Advertising MPLS LSPs in the IGP

`draft-gredler-ospf-label-advertisement`

`draft-gredler-isis-label-advertisement`

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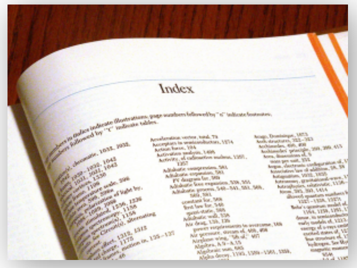
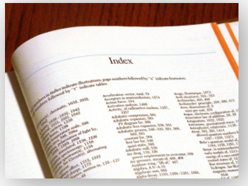
Two Types of Advertisement

Label Range,
Index to Label Range
(=sink-tree paths)



Multi-Hop Segments
(= explicit paths)

Automatic Meshing



Desire for ***automatic meshing*** of transport paths (= LDP alike sink trees)

Transport path tree is computed according to an ***algorithm –*** e.g.

- SPT(Metric)
- SPT(Delay)
- MRT(Metric)

Problem ***may*** be solved using domain-wide labels

… Really ?

History tends to repeat itself … On Domain-wide-labels
Quote from IETF60 (San Diego, August 2004) minutes …

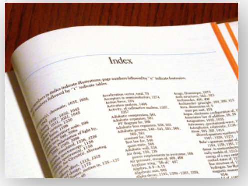
Source Routed MPLS LSP using Domain Wide Label

draft-tian-mpls-lsp-source-route-01, Albert Tian

This draft introduces global labels as a means of source routing or loose source routing a packet in an MPLS network. If each destination of interest (say all of the loopback addresses used as router-IDs) had a label which was both globally known and globally used by all routers, then one could source route a packet by stacking up labels for each of the routers in the source route. This technique could be applied to fast reroute.

In the ensuing discussion it was pointed out that the idea of global labels had been discussed in the early days of MPLS*. At that time it was decided that labels would only have* ***local significance*** *(within the forwarding plane). Many workgroup members* ***expressed opposition to such a fundamental change*** *to the MPLS architecture. Alex Zinin stated, "****The workgroup is done with architecture. Unless it can be proved that architecture is not sufficient then this doesn't fit in charter****."*

Index to Label Range



No requirement for domain-wide label

Problem has been solved before:

RFC4761, Kompella & Rekhter, VPLS BGP Signaling

```
3.2.1.  Label Blocks

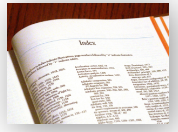
   To accomplish this, we introduce the notion of "label blocks".  A
   label block, defined by a label base LB and a VE block size VBS, is a
   contiguous set of labels {LB, LB+1, ..., LB+VBS-1}.  Here's how label
   blocks work.  All PEs within a given VPLS are assigned unique VE IDs
   as part of their configuration.  A PE X wishing to send a VPLS update
   sends the same label block information to all other PEs.  Each
   receiving PE infers the label intended for PE X by adding its
   (unique) VE ID to the label base.  In this manner, each receiving PE
   gets a unique demultiplexor for PE X for that VPLS.
```

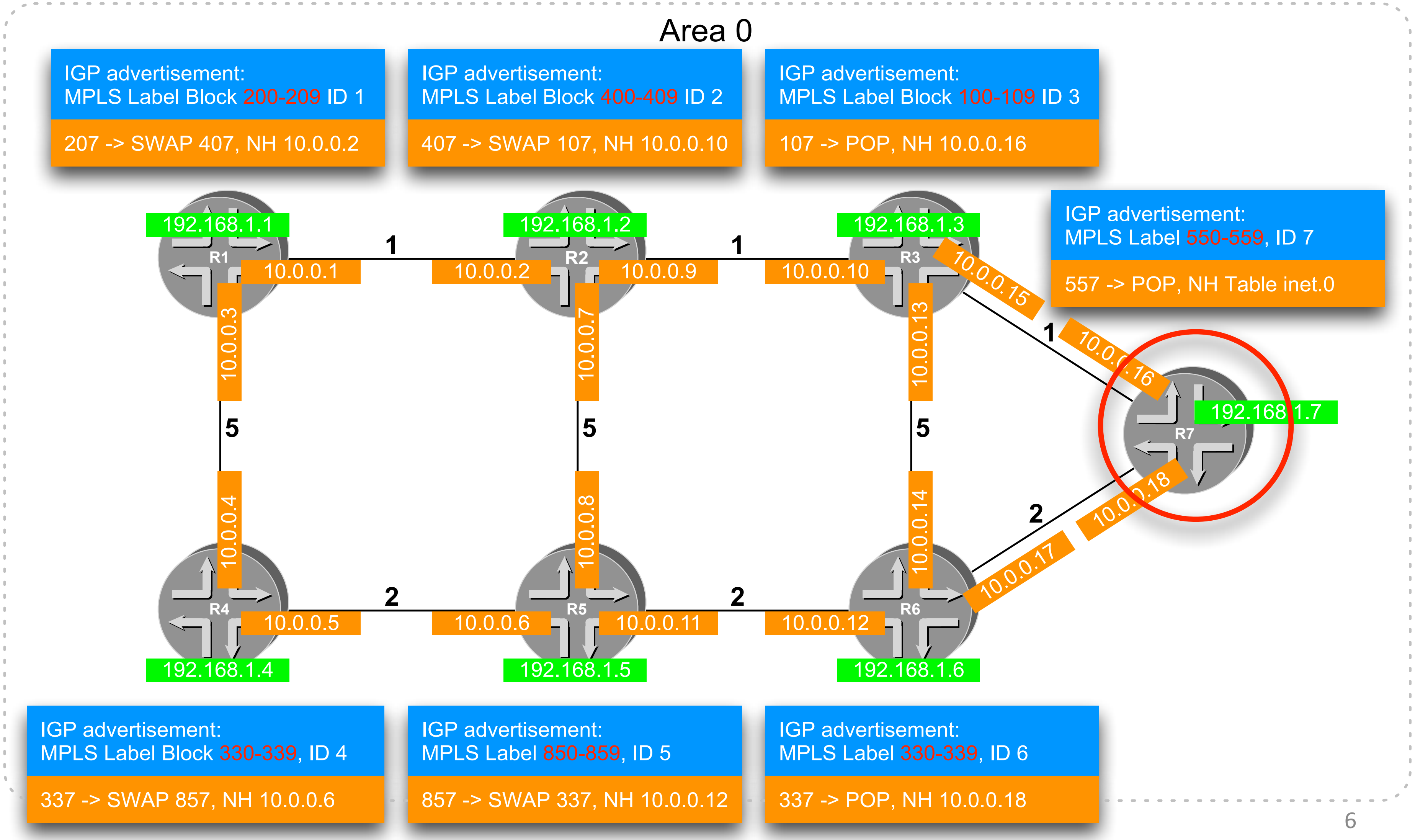
Mirror Label Block ***source semantics*** from VPLS into ***destination semantics***

Assign each router a domain-wide unique ID

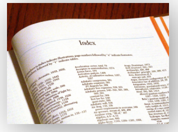
- ID is an index to locate the actual label value, inside label block
- Each LSR allocates and advertises a block of ***locally significant*** labels
- The block should be large enough to accommodate the range of assigned IDs

Example:
LFIB construction for R7, Algorithm: SPT(Metric)





Index to Label RANGE



- Index advertises { egress router context, Algorithm } tuples
  - Currently support for two contexts
    - IPv4 “Internet” forwarding table
    - IPv6 “Internet” forwarding table

- Extensible for ***additional*** algorithms
  - (SPT-delay, SPT-TE, MRT, ARC …)

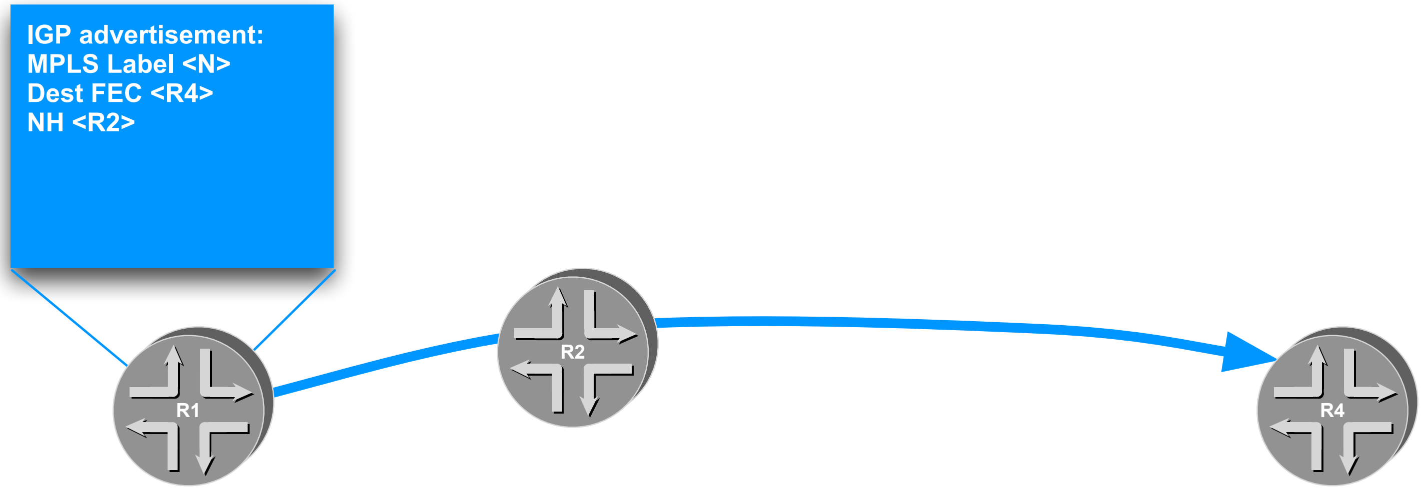
- What if I want to have ***identical*** labels in my domain ?
  - Most devices have ***configurable*** label-ranges per protocol
  - Routers who do not have support for this still can ***interoperate***
    - Protocol operations ***do not assume*** identical label-range for downstream routers

Protocol semantics of MPLS LSPs (1)

RFC 3031

LSP in its most generic form:

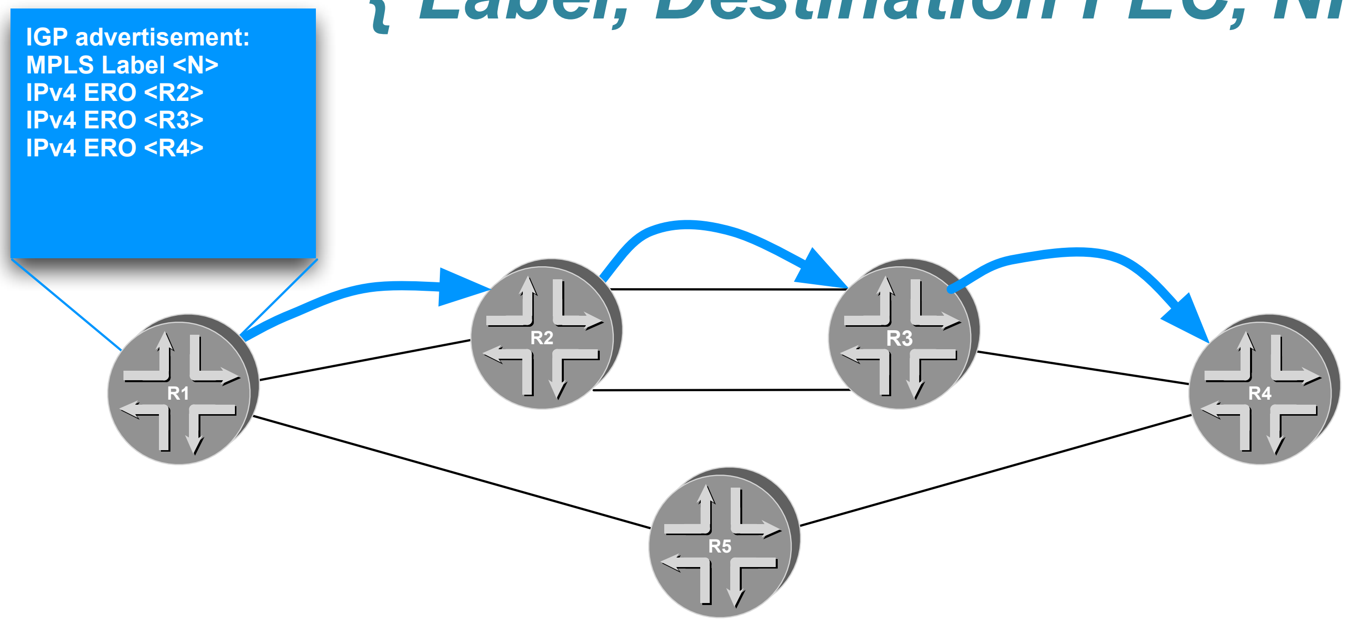
{ Label, Destination FEC, NH }



Protocol semantics of MPLS LSPs (2)

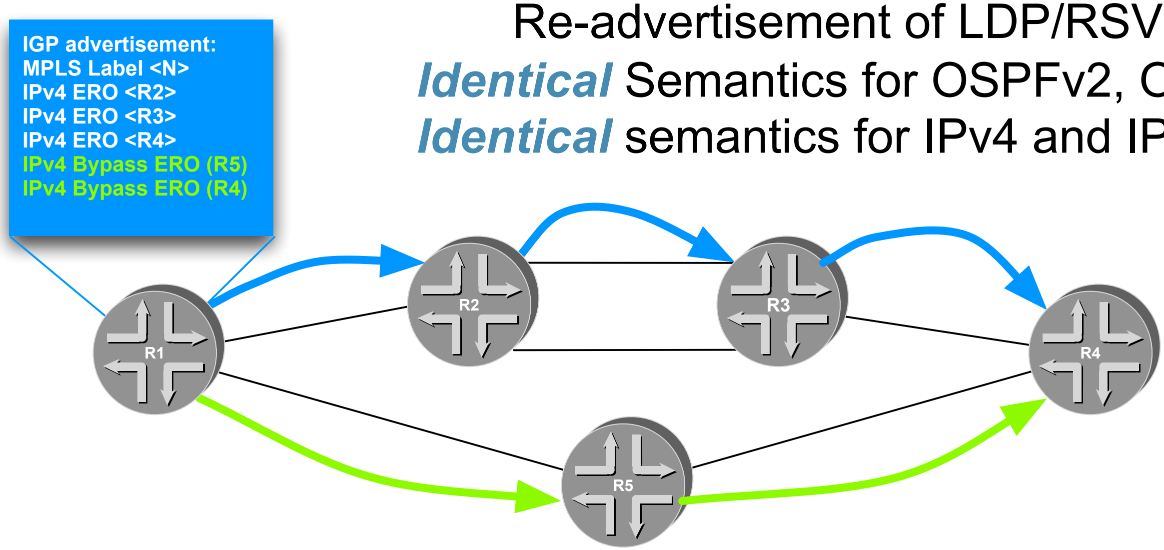
LSP supporting list of NHs = ERO

{ Label, Destination FEC, NH[ ] }



Protocol semantics of MPLS LSPs (3)

Segments and Labels are ***Node*** properties
Nexthop notion gives the Segment/Label a direction
Support for ***more than one*** Nexthop = Path ERO
FEC/Prefix describes what is at the tail-end of the path
(= Support for stitching to LDP/RSVP/LBGP)
Support for ***more than one*** path (Primary, Bypass) for a given destination
Identical semantics for
Re-advertisement of existing IGP label stack
Re-advertisement of LDP/RSVP/LBGP label
Identical Semantics for OSPFv2, OSPFv3 and IS-IS
Identical semantics for IPv4 and IPv6 FECs



Merge draft-gredler-isis-label-advertisement-03 into draft-previdi-isis-segment-routing-extensions-01

[Docs] [txt|pdf] [Tracker] [Email] [Nits]

Versions: 00 01

IS-IS for IP Internets S. Previdi, Ed.
Internet-Draft C. Filsfils
Intended status: Standards Track A. Bashandy
Expires: December 30, 2013 Cisco Systems, Inc.
B. Decraene
S. Litkowski
Orange
R. Geib
Deutsche Telekom
I. Milojevic
Telekom Srbija
R. Shakir
British Telecom
S. Y
TDC
W. Henderi
Alcatel-Luc
J. Tants
Ericsson
June 28, 2013

IS-IS Extensions for Segment Routing
draft-previdi-isis-segment-routing-extensions-00

[Docs] [txt|pdf|xml|html] [Tracker] [Email] [Diff1] [Diff2] [Nits]

Versions: 00 01 02 03

IS-IS for IP Internets H. Gredler, Ed.
Internet-Draft Juniper Networks, Inc.
Intended status: Standards Track S. Amante
Expires: November 22, 2013 Level 3 Communications, Inc.
T. Scholl
Amazon
L. Jalil
Verizon
May 21, 2013

Advertising MPLS labels in IS-IS
draft-gredler-isis-label-advertisement-03

[Docs] [txt|pdf|xml|html] [Tracker] [Email] [Diff1] [Diff2] [Nits]

Versions: 00 01

IS-IS for IP Internets S. Previdi, Ed.
Internet-Draft C. Filsfils
Intended status: Standards Track A. Bashandy
Expires: January 2, 2014 Cisco Systems, Inc.
H. Gredler
Juniper Networks, Inc.
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Orange
R. Geib
Deutsche Telekom
I. Milojevic
Telekom Srbija
R. Shakir
British Telecom
S. Ytti
TDC Oy
W. Henderickx
Alcatel-Lucent
J. Tantsura
Ericsson
July 1, 2013

IS-IS Extensions for Segment Routing
draft-previdi-isis-segment-routing-extensions-01

Merge draft-gredler-ospf-label-advertisement-03 into draft-psenak-ospf-segment-routing-extensions-01

[Docs] [txt|pdf] [Tracker] [Email] [Nits]

Versions: 00 01

```
Network Working Group                                   P. Psenak, Ed.
Internet-Draft                                          S. Previdi, Ed.
Intended status: Standards Track                            C. Filsfils
Expires: December 30, 2013                          Cisco Systems, Inc.
                                                          June 28, 2013


                  OSPF Extensions for Segment Routing
           draft-psenak-ospf-segment-routing-extensions-00
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Versions: 00 01 02 03

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Open Shortest Path First IGP                            H. Gredler, Ed.
Internet-Draft                                    Juniper Networks, Inc.
Intended status: Standards Track                              S. Amante
Expires: November 22, 2013                  Level 3 Communications, Inc.
                                                               T. Scholl
                                                                  Amazon
                                                                L. Jalil
                                                                 Verizon
                                                            May 21, 2013


                    Advertising MPLS labels in OSPF
               draft-gredler-ospf-label-advertisement-03
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Versions: 00 01

```
Open Shortest Path First IGP                            P. Psenak, Ed.
Internet-Draft                                          S. Previdi, Ed.
Intended status: Standards Track                            C. Filsfils
Expires: January 2, 2014                            Cisco Systems, Inc.
                                                             H. Gredler
                                                  Juniper Networks, Inc.
                                                               R. Shakir
                                                         British Telecom
                                                            July 1, 2013


                  OSPF Extensions for Segment Routing
           draft-psenak-ospf-segment-routing-extensions-01
```

Draft-Merge Summary

- Common
  - Protocol Semantics
- Differences
  - draft-gredler-* builds on top of ***RFC3031*** and ***does not require*** a new architecture.
  - Draft-gredler-* proposes to re-use only ***existing data plane*** for source-routing (=MPLS)

ISSUE: SR-V6 dataplane is a *significant* change of IPv6 dataplane

Proposal to create a ***source routing extension header***

- Issue: requires ***new Hardware*** to overcome first N-bytes lookup buffer limits, of deployed hardware

Data planes in routers (IPv4, IPv6, MPLS)

- Why need for data plane #4 ?

Use cases ?

MPLS ***is*** the ***'routing header'*** of IPv4 and IPv6 today

SR-v6 dataplane is ***more complex*** than MPLS Label operation

- Requires IPv6 address rewrite capabilities to adjust SID segment pointer