Network Topology Models
# draft-clemm-i2rs-yang-network-topo
draft-clemm-i2rs-yang-l3-topo
draft-liu-yang-abstract-te-topo

Alexander Clemm (Cisco), Xufeng Liu (Ericsson),
Igor Bryskin, Aihua Guo (Adva Optical),
Pavan Beeram (Juniper), Jan Medved (Cisco), Nitin Bahadur
(Bracket Computing), Robert Varga, Tony Tkacik (Pantheon)
Hari Ananthakrishnan (Packet Design)

Purpose

- ″ Provide YANG data models to represent topology
  - . Represent horizontal and vertical layering
  - . Extract commonalities between different topology types
  - . Allow for easy extension, derivation of additional topology types
- ″ Applications
  - . draft-ietf-i2rs-architecture-05 (Topology Management)
  - . Data nodes capture and reconcile their understanding of network topology, propagate topology info
  - . Network controllers represent controller network topology
- ″ Changes since earlier revisions
  - . Minor model updates + split model into separate drafts
    - ″ Generic
    - ″ L3 Unicast-IGP   draft-clemm-i2rs-yang-network-topo-01
    - ″ OSPF   draft-clemm-i2rs-yang-l3-topo-00
    - ″ ISIS
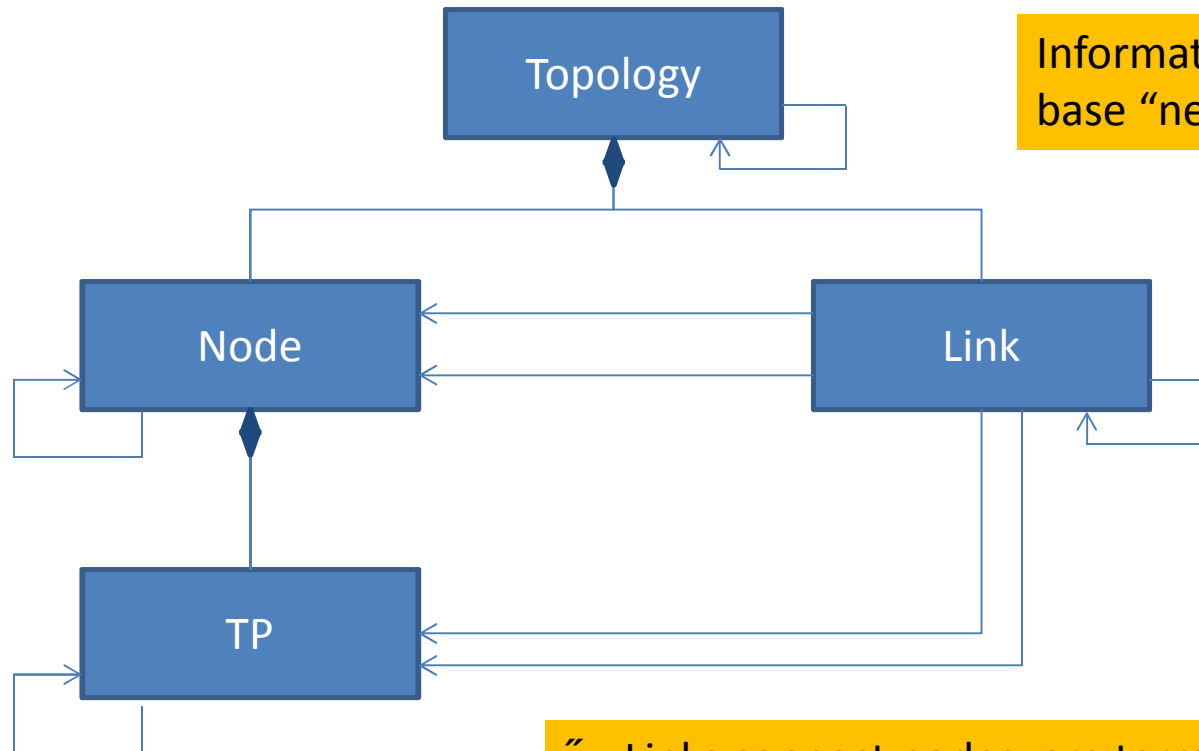   - ″ TED   draft-liu-yang-abstract-te-topo

Data model "architecture"
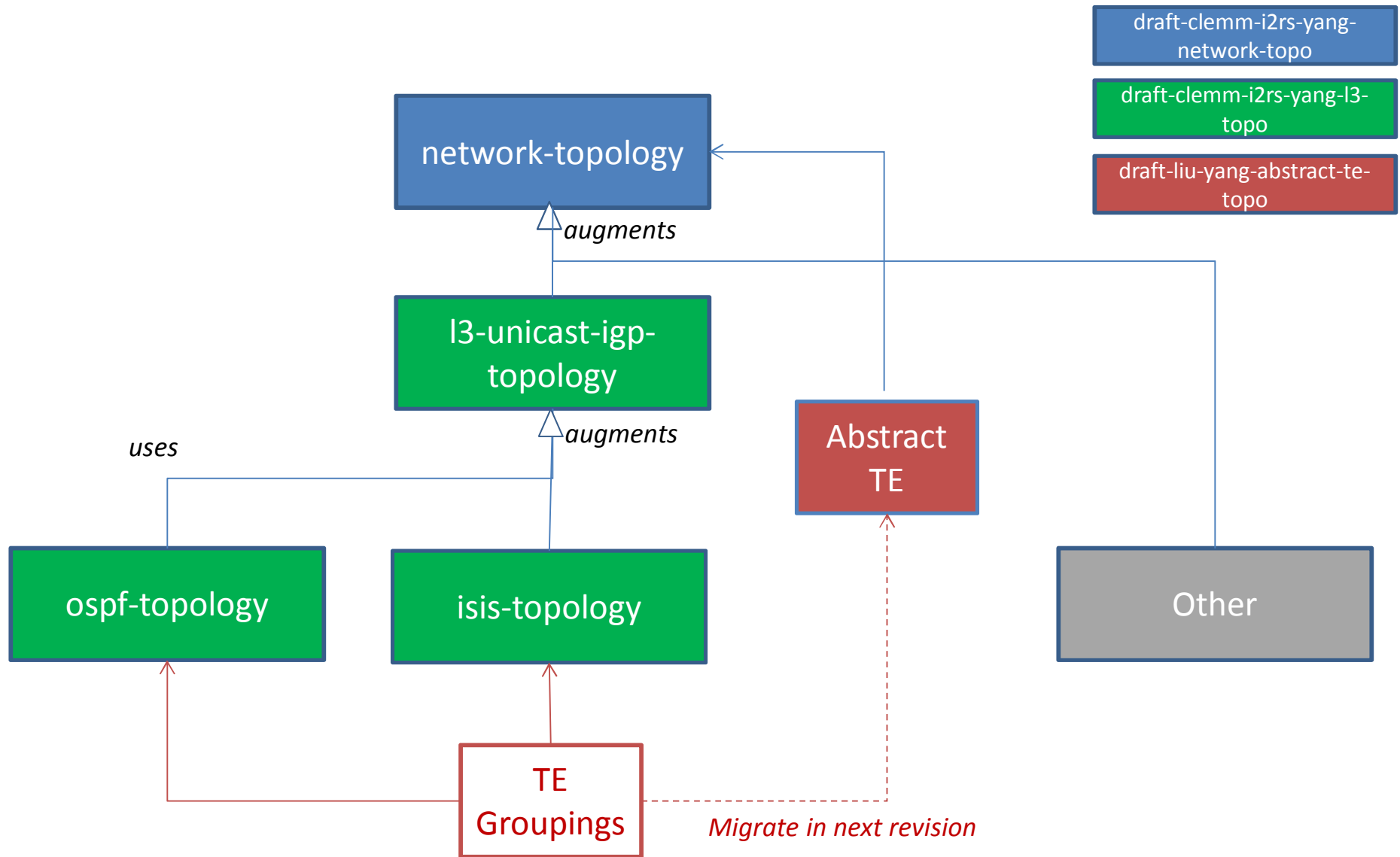
Horizontal and vertical layering
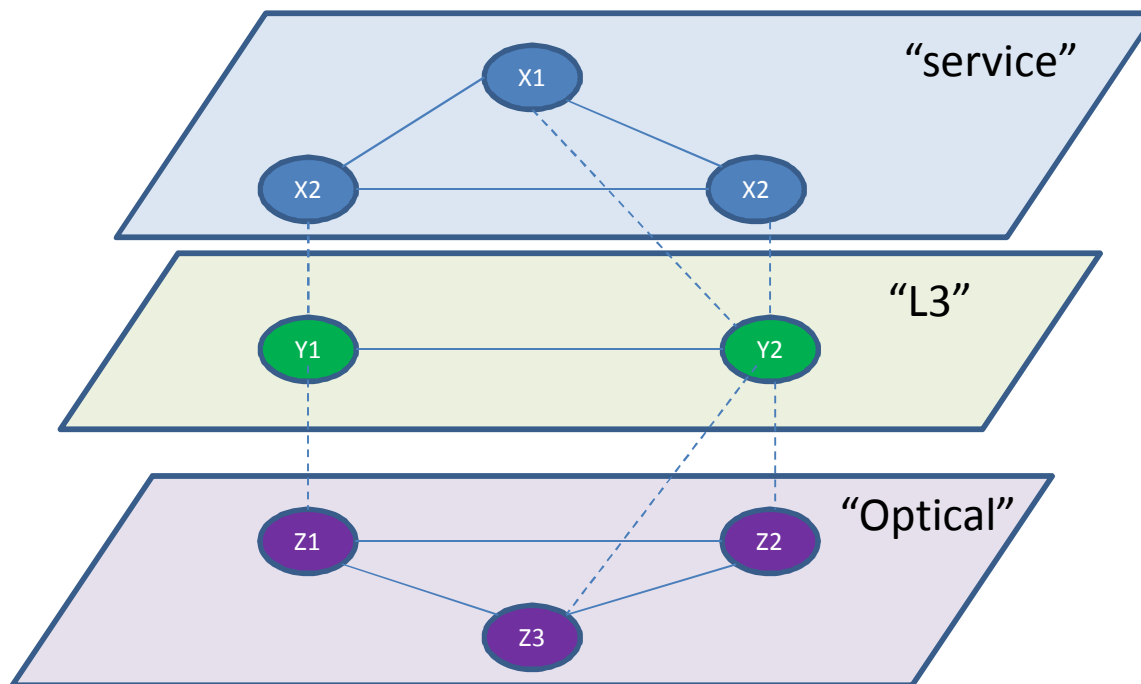
Data model structure (contd.)
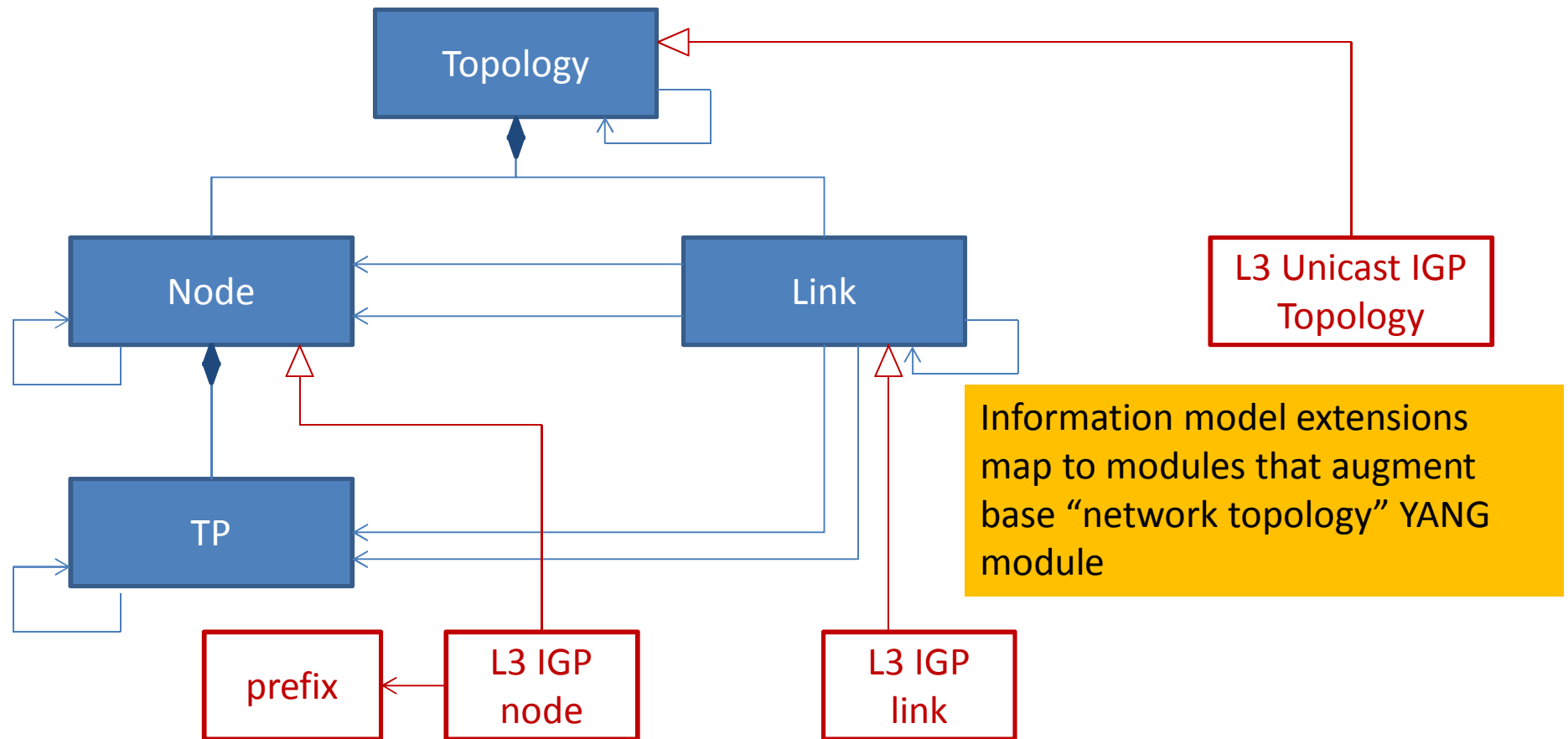

Information model underlying base "network topology" YANG module

˝ Links connect nodes, are terminated by termination points
˝ Topologies can refer to underlay topologies
˝ Links can refer to underlay links
˝ Nodes can refer to underlay nodes
˝ Unidirectional, point-to-point links
   represent non-ptp through hierarchies of nodes, links

```
module: network-topology
  +--rw network-topology
     +--rw topology* [topology-id]
        +--rw topology-id              topology-id
        +--ro server-provided?         boolean
        +--rw topology-types
        +--rw supporting-topology* [topo-ref]
        |  +--rw topo-ref     leafref
        +--rw node* [node-id]
        |  +--rw node-id                  node-id
        |  +--rw termination-point* [tp-id]
        |  |  +--rw tp-id                          tp-id
        |  |  +--rw supporting-termin-point* [topo-ref node-ref tp-ref]
        |  |     +--rw topo-ref     leafref
        |  |     +--rw node-ref     leafref
        |  |     +--rw tp-ref       leafref
        |  +--rw supporting-node* [topo-ref node-ref]
        |     +--rw topo-ref     leafref
        |     +--rw node-ref     leafref
        +--rw link* [link-id]
           +--rw link-id              link-id
           +--rw source
           |  +--rw source-node     leafref
           |  +--rw source-tp?      leafref
           +--rw destination
           |  +--rw dest-node     leafref
           |  +--rw dest-tp?      leafref
           +--rw supporting-link* [topo-ref link-ref]
              +--rw topo-ref     leafref
              +--rw link-ref     leafref
```
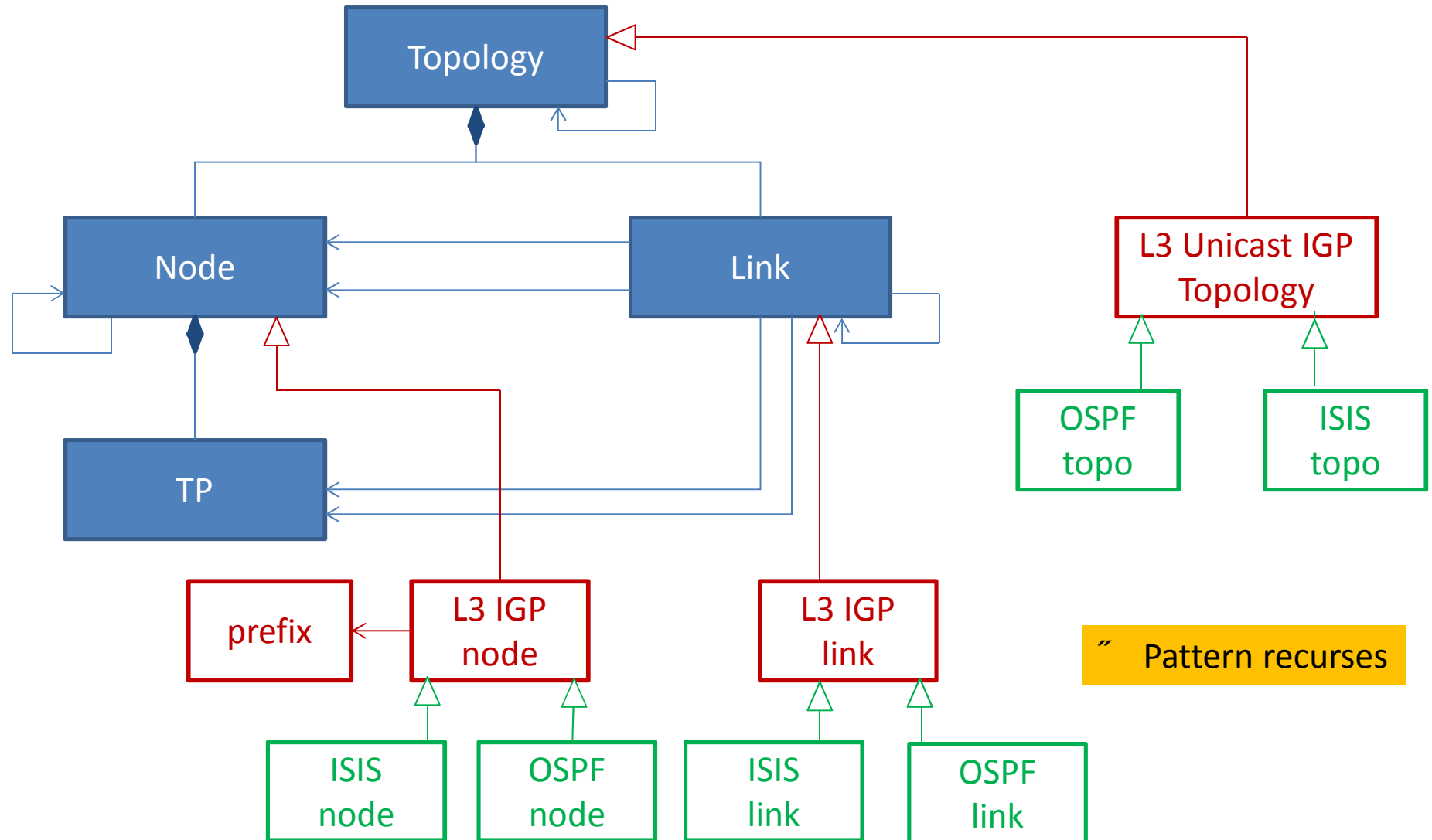
Recap: Data model structure (contd.)

Topology

Node

Link

TP

prefix

L3 Unicast IGP Topology

L3 IGP node

L3 IGP link

Information model extensions map to modules that augment base "network topology" YANG module

˝ Derive Layer 3 Unicast IGP topology object classes
˝ Integrity rules ensure links, nodes, topology of matching type

Recap: Data model structure (contd.)

```
module: l3-unicast-igp-topology
  augment /nt:network-topology/nt:topology/nt:topology-types:
    +--rw l3-unicast-igp-topology!
  augment /nt:network-topology/nt:topology:
    +--rw igp-topology-attributes
       +--rw name?    string
       +--rw flag*    flag-type
  augment /nt:network-topology/nt:topology/nt:node:
    +--rw igp-node-attributes
       +--rw name?         inet:domain-name
       +--rw flag*         flag-type
       +--rw router-id*    inet:ip-address
       +--rw prefix* [prefix]
          +--rw prefix     inet:ip-prefix
          +--rw metric?    uint32
          +--rw flag*      flag-type
  augment /nt:network-topology/nt:topology/nt:link:
    +--rw igp-link-attributes
       +--rw name?     string
       +--rw flag*     flag-type
       +--rw metric?    uint32
  augment /nt:network-topology/nt:topology/nt:node/nt:termination-point:
    +--rw igp-termination-point-attributes
       +--rw (termination-point-type)?
          +--:(ip)
          |  +--rw ip-address*       inet:ip-address
          +--:(unnumbered)
             +--rw unnumbered-id?    uint32
```

Discussion

˝ Network topology focuses on what's truly common

- . Generic, optional features:
  augment separately
  (e.g. connectivity matrix, schedule info)
- . Topology specifics: augment separately

˝ Read-only vs read-write topology

- . Server-provided flag as opposed to "read-only" vs
  "configured" state"

˝ Model has considerable traction, multi-vendor support

˝ Implementations exist

˝ Ask: Adopt as WG document