node-red-contrib-edge-tpu `0.0.1`

This package contains Node-RED nodes taking advantage of Shenzhou TPU to interfence using AI models. There are also nodes for GUI presentation of result and system performance.

Install

Run the following npm command in your Node-RED user directory (typically ~/.node-red):

```
npm install --prefix=~/.node-red node-red-contrib-edge-tpu
```

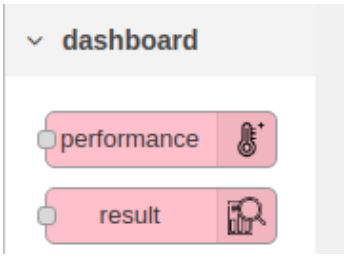
Category

- ## Inference Node

  Find the inference node in category " `Shen Zhou` " as follow:

- ## Result Node and Performance Node

  Find the inference node in category " `dashboard` " as follow:



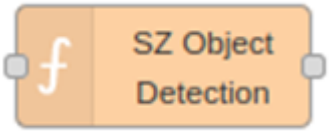
Usage

- # Inference Node

> “SZ Image Classification” node:

Run image classification models with specified TPUs

> “SZ Object Detection” node:



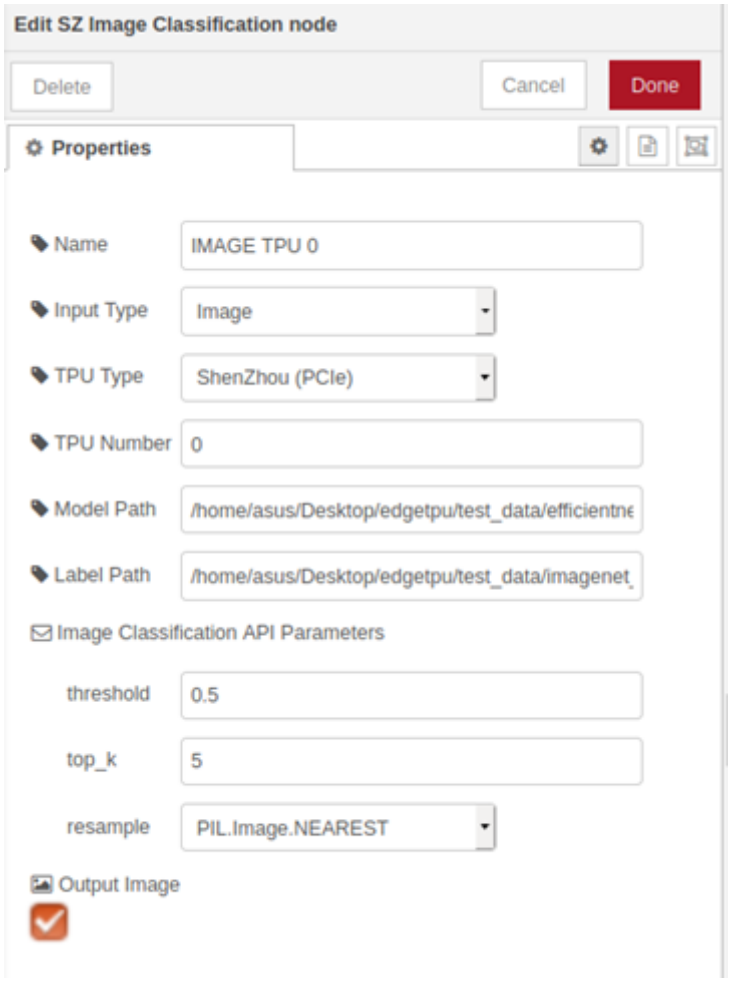
Run object detection models with specified TPUs

- Node Properties:

The explanation about the items of Properties:

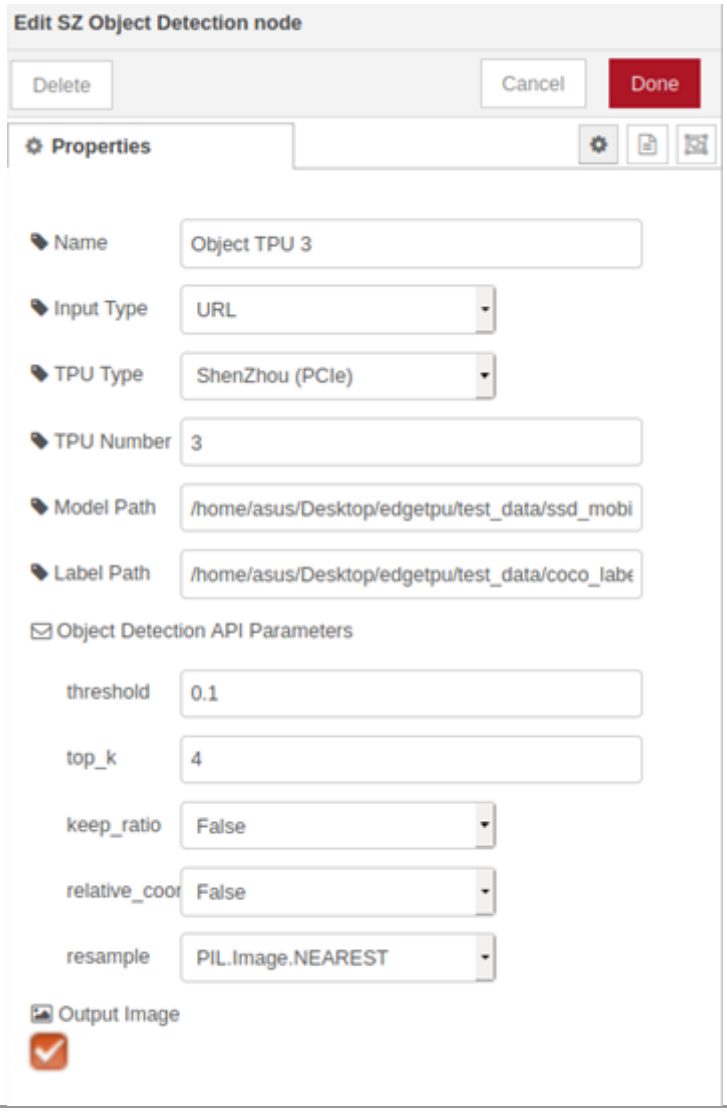
1. **Input Type:** The source input format, including the paths of image file, URL link, video file and camera device
2. **TPU Type:** Support M.2 edge TPU type at current
3. **TPU Number:** Select a number of edge TPU
4. **Model Path:** The edge TPU support model files path
5. **Label Path:** The label file path of model
6. **Image Classification API parameter:**
   o threshold : Minimum confidence threshold for results.
   o top_k : The maximum number of results

o resample : A resampling filter for image resizing.



7. **Object Detection API parameter:**
   o threshold : Minimum confidence threshold for detected objects.
   o top_k : The maximum number of detected objects to return.
   o keep_ratio : If true, keeping the image aspect ratio the same when down-sampling the image. If false, resizing and reshaping the image (without cropping) to match the input tensor's dimensions.
   o relative_coord : If true, providing coordinates as float values between 0 and 1, representing each position relative to the total image width/height. If false, providing coordinates as integers, representing pixel positions in the original image. [0, 0] is always the top-left corner.

o resample : A resampling filter for image resizing.



Note: The API parameter can reference the following link

- https://coral.ai/docs/edgetpu/api-intro/#edge-tpu-api-overview (https://coral.ai/docs/edgetpu/api-intro/#edge-tpu-api-overview)

- Input and Output data Formats:

1. Input data format to inference node:

When the infernce using a edgetpu model is performed, you need to pass the corresponding msg.payload to the inference node. The msg.payload would be a string of path about image or frame sources.

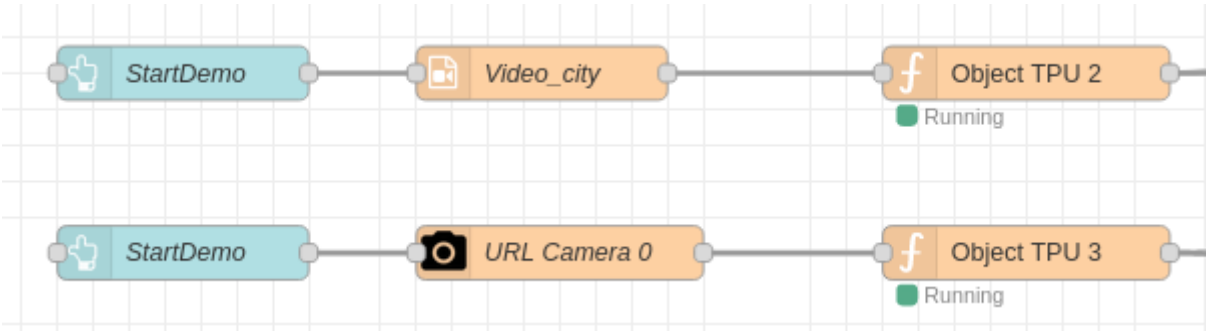
Source Type	Payload format	Example
Image	Strings	“/home/asus/Desktop/test.jpg”
URL Streaming server	Strings	“http://127.0.0.1:8080/?action=stream” (http://127.0.0.1:8080/?action=stream%E2%80%9D)
Video	Strings	“/home/asus/Desktop/test.mp4”
Local Camera	Strings	“0”

An example of input to inference node for url streaming server:

```
{
    payload: “http://127.0.0.1:8080/?action=stream”
}
```

You also need to select the “input type” item to URL on inference node:

1.1 Input data format to inference node:

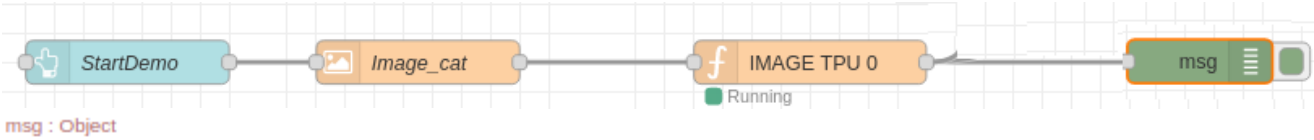


2. Output data format from inference node::

2.1 SZ Image Classification node output json format:

Output	Format	Description
className	Strings	Class Name category
score	Integer	The percent about the inference result
inf_fps	Integer	The FPS about TPU inference for a frame
starttime	Integer	Inference node start time(Millionseconds)
image	Strings	Base64 format strings (Output Image item is selected and then the image would be transfer)

Reference the Results on Node-red debug message:



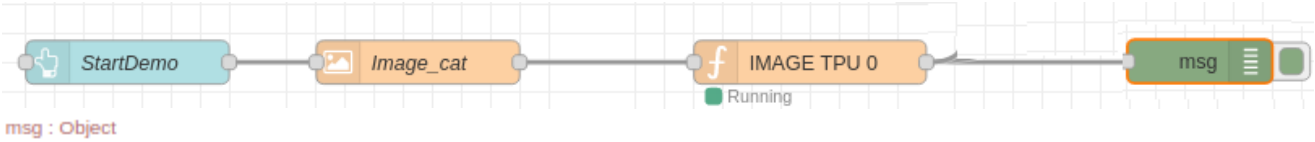
msg : Object


```
▾ object
▾ payload: object
  ▾ classes: array[1]
    ▾ 0: object
        className: "chickadee"
        score: 0.640625
  inf_fps: 32.2
  starttime: 1605168875943
  image:
  "/9j/4AAQSkZJRgABAQAAAQABAAD
  /2wBDAAgGBgcGBQgHBwcJCQgKDBQNDAs
  LDBkSEw8UHRofHh0aHBwgJC4nICIsIxw
  cKDcpLDAxNDQ0Hyc5PTgyPC4zNDL
  /2wBDAQkJCQwLDBgNDRgyIRwhMjIyMjI
  yMjIyMjIyMjIyMjIyMjIyMjIyMjI
  yMjIyMjIyMjIyMjIyMjIyMjL
  /wAARCAFXAgADASIAAhEBAxEB
  /8QAHwAAAQUBAQEBAQEAAAAAAAAAAAEC
```


2.2 SZ Object Detection node output json format:

Output	Format	Description
bbox	array	The coordinate about x1, y1, x2 and y2 return from the edgetpu object detection api.
className	Strings	Class Name category
score	Integer	The percent about the inference result
inf_fps	Integer	The FPS about TPU inference for a frame
starttime	Integer	Inference node start time(Millionseconds)
image	Strings	Base64 format strings (Output Image item is selected and then the image would be transfer)

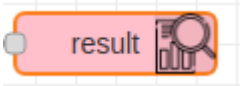
Reference the Results on Node-red debug message:



msg : Object


```
▾ object
▾ payload: object
  ▾ objects: array[4]
    ▾ 0: object
      ▸ bbox: array[4]
        className: "person"
        score: 0.87890625
    ▾ 1: object
      ▸ bbox: array[4]
        className: "person"
        score: 0.58203125
    ▸ 2: object
    ▸ 3: object
  inf_fps: 143.85
  starttime: 1605169814422
  image:
  "/9j/4AAQSkZJRgABAQAAAQABAAD
  /2wBDAAgGBgcGBQgHBwcJCQgKDBQNDAs
  LDBkSEw8UHRofHh0aHBwgJC4nICIsIxw
  cKDcpLDAxNDQ0Hyc5PTgyPC4zNDL
  /2wBDAQkJCQwLDBgNDRgyIRwhMjIyMjI
  yMjIyMjIyMjIyMjIyMjIyMjIyMjI
  yMjIyMjIyMjIyMjIyMjIyMjL
  /wAARCAHgAoADASIAAhEBAxEB
  /8QAHwAAAQUBAQEBAQEAAAAAAAAAAAEC
```


- # Result node

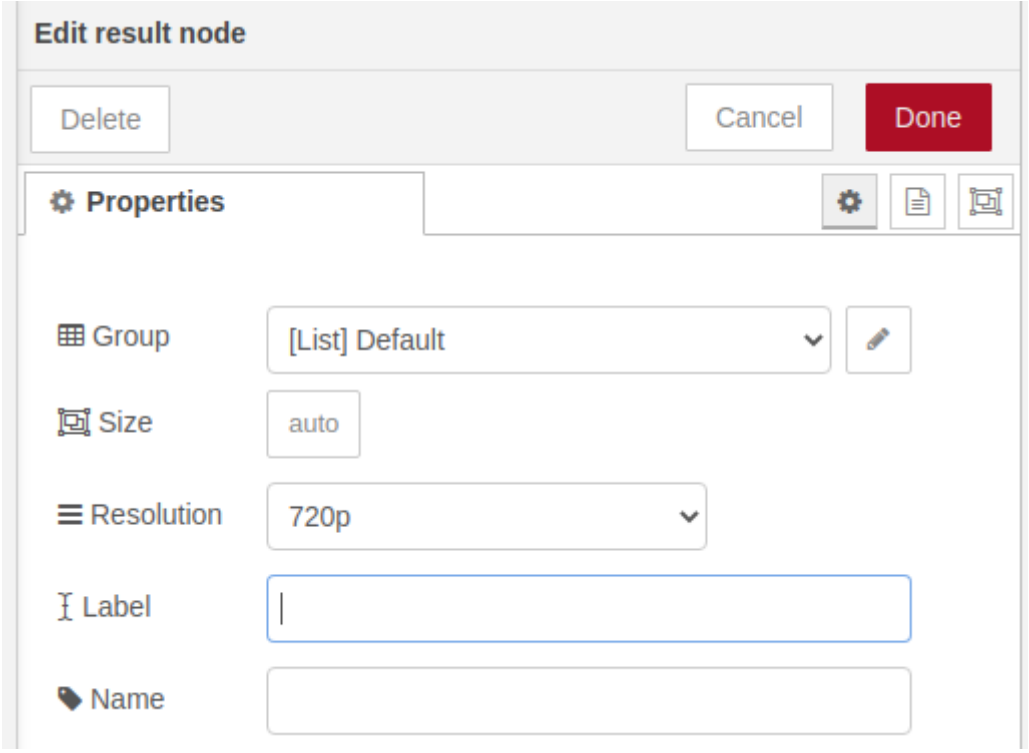


Show the output results from Inference Node:

- Node Properties:

1. Group: Select which group on dashboard and show the widgets
2. Size：sets the basic geometry of the grid layout in pixels
3. Resolution：Reconfig the resolution of frames
4. Label：Show the topic on the dashboard

5. Name：Config and show the name on the node

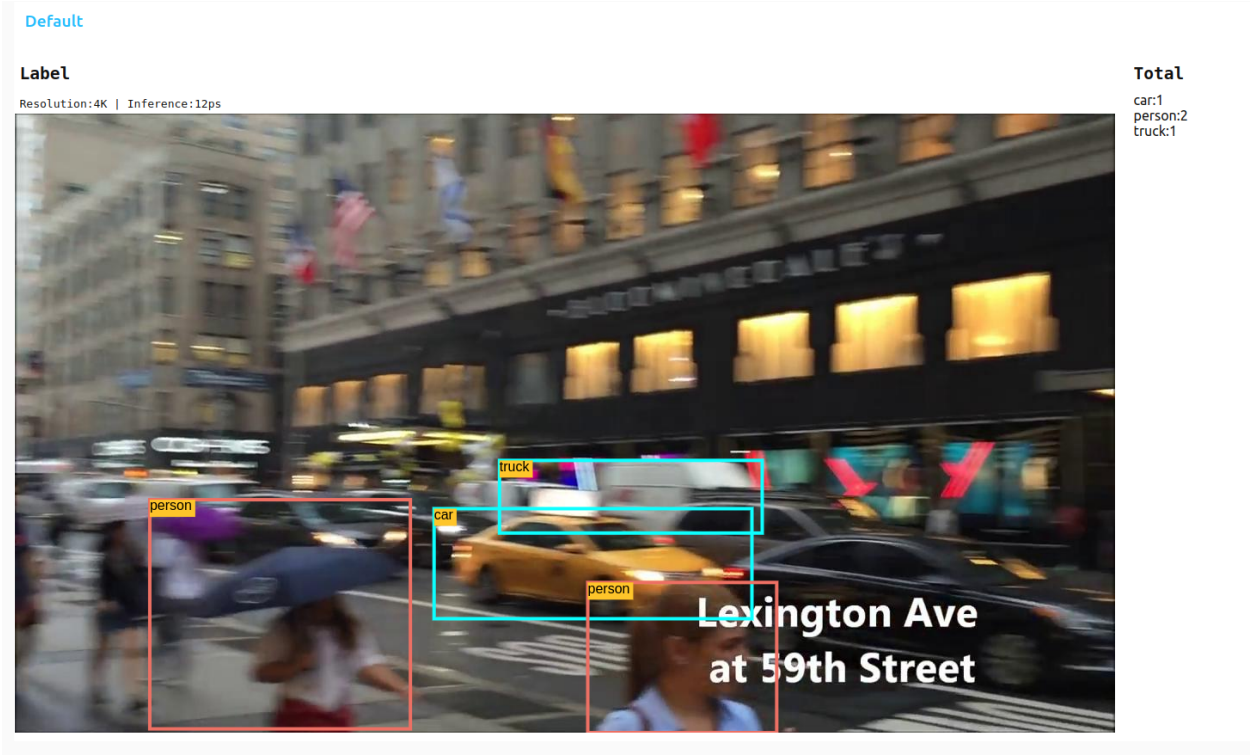


- Output

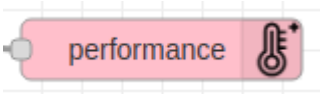
Reference the following image about the node outputs:

1. Default mapping to Group
2. Size set “auto” and the video source is 720p
3. Label mapping to the Label config of properties
4. The colors of bounding-box are classified with people and not people:
   - people : Orange
   - not people : Blue

5. The right filed (Total): show the quantity of classification object



- # Performance node



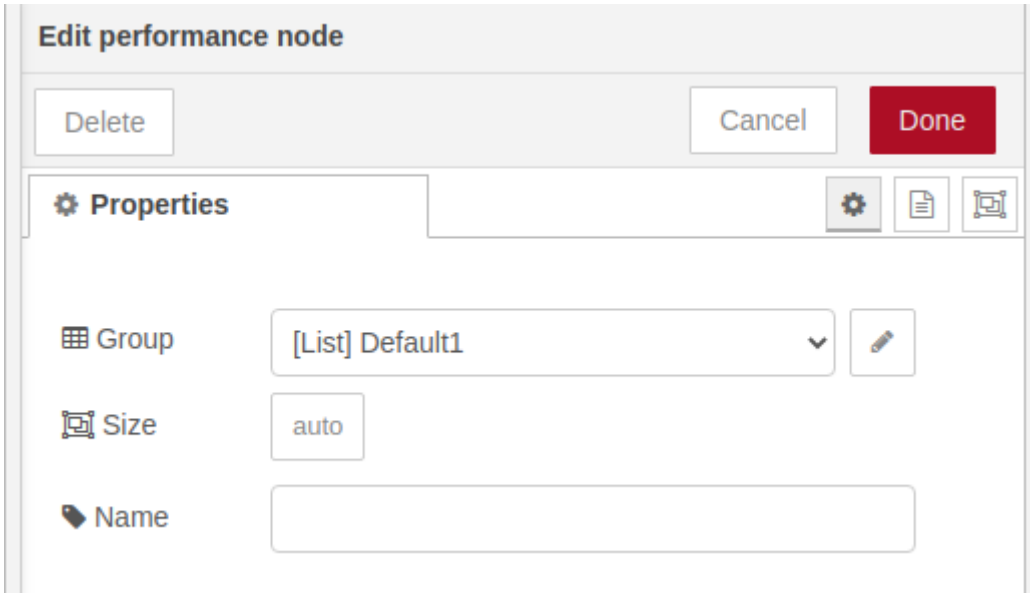
Show the following system information:

1. The temperature of edge TPUs
2. CPU usage
3. RAM usage

- Node Properties:

1. Group: Select which group on dashboard and show the widgets
2. Size：sets the basic geometry of the grid layout in pixels

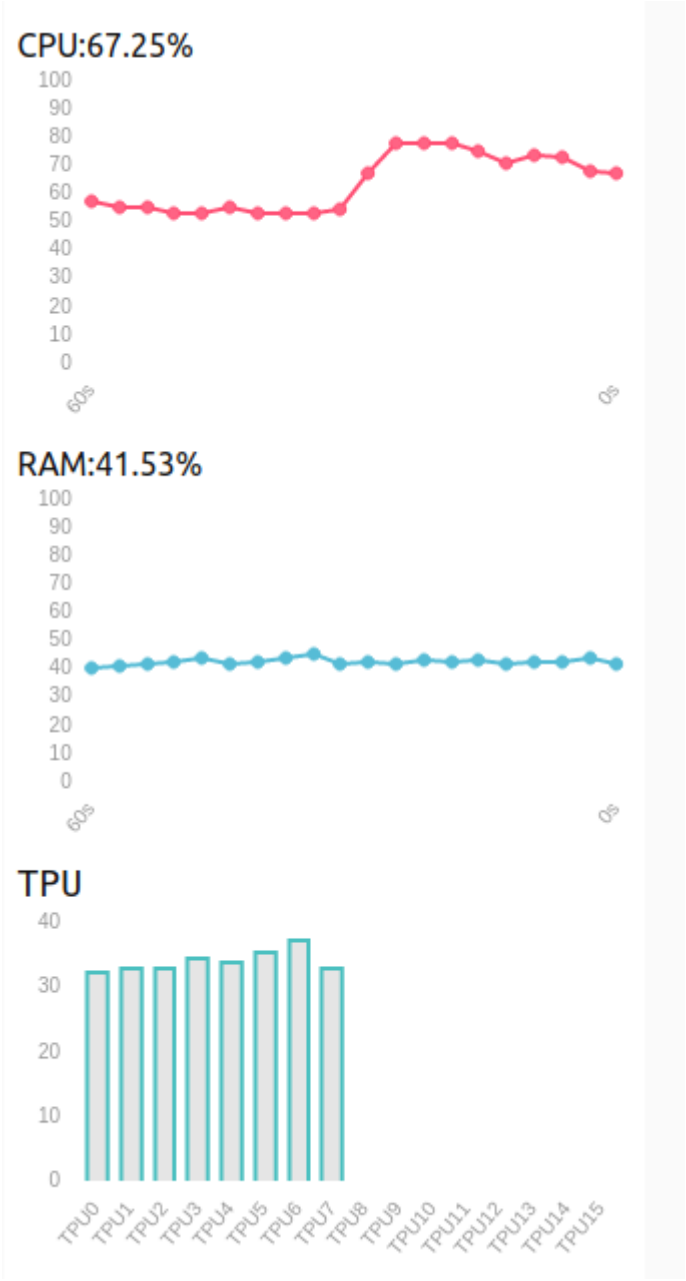
3. Name：Config and show the name on the node



- Output

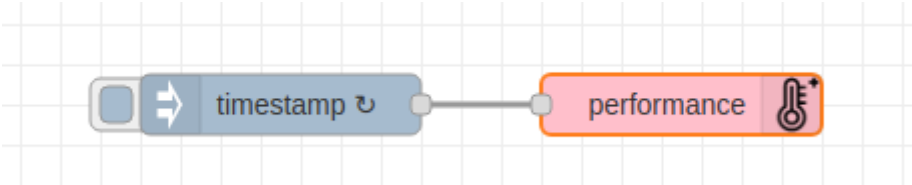
1. Default1 mapping to Group

2. The following informaion：CPU usage, RAM usage and TPU temperature



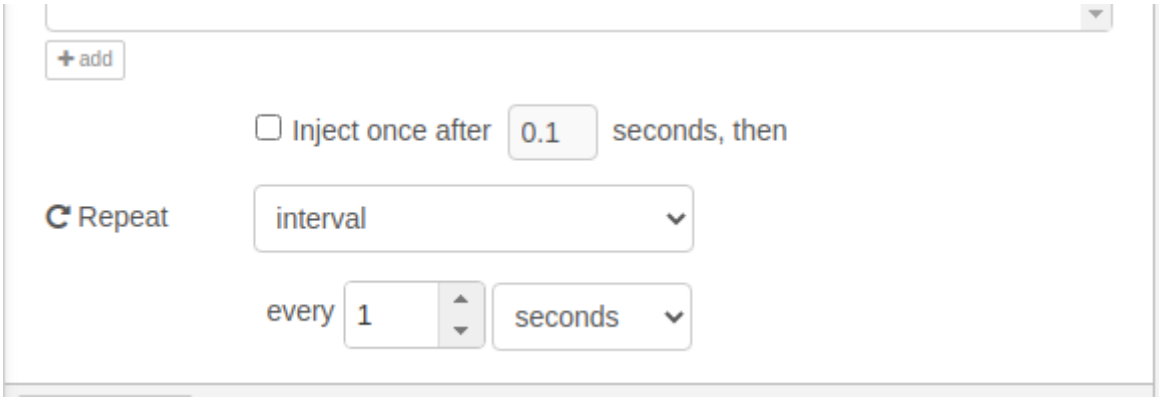
- Exmaple flow

Get a “inject node” and then connect to performance node:

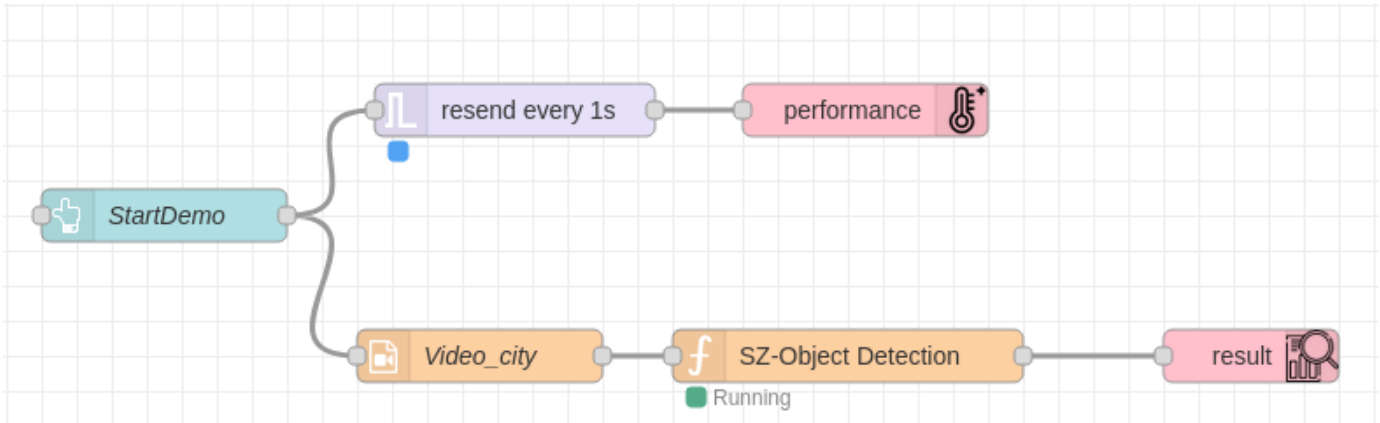


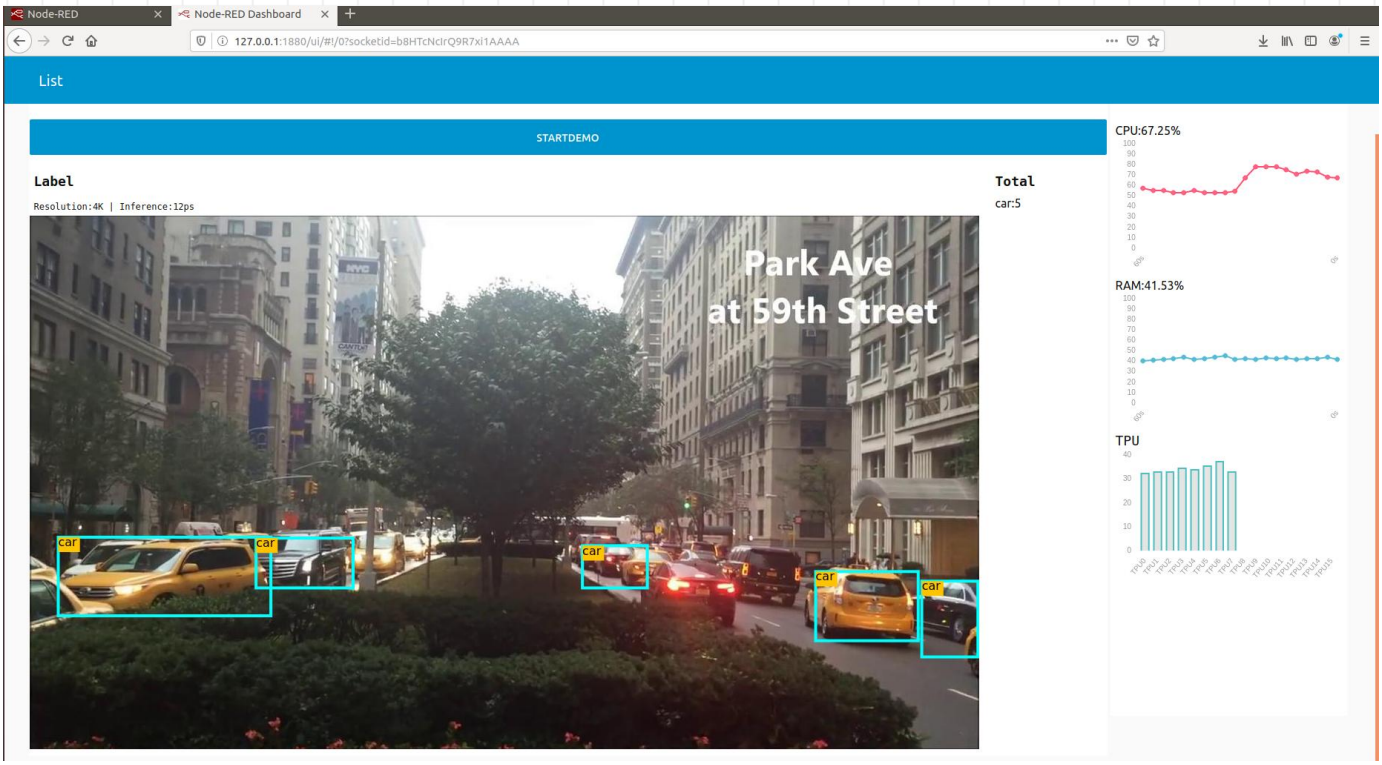
Set the “Repeat” filed of “inject node” to “interval” every 1 seconds and then the

performance node will update the result per second



node-red-contrib-edge-tpu Example Flow





```
[
    {
        "id": "b5cf4e81.1b595",
        "type": "tab",
        "label": "result flow",
        "disabled": false,
        "info": ""
    },
    {
        "id": "d7abc15d.9c02b",
        "type": "function",
        "z": "b5cf4e81.1b595",
        "name": "Video_city",
        "func": "\nmsg.payload=\"./node_modules/node-red-contrib-edge-tpu/test_data/te
        "outputs": 1,
        "noerr": 0,
        "initialize": "",
        "finalize": "",
        "x": 330,
        "y": 460,
        "wires": [
            [
                "2013f5c5.9da0ea"
            ]
        ],
        "icon": "font-awesome/fa-file-video-o"
    },
    {
        "id": "2013f5c5.9da0ea",
        "type": "SZ Object Detection",
        "z": "b5cf4e81.1b595",
        "name": "",
        "intype": "2",
        "tputype": "0",
        "tpunum": "0",
        "modelpath": "./node_modules/node-red-contrib-edge-tpu/test_data/ssd_mobilenet
        "labelpath": "./node_modules/node-red-contrib-edge-tpu/test_data/coco_labels.t
        "threshold": "0.5",
        "topk": "5",
        "keepratio": "0",
        "relativecoord": "0",
        "resample": "0",
        "outimage": true,
        "x": 540,
        "y": 460,
        "wires": [
            [
                "9f0aa671.73e948"
            ]
        ]
    },
    {
        "id": "9f0aa671.73e948",
        "type": "ui_result",
```

```
    "z": "b5cf4e81.1b595",
    "group": "cd8d5087.f050d",
    "name": "",
    "title": "Label",
    "order": 0,
    "resolution": "1",
    "width": "0",
    "height": "0",
    "x": 770,
    "y": 460,
    "wires": []
},
{
    "id": "da450bda.80ee18",
    "type": "ui_performance",
    "z": "b5cf4e81.1b595",
    "group": "79ffb604.012868",
    "name": "",
    "title": "",
    "order": 0,
    "width": 0,
    "height": 0,
    "x": 550,
    "y": 320,
    "wires": []
},
{
    "id": "776e989a.6a90f8",
    "type": "ui_button",
    "z": "b5cf4e81.1b595",
    "name": "StartDemo",
    "group": "cd8d5087.f050d",
    "order": 1,
    "width": 0,
    "height": 0,
    "passthru": false,
    "label": "StartDemo",
    "tooltip": "",
    "color": "",
    "bgcolor": "",
    "icon": "",
    "payload": "",
    "payloadType": "str",
    "topic": "",
    "x": 150,
    "y": 380,
    "wires": [
        [
            "d7abc15d.9c02b",
            "afa795d8.c51978"
        ]
    ]
},
{
    "id": "afa795d8.c51978",
```

```
        "type": "trigger",
        "z": "b5cf4e81.1b595",
        "name": "",
        "op1": "1",
        "op2": "0",
        "op1type": "str",
        "op2type": "str",
        "duration": "-1",
        "extend": false,
        "overrideDelay": false,
        "units": "s",
        "reset": "",
        "bytopic": "all",
        "topic": "topic",
        "outputs": 1,
        "x": 350,
        "y": 320,
        "wires": [
            [
                "da450bda.80ee18"
            ]
        ]
    },
    {
        "id": "cd8d5087.f050d",
        "type": "ui_group",
        "name": "Default",
        "tab": "36b75a6f.51b2c6",
        "order": 2,
        "disp": true,
        "width": "27",
        "collapse": false
    },
    {
        "id": "79ffb604.012868",
        "type": "ui_group",
        "name": "Default1",
        "tab": "36b75a6f.51b2c6",
        "order": 3,
        "disp": true,
        "width": "6",
        "collapse": false
    },
    {
        "id": "36b75a6f.51b2c6",
        "type": "ui_tab",
        "name": "List",
        "icon": "dashboard"
    }
]
```