

I2RS Working Group
Internet-Draft
Intended status: Informational
Expires: January 5, 2015

S. Hares
L. Dunbar
Huawei
July 4, 2014

An Information Model for Service Chaining Policy
draft-hares-dunbar-i2rs-sfc-policy-im-01

Abstract

This draft describes an I2RS information model for managing the service chain steering policy rules to a router via the I2RS interface (SFC-Policy IM).

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of [BCP 78](#) and [BCP 79](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <http://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on January 5, 2015.

Copyright Notice

Copyright (c) 2014 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to [BCP 78](#) and the IETF Trust's Legal Provisions Relating to IETF Documents (<http://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

Internet-Draft

SFC Policy IM

July 2014

This document may contain material from IETF Documents or IETF Contributions published or made publicly available before November 10, 2008. The person(s) controlling the copyright in some of this material may not have granted the IETF Trust the right to allow modifications of such material outside the IETF Standards Process. Without obtaining an adequate license from the person(s) controlling the copyright in such materials, this document may not be modified outside the IETF Standards Process, and derivative works of it may not be created outside the IETF Standards Process, except to format it for publication as an RFC or to translate it into languages other than English.

Table of Contents

1.	Introduction	2
2.	Definition of terms	2
3.	Service Chaining Background	4
4.	Overview of information model for Service Chain	4
5.	Requirements for Service Function Forwarder Node (SFFN) Resources SFC Flow Filtering	5
6.	Service Forwarder Node RBNF	7
7.	Information Model for Service Chain Function Instance Discovery	8
8.	Information Model for Interested Service Function Instances .	9
9.	SFFN Instances Addresses	10
10.	Information Model for Reporting Directly Attached Instances .	10
11.	RBNF for Reporting Directly Attached Instances	10
12.	Information Model for Traffic steering rules	11
13.	Traffic Steering Rules RBNF	11
14.	Security Considerations	12
15.	IANA Considerations	12
16.	Acknowledgements	12
17.	References	12
17.1.	Normative References	13
17.2.	Informative References	13
	Authors' Addresses	14

[1.](#) Introduction

This draft describes an I2RS information model for managing the Service Chain via the I2RS interface.

[2.](#) Definition of terms

[[NFV-Terminology](#)].

SF: Service Function

[[I-D.ietf-sfc-problem-statement](#)].

SFF: Service Function Forwarder

Service Chain

[I-D.bitars-service-chaining] defines a service chain as an ordered set of services applied to a packet of flow. An example of this is a sequence of service function such as Chain#1 {s1, s4, s6} or Chain#2{s4, s7} at functional level. Also see the definition of Service Function Chain in [[I-D.bitars-service-chaining](#)]

Service Chain Instance Path

The actual Service Function Instance Components selected for a service chain.

SFFN: Service Function Forwarder Node

[[I-D.bitars-service-chaining](#)] states service function can run: a) natively within a router (or routing system), b) on a virtual machine on a server or service engine, or in a dedicated standalone hardware appliance.

VNF: Virtualized Network Function

[NFV-Terminology]

STOPO

Service topology is a topology of Service nodes (SFF).

SFFaddr: Service Node Address

[I-D.ietf-sfc-problem-statement] states this address should be IP Address, or tuple of (SFFaddr, host system IP address) or tuple of (host system IP address, system internal ID for service engine).

Service Type

[[I-D.ietf-sfc-problem-statement](#)].

3. Service Chaining Background

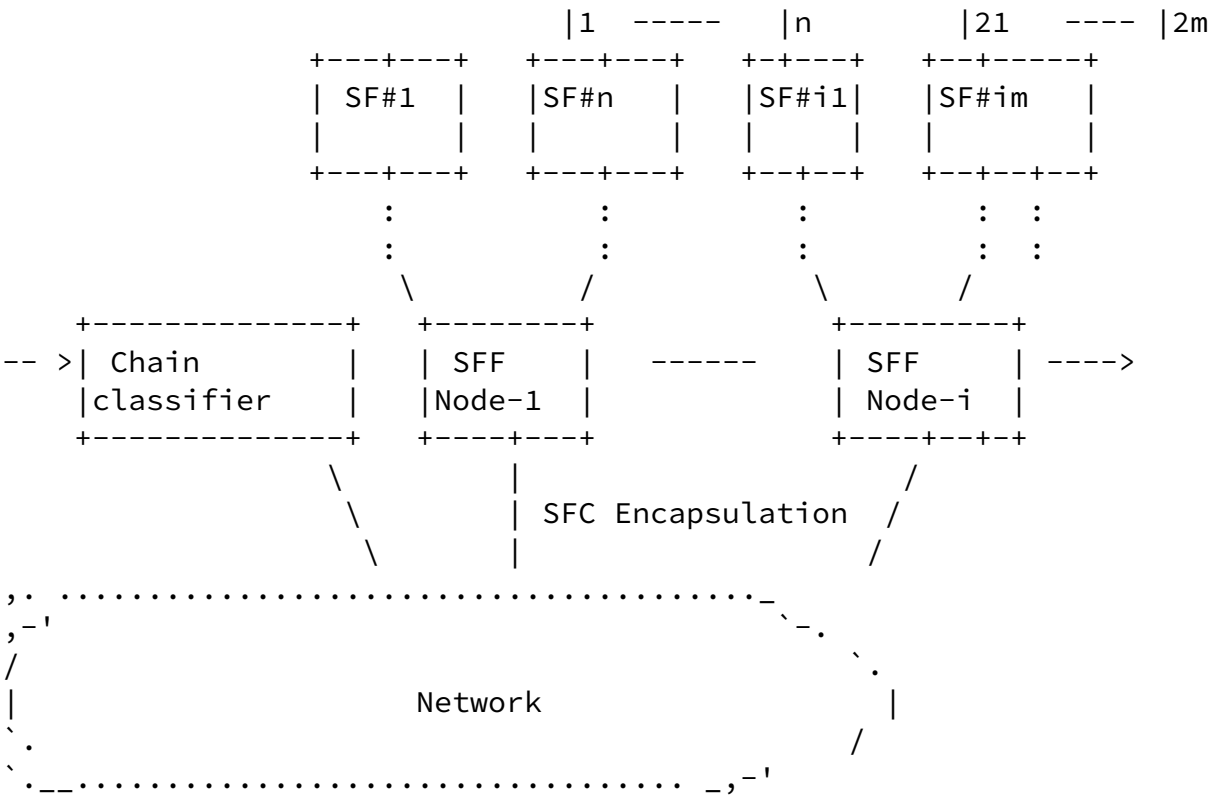


Figure 1 Framework of Service Chain

4. Overview of information model for Service Chain

There are three major categories of information models for Service Chain management:

- 1) Service function instances discovery;
- 2) Traffic flow steering rules on a router for specific service chain.
- 3) Service Chain path computation

This document focuses on the first (service function instance discovery), and the second (the traffic flow steering rules) as expressed in I2RS policies. The third category, the Service Chain path computation, is out of scope for this document. An I2RS information model for Service Topology with its Traffic Engineering Databased (TED) and associated inventory can be found in [[I-D.hares-i2rs-info-model-service-topo](#)]. Additional I2RS modes on basic network policy (BNP IM) and Policy based Routing (PBR IM) is contained in [[I-D.hares-i2rs-info-model-policy](#)].

5. Requirements for Service Function Forwarder Node (SFFN) Resources SFC Flow Filtering

This section reviews the requirements for SFC Flow Filtering Policies for an existing service for SFFNs within the SFC domain.

Inherent in the [[I-D.ietf-sfc-problem-statement](#)] is the need for policies that establish and filter data flow on the Service chain pathways. This document defines an I2RS model to interface to the SFC's Service Function Forwarder (SFF) to install or change the Policy controlling data flow to their designated and service functions and subsequent SFFN.

The SFC use case [[I-D.bitar-i2rs-service-chaining](#)] suggests SFF resources that must be on each SFF Node (SFFN). The SFFN resources include the following elements that the I2RS Client-I2RS Agent protocol can utilize:

SFC-Use-REQ01:Address (R)

has the following address requirements:

- * IP address
- * service-node tuple (service node IP address, Host system address)
- * host-node tuple (hosting system IP-address, system internal identifier)

SFC-Use-REQ02:Supported Service Types (R/W) SHOULD include:

NAT, IP Firewall, Load balancer, DPI, and others. Note that the current SFC WG suggest that the SFF does not need to know the SFFN type to steer the data to their designated service function. Therefore, this parameter has been given "a forwarding" function value.

SFC-Use-REQ03:Virtual contexts (R/W)SHOULD include:

- * Maximum Number of virtual contexts supported
- * Current number of virtual contexts in use
- * Number of virtual contexts available

- * Supported Context (VRF)

SFC-Use-REQ04: Customers currently on node (R)

SFC-Use-REQ05: Customer Support Table (per customer ID) (R)

with the following contents per entry:

- * Customer-id
- * List of supported Virtual Contexts

SFC-Use-REQ06: Service Resource Table (R/W)

which includes:

- * index: Comprised of service node, virtual context, service type
- * service bandwidth capacity
- * supported packet rate (packets/second)
- * supported bandwidth (kps)
- * IP Forwarding support: specified as routing-instance(s), RIBs, Address-families supported
- * Maximum RIB-size
- * Maximum Forward Data Base size
- * Maximum Number of 64 bit statistics counters for policy accounting
- * Maximum number of supported flows for services

SFC-Use-REQ07: Virtual Network Topology (VNT) (R)

which includes:

- * number of access points to which service topology applies
- * topology of access points

[6.](#) Service Forwarder Node RBNF

```
<SFF_node> ::= <SFFN_address> /*SFC-Use-REQ01 */
               [<Attached_Service_node>] /*SFC-Use-REQ02 */
               [<SFFN_virtual_contexts>] /*SFC-Use-REQ03 */
               [<SFFN_customer_cnt>] /*SFC-Use-REQ04 */
               [<SFFN_Customer_support_table>] /*SFC-Use-REQ05 */
               [<SFFN_Service_Resource_table>] /*SFC-Use-REQ06 */
```

```

[<SFFN_VNTopo>]          /*SFC-Use-07*/

<SFFN_address> ::= <ip_address>

<Attached_Service_node> ::=
    | [ (<service-node-ip_address>
        <host-system-ip_address>)]
    | [ (<hosting-system-ip_address>
        <system-internal_ID>)]

    <service-node-ip_address> ::= <ip_address>
    <host-system-ip_address> ::= <ip_address>
    <hosting-system-ip_address> ::= <ip_address>
    <system-internal_ID> ::= INTEGER-64;

/* SFC-Use-02 */
<SFFN_supported_types> ::= <Attached_Service_node_types>

/* These are the types specified by the SFC-REQ-02]
    <SF_Types> ::= [<SF_TYPE_FW>
                    [<SF_TYPE_LB>]
                    [<SF_TYPE_DPI>]
                    [<SF_TYPE_NAT>]
                    ...
/* SFC-Use-03 */
<SFFN_virtual_contexts> ::= <VContext_max>
    <VContext_current_inuse>
    <VContext_current_avail>
    <SFFN_Types>

/*SFC-Use-04 */
<SFFN_customer_cur_cnt> ::= INTEGER;

/* SFC-Use-05: Customer Support Table per Customer ID */
<SFFN_customer_table> ::= [<SFFN_customer< ...]

<SFFN_customer> ::= <SFFN_customer_Name>
    <SFFN_customer_ID>
    <SFFN_customers_contexts>

```

```

<SFFN_customers_contexts> ::= <SFFN_Types>

```



```

/*SFC-Use-REQ06 */
<SFFN_Service_Resource_table> ::= <SFF_Service_resource_index>
    <SFFN-SR_service_BW_capacity>
    <SFFN-SR_packet_rate_max>
    <SFFN-SR_BW>
    <SFFN-SR_IP_fwd_instance_list>
    <SFFN-SR_MAX_RIB>
    <SFFN-SR_MAX_FIB>
    <SFFN-SR_MAX_COUNTER64>
    <SFFN-SR_MAX_Flows>

    <SFF_Service_resource_index> := <SFFN_Address>
        <VContext_ID>
        <Service_types>

/*SFC-Use-REQ07
 * SFC_topology is defined by
 * ietf-hares-i2rs-service-topology
 * which includes node code
 */
<SFF_VNT> ::= <SFC_Topology>

```

7. Information Model for Service Chain Function Instance Discovery

A Service function instance can be either attached to a router via a physical interface or instantiated on a virtual machine that is attached to a router. Following are our assumptions:

- 1) The Service Chain Manager can get all the IP addresses or IP prefix of the service function instances needed from a database or provisioning system, and passed to the relevant routers. The Routers can send ARP/ND broadcast/multicast messages to all the attached nodes.
- 2) Service function instances will respond to ARP (IPv4)/ND (IPv6) requests from its L2/L3 boundary router.

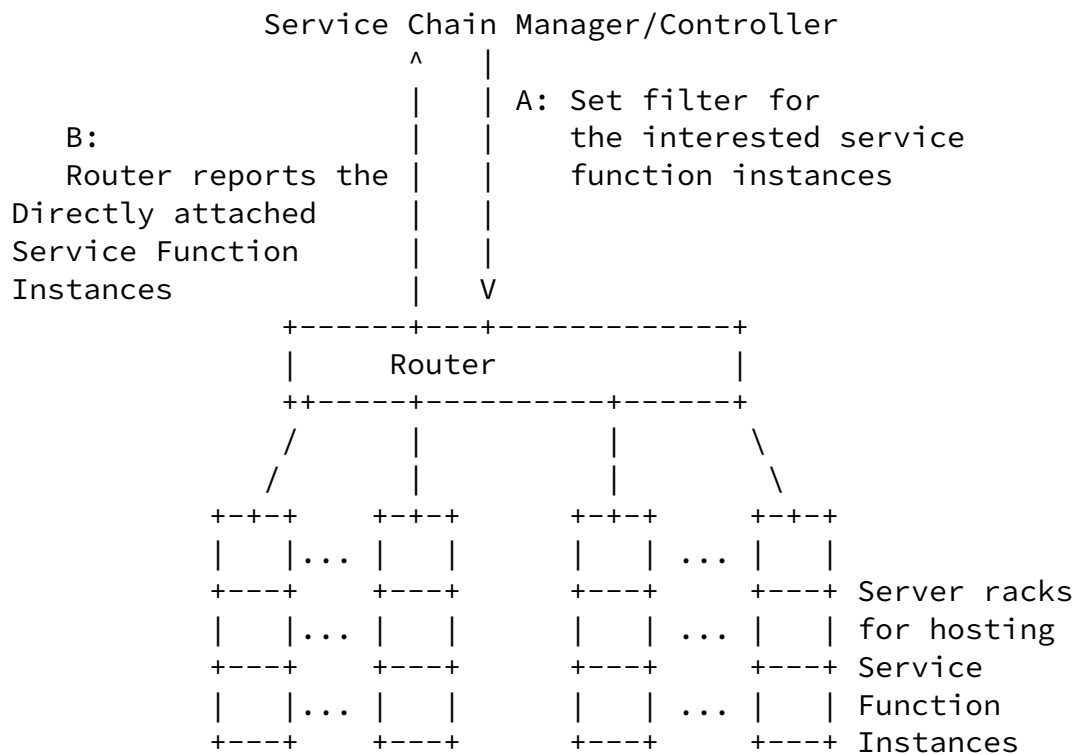


Figure 1: Service Function Instances

8. Information Model for Interested Service Function Instances

Service Function Instances placement can be managed by entities that are not integrated with Service Chain Manager. Therefore, it is necessary for the Service Chain Manager to discover all the Service Function Instances that might be needed for a specific service chain. Service Chain Manager can send down the filter periodically or on-demand (i.e. when there is a request for building a specific service chain for a client).

Some service function instances are attached to router via tunnels, e.g. VxLAN. Service Function Instances might be partitioned by clients, which are differentiated by different network ID (e.g. VNID, VPN ID, etc). Some filter will carry the network ID (tenant ID, or VPN ID) to get specific service functions.

The I2RS Client can operate as the service chain manager/controller communicating with the I2RS Agents operating in the router or I2RS Agents operating on the service function instances in the server racks to discover and control specific service function instances.

The I2RS Client-Agent must be able to discover the I2RS Agent associated with a specific Service Function instance by querying for:

9. SFFN Instances Addresses

```

<interested-SF-filter> ::= <SF-FILTER-NAME>
                        [<ipv4-address-list>|<ipv6-address-list>]
                        [<client-identifier>]

<ipv4-address-list> ::= ((<ipv4-address>
                        |<ipv4-prefix>) ...)
<ipv4-prefix> ::= <IPV4_ADDRESS><IPV4_PREFIX_LENGTH>
<ipv6-address-list> = ((<ipv6-address>
                        |<ipv6-prefix>) ...)
<ipv6-prefix> ::= <IPV6_ADDRESS><IPV6_PREFIX_LENGTH>

<client-identifier> ::= <client-identifier-type>
                        <client-identifier >
<client-identifier-type> ::= <GRE>
                        | <VxLAN>
                        | <NVGRE>

<client-identifier > ::= (<VXLAN> <VXLAN_IDENTIFIER>)
                        | (<NVGRE> <VIRTUAL_SUBNET_ID>)
                        | (<GRE> <GRE_KEY>)

```

10. Information Model for Reporting Directly Attached Instances

When a router receives the filter of the interested Service Function Instances, it can scan through all its interfaces to check if any of the addresses in the filter list are attached to the interfaces. For the Service Function Instances attached via Layer 2, the router can send ARP/ND to get the matching instances to respond. For the Service Function Instances attached via Layer 3, the router can use Ping to check if the addresses in the filter are attached.

The response should be grouped by <SF-FILTER-NAME >

11. RBNF for Reporting Directly Attached Instances

```

<sf-instance-list> ::= <INSTANCE-LIST-NAME>

```

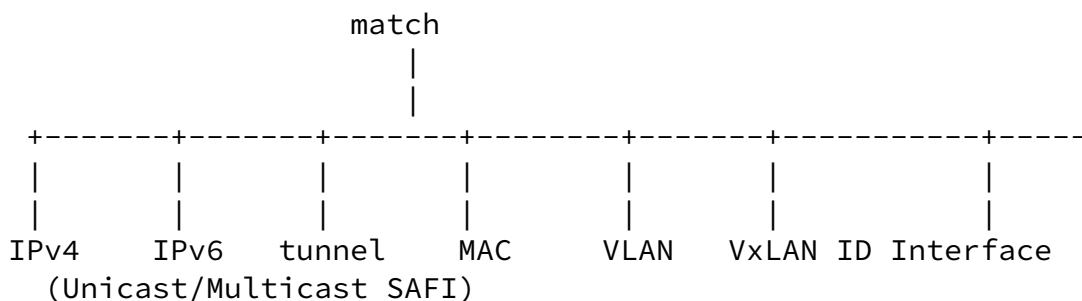
```

< SF-FILTER-NAME>
[<INTERFACE_IDENTIFIER>
|<ipv4-address-list>
|<ipv6-address-list>]]

```

[12.](#) Information Model for Traffic steering rules

The semantics of traffic steering rules is "Match" and "Action", similar to the "route" described in [[I-D.ietf-i2rs-rib-info-model](#)]. However, there are more matching criteria for traffic steering rules.



The steering rules include matches on combinations of:

- o Addresses: IP addresses (IPv4/IPv6), Multicast IP addresses, MAC Addresses;
- o Label fields: MPLS labels, VLAN-IDs, GRE-Keys
- o interfaces
- o Layer 4 fields
- o packet sizes

[13.](#) Traffic Steering Rules RBNF

```
<SFC-Policy> ::= <steering-rules>

<steering-rules> ::= <match> <action>
  <match> ::= <address>
    | <label>
    | <interface>
    | <l4-field>
    | <packet-size>
  <address> ::= <ip-address>
    | <multicast-address>
    | <mac-address>]
  <ip-address> ::= <IPV4_ADDRESS>
    | <ipv4-prefix >
    | <IPV6_ADDRESS>
    | <ipv6-prefix >]
  <label> ::= [MPLS_LABEL] | <VXLAN-ID> | <GRE-KEY>
  <l4-field> ::= <TCP_PORT> | <UDP_PORT>

  <action> ::= <nexthop-list>
    | <drop-policy>
    | <metadata>
  <drop-policy> ::= <PASS> | <DROP>
  <metadata> ::= [<ATTACH> <object>] | <detach>
```

The I2RS interface of a router should allow "write" and "read" of above

[14.](#) Security Considerations

The SC use cases described in this document assumes use of I2RS programmatic interfaces described in the I2RS framework mentioned in [[I-D.ietf-i2rs-architecture](#)]. This document does not change the underlying security issues inherent in the existing in [[I-D.ietf-i2rs-architecture](#)].

[15.](#) IANA Considerations

This draft includes no request to IANA.

[16.](#) Acknowledgements

We'd like to thank Qin Wu for his comments on this document relating to the service topologies.

[17.](#) References

Hares & Dunbar	Expires January 5, 2015	[Page 12]
----------------	-------------------------	-----------

Internet-Draft	SFC Policy IM	July 2014
----------------	---------------	-----------

[17.1.](#) Normative References

- [[I-D.ietf-i2rs-architecture](#)]
Atlas, A., Halpern, J., Hares, S., Ward, D., and T. Nadeau, "An Architecture for the Interface to the Routing System", [draft-ietf-i2rs-architecture-04](#) (work in progress), June 2014.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.

[17.2.](#) Informative References

- [[I-D.bitar-i2rs-service-chaining](#)]
Bitar, N., Heron, G., Fang, L., ramki, r., Leymann, N., Shah, H., and W. Haddad, "Interface to the Routing System (I2RS) for Service Chaining: Use Cases and Requirements", [draft-bitar-i2rs-service-chaining-01](#) (work in progress),

February 2014.

[I-D.hares-i2rs-info-model-policy]

Hares, S. and W. Wu, "An Information Model for Network policy", [draft-hares-i2rs-info-model-policy-02](#) (work in progress), March 2014.

[I-D.hares-i2rs-info-model-service-topo]

Hares, S., Wu, W., and X. Guan, "An Information model for service topology", [draft-hares-i2rs-info-model-service-topo-00](#) (work in progress), February 2014.

[I-D.ietf-i2rs-rib-info-model]

Bahadur, N., Folkes, R., Kini, S., and J. Medved, "Routing Information Base Info Model", [draft-ietf-i2rs-rib-info-model-03](#) (work in progress), May 2014.

[I-D.ietf-sfc-problem-statement]

Quinn, P. and T. Nadeau, "Service Function Chaining Problem Statement", [draft-ietf-sfc-problem-statement-07](#) (work in progress), June 2014.

[I-D.medved-i2rs-topology-requirements]

Medved, J., Previdi, S., Gredler, H., Nadeau, T., and S. Amante, "Topology API Requirements", [draft-medved-i2rs-topology-requirements-00](#) (work in progress), February 2013.

Hares & Dunbar

Expires January 5, 2015

[Page 13]

Internet-Draft

SFC Policy IM

July 2014

[I-D.white-i2rs-use-case]

White, R., Hares, S., and A. Retana, "Protocol Independent Use Cases for an Interface to the Routing System", [draft-white-i2rs-use-case-05](#) (work in progress), June 2014.

[NFV-Terminology]

"Network Functions Virtualization (NFV); Terminology for Main Concepts in NFV",
<http://www.etsi.org/deliver/etsi_gs/NFV/001_099/003/01.01.01_60/gs_NFV003v010101p.pdf>.

Authors' Addresses

Susan Hares
Huawei
7453 Hickory Hill
Saline, MI 48176
USA

Email: shares@endzh.com

Linda Dunbar
Huawei
6340 Legacy Drive, Suite 175
Plano, TX 75024
USA

Phone: +1-469-277-5840
Email: ldunbar@huawei.com