

DYNAMIC SERVICE FUNCTION CHAINING OF NETWORK FUNCTIONS USING SDN

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INTRODUCTION

- Software Defined Network
- Layers of SDN
 - Data Plane
 - Control Plane
 - Management Plane
- Service Function Chaining provides the ability to define an ordered list of network services, or service functions (like firewalls, load balancers, DPI) for a set of packets .
- Services "stitched" together in the network to create a service chain.

LITERATURE SURVEY

Near Optimal Service Function Path Instantiation in a Multi-Datacenter Environment in 2015

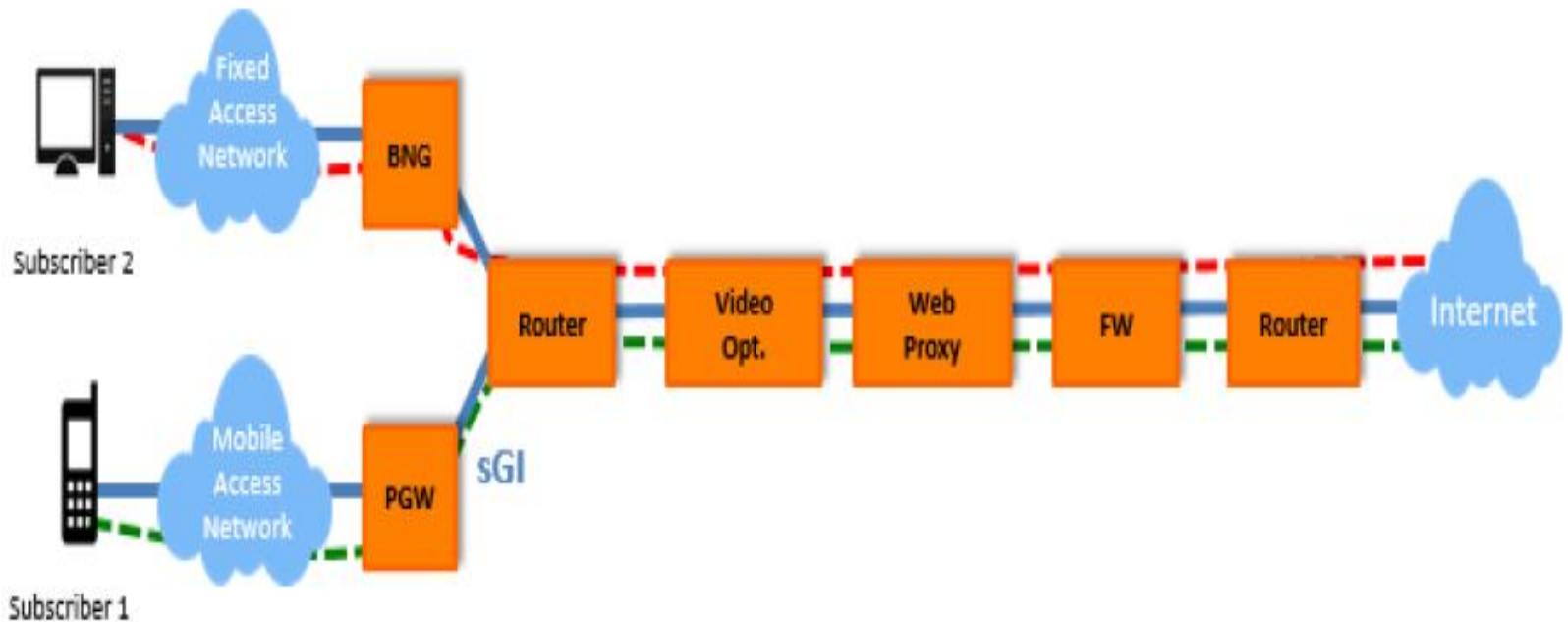
Author : Ahmed M. Medhat et.al.,

- shortest path algorithm for the real time services/applications.
- good Quality of Service (QoS)
- Load balancing algorithms

PROBLEM STATEMENT

- In the static service chain model, all traffic will have to flow through each of the enablers, even though only a subset of these services may be necessary, which is time consuming.

EXISTING SYSTEM



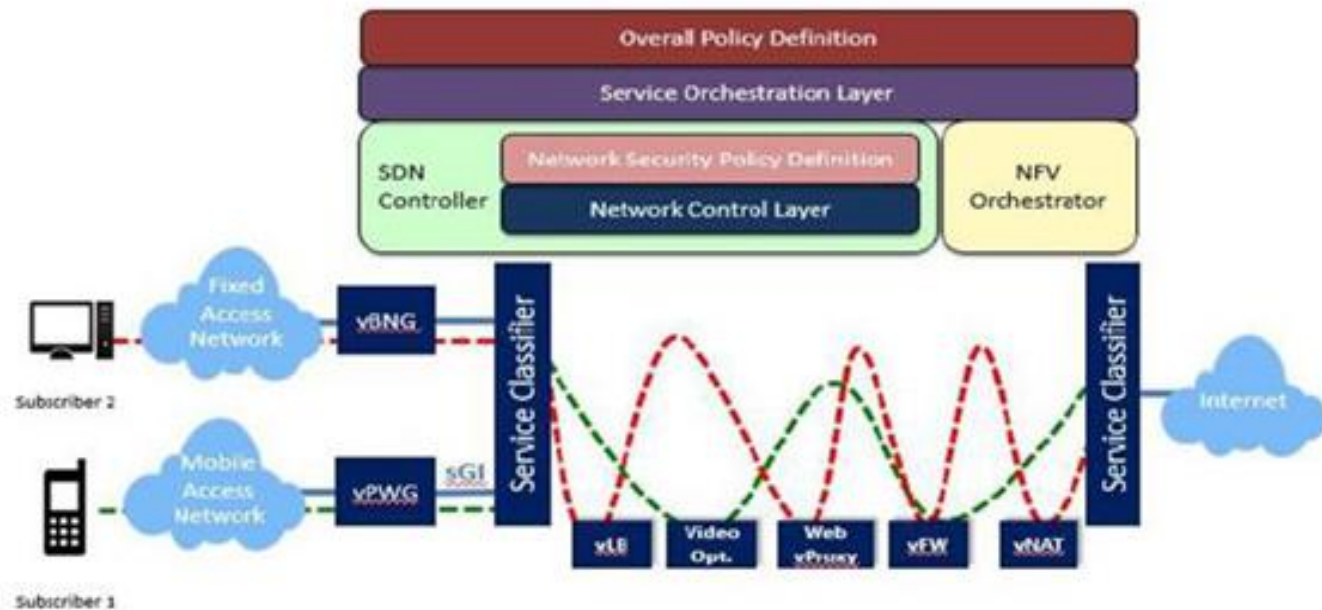
STATIC SERVICE FUNCTION CHAINING



DRAWBACKS

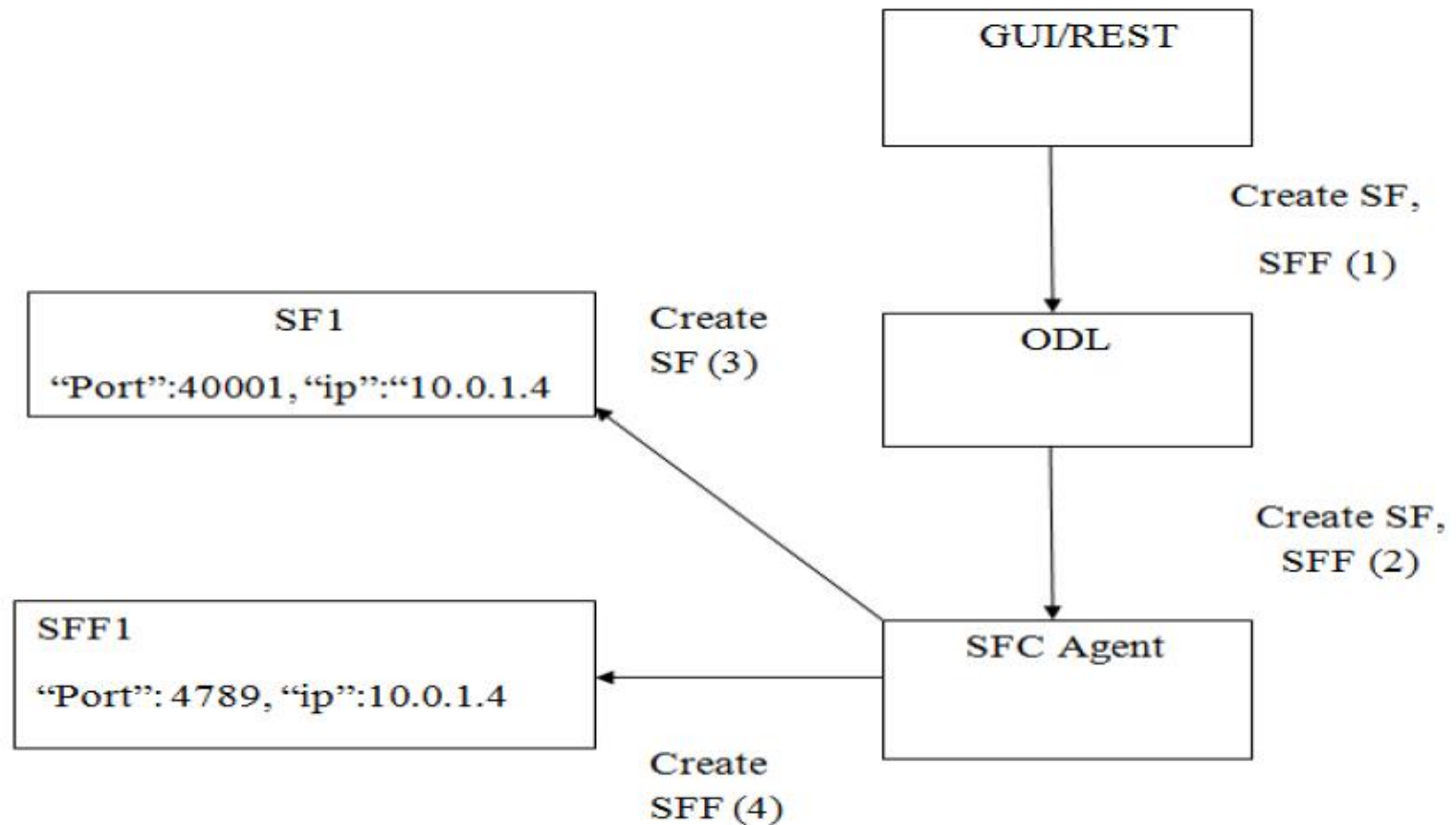
- Topological Dependencies
- Configuration Complexity
- Inconsistent ordering of service functions

PROPOSED SYSTEM

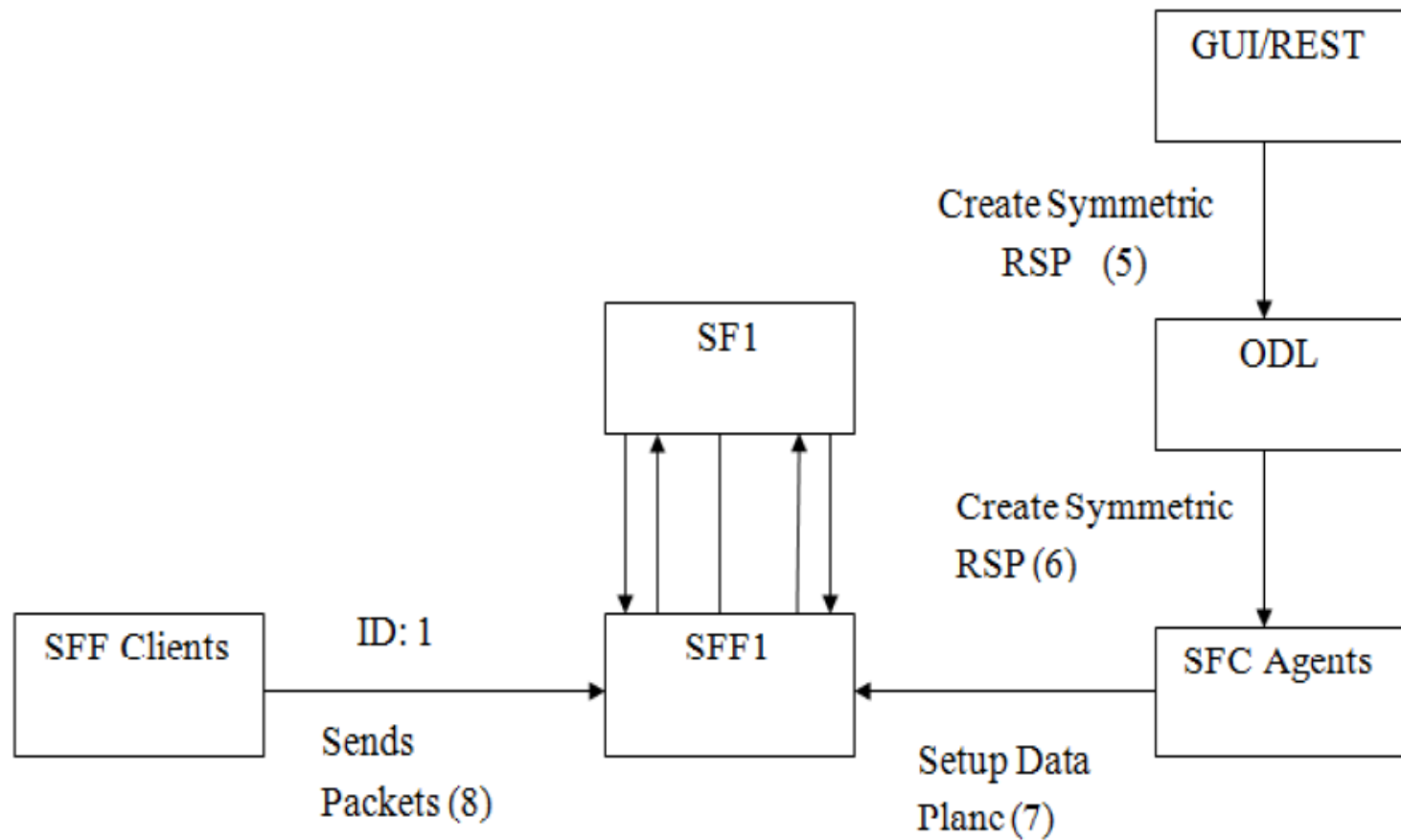


DYNAMIC SERVICE FUNCTION CHAINING

DETAILED DESIGN



Topology after creation of SF,SFF and workflow



Topology after creation of Symmetric RSP and workflow

MODULES

- Service Function Forwarder (SFF): Switch
- Service Function(SF): any application such as DPI/FW/LB
- Service Function Chain(SFC): the intended list of SFs that the packets have to traverse in a definite order
- Service Function Path (SFP): actual instance of the services that are traversed, or a specific instance of the SFC
- Service Classifier: Function that helps in packet classification

PSEUDOCODE

Input: Applications to be assessed/uploaded from/to the Internet.

Output: Accessing the particular applications.

 Requesting for the applications by Clients

 Classifier will classifies the set of data packets and forwards the packets by SFF.

 If(Host IP address is present in Flow Table)

 Dynamically selects the SF from SFC

 Providing access/upload applications

 Else

 Unable to access/upload

End if

TESTING

Sl.no	Test case input description	Expected Result	Status
1	SDN Controller: Start	Host Reachable	Pass
	SDN Controller : Stop	Host Unreachable	Pass
2	Service Function Forwarder: Valid IP	Allows forwarding of packets	Pass
	Service Function Forwarder: Invalid IP	Not allows forwarding of packets	Pass
3	Service Function Chain: Specific Service Function is present	Provides the service function	Pass
	Service Function Chain: Specific Service Function is absent	Change the topology	Fail

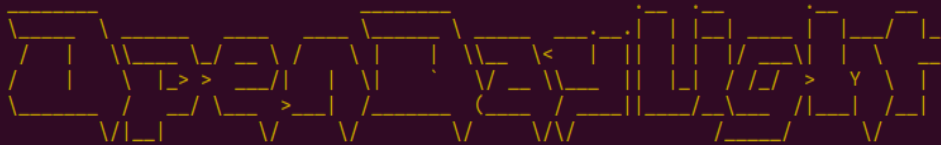
RESULT ANALYSIS

```
root@vineetha-VirtualBox: /home/vineetha/sfc
PSHOT.pom
[INFO] Installing /home/vineetha/sfc/sfc-karaf/target/sfc-karaf-0.1.4-SNAPSHOT.tar.gz to /root/.m2/repository/org/opendaylight/sfc/sfc-karaf/0.1.4-SNAPSHOT/sfc-karaf-0.1.4-SNAPSHOT.tar.gz
[INFO] Installing /home/vineetha/sfc/sfc-karaf/target/sfc-karaf-0.1.4-SNAPSHOT.zip to /root/.m2/repository/org/opendaylight/sfc/sfc-karaf/0.1.4-SNAPSHOT/sfc-karaf-0.1.4-SNAPSHOT.zip
[INFO] -----
[INFO] Reactor Summary:
[INFO]
[INFO] sfc ..... SUCCESS [ 55.533 s]
[INFO] sfc-model ..... SUCCESS [03:06 min]
[INFO] sfc-provider ..... SUCCESS [02:58 min]
[INFO] sfc-test-consumer ..... SUCCESS [ 20.773 s]
[INFO] sfc-ui ..... SUCCESS [01:10 min]
[INFO] sfc-sb-rest ..... SUCCESS [ 28.245 s]
[INFO] sfclisp ..... SUCCESS [ 57.373 s]
[INFO] sfc-ovs ..... SUCCESS [ 35.160 s]
[INFO] sfcoufl2 ..... SUCCESS [01:42 min]
[INFO] sfc-netconf ..... SUCCESS [ 8.161 s]
[INFO] sfc-config ..... SUCCESS [ 7.682 s]
[INFO] sfc-jsonconfig ..... SUCCESS [ 0.481 s]
[INFO] features-sfc ..... SUCCESS [16:55 min]
[INFO] features-sfc-sb-rest ..... SUCCESS [ 2.651 s]
[INFO] features-sfclisp ..... SUCCESS [01:32 min]
[INFO] features-sfc-ovs ..... SUCCESS [ 0.641 s]
[INFO] features-sfcoufl2 ..... SUCCESS [ 0.655 s]
[INFO] features-sfc-netconf ..... SUCCESS [ 0.681 s]
[INFO] sfc-karaf ..... SUCCESS [05:31 min]
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 37:04 min
[INFO] Finished at: 2016-02-16T06:48:32-05:00
[INFO] Final Memory: 119M/343M
[INFO] -----
root@vineetha-VirtualBox: /home/vineetha/sfc#
```

root@vineetha-VirtualBox: /home/vineetha/sfc

↑ En 🔊 Tue Apr 5 3:06 AM ⚙

```
bash: /home/vineetha/.bashrc: line 117: syntax error: unexpected end of file
vineetha@vineetha-VirtualBox:~$ sudo su
[sudo] password for vineetha:
root@vineetha-VirtualBox:/home/vineetha# ./sfc-karaf/target/assembly/bin/karaf
bash: ./sfc-karaf/target/assembly/bin/karaf: No such file or directory
root@vineetha-VirtualBox:/home/vineetha# cd sfc
root@vineetha-VirtualBox:/home/vineetha/sfc# ./sfc-karaf/target/assembly/bin/kar
af
```



```
Hit '<tab>' for a list of available commands
and '[cmd] --help' for help on a specific command.
Hit '<ctrl-d>' or type 'system:shutdown' or 'logout' to shutdown OpenDaylight.
```

```
opendaylight-user@root>feature:install odl-dlux-all
opendaylight-user@root>
```



OpenDaylight RestConf API Documentation

[Controller Resources](#)[Mounted Resources](#)

Mount Points - Select an API below for details on available queries.

Loading. Please wait...

Select a mount point.

503 : undefined http://10.0.2.15:8181/apidoc/apis

OpenDaylight Dlux - Mozilla Firefox

RestConf Documentation x OpenDaylight Dlux x

http://localhost:8181/sfc/index.html#/sfc/serviceforwarder

Search

OpenDayLight

SFC

Service Nodes

Service Function Forwarders

Service Functions

Service Function Chains

Service Function Paths

Access Lists/Classifiers

NSH Metadata

IPFIX APPID

System info

Config

Add Service Function Forwarder

Create new Open vSwitch bridge

Clear sorting

Service Function Forwarder name	IP management address	REST URI	Service Node	Data plane locator	Service Function dictionary	Actions
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
SFF1	10.0.2.15	http://10.0.2.15.5000		sff dpi	SF1	x 🔗 📄

10

25

50

100

Delete All

SFC

Service Nodes

Service Function Forwarders

Service Functions

Service Function Chains

Service Function Paths

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NSH Metadata

IPFIX APPID

System info





Config

Add Service Function

Clear sorting

Service Functions

Service Function Types

Service Function name	Service Function type	IP Management Address	REST URI	NSH aware	Data plane locator	Actions
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
SF1	dpi	10.0.2.15	http://10.0.2.15:5000	true	vlan	   

10 25 50 100

Delete All

[Add Service Function](#)
[Clear sorting](#)
[Service Functions](#)
[Service Function Types](#)

Service Function name	Service Function type	IP Management Address	REST URI	NSH aware	Data plane locator	Actions
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
dpi-102-1	dpi	10.3.1.102	http://localhost:10001	true	4	x 🔍 🔗
dpi-102-2	dpi	10.3.1.102	http://localhost:10002	true	1	x 🔍 🔗
dpi-102-3	dpi	10.3.1.102	http://localhost:10003	true	101	x 🔍 🔗
firewall-101-1	firewall	10.3.1.101	http://localhost:10001	true	007	x 🔍 🔗
firewall-101-2	firewall	10.3.1.101	http://localhost:10002	true	2	x 🔍 🔗
firewall-104	firewall	10.3.1.104	http://localhost:10001	true	my-locator	x 🔍 🔗
napt44-103-1	napt44	10.3.1.103	http://localhost:10001	true	master	x 🔍 🔗
napt44-103-2	napt44	10.3.1.103	http://localhost:10002	true	preferred	x 🔍 🔗
napt44-104	napt44	10.3.1.104	http://localhost:10002	true	3	x 🔍 🔗

10 25 50 100

[Delete All](#)

SFC

Service Nodes Service Function Forwarders Service Functions **Service Function Chains**
Service Function Paths Access Lists/Classifiers NSH Metadata IPFIX APPID System info Config

Add Service Fu Add Service Function Chain Clear sorting

Service Function type
dpi

Service Function Chain

Chain-1 x



10 25 50 100

Delete All

OpenDaylight Dlux - Mozilla Firefox

RestConf Docume... x OpenDaylight Dlux x how to overco... x Problem loadin... x Problem loadin... x New Tab x WSO2 Manage... x

10.0.2.15:8181/sfc/index.html#/sfc/servicepath

Search

SFC

Service Nodes

Service Function Forwarders

Service Functions

Service Function Chains

Service Function Paths

Access Lists/Classifiers

NSH Metadata

IPFIX APPID

System info

Config

Clear sorting

Service Function name

SF1

51015

Service Function Forwarder

SFF1

51015


Service Function Paths

Rendered Service Paths

Rendered Service Path

Chain-1-Path-1-Path-3-Reverse (Parent Path: Chain-1-Path-1) (Path-ID: 4, starting index: 255) x


Classifier Context metadata



SF1

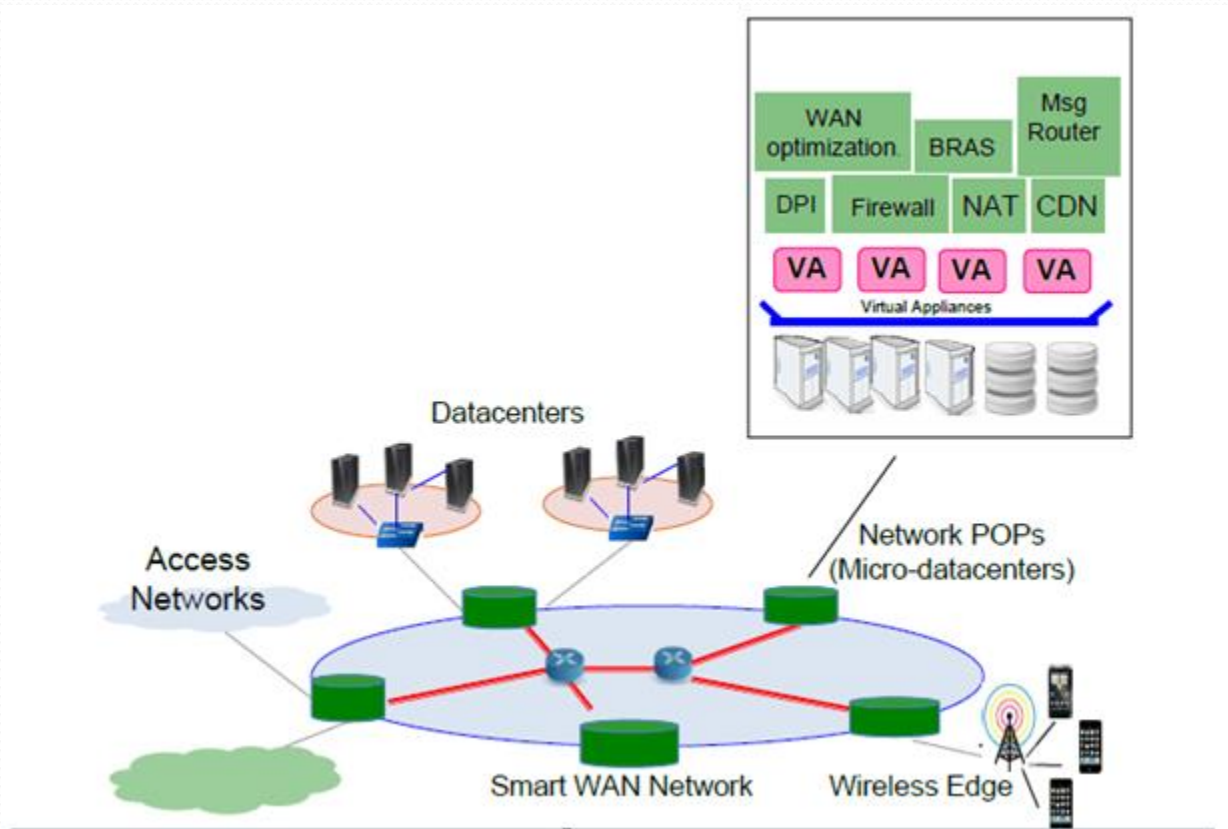
Chain-1-Path-1-Path-3 (Parent Path: Chain-1-Path-1) (Path-ID: 3, starting index: 255) x

Classifier Context metadata



SF1

SFC USE CASES: SMART WANS



CONCLUSION AND FUTURE WORK

- The Dynamic Service Function Chaining provides dynamic use of the service thus reduce the time complexity.
- Use of some algorithms like SF Selection algorithm will be implemented in the ODL SFC Project in order to evaluate and prove its benefits on real networking environment.

REFERENCES

- [1] Ahmed M. Medhat, Giuseppe Carella, Christian Luck, Marius-Iulian Corici, Thomas Magedanz "Near Optimal Service Function Path Instantiation in a multi-Datacenter Environment" in 2015.
- [2]Jeremias Blendin, Julius Ruckert, Nicolai Leymann, Georg Schyguda, and David Hausheer "Position Paper: Software-Defined Network Service Chaining" in 2014 .
- [3]Wolfgang John, Kostas Pentikousis, George Agapiou, Eduardo Jacob, Maria Kind, Antonio Manzalini, Fulvio Risso, Dimitri Staessens, Rebecca Steinert, and Catalin Meirosu "Research Directions in Network Service Chaining" 2014.
- [4]Ying-Dar Lin, Po-Ching Lin, Chih-Hung Yeh, Yao-Chun Wang, and Yuan-Cheng Lai "An Extended SDN Architecture for Network Function Virtualization with a Case Study on Intrusion Prevention" 2015.



THANK YOU