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Y. Zhu  
H. Chen  
China Telecom  
M. Chen  
Z. Du  
Huawei  
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**ISIS Extensions for Flex Ethernet Link Advertisement**  
**draft-zhu-ccamp-flexeth-link-advertisement-01**

**Abstract**

This document specifies the extensions to the IS-IS routing protocol to carry and flood Flex Ethernet (FlexE) link state information. The FlexE link state information is necessary for a node or a controller to compute a path that is required to over FlexE links.

**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](#)].

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## [1.](#) Introduction

Flex Ethernet (FlexE) [[I-D.izh-ccamp-flex-e-fwk](#)] provides a generic mechanism for supporting a variety of Ethernet MAC rates that may or may not correspond to any existing Ethernet PHY rate. This includes MAC rates that are both greater than (through bonding) and less than (through sub-rate and channelization) the Ethernet PHY rates used to carry Ethernet traffic.

FlexE supports interface bonding, a bonded interface is consisted of from 1 to n 100GBASE-R Ethernet interfaces (other rates of interface will be supported in the future), the bonded interface is called FlexE interface in this document. FlexE also supports interface channelization, a FlexE interface can be channelized into multiple sub-interfaces, the sub-interface is called FlexE sub-interface in the rest of this document.

The FlexE mechanism operates using a calendar which assigns 66B block positions on sub-calendars on each PHY of a FlexE interface to each of the FlexE flows. The calendar has a granularity of 5G, and has a length of 20 slots for a 100G interface. Currently, only 100GBASE-R PHY and 5G granularity are supported in FlexE implementation



agreement version 1.0 [[FlexE](#)], other types (e.g., 200G, 400G) of PHY and granularities (e.g., 25G) will be supported in the future.

A FlexE interface has a number of time slots resource. These time slots can be transparent to the upper layer application, the upper layer application (e.g., RSVP-TE) can just treat the FlexE interface as a normal Ethernet interface or the time slots can be allocated to form a FlexE sub-interface through configuration or some dynamic protocols. The later is called channelization. How to signal or configure the FlexE sub-interface is out of the scope of this document.

The logical link that connects two FlexE interfaces residing in two adjacent nodes is called FlexE link, and the logical link that connects two FlexE sub-interfaces residing in two adjacent nodes is call FlexE sub-link.

More details about FlexE can be found in FlexE framework document [[I-D.izh-ccamp-flex-e-fwk](#)].

This document defines extensions to ISIS protocol to advertise the FlexE link and sub-link state information.

## 2. FlexE Link

A FlexE link is a logical link that connects two FlexE interfaces, it looks like a LAG (Link Aggregation Group).

This document defines a new sub-TLV, which is referred to as FlexE Interface sub-TLV, to the extended IS reachability TLV [[RFC5303](#)]. It is defined to describes the resources and attributes of a FlexE interface. The format of FlexE Interface sub-TLV is as below:

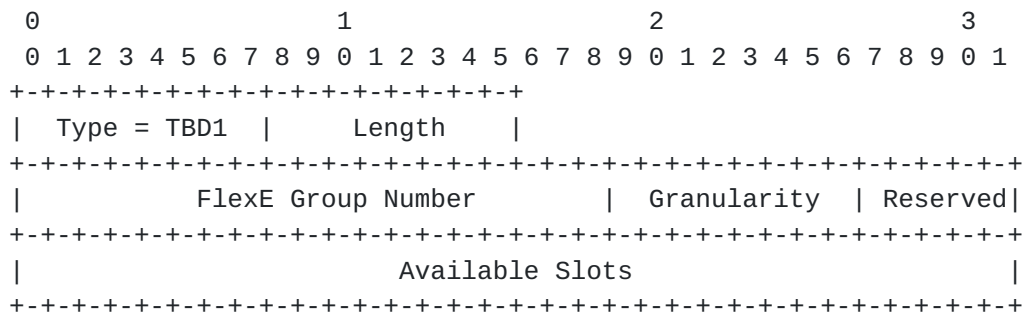


Figure 2: FlexE Interface sub-TLV

The Type field is 1 octet in length and the value is TBD1.



The Length field is 1 octet in length that indicates the length (8) of the value field of the sub-TLV in octet.

FlexE Group Number field is 20 bits in length and carries the FlexE Group [[FlexE](#)] number of the FlexE Group that the FlexE interface belongs.

The Granularity is 1 octet in length and its value identifies the granularity of the FlexE time slots of a FlexE interface. Current OIF agreement only allows the "5G" granularity, other granularities may be defined in the future.

Value	Granularity
-----	-----
0	Reserved
1	5G
2-254	Unassigned
255	Reserved

For each PHY of a FlexE interface, there are two calendars, one is called Active calendar and the other is called Backup calendar. The two calendars are used to facilitate reconfiguration, for example, FlexE flow resizing can be achieved through calendar updates. More detail about FlexE calendar can be found [[FlexE](#)].

The Available Slots fields is 4-octet in length that indicates the maximum number of slots available on the active calendar of the FlexE interface.

For a FlexE interface, 5G granularity is only supported in [[FlexE](#)], more granularities may be supported in the future. To support this, FlexE Interface sub-TLV can occur multiple times in an extended IS reachability TLV, but for each granularity, only one FlexE Interface sub-TLV can be included and it carries the available time slots of the granularity of the FlexE interface. When multiple FlexE Interface sub-TLVs for the same granularity occur, only the first FlexE Interface sub-TLV is considered to be valid, the rests MUST be ignored.

### **3. FlexE Sub-link**

Through channelization, a FlexE interface can be sliced into a number of FlexE sub-interfaces, each FlexE sub-interface has dedicated bandwidth and is isolated from other FlexE sub-interfaces. A set of FlexE sub-interfaces can be allocated to a specific application/user to form a sliced network. Or a series of FlexE sub-interfaces can be concatenated (e.g., through Segment Routing) to form a leased line.



A FlexE sub-link connects two FlexE sub-interfaces. From link characteristic point of view, a FlexE sub-link is same as an Ethernet link, it can be advertised and used as a normal link. But for some scenarios, it may be useful to indicate whether a link is a channelized FlexE sub-link. Then a controller or a node can use this information to determine whether a path should be over the link. Therefore, this document defines a new flag, which is referred to as Channelized FlexE sub-link, to the Link Attributes sub-TLV[RFC5029].

## **4. IANA Considerations**

### **4.1. FlexE Interface Sub-TLV**

IANA is requested to allocate the following new sub-TLV types of top-level TLV 22 that have been reflected in the IS-IS sub-TLV registry for TLV 22:

Value	sub-TLV Name	Reference
-----	-----	-----
TBD1	FlexE Interface	This document

### **4.2. Channelized FlexE Sub-link Flag**

IANA is requested to allocate the following new bit value to "link-attribute bit values for sub-TLV 19 of TLV 22".

Value	Name	Reference
-----	-----	-----
TBD2	Channelized FlexE sub-link	This document

## **5. Security Consideration**

This document describes a mechanism for advertising FlexE link state information through IS-IS LSPs and does not introduce any new security issues.

## **6. Acknowledgements**

## **7. References**

### **7.1. Normative References**

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- [RFC5303] Katz, D., Saluja, R., and D. Eastlake 3rd, "Three-Way Handshake for IS-IS Point-to-Point Adjacencies", [RFC 5303](#), DOI 10.17487/RFC5303, October 2008, <<https://www.rfc-editor.org/info/rfc5303>>.

## **7.2. Informative References**

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### Authors' Addresses

Yongqing Zhu  
China Telecom  
109, West Zhongshan Road, Tianhe District, Guangzhou, China  
  
Email: zhuyq@gsta.com

Huanan Chen  
China Telecom  
109, West Zhongshan Road, Tianhe District, Guangzhou, China  
  
Email: chenhuanan@gsta.com

Mach(Guoyi) Chen  
Huawei  
  
Email: mach.chen@huawei.com

Zongpeng Du  
Huawei  
  
Email: duzongpeng@huawei.com

