

Configuration Guide

How to Configure a BYOD Environment with the DWS-3160

(Mac Authentication+ Captive Portal)



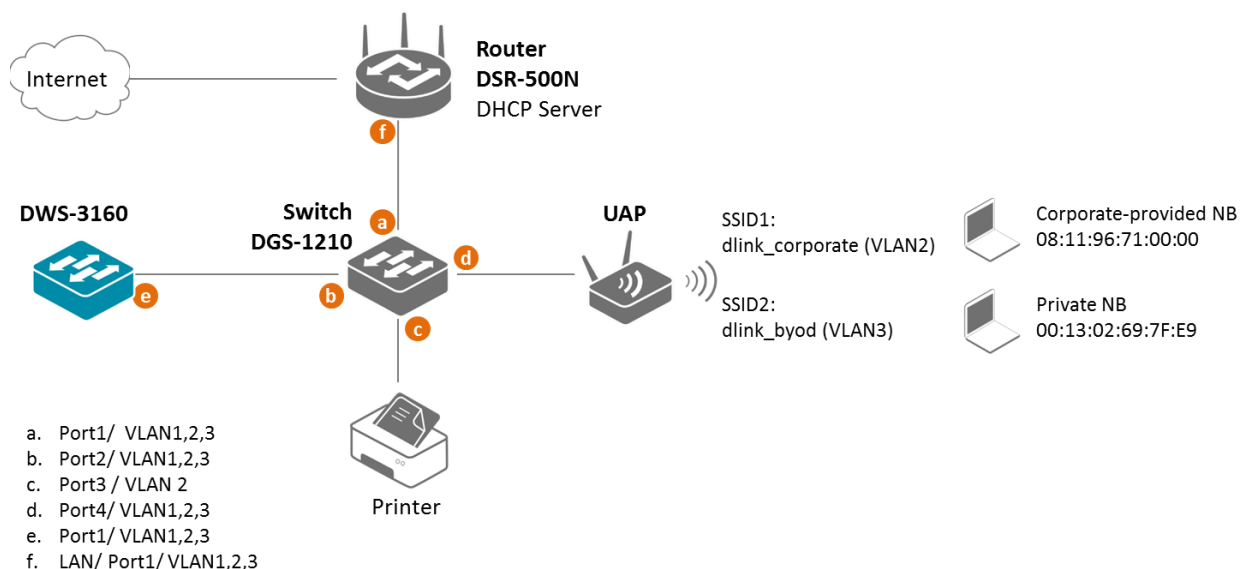
Overview

This guide describes how to configure and implement BYOD environment with the D-Link DWS-3160 Unified Switch for user and device authentication.

Situation Note

The trend of Bring Your Own Device (BYOD) in working place is a new challenge on network security and management. Many corporations that allow employees to use their own device at work expecting have better performance and productivity; however, on the downside, corporations also concern the network security and information leakage by using private device. How to distinguish corporate-provided device and private device (BYOD device), and give different authorities is the major task for IT teams.

The scenario in this guide shows you how to implement a BYOD environment with DWS-3160. Use device MAC authentication to enforce client associating specific SSIDs based on the device which is corporate-provided or private. All connection from SSIDs required performing authentication before granted authority.



The authentication methods on each SSID are difference:

- dlink_corporate SSID: This SSID is for D-Link employee who works with corporate -provided device. It requires device MAC authentication and Captive Portal to complete the authentication process. After complete authentication, the client is authorized in VLAN₂ network.
- dlink_byod SSID: This SSID is for D-Link employee who works with his private device(BYOD device). It requires Captive Portal to complete the authentication process. After complete authentication, the client is authorized in VLAN₃ network.

NOTE: The screenshots in this guide are from the DWS-3160's firmware version 4.3.0.5. If you are using an earlier version of the firmware, the screenshots may not be identical to what you see on your browser.

Configuration Steps (DWS-3160)

1. Set up VLANs based on the network architecture. Create three VLANs. VLAN1 is the default VLAN for AP management, VLAN2 is for the traffic associated from SSID dlink_corporate, and VLAN3 is for the traffic associated from SSID dlink_byod. Associate VLAN 1 to 3 memberships on Port1.

Create three VLANs. Un-tag VLAN1, and tag VLAN2 and VLAN3 on port 1 (o/1). Navigate to LAN > DWS-3160-24PC > L2 Feature > VLAN > 802.1Q VLAN Settings.

802.1Q VLAN Settings

VLAN List | Add/Edit VLAN | Find VLAN | VLAN Batch Settings | Total Entries: 3

VID: 1 | VLAN Name: default (Max: 32 characters) | Apply

Advertisement: Enabled

Port	Select All	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Tagged	All	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Untagged	All	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Forbidden	All	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not Member	All	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Tagged Ports: 02-24
 Untagged Ports: 01
 Forbidden Ports:
 Not Member Ports:

802.1Q VLAN Settings

VLAN List | Add/Edit VLAN | Find VLAN | VLAN Batch Settings | Total Entries: 3

VID: 2 | VLAN Name: dlink_corporate (Max: 32 characters) | Apply

Advertisement: Enabled

Port	Select All	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Tagged	All	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Untagged	All	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Forbidden	All	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not Member	All	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Tagged Ports: 01
 Untagged Ports: 02-24
 Forbidden Ports:
 Not Member Ports:

802.1Q VLAN Settings

VLAN List | Add/Edit VLAN | Find VLAN | VLAN Batch Settings | Total Entries: 3

VID: 3 | VLAN Name: dlink_byod (Max: 32 characters) | Apply

Advertisement: Disabled

Port	Select All	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Tagged	All	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Untagged	All	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Forbidden	All	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not Member	All	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Tagged Ports: 01
 Untagged Ports: 02-24
 Forbidden Ports:
 Not Member Ports:

802.1Q VLAN Settings Safeguard

VLAN List Add/Edit VLAN Find VLAN VLAN Batch Settings Total Entries: 3

VID	VLAN Name	Advertisement	Tagged Ports	Untagged Ports	Forbidden Ports		
1	default	Enabled		1-24		Edit	Delete
2	dlink_corp...	Enabled	1			Edit	Delete
3	dlink_byod	Disabled	1			Edit	Delete

1/1 1 Go

2. Create two SSIDs: SSID dlink_corporate and SSID dlink_byod, and assign VLAN 2 and 3 on these two SSIDs respectively. Enable MAC authentication on SSID dlink_corporate only. The MAC authentication database can be either (a) local database or (b) external RADIUS.

Set up two SSIDs. For the MAC authentication, if the MAC authentication database is local database, select "Local" on MAC Authentication, if RADIUS, select "RADIUS" on MAC Authentication. In this case, use local database as authentication server. Navigate to WLAN> DWS-3160-24PC> Administration> Advanced Configuration> Networks.

Networks Safeguard

Wireless Network Configuration

SSID:

Hide SSID:

Deny Broadcast:

VLAN: (1 to 4094)

MAC Authentication: Local RADIUS Disable

Redirect: None HTTP

Redirect URL:

Wireless ARP Suppression Mode:

L2 Distributed Tunneling Mode:

L3 Tunnel:

Networks Safeguard

Wireless Network Configuration

SSID:

Hide SSID:

Deny Broadcast:

VLAN: (1 to 4094)

MAC Authentication: Local RADIUS Disable

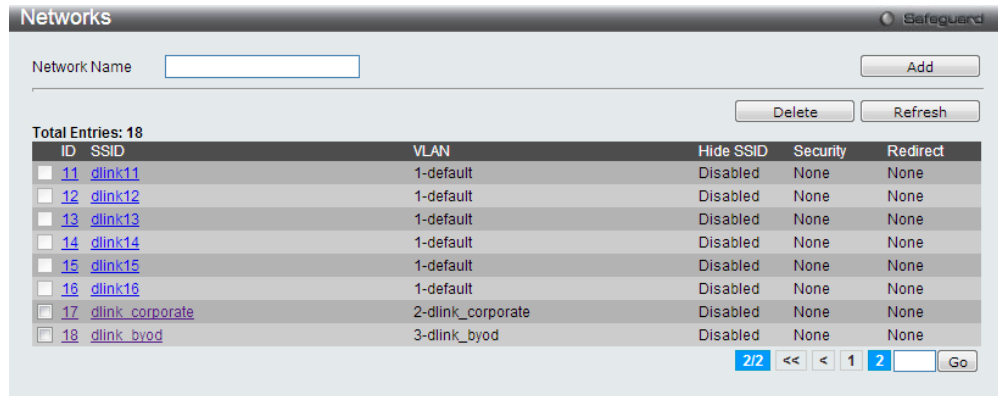
Redirect: None HTTP

Redirect URL:

Wireless ARP Suppression Mode:

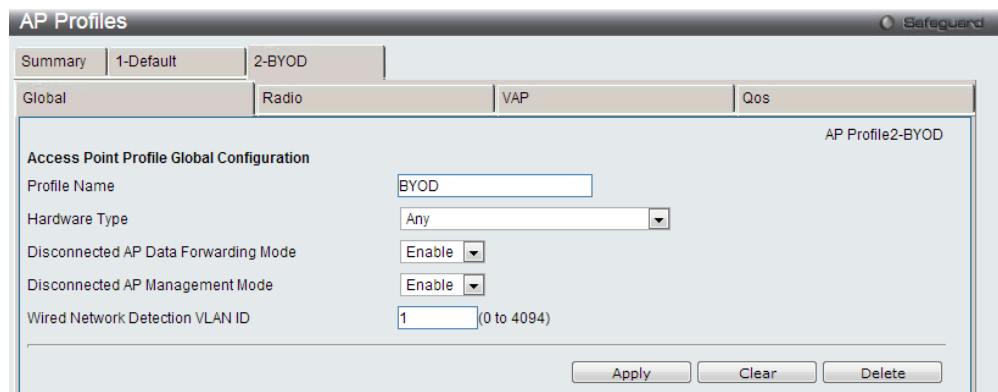
L2 Distributed Tunneling Mode:

L3 Tunnel:

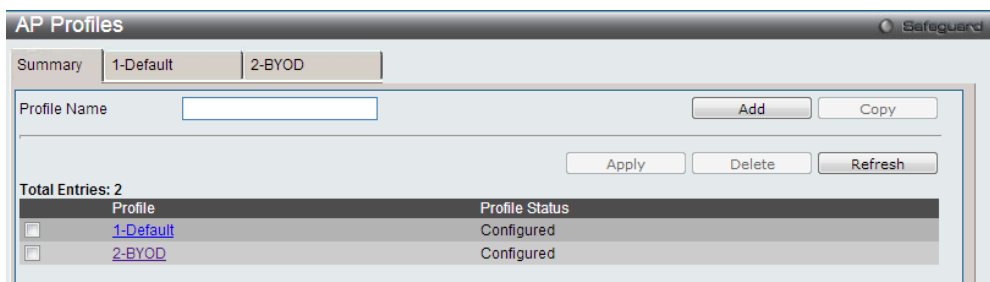
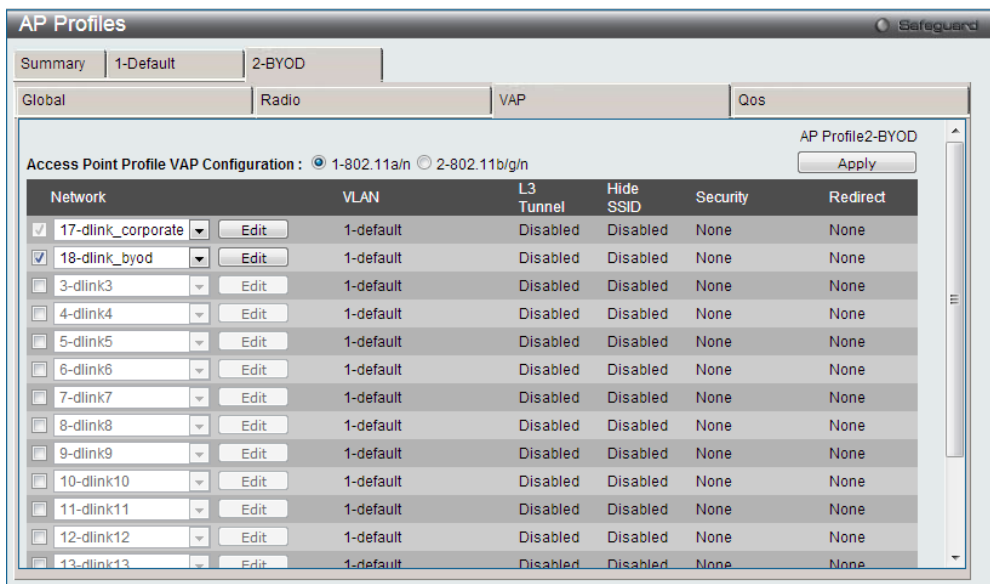


3. Create an AP Profile and associate SSIDs on it.

3-1. Create an AP Profile "BYOD". Navigate to WLAN> DWS-3160-24PC> Administration> Advanced Configuration> AP Profiles> BYOD> Global.

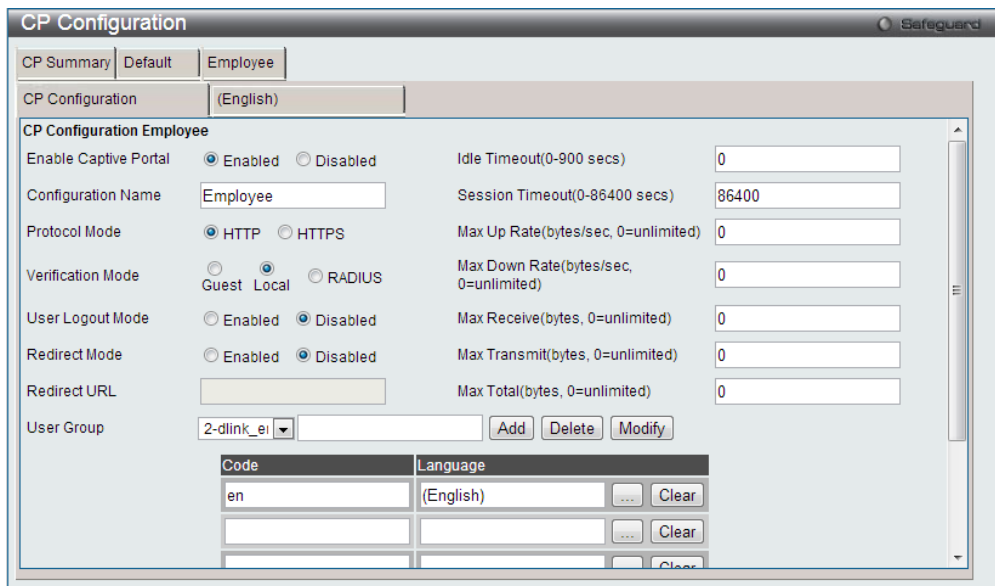


3-2. Associate SSID dlink_corporate and dlink_byod on this AP Profile. Navigate to WLAN> DWS-3160-24PC> Administration> Advanced Configuration> AP Profiles> BYOD> VAP.



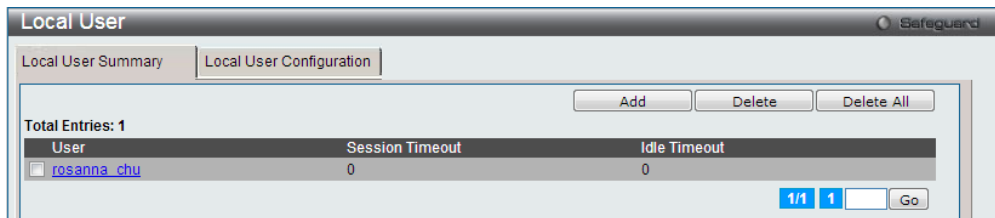
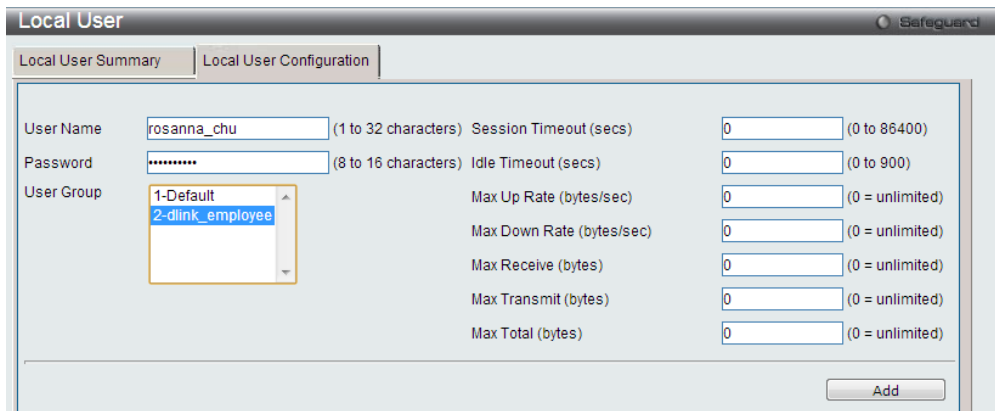
4. Create a CP Profile. Select the authentication server on the Captive Portal. The authentication server can be either (a) local database or (b) external RADIUS. In this case, use local database as authentication server.

Navigate to WLAN> DWS-3160-24PC> Security> Captive Portal> CP Configuration. There are three settings: (a) Create a CP Profile "Employee". (b) Select Verification Mode. If the user authentication database is local database, select "Local" on Verification Mode, if RADIUS, select "RADIUS" on Verification Mode. In this case, use local database as authentication server. (c) Add one User Group "dlink_employee", and then select it as User Group.



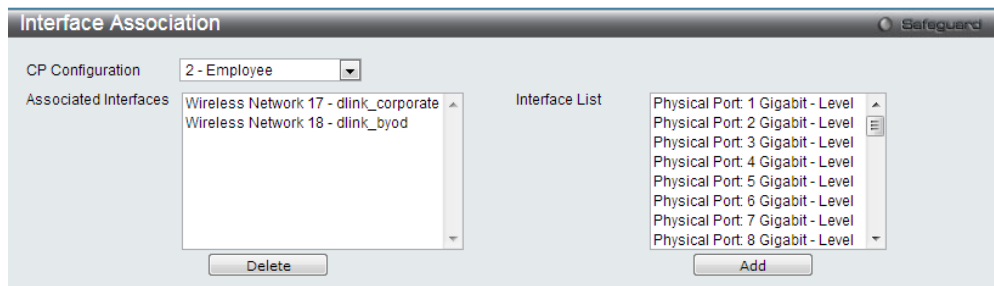
5. Create Captive Portal accounts on local database.

Create user account under User Group "2-dlink_employee". Navigate to WLAN> DWS-3160-24PC> Security> Captive Portal> Local User.



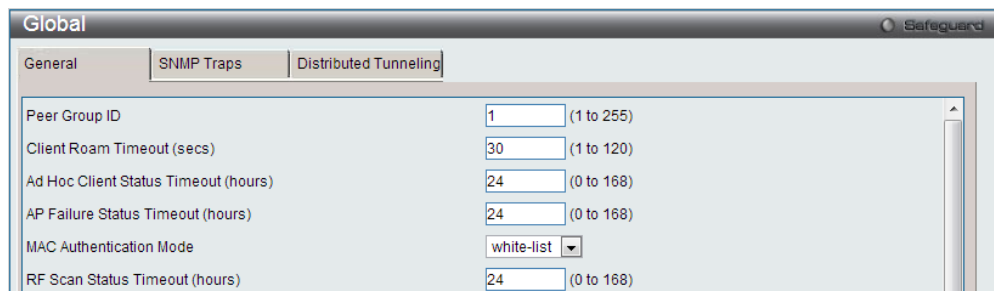
6. Associate these two SSID interfaces on CP Configuration "2-Employee".

Select CP Configuration "2-Employee". Add interface SSID dlink_corporate and SSID dlink_byod on Associated Interfaces. Navigate to WLAN> DWS-4026> Security> Captive Portal> Interface Association.

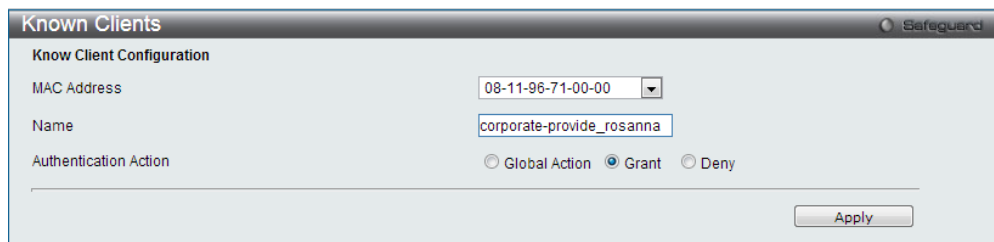


7. Create device MAC authentication database on local database.

7-1. Choose MAC Authentication Mode as "white-list". Navigate to WLAN> DWS-3160-24PC> Administration> Advanced Configuration> Global.



7-2. Create device MAC authentication accounts in the Known Client database. Add corporate-provided NB MAC o8:11:96:71:00:00 in the database. The Authentication Action is "Grant". Navigate to WLAN> DWS-3160-24PC> Administration> Advanced Configuration> Client> Known Clients.



How to Configure a BYOD Environment with the DWS-3160

VID Settings

VID: 2

VLAN Name: dlink_corporate

Port	Select All	01	02	03	04	05	06	07	08	09	10
Untagged	All	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tagged	All	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not Member	All	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

VID Settings

VID: 3

VLAN Name: dlink_byod

Maximum 20 characters.

Port	Select All	01	02	03	04	05	06	07	08	09	10
Untagged	All	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tagged	All	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not member	All	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

802.1Q VLAN Settings

Asymmetric VLAN [Example] Enabled Disabled

Total static VLAN entries: 3

Maximum 256 entries.

VID	VLAN Name	Untagged	Tagged	Delete
1	default	01-02, 04		Delete
2	dlink_corporate	03	01-02, 04	Delete
3	dlink_byod		01-02, 04	Delete

- (Option) Enable PoE on the ports which connect with APs if needed. In default, all ports are enabled auto PoE detection.

PoE Port Settings

From Port: 1 To Port: 8 State: Enabled Time Range: N/A Priority: Normal Power Limit: Auto

The port 1 to port 8 can be set a power limit between 1W and 30W. Max power used by PSE: Class 1: 4W, Class 2: 7W, Class 3: 15.4W, Class 4: 30W.

Port	State	Time Range	Priority	Power Limit	Power (W)	Voltage (V)	Current (mA)	Classification	Status
1	Enabled	N/A	Normal	Auto	0.0	0.0	0.0	N/A	POWER OFF
2	Enabled	N/A	Normal	Auto	0.0	0.0	0.0	N/A	POWER OFF
3	Enabled	N/A	Normal	Auto	0.0	0.0	0.0	N/A	POWER OFF
4	Enabled	N/A	Normal	Auto	0.0	0.0	0.0	N/A	POWER OFF
5	Enabled	N/A	Normal	Auto	0.0	0.0	0.0	N/A	POWER OFF
6	Enabled	N/A	Normal	Auto	0.0	0.0	0.0	N/A	POWER OFF
7	Enabled	N/A	Normal	Auto	0.0	0.0	0.0	N/A	POWER OFF
8	Enabled	N/A	Normal	Auto	0.0	0.0	0.0	N/A	POWER OFF

Configuration Steps (DSR-500N)

1. Set up VLANs based on the network architecture. Create three VLANs. VLAN₁ is the default VLAN for AP management, VLAN₂ is for the traffic associated from SSID dlink_corporate, and VLAN₃ is for the traffic associated from SSID dlink_byod.

1-1. Set up VLAN₂ and VLAN₃. Navigate to SETUP> VLAN Settings> Available VLANs.

The screenshot shows the D-Link web interface for a DSR-500N device. The navigation menu on the left includes Wizard, Internet Settings, Wireless Settings, Network Settings, DMZ Setup, VPN Settings, USB Settings, and VLAN Settings. The main content area is titled 'AVAILABLE VLANs' and includes a 'LOGOUT' link. Below this, there is a section for 'VLAN Configuration' with the following fields: Name (dlink_corporate), Id (2), and Inter VLAN Routing Enable (checked). A 'Helpful Hints...' section on the right provides instructions on how to use the interface.

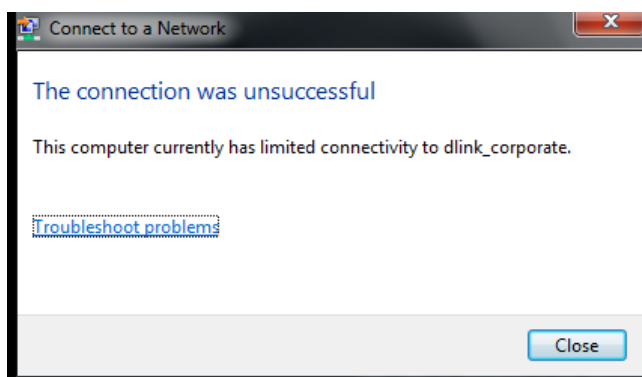
The screenshot shows the D-Link web interface for a DSR-500N device, similar to the previous one. The navigation menu on the left includes Wizard, Internet Settings, Wireless Settings, Network Settings, DMZ Setup, VPN Settings, USB Settings, and VLAN Settings. The main content area is titled 'AVAILABLE VLANs' and includes a 'LOGOUT' link. Below this, there is a section for 'VLAN Configuration' with the following fields: Name (dlink_byod), Id (3), and Inter VLAN Routing Enable (checked). A 'Helpful Hints...' section on the right provides instructions on how to use the interface.

1-2. Enable DHCP server on default VLAN, VLAN₂ and VLAN₃. Navigate to SETUP> VLAN Settings> Multiple VLAN Subnets.

DSR-500N	SETUP	ADVANCED	TOOLS	STATUS	HELP
Wizard					Helpful Hints... By default, when you add a new VLAN, it is assigned an IP address of 192.168.2.1 with subnet-mask 255.255.255.0, the next added one is assigned 192.168.3.1 and so on. You can change the assigned IP address, subnet mask and many other options here. The only non-editable field in VLAN ID. More...
Internet Settings	MULTI VLAN SUBNET CONFIG LOGOUT This page shows the list of available multiple VLAN subnets. <input type="button" value="Save Settings"/> <input type="button" value="Don't Save Settings"/>				
Wireless Settings	MULTI VLAN SUBNET Vlan ID: 1 IP Address: <input type="text" value="192.168.10.1"/> Subnet Mask: <input type="text" value="255.255.255.0"/>				
Network Settings	DHCP DHCP Mode: <input type="text" value="DHCP Server"/> <input type="button" value="v"/> Domain Name: <input type="text" value="DLink"/> Starting IP Address: <input type="text" value="192.168.10.100"/> Ending IP Address: <input type="text" value="192.168.10.254"/>				
DMZ Setup					
VPN Settings					
USB Settings					
VLAN Settings					

Proof of Concept

- The NB with MAC 08:11:96:71, which is the corporate-provided device, is allowed get IP address from both SSIDs. But for the NB with MAC 00:13:02:69:7F:Eg, which is the private device, is allowed get IP address only from SSID dlink_byod. If it associates SSID dlink_corporate, it could not get IP address and would get error message as below. The MAC authentication forces the private device associate network from SSID dlink_byod



- After NB associates with SSID and gets IP address, the system requires processing Captive Portal to identify the user.

3. While the corporate-provided NB associates SSID dlink_corporate and completes the authentication, it can access resources on VLAN₂, for example, printer and internet.
4. While the corporate-provided or private NB associates SSID dlink_byod and completes the authentication, it can access resources on VLAN₃, for example, internet.

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