

Service Function Chaining  
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**NSH Context Header Allocation for Broadband  
draft-ietf-sfc-nsh-broadband-allocation-01**

Abstract

This document provides a recommended allocation of Network Service Header (NSH) context headers within the broadband service provider network context. Both fixed and mobile deployments are considered.

Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [[RFC2119](#)].

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## [1.](#) Introduction

Service Function Chaining (SFC) [[RFC7665](#)] provides a mechanism for network traffic to be steered through an ordered list of Service Functions (SFs). Furthermore, SFC allows to share metadata among involved SFC data functional elements (classifiers and SFs). Particularly, the Network Service Header (NSH, [[RFC8300](#)]) provides support for carrying shared metadata either using a fixed context header or as optional TLVs.

This document describes a recommended default allocation scheme for the fixed-length context header used for SFC within fixed and mobile broadband service provider networks. Also, the document defines companion TLV types when MD Type 0x02 is used. The use cases describing the need for metadata in these deployment contexts are described in [[I-D.ietf-sfc-use-case-mobility](#)].



This document does not address control plane considerations. The reader may refer to [[I-D.ietf-sfc-control-plane](#)].

## 2. Terminology

This document makes use of the terms as defined in [[RFC7498](#)], [[RFC7665](#)], and [[RFC8300](#)].

## 3. Network Service Header (NSH) Context Headers: A Reminder

The NSH is composed of a 4-byte base header (BH1), a 4-byte service path header (SH1), and a fixed 16-byte context header in the case of MD Type 0x01 or optional TLVs in the case of MD Type 0x02 [[RFC8300](#)].

Figure 1 shows the format of the MD Type 0x01 NSH header.

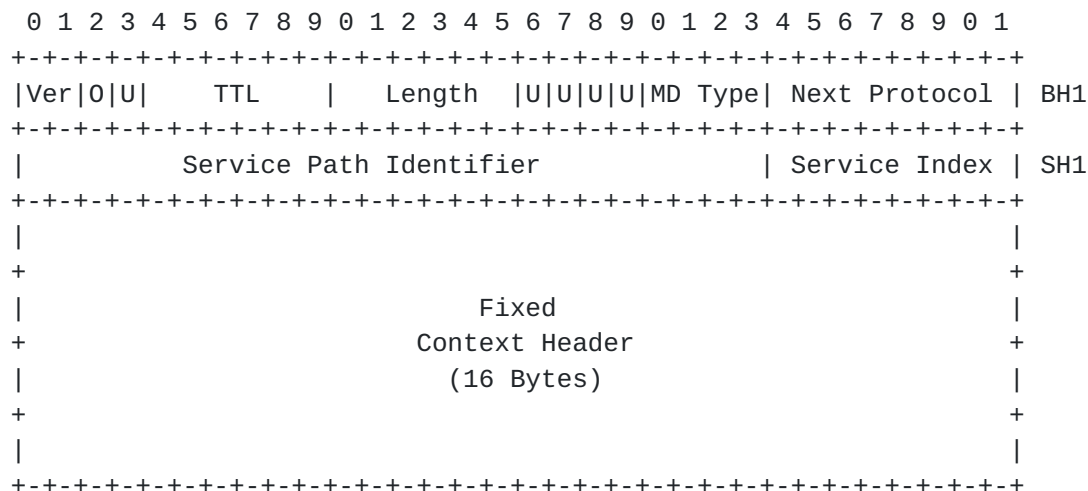


Figure 1: Network Service Header (MD Type 0x01)

Figure 2 shows the MD Type 0x02 NSH header format.

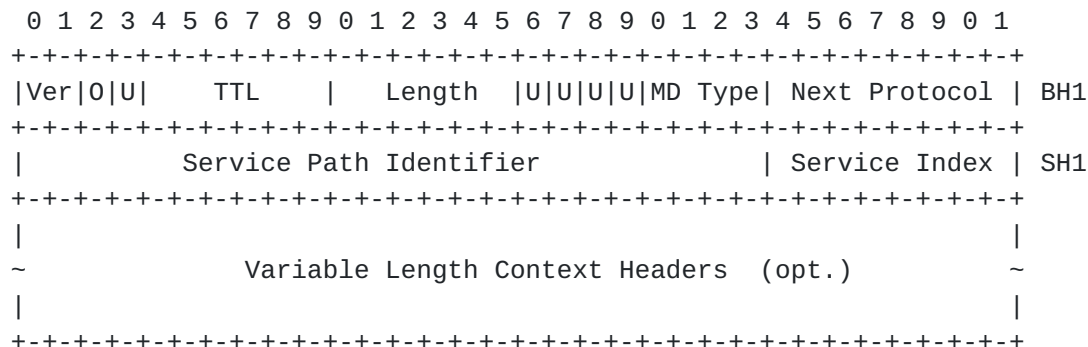


Figure 2: Network Service Header (MD Type 0x02)



#### 4. Recommended Context Allocation For Broadband

The following header allocations provide information to support service function chaining in a service provider network, for example as described for mobility in [[I-D.ietf-sfc-use-case-mobility](#)].

The set of metadata headers can be delivered to SFs that can use the metadata within to enforce service policy, communicate between service functions, provide subscriber information, and other functionality. Several of the headers are typed allowing for different metadata to be provided to different SFs or even to the same SF but on different packets within a flow.

Which metadata are sent to which SFs is decided in the SFC control plane and is thus out of the scope of this document.

##### 4.1. MD Type 0x01 Allocation Specifics

Figure 3 provides a high-level description of the fields in the recommended allocation of the fixed sixteen byte context header for a broadband context. Each four byte word in the sixteen byte context header is referred to as CH1, CH2, CH3, and CH4, respectively.

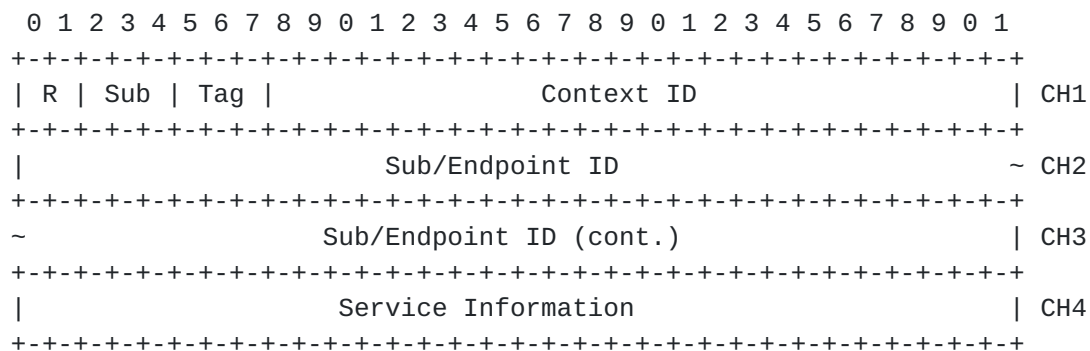


Figure 3: NSH Context Allocation

The intended use for each of the context header fields is as follows:

R: MUST be set to zero upon origination, and they MUST be ignored and preserved unmodified by other NSH supporting elements.

Sub: Sub/Endpoint ID type field. These bits determine the type of the 64-bit Sub/Endpoint ID field that spans CH2 and CH3.

000: The 64-bit Sub/Endpoint ID field is an opaque field that can be used or ignored by SFs as determined by the control plane.

001: The Sub/Endpoint ID field contains an IMSI [[itu-e-164](#)].



010: The Sub/Endpoint ID field contains an MSISDN (8-15 digit) [[itu-e-164](#)].

011: The Sub/Endpoint ID field contains a 64-bit identifier that can be used to group flows (e.g., in Machine-to-Machine (M2M) contexts).

100: The Sub/Endpoint IP field contains a wireline subscriber ID in CH2, and CH3 contains the line identifier.

101-111: Reserved.

Tag: Indicates the type of the Service Information field in CH4. The following values are defined:

000: If the Tag field is not set, the Service Information field in CH4 is an opaque field that can be used or ignored by SFs as determined by the control plane.

001: The Service Information field in CH4 contains information related to the Access Network (AN) for the subscriber. This is shown in Figure 4 for a 3GPP Radio Access Network (RAN).

Note that these values should correspond to those that can be obtained for the flow from the corresponding 3GPP PCRF (Policy and Charging Rules Function) component using Diameter as described in [[TS.29.230](#)].

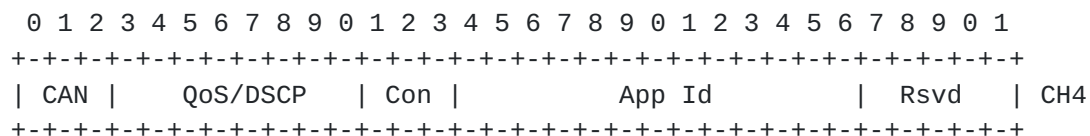


Figure 4: Service Information RAN Allocation

CAN: IP-CAN-Type for IP Connectivity Access Network (Diameter AVP code 1027).

QoS: QoS-Class-Identifier AVP (Diameter AVP code 1028) or Differentiated Services Code Point (DSCP) marking as described in [[RFC2474](#)].

Con: Access congestion level. An Access Congestion level '000' means an unknown/undefined congestion level. An Access Congestion level '001' means no congestion. For other values of Access Congestion level, a higher value indicates a higher level of congestion.





App Id: Application ID describing the flow type. Allocation of IDs is done using the control plane and is out of the scope of this document.

Rsvd: Reserved.

010-111: Reserved.

Context ID: The Context ID field allows the Sub/Endpoint ID field to be scoped. For example, the Context ID field may contain the incoming VRF, VxLAN VNID, VLAN, or a policy identifier within which the Sub/Endpoint ID field is defined.

Sub/Endpoint ID: 64-bit length Subscriber/Endpoint identifier (e.g., IMSI, MSISDN, or implementation-specific Endpoint ID) of the corresponding subscriber/machine/application for the flow.

Service Information: The Service Information field is a unique identifier that can carry metadata specific to the flow or subscriber identified in the Sub/Endpoint ID field.

#### 4.2. MD Type 0x02 Allocation Specifics

Figure 5 depicts the format of the recommended allocation of the variable length headers for a mobility context.

```

0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
|      TLV Class = 3GPP          |C|   Type   |U|U|U|   Len   |
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
|      Data ...
+--+--+--+--+--+--+--+--+

```

Figure 5: TLV Allocation

The intended use of the header is for TLVs associated with 3GPP Radio Access Networks as described in [TS.29.230]. This TLV can be used by 3GPP to extend the metadata as per use cases. Having this TLV helps to carry more information that does not fit within the MD Type 0x01.

The Len field carries the total length. Type = 0x01 is reserved. If set to 0x01, the TLV carries the 4 context headers as defined in [Section 4.1](#).



## **5. Context Allocation and Control Plane Considerations**

This document describes an allocation scheme for both the fixed context header (MD Type#1) and optional TLV headers (MD Type#2) in the context of broadband service providers. This allocation of headers should be considered as a guideline and may vary depending on the use case.

The control plane aspects of specifying and distributing the allocation scheme among different SFs within the Service Function Chaining environment to guarantee consistent semantics for the metadata is beyond the scope of this document.

## **6. Security Considerations**

This specification relies on NSH to share metadata among SFC data plane elements. Security-related consideration discussed in [\[RFC8300\]](#) MUST be followed.

The recommended header allocation in this document includes sensitive information that MUST NOT be revealed outside an SFC-enabled domain. Those considerations are already discussed in [\[RFC8300\]](#). NSH allows by design to remove any NSH data before existing an SFC-enabled domain.

Furthermore, means to prevent that illegitimate nodes insert spoofed data MUST be supported. As a reminder, the NSH specification assumes ingress boundary nodes strip any NSH data that may be present in a packet. Misbehaving nodes from within an SFC-enabled domain may alter the content of the NSH data. Such treats are discussed in [\[RFC8300\]](#). This document does not introduce new treats compared to those discussed in [\[RFC8300\]](#).

## **7. IANA Considerations**

This document requests IANA to assign a TLV class for 3GPP to be used for its use cases.

## **8. Acknowledgments**

The authors would like to thank Jim Guichard for his assistance structuring the document.

## **9. References**



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