Multicast Network Address Translation
draft-ietf-mboned-mnat-00

Abstract

   This document defines a method for a network to maintain Network
   Address Translation address mappings for the transport of globally
   addressed multicast traffic within a network that can't otherwise
   forward the globally addressed traffic. A new Multicast Network
   Address Translation (MNAT) service is defined to communicate the
   address mappings to ingress and egress points within the network, and
   considerations for operation of the MNAT service are described.

Status of This Memo

Copyright Notice

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1. Introduction

Network Address Translation is very widely used for unicast traffic
in a variety of networks and according to a variety of mechanisms.
[RFC2663] is recommended reading for background on the ways unicast
NAT is used.

The handling of multicast traffic can pose a variety of additional
problems for a network, some of which can be mitigated or avoided if
traffic can be mapped to a different address space than its original
addressing. This document defines a new service, Multicast Network
Address Translation (MNAT) as a mechanism to administer network
address mappings for multicast traffic within a network, for the
purpose of working around various addressing-related issues. An
overview of some of the motivating use cases that can be resolved by
network address remapping for multicast traffic is given in
Section 1.3. An explanation of the protocol operation is given in
Section 2.

Messaging to and from the MNAT service is defined with RESTCONF
[RFC8040] using the YANG [RFC7950] model in Section 3.

Unlike traditional unicast NAT, MNAT performs address translation at
both an ingress point to the network (where the traffic is
transformed to use an address scheme local to the network), and also
at an egress point from the network (where the traffic is transformed
back to the original address scheme for further forwarding, or for
further processing by a receiving application).

1.1. Background

The reader is assumed to be familiar with the concepts and
terminology regarding source-specific multicast as described in
[RFC4607] and the use of IGMPv3 [RFC3376] and MLDv2 [RFC3810] for
group management of source-specific multicast channels, as described
in [RFC4604].

The reader is also assumed to be familiar with the concepts and
terminology for RESTCONF [RFC8040] and YANG [RFC7950].

The reader is also assumed to be familiar with the use of DNS-SD
[RFC6763] for discovery of services provided by the network to end
hosts.

1.2. Terminology

```
+---------+-------------------------------------------------------+
|    Term | Definition                                            |
+---------+-------------------------------------------------------+
|   (S,G) | A source-specific multicast channel, as described in  |
|         | [RFC4607]. A pair of IP addresses with a source host IP |
|         | and destination group IP.                             |
|         |                                                       |
|  egress | A MNAT client operating at a point where NATted       |
|    node | multicast traffic exits the network (close to the     |
|         | receiver)                                             |
|         |                                                       |
| ingress | A MNAT client operating at a point where multicast    |
|    node | traffic enters the network and gets NATted (close to  |
|         | the sender)                                           |
|         |                                                       |
|    MNAT | A client using the ietf-mnat YANG model via RESTCONF, |
|  client | or a client with equivalent signaling to an MNAT      |
|         | service.                                              |
|         |                                                       |
|  NATted | Multicast traffic that has been translated to use     |
| traffic | addressing or encapsulation assigned locally within the |
|         | network, rather than its original global addressing.  |
|         |                                                       |
|     SSM | Source-specific multicast, as described in [RFC4607]  |
+---------+-------------------------------------------------------+
```

   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
   [RFC2119] and [RFC8174] when, and only when, they appear in all
   capitals, as shown here.

1.3. Motivation

   This section lists use cases where a global (S,G) may not be possible
   to transport within a network, requiring the use of some kind of
   encapsulation or address translation in order to adequately
   communicate the group membership for packet replication within the
   network, or in order to perform the forwarding for the subscribed
   traffic within the network.

   1. Global IPv6 (S,G)s subscribed from within an IPv4-only network,
       or global IPv4 (S,G)s subscribed from within an IPv6-only
       network.

   2. Networks with legacy devices that support only IGMPv2 or MLDv1,
       or otherwise do not support SSM and cannot discover the external
       sources without the use of non-standard services since

interdomain any-source multicast has been deprecated (see
[RFC8815]).

3. Networks that ingest external multicast traffic in a way that the
    route to the source of the traffic does not go through the ingest
    point may need to use a different source so that the Reverse Path
    Forwarding (RPF) can find the correct network location for the
    ingest.

4. Networks that provision multicast transport and packet
    replication channels with static routing instead of dynamic tree-
    building protocols like PIM-SM [RFC7761].

5. Networks using VLAN [IEEE-802.1Q] for traffic segregation and has
    Layer 2 access devices that assign VLAN tags according to MAC
    addresses will get MAC address collisions among multicast groups.
    Because the bits used for the multicast addresses come from the
    bottom 23 bits of the destination group address as described in
    [RFC1112] and those bits can collide between groups, especially
    in SSM. The technological limitations of VLAN assignment using
    MAC addresses at Layer 2 breaks the traffic segregation of
    multicast traffic for different services in such devices.

A note elaborating on the use of static routing for multicast groups:

Some networks have found that there are good use cases to deliver a
limited set of packet-replicating flows, including sometimes the use
of externally sourced multicast traffic, but have struggled with the
operational complexity of operating a dynamic tree-building system
based on PIM-SM [RFC7761]. Operating an MNAT service can allow these
networks to provide for the limited use of packet-replicating data
channels while keeping the operational complexity of handling a
dynamically changing set of channels confined to a single service
that implements their business logic for admission control, rather
than trying to apply access control lists for group membership
propagation spread across the network.

1.4. Notes for Contributors and Reviewers

Note to RFC Editor: Please remove this section and its subsections
before publication.

This section is to provide references to make it easier to review the
development and discussion on the draft so far.

1.4.1. Venues for Contribution and Discussion

   This document is in the Github repository at:

   https://github.com/GrumpyOldTroll/draft-ietf-mnat

   Readers with feedback are invited to open issues and send pull
   requests for this document.

   Please note that contributions may be merged and substantially
   edited, and as a reminder, please carefully consider the Note Well
   before contributing: https://datatracker.ietf.org/submit/note-well/

   Substantial discussion of this document should take place on the
   MBONED working group mailing list (mboned@ietf.org).

   o Join: https://www.ietf.org/mailman/listinfo/mboned

   o Search: https://mailarchive.ietf.org/arch/browse/mboned/

1.4.2. Implementation status

   There is an implementation prototype (MIT-licensed) at:

   o https://github.com/GrumpyOldTroll/mnat

   Pull requests, comments, testing and deployment reports, etc. are
   very welcome. Contributors before the final stages of RFC
   publication will be credited in this document unless requested
   otherwise.

2. Protocol Operation

2.1. Overview

   The use of MNAT within a network is defined in terms the folowing
   entities:

   o MNAT service

   o ingress nodes

   o egress nodes

   Address translation is performed at the ingress (closest to the
   sender) and egress (closest to the receiver) nodes. Ingress is where
   an external (S,G) is mapped to locally assigned address mapping
   before being forwarded for transport within the network. Egress is

where the traffic received on locally assigned addresses is
translated back to the corresponding external (S,G) address before
being forwarded for further transmission or processed by a receiving
application.

The MNAT service maintains the mapping between external (S,G)s and
the local network addresses used to transport traffic of those (S,G)s
within the network. The address mapping is performed according to
the needs of the network operating the MNAT service, to satisfy
whatever constraints and restrictions may be necessary or desirable
according to the operational considerations within that network.
Some example considerations that have motivated the design of MNAT
are described in Section 1.3.

Ingress and egress nodes communicate with the MNAT service according
to the schema defined by the YANG model in Section 3. Based on the
messages exchanged with the MNAT service, each ingress or egress node
maintains an up-to-date table of the mappings between the external
(S,G)s and the locally assigned addresses for transport within the
network. The table of mappings is used to perform the corresponding
network address translations.

TBD: probably add a diagram here. Probably something roughly similar
to page 7 of the IETF 108 mboned presentation touching on this:
https://www.ietf.org/proceedings/108/slides/slides-108-mboned-status-
update-on-multicast-to-the-browser-00.pdf#page=7

2.1.1. Egress Node Operational Modes

Egress nodes can run in at least two separate modes of operation.

One of the modes is "bump in the wire", which refers to a node that
receives traffic using the network-assigned locally chosen addresses,
and translates the traffic back to the associated externally
addressed (S,G) before forwarding the traffic along the rest of the
network paths to the receiving applications that tried to join the
external (S,G).

The second mode is "bump in the host", which refers to a virtual node
operating inside a client application.

As a "bump in the host" egress node, the virtual egress node can
discover and connect to the MNAT service from a receiving
application. The receiving application would then use the knowledge
about the address mapping within the network to perform a join for
the mapped addresses in the local network, rather than for the
external (S,G). The payloads of the traffic received with the

locally mapped addresses are treated by the application as though
they arrived with the external (S,G) addressing.

A common scenario for a bump in the wire egress node deployment might
be to have egress nodes operating in Customer Premises Equipment
(CPE), such as a Cable Modem or Wi-Fi router inside the home of a
customer to a multicast-capable Internet Service Provider (ISP). In
this scenario, the egress node discovery mechanism for the MNAT
service might be a static configuration for the MNAT service's
hostname, pushed by the ISP to the CPE devices.

For a bump in the host egress node, the discovery of the MNAT service
might either operate via DNS-SD [RFC6763] using a search domain for
the ISP distributed to hosts via a DHCP Domain Search option
[RFC3397], or via configuration instructions the ISP gives to their
customers to configure a search domain for their devices, or to
configure the MNAT service's hostname for that ISP in their
applications.

2.2. Service Discovery

It is RECOMMENDED that egress devices in end-user operating systems
or applications use DNS-SD [RFC6763] by default to discover an MNAT
service within their containing networks. However, a network may
require the use of other mechanisms, including options such as manual
configuration, so implementors are advised to offer manual
configuration options in addition to automatic discovery with DNS-SD.

As long as an MNAT client can find a valid hostname to use, it can
connect to the given MNAT service and monitor changes to the address
assignments within the network.

2.2.1. Detecting Invalid Services

TBD: recommendations for noticing and discontinuing use of MNAT
services that report mappings that don't correspond to the mappings
apparently in use in the client's local network (particularly from
egress nodes).

2.3. RESTCONF Bootstrap

TBD: describe the RESTCONF validation and bootstrapping steps. Use
the same section name from I-D.draft-ietf-mboned-dorms as a template,
assuming it passes a wider review.

[2.4](#). Message Handling

[2.4.1](#). Notification Subscription

   When possible, changes to the group assignments should be
   communicated with subscriptions to data model updates using a server
   push mechanism, for example as described in [[RFC8641](#)].

   Where clients or servers do not support server push updates, long
   polling can be used instead to provide timely updates. See [[RFC6202](#)]
   for an explanation of the approach and a discussion of its pros and
   cons.

   If long polling and server push are both unavailable, MNAT clients
   may need to poll the server to monitor updates instead. This
   approach is likely to encounter delays in the detection of changes to
   mapping decisions within the MNAT service, but can be used as a last
   resort for providing multicast connectivity where the use of MNAT is
   required by a network to enable multicast forwarding.

[2.4.2](#). Watcher Keys

   MNAT clients open a persistent connection to the MNAT service and
   request allocation of a watcher key with the get-new-watcher-key
   Remote Procedure Call (RPC). Watcher keys are identifiers chosen by
   the MNAT service and communicated to client nodes in the response to
   a successful get-new-egress-key RPC. Watcher keys SHOULD be based on
   a random value and unique per new key requested.

   Egress nodes communicate an interest in global (S,G)s by posting
   updates to the egress-global-joined container under a watcher with id
   equal to their watcher-key.

   Ingress nodes communicate an interest in sets of global (S,G)s by
   providing a monitor object with a matching filter under a watcher
   with id equal to their watcher-key.

   Watcher-keys expire if the refresh-watcher-id rpc is not invoked
   within the refresh-period given in the response to the get-new-
   watcher-id rpc.

   TBD: better explanation about how the service times out egress nodes
   that don't refresh their egress key on schedule, and how egress nodes
   that reconnect can attempt to refresh the prior key they were using,
   but must request a new one on error. Probably define a state per
   egress key (e.g. active vs. recently expired vs. non-existant) for
   the MNAT service to maintain. Explain how the MNAT service should
   use population count from the egress joins to make prioritization

decisions for the assignment of flows when there is limited flow
space. Probably reference CBACC in that explanation (I-D.draft-ietf-
mboned-cbacc).

2.4.3. Egress Group Management

The egress-global-joined container in the YANG model provides a
mechanism for egress nodes to directly advertise their group
membership to the MNAT service for externally addressed (S,G)s.

Egress nodes advertise their group membership to external (S,G)s to
the MNAT service and also advertise group membership to their next-
hop router using IGMP or MLD for the locally mapped addressing
withing the network. Joins and leaves for the locally mapped network
addresses occur in response to downstream joins for an external (S,G)
that has or gains a mapping according to the MNAT service, when the
join or leave propagates to the egress node.

Payloads of the locally mapped traffic should be treated as though
they were carried in packets addressed as the external (S,G),
including any authentication checks that should be performed for the
traffic. Egress nodes that forward traffic (non-virtual egress
nodes) will perform an address translation from the locally mapped
addressing to the original (S,G) (according to the address mapping
the MNAT service provides) before forwarding packets matching a
locally mapped address. It is the responsibility of the MNAT service
and the network that operates it to ensure that multiple different
traffic streams are not merged to the same locally mapped addresses
in a way that collides.

TBD: describe the effects of transient and persistent collisions?

2.4.4. Ingress Considerations

Like egress nodes, ingress nodes monitor the assignments provided by
the MNAT service and perform network address translation and group
membership propagation. Ingress nodes perform the translation from
an external (S,G) to the internally mapped addressing for the local
network transport.

In general, ingress nodes are translating traffic before the in-
network multicast fanout to multiple egress nodes. So an ingress
node is generally assumed to be feeding one or more egress nodes.
Because one ingress node can feed many egress nodes, ingress nodes
should be given priority ahead of egress nodes for notifications
about changes to the address mapping from the MNAT service.

2.4.5. **MNAT Service Considerations**

   The details of the address assignment strategies used by the internal
   logic of the MNAT service are out of scope for this document.
   Different instances of MNAT services are expected to use a wide range
   of considerations specific to the networks in which the instances
   operate.

   However, outside of address assignment there are some operational
   points an MNAT service instance should take into consideration:

   1. Assignment Transition Grace Period

       It's recommended to provide a grace period between reassigning a
       local address mapping to a new external (S,G) after unassigning
       its mapping to an old (S,G). The grace period should account for
       the expected time for the connected ingress and egress nodes to
       process the unassigning of the external (S,G) and for egress
       nodes to perform leave operations for the old locally mapped
       address, and for the leave operations to propagate through the
       network. For most networks, 250 seconds is a good default, as
       this allows a usually sufficient time for IGMP and MLD membership
       to time out and for any resulting prune operations to propagate
       through the network. However, different networks may tune the
       grace period differently for a variety of operational
       considerations.

   2. Scaling

       The MNAT service should be appropriately provisioned to support
       the expected number of ingress and egress nodes within the
       network. In an eyeball network, restrictions on the number of
       egress nodes per shared receiver IP address may be appropriate in
       order to prevent a rogue client application from forming an
       excessive number of egress connections. Alternately, for bump-
       in-the-wire deployments of egress nodes in CPE devices it may be
       appropriate to authenticate the egress connections with a client
       certificate for each home to avoid denial of service attacks
       based on overloading the MNAT service with egress connections.

       Additionally, it's RECOMMENDED to provide per-egress limits on
       the number of external simultaneous (S,G)s permitted per egress
       at a level appropriate to the scaling limitations for the
       network, to prevent denial of service attacks based on
       overloading the group assignments from a single malicious egress
       node.

2.4.6. Example Messaging Walkthrough

   TBD: show what an expected example message sequence or 2 would look
   like.

3. YANG Model

3.1. Yang Tree

   The tree diagram below uses the notation defined in [RFC8340].

   module: ietf-mnat
     +--rw egress-global-joined
     | +--rw watcher* [id]
     | +--rw id   watcher-key
     | +--rw joined-sg* [id]
     | +--rw id   string
     | +--rw (channel-type)?
     | +--:(ssm-channel)
     | | +--rw source   inet:ip-address
     | | +--rw group
     | | rt-types:ip-multicast-group-address
     | +--:(asm-channel)
     | +--rw asm-group
     | rt-types:ip-multicast-group-address
     +--rw ingress-watching
     | +--rw watcher* [id]
     | +--rw id   watcher-key
     | +--rw monitor* [id]
     | +--rw id   string
     | +--rw (monitor-type)?
     | +--:(monitor-global-sources)
     | +--rw global-source-prefix   inet:ip-prefix
     +--ro assigned-channels
        +--ro watcher* [id]
           +--ro id   watcher-key
           +--ro mapped-sg* [id]
              +--ro id   assignment-id
              +--ro state   assignment-state
              +--ro global-subscription
              | +--ro (channel-type)?
              | +--:(ssm-channel)
              | | +--ro source   inet:ip-address
              | | +--ro group
              | | rt-types:ip-multicast-group-address
              | +--:(asm-channel)
              | +--ro asm-group
              | rt-types:ip-multicast-group-address

```
                    +--ro local-mapping
                       +--ro (mapping-type)?
                          +--:(local-multicast-mapping)
                             +--ro (channel-type)?
                                +--:(ssm-channel)
                                |  +--ro source        inet:ip-address
                                |  +--ro group
                                |          rt-types:ip-multicast-group-address
                                +--:(asm-channel)
                                   +--ro asm-group
                                           rt-types:ip-multicast-group-address

    rpcs:
      +---x get-new-watcher-id
      |  +--ro output
      |     +--ro watcher-id        watcher-key
      |     +--ro refresh-period?   uint16
      +---x refresh-watcher-id
         +---w input
         |  +---w watcher-id    watcher-key
         +--ro output
            +--ro refresh-period?   uint16
```

                         MNAT Tree Diagram

3.2. Yang Module

```
   <CODE BEGINS> file ietf-mnat@2021-02-01.yang
   module ietf-mnat {
     yang-version 1.1;

     namespace "urn:ietf:params:xml:ns:yang:ietf-mnat";
     prefix mnat;

     import ietf-inet-types {
       prefix inet;
       reference
         "RFC 6991: Common YANG Data Types";
     }

     import ietf-routing-types {
       prefix "rt-types";
       reference "RFC 8294";
     }

     organization
       "IETF MBONED (Multicast Backbone Deployment) Working Group";
```

```
    contact
      "WG Web:    <https://datatracker.ietf.org/wg/mboned/>
       WG List:  <mailto:mboned@ietf.org>

       Author:    Jake Holland
                  <mailto:jakeholland.net@gmail.com>";

    description
      "Multicast Network Address Translation Model.

       Copyright (c) 2012 - 2020 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 Simplified 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; see
       the RFC itself for full legal notices.";

    revision "2020-10-22" {
      description
        "Initial version.";
    }

    grouping multicast-channel {
      choice channel-type {
        description
          "ASM or SSM multicast channels can be represented.";
        case ssm-channel {
          leaf source {
            type inet:ip-address;
            mandatory true;
            description
              "Source address of a multicast channel";
          }
          leaf group {
            type rt-types:ip-multicast-group-address;
            mandatory true;
            description "The global (S,G)'s group address";
          }
        }
        case asm-channel {
          leaf asm-group {
            type rt-types:ip-multicast-group-address;
```

```
            mandatory true;
            description "The global (S,G)'s group address";
          }
        }
      }
    }

    grouping monitor-definition {
      choice monitor-type {
        description
          "Definition of monitor characteristics.";
        case monitor-global-sources {
          leaf global-source-prefix {
            type inet:ip-prefix;
            mandatory true;
            description
              "Prefix to match for source IPs.";
          }
        }
      }
    }

    typedef watcher-key {
      type string;
      description
        "A key for egress identification.";
    }

    typedef assignment-id {
      type uint32;
      description
        "A type for assignment identifiers.";
    }

    identity assignment-state {
      description
        "Base identity to represent assignment states";
    }

    typedef assignment-state {
      type identityref {
        base assignment-state;
      }
      description "Status of an assigned (S,G).";
    }

    identity unassigned {
      base assignment-state;
```

```
      description
        "Represents an unassigned global (S,G) that cannot be
         received in the local network.";
    }

    identity assigned-local-multicast {
      base assignment-state;
      description
        "Represents an assigned global (S,G) that can be
         received in the local network by joining the associated
         local-mapping.";
    }

    container egress-global-joined {
      description
        "Declarations of subscriptions to global (S,G)s per
         egress.";

      list watcher {
        key "id";
        description
          "Mappings of traffic that correspond to the registered
           interest list for a given watch id (from the
           get-new-watcher-id rpc)";
        leaf id {
          type watcher-key;
          description
            "Identifier from get-new-watcher-id.  Tracks assignments
             of interest to the specific watcher.";
        }
        list joined-sg {
          key "id";
          leaf id {
            type string;
            description
              "id of the joined (S,G)";
          }
          description
            "(S,G)s in the global address space that an egress is
             joined to.  These should get corresponding entries in
             the assigned-channels lists.";
          uses multicast-channel;
        }
      }
    }
    container ingress-watching {
      description
        "Matches on (S,G)s that get ingested from this ingress.";
```

```
        list watcher {
          key "id";
          description
            "Mappings of traffic that correspond to the registered
             interest list for a given watch id (from the
             get-new-watcher-id rpc)";
          leaf id {
            type watcher-key;
            description
              "Identifier from get-new-watcher-id.  Tracks assignments
               of interest to the specific watcher.";
          }
          list monitor {
            key "id";
            leaf id {
              type string;
              description
                "id of the monitor definition";
            }
            uses monitor-definition;
          }
        }
      }
      container assigned-channels {
        config false;
        description
          "MNAT mappings of global (S,G)s into a local transport.";

        list watcher {
          key "id";
          description
            "Mappings of traffic that correspond to the registered
             interest list for a given watch id (from the
             get-new-watcher-id rpc)";
          leaf id {
            type watcher-key;
            description
              "Identifier from get-new-watcher-id.  Tracks assignments
               of interest to the specific watcher.";
          }
          list mapped-sg {
            key "id";
            description
              "The local network's assignment of global channels to
               local transport characteristics.";

            leaf id {
              type assignment-id;
```

```
              mandatory true;
              description
                "Identifier for this assignment.";
            }
            leaf state {
              type assignment-state;
              mandatory true;
              description
                "Status of the global (S,G)s that are assigned in the
                 local network.";
            }
            container global-subscription {
              description
                "The global channel that's mapped.";
              uses multicast-channel;
            }
            container local-mapping {
              choice mapping-type {
                description
                  "The description of how the global channel is
                   transported within the local network";

                case local-multicast-mapping {
                  description
                    "Defines the use of a local multicast (S,G) or
                     (*,G).";
                  uses multicast-channel;
                }
              }
            }
          }
        }
      }

      rpc get-new-watcher-id {
        description
          "Obtain a secret key unique to an individual mnat-egress
           instance, assigned by the server and used for subscription
           management.";
        output {
          leaf watcher-id {
            type watcher-key;
            mandatory true;
            description
              "Identifier for assignment monitoring.";
          }
          leaf refresh-period {
            type uint16;
```

```
          default 10;
          description
            "Number of seconds to wait between refresh messages.";
        }
      }
    }
    rpc refresh-watcher-id {
      description
        "A secret key unique to an individual mnat-egress instance,
         assigned by the server and used for subscription
         management.";
      input {
        leaf watcher-id {
          type watcher-key;
          mandatory true;
          description
            "Egress identifier for assignment monitoring.";
        }
      }
      output {
        leaf refresh-period {
          type uint16;
          default 10;
          description
            "Number of seconds to wait between refresh messages.";
        }
      }
    }
  }

  <CODE ENDS>
```

4. IANA Considerations

4.1. The YANG Module Names Registry

This document adds one YANG module to the "YANG Module Names"
registry maintained at <https://www.iana.org/assignments/yang-
parameters>. The following registrations are made, per the format in
Section 14 of [RFC6020]:

```
    name:      ietf-mnat
    namespace: urn:ietf:params:xml:ns:yang:ietf-mnat
    prefix:    mnat
    reference: I-D.draft-jholland-mboned-mnat
```

4.2. The XML Registry

This document adds the following registration to the "ns" subregistry
of the "IETF XML Registry" defined in [RFC3688], referencing this
document.

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

4.3. The Service Name and Transport Protocol Port Number Registry

This document adds one service name to the "Service Name and
Transport Protocol Port Number Registry" maintained at
<https://www.iana.org/assignments/service-names-port-numbers>. The
following registrations are made, per the format in Section 8.1.1 of
[RFC6335]:

```
     Service Name:             mnat
     Transport Protocol(s):    TCP, UDP
     Assignee:                 IESG <iesg@ietf.org>
     Contact:                  IETF Chair <chair@ietf.org>
     Description:              The MNAT service (RESTCONF that
                               includes ietf-mnat YANG model)
     Reference:                I-D.draft-jholland-mboned-mnat
     Port Number:              N/A
     Service Code:             N/A
     Known Unauthorized Uses:  N/A
     Assignment Notes:         N/A
```

5. Security Considerations

TBD. (What, me worry?)

Notable points to cover:

o communcation with the MNAT service should be secured. RESTCONF
   does this, alternate methods should also do it.

o separate authentication of the contents of the multicast traffic
   is recommended (e.g. with AMBI or TESLA). Probably it's not
   recommended for a network with MNAT to pass external traffic that
   does not provide authentication, and if the internal traffic is
   not authenticated, to segregate the internal from the external
   traffic in the MNAT assignment pools.

o mistaken mappings can result in receipt of payloads for the wrong
   channel. This can happen transiently even during normal

operation. Recommend some steps to mitigate and avoid (e.g. the
grace period and the authentication-TBD: explain how they help)

o Clients can (deliberately or accidentally) overload the service.
   Limits should be set to avoid disrupting traffic to the rest of
   the network.

6. Acknowledgements

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