

智慧整合感控系統概論

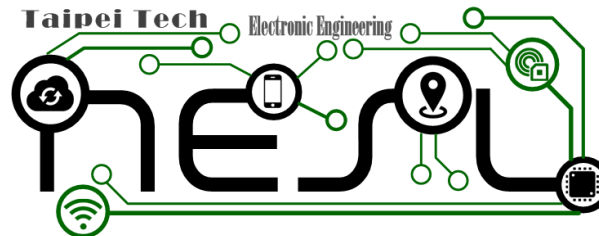
Introduction to Cyber-Physical Systems

LAB : OM2M + NodeRED

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行動寬頻尖端技術
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學習目標

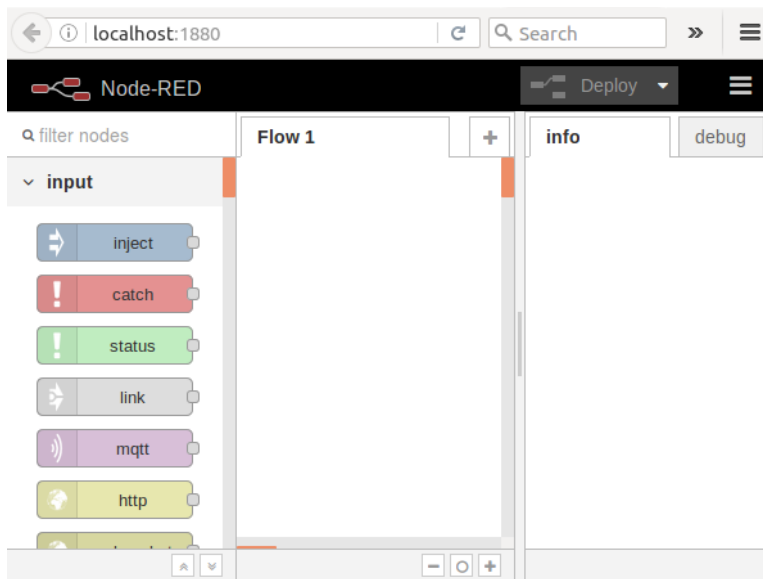
1

利用NodeRED存取OM2M

NodeRED與OM2M

❖ 本次上課的VM內已提供NodeRED中OM2M的套件

- Open a new terminal and input the command:
 - \$ sudo node-red -vv
- Use any browser to open <http://localhost:1880>

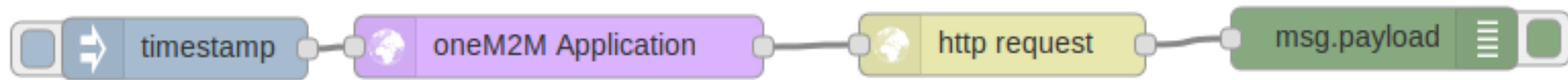


```
Welcome to Node-RED
=====
28 Jun 15:34:34 - [info] Node-RED version: v0.14.3
28 Jun 15:34:34 - [info] Node.js version: v4.2.6
28 Jun 15:34:34 - [info] Linux 4.4.0-21-generic x64 LE
28 Jun 15:34:34 - [info] Loading palette nodes
28 Jun 15:34:36 - [warn] -----
28 Jun 15:34:36 - [warn] [rpi-gpio] Info : Ignoring Raspberry Pi specific node
28 Jun 15:34:36 - [warn] -----
28 Jun 15:34:36 - [info] Settings file : /home/iotclass/.node-red/settings.js
28 Jun 15:34:36 - [info] User directory : /home/iotclass/.node-red
28 Jun 15:34:36 - [info] Flows file : /home/iotclass/.node-red/flows_iotclas
s.json
28 Jun 15:34:36 - [info] Creating new flow file
28 Jun 15:34:36 - [info] Starting flows
28 Jun 15:34:36 - [info] Started flows
28 Jun 15:34:36 - [info] Server now running at http://127.0.0.1:1880/
```

練習一：Creat a “MY_SENSOR2” Application

❖ NodeRED

- “inject” from the input library
- “oM2M ONE Application” from the function library
- “http request” from the function library
- “debug” from the output library



練習一：Creat a “MY_SENSOR2” Application

❖ NodeRED

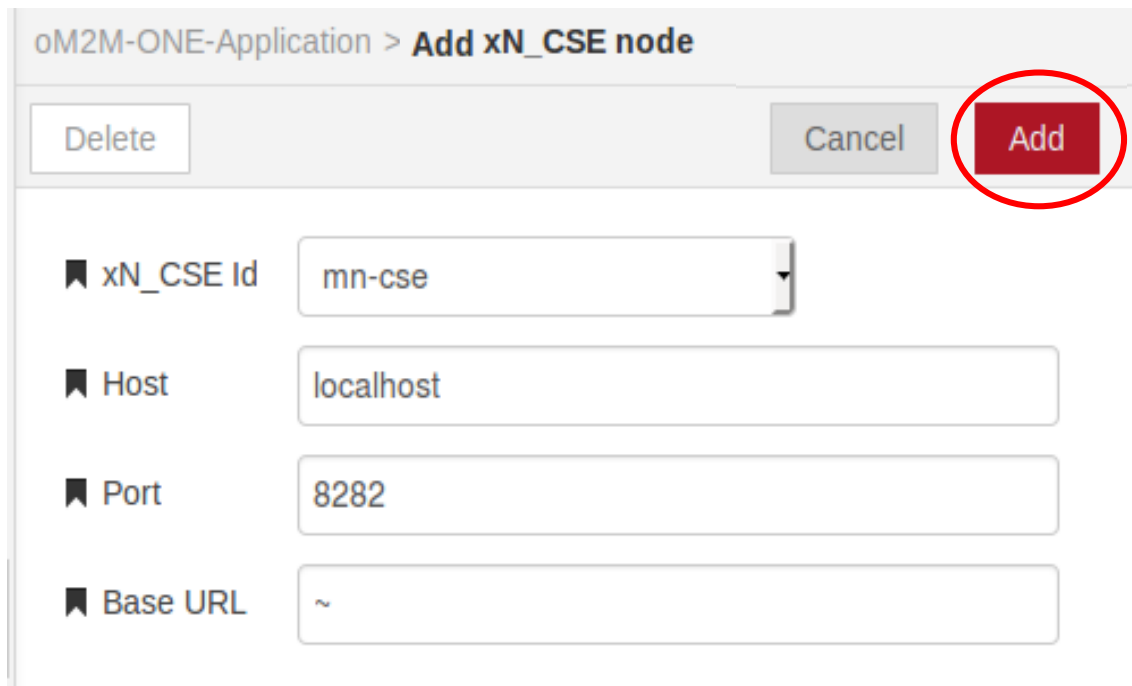
- edit xN_CSE attribute contents

The screenshot shows the NodeRED web interface. On the left, a flow contains a 'timestamp' node connected to a 'oneM2M Application' node, which is circled in red. On the right, the 'Edit oM2M-ONE-Application node' dialog box is open. It has a 'Cancel' button and a 'Done' button. The dialog lists several attributes: 'xN_CSE' with a value 'Add new xN_CSE...' and an edit icon circled in red; 'NM' with a value 'Add new NM...' and an edit icon; 'Type' with a value 'Type'; 'Category' with a value 'Category'; 'Location' with a value 'Location'; and 'Announce' with an unchecked checkbox.

練習一：Creat a “MY_SENSOR2” Application

❖ NodeRED

- “Add new xN_CSE node” according to the information shown in the picture below



oM2M-ONE-Application > Add xN_CSE node

Delete Cancel Add

■ xN_CSE Id mn-cse

■ Host localhost

■ Port 8282

■ Base URL ~

練習一：Creat a “MY_SENSOR2” Application

❖ NodeRED

- Choose “http://localhost:8282” from the xN_CSE list (You just created this item in the previous step).

Edit oM2M-ONE-Application node

Cancel Done

xN_CSE http://localhost:8282

NM Add new NM...

Type Type

Category Category

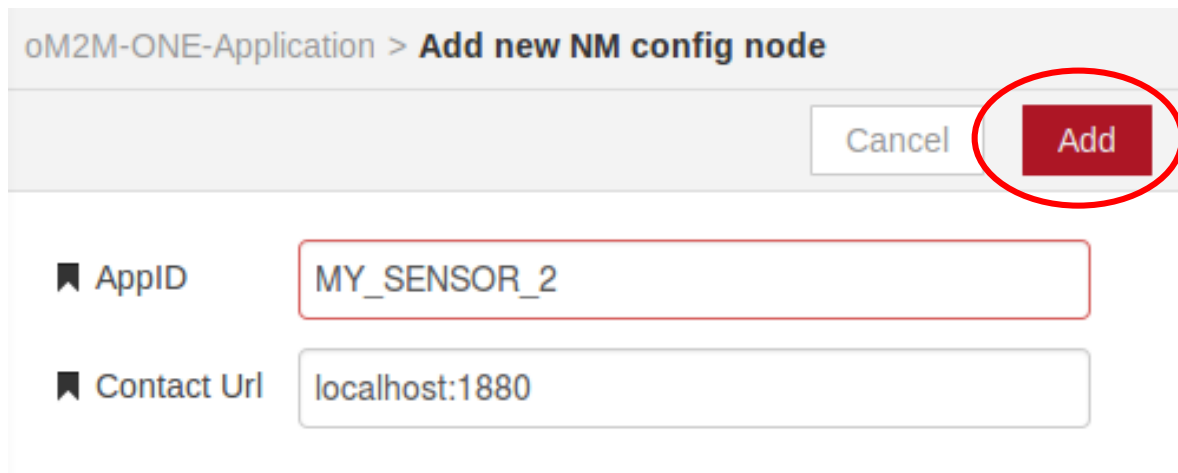
Location Location

Announce

練習一：Creat a “MY_SENSOR2” Application

❖ NodeRED

- “Add new NM config node” with the information shown in the picture below.



oM2M-ONE-Application > Add new NM config node

Cancel Add

AppID MY_SENSOR_2

Contact Url localhost:1880

練習一：Creat a “MY_SENSOR2” Application

❖ NodeRED

- Choose “MY_SENSOR_2” from the NM list
(You just created this item in the previous step).

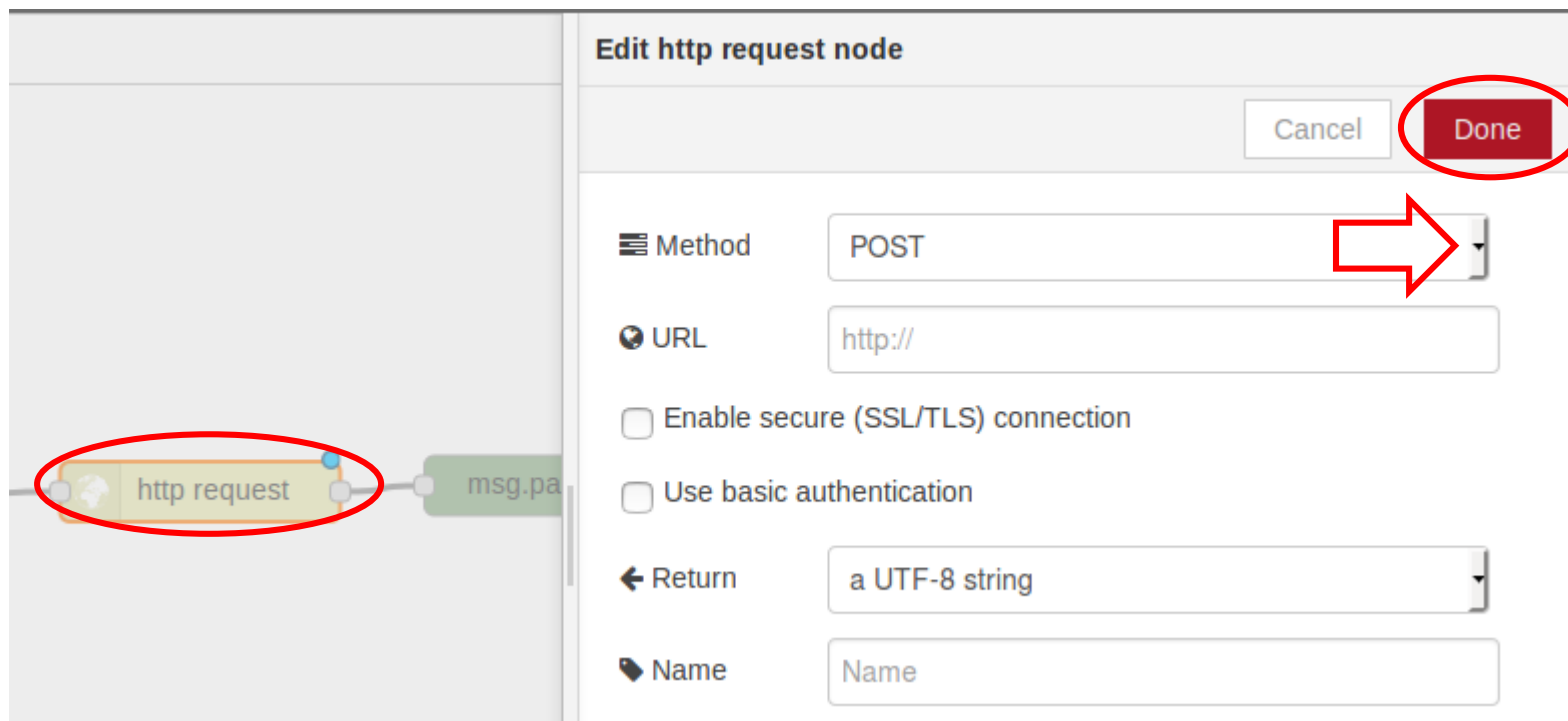
The screenshot shows the 'Edit oM2M-ONE-Application node' dialog in NodeRED. The 'NM' field is set to 'MY_SENSOR_2', which is highlighted with a red arrow. The 'Done' button is circled in red. The 'xN_CSE' field is set to 'http://localhost:8282', 'Type' is 'Demo', 'Category' is 'GatewayApplication', 'Location' is 'NCTU', and 'Announce' is checked.

Field	Value
xN_CSE	http://localhost:8282
NM	MY_SENSOR_2
Type	Demo
Category	GatewayApplication
Location	NCTU
Announce	<input checked="" type="checkbox"/>

練習一：Creat a “MY_SENSOR2” Application

❖ NodeRED

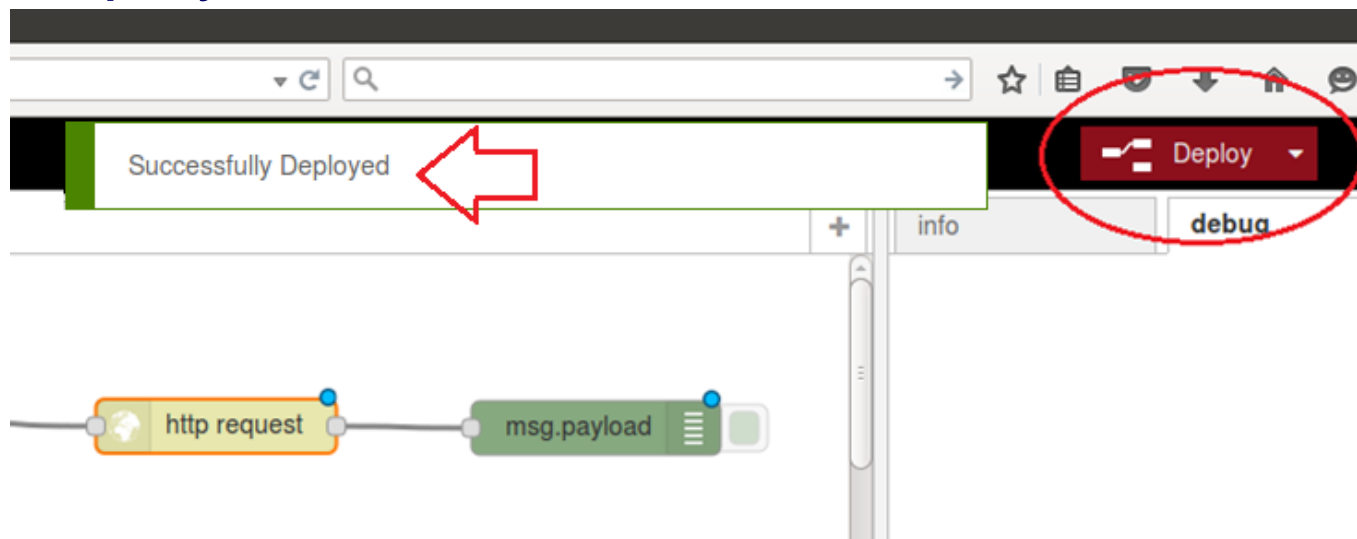
- Choose “POST” from the Method list.



練習一：Creat a “MY_SENSOR2” Application

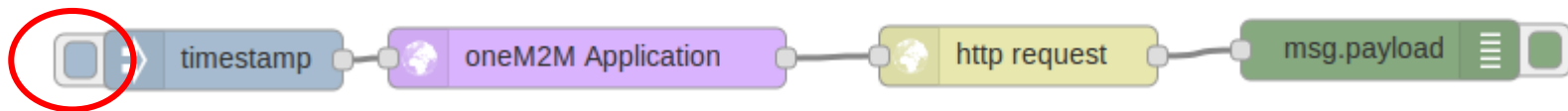
❖ NodeRED

■ Deploy & Execute



Successfully injected: timestamp

Click Here!



練習一：Creat a “MY_SENSOR2” Application

❖ Open OM2M Resource Tree Navigation Tool for MN-CSE

OM2M CSE Resource Tree

<http://127.0.0.1:8282/~mn-cse>

– mn-name

- acp_admin
- acpae-344339622
- acpae-819133182
- MY_SENSOR
- MY_SENSOR_2**
- in-name

Attribute	Value
ty	2
ri	/mn-cse/CAE819133182
pi	/mn-cse
ct	20160630T151701
lt	20160630T151701
lbl	Type/Demo Category/GatewayApplication Location/NCTU
acpi	<div>AccessControlPolicyIDs</div> <div>/mn-cse/acp-410481084</div>
et	20170630T151701
api	app-sensor
aei	CAE819133182
rr	false

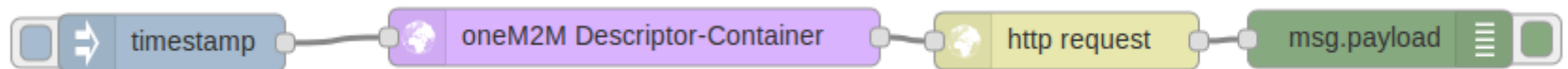
查核一：Creat a “MY_SENSOR2” Application

❖ 請利用OM2M Resource Tree Visualizer Tool顯示練習一的結果。

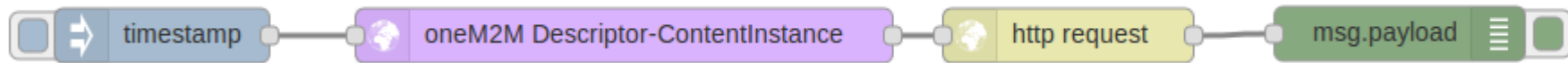
練習二：Create Container & ContentInstance

❖ NodeRED

- Repeat the steps of the previous exercise to complete these tasks.
 - Descriptor Container



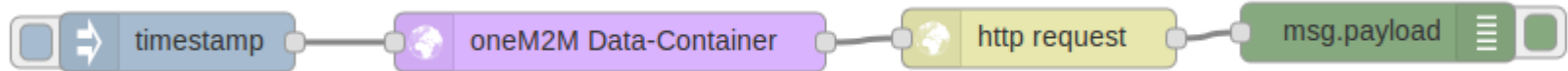
- Descriptor Content Instance



練習二：Create Container & ContentInstance

❖ NodeRED

- Repeat the steps of the previous exercise to complete these tasks.
 - Data Container



- Data Content Instance



練習二：Create Container & ContentInstance

❖ NodeRED

- Add the details about “My Data”

Edit function node

Cancel Done

Name My Data

Function

```
1 var data = {  
2   type: 'string',  
3   unit: 'test data',  
4   data: 'Hello World!'  
5 };  
6 msg.payload = JSON.stringify(data);  
7 return msg;  
8
```

My Data

Outputs 1

CODE

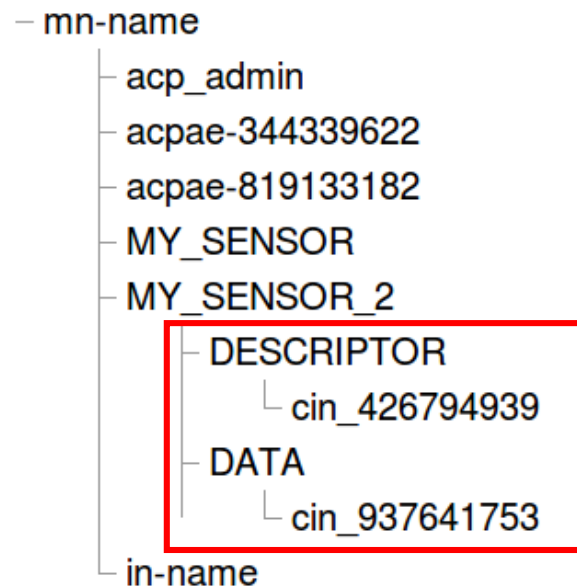
```
var data = {  
  type: 'string',  
  unit: 'test data',  
  data: 'Hello World!'  
};  
msg.payload =  
JSON.stringify(data);  
return msg;
```


練習二：Create Container & ContentInstance

❖ Open OM2M Resource Tree Navigation Tool for MN-CSE

OM2M CSE Resource Tree

<http://127.0.0.1:8282/~mn-cse/cnt-743761537>



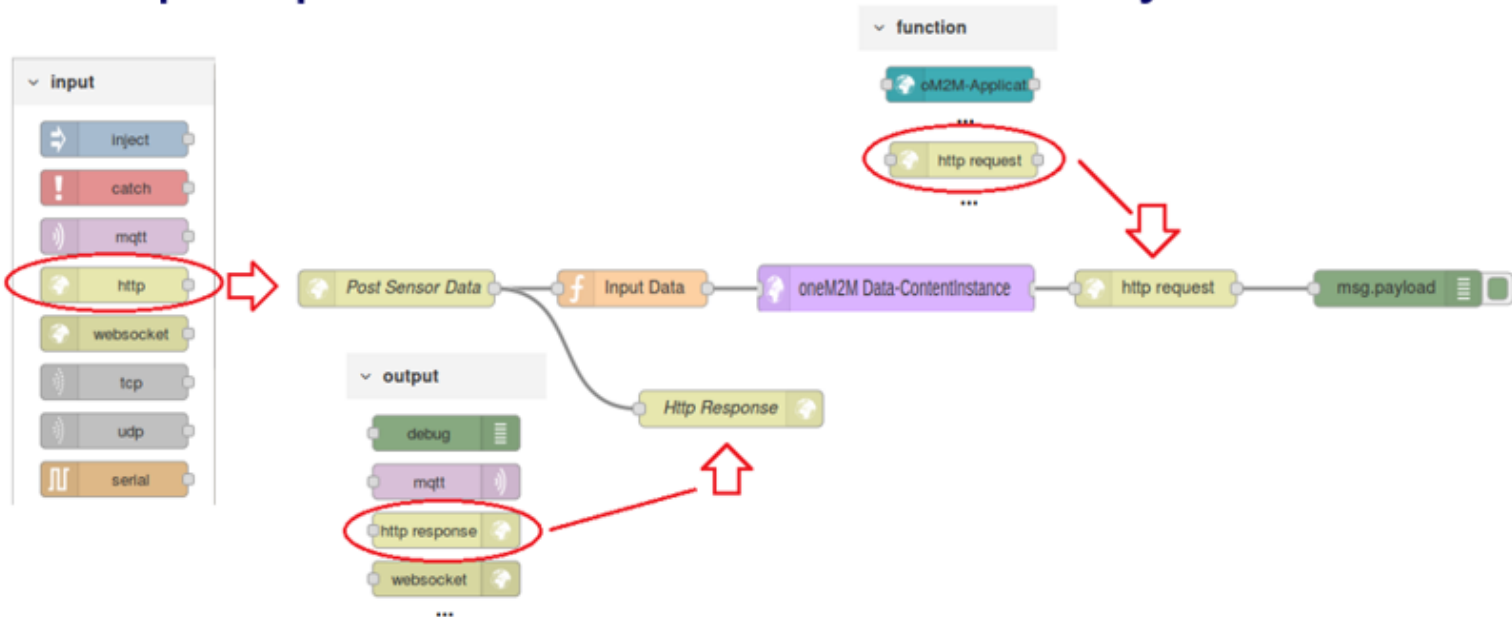
查核二：Create Container & ContentInstance

- ❖ 請利用OM2M Resource Tree Visualizer Tool顯示練習二的結果。
- ❖ PS: 以上練習等同於之前使用Postman練習產生一MY_SENSOR Application (但比較快速和簡單)

練習三：Extend with the HTTP Server

❖ NodeRED

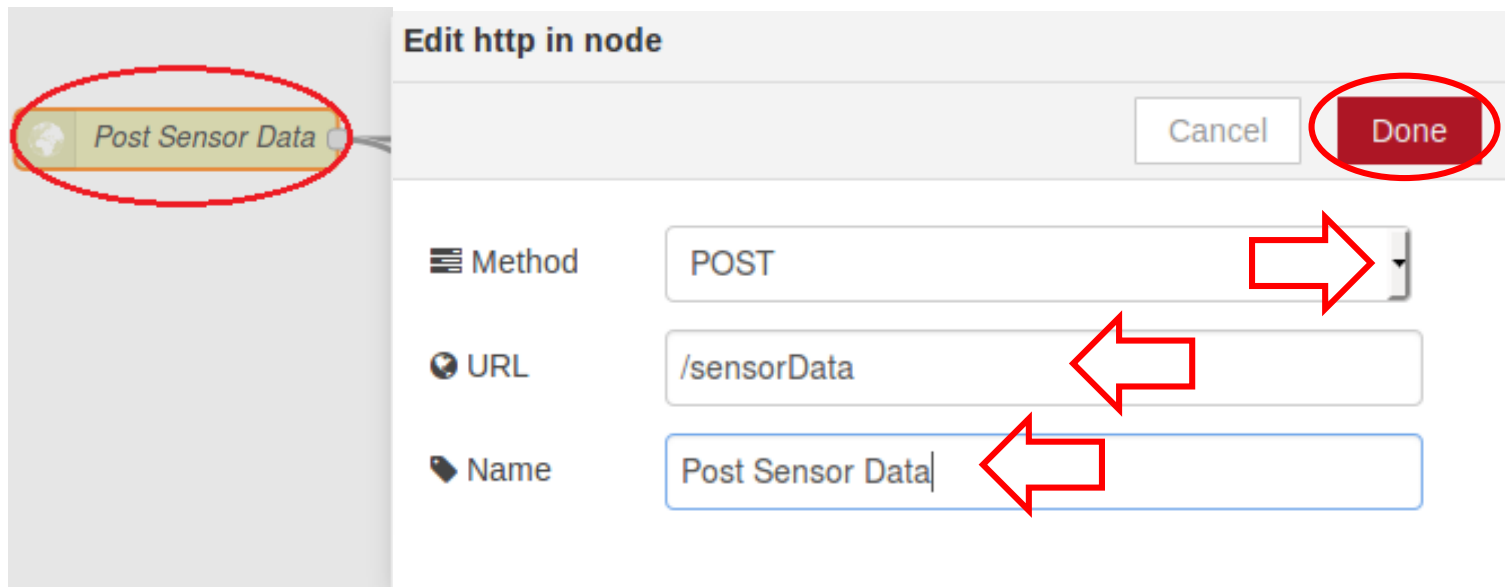
- “http” from the input library
- “http response” from the output library
- “http request” from the function library



練習三：Extend with the HTTP Server

❖ NodeRED

- Fill out the form according to the picture



The image shows a screenshot of the NodeRED interface. On the left, a node labeled 'Post Sensor Data' is circled in red. To its right is the 'Edit http in node' dialog box. The dialog has a title bar, a 'Cancel' button, and a 'Done' button (circled in red). Below the buttons, there are three fields: 'Method' set to 'POST' (with a red arrow pointing to the dropdown), 'URL' set to '/sensorData' (with a red arrow pointing to the input), and 'Name' set to 'Post Sensor Data' (with a red arrow pointing to the input).

練習三：Extend with the HTTP Server

- ❖ With this configuration, we are creating a server that listens for HTTP POST requests in the following address:

<http://localhost:1880/sensorData>.

- Remember that <http://localhost:1880> is the address of Node-RED. All other web services that we create are opened under the Node-RED address.

練習三：Extend with the HTTP Server

❖ NodeRED

- Fill out the form according to the picture.

Edit function node

Cancel Done

Name Input Data

Function

```
1 var data = {  
2   type: 'string',  
3   unit: 'fake data',  
4   data: msg.payload.name  
5 };  
6 msg.payload = JSON.stringify(data);  
7 return msg;  
8
```

Inputs: Input Data

Outputs: 1

CODE

```
var data = {  
  type: 'string',  
  unit: 'fake data',  
  data: msg.payload.name  
};  
msg.payload =  
JSON.stringify(data);  
return msg;
```

練習三：Extend with the HTTP Server

- ❖ In order to test our server, please send an HTTP POST (using Postman) to <http://localhost:1880/sensorData>.
 - You must include a JSON object similar to this example: {"name": "TYPE YOUR NAME HERE"} in the body of the request.
 - In Postman, set the data type to "application/json".
 - No need to add Authentication Information.

查核三：Extend with the HTTP Server

❖ 請利用OM2M Resource Tree Visualizer Tool顯示練習三的結果。

練習四：Subscribe to Data

❖ NodeRED

- Create a IN-AE in the IN-CSE

xN_CSE:

xN_CSE Id= in-cse,
Host = localhost,
port = 8080,

NM: AppID = MY_NETWORK_APPLICATION,
Type = NetworkApplication
Category = demo
Location = Cloud

Edit oM2M-ONE-Application node

Cancel

Done

xN_CSE

http://localhost:8080

NM

MY_NETWORK_APPLICATION

Type

NetworkApplication

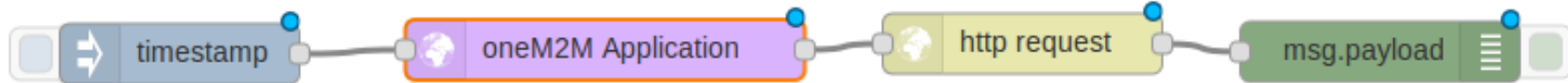
Category

Demo

Location

Cloud

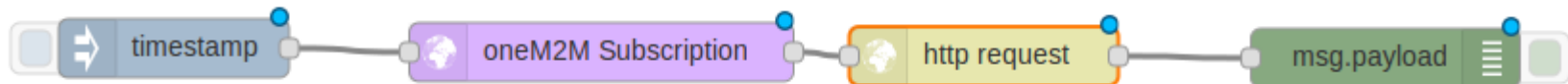
Announce



練習四：Subscribe to Data

❖ NodeRED

- Create a subscription from the IN-AE into the MN-AE



Edit oM2M-ONE-Subscription node

Cancel Done

xN_CSE http://localhost:8282

NM MY_SENSOR_2

CNT DATA

Contact Path http://localhost:1880/notification

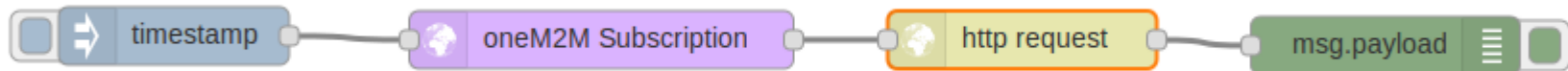
Filter Type Modified Since

Filter Criteria content

練習四：Subscribe to Data

❖ NodeRED

- Complete the “http request” object according to the picture.



Edit http request node

Cancel Done

Method POST

URL http://

☐ Enable secure (SSL/TLS) connection

☐ Use basic authentication

Return a UTF-8 string

Name Name

練習四：Subscribe to Data

❖ Open OM2M Resource Tree Navigation Tool

OM2M CSE Resource Tree

<http://127.0.0.1:8080/~in-cse/CAE23111059>

– in-name

- acp_admin
- acpae-23111059
- MY_NETWORK_APPLICATION
- mn-cse

OM2M CSE Resource Tree

<http://127.0.0.1:8282/~mn-cse/cnt-743761537>

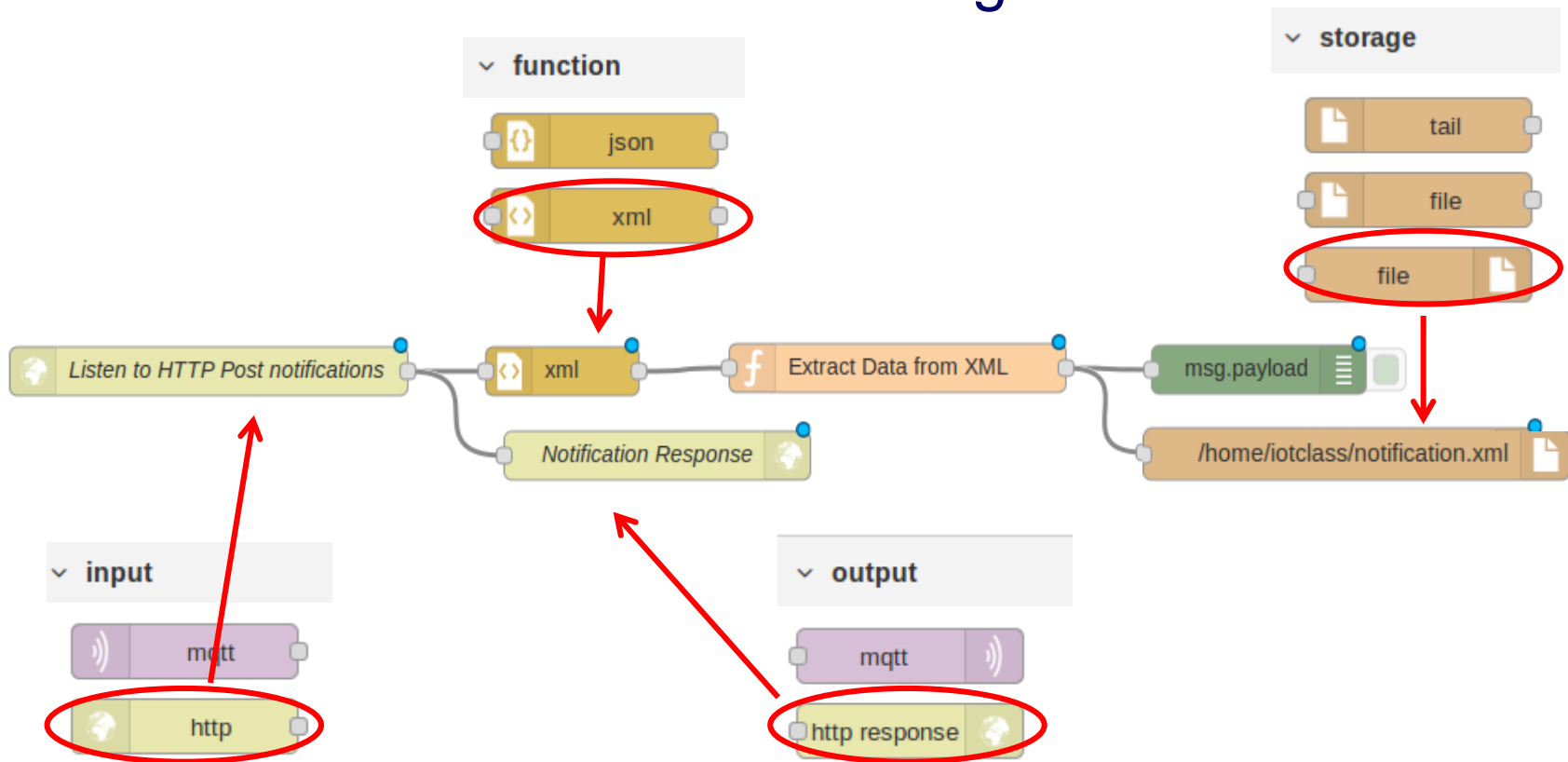
– mn-name

- acp_admin
- acpae-344339622
- acpae-819133182
- MY_SENSOR
- MY_SENSOR_2
 - DATA
 - cin_937641753
 - cin_138762453
 - SUB_DATA
 - DESCRIPTOR
- in-name

練習四：Subscribe to Data

❖ NodeRED

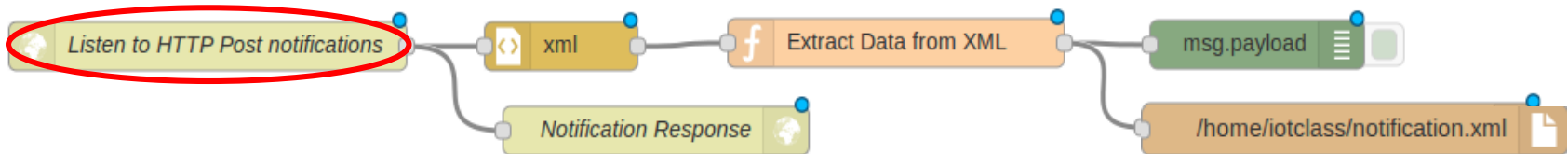
- Create a web service listening for notifications



練習四：Subscribe to Data

❖ NodeRED

- Complete its form according to the picture.



Edit http in node

Cancel Done

Method POST

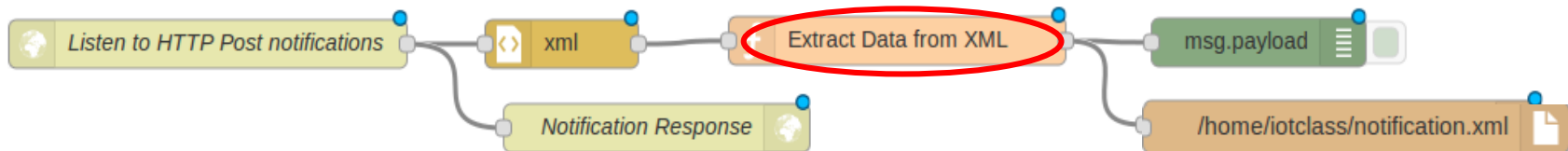
URL /notification

Name Listen to HTTP Post notifications

練習四：Subscribe to Data

❖ NodeRED

- Complete its form according to the picture.



Edit function node

Cancel

Done

Name

Extract Data from XML

Function

```
1 var notification = msg.payload['m2m:sgn'];
2 var nev = notification['nev'][0];
3 var rep = nev['rep'][0];
4 var con = rep['con'][0];
5 msg.payload = con;
6 return msg;
7
```

Outputs

1

CODE

```
var notification = msg.payload['m2m:sgn'];
var nev = notification['nev'][0];
var rep = nev['rep'][0];
var con = rep['con'][0];
msg.payload = con;
return msg;
```

練習四：Subscribe to Data

❖ NodeRED

- Complete its form according to the picture.



Edit http response node

Cancel

Done

Name

Notification Response

The messages sent to this node **must** originate from an *http input* node

Edit file node

Cancel

Done

Filename

/home/iotclass/notification.xml

Action

overwrite file

☒ Add newline (\n) to each payload?

☐ Create directory if it doesn't exist?

Name

Name

練習四：Subscribe to Data

❖ At this moment, we have created a web service which is listening to HTTP POST requests in the following address:

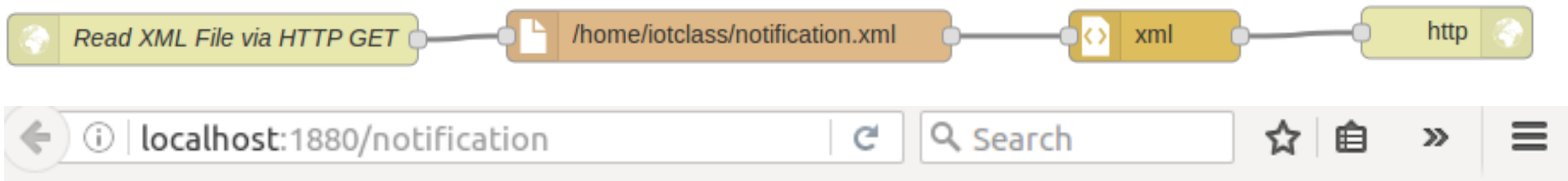
<http://localhost:1880/notification>.

- In order to insert new data to “MY_SENSOR_2” MN-AE make an HTTP POST (using Postman) to the address <http://localhost:1880/sensorData> including a JSON object similar to {“name”: “TYPE YOUR NAME HERE”}.
- No Authentication Information is needed.

練習四：Subscribe to Data

❖ NodeRED

- Extend your Network Application, creating an HTTP GET web service in order to retrieve the content of the XML file which is the result of the previous exercise.



查核四：Subscribe to Data

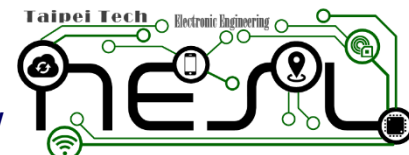
❖ 請使用網頁顯示練習四的結果。



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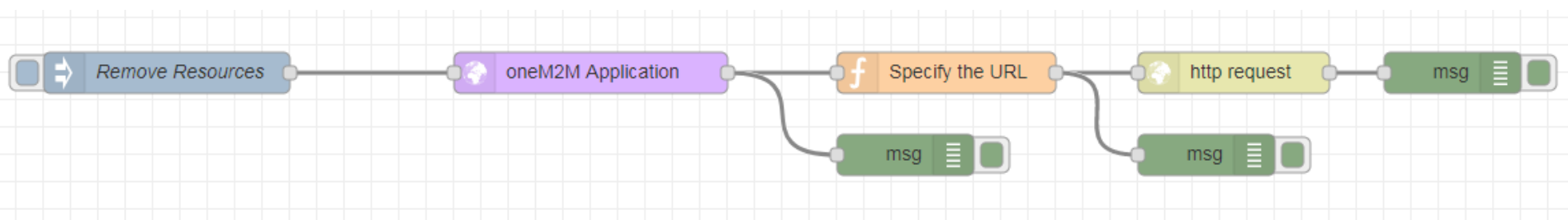
<http://www.cc.ntut.edu.tw/~chlee/>



練習五：Delete

❖ 刪除特定資源 - 指定URL

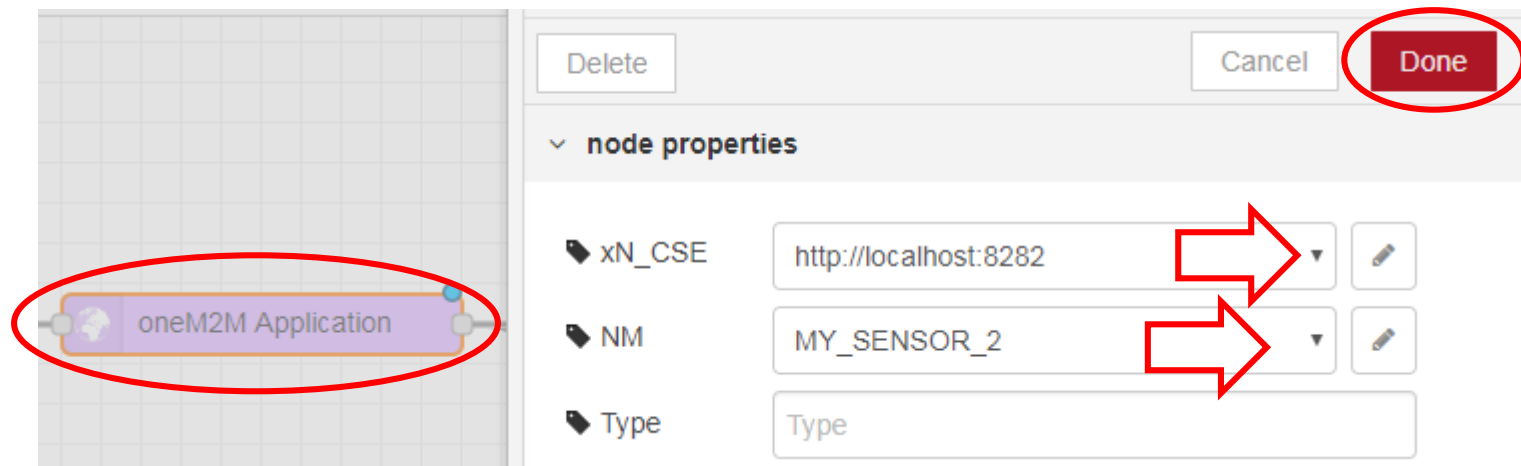
❖ NodeRED



練習五：Delete

❖ NodeRED

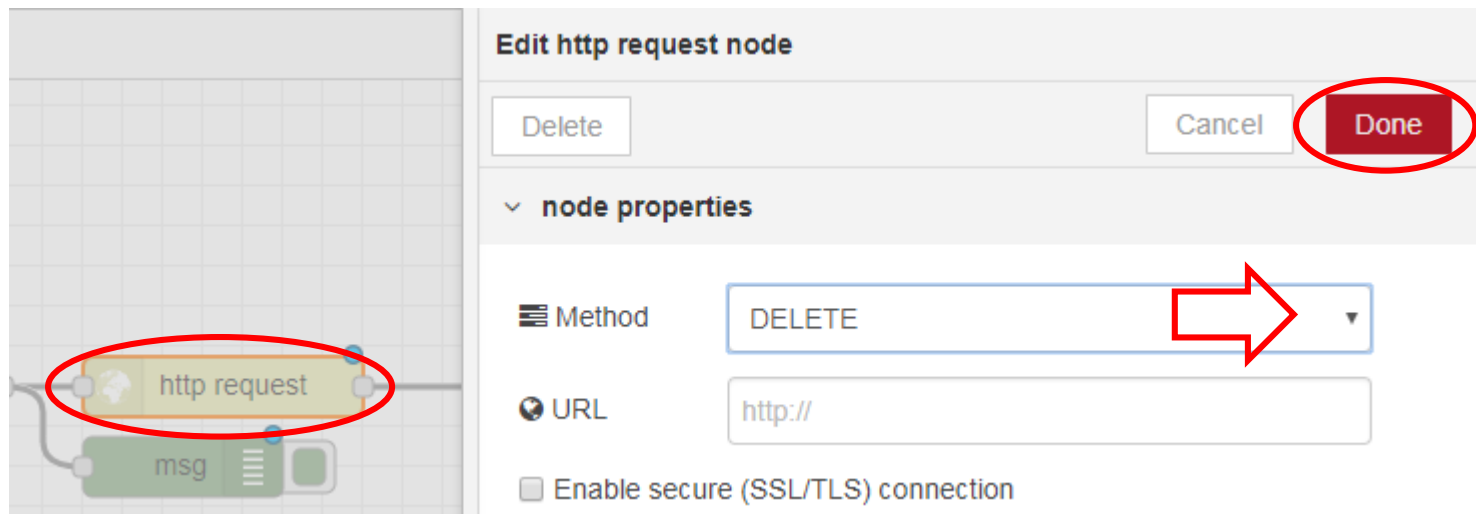
- Choose “http://localhost:8282” from the xN_CSE list
- Choose “MY_SENSOR_2” from the NM list



練習五：Delete

❖ NodeRED

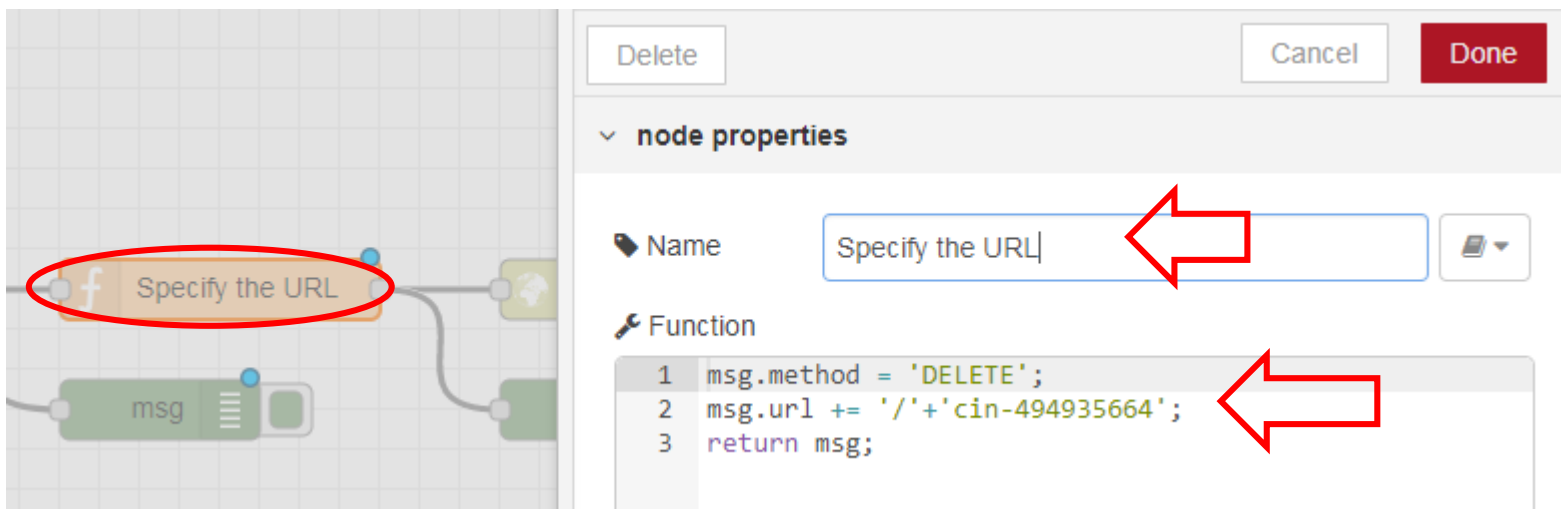
- Choose “DELETE” from the Method list.



練習五：Delete

❖ NodeRED

- Add the details about “Specify the URL”



CODE

```
msg.method = 'DELETE';  
msg.url += '/' + 資源的URN (去掉/mn-cse)';  
return msg;
```

練習五：Delete

❖ NodeRED

- Add the details about “Specify the URL”
 - 由原先的URL中判斷：
 - 如果為*/in-cse則接上”in-name”
 - 如果為*/mn-cse則接上”mn-name”

CODE

```
msg.method = 'DELETE';  
var mn_name = msg.url.match(/\\/(([/-]*)-[/]*\V?$\/);  
if(mn_name!==null && mn_name.length>=2) {  
    msg.url += '/' + mn_name[1] + '-  
name/' + msg.headers['X-M2M-NM'];  
}  
return msg;
```

Delete

node properties

Name

Specify the URL

Function

```
1 msg.method = 'DELETE';  
2 var mn_name = msg.url.match(/\\/(([/-]*)-[/]*\V?$\/);  
3 if(mn_name!==null && mn_name.length>=2) {  
4     msg.url += '/' + mn_name[1] + '-name/' + msg.headers  
5 }  
6 return msg;
```


- ❖ This LAB shows how to use NodeRED to create web applications for OM2M.
 - The OM2M plugin for NodeRED has been integrated into the provided VM.