Composite Link Requirements
draft-so-yong-mpls-ctg-requirement-00.txt

|	
Ning So	ning.so@verizonbusiness.com
Andrew Malis	andrew.g.malis@verizon.com
Dave McDysan	dave.mcdysan@verizon.com
Lucy Yong	lucyyong@huawei.com
Fredric Jounay	frederic.jounay@orange-ftgroup.com
Yuji Kamite	y.kamite@ntt.com

Differences between this and prior version

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

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

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

Definitions From Framework Draft (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 ********|*|  |      |
                   |   |  |  |============================|  |      R2|
                   |R1 |  +---+                           +---+      |
                   +--------+                             +--------+
                        !     !                               !    !
                        !     !<---- Component Links ---->!    !
                        !<------- Composite Link ---------->!
```
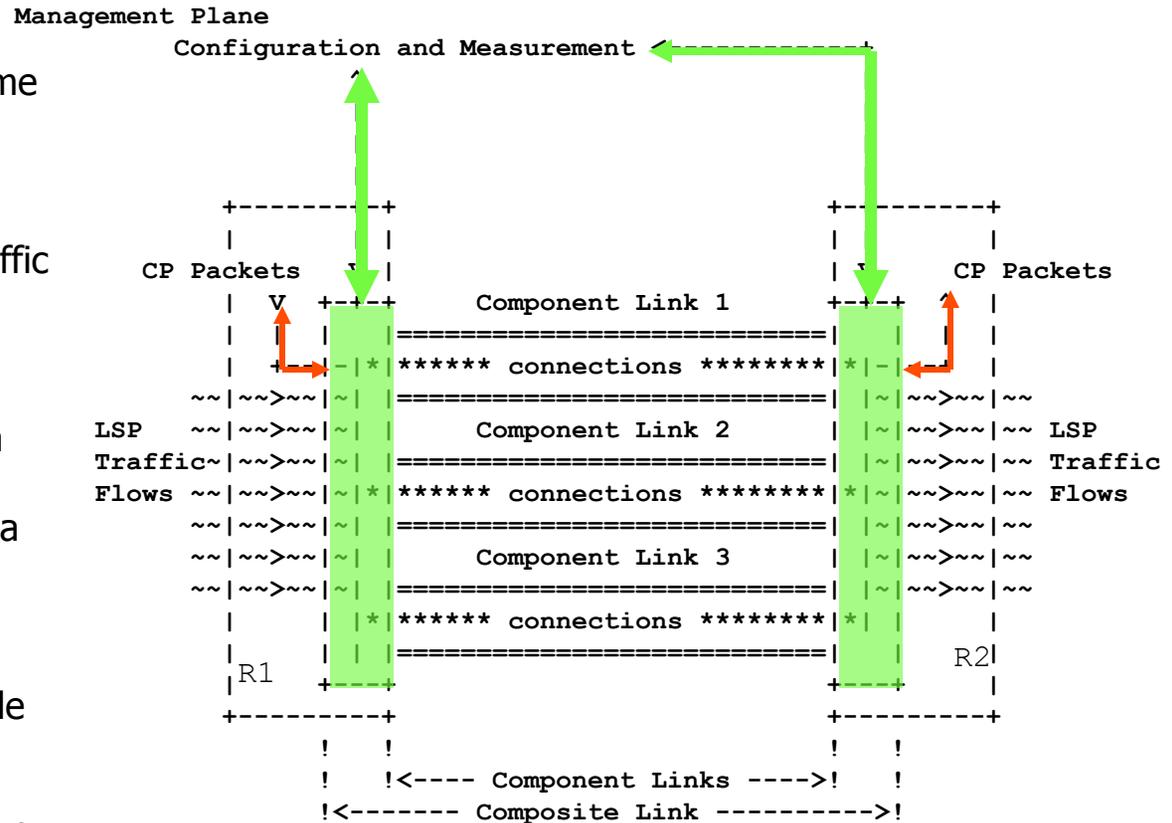
━━━━━ Interior Functions: Data/forwarding, determination of component link.
       Management Control of these functions important for interoperability.

━━━━━ Exterior Functions: Routing and Signaling

Traffic Flow Taxonomy

◆ Definition of Traffic Flow Types in terms of Routing and Signaling Functions Exterior to the Composite Link

Traffic Flows	IGP	IGP-TE	RSVP-TE	LDP
With TE Info	Y	Y	Y	N
Without TE Info	Y	N	N	Y
With & Without TE Info	Y	Y	Y	Y

Revised Requirements Outline

- Management/Measurement of Interior Functions
  - Functions common to all LSP flows
  - Functions specific to LSP flows with TE information
  - Functions specific to LSP flows without TE information
  - Sets of LSP flows with and without TE information
- Exterior Functions
  - Functions common to all LSP flows
  - Functions specific to LSP flows with TE information
  - Functions specific to LSP flows without TE information
  - Sets of LSP flows with and without TE information
- Requirements from previous combine requirements-framework-02 draft mapped into this outline
  - Some new requirements added

4.1 Management of Interior Functions

- 4.1.1. Functions common to all LSP flows
  - 4.1.1.1. Traffic Flow and CTG Mapping
  - 4.1.1.2. Management of Other Operational Aspects
  - 4.1.1.2.1. Resilience
  - 4.1.1.2.2. OAM Messaging Support
  - 4.1.1.2.3. Flow/Connection Mapping Change Frequency
- 4.1.2. Functions specific to LSP flows with TE information
- 4.1.3. Functions specific to LSP flows without TE information
- 4.1.4. Sets of LSP flows with and without TE information
  - 4.1.4.1. Handling Bandwidth Shortage Events

Bandwidth Shortage Events

- "Bandwidth Shortage" can occur if sum of total bandwidth for LSPs (mapped to connections) with provisioned/ signaled TE information (RSVP-TE) and those signaled (LDP) without TE information (but with measured bandwidth) exceeds composite link bandwidth

- Policy-based preemption capability using signaled or configured preemption and holding parameters required at connection level:
  - Connection with RSVP-TE LSPs, signal LSP preemption
    - Soft preemption (i.e., notify LSP source prior to preemption) desirable
  - Use some to-be-specified method to notify LDP signaled LSPs that the connection has been pre-empted
  - Non-re-routable RSVP-TE LSPs or non-releasable LDP labels, signal that LSP is disconnected

4.2 Exterior Functions

- Routing and Signaling Functions are exterior to composition link
  - Functions common to all LSP flows
  - Functions specific to LSP flows with TE information
  - Functions specific to LSP flows without TE information
  - Sets of LSP flows with and without TE information

4.2.1 Functions Common to All LSP Flows

- **4.2.1.1 Signaling Protocol Extensions**
  - Signal composite link between routers
  - Signal component link as part of composite link
  - Automatically inject composite link into IGP
- **4.2.1.2 Router Advertisement Extensions**
  - Identify adjacency as composite link
- **4.2.1.3 Multi- Layer Networking Aspects**
  - Use GMPLS/MPLS-TP control plane signaled component link parameters
    - Maximum acceptable latency
    - Actual (estimated or measured) latency
    - Bandwidth
    - Delay variation (desirable)
    - Loss Rate (desirable)
  - Derive advertised (composite link) interface parameters from above signaled component link parameters

4.2.2. Functions specific to LSP flows with TE information

- **4.2.2.1. Signaling Protocol Extensions**
  - Mandatory additional LSP signaling parameters
    - Maximum acceptable latency
    - Actual (estimated or measured) accumulated latency based upon the actual component link assigned by the composite link
    - Bandwidth of the highest and lowest speed component link traversed
  - Desirable additional LSP signaling parameters
    - Delay Variation
    - Loss Rate
- **4.2.2.2. Routing Advertisement Extensions**
  - Represent multiple values for component links
    - Actual (estimated or measured) Latency
    - Capacity
  - For example, if a range of latencies is used, CSPF can use this to prune certain composite links, but signaling provides feedback on actual accumulated latency against the signaled maximum latency
  - Solution should consider use of OSPF QoS Routing [RFC 2676].

4.2.3. Functions for LSP flows without TE information

- Intent is NOT to recreate RSVP-TE functions for LDP [RFC 3468] CR-LDP
- Objective is functions more localized and simpler than RSVP-TE since many operators use LDP
- 4.2.3.1 Signaling Protocol Extensions
  - Signal allowed measured capacity to nodes adjacent to composite link endpoints
- 4.2.3.2. Routing Advertisement Extensions
  - Advertise capacity allocated to LDP flows on the composite link

4.2.4. Functions for LSP flows with and without TE information`

- RSVP-TE LSP flows support preemption, but LDP currently does not except by changing IGP metric
- 4.2.4.1 Signaling Protocol Extensions
  - Indication via composite link head end node to preempt specific LDP LSP
- 4.2.4.2 Routing Advertisement Extensions
  - Indication that all LDP-signaled traffic should avoid specified composite link

Next Steps

- Agreement on requirements/ framework separation, scope and overall structure.

- Adopt framework and requirement drafts as WG drafts

  - Draft-so-yong-mpls-CTG-framework-00
  - Draft-so-yong-mpls-CTG-requirement-00

- Determine how best to organize this work and assign to appropriate working group(s).

Acknowledgements

Co-Authors like to thank Adrian F., Lou B., Kireeti K., Eric Gray, Dmitri P., and other for reviews and suggestions