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A Base YANG Data Model for Network Inventory
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Abstract

This document defines a base YANG data model for reporting network inventory. The scope of this base model is set to be application- and technology-agnostic. The base data model can be augmented with application- and technology-specific details.

About This Document

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

The latest revision of this draft can be found at <https://ietf-ivy-wg.github.io/network-inventory-yang/draft-ietf-ivy-network-inventory-yang.html>. Status information for this document may be found at <https://datatracker.ietf.org/doc/draft-ietf-ivy-network-inventory-yang/>.

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

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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This Internet-Draft will expire on 14 November 2026.

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1. Introduction

This document defines a base YANG data model for reporting network inventory that is application- and technology-agnostic. The base data model can be augmented to describe application- and technology-specific information. Please note that the usage of term "network inventory", in the context of this document, is to indicate that it is describing "network-wide" scope inventory information.

Network Inventory is a collection of data for network devices and their components managed by a specific management system.

Network inventory management is a fundamental functional block in the overall network management which was specified many years ago. Network inventory management is a critical component of network management for ensuring that the network is well-planned (e.g., identify assets to upgrade or to decommission), remains healthy (e.g., auditing to identify faulty elements), and is maintained appropriately to meet the performance objectives. Also, network inventory management allows operators to keep track of which devices are deployed in their networks, including relevant embedded software and hardware versions.

Exposing standard interfaces to retrieve network element components as maintained in an inventory are key enablers for many applications. For example, [I-D.ietf-teas-actn-poi-applicability] identifies a gap about the lack of YANG data models that could be used at Abstraction and Control of TE Networks (ACTN) Multi-Domain Service Coordinator-Provisioning Network Controller Interface (MPI) level to report whole or partial network hardware inventory information available at domain controller level towards upper layer systems (e.g., Multi-Domain Service Coordinator (MDSC) or Operations Support Systems (OSS) layers).

It is key for operators to coordinate with the industry towards the use of a standard YANG data model for Network Inventory data instead of using vendors' proprietary APIs.

[RFC8348] defines a YANG data model for the management of the hardware on a single server and therefore it is more applicable to the domain controller towards the network elements rather than at the northbound interface of a network controller (e.g., toward an application or another hierarchical network controller). However, the YANG data model defined in [RFC8348] has been used as a reference for defining the YANG network inventory data model presented in this document.

Per the definition of [RFC8309] and [RFC8969], the YANG data model defined in [RFC8348] is a device model while the YANG data model defined in this document is a network model.

As outlined in Section 6, the network inventory provides a read-only perspective of the actual inventory data that a network controller knows of what it is actually installed within the network. Therefore, other inventory data (e.g., spare or inactive assets) are outside the scope of this model.

As outlined in Section 3, the base inventory YANG data model defined in this document supports only physical network elements but generalizes the network element definition to allow supporting other types of network elements through proper augmentations.

This document defines one YANG module "ietf-network-inventory" in Section 5.

This base data model is application- and technology-agnostic (that is, valid for IP/MPLS, optical, and microwave networks as well as optical local loops, access networks, core networks, data centers, etc.) and can be augmented to include required application- and technology-specific inventory details together with specific hardware or software component's attributes.

The YANG data model defined in the document is scoped to cover the common use cases for Inventory but at network-wide level, covering both hardware and base software information.

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

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 I-D
- * 2026-05-13 --> the actual date of the publication of this document

2. Terminology and Notations

2.1. Requirements Notations

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.

2.2. Terminology

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

- * server
- * augment
- * data model
- * data node

The following terms are defined in [RFC6241] and are not redefined here:

- * state data

The following terms are defined in [RFC8453] and are not redefined here:

- * Abstraction and Control of TE Networks (ACTN)
- * Multi-Domain Service Coordinator (MDSC)
- * Provisioning Network Controller (PNC)
- * MDSC-PNC Interface (MPI)

The following terms are defined in the description statements of the corresponding YANG identities, defined in [IANA_HW_YANG], and are not redefined here:

- * backplane
- * battery
- * cpu
- * fan
- * module
- * power supply
- * sensor
- * stack
- * storage device

Also, the document makes use of the following terms:

Chassis: A field replaceable equipment with a particular structural format and dimensions. A chassis can, but does not need to, include spaces (called slots) to take cards.

Elsewhere, a chassis can be called shelf, sub-rack, stand-alone unit, etc.

Port: A component where networking traffic can be received and/or transmitted, e.g., by attaching networking cables.

In case of pluggable ports, the port may be empty when no

pluggable module is plugged in.

Network Inventory: A collection of data for network elements and their components with network-wide scope, managed by a specific management system.

Physical Network Element: An implementation or application specific group of components (e.g., hardware components).

Network Element: The generalization of the physical network element definition.

Hardware Component: The generalization of the hardware components defined in [IANA_HW_YANG] (e.g., backplane, battery, container, central processing unit (CPU), chassis, fan, module, port, power supply, sensor, stack, and storage device components).

The list of hardware components can be extended in future versions of [IANA_ENTITY_MIB] (and, consequently, of ([IANA_HW_YANG])).

Component: The generalization of the hardware component definition to include other inventory objects which can be managed, from an inventory perspective, like hardware components.

Card: Pluggable equipment with a particular structural format and dimensions which can be inserted into one or more slots (or sub-slots). A card can have spaces (called sub-slots) to take other cards.

Elsewhere, a card can be called board, module, circuit pack, etc..

Slot: A space in a chassis that can be equipped with one card, which may be chosen from a limited range of types of cards. A slot can be subdivided into smaller spaces that can also be part of a Card (called sub-slots).

Container: A hardware component class that is capable of containing one or more removable physical entities (e.g., a slot in a chassis is containing a board).

2.3. Tree Diagrams

The meanings of the symbols in the YANG tree diagrams are defined in [RFC8340].

2.4. YANG Prefixes

Table 1 list the prefixes of the modules that are used in this document.

Prefix	YANG Module	Reference
inet	ietf-inet-types	Section 4 of [RFC9911]
yang	ietf-yang-types	Section 3 of [RFC9911]
ianahw	iana-hardware	[IANA_HW_YANG]
nwi	ietf-network-inventory	RFC XXXX

Table 1: Prefixes and corresponding YANG modules

2.5. Artwork folding

This document uses artwork folding [RFC8792] for better formatting.

3. YANG Data Model for Network Inventory Overview

The base network inventory model, defined in this document, provides a list of network elements and of network element components.

The network-inventory top level container has been defined to support reporting other types of network inventory objects, besides the network elements and network element components.

These additional types of network inventory objects can be defined, together with the associated YANG data model and the rationale for managing them as part of the network inventory, in other documents providing application- and technology-specific companion augmentation data models, such as [I-D.ietf-ivy-network-inventory-location].

The network element definition is generalized to support physical network elements and other types of components' groups that can be managed as physical network elements from an inventory perspective.

Physical network elements are usually devices such as hosts, gateways, terminal servers, and the like, which have management agents responsible for performing the network management functions requested by the network management stations ([RFC1157]).

The "ne-type" is defined as a YANG identity to describe the type of the network element. This document defines only the "physical-network-element" identity.

Other types of network elements can be defined in other documents, together with the associated YANG identity and the rationale for managing them as network elements from an inventory perspective.

The component definition is also generalized to support any types of component inventory objects that can be managed as hardware components from an inventory perspective.

The data model for components defined in this document uses a list of components within each network element.

Different types of components can be distinguished by the class of component. The component "class" is defined as a union between the hardware class identity, defined in "iana-hardware", and the "non-hardware" identity, defined in this document.

Other types of components can be defined in other documents, together with the associated YANG identity and the rationale for managing them as components from an inventory perspective.

The identity definition of additional types of "ne-type" and "non-hardware" identity of component are outside the scope of this document and could be defined in application- and technology-specific companion augmentation data models, such as [I-D.ietf-ivy-network-inventory-software].

In [RFC8348], rack, chassis, slot, sub-slot, board and port are defined as components of network elements with generic attributes.

While [RFC8348] is used to manage the hardware of a single server (e.g., a network element), the Network Inventory YANG data model is used to retrieve the base inventory information that a controller discovers from all the network elements with network-wide scope under its control.

However, the YANG data model defined in [RFC8348] has been used as a reference for defining the YANG network inventory data model. This approach can simplify the implementation of this inventory model when the controller uses the YANG data model defined in [RFC8348] to retrieve the hardware from the network elements under its control.

3.1. Common attributes for inventory object

For all the inventory objects, there are some common attributes, such as:

uuid: The Universally Unique Identifier (UUID) of the inventory object, assigned by the server. Such identifiers are widely implemented with systems and guaranteed to be globally unique.

name: A human-interpretable label of the inventory object, provided by a network operator or by the server. It could also be present on a Graphical User Interface (GUI).

alias: A human-interpretable label of the inventory object, provided by a network operator. It could also be present on a GUI instead as well as the name.

description: A human-interpretable description of the inventory object, provided by a network operator or by the server. The description provides more detailed information to prompt users when performing maintenance operations etc.

3.1.1. Common attributes for network elements and components

To be consistent with the component definition, some of the attributes defined in [RFC8348] for components are reused for network elements, such as:

mfg-name: The name of the manufacturer of the entity (component or network element).

product-name: The vendor-specific and human-interpretable string describing the entity (component or network element) type.

It is expected that vendors assign unique product names to different entities within the scope of the vendor.

Other software-related attributes are defined in Section 3.3.2 and applicable to network elements and components.

3.2. Network Element

In addition to the common attributes defined for network elements and components in Section 3.1, the following attributes are defined for the network elements:

ne-id: The identifier that uniquely identifies the network element

(NE) within the network, assigned by the server since the network elements cannot guarantee that their local identifier is unique within the network.

The ne-id should be assigned such that the same network element will always be identified through the same identifier, even if the network elements get disconnected from the network controller. Mechanisms to ensure this (e.g., checking the mfg-name, product-name, management IP address, physical location) are implementation specific and outside the scope of standardization.

ne-type: The type of network element (e.g., physical network element). See Section 3 for the definition of NE types.

product-rev: A vendor-specific product revision string for the network-element.

3.3. Components

The YANG data model for network inventory mainly follows the same approach of [RFC8348] and reports the network hardware inventory as a list of components with different types (e.g., chassis, module, and port).

In addition to the common attributes defined for network elements and components in Section 3.1, the following attributes are defined for the components:

component-id: The identifier that uniquely identifies the component within the NE. It can be assigned by the NE or by the server.

class: The type of component (e.g., chassis, module, port). See Section 3 for the definition of component types.

hardware-rev: The vendor-specific hardware revision string for the component.

The preferred value is the hardware revision identifier actually printed on the component itself (if present).

mfg-date: The date of manufacturing of the component.

part-number: The vendor-specific part number of the component type.

It is expected that vendors assign unique part numbers to different component types within the scope of the vendor.

Although the part number is often an alphanumeric string and not a number, this document uses this term since it is widely used and well known in the industry.

serial-number: The vendor-specific serial number of the component instance.

It is expected that vendors assign unique serial numbers to different component instances at least within the scope of the part-number.

Although the serial number is often an alphanumeric string and not a number, this document uses this term since it is widely used and well known in the industry.

asset-id: An asset tracking identifier for the component, provided by a network operator.

is-fru: Indicates whether or not a component is considered a 'field-replaceable unit' by the vendor.

For state data like "admin-state", "oper-state", and so on, this document considers that they are related to device hardware management, not network inventory. Therefore, they are outside of the scope of this document. Same for the sensor-data, they should be defined in some other performance monitoring data models instead of the inventory data model.

3.3.1. Hardware Components

Other models (e.g., [TMF_SD2-20]) classifies the hardware components into two groups: holder group and equipment group. The holder group contains rack, chassis, slot, sub-slot while the equipment group contains network-element, board and port. This model, likewise [RFC8348], does not follow this classification and manage all the hardware components without distinguishing between holder and equipment groups.

See Appendix D, Appendix E, and Appendix F for concrete hardware component examples.

Figure 1 describes the relationship between typical inventory objects in a physical network element.

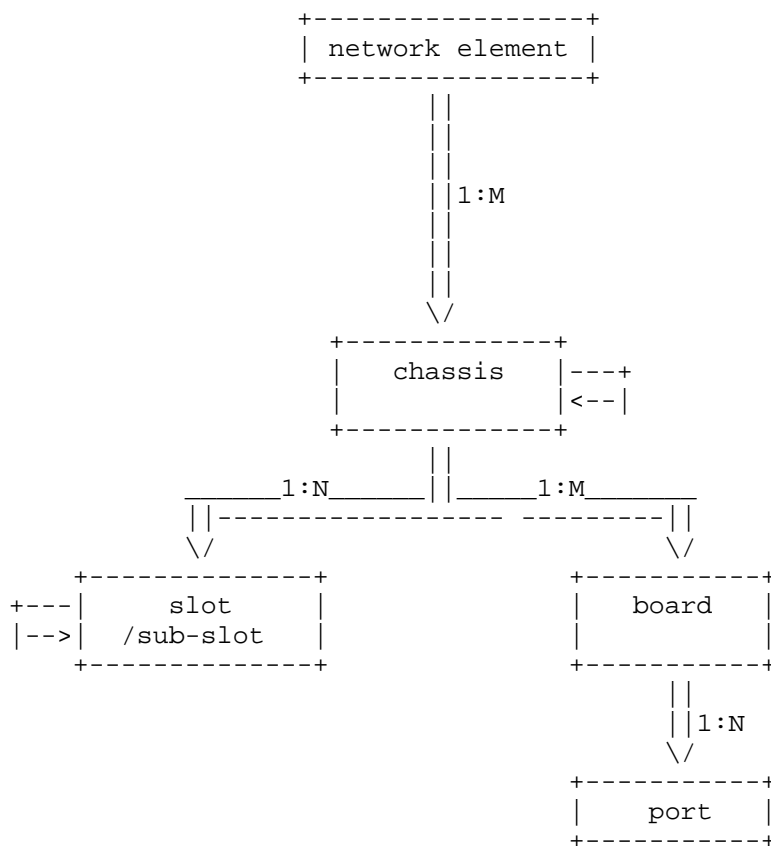


Figure 1: Relationship between typical inventory objects in physical network elements

The "iana-hardware" module [IANA_HW_YANG] defines YANG identities for the hardware component types in the IANA-maintained "IANA-ENTITY-MIB" registry.

Some of the definitions taken from [RFC8348] are based on the ENTITY-MIB [RFC6933].

Additional attributes of specific hardware, such as CPU, storage, port, or power supply are defined in the hardware extension.

3.3.2. Software Components

Each instance of a network element or a component includes its own "software-rev" list which provides basic software attributes for each entity (network element and component).

The scope of the list is to provide information about the software images intended to be running within the related entity.

The model supports scenarios where multiple software modules can be images intended to be running within the entity. For example, on a network element an Operating System and an Application software modules can be intended to be running; in the same way, on a component like a circuit pack a boot-loader, a firmware and one or more FPGA software modules can be intended to be running.

For each software module, intended to be running, the name and version information is provided.

The management of inactive/standby software modules and of the software upgrade or downgrade life-cycle are outside the scope of the base inventory model and can be addressed in other models which augment the base inventory model such as the model under definition in [I-D.ietf-ivy-network-inventory-software].

The software and hardware components share the same attributes of the component and have similar replaceable requirements. Generally, the device also has other software data, for example, one or more software patch information.

The software components lifecycle (like activation, deactivation, installation, storage, removal, etc.) is outside the scope of this document and defined in other documents such as [I-D.ietf-ivy-network-inventory-software].

3.4. Changes Since RFC 8348

This document re-defines some attributes listed in [RFC8348], based on some integration experience for network inventory data.

3.4.1. Part Number

According to the description in [RFC8348], the attribute named "model-name" under the component, is preferred to have a customer-visible part number value. "Model-name" is not straightforward to understand, and therefore, in this model the attribute is called "part-number".

3.4.2. Component identifiers

There are some use cases where the name of the components are assigned and changed by the operator. In these cases, the assigned names are also not guaranteed to be always unique.

In order to support these use cases, this model is not aligned with [RFC8348] in defining the component name as the key for the component list.

Instead, the name is defined as an optional attribute and the component-id is defined as the key for the component list (in alignment with the approach followed for the network-element list).

3.4.3. Parent relative position

There are some use cases where the parent relative position is not reported as an integer but as a string.

In order to support these use cases and allowing a straightforward match between the relative position definition in the device and in the network inventory, this model is defining the 'parent-rel-pos' data node as a string instead of as an integer.

If the device reports the relative position as an integer, e.g., using the device model defined in [RFC8348], the integer value reported by the device can be mapped into a string within the network inventory.

4. Network Inventory Tree Diagram

Figure 2 shows the tree diagram of the YANG data model defined in module "ietf-network-inventory" (Section 5).

```

module: ietf-network-inventory
  +--ro network-inventory
    +--ro network-elements
      +--ro network-element* [ne-id]
        +--ro ne-id          string
        +--ro ne-type?       identityref
        +--ro uuid?          yang:uuid
        +--ro name?          string
        +--ro alias?         string
        +--ro description?   string
        +--ro software-rev* [name]
          | +--ro name        string
          | +--ro revision?   string
          | +--ro patch* [revision]
          |   +--ro revision  string
        +--ro mfg-name?      string
        +--ro product-name?  string
        +--ro product-rev?   string
        +--ro components
          +--ro component* [component-id]
            +--ro component-id  string
            +--ro class          union
            +--ro uuid?          yang:uuid
            +--ro name?          string
            +--ro alias?         string
            +--ro description?   string
            +--ro software-rev* [name]
              | +--ro name        string
              | +--ro revision?   string
              | +--ro patch* [revision]
              |   +--ro revision  string
            +--ro mfg-name?      string
            +--ro product-name?  string
            +--ro hardware-rev?  string
            +--ro mfg-date?      yang:date-and-time
            +--ro part-number?   string
            +--ro serial-number? string
            +--ro asset-id?      string
            +--ro is-fru?        boolean
            +--ro uri*           inet:uri
            +--ro parent*
              | -> ../../component/component-id
            +--ro parent-rel-pos? string
            +--ro is-main?       boolean

```

Figure 2: Network inventory tree diagram

5. YANG Data Model for Network Inventory

```
<CODE BEGINS> file "ietf-network-inventory@2026-05-13.yang"
module ietf-network-inventory {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-network-inventory";
  prefix nwi;

  import iana-hardware {
    prefix ianahw;
    reference
      "https://www.iana.org/assignments/yang-parameters";
  }
  import ietf-yang-types {
    prefix yang;
    reference
      "RFC 9911: Common YANG Data Types";
  }
  import ietf-inet-types {
    prefix inet;
    reference
      "RFC 9911: Common YANG Data Types";
  }

  organization
    "IETF IVY Working Group";
  contact
    "WG Web:  <https://datatracker.ietf.org/wg/ivy/>
    WG List:  <mailto:ivy@ietf.org>

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    Editor:   Fabio Peruzzini
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    Editor:   Phil Bedard
              <phbedard@cisco.com>";
  description
    "This module defines a base model for retrieving network
    inventory."
```

The model fully conforms to the Network Management Datastore Architecture (NMDA).

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This version of this YANG module is part of RFC XXXX; see the RFC itself for full legal notices.

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.";

```
revision 2026-05-13 {
  description
    "Initial version";
  reference
    "RFC XXXX: A YANG Data Model for Network Inventory.";
}

/*
 * Identities
 */

identity non-hardware-component-class {
  description
    "Base identity for non hardware components (e.g., software
    components) in a managed device.";
}

identity ne-type {
  description
    "Base identity for network element (NE) types.";
}

identity ne-physical {
  base nwi:ne-type;
  description
    "A physical network element (NE). ";
}
```

```
}

/*
 * Types
 */

typedef ne-ref {
  type leafref {
    path "/nwi:network-inventory/nwi:network-elements"
      + "/nwi:network-element/nwi:ne-id";
    require-instance false;
  }
  description
    "This type is intended to be used by data models that need to
    reference Network Element.";
}

/*
 * Groupings
 */

grouping component-ref {
  description
    "This grouping is intended to be used by data models that need
    to reference a component within a Network Element.";
  leaf ne-ref {
    type nwi:ne-ref;
    description
      "The reference to the Network Element which contains the
      component to be referenced.";
  }
  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";
      require-instance false;
    }
    description
      "The reference to the component.";
  }
}

grouping port-ref {
  description
    "This grouping is intended to be used by data models that need
    to reference a port component within a Network Element.";
  leaf ne-ref {
```

```
    type nwi:ne-ref;
    description
      "The reference to the Network Element which contains the
       port to be referenced.";
  }
  leaf port-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";
      require-instance false;
    }
    description
      "The reference to the port component.

      Note: the class of the referenced port component MUST be
      'ianahw:port' or a derived identity.";
  }
}

grouping basic-common-entity-attributes {
  description
    "The set of basic attributes which are common to all the
     entities (e.g., component, network elements, location, passive
     entities) defined in this module and in other inventory
     modules.";
  leaf uuid {
    type yang:uuid;
    description
      "The Universally Unique Identifier of the entity
       (e.g., component).";
  }
  leaf name {
    type string;
    description
      "The name of the entity (e.g., component), as specified by
       a network operator, that provides a non-volatile 'handle'
       for the entity and that can change anytime during the entity
       lifetime.

       If no value is discovered, the server MAY set the value of
       this node to a locally unique value in the operational
       state.";
  }
  leaf alias {
    type string;
    description
      "The alias name of the entity (e.g., component). This alias
```

```
        name can be specified by a network operator.";
    }
    leaf description {
        type string;
        description
            "The textual description of the entity (e.g., component).";
    }
}

grouping ne-component-common-entity-attributes {
    description
        "The set of attributes which are common to all the entities
        (e.g., component, network elements) defined in this module.";
    uses basic-common-entity-attributes;
    list software-rev {
        key "name";
        description
            "The list of the software modules representing the software
            images intended to be running within the entity
            (e.g., component).";
        leaf name {
            type string;
            description
                "The vendor-specific name of the software module.";
        }
        leaf revision {
            type string;
            description
                "The vendor-specific revision string of the software
                module when not implicitly defined as part of the name of
                the software module.";
        }
    }
    list patch {
        key "revision";
        description
            "The list of software patches configured to be active for
            the software module.";
        leaf revision {
            type string;
            description
                "The vendor-specific revision string of the software
                patch when not implicitly defined as part of the name or
                revision of the software module.";
        }
    }
}
leaf mfg-name {
    type string;
```

```
    description
      "The name of the manufacturer of this entity
       (e.g., component).";
  }
  leaf product-name {
    type string;
    description
      "The vendor-specific and human-interpretable string
       describing the entity (e.g., component) type. It is expected
       that vendors assign unique product names to different entity
       (e.g., component) types within the scope of the vendor.";
  }
}

grouping component-attributes {
  description
    "The set of common attributes of a component.

    This grouping is intended also to be re-used by data models
    that need to report the common attributes of a component.";
  leaf component-id {
    type string;
    description
      "An identifier that uniquely identifies the component
       in a node.";
  }
  leaf class {
    type union {
      type identityref {
        base ianahw:hardware-class;
      }
      type identityref {
        base nwi:non-hardware-component-class;
      }
    }
    mandatory true;
    description
      "The type of the component.";
  }
  uses ne-component-common-entity-attributes {
    refine "software-rev" {
      reference
        "RFC 6933: Entity MIB (Version 4) -
         entPhysicalSoftwareRev";
    }
    refine "mfg-name" {
      description
        "The name of the manufacturer of this component.
```

The preferred value is the manufacturer name string actually printed on the component itself (if present).

Note that comparisons between instances of the 'part-number', 'software-rev', and 'serial-number' nodes are only meaningful amongst components with the same value of 'mfg-name'.

If the manufacturer name string associated with the component is unknown to the server, then this node is not instantiated.";

```
reference
  "RFC 6933: Entity MIB (Version 4) -
    entPhysicalMfgName";
}
}
leaf hardware-rev {
  type string;
  description
    "The vendor-specific hardware revision string for the
    component.

    The preferred value is the hardware revision identifier
    actually printed on the component itself (if present).";
  reference
    "RFC 6933: Entity MIB (Version 4) - entPhysicalHardwareRev";
}
leaf mfg-date {
  type yang:date-and-time;
  description
    "The date of manufacturing of the component.";
  reference
    "RFC 6933: Entity MIB (Version 4) - entPhysicalMfgDate";
}
leaf part-number {
  type string;
  description
    "The vendor-specific part number of the component
    type. It is expected that vendors assign unique part
    numbers to different component types within the
    scope of the vendor.";
}
leaf serial-number {
  type string;
  description
    "The vendor-specific serial number of the component instance.
```

```
        It is expected that vendors assign unique serial numbers to
        different component instances within the scope of the
        'part-number'.";
    }
    leaf asset-id {
        type string;
        description
            "This node is an asset tracking identifier for the component,
            as specified by a network operator.

            A server implementation MAY map this leaf to the
            entPhysicalAssetID MIB object.  Such an
            implementation needs to use some mechanism to handle
            the differences in size and characters allowed
            between this leaf and entPhysicalAssetID.

            The definition of such a mechanism is outside the
            scope of this document.";
        reference
            "RFC 6933: Entity MIB (Version 4) -
            entPhysicalAssetID";
    }
    leaf is-fru {
        type boolean;
        description
            "This node indicates whether or not this component is
            considered a 'field-replaceable unit' by the vendor.
            If this node contains the value 'true', then this
            component identifies a field-replaceable unit.
            For all components that are permanently contained
            within a field-replaceable unit, the value 'false'
            should be returned for this node.";
        reference
            "RFC 6933: Entity MIB (Version 4) -
            entPhysicalIsFRU";
    }
    leaf-list uri {
        type inet:uri;
        description
            "This node contains identification information about
            the component.";
        reference
            "RFC 6933: Entity MIB (Version 4) - entPhysicalUris";
    }
}

/*
 * Data Nodes
```



```
*/

container network-inventory {
  config false;
  description
    "Top-level container for network inventory.";
  container network-elements {
    description
      "The top-level container for the list of network elements
       within the network.";
    list network-element {
      key "ne-id";
      description
        "The list of network elements within the network.";
      leaf ne-id {
        type string;
        description
          "An identifier that uniquely identifies the NE in
           a network.";
      }
      leaf ne-type {
        type identityref {
          base nwi:ne-type;
        }
        default "nwi:ne-physical";
        description
          "The network element type.";
        reference
          "RFC XXXX: A YANG Data Model for Network Inventory,
           Section 3.";
      }
    }
    uses ne-component-common-entity-attributes;
    leaf product-rev {
      type string;
      description
        "The vendor-specific product revision string for the
         network-element.";
    }
  }
  container components {
    description
      "The top-level container for the list of components
       within a network element.";
    list component {
      key "component-id";
      description
        "The list of components within a network element.";
      uses component-attributes;
      leaf-list parent {
```

```
type leafref {
  path "../..component/component-id";
  require-instance false;
}
description
  "The identifiers of all the components that
  physically contain this component.

  If this list is empty, this component is not
  contained in any other component but it is contained
  in the network-element.";
reference
  "RFC 6933: Entity MIB (Version 4) -
  entPhysicalContainedIn";
}
leaf parent-rel-pos {
  when 'count(..parent) < 2' {
    description
      "This data node is applicable only when this
      component is contained in the network-element or
      in only one parent component.";
  }
  type string;
  description
    "The relative position with respect to the parent
    component among all the sibling components.

    The format of this string is
    implementation-specific. When mapping from RFC 6933,
    the entPhysicalParentRelPos integer value SHOULD be
    encoded as an integer string.";
  reference
    "RFC 6933: Entity MIB (Version 4) -
    entPhysicalParentRelPos";
}
leaf is-main {
  when "derived-from-or-self(..nwi:class, "
    + "'ianahw:chassis')";
  type boolean;
  description
    "This node indicates whether the chassis is taking or
    not the 'main' role.

    This node is applicable only to scenarios where the
    network element contains chassis components which
    can take or not the 'main' role (e.g., multi-chassis
    network elements).
```


For example, the network controller can collect this information by reading it from the devices using the device model supported by the devices. This model does not constraint the device models used on the device: the YANG data model defined in [RFC8348] is an option but other options (e.g., vendor specific interfaces or YANG data models) are also allowed. In case some information is not provided by the device, the network controller SHALL omit this information unless this information is known by other sources of information (e.g., through local configuration within the network controller).

In case of hierarchical controllers, a hierarchical network controller can also collect the network inventory information from its lower level network controllers using this YANG data model (or other mechanisms which are outside the scope of this document) and report the combined network inventory information to a higher level network controller, to an Inventory OSS or to any other type of application which needs to discover the network inventory information.

When used in brownfield scenarios, it is worth noting that existing deployments are based on proprietary Inventory OSS and that the migration path is highly dependent on the specific proprietary solution. Therefore, the migration processes are operator dependent: it is expected that the deployment of the standard YANG-based solution on the controllers will take some time and its integration with existing Inventory OSSes will also take longer time. In a longer term, the network controllers could provide inventory information, using this YANG data model, also to next generation OSSes.

When this model is used, the source of truth for the inventory data in the scope of this model is the network controller providing this data. Some legacy inventory information (e.g., inactive assets, warehouse spares, procurement or commercial metadata) fall outside the scope of the base model.

7. Security Considerations

This section is modeled after the template described in Section 3.7 of [RFC9907].

The "ietf-network-inventory" YANG module defines a data model that is designed to be accessed via YANG-based management protocols, such as NETCONF [RFC6241] and RESTCONF [RFC8040]. These YANG-based management protocols (1) have to use a secure transport layer (e.g., SSH [RFC4252], TLS [RFC8446], and QUIC [RFC9000]) and (2) 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.

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:

- * `"/nwi:network-elements"`

This subtree reports the inventory information for all the network elements and their hardware components deployed within the network as well as of the software modules being active on these network elements and components. Unauthorized access to this subtree can disclose this information. A malicious attacker can use this information to perform targeted attacks to network elements, hardware components or software modules with known vulnerabilities.

In large networks, the massive volume of reported data can cause scalability issues, as reported in Appendix C. A malicious attacker could leverage this to cause resource exhaustion.

Modules that use the groupings that are defined in this document should identify the corresponding security considerations. For example, reusing the 'component-attributes' grouping may expose sensitive information.

8. IANA Considerations

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

URI: urn:ietf:params:xml:ns:yang:ietf-network-inventory
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" registry [RFC6020] within the "YANG Parameters" registry group.

name: ietf-network-inventory
namespace: urn:ietf:params:xml:ns:yang:ietf-network-inventory
prefix: nwi
reference: RFC XXXX

9. References

9.1. Normative References

[IANA_ENTITY_MIB]

IANA, "IANA-ENTITY-MIB", n.d.,
<<https://www.iana.org/assignments/ianaentity-mib/ianaentity-mib.xhtml>>.

[IANA_HW_YANG]

IANA, "iana-hardware YANG Module", n.d.,
<<https://www.iana.org/assignments/iana-hardware/iana-hardware.xhtml>>.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <<https://www.rfc-editor.org/rfc/rfc2119>>.

[RFC6020] Bjorklund, M., Ed., "YANG - A Data Modeling Language for the Network Configuration Protocol (NETCONF)", RFC 6020, DOI 10.17487/RFC6020, October 2010, <<https://www.rfc-editor.org/rfc/rfc6020>>.

[RFC6241] Enns, R., Ed., Bjorklund, M., Ed., Schoenwaelder, J., Ed., and A. Bierman, Ed., "Network Configuration Protocol (NETCONF)", RFC 6241, DOI 10.17487/RFC6241, June 2011, <<https://www.rfc-editor.org/rfc/rfc6241>>.

[RFC6933] Bierman, A., Romascanu, D., Quittek, J., and M. Chandramouli, "Entity MIB (Version 4)", RFC 6933, DOI 10.17487/RFC6933, May 2013, <<https://www.rfc-editor.org/rfc/rfc6933>>.

[RFC7950] Bjorklund, M., Ed., "The YANG 1.1 Data Modeling Language", RFC 7950, DOI 10.17487/RFC7950, August 2016, <<https://www.rfc-editor.org/rfc/rfc7950>>.

[RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <<https://www.rfc-editor.org/rfc/rfc8174>>.

- [RFC8341] Bierman, A. and M. Bjorklund, "Network Configuration Access Control Model", STD 91, RFC 8341, DOI 10.17487/RFC8341, March 2018, <<https://www.rfc-editor.org/rfc/rfc8341>>.
- [RFC8342] Bjorklund, M., Schoenwaelder, J., Shafer, P., Watsen, K., and R. Wilton, "Network Management Datastore Architecture (NMDA)", RFC 8342, DOI 10.17487/RFC8342, March 2018, <<https://www.rfc-editor.org/rfc/rfc8342>>.
- [RFC8348] Bierman, A., Bjorklund, M., Dong, J., and D. Romascanu, "A YANG Data Model for Hardware Management", RFC 8348, DOI 10.17487/RFC8348, March 2018, <<https://www.rfc-editor.org/rfc/rfc8348>>.
- [RFC9911] Schoenwaelder, J., Ed., "Common YANG Data Types", RFC 9911, DOI 10.17487/RFC9911, December 2025, <<https://www.rfc-editor.org/rfc/rfc9911>>.

9.2. Informative References

- [I-D.ietf-ivy-network-inventory-location]
Wu, B., Belotti, S., Bouquier, J., Peruzzini, F., and P. Bedard, "A YANG Data Model for Network Inventory Location", Work in Progress, Internet-Draft, draft-ietf-ivy-network-inventory-location-05, 28 February 2026, <<https://datatracker.ietf.org/doc/html/draft-ietf-ivy-network-inventory-location-05>>.
- [I-D.ietf-ivy-network-inventory-software]
Wu, B., Zhou, C., Wu, Q., and M. Boucadair, "A YANG Network Data Model of Network Inventory Software Extensions", Work in Progress, Internet-Draft, draft-ietf-ivy-network-inventory-software-03, 15 April 2026, <<https://datatracker.ietf.org/doc/html/draft-ietf-ivy-network-inventory-software-03>>.
- [I-D.ietf-teas-actn-poi-applicability]
Peruzzini, F., Bouquier, J., Busi, I., King, D., and D. Ceccarelli, "Applicability of Abstraction and Control of Traffic Engineered Networks (ACTN) to Packet Optical Integration (POI)", Work in Progress, Internet-Draft, draft-ietf-teas-actn-poi-applicability-18, 14 March 2026, <<https://datatracker.ietf.org/doc/html/draft-ietf-teas-actn-poi-applicability-18>>.

[I-D.ygb-ivy-passive-network-inventory]

Guo, A., van caenegem, T., Davis, N., Tilocca, M., and B. Peters, "A YANG Data Model for Passive Network Inventory", Work in Progress, Internet-Draft, draft-ygb-ivy-passive-network-inventory-04, 2 March 2026, <<https://datatracker.ietf.org/doc/html/draft-ygb-ivy-passive-network-inventory-04>>.

[OpenConfig]

OpenConfig Working Group, "OpenConfig Public Release v5.6.0", Release 5.6.0 , January 2026, <<https://github.com/openconfig/public/tree/v5.6.0/>>.

[RFC1157] Case, J., Fedor, M., Schoffstall, M., and J. Davin, "Simple Network Management Protocol (SNMP)", RFC 1157, DOI 10.17487/RFC1157, May 1990, <<https://www.rfc-editor.org/rfc/rfc1157>>.

[RFC3688] Mealling, M., "The IETF XML Registry", BCP 81, RFC 3688, DOI 10.17487/RFC3688, January 2004, <<https://www.rfc-editor.org/rfc/rfc3688>>.

[RFC4152] Tesink, K. and R. Fox, "A Uniform Resource Name (URN) Namespace for the Common Language Equipment Identifier (CLEI) Code", RFC 4152, DOI 10.17487/RFC4152, August 2005, <<https://www.rfc-editor.org/rfc/rfc4152>>.

[RFC4252] Ylonen, T. and C. Lonvick, Ed., "The Secure Shell (SSH) Authentication Protocol", RFC 4252, DOI 10.17487/RFC4252, January 2006, <<https://www.rfc-editor.org/rfc/rfc4252>>.

[RFC7951] Lhotka, L., "JSON Encoding of Data Modeled with YANG", RFC 7951, DOI 10.17487/RFC7951, August 2016, <<https://www.rfc-editor.org/rfc/rfc7951>>.

[RFC8040] Bierman, A., Bjorklund, M., and K. Watsen, "RESTCONF Protocol", RFC 8040, DOI 10.17487/RFC8040, January 2017, <<https://www.rfc-editor.org/rfc/rfc8040>>.

[RFC8309] Wu, Q., Liu, W., and A. Farrel, "Service Models Explained", RFC 8309, DOI 10.17487/RFC8309, January 2018, <<https://www.rfc-editor.org/rfc/rfc8309>>.

[RFC8340] Bjorklund, M. and L. Berger, Ed., "YANG Tree Diagrams", BCP 215, RFC 8340, DOI 10.17487/RFC8340, March 2018, <<https://www.rfc-editor.org/rfc/rfc8340>>.

- [RFC8446] Rescorla, E., "The Transport Layer Security (TLS) Protocol Version 1.3", RFC 8446, DOI 10.17487/RFC8446, August 2018, <<https://www.rfc-editor.org/rfc/rfc8446>>.
- [RFC8453] Ceccarelli, D., Ed. and Y. Lee, Ed., "Framework for Abstraction and Control of TE Networks (ACTN)", RFC 8453, DOI 10.17487/RFC8453, August 2018, <<https://www.rfc-editor.org/rfc/rfc8453>>.
- [RFC8792] Watsen, K., Auerswald, E., Farrel, A., and Q. Wu, "Handling Long Lines in Content of Internet-Drafts and RFCs", RFC 8792, DOI 10.17487/RFC8792, June 2020, <<https://www.rfc-editor.org/rfc/rfc8792>>.
- [RFC8969] Wu, Q., Ed., Boucadair, M., Ed., Lopez, D., Xie, C., and L. Geng, "A Framework for Automating Service and Network Management with YANG", RFC 8969, DOI 10.17487/RFC8969, January 2021, <<https://www.rfc-editor.org/rfc/rfc8969>>.
- [RFC9000] Iyengar, J., Ed. and M. Thomson, Ed., "QUIC: A UDP-Based Multiplexed and Secure Transport", RFC 9000, DOI 10.17487/RFC9000, May 2021, <<https://www.rfc-editor.org/rfc/rfc9000>>.
- [RFC9907] Bierman, A., Boucadair, M., Ed., and Q. Wu, "Guidelines for Authors and Reviewers of Documents Containing YANG Data Models", BCP 216, RFC 9907, DOI 10.17487/RFC9907, March 2026, <<https://www.rfc-editor.org/rfc/rfc9907>>.
- [TMF_SD2-20] TM Forum, "SD2-20_Equipment Model", TMF MTOSI 4.0, Network Resource Fulfilment (NRF), SD2-20 , May 2008, <<https://www.tmforum.org/resources/suite/mtosi-4-0/>>.

Appendix A. Comparison With Openconfig-platform Data Model

Since more and more devices can be managed by domain controller through OpenConfig, to ensure that our inventory data model can cover these devices' inventory data, we have compared our inventory data model with the "openconfig-platform" and "openconfig-platform-types" YANG modules, as defined in [OpenConfig], which defines the YANG data model used to manage inventory information in OpenConfig.

Openconfig-platform data model is NE-level and uses a generic component concept to describe its inner devices and containers, which is similar to "ietf-hardware" model in [RFC8348]. Since we have also reused the component concept of [RFC8348] in our inventory data model, we can compare the component's attributes between "openconfig-platform" and our model directly, which is stated in Table 2.

Attributes in oc-platform	Attributes in our model	remark
name	name	
type	class	see Table 3 for comparison between oc-platform- type:OPENCONFIG_HARDWARE_COMPONENT and ianahw:hardware-clas
id	uuid	
location	location	
description	description	
mfg-name	mfg-name	
mfg-date	mfg-date	
hardware- version	hardware- rev	
firmware- version	software- rev*	items of software-rev list that provide firmware information
software- version	software- rev*	items of software-rev list that provide software information
serial-no	serial- number	
part-no	part-number	
clei-code	uri	CLEI code can be mapped into one URI as defined in [RFC4152]
removable	is-fru	

oper-status		state data
empty		If there is no other component that refer to an holder as parent, it can be considered empty
parent	parent-references	
redundant-role		functional information, may be part of future augmentation
last-switchover-reason		state data
last-switchover-time		state data
last-reboot-reason		state data
last-reboot-time		state data
switchover-ready		state data
temperature		performance data
memory		performance data
allocated-power		state/performance data
used-power		state/performance data
pcie		alarm data
properties		Generic properties can be handled as part of "description"
subcomponents		

Table 2: Comparison between openconfig platform and inventory data models

As it mentioned in Section 3.3 that state data and performance data are out of scope of our data model, it is same for alarm data and it should be defined in some other alarm data models separately. For the same reason some component specific structures in "openconfig-platform", like the one defined for fan, backplane, controller-card, etc., are considered out of scope since they provide specialized operational and alarms data for that components.

It is also useful to compare the identity oc-platform-type:OPENCONFIG_HARDWARE_COMPONENT with ianahw:hardware-class in the following Table 3 to highlight that our model align with openconfig-platorm also for the definition of hardware component type/class.

oc-platform- type:OPENCONFIG_HARDWARE_COMPONENT	ianahw:hardware- class
CHASSIS	chassis
BACKPLANE	backplane
FABRIC	module
POWER_SUPPLY	power-supply
FAN	fan
FAN_TRAY	module
FAN_TRAY_CONTROLLER	module
SENSOR	sensor
LINECARD	module
CONTROLLER_CARD	module
PORT	port
USB_PORT	port
TRANSCEIVER	module
CPU	cpu
STORAGE	storage-drive
INTEGRATED_CIRCUIT	module
WIFI_ACCESS_POINT	N/A (technology specific)
FPGA	module

Table 3: Comparison between openconfig-platform
OPENCONFIG_HARDWARE_COMPONENTEN and IANA hardware-class identity

Overall we can state that our inventory data model can be populated with data from a device running OpenConfig.

Appendix B. Terminology of Container

Within this document , with the term "container" we consider a hardware component class capable of containing one or more removable physical entities, e.g. a slot in a chassis is containing a board.

+=====+=====+	
terminology of IVY base model terminology in other model	
+=====+=====+	
container	holder
+-----+-----+	

Table 4: terminology mapping

Appendix C. Efficiency Issue

During the integration with OSS in some operators, some efficiency/scalability concerns have been discovered when synchronizing network inventory data for big networks. As outlined in Section 7, these efficiency and scalability issues can pose security issues.

While implementing NACM [RFC8341] and protocol-specific filtering mechanisms (e.g., RESTCONF filtering [RFC8040]) mitigates these efficiency and scalability concerns, full resolution may require further protocol enhancements beyond the scope of this document.

Considering that relational databases are widely used by existing OSS systems and also by some network controllers, the inventory objects are most likely to be saved in different tables. With the model defined in this document, when doing a full synchronization, network controller needs to convert all inventory objects of each NE into component objects and combine them together into a single list, and then construct a response and send to OSS or MDSC. The OSS or MDSC needs to classify the component list and divide them into different groups, in order to save them in different tables. The combining-regrouping steps are impacting the network controller & OSS/MDSC processing, which may result in efficiency/scalability limitations in large scale networks.

An alternative YANG model structure, which defines the inventory objects directly, instead of defining generic components, has also been analyzed. However, also with this model, there still could be some scalability limitations when synchronizing full inventory resources in large scale of networks. This scalability limitation is caused by the limited transmission capabilities of HTTP protocol. We think that this scalability limitation should be solved at protocol level rather than data model level.

The model proposed by this document is designed to be as generic as possible so to cover future special types of inventory objects that could be used in other technologies, that have not been identified yet. If the inventory objects were to be defined directly with fixed hierarchical relationships in YANG model, this new type of inventory objects needs to be manually defined, which is not a backward compatible change and therefore is not an acceptable approach for implementation. With a generic model, it is only needed to augment a new component class and extend some specific attributes for this new inventory component class, which is more flexible. We consider that this generic data model, enabling a flexible and backward compatible approach for other technologies, represents the main scope of this document. Solution description to efficiency/scalability limitations mentioned above is considered as out-of-scope.

Appendix D. Examples of ports

This appendix provides some examples of port implementations and how they can be modelled using the "ietf-network-inventory" module defined in Section 5.

Figure 4 shows an example of a single board which contains three type of ports:

1. An integrated port (non-pluggable);
2. An empty port;
3. A pluggable port

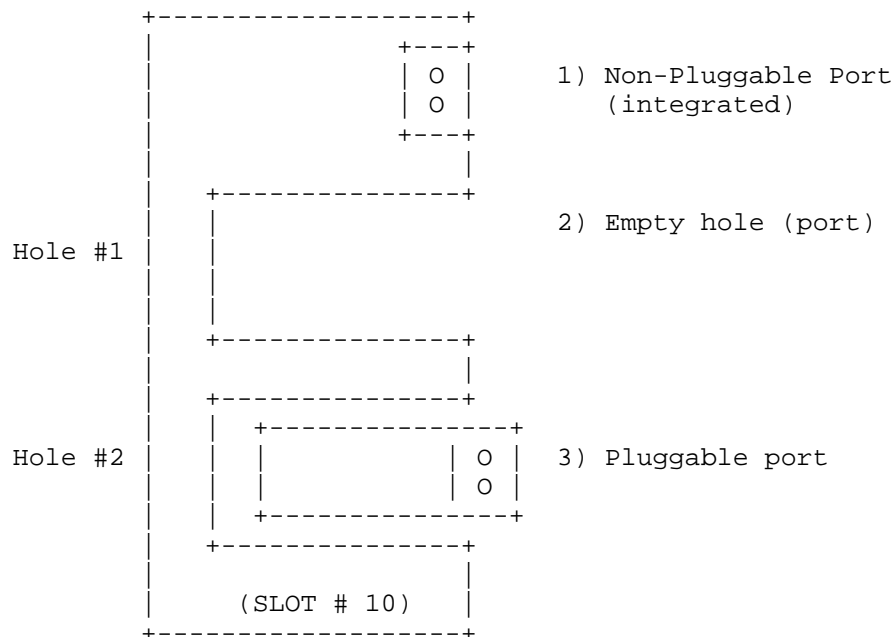


Figure 4: Example of a board with different types of ports

D.1. JSON Examples

This appendix contains an example of an instance data tree in JSON encoding [RFC7951], instantiating the "ietf-network-inventory" module to describe the three types of ports on a single board, as shown in Figure 4.

===== NOTE: '\ ' line wrapping per RFC 8792 =====

```
{
  "ietf-network-inventory:network-inventory": {
    "network-elements": {
      "network-element" : [
        {
          "ne-id": "NE-1",
          "description": "Network element example with fixed and \
                        pluggable ports.",
          "components": {
            "component": [
              {
                "component-id": "board-1",
                "class": "iana-hardware:module",
                "description": "Board example with fixed and \
```


Appendix E. Example of multi-chassis network elements

This appendix provides some examples of multi-chassis network elements and how they can be modelled using the "ietf-network-inventory" module defined in Section 5.

Multi-chassis network elements are network elements composed by two or more chassis interconnected, in principle, with any topology.

Stacked switches are an example of multi-chassis which consist of multiple standalone switches that are interconnected through dedicated stack ports and cables and managed as a single logical unit. Stacked switch:

- * are connected using a daisy-chain or a ring topology
- * are managed using a single IP Address
- * synchronized software-upgrade
- * use Priority/MAC-Addr(s) to decide Main/Members selection and communication.

Figure 5 and Figure 6 describe two examples of stacked switch with three stacked switches (pizza boxes) connected in a daisy-chain or ring topology.

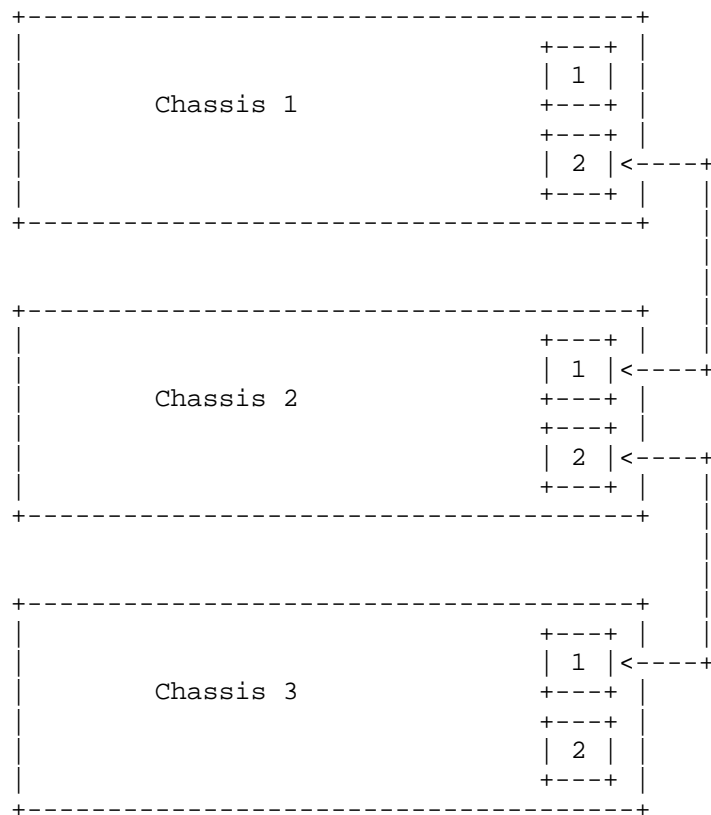


Figure 5: Example of a stacked switch in a daisy chain topology

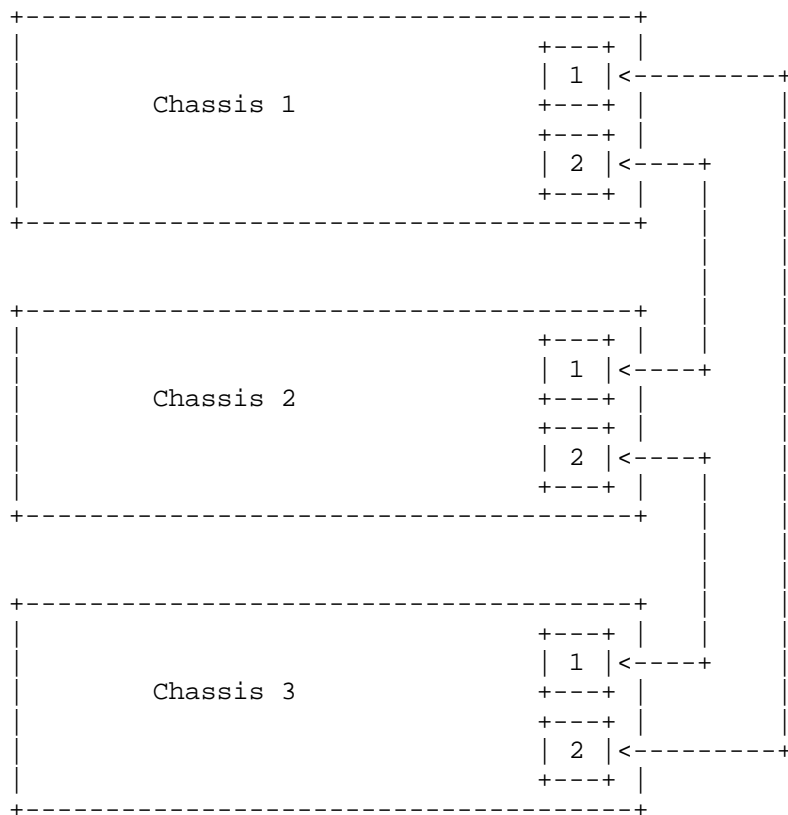


Figure 6: Example of a stacked switch in a ring topology

Using the base network inventory YANG data model, each stackable switch can be modelled as a chassis within the same network element, which models the stacked switch. The stack ports are modelled like other ports. The stack cables are not reported using the base network inventory YANG data model but can be reported using the passive network inventory YANG data model under definition in [I-D.ygb-ivy-passive-network-inventory].

Cascaded switches are another example of multi-chassis which consist of multiple standalone switches that are interconnected and managed as a single logical unit. Cascaded switch:

- * are usually connected in a tree topology
- * are managed using a single IP Address
- * the root of the tree is configured as Main.

Figure 7 describe an example of cascaded switch with three chassis connected in a tree topology.

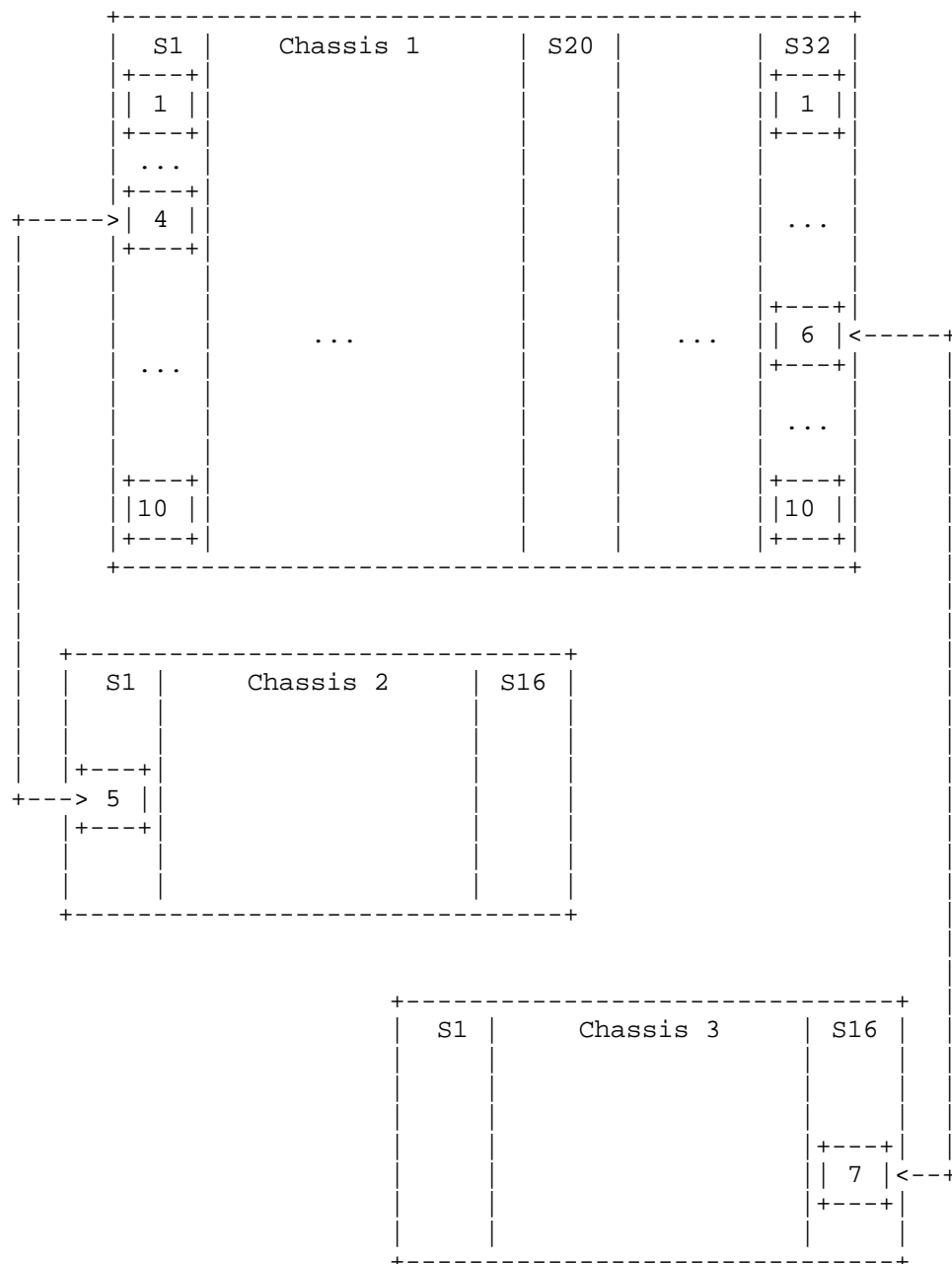


Figure 7: Example of a cascaded switch in a tree topology

Using the base network inventory YANG data model each interconnected switch can be modelled as a chassis within the same network element, which models the cascaded switch. The ports used to interconnect the different chassis are normal (traffic) ports and modelled like other ports. The interconnecting cables are not reported using the base network inventory YANG data model but can be reported using the passive network inventory model under definition in [I-D.ygb-ivy-passive-network-inventory].

E.1. JSON Examples

This appendix contains an example of an instance data tree in JSON encoding [RFC7951], instantiating the "ietf-network-inventory" model to describe the three examples of multi-chassis NEs, as shown in Figure 5, Figure 6 and Figure 7.

Note: the base inventory model allows reporting only the chassis and ports configuration. Reporting the link between the chassis of the same NE is outside the scope of the base inventory model. The YANG data model under definition in [I-D.ygb-ivy-passive-network-inventory] as an augmentation of the base inventory YANG data model can be used to provide this additional information.

===== NOTE: '\ ' line wrapping per RFC 8792 =====

```
{
  "ietf-network-inventory:network-inventory": {
    "network-elements": {
      "network-element" : [
        {
          "ne-id": "NE-1",
          "description": "Stack Switch in a daisy chain topology.",
          "components": {
            "component": [
              {
                "component-id": "chassis-1",
                "class": "iana-hardware:chassis",
                "description": "First switch of the stack.",
                "parent-rel-pos": "1",
                "is-fru": true
              },
              {
                "component-id": "port-1-1",
                "class": "iana-hardware:port",
                "description": "First stack port of the first \
```

```

switch in the stack.",
    "parent": [
        "chassis-1"
    ],
    "parent-rel-pos": "1"
},
{
    "component-id": "port-1-2",
    "class": "iana-hardware:port",
    "description": "Second stack port of the first \
                    switch in the stack.",
    "parent": [
        "chassis-1"
    ],
    "parent-rel-pos": "2"
},
{
    "component-id": "transceiver-module-1-2",
    "class": "iana-hardware:module",
    "description": "Transceiver module plugged in the \
                    second stack port of the first switch in the stack.",
    "parent": [
        "port-1-2"
    ],
    "is-fru": true
},
{
    "component-id": "chassis-2",
    "class": "iana-hardware:chassis",
    "description": "Second switch of the stack.",
    "parent-rel-pos": "2",
    "is-fru": true
},
{
    "component-id": "port-2-1",
    "class": "iana-hardware:port",
    "description": "First stack port of the second \
                    switch in the stack.",
    "parent": [
        "chassis-2"
    ],
    "parent-rel-pos": "1"
},
{
    "component-id": "transceiver-module-2-1",
    "class": "iana-hardware:module",
    "description": "Transceiver module plugged in the \
                    first stack port of the first switch in the stack.",

```

```
    "parent": [
      "port-2-1"
    ],
    "is-fru": true
  },
  {
    "component-id": "port-2-2",
    "class": "iana-hardware:port",
    "description": "Second stack port of the second \
                    switch in the stack.",
    "parent": [
      "chassis-2"
    ],
    "parent-rel-pos": "2"
  },
  {
    "component-id": "transceiver-module-2-2",
    "class": "iana-hardware:module",
    "description": "Transceiver module plugged in the \
                    second stack port of the first switch in the stack.",
    "parent": [
      "port-2-2"
    ],
    "is-fru": true
  },
  {
    "component-id": "chassis-3",
    "class": "iana-hardware:chassis",
    "description": "Third switch of the stack.",
    "parent-rel-pos": "3",
    "is-fru": true
  },
  {
    "component-id": "port-3-1",
    "class": "iana-hardware:port",
    "description": "First stack port of the third \
                    switch in the stack.",
    "parent": [
      "chassis-3"
    ],
    "parent-rel-pos": "1"
  },
  {
    "component-id": "transceiver-module-3-1",
    "class": "iana-hardware:module",
    "description": "Transceiver module plugged in the \
                    first stack port of the third switch in the stack.",
    "parent": [
```



```

        "port-3-1"
      ],
      "is-fru": true
    },
    {
      "component-id": "port-3-2",
      "class": "iana-hardware:port",
      "description": "Second stack port of the second \
                      switch in the stack.",
      "parent": [
        "chassis-3"
      ],
      "parent-rel-pos": "2"
    }
  ]
}
},
{
  "ne-id": "NE-2",
  "description": "Stack Switch in a ring topology.",
  "components": {
    "component": [
      {
        "component-id": "chassis-1",
        "class": "iana-hardware:chassis",
        "description": "First switch of the stack.",
        "parent-rel-pos": "1",
        "is-fru": true
      },
      {
        "component-id": "port-1-1",
        "class": "iana-hardware:port",
        "description": "First stack port of the first \
                      switch in the stack.",
        "parent": [
          "chassis-1"
        ],
        "parent-rel-pos": "1"
      },
      {
        "component-id": "transceiver-module-1-1",
        "class": "iana-hardware:module",
        "description": "Transceiver module plugged in the \
                      first stack port of the first switch in the stack.",
        "parent": [
          "port-1-1"
        ],
        "is-fru": true
      }
    ]
  }
}

```

```
    },
    {
      "component-id": "port-1-2",
      "class": "iana-hardware:port",
      "description": "Second stack port of the first \
                      switch in the stack.",
      "parent": [
        "chassis-1"
      ],
      "parent-rel-pos": "2"
    },
    {
      "component-id": "transceiver-module-1-2",
      "class": "iana-hardware:module",
      "description": "Transceiver module plugged in the \
second stack port of the first switch in the stack.",
      "parent": [
        "port-1-2"
      ],
      "is-fru": true
    },
    {
      "component-id": "chassis-2",
      "class": "iana-hardware:chassis",
      "description": "Second switch of the stack.",
      "parent-rel-pos": "2",
      "is-fru": true
    },
    {
      "component-id": "port-2-1",
      "class": "iana-hardware:port",
      "description": "First stack port of the second \
                      switch in the stack.",
      "parent": [
        "chassis-2"
      ],
      "parent-rel-pos": "1"
    },
    {
      "component-id": "transceiver-module-2-1",
      "class": "iana-hardware:module",
      "description": "Transceiver module plugged in the \
first stack port of the second switch in the stack.",
      "parent": [
        "port-2-1"
      ],
      "is-fru": true
    },
  ],
}
```

```
{
  "component-id": "port-2-2",
  "class": "iana-hardware:port",
  "description": "Second stack port of the second \
                  switch in the stack.",
  "parent": [
    "chassis-2"
  ],
  "parent-rel-pos": "2"
},
{
  "component-id": "transceiver-module-2-2",
  "class": "iana-hardware:module",
  "description": "Transceiver module plugged in the \
second stack port of the second switch in the stack.",
  "parent": [
    "port-2-2"
  ],
  "is-fru": true
},
{
  "component-id": "chassis-3",
  "class": "iana-hardware:chassis",
  "description": "Third switch of the stack.",
  "parent-rel-pos": "3",
  "is-fru": true
},
{
  "component-id": "port-3-1",
  "class": "iana-hardware:port",
  "description": "First stack port of the third \
                  switch in the stack.",
  "parent": [
    "chassis-3"
  ],
  "parent-rel-pos": "1"
},
{
  "component-id": "transceiver-module-3-1",
  "class": "iana-hardware:module",
  "description": "Transceiver module plugged in the \
first stack port of the third switch in the stack.",
  "parent": [
    "port-3-1"
  ],
  "is-fru": true
},
{

```

```

        "component-id": "port-3-2",
        "class": "iana-hardware:port",
        "description": "Second stack port of the third \
                        switch in the stack.",
        "parent": [
            "chassis-3"
        ],
        "parent-rel-pos": "2"
    },
    {
        "component-id": "transceiver-module-3-2",
        "class": "iana-hardware:module",
        "description": "Transceiver module plugged in the \
                        second stack port of the third switch in the stack.",
        "parent": [
            "port-3-2"
        ],
        "is-fru": true
    }
]
}
},
{
    "ne-id": "NE-3",
    "description": "Cascaded Switch in a tree topology.",
    "components": {
        "component": [
            {
                "component-id": "chassis-1",
                "class": "iana-hardware:chassis",
                "description": "First chassis of the cascaded switch\
                                .",
                "parent-rel-pos": "1",
                "is-fru": true
            },
            {
                "component-id": "slot-1-1",
                "class": "iana-hardware:container",
                "description": "Slot 1 of the first chassis of the \
                                cascaded switch.",
                "parent": [
                    "chassis-1"
                ],
                "parent-rel-pos": "1"
            },
            {
                "component-id": "card-1-1",
                "class": "iana-hardware:module",

```

```

        "description": "Card plugged into slot 1 of the \
                        first chassis of the cascaded switch.",
        "parent": [
            "slot-1-1"
        ],
        "is-fru": true
    },
    {
        "component-id": "port-1-1-1",
        "class": "iana-hardware:port",
        "description": "Empty port 1 on the card plugged \
into slot 1 of the first chassis of the cascaded switch.",
        "parent": [
            "card-1-1"
        ],
        "parent-rel-pos": "1"
    },
    {
        "component-id": "port-1-1-4",
        "class": "iana-hardware:port",
        "description": "Pluggable port 4 on the card \
plugged into slot 1 of the first chassis of the cascaded switch.",
        "parent": [
            "card-1-1"
        ],
        "parent-rel-pos": "4"
    },
    {
        "component-id": "transceiver-module-1-1-4",
        "class": "iana-hardware:module",
        "description": "Transceiver module plugged in port \
4 on the card plugged into slot 1 of the first chassis of the \
                        cascaded switch.",
        "parent": [
            "port-1-1-4"
        ],
        "is-fru": true
    },
    {
        "component-id": "port-1-1-10",
        "class": "iana-hardware:port",
        "description": "Empty port 10 on the card plugged \
into slot 1 of the first chassis of the cascaded switch.",
        "parent": [
            "card-1-1"
        ],
        "parent-rel-pos": "10"
    },
    },

```

```

    {
      "component-id": "slot-1-20",
      "class": "iana-hardware:container",
      "description": "Empty slot 20 of the first chassis \
                      of the cascaded switch.",
      "parent": [
        "chassis-1"
      ],
      "parent-rel-pos": "20"
    },
    {
      "component-id": "slot-1-32",
      "class": "iana-hardware:container",
      "description": "Slot 32 of the first chassis of the \
                      cascaded switch.",
      "parent": [
        "chassis-1"
      ],
      "parent-rel-pos": "32"
    },
    {
      "component-id": "card-1-32",
      "class": "iana-hardware:module",
      "description": "Card plugged into slot 32 of the \
                      first chassis of the cascaded switch.",
      "parent": [
        "slot-1-32"
      ],
      "is-fru": true
    },
    {
      "component-id": "port-1-32-1",
      "class": "iana-hardware:port",
      "description": "Empty port 1 on the card plugged \
into slot 32 of the first chassis of the cascaded switch.",
      "parent": [
        "card-1-32"
      ],
      "parent-rel-pos": "1"
    },
    {
      "component-id": "port-1-32-6",
      "class": "iana-hardware:port",
      "description": "Pluggable port 6 on the card \
plugged into slot 32 of the first chassis of the cascaded switch.",
      "parent": [
        "card-1-32"
      ],
    },

```

```

        "parent-rel-pos": "6"
    },
    {
        "component-id": "transceiver-module-1-32-6",
        "class": "iana-hardware:module",
        "description": "Transceiver module plugged in port \
6 on the card plugged into slot 32 of the first chassis of the \
                                cascaded switch.",
        "parent": [
            "port-1-32-6"
        ],
        "is-fru": true
    },
    {
        "component-id": "port-1-32-10",
        "class": "iana-hardware:port",
        "description": "Empty port 10 on the card plugged \
into slot 32 of the first chassis of the cascaded switch.",
        "parent": [
            "card-1-32"
        ],
        "parent-rel-pos": "10"
    },
    {
        "component-id": "chassis-2",
        "class": "iana-hardware:chassis",
        "description": "Second chassis of the cascaded \
                                switch.",
        "parent-rel-pos": "2",
        "is-fru": true
    },
    {
        "component-id": "slot-2-1",
        "class": "iana-hardware:container",
        "description": "Slot 1 of the second chassis of the \
                                cascaded switch.",
        "parent": [
            "chassis-2"
        ],
        "parent-rel-pos": "1"
    },
    {
        "component-id": "card-2-1",
        "class": "iana-hardware:module",
        "description": "Card plugged into slot 1 of the \
                                second chassis of the cascaded switch.",
        "parent": [
            "slot-2-1"
        ]
    }

```

```

    ],
    "is-fru": true
  },
  {
    "component-id": "port-2-1-5",
    "class": "iana-hardware:port",
    "description": "Pluggable port 5 on the card \
plugged into slot 1 of the second chassis of the cascaded switch.",
    "parent": [
      "card-2-1"
    ],
    "parent-rel-pos": "5"
  },
  {
    "component-id": "transceiver-module-2-1-5",
    "class": "iana-hardware:module",
    "description": "Transceiver module plugged in port \
5 on the card plugged into slot 1 of the second chassis of the \
cascaded switch.",
    "parent": [
      "port-2-1-5"
    ],
    "is-fru": true
  },
  {
    "component-id": "slot-2-16",
    "class": "iana-hardware:container",
    "description": "Slot 16 of the second chassis of \
the cascaded switch.",
    "parent": [
      "chassis-2"
    ],
    "parent-rel-pos": "16"
  },
  {
    "component-id": "chassis-3",
    "class": "iana-hardware:chassis",
    "description": "Third chassis of the cascaded switch\
.",
    "parent-rel-pos": "3",
    "is-fru": true
  },
  {
    "component-id": "slot-3-1",
    "class": "iana-hardware:container",
    "description": "Empty slot 1 of the third chassis \
of the cascaded switch.",
    "parent": [

```



```

        "chassis-3"
      ],
      "parent-rel-pos": "1"
    },
    {
      "component-id": "slot-3-16",
      "class": "iana-hardware:container",
      "description": "Slot 16 of the third chassis of the \
                    cascaded switch.",
      "parent": [
        "chassis-3"
      ],
      "parent-rel-pos": "16"
    },
    {
      "component-id": "card-3-16",
      "class": "iana-hardware:module",
      "description": "Card plugged into slot 16 of the \
                    third chassis of the cascaded switch.",
      "parent": [
        "slot-3-16"
      ],
      "is-fru": true
    },
    {
      "component-id": "port-3-16-7",
      "class": "iana-hardware:port",
      "description": "Pluggable port 7 on the card \
                    plugged into slot 16 of the third chassis of the cascaded switch.",
      "parent": [
        "card-3-16"
      ],
      "parent-rel-pos": "7"
    },
    {
      "component-id": "transceiver-module-3-16-7",
      "class": "iana-hardware:module",
      "description": "Transceiver module plugged in port \
                    7 on the card plugged into slot 16 of the third chassis of the \
                    cascaded switch.",
      "parent": [
        "port-3-16-7"
      ],
      "is-fru": true
    }
  ]
}

```

```

    ]
  }
}

```

Appendix F. Example of non-modular network elements

This appendix provides some examples of non-modular network elements and how they can be modelled using the "ietf-network-inventory" module defined in Section 5.

Non-modular network elements (also known as "pizza boxes") are network elements composed by a single chassis as a self-contained system. A non-modular network element does not have any slots to take cards so it cannot take any non-field replaceable modules other than pluggable ports.

Figure 8 describes an example of a pizza box with 8 ports.

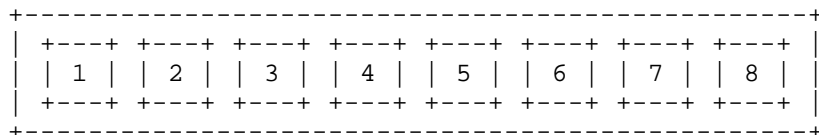


Figure 8: Example of an 8 ports pizza box device

Using the base network inventory YANG data model a non-modular network element can be modelled as a network element containing only one chassis and ports (as child components of the chassis).

Reporting the single chassis component within a non-modular network element is required because the chassis component is the type of component which provides the physical characteristics of the network element chassis (the network element is defined just as an assembly of components) and its location, using the network inventory YANG data model under definition in [I-D.ietf-ivy-network-inventory-location].

F.1. JSON Examples

This appendix contains an example of an instance data tree in JSON encoding [RFC7951], instantiating the "ietf-network-inventory" module to describe the pizza box example, as shown in Figure 8.

```
{
  "ietf-network-inventory:network-inventory": {
    "network-elements": {
      "network-element" : [
        {
          "ne-id": "Pizza-box-NE",
          "description": "Example of a pizza box NE.",
          "components": {
            "component": [
              {
                "component-id": "pizza-chassis",
                "class": "iana-hardware:chassis",
                "description": "Pizza box chassis.",
                "is-fru": true
              },
              {
                "component-id": "port-1",
                "class": "iana-hardware:port",
                "description": "Port 1 of the pizza box.",
                "parent": [
                  "pizza-chassis"
                ],
                "parent-rel-pos": "1"
              },
              {
                "component-id": "port-2",
                "class": "iana-hardware:port",
                "description": "Port 2 of the pizza box.",
                "parent": [
                  "pizza-chassis"
                ],
                "parent-rel-pos": "2"
              },
              {
                "component-id": "port-3",
                "class": "iana-hardware:port",
                "description": "Port 3 of the pizza box.",
                "parent": [
                  "pizza-chassis"
                ],
                "parent-rel-pos": "3"
              },
              {
                "component-id": "port-4",
                "class": "iana-hardware:port",
                "description": "Port 4 of the pizza box.",
                "parent": [
                  "pizza-chassis"
                ]
              }
            ]
          }
        }
      ]
    }
  }
}
```

```
[{"component-id": "port-0", "class": "iana-hardware:port", "description": "Port 0 of the pizza box.", "parent": [{"pizza-chassis"}], "parent-rel-pos": "0"}, {"component-id": "port-1", "class": "iana-hardware:port", "description": "Port 1 of the pizza box.", "parent": [{"pizza-chassis"}], "parent-rel-pos": "1"}, {"component-id": "port-2", "class": "iana-hardware:port", "description": "Port 2 of the pizza box.", "parent": [{"pizza-chassis"}], "parent-rel-pos": "2"}, {"component-id": "port-3", "class": "iana-hardware:port", "description": "Port 3 of the pizza box.", "parent": [{"pizza-chassis"}], "parent-rel-pos": "3"}, {"component-id": "port-4", "class": "iana-hardware:port", "description": "Port 4 of the pizza box.", "parent": [{"pizza-chassis"}], "parent-rel-pos": "4"}, {"component-id": "port-5", "class": "iana-hardware:port", "description": "Port 5 of the pizza box.", "parent": [{"pizza-chassis"}], "parent-rel-pos": "5"}, {"component-id": "port-6", "class": "iana-hardware:port", "description": "Port 6 of the pizza box.", "parent": [{"pizza-chassis"}], "parent-rel-pos": "6"}, {"component-id": "port-7", "class": "iana-hardware:port", "description": "Port 7 of the pizza box.", "parent": [{"pizza-chassis"}], "parent-rel-pos": "7"}, {"component-id": "port-8", "class": "iana-hardware:port", "description": "Port 8 of the pizza box.", "parent": [{"pizza-chassis"}], "parent-rel-pos": "8"}]
```

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This document was prepared using kramdown.

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