F5 Private Cloud Solutions Documentation

F5 Networks, Inc.

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Agility 2019 Hands-on Lab Guide

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Class 1: F5 Private Cloud Solutions for Openstack

1.1 Getting Started

During this lab you will learn how to:

- · Install the F5 LBaaS Agent using Ansible
- Deploy Basic L4-L7 services using LBaaS
- Deploy enhanced L4-L7 services using ESD.

1.1.1 About OpenStack

OpenStack provides an Open Source Infrastructure As-A Service (IaaS) solution that provides a framework for provisioning Network, Compute, and Storage in an automated and repeatable manner.

1.1.2 About LBaaS

Load Balancing As-A Service (LBaaS) is a community standard around providing Load Balancing as a standardized service within OpenStack. The current version, LBaaS v2, provides basic L4-L7 capabilities.

1.1.3 About F5 & OpenStack

F5 can be deployed in two ways in an OpenStack environment. The two methods are a **undercloud** or **overcloud** deployment. It is possible to use one or both of these methodologies when deploying F5 & OpenStack.

Undercloud: LBaaS

Undercloud commonly refers to a deployment where the BIG-IP device (physical or virtual) is outside of the OpenStack environment. Typically this is done with physical hardware to provide a multi-tenant environment and used with LBaaS.

Overcloud: HEAT

Overcloud refers to a deployment where a BIG-IP Virtual Edition (VE) is provisioned within a tenant network as a virtual machine within OpenStack Nova. In this scenario the BIG-IP is in a similar topology to other tenant virtual machines. When deploying in overcloud OpenStack HEAT templates (automation templates) are commonly used to deploy the BIG-IP device. A customer can manage the BIG-IP device through traditional methods, HEAT templates, and/or other automation templates.

It is also possible to deploy a BIG-IP VE in an overcloud deployment and use LBaaS. In this deployment you are limited by the number of interfaces currently supported on BIG-IP VE can use (9 data & 1 mgmt).

1.1.4 Under or Over?

The decision to use one method or both will depend on customer requirements. An undercloud deployment using LBaaS is well suited to providing basic services that can be provided in a multi-tenant manner. Overcloud is well suited to providing access to features and functions that may not be exposed via LBaaS or provide per-tenant services.

1.2 Lab Topology

The current Lab Environment looks like the following:



You will be connecting via RDP to a Windows host to perform all the steps in this lab.

1.2.1 Lab Components

The following table lists VLANS, IP Addresses and Credentials for all components:

Component	VLAN/IP Address(es)	Credentials
Windows RDP Host	• 10.0.10.50	student/[Viewable in Ravello]
OpenStack	• 10.0.10.10	student / [SSH Key]
BIG-IP	• 10.0.10.20	admin/admin

1.2.2 Connecting to the Lab Environment

Please follow the instructions provided by the instructor to start your lab and access your jump host by clicking on this "rdp" host link.



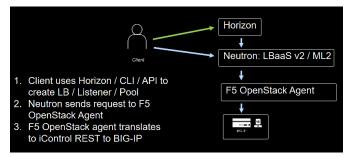
Note: All work for this lab will be performed exclusively from the Windows jumphost. No installation or interaction with your local system is required.

1.3 Installing the F5 LBaaS Agent

Two pieces of software are required to use F5 BIG-IP with OpenStack LBaaS.

- 1. F5 LBaaS Driver
- 2. F5 OpenStack Agent.

The F5 LBaaS driver communicates with F5 OpenStack Agent that will then use F5 iControl REST to update the BIG-IP configuration.



The following lab will first guide you through using both the OpenStack GUI/CLI.

You will then install the required software via an Ansible automation script.

1.3.1 Login to OpenStack CLI

Verify OpenStack environment

The first exercise is to use the OpenStack CLI to verify the environment.

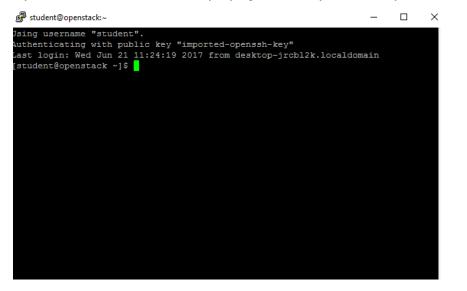
First Launch Putty from the Desktop.



Click on "OpenStack All-In-One", select load, then click "Open".

🕵 PuTTY Configuration		? >	×
Category:			
E Session	Basic options for your PuTTY sea	ssion	
	Specify the destination you want to connec	ct to	
⊡ ·· Terminal Kevboard	Host Name (or IP address)	Port	
Bell		22	
Features	Connection type:	◯ Serial	
… Appearance … Behaviour … Translation … Selection … Colours ⊡ Connection … Data … Proxy … Telnet	Load, save or delete a stored session Saved Sessions Default Settings Openstack All-In-One	Load Save Delete	
Rlogin ⊕-SSH Serial	Close window on exit: Always Never Only on closed	ean exit	
About Help	Open	Cancel	

If you fail to connect on the first try, try again. When you connect you should see.



Type source keystonerc_demo. The prompt should change from:

[student@openstack ~]\$

To:

```
[student@openstack ~(keystone_demo)]$
```

Run neutron subnet-list and you should see

[student@openstack ~(k	eystone_demo)]\$ ne	utron subnet-lis	t
- id	name	cidr	allocation_pools
0c03d2f4-a60a-4869- a378-e46e5cf47eac 	internal-subnet 	10.1.100.0/24 	<pre> {"start": "10.1.100.100", "end": "10.1.100.200"}</pre>

Please ask for assistance if you do not see the correct output. Leave this window open, it will be used throughout the lab.

1.3.2 Deploy Backend Instances

During the previous excercise we made use of the OpenStack CLI. OpenStack also has a web gui, Horizon, that can be used. The following will deploy two backend web servers that will be used later in the lab.

Launch Google Chrome and click on the "Login – OpenStack..." bookmark.



Login to Horizon (OpenStack GUI) using the username: demo, password: demo

	openstack DashBoard	
Log in		
User Name		
demo		
Password		
****		۲
		Connect

You should see.

Instance Overview - Oper >						— - u ^
← → C (10.10.10/0	dashboard/project/					무 ☆ :
🔢 Apps 🧧 Login - OpenStacl	k Da 🚯 BIG-IP® - bigip.my-la					
🧧 openstack	📼 demo 👻					🚢 demo 👻
Project	Overview					
Compute	Limit Summary					
Overvie	ew					
Instanc	ies			(\prime)		
Volum	lnstances	VCPUs	RAM	Floating IPs	Security Groups	Volumes
Imag	Used 0 of 10	Used 0 of 20	Used 0 of 51,200	Used 1 of 50	Used 2 of 10	Used 0 of 10
Access & Secur	ity					
Network	• I I I I I I I I I I I I I I I I I I I					
	Volume Storage					
Orchestration	Vsed 0 of 1,000					
Object Store	Usage Summary					
Identity	Select a period of tir	ne to query its usage:				
	From: 2017-06-01	To: 2017-06-21	Submit The date should be in YYYY-mm	-dd format.		
		Bytes This Period's VCPU-Hours: 0.04 This P	eriod's GB-Hours: 0.04 This Period's I	RAM-Hours: 22.33		
	Usage					Lownload CSV Summary
	Instance Name	VCPUs	Disk	RAM	Time since created	
			No items	s to display.		

Click on "Instances" and then "Launch Instance" (top right of page).

Launch Instance

For the Instance name specify "server" for the count enter "2". Then click next.

Instance Name *	
server	
Availability Zone	
nova	٣
Count *	
2	

Click on the "+" next to "f5demo". Then click next.

f5demo	6/29/17 1:34 A	124.69 MB	QCOW2	Duble		
Isdemo	M	124.69 MD	QCOVVZ	Public	Ŧ	

Click on the "+" next to "m1.tiny". Then click next.

> m1.tiny 1 512 MB 1 GB 1 GB 0 GB Yes	+	
---	---	--

Click on the "+" next to "internal" Network. This step should have been completed for you since the internal network is the only network available. Then click on next TWICE until you are on the Security Groups tab.

Internal internal-subnet No Up Active +	+	Active	Up	No	internal-subnet	> internal	>
---	---	--------	----	----	-----------------	------------	---

On the Security Groups tab click on the "+" next to "default-allow-all". Then click next.

> default-allow-all +

Click on the "+" next to "demo-key-pair" and the click on "Launch Instance". This step should have been completed for you since the demo-key-pair is the only available key pair.



You should now see them starting.

Instances Instance Name = v Filter 🔷 Launch Instance 💼 De More Actions nces Instance Name Image Name IP Address Size Key Pair Status Availability Zone Task Power State Time since created Actions cirros image □ server-2 m1.tiny Scheduling No State 0 minutes Associate Floating IP demo-key-pair Build nova server-1 cirros image m1.tiny demo-key-pair No State 1 minute Associate Floating IP Build nova Displaying 2 items

Once the instance status is "active" on "server-1" then "Log" you should see

Instances / server-1

```
Overview Log Console Action Log
```

Instance Console Log

```
Welcome to Alpine Linux 3.6
Kernel 4.9.32-0-virthardened on an x86_64 (/dev/tty50)
alpine login:
```

1.3.3 Install Driver/Agent

Complete directions for installing the Driver/Agent can be found at: http://f5-openstack-lbaasv2-driver. readthedocs.io/en/mitaka/map_quick-start-guide.html

During this lab we will be using Ansible (a Systems/Network automation tool) to automate the installation. The Ansible module that is being used in this lab can be found at: https://github.com/f5devcentral/ f5-openstack-ansible

Install via Ansible

Open your Putty Window (Directions in Login to OpenStack CLI if you closed the Window).

Change your directory by typing cd f5-openstack-ansible/playbooks

[student@openstack ~]\$cd f5-openstack-ansible/playbooks/

Now run

You should see.

TASK [configure_lbaasv2_agent : Start F5 OpenStack Agent] ************************************
TASK [Restart neutron-metadata-agent] ************************************
TASK [Restart neutron-dhcp-agent] ************************************
TASK [Restart neutron-13-agent] ************************************
TASK [Restart neutron-openvswitch-agent] ************************************
TASK [Restart Neutron] ************************************
PLAY RECAP ************************************
[student@openstack playbooks]\$

Change back to your home directory by typing cd.

Now type source keystonerc_admin and you should see a prompt that looks like:

[student@openstack ~(keystone_admin)]\$

Expand the window to full screen and type. neutron agent-list

	agent_type	host	availability_zone		admin_state_up	binary
20c8f652-3e0c-4d26-9f21-52e9fba62b95	Metadata agent	openstack.my-lab	+ 	+ :-)	True	neutron-metadata-agent
2528f3eb-e9b6-4336-926e-5e921e71cbd9	L3 agent	openstack.my-lab	nova		True	neutron-13-agent
299fe424-dd7d-4533-ad33-eae83b49f90a	DHCP agent	openstack.my-lab	nova		True	neutron-dhcp-agent
5f92bcf6-bd14-474e-a5f2-07864623e421	Loadbalancerv2 agent	openstack.my-lab:3b6ed4b9-082f-58e7-9023-0d98339b8962			True	f5-oslbaasv2-agent
5401a932-d0d2-4e64-a7de-0bf91c87e397	Open vSwitch agent	openstack.my-lab			True	neutron-openvswitch-agen
ff731693-b615-40aa-a937-96abaef3e913	Metering agent	openstack.my-lab			True	neutron-metering-agent

There should be a table that contains the following information.

agent_type	alive	admin_state_up	binary
Loadbalancerv2 agent	:-)	True	f5-oslbaasv2-agent

Now type source keystonerc_demo to restore your prompt to the demo user.

[student@openstack ~(keystone_demo)]\$

1.4 Deploying Basic L4-L7 Services using LBaaS

There's multiple ways of provisioning F5 Services via OpenStack LBaaS including.

- 1. Horizon GUI
- 2. CLI
- 3. OpenStack API

Today we will be covering the first two options.

1.4.1 Lab 1.4: Deploy L4-L7 via Horizon

The F5 LBaaS integration will configure the Networking on the BIG-IP to connect to the OpenStack network. From Chrome click on the "BIG-IP" bookmark and login with the credentials "admin / admin". Observe that there is only a single partition "Common".

Also note only one self-ip in Route Domain 0.

.017 User. admin (PDT) Role: Administrato	r			Pa	artition: Common 🔻	
					Common	
					All [Read Only]	
Mpana anta ana ana ang						
Network » Self IPs						
🔅 👻 Self IP List						
*		Search				
🖌 🗢 Name	Application	IP Address	Netmask	VLAN / Tunnel	Traffic Group	÷ I
		10.0.10.20		Dataplan		

Switch back to the OpenStack Horizon tab inside Chrome and do a forced refresh (Shift+[Reload]).

penstack	🚍 demo 👻		
Project ^	Overview		
Compute ~	Limit Summary		
Network ^			
Networks	Instances	VCPUs	RAM
Routers	Used 2 of 10	Used 2 of 20	Used 1,024 of 51,200
Load Balancers			

You should now see a new menu item under "Network".

If you do not see "Load Balancers" verify that the Loadbalancer Agent is running from the previous lab. Click on the "Load Balancers" menu item, then click on "+Create Load Balancer".



Complete the following information.

Important: Make sure to use the values below and not the GUI defaults!

Load Balancer Details

name	value
Name	lb1
Subnet	internal-subnet

Listener Details

name	value
Name	listener1
Protocol	HTTP
Port	80

Pool Details

name	value
Name	pool1
Method	ROUND_ROBIN

Pool Members

name	port
server-1	80
server-2	80

Monitor type

name	value
Monitor type	HTTP

Then click on "Create Load Balancer"

Load Balancer Details	Provide the details for the health more	nitor.	6
	Monitor type *		
Listener Details	HTTP		
Pool Details	Health check interval (sec) * 🛛 🖗	Retry count before markdown * 📀	Timeout (sec) *
Pool Members	5	3	5
Monitor Details	HTTP method	Expected HTTP status code 🛛 🔞	URL path
	GET v	200	1

On the BIG-IP take a look at the Partition. You should see that a new partition was created.



Change to that partition and inspect the Self IPs items under Network. You should see that a VXLAN tunnel that was created connected to the tenant network. Verify the tenant network is the internal network from viewing the neutron subnet-list command you ran in the previous lab.

Net	work » Self IPs						
\$	Self IP List						
*	Search						
	♦ Name	Application	IP Address	Netmask	VLAN / Tunnel	Traffic Group	Partition / Path
	local-bigip1-068dccc5-6c34-4d75-ba2e-d9f274e0825f		10.1.100.104%1	255.255.255.0	tunnel-vxlan-33	traffic-group-local-only	Project_e9363ad706454847b
	self-dataplane		10.0.10.20	255.255.255.0	Dataplan	traffic-group-local-only	Common
De	ete						

Under Network Map you will see the entries that were created by LBaaS via the Horizon Panel.

Local Traffic Network Map					
Project_c4160830-898e-4744-995b-0c4cbfe8f619					
Project_5a28cfe3-050c-4b4b-8838-0cbf470ba90e					
10.1.100.101%1:80					
10.1.100.102%1:80					

Observe that the BIG-IP Pool name uses the OpenStack Pool ID from the load balancer configuration. Horizon>Network>Load Balancers>Ib1>Listeners>Listener 1 – Default Pool ID

(yours will differ in value from the example).

Load Balancers / Ib1 / listener1

Protocol	HTTP
Protocol Port	80
Connection Limit	Unlimited
Admin State Up	Yes
Default Pool ID	5a28cfe3-050c-4b4b-8838-0cbf470ba90e
Listener ID	c4160830-898e-4744-995b-0c4cbfe8f619
Tenant ID	e9363ad706454847bef0562767a667e6
Listener ID	c4160830-898e-4744-995b-0c4cbfe8f619

To test this configuration we will need to add a Floating IP to be able to access the Tenant Subnet externally. On the main "Load Balancers" page, click on the downward arrow next to "Edit" and select "Associate Floating IP"

Load Balancers

Q	Filter		+ Create Load Bal	lancer 📋 Delete	Delete Load Balancers		
	Name 📤	Description	Operating Status	Provisioning Status	IP Address	Listeners	Actions
	> lb1	-	Online	Active	10.1.100.103	1	Edit
Displ	laying 1 item						Floating IP .oad Balancer

Specify the "public" pool.

Associate Floating IP Address

Select a floating IP address to associate with the load balancer or a floating IP pool in which to allocate a new floating IP address.
Floating IP address or pool *
public

Cancel

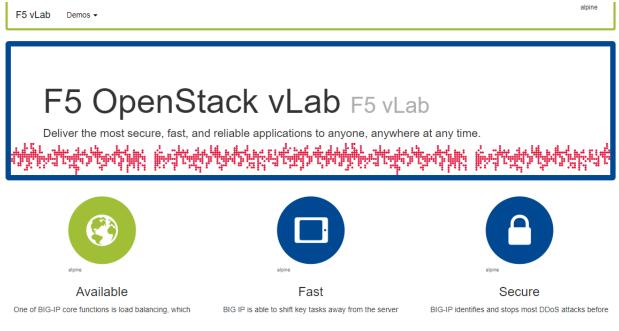
And click "Associate". Click on "lb1" and you will see the Floating IP Address.

Load Balancers / Ib1

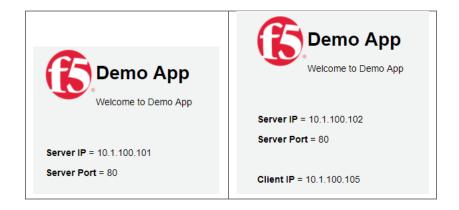
IP Address 10.1.100.103 Operating Status Online Provisioning Status Active

Overview	Listeners	
Provider		f5networks
Admin State L	Jp	Yes
Floating IP Ad	Idress	10.0.10.101
Load Balance	r ID	0d869c25-fa0b-4730-8b5d-3402a1ad9a22
Subnet ID		068dccc5-6c34-4d75-ba2e-d9f274e0825f
Port ID		11a715e0-9294-44cd-9f54-7718a22cdfa4

Enter this value into the Chrome URL and you should see (colors may vary, there's a chance they may be the same).



Adding "/simple.shtml" you can see the Server IP and see the service being load balanced.



1.4.2 Lab 1.5: Deploy L4-L7 via CLI

In addition to using the Horizon GUI panel you can also provision LBaaS via the command-line. From your Putty window run the following commands:

See also Text file of commands.

```
neutron lbaas-loadbalancer-create --name lb2 internal-subnet
neutron lbaas-listener-create --name listener2 --loadbalancer lb2 --protocol TCP --
oprotocol-port 22
neutron lbaas-pool-create --name pool2 --lb-algorithm ROUND_ROBIN --listener_
oplistener2 --protocol TCP
neutron lbaas-member-create --subnet internal-subnet --address 10.1.100.101 --
oprotocol-port 22 pool2
neutron lbaas-member-create --subnet internal-subnet --address 10.1.100.102 --
oprotocol-port 22 pool2
neutron lbaas-healthmonitor-create --delay 3 --type TCP --max-retries 3 --timeout 3 --
opool pool2
```

Verify on the BIG-IP that you see the new Virtual Server deployed.

1.5 Deploying Enhanced L4-L7 Services using ESD

LBaaS only provides a subset of the capabilities of an F5 BIG-IP. The following exercise will demonstrate how to provide a way to extend LBaaS through the use of custom policies.

1.5.1 Deploy Enhanced L4-L7 via ESD

In addition to supporting LBaaS v2 capabilities, the F5 OpenStack LBaaS integration can support Enhanced Service Definitions to expose F5 specific capabilities. The following exercise will modify the TCP profiles that we created on our first listener.

First take a look at the existing TCP configuration on the BIG-IP. Observe that it is using the default TCP profile.

Configuration: Basic •						
Protocol	TCP					
Protocol Profile (Client)	tcp 🔻					
Protocol Profile (Server)	(Use Client Profile)					
HTTP Profile	http 🔹					

From your Putty window run.

```
neutron lbaas-17policy-create --listener listener1 --name esd_demo_3 --action REJECT
```

You should see the following output.

• • •	-(keystone_demo)]\$ neutron lbaas-17policy-createlistener 1 _demo_3action REJECT _tcy:
Field	Value
<pre> admin_state_up description id listener_id name position redirect_pool_id redirect_url rules</pre>	REJECT True 8336d41d-3c00-47ea-9d03-437632ea3423 f023d320-fbb7-4a9d-a8ec-1b6ea53f1e45 esd_demo_3 1 e9363ad706454847bef0562767a667e6

Refresh your window on the BIG-IP and you will see that the TCP profile has changed.

Configuration: Basic 🔻						
Protocol	TCP T					
Protocol Profile (Client)	tcp-wan-optimized •					
Protocol Profile (Server)	tcp-lan-optimized •					
HTTP Profile	http 🔻					
575 5 F						

Now from your Putty window run.

cat /etc/neutron/services/f5/esd/demo.json

You will see the definition that we referenced earlier.



In addition to TCP profiles you can also add iRules, Local Traffic Policies, client/server SSL profiles, and modify session persistence.

Class 2: Deploying Cisco APIC with F5 iWorkflow and BIG-IP

About This Solution

The **Cisco Application Policy Infrastructure Controller** (Cisco APIC) is the unifying point of automation and management for the **Cisco Application Centric Infrastructure** (Cisco ACI[™]) fabric. The Cisco APIC provides centralized access to all fabric information, optimizes the application lifecycle for scale and performance, supporting flexible application provisioning across physical and virtual resources.

For additional information, visit www.cisco.com/go/apic.

About This Demonstration

This preconfigured demonstration includes:

- Scenario 1: Deploy Service Graph using F5 iApps in Cisco ACI with F5 iWorkflow
- Scenario 2: Modify L4 L7 deployed graph parameters
- Scenario 3: Remove APIC Service Graph
- · Scenario 4: Using POSTMAN REST client to deploy service graph

There are two options to complete each lab task

- (1) Using iWorkflow and APIC UI Scenario 1
- (2) Using POSTMAN REST client (APIC Only) Scenario 4

The goal of ACI is to accelerate application deployment by building L4-L7 policy into Cisco ACI model. We recommend using the REST client model as the most effective way to execute the APIC portion of the lab; for BIG-IP and iWorkflow, please continue to use the UI. You are encouraged to use the UI screen shots as a reference to the tasks executed by POSTMAN.

2.1 Demonstration Requirements

Required	Optional
• Laptop	Cisco AnyConnect

2

2.1.1 Demonstration Configuration

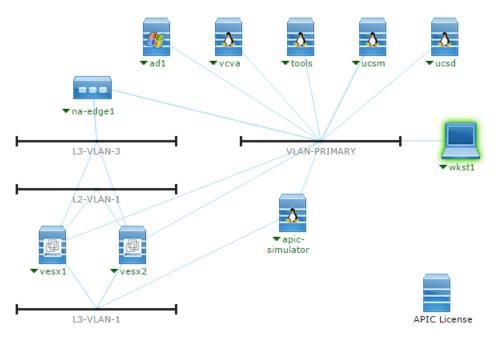
This demonstration contains preconfigured users and components to illustrate the scripted scenarios and features of this Cisco solution. All access information needed to complete the demonstration scenario, is located in the **Topology** and **Servers** menus of your **active demonstration**, and throughout this script.

- **Topology Menu**. Click on any server in the topology to display the available server options and credentials.
- Servers Menu. Click on 🗉 or **>** next to any server name to display the available server options and credentials.

2.1.2 Demonstration Topology

The following is the virtual demonstration topology, which consists of the following virtual machines:

- APIC Simulator version 2.1(1h)
 - APIC1, APIC2, APIC3
 - Leaf1 and Leaf2
 - Spine1 and Spine2
- VMware Virtual Center Server 5.5 Appliance
- F5 iWorkflow release 2.0.2
- F5 BIG-IP release 12.0.0 HF4
- VMware ESXi 5.5 Host 1
- VMware ESXi 5.5 Host 2
- Workstation Windows 8
- NetApp EDGE Storage Appliance ONTAP 8.2
- Linux Tools Repository (Ubuntu 12.04)



This demonstration contains preconfigured users and components to illustrate the scripted scenarios and features. All access information needed to complete the scripted scenarios is located in the **Topology** and **Servers** menus of your **active demonstration**, and throughout this script.

2.1.3 Demonstration Preparation

Follow the steps below to schedule and configure your environment.

- 1. Browse to dcloud.cisco.com, choose the location closest to you, and then login with your Cisco.com credentials.
- 2. Schedule a session. [Show Me How].
- 3. Test your bandwidth from the demonstration location before performing any scenario. [Show Me How]
- 4. Verify your session has a status of **Active** under **My Demonstrations** on the **My Dashboard** page in the Cisco dCloud UI.
- 5. It may take up to 15 minutes for your demo to become active.
- 6. Access the workstation named **wkst1** located at **198.18.133.36** and login using the following credentials: Username: **dcloud****demouser**, Password: **C1sco12345**.
- 7. Option 1: (Preferred) Use Cisco AnyConnect [Show Me How] and the local RDP client on your laptop [Show Me How].
 - · Accept any certificates or warnings.
 - From the Start menu, click Desktop.
- 8. Option 2: Use the Cisco dCloud Remote Desktop client with HTML5. [Show Me How]
 - · Accept any certificates or warnings.
 - From the Start menu, click Desktop.
- 9. Start Menu



- 10. The fabric discovery is automatically started at demo setup. Double-click the **APIC Login** icon and login (admin/C1sco12345).
- 11. Select **Fabric** from the top menu.
- 12. Select **Inventory** from the top sub-menu.
- 13. In the left menu, click **Fabric Membership** and check that you have the 4 devices populated as shown in Figure 3. (IP addresses may vary.)

Note: The fabric discovery can take up to 15 minutes to complete. If you login before 15 minutes have passed, all devices may not be fully discovered.

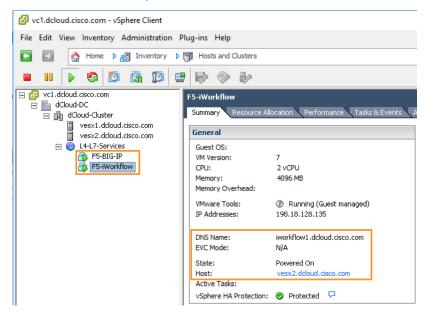
1. Completed Fabric Membership

Fabric Membership								
							ACTIONS	
NODEID	NODE NAME	RACK NAME	MODEL	ROLE	IP	DECOMISSIONED	SUPPORTED MODEL	
101	Leaf1		N9K-C9396PX	leaf	10.0.248.31/32	False	True	
102	Leaf2		N9K-C9396PX	leaf	10.0.248.28/32	False	True	
103	Spine1		N9K-C9508	spine	10.0.104.95/32	False	True	
104	Spine2		N9K-C9508	spine	10.0.248.30/32	False	True	
	NODE ID 101 102 103	NODE ID NODE NAME 101 Leaf1 102 Leaf2 103 Spine1	NODE ID NODE NAME RACK NAME 101 Leaf1 102 Leaf2 103 Spine1 103 Spine1	NODE ID NODE NAME RACK NAME MODEL 101 Leaf1 N9K-C9396PX 102 Leaf2 N9K-C9396PX 103 Spine1 N9K-C9508	NODE ID NODE NAME RACK NAME MODEL ROLE 101 Leaf1 N9K-C9396PX leaf 102 Leaf2 N9K-C9396PX leaf 103 Spine1 N9K-C9508 spine	NODE ID NODE NAME RACK NAME MODEL ROLE IP 101 Leaf1 N9K-C9396PX leaf 10.0.248.31/32 102 Leaf2 N9K-C9396PX leaf 10.0.248.28/32 103 Spine1 N9K-C9306 spine 10.0.104.95/32	NODE ID NODE NAME RACK NAME MODEL ROLE IP DECOMISSIONED 101 Leaf1 N9K-C9396PX leaf 10.0.248.31/32 False 102 Leaf2 N9K-C9396PX leaf 10.0.248.28/32 False 103 Spine1 N9K-C9306PX spine 10.0.049.5/32 False	

Note: To demonstrate Fabric Discovery, reset the APIC Simulator (see *Appendix A*.) If only TEP-1-101 is present at login, see *Appendix B* to discover the Fabric.



- 1. Double-click the VI Login icon different and login with the following credentials: Username: demouser, Password: C1sco12345. (If password is grayed out, click Login.)
- 2. Check that the F5 iWorkflow and BIG-IP virtual machine is present and running as below.
- 3. Virtual Center Inventory



Note: If the F5 BIG-IP and iWorkflow VMs are not present in the L4-L7 Services Resource Pool, *add it manually*.

2.2 Deploy Service Graph using F5 iApps in Cisco ACI with F5 iWorkflow

2.2.1 Overview

Cisco Application Centric Infrastructure (ACI) technology provides the capability to insert Layer 4 through Layer 7 (L4-L7) functions using an approach called a service graph. One of Cisco ACI's changes to the operation model with the service graph function is that a configuration now includes not only the network connectivity consisting of VLANs, IP addresses, etc., but also the configuration of access control lists, load-balancing rules, etc., on service appliances, such as the firewalls and load balancers. This approach differs from the traditional operation model of service insertion. Prior to Cisco ACI, the fabric configuration would have consisted only of connectivity for firewalls and load balancers. With Cisco ACI, the service graph configuration includes the ability to push configuration of firewalls and load balancers from ACI.

2.2.2 APIC GUI Layout

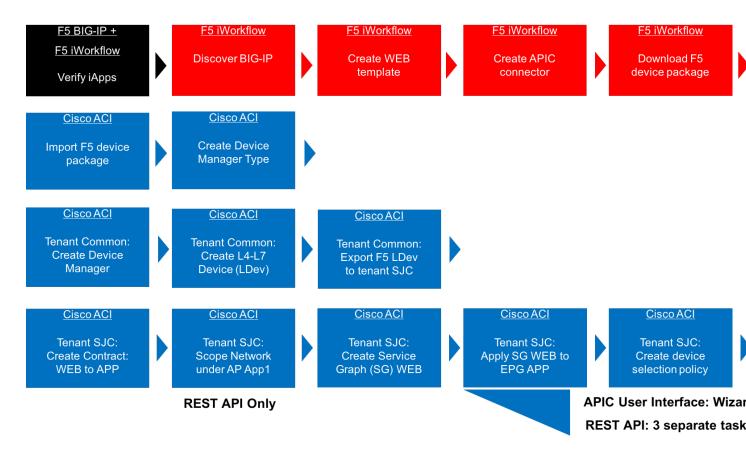
uluilu cisco	System	Tenants	Fabric	VM Networking L4-L7	Services	Admin	Operatio	ns Menu	ı Bar tal	e e		i		nced Mode 1e, admin -
ALL TENANTS	Add Tenant Sea	arch: enter name, de	escr commo	on infra mgmt Subme	nu Bar t	ab								
Tenant common		 Q 	Tenant - d	common										;
Duick Start			ronant (Johnnon										
4 🐣 Tenant comm	non						Tabs	Dashboard	Policy	Operational	Stats	Health	Faults	History
Applicatio	n Profiles		1.1.4.4.1014		100				E avella (Devente Di	Demo	1		
Networking	9		Health		100				Fault	Counts By	/ Doma	un		
L4-L7 Ser	vice Parameters		Zoom	1H 1D All					Fault Level			1	0	0
Security F	Policies								SYSTEM	VIDE 0		D	0	0
Troublesh	oot Policies											-	-	-
Monitoring									Access	0	(0	0	0
▶ 🖿 L4-L7 Se	_{rvices} Navig	ation Pane	V ore	Vork Pane					External	0	(D	0	0

The top of the GUI screen is the Menu bar tab, the middle of the GUI is the Submenu bar tab, the bottom left of the GUI screen is the Navigation Pane, and the middle-right of the GUI is the Work Pane.

2.2.3 F5 iWorkflow and Cisco ACI Lab

The goal of this lab is to demonstrate a WEB application deployment that has L4-L7 ADC requirements in ACI environment. Using F5 iWorkflow service catalog model, the WEB application ADC requirements are defined in iWorkflow service catalog template using F5 iApps technology. Thru F5 dynamic device package, this service catalog is imported into ACI. In Cisco ACI, when deploy application WEB, administrator can now pick WEB template to apply ADC functionality to application WEB.

To achieve this scenario, you will configure ACI L4-L7 service insertion in managed mode with device manager using F5 BIG-IP VE Virtual ADC and F5 iWorkflow orchestration + automation platform using User Interface.



2.2.4 F5 iWorkflow and Cisco ACI Lab Flow Chart

2.2.5 BIG-IP – Verify the F5 BIG-IP iApps

F5 iApps is a user-customized framework for deploying application, providing a flexible way to automate tasks and templatize F5 virtual server configurations.

The iApps must be imported into F5 BIG-IP in order to allow F5 iWorkflow to create an application template based on this iApps. In this step, we will verify the iApps is already exist in F5 BIG-IP.

Log into the F5 BIG-IP with the following username and password from the web browser:

BIG-IP: https://198.18.128.130

Username: admin

Password: Clsco12345

After you have logged into the F5 BIG-IP GUI. In the Navigation pane, click the iApps -> Templates. You should see the iApps template **appsvcs_integration_v1.0_001** pre-loaded into the F5 BIG-IP:

ONLINE (ACTIVE) Standalone				
Main Help About	iApps » Templates : Templates			
Mage Statistics	🐡 🚽 Template List			
iApps				
Application Services	* Se:	arch		
Templates	🖌 🔺 Name	Validity Associated Application Services	Verification	♦ Certificate
AWS	appsvcs_integration_v1.0_001		None	
	appsvcs_integration_v2.0_001		None	

Note: Up to iWorkflow release 2.0.2, iApps to be used by iWorkflow / APIC integration must be exist in BIG-IP in order for iWorkflow to be discovered. Beginning iWorkflow release 2.1.0, user import iApps into iWorkflow and iWorkflow will push the iApps to BIG-IP

2.2.6 iWorkflow – Set up the F5 iWorkflow Clouds and Services

F5 iApps template is **ALREADY** added in iWorkflow:

iApps Templates +	appsvcs_integration_v1.0_001						
2 items total	Template Properties						
appsvcs_integration_v1.0_001	Template Name	appsvcs_integration_v1.0_001					
f5.http.v1.2.0	Devices with Template	vcmp132.bd.f5.local - TMOS Version 12.1.2.0.0.249					
	Devices with Template	vcmp133.bd.f5.local - TMOS Version 12.1.2.0.0.249					

F5 iWorkflow Clouds and Services allows administrator to create a cloud connector to Cisco APIC by generating a customized device package that contains the service catalog. It is also where administrator can manage service catalog life cycle.

In this step, we will configure F5 iWorkflow prior to Cisco ACI integration.

Log into the F5 iWorkflow 198.18.128.135 with the following username and password from the web browser:

iWorkflow: https://198.18.128.135

Username: admin

Password: Clsco12345

After you have logged into the F5 iWorkflow GUI. Click on "Clouds and Services", select "+" Devices

ß	iWorkflow	Clou	ds and Services	BIG-IP Connectivity	BIG-IP HA	Syster	n Settings	Access Control		
						т	Filter			
	Clouds	+	Services		Tenants		+	Catalog	+	Devices
	0 Items total	T	0 Items total	T	0 Items total		Ť	0 Items total	T.	0 Items total

Register F5 BIG-IP by selecting "Discover Device"



Register the F5 BIG-IP by using the BIG-IP's IP address and credential as the following:

IP Address: 198.18.128.130

 $Username: {\tt admin}$

Password: Clscol2345

Click Save to register the BIG-IP device:

Devices +	Discover Device						
0 Items total	IP Address	198.18.128.130					
	User Name	admin					
	Password						

You can now double click the registered BIG-IP and verify its status. It should say "Available" when the BIG-IP is communicating with the iWorkflow:

Devices	\mathbf{t}	bigip1.dcloud.cisco	bigip1.dcloud.cisco.com		Rediscover
bizint debud sissa sam	Ţ	Device Properties			
bigip1.dcloud.cisco.com BIG-IP1200 198:18:128:130		Host Name	bigip1.dcloud.cisco.com		
		Address	198.18.128.130		
		Product	BIG-IP 12.0.0 Build 4.0.674 Hotfix HF4		
		REST Framework Version	13.0.0-0.0.5560		
		Availability	• Available		
		Last Contact	Mar 2, 2017 6:51:20 PM		
		Management Address	198.18.128.130		
		Configuration	Refresh BIG-IP Connectivity Info		
		Configuration	Reset All Config		

2.2.7 iWorkflow – Create WEB application template in iWorkflow Catalog

After BIG-IP is successfully discovered by iWorkflow, the iApps reside on BIG-IP are now exposed to iWorkflow.

In this step, we will create a WEB application template based on iApps in iWorkflow Cloud Catalog. We can specify the WEB application F5 virtual server requirements here and build it into a template.

Move your mouse to the left or right side of the screen and the Cloud Catalog menu should appear, click "+" to add a template

Catalog	+	Devices	t	bigip1.dcloud.cisco	D.COM Remove	Redisc
0 Items total	T		Τ	Device Properties		
		bigip1.dcloud.cisco.com BIG-IP120.0 198.18.128.130		Host Name	bigip1.dcloud.cisco.com	
				Address	198.18.128.130	
				Product	BIG-IP 12.0.0 Build 4.0.674 Hotfix HF4	
				REST Framework Version	13.0.0-0.0.5560	

A New Template screen will appear. Enter and select the following in the New Template:

Name: WEB

Input Parameters: All Options

Cloud: All Clouds

Application Type: appsvcs_integration_v1.0_001

Catalog	+	New Template		Tenant Preview		
0 Items total		Properties	Properties			
		Name	WEB			
		Input Parameters	 Accept Defaults Common Options All Options 			
		Cloud	All Clouds			
		Application Type	appsvcs_integration_v1.0_001 🔹			

Note:	Only field marke	d "Tenant Editable	e" will be visib	le in Cisco APIC
10101				



You can now edit all the available options that need to be included with this template.

Expand the Virtual Server Listener & Pool Configuration by clicking the >. Scroll down and CHECK the following to make them Tenant Editable. What this does is allow the parameters expose to Cisco APIC thru F5 device package. Administrator has total control over what is exposed via a custom device package (this reduces the complexity). It is highly recommended to expose only what is needed to APIC:

pool___addr: this is the VIP

pool__port: this is the VIP listening port

Note: By default, this iApp allows VIP as tenant editable field. When you check VIP listening port as tenant editable, iWorkflow will highlight it.

⇒ Virtual Server Lister Name	ner & Pool Configuration	Default Value	14/14 Tenant Editable
pool_AdvOptions	Pool: Advanced Options		
pool_Description	Pool: Description	pooldescr	
pool_LbMethod	Pool: Load Balancing Method	round-robin	•
pool_MemberDef	Pool: Member Default Port	80	0
pool_Monitor	Pool: Health Monitor	/Common/http	8
pool_Name	Pool: Name		0
pool_addr	Virtual Server: Address		
pool_mask	Virtual Server: Mask	255.255.255.255	0
pool_port	Virtual Server: Port	80	×

Click "Tenant Preview" to review the parameters will be visible in Cisco APIC:

New Template	Tenant Preview	Save	Cancel

You should only see 3 parameters:

Virtual Server: Address Virtual Server: Port Pool: Members

	€ WEB				
	Tenant users will see a form th	at looks like this when deploying an applicati	on using this Catalog	7	
	Virtual Server: Address				
	Virtual Server: Port	80			
	Pool: Members	Ipaddress			
		+ ×			
CI	ick 💽 to go back, then "Save"				
	New Template		Tenant Preview	Save	Cancel

Notice a new application template now under iWorkflow Cloud Catalog. The "Save" operation will also update the F5 iWorkflow Cloud APIC device package with the updated service catalog.

This service catalog is ready to be consumed by Cisco APIC.

Catalog	+	WEB			Delet	e Tenant Preview
1 item total	IT.	Properties				
WEB appoints_integration_v1.0_001		Name		WEB		
apparts_int@atorciris_cori		Input Parameters		Common Options		
		inpat Palameters		 All Options 		
		Cloud		All Clouds	•	
		Application Type		appsvcs_integration_v1.0_001		
		Sections				
		Virtual Server Listen				
		Name	Descript	tion		Default Value
		pool_addr	Virtual :	Server: Address		
		pool_port	Virtual :	Server: Port		80
		▶ pool_Members	Pool: M	embers	1.	

2.2.8 iWorkflow – Create F5 iWorkflow APIC device package

The next step is to create the iWorkflow Cloud APIC Connectors which will generate a custom device package that contains iWorkflow service catalog. The template we created in the previous step will appear in APIC as a service function.

Move your mouse to the left / right side of the screen to make the Clouds menu to appear.

To create a new Connectors, move the mouse to the Clouds menu and the + should appear.

Clouds	+
	T
O Items total	

Click "+" to create a new Cloud Connector:

Name: dcloud

Connector Type: Cisco APIC

Click "Save" to finish

New Cloud		Save	Cancel
Basic Properties			
Name	dcloud		
Description			
Connector Type	CISCO APIC 🔹		

Double Click the dcloud connector, you can download this customized device package that contains iWork-flow Catalog to your desktop.

Clouds	+	dcloud	dcloud		Delete
1 item total	ir.	Basic Properties			
dcloud Cisto APIC		Name	dcloud		
		Description			
		Connector Type	CISCO APIC		
		Devices	Select	٣	
		APIC Device Package			
		Download Device Package	F5DevicePackage.zip		

💿 Save As	×
\leftarrow \rightarrow \checkmark \bigstar This PC \Rightarrow Desktop	 olimits Search Desktop
Organize 🔻 New folder	
 ✓ J Quick access ✓ Desktop ✓ Downloads ✓ Downloads ✓ Documents ✓ Pictures ✓ APIC Device Pac ✓ ftproot (\\198.18 Scripts ✓ OneDrive ✓ This PC 	∧ Date modified Type No items match your search.
> 📃 Desktop > 🚊 Documents	
> 🕹 Downloads 🗸 🧹	2
File name: F5DevicePackage.zip Save as type: Compressed (zipped) Folde	~ r ~
∧ Hide Folders	Save Cancel

We now complete the configuration steps on iWorkflow necessary prior to F5 ACI integration.

2.2.9 APIC – Import the Custom Device Package

Starting here, you will use Cisco APIC to perform the workflow in deploying the WEB application, with the integration of F5 iWorkflow and BIG-IP, user can apply WEB application L4-L7 requirements within APIC policy model, reducing significant amount of operation complexity.

In this step, you will import the customized device package generated by F5 iWorkflow into Cisco APIC. This will allow the iWorkflow service catalog available in Cisco APIC. The device package serves as a conduit to facilitate communications between F5 iWorkflow and BIG-IP.

Switch to your APIC GUI and click the following to import the device package:

L4-L7 Services -> Packages -> L4-L7 Service Device Type

Click the ACTIONS button at the Work pane and choose IMPORT DEVICE PACKAGE

ahaha cisco	System	Tenants	Fabric	VM Networking L4-L7 Services	s Admin	Operations	Q	
				Inventory Packag				
Packages 🧃 🖸			L4-L7 Service Device Types					
🔲 Quick Start								
L4-L7 Service Device Types			⊖ ±					
			Vendor	A Model	Version	Functions		
					Se	No items have been found. lect Actions to create a new item.		

A new pop-up should appear to allow you to choose the device package to be installed, click "Browse":

Import Device Package	i 🗙
File Name:	BROWSE
	SUBMIT

Go to Desktop and select F5DevicePackage.zip

Open ← → ✓ ↑ □ → This PC → Desktop → ✓	ල Search Desktop	×
	O Search Desktop	þ
Organize 🔻 New folder		
A Name	Date modified	Туре
Quick access	12/8/2016 1:03 PM	Shortcut
Desktop 🖈 Build ACI Fabric	9/19/2014 11:45 AM	Shortcut
- Downloads 💉 🙀 Cisco ASDM-IDM	10/6/2016 3:17 PM	Shortcut
🔮 Documents 🖈 🛛 🔡 F5DevicePackage.zip	3/2/2017 8:16 PM	Compres
📰 Pictures 🖈 🌮 Postman	3/2/2017 5:11 PM	Shortcut
APIC Device Pac 📰 UCS Director	12/8/2016 1:48 PM	Shortcut
🛫 ftproot (\\198.18 🙈 UCS Manager	12/8/2016 1:48 PM	Shortcut
Scripts 5	12/8/2016 1:31 PM	Shortcut
CneDrive		
💻 This PC		
E. Desktop		
🔮 Documents		
🖶 Downloads		
h Music		
E Pictures V K		>
File name: F5DevicePackage.zip	✓ All Files	\sim
	Open 🔽 Can	cel

Click "Submit"

Import De	vice Package		i X
File Name:	C:\fakepath\F5DevicePackage.zip	BROWSE	
		SUBMIT	CLOSE

Now F5 device package is imported into APIC

uluiju cisco	System	Tenants	Fabric	VM Networking L4-L	7 Services Admin	Operations	P
					ry Packages		
Packages		 O 	14-175	ervice Device Ty	ines		
🔲 Quick Start					pes		
L4-L7 Servi F5-iWorld	ice Device Types kflow-2.0-dcloud		⊖ ₹				
			Vendor	🔺 Model	Version	Functions	
			F5	iWorkflow	2.0-dcloud	WEB	

Expand the Device Package, notice Service Function "WEB" is equivalent to iWorkflow Catalog template "WEB". Under Operational, parameters visible in APIC are the "Tenant Editable" parameters in iWorflow:

Packages 🧃 🖸	L4-L7 Service Function	- WEB				
 Quick Start L4-L7 Service Device Types 						
 F5-iWorkflow-2.0-dcloud L4-L7 Service Functions 						
E WEB	0					
 L4-L7 Services Function Profiles WEB 	Folder/Param Category Display Fe	ature Display Label	Display Type	Required	Locked	Ca
	NetworkRelation		advanced		false	1
	🔺 🖿 WEB	WEB	advanced		false	1
	🔺 🚞 poolMembers	Pool Members	advanced		false	1
	🔺 🚞 member	Member	advanced		false	n
	💷 📃 IPAddre	IPAddress	advanced	true		1
	, 📃 pool_addr	Address	advanced	true		1
	🔤 📃 pool_port	Port	advanced	true		1

Under Function Profiles, you can see if there is any default value assigned to the parameters:

Packages 2 C	L4-L7 Services Function Profile - WEB						
 F5-iWorkflow-2.0-dcloud I=L4-L7 Service Functions 	⊖ ±						
 WEB L4-L7 Services Function Profiles WEB 	Properties Name: WEB Description: Associated Function: F5-IWO						
	FEATURES AND PAR	RAMETERS Basic Parameters All Parameters					
	All	Meta Folder/Param Key	Name Value	Mandatory			
		Function Config General WEB General Pool Members General Pool Member Ge	WEB-Default poolMem member IPAddress pooladdr	false false			
		- 🗐 Port	pool_port 80	false			

2.2.10 APIC – Create APIC L4-L7 Device Manager under L4-L7 Services

In order to integrate F5 iWorkflow cluster into Cisco APIC L4-L7 devices, we use Cisco APIC device manager feature to define and specify F5 iWorkflow.

From APIC perspective, F5 iWorkflow is a "device manager" managing the F5 BIG-IP ADC (both physical and virtual form factors).

We will first define the device manager type. In the APIC GUI, click the following to configure the Device Manager Type:

L4-L7 Services -> Inventory -> Device Manager Type

Click the ACTIONS button at the Work pane and choose Create Device Manager Type

alialia cisco	System	Tenants	Fabric	VM Networking L4-L7 Services	Admin	Operations	ρ
Inventory		⊴ ⊙	Device I	Manager Types			
🔲 Quick Start							
Device Man			⊖ ±				
L4-L7 Chas	ssis Types		🔺 Vendor		Model		Version
						No items have been found. It Actions to create a new item.	

A new pop-up should appear to allow you to enter the device manager information. Enter the following information:

Vendor: F5

Model: iWorkflow Version: 2.0-dcloud L4-L7 Service Device Type: F5-iWorkflow-2.0-dcloud Device Manager: Leave this field empty

Note: It is extremely import to match the Version number with the major version of the device package



Click SUBMIT to accept the configuration.

С	reate Device Manage	er Type		
_				
	Vendor:	F5		
	Model:	iWorkflow		
	Version:	2.0-dcloud		
	L4-L7 Service Device Type:	F5-iWorkflow-2.0-dcloud	- d	P
	Device Manager:			× +
		Name		
_		C	SUBMIT	CANCEL

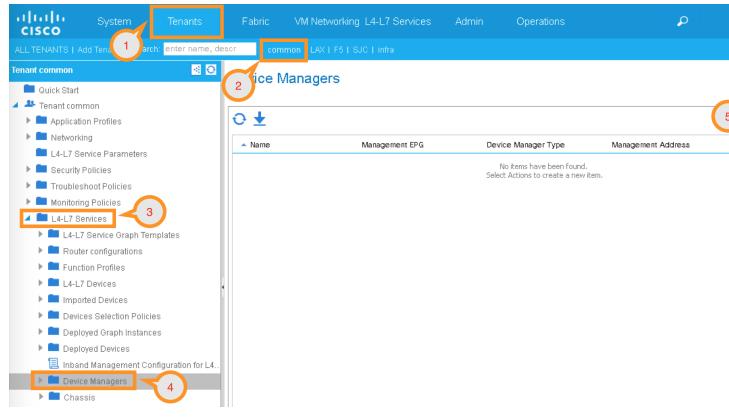
The Device Manager Type is now configured and we can now associate this device manager type with a device manager.

2.2.11 APIC – Create Device Manager under Tenant Common

To create a device manager, navigate to your tenant common to create a new L4-L7 Device Manager by clicking the following:

Tenants Common -> L4-L7 Services -> Device Managers

In the Work pane, click: ACTIONS -> Create Device Manager



A new pop-up should appear to allow you to Create Device Manager in your tenant. You will specify F5 iWorkflow management IP here and associate it with the device manager type created in the previous step. Enter the following information:

Device Manager Name: dcloud-device-manager

Management EPG: Leave this field empty since we use OOB to communicate

Device Manager Type: F5-iWorkflow-2.0-dcloud

Click the + to enter the iWorkflow management IP for device manager Management connectivity:

Host: 198.18.128.135

Port: 443

Click UPDATE to accept.

Enter the Device Manager's login credential:

Username: admin

Password: Clscol2345

Confirm Password: C1sco12345

Click SUBMIT to accept the configuration.

Create Device Manag	jer		(i 🗙
Please enter device m	anager info below.		
Device Manager Name:	dcloud-device-manager		
Management EPG:	select an option	•	
Device Manager Type:	F5-iWorkflow-2.0-dcloud	jement. 👻 🗗	
Management:			× +
	Host	Port	
	198.18.128.135	443	
Username:	admin		
Password:			
Confirm Password:			
			SUBMIT CANCEL

This complete the steps to create APIC L4-L7 device manager. We will use this device manager in the next step when creating APIC L4-L7 device.

2.2.12 APIC – Create the L4-L7 Device

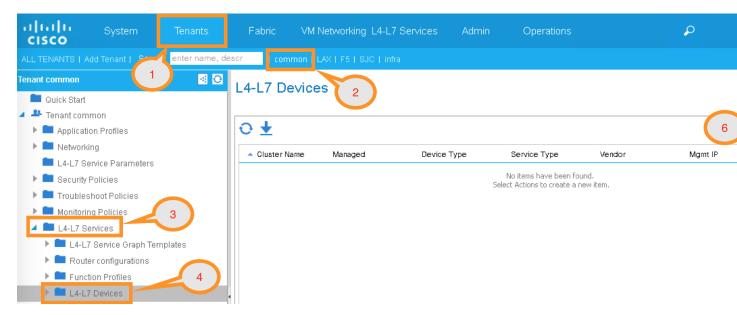
In this step, we will create an APIC L4-L7 device, this is the logical construct that contains F5 BIG-IP and iWorkflow information. You will see in the later steps on how to build an APIC service graph using this L4-L7 device.

Navigate to your tenant to create a new L4-L7 Device by clicking the following:

Tenants Common -> L4-L7 Services -> L4-L7 Devices

In the Work pane, click:

ACTIONS -> Create L4-L7 Devices



A new window should appear for you to create the L4-L7 Devices.

Create L4-L7 Devices	5					
STEP 1 > General						1. General 2.
Please select device	package and enter connecti	vity info	rmation.			
General Managed: Name:		0	Device 1 Management IP Address: Chassis:	selecta value	0	Management Port: er
Service Type:	ADC	•	Device Interfaces:			
Device Type: Physical Domain:		• 0	pevice internaces.	Name	Path	
View:	◉ Single Node					
Device Package:	select a package	- 0				
Model:		*	Cluster Management IP Addreaa: Device Manager: Cluster Interfaces:		0 	Management Port: en
				Туре	Name	Concrete Interfaces
Connectivity APIC to Device Management Connectivity:	◉ Out-Of-Band ◯ In-Band					
Credentials _{Username:}		0				
Pasaword:		0				
Confirm Pasaword:		0				

In the Create L4-L7 Devices window, enter the following:

Managed: CHECK Name: F5-BIG-IP Service Type: ADC Device Type: Virtual VMM Domain, click the down arrow to select: My-vCenter Mode: Single Node Device Package: F5-iWorkflow-2.0-dcloud Model: Unknown (Manual) Context Aware: Single APIC to Device Management Connectivity: Out-Of-Band Username: admin

Password: Clsco12345

Confirm Password: Clsco12345

After completion, it should look like:

General			
Managed:	✓		
Name:	F5-BIG-IP		
Service Type:	ADC		-
Device Type:	PHYSICAL	VIRTUAL	
VMM Domain:	My-vCenter		- e
View:	💿 Single Node	🗇 HA No	ode
	🔘 Cluster		
Device Package:	F5-Workflow-2	2.0-deloud	× 👻 🗗
Model:	Unknown (Mani	ual)	-
Context Aware:	Multiple	Single	
Connectivity			
APIC to Device	Out-Of-Band		
Management Connectivity:	🗇 In-Band		
Credentials			
Username:	admin		
Pasaword:			
Confirm Password:			

What did I configure?

Managed: this means this L4-L7 device will be managed by Cisco APIC to be used in L4-L7 service insertion Name: User defined name of the L4-L7 device

Service Type: Firewall or ADC, F5 BIG-IP is considered an ADC device

Device Type: Physical or Virtual, we use BIG-IP Virtual Edition in this lab

VMM Domain: If device type is virtual, select the VMM domain for this L4-L7 device, the VMM domain

contains BIG-IP VE virtual machine

Mode: Single or HA, in this lab, only one BIG-IP VE, so select Single Node

Device Package: Drop down menu, pick the device package dcloud

Model: Choose Unknown(Manual) giving you flexibility to enter any F5 BIG-IP interface convention

Context Aware: Single Context device can be used by only 1 tenant; where Multi Context device can be shared among multiple tenants. In the case of virtual, we will select single context

APIC to Device Management Connectivity: All management connections are out-of-band in this lab Credentials: F5 BIG-IP admin credentials

On the right-hand side of the wizard, in the Device 1, enter the following:

Management IP Address: 198.18.128.130

VM: Click the down arrow and select dcloud-DC/F5-BIG-IP

Management Port: https

Click the + to add a Device Interface:

Name: 1_1

VNIC: Network adapter 2

Click UPDATE to accept the Device Interface configuration.

Click the + to add 2nd Device Interface:

Name: 1_2

VNIC: Network adapter 3

Click UPDATE to accept the Device Interface configuration.

Device 1

Management IP Address:	198.18.128.130		Management Port: https	Management Port: https	•
VM:	dCloud-DC/F5-BIG	-IP 👻 🕑			
Chassis:	aelecta value	•			
Device Interfaces:				×	+
	Name	VNIC	Path (Only For Route Peering)		
	1_1	Network adapter	2		
	1_2	Network adapter	3		

What did I configure?

Under Device 1, enter the BIG-IP VE management IP and management port of https (443)

Since this is a BIG-IP VE cluster, the VM field is visible and based on the VMM domain specified earlier, pick the VM for this L4-L7 device.

Device Interfaces: specify the BIG-IP VE interface to be used in data plane. We are configuring physical 2-arm in this lab, two BIG-IP interfaces are specified in this cluster. Notice the interface naming is 1_1, which is equivalent to interface 1.1 of BIG-IP. "_" is used instead of "." is because APIC does not allow "." as parameter value.

Next part of the configuration is L4-L7 device cluster information.

By default, APIC will populate Device 1's management IP as the Cluster Management IP. In this lab, since we are going to use the iWorkflow to manage BIG-IP, the Cluster IP will be changed to the iWorkflow's IP. The device will eventually ignore this setting and it will use the Device Manager information configured earlier to establish communication.

Management IP Address: 198.18.128.135 Management Port: https Device Manager: common/dcloud-device-manager Click the + to add the 1st Logical Interface: Type: consumer Name: External Concrete Interface: Device1/1_1 Click UPDATE to accept the consumer interface configuration. Click the + to add the 2nd Logical Interface: Type: provider Name: Internal Concrete Interface: Device1/1_2 Click UPDATE to accept the consumer interface configuration.

Cluster

Management IP Address:	198.18.128.135		Management Port:	https		
	ommon/dcloud-device-manag 👻 🗗					
Cluster Interfaces:					×	+
	Туре	Name	Concrete Interfaces			
	consumer	External	Device1/1_1			
	provider	Internal	Device1/1_2			

Make sure all L4-L7 Devices parameters are entered correctly, click "NEXT"

STEP 1 > General			1. General 2.
Please select device package and enter co	nectivity information.		
General Managed: ✓ Name: F5-BIG-IP Service Type: ADC Device Type: PHYSICAL VIRTUA VMM Domain: My-vCenter View: ● Single Node ● HA ● Cluster	Chassis: select Device Interfaces:	d-DC/F5-BIG-IP 🗾 🛃	
Device Package: F5-Workflow-2.0-dcloud Model: Unknown (Manual) Context Aware: Multiple Single	Cluster Management IP 198.13 Address:		Management Port: htt
Connectivity APIC to Device Out-Of-Band Management Connectivity:	Type consu		Concrete Interfaces Device1/1_1 Device1/1_2
Credentials Username: admin Pasaword: Confirm Pasaword:			

PREVIOUS

STEP2, Device Configuration. We would like to set up some basic information on the BIG-IP by choosing the All Parameters tab.

Click > to expand the field Device Host Configuration and enter the following parameters and click UPDATE to save the change:

Host Name: bigip1.dcloud.cisco.com

Click "FINISH"

Device 1			
eatures:	Basic Parameters All Parameters		
HostConfig	Folder/Param	Name	v
DeviceHAParams	Device Host Configuration	HostConfig HostName	b
VempConfig	Instrume Instrume	nosiname	U
<u>iWorkflowConfig</u>	Primary DNS IP Address		
All	Secondary DNS IP Address		
	Syslog Server IP Address		
	HighAvailability		
Cluster			

Navigate to the newly created L4-L7 Device to verify its Configuration State is stable:

Tenants common ->L4-L7 Services -> L4-L7 Devices -> F5-BIG-IP

In the Work pane, ensure the Configuration State is stable, if the device is not stable, click the Faults tab and ensure no faults or all the faults are in clearing state.

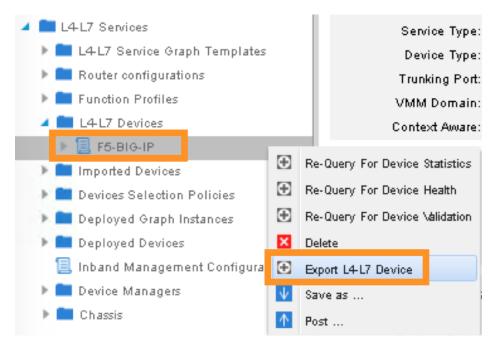
ALL TENANTS Add Tenant Search: enter na	ame, deacr I common I F5 I infra I LAX I mgmt					
Tenant common 🧧 🖸	L4-L7 Devices - F5-BIG-IP					
🖿 Quick Start						_
Tenant common						
Application Profiles	0 ±		Δ 🚺 🕕			
🕨 🚞 Networking	0 <u>+</u>					
🔲 L4-L7 Service Parameters	General					
Security Policies	Managed: 🔽	Devices				
Troubleshoot Policies	Name: F5-BIG-IP					
Monitoring Policies	Device Package: F5-iWorkflow-2.0-doloud				Management	Management
🔺 🚞 L4-L7 Services	Service Type: ADC	🔺 Name	VM Name	VCenter Name	Address	Port
🕨 🚞 L4-L7 Service Graph Templates	Device Type: VIRTUAL	Device1	F5-BIG-IP	dCloud-DC	198.18.128.130	443
Router configurations	Trunking Port: 🗖					
🕨 🚞 Function Profiles	VMM Domain: My-vCenter					
🔺 🚞 L4-L7 Devices	Context Aware: Single					
🕨 📃 F5-BIG-IP	Function Type: GoThrough GoTo					
🕨 🔜 Imported Devices	i indiana iype.					
🕨 🚞 Devices Selection Policies	Credentials					
🕨 🚞 Deployed Graph Instances	Username: admin					
🕨 🚞 Deployed Devices	Pasaword:					
📃 Inband Management Configuration for .		I				
🕨 💼 Device Managers		Cluster				
🕨 🚞 Chassis	Configuration State	Managemer Addr	nt IP 198.18.128 ess:	8.135 N	Management Port: 4	43
	Configuration Issues:			cloud-device-mana	eg 👻 🔁	
	Devices State: stable	Cluster Interfa	ices:			
	Devices state. Stable					
			Турө		Name	Concrete Interfa
			consumer	E>	demal	Device1/[1_1]
			provider	In	ternal	Device1/[1_2]
		1				

We now complete the configuration of the ACI L4-L7 device, and we will use this device when creating L4-L7 Service Graph Template in the next step.

2.2.13 APIC – Export L4-L7 Device to Tenant

Export F5-BIG-IP L4-L7 device as a resource to another tenant where application profile is configured.

Right click on F5-BIG-IP, and select "Export L4-L7 Device"



Drop down and select tenant "SJC", the "SUBMIT"

Export L4-L7 Device	i 🗙
Choose a tenant to export	
Tenant: SJC	~ @
Description:	
	SUBMIT

ALL TENANTS Add Tenant Search: enter n	sme, descr I common	I F5 I infra I LAX I mgm	it			
Tenant common 🧧 🖸	L4-L7 Devices					
Cuick Start						
Internation American Americ						
Application Profiles	🖯 🕁					
🕨 🚞 Networking						
💼 L4-L7 Service Parameters	 Cluster Name 	Managed	Device Type	Service Type	Vendor	Mgmt IP
Security Policies	F5-BIG-IP	True	VIRTUAL	ADC	F5	198.18.128.135
Troubleshoot Policies						
🕨 🚞 Monitoring Policies						
🔺 🚞 L4-L7 Services						
🕨 🚞 L4-L7 Service Graph Templates						
Router configurations						
Function Profiles						
🔺 🚞 L4-L7 Devices						
▶ 📃 F5-BIG-IP						

2.2.14 APIC – Create L4-L7 Service Graph Templates

An APIC L4-L7 Service Graph Template is an abstract object allowing L4-L7 configuration build into ACI policy model. In this step, you will create a service graph template and add L4-L7 device you created in the previous step, then select the WEB service function for this graph.

Go to Tenant SJC by typing "SJC" in the Tenant search box



To create a new Service Graph Template, click the following in the navigation pane:

Tenants SJC -> L4-L7 Services -> L4-L7 Service Graph Template

In the Work pane:

ACTIONS -> Create L4-L7 Service Graph Template

Graph Templates
4
Function Nodes Description
· · · · · · · · · · · · · · · · · · ·
Select Actions to create a new item.
Function Nodes Description No items have been found.

In the new window, enter the following:

Graph Name: WEB

Graph Type: Create a New One (should be the default)

Now, drag the Device Clusters to the right side of the window into the graph. You should be able to place the Node "SJC/F5-BIG-IP (Imported Managed)" between the Consumer EPG and the Provider EPG.

When this graph template is deployed, the traffic will be redirected to the F5 BIG-IP of this device cluster automatically by Cisco ACI.

Double click the word N1 under the Node to change the name to ADC.

Under F5-BIG-IP Information, click the Two-Arm option for this graph.

Select the Profile: F5-iWorkflow-2.0-dcloud/WEB <- this coming from the F5 device package

This is WEB application template that we created earlier.

Click "SUBMIT"

Create L4-L7 Service Graph Template
Drag device clusters to create graph nodes.
Device Clusters Graph Name: WEB
O + + Graph Type: Oreate A New One Clone An Existing One
SUC/F5-BIG-IP (Imported Managed)
3 Please drag a device from devices table and drop it here to create a service node.
F5-BIG-IP Information ADC: Two-Arm One-Arm 5 Profile: F6-Workflow-2.0-dc loud/WEB E Route Redirect:
6

2.2.15 APIC – Deploy the Service Graph (EPG and Contract selection)

The new ADC L4-L7 Service Graph Template is now created and we are ready to deploy the BIG-IP with the pre-created web and app EPG.

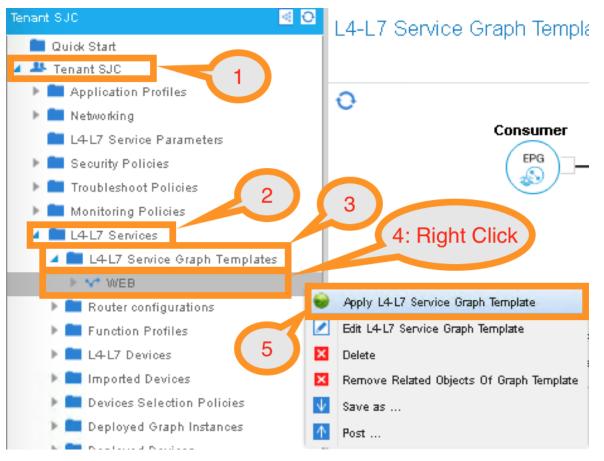
In this step, we are deploying WEB graph, connecting between the web tier and the app tier. Inside contract between the web and app EPG, we will assign the service graph template created in the previous step, this will provide F5 BIG-IP ADC functionality to APP tier.

To deploy the service graph, click the following in the Navigation pane of your tenant:

Tenants SJC -> L4-L7 Services -> L4-L7 Service Graph Template

Select the Service Graph Template you just created from the Work pane. Right click and choose the option to

Apply L4-L7 Service Graph Template



In the new window, you will have the ability to choose which EPGs the Service Graph will be inserted in between.

Select the following for the EPG information:

Consumer EPG / External Network: SJC/App1/epg-web

Provider EPG / External Network: SJC/App1/epg-app

Under Contract Information, use the option to create a new Contract:

Create a New Contract: SELECTED

Contract Name: web2app-contract

No Filter (Allow All Traffic): CHECKED

Apply L4-L7 Service Graph Template To EPGs	
STEP 1 > Contract	1.
Config A Contract Between EPGs	
- EPGs Information - Consumer EPG / External Network: SJC/App1/epg-web - Consumer EPG / Internal Network: SJC/App1/epg-app - C	G
Contract Information Contract: Contract: Cont	
No Filter (Allow All Traffic): 🗹	

Click NEXT to continue to the next screen.

2.2.16 APIC – Deploy the Service Graph (Connectivity to Fabric)

A new window to apply the service graph template will now appear. This window will show the Service Graph Template that you created earlier.

In addition to the Service Graph Template, there are some options that need to be selected to deploy the BIG-IP with a Service Graph. Under the SJC/WEB Information, you need to choose the appropriate connector information:

Under the Connector, choose the following:

Type: General

BD: SJC/SJCBDWeb

Cluster Interface: External

We use the External interface for the communication between the BIG-IP and the Web servers. The Web servers belong to Web EPG, which tied to the SJCBDWeb Bridge Domain.

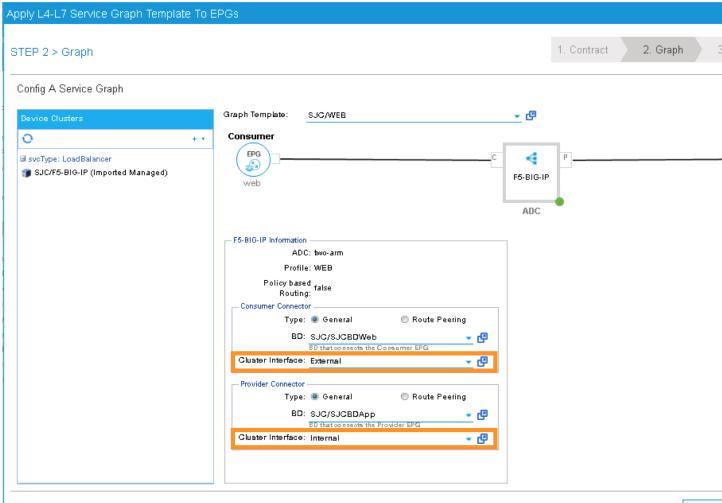
Type: General

BD: SJC/SJCBDApp

Cluster Interface: internal

We use the Internal interface for the communication between the BIG-IP and the App servers. The App servers belong to App EPG, which tied to the SJCBDApp Bridge Domain.

Click NEXT to continue to the next screen.



PREVIO

2.2.17 APIC – Deploy the Service Graph (BIG-IP Parameters)

A new window for the BIG-IP parameters will now appear. In this window, you will have the ability to modify the parameters to be deployed to the BIG-IP. Let us modify some parameters to push the Service Graph into the BIG-IP.

Under Feature, it should be selected All. Parameters should be All Parameters.

Apply L4-L7 Service Graph Template To EPGs

STEP 3 > F5-BIG-IP Parameters

config parameters for the selected device

rofile Name: 🛛 WEB 🔂	l	
Features:	Required Parameters All Parameters	
AU	Folder/Param	Name
All	🔲 🔺 🗮 Function Config	Function
	🗖 🥒 🚔 WEB	WEB-Default
	🔲 🛛 🔺 🚔 Pool Members	poolMembers
	🗖 🔷 💇 Member	member
	🔲 🔤 IPAddress	IPAddress
	Address	pool <u>a</u> ddr

Once you click the All Parameters tab, the folder and parameters will appear. To edit the parameter, you need to expand the parameter by clicking the > and double the field to change the parameter's name and value. Let us edit the following parameters:

Under Device Config

Press > to expand the Network configuration folder

Press > to expand the folder ExternalSelfIP

Double click the parameter Enable Floating? and select No as the value

Click UPDATE to apply

Double click the parameter External Self IP Address and enter 10.10.10.130 as the value

Click UPDATE to apply

Double click the parameter External Self IP Netmask and enter 255.255.255.0 as the value

Click UPDATE to apply

Double click the parameter Port Lockdown and select Default as the value

Click UPDATE to apply

Press > to expand the folder InternalSelfIP

Double click the parameter Enable Floating? and select No as the value

Click UPDATE to apply

Double click the parameter Internal Self IP Address and enter 192.168.10.130 as the value

Click UPDATE to apply

Double click the parameter Internal Self IP Netmask and enter 255.255.255.0 as the value

Click UPDATE to apply

Double click the parameter Port Lockdown and select Default as the value

R	equired Parameters	All Parameters		
	Folder/Param		Name	Value
	🔲 🥒 💇 Device Con	fig	Device	
	😑 🛛 🔺 💆 Network		Network	
+	🗹 🛛 🔺 💆 Exter	nalSelfIP	ExternalSelfIP	
	🗹 📃 Er	able Floating?	Floating	NO
	🗹 🔤 E>	ternal Self IP	SelfIPAddress	10.10.10.130
	🗹 🔚 Pa	ort Lockdown	PortLockdown	DEFAULT
	🗹 - 🖾 Se	lf IP Netmask	SelfIPNetmask	255.255.255.0
÷	🗹 🔹 🚄 Interr	alSelfIP	InternalSelfIP	
	🗹 - 🖾 Er	able Floating?	Floating	NO
	🗹 🗧 In	ternal Self IP Address	SelfIPAddress	192.168.10.130
	🗹 🛛 🔤 In	ternal Self IP Netmask	SelfIPNetmask	255.255.255.0
	🗹 📃 Po	rt Lockdown	PortLockdown	DEFAULT

Click UPDATE to apply

Device config is BIG-IP device level configuration, like self-IP and default route. Resource configured in the device config will be used by Function Config

Assign Device Config "Network" to Function Config "NetworkRelation"

Note: It is extremely important to assign Network to NetworkRelation, fail to perform this step will result in graph deployment failure, as there will not be any network resource associated with the graph

🔺 😅 Function Config	Function		
🔺 😅 NetworkRelation	NetworkRelation	NetworkRelation	
🧾 Select Network	NetworkRel	Network	

The above step associates the network information under device config to the BIG-IP virtual server.

Apply at deployment WEB service graph configuration under Function Config

Press > to expand the WEB configuration folder

Double click on the name and delete Default

Click UPDATE to apply

Press > to expand the Pool Members folder

Press > to expand the Member folder

Double click to enter value into the IPAddress field: 192.168.10.150

Click UPDATE to apply

Back to the WEB configuration folder

Double click to enter value into the Address field (pool_addr): 10.10.10.100

Click UPDATE to apply

Double click the parameter Port field (pool_port): 80

Click UPDATE to apply

	2 4	💇 WEB	WEB	
		🔺 💇 Pool Members	poolMembers	
÷		🔺 😅 Member	member	
		IPAddress	IPAddress	192.168.10.150
		Address	pooladdr	10.10.10.100
		🗐 Port	poolport	80

Function config is BIG-IP virtual server level configuration. We define the WEB service catalog parameters here, as well as associating the device level network config to this virtual server.

Make sure both the device config and function config are correct

Device Config

		💇 Device Config	Device	
	B	🔺 😅 Network	Network	
+		ExternalSelfIP	ExternalSelfIP	
		Enable Floating?	Floating	NO
		External Self IP	SelfIPAddress	10.10.10.130
		- 🔤 Port Lockdown	PortLockdown	DEFAULT
		🔤 Self IP Netmask	SelfIPNetmask	255.255.255.0
+		🔺 😅 InternalSelfIP	InternalSelfIP	
		- 🔤 Enable Floating?	Floating	NO
		🔄 🔤 Internal Self IP Address	SelfIPAddress	192.168.10.130
		– 🧮 Internal Self IP Netmask	SelfIPNetmask	255.255.255.0
		- 🔤 Port Lockdown	PortLockdown	DEFAULT
+		🕨 🛄 Route		
		▶ 🛄 SNAT Pool		

Function Config

🗹 🤺 😅 Function Config	Function
🗹 🛛 🧧 🖾 NetworkRelation	NetworkRelation
🗹 📃 Select Network	NetworkRel Network
🗹 🧉 🖾 WEB	WEB
🗹 🔰 🎽 Pool Members	poolMembers
🗹 🛛 🚄 🧮 Member	member
☑ IPAddress	IPAddress 192.168.10.150
Address	pooladdr 10.10.100
Port 🔤	poolport 80

Click "FINISH" to deploy the graph

nfig parameters for t rofile Name: WEB 🔮 Features:				
All	Folder/Param Image: Config Image: Config	Name Device Network Function NetworkRelation NetworkRel WEB pool_Members member IPAddress pool_addr pool_port	Value Network 192.168.10.150 10.10.10.100 80	Арру То Specific D
	RED indicators parameters needed to be updated	and GREEN indicates parameters w	vill be summitted to the provi	der EPG.

2.2.18 APIC – Verifying WEB application deployment

APIC: Verifying the service graph deployment

You can now verify if APIC has deployed the service graph correctly. First, navigate the following:

Tenant SJC -> L4-L7 Services -> Deployed Graph Instances

You should be able to see a screen similar to the following. The State should say "applied"

ALL TENANTS I Add Tenant I Search: Ontor na	ame, descr I SJC I o	common F5 infra LAX	
Tenant SJC 🛛 🗟 🖸	Deployed Graph	Instances	
Cuick Start			
Tenant SJC			
Application Profiles	0 ₹		
🕨 🚞 Networking	Service Graph	Contract	Contained By
L4-L7 Service Parameters	· · · · · · · · · · · · · · · · · · ·		
🕨 💼 Security Policies	WEB	web2app-contract	Tenant SJC
🕨 💼 Troubleshoot Policies			
🕨 💼 Monitoring Policies			
🔺 🚞 L4-L7 Services			
🕨 🚞 L4-L7 Service Graph Templates			
Router configurations			
Function Profiles			
L4-L7 Devices			
Imported Devices			
Devices Selection Policies			
🔺 🔲 Deployed Graph Instances			
▶ 💙 web2app-contract-WEB-SJC			

Tenant SJC -> L4-L7 Services -> Deployed Devices

You should be able to see a screen similar to the following. The State should say "allocated"

Tenant SJC 🧧 🖸	Deployed Devices	
💼 Quick Start		
🔺 🚢 Tenant SJC		
🕨 💼 Application Profiles	0 ±	
🕨 💼 Networking	<u> </u>	
💼 L4-L7 Service Parameters	🔺 Device Name	VRF
🕨 💼 Security Policies	F5-BIG-IP	SJCcbx1
🕨 💼 Troubleshoot Policies		
🕨 💼 Monitoring Policies		
🔺 🚞 L4-L7 Services		
🕨 🚞 L4-L7 Service Graph Templates		
Router configurations		
Function Profiles		
L4-L7 Devices		
Imported Devices		
🕨 🚞 Devices Selection Policies	•	
🕨 💼 Deployed Graph Instances		
Deployed Devices		

Make sure there is no faults to the deployment:

enant SJC 🧃 🖸	Virtual De	vice - F5-BIG-	IP-SJC	cbd1			
🔲 Quick Start							
🖌 🐣 Tenant SJC							Policy
Application Profiles	0 🛨 🗹	6				AAOO 100	
Networking	~						
🔲 L4-L7 Service Parameters	✓ Severity	Acknowledged Co	ode	Cause	Creation Time	Last Transition	Affected Object
Security Policies					No ite	ms have been found.	
Troubleshoot Policies							
Monitoring Policies							
🔺 🚞 L4-L7 Services							
🕨 💼 L4-L7 Service Graph Templates							
Router configurations							
Function Profiles							
🕨 💼 L4-L7 Devices							
Imported Devices							
🕨 💼 Devices Selection Policies	•						
🕨 💼 Deployed Graph Instances							
🔺 💼 Deployed Devices							
🔺 😪 F5-BIG-IP-SJCabd							
BGP Device Configuration							
💼 OSPF Device Configuration							
▶ 🐦 web2app-contract-WEB-SJC							
📃 Inband Management Configuration for .							

2.2.19 iWorkflow – Verifying the template deployment

Once the service graph is deployed in Cisco APIC, administrator can also view application status in F5 iWorkflow.

Log into the F5 iWorkflow 198.18.128.135 with the following username and password from the web browser (if the previous session has timed out):

iWorkflow: https://198.18.128.135

Username: admin

Password: Clsco12345

Under the iWorkflow Cloud and Services. In the Work pane, under:

Services: graph deployment status

Tenant: APIC tenant information

Nodes: pool members information

Notice the graph is "unhealthy" because no servers are available to the BIG-IP virtual server. This is expected because dCloud only validate control plane, as a result, BIG-IP data plane validation to the servers failed.

O items total 1 item total 1 item total 1 item total	🚯 iWorkflo)W Cl∘	uds and Services	BIG-IP Connectivity	BIG-IP HA	System	Settings	Acc	ess Control
O items total 1 item total 1 item total 1 item total							Filter		
0 items total 1 item total 1 item total 1 item total 1 item total	Activities		Nodes		Services	5			Tenan
		IT.	d its up to tal	17	d in un antal		17		1 in un antal
▲ 192.168.10.150%2848:80 ♀ ~apic-SJC-SJC-tx1-13097~WE apic-SJC GENERATED ~apic SJC-SJCctx1-13097~W apic SJC-SJCctx1-13097 apic SJC-SJCctx1-13097 dientside bits in: 0 dientside bits in: 0 dientside bits in: 0	u items total		A 192.168.10		~apic-SJC apic-SJC-SJCtx1 active member	I-13097 cnt: 0	3097~WE		apic-SJC-SJ

Tenants:

Tenants	+	Tenant Properties			Save
1 Item total	Ţ	Tenant Properties			
apic-SJC-SJCctx1-13097	e e	Name	apic-SJC-SJCctx1-13097		
		Description	Created by APIC device package		
		Access			
		Available Clouds	dcloud 🔹	± ×	
		Contact Info			
		Address			
		Phone			
		Email			

Services

Notices "Customize Application Template" contains the fields visible in APIC. User input the values from APIC.

Services	~apic-SJC-SJCctx1-13097~WEB-ADC-453			
1 Item total	Properties Statistics			
• ~ apic-SJC-SJCctx1-13097~W apic-SJC-SJCcx1-13097 active member crt:0	General Properties			
dientside bits in:0	Name	~apic-SJC-SJCctx1-13097~WEB-ADC-45347.app~WEB-ADC-45347		
	Status	Application Service unhealthy: unavailable		
	Application Type	WEB		
	Cloud	dcloud		
	Customize Application Templa	te		
	Pool Port	80		
	Pool Addr	10.10.10.100%2848		
	Pool Members	Ipaddress		
	Poormanders	192.168.10.150%2848		

In case Customize Application Template is empty, please check back in a few minutes until the resource is refresh

cisco.

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Nodes:

This the member IP entered through APIC.

Nodes	192.168.10.150%2848:80		
T I Item total	Properties	Statistics	
▲ 192.168.10.150%2848:80 GENERATED ~apic SJC-SJCcx1-13097~W	General Proper		
	Cloud		dcloud
	Status		A
	Server Address		192.168.10.150%2848
	Properties		
	Instance State		GENERATED

2.2.20 BIG-IP – Verifying Application Services (Virtual Server) deployment

Log into the F5 BIG-IP 198.18.128.130 with the following username and password from the web browser (if the previous session has timed out):

BIG-IP: https://198.18.128.130

Username: admin

Password: Clsco12345

On the Main menu, click Local Traffic -> Network Map. Then on the top right corner, next to the Log out button, click the drop down to select the newly created Partition (please note that this reflects the APIC Virtual Device ID):



Once you are in the partition, click Local Traffic -> Network Map. You should be able to see the virtual server is configured along with its pool and pool members.

ONLINE (ACTIVE) Standalone				
Main Help About	Local Traffic » Network Map			
Mage Statistics	🚓 🚽 Network Map			
iApps	Status Any Status The Show Summary Update Map	ype All Types 🔻	Search *	Search iRule
Local Traffic	Local Traffic Network Map			
Network Map	WEB-ADC-45347_vs			
Virtual Servers	WEB-ADC-45347_pool 192.168.10.150%2848:80			
Policies >	132.100.10.130702040.00			

On the right Navigation menu, click the Local Traffic -> Virtual Servers and you should be able to see the brief Virtual IP information. You can see that the VIP is currently listening on HTTP port 80.

The number (in this example, 2848) after the % mark represents the route domain (RD) number. There will be a RD number assign to each APIC partition, which equivalent to an ACI L3 VRF. This allows BIG-IP to provide multi-tenancy support in ACI environment.

ONLINE (ACTIVE) Standalone							
Main Help About	Local Traffic » Virtual Servers : Virtual	Server List					
Statistics	🚓 👻 Virtual Server List Virtual Addres	ss List Statistics	-				
iApps	*	Search					
S DNS	🕑 🖃 Status 🔺 Name	Application	Destination	Service Port	Type	Resources	Partition / Par
	WEB-ADC-45347_vs	WEB-ADC-45347	10.10.10.10(<mark>%</mark> 2848	80 (HTTP)	Standard	Edit	apic-SJC-SJC
Local Traffic	Enable Disable Delete						
Network Map							
Virtual Servers							

In the Virtual Server List, click the Name in the hyperlink and you will see the Property of the Virtual Server with more detailed information. The configured the parameters will appear here.

Main Help About	Local Traffic » Virtual Servers :	Virtual Server List » WEB-ADC-45347_vs				
Statistics	🚓 🚽 Properties 🛛 Reso	urces Security 👻 Statistics				
iApps	General Properties					
🕥 DNS	Name	WEB-ADC-45347_vs				
2.9.1.17.55	Application	WEB-ADC-45347				
Local Traffic	Partition / Path	apic-SJC-SJCctx1-13097/WEB-ADC-45347.app				
Network Map	Description	vsdescr				
Virtual Servers	Туре	Standard				
Policies >	Source Address	0.0.0.0%2848/0 10.10.10.100%2848 80 HTTP				
Profiles >						
iRules >	Destination Address/Mask					
Pools >	Service Port					
Nodes >	Notify Status to Virtual Address					
Monitors 📀	Availability	Offline (Enabled) - The children pool member(s)				
Traffic Class 🛞	Syncookie Status	Off				
Address Translation +	State	Enabled T				

Click on "Resource", notice the pool name being used

Local Traffic » Virtual Servers : Virtual Server List » WEB-ADC-45347_vs								
🚓 🗸 Properties	Reso	ources	Security	+	Statistics	Ø		
Load Balancing								
Default Pool		WEB-ADC-	45347_pool	•				
Default Persistenc	e Profile	cookie	T					
Fallback Persisten	ce Profile	source_ad	dr 🔻					
Update								

Click Local Traffic -> Pools and you should see the brief information of the real server pool information:

<u></u>									
Main	Help	About	Local Traffic » Pools : Pool List » WEB-ADC-45347_pool					d -	
Ma Statis	tics		.⇔	Properti	es	Memb	ers	Statistics	(
iApps			Load B	alancing					
S DNS			Load	Balancing	, Method		Round R	obin	
Coral	Traffic		Priori	ty Group A	ctivation		Disabled	•	
Ne	twork Map		Upda	te					
Vir	tual Servers	Þ	Curren	t Member	s				
F	olicies			- Status	Member	er		▲ Address	
F	rofiles) – E		•	192.168.	10.1509	62848:80	192.168.10.15	50%284
if	Rules		Enab	le Disal	ble Forc	e Offline	e Remov	/e	
F	ools,	Þ							

Go back to the Navigation pane and click the iApps -> Application Services. Notice the name of the Application Services is same as the Services name in iWorkflow.

Template is the iApps template that associated with this application service

Partition/Path is the APIC created partition and the name of the application service

ſ	ONLINE (ACTIVE) Standalone				
Ma	in Help About	iApps » Application Services : Applications			
Mag s	tatistics	🚓 🚽 Application Service List			
1	lpps	* Search			
	Application Services	▼ ▲ Name	♦ Template	Template Validity	Partition / P
	Templates AWS	WEB-ADC-45347	appsvcs_integration_v1.0_001		apic-SJC-SJC

F5 iWorkflow service name

Properties	Statistics			
General Prope	rties			
Name		~apic-SJC-SJCctx1-13097~WEB-ADC-45347.app	WEB-ADC-45347	

Click the application service name will direct to the Application Services Components. By using iApps template, you can configure a full features virtual server by specifying customized parameters exposed to APIC. Only the highlighted ones are entered by APIC, the rest of the virtual servers features are built inside the iApps template.

iApps » Application	Services : Applications	WEB-ADC-45347		
🚓 👻 Properties	Reconfigure	Components	-	
Name			Availab	ility Type
🖃 🚍 BIG-IP				
UVEB-ADC-45	5347			Application S
🖃 📑 🗔 WEB-A	ADC-45347_vs		🔶 Offlir	ne Virtual Serve
🖃 👥 WEB-/	ADC-45347_pool		🔶 Offlir	ne Pool
💷 http	p			Monitor
e <u>]</u> 🗆	192.168.10.150%2848:80		🔶 Offlir	ne Pool Member
	192.168.10.150%2848		🔲 Unkn	
i source	e_addr			Profile
10.10.	10.100%2848			Virtual Addre
i cookie				Virtual Serve
WEB-/	ADC-45347_http			Profile
tcp-w	an-optimized			Profile
🔲 top-lar	n-optimized			Profile
🔲 oneco	nnect			Profile
🔲 httpco	mpression			Profile
🖃 🌍 publish_st	tats			icall_periodic
🌍 publish	n_stats			icall_script

Network -> Self IP configuration from APIC

		No. of Concession, Name						
Ma	ain Help About	Net	twork » Self IPs					
M	Statistics	\$	Self IP List					
i	Apps	*	Search					
5 1	ONS	v	🗢 Name	Application	IP Address	Netmask	VLAN / Tunnel	Traffic Grou
			apic-SJC-SJCctx1-13097_Network_ExternalSelfIP		10.10.10.130%2848	255.255.255.0	apic-13097_49154	traffic-group-lo
	ocal Traffic		apic-SJC-SJCctx1-13097_Network_InternalSelfIP		192.168.10.130%2848	255.255.255.0	apic-13097_49155	traffic-group-lo
	Acceleration	De	elete					
a (Device Management							
•	Security							
	Network							
	Interfaces	•						
	Routes	÷						
	Self IPs (÷						

VLAN information imported from APIC:

Ma	in Help Ab	out	Network » VLANs : VLA	AN List	A	 	Acres		
Maga S	tatistics		🗱 👻 VLAN List	VLAN Groups					
<u>i</u> /	Apps		*		Search				
() D	INS		🖌 🔺 Name			Application	¢ Tag	Untagged Interfaces	Tagged Interfa
CC L	ocal Traffic		apic-13097_49154					1.1 1.2	
🦳 A	cceleration		Delete						
📄 D	evice Management								
🔘 s	iecurity								
<u></u> N	letwork								
	Interfaces	×.							
	Routes	÷							
	Self IPs	÷							
	Packet Filters	×.							
	Trunks	÷							
	Tunnels	Þ							
	Route Domains	÷							
	VLANS	Þ							

Same VLAN tags are being assigned in APIC

Tenant SJC 🧧 🖸	Function Node - A	DC				
Cuick Start						
🔺 🚢 Tenant SJC						
Application Profiles	0 ± /			AAOO		
🕨 🚞 Networking						
L4-L7 Service Parameters	Properties					
Security Policies	Name: A	ADC				
Troubleshoot Policies	Function Type: G	боТо				
Monitoring Policies	Devices: o	ommon/F5-BIG-IP				
🔺 🚞 L4-L7 Services	Cluster Interfaces:	<u>▲ Name</u>	🗸 Concrete in	nterfaces		
L4L7 Service Graph Templates		External	Device1/[1	1_1]		
Router configurations		Internal	Device1/[1	1 21		
Function Profiles		internal.		1		
L4-L7 Devices	Function Connectors:			_		
Imported Devices	Fullction connectors.	🔺 Nате	Enca)lass ID
Devices Selection Policies	*	consumer	vlan-	-1168	4	9154
🔺 🚞 Deployed Graph Instances		provider	vlan-	1001	4	9155
✓ ★ web2app-contract-WEB-SJC						
E Function Node - ADC	Folders And Para	ameters				

This concludes Scenario 1 "Deploy Service Graphs in Cisco ACI using F5 iWorkflow" lab.

2.3 Modify L4 – L7 deployed graph parameters

User can modify deployed graph parameters, only parameters mark "Tenant Editable" in iWorkflow can be changed in APIC. Once a graph is deployed, user need to go under Application Profiles / EPG level in order to make changes to deployed graph parameters. The deployed graph parameters reside under the provider EPG, in this case, it is the app EPG.

Go to APIC Tenant SJC -> Application Profiles -> App1 -> Application EPGs -> EPG app -> L4-L7 Service Parameters, click the pen button:

Tenant SJC Quick Start Tenant SJC A Deplication Profiles A App1	L4-L7 Service Param	Search By Name / Value:		
Application EPGs	Meta Folder/Param Kay	Contract Name	Service Graph Name	Service Function
Domains (VMs and Bare-M	🕨 🚞 Network	web2app-contract	WEB	ADC
Static Ports	🕨 🚞 NetworkRelation	web2app-contract	WEB	ADC
Static Leafs	> 🖿 WEB	web2app-contract	WEB	ADC
🕨 🚞 Fiber Channel (Paths)				
Contracts				
🔲 Static EndPoint				
🕨 💼 Subnets				
L4-L7 Virtual IPs				
L4-L7 IP Address Pool	4			
L4-L7 Service Parameters				

Select the following:

Contract Name: SJC/web2app-contract

Graph Name: SJC/WEB

Node Name: ADC

Then click "All Parameters"

Edit l	Edit L4-L7 Service Parameters					
Clie	ck row to edit value	e				
	Contract Name:	SJC/web2app-contract	- 6			
	Graph Name:	SJC/WEB	~ @			
	Node Name:	ADC	~ @			
Fei	atures and Parameters					
F	eatures:	Basic Param	eters All Parameters			
	All	Fo	ider/Param	Name	Value	
		84	🚔 Device Config	Device		
		X =	🕨 🛄 Network	Network		
		✓ ▲	Function Config	Function		
		🗙 🗹	NetworkRelation	NetworkRelation		
			NEB 💭 WEB	WEB		

Expand WEB folder, double click on pool___port, change the value from 80 to 8080, then "UPDATE"

Basic Parameters All Parameters						
Folder/Param	Name	Apply To Specific Value Device				
😑 🥒 🔿 Device Config	Device	Device				
🔀 😑 🕨 📮 Network	Network	Network				
🗹 🔺 🚔 Function Config	Function	Function				
🔀 🗹 🕨 🔍 Network Relation	NetworkRelation	NetworkRelation				
🔀 🗹 🔺 🚔 WEB	WEB	WEB				
🛛 🗹 🔹 🕨 🖂 Pool Members	poolMembers					
🗙 🗹 🛛 🔁 Address	pool <u>a</u> ddr	10.10.10.100				
🛛 🔽 🔤 Port	poolport	8080				
	UPDATE RESET CANCE					

Then "SUBMIT"

t L4-L7 Service Pa	rameters							i
lick row to edit value	9							
Contract Name: SJC/web2app-contract				-	æ			
Graph Name:	Graph Name: SJC/WEB				æ			
Node Name:	ADC			•	Ø			
Features and Parameters					_			
Features:		Basic Pa	rameters	All Paramete	rs			
All			Folder/Pa	nam		Name	Value	Apply To Specific Device
		B	🔺 🔿 De	evice Config		Device		
		× =	▶ 🛄	Network		Network		
			4 📑 Fu	inction Config		Function		
		× 🗹		NetworkRelation		NetworkRelation		
		×	4 🚍			WEB		
		X 🗹		📮 Pool Member	s	poolMembers		
		×		E Address		pooladdr	10.10.10.100	
		X 🗹		💷 Port		poolport	8080	
							SHOW USAGE S	UBMIT CANCEI

Notice on iWorkflow, under Services, the port value is updated to 8080

Services	~apic-SJC-SJCctx1-1	13097~WEB-ADC-453				
1 Item total	Properties Statistics					
~apic-SJC-SJCctx1-13097~W apic SJC-SJCctx1-13097 active member on::0 dientside-bits in:0	General Properties					
	Name	~apic-SJC-SJCctx1-13097~WEB-ADC-45347.app~WEB-ADC-45347				
	Status	Application Service unhealthy: unavailable, Application Service is				
	Application Type	WEB				
	Cloud	dcloud				
	Customize Application Templa	te				
	Pool Port	8080				
	Pool Addr	10.10.10.100%2848				
	Pool Members	Ipaddress				
	Foormembers	192.168.10.150%2848				

BIG-IP virtual server reflects the same configuration update

Local Traffic » Virtual Servers : Virtual Server	List
🗱 🚽 Virtual Server List Virtual Address List	Statistics 👻
* Sea	arch
💽 💌 Status 🔺 Name	Application
WEB-ADC-45347_vs Enable Disable Delete	WEB-ADC-45347 10.10.10.100
	* Sea ✓ ✓ Status ▲ Name

This concludes Scenario 2 "Modify L4 – L7 deployed graph parameters" lab.

2.4 Remove APIC Service Graph

2.4.1 APIC – Remove Only Service Graph Deployment

The easiest way to remove a service graph deployment, which is same as removing virtual server from the BIG-IP, yet remain all the EPG and device selection policy parameters for easy re-deployment is to un-associate a service graph under the contract subject.

Go to the contract subject by clicking the following:

Tenants SJC -> Security Policies -> Contracts -> web2app-contract -> Subject

Move the mouse to Service Graph and hover near the drop-down menu, you will see "X", click "X" and graph will be removed from contract subject:

Tenant SJC	⊴ ⊙	Contract Subject	- Subject	
Quick Start Tenant SJC			Cabjoot	
 Application Profiles Networking 				
L4-L7 Service Parameters		o±		
 Contracts Source web2app-contract 		Property Name:	Subject	
🚺 Subject		Description:	optional	
 Imported Contracts Filters 		Apply Both Directions: Reverse Filter Ports:		
 Troubleshoot Policies Monitoring Policies 		Filters:		
L4-L7 Services			Name default	
		Service Graph:	SJC/WEB	× → @
		QoS Class:	Unapecified	•
		Target DSCP:	Unapecified	•

Click "X", the service graph SJC/WEB will disappear:

Service Graph:	aelectia value	•
QoS Class:	Unapecified	•
Target DSCP:	Unapecified	•

Click "SUBMIT"

Service Graph:	aelectia value	-
QoS Clasa:	Unapecified	•
Target DSCP:	Unapecified	•

Notice iWorkflow: Tenant, Service and Node are empty:

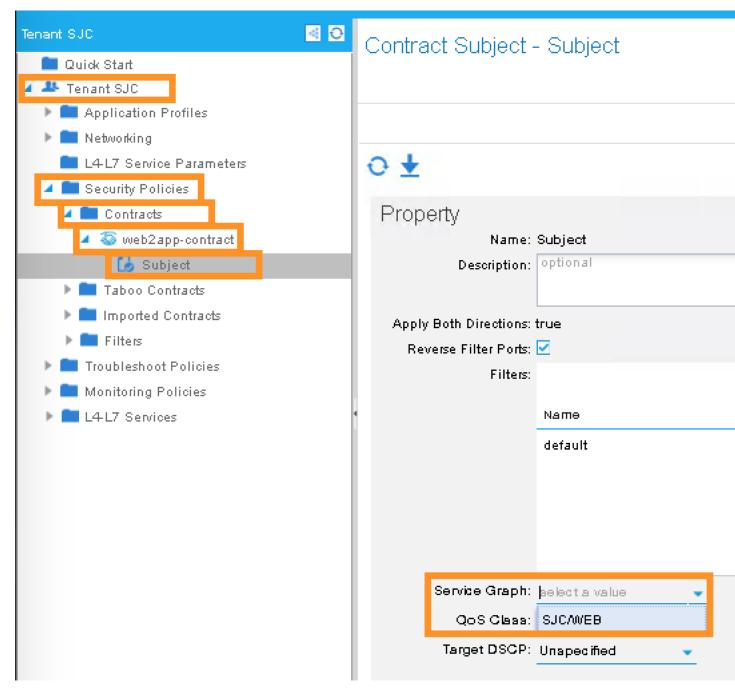
Tenants	+	Nodes	Services
	т	T	
0 Items total		0 Items total	0 Items total

BIG-IP, the partition is removed, including all virtual servers and network related configurations:



2.4.2 APIC – Re-deploy Service Graph

In order to re-deploy the same graph, simply go to contract subject and re-associate SJC/WEB under Service Graph:



Click "SUBMIT"

Service Graph: SJC/WEB	S1 🚽
	Gr
QoSClass: Unspecified	•
Target DSCP: Unapedified	•

You will see the Application Service is redeployed in iWorkflow and BIG-IP

Tenants	+	Noc	des			Servi	ces
	T				7		
1 Item total		1 Item	total			1 Item to	tal
apic-SJC-SJCctx1-51597			2.168.10.150% ATED ~apic SJC-SJC			-apic apic SJC-SJ active men dientside-I	
Partition: apic-SJC-SJCctx1-51							
🕁 🗸 Virtual Server List Virtual Address		tics ¬					
*	Search						
🕑 🖃 Status 🔺 Name	\$ A	pplication	Destination	♦ Service Port	Type	Resources	Partition / Path
WEB-ADC-4852_vs	WE	B-ADC-4852	10.10.10.100% 2729	8080	Standard	Edit	apic-SJC-SJCctx1-6
Enable Disable Delete							

Notice the tenant VID, graph ID and the RD values are different from previous deployment.

2.4.3 APIC – Remove all graph associated objects

If you want to clean up all the related objects of the deployed graph template, go to:

Tenants SJC ->L4-L7 Services -> L4-L7 Service Graph Templates, right click on the graph template WEB, then select

"Removed Related Objects of Graph Template"



Select:

Contract: web2app-contract

Provider EPF: App1/app

Radio button: "remove both contracts and relations to the EPGs"

Check box:

Remove related EPF parameters <- this will remove all L4-L7 parameters of this particular contract/graph/node under EPG

Remvoe related device selection policies <- this will remove connectivity policy of this particular contract/graph/node

Click "SUBMIT"

Remove Related Objects Of Grap	h Template	i 🕽
Please check Contract, EPG Para	meters and Device Selection Policies to rem	IOVE
Graph Temp <mark>late Name:</mark>	WEB	_
Contract:	web2app-contract 🗸 🗸	9
Provider EPG / Internal Network	Арр1/арр 🗸	9
Contract:	Keep both contract and relations to the EPGs	
	Remove both contract and relations to the EPGs	
	Keep contract and remove relations to the EPGs	
	Remove contract will not remove its exported contract interfaces and contra relations to the EPGs. Users have to manally remove those objects.	act linte maces
Remove Related EPG Parameters:		
Remove Related Device Selection		
Policies:	su	BMIT CANCEL

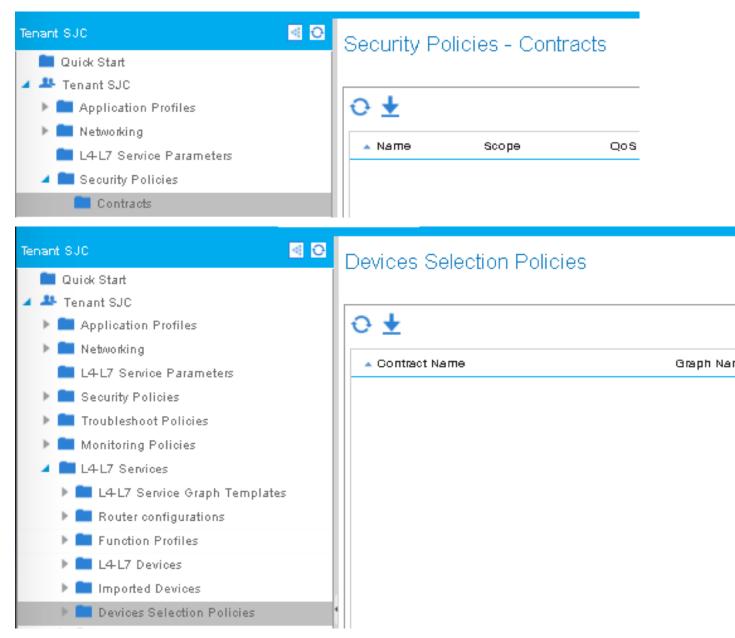
Notice on APIC:

EPG app: related L4-L7 Services Parameters are removed

Related Devices Selection Policies is removed

Related contract is removed

Tenant SJC 🧧 🖸	L4-L7 Service Para	meters				
Quick Start	0/	Search By Name /				
	0.0	Value:				
Application Profiles	×					
4 😓 App1						
🔺 🚞 Application EPGs	Meta Folder/Param Key	Contract Name	Service Graph Name	Service Function Name	Folder/Param Instance	Value
🔺 🚫 EPG app	· · · · · · · · · · · · · · · · · · ·				Name	
🔲 Domains (VMs and Bare-M						
🕨 💼 Static Ports						
E Static Leafs						
🕨 🖿 Fiber Channel (Paths)						
Contracts						
🖿 Static EndPoint						
🕨 🖿 Subnets						
L4-L7 Virtual IPs						
L4-L7 IP Address Pool	4					
📒 L4-L7 Service Parameters						



F5 iWorkflow configuration related to APIC tenant and service graph is un-configured

Tenants +	Nodes	Services
0 Items total	0 Items total	0 Items total

BIG-IP is also clean:

Partition:	Common	•
	Common	
	All [Read Only]	

2.4.4 APIC – Remove L4-L7 Devices from Tenant Common

Remove the L4-L7 logical device cluster from common tenant.

Tenant Common->L4-L7 Services -> L4-L7 devices -> , right click on the logical device cluster and click delete

This will also delete the device group from the BIG-IP (no device group correcponding to the logcail device cluster present anymore)

ſ	ONLINE (ACTIVE) Standalone				
Mai	in Help Ab	out	Device Management » Device Groups		
100 s	tatistics		🔅 👻 Device Group List		
iA	Apps		* Search		
S D	NS		Group Name	\$ Type	≑ Conf
			datasync-global-dg (Includes Self)	Sync-Only	Manual
	ocal Traffic		Delete		
A	cceleration				
📄 D	evice Management				
	Overview				
	Devices				
	Device Groups	()			
	Device Trust	Þ			
	Traffic Groups	÷			

2.4.5 APIC – Remove Device Manager from Tenant Common

Remove the device manager from common tenant.

Tenant Common->L4-L7 Services -> L4-L7 devices -> Device Managers-> 'dcloud-device-manager, right click on the device manager and click delete

2.4.6 APIC – Remove Device Manager Type from L4-L7 Services

Remove the device manager type from L4-L7 services

Go to L4-L7 Services -> Inventory -> Device manager types , right click on the device manager and click delete

vThis conclude Scenario 3 "Remove APIC Service Graph" lab.

2.5 Using POSTMAN REST client to deploy service graph

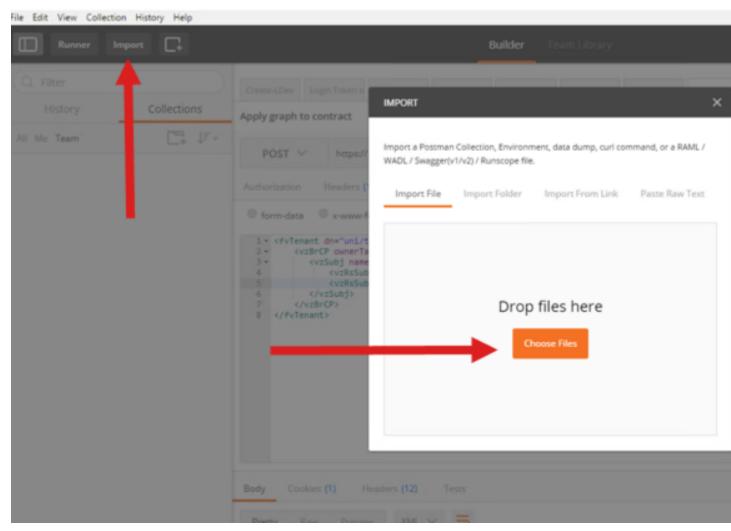
Launch POSTMAN from desktop

Import the POSTMAN collection

The JSON collection if saved on your desktop - 'dCloud-F5-iWorkflow-App-iApps-Final.postman_collection.json'

Click on Collection->Import

Click on the 'Choose Files' button and browse to the json collection and import it



The POSTMAN collection will be loaded in your POSTMAN window:

Runner	Import				6	uilder	Tear
Q. Filter		Create-LDev	Login Tc 🛛 🗙	Export from o	Create Service	Create Co	ontra /
History	Collections						
All N		POST	V https://	200	/api/aaaLogin.3	aml	

To view what each API call executed, click on the POST requests

Click on the Body to view the payload being passed

Click the Send button to execute the request

Check the status at the bottom of the window to see if the request got executed successfully (200 OK)

POST V	ttps://198.18.133.200/api/node/mo/uni/tn-common.xml		Params Ser	nd 💙 Save
key	value	URI to which	request is passed	Bulk
horization	Headers Body Pre-request Script Tests			Cookies
form-data	$^{\odot}$ x-www-form-unlencoded $^{~\bullet}$ raw $^{~\odot}$ binary $~~{\rm Text}~{}\sim$			
4 5 6 7 8 9 10	<pre>cunsRUBewitt tDm*uni/infr/n/Dev-F5-liker/Flow-2-8-eCloud cvmsCfreeSecret name*password" value**Clscol2145*/> cvmsCignt name*" port**443* hott**138.18.128.135*/> cvmsRuELevToDom* tDm*uni/vmme/VMumre/dom/Hy-vCenter*/> cvmsCier name*"Dwriczir value**2650-19* vcenterimae**d cvmsCierd name*"burtvalue**admin*/> cvmsCierd name*"burtvalue**admin*/> cvmsCierd name*"burtvalue**admin*/> cvmsCiert name**password* value**Clscol2345*/> cvmsCigf name**Dwriczi*443* hott**185.18.18.18.18.19*/> cvmsCiff name**1_1* vmiciame**letwork adapter 2*/></pre>			P ay lo ad
12 13 14 15 15 17 18 19 20	<pre>cvn5tf name="l_2" vnidime="litturk adapter 37/> cvn5tevfader name="hostName" value="bigj1.dcloud.cis cvns5tevfader) cvns5tevfader) cvns8tevfader) cvns8</pre>	*lr=dCloud=0C*/>	n	
13 14 15 15 16 17 18 19 20	<pre>cvn50evFolder mame="NostConfig" key="MostConfig"> cvn50evFolder) cvn50evFolder) cvn54cDevFolder) cvn54c</pre>	*lr=dCloud=0C*/>		Time: 123 ms Size: Si

Note: Device package install, device manager configuration has already been done, POSTS are from the point of when a graph is to be created

Run each postman POST and then see the corresponding object created on the APIC

- 1. Login Token to APIC Used for authentication to the APIC. The response to the POST operation will contain an authentication token. Subsequent operations on the REST API will use this token value to authenticate future requests.
- 2. CreateDeviceManagerType Used to create a device manger type under L4-L7 services->Inventory
- 3. CreateDeviceManager-Common Will create a device manager which has iWorkflow credentials under tenant common
- 4. Create-Ldev-Common- Creates a logical device cluster on the APIC in tenant common
- 5. Export from Common to SJC tenant Exports the LDev from common tenant to SJC tenant
- Scope Network under AP This will scope the network parameters like self IP/route under the application profiles
- 7. Create contract Creates a contract to be used in tenant SJC
- 8. Assign contract to web EPG

- 9. Assign contract to app EPG
- 10. Create service graph template Creates the service graph template to be used
- 11. Apply service graph template Specifies the parameters (virtual server/pool. Pool members etc.) to be configured for this particular graph
- 12. Create device selection policy Creates a device selection policy (This construct gets created automatically when using the UI, this is an extra step needed when using automation)
- 13. Apply graph to contact Attach the graph to the contract

This conclude Scenario 4 "POSTMAN REST client" lab.

A. Reset APIC Simulator

APIC Fabric Members are created by default, so that the demonstration can begin with the creation of the APIC objects.

If you want to demonstrate the fabric discovery, reboot the **apic-fcs** via Guest OS Control as follows:

- 1. From the Demo Dashboard, click Servers.
- 2. Servers Tab

	Stop Demo	Share Demo	Save Demo	Extend Demo
Topology				~
Demonstration Documentation				~
Session Details				~
Servers				~
Session Alerts				~

3. From the Servers list, click the 🕒 next to apic-fcs.

Servers					
Note: These o	controls are only needed if you	are experiencing a problem with the d	lemonstration		Enable Status Polling
	Server Name	Remote Access			
🛨 🕨 ad1		198.18.133.1	guestToolsRunning	running	
🛨 🕨 apic-fcs	zs.	198.18.133.200	guestToolsRunning	running	
🛨 🕨 na-edg	ge1	198.18.133.115	guestToolsRunning	running	
🛨 🕨 vcva		198.18.133.211	guestToolsRunning	running	
🛨 🕨 vesx1		198.18.133.32	guestToolsRunning	running	
🛨 🕨 tools1		198.18.133.210	guestToolsRunning	running	
🛨 🕨 vesx2		198.18.133.31	guestToolsRunning	running	
🛨 🕨 wkst1		198.18.133.36	guestToolsRunning	running	Remote Desktop

4. Click the **Reboot** button in **Guest OS Control** to restart the server.

Note: These controls are only needed if you are expe	riencing a problem with the demonstration		
Server Name	IP Address	VMWare Tools	Guest OS Status
🛨 🕨 ad1	198.18.133.1	guestToolsRunning	running
□ ► apic-fcs	198.18.133.200	guestToolsRunning	running
Application Policy Infrastructure Controller Simulate	or (1.0.1e)		
Power Control:	Memory: 24Gb		
Guest OS Control: 🕐 🗇	CPU's 6		
Credentials: admin/C1sco12345	Links:		
🛨 🕨 na-edge1	198.18.133.115	guestToolsRunning	running

Note: It will take up to 5 minutes before you can login and rebuild the Fabric using one of the Fabric Discovery methods in *Appendix B*.

A. Fabric Discovery

If they are not configured, use one of the three methods below to configure:

Method	Automation Level	Explanation	Completion Time
Script Configuration	High	Skip the configuration steps and discover the APIC Fabric automati- cally, as shown in <i>Con- figure APIC Fabric Us- ing Scripts</i> .	1 minute, followed by 15 minutes to build the fabric
Wizard Configuration	Medium	Set up the APIC Fabric using the Post- man–REST client, as shown in <i>Configure</i> <i>APIC Fabric Using</i> <i>Postman–REST Client</i> .	5 minutes, followed by 15 minutes to build the fabric

Note: The full fabric discovery can take up to 15 minutes. The apic3 controller will be discovered after all the devices are discovered. You can check monitor the progress by selecting **Topology** from the **Inventory** pane in the APIC GUI. While the discovery is taking place, you can complete *Scenario 1*, which ends in the APIC Topology window showing the discovered elements.

Demonstration Steps

2.5.1 Configure APIC Fabric Using Scripts

- 1. From the demonstration workstation, click the **Build ACI Fabric** icon.
- Type Y <Enter> at the Do you want to continue (Y/N)? prompt. The script will begin building the fabric, which will take about 15 minutes.
- 3. Build ACI Fabric Script

	Build ACI Fabric	-	×	
	"This script will build the ACI Fabric, it will take up to 15 minutes for the full fabric discovery to complete	e."		^
D	Do you want to continue <¥/N>?_			

4. Type **Y** <**Enter**> at the **Do you want to continue (Y/N)?** prompt. The script will begin building the F5, which will complete before the ACI fabric is set up.

2.5.2 Configure APIC Fabric Using Postman–REST Client

- 1. From the demonstration workstation, launch 'APIC Login', and then log in to the Application Policy Infrastructure Controller with the following credentials: Username: admin, Password: C1sco12345.
- 2. From the menu bar, click Fabric.
- 3. From the sub-menu bar, click Inventory.
- 4. In the left-pane, choose Fabric Membership.
- 5. Review the current members of the Fabric.
- 6. Fabric Membership

Fabric Me	mbership							🔰 i
€₹								ACTIONS *
SERIAL NUMBER	NODEID	NODE NAME	RACK NAME	MODEL	ROLE		DECOMISSIONED	SUPPORTED MODEL
TEP-1-101	0			N9K-C9396PX	leaf	0.0.0.0	False	True

7. Launch the **Postman – REST Client** [**1**] from the taskbar. You are automatically be logged in. This is where you will register the switches for the APIC.

Note: If you get a status of **403 Forbidden** while performing the activity in this scenario, review the text below for more information on the error. If you see **Token was invalid (Error: Token timeout)**, this means that your session has timed out. You will need to launch the **APIC Login** POST [INTERCEDENT] and then proceed with the next POST.

ody	Cookie	is Hea	ders (5)	Tests		STATUS	403 Forbid	Iden TIME 84	ms
Pr	etty	Raw	Previe	ew		Q	≣ŀ	JSON 🕶	M
{									
-	imdata	a: [
		- error	:{						
		-	attribut	es: {					
			coc	le: "403	3",				
			tex	t: "Tok	en was	invalid	(Error: To	oken timeou	t)"

- 8. In the left-pane, click the arrow [▶] next to dCloud APIC Demo, and then click the arrow next to Create Fabric and dCloud APIC Connectivity.
- 9. dCloud APIC Demo



- 10. Go to dCloud APIC Connectivity and then choose APIC Login. Click Send to connect to the APIC.
- 11. APIC Login and Send

story Collections	*	Normal	Basic Auth	Digest Auth	0 Auth 1.0	Auth 2.0	No environment			
dCloud APIC Demo		APIC Log	in							
App Network Profiles										
Create Fabric		https://	198.18.133.2	200/api/aaaLog	gin.xml			POST	URL params	G Headers (1
POST Add Spine 1 to Fabric		form-	lata x-ww	w-form-urlenco	ded raw b	nary XML (application/xml) 🖛			
POST Add Spine 2 to Fabric										
POST Add Leaf 2 to Fabric		1 <4	iaaUser nam	ne="admin" p	wd="C1sco1234	5" <u>/></u>				
POST Configure Leaf 1										
enants										
/MM Domain										
VMM Domain dCloud APIC Connectivity POST APIC Login										
dCloud APIC Connectivity										
dCloud APIC Connectivity POST APIC Login		Send	• Save	e Preview	Pre-request scr	pt Tests	Add to collection			Reset
ICloud APIC Connectivity POST APIC Login POST Turn On HTTP access		Send	• Save	Preview	Pre-request scr	pt Tests	Add to collection			Reset
Cloud APIC Connectivity POST APIC Login POST Turn On HTTP access		Send	Save	Preview	Pre-request scr	pt Tests	Add to collection			Rese
Cloud APIC Connectivity POST APIC Login POST Turn On HTTP access		Send	▼ Save	Preview	Pre-request scr	pt Tests	Add to collection			Rese

- 12. Review the Status of the submission. A result of 200 OK means the submission was successful.
- 13. Status

100	10131313 (b - Remote Desit	In Conversion			- • • • •	
		× /			- 0 -	🥥 Goos Jaktro
Recycle Bin < 🔿 🖈 🙆 his		//198.18.133.200/#ca.1/root/dhepClients			☆ =	file Communicate Year Help
File Edit View	🔣 Appo 🗥 APIC 🗋 Cloco /					
× Share Brow		POSTMAN APLONECOV Collector name: Uppa		spie soporten 🗄 🗆 💥 🖾 🖯	j vektore, admin 🔻	• O _
Deniment and	cisco	History Collections	Normal Basic Auth Digest Auth 0 Auth 1.0 0 Auth 2.0 @ Meevioceneet*			of AaBbCr 🗧 🗛 🔥 And - 😜 📩
Support Se.	Investory	▼ dCloud APIC Dame	APICLogin		🗐 i	dC-H2 · Change & Select · Share Webbx
	Qaá Ilat	App Network Profiles	Afficia			G Editing WebEx
ခွ	Topology	▼ Create Fabric	https://100.10.133.200/api/aaaLogin.xml	POST • & URL parama & Headers (1)	ACTIONS -	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	Tabes Pales Plender ship Concerning Pales Pales	FORT Add Spine 1 to Fabric	form-data s-www-form-unlencoded raw binary XM.(poplication)mD =		DECOMISSIONED SUPPORTED MODEL	· ·
	Chrynadrable Hodes	10051 Add Spine 2 to Fabric	1 Kasaliser name-Tadmin" pud-"Ciscol2345" ()		Polae True	
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جو ا	k	FORT Configure Leaf 1				
Connected Backup In		► Tenants				
		WMH Domain Vide Connectivity				
		Post APIC Login				ssion was successful.
		POST Turn On HTTP access				
Soogle Chrome		P051 Extend Web Token Timer	Sond Same Preview Pre-request script. Tests Add to collection	Reset		
		dCloud APIC Lab	Body Carlies Headers()) Dess STATES DOOR IN BIO			
GTRC Suppo			Body Cookee Header(3) Tests BITTED 1001A LLL 10 14			
GTRC			Pretty Raw Preview 🕱 🔍 🛃 201.+ 用	Copy		
Suppo			(initia)			1
			CaseLogin token="#PR2y0/0820c25358PCR0g834By8eL18x838Qrg52c1PCx8pypg83pin58apC630c260	OUTLINE C		
Marage Prinzes			(assisted)ands name="all" release"admd=" release"admd=") (assisted)alls /)	+ (indata)		
Manage			canadeliteRolano	 aasLegin taken bMitbyGr082tscdj2rd 		en it will discover the others.
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2		Type to liter	 Ordemaintraphetry contact/re-comment read/violingeoutadaint write/violingeoutadaint // Ordemaintraphetry contact/re-infrat read/violingeoutadaint write/violingeoutadaint //) 	(Dr.DonianMapEnty) dr. um/ti-regnt		
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WebEx One-Click						Page 5 of 24
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		152	simulator			
		vesx1 vesx2				
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						Cisco dCloud
		L3-VLAN-1	4			•
			Page: 5 of 24 Words: 3.003 👌			
	<				>	
		Proposals For Partner Sell	lers Proposals For Cisco Sellers Cisco SalesConnect Mobile App /	ibout Cisco dCloud		
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- 14. Go to Create Fabric.
- 15. Choose the **Add Spine1 to Fabric** post. Click **Send** to configure the first spine, a and then it will discover the others.
- 16. Review the status of the submission.
- 17. In the APIC application window, you can see Spine1 is now part of the Fabric Membership.
- 18. Fabric Membership

Fabric Mer	nbership							🗐 i
∂₹								ACTIONS
SERIAL NUMBER	NODEID	NODE NAME	RACK NAME	MODEL	ROLE	IP	DECOMISSIONED	SUPPORTED MODEL
TEP-1-101	0			N9K-C9396PX	leaf	0.0.0.0	False	True
TEP-1-103	103	Spine1			unsupported	0.0.0.0	False	False

- 19. Go to the Postman REST Client window.
- 20. Under Create Fabric, choose the Add Spine2 to Fabric post and then click Send to configure the second spine.
- 21. Review the status of the submission.
- 22. In the APIC window, you can see Spine2 is now part of the Fabric Membership.
- 23. Fabric Membership

Fabric Mer	Fabric Membership										
⊖ੁ								ACTIONS -			
SERIAL NUMBER	NODEID	NODE NAME	RACK NAME	MODEL	ROLE	IP	DECOMISSIONED	SUPPORTED MODEL			
TEP-1-101	0			N9K-C9396PX	leaf	0.0.0.0	False	True			
TEP-1-103	103	Spine1			unsupported	0.0.0.0	False	False			
TEP-1-104	104	Spine2			unsupported	0.0.0.0	False	False			

- 24. Go to the Postman REST Client window.
- 25. Under Create Fabric, choose the Add Leaf2 to Fabric post.
- 26. Review the command for this post and you can see that it:
 - Looks for the serial number (TEP-1-102)
 - Sets up the serial number for node 102
 - Names Leaf2
- 27. Add Leaf2 to Fabric

Add Leaf 2 to Fabric

ps://198.	18.133.200/api	i/node/mo/un	i/controller/nodei	dentpol/no	dep-TEP-1-102	POST	•	🗹 URL params	G Headers (1)
orm-data	x-www-form-	-urlencoded	raw binary	JSON (a	application/json) 🔻				
1 {"fabr 102",' 3	icNodeIdent 'nodeId":"10	P":{"attri 2","name":	butes":{"dn": "Leaf2","rn":	"uni/con "nodep-T	troller/nodei EP-1-102","st	dentpol/no atus":"cre	dep-TR ated"	EP-1-102","ser },"children":[Lal":"TEP-1-]}}

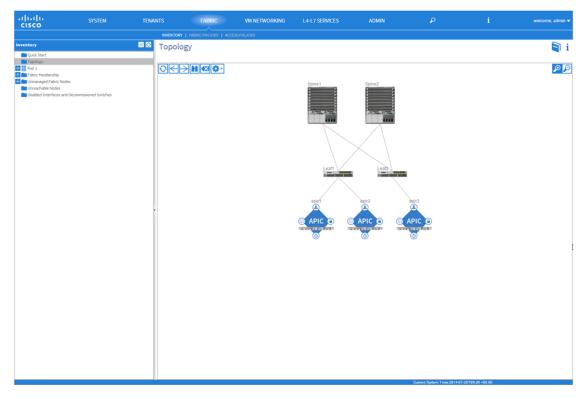
- 28. Click Send.
- 29. Review the status of the submission.
- 30. In the APIC window, you can see Leaf2 is now part of the Fabric Membership.
- 31. Fabric Membership

Fabric Mei	mbership	D						🛐 i
€₹								ACTIONS -
SERIAL NUMBER	NODEID	NODE NAME	RACK NAME	MODEL	ROLE	IP	DECOMISSIONED	SUPPORTED MODEL
TEP-1-101	0			N9K-C9396PX	leaf	0.0.0.0	False	True
TEP-1-103	103	Spine1			unsupported	0.0.0.0	False	False
TEP-1-104	104	Spine2			unsupported	0.0.0.0	False	False
TEP-1-102	102	Leaf2			unsupported	0.0.0.0	False	False

- 32. Go to the Postman REST Client window.
- 33. Under **Create Fabric**, choose the **Configure Leaf 1 to Fabric** post, which will update the first member of the Fabric.
- 34. Click Send.
- 35. Review the status of the submission.
- 36. In the **APIC window**, you can see that **Node ID** and **Node Name** have been set for serial number TEP-1-101.
- 37. As it discovers Leaf1, an IP address is allocated.
- 38. The discovery will continue until it finds all of the links to the other members and populates the IP Addresses.
- 39. Fabric Membership

Fabric Me	mbership							i
⊖ੁ								ACTIONS *
SERIAL NUMBER	NODEID	NODE NAME	RACK NAME	MODEL	ROLE	IP	DECOMISSIONED	SUPPORTED MODEL
TEP-1-101	101	Leaf1		N9K-C9396PX	leaf	10.0.192.95/32	False	True
TEP-1-102	102	Leaf2		N9K-C9396PX	leaf	10.0.192.92/32	False	True
TEP-1-103	103	Spine1		N9K-C9508	spine	10.0.224.127/32	False	True
TEP-1-104	104	Spine2		N9K-C9508	spine	10.0.192.94/32	False	True

- 40. Wait for discovery to finish. In the APIC window, select **Fabric > Inventory** from the main menu. Click **Topology** and demonstrate that the entire fabric has been discovered and is included in the topology.
- 41. Fabric Discovery Topology





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Class 3: Automation of Cisco APIC and F5 BIG-IP using Ansible

Pre-requisites

• iApps to be used for service insertion is already present on the iWorkflow All pre-requisites are already satisfied for this lab. We DO NOT need to do the above

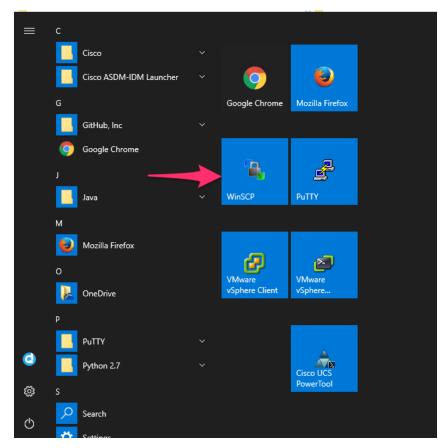
3.1 Lab Topology

3.1.1 Install Ansible

- On dCloud once logged into RDP, open Putty and go to server 'Tools' (root/C1sco12345). Run the following commands to install Ansible
 - pip install --upgrade pip
 - yum install openssl-devel
 - yum install python-devel
 - yum install gcc
 - pip install cryptography
 - pip install ansible
- · Once ansible is installed successfully, run following command from /root directory
 - export ANSIBLE_LIBRARY=/root/library

3.1.2 Environment setup

- Download ansible_automation_files.tar from https://tinyurl.com/y9zvj6nl to desktop
- · Open WinSCP, click on with windows startup button and then click WinSCP



- On WinSCP
 - Hostname: tools.dcloud.cisco.com
 - Port: 22
 - Click on the EDIT button to change username and password
 - * Username: root
 - * Password: Clsco12345
 - Click Save
 - Click login
 - In the right hand pane click on the /home/user01/Scripts tab, change it to /root

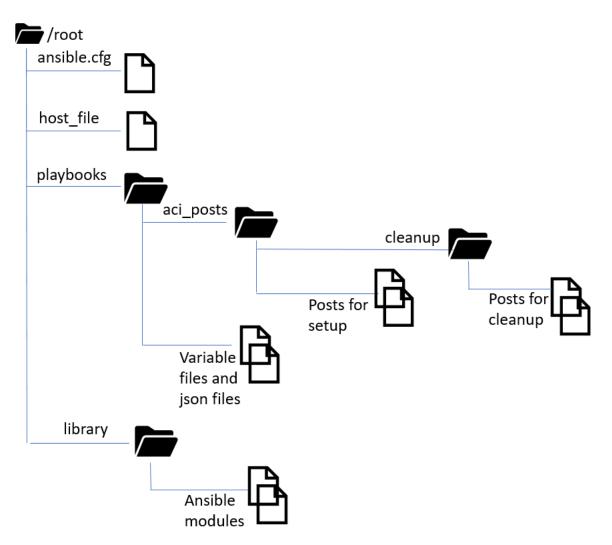
C:\Scripts			/home/user01/Scripts
Name	Size	Туре	Name
t		Parent directe	t
dcv		File folder	🖭 Tenant.xml
🖁 asa-device-pkg-1.2.7.8.zip	212 KB	Compressed	Remove_All.cfa.bk
🖄 backup-rename.ps1	0 KB	Windows Pov	Remove_ Open directory ? X
🗟 backup-start.ps1	4 KB	Windows Pov	DevicePa Open directory:
Base.cfg	1 KB	CFG File	DeleteTer
🖻 base-start.ps1	5 KB	Windows Pov	DeleteM[
Build_APIC_Fabric.bat	8 KB	Windows Bat	DeleteGra Site bookmarks Shared bookmarks
Chrome_APIC_F5_Profile.zip	3,610 KB	Compressed	DeleteAN
cuic_backup_ucsd_aci_v2.tar.gz	3,258 KB	GZ File	CreateGra Add
💿 demo_shutdown.bat	1 KB	Windows Bat	CreateDe Remove
a demo-shutdown.ps1	4 KB	Windows Pov	CreateCo
DevicePackage-11.0-65.36.zip	610 KB	Compressed	CreateAp
🙀 f5-start.ps1	7 KB	Windows Pov	Build_All.
Firefox_APIC_Demo_Profile.zip	7,287 KB	Compressed	AttachGr
Firefox_APIC_F5_Profile.zip	7,329 KB	Compressed	👔 asa-devic
🙀 Fix-RP.ps1	1 KB	Windows Pov	🔢 asa-devic
🔁 get_master_script.py	2 KB	Python File	Down
LicenseFunctions.psm1	0 KB	Windows Pov	
🔁 master.py	15 KB	Python File	
🗉 plink.exe	343 KB	File EXE	Location Profiles OK Cancel Help
Postman_Config.zip	68 KB	Compressed	

- Click OK
- Similarly change the left hand pane from C:\Scripts to C:\Users\demouser\Desktop
- Copy the download tar file from the desktop to the root directory on the ansible host
- SSH to the 'Tools' host using Putty
 - Username: root
 - Password: C1sco12345
 - Untar the ansible_automation_files.tar file using command:

```
tar xvf ansible_automation_files.tar
```

3.1.3 Directory structure

All the files and folders are under /root directory itself. Let's take a look at the files and directories. This is for reading and familiarizing yourself with the playbooks and files we are going to use. No task to be performed in this section



- File ansible.cfg
 - Ansible configuration file where you can set ansible environment variables, for more information refer to link http://docs.ansible.com/ansible/intro_configuration.html
- File host_file
 - This file is the ansible inventory file, which stored information about the host(s) that we want to run the playbook against, and variable information pertaining to those hosts. For more information about the inventory file refer to link http://docs.ansible.com/ansible/intro_inventory.html#inventory
 - The host file is specific to your environment
 - Sample host_file for the dCloud environment

```
[iworkflow]
198.18.128.135
[iworkflow:vars]
username=admin
password=C1sco12345
[apic]
198.18.133.200
```

(continues on next page)

(continued from previous page)

```
[apic:vars]
username=admin
password=C1sco12345
```

- Directory playbooks This directory contains
 - All the playbooks we are going to run in this lab
 - * iworkflow_setup.yaml Configure setting on iWorkflow
 - * aci_tenant_setup.yaml Create a tenant and related parameters on APIC
 - * logical_device_cluster.yaml Create a logical device cluster on APIC (this enabled communication of APIC with BIG-IP)
 - * service_insertion.yaml Configure service insertion on APIC
 - * aci_delete_service.yaml Clean up of the configuration done on APIC
 - The variable file which we are going to edit to customize it to our needs
 - * This is a sample input to the variable file, you can modify it to fit your environment

bigip_ip	198.18.128.130
bigip username	admin
bigip_password	C1sco12345
bigip_hostname	bigip1.dcloud.cisco.com
iworkflow_ip	198.18.128.135
iworkflow_username	admin
iworkflow_password	C1sco12345
tenant_name	Demo
context_name	{{tenant_name}}_ctx1
app_profile_name	App_profile
provider_bd_name	{{tenant_name}}_BDApp
provider_ip	192.168.10.220
provider_mask	24
provider_epg_name	prov_EPG_app
consumer_bd_name	{{tenant_name}}_BDWeb
consumer_ip	10.10.10.220
consumer_mask	24
consumer_epg_name	cons_EPG_web
contract_name	web2app-demo-contract
filter_name	{{contract_name}}_filter
subject_name1	http
subject_name2	https
iworkflow_servicetemplate_name	SimpleHTTP
devicePackage_name	dCloudConnector
downloaded_devicePackage_name	F5DevicePackageSimple
logicalDeviceCluster_name	StandaloneBIGIP
SGtemplate_name	SimpleHTTP_ServiceGraphTemplate
	Continued on next page

external_selfip	10.10.120
external_netmask	255.255.255.0
internal_selfip	192.168.10.120
internal_netmask	255.255.255.0
vip_ip	10.10.10.100
vip_port	80
poolMember_ip	192.168.10.140
lb_method	round-robin

Table 1 – continued from previous pag

- Directory aci_posts
 - This directory has all the aci posts we are going to execute on the APIC
 - Each post is a j2 (jinja2) template file. This template file contains variables which are going to be substituted at run time from information present in the variable file. The XML file then created after the substitution will be then run on the APIC
- · JSON blob for creating a service template on iWorkflow
- Directory library
 - This contains the python files which are responsible for running code for modules. For this lab we have the one aci module aci_rest.py which will be used to run the posts on the APIC

3.2 Module 1: L4-7 Services with Cisco APIC and BIG-IP

3.2.1 Lab 1: Customize files to fit the environment

Let's take a look at the host_file and variable_file and fill it out.

3.2.2 Lab 2: Executing the playbooks

iWorflow

Let's login to iWorkflow and have a look at the configuration before we run the playbook

Let us first execute the playbook on iWorkflow. This playbook will perform the following tasks

- Discover device
- Create a cloud connector
- · Create a service template Parameters than are tenant editable on this template are
 - Virtual IP
 - Virtual Port
 - Load balancing method
 - Pool members

To execute the playbook run command:

1. SSH to the "Tools" host

- 2. Go to the /root directory
- 3. ansible-playbook --step playbooks/iworkflow_setup.yaml

Note: The playbook will be run step by step, after the first task device discovery, make sure before you go to the next step the device is discovered correctly and the BIG-IP is in a healthy state

4. The following gets created on iWorkflow after playbook(iworkflow_setup.yaml) execution

• Star	dalone					Hostname: iwo	rkflow1.dcloud.cisco.com	IP Address: 198.18.1	128.135 Time: 7/14/1	7 7:22 PM Adm
6	iWorkflow	Cloud	ds and Services	BIG-IP Connectivity	BIG-IP HA	System Settings	Access Control			
						T Filter				
	iApps Templates	+	Service Te	emplates +	Clouds	+	Devices	÷	Tenants	+
		T		Τ.		т		T		T
	1 item total		1 item total		1 item total		1 item total		0 items total	
	appsvcs_integration_v1.0_001		SimpleHTTP appsvcs_Integration	_v1.0_001	dCloudConne Cisco APIC	ctor	bigip1.dcloud.cisco BIG-IP 12.0.0 198.18.12			
	Pre-requisite uploaded by the playbook									

5. Once executed the playbook downloads the device package to the playbooks directory. Open WinSCP again and move this downloaded device package to desktop on your dcloud environment. Name of the device package is picked up from the variable file**

Manual step to upload Device Package to APIC

- 1. Go to APIC UI, login with admin/Clscol2345
- 2. Click on L4-L7 services->Packages->Import a device package

				vices:b root vnsQuicks Director 🚯 BIG-IP® (1				
uluih cisco	System	Tenants	Fabric	VM Networking	L4-L7 Services	Admin	Operations			
					Inventory Packages					
Packages			 O 	Quick Start						
Quick Start										
L4-L7 Service	e Device Types			HELP						
				offload, load balanc	er, context switch, SSL te	ermination device,	ges, which are used to defin or intrusion prevention syste tion for each function. A net			
				You can use the Import a Device Package wizard to import a device package for a functi packages before configuring a service graph.						
				Quick Start	e Package	-	•			

- 3. Click on Browse and then select the device package present on the desktop
- 4. Once uploaded, you can view the device package contents on the left-hand side of the pane

uluih cisco	System	Tenants	Fabric	VM Networking	L4-L7 Services	Admin	Operations		£		i	Adva welcom	nced Mo e, admin
					Inventory Package								
ackages Quick Start L4-L7 Servic	ce Device Types		0	L4-L7 Service	es Function F	Profile - Simple	eHTTP				General	Faults	Histo
E5-IWorkflow-2.0-dCloudConnector L4-L7 Service Functions				0 ±			Δ Δ						
📜 Si 4 🖿 L4-L7	mpleHTTP 7 Services Function Profile mpleHTTP	85	_	Descri		2.0-dCloudConnector/	SimpleHTTP						
				FEATURES A	ND PARAM	ETERS Basic Parameters	All Parameters						
				All		Meta Folder/Param Key		Name	Value	Mandatory	Locked	Shared	ł
				All	[4 😅 Function Config		Function					
						SimpleHTTF		SimpleHTT			false	false	
						E LbMetho		poolLbM	round-robin	false	false		
						A 🚭 Pool Mer		poolMem			false		
						A 😅 Memi	oer Address	member IPAddress		false	false false		
						Address	Audress	pool addr		false	false		
						E Port		pool_port	80	false	false		

APIC

Let's login to APIC and have a look at the configuration before we run the playbook

Let us now execute the playbooks on APIC.

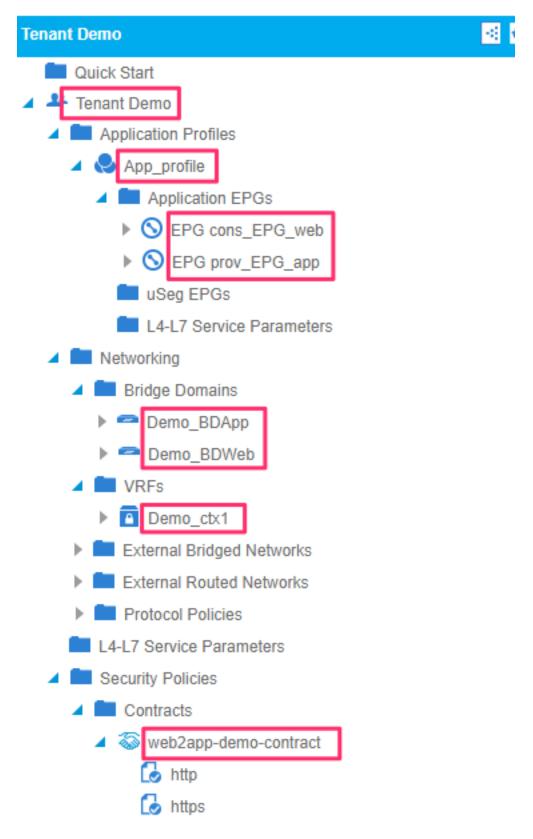
1. Log back into the 'Tools' host, go to the /root directory

Playbook aci_tenant_setup.yaml - this playbook will perform the following tasks

- · Create a tenant
- Create a Private Context
- · Create two bridge domains
- · Create an application profiles
- Create two EPG (End Point Groups)
- Create a contract
- 2. To execute the playbook run command

ansible-playbook --step playbooks/aci_tenant_setup.yaml

3. The following gets created on APIC after playbook (aci_tenant_setup.yaml) execution



- 4. Playbook logical_device_cluster.yaml this playbook will perform the following tasks
 - Create a device manager type

- Create a device manager in tenant common
- · Create a logical device cluster in tenant common
- 5. To execute the playbook run command

ansible-playbook --step playbooks/logical_device_cluster.yaml

- 6. The following gets created on APIC after playbook (logical_sevice_cluster.yaml) execution
 - 1. Device Manager Type under L4-L7 services->Inventory->Device Manager Types

ululu cisco	System	Tenants	Fabric	VM Networking	L4-L7 Services	Admin	Operations		
					Inventory Packages				
Inventory	Sec. 1		vice Manac	jer type - F5-iV	Vorkflow-2.0-	dCloudCon	nector		
Quick Start			vice manag	Jei type - i 5-iv	VOI KIIOW-2.0-		lector		
Inventory									
🔺 🚞 Device Manag	er Types	• •				ΔΑΟ			
📃 F5-iWorkflo	w-2.0-dCloudConnect	or 💙 📥							
L4-L7 Chassis	Types	Propertie	es						
			Vendor: F5						
			Model: iWo	: iWorkflow					
			Version: 2.0-	dCloudConnector					
		L4-L7 Service	Device Type: F5	-iWorkflow-2.0-dCloud	Connector	<u>▼</u> 🗗			
		De	evice Manager:	Name					
							No items have been foun Select Actions to create a nev		
		4							

2. Device Manager under Tenant common ->L4-L7 services->Device Managers

ululu cisco	System	Tenants	Fabri	c VM Networki	ng L4-L7 Services	Admin	Operations
ALL TENANTS Add	Tenant Search:	enter name, descr	commo	on An_Service_Demo	AAn_Service_Demo LAX	(SJC	
Tenant common			< O De	wice Manager	dcloud-device-	manager	
 Security Poli Troubleshoo Monitoring P 	Profiles ce Parameters icies t Policies Policies	-	0	Properties Name: Management EPG:	Icloud-device-manager	management.	
_	ces rvice Graph Templa onfigurations	tes		Manangement:	▲ Host	_	Port
Function Function L4-L7 De Imported Devices	vices		ł		198.18.128.135		443
 Deployed Inband M Device M 	lanagement Configu lanagers	ration for L4-L7 device	es	Username: Password: Confirm Password:			
dclou	d-device-manager			Cluster Screen:	▲ Name		

3. Logical device cluster under tenant common -> L4-L7 Devices. Make sure before proceeding to the next step that your logical device cluster is in 'Stable' state

ululu cisco	System	Tenants	Fabric	VM Networking	L4-L7 Services	Admin	Operations		P		i		anced Mo ne, admin
	Id Tenant Search:	enter name, descr	common A										
Tenant common				Devices - Sta	ndalonoBICIE	5							
Quick Start			L4-L7	Devices - Sta	IndalonebiGir					Policy	arameters	Faults	Histor
Application			0 ±				A A O O					AC	TIONS -
Security P Troublesh Monitoring L4-L7 Sen L4-L7 Sen	vice Parameters olicies pot Policies I Policies vices Service Graph Templa configurations nn Profiles	ates	Gen	Managed: 🗹 Name: Star	rUAL vCenter	onnector	Name VM Name Device1 Standalon	VCenter Name	Management Address 198.18.12	Management Port 443	Interfaces 1_1 1_2	×	+
 Importe Device 	ndaloneBIGIP ed Devices s Selection Policies ed Graph Instances			dentials Username: adm Password: Confirm Password:									
🔺 🚞 Device	Managers oud-device-manager	uration for L4-L7 devices	00111	figuration State onfiguration Issues: Devices State: stab			Cluster Management IP Address: Device Manager: Cluster Interfaces:			ager 👻 🗗	ete Interfaces		+

4. On the BIG-IP a device group will be created which has the same name as that of the logical device cluster

ONLINE (ACTIVE) Standalone					
Main Help About	Device Management » Device Groups				
Mage Statistics	🔅 🗸 Device Group List				
iApps	9 Search				Create
S DNS	Group Name	Type	ConfigSync	ConfigSync Status	Members
-	StandaloneBIGIP (Includes Self)	Sync-Failover	Auto	Standalone	1
Local Traffic	datasync-global-dg (Includes Self)	Sync-Only	Manual	Standalone	1
Acceleration	Delete				
Device Management					
Overview					
Devices					
Device Groups					
Device Trust					
Traffic Groups					

- 7. Playbook service_insertion.yaml this playbook will perform the following tasks
 - · Export the logical device cluster from tenant common to user tenant
 - · Create a service graph template
 - Assign L4-L7 BIG-IP parameters (VIP, Port etc.) to the graph
 - · Create a device selection policy
 - Then attach the service graph template to the contract
- 8. To execute the playbook run command

ansible-playbook --step playbooks/service_insertion.yaml

9. The following gets created on APIC after playbook (service_insertion.yaml) execution

Tenant Demo	 O 	Contract Subject	- http		
Image: Antipart An	-		- mp		
Application Profiles					
Networking					
L4-L7 Service Parameters					
Security Policies		⊖ <u>↓</u>		AOO	
Contracts		Description			
web2app-demo-contract		Property	h.44		
💪 http		Name: Description:	•		7
🛃 https		Description.	optional		
Taboo Contracts					
Imported Contracts		Apply Both Directions:			
Filters		Reverse Filter Ports: Filters:			
Troubleshoot Policies		<			
Monitoring Policies			Name	Tenant	Directives
L4-L7 Services			default	common	
L4-L7 Service Graph Templates					
SimpleHTTP_ServiceGraphTemplate					
Router configurations				Atta	ch the service
Function Profiles					h template to
L4-L7 Devices					<u> </u>
Imported Devices		Service Graph	Demo/SimpleHTTP_Ser 👻 🗗	the e	contract
✓ common/StandaloneBIGIP		QoS Class:	Unspecified 🗸		
Devices Selection Policies		Target DSCP:	Unspecified -		
web2app-demo-contract-SimpleHTTP_Servic	eGr				
Deployed Graph Instances					

10. You can view the BIG-IP parameters that get configured under provider EPG. Click on the pencil edit button, select the appropriate graph/contract and node. Click on the 'all parameters' tab to view all the details

Tenant Demo	3 🖸 L	4-L7 Service Parame	eters					
Tenant Demo Application Profiles	î (Search By Name / Value:						
🔺 😓 App_profile		×						
Application EPGs								
S EPG cons_EPG_web		Meta Folder/Param Key	Contract Name	Service Graph Name	Service Function Name	Folder/Param Instance Name	Value	Specific Device
EPG prov_EPG_app		Network	web2app-demo-cont	SimpleHTTP Servic	ADC	Network		
Domains (VMs and Bare-Metals)	- 10	NetworkRelation	web2app-demo-cont			NetworkRelation		
Static Ports		SimpleHTTP		SimpleHTTP_Servic		SimpleHTTP		
Static Leafs				-				
Fiber Channel (Paths)								
Contracts								
Static EndPoint								
Subnets								
L4-L7 Virtual IPs								
L4-L7 IP Address Pool								
L4-L7 Service Parameters								

Edit L4-L7 Service Pa	arameters					() ×
Click row to edit value	8					
	Demo/web2app-de					
	Demo/SimpleHTTP_	_ServiceGra	0			
Node Name:	ADC		₽			
Features and Parameters						
Features:	В	asic Parame	eters All Parameters			
All		Fol	der/Param	Name	Value	Apply To Specific Device
			Device Config	Device		
	E	× E	Network	Network		
			Function Config	Function		
	E	× 🗹	NetworkRelation	NetworkRelation		
		_	SimpleHTTP	SimpleHTTP		
	E	×	A 🗇 Pool Members	poolMembers		
	E38	_	A 🔤 Member	member		
		×	E IPAddress	IPAddress	192.168.10.141	
		×	Address	pooladdr	10.10.10.100	
		×	E LbMethod	poolLbMethod	fastest-node	
	E	×	E Port	poolport	80	
					SHOW USAGE S	SUBMIT CANCEL

Verify

Verify successful deployment of network and application parameters on the APIC, iWorkflow, BIG-IP

1. On the APIC make sure the graph is deployed and the state is 'applied'

Tenant Demo 🧧 🖸	Deployed Graph l	nstances			
Cuick Start		Istances			
🖌 🐣 Tenant Demo					
Application Profiles	⊖ ±				
Networking	Service Graph	Contract	Contained By	State	 Description
L4-L7 Service Parameters	SimpleHTTP_ServiceGrap		Private Network Demo_ctx1	applied	
Security Policies	Simplem Tr_ServiceOrap	webzapp-demo-contract	T INdle Network Delilo_ctx1	applied	
Troubleshoot Policies					
Monitoring Policies					
L4-L7 Services					
🔺 🚞 L4-L7 Service Graph Templates					
SimpleHTTP_ServiceGraphTemplate					
Router configurations					
Function Profiles					
L4-L7 Devices					
Imported Devices					
Devices Selection Policies					
🔺 🛅 Deployed Graph Instances					
v* web2app-demo-contract-SimpleHTTP_ServiceGraphTe					
k 💼 baalaand baalaan					

 View the deployed devices tab and take node of the Virtual device ID. This will be the identified on the BIG-IP with which you can associate the partition created on the BIG-IP to the graph deployed on the APIC. Also keep note of the VLAN tags

Tenant Demo 🧃 🖸	Virtual Device - S	tandaloneBIGIP-Demo_ctx	c1	
Cuick Start				_
🖌 😃 Tenant Demo				Policy O
Application Profiles	0 +		A A O O 100	
Networking	• <u>-</u>			
L4-L7 Service Parameters	Properties			
Security Policies	Devices:	StandaloneBIGIP		
Troubleshoot Policies	Virtual Device ID:			
Monitoring Policies		Demo_ctx1		
L4-L7 Services	Operational State:			
L4-L7 Service Graph Templates	ACKed Transaction ID: Current Transaction ID:			
SimpleHTTP_ServiceGraphTemplate	Cluster Interfaces:			
Router configurations	Cluster Interfaces.	Logical Interface	Encap	
Function Profiles		StandaloneBIGIP_External	vlan-1006	
L4-L7 Devices		StandaloneBIGIP_Internal	vlan-1173	
Imported Devices				
Devices Selection Policies				
🔺 🚞 Deployed Graph Instances				
v* web2app-demo-contract-SimpleHTTP_ServiceGraphTe				
🔺 🚞 Deployed Devices				
StandaloneBIGIP-Demo_ctx1				
Inband Management Configuration for L4-L7 devices				
Device Managers				
Chassis				

- 3. On the iWorkflow, make sure there is a
 - Tenant created which will map to a BIG-IP partition
 - A L4-L7 service which will map to the virtual server configured on the BIG-IP
 - · Nodes are created which map to the node members created on the BIG-IP

		Т	Filter		
Nodes	L4-L7 Services	Tenants	+	Activities	
Τ	T		T		1
1 item total	1 item total	1 item total		0 items total	
192.168.10.141%3621:80 GENERATED ~aplc-Demo-Demo_ctx1-5		apic-Demo-Demo_ctx1·	-5229		

- 4. On the BIG-IP make sure a partition is created (note the partition is referencing the Virtual ID generated by APIC).
 - Click on 'Network Map' to get a unified view of the objects deployed on the BIG-IP. To see individual objects, click on the appropriate tab from the left hand pane

	s: Jul 14, 2017 User: admin s: 8:19 PM (UTC) Role: Administrator Partition: apic-Demo-Demo_ctx1-5229 T
ONLINE (ACTIVE) Standalone	Common apic-Demo_dot-5229 All (Read Only)
Main Help About	Local Traffic » Network Map
Statistics	🔅 🚽 Network Map
iApps	Status Any Status V Type All Types V Search * Search IRule Definition
S DNS	Show Summary Update Map Virtual Server
Local Traffic	Local Traffic Network Map
Network Map	SimpleHTTP_ServiceGraphTemplate-ADC-12101_vs
Virtual Servers	Internet in the second performance of the second seco
Policies	
Profiles	
iRules >	Pool Member
Pools >	
Nodes	
Monitors 🛞	
Traffic Class	
Address Translation	

 To view network related parameters, click on the 'Network' tab and then view the Self IP's and the VLAN information. The Self IP information is user driver (part of the service graph). The VLAN information is dynamically generated by APIC which is configured on the BIG-IP

ONLINE (ACTIVE) Standalone							
Main Help About	Network » Self IPs						
Statistics	🔅 🗸 Self IP List						
iApps	* Search						Create
S DNS	✓ ♦ Name	Application			VLAN / Tunnel		Partition / Path
Local Traffic	apic-Demo-Demo_ctx1-5229_Network_ExternalSelfIP apic-Demo_Demo_ctx1-5229_Network_InternalSelfIP		10.10.10.120%3621				apic-Demo-Demo_ctx1-5229 apic-Demo-Demo_ctx1-5229
Acceleration	Delete						
Device Management							
Security							
Retwork							
Interfaces >							
Routes							
Self IPs 📀							
Main Help About	Network » VLANS ; VLAN List	_					
iApps	* Search						Create
S DNS	✓ ▲ Name		÷ Ap	plication 💠 Tag	Untagged Interfac	ces Tagged Interfaces	
0	apic-5229_32771			1006			apic-Demo-Demo_ctx1-5229
Local Traffic	apic-5229_49156			1173	1.2		apic-Demo-Demo_ctx1-5229
Acceleration	Delete				× .		
Device Management						te the VLAN	
Security						tch the one sent in the	5
Retwork						oloyed grap	h on
Interfaces					AP		
Routes 📀						~	
Self IPs 🔶							
Packet Filters							
Trunks							
Tunnels							
Route Domains 📀							
VLANS							

3.2.3 Lab 3: Making modifications to the service graph

Playbook modify_parameters.yaml - this playbook will perform the following task

- Changes the load balancing method to the desired load balancing method (input taken from the variable file)
- 1. Open the variable file placed under /root/playbooks/variable_file.yaml and change the lb_method parameter from round-robin to fastest-node

cisco System	Edit L4-L7 Service Parameters						
ALL TENANTS Add Tenant Sear							
Tenant Demo	Click row to edit value						
Quick Start	Contract Name: Demo/web2app-demo-contract 🗸 🗸 🗗						
4 🐣 Tenant Demo	Graph Name: Demo/SimpleHTTP_ServiceGraphTemplate 🗸 🗗						
Application Profiles	Node Name: ADC						
🔺 🌏 App_profile	Features and Parameters						
🔺 💼 Application EPGs							
Separation Separati	Features: Basic Parameters All Parameters						
Separation of the second se	Folder/Param Name Value Apply To Specific						
Domains (VMs							
Static Ports	E 4 C Device Config Device						
Static Leafs	☑ E ▶ □ Network						
Fiber Channel	✓ 4 [→] → ² Function Config Function						
Contracts	X P C NetworkRelation NetworkRelation						
Static EndPoir							
Subnets	☑ ☑ ▶ 📮 Pool Members pool_Members						
🔲 L4-L7 Virtual II	Image: Second						
💼 L4-L7 IP Addre							
L4-L7 Service	🔀 🗹 🛛 🗟 Port pool_port 80						
uSeg EPGs							
L4-L7 Service Param							
Networking							
L4-L7 Service Parameters							
Security Policies							
Troubleshoot Policies							
Monitoring Policies	SHOW USAGE SUBMIT CANCEL						
🔺 💼 L4-L7 Services	STON SAGE SUBMIT CARGE						
CMLINE (ACTIVE) Standalone Main Help About	Local Traffic						
iApps							
() DNS	Load Balancing Load Balancing Method Round Robin						
0	Load Balancing Method Robin Priority Group Activation Disabled						
Local Traffic	Ubanied V Update						
Network Map	[abune]						
Virtual Servers >	Current Members A						
Policies >	Control manufacture and a service Port > FODN > Ephemeral > Ratio > Priority Group > Connection Limit > Partition / Path						
Profiles	□ ◆ 192.168.10.141%362180 192.168.10.141%3621 80 No 1 0 (inactive) 0 apic-Demo-Demo_ctrl-1						
iRules >	Enable Disable Force Offline Remove						
Pools >							
Nodes >							
Monitors 📀							
Traffic Class 🕞							
Address Translation							

Before modification:

2. To execute the playbook run command

ansible-playbook --step playbooks/ modify_parameters.yaml
After running the playbook for modification:

cisco System	Edit L4-L7 Service Parameters					i	X i
ALL TENANTS Add Tenant Sear							
Tenant Demo	Click row to edit value						
Quick Start	Contract Name: Demo/web2app-demo-contract 🗸 🗸						
🔺 🐣 Tenant Demo	Graph Name: Demo/SimpleHTTP_S	GerviceGraphTemplate	- @				
Application Profiles	Node Name: ADC		 ▼ [2]				
🔺 🌏 App_profile	Features and Parameters						
Application EPGs							
Separation Separati	Features: Bas	sic Parameters All Param	neters				
🔺 🚫 EPG prov_EPG_a		Folder/Param	Nar	ma	Value	Apply To Specific	
Domains (VMs	All				1000	Device	
Static Ports		E 4 🔤 Device Config		vice			
E Static Leafs	×	B ► 📮 Network		twork			
🕨 🧰 Fiber Channel		Image: Second	-	nction			
Contracts		-		tworkRelation			
Static EndPoin		SimpleHTTI		npleHTTP			
Subnets				olMembers			
L4-L7 Virtual II				oladdr	10.10.10.100	1	
💼 L4-L7 IP Addre				blLbMethod	fastest-node		
L4-L7 Service		🗹 🔄 Port	poo	olport	80		
uSeg EPGs							
L4-L7 Service Param							
Networking							
L4-L7 Service Parameters							
Security Policies							
Troubleshoot Policies							
Monitoring Policies					SHOW USAGE	SUBMIT CANCEL	
🔺 🛄 L4-L7 Services							
/ 🛑 1.117 Oresies Oresh Tran	atataa IIII III						
Hostname: bigip1.deloud.cisco.com Dat IP Address: 198.18.128.130 Tim ONLINE (ACTIVE) Standalone	e: Jul 14, 2017 User: admin e: 8.26 PM (UTC) Role: Administrator				Partition: a	pic-Demo-Demo_ctx1-5229 ¥	Log out
Main Help About	Local Traffic » Pools : Pool List » SimpleHTTP_Ser		pool				
Mage Statistics	🚓 🚽 Properties Members Statistics						
iApps	Load Balancing						
😚 dns	Load Balancing Method Fastest (node)	•					
Local Traffic	Priority Group Activation Disabled						
Network Map	Update						
Virtual Servers							
Policies	Current Members						Add
Profiles	Status + Member					onnection Limit Partition / P	
iRules	■ ◆ 192.168.10.141%3621:80	192.168.10.141%3621	80	No 1	0 (Inactive) 0	apic-Demo-De	mo_ctx1-5229
Pools	Enable Disable Force Offline Remove						
Nodes							
Monitors (+)							
Traffic Class (+)							

3.2.4 Lab 4: Deleting the service

Playbook aci_delete_service.yaml - this playbook will perform the following tasks

- · Detach the service graph from the contract
 - This will delete the partition created on the BIG-IP (thus deleting all the objects that belong to that partition)
- · Delete the device selection policy
- Delete the BIG-IP parameters which are present under the provider End Point Group (EPG). Remove the provided as well as consumed contracts from the EPG's
- · Delete the service graph template
- · Delete the contract

- · Delete the logical device cluster
 - This will delete the device group that is created on the BIG-IP
- · Delete the device manager from tenant common
- Delete the device manager type under L4-L7 Services
- 1. To execute the playbook run command

ansible-playbook --step playbooks/ aci_delete_service.yaml

After execution of this playbook, the BIG-IP will be in a clean state. There will be no partition on the BIG-IP pertaining to the service graph and there will be no device group pertaining to the logical device cluster

Hostn IP Add	ame: bigip1.dcloud.cisco.com dress: 198.18.128.130	Date: Jul 14, 2017 User: admir Time: 7:29 PM (UTC) Role: Admir	n nistrator			Partition: Cor	nmon 🔻	Log out
	ONLINE (ACTIVE)					Cor	nmon	
	Standalone					All	Read Only]	
10000		e e daamaan iyaan aa daamay		antipananantipananatipananan	un na star	anna <mark>kara</mark>		
Ma	in Help About	Device Management » Dev	rice Groups					
Ma s	tatistics	🔅 👻 Device Group List						
ſ	ONLINE (ACTIVE) Standalone							
Ма	in Help About	Device Management » Dev	rice Groups					
1 s	itatistics	🔅 👻 Device Group List						
1	Apps	*	Search					Create
()	INS	Group Name			Type	+ ConfigSync	ConfigSync Status	Members
	ocal Traffic	datasync-global-dg (Inclu	udes Self)		Sync-Only	Manual	Standalone	1
_		Delete						
A	cceleration							
	Device Management							
	Overview							
	Devices							
	Device Groups							
	Device Trust	- b						