



PSI3541 2023

SISTEMAS EMBARCADOS DISTRIBUIDOS

AULA 09 02/05/2023

ATIVIDADE 9.1 PID CONTROL: SMART HOME SIM, MODBUS, NODE-RED

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OBJETIVO

- IMPLEMENTAR UM CONTROLE PROPORCIONAL PARA O AQUECEDOR A CASA INTELIGENTE

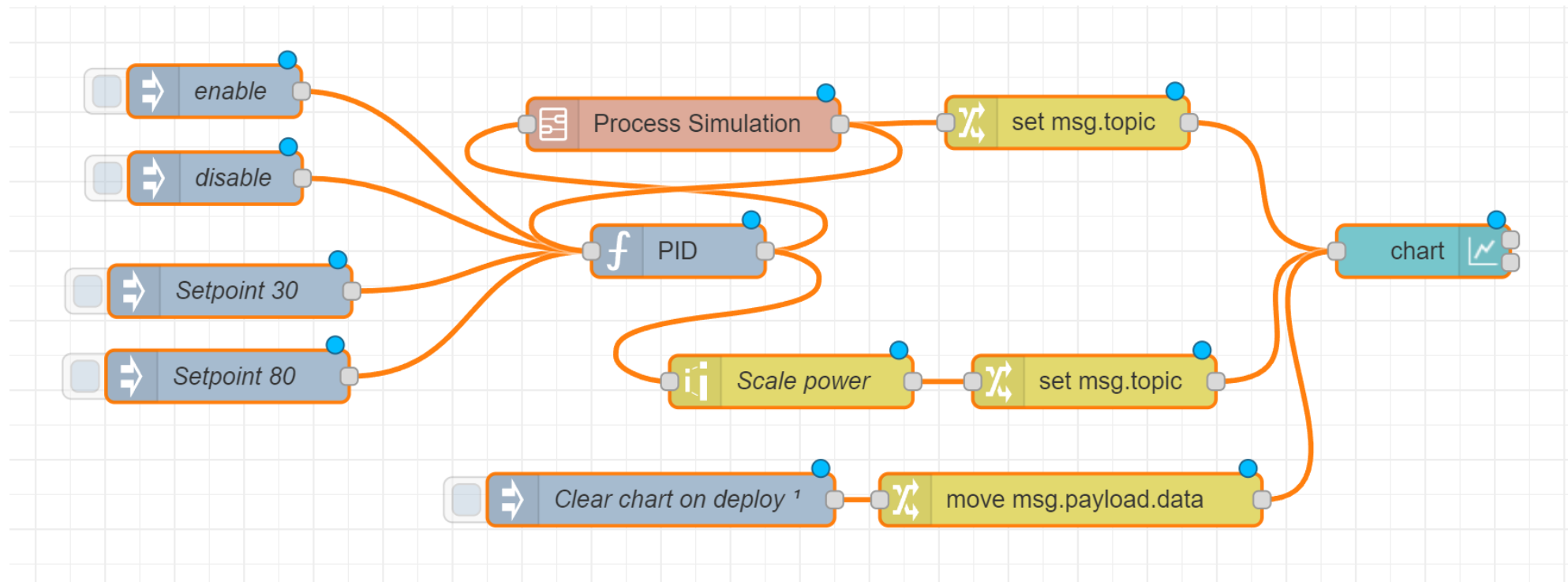
MÓDULOS DO NODE-RED UTILIZADOS

- node-red-contrib-pid 1.1.7
 - <https://flows.nodered.org/node/node-red-contrib-pid>
- node-red-contrib-modbus 5.26.0
 - <https://flows.nodered.org/node/node-red-contrib-modbus>
- node-red-dashboard 3.4.0
 - <https://flows.nodered.org/node/node-red-dashboard>

NÓ DE CONTROLE PID

- ENTRADA:
 - MSG.TOPIC, MSG.PAYLOAD
 - VALORES DOS PARÂMETROS DE CONFIGURAÇÃO
 - VALORES DO PROCESSO
- SAÍDA:
 - VALOR DE CONTROLE DO PROCESSO
 - VARIA ENTRE (0,1)
- FLUXO EXEMPLO: Sample flow for exercising node-red-contrib-pid
 - <https://flows.nodered.org/flow/42f125b56a00dd5d1433c2f8023263e9>
- TUNNING: PID loop tuning using node-red-contrib-pid in node red
 - <https://blog.clanlaw.org.uk/pid-loop-tuning.html>

FLUXO EXEMPLO



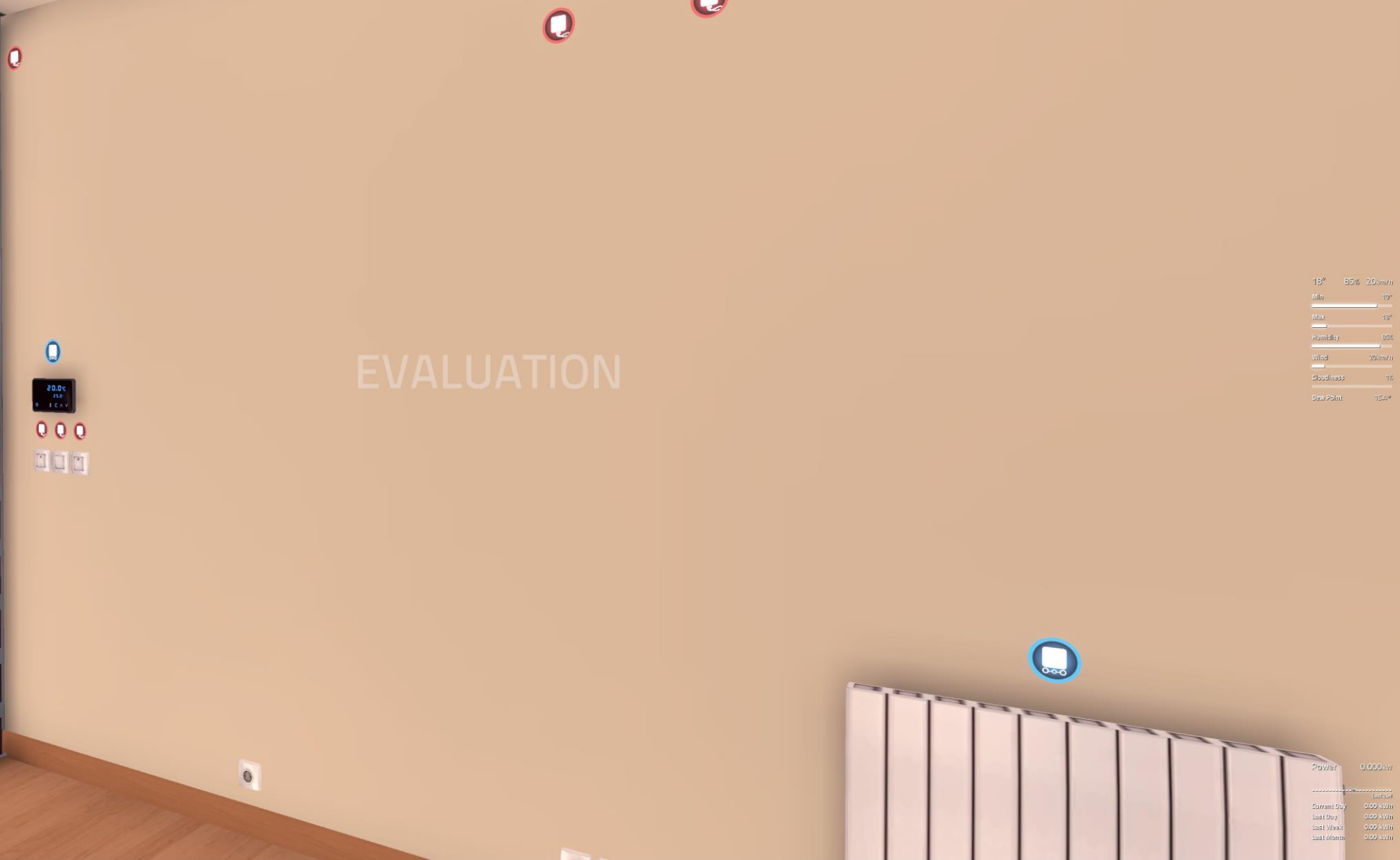
NÓ DE CONTROLE PID

CONFIGURAÇÃO	MSG.TOPIC	P/ CONTROLE ON-OFF	P/ CONTROLE PROPORCIONAL
Setpoint	setpoint		
Proportional band	prop_band	0	
Integral time	t_integral	VALOR MUITO GRANDE	VALOR MUITO GRANDE
Derivative time	t_derivative	0	0
Initial integral	integral_default		
Max sample interval	max_interval		
Derivative smoothing fator	smooth_factor		
Enable state	enable		
Output power when disabled	disabled_op		



11:57:30

2023/05/02 - Tuesday
0 Days 00:00:00
Daylight Saving Time



EVALUATION

18° 85% 20m/h
 Min 10°
 Max 18°
 Humidity 80%
 Wind 20m/h
 Cloudiness 1%
 Dew Point 10.4°

Power 0.000kW
 Current Day 0.00 kWh
 Last Day 0.00 kWh
 Last Week 0.00 kWh
 Last Month 0.00 kWh

N Ground Floor
 1:500 Scale

20°C
 10°C



INT
LONG
FLOAT
DOUBLE
STRING
DATETIME
TIMESPAN

OUTPUTS

BIT
BYTE
SHORT
INT
LONG
FLOAT
DOUBLE
STRING
DATETIME
TIMESPAN

MEMORIES

SOURCES

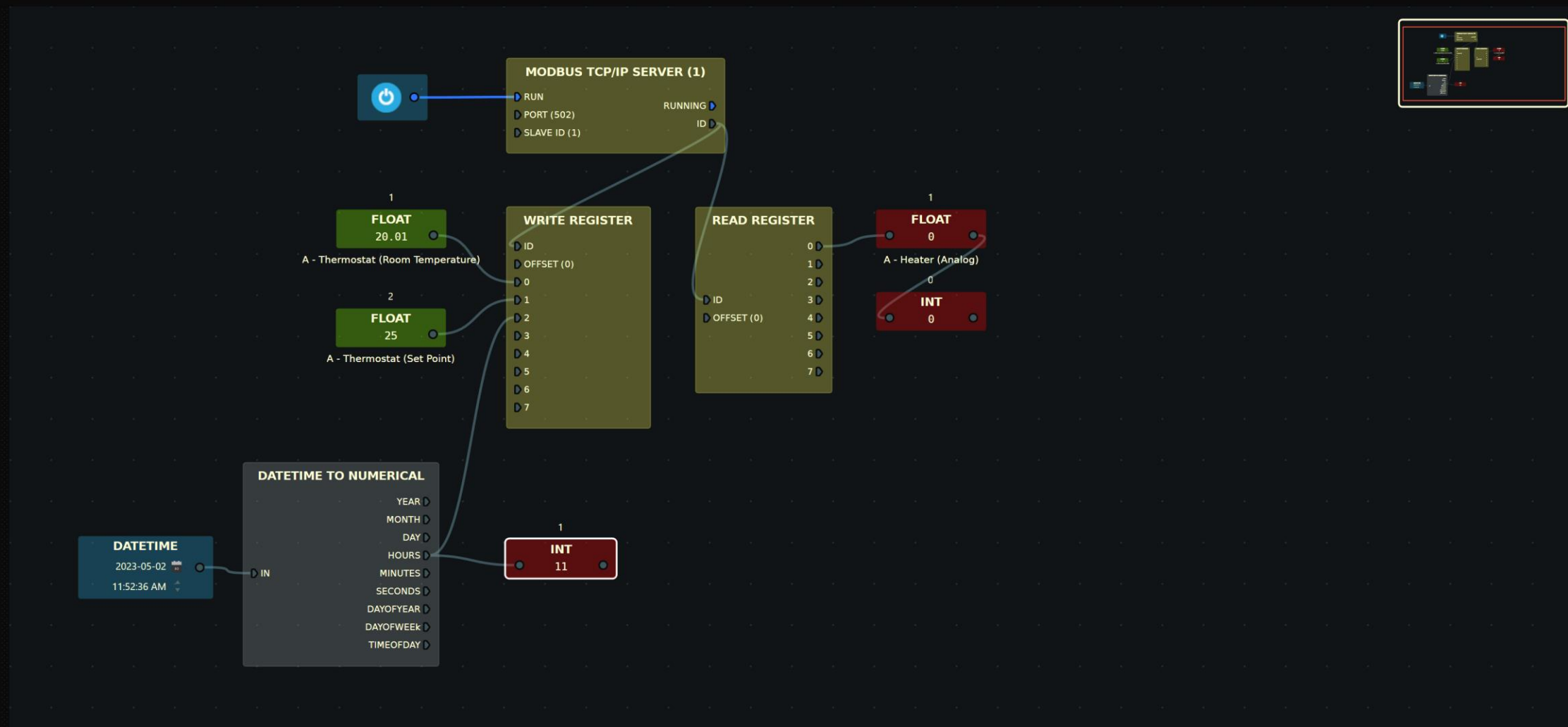
BIT
NUMERICAL
STRING
DATETIME
SYSTEM TIME
CYCLE TIME

TAGS

- A - Heater
- A - Heater (Analog)
- A - Thermostat (Room Temperature)
- A - Thermostat (Set Point)
- Date and Time

PLUGINS

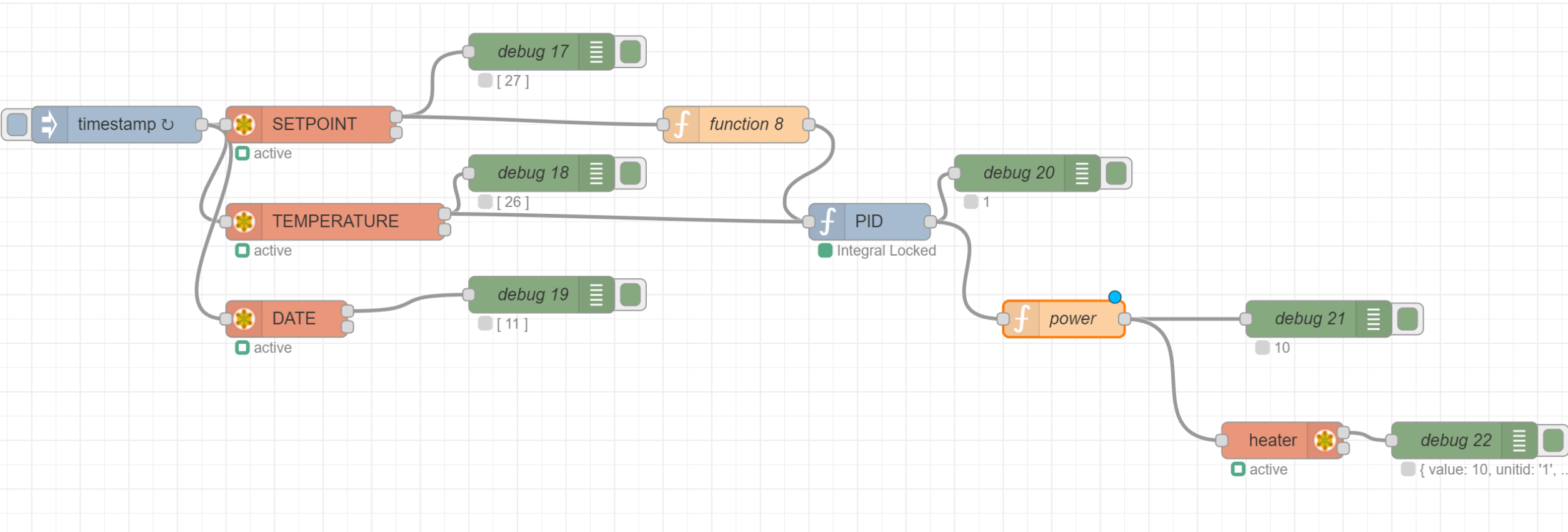
- ▶ ADVANTECH
- ▶ AUTOMGEN
- ▶ FUNCTION BLOCKS
 - ▶ ARITHMETIC
 - ▶ BIT
 - ▶ COMPARISON
 - ▶ COUNTERS
 - ▶ EXTRA
 - ▶ TIMERS
 - TOF
 - TON
 - ▶ TRIGGERS
- ▶ KEY BINDINGS
- ▶ DATA ANALYSIS
- ▶ MHJ-SOFTWARE
- ▶ MODBUS
 - ▶ INPUTS
 - WRITE DISCRETE
 - WRITE REGISTER
 - MODBUS TCP/IP CLIENT
 - MODBUS TCP/IP SERVER
 - ▶ OUTPUTS
 - READ DISCRETE
 - READ REGISTER
- ▶ OPC



PROPERTIES LOGGER

DESCRIPTION

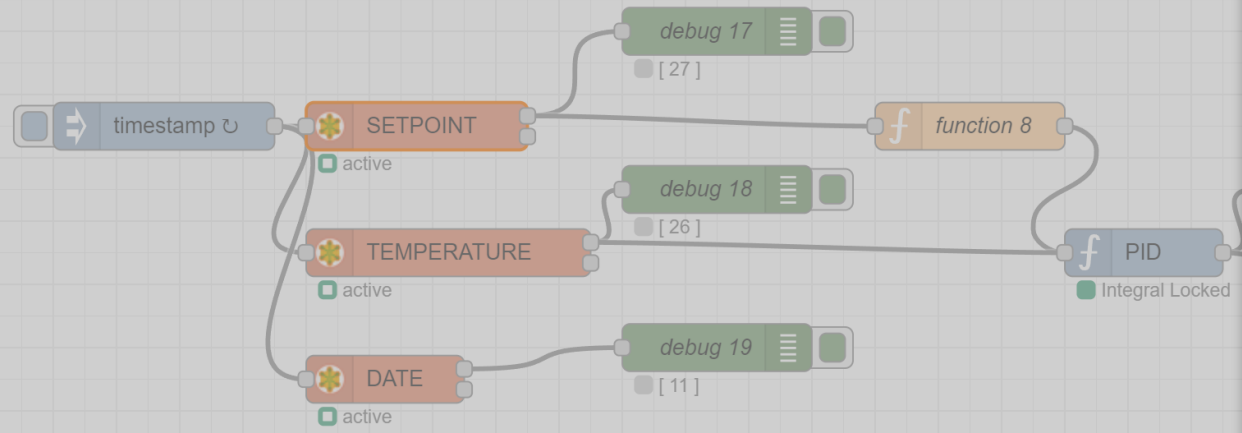
ADDRESS 1



filter nodes

- Flow 1
- Flow 2
- Flow 3
- Flow 4
- Flow 5

- http response
- http request
- websocket in
- websocket out
- tcp in
- tcp out
- tcp request
- udp in
- udp out
- sequence
 - split
 - join
 - sort
 - batch
- parser



Edit Modbus-Getter node

Delete Cancel Done

Properties

Settings

Name: SETPOINT

Unit-Id: 1

FC: FC 4: Read Input Registers

Address: 0

Quantity: 1

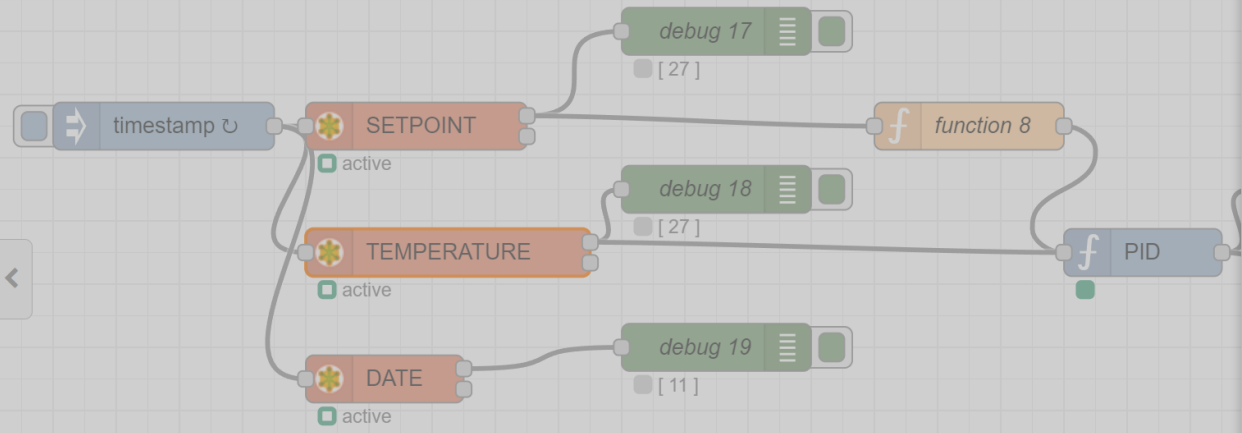
Delay to activate input:

Server: connect-io

filter nodes

- Flow 1
- Flow 2
- Flow 3
- Flow 4
- Flow 5

- http response
- http request
- websocket in
- websocket out
- tcp in
- tcp out
- tcp request
- udp in
- udp out
- sequence
 - split
 - join
 - sort
 - batch
- parser



Edit Modbus-Getter node

Delete Cancel Done

Properties

Settings

Name: TEMPERATURE

Unit-Id: 1

FC: FC 4: Read Input Registers

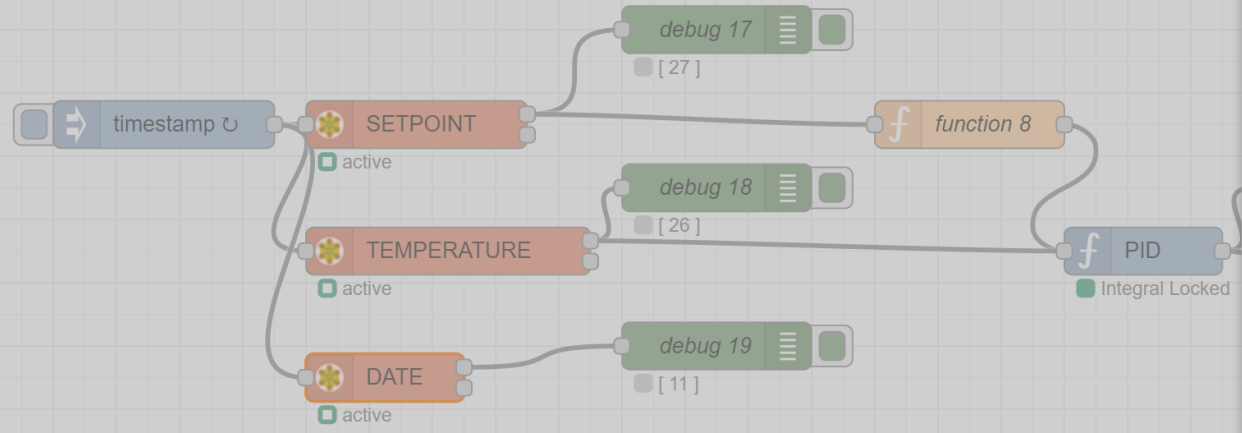
Address: 1

Quantity: 1

Delay to activate input:

Server: connect-io

- http response
- http request
- websocket in
- websocket out
- tcp in
- tcp out
- tcp request
- udp in
- udp out
- sequence
 - split
 - join
 - sort
 - batch
- parser



Edit Modbus-Getter node

Delete Cancel Done

Properties

Settings

Name:

Unit-Id:

FC:

Address:

Quantity:

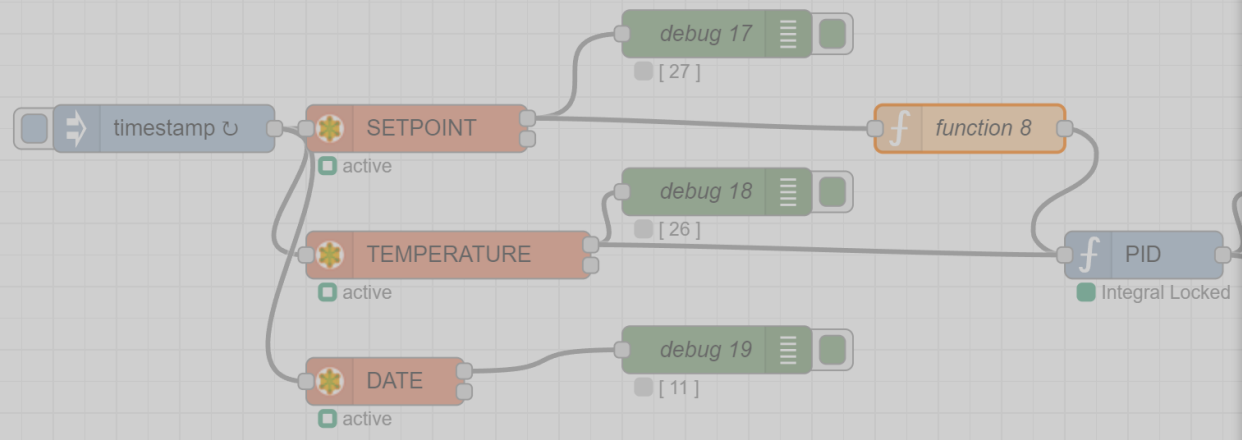
Delay to activate input

Server:

filter nodes

- Flow 1
- Flow 2
- Flow 3
- Flow 4
- Flow 5

- http response
- http request
- websocket in
- websocket out
- tcp in
- tcp out
- tcp request
- udp in
- udp out
- sequence
 - split
 - join
 - sort
 - batch
- parser



Edit function node

Delete Cancel Done

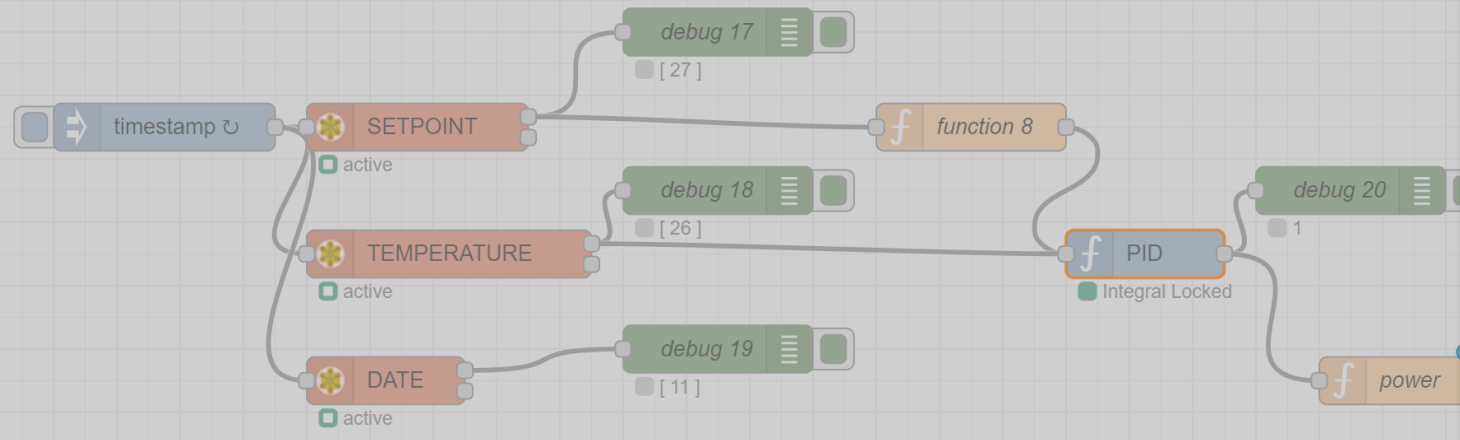
Properties

Name: function 8

Setup On Start On Message On Stop

```
1 msg.topic='setpoint';
2 return msg;
```

- http response
- http request
- websocket in
- websocket out
- tcp in
- tcp out
- tcp request
- udp in
- udp out
- sequence
 - split
 - join
 - sort
 - batch
- parser



Edit PID node

Delete Cancel Done

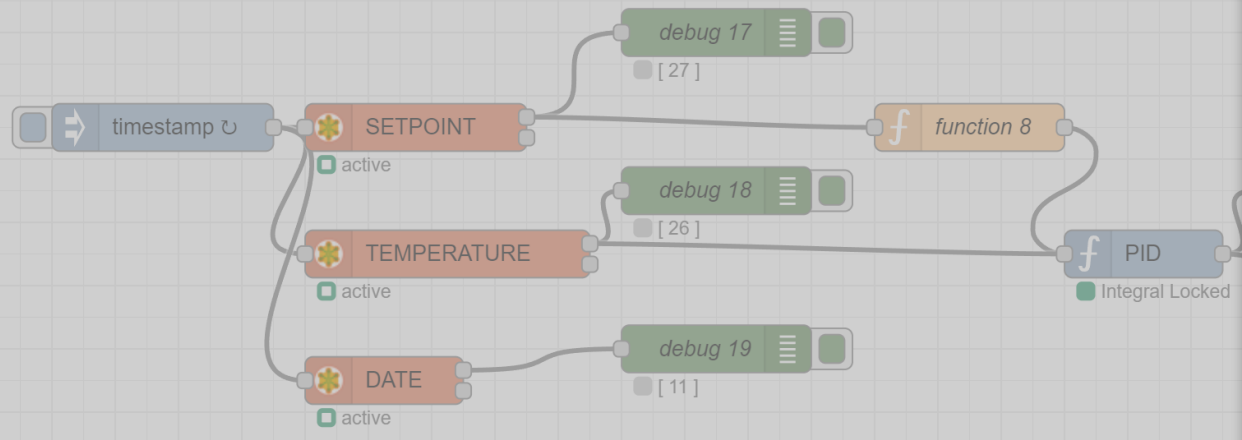
Properties

Name	<input type="text" value="Name"/>
Setpoint	<input type="text" value="21"/>
Proportional band	<input type="text" value="2"/>
Integral time (secs)	<input type="text" value="999999999"/>
Derivative time (secs)	<input type="text" value="0"/>
Initial integral	<input type="text" value="0.5"/>
Max sample interval (secs)	<input type="text" value="600"/>
Derivative smoothing factor	<input type="text" value="3"/>
Enable state (1=Enabled, 0=Disabled))	<input type="text" value="1"/>
Output Power	<input type="text"/>

filter nodes

Flow 1 Flow 2 Flow 3 Flow 4 Flow 5

- http response
- http request
- websocket in
- websocket out
- tcp in
- tcp out
- tcp request
- udp in
- udp out
- sequence
 - split
 - join
 - sort
 - batch
- parser



Edit function node

Delete Cancel Done

Properties

Name power

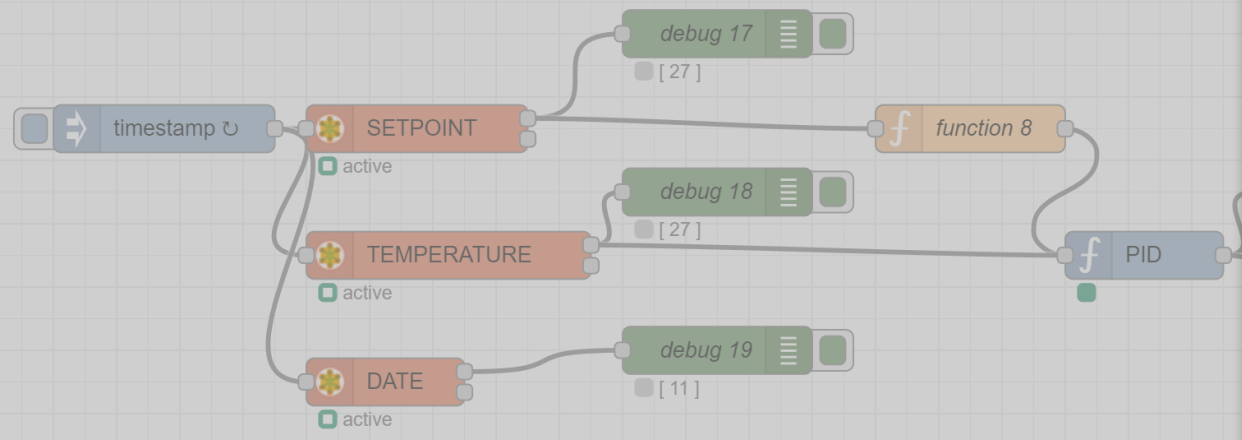
Setup On Start On Message On Stop

```
1 var heater;
2
3 if(msg.payload<0.5)
4 {
5     heater=0;
6 }
7 if (msg.payload>=0.5)
8 {
9     heater=msg.payload-0.5;
10    heater=2*heater;
11    heater=heater*10;
12 }
13
14 msg.payload=heater;
15 return msg;
```

filter nodes

- Flow 1
- Flow 2
- Flow 3
- Flow 4
- Flow 5

- http response
- http request
- websocket in
- websocket out
- tcp in
- tcp out
- tcp request
- udp in
- udp out
- sequence
 - split
 - join
 - sort
 - batch
- parser



Edit Modbus-Write node

Delete Cancel Done

Properties

Settings

Name: heater

Unit-Id: 1

FC: FC 6: Preset Single Register

Address: 0

Delay to activate input:

Server: connect-io

ATIVIDADE 9.1 PARTE PRÁTICA

IMPLEMENTE UM CONTROLE ON-OFF PARA O AQUECEDOR DA CASA INTELIGENTE USANDO O NÓ DE CONTROLE PID.

- SETPOINT= 25 C
- DASHBOARD: SETPOINT, TEMPERATURA AMBIENTE, CONTROLE DO AQUECEDOR

ATIVIDADE 9.2

IMPLEMENTE UM CONTROLE PROPORCIONAL PARA O AQUECEDOR DA CASA INTELIGENTE USANDO O NÓ DE CONTROLE PID.

- SETPOINT= 25 C
- DASHBOARD: SETPOINT, TEMPERATURA AMBIENTE, CONTROLE DO AQUECEDOR
- BANDA PROPORCIONAL = 2 C

ATIVIDADE 9.3

- IMPLEMENTE UM CONTROLE DE HORÁRIO PARA O AQUECEDOR
 - HORÁRIO DE OPERAÇÃO: LIGA O AQUECEDOR
 - HORÁRIO DESLIGADO: DESLIGA O AQUECEDOR
- O USUÁRIO DEVE INSERIR OS HORÁRIOS PELO DASHBOARD

filter nodes

- Flow 4
- Flow 5
- Flow 6
- Flow 7
- Flow 8
- Flow 9
- Flow 10
- Flow 9

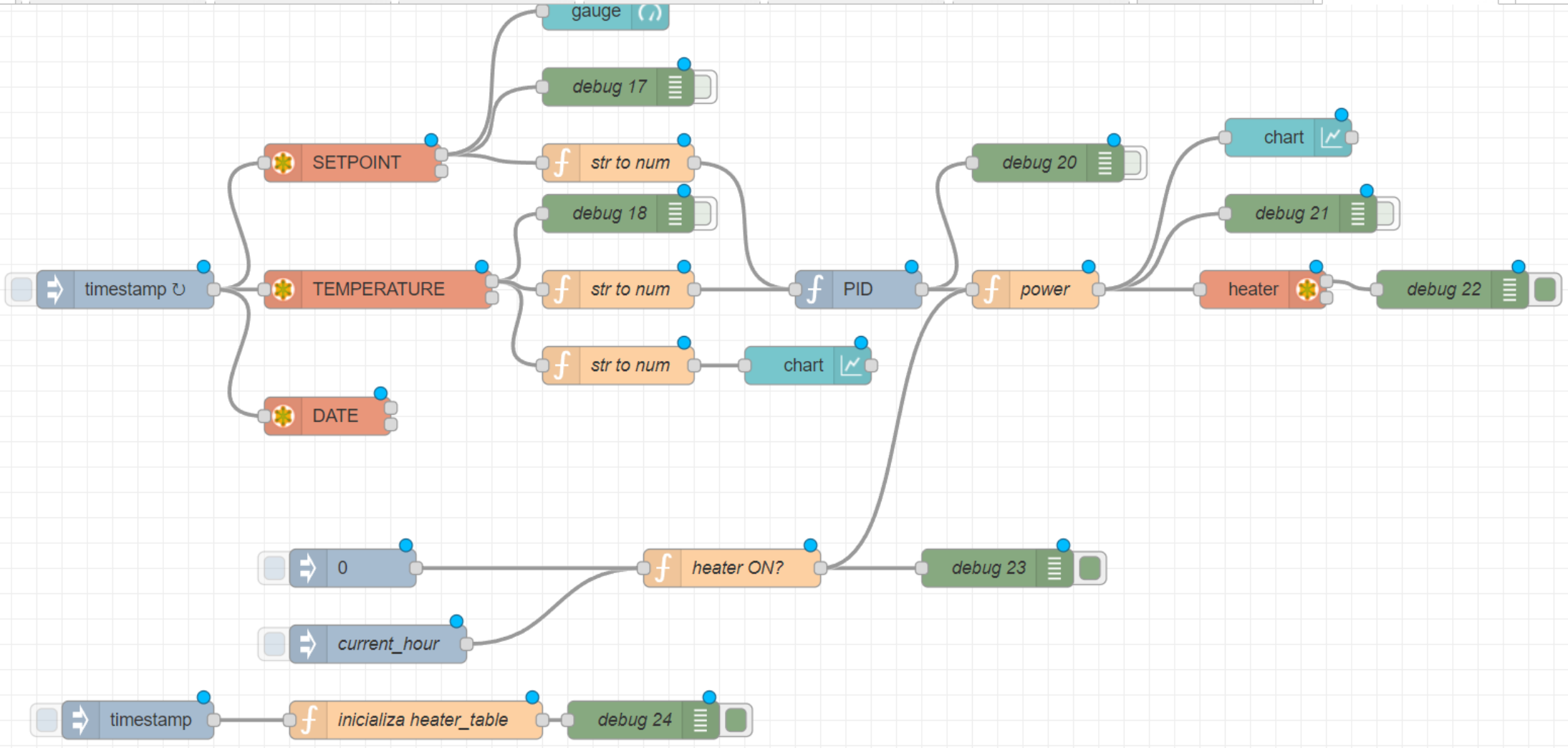
subflows

Process Simulation

common

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

function



DÚVIDAS?

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