# IETF Hackathon - SRv6 SFC Architecture with SR-aware Functions

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Wataru Mishima, Yuta Fukagawa

I E T F

# Hackathon Plan

**Objective: Comprehensive management of SRv6 SFC using a controller.**

- SRv6 controller computes SR Policies based on network function information.
- We implemented BGP-LS Service Segment extension at IETF 122 in Bangkok.

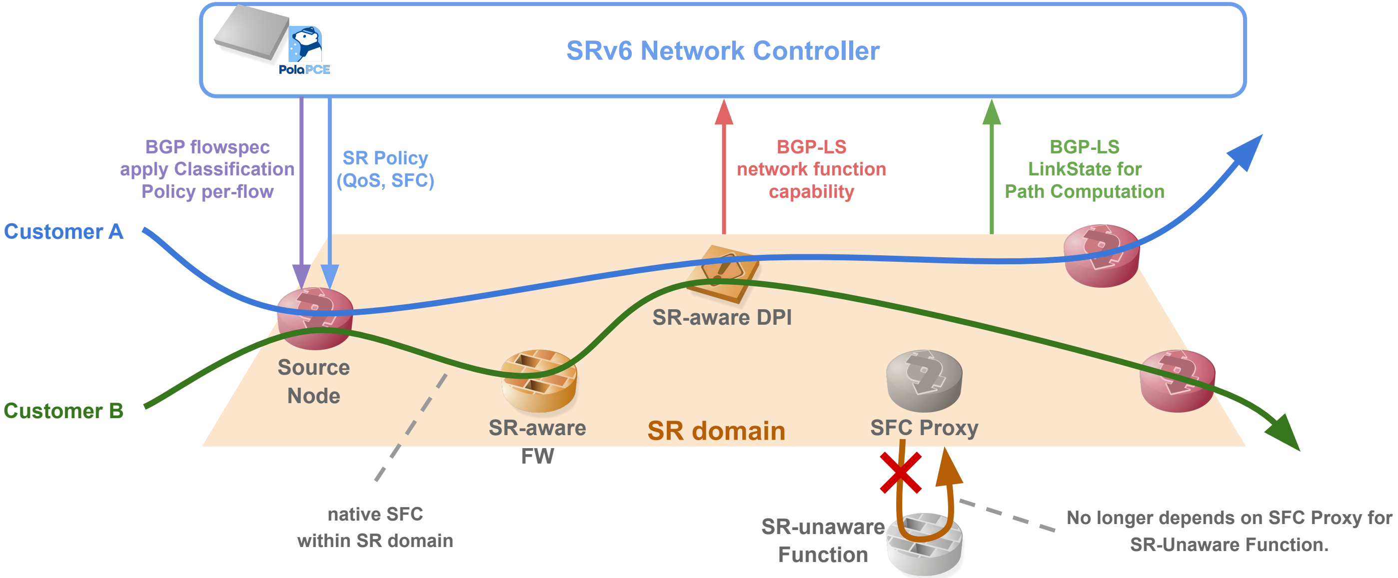
**Hackathon Goal: Implement SRv6 SFC path computation in the following OSS:**

- Update GoBGP gRPC API
- Implement SRv6 SFC path computation in Pola PCE
- Conduct interoperability testing

# SRv6 SFC Architecture

## The concept that controller manages the entire SRv6 SFC network.

A controller collects Service Segment information and applies SR Policies based on information about available Network Functions.




SRv6 SFC Architecture with SR-aware Functions

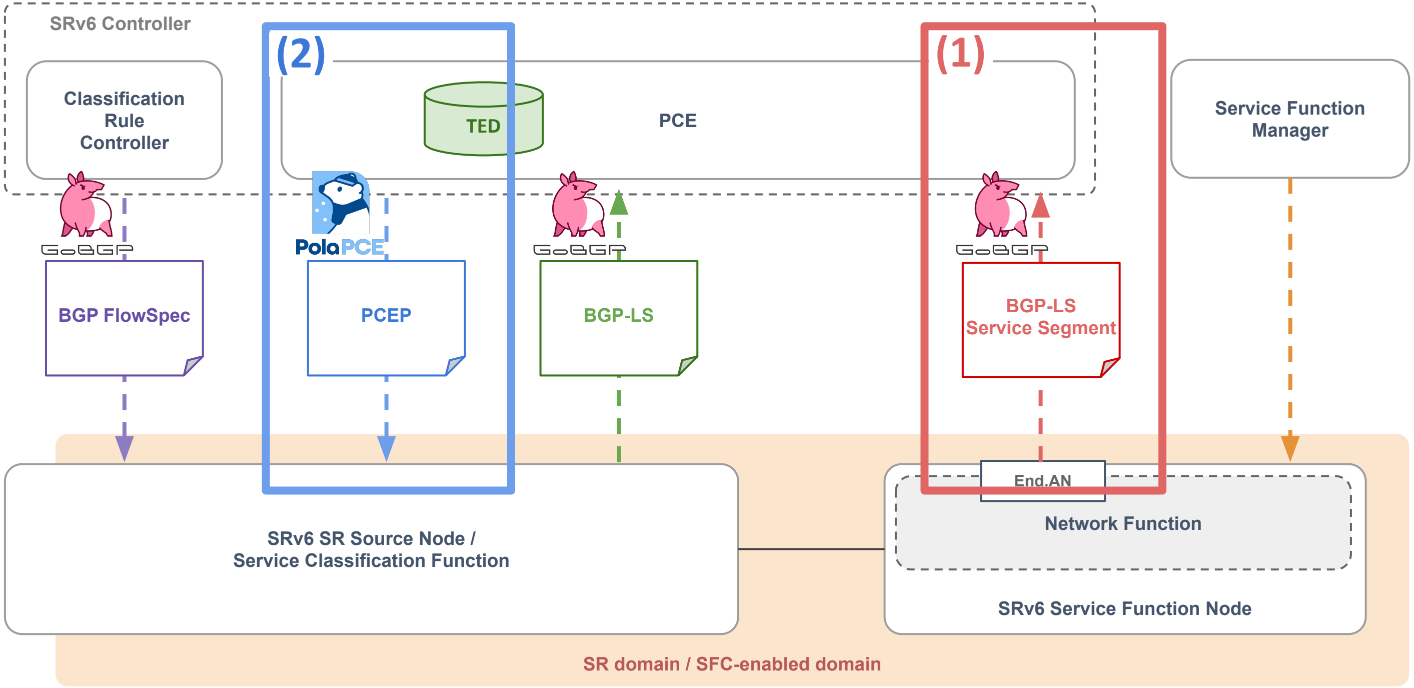
# Implementations (1/3)

- **GoBGP** (https://github.com/osrg/gobgp)
    - An open-source BGP daemon.
    - We added RFC 9514 TLVs and gRPC API for BGP-LS Service Segment.
- **Pola PCE** (https://nttcom.github.io/pola/)
    - An open-source Path Computation Element developed by NTT docomo Business.
    - We added gRPC API for BGP-LS Service Segment and uSID Path computation.

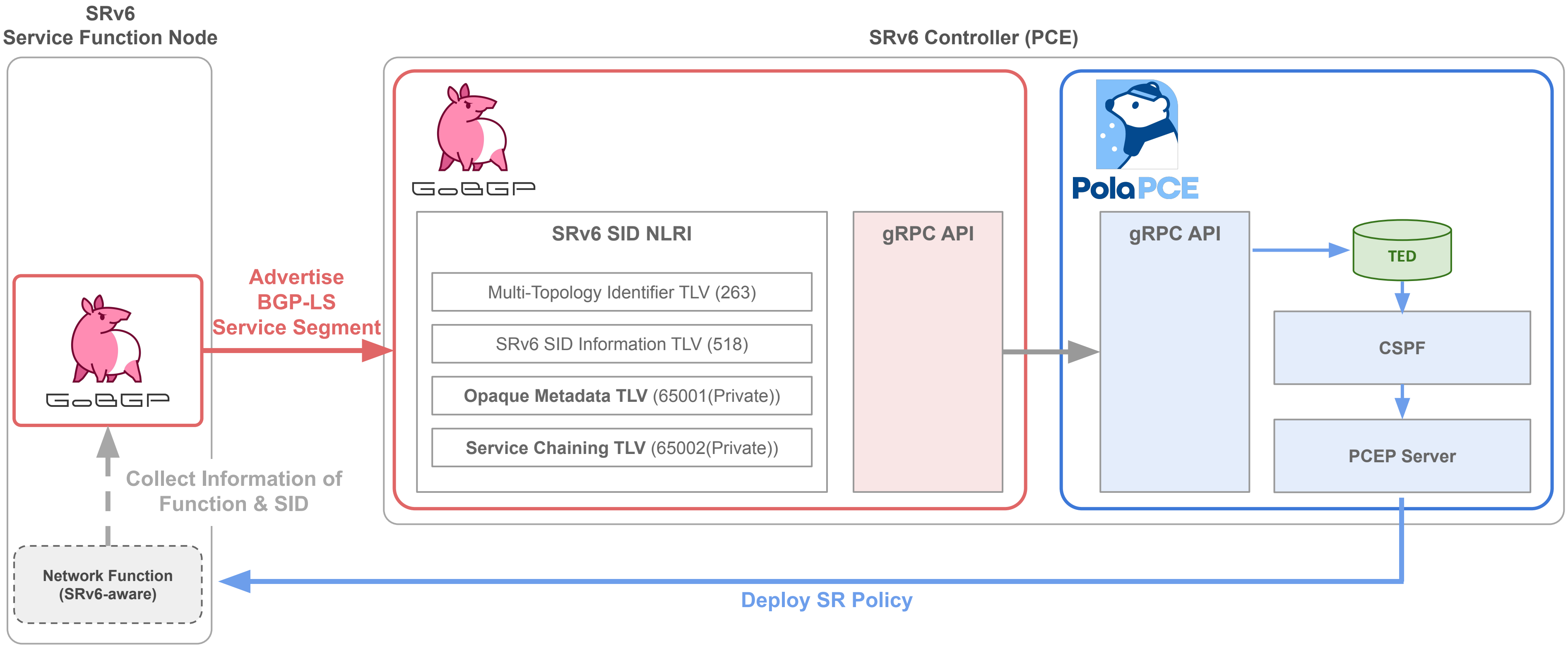
# Implementations (2/3)

(1) Collect network function information (including SIDs).

(2) Compute SR Policies with TE and SFC constraints.



# Implementations (3/3)




SRv6 SFC Architecture with SR-aware Functions

# Result

```
pola:/# /bin/pola/pola sr-policy list -p 50052
Session: fd00:ffff::4
  PolicyName: DYNAMIC_POLICY_100
    SrcAddr: fc00:b100:4::1
    DstAddr: fc00:b100:1::1
    Color: 100
    Preference: 0
    SegmentList: fc00:b100:3:: -> fc00:b100:2:: -> fc00:b100:1::
```

```
pola:/# /bin/pola/pola sr-policy list -p 50052
Session: fd00:ffff::4
  PolicyName: DYNAMIC_POLICY_100
    SrcAddr: fc00:b100:4::1
    DstAddr: fc00:b100:1::1
    Color: 100
    Preference: 0
    SegmentList: fc00:b100:2:: -> fc00:b100:1::
```

**Automatically re-computes SR Policy due to topology changes**

# Result

```
root@pola:/# /bin/pola/pola ted -p 50052
Node: 1
  0000.0000.0001
  Hostname: r1
  ISIS Area ID: 49.0001
  SRGB: 0 - 0
  Prefixes:
  PrefixesV6:
    fd00:a1::/64
    fc00:b100:1::/64
    fd00:a2::/64
    fc00:b100:1::1/128
  Links:
    Local: fd00:a2::1 Remote: fd00:a2::3
      RemoteNode: 0000.0000.0003
      Metrics:
        IGP: 10
      Adj-SID: 0
    Local: fd00:a1::1 Remote: fd00:a1::2
      RemoteNode: 0000.0000.0002
      Metrics:
        IGP: 10
      Adj-SID: 0
  SRv6 SIDs:
    SIDs: [fc00:b100:1:0:1::]
    EndpointBehavior: 0
    MultiTopoIDs: [2]
    ServiceType: 0
    TrafficType: 0
    OpaqueType: 0
    Value: 0x
```

```
Node: 1
  0000.0000.0003
  Hostname: r3
  ISIS Area ID: 49.0001
  SRGB: 0 - 0
  Prefixes:
    fc00: b100:3::1/128
    fc00: b100:3::/48
    fd00:a2: :/64
    fd00:a5::/64
    fd00: a4::/64
  Links:
    Local: fd00:a5::3 Remote: fd00:a5::2
      RemoteNode: 0000. 0000.0002
      Metrics:
        METRIC_TYPE_IGP: 10
        METRIC_TYPE_TE: 10
      Adj-SID: 0
      SRv6 End.X SID:
        EndpointBehavior: UA
        SIDs: [fc00:b100:3:e001::]
        SID Structure: Block: 32, Node: 16, Func: 16, Arg: 64
    Local: fd00:a2::3 Remote: fd00:a2::1
      RemoteNode: 0000.0000.0001
      Metrics:
        METRIC_TYPE_IGP: 10
        METRIC_TYPE_TE: 50
      Adj-SID: 0
      SRv6 End.X SID:
        EndpointBehavior: UA
        SIDs: [fc00:b100:3:e000: :]
        SID Structure: Block: 32, Node: 16, Func: 16, Arg: 64
    Local: fd00:a4::3 Remote: fd00:a4::4
      RemoteNode: 0000. 0000.0004
      Metrics:
        METRIC_TYPE_IGP: 10
        METRIC_TYPE_TE: 10
      Adj-SID: 0
      SRv6 End.X SID:
        EndpointBehavior: UA
        SIDs: [fc00:b100:3: e002::]
        SID Structure: Block: 32, Node: 16, Func: 16, Arg: 64
    SRv6 SIDs:
      SIDs: [fc00:b100:3::]
      Block: 32, Node: 16, Func: 0, Arg: 80
      EndpointBehavior: UN, Flags: 0, Algorithm: 0
      MultiTopoIDs: [2]
```

**PCE TED includes BGP-LS Service Segment (from GoBGP)**

**PCE TED includes RFC 9514 TLVs (from IOS-XR)**

# What got done

- **GoBGP**
  - **COMPLETED: RFC 9514 TLVs**
    - **SRv6 End.X SID, SRv6 Endpoint Behavior, and SRv6 SID Structure**
  - **COMPLETED: gRPC API**
    - **Sending RFC 9514 and *I-D.idr-bgp-ls-sr-service-segments* information**
- **Pola PCE**
  - **COMPLETED: SRv6 uSID Path Computation**
- **Interoperability Testing (GoBGP & Pola PCE)**
  - **COMPLETED: Dynamic Path Computation**
  - **WIP: SFC-constrained SPF**
- **M-Plane**
  - **WIP: Network Function Deployment**
  - **WIP: Sending SRv6 End.AN**

# Our Code

- **GoBGP**: https://github.com/watal/gobgp/tree/feature/bgp-ls-service-segments
- **Pola PCE**: https://github.com/nttcom/pola/tree/develop

# Members


- **Wataru Mishima**, NTT docomo Business / Kanagawa Institute of Technology, w.mishima@ntt.com
- **Yuta Fukagawa**, NTT docomo Business / Kanagawa Institute of Technology, y.fukagawa@ntt.com
- **Kiyoto Nakata**, Kindai University, 2433340426t@kindai.ac.jp
- **Taisei Tanabe**, National Institute of Informatics, tanabe@nii.ac.jp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