

VALIDATED REFERENCE DESIGN GUIDE

HPE FLEXFABRIC ZERO TOUCH PROVISIONING

CONTENTS

Introduction	3
Environment 1: With HPE IMC	3
Environment 2: Without HPE IMC	7
For devices without L2 network connectivity to the DHCP server	10

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INTRODUCTION

This document provides guidance on provisioning new HPE FlexFabric Switches in your network automatically, fresh out of the box, without setting up console access into the switch or typing commands manually to configure credentials and enable remote network management access.

Two environments are described in this guide:

- With HPE Intelligent Management Center (IMC)
- Without HPE IMC

ENVIRONMENT 1: WITH HPE IMC

The example configuration described in this section is applicable in environments with HPE IMC already deployed and assumes the new switches will also be deployed in the same IP subnet as the DHCP server. Refer to the last section of this guide for additional configuration steps if the new devices are in a different IP subnet.

Requirements

The following components are required:

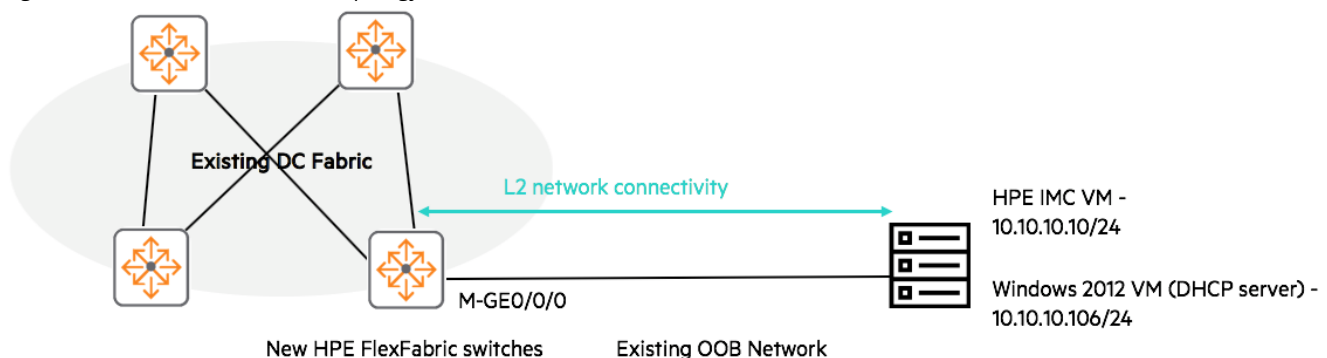
- DHCP server (Windows® server 2012 is used in this example)
- There is no requirement to identify MAC addresses of the new switches for this to function as expected.

Network Topology

The topology as shown in figure 1 will be used to describe environment 1:

- The new HPE FlexFabric Switches will connect into the existing out of band (OOB) management network using their management Ethernet port
- L2 network connectivity exists between the new switches and DHCP server/HPE IMC
- HPE IMC and DHCP server exist on the same subnet

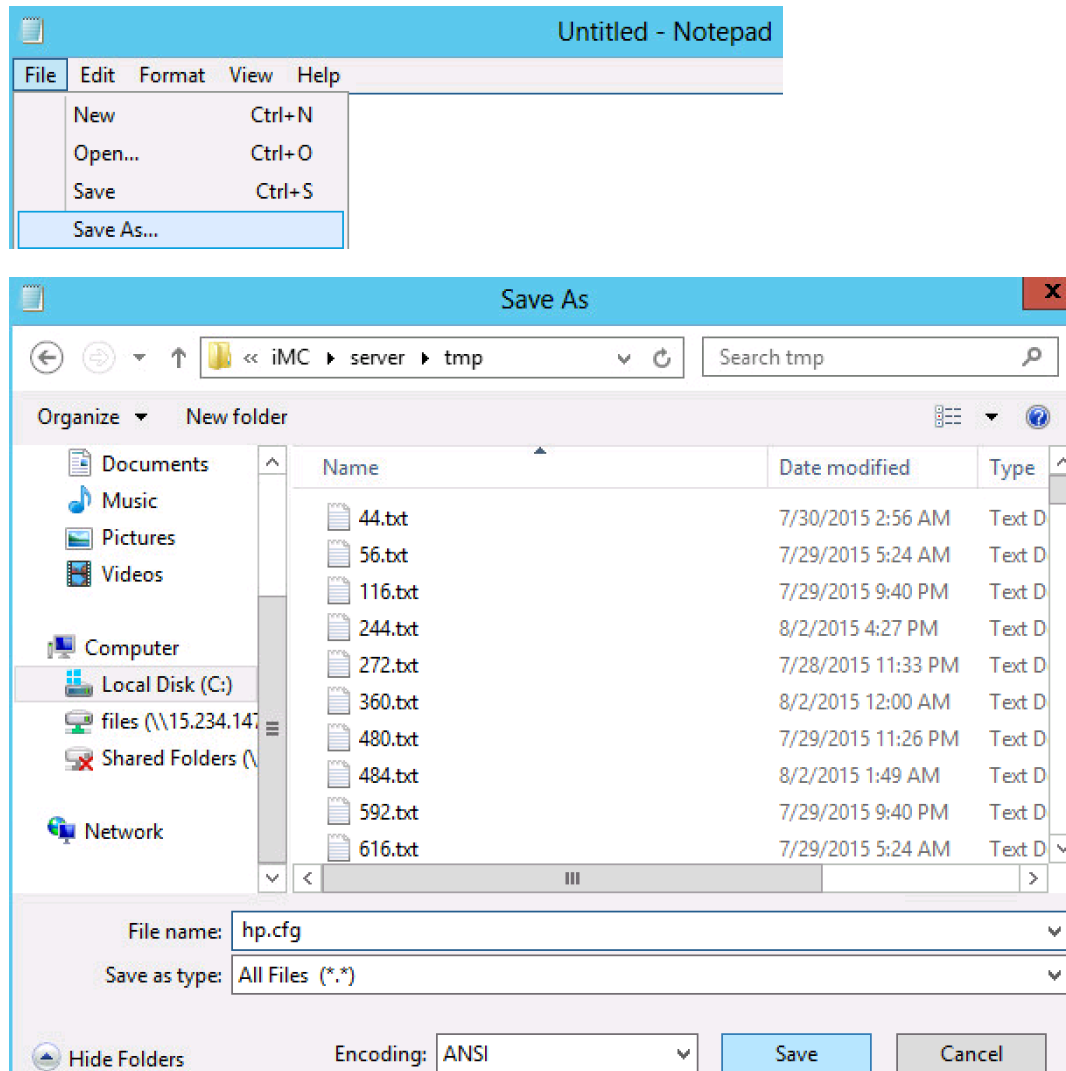
Figure 1. Environment 1 network topology



Step 1.1: HPE IMC configuration

A .cfg file will need to be created in the IMC TFTP directory, by default this directory should be “c:\Program Files\iMC\server\tmp”. As shown in figure 2, launch “Notepad”, “Save As...”, select the correct directory, rename the file as desired, and save. The file name is not fixed, in this example, it is saved as hp.cfg.

Figure 2. cfg file creation in HPE IMC VM



Fill in the .cfg file with your desired switch configuration, here is the sample configuration used, additional configuration may be added as desired, and the values in red should be changed as appropriate.

```
interface M-GigabitEthernet0/0/0
ip address dhcp-alloc
#
telnet server enable
ssh server enable
#
snmp-agent
snmp-agent community read public
```

```
snmp-agent community write private
snmp-agent sys-info version all
#
line vty 0 15
 authentication-mode scheme
#
local-user admin class manage
 password simple password
 service-type telnet ssh
 authorization-attribute user-role network-admin
```

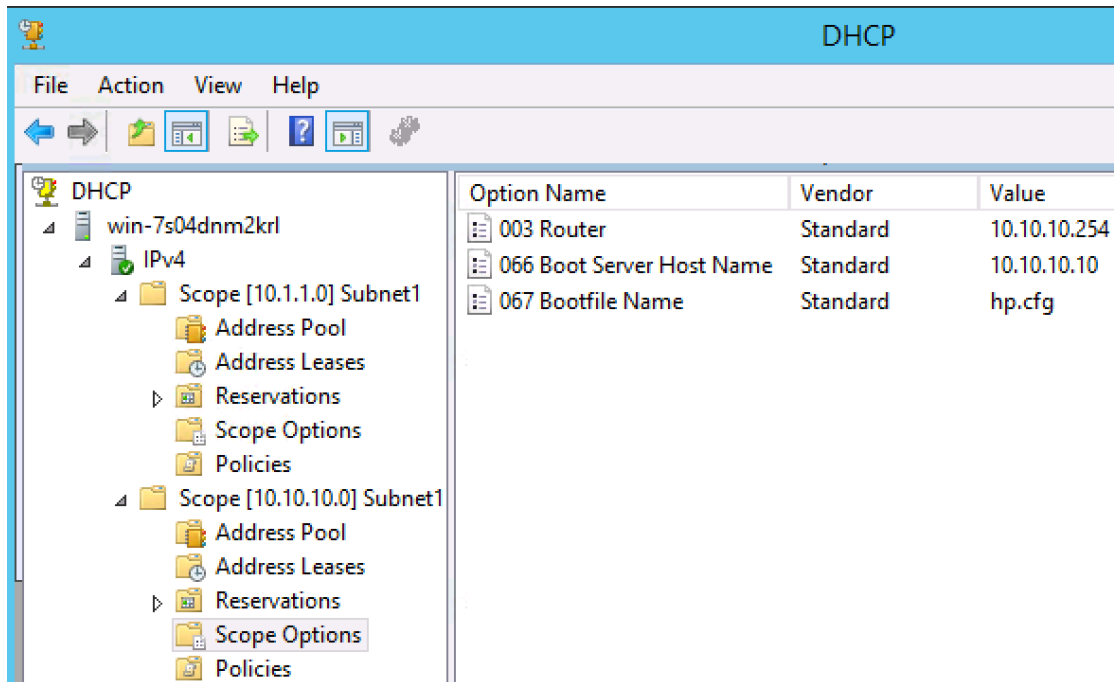
Here is an example of other additional configuration such as VLANs, OSPF, etc., which maybe added into the above .cfg file.

```
vlan 10 to 11
ospf 1
 area 0.0.0.0
 network 192.168.11.0 0.0.0.255
```

Step 1.2: DHCP Server Configuration

As shown in figure 3, configure your DHCP server with its desired network scope, then add two more options. Option 66 will specify the TFTP server IP (HPE IMC), while option 67 will specify the configuration file the new switches should boot up to, as previously created in step 1.1.

Figure 3. DHCP server scope addition



Step 1.3: Connect new switches into the OOB network

With the previous steps done, connect (only the management Ethernet port) and power up the new switches into the OOB network, the following console output as shown in figure 4 should be seen with initial zero touch provisioning complete. The IP address assigned to the switch will be shown.

If console access is not available, the IP addresses assigned in the DHCP server address leases as shown in figure 5 can also be used to identify the IPs and establish remote network management access.

Once initial zero touch provisioning is complete and working as expected, the network administrator can proceed to cable up the remaining ports into the DC fabric and proceed to configure device specifics such as unique “sysname”, static management IP, uplink IPs, etc. Either CLI via remote network management access or IMC could be used to complete the rest of the desired configuration.

Note: This procedure should not disrupt existing switches with saved configuration if they reboot, the existing switches will not initiate the automatic configuration attempt shown below.

Figure 4. New switch boot up

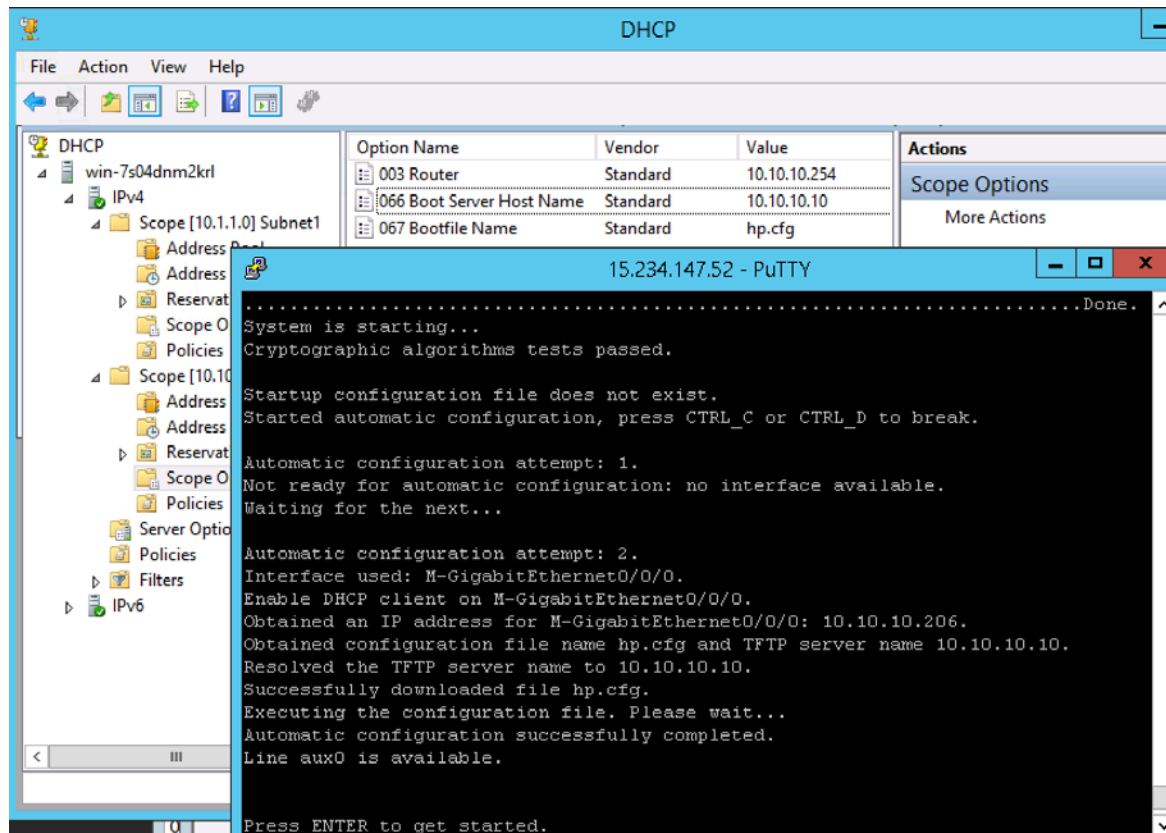


Figure 5. IP address assignment of new switches as seen in DHCP server

Client IP Address	Name	Lease Expiration
10.10.10.200		8/5/2015 11:30:58 AM
10.10.10.201	cumulus	8/5/2015 8:04:23 AM
10.10.10.202		8/4/2015 11:33:40 AM
10.10.10.203		8/4/2015 12:01:50 PM
10.10.10.204		8/4/2015 2:39:28 PM
10.10.10.205		8/5/2015 11:30:51 AM
10.10.10.206		8/5/2015 11:21:42 AM

Example of remote access into the switch

```
<HPE>telnet 10.10.10.206
Trying 10.10.10.206 ...
Press CTRL+K to abort
Connected to 10.10.10.206 ...

*****
* Copyright (c) 2010-2016 Hewlett-Packard Development Company, L.P.          *
* Without the owner's prior written consent,                                *
* no decompiling or reverse-engineering shall be allowed.                    *
*****

login: admin
Password:
<HPE>%Feb 24 02:04:43:191 2016 HPE SHELL/5/SHELL_LOGIN: admin logged in from 10.10.10.206.
```

ENVIRONMENT 2: WITHOUT HPE IMC

The example configuration described in this section is applicable in environments without HPE IMC and assumes the new switches will also be deployed in the same IP subnet as the DHCP server. Refer the last section of this guide for additional configuration guidance if the new devices are in a different IP subnet.

Requirements

The following components are required:

- DHCP server (Windows server 2012 is used in this example)
- TFTP server (3CDaemon application is used in this example and installed on the same Windows server VM)

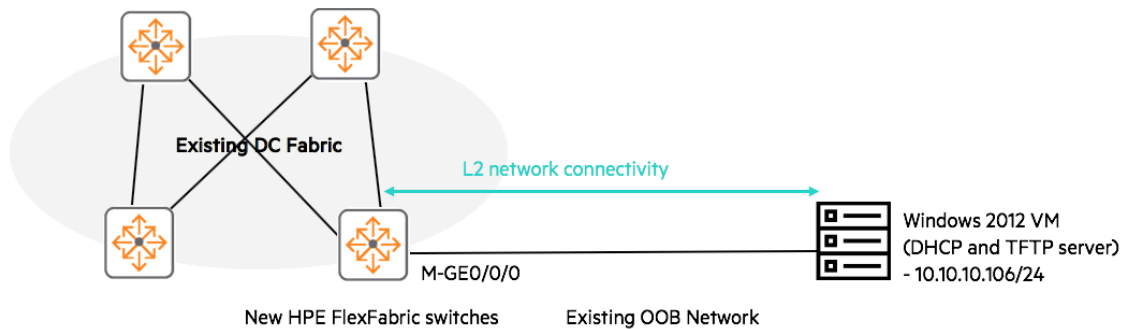
There is no requirement to identify MAC addresses of the new switches for this to function as expected.

Network Topology

The topology as shown in figure 6 will be used to describe environment 2:

- The new HPE FlexFabric Switches will connect into the existing OOB management network using their management Ethernet port
- L2 network connectivity exists between the new switches and TFTP/DHCP server
- TFTP and DHCP server exist on the same subnet

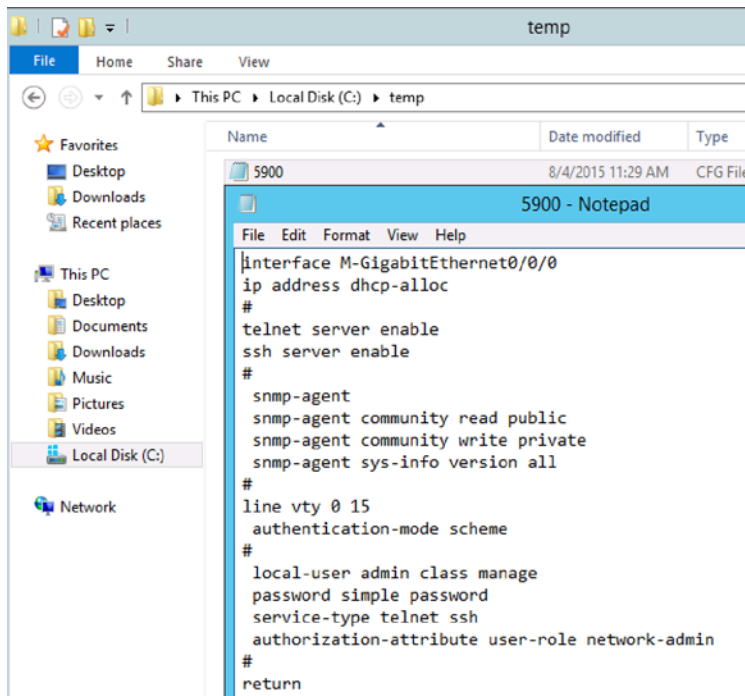
Figure 6. Environment 2 network topology



Step 2.1: TFTP server configuration

A .cfg file will need to be created in the TFTP server directory, this directory will depend on your TFTP server application. Utilize the procedure as previously shown in figure 2, launch “Notepad”, “Save As....”, select the correct directory, rename the file as desired, and save. The file name is not fixed, in this example, it is saved as 5900.cfg as shown in figure 7.

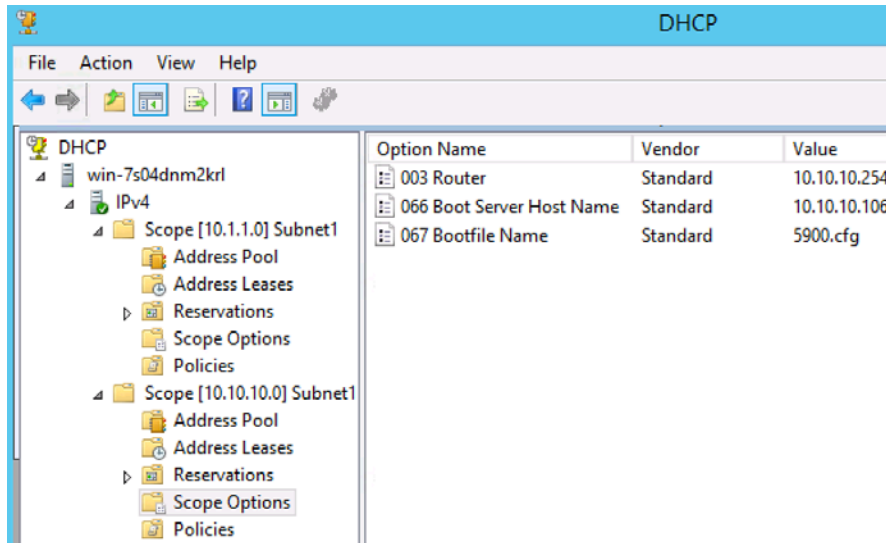
Figure 7. cfg creation in TFTP server



Step 2.2: DHCP server configuration

As shown in figure 8, configure your DHCP server with its desired network scope, then add two more options. Option 66 will specify the TFTP server IP (same IP as the DHCP server), while option 67 will specify the configuration file the new switches should boot up to, as previously created in step 2.1.

Figure 8. DHCP server scope addition



Step 2.3: Connect new switches into the OOB network

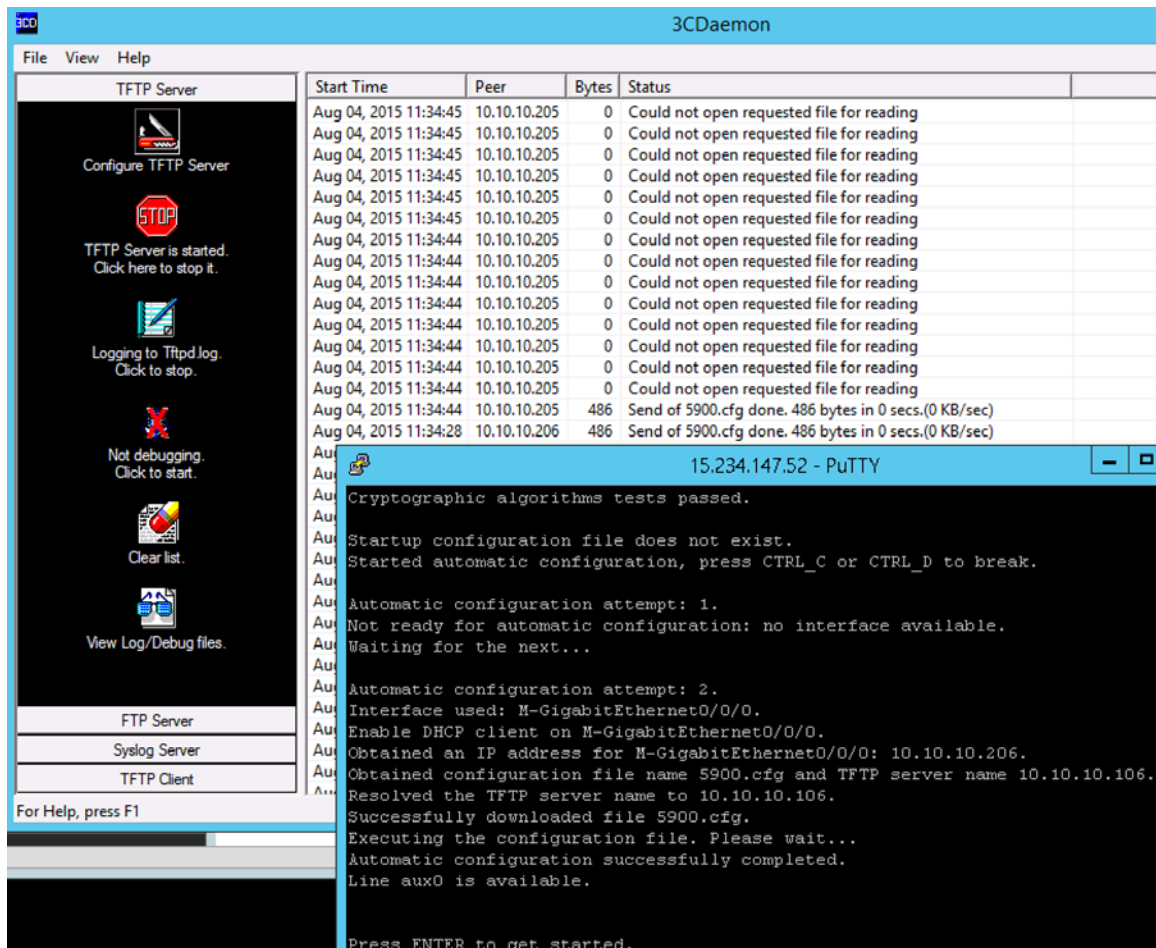
With the previous steps done, connect (only the management Ethernet port) and power up the new switches into the OOB network, the following console output as shown in figure 9 should be seen with initial zero touch provisioning complete. The IP address assigned to the switch will be shown, the TFTP server console should state the .cfg file was sent as expected.

If console access is not available, the IP addresses assigned in the DHCP server address leases as previously shown in figure 5 can also be used to identify the IPs and establish remote network management access.

Once initial zero touch provisioning is complete and working as expected, the network administrator can proceed to cable up the remaining ports into the DC fabric and configure device specifics such as unique “sysname”, static management IP, uplink IPs etc. As IMC is not available to complete the rest of the desired configuration, CLI via remote network management access will have to be used in this environment.

Note: This procedure should not disrupt existing switches with saved configuration if they reboot, the existing switches will not initiate the automatic configuration attempt shown below.

Figure 9. New switch boot up



FOR DEVICES WITHOUT L2 NETWORK CONNECTIVITY TO THE DHCP SERVER

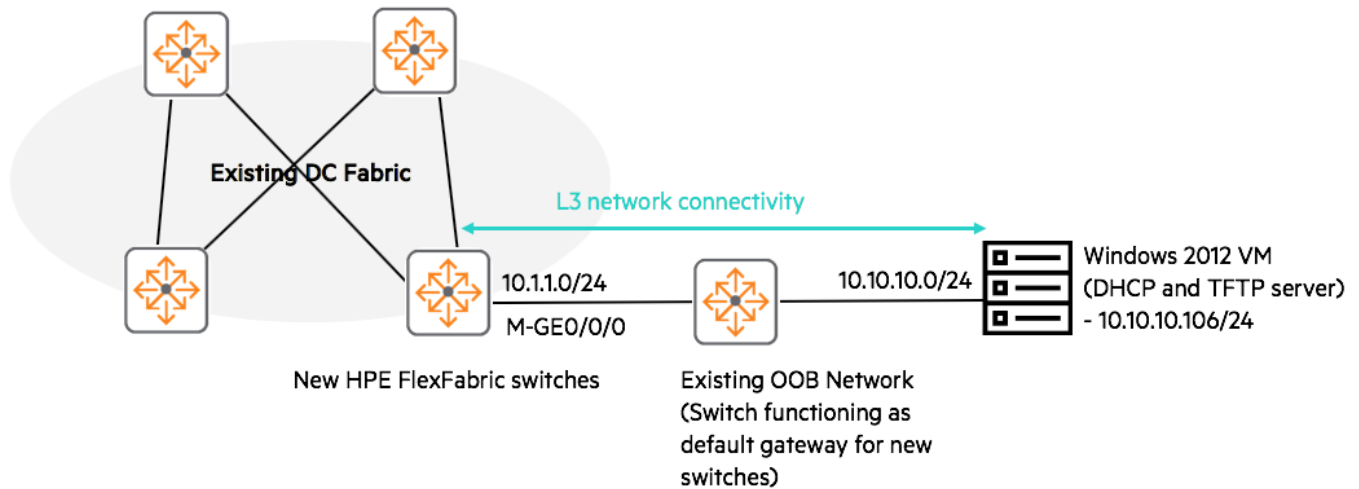
This section is applicable for environments where the new switches need to be deployed in a different subnet from the DHCP server, the procedures from environment 1 and 2 are still applicable, the only additional configuration required is DHCP relay on the default gateway switch.

Network topology

The topology as shown in figure 10 will be used to describe this environment:

- The new HPE FlexFabric Switches will connect into the existing network using their management Ethernet port
- L3 network connectivity exists between the new switches and TFTP/DHCP server

Figure 10. L3 network topology



Additional step: DHCP relay on default gateway configuration

As shown below, the following configuration can be added for the default gateway to function as a DHCP relay.

```
dhcp enable
#
interface Vlan-interface1
 ip address 10.1.1.1 255.255.255.0
 dhcp select relay
 dhcp relay server-address 10.10.10.106
```

The following display command can be used to verify DHCP relay requests.

```
[12504core]dis dhcp relay statistics
DHCP packets dropped: 0
DHCP packets received from clients: 4
  DHCPDISCOVER: 2
  DHCPREQUEST: 2
  DHCPINFORM: 0
  DHCPRELEASE: 0
  DHCPDECLINE: 0
  BOOTPREREQUEST: 0
DHCP packets received from servers: 4
  DHCPOFFER: 2
  DHCPACK: 2
  DHCPNAK: 0
  BOOTPREPLY: 0
DHCP packets relayed to servers: 4
  DHCPDISCOVER: 2
  DHCPREQUEST: 2
  DHCPINFORM: 0
  DHCPRELEASE: 0
  DHCPDECLINE: 0
  BOOTPREREQUEST: 0
DHCP packets relayed to clients: 4
  DHCPOFFER: 2
```

DHCPACK:	2
DHCNNAK:	0
BOOTPREPLY:	0
DHCP packets sent to servers:	0
DHCPDISCOVER:	0
DHCPREQUEST:	0
DHCPINFORM:	0
DHCPRELEASE:	0
DHCPDECLINE:	0
BOOTPREQUEST:	0
DHCP packets sent to clients:	0
DHCPOFFER:	0
DHCPACK:	0
DHCNNAK:	0
BOOTPREPLY:	0

The following will be shown on the switch console to verify DHCP IP assignment and the correct .cfg file.

```
Loading file flash:/5930-cmw710-system-d2420.bin.....
.....Done.
Loading file flash:/5930-cmw710-boot-d2420.bin.....Done.

Image file flash:/5930-cmw710-boot-d2420.bin is self-decompressing.....
.....Done.
System is starting...
Cryptographic algorithms tests passed.

Startup configuration file does not exist.
Started automatic configuration, press CTRL_C or CTRL_D to break.

Automatic configuration attempt: 1.
Not ready for automatic configuration: no interface available.
Waiting for the next...

Automatic configuration attempt: 2.
Interface used: M-GigabitEthernet0/0/0.
Enable DHCP client on M-GigabitEthernet0/0/0.
Obtained an IP address for M-GigabitEthernet0/0/0: 10.1.1.60.
Obtained configuration file name 5900.cfg and TFTP server name 10.10.10.106.
Resolved the TFTP server name to 10.10.10.106.
Successfully downloaded file 5900.cfg.
Executing the configuration file. Please wait...
Automatic configuration successfully completed.
Line aux0 is available.
```

Press ENTER to get started.

