



中国移动
China Mobile

MPLS SD&AI NET
WORLD22

SRv6 Compression Requirements, Principle and Progress

Weiqiang Cheng
Principal Architect of IP network
China Mobile

Why Operators need SRv6?

Native SDN

Recovering
Seconds -> 50ms

Simplified

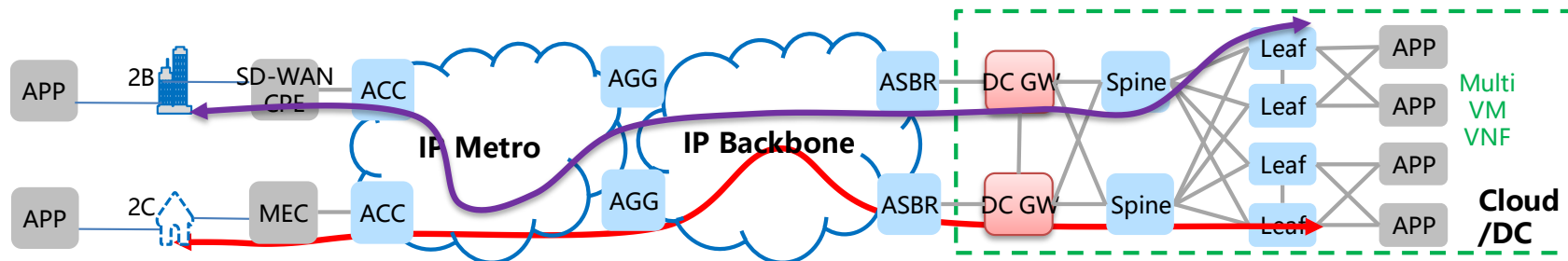
Protocols
Reduced

Programmable

Routing/Service/
Application

Evolvable

Smoothly based
on IPv6



Cloud/Network
Convergence

E2E SRv6 Solution (Application-side Solution)

SRv6 is simple and powerful, is considered as a next-generation IP bearer protocol

- **SRH Overhead**

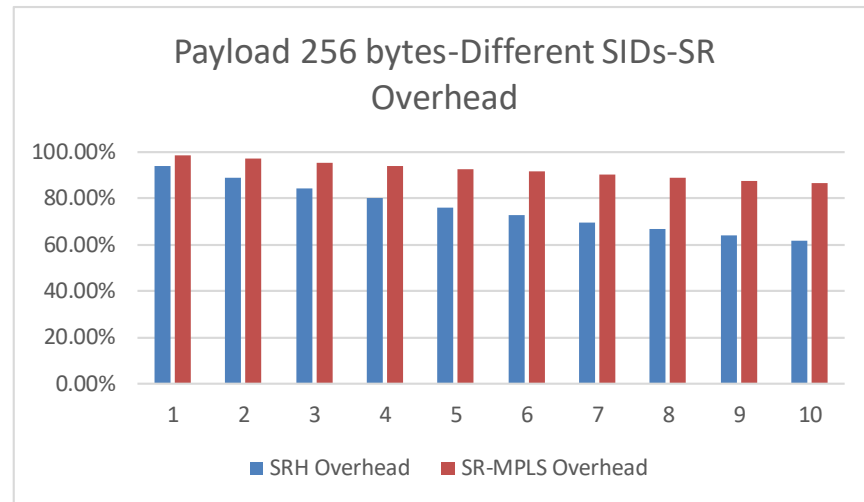
- SRH overhead is too heavy (as shown on the figure) for SR-TE.
- SRH overhead also needs the chips to process 160 bytes-long SIDs list, challenges for current chipset.

- **Compressed SRv6**

- The overhead **MUST** be reduced.
- The benefits of SRv6 **MUST** be maintained.
- It **MUST** be complied with IPv6/SRv6 RFCs, RFC8200 , RFC8654, RFC8986, etc.

IETF setup a Design team for discussing the requirements of SRv6 compression and analyzing potential solutions.

- draft-ietf-spring-compression-analysis
- draft-ietf-spring-compression-requirement



From IETF angle:

- SRv6 SID List Compression Requirements
 - Reduced the size
 - Good forwarding and less states
- SRv6 Specific Requirement
 - SRv6 based
 - Support all SRv6 functions
 - SID summarization
 - Flexible address planning
 - 64K Adj SID per node(16 bits)
 - 1M Prefix/Node SID (20 bits)
 - 1M Service SID (20 bits)
- Protocol Design Requirements
 - SRv6 Base Coexistence

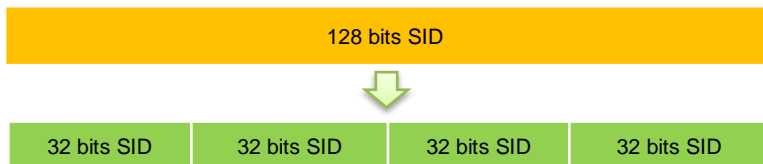
From draft-ietf-spring-compression-analysis

From operator (CMCC) angle:

- SRv6 SID List Compression Requirements
 - 32-bits C-SID for large-scale deployment, reducing 75% SID size, same as MPLS label.
 - Same as SRv6 forwarding and states
- SRv6 Specific Requirement
 - SRv6 has been deployed
 - All SRv6 functions(SRH and All Behaviors and Flavors)
 - SID summarization(Hierarchical address design, better OAM)
 - Flexible address planning(Fit the existing CMCC IPv6 GUA design, better OAM, support **BSID for SD-WAN, Leased-line**)
 - 64K Adj SID per node. **Large node may have 1K+ v-intf**
 - 1M Prefix/Node SID, **over 1 Million nodes in CMCC, increase very fast in 5G/6G era.**
 - 1M Service SID , **over 30K+ VPN instances at a node**
 - **MUST reserve enough bits for future** (10+ years) extension in prefix, no enough reserved bits will cause readdressing in the future.

Compressed SRv6 deployment MUST be scalable and future-proof in 5G/6G era

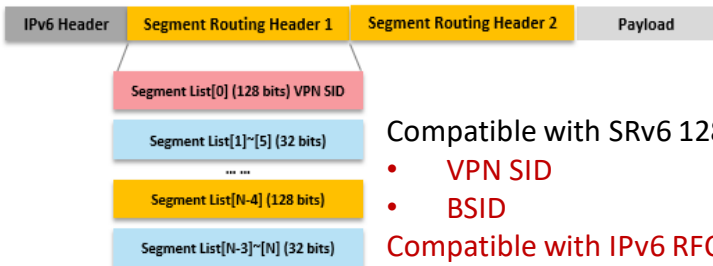
Efficient and Scalable



Efficient and Scalable is a trade-off

32 bits has the best balance between efficiency and scalability
 16 bits brings better compression with scalability issues

Compatible with IPv6/ SRv6

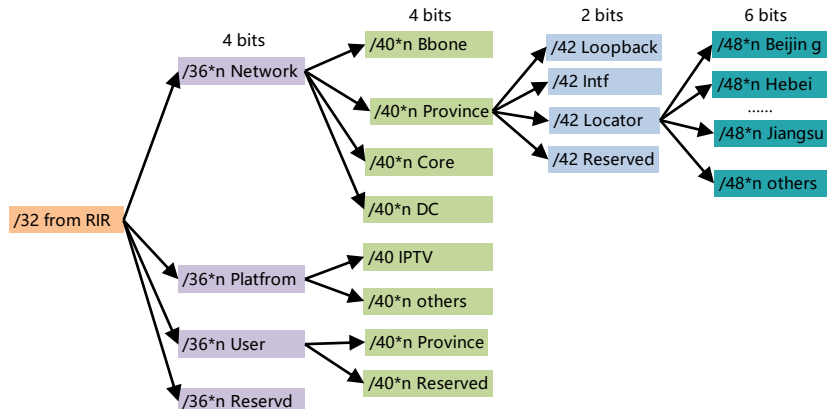


Compatible with SRv6 128bit SID

- VPN SID
- BSID

Compatible with IPv6 RFC8200, etc.

Simple and Flexible



Simple and Flexible Network Planning

Simple deployment follows IPv6/SRv6
 Flexible address planning for different scenarios

IETF SPRING WG

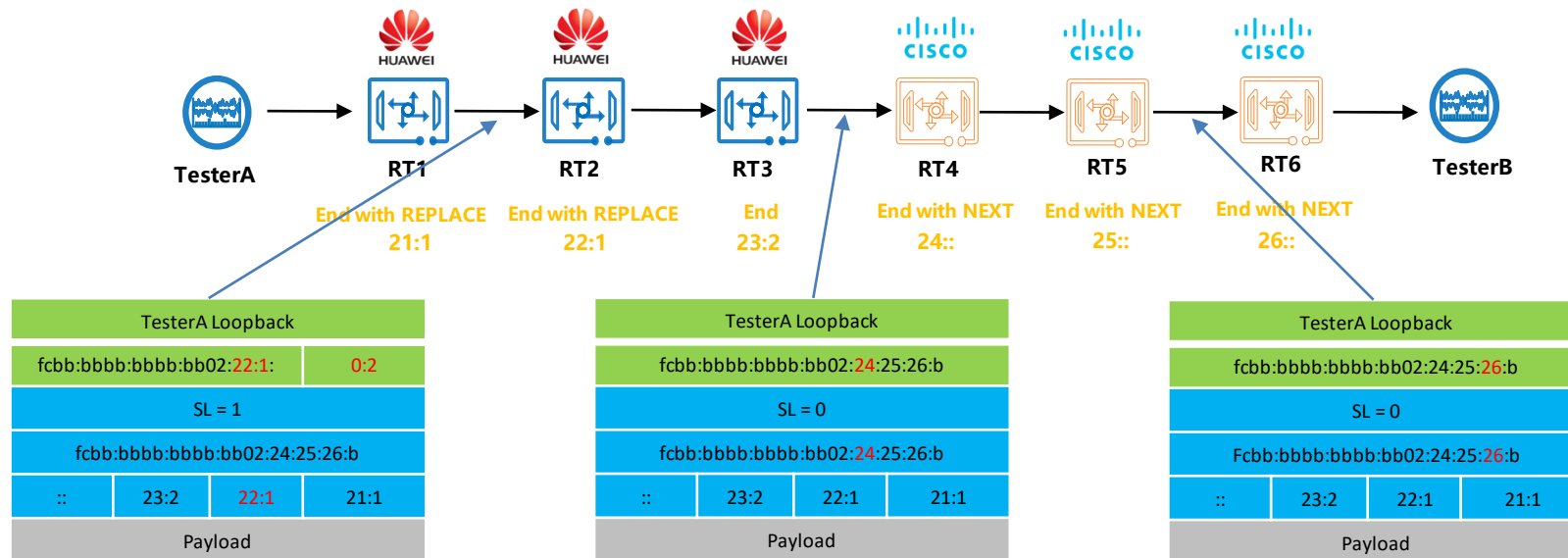
- draft-ietf-srv6-srh-compression(C-SID) is adopted.
- C-SID draft defines flavors for the SR endpoint behaviors, which enable a compressed SRv6 Segment-List encoding in the Segment Routing Header (SRH).
 - Replace-C-SID Flavor a.k.a G-SRv6
 - Next-C-SID Flavor a.k.a uSID
 - Next-and-Replace-C-SID Flavor
- All the flavors are defined under the SRv6 network programming architecture RFC8986.
- Replace-C-SID flavor SID and Next-C-SID can be encoded in a single SRH for better interop, and the interop test had been done in 2020.

SPRING
Internet-Draft
Intended status: Standards Track
Expires: 22 September 2022

W. Cheng, Ed.
China Mobile
C. Filsfils
Cisco Systems, Inc.
Z. Li
Huawei Technologies
B. Decraene
Orange
D. Cai
Alibaba
D. Voyer
Bell Canada
F. Clad, Ed.
Cisco Systems, Inc.
S. Zadok
Broadcom
J. Guichard
Futurewei Technologies Ltd.
L. Aihua
ZTE Corporation
R. Raszuk
NTT Network Innovations
C. Li
Huawei Technologies
21 March 2022

Compressed SRv6 Segment List Encoding in SRH
[draft-ietf-srv6-srh-compression-01](#)

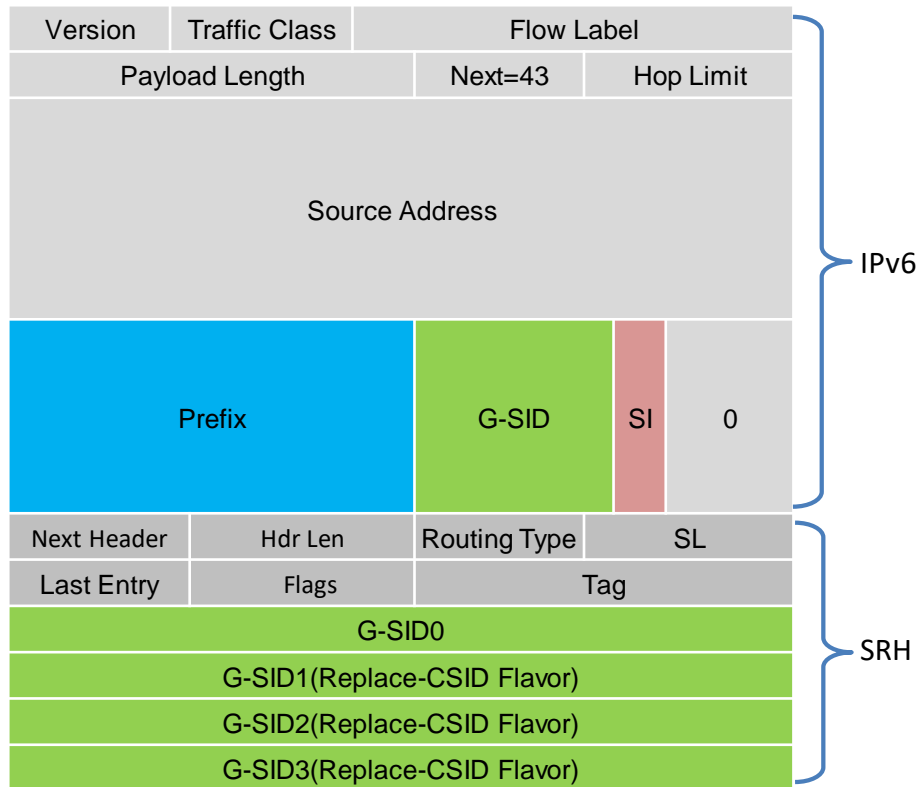
C-SID Solution: REPLACE and NEXT flavors Interop-Test

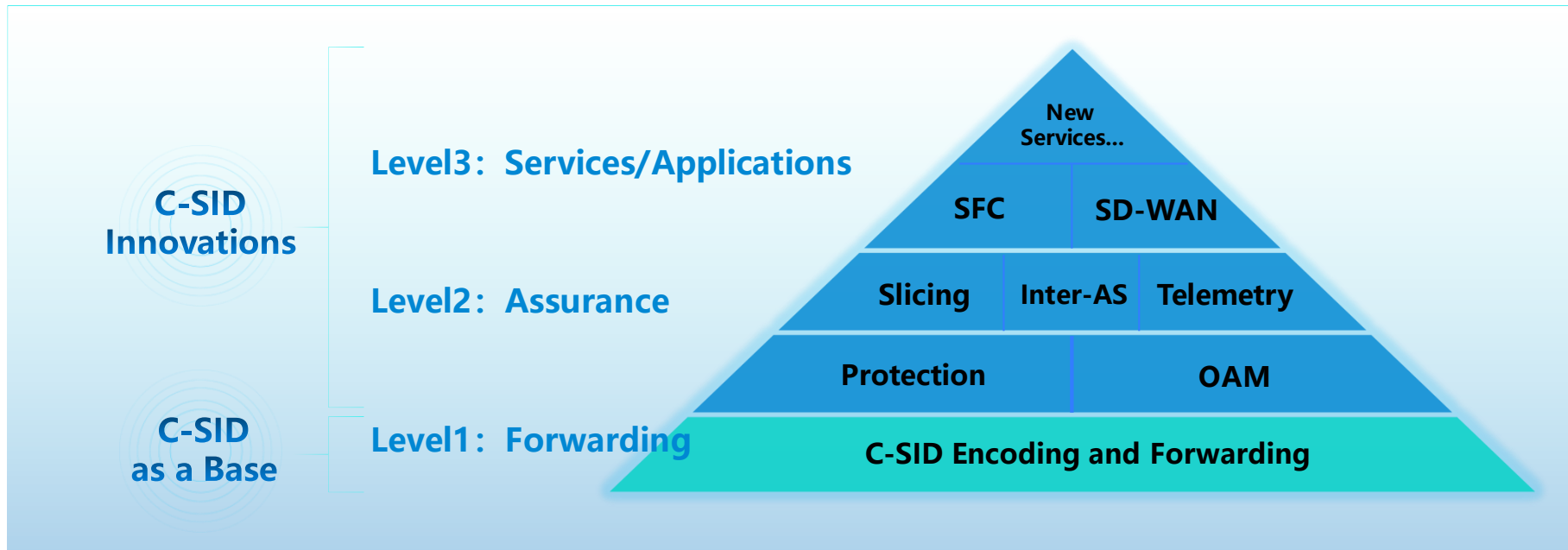


- China Mobile has completed the interworking test of C-SID REPLACE and NEXT flavors with vendors of Huawei and Cisco in 2020.
- The two flavors of C-SID can interwork and coexist with each other
- C-SID can solve the compression problem of SRv6 , and fully comply with the SRv6 system

G-SRv6 provide a compression mechanism of encoding 16/32-bit REPLACE-C-SID flavor C-SID in a SRH

- Reduce 75% size of SRv6 SID and keep the best balance of Scalability, Efficiency, Compatibility and Flexibility.
- Up to 1M Node ID (20 bits) to support large-scale deployment.
- Support hierarchical network design for better route aggregation and OAM (4/8/8, CORE/AGG/ACC or Region/Ring/NE-ID, etc)
- Safer in deployment:
 - No extra security configurations at border routers.
 - No risks of re-addressing
- Support SRv6 based SD-WAN, Leased Line, etc, bring more revenue to operators.
- No change compression for any prefix, any combination of C-SIDs in any use cases.
- Compatible with SRH/SRv6, no modification of SRH.





C-SID is a important basic forwarding mechanism.

More innovations can be built based on C-SID, such as network slicing, OAM, IFIT, and SD-WAN.



Interworking test of G-SRv6 with 10+ vendors

Chip	 BROADCOM	 intel	 MARVELL	 centec
Router	 HUAWEI	 ZTE中兴	 H3C	 Ruijie
Controller	 中盈 优创 China Unitech	 HUAWEI	 ZTE中兴	
Tester	 SPIRENT	 ixia A Keysight Business		

Deployment in a large scale network

- 2022: Will deploy G-SRv6 in the IP backbone network, with 1000+ routers
- Near Future: Will deploy G-SRv6 in 5G backhaul network, with over 1 Million of SPN nodes

MPLSSD&AI[★]NET
WORLD22

Thank you

MPLSSD&AI[★]NETWORLD22
5/6/7APRIL

