



CSL EPC RFID Intelligent Fixed Reader Family

User's Manual: CS463, CS203X

CS463 4 Port Reader



CS203X Integrated Reader



Version 2.1

2023 November 8

CSL: The One-Stop-Shop for RFID Solutions

1 Release Notes

Dates	Release	Description
2023 11 08	Version 2.1	Clarify package contents of CS203X
2021 05 14	Version 2.0	<p>Expand to all CSL intelligent fixed reader</p> <p>Update based on Web Application 1.1.13</p> <p>Update mounting design for wood structure</p> <p>Elaborate regulatory region compliance chapter</p> <p>Add chapter on historical firmware versions</p> <p>Add embedded Linux software development guidelines.</p> <p>Add database usage guidelines.</p>
2019 09 05	Version 1.9	Add new features, including CS108 Bluetooth API access mode, Custom Embedded RFID HTTP access mode, etc. Introduce difference in control for Linux 3.0.35 units and Linux 4.xx.yy units
2019 04 12	Version 1.4	Add mounting of reader guidelines in Section 5.3
2019 04 09	Version 1.3	Add example event to send tag inventory to remote server (e.g. Cloud Server)
2019 04 01	Version 1.2	Add descriptions on GPIO – such as example circuits, also the new data formatter for configurable upload to

		Cloud server
2019 03 05	Version 1.0	First Release

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3 Regulatory Regions

3.1 Introduction

The CSL Intelligent Fixed Reader family is offered as various regulatory region specific models, using the format of **CSXYZ-N** where **N** is of various values, each covering one regulatory region. Each regulatory region may apply to one or more countries.

For example, CS463-2 covers the regulatory region of FCC, which includes USA, Canada, Mexico and other Latin America Countries that use the FCC frequency range.

The following is a model table with N as index, for **CSXYZ-N**, and the corresponding frequency band and regulatory regions:

- N=1:** 865-868 MHz for Europe ETSI, Russia, Mid-East countries, Hong Kong
865-867 MHz for India
- N=2:** 902-928 MHz, FCC, for USA, Canada and Mexico. Hopping frequencies locked
- N=2 AS:** 920-926 MHz, Australia. Hopping frequencies locked
- N=2 NZ:** 921.5-928 MHz, New Zealand. Hopping frequencies locked
- N=2 OFCA:** 920-925 MHz, Hong Kong. Hopping frequencies locked
- N=2 RW:** 920-928 MHz, Rest of the World, e.g. Philippines, Brazil, Peru, Uruguay, and any other countries that use sub or partial sections of the FCC frequency range
- N=4:** 922-928 MHz, Taiwan
- N=6:** 917-920.8 MHz, South Korea
- N=7:** 920-925 MHz, China
- N=8:** 916.7-920.9 MHz, Japan
- N=9:** 915-921 MHz, Europe Upper Band

Note that you MUST follow each country's emission regulation and use the appropriate regulatory region model. For example, in USA you can only use N = "2". In Hong Kong you can only use N = "2 OFCA" or N= "1". In Australia you can only use N = "2 AS". etc.

Some regulatory regions require the User Manual to contain some declaration statement. The following sections are those statements.

3.2 FCC Statement and IC Statement

FCC STATEMENT

1. *This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:*

- (1) *This device may not cause harmful interference.*
- (2) *This device must accept any interference received, including interference that may cause undesired operation.*

2. *Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.*

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna.*
 - *Increase the separation between the equipment and receiver.*
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- Consult the dealer or an experienced radio/TV technician for help*

IC STATEMENT

IC Notice to Canadian Users

This device complies with industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

(1) This device may not cause harmful interference

(2) This device must accept any interference received, including interference that may cause undesired operation of the device.

This device complies with RSS-247 of industry Canada. Operation is subject to the condition that this device does not cause harmful interference.

This Class B digital apparatus complies with Canadian ICES-003(Cet appareil numérique de classe B est conforme à la norme NMB-003 du Canada).

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 5mm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

3.3 European CE

In Europe, there are 2 frequency bands allocated to RFID operation:

1. 865-868 MHz band with 4 frequency channels
2. 915-921 MHz band with 3 frequency channels

3.4 Hong Kong OFCA

Hong Kong Government requires the frequency of operation to be limited to within one of the following 2 frequency bands

1. 920 - 925 MHz, hopping frequency channels, follow USA FCC Part 15 regulation
2. 865 – 868 MHz, fixed frequency channels, follow the European CE RFID regulation in this band

3.5 Australia AS

Australia Government requires the frequency of operation to be limited to within the frequency band allocated: 920-926 MHz.

3.6 New Zealand NZ

New Zealand Government requires the frequency of operation to be limited to within the frequency band allocated: 921.5-928 MHz.

4 Introduction

4.1 CSL Intelligent Fixed Reader Family

The CSL Intelligent Fixed Reader Family consists of many members, some with Wi Fi and Bluetooth connectivity, and some without. Some are IP68 and MIL-STD-810F ruggedized, some are not. The following is a product matrix differentiating them:

Model #	RFID Antenna Ports	Ethernet	Wi Fi / Bluetooth	IP Rating	Ruggedized MIL-STD-810F
CS463	4 external antenna ports	Yes	Yes	None	No
CS203X	2: 1 internal (embedded) integrated antenna, 1 external antenna port	Yes	No	IP68	Yes

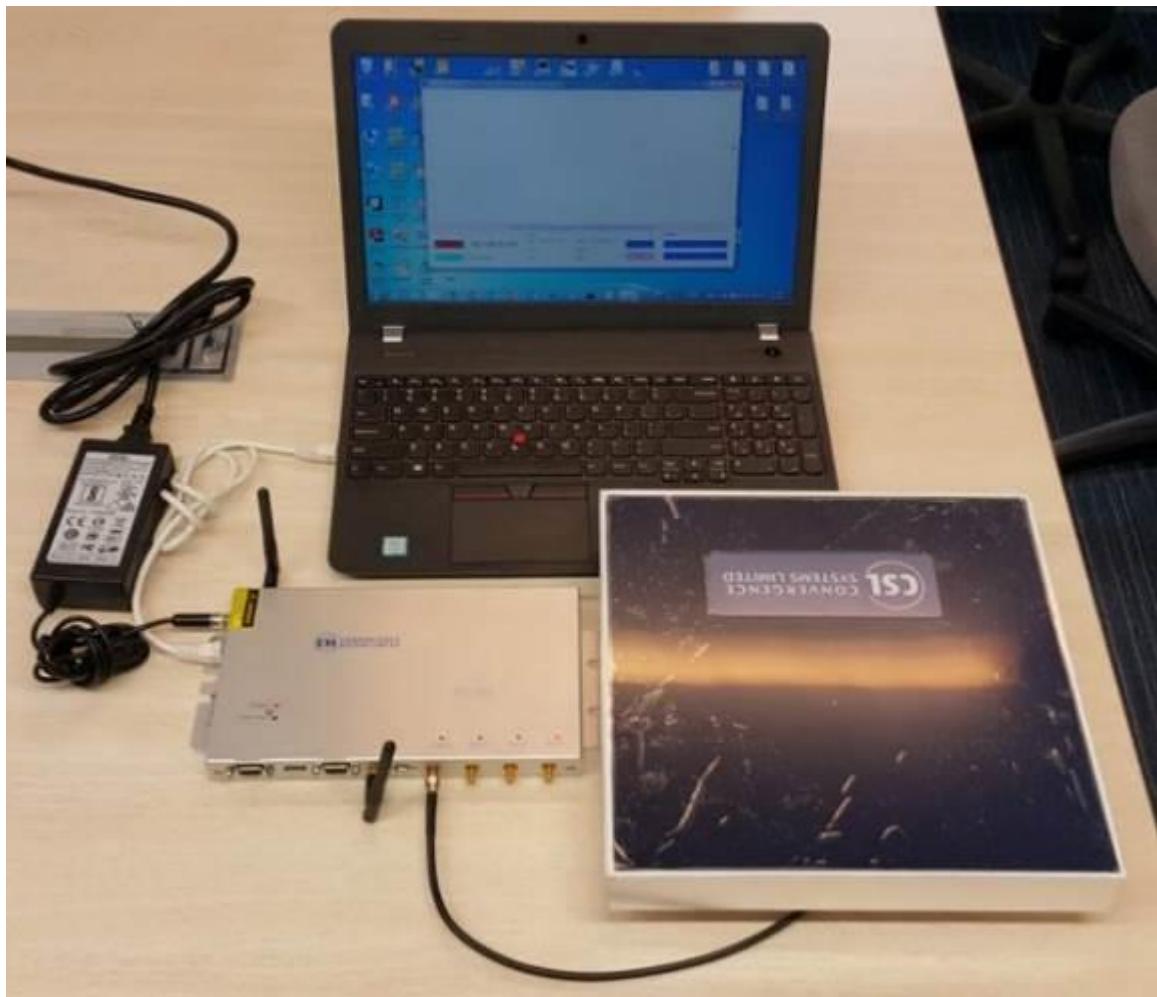
4.2 CS463 4 Port Intelligent Fixed Reader

The CS463 RFID 4-port fixed reader is an intelligent reader designed to work standalone in an autonomous manner. An intelligent Event Engine is embedded with configurable complex logic sequence, triggers and resultant actions that are automatically activated on power up. The settings can be saved and further deployed to as many readers, as many sites as you want, thus providing easy scalability for the system integrators.



CS463 has the following connectivity: Ethernet, Wi Fi (2.4 GHz b/g/n), Bluetooth 4.0, RS232, and USB.

The photo below shows a typical connection during operation of CS463 4-port fixed reader



Note: Use only the Power Adaptor Unit included in the package.

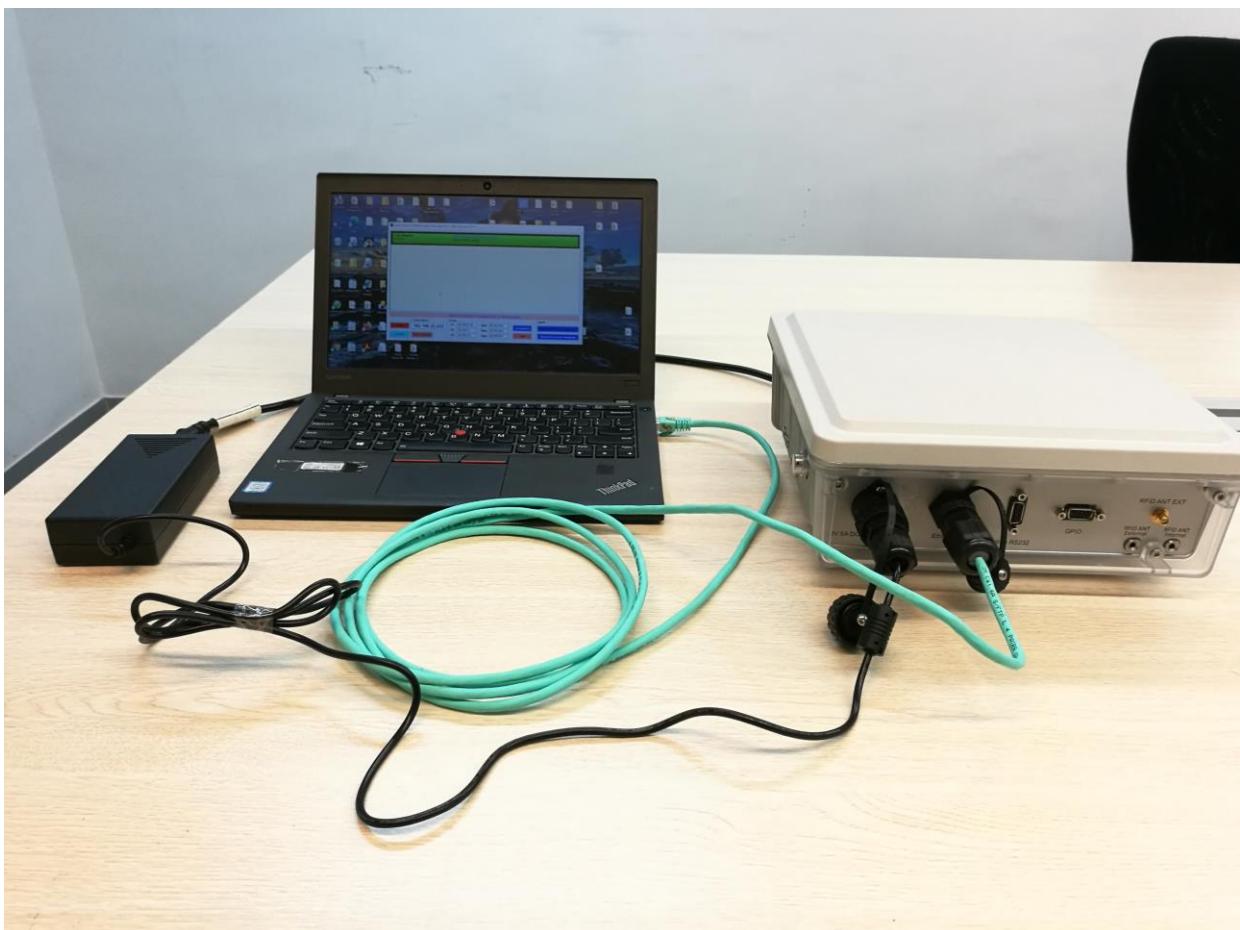
4.3 CS203X Intelligent Integrated Reader with 1 External Port

The CS203X RFID Integrated fixed reader is an intelligent reader designed to work standalone in an autonomous manner. An intelligent Event Engine is embedded with configurable complex logic sequence, triggers and resultant actions that are automatically activated on power up. The settings can be saved and further deployed to as many readers, as many sites as you want, thus providing easy scalability for the system integrators. CS203X integrated reader has 1 embedded antenna, plus 1 RF port that connects to an external antenna.



CS203X has the following connectivity: Ethernet.

The photo below shows a typical connection during operation of CS203X Integrated fixed reader



4.4 Product Package

4.4.1 Basic Package Content

The reader package of CS463 contains:

- | | |
|---------------------------------|--|
| 1. CS463: | 4 Port Intelligent RFID Reader |
| 2. CS463WIFIANT: | Dipole Antenna for Wi Fi and Bluetooth, Quantity=2 |
| 3. CS463ADAPTER: | AC Adapter, 12 VDC, 5A, 60 Watt Energy Level VI |
| 4. Country Specific Power Cord: | Power Cord for Specific Country Model |
| 5. CS463HD15ADAPTER: | HD-15 to Wiretap Terminal Adapter |
| 6. CS463GPIOCABLE: | GPIO Cable for CS463 |
| 7. CS463QSG: | Quick Start Guide |
| 8. CS463RG | Regulatory Guide |

The reader package of CS203X contains:

- | | |
|------------|--|
| 1. CS203X: | Integrated Intelligent RFID Reader / 1 external antenna port |
|------------|--|

4.5 Product Specifications

CS463 4 Port Reader



CS203X Integrated Reader



Features:

- ISO 18000-6C and EPCglobal Class 1 Gen 2 UHF RFID protocol compliant including dense reader mode
- Ultra-long read range – peak at more than 20 meters for Monza R6 Dogbone tag with CS771S antenna
- Sophisticated data handling for efficient management of large streams of tag data.
- Highly configurable buffering and tag filtering modes to eliminate the redundant tag data so as to reduce LAN traffic and server loading
- Robust performance in dense-reader environments
- Excellent in transmit and receive mode – generates a different combination of unique reader-to-tag command rate, tag-to-reader backscatter rate, modulation format, and backscatter type
- Configurable parameters offer maximum throughput and optimal performance
- Supports all Gen 2 commands, including inventory, read, write, lock and kill

Specifications:

Physical Characteristics:	Length: 272 cm; Width: 152 cm; Height: 24 cm; Weight: 720 grams
Environment:	Operating Temp: -20 ⁰ C to 50 ⁰ C Storage Temp: -40 ⁰ C to 85 ⁰ C Humidity: 5% to 95% non-condensing
Antenna:	External antenna with a RP-SMA Plug connector
RF Power:	32.5 dBm at antenna port for CS463 and CS203X. 30 dBm at antenna port for CS468XJ
RFID Frequency Ranges:	Various bands as designated by suffix.
Connectivity	All - Ethernet , RS232 Debug Serial Port* CS463 only - RS232 Control Serial Port**, USB Host Port, USB Client Port, Wi Fi 802.11b/g/n , Bluetooth
Accessories:	GPIO cable, HD-15 to Wiretap Terminal Adapter
Order Code:	Various bands as defined by suffix
Restrictions on Use:	Approvals, features and parameters may vary depending on country legislation and may change without notice

*RS232 Debug Serial Port is the standard Linux boot up port, it displays all the Linux messages, and you can access Linux OS and file system on this port using standard terminal programs such as HyperTerminal, Putty, etc.

**RS232 Control Serial Port is the serial port that you can use to connect to other devices, sensors and systems that have RS232 connectivity. This port is meant to be used by software programs embedded into CS463.

4.6 Product Accessories

CSL Intelligent Fixed Reader comes with a HD-15 to wiretap terminal adapter accessory. This enables you to connect wires to the HD-15 GPIO socket conveniently.



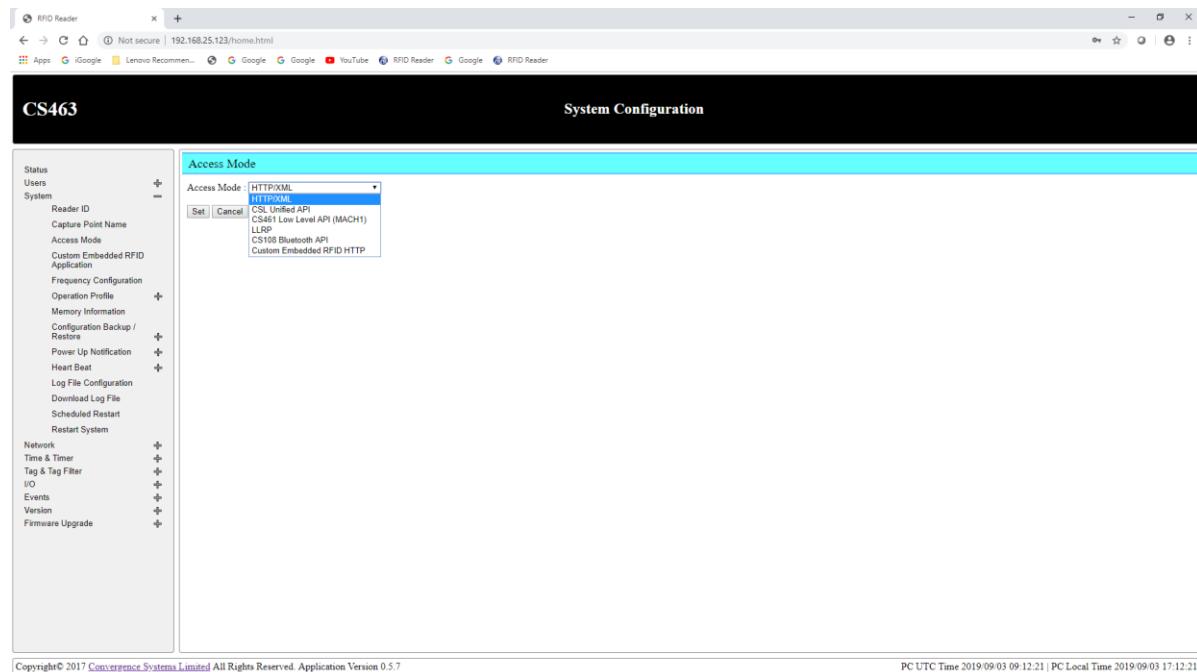
4.7 How to Connect to and Control CSL Intelligent Fixed Reader

One can connect to CSL Intelligent Fixed reader via Ethernet, RS232, Wi Fi, USB and GPIO interface, depending on which particular model.

One can control CSL Intelligent Fixed Reader in the following 7 ways:

- 1) Use the browser interface and the built-in event engine to configure CS463 to run autonomously based on certain logic sequence.
- 2) Use LLRP V1.1 API to control the reader.
- 3) Use CSL Unified API to control the reader
- 4) Use CS461 Low Level API (MACH 1 API) to control the reader
- 5) Use CS461 High Level API (HTTP/XML API) to control the reader
- 6) Use CS108 Bluetooth API to control the reader
- 7) Write embedded program in the Linux OS inside directly to control the reader.

To switch among 1) to 7), just go to the browser interface, System/Access Mode page, and then choose the Access Mode, as shown below:



4.8 Software Development Kits

Software development kits are available for the following on CSL website:

- 1) LLRP API
- 2) CSL Unified API
- 3) CS461 Low Level API (Mach1 API)
- 4) CS461 High Level API (HTTP/XML API)
- 5) CS108 Bluetooth API
- 6) Custom Embedded RFID: sample codes in /opt

5 Reader Basics

5.1 Basic Hardware

5.1.1 CS463 Basic Hardware

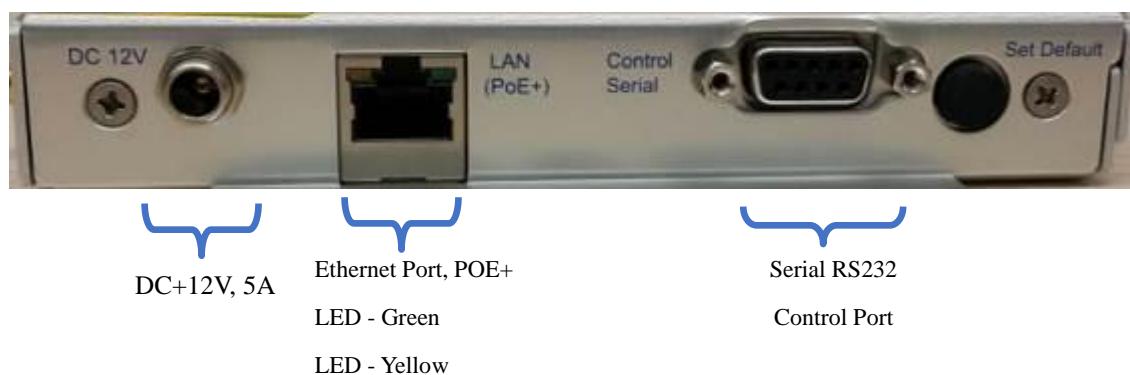
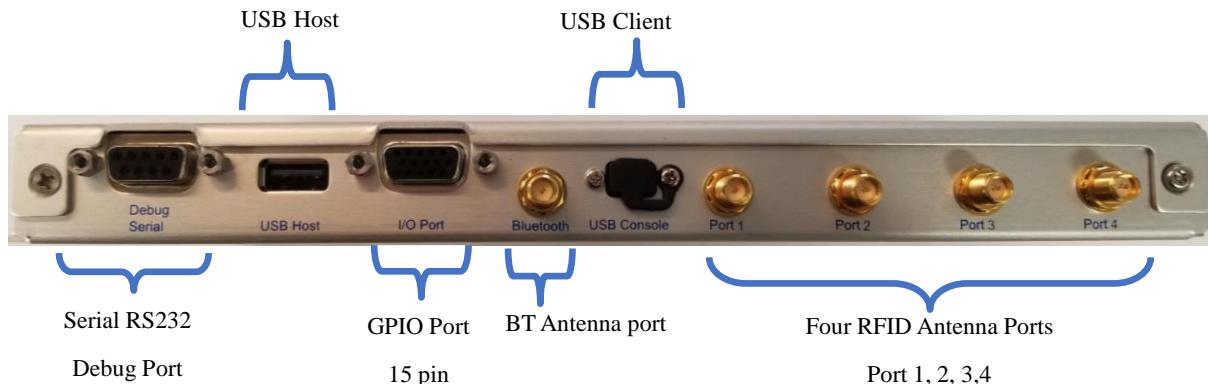
The CS463 RFID Reader is an EPCglobal Class 1 Gen 2 4 Port reader product.

Below is the top view of the CS463 4-port reader. There are LEDs to indicate the operating status

1. Power
2. Activity (programmable LED)
3. Active antenna port currently selected (Port 1, 2, 3,4)



Below is the front side, left side and back side views of the CS463 reader.



5.1.3 CS203X Basic Hardware

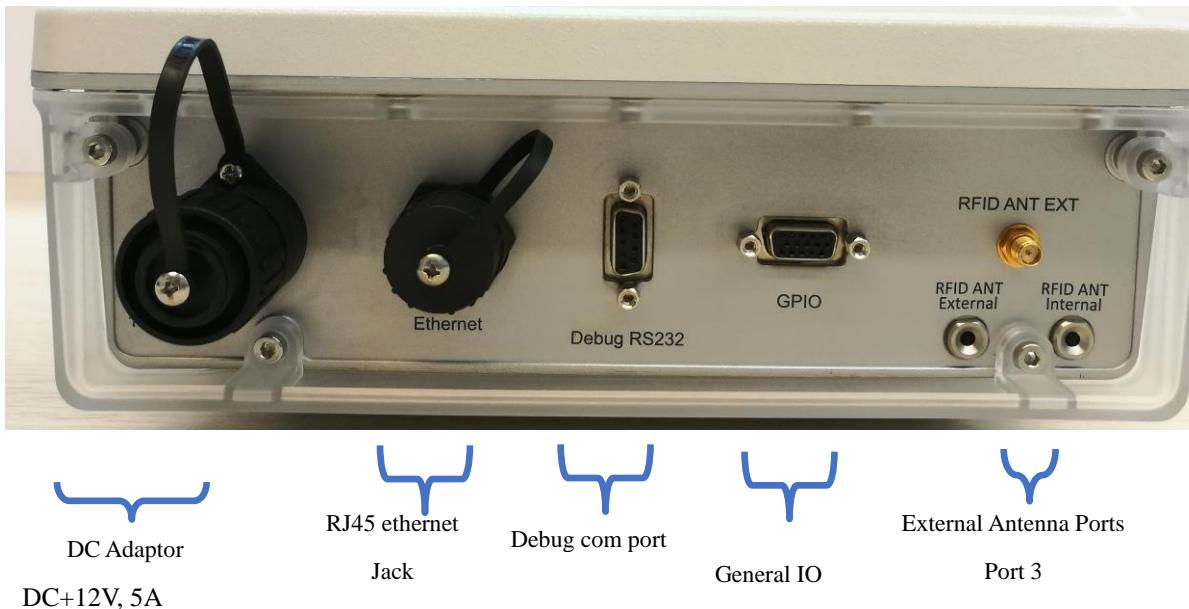
The CS203X RFID Reader is an EPCglobal Class 1 Gen 2 4 Port reader product.

Below is the front and side view of the CS203X Integrated reader. There are LEDs to indicate the operating status

1. Power
2. Activity (programmable LED)
3. Active antenna port currently selected (Port 3,4) Port 3 is external antenna port.
Port 4 is internal embedded antenna.
4. Ethernet link and Ethernet data LED



Below is the front, back, bottom and left side views of the CS203X reader .



Internal antenna
in this side



5.2 Set up Hardware

5.2.1 Set up CS463

1) AC Adaptor Unit

CS463 4-port reader can be powered up with the AC adaptor unit included in the package. Below photo shows the typical connection to use the AC adaptor. The AC adapter connects to CS463 via a “Locking” plug DC power plug. Please screw tight the lock on the DC power plug to ensure reliable power connection. That way the DC power plug would not loosen up over time.



With power connected, the Power LED should light up immediately.

Plug in AC adapter,



When using AC adaptor, please remember to screw tight as shown below:



2) PoE+

CS463 also supports the use of Power over Ethernet (PoE+) to give it power. Below shows the typical connection of using PoE+ as the power supply to the CS463 4-port reader. Note that it must be POE Plus (POE+) for it to give enough power to CS463. Make sure you use 30 Watt POE+ port to ensure CS463 receive enough power to operate.



3) RFID Antenna Connection

Connect RFID antenna with wrench (8mm torque with 100 N-cm) to reader
(CS463 has 4 available RFID antenna ports from Port 1 to Port 4)



4) Wi Fi and Bluetooth Antenna (only for CS463 reader)

Connect two Wi Fi/BT antennas to reader as below



5) Ethernet Cable

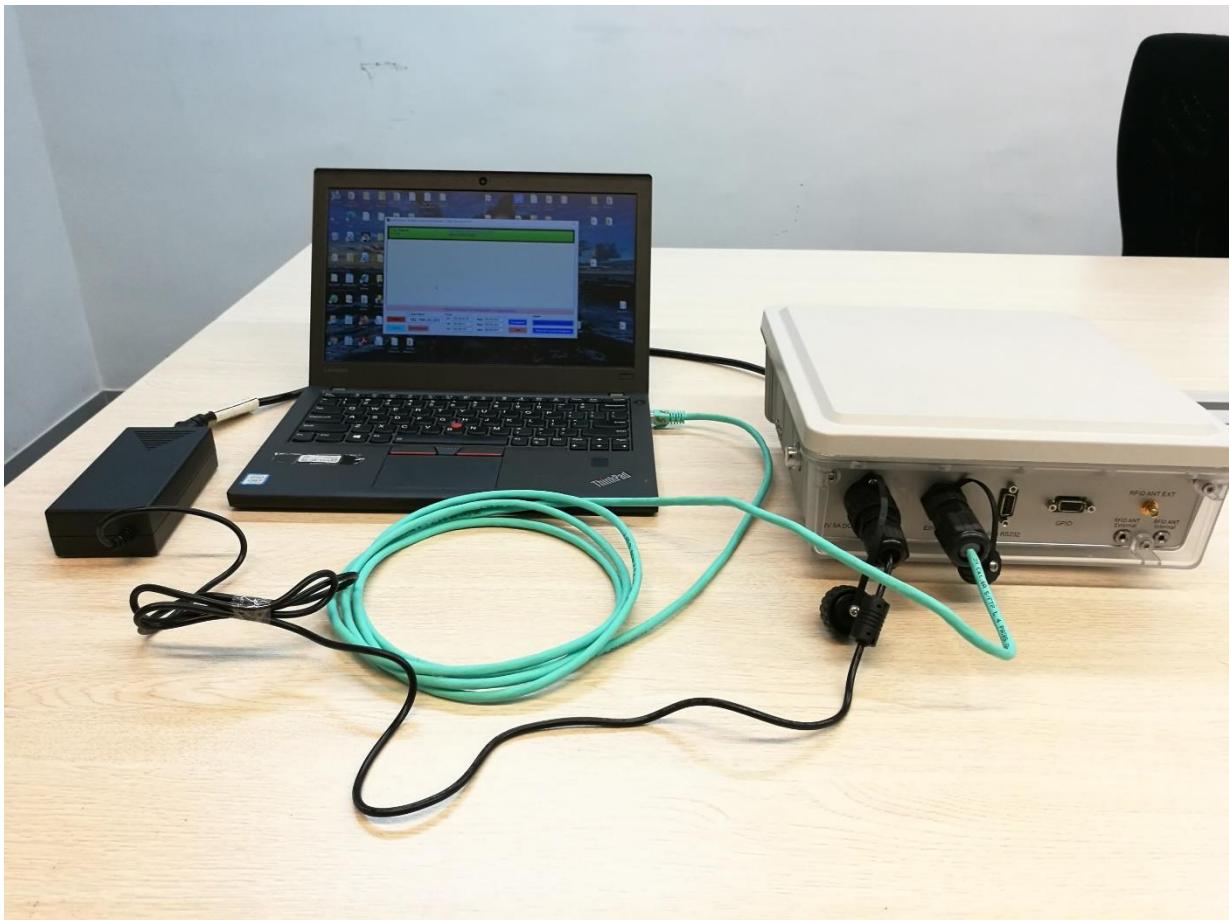
Connect Ethernet cable to reader as below



5.2.2 Set up CS203X

1) AC Adaptor Unit

CS203X reader can be powered up with the AC adaptor unit included in the package. Below photo shows the typical connection to use the AC adaptor. The AC adapter connects to CS203X via a plug DC power plug. Please screw tight the lock on the DC power plug to ensure reliable power connection. That way the DC power plug would not loosen up over time.

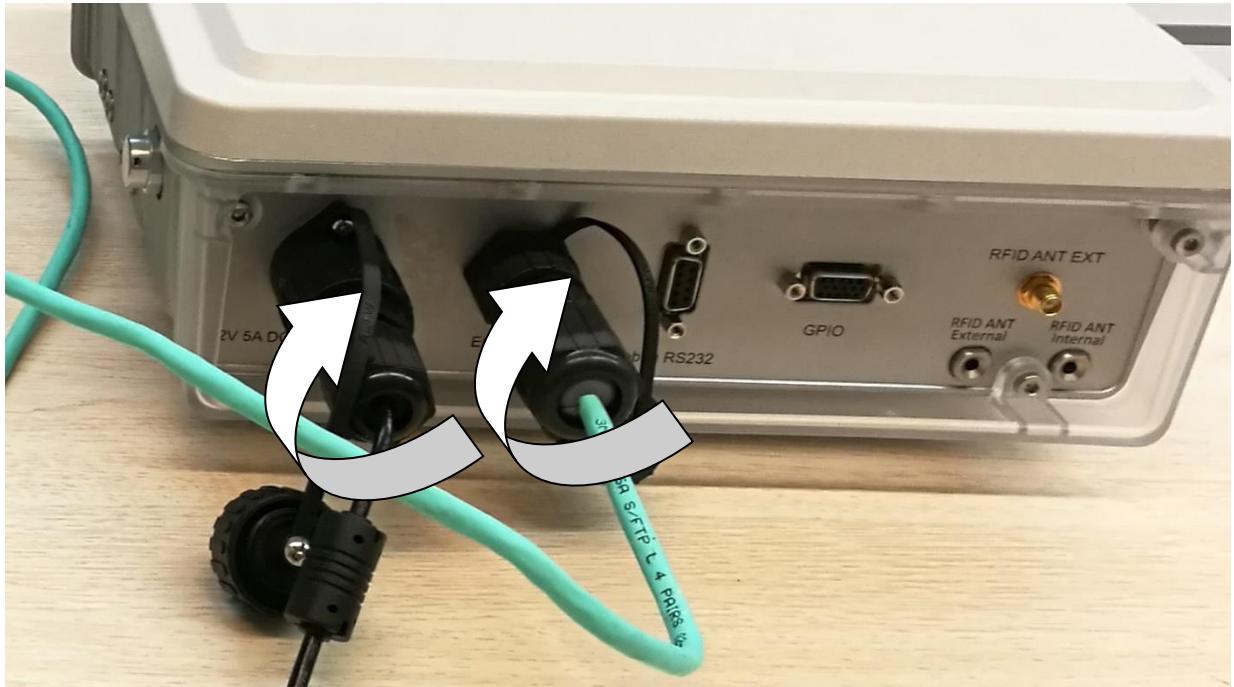


With power connected, the Power LED should light up immediately.

Plug in AC adapter,

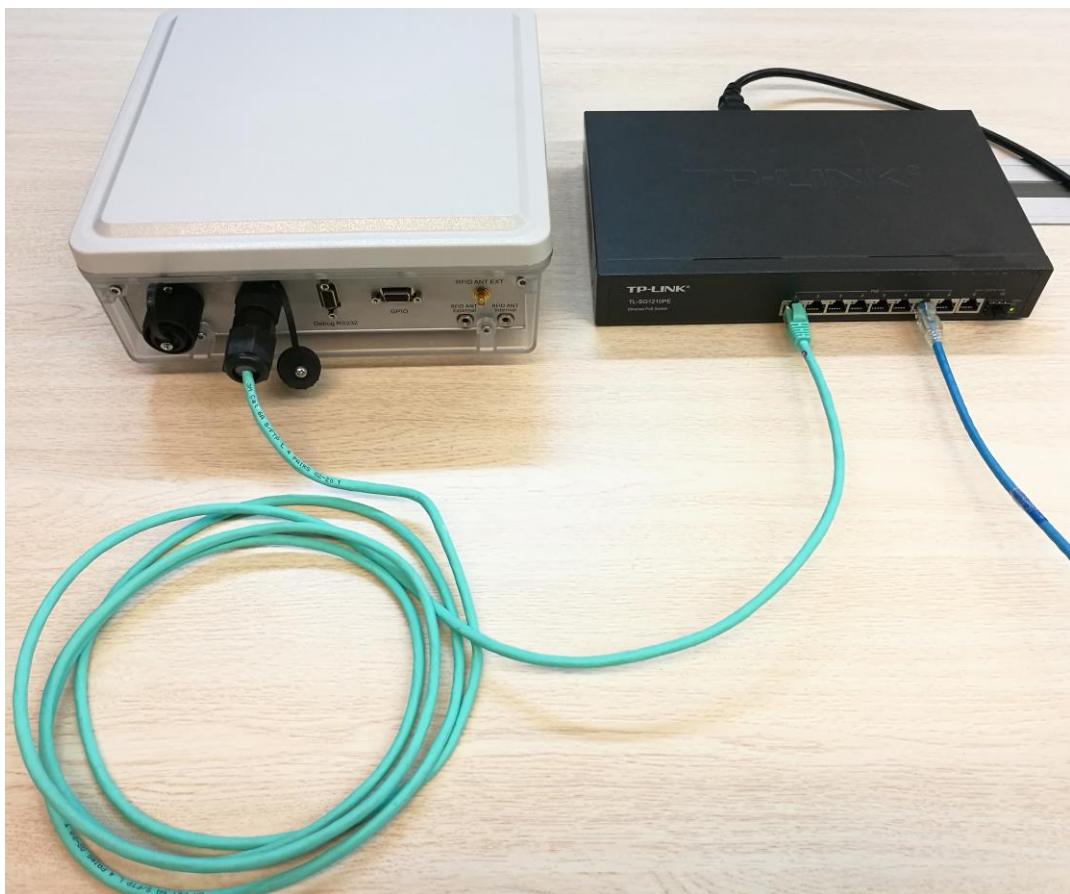


When using AC adaptor, please remember to screw tight as shown below:



2) PoE+

CS203X also supports the use of Power over Ethernet (PoE+) to give it power. Below shows the typical connection of using PoE+ as the power supply to the CS203X reader. Note that it must be POE Plus (POE+) for it to give enough power to CS203X. Make sure you use 30 Watt POE+ port to ensure CS203X receive enough power to operate.



3) RFID Internal and External Antenna Connection

There is one internal RFID antenna connected to antenna ports Port 4 internally.

Connect RFID antenna with wrench (8mm torque with 100 N-cm) to reader
(CS203X has one available RFID external antenna ports Port 3)



5.3 Mounting of CSL Intelligent Fixed Readers

Reader should be mounted in different ways depending on the surface on which the reader is installed:

- 1) Reader is installed on metal surface
- 2) Reader is installed on non-metal surface

Installation method on large metal surface



Reader can be installed directly on metal surface, no spacer needed: heat can directly enter metal surface and dissipate away.

Installation method on non-metal surface, such as wood surface: The reader should be mounted leaving some space between the bottom of the reader and the surface. This will allow ventilation of air underneath the reader.



Installation method on metal poles:

The standard C-Clamp for pole mounting will fit the screw holes at the back of CS203X:



5.4 Operating Systems and Versions on CSL Intelligent Fixed Readers

There are 2 Linux OS versions: 3.0.35 or 4.x.x. For units shipped before September 2019, the OS is Linux 3.0.35. After September 2019, the OS is 4.xx.yy or beyond. Some of the firmware has different versions per the OS version. Please note this variation.

5.5 Connecting to CSL Intelligent Fixed Readers using Browser

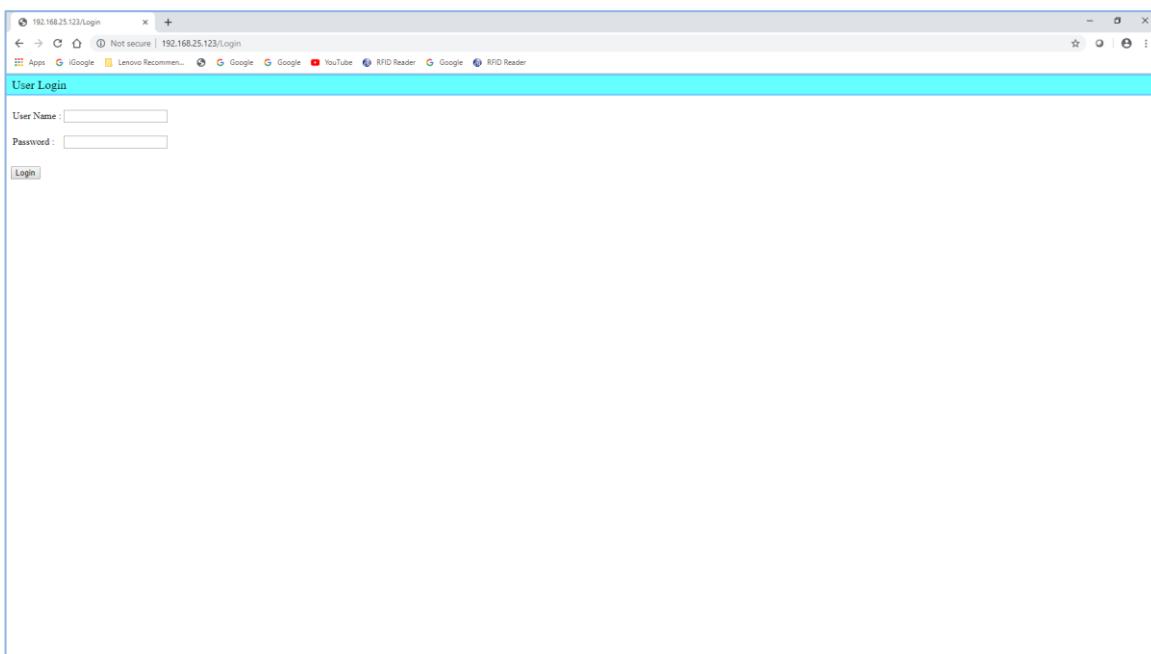
All CSL Intelligent Fixed Readers are set to Ethernet Static IP of 192.168.25.160 ex-factory. Wi Fi is disabled ex-factory. This is to simplify out-of-box experience.

Set your PC to a static IP of 192.168.25.100 (or any other as long as the subnet is 25)

Connect Ethernet cable from your PC to the reader directly, or via an Ethernet switch.

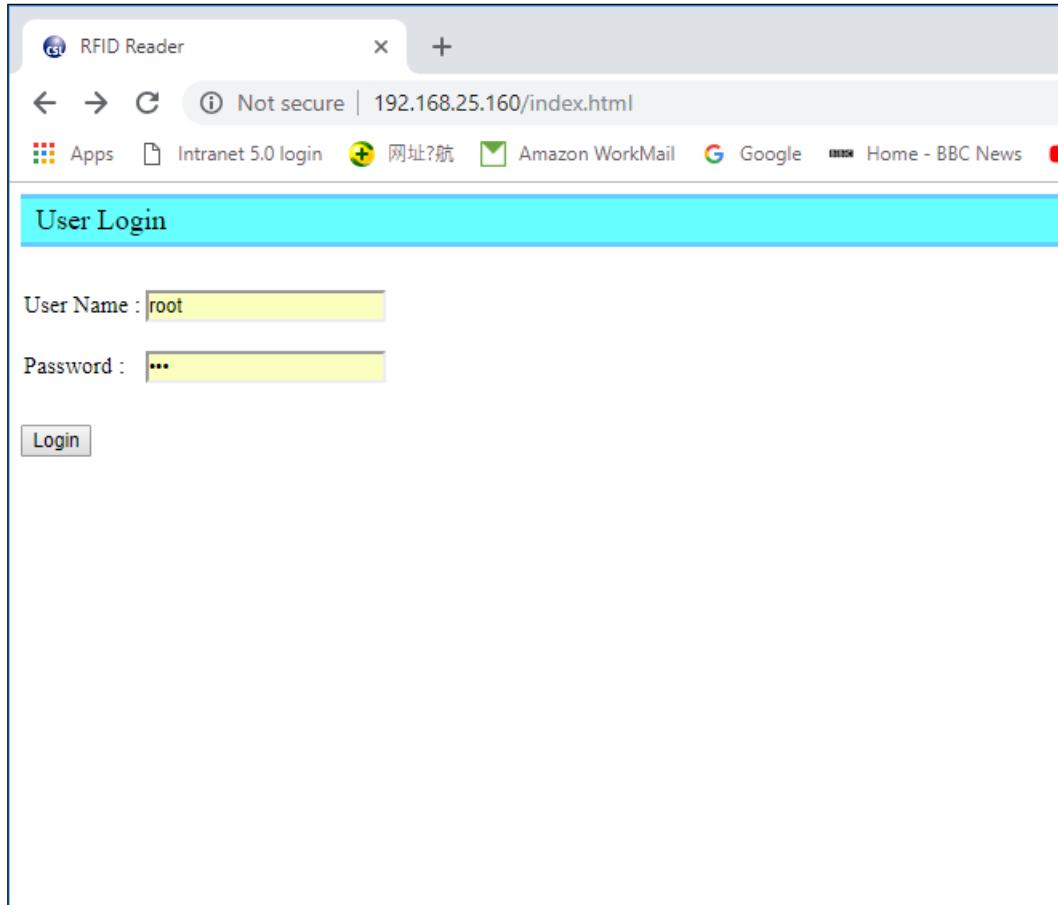
Power up the reader, wait 2.5 minutes.

Open browser on your PC, and type in 192.168.25.160.



You will then see a User Login page.

Key in User Name: **root**, Password: **csl** then click Login to login to system



You will then see a Status page:

The screenshot shows a web browser window titled "RFID Reader" with the URL "192.168.25.123/home.html". The main content area is titled "Status" and displays the "CSL RFID Management System". On the left, there is a sidebar with expandable sections: Status, Users, System, Network, Timer & Timer, Tag & Tag Filter, IO, Events, Version, and Firmware Upgrade. The "Status" section is expanded, showing the following data:

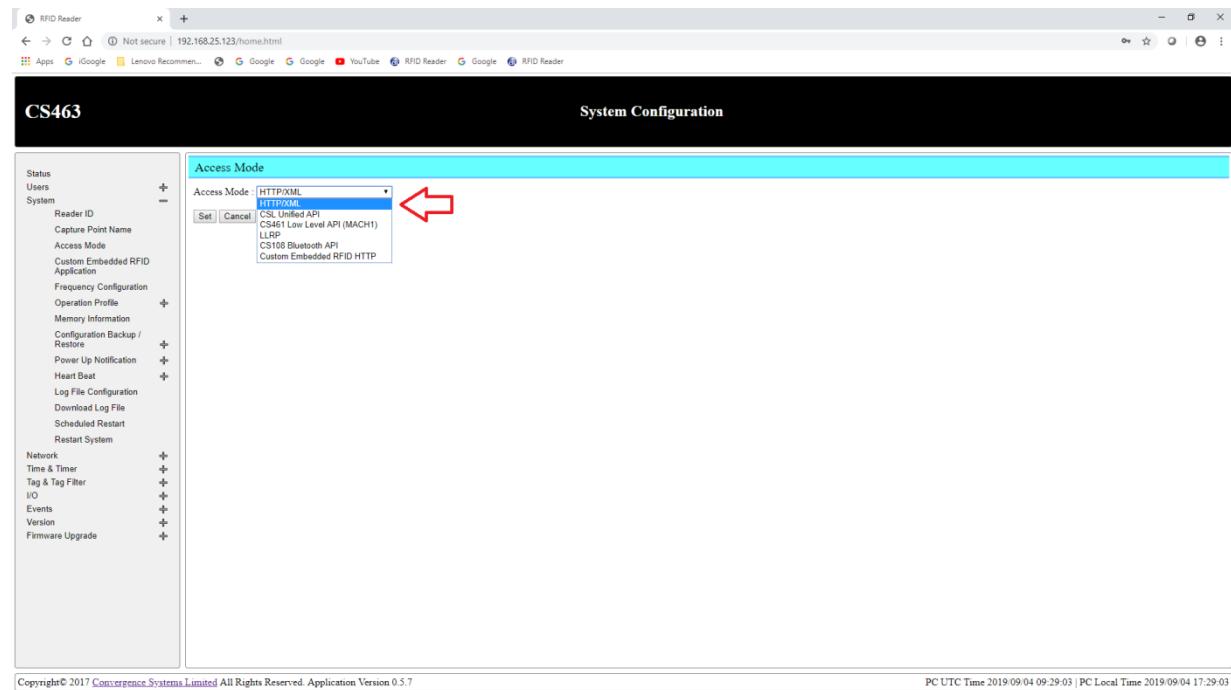
Reader ID :	CS463 INTELLIGENT RFID READER
Model Name :	CS463-7
Host Name :	cs463-7b6400f8
Reader Serial # :	HKO1808ES0002
PCB Serial # :	BEPB1947ES152022
Frequency Band :	7
Regulatory Region :	China
Access Mode :	HTTP/XML
Up Time :	6.65 hours
Free RAM Memory :	719 MBytes
Used RAM Memory :	170 MBytes
Local Time :	2019/09/04 Wednesday 17:27:38
Time Zone :	GMT+08:00
UTC Time :	2019/09/04 Wednesday 09:27:38
Auto Logout Time :	60 minutes
Enabled Events :	None Enabled
Cloud Server Connection :	Not Enabled
Scheduled Restart :	Not Enabled
Antenna Port 1 Power :	Not Enabled

At the bottom of the status page, it says "Copyright© 2017 Convergence Systems Limited All Rights Reserved Application Version 0.5.7" and "PC UTC Time 2019/09/04 09:27:40 | PC Local Time 2019/09/04 17:27:40".

Default Access Mode ex-factory is HTTP/XML.

Change the Access Mode if reader not in HTTP/XML mode

- In order to read and show RFID tags in Web page, please change the Access Mode to “HTTP/XML” as shown below in System page.
- Please click “Set” to confirm the change.



To control CS463 reader now using the browser interface, please go to Chapter 5.

5.6 Connecting to CSL Intelligent Fixed Readers via Debug Serial Port

For a Linux device, Debug Serial Port is a popular interface to monitor the boot up and also type in commands.

On the PC side, one needs to run a terminal application. In this user manual, the application PuTTY is used to review the CS463 operation in Linux OS level.

(a) Hardware connection

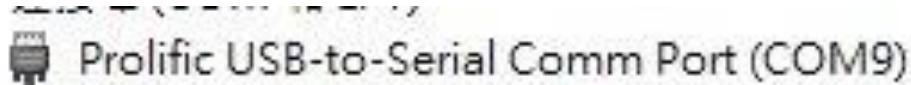
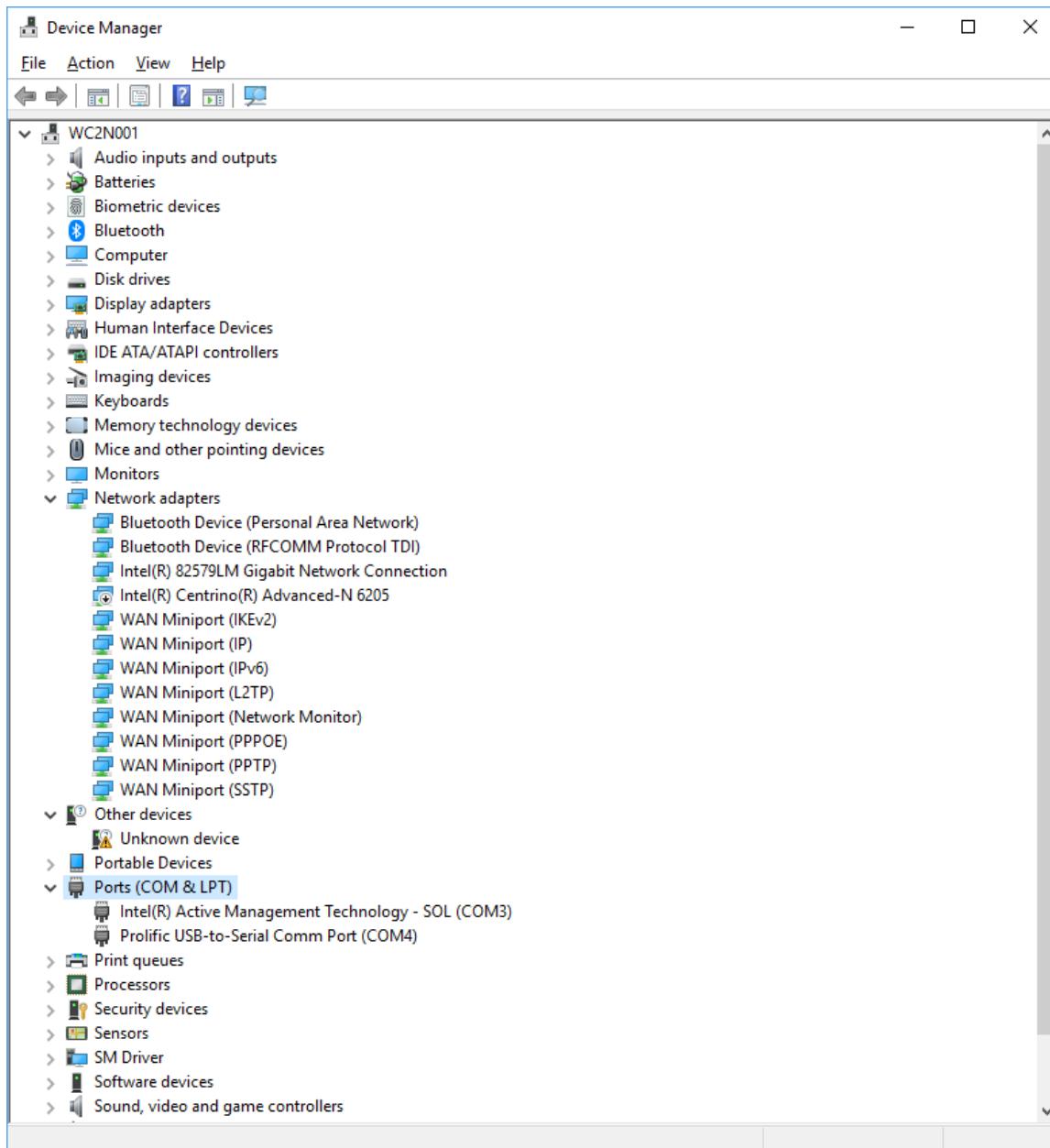
You need to connect your PC to the Debug Serial Port. If your PC has serial port, you can connect directly. If your PC does not have a serial port, you can use a USB to Serial adapter.

Please use a USB-to-Serial cable to connect the CS463 debug port to the USB port of PC



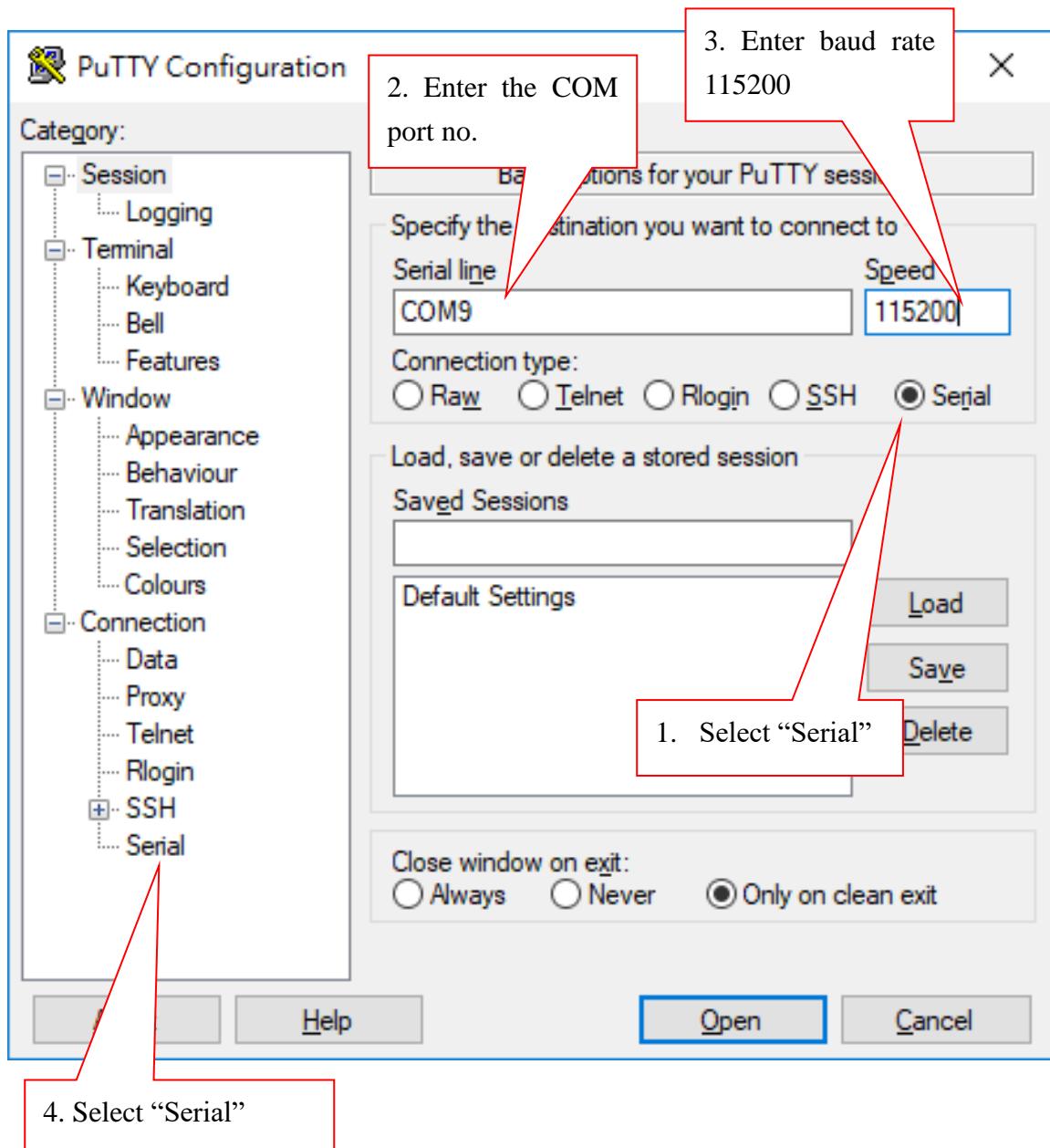
- (b) Check the COM port number that corresponds to the USB to Serial Adapter

Check it out from the device manager of your PC

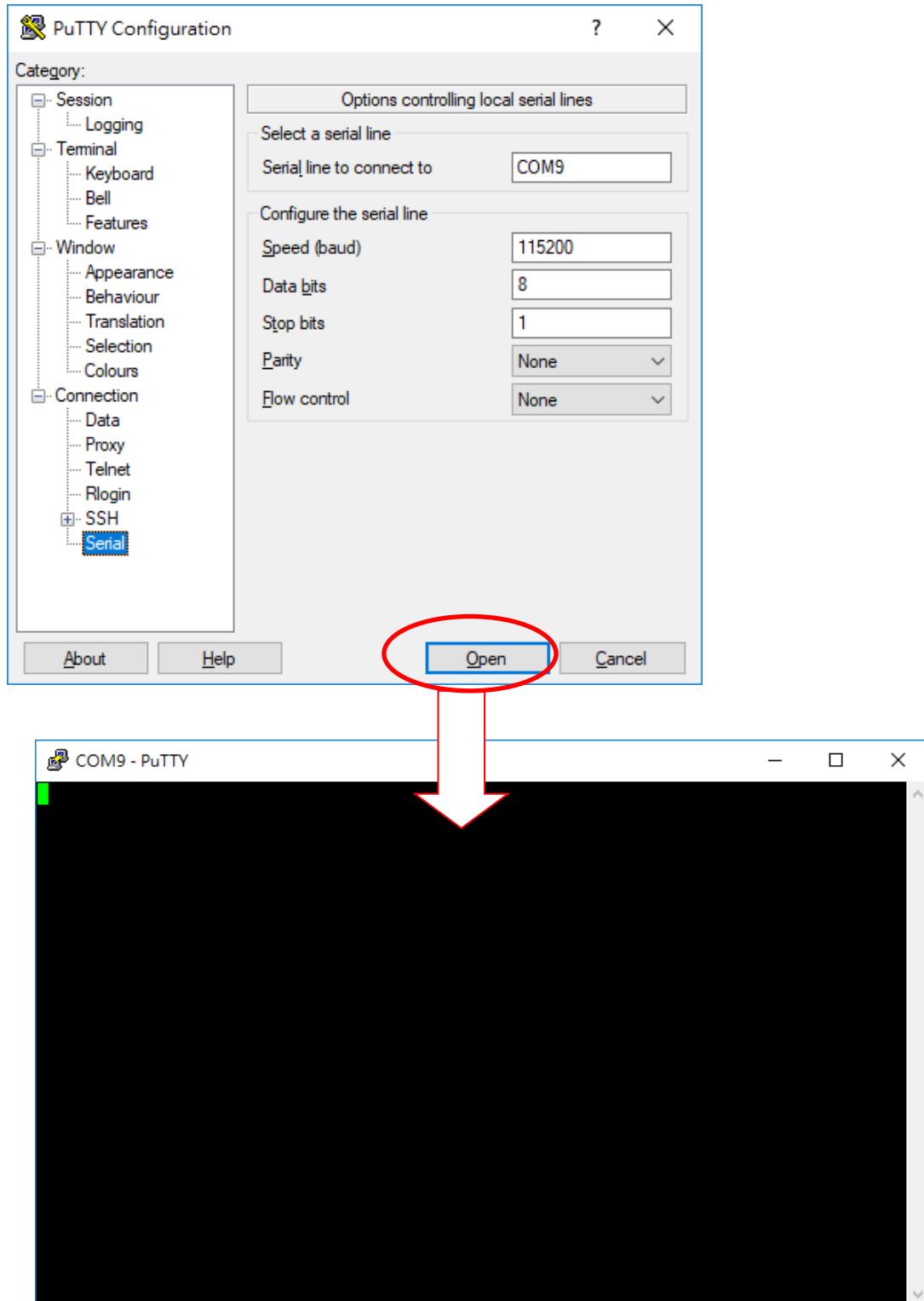


(c) Setup a Baud Rate = 115,200 connection to the appropriate serial port

Below show the set up page of the PuTTy .



After clicking “Serial” in step 4 in above diagram, the window will change to as below, please select “None” for the “Flow control” option. Then click “Open” to confirm the connection

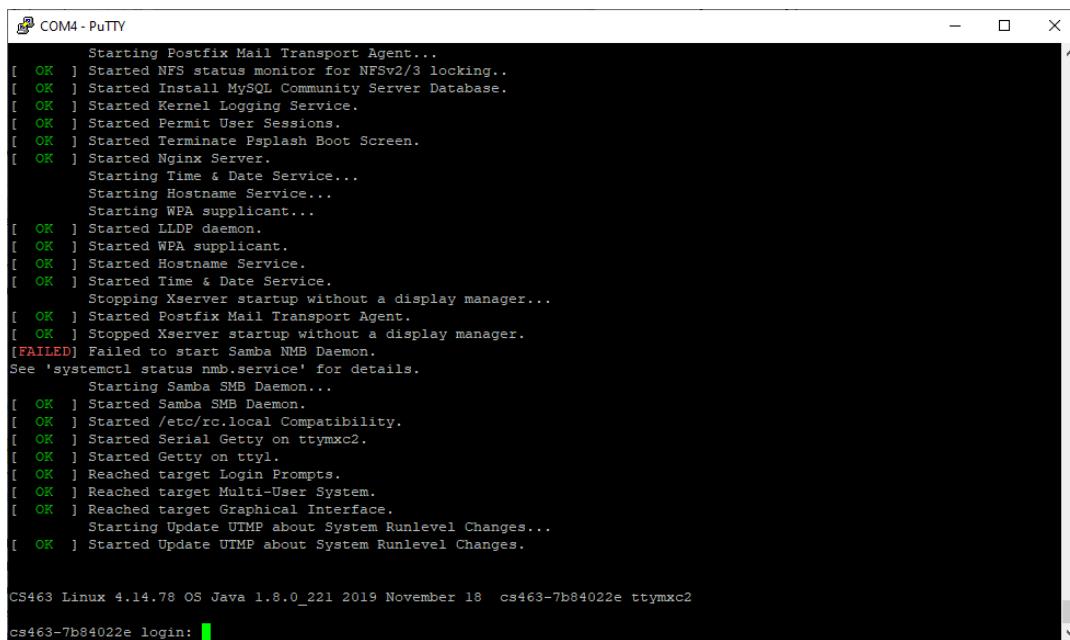


Now PuTTy is ready for CS463 to power up.

Below diagram shows the display at the end of CS463 Linux boot up and embedded processes boot up. There is a prompt for login and password.

The login should be **root**

The password should be **csl** (for older shipment units the password was cs463. Try that if csl does not work)



```
Starting Postfix Mail Transport Agent...
[ OK ] Started NFS status monitor for NFSv2/3 locking..
[ OK ] Started Install MySQL Community Server Database.
[ OK ] Started Kernel Logging Service.
[ OK ] Started Permit User Sessions.
[ OK ] Started Terminate Pplash Boot Screen.
[ OK ] Started Nginx Server.
Starting Time & Date Service...
Starting Hostname Service...
Starting WPA supplicant...
[ OK ] Started LLDP daemon.
[ OK ] Started WPA supplicant.
[ OK ] Started Hostname Service.
[ OK ] Started Time & Date Service.
Stopping Xserver startup without a display manager...
[ OK ] Started Postfix Mail Transport Agent.
[ OK ] Stopped Xserver startup without a display manager.
[FAILED] Failed to start Samba NMB Daemon.
See 'systemctl status nmb.service' for details.
Starting Samba SMB Daemon...
[ OK ] Started Samba SMB Daemon.
[ OK ] Started /etc/rc.local Compatibility.
[ OK ] Started Serial Getty on ttymxc2.
[ OK ] Started Getty on ttymxc2.
[ OK ] Reached target Login Prompts.
[ OK ] Reached target Multi-User System.
[ OK ] Reached target Graphical Interface.
Starting Update UTMP about System Runlevel Changes...
[ OK ] Started Update UTMP about System Runlevel Changes.

CS463 Linux 4.14.78 OS Java 1.8.0_221 2019 November 18 cs463-7b84022e ttymxc2
cs463-7b84022e login: [REDACTED]
```

(d) Linux commands examples

- ifconfig

The purpose of “ifconfig” command is to show the relevant network information

```

COM9 - PuTTY
root@cs463-ubuntu:~# ifconfig
eth0      Link encap:Ethernet HWaddr 00:05:7b:84:00:08
          inet addr:192.168.25.180 Bcast:192.168.25.255 Mask:255.255.255.0
                  UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
                  RX packets:17583 errors:2 dropped:1302 overruns:0 frame:2
                  TX packets:18252 errors:0 dropped:0 overruns:0 carrier:0
                  collisions:0 txqueuelen:1000
                  RX bytes:1193166 (1.1 MB) TX bytes:23078423 (23.0 MB)

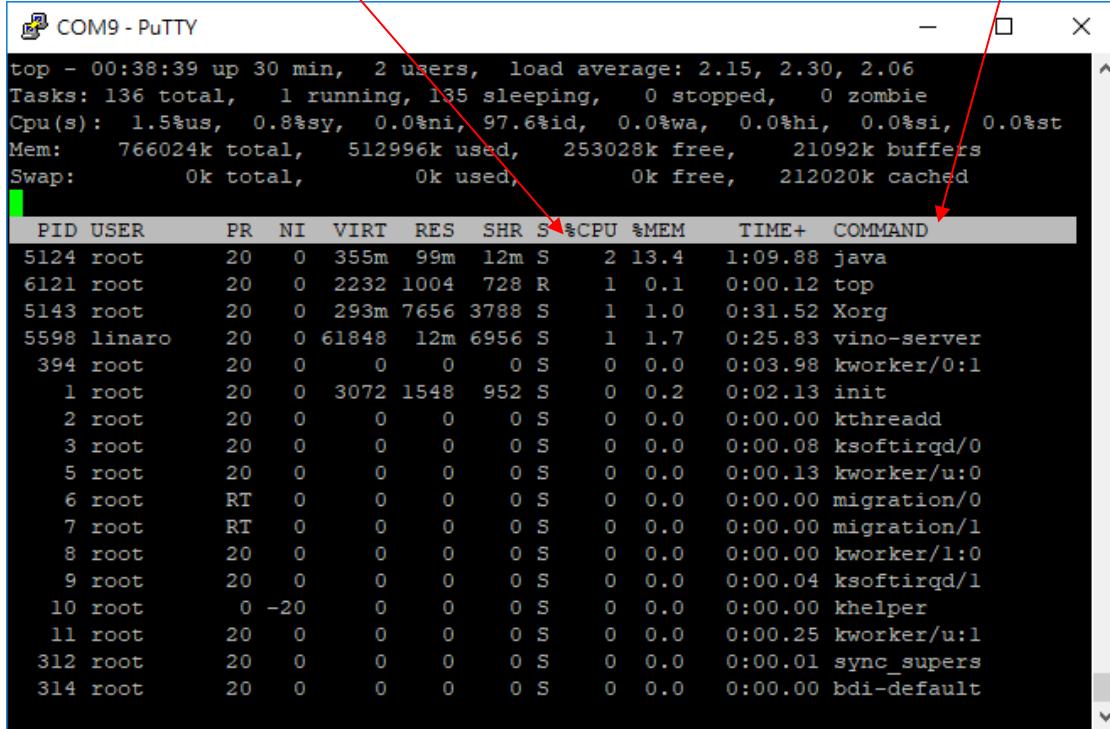
lo       Link encap:Local Loopback
          inet addr:127.0.0.1 Mask:255.0.0.0
                  UP LOOPBACK RUNNING MTU:16436 Metric:1
                  RX packets:151 errors:0 dropped:0 overruns:0 frame:0
                  TX packets:151 errors:0 dropped:0 overruns:0 carrier:0
                  collisions:0 txqueuelen:0
                  RX bytes:16624 (16.6 KB) TX bytes:16624 (16.6 KB)

wlan0    Link encap:Ethernet HWaddr 00:05:7b:87:00:11
          inet addr:192.168.25.101 Bcast:192.168.25.255 Mask:255.255.255.0
                  UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
                  RX packets:61 errors:0 dropped:0 overruns:0 frame:0
                  TX packets:37 errors:0 dropped:0 overruns:0 carrier:0
                  collisions:0 txqueuelen:1000
                  RX bytes:7719 (7.7 KB) TX bytes:12353 (12.3 KB)

root@cs463-ubuntu:~#
  
```

- top

The key purpose of “top” command is to show user how many process being execute and the occupancy of CPU percentage.



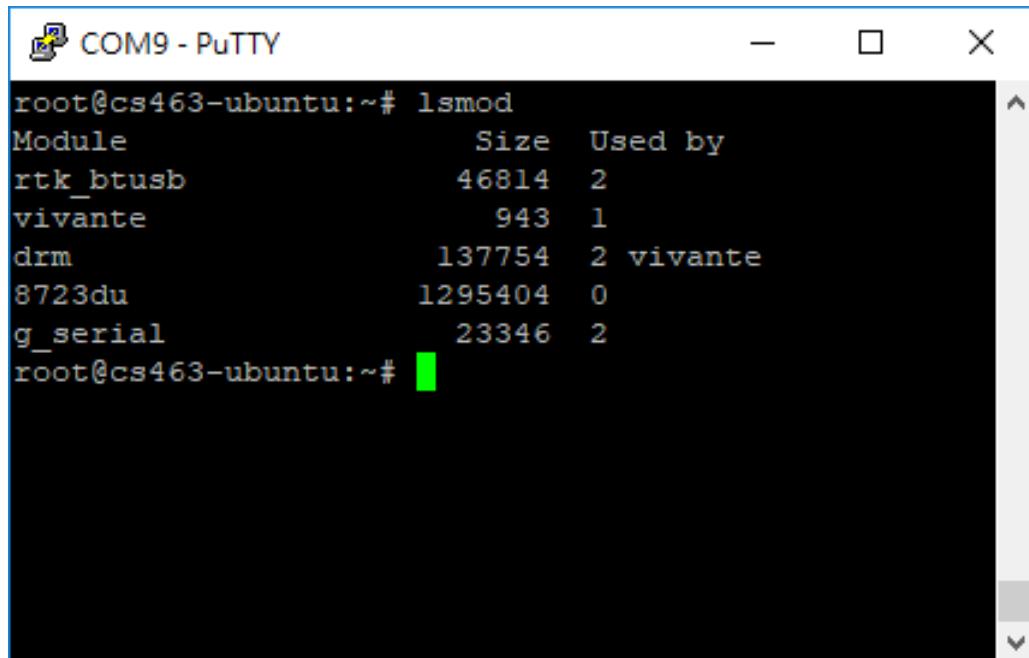
```
top - 00:38:39 up 30 min,  2 users,  load average: 2.15, 2.30, 2.06
Tasks: 136 total,   1 running, 135 sleeping,   0 stopped,   0 zombie
Cpu(s): 1.5%us, 0.8%sy, 0.0%ni, 97.6%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0%st
Mem: 766024k total, 512996k used, 253028k free, 21092k buffers
Swap: 0k total, 0k used, 0k free, 212020k cached

PID USER      PR NI  VIRT  RES  SHR S %CPU %MEM     TIME+ COMMAND
5124 root      20  0 355m 99m 12m S    2 13.4  1:09.88 java
6121 root      20  0 2232 1004 728 R    1  0.1  0:00.12 top
5143 root      20  0 293m 7656 3788 S    1  1.0  0:31.52 Xorg
5598 linaro   20  0 61848 12m 6956 S    1  1.7  0:25.83 vino-server
394 root      20  0 0     0     0 S    0  0.0  0:03.98 kworker/0:1
 1 root      20  0 3072 1548 952 S    0  0.2  0:02.13 init
 2 root      20  0 0     0     0 S    0  0.0  0:00.00 kthreadd
 3 root      20  0 0     0     0 S    0  0.0  0:00.08 ksoftirqd/0
 5 root      20  0 0     0     0 S    0  0.0  0:00.13 kworker/u:0
 6 root      RT  0 0     0     0 S    0  0.0  0:00.00 migration/0
 7 root      RT  0 0     0     0 S    0  0.0  0:00.00 migration/1
 8 root      20  0 0     0     0 S    0  0.0  0:00.00 kworker/1:0
 9 root      20  0 0     0     0 S    0  0.0  0:00.04 ksoftirqd/1
10 root     0 -20 0     0     0 S    0  0.0  0:00.00 khelper
11 root      20  0 0     0     0 S    0  0.0  0:00.25 kworker/u:1
312 root      20  0 0     0     0 S    0  0.0  0:00.01 sync_supers
314 root      20  0 0     0     0 S    0  0.0  0:00.00 bdi-default
```

To escape, type Control C.

- **lsmod**

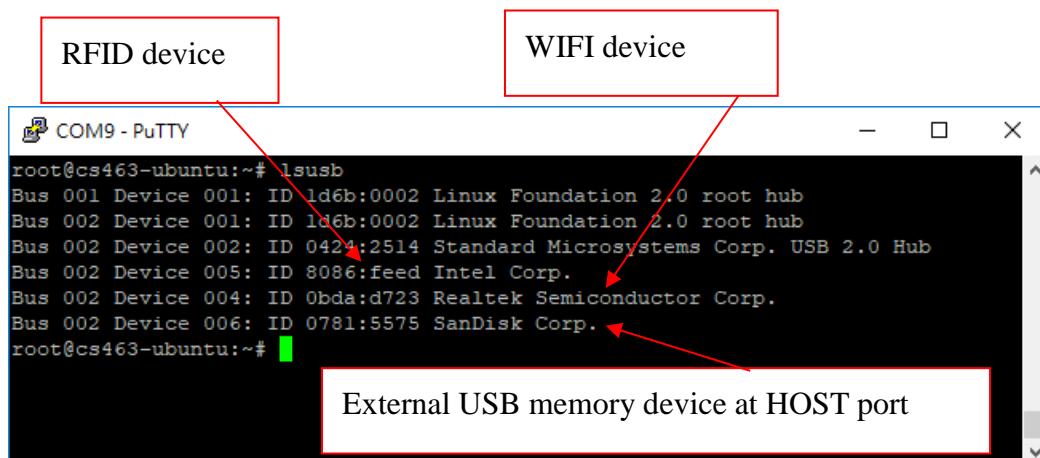
The purpose of “lsmod” command is to list out how many modules in operation as shown below. Note that **rtk_btusb** is the Bluetooth driver. **8723du** is the Wi Fi driver.



```
root@cs463-ubuntu:~# lsmod
Module           Size  Used by
rtk_btusb        46814  2
vivante          943   1
drm              137754  2 vivante
8723du          1295404 0
g_serial         23346  2
root@cs463-ubuntu:~#
```

- **lsusb**

The purpose of “lsusb” command is to list out how many USB devices are connected to the system.



```
root@cs463-ubuntu:~# lsusb
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 002 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 002 Device 002: ID 0424:2514 Standard Microsystems Corp. USB 2.0 Hub
Bus 002 Device 005: ID 8086:feed Intel Corp.
Bus 002 Device 004: ID 0bda:d723 Realtek Semiconductor Corp.
Bus 002 Device 006: ID 0781:5575 SanDisk Corp.
root@cs463-ubuntu:~#
```

RFID device

WIFI device

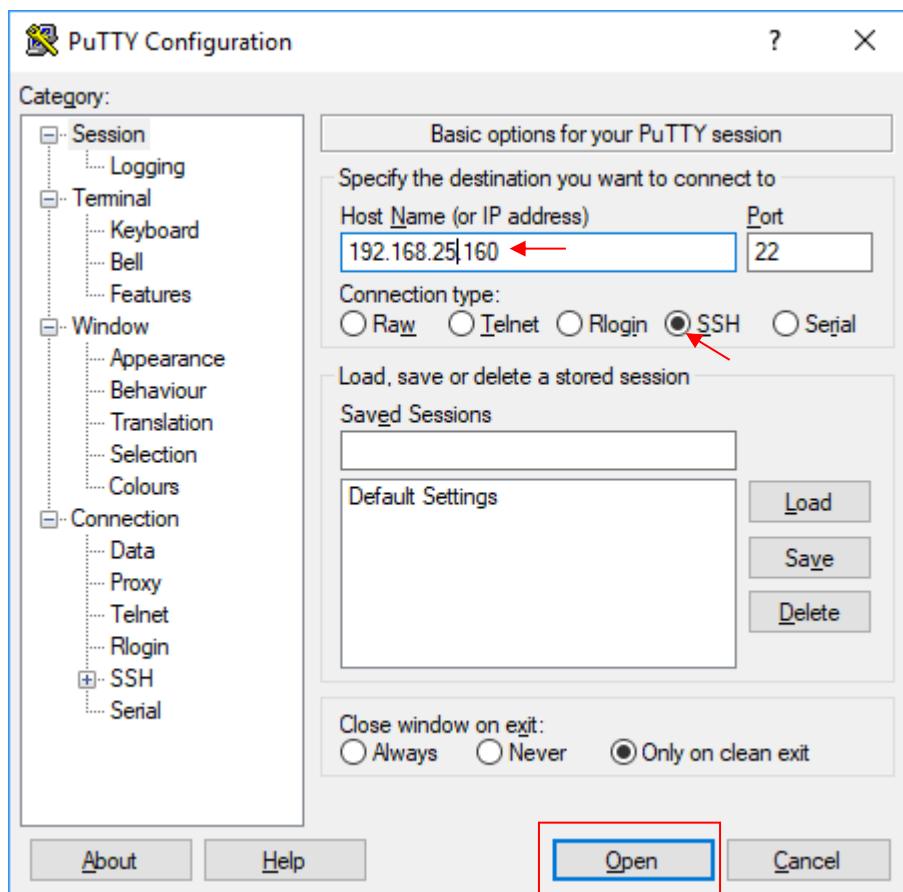
External USB memory device at HOST port

5.7 Connecting to CSL Intelligent Fixed Readers via SSH

Another popular way to connect to a Linux device is via SSH.

You can also use the application PuTTY, but choose SSH on the front page:

Start Putty, select SSH on Connection Type and type in IP address of CS463, then click Open



For some older units, you should type in

Login name = linaro

Password = linaro

For later versions, you should type in

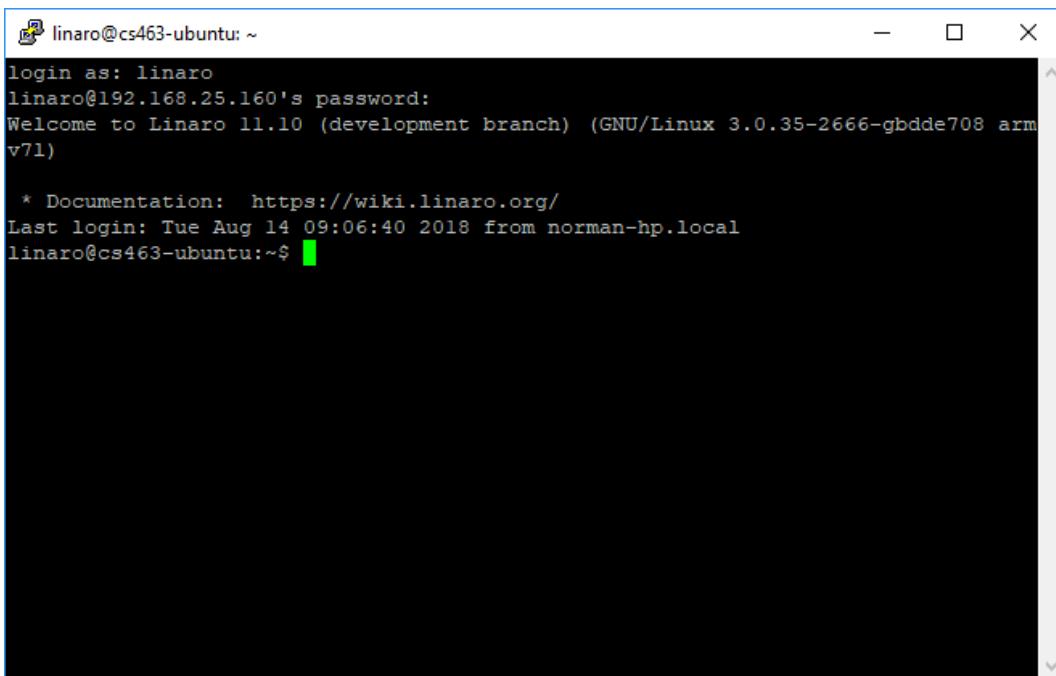
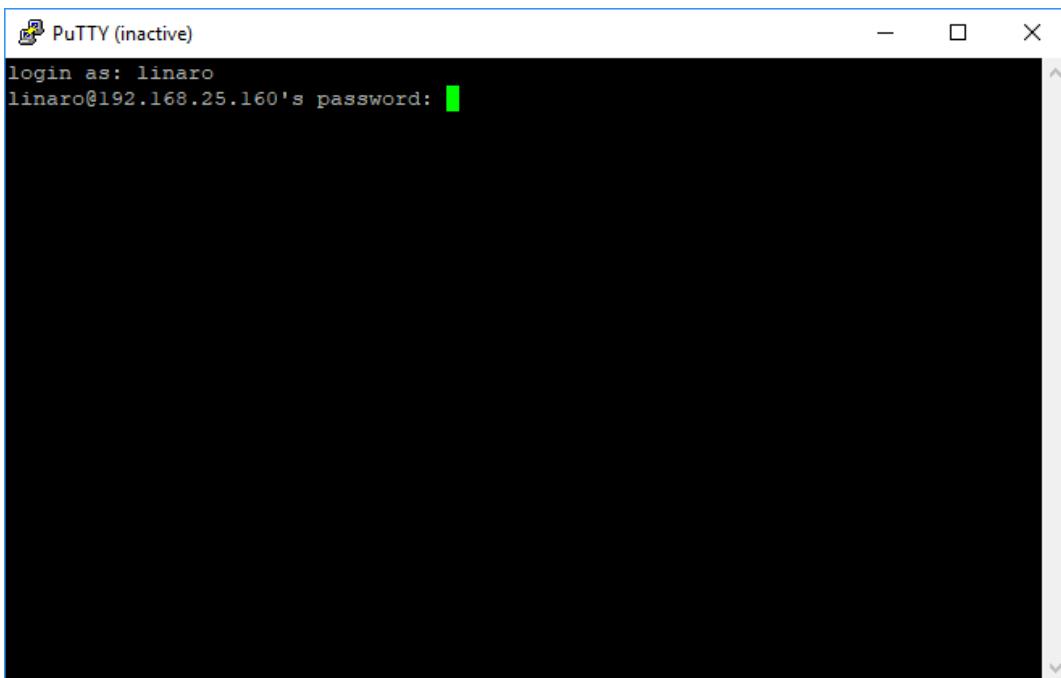
Login name = root

Password = cs1 (if cs1 does not work, try cs463)

Input login name “linaro”



Input password “linaro”



5.8 Embedded Linux Applications Development

Using the Debug Serial Port or using SSH, one can now develop embedded Linux codes inside CS463 in the usual Linux development manner.

The Linux OS inside CS463 is Yocto Linux.

For popular open source software, one can use the command “**dnf**” to download popular precompiled binaries (**dnf** is similar to apt-get) by following the steps below:

Step 1: type the command “**dnf --refresh makecache**” (beware of the double dash) to refresh the directory of available precompiled binaries

Step 2: type the command “**dnf list**” to list the available precompiled binaries in long name format.

Step 3: type the command “**dnf list | grep <keyword of the application you want>**” to narrow your search to those in long name format.

Step 4: type the command “**dnf install <long name of the application as obtained from Step 3>**”

5.9 File Transfer to and from CS463 using USB Memory Device

File Transfer to and from CS463 using USB Memory Device

First of all, we need to connect to the Linux OS via the Debug Serial Port.

Plug in “serial to USB” adapter to debug port

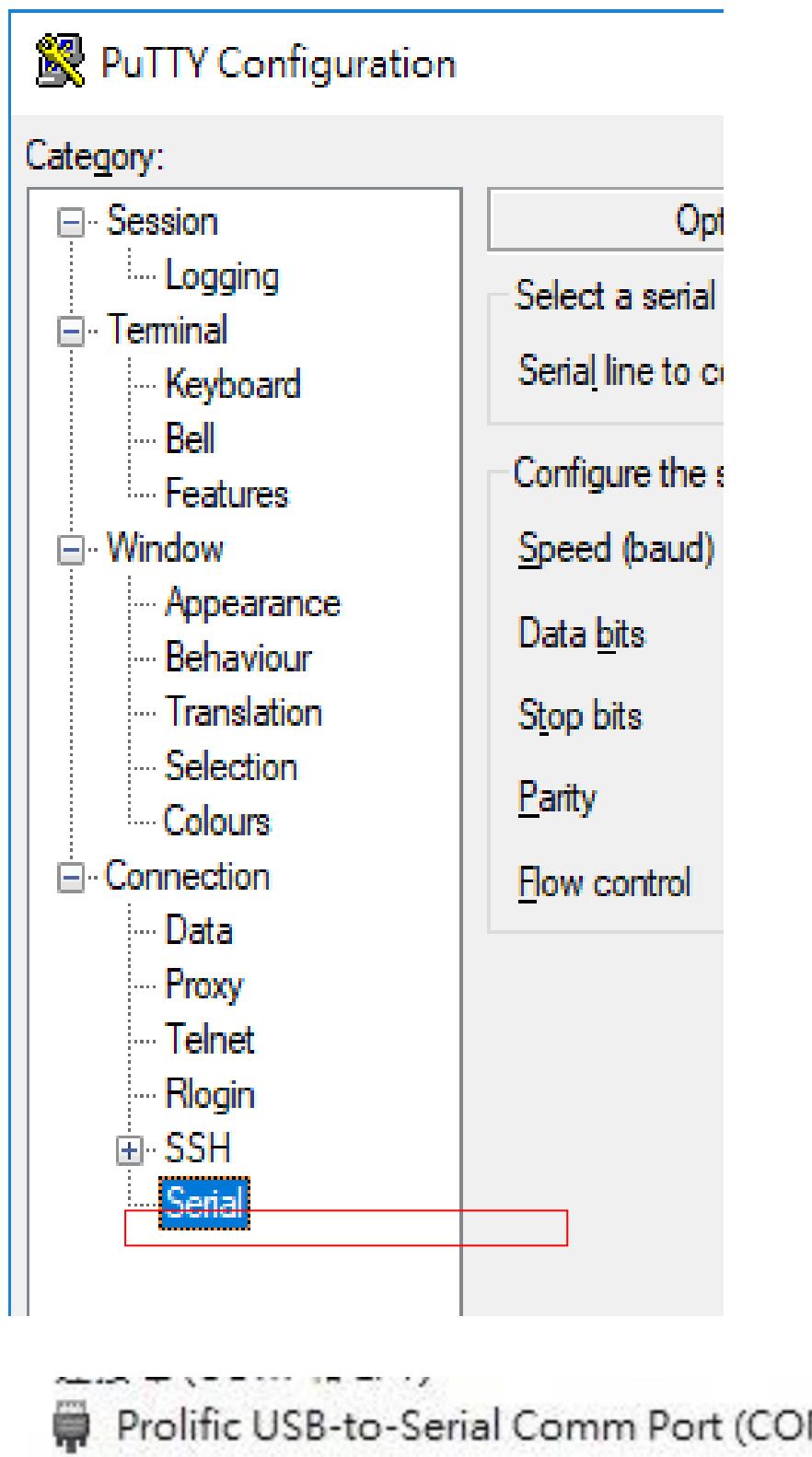


Plug USB side of adapter to PC USB port



Check COM port number

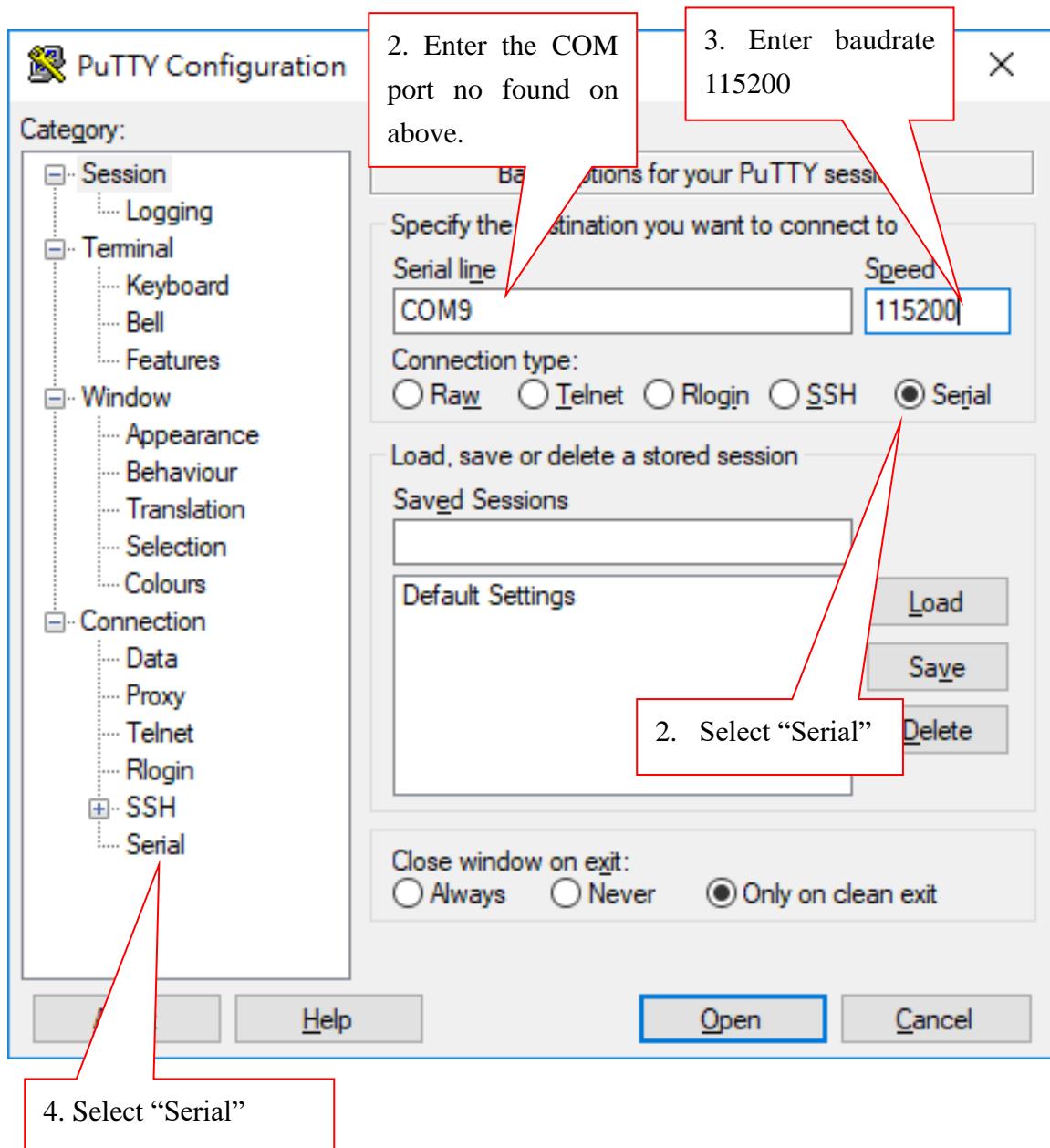
Check it out from the device manager of your PC



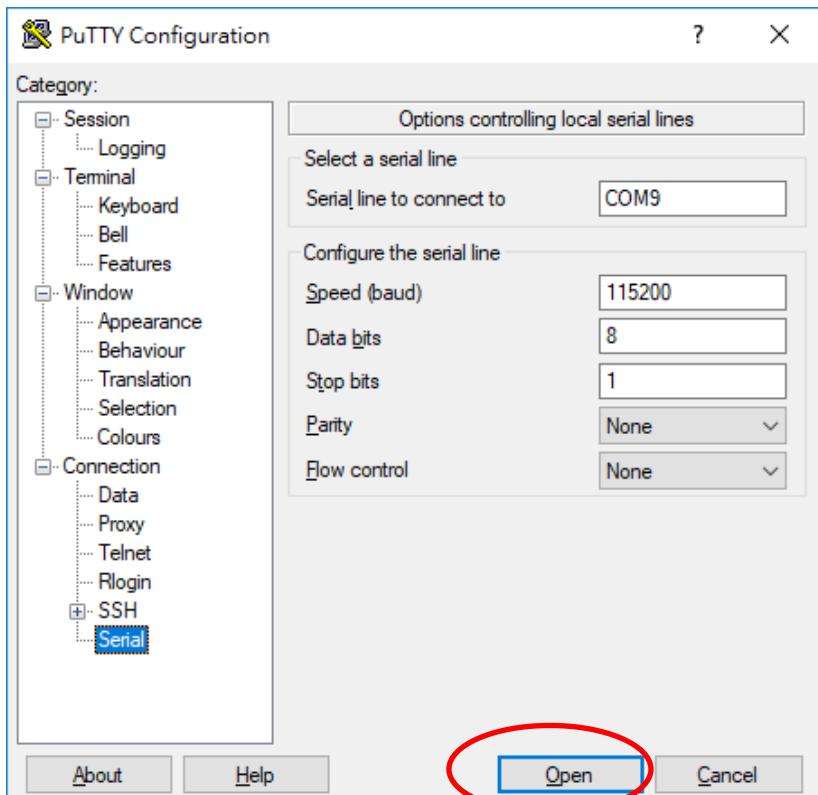
Prolific USB-to-Serial Comm Port (COM9)

Setup connection

Below show the set up page of the PuTTY .



After clicking “Serial” in step 4 in above diagram, the window will change to as below, please select “None” for the “Flow control” option. Then click “Open” to confirm the connection



The screenshot shows the PuTTY terminal window titled 'COM9 - PuTTY'. The window displays system status information and the output of the 'top' command. The 'top' command output shows various processes running on the system, including Java, Xorg, vino-server, and several kworker processes. The terminal window has a black background with white text and a standard Windows-style title bar.

```

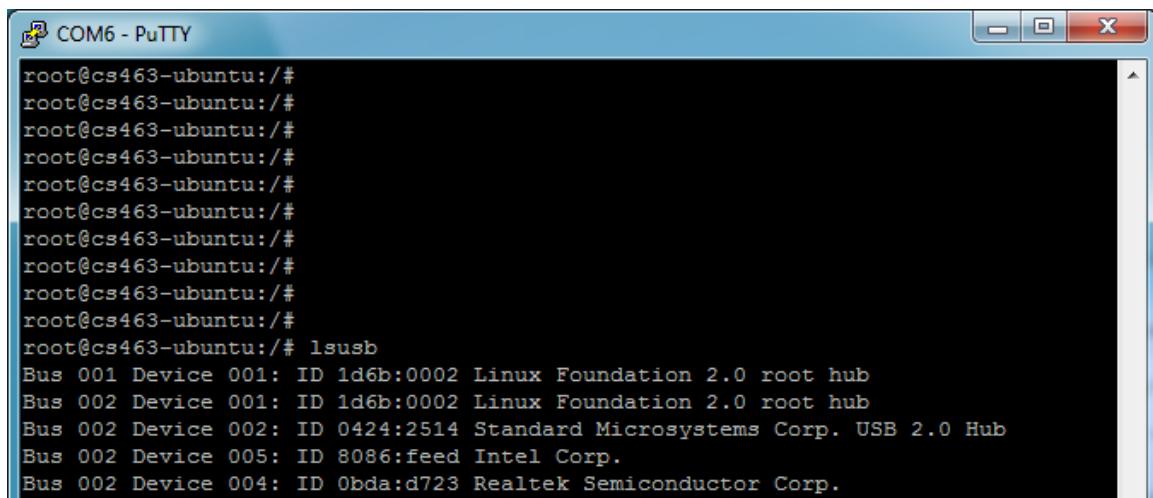
top - 00:38:39 up 30 min,  2 users,  average: 2.15, 2.30, 2.06
Tasks: 136 total,   1 running, 135 sleeping,   0 stopped,   0 zombie
Cpu(s): 1.5%us, 0.8%sy, 0.0%ni, 97.6%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0%st
Mem: 766024k total, 512996k used, 253028k free, 21092k buffers
Swap: 0k total, 0k used, 0k free, 212020k cached

PID USER      PR NI    VIRT    RES    SHR S %CPU %MEM TIME+ COMMAND
5124 root      20  0 355m  99m 12m S  2 13.4  1:09.88 java
6121 root      20  0 2232 1004 728 R  1  0.1  0:00.12 top
5143 root      20  0 293m 7656 3788 S  1  1.0  0:31.52 Xorg
5598 linaro   20  0 61848 12m 6956 S  1  1.7  0:25.83 vino-server
394 root      20  0 0     0     0 S  0  0.0  0:03.98 kworker/0:1
1 root       20  0 3072 1548 952 S  0  0.2  0:02.13 init
2 root       20  0 0     0     0 S  0  0.0  0:00.00 kthreadadd
3 root       20  0 0     0     0 S  0  0.0  0:00.08 ksoftirqd/0
5 root       20  0 0     0     0 S  0  0.0  0:00.13 kworker/u:0
6 root       RT  0 0     0     0 S  0  0.0  0:00.00 migration/0
7 root       RT  0 0     0     0 S  0  0.0  0:00.00 migration/l
8 root       20  0 0     0     0 S  0  0.0  0:00.00 kworker/l:0
9 root       20  0 0     0     0 S  0  0.0  0:00.04 ksoftirqd/1
10 root      0 -20 0     0     0 S  0  0.0  0:00.00 khelper
11 root      20  0 0     0     0 S  0  0.0  0:00.25 kworker/u:1
312 root      20  0 0     0     0 S  0  0.0  0:00.01 sync_supers
314 root      20  0 0     0     0 S  0  0.0  0:00.00 bdi-default

```

Now PuTTy is ready for CS463

Use Linux command lsusb to list all USB device in CS463

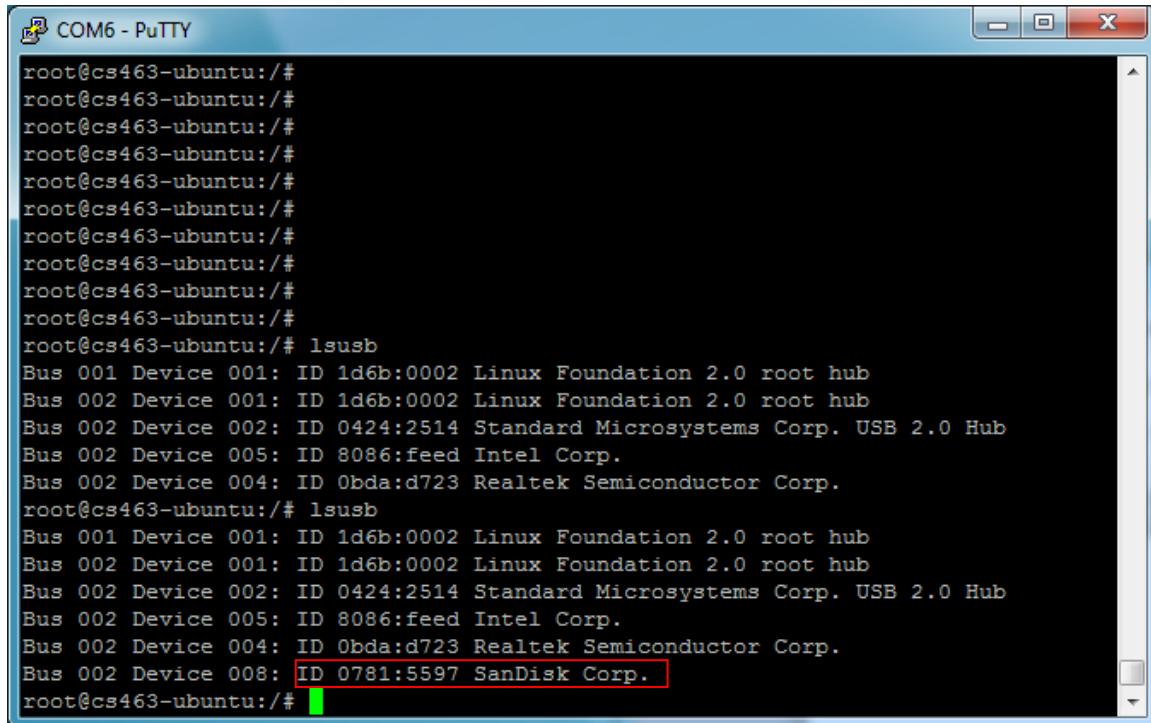


```
root@cs463-ubuntu:~#
root@cs463-ubuntu:~# lsusb
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 002 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 002 Device 002: ID 0424:2514 Standard Microsystems Corp. USB 2.0 Hub
Bus 002 Device 005: ID 8086:feed Intel Corp.
Bus 002 Device 004: ID 0bda:d723 Realtek Semiconductor Corp.
```

Plug in USB memory device to the CS463 USB Host port



After plug in USB memory, “lsusb” command to show one more USB device appearing

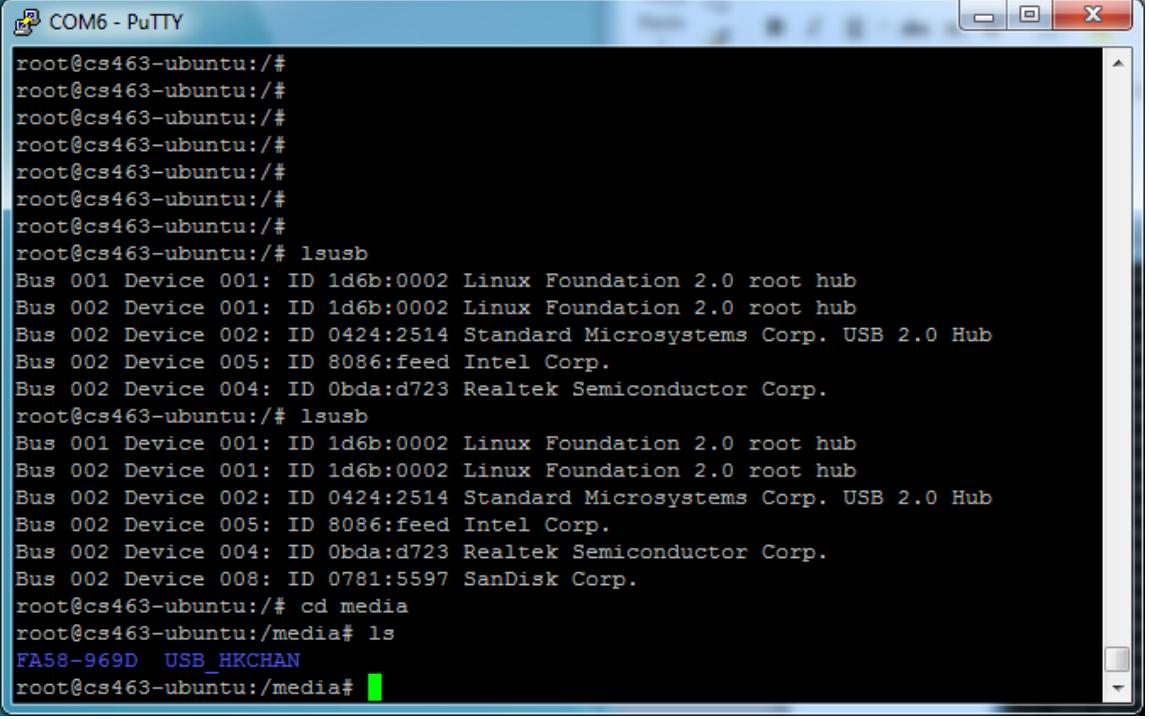


```
root@cs463-ubuntu:/# 
root@cs463-ubuntu:/# 
root@cs463-ubuntu:/# 
root@cs463-ubuntu:/# 
root@cs463-ubuntu:/# 
root@cs463-ubuntu:/# 
root@cs463-ubuntu:/# 
root@cs463-ubuntu:/# 
root@cs463-ubuntu:/# 
root@cs463-ubuntu:/# lsusb
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 002 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 002 Device 002: ID 0424:2514 Standard Microsystems Corp. USB 2.0 Hub
Bus 002 Device 005: ID 8086:feed Intel Corp.
Bus 002 Device 004: ID 0bda:d723 Realtek Semiconductor Corp.
root@cs463-ubuntu:/# lsusb
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 002 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 002 Device 002: ID 0424:2514 Standard Microsystems Corp. USB 2.0 Hub
Bus 002 Device 005: ID 8086:feed Intel Corp.
Bus 002 Device 004: ID 0bda:d723 Realtek Semiconductor Corp.
Bus 002 Device 008: ID 0781:5597 SanDisk Corp.
root@cs463-ubuntu:/#
```

At this point, the way to get to the files in the USB memory finger is different for Linux 3.0.35 and Linux 4.xx.yy:

For Linux 3.0.35

Go to “media” sub-directory to check volume label of USB memory as below

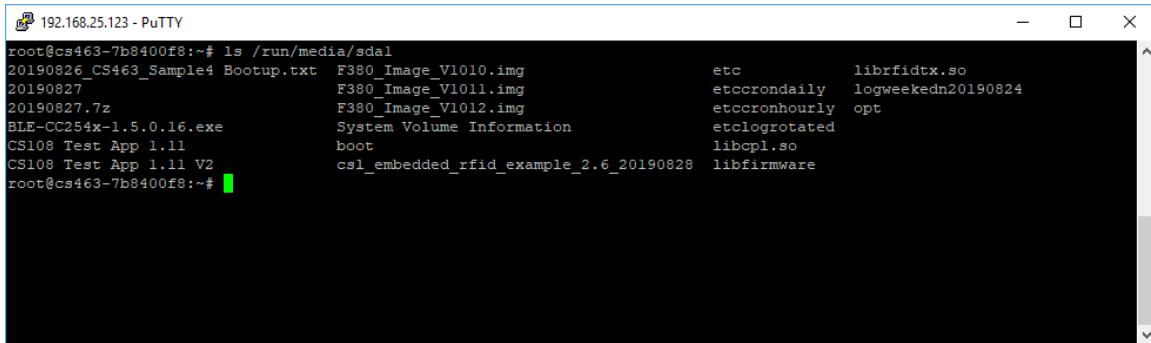


```
root@cs463-ubuntu:/#
root@cs463-ubuntu:/#
root@cs463-ubuntu:/#
root@cs463-ubuntu:/#
root@cs463-ubuntu:/#
root@cs463-ubuntu:/#
root@cs463-ubuntu:/#
root@cs463-ubuntu:/# lsusb
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 002 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 002 Device 002: ID 0424:2514 Standard Microsystems Corp. USB 2.0 Hub
Bus 002 Device 005: ID 8086:feed Intel Corp.
Bus 002 Device 004: ID 0bda:d723 Realtek Semiconductor Corp.
root@cs463-ubuntu:/# lsusb
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 002 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 002 Device 002: ID 0424:2514 Standard Microsystems Corp. USB 2.0 Hub
Bus 002 Device 005: ID 8086:feed Intel Corp.
Bus 002 Device 004: ID 0bda:d723 Realtek Semiconductor Corp.
Bus 002 Device 008: ID 0781:5597 SanDisk Corp.
root@cs463-ubuntu:/# cd media
root@cs463-ubuntu:/media# ls
FA58-969D  USB_HKCHAN
root@cs463-ubuntu:/media#
```

Here, for example, it shows there is a USB with name USB_HKCHAN. To access files inside, just type “cd USB_HKCHAN” and you will see all the files inside.

For Linux 4.xx.yy

The files are in the path: “/run/media/sda1”



A screenshot of a PuTTY terminal window titled "192.168.25.123 - PuTTY". The window displays a command-line interface where the user has run the command "ls /run/media/sda1". The output shows a list of files and directories:

```
root@cs463-7b8400f8:~# ls /run/media/sda1
20190826_CS463_Sample4 Bootup.txt  F380_Image_V1010.img      etc          librfidtx.so
20190827                      F380_Image_V1011.img      etc_crondaily logweekendn20190824
20190827.7z                   F380_Image_V1012.img      etc_cronhourly opt
BLE-CC254x-1.5.0.16.exe       System Volume Information etc_clogrotated
CS108 Test App 1.11           boot                         libcpl.so
CS108 Test App 1.11 V2        csl_embedded_rfid_example_2.6_20190828 libfirmware
root@cs463-7b8400f8:~#
```

5.10 Connecting to Host PC using USB Client Port

First of all, we need to connect to the Linux OS via the debug serial port.

Plug in “serial to USB” adapter to debug port

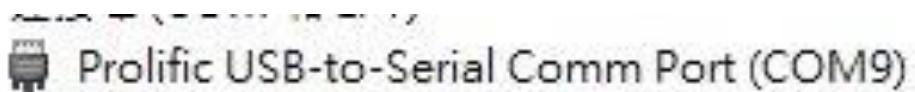
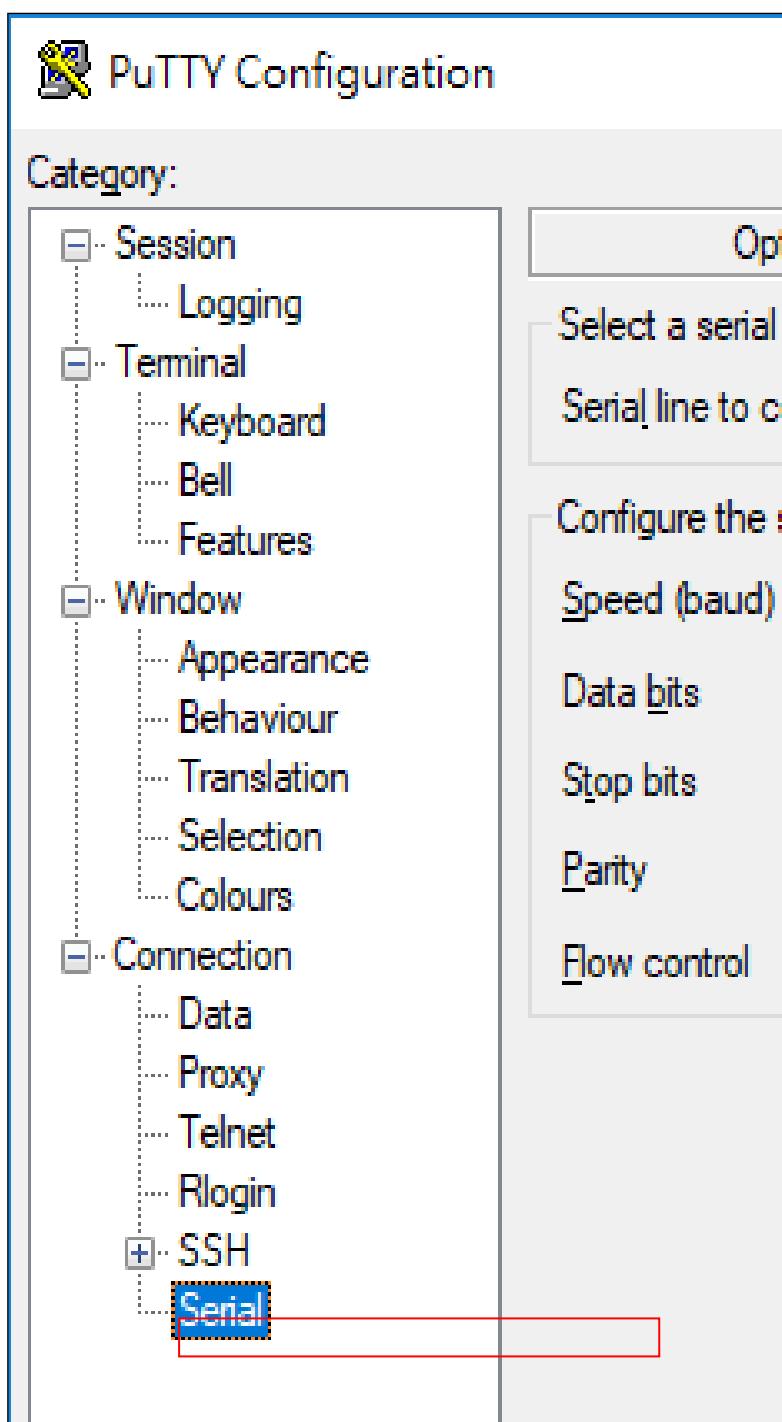


Plug USB side of adapter to PC USB port



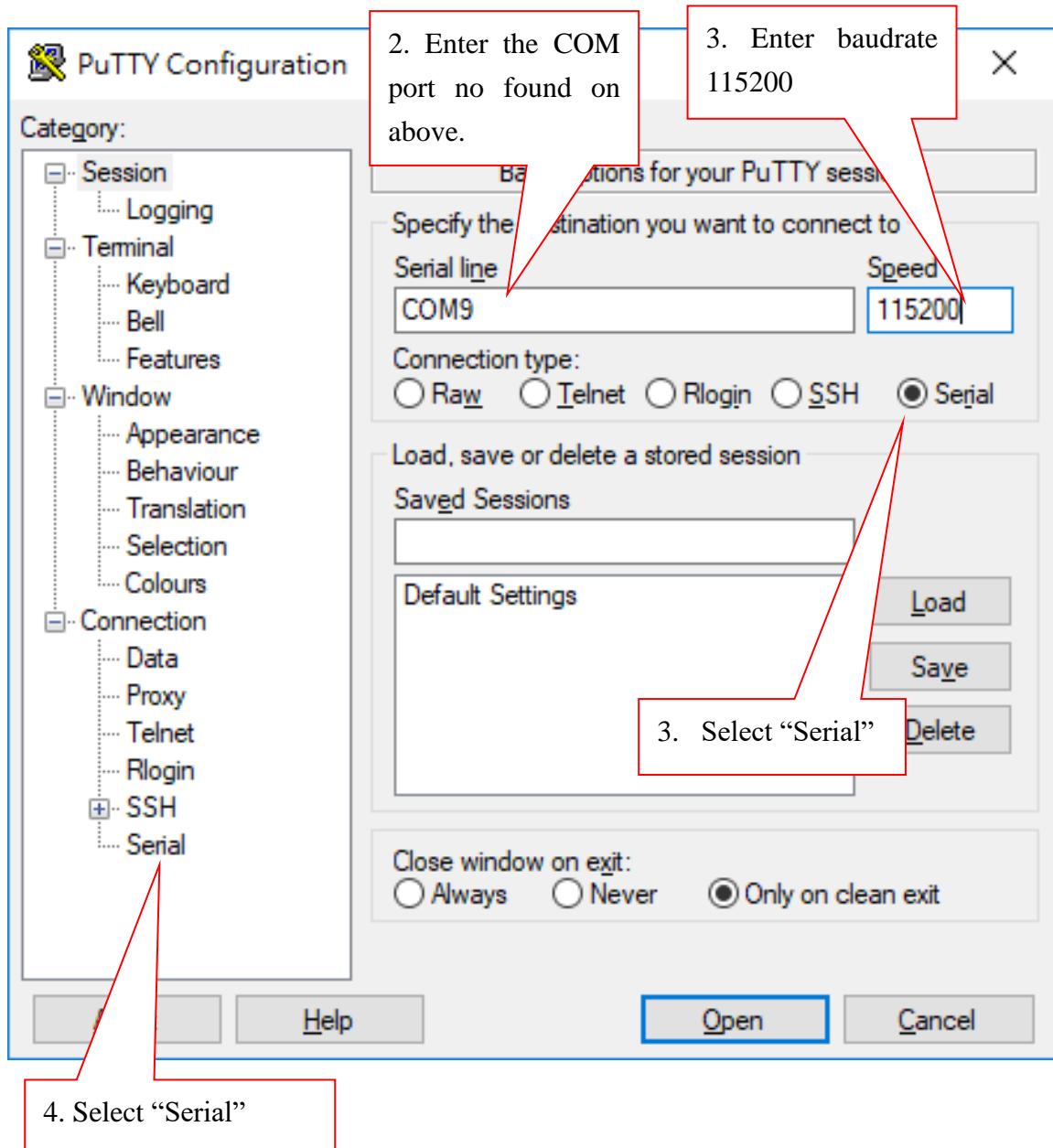
Check COM port number

Check it out from the device manager of your PC

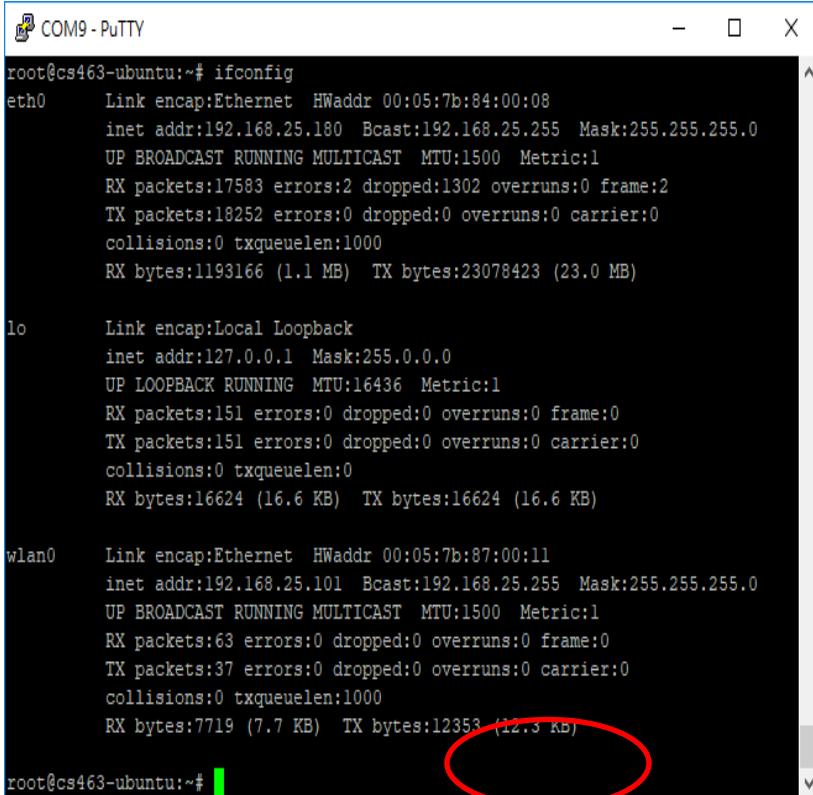


Setup connection

Below show the set up page of the PuTTy .



After clicking “Serial” in above step the window will change to as below, please select “None” for the “Flow control” option. Then click “Open” to confirm the connection

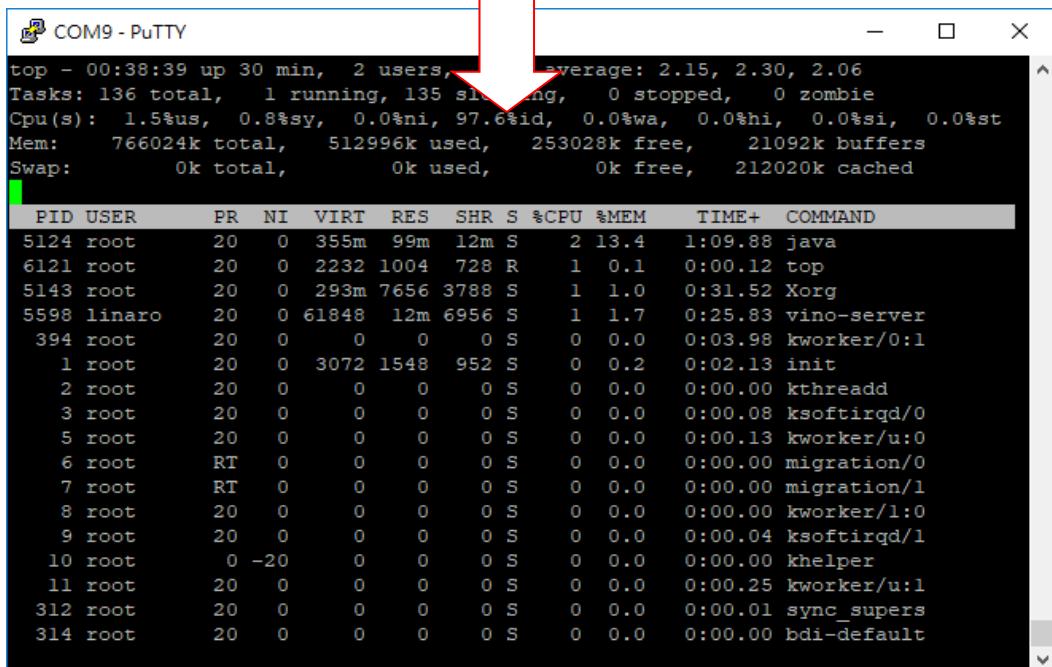


```
COM9 - PuTTY
root@cs463-ubuntu:~# ifconfig
eth0      Link encap:Ethernet HWaddr 00:05:7b:84:00:08
          inet addr:192.168.25.180 Bcast:192.168.25.255 Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
          RX packets:17583 errors:2 dropped:1302 overruns:0 frame:2
          TX packets:18252 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:1193166 (1.1 MB) TX bytes:23078423 (23.0 MB)

lo       Link encap:Local Loopback
          inet addr:127.0.0.1 Mask:255.0.0.0
          UP LOOPBACK RUNNING MTU:16436 Metric:1
          RX packets:151 errors:0 dropped:0 overruns:0 frame:0
          TX packets:151 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:16624 (16.6 KB) TX bytes:16624 (16.6 KB)

wlan0    Link encap:Ethernet HWaddr 00:05:7b:87:00:11
          inet addr:192.168.25.101 Bcast:192.168.25.255 Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
          RX packets:63 errors:0 dropped:0 overruns:0 frame:0
          TX packets:37 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:7719 (7.7 KB) TX bytes:12353 (12.3 KB)

root@cs463-ubuntu:~#
```



```
COM9 - PuTTY
top - 00:38:39 up 30 min,  2 users,  load average: 2.15, 2.30, 2.06
Tasks: 136 total,   1 running, 135 sleeping,   0 stopped,   0 zombie
Cpu(s): 1.5%us, 0.8%sy, 0.0%ni, 97.6%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0%st
Mem: 766024k total, 512996k used, 253028k free, 21092k buffers
Swap: 0k total, 0k used, 0k free, 212020k cached

PID USER      PR NI    VIRT    RES    SHR S %CPU %MEM     TIME+ COMMAND
5124 root      20  0  355m  99m 12m S    2 13.4  1:09.88 java
6121 root      20  0 2232  1004 728 R    1  0.1  0:00.12 top
5143 root      20  0 293m  7656 3788 S    1  1.0  0:31.52 Xorg
5598 linaro   20  0 61848 12m 6956 S    1  1.7  0:25.83 vino-server
394 root      20  0     0     0     0 S    0  0.0  0:03.98 kworker/0:1
 1 root      20  0 3072 1548 952 S    0  0.2  0:02.13 init
 2 root      20  0     0     0     0 S    0  0.0  0:00.00 kthreadd
 3 root      20  0     0     0     0 S    0  0.0  0:00.08 ksoftirqd/0
 5 root      20  0     0     0     0 S    0  0.0  0:00.13 kworker/u:0
 6 root      RT  0     0     0     0 S    0  0.0  0:00.00 migration/0
 7 root      RT  0     0     0     0 S    0  0.0  0:00.00 migration/1
 8 root      20  0     0     0     0 S    0  0.0  0:00.00 kworker/1:0
 9 root      20  0     0     0     0 S    0  0.0  0:00.04 ksoftirqd/1
10 root     0 -20  0     0     0 S    0  0.0  0:00.00 khelper
11 root      20  0     0     0     0 S    0  0.0  0:00.25 kworker/u:1
312 root     20  0     0     0     0 S    0  0.0  0:00.01 sync_supers
314 root     20  0     0     0     0 S    0  0.0  0:00.00 bdi-default
```

Now PuTTy is ready for CS463

Use a mini-USB to USB Type A cable to connect between CS463 USB Console port and the PC USB port



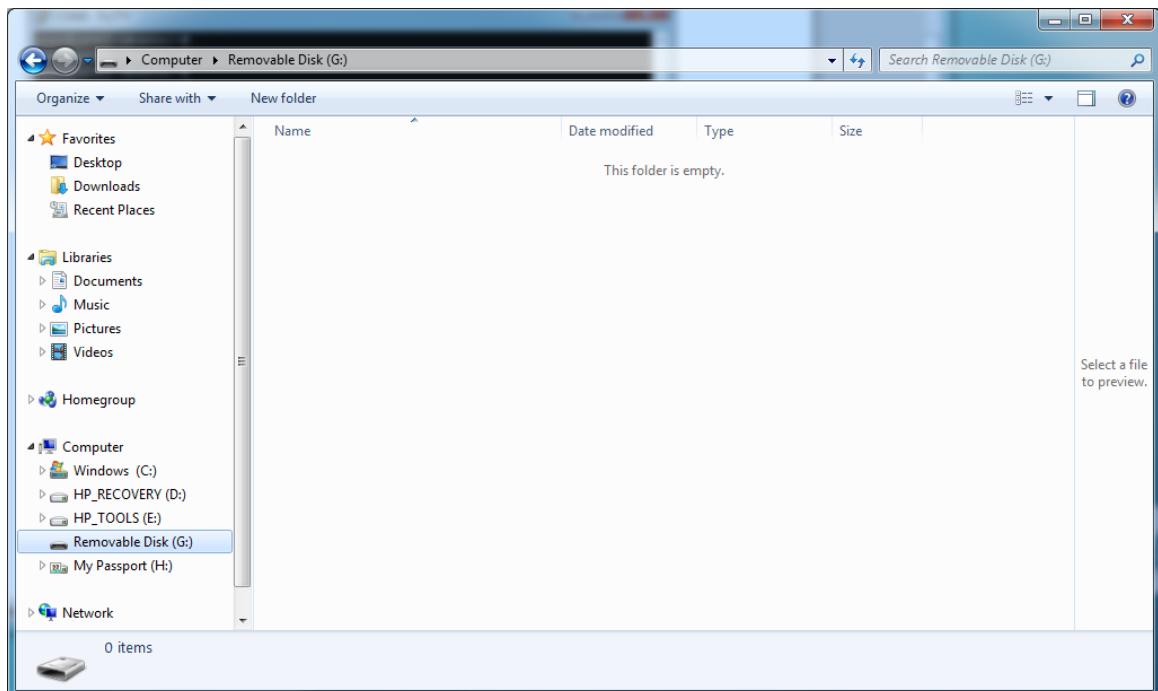
At this point, to connect to a PC and let the PC “sees” the CS463 as a hard disk is different for Linux 3.0.35 and Linux 4.xx.yy:

For Linux 3.0.35

Type the following Linux commands on PuTTY window one by one

1. cd ..
2. cd opt
3. ./usb_client_store_start

Use window explorer to check whether one more drive appear on PC



For Linux 4.xx.yy

Type the following Linux commands on PuTTY window one by one

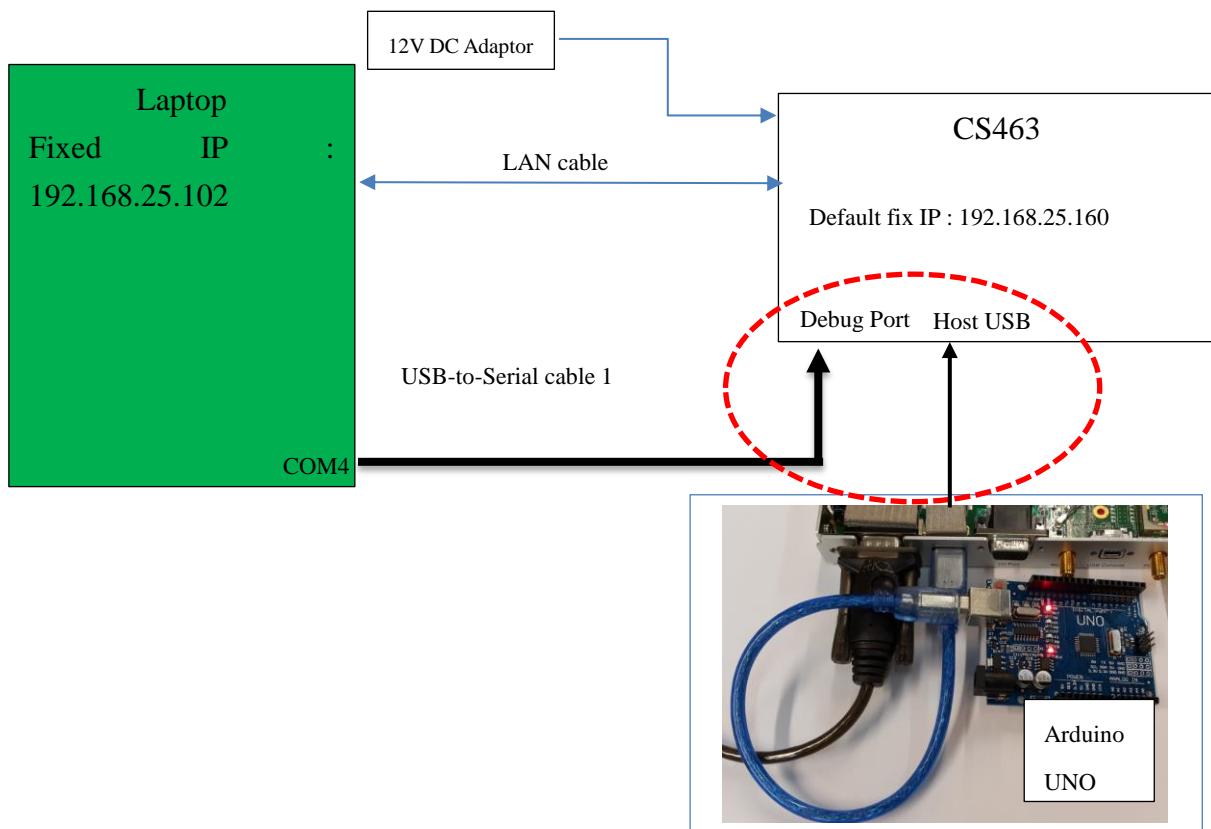
1. cd /opt
2. ./usbcdisk_start

After that you can use the File Explorer on the Windows PC to check if it discovers a new hard disk.

5.11 Connect from USB Host Port using USB Com Driver to a USB Client

Arduino UNO board is used as an example to echo back the received message from USB Com driver

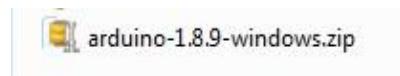
Setup the reader as below



Step 1: Download the Arduino program into Arduino UNO board.

- (i) Setup the Arduino environment. It can download the from below URL

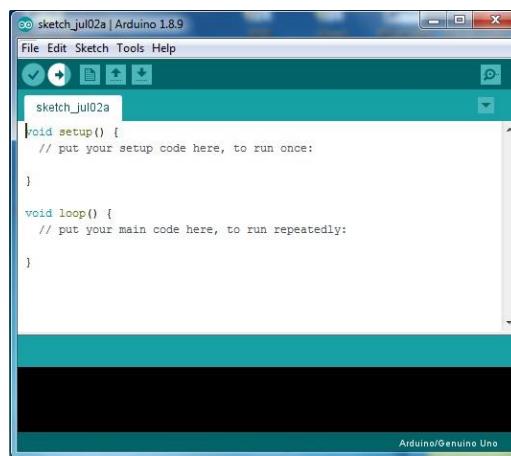
<https://www.arduino.cc/en/Main/Software>



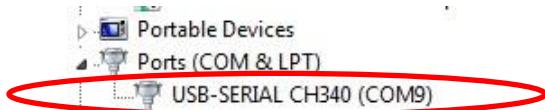
- (ii) After unzip, and then go into the directory to execute the Application (circled in below figure)

Name	Date modified	Type	Si
drivers	3/15/2019 3:15 PM	File folder	
examples	3/15/2019 3:15 PM	File folder	
hardware	3/15/2019 3:15 PM	File folder	
java	3/15/2019 3:16 PM	File folder	
lib	3/15/2019 3:16 PM	File folder	
libraries	3/15/2019 3:16 PM	File folder	
reference	3/15/2019 3:16 PM	File folder	
tools	3/15/2019 3:16 PM	File folder	
tools_builder	3/15/2019 3:15 PM	File folder	
arduino.exe	3/15/2019 3:16 PM	Application	
arduino.l4j.ini	3/15/2019 3:16 PM	Configuration sett...	
arduino_debug.exe	3/15/2019 3:16 PM	Application	
arduino_debug.l4j.ini	3/15/2019 3:16 PM	Configuration sett...	
arduino-builder.exe	3/15/2019 3:15 PM	Application	
libusb0.dll	3/15/2019 3:15 PM	Application extens...	
msvcp100.dll	3/15/2019 3:15 PM	Application extens...	

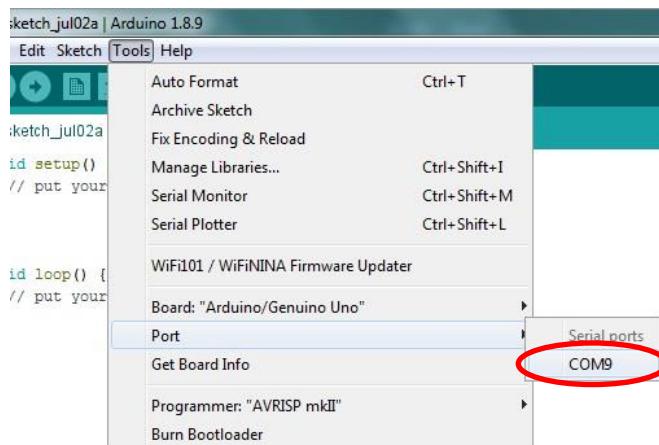
- (iii) Below is the default page of Arduino IDE



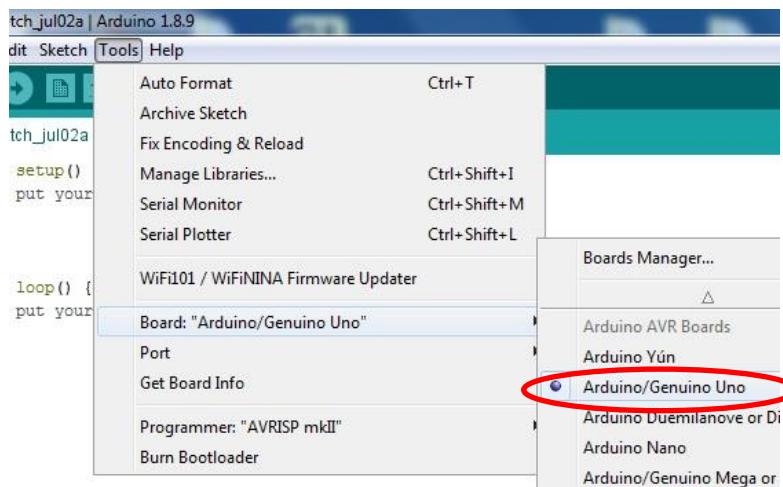
- (iv) Connect the Arduino UNO board to your laptop with USB cable
- (v) Check the COM port number for the Arduino dongle from device manager



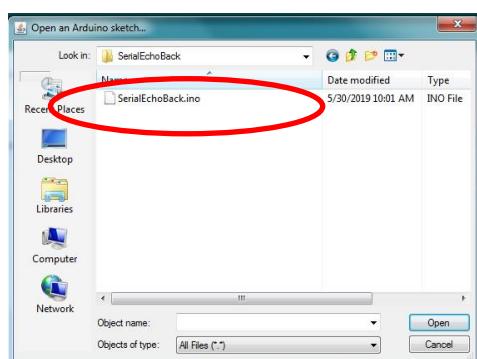
- (vi) Select the correct COM port in Arduino IDE
Main menu : Tool → Port



- (vii) Select the correct Board type
Main menu : Tool → Board



- (viii) Download the SerialEchoBack from CSL Web site and Read the Download program “SerialEchoBack.ino” into Arduino IDE
 Main menu: File → Open

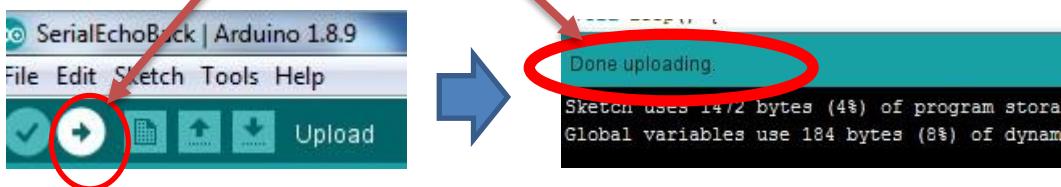


Program Code :

```
void setup() {
  Serial.begin(115200);
}

void loop() {
  if (Serial.available()) {      // If anything comes in Serial (USB),
    Serial.write(Serial.read());   // read it and send it out Serial1 (pins 0 & 1)
  }
}
```

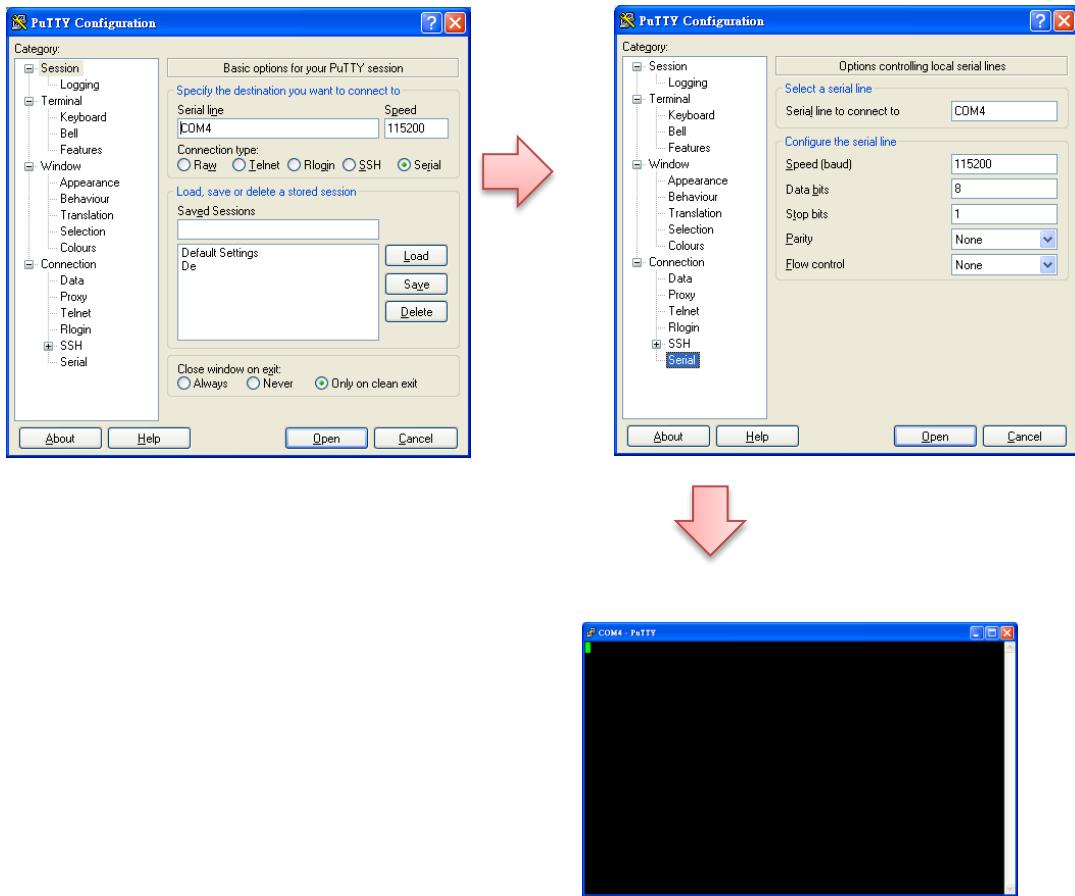
- (ix) Upload the program code to Arduino board
 Press the “Arrow” icon to start the upload, if successful, the left bottom corner will show the complete message



Step 2: Ensure the hardware setup mentioned in beginning of this section was done

Step 3: Boot up the CS463

Step 4: Open PuTTY window for debug port according to below settings on Laptop



Step 5: After boot up finished, plug in the Arduino dongle to CS463 host USB port

Step 6: Input below command to check the connectivity of Arduino device on laptop command prompt for CS463 debug port.

Command: ls /dev/ttyUSB*

it will show as below
/dev/ttyUSB0

```
root@imx6dlsabredz:/#  
root@imx6dlsabredz:#  
root@imx6dlsabredz:# ls /dev/ttyUSB*  
/dev/ttyUSB0  
root@imx6dlsabredz:#
```

Step 7: Open the serial terminal for Arduino with below command

Command: minicom -D /dev/ttyUSB0 -s

Select the “Serial Port

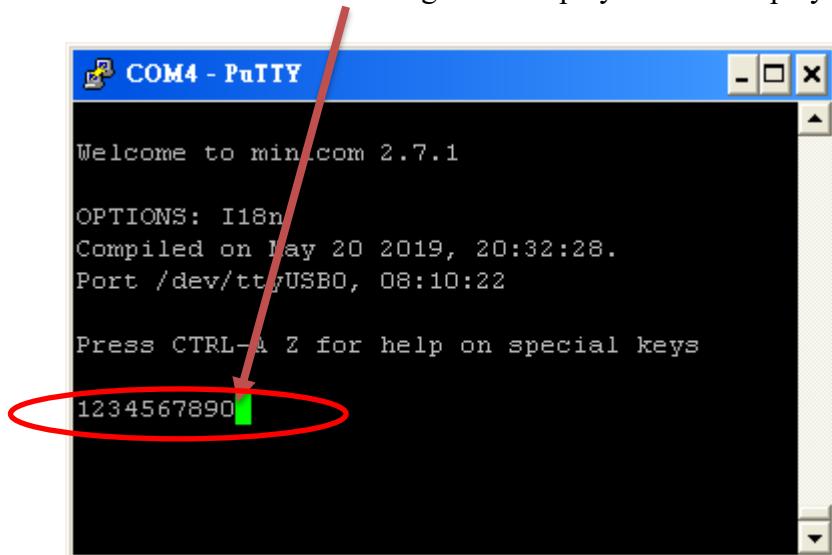
Set the “Hardware Flow Control” to No

```
lqqqqqq[configuration]qqqqqqk
x Filenames and paths      x
x File transfer protocols  x
x Serial port setup        x
x Modem and dialing        x
x Screen and keyboard      x
x Save setup as dfl        x
x Save setup as..          x
x Exit                      x
x Exit from Minicom         x
mqqqqqqqqqqqqqqqqqqqqqqqqqqqj
```

After the setting, return to main menu by pressing {ESC} twice.

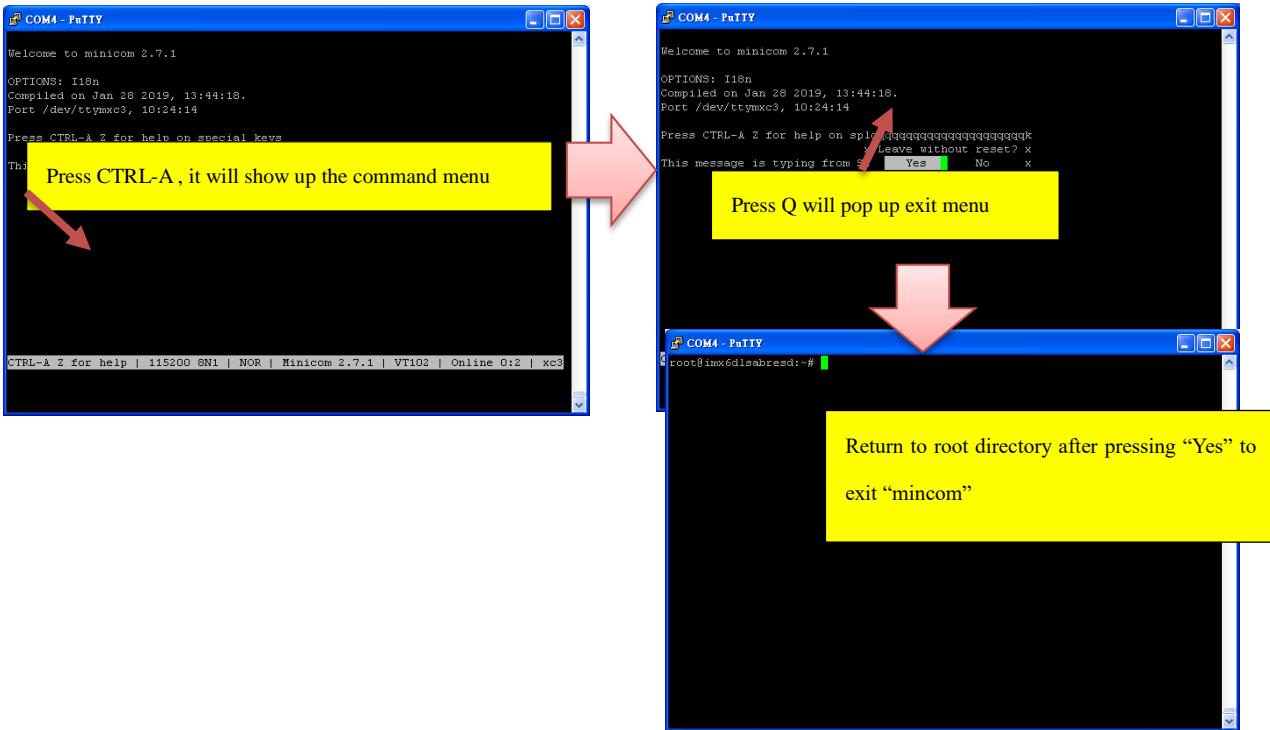
Step 8: Perform the “serial echo back”

In the “minicom” menu, please type in 1,2,3,4,5,6,7,8,9, and then 0 one-by-one. You should observe that “1234567890” digits are displayed in the display as shown below



Step 8 : Exit “minicom” program

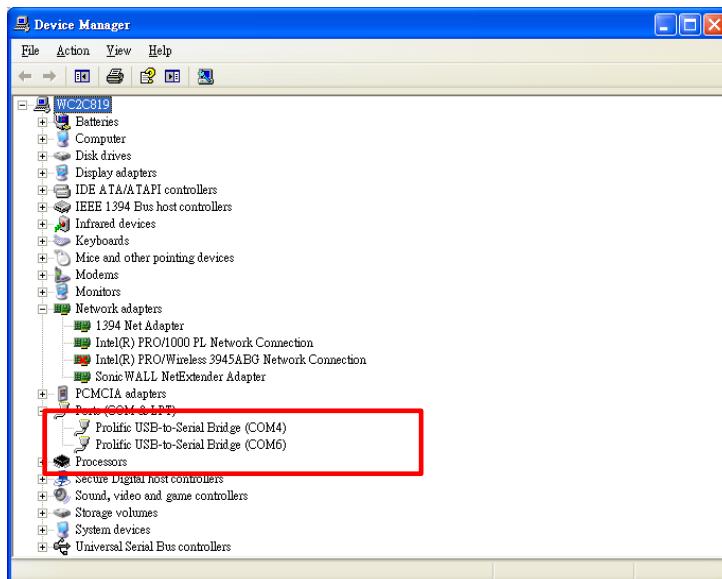
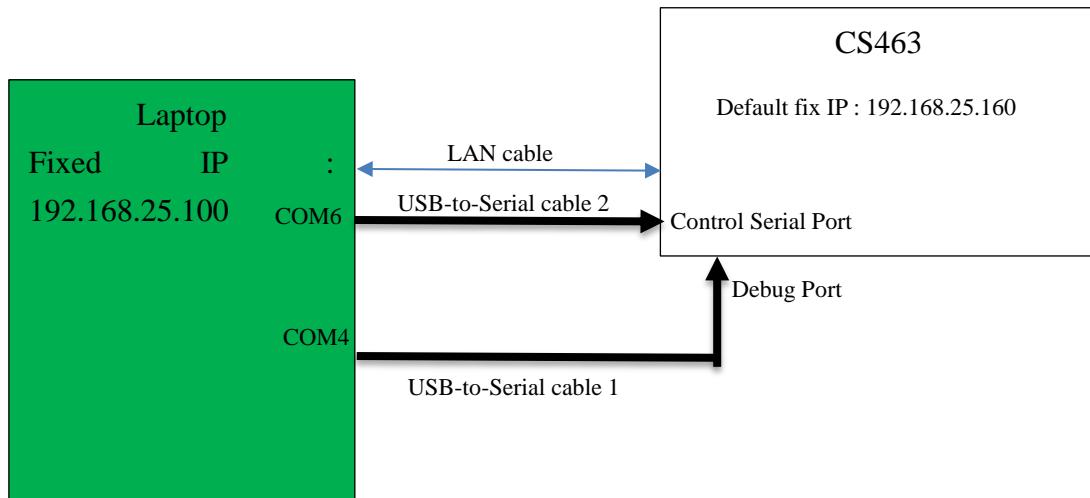
After the 2-way communication in step 4, follow below procedure to exit “minicom”



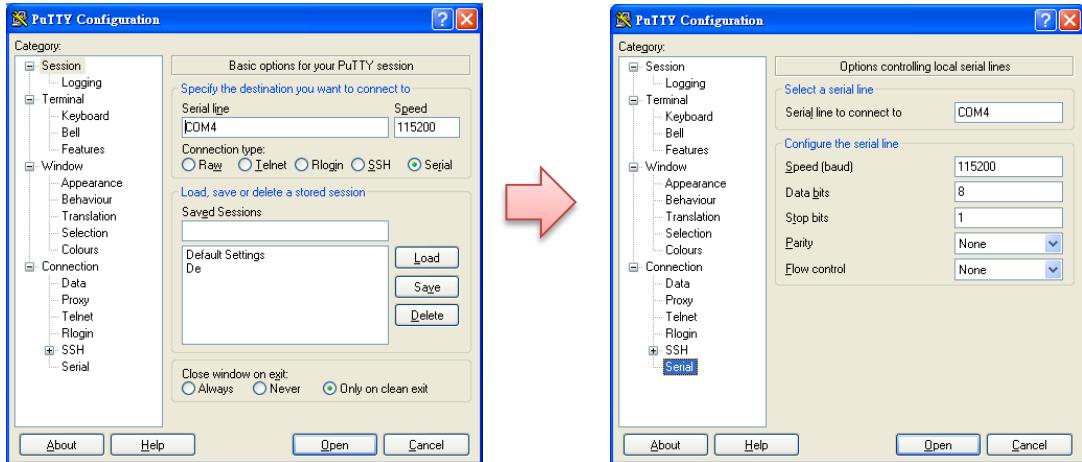
5.12 Connecting from Control Serial Port to RS232 Client Devices

Following section show how to send and receive data from CS463 Control Serial port

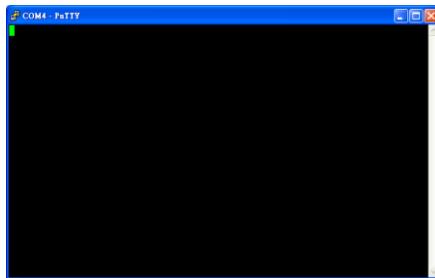
Set up the connection as below. Connect two USB-to-Serial cables between PC and the CS463. In below demonstration, the corresponding COM ports shown in device manager are 4 and 6 respectively.



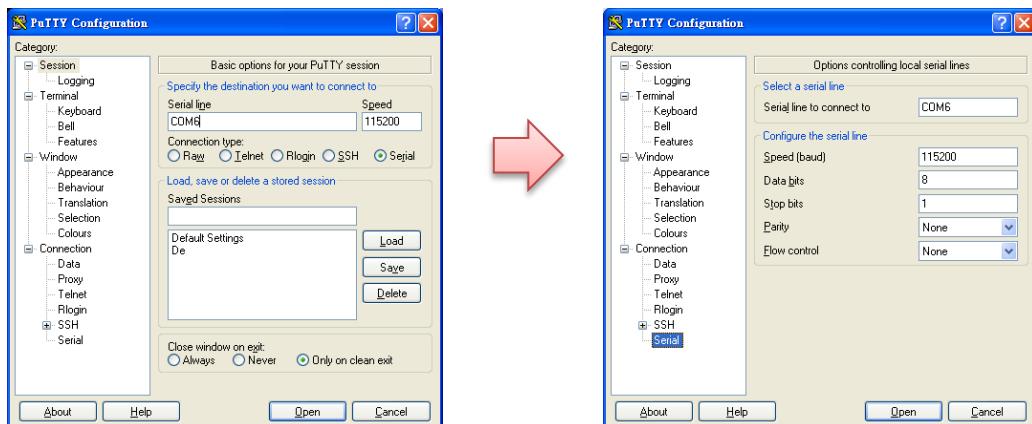
Step 2: Open PuTTY window for debug port according to below settings



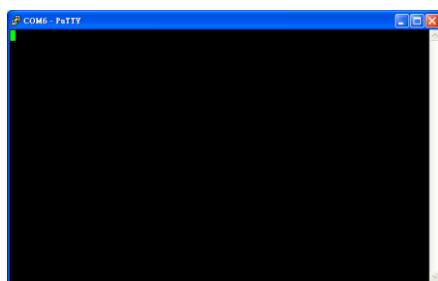
Click Open to open the com port 4 which connected with CS463 debug port, below window will pop up



Step 3 : Open PuTTY window for “Control Serial “ port according to below settings

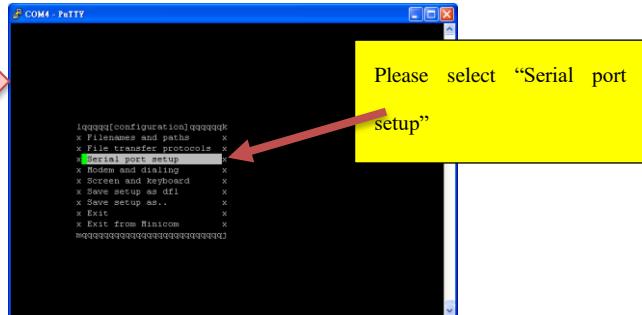
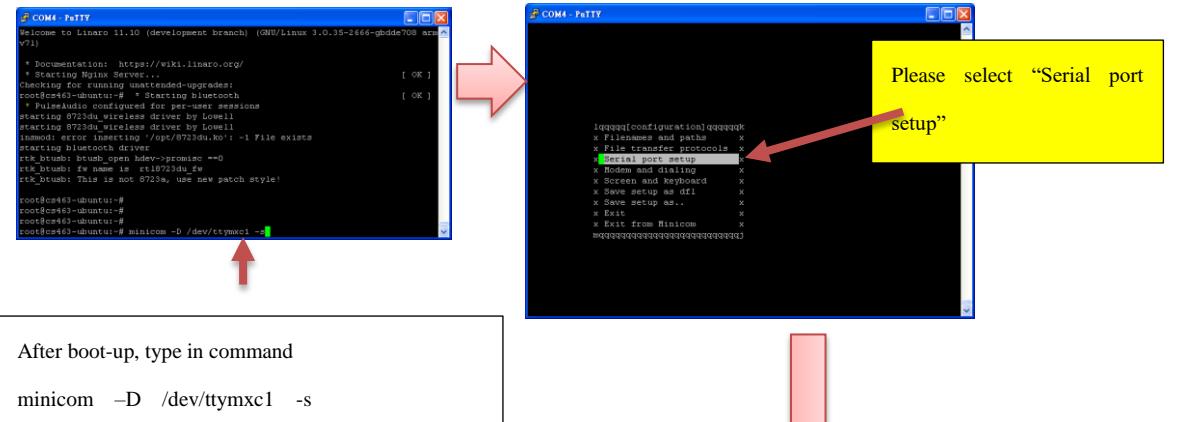


Click Open to open the com port 6 which connected with CS463 debug port, below window will pop up

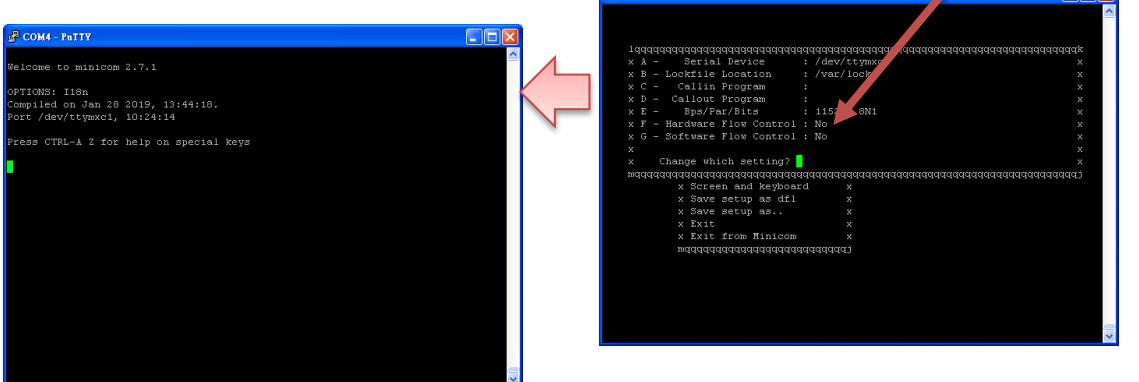


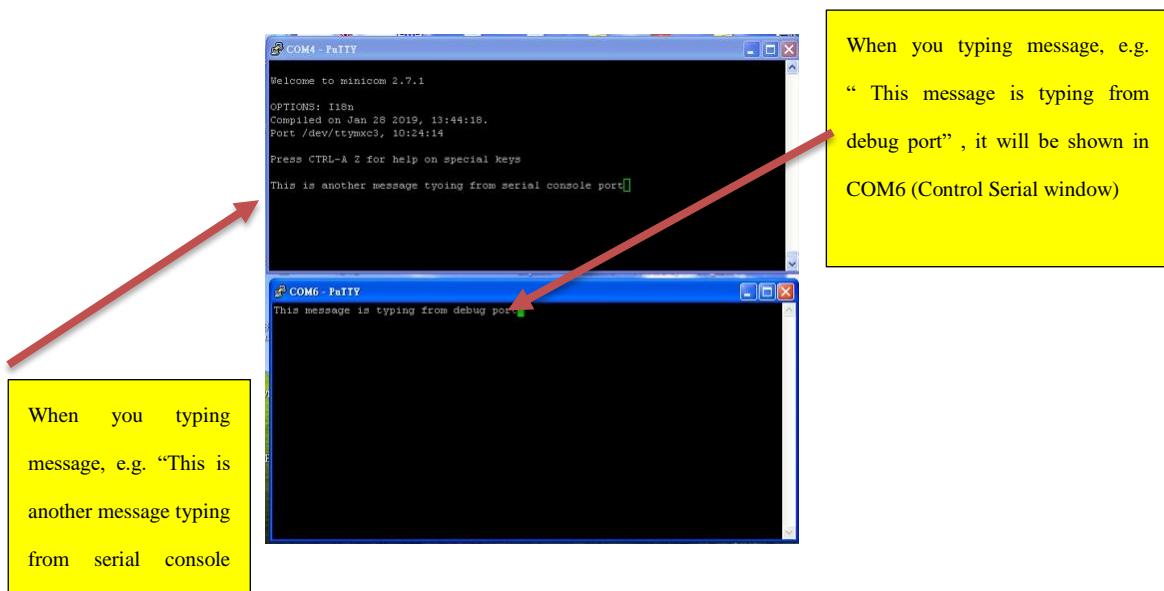
Step 4: Power up the CS463

Follow below procedure to start the “minicom” serial port communication in debug port, so all data going to or from Control Port can be monitored in Debug port command prompt



Remarks: Black arrow means to add space
Please aware the use of capital/small characters





Step 5 : Exit “minicom” program

After the 2-way communication in step 4, follow below procedure to exit “minicom”



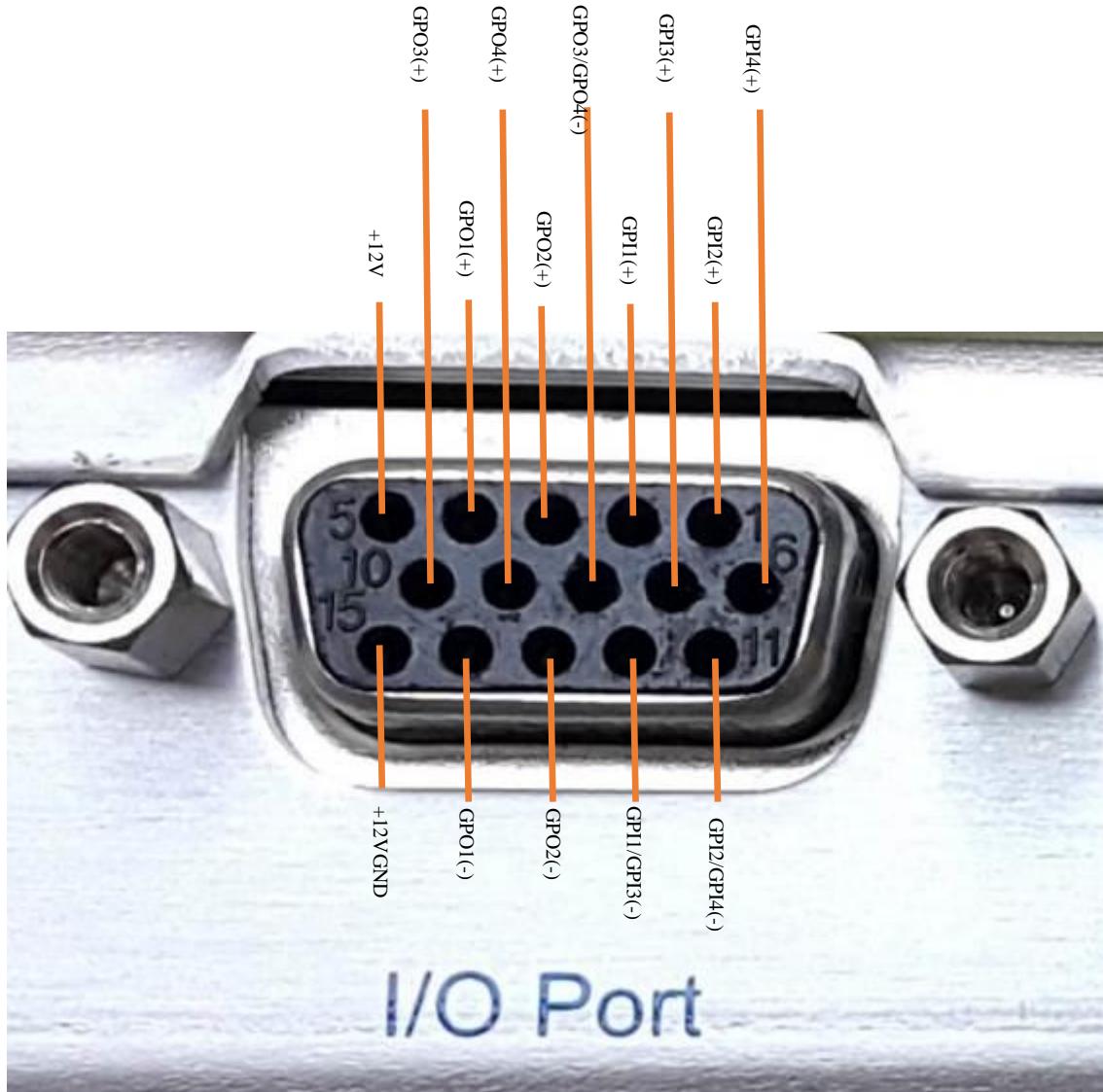
5.13 GPIO Port and Accessories for Connection

CS463 has 4 General Purpose Inputs and 4 General Purpose Outputs, all of them optically isolated, and also an isolated 12 Volt DC output power supply with a rating of 2 Watt.

Below figure shows the pin definition for the GPIO port.

GPI : General Purpose Input

GPO : General Purpose Output



Of the 4 GPOs, two of them are fully isolated with independent (+) and (-) terminals: GPO1 and GPO2. Two of them share a common (-) terminal: GPO3 and GPO4.

Of the 4 GPIOs, GPI1 and GPI3 share the same (-) terminal, and GPI2 and GPI4 share the same (-) terminal.

The 12 Volt output is fully isolated, with terminals +12V and +12VGND.

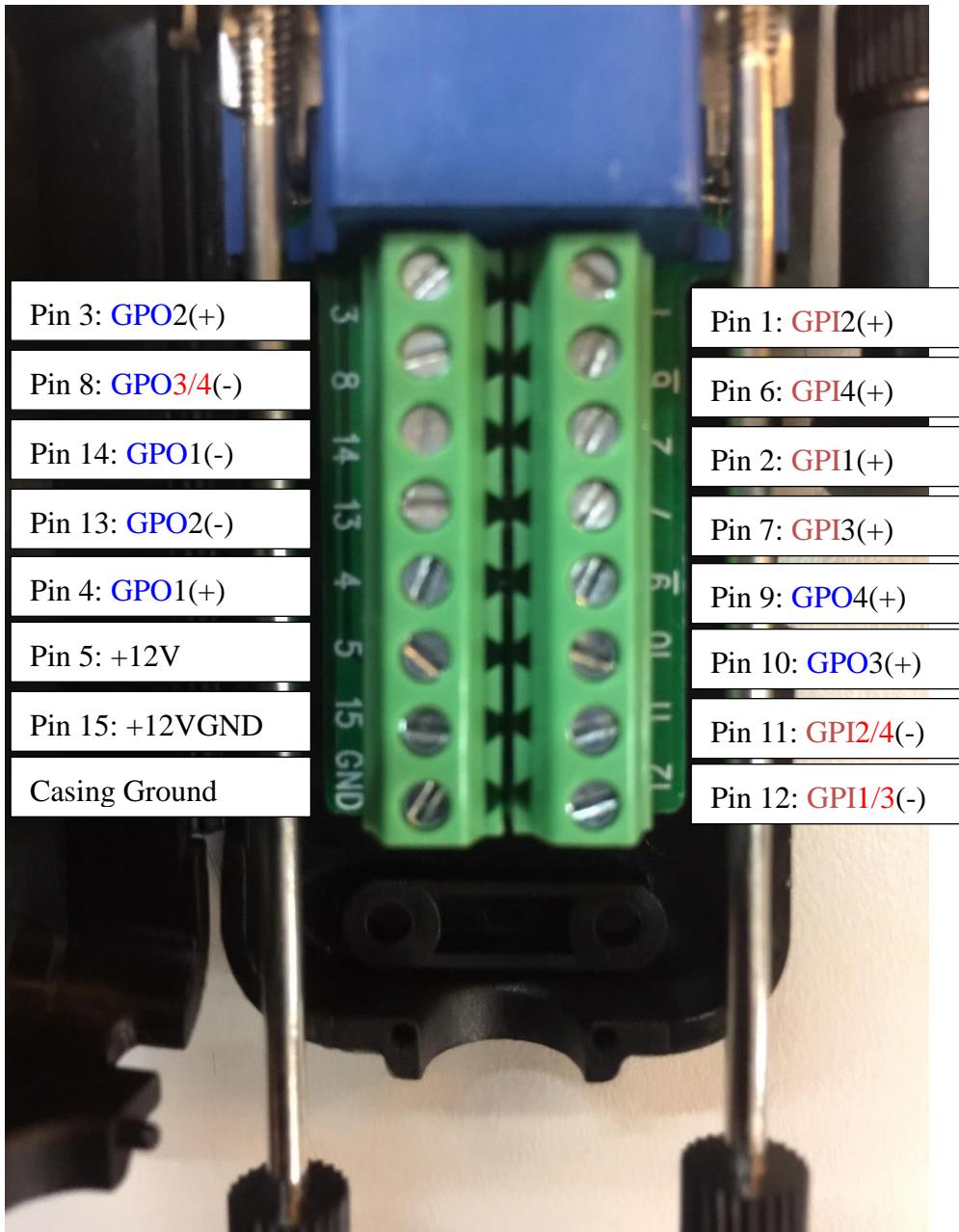
In summary, the following is the application table for system integrators (common pins are highlighted in specific colors for reminder):

Function		Terminal and Pin of (+)	Terminal and Pin of (-)	Isolated?	Initial State on Power Up
Output	GPO1	GPO1(+), Pin 4	GPO1(-), Pin 14	Full Isolation	NO (Normal Open)
	GPO2	GPO2(+), Pin 3	GPO2(-), Pin 13	Full Isolation	NO
	GPO3	GPO3(+), Pin 10	GPO3(-), Pin 8	(-) Pin common with GPO4(-)	NO
	GPO4	GPO4(+), Pin 9	GPO4(-), Pin 8	(-) Pin common with GPO3(-)	NO
Input	GPI1	GPI1(+) Pin 2	GPI1(-) Pin 12	(-) Pin common with GPI3(-)	
	GPI2	GPI2(+) Pin 1	GPI2(-) Pin 11	(-) Pin common with GPI4(-)	
	GPI3	GPI3(+) Pin 7	GPI3(-) Pin 12	(-) Pin common with GPI1(-)	
	GPI4	GPI4(+) Pin 6	GPI4(-) Pin 11	(-) Pin common with GPI2(-)	
Power Supply	+12V	+12V Pin 5	+12VGND Pin 15	Full Isolation	

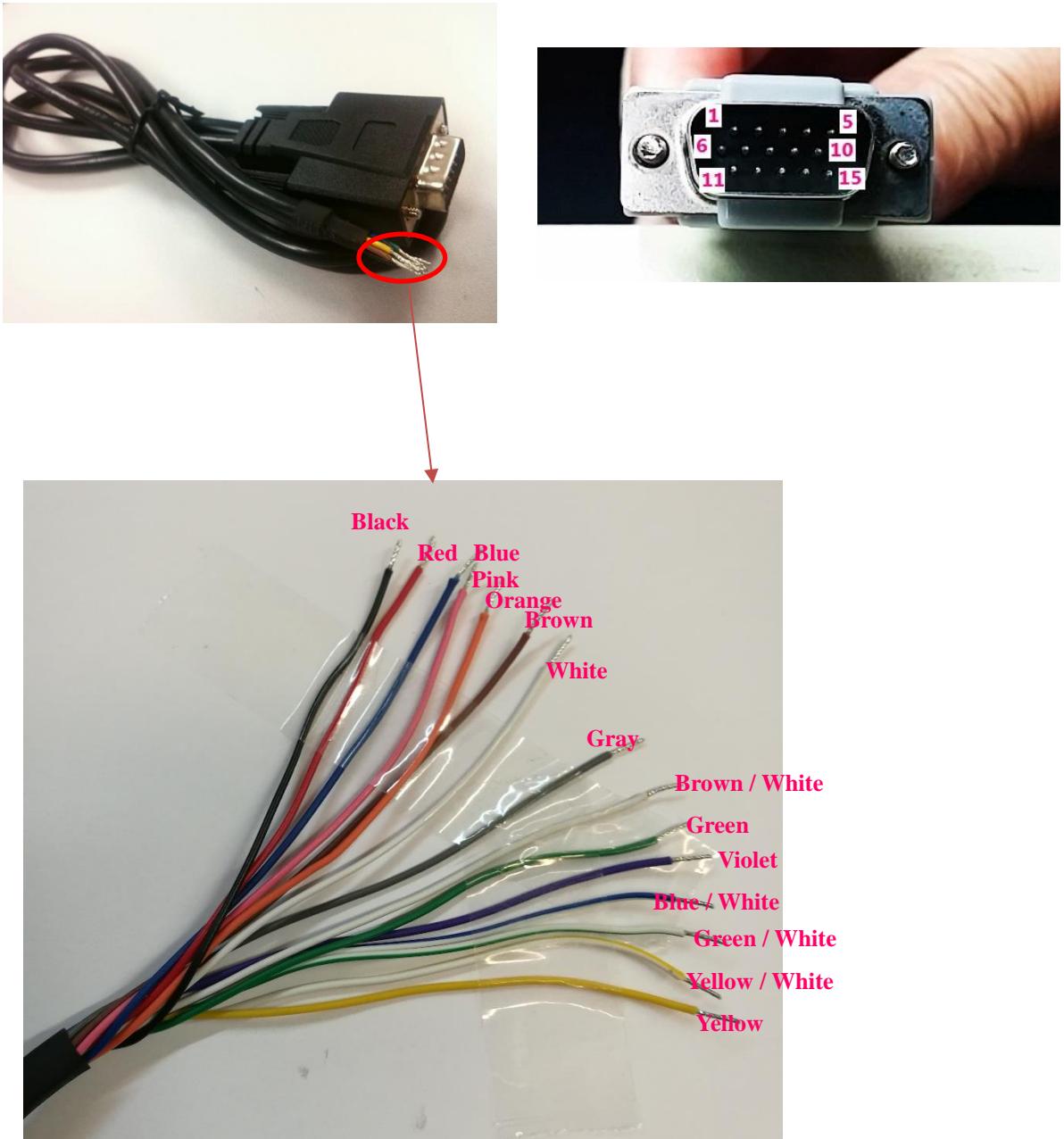
There are 2 accessories that come with the GPIO port operation:

- 1) HD15 to Wiretap Terminal Adapter
- 2) HD15 with pigtailed GPIO Cable

When using the HD15 to Wiretap Terminal Adapter, the Pin #s are actually printed to the outside of the terminal, as shown in below photo. Here the functions are labeled for easy reference.



HD15 with pigtailed GPIO cable:



Following is the application table for system integrators (common pins are highlighted in specific colors for reminder):

Pin Name	GPIO cable for CS463 (DE-15 plug)	
	Pin Number	Pigtail Wire Color
+12V	5	Red
GND	15	Black
GPO_1 (+)	4	Yellow
GPO_1 (-)	14	Yellow/White
GPO_2 (+)	3	Blue
GPO_2 (-)	13	Blue/White
GPO_3 (+)	10	Violet
GPO_3/4 (-)	8	Pink
GPO_4 (+)	9	Orange
GPO_3/4 (-)	8	Pink
GPI_1 (+)	2	Green
GPI_1/3 (-)	12	Green/White
GPI_2 (+)	1	Brown
GPI_2/4 (-)	11	Brown/White
GPI_3(+)	7	Gray
GPI_1/3 (-)	12	Green/White
GPI_4 (+)	6	White
GPI_2/4 (-)	11	Brown/White

5.14 Connecting to Bluetooth Devices: e.g. Speaker

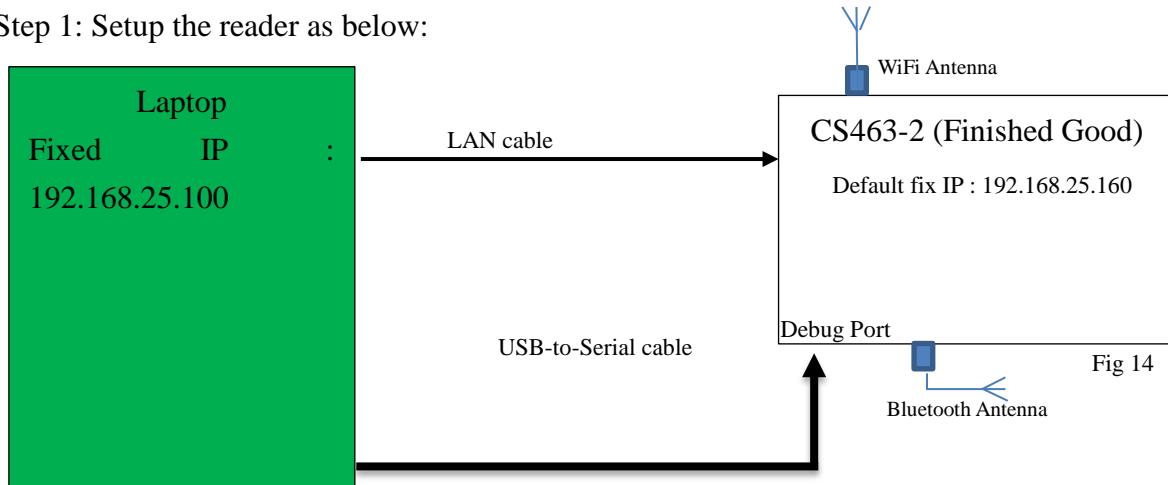
Below section show how Bluetooth speaker is used to connect to CS463.

Please note the connection method with Linux 3.0.35 is different from Linux 4.x.x.

For Linux 3.0.35

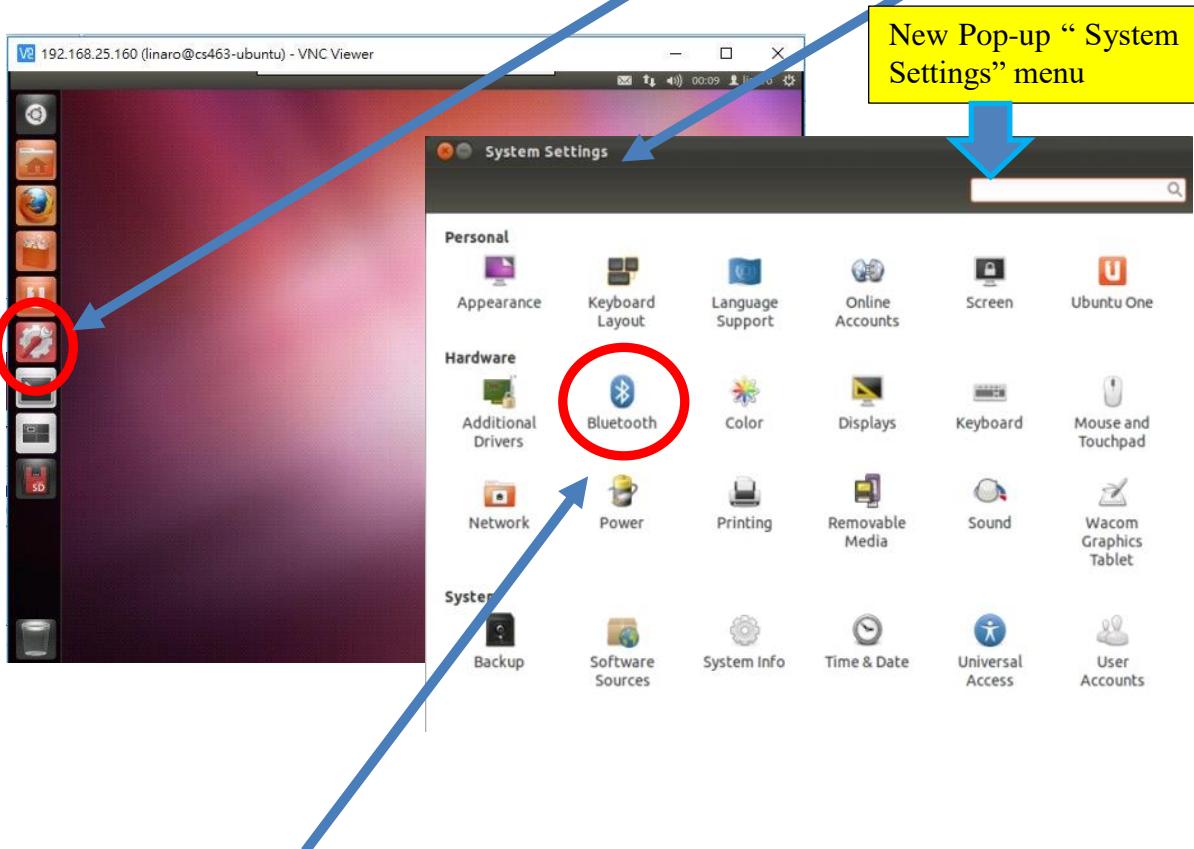
Bluetooth connection method with Linux 3.0.35

Step 1: Setup the reader as below:



Step 2: Using VNC Viewer to connect to CS463 through ethernet as shown below.

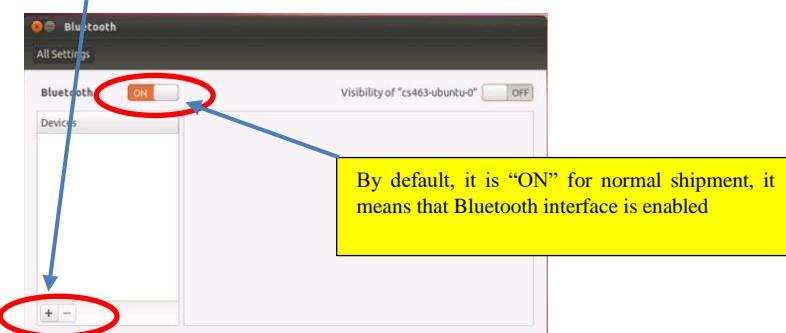
Step 3: Within the Ubuntu main menu, click the setup icon to enter “System Settings”



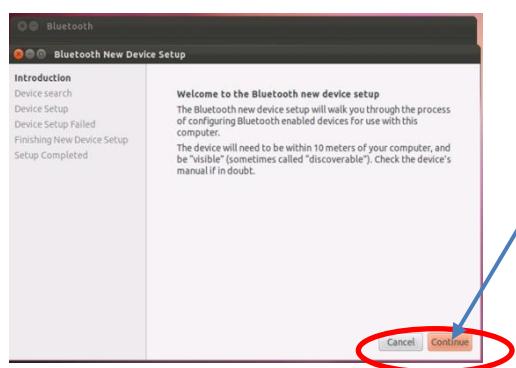
Step 4: Click the “Bluetooth” icon to open the Bluetooth Activity

Step 5: After clicking the “Bluetooth” icon, below window will pop up.

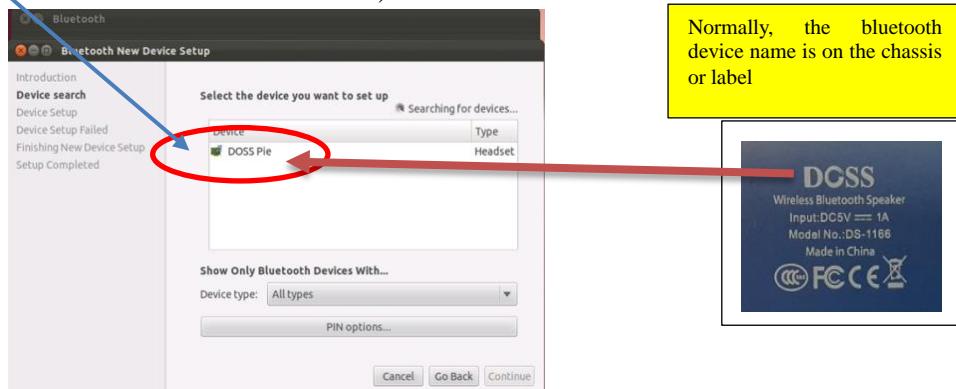
Please click the “+” icon.



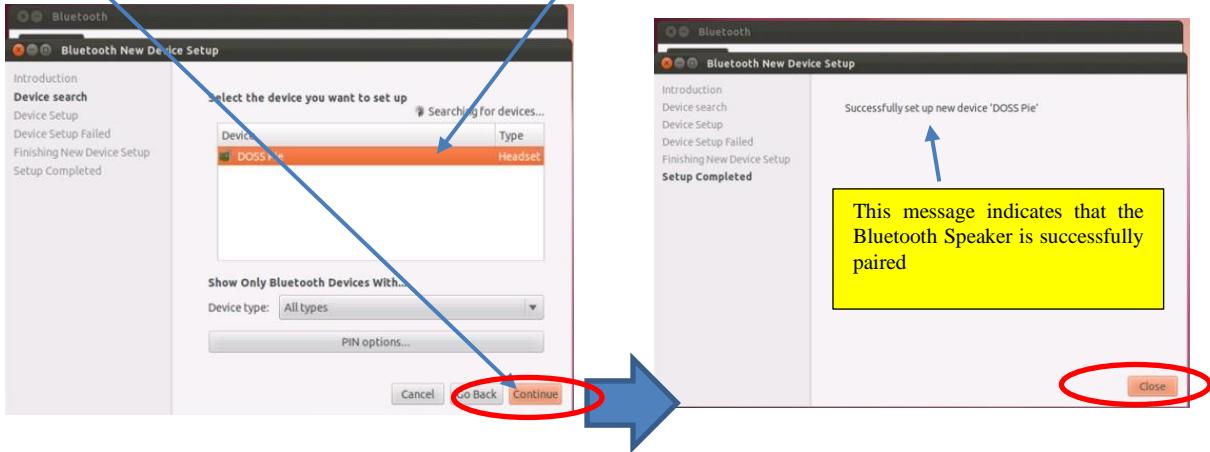
Step 6: After clicking the “+” icon, below window will pop up. Please press “Continue” to proceed.



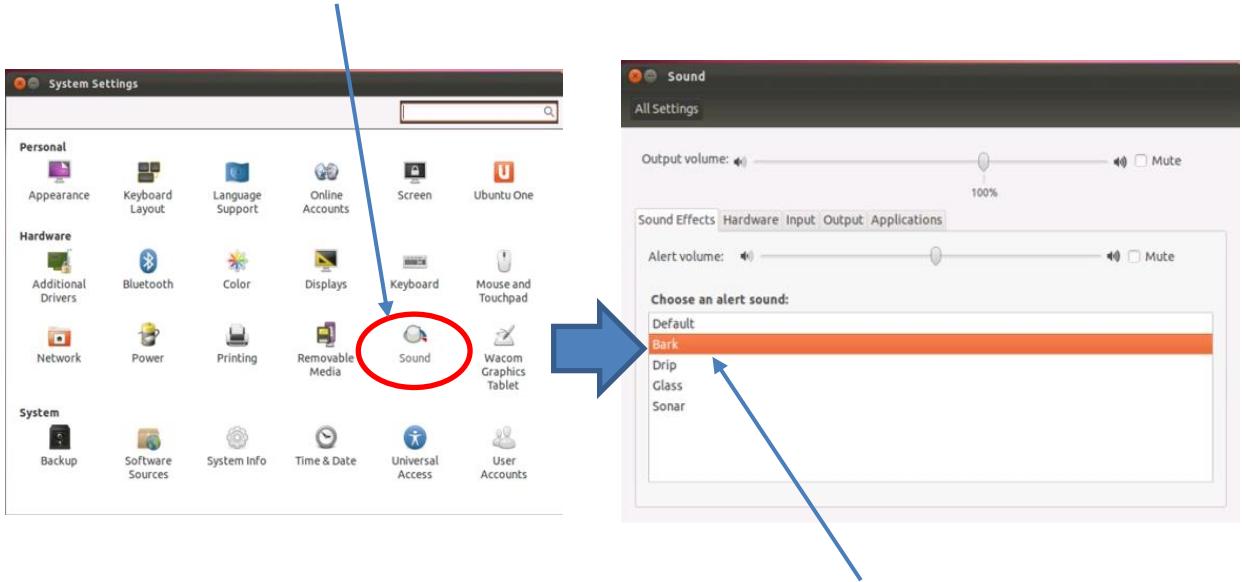
Step 7: After pressing the “Continue” icon, please power up your Bluetooth Speaker device and force it into “Pairing “ mode. After some time, the Bluetooth Speaker, namely “DOSS Pie” is shown in below Figure in this example. (Please note that your device should have different name other than this one).



Step 8: Please use the cursor to select (become highlighted after selection). Then press “Continue” to proceed

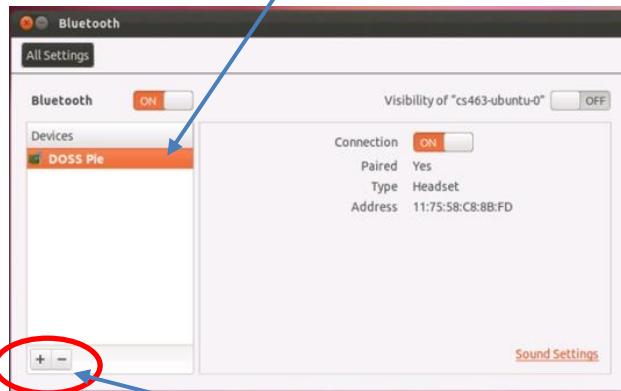


Step 9: After pairing the Bluetooth Speaker device, please go back to “System Settings” menu. Please select the “Sound” icon.

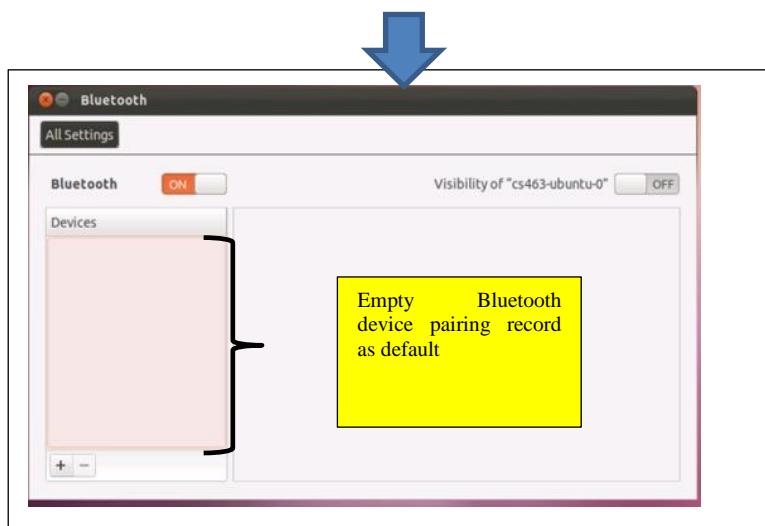
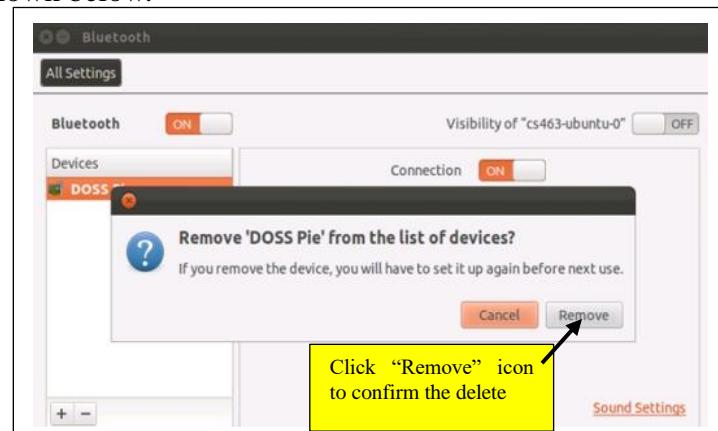


Step 10: After entered the “Sound” menu, please click the alert sound “Bark” twice (or any other alert sound). You will hear the corresponding sound from the Bluetooth Speaker.

Step 11: After successfully generating the sound from Bluetooth Device. Please go back to the device menu as shown below. Please select (highlight) the Bluetooth device,



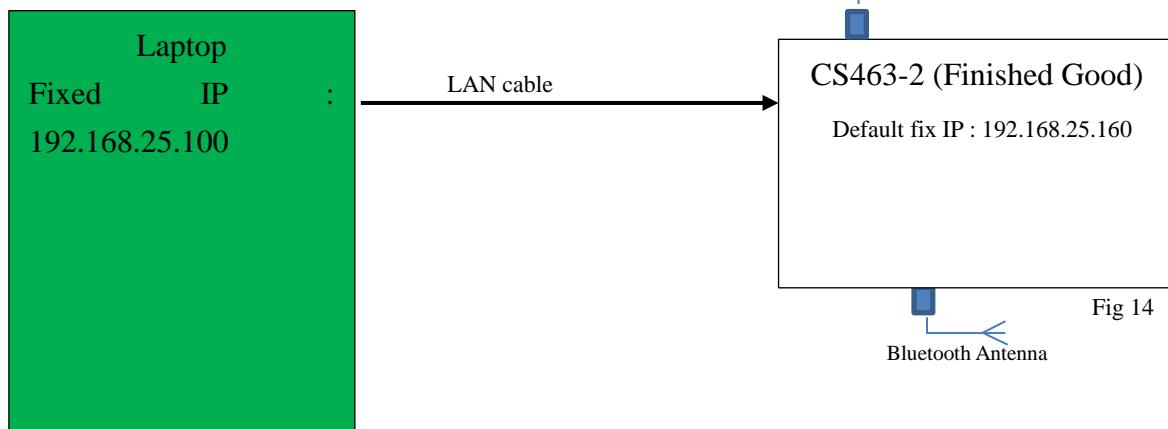
Step 12: **Remove the paired device record** by clicking the “-“ icon. Then the paired device record will be empty as shown below.



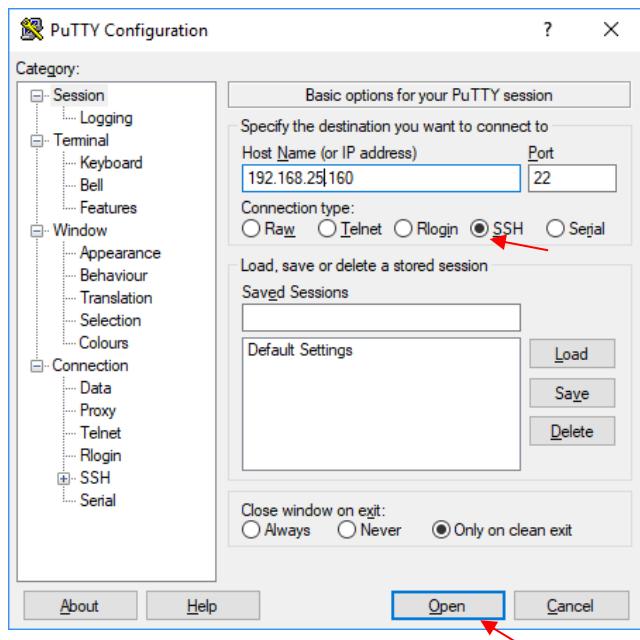
For Linux 4.xx.yy

Bluetooth connection method with Linux 4.xx.yy

Please Setup the reader as below:



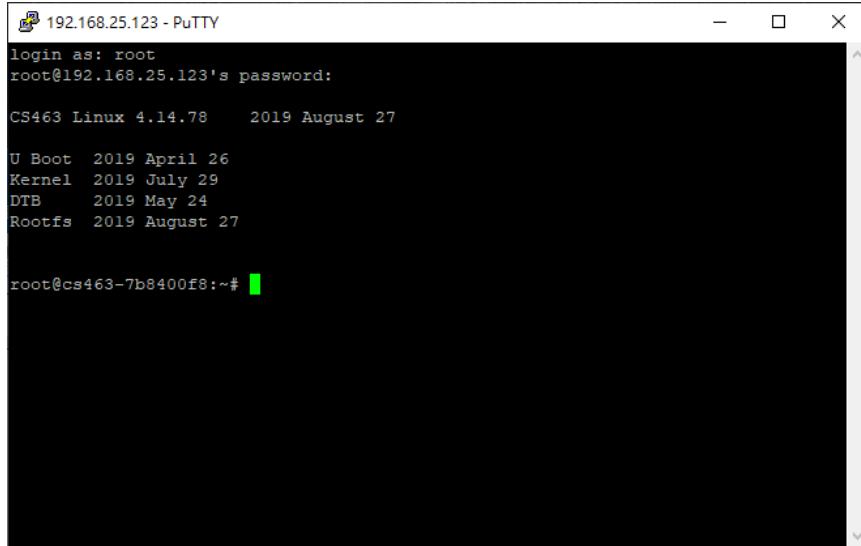
Start PuTTY in PC, select SSH on Connection Type and type in IP address of CS463, then click Open as below



Login to CS463 with below account

User: root

Password: csl



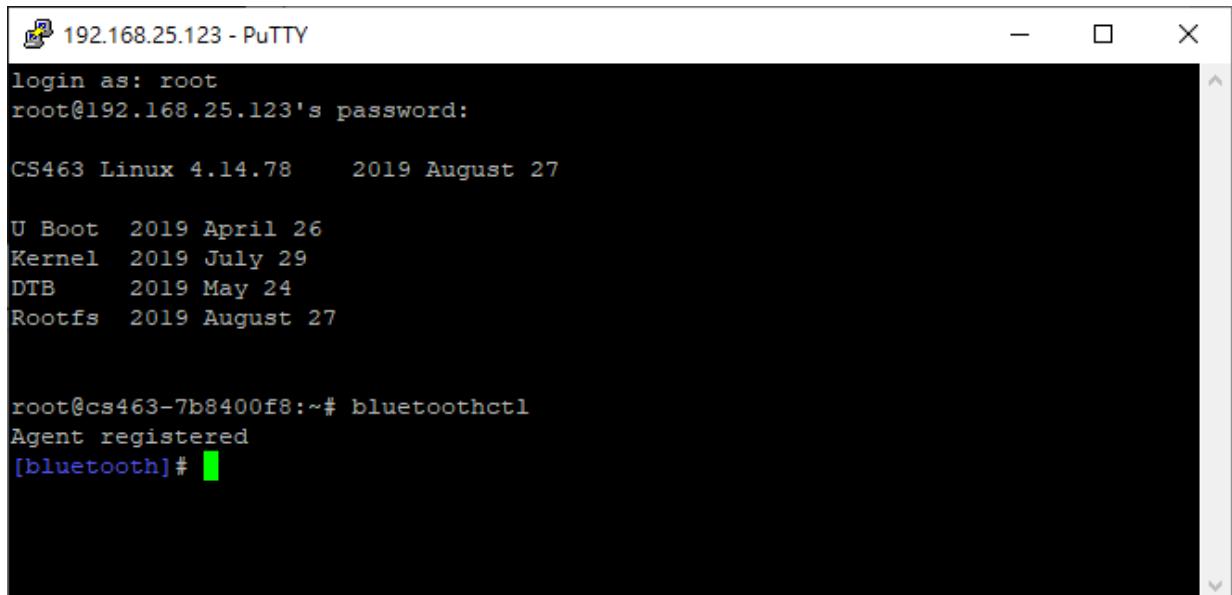
```
192.168.25.123 - PuTTY
login as: root
root@192.168.25.123's password:

CS463 Linux 4.14.78      2019 August 27

U Boot 2019 April 26
Kernel 2019 July 29
DTB    2019 May 24
Rootfs 2019 August 27

root@cs463-7b8400f8:~#
```

Run the Bluetooth control application by command bluetoothctl as below



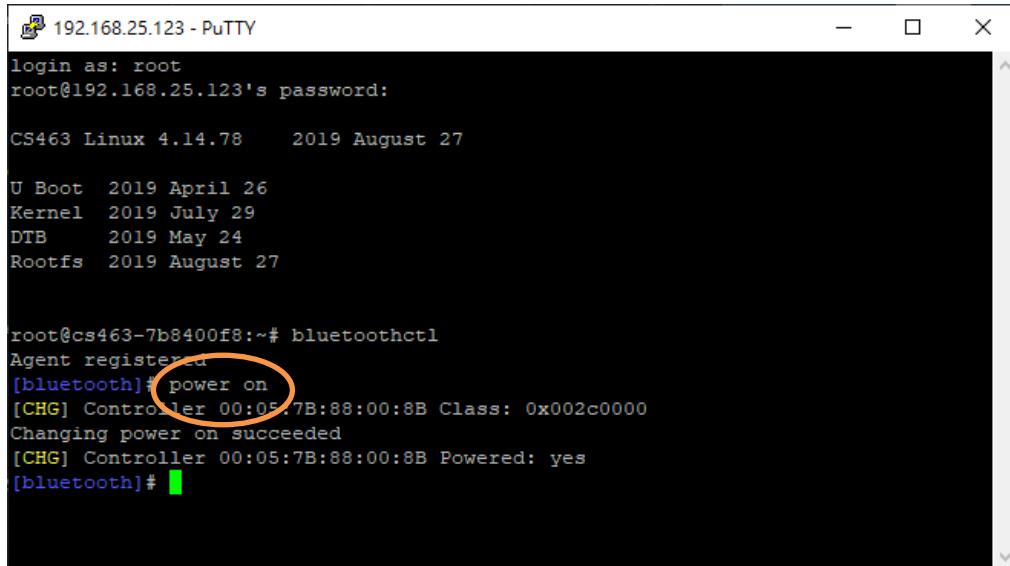
```
192.168.25.123 - PuTTY
login as: root
root@192.168.25.123's password:

CS463 Linux 4.14.78      2019 August 27

U Boot 2019 April 26
Kernel 2019 July 29
DTB    2019 May 24
Rootfs 2019 August 27

root@cs463-7b8400f8:~# bluetoothctl
Agent registered
[bluetooth] #
```

Turn on CS463 Bluetooth feature by running command “power on” in Bluetooth control software shell as below



```

192.168.25.123 - PuTTY
login as: root
root@192.168.25.123's password:

CS463 Linux 4.14.78      2019 August 27

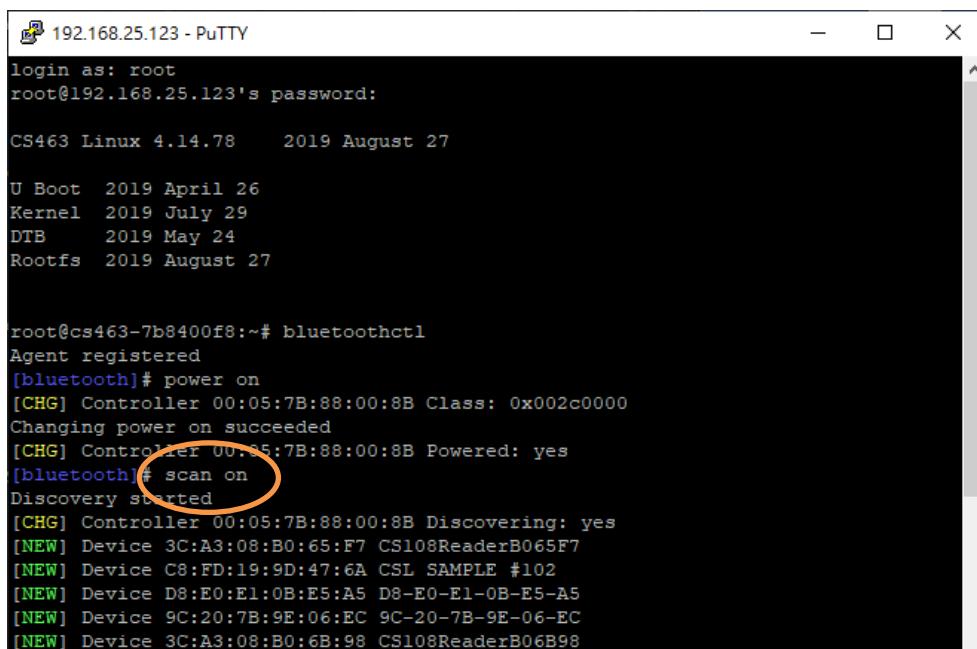
U Boot 2019 April 26
Kernel 2019 July 29
DTB    2019 May 24
Rootfs 2019 August 27

root@cs463-7b8400f8:~# bluetoothctl
Agent registered
[bluetooth]# power on
[CHG] Controller 00:05:7B:88:00:8B Class: 0x002c0000
Changing power on succeeded
[CHG] Controller 00:05:7B:88:00:8B Powered: yes
[bluetooth]#

```

Turn on testing Bluetooth speaker and enter to pairing mode.

Start the CS463 Bluetooth scanning process by running command “scan on” as below



```

192.168.25.123 - PuTTY
login as: root
root@192.168.25.123's password:

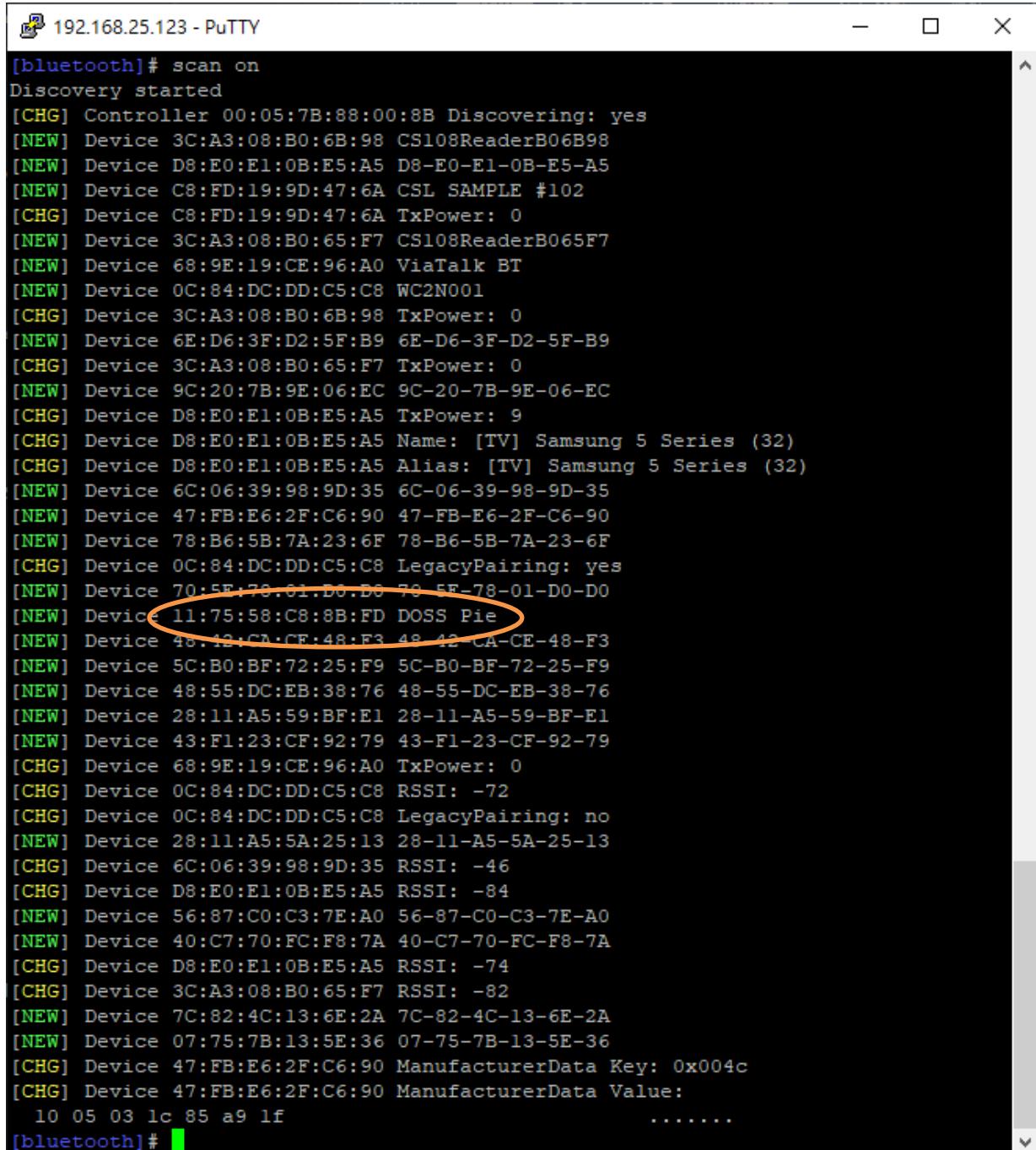
CS463 Linux 4.14.78      2019 August 27

U Boot 2019 April 26
Kernel 2019 July 29
DTB    2019 May 24
Rootfs 2019 August 27

root@cs463-7b8400f8:~# bluetoothctl
Agent registered
[bluetooth]# power on
[CHG] Controller 00:05:7B:88:00:8B Class: 0x002c0000
Changing power on succeeded
[CHG] Controller 00:05:7B:88:00:8B Powered: yes
[bluetooth]# scan on
Discovery started
[CHG] Controller 00:05:7B:88:00:8B Discovering: yes
[NEW] Device 3C:A3:08:B0:65:F7 CS108ReaderB065F7
[NEW] Device C8:FD:19:9D:47:6A CSL SAMPLE #102
[NEW] Device D8:E0:E1:0B:E5:A5 D8-E0-E1-0B-E5-A5
[NEW] Device 9C:20:7B:9E:06:EC 9C-20-7B-9E-06-EC
[NEW] Device 3C:A3:08:B0:6B:98 CS108ReaderB06B98

```

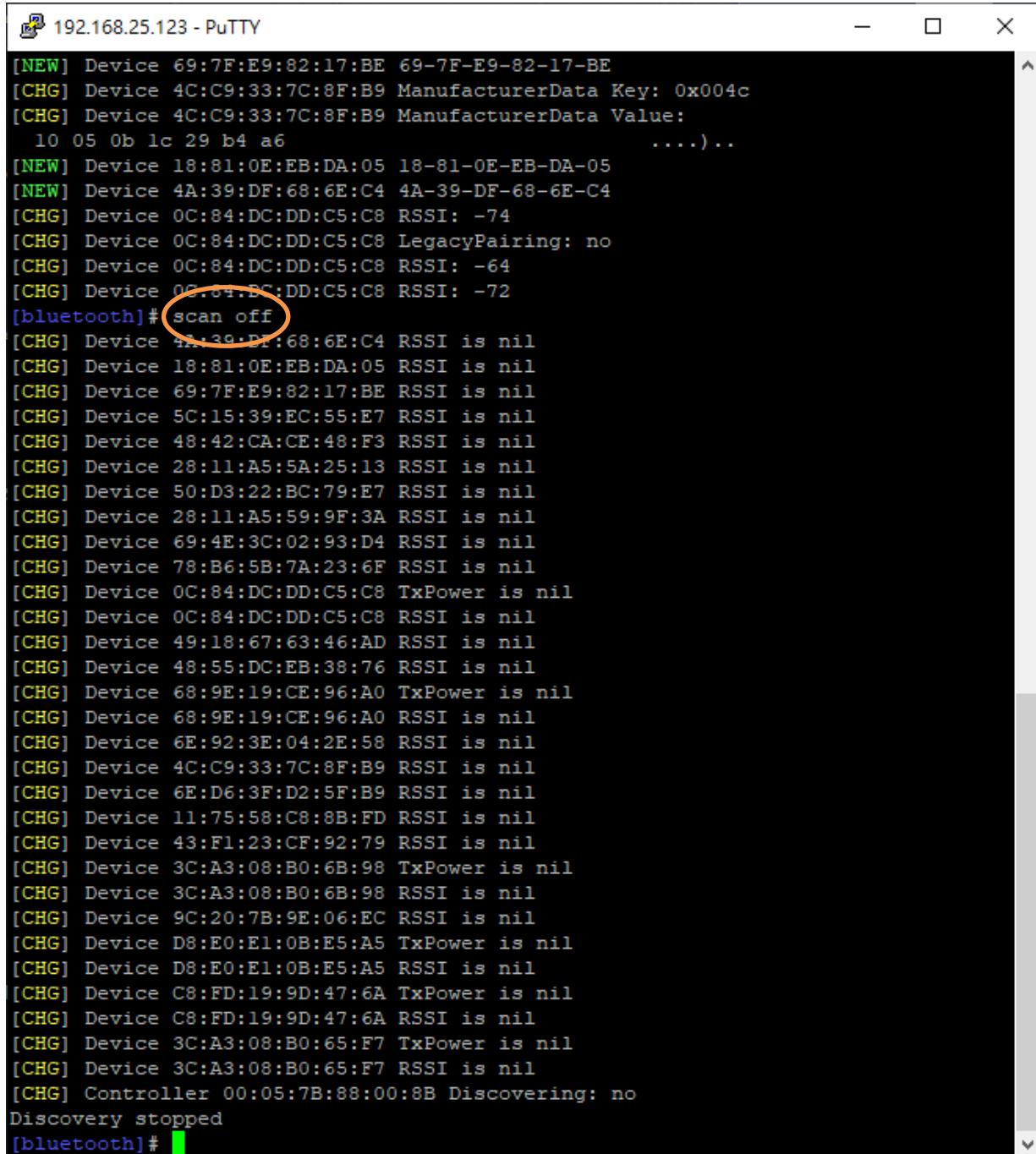
Look for target Bluetooth device in scanning result as shown below, the Bluetooth speaker device called DOSS Pie was used in this example, the device name and its Mac address shown as below



```
[bluetooth]# scan on
Discovery started
[CHG] Controller 00:05:7B:88:00:8B Discovering: yes
[NEW] Device 3C:A3:08:B0:6B:98 CS108ReaderB06B98
[NEW] Device D8:E0:E1:0B:E5:A5 D8-E0-E1-0B-E5-A5
[NEW] Device C8:FD:19:9D:47:6A CSL SAMPLE #102
[CHG] Device C8:FD:19:9D:47:6A TxPower: 0
[NEW] Device 3C:A3:08:B0:65:F7 CS108ReaderB065F7
[NEW] Device 68:9E:19:CE:96:A0 ViaTalk BT
[NEW] Device 0C:84:DC:DD:C5:C8 WC2N001
[CHG] Device 3C:A3:08:B0:6B:98 TxPower: 0
[NEW] Device 6E:D6:3F:D2:5F:B9 6E-D6-3F-D2-5F-B9
[CHG] Device 3C:A3:08:B0:65:F7 TxPower: 0
[NEW] Device 9C:20:7B:9E:06:EC 9C-20-7B-9E-06-EC
[CHG] Device D8:E0:E1:0B:E5:A5 TxPower: 9
[CHG] Device D8:E0:E1:0B:E5:A5 Name: [TV] Samsung 5 Series (32)
[CHG] Device D8:E0:E1:0B:E5:A5 Alias: [TV] Samsung 5 Series (32)
[NEW] Device 6C:06:39:98:9D:35 6C-06-39-98-9D-35
[NEW] Device 47:FB:E6:2F:C6:90 47-FB-E6-2F-C6-90
[NEW] Device 78:B6:5B:7A:23:6F 78-B6-5B-7A-23-6F
[CHG] Device 0C:84:DC:DD:C5:C8 LegacyPairing: yes
[NEW] Device 70:5E:70:01:D0:D0 70-5E-70-01-D0-D0
[NEW] Device 11:75:58:C8:8B:FD DOSS Pie
[NEW] Device 48:42:CA:CE:48:F3 48-42-CA-CE-48-F3
[NEW] Device 5C:B0:BF:72:25:F9 5C-B0-BF-72-25-F9
[NEW] Device 48:55:DC:EB:38:76 48-55-DC-EB-38-76
[NEW] Device 28:11:A5:59:BF:E1 28-11-A5-59-BF-E1
[NEW] Device 43:F1:23:CF:92:79 43-F1-23-CF-92-79
[CHG] Device 68:9E:19:CE:96:A0 TxPower: 0
[CHG] Device 0C:84:DC:DD:C5:C8 RSSI: -72
[CHG] Device 0C:84:DC:DD:C5:C8 LegacyPairing: no
[NEW] Device 28:11:A5:5A:25:13 28-11-A5-5A-25-13
[CHG] Device 6C:06:39:98:9D:35 RSSI: -46
[CHG] Device D8:E0:E1:0B:E5:A5 RSSI: -84
[NEW] Device 56:87:C0:C3:7E:A0 56-87-C0-C3-7E-A0
[NEW] Device 40:C7:70:FC:F8:7A 40-C7-70-FC-F8-7A
[CHG] Device D8:E0:E1:0B:E5:A5 RSSI: -74
[CHG] Device 3C:A3:08:B0:65:F7 RSSI: -82
[NEW] Device 7C:82:4C:13:6E:2A 7C-82-4C-13-6E-2A
[NEW] Device 07:75:7B:13:5E:36 07-75-7B-13-5E-36
[CHG] Device 47:FB:E6:2F:C6:90 ManufacturerData Key: 0x004c
[CHG] Device 47:FB:E6:2F:C6:90 ManufacturerData Value:
  10 05 03 lc 85 a9 lf .....[bluetooth]#
```

Run the command “scan off” to stop the Bluetooth scanning process

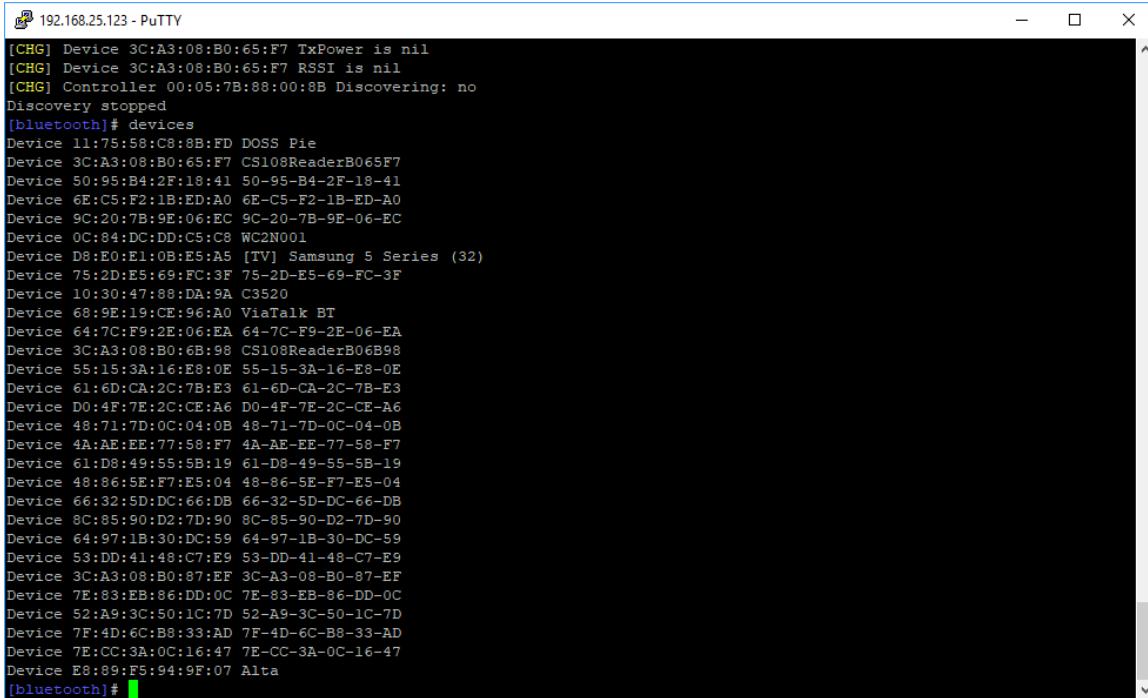
once target device can be found



The screenshot shows a PuTTY terminal window titled "192.168.25.123 - PuTTY". The window displays a log of Bluetooth device discoveries. A red oval highlights the command "[bluetooth]# scan off" which is being typed by the user. The log continues with a list of devices and their RSSI values.

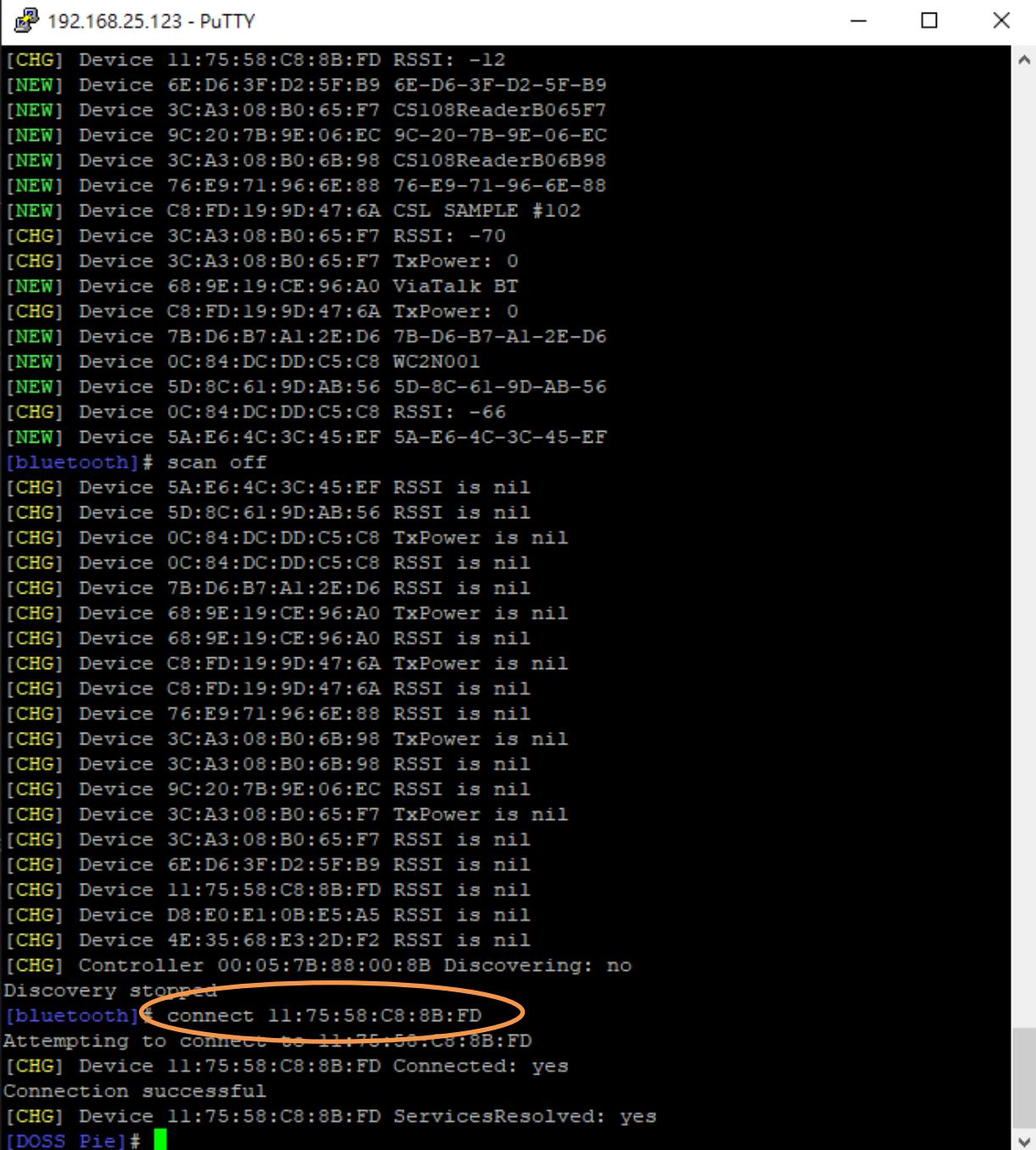
```
[NEW] Device 69:7F:E9:82:17:BE 69-7F-E9-82-17-BE
[CHG] Device 4C:C9:33:7C:8F:B9 ManufacturerData Key: 0x004c
[CHG] Device 4C:C9:33:7C:8F:B9 ManufacturerData Value:
    10 05 0b 1c 29 b4 a6 .....)
[NEW] Device 18:81:0E:EB:DA:05 18-81-0E-EB-DA-05
[NEW] Device 4A:39:DF:68:6E:C4 4A-39-DF-68-6E-C4
[CHG] Device 0C:84:DC:DD:C5:C8 RSSI: -74
[CHG] Device 0C:84:DC:DD:C5:C8 LegacyPairing: no
[CHG] Device 0C:84:DC:DD:C5:C8 RSSI: -64
[CHG] Device 0C:84:DC:DD:C5:C8 RSSI: -72
[bluetooth]# scan off
[CHG] Device 4A:39:DF:68:6E:C4 RSSI is nil
[CHG] Device 18:81:0E:EB:DA:05 RSSI is nil
[CHG] Device 69:7F:E9:82:17:BE RSSI is nil
[CHG] Device 5C:15:39:EC:55:E7 RSSI is nil
[CHG] Device 48:42:CA:CE:48:F3 RSSI is nil
[CHG] Device 28:11:A5:5A:25:13 RSSI is nil
[CHG] Device 50:D3:22:BC:79:E7 RSSI is nil
[CHG] Device 28:11:A5:59:9F:3A RSSI is nil
[CHG] Device 69:4E:3C:02:93:D4 RSSI is nil
[CHG] Device 78:B6:5B:7A:23:6F RSSI is nil
[CHG] Device 0C:84:DC:DD:C5:C8 TxPower is nil
[CHG] Device 0C:84:DC:DD:C5:C8 RSSI is nil
[CHG] Device 49:18:67:63:46:AD RSSI is nil
[CHG] Device 48:55:DC:EB:38:76 RSSI is nil
[CHG] Device 68:9E:19:CE:96:A0 TxPower is nil
[CHG] Device 68:9E:19:CE:96:A0 RSSI is nil
[CHG] Device 6E:92:3E:04:2E:58 RSSI is nil
[CHG] Device 4C:C9:33:7C:8F:B9 RSSI is nil
[CHG] Device 6E:D6:3F:D2:5F:B9 RSSI is nil
[CHG] Device 11:75:58:C8:8B:FD RSSI is nil
[CHG] Device 43:F1:23:CF:92:79 RSSI is nil
[CHG] Device 3C:A3:08:B0:6B:98 TxPower is nil
[CHG] Device 3C:A3:08:B0:6B:98 RSSI is nil
[CHG] Device 9C:20:7B:9E:06:EC RSSI is nil
[CHG] Device D8:E0:E1:0B:E5:A5 TxPower is nil
[CHG] Device D8:E0:E1:0B:E5:A5 RSSI is nil
[CHG] Device C8:FD:19:9D:47:6A TxPower is nil
[CHG] Device C8:FD:19:9D:47:6A RSSI is nil
[CHG] Device 3C:A3:08:B0:65:F7 TxPower is nil
[CHG] Device 3C:A3:08:B0:65:F7 RSSI is nil
[CHG] Controller 00:05:7B:88:00:8B Discovering: no
Discovery stopped
[bluetooth]#
```

Run the command “devices” to check available devices.



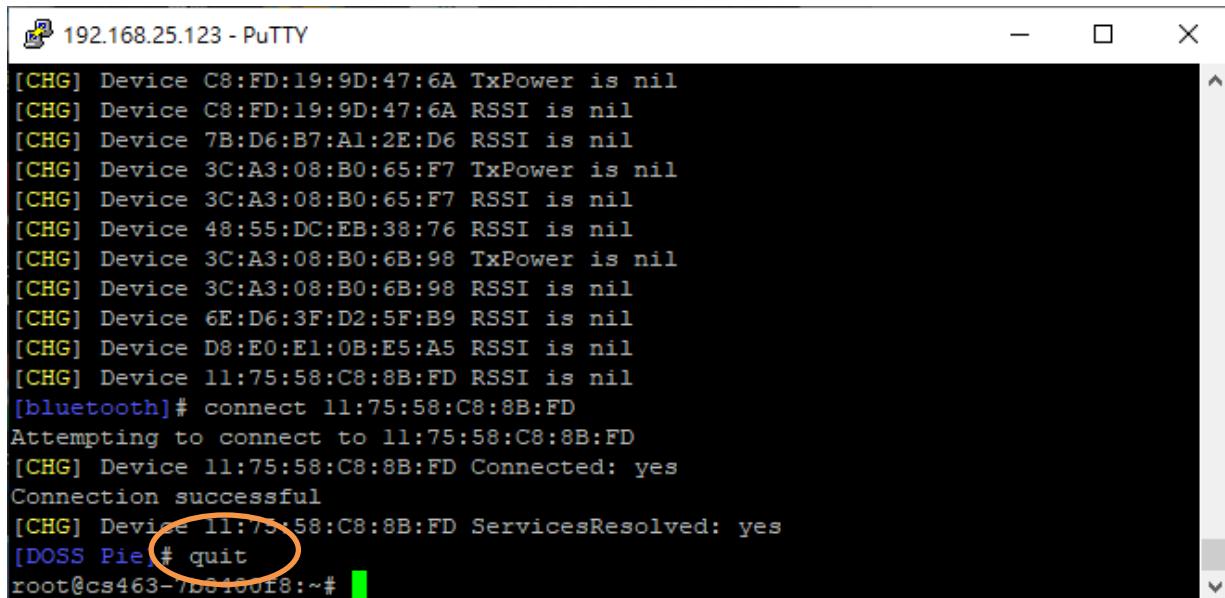
```
[CHG] Device 3C:A3:08:B0:65:F7 TxPower is nil
[CHG] Device 3C:A3:08:B0:65:F7 RSSI is nil
[CHG] Controller 00:05:7B:88:00:8B Discovering: no
Discovery stopped
[bluetooth]# devices
Device 11:75:58:C8:8B:FD DOSS Pie
Device 3C:A3:08:B0:65:F7 CS108ReaderB065F7
Device 50:95:B4:2F:18:41 50-95-B4-2F-18-41
Device 6E:C5:F2:1B:ED:A0 6E-C5-F2-1B-ED-A0
Device 9C:20:7B:9E:06:EC 9C-20-7B-9E-06-EC
Device 0C:84:DC:DD:C5:C8 WC2N001
Device D8:E0:E1:0B:E5:A5 [TV] Samsung 5 Series (32)
Device 75:2D:E5:69:FC:3F 75-2D-E5-69-FC-3F
Device 10:30:47:88:DA:9A C3520
Device 68:9E:19:CE:96:A0 ViaTalk BT
Device 64:7C:F9:2E:06:EA 64-7C-F9-2E-06-EA
Device 3C:A3:08:B0:6B:98 CS108ReaderB06B98
Device 55:15:3A:16:E8:0E 55-15-3A-16-E8-0E
Device 61:6D:CA:2C:7B:E3 61-6D-CA-2C-7B-E3
Device D0:4F:7E:2C:CE:A6 D0-4F-7E-2C-CE-A6
Device 48:71:7D:0C:04:0B 48-71-7D-0C-04-0B
Device 4A:AE:EE:77:58:F7 4A-AE-EE-77-58-F7
Device 61:D8:49:55:5B:19 61-D8-49-55-5B-19
Device 48:86:5E:F7:E5:04 48-86-5E-F7-E5-04
Device 66:32:5D:DC:66:DB 66-32-5D-DC-66-DB
Device 8C:85:90:D2:7D:90 8C-85-90-D2-7D-90
Device 64:97:1B:30:DC:59 64-97-1B-30-DC-59
Device 53:DD:41:48:C7:E9 53-DD-41-48-C7-E9
Device 3C:A3:08:B0:87:EF 3C-A3-08-B0-87-EF
Device 7E:83:EB:86:DD:0C 7E-83-EB-86-DD-0C
Device 52:A9:3C:50:1C:7D 52-A9-3C-50-1C-7D
Device 7F:4D:6C:B8:33:AD 7F-4D-6C-B8-33-AD
Device 7E:CC:3A:0C:16:47 7E-CC-3A-0C-16-47
Device E8:89:F5:94:9F:07 Alta
[bluetooth]#
```

Connect to the Bluetooth speaker by running command “connect <MAC address>”, e.g. connect 11:75:58:C8:8B:FD as shown below:



```
[CHG] Device 11:75:58:C8:8B:FD RSSI: -12
[NEW] Device 6E:D6:3F:D2:5F:B9 6E-D6-3F-D2-5F-B9
[NEW] Device 3C:A3:08:B0:65:F7 CS108ReaderB065F7
[NEW] Device 9C:20:7B:9E:06:EC 9C-20-7B-9E-06-EC
[NEW] Device 3C:A3:08:B0:6B:98 CS108ReaderB06B98
[NEW] Device 76:E9:71:96:6E:88 76-E9-71-96-6E-88
[NEW] Device C8:FD:19:9D:47:6A CSL SAMPLE #102
[CHG] Device 3C:A3:08:B0:65:F7 RSSI: -70
[CHG] Device 3C:A3:08:B0:65:F7 TxPower: 0
[NEW] Device 68:9E:19:CE:96:A0 ViaTalk BT
[CHG] Device C8:FD:19:9D:47:6A TxPower: 0
[NEW] Device 7B:D6:B7:A1:2E:D6 7B-D6-B7-A1-2E-D6
[NEW] Device 0C:84:DC:DD:C5:C8 WC2N001
[NEW] Device 5D:8C:61:9D:AB:56 5D-8C-61-9D-AB-56
[CHG] Device 0C:84:DC:DD:C5:C8 RSSI: -66
[NEW] Device 5A:E6:4C:3C:45:EF 5A-E6-4C-3C-45-EF
[bluetooth]# scan off
[CHG] Device 5A:E6:4C:3C:45:EF RSSI is nil
[CHG] Device 5D:8C:61:9D:AB:56 RSSI is nil
[CHG] Device 0C:84:DC:DD:C5:C8 TxPower is nil
[CHG] Device 0C:84:DC:DD:C5:C8 RSSI is nil
[CHG] Device 7B:D6:B7:A1:2E:D6 RSSI is nil
[CHG] Device 68:9E:19:CE:96:A0 TxPower is nil
[CHG] Device 68:9E:19:CE:96:A0 RSSI is nil
[CHG] Device C8:FD:19:9D:47:6A TxPower is nil
[CHG] Device C8:FD:19:9D:47:6A RSSI is nil
[CHG] Device 76:E9:71:96:6E:88 RSSI is nil
[CHG] Device 3C:A3:08:B0:6B:98 TxPower is nil
[CHG] Device 3C:A3:08:B0:6B:98 RSSI is nil
[CHG] Device 9C:20:7B:9E:06:EC RSSI is nil
[CHG] Device 3C:A3:08:B0:65:F7 TxPower is nil
[CHG] Device 3C:A3:08:B0:65:F7 RSSI is nil
[CHG] Device 6E:D6:3F:D2:5F:B9 RSSI is nil
[CHG] Device 11:75:58:C8:8B:FD RSSI is nil
[CHG] Device D8:E0:E1:0B:E5:A5 RSSI is nil
[CHG] Device 4E:35:68:E3:2D:F2 RSSI is nil
[CHG] Controller 00:05:7B:88:00:8B Discovering: no
Discovery stopped
[bluetooth]# connect 11:75:58:C8:8B:FD
Attempting to connect to 11:75:58:C8:8B:FD
[CHG] Device 11:75:58:C8:8B:FD Connected: yes
Connection successful
[CHG] Device 11:75:58:C8:8B:FD ServicesResolved: yes
[DOSS Pie]#
```

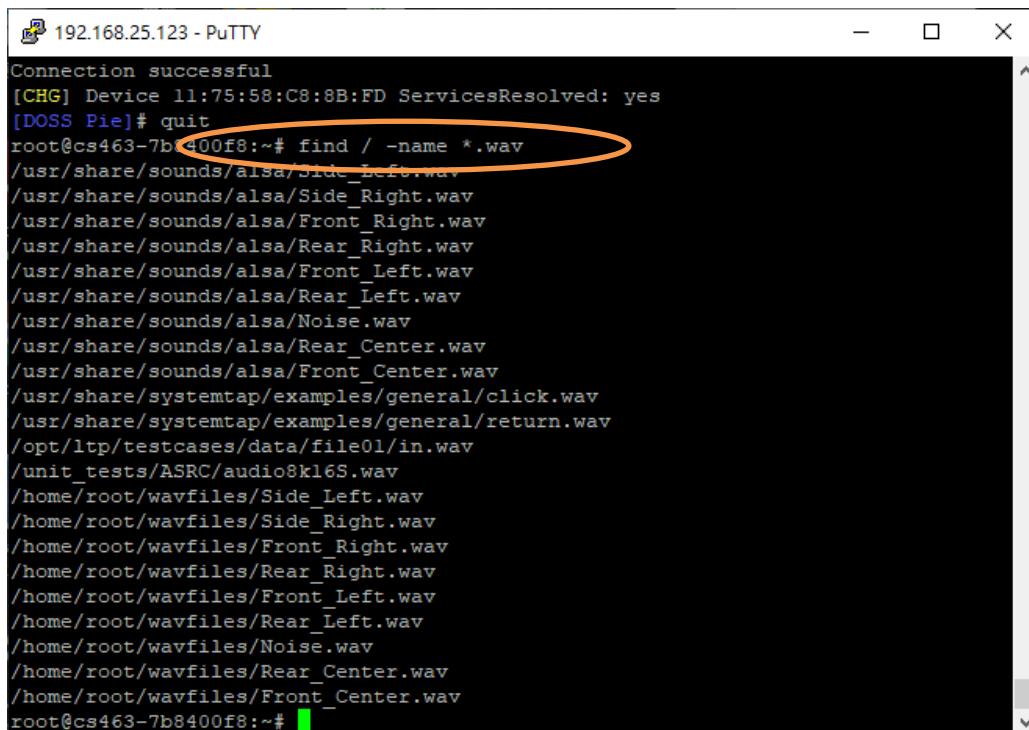
After successful connection, where usually the Bluetooth speaker would sound some audio message saying pairing is successful, we should leave this Bluetooth controlling session for next step by command “quit” as below



The screenshot shows a PuTTY terminal window titled "192.168.25.123 - PuTTY". The terminal displays a list of Bluetooth devices with their MAC addresses and RSSI values. The output includes:

```
[CHG] Device C8:FD:19:9D:47:6A TxPower is nil
[CHG] Device C8:FD:19:9D:47:6A RSSI is nil
[CHG] Device 7B:D6:B7:A1:2E:D6 RSSI is nil
[CHG] Device 3C:A3:08:B0:65:F7 TxPower is nil
[CHG] Device 3C:A3:08:B0:65:F7 RSSI is nil
[CHG] Device 48:55:DC:EB:38:76 RSSI is nil
[CHG] Device 3C:A3:08:B0:6B:98 TxPower is nil
[CHG] Device 3C:A3:08:B0:6B:98 RSSI is nil
[CHG] Device 6E:D6:3F:D2:5F:B9 RSSI is nil
[CHG] Device D8:E0:E1:0B:E5:A5 RSSI is nil
[CHG] Device 11:75:58:C8:8B:FD RSSI is nil
[bluetooth]# connect 11:75:58:C8:8B:FD
Attempting to connect to 11:75:58:C8:8B:FD
[CHG] Device 11:75:58:C8:8B:FD Connected: yes
Connection successful
[CHG] Device 11:75:58:C8:8B:FD ServicesResolved: yes
[DOSS Pie]# quit
root@cs463-/b3100f8:~#
```

The connected Bluetooth device is ready for use, so the Bluetooth functionality can be checked by playing any wav file. Some wav file was placed in shipped CS463 and can be search by command “find / -name *.wav as below

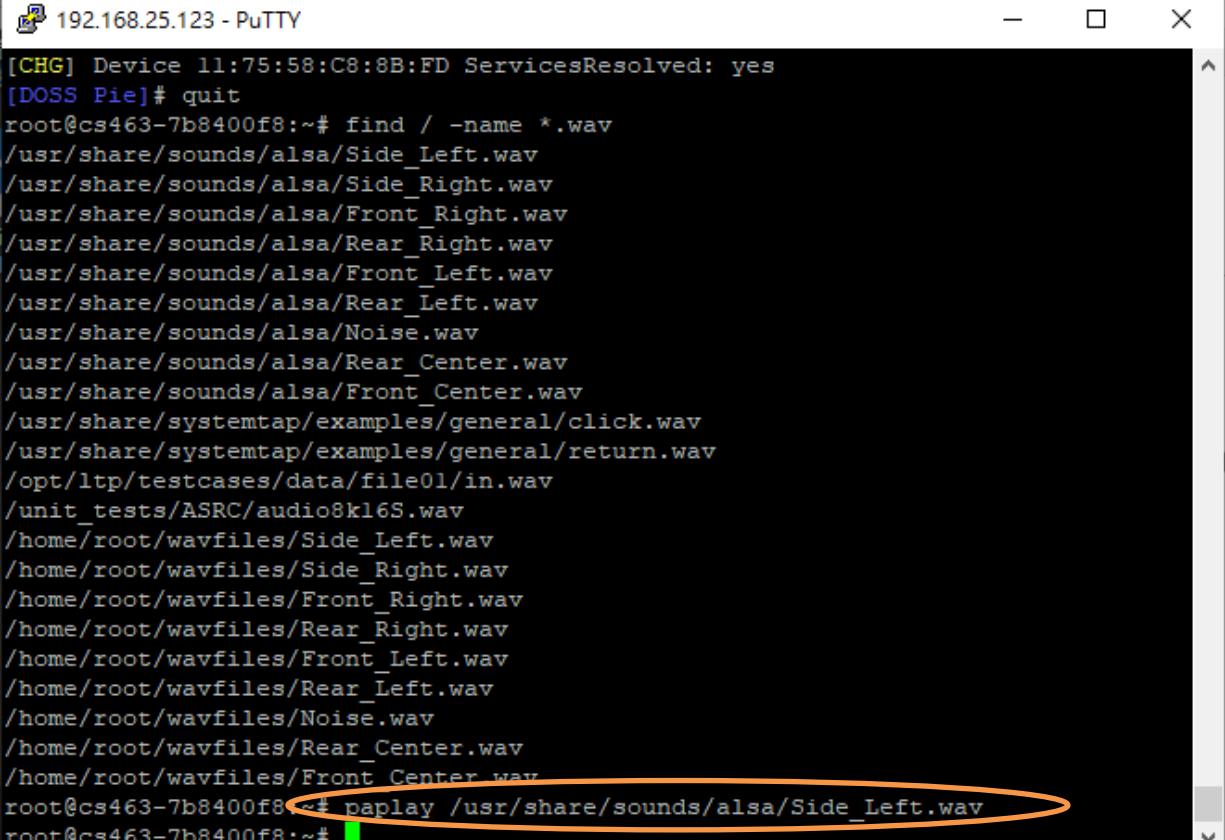


```
192.168.25.123 - PuTTY
Connection successful
[CHG] Device 11:75:58:C8:8B:FD ServicesResolved: yes
[DOSS Pie]# quit
root@cs463-7b8400f8:~# find / -name *.wav
/usr/share/sounds/alsa/Side_Left.wav
/usr/share/sounds/alsa/Side_Right.wav
/usr/share/sounds/alsa/Front_Right.wav
/usr/share/sounds/alsa/Rear_Right.wav
/usr/share/sounds/alsa/Front_Left.wav
/usr/share/sounds/alsa/Rear_Left.wav
/usr/share/sounds/alsa/Noise.wav
/usr/share/sounds/alsa/Rear_Center.wav
/usr/share/sounds/alsa/Front_Center.wav
/usr/share/systemtap/examples/general/click.wav
/usr/share/systemtap/examples/general/return.wav
/opt/ltp/testcases/data/file01/in.wav
/unit_tests/ASRC/audio8kl65.wav
/home/root/wavfiles/Side_Left.wav
/home/root/wavfiles/Side_Right.wav
/home/root/wavfiles/Front_Right.wav
/home/root/wavfiles/Rear_Right.wav
/home/root/wavfiles/Front_Left.wav
/home/root/wavfiles/Rear_Left.wav
/home/root/wavfiles/Noise.wav
/home/root/wavfiles/Rear_Center.wav
/home/root/wavfiles/Front_Center.wav
root@cs463-7b8400f8:~#
```

The found wav file can be played by command

```
paplay /usr/share/sounds/alsa/Side_Left.wav
```

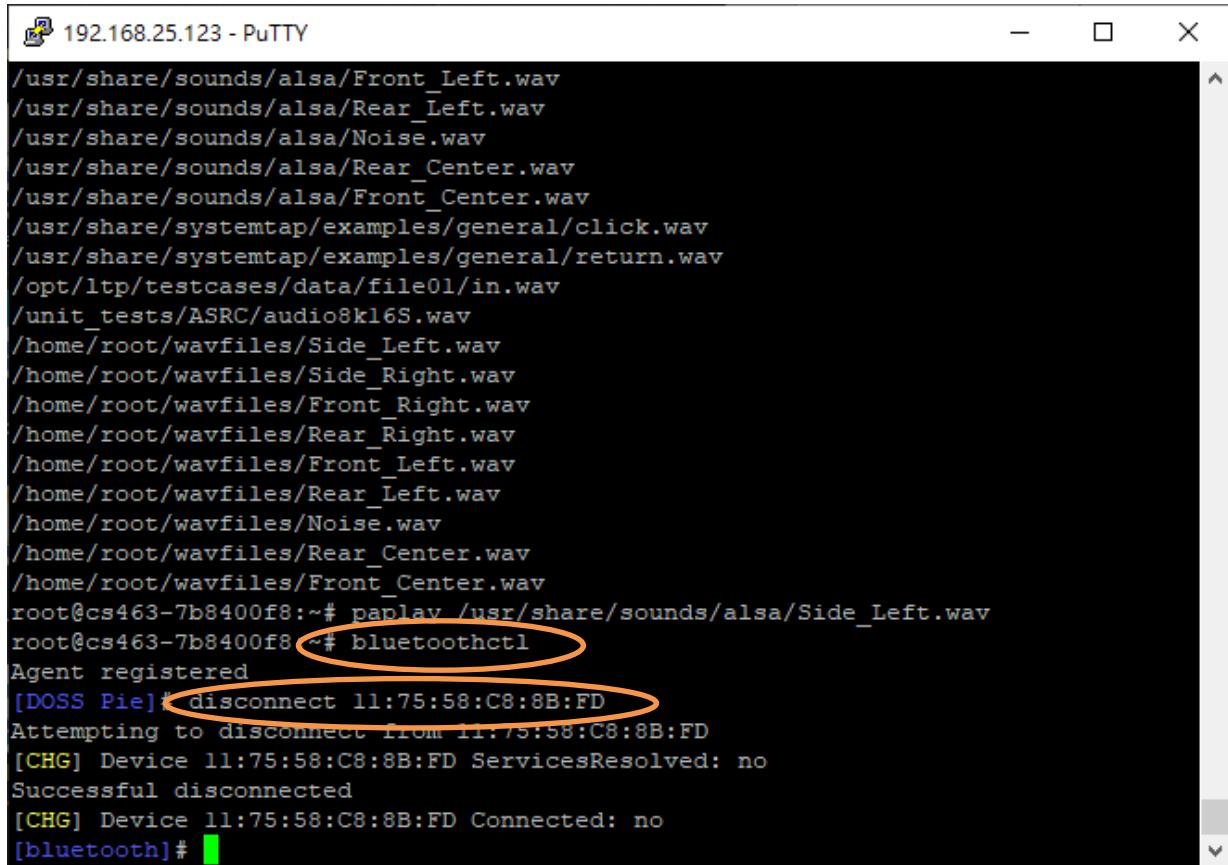
Some voice should be heard from the Bluetooth speaker



```
[CHG] Device 11:75:58:C8:8B:FD ServicesResolved: yes
[DOSS Pie]# quit
root@cs463-7b8400f8:~# find / -name *.wav
/usr/share/sounds/alsa/Side_Left.wav
/usr/share/sounds/alsa/Side_Right.wav
/usr/share/sounds/alsa/Front_Right.wav
/usr/share/sounds/alsa/Rear_Right.wav
/usr/share/sounds/alsa/Front_Left.wav
/usr/share/sounds/alsa/Rear_Left.wav
/usr/share/sounds/alsa/Noise.wav
/usr/share/sounds/alsa/Rear_Center.wav
/usr/share/sounds/alsa/Front_Center.wav
/usr/share/systemtap/examples/general/click.wav
/usr/share/systemtap/examples/general/return.wav
/opt/ltp/testcases/data/file01/in.wav
/unit_tests/ASRC/audio8kl6S.wav
/home/root/wavfiles/Side_Left.wav
/home/root/wavfiles/Side_Right.wav
/home/root/wavfiles/Front_Right.wav
/home/root/wavfiles/Rear_Right.wav
/home/root/wavfiles/Front_Left.wav
/home/root/wavfiles/Rear_Left.wav
/home/root/wavfiles/Noise.wav
/home/root/wavfiles/Rear_Center.wav
/home/root/wavfiles/Front_Center.wav
root@cs463-7b8400f8:~# paplay /usr/share/sounds/alsa/Side_Left.wav
root@cs463-7b8400f8:~#
```

After the testing finished, the connected device can be disconnected by below method.

Go to Bluetooth control session by command “bluetoothctl” then run the command “disconnect 11:75:58:C8:88:FD” as below



The screenshot shows a PuTTY terminal window titled "192.168.25.123 - PuTTY". The terminal displays a list of wav files in the /usr/share/sounds/alsa directory. The user then runs the command "bluetoothctl". Two specific lines in the command history are circled with red ovals: "[DOSS Pie] disconnect 11:75:58:C8:8B:FD" and "[CHG] Device 11:75:58:C8:8B:FD ServicesResolved: no". The terminal prompt "[bluetooth]" is visible at the bottom.

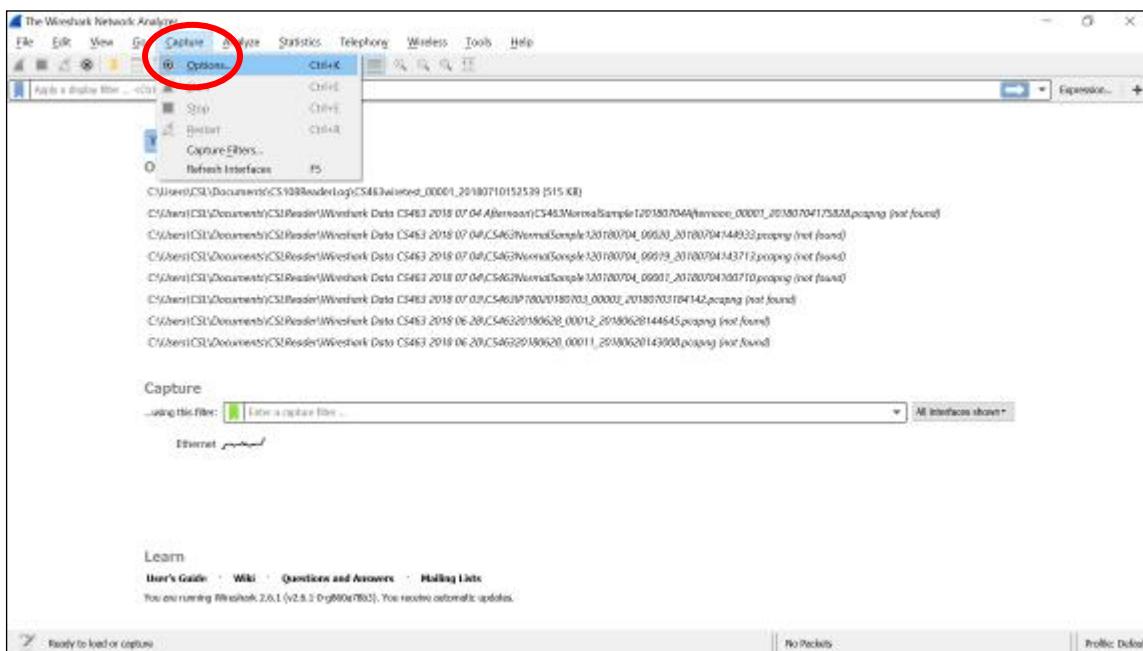
```
/usr/share/sounds/alsa/Front_Left.wav
/usr/share/sounds/alsa/Rear_Left.wav
/usr/share/sounds/alsa/Noise.wav
/usr/share/sounds/alsa/Rear_Center.wav
/usr/share/sounds/alsa/Front_Center.wav
/usr/share/systemtap/examples/general/click.wav
/usr/share/systemtap/examples/general/return.wav
/opt/ltp/testcases/data/file01/in.wav
/unit_tests/ASRC/audio8kl6S.wav
/home/root/wavfiles/Side_Left.wav
/home/root/wavfiles/Side_Right.wav
/home/root/wavfiles/Front_Right.wav
/home/root/wavfiles/Rear_Right.wav
/home/root/wavfiles/Front_Left.wav
/home/root/wavfiles/Rear_Left.wav
/home/root/wavfiles/Noise.wav
/home/root/wavfiles/Rear_Center.wav
/home/root/wavfiles/Front_Center.wav
root@cs463-7b8400f8:~# paplay /usr/share/sounds/alsa/Side_Left.wav
root@cs463-7b8400f8 ~# bluetoothctl
Agent registered
[DOSS Pie] disconnect 11:75:58:C8:8B:FD
Attempting to disconnect from 11:75:58:C8:8B:FD
[CHG] Device 11:75:58:C8:8B:FD ServicesResolved: no
Successful disconnected
[CHG] Device 11:75:58:C8:8B:FD Connected: no
[bluetooth] #
```

5.15 Wireshark Logging on PC Server Side

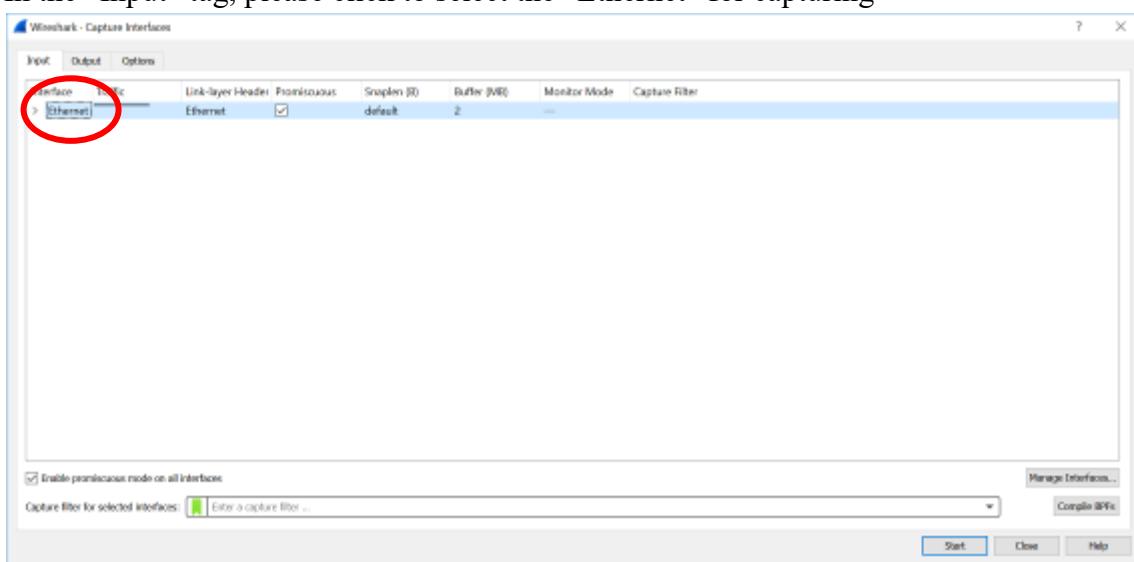
The purpose of Wireshark is to capture the Ethernet protocol handshake package between reader and the PC and log them for analysis.

(a) Run the “Wireshark application

Please select “Capture” to enter “Option” page as shown below

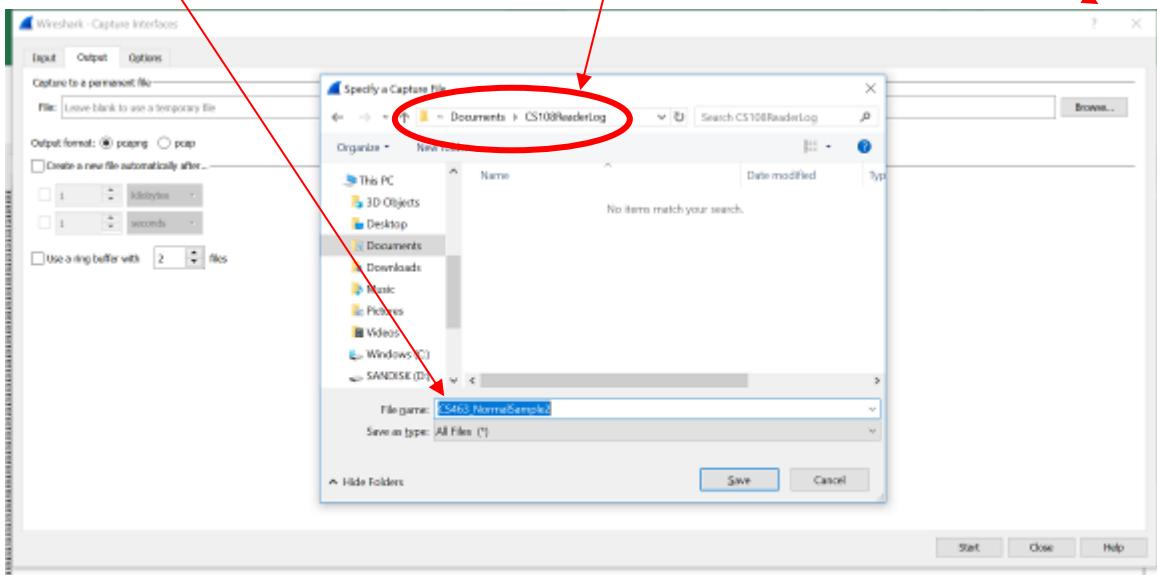


In the “Input” tag, please click to select the “Ethernet” for capturing



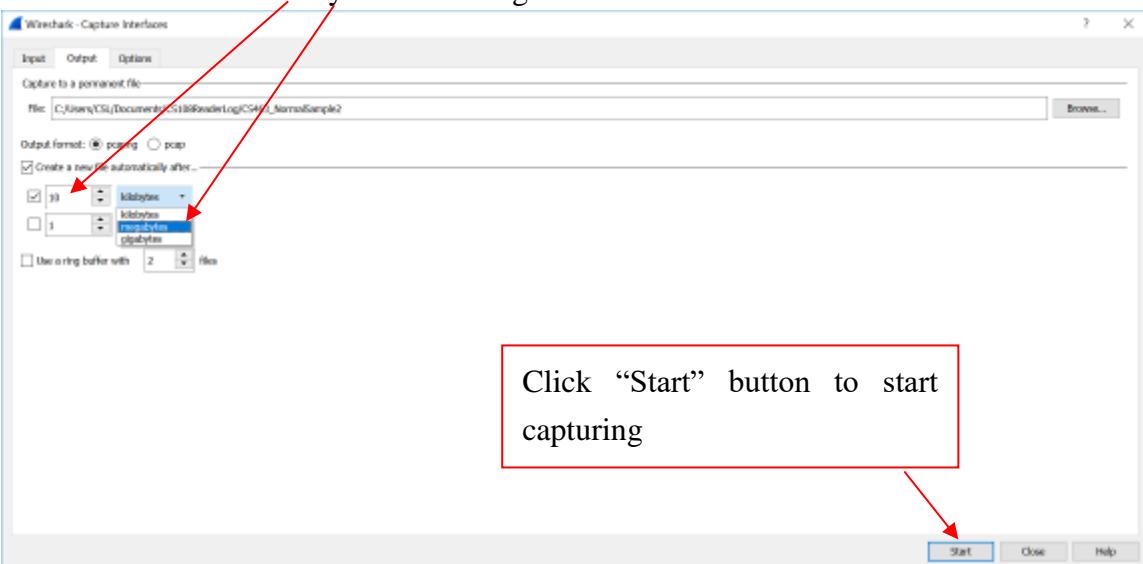
(b) In the “Output” tag,

- ⇒ Please select the “Browse” icon at the top right corner
- ⇒ A new window pop-up to allow the select of the directory to store the log data.
- ⇒ Select the path and then key in your preference filename



(c) Select the output format and file size

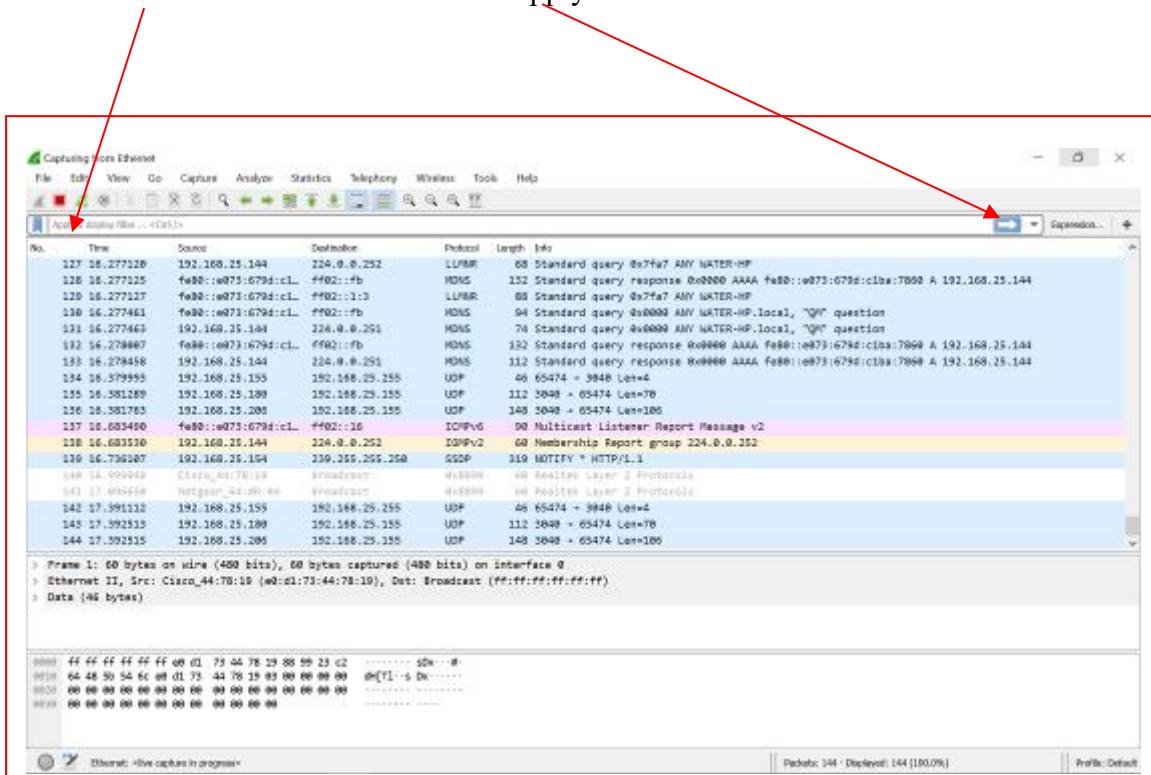
It is normal to use 10MByte for each log file as shown below



(d) Wireshark capturing

To filter the IP 192.168.25.180, please enter

Ip.addr == 192.168.25.180 and then click “Apply” icon



6 GPIO Ports Connection Guide

The CSL Fixed Intelligent Reader Family's GPIO ports are actually optically isolated switches only. There are various ways one can connect them up for common peripheral control. The following sub-chapters describe typical ways to connect up for General Purpose Input and General Purpose Output operations.

In addition to 4 optically isolated GPO and 4 optically isolated GPI, the CSL fixed intelligent reader family also supply an isolated 12 Volt DC supply at 2 Watt, i.e., a maximum of 160 mA current drive output. For low power peripheral devices, including most relays, this 12 Volt isolated DC power supply can be used to drive them.

For load that requires higher current drive, external power supply is needed, and some of the examples show how this is done in a safe manner. The important thing to remember is to handle exception cases when the load encounters a shorting failure, so that unlimited current can pass through that, and the optical isolated switch can be damaged if a protective resistor (high power resistor) is not placed in series with the power supply path. As long as a protective resistor is there, the overall circuit is protected. This is a standard industry practice.

6.1 General Purpose Input (GPI)

GPI ports contain an optical isolator inside. The input line has a series resistor of 1K Ohm with 1.5 Watt rating for protection. This will withstand external voltage up to 36 volt as shown below.

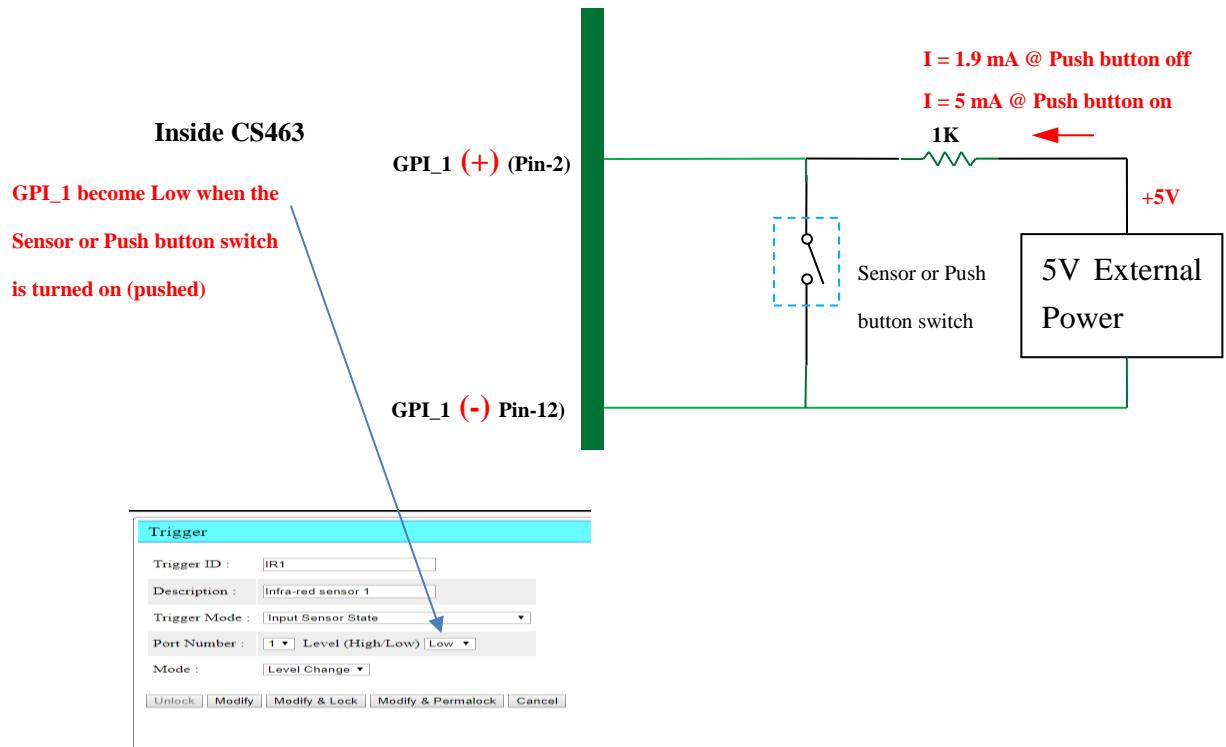
$$P = V^2 / R$$
$$P = 36^2 / 1000 = 1.296 \text{ Watt} < 1.5 \text{ Watt}$$

Therefore the highest voltage the GPI port of CSL Intelligent Fixed reader can “see” is 36 volts.

If one uses the 12 Volt DC output from the CSL Intelligent Fixed Reader in the input sensing circuit (examples are in next few pages), then that voltage is well below the limit of 36 Volt.

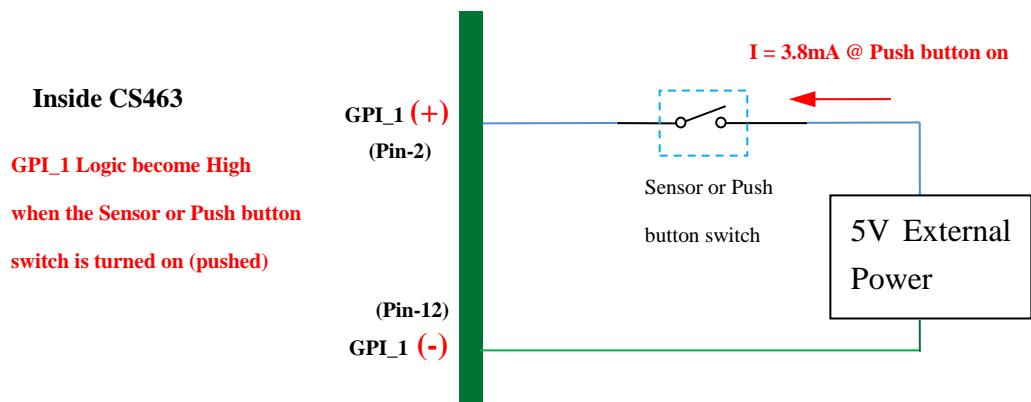
Example 1: (GPI with +5V External Power Supply)

Each GPI pin pair “looks” into an optical isolator with an operational forward voltage of 1.2 Volt, maximum 50 mA current. An internal series 1K Ohm 1.5 Watt resistor is also present for protection.



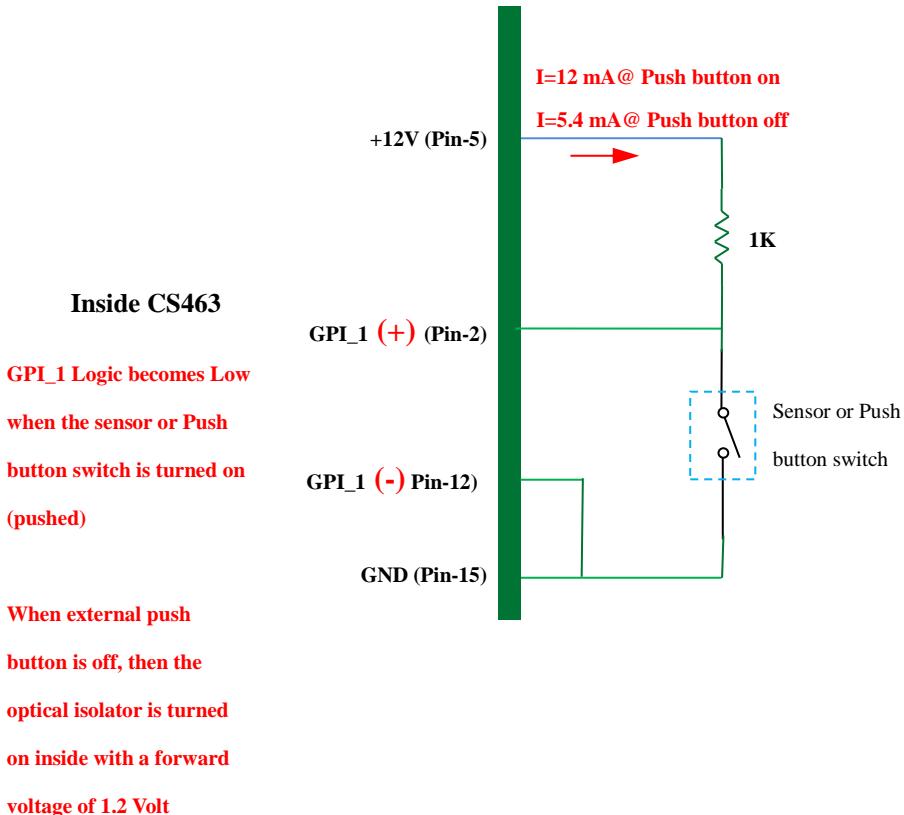
Example 2: (GPI with +5V External Power Supply)

Each GPI pin pair “looks” into an optical isolator with an operational forward voltage of 1.2 Volt, maximum 50 mA current. An internal series 1K Ohm 1.5 Watt resistor is also present for protection.



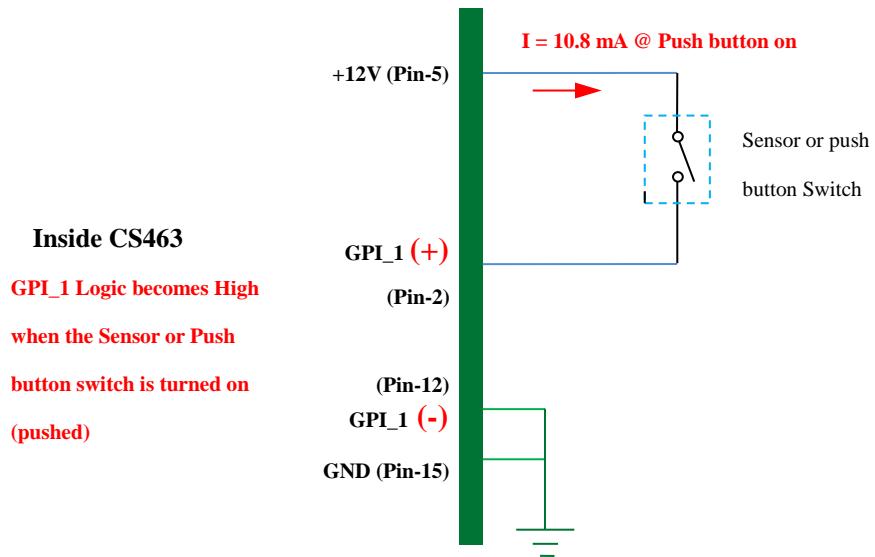
Example 3: (GPI using the Internal Isolated +12V, 2 Watt Power Supply)

Each GPI pin pair “looks” into an optical isolator with an operational forward voltage of 1.2 Volt, maximum 50 mA current. An internal series 1K Ohm 1.5 Watt resistor is also present for protection.



Example 4: (GPI using the Internal Isolated +12V, 2 Watt Power Supply)

Each GPI pin pair “looks” into an optical isolator with an operational forward voltage of 1.2 Volt, maximum 50 mA current. An internal series 1K Ohm 1.5 Watt resistor is also present for protection.



6.2 General Purpose Output (GPO)

Maximum current that can pass through the GPO optically isolated switches of CSL Intelligent Fixed Readers is 2 Ampere.

Therefore a protection resistor with very high power rating must be added in series to the external circuit to limit the current to 2 Ampere. The value of this resistor should be such that the current cannot exceed 2 A.

$$\text{Resistor Value} = \text{External Voltage} / 2 \text{ A.}$$

In addition, there is actually a resettable fuse internal to the GPO circuit in series with the circuit that will protect the switch as a last-ditch defense.

Example 1: GPO with +10V External Power Supply for High Load Current

A high wattage external resistor of **N** Ohm and rated to **P** Watt must be connected in case the LOAD shorts out. N and P must satisfy the following equation to limit current to 2 Ampere in such LOAD shorting situation:

Resistance Value of Resistor:

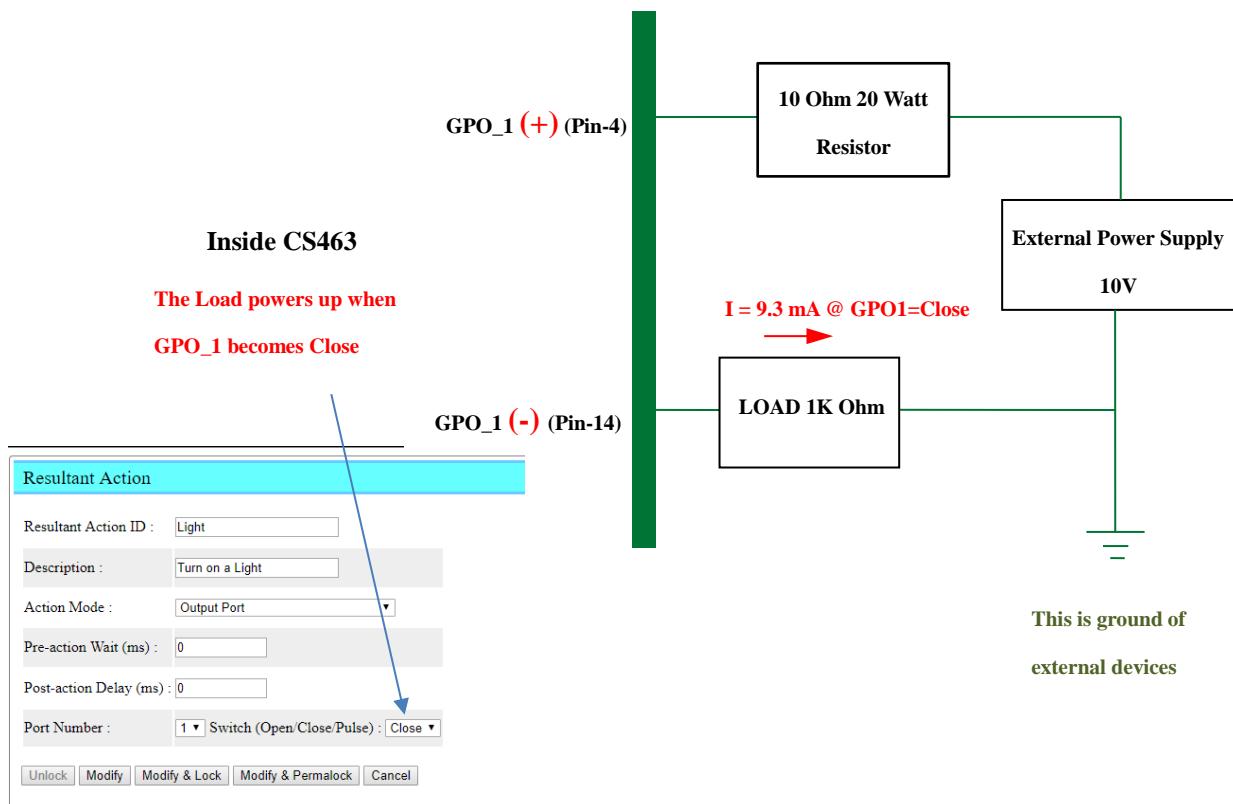
$$N > \text{Voltage of External Power Supply} / 2$$

Power Rating of Resistor:

$$P > (\text{Voltage of External Power Supply} / N)^2 * N$$

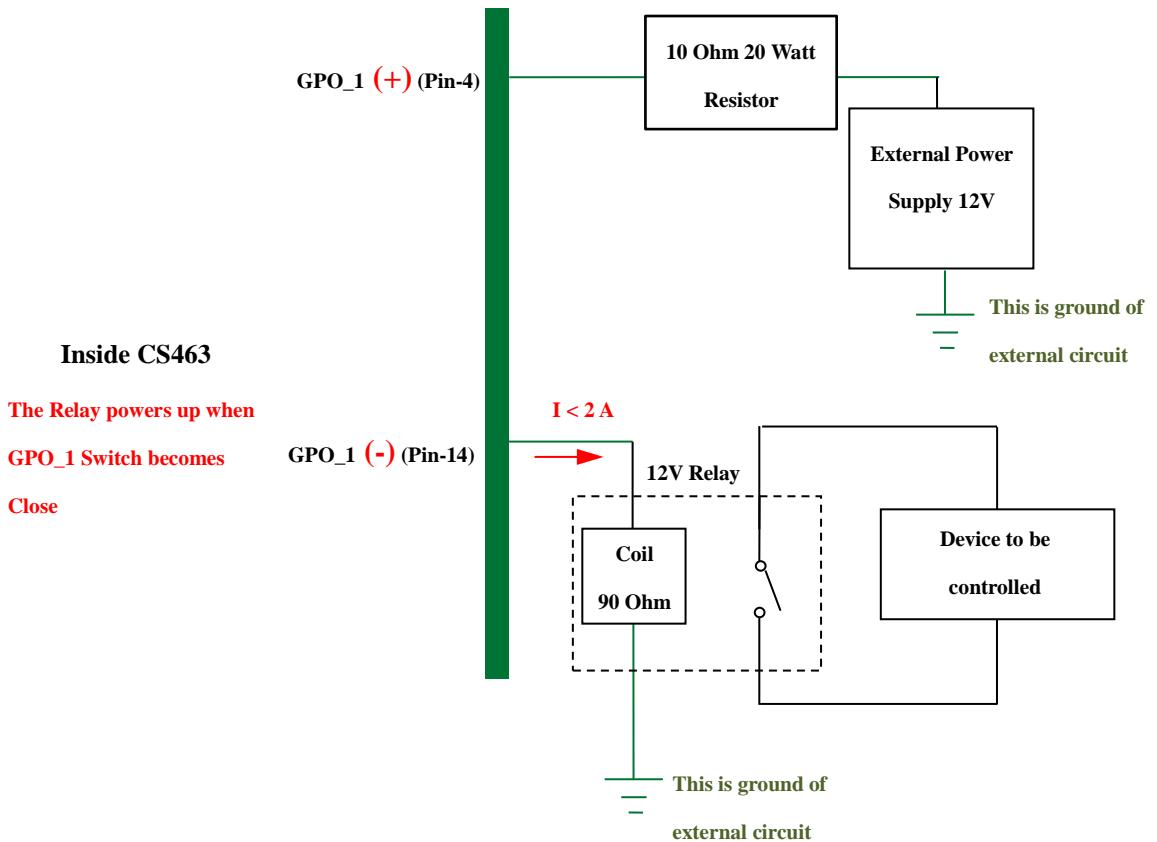
In this example, current in the load (e.g. a buzzer with 1K Ohm internal resistance) is calculated by the following equation:

$$\begin{aligned} I_{LOAD} &= (\text{Voltage of External Power Supply} - 0.6) / (N + R_{LOAD}) \\ &= (10 - 0.6) / (10 + 1000) \\ &= 9.3 \text{ mA} \end{aligned}$$



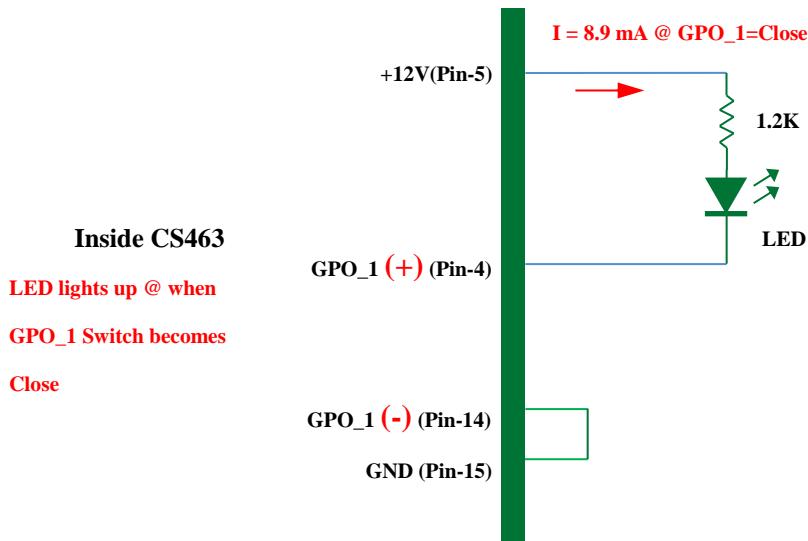
Remark: The maximum current flowing through GPO pin pair is 2A

Example 2: GPO using relay for full isolation and high coil current (with External Power Supply)

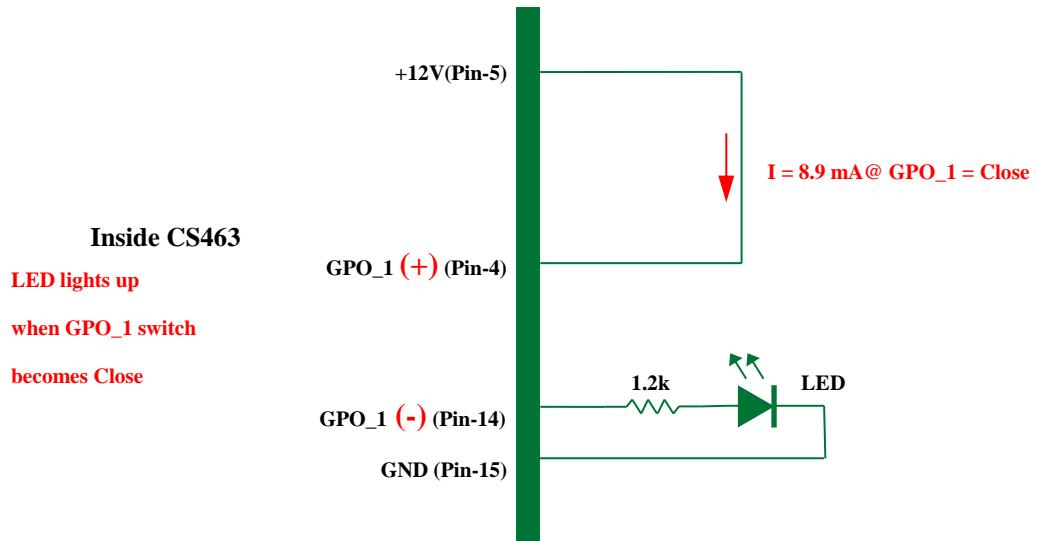


Remark: The maximum current flowing through GPO pin pair is 2A

Example 3: GPO for Load Current < 160 mA (using +12V, 2 Watt Internal Isolated Power Supply)



Example 4: GPO for Load Current < 160 mA (with +12V, 2 Watt Internal Power Supply)

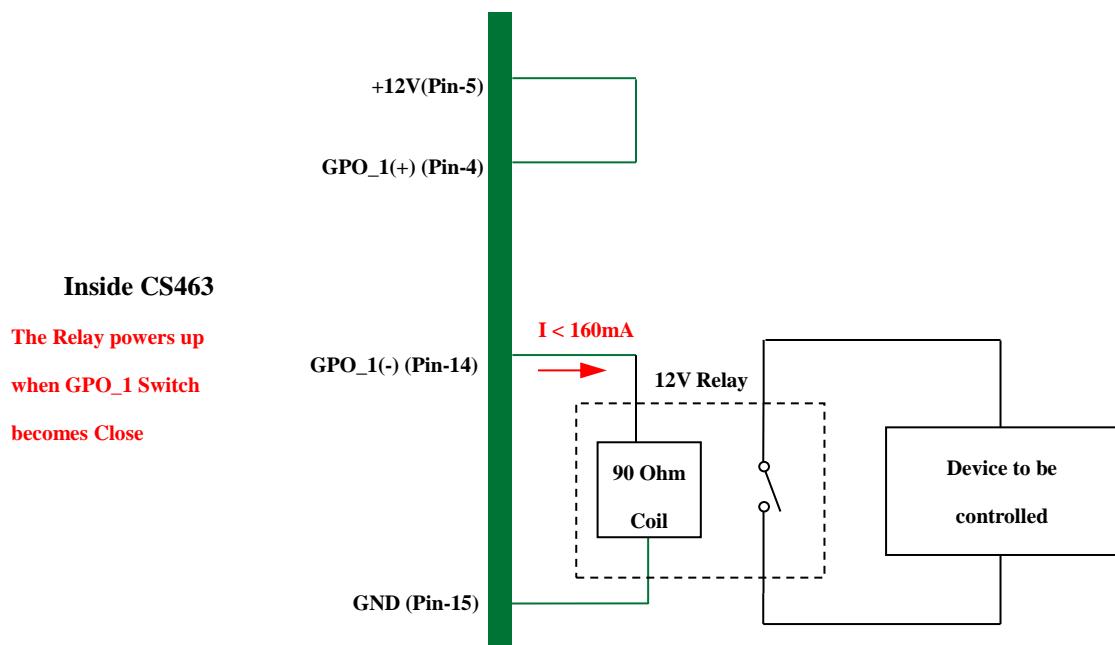


Example 5: GPO using Relay for Full Isolation and Low Coil Current (using +12V, 2 Watt Internal Isolated Power Supply)

2 Watt supply at 12 Volt means output current is at most 160 mA.

The example relay below is a 12 Volt relay with 90 Ohms resistance coil, which means current flowing through the coil is 133 mA.

Since $133 < 160$, therefore this setup would work.



7 Quick Start

This chapter describes quick start guidelines for the various readers in the CSL Intelligent Fixed Reader family.

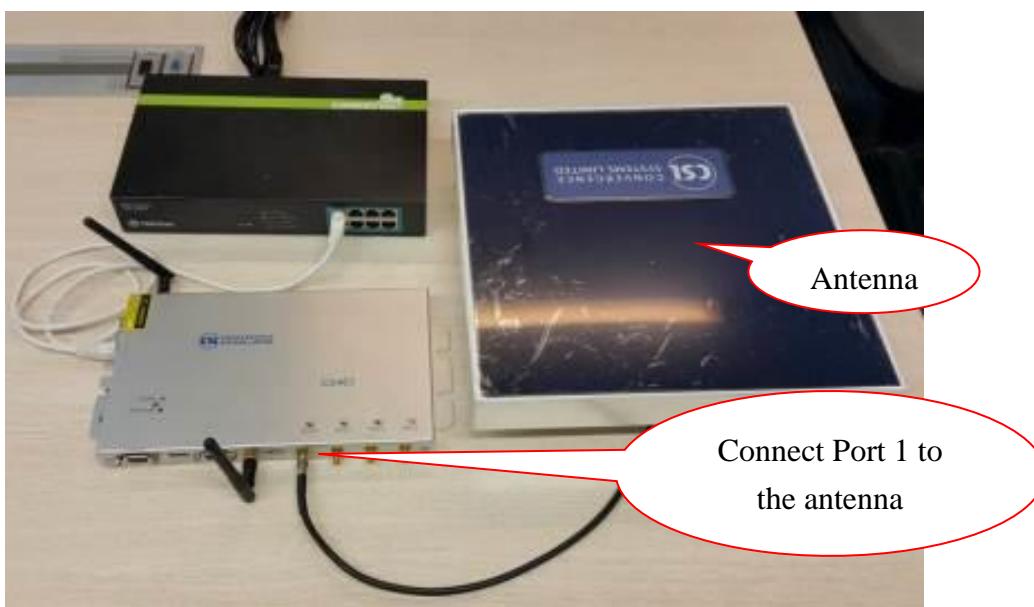
7.1 CS463 Quick Start

This chapter explains how to quickly connect up and run CS463 OOB (Out Of Box) to read RFID tags and display them on a browser.

CS463 comes with a Default Profile and a Default Event. The Default Event is not enabled at the point of delivery to customer. On receiving the CS463 reader, the customer can then enable the Default Event and use that to immediately read RFID tags from antenna Port 1 and observe the tag IDs showing up in the **Events/Tag Inventory** page.

After login to the reader and ensuring the reader is in HTTP/XML access mode (this should be the state when delivered from factory) as explained in section 4.3,

- **Make sure antenna Port 1 is connected to an antenna** as stated in Default Profile of Operation Profile.



- Go to the Operation Profile in System page and select List Profile to ensure the Default Profile can be found as shown below

CS463 System Configuration

Operation Profile Table

Profile ID	Antenna Port	Reader Mode/Link Profile	Session #	Target	Query Algorithm	Tag Population	Extra Bank
Default Profile	1,	Range Dense Reader	S0	A/B Toggle	DynamicQ	200	
Example Profile for Doorway 1 Antenna Port 1	1,	Range Dense Reader	S0	A/B Toggle	FixedQ	2	TID
Example Profile for Doorway 1 Antenna Port 2	2,	Range Dense Reader	S0	A/B Toggle	FixedQ	2	TID

- Go to the List Event of Event Management in Event page and click List Event to show the Default Event

CS463 System Configuration

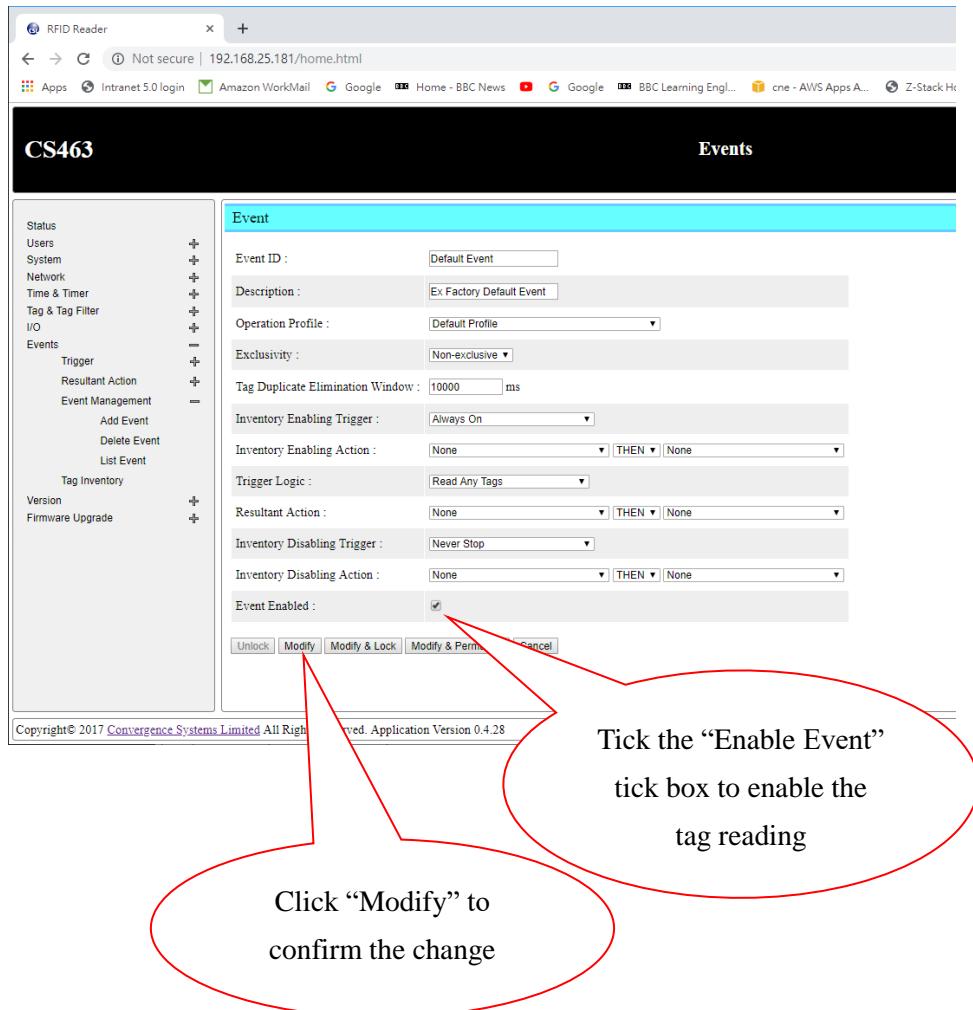
Event Table

Event ID	Description	Operation Profile	Exclusivity	Tag Duplicate Elimination Window (ms)	Inventory Enabling Trigger	Inventory Enabling Action	Trigger Logic	Resultant Action	Inventory Disabling Trigger	Inventory Disabling Action	Enable
Default Event	Ex Factory Default Event	Default Profile	Non-exclusive	10000	Always On	None	Read Any Tags	None	Never Stop	None	False
Example Event Entrance Boom Barrier Control		Example Profile for Doorway 1 Port 1	Exclusive	1000	Infrared Sensor GPI Port 1 High	None	Tag within Tag Group Detected	Turn ON LED on GPO Port 1 AND Open Boom Barrier on GPO Port 3	Infrared Sensor GPI Port 2 High	Close Boom Barrier on GPO Port 3 AND Turn OFF LED on GPO Port 1	False
Example Event Exit Boom Barrier Control		Example S for Doorway 1 Antenna Port 2		1000	Infrared		Tag within Group	Turn ON LED on GPO Port 2 AND Open Boom Barrier on GPO Port 3	Infrared Sensor GPI Port 1 High	Close Boom Barrier on GPO Port 3 AND Turn OFF LED on GPO Port 2	False
Example Event Send to CSL Demo Cloud		Default Profile	No ex				CSL Demo	Never Stop	None		False

Click “Default Event” to continue

Click “List Event” to show default Event

In Default Event, reading of tag from antenna port 1 can be started after the default event is enabled (ticking the tick box) and the button “Modify” clicked to confirm the change



- Reading of tag from antenna port 1 can be stopped once the default event is disabled by unchecking the “Enable Event” tick box and clicking the “Modify” button to confirm the change

Now go to the page Events/Tag Inventory, you should be able to see tags being read:

The screenshot shows a web-based application titled "RFID Reader" with the URL "192.168.25.141/home.html". The main title bar says "CS463". The left sidebar has a tree view with nodes like Status, Users, System, Network, Time & Timer, Tag & Tag Filter I/O, Events (which is expanded), Trigger, Resultant Action, Event Management, Add Event, Delete Event, and Tag Inventory (which is circled in red). The right side shows a table titled "Capture Tags Raw" with the rate set to 68 tags/s. The table has columns: #, PC, EPC, Count, Ant #, Time, Freq(MHz), RSSI(dBm), and Offer Bank. Ten rows of data are listed, each with a unique EPC and timestamp.

#	PC	EPC	Count	Ant #	Time	Freq(MHz)	RSSI(dBm)	Offer Bank
1	3000	E28011606000020D77242C31	4	1	2019/03/27 08:15:40		-58	
2	3000	E28011606000020D7722E2A1	4	1	2019/03/27 08:15:40		-47	
3	3000	E28011606000020D77242C61	4	1	2019/03/27 08:15:40		-61	
4	3000	E28011606000020D7722EC81	3	1	2019/03/27 08:15:39		-45	
5	3000	E28011606000020D7722E261	4	1	2019/03/27 08:15:40		-40	
6	3000	E28011606000020D772528A5	4	1	2019/03/27 08:15:40		-57	
7	3000	E28011606000020D7722EC51	4	1	2019/03/27 08:15:40		-36	
8	3000	E28011606000020D7722E251	4	1	2019/03/27 08:15:40		-35	
9	3000	E28011606000020D7723F8D1	4	1	2019/03/27 08:15:40		-61	
10	3000	108000000000000000000000047	4	1	2019/03/27 08:15:40		-64	

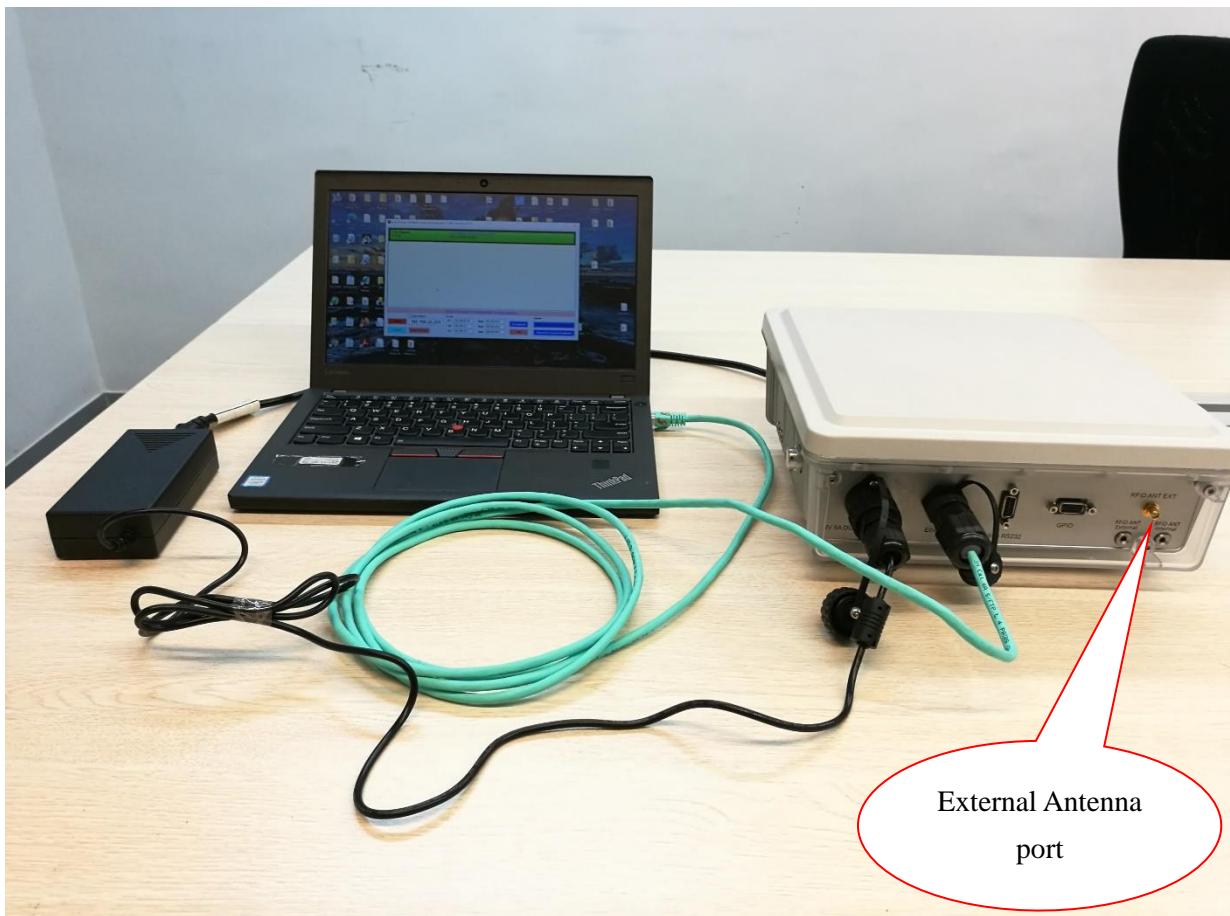
Copyright© 2017 Convergence Systems Limited All Rights Reserved. Application Version 0.3.6 PC UTC Time 2019/03/27 08:15:40 | PC Local Time 2019/03/27 16:15:40

7.2 CS203X Quick Start

This chapter explains how to quickly connect up and run CS203X OOB (Out Of Box) to read RFID tags and display them on a browser.

CS203X comes with a Default Profile and a Default Event. The Default Event is not enabled at the point of delivery to customer. On receiving the CS203X reader, the customer can then enable the Default Event and use that to immediately read RFID tags from antenna Port 4 (internal) and observe the tag IDs showing up in the [Events/Tag Inventory](#) page.

After login to the reader and ensuring the reader is in HTTP/XML access mode (this should be the state when delivered from factory) as explained in section 4.3,



- Go to the Operation Profile in System page and select List Profile to ensure the Default Profile can be found as shown below

CS201X Reader ID = CSL_Intelligent_Reader, Access Mode = HTTP/XML
Event Enabled : None

System

	Profile ID	Antenna Port	Reader Mode/Link Profile	Session #	Target	Query Algorithm	Tag Population	Extra Rank
Default Profile	4,	Range Dense Reader	\$0	A/B Toggle	DynamicQ	50		
Example Profile	4,	Range Dense Reader	\$0	A/B Toggle	DynamicQ	2		
test	4,	Range Dense Reader	\$1	A	DynamicQ	8		
Read Moisture S2	4,	Range Dense Reader	\$0	A/B Toggle	DynamicQ	50		
ctesius	4,	Range Dense Reader	\$0	A/B Toggle	DynamicQ	50		
Read Temp Magnum S3	4,	Range Dense Reader	\$0	A/B Toggle	DynamicQ	50		
Example Profile for Doorway: 1 Antenna Port 4	4,	Range Dense Reader	\$0	A/B Toggle	FixedQ	2	TID	
Example Profile for Doorway: 1 Antenna Port 1 (External)	3,	Range Dense Reader	\$0	A/B Toggle	FixedQ	2	TID	
Default Profile Antenna Port 3	3,	Range Dense Reader	\$0	A/B Toggle	DynamicQ	50		

- Go to the List Event of Event Management in Event page and click List Event to show the Default Event

CS201X Reader ID = CSL_Intelligent_Reader, Access Mode = HTTP/XML
Event Enabled : None

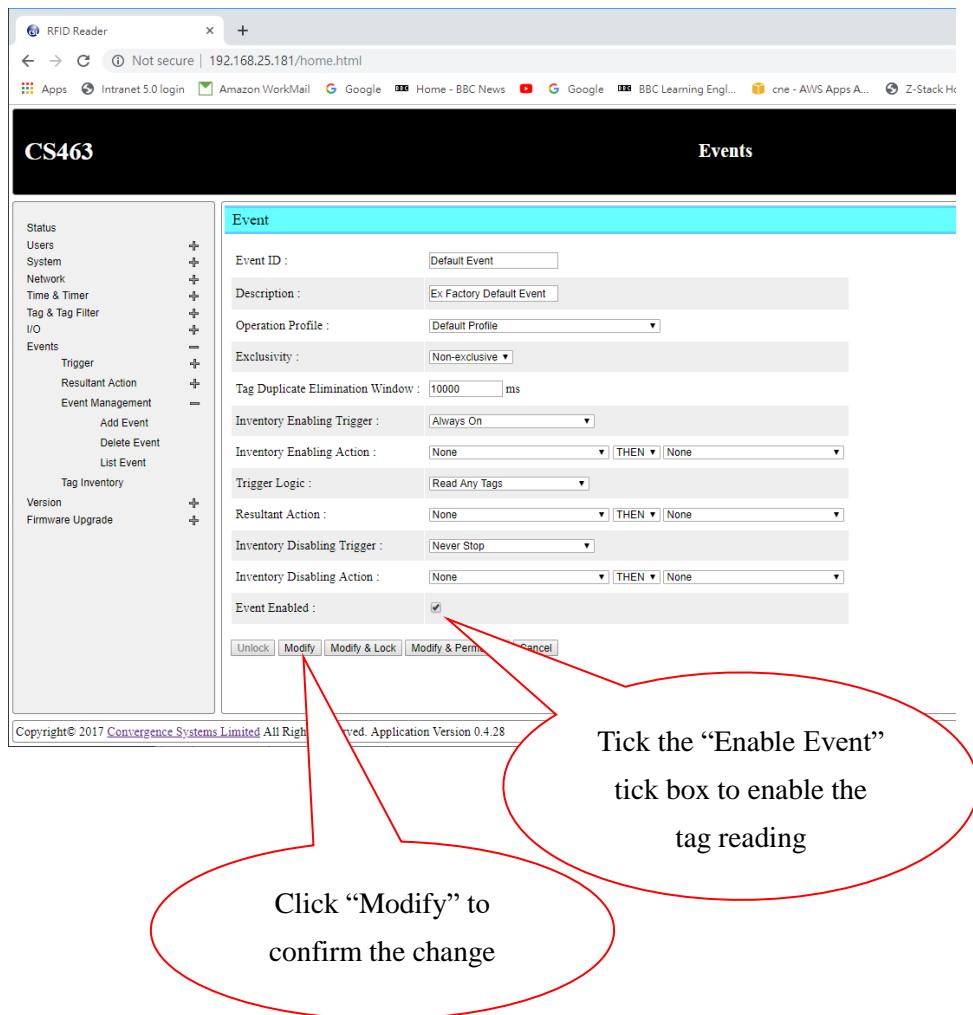
Events

Event ID	Description	Operation Profile	Exclusivity	Tag Duplicate Elimination Window (ms)	Inventory Enabling Trigger	Inventory Enabling Action	Trigger Logic	Resultant Action	Inventory Disabling Trigger	Inventory Disabling Action	Enable
Default Event	Ex Factory Default Event, Internal Antenna (Port 4)	Default Profile	Non-exclusive	6000	Always On	None	Read Any Tags	None	Never Stop	None	False
Example Event Entrance Room Barrier Control	Internal Antenna (Port 4)	Example Profile for Doorway 1 Antenna Port 4	Exclusive	1000	Infrared Sensor GPI	Port 1 High	None	Tag from Antenna Port 4 with Registered Tag Group	Turn ON LED on GPO Port 1 AND Open Boom Barrier on GPO Port 3	Infrared Sensor GPI	Close Boom Barrier on GPO Port 1 AND Turn OFF LED on GPO Port 3
Example Event Exit Boom Barrier Control	External Antenna (Port 3)	File for	Exclusive	1000	Infrared Sensor GPI	None	Tag from Antenna Port 3 with Registered Tag	Turn ON LED on GPO Port 2 AND Open Boom Barrier on GPO Port 3	Infrared Sensor GPI	Close Boom Barrier on GPO Port 2 AND Turn OFF LED on GPO Port 2	
Example Event Send to CSL Demo Cloud Server	Internal Antenna (Port 4)	Default Profile									
Example Tag Database Display	Internal Antenna (Port 4)	Test Tag Database Profile									
Example TCP Send to CSV	Internal Antenna (Port 4)	Default Profile									
Group	display Group Tags - Internal Antenna (Port 4)	Test Tag Database Profile									
TCP461	Internal Antenna (Port 4)	Default Profile	No exclusivity	600	Always On	None	Read Temp tag	Pulse 2s	TCP461	Never Stop	None
Read Temp											
Read Moisture											
ctesius											
Operate on from Antennas											

Click “Default Event” to continue

Click “List Event” to show default Event

In Default Event, reading of tag from antenna port 4 (internal) can be started after the default event is enabled (ticking the tick box) and the button “Modify” clicked to confirm the change



- Reading of tag from antenna port 4 (internal) can be stopped once the default event is disabled by unchecking the “Enable Event” tick box and clicking the “Modify” button to confirm the change

Now go to the page Events/Tag Inventory/Capture Tags Raw, you should be able to see tags being read:

The screenshot shows a Windows application window titled "RFID Reader". The URL bar indicates the page is "192.168.25.160/home.html". The main content area is titled "Events" and displays a table titled "Capture Tags Raw (Refresh Time = 1 second)". The table has columns: #, PC, EPC, Count, Ant #, Time, Freq(MHz), RSSI(dBm), and Phase(Degree). The table contains 18 rows of data. At the bottom of the table, it says "Application Version 1.3.9, Reader ID = CSL_Intelligent_Reader, Access Mode = HTTP XML". To the right of the table, it says "PC UTC Time 2020/12/22 06:27:19 | PC Local Time 2020/12/22 14:27:19".

#	PC	EPC	Count	Ant #	Time	Freq(MHz)	RSSI(dBm)	Phase(Degree)
1	3000	E28011606000020D7725S2A5	64	4	2019/04/12 16:45:19	918.25	-75	112.5
2	3000	E28011606000020D77242A70	24	4	2019/04/12 16:45:05	904.75	-71	8.44
3	3000	E28011606000020D7722E2C0	198	4	2019/04/12 16:45:20	926.25	-62	168.75
4	3000	E28011606000020D7722C0E0	80	4	2019/04/12 16:45:20	926.25	-62	47.81
5	3000	E28011606000020D7722C0F0	76	4	2019/04/12 16:45:20	926.25	-61	160.31
6	3000	E28011606000020D7722C0D0	185	4	2019/04/12 16:45:20	926.25	-64	106.88
7	3000	E28011606000020D7722C080	3	4	2019/04/12 16:45:02	922.25	-63	30.94
8	3000	E28011606000020D7722C070	104	4	2019/04/12 16:45:19	918.25	-67	11.25
9	3000	E282700120007000009A36A1	4	4	2019/04/12 16:45:07	921.25	-71	154.69
10	3000	E28011606000020D7722C0C0	189	4	2019/04/12 16:45:20	926.25	-64	171.56
11	3000	E28011606000020D7722C0B0	188	4	2019/04/12 16:45:20	926.25	-51	19.69
12	3000	E28011606000020D7722E270	181	4	2019/04/12 16:45:20	926.25	-65	56.25
13	3000	E28011606000020D7722E260	156	4	2019/04/12 16:45:19	918.25	-60	39.38
14	3000	E28011606000020D7722C0C0	188	4	2019/04/12 16:45:20	926.25	-53	146.25
15	3000	E28011606000020D7722C0E0	9	4	2019/04/12 16:45:02	922.25	-55	106.88
16	3000	E28011606000020D7722C0D0	171	4	2019/04/12 16:45:20	926.25	-59	112.5
17	3000	E28011606000020D7722E220	95	4	2019/04/12 16:45:19	914.25	-67	104.06
18	3000	E28011606000020D7722C010	9	4	2019/04/12 16:45:10	921.75	-72	115.31

8 Web Browser Interface Details

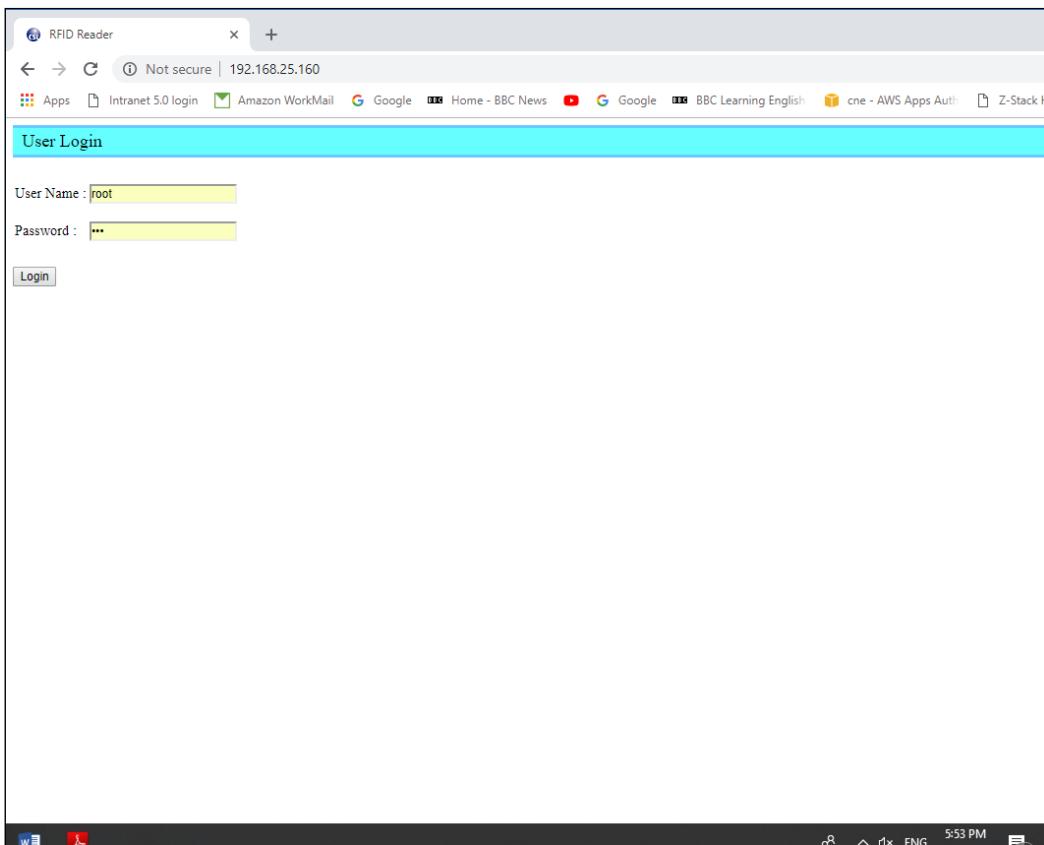
This chapter describes in details the various pages of the web browser interface. With CS463, this web browser enables full control of the reader, including the event engine.

8.1 Home Page

The home page of the web-based administration interface can be entered by just entering the IP address of the reader (default IP address is printed on the label) on the web browser.

For example, if the IP address of the reader is 192.168.25.160, you should enter:

http://192.168.25.160



Use default User Name: **root** and Password: **cs1** and click Login to login to the Reader

8.2 Status

The “Status” page gives a quick overview of the current status of the reader.

The reader basic information such as serial number and access mode can be found on beginning of status page

CSL RFID Management System	
Reader ID :	CSL 463-2 RFID READER
Model Name :	CS463-2
Reader Serial # :	VBE1832ES0019000
PCB Serial # :	RES1234ES1234567
Regulatory Region :	2
Up Time :	428217.97 hours
Local Time :	2018/11/07 Wednesday 09:58:44
Time Zone :	GMT+00:00
UTC Time :	2018/11/07 Wednesday 09:58:44
Auto Logout Time :	30 minutes
Access Mode :	HTTP_XML
Antenna Port 0 Power :	
Antenna Port 1 Power :	
Antenna Port 2 Power :	
Antenna Port 3 Power :	

Copyright© 2017 Convergence Systems Limited All Rights Reserved PC UTC Local Time 9:59:35/17:59:35

If any event was enabled and reading tag, the basic RFID related parameters will show on status page such as transmitting power, profile and session as below

CSL RFID Management System	
Auto Logout Time :	30 minutes
Access Mode :	HTTP_XML
Antenna Port 0 Power :	300
Antenna Port 1 Power :	
Antenna Port 2 Power :	
Antenna Port 3 Power :	
Profile ID :	Default Profile
Tag Population :	200
Session No. :	0
Enabled Events :	Default Event
OS Version :	Linux v3.0.35-2666-gbdde708
RFID Firmware Version :	

Copyright© 2017 Convergence Systems Limited All Rights Reserved Application Version 0.2.23 PC UTC Time 2019/02/19 07:53:15 | PC Local Time 2019/02/19 15:53:15

All firmware versions are shown on status page.

Setting	Value
OS Version	Linux v3.0.35-2666-gbdde708
RFID Firmware Version	2.6.23
Web Application Version	0.4.28
JNI Library Version	0.3.2
CSL Unified API Library Version	1.0.1
CS461 Low Level API (MACHI) Library Version	1.0.3
LLRP Library Version	1.0.6

Network information can be found on status page such as IP and Mac address

Setting	Value
LLRP Library Version	1.0.2
Network Setting	Ethernet
Enable	true
Connection Type	DHCP
IP Address	192.168.25.124
MAC Address	00057B840008
Subnet Mask	255.255.255.0
Network Setting	WiFi
Enable	true
Connection Type	Static IP
IP Address	
MAC Address	
Subnet Mask	
Gateway	192.168.25.1

8.3 Users Management

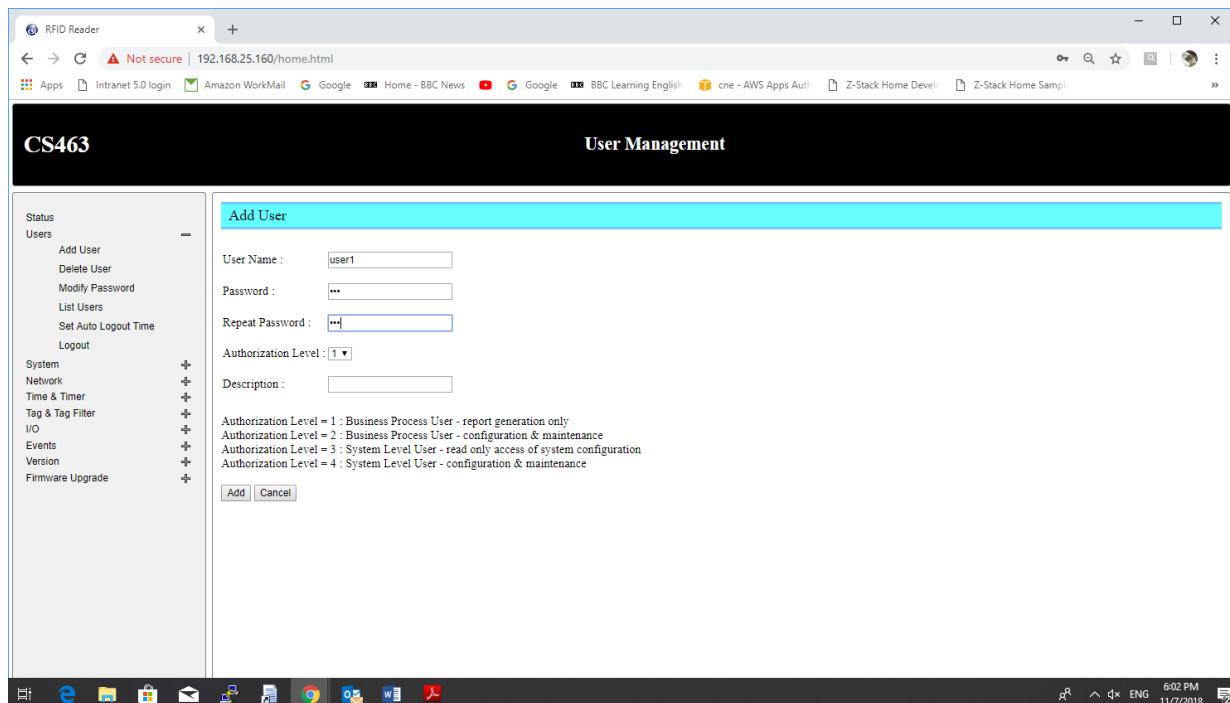
The “Users Management” page contains sub-menu for adding, deleting and modifying password, set auto-logout time and login/logout.

The screenshot shows a web-based interface titled "User Management". On the left, there is a sidebar with a tree menu under the "Users" category. The menu items include: Status, Add User, Delete User, Modify Password, List Users, Set Auto Logout Time, Logout, System, Network, Time & Timer, Tag & Tag Filter, I/O, Events, Version, and Firmware Upgrade. The "Add User" item is currently selected. The main content area is titled "User Account Table" and displays a single row of data:

User Name	Auth Level	Description
root	9	top level administrator

8.3.1 Add User

To add user, input the user name, password, authorization level and description. Then click “Add”.



8.3.2 Delete User

To delete user, select the user name and then click “Delete”.

The screenshot shows a web browser window titled "RFID Reader" with the URL "192.168.25.160/home.html". The page is titled "User Management" and features a sidebar on the left with a tree view of system components. The main area is titled "Delete User" and contains a form with a dropdown menu labeled "User Name : user1". Below the dropdown are two buttons: "Delete" and "Cancel". The sidebar includes sections for "Status", "Users" (with options like Add User, Delete User, Modify Password, List Users, Set Auto Logout Time, Logout), and "System" (with sections for Network, Time & Timer, Tag & Tag Filter, I/O, Events, Version, and Firmware Upgrade). At the bottom of the page, there is a copyright notice: "Copyright© 2017 [Convergence Systems Limited](#) All Rights Reserved".

8.3.3 Modify Password

To modify password, input the current password, new password and retype new password. Then click “Modify”.

The screenshot shows a web browser window titled "RFID Reader" with the URL "192.168.25.160/home.html". The page is titled "User Management" and displays a "Modify User Password" form. The left sidebar menu includes "Status", "Users" (selected), "Add User", "Delete User", "Modify Password", "List Users", "Set Auto Logout Time", and "Logout". Under "System", options include "Network", "Time & Timer", "Tag & Tag Filter", "I/O", "Events", "Version", and "Firmware Upgrade". The "Modify User Password" form has fields for "User Name" (set to "root"), "Current Password" (empty), "New Password" (empty), and "Repeat New Password" (empty). Below the form are "Modify" and "Cancel" buttons. At the bottom of the page, a copyright notice reads "Copyright© 2017 Convergence Systems Limited All Rights Reserved".

8.3.4 List Users

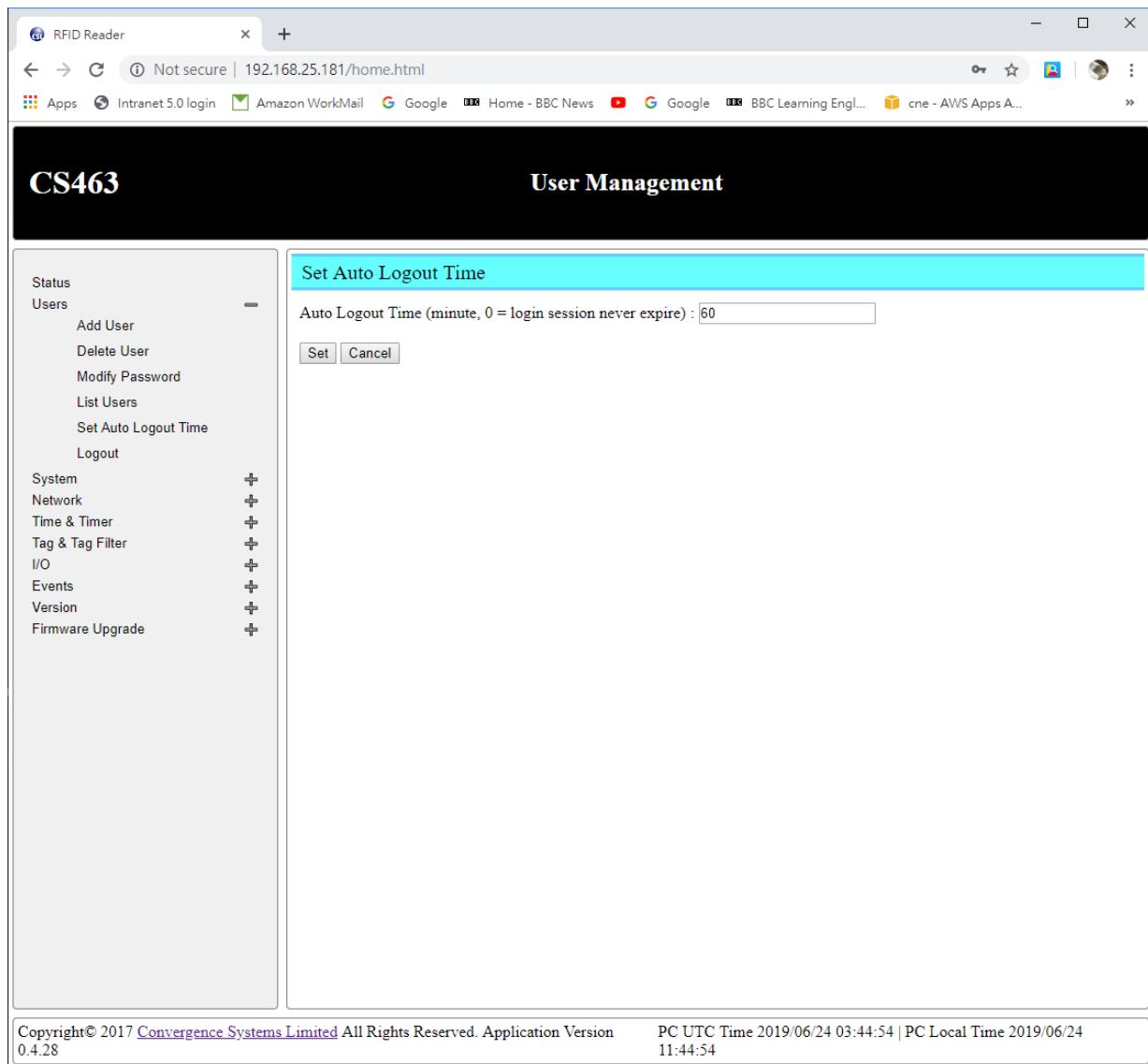
The “List Users” page lists all the users and his/her authority.

The screenshot shows a web browser window titled "RFID Reader" with the URL "192.168.25.160/home.html". The page is titled "User Management" and displays a table titled "User Account Table". The table has three columns: "User Name", "Auth Level", and "Description". It contains two rows: one for "root" (Auth Level 9, Description: top level administrator) and one for "user1" (Auth Level 1). On the left, there is a sidebar with a tree-like navigation menu under "Users". The menu items are: Add User, Delete User, Modify Password, List Users, Set Auto Logout Time, and Logout. Other menu items like Status, System, Network, Time & Timer, Tag & Tag Filter, I/O, Events, Version, and Firmware Upgrade are collapsed under their respective plus signs. At the bottom of the page, there is a copyright notice: "Copyright© 2017 Convergence Systems Limited All Rights Reserved".

User Name	Auth Level	Description
root	9	top level administrator
user1	1	

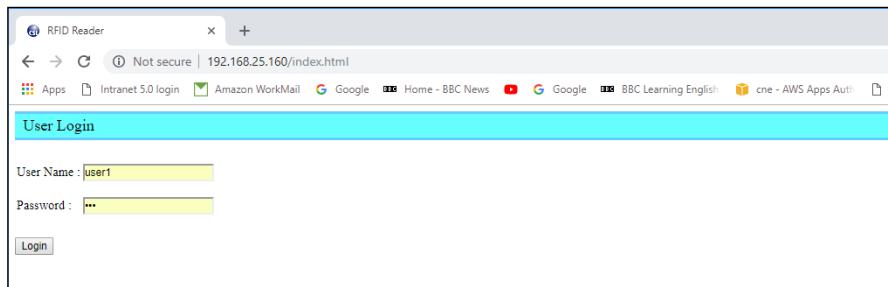
8.3.5 Set Auto Logout Time

The “Set Auto Logout Time” page allows ones to set the time for automatic logout if the user is idle.



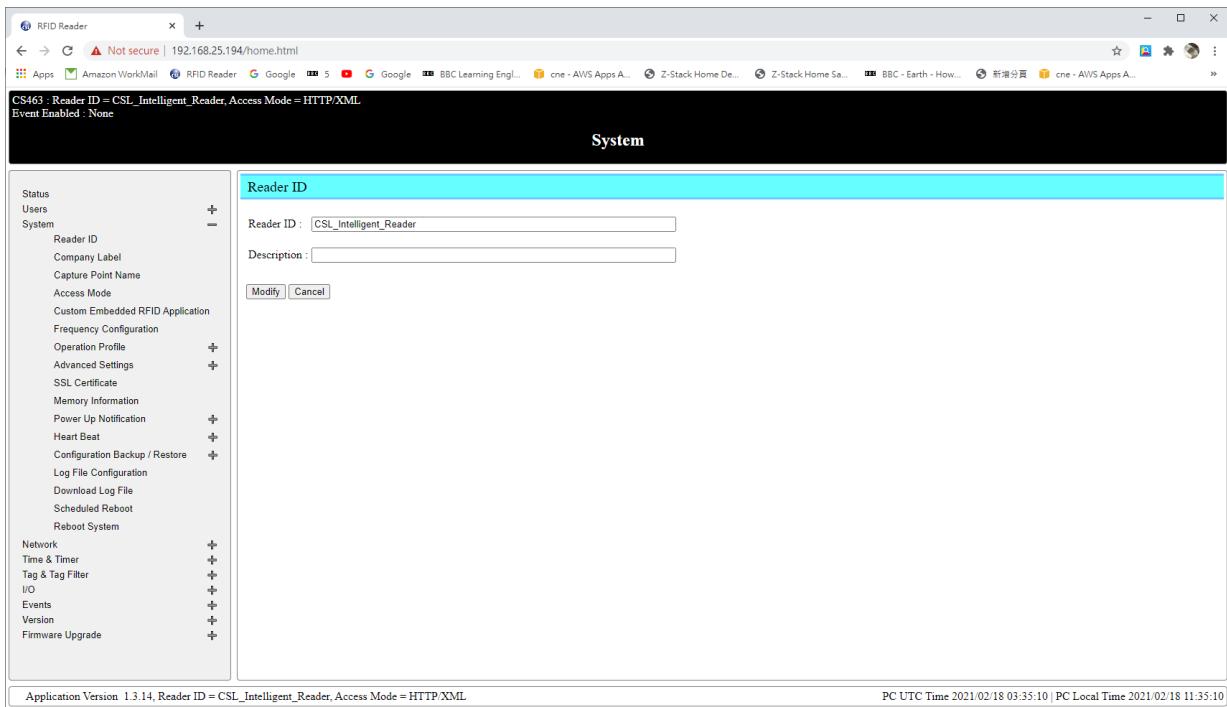
8.3.6 Login/Logout

The “Login/Logout” page is for users to login or logout the web browser interface.



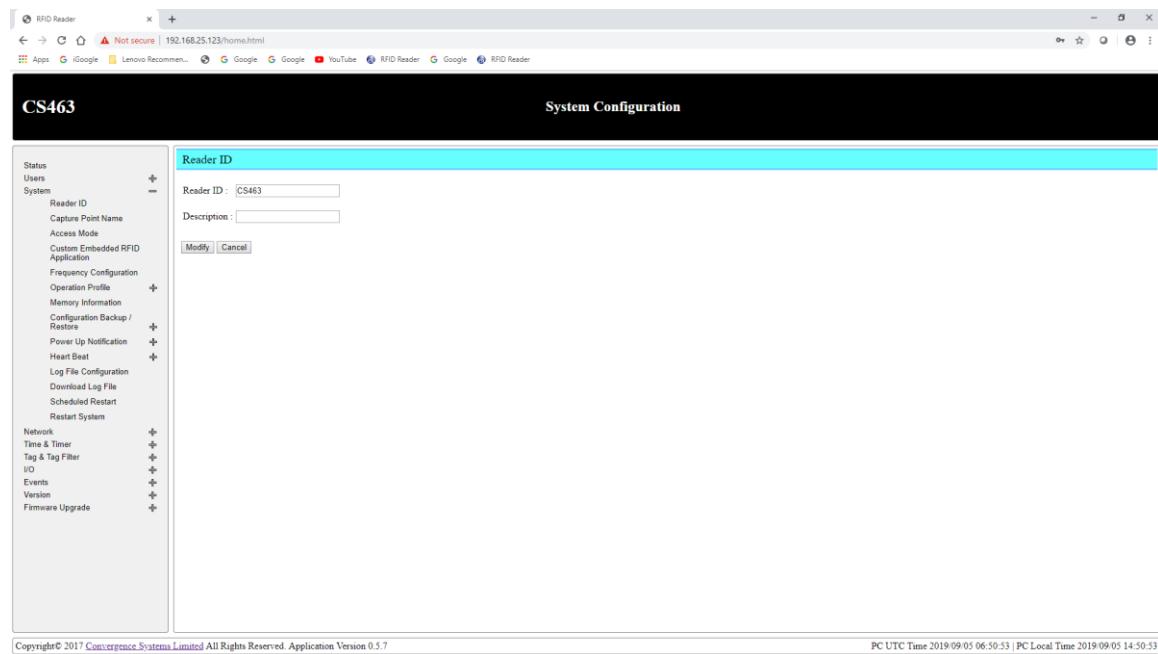
8.4 System

The “System” page contains many sub-menus to configure the reader for operation. Users are recommended to access these pages to determine the required settings before any operation.



8.4.1 Reader ID

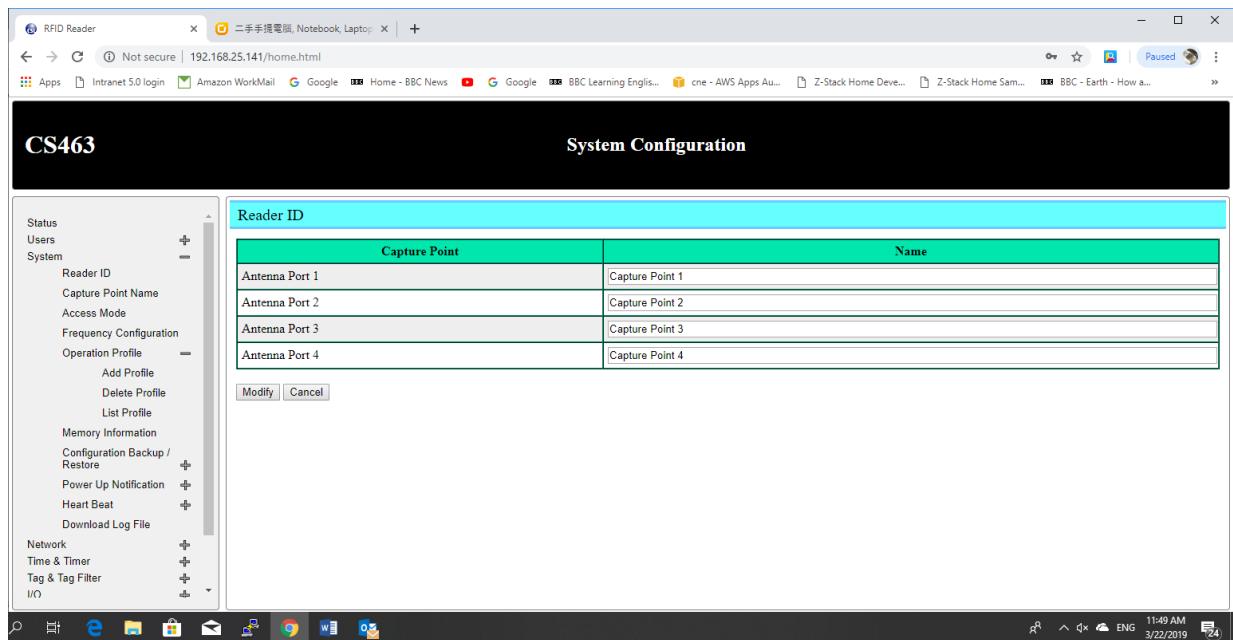
Here is the “Reader ID” submenu:



One can modify the reader ID here. Note that the ID cannot be too long if one plans to use Bluetooth to control the reader (using the CS108 Bluetooth API access mode) because Bluetooth standard does not allow too long a device name.

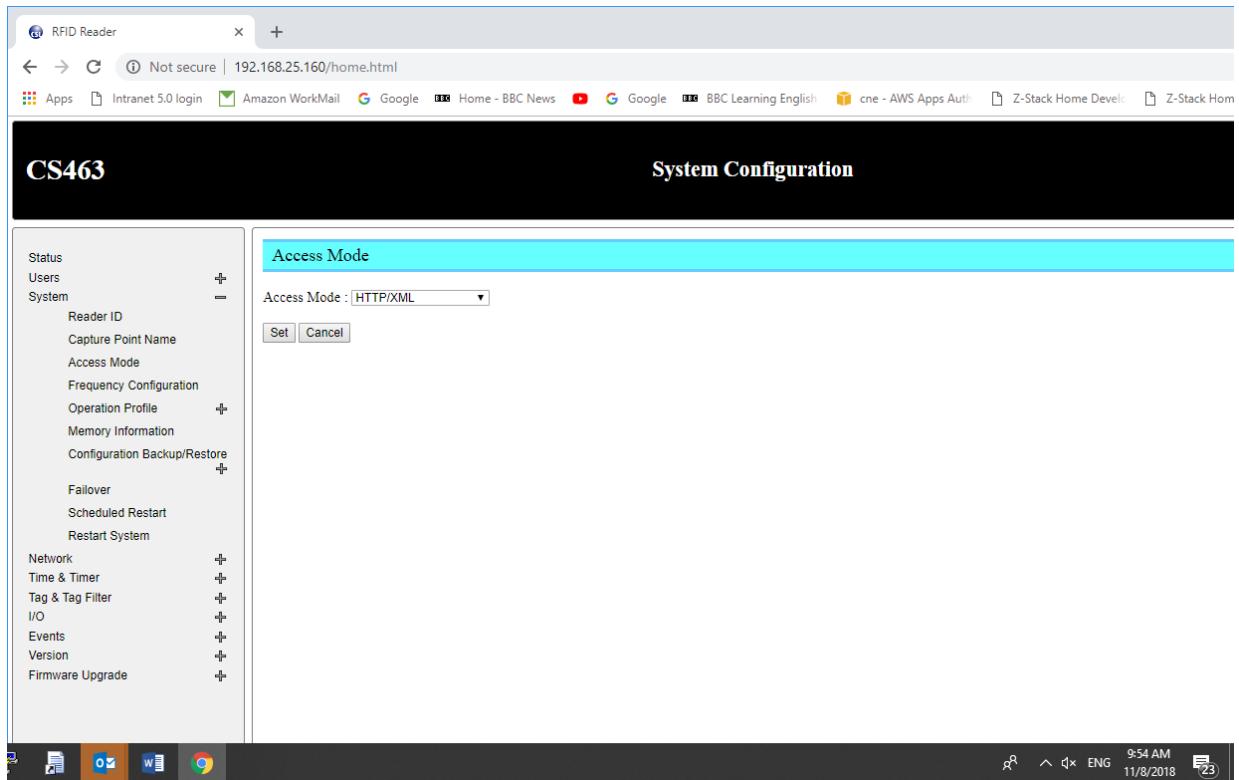
8.4.2 Capture Point Name

The name of each antenna port is the capture point name (Some readers call it read point name). This name can be configured. In other words, each antenna port (or capture point, or read point) can be uniquely identified and accessed or referred to. Note that the word capture and read are interchangeably used in the context of this reader. A capture point is the same as a read point.



8.4.3 Access Mode

Here is the “Access Mode” submenu:



CS463 offers 9 different access modes:

1. HTTP/XML
2. CSL Unified API/High Level
3. CSL Unified API/Low Level
4. CSL Unified API/High Level via RS232 Control Serial Port
5. CSL Unified API/Low Level via RS232 Control Serial Port
6. CS461 Low Level API (MACH1)
7. LLRP
8. CS108 Bluetooth API (CS463 model only)
9. Custom Embedded RFID HTTP

Set Access Mode

CS463 can be controlled using popular programming interface APIs.

For configuring the reader to be controlled by LLRP API, please set the Access Mode to LLRP.

For configuring the reader to be controlled by CSL Unified API so that one can use the C# Demo App to control CS463, please set the Access Mode to CSL Unified API

For customers who have already developed programs using the CS461 high level or low level API, they can use their existing programs to connect to CS463:

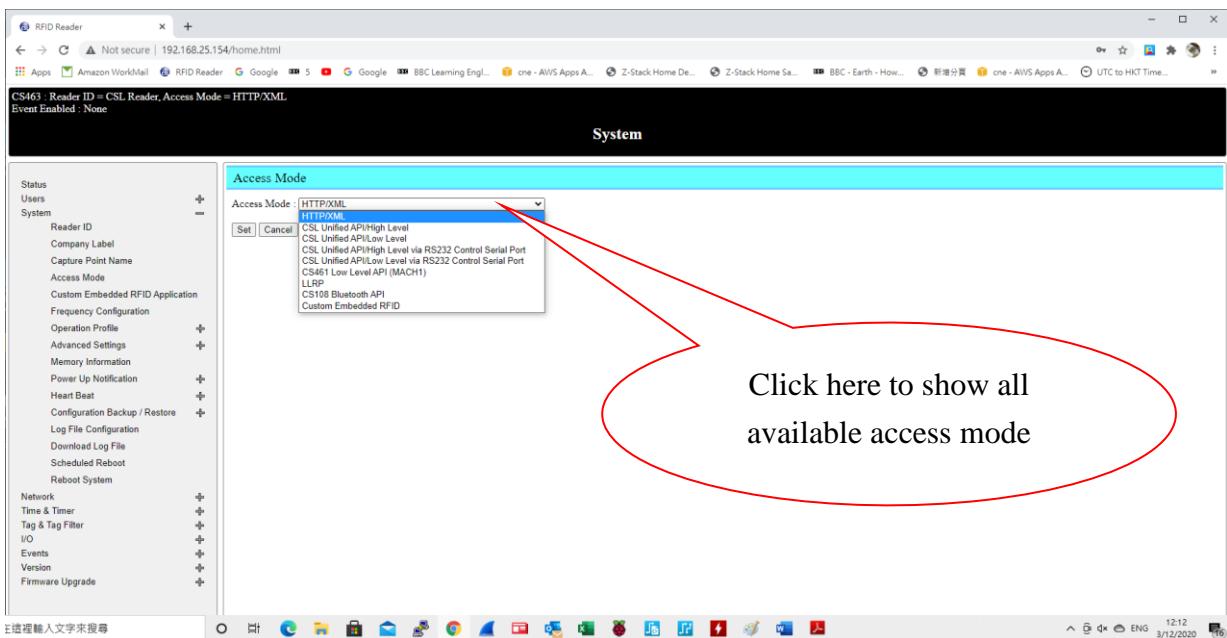
For configuring the reader to be controlled by CS461 High Level API, please remember to set the Access Mode to “HTTP/XML”

For configuring the reader to be controlled by CS461 Low-Level API (MACH 1 API), please remember to set the Access Mode to “CS461 Low Level API (MACH1)”.

If you need to configure the reader on the web interface (e.g. Network setting, Time settings, Event Engine, etc.), you must set the Access Mode to “HTTP/XML”.

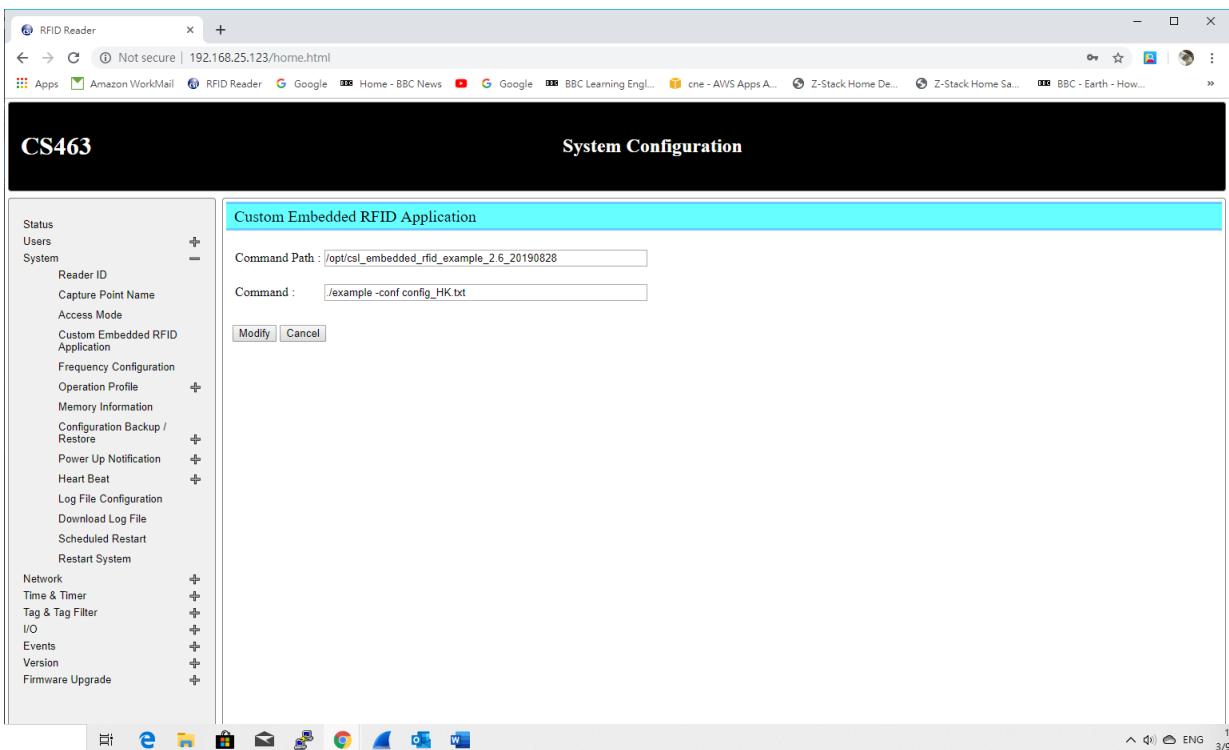
If you have already developed codes to control CS108 handheld sled reader, you can set the Access Mode to “CS108 Bluetooth API”. Once you set that, you can use your iPhone or Android CS108 App to control this CS463 reader.

Some customers would like to use their own embedded control system. In that case, set the Access Mode to “Custom Embedded RFID HTTP” and then configure the page “Custom Embedded RFID Application” so that every time the reader powers up it will run that particular application.



8.4.4 Custom Embedded RFID application

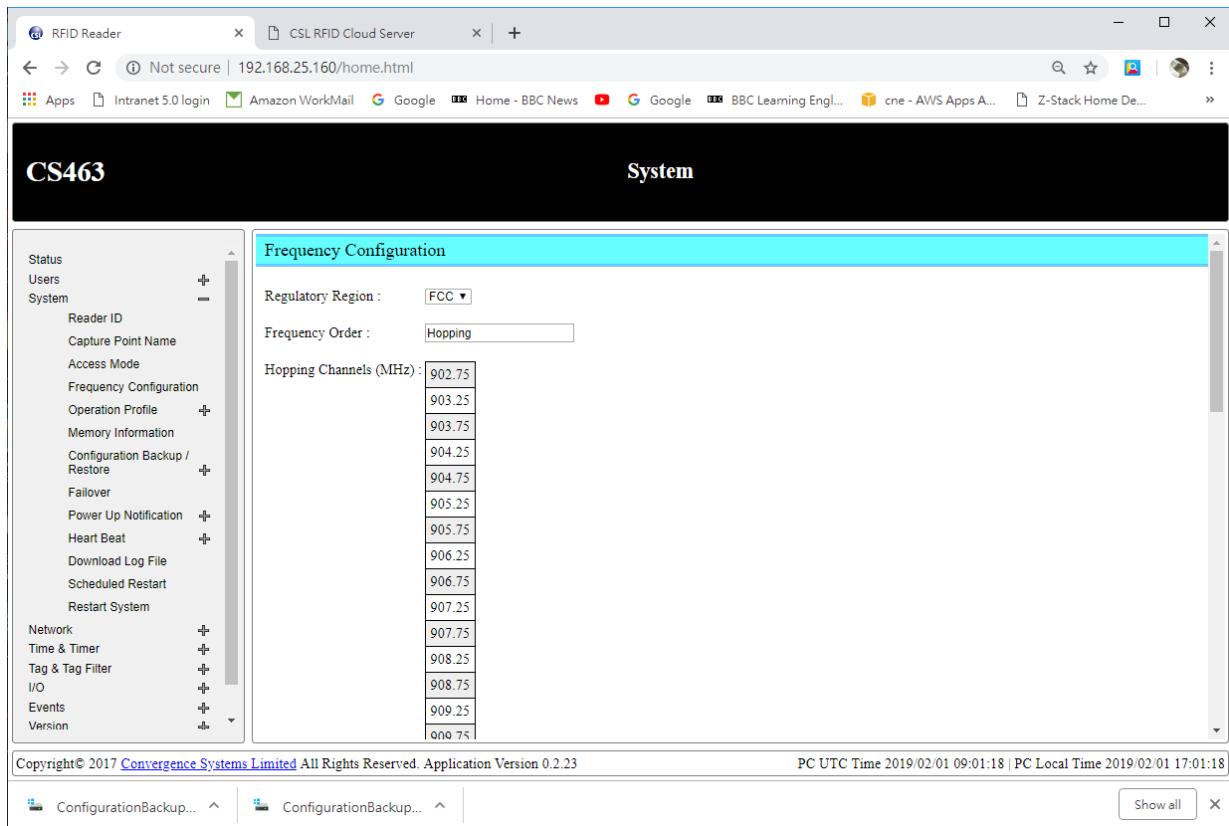
This page is used to input custom embedded RFID application path and its command. This command will be run on power on – provided **Access Mode has been changed to “Custom Embedded RFID HTTP”**.



If one SSH into the reader, and change directory to /opt, you will indeed see a sub-directory with that name. If you go into that sub-directory, you will then see the program example.c and the related makefile and other resources. This example.c code demonstrates how to run the RFID circuits inside to do inventory. You can modify that code or build your own company's code based on that.

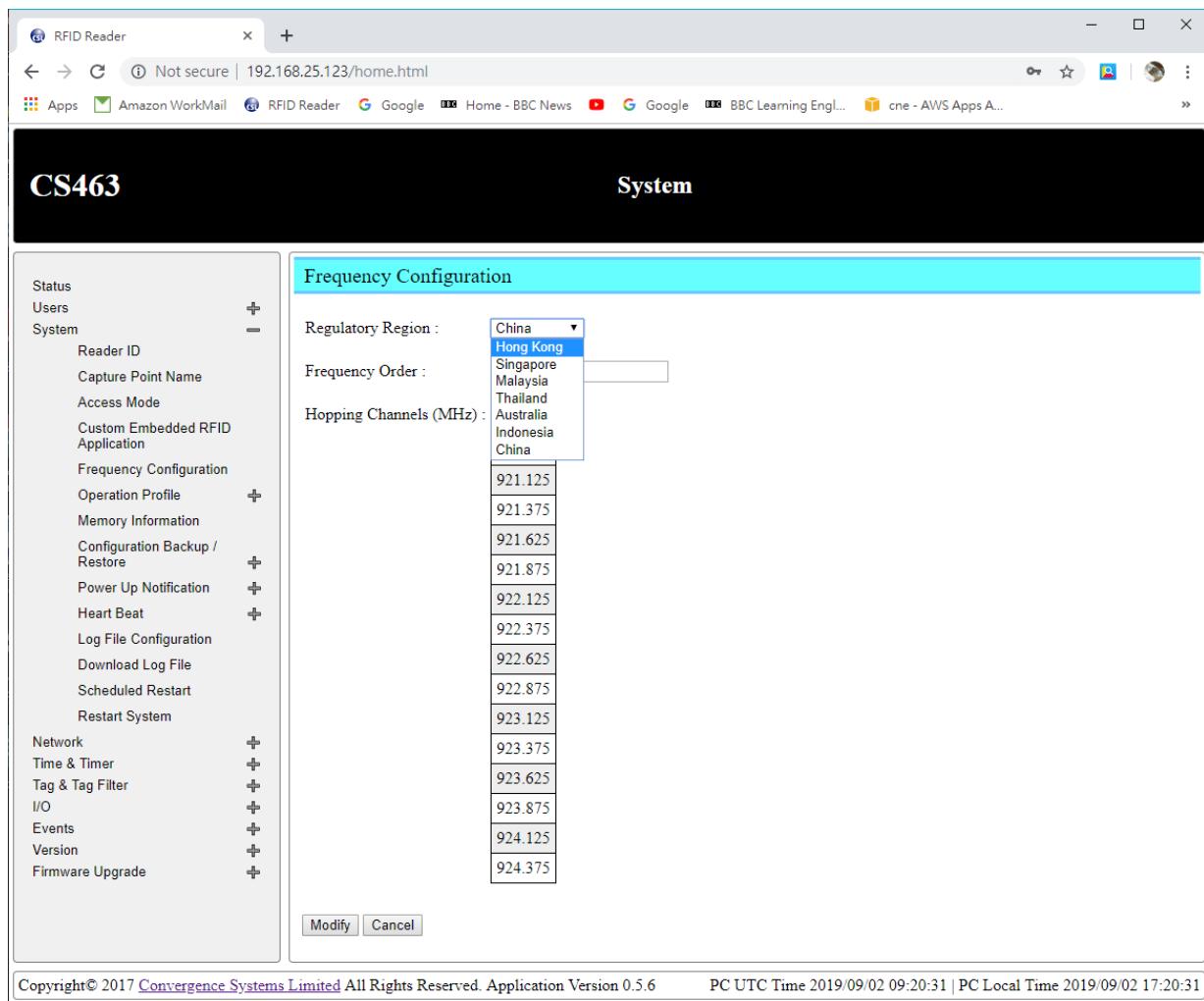
8.4.5 Frequency Configuration

The “Frequency Configuration” page allows user to configure the country and frequency to be used by the reader. Please refer to the regulatory law of your region for the allowed frequency to be used. Here is the “Frequency Configuration” submenu:



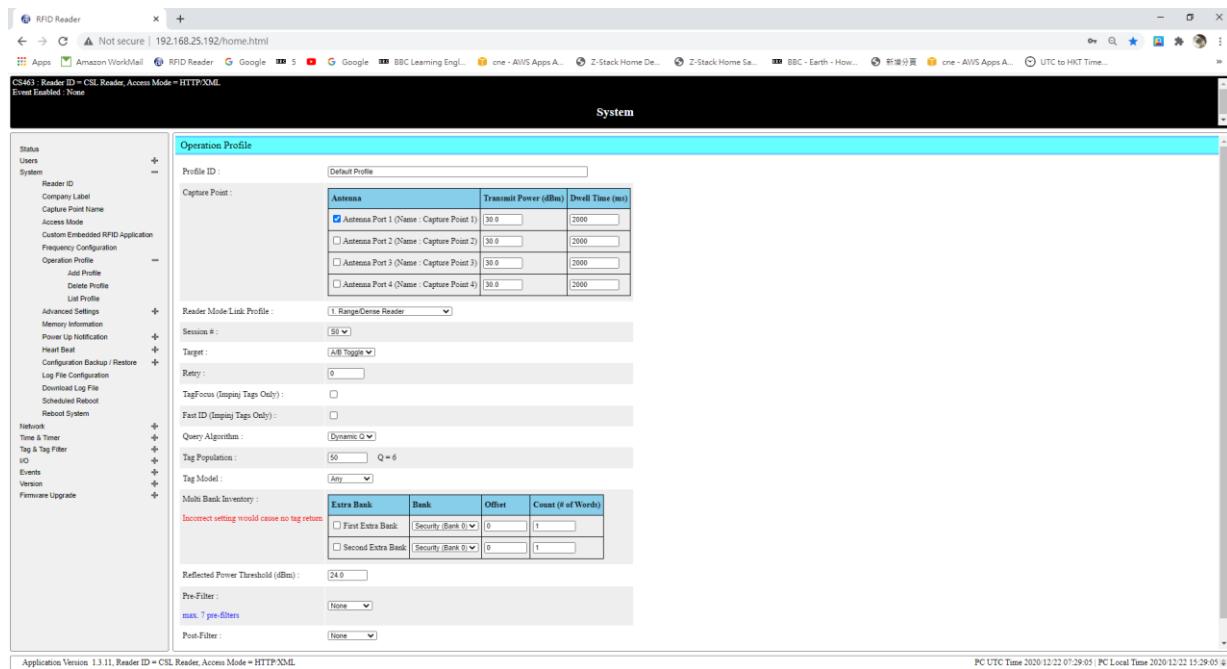
Set Regulatory Region

One can set the different “Regulatory Region” for different operation frequency band in different country in this page for RW model and frequency band is fixed for all other model. Click “Modify” to confirm the change.



8.4.6 Operation Profile

The “Operation Profile” page is extremely important as it sets the basic RFID parameters of the reader.



Parameter	Description
Profile ID	Each profile can be saved and recall for use in Event Engine, or be uploaded and redeployed to other CS463 readers in the field.
Capture Point	Which antenna port to enable (turn power on) and the output conducted power of each antenna port, in terms of 10 x Power (dBm) Dwell time of each antenna port – how long the reader will stay in that particular antenna port to do RFID tag inventory in each antenna cycle.

Parameter	Description
Reader Mode/Link Profile	<p>For CS463 there are different Reader Modes:</p> <p>0 – Best Multipath Fading Resistance</p> <p>1 – Longest Read Range, Dense Reader Mode</p> <p>2 – Read Range and Throughput, Dense Reader Mode</p> <p>3 – Maximum Throughput</p> <p>Please see Appendix B for more details</p>
Session #	Session # S0, S1, S2, and S3, as defined by EPC
Target	Flag A, B or A/B Toggle of the tag to be inventoried
Query Algorithm	Fixed Q or Dynamic Q Algorithm
Tag Population	<p>Estimated population of tags to be read at a time.</p> <p>Based on this tag population estimate, the corresponding Q parameter to be broadcasted during a Query will be displayed on the right side of the edit box</p>
Multi Bank Inventory	CS463 has a unique multi-bank inventory capability: up to 2 more banks, with each bank's starting address and length of words to be captured configurable
LNA	Control RF front end gain of reader
TagFocus	<p>Enabling impinj TagFocus feature can reduce the time to finish reading high number of tags. Pls note this feature can only work with those tags got this feature</p>
FastID	<p>If this feature was enabled, the tag chip with this feature, will backscatters the EPC and TID together during an inventory. Pls note this feature can only work with those tags got this feature</p>
Tag Model	For special feature tag such as temperature reading, right model must be chosen

8.4.7 Memory Information

The “Memory Information” page shows the RAM and Flash memory used and free (available for use).

It also displays the Clear Cache cycle time. This is the periodic time when the Linux OS cache is cleared.

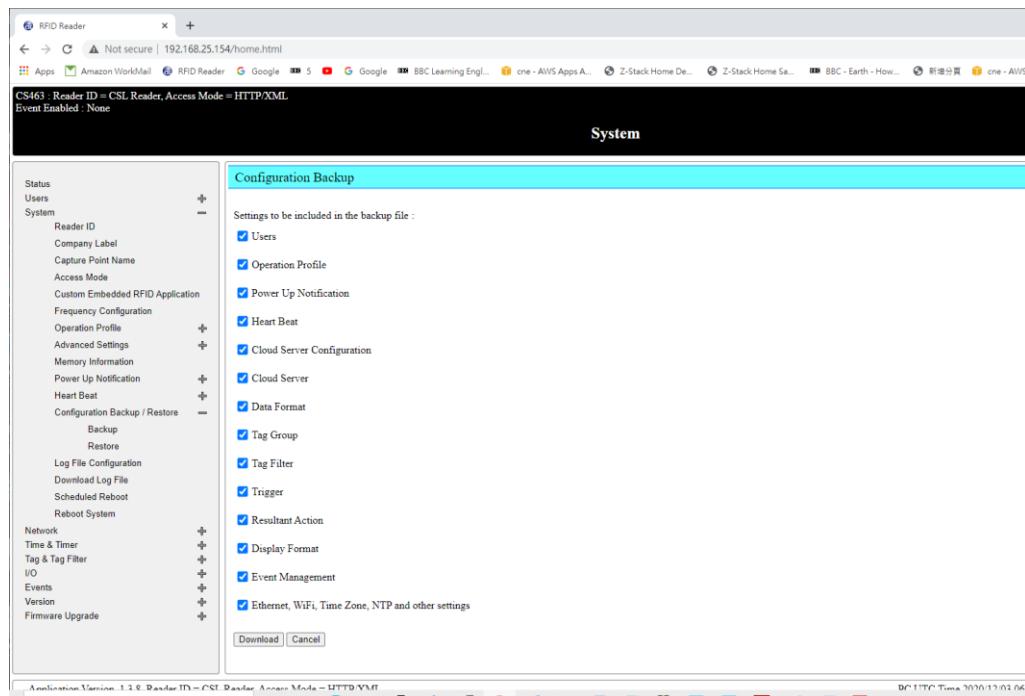
The screenshot shows the CS463 System Configuration interface. The main window title is "System Configuration". A sub-section titled "Memory Information" is highlighted with a blue border. The "Memory Information" section displays the following data:

	Total	Used	Free	Buffer Cached
RAM (MBytes)	1000	171	574	255
Flash Memory (MBytes)	3869	2489	1380	

Below the table, there is a field labeled "Clear Cache Cycle Time (Hours) : 6" with a "Modify" button and a "Cancel" button. The left sidebar contains a tree view of system configuration categories, including Reader ID, System, Network, Time & Timer, Tag & Tag Filter, IO, Events, Version, and Firmware Upgrade. The "Memory Information" node is expanded under the System category.

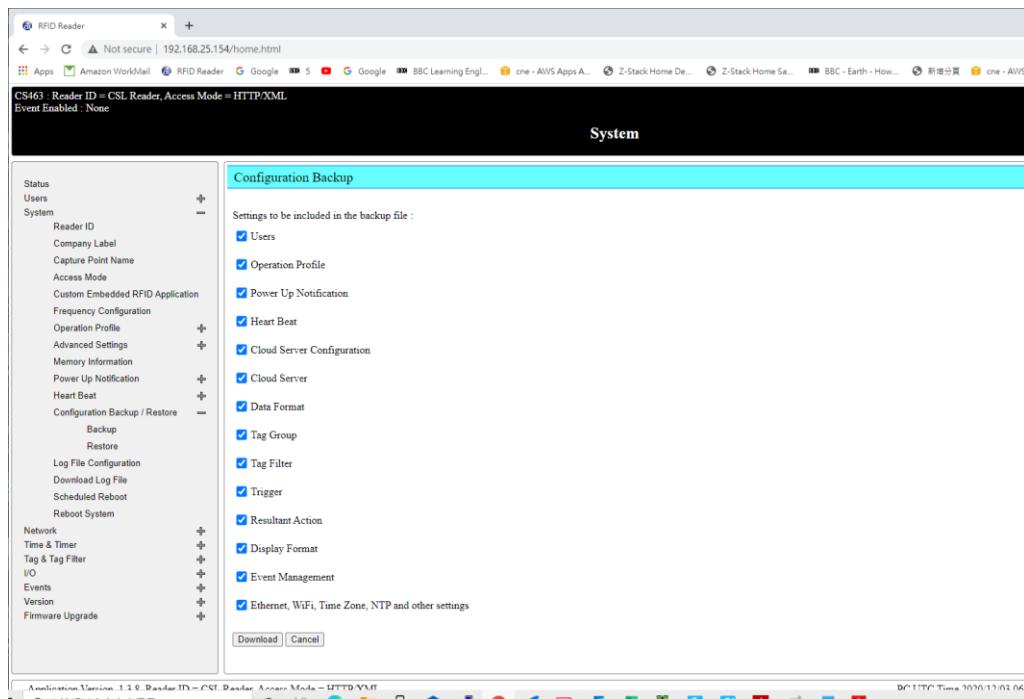
8.4.8 Configuration Backup/Restore

The “Configuration Backup/Restore” page allows backup of configurations, restoring of configurations.



Configuration Backup

To backup configuration, click “Download” in “Configuration Backup” page. The system would start to backup the configuration to file.



Configuration Restore

To restore backup configuration, click “Choose File”. Then select the backup configuration file and click “Open”.

The screenshot shows the 'Firmware Upgrade' interface for the CS463 device. On the left, there is a navigation menu with items like Status, Users, System, Reader ID, Capture Point Name, Access Mode, Frequency Configuration, Operation Profile, Memory Information, Configuration Backup / Restore, Fallback, Power Up Notification, Heart Beat, Scheduled Restart, and Restart System. Under Network, there are entries for Time & Timer, Tag & Tag Filter, I/O, Events, and Version. The main area is titled 'Configuration Restore' and contains a message: 'System will be restarted after restoration completed!' followed by a 'Choose File' button. Below this is a 'Restore' button with a progress bar. The status bar at the bottom right shows the date and time: 3:42 PM 11/12/2018.

The screenshot shows a Windows 'Open' file dialog box. The file path is 'This PC > Desktop > norman > 463 > manual > tem3'. The file 'ConfigurationBackup_20181108_0218' is selected. A tooltip provides file details: Type: File, Size: 5.47 KB, Date modified: 11/8/2018 10:18 AM. The dialog includes standard buttons for 'File name:' (set to 'ConfigurationBackup_20181108_0218'), 'Open', and 'Cancel'.

8.4.9 Power Up Notification

System can send power up notification to server with particular format if it is enabled

Add Power up Notification

The screenshot shows a web browser window titled 'RFID Reader' with the URL 'Not secure | 192.168.25.181/home.html'. The main content area is titled 'CS463' and 'System'. On the left, there is a sidebar menu with the following items:

- Status
- Users
- System
 - Reader ID
 - Capture Point Name
 - Access Mode
 - Frequency Configuration
 - Operation Profile
 - Memory Information
 - Configuration Backup / Restore
 - Power Up Notification
 - Add Power Up Notification
 - Delete Power Up Notification
 - List Power Up Notification
 - Heart Beat
 - Download Log File
 - Scheduled Restart
 - Restart System
- Network
- Time & Timer
- Tag & Tag Filter
- I/O
- Events
- Version
- Firmware Upgrade

The right side of the screen displays a configuration form for 'Add Power Up Notification' with the following fields:

- Power Up Notification ID :
- Type :
- Server ID :
- Data Format ID :
- Enable :

At the bottom of the configuration form are two buttons: 'Add' and 'Cancel'.

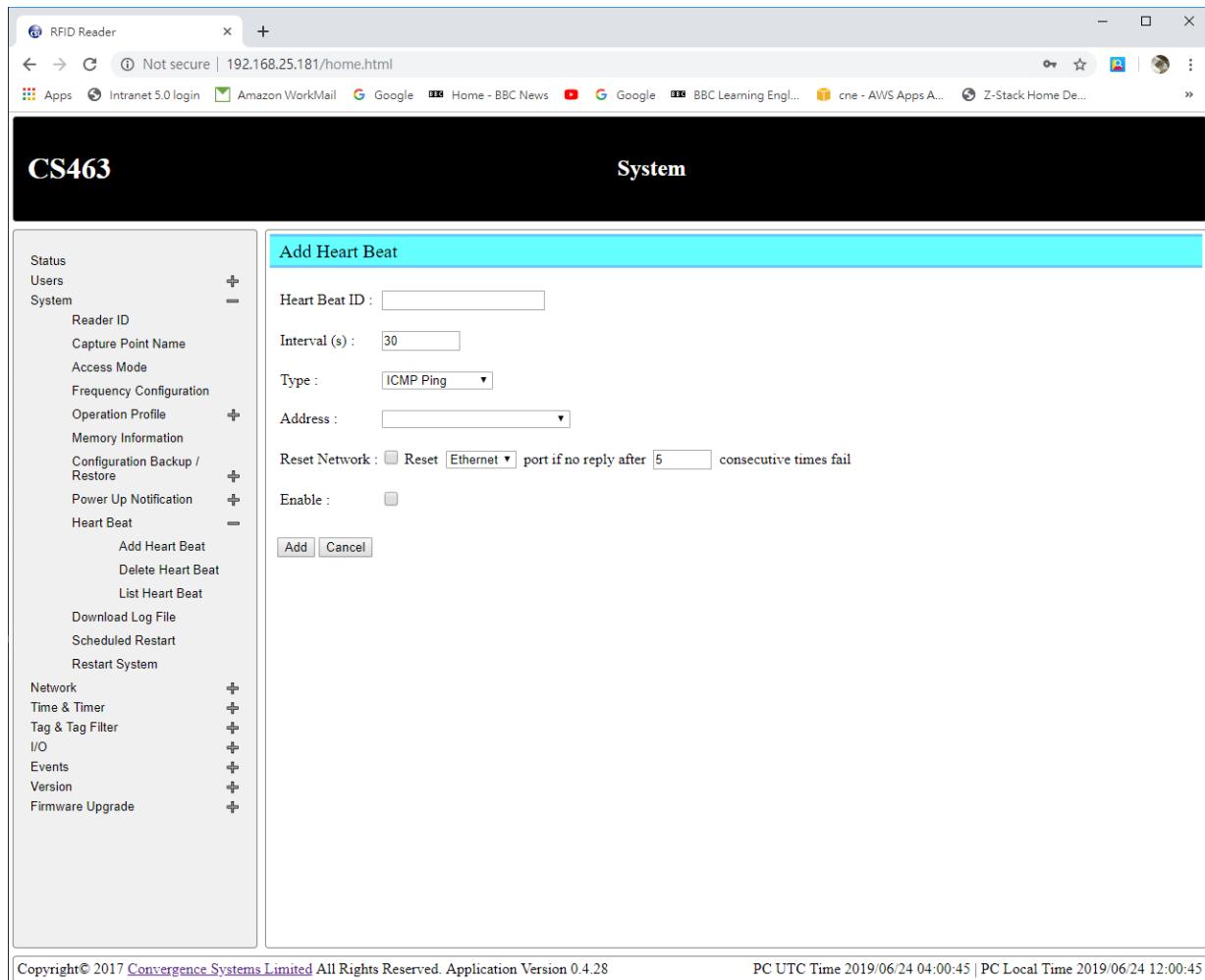
At the bottom of the page, there is a copyright notice: 'Copyright© 2017 [Convergence Systems Limited](#) All Rights Reserved. Application Version 0.4.28' and a timestamp: 'PC UTC Time 2019/06/24 03:53:51 | PC Local Time 2019/06/24 11:53:51'.

8.4.10 Heartbeat

The Heartbeat is used to monitor the system still running

Add Heat Beat

The Heartbeat sending interval, type and address sending should be set on Add Heart Beat as below



If the HTTP Post type server is selected, corresponding Server and Data Format should be selected as below. Server and Data Format was defined in Cloud Server page

The screenshot shows a web-based configuration interface for the CS463 system. The left sidebar contains a tree view of system components:

- Status
- Users
- System
 - Reader ID
 - Capture Point Name
 - Access Mode
 - Frequency Configuration
 - Operation Profile
 - Memory Information
 - Configuration Backup / Restore
 - Power Up Notification
 - Heart Beat
 - Add Heart Beat
 - Delete Heart Beat
 - List Heart Beat
 - Download Log File
 - Scheduled Restart
 - Restart System
- Network
- Time & Timer
- Tag & Tag Filter
- I/O
- Events
- Version
- Firmware Upgrade

The main content area is titled "System" and displays the "Add Heart Beat" configuration dialog. The dialog fields are as follows:

- Heart Beat ID :
- Interval (s) :
- Type :
- Server ID :
- Data Format ID :
- Reset Network : Reset port if no reply after consecutive times fail
- Enable :

At the bottom of the dialog are two buttons: "Add" and "Cancel".

At the bottom of the interface, there is copyright information: "Copyright© 2017 Convergence Systems Limited All Rights Reserved. Application Version 0.4.28" and "PC UTC Time 2019/06/24 04:01:39 | PC Local Time 2019/06/24 12:01:39".

8.4.11 Log File Configuration

There is different type of log files which can be enabled as shown below.

CS463

Log File Configuration

Enable Linux Syslog :

Enable System Log :

Enable Health Log :

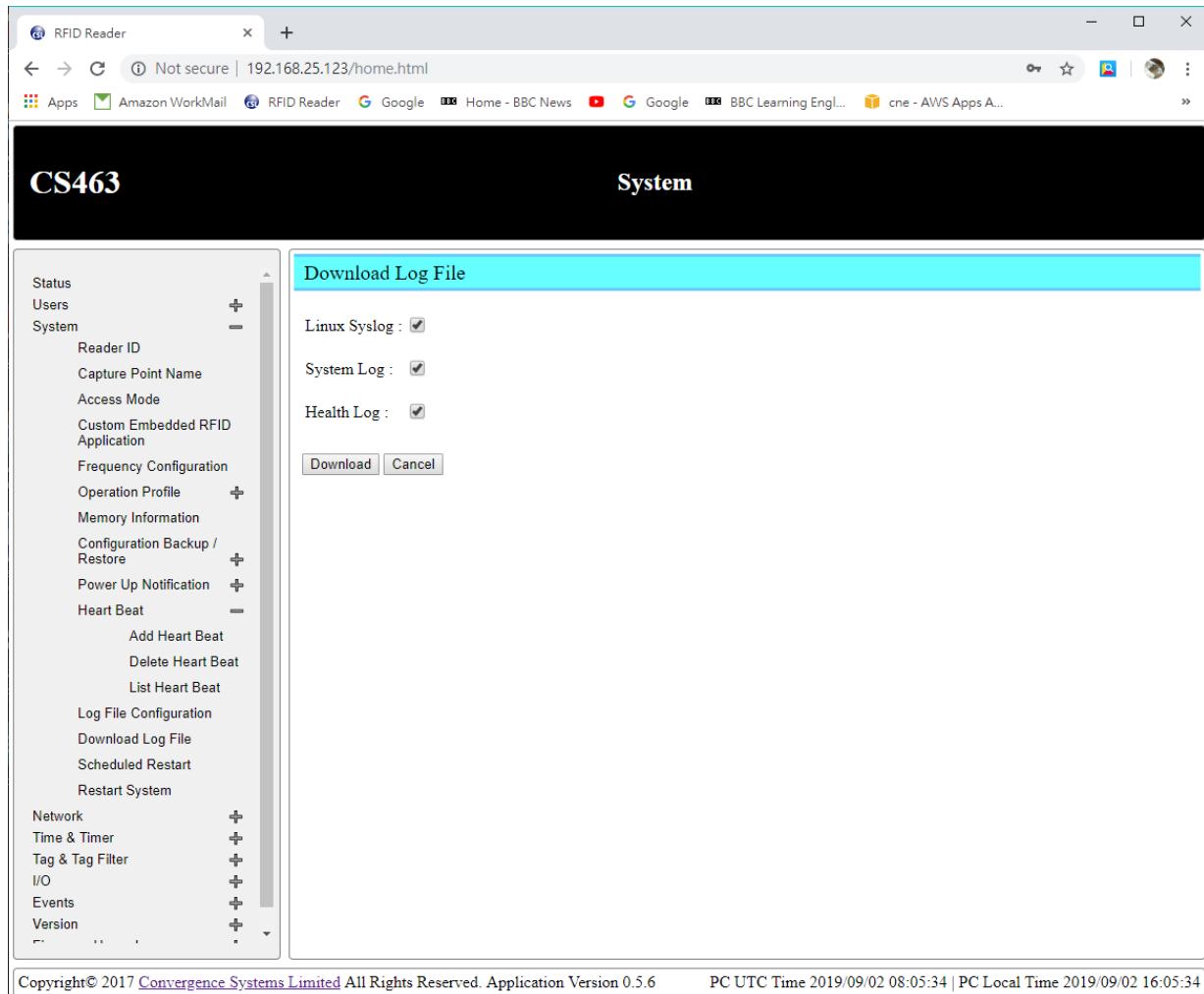
Enable JNI Server Log :

Modify **Cancel**

Copyright© 2017 [Convergence Systems Limited](#) All Rights Reserved. Application Version 0.5.6 PC UTC Time 2019/09/02 07:53:12 | PC Local Time 2019/09/02 15:53:12

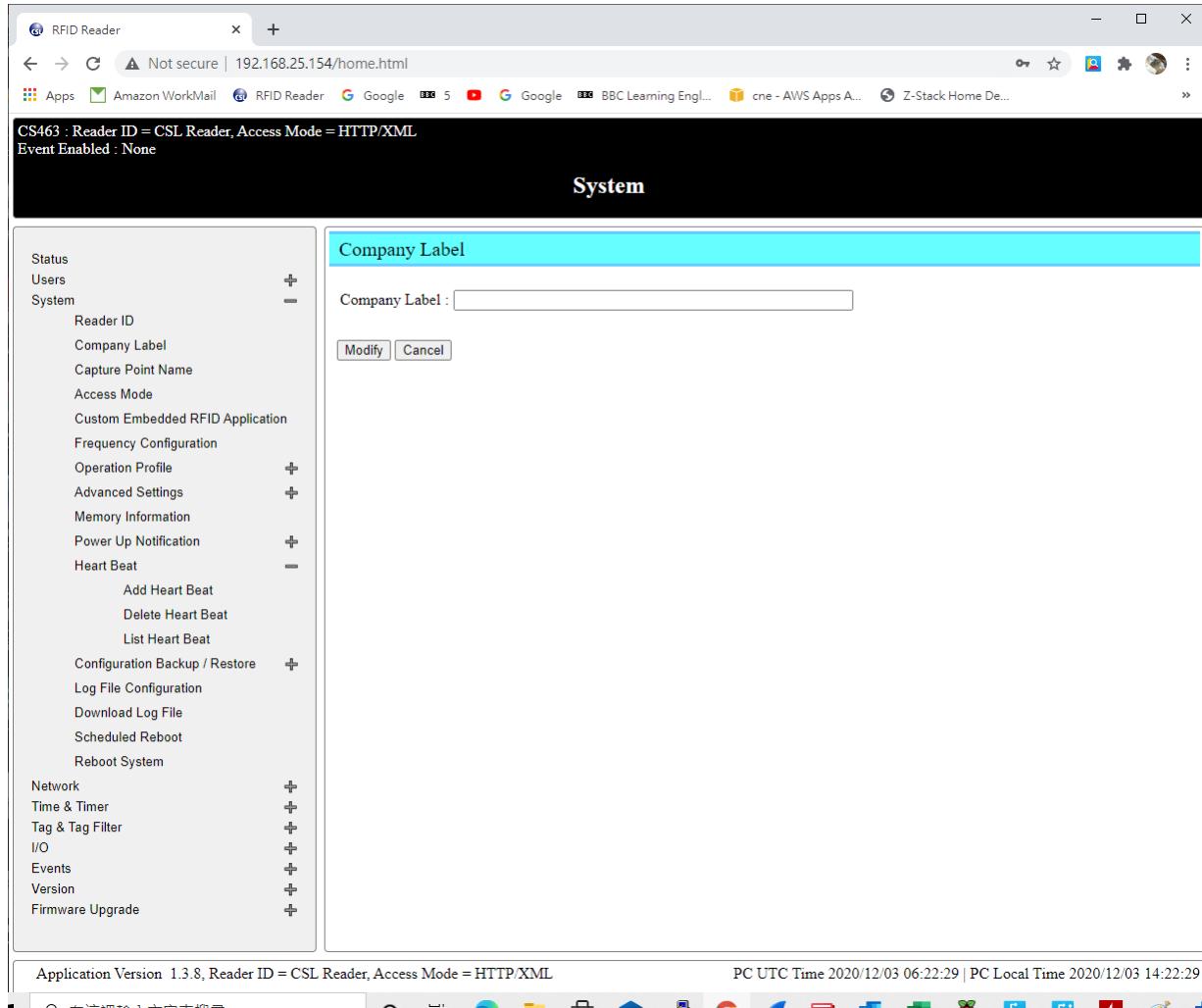
8.4.12 Download Log file

All Log files can be download in this page, select Log files type going to download then click Download to start download



8.4.13 Company Label

Company label can be shown on web page and was defined in this page



8.4.15 Advanced Settings

The reader sensitivity can be set on this page by changing below parameters

The screenshot shows a web browser window titled "RFID Reader" with the URL "192.168.25.154/home.html". The main content area displays the "System" configuration page. On the left, there is a sidebar with various settings categories like Reader ID, Company Label, Capture Point Name, Access Mode, etc. The "Advanced Settings" section is expanded, showing "Configure RF LNA and IF LNA Gain" as a sub-item. The main panel has a title "Configure RF LNA and IF LNA Gain". It shows current settings from the reader: RF LNA Compression mode: 1, RF LNA Gain: 1dB, IF LNA Gain: 24dB, AGC Gain: -6dB. Below this, there is a "Settings write to reader:" section with dropdown menus for each setting. At the bottom are "Confirm" and "Cancel" buttons. The status bar at the bottom of the browser window shows "Application Version 1.3.8, Reader ID = CSL Reader, Access Mode = HTTP/XML" and "PC UTC Time 2020/12/03 06:23:09 | PC Local Time 2020/12/03 14:23:00".

8.4.16 Scheduled Restart

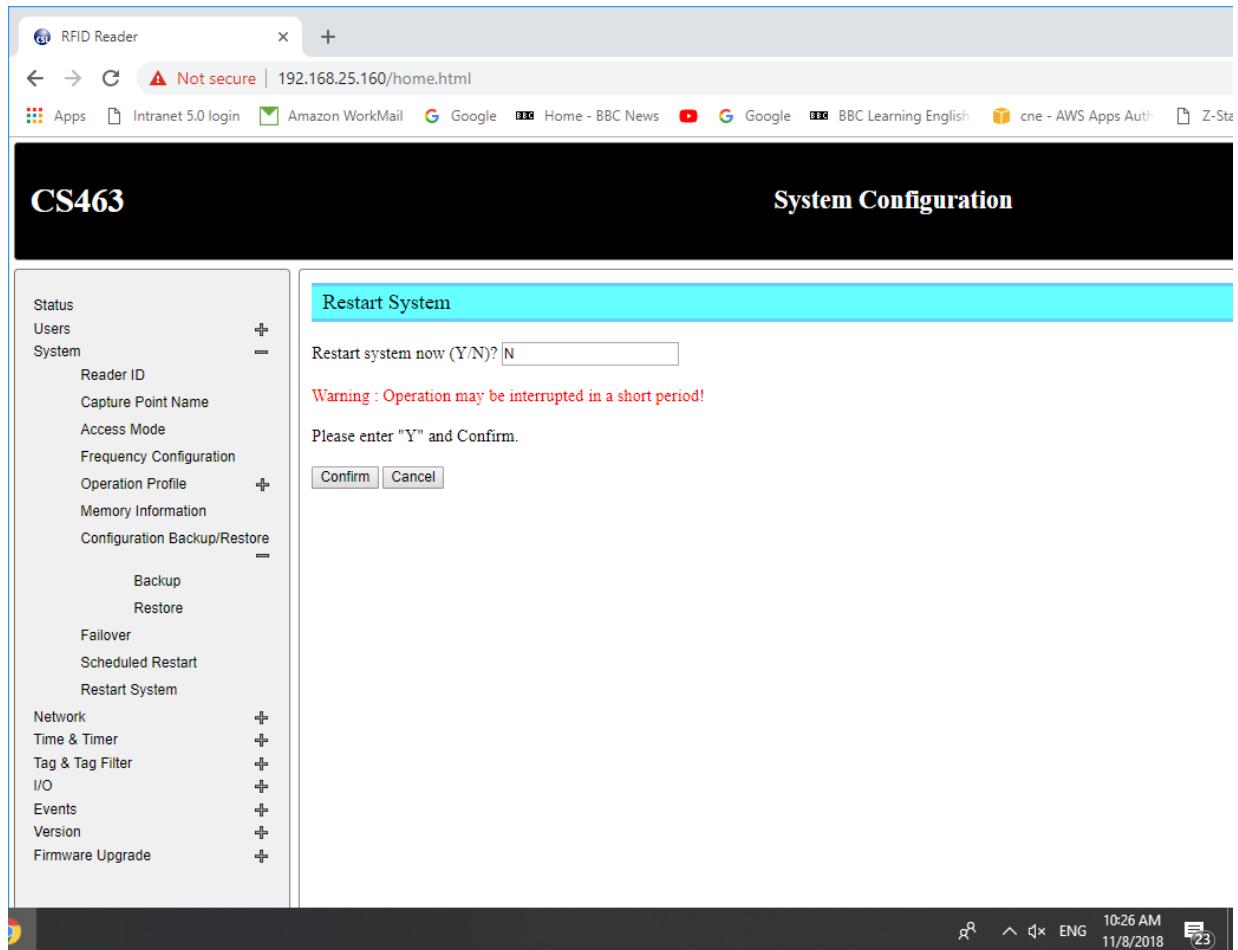
System Restart can be scheduled on this page

The screenshot shows a web-based configuration interface for an RFID Reader. The title bar indicates the page is 'Not secure | 192.168.25.192/home.html'. The main menu on the left includes sections like Status, Users, System, Network, Time & Timer, Tag & Tag Filter, I/O, Events, Version, and Firmware Upgrade. The 'System' section is expanded, showing sub-options such as Reader ID, Company Label, Capture Point Name, Access Mode, Custom Embedded RFID Application, Frequency Configuration, Operation Profile, Advanced Settings (which further includes 'Configure RF LNA and IF LNA Gain'), Memory Information, Power Up Notification, Heart Beat, Configuration Backup / Restore, Log File Configuration, Download Log File, Scheduled Reboot, and Reboot System. A 'Scheduled Reboot Setup' dialog box is open in the center, titled 'Scheduled Reboot Setup'. It contains fields for 'Schedule Mode' (set to 'Daily'), 'Reboot Time' (set to '17:07'), and an 'Enable' checkbox which is unchecked. Below these fields, there are two informational messages in red: 'It is strongly recommended that at least a quarterly reboot is scheduled.' and 'In case scheduled reboot cannot be arranged due to unknown future schedule, use API to invoke a reboot at time of convenience'. At the bottom of the dialog are 'Confirm' and 'Cancel' buttons. The status bar at the bottom right shows the date and time as '16:13 22/12/2020'.

8.4.17 Restart System

To restart the system, input “Y” and click “Process”.

Y must be capital letter

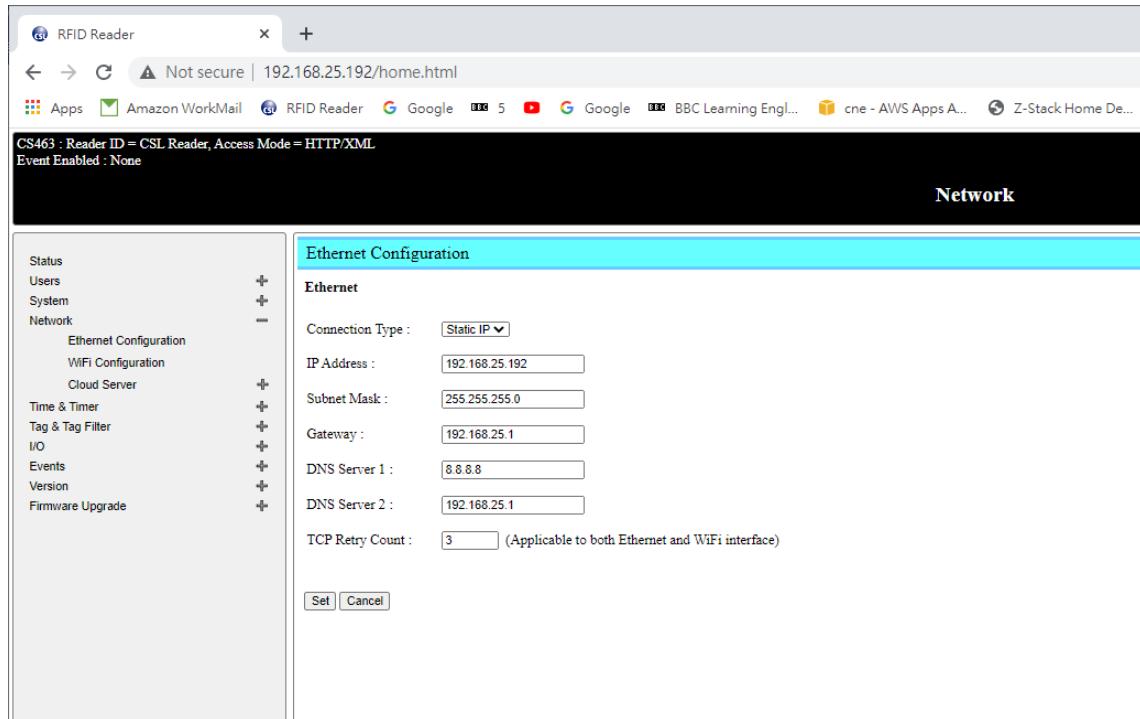


8.5 Network Management

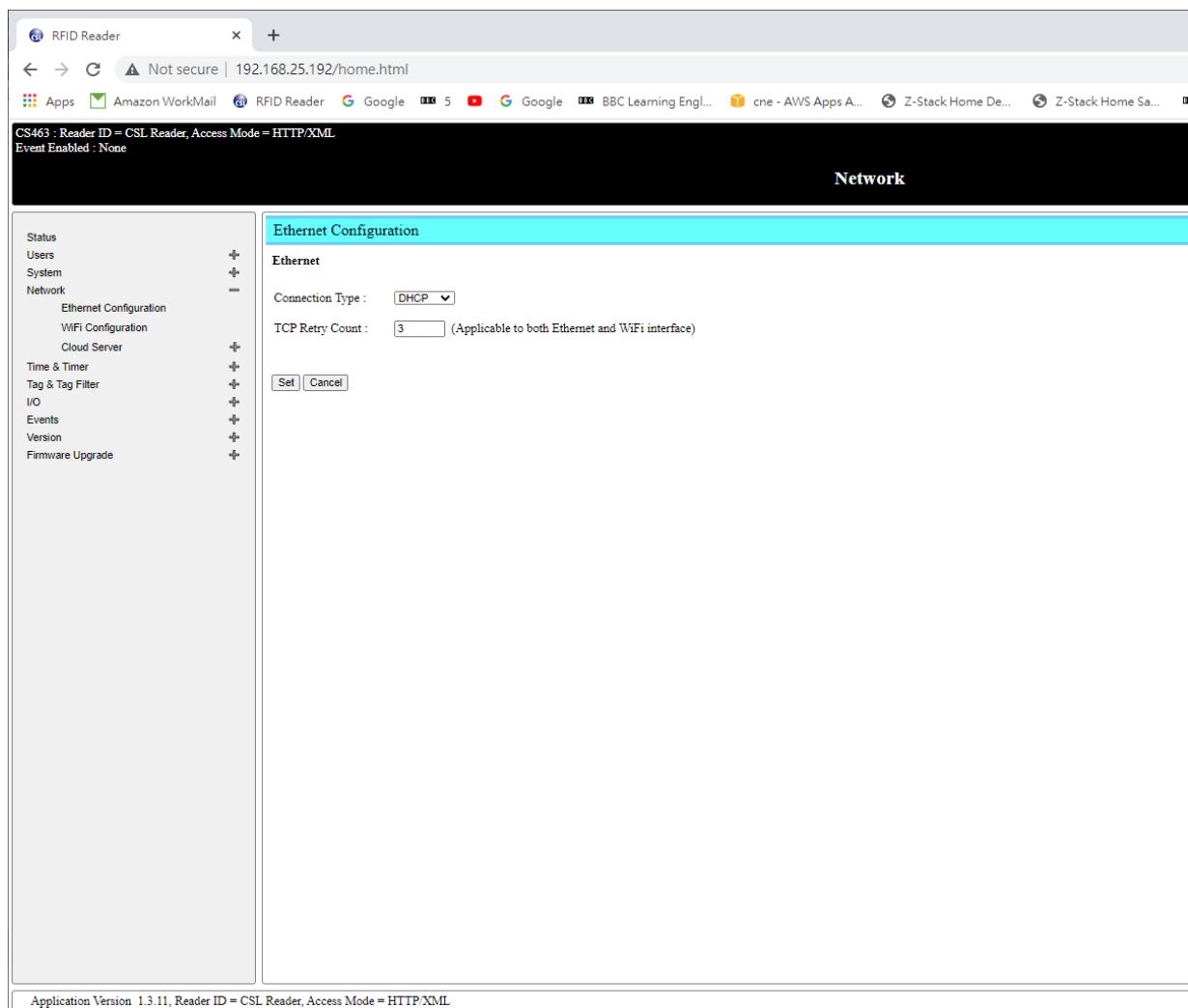
“Network Management” page allows the user to set the network parameters. Here is the network management sub-menu:

The connection can be static IP or DHCP

Connection can be set to static IP as below

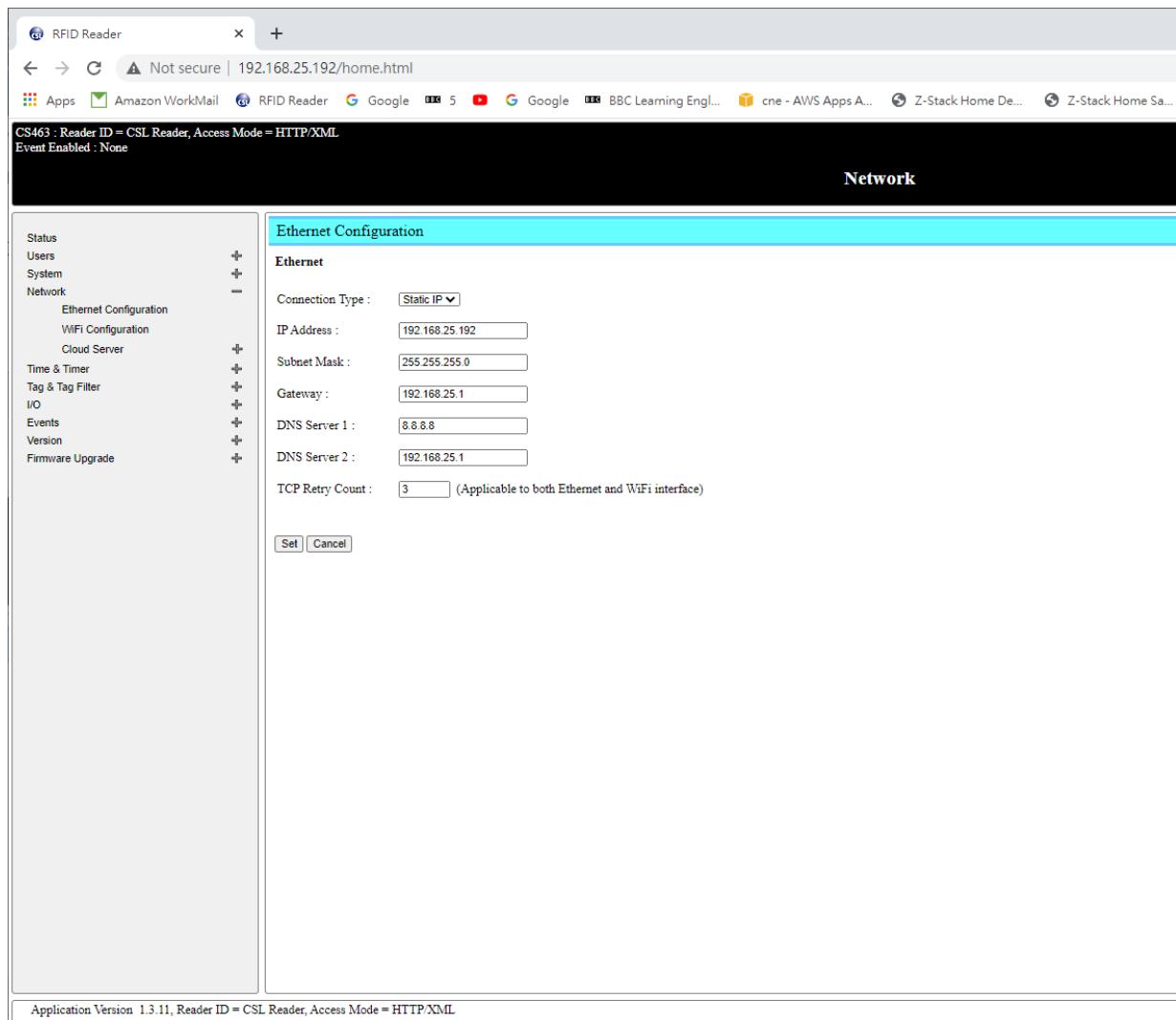


Connection can be set to DHCP as below



8.5.1 Ethernet Configuration

In “Network Configuration” page, one can configure the network parameters such as the reader IP address, Subnet mask, Gateway and DNS server.



8.5.2 Wi Fi Configuration

All basic setup for wifi can found in this page, you are able to enable/disable the wifi from here

The screenshot shows a web-based configuration interface for the CS463 device. The title bar indicates the page is titled 'Network' and the sub-page is 'WiFi Configuration'. The left sidebar contains a navigation menu with items like Status, Users, System, Network (which is expanded), Ethernet Configuration, WiFi Configuration (which is selected and highlighted in blue), Cloud Server, Time & Timer, Tag & Tag Filter, I/O, Events, Version, and Firmware Upgrade. The main content area is titled 'WiFi' and contains the following configuration fields:

- Enable :
- Connection Type :
- IP Address :
- Subnet Mask :
- Gateway :
- DNS Server 1 :
- DNS Server 2 :
- Security Protocol :
- SSID :
- PSK :

At the bottom of the page, there are two buttons: 'Set' and 'Cancel'. The footer of the page includes copyright information: 'Copyright© 2017 Convergence Systems Limited All Rights Reserved. Application Version 0.4.28' and a timestamp: 'PC UTC Time 2019/06/24 06:18:30 | PC Local Time 2019/06/24 14:18:30'.

8.5.3 Cloud Server Basic Settings

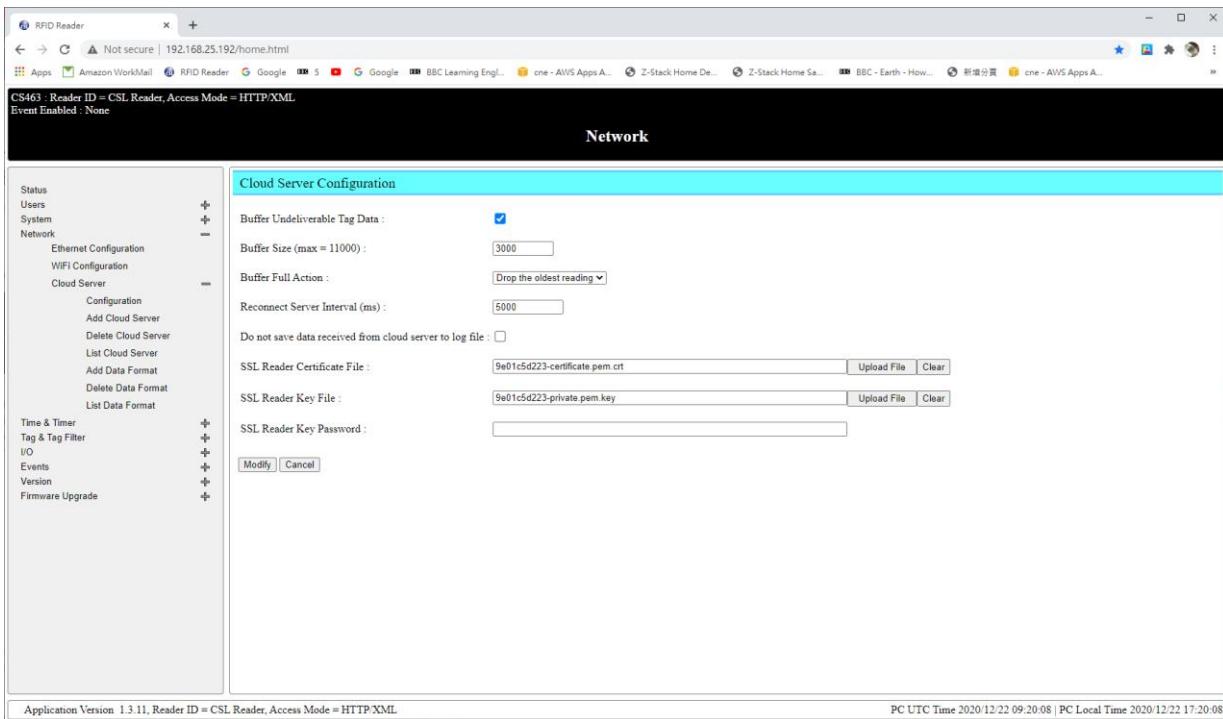
Trusted server for automatic data submission by the reader using the event engine is set in the “Cloud Server” page. Here is the “Cloud Server” submenu:

Server ID	Description	Type	Path	Port
Example CSL Demo Cloud Server	Demo Use Only - refer to User Manual on How to Access	HTTP	https://democloud.convergence.com.hk:28090/WebServiceRESTv1.0/req/create-update-delete/update-entity/tagdata	
Example Free Cloud Server	Free Cloud Server on Internet	HTTP	http://ptsv2.com/t3x72h-1558341359 post	
TCP Server 1		TCP	192.168.25.173	9394

Configuration

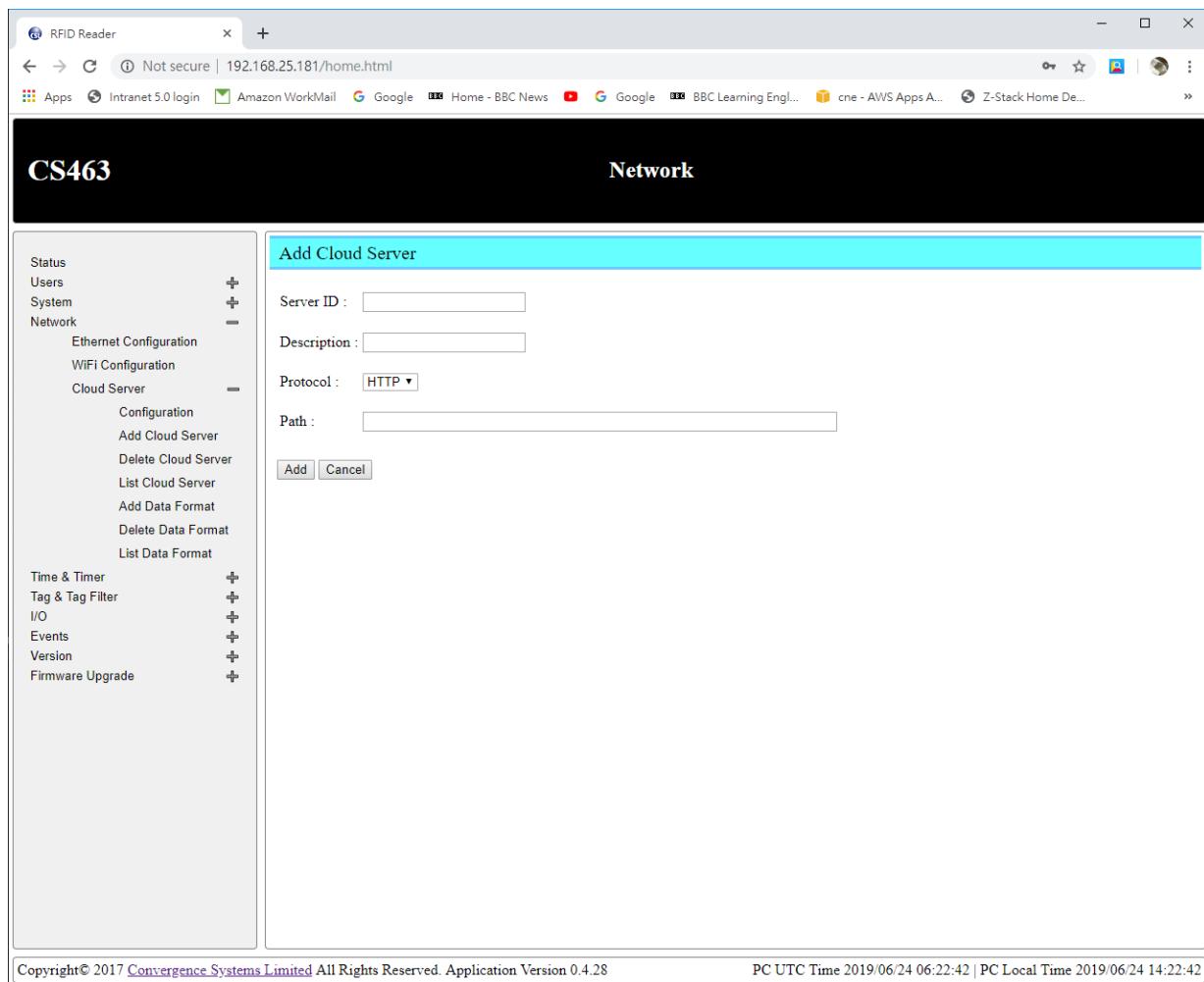
One can enable network failure data backlog in the Configuration in Cloud Server page. It allows the reader to buffer the tags read during network failure in memory. Buffered tags are sent to trusted server when network is restored.

A further selection is necessary in the way the data is backlogged: Either “Drop the Oldest reading or Ignore the new reading.



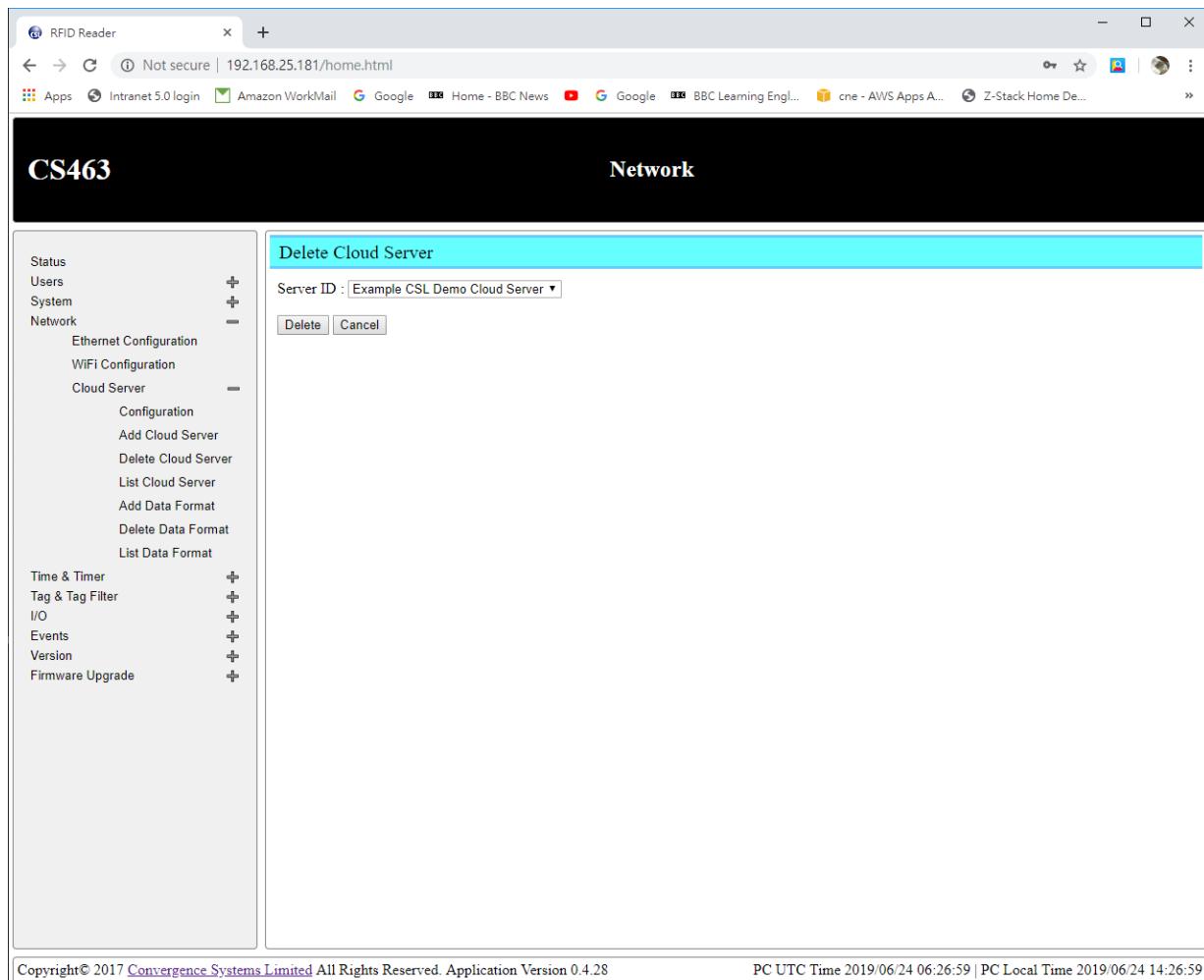
Add Cloud Server

To add a trusted server for receiving tag events, input the web address path then click Add.



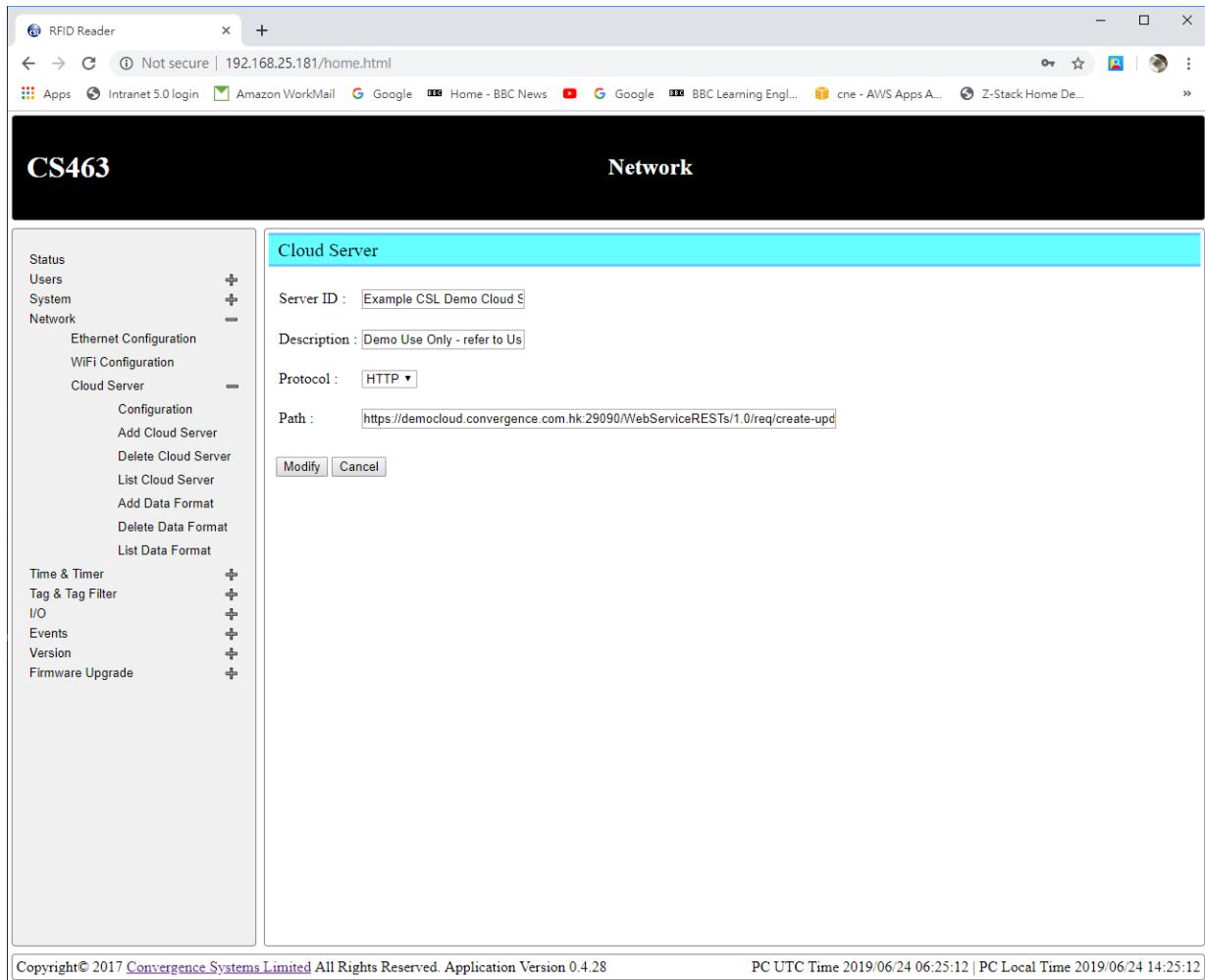
Delete Cloud Server

To delete cloud server, select the server ID and click “Delete”.



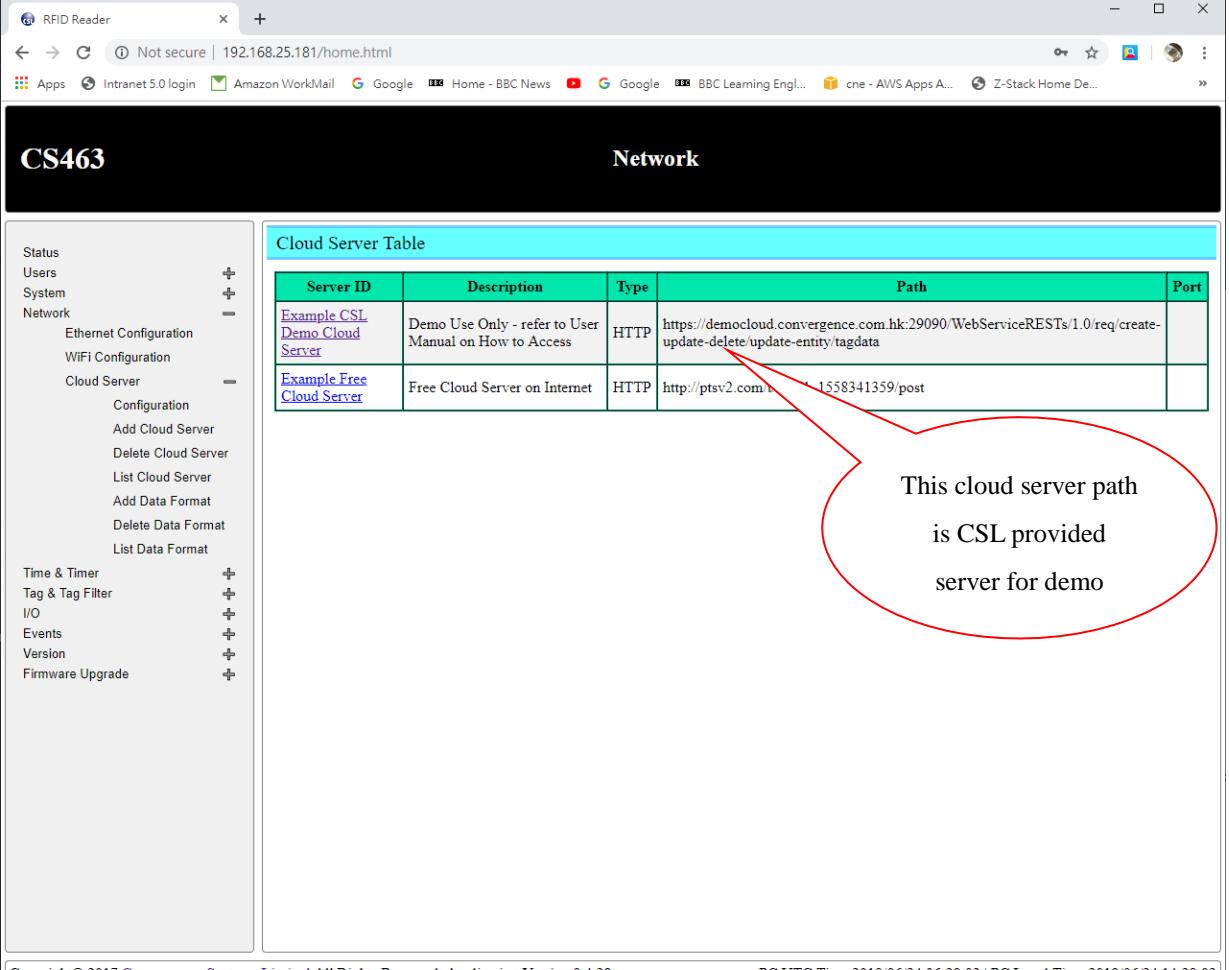
Modify Cloud Server

To modify cloud server, select the server ID in List Cloud Server submenu, modify any fields and click “Modify”.



List Cloud Server

Information of trusted server can be retrieved by the “List Cloud Server” page.



The screenshot shows a web-based interface for managing network resources. On the left, there is a sidebar with various configuration options under categories like Status, Users, System, Network, Time & Timer, Tag & Tag Filter, I/O, Events, Version, and Firmware Upgrade. The main area is titled "Network" and contains a table titled "Cloud Server Table". The table has columns for Server ID, Description, Type, Path, and Port. There are two entries:

Server ID	Description	Type	Path	Port
Example CSL Demo Cloud Server	Demo Use Only - refer to User Manual on How to Access	HTTP	https://democloud.convergence.com.hk:29090/WebServiceRESTs/1.0/req/create-update-delete/update-entity/tagdata	
Example Free Cloud Server	Free Cloud Server on Internet	HTTP	http://ptsv2.com/l/1558341359/post	

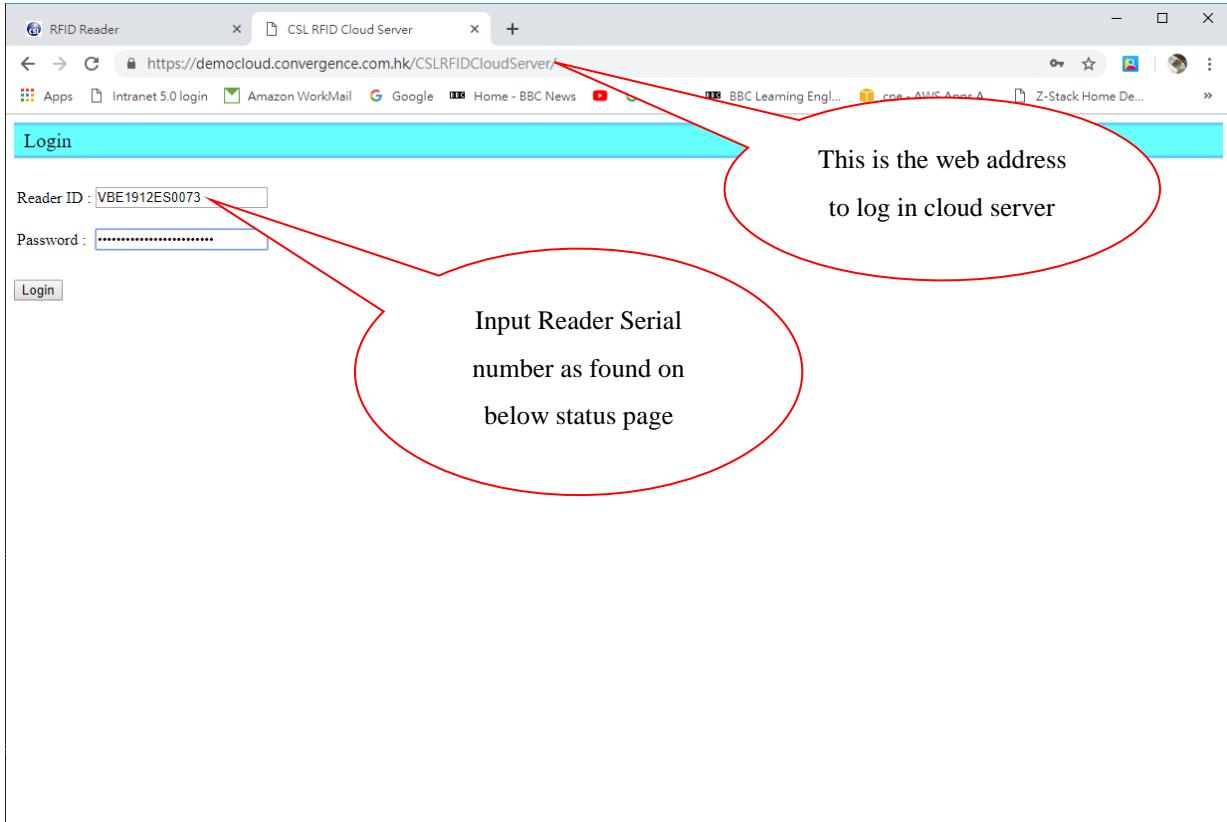
A red callout with an arrow points from the text "This cloud server path is CSL provided server for demo" to the "Path" column of the second row.

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Log in Cloud Server from Web page, the path is

democloud.convergence.com.hk/CSLRFIDCloudServer/

you may encounter a certificate warning, please press “details” and then “proceed to website”

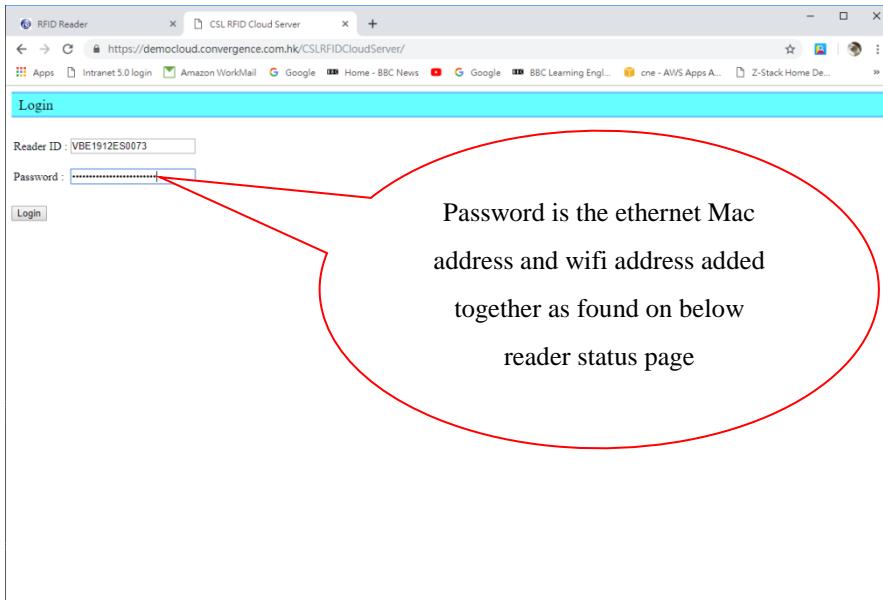


You can find the Reader ID from the entry called Reader Serial # on Status page.

Status	
Reader ID :	CSL-463 RFID READER
Model Name :	CS463-2 (Frequency Locked)
Reader Serial # :	VBE1912ES0073 (circled in red)
PCB Serial # :	BEPB191CES076022
Regulatory Region :	2
Special Country Version :	
Up Time :	0.46 hours
Local Time :	1970/01/01 Thursday 00:27:52
Time Zone :	GMT+00:00
UTC Time :	1970/01/01 Thursday 00:27:52
Auto Logout Time :	30 minutes
Access Mode :	HTTP_XML
Antenna Port 0 Power :	300
Antenna Port 1 Power :	

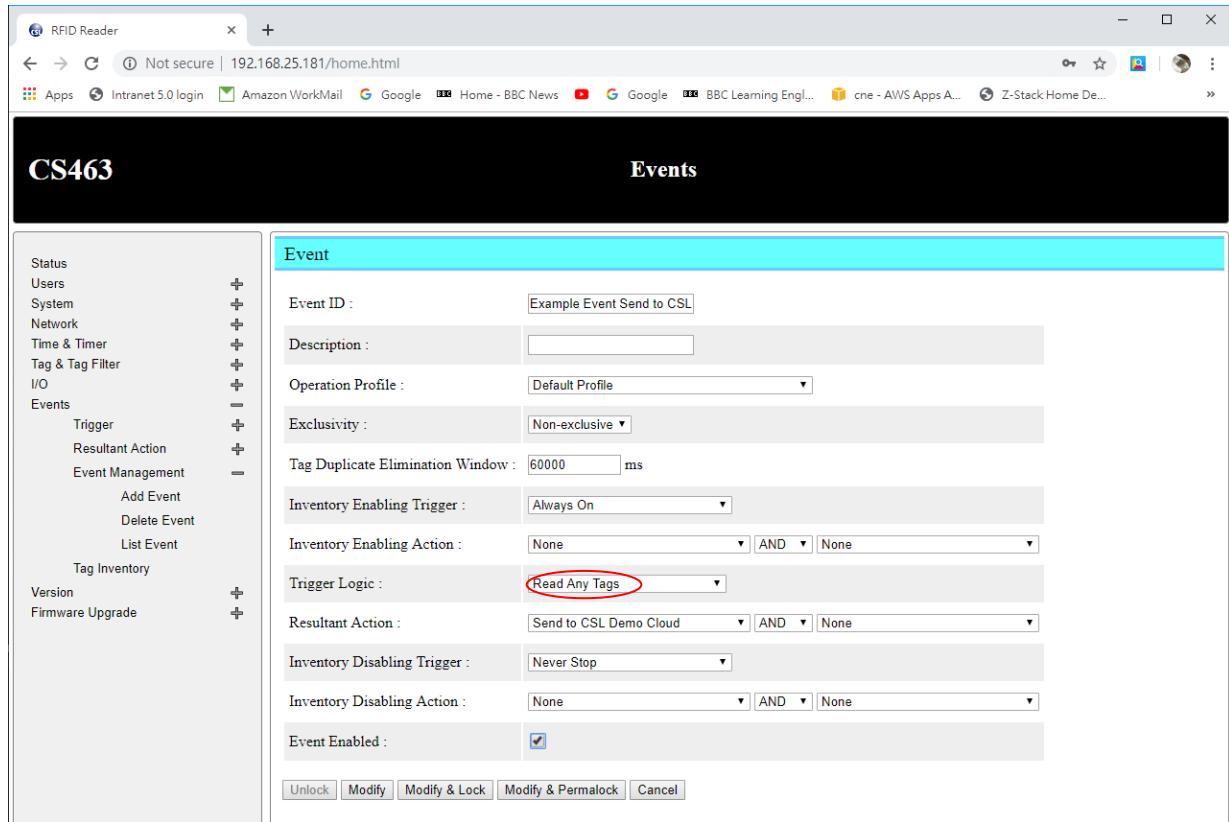
Copyright© 2017 Convergence Systems Limited All Rights Reserved. Application Version 0.2.23 PC UTC Time 2019/02/04 01:41:53 | PC Local Time 2019/02/04 09:41:53

For the password,



So the password for this reader to log in server web page is 00057B84004100057B870041

If any resultant action Send to cloud is set and was triggered as below



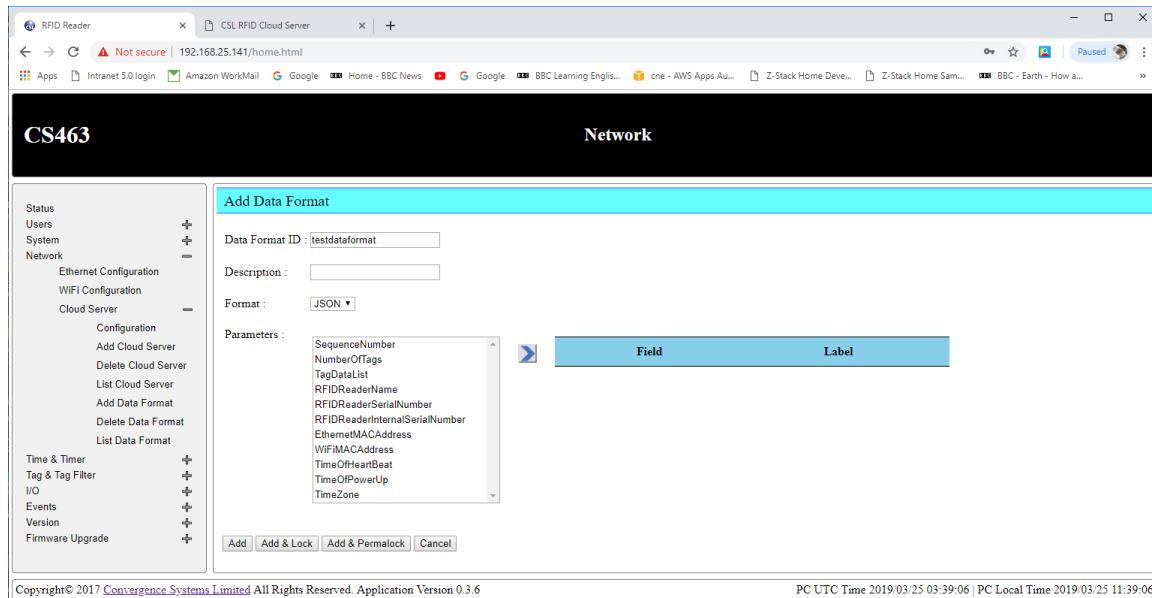
The result can be found on Cloud Server Webpage as below

#	Access Password	Kill Password	PC	EPC	TID Bank	User Bank	Time of Read	Time Zone	Location of Read	E Compass	Antenna Port	RSSI	User Description	RFID Reader Name	RFID Reader Serial #	RFID Reader Internal Serial #	Smart Phone Name	Smart Phone BT MAC	Smart Phone Serial #	Smart Phone WiFi MAC	Smart Phone UUID	PC Name
6			3000	123456789012345678901234			2019/03/27 09:52:19.792	+00:00		1	-22		CSL_463 RFID READER	VBE1832ES0039 VBE1832ES0017							00	
5			3000	123456789012345678901234			2019/03/27 09:52:18.154	+00:00		1	-23		CSL_463 RFID READER	VBE1832ES0039 VBE1832ES0017							00	
4			3000	123456789012345678901234			2019/03/27 09:52:16.573	+00:00		1	-24		CSL_463 RFID READER	VBE1832ES0039 VBE1832ES0017							00	
3			3000	123456789012345678901234			2019/03/27 09:52:14.546	+00:00		1	-23		CSL_463 RFID READER	VBE1832ES0039 VBE1832ES0017							00	
2			3000	123456789012345678901234			2019/03/27 09:52:13.339	+00:00		1	-21		CSL_463 RFID READER	VBE1832ES0039 VBE1832ES0017							00	
1			3000	123456789012345678901234			2019/03/27 09:52:11.778	+00:00		1	-23		CSL_463 RFID READER	VBE1832ES0039 VBE1832ES0017							00	

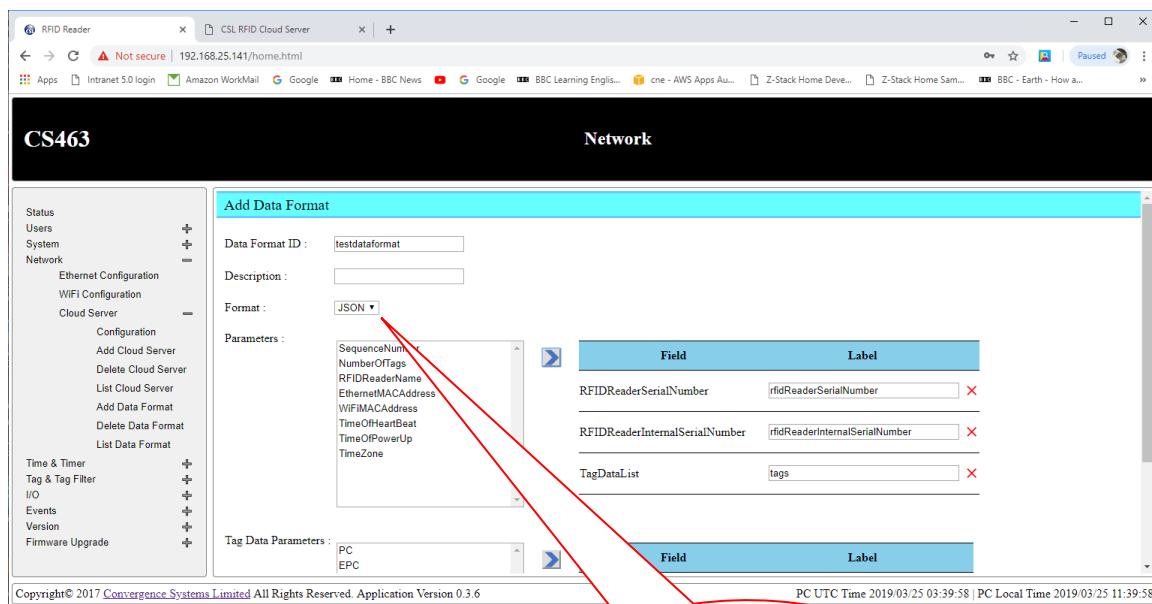
8.5.4 Cloud Server Data Formatter

Add Data Format for Cloud Server

Different fields can be added to the reporting format for Cloud Server as below



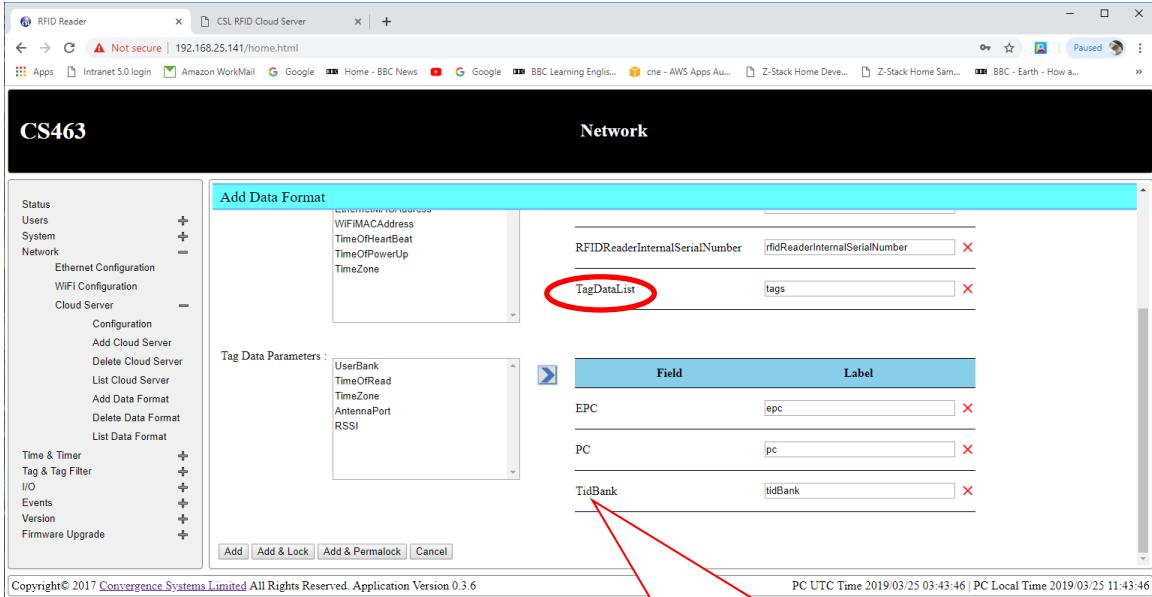
If data is going to be sent to CSL provided Cloud Server, the fields RFIDReaderSerialNumber and RFIDReaderInternalSerialNumber must be added as below otherwise CSL Cloud Server would ignore the send data.



Json Format should be
choose for CSL Cloud

Server

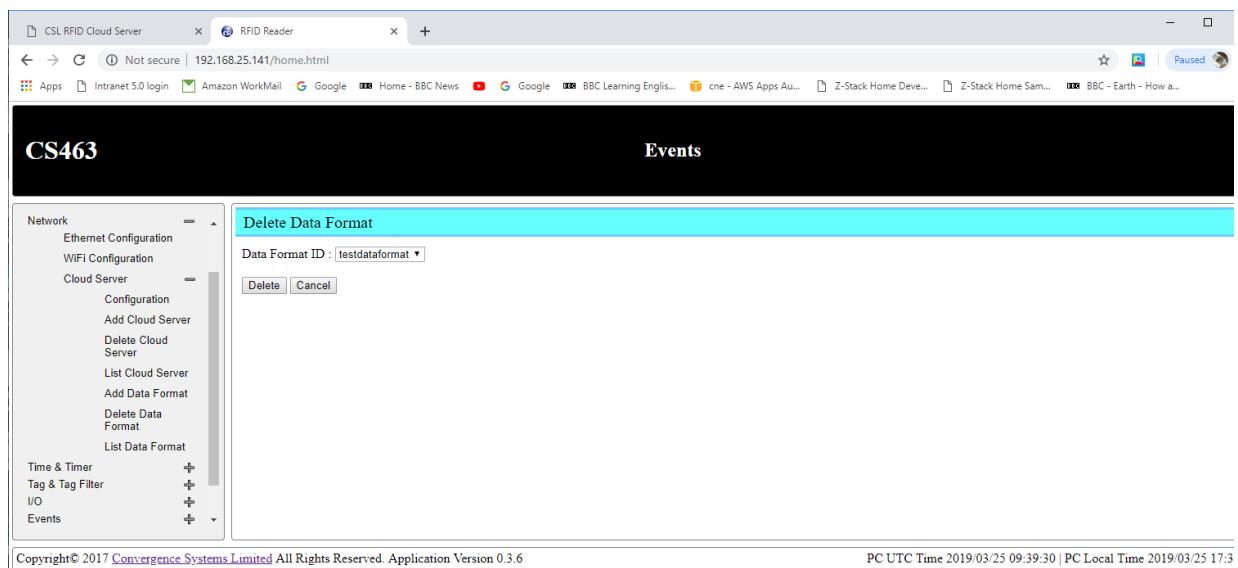
Once the TagDataList was added, more tag related parameter can be selected to send to cloud Server



The TID bank reading should have
defined on System Profile page,
otherwise, no data will show on cloud
Server as it is not available

Delete Data Format

Any unwanted Data format can be deleted as below



List Data Format

All created Data format can be found on this page List Data Format and can be modified as long as it is not Permalock

Data Format ID	Description	Format
Example Power Up Notification Data Format		JSON
Example Tag Upload to Cloud Server Data Format		JSON
Example Heart Beat Data Format		JSON

Any available field can be added or remove from reporting format on here

The screenshot shows a web-based configuration interface for an RFID Reader. The left sidebar contains a navigation tree with sections like Status, Users, System, Network, Ethernet Configuration, WiFi Configuration, Cloud Server, Time & Timer, Tag & Tag Filter, I/O, Events, Version, and Firmware Upgrade. The main content area is titled "Data Format" and includes fields for "Data Format ID" (set to "Example Tag Upload to Clou..."), "Description" (empty), and "Format" (set to "JSON"). A "Parameters" section lists various parameters such as SequenceNumber, NumberOfTags, EthernetMACAddressWithColon, WiFiMACAddressWithColon, HeartBeatFlag, PowerUpFlag, TimeOfHeartBeat, TimeOfPowerUp,TimeStampOfHeartBeat, and TimeStampOfPowerUp. Below this is a "Tag Data Parameters" section with UserBank,TimeStampOfRead, TimeZone, and AntennaPort_Number. To the right, there are two tables mapping fields to labels:

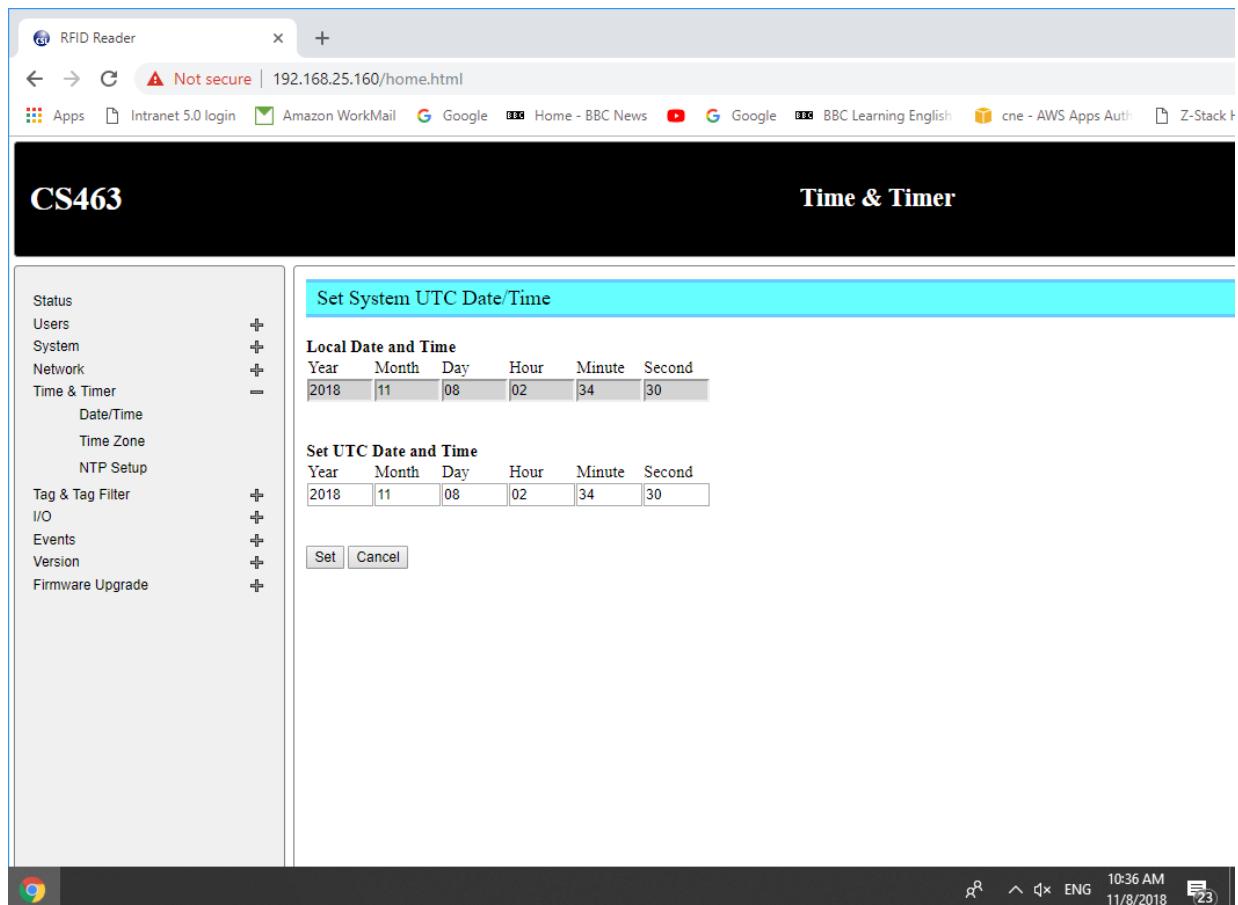
Field	Label
RFIDReaderName	rfidReaderName
RFIDReaderSerialNumber	rfidReaderSerialNumber
RFIDReaderInternalSerialNumber	rfidReaderInternalSerialNumber
EthernetMACAddress	pcEthernetMACAddress
WiFiMACAddress	pcWiFiMACAddress
TimeZone	timeZone
TagDataList	tags

Field	Label
PC	pc

At the bottom of the interface, there is a copyright notice: "Copyright© 2017 Convergence Systems Limited All Rights Reserved. Application Version 0.4.28" and a timestamp: "PC UTC Time 2019/06/24 06:48:09 | PC Local Time 2019/06/24 14:48:09".

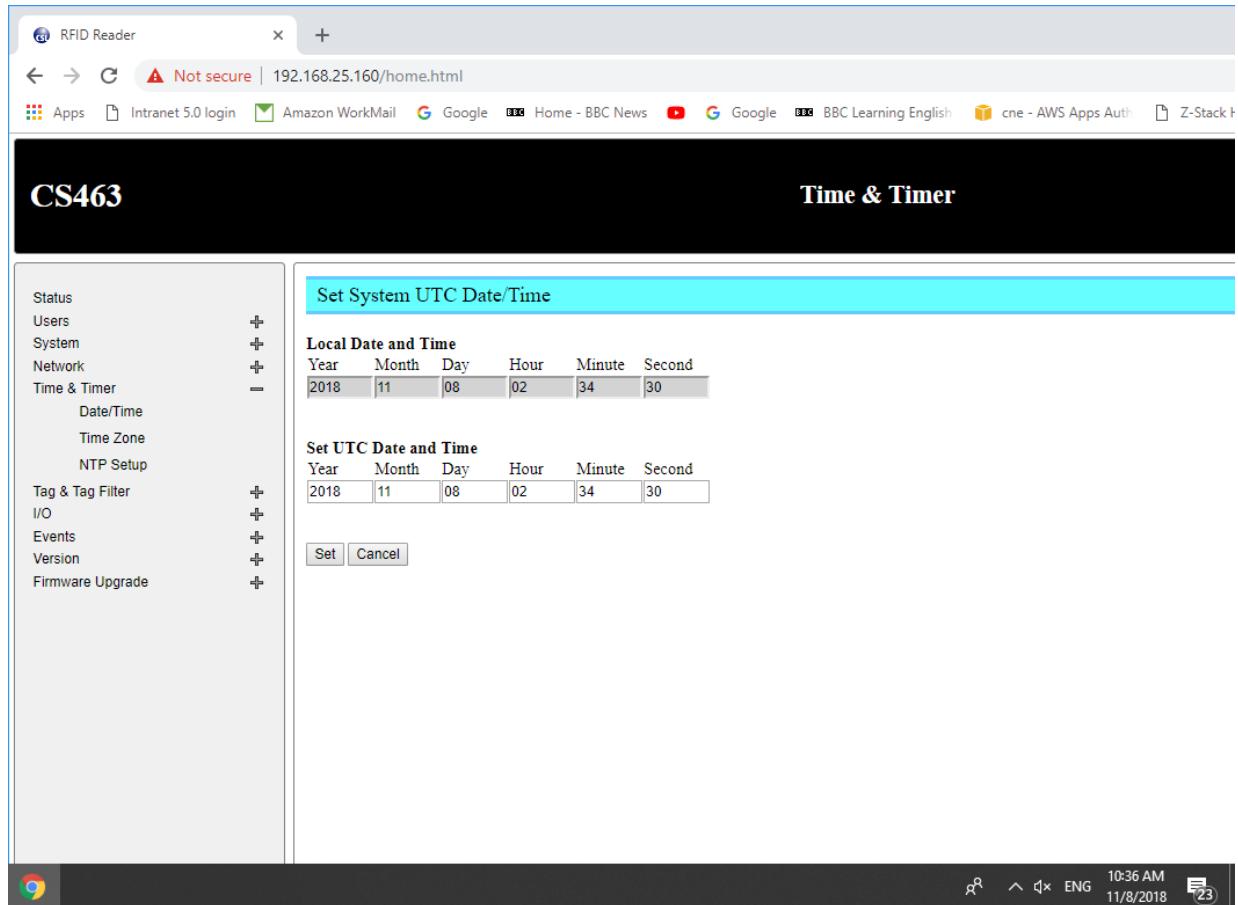
8.6 Time and Timer Setting

Here is the “Time and Timer Setting” submenu:



8.6.1 Date/Time

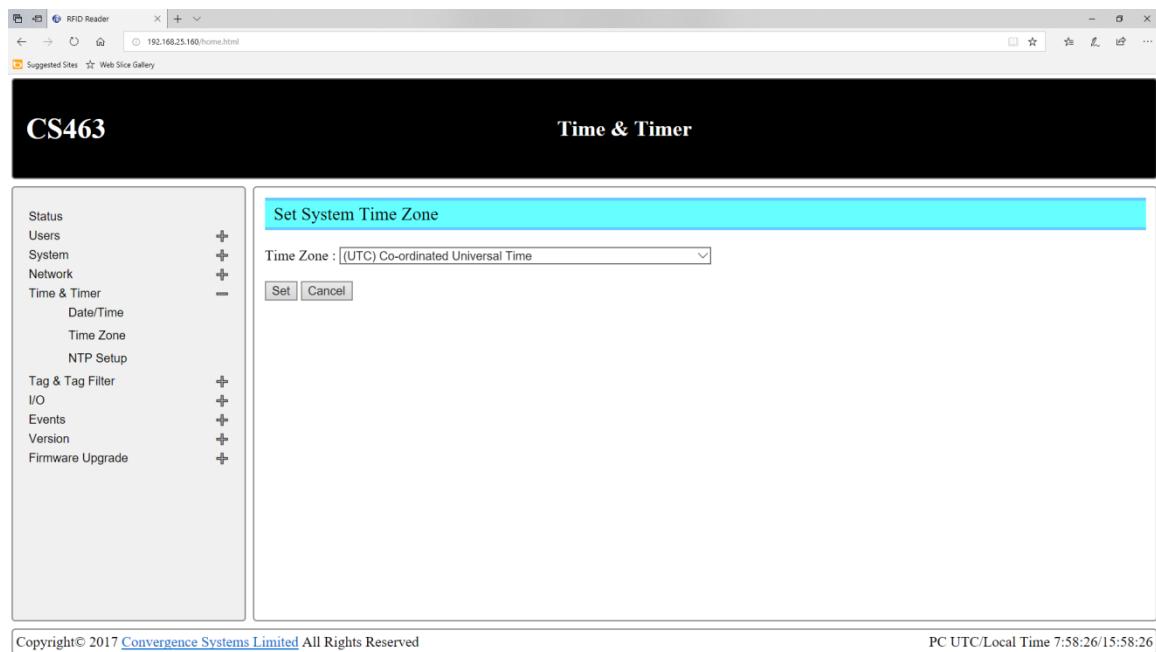
The “Date/Time” page allows the user to set the real time clock inside the reader. Please note that you have to configure the UTC (GMT) time on the reader. The local time will then be calculated based on the time zone you set. Note that for some country they also practice Daylight Savings Time.



Warning: After changing the date and time, the reader may pause reading 30-60 seconds for re-initiation. It is recommended not to open the “Capture Tags Testing” page in “Tag & Tag Filter” for viewing tags in this period.

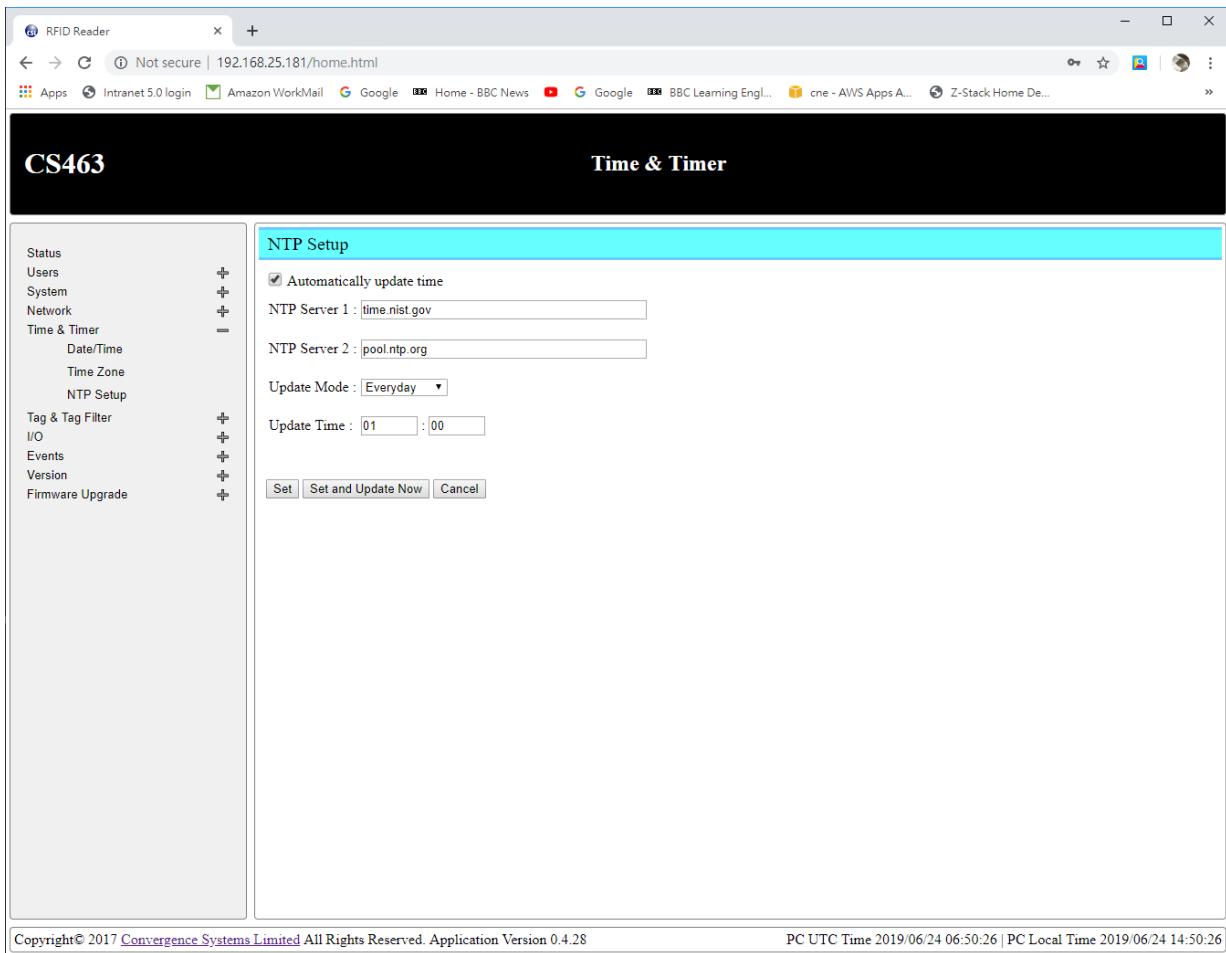
8.6.2 Time Zone

The time zone can be set on this page



8.6.3 NTP Setup

This page allows one to setup the NTP server. The CS463 reader will update its time by connecting to the NTP server at a preset time and preset mode. Be sure to enter the gateway and DNS server in the network configuration page in order for the NTP server be reachable by the reader.



8.7 Tag & Tag Filter

The “Tag & Tag Filter” page allows you to create the Tag group or Tag database which will be used in Tigger page and define filter to be enabled on operation profile. In actual deployment, RFID reader is used to do security screening of incoming or outgoing vehicles/personnel/asset or logistic items. A list of predefined tag IDs can be downloaded to each RFID reader so that the RFID reader will distinguish whether that tag belongs to that list (tag group or tag database). Only when a tag belongs to that group would the RFID reader carries out further action as stipulated by the event – for example open the door.

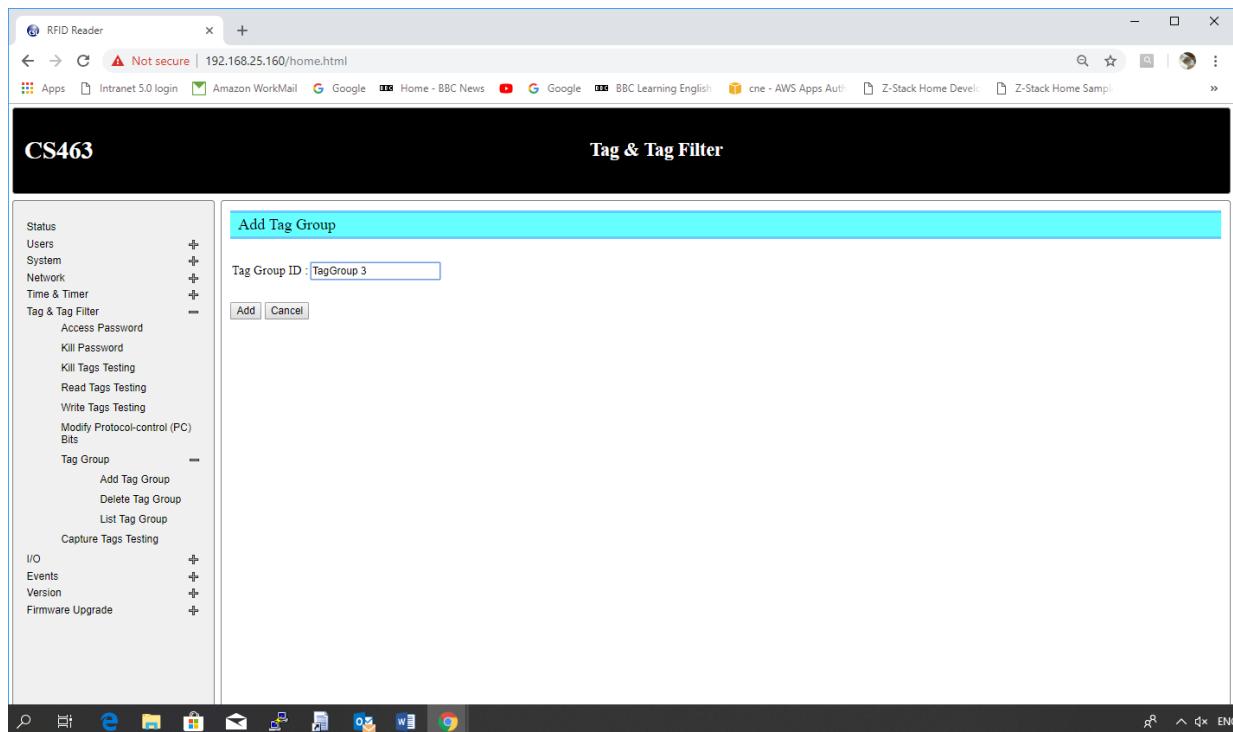
8.7.1 Tag Group

Tags group can be created and download from CS463 reader as follow

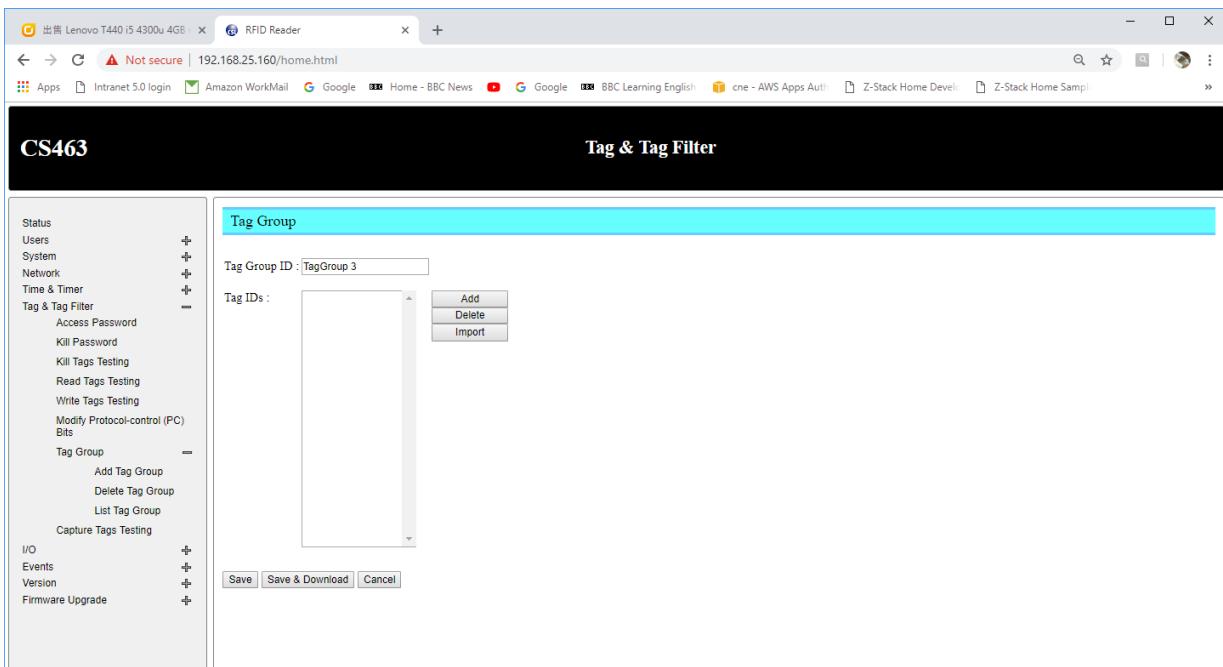
- Add tag group

Go to Tag group in Tag & Tag Filter and click Add Tag Group

Input the new tags group name as below



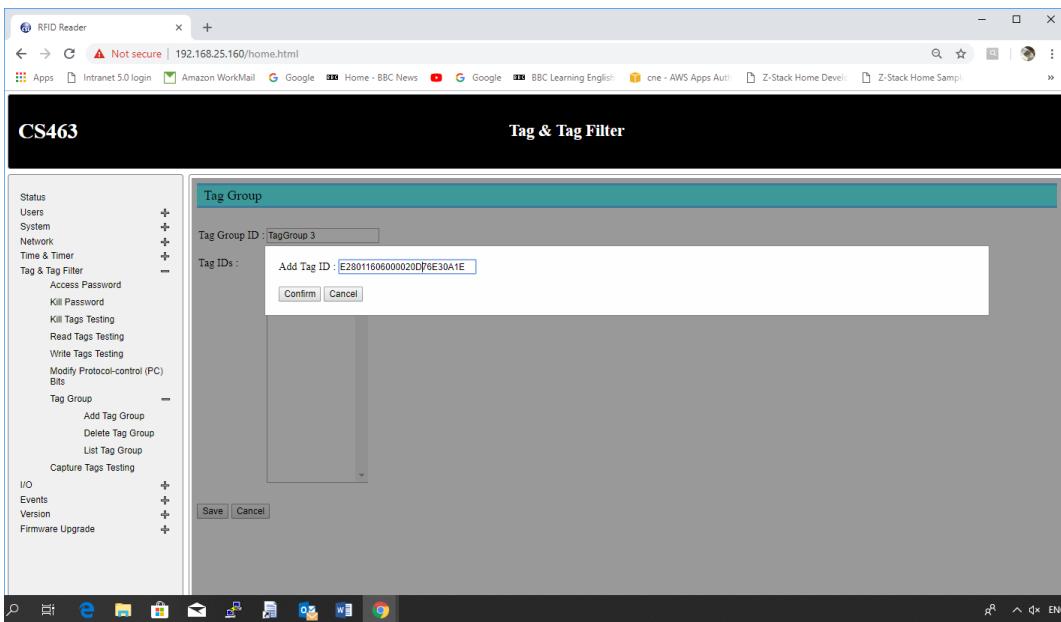
Click Add to confirm the new group



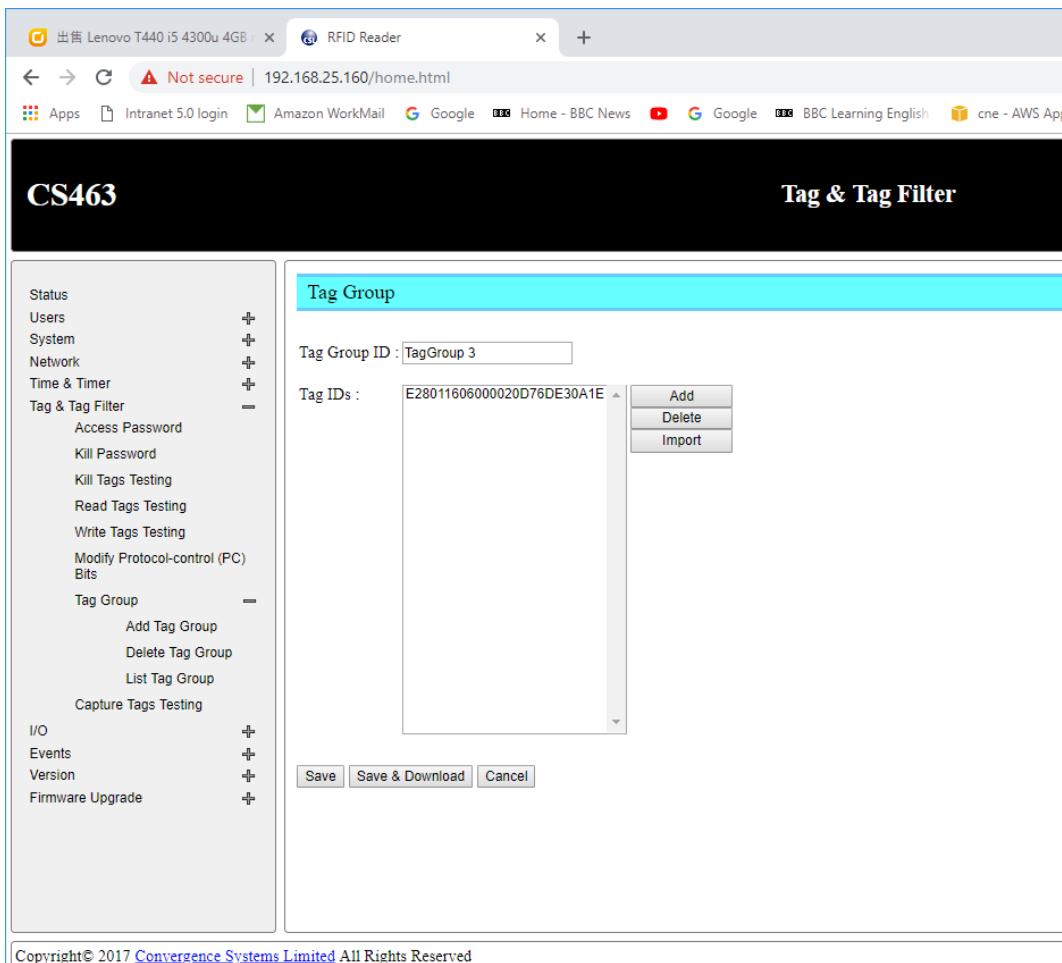
Add Tags to the group

Click Add to add new tags to the group and below menu will pop up

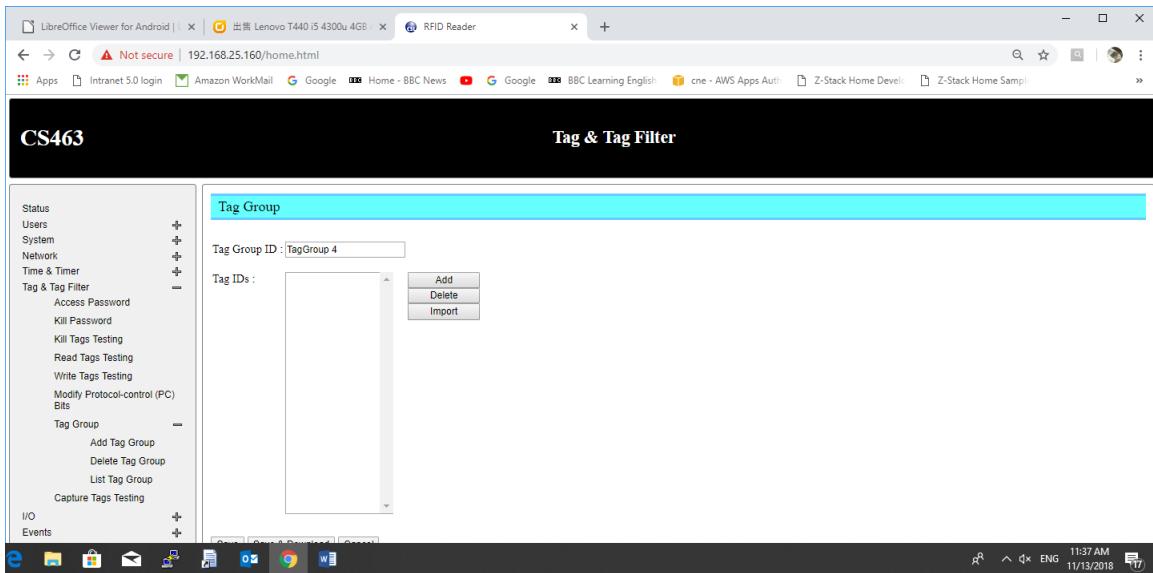
Click confirm the to confirm the addition of new tag to the tag group



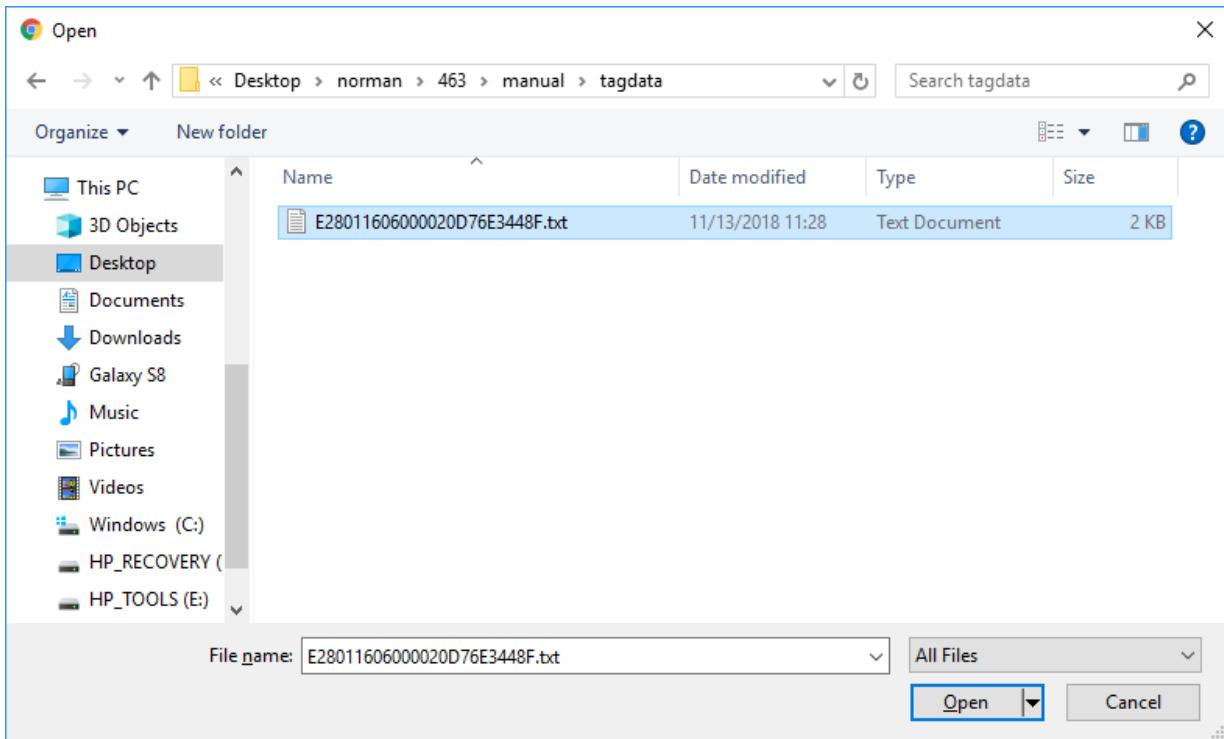
Click Save to save the new tag group



Import New tags



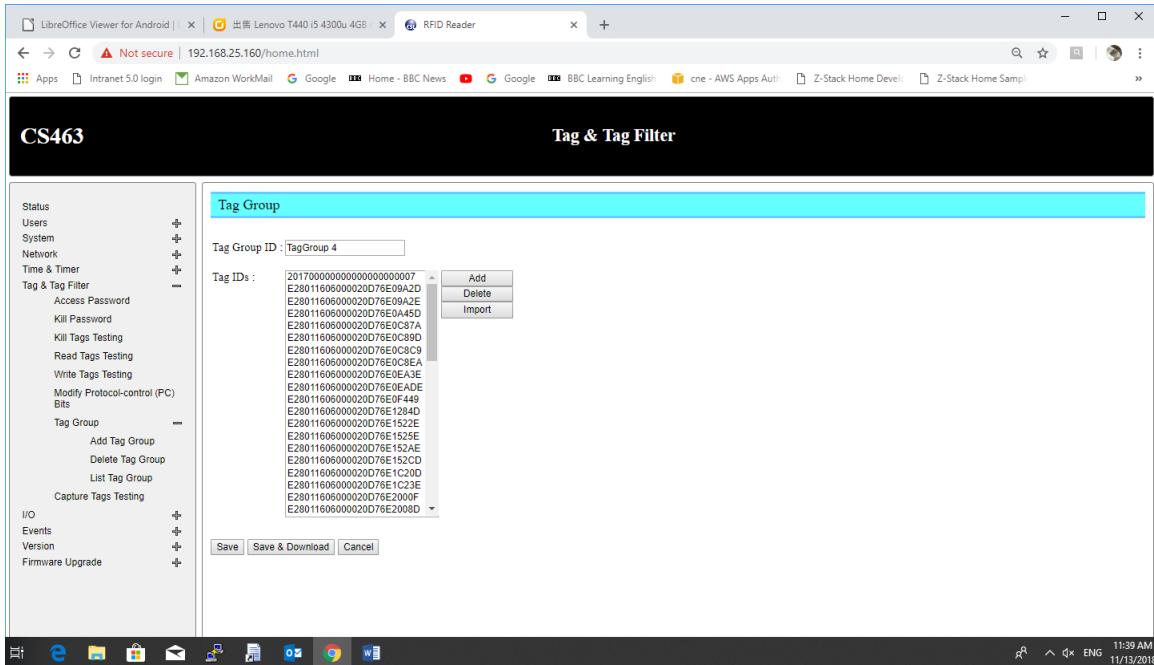
Click Import then select the tags record file



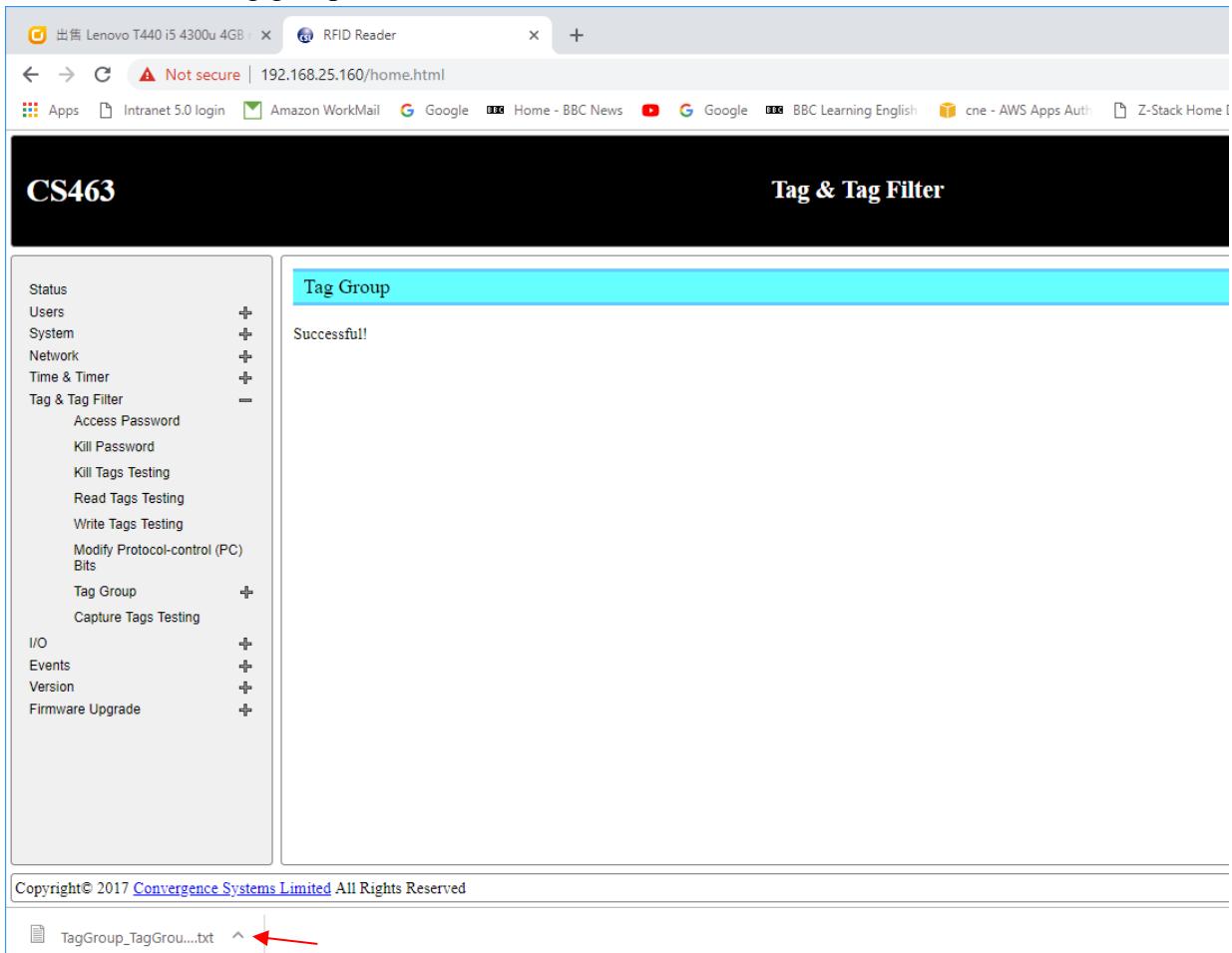
New Tags was added to the window

Click Save to save new record to the tag group

Click Save & Download



All record in the tag group was saved to file as below



8.7.2 Tag Database

Database can be created in reader for user to link tag with database record include basic information such as staff name, number and corresponding photo, then show the record on web page after proper even defined. The detail usage can be found on section 9.6 even Example 4: Example Event using Database Tag Group and Database Display

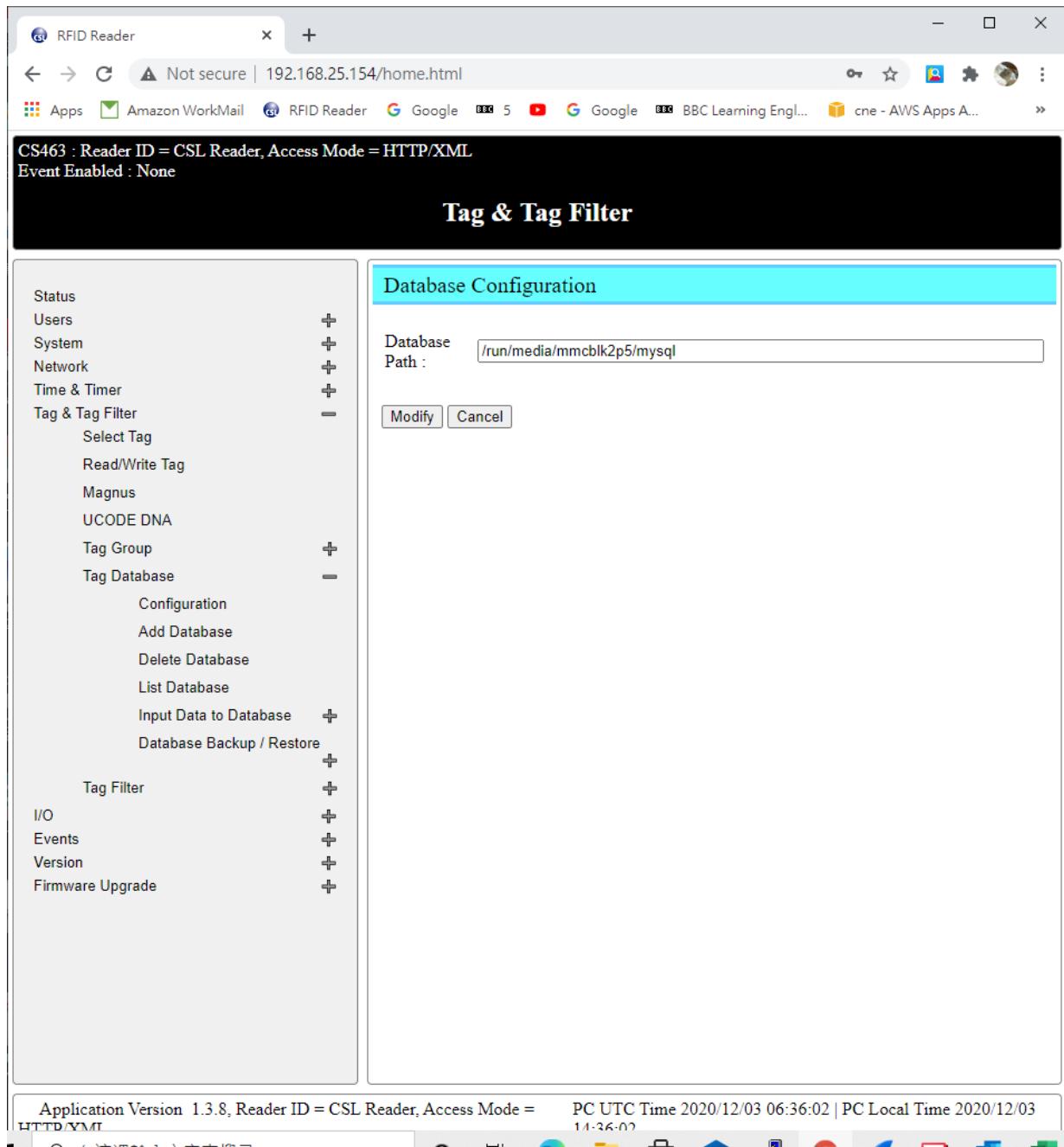
The defined database can be shown on page List Database as below

Tag & Tag Filter

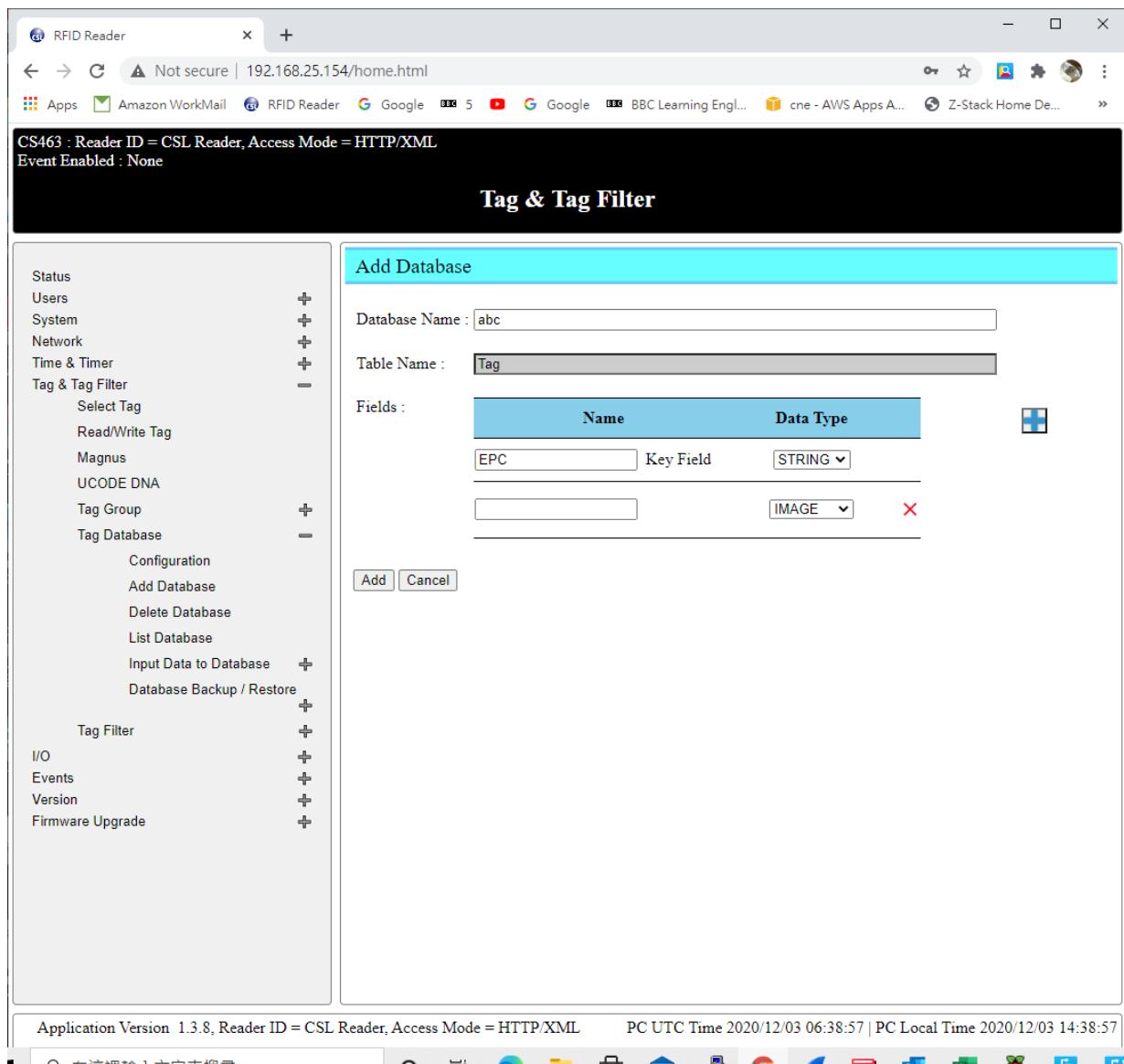
Database Name	Table Name
ExampleDatabase	Tag
CSLReaderDBDemo	Tag

Application Version 1.3.8, Reader ID = CSL Reader, Access Mode = **HTTP/XML** PC UTC Time 2020/12/03 06:31:47 | PC Local Time 2020/12/03 14:31:47

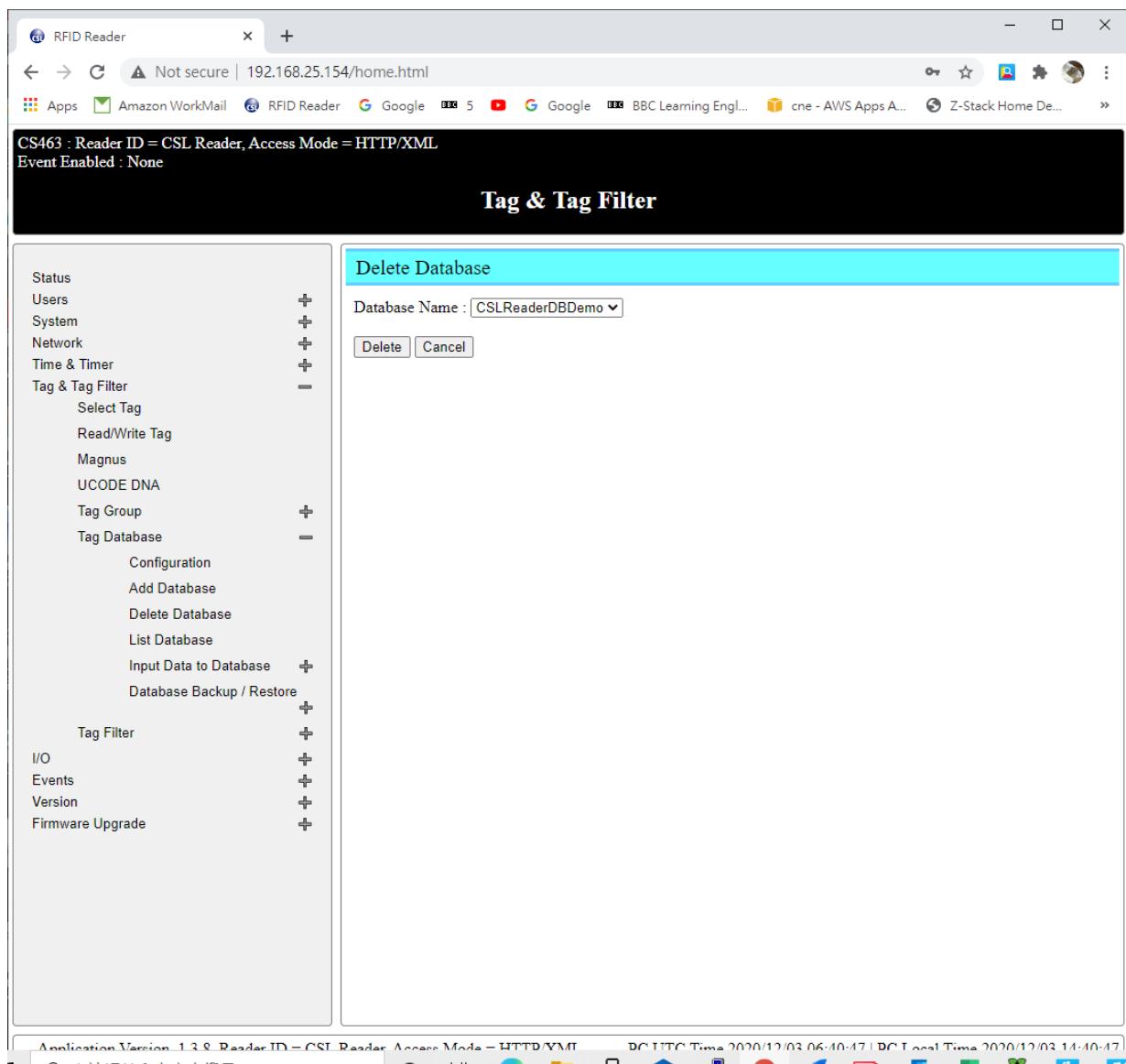
The location of Database in reader can be set on Database Configuration submenu



Database can be added on Add Database submenu as below



Particular Database can be deleted on Delete Database as below



All defined database can be shown on List Database Submenu as below

RFID Reader

Not secure | 192.168.25.154/home.html

CS463 : Reader ID = CSL Reader, Access Mode = HTTP/XML
Event Enabled : None

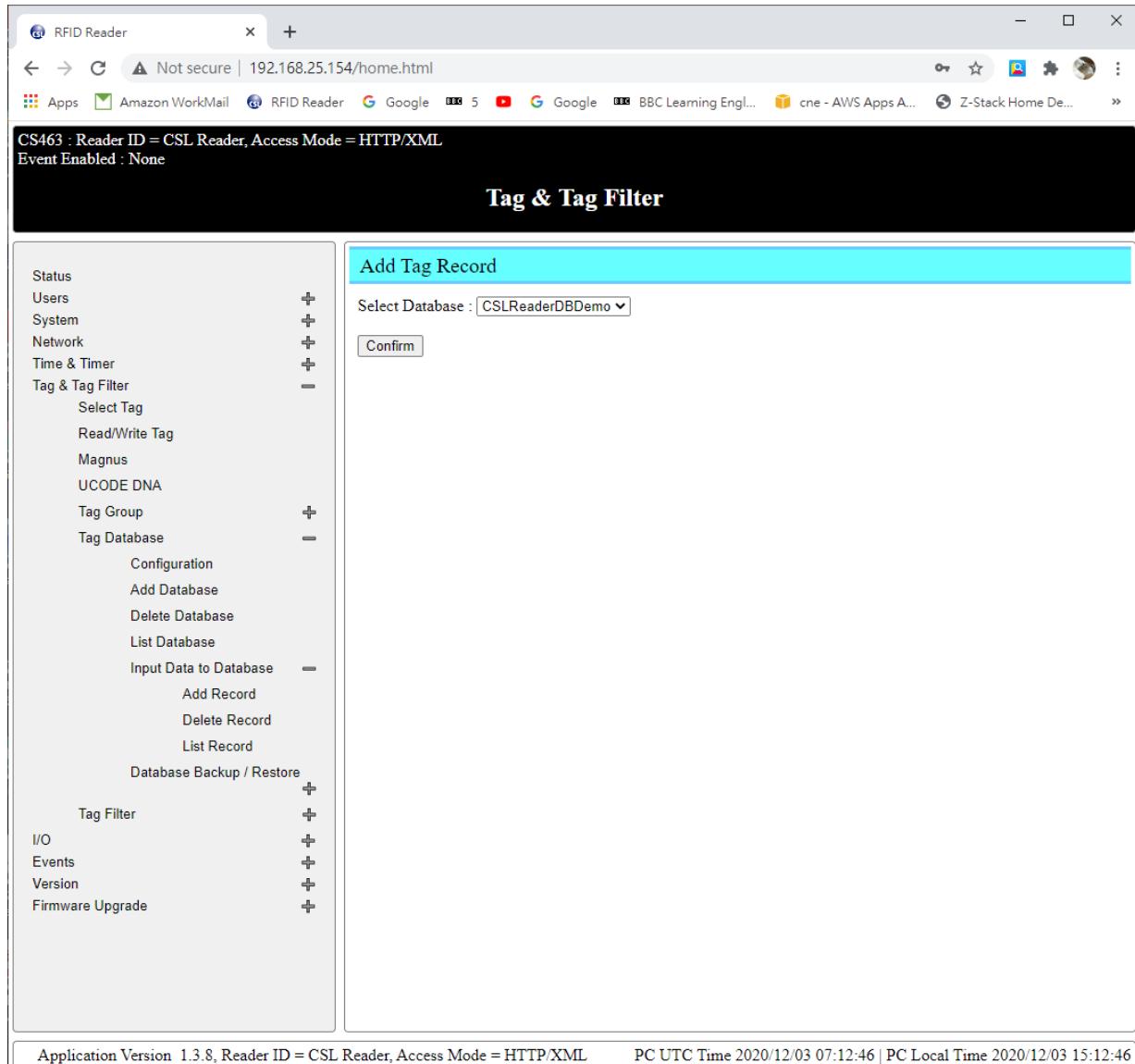
Tag & Tag Filter

Database Table	
Database Name	Table Name
ExampleDatabase	Tag
CSLReaderDBDemo	Tag

Status
Users
System
Network
Time & Timer
Tag & Tag Filter
Select Tag
Read/Write Tag
Magnus
UCODE DNA
Tag Group
Tag Database
Configuration
Add Database
Delete Database
List Database
Input Data to Database
Database Backup / Restore
Tag Filter
I/O
Events
Version
Firmware Upgrade

Application Version 1.3.8 Reader ID = CSL Reader Access Mode = HTTP/XML DC UTC Time 2020/12/03 06:12:32 | DC Local Time 2020/12/03 14:12:32

Tag Record on particular database can be added after choosing right database



The Tag Record content can be load to database in this page

The screenshot shows a web-based application titled "RFID Reader" running on a local IP address (192.168.25.154). The main menu on the left includes options like Status, Users, System, Network, Time & Timer, Tag & Tag Filter, Tag Group, Tag Database, Configuration, Add Database, Delete Database, List Database, Input Data to Database, Add Record, Delete Record, List Record, Database Backup / Restore, Tag Filter, I/O, Events, Version, and Firmware Upgrade. The "Tag & Tag Filter" section is currently selected.

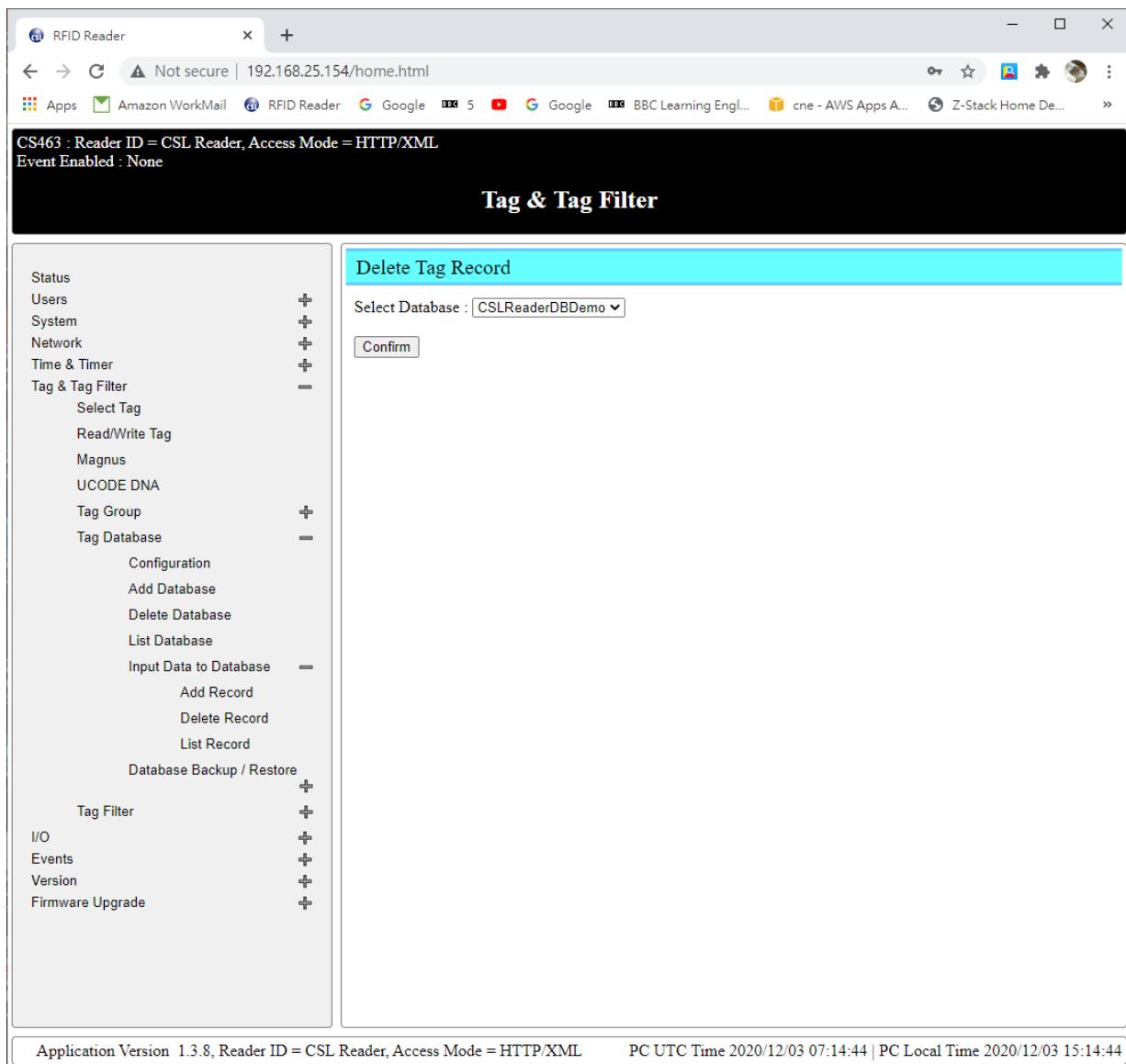
The central panel is titled "Tag & Tag Filter" and contains a sub-form titled "Add Tag Record". The "Add Tag Record" form has the following fields:

- Database Name: CSLReaderDBDemo
- EPC: (Input field)
- ProductId: (Input field)
- ProductName: (Input field)
- ProductPhoto1: (Input field with "Choose Image" button) - Note: Do not use image larger than 1MByte
- ProductPhoto2: (Input field with "Choose Image" button) - Note: Do not use image larger than 1MByte

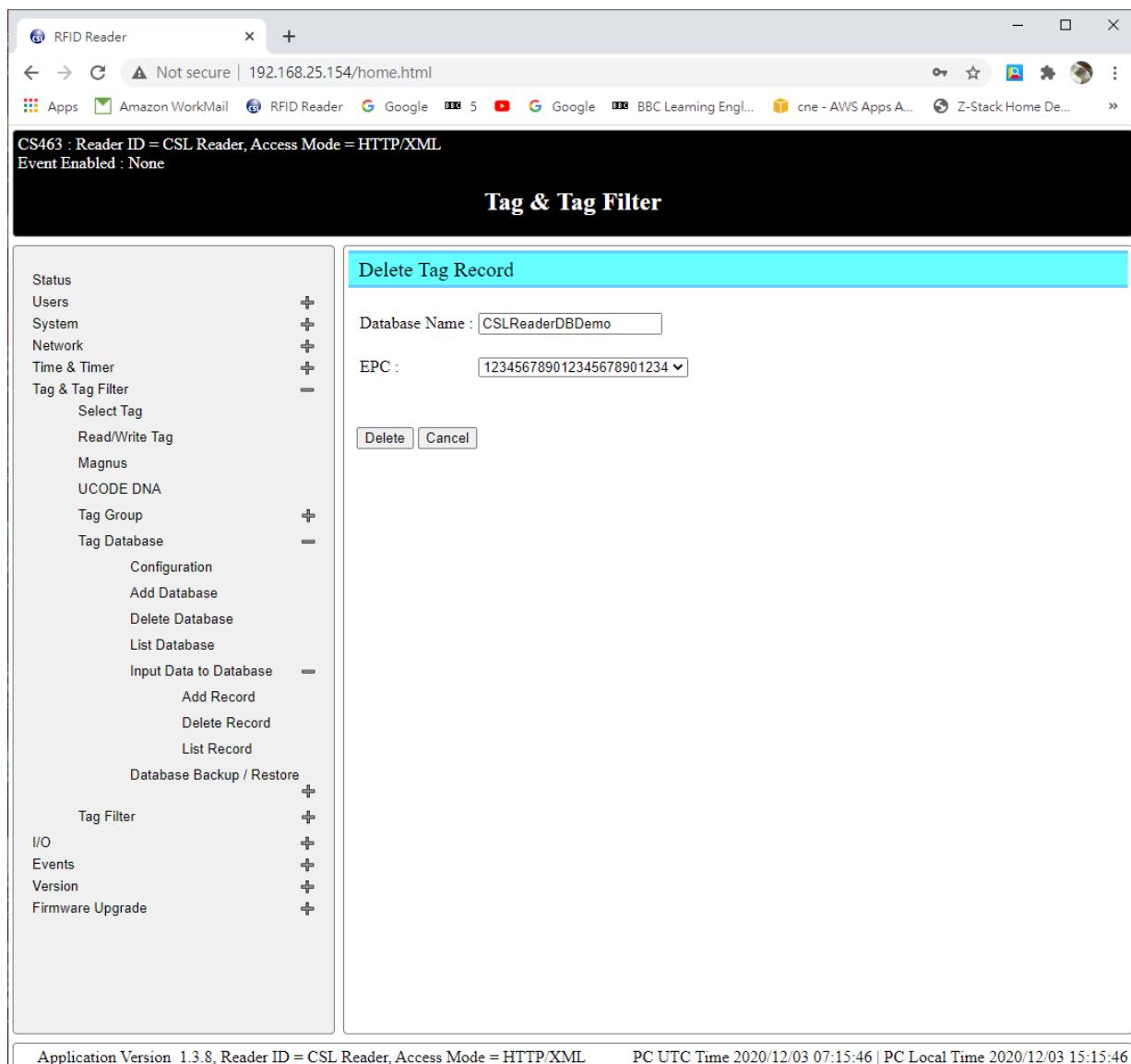
At the bottom of the "Add Tag Record" form are "Add" and "Cancel" buttons.

The status bar at the bottom of the screen displays the application version (1.3.8), reader ID (CSL Reader), access mode (HTTP/XML), PC UTC time (2020/12/03 07:13:19), and PC local time (2020/12/03 15:13:19).

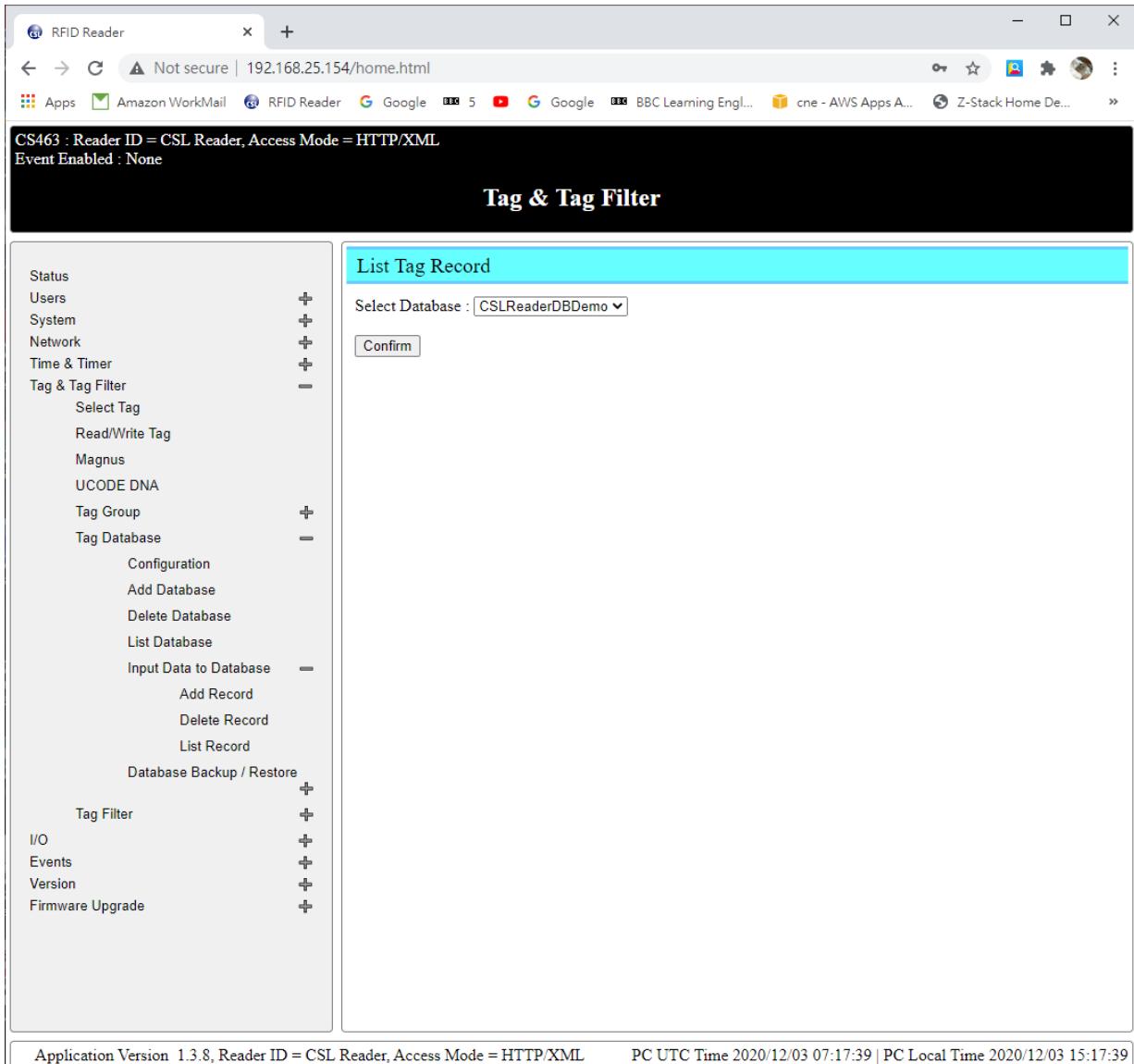
Tag Record on particular database can be deleted after choosing right database



Click Delete to delete particular record on selected Database as shown on below



Tag Record on particular database can be modified on List Tag Record submenu after choosing right database as below



RFID Reader Not secure | 192.168.25.154/home.html

CS463 : Reader ID = CSL Reader, Access Mode = HTTP/XML
Event Enabled : None

Tag & Tag Filter

Status
Users
System
Network
Time & Timer
Tag & Tag Filter
Select Tag
ReadWrite Tag
Magnus
UCODE DNA
Tag Group
Tag Database
Configuration
Add Database
Delete Database
List Database
Input Data to Database
Add Record
Delete Record
List Record
Database Backup / Restore
Tag Filter
I/O
Events
Version
Firmware Upgrade

Tag Record Table

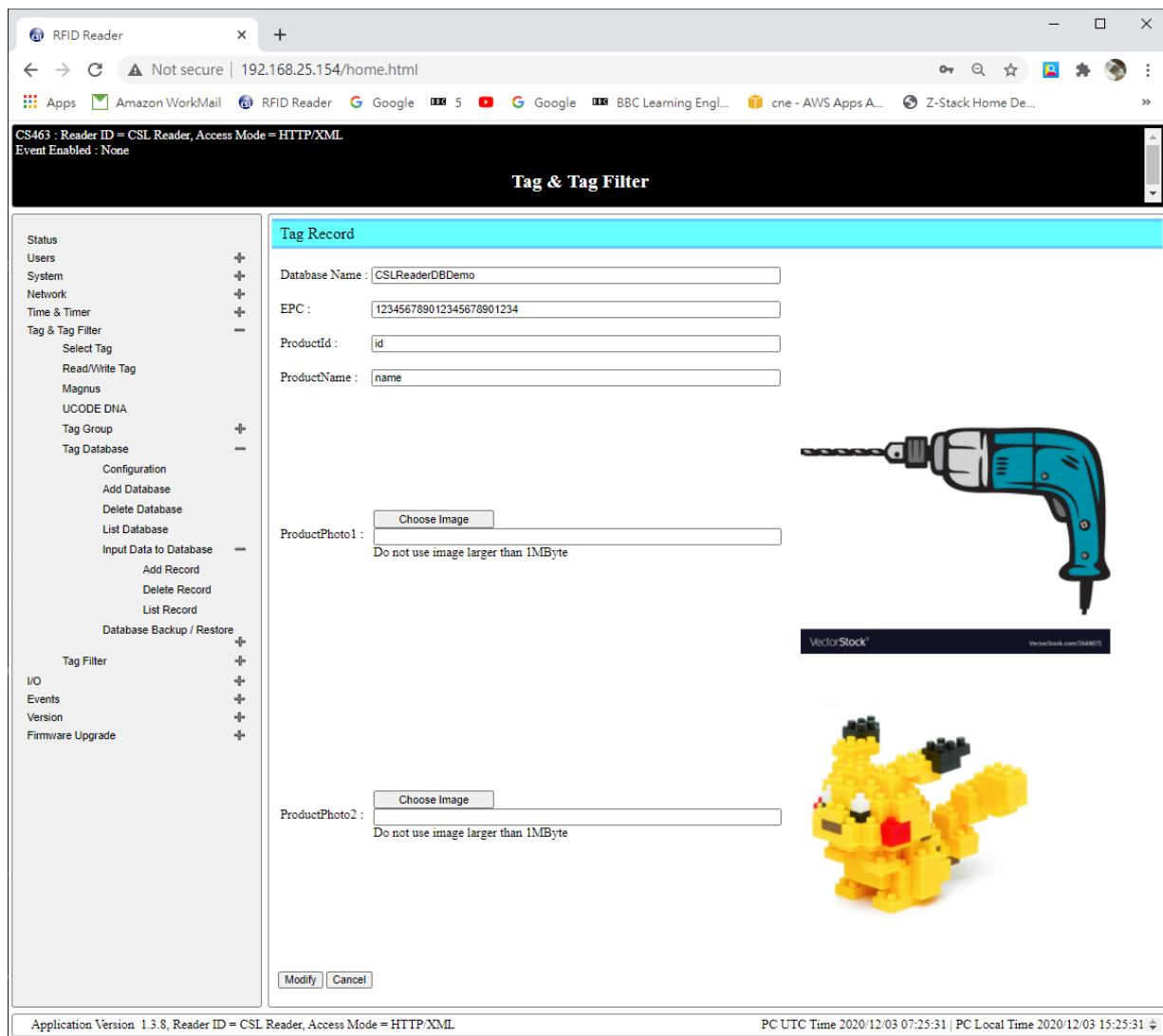
Database Name : CSLReaderDBDemo

EPC	ProductId	ProductName
123456789012345678901234	id	name

Click here to start the modification

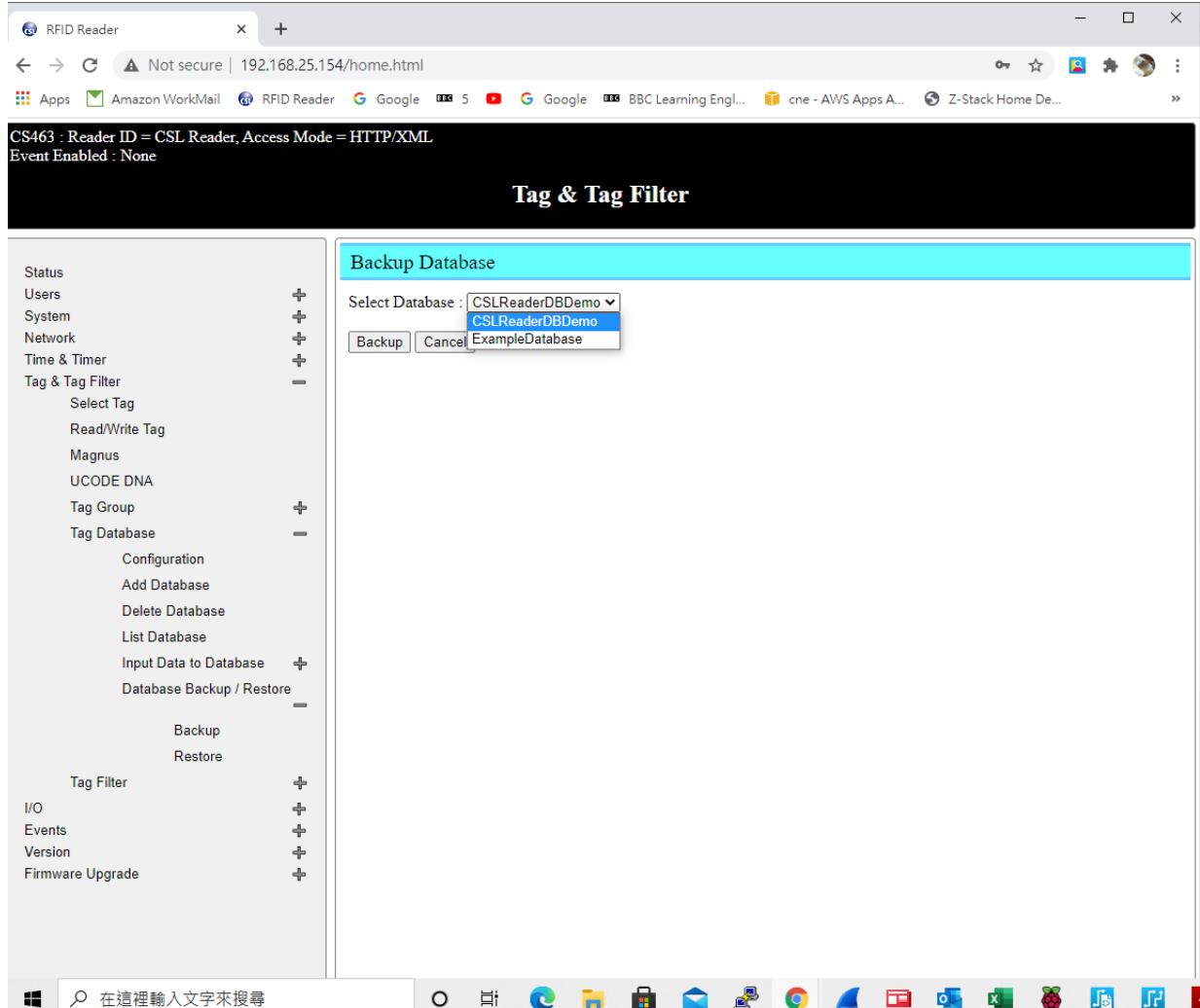
Application Version 1.3.8, Reader ID = CSL Reader, Access Mode = HTTP/XML PC UTC Time 2020/12/03 07:17:56 | PC Local Time 2020/12/03 15:17:56

The content of database on particular record can be modified in this page as below



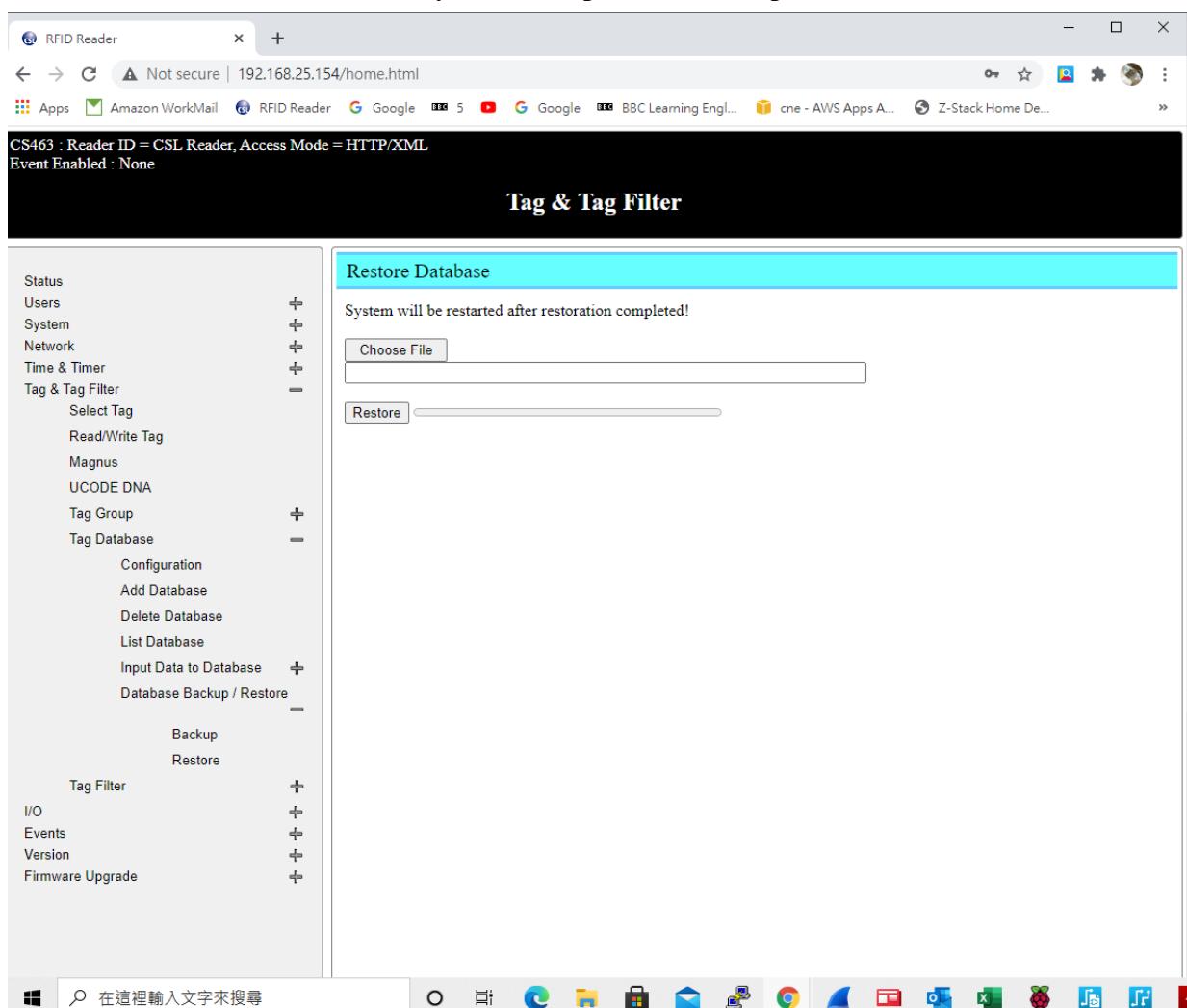
Then click Modify to confirm the modification

Each Database can be backup on Database Backup/Restore submenu as below after choosing target database



Click Backup to start the backup

Particular database can restore to system from previous backup file as below



8.7.3 Tag Filter

The tag filter was used to find particular tags from large population. There are two type of filter can be used include pre filter and post filter. If the pre filter is used, tags not matching filter will not transmit response while post filter reader will filter out all not matching tags after received all tags response.

All defined filter can be found in page List Filter under Tag & Tag Filter page as below

Filter ID	Type	Bank	Mask	Offset (bits)	Pre-Filter Action	Post-Filter Match/Not Match
20201030	PRE_FILTER	EPC (Bank 1)	20201030	0	0	
E2018	PRE_FILTER	EPC (Bank 1)	E2018	0	0	
20201030P	POST_FILTER	EPC (Bank 1)	20201030	0		Match
BBBBBBB04	PRE_FILTER	EPC (Bank 1)	BBBBBBB04	64	2	

Application Version 1.3.20, Reader ID = SeedCS463, Access Mode = HTTP XML PC UTC Time 2021/05/06 08:38:20 | PC Local Time 2021/05/06 16:38:20

Filters can be added in Add Filter as shown below

Add Tag Filter

Filter ID : BBBBBBB04

Type : PRE_FILTER

Bank : EPC (Bank 1)

Mask : BBBBBBB04

Offset (bits) : 0

Action : 0

Action	Tag Matching	Tag Not Matching
0	assert SL or inventoried -> A	deassert SL or inventoried -> B
1	assert SL or inventoried	do nothing
2	do nothing	assert SL or inventoried -> B
3	negate SL or (A -> B, B -> A)	nothing
4	deassert SL or inventoried -> B	inventoried -> A
5	deassert SL or inventoried -> B	do
6	do nothing	
7	do nothing	

Only tag with same character on memory bank beginning with will apply the action

Once any filter was defined here, such filter can be enabled in operation profile then take effect as shown below

The screenshot shows the 'Operation Profile' configuration page. On the left, there's a sidebar with various system settings like Reader ID, Company Label, Capture Point Name, Access Mode, etc. The main area is titled 'Operation Profile'.

Operation Profile Settings:

- Retry: 0
- TagFocus (Impinj Tags Only):
- Fast ID (Impinj Tags Only):
- Query Algorithm: Dynamic Q
- Tag Population: 50 (Q = 6)
- Tag Model: Any
- Multi Bank Inventory:

Extra Bank	Bank	Offset	Count (# of Words)
<input type="checkbox"/> First Extra Bank	Security (Bank 0) <input type="button" value="▼"/>	0	1
<input type="checkbox"/> Second Extra Bank	Security (Bank 0) <input type="button" value="▼"/>	0	1

Incorrect setting would cause no tag return
- Reflected Power Threshold (dBm): 24.0
- Pre-Filter: max. 7 pre-filters (dropdown menu open, showing options: None, 20201030, E2018, BBBB004). A red arrow points from this dropdown to a callout box.
- Post-Filter: Automatic Reconfigure Antenna Port in case of Antenna Port Error:

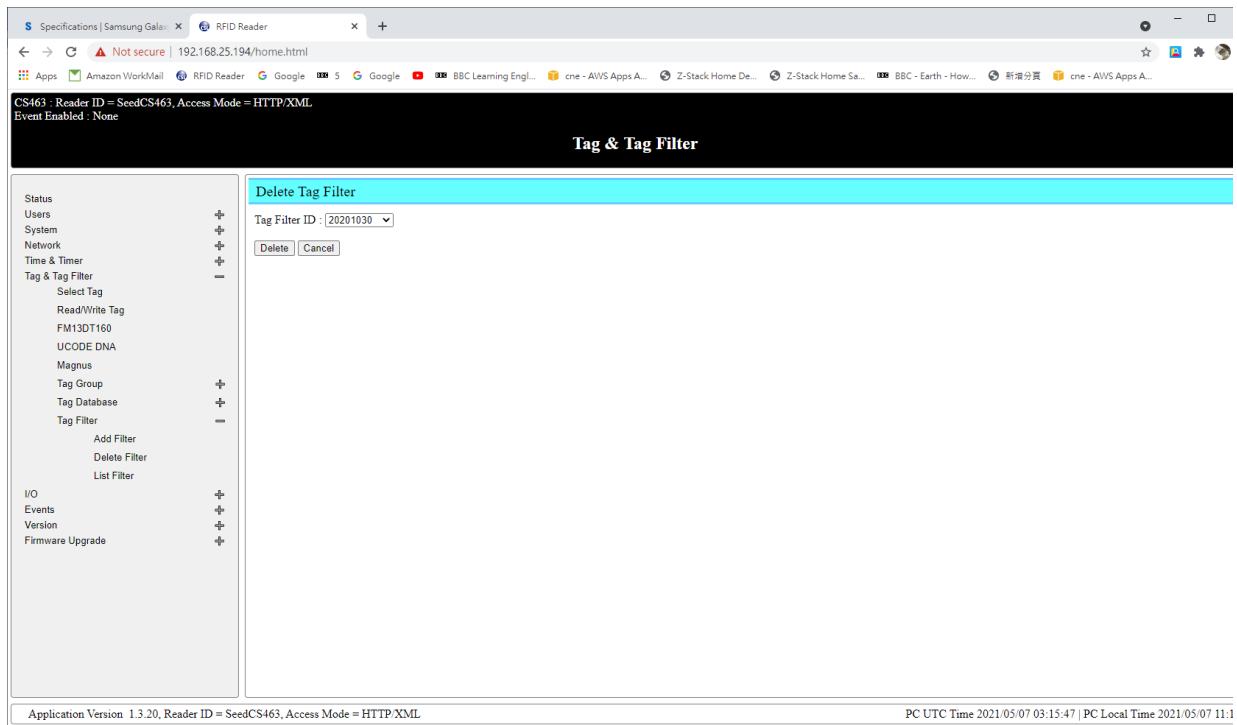
Buttons at the bottom:

- Unlock
- Modify
- Modify & Lock
- Modify & Permalock
- Cancel

At the very bottom, it says: Application Version 1.3.20, Reader ID = SeedCS463, Access Mode = HTTP XML

Choose the filter to
apply from here

Any filter can be deleted from this page



8.8 I/O Management

The “IO Port Testing” page allows users to test functionality of IO port

The screenshot shows a web-based interface titled "CS463". The main content area is titled "Events" and contains a table for "I/O Port Testing". The table has columns for "I/O Port", "State", and "Output Control". The "State" column shows "Low" for Input Ports 1-4 and "Opened" for Output Ports 1-4. The "Output Control" column for Output Ports 1-4 contains "Close" and "Open" buttons. On the left, there is a sidebar with a tree view of system navigation options.

I/O Port	State	Output Control
Input Port 1	Low	
Input Port 2	Low	
Input Port 3	Low	
Input Port 4	Low	
Output Port 1	Opened	<input type="button" value="Close"/> <input type="button" value="Open"/>
Output Port 2	Opened	<input type="button" value="Close"/> <input type="button" value="Open"/>
Output Port 3	Opened	<input type="button" value="Close"/> <input type="button" value="Open"/>
Output Port 4	Opened	<input type="button" value="Close"/> <input type="button" value="Open"/>

Copyright© 2017 [Convergence Systems Limited](#) All Rights Reserved. Application Version 0.5.6 PC UTC Time 2019/09/02 08:42:19 | PC Local Time 2019/09/02 16:42:19

8.8.1 I/O Port Testing

Below is the “IO Port Testing” page, it allows one to look at sensor input (you MUST press the “Refresh” button to update the input state), and control the outputs for system testing.

I/O Port	State	Output Control
Input Port 1	Low	<input type="button" value="Close"/> <input type="button" value="Open"/>
Input Port 2	Low	<input type="button" value="Close"/> <input type="button" value="Open"/>
Input Port 3	Low	<input type="button" value="Close"/> <input type="button" value="Open"/>
Input Port 4	Low	<input type="button" value="Close"/> <input type="button" value="Open"/>
Output Port 1	Opened	<input type="button" value="Close"/> <input type="button" value="Open"/>
Output Port 2	Opened	<input type="button" value="Close"/> <input type="button" value="Open"/>
Output Port 3	Opened	<input type="button" value="Close"/> <input type="button" value="Open"/>
Output Port 4	Opened	<input type="button" value="Close"/> <input type="button" value="Open"/>

8.9 Event Management

Event is the most important part of the reader configuration. By setting it intelligently, one can handle many business applications autonomously with no interactive computation requirements needed from remote server. To create and enable an event, one needs to set up triggers, resultant actions, and then use that to assemble events. Once an event is created, the reader would run according to it continuously, and will continue even if the reader is powered down and up (rebooted). In other words, the reader is running autonomously.

Event Table											
Event ID	Description	Operation Profile	Exclusivity	Tag Duplicate Elimination Window (ms)	Inventory Enabling Trigger	Inventory Enabling Action	Trigger Logic	Resultant Action	Inventory Disabling Trigger	Inventory Disabling Action	Enable
Default Event	Ex Factory Default Event	Default Profile	Non-exclusive	6000	Always On	None	Read Any Tags	None	Never Stop	None	False
Example Event Entrance Boom Barrier Control	Example Profile for Doorway 1 Antenna Port 1	Exclusive	1000	Infrared Sensor GPI Port 1 High	None	Tag from Antenna Port 1 within Registered Tag Group	Turn ON LED on GPO Port 1 AND Open Boom Barrier on GPO Port 3	Infrared Sensor GPI Port 1 High	Close Boom Barrier on GPO Port 3 AND Turn OFF LED on GPO Port 1	False	
Example Event Exit Boom Barrier Control	Example Profile for Doorway 1 Antenna Port 2	Exclusive	1000	Infrared Sensor GPI Port 2 High	None	Tag from Antenna Port 2 within Registered Tag Group	Turn ON LED on GPO Port 2 AND Open Boom Barrier on GPO Port 3	Infrared Sensor GPI Port 2 High	Close Boom Barrier on GPO Port 1 AND Turn OFF LED on GPO Port 2	False	
Example Event Send to CSL Demo Cloud Server	Default Profile	Non-exclusive	60000	Always On	None	Read Any Tags	Send to CSL Demo Cloud	Never Stop	None	False	
Example Event Save to External USB Memory	Default Profile	Non-exclusive	60000	Always On	None	Read Any Tags	Save to External USB Memory	Never Stop	None	False	
Example Tag Database Display	Test Tag Database Profile	Non-exclusive	1000	Always On	None	Tag Within Database Detected	Show on Display Tag Database Record Page	Never Stop	None	False	
Example TCP Send using CSV 2 Format	Default Profile	Non-exclusive	1000	Always On	None	Read Any Tags	Send TCP using CSV 2 Format	Never Stop	None	False	
Example Tags Group Display	display Group Tags	Test Tag Database Profile	Non-exclusive	1000	Always On	None	Tag within Tag Group Detected	Show on Display Tag Group Record Page	Never Stop	None	False
TCP461	Default Profile	Non-exclusive	1000	Always On	None	Read Any Tags	TCP461	Never Stop	None	False	
Operate on Tags from Antenna 1	Default Profile	Non-exclusive	3000	Always On	None	Tag from Antenna Port 1	Turn ON LED on GPO Port 1	Never Stop	None	False	
Tags from Antenna 2	Default Profile	Non-exclusive	3000	Always On	None	Tag from Antenna Port 2	Turn ON LED on GPO Port 2	Never Stop	None	False	
Read Temp	Read Temperature from Magnus S3 Tag	Read Temp Magnus S3	Non-exclusive	600	Always On	None	Read Temp tag	Pulse 2s	Never Stop	None	False
Read Moisture	Read moisture from Magnus S2	Read Moisture S2	Non-exclusive	600	Always On	None	Read S2	None	Never Stop	None	False

8.9.1 Event Management

Here is the “Event management” submenu:

Note that there is ex-factory a “Default Event” running the “Default Profile”. It comes disabled (in the Enable column, it is False). Once you enable it, it will start reading RFID tags from Port 1 (assuming an antenna is connected to Port 1 for model CS463/CS468XJ and there are RFID tags in front of the antenna)

The screenshot shows the 'Events' submenu of the RFID Reader software. The left sidebar lists various menu items under 'Events', including 'Trigger', 'Resultant Action', 'Event Management', and 'Firmware Upgrade'. The 'Event Management' item is currently selected. The main area displays a table titled 'Event Table' with the following columns: Event ID, Description, Operation Profile, Exclusivity, Tag Duplicate Elimination Window (ms), Inventory Enabling Trigger, Inventory Enabling Action, Trigger Logic, Resultant Action, Inventory Disabling Trigger, Inventory Disabling Action, and Enable. The 'Default Event' row is highlighted with a red circle. The table data is as follows:

Event ID	Description	Operation Profile	Exclusivity	Tag Duplicate Elimination Window (ms)	Inventory Enabling Trigger	Inventory Enabling Action	Trigger Logic	Resultant Action	Inventory Disabling Trigger	Inventory Disabling Action	Enable
Default Event	Ex Factory Default Event	Default Profile	Non-exclusive	6000	Always On	None	Read Any Tags	None	Never Stop	None	False
Example Event Entrance Boom Barrier Control	Example Profile for Doorway 1 Antenna Port 1	Default Profile	Exclusive	1000	Infrared Sensor GPIO Port 1 High	None	Tag from Antenna Port 1 within Registered Tag Group	Turn ON LED on GPO Port 1 AND Open Boom Barrier on GPO Port 3	Infrared Sensor GPIO Port 2 High	Close Boom Barrier on GPO Port 3 AND Turn OFF LED on GPO Port 1	False
Example Event Exit Boom Barrier Control	Example Profile for Doorway 1 Antenna Port 2	Default Profile	Exclusive	1000	Infrared Sensor GPIO Port 2 High	None	Tag from Antenna Port 2 within Registered Tag Group	Turn ON LED on GPO Port 2 AND Open Boom Barrier on GPO Port 3	Infrared Sensor GPIO Port 1 High	Close Boom Barrier on GPO Port 2 AND Turn OFF LED on GPO Port 2	False
Example Event Send to CSL Demo Cloud Server		Default Profile	Non-exclusive	60000	Always On	None	Read Any Tags	Send to CSL Demo Cloud	Never Stop	None	False
Example Event Save to External USB Memory		Default Profile	Non-exclusive	60000	Always On	None	Read Any Tags	Save to External USB Memory	Never Stop	None	False
Example Tag Database Display	Test Database	Default Profile	Non-exclusive	1000	Always On	None	Tag Within Database Detected	Show on Display Tag Database Record Page	Never Stop	None	False
Example TCP Send using CSV 2 Format		Default Profile	Non-exclusive	1000	Always On	None	Read Any Tags	Send TCP using CSV 2 Format	Never Stop	None	False
Example Tags Group Display	display Group Tags	Test Tag Data Profile	Non-exclusive	1000	Always On	None	Tag within Tag Group Detected	Show on Display Tag Group Record Page	Never Stop	None	False
TCP461		Default Profile	Non-exclusive	1000	Always On	None	Read Any Tags	TCP461	Never Stop	None	False
Operate on Tags from Antenna_1		Default Profile	Non-exclusive	1000	Always On	None	Tag from Antenna Port 1	Turn ON LED on GPO Port 1	Never Stop	None	False
Tags from Ant_2		Default Profile	Non-exclusive	1000	Always On	None	Tag from Antenna Port 2	Turn ON LED on GPO Port 2	Never Stop	None	False
Read Temp	Read Temperature from Maemos S3	Read Temp Magnus	Non-exclusive	60	Always On	Temp tag	Pulse 2s	Never Stop	None	False	

Application Version 1.3.11, Reader ID = CSL Reader, Access Mode = HTTP/XML. PC UTC Time 2020/12/23 06:35:21 | PC Local Time 2020/12/23 14:35:21

Here is the Default

Event

Add Event

Below is the “Add Event” page:

The screenshot shows the 'Add Event' page in the CS463 software. The left sidebar has a tree view with nodes like Status, Users, System, Network, Time & Timer, Tag & Tag Filter, I/O, Events (selected), Trigger, Resultant Action, Event Management (selected), Add Event (under Events), Delete Event, List Event, Tag Inventory, Version, and Firmware Upgrade. The main area is titled 'Add Event' and contains the following fields:

- Event ID: Example Event
- Description: (empty input field)
- Operation Profile: Default Profile
- Exclusivity: Non-exclusive
- Tag Duplicate Elimination Window: 60000 ms
- Inventory Enabling Trigger: Always On
- Inventory Enabling Action: None AND None
- Trigger Logic: Read Any Tags
- Resultant Action: None AND None
- Inventory Disabling Trigger: Never Stop
- Inventory Disabling Action: None AND None
- Enable Event: (checkbox)

At the bottom are buttons for Add, Add & Lock, Add & Permalock, and Cancel.

One has to input a name for each event.

One should select the operation profile for the event. This operation profile is defined in the “System” page “Operation Profile” submenu.

The Inventory Enabling Trigger is the initial trigger that turns on the RF power of the reader to start doing inventory. This trigger can be set to “Always On” and then the reader will do inventory the moment the reader is powered on. Note that this trigger has to be defined in the Trigger page. Note that if one wants the reader to be always on, simply choose “Always On” in the Inventory Enabling Trigger entry.

The Inventory Enabling Action is the action that accompanies an inventory enabling trigger. For example, one may want to turn on a signal light when the inventory has started.

Once the inventory enabling cycle is entered, then the event engine would look for actual event triggers, and these triggers can be Boolean operated together as defined in the entry “Trigger Logic”. The Trigger Logic is a Boolean combination of triggers that are defined in the “Trigger” page which will be described later.

When the Trigger Logic is satisfied, the event is established, and the resultant actions are defined in “Resultant Action” section. Again it can be a combination, sequential (THEN) or (AND), of actions.

The overall inventory enabling cycle is ended based on the triggers defined in “Inventory Disabling Trigger” section. Sometimes this can be another Infrared sensor at the exit of the reader read zone, or it can be defined as a period of time of no tag reads. If the user wants the reader to be always reading tags, then the selection “Never Stop” should be chosen here.

The Inventory Disabling Action is the action that accompanies the inventory disabling trigger. For example, one may want to turn off a signal light (that was turned on due to an inventory enabling action as described before) when the inventory is stopped.

Modify Event

To modify event, go to “List Event” page and select the “Event ID”, modify the event and click “Modify”.

The screenshot shows the CS463 software interface with the title bar "RFID Reader" and the URL "192.168.25.181/home.html". The main window is titled "Events". On the left, there is a navigation tree with categories like Status, Users, System, Network, Time & Timer, Tag & Tag Filter, I/O, Events (which is expanded to show Trigger, Resultant Action, and Event Management), Tag Inventory, Version, and Firmware Upgrade. The "Events" section under "Events" is selected. The right side of the window contains a form for configuring an event. The fields include:

- Event ID: Default Event
- Description: Ex Factory Default Event
- Operation Profile: Default Profile
- Exclusivity: Non-exclusive
- Tag Duplicate Elimination Window: 10000 ms
- Inventory Enabling Trigger: Always On
- Inventory Enabling Action: None | THEN | None
- Trigger Logic: Read Any Tags
- Resultant Action: None | THEN | None
- Inventory Disabling Trigger: Never Stop
- Inventory Disabling Action: None | THEN | None
- Event Enabled:

At the bottom of the form, there are five buttons: "Unlock", "Modify", "Modify & Lock", "Modify & Permalock", and "Cancel". A red arrow points to the "Modify" button.

Copyright© 2017 [Convergence Systems Limited](#) All Rights Reserved. Application Version 0.4.28 PC UTC Time 2019/06/24 07:33:04 | PC Local Time 2019/06/24 15:33:04

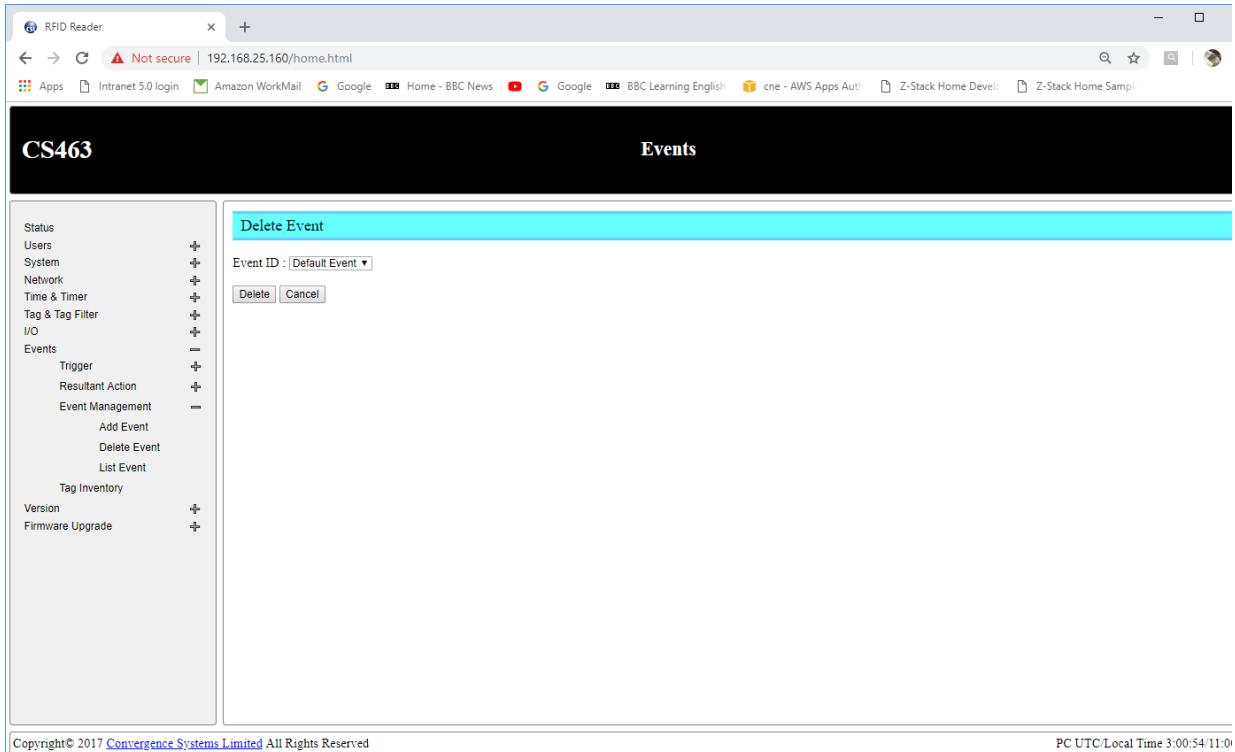
Enable/Disable Event

To enable/disable event, select/de-select the checkbox “Enable Event” and click “Modify”.

The screenshot shows the CS463 software interface with the title bar "RFID Reader" and the URL "192.168.25.160/home.html". The main window is titled "Events". On the left, there is a navigation tree with nodes like Status, Users, System, Network, Time & Timer, Tag & Tag Filter, I/O, Events (Trigger, Resultant Action, Event Management), Tag Inventory, Version, and Firmware Upgrade. The "Event Management" node is expanded, showing "Add Event", "Delete Event", and "List Event". The "Add Event" page is currently active, showing fields for Event ID (Default Event), Description (empty), Operation Profile (Default Profile), Exclusivity (Non-exclusive), Tag Duplicate Elimination Window (60000 ms), Inventory Enabling Trigger (Always On), Inventory Enabling Action (None), Trigger Logic (Any Tags), Resultant Action 1 (None), Then Resultant Action 2 (None), Inventory Disabling Trigger (Never Stop), Inventory Disabling Action (None), and an "Enable Event" checkbox. A red arrow points to the "Enable Event" checkbox. At the bottom of the page are "Modify" and "Cancel" buttons. The footer of the browser window shows "Copyright© 2017 Convergence Systems Limited All Rights Reserved" and "PC UTC/Local Time 2:58:24/10:5".

Delete Event

To delete event, select the “Event ID” and click “Delete”.



List Event

Below is the “List Event” page:

The screenshot shows the 'Events' section of the RFID Reader application. On the left, there is a sidebar with various navigation links such as Status, Users, System, Network, Time & Timer, Tag & Tag Filter, I/O, Events, Trigger, Resultant Action, Event Management, Add Event, Delete Event, List Event, Display Format, Tag Inventory, Version, and Firmware Upgrade. The 'Events' link is currently selected. The main area displays a table titled 'Event Table' with the following data:

Event ID	Description	Operation Profile	Exclusivity	Tag Duplicate Elimination Window (ms)	Inventory Enabling Trigger	Inventory Enabling Action	Trigger Logic	Resultant Action	Inventory Disabling Trigger	Inventory Disabling Action	Enable
Default Event	Ex Factory Default Event	Default Profile	Non-exclusive	6000	Always On	None	Read Any Tags	None	Never Stop	None	False
Example Event Entrance Boom Barrier Control	Example Profile for Doorway 1 Antenna Port 1	Exclusive	1000	Infrared Sensor GPIO Port 1 High	None	Tag from Antenna Port 1 within Registered Tag Group	Turn ON LED on GPO Port 1 AND Open Boom Barrier on GPO Port 3	Infrared Sensor GPIO Port 2 High	Close Boom Barrier on GPO Port 3 AND Turn OFF LED on GPO Port 1	False	
Example Event Exit Boom Barrier Control	Example Profile for Doorway 1 Antenna Port 2	Exclusive	1000	Infrared Sensor GPIO Port 2 High	None	Tag from Antenna Port 2 within Registered Tag Group	Turn ON LED on GPO Port 2 AND Open Boom Barrier on GPO Port 3	Infrared Sensor GPIO Port 1 High	Close Boom Barrier on GPO Port 3 AND Turn OFF LED on GPO Port 2	False	
Example Event Send to CSL Demo Cloud Server	Default Profile	Non-exclusive	60000	Always On	None	Read Any Tags	Send to CSL Demo Cloud	Never Stop	None	False	
Example Event Save to External USB Memory	Default Profile	Non-exclusive	60000	Always On	None	Read Any Tags	Save to External USB Memory	Never Stop	None	False	
Example Tag Database Display	Test Tag Database Profile	Non-exclusive	1000	Always On	None	Tag Within Database Detected	Show on Display Tag Database Record Page	Never Stop	None	False	
Example TCP Send using CSV 2 Format	Default Profile	Non-exclusive	1000	Always On	None	Read Any Tags	Send TCP using CSV 2 Format	Never Stop	None	False	
Example Tags Group Display	display Group Tags	Test Tag Database Profile	Non-exclusive	1000	Always On	None	Tag within Tag Group Detected	Show on Display Tag Group Record Page	Never Stop	None	False
TCP461	Default Profile	Non-exclusive	1000	Always On	None	Read Any Tags	TCP461	Never Stop	None	False	
Operate on Tags from Antenna 1	Default Profile	Non-exclusive	3000	Always On	None	Tag from Antenna Port 1	Turn ON LED on GPO Port 1	Never Stop	None	False	
Tags from ant 2	Default Profile Antenna Port 2	Non-exclusive	3000	Always On	None	Tag from Antenna Port 2	Turn ON LED on GPO Port 2	Never Stop	None	False	
Read Temp	Read Temperature from Maemus S3	Read Temp Magnus	Non-exclusive	600	Always On	None	Read Temp tag	Pulse 2s	Never Stop	None	False

Application Version 1.3.11, Reader ID = CSL Reader, Access Mode = HTTP/XML

PC UTC Time 2020/12/23 06:35:21 | PC Local Time 2020/12/23 14:35:21

8.9.2 Trigger

A trigger is a stimulus that causes the reader to recognize it and do something about it.

The trigger is used in Inventory Enabling, Inventory Disabling, and of course inside the actual Event Triggering Logic section. Below is the “Trigger” submenu:

Trigger ID	Description	Trigger Mode
Read Any Tags		Read Any Tags (any ID, 1 trigger per tag)
Port 1 Level High Trigger		Input Sensor State
Read Tags Every 10 Seconds	Time Elapsed Type Trigger	Specified Time Span elapsed
Infrared Sensor GPI Port 1 High		Input Sensor State
Infrared Sensor GPI Port 2 High		Input Sensor State
Tag within Tag Group Detected		Trigger in Tag Group
Read Any Tags bigger than -60 dBm		Trigger if RSSI larger than or equal to
Tag Within Database Detected		Trigger in Tag Database
Tag in Default DB		Trigger in Tag Database
Tag from Antenna Port 1	Tag group1 from ant 1	Trigger in Tag Group
Tag from Antenna Port 2	Tag group2 from Ant 2	Trigger in Tag Group
Read Temp tag	Read Temp tag	Trigger if Temperature is larger than or equal to
Read S2	Moisture Measure	Trigger if Moisture is larger than or equal to
cteaus		Trigger if Temperature is larger than or equal to
Tag from Antenna Port 1 within Registered Tag Group		Trigger in Tag Group
Tag from Antenna Port 2 within Registered Tag Group		Read Any Tags (any ID, 1 trigger per tag)

Add Trigger

Below is the “Add Trigger” page:

There are many different types of trigger as follows:

The screenshot shows the 'Events' section of the RFID Reader software. On the left, there is a sidebar with various menu items like Status, Users, System, Network, Time & Timer, Tag & Tag Filter, I/O, Events (which is currently selected), Resultant Action, Event Management, Display Format, Tag Inventory, Version, and Firmware Upgrade. The main area is titled 'Events' and contains a sub-section 'Add Trigger'. The 'Trigger Mode' dropdown is set to 'Read Any Tags (any ID, 1 trigger per tag)'. A tooltip or dropdown menu is open over this field, listing several other trigger modes: Input Sensor State, No Tag Read in Specified Time Span, Trigger in Tag Group, Trigger in Tag Database, Trigger if RSSI larger than or equal to, Trigger if Moisture is larger than or equal to, Trigger if Temperature is larger than or equal to, Trigger if Temperature is less than or equal to, and Specified Time Span elapsed.

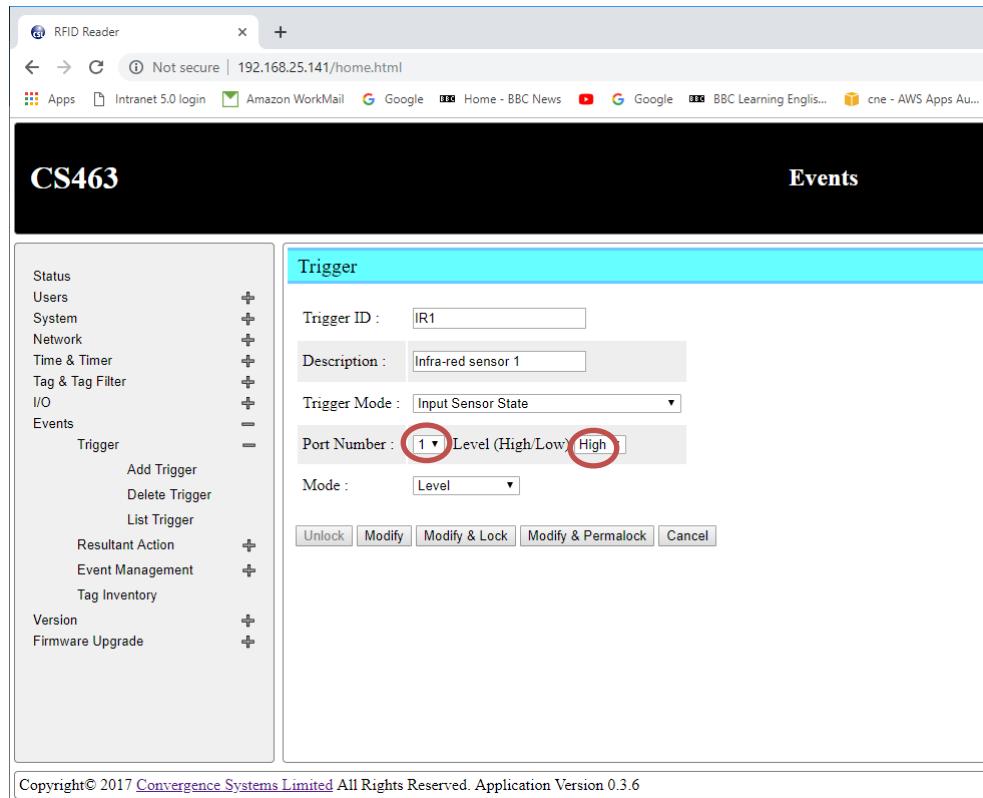
1. “Read Any Tags (any ID, 1 trigger per tag)” would look at tags coming in to the four antenna ports (or capture points), the ones being ticked here would be selected, and will generate 1 trigger per tag (different ID) notification. By selecting which antenna port one can then select tags read by specific antennas to trigger an event. Note that in Time Windowed Mode there is a duplicate elimination action within each time window, and for the same ID within that window, it will only be recorded once into the buffer – unless the box called “Antenna Differentiation” in the Event Management page is ticked, in that case the same tag read by different antennas will generate different triggers. Hence for each different ID within that duplicate elimination time it will generate an event.
2. “Input Sensor State” would look at the state (high or low) of one of the general purpose IO input.
3. “No Tag Read in Specified Time Span” would check if for a specified time read, no tag passes through the reader read zone.
4. “Trigger in Tag Group” would check if any tag is within a pre-defined tag group .
5. “Trigger if RSSI larger than or equal to” would check if read tag Rssi is larger or equal to defined value
6. “Specified Time Span elapsed”.

For “read any tags” trigger, the user also has to specify which antenna port or capture point it is collecting the tags from. To choose it, just tick the box on the left of each entry.

The screenshot shows a web-based application titled "RFID Reader" with the URL "192.168.25.141/home.html". The main menu on the left includes options like Status, Users, System, Network, Time & Timer, Tag & Tag Filter, I/O, Events (which is expanded to show Trigger, Resultant Action, Event Management, and Tag Inventory), Version, and Firmware Upgrade. The central area is titled "Events" and contains a sub-dialog titled "Add Trigger". This dialog has fields for "Trigger ID" (empty), "Description" (empty), and "Trigger Mode" set to "Read Any Tags (any ID, 1 trigger per tag)". Below these is a "Capture Point" section containing four entries, each with a checked checkbox and a descriptive name: "Antenna Port 1 (Name : Capture Point 1)", "Antenna Port 2 (Name : Capture Point 2)", "Antenna Port 3 (Name : Capture Point 3)", and "Antenna Port 4 (Name : Capture Point 4)". At the bottom of the dialog are four buttons: "Add", "Add & Lock", "Add & Permalock", and "Cancel".

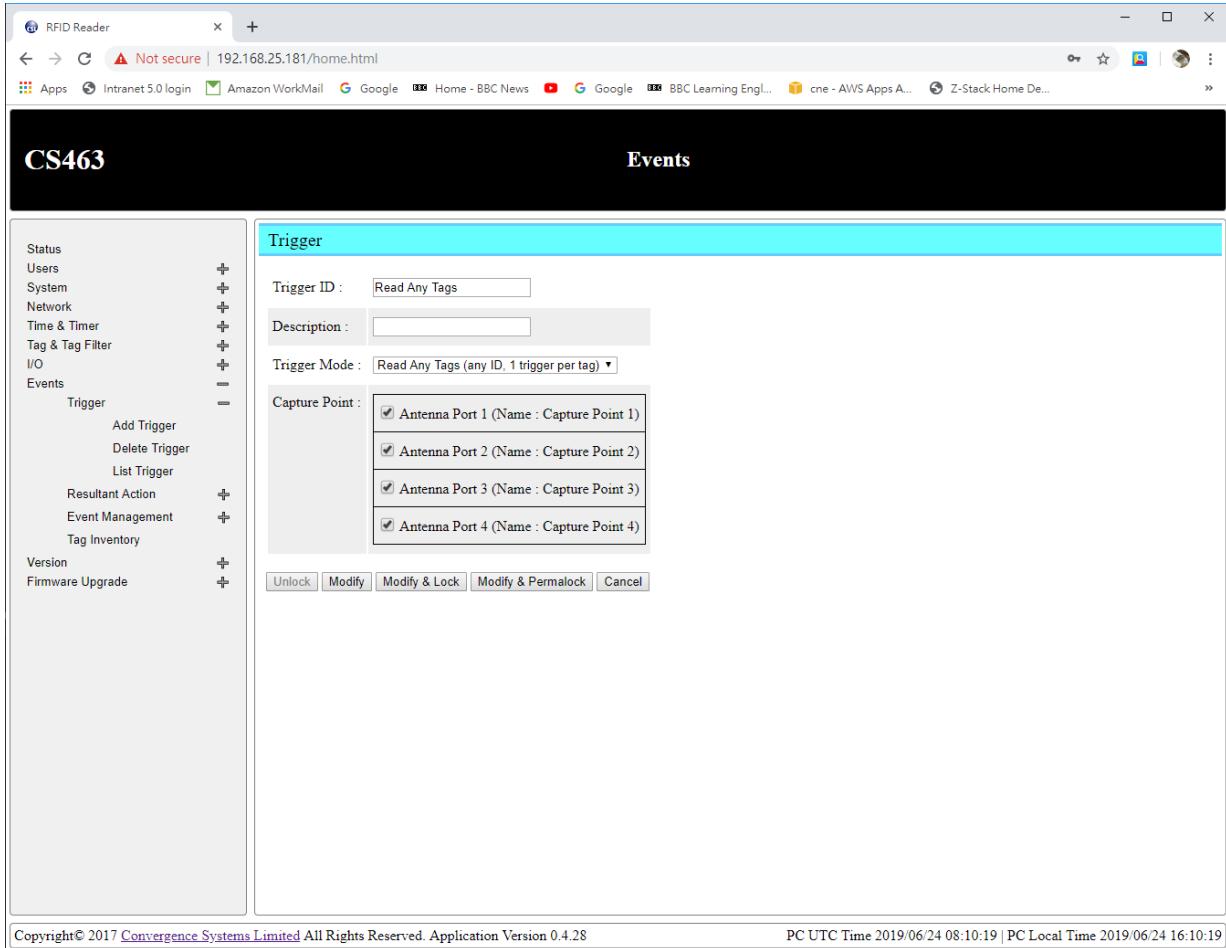
For “Input Sensor State” trigger, the Port Number 1 shown on below, is mapped to physical GPI1 port which using pin 2 /pin12 of GPI1 terminal (GPI1 ports details see section 5.8).

Level High was selected on below case so the trigger will be set if there is high voltage applied on pin2 (GPI1(+)) and pin 12 (GPI1(-)) is properly connected



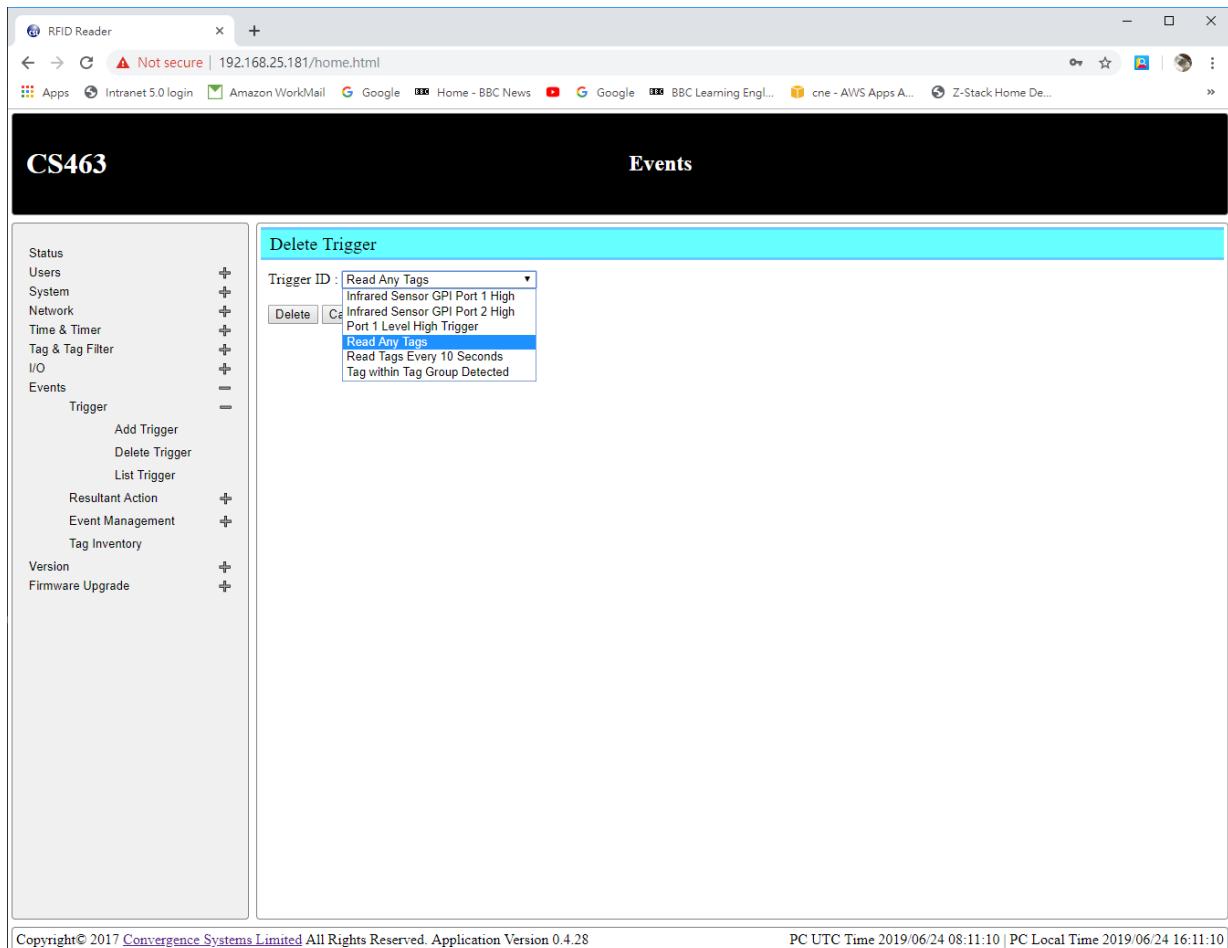
Modify Trigger

To modify trigger, go to List Trigger and select the “Trigger ID”, modify the trigger and click “Modify”.



Delete Trigger

To delete trigger, select the “Delete Tigger” and click “Delete”.



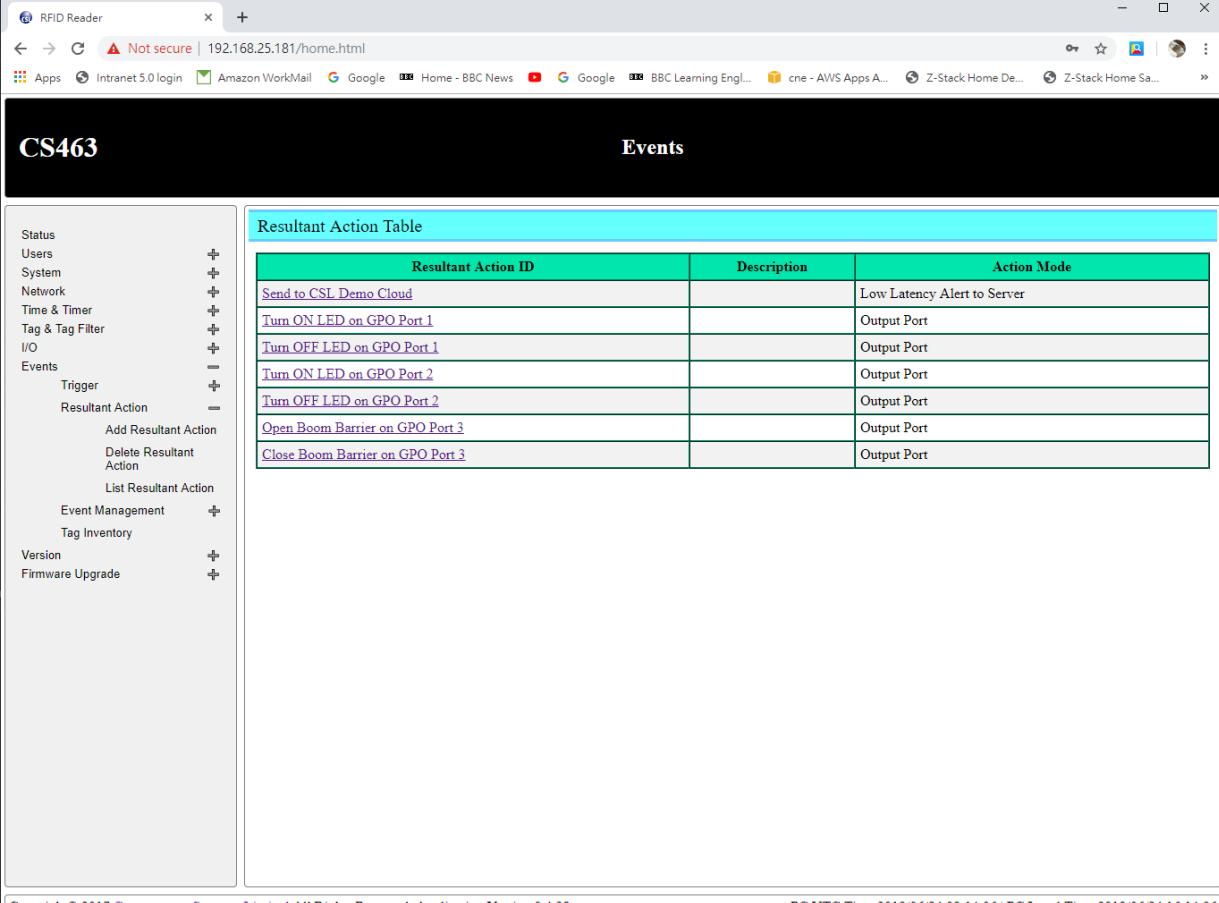
List Trigger

Below is the “List Trigger” page.

Trigger ID	Description	Trigger Mode
Read Any Tags		Read Any Tags (any ID, 1 trigger per tag)
Port 1 Level High Trigger		Input Sensor State
Read Tags Every 10 Seconds	Time Elapsed Type Trigger	Specified Time Span elapsed
Infrared Sensor GPI Port 1 High		Input Sensor State
Infrared Sensor GPI Port 2 High		Input Sensor State
Tag within Tag Group Detected		Trigger in Tag Group

8.9.3 Resultant Action

The “Resultant Action” pages define the resultant action that will be enforced when an event logic is established. Below is the “Resultant Action” submenu:



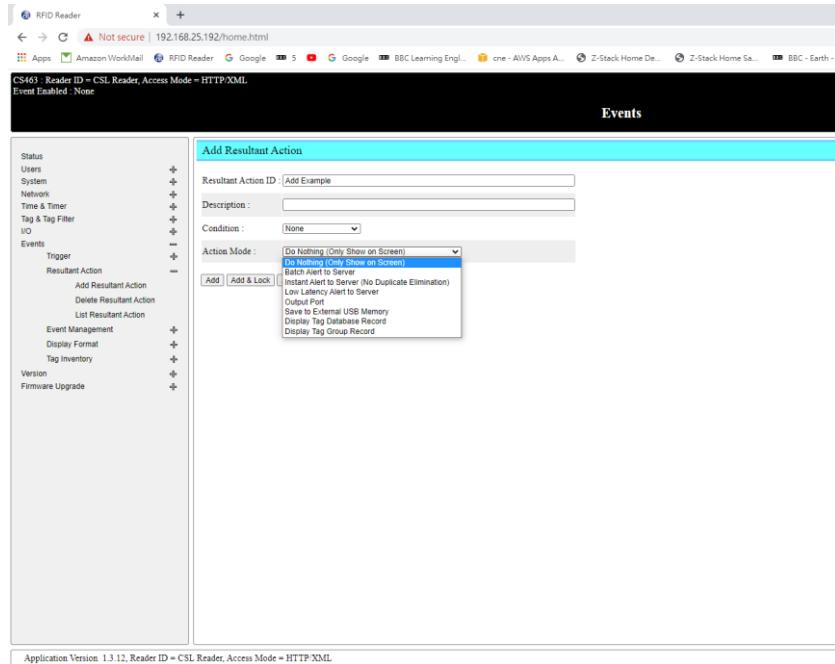
The screenshot shows a web-based application window titled "RFID Reader". The title bar includes a "Not secure" warning and the URL "192.168.25.181/home.html". The main content area has a header "Events" and a sub-header "Resultant Action Table". On the left, there is a sidebar with a tree view of system components: Status, Users, System, Network, Time & Timer, Tag & Tag Filter, I/O, Events (which is expanded to show Trigger and Resultant Action), and Version/Firmware Upgrade. The "Resultant Action" node under Events is selected. The central table lists eight resultant actions:

Resultant Action ID	Description	Action Mode
Send to CSL Demo Cloud		Low Latency Alert to Server
Turn ON LED on GPO Port 1		Output Port
Turn OFF LED on GPO Port 1		Output Port
Turn ON LED on GPO Port 2		Output Port
Turn OFF LED on GPO Port 2		Output Port
Open Boom Barrier on GPO Port 3		Output Port
Close Boom Barrier on GPO Port 3		Output Port

At the bottom of the page, there is a copyright notice: "Copyright© 2017 [Convergence Systems Limited](#) All Rights Reserved. Application Version 0.4.28" and a timestamp: "PC UTC Time 2019/06/24 08:14:06 | PC Local Time 2019/06/24 16:14:06".

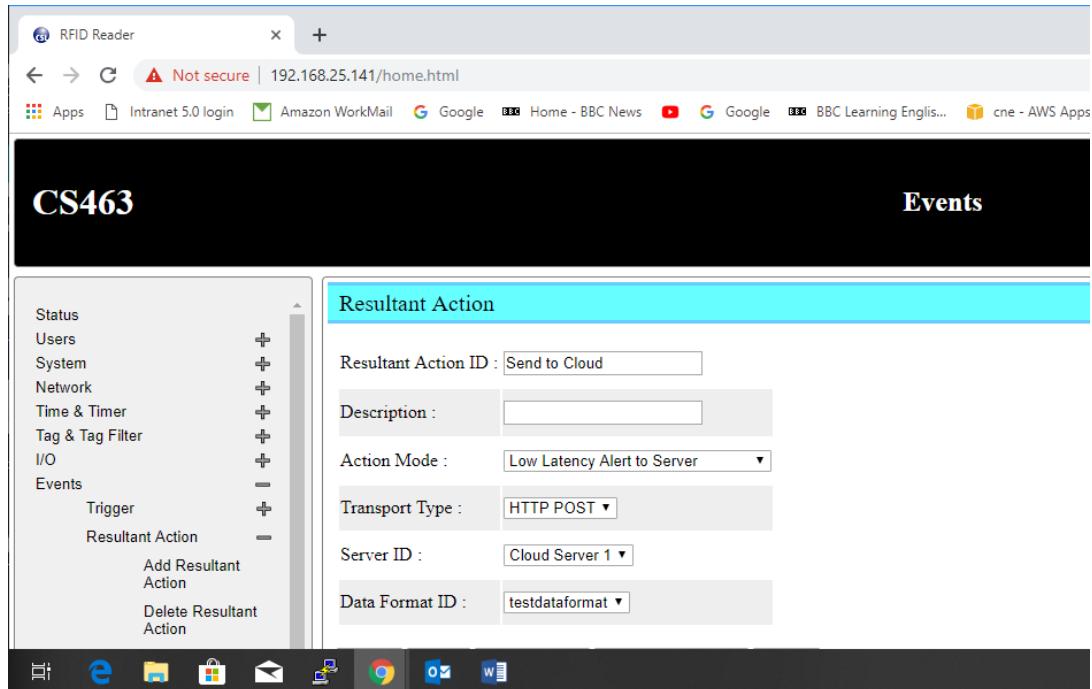
Add Resultant Action

There are 8 types of possible action:



1. Do Nothing (Only Show on Screen) – here nothing is affected, except the tags collected can be shown on browser screen. Note that there are APIs that can collect the tag IDs or information on demand from the remote server. So this is actually a polling mode in terms of collecting tag information.
2. Batch Alert to Server – here the collected tag information are sent to Server at the end of each duplicate elimination cycle (Time Window)
3. Instant Alert to Server – here the collected tag information are sent to Server immediately as it is read.
4. Low Latency Alert to Server
5. Output Port – here the General Purpose IO output port would be controlled to have certain level change or pulse or even pulse train.
6. Save to External USB Memory – here the tag information was sent to external USB flash memory.
7. Display Tag Database Record
8. Display Tag Group Record

If one selects “Batch Alert to Server”, “Low Latency Alert to Server” or the “Instant Alert to Server”, then one has to also select the Server ID, which is defined in the Trusted Server page of the Network page. The user also has to select the Server ID and Data format ID are going to use.



Data Format ID was defined in Cloud Server page

The screenshot shows the CS463 Cloud Server interface. On the left is a navigation sidebar with sections like Status, Users, System, Network, Ethernet Configuration, WiFi Configuration, Cloud Server, Time & Timer, Tag & Tag Filter, I/O, Events, Version, and Firmware Upgrade. The main area is titled "Events" and contains a "Data Format Table". The table has columns for "Data Format ID", "Description", and "Format". It lists three entries: "Example Power Up Notification Data Format", "Example Tag Upload to Cloud Server Data Format", and "Example Heart Beat Data Format", all in JSON format.

Data Format ID	Description	Format
Example Power Up Notification Data Format		JSON
Example Tag Upload to Cloud Server Data Format		JSON
Example Heart Beat Data Format		JSON

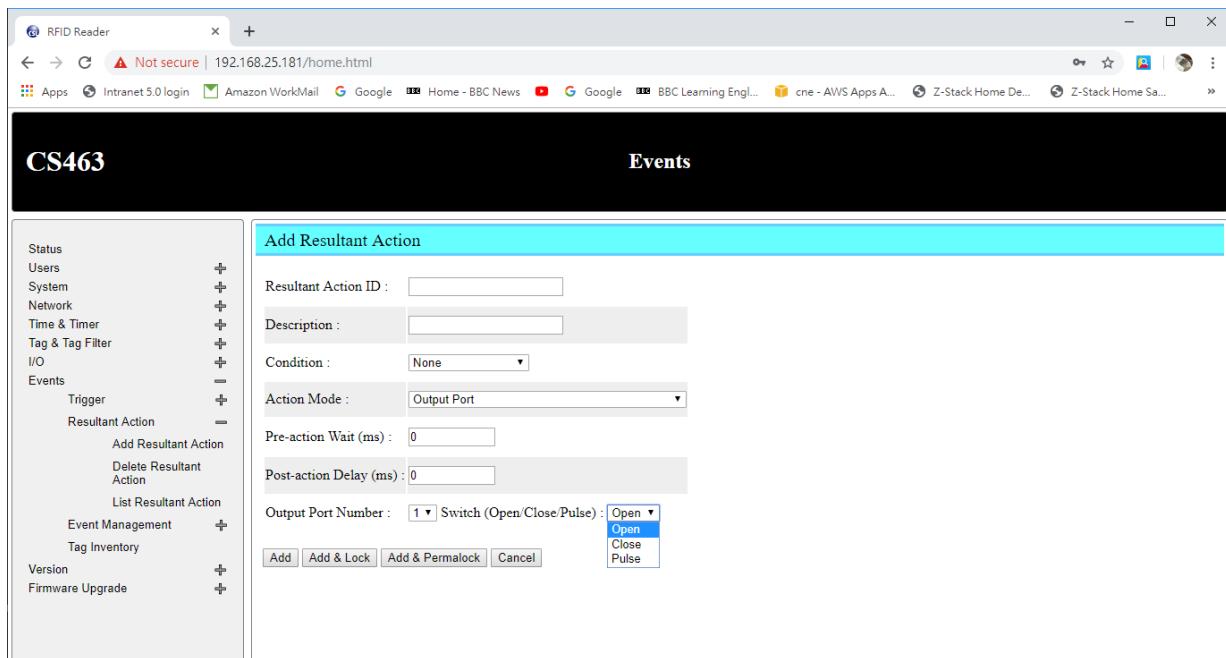
Different field can be added to reporting format as below

The screenshot shows the CS463 Cloud Server interface under the "Network" section. The left sidebar includes sections for Status, Users, System, Network, Ethernet Configuration, WiFi Configuration, Cloud Server, Time & Timer, Tag & Tag Filter, I/O, Events, Version, and Firmware Upgrade. The main area is titled "Data Format" and shows a configuration form. It includes fields for "Description" (empty), "Format" (set to "JSON"), and "Parameters". The "Parameters" list includes SequenceNumber, NumberOfTags, RFIDReaderName, EthernetMACAddress, WiFiMACAddress, TimeOfHeartBeat, TimeOfPowerUp, and TimeZone. Below this is a "Tag Data Parameters" list with UserBank, TimeOfRead, TimeZone, AntennaPort, and RSSI. To the right, there are two tables mapping "Field" to "Label": one for "RFIDReaderSerialNumber" (label rfidReaderSerialNumber) and "RFIDReaderInternalSerialNumber" (label rfidReaderInternalSerialNumber), and another for "EPC" (label epc) and "PC" (label pc). At the bottom, copyright and timestamp information are displayed.

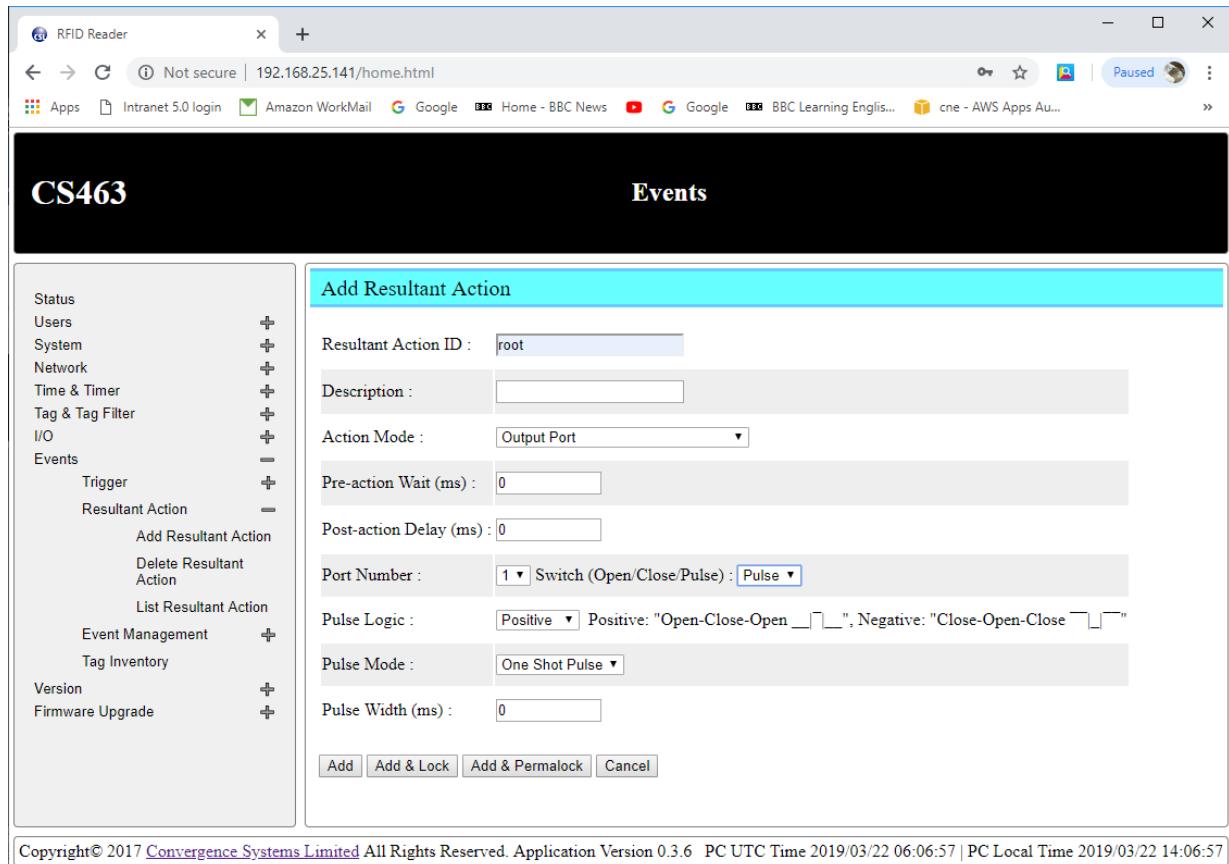
Copyright© 2017 Convergence Systems Limited All Rights Reserved. Application Version 0.3.6

PC UTC Time 2019/03/25 08:26:02 | PC Local Time 2019/03/25 16:26:02

If one selects “Output Port” then one has to input few more fields. The user has to select the Port Number, 1 to 4. The Output Logic has to be selected, which can be either Open, Close or Pulse .



For Pulse, there are more parameters to be configured. The Pulse Logic, which can Open-Close-Open, or Close-Open-Close, and Pulse Mode, which can be One Shot Pulse or Pulse Train, the Pulse Width in msec., and for Pulse Train, the duty cycle and Pulse Duration. These are all self-explanatory.



Modify Resultant Action

To modify resultant action, select the “Resultant Action ID” from list table, modify it and then click “Modify”.

The screenshot shows a web-based application window titled "RFID Reader". The URL bar indicates "Not secure | 192.168.25.181/home.html". The main title is "Events". On the left, there is a navigation sidebar with the following menu items:

- Status
- Users
- System
- Network
- Time & Timer
- Tag & Tag Filter
- I/O
- Events** (selected)
- Trigger
- Add Resultant Action
- Delete Resultant Action
- List Resultant Action
- Event Management
- Tag Inventory
- Version
- Firmware Upgrade

The main content area is titled "Resultant Action" and contains the following fields:

- Resultant Action ID : Turn ON LED on GPO Port 1
- Description : (empty input field)
- Condition : None
- Action Mode : Output Port
- Pre-action Wait (ms) : 0
- Post-action Delay (ms) : 0
- Output Port Number : 1 ▾ Switch (Open/Close/Pulse) : Close ▾

At the bottom of the content area are several buttons: **Unlock**, **Modify**, **Modify & Lock**, **Modify & Permalock**, and **Cancel**.

At the very bottom of the window, there is a footer bar with the text: "Copyright© 2017 [Convergence Systems Limited](#) All Rights Reserved. Application Version 0.4.28" and "PC UTC Time 2019/06/24 08:41:17 | PC Local Time 2019/06/24 16:41:17".

Delete Resultant Action

To delete resultant action, select the “Resultant Action ID” and click “Delete”.

The screenshot shows a web browser window for an 'RFID Reader' device at the URL 192.168.25.160/home.html. The page title is 'Events'. On the left, there is a sidebar menu with the following items:

- Status
- Users
- System
- Network
- Time & Timer
- Tag & Tag Filter
- I/O
- Events
 - Trigger
 - Resultant Action
 - Add Resultant Action
 - Delete Resultant Action
 - List Resultant Action
- Event Management
- Tag Inventory
- Version
- Firmware Upgrade

The main content area has a blue header bar with the text "Delete Resultant Action". Below it, a dropdown menu shows "Resultant Action ID : Light". At the bottom of this area are two buttons: "Delete" and "Cancel".

At the bottom of the page, there is a footer bar with the text "Copyright© 2017 Convergence Systems Limited All Rights Reserved" and the time "11:22 AM".

List Resultant Action

Below is the “List Resultant Action” action page.

Resultant Action ID	Description	Action Mode
Send to CSL Demo Cloud	Low Latency Alert to Server	
Turn ON LED on GPO Port 1		Output Port
Turn OFF LED on GPO Port 1		Output Port
Turn ON LED on GPO Port 2		Output Port
Turn OFF LED on GPO Port 2		Output Port
Open Boom Barrier on GPO Port 3		Output Port
Close Boom Barrier on GPO Port 3		Output Port

Copyright© 2017 [Convergence Systems Limited](#). All Rights Reserved. Application Version 0.4.28 PC UTC Time 2019/06/24 08:42:10 | PC Local Time 2019/06/24 16:42:10

8.9.4 Tag Inventory

Capture Tags Raw

If there is any Event was enabled to read tags, all raw tags data can be found in this page

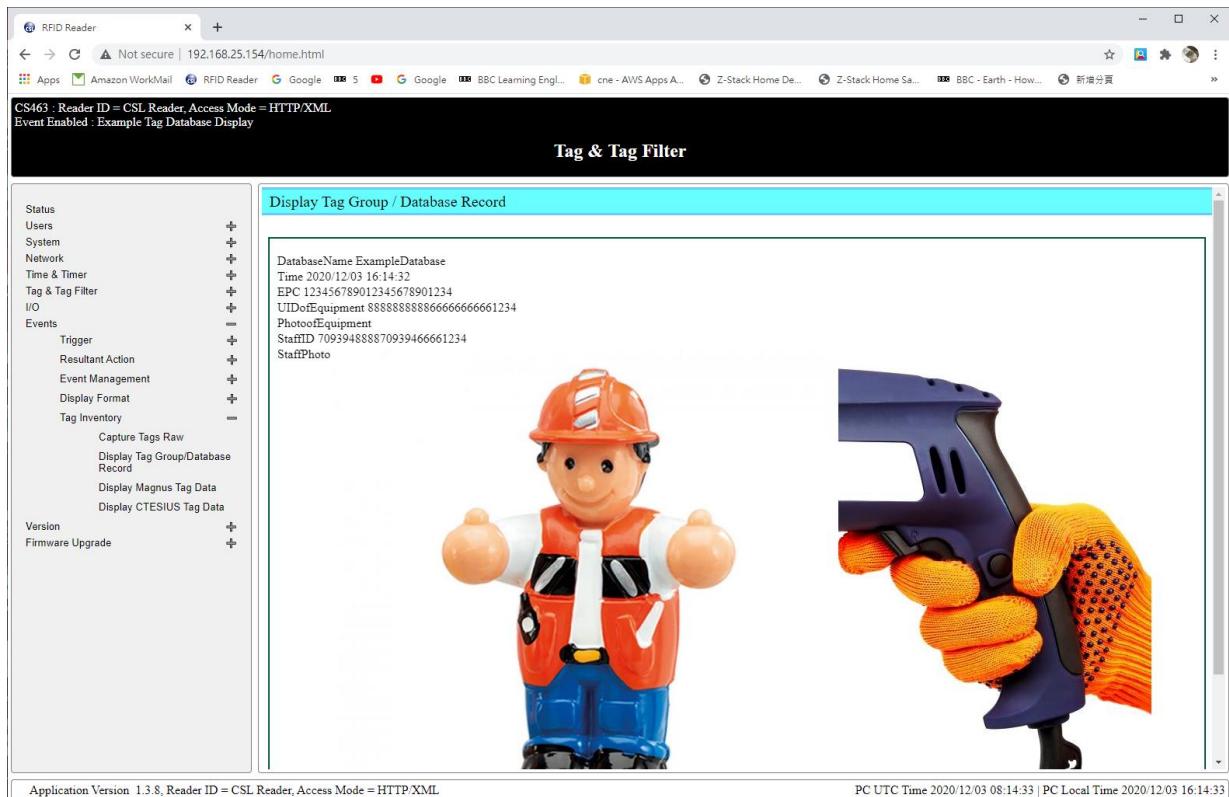
The screenshot shows a web-based interface for an RFID Reader. On the left, there is a sidebar with various configuration options like Status, Users, System, Network, Time & Timer, Tag & Tag Filter, I/O, Events, Version, and Firmware Upgrade. The main content area is titled 'Events' and contains a sub-section titled 'Capture Tags Raw (Refresh Time = 1 second)'. It displays the following information:

- Rate = 15 Tags/s
- Total Unique IDs = 1
- Elapsed Time = 7 seconds
-

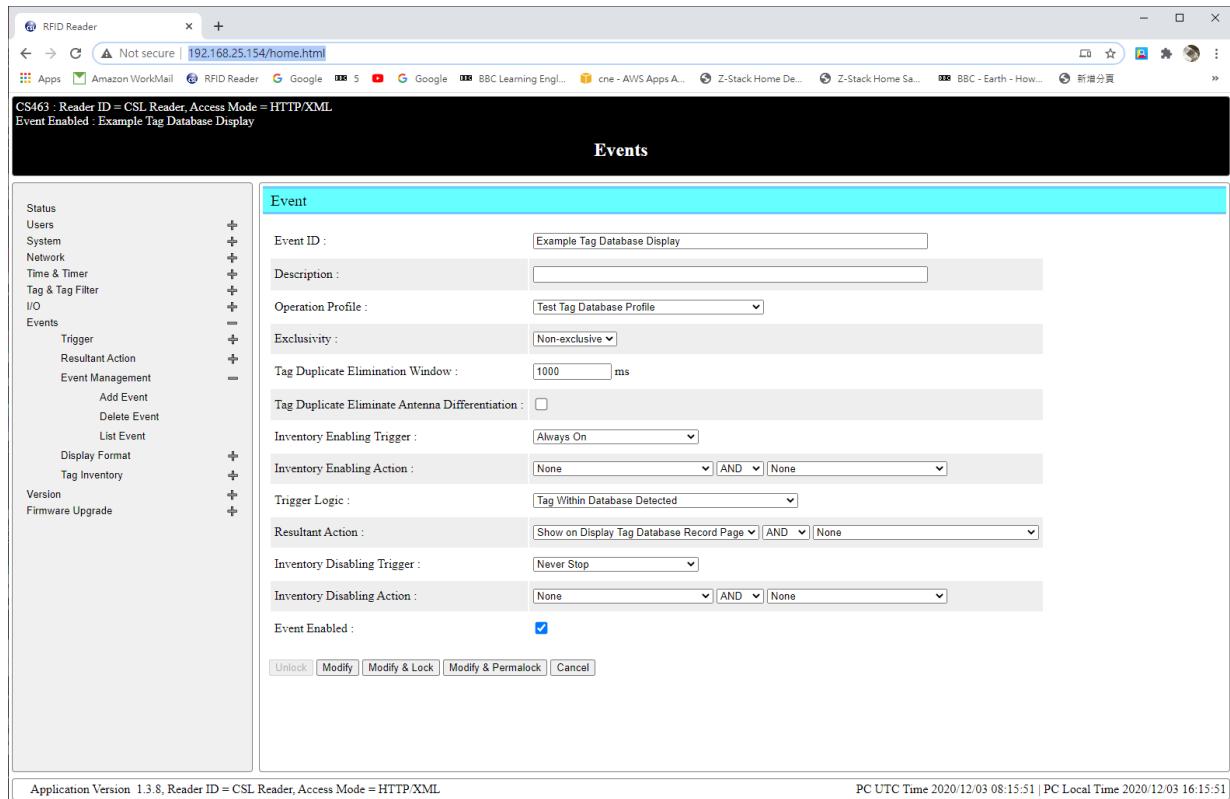
#	PC	EPC	Count	Ant #	Time	Freq(MHz)	RSSI(dBm)	Phase(Degree)
1	3000	E28011606000020D7724CE2	174	1	2020/12/03 15:56:02	924.5	-67	168.75

8.9.5 Display Tag Group/Database Record

When tag record within particular database was read by reader, the database content can be shown in this page as below



Below is the Event called “Example Tag Database Display” (installed on shipped reader), once the Event was enabled and right tag was detected, the database content will be shown as previous diagram



8.10 Version Management

The “Version Management” page allows you to review the version upgrade history (in the Version Control Submenu), and to do firmware upgrade (in the Firmware Upgrade Submenu).

Version Control

In the “Version Control” sub-menu page, one can see the version number of the software. This is an important page to check if the versions are correct, especially after a firmware upgrade. It also shows the upgrade history of the reader.

The screenshot shows a web-based interface for the CS463 intelligent RFID reader. The top navigation bar includes links for Apps, Intranet 5.0 login, Amazon WorkMail, Google, BBC News, BBC Learning English, AWS Apps, Z-Stack Home Daemon, and Z-Stack Home Server. The main title is "CS463" and the sub-section is "Version". A sidebar on the left lists "Status", "Users", "System", "Network", "Time & Timer", "Tag & Tag Filter", "I/O", "Events", "Version" (which is expanded to show "Version Control" and "Firmware Upgrade"), and "Firmware Upgrade". The "Version Control" section displays the following software versions:

Reader ID :	CS463 INTELLIGENT RFID READER
Model Name :	CS463-2
RFID Firmware Version :	2.6.23
Web Application Version :	0.4.28
JNI Library Version :	0.3.2
CSL Unified API Library Version :	1.0.1
CS461 Low Level API (MACH1) Library Version :	1.0.3
LLRP Library Version :	1.0.6

The "Firmware Upgrade" section contains a table of upgrade logs:

#	File	Version	Upgrade Time	Remark
1	CS463WebApplication.war		2018/11/02 Friday 11:45:22	
2	CS463WebApplication_V0.2.13.war	0.2.13	2018/11/28 Wednesday 11:41:41	
3	CS463WebApplication_V0.2.19.war	0.2.19	2019/01/03 Thursday 16:21:53	
4	libcs463jni_V0.2.zip	0.2	2019/01/03 Thursday 16:23:24	
5	libcs463jni_V0.3.zip	0.3	2019/01/16 Wednesday 15:59:47	
6	CS463WebApplication_V0.2.20.war	0.2.20	2019/01/16 Wednesday 16:02:24	
7	CS463LLRPDaemon	1.0.2	2019/01/16 Wednesday 16:13:13	
8	CS463Mach1Daemon_V1.0.0.zip	1.0.0	2019/01/16 Wednesday 17:14:34	

At the bottom, it says "Copyright© 2017 Convergence Systems Limited All Rights Reserved. Application Version 0.4.28" and "PC UTC Time 2019/06/24 08:42:58 | PC Local Time 2019/06/24 16:42:58".

8.11 Firmware Upgrade

Firmware Upgrade

In the “Firmware Upgrade” submenu, just press the “Choose File” button and find the upgrade file (which the user has already downloaded from CSL website before). Then press the “Firmware Upgrade” button. The upgrade takes a few minutes, depending on the size of that particular upgrade. Please wait until you see the success message. After that please wait for the WebApplication to automatically restart to the login page.

Firmware upgrades include the following 6 items:

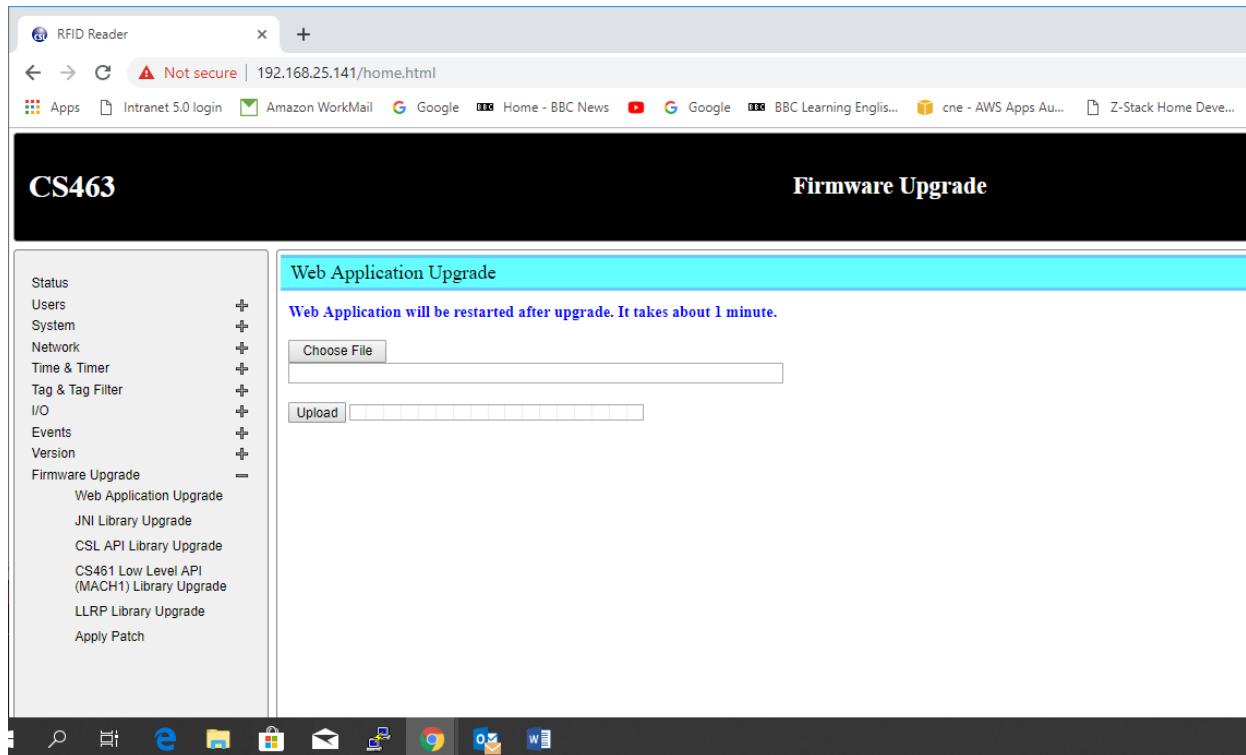
1. Web Application Upgrade
2. JNI Library Upgrade
3. CSL API Library Upgrade
4. CS461 Low Level API (MACH1) Library Upgrade
5. LLRP Library Upgrade
6. Apply Patch

Linux Version Variations

There are 2 Linux OS versions: 3.0.35 or 4.x.x. For units shipped before June 2019, the OS is 3.0.35. After July 2019, the OS is 4.x.x. Some of the firmware has different versions per the OS version. Please note this variation.

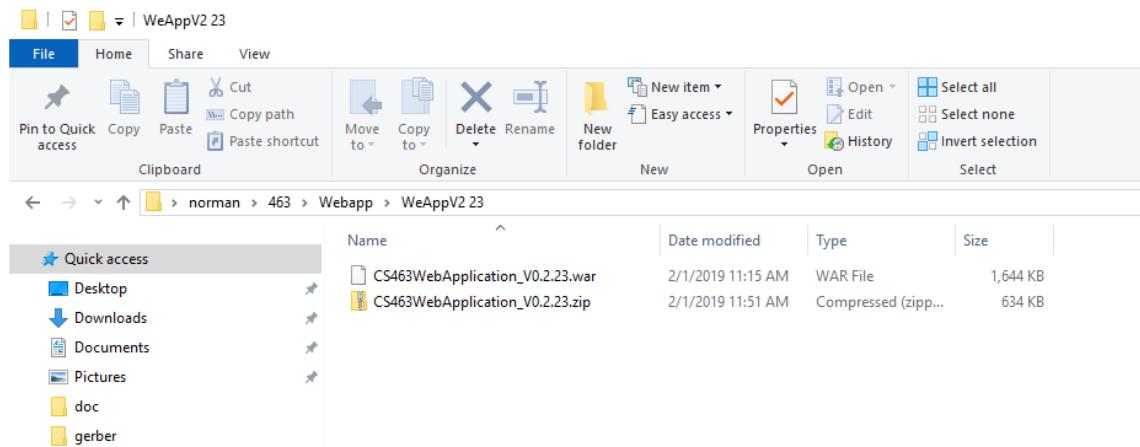
Upgrading Web Application

Below is the page to upgrade Web application. Linux OS versions: 3.0.35 or 4.x.x use same Web application



In case of web application version 3.x or later, the upgrading can be done directly using the zipped file

For existing web application 2.x or earlier, the zipped Web application file needs to be unzipped first before upgrading. The unzipped file should have the file extension of “war” as shown below.



Click Choose File

Firmware Upgrade

CS463

Web Application Upgrade

Web Application will be restarted after upgrade. It takes about 1 minute.

Choose File

Upload

File name: CS463WebApplication_V0.2.23.war

Open Cancel

Status

Users

System

Network

Time & Timer

Tag & Tag Filter

I/O

Events

Version

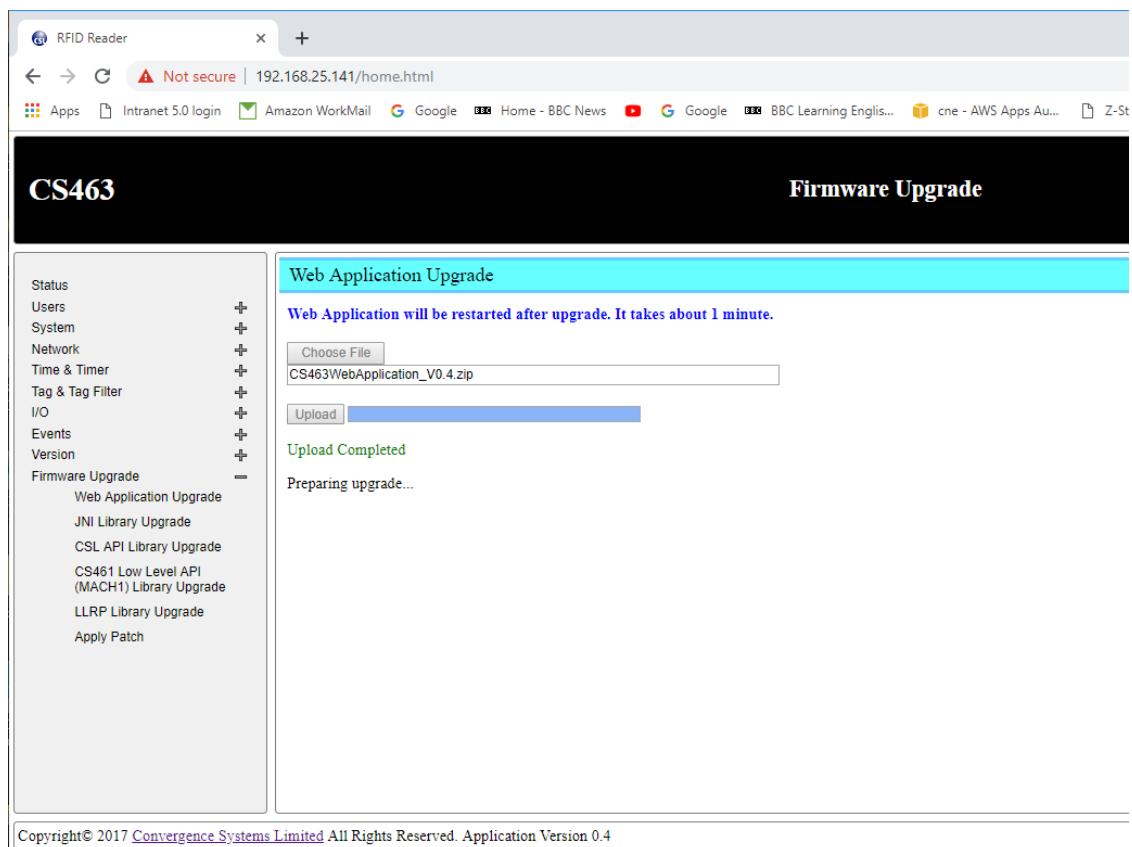
Firmware Upgrade

- Web Application Upgrade
- JNI Library Upgrade
- CSL API Library Upgrade
- CS461 Low Level API (MACH1) Library Upgrade
- LLRP Library Upgrade
- Apply Patch

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PC UTC Time 201

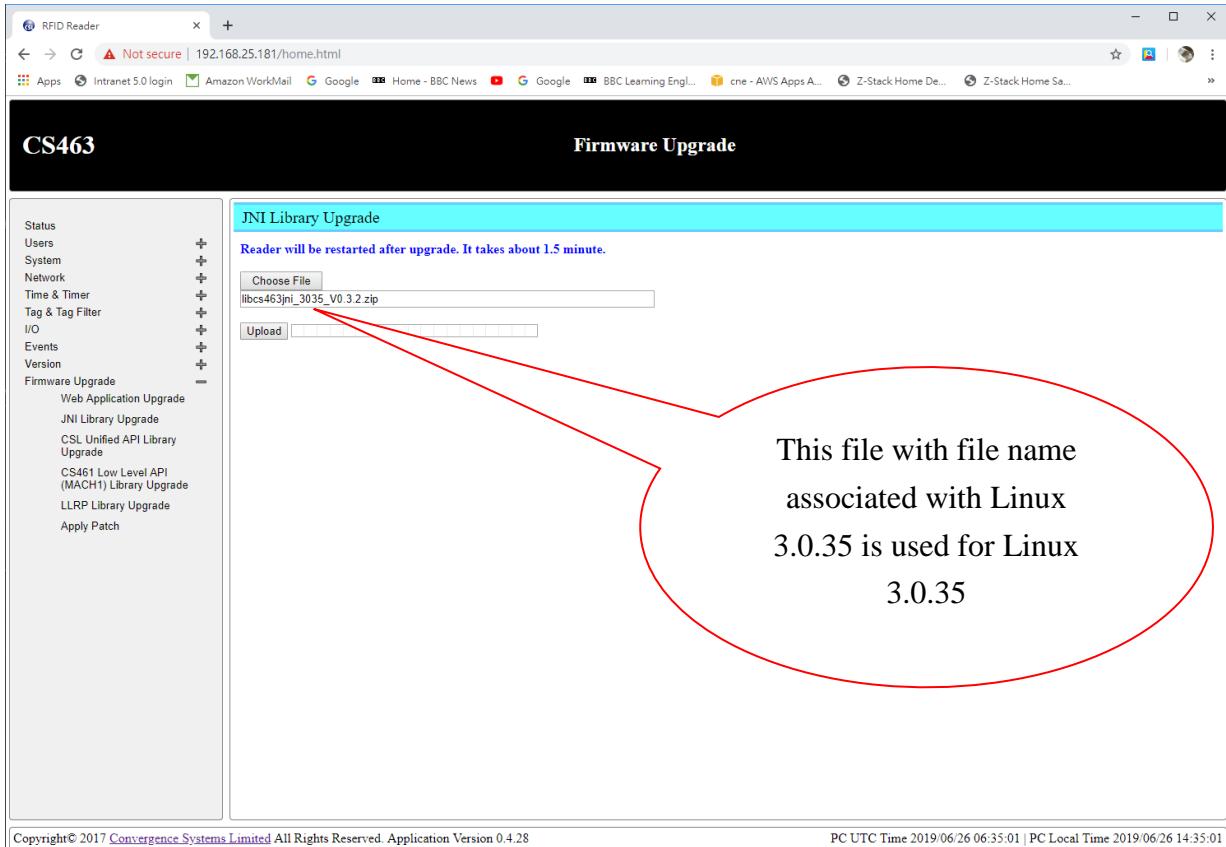
Then click Upload after choose the Web application file and upgrading will start



Upgrading JNI Library

Choose the JNI Library zipped file (no need to unzip)

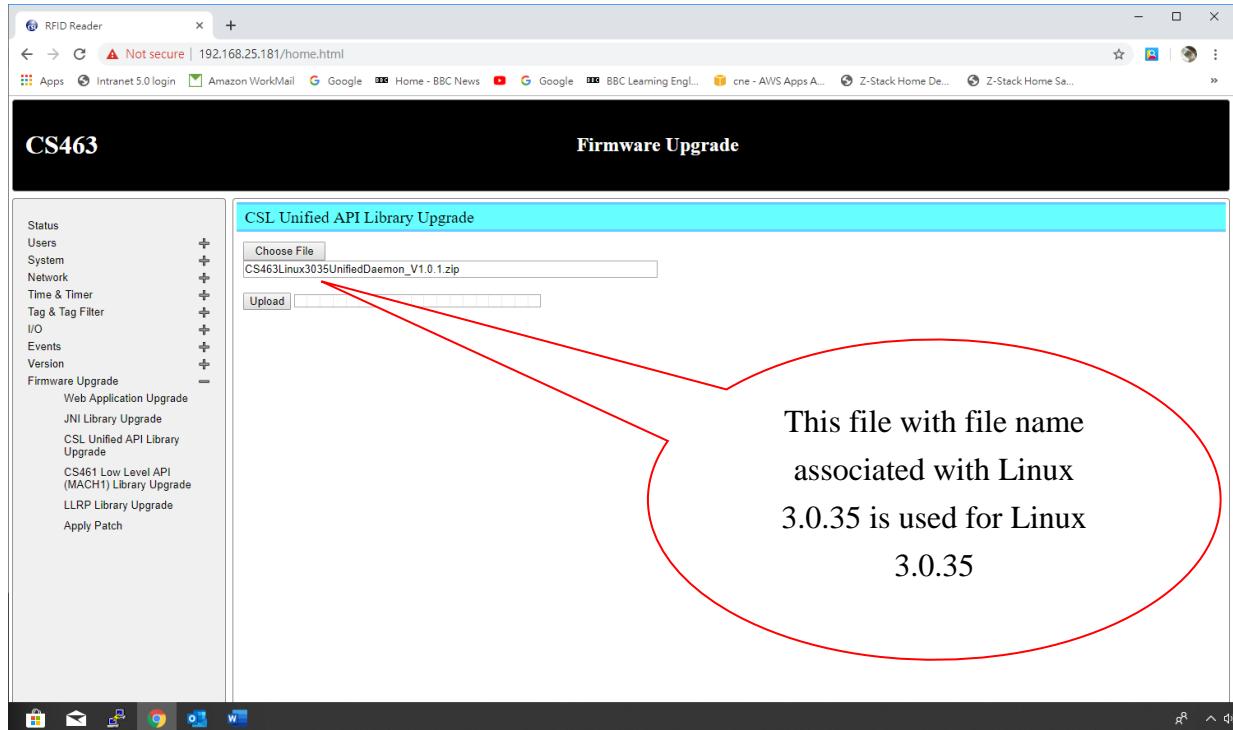
The JNI library are different on different Linux OS versions: 3.0.35 or 4.x.x. Please choose the corresponding version to upgrade.



Then click Upload

Upgrading CSL API library

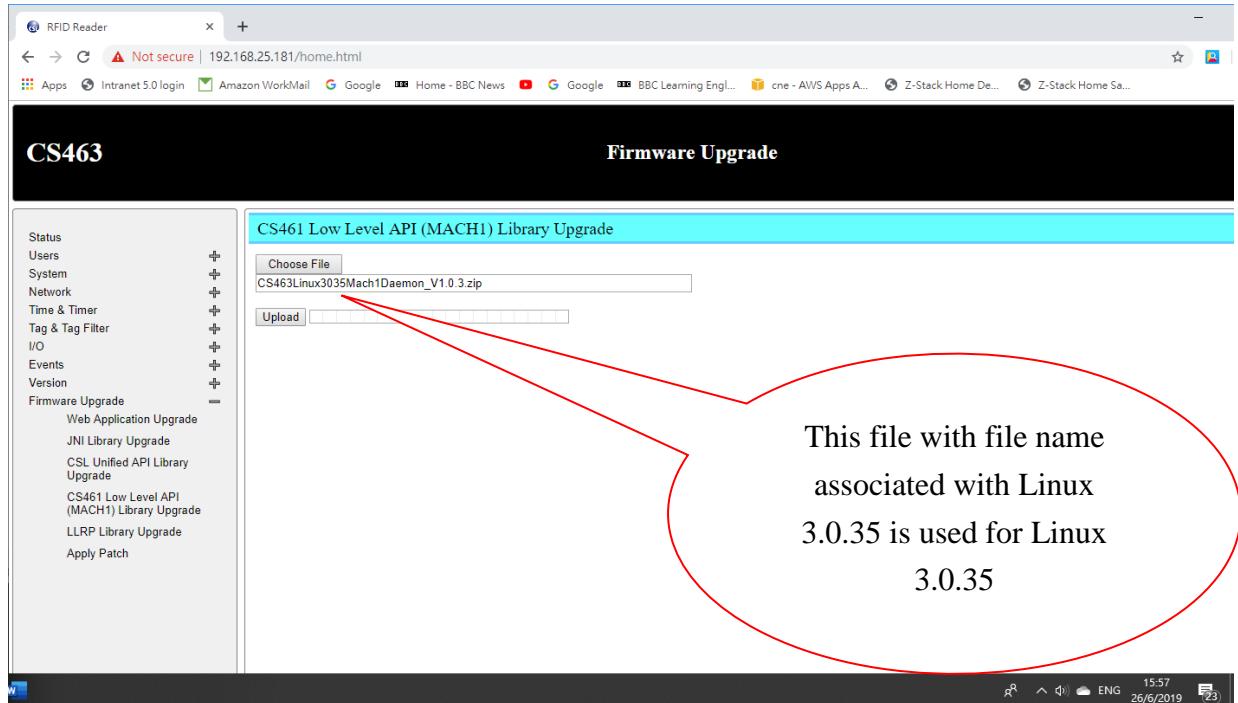
Choose zipped Daemon file corresponding to reader Linux version.



Then click upload

Upgrading CS461 Low Level API library

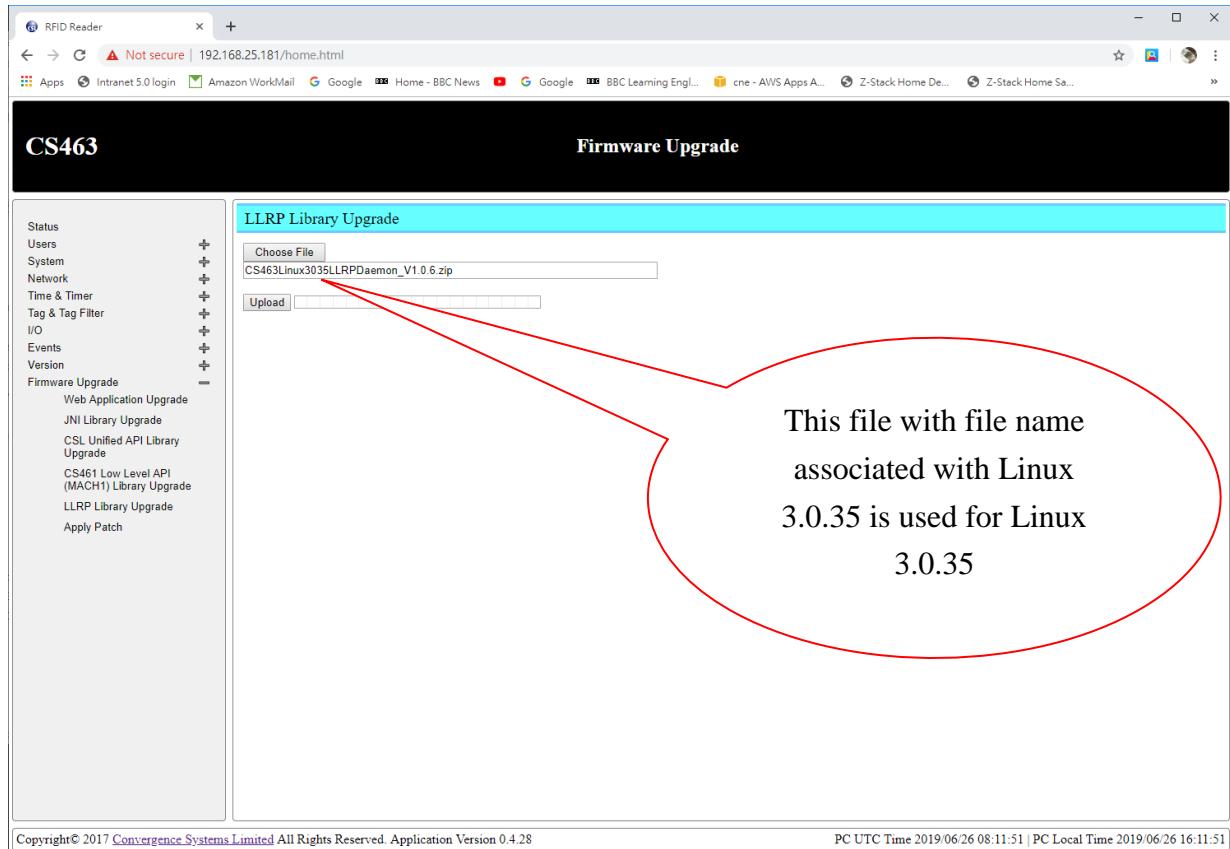
Choose zipped Mach1 Daemon file corresponding to reader Linux version



Then click Upload

Upgrading LLRP Library

Choose the zipped Daemon file corresponding to reader Linux version



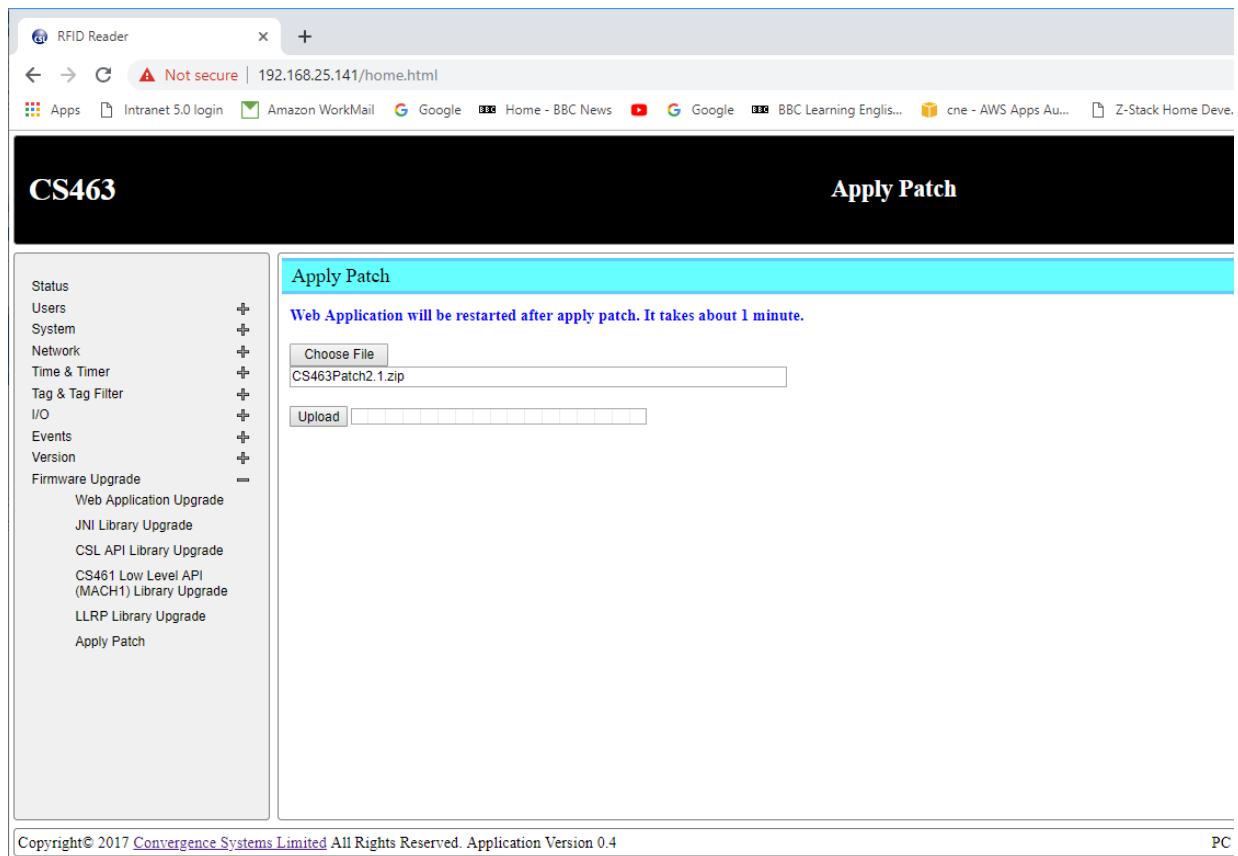
Then click upload

Applying Patch to System

If there is any patch for system, it can be done on this page. Linux OS versions: 3.0.35 or 4.x.x can use same Patch file

The screenshot shows a web browser window titled "RFID Reader" with the URL "192.168.25.141/home.html". The main content area is titled "CS463" on the left and "Apply Patch" on the right. A sidebar on the left contains a tree view of system components: Status, Users, System, Network, Time & Timer, Tag & Tag Filter, I/O, Events, Version, and Firmware Upgrade. Under Firmware Upgrade, there are several options: Web Application Upgrade, JNI Library Upgrade, CSL API Library Upgrade, CS461 Low Level API (MACH1) Library Upgrade, LLRP Library Upgrade, and Apply Patch. The main panel has a blue header bar with the text "Apply Patch" and a message: "Web Application will be restarted after apply patch. It takes about 1 minute." Below this is a "Choose File" input field and an "Upload" progress bar. At the bottom of the page, there is a copyright notice: "Copyright© 2017 Convergence Systems Limited All Rights Reserved. Application Version 0.4" and a "PC" label.

Choose the zipped patch file then click upload



9 Read Tag using Browser Interface and Event Engine

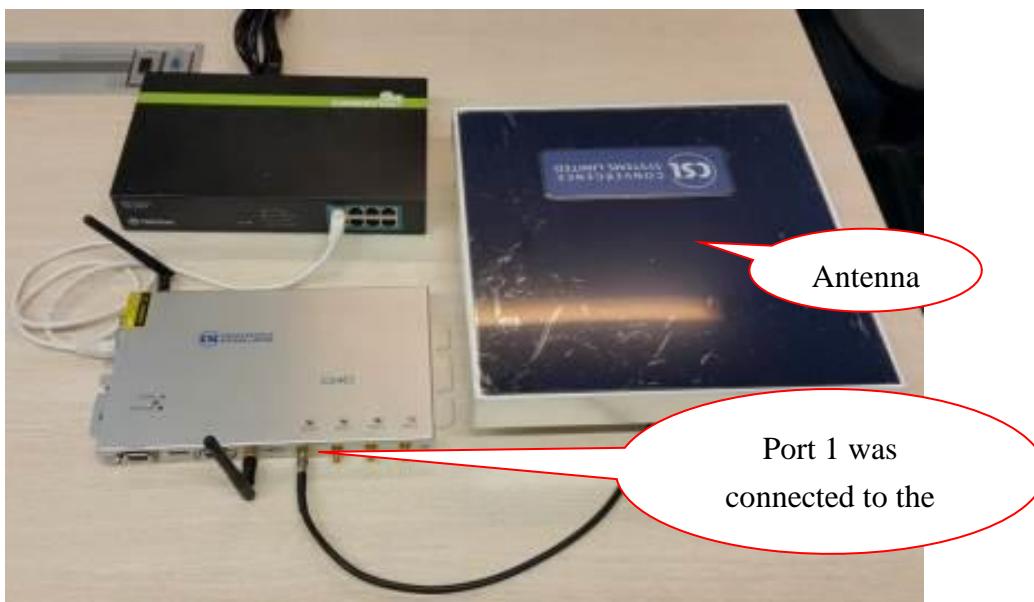
One can use a browser to quickly configure the CS463 reader to autonomously read tags based on certain logic sequence defined in the event engine and operation profile.

9.1 Read Tag using Default Profile and Default Event

CS463 comes with a Default Profile and a Default Event. The Default Event is not enabled yet. Once the user enable that event, then the user can use that to immediately read RFID tags from antenna Port 0.

After login to the reader and ensuring the reader is in HTTP/XML access mode as explained in section 4.3,

- **Make sure antenna Port 1 is connected to an antenna** as stated on Default Profile of Operation Profile which mentioned on previous session Setup Reader.
-



- Go to the Operation Profile in System page and select List Profile to ensure there is Default Profile can be found as below

System Configuration

Profile ID	Antenna Port	Reader Mode/Link Profile	Session #	Target	Query Algorithm	Tag Population	Extra Bank
Default Profile	1,	Range Dense Reader	S0	A/B Toggle	DynamicQ	200	
Example Profile for Doorway 1 Antenna Port 1	1,	Range Dense Reader	S0	A/B Toggle	FixedQ	2	TID,
Example Profile for Doorway 1 Antenna Port 2	2,	Range Dense Reader	S0	A/B Toggle	FixedQ	2	TID,

- Go to the List Event of Event Management in Event page and click List Event to show the Default Event

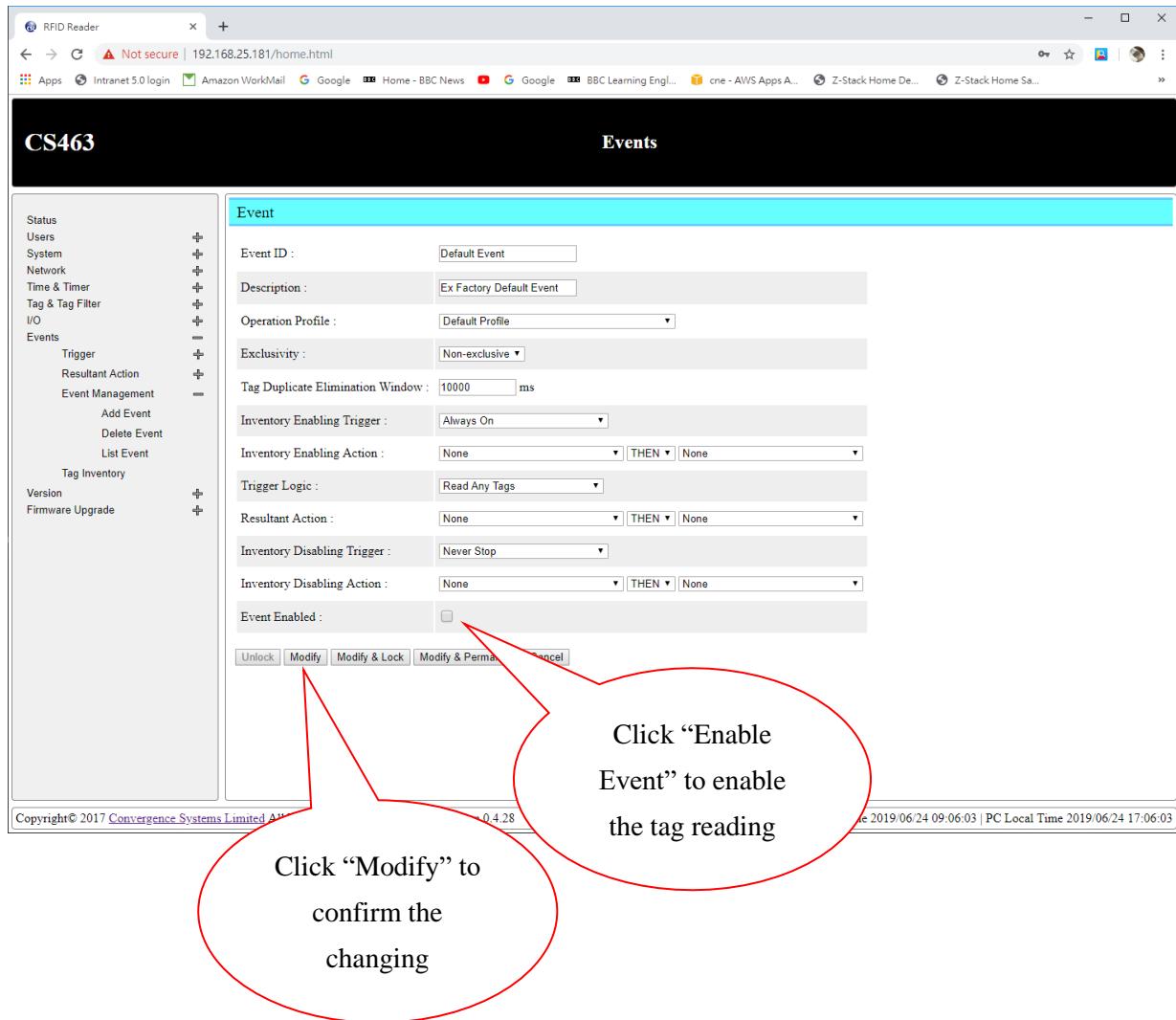
Event Table

Event ID	Description	Operation Profile	Exclusivity	Tag Duplicate Elimination Window (ms)	Inventory Enabling Trigger	Inventory Enabling Action	Trigger Logic	Resultant Action	Inventory Disabling Trigger	Inventory Disabling Action	Enable
Default Event	Ex Factory Default Event	Default Profile	Non-exclusive	10000	Always On	None	Read Any Tags	None	Never Stop	None	False
Example Event Entrance Boom Barrier Control	Profile 1: Doorway 1 Antenna Port 1	Profile 1	Exclusive	1000	Infrared Sensor GPI Port 1 High	None	Tag within Tag	Turn ON LED on GPO Port 1 AND Open Boom Barrier on GPO Port 3	Infrared Sensor GPI Port 2 High	Close Boom Barrier on GPO Port 3 AND Turn OFF LED on GPO Port 1	False
Example Event Exit Boom Barrier Control	Example profile for Doorway 1 Antenna Port 2	Profile 1	Exclusive	1000					Infrared Sensor GPI Port 2 High	Close Boom Barrier on GPO Port 2 AND Turn OFF LED on GPO Port 2	False
Example Event Send Email Demo Client Server		Default Profile	Non-exclusive	60000					Never Stop	None	False

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PC UTC Time 2019/06/24 09:05:06 | PC Local Time 2019/06/24 17:05:06

In Default Event, the reading tag from antenna port 1 can be started after the default event was enable and click Modify to confirm the change



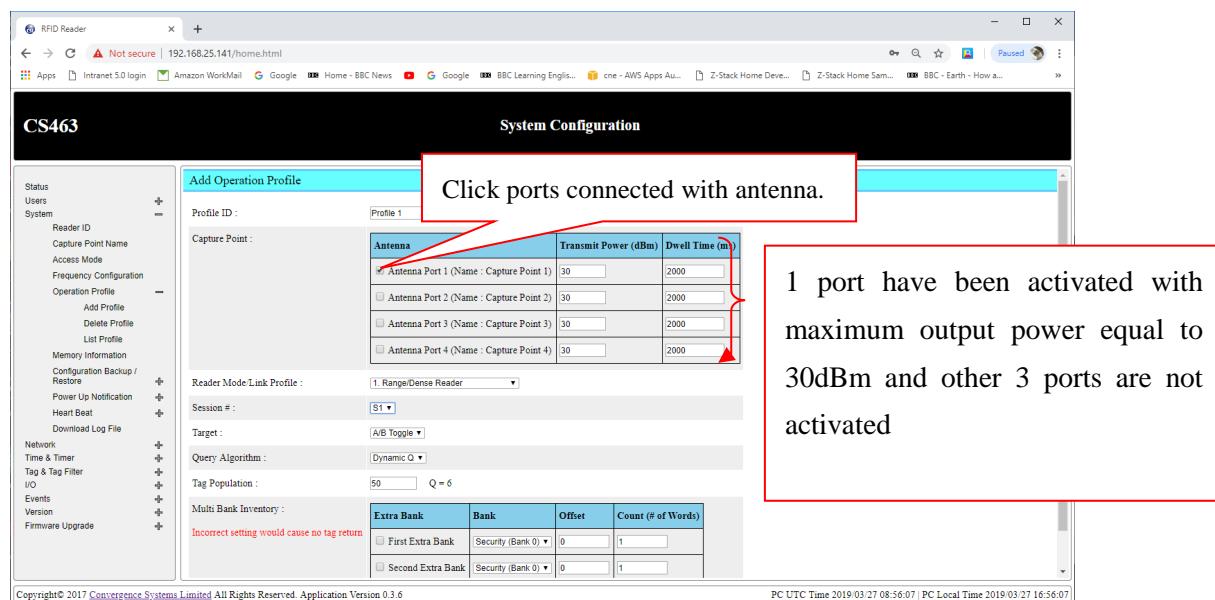
- reading tag from antenna port 1 can be stopped once the default event was disable by unchecking Enable Event and click Modify to confirm the change

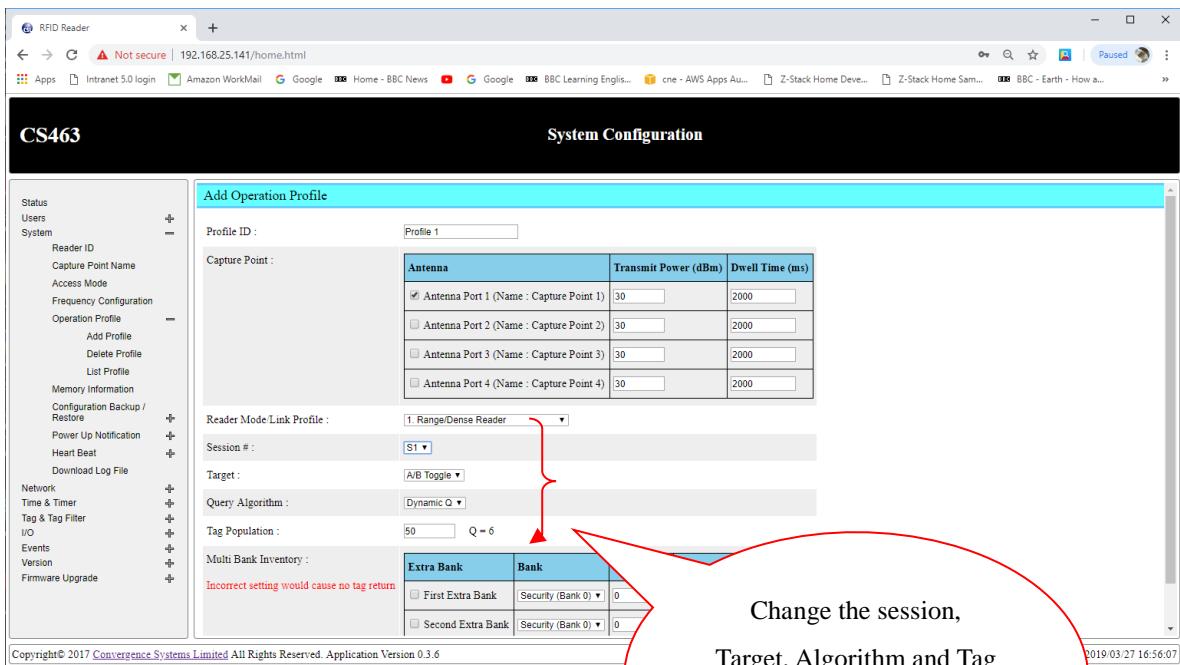
9.2 Read Tag using Custom Profile and Custom Event

To define your own profile and event, the following steps are needed:

Add Profile:

- Go to the Operation Profile in System page, then click Add Profile as below

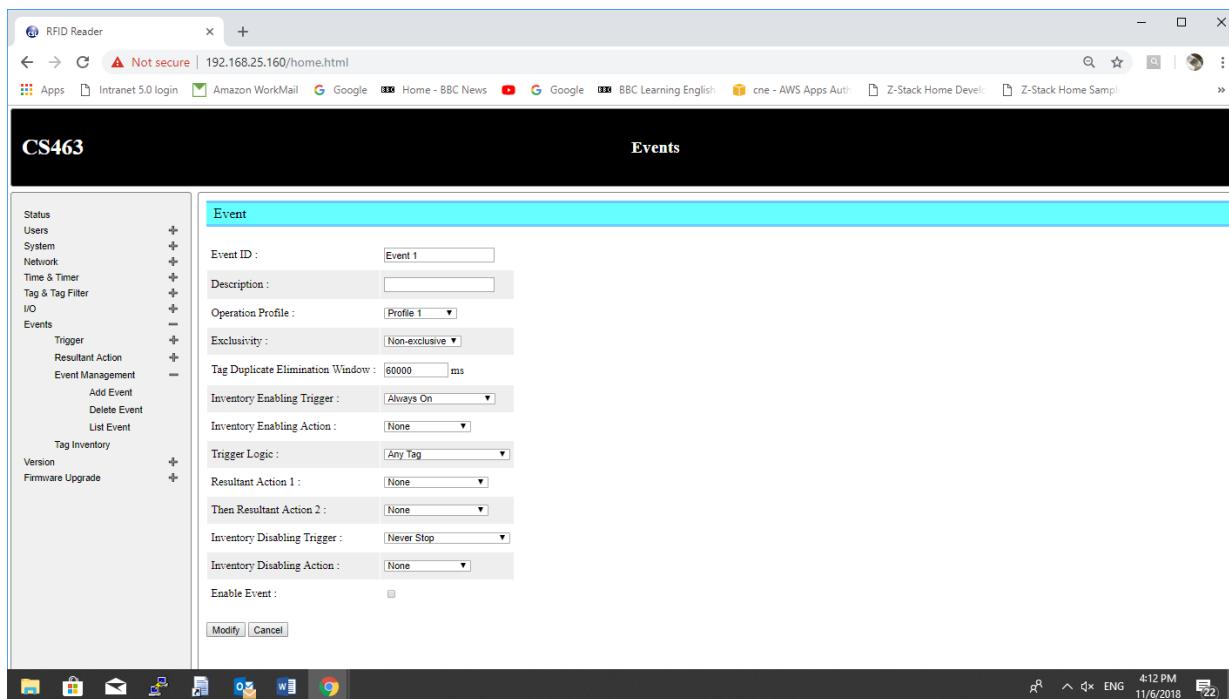




Change the session,
Target, Algorithm and Tag
population to optimize
reader performance

- Please click “Add” to confirm the change.

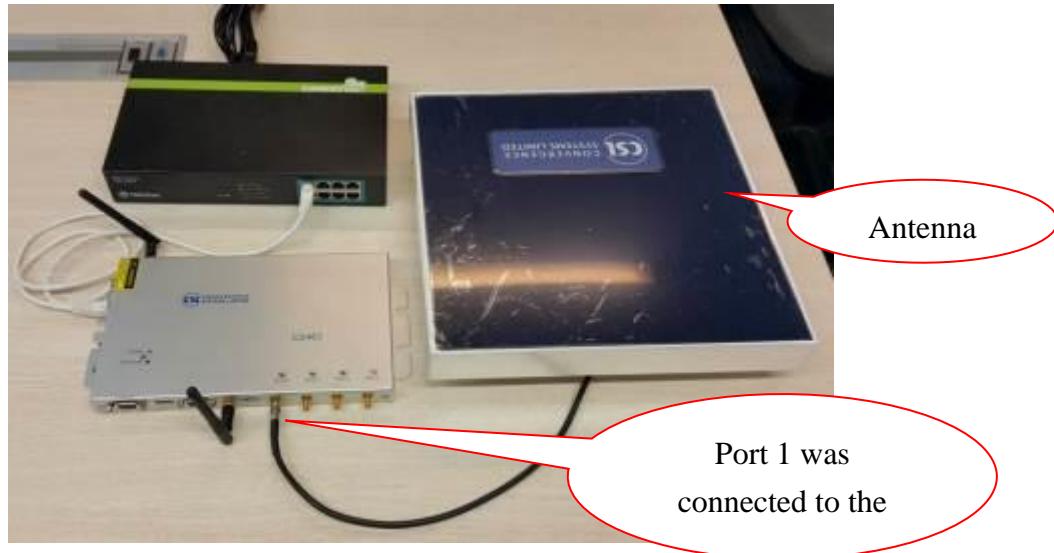
Add Event and change to use Profile 1 which created before



Click Modify to confirm

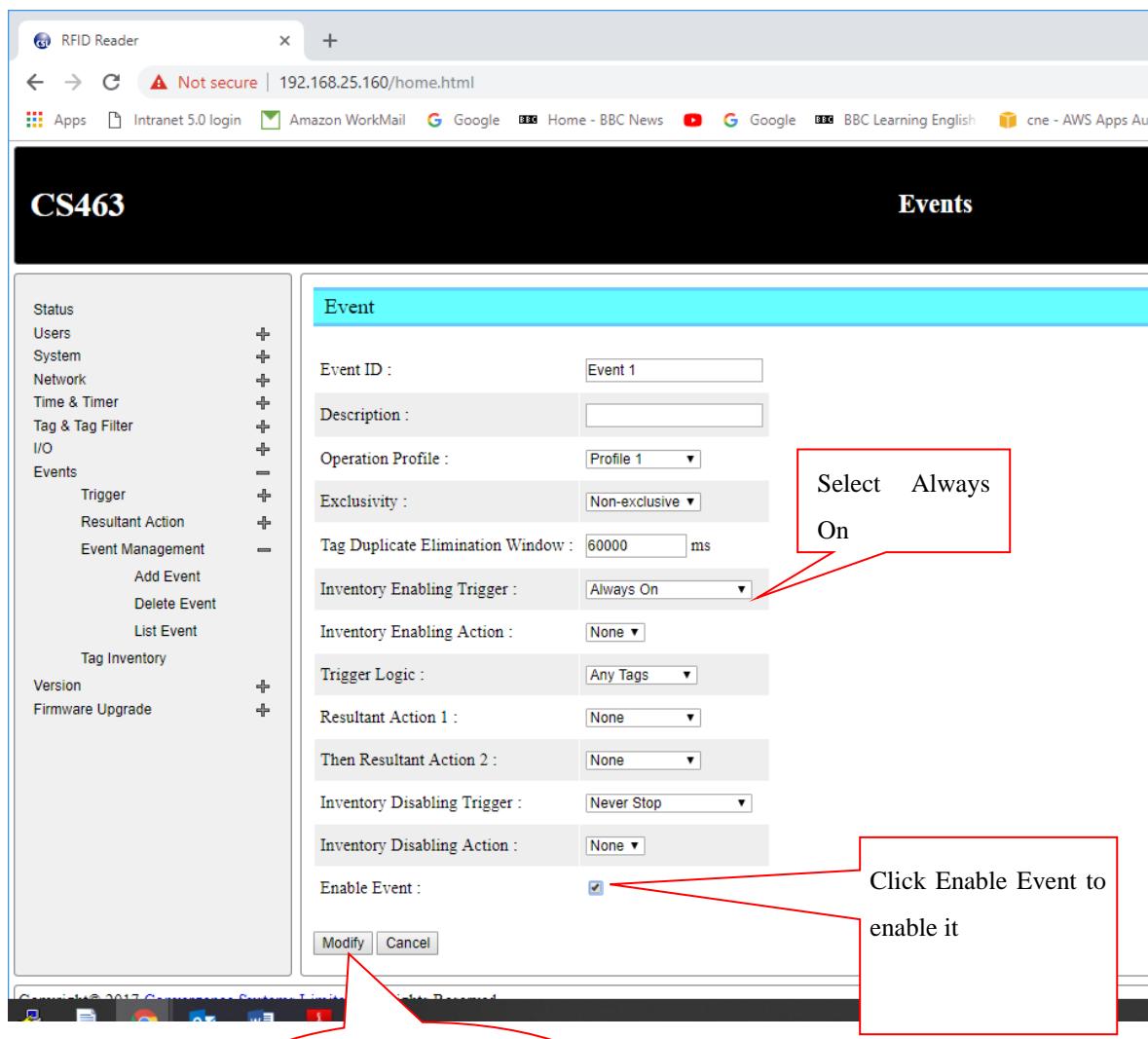
Start inventory reading using Test Event 1

- **Make sure antenna Port 1 is connected to an antenna** as stated on Default Profile of Operation Profile which mentioned on previous session Setup Reader.



- Go to List Event in Event Management and click “Event 1” to modify the Event.

Event Table											
Event ID	Description	Operation Profile	Exclusivity	Duplicate Elimination Window (ms)	Inventory Enabling Trigger	Inventory Enabling Action	Trigger Logic	Resultant Action	Inventory Disabling Trigger	Inventory Disabling Action	Enable
In		Default Profile	Exclusive	4000	IR1	None	TagDetected	Send to Cloud, then Light	IR2	None	False
Out		Default Profile	Exclusive	10000	IR2	None	TagDetected	Send to Cloud, then Light	IR1	None	False
Event 1		Default Profile	Non-exclusive	60000	Always On	None	Any Tags	None	Never Stop	None	False
Event 2		Default Profile	Non-exclusive	60000	Always On	None	Any Tags	None	Never Stop	None	False



- Please click "Modify" to confirm the change and inventory will start.
- Go to Tag inventory to check inventory result.

CS463

Events

Capture Tags Raw

Rate = 97 Tags/s

#	PC	EPC	Count	Ant #	Time	Freq(MHz)	RSSI(dBm)	Offer Bar
1	3000	E28011606000020D776E2006A	2	1	2019/03/27 09:57:52		-64	
2	3000	E28011606000020D7722E212	2	1	2019/03/27 09:57:53		-67	
3	3000	E28011606000020D77249A61	2	1	2019/03/27 09:57:54		-67	
4	3000	E28011606000020D77249AE2	2	1	2019/03/27 09:57:52		-69	
5	3000	E28011606000020D77249C50	2	1	2019/03/27 09:57:52		-71	
6	3000	E28011606000020D77249A52	1	1	2019/03/27 09:57:51		-64	
7	3000	E28011606000020D77249CC1	2	1	2019/03/27 09:57:53		-70	
8	3000	E28011606000020D77249CB1	2	1	2019/03/27 09:57:52		-68	
9	3000	E28011606000020D7722E2C1	1	1	2019/03/27 09:57:54		-49	
10	3000	E28011606000020D77249CB1	2	1	2019/03/27 09:57:54		-36	

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Click “Tag Inventory” to check Inventory result

The Inventory can be stopped by disabling the Event 1 on Event Management as below

CS463

Events

Event

Event ID : Event 1

Description :

Operation Profile : Profile 1

Exclusivity : Non-exclusive

Tag Duplicate Elimination Window : 60000 ms

Inventory Enabling Trigger : Always On

Inventory Enabling Action : None

Trigger Logic : Any Tag

Resultant Action 1 : None

Then Resultant Action 2 : None

Inventory Disabling Trigger : Never Stop

Inventory Disabling Action : None

Enable Event :

Unchecked Enable Event to disable it

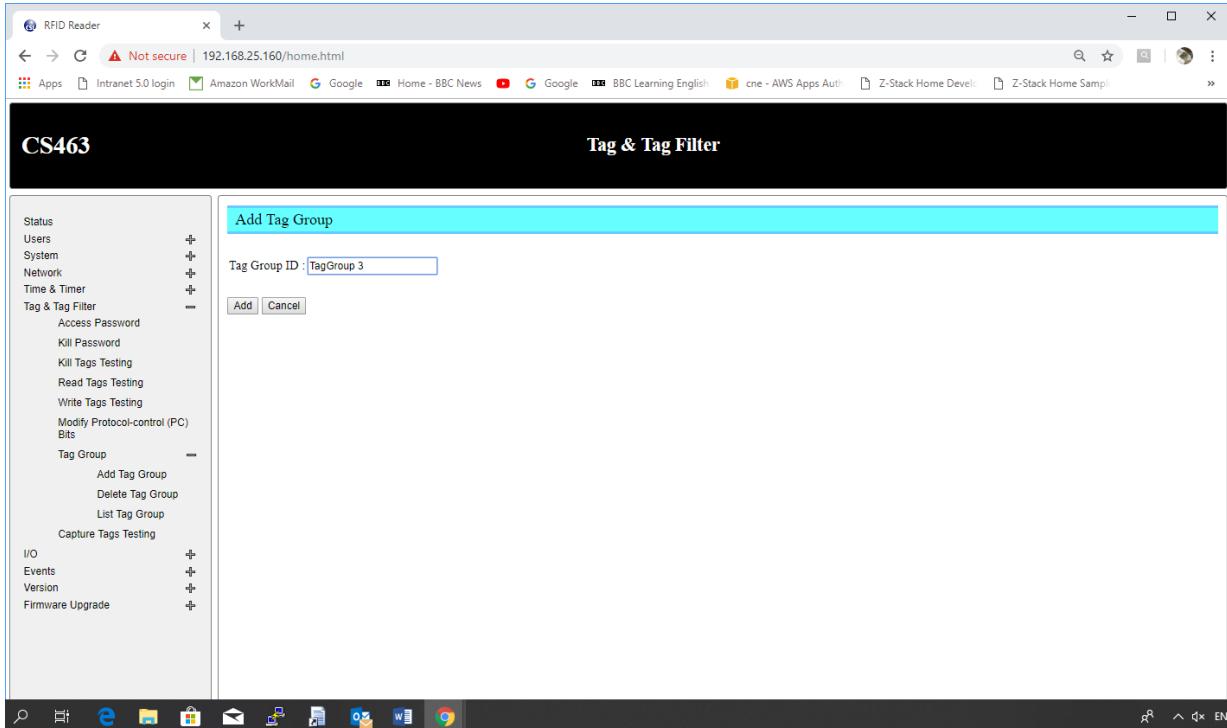
Click “Modify” to apply the change

Below procedure to enable particular group of tag to be detected and used this group as trigger

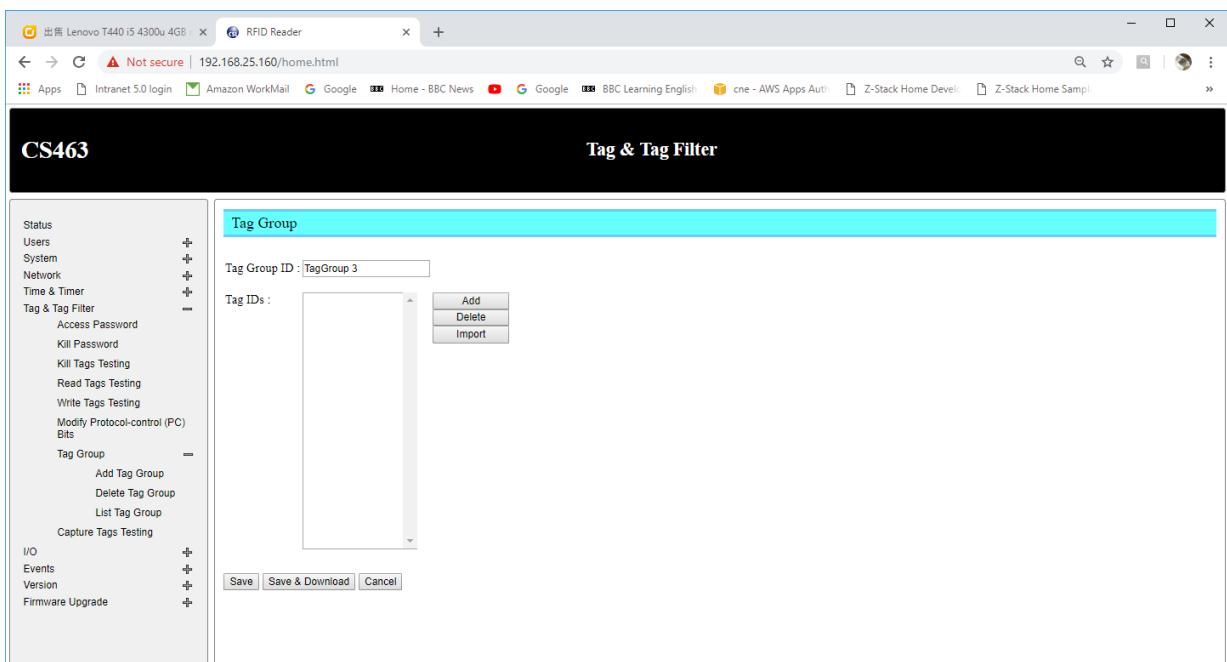
- Add tag group

Go to Tag group in Tag & Tag Filter and click Add Tag Group

Input the new tags group name as below



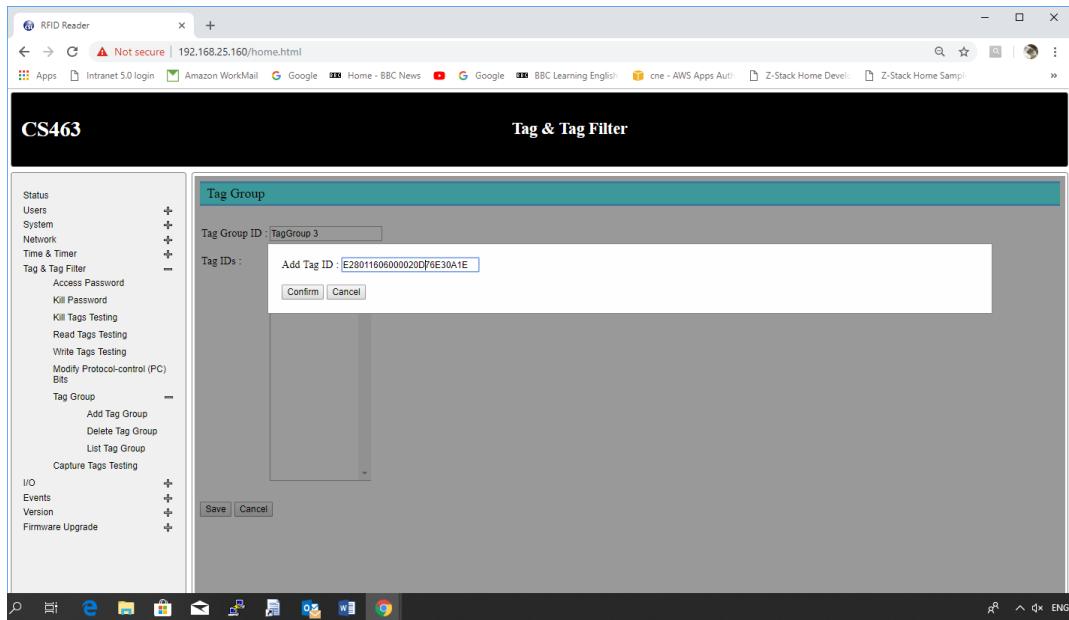
Click Add to confirm the new group



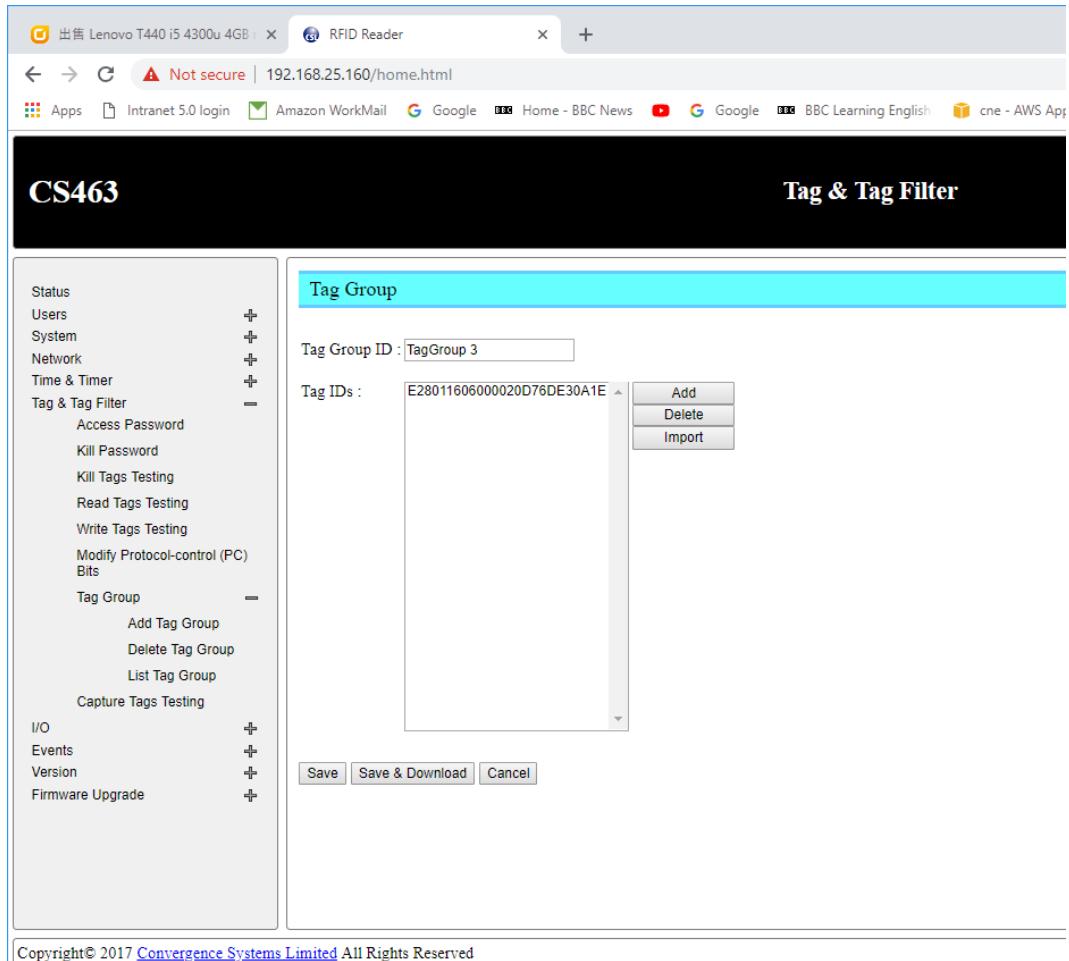
Add Tags to the group

Click Add to add new tags to the group and below menu will pop up

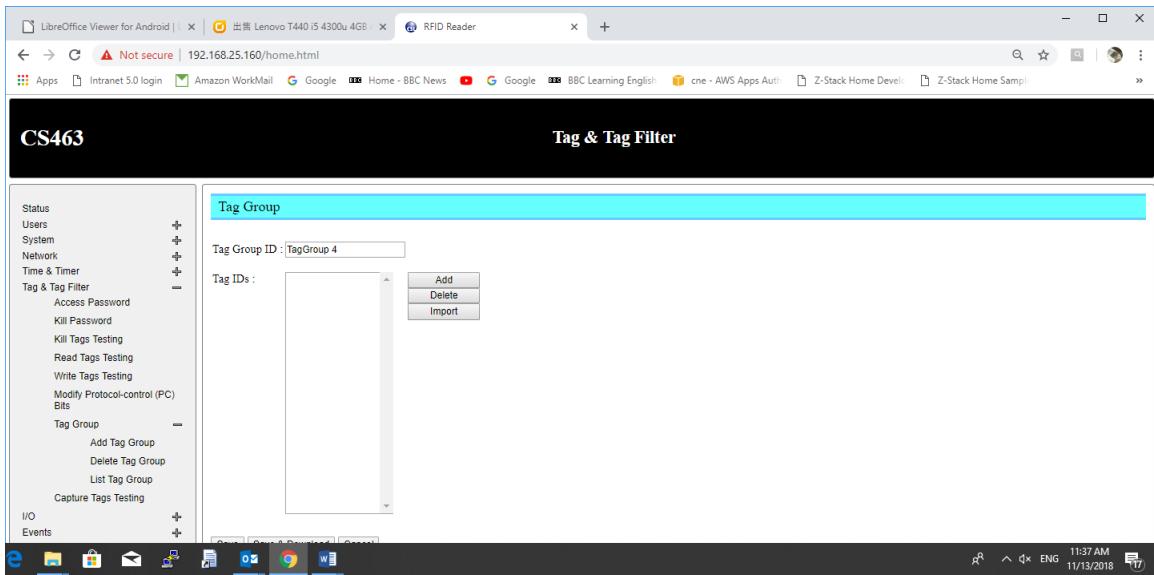
Click confirm to confirm the addition of new tag to the tag group



Click Save to save the new tag group



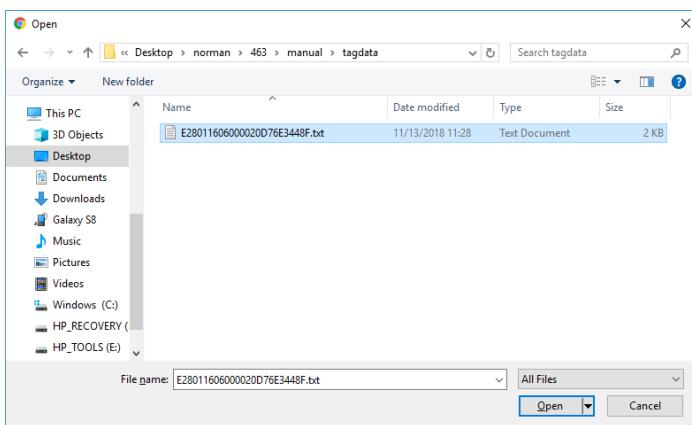
Import New tags



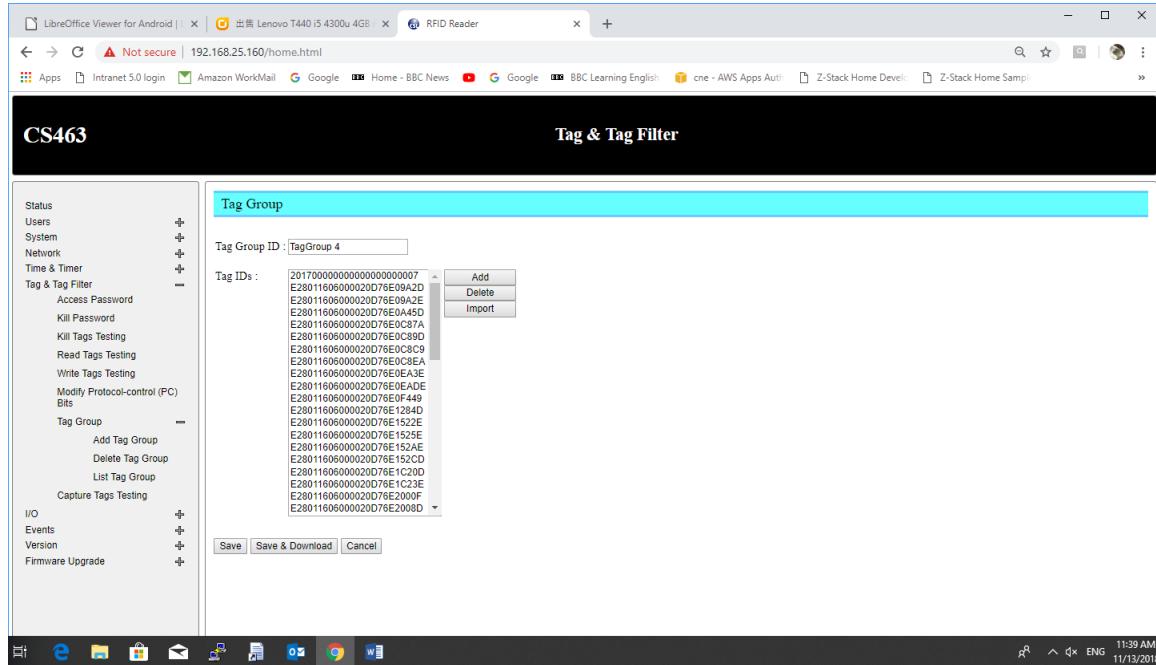
Prepare tag record file, below is the example file and view by notepad

```
E28011606000020D76E3448F.txt - Notepad
File Edit Format View Help
E28011606000020D76E3448F
E28011606000020D76E0C89D
E28011606000020D76E2A26F
E28011606000020D76E0C87A
E28011606000020D7723F875
E28011606000020D77234C51
E28011606000020D77242AF4
E28011606000020D77229C91
E28011606000020D76E1522E
E28011606000020D76E1C23E
E28011606000020D7722E2B5
E28011606000020D77246835
E28011606000020D76E152CD
E28011606000020D76E1284D
E28011606000020D76E2000F
E28011606000020D76E1525E
E28011606000020D76E2708D
E28011606000020D76E2340D
E28011606000020D76E1C28D
E28011606000020D772528A1
E28011606000020D76E2326E
E28011606000020D76E2A24E
E28011606000020D7722E2C1
E28011606000020D76E0EADE
E28011606000020D7724FCC1
E28011606000020D76E09A2D
E28011606000020D76E2A27F
E28011606000020D76E0A45D
E28011606000020D76E152AE
E28011606000020D76E3046E
```

Click Import then select the tags record file

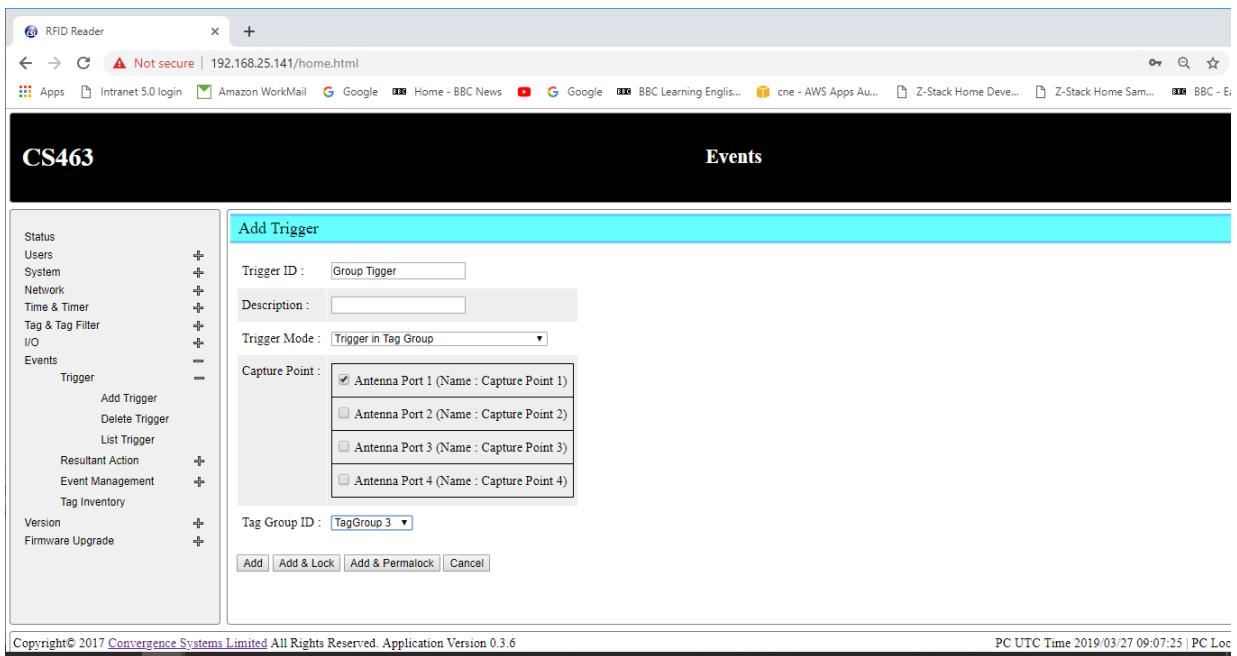


New Tags was added to the window

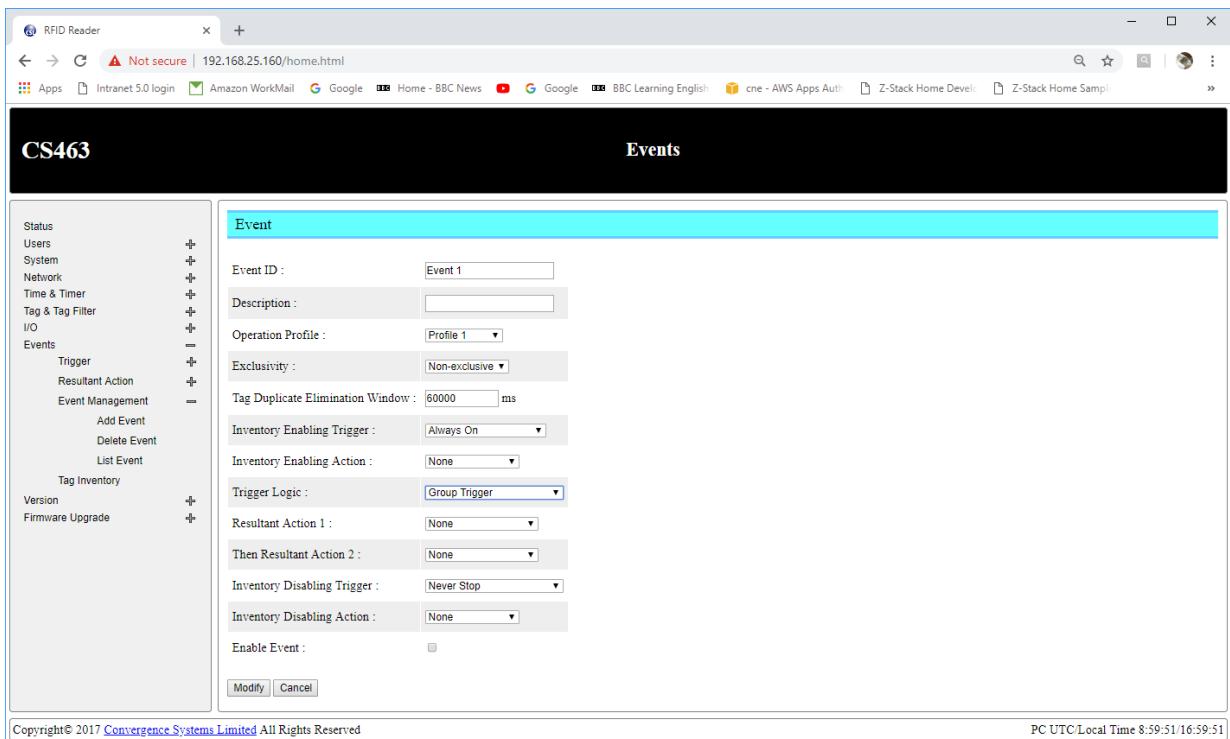


Click Save to save new record to the tag group

In the Add trigger of Event menu, new tag group (TagGroup 3) is available as shown below



Go to Event management, Group Trigger can be used in Trigger Logic on Event 1



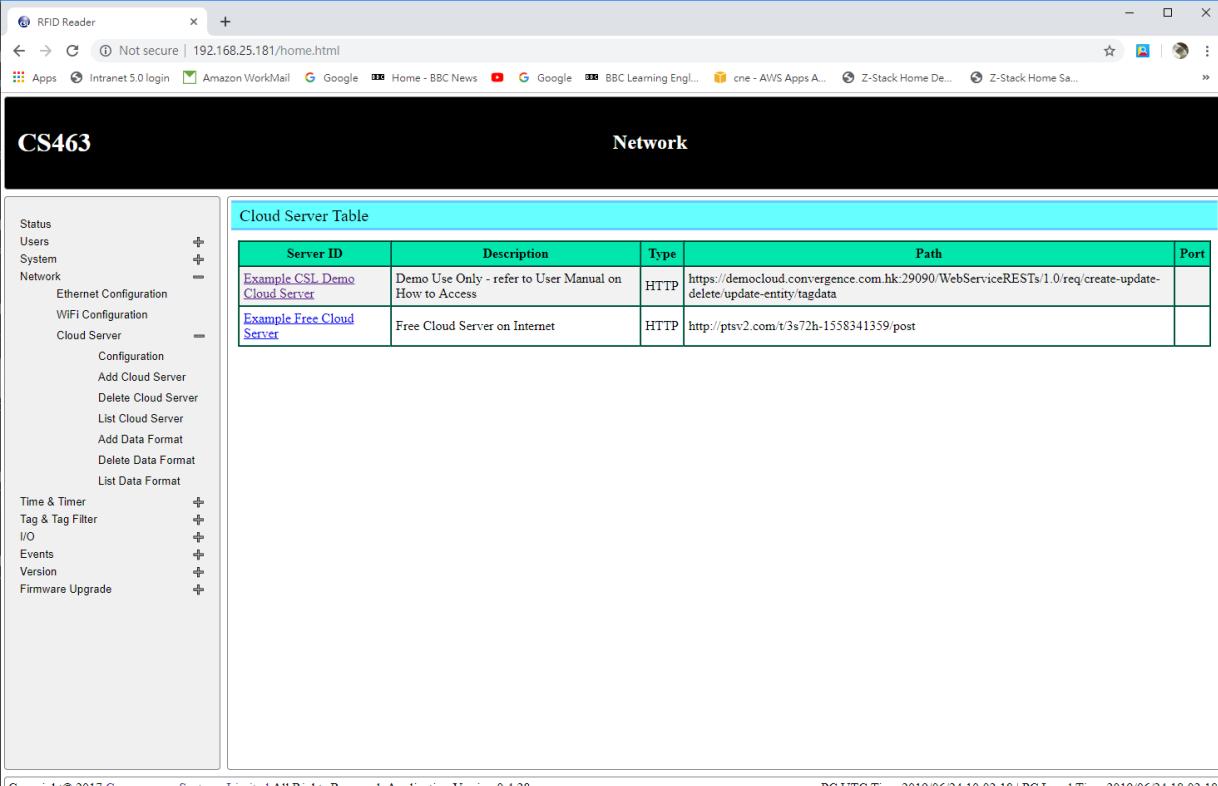
9.3 Example 1: Example Event Send to CSL Demo Cloud server

Step 1: Set up the Cloud Server Path (use CSL Demo Cloud Server in this example)

List the Cloud Server and check CSL Cloud Server path is correct (this server is saved on reader when shipped)

CSL cloud server path:

<https://democloud.convergence.com.hk:29090/WebServiceRESTs/1.0/req/create-update-delete/update-entity/tagdata>



The screenshot shows a web-based configuration interface for the CS463 device. The left sidebar contains a navigation menu with items like Status, Users, System, Network, Ethernet Configuration, WiFi Configuration, Cloud Server, Time & Timer, Tag & Tag Filter, I/O, Events, Version, and Firmware Upgrade. The main content area is titled "Network" and displays a "Cloud Server Table". The table has columns for Server ID, Description, Type, Path, and Port. It lists two entries:

Server ID	Description	Type	Path	Port
Example CSL Demo Cloud Server	Demo Use Only - refer to User Manual on How to Access	HTTP	https://democloud.convergence.com.hk:29090/WebServiceRESTs/1.0/req/create-update-delete/update-entity/tagdata	
Example Free Cloud Server	Free Cloud Server on Internet	HTTP	http://ptsv2.com/t/3s72h-1558341359/post	

At the bottom of the interface, there is a copyright notice: "Copyright© 2017 Convergence Systems Limited All Rights Reserved. Application Version 0.4.28" and a timestamp: "PC UTC Time 2019/06/24 10:02:18 | PC Local Time 2019/06/24 18:02:18".

Add Data Format for Cloud server reporting

Create a new Data Format ID

The screenshot shows a web-based interface for the CS463 device. The left sidebar contains a navigation menu with categories like Status, Users, System, Network, Time & Timer, Tag & Tag Filter, I/O, Events, Version, and Firmware Upgrade. Under the Network category, there are sub-options for Ethernet Configuration, WiFi Configuration, Cloud Server, Configuration, Add Cloud Server, Delete Cloud Server, List Cloud Server, Add Data Format, Delete Data Format, and List Data Format. The main content area is titled 'Add Data Format'. It has fields for 'Data Format ID' (set to 'Example Tag Upload to Clou'), 'Description' (empty), and 'Format' (set to 'JSON'). Below these is a 'Parameters' section containing a list of items: SequenceNumber, NumberOfTags, TagDataList, RFIDReaderName, RFIDReaderSerialNumber, RFIDReaderInternalSerialNumber, EthernetMACAddress, WiFiMACAddress, EthernetMACAddressWithColon, WiFiMACAddressWithColon, HeartBeatFlag, PowerUpFlag, TimeOfHeartBeat, TimeOfPowerUp,TimeStampOfHeartBeat,TimeStampOfPowerUp, and TimeZone. There is a 'Field' and 'Label' table header, but no data rows are present. At the bottom of the dialog are buttons for 'Add', 'Add & Lock', 'Add & Permalock', and 'Cancel'. The footer of the page includes copyright information: 'Copyright© 2017 Convergence Systems Limited All Rights Reserved. Application Version 0.4.28' and 'PC UTC Time 2019/06/24 10:11:54 | PC Local Time 2019/06/24 18:11:54'.

Select fields to be used as below. Note that in order to send data to CSL Demo Cloud Server, you **MUST** include **RFIDReaderSerialNumber** and **RFIDReaderInternalSerialNumber**. The server will check the actual production CS463 units serial number and internal serial number as well as the MAC addresses to ensure it is a bona fide CSL product.

For your own server you do may not send these data.

Add Data Format

Field	Label
TagDataList	tags
RFIDReaderName	rfidReaderName
RFIDReaderSerialNumber	rfidReaderSerialNumber
RFIDReaderInternalSerialNumber	rfidReaderInternalSerialNumber

Field	Label
EPC	epc
AntennaPort	antennaPort

Tag Data Parameters :

Parameters :

- SequenceNumber
- TimeStampOfRead
- EthernetMACAddress
- WiFiMACAddress
- EthernetMACAddressWithColon
- WiFiMACAddressWithColon
- HeartBeatFlag
- PowerUpFlag
- TimeOfHeartBeat
- TimeOfPowerUp
- TimeStampOfHeartBeat
- TimeStampOfPowerUp
- TimeZone

Tag Data Parameters :

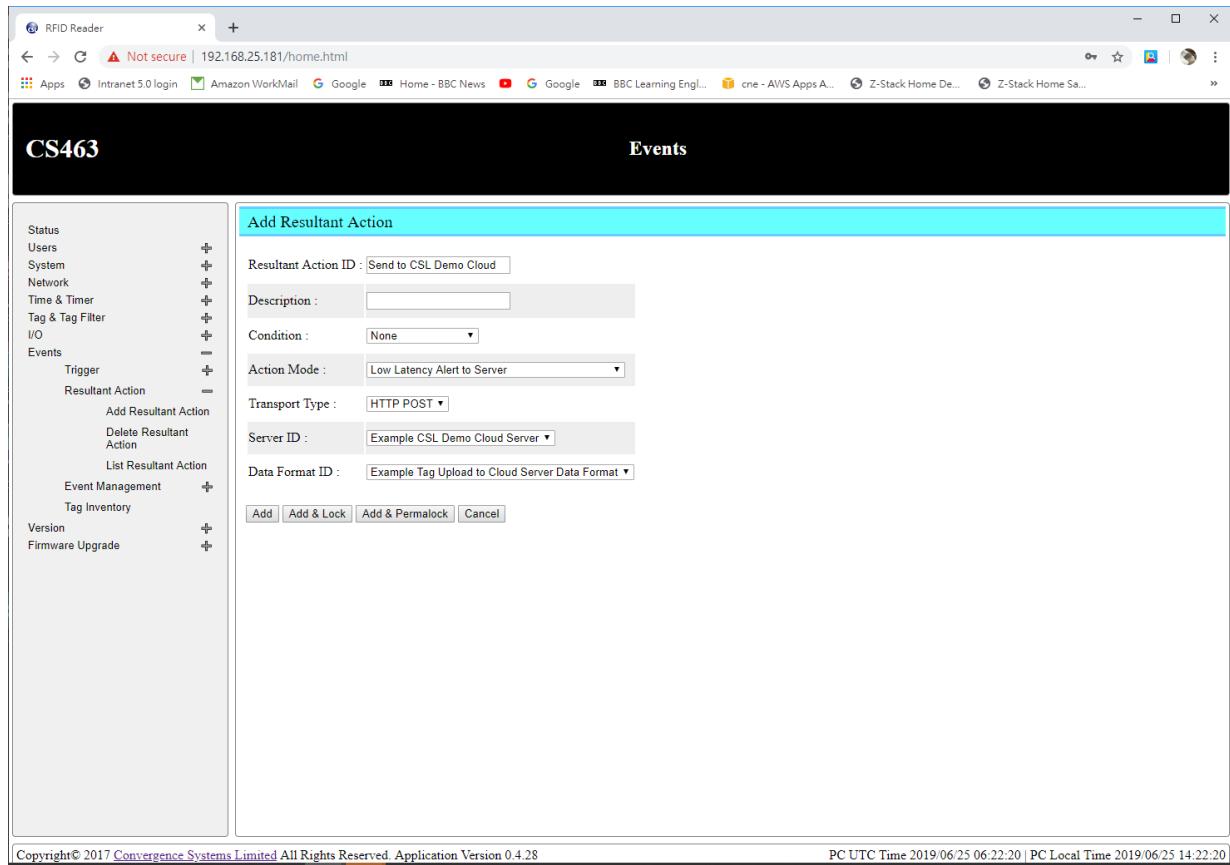
- PC
- TagID
- UserIndex
- TimeOfRead
- TimeStampOfRead
- TimeZone
- AntennaPort_Number
- RSSI
- RSSI_Number
- EventId
- HeartBeatFlag
- PowerUpFlag
- TimeOfHeartBeat
- TimeOfPowerUp
- TimeStampOfHeartBeat
- TimeStampOfPowerUp

Add & Lock | **Add & Permalock** | **Cancel**

Click Add

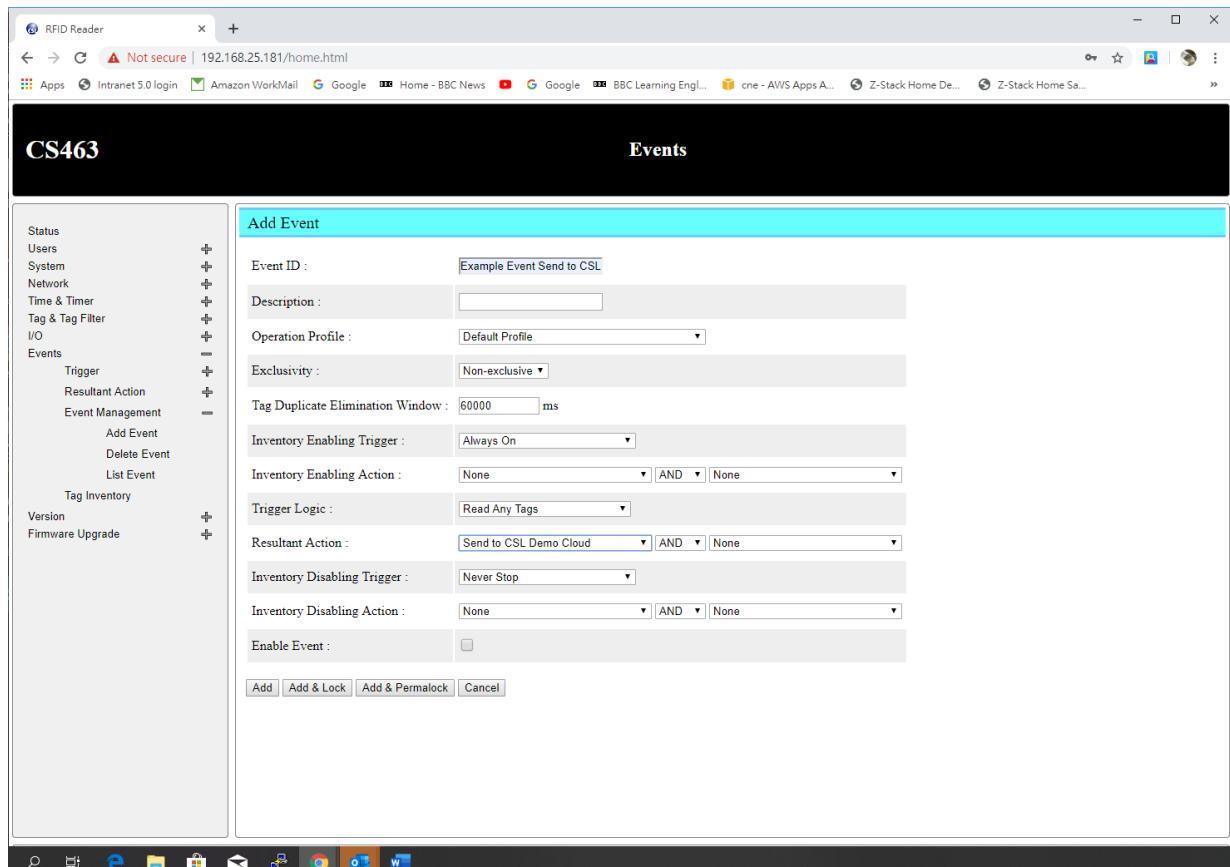
Step 2: Add Resultant Action that sends data to this Cloud Server

Add Resultant Action with Low Latency Alert Server action mode as below and using the proper Server ID (the ID “Send to CSL Demo Cloud” is used in this example) and Data Format ID

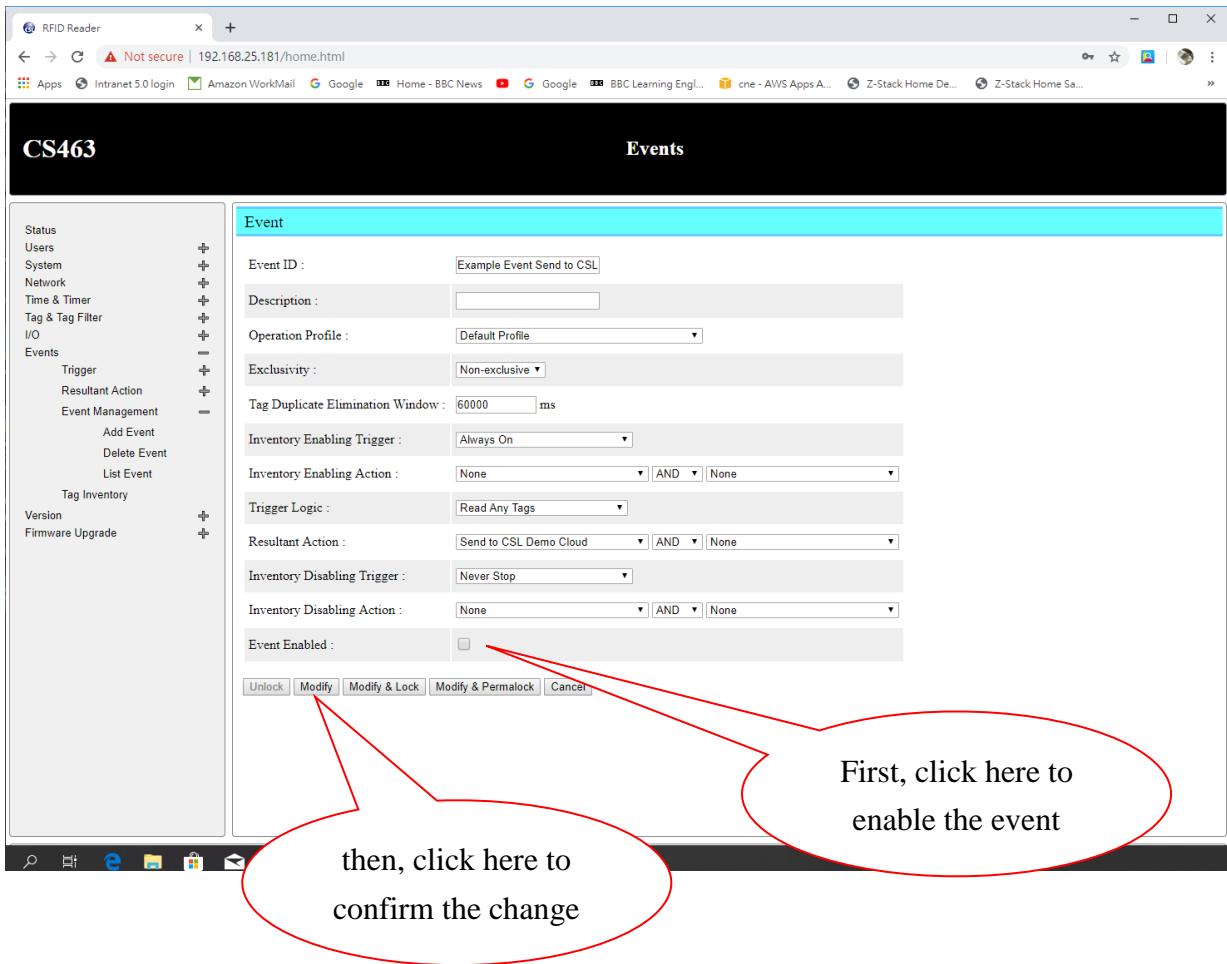


Step 3: Set up the Event

Add “Example Event Send to CSL Demo Cloud Server” and using previous defined Resultant Action “Send to CSL Demo Cloud”



Enable the event “Example Event Send to CSL Demo Cloud Server” to start Inventory so that data will be sent to cloud server



Go to Tag Inventory page to check any tags was read from reader as below (show all tags read mean raw data)

The screenshot shows a web-based application titled "RFID Reader" with the URL "192.168.25.141/home.html". The main title bar says "CS463" and "Events". On the left, there is a sidebar with various menu items like Status, Users, System, Network, Time & Timer, Tag & Tag Filter, I/O, Events (with sub-options Trigger, Resultant Action, Event Management, Add Event, Delete Event, List Event), Tag Inventory, Version, and Firmware Upgrade. The central area is titled "Capture Tags Raw" and displays a table of data. The table has columns: #, PC, EPC, Count, Ant #, Time, Freq(MHz), RSSI(dBm), and Offer Bank. The data shows 10 entries of captured tags. At the bottom of the table, it says "Rate = 89 Tags/s". The footer of the page includes copyright information: "Copyright© 2017 Convergence Systems Limited All Rights Reserved Application Version 0.4.2" and "PC UTC Time 2019/04/08 08:12:39 | PC Local Time 2019/04/08 08:12:39".

#	PC	EPC	Count	Ant #	Time	Freq(MHz)	RSSI(dBm)	Offer Bank
1	3000	E28011606000020D77242AC1	5	1	2019/04/08 16:12:33		-59	
2	3000	E28011606000020D77249C01	5	1	2019/04/08 16:12:33		-57	
3	3000	E28011606000020957BB4B20	1	1	2019/04/08 16:12:30		-73	
4	3000	E28011606000020D77246840	3	1	2019/04/08 16:12:33		-65	
5	3000	E28011606000020D77252845	4	1	2019/04/08 16:12:33		-62	
6	3000	E28011606000020D77249A60	4	1	2019/04/08 16:12:33		-57	
7	3000	20170000000000000000000000000000D	3	1	2019/04/08 16:12:33		-67	
8	3000	44444400000000000000000000000006	5	1	2019/04/08 16:12:33		-60	
9	3000	7778888000000000000000000000000060	1	1	2019/04/08 16:12:30		-68	
10	3000	99988800000000000000000000000000	5	1	2019/04/08 16:12:33		-66	

Step 5: Verify tag data is indeed sent to the CSL Demo Cloud Server

To verify the tag data has been sent to the remote server, in this case the CSL Demo Server, you need to log in to the CSL Demo Cloud Server.

To log in Cloud Server from Web page, the path is

democloud.convergence.com.hk/CSLRFIDCloudServer/

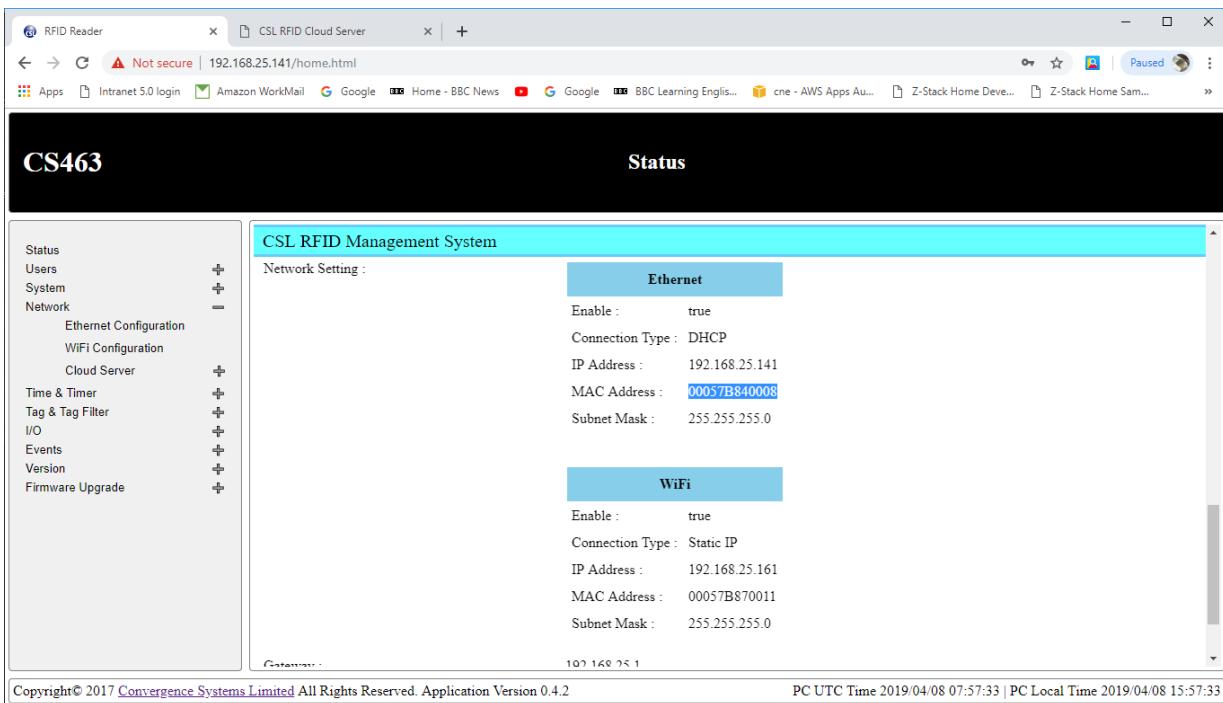
you may encounter a certificate warning, please press “details” and then “proceed to website”

To log in, it asks you for the Reader ID, which is the Reader Serial Number as printed on the product label. You can also find this on the Status Page **Reader Serial #** entry.

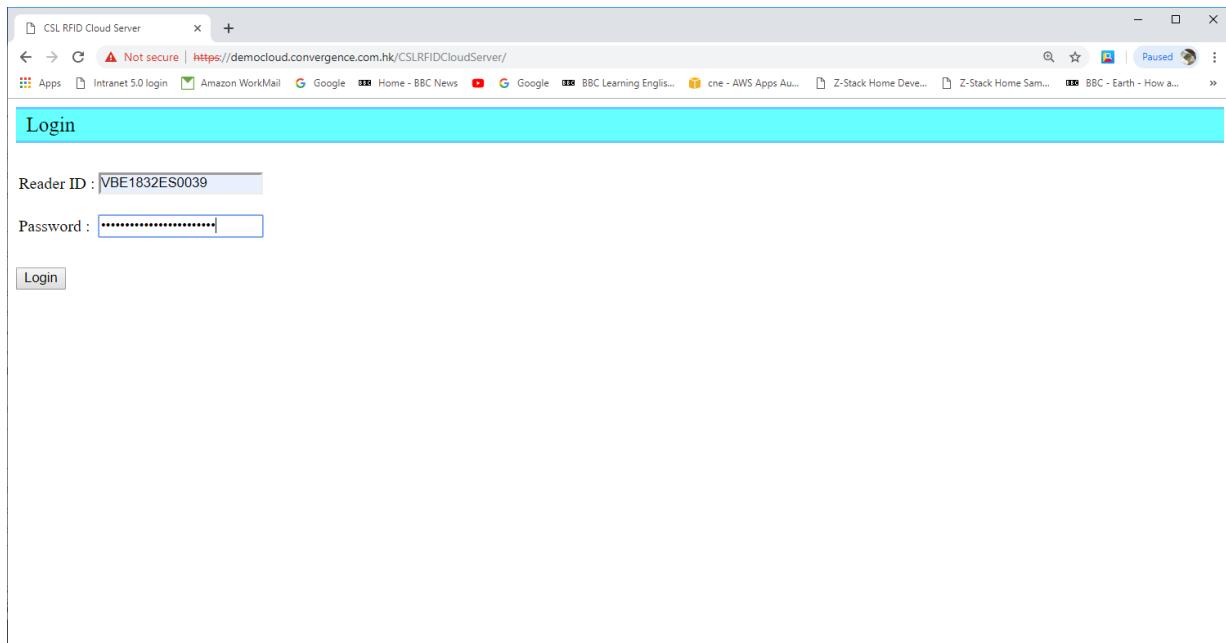
Get the login password from status page and the password is the concatenation of the Ethernet MAC address and the Wi Fi MAC address:

Password = “Ethernet MAC Address + Wi Fi MAC Address” (details go to section 8.5.3)

Again, you can find this information either on the product label or on the Status page. Note that you need to enable the Wi Fi in order to see the Wi Fi MAC address on the Status page.



Log in CSL Demo Cloud Server web page



The CSL web page after login for this Reader will show a table with all the data uploaded:

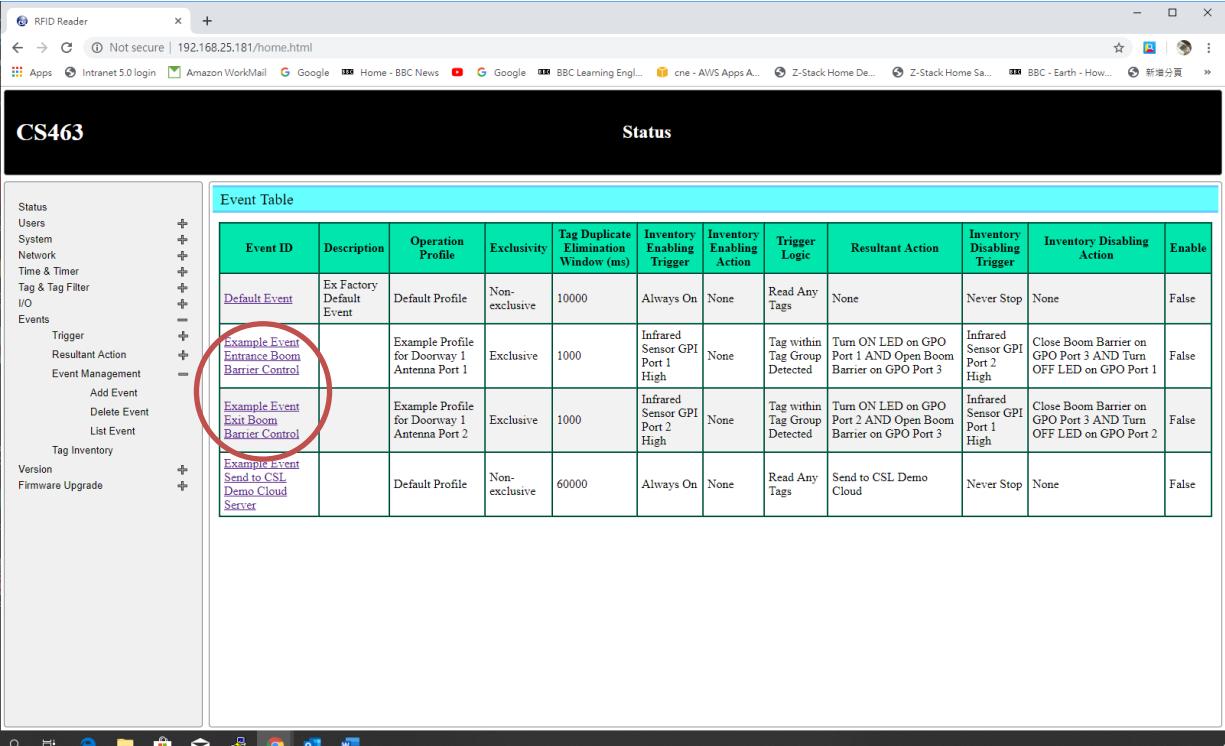
#	Access Password	Kill Password	PC	EPC	TID Bank	User Bank	Time of Read	Time Zone	Location of Read	E Compass	Antenna Port	RSSI	User Description	RFID Reader Name	RFID Reader Serial #	RFID Reader Internal Serial #	Smart Phone Name	Smart Phone Serial #	Smart Phone BT MAC
185				E28011606000020957BB4A6						1	-65		CSL 463 RFID READER	VBE1832ES0039	VBE1832ES0017				
184				E28011606000020D77249A61						1	-65		CSL 463 RFID READER	VBE1832ES0039	VBE1832ES0017				
183				44444000000000000000039						1	-68		CSL 463 RFID READER	VBE1832ES0039	VBE1832ES0017				
182				E28011606000020D77242AB1						1	-63		CSL 463 RFID READER	VBE1832ES0039	VBE1832ES0017				
181				E280116060000208EFD8925F						1	-75		CSL 463 RFID READER	VBE1832ES0039	VBE1832ES0017				
180				108000000000000000000021						1	-70		CSL 463 RFID READER	VBE1832ES0039	VBE1832ES0017				
179				E28011606000020D77249A02						1	-69		CSL 463 RFID READER	VBE1832ES0039	VBE1832ES0017				
178				E28011606000020D77246801						1	-65		CSL 463 RFID READER	VBE1832ES0039	VBE1832ES0017				
177				222333201900000000000099						1	-64		CSL 463 RFID READER	VBE1832ES0039	VBE1832ES0017				
176				E28011606000020957BB205A						1	-71		CSL 463 RFID READER	VBE1832ES0039	VBE1832ES0017				
175				E28011606000020D77249CC1						1	-68		CSL 463 RFID READER	VBE1832ES0039	VBE1832ES0017				

9.4 Example 2: Traffic Control – Management of Traffic at Building Entrance

Define two events to manage the Truck/Personnel In and Out, one event for incoming called “Example Event Entrance Boom Barrier Control”, while another event for outgoing called “Example Event Exit Boom Barrier Control”, also those two event is exclusive since the system should not handle the Entrance/Exit simultaneously. Also, two antenna was used in this example, ensure antenna was connected both on Antenna Port 1 and Port 2 before enable the example event mentioned on following section

For incoming personnel case, the Tigger “Infrared Sensor GP1 Port 1 High” is used to detect incoming personnel then start inventory, this personnel leaving is detected by “Infrared Sensor GP1 Port 2 High” then stop inventory.

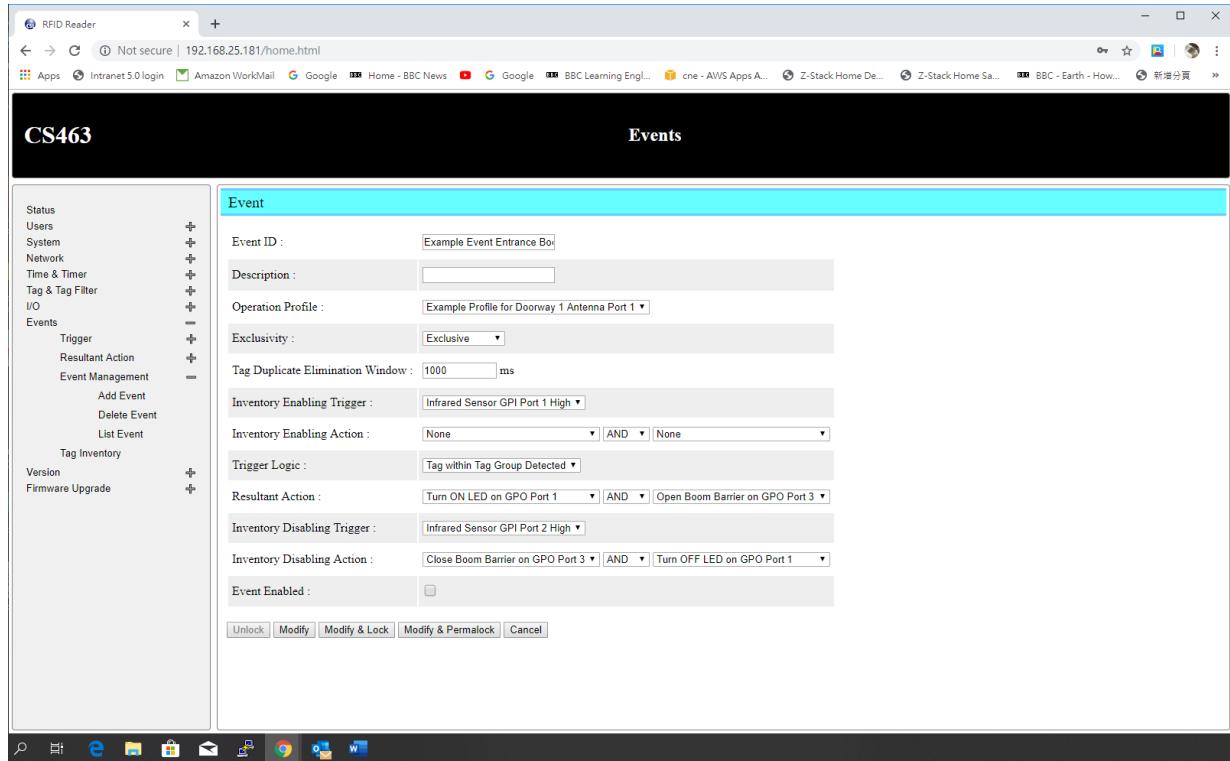
For leaving personnel case, the Tigger “Infrared Sensor GP1 Port 2 High” is used to detect leaving personnel then start inventory, the personnel going out is detected by “Infrared Sensor GP1 Port 1 High” then stop inventory.



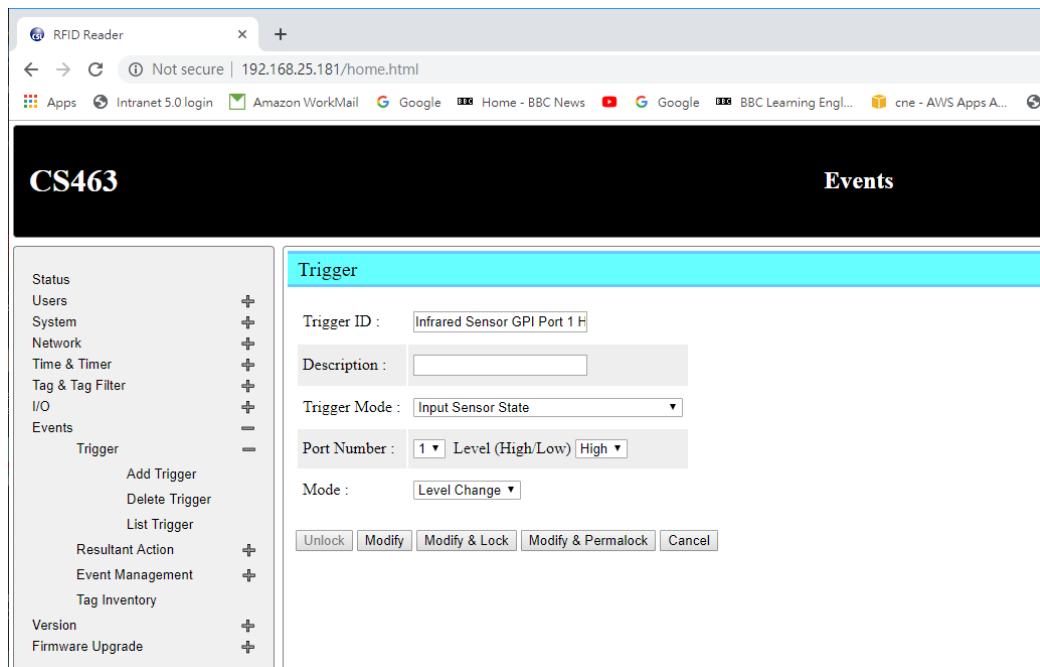
Event Table											
Event ID	Description	Operation Profile	Exclusivity	Tag Duplicate Elimination Window (ms)	Inventory Enabling Trigger	Inventory Enabling Action	Trigger Logic	Resultant Action	Inventory Disabling Trigger	Inventory Disabling Action	Enable
Default Event	Ex Factory Default Event	Default Profile	Non-exclusive	10000	Always On	None	Read Any Tags	None	Never Stop	None	False
Example Event Entrance Boom Barrier Control	Example Profile for Doorway 1 Antenna Port 1	Exclusive	1000	Infrared Sensor GPI Port 1 High	None	Tag within Tag Group Detected	Turn ON LED on GPO Port 1 AND Open Boom Barrier on GPO Port 3	Infrared Sensor GPI Port 2 High	Close Boom Barrier on GPO Port 3 AND Turn OFF LED on GPO Port 1	Close Boom Barrier on GPO Port 2 High	False
Example Event Exit Boom Barrier Control	Example Profile for Doorway 1 Antenna Port 2	Exclusive	1000	Infrared Sensor GPI Port 2 High	None	Tag within Tag Group Detected	Turn ON LED on GPO Port 2 AND Open Boom Barrier on GPO Port 3	Infrared Sensor GPI Port 1 High	Close Boom Barrier on GPO Port 3 AND Turn OFF LED on GPO Port 2	Close Boom Barrier on GPO Port 1 High	False
Example Event Send to CSL Demo Cloud Server		Default Profile	Non-exclusive	60000	Always On	None	Read Any Tags	Send to CSL Demo Cloud	Never Stop	None	False

Personnel Incoming case

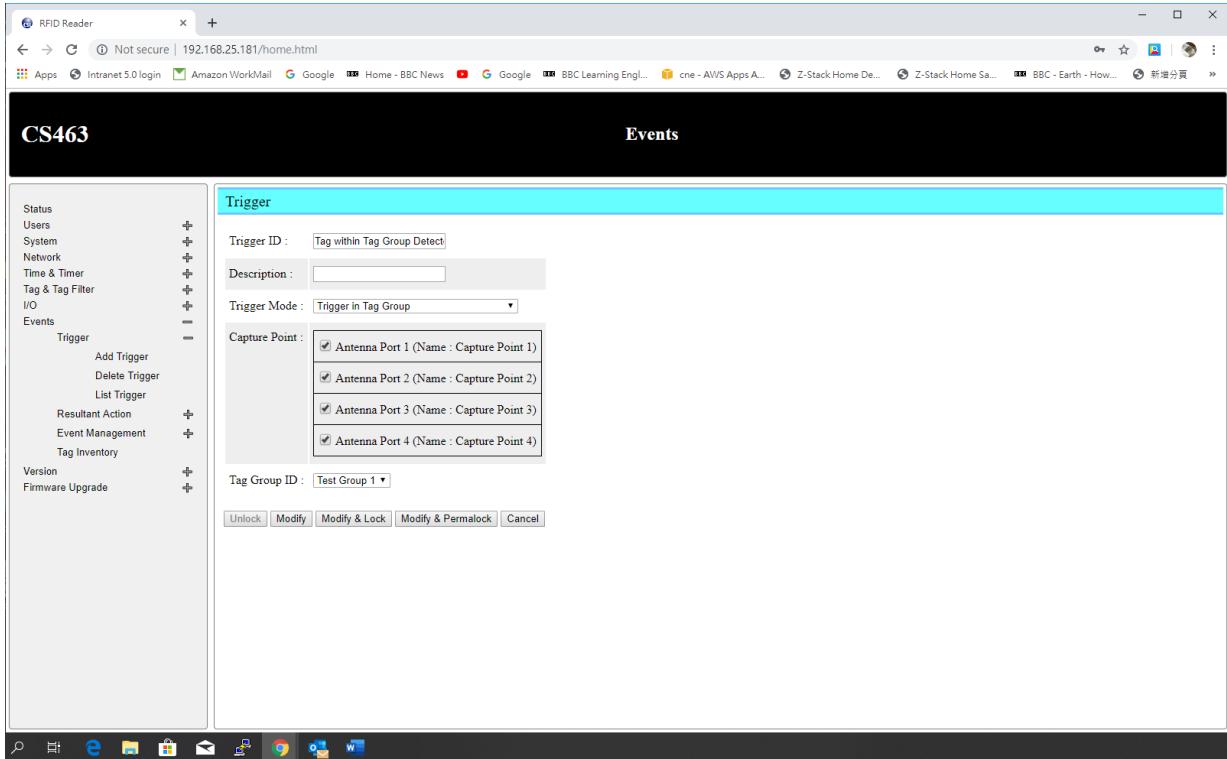
“Example Event Entrance Boom Barrier Control” even details



One Input port is used to monitor the incoming Personnel/truck, If the level of input port changed from Low to High such as infrared detector, the inventory will be enabled. This trigger is defined as below



There is another trigger to control the detection of tag group as shown below and trigger mode is “Trigger in Tag Group”

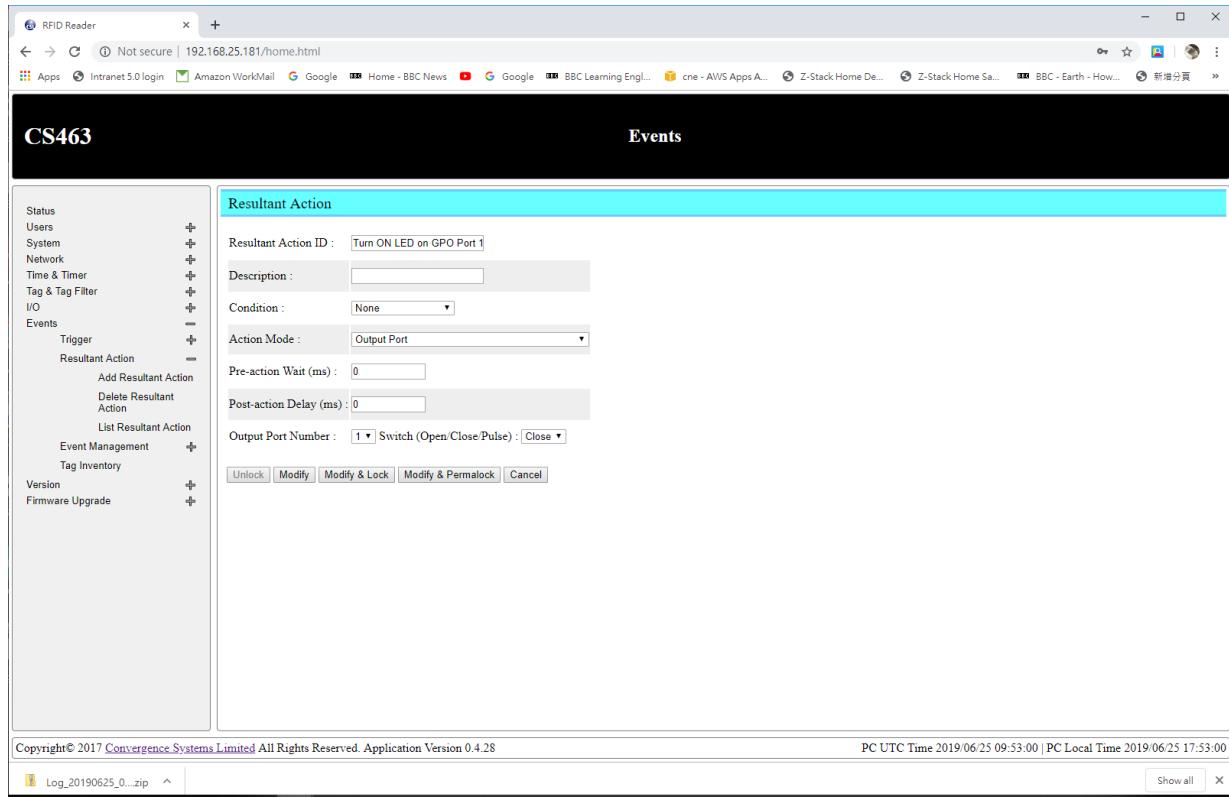


The Tag Group called Test Group 1 is used in this trigger and this tag group was defined in Tag group under Tag & Tag filter page as shown below



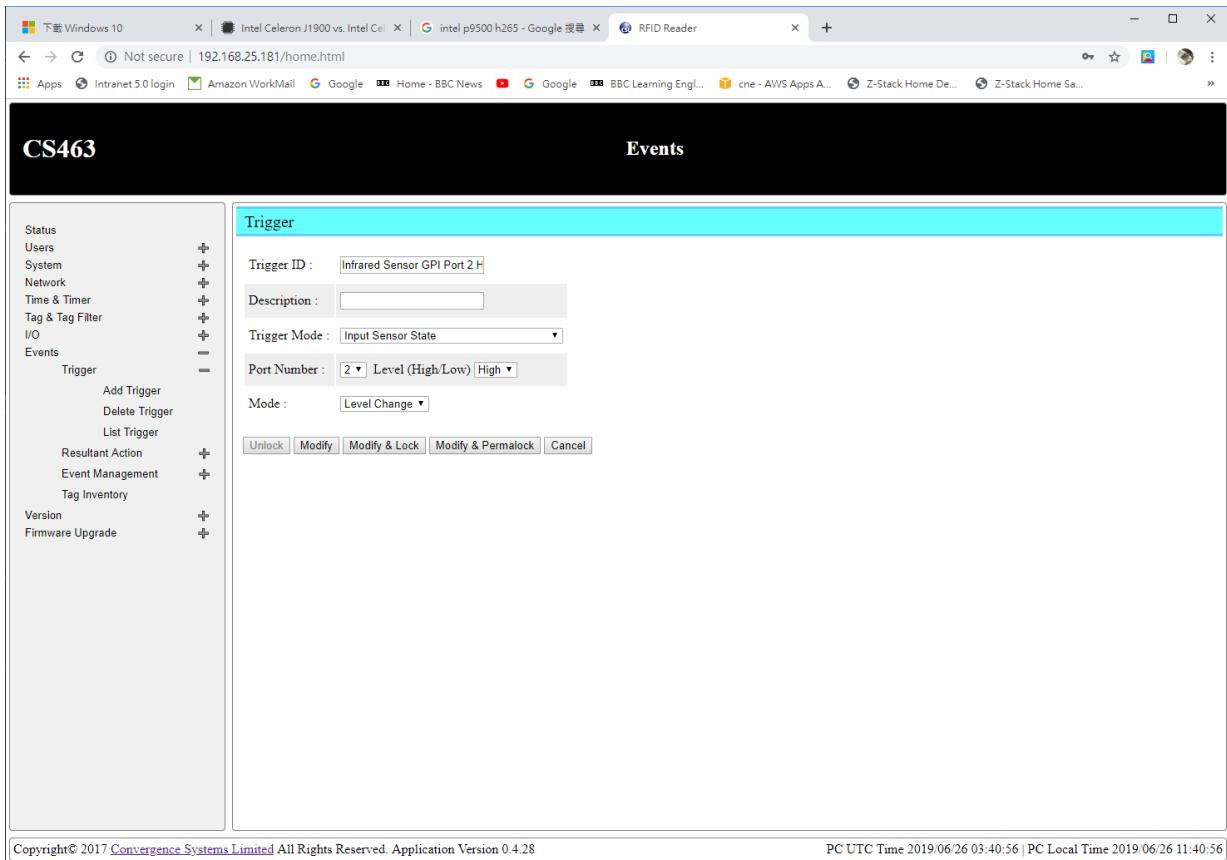
There are Resultant actions after particular tag was detected within the group and defined as below

This resultant action will turn on the output port



The inventory will be stopped by trigger called “Infrared Sensor GPI Port 2 High”

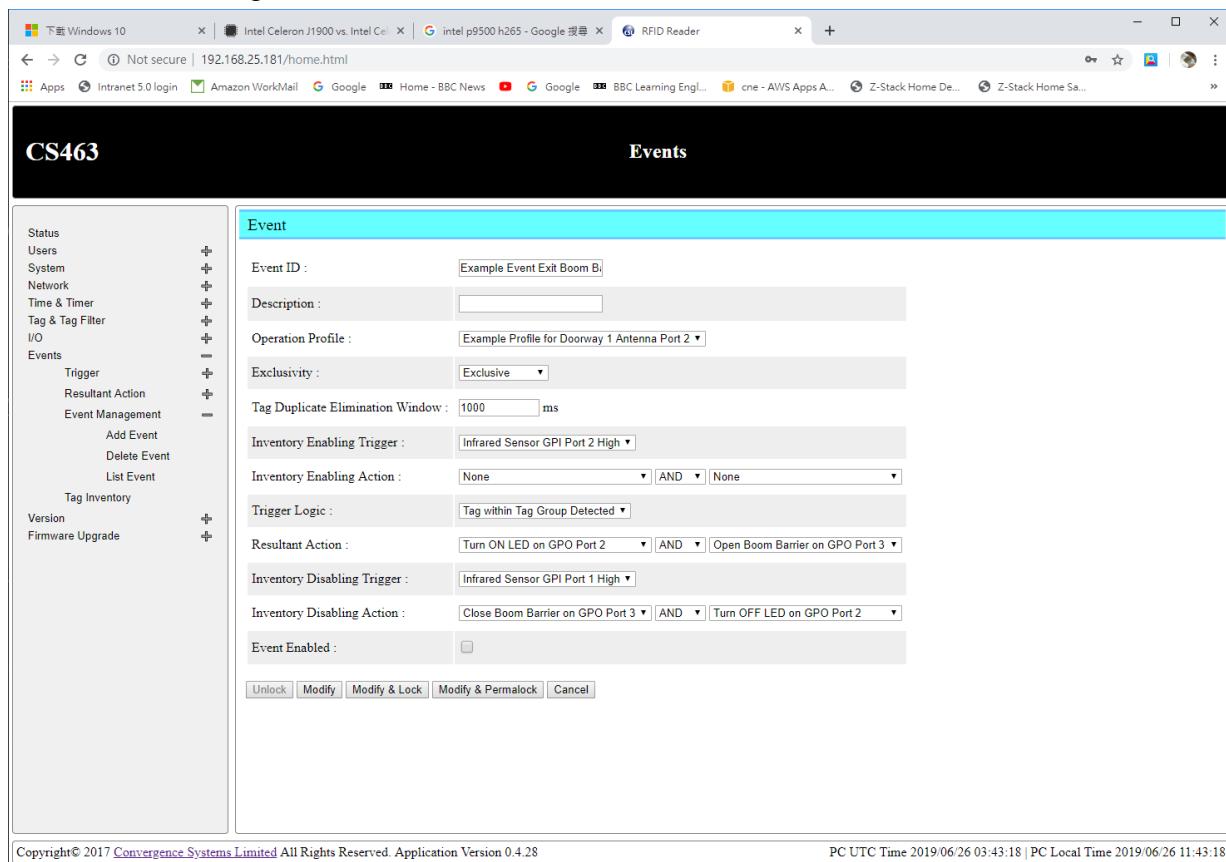
Another Input port is used to monitor the incoming Personnel/truck leaving detection zone, If the state of input port level changed from Low to High such as infrared detector, the inventory will be stopped. This trigger is defined as below



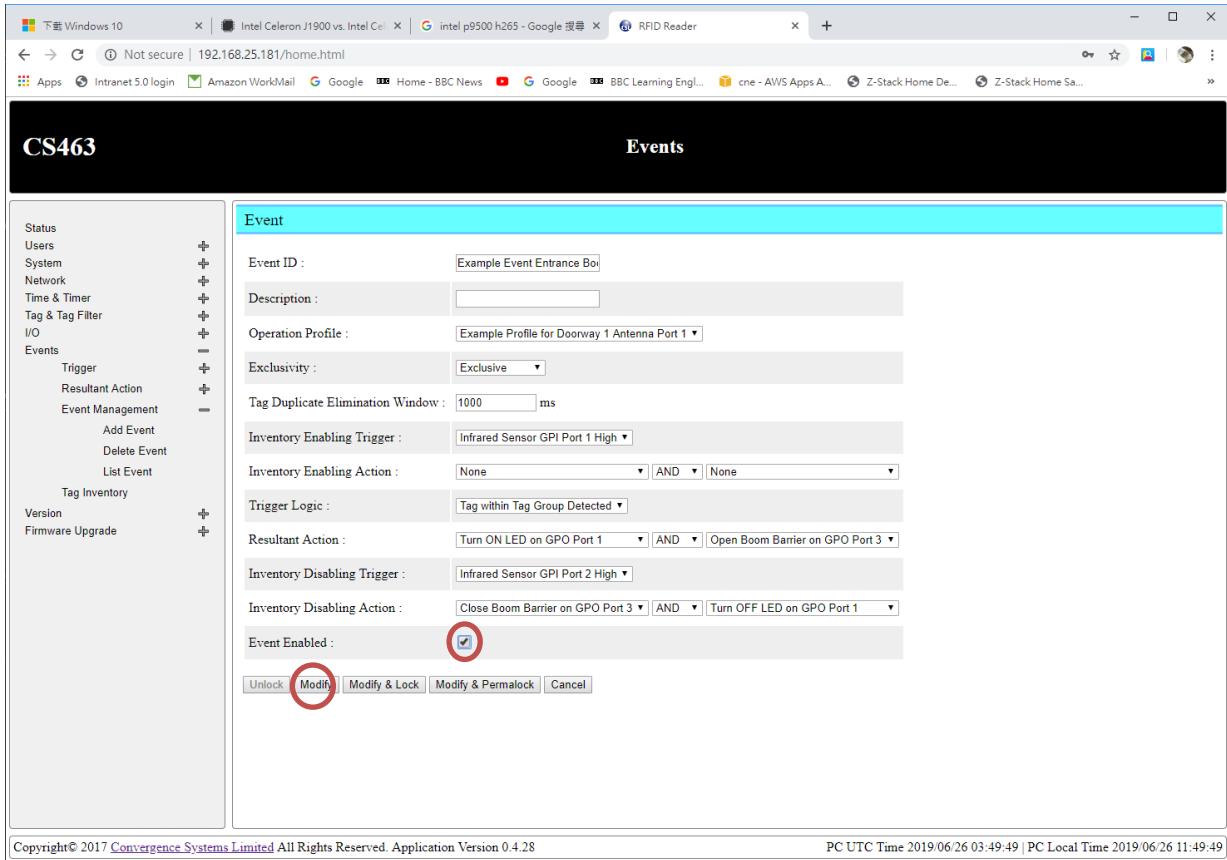
Personnel Outgoing case

“Example Event Exit Boom Barrier Control” event details

For leaving personnel case, the Tigger “Infrared Sensor GPI Port 2 High” is used to detect leaving personnel reaching detection zone then start inventory, this personnel going out is detected by “Infrared Sensor GPI Port 1 High” and stop inventory. All other logic is same as Personnel Incoming case as shown below



After the both “Example Event Entrance Boom Barrier Control”/ “Example Event Exit Boom Barrier Control” event was defined, each event should be enabled by clicking Even Enabled and click Modify to save the changed



After both events was enabled and Enable field become true as shown below

Please ensure both Antenna Port 1 and Antenna Port 2 was connected with antenna before enable mentioned Events

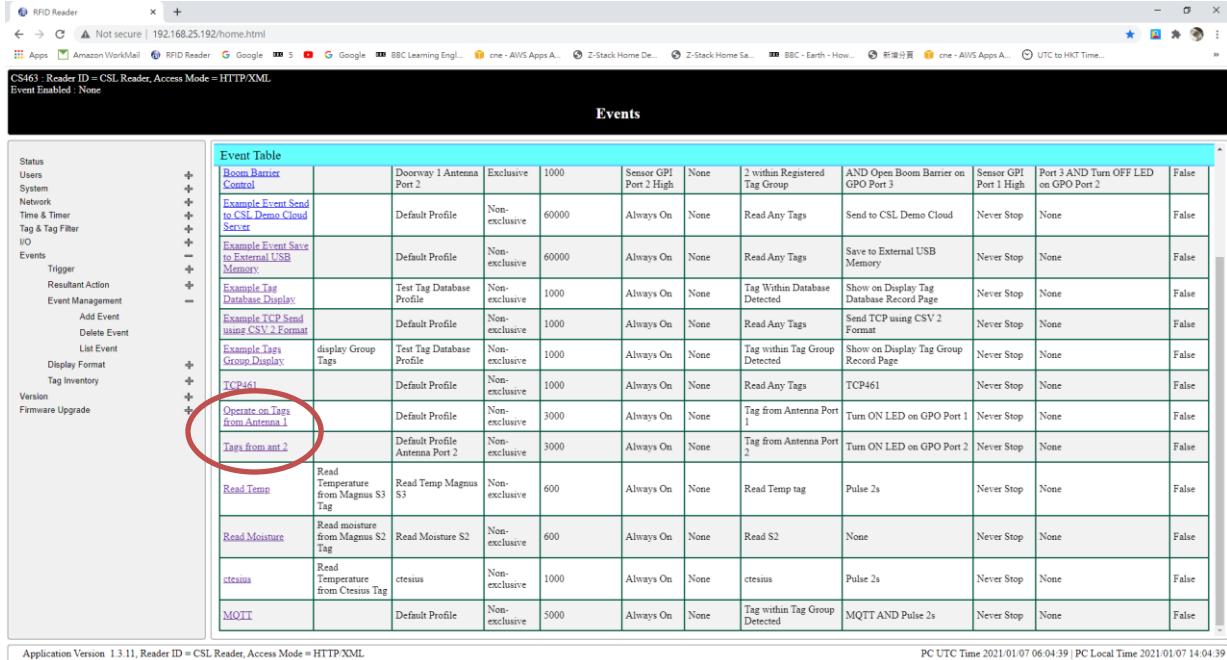
The screenshot shows the CS463 software interface. On the left, there is a sidebar with various menu items like Status, Users, System, Network, Time & Timer, Tag & Tag Filter, I/O, Events, Trigger, Resultant Action, Event Management, Add Event, Delete Event, List Event, Tag Inventory, Version, and Firmware Upgrade. The 'Events' section is currently selected. The main area is titled 'Events' and contains a table with the following data:

Event ID	Description	Operation Profile	Exclusivity	Tag Duplication Elimination Window (ms)	Inventory Enabling Trigger	Inventory Enabling Action	Trigger Logic	Resultant Action	Inventory Disabling Trigger	Inventory Disabling Action	Enable
Default Event	Ex Factory Default Event	Default Profile	Non-exclusive	10000	Always On	None	Read Any Tags	None	Never Stop	None	False
Example Event Entrance Boom Barrier Control	Example Profile for Doorway 1 Antenna Port 1	Exclusive	1000	Infrared Sensor GPI Port 1 High	None	Tag within Tag Group Detected	Turn ON LED on GPO Port 1 AND Open Boom Barrier on GPO Port 3	Infrared Sensor GPI Port 2 High	Close Boom Barrier on GPO Port 3 AND Turn OFF LED on GPO Port 1		True
Example Event Exit Boom Barrier Control	Example Profile for Doorway 1 Antenna Port 2	Exclusive	1000	Infrared Sensor GPI Port 2 High	None	Tag within Tag Group Detected	Turn ON LED on GPO Port 2 AND Open Boom Barrier on GPO Port 3	Infrared Sensor GPI Port 1 High	Close Boom Barrier on GPO Port 3 AND Turn OFF LED on GPO Port 2		True
Example Event Send to CSL Demo Cloud Server	Default Profile	Non-exclusive	60000	Always On	None	Read Any Tags	Send to CSL Demo Cloud	Never Stop	None		False

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PC UTC Time 2019/06/26 04:03:04 | PC Local Time 2019/06/26 12:03:04

9.5 Example 3: Multiple Antenna Ports with Different Events for Each Port



The screenshot shows the 'Events' section of the software. On the left, there's a sidebar with various menu items like Status, Users, System, Network, Time & Timer, Tag & Tag Filter, I/O, Events, Trigger, Resultant Action, Event Management, Add Event, Delete Event, List Event, Display Format, Tag Inventory, Version, and Firmware Upgrade. The 'Events' item is selected. The main area is titled 'Event Table' and contains a grid of rows and columns. The columns are: Status, Name, Description, Type, Profile, Duration, Sensor GPIO, None, 2 within Registered Tag Group, AND Open Boom Barrier on GPO Port 3, Sensor GPIO Port 1 High, Port 3 AND Turn OFF LED on GPO Port 2, and Enabled. There are approximately 15 rows in the table. Two specific rows are highlighted with red circles: 'Operate on Tags from Antenna 1' and 'Tags from ant 2'. Both of these rows have their 'Enabled' status set to 'True'.

Status	Name	Description	Type	Profile	Duration	Sensor GPIO	None	2 within Registered Tag Group	AND Open Boom Barrier on GPO Port 3	Sensor GPIO Port 1 High	Port 3 AND Turn OFF LED on GPO Port 2	Enabled
+ Status	Boom Barrier Control	Doorway 1 Antenna Port 2	Exclusive	1000	Sensor GPIO Port 2 High	None	2 within Registered Tag Group	Send to CSL Demo Cloud	Never Stop	None	False	
+ Users	Example Event Send to CSL Demo Cloud Server	Default Profile	Non-exclusive	60000	Always On	None	Read Any Tags	Save to External USB Memory	Never Stop	None	False	
+ System	Example Event Save to External USB Memory	Default Profile	Non-exclusive	60000	Always On	None	Read Any Tags	Show on Display Tag Database Record Page	Never Stop	None	False	
+ Network	Example Tag Database Display	Test Tag Database Profile	Non-exclusive	1000	Always On	None	Tag Within Database Detected	Send TCP using CSV 2 Format	Never Stop	None	False	
+ Time & Timer	Example TCP Send using CSV 2 Format	Default Profile	Non-exclusive	1000	Always On	None	Read Any Tags	Show on Display Tag Group Record Page	Never Stop	None	False	
+ Tag & Tag Filter	Example Tags Group Display	display Group Tags	Test Tag Database Profile	Non-exclusive	1000	Always On	None	Tag within Tag Group Detected	Never Stop	None	False	
+ I/O	TCP461	Default Profile	Non-exclusive	1000	Always On	None	Read Any Tags	TCP461	Never Stop	None	False	
+ Events	Operate on Tags from Antenna 1	Default Profile	Non-exclusive	3000	Always On	None	Tag from Antenna Port 1	Turn ON LED on GPO Port 1	Never Stop	None	False	
+ Trigger	Tags from ant 2	Default Profile Antenna Port 2	Non-exclusive	3000	Always On	None	Tag from Antenna Port 2	Turn ON LED on GPO Port 2	Never Stop	None	False	
+ Resultant Action	Read Temp	Read Temperature from Magnus S3 Tag	Read Temp Magnus S3	Non-exclusive	600	Always On	None	Read Temp tag	Pulse 2s	Never Stop	None	False
+ Event Management	Read Moisture	Read moisture from Magnus S2 Tag	Read Moisture S2	Non-exclusive	600	Always On	None	Read S2	None	Never Stop	None	False
+ Add Event	Celsius	Read Temperature from Celsius Tag	celsius	Non-exclusive	1000	Always On	None	celsius	Pulse 2s	Never Stop	None	False
+ Delete Event	MQTT	Default Profile	Non-exclusive	5000	Always On	None	Tag within Tag Group Detected	MQTT AND Pulse 2s	Never Stop	None	False	
+ List Event												
+ Display Format												
+ Tag Inventory												
+ Version												
+ Firmware Upgrade												

The event “Operate on Tags from Antenna 1” is used to handle tags from antenna port 1 while event “Tags from ant 2” work for tags from antenna port 2. If both even was enabled, different event can work for each port simultaneously.

The event “Operate on Tags from Antenna 1” details as below. It will turn on GPIO port1 if tag within tag group defined in Test Group 1, was detected coming from antenna port1.

CS463 : Reader ID = CSL Reader, Access Mode = HTTP/XML
Event Enabled : None

Events

Status
Users
System
Network
Time & Timer
Tag & Tag Filter
I/O
Events
Trigger
Resultant Action
Event Management
Add Event
Delete Event
List Event
Display Format
Tag Inventory
Version
Firmware Upgrade

Event

Event ID : Operate on Tags from Antenna 1
Description :
Operation Profile : Default Profile
Exclusivity : Non-exclusive
Tag Duplicate Elimination Window : 3000 ms
Tag Duplicate Eliminate Antenna Differentiation :
Inventory Enabling Trigger : Always On
Inventory Enabling Action : None AND None
Trigger Logic : Tag from Antenna Port 1
Resultant Action : Turn ON LED on GPO Port 1 AND None
Inventory Disabling Trigger : Never Stop
Inventory Disabling Action : None AND None
Event Enabled :

Unlock Modify Modify & Lock Modify & Permalock Cancel

Application Version 1.3.11, Reader ID = CSL Reader, Access Mode = HTTP/XML PC UTC Time 2021/01/07 06:34:32 | PC Local Time 2021/01/07 14:34:32

Corresponding trigger shown on below

CS463 : Reader ID = CSL Reader, Access Mode = HTTP/XML
Event Enabled : None

Events

Status
Users
System
Network
Time & Timer
Tag & Tag Filter
I/O
Events
Trigger
Add Trigger
Delete Trigger
List Trigger
Resultant Action
Event Management
Display Format
Tag Inventory
Version
Firmware Upgrade

Trigger

Trigger ID : Tag from Antenna Port 1
Description : Tag group1 from ant 1
Trigger Mode : Trigger in Tag Group
Capture Point : Antenna Port 1 Name : Capture Point 1
 Antenna Port 2 Name : Capture Point 2
 Antenna Port 3 Name : Capture Point 3
 Antenna Port 4 Name : Capture Point 4
Tag Group ID : Test Group 1

Unlock Modify Modify & Lock Modify & Permalock Cancel

Application Version 1.3.11, Reader ID = CSL Reader, Access Mode = HTTP/XML PC UTC Time 2021/01/07 06:37:20 | PC Local Time 2021/01/07 14:37:20

The event “Tags from ant 2” details as below. It will turn on GPIO port2 if tag within tag group defined in TagGroup 3, was detected coming from antenna port 2.

CS463 : Reader ID = CSL Reader, Access Mode = HTTP/XML
Event Enabled : None

Events

Status
Users
System
Network
Time & Timer
Tag & Tag Filter
I/O
Events
Trigger
Resultant Action
Event Management
Add Event
Delete Event
List Event
Display Format
Tag Inventory
Version
Firmware Upgrade

Event

Event ID : Tags from ant 2
Description :
Operation Profile : Default Profile Antenna Port 2
Exclusivity : Non-exclusive
Tag Duplicate Elimination Window : 3000 ms
Tag Duplicate Eliminate Antenna Differentiation :
Inventory Enabling Trigger : Always On
Inventory Enabling Action : None
Trigger Logic : Tag from Antenna Port 2
Resultant Action : Turn ON LED on GPO Port 2
Inventory Disabling Trigger : Never Stop
Inventory Disabling Action : None
Event Enabled :
Buttons: Unlock, Modify, Modify & Lock, Modify & Permalock, Cancel

Application Version 1.3.11, Reader ID = CSL Reader, Access Mode = HTTP/XML | PC UTC Time 2021/01/07 06:43:52 | PC Local Time 2021/01/07 14:43:52

Corresponding trigger shown on below

CS463 : Reader ID = CSL Reader, Access Mode = HTTP/XML
Event Enabled : None

Events

Status
Users
System
Network
Time & Timer
Tag & Tag Filter
I/O
Events
Trigger
Add Trigger
Delete Trigger
List Trigger
Resultant Action
Event Management
Display Format
Tag Inventory
Version
Firmware Upgrade

Trigger

Trigger ID : Tag from Antenna Port 2
Description : Tag group3 from Ant 2
Trigger Mode : Trigger in Tag Group
Capture Point : Antenna Port 2 Name : Capture Point 2
 Antenna Port 3 Name : Capture Point 3
 Antenna Port 4 Name : Capture Point 4
Tag Group ID : TagGroup 3
Buttons: Unlock, Modify, Modify & Lock, Modify & Permalock, Cancel

Application Version 1.3.11, Reader ID = CSL Reader, Access Mode = HTTP/XML | PC UTC Time 2021/01/07 06:44:25 | PC Local Time 2021/01/07 14:44:25

9.6 Example 4: Example Event using Database Tag Group and Database Display

The event Example Tag Database Display can display content of database located in reader if tag within database tag group was detected from antenna port 1 on CS463 or antenna port 4 on CS203X. This database record can contain Picture/Photo and text such as equipment photo, staff photo and corresponding text

Event ID	Description	Operation Profile	Exclusivity	Tag Duplication Elimination Window (ms)	Inventory Enabling Trigger	Inventory Enabling Action	Trigger Logic	Resultant Action	Inventory Disabling Trigger	Inventory Disabling Action	Enable
Default Event	Ex Factory Default Event	Default Profile	Non-exclusive	6000	Always On	None	Read Any Tags	None	Never Stop	None	False
Example Event Entrance Boom Barrier Control	Example Profile for Doorway 1 Antenna Port 1	Exclusive	Exclusive	1000	Infrared Sensor GPI Port 1 High	None	Tag from Antenna Port 1 within Registered Tag Group	Turn ON LED on GPO Port 1 AND Open Boom Barrier on GPO Port 3	Infrared Sensor GPI Port 3 AND Turn OFF LED on GPO Port 1	Close Boom Barrier on GPO Port 3 AND Turn OFF LED on GPO Port 1	False
Example Event Exit Boom Barrier Control	Example Profile for Doorway 1 Antenna Port 2	Exclusive	Exclusive	1000	Infrared Sensor GPI Port 2 High	None	Tag from Antenna Port 2 within Registered Tag Group	Turn ON LED on GPO Port 2 AND Open Boom Barrier on GPO Port 3	Infrared Sensor GPI Port 2 High	Close Boom Barrier on GPO Port 2 AND Turn OFF LED on GPO Port 2	False
Example Event Send to CSL Demo Cloud Server	Default Profile	Non-exclusive	60000	Always On	None	Read Any Tags	Send to CSL Demo Cloud	Never Stop	None	None	False
Example Event Save to External USB Memory	Default Profile	Non-exclusive	60000	Always On	None	Read Any Tags	Save to External USB Memory	Never Stop	None	None	False
Example Tag Database Display	Test Tag Database Profile	Non-exclusive	1000	Always On	None	Tag Within Database Detected	Show on Display Tag Database Record Page	Never Stop	None	None	False
Example TCP Send using CSV 2 Format	Default Profile	Non-exclusive	1000	Always On	None	Read Any Tags	Send TCP using CSV 2 Format	Never Stop	None	None	False
Example Tags Group Display	display Group Tags	Test Tag Database Profile	Non-exclusive	1000	Always On	None	Tag within Tag Group Detected	Show on Display Tag Group Record Page	Never Stop	None	False
TCP461	Default Profile	Non-exclusive	1000	Always On	None	Read Any Tags	TCP461	Never Stop	None	None	False
Operate on Tags from Antenna 1	Default Profile	Non-exclusive	3000	Always On	None	Tag from Antenna Port 1	Turn ON LED on GPO Port 1	Never Stop	None	None	False
Tags from ant 2	Default Profile	Non-exclusive	3000	Always On	None	Tag from Antenna Port 2	Turn ON LED on GPO Port 2	Never Stop	None	None	False
Read Temp	Read Temperature from Maemos S3	Read Temp Magnus	Non-exclusive	600	Always On	None	Read Temp tag	Pulse 2s	Never Stop	None	False

Application Version 1.3.11, Reader ID = CSL Reader, Access Mode = HTTP/XML PC UTC Time 2021/01/07 07:39:00 | PC Local Time 2021/01/07 15:39:00

After corresponding even was enabled, database content will be shown on below page if the tag in database was detected and its corresponding record can be found in database

Display Tag Group / Database Record	
Database Name	Example Database
Time	2021-01-07 16:52:47
EPC	123456789012345678901234
LIDofEquipment	888888888886666666661234
PhotoofEquipment	
StaffID	709394888870939466661234
StaffPhoto	

Application Version 1.3.11, Reader ID = CSL Reader, Access Mode = HTTP/XML PC UTC Time 2021/01/07 08:52:48 | PC Local Time 2021/01/07 16:52:48

Below show the database event details.

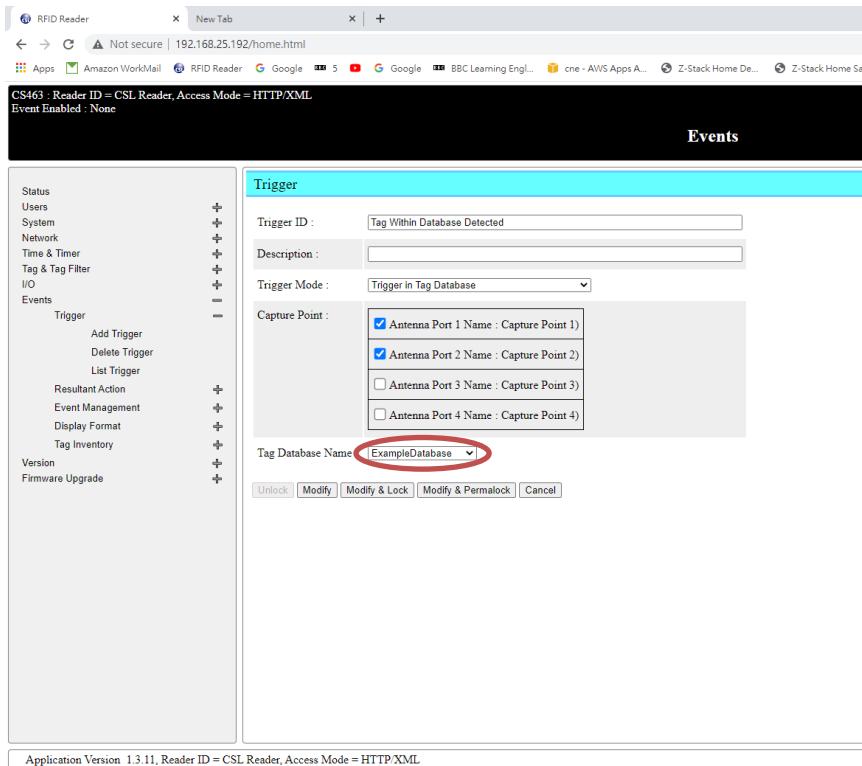
The screenshot shows a web-based configuration interface for an RFID Reader. The top navigation bar includes links for 'RFID Reader', 'New Tab', and several other tabs like 'Not secure | 192.168.25.192/home.html', 'Amazon WorkMail', 'Google', 'BBC Learning Engl...', 'cne - AWS Apps A...', 'Z-Stack Home De...', 'Z-Stack Home Sa...', 'BBC - Earth - How...', and '新增分'. The main content area has a title 'Events' and a sidebar with a tree view of configuration categories: Status, Users, System, Network, Time & Timer, Tag & Tag Filter, I/O, Events (with sub-options Trigger, Resultant Action, Event Management, Add Event, Delete Event, List Event, Display Format, Tag Inventory), Version, and Firmware Upgrade. The central panel is titled 'Event' and contains the following fields:

- Event ID: Example Tag Database Display
- Description: (empty)
- Operation Profile: Test Tag Database Profile
- Exclusivity: Non-exclusive
- Tag Duplicate Elimination Window: 1000 ms
- Tag Duplicate Eliminate Antenna Differentiation: checked
- Inventory Enabling Trigger: Always On
- Inventory Enabling Action: None AND None
- Trigger Logic: Tag Within Database Detected
- Resultant Action: Show on Display Tag Database Record Page AND None
- Inventory Disabling Trigger: Never Stop
- Inventory Disabling Action: None AND None
- Event Enabled: checked

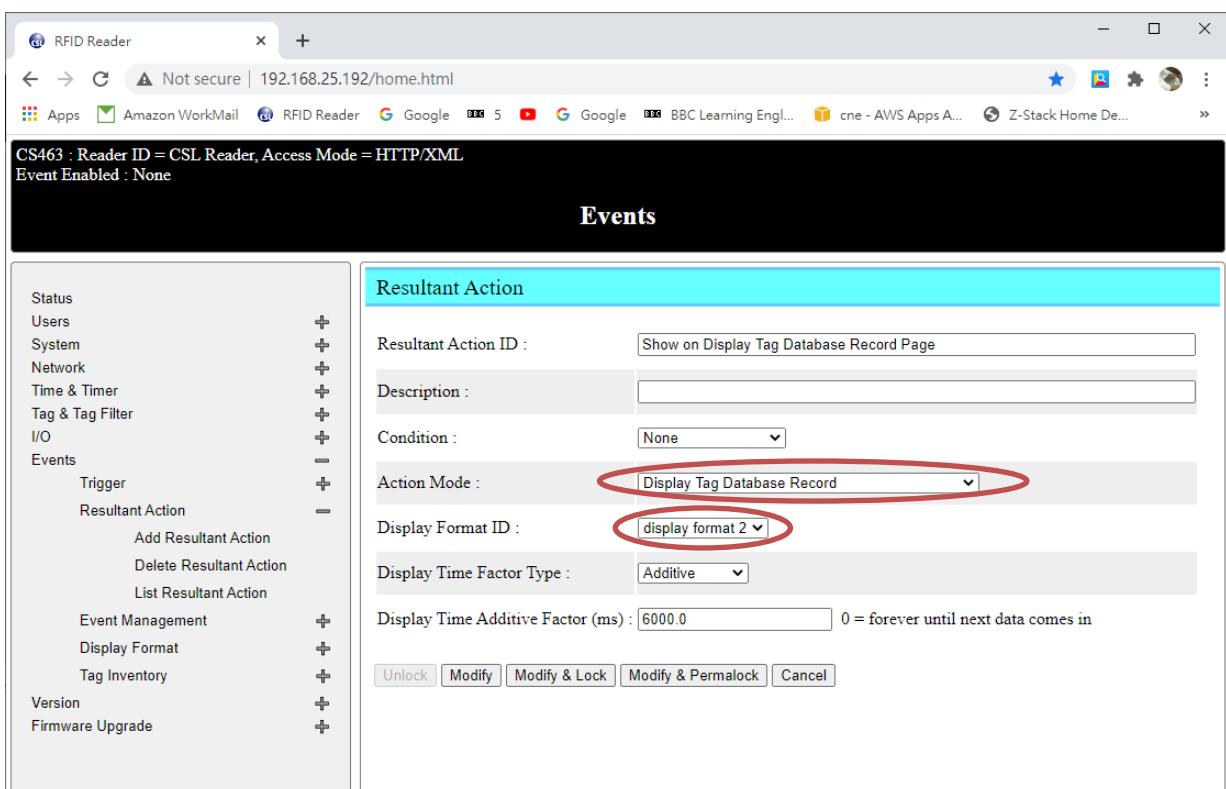
At the bottom of the central panel are buttons for 'Unlock', 'Modify', 'Modify & Lock', 'Modify & Permalock', and 'Cancel'.

The footer of the page displays the text 'Application Version 1.3.11, Reader ID = CSL Reader, Access Mode = HTTP/XML'.

The database is going to use in this event, was choose in Trigger page as shown below



The way showing database content was defined in Display Format, so, you need choose right display format in Resultant Action page as shown below on Display Tag Database Record Action Mode



Display Format can be modified/added in Display format page as shown below

The screenshot shows a web-based application titled "RFID Reader". The left sidebar contains a tree view with categories like Status, Users, System, Network, Time & Timer, Tag & Tag Filter, I/O, Events, Trigger, Resultant Action, Event Management, and Display Format. Under Display Format, there are links for Add Display Format, Delete Display Format, and List Display Format, with the latter being circled in red.

The main content area is titled "Display Format" and shows a table with the following data:

Field Name	Enable	Display Label	Top Position	Left Position	Font Size	Font Color	Image Height (0 = auto)	Image Width (0 = auto)
DatabaseName	<input checked="" type="checkbox"/>	DatabaseName	20.0	10.0	16.0			
Time	<input checked="" type="checkbox"/>	Time	40.0	10.0	16.0			
EPC	<input checked="" type="checkbox"/>	EPC	60.0	10.0	16.0			
UIDofEquipment	<input checked="" type="checkbox"/>	UIDofEquipment	80.0	10.0	16.0			
PhotoofEquipment	<input checked="" type="checkbox"/>	PhotoofEquipment	100.0	10.0			0.0	0.0
StaffID	<input checked="" type="checkbox"/>	StaffID	120.0	10.0	16.0			
StaffPhoto	<input checked="" type="checkbox"/>	StaffPhoto	140.0	10.0			0.0	0.0

At the bottom of the table are two buttons: "Modify" and "Cancel".

Application Version 1.3.11, Reader ID = CSL Reader, Access Mode = HTTP/XML

PC UTC Time 2021/01/07 08:42:23 | PC Local Time 2021/01/07 16:42:23

Type of record on particular database can be listed in List Database as shown below.

The content of each record on each database can be changed from List Tag Record as shown below

CS463 : Reader ID = CSL Reader, Access Mode = HTTP/XML
Event Enabled : None

Tag & Tag Filter

Tag Record Table		
Database Name : ExampleDatabase		
EPC	UIDofEquipment	StaffID
123456789012345678901234	8888888866666666661234	70939488870939466661234

click here to choose which record to be modified

Status
Users
System
Network
Time & Timer
Tag & Tag Filter
 Select Tag
 Read/Write Tag
 Magnus
 UCODE DNA
 Tag Group
 Tag Database
 Configuration
 Add Database
 Delete Database
 List Database
 Input Data to Database
 Add Record
 Delete Record
 List Record
 Database Backup / Restore

I/O
Events
Version
Firmware Upgrade

Application Version 1.3.11, Reader ID = CSL Reader, Access Mode = HTTP/XML PC UTC Time 2021/01/08 07:46:05 | PC Local Time 2021/01/08 15:46:05

The content of record can be modified in this page

CS463 : Reader ID = CSL Reader, Access Mode = HTTP/XML
Event Enabled : None

Tag & Tag Filter

Status
Users
System
Network
Time & Timer
Tag & Tag Filter
 Select Tag
 Read/Write Tag
 Magnus
 UCODE DNA
 Tag Group
 Tag Database
 Configuration
 Add Database
 Delete Database
 List Database
 Input Data to Database
 Add Record
 Delete Record
 List Record
 Database Backup / Restore

I/O
Events
Version
Firmware Upgrade

Tag Record

Database Name : ExampleDatabase

EPC : 123456789012345678901234

UIDofEquipment : 8888888866666666661234

PhotoEquipment : Do not use image larger than 1MBbyte



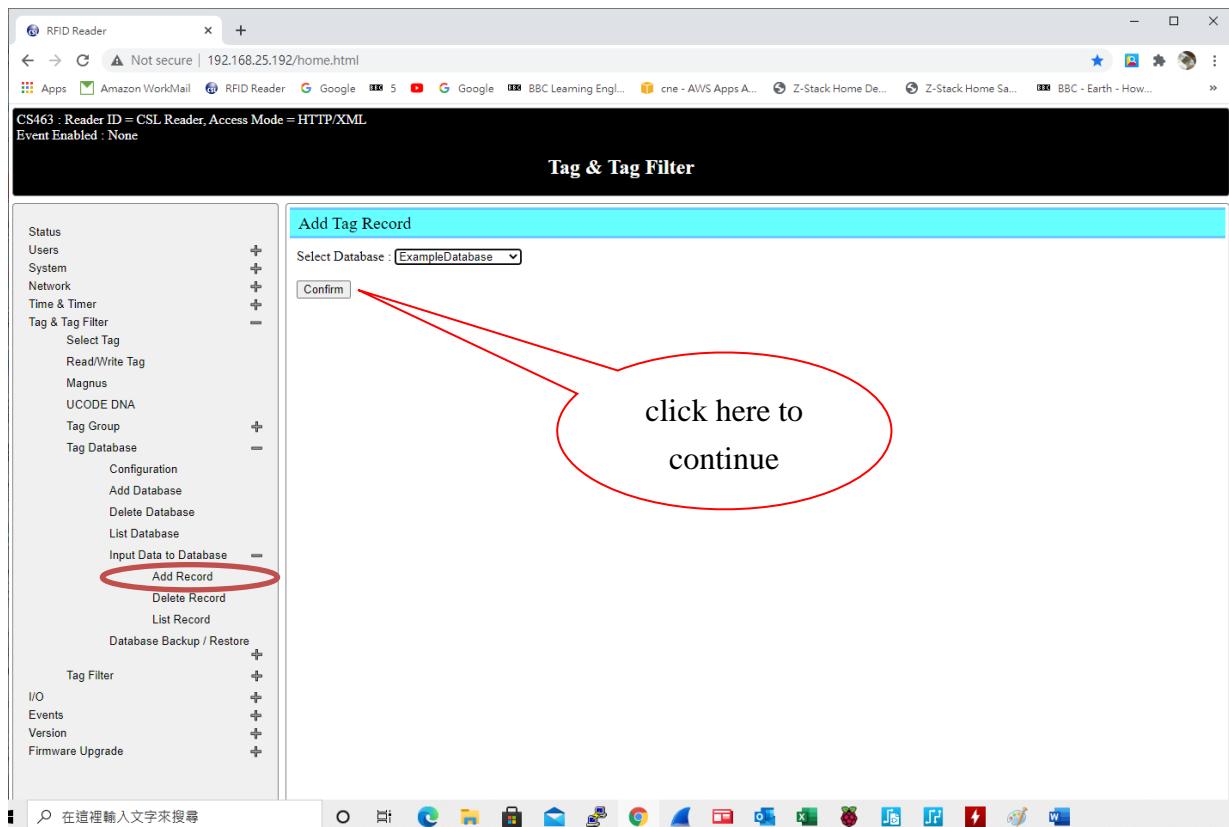
StaffID : 70939488870939466661234

StaffPhoto : Do not use image larger than 1MBbyte

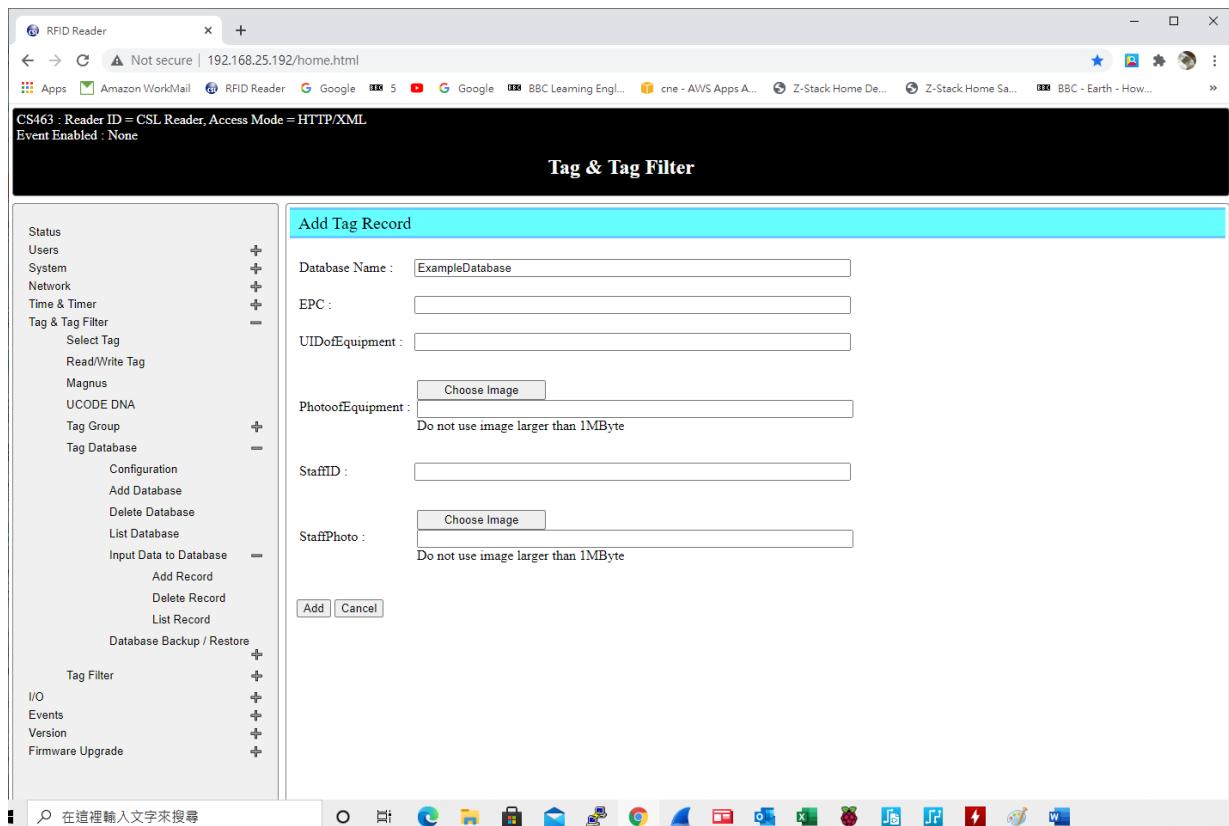


Application Version 1.3.11, Reader ID = CSL Reader, Access Mode = HTTP/XML PC UTC Time 2021/01/08 07:56:29 | PC Local Time 2021/01/08 15:56:29

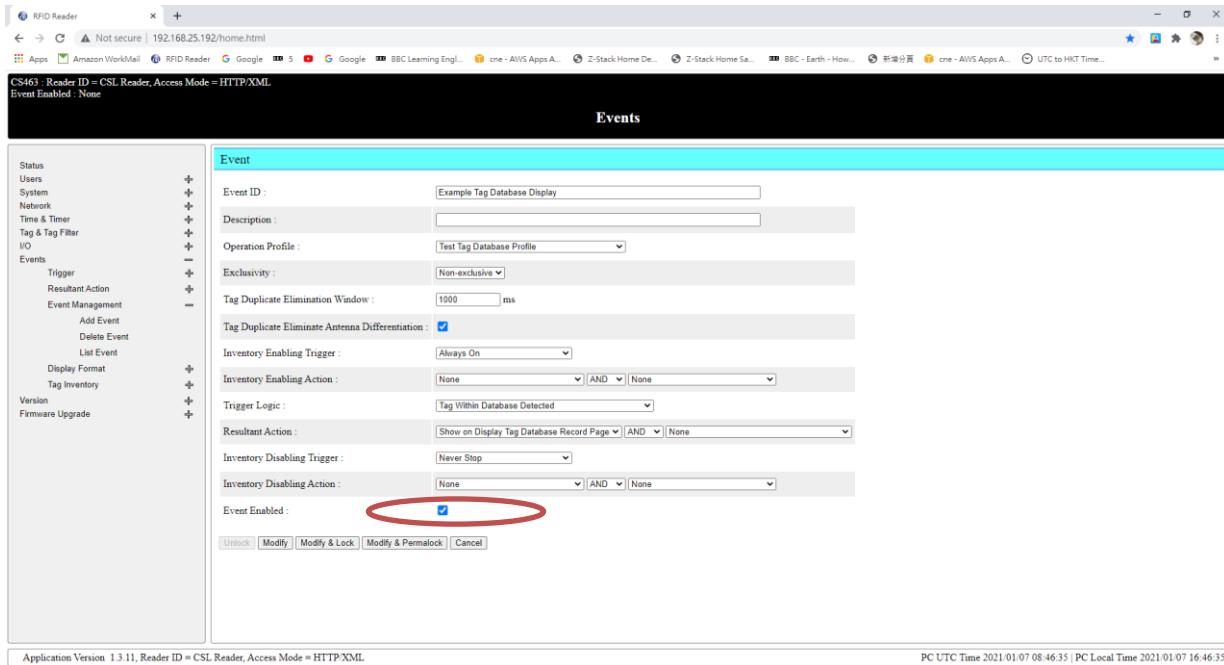
The new record can be added to particular database in Add Record as shown below



The content of each record on particular database can be added in this page as shown below



After all necessary modification was done, the event can be run again by clicking Event Enabled as shown below

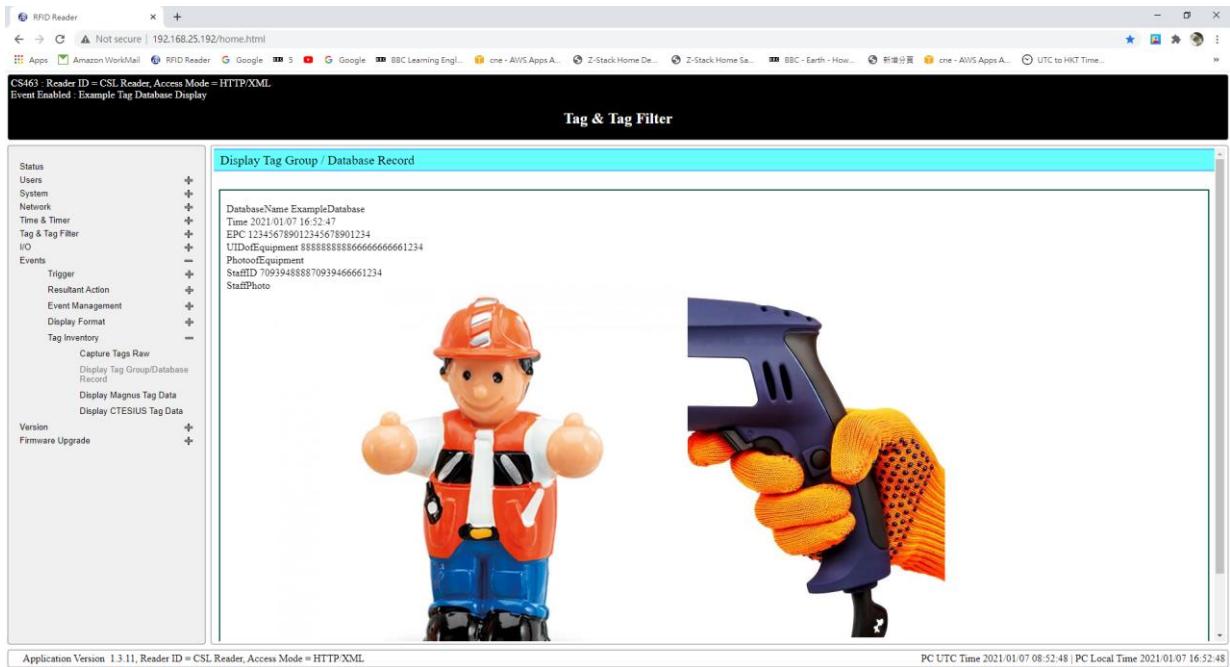


You should see the event status changed to Enabled

Event Table												
	Event ID	Description	Operation Profile	Exclusivity	Tag Duplicate Elimination Window (ms)	Inventory Enabling Trigger	Inventory Enabling Action	Trigger Logic	Resultant Action	Inventory Disabling Trigger	Inventory Disabling Action	Enable
	Default Event	Ex Factory Default Event	Default Profile	Non-exclusive	6000	Always On	None	Read Any Tags	None	Never Stop	None	False
	Example Event Entrance Boom Barrier Control	Example Profile for Doorway 1 Antenna Port 1	Exclusive	1000	Infrared Sensor GPIO Port 1 High	None	Tag from Antenna Port 1 within Registered Tag Group	Turn ON LED on GPO Port 1 AND Open Boom Barrier on GPO Port 3	Infrared Sensor GPIO Port 3 AND Turn OFF LED on GPO Port 1	Close Boom Barrier on GPO Port 3 AND Turn OFF LED on GPO Port 1	None	False
	Example Event Exit Boom Barrier Control	Example Profile for Doorway 1 Antenna Port 2	Exclusive	1000	Infrared Sensor GPIO Port 2 High	None	Tag from Antenna Port 2 within Registered Tag Group	Turn ON LED on GPO Port 2 AND Open Boom Barrier on GPO Port 3	Infrared Sensor GPIO Port 3	Close Boom Barrier on GPO Port 3 AND Turn OFF LED on GPO Port 2	None	False
	Example Event Send to CSL Demo Cloud Server		Default Profile	Non-exclusive	60000	Always On	None	Read Any Tags	Send to CSL Demo Cloud	Never Stop	None	False
	Example Event Save to External USB Memory		Default Profile	Non-exclusive	60000	Always On	None	Read Any Tags	Save to External USB Memory	Never Stop	None	False
	Example Tag Database Display	Test Tag Database Profile	Non-exclusive	1000	Always On	None	Tag Within Database Detected	Show on Display Tag Database Record Page	Never Stop	None	True	
	Example TCP Send using CSV 2 Format		Default Profile	Non-exclusive	1000	Always On	None	Read Any Tags	Send TCP using CSV 2 Format	Never Stop	None	False
	Example Tags Group Display	display Group Tags	Test Tag Database Profile	Non-exclusive	1000	Always On	None	Tag within Tag Group Detected	Show on Display Tag Group Record Page	Never Stop	None	False
	TCP461		Default Profile	Non-exclusive	1000	Always On	None	Read Any Tags	TCP461	Never Stop	None	False
	Operate on Tags from Antenna 1		Default Profile	Non-exclusive	3000	Always On	None	Tag from Antenna Port 1	Turn ON LED on GPO Port 1	Never Stop	None	False
	Tags from ant 2		Default Profile	Non-exclusive	3000	Always On	None	Tag from Antenna Port 2	Turn ON LED on GPO Port 2	Never Stop	None	False
	Read Temp	Read Temperature from Maenius S3	Read Temp Magnus	Non-exclusive	600	Always On	None	Read Temp tag	Pulse 2s	Never Stop	None	False

Application Version 1.3.11, Reader ID = CSL Reader, Access Mode = HTTP/XML PC UTC Time 2021/01/07 08:47:27 | PC Local Time 2021/01/07 16:47:27

If you go to Display Tag Group/Database Record, you can see the database record content linking to the detected tag(The tag with EPC 123456789012345678901234 was used in this event Example Tag Database Display shipped with reader).



9.7 Example 5: Read Magnus S3 Tag Temperature

The screenshot shows the 'Events' section of the software interface. On the left is a navigation tree with categories like Status, Users, System, Network, Time & Timer, Tag & Tag Filter, I/O, Events, Trigger, Resultant Action, Event Management, Add Event, Delete Event, List Event, Display Format, Tag Inventory, Version, and Firmware Upgrade. The 'Events' node is expanded. In the main area, there is a table titled 'Event Table' with columns: Event ID, Description, Operation Profile, Exclusivity, Tag Duplicate Elimination Window, Tag Duplicate Eliminate Antenna Differentiation, Inventory Enabling Trigger, Inventory Enabling Action, Trigger Logic, Resultant Action, Inventory Disabling Trigger, Inventory Disabling Action, and Event Enabled. There are 14 rows in the table. The 7th row, which corresponds to the 'Read Temp' event, has its entire row highlighted in light blue and is circled in red.

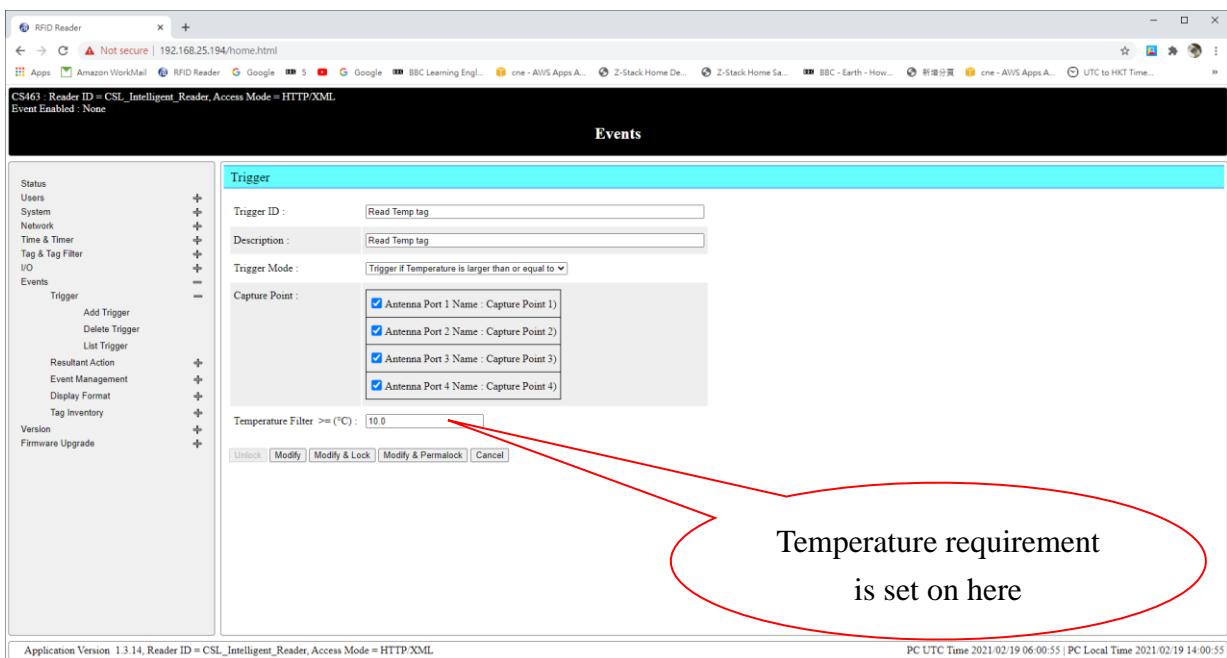
Event Table												
		Doorway 1 Antenna Port 2	Exclusive	1000	Sensor GPIO Port 2 High	None	2 within Registered Tag Group	AND Open Boom Barrier on GPO Port 3	Sensor GPIO Port 1 High	Port 3 AND Turn OFF LED on GPO Port 2	False	
CS463 : Reader ID = CSL_Intelligent_Reader, Access Mode = HTTP/XML	Not secure 192.168.25.194/home.html		Default Profile	Non-exclusive	60000	Always On	None	Read Any Tags	Send to CSL Demo Cloud Server	Never Stop	None	False
Event Enabled : None			Default Profile	Non-exclusive	60000	Always On	None	Read Any Tags	Save to External USB Memory	Never Stop	None	False
Example Event Save to External USB Memory			Default Profile	Non-exclusive	1000	Always On	None	Tag Within Database Detected	Show on Display Tag Database Record Page	Never Stop	None	False
Example Tag Database Display		Test Tag Database Profile	Non-exclusive	1000	Always On	None	Read Any Tags	Show on Display Tag Database Record Page	Never Stop	None	False	
Example TCP Send using CSV 2 Format		Default Profile	Non-exclusive	1000	Always On	None	Read Any Tags	Send TCP using CSV 2 Format	Never Stop	None	False	
Example Tag Group Display	display Group Tags	Test Tag Database Profile	Non-exclusive	1000	Always On	None	Tag within Tag Group Detected	Show on Display Tag Group Record Page	Never Stop	None	False	
TCP461		Default Profile	Non-exclusive	1000	Always On	None	Read Any Tags	TCP461	Never Stop	None	False	
Operate on Tags from Antenna 1		Default Profile	Non-exclusive	3000	Always On	None	Tag from Antenna Port 1	Turn ON LED on GPO Port 1	Never Stop	None	False	
Tags from Ant 2		Default Profile	Non-exclusive	3000	Always On	None	Tag from Antenna Port 2	Turn ON LED on GPO Port 2	Never Stop	None	False	
Read Temp	Read Temperature from Magnus S3 Tag	Read Temp Magnus S3	Non-exclusive	0	Always On	None	Read Temp tag	Pulse 2s	Never Stop	None	False	
Read Moisture	Read moisture from Magnus S2 Tag	Read Moisture S2	Non-exclusive	600	Always On	None	Read S2	None	Never Stop	None	False	
Celsius	Read Temperature from Celsius Tag	celsius	Non-exclusive	1000	Always On	None	celsius	Pulse 2s	Never Stop	None	False	
MQTT		Default Profile	Non-exclusive	5000	Always On	None	Tag within Tag Group Detected	MQTT AND Pulse 2s	Never Stop	None	False	

The event Read Temp is used to read temperature from Magnus S3 tag. This Event was shipped with latest version of reader.

Once the event was enabled as below and the condition on temperature higher than 10C in trigger Read Temp tag was fulfilled, reader will send pulse to IO port. You can check the temperature reading on Display Magnus Tag Data page under Tag Inventory and shown on coming section

The screenshot shows the configuration of the 'Read Temp' event. The 'Event' configuration dialog is open, showing various settings for the event. The 'Trigger Logic' dropdown is set to 'Read Temp tag' and is circled in red. The 'Event Enabled' checkbox at the bottom is checked and also circled in red. Other visible settings include 'Event ID' (Read Temp), 'Description' (Read Temperature from Magnus S3 Tag), 'Operation Profile' (Read Temp Magnus S3), 'Exclusivity' (Non-exclusive), 'Tag Duplicate Elimination Window' (0 minutes 0 seconds), 'Tag Duplicate Eliminate Antenna Differentiation' (unchecked), 'Inventory Enabling Trigger' (Always On), 'Inventory Enabling Action' (None AND None), 'Resultant Action' (Pulse 2s AND None), 'Inventory Disabling Trigger' (Never Stop), 'Inventory Disabling Action' (None AND None), and 'Event Enabled' (checked).

Here is the trigger Read Temp tag used on Read Temp event



You can find the temperature result on this page Display Magnus Tag Data page under Tag Inventory

The screenshot shows a web-based RFID reader interface. On the left is a sidebar with various configuration options like Status, Users, System, Network, Time & Timer, Tag & Tag Filter, I/O, Events, Trigger, Resultant Action, Event Management, Display Format, Tag Inventory, Version, and Firmware Upgrade. The main area is titled 'Display Magnus Tag Data' and shows a table of tag data. The table has columns: #, EPC, Count, Sensor Code, Sensor Code Avg., Wet/Dry, On Chip RSSI, Temperature Code, Temperature Code Avg., and Temperature(°C). There is one row of data: #1, EPC FFFFFFFFFFFFFFFFFFFF, Count 48, Sensor Code 373, Sensor Code Avg. 373.00, Wet/Dry dry, On Chip RSSI 18, Temperature Code 2243, Temperature Code Avg. 2242.00, and Temperature(°C) 22.90. A red circle highlights the 'On Chip RSSI' column. A red callout bubble points to the 'Temperature read' value.

The returned value of On Chip RSSI S3 tag should be within a range (details can be found on official Magnus S3 document) otherwise the temperature accuracy will be affected. The target range of On Chip RSSI can be set on Profile page as shown below. If the received “On Chip RSSI” from S3 tag out of the defined range, the temperature result will not show on Display Magnus Tag Data page. Correcting the problem, you need to adjust the reader power or the distance between reader antenna and S3 tag

The screenshot shows the 'Operation Profile' page. The sidebar includes Reader ID, Company Label, Capture Point Name, Access Mode, Custom Embedded RFID Application, Frequency Configuration, Operation Profile (with sub-options Add Profile, Delete Profile, List Profile), Advanced Settings, SSL Certificate, Memory Information, Power Up Notification, Heart Beat, Configuration Backup / Restore, Log File Configuration, Download Log File, Scheduled Reboot, and Reboot System. The main area is titled 'Operation Profile' and shows a table for 'Capture Point'. It includes fields for Reader Mode/Link Profile (Range/Dense Reader), Session # (S0), Target (A/B Toggle), Retry (0), TagFocus (Impinj Tags Only) (unchecked), Fast ID (Impinj Tags Only) (unchecked), Query Algorithm (Dynamic Q), Tag Population (50), Tag Model (Magus-S3), and two input fields for 'Min. On Chip RSSI' (13) and 'Max. On Chip RSSI' (21). A red circle highlights these two input fields.

Here is the operation profile Read Temp Magnus S3 used on event Read Temp.

The tag model Magus S3 was chosen in this operation profile, correct model of tag must match the using one otherwise you can't read the temperature

The screenshot shows a web-based configuration interface for an RFID Reader. The left sidebar contains a tree view of settings: Status, Users, System, Reader ID, Company Label, Capture Point Name, Access Mode, Custom Embedded RFID Application, Frequency Configuration, Operation Profile (selected), Advanced Settings, SSL Certificate, Memory Information, Power Up Notification, Heart Beat, Configuration Backup / Restore, Log File Configuration, Download Log File, Scheduled Reboot, Reboot System, Network, Time & Timer, Tag & Tag Filter, I/O, Events, Version, and Firmware Upgrade.

The main panel is titled "Operation Profile" and displays the following configuration:

- Profile ID:** Read Temp Magnus S3
- Capture Point:**

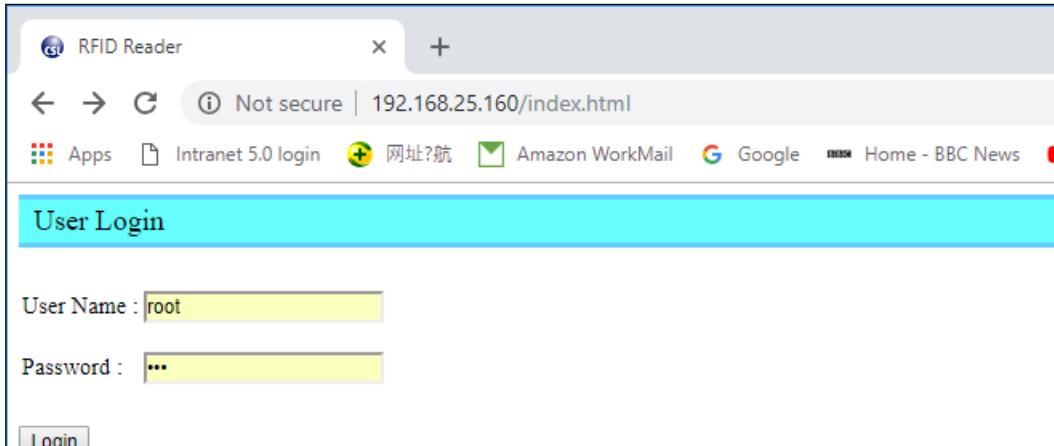
Antenna	Transmit Power (dBm)	Dwell Time (ms)
<input checked="" type="checkbox"/> Antenna Port 1 (Name : Capture Point 1)	30.0	2000
<input type="checkbox"/> Antenna Port 2 (Name : Capture Point 2)	30.0	2000
<input type="checkbox"/> Antenna Port 3 (Name : Capture Point 3)	30.0	2000
<input type="checkbox"/> Antenna Port 4 (Name : Capture Point 4)	30.0	2000
- Reader Mode/Link Profile:** 1. Range/Dense Reader
- Session #:** S0
- Target:** A/B Toggle
- Retry:** 0
- TagFocus (Impinj Tags Only):**
- Fast ID (Impinj Tags Only):**
- Query Algorithm:** Dynamic Q
- Tag Population:** 50 Q = 6
- Tag Model:** Magus-S3 (dropdown menu)
 - Magus-S3 (selected)
 - Magus-S2
 - Magus-S3
 - CTESIUS
 - Z1
- Min. On Chip RSSI:** -40
- Max. On Chip RSSI:** 21

At the bottom of the main panel, it says "Application Version 1.3.14, Reader ID = CSL_Intelligent_Reader, Access Mode = HTTP/XML".

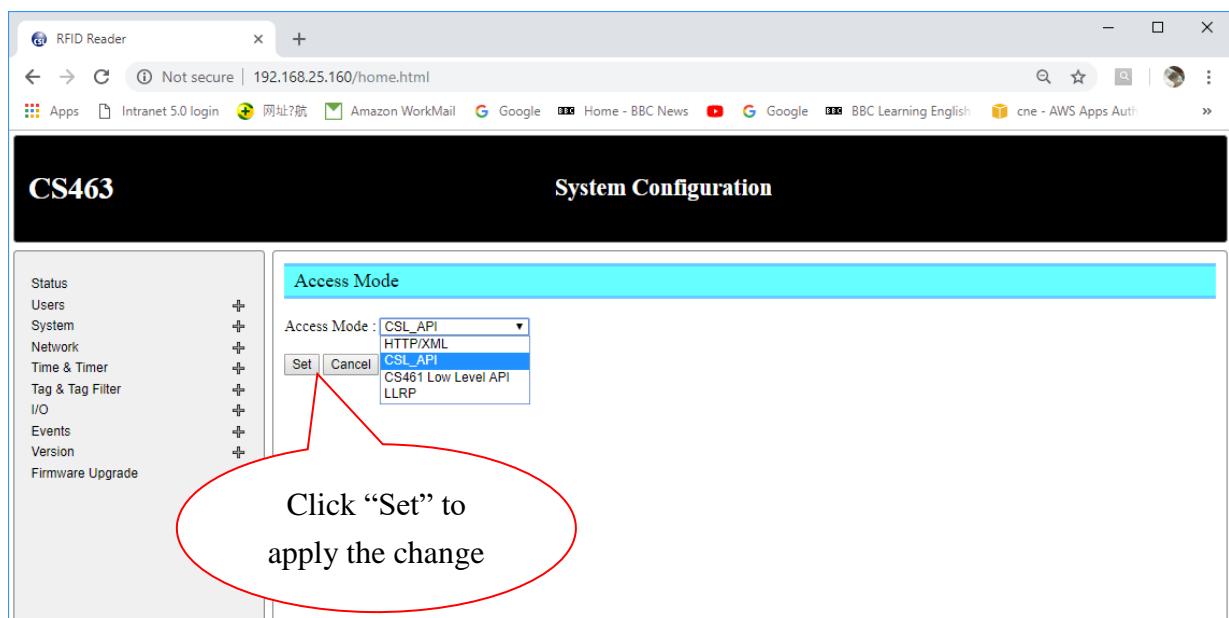
10 Read Tag using CSL Unified API

The CS463 can be controlled via the Ethernet. In this case user needs to connect the PC with CS463 with a Ethernet cable directly or via a router, or via the Wi Fi network.

Log in to the reader with User name **root** and password **csl**



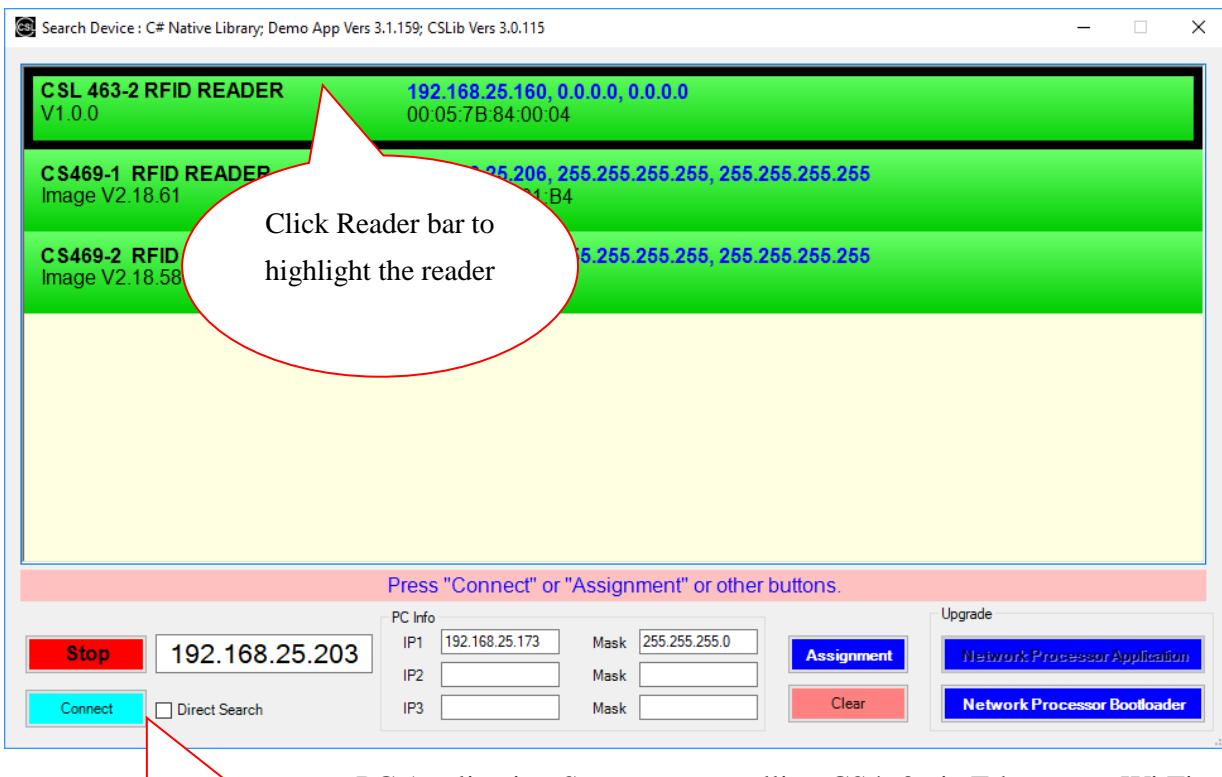
Change the access mode to **CSL_API** then click Set to apply the change



At this point, you can logout from reader and start the Demo application

Below is the screen capture of a Demo application, which is also available for download from Convergence website (www.convergence.com.hk), on PC controlling CS463.

Highlight the CS463 reader which are going to connect then click Connect

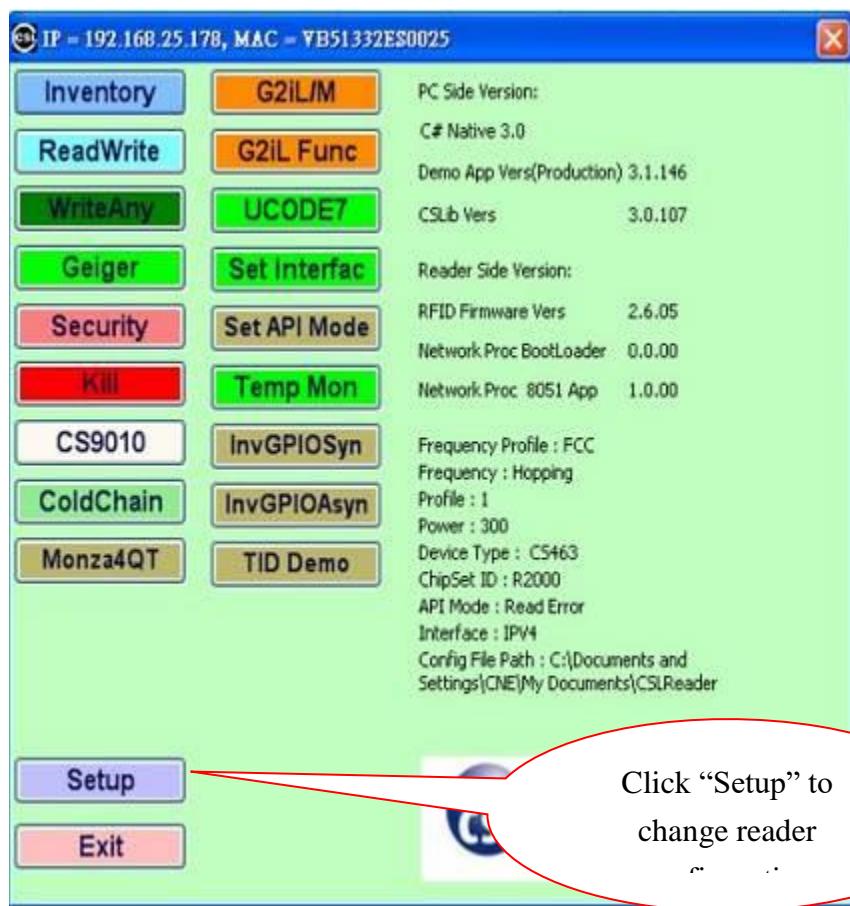


PC Application Screen – controlling CS463 via Ethernet or Wi Fi

Click “Connect” to connect to the reader

Below shows the main menu of the PC Demo application. User can perform typical basic tag operations via this PC Demo application as mentioned below.

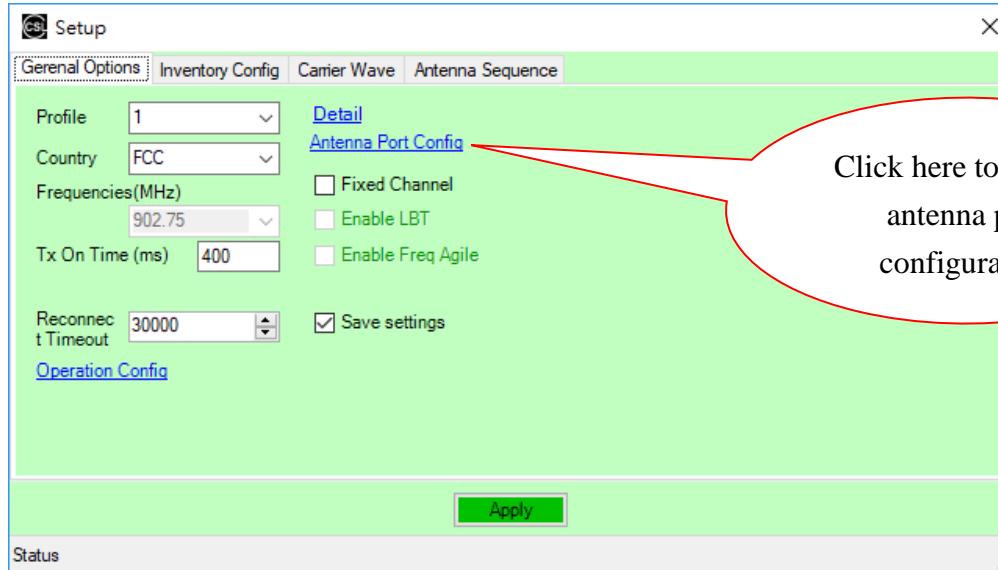
- Inventory
- Tag memory bank read and write
- GPIO On/Off control
- Antenna port settings
- Output power settings



Main menu of PC Demo application

Go to Setup Page to modify the setting of reader to match hardware connection such as which ports were connected with antenna

Go to Antenna Port Config to configure which port was connected with antenna

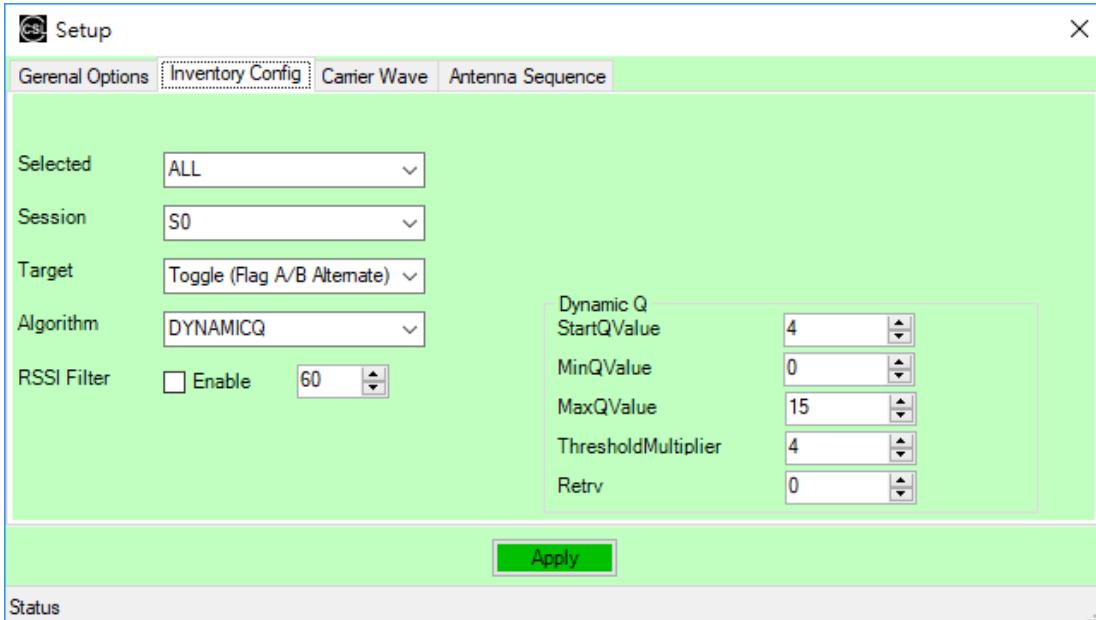


Click corresponding antenna port which was connected with antenna, and change the state to Active state

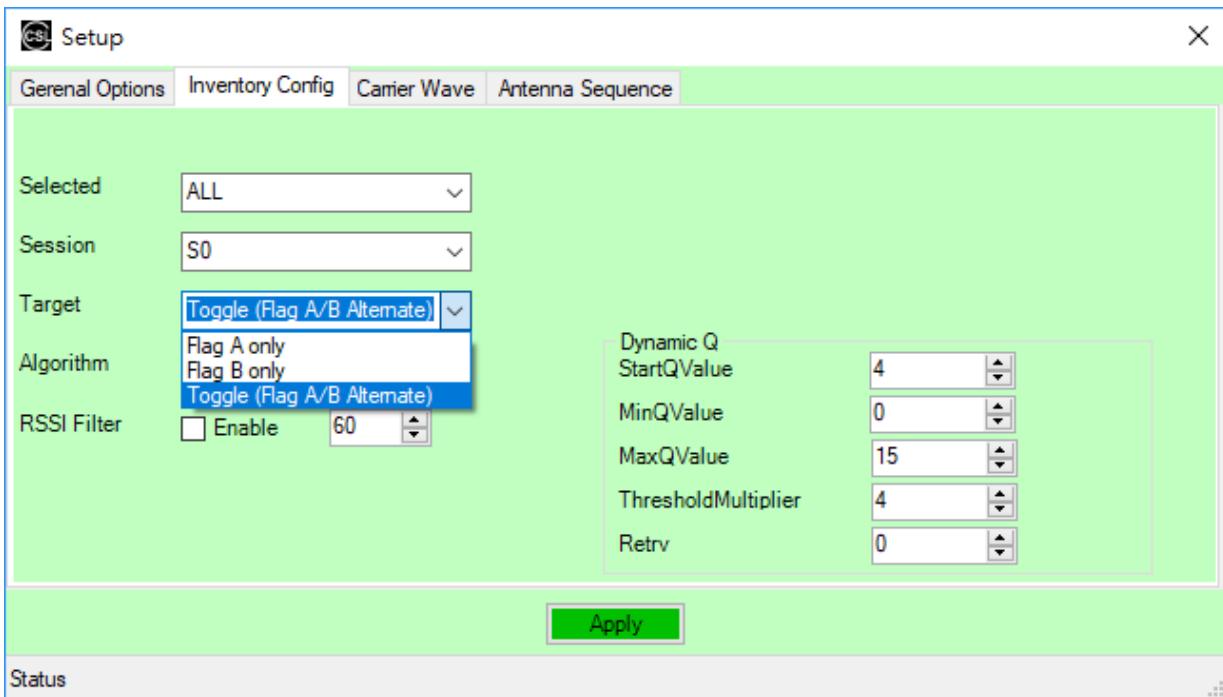
	#	Power Level 1/10 dBm	Dwell Time (milliseconds)	Inventory Rounds	EAS override	Enable Local Inventory	
Active	0	300	2000	No Limit	<input type="checkbox"/>	<input type="checkbox"/>	D
Inactive	1				<input type="checkbox"/>	<input type="checkbox"/>	D
Inactive	2				<input type="checkbox"/>	<input type="checkbox"/>	D
Inactive	3				<input type="checkbox"/>	<input type="checkbox"/>	D
Inactive	4				<input type="checkbox"/>	<input type="checkbox"/>	D
Inactive	5				<input type="checkbox"/>	<input type="checkbox"/>	D
Inactive	6				<input type="checkbox"/>	<input type="checkbox"/>	D
Inactive	7				<input type="checkbox"/>	<input type="checkbox"/>	D
Inactive	8				<input type="checkbox"/>	<input type="checkbox"/>	D
Inactive	9				<input type="checkbox"/>	<input type="checkbox"/>	D
Inactive	10				<input type="checkbox"/>	<input type="checkbox"/>	D

Apply Change | **Restore Default**

Go to Inventory Config page and change all inventory related parameter such as session, target and algorithm



Click apply to confirm the changing

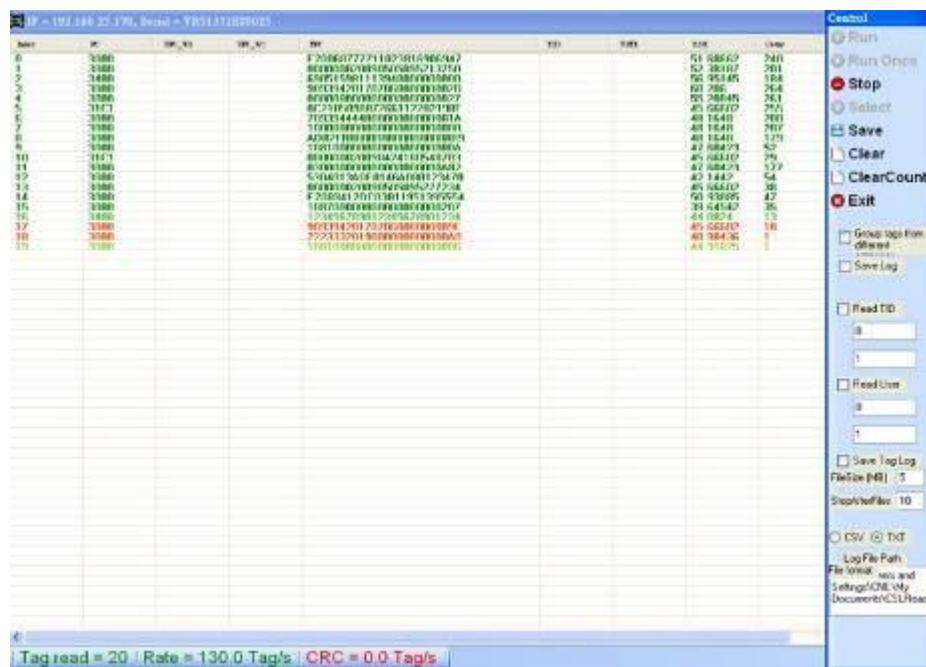


After the configure the reader, inventory can be started to read tags

Click the “Inventory” icon to go the corresponding sub-menu as below.

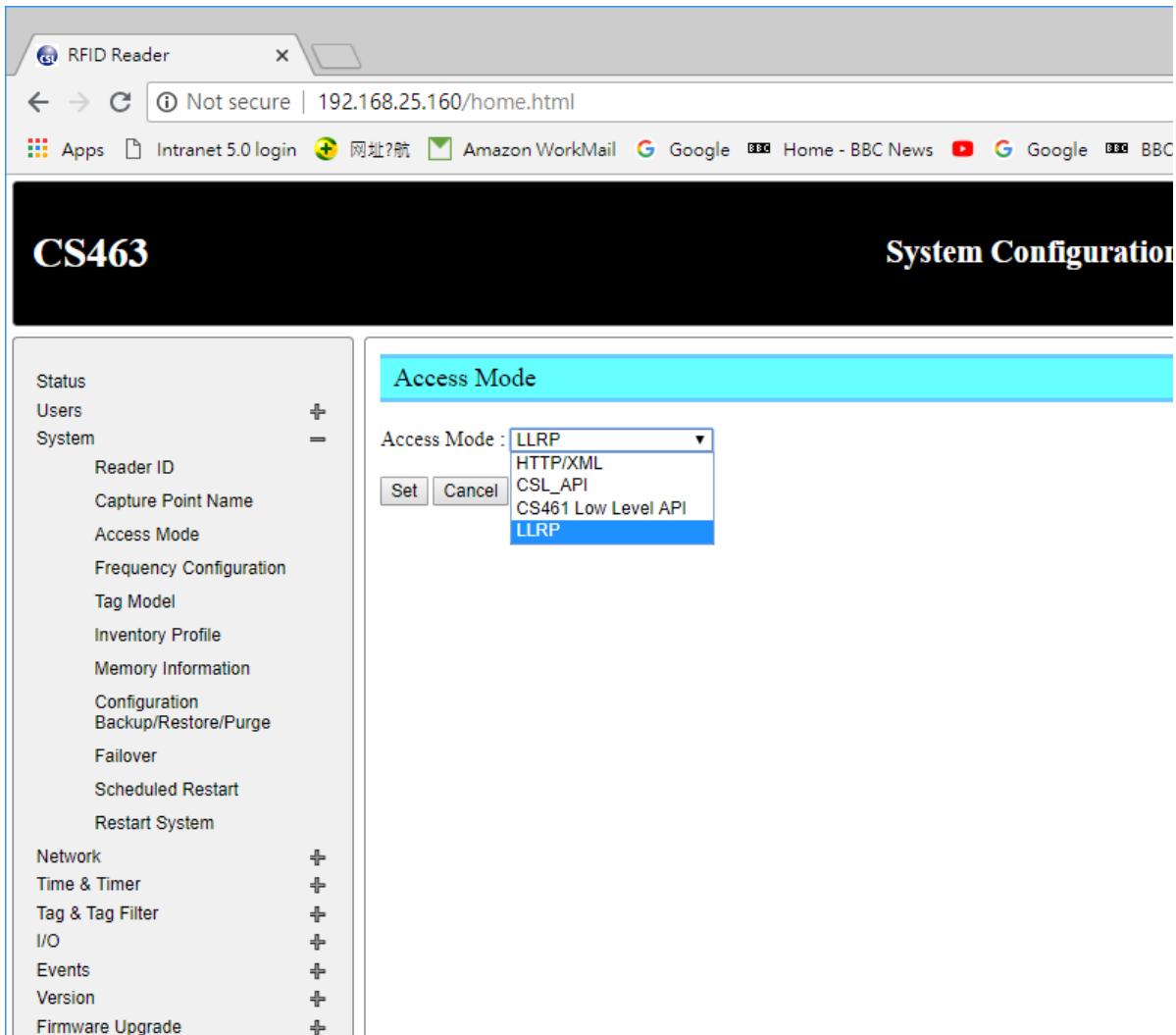


Click Run to start the inventory tags reading

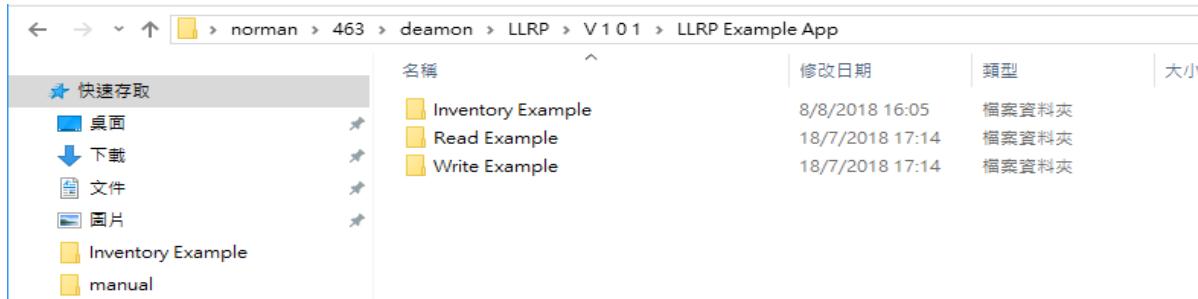


Inventory operation using PC Demo application

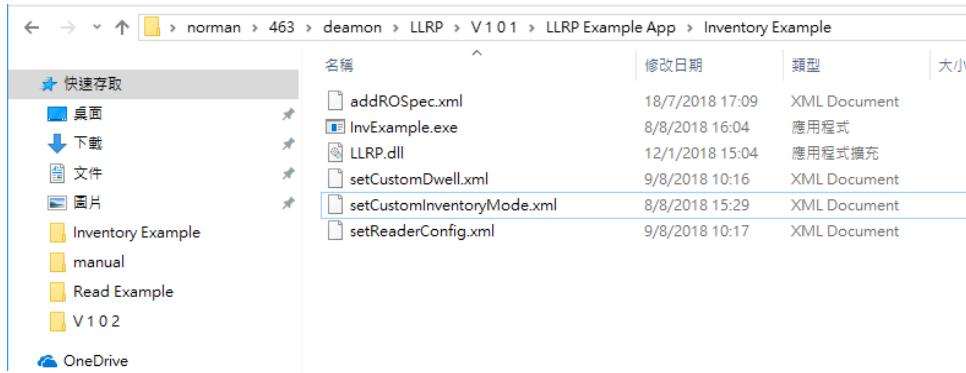
11 Read Tag using LLRP V1.1 API



Download the LLRP application from CSL website and unzip got follow files



Files in Inventory Example directory



Download XML editor (XML Notepad) from Microsoft

<https://www.microsoft.com/en-us/download/details.aspx?id=7973>

The screenshot shows a web browser window with the Microsoft download page for XML Notepad 2007. The title bar says "Detailed specifications" and "Download XML Notepad". The address bar shows the URL "https://www.microsoft.com/en-us/download/details.aspx?id=7973". Below the address bar, there are several links: "Apps", "Intranet 5.0 login", "网址?航", "Amazon WorkMail", "Google", "BBC Home - BBC News", "Google", and "BBC Learn". The main content area has a heading "XML Notepad 2007". A note below it says "Important! Selecting a language below will dynamically change the complete page content to that language." There is a "Language:" dropdown set to "English" and a large orange "Download" button. On the left side, there is a sidebar with three expandable sections: "Details", "System Requirements", and "Install Instructions", each preceded by a plus sign icon.

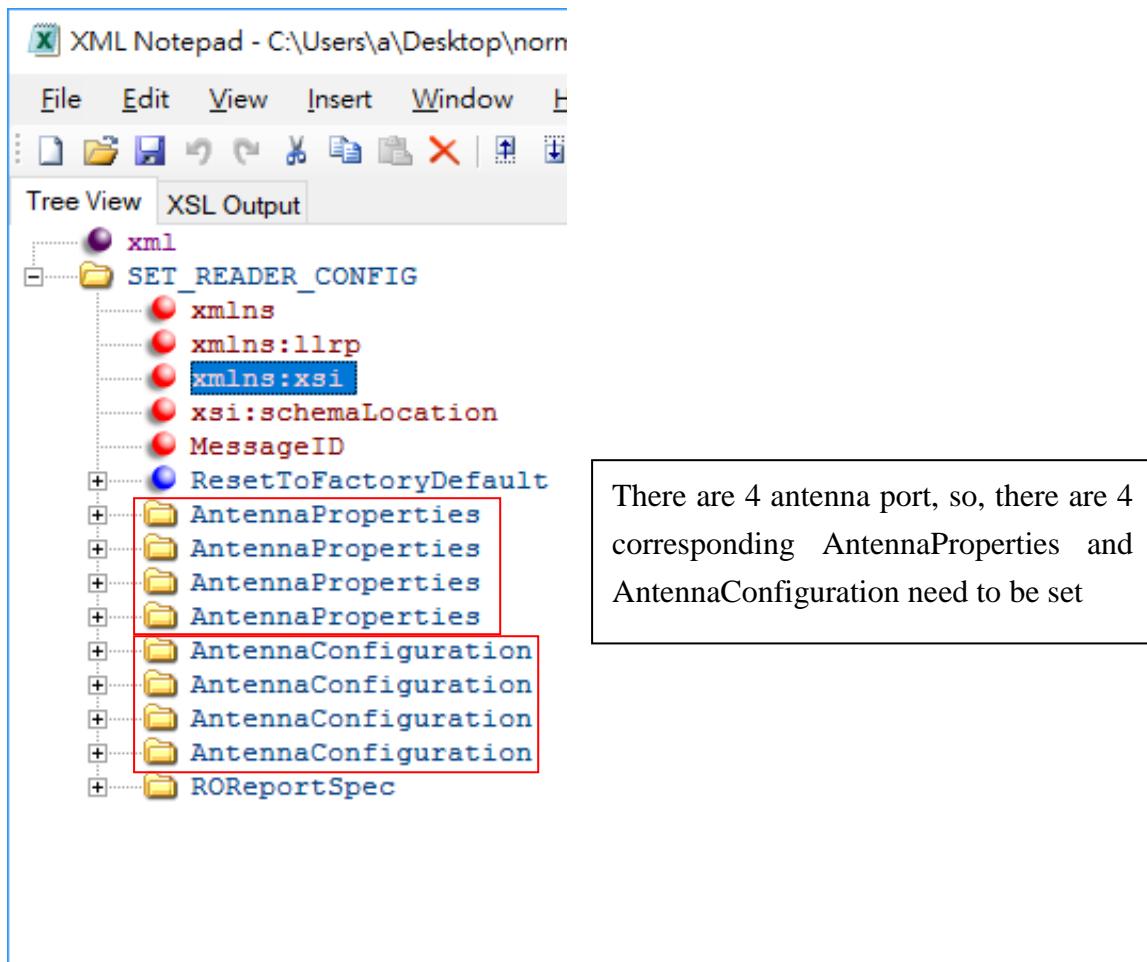
XML Notepad 2007 provides a simple intuitive user interface for browsing and editing XML documents.

Details

System Requirements

Install Instructions

Edit the file **setReaderConfig.xml** by xml Notepad



Edit **setReaderConfig.xml** to specify which antenna port to be used

The screenshot shows the XML Notepad interface with the file **setReaderConfig.xml** open. The left pane displays the XML tree structure, and the right pane shows the XML code. The code includes fields for version, URLs, and various configuration parameters. A callout box highlights the **AntennaConnected** field, which is set to **1**, with the text: "Any using port with connected antenna need to set 1".

```
<?xml version="1.0"?>
<SET_READER_CONFIG>
    < xmlns="">
    < xmlns:llrp="">
    < xmlns:xsi="">
    < xsi:schemaLocation="">
    < MessageID="">
    < ResetToFactoryDefault="">
    < AntennaProperties>
        < AntennaID="">
        < AntennaGain="">
        < AntennaConnected>1</AntennaConnected>
        < #text>
        < AntennaProperties>
            < AntennaID="">
            < AntennaGain="">
            < AntennaConnected>0</AntennaConnected>
            < #text>
            < AntennaProperties>
            < AntennaProperties>
            < AntennaConfiguration>
            < AntennaConfiguration>
            < AntennaConfiguration>
            < ROResponseSpec>
    
```

Edit **setReaderConfig.xml** to change transmit power, session and tag population

The transmit power, session and tag population need to be set for each antenna port

```

<?xml version="1.0" encoding="UTF-8"?>
<llrp:Message ID="1" Version="1.0" xmlns:llrp="http://www.llrp.org/lt" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://www.llrp.org/lt http://www.llrp.org/lt.xsd">
    <ResetToFactoryDefault>
        <AntennaProperties>
            <AntennaProperties>
                <AntennaProperties>
                    <AntennaProperties>
                        <AntennaConfiguration>
                            <AntennaID>
                                <RFTransmitter>
                                    <HopTableID>
                                    <ChannelIndex>
                                    <TransmitPower>
                                        <#comment>Power index from 0 to 80</#comment>
                                        <Value>80</Value>
                                    <#comment>false</#comment>
                                    <ModeIndex>
                                    <#comment>Unused</#comment>
                                    <Session>
                                        <#comment>Session must be the same for all</#comment>
                                        <Value>0</Value>
                                    <#comment>600</#comment>
                                    <TagPopulation>
                                        <#comment>Unused</#comment>
                                        <Value>0</Value>
                                    </TagPopulation>
                                    <#comment>0</#comment>
                                </RFTransmitter>
                            </AntennaConfiguration>
                        </AntennaProperties>
                    </AntennaProperties>
                </AntennaProperties>
            </AntennaProperties>
        </AntennaProperties>
    </AntennaProperties>
</llrp:Message>

```

Power index from 0 to 80.
Real power = (power index * 2.5 + 100) / 10 dBm

Edit setCustomInventoryMode.xml to change the target and inventory algorithm

First byte Format: Mode: 0 = Toggle AB (default); 1 = Target A; 2 = Target B (Hex #, 1 bytes)

Second byte Format: inventory algorithm: 0 = fixed Q; 1 = Dynamic Q (default) (Hex #, 1 bytes)

For Example: Set Toggle AB and Dynamic, data should be “0001”

```

<?xml version="1.0" encoding="utf-8"?>
<CUSTOM_MESSAGE>
  <MessageID>101</MessageID>
  <VendorIdentifier>51654</VendorIdentifier>
  <Data>0001</Data>
</CUSTOM_MESSAGE>

```

Set the target and inventory algorithm

Edit setCustomDwell.xml to change the dwell time

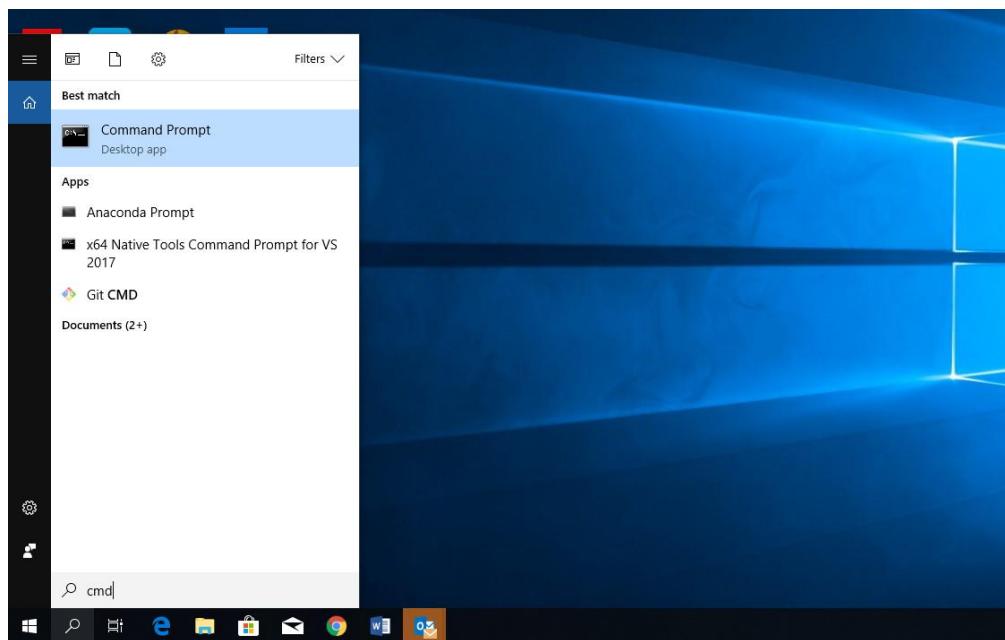
```

<?xml version="1.0" encoding="utf-8"?>
<!-- Vendor Identifier must be 51654 -->
<!-- Message type 100 is to set antenn -->
<!-- Format: dwell time for port 1 (Hex) -->
<!-- Example to apply to individual po -->
<!-- 2710271003E803E8 -->

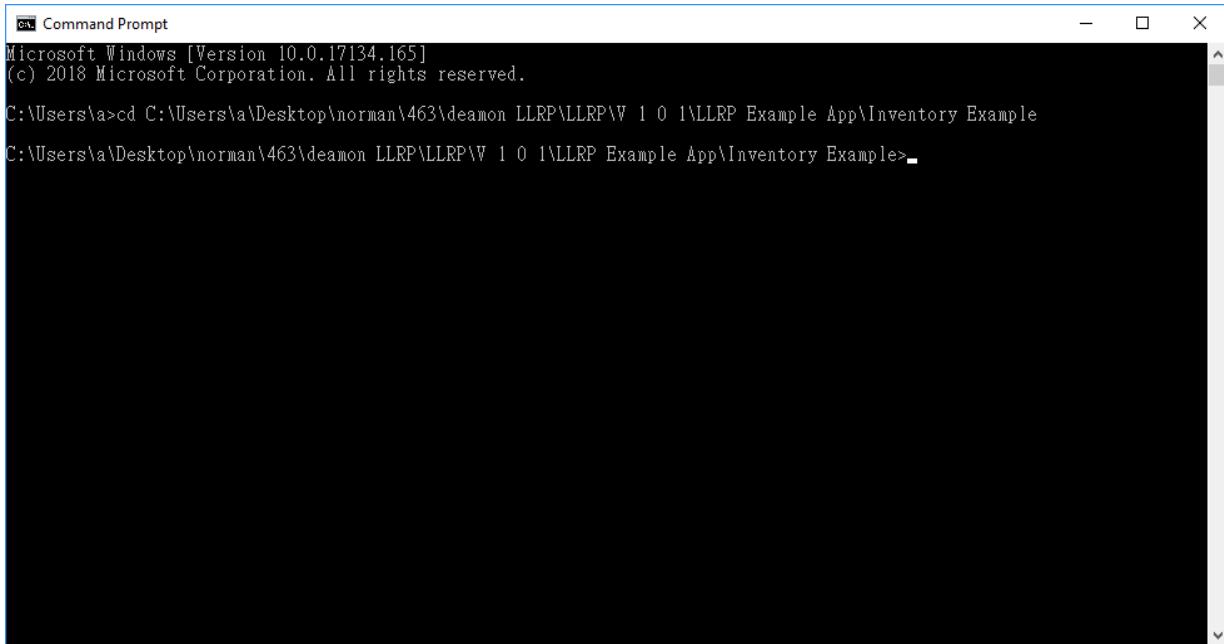
```

Antenna port 2 and 3 dwell time set to 1s
 $(0x3E8)=1000\text{ms}$, ports 0 and 1 dwell time set to 1s
 $(0x2710)=10000\text{ms}$

Start dos command prompt by typing cmd on window



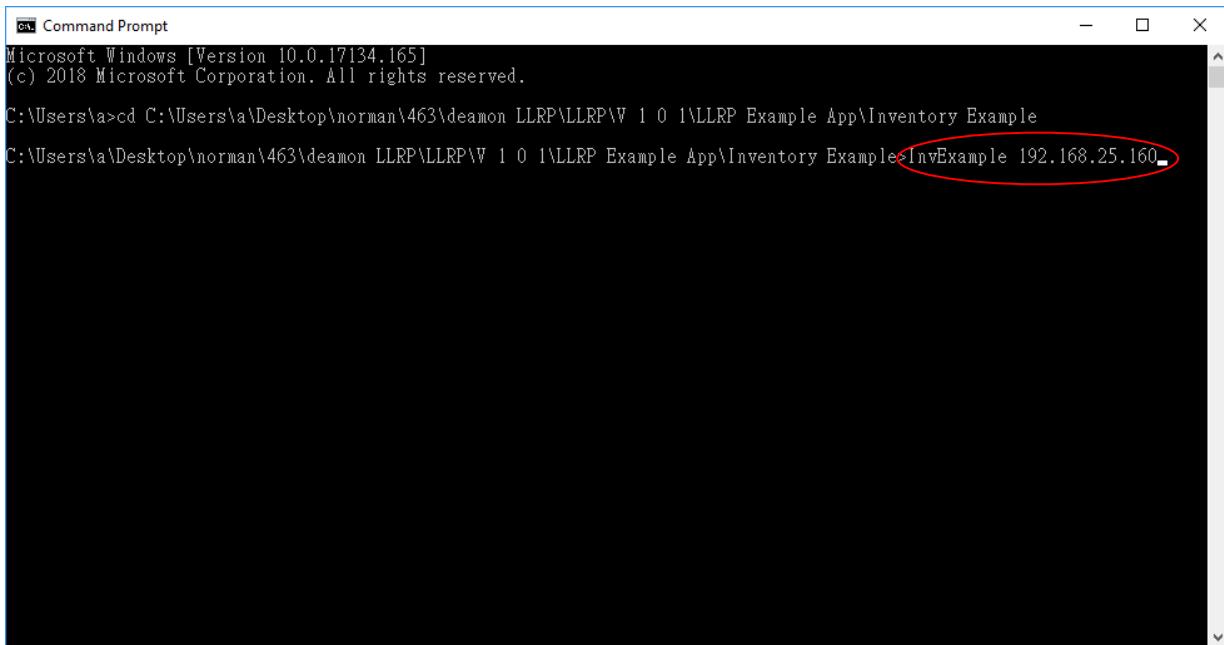
Change the working directory to LLR software located



```
Command Prompt
Microsoft Windows [Version 10.0.17134.165]
(c) 2018 Microsoft Corporation. All rights reserved.

C:\Users\...\cd C:\Users\...\LLRP\Inventory Example>
```

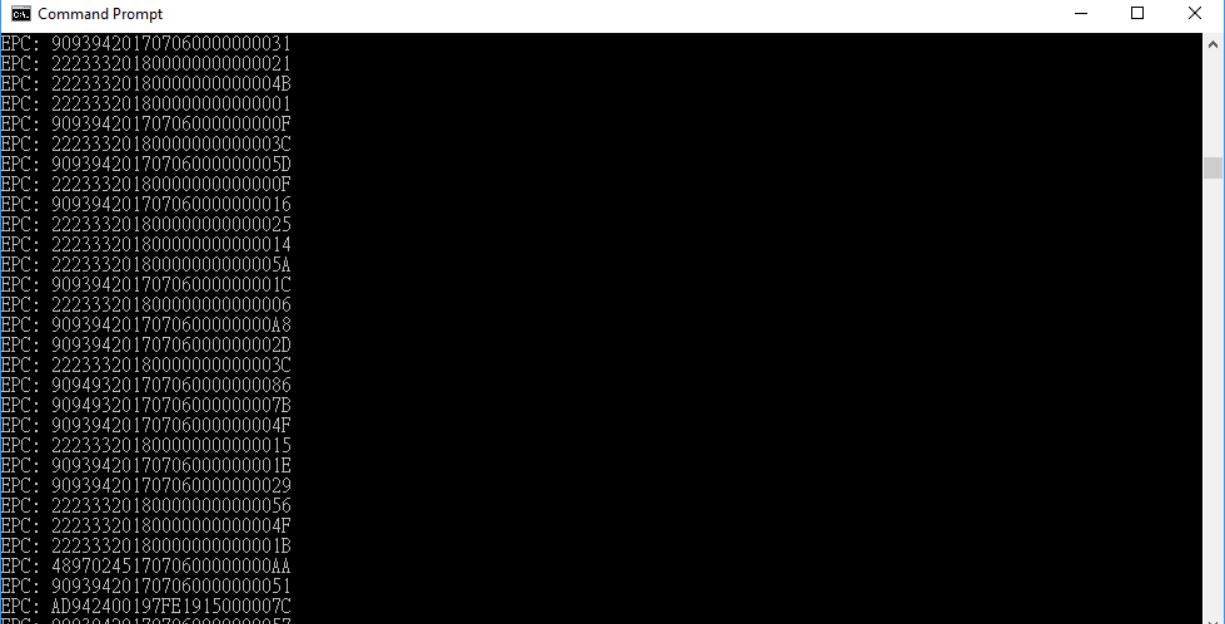
Run the command InvExample with reader IP as below



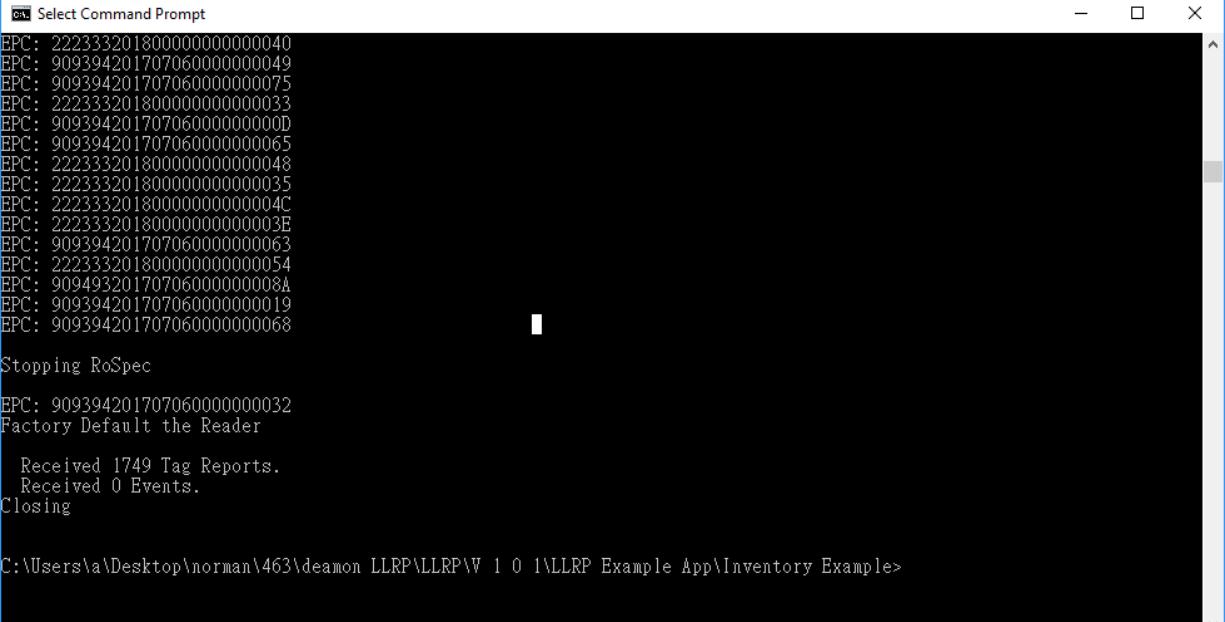
```
Command Prompt
Microsoft Windows [Version 10.0.17134.165]
(c) 2018 Microsoft Corporation. All rights reserved.

C:\Users\...\cd C:\Users\...\LLRP\Inventory Example>
C:\Users\...\cd C:\Users\...\LLRP\Inventory Example>InvExample 192.168.25.160
```

Inventory result shown as below



```
EPC: 90939420170706000000000031
EPC: 2223332018000000000000021
EPC: 222333201800000000000004B
EPC: 2223332018000000000000001
EPC: 90939420170706000000000F
EPC: 222333201800000000000003C
EPC: 90939420170706000000005D
EPC: 222333201800000000000000F
EPC: 909394201707060000000016
EPC: 222333201800000000000025
EPC: 222333201800000000000014
EPC: 22233320180000000000005A
EPC: 90939420170706000000001C
EPC: 222333201800000000000006
EPC: 909394201707060000000048
EPC: 90939420170706000000002D
EPC: 22233320180000000000003C
EPC: 909493201707060000000086
EPC: 90949320170706000000007B
EPC: 90939420170706000000004F
EPC: 222333201800000000000015
EPC: 90939420170706000000001E
EPC: 909394201707060000000029
EPC: 222333201800000000000056
EPC: 22233320180000000000004F
EPC: 22233320180000000000001B
EPC: 4897024517070600000000AA
EPC: 909394201707060000000051
EPC: AD942400197FE1915000007C
EPC: 909394201707060000000057
```



```
EPC: 222333201800000000000040
EPC: 909394201707060000000049
EPC: 909394201707060000000075
EPC: 222333201800000000000033
EPC: 90939420170706000000000D
EPC: 909394201707060000000065
EPC: 222333201800000000000048
EPC: 222333201800000000000035
EPC: 22233320180000000000004C
EPC: 22233320180000000000003E
EPC: 909394201707060000000063
EPC: 222333201800000000000054
EPC: 90949320170706000000008A
EPC: 909394201707060000000019
EPC: 909394201707060000000068

Stopping RoSpec

EPC: 909394201707060000000032
Factory Default the Reader

Received 1749 Tag Reports.
Received 0 Events.

Closing

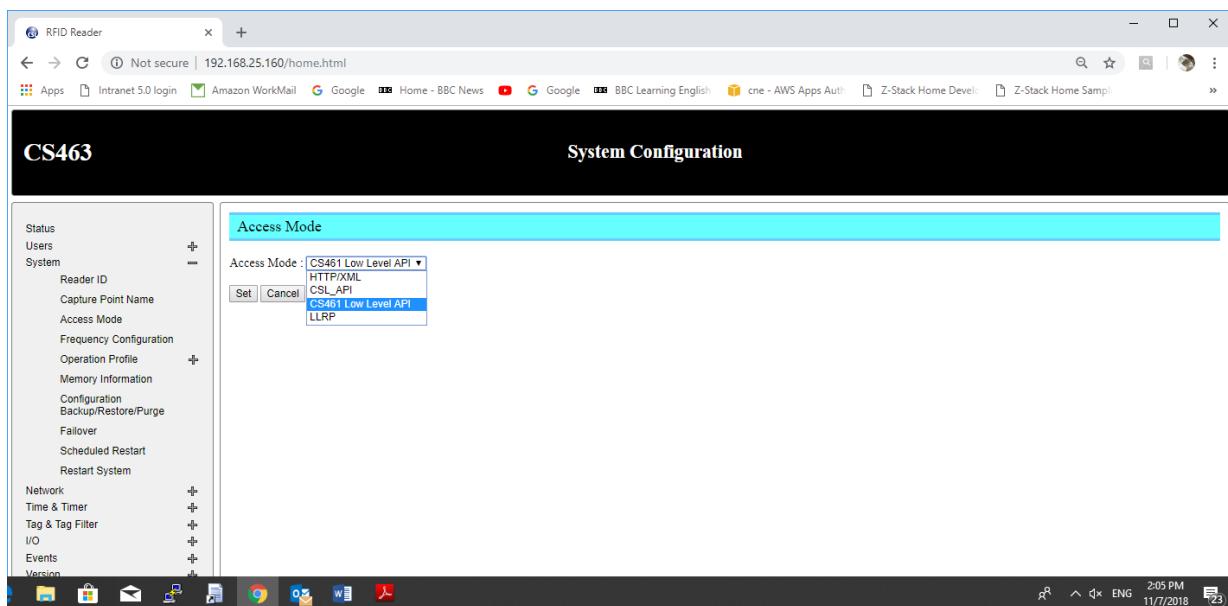
C:\Users\...\Desktop\norman\463\deamon LLRP\LLRP\V 1.0.1\LLRP Example App\Inventory Example>
```

12 Read Tag using CS461 High Level API (CSL HTTP/XML API)

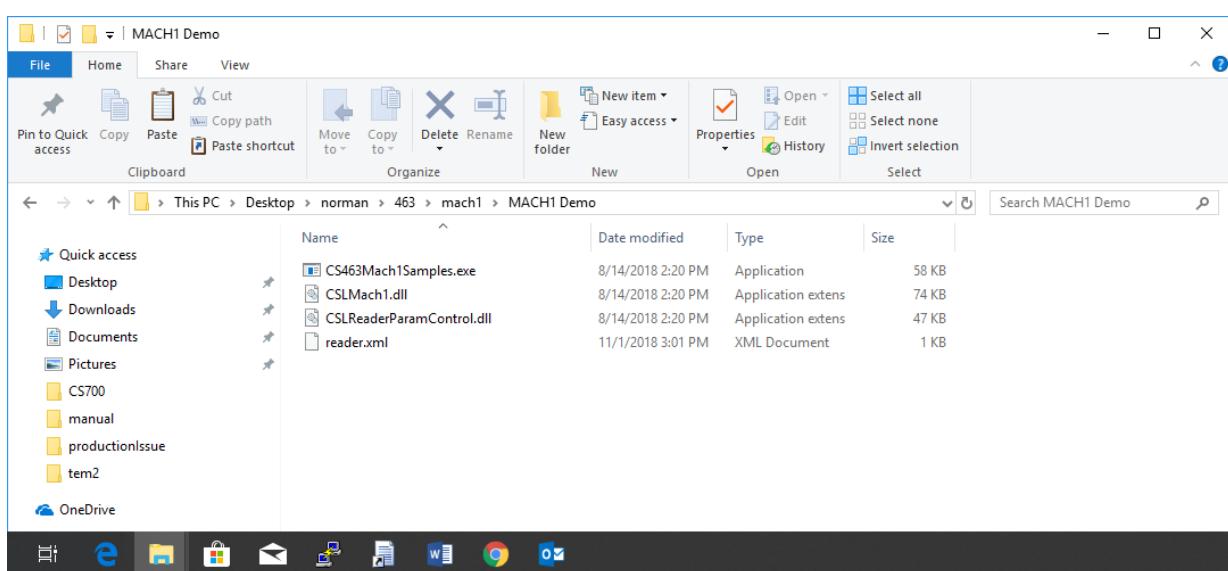
To be added

13 Read Tag using CS461 Low Level API (MACH1 API)

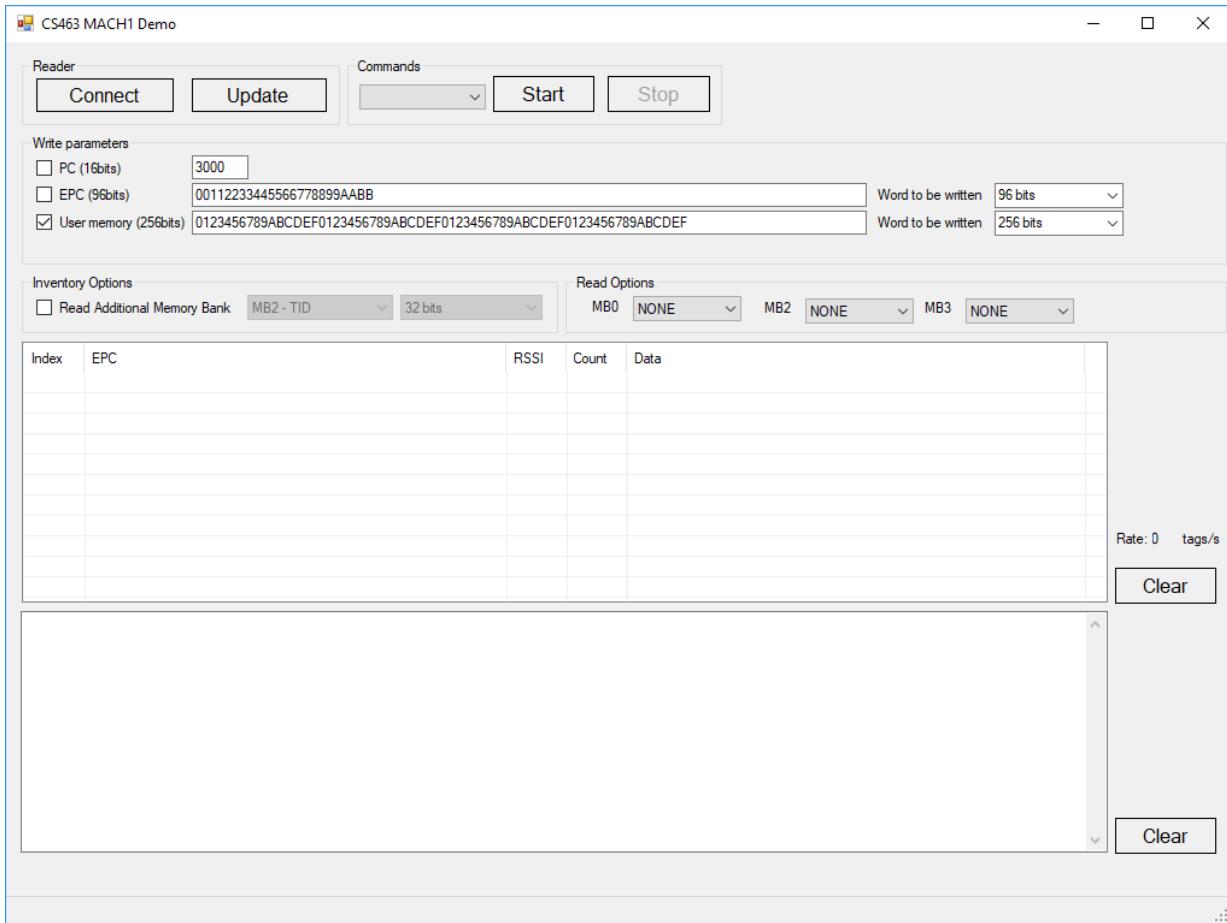
- Change the access mode to CS461 Low Level API



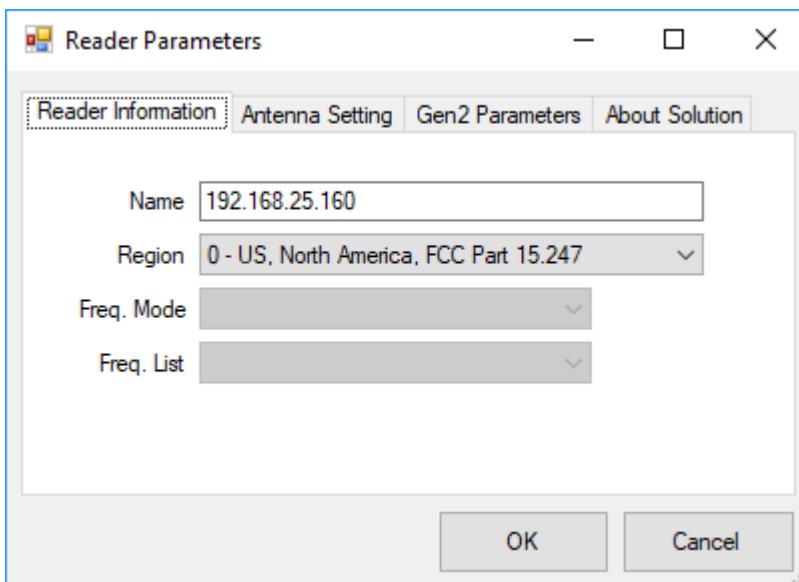
- Unzip package and start the Mach1 PC software by double click the CS463Mach1Samples



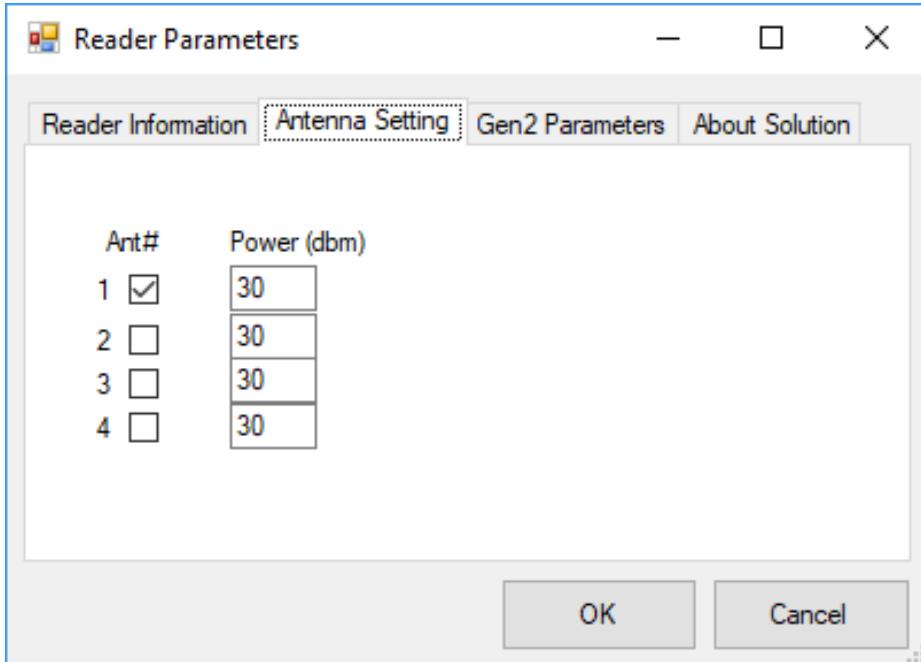
- Click Connect to connect to reader



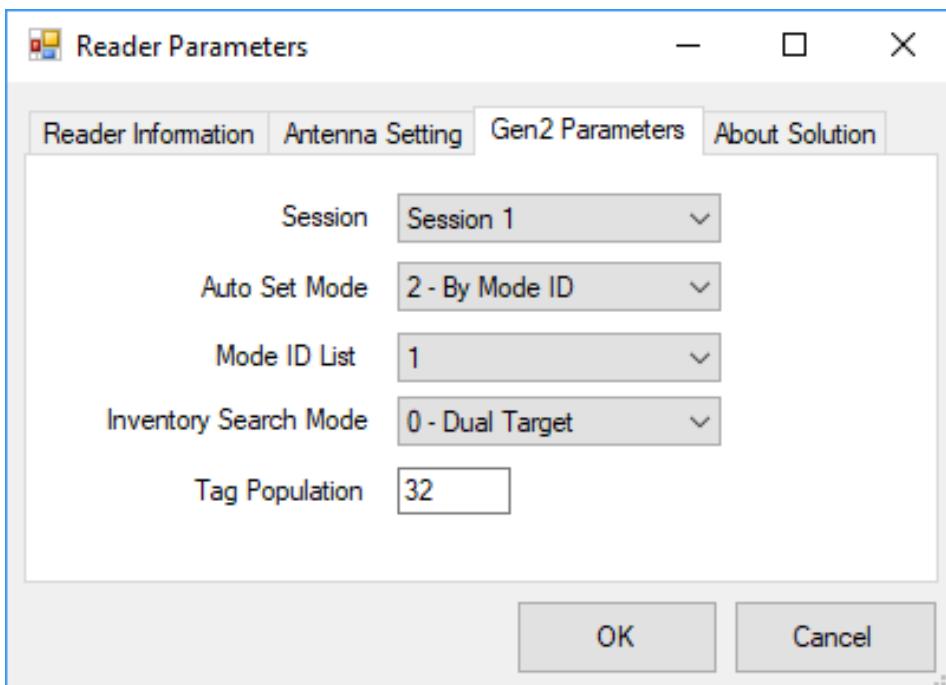
- Input correct IP address and operation Region of the connecting reader



- Go to Antenna Setting page
- Select the corresponding antenna ports which connected with antenna, going to use this port to read tags, also set the correct RF transmitting power

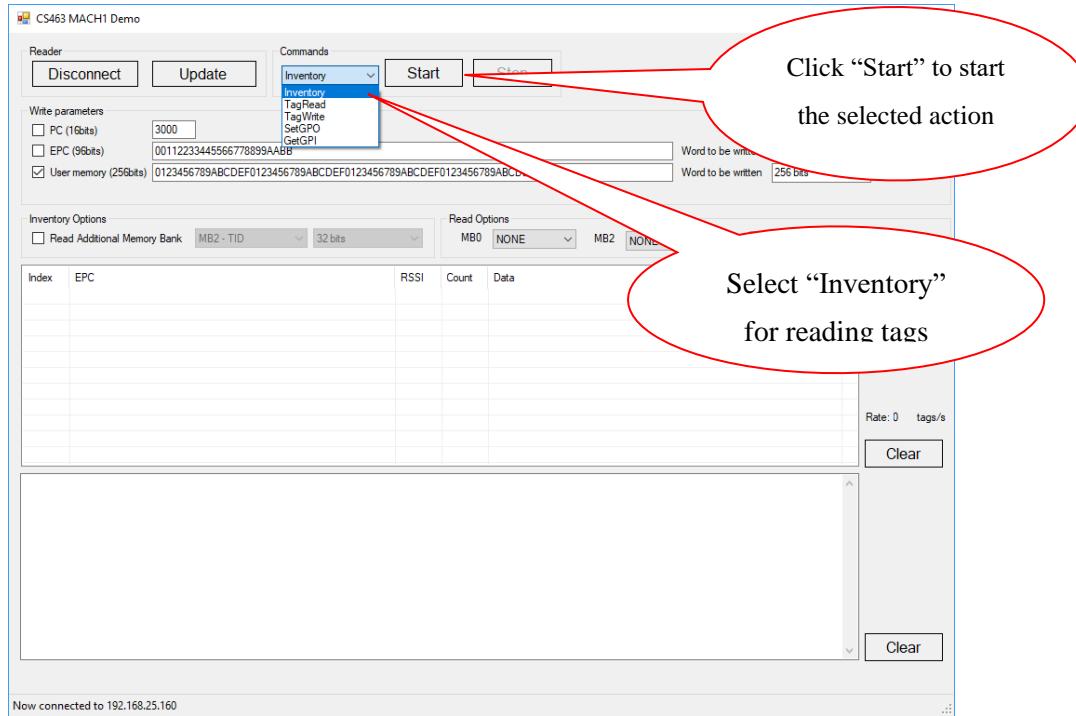


- Go to Gen2 Parameters page
- Set up inventory related parameters include session, mode (modulation Profile), Inventory Search Mode(Target A or Target A/B) and tag population

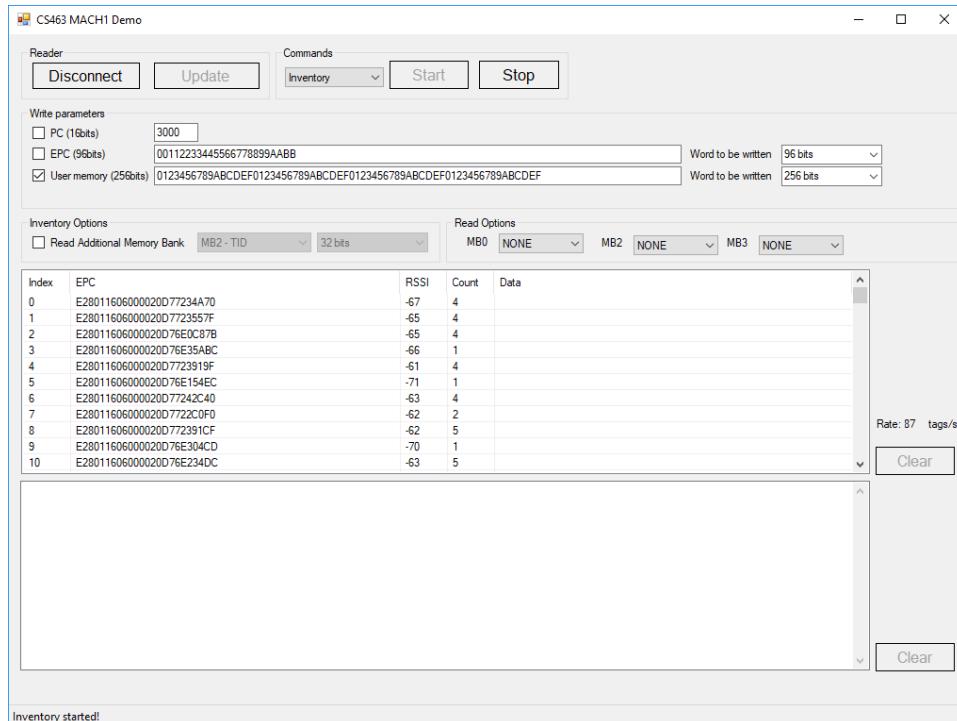


Click OK to confirm the change

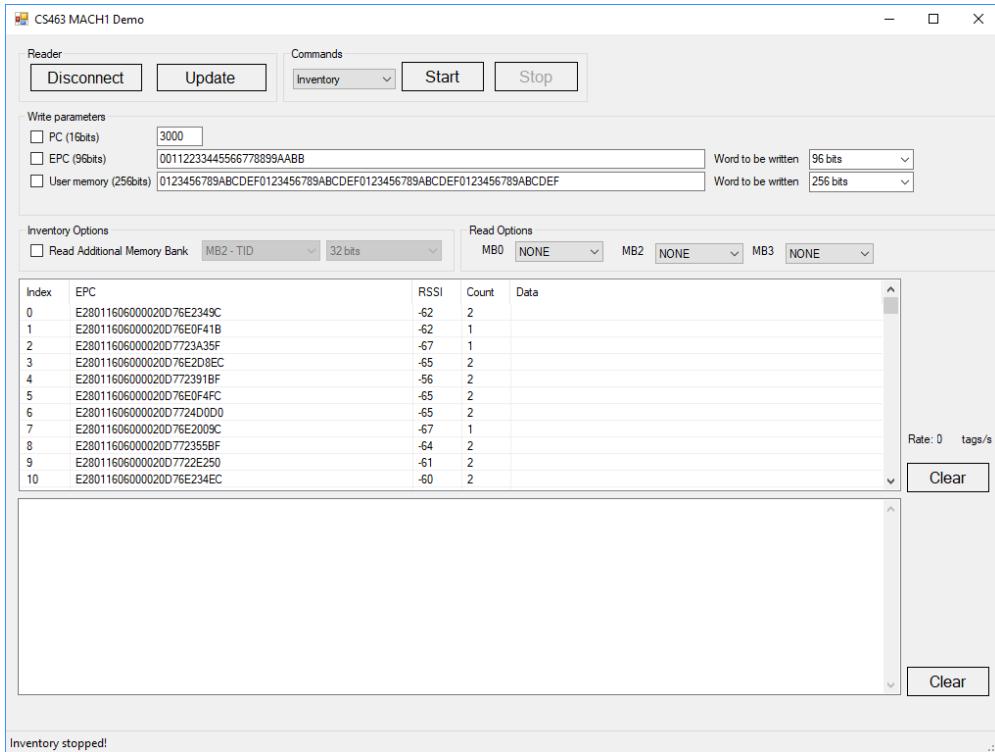
- Select Inventory on Commands tab then click “Start”



- Tags reading result shown on below

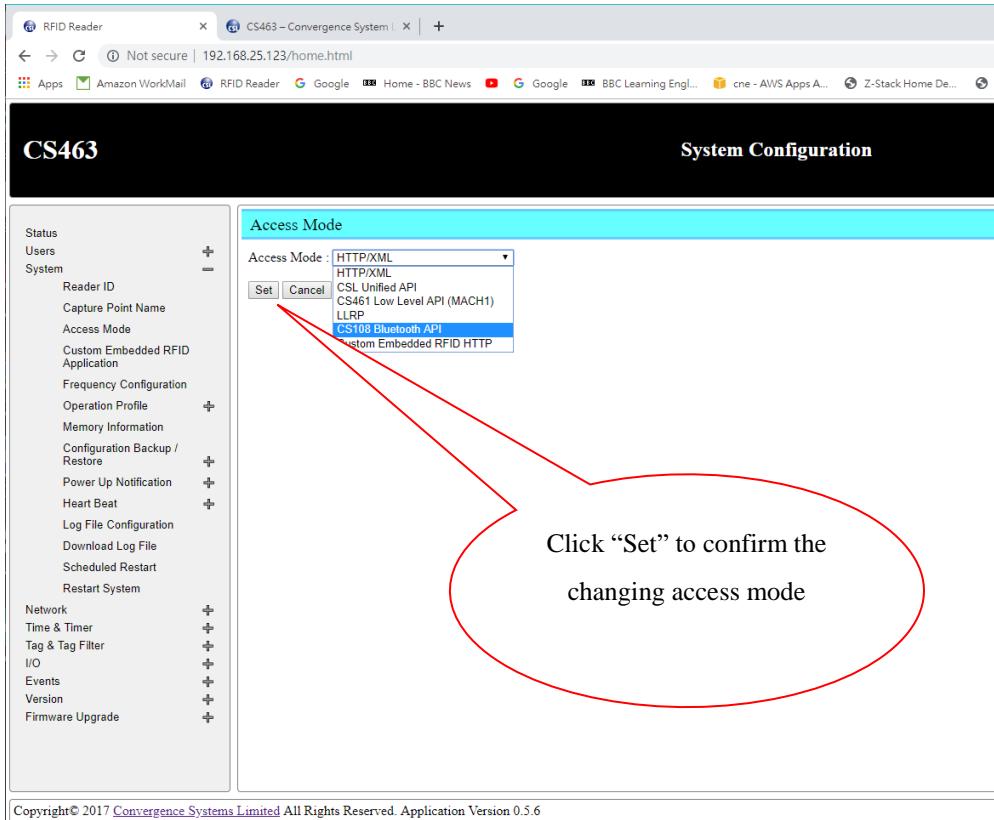


- Click Stop to stop the inventory



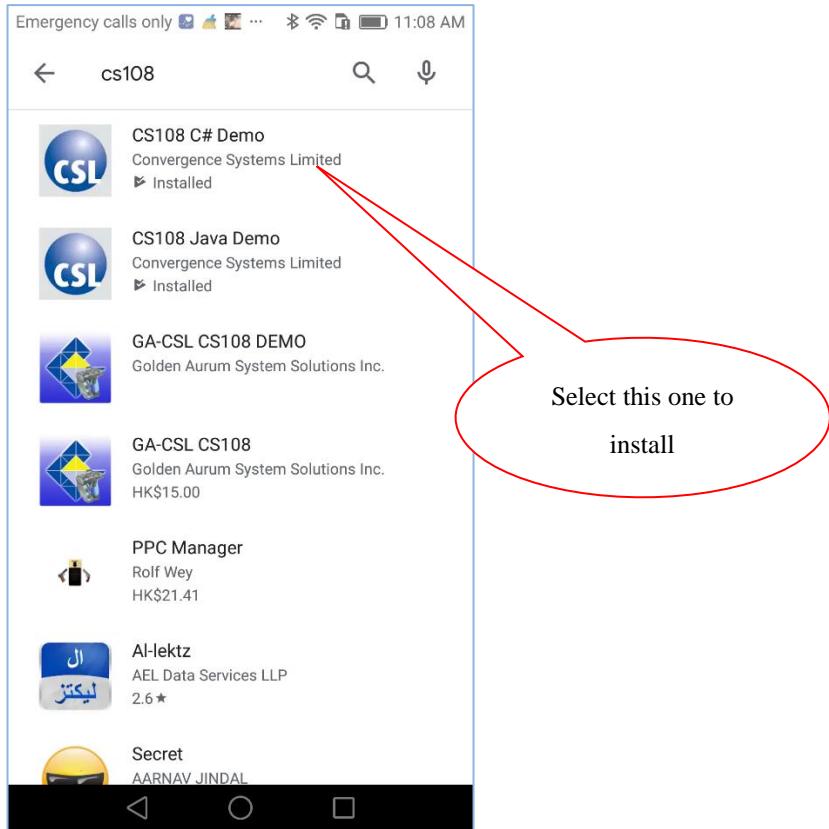
14 Read Tag using CS108 Bluetooth API

Change the reader access mode to CS108 Bluetooth API as shown below



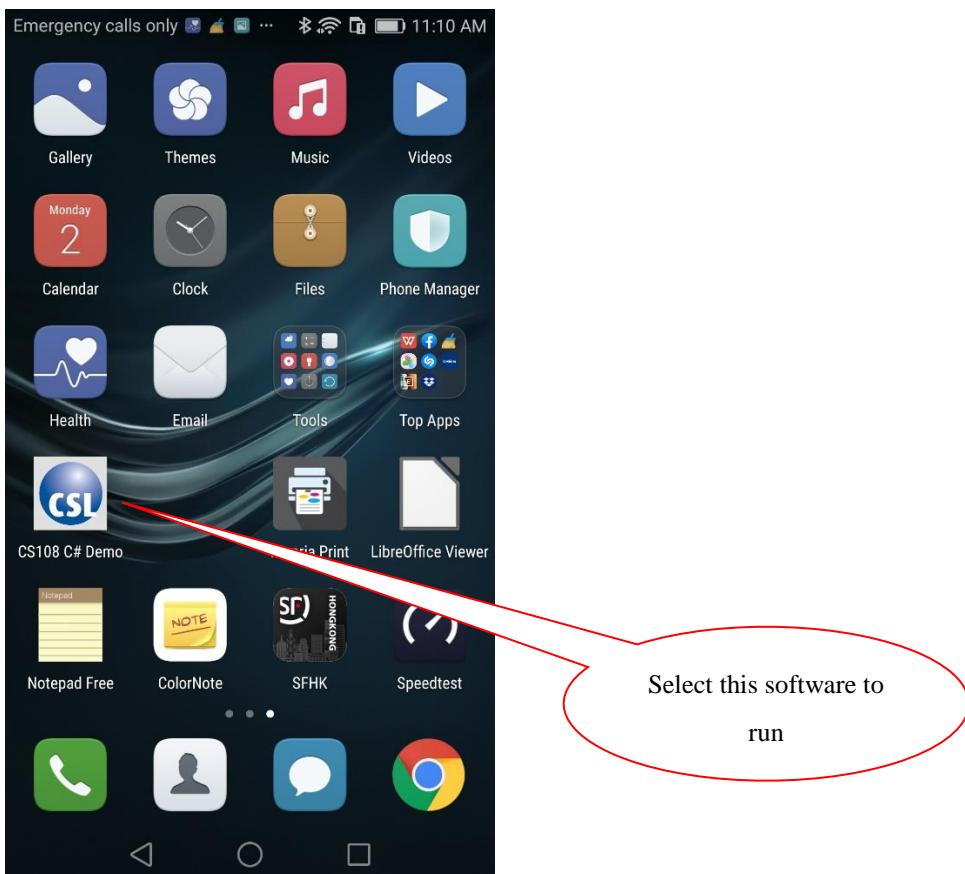
Click Set to confirm the changing

Using Android Phone with Play store and search application with keyword CS108 C# as below

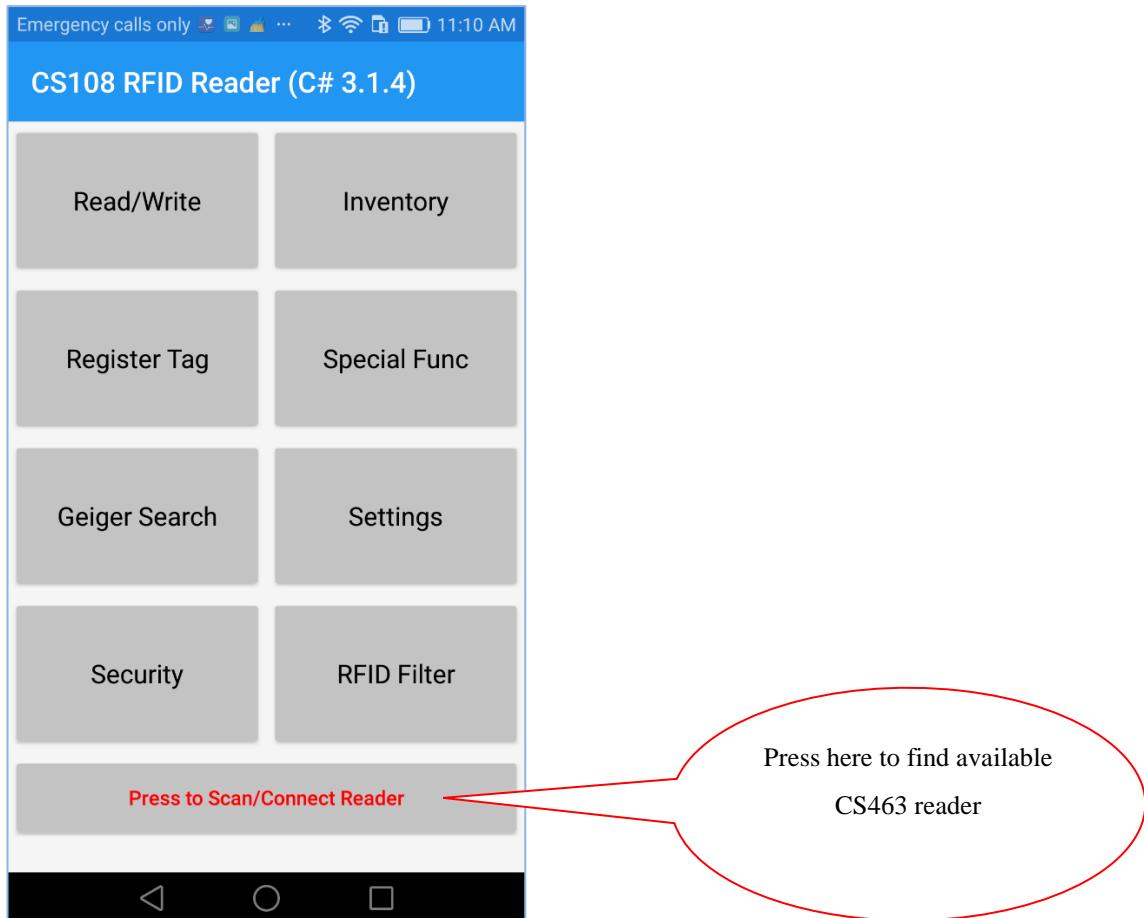


Select the CS108 C# Demo to install

After the CS108 C# Demo application installation successful, the software icon can be found on phone main page as below

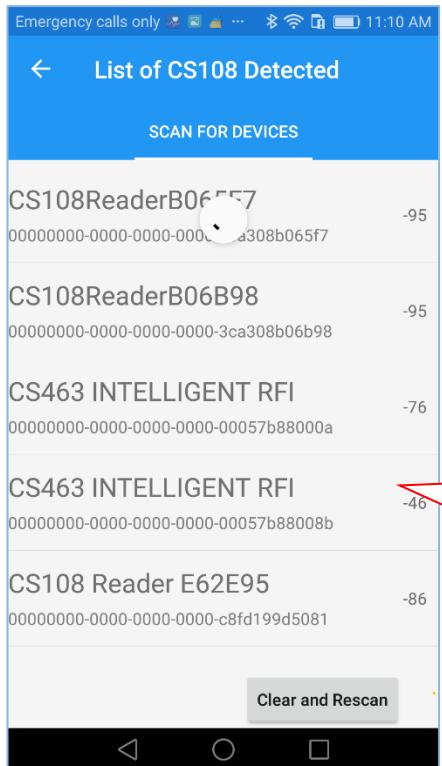


After running CS108 C# Demo application, below screen should appear



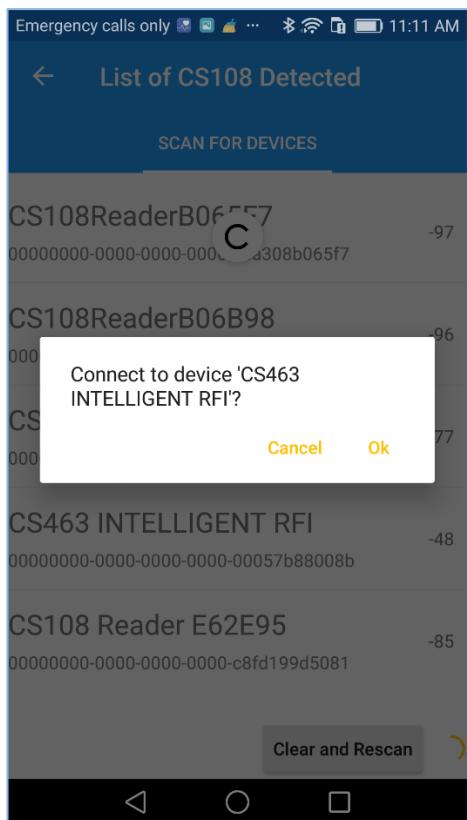
Select “Press to Scan/Connect Reader to find available CS463 reader

All available reader can be found in this page as below and select the right one to connect



Press right reader to connect,
also, the signal strength is
stronger if the reader is close to
you comparing all available
reader. Please make sure the
Reader ID is LESS than 21
characters long !!!!

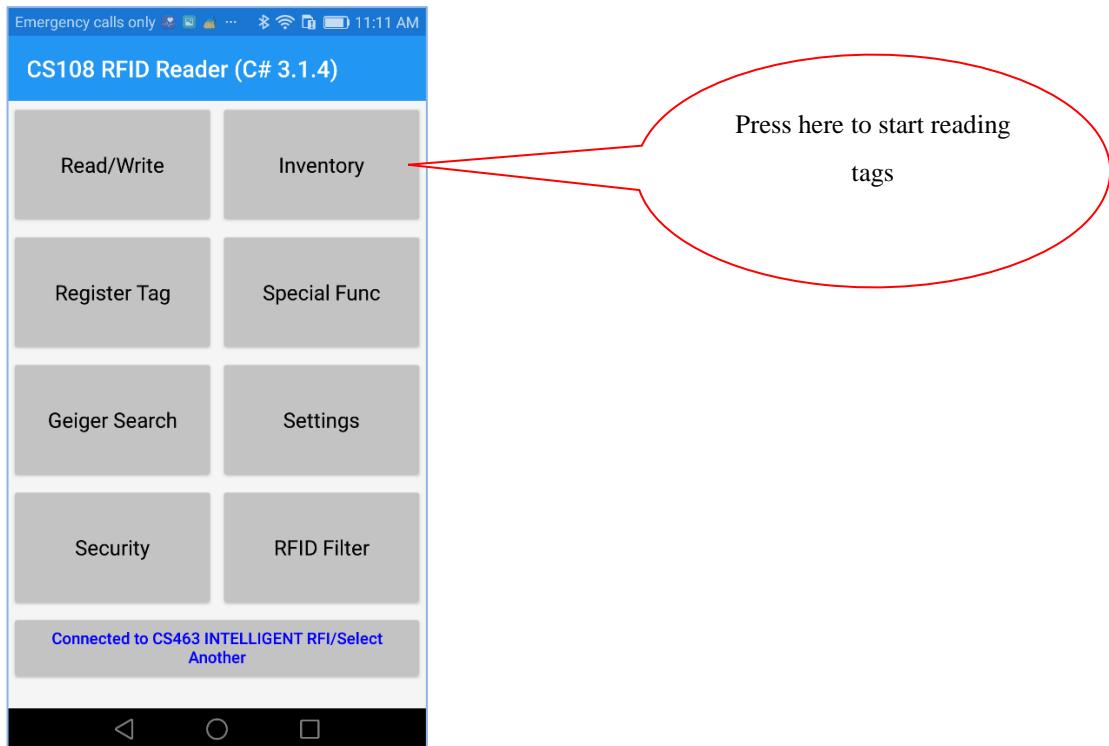
Press OK to confirm the connection



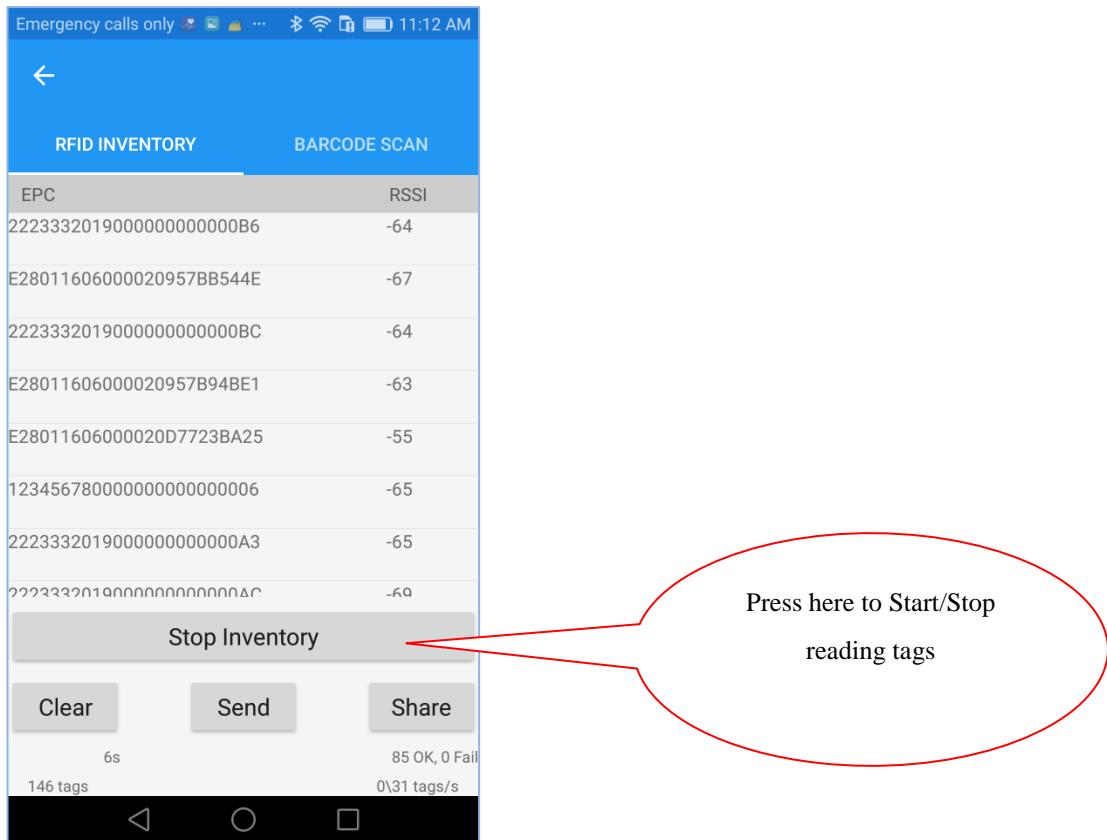
CS108 C# Demo main page is shown as below and detail operation can be found on CS108 operation manual available on CSL Web page

You can select Inventory page to read tags

Remark: Ensure Antenna was connected on Reader before starting to read Tags

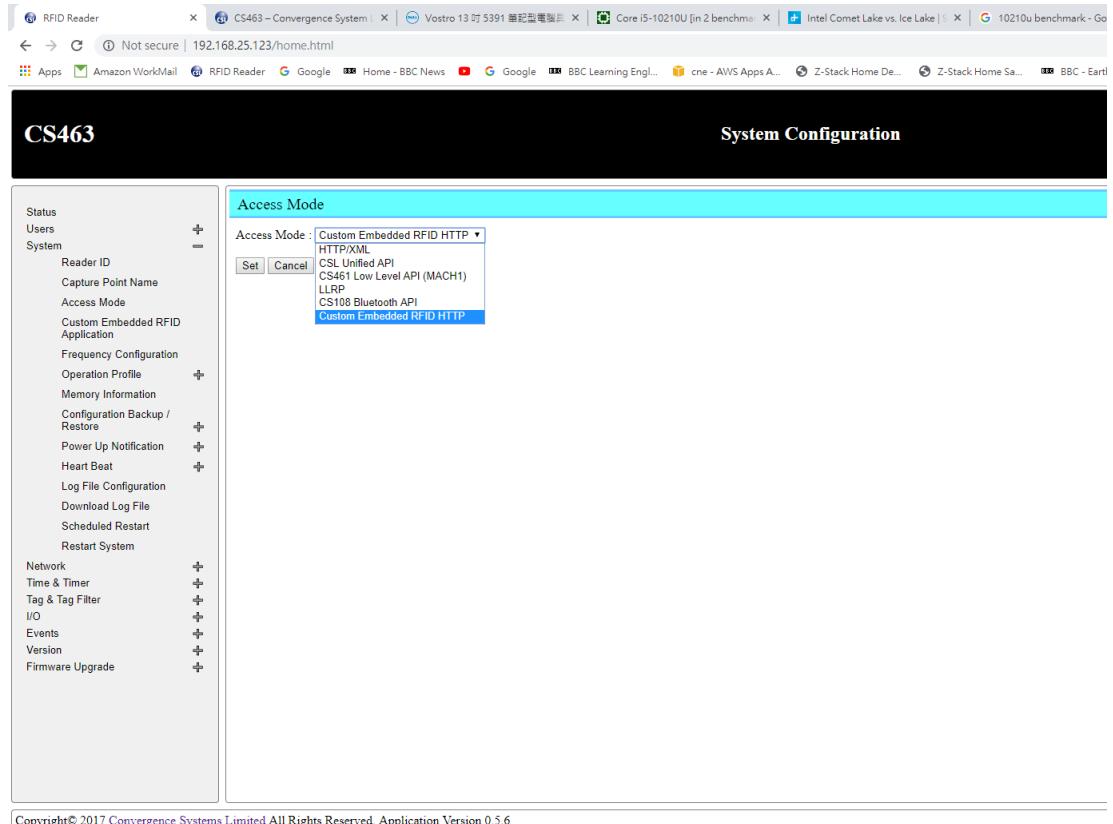


Available tags was shown below after you press the Start Inventory



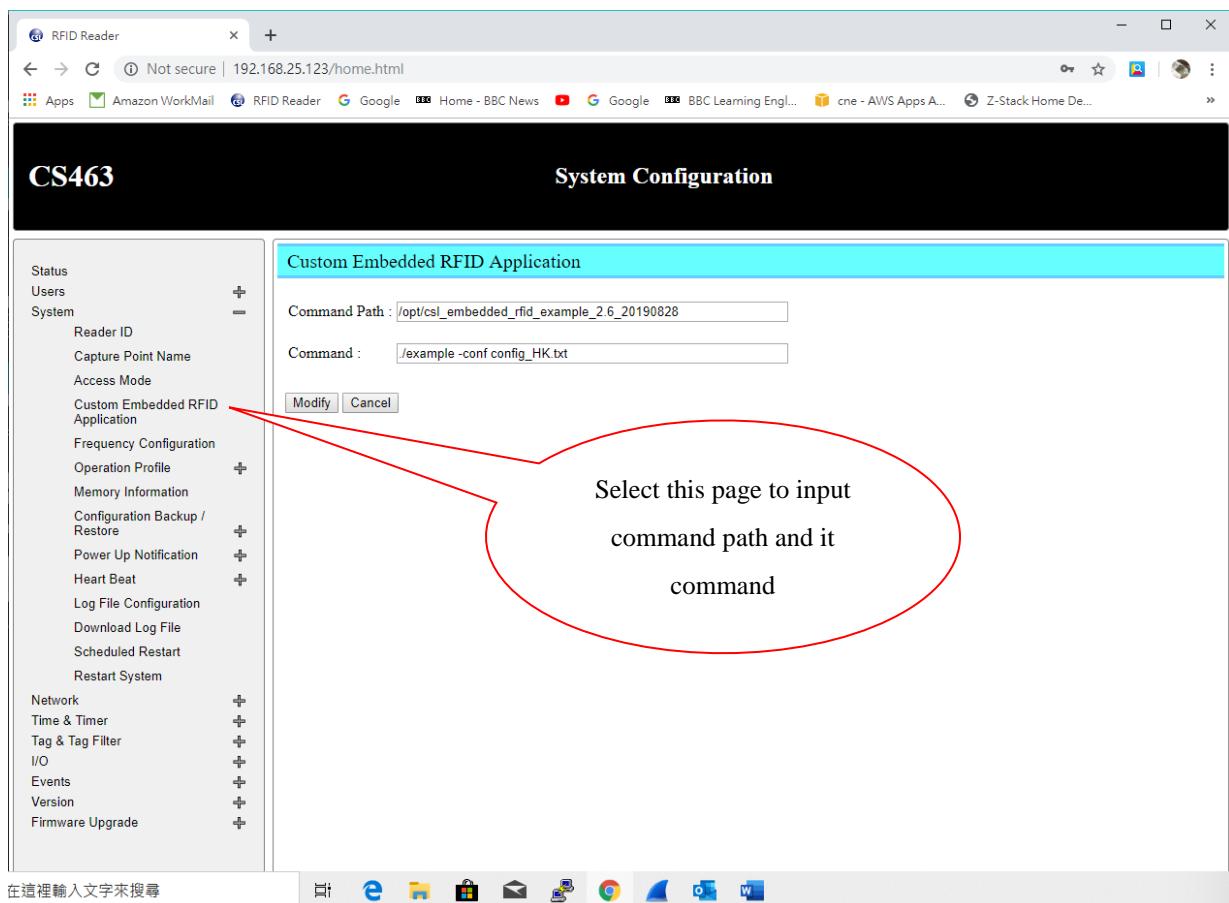
15 Read Tag using Custom Embedded RFID

Change the access mode to Custom Embedded RFID



Click Set to confirm the change

Input the Embedded RFID application path and its command in this page as shown below, the application will run once the access mode changed to “Custom Embedded RFID”



16 Demo Source Codes for Download

The source codes are available on below link

<https://www.convergence.com.hk/downloads/cs463/>

USER'S MANUAL		
File	Latest Version	Note
CSL CS463 Intelligent A-Port RFID Reader User's Manual	v1.4 (Apr 2019)	CSL CS463 Intelligent A-Port RFID Reader User's Manual

WEB APPLICATION AND LIBRARY		
File	Latest Version	Note
CS463 Web Application	v0.4 (Mar 2019)	
CS463 INI Library	v0.3.1 (Mar 2019)	
CS463 Patch	v2.1 (Mar 2019)	

API DAEMON, DEMO APP AND SOFTWARE DEVELOPMENT KIT		
File	Latest Version	Note
CSL Unified API		
CS463 CSL Unified API Daemon	v1.0.0 (Mar 2019)	
CS Native Single Reader on Windows OS with User Interface (Installer)	Aug 2018	Demo App in C# Native, connects to 1 reader
CS Native Single Reader on Windows OS with User Interface (Source Codes)	Aug 2018	Source Code, Libraries, Binaries and Reference Manual for Single Reader in C#

17 Historical Firmware Versions

The following are lists of historical firmware versions of each firmware:

Web Application:

Version Number	Date	Description

JNI Library:

Version Number	Date	Description

Patch:

Version Number	Date	Description

CSL Unified API Library (Daemon):

Version Number	Date	Description

CS461 Low Level API (MACH1) Library:

Version Number	Date	Description

LLRP Library:

Version Number	Date	Description

CS108 Bluetooth API Library:

Version Number	Date	Description

CSL C# Demo App:

Version Number	Date	Description

Appendix A: Federal Communications Commission Compliance

The CS463 model has been tested and found to comply with the limits for a class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Consult the dealer or an qualified radio/TV technician for assistance

FCC NOTICE:

To comply with FCC part 15 rules in the United States, the system must be professionally installed to ensure compliance with the Part 15 certification. It is the responsibility of the operator and professional installer to ensure that only certified systems are deployed in the United States. The use of the system in any other combination (such as co-located antennas transmitting the same information) is expressly forbidden.

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Note:

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Appendix B: Reader Modes (Link Profiles)

There are 4 link profiles in the CSL Intelligent Fixed Readers: 0, 1, 2, 3. Only 1 profile is active at any time. The purpose of each link profile is explained below. These definitions correspond to different application or physical scenarios. The user should try out each profile to see which one gives best performance. Some profiles are not allowed in some countries due to band edge emission issue.

Reader Mode/ Link Profile	0	1	2	3
Definition	Best Multipath Fading Resistance	Longest Read Range, Dense Reader Mode	Read Range and Throughput, Dense Reader Mode	Maximum Throughput
R-T Modulation	DSB-ASK	PR-ASK	PR-ASK	DSB-ASK
Tari (μ s)	25.00	25.00	25.00	6.25
X	1.00	0.50	0.50	0.50
PW (Pulse Width in usec)	12.50	12.50	12.50	3.13
RTcal (usec)	75.00	62.50	62.50	15.63
TRcal (usec)	200.00	85.33	71.11	20.00
DR (Divide Ratio)	8	64/3	64/3	8
T-R Modulation	FM0	Miller-4	Miller-4	FM0
TRExt	1	1	1	1
Link Frequency(LF) (KHz)	40	250	300	400
Data Rate (Kbps)	40	62.5	75	400

Appendix C: Sessions

Session is a concept of the EPC Global Standard to allow a tag to respond to multiple readers inventorying it at the same time, each using a different session number.

There are 4 possible sessions: S0, S1, S2, S3.

The user however has to be careful because these 4 sessions have different behaviors, notably how the tag flag “persists” in time. A tag, before being inventoried or when just after being powered on, has a flag of State A. When it is inventoried, the flag will go to State B. The tag flag will stay in State B until the tag powers off or the persistence time is up.

A reader can declare it only wants to inventory flag A, so that after a tag is inventoried and its flag gone to State B, it will no longer respond to further inventory rounds – until the end of the persistence time.

Now for S0, S1, S2 and S3, the persistence times are DIFFERENT! Because of that, one has to be very careful in choosing which session to use.

Session	Tag Flags Persistence Time
S0	Tag Energized: indefinite Tag Not Energized: none
S1	Tag Energized: 0.5 second < Persistence Time < 5 seconds Tag Not Energized: 0.5 second < Persistence Time < 5 seconds
S2	Tag Energized: indefinite Tag Not Energized: 2 seconds < Persistence Time
S3	Tag Energized: indefinite Tag Not Energized: 2 seconds < Persistence Time

Appendix D: Tag Population and Q

Tag Population is the RFID tag population that is to be inventoried. To be more precise, it is the population of tags that can be “seen” by the RFID reader.

Q is an EPC Global Standard concept related to the way a group of tags is inventoried. When a reader broadcasts its desire to inventory tags, it sends out a Q value. The tag will, based on that Q, calculate a certain number and define that as the number of repeated inventories the reader will do. Basically, the relationship of Inventory Repeats and Q is:

$$\text{Inventory Repeats} = 2^Q$$

The tag will then choose by random a certain number less than this Inventory Repeats. When the reader starts doing inventory, the tag will then respond at that repeat number.

In other words, the Inventory Repeats should correspond to Tag Population:

$$\text{Tag Population} = \text{Inventory Repeats} = 2^Q$$

For example, if there are 8 tags, then in theory the Q can be 3, and if each tag chooses a number different from that of the other 7 (miraculously, of course), then the 8 tags will be inventoried in an orderly manner in turn.

Of course this will never happen, as the tags will easily choose a number the same as that of another one, and a collision will occur.

Therefore, it is a normal practice to have a bigger Q, such as 4 in this case, so that the 8 tags would have a lower chance of choosing the same number.

Therefore, reversing the equation, ideally, we can have:

$$Q = \text{INTEGER}(\log_2(\text{Tag Population}))$$

But in reality, we need some headroom, so that:

$$Q = \text{INTEGER}(\log_2(\text{Tag Population} \times 2)) + 1$$

Appendix E: Query Algorithm

There are 2 types of Query Algorithm: Fixed Q and Dynamic Q.

For Fixed Q, the Q value does not change. In other words, the expected Tag Population does not change.

For Dynamic Q, the Q value changes adaptively: when there are a lot of inventory repeats where no tags respond, the reader will interpret that there are not that many RFID tags in the environment, and hence it is more efficient to change the Q to a smaller value. When there are a lot of inventory repeats where the reader receives data but they do not satisfy checksum, meaning there is heavy collision, then the reader will interpret that there are too many RFID tags in the environment and hence it is better to increase the value of Q. Dynamic Q algorithm is a way to allow the RFID reader to adapt to different amount of RFID tags being seen by the reader. The idea is that if there are a smaller number of tags in the environment, then the Q can be reduced and the reader can collect all the tag data faster.

Appendix F: Target

Target refers to the target flag that the reader wants to inventory. There are 2 possible flags of an RFID tag: State A and State B.

When an RFID tag is first powered up, it has a flag of State A. After it is inventoried, the state of the flag becomes State B.

The tag will only go back to State A if either it is powered off and powered on again, or if its persistence time has run up (See Appendix B).

For each round of inventory, the reader sends out a notification to the environment which tag flag state it wants to inventory. It can inventory State A, or it can inventory State A and State B alternatively from one round of inventory to the next round of inventory.

In theory, it is a good thing to inventory only State A. The reason being that those tags that have been inventoried should not respond again, and will hence quickly reduce the amount of collisions between tags. Generally in practice if you set inventory to State A only, the inventory of large amount of tags can be faster.

The only catch is that when a tag responds to the reader, it does not know another tag is colliding with it. It sends out the response and thinks it has done the job, hence transitioning to flag State B. So in such a case, the tag will not respond to further inventory queries by the reader, even though its response has been lost due to collisions. Because of that, sometimes the user will set the inventory to target State A in one inventory round, and then State B in the next round, and vice versa, and so on. This is called A/B Toggle or A & B Dual Target or simply Dual Target.

Appendix G: Receiver Amplifier Gain Values

The receive path has many amplifiers and their gain can be configured also.

There are 4 parameters:

RF LNA High Compression Mode: 0 or 1 (default is 1)

RF LNA Gain: 1 dB, 7 dB, or 13 dB (for 13 dB, RF LNA High Compression Mode must be 0) (default is 1 dB)

IF LNA Gain: 24 dB, 18 dB, 12 dB, or 6 dB (default is 24 dB)

AGC Gain: -12 dB, -6 dB, 0 dB, 6 dB (default is -6 dB)

If one has to read tags that are far away, or tags that are heavily blocked, then increasing the RF LNA Gain may help.

However, if tags can be very close to the antenna, then one may need to check if the increased LNA Gain cause saturation of the LNA. To check, just put a tag at a distance that is closest possible to the antenna during the site's specific business scenario, and see if that tag can be read properly.

Appendix H: TagFocus

TagFocus is a special Impinj extension to EPC protocol to enable longer persistence time when Session is S1, Target is Flag A only (no toggle). This combination setting is traditionally used to inventory a lot of tags. However, since the normal persistence time of this combination as defined by EPC is only 2 to 5 seconds, so when this time is up, the tag will still go back to Flag A. Therefore, depending on how many tags the reader can read during this period of 2 to 5 seconds, the inventory will be very fast up to a certain limit and then will become very slow.

For Impinj IC based tags, this TagFocus property, when invoked, will cause the tag to stay in Flag B a much longer time, until the end of all inventory rounds. This will enable much faster read when you need to read more than 1000 tags, for example.

Appendix I: FastID

FastID is a special Impinj extension to EPC protocol. By setting this, an inventory of Bank 1 EPC will have both Bank 1 EPC and Bank 2 TID coming back together in a simple inventory. The PC value is automatically modified – specifically the first 5 bits that contain the encoded EPC length. Since the added TID makes the whole return values longer, therefore this first 5 bits of PC is always made larger. The reader always captures the data based on the 5 bits of PC, so it simply grabs a longer number. The user will then need to separate the EPC and the TID bits – the length of which is known a priori because the TID Bank 2 length of Impinj tag IC is known.

Appendix J: Security

There are 4 actions you can apply on the memory inside an RFID tag:

- 1) Lock
- 2) Unlock
- 3) Permanent Lock
- 4) Permanent Unlock

You can obtain an EPC Global document which can be downloaded from the EPC Global website that explains this:

<https://www.gs1.org/epcrfid/epc-rfid-uhf-air-interface-protocol/2-0-1>.

Once there, press the button showing the latest air interface protocol document and click on it to get the pdf file.

Click the latest Air Interface Protocol document

EPC UHF Gen2 Air Interface Protocol

Conformance Requirements

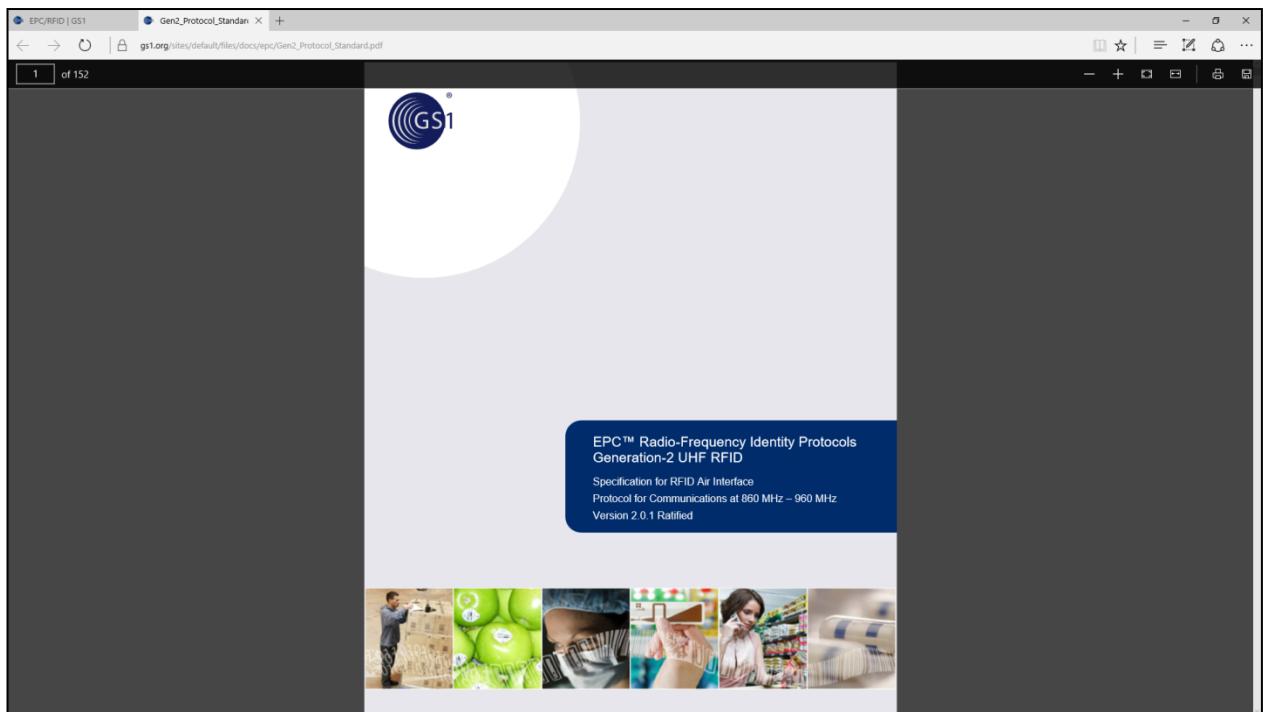
- Gen2 v 2.0 Conformance Requirements
- Gen2 v 1.2.0 Conformance Requirements
- Gen2 v 1.1.0 Conformance Requirements

Supporting Files

- Gen2v2 fact sheet

GS1's EPC "Gen2" air interface protocol, first published by EPCglobal in 2004, defines the physical and logical requirements for an RFID system of interrogators and passive tags, operating in the 860 MHz - 960 MHz UHF range. Over the past decade, EPC Gen2 has established itself as the standard for UHF implementations across multiple sectors, and is at the heart of more and more RFID implementations.

2008 saw the publication of Gen 2 Version 1.2.0 which incorporated a number of enhancements requested by the retail community to support their RFID rollouts at item level.



For the Access Password and Kill Password the security locking affects both reading and writing.

For the EPC memory bank and the User memory bank, the security locking affects only writing.

For the TID memory bank, since we are the user and not the manufacturing vendor, there is no security action that can be applied. It has been permanently unlocked in the factory and it cannot be changed.

Appendix K: Models & Regulatory Region

There are various models, denoted by the alphanumeric key to the right of the dash after the **CSXYZ-N**, here denoted by “**N**”. The applicable regulatory regions for each model are described below:

- N=1:** 865-868 MHz for Europe ETSI, Russia, Mid-East countries – 4 channels
865-867 MHz for India – 3 channels
- N=2:** 902-928 MHz, FCC, for USA, Canada and Mexico. Hopping frequencies locked
- N=2 AS:** 920-926 MHz, Australia. Hopping frequencies locked
- N=2 NZ:** 921.5-928 MHz, New Zealand. Hopping frequencies locked
- N=2 OFCA:** 920-925 MHz, Hong Kong. Hopping frequencies locked
- N=2 RW:** 920-928 MHz, Rest of the World, e.g. Philippines, Brazil, Peru, Uruguay, Bangladesh, etc.
- N=4:** 922-928 MHz, Taiwan
- N=6:** 917-920.8 MHz, South Korea
- N=7:** 920-925 MHz, China
- N=8:** 916.7-920.9 MHz, Japan
- N=9:** 915-921 MHz, Europe Upper Band

Appendix L: Technical Support

All technical support should be sent to the following email:

info@convergence.com.hk