



YANG and RestConf Overview for Fibre Channel (T11-2017-00028-v000)

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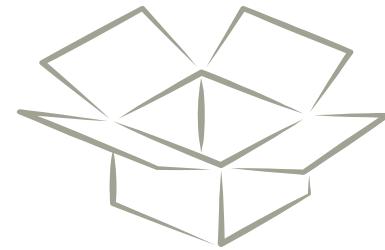
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Yang



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Yang

- Human readable data model
- Hierarchical
- Reusable types and groupings
- Extensible
- Operations (RPCs)
- Formal constraints for configuration validation
- Modular (modules and sub-modules)



YANG Types

- Native
 - {u}int {8,16,32,64}, string, enumeration, boolean, etc.
- ietf-yang-types.yang
 - a collection of generally useful derived YANG data types
- ietf-inet-types.yang
 - a collection of generally useful derived YANG data types for Internet addresses and related things.
- iana-if-types
 - defines YANG identities for IANA-registered interface types



iana-if-types.yang

Already has

```
identity fibreChannel {  
    base iana-interface-type;  
    description  
        "Fibre Channel.";  
}
```

Examples of possible Fibre Channel types (fibre-channel-types.yang)

```
typedef wwn-type {
    type string {
        pattern '([0-9a-fA-F]{2}(:[0-9a-fA-F]{2}){7})';
    }
    description
        "Fibre channel WWN (16 uppercase hex digits with the colon separator).
         For example 11:22:33:44:55:66:77:88.";
}

typedef domain-id-type {
    type uint32 {
        range 1..239;
    }
    description "Fibre Channel Domain Identifier.";
}

typedef fcid-type {
    type uint32;
    description
        "Fibre channel ID (FCID) (when displayed, it typically is shown as 12
         unseparated uppercase hex digits)";
}
```



ietf-interfaces yang module

```
module: ietf-interfaces
  +-rw interfaces
    +-rw interface* [name]
      +-rw name                      string
      +-rw description?              string
      +-rw type                      identityref
      +-rw enabled?                  boolean
      +-rw link-up-down-trap-enable? enumeration {if-mib}?
```



ietf-interfaces yang module

```
+--ro interfaces-state
    +-+ro interface* [name]
        +-+ro name                  string
        +-+ro type                  identityref
        +-+ro admin-status          enumeration {if-mib}?
        +-+ro oper-status           enumeration
        +-+ro last-change?         yang:date-and-time
        +-+ro if-index              int32 {if-mib}?
        +-+ro phys-address?        yang:phys-address
        +-+ro higher-layer-if*     interface-state-ref
        +-+ro lower-layer-if*      interface-state-ref
        +-+ro speed?               yang:gauge64
```



ietf-interfaces yang module

```
+--ro statistics
    +-+ro discontinuity-time      yang:date-and-time
    +-+ro in-octets?              yang:counter64
    +-+ro in-unicast-pkts?        yang:counter64
    +-+ro in-broadcast-pkts?      yang:counter64
    +-+ro in-multicast-pkts?      yang:counter64
    +-+ro in-discard?             yang:counter32
    +-+ro in-errors?              yang:counter32
    +-+ro in-unknown-protos?       yang:counter32
    +-+ro out-octets?              yang:counter64
    +-+ro out-unicast-pkts?        yang:counter64
    +-+ro out-broadcast-pkts?      yang:counter64
    +-+ro out-multicast-pkts?      yang:counter64
    +-+ro out-discard?             yang:counter32
    +-+ro out-errors?              yang:counter32
```



Augment ietf-interface.yang

For Fibre Channel using iana type (a snippet)

```
augment "/if:interfaces/if:interface" {
    when "/if:type = 'ianaif:fibreChannel' {
        description
            "Applies to the fibre channel interface.";
    }
    description
        "Augment interface model with fibre channel
interfaces.";
    container fibrechannel {
```



Leverage existing MIBs

- RFC 4044 – Fibre Channel Management MIB
- RFC 4936 – Fibre Channel Zone Server Manager

Development Model

- Manage development with T11
 - Same model as IEEE
- IEEE YANG Models kept in github
 - See <https://github.com/YangModels/yang/tree/master/standard/ieee>



Conventions and Style Guides

- Guidelines for Authors and Reviewers of YANG Data Model Documents
 - <https://tools.ietf.org/html/rfc6087>
- OpenConfig Style Guide
 - https://github.com/openconfig/public/blob/master/doc/openconfig_style_guide.md
- ODL YANG Best Practices
 - http://events.linuxfoundation.org/sites/events/files/slides/YangBestPractices-ODL%20Summit%202015_v4.pdf



pyang

- Extensible YANG validator written in Python
- --lint
 - Validate the module(s) according to RFC 6087 rules.
- --strict
 - Force strict YANG compliance.
- -f tree
 - Format YANG module to tree

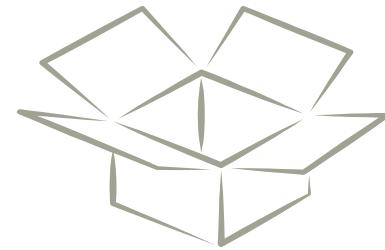


IETF YANG Tutorial

- Link to slides at IETF 84: NETCONF and YANG
 - <https://www.ietf.org/edu/documents/2012-ietf-84-netconf-yang.pdf>
 - Starts on slide 42



RestConf



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RestConf

- Describes how to access YANG defined data through a RESTful protocol
- IETF Draft
- Simpler interface than NETCONF
 - Client libraries for most languages
- HTTP and XML
 - JSON
- Operations (Get, Post, Put, Delete,...)



RestConf Operations

- GET
 - Used to retrieve the representation of the resource including the metadata information.
- POST
 - Used to create a new resource in the specific resource location identified by the URI specified in the given request. The URI of the newly created resource is mentioned in the "Location" header of the response.
- PUT
 - Used to update or replace an existing "Container" resource completely. If the URI does not identify the resource to be replaced, then the resource in the request URI is newly created, and the URI of the newly created resource is mentioned in the "Location" header of the response.



RestConf Operations

- PATCH
 - Used to edit or update the leaf attributes of the resource (List or Container), if the system supports the modification.
- DELETE
 - Used to delete the known resource.
- HEAD
 - Used to retrieve the metadata information of the resource, identified by the given request. The response to this operation contains only the headers and an empty response body.
- OPTIONS
 - Used to retrieve the allowed methods on the resource identified by the given request. The response to this operation contains the headers and an empty response body. The "Allow" header contains the allowed operations on the resource.





Thank you

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