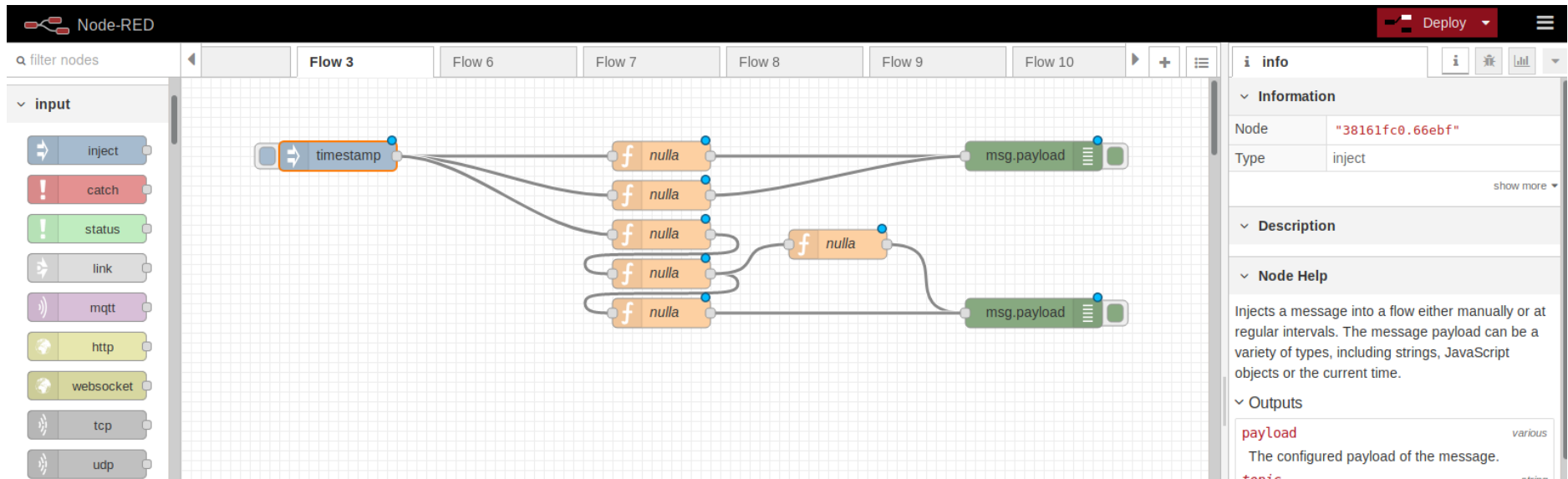
Join - Libertà di connessione

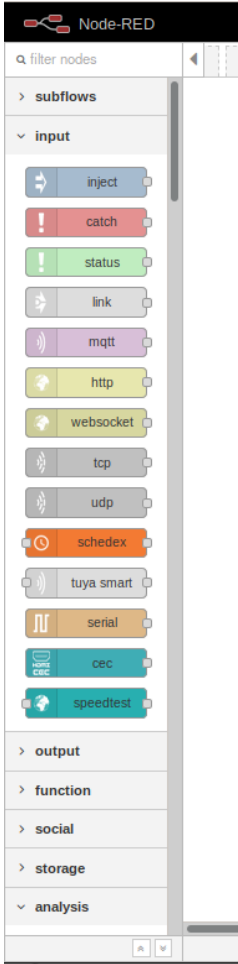
I link veicolano i
dati fra nodi e si
disegnano con
web editor



Editor

I flussi si creano e gestiscono con un editor web. Vediamo le principali funzioni.



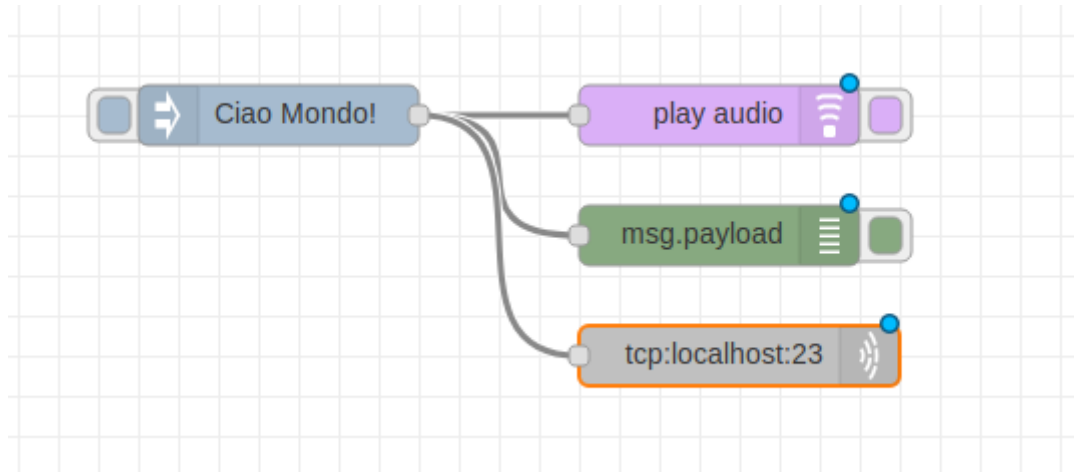


Palette dei nodi

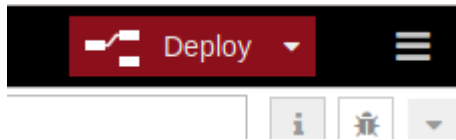
A sinistra si trova la palette dei nodi.

Contiene un catalogo dei tipi di nodo installati.

Di default sono già presenti nodi interessanti che permettono di creare flussi per i primi test



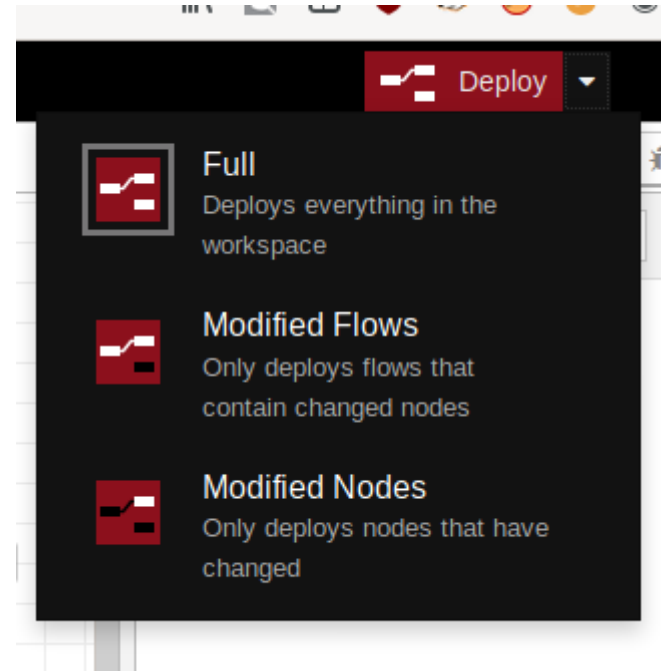
Deploy



Compiliamo il flusso usando il pulsante Deploy.

Al termine del deploy possiamo il flusso è in funzione e in attesa di dati.

La tendina permette di selezionare diverse modalità di deploy.



Debug

Il nodo debug ha come output la scheda a destra.

Possiamo vedere il messaggio (msg.payload) iniettato dal nodo inject.

Viene visualizzato anche l'orario e l'id del nodo che lo ha emesso (passandoci mouse il nodo viene evidenziato).



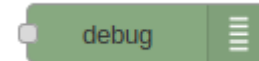
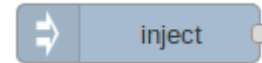
Elementi di node-red

Node

A Node is the basic building block of a flow.

Nodes are triggered by either receiving a message from the previous node in a flow, or by waiting for some external event, such as an incoming HTTP request, a timer or GPIO hardware change. They process that message, or event, and then may send a message to the next nodes in the flow.

A node can have at most one input port and as many output ports as it requires.



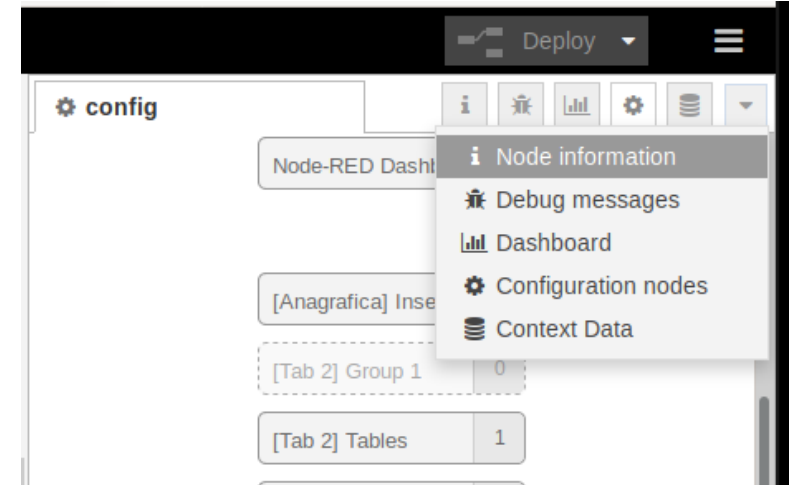
Elementi di node-red

Configuration node

A Configuration (config) Node is a special type of node that holds reusable configuration that can be shared by regular nodes in a flow.

For example, the MQTT In and Out nodes use an MQTT Broker config node to represent a shared connection to an MQTT broker.

Config nodes do not appear in the main workspace, but can be seen by opening the Configuration nodes sidebar.

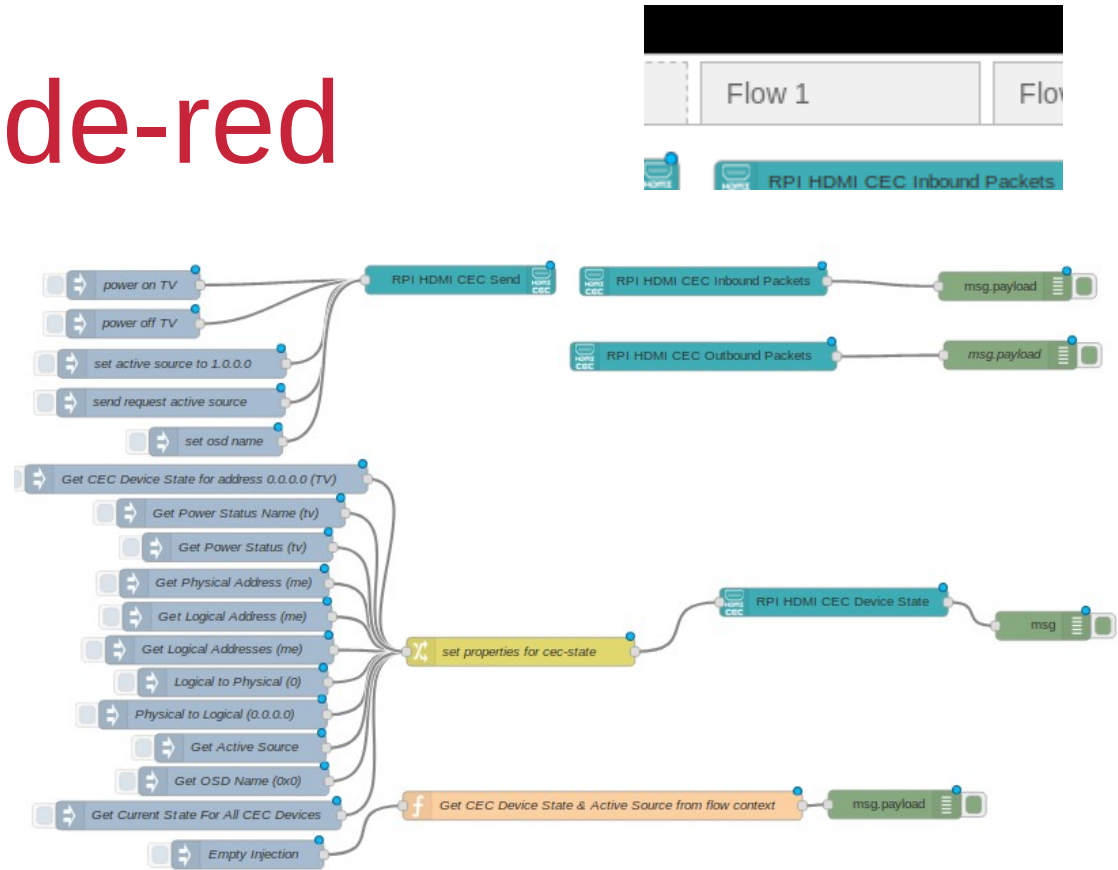


Elementi di node-red

Flow

A Flow is represented as a tab within the editor workspace and is the main way to organise nodes.

The term “flow” is also used to informally describe a single set of connected nodes. So a flow (tab) can contain multiple flows (sets of connected nodes).



Elementi di node-red

Context

Context is a way to store information that can be shared between nodes without using the messages that pass through a flow.

There are three types of context;

- Node - only visible to the node that set the value

- Flow - visible to all nodes on the same flow (or tab in the editor)

- Global - visible to all nodes

By default, Node-RED uses an in-memory Context store so values do not get saved across restarts. It can be configured to use a file-system based store to make the values persistent. It is also possible to plug-in alternative storage plugins.

Elementi di node-red

Message

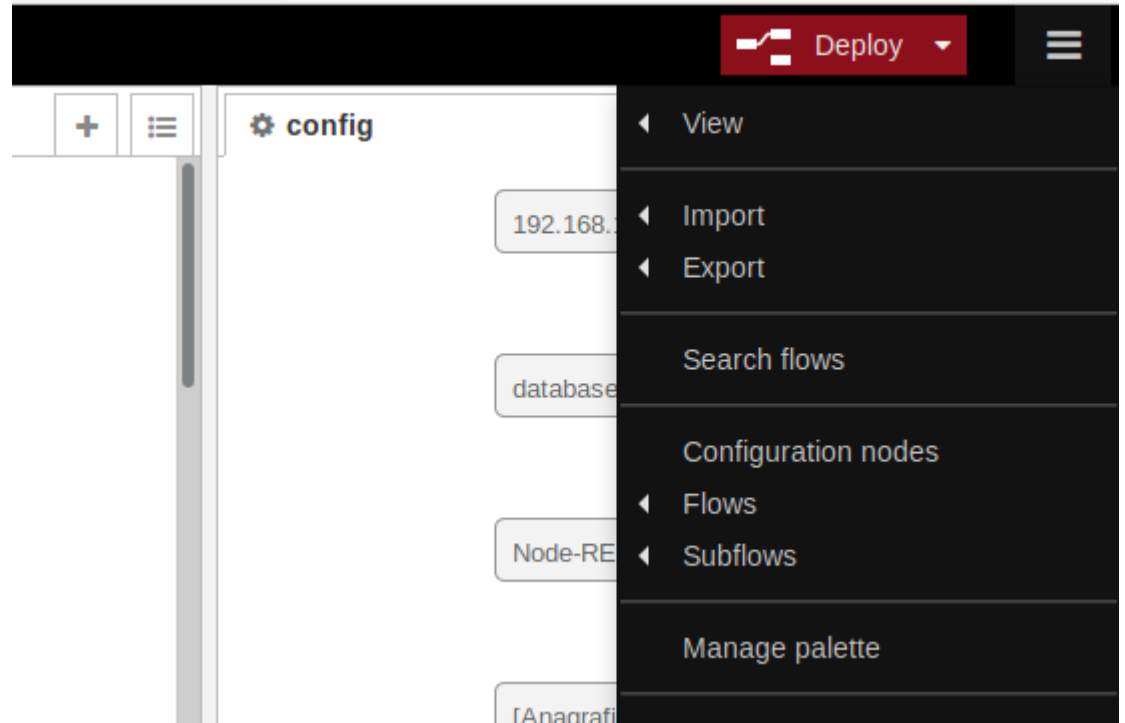
Messages are what pass between the nodes in a flow.
They are plain JavaScript objects that can have any set of properties.
They are often referred to as **msg** within the editor.
By convention, they have a **payload** property containing the most useful information.

Elementi di node-red

Subflow

A Subflow is a collection of nodes that are collapsed into a single node in the workspace.

They can be used to reduce some visual complexity of a flow, or to package up a group of nodes as a reusable component used in multiple places.



Elementi di node-red

Wire

Wires connect the nodes and represent how messages pass through the flow.

Palette

The Palette is on the left of the editor and lists of the nodes that are available to use in flows.

Extra nodes can be installed into the palette using either the command-line or the Palette Manager.

Workspace

The Workspace is the main area where flows are developed by dragging nodes from the palette and wiring them together.

The workspace has a row of tabs along the top; one for each flow and any subflows that have been opened.

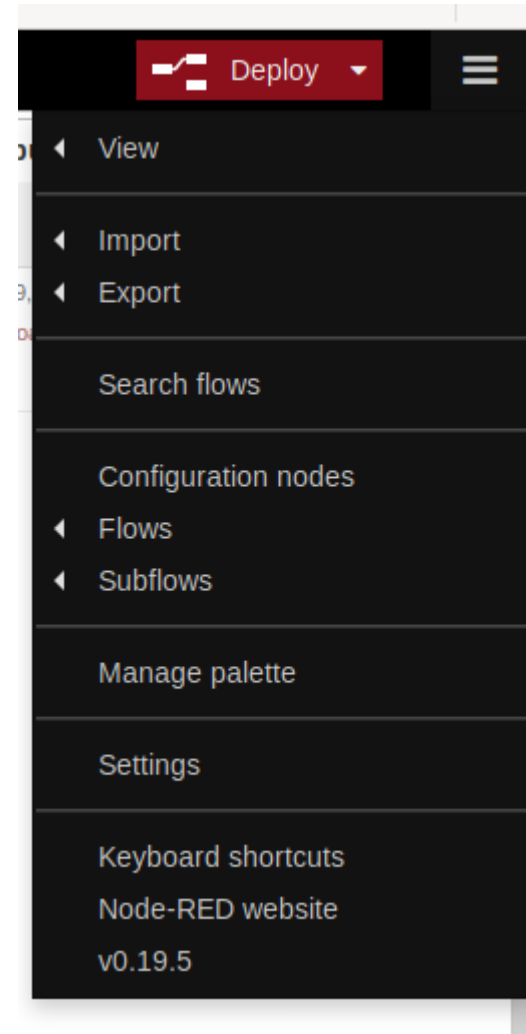
Menù

Permette di importare flussi (contiene anche una folder di esempi).

Impostare i settaggi.

Installare nuove palette.

Altre operazioni effettuabili da editor.



Sidebar

Node information: fornisce info sui nodi e le variabili

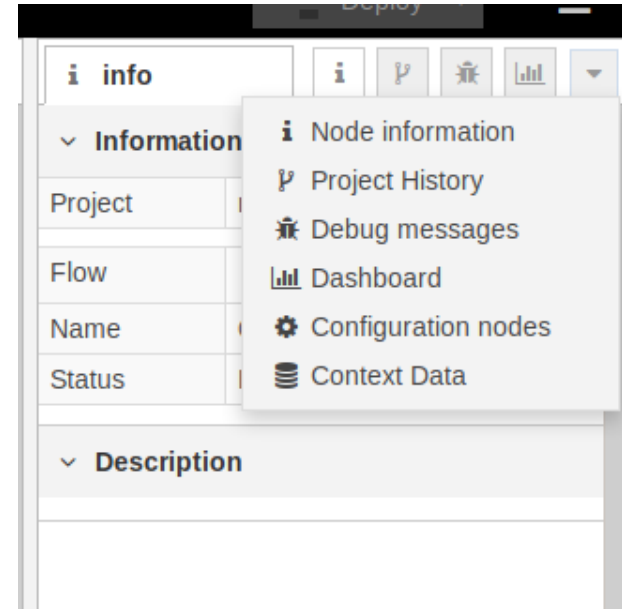
Project history
(va abilitato da conf e si attiva se git è installato)

Debug

Dashboard (se installata la palette dedicata)

Configuration nodes

Context data: variabili d'ambiente



Piattaforme

Sono supportate tutte le piattaforme supportate da nodejs:

Linux

Mac

Windows

Android

Cloud

Docker

Snap

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



Running locally

Installing Node-RED on your local computer



Raspberry Pi

Get started using our all-in-one install script for the mighty Raspberry Pi



Docker

Running Node-RED using Docker



Install from git

Building Node-RED from source. Get the very latest development code and start contributing.



BeagleBone Boards

Running Node-RED on BeagleBone boards



Android

A bit experimental, but you can run on Android devices using Termux



IBM Cloud

Deploying Node-RED from the IBM Cloud catalog in a couple of clicks



AWS

Get started running on EBS or EC2



Microsoft Azure

Running on an Azure Virtual Machine Instance

Menù schede

Node information: fornisce info sui nodi e le variabili

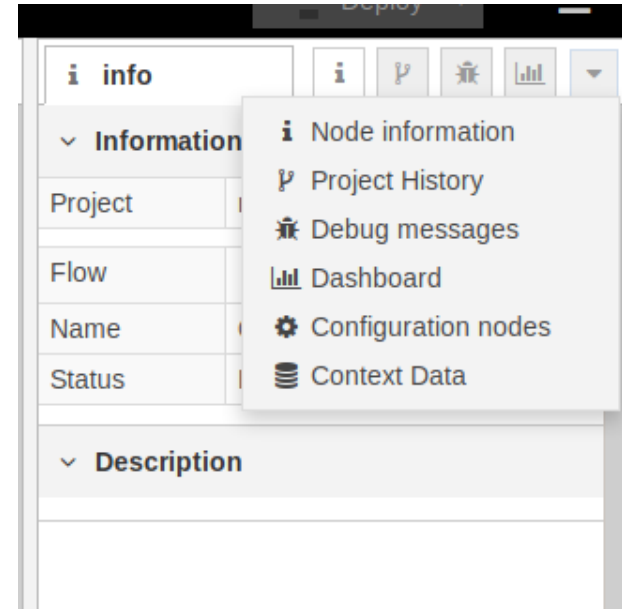
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Debug

Dashboard (se installata la palette dedicata)

Configuration nodes

Context data: variabili d'ambiente



Context data

Le variabili d'ambiente servono a memorizzare dati di contesto:

- nodo
- flusso (possono essere settate e lette dai nodi dello stesso flusso)
- globali (lette e scritte da tutti i nodi di tutti i flussi)

Non sono memorizzate in modo permanente (si perdono con restart di node-red)

The screenshot displays the Node-RED web interface. On the left, a workspace shows a flow with two nodes: a 'Test_variabale_globale' node and a function node. The top bar indicates the current flow is 'Flow 3'. The central panel is titled 'Edit function node' and contains a 'Name' field with the value 'Name' and a 'Function' editor with the following code:

```
1 global.set("Variabile_globale",msg.payload);  
2 return msg;
```

The right-hand panel shows the 'context' sidebar. It has a search bar and a list of context items. The 'Node' section is expanded, showing an 'empty' value. The 'Flow' section is also expanded, showing an 'empty' value. The 'Global' section is expanded, showing a variable named 'Variabile_globale' with the value 'Test_variabale_globale'.

Context data

Salvare le variabili global in modo permanente

The screenshot displays the Node-RED interface with two panels open. The 'User Settings' panel on the left shows the 'Nodes' tab with a search for 'node-red-contrib-config'. The search results show a node named 'node-red-contrib-config' with a description: 'A node-red node to set flow and global context values at start up.' and a version of '1.1.2' from '1 year, 10 months ago'. An 'install' button is visible next to the node. The 'Context Data' panel on the right shows the 'context' tab with a 'Node' section containing 'none selected' and a 'Flow' section containing 'empty'. The 'Global' section is also visible at the bottom of the context panel.

User Settings

View: Nodes Install

Keyboard: sort: [icon] a-z recent [refresh]

node-red-contrib-config 2 / 2219 x

Palette

node-red-contrib-config [link icon]

A node-red node to set flow and global context values at start up.

1.1.2 1 year, 10 months ago install

context

Node [refresh] none selected

Flow [refresh] 23/9/2019, 21:56:22 empty

Global [refresh]

Context data

Salvare le variabili global in modo permanente

The screenshot displays a software interface with three main components:

- Flow Editor (Left):** Shows a flow diagram with a node labeled "Test_variabale_globale" connected to a function node "f". A "Config" button is visible at the bottom.
- Edit config node (Center):** A dialog box for editing configuration nodes. It includes a "Delete" button, "Cancel", and "Done" buttons. The "Properties" section shows "Name" (empty), "Active" (checked), and "Config" (expanded). The "Config" section shows "Property" set to "global. permanente" and "Value" set to "123456".
- Context Data Panel (Right):** A panel titled "context" showing a tree structure. The "Node" section is expanded, showing "refresh to load". The "Flow" section is expanded, showing "empty". The "Global" section is expanded, showing a table of global variables.

Global Variables	
Variabile_globale	"Test_variabale_globale"
permanente	"123456"

Context data

Il nodo config permette di caricare variabili di configurazione in fase di startup

The screenshot displays the Node-RED web interface. On the left, the 'Flow 3' workspace shows a 'Test_variabale_globale' node connected to a 'Config' node. The 'Config' node is highlighted with an orange border. In the center, the 'Edit config node' dialog is open, showing the 'Properties' tab. The 'Name' field is empty, 'Active' is checked, and the 'Config' section shows 'Property' set to 'global. permanente' and 'Value' set to '123456'. On the right, the 'context' sidebar is visible, showing a tree structure with 'Node', 'Flow', and 'Global' sections. The 'Global' section is expanded, showing a list of context variables. The variable 'permanente' is highlighted with a red border and contains the value '123456'.

Magazzino_scadenze | Flow 2 | Flow 3

Test_variabale_globale → Config

Edit config node

Delete Cancel Done

Properties

Name

Active ☒

Config

Property

Value

context

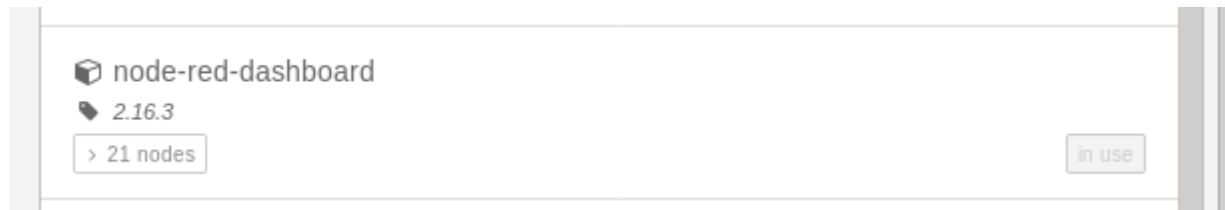
Node

Flow

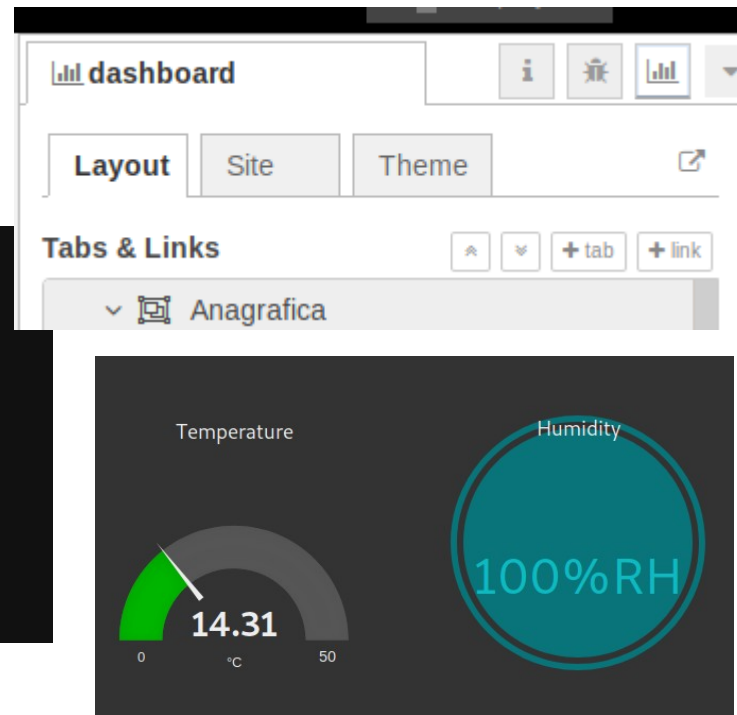
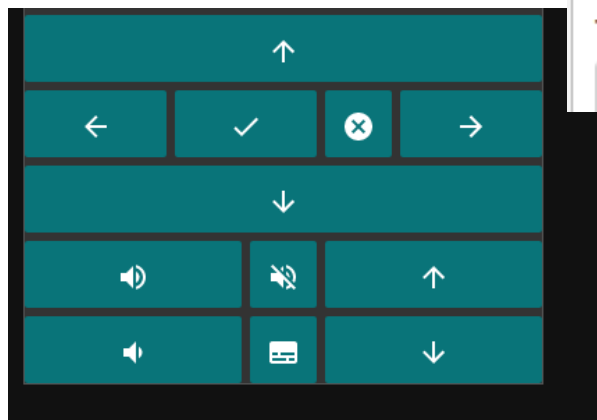
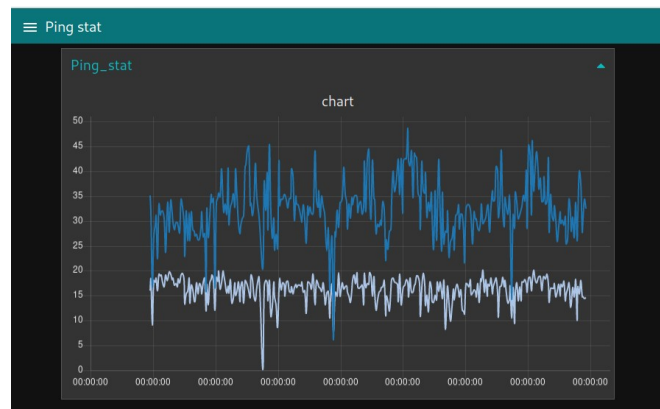
Global

permanente "123456"

Dashboard

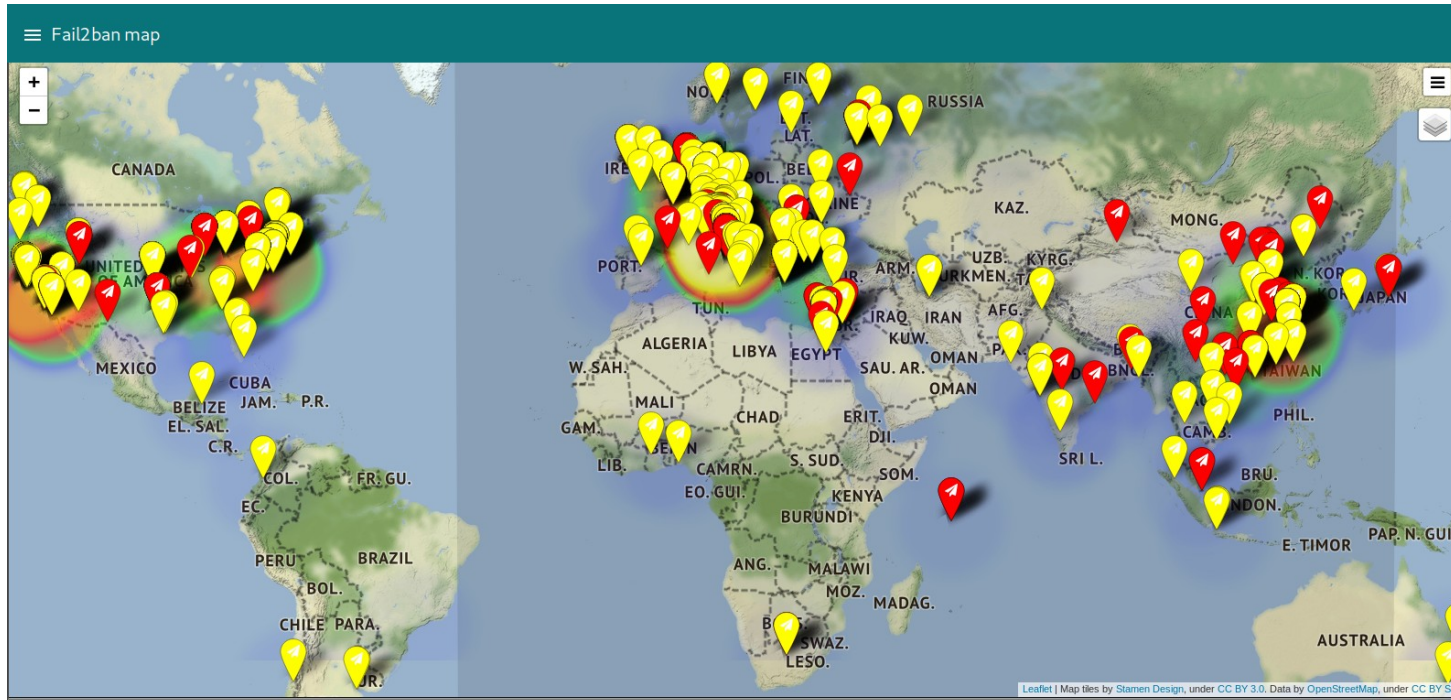


Una serie di nodi da integrare su pagina web per interagire con node-red



Worldmap

Visualizzazione dati su mappa



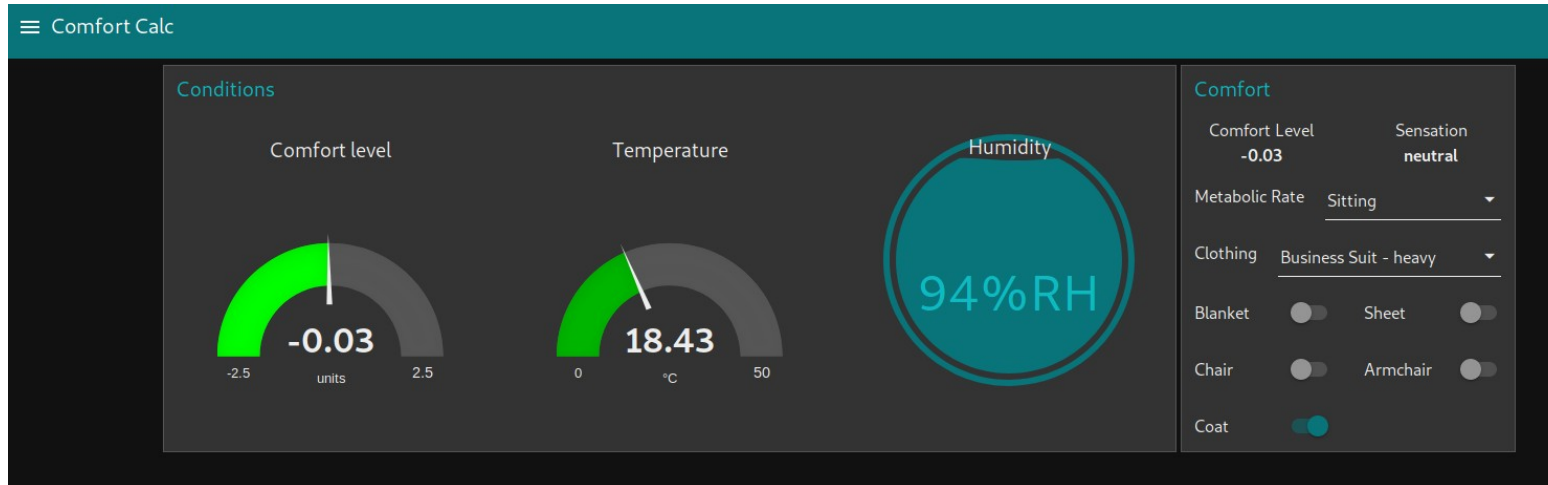
Nodo comfort

node-red-contrib-comfort

A Node Red node to calculate the thermal comfort level of an environment using ASHRAE Standard 55

v1.1.1  25

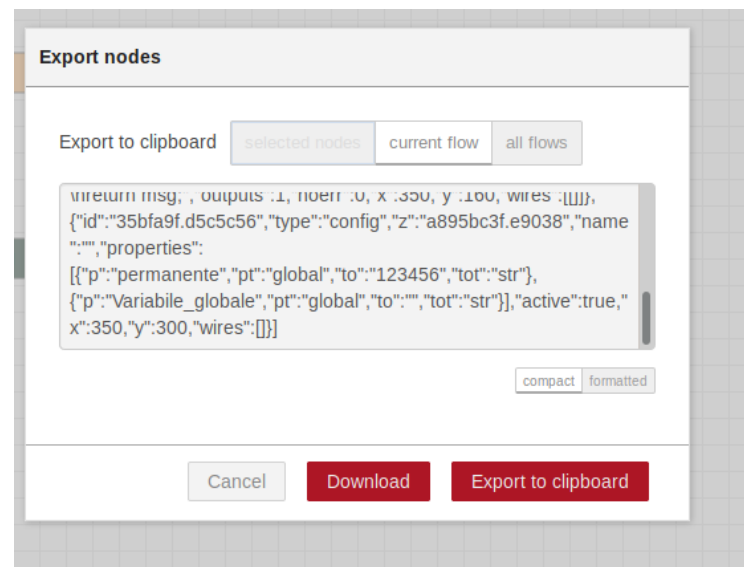
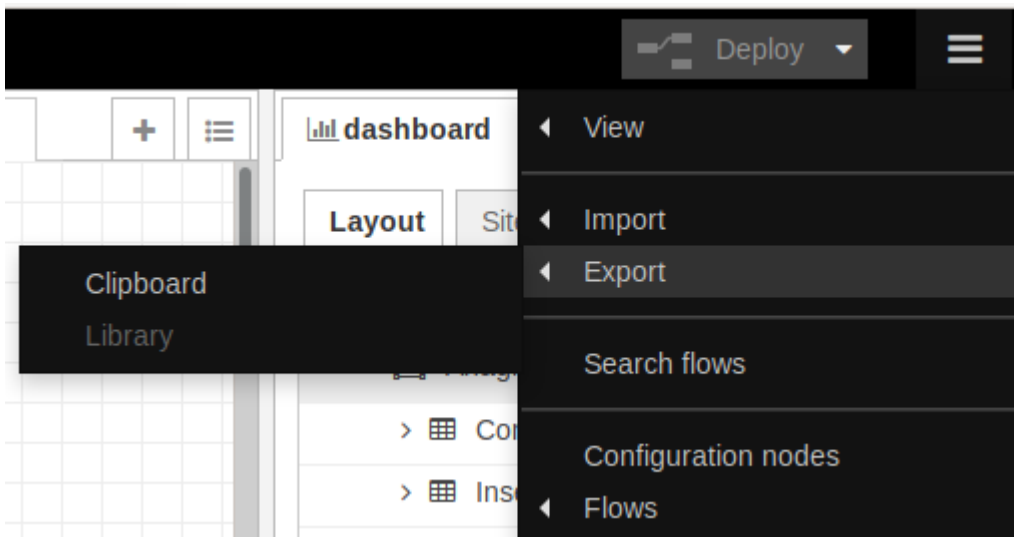
node



Condivisione dei flussi

Menu principale export.

Non vengono esportati i nodi di configurazione delle credenziali.



Condivisione dei flussi

Sul sito [nodered.org](https://flows.nodered.org) si trovano i flussi condivisi da utenti e programmatori.

https://flows.nodered.org/?num_pages=1

Node-RED Library

Find new nodes, share your flows and see what other people have done with Node-RED.

☒ flows ☒ nodes 3537 of 3546 things

Sort by:
☒ recent
☐ downloads
☐ rating

node-red-contrib-plejd A set of Node-RED nodes for interacting with Plejd v0.0.5 ★5.0 (1 🧑) node	node-red-contrib-binary A Node-RED node to parse and serialize binary data v0.0.7 node	node-red-contrib-zway Z-Way connectivity nodes for node-red v0.1.6 ★5.0 (1 🧑) node
formbird-nodered formbird api nodes v1.0.10 node	node-red-contrib-tibber-api Node Red module for integrating with Tibber api v0.4.11 ★5.0 (1 🧑) node	node-red-contrib-xiaomi-ble Xiaomi Bluetooth4 (BLE) sensors v1.2.4 ★5.0 (1 🧑) node
node-red-contrib-neogramm-automation-kit Connect to the neogramm AutomationKit v0.1.5 node	node-red-contrib-flightradar24 Node-RED node to fetch aircraft data from Flightradar24 v0.0.7 ★4.0 (1 🧑) node	node-red-contrib-alexa-remote2 node-red nodes for interacting with alexa v3.2.2 📁 120 ★5.0 (1 🧑) node
node-red-contrib-skyremote-new This node-red node allows you to remotelv node	node-red-contrib-dockerode node-red nodes to communicate with docker node	node-red-contrib-hal A set of nodes to help with basic home node

Add a flow

Palette interessanti

- <https://flows.nodered.org/node/node-red-contrib-cec>
- <https://flows.nodered.org/node/node-red-contrib-ui-led>
- https://flows.nodered.org/?term=-ui-&type=node&num_pages=1
- <https://flows.nodered.org/node/node-red-contrib-sun-position>
- <https://flows.nodered.org/node/node-red-contrib-clap>
- <https://flows.nodered.org/node/node-red-contrib-finite-state-machine>
- <https://github.com/firmata/arduino/issues/257>
- <https://diyprojects.io/connecting-esp8266-blynk-johnny-five-firmata-wifi/>
- <https://github.com/GabrieleMaurina/node-red-contrib-machine-learning>
- <https://flows.nodered.org/node/node-red-contrib-generic-ble>
- <https://flows.nodered.org/node/node-red-contrib-redlink>
- <https://github.com/bartbutenaers/node-red-contrib-ui-svg> (ancora in beta)

Altre risorse (links)

- Coursera Developer Guide Advanced Node-RED
- How to safely expose Node RED to the Internet
- Using Node-Red to Connect Patient, Staff and Medical Equipment
- <https://infusionsystems.com/pishield/controlling-a-midi-keyboard-through-node-red/>
- Node-Red, InfluxDB, and Grafana Tutorial on a Raspberry Pi
- NodeRED Multi-Node Redundancy Example
- Open energy monitor
- Node-RED Dashboard Template Examples (AngularJS)

Dubbi (miei)

- Non conosco quasi nulla di nodejs.
- Quanto è sicuro?
- Come e dove pubblichiamo i nostri flussi? L'export non è propriamente facile da leggere.
- https://etherpad.wikimedia.org/p/raspibo_nodered

Dubbi? Idee?