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Introduction

This document describes how to trace MAC addresses of a virtual machine (VM) and VMkernel (VMK) interface at these network levels:

- Cisco Nexus 5000 Series Switches
- Cisco Unified Computing System (UCS) 6248 Fabric Interconnect (FI)
- VMware ESXi host
- Cisco Nexus 1000V Switch

It is important to understand which uplink a VM or VMK interface uses for communication for both troubleshooting and design aspects.

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- vPC feature in Cisco NX-OS
- Cisco Unified Computing System
- VMware ESXi
- Cisco Nexus 1000V Switch

Components Used

The information in this document is based on these software and hardware versions:

- Cisco Nexus 5020 Switch Version 5.0(3)N2(2a)
- Cisco Unified Computing System Version 2.1(1d)
- Cisco Unified Computing System B200 M3 Blade Server with Cisco Virtual Interface Card (VIC) 1240 (Palo) CNAvSphere 5.1 (ESXi and vCenter)
- Cisco Nexus 1000V Switch Version 4.2(1)SV2(1.1a)

The information in this document was created from the devices in a specific lab environment. All of

the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Configure

Network Topology

In this example setup, the VM and VMK interfaces are on same host (IP address 172.16.18.236) and the same VLAN 18 (subnet 172.16.18.0/24).

In the Nexus 1000V, the host is represented as Virtual Ethernet Module (VEM) # 5.

In the UCS, the host is installed on blade 1 in chassis 1.



Tracing of MAC Addresses at Different Network Segments

This procedure describes how to trace MAC addresses at various network levels.

1. In the vCenter, find the MAC address of the VM you wish to trace. In this example, the MAC address of the VM (ciscolive-vm) is 0050:568f:63cc:



 Enter the esxcfg-vmknic -I command on the ESXi shell in order to find the MAC address of VMK interface from the host. In this example, the VMK (vmk0) is the management interface and has a MAC address of 0050:56:67:8e:b9:

mc-vsm#	show mac address-	table in	8eb9		
18	0050.5667.8eb9	static	0	Veth19	5
18	0050.5667.8eb9	dynamic	0	Po4	(
mc-vsm#	show mac address-	table in	63cc		
18	0050.568f.63cc	dynamic	93	Po1	3
18	0050.568f.63cc	dynamic	93	Po2	
18	0050.568f.63cc	static	0	Veth56	5
18	0050.568f.63cc	dynamic	93	Po4	(
mc-vsm#					

3. Confirm that the MAC addresses of the VM (ciscolive-vm) and the VMK interface (vmk0) are being learned on the ESXi host (VEM) and the Nexus 1000V.

At the VEM level, enter the **vemcmd show I2 18** command in order to confirm that both MAC addresses are learned:

1. # vanend abox 22 5.8									
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FLAGE 18, main	4 54, **								
Figure P -	PULAR 8 - Amount D								
from the	MIC Address	100	A presented.	FLoor					
85,00,00	88(30).54(88).43(8)	- 73							
804000	88 (50, 54 (87) 54 (85)								
000000	88150.58155145145								
85,65,65	88158156184155192								
TYPERA IN	BE FOR 25125 Faith Sec.	244	23						
formanian.	84-10-54-54-54-58	- 40							
Anatolia .	86 (30) 56 (84) KO (00)								
Creamber	88 (10), 54 (14) he ded								
Cynonite	85 (30) 34 (42) 14 (82	37							
MMO0	88 (50, 54 (82) 13 (36)	- 99							
859550	RE (50, 54 (RE) E3 (55)	- 45							
The ball is a second se	88 1541 56 14PT 88 195	- 14							
TOO WELL	81 -12-54 -84 -84 -54 -54	100							
Anaples .	84-52-54-84-29-35	5.4							
Comunity	81-10-54-10-96	204	1.82						
Anatabar	81.55.54.84.45.45.84								
Creamber	81-00-24-45-44-00	208							
Cynambo	88(30).54(54).78(37)	205							
0930830	88 (50, 54 (87) (5 (77)	205							
The balance is a second	BR 1551 58 1871 85 188		1.11						
TOO WELL	10	100	100						
toownig.	84-52-55-56-84-54-88	244							
Comunity.	84-52-54-62-84-84								
Creanite	86-50-56-86-13-20	204							
Creamber	81.00.04.06.00.00	208							
85,45,310	85 (30, 34 (8E) x3 (3a)								
1000	BRIDE NAMES OF STREET								
1000030	BR 1501 58 1471 37 187								
Translation 1	88158156156158155								
1040.00	and other first of all the task	5.6							
All and the	111132-541471 Balloh								
Comunity	81125 M 122 18 18	204	204						

At the Nexus 1000V level, enter a **show mac address-table** command in order to confirm that both MAC addresses are learned on VLAN 18 on VEM # 5:

mc-vsm#	show mac address-	table in	8eb9			
18	0050.5667.8eb9	static	0	Veth19		5
18	0050.5667.8eb9	dynamic	0	Po4		6
mc-vsm#	show mac address-	table in	63cc			
18	0050.568f.63cc	dynamic	93	Po1	:	3
18	0050.568f.63cc	dynamic	93	Po2	_	4
18	0050.568f.63cc	static	0	Veth56		5
18	0050.568f.63cc	dynamic	93	Po4		6
mc-vsm#						

Enter the **show port-channel summary** command for VEM # 5 in order to see the portchannel and member ports:

mc-vsm	n#						
mc-vsm Flags:	n# show port D - Down I - Indiv s - Suspe S - Switc U - Up (p	-channel P ridual H nded r hed R ort-chan	summary - Up in po - Hot-stan - Module-r - Routed nel)	ort-channel (m dby (LACP on) removed	nembers) ly)		
Group	Port- Channel	Туре	Protocol	Member Port:	5		
1	Pol (SU)	Eth	NONE	Eth3/1(P) Eth3/10(r)	Eth3/2(P)	Eth3/9(r)	
2	Po2 (SU)	Eth	NONE	Eth4/1(P) Eth4/10(P)	Eth4/2(P)	Eth4/9(P)	
3	Po3 (SU)	Eth	NONE	Eth5/1(P) Eth5/10(r)	Eth5/2(P)	Eth5/9(r)	
4	Po4 (SU)	Eth	NONE	Eth6/1(P) Eth6/12(P)	Eth6/2(P)	Eth6/11(P)	

4. Gather additional details from Nexus 1000V.

Enter the **show interface vethernet 56** command in order to see that Veth56 corresponds to the VM (ciscolive-vm):

```
mc-vsm# show interface vethernet 56
Vethernet56 is up
 Port description is ciscolive-vm, Network Adapter 1
 Hardware: Virtual, address: 0050.568f.63cc (bia 0050.568f.63cc)
 Owner is VM "ciscolive-vm", adapter is Network Adapter 1
 Active on module 5
 VMware DVS port 3033
 Port-Profile is vApp-Network
 Port mode is access
 5 minute input rate 80 bits/second, 0 packets/second
 5 minute output rate 12552 bits/second, 8 packets/second
 Rx
   23795 Input Packets 7293075158593488853 Unicast Packets
   203449390 Multicast Packets 4294967761 Broadcast Packets
   2333878 Bytes
 Τx
   1350625 Output Packets 4768 Unicast Packets
   519692101807 Multicast Packets 4321524090 Broadcast Packets 1345857 Flood Packets
   254466737 Bytes
   0 Input Packet Drops 0 Output Packet Drops
```

Enter the **show interface vethernet 19** command in order to see that Veth19 corresponds to the VMK interface (vmk0) of the host:

```
mc-vsm# show interface vethernet 19
Vethernet19 is up
 Port description is VMware VMkernel, vmk0
 Hardware: Virtual, address: 0050.5667.8eb9 (bia 0050.5667.8eb9)
 Owner is VMware VMkernel, adapter is vmk0
 Active on module 5
 VMware DVS port 2110
 Port-Profile is 13
 Port mode is access
 5 minute input rate 12904 bits/second, 1 packets/second
 5 minute output rate 13384 bits/second, 8 packets/second
 Rx
   12200 Input Packets 7310589476873731518 Unicast Packets
   7310589476867241067 Multicast Packets 873444753044241742 Broadcast Packets
   16040625 Bytes
 Τx
   65549 Output Packets 3731 Unicast Packets
   141938759046 Multicast Packets 137454132371 Broadcast Packets 59221 Flood Packets
   12416427 Bytes
   8227343645136678255 Input Packet Drops 210453427045 Output Packet Drops
```

5. Check the pinning of the traffic from the VM (ciscolive-vm) and the VMK interface

m	c-vsm#	module ve	m 5 exe	ecute	vemcmd	show por	t vsm		
	LTL	VSM Port	Admin	Link	State	PC-LTL	SGID	Vem Port	туре
	6	Internal	DOWN	UP	FWD	0		vns	
	8	Internal	UP	UP	FWD	0			
	9	Internal	DOWN	DOWN	FWD	0			
	10	Internal	DOWN	DOWN	FWD	0	0		
	11	Internal	DOWN	DOWN	FWD	0			
	12	Internal	DOWN	DOWN	FWD	0	0		
	14	Internal	DOWN	DOWN	FWD	0			
	15	Internal	DOWN	DOWN	FWD	0			
	16	Internal	DOWN	DOWN	FWD	0		ar	
	17	Eth5/1	UP	UP	FWD	305	0	vmnic0	
	18	Eth5/2	UP	UP	FWD	305	1	vmnic1	
	49	Veth19	UP	UP	FWD	0		vmk0]
	50	Veth23	UP	UP	FWD	0	1	tinian-sa	n.eth0
	51	Veth38	UP	UP	F/B*	0	0	tinian-es	xi-1.eth3
	52	Veth37	UP	UP	F/B*	0	0	tinian-es	xi-1.eth2
	53	Veth22	UP	UP	F/B*	0	1	tinian-es	xi-1.eth1
	54	Veth21	UP	UP	F/B*	0	0	tinian-es	xi-1.eth0
	55	Veth36	UP	UP	F/B*	0	1	tinian-es	xi-2.eth3
	56	Veth35	UP	UP	F/B*	0	0	tinian-es	xi-2.eth2
	57	Veth25	UP	UP	F/B*	0	1	tinian-es	xi-2.eth1
	58	Veth24	UP	UP	F/B*	0	0	tinian-es	xi-2.eth0
	59	Veth43	UP	UP	F/B*	0	1	tinian-es	xi-3.eth3
	60	Veth44	UP	UP	F/B*	0	0	tinian-es	xi-3.eth2
	61	Veth45	UP	UP	F/B*	0	1	tinian-es	xi-3.eth1
	62	Veth46	UP	UP	F/B*	0	0	tinian-es	xi-3.eth0
	63	Veth47	UP	UP	F/B*	0	1	tinian-es	xi-4.eth3
	64	Veth48	UP	UP	F/B*	0	0	tinian-es	xi-4.eth2
	65	Veth49	UP	UP	F/B*	0	1	tinian-es	xi-4.eth1
	66	Veth50	UP	UP	F/B*	0	0	tinian-es	xi-4.eth0
	67	Veth26	UP	UP	FWD	0	1	tinian-vo	.eth0
	68	Veth56	UP	UP	FWD	0	0	ciscolive	-vm.eth0
	69	Veth31	UP	UP	FWD	0	1	maug-vc.e	th0
	75	Veth59	UP	UP	FWD	0	0	mc-ucsc.e	th0
	78	Veth72	UP	UP	FWD	0	1	mc-dc-2.e	th0
	305	Po3	UP	UP	FWD	0			

* F/B: Port is BLOCKED on some of the vlans. One or more vlans are either not created or not in the list of allowed vlans for this port. Please run "vemcmd show port vlans" to see the details. mc-vsm# This output shows the subscriber group ID (SGID) mapping for the VM (ciscolive-vm) and the VMK interface

- SGID 0 of the VM (ciscolive-vm) matches SGID 0 of vmnic0.
- SGID 1 of the VMK interface
- 6. Get the MAC addresses of the VMNICs from either the vCenter or the ESXi command-line interface (CLI).

In the vCenter, navigate to the Configuration tag:



On the ESXi CLI, enter the esxcfg-nics -1 command:

- # esxafg-nics -1													
Name	PCI	Driver	Link	Speed	Duplex	MAC Address	MTU	Description					
vmnic0	0000:06:00.00	enic	Up	20000Mbps	Full	00:25:b5:00:00:5f	1500	Cisco Systems	Inc	Cisco	VIC	Ethernet	NIC
vmnic1	0000:07:00.00	enic	Up	20000Mbps	Full	00:25:b5:00:00:4f	1500	Cisco Systems	Inc	Cisco	VIC	Ethernet	NIC
vmnic2	0000:08:00.00	enic	Up	20000Mbps	Full	00:25:b5:00:00:5c	9000	Cisco Systems	Inc	Cisco	VIC	Ethernet	NIC
vmnic3	0000:09:00.00	enic	Up	20000Mbps	Full	00:25:b5:00:00:4c	9000	Cisco Systems	Inc	Cisco	VIC	Ethernet	NIC
vmnic4	0000:0a:00.00	enic	Up	20000Mbps	Full	00:25:b5:00:00:1d	9000	Cisco Systems	Inc	Cisco	VIC	Ethernet	NIC
vmnic5	0000:0b:00.00	enic	Up	20000Mbps	Full	00:25:b5:00:00:0d	9000	Cisco Systems	Inc	Cisco	VIC	Ethernet	NIC
vmnic6	0000:0c:00.00	enic	Up	20000Mbps	Full	00:25:b5:00:00:3d	9000	Cisco Systems	Inc	Cisco	VIC	Ethernet	NIC
vmnic7	00.00:0d:00.00	enic	Up	20000Mbps	Full	00:25:b5:00:00:2d	9000	Cisco Systems	Inc	Cisco	VIC	Ethernet	NIC
vmnic8	0000:0e:00.00	enic	Up	20000Mbps	Full	00:25:b5:00:00:5d	9000	Cisco Systems	Inc	Cisco	VIC	Ethernet	NIC
vmnic9	0000:0f:00.00	enic	Up	20000Mbps	Full	00:25:b5:00:00:4d	9000	Cisco Systems	Inc	Cisco	VIC	Ethernet	NIC

7. In the UCS Manager (UCSM), find the virtual network interface controllers (vNICs) of the UCS that correspond to the VMNICs:

Servers Law SAN VM Admin							
Filter: Al ·	Actions Change Dynamic	VIEC Connection Policy Not	mic vHDC Connection Pulicy - ing Selected				
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Sevent 5	WECK						
Sever-1-7	A Filer + Doort on	Piet					
A Sub-Organizations	New	MRC Address					
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voort	-@ viac viac-a	00-25-05-00-00-5F	L Served Grater	ACLEOSE 1	A	Desired Placement Any	Actual Pacement
root Server Templete SeanText		00-25-03-00-00-5F	1 2	1	A	Desired Placement Any Any	Adual Pacement
oot III Service Templete Sear/Test 0, 540-Organizations	 VIC: VIC: 0 VIC: VIC: 0 VIC: VIC: 1 VIC: VIC: 2 	01-25-05-00-00-5F 01-25-05-00-00-4F 01-25-05-00-00-5C	1 2 0	1 2 2	A A A A A A A A A A A A A A A A A A A	Desired Placement Any Any Any	Actual Pacement
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The primary FI for vNIC-0 is FI-A, while the primary FI for vNIC-1 is FI-B. You can now infer that traffic from the VM (ciscolive-vm) traverses through FI-A and that traffic from the VMK interface (vmk0) traverses through FI-B.

8. Confirm that the MAC address of the VM (ciscolive-vm) is learned on FI-A:

```
Mike-Cliff-Pod-16-A(nxos) # show mac address-table | in 63cc
* 18
     0050.568f.63cc
                            dynamic 0
                                                F F Veth882
Mike-Cliff-Pod-16-A(nxos)#
Mike-Cliff-Pod-16-A(nxos) # show int vethernet 882
Vethernet882 is up
   Bound Interface is port-channel1288
 Hardware: Virtual, address: 547f.eea2.5ac0 (bia 547f.eea2.5ac0)
 Description: server 1/1, VNIC vNIC-0
 Encapsulation ARPA
 Port mode is trunk
 EtherType is 0x8100
 Rx
    38196726 unicast packets 130708 multicast packets 99167 broadcast packets
   38426601 input packets 44470647026 bytes
   0 input packet drops
 TX
   18711011 unicast packets 552876 multicast packets 10560283 broadcast packets
   29824170 output packets 9379742901 bytes
    0 flood packets
    0 output packet drops
```

9. Confirm that the MAC address of the VMK interface

```
Mike-Cliff-Pod-16-B(nxos) # show mac address-table | in 8eb9
          0050.5667.8eb9
                           dynamic 0
                                                    F (Veth883)
* 18
                                                F
Mike-Cliff-Pod-16-B(nxos)#
Mike-Cliff-Pod-16-B(nxos) # show int vethernet 883
Vethernet883 is up
    Bound Interface is port-channel1287
  Hardware: Virtual, address: 547f.eea3.c7e0 (bia 547f.eea3.c7e0)
Description: server 1/1, VNIC vNIC-1
  Encapsulation ARPA
 Port mode is trunk
 EtherType is 0x8100
 Rx
    30553743 unicast packets 94871 multicast packets 1633080 broadcast packets
    32281694 input packets 32522468006 bytes
    0 input packet drops
  тх
    16919347 unicast packets 588794 multicast packets 8994408 broadcast packets
    26502549 output packets 8364051391 bytes
    0 flood packets
    0 output packet drops
```

10. Check the pinning of these Veths to their uplinks with the show circuit detail command:



Note: Other commands that output similar information are **show pinning serverinterfaces**, **show pinning border-interfaces**, and **show pinning interface vethernet x**.You can also check the pinning in the UCSM:

Epupment Servers LAN SAN IM Admin	General Storage Netw	ork ISCSE vNECs Boot Ord	er Witual Machines FC Zane	s Pakces Server Details FSM	VDF Paths Faults Events			
Filter Al.	ta a dine ⇒	Expert 👸 Print						
a al	Name	Adapter Part	PEX:Heat Part	PEX Network Part	P3 Server Part	WEC	P3 Uplinik	Leik State
0 finan	D - Path A/1	6/PC-1288	km/PC-3025	k#/1005	A/0/1025			
D Tores belles	- Witel Crove	682				9460-0	APC-88	Up
G-A rest	Wital Cruit	884				vA6C-2	A/PC-88	Up
D To Server-1-1	Witel Orbit	886				VRC-4	AFC-88	Up
6CS2 v/8Cx	Citad Oracle	868				9400-6	A/FC-88	Up
	Wittel Orbit	890				9034	APC-88	Up
0-0400	D-Path Kit	6/PC-1287	rght/PC-1153	1001/1153	8,0/1153			
8 - Q VAC VAC-0	What Crop	660				VMC-1	8/PC-89	Up
10	Wital Croit	885				VAC-0	8,PC-89	Up
B	Wittel Crout	887				V400-5	8,90-89	Up
III - Q VAC VAC-4	Virtual Crout	889				W80-7	8,PC-89	Up
8- 40C v48C-5	Wrbal Crout	1891				W8C-9	8,PC-89	Up

- 11. Gather additional details about the port-channels. In this configuration, there are three portchannels in use for each FI. For example, FI-B has three associated port-channels:
 - Port-channel 89 is the Link Aggregation Congrol Protocol (LACP) port-channel between FI-B and the upstream Nexus 5020.
 - Port-channel 1153 is automatically created and is between FI-B and input/output module (IOM)-B.
 - Port-channel 1287 is automatically created and is between IOM-B and Cisco VIC 1240 (blade).
 - 1. Enter the **show port-channel summary** command in order to see the port-channel configuration of FI-B:

<pre>Mike-Cliff-Pod-16-B(nxos)# show port-channel summary Flags: D - Down P - Up in port-channel (members) I - Individual H - Hot-standby (LACP only) s - Suspended r - Module-removed S - Switched R - Routed U - Up (port-channel)</pre>							
Group	Port- Channel	Туре	Protocol	Member Ports			
89	Po89 (SU)	Eth	LACP	Eth1/5(P)	Eth1/6(P)		
1153	Po1153 (SU)	Eth	NONE	Eth1/1(P)	20112/ 3(2)		
1287	Po1287 (SU)	Eth	NONE	Eth1/1/1(P)	Eth1/1/3(P)		
Mike-0	Cliff-Pod-16	-B (nxos) #					

2. Enter the **show cdp neighbors** command in order to discover and view additional information on FI-B:

```
Mike-Cliff-Pod-16-B(nxos) # show cdp neighbors
Capability Codes: R = Router, T = Trans-Bridge, B = Source-Route-Bridge
S = Switch, H = Host, I = IGMP, r = Repeater,
V = VoIP-Phone, D = Remotely-Managed-Device,
s = Supports-STP-Dispute
Device-ID Local Intrfce Hldtme Capability Platform Port ID
SJ-SV-C4K-1 mgmt0 179 R S I WS-C4506 Gig5/40
NSK-Rack16-2(FLC12110027)Eth1/5 163 S I s N5K-C5020P-BA Eth1/22
N5K-Rack16-1(SSI1351055H)Eth1/6 157 S I s N5K-C5020P-BF Eth1/29
mc-vsm(1981308841355189719)Eth1/1/3 160 S I s Nexus1000V Eth5/2
```

3. Enter the **show port-channel summary** command in order to see the port-channel configuration of FI-A:

Mike-C Flags:	<pre>4ike-Cliff-Pod-16-A(nxos)# show port-channel summary ?lags: D - Down P - Up in port-channel (members) I - Individual H - Hot-standby (LACP only) s - Suspended r - Module-removed S - Switched R - Routed U - Up (port-channel)</pre>							
Group	Port- Channel	Туре	Protocol	Member Ports				
38	Po88 (SU)	Eth	LACP	Eth1/5(P)	Eth1/6(P)			
1025	Po1025 (SU)	Eth	NONE	Eth1/1(P)				
1288	Po1288 (SU)	Eth	NONE	Eth1/1/1(P)	Eth1/1/3(P)			
Mike-0	(ike-Cliff-Pod-16-A(nxos)#							

4. Enter the **show cdp neighbors** command in order to discover and view additional information on FI-A:

Mike-Cliff-Pod-16-A(nxos)# show cdp	neighbor	cs		
Capability Codes: R - S - V - s -	- Router, T - Tr - Switch, H - Ho - VoIP-Phone, D - Supports-STP-I	rans-Brid ost, I - - Remote Dispute	lge, B - IGMP, 1 ely-Mana	Source-Rout - Repeater, ged-Device,	e-Bridge
Device-ID	Local Intrfce	Hldtme (Capabili	ty Platform	Port ID
SJ-SV-C4K-1	mgmt0	142 H	RSI	WS-C4506	Gig5/39
N5K-Rack16-2 (FLC12110	0027)Eth1/5	147	SIS	N5K-C50	20P-BA Eth1/10
N5K-Rack16-1 (SSI13510	055H)Eth1/6	121	SIS	N5K-C50	20P-BF Eth1/11
mc-vsm (1981308841355)	189719) Eth1/1/1	167	7 S 1	s Nexus	1000V Eth5/1

12. Determine the specific pinning of the member interface from the port-channel.

Enter a show port-channel command in order to see that the FI-B - VMK interface



Enter a **show port-channel** command in order to see that the FI-A - VM (ciscolive-vm) MAC address is pinned to Ethernet1/5 of port-channel 88:



13. Check that the MAC addresses are learned on the upstream Nexus 5020.

Enter a show mac address-table command in order to see that the VMK interface

```
N5K-Rack16-1#
N5K-Rack16-1# show mac address-table | in 8eb9
* 18 0050.5667.8eb9 dynamic 10 F F <mark>Po89</mark>
N5K-Rack16-1#
```

Enter a **show mac address-table** command in order to see that the VM (ciscolive-vm) MAC address is learned on the Nexus 5020-2:

```
N5K-Rack16-2#
N5K-Rack16-2# show mac address-table | in 63cc
* 18 0050.568f.63cc dynamic 0 F F Po88
N5K-Rack16-2#
```

When you troubleshoot network issues, this example helps you quickly isolate and identify how and where a MAC address is learned and what the expected path is for network traffic.

Verify

Verification procedures are included in the configuration example.

Troubleshoot

This configuration example is intended to help with network troubleshooting.