IETF Hackathon

-Comprehensive Evaluation of Multicast Source Routing over IPv6

IETF 118

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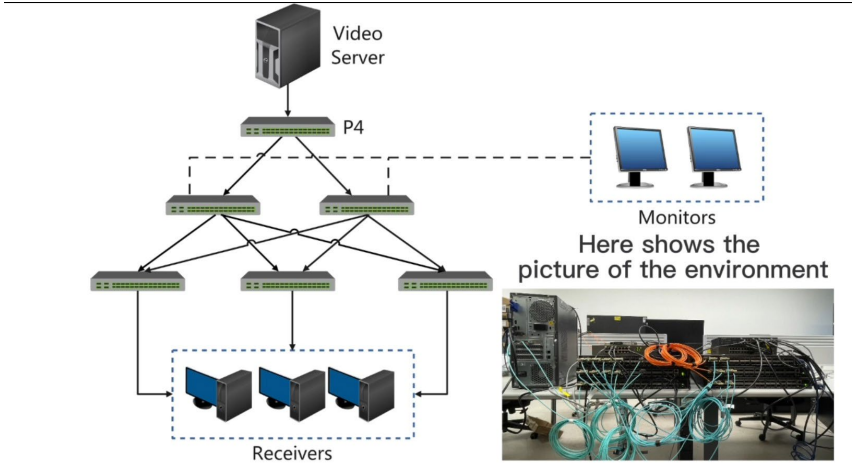
Hackathon Plan

- Implement MSR6 BE, MSR6 TE and MSR6 TE with RLB on hardware using the *P4* language.
- Evaluate the *hardware performance* of MSR6 based on several P4 switches.
- Conduct simulations to evaluate the resource performance of MSR6 and other 5 multicast solutions from a *macro perspective* based on real network topology.
- Documents
  - https://datatracker.ietf.org/doc/draft-geng-msr6-traffic-engineering/02
  - https://datatracker.ietf.org/doc/draft-geng-msr6-rlb-segment/01
  - https://datatracker.ietf.org/doc/draft-chen-pim-srv6-p2mp-path/
  - https://datatracker.ietf.org/doc/draft-chen-pim-mrh6/

HARDWARE-BASED EVALUATION

- Multi-node testing topology was constructed using 6 P4 switches as the ingress, transit, and egress nodes in the MSR6 domain.
- The data to be measured are *hardware resource usage*, *process delay* and *stability*.

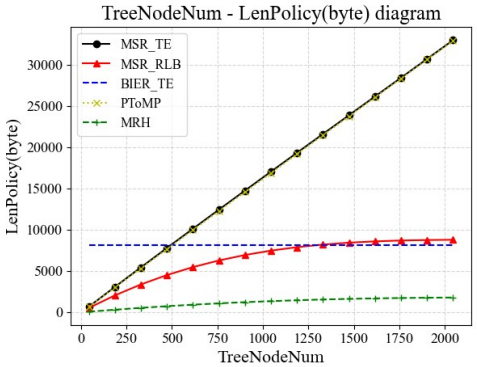


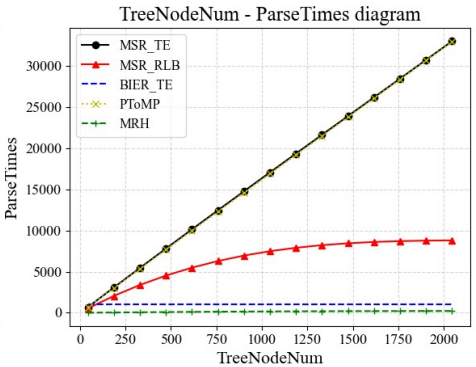
Resource Occupancy of MSR6 TE

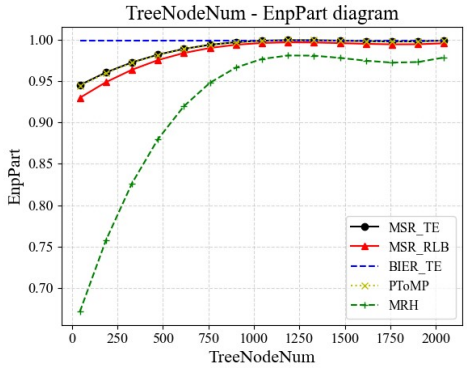
	Average	0	1	2	3
Action Data Bus Bytes	6.1%	3.1%	0.0%	1.6%	68.8%
Exact Match Input Xbar	2.5%	14.8%	0.8%	1.6%	12.5%
Gateway	1.0%	6.3%	0.0%	6.3%	0.0%
Hash Bit	2.0%	12.0%	2.4%	0.0%	9.6%
Logical Table ID	4.2%	25.0%	6.3%	12.5%	6.3%
SRAM	3.8%	7.5%	1.3%	1.3%	35.0%
Stash	2.1%	12.5%	6.3%	0.0%	6.3%
TCAM	2.1%	0.0%	0.0%	25.0%	0.0%
Ternary Match Input Xbar	2.0%	0.0%	0.0%	24.2%	0.0%
VLIW Instruction	2.1%	6.3%	6.3%	6.3%	6.3%
Exact Match Search Bus	2.1%	12.5%	6.3%	6.3%	6.3%
Exact Match Result Bus	2.1%	12.5%	6.3%	0.0%	6.3%
Ternary Result Bus	2.1%	12.5%	0.0%	12.5%	0.0%

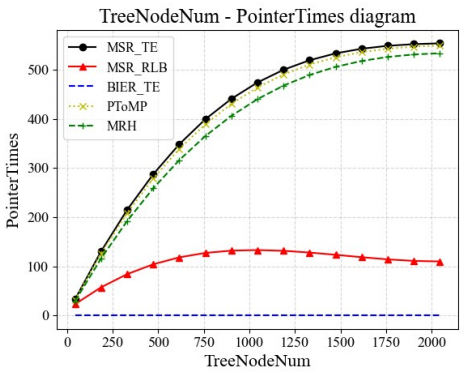
SOFTWARE-BASED EVALUATION

- We conducted macro-mathematical simulations on ***five multicast TE schemes***.
- We evaluated these five schemes from the perspectives of multicast *Policy Length*, *Parsing Times*, *Feasibility of Compression*, and *Complexity of the Pointer-processing* in *data center* network topology scenarios and *randomly generated* network topology scenarios, respectively.









Conclusions

- **Hardware-based evaluation:**
  - We tested the MSR6 BE and MSR6 TE schemes and proved that the MSR6 scheme prototype can work in the experimental environment.

delay test	MSR6-related actions can achieve a delay similar to normal IPv6 forwarding actions.
stability test	The traffic path switching in MSR6 TE will not affect the continuity of data packets.

- **Software-based evaluation:**

Small multicast business tree size (less than 1/5 of the total number of topology nodes)	*all multicast source routing schemes*	have significant advantages compared to the BIER-TE scheme.
Relatively large multicast business tree size	*MSR6 TE with RLB*	superior to other MSR, taking into account encapsulation length and parsing times.
	MSR6 PToMP	is better for situations where downstream nodes are large and congested.

Wrap Up

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