MPLS Transport Framework on Composite Link

draft-so-yong-mpls-ctg-framework-01.txt

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Differences From Previous Work

- Split the framework and Requirement draft into two drafts based on the group feedback in 75th IETF

  - Requirement – composite link motiviation/ problem statement, and transport and operation requirements

  - Framework – architecture of composite link and transport method, and applicability

CTG Framework (Revised)

- Composite link consists a set of component links that have the same end points.
- Component links may have different TE parameters
- Composite link can carry LSP traffic and control plane packets
- LSP traffic flows and CP packets first is mapped into a connection, then connections are mapped to a component link
- Traffic volume measurement on a per connection basis
  - enable bandwidth optimization over composite link
  - makes the measurement scalable and manageable
- Traffic mapping and connection mapping algorithm takes traffic and connection parameters into account

```
                    Management Plane
              Configuration and Measurement <------------

                 +--------+                       +--------+
                 |        |                       |        |
     CP Packets  |      V |                       | V |    CP Packets
        |      V +-+-+    |    Component Link 1    +-+-+ ^  |
        |      | |   |====|========================|   | |  |
        |   +--|-|*|******|****** connections ******|*|-|--+ |
     ~~ |~~>~~|~| |====|========================| |~|~~>~~|~~
 LSP ~~ |~~>~~|~| |    |    Component Link 2    | |~|~~>~~|~~ LSP
 Traffic~|~~>~~|~| |====|========================| |~|~~>~~|~~ Traffic
 Flows ~~|~~>~~|~|*|******|****** connections ******|*|~|~~>~~|~~ Flows
     ~~ |~~>~~|~| |====|========================| |~|~~>~~|~~
     ~~ |~~>~~|~| |    |    Component Link 3    | |~|~~>~~|~~
     ~~ |~~>~~|~| |====|========================| |~|~~>~~|~~
        |    | |*|******|****** connections ******|*| |    |
        |    | | |====|========================|   | |    |
        |R1   +---+    |                       +---+  R2 |
        +--------+                       +--------+
                  !    !                       !    !
                  !    !<---- Component Links ---->!    !
                  !<------- Composite Link ---------->!
```
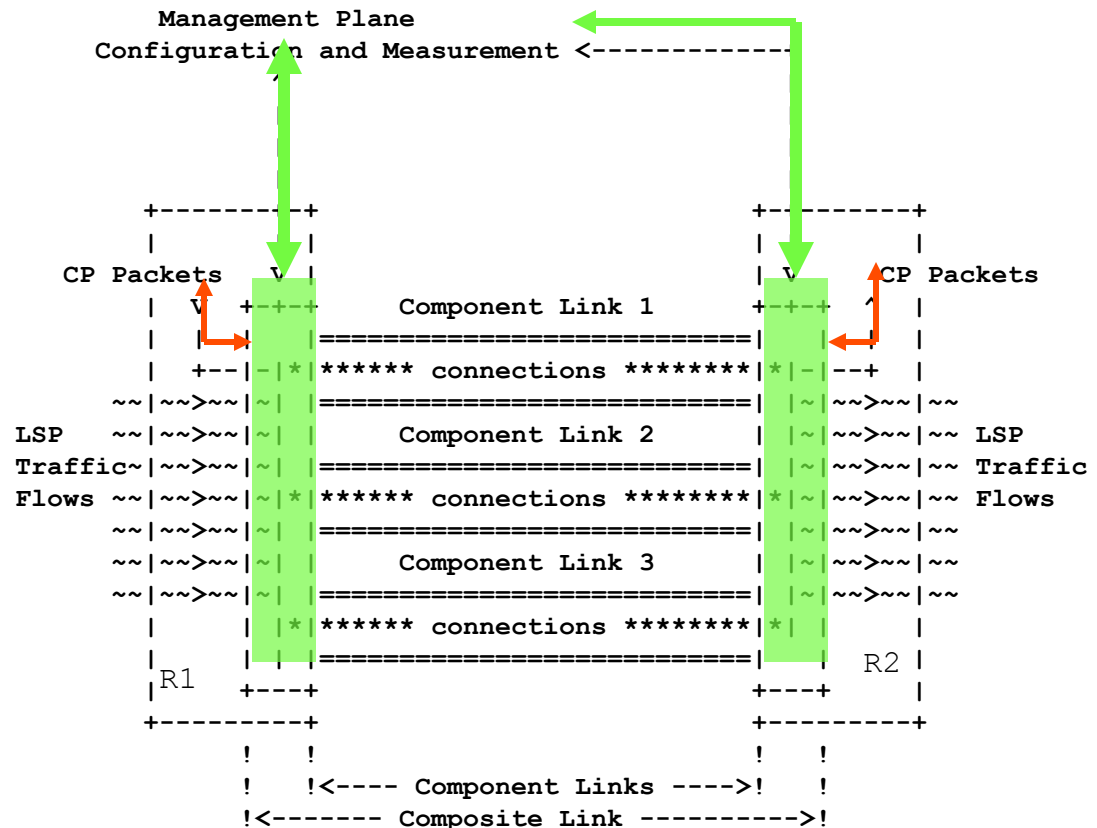
━━━━━━ Interior Functions: Data/forwarding, determination of component link.
Management Control of these functions important for interoperability.

━━━━━━ Exterior Functions: Routing and Signaling

Interior Functions

- Implement locally on LSRs that are connected via a composite link directly
  - Mapping of traffic flows to connections
  - Mapping of connections to component links
  - Traffic volume measurement on a per connection
  - Component link failure recovery
  - Component link congestion prevention
  - Operator configuration
    - Composite link, component link, connection, LSP placement, etc
  - Management plane Support
    - Report which component link a LSP is assigned to
    - Alarm on component link failure
- Although interior functions are local, it is important for vendor device to be manageable in an interoperable way

Interior Functions

- LSP flows with TE information
  - Get LSP parameters from RSVP-TE messages
- LSP flows without TE information
  - LSP is signaled via LDP messages
  - Assign LDP LSP to pre-configured connection
  - Monitor connection BW and use it for BW optimization
- Hybrid case- LSPs with TE and without TE info
  - Obtains LSP parameters in different ways
  - Separate RSVP-TE LSP and LDP LSP into different connections
  - pre-empt the flows based on the priority when congestion happens
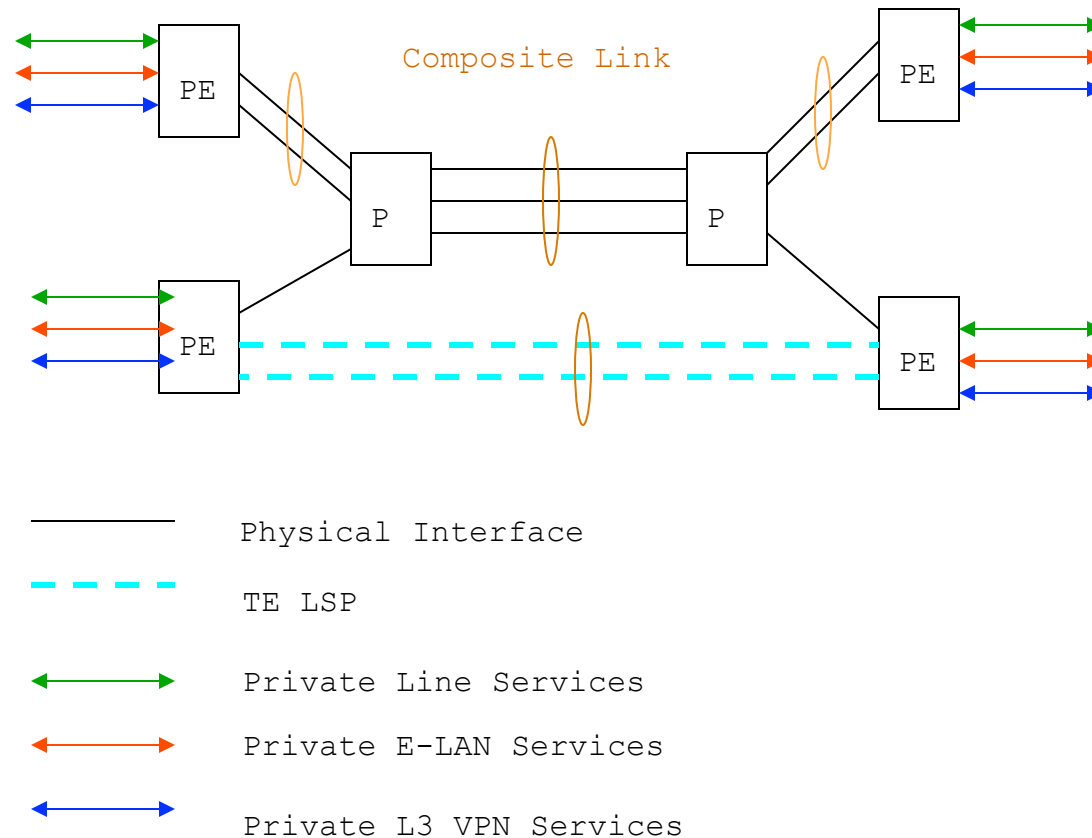
Exterior Functions

- Apply to MPLS routers via signaling or routing protocols
  - Protocol enhancement for further study
  - Requirements are in the separate draft
- Composite Link Advertisement
  - Advertise as a single virtual interface between connected routers within IGP
  - Possible to advertise multiple latency values or a range of values
- Component Link Setup
  - TE LSP may be signaled as a component link
  - TE LSP may be supported by MPLS(-TP) or GMPLS enabled transport network

Exterior Functions

- **LSP Flows with TE information**
  - RSVP-TE PATH and RESV messages are used for LSP establishment
  - LSR selects a label for LSP over a composite link
  - LSP parameters in PATH and RESV are used in LSP assignment
- **LSP Flows without TE information**
  - FEC is bound to a connection on a composite link
  - LDP Label Request message and Label Mapping message are used for LDP LSP establishment
  - Traffic volume measurement on a per connection
- **Hybrid Case – LSPs with TE and without TE**
  - Facilitate flow preemption on the capacity shortage
  - Provide soft preemption

Applicability
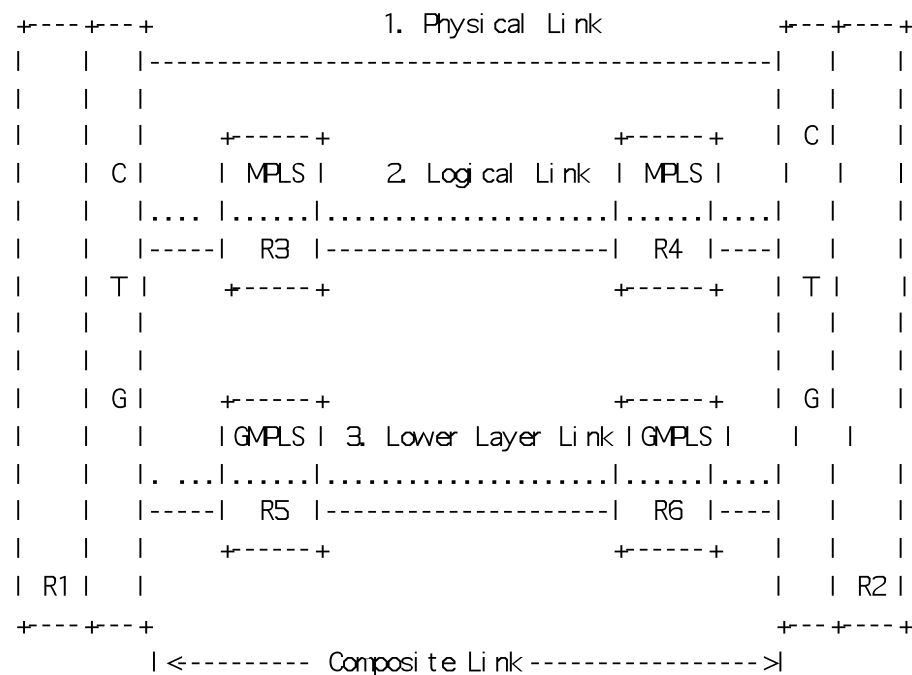
- Composite link can apply between Ps, P and PE, and PEs

Composite Link

PE

PE

P

P

PE

PE

---------- Physical Interface

- - - - - - TE LSP

←————→ Private Line Services

←————→ Private E-LAN Services

←————→ Private L3 VPN Services

Applicability

- Component link may be a physical link or logical link
    - In single layer, physical link or TE LSP may be used as component link
        - In one IGP, R3 and R4 provides the segment of TE LSP
        - In different IGPs, R3 and R4 provides the connectivity between R1 and R2
    - In multi-layer, lower layer with GMPLS may provide a logical interface as a component link for the layer of composite link

```
+---+---+                     1. Physical Link             +--+---+
|   |   |---------------------------------------------------|  |   |
|   |   |                                                   |  |   |
|   |   |      +-----+                          +-----+   | C |   |
|   | C |      | MPLS |    2. Logical Link  | MPLS |     |  |   |
|   |   |....  |......|......................|....| |   |   |
|   |   |-----| R3  |---------------------| R4  |----|   |   |
|   | T |      +-----+                          +-----+   | T |   |
|   |   |                                                   |  |   |
|   |   |                                                   |  |   |
|   | G |      +-----+                          +-----+   | G |   |
|   |   |      |GMPLS | 3. Lower Layer Link |GMPLS |     |  |   |
|   |   |.  ...|......|......................|......| |   |   |
|   |   |-----| R5  |---------------------| R6  |----|   |   |
|   |   |      +-----+                          +-----+   |  |   |
| R1 |   |                                                 |  | R2 |
+---+---+                                                  +--+---+
     |<--------- Composite Link ----------------->|
```

76th IETF Hiroshima   9

Next Steps

- Agreement on requirements/ framework separation, scope and overall structure
- Adopt framework and requirement drafts into WG draft
  - Draft-so-yong-mpls-CTG-framework-00
  - Draft-so-yong-mpls-CTG-requiremetn-00
- Determine how best to organize this work and assign to appropriate working group(s).

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