IETF 104 – Prague
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6man Working Group

Segment Routing Header

draft-ietf-6man-segment-routing-header-17

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Agenda

- Running Code and Deployments
- Changes 16/17
- Issues to close
- Close last call

SRv6 Collaboration Adoption

- 6 years since first presentation to the IETF
- 5 years since the first implementation
- Industry support, operators, vendors, academic research
- Twenty-four revisions
- 1000+ emails on 6man (~1 email per line of text).
- 16+ IETF presentations delivered.
- 35+ drafts reference the draft-ietf-6man-segment-routing-header.

Open Source Delivered.

- Linux 4.10 Feb 2017
- Linux srext April 2017
  - https://github.com/netgroup/SRv6-net-prog
- FD.io VPP 17.04: April
  - https://wiki.fd.io/view/VPP/Segment_Routing_for_IPv6

Cisco
Shipping Product Now

- First support April 2017
- Cisco ASR 9000 – Shipping now
- Cisco NCS 5500 – Shipping now
- Cisco NCS 540 – Shipping now
- Cisco ASR 1000 – engineering code

Huawei
Shipping Product Now

- ATN with VRPV8 – Shipping now
- CX600 with VRPV8 – Shipping now
- NE40E with VRPV8 – Shipping now
- ME60 with VRPV8 – Shipping now
- NE5000E with VRPV8 – Shipping now
- NE9000 with VRPV8 – Shipping now
- NG-OLT MA5800 with VRPV8 – Shipping now

NPUs and Test Gear

- Barefoot – Tofino NPU Shipping Now (since May 2017)
- Spirent - Hardware implementation in Spirent TestCenter.
- Ixia - Hardware implementation in Ixia IxNetwork.

Applications

- Wireshark
- tcpdump
- iptables
- nftables
- Snort

Research

- SDN Architecture and Southbound APIs for IPv6 Segment Routing Enabled Wide Area Networks - IEEE Journals & Magazine (https://doi.org/10.1109/TNSM.2018.2876251)
- Leveraging eBPF for programmable network functions with IPv6 Segment Routing (https://doi.org/10.1145/3281411.3281426)
  - http://netgroup.uniroma2.it/Stefano_Salsano/papers/18-sr-snort-demo.pdf
- Performance of IPv6 Segment Routing in Linux Kernel - IEEE Conference Publication (https://ieeexplore.ieee.org/document/8584976)
- Interface Counters in Segment Routing v6: a powerful instrument for Traffic Matrix Assessment (https://doi.org/10.1109/NOF.2018.8597768)
- Exploring various use cases for IPv6 Segment Routing (https://doi.org/10.1145/3234200.3234213)
- SRv6Pipes: enabling in-network bytestream functions (http://hdl.handle.net/2078.1/197480)
- SERA: SEgment Routing Aware Firewall for Service Function Chaining scenarios (http://netgroup.uniroma2.it/Stefano_Salsano/papers/18-ifip-sera-firewall-sfc.pdf)
- Software Resolved Networks (https://doi.org/10.1145/3185467.3185471)
- 6LB: Scalable and Application-Aware Load Balancing with Segment Routing (https://doi.org/10.1109/TNET.2018.2799242)
- Implementation of virtual network function chaining through segment routing in a linux-based NFV infrastructure - IEEE Conference Publication (https://doi.org/10.1109/NETSOFT.2017.8004208)
- A Linux kernel implementation of Segment Routing with IPv6 - IEEE Conference Publication (https://doi.org/10.1109/INFCOMW.2016.7562234)
- Leveraging IPv6 Segment Routing for Service Function Chaining (http://hdl.handle.net/2078.1/168097)

SIGCOM 2017
L3VPN with TE and Service Programming

- T.Encap, END, END.DX6, END.X
- Linux srext kernel module created by University of Rome, Tor Vergata, Italy.
- FD.io Vector Packet Processor (VPP) virtual router.
- Barefoot Networks Tofino NPU using the P4 programming language.
- Cisco NCS 5500 router using commercially available NPU.
- Cisco ASR 1000 router using custom ASIC.
- L3VPN with Traffic Engineering and Service Programming

EANTC 2018
L3 VPN with TE and TILFA

- T. Encaps, END, END.X, END.DT4
- Cisco NCS 5500 - commercially available NPU
- UTStarcom UAR500 – Hardware Implementation
- Ixia IxNetwork – Hardware Implementation
- Spirent TestCenter – Hardware Implementation

Cisco and Softbank 5G Nation-wide SRv6

- Segment Routing Header
  - draft-ietf-6man-segment-routing-header
- END (PSP), END.X (PSP), END.DT4, T.Encaps.Red and T.Insert.Red functions
  - draft-filsfils-spring-srv6-network-programming
- ISIS SRv6 extensions
  - draft-bashandy-isis-srv6-extensions
- BGP VPN SRv6 extensions
  - draft-dawra-bess-srv6-services
- SRv6 Topology Independent (TI-LFA) Fast Reroute
  - draft-ietf-rtgwg-segment-routing-ti-lfa
- BGP Prefix Independent Convergence (PIC) core and edge
  - draft-ietf-rtgwg-bgp-pic
- Ping and Traceroute
  - draft-ali-6man-spring-srv6-oam

Huawei and China Telecom SRv6 Video Network

- A Segment Routing Header
  - draft-ietf-6man-segment-routing-header
- END.DT4 function
  - draft-filsfils-spring-srv6-network-programming
- BGP SRv6 extensions
  - draft-dawra-bess-srv6-services
- BGP Prefix Independent Convergence (PIC) core and edge
  - draft-ietf-rtgwg-bgp-pic
- Ping and Traceroute
  - draft-ali-6man-spring-srv6-oam

Changes 16/17

Deployment Model

- Intra SR Domain deployment model
  - securing the SR Domain from external attempt to use its SIDs
  - SR Domain as a single system with delegation between components
  - handling packets of the SR Domain

Other Changes

- Network Programming
  - Remove reference
- TLV processing limits
  - When length of TLVs exceeding hdr ext len
- Pad TLV
  - Minor description updates
- HMAC
  - Cover destination address matching first segment
- Extension header processing order
  - Process in the order received
- Flow label/ECMP
  - Set for intra-domain and inter-domain packets

IANA

- Issue 64
  - Added IANA Designated Expert instructions for Flags and TLV
  - Require a WG draft
  - Require notification to 6man
  - Based on recommended text from RFC8126

Issues to Close

https://trac.ietf.org/trac/6man/report/9

Tag

- Processing is defined in the draft
- Usage is not
- Example uses:
  - OpenStack "Group Based Policy" https://wiki.openstack.org/wiki/GroupBasedPolicy
  - OpenDaylight, "Group Policy" https://wiki.opendaylight.org/view/Group_Policy:Main

TLV

- Fundamental to SR architecture: integrated underlay, overlay and service chaining solution.
- SR Source nodes combine segments for TE or service functions.
- A TLV within the SRH ensures lower processing overhead for topological segments.
- No need to parse TLVs at every segment.

Management Section

- Not planned
- Leave this work to other documents
- Management
  - Data Model
    - SID
    - SRH Encap
  - HMAC

The Plan to Close Last Call

- Objective:
  - Close open issue this week
- Meetings
  - Tuesday/Wednesday meet submitters, document resolution
- Report to the list:
  - Update on each open issue, include proposed text if any
- Update the draft:
  - Minor updates this week
- Report:
  - Friday report and discuss.

Discussion