(G) + MPLS = GMPLS ?

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Agenda

- Background on MPLS and GMPLS
- GMPLS and packet networks
- Migration

Background on MPLS and GMPLS

- MPLS (TE features)
  - RSVP-TE signaling, OSPF-TE and ISIS-TE routing
  - Relevant to packet networks
    - Forwarding/switching done at granularity of a packet (MPLS label)

- GMPLS
  - Extensions to RSVP-TE, OSPF-TE and ISIS-TE
  - Extends scope to other networks
    - MPLS/Packet networks still well in scope
    - New Label Request and Label : “Generalized”
    - Forwarding/switching can be done at granularity of timeslot (TDM), lambda (OXC); etc
  - Also introduces new features and functionalities

(G)MPLS feature set

- Features from RFC 3471/ 3473
  - Bidirectional LSPs (UPSTREAM & SUGGESTED LABEL)
  - Notification of errors (NOTIFY)
  - Graceful teardown (ADMIN STATUS)
  - Fault handling or “Graceful Restart” (RECOVERY & SUGGESTED LABEL)
- Other features
  - LSP Hierarchy (forwarding adjacencies and non-adjacent RSVP signaling)
  - Support for Link Bundling
  - Unnumbered interface support
  - End-to-end protection and restoration

GMPLS and packet networks - misconceptions

- X Most of the GMPLS features are not applicable to MPLS/packet networks
- X In order to enable a feature introduced by GMPLS specs in an MPLS/packet network, the packet device (LSR) MUST implement all objects and procedures from the GMPLS specs
- X In order to enable a GMPLS feature the LSR MUST exchange (send and receive) Generalized Label Request in Path and Generalized Label in Resv

GMPLS and packet networks - facts

- ✓ G = generalized, includes MPLS/packet networks
- ✓ Many of the features introduced by GMPLS specs are equally applicable to MPLS networks
  - E.g. LSP Hierarchy in MPLS networks can help scaling of RSVP LSPs and has application in inter-area/AS LSP signaling as well
- ✓ It is possible for an LSR to support a feature introduced by GMPLS specs without implementing all the new objects and procedures
  - E.g. RSVP graceful restart is supported by various router vendors in MPLS networks
- ✓ Deploying a feature introduced by GMPLS specs in an MPLS/packet network does *not* necessarily require the LSR to signal Generalized Label Request and Generalized Label
  - E.g. Support for targeted error notification with Notify is feasible in MPLS networks, without having to exchange Generalized Label Request and Generalized Label

GMPLS features in packet networks

- These GMPLS features are applicable to packet networks
- They are “self-contained” in that any such feature can be introduced in packet networks independently on its own
- Examples
  - Graceful restart
  - LSP hierarchy
  - LSP stitching
  - Use of ADMIN_STATUS for graceful teardown
  - Link Bundling
  - Error notification with Notify
  - Unnumbered interface support
  - Bidirectional LSP support

Migration: what do we mean be this ?

- Implementing a move from “MPLS” objects to “GMPLS” objects
  - Unified control plane across all networks
  - Easy progression of features in the future
  - Requires packet/MPLS networks to adopt new objects defined in the context of GMPLS

- Components of migration
  - *Feature-based*
    - Adding support for GMPLS objects and procedures that are tied to some GMPLS feature, such as Graceful restart or targeted Notify
  - *Non feature-based*
    - GMPLS objects/procedures that are incompatible with legacy MPLS LSR and not tied to a particular feature
    - Signaling – Use of Generalized Label Request and Generalized Label in RSVP messages for LSP setup
    - Routing – Use of new IGP extensions in OSPF and ISIS in IGP link-state advertisements

Migration: where are we today ?

- There are LSRs in MPLS networks which already do support one or more so-called “GMPLS features”
- There are also LSRs which may be capable of full-scale GMPLS signaling and routing to setup LSPs across optical networks
- An MPLS network upgrade to make all MPLS LSRs ‘GMPLS capable’, all “at once” is unrealistic
- But an incremental MPLS network upgrade of a subset of LSRs to a new software release, in order to enable new features or services relevant to the packet network is not something unheard of

Migration: where do we go from here ?

- Step 1
  - Add support on the LSR to receive and process the non feature-based (backward incompatible) components such as Generalized Label Request for packet LSPs
  - Enable GMPLS features in MPLS networks, thereby adding support for the feature-based components
- Step 2
  - Provide configurable options to ‘originate’ the non feature-based components for packet LSPs and/or links
- Step 3
  - Move to using GMPLS objects

Migration: challenges

- There are still misconceptions regarding the implications of GMPLS on MPLS networks. These need to be resolved.
- There need to be some standard recommendations on steps for migration
- Tackling the non feature-based components is the main issue. Earlier the vendors and service providers get through Step 1, easier the completion of Step 3 in the future.

Conclusion

- MPLS-GMPLS migration is a practical problem
- Needs practical and realistic solutions
- It is a process of getting to a point in future, so we need to be careful in not over-doing the work for transition
- Important to expect and take incremental steps
- MPLS-GMPLS migration is now on CCAMP WG charter
  - Evaluate possible approaches for migration and come up with recommendations
  - Try and make use of objects/procedures defined in the context of GMPLS for any future extensions for MPLS networks