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

Presenter: Dan Li

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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!