

A YANG Data Model for Microwave Topology draft-ietf-ccamp-mw-topo-yang-01

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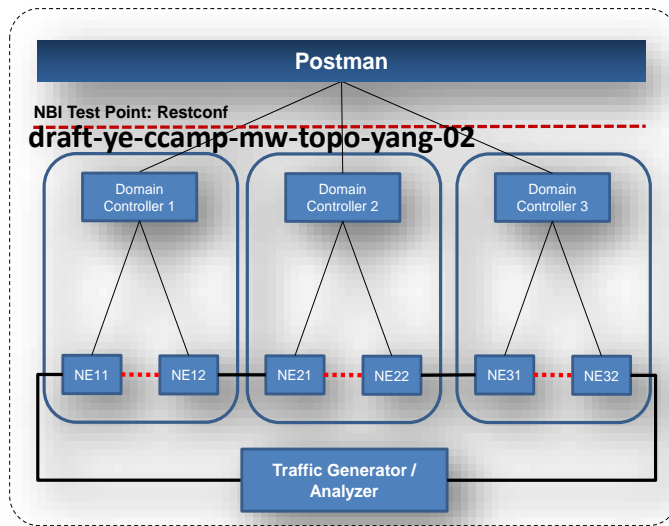
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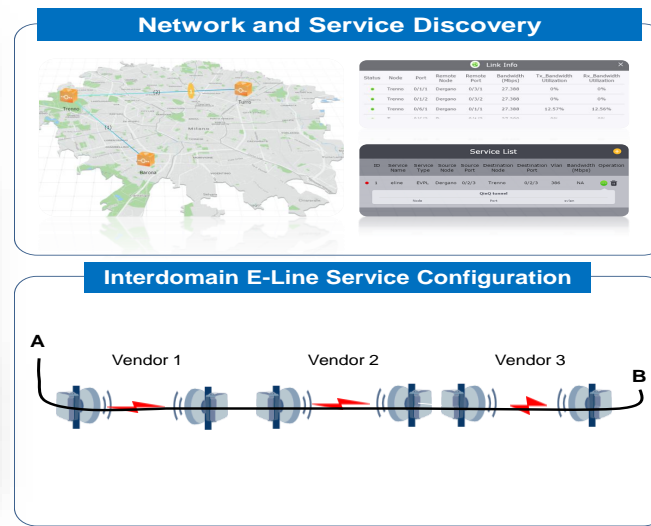
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Running code

- ETSI mWT plugtest on microwave domain took place on 21st -24th January, 2019 :
 - draft-ye-ccamp-mw-topo-yang-02 was implemented and tested at the NBI of the domain controller
 - Operators: Vodafone, DT, BT, Orange
 - Vendors: Ceragon, Ericsson, Huawei, Intracom, NEC, Nokia and SIAE, representing almost 90% of the market
 - **“A clearly defined NBI** based on the vast library of IETF Data Models and the Restconf protocol allows to **quickly achieve complete interoperability**, without need of extensive and extremely resource-intensive prior interoperability testing among any combination of Domain Controller implementations.
 - More information can be found at:
 - ETSI press: <https://www.etsi.org/newsroom/news/1538-2019-01-etsi-first-millimetre-wave-transmission-test-event-achieves-100-interoperability-2>
 - Test report: https://portal.etsi.org/Portals/0/TBpages/CTI/Docs/1st_mWT_PLUGTEST_REPORT_v1.0.zip



Test Architecture



Test cases



Update of the draft

- The draft-ietf-ccamp-mw-topo-yang (-00 version) was adopt in Feb. 2019.
- 01 version was uploaded in Mar. 2019 with following changes:
 - Move the mw-bandwidth definitions from the te-link-attibutes(-00 version) to TE-bandwidth (-01 version)
 - Define mw-channel list, and take out tunnel concept from the draft
 - Address the comments from the list: multiple enhancement to make the YANG module & draft more complete

```
module: ietf-microwave-topology
augment /nw:networks/nw:network/nw:network-types/tet:te-topology:
  +--rw mw-topology!
augment /nw:networks/nw:network/nt:link/tet:te/tet:te-link-attributes:
  +--rw mw-channels* [mw-channel-frequency mw-channel-id]
    +--rw mw-channel-id          uint32
    +--rw mw-channel-frequency   uint32
    +--rw mw-channel-separation? uint32
    +--ro mw-channel-nominal-bandwidth? uint64
    +--ro mw-channel-current-bandwidth? uint64
    +--rw mw-channel-availability* [availability]
      | +--rw availability      decimal64
      | +--ro channel-bandwidth? uint64
    +--rw interface-root {root-radio-if}?
augment /nw:networks/nw:network/nw:node/nt:termination-point/tet:te
/tet:interface-switching-capability/tet:max-lsp-bandwidth
/tet:te-bandwidth/tet:technology:
  +--:(mw)
    +--ro mw-bandwidth?   uint64
    +--ro mw-unreserved-bandwidth uint64
```

```
/*
 * Groupings
 */
grouping mw-bandwidth {
  description "Microwave bandwidth attributes";
  leaf mw-bandwidth {
    type uint64;
    units "Kbps";
    config false;
    description "Microwave nominal bandwidth. Calculation
of microwave nominal bandwidth is implementation specific.
For example, if there's only one channel in the mw-channels
list, the microwave nominal bandwidth is equal to the
channel bandwidth. If there's two channels in the mw-channels
list, depending on the configuration of the channels, the
microwave nominal bandwidth is the sum of channel
bandwidth(2+0), or just one channel bandwidth
(1+1 with protection).";
  }

  leaf mw-unreserved-bandwidth {
    type uint64;
    units "Kbps";
    config false;
    description "The unreserved bandwidth of the link is
mw-bandwidth minus occupied bandwidth
on mw link";
  }
}
```

Note: mw-bandwidth & mw-unreserved-bandwidth highlighted here are examples from the draft.

mw-bandwidth in TE-bandwidth

- Following the guidance in draft-ietf-teas-yang-te-topo (section 6 Guidance for Writing Technology Specific TE Topology Augmentations), add mw-bandwidth & mw-unreserved-bandwidth at each place where te-bandwidth is used in te-topo model
- mw-bandwidth: Microwave nominal bandwidth. Calculation of microwave nominal bandwidth is implementation specific.
 - only one channel in the mw-channels list, mw-bandwidth = mw-channel-nominal-bandwidth.
 - two channels in the mw-channels list(2+0), mw-bandwidth = mw-channel-nominal-bandwidth_1 + mw-channel-nominal-bandwidth_2
 - two channels in the mw-channels list(1+1 with protection), mw-bandwidth = mw-channel-nominal-bandwidth_1

```
augment /nw:networks/nw:network/nw:node/nt:termination-point/tet:te
/tet:interface-switching-capability/tet:max-lsp-bandwidth
/tet:te-bandwidth/tet:technology:
  +--: (mw)
  |   +--ro mw-bandwidth?      uint64
  |   +--ro mw-unreserved-bandwidth uint64
augment /nw:networks/nw:network/nw:node/tet:te/tet:te-node-attributes
/tet:connectivity-matrices/tet:path-constraints/tet:te-bandwidth
/tet:technology:
  +--: (mw)
  |   +--ro mw-bandwidth?      uint64
  |   +--ro mw-unreserved-bandwidth uint64
augment /nw:networks/nw:network/nw:node/tet:te/tet:te-node-attributes
/tet:connectivity-matrices/tet:connectivity-matrix
/tet:path-constraints/tet:te-bandwidth/tet:technology:
  +--: (mw)
  |   +--ro mw-bandwidth?      uint64
  |   +--ro mw-unreserved-bandwidth uint64
augment /nw:networks/nw:network/nw:node/tet:te
/tet:information-source-entry/tet:connectivity-matrices
/tet:path-constraints/tet:te-bandwidth/tet:technology:
  +--: (mw)
  |   +--ro mw-bandwidth?      uint64
  |   +--ro mw-unreserved-bandwidth uint64
```

```
augment /nw:networks/nw:network/nw:node/tet:te
/tet:information-source-entry/tet:connectivity-matrices
/tet:connectivity-matrix/tet:path-constraints/tet:te-bandwidth
/tet:technology:
  +--: (mw)
  |   +--ro mw-bandwidth?      uint64
  |   +--ro mw-unreserved-bandwidth uint64
augment /nw:networks/nw:network/nw:node/tet:te
/tet:tunnel-termination-point/tet:client-layer-adaptation
/tet:switching-capability/tet:te-bandwidth/tet:technology:
  +--: (mw)
  |   +--ro mw-bandwidth?      uint64
  |   +--ro mw-unreserved-bandwidth uint64
augment /nw:networks/nw:network/nw:node/tet:te
/tet:tunnel-termination-point/tet:local-link-connectivities
/tet:path-constraints/tet:te-bandwidth/tet:technology:
  +--: (mw)
  |   +--ro mw-bandwidth?      uint64
  |   +--ro mw-unreserved-bandwidth uint64
augment /nw:networks/nw:network/nw:node/tet:te
/tet:tunnel-termination-point/tet:local-link-connectivities
/tet:local-link-connectivity/tet:path-constraints
/tet:te-bandwidth/tet:technology:
  +--: (mw)
  |   +--ro mw-bandwidth?      uint64
  |   +--ro mw-unreserved-bandwidth uint64
```

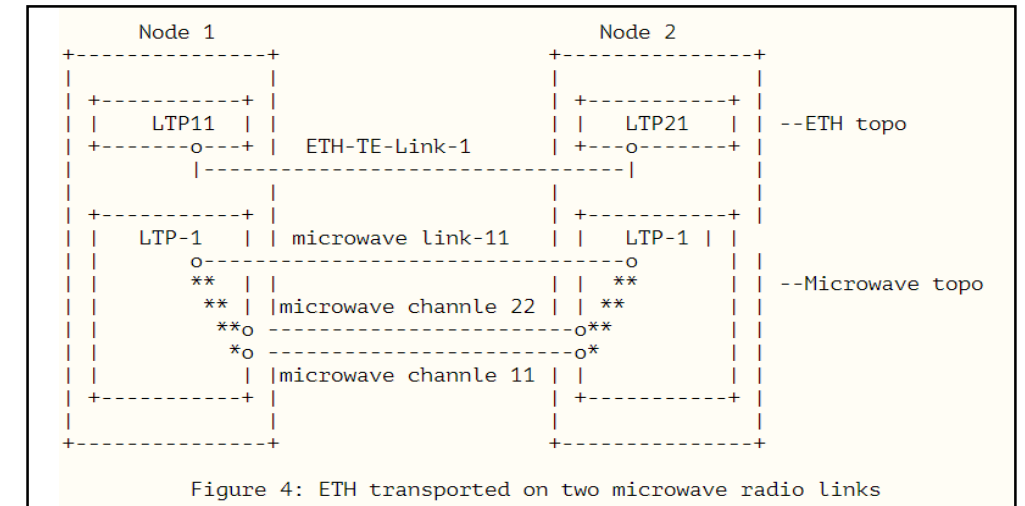
Note: mw-bandwidth & mw-unreserved-bandwidth are examples from the draft.

mw-channel list

- As the multiple mw-channels may have the same frequency, both mw-channel-frequency and mw-channel-id are used as the index of the list.

```
augment /nw:networks/nw:network/nt:link/tet:te/tet:te-link-attributes:
  +--rw mw-channels* [mw-channel-frequency mw-channel-id]
    +--rw mw-channel-id          uint32
    +--rw mw-channel-frequency   uint32
    +--rw mw-channel-separation? uint32
    +--ro mw-channel-nominal-bandwidth? uint64
    +--ro mw-channel-current-bandwidth? uint64
    +--rw mw-channel-availability* [availability]
      | +--rw availability      decimal64
      | +--ro channel-bandwidth? uint64
    +--rw interface-root {root-radio-if}?
```

- The ETH link is supported by the microwave link in underlay microwave topology, the microwave link is composed of two microwave channels.



- Take out tunnel concept to make the model more straightforward
- Open issues: map the microwave specific attributes, e.g. “mw-channel-nominal-bandwidth” to relevant use-cases

Enhancement of the YANG module & draft

- Thanks for Tom Petch's comments, the draft address comments including:
 - Complete the reference
 - Add copyright statement and some clarification in the YANG module
 - Editorial in IANA section

Next steps

- Open issue:
 - map the microwave specific attributes, e.g. “mw-channel-nominal-bandwidth” to relevant use-cases
 - Further clarification on description of mw-bandwidth & mw-unreserved-bandwidth may be needed.
- Review and comments are welcome!