

YANG Groupings for TCP Clients and TCP Servers
draft-ietf-netconf-tcp-client-server-01

Abstract

This document defines three YANG modules: the first defines a grouping for configuring a generic TCP client, the second defines a grouping for configuring a generic TCP server, and the third defines a grouping common to the TCP clients and TCP servers.

Editorial Note (To be removed by RFC Editor)

This draft contains many 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. No other RFC Editor instructions are specified elsewhere in this document.

Artwork in this document contains placeholder values for the date of publication of this draft. Please apply the following replacement:

- o "2019-06-07" --> the publication date of this draft

The following Appendix section is to be removed prior to publication:

- o [Appendix A](#). Change Log

Status of This Memo

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1. Introduction

This document defines three YANG 1.1 [[RFC7950](#)] modules: the first defines a grouping for configuring a generic TCP client, the second defines a grouping for configuring a generic TCP server, and the third defines a grouping common to the TCP clients and TCP servers.

It is intended that these groupings will be used either standalone, for TCP-based protocols, as part of a stack of protocol-specific configuration models. For instance, these groupings could help define the configuration module for SSH, TLS, or HTTP based applications.

2. Terminology

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.

3. The TCP Client Model

3.1. Tree Diagram

This section provides a tree diagram [[RFC8340](#)] for the "ietf-tcp-client" module.

```
module: ietf-tcp-client
```

```
  grouping tcp-client-grouping
    +-- remote-address      inet:host
    +-- remote-port?       inet:port-number
    +-- local-address?     inet:ip-address {local-binding-supported}?
    +-- local-port?        inet:port-number {local-binding-supported}?
    +-- keepalives! {keepalives-supported}?
      +-- idle-time         uint16
      +-- max-probes        uint16
      +-- probe-interval    uint16
```

3.2. Example Usage

This section presents an example showing the tcp-client-grouping populated with some data.


```
<tcp-client xmlns="urn:ietf:params:xml:ns:yang:ietf-tcp-client">
  <remote-address>www.example.com</remote-address>
  <remote-port>443</remote-port>
  <local-address>0.0.0.0</local-address>
  <local-port>0</local-port>
  <keepalives>
    <idle-time>15</idle-time>
    <max-probes>3</max-probes>
    <probe-interval>30</probe-interval>
  </keepalives>
</tcp-client>
```

3.3. YANG Module

The ietf-tcp-client YANG module references [\[RFC6991\]](#).

```
<CODE BEGINS> file "ietf-tcp-client@2019-06-07.yang"
module ietf-tcp-client {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-tcp-client";
  prefix tcpc;

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

  import ietf-tcp-common {
    prefix tcpcmn;
    reference
      "RFC XXXX: YANG Groupings for TCP Clients and TCP Servers";
  }

  organization
    "IETF NETCONF (Network Configuration) Working Group and the
     IETF TCP Maintenance and Minor Extensions (TCPM) Working Group";

  contact
    "WG Web:  <http://datatracker.ietf.org/wg/netconf/>
      <http://datatracker.ietf.org/wg/tcpm/>
     WG List: <mailto:netconf@ietf.org>
               <mailto:tcpm@ietf.org>
    Authors:  Kent Watsen <mailto:kent+ietf@watsen.net>
               Michael Scharf
               <mailto:michael.scharf@hs-esslingen.de>";

  description
```


"This module defines reusable groupings for TCP clients that can be used as a basis for specific TCP client instances.

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```
revision 2019-06-07 {
  description
    "Initial version";
  reference
    "RFC XXXX: YANG Groupings for TCP Clients and TCP Servers";
}

// Features

feature local-binding-supported {
  description
    "Indicates that the server supports configuring local bindings,
    the 'local-address' and 'local-port' nodes.";
}

feature tcp-client-keepalives {
  description
    "Per socket TCP keepalive parameters are configurable for
    TCP clients on the server implementing this feature.";
}

// Groupings

grouping tcp-client-grouping {
```


description

"A reusable grouping for configuring a TCP client.

Note that this grouping uses fairly typical descendent node names such that a stack of 'uses' statements will have name conflicts. It is intended that the consuming data model will resolve the issue (e.g., by wrapping the 'uses' statement in a container called 'tcp-client-parameters'). This model purposely does not do this itself so as to provide maximum flexibility to consuming models.";

leaf remote-address {

 type inet:host;

 mandatory true;

 description

 "The IP address or hostname of the remote peer to establish a connection with. If a domain name is configured, then the DNS resolution should happen on each connection attempt. If the the DNS resolution results in multiple IP addresses, the IP addresses are tried according to local preference order until a connection has been established or until all IP addresses have failed.";

}

leaf remote-port {

 type inet:port-number;

 default "0";

 description

 "The IP port number for the remote peer to establish a connection with. An invalid default value (0) is used (instead of 'mandatory true') so that as application level data model may 'refine' it with an application specific default portnumber value.";

}

leaf local-address {

 if-feature "local-binding-supported";

 type inet:ip-address;

 description

 "The local IP address/interface (VRF?) to bind to for when connecting to the remote peer. INADDR_ANY ('0.0.0.0') or INADDR6_ANY ('0:0:0:0:0:0:0:0' a.k.a. ':::') MAY be used to explicitly indicate the implicit default, that the server can bind to any IPv4 or IPv6 addresses, respectively.";

}

leaf local-port {

 if-feature "local-binding-supported";

 type inet:port-number;


```
    default "0";
    description
      "The local IP port number to bind to for when connecting
       to the remote peer.  The port number '0', which is the
       default value, indicates that any available local port
       number may be used.";
  }
  uses tcpcmn:tcp-connection-grouping {
    augment "keepalives" {
      if-feature "tcp-client-keepalives";
      description
        "Add an if-feature statement so that implementations
         can choose to support TCP client keepalives.";
    }
  }
}
}
}
<CODE ENDS>
```

4. The TCP Server Model

4.1. Tree Diagram

This section provides a tree diagram [[RFC8340](#)] for the "ietf-tcp-server" module.

module: ietf-tcp-server

```
grouping tcp-server-grouping
+-- local-address          inet:ip-address
+-- local-port?            inet:port-number
+-- keepalives! {keepalives-supported}?
| +-- idle-time           uint16
| +-- max-probes          uint16
| +-- probe-interval      uint16
+-- external-endpoint-values! {external-endpoints}?
    +-- address            inet:ip-address
    +-- port?              inet:port-number
```

4.2. Example Usage

This section presents an example showing the tcp-server-grouping populated with some data.


```
<tcp-server xmlns="urn:ietf:params:xml:ns:yang:ietf-tcp-server">
  <local-address>10.20.30.40</local-address>
  <local-port>7777</local-port>
  <keepalives>
    <idle-time>15</idle-time>
    <max-probes>3</max-probes>
    <probe-interval>30</probe-interval>
  </keepalives>
</tcp-server>
```

4.3. YANG Module

The ietf-tcp-server YANG module references [\[RFC6991\]](#).

```
<CODE BEGINS> file "ietf-tcp-server@2019-06-07.yang"
module ietf-tcp-server {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-tcp-server";
  prefix tcps;

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

  import ietf-tcp-common {
    prefix tcpcmn;
    reference
      "RFC XXXX: YANG Groupings for TCP Clients and TCP Servers";
  }

  organization
    "IETF NETCONF (Network Configuration) Working Group and the
     IETF TCP Maintenance and Minor Extensions (TCPM) Working Group";

  contact
    "WG Web:   <http://datatracker.ietf.org/wg/netconf/>
     <http://datatracker.ietf.org/wg/tcpm/>
     WG List:  <mailto:netconf@ietf.org>
               <mailto:tcpm@ietf.org>
     Authors:  Kent Watsen <mailto:kent+ietf@watsen.net>
               Michael Scharf
               <mailto:michael.scharf@hs-esslingen.de>;

  description
    "This module defines reusable groupings for TCP servers that
     can be used as a basis for specific TCP server instances."
```


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```
revision 2019-06-07 {
  description
    "Initial version";
  reference
    "RFC XXXX: YANG Groupings for TCP Clients and TCP Servers";
}
```

// Features

```
feature tcp-server-keepalives {
  description
    "Per socket TCP keepalive parameters are configurable for
    TCP servers on the server implementing this feature.";
}
```

```
feature external-endpoints {
  description
    "Per socket TCP keepalive parameters are configurable for
    TCP servers on the server implementing this feature.";
}
```

// Groupings

```
grouping tcp-server-grouping {
  description
    "A reusable grouping for configuring a TCP server."
```


Note that this grouping uses fairly typical descendent node names such that a stack of 'uses' statements will have name conflicts. It is intended that the consuming data model will resolve the issue (e.g., by wrapping the 'uses' statement in a container called 'tcp-server-parameters'). This model purposely does not do this itself so as to provide maximum flexibility to consuming models.";

```
leaf local-address {
  type inet:ip-address;
  mandatory true;
  description
    "The local IP address to listen on for incoming
    TCP client connections. INADDR_ANY (0.0.0.0) or
    INADDR6_ANY (0:0:0:0:0:0:0:0 a.k.a. ::) MUST be
    used when the server is to listen on all IPv4 or
    IPv6 addresses, respectively.";
}
leaf local-port {
  type inet:port-number;
  default "0";
  description
    "The local port number to listen on for incoming TCP
    client connections. An invalid default value (0)
    is used (instead of 'mandatory true') so that an
    application level data model may 'refine' it with
    an application specific default port number value.";
}
uses tcpcmn:tcp-connection-grouping {
  augment "keepalives" {
    if-feature "tcp-server-keepalives";
    description
      "Add an if-feature statement so that implementations
      can choose to support TCP server keepalives.";
  }
}
container external-endpoint-values {
  if-feature external-endpoints;
  presence
    "Indicates that external endpoint values are configured.";
  description
    "External endpoint values described the values used by
    an external system that terminates connections before
    passing them onto server. Such systems may include,
    e.g., a network address translator (NAT) or a load
    balancer (LB).
```

These values have no effect on the local operation of


```
        this server, but MAY be used by the application when
        sending messages including response contact information
        (e.g., URL).";
    leaf address {
        type inet:ip-address;
        mandatory true;
        description
            "The external IP address used to listen for incoming
            TCP client connections that are forwarded to this
            server.";
    }
    leaf port {
        type inet:port-number;
        default "0";
        description
            "The external port number used to listen for incoming
            TCP client connections that are forwarded to this
            server. An invalid default value (0) is used (instead
            of 'mandatory true') so that an application level data
            model may 'refine' it with an application specific
            default port number value.";
    }
}
}
}
}
<CODE ENDS>
```

5. The TCP Common Model

5.1. Tree Diagram

This section provides a tree diagram [[RFC8340](#)] for the "ietf-tcp-common" module.

module: ietf-tcp-common

```
grouping tcp-common-grouping
+-- keepalives! {keepalives-supported}?
   +-- idle-time      uint16
   +-- max-probes     uint16
   +-- probe-interval uint16
grouping tcp-connection-grouping
+-- keepalives! {keepalives-supported}?
   +-- idle-time      uint16
   +-- max-probes     uint16
   +-- probe-interval uint16
```


5.2. Example Usage

This section presents an example showing the tcp-common-grouping populated with some data.

```
<tcp-common xmlns="urn:ietf:params:xml:ns:yang:ietf-tcp-common">
  <keepalives>
    <idle-time>15</idle-time>
    <max-probes>3</max-probes>
    <probe-interval>30</probe-interval>
  </keepalives>
</tcp-common>
```

5.3. YANG Module

The ietf-tcp-common YANG module references [\[RFC6991\]](#).

```
<CODE BEGINS> file "ietf-tcp-common@2019-06-07.yang"
module ietf-tcp-common {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-tcp-common";
  prefix tcpcmn;

  organization
    "IETF NETCONF (Network Configuration) Working Group and the
     IETF TCP Maintenance and Minor Extensions (TCPM) Working Group";

  contact
    "WG Web:   <http://datatracker.ietf.org/wg/netconf/>
     <http://datatracker.ietf.org/wg/tcpm/>
     WG List:  <mailto:netconf@ietf.org>
               <mailto:tcpm@ietf.org>
     Authors:  Kent Watsen <mailto:kent+ietf@watsen.net>
               Michael Scharf
               <mailto:michael.scharf@hs-esslingen.de>;

  description
    "This module defines reusable groupings for TCP commons that
     can be used as a basis for specific TCP common instances.

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```


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```
revision 2019-06-07 {
  description
    "Initial version";
  reference
    "RFC XXXX: YANG Groupings for TCP Clients and TCP Servers";
}

// Features
feature keepalives-supported {
  description
    "Indicates that keepalives are supported.";
}

// Groupings
grouping tcp-common-grouping {
  description
    "A reusable grouping for configuring TCP parameters common
    to TCP connections as well as the operating system as a
    whole.";
  container keepalives {
    if-feature "keepalives-supported";
    presence "Indicates that keepalives are enabled.";
    description
      "Configures the keep-alive policy, to proactively test the
      aliveness of the TCP peer. An unresponsive TCP peer is
      dropped after approximately (idle-time * 60) + (max-probes
      * probe-interval) seconds.";
    leaf idle-time {
      type uint16 {
        range "1..max";
      }
      units "seconds";
      mandatory true;
      description
```



```
        "Sets the amount of time after which if no data has been
        received from the TCP peer, a TCP-level probe message
        will be sent to test the aliveness of the TCP peer.";
    }
    leaf max-probes {
        type uint16 {
            range "1..max";
        }
        mandatory true;
        description
            "Sets the maximum number of sequential keep-alive probes
            that can fail to obtain a response from the TCP peer
            before assuming the TCP peer is no longer alive.";
    }
    leaf probe-interval {
        type uint16 {
            range "1..max";
        }
        units "seconds";
        mandatory true;
        description
            "Sets the time interval between failed probes.";
    }
} // container keepalives
} // grouping tcp-common-grouping

grouping tcp-connection-grouping {
    description
        "A reusable grouping for configuring TCP parameters common
        to TCP connections.";
    uses tcp-common-grouping;
}

/*
The following is for a future bis...
This comment is here now so as support discussion with TCPM.
This comment will be removed before publication.

Should future system-level parameters be defined as a
grouping or a container?

grouping tcp-system-grouping {
    description
        "A reusable grouping for configuring TCP parameters common
        to the operating system as a whole.";

    // currently just a placeholder
```



```
    }  
  */  
  
}  
<CODE ENDS>
```

6. Security Considerations

The YANG modules defined in this document are designed to be accessed via YANG based management protocols, such as NETCONF [[RFC6241](#)] and RESTCONF [[RFC8040](#)]. Both of these protocols have mandatory-to-implement secure transport layers (e.g., SSH, TCP) with mutual authentication.

The NETCONF access control model (NACM) [[RFC8341](#)] provides the means to restrict access for particular users to a pre-configured subset of all available protocol operations and content.

Since the modules defined in this document only define groupings, these considerations are primarily for the designers of other modules that use these groupings.

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

None of the writable/creatable/deletable data nodes in the YANG modules defined in this document are considered more sensitive or vulnerable than standard configuration.

Some of the readable data nodes in the YANG modules 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. These are the subtrees and data nodes and their sensitivity/vulnerability:

None of the readable data nodes in the YANG modules defined in this document are considered more sensitive or vulnerable than standard configuration.

This document does not define any RPC actions and hence this section does not consider the security of RPCs.

7. IANA Considerations

7.1. The IETF XML Registry

This document registers two URIs in the "ns" subregistry of the IETF XML Registry [[RFC3688](#)]. Following the format in [[RFC3688](#)], the following registrations are requested:

URI: urn:ietf:params:xml:ns:yang:ietf-tcp-client
Registrant Contact: The NETCONF WG of the IETF.
XML: N/A, the requested URI is an XML namespace.

URI: urn:ietf:params:xml:ns:yang:ietf-tcp-server
Registrant Contact: The NETCONF WG of the IETF.
XML: N/A, the requested URI is an XML namespace.

7.2. The YANG Module Names Registry

This document registers two YANG modules in the YANG Module Names registry [[RFC6020](#)]. Following the format in [[RFC6020](#)], the following registrations are requested:

name: ietf-tcp-common
namespace: urn:ietf:params:xml:ns:yang:ietf-tcp-common
prefix: tcpcmn
reference: RFC XXXX

name: ietf-tcp-client
namespace: urn:ietf:params:xml:ns:yang:ietf-tcp-client
prefix: tcpc
reference: RFC XXXX

name: ietf-tcp-server
namespace: urn:ietf:params:xml:ns:yang:ietf-tcp-server
prefix: tcps
reference: RFC XXXX

8. References

8.1. Normative References

[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/info/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/info/rfc6020>>.
- [RFC6991] Schoenwaelder, J., Ed., "Common YANG Data Types", [RFC 6991](#), DOI 10.17487/RFC6991, July 2013, <<https://www.rfc-editor.org/info/rfc6991>>.
- [RFC7950] Bjorklund, M., Ed., "The YANG 1.1 Data Modeling Language", [RFC 7950](#), DOI 10.17487/RFC7950, August 2016, <<https://www.rfc-editor.org/info/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/info/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/info/rfc8341>>.

8.2. Informative References

- [RFC3688] Mealling, M., "The IETF XML Registry", [BCP 81](#), [RFC 3688](#), DOI 10.17487/RFC3688, January 2004, <<https://www.rfc-editor.org/info/rfc3688>>.
- [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/info/rfc6241>>.
- [RFC8040] Bierman, A., Bjorklund, M., and K. Watsen, "RESTCONF Protocol", [RFC 8040](#), DOI 10.17487/RFC8040, January 2017, <<https://www.rfc-editor.org/info/rfc8040>>.
- [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/info/rfc8340>>.

[Appendix A](#). Change Log

[A.1](#). 00 to 01

- o Added 'local-binding-supported' feature to TCP-client model.
- o Added 'keepalives-supported' feature to TCP-common model.
- o Added 'external-endpoint-values' container and 'external-endpoints' feature to TCP-server model.

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