Network Inventory YANG
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A YANG Data Model for Network Inventory Location
draft-ietf-ivy-network-inventory-location-04

Abstract

This document defines a YANG data model for Network Inventory location (e.g., site, room, rack, geo-location data), which provides location information with different granularity levels for inventoried network elements.

Accurate location information is useful for network planning, deployment, and maintenance. However, such information cannot be obtained or verified from the Network Elements themselves. This document defines a location model for network inventory that extends the base inventory with comprehensive location data.

Discussion Venues

This note is to be removed before publishing as an RFC.

Discussion of this document takes place on the Network Inventory YANG Working Group mailing list (inventory-yang@ietf.org), which is archived at https://mailarchive.ietf.org/arch/browse/inventory-yang/.

Source for this draft and an issue tracker can be found at https://github.com/ietf-ivy-wg/network-inventory-location.

Status of This Memo

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

Copyright Notice

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1. Introduction

NEs can be grouped by location to provide more information for network planning, deployment, and maintenance (e.g., easily locate problematic NEs, optimize network resources, or help planning forecasts). The location can reflect outdoor or indoor information. An indoor location may be represented as a building, room, or other similar organizational structures. Outdoor locations can be walls, poles, or other mount places.

The information about sites, equipment rooms, and other more precise locations is critical, but it cannot be automatically populated and retrieved from network elements (NEs). Instead, it is usually configured manually.

The Network Inventory location model is to record physical locations, such as sites, building, equipment rooms, racks, and so on. Additionally, it includes provisions for physical addresses or geo-location data (geographic coordinates). The location model augments the base network inventory [I-D.ietf-ivy-network-inventory-yang] to enrich NEs with location information.

The Network Inventory location model is classified as a network model (Section 3.5.1 of [I-D.ietf-netmod-rfc8407bis]).

The YANG data model in this document conforms to the Network Management Datastore Architecture (NMDA) defined in [RFC8342].

Note: The NMDA design needs to be revisited once the module is stable per (Section 4.23.2 of [I-D.ietf-netmod-rfc8407bis]).

1.1. Editorial Note (To be removed by RFC Editor)

Note to the RFC Editor: This section is to be removed prior to publication.

This document contains placeholder values that need to be replaced with finalized values at the time of publication. This note summarizes all of the substitutions that are needed.

Please apply the following replacements:

* XXXX --> the assigned RFC number for this document

* AAAA --> the assigned RFC number for [I-D.ietf-ivy-network-inventory-yang]

1.2. Terminology and Notations

The following terms are defined in [RFC7950] and are not redefined here:

* client
* server
* augment
* data model
* data node The following terms are defined in [RFC6241] and are not redefined here:
* configuration data
* state data The tree diagram used in this document follows the notation defined in [RFC8340].

Also, this document uses terms defined in [I-D.ietf-ivy-network-inventory-yang].

2. Hierarchical Locations of Network Inventory

The "location" list is generalized to support a variety of geographic location, such as sites, rooms, buildings.

A site represents a general geographic location to group a set of NEs and corresponding inventory components. NEs, racks, equipment rooms, and buildings can be grouped within a site.

A room is a facility, a space for network elements and other equipment (such as servers, storage) with power supply systems, air conditioning system, etc.

Locations can be nested to form a hierarchy. For example, buildings may be within a site, and a room may be within a building.

The "location-type" is defined as a YANG identity to identify the type of an inventory location, which may be site, equipment room, building, etc.

```
        +--rw locations
           +--rw location* [id]
           |  +--rw id                  string
           |  +--ro uuid?               yang:uuid
           |  +--rw name?               string
           |  +--rw description?        string
           |  +--rw alias?              string
           |  +--rw type?               identityref
           |  +--rw parent?             -> ../../location/id
           |  +--rw child*              -> ../../location/id
           |  +--rw physical-address
           |  |     ...
           |  +--rw geo-location
           |        ...
```

Figure 1: YANG Subtree of Location

3. Rack

"racks" represent physical equipment racks in which NEs can be installed, which facilitate device maintenance. Through "rack-location", each rack can be assigned to a site or a specific location within a site, such as an equipment room.

Each rack is assigned a unique ID and a name in the context of a facility, e.g. a site. A rack may have some specific attributes, such as appearance-related attributes and electricity-related attributes. The height, depth and width are described by Figure 2 (please consider that the door of the rack is facing the user).

Note: Further discussion is needed to decide whether to separate "racks" from the list of "location".

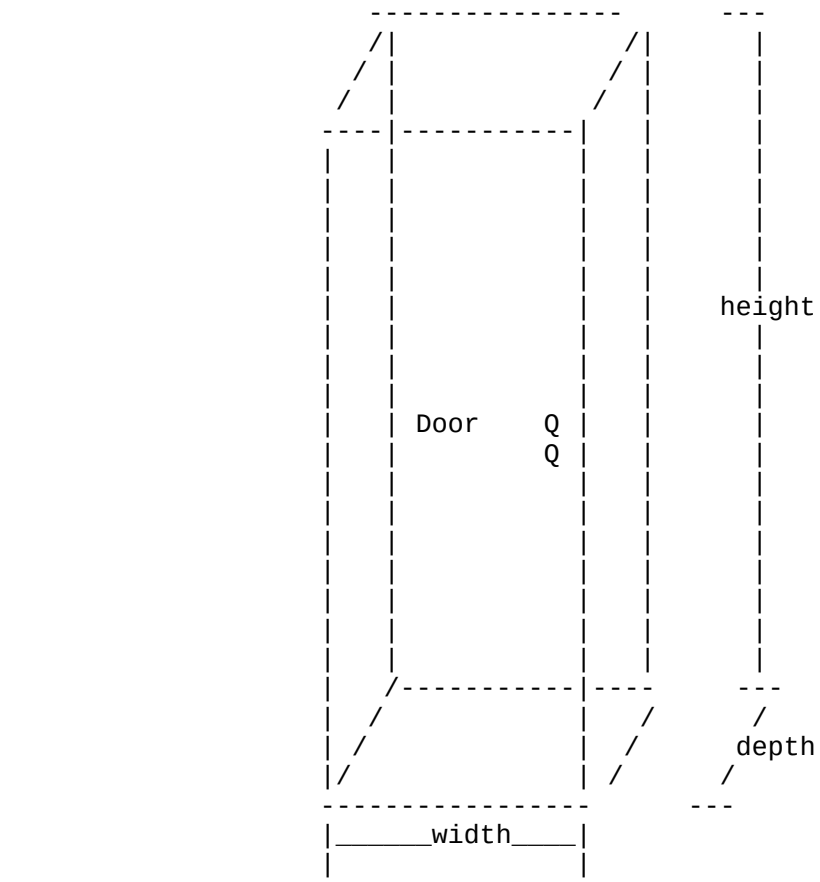

Figure 2: Height, Width and Depth of Rack

The rack attributes include:

```
+--rw racks
   +--rw rack* [id]
      +--rw id                      string
      |     ...
      +--rw height?                 uint16
      +--rw width?                  uint16
      +--rw depth?                  uint16
      +--rw max-voltage?            uint16
      +--rw max-allocated-power?    uint16
      +--rw contained-chassis* [relative-position]
            ...
```

Figure 3: YANG Subtree of Rack

Max-voltage: the maximum voltage supported by the rack.

4. Network Inventory Location Tree

Figure 4 provides an overview of the data model for "ietf-ni-location" module.

```
module: ietf-ni-location

  augment /nwi:network-inventory:
    +--rw locations
       +--rw location* [id]
       |  +--rw id                    string
       |  +--ro uuid?                 yang:uuid
       |  +--rw name?                 string
       |  +--rw description?          string
       |  +--rw alias?                string
       |  +--rw type?                 string
       |  +--rw parent?               -> ../../location/id
       |  +--rw child*                -> ../../location/id
       |  +--rw timestamp?            yang:date-and-time
       |  +--rw valid-until?          yang:date-and-time
       |  +--rw physical-address
       |  |  +--rw address?         string
       |  |  +--rw postal-code?     string
       |  |  +--rw state?           string
       |  |  +--rw city?            string
       |  |  +--rw country-code?    string
       |  +--rw geo-location
       |     +--rw reference-frame
       |     |  +--rw alternate-system?    string
       |     |  |       {alternate-systems}?
       |     |  +--rw astronomical-body?   string
       |     |  +--rw geodetic-system
       |     |     +--rw geodetic-datum?    string
       |     |     +--rw coord-accuracy?    decimal64
       |     |     +--rw height-accuracy?   decimal64
       |     +--rw (location)?
       |     |  +--:(ellipsoid)
       |     |  |  +--rw latitude?    decimal64
       |     |  |  +--rw longitude?   decimal64
       |     |  |  +--rw height?      decimal64
       |     |  +--:(cartesian)
       |     |     +--rw x?          decimal64
       |     |     +--rw y?          decimal64
       |     |     +--rw z?          decimal64
       |     +--rw velocity
       |     |  +--rw v-north?   decimal64
```

```
          |     |  +--rw v-east?    decimal64
          |     |  +--rw v-up?      decimal64
          |     +--rw timestamp?         yang:date-and-time
          |     +--rw valid-until?       yang:date-and-time
          +--rw racks
             +--rw rack* [id]
                +--rw id                     string
                +--ro uuid?                  yang:uuid
                +--rw name?                  string
                +--rw description?           string
                +--rw alias?                 string
                +--rw rack-location
                |  +--rw location-ref?    ni-location-ref
                |  +--rw row-number?      uint32
                |  +--rw column-number?   uint32
                +--rw height?                uint16
                +--rw width?                 uint16
                +--rw depth?                 uint16
                +--rw max-voltage?           uint16
                +--rw max-allocated-power?   uint16
                +--rw contained-chassis* [relative-position]
                |  +--rw relative-position    uint8
                |  +--rw ne-ref?              leafref
                |  +--rw component-ref?       leafref
                +--rw timestamp?             yang:date-and-time
                +--rw valid-until?           yang:date-and-time
     augment /nwi:network-inventory/nwi:network-elements
               /nwi:network-element:
       +--rw locations
          +--rw location*   ni-location-ref
          +--rw rack?
                  -> /nwi:network-inventory/nil:locations/racks/rack/id
```

Figure 4: Network Inventory Location Tree Structure

5. YANG Data model for Network Inventory Location

The "ietf-ni-location" module uses types defined in [RFC9179], [I-D.ietf-ivy-network-inventory-yang].

<CODE BEGINS> file "ietf-ni-location@2025-07-07.yang"

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

  import ietf-yang-types {
    prefix yang;
```

```
      reference
        "RFC 6991: Common YANG Data Types";
    }
    import ietf-network-inventory {
      prefix nwi;
      reference
        "RFCAAAA: A YANG Data Model for Network Inventory";
    }
    import ietf-geo-location {
      prefix geo;
      reference
        "RFC 9179: A YANG Grouping for Geographic Locations";
    }

    organization
      "IETF Network Inventory YANG (ivy) Working Group";
    contact
      "WG Web:   <https://datatracker.ietf.org/wg/ivy>
       WG List:  <mailto:inventory-yang@ietf.org>

       Editor: Bo Wu
            <lana.wubo@huawei.com>
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       Editor: Fabio Peruzzini
            <fabio.peruzzini@telecomitalia.it>
       Editor: Phil Bedard
            <phbedard@cisco.com>";
    description
      "This YANG module defines a model for Network Inventory
       location.

       Copyright (c) 2025 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; see
       the RFC itself for full legal notices.";

    revision 2025-07-07 {
```

```
    description
      "Initial version";
    reference
      "RFC XXXX: A YANG Data Model for Network Inventory location.";
    //RFC Editor: Please replace XXXX with actual RFC number,
    //update date information and remove this note
  }

  /* Identities */
  /* Typedef */

  typedef ni-location-ref {
    type leafref {
      path
        "/nwi:network-inventory/nil:locations/nil:location/nil:id";
    }
    description
      "This type is used by data models that need to reference
       network inventory location.";
  }

  /* Grouping */

  grouping physical-address {
    description
      "The grouping of the physical address.";
    container physical-address {
      description
        "Top level container for the physical address.";
      leaf address {
        type string;
        description
          "Specifies an address (number and street).";
      }
      leaf postal-code {
        type string;
        description
          "Specifies a postal code.";
      }
      leaf state {
        type string;
        description
          "Specifies a state. This leaf can also be
           used to describe a region for a country that
           does not have states.";
      }
      leaf city {
        type string;
```

```
          description
            "Specifies a city.";
        }
        leaf country-code {
          type string {
            pattern '[A-Z]{2}';
          }
          description
            "Specifies a country.
             Expressed as ISO ALPHA-2 code.";
        }
      }
    }

    grouping locations {
      description
        "The grouping of the locations.";
      container locations {
        description
          "The container for the NE location information.";
        list location {
          key "id";
          description
            "The list of locations within the network.";
          leaf id {
            type string;
            description
              "An identifier of the location.";
          }
          uses nwi:basic-common-entity-attributes;
          leaf type {
            type string;
            description
              "The type of network inventory location, e.g.
               equipment room, building, or site.

               This allows operators to flexibly define custom location
               types (e.g., 'pole', 'roof', 'floor') based on their
               specific network scenarios without requiring model
               extensions. String-based types enable dynamic adaptation
               to heterogeneous organizational naming conventions.";
          }
          leaf parent {
            type leafref {
              path "../../location/id";
            }
            description
              "The name of the location that physically contains this
```

```
            location.";
        }
        leaf-list child {
          type leafref {
            path "../../location/id";
          }
          description
            "The name of the contained child locations.";
        }
        leaf timestamp {
          type yang:date-and-time;
          description
            "Reference time when location was recorded.";
        }
        leaf valid-until {
          type yang:date-and-time;
          description
            "The timestamp for which this location is valid until.
             If unspecified, the location has no specific
             expiration time.";
        }
        uses physical-address;
        uses geo:geo-location;
      }
      uses racks;
    }
  }

  grouping racks {
    description
      "The attributes of the rack.";
    container racks {
      description
        "Top level container for the list of racks.";
      list rack {
        key "id";
        description
          "The list of racks within a location,
           e.g. equipment room.";
        leaf id {
          type string;
          description
            "An identifier that uniquely identifies the rack
             within a location, e.g. equipment room.";
        }
        uses nwi:basic-common-entity-attributes;
        container rack-location {
          description
```

```
            "The location information of the rack, which
             comprises the name of the location, row number, and
             column number.";
          leaf location-ref {
            type ni-location-ref;
            description
              "Name of location where this rack is located.";
          }
          leaf row-number {
            type uint32;
            description
              "Identifies the row within the equipment room where
               the rack is located.";
          }
          leaf column-number {
            type uint32;
            description
              "Identifies the physical location of the rack within
               the column.";
          }
        }
        leaf height {
          type uint16;
          units "millimeter";
          description
            "Rack height.";
        }
        leaf width {
          type uint16;
          units "millimeter";
          description
            "Rack width.";
        }
        leaf depth {
          type uint16;
          units "millimeter";
          description
            "Rack depth.";
        }
        leaf max-voltage {
          type uint16;
          units "volt";
          description
            "The maximum voltage could be supported by the rack.";
        }
        leaf max-allocated-power {
          type uint16;
          units "watts";
```

```
            description
              "The maximum allocated power to the rack.";
          }
          list contained-chassis {
            key "relative-position";
            description
              "The list of chassis within a rack.";
            leaf relative-position {
              type uint8;
              description
                "A relative position of chassis within
                 the rack";
            }
            leaf ne-ref {
              type leafref {
                path "/nwi:network-inventory/nwi:network-elements"
                   + "/nwi:network-element/nwi:ne-id";
              }
              description
                "The reference to the network element containing
                 the chassis component.";
            }
            leaf component-ref {
              type leafref {
                path "/nwi:network-inventory/nwi:network-elements"
                   + "/nwi:network-element[nwi:ne-id=current()/.."
                   + "/ne-ref]/nwi:components/nwi:component"
                   + "/nwi:component-id";
              }
              description
                "The reference to the chassis component within
                 the network element and contained by the rack.";
            }
          }
          leaf timestamp {
            type yang:date-and-time;
            description
              "Reference time when location was recorded.";
          }
          leaf valid-until {
            type yang:date-and-time;
            description
              "The timestamp for which this location is valid until.
               If unspecified, the location has no specific
               expiration time.";
          }
        }
      }
```

```
    }

    grouping locations-ref {
      description
        "The attributes of the locations.";
      container locations {
        description
          "The container for the location.";
        leaf-list location {
          type ni-location-ref;
          description
            "The reference of the location.";
        }
        leaf rack {
          type leafref {
            path "/nwi:network-inventory/nil:locations/nil:racks"
               + "/nil:rack/nil:id";
          }
          description
            "The reference to the rack.";
        }
      }
    }

    augment "/nwi:network-inventory" {
      description
        "Provides location information for network inventory.";
      uses locations;
    }

    augment
      "/nwi:network-inventory/nwi:network-elements"
      + "/nwi:network-element" {
        description
          "Augment network element with location information.";
        uses locations-ref;
      }
  }
  <CODE ENDS>
```

6. Operational Considerations

This section summarizes the creation, retrieval, and validation of location data in deployments.

Network elements are associated with a location by setting the location-ref leaf. If a network element is installed in a rack, the element (or its chassis component) additionally carries rack-ref and relative-position attributes.

During network operations such as fault diagnosis, maintenance, or capacity planning, it is often necessary to identify which devices and components reside within a specific site, room, or rack. The model supports this by exposing location references (e.g., location-ref, rack-ref) on network elements and chassis components. These associated items can be retrieved using YANG query mechanisms (e.g., NETCONF <get> or RESTCONF retrieval) combined with filtering.

Before using a location for field dispatch or planning, verification is required to ensure at least one of physical-address or geo-location is present and that the valid-until leaf is either not present or indicates a future time. Once the valid-until time has passed, the location MUST be considered stale and MUST NOT be used for operational purposes.

In large-scale inventories containing numerous network elements and components, querying location associations can impose a load on the server. To optimize retrieval and avoid overwhelming the server, mechanisms such as RESTCONF or NETCONF pagination should be utilized for queries involving large result sets.

7. Security Considerations

This section uses the template described in Section 3.7 of [I-D.ietf-netmod-rfc8407bis].

The "ietf-ni-location" YANG module defines a data model that is designed to be accessed via YANG-based management protocols, such as NETCONF [RFC6241] or RESTCONF [RFC8040]. These protocols have to use a secure transport layer (e.g., SSH [RFC6242], TLS [RFC8446], and QUIC [RFC9000]) and have to use mutual authentication.

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 that are writable/creatable/deletable (i.e., config true, which is the default). All writable data nodes are likely to be reasonably sensitive or vulnerable in some network environments. Write operations (e.g., edit-config) and delete operations to these data nodes without proper protection or authentication can have a negative effect on network operations. The following subtrees and data nodes have particular sensitivities/vulnerabilities:

'locations': The list may be used to track the set of network elements.

Some of the readable data nodes in this YANG module may be considered sensitive or vulnerable in some network environments. It is thus important to control read access (e.g., via get, get-config, or notification) to these data nodes. Specifically, the following subtrees and data nodes have particular sensitivities/ vulnerabilities:

Since this module identifies locations, authors using this module SHOULD consider any privacy issues that may arise when the data is readable (e.g., customer device locations, etc).

8. IANA Considerations

IANA is requested to register the following URI in the "ns" subregistry within the "IETF XML Registry" [RFC3688]:

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

IANA is requested to register the following YANG module in the "YANG Module Names" subregistry [RFC6020] within the "YANG Parameters" registry.

Name: ietf-ni-location
Maintained by IANA? N
Namespace: urn:ietf:params:xml:ns:yang:ietf-ni-location
Prefix: nil
Reference: RFC XXXX

9. References

9.1. Normative References

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[RFC9179] Hopps, C., "A YANG Grouping for Geographic Locations", RFC 9179, DOI 10.17487/RFC9179, February 2022, <https://www.rfc-editor.org/rfc/rfc9179>.

9.2. Informative References

[I-D.ietf-ccamp-network-inventory-yang] Yu, C., Belotti, S., Bouquier, J., Peruzzini, F., and P. Bedard, "A YANG Data Model for Network Hardware Inventory", Work in Progress, Internet-Draft, draft-ietf-ccamp-network-inventory-yang-02, 9 July 2023, <https://datatracker.ietf.org/doc/html/draft-ietf-ccamp-network-inventory-yang-02>.

[I-D.ietf-netmod-rfc8407bis] Bierman, A., Boucadair, M., and Q. Wu, "Guidelines for Authors and Reviewers of Documents Containing YANG Data Models", Work in Progress, Internet-Draft, draft-ietf-netmod-rfc8407bis-28, 5 June 2025, <https://datatracker.ietf.org/doc/html/draft-ietf-netmod-rfc8407bis-28>.

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Acknowledgments

The authors would like to thank the authors and contributors of [I-D.ietf-ccamp-network-inventory-yang] to trigger this work. During the discussion of base Network Inventory (NI) model, it is agreed that the definition of the equipment room and rack can be a separate location model and support manual configuration, while the NI model aggregates the inventory data of the Network Elements (NEs) on the network. Usually the information about sites or equipment rooms is not detectable by network controller and configured manually.

The authors wish to thank Mohamed Boucadair and many others for their helpful comments and suggestions.

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