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RIFT Key/Value Structure and Registry

Abstract

The Routing in Fat-Trees RIFT [RIFT] protocol allows for key/value
pairs to be advertised within Key-Value Topology Information
Elements (KV-TIEs). The data contained within these KV-TIEs can be
used for any imaginable purpose. This document defines the various
Key-Types (i.e. Well-Known, OUI, and Experimental) and a method to
structure corresponding values.

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 RFC 2119 [RFC2119].

Status of This Memo

This Internet-Draft is submitted in full conformance with the
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1. Description

The Routing in Fat-Trees RIFT [RIFT] protocol allows for key/value
pairs to be advertised within Key-Value Topology Information
Elements (KV-TIEs). There are no restrictions placed on the type of
data that is contained in KV-TIEs nor what the data is used for.

For example, it might be beneficial to advertise overlay protocol
state from leaf nodes to the Top-of-Fabric (ToF) nodes. This would
make it possible to view critical state of a fabric-wide service
from a single ToF node rather than retrieving and reconciling the
same state from multiple leaf nodes.

2. Key Structure

This section describes the generic Key structure and semantics,
Figure 1 further illustrates these components.

```
 0                   1                   2                   3
 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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   Key-Type    |                Key Identifier                 |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                        Values (variable)                      |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
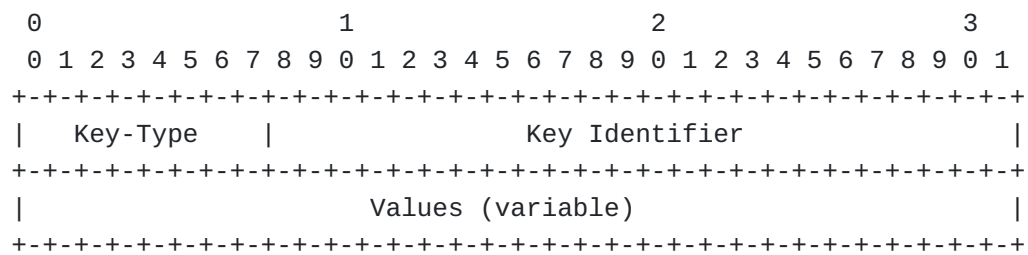
Figure 1: Generic Key-Value Structure

where:

Key-Type:
A 1-byte value that identifies the Key-Type. It MUST be a
reserved value from the RIFT Key-Type Registry that is defined
later in this document.

The range of valid values is 1 - 255 (2^8-1).

0 is an illegal value and MUST NOT be allocated to or used by
any implementation. It MUST be ignored on receipt.

Key Identifier:
A 3-byte value that identifies the specific key and describes
the structure of the contained values.

The range of valid values is 1 - 16777215 (2^24-1).

0 is an illegal value and MUST NOT be allocated to or used by
any implementation. It MUST be ignored on receipt.

Values:
A variable length value that contains data associated with the
Key Identifier. It SHOULD contain 1 or more elements. Whether
the collection of elements allows duplicates and/or is ordered
is governed by the particular Key Identifier's specification.

2.1. Experimental Key-Type

This section reserves a value in the RIFT Key-Type Registry to
indicate an Experimental Key-Type.

As shown in [Figure 2](), the Key-Type will be used to identify the Key-
Type as Experimental. The Key Identifier will be used to identify
the specific key and describe the structure of the contained values.

```
 0                   1                   2                   3
 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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|       1        |          Experimental Key Identifier        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                   Experimental Values (variable)             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
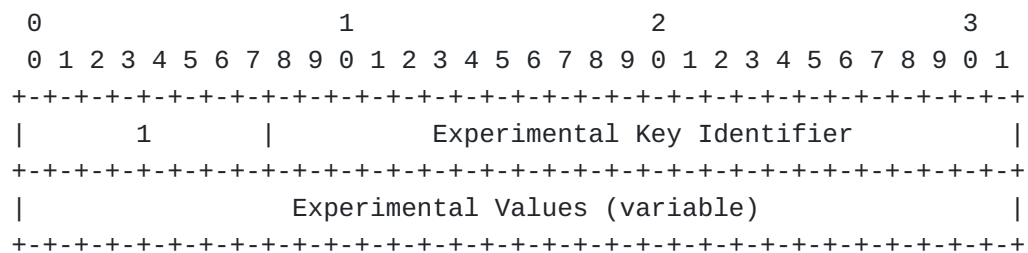
Figure 2: Experimental Key-Type

2.2. Well-Known Key-Type

This section reserves a value in the RIFT Key-Type Registry to
indicate Well-Known Key-Types that all implementations SHOULD
support.

As shown in Figure 3, the Key-Type will be used to identify the Key-
Type as Well-Known. The Key Identifier will be used to identify the
specific key and describe the structure of the contained values.

```
 0                   1                   2                   3
 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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|       2        |          Well-Known Key Identifier          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                   Well-Known Values (variable)               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
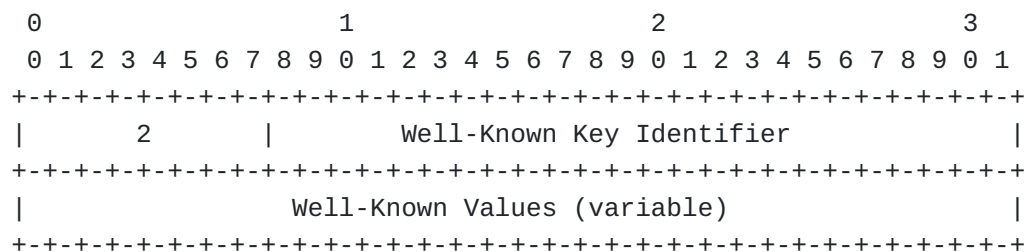
Figure 3: Well-Known Key-Type

2.3. OUI Key-Type

This section reserves a value in the RIFT Key-Type Registry to
indicate an OUI (vendor-specific) Key-Type that any implementation
MAY support.

As shown in Figure 4, the Key-Type will be used to identify the Key-
Type as OUI. The Key Identifier MUST use the implementing
organization's reserved OUI space to indicate the key and value
structure.

```
 0                   1                   2                   3
 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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|       3       |              OUI Key Identifier               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|               Vendor Specific Values (variable)               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
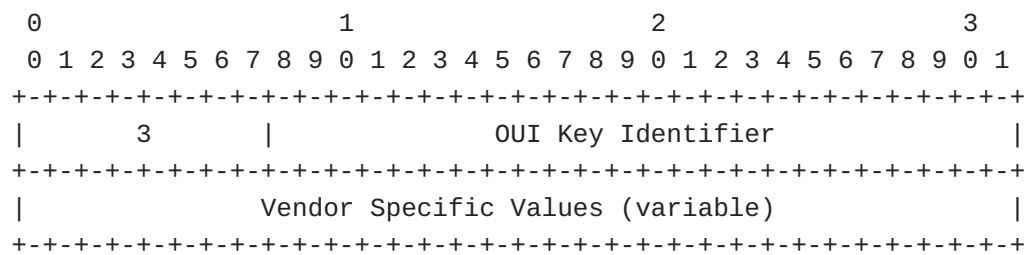
Figure 4: OUI Key-Type

3. Operational Considerations

While no restrictions are placed on Key-Value data or what it is
used for, it is RECOMMENDED that a serialized Thrift model be used
for simpler interoperability. [RIFT-AUTO-EVPN] is an example of this
type of implementation.

Key-Value elements SHOULD NOT be used to carry topology information
used by RIFT itself to perform distributed computations.

In cases where KV-TIEs are flooded from north to south, policies
SHOULD be implemented in order to avoid network-wide flooding.

For networks with more than one ToF node, it is RECOMMENDED that
those ToF nodes contain identical KV-TIE information when being
distributed from north to south. RIFT [RIFT] requires that only one
KV-TIE is selected when identical keys are received from multiple
northbound neighbors. If this is not considered then the tie-
breaking rules may cause a node to select a suboptimal KV-TIE.
Consider a case where failure conditions cause the ToF nodes to
become split-brained. While the Key-Type and Key Identifier will be
identical, the value(s) contained within may differ. The node(s)
receiving these differing KV-TIEs will select the one from the ToF
node with the highest System ID, potentially leading to unintended
effects.

4. IANA Considerations

This section requests that IANA create two new registries the "RIFT
Key-Type" and "RIFT Well-Known Key-Type" registries in accordance
with [RFC8126].

Experts reviewing requests for new values to either registry MUST
consider the items in the Expert Review Guidance (Section 4.3)
section.

The following sections detail each registry's requirements and
suggested values.

4.1. RIFT Key-Type Registry

This section requests that IANA create and help govern the following registry:

Registry Name:
    RIFT Key-Type Registry

Registration Procedures:
    Expert Review

Description:
    Key-Type registry for the RIFT protocol.

Reference:
    This document.

4.1.1. RIFT Key-Type Registry Requested Entries

This section requests that IANA register the following suggested values to the "RIFT Key-Type Registry".

Value	Key-Type	Description	Status/ Reference
0	Illegal	Not allowed.	This document
1	Experimental	Indicates that the Key-Type is Experimental.	This document.
2	Well-Known	Indicates that the Key-Type is Well-Known.	This document.
3	OUI	Indicates that the Key-Type is OUI (vendor specific).	This document.

Table 1

4.2. RIFT Well-Known Key-Type Registry

This section requests that IANA create and help govern the following registry:

Registry Name:
    RIFT Well-Known Key-Type Registry

Registration Procedures:
    Expert Review

Description:
    Well-Known Key-Type (2) registry for the RIFT protocol.

Reference:
    This document.

4.2.1. RIFT Well-Known Key-Type Registry Requested Entries

This section requests that IANA register the following suggested
values to the "RIFT Well-Known Key-Type Registry".

Value	Key-Identifier	Description	Status/ Reference
0	Illegal	Not allowed.	This document.
1	MAC/IP Binding	To be defined.	To be defined.
2	FAM Security Roll-Over Key	To be defined.	To be defined.

Table 2

4.3. Expert Review Guidance

Experts reviewing requests for values from the RIFT Key-Type
Registry or the the the Well-Known RIFT Key-Type Registry are
responsible for the following:

1. Determining the existence of a specification that clearly
   defines the purpose supporting the request and MUST contain all
   required fields for given registry.

   The document MUST also be permenent and publically available.

2. Ensuring that any requests are made available to the RIFT
   working group for review should the work originate from outside
   of the RIFT Working Group.

3. Ensuring that any work produce outside of the IETF does not
   conflict with any work that is already published or actively
   pursuing being published.

5. Security Considerations

This document introduces no new security concerns to RIFT or other
specifications referenced in this document given that the Key-Value
TIEs are already extensively secured by the RIFT [RIFT] protocol
specification itself.

6. Acknowledgements

To be provided.

7. Normative References

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[RIFT]   Przygienda, T., Sharma, A., Thubert, P., Rijsman, B.,
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