SOMAIYA
VIDYAVIHAR UNIVERSITY
K J Somaiya Institute of Management

Department of Data Science & Technology

Certificate

Masters in Computer Applications
Trimester IV (2022 – 23)

This is to certify that Mr. /Ms. Vaibhav Kumar *Roll No.* 19 *of MCA, has satisfactorily completed the practical course "Internet of Things" prescribed by the College for the Partial fulfilment of the Degree by the Somaiya Vidyavihar University, during the academic year 2022-23.*

G. C. Gaundalkar

Signature of the Faculty-Incharge

Signature of the Programme Coordinator

6/10/2022

Date of Examination

6/10/2022

Signature of the External Examiner/s

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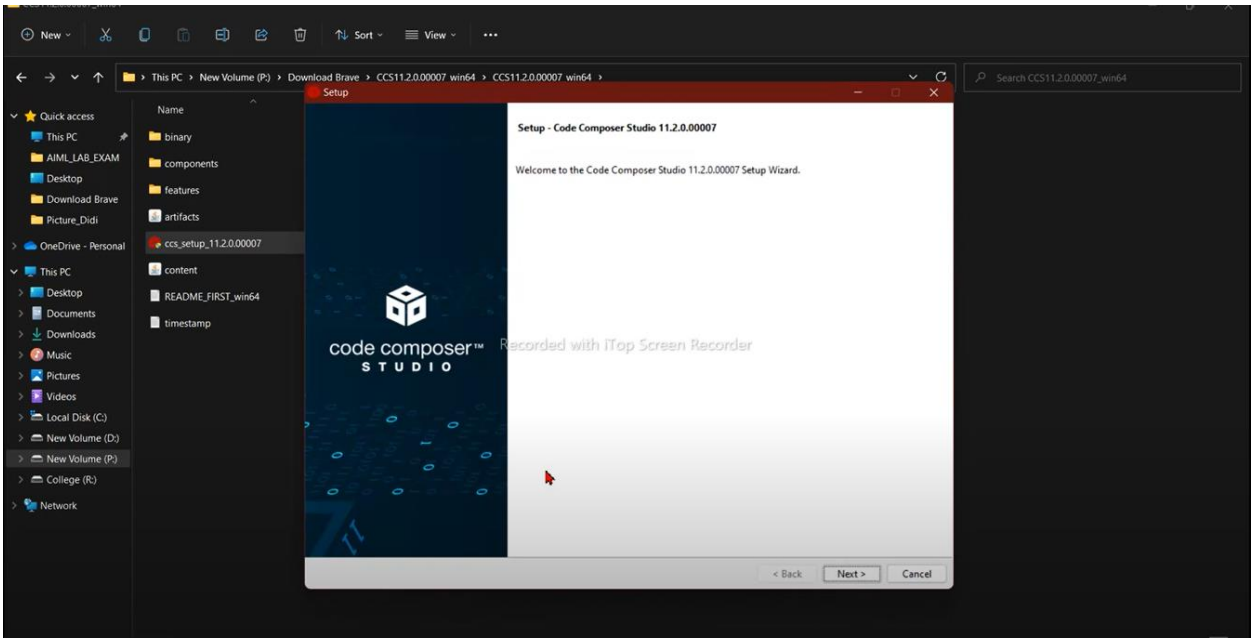
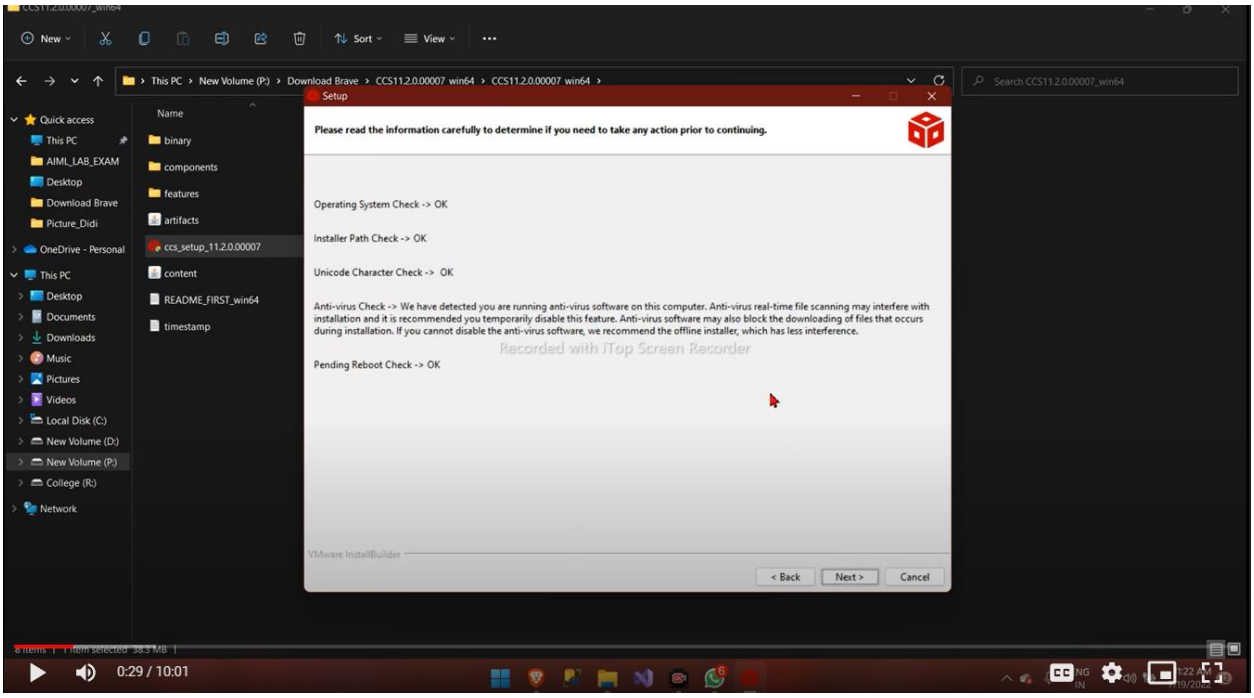
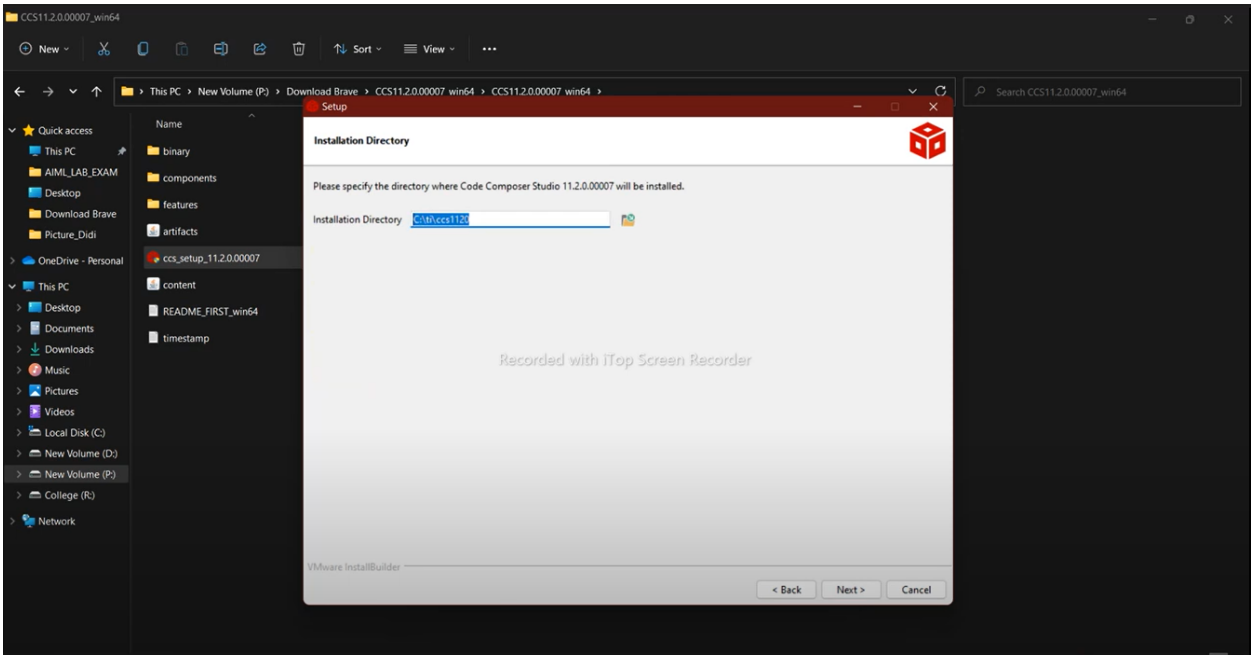
Practical 1

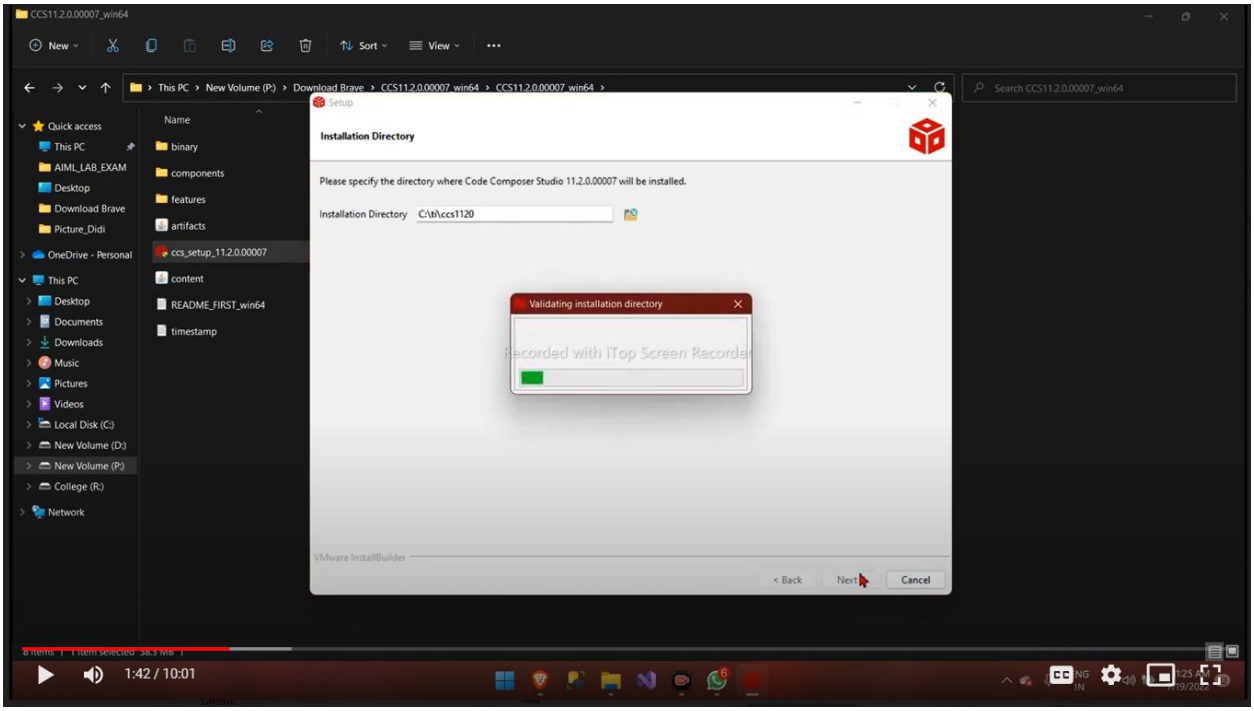
Practical Name: CCS Installation, User Interface tour, Project creation, Compiling and debugging with MSP432

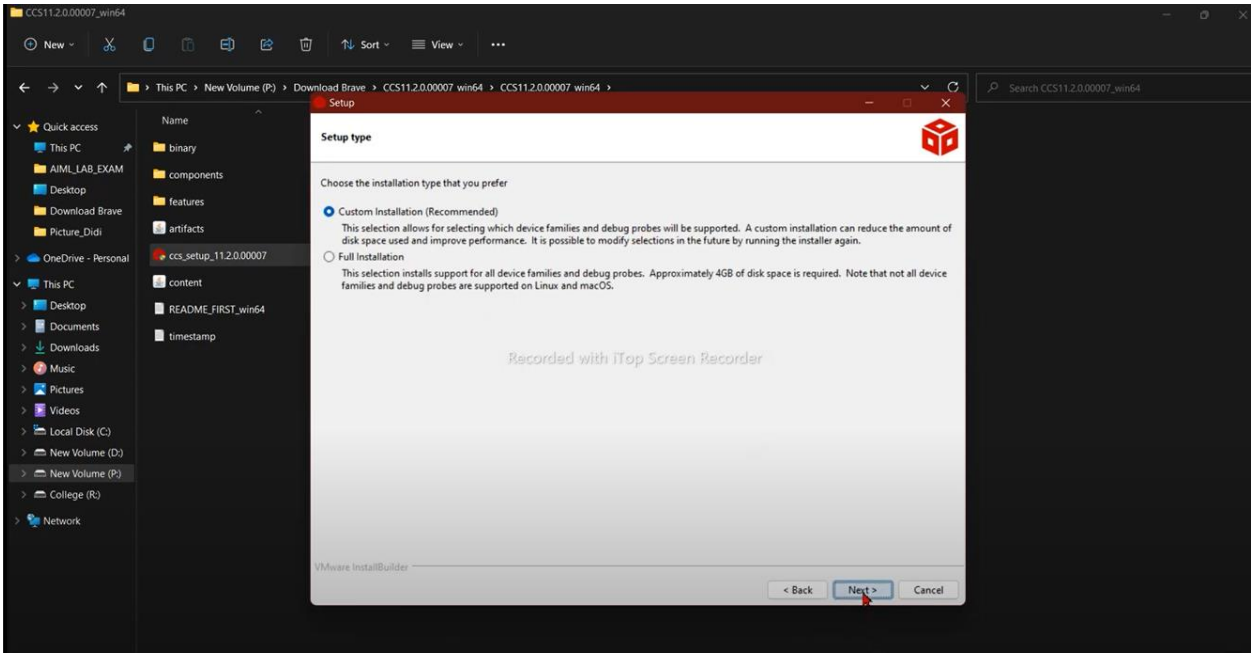
CCS INSTALLATION:

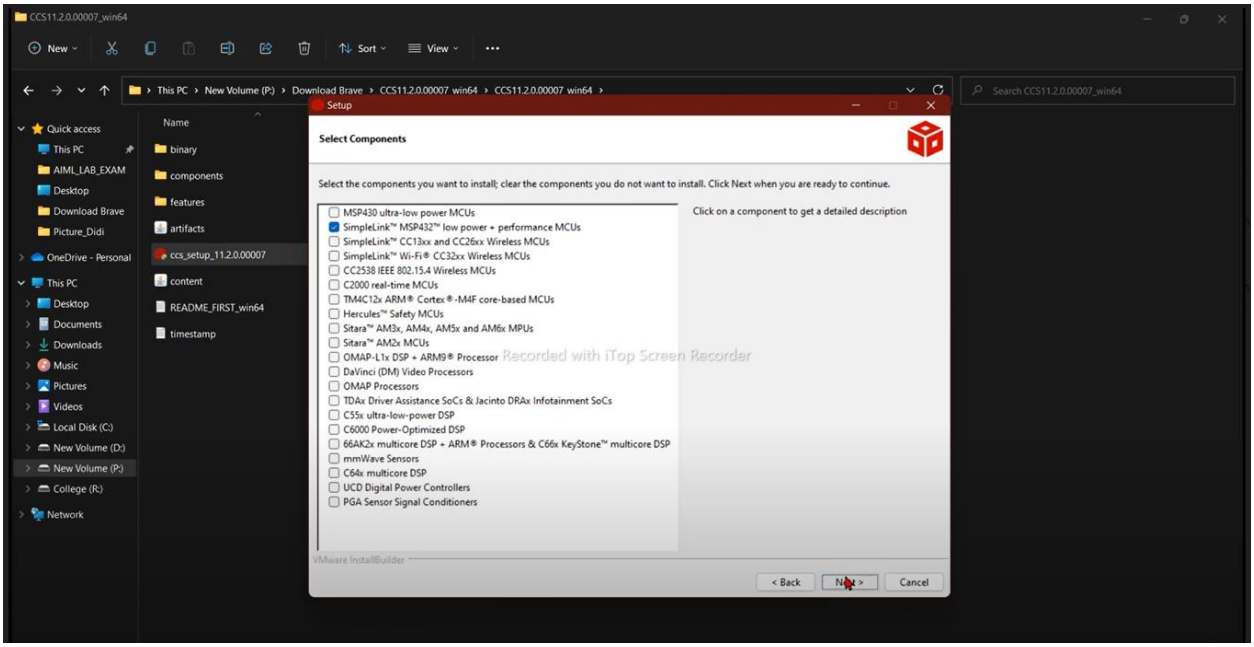


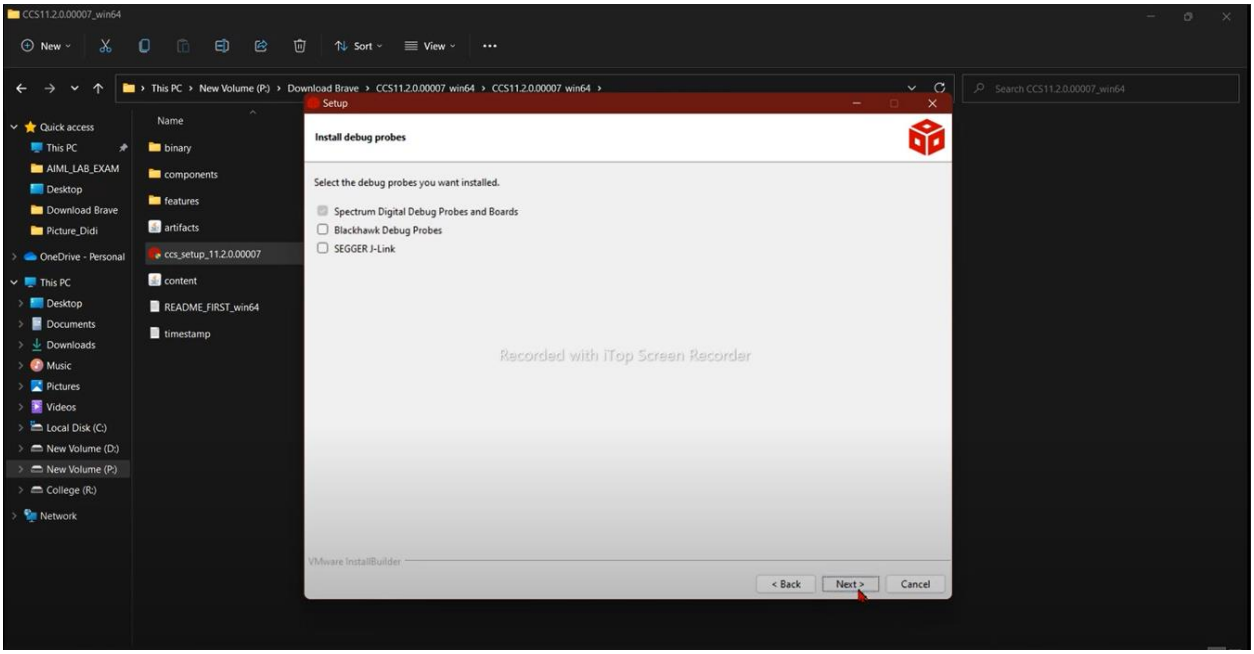

Setup
Please read the information carefully to determine if you need to take any action prior to continuing.
Operating System Check -> OK
Installer Path Check -> OK
Unicode Character Check -> OK
Anti-virus Check -> We have detected you are running anti-virus software on this computer. Anti-virus real-time file scanning may interfere with installation and it is recommended you temporarily disable this feature. Anti-virus software may also block the downloading of files that occurs during installation. If you cannot disable the anti-virus software, we recommend the offline installer, which has less interference.
Pending Reboot Check -> OK
Recorded with iTop Screen Recorder
VMware InstallBuilder
< Back
Next >
Cancel
0:29 / 10:01


Setup
Installation Directory
Please specify the directory where Code Composer Studio 11.2.0.00007 will be installed.
Installation Directory
Recorded with iTop Screen Recorder
VMware InstallBuilder
< Back
Next >
Cancel


CCS11.2.0.00007_win64
Setup
Installation Directory
Please specify the directory where Code Composer Studio 11.2.0.00007 will be installed.
Installation Directory C:\ti\ccs1120
Validating installation directory
Recorded with iTop Screen Recorder
VMware InstallBuilder
< Back
Next >
Cancel
1:42 / 10:01


CCS11.2.0.00007_win64
Setup
Setup type
Choose the installation type that you prefer
Custom Installation (Recommended)
This selection allows for selecting which device families and debug probes will be supported. A custom installation can reduce the amount of disk space used and improve performance. It is possible to modify selections in the future by running the installer again.
Full Installation
This selection installs support for all device families and debug probes. Approximately 4GB of disk space is required. Note that not all device families and debug probes are supported on Linux and macOS.
Recorded with iTop Screen Recorder
VMware InstallBuilder
< Back
Next >
Cancel


CCS11.2.0.00007_win64
New
Sort
View
This PC › New Volume (P:) › Download Brave › CCS11.2.0.00007 win64 › CCS11.2.0.00007 win64 ›
Search CCS11.2.0.00007_win64
Quick access
This PC
AIML_LAB_EXAM
Desktop
Download Brave
Picture_Didi
OneDrive - Personal
This PC
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
New Volume (D:)
New Volume (P:)
College (R:)
Network
Name
binary
components
features
artifacts
ccs_setup_11.2.0.00007
content
README_FIRST_win64
timestamp
Setup
Select Components
Select the components you want to install; clear the components you do not want to install. Click Next when you are ready to continue.
MSP430 ultra-low power MCUs
SimpleLink™ MSP432™ low power + performance MCUs
SimpleLink™ CC13xx and CC26xx Wireless MCUs
SimpleLink™ Wi-Fi® CC32xx Wireless MCUs
CC2538 IEEE 802.15.4 Wireless MCUs
C2000 real-time MCUs
TM4C12x ARM® Cortex®-M4F core-based MCUs
Hercules™ Safety MCUs
Sitara™ AM3x, AM4x, AM5x and AM6x MPUs
Sitara™ AM2x MCUs
OMAP-L1x DSP + ARM9® Processor
DaVinci (DM) Video Processors
OMAP Processors
TDAx Driver Assistance SoCs & Jacinto DRAx Infotainment SoCs
C55x ultra-low-power DSP
C6000 Power-Optimized DSP
66AK2x multicore DSP + ARM® Processors & C66x KeyStone™ multicore DSP
mmWave Sensors
C64x multicore DSP
UCD Digital Power Controllers
PGA Sensor Signal Conditioners
Click on a component to get a detailed description
Recorded with iTop Screen Recorder
VMware InstallBuilder
< Back
Next >
Cancel


CCS11.2.0.00007_win64
New
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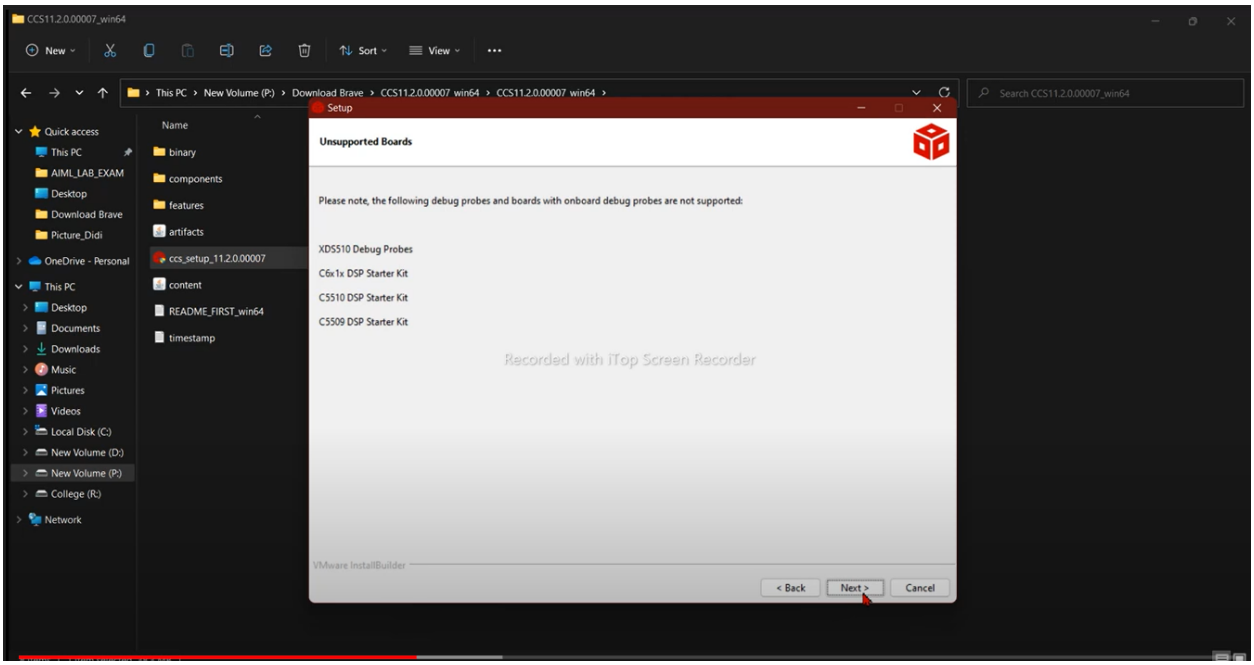
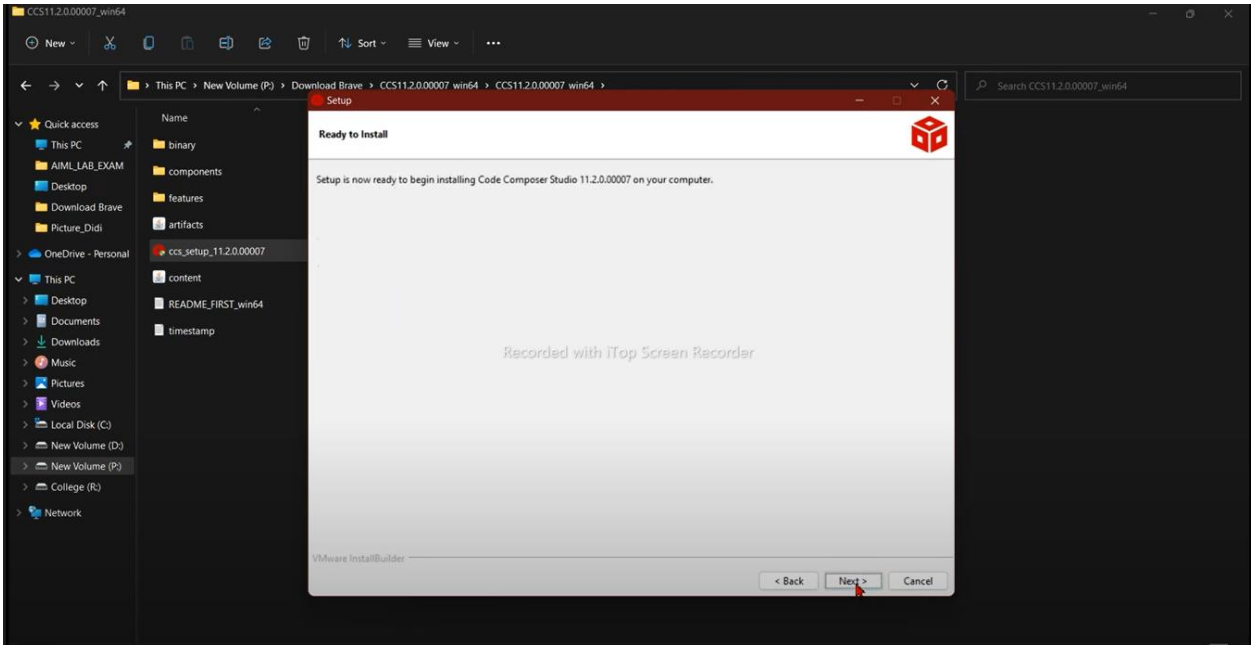
View
This PC › New Volume (P:) › Download Brave › CCS11.2.0.00007 win64 › CCS11.2.0.00007 win64 ›
Search CCS11.2.0.00007_win64
Quick access
This PC
AIML_LAB_EXAM
Desktop
Download Brave
Picture_Didi
OneDrive - Personal
This PC
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
New Volume (D:)
New Volume (P:)
College (R:)
Network
Name
binary
components
features
artifacts
ccs_setup_11.2.0.00007
content
README_FIRST_win64
timestamp
Setup
Install debug probes
Select the debug probes you want installed.
Spectrum Digital Debug Probes and Boards
Blackhawk Debug Probes
SEGGER J-Link
Recorded with iTop Screen Recorder
VMware InstallBuilder
< Back
Next >
Cancel


CCS11.2.0.00007_win64
New
Sort
View
This PC › New Volume (P:) › Download Brave › CCS11.2.0.00007 win64 › CCS11.2.0.00007 win64 ›
Search CCS11.2.0.00007_win64
Quick access
This PC
AIML_LAB_EXAM
Desktop
Download Brave
Picture_Didi
OneDrive - Personal
This PC
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
New Volume (D:)
New Volume (P:)
College (R:)
Network
Name
binary
components
features
artifacts
ccs_setup_11.2.0.00007
content
README_FIRST_win64
timestamp
Setup
Unsupported Boards
Please note, the following debug probes and boards with onboard debug probes are not supported:
XDS510 Debug Probes
C6x1x DSP Starter Kit
C5510 DSP Starter Kit
C5509 DSP Starter Kit
Recorded with iTop Screen Recorder
VMware InstallBuilder
< Back
Next >
Cancel


CCS11.2.0.00007_win64
New
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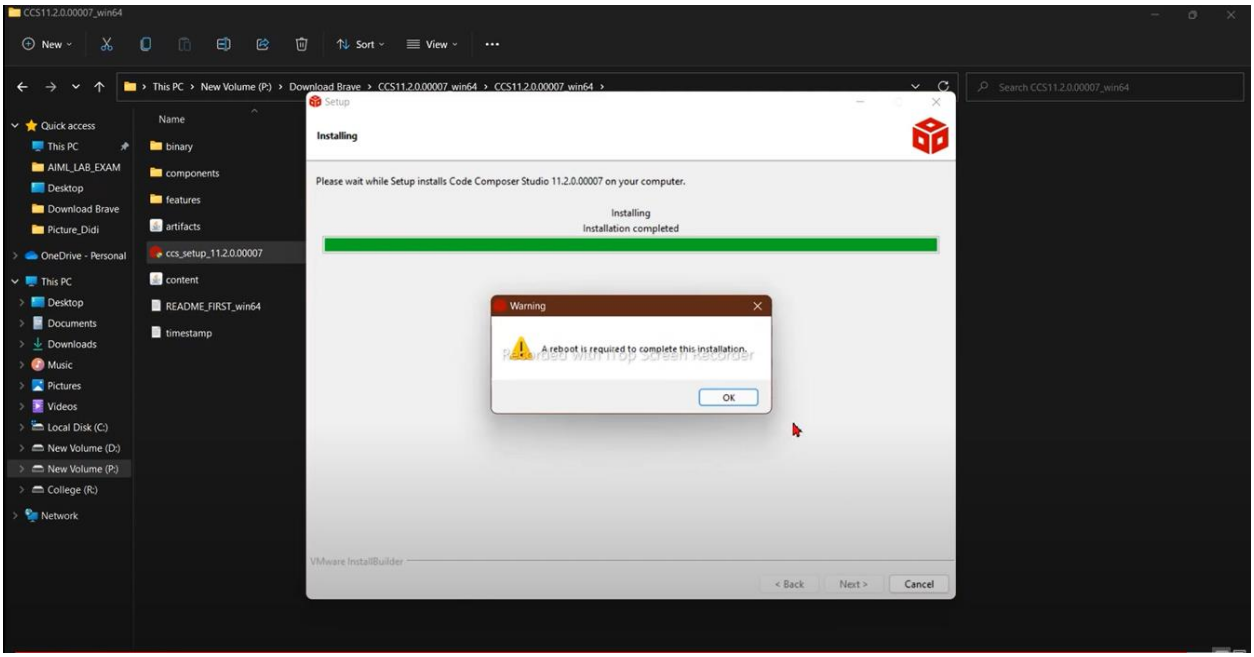
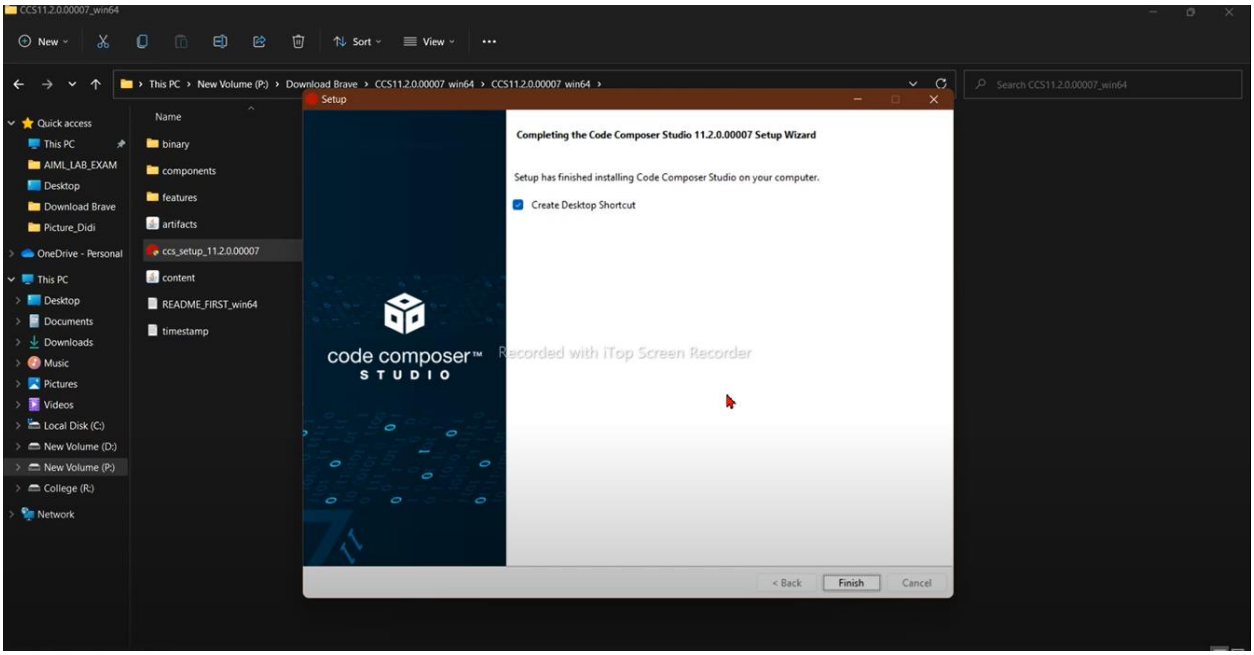
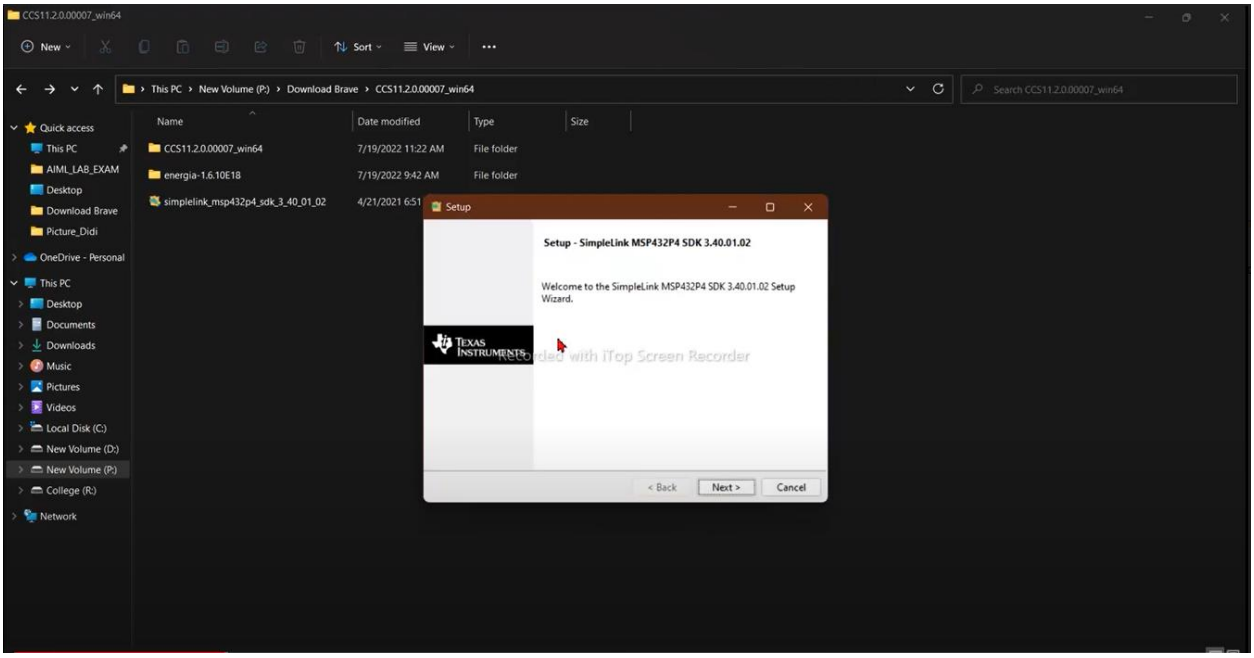
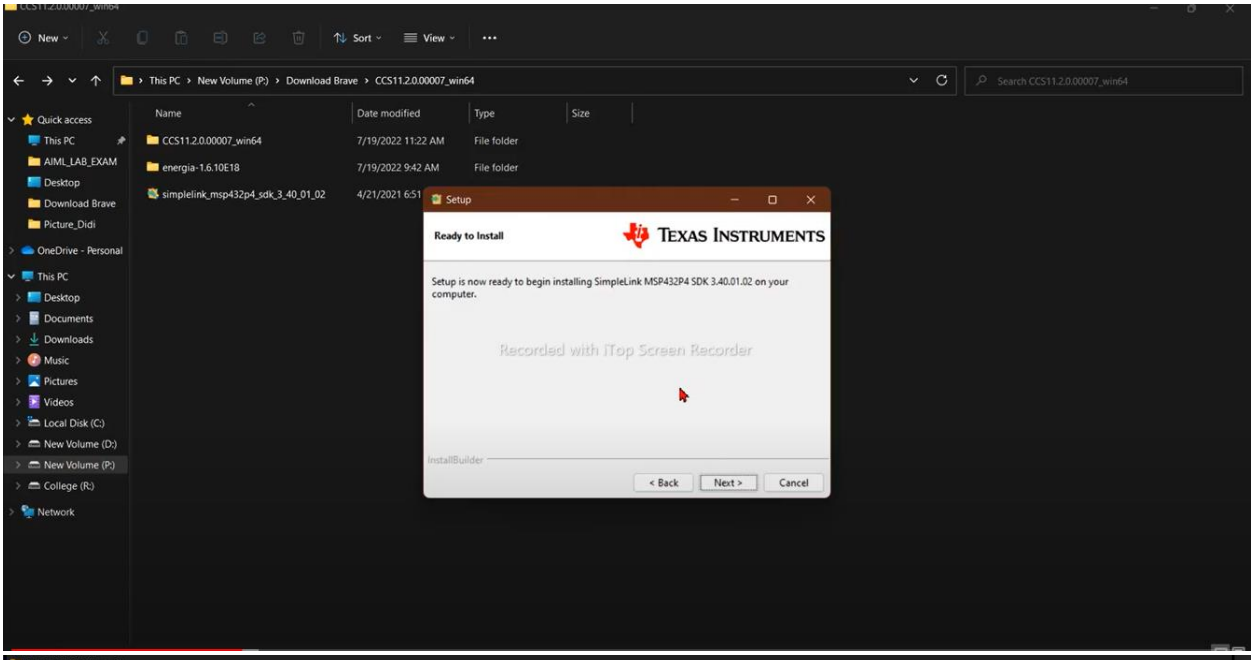
This PC › New Volume (P:) › Download Brave › CCS11.2.0.00007 win64 › CCS11.2.0.00007 win64 ›
Search CCS11.2.0.00007_win64
Quick access
This PC
AIML_LAB_EXAM
Desktop
Download Brave
Picture_Didi
OneDrive - Personal
This PC
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
New Volume (D:)
New Volume (P:)
College (R:)
Network
Name
binary
components
features
artifacts
ccs_setup_11.2.0.00007
content
README_FIRST_win64
timestamp
Setup
Ready to Install
Setup is now ready to begin installing Code Composer Studio 11.2.0.00007 on your computer.
Recorded with iTop Screen Recorder
VMware InstallBuilder
< Back
Next >
Cancel


Setup
Installing
Please wait while Setup installs Code Composer Studio 11.2.0.00007 on your computer.
Installing
Installation completed
Warning
A reboot is required to complete this installation.
OK
VMware InstallBuilder
< Back
Next >
Cancel


Setup
Completing the Code Composer Studio 11.2.0.00007 Setup Wizard
Setup has finished installing Code Composer Studio on your computer.
Create Desktop Shortcut
code composer™ STUDIO
Recorded with iTop Screen Recorder
< Back
Finish
Cancel

MSP432 SDK INSTALLATION




New
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This PC › New Volume (P:) › Download Brave › CCS11.2.0.00007_win64
Search CCS11.2.0.00007_win64
Quick access
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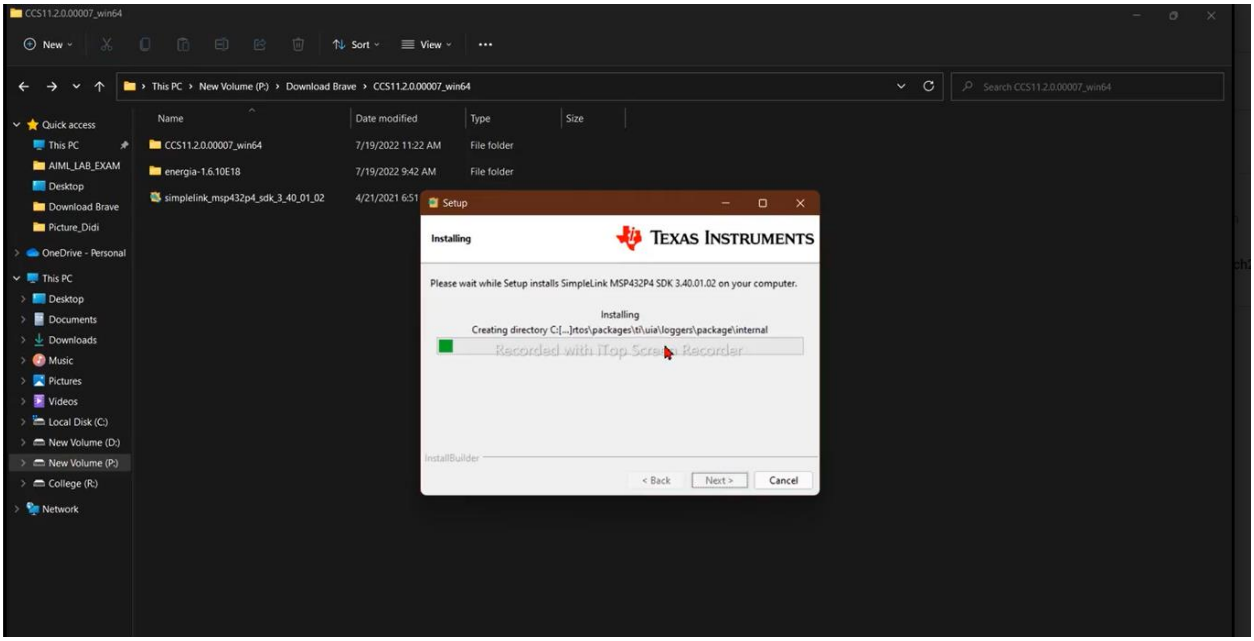
AIML_LAB_EXAM
Desktop
Download Brave
Picture_Didi
OneDrive - Personal
This PC
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
New Volume (D:)
New Volume (P:)
College (R:)
Network
Name
Date modified
Type
Size
CCS11.2.0.00007_win64
7/19/2022 11:22 AM
File folder
energia-1.6.10E18
7/19/2022 9:42 AM
File folder
simplelink_msp432p4_sdk_3_40_01_02
4/21/2021 6:51
Setup
Ready to Install
TEXAS INSTRUMENTS
Setup is now ready to begin installing SimpleLink MSP432P4 SDK 3.40.01.02 on your computer.
Recorded with iTop Screen Recorder
InstallBuilder
< Back
Next >
Cancel


New
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This PC › New Volume (P:) › Download Brave › CCS11.2.0.00007_win64
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Quick access
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Desktop
Download Brave
Picture_Didi
OneDrive - Personal
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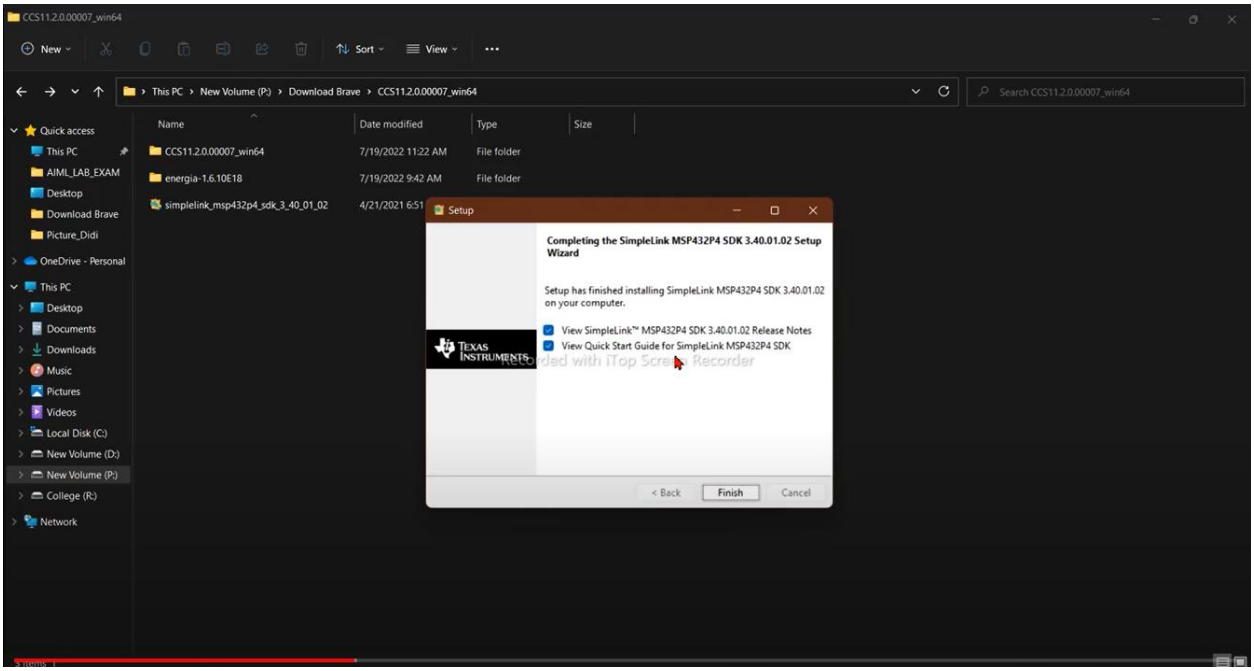
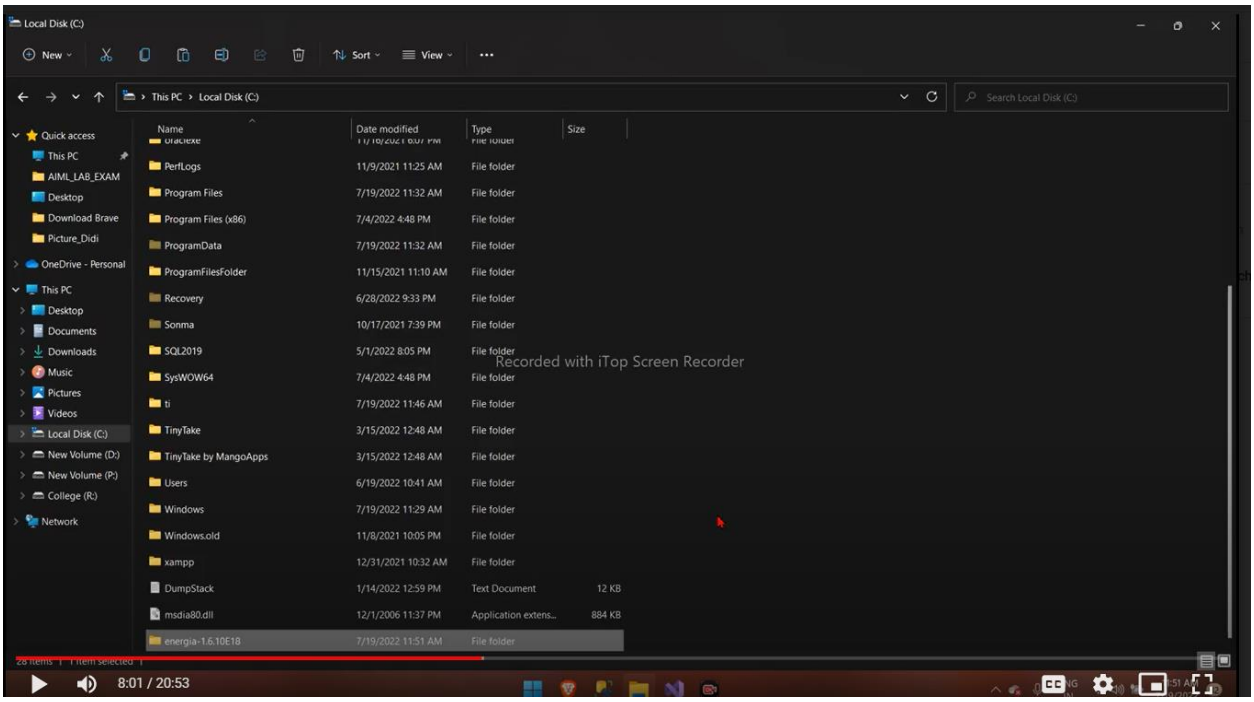
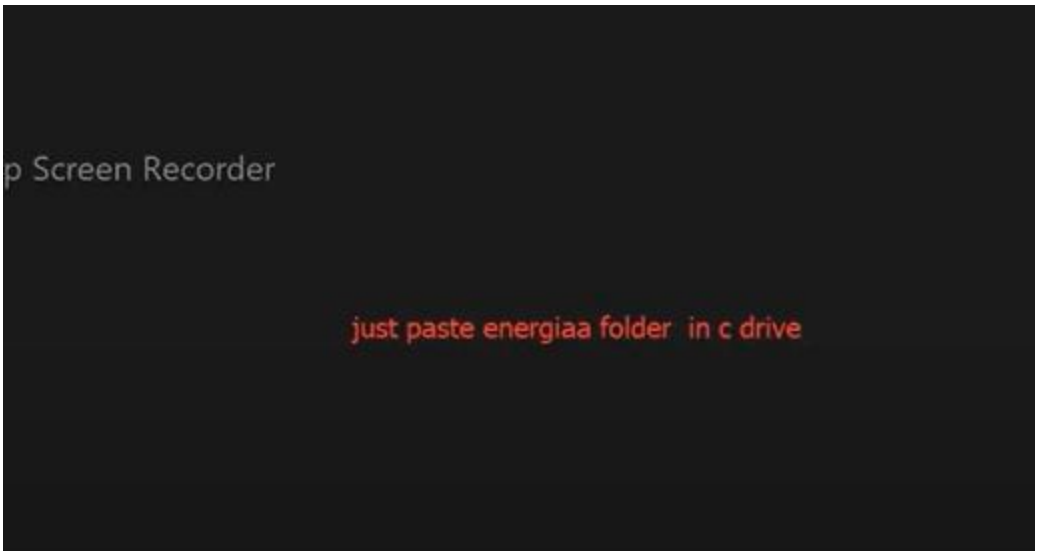
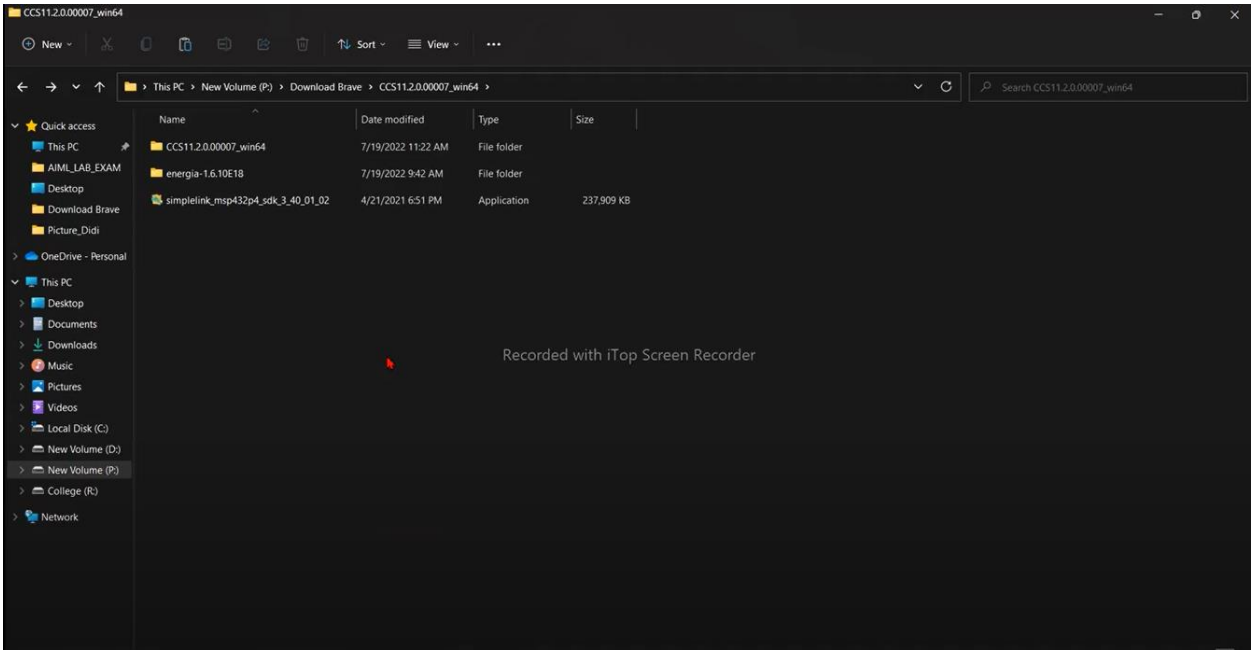
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
New Volume (D:)
New Volume (P:)
College (R:)
Network
Name
Date modified
Type
Size
CCS11.2.0.00007_win64
7/19/2022 11:22 AM
File folder
energia-1.6.10E18
7/19/2022 9:42 AM
File folder
simplelink_msp432p4_sdk_3_40_01_02
4/21/2021 6:51
Setup
Installing
TEXAS INSTRUMENTS
Please wait while Setup installs SimpleLink MSP432P4 SDK 3.40.01.02 on your computer.
Installing
Creating directory C:[...]rtos\packages\ti\uia\loggers\package\internal
Recorded with iTop Screen Recorder
InstallBuilder
< Back
Next >
Cancel



ENERGIA INSTALLATION WITH BOARD MANAGER DETAILS:




p Screen Recorder
just paste energiaa folder in c drive


CCS11.2.0.00007_win64
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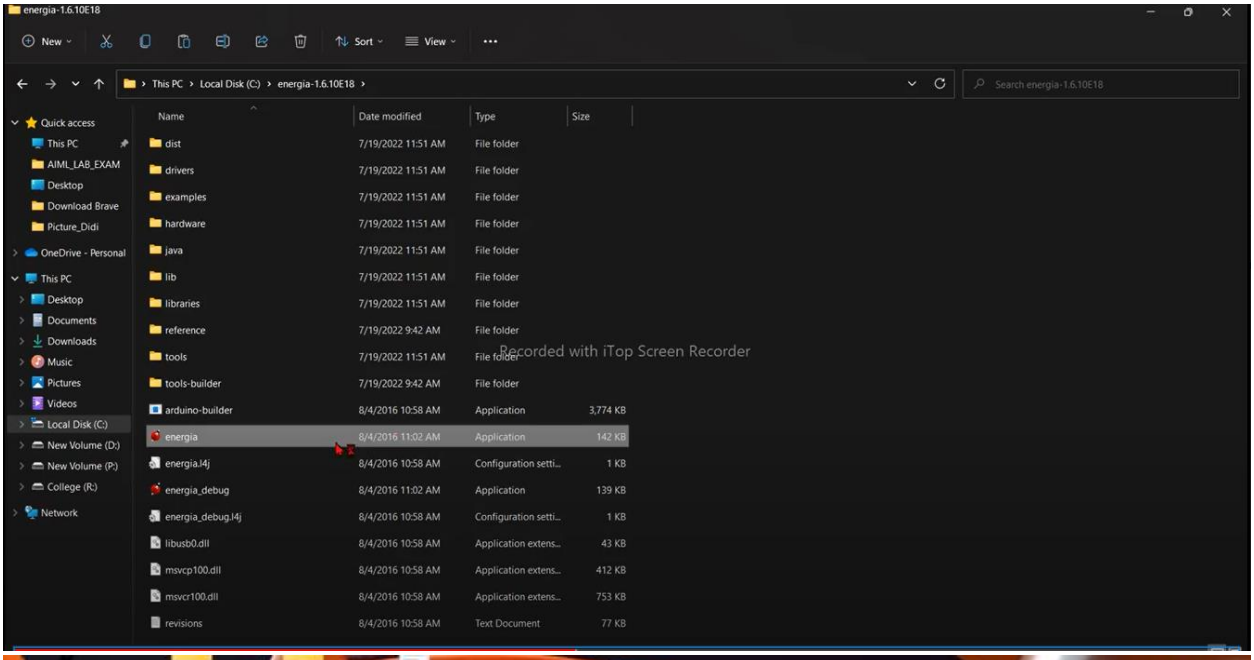
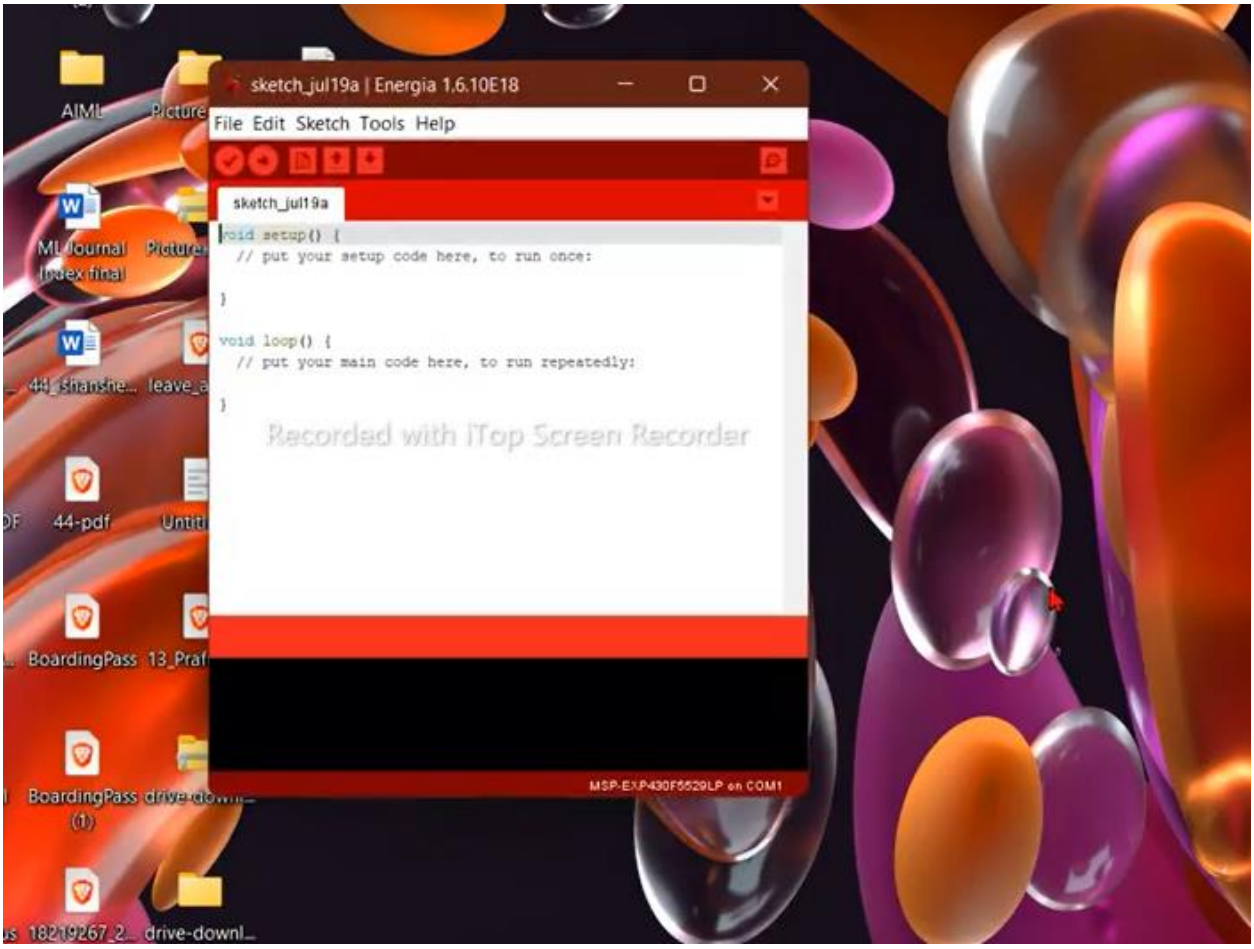
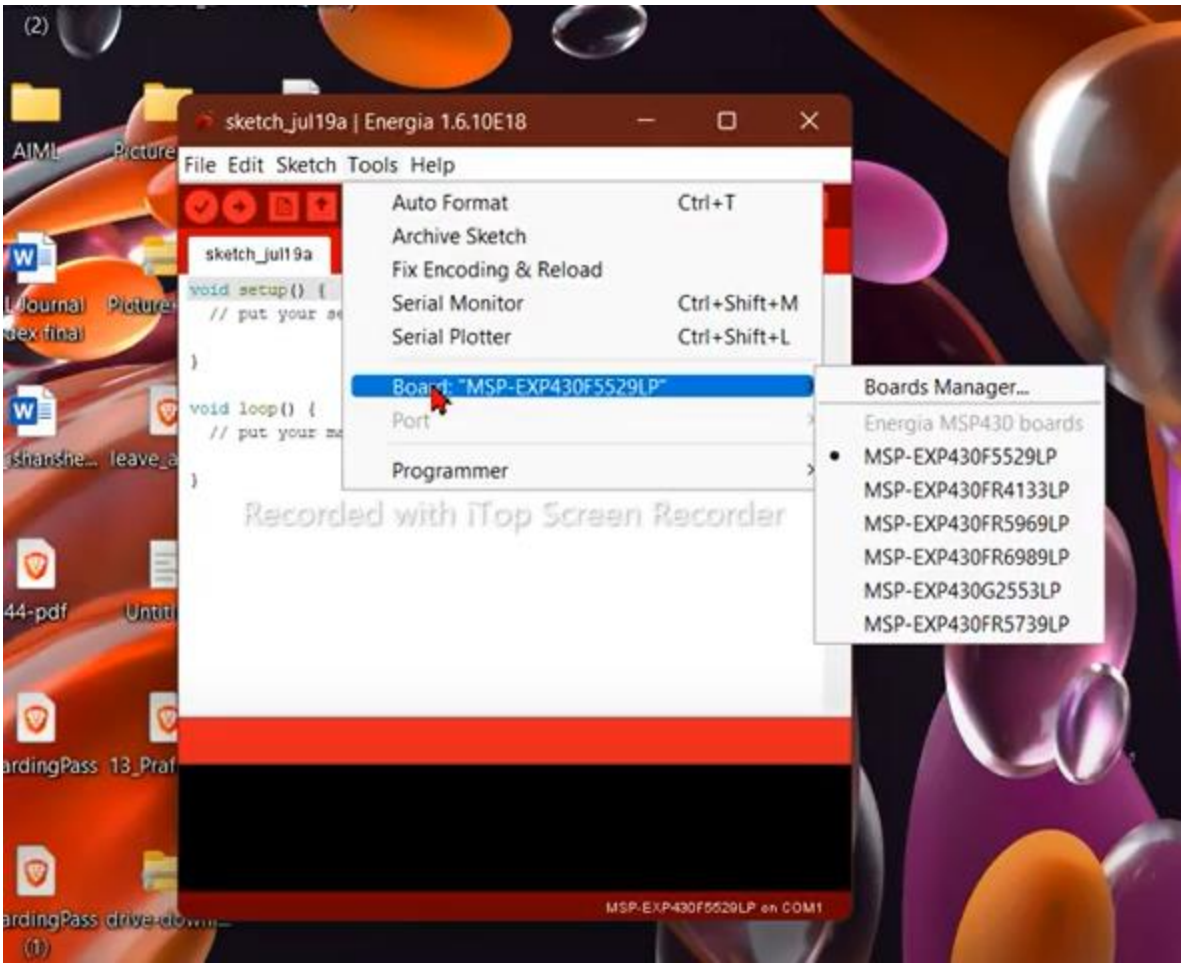
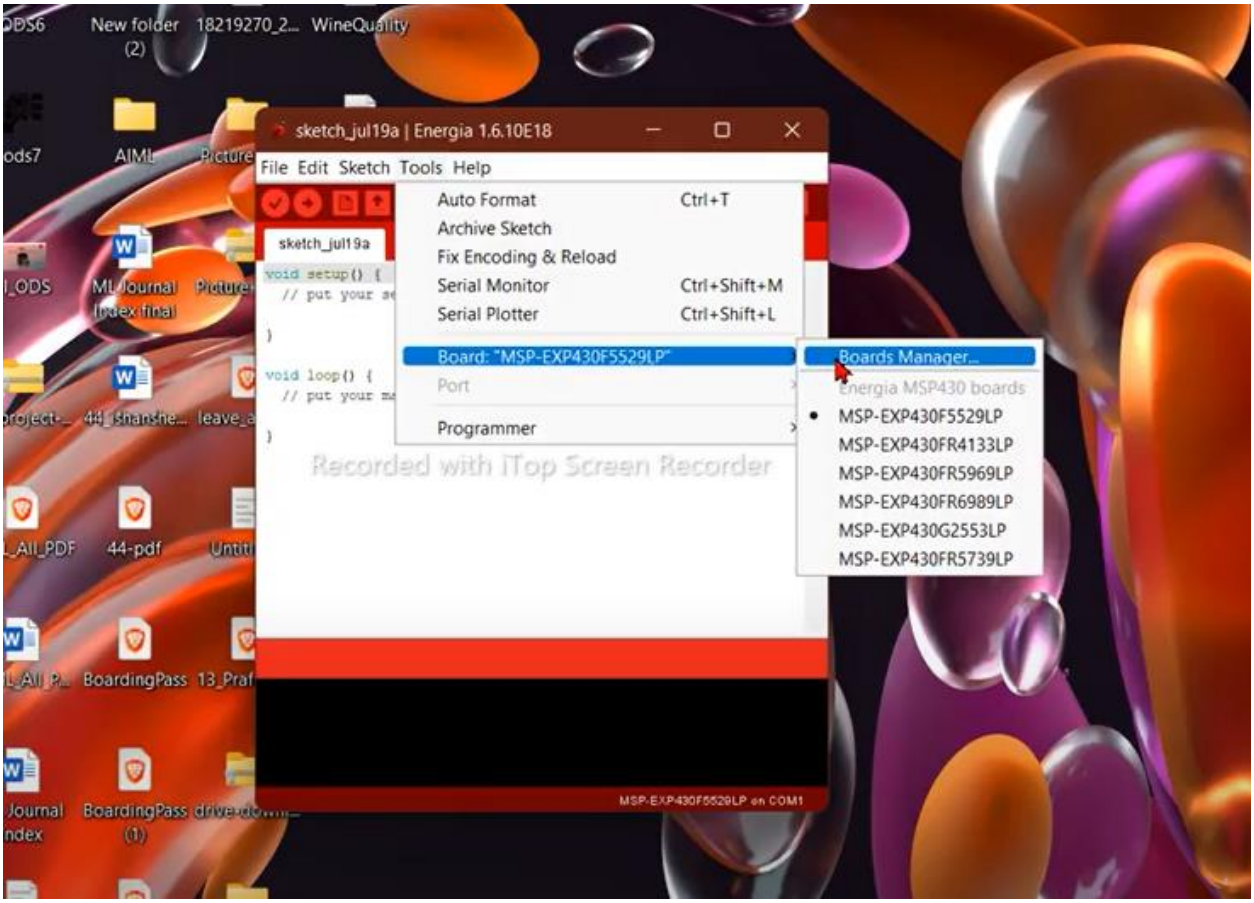
This PC › New Volume (P:) › Download Brave › CCS11.2.0.00007_win64 ›
Search CCS11.2.0.00007_win64
Quick access
This PC
AIML_LAB_EXAM
Desktop
Download Brave
Picture_Didi
OneDrive - Personal
This PC
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
New Volume (D:)
New Volume (P:)
College (R:)
Network
Name
Date modified
Type
Size
CCS11.2.0.00007_win64
7/19/2022 11:22 AM
File folder
energia-1.6.10E18
7/19/2022 9:42 AM
File folder
simplelink_msp432p4_sdk_3_40_01_02
4/21/2021 6:51 PM
Application
237,909 KB
Recorded with iTop Screen Recorder

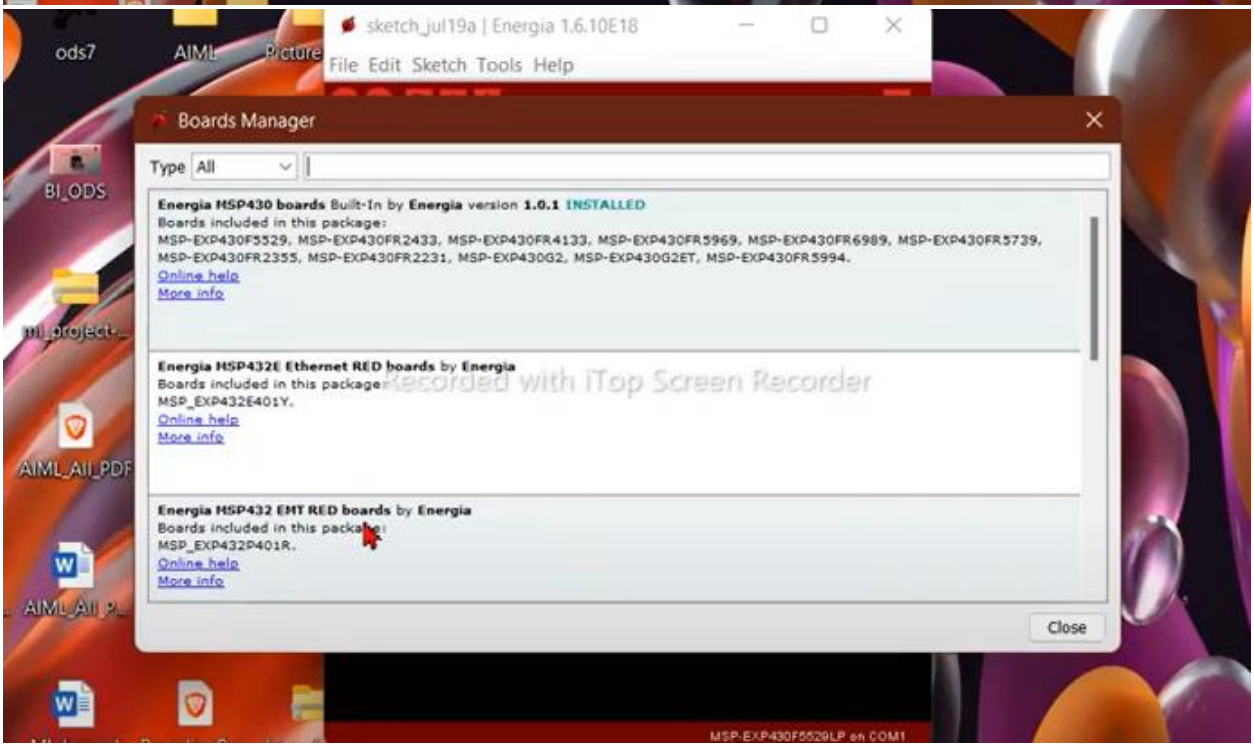

energia-1.6.10E18
New
Sort
View
This PC > Local Disk (C:) > energia-1.6.10E18 >
Search energia-1.6.10E18
Quick access
This PC
AIML_LAB_EXAM
Desktop
Download Brave
Picture_Didi
OneDrive - Personal
This PC
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
New Volume (D:)
New Volume (P:)
College (R:)
Network
Name
Date modified
Type
Size
dist 7/19/2022 11:51 AM File folder
drivers 7/19/2022 11:51 AM File folder
examples 7/19/2022 11:51 AM File folder
hardware 7/19/2022 11:51 AM File folder
java 7/19/2022 11:51 AM File folder
lib 7/19/2022 11:51 AM File folder
libraries 7/19/2022 11:51 AM File folder
reference 7/19/2022 9:42 AM File folder
tools 7/19/2022 11:51 AM File folder
tools-builder 7/19/2022 9:42 AM File folder
arduino-builder 8/4/2016 10:58 AM Application 3,774 KB
energia 8/4/2016 11:02 AM Application 142 KB
energia.l4j 8/4/2016 10:58 AM Configuration setti... 1 KB
energia_debug 8/4/2016 11:02 AM Application 139 KB
energia_debug.l4j 8/4/2016 10:58 AM Configuration setti... 1 KB
libusb0.dll 8/4/2016 10:58 AM Application extens... 43 KB
msvcp100.dll 8/4/2016 10:58 AM Application extens... 412 KB
msvcr100.dll 8/4/2016 10:58 AM Application extens... 753 KB
revisions 8/4/2016 10:58 AM Text Document 77 KB
Recorded with iTop Screen Recorder

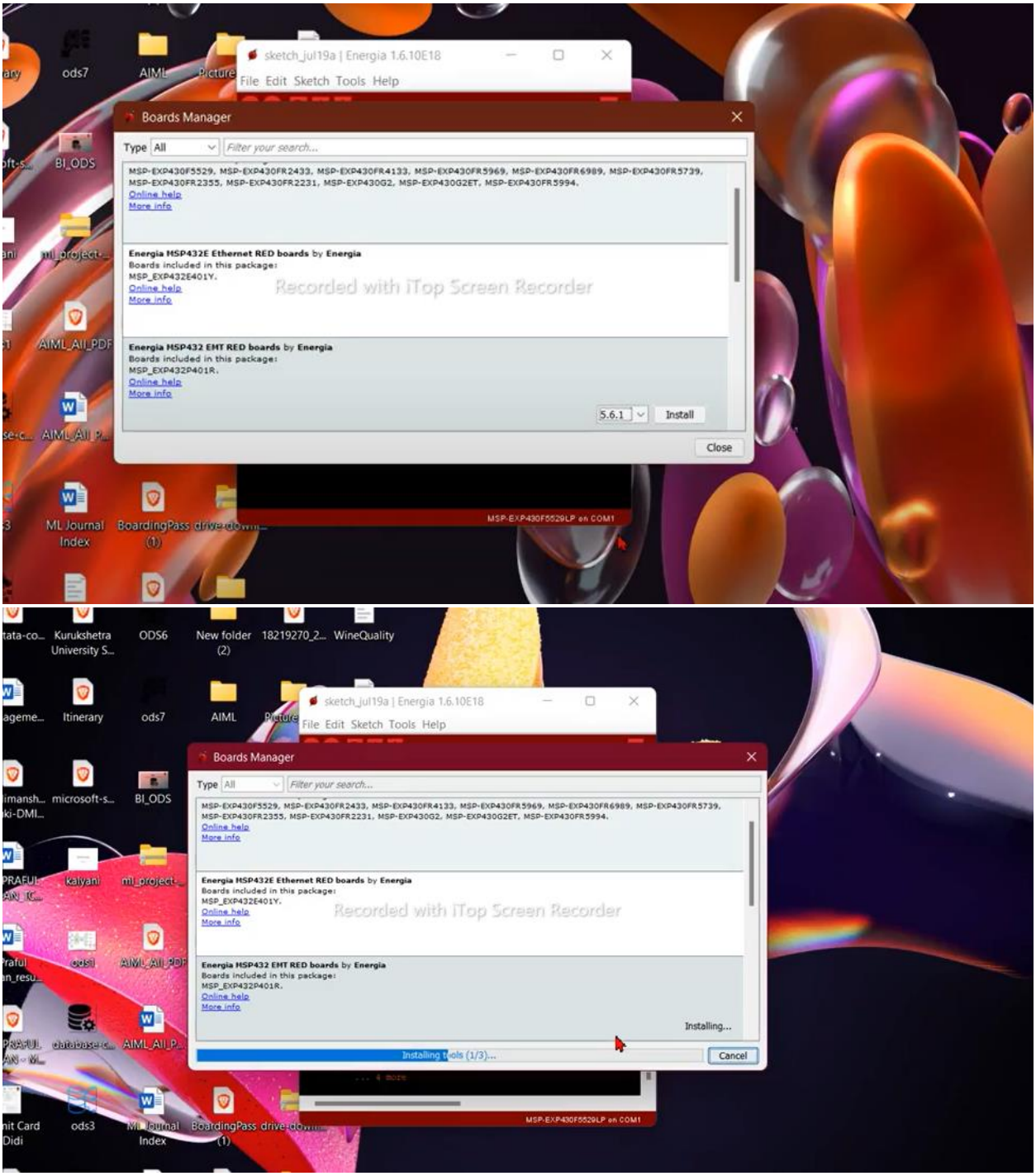

ods7
AIML
Picture_Didi
phishing_C...
BI_ODS
ML_Journal_Index final
AIML_All_PDF
44-pdf
AIML_All_P...
BoardingPass
13_PrafulKa...
EnergiaMT
Recorded with iTop Screen Recorder
EnergiaMT is a modified version of the Arduino/ Genuino IDE for the Texas Instruments MSP430, MSP432, Tiva C and CC3200 LaunchPad boards.
This software is not supported by the Arduino LLC.

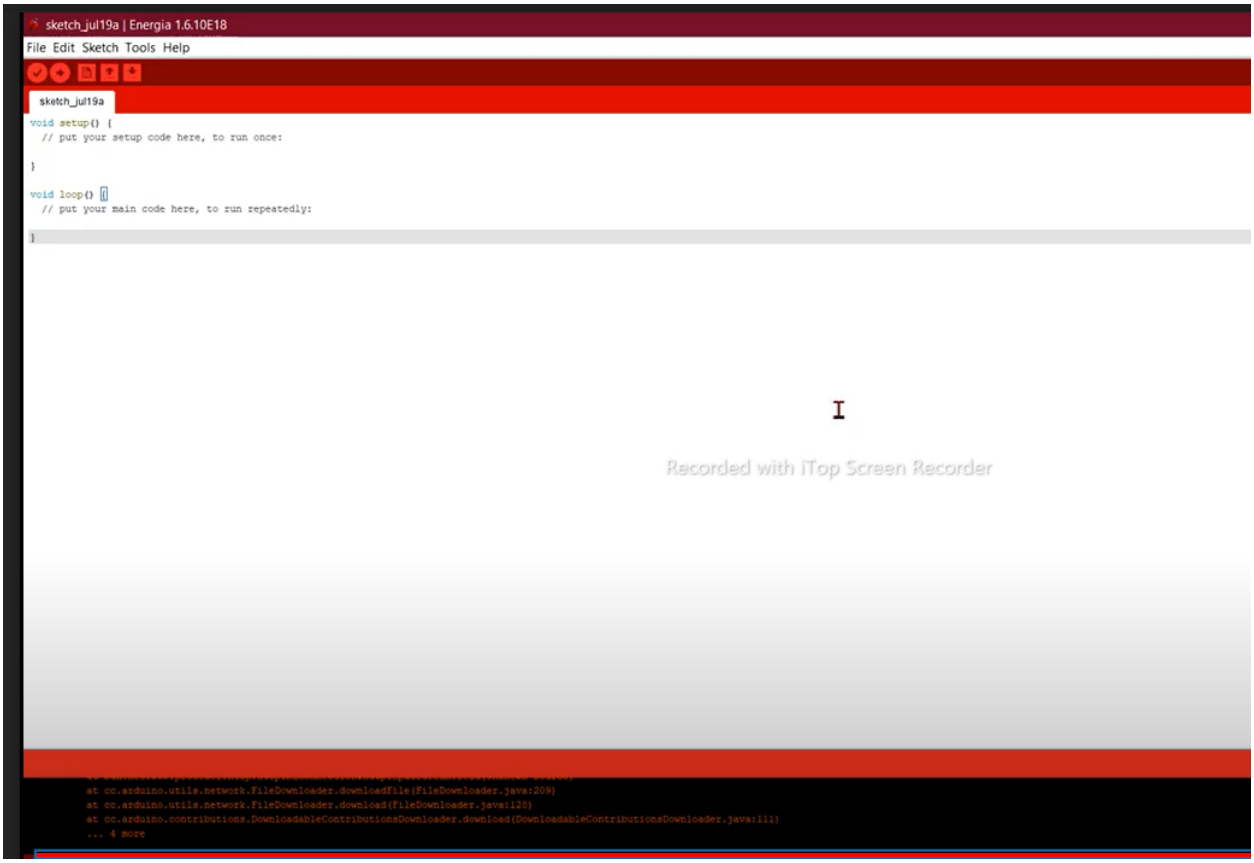

sketch_jul19a | Energia 1.6.10E18
File Edit Sketch Tools Help
sketch_jul19a
void setup() {
// put your setup code here, to run once:
}
void loop() {
// put your main code here, to run repeatedly:
}
Recorded with iTop Screen Recorder
MSP-EXP430F5529LP on COM1
AIML
Picture
ML Journal Index final
44-pdf
BoardingPass
13_Praf
BoardingPass (1)
drive-downl...


sketch_jul19a | Energia 1.6.10E18
File Edit Sketch Tools Help
Auto Format Ctrl+T
Archive Sketch
Fix Encoding & Reload
Serial Monitor Ctrl+Shift+M
Serial Plotter Ctrl+Shift+L
Board: "MSP-EXP430F5529LP"
Port
Programmer
Boards Manager...
Energia MSP430 boards
MSP-EXP430F5529LP
MSP-EXP430FR4133LP
MSP-EXP430FR5969LP
MSP-EXP430FR6989LP
MSP-EXP430G2553LP
MSP-EXP430FR5739LP
Recorded with iTop Screen Recorder
MSP-EXP430F5529LP on COM1


sketch_jul19a | Energia 1.6.10E18
File Edit Sketch Tools Help
Auto Format Ctrl+T
Archive Sketch
Fix Encoding & Reload
Serial Monitor Ctrl+Shift+M
Serial Plotter Ctrl+Shift+L
Board: "MSP-EXP430F5529LP"
Port
Programmer
Boards Manager...
Energia MSP430 boards
MSP-EXP430F5529LP
MSP-EXP430FR4133LP
MSP-EXP430FR5969LP
MSP-EXP430FR6989LP
MSP-EXP430G2553LP
MSP-EXP430FR5739LP
Recorded with iTop Screen Recorder
MSP-EXP430F5529LP on COM1


sketch_jul19a | Energia 1.6.10E18
File Edit Sketch Tools Help
Boards Manager
Type All
Energia MSP430 boards Built-In by Energia version 1.0.1 INSTALLED
Boards included in this package:
MSP-EXP430F5529, MSP-EXP430FR2433, MSP-EXP430FR4133, MSP-EXP430FR5969, MSP-EXP430FR6989, MSP-EXP430FR5739, MSP-EXP430FR2355, MSP-EXP430FR2231, MSP-EXP430G2, MSP-EXP430G2ET, MSP-EXP430FR5994.
Online help
More info
Energia MSP432E Ethernet RED boards by Energia
Boards included in this package:
MSP_EXP432E401Y.
Online help
More info
Energia MSP432 EMT RED boards by Energia
Boards included in this package:
MSP_EXP432P401R.
Online help
More info
Close
Recorded with iTop Screen Recorder
MSP-EXP430F5529LP on COM1


sketch_jul19a | Energia 1.6.10E18
File Edit Sketch Tools Help
Boards Manager
Type All
Filter your search...
MSP-EXP430F5529, MSP-EXP430FR2433, MSP-EXP430FR4133, MSP-EXP430FR5969, MSP-EXP430FR6989, MSP-EXP430FR5739, MSP-EXP430FR2355, MSP-EXP430FR2231, MSP-EXP430G2, MSP-EXP430G2ET, MSP-EXP430FR5994.
Online help
More info
Energia MSP432E Ethernet RED boards by Energia
Boards included in this package:
MSP_EXP432E401Y.
Online help
More info
Recorded with iTop Screen Recorder
Energia MSP432 EMT RED boards by Energia
Boards included in this package:
MSP_EXP432P401R.
Online help
More info
5.6.1
Install
Close
MSP-EXP430F5529LP on COM1
Installing...
Installing tools (1/3)...
Cancel

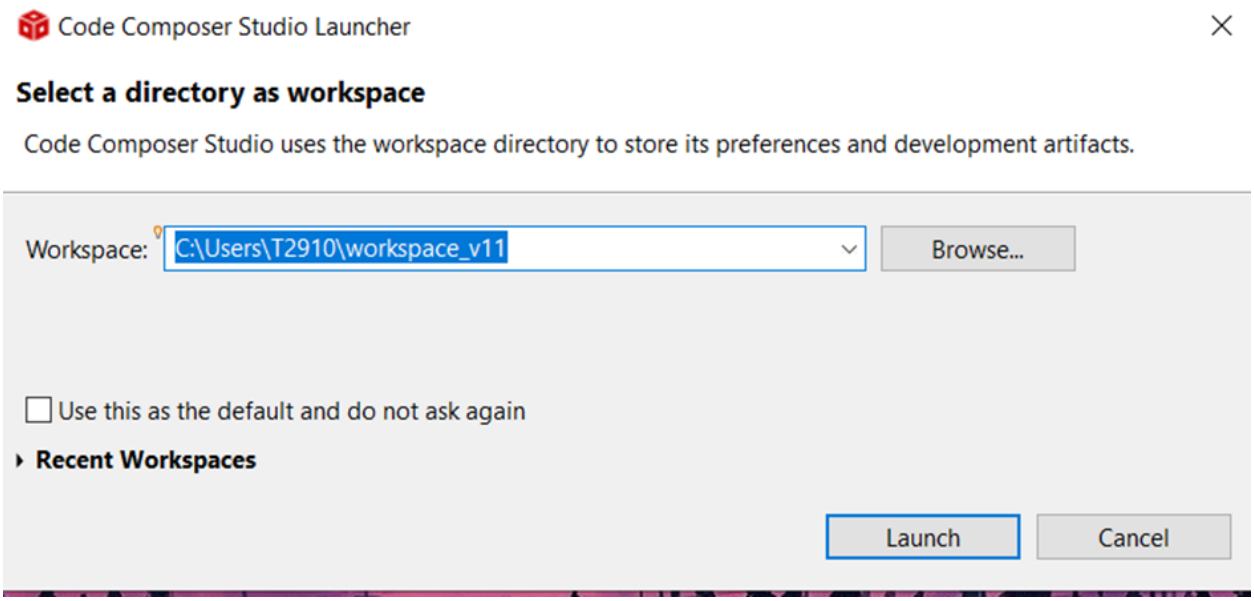

sketch_jul19a | Energia 1.6.10E18
File Edit Sketch Tools Help
sketch_jul19a
void setup() {
// put your setup code here, to run once:
}
void loop() {
// put your main code here, to run repeatedly:
}
Recorded with iTop Screen Recorder
at cc.arduino.utils.network.FileDownloader.downloadFile(FileDownloader.java:209)
at cc.arduino.utils.network.FileDownloader.download(FileDownloader.java:128)
at cc.arduino.contributions.DownloadableContributionsDownloader.download(DownloadableContributionsDownloader.java:111)
... 4 more

Practical 2

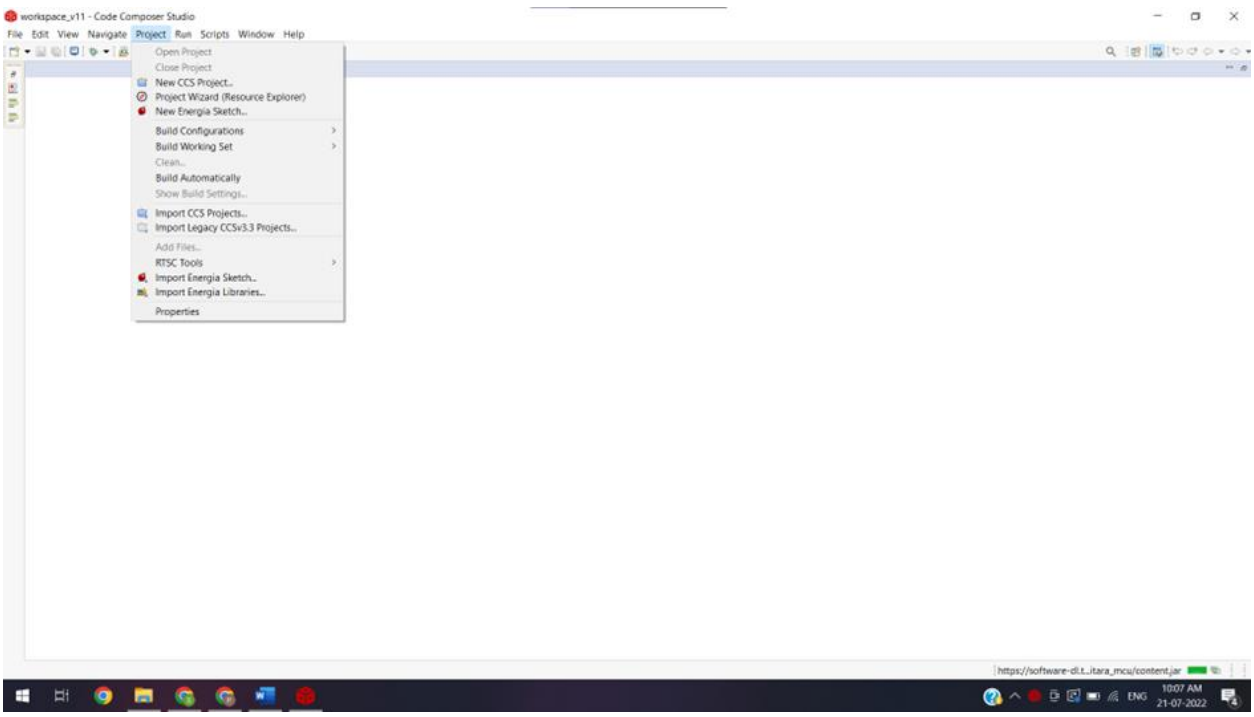
Practical Name: Hello world of Embedded Systems

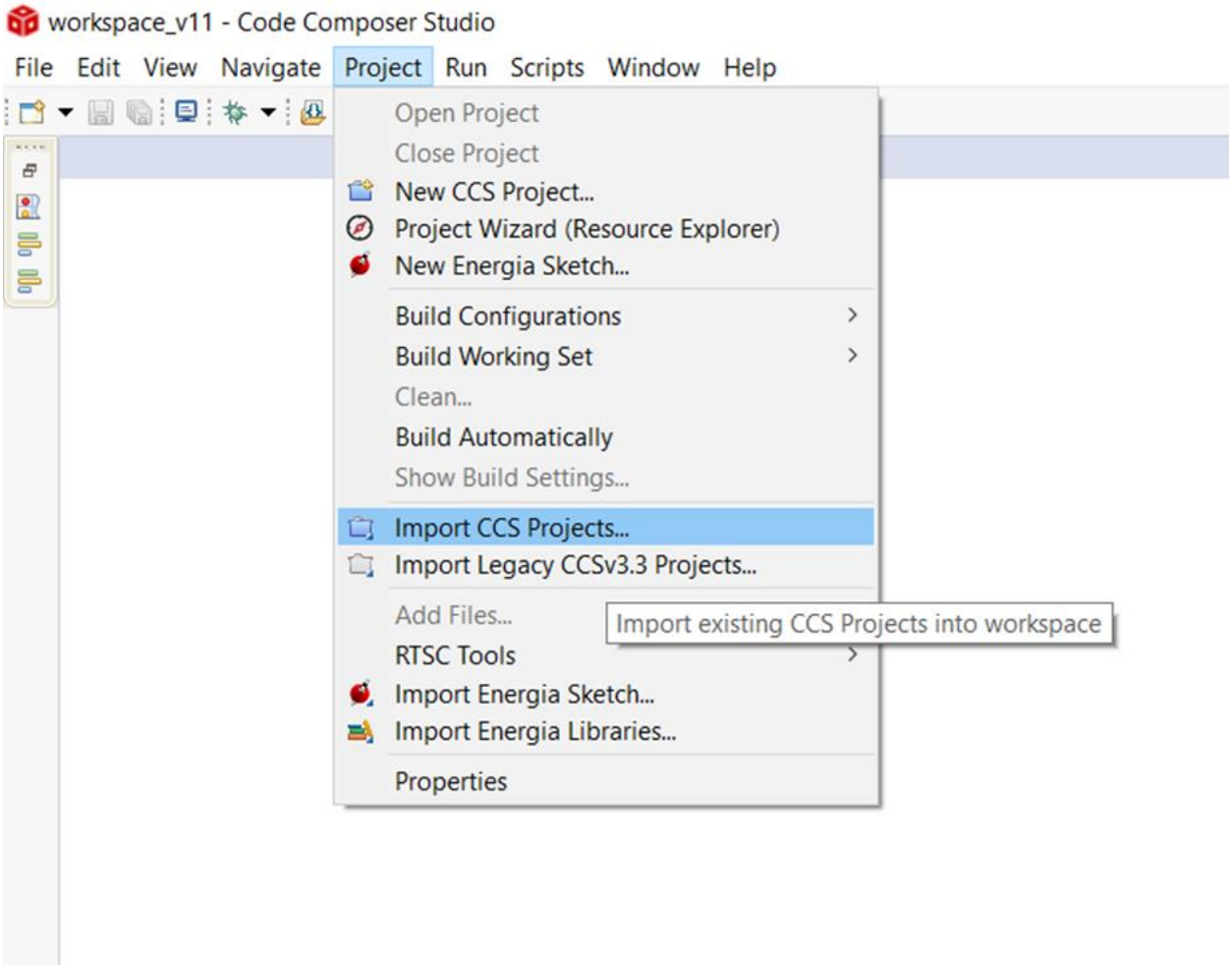
Open Code Composer Studio Launcher

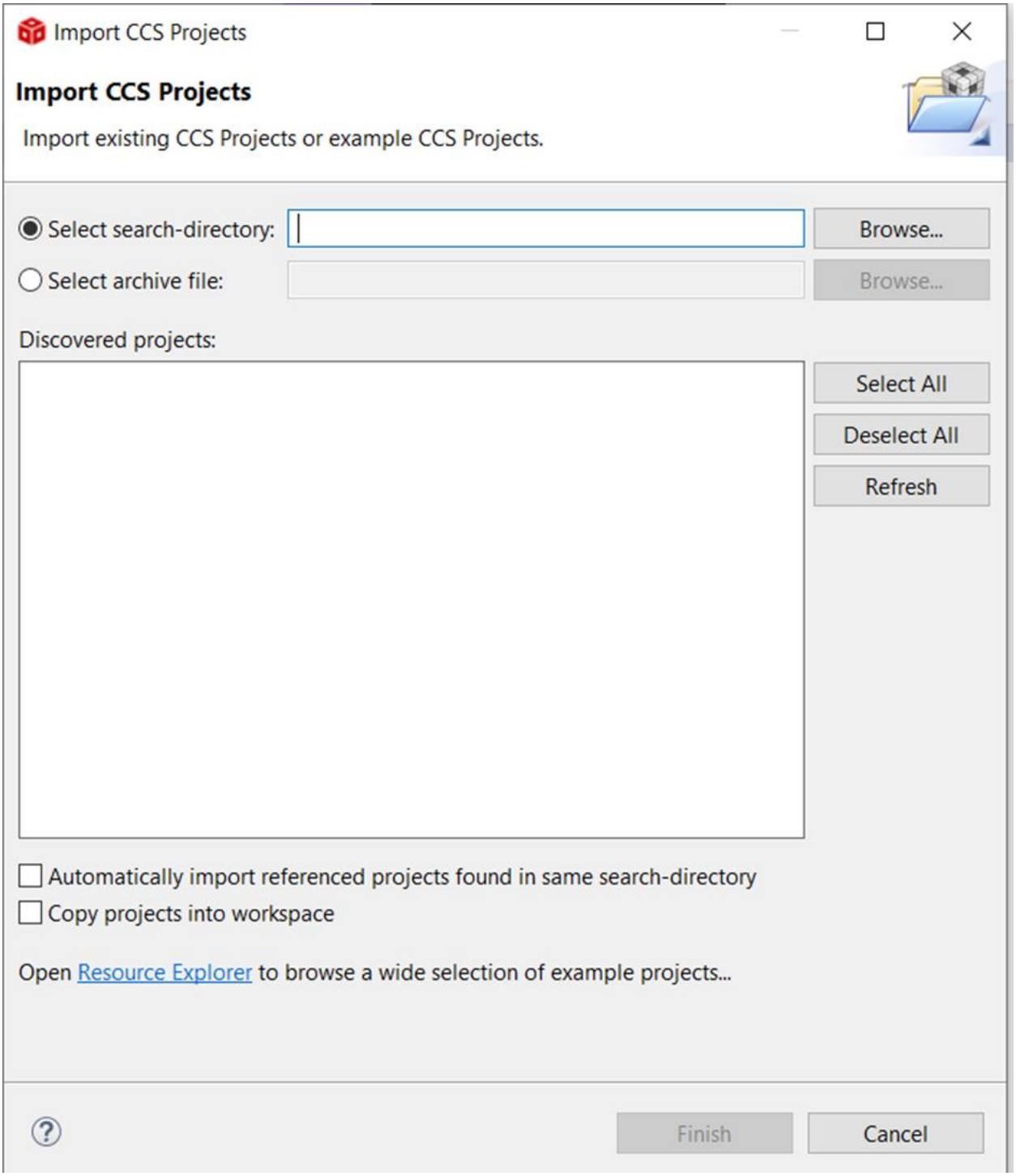
Keep the workspace path bydefault

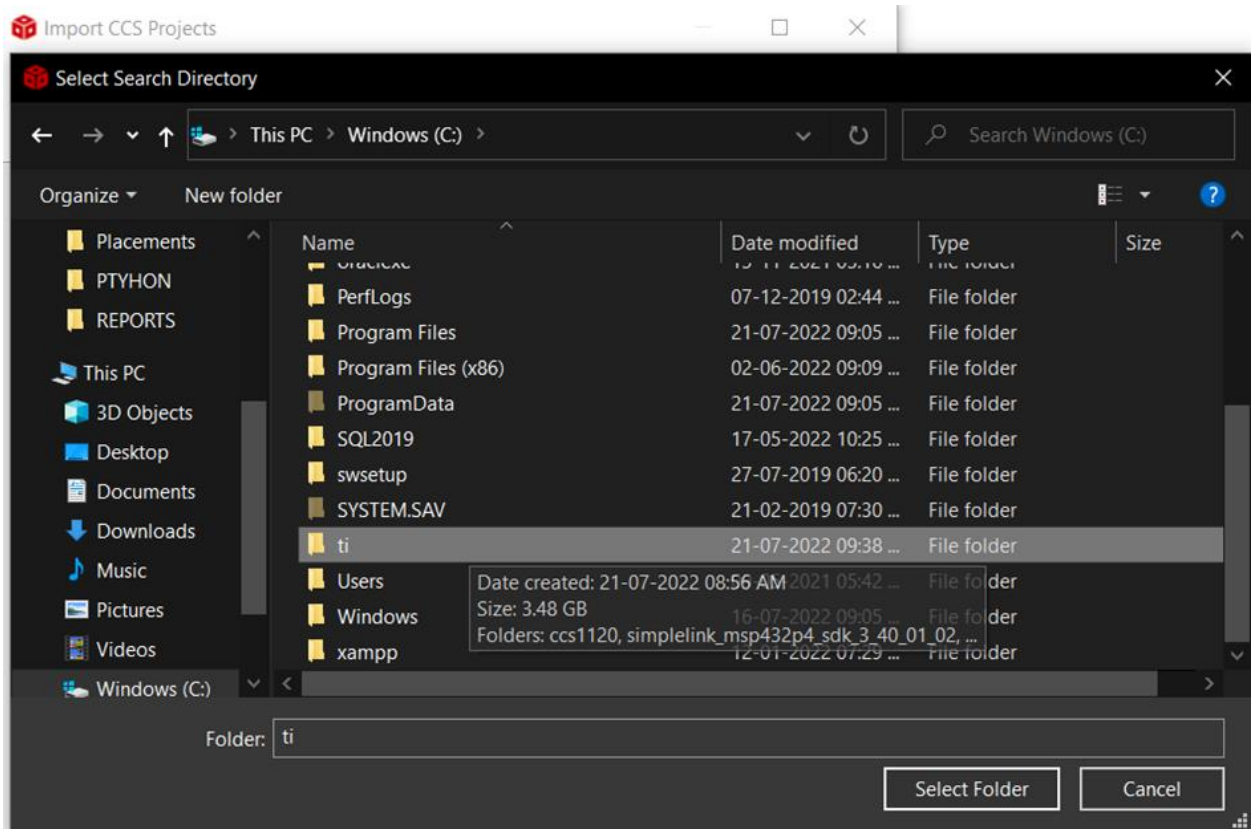


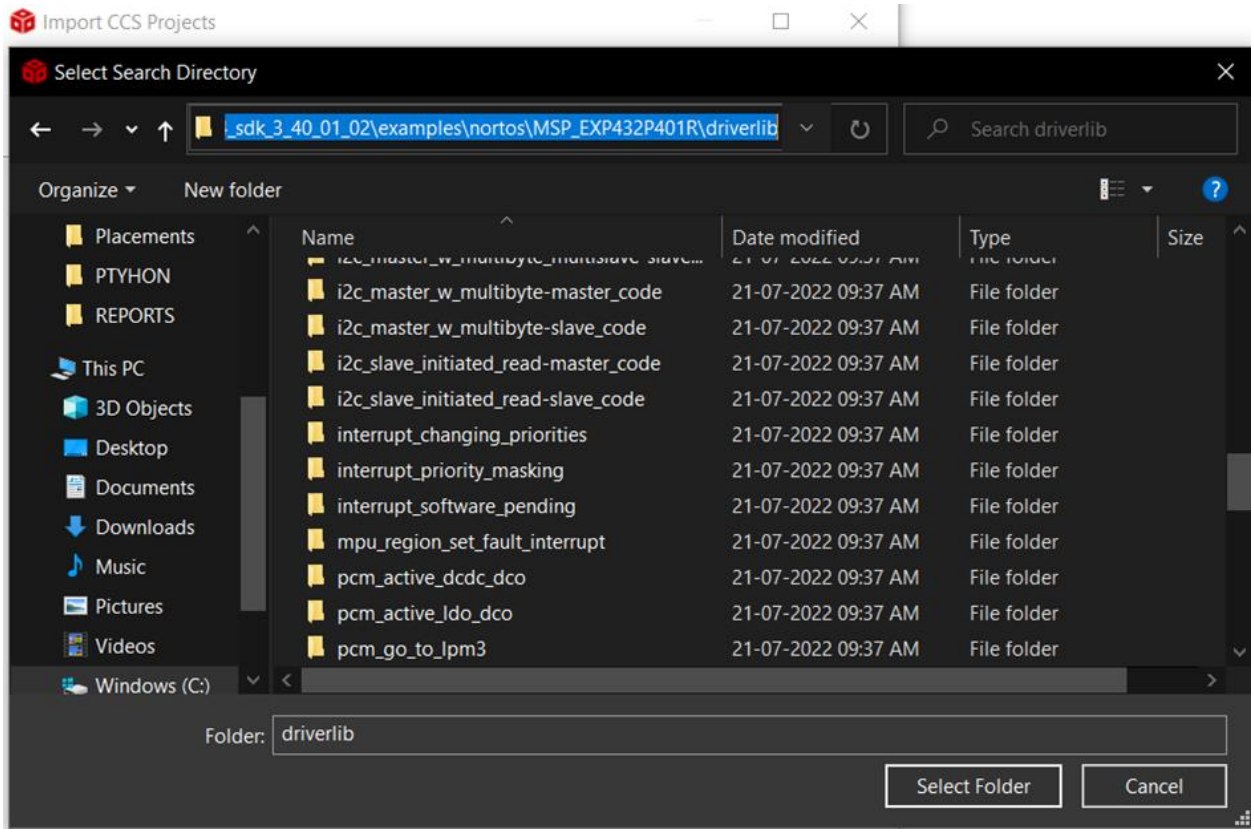
Select the Project Menu->Import CCS Project



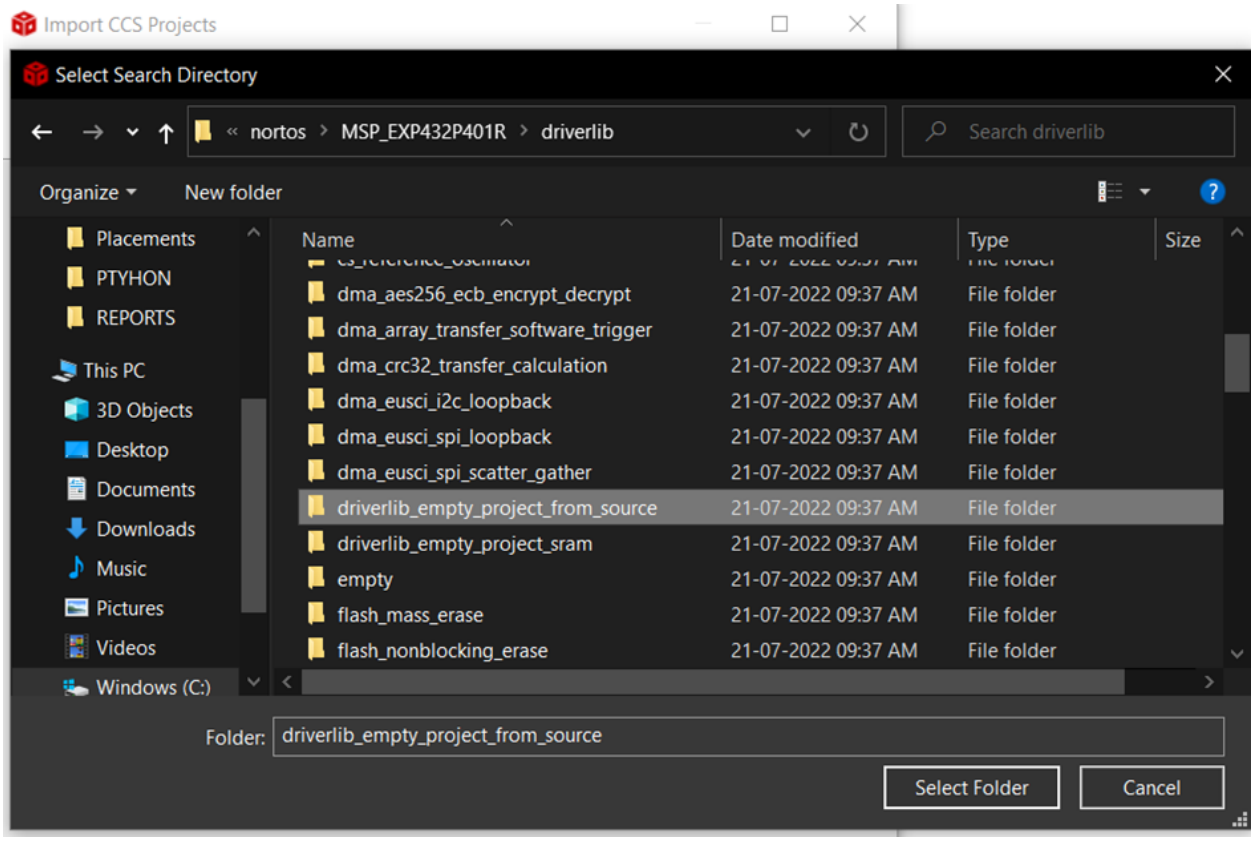

workspace_v11 - Code Composer Studio
File Edit View Navigate Project Run Scripts Window Help
Open Project
Close Project
New CCS Project...
Project Wizard (Resource Explorer)
New Energia Sketch...
Build Configurations
Build Working Set
Clean...
Build Automatically
Show Build Settings...
Import CCS Projects...
Import Legacy CCSv3.3 Projects...
Add Files...
RTSC Tools
Import Energia Sketch...
Import Energia Libraries...
Properties
Import existing CCS Projects into workspace

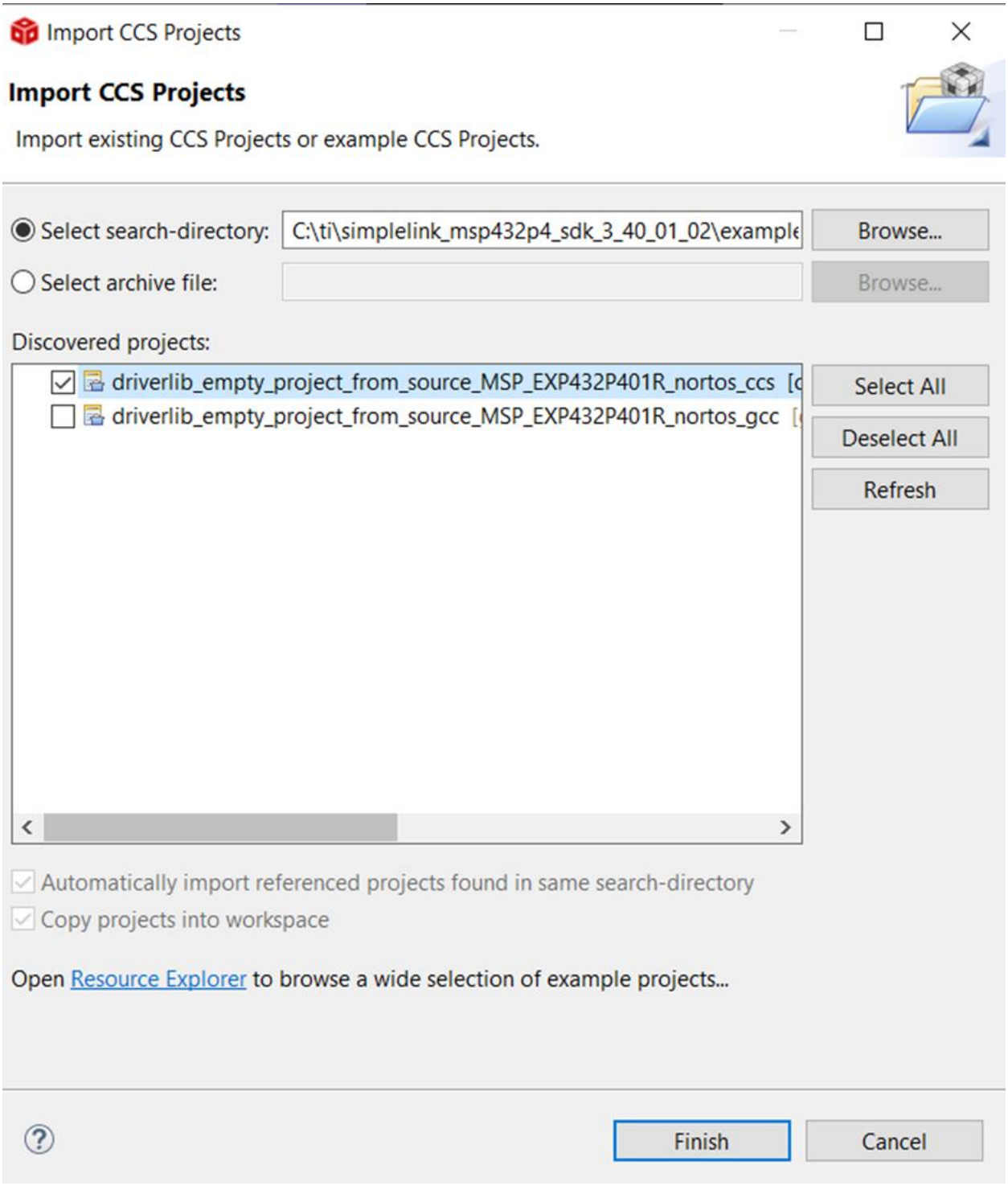

Import CCS Projects
Import CCS Projects
Import existing CCS Projects or example CCS Projects.
Select search-directory:
Browse...
Select archive file:
Browse...
Discovered projects:
Select All
Deselect All
Refresh
Automatically import referenced projects found in same search-directory
Copy projects into workspace
Open Resource Explorer to browse a wide selection of example projects...
Finish
Cancel

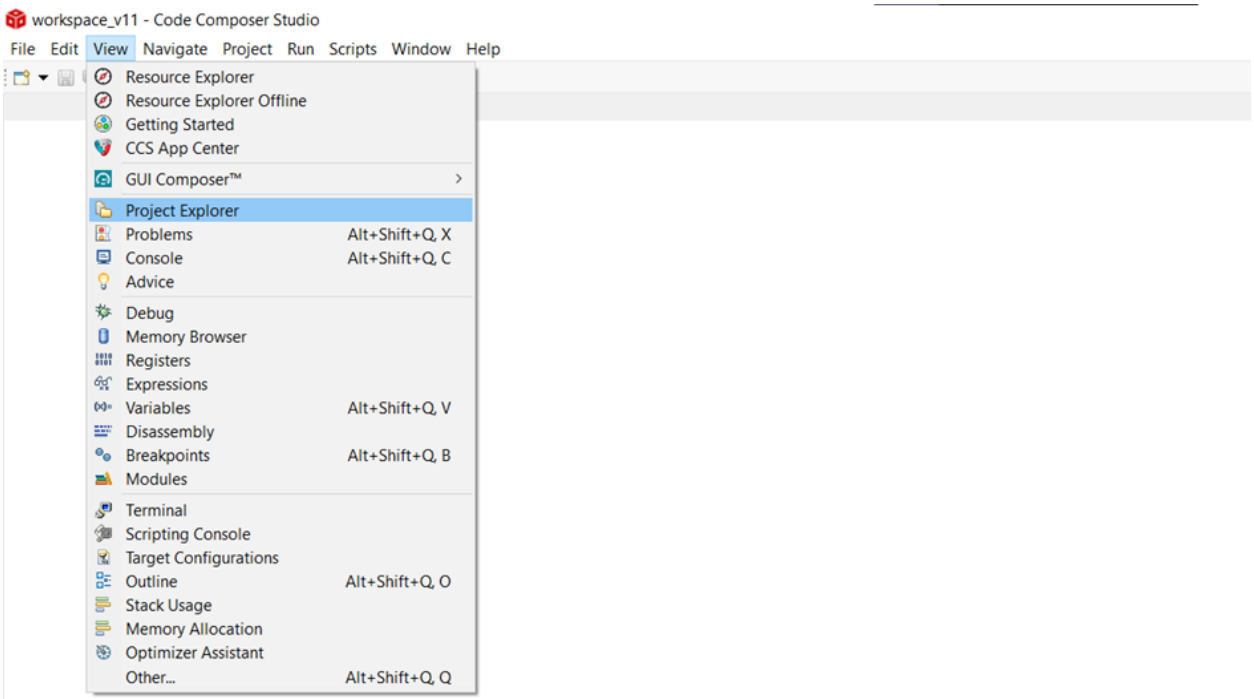

Import CCS Projects
Select Search Directory
This PC › Windows (C:) ›
Search Windows (C:)
Organize
New folder
Placements
PTYHON
REPORTS
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Windows (C:)
Name
Date modified
Type
Size
PerfLogs 07-12-2019 02:44 ... File folder
Program Files 21-07-2022 09:05 ... File folder
Program Files (x86) 02-06-2022 09:09 ... File folder
ProgramData 21-07-2022 09:05 ... File folder
SQL2019 17-05-2022 10:25 ... File folder
swsetup 27-07-2019 06:20 ... File folder
SYSTEM.SAV 21-02-2019 07:30 ... File folder
ti 21-07-2022 09:38 ... File folder
Users
Windows
xampp
Date created: 21-07-2022 08:56 AM
Size: 3.48 GB
Folders: ccs1120, simplelink_msp432p4_sdk_3_40_01_02, ...
Folder: ti
Select Folder
Cancel

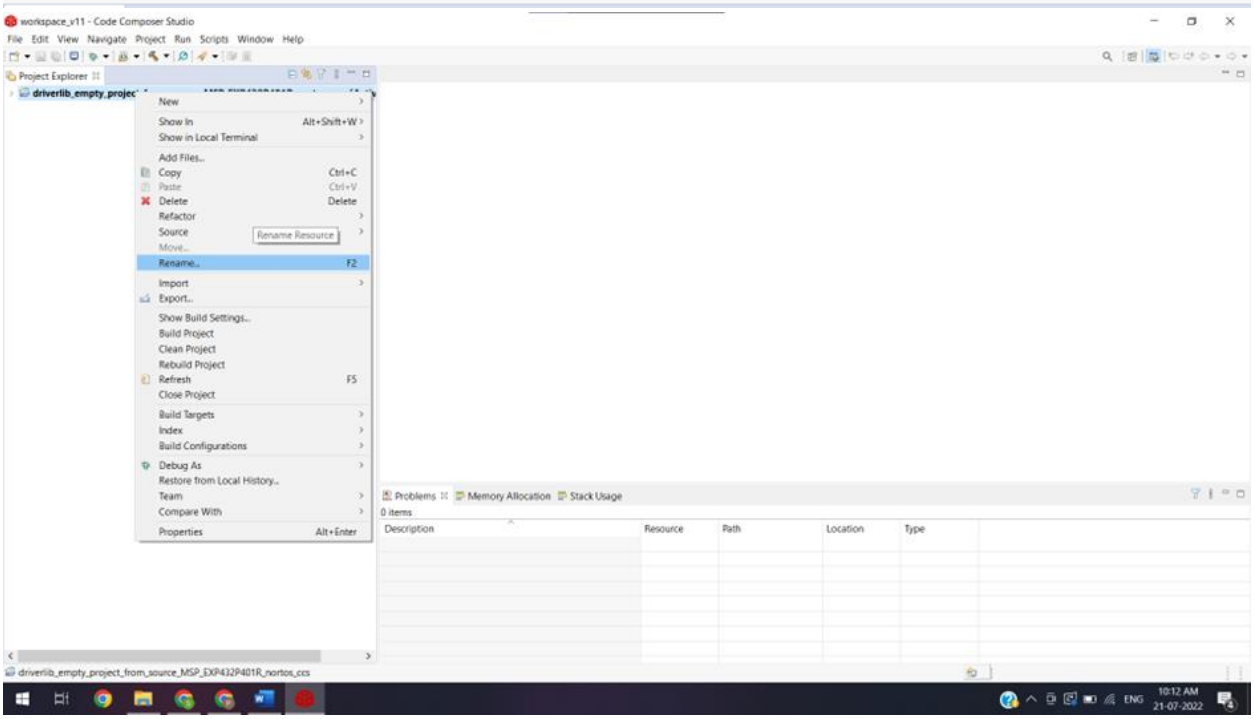

Import CCS Projects
Select Search Directory
_sdk_3_40_01_02\examples\nortos\MSP_EXP432P401R\driverlib
Search driverlib
Organize
New folder
Placements
PTYHON
REPORTS
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Windows (C:)
Name
Date modified
Type
Size
i2c_master_w_multibyte-master_code 21-07-2022 09:37 AM File folder
i2c_master_w_multibyte-slave_code 21-07-2022 09:37 AM File folder
i2c_slave_initiated_read-master_code 21-07-2022 09:37 AM File folder
i2c_slave_initiated_read-slave_code 21-07-2022 09:37 AM File folder
interrupt_changing_priorities 21-07-2022 09:37 AM File folder
interrupt_priority_masking 21-07-2022 09:37 AM File folder
interrupt_software_pending 21-07-2022 09:37 AM File folder
mpu_region_set_fault_interrupt 21-07-2022 09:37 AM File folder
pcm_active_dcdc_dco 21-07-2022 09:37 AM File folder
pcm_active_ldo_dco 21-07-2022 09:37 AM File folder
pcm_go_to_lpm3 21-07-2022 09:37 AM File folder
Folder: driverlib
Select Folder
Cancel

Path:C:\ti\simplelink_msp432p4_sdk_3_40_01_02\examples\nortos\MSP_EXP432P401R\driverlib

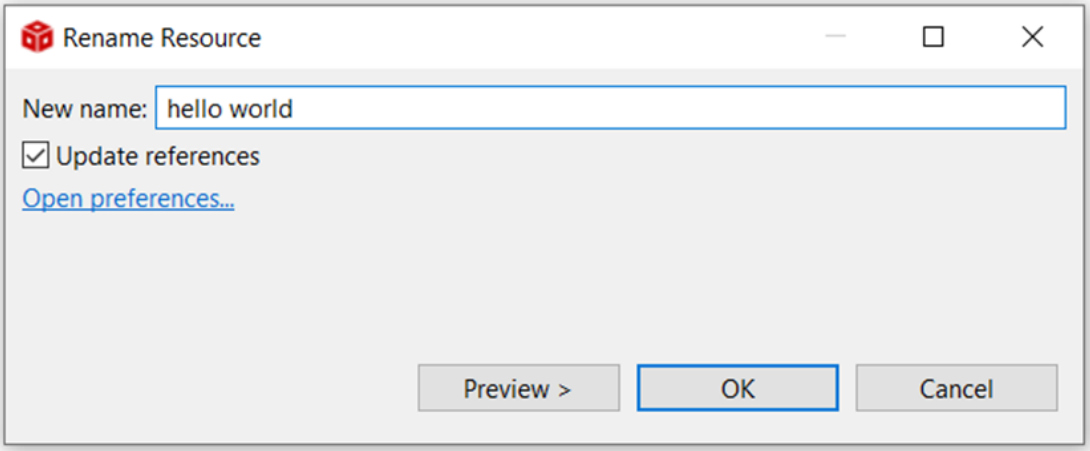


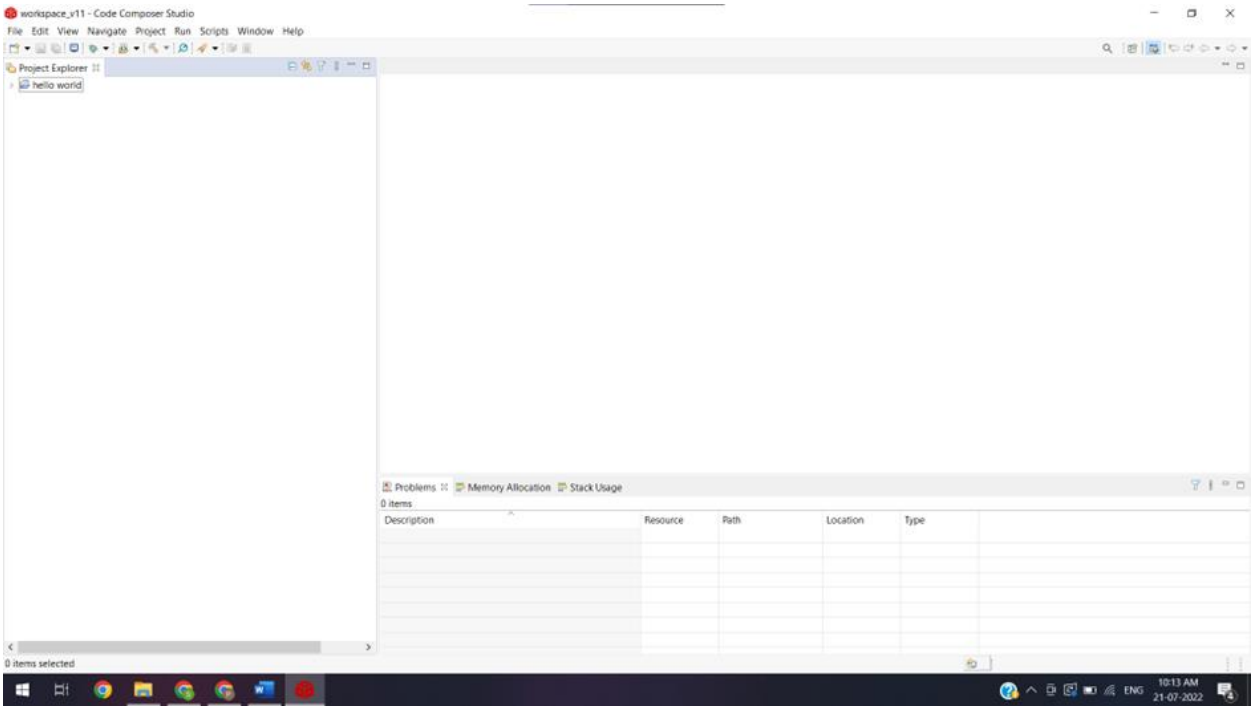

Import CCS Projects
Import CCS Projects
Import existing CCS Projects or example CCS Projects.
Select search-directory:
C:\ti\simplelink_msp432p4_sdk_3_40_01_02\example
Browse...
Select archive file:
Browse...
Discovered projects:
driverlib_empty_project_from_source_MSP_EXP432P401R_nortos_ccs
driverlib_empty_project_from_source_MSP_EXP432P401R_nortos_gcc
Select All
Deselect All
Refresh
Automatically import referenced projects found in same search-directory
Copy projects into workspace
Open Resource Explorer to browse a wide selection of example projects...
Finish
Cancel





Give Project Name HELLO WORLD






```
/* DriverLib Includes */
#include <ti/devices/msp432p4xx/driverlib/driverlib.h>

/* Standard Includes */
#include <stdint.h>
#include <stdbool.h>

int main(void)
{
    /* Stop Watchdog */
```

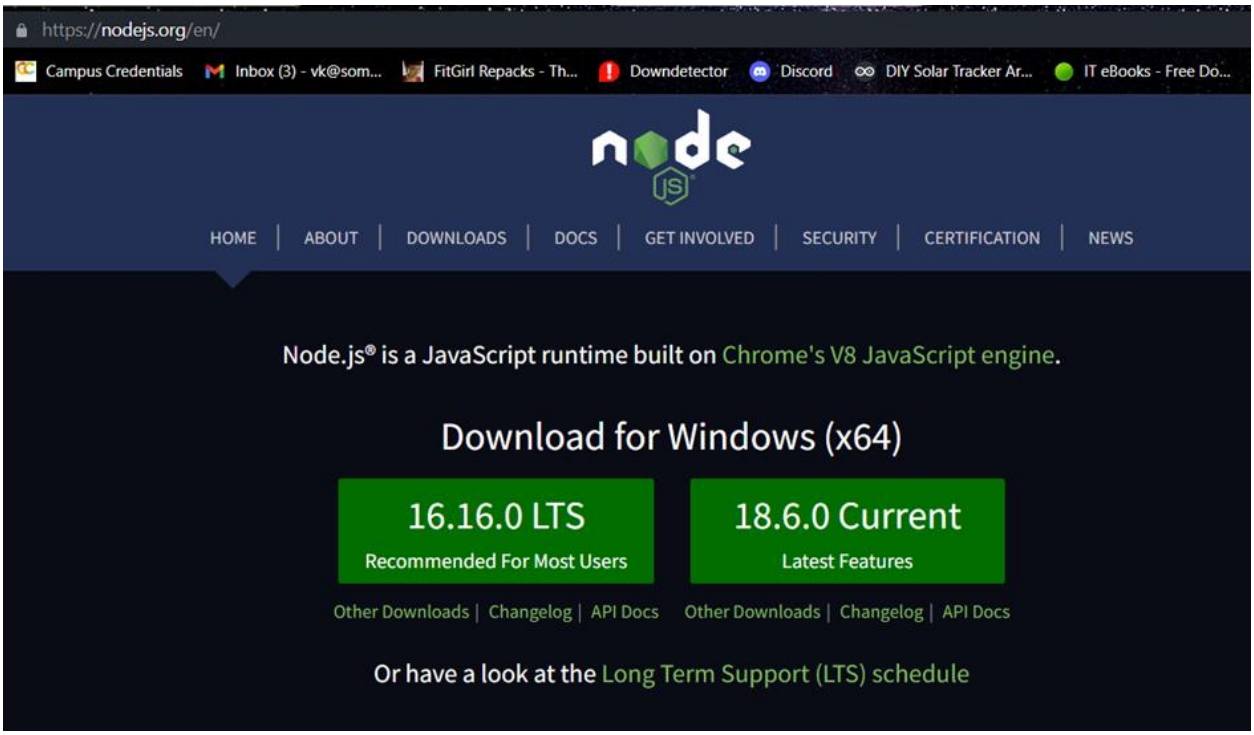
```
    MAP_WDT_A_holdTimer();//watch dog timer , this timer starts when kit is given power
    // if it stops it will cause kit to reset
    int i;
    GPIO_setAsOutputPin(GPIO_PORT_P2,GPIO_PIN0);
    // port is combination of 8 pins 0-7 , means 8 bits , 8 bits forms a port
    // this MC has 10 ports
    // this func tells mc to make PORT2, pin 0  as OUTPUT pin
    // GPIO means general purpose input output

    while(1) // super loop
    {
       GPIO_setOutputHighOnPin(GPIO_PORT_P2,GPIO_PIN0);//setting the pin as HIGH
       for(i=0;i<10000;i++); // random delay
       GPIO_setOutputLowOnPin(GPIO_PORT_P2,GPIO_PIN0);//setting the pin as LOW
       for(i=0;i<100000;i++); //random delay
    }
}
```

Practical 3

Practical Name: Installing Node.js, Node-Red and Node Red interface.

Visit the URL: https://nodejs.org/en/

Download the nodejs for Windows(x64)



Open the Command Prompt

Enter the following commands to install Node.js

Node - - version

Install g - -unsafe-perm node-red

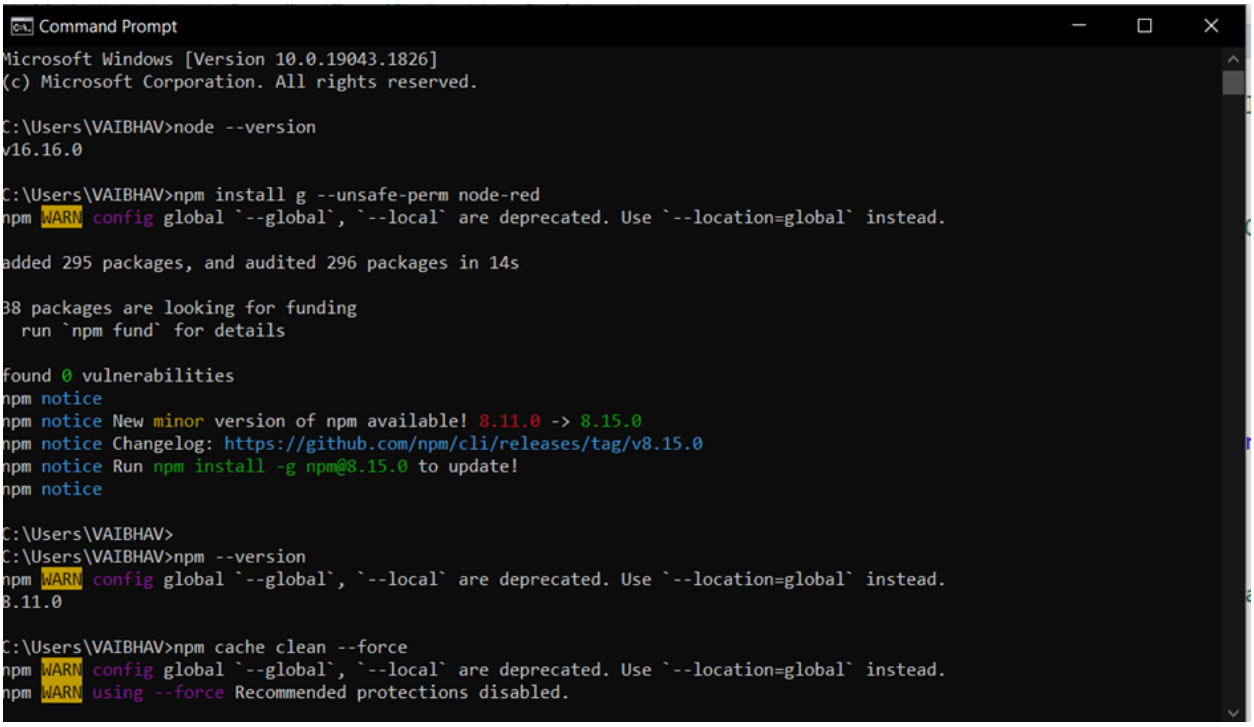
npm - -version

npm cache clean - -force

node -v

node -red

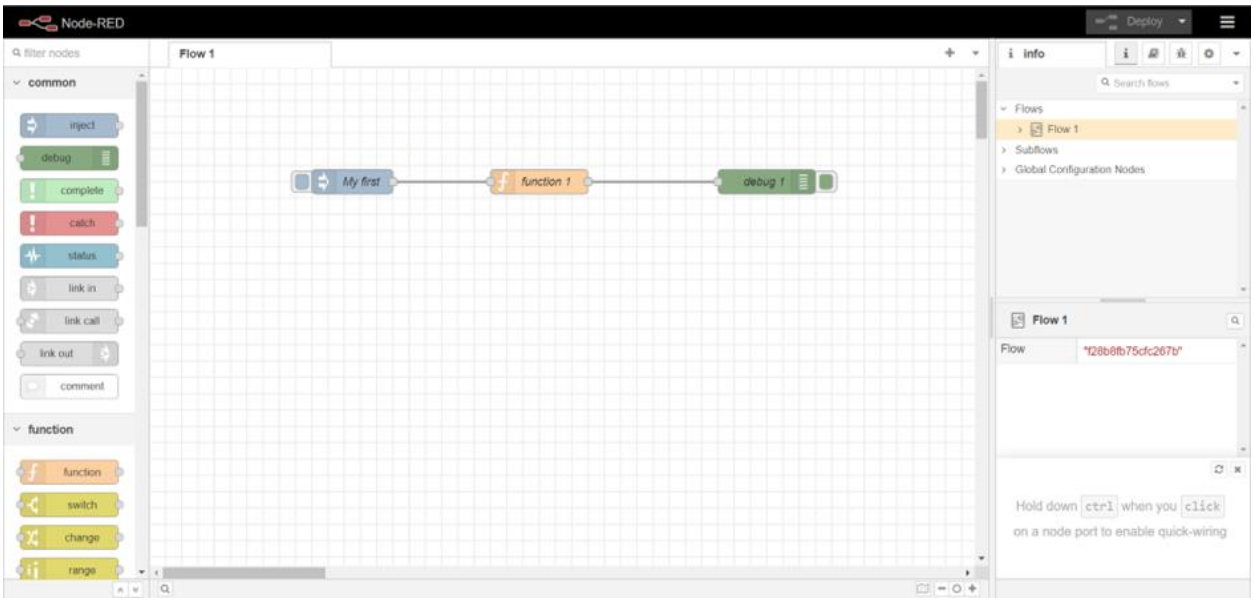
Then open the browser and start node red at the port 1880 and put the screen shot of the same with the URL used in the web browser.

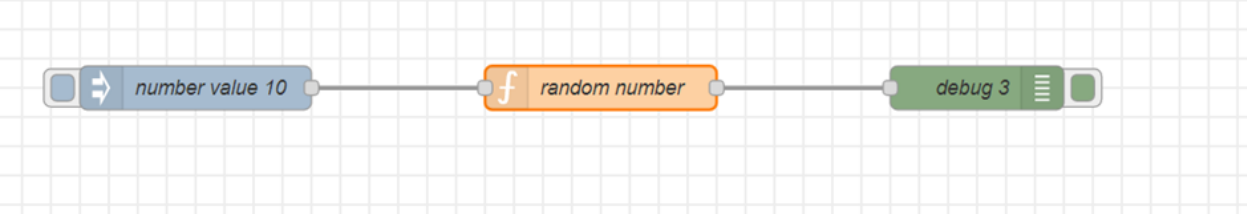


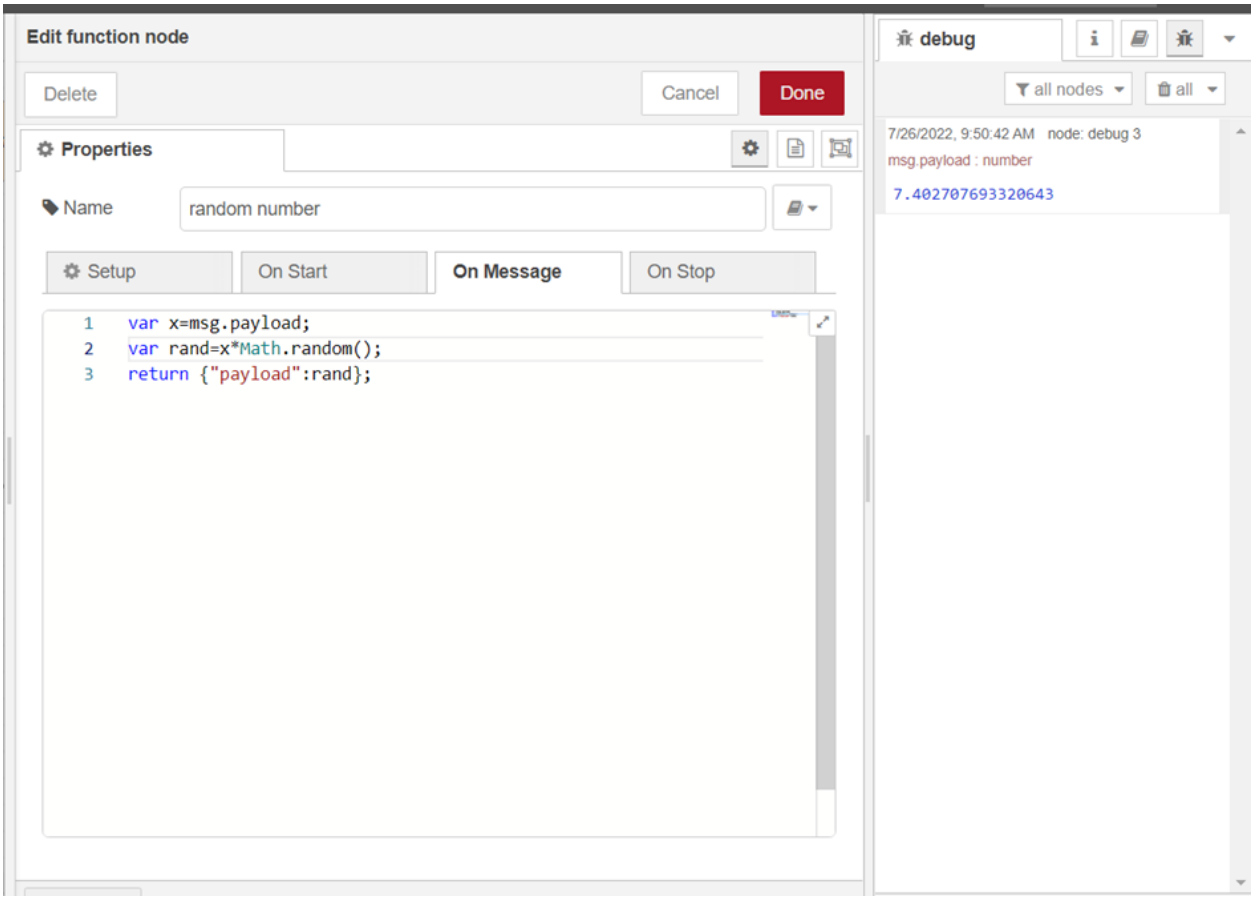
```
node-red
Microsoft Windows [Version 10.0.19043.1826]
(c) Microsoft Corporation. All rights reserved.

C:\Users\VAIBHAV>node -v
v16.16.0

C:\Users\VAIBHAV>node-red
26 Jul 09:02:07 - [info]

Welcome to Node-RED
===================

26 Jul 09:02:07 - [info] Node-RED version: v3.0.1
26 Jul 09:02:07 - [info] Node.js  version: v16.16.0
26 Jul 09:02:07 - [info] Windows_NT 10.0.19043 x64 LE
26 Jul 09:02:09 - [info] Loading palette nodes
26 Jul 09:02:12 - [info] Settings file  : C:\Users\VAIBHAV\.node-red\settings.js
26 Jul 09:02:12 - [info] Context store  : 'default' [module=memory]
26 Jul 09:02:12 - [info] User directory : \Users\VAIBHAV\.node-red
26 Jul 09:02:12 - [warn] Projects disabled : editorTheme.projects.enabled=false
26 Jul 09:02:12 - [info] Flows file     : \Users\VAIBHAV\.node-red\flows.json
26 Jul 09:02:12 - [info] Server now running at http://127.0.0.1:1880/
26 Jul 09:02:12 - [warn]

---------------------------------------------------------------------
Your flow credentials file is encrypted using a system-generated key.

If the system-generated key is lost for any reason, your credentials
file will not be recoverable, you will have to delete it and re-enter
your credentials.
```

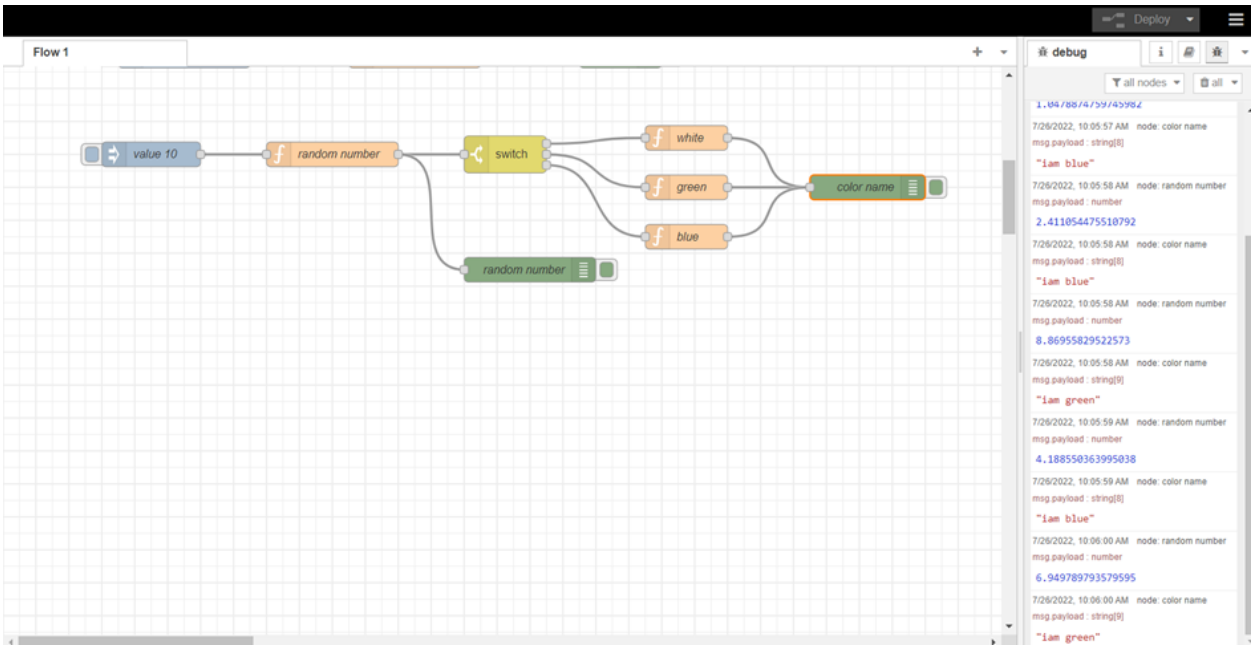
Then open the browser and start node red at the port 1880

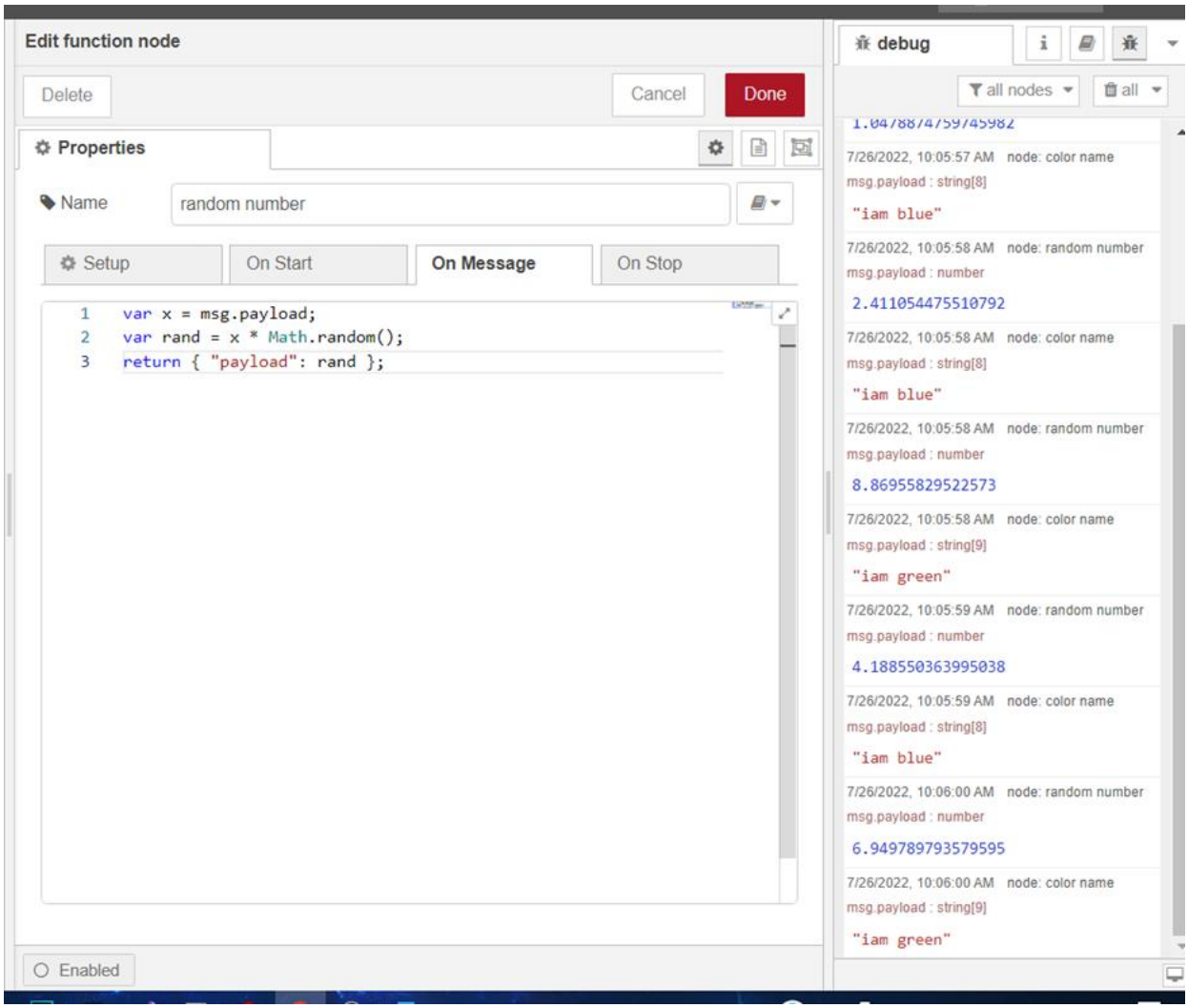
https://127.0.0.1:1880/




number value 10
random number
debug 3


Edit function node
Delete
Cancel
Done
Properties
Name
random number
Setup
On Start
On Message
On Stop
1 var x=msg.payload;
2 var rand=x*Math.random();
3 return {"payload":rand};
debug
all nodes
all
7/26/2022, 9:50:42 AM node: debug 3
msg.payload : number
7.402707693320643

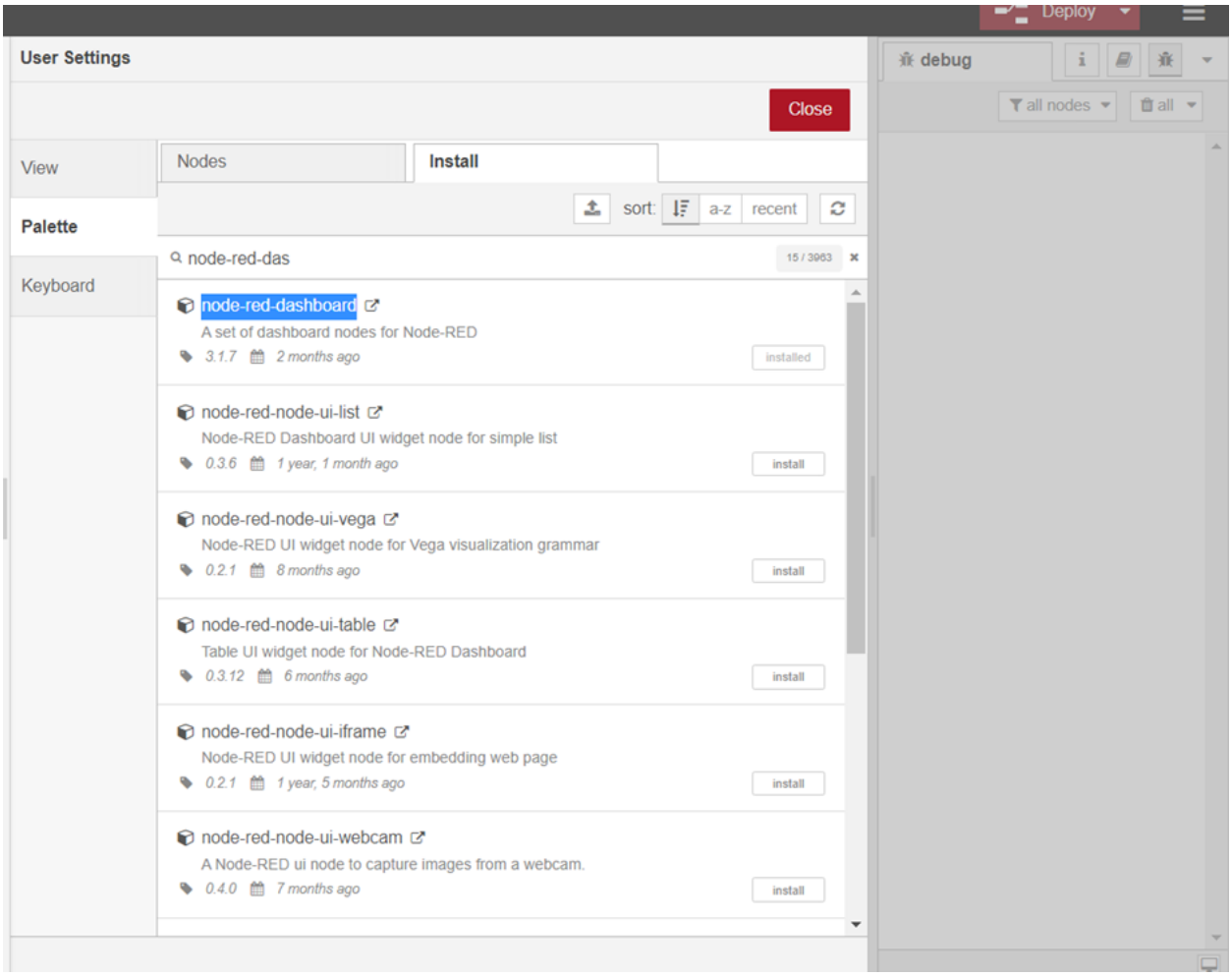

Deploy
Flow 1
value 10
random number
switch
white
green
blue
color name
random number
debug
all nodes
all
7/26/2022, 10:05:57 AM node: color name
msg.payload : string[8]
"iam blue"
7/26/2022, 10:05:58 AM node: random number
msg.payload : number
2.411054475510792
7/26/2022, 10:05:58 AM node: color name
msg.payload : string[8]
"iam blue"
7/26/2022, 10:05:58 AM node: random number
msg.payload : number
8.86955829522573
7/26/2022, 10:05:58 AM node: color name
msg.payload : string[9]
"iam green"
7/26/2022, 10:05:59 AM node: random number
msg.payload : number
4.188550363995038
7/26/2022, 10:05:59 AM node: color name
msg.payload : string[8]
"iam blue"
7/26/2022, 10:06:00 AM node: random number
msg.payload : number
6.949789793579595
7/26/2022, 10:06:00 AM node: color name
msg.payload : string[9]
"iam green"

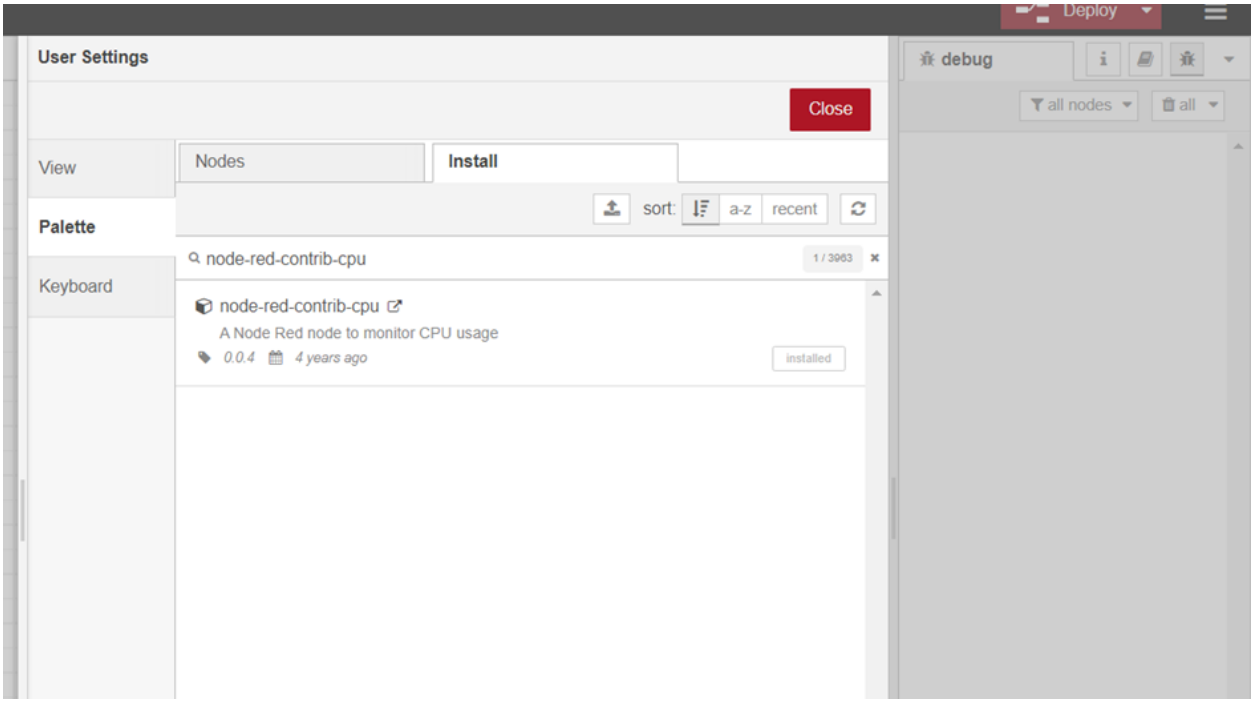


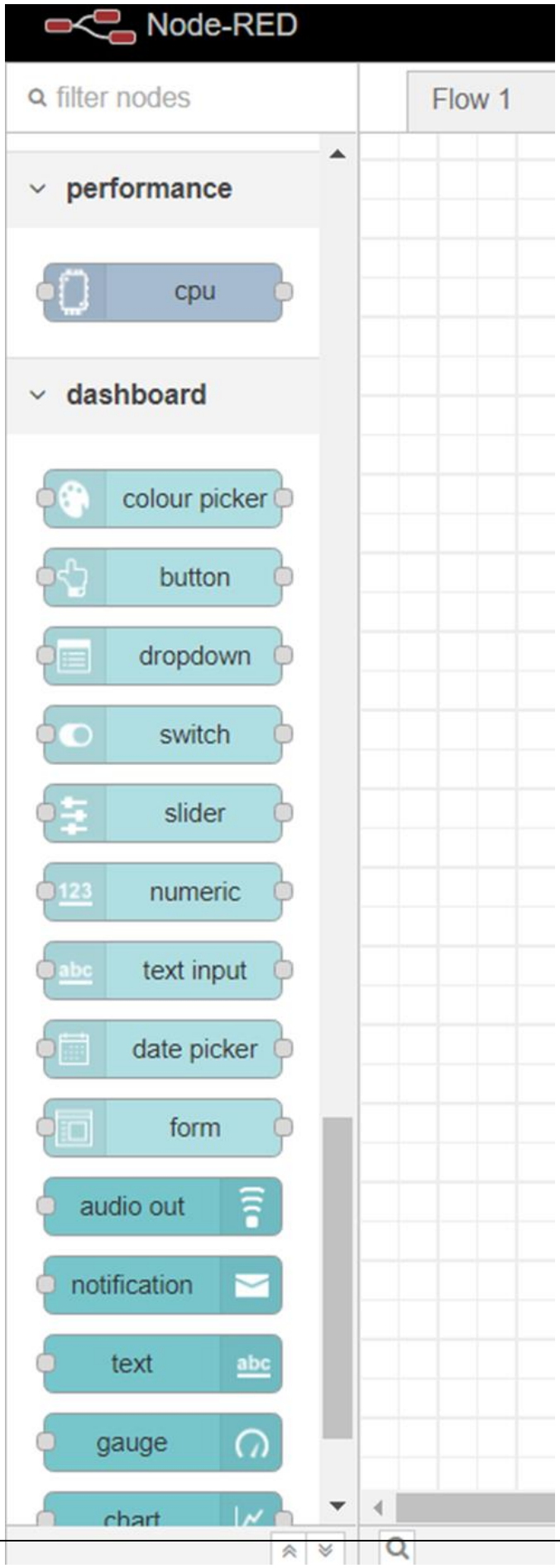
Install pallet

node-red-contrib-cpu

Node-red-dashboard

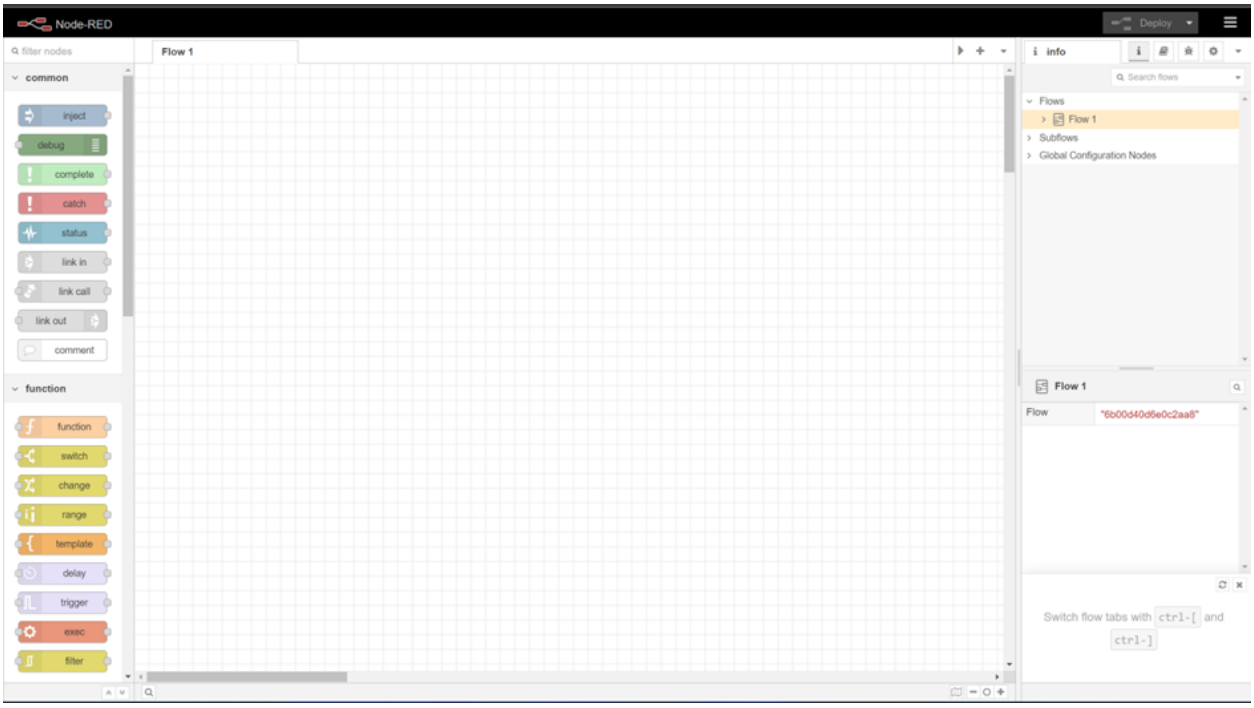

Deploy
User Settings
Close
View
Palette
Keyboard
Nodes
Install
sort:
a-z
recent
node-red-das
15 / 3963
node-red-dashboard
A set of dashboard nodes for Node-RED
3.1.7
2 months ago
installed
node-red-node-ui-list
Node-RED Dashboard UI widget node for simple list
0.3.6
1 year, 1 month ago
install
node-red-node-ui-vega
Node-RED UI widget node for Vega visualization grammar
0.2.1
8 months ago
install
node-red-node-ui-table
Table UI widget node for Node-RED Dashboard
0.3.12
6 months ago
install
node-red-node-ui-iframe
Node-RED UI widget node for embedding web page
0.2.1
1 year, 5 months ago
install
node-red-node-ui-webcam
A Node-RED ui node to capture images from a webcam.
0.4.0
7 months ago
install
debug
all nodes
all

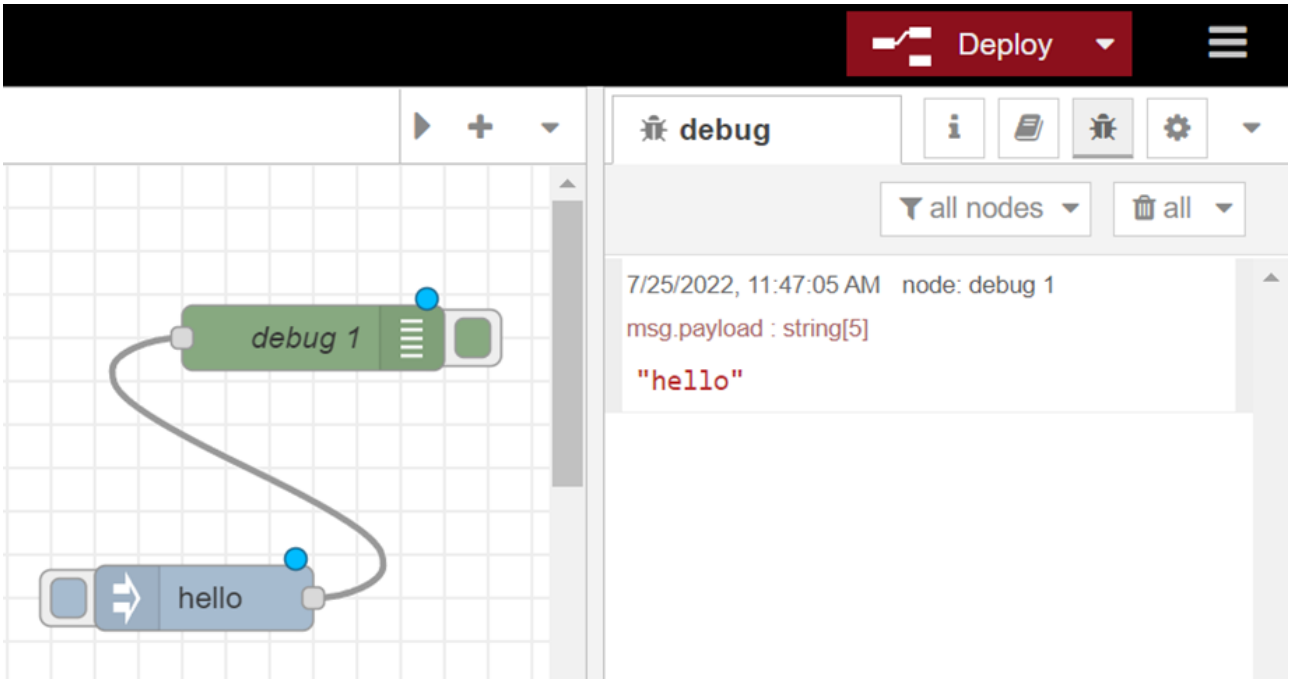

Deploy
User Settings
Close
View
Palette
Keyboard
Nodes
Install
sort:
a-z
recent
node-red-contrib-cpu
1 / 3963
node-red-contrib-cpu
A Node Red node to monitor CPU usage
0.0.4
4 years ago
installed
debug
all nodes
all

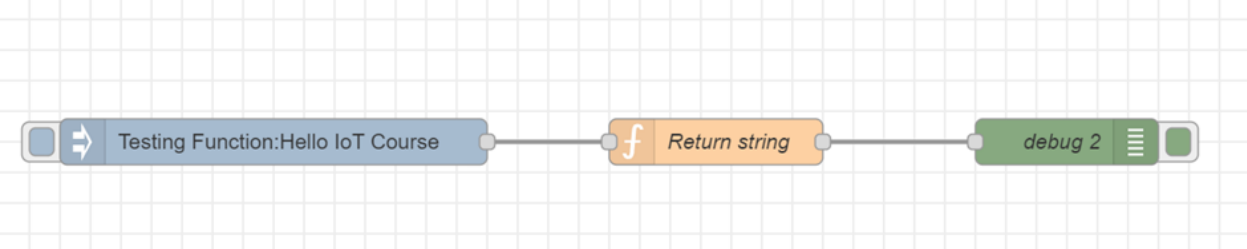

Node-RED
filter nodes
Flow 1
performance
cpu
dashboard
colour picker
button
dropdown
switch
slider
numeric
text input
date picker
form
audio out
notification
text
gauge
chart

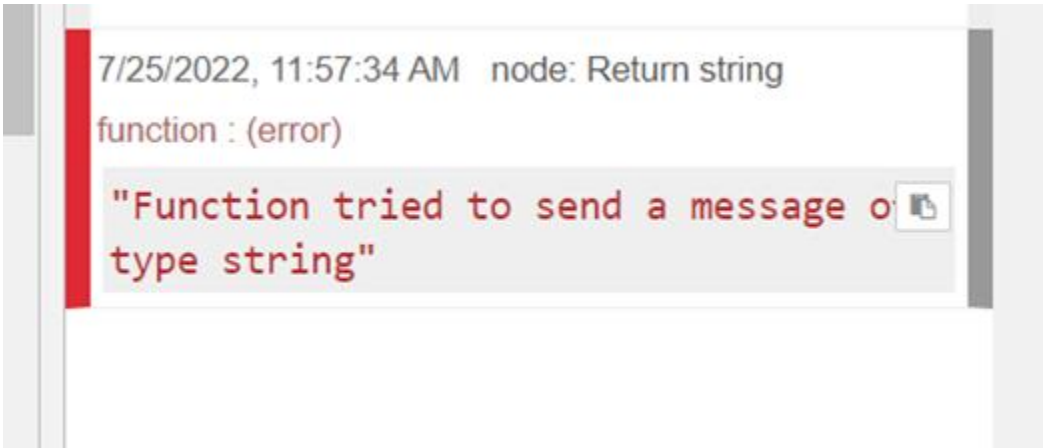
Practical 4

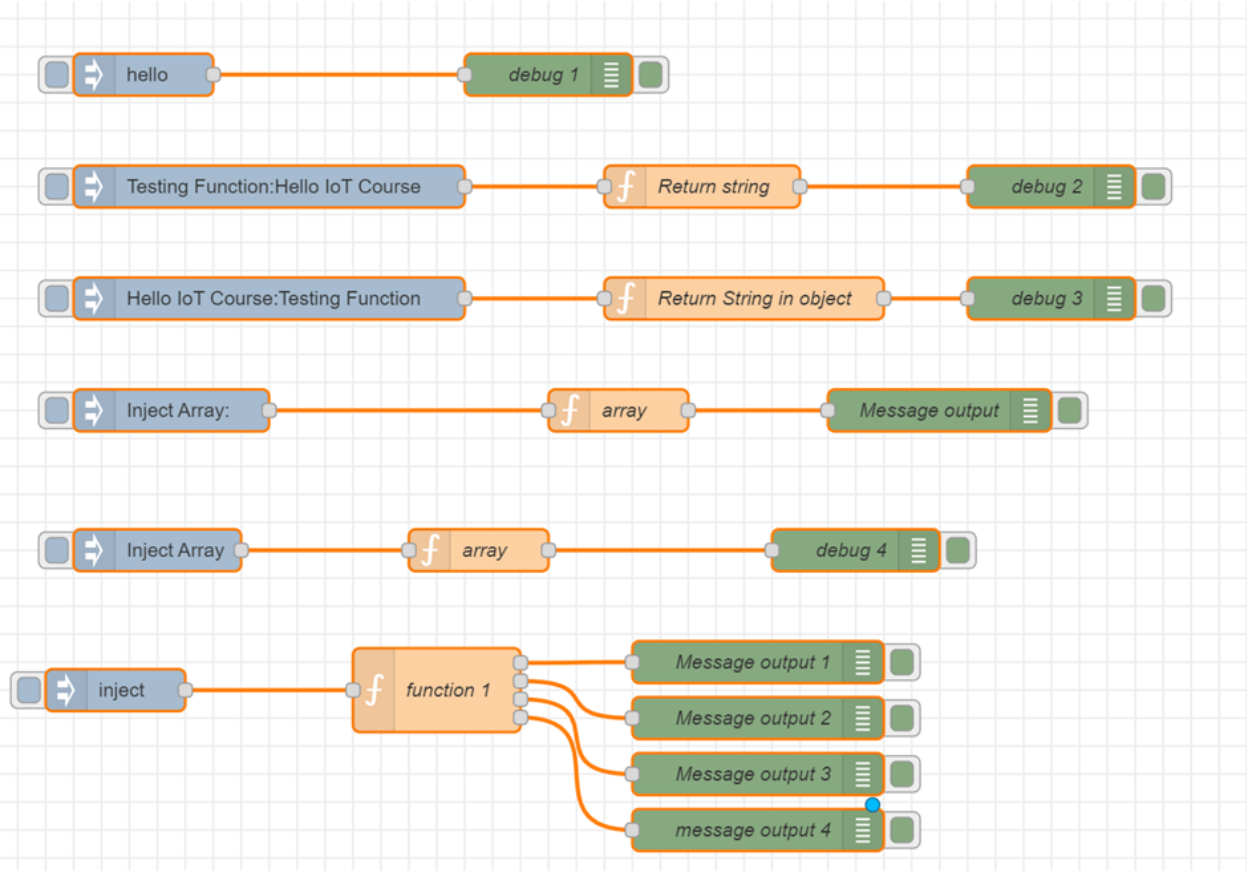
Practical Name: Introducing the inject, function, debug and switch nodes.

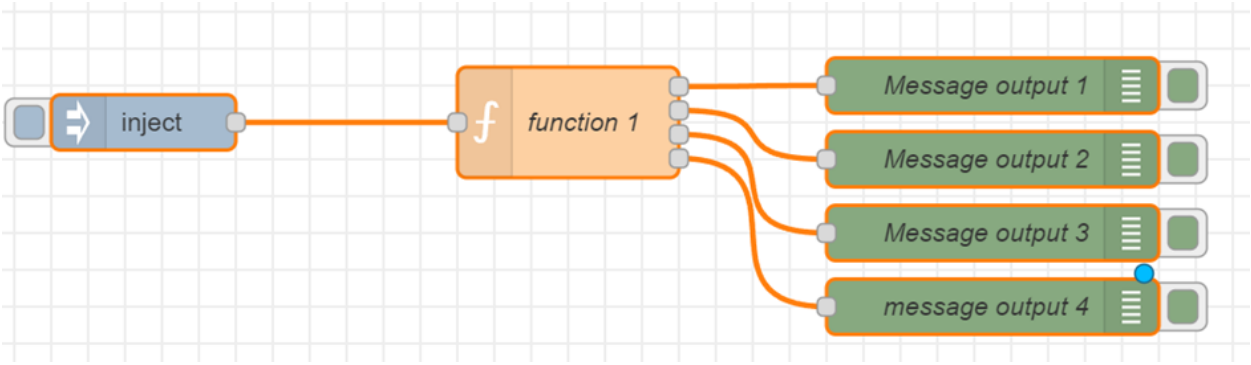





Testing Function:Hello IoT Course
Return string
debug 2

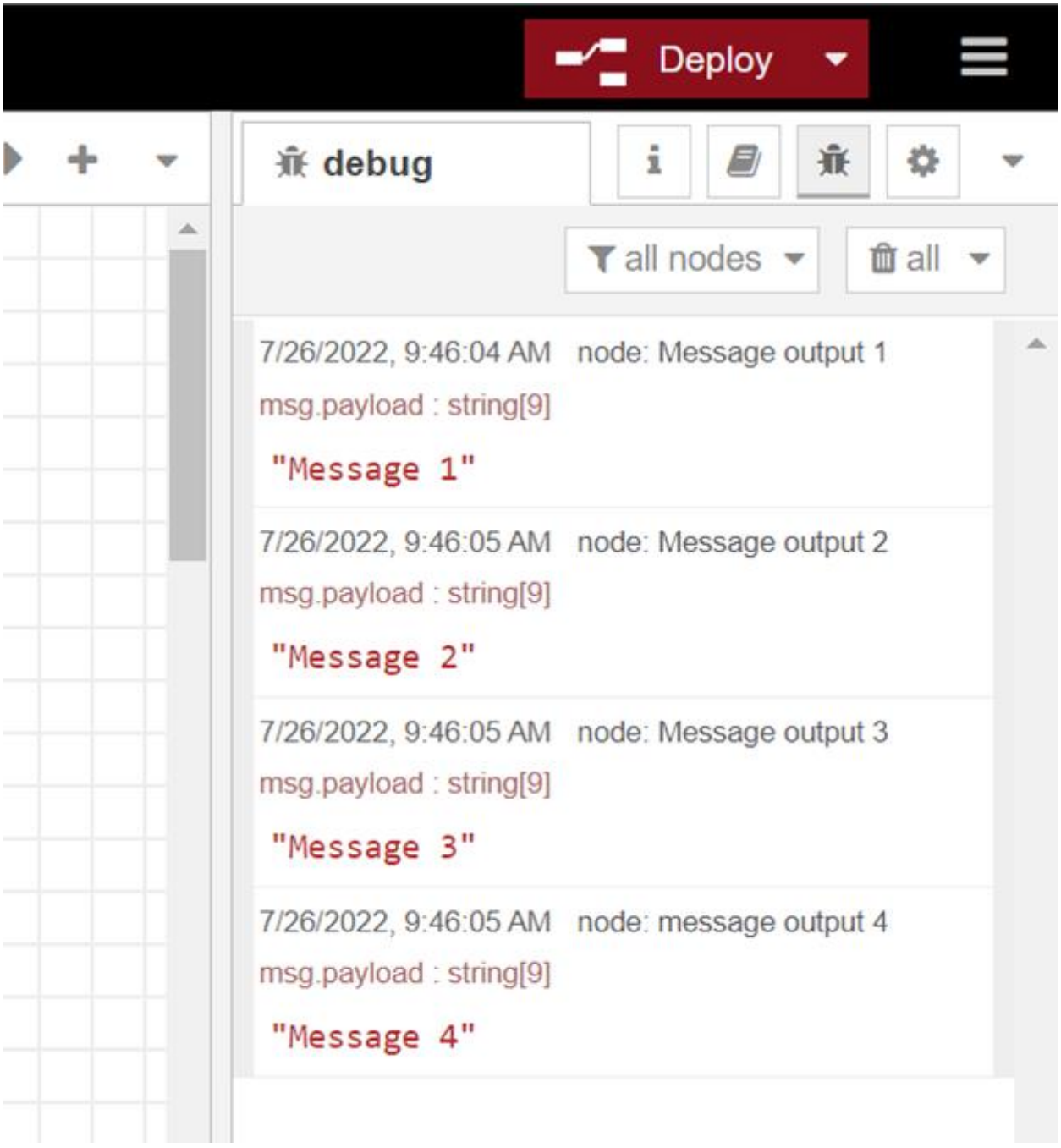

7/25/2022, 11:57:34 AM node: Return string
function : (error)
"Function tried to send a message o
type string"

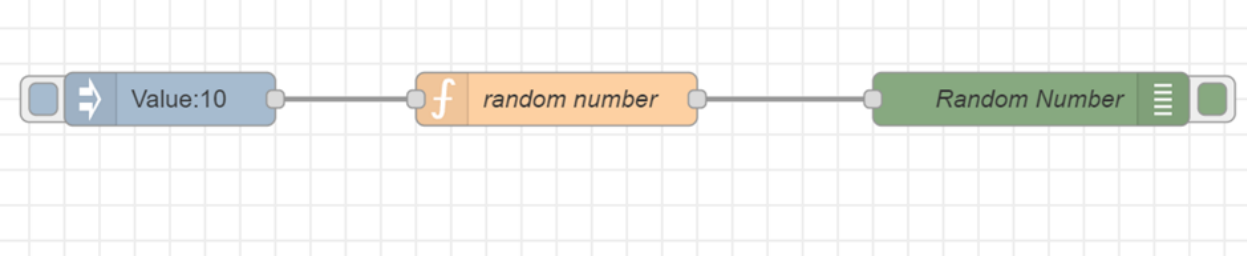

hello
debug 1
Testing Function:Hello IoT Course
Return string
debug 2
Hello IoT Course:Testing Function
Return String in object
debug 3
Inject Array:
array
Message output
Inject Array
array
debug 4
inject
function 1
Message output 1
Message output 2
Message output 3
message output 4

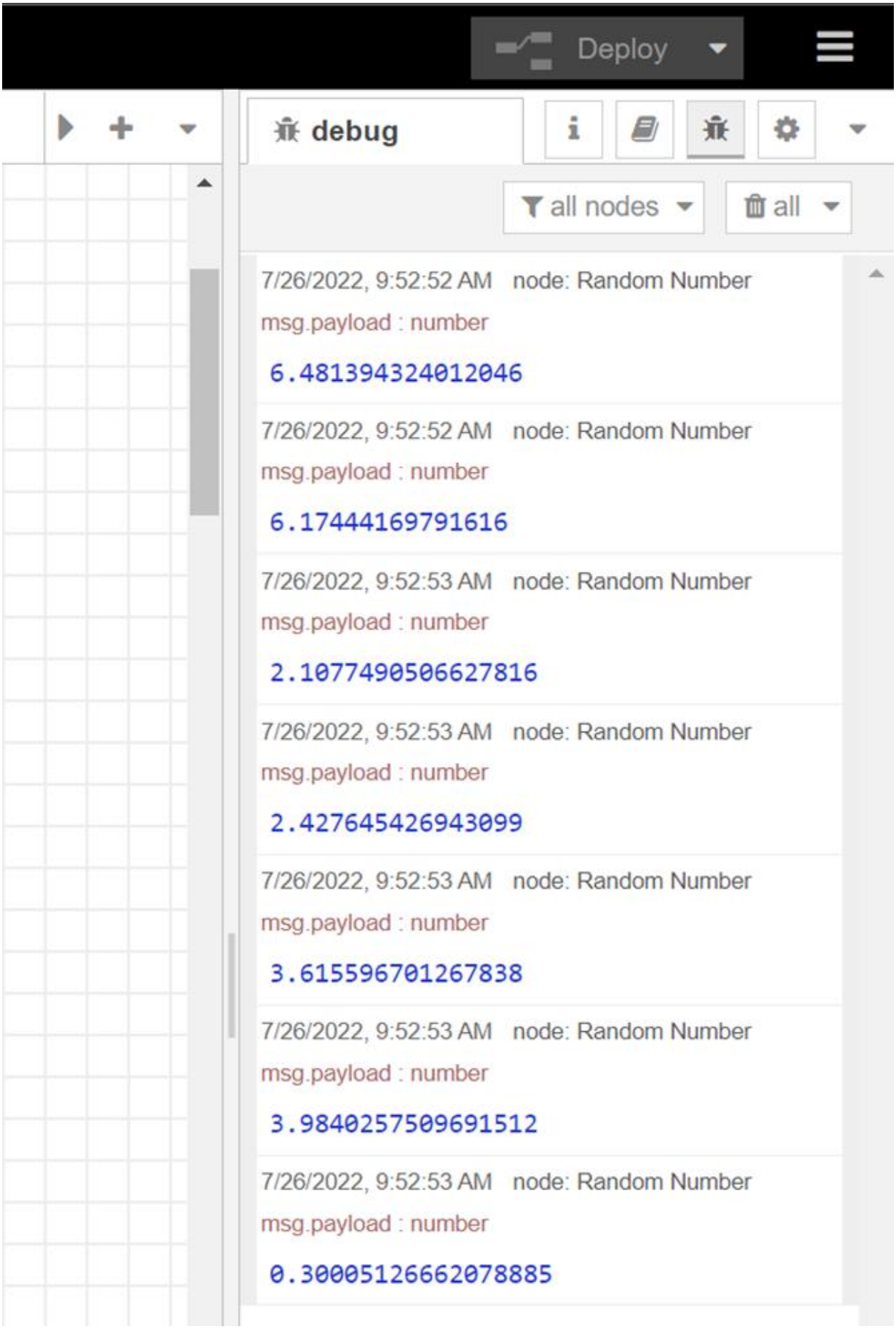

inject
function 1
Message output 1
Message output 2
Message output 3
message output 4

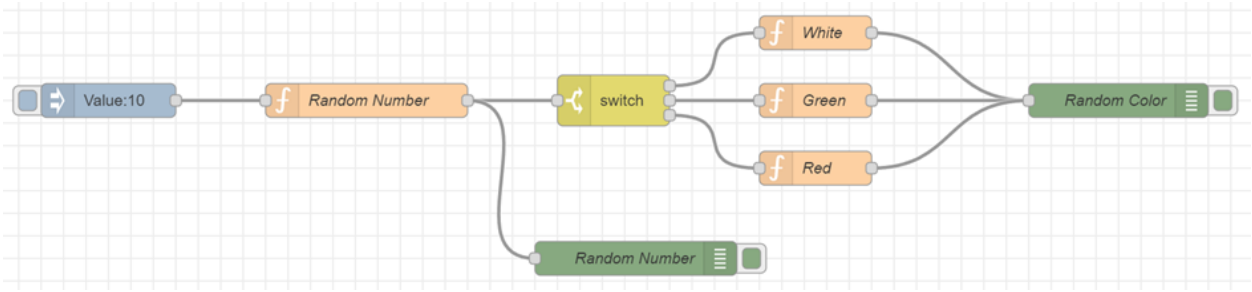
Practical 5

Practical Name: Random number generator with selection of color. Introducing the HTTP node.




Value:10
random number
Random Number

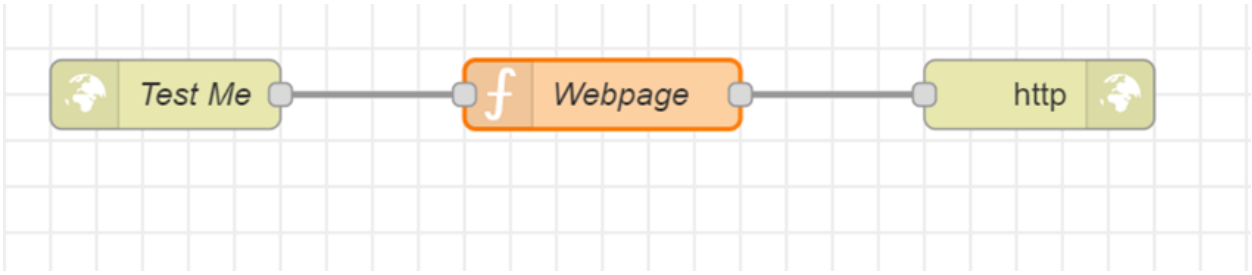

Deploy
debug
all nodes
all
7/26/2022, 9:52:52 AM node: Random Number
msg.payload : number
6.481394324012046
7/26/2022, 9:52:52 AM node: Random Number
msg.payload : number
6.17444169791616
7/26/2022, 9:52:53 AM node: Random Number
msg.payload : number
2.1077490506627816
7/26/2022, 9:52:53 AM node: Random Number
msg.payload : number
2.427645426943099
7/26/2022, 9:52:53 AM node: Random Number
msg.payload : number
3.615596701267838
7/26/2022, 9:52:53 AM node: Random Number
msg.payload : number
3.9840257509691512
7/26/2022, 9:52:53 AM node: Random Number
msg.payload : number
0.30005126662078885

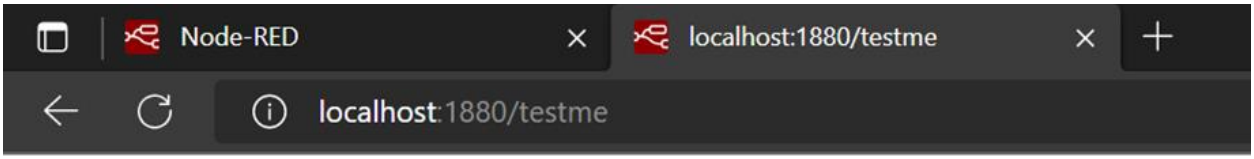


7/26/2022, 10:10:24 AM node: Random Color
msg.payload : string[8]
"I am Red"

7/26/2022, 10:10:27 AM node: Random Number
msg.payload : number
2.553326889911689

7/26/2022, 10:10:27 AM node: Random Color
msg.payload : string[10]
"I am Green"

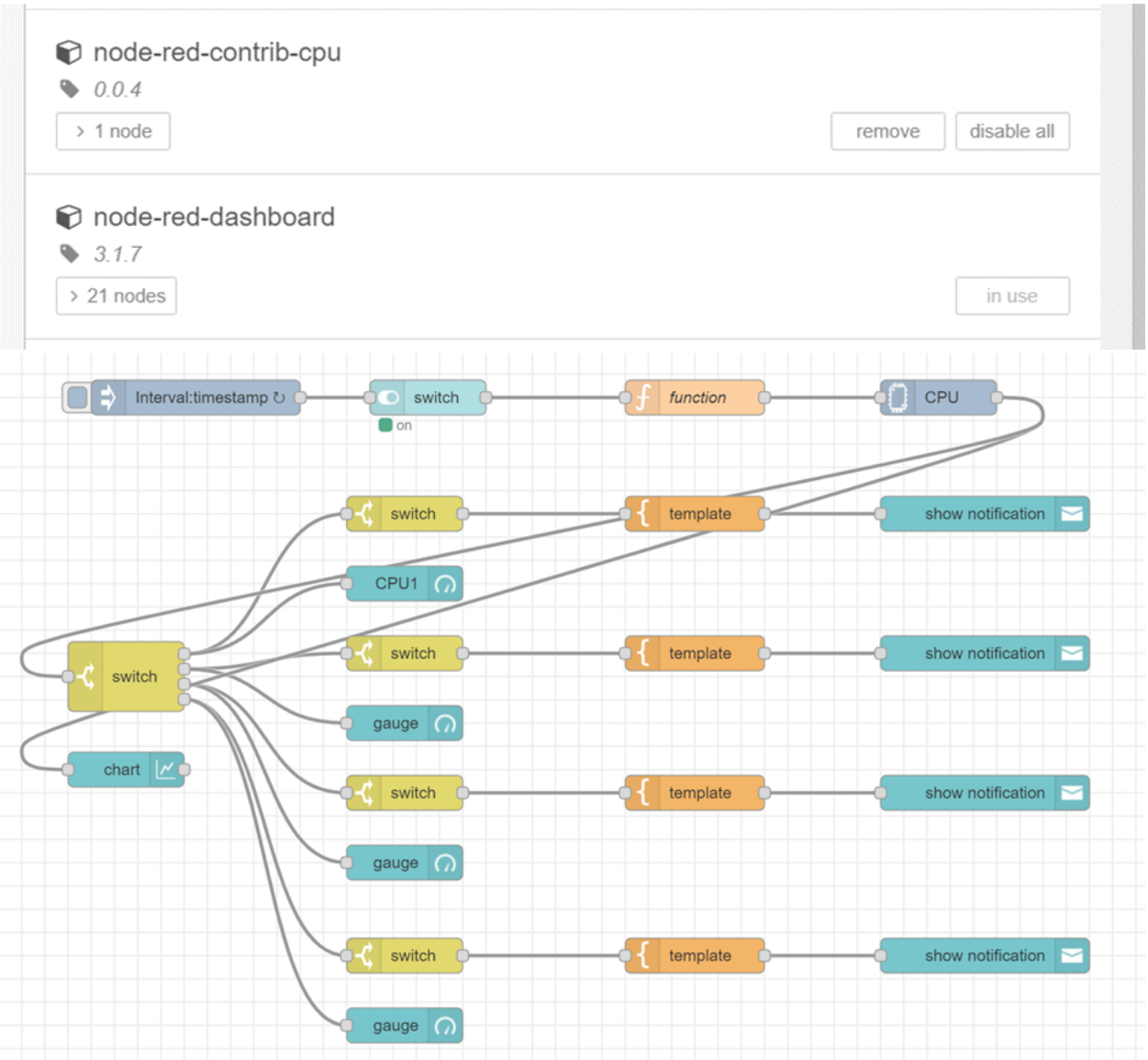


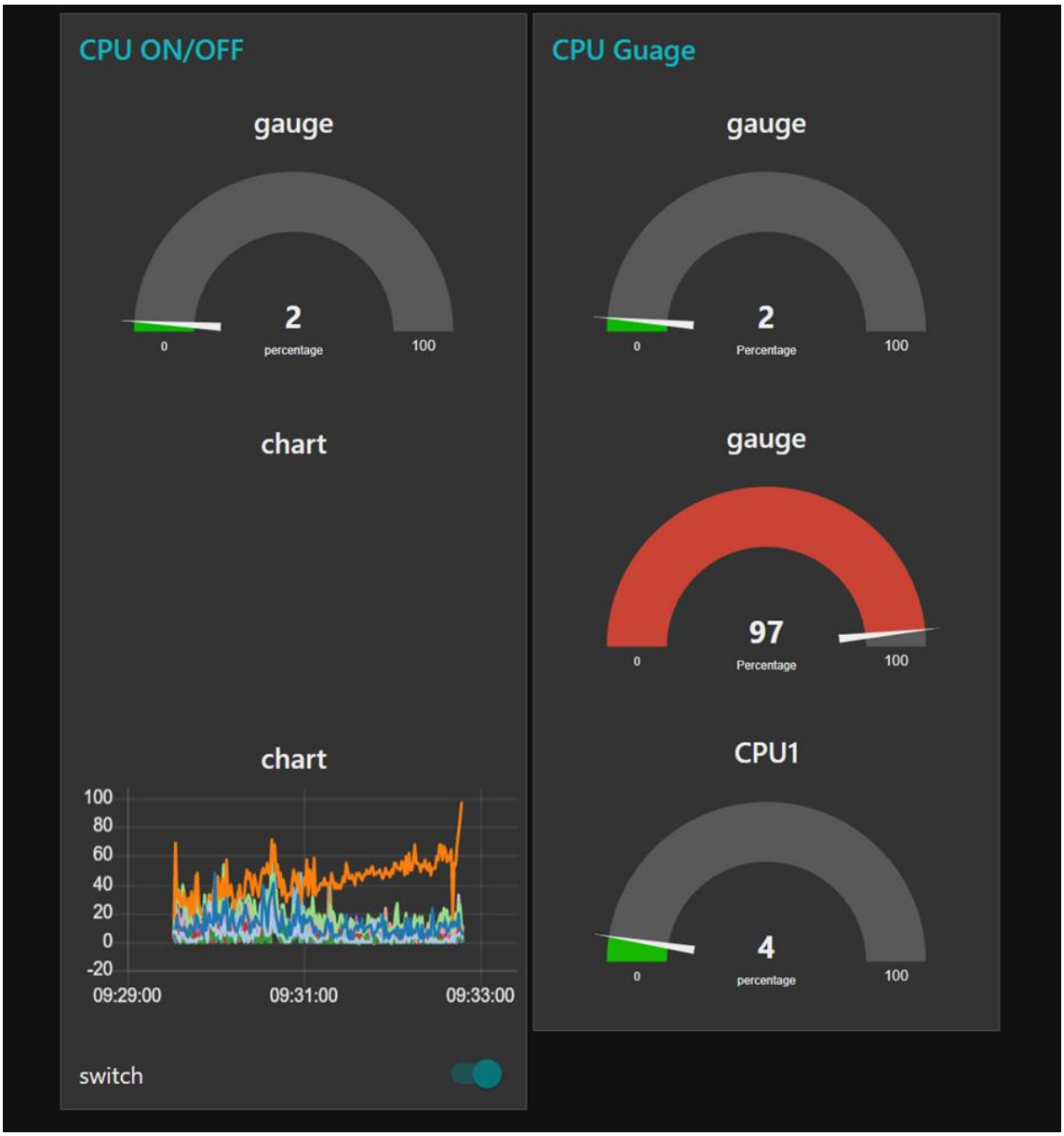


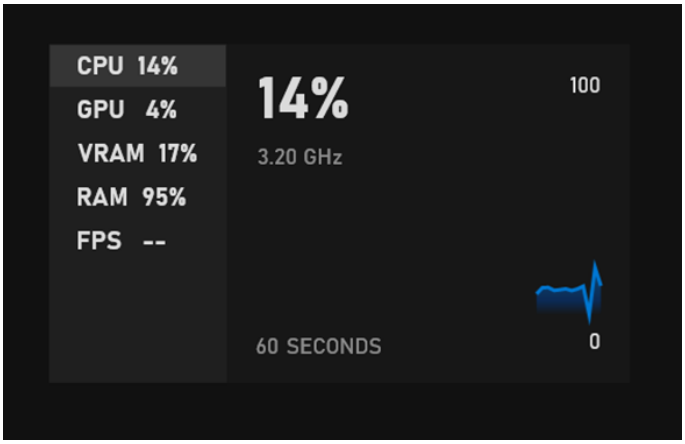
Hello World

Practical 6

Practical Name: CPU utilization flow.



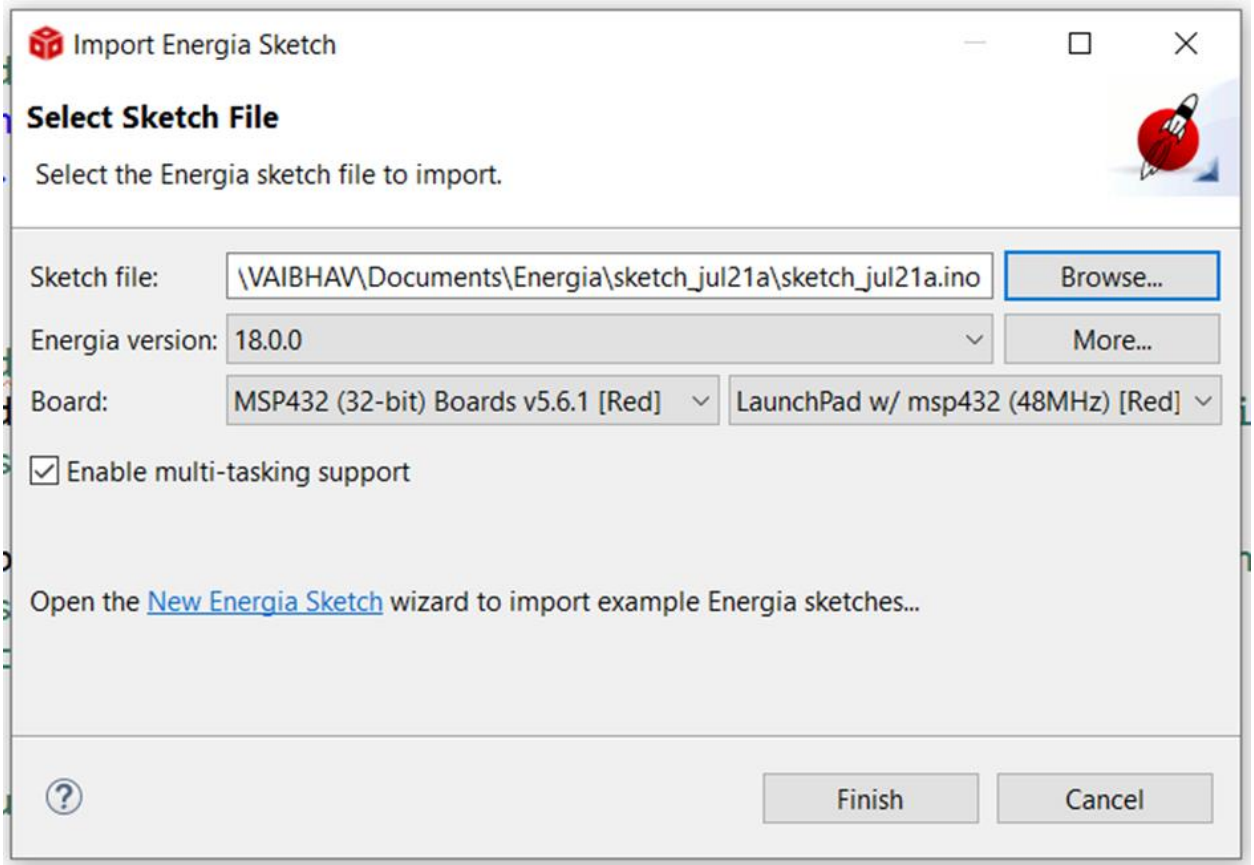

CPU ON/OFF
gauge
2
percentage
0
100
chart
chart
100
80
60
40
20
0
-20
09:29:00
09:31:00
09:33:00
switch
CPU Guage
gauge
2
Percentage
0
100
gauge
97
Percentage
0
100
CPU1
4
percentage
0
100


CPU 14%
GPU 4%
VRAM 17%
RAM 95%
FPS --
14%
3.20 GHz
100
60 SECONDS
0

Practical 7

Practical Name: WiFi Setup

Create a project



Write the code in Energia Sketch and save the file

sketch_jul21a.ion

```
#include <WiFi.h>

#include <SPI.h>

void setup() {

  // put your setup code here, to run once:

}

void loop() {
```

```
  // put your main code here, to run repeatedly:

}
```

main.css

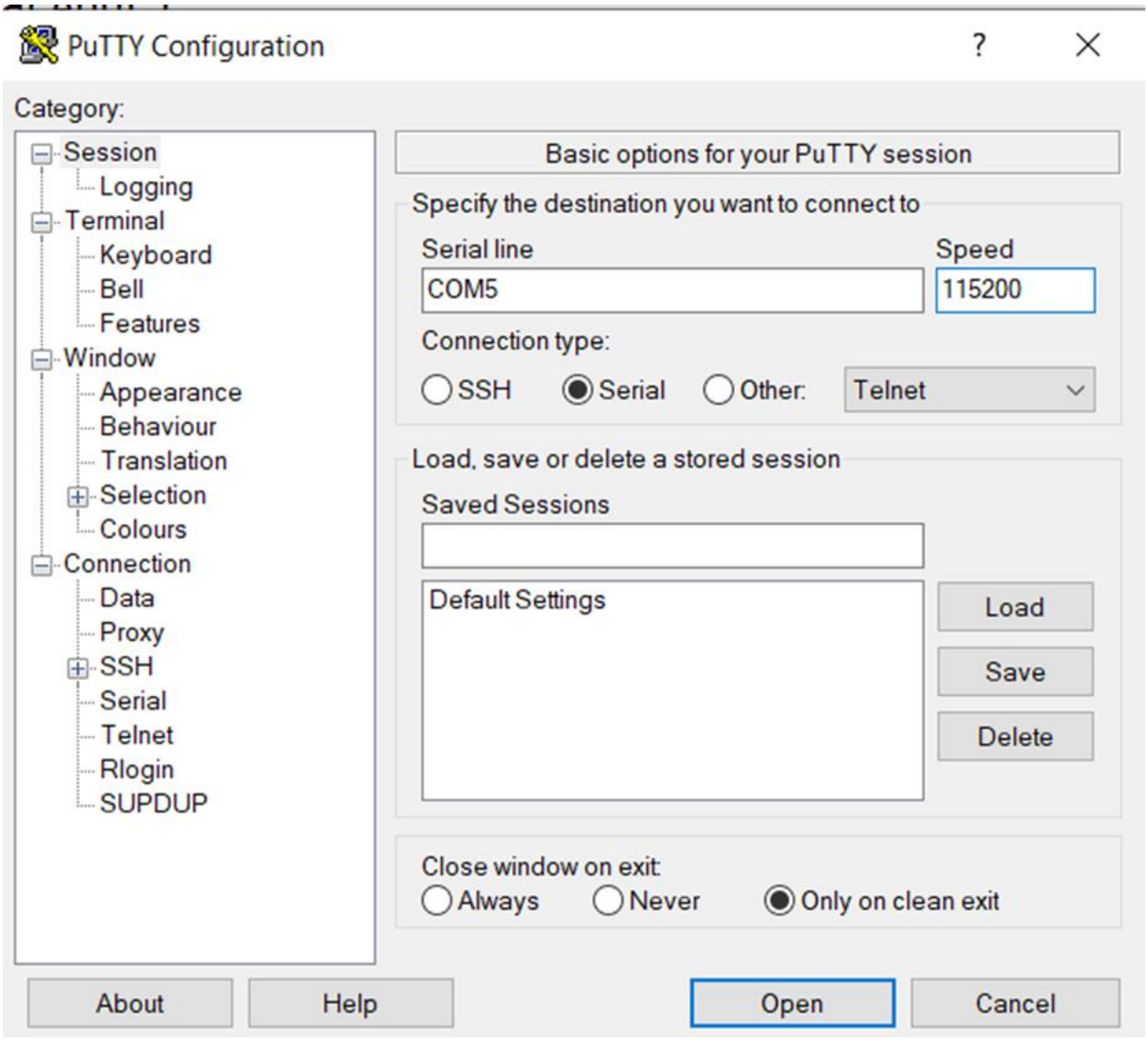
```
#include <WiFi.h>

#include <SPI.h>

//#define SSID "octanauts"

//#define PASSWORD "aditya30"

IPAddress shieldIP,subnetMask,gatewayIP; //IPAddress is a datatype , all others are variables of type IPAddres uint8_t rssi;//unsigned interger of 8 bits

uint8_t networkId;

byte macAddr[6];// mac address is 6 bytes // physical address of device is mac add

byte encryptionType;

//char ssid[]="vivoY73";// my cell phone

char ssid[]="VK";

/*

 char ssid[]="vK";

 char password[]="";

 */

void setup() {

  // put your setup code here, to run once:

    Serial.begin(115200);//Serial is class and begin is method all present in SPI library

    //putty is a terminal emulator

    //it will connnect the port and device at a given speed

    Serial.print("connecting to WIFI..");

    while(WiFi.begin(ssid)!=WL_CONNECTED)//for cell phone //WL_CONNECTED while it is not connected

        //while(WiFi.begin(ssid.password)!=WL_CONNECTED)
```

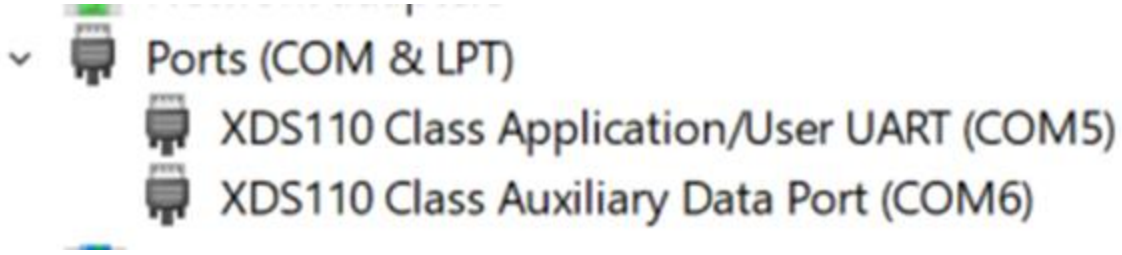
```
  {
    Serial.print(".");
    delay(1);
  }
  Serial.println("");
  Serial.print("Wifi Connected , Fetching Wifi Sheild's IP address :");
  while(WiFi.localIP()==INADDR_NONE){
    Serial.print(".");
    delay(1);
  }
  shieldIP = WiFi.localIP();//WIFI Method , local IP takes IP address and stores in var in IPADRESS DATATYPE
  Serial.println(shieldIP);
  Serial.print("Access Point name:");
  Serial.println(ssid);
  Serial.print("Signal Strength");//
  rssi=WiFi.RSSI();//it fecthes the signal strength
  Serial.println(rssi); //RSSI-Recived signal strength indication
  uint8_t networkId= WiFi.scanNetworks();
  Serial.print("number of access points in range:");
  Serial.println(networkId);
  for(int i=1;i<=networkId;i++){
    Serial.print("Name of Access points and encryption type:");
   Serial.print(WiFi.SSID(i));
    Serial.print(",");
    encryptionType=WiFi.encryptionType(i);
    //Serial.println(encryptionType,HEX);
```

```
        Serial.println(encryptionType,DEC);
    }
    subnetMask = WiFi.subnetMask();
    Serial.print("Subnet Mask:");
    Serial.println(subnetMask);
    gatewayIP=WiFi.gatewayIP();
    Serial.print("Gateway IP Address:");
    Serial.println(gatewayIP);
    WiFi.macAddress(macAddr);
    Serial.print("Mac Address of Sheild:");
    for(int i=0;i<6;i++){
        Serial.print(macAddr[i],HEX);
        if(i<=4)
            Serial.print(':');
        else
            Serial.println();
    }
}
void loop() {
  // put your main code here, to run repeatedly:
}
```

Putty terminal is need to connect the port and device at given speed.

Setting up the putty configuration:


PuTTY Configuration
Category:
Session
Logging
Terminal
Keyboard
Bell
Features
Window
Appearance
Behaviour
Translation
Selection
Colours
Connection
Data
Proxy
SSH
Serial
Telnet
Rlogin
SUPDUP
Basic options for your PuTTY session
Specify the destination you want to connect to
Serial line
Speed
COM5
115200
Connection type:
SSH
Serial
Other:
Telnet
Load, save or delete a stored session
Saved Sessions
Default Settings
Load
Save
Delete
Close window on exit:
Always
Never
Only on clean exit
About
Help
Open
Cancel


Ports (COM & LPT)
XDS110 Class Application/User UART (COM5)
XDS110 Class Auxiliary Data Port (COM6)

Output:

COM5 - PuTTY

```
.....
.....connecti
ng to WIFI...
Wifi Connected , Fetching Wifi Sheild's IP address :.....192.168.40.125
Access Point name:123456789
Signal Strength199
number of access points in range:12
Name of Access points and encryption type:DIRECT-LXDESKTOP-P1Q9VR6ms02,2
Name of Access points and encryption type:SOMAIYA-WIFI,2
Name of Access points and encryption type:roshan,7
Name of Access points and encryption type:Parmeet,7
Name of Access points and encryption type:SOMAIYA-GUEST,7
Name of Access points and encryption type:SOMAIYA-WIFI,2
Name of Access points and encryption type:Redmi,7
Name of Access points and encryption type:123,7
Name of Access points and encryption type:123456789,7
Name of Access points and encryption type:Redmi Note 9 Pro Max,7
Name of Access points and encryption type:MOTO G10 POWER,7
Name of Access points and encryption type:(,,0
Subnet Mask:255.255.255.0
Gateway IP Address:192.168.40.168
Mac Address of Sheild:A8:1B:6A:99:BF:F8
```

COM5 - PuTTY

```
.....
.....connecting to WIFI...
Wifi Connected , Fetching Wifi Sheild's IP address :.....
.....192.168.171.196
Access Point name:vivoY73
Signal Strength206
number of access points in range:8
Name of Access points and encryption type:vivoY73,7
Name of Access points and encryption type:OPPO F19 Pro+,7
Name of Access points and encryption type:MOTOG10POWER,7
Name of Access points and encryption type:DIRECT-BxLAPTOP-RU5M5INVmsV7,2
Name of Access points and encryption type:DIRECT-JMKARANmsJt,2
Name of Access points and encryption type:mactavish747,7
Name of Access points and encryption type:BJr3-c2FydGhhay52azEz,7
Name of Access points and encryption type:(,,0
Subnet Mask:255.255.255.0
Gateway IP Address:192.168.171.189
Mac Address of Sheild:A8:1B:6A:99:C8:36
```

Practical 8

Practical Name: Analog To Digital Converter

1)Explain the ADC properties:

Analog to Digital Converter (ADC) is an electronic integrated circuit used to convert the analog signals such as voltages to digital or binary form consisting of 1s and 0s. Most of the ADCs take a voltage input as 0 to 10V, -5V to +5V, etc., and correspondingly produces digital output as some sort of a binary number.

Main features of ADC are:

- The sample rate of an ADC is nothing but how fast an ADC can convert the signal from analog to digital.
- Bit resolution is nothing but how much accuracy can an analog to digital converter can convert the signal from analog to digital

2)Explain the API used for configuring the ADC:

1)GPIO_setAsOutputPin(): Its NOT a digital OR operator,we want to use all 3 pins thats why we used Pipe operator GPIO_setAsPeripheralModuleFunctionInputPin() : potentiometer is connect in port 4 ,pin 7 becoz ADC exists in PIN 7 of port 4 and then digital signal goes to LED

2)ADC14_initModule() : It is called first to initialize the ADC14 module with the desired ADC14 clock, clock predivder and clock divider. ADC Noroute parameter means no internal analog source is user for the conversion.

3)ADC14_configureSingleSampleMode(ADC_MEM6,true) : It is executed with ADC_MEM6 as the target conversion memory register for input channel A6.The true boolean means that this single conversion is a repeat-signal-mode

4)ADC14_configureConversionMemory(ADC_MEM6,ADC_VREFPOS_AVCC_VREFNEG_VSS,ADC_INPUT_A6,false): It is used to set up the conversion memory register as ADC14MEM6 for the input analog channel A6. The ADC references are default reference voltages. The last Boolean value false indicates that this conversion is not a differential conversion instead it is single ended conversion.

5)ADC14_ setSampleHoldTime(): It is is used to set up the length of sample-and-hold during the AC operations. The first parameter controls the registers ADC14MEMO~ADC14MEM7 and ADC14MEM24~ADC14MEM31. Since A6 belongs to this range, we set the length as 64 ADC14CLK cycles. The second parameter is not used in this project, but it is also set to this value.

6) ADC14 enableSampleTimer() : It is called with the parameter ADC_AUTOMATIC_ ITERATION to enable the sample timer to repeat its trigger itself.

7) ADC14_enableConversion_ (): It only enables the conversion, but the conversion cannot be started until it is triggered by a trigger source. Generally, two API functions, ADC14 set_ SampleHoldTrigger() and ADC14_ toggleConversionTrigger (), can handle this trigger job. However, the latter is more powerful to trigger and start an ADC conversion.

8)An infinitive while (): loop is used starting at line 28 to repeatedly check the conversion results and assign them to the GPIO P2 pins P2.0-P2.3 to display them in a three-color LED.

9)ADC14 _isBusy(): It is tested with another conditional while() loop to see whether the ADC conversion is complete. A true is returned if the ADC is busy in conversion. This while() loop will not be released until a false is returned, which means that the ADC is not busy and a conversion has been done.
10)ADC14_getResult (): It is used for the conversion result stored in the ADC14MEM6 Register if a false is returned. Then the result is shift left by eight bits and assigned to the GPIO P2 to display it on the three-color LED.

Code:

```
#include <ti/devices/msp432p4xx/driverlib/driverlib.h>

#include<SLFS.h>

#include<WiFi.h>

#include<WiFiClient.h>

#include<WiFiServer.h>

#include<WiFiUdp.h>

// combinaton of energia and ccs functios IPAddress shieldIP,subnetMask,gatewayIP;
//IPAddress is a datatype , all others are variables of type IPAddress

uint8_t rssi;//unsigned interger of 8 bits

uint8_t networkId;

byte macAddr[6];// mac address is 6 bytes // physical address of device is mac add

byte encryptionType;

char ssid[]="vivoY73";// my cell phone

//char ssid[]="VK";
```

```
/*
 char ssid[]="vK";
 char password[]="";
 */
void setup() {
  // put your setup code here, to run once:
    Serial.begin(115200);//Serial is class and begin is method all present in SPI library
    //putty is a terminal emulator
    //it will connnect the port and device at a given speed
    Serial.print("connecting to WIFI..");
    while(WiFi.begin(ssid)!=WL_CONNECTED)//for cell phone //WL_CONNECTED while it is not connected
        //while(WiFi.begin(ssid.password)!=WL_CONNECTED)
    {
        Serial.print(".");
        delay(1);
    }
    Serial.println("");
    Serial.print("Wifi Connected , Fetching Wifi Sheild's IP address :");
    while(WiFi.localIP()==INADDR_NONE){
        Serial.print(".");
        delay(1);
    }
    shieldIP = WiFi.localIP();//WIFI Method , local IP takes IP address and stores in var in IPADRESS DATATYPE
    Serial.println(shieldIP);
    Serial.print("Access Point name:");
```

```
Serial.println(ssid);
Serial.print("Signal Strength");//
rssi=WiFi.RSSI();//it fecthes the signal strength
Serial.println(rssi); //RSSI-Recived signal strength indication
uint8_t networkId= WiFi.scanNetworks();
Serial.print("number of access points in range:");
Serial.println(networkId);
for(int i=1;i<=networkId;i++){
    Serial.print("Name of Access points and encryption type:");
    Serial.print(WiFi.SSID(i));
    Serial.print(",");
    encryptionType=WiFi.encryptionType(i);
    //Serial.println(encryptionType,HEX);
    Serial.println(encryptionType,DEC);
}

subnetMask = WiFi.subnetMask();
Serial.print("Subnet Mask:");
Serial.println(subnetMask);
gatewayIP=WiFi.gatewayIP();
Serial.print("Gateway IP Address:");
Serial.println(gatewayIP);
WiFi.macAddress(macAddr);
Serial.print("Mac Address of Sheild:");
for(int i=0;i<6;i++){
    Serial.print(macAddr[i],HEX);
```

```
    if(i<=4)
        Serial.print(':');
    else
        Serial.println();
  }
```

//ADC CODE STARTS

```
  GPIO_setAsOutputPin(GPIO_PORT_P2,GPIO_PIN0|GPIO_PIN1|GPIO_PIN2);
```

//its NOT a digital OR operator,we want to use all 3 pins thats why we used Pipe operator

```
GPIO_setAsPeripheralModuleFunctionInputPin(GPIO_PORT_P4,GPIO_PIN7,GPIO_TERTIARY_MODULE_FUNCTION);
```

//potentiometer is connect in port 4 ,

//pin 7 becoz ADC exists in PIN 7 of port 4 and then digital signal goes to LED

```
ADC14_initModule(ADC_CLOCKSOURCE_MCLK,ADC_PREDIVIDER_1,ADC_PREDIVIDER_1,ADC_NOROUTE);
```

//initModule requires 4 parameters//clock is started

//predivider is divding the clock to make it small

//master clock is 3 MHz which is divider by 2 divders

// ADC Noroute means use ADC to connect to that pin

// more the predivider more the numbers we can get

```
ADC14_configureSingleSampleMode(ADC_MEM6,true);
```

//ADC_MEM6 internal memory for storing converted result

```
ADC14_configureConversionMemory(ADC_MEM6,ADC_VREFPOS_AVCC_VREFNEG_VSS,ADC_INPUT_A6,false);
```

//2nd parameter is 3.3v i.e the refrences voltage ,3rd para is use that channel 6 inside MC and store it to the mem 6,false is it will run only once

```
/*changing the vaules to 64 to 32 and 4*/
ADC14_setSampleHoldTime(ADC_PULSE_WIDTH_32,ADC_PULSE_WIDTH_4);
```

```
//it will hold the signal for 64 clock cycle , 2 times becoz it require 2 parameter ; our MC is 32bit so it divided into 16-16 bits channels 2nd para is useless as of now
ADC14_setResolution(ADC_12BIT);
ADC14_enableSampleTimer(ADC_AUTOMATIC_ITERATION);//it will run automatically
ADC14_enableModule();//for activating the module
ADC14_enableConversion();//start conversion
ADC14_toggleConversionTrigger();// trigger the conversion again and again

   // ADC has to be given some reference voltage means range of voltage to work

}
void loop() {
  // put your main code here, to run repeatedly:
    int result,regressedData1;
    float regressedData;

 while(!ADC14_isBusy());//it will wait till the dADC works to convert the signals
 result=ADC14_getResult(ADC_MEM6);
P2OUT=result>>8;//right shift operator , for using multiple colors by changing bits
 Serial.println(result);
delay(500);
ADC14_toggleConversionTrigger();// trigger the conversion again and again
}
```

34			
35	slope	0.786296	
36	intecept	7.695073	
37	corelation	0.999397	
38			

Slope= slope(TRUTH,FINAL)

Intercept=intercept(TRUTH,FINAL)

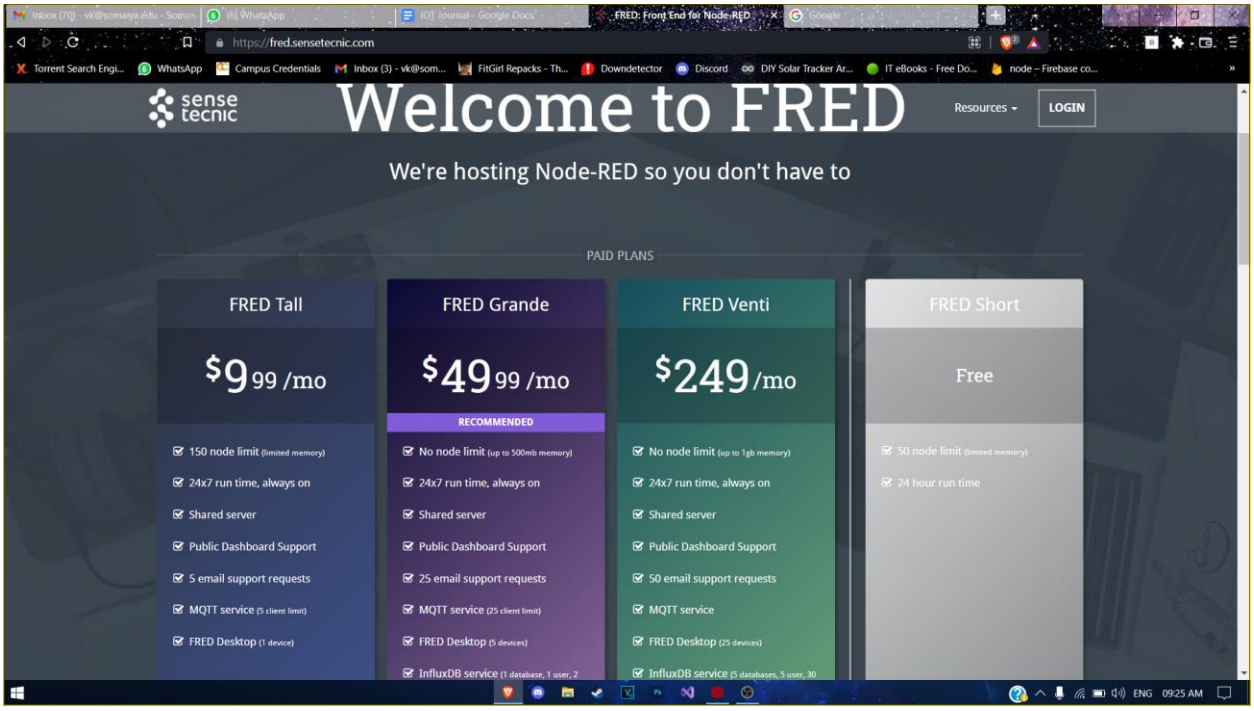
Corelation=correal(TRUTH,FINAL)

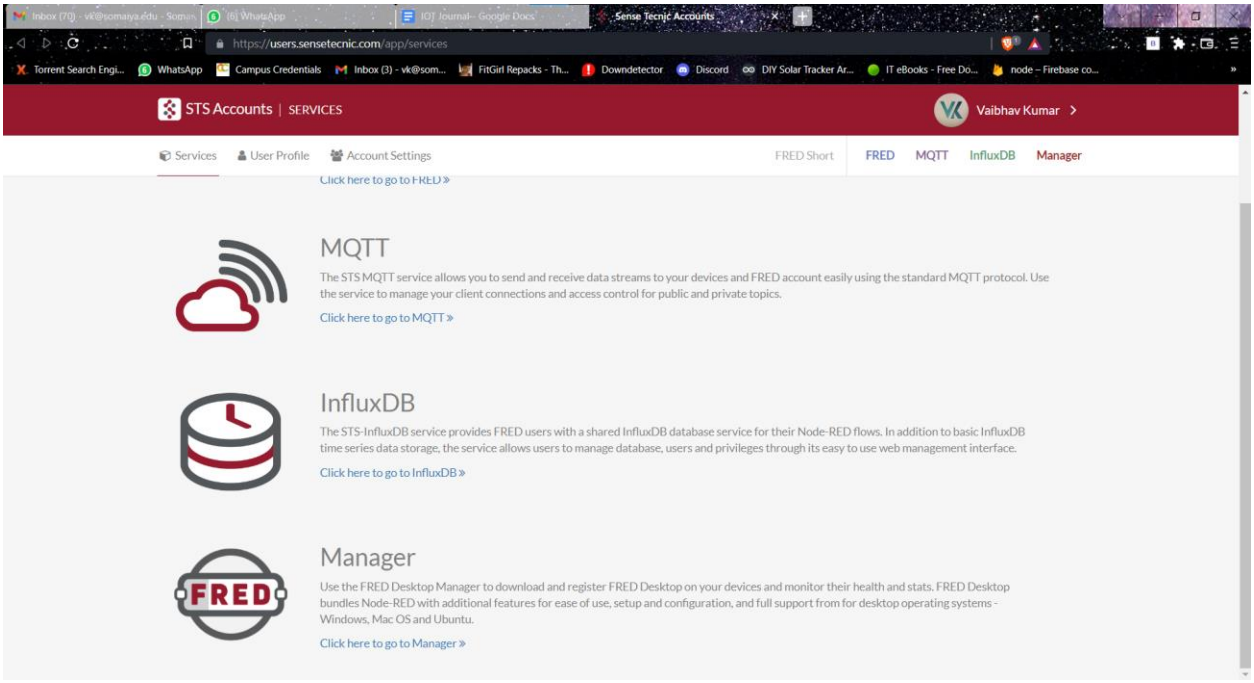
Practical 9

Practical Name: Sending Raw data to the cloud

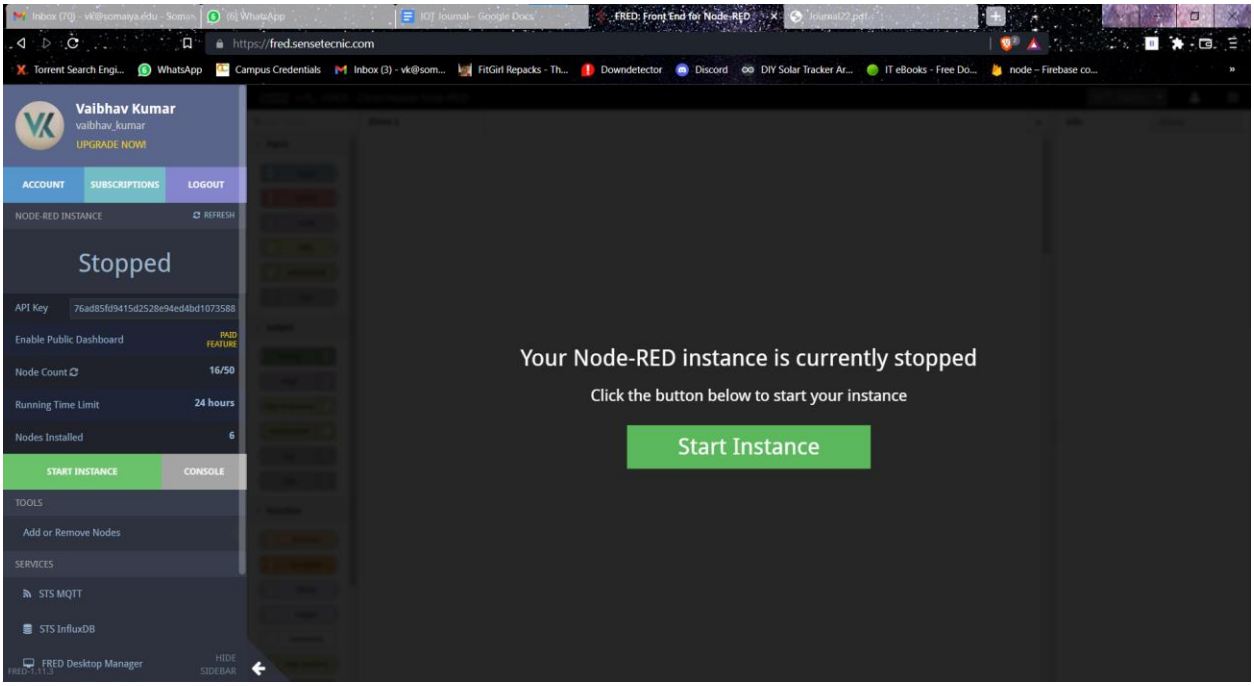
1)Explain the MQTT input and output node.

Using protocol mqtt its is most popular and most used protocol in IOT.It works on publish subscribe model.It is located across the world and many non profit organizations used this protocol.It requires port 1883.The url of server is broker.hivemq.com.

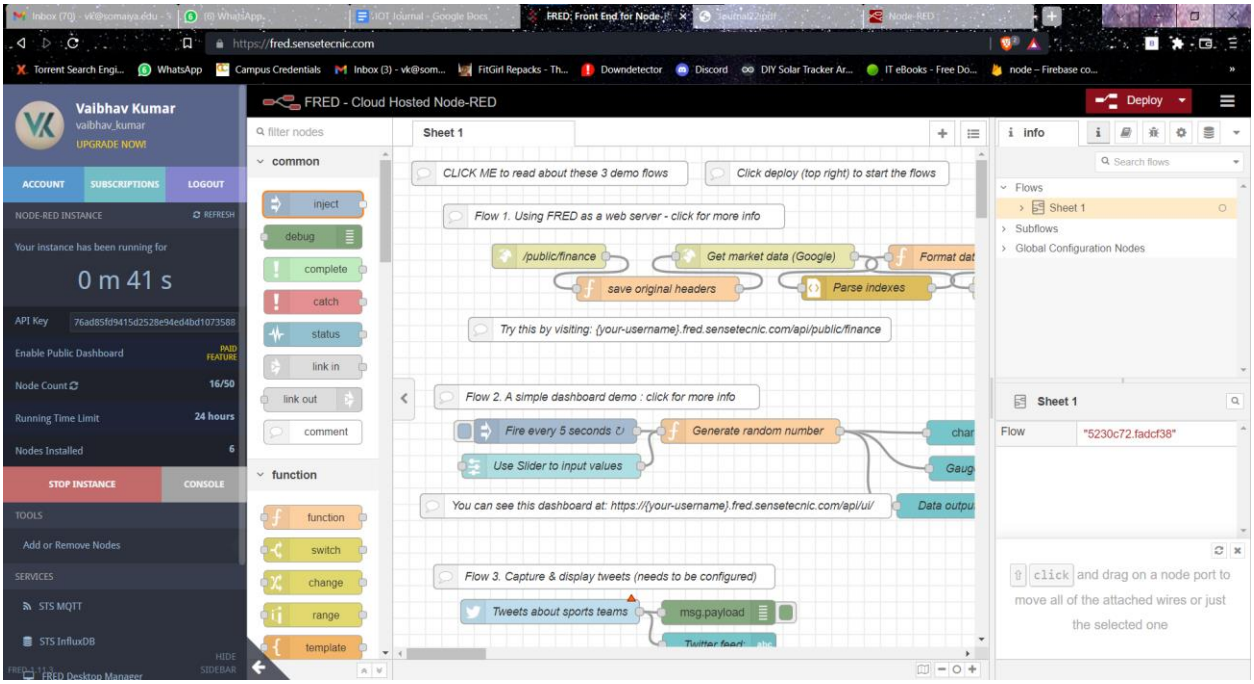




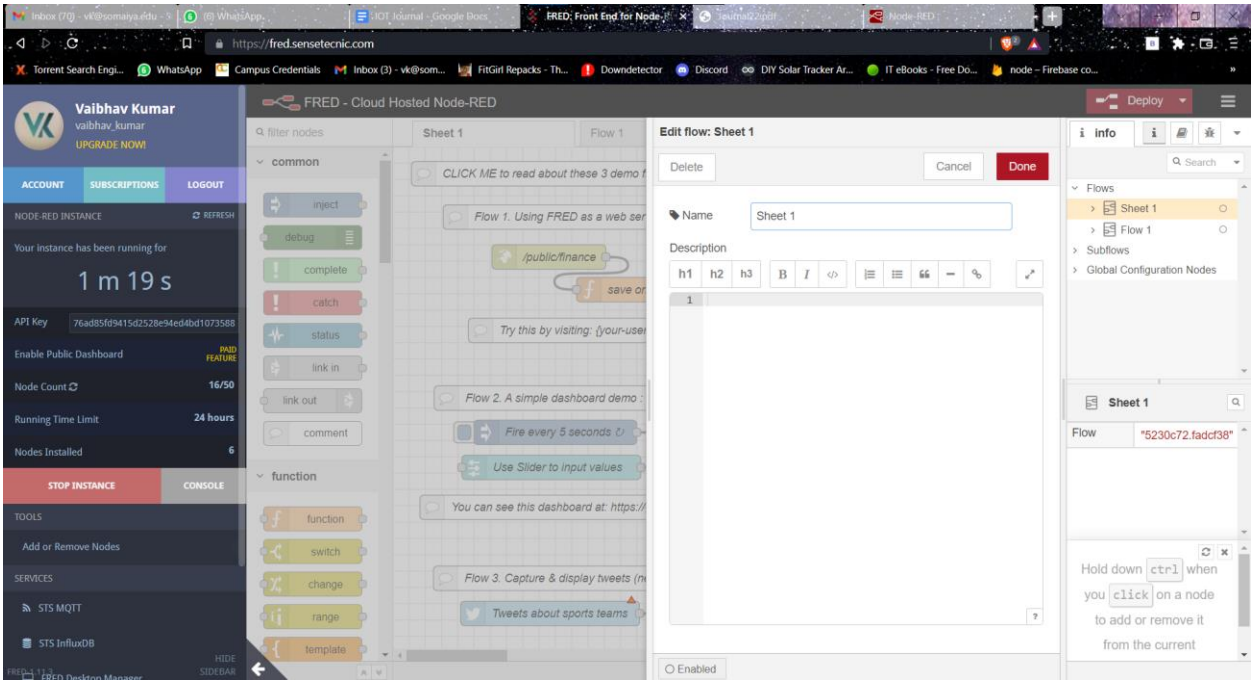
Click on to go to FRED

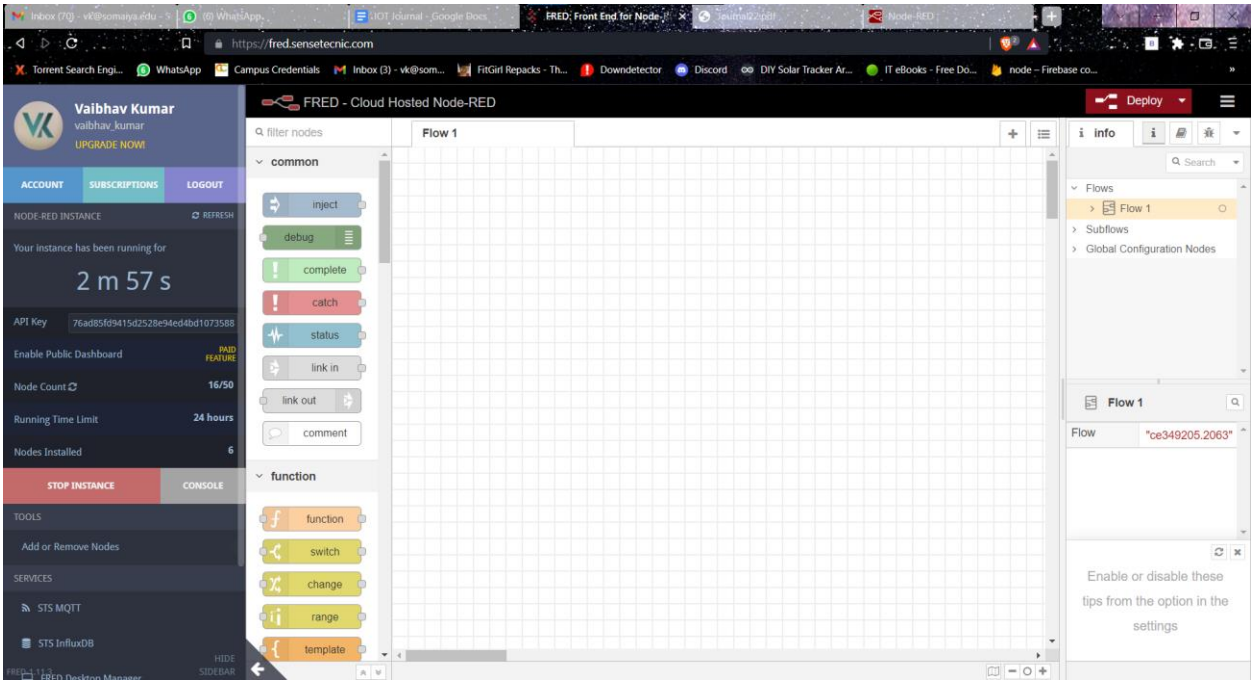


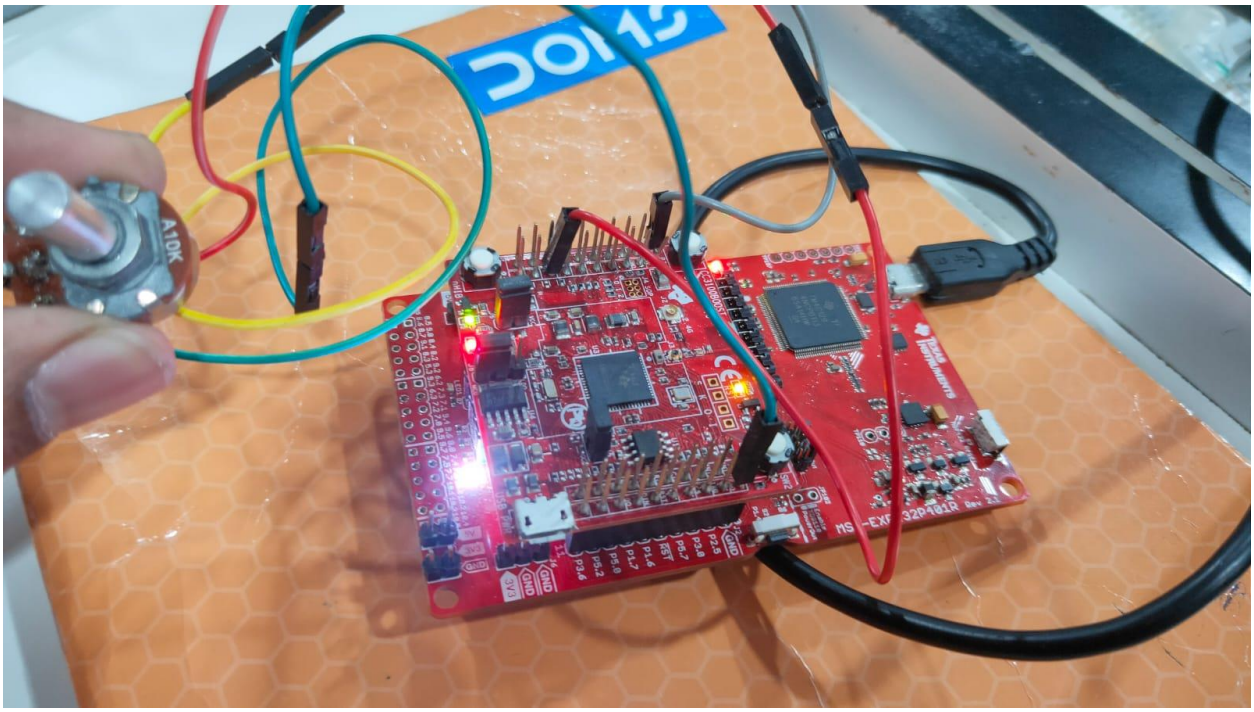
Click on start Instance and then create the empty flow

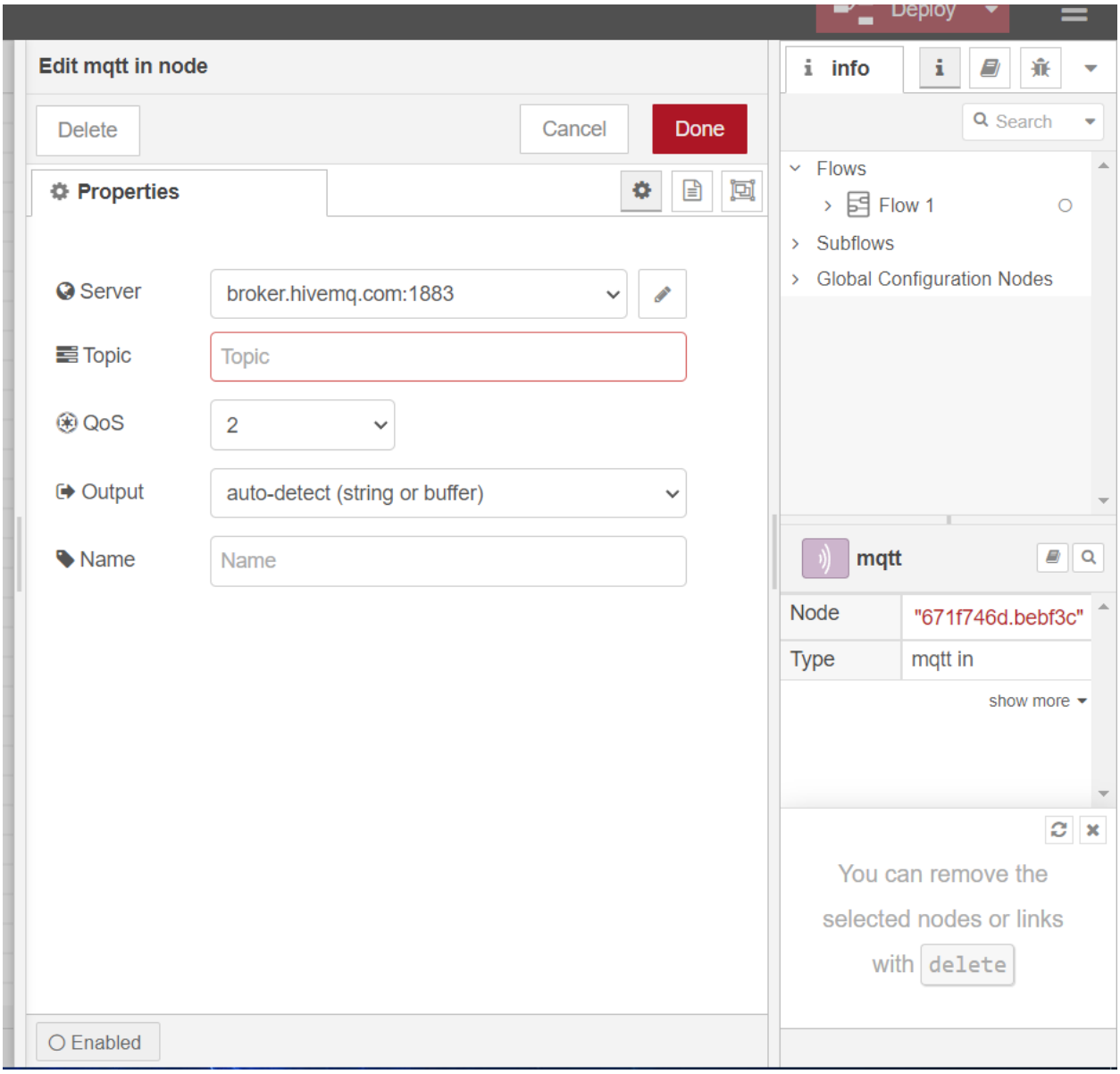


Now delete the sheet 1 by double clicking on sheet and click delete button

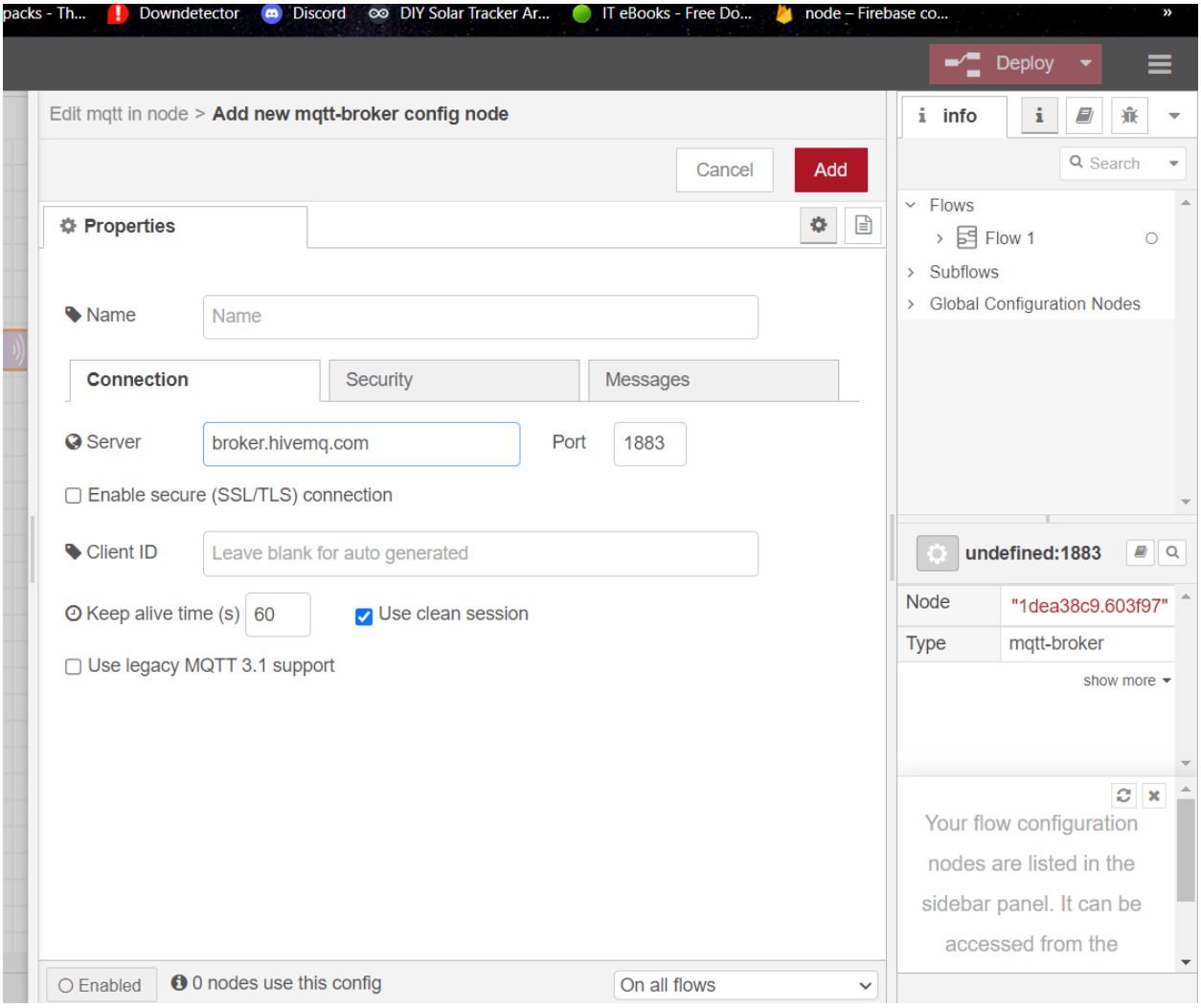


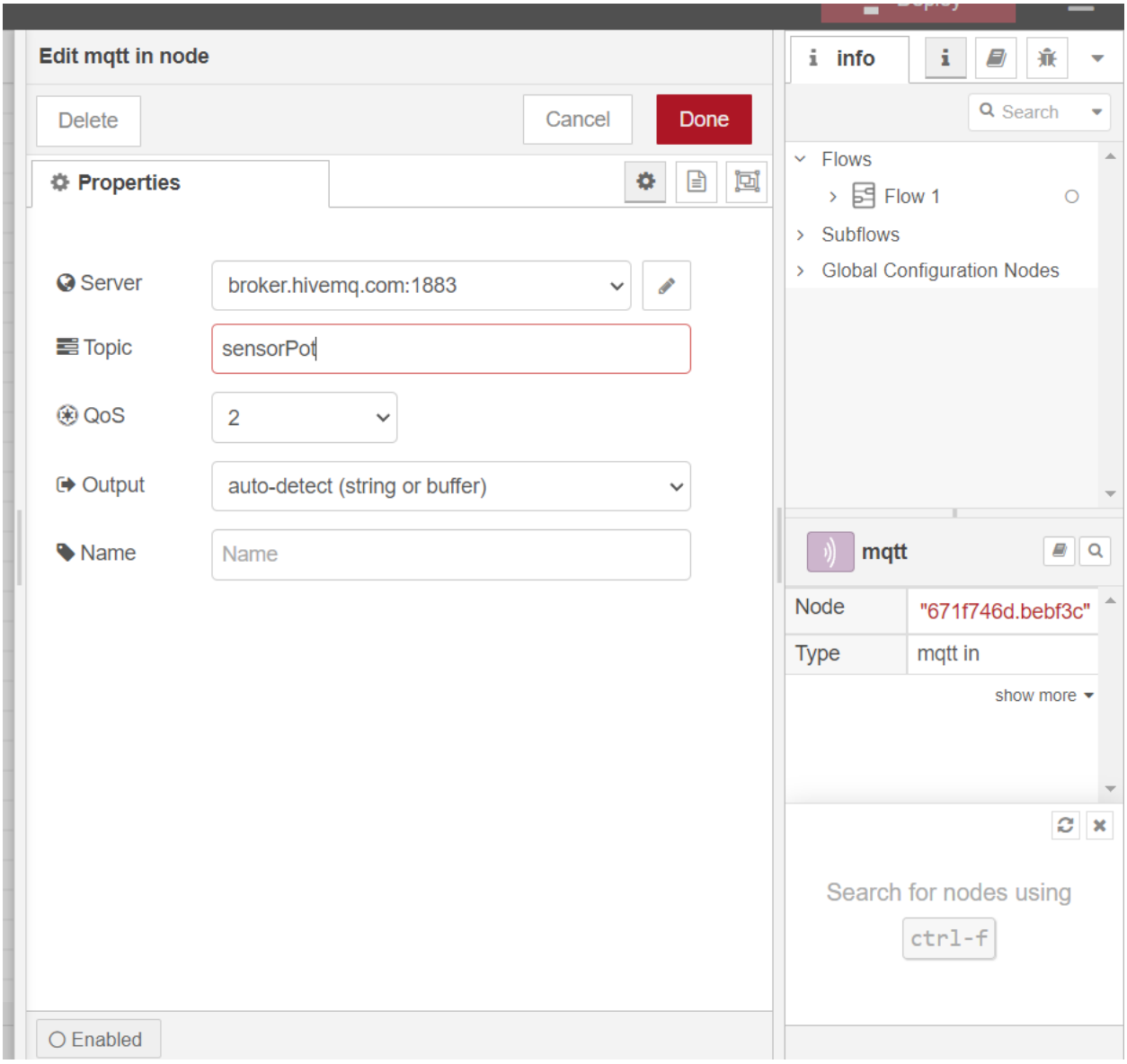

https://fred.sensetecnic.com
FRED - Cloud Hosted Node-RED
Deploy
Vaibhav Kumar
vaibhav_kumar
UPGRADE NOW!
ACCOUNT
SUBSCRIPTIONS
LOGOUT
NODE-RED INSTANCE
REFRESH
Your instance has been running for
2 m 57 s
API Key
Enable Public Dashboard
PAID FEATURE
Node Count
16/50
Running Time Limit
24 hours
Nodes Installed
6
STOP INSTANCE
CONSOLE
TOOLS
Add or Remove Nodes
SERVICES
STS MQTT
STS InfluxDB
HIDE SIDEBAR
filter nodes
Flow 1
common
inject
debug
complete
catch
status
link in
link out
comment
function
function
switch
change
range
template
info
Search
Flows
Flow 1
Subflows
Global Configuration Nodes
Flow
"ce349205.2063"
Enable or disable these tips from the option in the settings


A10K

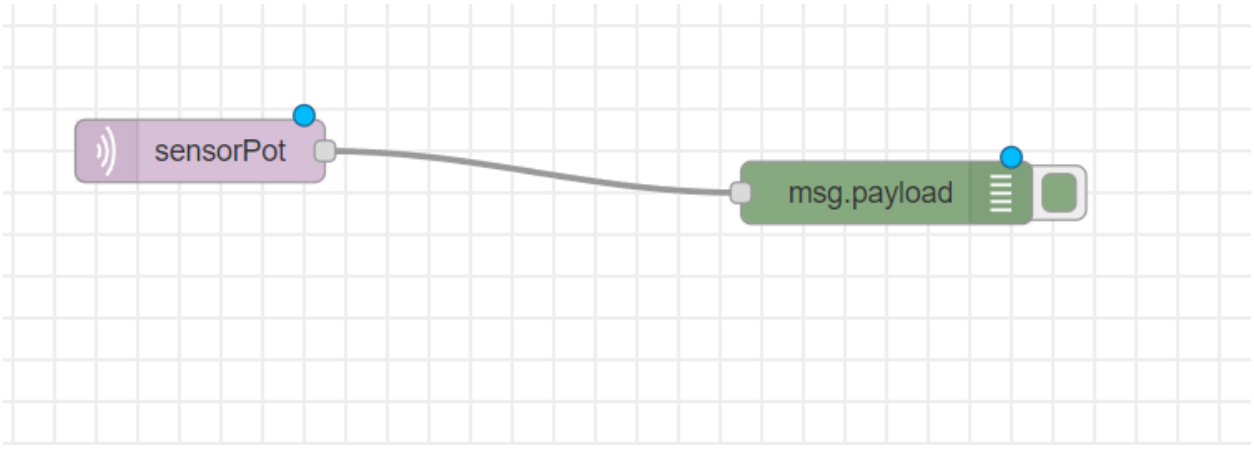


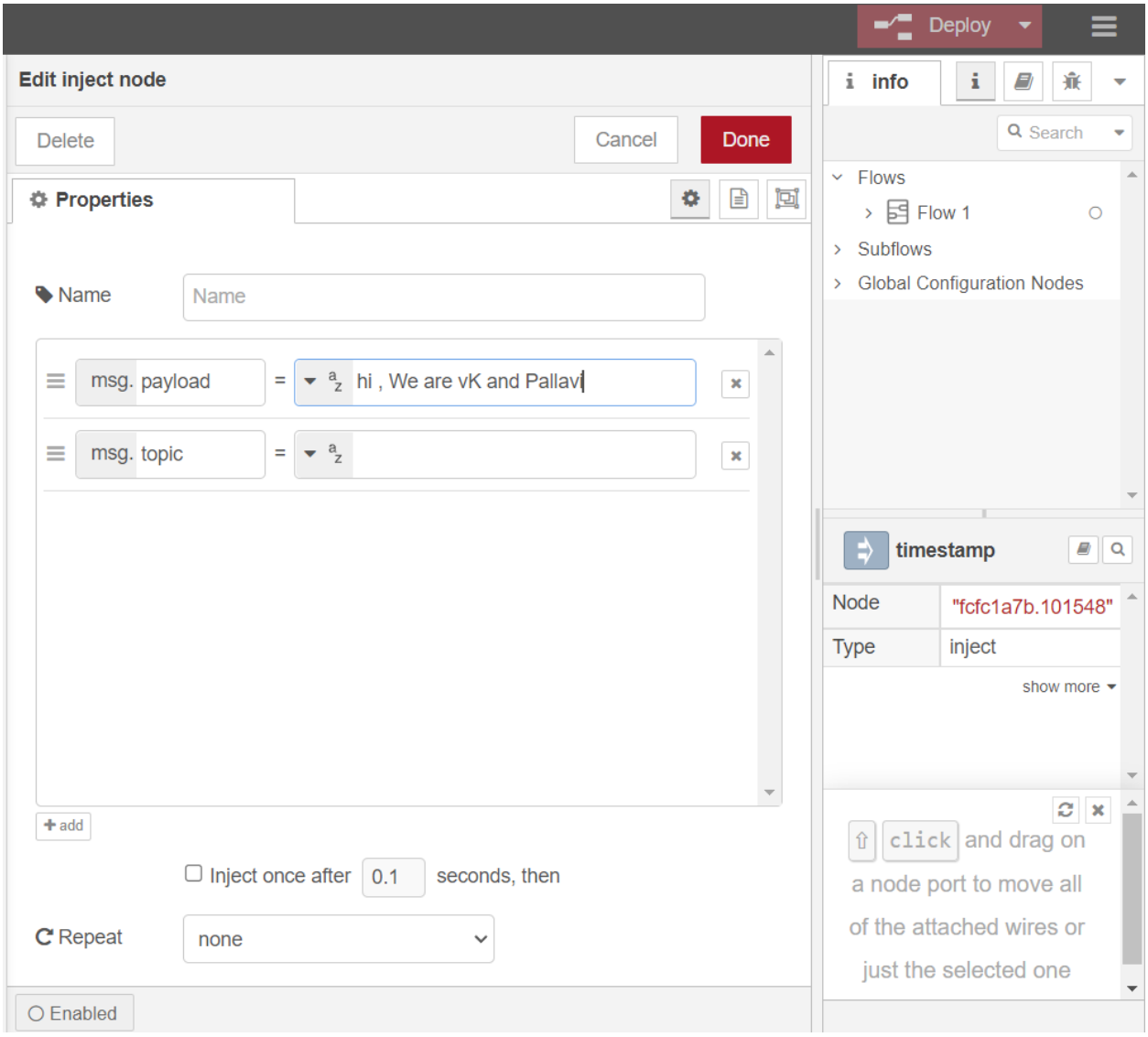
Click on pencil beside the Server

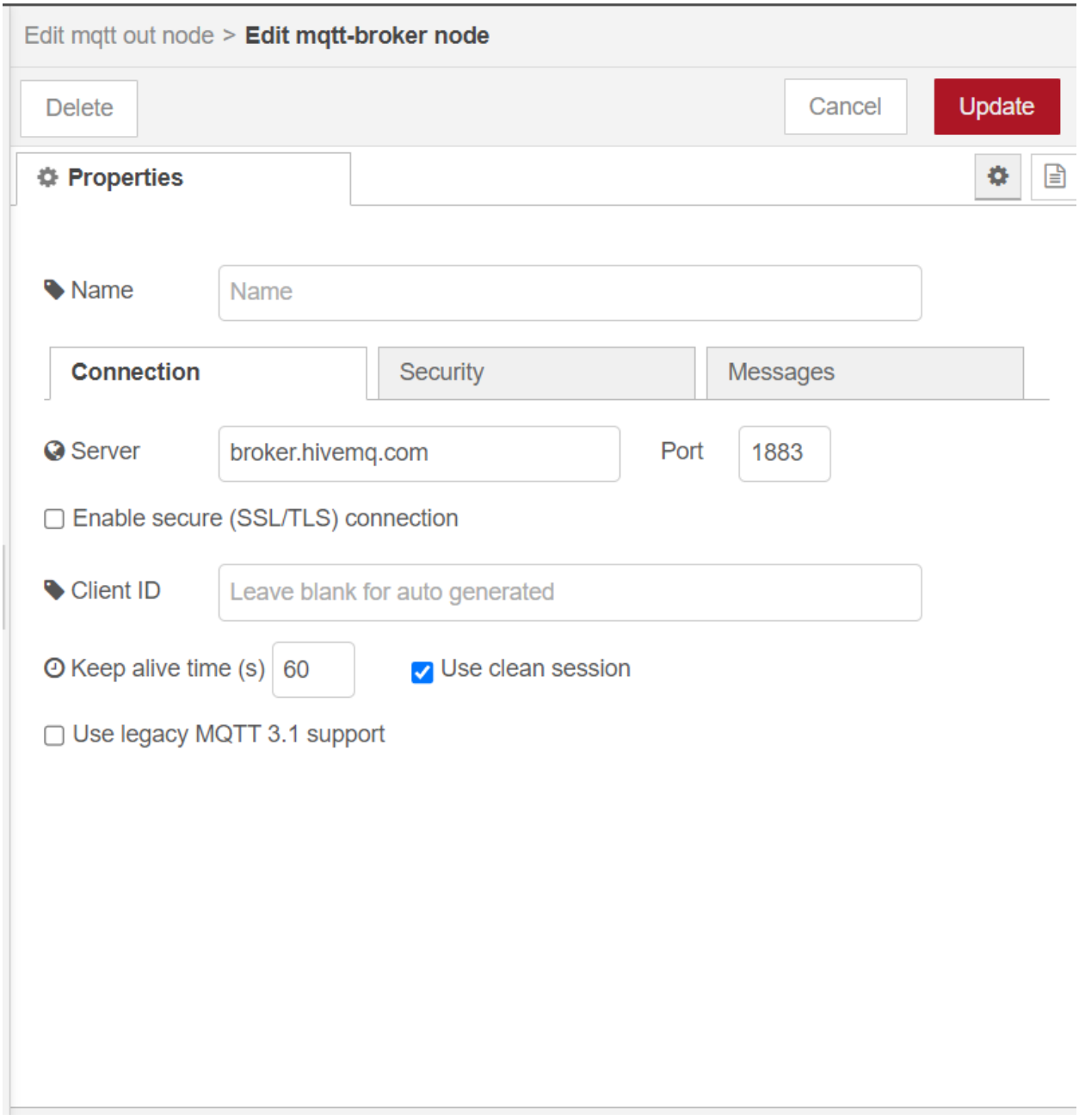

packs - Th...
Downdetector
Discord
DIY Solar Tracker Ar...
IT eBooks - Free Do...
node – Firebase co...
Deploy
Edit mqtt in node > Add new mqtt-broker config node
Cancel
Add
Properties
Name
Name
Connection
Security
Messages
Server
broker.hivemq.com
Port
1883
Enable secure (SSL/TLS) connection
Client ID
Leave blank for auto generated
Keep alive time (s)
60
Use clean session
Use legacy MQTT 3.1 support
Enabled
0 nodes use this config
On all flows
info
Search
Flows
Flow 1
Subflows
Global Configuration Nodes
undefined:1883
Node
"1dea38c9.603f97"
Type
mqtt-broker
show more
Your flow configuration nodes are listed in the sidebar panel. It can be accessed from the

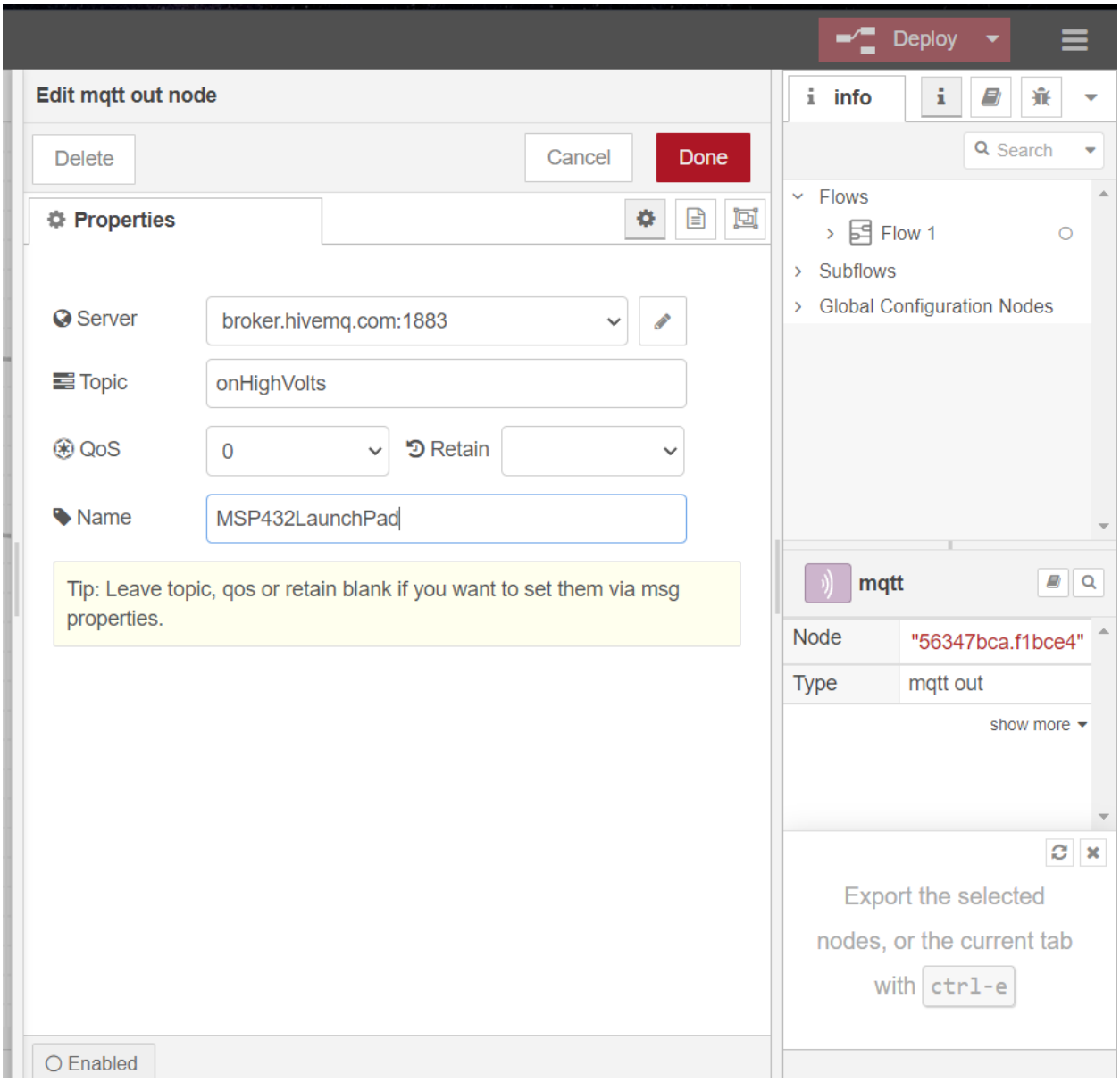


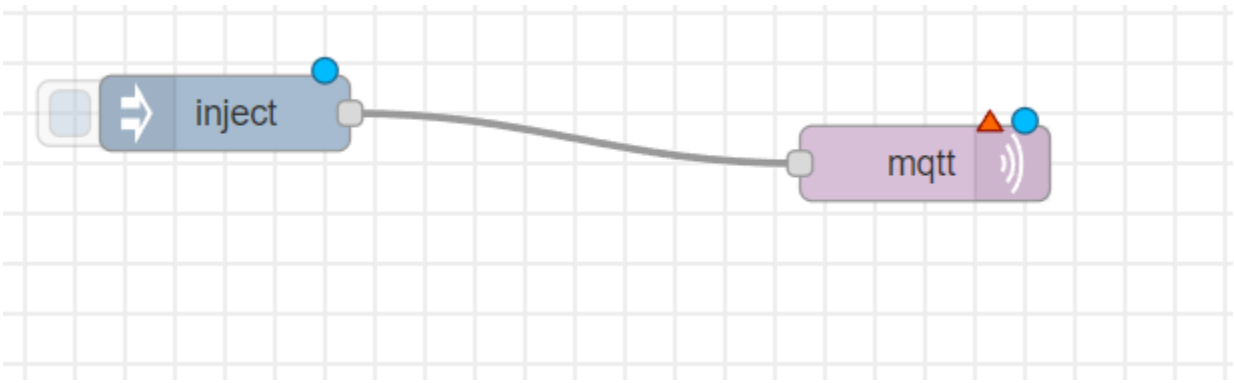
That sets the first node




Deploy
Edit inject node
Delete
Cancel
Done
Properties
Name
Name
msg. payload
=
hi , We are vK and Pallavi
msg. topic
=
add
Inject once after
0.1
seconds, then
Repeat
none
Enabled
info
Search
Flows
Flow 1
Subflows
Global Configuration Nodes
timestamp
Node
"fcfc1a7b.101548"
Type
inject
show more
click and drag on a node port to move all of the attached wires or just the selected one

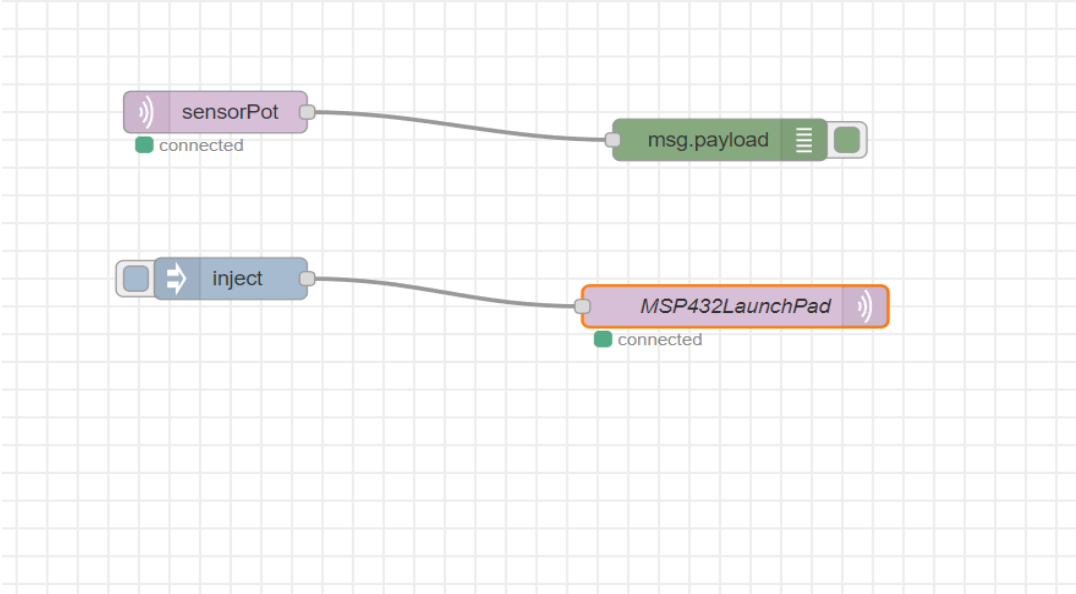

Edit mqtt out node > Edit mqtt-broker node
Delete
Cancel
Update
Properties
Name
Name
Connection
Security
Messages
Server
broker.hivemq.com
Port
1883
Enable secure (SSL/TLS) connection
Client ID
Leave blank for auto generated
Keep alive time (s)
60
Use clean session
Use legacy MQTT 3.1 support





The one publishes on topic and the other one subscriber subscribe on the same topic.

Now deploy.



2) Explain the JSON data frame created in the firmware.

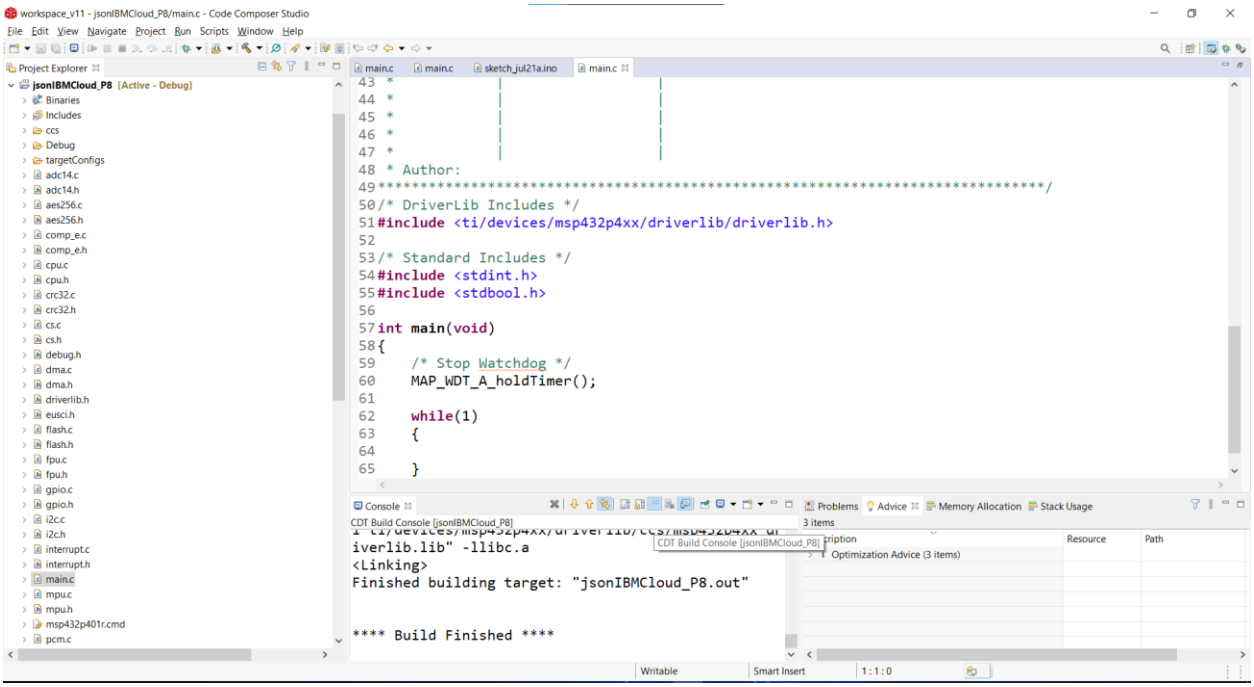
cloudEnergia | Energia 1.6.10E18

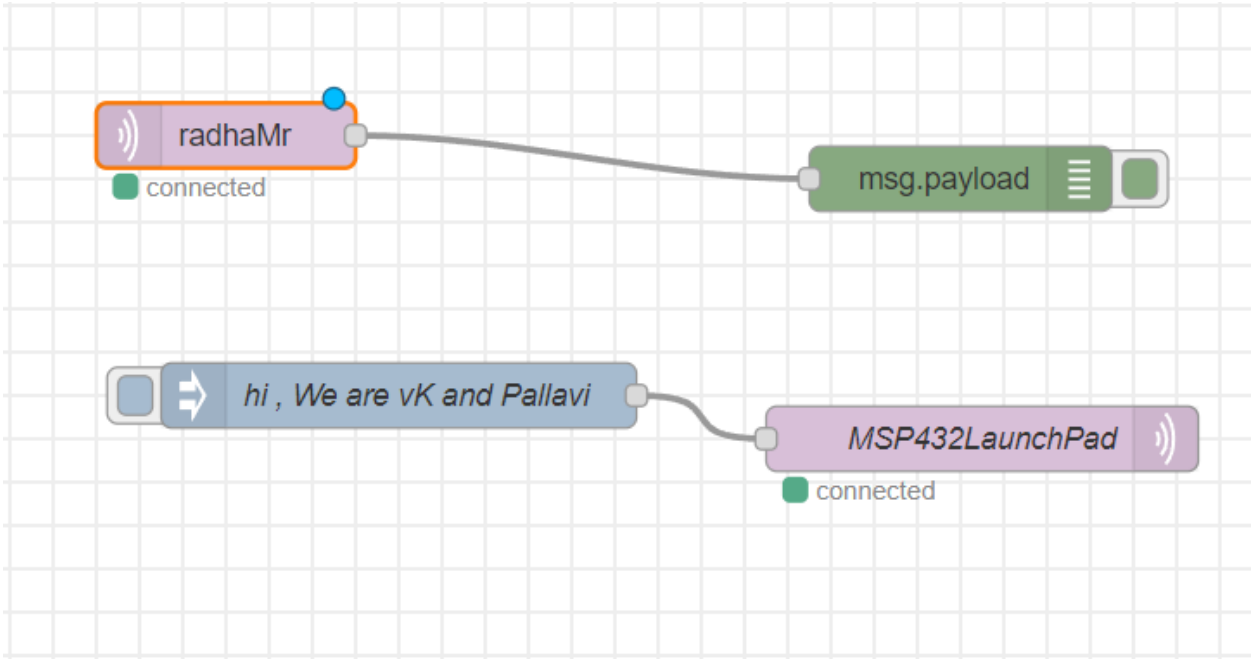
File Edit Sketch Tools Help

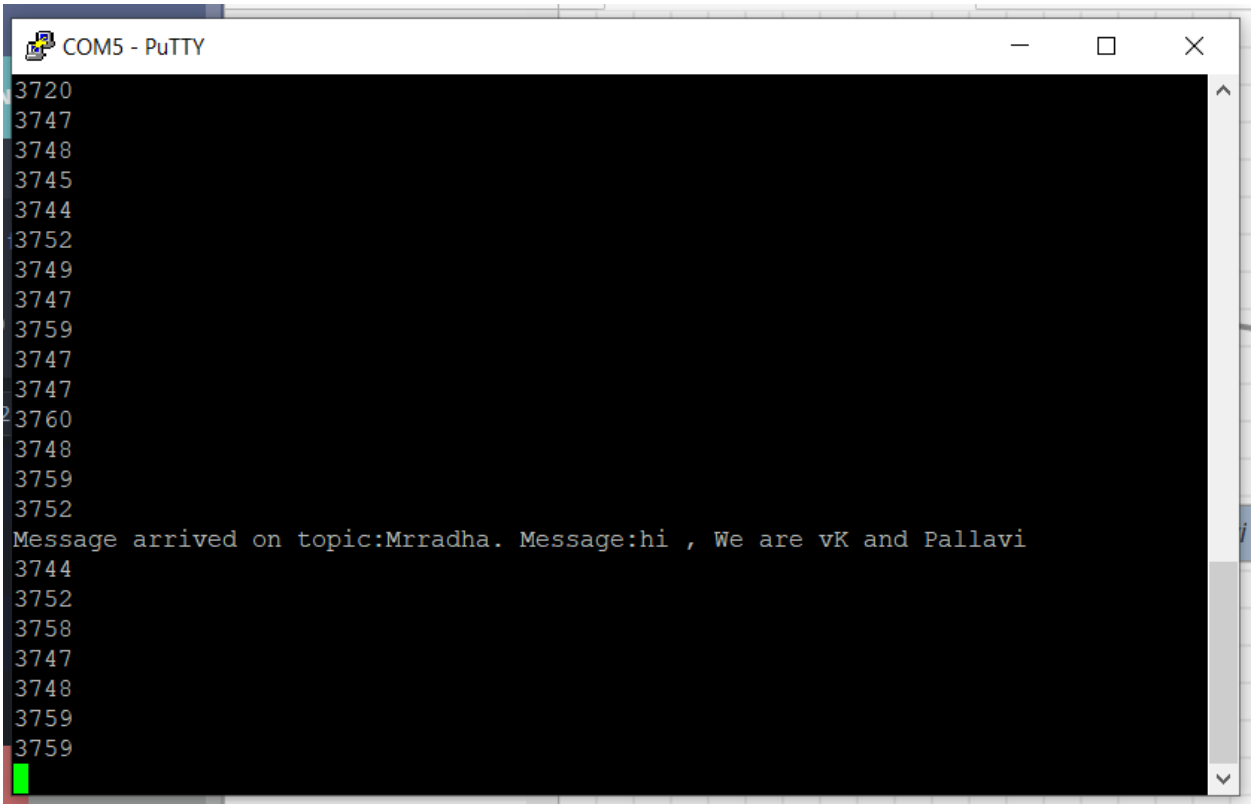
cloudEnergia

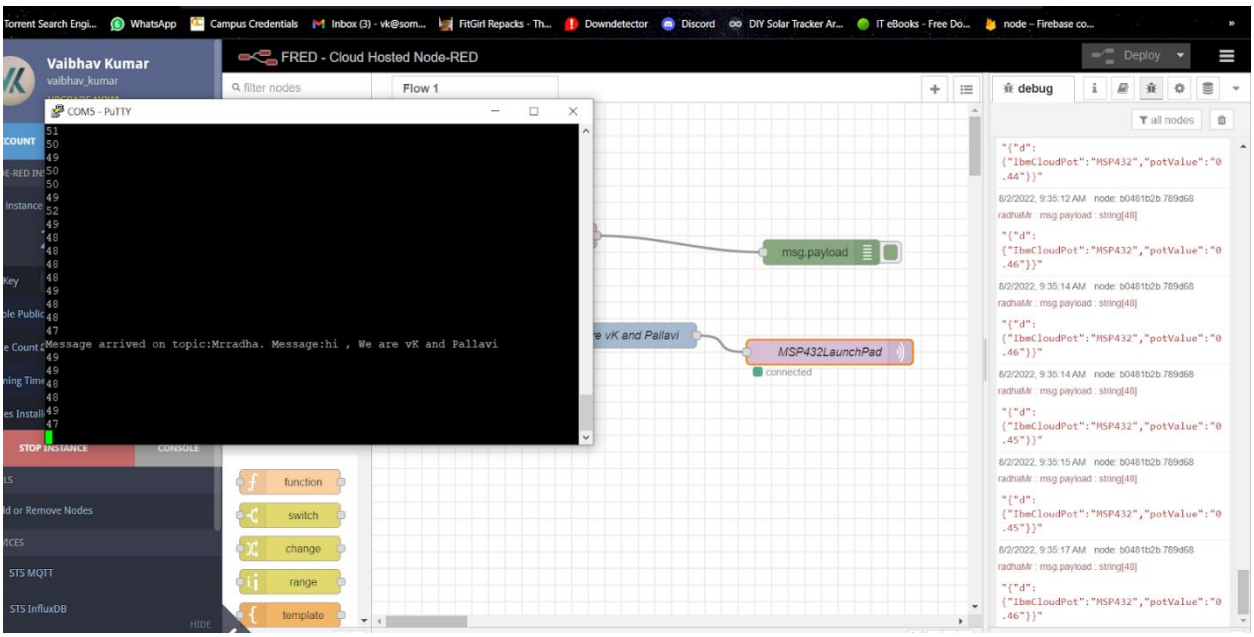
```
#include <WiFi.h>
#include <SPI.h>
#include <PubSubClient.h>
#include <aJSON.h>
void setup() {
  // put your setup code here, to run once:

}

void loop() {
  // put your main code here, to run repeatedly:

}
```

Create the project and first compile it empty without any code.



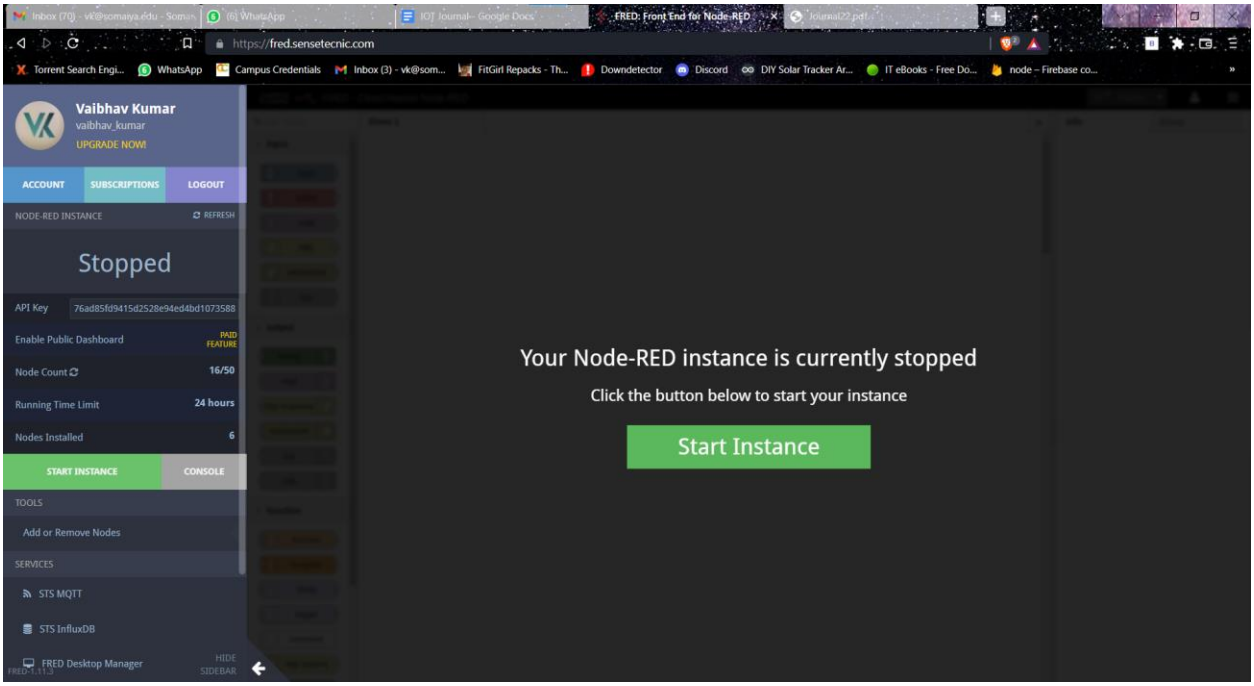


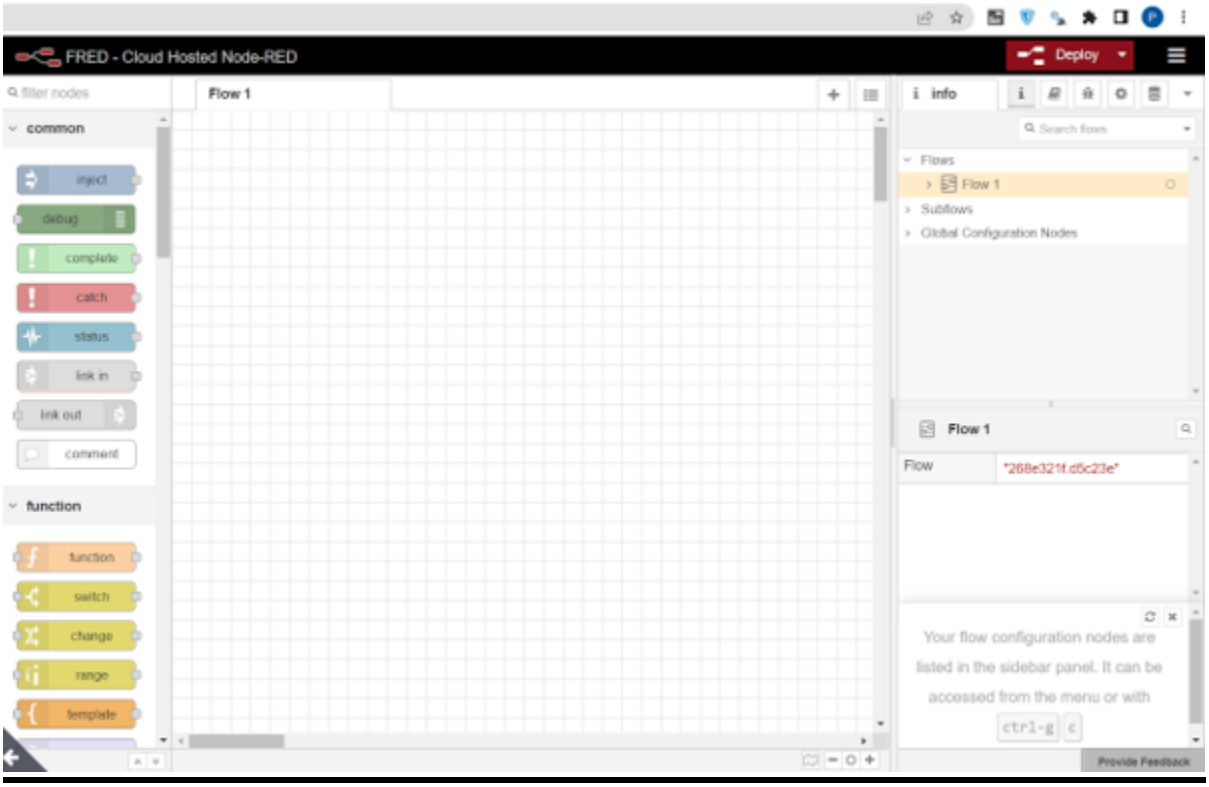

COM5 - PuTTY
3720
3747
3748
3745
3744
3752
3749
3747
3759
3747
3747
3760
3748
3759
3752
Message arrived on topic:Mrradha. Message:hi , We are vK and Pallavi
3744
3752
3758
3747
3748
3759
3759

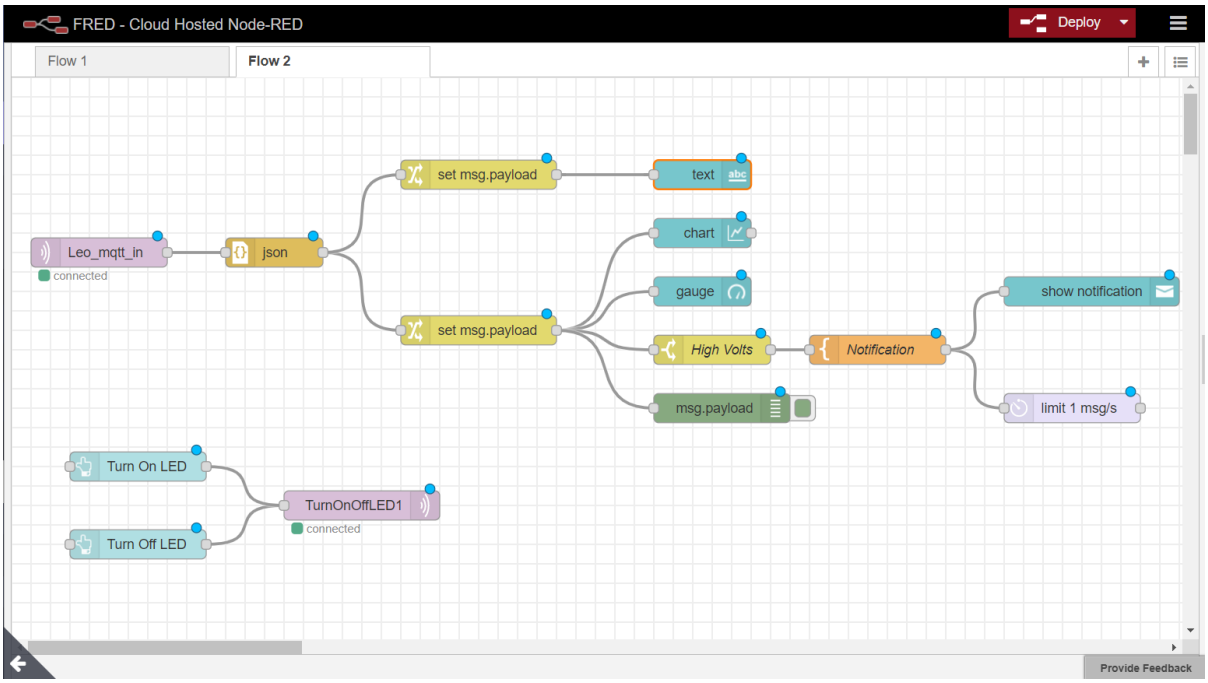

FRED - Cloud Hosted Node-RED
Deploy
Vaibhav Kumar
vaibhav_kumar
Flow 1
debug
COM5 - PuTTY
Message arrived on topic:Mrradha. Message:hi , We are vK and Pallavi
msg.payload
MSP432LaunchPad
connected
function
switch
change
range
template
STS MQTT
STS InfluxDB

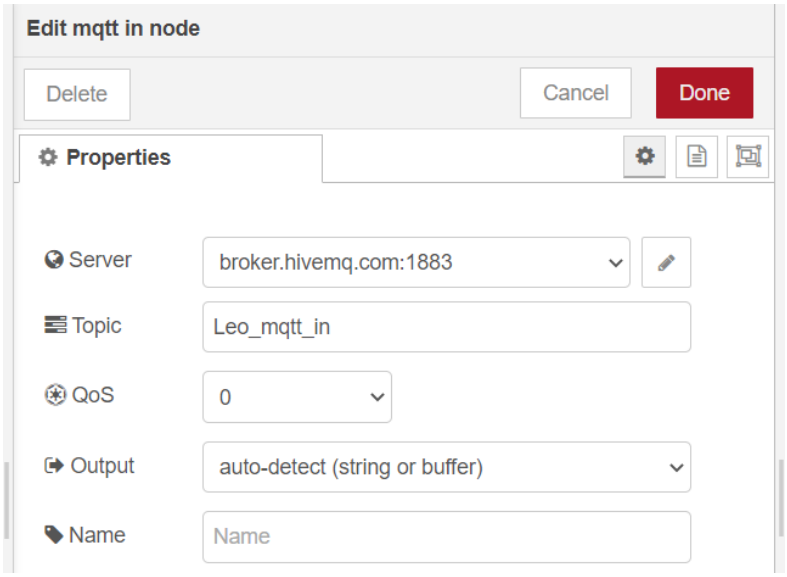
Practical 10

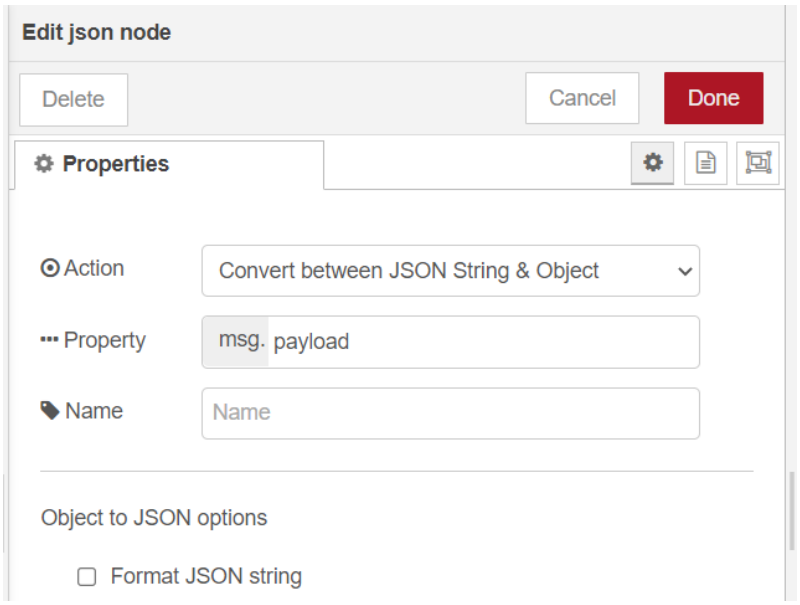
Connecting MSP432 to the cloud

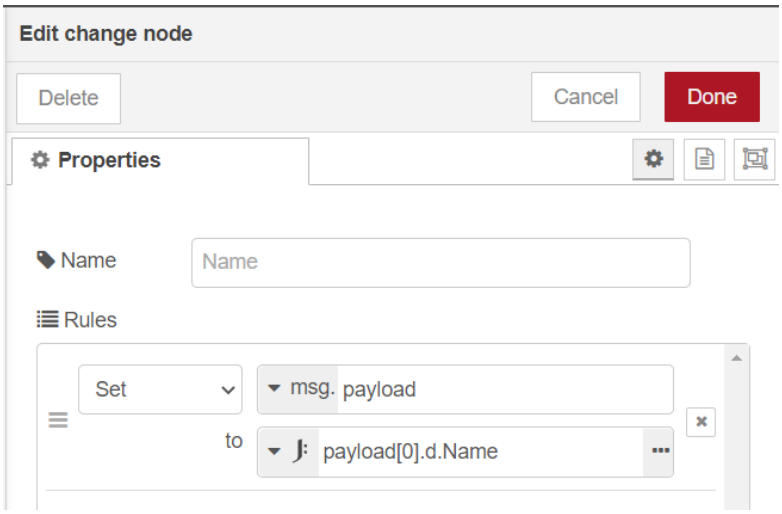


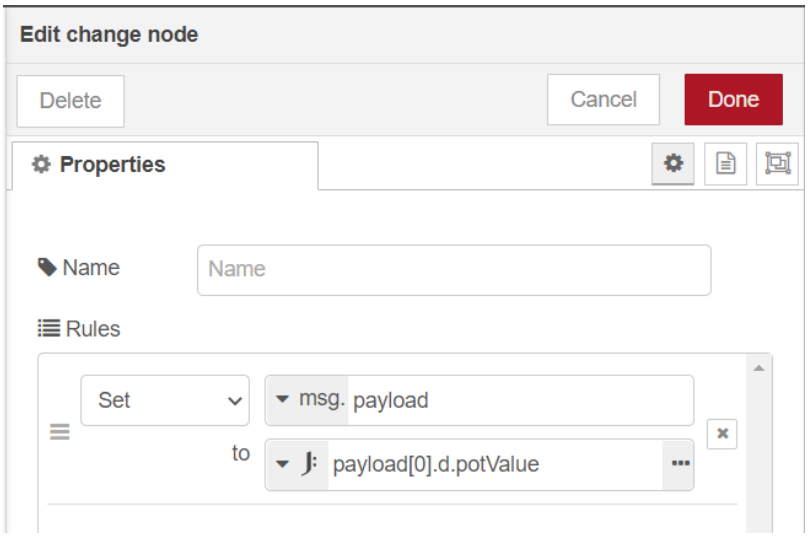


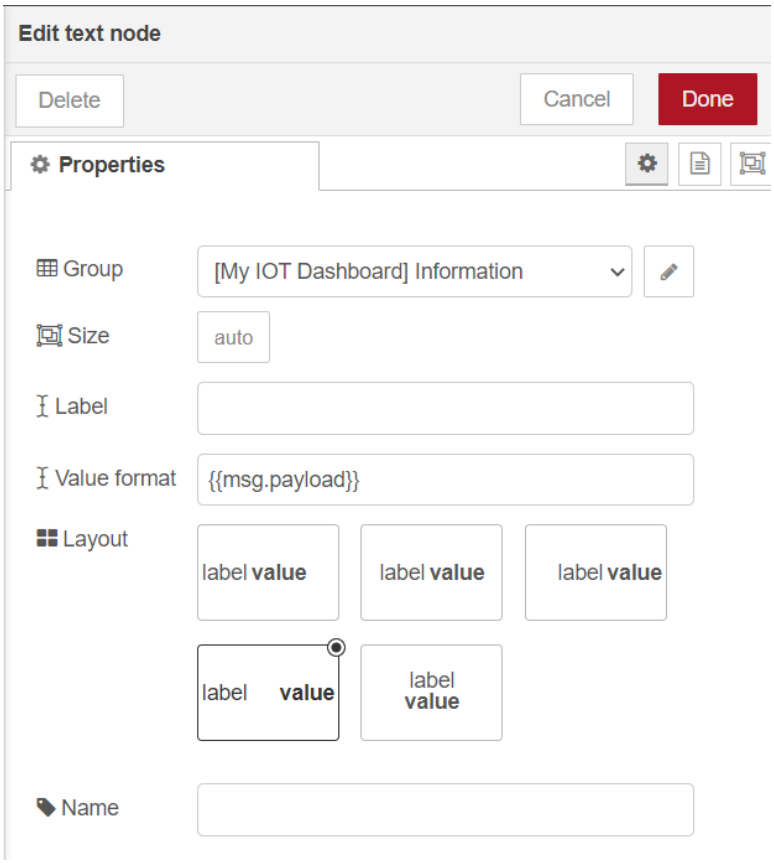

FRED - Cloud Hosted Node-RED
Deploy
Flow 1
Flow 2
set msg.payload
text
chart
Leo_mqtt_in
connected
json
gauge
set msg.payload
High Volts
Notification
show notification
msg.payload
limit 1 msg/s
Turn On LED
TurnOnOffLED1
connected
Turn Off LED
Provide Feedback

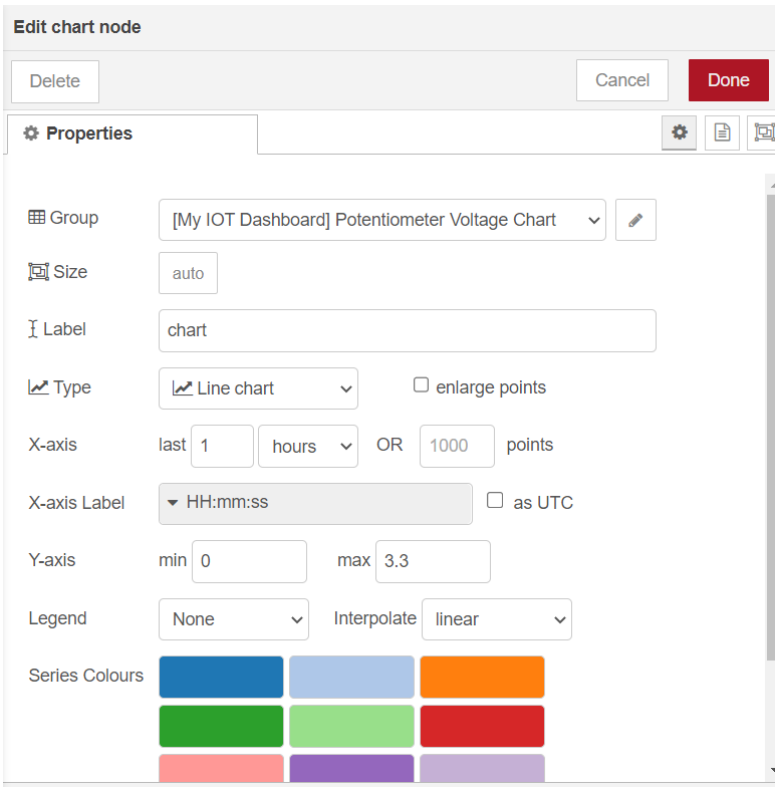

Edit mqtt in node
Delete
Cancel
Done
Properties
Server
broker.hivemq.com:1883
Topic
Leo_mqtt_in
QoS
0
Output
auto-detect (string or buffer)
Name
Name

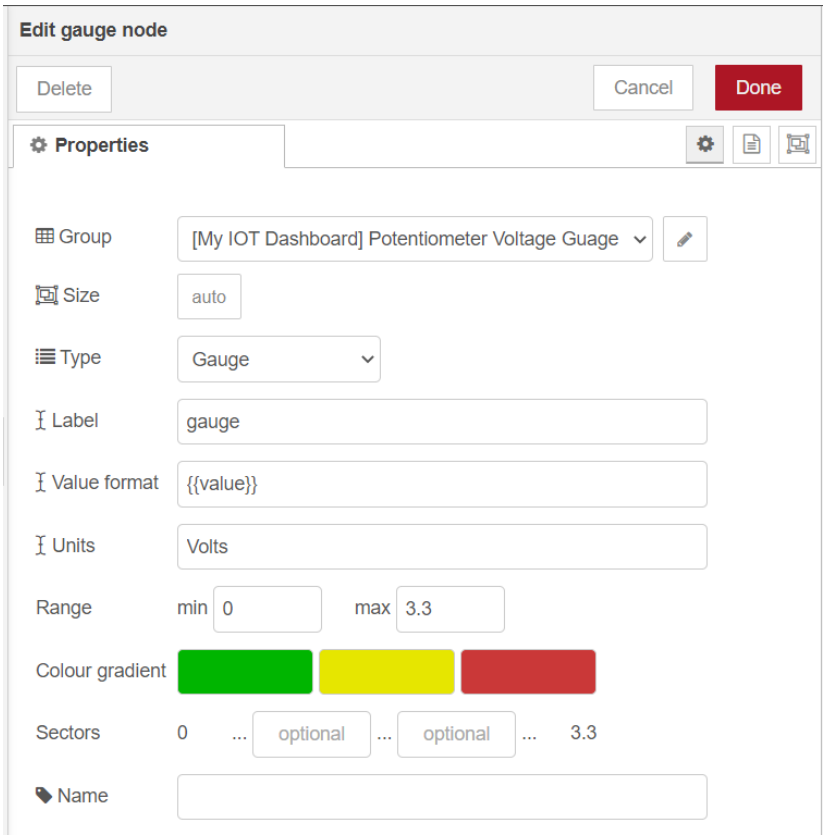

Edit json node
Delete
Cancel
Done
Properties
Action
Convert between JSON String & Object
Property
msg. payload
Name
Name
Object to JSON options
Format JSON string

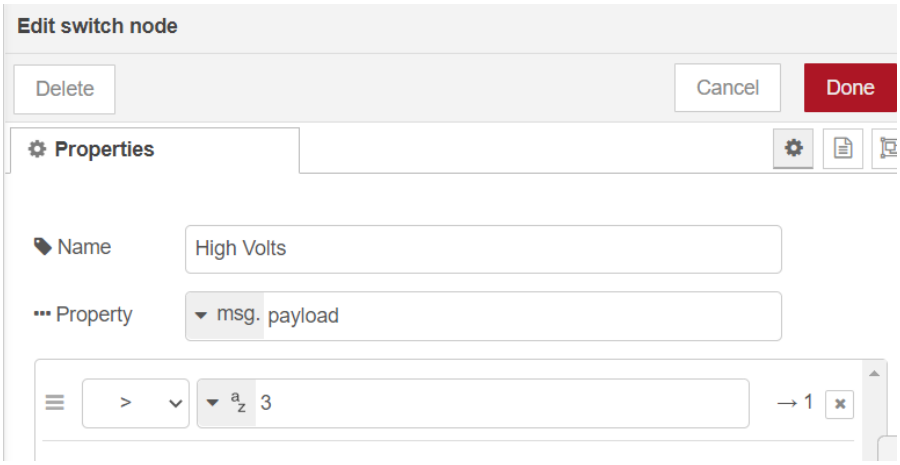

Edit change node
Delete
Cancel
Done
Properties
Name
Name
Rules
Set
msg. payload
to
payload[0].d.Name


Edit change node
Delete
Cancel
Done
Properties
Name
Name
Rules
Set
msg.
payload
to
payload[0].d.potValue


Edit text node
Delete
Cancel
Done
Properties
Group
[My IOT Dashboard] Information
Size
auto
Label
Value format
{{msg.payload}}
Layout
label value
label value
label value
label value
label
value
Name


Edit chart node
Delete
Cancel
Done
Properties
Group
[My IOT Dashboard] Potentiometer Voltage Chart
Size
auto
Label
chart
Type
Line chart
enlarge points
X-axis
last
1
hours
OR
1000
points
X-axis Label
HH:mm:ss
as UTC
Y-axis
min
0
max
3.3
Legend
None
Interpolate
linear
Series Colours


Edit gauge node
Delete
Cancel
Done
Properties
Group
[My IOT Dashboard] Potentiometer Voltage Guage
Size
auto
Type
Gauge
Label
gauge
Value format
{{value}}
Units
Volts
Range
min 0
max 3.3
Colour gradient
Sectors
0 ... optional ... optional ... 3.3
Name


Edit switch node
Delete
Cancel
Done
Properties
Name
High Volts
Property
msg. payload
> 3
→ 1

CSSCODE

```
#include <ti/devices/msp432p4xx/driverlib/driverlib.h>
#include <WiFi.h>
#include <SPI.h>
#include <PubSubClient.h>
#include <aJSON.h>


IPAddress shieldIP,subnetMask,gatewayIP;
uint8_t rssi;
uint8_t networkId;
byte macAddr[6];
byte encryptionType;

char ssid[]="Galaxy M21F8D8";

WiFiClient wclient;

char server[]="broker.hivemq.com";
PubSubClient client(server,1883,callback,wclient);

char* jsonPayload;
aJsonStream serial_stream(&Serial);


void setup() {
  // put your setup code here, to run once:
    Serial.begin(115200);
       Serial.print("connecting to WIFI..");
       while(WiFi.begin(ssid)!=WL_CONNECTED)//for cell phone //WL_CONNECTED while it is
not connected
           //while(WiFi.begin(ssid.password)!=WL_CONNECTED)
       {
           Serial.print(".");
           delay(1);//delay in ms
       }
       Serial.println("");
       Serial.print("Wifi Connected , Fetching Wifi Sheild's IP address :");
       while(WiFi.localIP()==INADDR_NONE){
           Serial.print(".");
           delay(1);
       }
       shieldIP = WiFi.localIP();
```

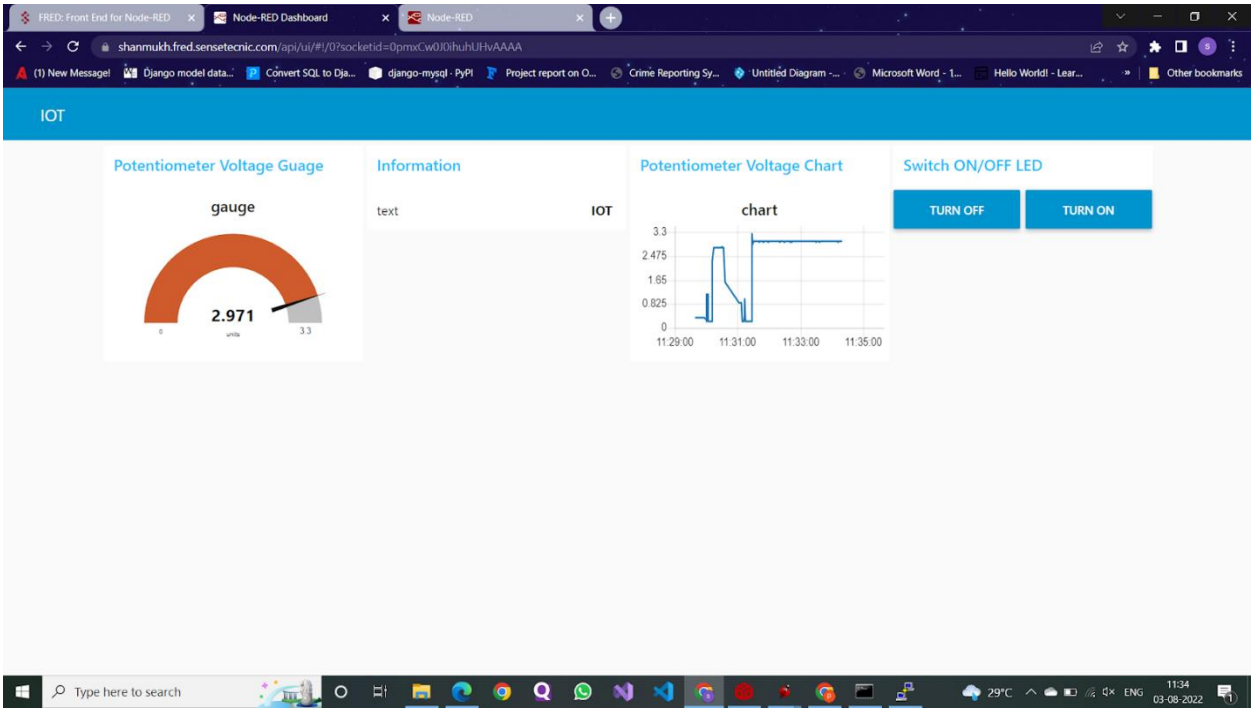
```
        Serial.println(shieldIP);

        Serial.print("Access Point name:");
        Serial.println(ssid);

        Serial.print("Signal Strength");//
        rssi=WiFi.RSSI();//it fecthes the signal strength
        Serial.println(rssi); //RSSI-Recived signal strength indication

        uint8_t networkId= WiFi.scanNetworks();
        Serial.print("number of access points in range:");
        Serial.println(networkId);

        for(int i=1;i<=networkId;i++){
              Serial.print("Name of Access points and encryption type:");
              Serial.print(WiFi.SSID(i));
              Serial.print(",");
              encryptionType=WiFi.encryptionType(i);
              Serial.println(encryptionType,HEX);
              //Serial.println(encryptionType,DEC);
           }
           subnetMask = WiFi.subnetMask();
           Serial.print("Subnet Mask:");
           Serial.println(subnetMask);

           gatewayIP=WiFi.gatewayIP();
           Serial.print("Gateway IP Address:");
           Serial.println(gatewayIP);

           WiFi.macAddress(macAddr);
           Serial.print("Mac Address of Sheild:");
           for(int i=0;i<6;i++){
              Serial.print(macAddr[i],HEX);
              if(i<=4)
                 Serial.print(':');
              else
                 Serial.println();
           }
              GPIO_setAsOutputPin(GPIO_PORT_P1,GPIO_PIN0);
              GPIO_setAsOutputPin(GPIO_PORT_P2,GPIO_PIN0|GPIO_PIN1|GPIO_PIN2);

GPIO_setAsPeripheralModuleFunctionInputPin(GPIO_PORT_P4,GPIO_PIN7,GPIO_TERTIAR
Y_MODULE_FUNCTION);//potentiometer is connect in port 4 ,
```

```
                                                                    //pin 7 becoz ADC
exists in PIN 7 of port 4 and then digital signal goes to LED

ADC14_initModule(ADC_CLOCKSOURCE_MCLK,ADC_PREDIVIDER_1,ADC_PREDIVIDER_
1,ADC_NOROUTE);//initModule requires 4 parameters//clock is started //predivider is divding
the clock to make it small//master clock is 3 MHz which is divider by 2 divders // ADC Noroute
means use ADC to connect to that pin // more the predivider more the numbers we can get
                ADC14_configureSingleSampleMode(ADC_MEM6,true);//ADC_MEM6 internal
memory for storing converted result

ADC14_configureConversionMemory(ADC_MEM6,ADC_VREFPOS_AVCC_VREFNEG_VSS,A
DC_INPUT_A6,false);//2nd parameter is 3.3v i.e the refrences voltage  , 3rd para is use that
channel 6 inside MC and store it to the mem 6  , false is it will run only once

ADC14_setSampleHoldTime(ADC_PULSE_WIDTH_32,ADC_PULSE_WIDTH_4);//it will hold
the signal for 64 clock cycle , 2 times becoz it require 2 parameter ; our MC is 32bit so it divided
into 16-16 bits channels 2nd para is useless as of now
                ADC14_setResolution(ADC_12BIT);
                ADC14_enableSampleTimer(ADC_AUTOMATIC_ITERATION);//it will run
automatically
                ADC14_enableModule();//for activating the module
                ADC14_enableConversion();//start conversion
                ADC14_toggleConversionTrigger();// trigger the conversion again and again
}

void loop() {
  // put your main code here, to run repeatedly:
    if(!client.connected())
       {
          Serial.println("Disconnected:Reconnecting...");
          if(!client.connect("sagarPraful"))
          {
             Serial.println("connection failed");
          }
          else
          {
             Serial.println("Connection success");
             if(client.subscribe("prafulNalanda"))
             {
                Serial.println("Subscription sucessfull");
             }
          }
       }
```

```
int result,regressedData1;
    float regressedData;
    while(!ADC14_isBusy());
    result=ADC14_getResult(ADC_MEM6);
    //P2OUT=result>>8;
    //Serial.println(result);
    ADC14_toggleConversionTrigger();
    //result*slope+-itercept/1000
    regressedData=((result*0.786295966)+7.695073417)/1000;
    Serial.println(regressedData);
    regressedData1=((result*0.786295966)+7.695073417);
    P2->OUT = result>>8;

    String str=(String)regressedData1;
      int str_len=str.length()+2;
      char char_array[str_len];
      str.toCharArray(char_array,str_len);
      char pot_reading[str_len];

      if(regressedData<1)
      {
         pot_reading[0]='0';
         pot_reading[1]='.';
         for(int i=2;i<=str_len;i++)
         {
            pot_reading[i]=char_array[i-2];
         }
      }
      else
      {
         pot_reading[0]=char_array[0];
         pot_reading[1]='.';
         for(int i=2;i<=str_len;i++)
         {
            pot_reading[i]=char_array[i-1];

         }
      }
      aJsonObject *root=aJson.createObject();
         aJsonObject *d=aJson.createObject();
         aJson.addItemToObject(root,"d",d);
         aJson.addStringToObject(d,"IbmCloudPot","MSP432");
         aJson.addStringToObject(d,"potValue",pot_reading);
         jsonPayload=aJson.print(root)+'\0';//renders the jso object back to a string;
```

```
            aJson.deleteItem(d);
            aJson.deleteItem(root);
            //publish data to MQTT broker
            client.publish("nalandaPraful",jsonPayload);
            client.poll();
            delay(1000);
}

void callback(char* inTopic,byte* payload,unsigned int length)
{
   Serial.print("Message arrived on topic:");
   Serial.print(inTopic);
   Serial.print(". Message:");
   String arrivedMessage;
   for(int i=0;i<length;i++)
   {
      Serial.print((char)(payload[i]));
      arrivedMessage+=(char)payload[i];
   }
   Serial.println();
   if(arrivedMessage=="LED1ON")
      GPIO_setOutputHighOnPin(GPIO_PORT_P1,GPIO_PIN0);
   else
      if(arrivedMessage=="LED1OFF")
         GPIO_setOutputLowOnPin(GPIO_PORT_P1,GPIO_PIN0);
}
```

OUTPUT :


FRED: Front End for Node-RED
Node-RED Dashboard
Node-RED
shanmukh.fred.sensetecnic.com/api/ui/#!/0?socketid=0pmxCw0J0ihuhUHvAAAA
IOT
Potentiometer Voltage Guage
gauge
2.971
Information
text
IOT
Potentiometer Voltage Chart
chart
3.3
2.475
1.65
0.825
0
11:29:00
11:31:00
11:33:00
11:35:00
Switch ON/OFF LED
TURN OFF
TURN ON
Type here to search
29°C
ENG
11:34
03-08-2022