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Export of Gigabit Passive Optical Network Encapsulation Mode in IP Flow Information Export (IPFIX)
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Abstract

This document introduces new IP Flow Information Export (IPFIX) Information Elements to identify a set of G-PON Encapsulation Method entities in the Passive Optical Transport of the Optical Distribution Network.

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

The G-PON Encapsulation Method (GEM) data plane header defined in Section 8.3.1 of [itu-g984-3] facilitates the framing, error control, payload type identification and payload separation in the Optical Distribution Network. It is being used in the Optical Distribution Network between the Optical Line Termination (OLT) at the network operator and the Optical Network Unit (ONU), Optical Network Terminal (ONT) at the end user in the passive optical transport within the broadband access domain.

IPFIX is widely applied in the broadband access domain to gain visibility into the forwarding and data plane. However, that visibility is today constraint to the ethernet, IP and application transport properties of the data plane.

This document specifies two IPFIX Information Elements (IEs) to facilitate visibility in the GEM data plane.

Figure 1 shows the GEM frame, the GEM header and its properties.

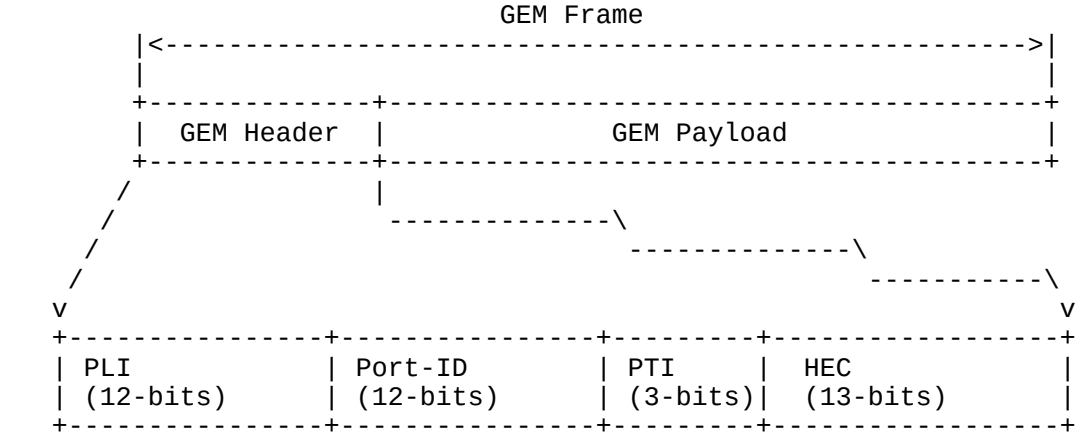

Figure 1: G.984.3 GEM header and frame structure

These IEs are used to export the GEM Port-ID and PTI to enable the distinction between user service and user and OAM application frames.

Some examples are provided in Appendix A.

2. Terminology

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.

This document makes use of the terms defined in [RFC7011], [itu-g984-1] and [itu-g984-3].

The following terms are used as defined in [RFC7011]:

* IPFIX
* IPFIX Information Elements
* Template
* Template Record
* Options Template
* Options Template Record

* Data Record

* Data Set

The following terms are used as defined in [itu-g984-1]:

* Optical Access Network (OAN)

* Optical Distribution Network (ODN)

* Optical Line Termination (OLT)

* Optical Network Termination (ONT)

* Optical Network Unit (ONU)

The following terms are used as defined in [itu-g984-3]:

* G-PON Encapsulation Method (GEM)

* GEM Port

* Gigabit-capable Passive Optical Network (G-PON)

3. New IPFIX G-PON GEM Elements

This section specifies the new IPFIX G-PON GEM IEs.

gponGemPti
: 3-bit GEM PTI content type field defined in Section 8.3.1 of [itu-g984-3]. The values are encoded in the 3 least significant bits of the IE.

gponGemPortId
: 12-bit GEM Port-ID field defined in Section 8.3.1 of [itu-g984-3].

4. Sample Use Cases

The IPFIX IEs gponGemPti (TBD1) or gponGemPortId (TBD2), sourceMacAddress (56), destinationMacAddress (80), ingressInterface (10), egressInterface (14) and forwardingStatus (89)[RFC5102] [RFC7270] [IANA-IPFIX], and some existing counter informations [IANA-IPFIX] providing answers to the following questions (amongst others):

* How many user or OAM frames are forwarded or dropped to which ONU on which egress interface and GEM Port-ID?

* If dropped, for which reasons?

The received ONU frames on an OLT are mapped and forwarded depending on GEM Port-ID to a dot1qVlanId (243) and dot1qPriority (244) upstream to the provider network.

5. IANA Considerations

Note to the RFC-Editor:

* Please replace TBD1 - TBD2 with the values allocated by IANA

* Please replace the [RFC-to-be] with the RFC number assigned to this document

5.1. New IPFIX G-PON GEM Information Elements

This document requests IANA to add new IEs (Section 5.1) to the "IPFIX Information Elements" registry [RFC7012] available at [IANA-IPFIX].

Table 1 lists the new G-PON GEM IEs:

Element ID	Name
TBD1	gponGemPti
TBD2	gponGemPortId

Table 1: New G-PON GEM IEs in the "IPFIX Information Elements" Registry

5.1.1. gponGemPti

Name: gponGemPti

ElementID: TBD1

Description: Values for this Information Element are listed in the "G-PON Encapsulation Method PTI" subregistry, see [IANA-IPFIX].

Abstract Data Type: unsigned8

Data Type Semantics: flags

Range: The valid range is 0-7.

Additional Information: See the assigned types in [IPFIX G-PON Encapsulation Method PTI Subregistry]. The values are encoded in the 3 least significant bits of the IE.

Note to IANA: Please replace [IPFIX G-PON Encapsulation Method PTI Subregistry] with the URL of the IANA subregistry.

Reference: [RFC-to-be]

5.1.2. gponGemPortId

Name: gponGemPortId

ElementID: TBD2

Description: The 12-bit GEM Port-ID field defined in Section 8.3.1 of [itu-g984-3].

Abstract Data Type: unsigned16

Data Type Semantics: identifier

Reference: [RFC-to-be]

5.1.2.1. G-PON Encapsulation Method PTI Subregistry

This document requests IANA to create a new subregistry called "IPFIX G-PON Encapsulation Method PTI" under the "IPFIX Information Elements" registry [RFC7012] available at [IANA-IPFIX].

The allocation policy of this new subregistry is Expert Review (Section 4.5 of [RFC8126]).

The designated experts for this registry should be familiar with the G-PON Encapsulation Method. The guidelines that are being followed by the designated experts for the IPFIX registry should be followed for this subregistry. In particular, criteria that should be applied by the designated experts include to monitor the G-PON Encapsulation Method related activities at ITU-T and mirror the GEM PTI content type fields into this registry. Hence, keeping both registries in sync.

Initial values in the registry are defined in Table 2 and reflect the 3-bit GEM PTI content type field defined in Section 8.3.1 of [itu-g984-3].

Value	GEM PTI Content Type Meaning	Additional Information
000	User data fragment, not the end of a frame	[RFC-to-be]
001	User data fragment, end of a frame	[RFC-to-be]
010	Reserved	[RFC-to-be]
011	Reserved	[RFC-to-be]
100	GEM OAM, not the end of a frame	[RFC-to-be]
101	GEM OAM, end of a frame	[RFC-to-be]
110	Reserved	[RFC-to-be]
111	Reserved	[RFC-to-be]

Table 2: "IPFIX G-PON Encapsulation Method PTI" Subregistry

6. Acknowledgements

The authors would like to thank Paul Aitken for their review and valuable comments, and xxx for the implementation and validation.

7. Implementation Status

Note to the RFC-Editor: Please remove this section before publishing.

7.1. Huawei MA5800T-X17

Huawei plans to implement the following IEs as part of a production implementation in the VRP based MA5800T-X17 OLT platform:

* gponGemPortId

The implementation will be validated in an upcoming IETF hackathon.

8. Security Considerations

There exists no extra security considerations regarding allocation of these new IPFIX IEs compared to [RFC7012].

The IEs described in this document export provider plane data metrics on how frames are being forwarded within an Optical Access Network. Applications and operators using the IEs described in this document must evaluate the sensitivity of this information in their implementation context, and apply the data-at-rest storage guidance in Section 11.8 of [RFC7011] as appropriate.

9. References

9.1. Normative References

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9.2. Informative References

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[RFC7270] Yourtchenko, A., Aitken, P., and B. Claise, "Cisco-Specific Information Elements Reused in IP Flow Information Export (IPFIX)", RFC 7270, DOI 10.17487/RFC7270, June 2014, <https://www.rfc-editor.org/info/rfc7270>.

Appendix A. IPFIX Encoding Examples

TBD.

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