IPPM
Internet-Draft
Intended status: Standards Track
Expires: 3 January 2026

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2 July 2025

A YANG Data Model for the Alternate Marking Method
draft-ietf-ippm-alt-mark-yang-01

Abstract

Alternate-Marking Method is a technique used to perform packet loss, delay, and jitter measurements on in-flight packets. This document defines a YANG data model for the Alternate Marking Method.

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1. Introduction

Alternate-Marking Method [RFC9341] [RFC9342] (AltMark) is a technique used to perform packet loss, delay, and jitter measurements on in-flight packets. This document defines a YANG data model for the Alternate Marking Method.

Section 2 includes the tree diagram, while Section 4 includes the data model. Also, an example is reported in Appendix A.

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.

1.2. Conventions

The following terms are defined in [RFC7950] and are used in this specification:

* augment

* data model

* data node

The terminology for describing YANG data models is found in [RFC7950].

2. AltMark Tree Diagram

Tree diagrams used in this document follow the notation defined in [RFC8340].

The AltMark model is organized as shown in the following figure. Each AltMark profile associates with one flow and the corresponding AltMark information.

The "altmark-info" is a container for all the read only information that assists monitoring systems in the interpretation of the AltMark data.

```
module: ietf-altmark

+--rw altmark
   +--ro altmark-info
   |  +--ro timestamp-type?
   |  +--ro available-interface*          [if-name]
   |  |  +--ro if-name                    if:interface-ref
   +--rw altmark-profiles
      +--rw admin-config
      |  +--rw enabled?                   boolean
      +--rw altmark-profile*              [profile-name]
         +--rw profile-name               string
         +--rw filter
         |  +--rw filter-type?            altmark-filter-type
         |  +--rw ace-name?            -> /acl:acls/acl/aces/ace/name
         +--rw method-type?               altmark-method-type
         +--rw protocol-type?             altmark-protocol-type
         +--rw node-action                altmark-node-action
         +--rw measurement-period?        uint64
         +--rw flow-mon-id?               uint32
         +--rw measurement-mode?          altmark-measurement-mode
         +--rw enable-loss-measurement?   boolean
         +--rw enable-delay-measurement?  boolean
```

In the "altmark-profiles", the "enabled" is an administrative configuration. When set to true, AltMark configuration is enabled for the system. Meanwhile, the AltMark data-plane functionality is enabled.

The "filter" is used to identify a flow, where the AltMark data can be applied. There may be multiple filter types. ACL [RFC8519] is a common way to specify a flow. The AltMark profile can associate with an ACE(Access Control Entry). AltMark actions MUST be driven by the accepted packets, when the matched ACE "forwarding" action is "accept".

The AltMark data can be encapsulated into multiple protocols, e.g., IPv6 [RFC9343], SRH [I-D.fz-spring-srv6-alt-mark], and MPLS [I-D.ietf-mpls-inband-pm-encapsulation]. Additional protocol extensions are reported in [I-D.ietf-ippm-alt-mark-deployment] The "protocol-type" is used to indicate the protocol for the AltMark application. For example, if the "protocol-type" is IPv6, the AltMark marking node will encapsulate the associated flow with the IPv6 [RFC9343] format.

3. AltMark Profile

The AltMark data is expected to be read and exported or locally aggregated at every node that the flow traverses within the AltMark domain. The "altmark-profile" contains the detailed information for the AltMark data. The information includes:

* profile-name: it is the unique identifier for each AltMark profile

* filter: it is used to identify a flow, where the AltMark data can be applied

* method-type: it is used to indicate the type of the method: single marking, double marking.

* protocol-type: it is used to indicate the protocol for the AltMark application

* node-action: indicates the operation applied to the flow (e.g. marking AltMark header, read the AltMark data, or unmarking AltMark header).

* measurement-period: it indicates the AltMark period (see [I-D.ietf-ippm-alt-mark-deployment]).

* flow-mon-id: it is used to identify the monitored flow and to correlate the exported data of the same flow from multiple nodes and from multiple packets.

* measurement-mode: it specifies the measurement mode: hop-by-hop or end-to-end.

* enable-loss-measurement: if true, it enables loss measurements.

* enable-delay-measurement: if true, it enables delay measurements.

Note that users can augment this module.

4. Alternate Marking Method YANG Data Model

<CODE BEGINS> file "ietf-altmark@2025-06-30.yang"

```
module ietf-altmark {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-altmark";
  prefix "altmark";

  import ietf-access-control-list {
    prefix "acl";
    reference
      "RFC 8519: YANG Data Model for Network Access Control
       Lists (ACLs)";
  }

  import ietf-interfaces {
    prefix "if";
    reference
      "RFC 8343: A YANG Data Model for Interface Management";
  }

  import ietf-lime-time-types {
    prefix "lime";
    reference
      "RFC 8532: Generic YANG Data Model for the Management of
       Operations, Administration, and Maintenance (OAM) Protocols
       That Use Connectionless Communications";
  }

  organization
    "IETF IPPM (IP Performance Metrics) Working Group";

  contact
    "WG Web: <https://datatracker.ietf.org/wg/ippm>
     WG List: <ippm@ietf.org>
     Author: thomas.graf@swisscom.com
     Author: wangminxue@chinamobile.com
     Author: giuseppe.fioccola@huawei.com
     Author: zhoutianran@huawei.com
     Author: xiao.min2@zte.com.cn";

  description
```

```
       "This YANG module specifies a vendor-independent data
        model for the Alternate Marking (AltMark).

        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 (RFC 2119) (RFC 8174) when, and only when,
        they appear in all capitals, as shown here.

        Copyright (c) 2024 IETF Trust and the persons identified as
        authors of the code.  All rights reserved.

        Redistribution and use in source and binary forms, with or
        without modification, is permitted pursuant to, and subject to
        the license terms contained in, the Revised BSD License set
        forth in Section 4.c of the IETF Trust's Legal Provisions
        Relating to IETF Documents
        (https://trustee.ietf.org/license-info).

        This version of this YANG module is part of RFC XXXX
        (https://www.rfc-editor.org/info/rfcXXXX); see the RFC itself
        for full legal notices.";

     revision 2025-06-30 {
       description "First revision.";
       reference "RFC XXXX: A YANG Data Model for Alternate-Marking";
     }

    /*
     * FEATURES
     */

     feature altmark
     {
       description
         "This feature indicated that the Alternate-Marking Method is
         supported.";
       reference
         "RFC 9341: Alternate-Marking Method;
          RFC 9342: Clustered Alternate-Marking Method";
     }

    /*
     * IDENTITIES
     */

     identity filter {
       description
```

```
        "Base identity to represent a filter. A filter is used to
        specify the flow to which the AltMark method is applied.";
    }

    identity acl-filter {
      base filter;
      description
        "Apply ACL rules to specify the flow.";
    }

    identity method {
      description
        "Base identity to represent the method type.";
    }

    identity single-marking {
      base method;
      description
        "The AltMark Single-Marking method.";
    }

    identity double-marking  {
      base method;
      description
        "The AltMark Double-Marking method.";
    }

    identity protocol {
      description
        "Base identity to represent the protocol. It's used to
         indicate the protocol for the application of the AltMark
         method.";
    }

    identity ipv6 {
      base protocol;
      description
        "The AltMark method is applied to IPv6 protocol.";
      reference
        "RFC 9343: IPv6 Application of the Alternate-Marking Method";
    }

    identity srh  {
      base protocol;
      description
        "The AltMark method is applied to SRH.";
      reference
        "[I-D.fz-spring-srv6-alt-mark]: Application of the
```

```
        Alternate Marking Method to the Segment Routing Header";
    }

    identity mpls  {
      base protocol;
      description
        "The AltMark method is applied to MPLS.";
      reference
        "[I-D.ietf-mpls-inband-pm-encapsulation]: Application of the
        Alternate Marking Method to the MPLS Label Stack";
    }

    identity node-action {
      description
        "Base identity to represent the node actions. It's used to
         indicate what action the node will take.";
    }

    identity action-marking {
      base node-action;
      description
        "It indicates that the node must mark the AltMark data field,
        according to the operations described in RFC 9341 and
        RFC 9342";
    }

    identity action-unmarking {
      base node-action;
      description
        "It indicates that the node must unmark the AltMark data field,
        according to the operations described in RFC 9341 and
        RFC 9342";
    }

    identity action-read {
      base node-action;
      description
        "It indicates the node only reads the AltMark data,
        according to the operations described in RFC 9341 and
        RFC 9342";
    }

    identity measurement-period {
      description
        "It indicates the AltMark Period.";
    }

    identity flow-mon-id {
```

```
      description
        "It indicates the FlowMonID.";
    }

    identity measurement-mode {
      description
        "It indicates the measurement mode.";
    }

    identity hbh-measurement {
      base measurement-mode;
      description
        "It indicates that hop-by-hop measurements can be enabled.";
    }

    identity e2e-measurement {
      base measurement-mode;
      description
        "It indicates that end-to-end measurements can be enabled.";
    }

    identity enable-loss-measurement {
      description
        "It indicates that loss measurements are enabled.";
      }

     identity enable-delay-measurement {
      description
        "It indicates that delay measurements are enabled.";
      }

    /*
     * TYPE DEFINITIONS
     */

    typedef altmark-filter-type {
      type identityref {
        base filter;
      }
      description
        "It specifies a known type of filter.";
    }

    typedef altmark-node-action {
      type identityref {
        base node-action;
      }
      description
```

```
        "It specifies a node action.";
    }

    typedef altmark-method-type {
      type identityref {
        base method;
      }
      description
        "It specifies the AltMark method used.";
    }

    typedef altmark-protocol-type {
      type identityref {
        base protocol;
      }
      description
        "It specifies a known type of carrier protocol for the AltMark
         data.";
    }

    typedef altmark-measurement-mode {
      type identityref {
        base measurement-mode;
      }
      description
        "It specifies the measurement mode.";
    }

   /*
    * GROUP DEFINITIONS
    */

    grouping altmark-filter {
      description "A grouping for AltMark filter definition";

      leaf filter-type {
        type altmark-filter-type;
        description "filter type";
      }

      leaf ace-name {
        when "derived-from-or-self(../filter-type,
        'altmark:acl-filter')";
        type leafref {
          path "/acl:acls/acl:acl/acl:aces/acl:ace/acl:name";
        }
        description "The Access Control Entry name is used to
        refer to an ACL specification.";
```

```
      }
    }

    grouping measurement-mode {
      description
        "A grouping for measurement mode.";

      leaf hbh-measurement {
        type boolean;
        default false;
        description
          "This object indicates that hop-by-hop measurements can be
          enabled.";
      }

      leaf e2e-measurement {
        type boolean;
        default false;
        description
          "This object indicates that end-to-end measurements can be
          enabled.";
      }
    }

    grouping altmark-setup {
      description
        "A grouping for AltMark profile.";

      leaf node-action {
        type altmark-node-action;
        default action-read;
        description
          "This object indicates the action that the node needs to
           take, i.e. marking/read/unmarking.";
      }

      leaf measurement-period {
        type uint64;
        description
        "It specifies the AltMark marking period.";
      }

      leaf flow-mon-id {
        type uint32;
        description
        "It specifies the FlowMonID.
        A 20-bit flow identifier. The field is set at the marking node.
        The FlowMonID can be uniformly assigned by a central controller
```

```
          or algorithmically generated by the marking node.
          The latter approach cannot guarantee the uniqueness of the
          FlowMonID, yet the conflict probability is small due to the
          large space.
          FlowMonID is used to identify the flow and to correlate the
          exported data of the same flow from multiple nodes and from
          multiple packets.";
        }

       }


      grouping altmark-admin-config {
        description
          "AltMark top-level administrative configuration.";

        leaf enabled {
          type boolean;
          default false;
          description
            "This object is to control the availability of configuration.
             It MUST be true before anything in the
             /altmark/altmark-profile can be edited.
             If false, any configuration in place is not used.";
        }
      }

     /*
      * DATA NODES
      */

      container AltMark {
        description "AltMark top level container";

        container altmark-info {
          config false;
          description
            "Describes information such as units or timestamp format
            that assists monitoring systems in the interpretation of the
            AltMark data.";

          leaf timestamp-type {
            type identityref {
              base lime:timestamp-type;
            }
            description
              "Type of timestamp, such as Truncated PTP or NTP.";
          }
```

```
          list available-interface {
            key "if-name";
            description
              "A list of available interfaces that support
              Alternate-Marking.";
            leaf if-name {
              type if:interface-ref;
              description "This is a reference to the Interface name.";
            }
          }
        }

        container altmark-profiles {
          description
            "Contains the AltMark profiles.";

          container admin-config {
            description
              "Contains all the administrative configurations related to
               the AltMark functionalities";

            uses altmark-admin-config;
          }

          list altmark-profile {
          if-feature altmark;
          key "profile-name";
          description
              "It describes the list of the AltMark profiles configured
              on the node";
          leaf profile-name {
              type string{
                length "1..300";
              }
            description
                "Unique identifier for each AltMark profile.";
            }

          container filter {
              uses altmark-filter;
              description
                "The filter which is used to indicate the flow where
                the AltMark is applied.";
            }

          leaf method-type {
              type altmark-method-type;
              description
```

```
                "This item is used to indicate the AltMark method.";
            }

          leaf protocol-type {
              type altmark-protocol-type;
              description
                "This item is used to indicate the carrier protocol where
                the AltMark is applied.";
            }

            uses altmark-setup;

            uses measurement-mode;

            leaf enable-loss-measurement {
                type boolean;
                default false;
                description
                "If true, it indicates that loss measurements are
                enabled.";
              }

            leaf enable-delay-measurement {
                type boolean;
                default false;
                description
                "If true, it indicates that delay measurements are
                enabled.";
              }

         }
       }
     }
   }
   <CODE ENDS>
```

5. Security Considerations

Alternate Marking [RFC9341] and Multipoint Alternate Marking [RFC9342] analyze different security concerns and related solutions. These aspects are valid and applicable also to this document. In particular the fundamental security requirement is that Alternate Marking MUST only be applied in a specific limited domain, as also mentioned in [RFC8799].

The YANG module specified in this document defines a schema for data that is designed to be accessed via network management protocols such as NETCONF [RFC6241] or RESTCONF [RFC8040]. The lowest NETCONF layer is the secure transport layer, and the mandatory-to-implement secure transport is Secure Shell (SSH) [RFC6242]. The lowest RESTCONF layer is HTTPS, and the mandatory-to-implement secure transport is TLS [RFC8446].

The Network Configuration Access Control Model (NACM) [RFC8341] provides the means to restrict access for particular NETCONF or RESTCONF users to a preconfigured subset of all available NETCONF or RESTCONF protocol operations and content.

There are a number of data nodes defined in this YANG module. These data nodes may be considered sensitive or vulnerable in some network environments. Write operations (e.g., edit-config) to these data nodes without proper protection can have a negative effect on network operations. These are the subtrees and data nodes and their sensitivity/vulnerability:

* /altmark/altmark-profiles/admin-config

The items in the container above include the top level administrative configurations related to the AltMark functionalities. Unexpected changes to these items could lead to the AltMark function disruption and/ or misbehavior of the AltMark.

* /altmark/altmark-profiles/altmark-profile

The entries in the container above include the AltMark profile configurations which indirectly create or modify the device configurations. Unexpected changes to these entries could lead to the mistake of the AltMark behavior for the corresponding flows.

6. IANA Considerations

IANA is requested to assign a new URI from the IETF XML Registry [RFC3688]. The following URI is suggested:

```
URI: urn:ietf:params:xml:ns:yang:ietf-altmark
Registrant Contact: The IESG.
XML: N/A; the requested URI is an XML namespace.
```

This document also requests a new YANG module name in the YANG Module Names registry [RFC7950] with the following suggestion:

```
          name: ietf-altmark
          namespace: urn:ietf:params:xml:ns:yang:ietf-altmark
          prefix: altmark
          reference: RFC XXXX
```

7. Acknowledgements

The authors would like to thank Alex Huang Feng for the precious comments and suggestions.

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Appendix A. Example

An example of the Alternate-Marking Profile is reported in the following figure. This configuration is received by an AltMark marking node. This node adds the AltMark IPv6 extension header to enable the method.

```
<rpc xmlns="urn:ietf:params:xml:ns:netconf:base:1.0"
     message-id="101">
  <edit-config>
    <target>
      <candidate/>
    </target>
    <config>
      <altmark xmlns="urn:ietf:params:xml:ns:yang:ietf-altmark">
        <alt-mark profiles>
          <admin-config>
            <enabled>true</enabled>
          </admin-config>
          <profile>
            <profile-name>ietf-test-profile</profile-name>
            <method-type>double-marking</method-type>
            <protocol-type>ipv6</protocol-type>
            <node-action>action-marking</node-action>
            <measurement-period>10</measurement-period>
            <flow-mon-id>1</flow-mon-id>
            <measurement-mode>hbh-measurement</measurement-mode>
            <enable-loss-measurement>true</enable-loss-measurement>
            <enable-delay-measurement>true</enable-delay-measurement>
          </profile>
        </profiles>
      </altmark>
    </config>
  </edit-config>
</rpc>
```

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