Analysis of Source Address Validation Data Plane Performance

— An Implementation of Independent SAV Table

draft-li-savnet-dataplane-performance-00

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Background

- For any SAV mechanism, source address checking actions are added to the data plane, which affects the forwarding performance of network devices.
- The accuracy of the new SAV mechanisms is expected to improve upon the current ones. The data plane implementation of new SAV mechanisms may be different.
- There are concerns about the data plane performance of SAV mechanisms, whether the existing mechanisms or new ones.

SAV Table

- The key idea of SAV is to check whether a source prefix arrives from a valid interface.
- A SAV Table is the data structure that stores SAV rules on the data plane.
- Strict uRPF uses FIB as its SAV table. If the packet is received on the interface which would be used to forward the traffic to the source, it passes the check.

Logical SAV Table

SAV rule	Source Prefix	Valid incoming interfaces
1	p1	if1, if2
2	p2	if3
3	p3	if1, if2, if3

Strict uRPF

FIB Entry	Destination Prefix	Outgoing Interface
1	p1	ECMP -> if1,if2
2	p2	if3
3	p3	ECMP -> if1,if2,if3

Independent SAV Table Mechanism

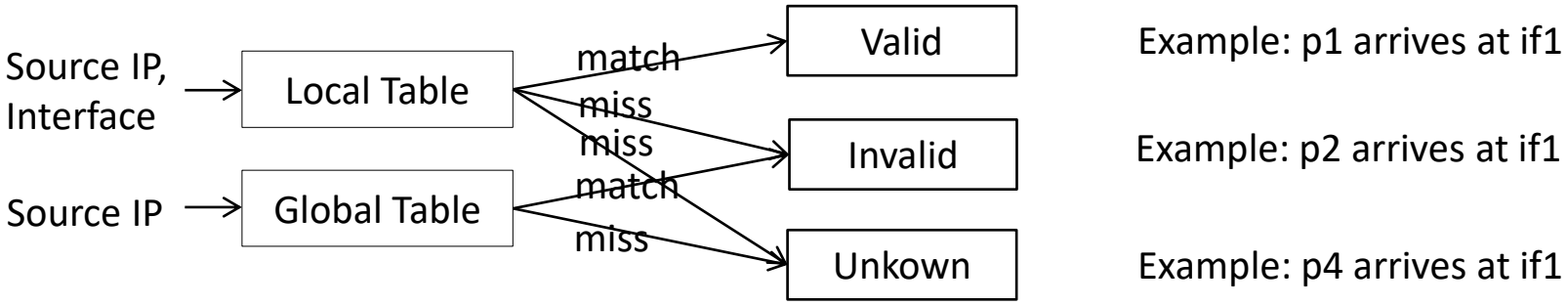
- New SAVNET mechanisms are expected to generate SAV rules based on the real data plane forwarding path. So, unlike Strict-uRPF reusing FIB, independent SAV table may be required.
- An early prototype of independent SAV Table mechanism is implemented.

Local Table (Each line card stores part of SAV rules which are related with its own interfaces)

Key-1: Source Prefix	Key-2: Valid Incoming Interface
p1	if1
p3	if1

Global Table

Key: Source Prefix
p1
p2
p3



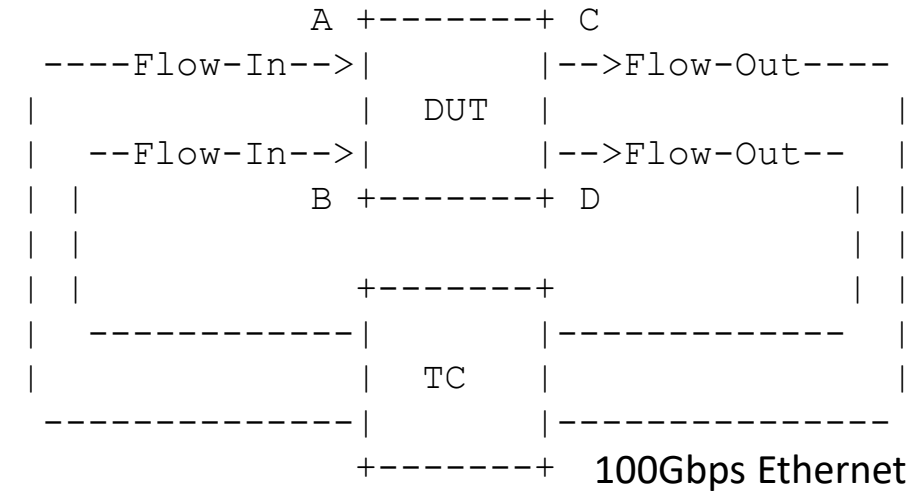
* The described mechanism is a possible option for realizing independent SAV table. Vendors may choose different solutions based on their existing implementations.

Performance Testing

- A test for the data plane performance of SAV is carried out on the H3C CR Device.

Index	SAV Mechanism	pps of Export Flows (Ratio to Non-SAV)	
0	Non-SAV	100%	
1	ACL	96.6%	
2	Strict uRPF	94.4%	
3	Loose uRPF	94.4%	
4	Independent SAV Table	94.5%	⟵ 1,000 source prefixes
5	Independent SAV Table	94.5%	⟵ 10,000 source prefixes
6	Independent SAV Table	94.5%	⟵ 100,000 source prefixes

Test Traffic: IPv6 packets, 78 Byte, line rate



Next Steps

- Revise the draft according to feedbacks.
  - The main purpose of this draft is to address the concerns about the data plane performance of SAV mechanisms.
  - Rename and modify the text to conform with the SAVNET charter.
- Any questions or comments are Welcomed.

Thanks