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J. Li
China Mobile
C. Lin
New H3C Technologies
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Flexible Algorithms for Energy Efficiency
draft-li-lsr-flex-algo-energy-efficiency-00

Abstract

[draft-liu-spring-sr-policy-energy-efficiency-00] describes how energy consumption information is utilized for path selection in Segment Routing (SR) networks. This document elaborates on extending IGP protocols to carry energy consumption information, enabling its dissemination within the IGP domain and ultimately transmitting it to the controller. This allows the controller to perform routing calculations based on energy consumption metrics.

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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1. Introduction

As communication devices continue to advance, their power consumption is also increasing. However, energy consumption levels vary across different devices. Considering these energy consumption levels in routing decisions can help reduce the energy consumption of network communications. This energy-aware routing strategy not only enhances network energy efficiency but also assists operators in optimizing operational costs by balancing performance with energy consumption, thus achieving more sustainable network management.

[draft-liu-spring-sr-policy-energy-efficiency-00] describes how energy-consumption information is utilized in SR networks. It elaborates on the use of energy consumption information for path computation in SR networks.

The metrics for energy consumption include:

Node Maximum Energy Consumption: The power consumption of a node at full load, measured in watts.

Node Real-Time Energy Consumption: The real-time power consumption of a node, measured in watts.

Node Maximum Unit Energy Consumption: The power consumption of a node at full load divided by traffic, measured in watts per gigabyte (W/GB).

Node Real-Time Unit Energy Consumption: The real-time power consumption of a node divided by real-time traffic, measured in watts per gigabyte (W/GB).

Node Average Unit Energy Consumption: The change in power consumption of a node over a measurement period divided by the change in traffic, measured in watts per gigabyte (W/GB).

Interface Maximum Unit Energy Consumption: The power consumption of an interface at full load divided by traffic, measured in watts per gigabyte (W/GB).

Interface Real-Time Unit Energy Consumption: The real-time power consumption of an interface divided by real-time traffic, measured in watts per gigabyte (W/GB).

Interface Average Unit Energy Consumption: The change in power consumption of an interface over a measurement period divided by the change in traffic, measured in watts per gigabyte (W/GB).

This document describes how to extend IGP protocols to carry energy consumption information, enabling its dissemination within the IGP domain and ultimately transmitting it to the controller, allowing the controller to perform routing calculations based on energy consumption metrics.

Additionally, by leveraging Flex-Algo technology, energy consumption-based constraints can be specified, enabling nodes in the network to select paths based on energy consumption information, thereby achieving the goal of reducing energy consumption. This document extends the energy consumption-based constraints in Flex-Algo.

1.1. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

2. IGP Protocol Advertise energy consumption

The energy consumption information is advertised within the domain via the IGP protocol. This information is divided into node energy consumption and link energy consumption.

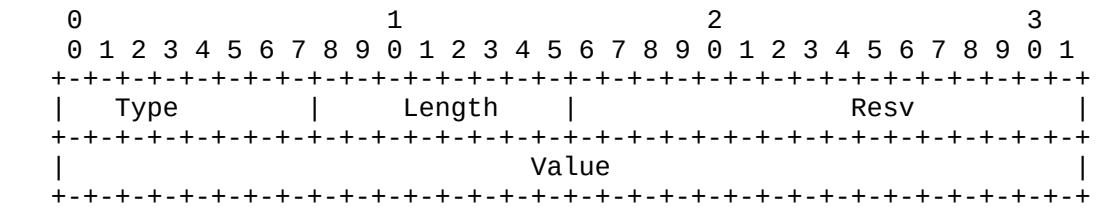
2.1. Advertise Link energy consumption

This document uses the energy consumption sub-TLV to advertise energy consumption information. The TLV types used for this announcement include "IS-IS energy consumption Sub-TLV" and "OSPF energy consumption Sub-TLV".

2.1.1. IS-IS Link energy consumption

2.1.1.1. Interface Maximum Unit Energy Consumption

The format of the "IS-IS Interface Maximum Unit Energy Consumption Sub-TLV" is shown in Figure 1.

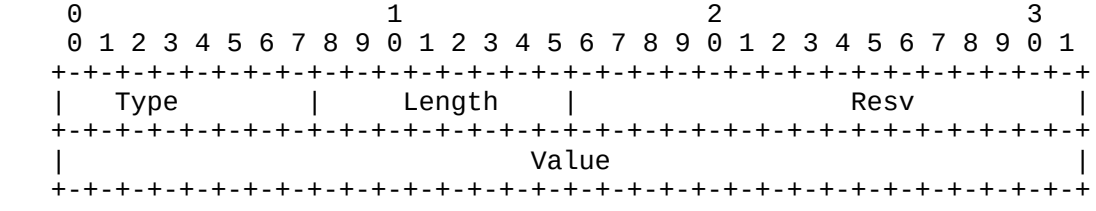


Type (1 octet): TBD1, Interface Maximum Unit Energy Consumption
Length (1 octet): 4
Value (4 octet): Maximum energy consumption, value range (0 - 4,294,967,295)

Figure 1: IS-IS Interface Maximum Unit Energy Consumption Sub-TLV

2.1.1.2. Interface Real-Time Unit Energy Consumption

The format of the "IS-IS Interface Real-Time Unit Energy Consumption Sub-TLV" is shown in Figure 2.

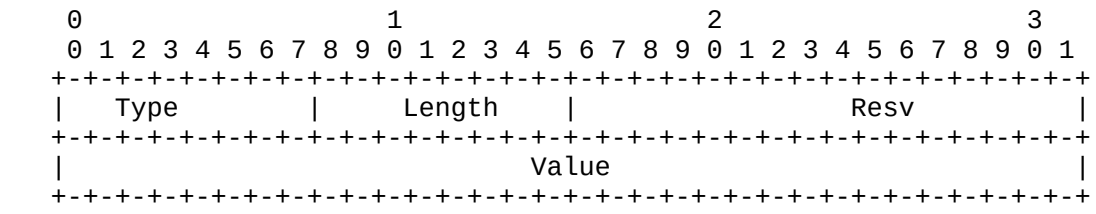


Type (1 octet): TBD2, Interface Real-Time Unit Energy Consumption sub TLV
Length (1 octet): 4
Value (4 octet): Interface Real-Time Unit Energy Consumption, value range (0 - 4,294,967,295)

Figure 2: IS-IS Interface Real-Time Unit Energy Consumption Sub-TLV

2.1.1.3. Interface Average Unit Energy Consumption

The format of the "IS-IS Interface Average Unit Energy Consumption Sub-TLV" is shown in Figure 3.



Type (1 octet): TBD3, Interface Average Unit Energy Consumption sub TLV

Length (1 octet): 4

Value (4 octet): Interface Average Unit Energy Consumption, value range (0 - 4,294,967,295)

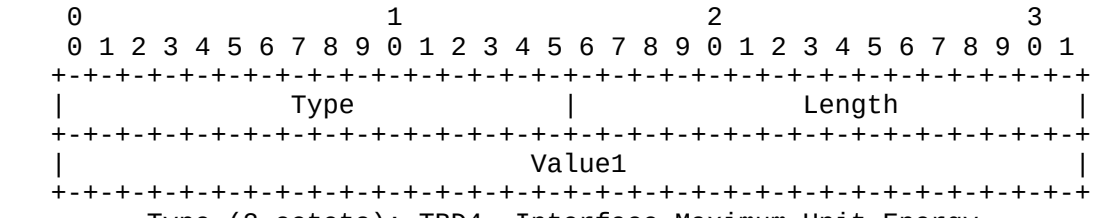
Figure 3: IS-IS Interface Average Unit Energy Consumption Sub-TLV

2.1.2. OSPF Link energy consumption

2.1.2.1. Interface Maximum Unit Energy Consumption

The extension of the OSPF protocol for energy consumption is similar.

The format of the "OSPF Interface Maximum Unit Energy Consumption Sub-TLV" is shown in Figure 6.



Type (2 octets): TBD4, Interface Maximum Unit Energy Consumption

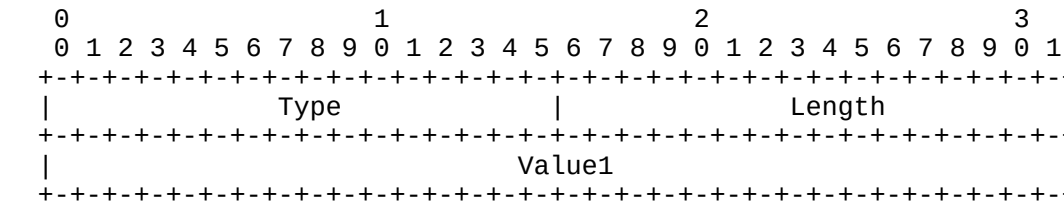
Length (2 octets): 4

Value : Interface Maximum Unit Energy Consumption value range (0 - 4,294,967,295)

Figure 6: OSPF Interface Maximum Unit Energy Consumption Sub-TLV

2.1.2.2. Interface Real-Time Unit Energy Consumption

The format of the "OSPF Interface Real-Time Unit Energy Consumption Sub-TLV" is shown in Figure 6.



Type (2 octets): TBD5, Interface Real-Time Unit Energy Consumption

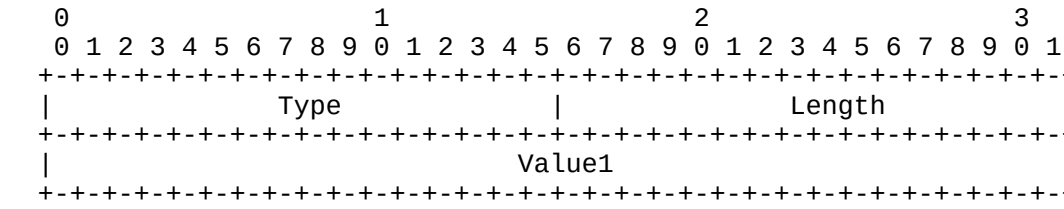
Length (2 octets): 4

Value : Interface Real-Time Unit Energy Consumption value range (0 - 4,294,967,295)

Figure 7: OSPF Interface Real-Time Unit Energy Consumption Sub-TLV

2.1.2.3. Interface Average Unit Energy Consumption

The format of the "OSPF Interface Average Unit Energy Consumption Sub-TLV" is shown in Figure 8.



Type (2 octets): TBD6, Interface Average Unit Energy Consumption

Length (2 octets): 4

Value : Interface Average Unit Energy Consumption value range (0 - 4,294,967,295)

Figure 8: OSPF Interface Average Unit Energy Consumption Sub-TLV

2.2. Advertise Node energy consumption

2.2.1. IS-IS Extend energy consumption

[RFC5311] defines the TLV types carried in the IS-IS LSP. To convey node energy consumption information, new energy consumption TLVs has been introduced. [RFC5305][RFC5311] defines how Metric information is carried within link information in the IS-IS protocol.

The format is shown below.

2.2.1.1. Node Maximum Energy Consumption

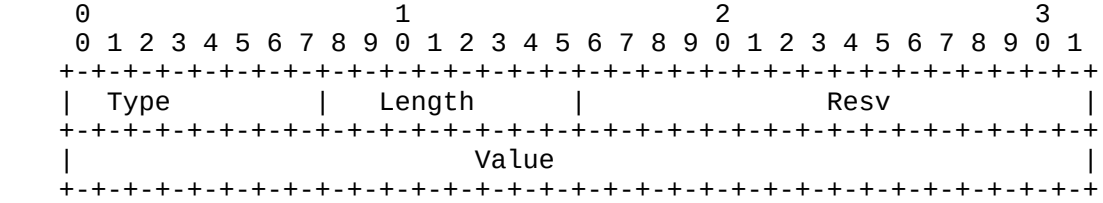


Figure 11: IS-IS Node Maximum Energy Consumption TLV

Type (1 octet): TBD7, Node Maximum Energy Consumption
Length (1 octet): 4
Value (4 octet): Node Maximum Energy Consumption range (0 - 16,777,215)

2.2.1.2. Node Real-Time Energy Consumption

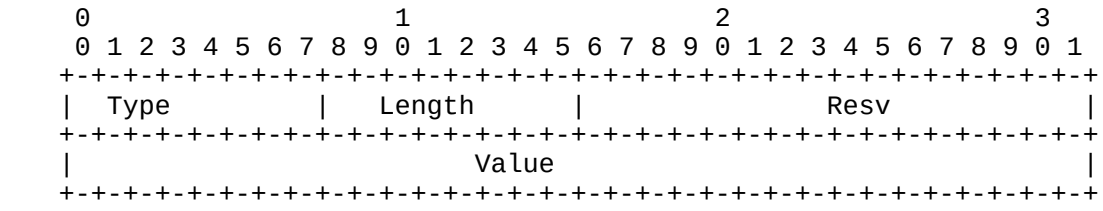


Figure 12: IS-IS Node Real-Time Energy Consumption TLV

Type (1 octet): TBD8, Node Real-Time Energy Consumption
Length (1 octet): 4
Value (4 octet): Node Real-Time Energy Consumption range (0 - 16,777,215)

2.2.1.3. Node Maximum Unit Energy Consumption

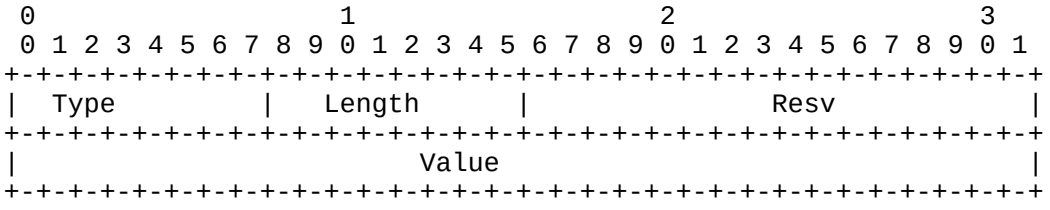


Figure 13: IS-IS Node Maximum Unit Energy Consumption consumption TLV

Type (1 octet): TBD9, Node Maximum Unit Energy Consumption

Length (1 octet): 4

Value (4 octet): Node Maximum Unit Energy Consumption range (0 - 16,777,215)

2.2.1.4. Node Real-Time Unit Energy Consumption

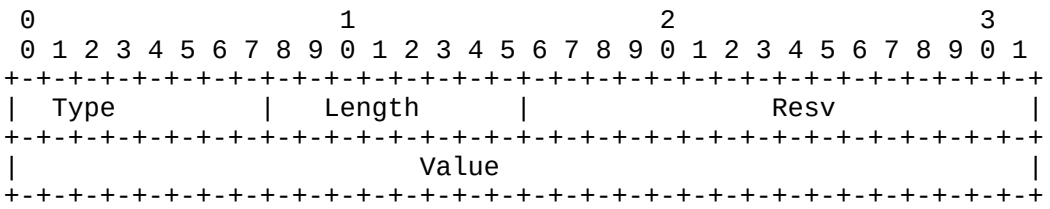


Figure 14: IS-IS Node Real-Time Unit Energy Consumption rate TLV

Type (1 octet): TBD10, Node Real-Time Unit Energy Consumption

Length (1 octet): 4

Value (4 octet): Node Real-Time Unit Energy Consumption (0 - 16,777,215)

2.2.1.5. Node Average Unit Energy Consumption

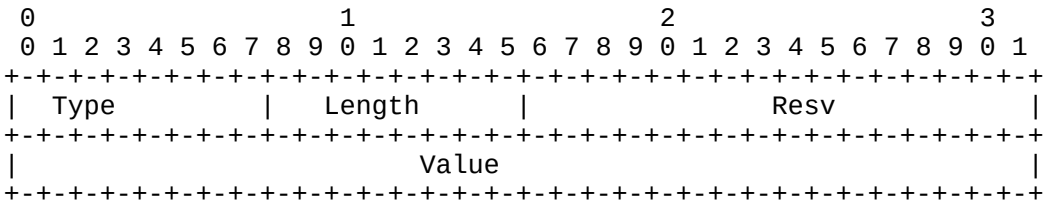


Figure 15: IS-IS Node Average Unit Energy Consumption rate TLV

Type (1 octet): TBD11, Node Average Unit Energy Consumption

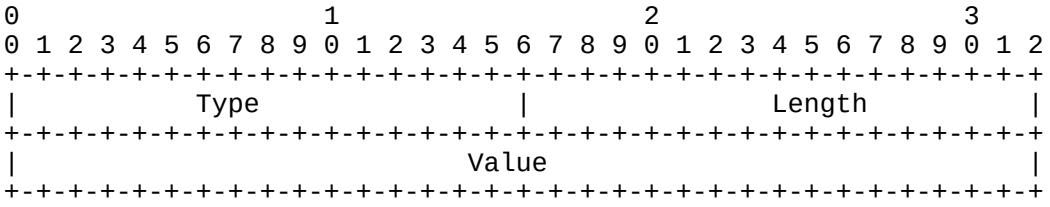
Length (1 octet): 4

Value (4 octet): Node Average Unit Energy Consumption (0 - 16,777,215)

2.2.2. OSPF Extend Node energy consumption

The newly defined OSPF energy consumption Sub-TLVs is included in Router LSA as Node energy consumption.

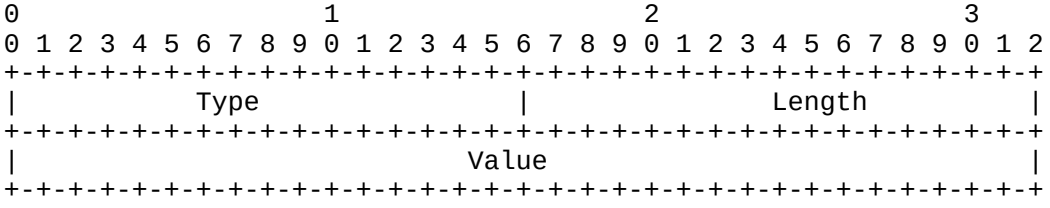
2.2.2.1. Node Maximum Energy Consumption



Type (2 octets): TBD12 Node Maximum Energy Consumption
Length (2 octets): 32
Value : Node Maximum Energy Consumption range (0 - 4,294,967,295)

Figure 16: OSPF Node Maximum Energy Consumption TLV

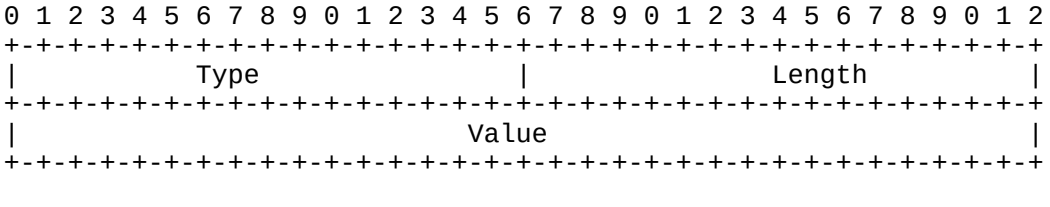
2.2.2.2. Node Real-Time Energy Consumption



Type (2 octets): TBD13, Node Real-Time Energy Consumption
Length (2 octets): 32
Value : Node Real-Time Energy Consumption range (0 - 4,294,967,295)

Figure 17: OSPF Node Real-Time Energy Consumption

2.2.2.3. Node Maximum Unit Energy Consumption

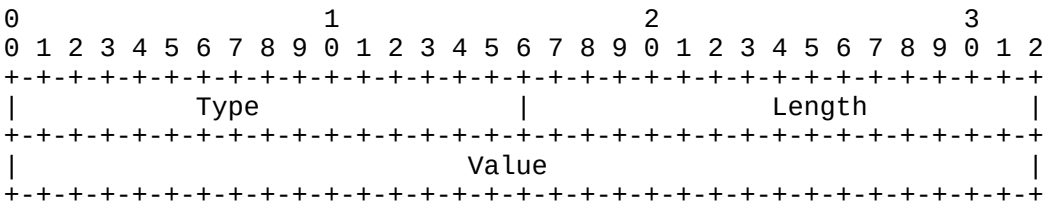


Type (2 octets): TBD14, Node Maximum Unit Energy Consumption
Length (2 octets): 32

Value : Node Maximum Unit Energy Consumption range (0 - 4,294,967,295)

Figure 18: OSPF Node Maximum Unit Energy Consumption

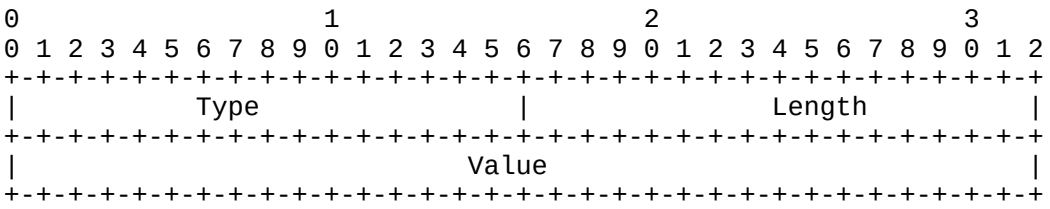
2.2.2.4. Node Real-Time Unit Energy Consumption



Type (2 octets): TBD15, Node Real-Time Unit Energy Consumption
Length (2 octets): 32
Value : Node Real-Time Unit Energy Consumption (0 - 4,294,967,295)

Figure 19: OSPF Node Real-Time Unit Energy Consumption

2.2.2.5. Node Average Unit Energy Consumption



Type (2 octets): TBD16, Node Average Unit Energy Consumption
Length (2 octets): 32
Value : Node Average Unit Energy Consumption range (0 - 4,294,967,295)

Figure 20: OSPF Node Average Unit Energy Consumption

3. Flexible Algorithm Definition constraints

To select low-power paths when forwarding traffic, this document defines "Exclude energy consumption Constraint" in the context of Flex-Algorithm. If a link’s energy consumption consumption exceeds

the advertised maximum energy consumption, that link is removed from the Flex-Algorithm topology.

3.1. IGP Metric-Type

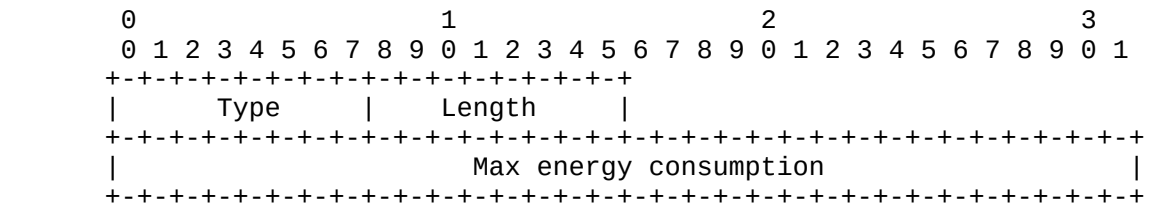
[RFC9350] the "IS-IS Flexible Algorithm Definition Sub-TLV" and the "OSPF Flexible Algorithm Definition TLV" are used to specify the metric-type for Flex-Algo computations. This document extends the metric-type to specify the use of energy consumption for path selection in Flex-Algo.

Type	Description	Reference
TBD17	Node Maximum Energy Consumption	
TBD18	Node Real-Time Energy Consumption	
TBD19	Node Maximum Unit Energy Consumption	
TBD20	Node Real-Time Unit Energy Consumption	
TBD21	Node Average Unit Energy Consumption	
TBD22	Interface Maximum Unit Energy Consumption	
TBD23	Interface Real-Time Unit Energy Consumption	
TBD24	Interface Average Unit Energy Consumption	

3.2. IS-IS

3.2.1. IS-IS Exclude Maximum Node Maximum Energy Consumption sub-TLV

IS-IS Flex-Algorithm Exclude Maximum Node Maximum Energy Consumption sub-TLV (FAEMNME) is a sub-TLV of the IS-IS FAD sub-TLV. It has the following format.



where:

Type: TBD25, Exclude Maximum Node Maximum Energy Consumption

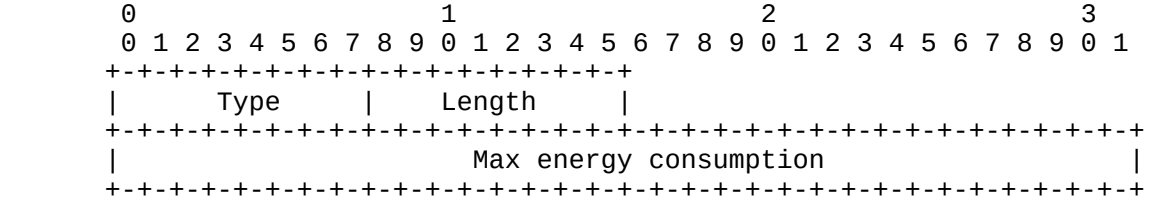
Length: 4 octets

Max energy consumption: 4 octet, Max energy consumption

Figure 21: IS-IS FAEMNME Sub-TLV

3.2.2. IS-IS Exclude Maximum Node Real-Time Energy Consumption sub-TLV

IS-IS Flex-Algorithm Exclude Maximum Node Real-Time Energy Consumption sub-TLV (FAEMNRE) is a sub-TLV of the IS-IS FAD sub-TLV. It has the following format.



where:

Type: TBD26, Exclude Maximum Node Real-Time Energy Consumption

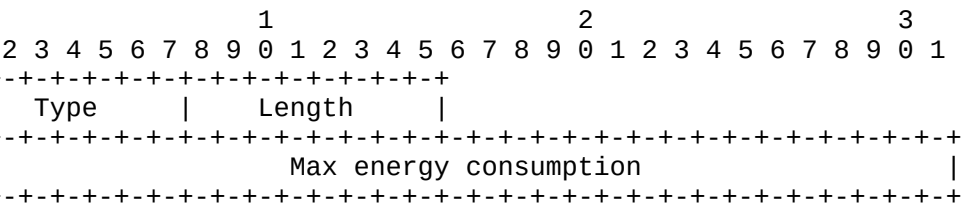
Length: 4 octets

Max energy consumption: 4 octet, Max energy consumption

Figure 21: IS-IS FAEMNRE Sub-TLV

3.2.3. IS-IS Exclude Maximum Node Maximum Unit Energy Consumption sub-TLV

IS-IS Flex-Algorithm Exclude Maximum Node Maximum Unit Energy Consumption sub-TLV (FAEMNMUE) is a sub-TLV of the IS-IS FAD sub-TLV. It has the following format.



where:

Type: TBD27, Exclude Node Maximum Unit Energy Consumption

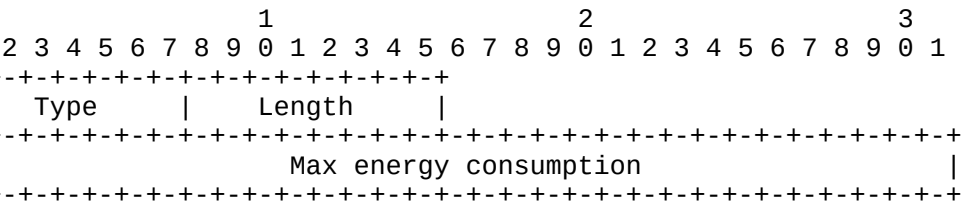
Length: 4 octets

Max energy consumption: 4 octet, Max energy consumption

Figure 21: IS-IS FAEMNMUE Sub-TLV

3.2.4. IS-IS Exclude Maximum Node Real-Time Unit Energy Consumption sub-TLV

IS-IS Flex-Algorithm Exclude Maximum Node Real-Time Unit Energy Consumption sub-TLV (FAEMNRUE) is a sub-TLV of the IS-IS FAD sub-TLV. It has the following format.



where:

Type: TBD28, Exclude Maximum Node Real-Time Unit Energy Consumption

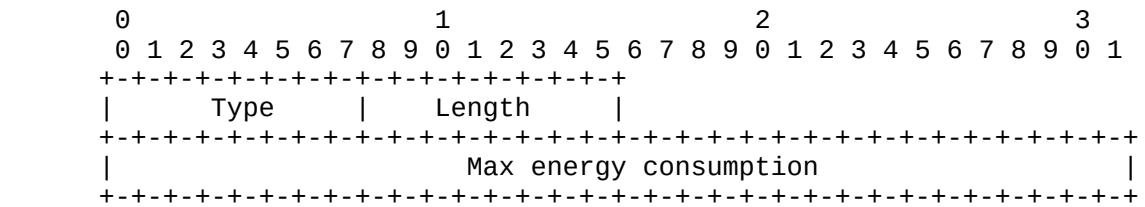
Length: 4 octets

Max energy consumption: 4 octet, Max energy consumption

Figure 21: IS-IS FAEMNRUE Sub-TLV

3.2.5. IS-IS Exclude Maximum Node Average Unit Energy Consumption sub-TLV

IS-IS Flex-Algorithm Exclude Maximum Node Average Unit Energy Consumption sub-TLV (FAEMNAUE) is a sub-TLV of the IS-IS FAD sub-TLV. It has the following format.



where:

Type: TBD29, Exclude Maximum Node Average Unit Energy Consumption

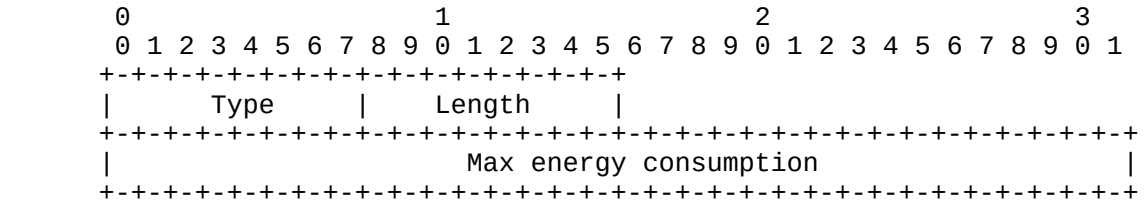
Length: 4 octets

Max energy consumption: 4 octet, Max Node Average Unit Energy Consumption

Figure 21: IS-IS FAEMNAUE Sub-TLV

3.2.6. IS-IS Exclude Maximum Interface Maximum Unit Energy Consumption sub-TLV

IS-IS Flex-Algorithm Exclude Maximum Interface Maximum Unit Energy Consumption sub-TLV (FAEMIMUE) is a sub-TLV of the IS-IS FAD sub-TLV. It has the following format.



where:

Type: TBD30, Exclude Maximum Interface Maximum Unit Energy Consumption

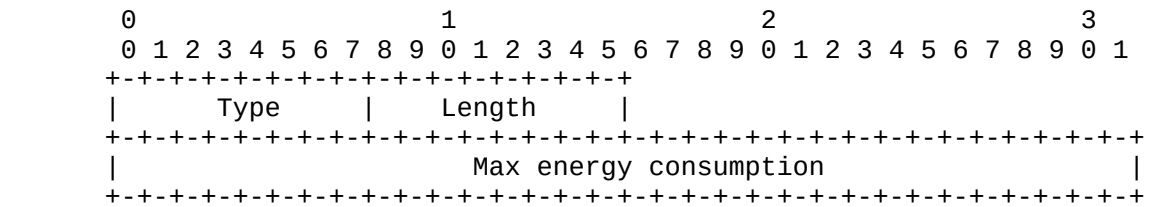
Length: 4 octets

Max energy consumption: 4 octet, Max Interface Maximum Unit Energy Consumption

Figure 21: IS-IS FAEMIMUE Sub-TLV

3.2.7. IS-IS Exclude Maximum Interface Real-Time Unit Energy Consumption sub-TLV

IS-IS Flex-Algorithm Exclude Maximum Interface Real-Time Unit Energy Consumption sub-TLV (FAEMIMUE) is a sub-TLV of the IS-IS FAD sub-TLV. It has the following format.



where:

Type: TBD31, Exclude Maximum Interface Real-Time Unit Energy Consumption

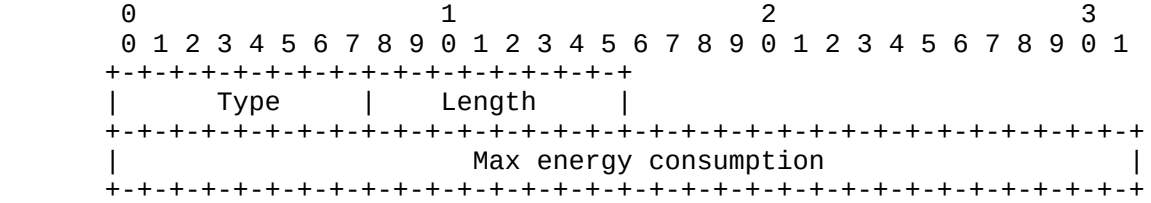
Length: 4 octets

Max energy consumption: 4 octet, Max energy consumption

Figure 21: IS-IS FAEMIMUE Sub-TLV

3.2.8. IS-IS Exclude Maximum Interface Average Unit Energy Consumption sub-TLV

IS-IS Flex-Algorithm Exclude Maximum Interface Average Unit Energy Consumption sub-TLV (FAEMNME) is a sub-TLV of the IS-IS FAD sub-TLV. It has the following format.



where:

Type: TBD32, Exclude Maximum Interface Average Unit Energy Consumption

Length: 4 octets

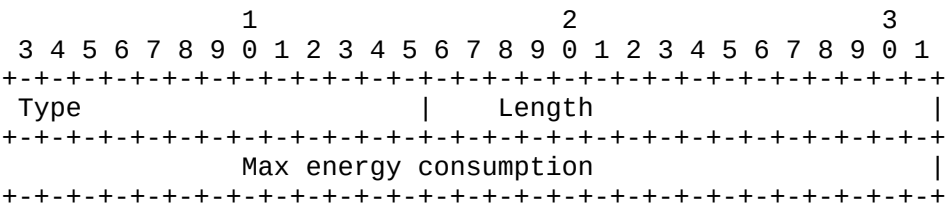
Max energy consumption: 4 octet, Max Interface Average Unit Energy Consumption

Figure 21: IS-IS FAEMIAUE Sub-TLV

3.3. OSPF

3.3.1. OSPF Exclude Maximum Node Maximum Energy Consumption sub-TLV

The OSPF Flex-Algorithm Exclude Maximum Node Maximum Energy Consumption sub-TLV (FAEMNME) is a sub-TLV of the OSPF FAD TLV. It has the following format.

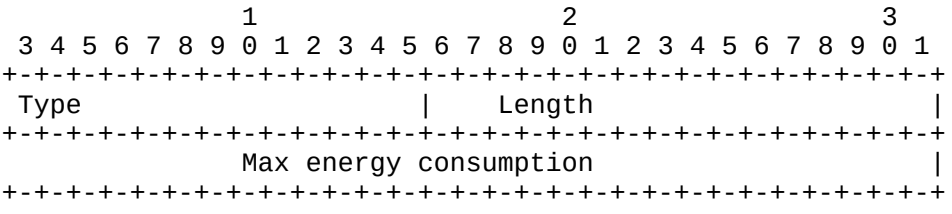


where:
Type: 2 octets, TBD33, Exclude Maximum Node Maximum Energy Consumption
Length: 4 octets
Max energy consumption: 4 octet

Figure 22: OSPF FAEMNME Sub-TLV

3.3.2. OSPF Exclude Maximum Node Real-Time Energy Consumption sub-TLV

The OSPF Flex-Algorithm Exclude Maximum Node Real-Time Energy Consumption sub-TLV (FAEMNME) is a sub-TLV of the OSPF FAD TLV. It has the following format.

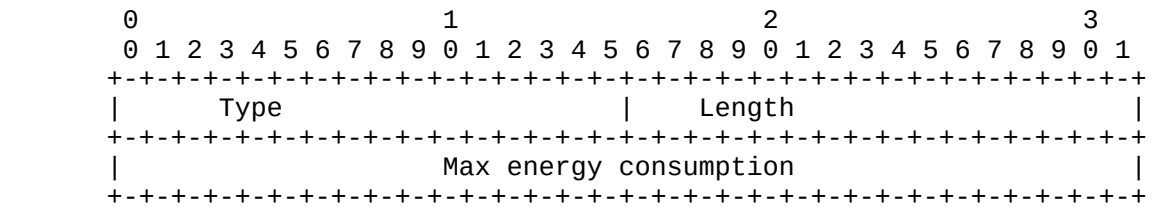


where:
Type: 2 octets, TBD34, Exclude Maximum Node Real-Time Energy Consumption
Length: 4 octets
Max energy consumption: 4 octet

Figure 22: OSPF FAEMNRE Sub-TLV

3.3.3. OSPF Exclude Maximum Node Maximum Unit Energy Consumption sub-TLV

The OSPF Flex-Algorithm Exclude Maximum Node Maximum Unit Energy Consumption sub-TLV (FAEMNUE) is a sub-TLV of the OSPF FAD TLV. It has the following format.

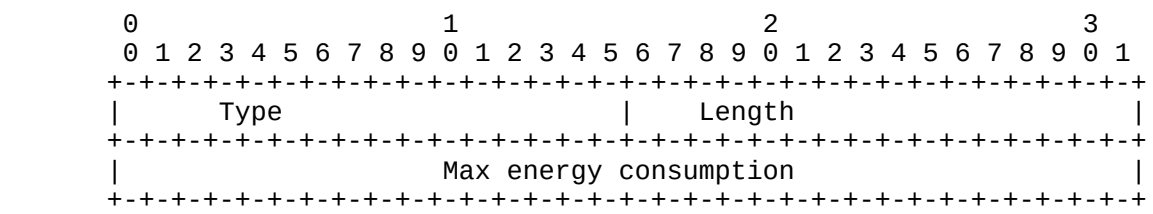


where:
Type: 2 octets, TBD35, Exclude Maximum Node Maximum Unit Energy Consumption
Length: 4 octets
Max energy consumption: 4 octet

Figure 22: OSPF FAEMNUE Sub-TLV

3.3.4. OSPF Exclude Maximum Node Real-Time Unit Energy Consumption sub-TLV

The OSPF Flex-Algorithm Exclude Maximum Node Real-Time Unit Energy Consumption sub-TLV (FAEMNRUE) is a sub-TLV of the OSPF FAD TLV. It has the following format.

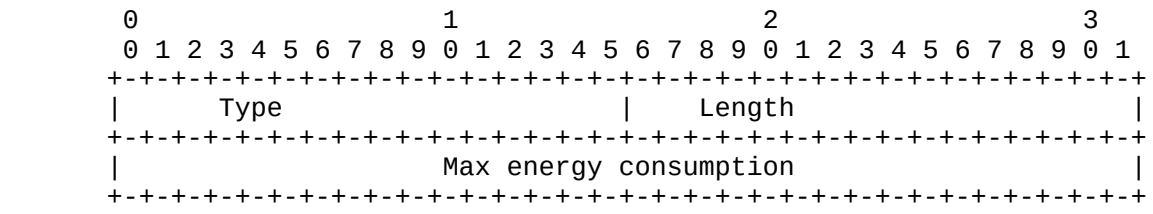


where:
Type: 2 octets, TBD36, Exclude Maximum Node Real-Time Unit Energy Consumption Consumption
Length: 4 octets
Max energy consumption: 4 octet

Figure 22: OSPF FAEMNRUE Sub-TLV

3.3.5. OSPF Exclude Maximum Node Average Unit Energy Consumption sub-TLV

The OSPF Flex-Algorithm Exclude Node Average Unit Energy Consumption sub-TLV (FAEMNME) is a sub-TLV of the OSPF FAD TLV. It has the following format.

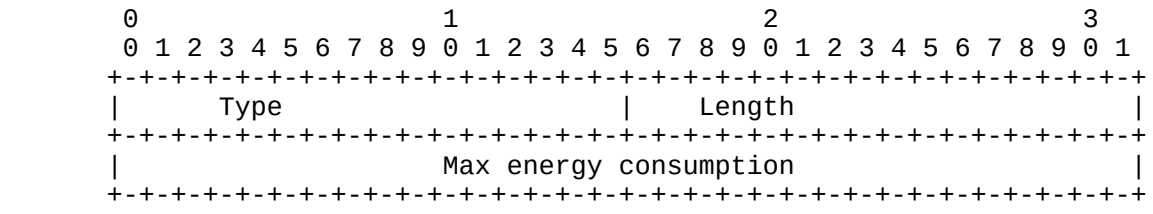


where:
Type: 2 octets, TBD37, Exclude Maximum Node Average Unit Energy Consumption
Length: 4 octets
Max energy consumption: 4 octet

Figure 22: OSPF FAEMNAUE Sub-TLV

3.3.6. OSPF Exclude Maximum Interface Maximum Unit Energy Consumption sub-TLV

The OSPF Flex-Algorithm Exclude Maximum Interface Maximum Unit Energy Consumption sub-TLV (FAEMIME) is a sub-TLV of the OSPF FAD TLV. It has the following format.

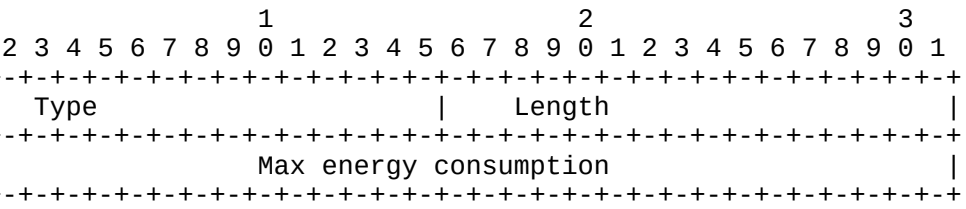


where:
Type: 2 octets, TBD38, Exclude Maximum Interface Maximum Unit Energy Consumption
Length: 4 octets
Max energy consumption: 4 octet

Figure 22: OSPF FAEMIMUE Sub-TLV

3.3.7. OSPF Exclude Maximum Interface Real-Time Unit Energy Consumption sub-TLV

The OSPF Flex-Algorithm Exclude Maximum Interface Real-Time Unit Energy Consumption sub-TLV (FAEMNME) is a sub-TLV of the OSPF FAD TLV. It has the following format.

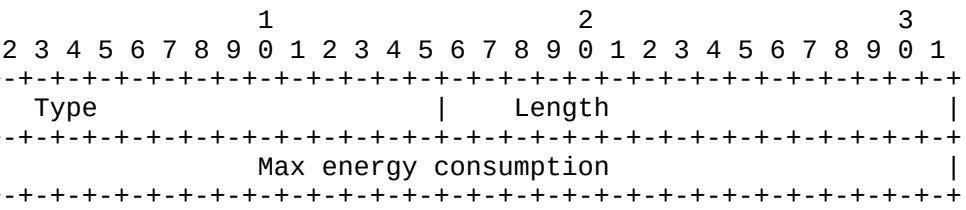


where:
Type: 2 octets, TBD39, Exclude Maximum Interface Real-Time Unit Energy Consumption Consumption
Length: 4 octets
Max energy consumption: 4 octet

Figure 22: OSPF FAEMIRUE Sub-TLV

3.3.8. OSPF Exclude Maximum Interface Average Unit Energy Consumption sub-TLV

The OSPF Flex-Algorithm Exclude Maximum Interface Average Unit Energy Consumption sub-TLV (FAEMIAUE) is a sub-TLV of the OSPF FAD TLV. It has the following format.



where:
Type: 2 octets, TBD40, Exclude Maximum Interface Average Unit Energy Consumption Consumption
Length: 4 octets
Max energy consumption: 4 octet

Figure 22: OSPF FAEMIAUE Sub-TLV

3.4. Calculation of Flex-Algorithm paths

A new additional rules are added to the existing rules in the Flex-Algorithm calculations specified in sec 13 of [RFC9350].

When the metric-type advertised in the Flex-Algorithm is related to energy consumption, energy consumption metrics are used for routing calculations.

5. If the Flex-Algorithm Definition uses something other than the IGP metric (Section 5), and such metric is not advertised for the particular link in a topology for which the computation is done, such link MUST be pruned from the computation. A metric of value 0 MUST NOT be assumed in such a case.

When energy consumption-related constraints are specified in the advertised Flex-Algo conditions, energy consumption metrics are used for path selection.

6. Check if any exclude FAEMGM rule is part of the Flex-Algorithm definition. If such exclude rule exists and the link has Maximum energy consumption advertised, check if the link energy consumption satisfies the FAEMGM rule. If the link does not satisfy the FAEMGM rule, the link MUST be pruned from the Flex-Algorithm computation.

4. Security Considerations

TBD.

5. IANA Considerations

5.1. IS-IS Link energy consumption Sub TLV

New energy consumption sub-TLVs is request from IS-IS Sub-TLVs of "Advertising Neighbor Information":

Type	energy consumption
TBD1	Interface Maximum Unit Energy Consumption.
TBD2	Interface Real-Time Unit Energy Consumption.
TBD3	Interface Average Unit Energy Consumption.

5.2. OSPF Link energy consumption Sub TLV

New energy consumption sub-TLVs is request from OSPF Sub-TLVs of "Advertising Neighbor Information":

Type	energy consumption	this document
TBD4	Interface Maximum Unit Energy Consumption.	
TBD5	Interface Real-Time Unit Energy Consumption.	
TBD6	Interface Average Unit Energy Consumption.	

5.3. IS-IS Node energy consumption TLV

New TLV Types for energy consumption are request from "IS-IS Top-Level TLV Codepoints" to advertise Node energy consumption.

Value	Type
Description	ISIS Node energy consumption
Reference	[This Document]

Type:

- TBD7 Node Maximum Energy Consumption.
- TBD8 Node Real-Time Energy Consumption.
- TBD9 Node Maximum Unit Energy Consumption.
- TBD10 Node Real-Time Unit Energy Consumption.
- TBD11 Node Average Unit Energy Consumption.

5.4. OSPF Node energy consumption TLV

New TLVs are request from "OSPF Router Information (RI) TLVs" to advertise Node energy consumption.

Value	Type
Description	OSPF Node energy consumption
Reference	[This Document]

Type:

TBD12 Node Maximum Energy Consumption.

TBD13 Node Real-Time Energy Consumption.

TBD14 Node Maximum Unit Energy Consumption

TBD15 Node Real-Time Unit Energy Consumption.

TBD16 Node Average Unit Energy Consumption.

5.5. IGP Metric-Type

New metric-types are requested from "IGP Metric-Type Registry".

Type	Description	Reference
TBD17	Node Maximum Energy Consumption	
TBD18	Node Real-Time Energy Consumption	
TBD19	Node Maximum Unit Energy Consumption	
TBD20	Node Real-Time Unit Energy Consumption	
TBD21	Node Average Unit Energy Consumption	
TBD22	Interface Maximum Unit Energy Consumption	
TBD23	Interface Real-Time Unit Energy Consumption	
TBD24	Interface Average Unit Energy Consumption	

5.6. IS-IS Exclude Maximum energy consumption sub-TLV

New IS-IS sub-TLV types is requested to be allocated from the "IS-IS Sub-Sub-TLVs for Flexible Algorithm Definition Sub-TLV" Registry to specify the use of MAX energy consumption for path constraint selection.

Value	Type
Description	Maximum energy consumption
Reference	[This Document]

Type:

TBD25 Max Node Maximum Energy Consumption.

TBD26 Node Real-Time Energy Consumption.

TBD27 Node Maximum Unit Energy Consumption.

TBD28 Node Real-Time Unit Energy Consumption.

TBD29 Node Average Unit Energy Consumption.

TBD30 Interface Maximum Unit Energy Consumption.

TBD31 Interface Real-Time Unit Energy Consumption.

TBD32 Interface Average Unit Energy Consumption.

5.7. OSPF Exclude Maximum energy consumption sub-TLV

New OSPF sub-TLV types are requested to be allocated from the "OSPF Flexible Algorithm Definition TLV Sub-TLVs" Registry to specify the use of Max energy consumption for path constraint selection.

Value	Type
Description	Maximum energy consumption
Reference	[This Document]

Type:

TBD33 Node Maximum Energy Consumption.

TBD34 Node Real-Time Energy Consumption.

TBD35 Node Maximum Unit Energy Consumption.

TBD36 Node Real-Time Unit Energy Consumption.

TBD37 Node Average Unit Energy Consumption.

TBD38 Interface Maximum Unit Energy Consumption.

TBD39 Interface Real-Time Unit Energy Consumption.

TBD40 Interface Average Unit Energy Consumption.

6. References

6.1. Normative References

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Authors' Addresses

Jinming Li
China Mobile
32 Xuanwumen West Street
Beijing
Xicheng District, 100053
China
Email: lijinming@chinamobile.com

Changwang Lin
New H3C Technologies
China
Email: linchangwang.04414@h3c.com