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# 1. Overview

Zebra best practices for deploying a MeshConnex (MCX) network details the use of APmode profile types, specifically a profile for "root" nodes and a profile for "non-root" nodes. There are a number of reasons for this suggestion:

- It lends to a hierarchical flow and organization of the master configuration
- It provides a means to ensure that non-root devices do not assume RF-Domain Manager responsibilities by disabling the "RF-Domain Manager Capable" parameter or by establishing a lower priority for these devices
- It aids in the change-control process within an organization
  - o Delineates between devices types, mitigating potential misconfiguration issues
  - o Allows for granularity in process recording

However, in a virtual controller setting, this is not possible as there is only a single device-type profile. The Virtual Controller function does not allow for multiple profiles as it only serves to manage *like devices*.

The purpose of this guide is to outline the configuration of a Virtual Controller MeshConnex<sup>™</sup> environment.

## **1.1 Technical Requirements**

Listed are the components used in creating this document:

- WiNG 5.4.0.0-047R
- (3x) AP7131 Access Points

# 2. Topology



## 2.1 Configuration

The steps involved with configuring a Virtual Controller based MeshConnex network are listed below. Full configuration of WLAN's and other parameters are beyond the scope of this document:

- 1. Configure Virtual Controller AP
- 2. Configure Smart-RF policy or establish static channels
- 3. Configure Meshpoint (MeshConnex WLAN)
- 4. Tune the system profile for MCX AP types

### 2.1.1 Configure Virtual Controller

A single AP will act as the adopting device for the other AP's that are of the same hardware type; i.e. all AP7131's or AP6532's, etc. Establishing the VC is simply a check box on the designated device, which is found at *Configuration > Devices > Virtual Controller AP > System Name:* 

Devices   Wireless   Network			<b>~</b>	
RF Domain	Security Services Management		🅤 Revert   🛃 Commit	Commit and Save
	Virtual Controller AP			0
System Profile	System Name	Device	Set as Virtual Controller AP	
Virtual Controller AP	ap7131-9313CC	00-23-68-93-13-CC	<b>v</b>	
Event Policy	ap7131-970408 ap7131-9E5144	00-23-68-97-04-08 00-23-68-9E-51-44	×	
-				
-				
	Tune to search in tables			Row Count: 3
	Type to search in tables			Edit
Event 0 0	0 80 84		Find Functional Area Virtual Controller AP	٩
De	vice 00-23-68-93-13-CC			
Vi	rtual Controller AP			
r				
	Set as Virtual Controller AP 🌘	$\checkmark$		
L				
Auto	Provisioning Rule			
Ad	opt Unknown APs Automatically	$\checkmark$		
	(Applicable only if AP is configured	d as Virtual Controller)		
	•			
•				
Auto	Provisioning Rule	d as Virtual Controller)		

At the command line, enter configuration mode on the device you wish to act as Virtual Controller:

#### Enter "self" configuration mode:

```
ap7131-9313CC#self
Enter configuration commands, one per line. End with CNTL/Z.
ap7131-9313CC(config-device-00-23-68-93-13-CC)#
Execute the virtual controller command:
ap7131-9313CC(config-device-00-23-68-93-13-CC)#virtual-controller
ap7131-9313CC(config-device-00-23-68-93-13-CC)#commit write
[OK]
ap7131-9313CC(config-device-00-23-68-93-13-CC)#show context
ap71xx 00-23-68-93-13-CC
use profile MCX-APs
use rf-domain default
hostname ap7131-9313CC
interface vlan10
 ip address dhcp
 no shutdown
virtual-controller
logging on
no logging console
logging buffered warnings
ap7131-9313CC(config-device-00-23-68-93-13-CC)#
```

### 2.1.2 Smart-RF Configuration

If Smart-RF will be used, then care should be taken to determine if indoor or outdoor channels are utilized as well as if DFS is to be avoided or not. The Smart-RF policy can be found by navigating to: *Configuration > Wireless > Smart-RF*:

WING v5.4	Dashboard Configuration	n Diagnostics Operations Statistics	AP7131		🤱 admin	
Devices Wireless Network	Security Services Mar	agement	5 Revert	📥 Commit	🛛 🔒 Comn	nit and Save
믪Wireless LANs	SMART RF					0
WLAN QoS Policy	Activate SMART RF Policy 🗹 🌘					
WLAN LOS Folicy PRadio QoS Policy AASociation ACL SMMRT RF MeshConnex Policy Mesh QoS Policy Mesh QoS Policy	Activate SMART RF Policy 💟 Basic Configuration Channel and Power Scanning Configuration Recovery	Basic Settings Sensitivity Sen				
					ОК	Reset
Event 0		Find	Functional Area	Type to search		

Enable Smart-RF by checking "Activate SMART RF Policy".

• Disable the three recovery modes, as these are generally not applicable for MCX links and may cause inadvertent performance issues. (Under Basic Configuration)

SMART RF			0
Activate SMART RF Policy 🗹 🌘	)		
Basic Configuration Channel and Power Scanning Configuration Recovery	Power Settings 5 GHz Minim um P 5 GHz Maxim um I 2.4 GHz Maxim um I 2.4 GHz Maxim um Channel Settings 5 GHz Channels 5 GHz Channel W 2.4 GHz Channels 2.4 GHz Channel	wer       0       4       0       (1 to 20 dBm)         wer       0       10       0       (1 to 20 dBm)         over       0       4       0       (1 to 20 dBm)         2ower       7       0       (1 to 20 dBm)         2ower       7       0       (1 to 20 dBm)         2ower       7       0       (1 to 20 dBm)         b       149       0       153         153       0       0       153         157       0       153       0         1       0       0       20MHz       40MHz       Automatic         0       1       0       0       20MHz       40MHz       Automatic         0       1       0       0       20MHz       0       40MHz       Automatic         0       1       0       0       20MHz       0       40MHz       Automatic         Settings       0       0       0       0       0       0       0	
	Area	Band Channel List	
	Ũ		T
		OK Ret	set

• MCX should generally be limited to the 5GHz band. Specify the Smart-RF channel list per the regulations for the country it is being configured in. (Under Channel and Power)

SMART RF		0
Activate SMART RF Policy 🗹 (	D	
Basic Configuration	Scanning Configuration for 5.0 GHz	
Channel and Power	Mesh Point I I Ime-mcx	
Scanning Configuration	Duration 0 50 (20 to 150 milliseconds)	
Recovery	Frequency 0 6 Seconds v (1 to 120)	
	Extended Scan Frequency 0 5 (0 to 50)	
	Sample Count	
	Client Avare Scanning 0 1 (1 to 255)	
	Power Save Aware Scanning 🕕 💿 Dynamic 🔘 Strict 🍥 Disable	
	Voice Aware Scanning 🛛 💿 Dynamic 🍥 Strict 🍥 Disable	
	Scanning Configuration for 2.4 GHz	
	Mesh Point	
	Duration 0 50 (20 to 150 milliseconds)	
	Frequency 0 6 Seconds v (1 to 120)	
	Extended Scan Frequency 0 5 (0 to 50)	
	Sample Count 0 10 (1 to 15)	
	Client Avare Scanning 0 1 (1 to 255)	
	Power Save Aware Scanning 🛯 💿 Dynamic 🔘 Strict 🍥 Disable	
	Voice Aware Scanning 0 💿 Dynamic i Strict i Disable	
	Note: The system automatically configures optimum values for certain fields, if you select the sensitivity option under 'Basic Settings' as 'Low', 'Medium' or 'High'. Some of the SMART RF parameters appear disabled in this case. Please choose the 'Custom' sensitivity option to enable the fields and manually enter each value.	
		OK Reset

- Remember to specify your MCX ID, binding the meshpoint to Smart-RF.
- The channel-list settings shown are an example only. In this case, US outdoor channels that avoid DFS frequencies were selected.

```
Smart-RF Configuration:
ap7131-9313CC#show run smart-rf-policy tme-smart-rf
smart-rf-policy tme-smart-rf
assignable-power 5GHz max 10
assignable-power 2.4GHz max 7
channel-list 5GHz 149,153,157,161,165
smart-ocs-monitoring meshpoint 5GHz tme-mcx
no interference-recovery
no neighbor-recovery
no coverage-hole-recovery
ap7131-9313CC#
```

### 2.1.3 Create MCX Meshpoint

The meshpoint is similar to a WLAN, only dedicated to the communication of the mesh AP's with one another. Navigate to *Configuration > Wireless > MeshConnex Policy* and create a new policy:

WING v5.4	Dashboard Configu	ration Diagnostics	Operations Statisti	ics	_		🧼 AP7131 - 🔢	🔒 admin 🛛 🚺
Devices   Wireless   Network	Security Services	Management					🅤 Revert   🛃 Comr	nit 🛛 🔚 Commit and Save
Nireless LANs	MeshConnex Policy							0
WLAN QoS Policy	Mesh Point Name 🛞	Mesh Id	Mesh Point Status	Descriptions	Control VLAN	Allowed VLANs	Security Mode	Mesh QoS Policy
Radio QoS Policy	tme-mcx	tme-mcx	🖌 Enabled	VC Mesh	10	8-11	PSK	default
🗧 AAA Policy	ų							
Association ACL								
SMART RF								
Mesh Connex Policy								
A litesh Qos Policy								
Mesh Point								
	4							
	-							
	Tune to search is tables		1					BowCount: 4
Type to search	rype to search in tables							Rowcount. 1
+-					A 1		Add	Eart Delete
Event 0 0	0 2	<b>B</b> 4				Find Fur	nctional Area Type to search	

The Mesh ID identifies the links to the AP's; like an SSID. Beacon format should be set to "mesh-point" to include the information element to the APs.

Configuration Security Radio Rates     Basic Configuration     Mesh Id   *   Imesh Point Status   *   Disabled   *   Beacon Format   *   *   Imesh-point *   *   Mesh Ool *   Control VLAN   *    * <tr< th=""></tr<>
Basic Configuration         Mesh Id       *         Mesh Point Status       •         Mesh QoS Policy       *         default       •         Beacon Format       •         Is Root       •         Control VLAN       •         Allowed VLANs       •         8-11       (2.4.7-12)         Neighbor Idle Timeout       •         VC Mesh       •
Mesh Id *     Mesh Point Status     Mesh QoS Policy     *     default     *     *     default     *     *     *     *     *     *     *     *     *     *     *     *     *     *     *                        <
Mesh Point Status Disabled
Mesh QoS Policy       *       default       •         Beacon Format       •       •       •         is Root       •       •       •         Control VLAN       •       10 *       • (1 to 4,094)         Alowed VLANs       •       •       •         Neighbor Idle Timeout       •       •       •         Descriptions       •       VC Mesh       •
Beacon Format is Root Control VLAN I I I I I I I I I I I I I I I I I I I
is Root Control VLAN I I I I I I I I I I I I I I I I I I I
Control VLAN       10
Alloved VLANs () [8-11 (2,4,7-12,) Neighbor Idle Timeout () 2 Minutes (1 to 1,440) Descriptions () VC Mesh
Neighbor Idle Timeout () 2 Minutes v (1 to 1,440) Descriptions VC Mesh
Descriptions VC Mesh
OK Reset Exit

Under the **Security** tab is where the PSK will be defined if encryption of the mesh links is desired.

Mesh Point Name tme-mcx			0
Configuration Security Radio Rates			
Select Authentication			
FSK Key Settings			
Enter 64 HEX or 8-63 ASCII Characters Pre-Shared Key			
Key Rotation			
Unicast Rotation Interval Broadcast Rotation Interval 30 30 30 (30 to 86,400 seconds) 30 (30 to 86,400 seconds)			
	ОК	Reset	Exit

Under the "Radio Rates" tab, the defaults can be left, as the rates will be adjusted within the device profile.

Meshpoint configuration at the command line is similar to that of creating a WLAN:

```
Meshpoint Configuration:

ap7131-9313CC#show run meshpoint tme-mcx

meshpoint tme-mcx

description VC Mesh

meshid tme-mcx

beacon-format mesh-point

control-vlan 10

allowed-vlans 8-11

security-mode psk

wpa2 psk 0 hellomoto

no root

ap7131-9313CC#
```

## 2.1.4 Tune System Profile

The system profile is the profile that is used by the devices within the Virtual Controller domain, whether you have selected to use the default or create another (as to stick with a naming

convention, for example). The profile parameters herein will ensure that MCX is optimized for mesh links. Navigate to *Configuration > Devices > System Profile* 

WING v5.4	Dashboard Configurati	on Diagnostics	Operations Statistics	-	_	-	AP7131		🔒 admin	P
Devices   Wireless   Network	Security Services Ma	nagement					🌖 Revert	🛃 Commit	🔚 Comr	nit and Save
RF Domain	System Profile									0
System Profile	Profile Activated									
Virtual Controller AP	General	Notupid: Timo Diretoos								
Device Overrides	Power	Autokey	Kev	Preferred	Server IP	Version	ŵ			
📆 Event Policy	Adoption	riatonoy	109	Tiolonou	00110111					
	► Interface									
	▶ Network	0								
	▶ Security									
	VRRP					+ Add R	ow			
	Critical Resources	RF Domain Manager								
	Services	Capable 📵 🗹								
	<ul> <li>Management</li> </ul>	Priority 🕕 📃	1 (1 to 255)							
	Advanced									
	Mesh Point									
									OK	Reset
Event 0 0		ia				F	ind Functional Area	Type to search		

As there is only a single profile supporting both root and non-root AP's, configure the profile for <u>root</u> parameters. Port link monitoring will determine if the device ends up as a root or a non-root device.

WING v5.4	Dashboard Configurat	tion Diagnostics	Operations S	statistics				AP7131	🛦 admin 🚺 🌾			
Devices Wireless Network	Security Services M	anagement					8	🛐 Revert 🛛 🛃 Commi	t 🛛 📊 Commit and Save			
RF Domain	System Profile	system Profile										
System Profile	Profile Activated ()											
Virtual Controller AP	General	Name	Type	Description	Admin Status	Mode	Native VLAN	Tag Native VLAN	Allowed VLANs			
Device Overrides	Power	ge1	Ethernet		🖌 Enabled	Trunk	10	×	8-11			
Event Policy	Adoption	ge2	Ethernet		🖌 Enabled	Access	1	×				
	▼ Interface											
	Ethernet Ports											
	Virtual Interfaces											
	Port Channels											
	Radios											
	WAN Backhaul											
	PPP0E											
	- ► Network											
	≤ ► Security											
	VRRP											
	Critical Resources											
	Services											
	► Management											
	Advanced											
	Mesh Point											
		Type to search in tabl	es						RowCount: 2			
									Edit			
Event o	6						Find Function	al Area Type to search				

Within this example, there will be no devices connected to Ge2. Scenarios may exist in which an IP camera (video surveillance), electric utility cap-bank (Smart Grid) or other device may utilize the Ge2 port. On the AP7161 and AP7181 devices, this port can also provide PoE (802.3af) for those devices.

For purposes of this document, the "radio2" interface configuration, specifically will be covered as it is used for the mesh links between nodes.

WING v5.4	Dashboard Configuratio	on Diagnostics Op	perations Statistics				🅁 AP7131 🛛 🚺	🔒 admin 🛛 🚺
Devices   Wireless   Network	Security Services Mar	nagement					🅤 Revert   🛃 Comn	nit 🛛 🔚 Commit and Save
RF Domain	System Profile							0
System Profile	Profile Activated							
Virtual Controller AP	General	Name (a)	Туре	Description	Admin Status	RF Mode	Channel	Transmit Power
Device Overrides	Power	radio1	Radio	radio1	🖌 Enabled	2.4 GHz WLAN	smart	smart
🗱 Event Policy	Adoption	radio2	Radio	radio2	🖌 Enabled	5 GHz WLAN	smart	smart
	▼ Interface	radio3	Radio	radio3	🖌 Enabled	Sensor	smart	smart
	Ethernet Ports							
	Virtual Interfaces							
	Port Channels							
	Radios							
	WAN Backhaul							
	PPPoE							
	▶ Network							
	Security							
	VRRP							
	Critical Resources							
	Services							
	▶ Management							
	▶ Advanced							
	Mesh Point							
		Type to search in tables						RowCount: 3
								Edit
Event 0 0	1 16	ε				Find Fund	ctional Area Type to search	

The settings within this document represent those specific to the AP7131. Remember that within a mesh network, typically all devices participating in a particular meshpoint will be the same model. Thus the parameters can be hard-coded for optimal performance, rather than accepting the typical default, client-friendly settings.

- Dynamic Chain Selection: un-checked
- Data Rates: "an" as we are specifically using the 5GHz radio for mesh and want the best throughput on the mesh links
- Radio Placement: depends on application
- Rate Selection: always set for Opportunistic

Radios					×
Name radio2					0
	86		Radio Settings	WLAN Mapping / Mesh Mapping Mesh Legacy Advanced	I Settings
Properties					
ropentes				WLAN Properties	
Description	0	radio	2	Bea con Interval	100 v (milliseconds)
				DTIM Interval BSSID	2 Select -
Admin Status	0	D	isabled 🖲 Enabled	RTS Threshold	2347 (1 to 2,347 bytes)
Radio QoS Policy	*	defa	ut 🔷 🕑 🔅	Short Preamble	
Association ACL	0		v 🔮 🎆	Guard Interval	Any V
				Probe Response Rate	follow-probe-request
Radio Settings				Probe Response Retry	
RF Mode		0	5GHz-wlan	Channel Scanning	
DFS Revert Home		0		Enable Off Channel Scan	
Lock RF Mode		0		Off Channel Scan list for 5 GHz	· · · · · · · · · · · · · · · · · · ·
Channel		0	smart 🔻		
Transmit Power			● smart		36+
			①      ①     ①      ①      ①      ①      ①     ①      ①     ①      ①	Off Channel Scan list for 2.4GHz	· · · · · · · · · · · · · · · · · · ·
Antenna Gain		0	0.00 (0.00 - 15.00 dBi)		
Antenna Mode			Default		2
Fachia Astensa Di	un ro il			Max Multicast	4 (0 to 100)
Wireless Client Poy	versi	y U		Scan Interval	10 (2 to 100 dtims)
Wile lease cheft P of		0	0 v (0 to 20 dBm)	Sniffer Redirect	
Dynamic Chain Sel	ectio	0		Radio Share	
Data Rates		0	Custom::basic-54,mcs8-15	Select	
Radio Placement		0	Outdoor 🚽	Feed WLAN Packets to Sensor	Off 🗸
Max Clients		0	256 (0 to 256)		
Rate Selection Met	hods	0	Opportunistic v	E ka hau Properties	1
	_	-		Forwarding Host	
Aeroscout Properties				Forwarding Port	0 (0 to 65,535)
Acrosour roperties				MAC to be forwarded	01 - 18 - 8E - 00 - 00 - 00
Forward	0				
MAC to be forwarded	0	01 -	- OC - CC - 00 - 00 - 00		
					OV Report

Next we must map the meshpoint to the radio, similar in the way that we map a WLAN to a radio:

Under the *WLAN Mapping / Mesh Mapping* tab, select the MeshPoint and click the "<" to move the meshpoint to the radio, as seen below:

Radios							×								
Name	radio2					(	2								
		Radio Settings	WLAN Mapping / Mesh Mapping	Mesh Legacy	Advanced Settings										
WLAN/	LAN/BSS Mappings														
0	Radio		E WLANS tme-wlan MeshPoint tme-mcx				1								
	Advanced Mapping		1		몸길 Create New WLAN	Create New MeshPoint									

Under *Advanced / Miscellaneous* is where one finds the MeshPoint Behavior setting, dependent on whether the device is a *Vehicle Mounted Modem* (VMM) or not. Generally this parameter will be left at its default setting of "External (Fixed)", unless a VMM is in use.

System Profile		0
Profile Activated		
General Power Adoption Vintual Interfaces Port Channels Radios WAN Backhaul PPPoE	Device RADIUS Authentication Parameters NAS-Identifier Attribute NAS-Port.Id Attribute LEDs (Light Emitting Diodes) Turn on LEDs	
Network     Security     VRP     Critical Resources     Services     Management     Advanced     Client Load Balancing     MINT Protocol     Miscellaneous     Mesh Point		
		OK Reset

Finally, navigate to *Mesh Point* within the System Profile. Here you will add the meshpoint that was created earlier, defining the device profile as that of a meshpoint device and specify that the profile will always set the device as a "root" AP.

WING v5.4	Dashboard Configuration	<mark>on</mark> Diagnostics Op	perations Statistics		_	_	🧼 AP7131 🛛	🔒 admin 🛛 🎼
Devices   Wireless   Network	Security Services Mai	nagement					튓 Revert   陆 Com	mit 🛛 🔚 Commit and Save
RF Domain	System Profile							0
System Profile	Profile Activated ()							
Virtual Controller AP	General	MeshConnex Policy	Is Root	Preferred Root	Preferred Neighbor	Preferred Interface	Monitor Critical	Monitor Primary Port
Device Overrides	Power						Resources	Link
📆 Event Policy	Adoption	tme-mcx	Ves Ves			None	× No	Ves
	▼ Interface							
	Ethernet Ports							
	Virtual Interfaces							
	Port Channels							
	Radios							
	WAN Backhaul							
	PPPoE							
	▶ Network							
	Security							
	VRRP							
	Critical Resources							
	Services							
	► Management							
	▼ Advanced							
	Client Load Balancing							
	MINT Protocol							
	Miscellaneous							
	Mesh Point							
		L						
		Type to search in tables						RowCount: 1
					<b></b>		Add	Edit Delete
Event 0 0	- 48 -	4				Find F	unctional Area Type to searc	th

Under *General* set "Is Root" to true and then check the "Monitor Primary Port Link" box, as shown below:

Mesh Point					×
AeshConnex Policy tr	ne-	mcx			0
General					
Is Root	0	True 🔻 🔶			
Monitor Critical Resources	0				
Monitor Primary Port Link	0	☑ ←────			
oot Path Preference					
Preferred Neighbor	0	00 - 00 - 00 - 00 - 00 - 00			
Preferred Root	0	00 - 00 - 00 - 00 - 00 - 00			
Preferred Interface	0	None 🔻			
			ОК	Reset	Exit

By monitoring the primary (Ge1) port, MCX can determine if the device should be a root AP or a non-root; if there is no data link detected on Ge1, the device will fallback to non-root, thus utilizing a single hardware profile and automatically provisioning our device type.

### There are caveats with this method of provisioning in a regular MCX environment where you may support multiple device types and profiles. Please see the MCX How-To guide for details on provisioning the device mode in those cases.

#### System Profile Configuration:

```
ap7131-9313CC#show run profile ap71xx MCX-APs
profile ap71xx MCX-APs
no autoinstall configuration
no autoinstall firmware
 crypto ikev1 policy ikev1-default
 isakmp-proposal default encryption aes-256 group 2 hash sha
crypto ikev2 policy ikev2-default
 isakmp-proposal default encryption aes-256 group 2 hash sha
 crypto ipsec transform-set default esp-aes-256 esp-sha-hmac
 crypto ikev1 remote-vpn
 crypto ikev2 remote-vpn
crypto auto-ipsec-secure
 interface radio1
 wlan tme-wlan bss 1 primary
 interface radio2
 data-rates custom basic-54 mcs8-15
 rate-selection opportunistic
 placement outdoor
 meshpoint tme-mcx bss 1
 aggregation ampdu none
 antenna-mode 2x2
 no dynamic-chain-selection
 interface radio3
 interface gel
 switchport mode trunk
 switchport trunk native vlan 10
 no switchport trunk native tagged
 switchport trunk allowed vlan 8-11
 ip dhcp trust
 qos trust dscp
 qos trust 802.1p
```

```
interface ge2
  ip dhcp trust
  qos trust dscp
  qos trust 802.1p
 interface vlan10
  ip address dhcp
  ip dhcp client request options all
 interface wwan1
 interface pppoel
 use firewall-policy default
 service pm sys-restart
 router ospf
 meshpoint-device tme-mcx
  name tme-mcx
  root
 monitor primary-port-link action no-root
ap7131-9313CC#
```

### 2.1.5 Misconfiguration Recovery

There is a parameter known as "*misconfiguration-recovery-time*" only found (as of 5.4.0.0-047R) at the CLI. This parameter essentially affords a failsafe in the event of a misconfiguration that causes the mesh to fail.

The default misconfiguration-recovery-time is 180 seconds. Once the mesh network has been deployed and functional, this should be set to 300 seconds. This will ensure that once a configuration change has been applied, it will have up to 5 minutes to settle and re-form links; otherwise the previous configuration will be reinstated. Enter config mode and go into the device profile to modify the parameter:

#### Misconfiguration-recovery-time

```
ap7131-9313CC#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
ap7131-9313CC(config)#profile ap71xx MCX-APs
ap7131-9313CC(config-profile-MCX-APs)#misconfiguration-recovery-time 300
ap7131-9313CC(config-profile-MCX-APs)#commit write
[OK]
ap7131-9313CC(config-profile-MCX-APs)#end
ap7131-9313CC(#
```

# 3. Troubleshooting

First, a good summary is necessary to establish just where we're at. Navigate to *Statistics* and select your RF-Domain name (*Default* if left unchanged), then *Mesh Point*. At this top-level view you can determine what links exists for all meshpoints or by selecting a specific meshpoint.

WING V5.4	Dashboard Configuratio	n Diagnostics Operations Statistics		📥 A97131 - [[[[]]] 🔒 admin	
System					
- y default	RF Domain detault	1			0
april 107131-831300 •	n <sup>2</sup> inventory		Mink Logical View Device Type Device Brief Info Device Data Tra	osmit	
* () #0101-M0160 -	© <sup>3</sup> Intentity	Verw Concentric Terrarchical depth 10% 100% Heapoint Name A Mont Joan Part AP Root AP 2.4 OHs 5 OHS 4 9 0.02 Weets	8751-915CC	P EL	
			ap7131.065144	#07131-970408	
Search				line the second s	efresh
Event Contraction				Find Functional Area Type to search	

Pay attention to the drop-downs that allow you to select a specific meshpoint and whether you would like to view *Paths* or *Neighbors*. The color coded legend will discern the link types.

Under the *Device Types* tab, you can select the individual devices to obtain other information such as the Paths as seen by the selected device:

System	RF Domain default													
→ → → → → → → → → → → → → → → → → → →			-			MCX Logic	al View-	ce Type Der	vice Grief Info Devi	ice Data Transn	nit			
+ 3 ap7131-970400 +	Source Bourte	Root					-		Non Root					
	AP Detection     Wretess Class     Wretess Class     An Arrange     Wretess Class     An Arrange     Meson     Meson	UAC 00.25 #7131-835	tms-mcx 68-93-13-CC 3CC						L Ins-mc MAC 06034846 4 apir13346 5164	x 1144 MAC 1871	002248-87-04-08 31-870408			
		MeshPoin	t Details											
					R Ge	neral AA Patr	Root	12 Multicast P	Ath   18 Neighbors	🍇 Security	/ 1 🚯 Proxy			
		Mesh Point Name	Meshpoint Identifier	Destination	Next Hop IFID	Is Root	MANT ID	Норв	Mobility	Metric	Path State	Bound	Path Timeout	Sequenc
		the-mcx	00-23-68-93-46-6	00-23-68-99-67-3	00-23-00-99-67-3	× No	68.9E.51.44	4	× No	100	Valid	Bound	5096	2346
		the-mox.	00-23-60-93-40-6	1 00-23-03-94-87-0	09-23-68-94-87-4	× No	68.97.04.06	1	× No	192	Vald	Bound	5596	2346

Of course, there is the power of the CLI to get more information:

Show wireless	s meshpoint on <rf-domain< th=""><th>)&gt;:</th><th></th><th></th><th></th><th></th></rf-domain<>	)>:								
ap7131-9313CC#show wireless meshpoint on default MESH HOSTNAME HOPS IS-ROOT CONFIG-AS-ROOT ROOT-HOSTNAME ROOT- BOUND-TIME PATH-METRIC NEXT-HOP-HOSTNAME NEXT-HOP-USE-TIME										
MESH BOUND-TIME P	HOSTNAME ATH-METRIC NEXT-HOP-HOS'	HOPS TNAME	IS-ROOT NEXT-HO	CONFIG-AS-ROOT DP-USE-TIME	ROOT-HOSTNAME	ROOT-				
tme-mcx N/A	ap7131-9313CC 0 N/A	0	YES	YES N/A	N/A					
tme-mcx 04:44:59	ap7131-970408 185 ap7131-9313CC	1	NO 0 days	YES 04:44:59	ap7131-9313CC	0 days				
tme-mcx 04:45:10	ap7131-9E5144 184 ap7131-9313CC	1	NO 0 days	YES 04:45:10	ap7131-9313CC	0 days				
Total number	of meshpoint displayed	: 3								

The above command will give a good reference point as to the number of hops for the devices, who is acting as root, etc.

And an example of the formatting if you expand your terminal client to full screen (a much better view of the information):



### Show wireless meshpoint neighbor detail on <rf-domain>:

ap7131-9313CC#sho wireless meshpoint neighbor detail on default Neighbors @00-23-68-93-13-CC (ap7131-9313CC), tme-mcx [00-23-68-93-48-60]	
Neighbor Name Neighbor MPID.IFID Root Name Root MPID Hops Type Interface Auth-State Resourced Rank LQ% LMet Age	RMet
ap7131-9E5144 00-23-68-99-E7-30.00-23-68-99-E7-30 ap7131-9313CC 00-23-68-93-48-60 1 Fixed 00-23-68-93-13-CC:R2 Enabled Yes 5 87 173 12	192
ap/131-9/0408 00-23-08-94-B/-80.00-23-08-94-B/-80 ap/131-9313CC 00-23-08-93-48-80         1       Fixed 00-23-68-93-13-CC:R2 Enabled         Yes       5       90       192       100	
Neighbors @00-23-68-97-04-08 (ap7131-970408), tme-mcx [00-23-68-94-B7-80]	
Neighbor Name Neighbor MPID.IFID Root Name Root MPID Hops Type Interface Auth-State Resourced Rank LQ% LMet Age	RMet
ap7131-9E5144 00-23-68-99-E7-30.00-23-68-99-E7-30 ap7131-9313CC 00-23-68-93-48-60 1 Fixed 00-23-68-97-04-08:R2 Enabled Yes 7 90 108 56	192
ap7131-9313CC 00-23-68-93-48-60.00-23-68-93-48-60 ap7131-9313CC 00-23-68-93-48-60 0 Root 00-23-68-97-04-08:R2 Enabled Yes 8 88 191 4	0
Neighbors @00-23-68-9E-51-44 (ap7131-9E5144), tme-mcx [00-23-68-99-E7-30]	
Neighbor Name Neighbor MPID.IFID Root Name Root MPID Hops Type Interface Auth-State Resourced Rank LQ% LMet Age	RMet
ap7131-970408 00-23-68-94-B7-80.00-23-68-94-B7-80 ap7131-9313CC 00-23-68-93-48-60	191

And with formatting:

ap7131-9313CC#s Neighbors @00-2	ho wireless meshpo 3-68-93-13-CC (ap	pint neighbor deta 7131-9313CC), tme-	il on d mex [00	efault -23-68-	93-48-60]											
Neighbor Name	Neighbor	MPID.IFID	Root	Name	Root	MPID	RMet	Hops	Туре	Interface	Auth-State	Resourced	Rank	LQ%	LMet	Age
ap7131-9E5144 ap7131-970408	00-23-68-99-E7-30 00-23-68-94-B7-80	.00-23-68-99-E7-30 .00-23-68-94-B7-80	ap7131 ap7131	-9313CC -9313CC	00-23-68 00-23-68	-93-48-60 -93-48-60	192 191	1	Fixed Fixed	00-23-68-93-13-CC:R2 00-23-68-93-13-CC:R2	Enabled Enabled	Yes Yes	5 5	87 90	173 192	12 100
Neighbors @00-2	eighbors @00-23-68-97-04-08 (ap7131-970408), tme-mcx [00-23-68-94-B7-80]															
Neighbor Name	Neighbor	MPID.IFID	Root	Name	Root	MPID	RMet	Hops	Туре	Interface	Auth-State	Resourced	Rank		LMet	Age
ap7131-9E5144 ap7131-9313CC	00-23-68-99-E7-30 00-23-68-93-48-60	00-23-68-99-E7-30 00-23-68-93-48-60	ap7131 ap7131	-9313CC -9313CC	00-23-68 00-23-68	-93-48-60 -93-48-60	192 0	1 0	Fixed Root	00-23-68-97-04-08:R2 00-23-68-97-04-08:R2	Enabled Enabled	Yes Yes	7 8	90 88	108 191	56 4
Neighbors @00-2	3-68-9E-51-44 (ap	7131-9E5144), tme-	мся [00		99-E7-30]											
Neighbor Name	Neighbor	MPID.IFID	Root	Name	Root	MPID	RMet	Hops	Туре	Interface	Auth-State	Resourced	Rank	LQ%	LMet	Age
ap7131-970408 ap7131-9313CC	00-23-68-94-B7-80 00-23-68-93-48-60	.00-23-68-94-B7-80 .00-23-68-93-48-60	ap7131 ap7131	-9313CC -9313CC	00-23-68 00-23-68	-93-48-60 -93-48-60	191 0	1 0	Fixed Root	00-23-68-9E-51-44:R2 00-23-68-9E-51-44:R2	Enabled Enabled	Yes Yes	7 8	88 88	117 192	92 8
Total number of ap7131-9313CC#	meshpoint display	yed: 3														

To get a good view of the tree structure of your meshpoint; that is – the various paths through your devices, use the following:

Below is the output of the "*debug wireless meshpoint on <rf-domain>*" command, which shows a device as it lost power and then came back into the mesh:

```
debug wireless meshpoint on <rf-domain>:
```

ap7131-9313CC#debug wireless meshpoint on default

ap7131-9313CC#

ap7131-9313CC#logging monitor debug

ap7131-9313CC#Jan 02 04:19:14 2012: DOT11: meshpoint:sending mint rem\_link message to dpd for meshpoint 00-23-68-94-B7-80 (mesh.c:1370)

Jan 02 04:19:14 2012: ap7131-9313CC : %AP-6-UNADOPTED: Access Point('ap7131-970408'/'ap71xx'/00-23-68-97-04-08) at rf-domain:'default' unadopted. Radios: Count=2, Bss: 00-23-68-96-28-70|00-23-68-94-B7-80|

Jan 02 04:20:18 2012: ap7131-9313CC : %NSM-6-DHCPDEFRT: Default route with gateway 172.16.10.1 learnt via DHCP

Jan 02 04:20:18 2012: ap7131-9313CC : %NSM-6-DHCPIP: Interface vlan10 acquired IP address 172.16.10.100/24 via DHCP

Jan 02 04:20:18 2012: %AUTHPRIV-4-WARNING: pluto[1488]: Handling received interface related netlink message address [0]

Jan 02 04:21:01 2012: ap7131-9E5144 : %NSM-6-DHCPDEFRT: Default route with gateway 172.16.10.1 learnt via DHCP

Jan 02 04:21:01 2012: ap7131-9E5144 : %NSM-6-DHCPIP: Interface vlan10 acquired IP address 172.16.10.101/24 via DHCP

Jan 02 04:21:34 2012: DOT11: meshpoint:sending mint new\_link message to dpd for meshpoint 00-23-68-94-B7-80 (mesh.c:1356)

Jan 02 04:21:38 2012: ap7131-9313CC : %AP-6-ADOPTED: Access Point('ap7131-970408'/'ap71xx'/00-23-68-97-04-08) at rf-domain:'default' adopted and configured. Radios: Count=2, Bss: 00-23-68-96-28-70|00-23-68-94-B7-80|

Jan 02 04:21:39 2012: ap7131-9313CC : %AP-6-AP\_AUTOUP\_NO\_NEED: AUTOUPGRADE: ap71xx mac 00-23-68-97-04-08 ver 5.4.0.0-047R Autoupgrade not required or not available

Jan 02 04:21:49 2012: ap7131-970408 : %DIAG-6-NEW\_LED\_STATE: LED state message adoptedevent from module cfgd

## 3.1 MCX Status / Troubleshooting Command Reference

Listed are some commands that will be effective in troubleshooting MCX from the CLI:

#### MCX troubleshooting command reference:

show wireless meshpoint on <rf-domain>
show wireless meshpoint neighbor detail on <rf-domain>
show wireless meshpoint path <meshpoint>
show wireless meshpoint tree on <rf-domain>
debug wireless meshpoint on <rf-domain>