

A Summary of Intra-domain and Inter-domain SAV Problem Statements and Next-step Work

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July 27, 2023

Intra-domain and Inter-domain SAV Problem Statement

□ Goals

- ◆ Conduct the **gap analysis** of existing intra-domain and inter-domain SAV mechanisms
- ◆ Analyze the **fundamental problems** of existing intra-domain and inter-domain SAV mechanisms
- ◆ Describe the **requirements** for new intra-domain and inter-domain SAV mechanisms

□ Current status

- ◆ Intra-domain and inter-domain problem statements **have been adopted by SAVNET WG**
 - draft-ietf-savnet-intra-domain-problem-statement, SAVNET WG Document
 - draft-ietf-savnet-inter-domain-problem-statement, SAVNET WG Document

Historical Versions of Intra-domain SAV Problem Statement

- ❑ draft-li-savnet-intra-domain-problem-statement-00, IETF 114 SAVNET WG
- ❑ draft-li-savnet-intra-domain-problem-statement-01, Sep 25, 2022
- ❑ draft-li-savnet-intra-domain-problem-statement-02, Oct 22, 2022
- ❑ draft-li-savnet-intra-domain-problem-statement-03, IETF 115 SAVNET WG
- ❑ draft-li-savnet-intra-domain-problem-statement-04, Nov 30, 2022
- ❑ draft-li-savnet-intra-domain-problem-statement-05, Dec 15, 2022
- ❑ draft-li-savnet-intra-domain-problem-statement-06, Feb 23, 2023
- ❑ draft-li-savnet-intra-domain-problem-statement-07, IETF 116 SAVNET WG
- ❑ draft-ietf-savnet-intra-domain-problem-statement-00, WG adopted
- ❑ draft-ietf-savnet-intra-domain-problem-statement-01, May 5, 2023

Intra-domain SAV Problem Statement

❑ ACL-based SAV

◆ Problem: **high operational overhead**

◆ Reason: requiring manual update when network topology, IP prefix or routing rule changes

❑ Strict uRPF

◆ Problem: **improper block** under asymmetric routing

◆ Reason: conducting SAV based on local FIB which may not match the real data-plane forwarding path from the source

❑ Loose uRPF

◆ Problem: **large amount of improper permit**

◆ Reason: allowing packets with source addresses that exist in the FIB table at all router interfaces

Requirements for New Intra-domain SAV Mechanisms

- ❑ Requirement #1: **Supporting automatic update**
 - ◆ The new mechanism **MUST** automatically adapt to network dynamics instead of relying on manual update
- ❑ Requirement #2: **Improving the validation accuracy** upon existing mechanisms
 - ◆ The new mechanism **MUST** avoid improper block in static networks
 - ◆ The new mechanism **SHOULD** Reduce improper permit as much as possible
- ❑ Requirement #3: **Working in incremental/partial deployment**
 - ◆ The new mechanism **SHOULD** provide effective protection when partially deployed in the intra-domain network

Historical Versions of Inter-domain SAV Problem Statement

- ❑ draft-wu-savnet-inter-domain-problem-statement-00, IETF 114 SAVNET WG
- ❑ draft-wu-savnet-inter-domain-problem-statement-01, Sep. 25, 2022
- ❑ draft-wu-savnet-inter-domain-problem-statement-02, Oct. 22, 2022
- ❑ draft-wu-savnet-inter-domain-problem-statement-03, IETF 115 SAVNET WG
- ❑ draft-wu-savnet-inter-domain-problem-statement-04, Nov. 29, 2022
- ❑ draft-wu-savnet-inter-domain-problem-statement-05, Dec. 15, 2022
- ❑ draft-wu-savnet-inter-domain-problem-statement-06, Mar. 4, 2023
- ❑ draft-wu-savnet-inter-domain-problem-statement-07, IETF 116 SAVNET WG
- ❑ draft-wu-savnet-inter-domain-problem-statement-08, June 1, 2023
- ❑ draft-wu-savnet-inter-domain-problem-statement-09, June 27, 2023
- ❑ draft-ietf-savnet-inter-domain-problem-statement-00, WG adopted
- ❑ draft-ietf-savnet-inter-domain-problem-statement-01, Jul 24, 2023

Inter-domain SAV Problem Statement

❑ ACL-based ingress filtering

- ◆ Problem: **high operational overhead**

- ◆ Reason: operators need to manually update ACL rules to adapt to network changes

❑ Source-based RTBH filtering

- ◆ Problem: **high operational overhead**

- ◆ Reason: operators need to manually update the specified source addresses

❑ Strict uRPF

- ◆ Problem: **improper block** when AS is multi-homed and has asymmetric routes to its provider

- ◆ Reason: it performs SAV only based on the local FIB which may not include the asymmetric routes of the legitimate packets

◆ Loose uRPF

- ◆ Problem: **improper permit**

- ◆ Reason: it is oblivious to the incoming interfaces of packets

Inter-domain SAV Problem Statement

□ FP-uRPF

- ◆ Problem: **improper block** in asymmetric routing scenarios, e.g., limited propagation of prefixes
- ◆ Reason: it performs SAV based on the local RIB which may not have the prefixes with limited propagation and their permissible incoming interfaces

□ VRF uRPF

- ◆ Problem: **improper block** in asymmetric routing scenarios, e.g., limited propagation of prefixes
- ◆ Reason: it performs SAV based on the local RIB which may not have the prefixes with limited propagation and their permissible incoming interfaces

□ EFP uRPF

- ◆ Problem: **improper block** in the cases of hidden prefixes, e.g., DSR
- ◆ Reason: it does not learn the hidden prefixes, which are legitimate source prefixes

Requirements for New Inter-domain SAV Mechanisms

- ❑ Requirement #1: **Improving validation accuracy** over existing mechanisms
 - ◆ The new mechanism SHOULD improve the validation accuracy upon existing inter-domain SAV mechanisms
- ❑ Requirement #2: **Working in incremental/partial deployment**
 - ◆ The new mechanism SHOULD provide effective protection for source addresses when it is partially deployed in the Internet
- ❑ Requirement #3: **Reducing operational overhead**
 - ◆ The new mechanism MUST be able to adapt to dynamic networks and asymmetric routing scenarios automatically
- ❑ Requirement #4: **Communicating SAV-specific information** between ASes
 - ◆ A SAV-specific communication approach between ASes SHOULD be designed

Next-step Works

- ❑ Design SAVNET architecture for intra-domain networks and SAVNET architecture for inter-domain networks, respectively
 - ◆How to simultaneously satisfy the accurate validation and automatic validation goals, as well as the considerations for security, convergence, and partial deployment
- ❑ Design the framework for how to exchange SAV-specific information between routers for intra-domain SAVNET and between ASes for inter-domain SAVNET
 - ◆Included in the SAVNET architecture draft or independently documented?
- ❑ Design SAVNET Yang models
- ❑ Design how to extend existing routing protocols to exchange SAV-specific information between routers
 - ◆Both intra-domain and inter-domain, both IPv4 and IPv6
 - ◆BGP, OSPF, IS-IS, RIFT?

Thanks!