Node-RED

linking IoT and cloud

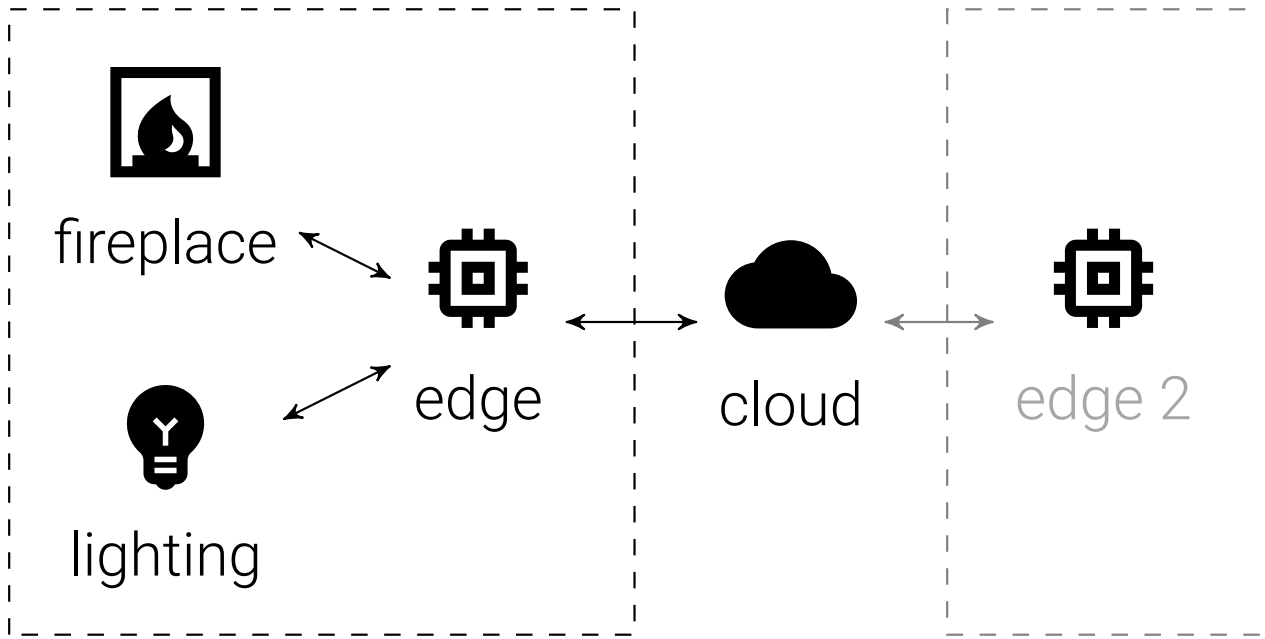
OpenCloudEdge

November 28, 2019

ETRO
ELECTRONICS &
INFORMATICS

GOAL

FROM IOT TO THE CLOUD

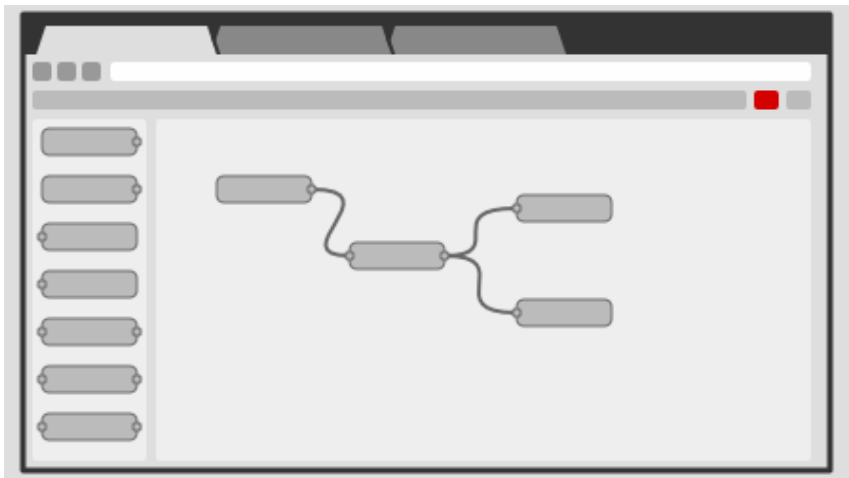


Short-term control: on the edge.
Long-term control and storage: in the cloud.

NODE-RED

Node-RED is a programming tool for wiring together hardware devices, APIs and online services in new and interesting ways.[1]

Use flows to graphically wire together IoT devices and web services.



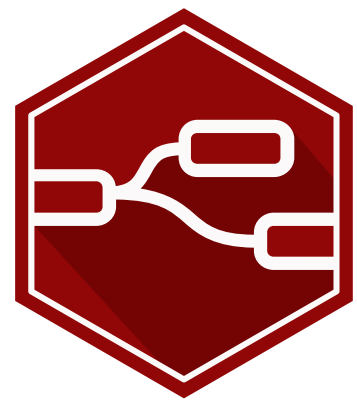
[1] https://nodered.org/

NODE-RED (CONT.)

developer JS Foundation, originally IBM

license Apache License 2.0

deployment Locally, “embedded”[2], cloud, or container



[2] Raspberry PI/Beaglebone/...

NODE-RED (CONT.)

FEATURES AND SUBPROJECTS

NODE-RED is highly modular. Built-in:

mqtt `sub` generates events, `pub` is event sink;

http either server or client, also WebSocket;

tcp/udp raw sockets, udp broad- and multicast;

parsers and serializers: JSON, YML, …;

[3] AWS/Fitbit/Google/OpenWeatherMap/…

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Official subprojects, notably:

ui dashboard functionality;

web a series of well-known web services[3];

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ui dashboard functionality;

web a series of well-known web services[3];

And many unofficial nodes, e.g.:

OpenHAB listen to events, get/set items;

CoAP server/client;

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EXPERIMENT 1

IOT CONNECTED HOME

Apartment with many connected appliances:

IR-blaster over WiFi to control a robot vacuum,

Zigbee lamps and remotes (Trådfri by IKEA),

television through Kodi.

Unifi WiFi-based presence tracking.

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Conclusions from experiment 1:

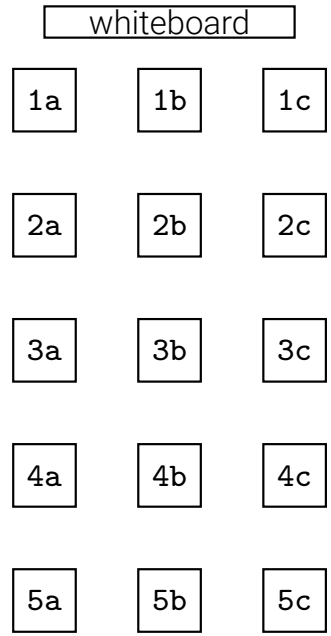
- NODE-RED is clearly the most stable component.
- Hacking together the rules is really easy, esp. compared to OpenHAB.

EXPERIMENT 2.A

STUDENT EXERCISES: COAP LIGHTING

Labs of “measuring and control”:

- used to be LabVIEW;
- NODE-RED offers an alike programming environment;
- introduction session: program and control connected lamps over CoAP.



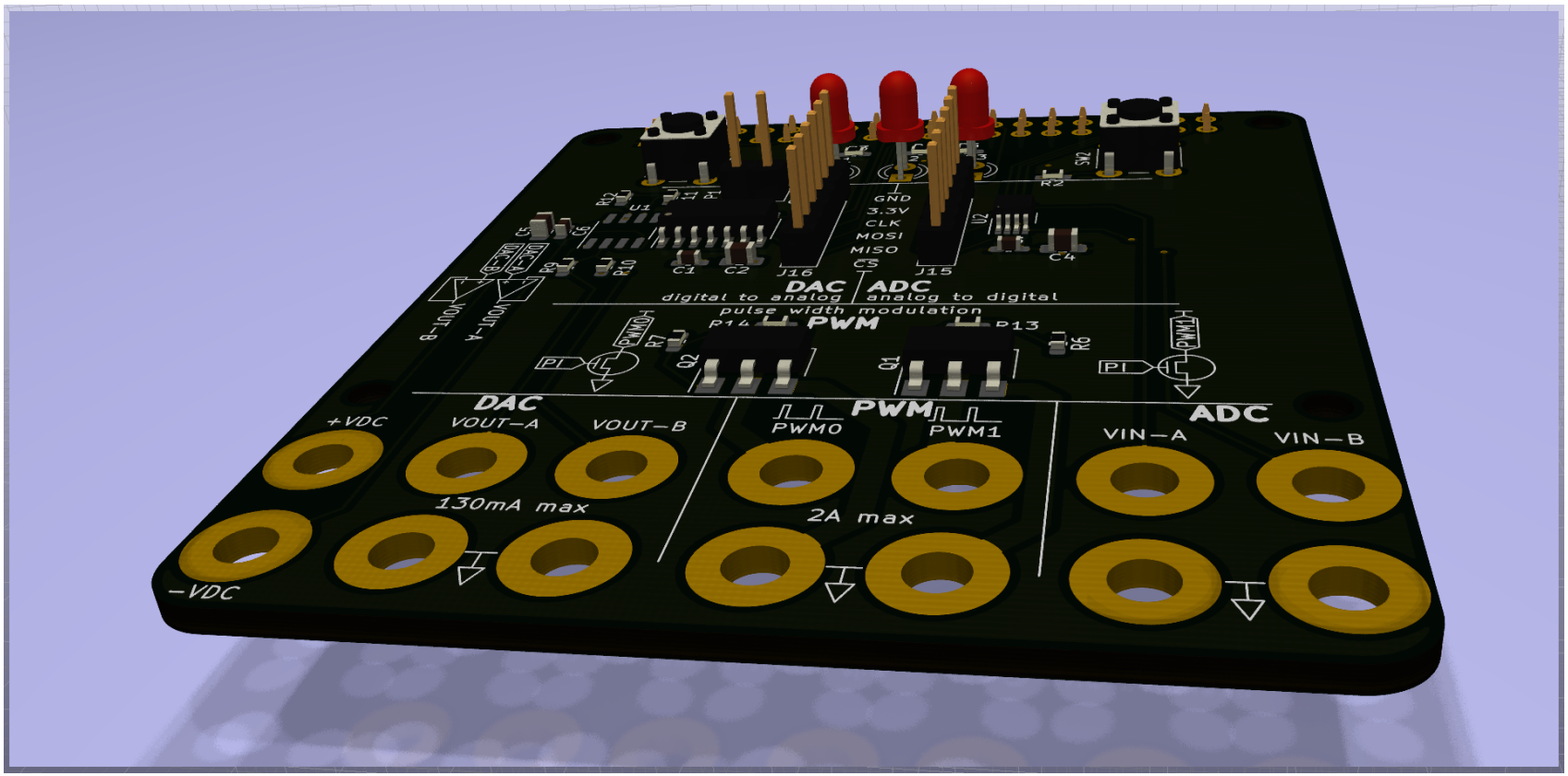
Conclusions from experiment 2.a:

- One NODE-RED instance per student: simultaneous editing of flows gives merge conflicts.
- Students of 3rd Ba civil engineering easily accomplish basic tasks. We might drop the introduction session.

EXPERIMENT 2.B (PENDING)

STUDENT EXERCISES: SIGNAL PROCESSING

Actual measurement labs on a custom Raspberry PI HAT, currently in production.



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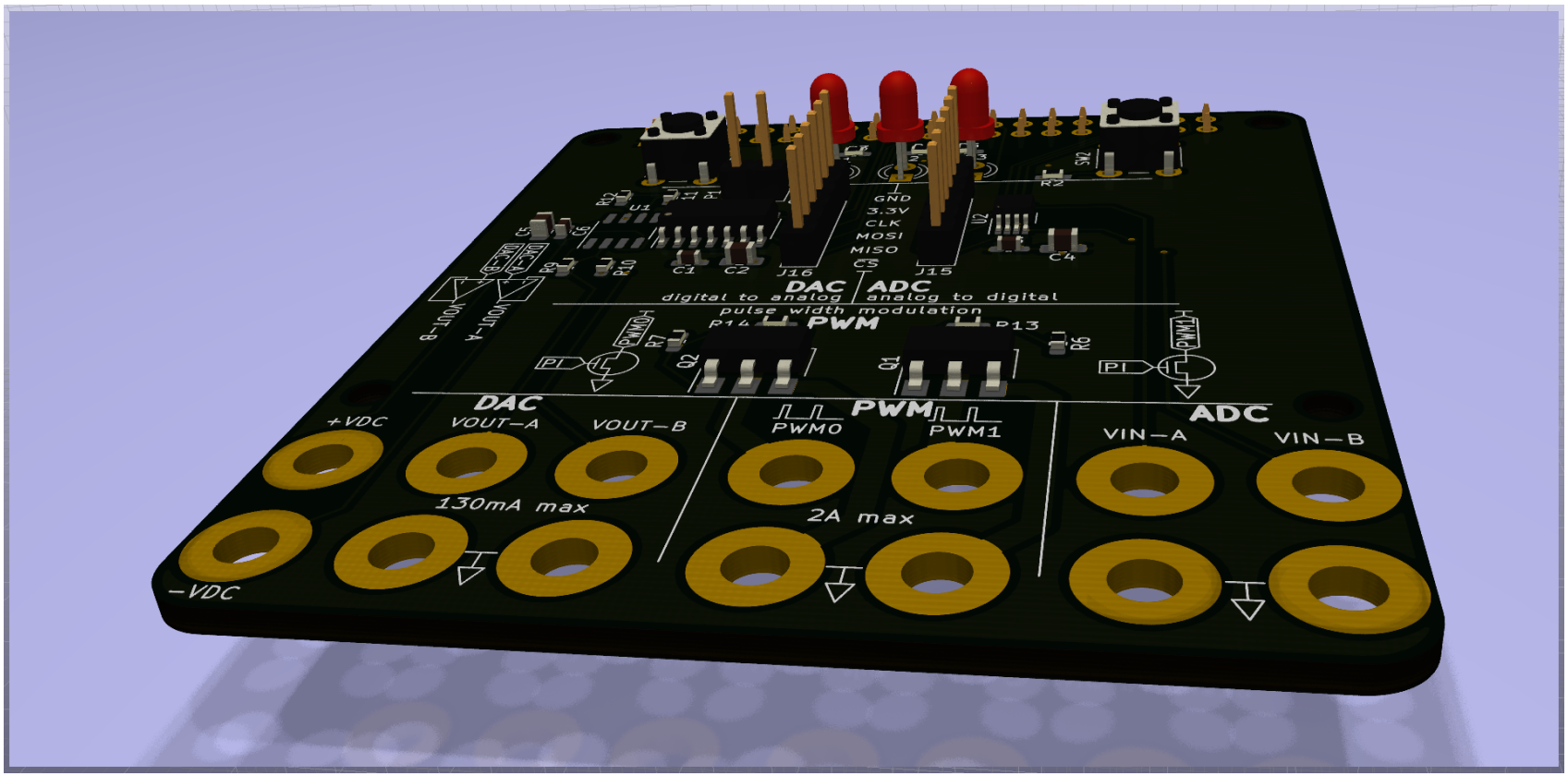
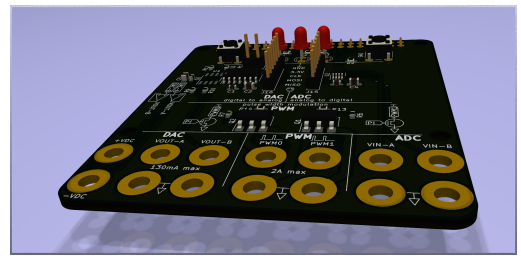


EXPERIMENT 2.B (PENDING)

STUDENT EXERCISES: SIGNAL PROCESSING

Two actual measurement labs on a custom Raspberry PI HAT, currently in production.

1. Build a thermostat:
   - digitally control a heater and fan
2. Explore limits of DACs:
   - Nyquist, aliasing, …
   - digital filtering



We need to write custom NODE-RED modules for DAC, ADC and PWM channels.

FURTHER EXPERIMENTS

WHAT'S NEXT?

How to connect from NODE-RED to the cloud project?

- NODE-RED feels like an “edge-solution”
- use NODE-RED in the cloud as well?
- sensor logging