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## WLAN Laboratory

### Lab 4. Cisco Access Point – part 2, CLI configuration

#### Objective:

The students will learn basic set of CLI commands of Cisco Access Point, practice configuration with Client Line Interface (CLI), reset and set up network interfaces/IP address and practice basic set up AP devices with CLI only.

#### Student Prerequisites:

- knowledge of the basic WLAN configuration,
- familiarity with the self-learning material of the course [1-3],
- basic knowledge of the Linux OS and Windows,
- basic knowledge of IPv4 addresses

#### Hardware and Software to be used in this lab assignment:

WLAN AP device (Cisco AP1200 or 1130AG), PC with WLAN card or laptop, serial console program (eg. Putty.exe), serial (RS232) cable, RJ45 Ethernet cables, on some computers a converter USB <-> RS232 is also need.

#### Description of the Experiment:

During the exercise students conducts basic configurations with CLI commands to build a simple WLAN network with wireless Internet access using enterprise class Cisco Access Point device (AP).

#### Lab goals:

- The AP device provide wireless Internet access (form faculty wire LAN) for wireless clients (PC).
- The clients stations should receive their IP address from the faculty DHCP server, in public IP range.

#### Lab phases/tasks:

##### I) Hardware reset

We assume that the AP device is in a configured state and its current configuration is not known. The first point to perform operations is bring the machine settings to a factory initial state.

Reset procedure: Unplug the power to AP, press and hold down the 'reset' button, turn on the power, holding down 'reset' button, wait until the LEDs light up in yellow/orange (2-3 seconds), release the 'reset' button. AP will restarted and restore factory initial settings (it will take approximately 2 minutes).

## II) Connection via RS232 port

Connect PC RS232 port (9 pin socket or USB converter) to AP RS232 port (RJ45 socket) with serial cable. Run console terminal program (putty.exe) and set serial port parameters to: 9600 bps, 8 data, 0 parity, 1 stop, no flow control. Open connection and pres [enter] to get started. You should to get response chars from AP (“ap>”).

Note! Remember to set up putty with proper name of serial port, check the name in Windows device manager.

## III) Enter privileged mode.

Cisco AP have 4 working modes. Basic information about modes are in the table below.

Command Mode	Access Method	Prompt	Exit
User EXEC	This is the first level of access. Change terminal settings, perform basic tasks, and list system information.	AP>	Enter the <b>logout</b> command.
Privileged EXEC	From user EXEC mode, enter the <b>enable</b> command.	AP#	To exit to user EXEC mode, enter the <b>disable</b> command.
Global configuration	From privileged EXEC mode, enter the <b>configure</b> command.	AP(config)#	To exit to privileged EXEC mode, enter the <b>exit</b> or <b>end</b> command, or press <b>Ctrl-Z</b> .
Interface configuration	From global configuration mode, specify <b>terminal</b> then specify an interface by entering the <b>interface</b> command followed by the interface type and number.	AP(config-if)#	To exit to privileged EXEC mode, enter the <b>end</b> command, or press <b>Ctrl-Z</b> . To exit to global configuration mode, enter the <b>exit</b> command.

To configure AP you have to enter to privileged mode.

```
ap>enable
Password: Cisco
ap#
```

**Cisco** is the default password. If the password has been changed, reset the AP to factory defaults. If help is needed refer to the online documentation [1].

## IV) Erase the existing configuration

If there is an existing configuration on the AP, erase the configuration and reload.  
(User commands are written in **bold** chars).

```
ap#erase startup-config
Erasing the nvram filesystem will remove all configuration files! Continue?
[confirm]Y[OK]
Erase of nvram: complete
ap#
*Mar  1 06:43:17.714: %SYS-7-NV_BLOCK_INIT: Initialized the geometry of
nvram
ap#reload

System configuration has been modified. Save? [yes/no]: no
Proceed with reload? [confirm]y
*Mar  1 06:44:28.955: %SYS-5-RELOAD: Reload requested by console. Reload
Reason: Reload Command.Xmodem file system is available.
flashfs[0]: 146 files, 7 directories
```

```

flashfs[0]: 0 orphaned files, 0 orphaned directories
flashfs[0]: Total bytes: 15998976
flashfs[0]: Bytes used: 5513728
flashfs[0]: Bytes available: 10485248
flashfs[0]: flashfs fsck took 27 seconds.
Base ethernet MAC Address: c4:71:fe:b0:83:96
Initializing ethernet port 0...
Reset ethernet port 0...
Reset done!

```

...

NOTE!! For more information about CLI operation refer to on-line documentation [1-3].

#### IV) Review of running configuration

AP configuration parameters and state are able to review with “show” CLI command.

1. Write “show ?” in CLI, and read a possible items to show. Look deeper at:
  - a) show inventory
  - b) show interfaces
  - c) show dhcp server
  - d) show ip http server all
  - e) show clock
  - f) show dot11 ?
  - g) ...
2. The current AP configuration is stored in the "running-config". Show the running-config and explore the data.
  - a) show running-config
3. Find with “show” command all names and MAC addresses of NIC interfaces in AP.

```

NIC 1: name. ...., MAC. ....
NIC 2: name. ...., MAC. ....
NIC 3: name. ...., MAC. ....

```

#### V) Configure Hostname

The system name, while not an essential setting, helps identify the AP on your network. The system name appears in the titles of the management system pages. Let's define the device name so that it is unique within the lab. Please choose a name consisting of the prefix "AP\_" and the number of the PC placed after it, e.g. “AP\_3” .

- a. Enter into global configuration mode

```

ap>
enable
Password:
ap#
ap#
configure terminal
ap(config)#

```

- b. Now configure the host name with the following command:

(where N is the yours PC number)

```

ap(config)#hostname AP_N
AP_N(config)#

```

## VI) Configure the Bridge Virtual Interface (bvi 1)

Define the IP address of the device. On the Cisco device, the IP address should be assigned to the bridge interface (named bvi 1), **not to** FastEthernet100 interface. Once the IP address has been established, further configuration will be possible via the Internet browser.

Enter to the bvi 1 interface configuration mode to configure the ip address, subnet mask of the interface:

Use an IP address from a private address range. To avoid conflicting IP addresses in the lab, set the third byte of the IP address to your PC's number. Assign an IP address and subnets mask to the bvi 1.

```
AP_3(config)# interface bvi1
AP_3(config-if)# ip address 10.0.N.1 255.255.255.0
```

## VII) Connect to AP with telnet (putty telnet service)

The PC Ethernet NIC IP address, it should be set in 10.0.N.\* 255.255.255.0 address space.

In PC command line, check.

```
Ping 10.0.N.1
```

If ping indicates the correct connection, enter the AP IP address (10.0.N.1) as telnet destination in a putty session. Login to the AP.

## VIII) Configure AP with CLI commands.

Enter to the global configuration context (“configure terminal”) and write “?” to see all configuration options. Write “<option> ?” to see in deep information.

### Station role

1. Refer to documentation [1-3].
2. Enter interface configuration context for Dot11radio 0 interface
3. Write “?” and identify parameters.
4. Write “station-role ?” to identify all possibly role of radio interfaces. What are the modes of operation of radio cards?  
.....
5. Set working mode of AP (station-role) to Access Point (root).
6. Exit from interface configuration context.

### Define SSID network name to “C4\_N” (N is yours PC number, eg. C4\_3 or C4\_6 ...)

7. Write “dot11 ssid C4\_3“. Note! You are enter into SSID “C4\_3” configuration context!
8. Write “?” to see all parameters in this mode. Write all parameter names in ssid context:  
.....  
.....
9. Set max-association to 15.
10. Set guset-mode.
11. Set authentication to open.

### Assign SSID to “C4\_N” (e.g. “C4\_3”)

12. Enter interface configuration context for Dot11radio 0 interface.
13. Assign SSID “C4\_N”.

### **Assign radio channel to N**

14. Assign radio channel to N. “channel 3”.

### **Switch on the radio interface**

15. Switch on the radio interface “no shutdown”.

### **VIII) Connect the PC (or a Smartphone) to yours AP wireless network.**

1. Check (in Windows or with your Smartphone) that your network name is visible to the client computers.
2. Set up static IP and mask in your PC wireless NIC to the same subnet as in your AP.
3. Connect your PC to AP with WLAN and check the connection with ping command (remember to disconnect Ethernet cable connection).

### **IX) Secure the wireless line connections**

1. Enter interface configuration context for Dot11radio 0 interface
2. Look in deep in “encryption” parameters. (enter “encryption ?” and deeper: mode, ciphers).
3. Set “tkip” ciphers.
4. Exit interface configuration context.
5. Enter SSID C4\_N configuration context.
6. Look at: “authentication ?” parameters, “authentication key-management ?”, “authentication key-management wpa?”
7. Set wpa key management “authentication key-management wpa”
8. Configure Wi-Fi Protected Access pre-shared key.  
Set wpa-psk pre-shared key (min 8 char in ascii mode e.g. wpa-psk key “wlan1234”):  
command “wpa-psk ascii wlan1234”.
9. Check the secure connections by establishing a wireless connection PC ↔ AP,  
(remember to disconnect Ethernet cable connection).

### **IX) Final set up and check**

1. Connect AP to backbone LAN network by Ethernet cable.
2. Set dynamic (DHCP) IP for yours PC.
3. In PC Renew DHCP IP address (or reconnect to the wireless network).
4. Check the secure connections by establishing a connection PC with Internet.  
Test the PC <-> Internet connection,  
(ping 8.8.8.8, and open a Internet page e.g. <http://google.com>).

### **Questions:**

1. List and describe the CLI command sequences necessary for enter into SSID configuration context.
2. List and describe the CLI command sequences necessary for set up a secure WPA wireless network with Cisco AP.
3. List and describe the CLI command sequences necessary for set up a secure WEP wireless network with Cisco AP.

## References:

- [1] Cisco IOS Software Configuration Guide for Cisco Aironet Access Points – web page:  
[https://www.cisco.com/c/en/us/td/docs/wireless/access\\_point/12-3\\_7\\_JA/configuration/guide/i1237sc.html?referring\\_site=bodynav](https://www.cisco.com/c/en/us/td/docs/wireless/access_point/12-3_7_JA/configuration/guide/i1237sc.html?referring_site=bodynav)
- [2] Cisco IOS Command Reference for Cisco Aironet Access Points and Bridges – web page:  
[https://www.cisco.com/c/en/us/td/docs/wireless/access\\_point/12-4\\_3g\\_JA/command/reference/cr1243g.html](https://www.cisco.com/c/en/us/td/docs/wireless/access_point/12-4_3g_JA/command/reference/cr1243g.html)
- [3] Basic Wireless LAN Connection Configuration Example – web page:  
<https://www.cisco.com/c/en/us/support/docs/wireless-mobility/wireless-lan-wlan/68005-wlan-connect.html#diag>
- [4] E. Perahia, R. Stacey, “Next Generation Wireless LANs 802.11n and 802.11ac”, Cambridge University Press, 2013
- [5] P. Roshan, J. Leary, “802.11 Wireless LAN Fundamentals” Cisco Press, 2004.