



User Manual

WISE-3310

ADVANTECH

Enabling an Intelligent Planet

Copyright

The documentation and the software included with this product are copyrighted 2015 by Advantech Co., Ltd. All rights are reserved. Advantech Co., Ltd. reserves the right to make improvements in the products described in this manual at any time without notice. No part of this manual may be reproduced, copied, translated or transmitted in any form or by any means without the prior written permission of Advantech Co., Ltd. Information provided in this manual is intended to be accurate and reliable. However, Advantech Co., Ltd. assumes no responsibility for its use, nor for any infringements of the rights of third parties, which may result from its use.

Acknowledgements

Linear Dust is a trademark of Linear Technology Corporation.

ARM is a trademark of ARM Corporation.

All other product names or trademarks are properties of their respective owners.

Packing List

Before setting up the system, check that the items listed below are included and in good condition. If any item does not accord with the table, please contact your dealer immediately.

- Gateway
 - WISE-3310 (P/N: WISE-3310-D200L1E)
- Accessory
 - 2.4 GHz Antenna *2 (P/N: 1750007622-01)
 - Adapter *1 (P/N: 96PSA-A36W12R1)

Safety Instructions

1. Read these safety instructions carefully.
2. Keep this User Manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. **DO NOT COVER THE OPENINGS.**
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If one of the following situations arises, get the equipment checked by service personnel:
 - The power cord or plug is damaged.
 - Liquid has penetrated into the equipment.
 - The equipment has been exposed to moisture.
 - The equipment does not work well, or you cannot get it to work according to the user's manual.
 - The equipment has been dropped and damaged.
 - The equipment has obvious signs of breakage.
15. **DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT WHERE THE STORAGE TEMPERATURE MAY GO BELOW -40° C (-40° F) OR ABOVE 85° C (185° F). THIS COULD DAMAGE THE EQUIPMENT. THE EQUIPMENT SHOULD BE IN A CONTROLLED ENVIRONMENT.**
16. **CAUTION: THERE IS DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER, DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.**

The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 70 dB (A).

DISCLAIMER: This set of instructions is given according to IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

Contents

Chapter 1	General Introduction	1
1.1	Introduction	2
1.2	Product Features.....	2
1.2.1	Key Features.....	2
1.2.2	Key Specification	2
1.3	Mechanical Specification.....	3
1.3.1	Dimensions:	3
1.4	Power Requirement	3
1.5	Environment Specifications	3
Chapter 2	Hardware Functionality	5
2.1	Introduction	6
2.2	WISE-3310 I/O Indication.....	6
	Figure 2.1 WISE-3310 front view.....	6
	Figure 2.2 WISE-3310 Back view	6
2.3	WISE-3310 Antenna Connectors	6
2.3.1	Spare Antenna Hole.....	6
2.3.2	Power Input Connector	7
2.3.3	Power Switch	7
2.3.4	COM Connector	7
	Table 2.1: COM Connector Pin Assignment.....	7
2.3.5	Reset Button	8
2.3.6	Ethernet Connector (LAN)	8
	Table 2.2: LAN Connector Pin Assignment.....	8
2.3.7	SD Connector	9
	Table 2.3: SD Connector Pin Assignment.....	9
2.4	WISE-3310 Hardware Installation	9
2.4.1	SD Card Installation	9
	Figure 2.3 WISE-3310 SD Card Installation	9
2.4.2	Mounting Assembly Method.....	10
	Figure 2.4 Flexible wall mounting	10
2.5	Test Tools	10
2.5.1	SD Test.....	10
2.5.2	Mini PCIe (Wi-Fi) Test.....	11
2.5.3	LAN Test.....	11
2.5.4	RS232 Test.....	12
Chapter 3	Building a WSN Network.....	13
3.1	Default Setting.....	14
3.2	Login	14
3.3	Web Setting Functions	15
3.3.1	Webmin.....	15
3.3.2	System	15
	Table 3.1: Bootup and Shutdown	16
3.3.3	Networking	18
	Table 3.2: WISE WSN Setting.....	19
	Table 3.3: WSN Network Statistic	20
	Table 3.4: WSN Network Statistic	20
3.3.4	Hardware	20

Chapter 4 Basic COM Port Settings..... 23

4.1	Introduction	24
4.1.1	CLI Access.....	24
4.1.2	Managing user and viewer Passwords.....	25
4.1.3	Mote Commands	25
4.2	Commands.....	25
4.2.1	Login.....	25
4.2.2	Logout.....	26
4.2.3	Reset	26
4.2.4	Show Config & Show Curconfig.....	27
4.2.5	Show Mote.....	28
4.2.6	Show Stat	29
4.2.7	Set Netid & Set Commonjoinkey	30
4.2.8	exec exchNetId.....	31
4.2.9	exec exchJoinKey.....	31
4.2.10	sm	32

Chapter 1

General Introduction

1.1 Introduction

Advantech Wireless IoT Gateway, WISE-3310, is powered by Freescale ARM® Cortex™-A9 i.MX6 Dual 1 GHz high performance processor. With high-reliability wireless mesh network solution and remote management, WISE-3310 creates a cost-effective open platform for easy integration and development in different M2M/IoT applications. Connect with Advantech Wireless IoT nodes, by Smartmesh IP protocol for applications in wireless sensor networks where seamless internet protocol (IP) is valued. Also, WISE-3310 supports SUSIAccess for an IoT PaaS Solution; it allows users to easily remote control and manage their devices through WISE CLOUD.

1.2 Product Features

1.2.1 Key Features

- Freescale ARM® Cortex™-A9 i.MX6 Dual 1 GHz high performance processor
- Onboard DDR3 1 GB memory and 4 GB flash capability
- Linear Tech Dust WSN IP Smartmesh solution
- Complaint with IPv6, 6LowPAN Internet Protocol and IEEE802.15.4e standard
- Supports wallmount, VESA mount for flexible mounting methods

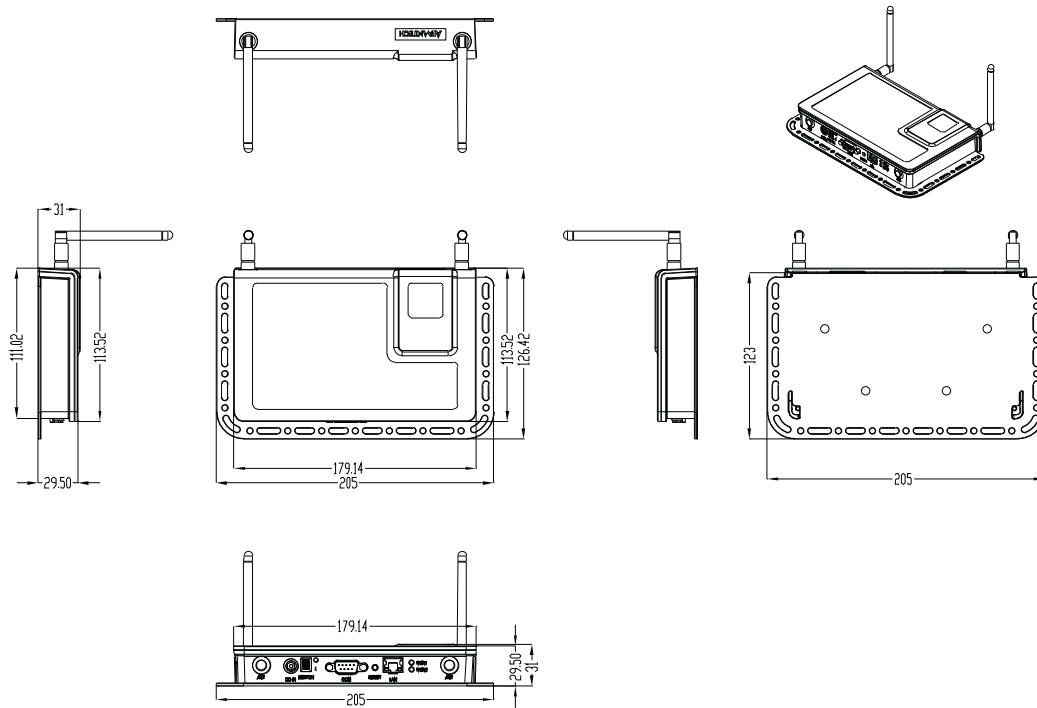
1.2.2 Key Specification

- **Kernel:** Linux V3.0.35
- **System Memory:** Onboard 1GB DDR3 memory
- **Flash:** Onboard 4 GB e.MMC flash
- **COM Port:** 1 x RS232 Port (2 wires)
- **LED:** 2 LED for WSN network power status
- **SD slot:** 1 x SD Slot
- **Power input:** 12 V DC
- **Power reset:** 1 x reset button for system reboot

1.3 Mechanical Specification

1.3.1 Dimensions:

- 205 x 126 x 31 mm (L x W x H) with the metal plate
- 180 x 114 x 31 mm without metal plate



1.4 Power Requirement

- **System Power:** DC 12 V
- **RTC Battery:** 3 V/210 mAh

1.5 Environment Specifications

- **Operating Temperature:** 0 ~ 40° C (32 ~ 104° F)
- **Relative Humidity:** 95% @ 40° C (non-condensing)
- **Storage Temperature:** -20 ~ 60° C (-4 ~ 104° F)
- **Vibration Loading During Operation:** 1 Gms, IEC 60068-2-64, random, 5 ~ 500 Hz, 1 Oct/min, 1 hr/axis.
- **EMC:** CE, FCC Class B

Chapter 2

Hardware
Functionality

2.1 Introduction

The following sections show the external connectors and pin assignments for applications.

2.2 WISE-3310 I/O Indication

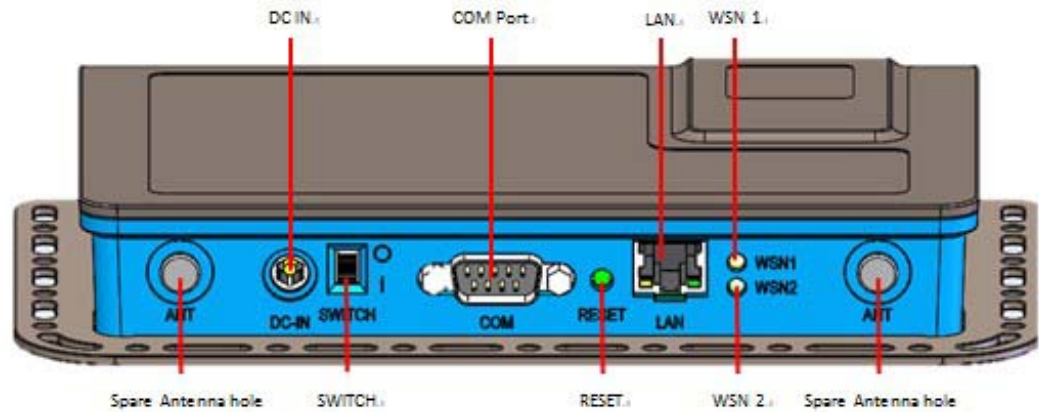


Figure 2.1 WISE-3310 front view



Figure 2.2 WISE-3310 Back view

2.3 WISE-3310 Antenna Connectors

2.3.1 Spare Antenna Hole

The WISE-3310 provides 2 spare antenna holes for standard SMA connectors.



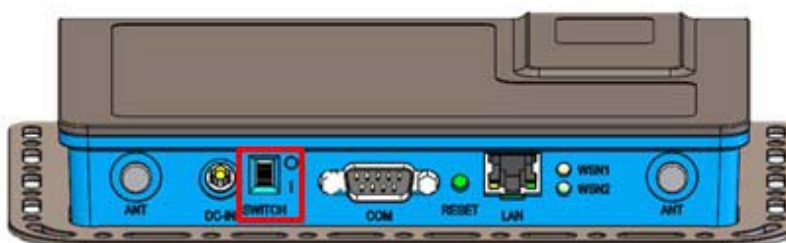
2.3.2 Power Input Connector

The WISE-3310 comes with a DC-jack header for 12V DC external power input.



2.3.3 Power Switch

The WISE-3310 has a power switch on the front side.



2.3.4 COM Connector

The WISE-3310 provides one D-sub 9-pin connector serial communication interface port. The port can support RS-232 mode communication.

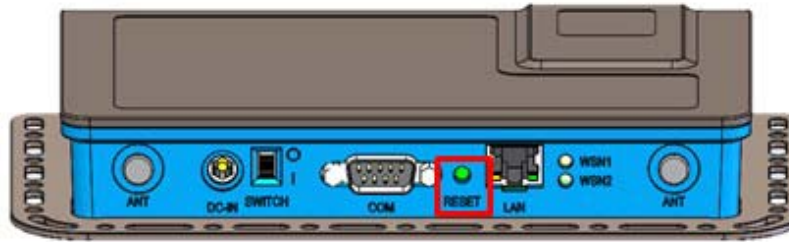


Table 2.1: COM Connector Pin Assignment

Pin	Description	Pin	Description
1	N/C	2	UART1_RXD
3	UART1_TXD	4	N/C
5	GND	6	N/C
7	N/C	8	N/C
9	N/C		

2.3.5 Reset Button

The WISE-3310 has a reset button on the front side. Press this button to activate the hardware reset function.



2.3.6 Ethernet Connector (LAN)

The WISE-3310 provides one RJ45 LAN interface connector, it is fully compliant with IEEE 802.3u 10/100/1000 Base-T CSMA/CD standards. The Ethernet port provides standard RJ-45 connector with LED indicators on the front side to show Active/Link status.

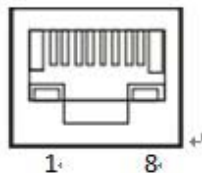
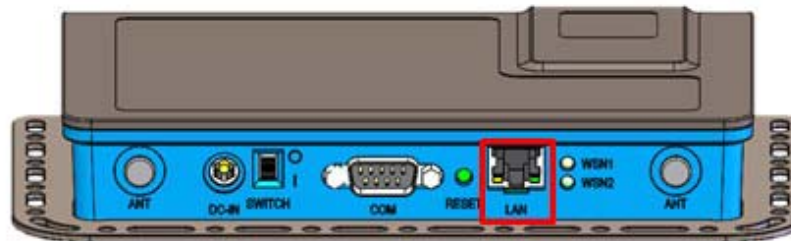


Table 2.2: LAN Connector Pin Assignment

Pin	Description	Pin	Description
1	TX+(10/100),BI_DA+(GHz)	5	BI_DC-(GHz)
2	TX-(10/100),BI_DA-(GHz)	6	RX-(10/100),BI_DB-(GHz)
3	RX+(10/100),BI_DB+(GHz)	7	BI_DD+(GHz)
4	BI_DC+(GHz)	8	BI_DD-(GHz)

2.3.7 SD Connector

The WISE-3310 provides an SD slot. Users can insert an SD card easily.

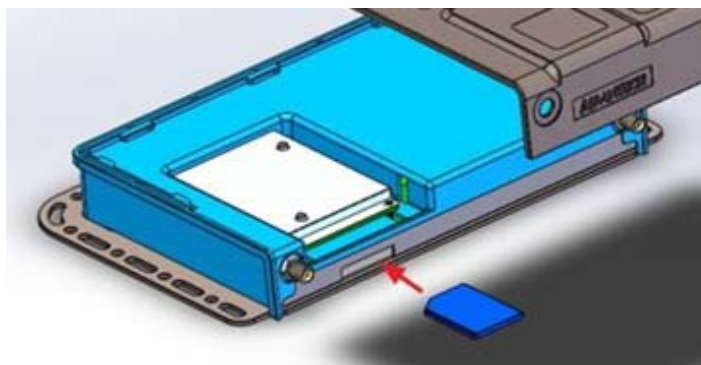


Table 2.3: SD Connector Pin Assignment

Pin	Description	Pin	Description
1	SD2_DATA3	2	SD2_CMD
3	GND	4	+V3.3
5	SD2_CLK	6	GND
7	SD2_DATA0	8	SD2_DATA1
9	SD2_DATA2	10	SD2_CD#
11	GND	12	SD2_WP

2.4 WISE-3310 Hardware Installation

2.4.1 SD Card Installation

1. Switch off the Power switch.
2. Insert SD Card directly into the WISE-3310 SD slot, as Figure 2.3.

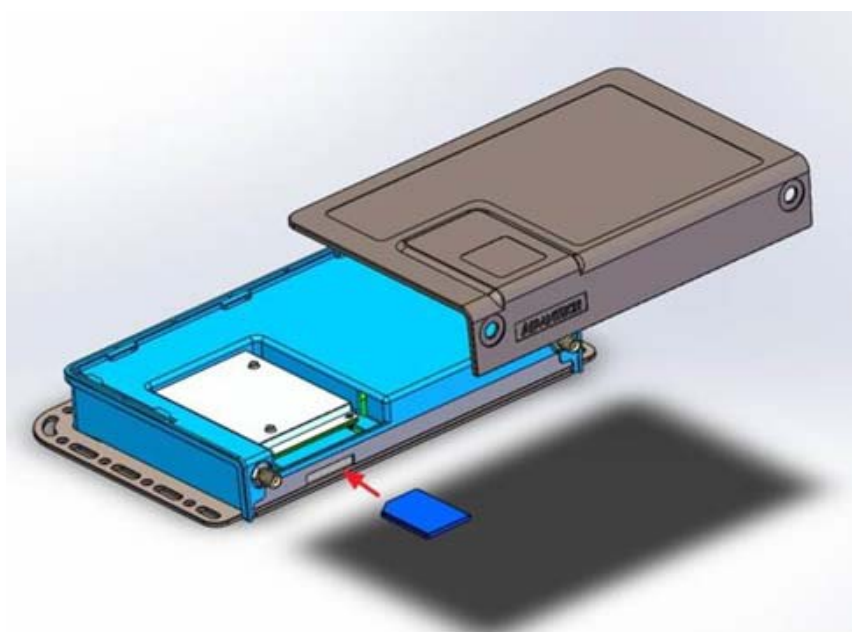


Figure 2.3 WISE-3310 SD Card Installation

2.4.2 Mounting Assembly Method

You can fix WISE-3310 to a wall by using wall mounting kit, as Figure 2.4.

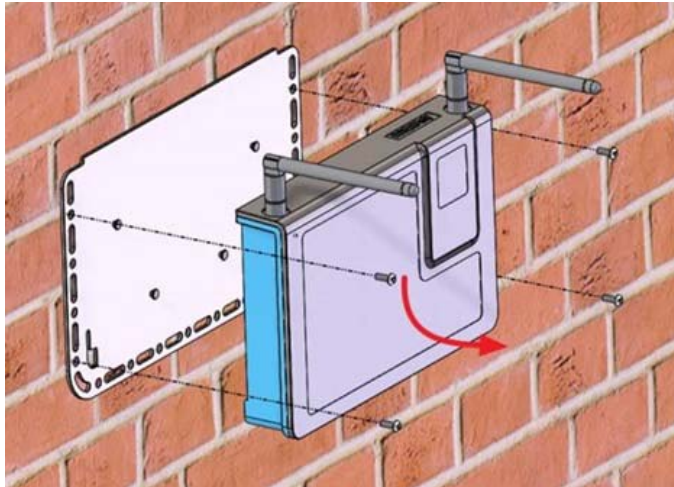


Figure 2.4 Flexible wall mounting

2.5 Test Tools

All test tools must be verified on WISE-3310, please prepare required test fixtures before verifying each specified I/O. If you have any problems getting test fixtures, please contact Advantech for help.

2.5.1 SD Test

1. When booting from eMMC, you should see only the directories below:

```
#ls /dev/mmcblk*  
/dev/mmcblk0 /dev/mmcblk0boot0 /dev/mmcblk0boot1 /dev/ mmcblk0p1
```

2. Insert SD card to SD card slot (SD1) and check your device again. You should be able to see more directories. /dev/mmcblk1 is the SD card storage.


```
#ls /dev/mmcblk*  
/dev/mmcblk0 /dev/mmcblk0boot1 /dev/mmcblk1 /dev/mmcblk1p2  
/dev/mmcblk0boot0 /dev/mmcblk0p1 /dev/mmcblk1p1
```

3. Create a file and copy to SD.

```
#echo 123456789ABCDEF > test.txt  
#dd if=./test.txt of=/dev/mmcblk1 bs=1024 count=1  
seek=25118  
0+1 records in  
0+1 records out  
16 bytes (16 B) copied, 0.000109331 s, 146 kB/s
```


4. Check if the file was created successfully.

```
#hexdump -C /dev/mmcblk1 -s 25720832 -s 32
01887800 31 32 33 34 35 36 37 38 39 41 42 43 44 45 46 0a
|123456789ABCDEF.|
01887810 1d 4f e2 19 d3 05 8b df ab 4a 40 5a c5 23 3c f2
|.....|
```

Note!  Please make sure that parameter “seek” is equal to 25118 as indicated in the above codes. If you create the file to a wrong sector, that may damage the system.

2.5.2 Mini PCIe (Wi-Fi) Test

The command used to test Wi-Fi module is as follows, the supported module P/N is EWM-W142H01E.

```
#ifconfig wlan0 up
#iwlist wlan0 scanning
#wpa_passphrase "Wifi name" password > /tmp/wpa.conf
#wpa_supplicant -Bdwext -iwlan0 -c/tmp/wpa.conf
#dhclient wlan0
```

2.5.3 LAN Test

WISE-3310 sets DHCP as default network protocol.

```
#ifconfig
eth0 Link encap:Ethernet HWaddr 00:04:9F:01:30:E0
inet addr:172.17.21.96 Bcast:172.17.21.255
Mask:255.255.254.0
UP BROADCAST RUNNING MULTICAST MTU:1500
Metric:1
RX packets:129 errors:0 dropped:18 overruns:0
frame:0
TX packets:2 errors:0 dropped:0 overruns:0
carrier:0
collisions:0 txqueuelen:1000
RX bytes:15016 (14.6 KiB) TX bytes:656 (656.0 B)
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:0 errors:0 dropped:0 overruns:0
frame:0
TX packets:0 errors:0 dropped:0 overruns:0
carrier:0
collisions:0 txqueuelen:0
RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)
```

If you would like to config IP manually, please use the command below:

```
#ifconfig eth0 xxx.xxx.xxx.xxx up
```

Here is a real case for your reference. The host's (WISE-3310) IP is 172.17.21.97; the target (a desktop computer) IP is 172.17.20.192.

```
#ifconfig eth0 172.17.21.97 up
#ifconfig eth0
eth0 Link encap:Ethernet HWaddr 00:04:9F:01:30:E0
inet addr:172.17.21.97 Bcast:172.17.255.255
Mask:255.255.0.0
UP BROADCAST RUNNING MULTICAST MTU:1500
Metric:1
RX packets:2851 errors:0 dropped:271 overruns:0
frame:0
TX packets:30 errors:0 dropped:0 overruns:0
carrier:0
collisions:0 txqueuelen:1000
RX bytes:291407 (284.5 KiB) TX bytes:2000 (1.9
KiB)
```

The target computer (Client) IP address is 172.17.20.192, so we can use the below command to see if we can get any response from the client.

```
#ping 172.17.20.192
PING 172.17.20.192 (172.17.20.192): 56 data bytes
64 bytes from 172.17.20.192: seq=0 ttl=128 time=7.417 ms
64 bytes from 172.17.20.192: seq=1 ttl=128 time=0.203 ms
64 bytes from 172.17.20.192: seq=2 ttl=128 time=0.300 ms
--- 172.17.20.192 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 0.203/2.640/7.417 ms
```

2.5.4 RS232 Test

RS232 port is debug console for WISE-3310.

Chapter 3

Building a WSN
Network

This chapter will show you how to configure WISE-3310 by using the web-based configuration interface.

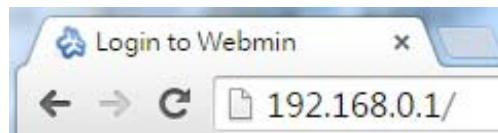
3.1 Default Setting

Please use your Ethernet port to connect to WISE-3310.

IP Address	192.168.0.1
User Name/ Password	admin/admin
Network ID WSN1/ WSN2	2001/2002
Join Key	JOINADVANTECHIOT

3.2 Login

1. Open a web browser (Chrome is suggested) and enter the IP Address.
http://192.168.0.1



Note! *If you have changed the default LAN IP Address of this device, ensure you enter the correct IP Address.*



2. The default username and password are both **admin**. Once you have entered the correct username and password, click the **Login** button to open the web-base configuration page.

Logout successful. Use the form below to login again.

Login to Webmin

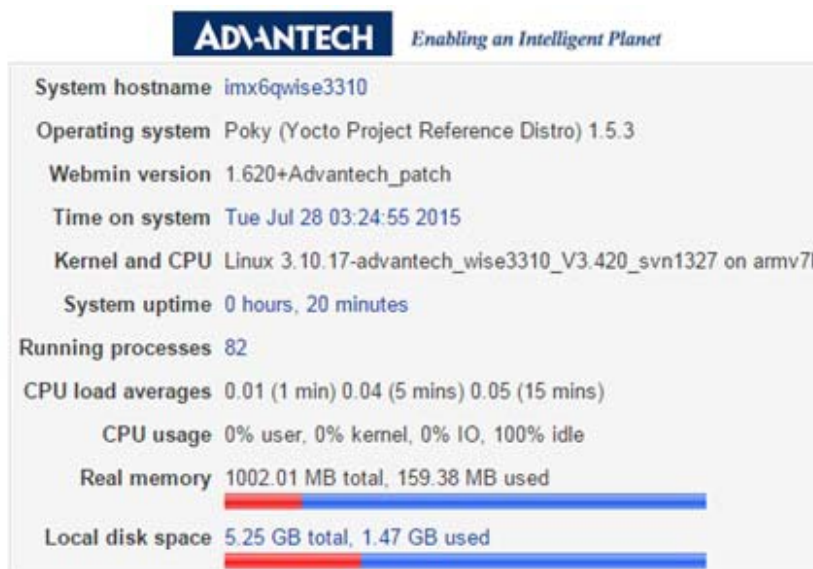
You must enter a username and password to login to the Webmin server on 192.168.0.1

Username

Password

Remember login permanently?

- If successful, you will be logged in and see the following page.



3.3 Web Setting Functions

The main functions of WISE-3310 web setting will be introduced in this section.

3.3.1 Webmin

Under **Webmin**, you can change Username and Password on **Webmin Users** page.

Webmin user access rights

Username

Password

[Return to user list](#)

3.3.2 System

The **System** section contains the following items: **Back to Factory Default**, **Bootup and Shutdown**, **Firmware Update** and **Running Process**.

3.3.2.1 Back to Factory Default

Click on Back to Advantech factory default, to revert the values of all web settings will be back to original setting.

Click on this button to back to factory default. (username/password, network, timezone, WISE/WSN)

3.3.2.2 Bootup and Shutdown

In this page, all actions running in the system appearing in the table.

Boot system : SysV init

Action	At boot?	Description
<input type="checkbox"/> apmd	Yes	Advanced Power Management daemon
<input type="checkbox"/> avahi-daemon	Yes	Zeroconf daemon for configuring your network
<input type="checkbox"/> connman	Yes	
<input type="checkbox"/> crond	Yes	cron is a standard UNIX program that runs user-specified
<input type="checkbox"/> dbus-1	Yes	D-Bus is a simple interprocess messaging system, used
<input type="checkbox"/> dustlink	No	
<input type="checkbox"/> neard	Yes	neard is a daemon used to enable NFC features
<input type="checkbox"/> nfsserver	Yes	NFS is a popular protocol for file sharing across
<input type="checkbox"/> ntpd	Yes	
<input type="checkbox"/> ofono	Yes	
<input type="checkbox"/> oprofileui-server	Yes	
<input type="checkbox"/> rc.local	Yes	Run /etc/rc.local if it exist
<input type="checkbox"/> rpcbind	No	rpcbind is a server that converts RPC (Remote
<input type="checkbox"/> serialmux	No	
<input type="checkbox"/> sshd	Yes	
<input type="checkbox"/> tcf-agent	Yes	Target Communication Framework agent
<input type="checkbox"/> xinetd	Yes	

Click on this button to immediately reboot the system. All currently logged in users will be

Table 3.1: Bootup and Shutdown

Start	Start immediately
Stop	Stop immediately
Restart	Restart immediately
Start On Boot	Start when device on boot
Disable On Boot	Disable when device on boot
Start Now and On Boot	Start immediately and start when device on boot
Disable Now and On Boot	Disable immediately and disable when device on boot
Reboot System	Click on this button to immediately reboot the system. All currently logged in users will be disconnected and all services will be re-started.

3.3.2.3 Firmware Update

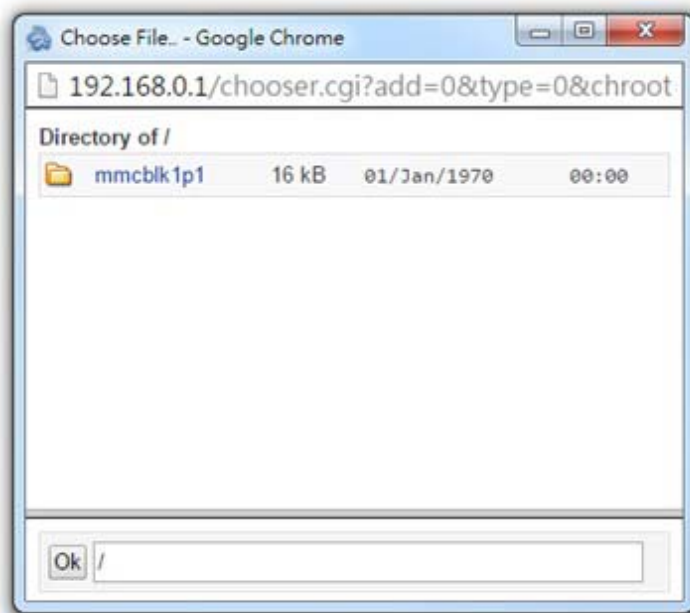
Please download the most updated Firmware version from Advantech Website and upload the image into SD card. After plugging the SD card into SD card slot, Firmware update process can be started.

Click **browse** icon to view image file in the SD card.

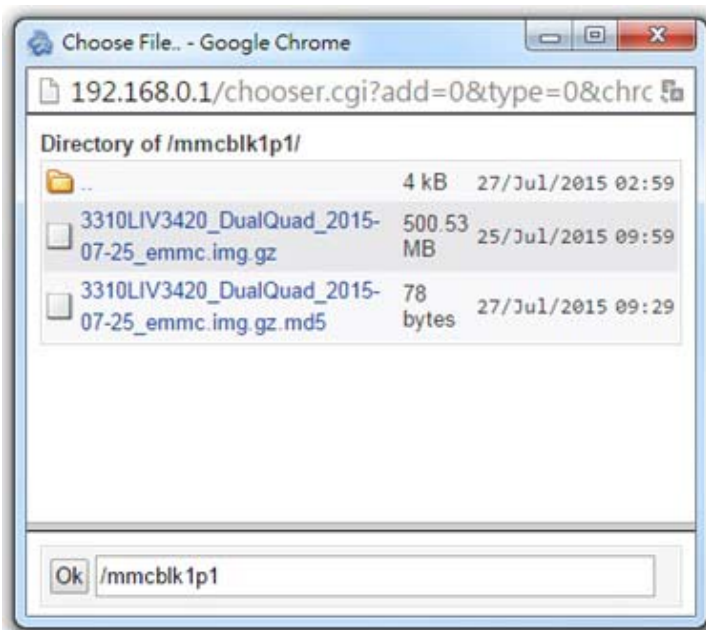
Firmware Update

Please select firmware image to Update

Double click “mmcb1p1” folder.



Select the file with “emmc.img.gz”.



Click **update** icon to start firmware update. The firmware update process may take around 5~10 minutes; please don't turn off the power or press the reset button. After the process completes, please type the default IP address to return to login page.



Please note, after firmware upgrade, the system will restore its default setting, the IP address will return to 192.168.0.1.

Note! *The device is unavailable during the upgrade process. Any connections to or through the device will be lost.*



3.3.2.4 Running Process

This page shows all running processes on your system, with child processes indented and displayed below their parent. For each process the PID, owner and command are displayed. Please click **Help** to get more information.

Display : PID | User | Memory | CPU | Search | Run..

ID	Owner	Started	Command
1	root	03:04	init [5]
163	root	03:04	/lib/udev/udev -d
824	root	03:06	/lib/udev/udev -d
827	root	03:06	/lib/udev/udev -d
589	root	03:05	/usr/sbin/rpcbind
606	messagebus	03:05	/usr/bin/dbus-daemon --system
609	root	03:05	/usr/sbin/connmand
626	root	03:05	/usr/sbin/sshd
632	root	03:05	/usr/sbin/wpa_supplicant -u
633	root	03:05	/usr/sbin/apmd -P /etc/apm/apmd_proxy --proxy-timeout 30
647	root	03:05	/usr/sbin/ntpd -p /var/run/ntp.pid -g
650	root	03:05	/usr/sbin/ntpd -p /var/run/ntp.pid -g
652	root	03:05	/sbin/syslogd -n -O /var/log/messages
655	root	03:05	/sbin/klogd -n
663	root	03:05	/usr/sbin/xinetd -pidfile /var/run/xinetd.pid -stayalive
670	avahi	03:05	avahi-daemon: running [imx6qwise3310.local]
671	avahi	03:05	avahi-daemon: chroot helper

3.3.3 Networking

The **Networking** section contains the following options: **Network Configuration** and **WISE WSN Setting**.

3.3.3.1 Network Configuration

On this page, you can set **Network Interface**, **Routing Gateways**, **Hostname** and **DNS Client** based on your networking environment.



3.3.3.2 WISE WSN Setting

There are 2 WSN networks available to be set up in WISE-3310. Each network has its default Network ID and JoinKey, both of the settings can be changed on this page.

Network1	
Network ID	2001
JoinKey	JOINADVANTECHIOT
Network2	
Network ID	2002
JoinKey	JOINADVANTECHIOT
Save WSN config	
Save&Exchange WSN config	
Network Statistics	
Network 1 Statistics	
Network 2 Statistics	

Table 3.2: WISE WSN Setting

Network ID	The network identifier is the identifier of your network. It is set to 2001/2002 by default.
JoinKey	The Joinkey is the password to join the network. It is set to JOIN-ADVANTECHIOT by default.
Save WSN config/ Save&Exchange WSN config	Click Save WSN config to apply the new settings to gateway/ Click Save&Exchange WSN config to apply new settings to both gateway and nodes.
Network Statistic	Click Network Statistic to see nodes status and WSN network health report.

3.3.3.3 Network Statistic

In **Network Statistic** page, nodes status and network health can be monitored in the table.

NetReliability	100 %				
NetPathStability	85 %				
NetLatency	1000 (msec)				
MAC address	MoteID	State	Routing	Reliability (%)	Latency (msec)
00-17-0d-00-00-58-2c-2b	1	OPER	YES	100	10
00-17-0d-00-00-60-63-8b	2	OPER	YES	100	140
00-17-0d-00-00-58-29-78	3	OPER	YES	100	1420
00-17-0d-00-00-30-60-05	4	OPER	YES	100	210
00-17-0d-00-00-60-64-c8	5	OPER	YES	100	230
00-17-0d-00-00-60-62-4c	6	OPER	YES	100	200
00-17-0d-00-00-60-63-e5	7	OPER	YES	100	310
00-17-0d-00-00-60-63-e4	8	OPER	YES	100	750
00-17-0d-00-00-60-64-1b	9	OPER	YES	100	850
00-17-0d-00-00-60-64-8f	10	OPER	YES	100	270
00-17-0d-00-00-60-64-9b	11	OPER	YES	100	1830
00-17-0d-00-00-58-32-15	12	OPER	YES	100	1820
00-17-0d-00-00-58-2d-5f	13	OPER	YES	100	1680
00-17-0d-00-00-30-08-92	14	OPER	YES	100	1290
00-17-0d-00-00-60-2e-47	15	OPER	YES	100	820
00-17-0d-00-00-60-61-f3	16	OPER	YES	100	1280
00-17-0d-00-00-30-53-b2	17	OPER	YES	100	1450
00-17-0d-00-00-30-08-96	18	OPER	YES	100	770
00-17-0d-00-00-60-63-d7	19	OPER	YES	100	330
00-17-0d-00-00-60-64-0f	20	OPER	YES	100	850
00-17-0d-00-00-60-62-c3	21	OPER	YES	100	750
00-17-0d-00-00-30-50-dc	22	OPER	YES	100	3460
00-17-0d-00-00-30-4c-20	23	OPER	YES	100	1180
00-17-0d-00-00-30-55-19	24	OPER	YES	100	1210
00-17-0d-00-00-60-63-fa	25	OPER	YES	100	1590
00-17-0d-00-00-60-64-1d	26	OPER	YES	100	1060
00-17-0d-00-00-60-62-da	27	OPER	YES	100	200

Table 3.3: WSN Network Statistic

Net Reliability	Network reliability as a percentage
Net Path Stability	Path stability as a percentage
Net Latency	Average latency, in milliseconds

Table 3.4: WSN Network Statistic

MAC address	MAC address (EUI-64) of the note.
Mote ID	Short address assigned to this note by the manager, MoteID 1 is always the AP
State	“Lost” = Note is not currently part of the network. “Negotiating” = Note is in the process of joining the network. “Operational” = Note is operational.
Routing	Enable routing function = Yes Disable routing function = No
Reliability	Network reliability as a percentage
Latency (msec)	Average latency, in milliseconds

3.3.4 Hardware

3.3.4.1 System Time

1. Set Time

This form is for changing the system's current time, which is used by all running processes. On operating systems that have a separate hardware clock, it can be used to set that too.

Set time | Change timezone | Time server sync
This form is for changing the system's current time, which is used by all running processes. On operating systems that have a separate hardware clock, it can be used to set that too.

System Time
Date: 28 | Month: July | Year: 2015
Hour: 06 | Minute: 45 | Second: 50
Apply | Set system time according to hardware time

Hardware Time
Date: 28 | Month: July | Year: 2015
Hour: 06 | Minute: 45 | Second: 50
Set hardware time according to system time

2. Change time zone

This form allows you to set the system's default time zone, which is used to convert the system time to a human-readable format and offset.

Set time | Change timezone | Time server sync
This form allows you to set the system's default time zone, which is used to convert the system time to a human-readable format and offset.

Time Zone
Change timezone to: Universal
Save

3. Time server sync

This form is for configuring the system to automatically synchronize the time with a remote server. Synchronization will be done using the UNIX time protocol or NTP, depending on which commands are installed and what the remote system supports.



The screenshot shows a web-based configuration interface. At the top, there are three tabs: 'Set time', 'Change timezone', and 'Time server sync', with the latter being the active tab. Below the tabs is a descriptive paragraph: 'This form is for configuring the system to automatically synchronize the time with a remote server. Synchronization will be done using the commands are installed and what the remote system supports.' The main configuration area is titled 'Time Server' and contains a text input field labeled 'Timeserver hostnames or addresses'. Below this field is a checked checkbox labeled 'Set hardware time too'. At the bottom of the form is a button labeled 'Sync and Apply'.

Chapter 4

Basic COM Port Settings

4.1 Introduction

This guide describes some basic commands that you can send to a SmartMesh IP Manager by logging on to its Command Line Interface (CLI). The CLI is available by connecting a serial terminal program to the Manager. The CLI is intended for human interaction with a manger, e.g., during development, or for interactive troubleshooting. Most commands are atomic – a command and its arguments are typed into the CLI, and a response is returned. For example, the help command returns a list of possible commands. Traces are not atomic - once started, they generate output asynchronously until canceled.

Note! Chapter 4 was abstracted from “SmartMesh_IP_Manager_CLI_Guide”. If you need more CLI information, Please refer to SmartMesh_IP_Manager_CLI_Guide” which can be downloaded from Linear Technology website.



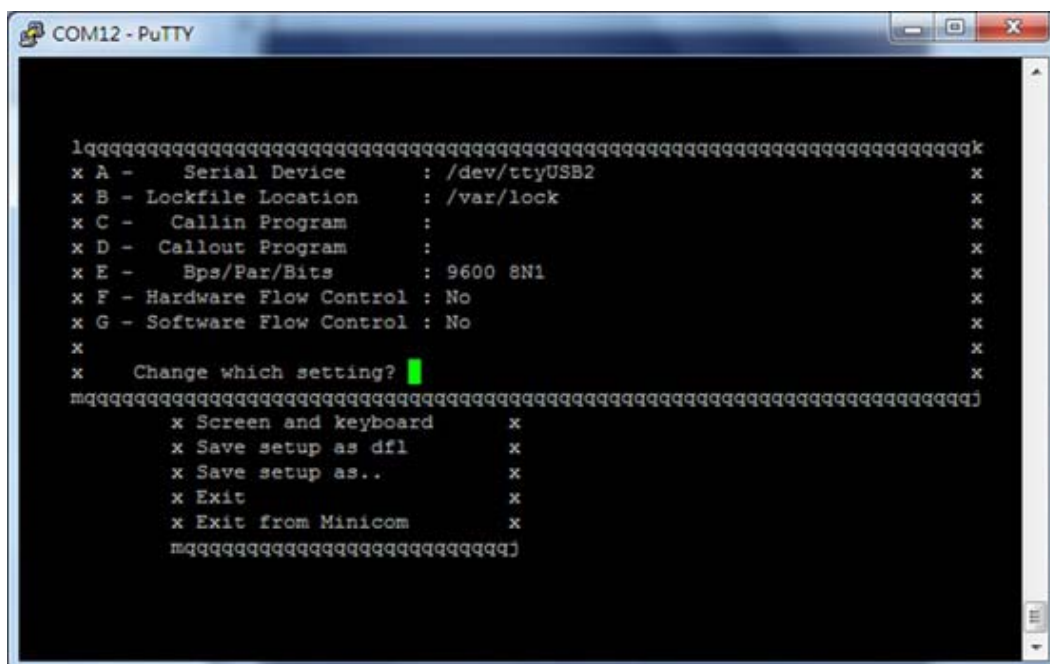
4.1.1 CLI Access

There are two dedicated serial ports on the SmartMesh IP manager: one is for API communication with an external application, and the other is dedicated to this command line interface. You can log on to the CLI from any serial terminal program (such as HyperTerminal or Tera Term):

Serial 0 — If connecting to an evaluation board integrated with an FTDI serial-to-usb interface, the CLI will be found on the 3rd COM port mapped onto your system.

The following are the steps to log on to CLI using minicom:

1. Establish a console connection to WISE-3310.
2. freescale login: **root**
3. root@freescale -**\$ minicom -s**
4. In configuration menu, select “**serial port setup**” and press **Enter**
5. A→**dev/ttyUSB2**; E→**9600 8N1**; F→No
(**dev/ttyUSB2_WSN1**, **dev/ttyUSB3_WSN2**)
6. Select **Exit** to leave.



There are two sets of privileges on this system, namely user and viewer. The user privilege allows for system settings to be set and the viewer privilege only allows the viewing of manager and network information.

For example, to login to the manager CLI from the terminal program, enter either of the following usernames and passwords:

```
login viewer
login user
```

To logout of the Manager CLI:

```
logout
```

4.1.2 Managing user and viewer Passwords

The default passwords should be changed with the following commands (after logging in with "user" privileges):

```
set config pwdviewer <newpassword>
set config pwduser <newpassword>
```

4.1.3 Mote Commands

Commands beginning with an 'm' such as mtrace or minfo are specific to the Access Point "mote" and are described in the WISE-3310_User_Manual documentation.

4.2 Commands

This manual describes the CLI commands available in the SmartMesh IP manager. The CLI is case-insensitive. In most cases

a command will be recognized by the shortest unambiguous string, so the following are all equivalent:

```
> trace rawio_enc on
> trace rawio on
> trace raw on
```

4.2.1 Login

Description

The CLI interface requires a login, and the password entered determines the privilege used for the session. The default passwords match the two privilege levels: viewer and user. The viewer cannot make any configuration changes to the manager. The user has access to all commands. The login command can be used repeatedly without logging out to switch between privilege levels. Passwords for the two privilege levels can be changed using the set config command.

Syntax

```
login [<user>:] <password>
```

Parameters

Parameter	Description
user	viewer or user
password	password for the privilege level. default passwords as shipped are "user" for user and "viewer" for viewer Note: passwords can be changed with the set config command

Example

```
login user: me$h  
login me$h
```

4.2.2 Logout

Description

Logout from the current CLI session.

Syntax

```
Logout
```

Example

```
Logout
```

4.2.3 Reset

Description

Reset a specified entity in the network: either a mote or the manager. This command requires user privilege.

Syntax

```
reset <entity>
```

Parameters

Parameter	Description
entity	<ul style="list-style-type: none">■ When called with "system", resets the manager and by extension the entire network.■ When called with "mote", mote can be referenced by Mote ID or MAC address.

Example

```
reset mote 2  
reset system
```

4.2.4 Show Config & Show Curconfig

```
> show config  
netid = 302  
txpower = 8  
frprofile = 1  
maxmotes = 33  
basebw = 9000  
dnfr_mult = 1  
numparents = 2  
cca = 0  
channellist = 00:00:7f:ff  
autostart = 1  
locmode = 0  
bbmode = 0  
bbsize = 1  
license = 00:00:00:00:00:00:00:00:00:00:00:00  
ip6prefix = fe:80:00:00:00:00:00:00:00:00:00:00:00:00:00  
ip6mask = ff:ff:ff:ff:ff:ff:00:00:00:00:00:00:00:00:00  
radiotest = 0  
bwmult = 300  
onechannel = 255
```

Both of these commands return the same data structure. The show config command will display the persistent parameters, i.e., the ones used after the next boot. The show curconfig command displays the current parameters being used.

4.2.5 Show Mote

```
> show mote 2
Mote #2, mac: 00-17-0D-00-00-38-16-6B
State: Oper, Hops: 1.1, Uptime: 0-00:30:39, Age: 1
Regular. Route/TplgRoute.
Power Cost: Max 65534, FullTx 110, FullRx 65
Capacity links: 200, neighbours 31
Number of neighbors (parents, descendants): 8 (2, 15)
Bandwidth total / mote exist (requested): 90 / 954 (987)
Links total / mote exist (requested): 64.0 / 6.0 (5.8)
Link Utilization : 1.0
Number of total TX links (exist / extra): 64 / 0
Number of links : 130
Compressed : 5
Upstream tx/rx : 122 (64/58) (Rx10=58.0)
Downstream rx : 3
Neighbors:
-> # 1 Q: 71% RSSI: -59/0
-> # 7 Q: 55% RSSI: -55/-49
<- # 9 Q: 97% RSSI: -39/-40
<- #15 Q: 94% RSSI: -37/-39
<- #17 Q: 87% RSSI: -40/-43
<- #18 Q: 91% RSSI: -44/-44
<- #20 Q: 29% RSSI: -76/-74
<- #24 Q: 29% RSSI: -76/-75
```

Description of fields:

- Mote: Short address of mote
- mac: EUI-64 of mote
- State: Manager-assigned current state for the mote, one of **Idle**, **Negot1-2**, **Conn1-5**, **Oper**, or **Lost**
- Hops: The average number of hops taken by this mote's upstream packets, as measured by the TTL when received at the AP
- Uptime: Time since the mote's most recent state change
- Age: Time, in seconds, since the manager received the most recent upstream packet from this mote
- Power type: Power (maxStCurrent in powerSrcInfo param = 0xffff), Regular, or Low Power (maxStCurrent less than needed for routing)
- Route type reported by the mote: Route, No-route (from routingMode param)
- Route type as assigned by the manager: TplgRoute, TplgNo-Route
- Power Cost: powerSrcInfo parameters reported by mote during joining
- Number of neighbors: first entry is # parents + # children = # nbrs, first entry in parentheses is # parents, second entry in parentheses is descendants. From this # children = # nbrs - # parents
- mac: EUI-64 of mote
- Bandwidth (ms/packet): the bandwidth section is devoted to upstream traffic and upstream links only; the total shows the combination of mote-local and descendant traffic; the mote exist value shows the bandwidth that the mote itself is responsible for; the requested value in parentheses shows the bandwidth that the mote asked for through service requests. Lower values here represent more bandwidth. In general, the mote exist value will be slightly less than the requested value since there is some roundoff as the manager cannot add fractional links.

- Links (links/superframe): the total shows the combination of links added to support mote-local and descendant traffic; the mote exist value shows the number of links added specifically for this mote's service requests; the requested value in parentheses shows a floating point number of links that could support the traffic, so the mote exist value is the requested value rounded up to the nearest integer.
- Link Utilization: a number between 0 and 1 representing how close to the provisioning limit the manager thinks the mote is. For example, if the manager expects the mote to send 1 pkt/s, the provisioning is 3x, and the mote has 10 link/s upstream, the utilization would be $1 \times 3 / 10 = 0.3$. This value is used to scale traffic requirements to the mote's parent to keep link numbers down in low-traffic networks.
- Number of total TX links: the exist value shows how many upstream links are currently assigned, and the extra value shows how many will be deleted during the next optimization cycle Number of links: Total links across all slotframes, not just the upstream links; also this is the sum of the next three rows
- Compressed: Number of compressed links, which are used for advertising, join listen, and discovery; these are assigned during the mote's join and never changed, so the manager saves memory by storing them in a compressed format
- Upstream: Total, (# Tx / # Rx as an integer), (# Rx needed, not rounded up)
- Downstream: # Rx links from parents; note that 1-hop motes may have two downstream Rx links from the AP, one broadcast and one multicast
- Neighbors: relationship (-> to parent, <- to child, – discovered), neighbor's mote ID, path quality (30% or 74% until path stability is measured), RSSI as measured by this mote, RSSI as measured by the neighbor mote

Note that "routing type" can be set either on the mote or on the manager. If either the mote or the manager declares a mote to be non-routing, then the mote will not be assigned children or advertisement links.

4.2.6 Show Stat

```

> show stat
Manager Statistics -----
established connections: 1
dropped connections: 0
transmit OK: 0
transmit error: 0
transmit repeat: 0
receive OK: 0
receive error: 0
acknowledge delay avrg: 0 msec
acknowledge delay max: 0 msec
Network Statistics -----
reliability: 100% (Arrived/Lost: 7217/0)
stability: 99% (Transmit/Fails: 14304/204)
latency: 200 msec
Motes Statistics -----
Mote Received Lost Reliability Latency Hops
#2 257 0 100% 580 1.3
#3 249 0 100% 450 1.0
#4 6463 0 100% 250 2.4
#5 248 0 100% 150 1.2

```

This command displays the mote and network statistics. The counters here are incremented or averaged over the lifetime of the network, or since they have actively been cleared using an exec clearStat CLI command or a clearStatistics API command.

In this example, mote 4 is generating data much more often than the other motes. It is also at 2.4 hops, so all its packets are being forwarded through other motes. Mote 3 is at 1.0 hops, so all its packets are going straight to the AP (it is the "single parent" mote). Motes 2 and 5 are forwarding a fraction of their traffic through mote 3.

Analyzing the numbers:

Reliability: Arrived = 7217 = 257 + 249 + 6463 + 248, Lost = 0. The arrived/lost counters and reliability are kept real-time on the manager so will always be up-to-the-second accurate.

Stability: Transmit = 14304 \approx 7217 (the packets that arrived) + 204 (the packets that failed and needed to be retransmitted) + 6463 (the packets from mote 4 that needed to be forwarded by 2, 3, & 5) + 50 (20% of mote 5's packets forwarded by mote 3) + 77 (30% of mote 2's packets forwarded by mote 3) + 293 (packets from mote 4 that went to motes 2 and 5 and needed to be forwarded through mote 3). The stability counters and average stability are calculated based on mote health reports so they lag the reliability statistics by up to 15 minutes.

4.2.7 Set Netid & Set Commonjoinkey

Description

Set a new Network ID and common join key in the Manager. The change will take effect upon the next system start (after reset or power cycle). This change is persistent. Note that features that require a license will take two resets - once for the license to take effect (and enable the settings change), and once for the setting to take effect.

Syntax

```
set config <param>=<value>
```

Parameters

Parameter	Description
param	■ netid: network id ■ commonjoinkey: common join key
value	Value (refer to the configuration parameter table)

Example

```
set config netid=100
```

4.2.8 exec exchNetId

Description

Exchange the Network ID. This command will change the Network ID of the manager and all motes connected to the network. The new Network ID takes effect the next time the network is restarted. Network IDs 0 and 65535 are reserved and should not be used. This change is persistent.

Syntax

```
exec exchNetId <netId>
```

Parameters

Parameter	Description
netId	Integer between 1 and 65534

Example

```
exec exchNetId 100
```

4.2.9 exec exchJoinKey

Description

Replace the join key for a specified mote. The message is sent to the mote and is also changed in the ACL. This change is persistent.

Syntax

```
exec exchJoinKey <address> <joinKey>
```

Parameters

Parameter	Description
address	Mote ID or MAC address of mote to be changed
joinkey	16-byte join key

Example

```
exec exchJoinKey 00-17-0D-00-00-38-00-21 000102030405060708090A0B0C0D0E0F
```

Note! *The joinkey showing on CLI is Hex code while in WebUI, it is presented as ASCII code.*



4.2.10 sm

Description

Show motes in the network

Syntax

```
sm [-v]
```

Parameters

Parameter	Description
-v	verbose

Example

```
> sm
MAC MotelD State Nbrs Links Joins Age StateTime
00-17-0D-00-00-38-07-13 1 Oper 2 25 1 0 0-00:45:39
00-17-0D-00-00-38-06-28 2 Oper 2 15 1 1 0-00:45:21
00-17-0D-00-00-38-04-2F 3 Oper 2 15 2 1 0-00:28:49
Number of motes (max 33): Total 3, Live 3, Joining 0
```

This command lists all the motes currently or previously in the network.

- MAC: EUI-64 of the mote
- MotelID: short address assigned to this mote by the manager. MotelID 1 is always the AP.
- State: Current state of each mote (Negot, Conn, Oper, Lost)
- Nbrs: Number of neighbors with which this mote has active links.
- Links: Total number of links, compressed and normal.
- Joins: Shows how many times the mote has advanced to the Operational state.
- Age: Seconds since the most recent packet was received by the manager from this mote.
- StateTime: Time (d-hh:mm:ss) since the mote was advanced to its current state. When a mote is Operational, StateTime shows how long the mote has been in the network.

ADVANTECH

Enabling an Intelligent Planet

www.advantech.com

Please verify specifications before quoting. This guide is intended for reference purposes only.

All product specifications are subject to change without notice.

No part of this publication may be reproduced in any form or by any means, electronic, photocopying, recording or otherwise, without prior written permission of the publisher.

All brand and product names are trademarks or registered trademarks of their respective companies.

© Advantech Co., Ltd. 2015