SRv6 uSID

Clarence Filsfils

The un-expected Innovation

Using IP protocol differently
than anyone else imagined in the past

Any service without any shim (MPLS, VxLAN…)

With Better Scale, Reliability, Cost
and Seamless Deployment in Brownfield

Grand Architecture with HW-Efficiency

- Revolutionary Network Programming Model (Turing Complete)
  - The IP Destination Address (DA) holds up to 14 instructions
    - 2-byte block, 1-byte uSID's
  - SRH extension header holds additional instructions (rarely needed)
- Any behavior can be bound to the instruction
  - Shortest path according to cost, latency with exclusion of unsecured links
  - TDM-alike behavior (one instruction per hop/interface)
  - TE, FRR, NFV, Cryptography…
- Linerate across our entire portfolio

Novel Architecture with Brownfield

- Classic Longest-Match at Legacy IP node
- The network program is opaque to legacy node
- Alibaba, Swisscom, Bell… are all brownfield deployments

Unified Core Metro Access DC Cloud IP solution

Outperforms per-domain custom shim (MPLS, VxLAN)

Outperform MPLS - Daniel Voyer (Bell Canada)

- Native Optimum Slicing
  - SLID is encoded in Flow Label
- HW Linerate Push: 3 times better
  - J2 uSID linerate push: 30 uSIDs >> 10 MPLS Labels
- HW Counter and FIB consumption: 4 times better
  - uSID requires 4 times less counters and FIB entries than MPLS
- Routing scale: 20 times better
  - uSID supports summarization. MPLS requires host routes.
- Lookup efficiency: 2 to 3 times better
  - uSID can process 2 to 3 SIDs in a single lookup (LPM nature)
- Load-balancing: optimum and deterministic
  - uSID provides HW friendly entropy (fixed offset, shallow)

Bell SRv6 uSID Deployment
Paris 2022

Outperforms VxLAN – Gyan Mishra (Verizon)

- Seamless Host support for Network Programming
  - 6 uSID's in outer DA: RFC2460 IPinIP with opaque DA
- TE in the DC
  - elephant flows exist, asymmetric fabrics exist, TE is needed
- TE in the Metro/Core from the host
  - An SRv6 uSID DC allows for the application to control the network program in the metro/core without complex DPI and protocol conversion at the DC boundary,
- uSID DC provides lower MTU overhead (~5%)
  - Lower MTU overhead means lower DC cost
- Vendor, Merchant and SONIC/SAI maturity
  - uSID support across DC vendor (Cisco), Merchant (Cisco, Broadcom, Marvell), Sonic/Sai (Alibaba deployment)

SRv6 uSID DC Use-Case
Paris 2023

Rich SRv6 uSID Ecosystem

Network Equipment Manufacturers

Cisco, Huawei, Nokia, Ciena, Juniper Networks, ZTE, Arrcus, Arista, H3C

Merchant Silicon

Broadcom, Marvell, Barefoot Networks (Intel)

SR v6 Segment Routing

Open-Source Networking Stacks

Linux, FD.io (VPP), P4, OCP, Open Compute Project, Kubernetes, SONiC, FRRouting

Smart NIC

Intel, Mellanox Technologies

Open-Source Applications

Pyroute2, IPTABLES SERA, GoBGP, exa, BGP, eBPF, cilium, TCPDUMP, WIRESHARK, SNORT, GoBMP

Partners

kaloom, Trend Micro, ENEA Qosmos Division, Keysight Technologies, NoviFlow, ixia A Keysight Business, Spirent Promise. Assured.

SRv6 is Proposed Standard

Architecture

- SR Architecture – RFC 8402
- SRTE Policy Architecture – RFC 9256

Data Plane

- SRv6 Network Programming – RFC 8986
- IPv6 SR header – RFC 8754

Control Plane

- SRv6 BGP Services – RFC 9252
- SRv6 ISIS – RFC 9352
- SR Flex-Algo – RFC 9350

Operation & Management

- SRv6 OAM – RFC 9259
- Performance Management – RFC 5357

Strong Commitment and Leadership

Editor of 96% IETF RFCs

Co-author of 100% IETF RFCs

The Leadership Journey

Undisputed leadership with +50k routers deployed

Editor of 96% of the 70 SR RFC's (co-author of 100%)

Led and funded >95% of open source

70 patents (IETF disclosure to enable rich multi-vendor solution)

Value

Any Service over IP without any shims

- TDM
- Disjointness
- BW
- Latency
- Secured Routing

Unified Solution

- No DPI at VxLAN/MPLS boundaries
- No GW

Native Host and Cloud

- uSID is in IP
- MPLS is neither in the IP socket nor in the cloud

Better Reliability

- 0 Net Outage in 4 years of commercial service & 50k+ deployed routers

Seamless Brownfield Deployment

- Alibaba
- Bell
- Swisscom

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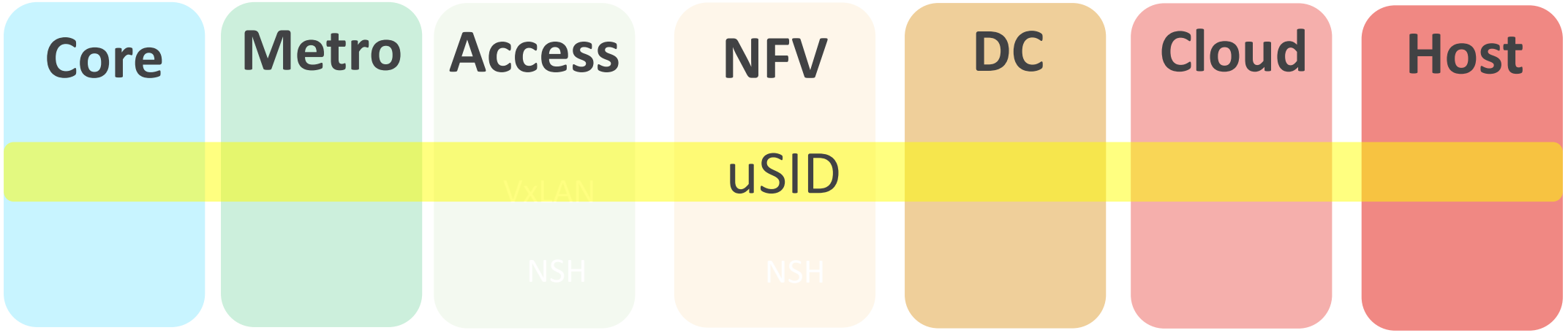
Cheaper

- Lower Overhead
- Smaller instructions (8 or 16 bits)
- Elimination of shim’s
- HW Linerate

Seamless Brownfield Deployment

- Alibaba
- Bell
- Swisscom

Operator Endorsement across Unified Solution



Dan Voyer
Bell Canada
Paris 2022

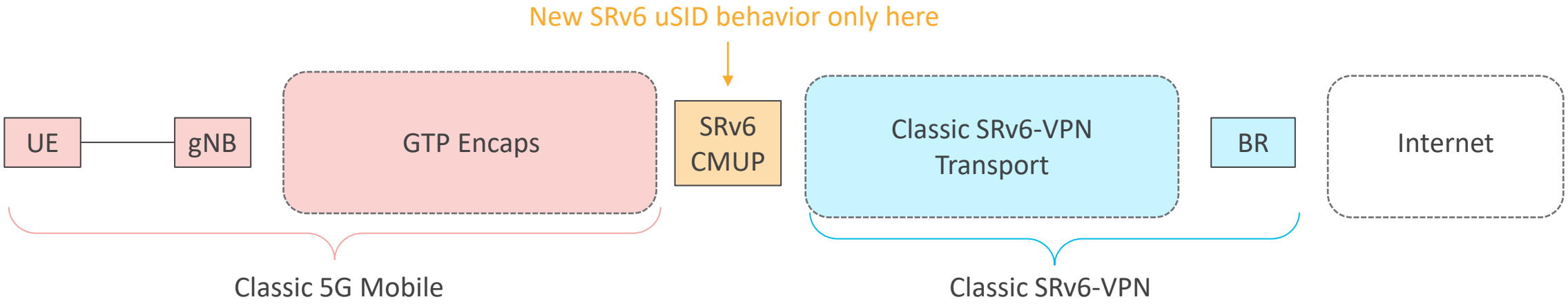
Dan Bernier
Bell & NoviFlow
Paris 2022

Gyan Mishra
Verizon
Paris 2023

Dan Bernier
Bell Canada
Paris 2023

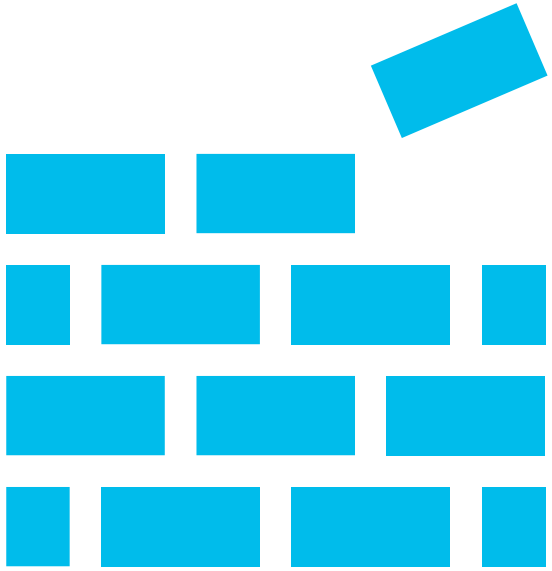
5G UPF Bypass – 50x Times Cheaper Transport

Demo

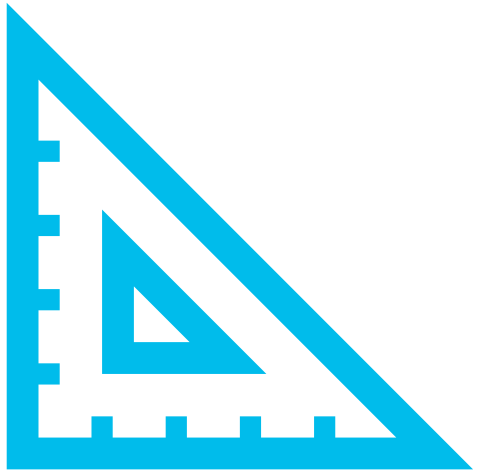


- Bypass UPF processing for selected mobile traffic (stationary devices…)
- Seamless Deployment
  - CMUP gateway does it all without any gNB or 5G Control Plane change
- 50x cheaper transport cost: Silicon1 Linerate vs x86 VNF
- 7% discount on fiber thanks to lower MTU overhead
- Lower latency (no DC detour, no x86 VNF delay)

Integrated Solution



Creation



Measure

Analyze

Measure

Performance Measurement (PM)

- Unidirectional
- Loss
- Latency histograms
- Liveness
- Silicon 1 integration
- 14M probes per sec!

Demo at booth

Path Tracing (PT)

- Per-ECMP Path Discovery
- Per-hop timestamp
- 60 usec accuracy in WAN
- HW Linerate
- Shipping
- In Deployment

Demo at booth

Deterministic Demand Matrix (DDM)

- Per-Demand
- Absolute
- HW Counters
- Telemetry Export

Demo at booth

Rakuten

Analytics

- Digging billions of Performance Measurements
- Correlating with Current and Past Routing Data
- Automatically drawing your attention to what matters

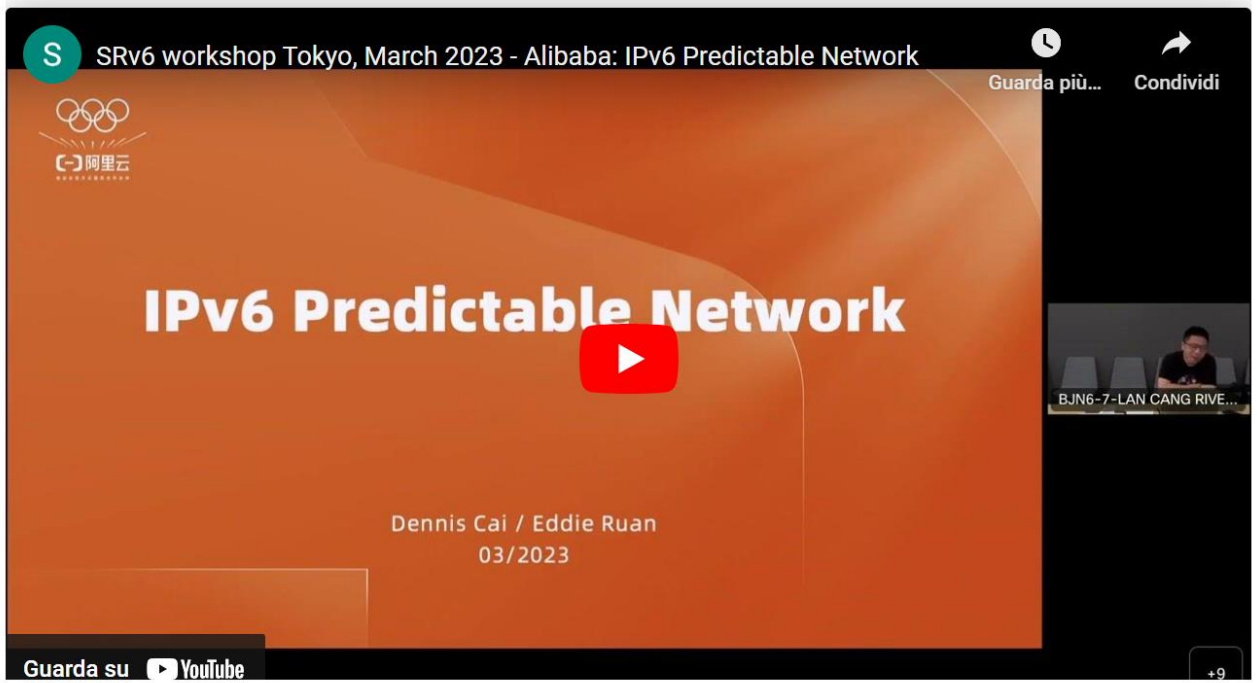
Measurement Analytics (MA)	Path Tracing Analytics (PTA)	Automated Capacity Planning (ACP)
Demo at booth	Demo at booth	Demo at booth
Colt		Rakuten

Simplicity Always Prevails

SRv6 uSID Events

segment-routing.net/conferences/2023-03-30-lead-operators-at-srv6-workshop-japan

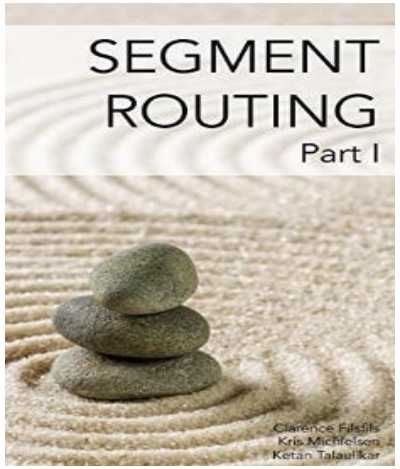
- Dubai in Jan 2023
- Tokyo in April 2023
  - Tutorial
  - Hands-on Lab
  - Lead Operator Deployment reports: Bell, Softbank, Rakuten, Alibaba
- US in May 2023
- EU and LatAm in Fall 2023



segment-routing.net

- Detailed recording of the presentations in this track
- Recordings of the demo’s
- Training

segment-routing.net/conferences/Paris23



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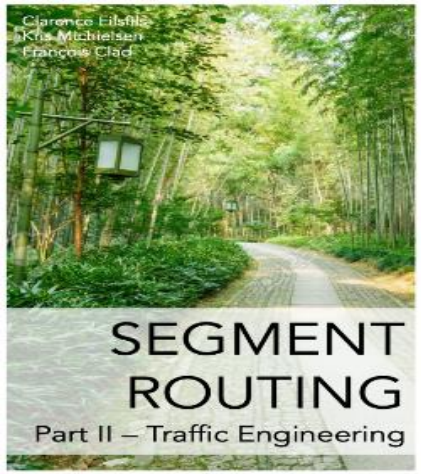

amazon.com/dp/B07N13RDM9

SRv6 Part III Coming by Summer 2023

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CISCO