LDP DoD
draft-beckhaus-ldp-dod-01.txt

Thomas Beckhaus (Deutsche Telekom AG)
Bruno Decraene (France Telecom)
Kishore Tiruveedhula, <u>Maciek Konstantynowicz</u> (Juniper)
Luca Martini (Cisco)

IETF 82, Taipei, Taiwan

draft-beckhaus-ldp-dod-01

- Motivation
- Updates from -00
- Next steps

Changes from -00

- Addressed open points from Quebec and mpls list
  - Updated access topologies
    - Added daisy chain, horseshoes, rings, …
  - Access IGP added as alternative to static routes for subset of access topologies
  - Generalized the service use cases
  - Added new LDP TLV for optimized fast-up restoration
- Editorial changes

Motivation

- Seamless MPLS design (draft-ietf-mpls-seamless-mpls) relies on LDP DoD for scalability and support of access devices
  - well strutured access topologies
  - compute and memory constraints limiting the amount of state access devices can hold
- RFC5036 specifies LDP Downstream on Demand mode of operation
  - but LDP DoD is not widely available on modern IP/MPLS devices

- **Goal of the draft is to address that**

MPLS LDP DoD in access and aggregation use cases and LDP DoD procedures

- Seamless MPLS access use cases drive the required LSR LDP DoD procedures for Access Nodes and border Aggregation Nodes

- *I-D.draft-beckhaus-ldp-dod-01* lists the access use cases and maps LDP DoD procedures against them

LDP DoD use cases (AN, AGN)

1) (AN, AGN) Initial network setup
2) (AN) Service provisioning, activation
3) (AN) Service changes, decommissioning
4) (AN) Service failure
5) (AN, AGN) Network transport failures
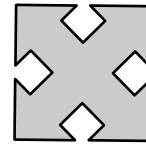
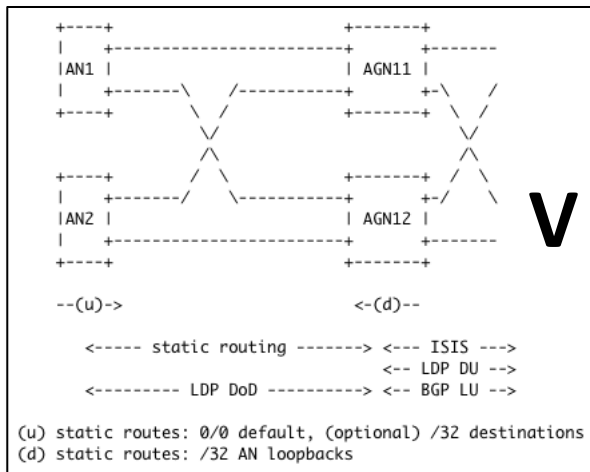**LDP DoD procedures (Access LSR)**

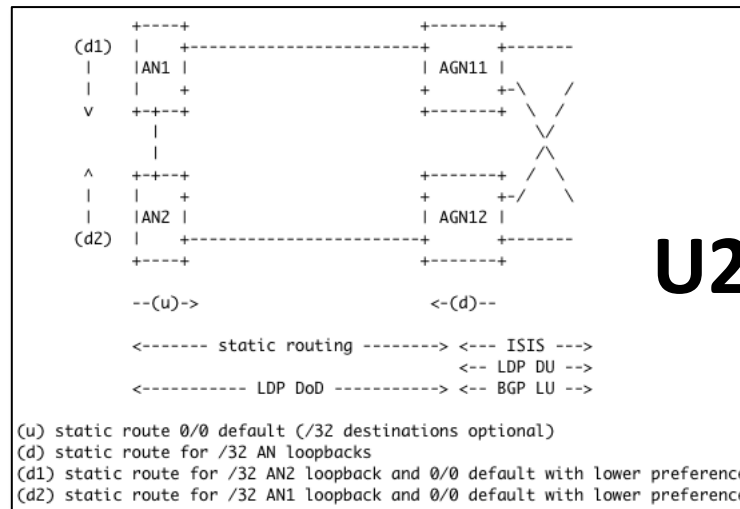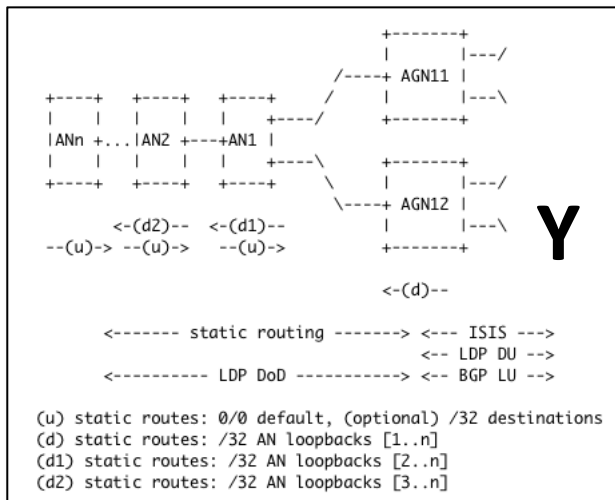a) LDP DoD session negotiation
b) Label request, mapping
c) Label withdraw
d) Label release
e) Local repair

- All described LDP DoD procedures rely on LDP specification [RFC 5036]
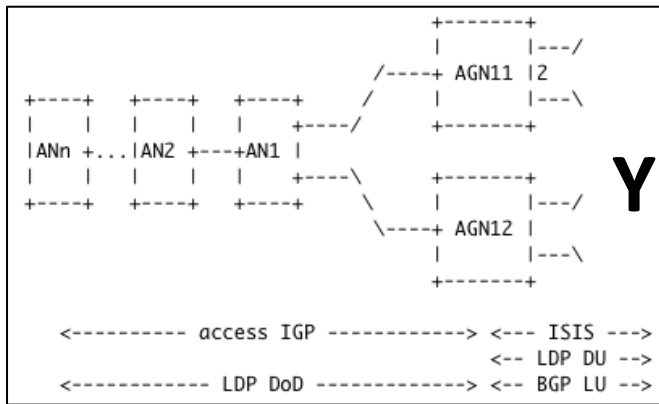 - Exception is fast-up convergence

Reference access topologies with access static routes

V

```
+----+                    +-------+
|    +--------------------+       +-------
|AN1 |                    | AGN11 |
|    +-------\  /---------+     +-\  /
+----+        \/          +-------+  \/
              /\                      /\
             /  \                    /  \
+----+      /    \       +-------+  +-/   \
|    +-----/      \------+       +--+/   \
|AN2 |                   | AGN12 |
|    +-------------------+       +-------
+----+                   +-------+

--(u)->                         <-(d)--

    <----- static routing ------> <--- ISIS --->
                                   <-- LDP DU -->
    <--------- LDP DoD ----------> <-- BGP LU -->

(u) static routes: 0/0 default, (optional) /32 destinations
(d) static routes: /32 AN loopbacks
```


Y

```
                        +-------+
                        |       |---/
                  /----+ AGN11 |
+----+ +----+ +----+  /        |---\
|    | |    | |    | +----/  +-------+
|ANn +...|AN2 +---+AN1 |
|    | |    | |    | +----\  +-------+
+----+ +----+ +----+       \ |       |---/
                        \----+ AGN12 |
    <-(d2)-- <-(d1)--        |       |---\
--(u)-> --(u)->   --(u)->    +-------+

                        <-(d)--

    <------- static routing -------> <--- ISIS --->
                                      <-- LDP DU -->
    <--------- LDP DoD ----------> <-- BGP LU -->

(u) static routes: 0/0 default, (optional) /32 destinations
(d) static routes: /32 AN loopbacks [1..n]
(d1) static routes: /32 AN loopbacks [2..n]
(d2) static routes: /32 AN loopbacks [3..n]
```


U2

```
          +----+                    +-------+
(d1)  |   +--------------------+       +-------
      |   |AN1 |                    | AGN11 |
      |   |    |  +                    +  +-\   /
v     +-+-+                         +-------+ \/
          |                                   /\
          |                                  /  \
^     +-+-+                         +-------+  /  \
      |   |    |  +                    +  +-/   \
      |   |AN2 |                    | AGN12 |
(d2)  |   +--------------------+       +-------
          +----+                    +-------+

    --(u)->                         <-(d)--

    <------- static routing -------> <--- ISIS --->
                                      <-- LDP DU -->
    <--------- LDP DoD ----------> <-- BGP LU -->

(u) static route 0/0 default (/32 destinations optional)
(d) static route for /32 AN loopbacks
(d1) static route for /32 AN2 loopback and 0/0 default with lower preference
(d2) static route for /32 AN1 loopback and 0/0 default with lower preference
```

- **Topologies with access static routes**
  - **I1** - a single AN homed to a single AGN
  - **I** - multiple ANs daisy-chained to a single AGN
  - **V** - a single AN dual-homed to two AGNs
  - **Y** - multiple ANs daisy-chained to two AGNs
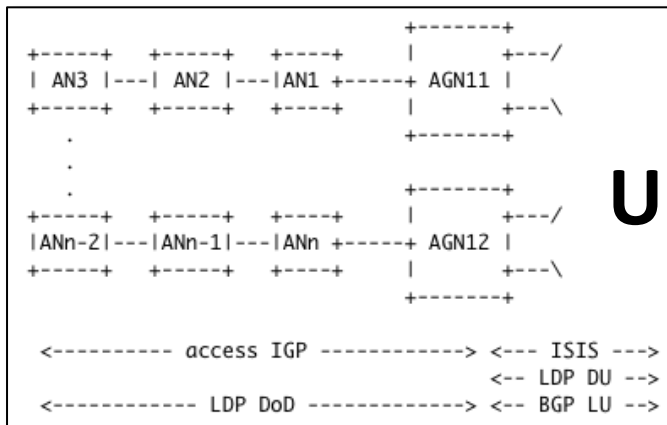 - **U2** - two ANs dual-homed to two AGNs

Reference access topologies with access IGP

```
                              +-------+
                              |       |---/
                        /----+ AGN11 |2
+----+  +----+  +----+  /     |       |---\
|    |  |    |  |    |  +----/ +-------+
|ANn +...|AN2 +----+AN1 |
|    |  |    |  |    |  +----\ +-------+
+----+  +----+  +----+   \    |       |---/
                         \----+ AGN12 |
                              |       |---\
                              +-------+

    <--------- access IGP -----------> <--- ISIS --->
                                       <-- LDP DU -->
    <----------- LDP DoD -------------> <-- BGP LU -->
```

Y

```
                              +-------+
+-----+  +-----+  +----+      |       +---/
| AN3 |---| AN2 |---|AN1 +-----+ AGN11 |
+-----+  +-----+  +----+      |       +---\
                              +-------+
  .
  .                           +-------+
  .                           |       +---/
+-----+  +-----+  +----+      |       
|ANn-2|---|ANn-1|---|ANn +-----+ AGN12 |
+-----+  +-----+  +----+      |       +---\
                              +-------+

    <--------- access IGP -----------> <--- ISIS --->
                                       <-- LDP DU -->
    <----------- LDP DoD -------------> <-- BGP LU -->
```

U

- **Topologies with access IGP**
  - **Y** - multiple ANs daisy-chained to two AGNs
  - **U** - multiple ANs in a horseshoe, dual-homed to two AGNs

New LDP Optional Parameter TLV Queue Request

```
A new Optional Parameter is defined for use in the Label Request message:


             Optional Parameter      Length      Value
             Queue Request TLV          0      see below
  0                      1                2                      3
  0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |1|0|  Queue Request (0x????)   |         Length (0x00)        |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+


U-bit = 1
    Unknown TLV bit is set to 1. If this optional TLV is unknown,
    it should be ignored without sending "no route" notification.
    Ensures backward compatibility.


F-bit = 0
    Forward unknown TLV bit is set to 0. The unknown TLV is not
    forwarded.


Type
    Queue Request Type value to be allocated by IANA.


Length = 0x00
    Specifies the length of the Value field in octets.
```

Optimized fast-up restoration

- The upstream LSR sends a Label Request message with a Queue Request TLV
  - If the downstream LSR supports the Queue Request TLV
    - it verifies if route is available, and replies with label mapping
    - If route not available, it queues the request and replies as soon as the route becomes available; it does not send a "no route" notification back.
    - upstream LSR does not retry the Label Request message if no reply from downstream LSR.
  - If the downstream LSR doesn't support the Queue Request TLV
    - It replies with "no route" notification, as per current procedures.

- If the upstream LSR wants to abort an outstanding label request
  - The upstream LSR sends a Label Abort Request, making the downstream LSR to remove the original request from the queue and send back a notification Label Request Aborted [RFC5036].

Next Steps

- Comments please
- MPLS WG adoption