YANG Groupings for TCP Clients and TCP Servers

draft-ietf-netconf-tcp-client-server-02

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Terminology

It is understood that TCP can work with simultaneous opens

- such that there is effectively no difference between client and server

That said, the terms "client" and "server" herein primarily mean:

- Client: the initiator of the protocol exchange
- Server: the receiver of the protocol exchange

However, only when discussing NETCONF and RESTCONF:

- Client: the controller/NMS application
- Server: the NE/device being managed

History

NETCONF WG has been working on this problem for ~5 years

The "problem" being:

How to configure
NETCONF and RESTCONF
clients and servers?

(Using YANG Data Models)

What are YANG Data Models?

YANG is an IETF replacement for SNMP MIBs.

YANG is a way to describe data.

YANG is to NETCONF/RESTCONF and XML/JSON:

- as MIB is to SNMP
- as XSD is to XML
- as ASN.1 is PEM/DER/BER
- as ABNF is to binary data.

Circa IETF 102

NETCONF WG had the following hierarchy of *adopted* WG drafts.

```
          crypto-types
            ^   ^
           /    \
          /      \
     trust-anchors   keystore
       ^   ^----+  ^
       |       \  |
       |   +-------+
       |  /      \
  ssh-client-server  tls-client-server
      ^         ^      ^
      |         |     |
      |   +------+      |
      |   |           |
      |   |           |
netconf-client-server   restconf-client-server
```

- The NETCONF protocol has transport bindings to both SSH and TLS.
- The RESTCONF protocol has a transport binding to HTTP/TLS.

Keepalives and Running Code

The YANG models defined knobs for configuring SSH and TLS level keepalives.

Nokia and the Broadband Forum (BBF) implementation

- A replacement for TR-069 (i.e., how cable modems call home).
- Discovered that TLS-level keepalives were not supported in OpenSSL.

Hence a request to add knobs to configure TCP-level keepalives.

But how?

Circa IETF 103

NETCONF WG discussed creating explicit TCP, HTTP, and HTTPS layers

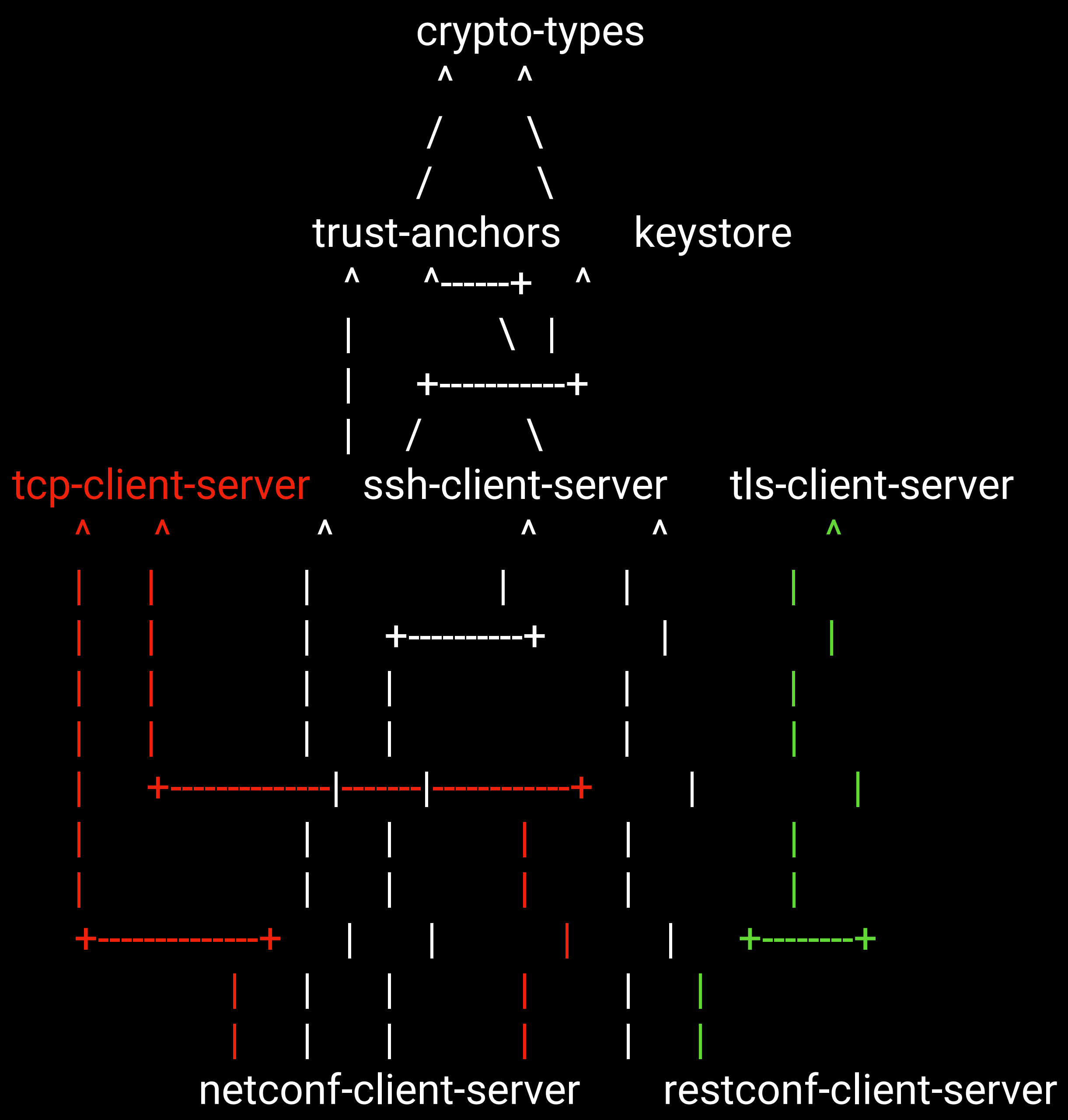
- The idea being that then each layer could define its own keepalive config parameters...

```
          crypto-types
           ^   ^
           /    \
          /      \
    trust-anchors   keystore   tcp-client-server
      ^   ^     ^  ^     ^ ^   ^
      |   +----+ | |    /  /   |
      |      \  | |    / /    |
      |   +---------+ |  /  /   |
      |  /     \  |   / /     |
      | / +----------------+ /   |
      | / /     \ |    /      |
  ssh-client-server  tls-client-server  http-client-server
   ^            ^     ^       ^
   |           |     \       |
   |      +---------+  https-client-server
   |     /                 ^
netconf-client-server            |
                   restconf-client-server
```

Circa IETF 104 (Current)

Moving from an "is-a" to a "has-a" relationship

- enables arbitrary protocol stack compositions (e.g., tcp/http vs. tcp/tls/http)



crypto-types

trust-anchors

keystore

tcp-client-server

ssh-client-server

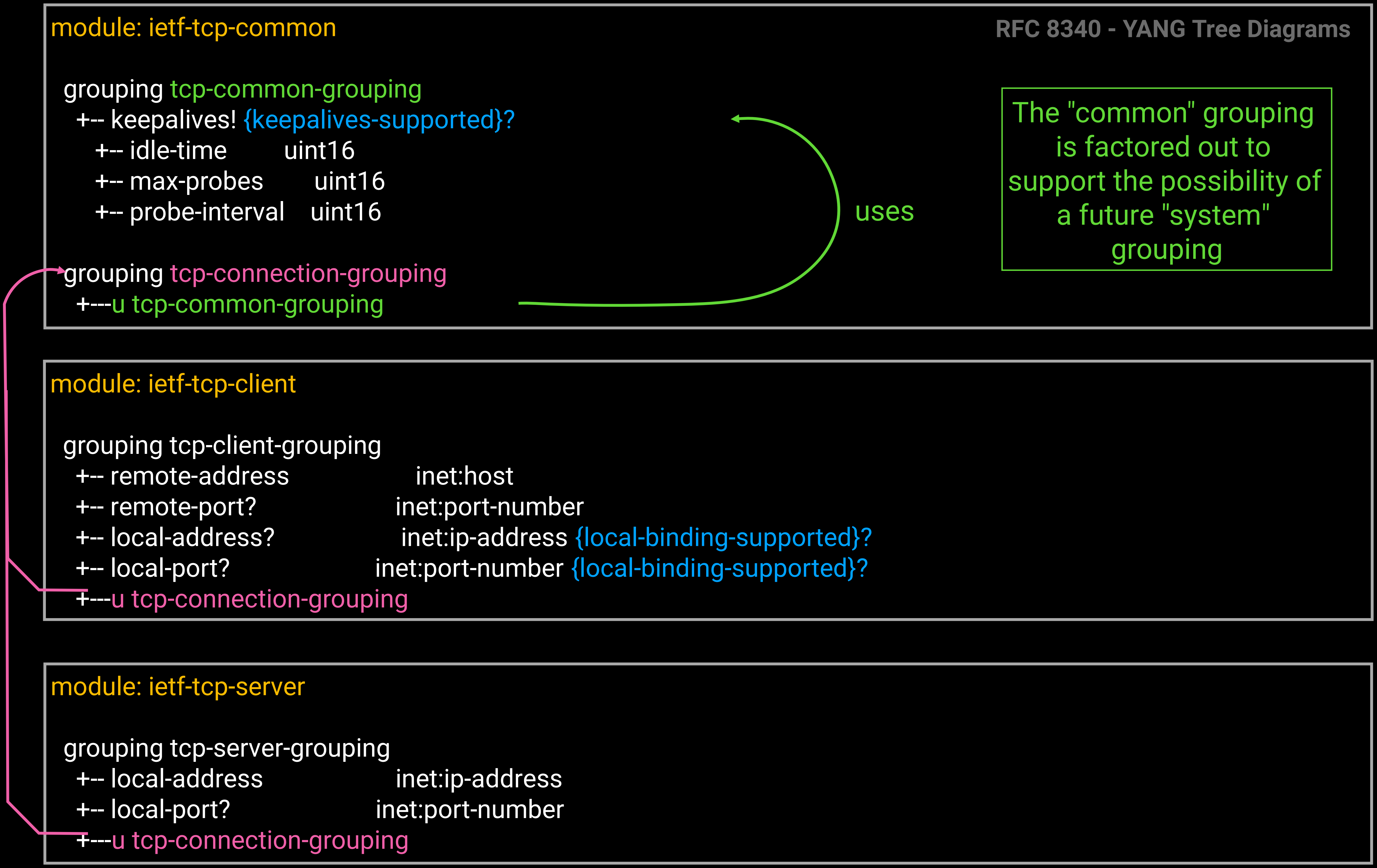
tls-client-server

http-client-server

netconf-client-server

restconf-client-server

Draft defines 3 YANG modules



RFC 8340 - YANG Tree Diagrams

```
module: ietf-tcp-common

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

  grouping tcp-connection-grouping
    +---u tcp-common-grouping
```

uses

The "common" grouping is factored out to support the possibility of a future "system" grouping

```
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}?
    +---u tcp-connection-grouping
```

```
module: ietf-tcp-server

  grouping tcp-server-grouping
    +-- local-address              inet:ip-address
    +-- local-port?                inet:port-number
    +---u tcp-connection-grouping
```

After flattening all the "uses" statements

```
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  // seconds
      +-- max-probes        uint16
      +-- probe-interval    uint16  // seconds
```

```
module: ietf-tcp-server

 grouping tcp-server-grouping
   +-- local-address    inet:ip-address
   +-- local-port?      inet:port-number
   +-- keepalives! {keepalives-supported}?
      +-- idle-time         uint16  // seconds
      +-- max-probes        uint16
      +-- probe-interval    uint16  // seconds
```

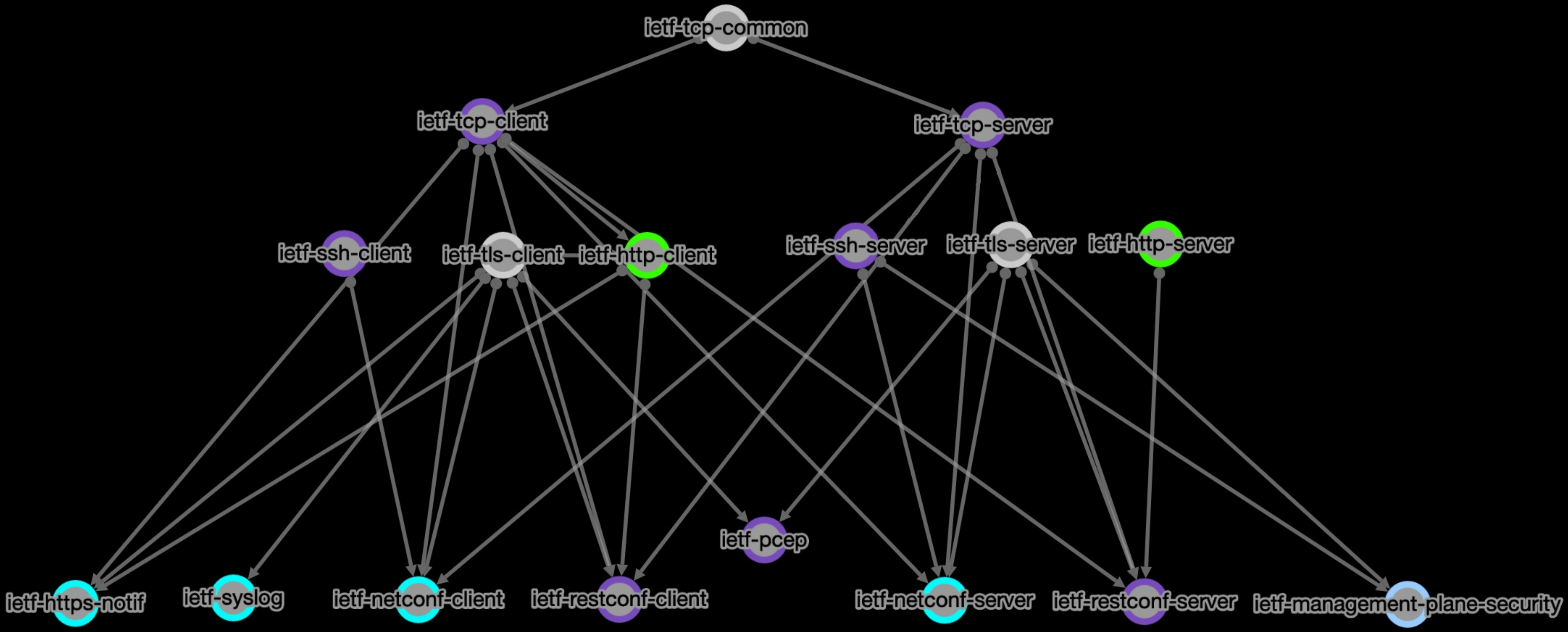
Examples (XML shown, but JSON also used)

```
<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>  // wildcard value
  <local-port>0</local-port>            // wildcard value
  <keepalives>
    <idle-time>15</idle-time>
    <max-probes>3</max-probes>
    <probe-interval>30</probe-interval>
  </keepalives>
</tcp-client>
```

```
<tcp-server xmlns="urn:ietf:params:xml:ns:yang:ietf-tcp-server">
  <local-address>10.20.30.40</local-address>
  <local-port>8888</local-port>
  <keepalives>
    <idle-time>15</idle-time>
    <max-probes>3</max-probes>
    <probe-interval>30</probe-interval>
  </keepalives>
</tcp-server>
```

Current Module Dependencies

(IETF-wide)



Next Steps

Honestly, we think that we're done...
- at least for a first release.

But the fundamental question is if this model, as simple as it is, is general and good enough for all situations in which a TCP YANG model could be used?

Questions, Comments, Concerns?