

**YANG Groupings for TCP Clients and TCP Servers**  
**draft-ietf-netconf-tcp-client-server-02**

**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 "2019-07-02" --> 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**

This Internet-Draft is submitted in full conformance with the provisions of [BCP 78](#) and [BCP 79](#).

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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.

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```
<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@2019-07-02.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
```

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

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This version of this YANG module is part of RFC XXXX (<https://www.rfc-editor.org/info/rfcXXXX>); see the RFC itself for full legal notices.;

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```
revision 2019-07-02 {
  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 (i.e., the local address and local port) for
     TCP clients.";
}

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

// Groupings
```

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```
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 port number 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";
```

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```
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
```

### 4.2. Example Usage

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

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```
<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@2019-07-02.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 2019-07-02 {  
    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.";  
}  
  
// 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
```

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```
'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.";
    }
}
}
}
}

<CODE ENDS>
```

## 5. The TCP Common Model

### 5.1. Tree Diagram

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

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```

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@2019-07-02.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>";

```

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**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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```
revision 2019-07-02 {  
    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.";
```

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```
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...
```

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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

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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

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## 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

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## 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.

### A.2. 01 to 02

- o Removed the 'external-endpoint-values' container and 'external-endpoints' feature from the TCP-server model.

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