IPAE Overview

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Overview of Talk

- Objectives of IPAE
- Features of IPAE
- IPAE Mechanisms
- Examples

Objectives of IPAE

- Allow SIPP and IPv4 hosts and routers to interoperate
- Allow the Internet to transition smoothly from IPv4 to SIPP
- Extend the life of the installed base of IPv4 hosts and routers

Features of IPAE

- SIPP and IPv4 hosts can interoperate until IPv4 addresses run out
- Hosts don't need to change addresses when upgraded
- Hosts and routers can upgrade incrementally
- No upgrade interdependencies between hosts, routers or DNS
- SIPP and IPv4 hosts within a domain interoperate after run out day
- Leverages installed base of IPv4 routers

IPAE Mechanisms

- IPv4-compatible SIPP address format
- SIPP/IPv4 routing model
- SIPP-in-IPv4 tunneling
- SIPP-to-IPv4 header translation
- DNS algorithms
- IPv4-to-SIPP header translation

IPAE Address Format

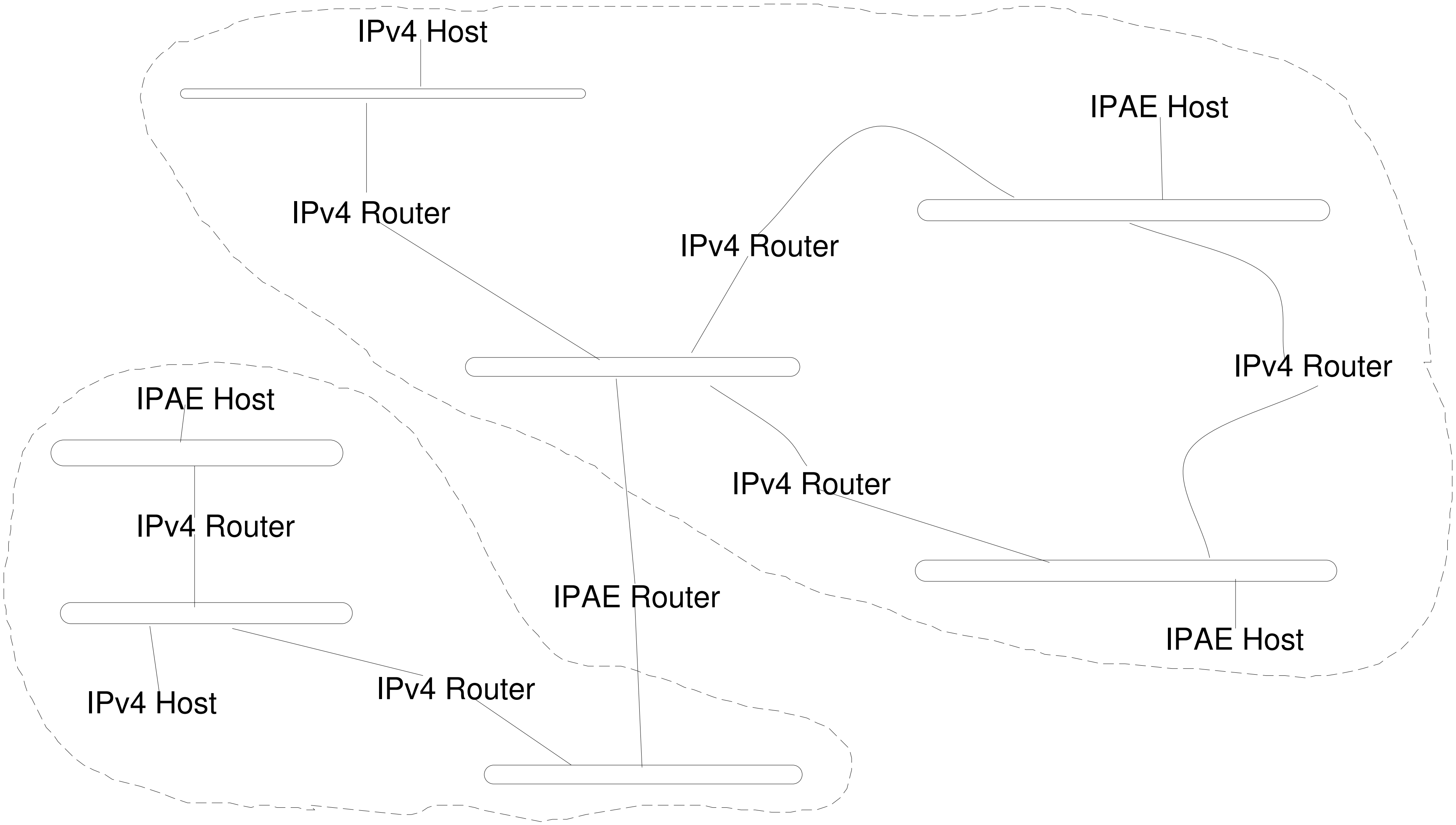
- **64-bit IPv4 compatible SIPP address format:**

1bit	31 bits	32 bits
C	SIPP Prefix	IPv4 Address

SIPP/IPv4 Routing Model

- **Clusters of IPv4 treated as a single SIPP subnet**
- **Packets to SIPP destinations within cluster are tunneled SIPP-in-IPv4**
- **Packets to IPv4 destinations within cluster are translated to IPv4**
- **Packets to on-subnet destinations sent in raw SIPP or IPv4 form**
- **Tunnel/translate/raw decision**
  - C-bit of destination address
  - IPv4 reachability mask of interface

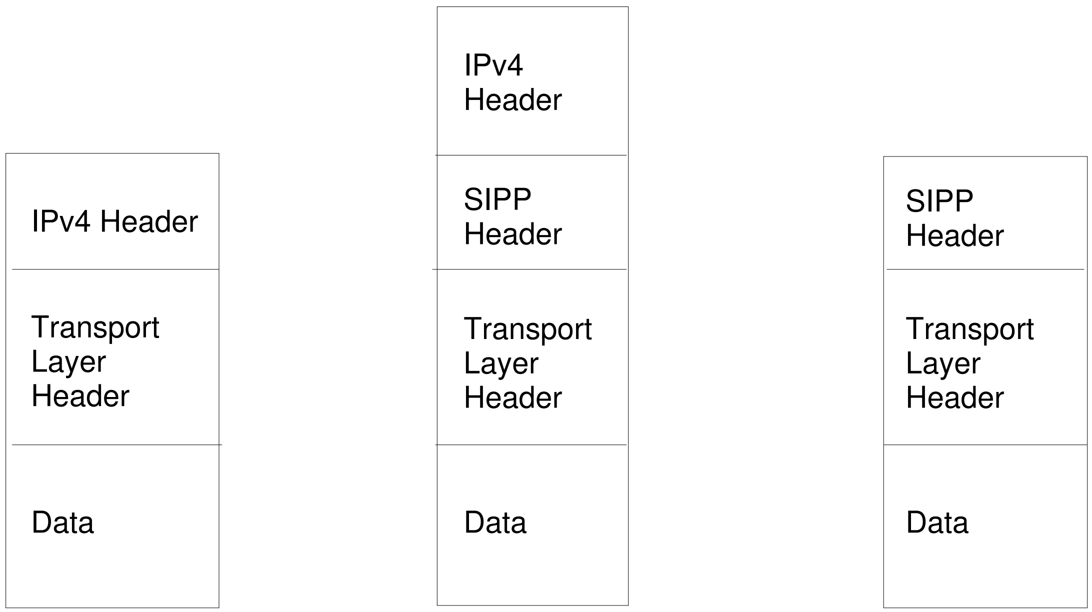
IPv4 Clusters



SIPP-in-IPv4 Tunneling

- **SIPP traffic to SIPP destinations within cluster is tuneled**
  - C-bit tells whether destination is SIPP
  - IPv4 reachability mask tells whether destination is within IPv4 cluster
- **Direct mapping from SIPP address to IPv4 "tunnel endpoint" address**
  - Low-order 32-bits of SIPP address
  - Automatic tunnel configuration

Packet Formats



IPv4 Packet Format

SIPP-in-IPv4 Packet Format

SIPP Packet Format

SIPP-to-IPv4 Translation

- **SIPP traffic to IPv4 destinations within cluster is translated**
  - C-bit tells whether destination is IPv4
  - IPv4 reachability mask tells whether destination is within IPv4 cluster
- **All information needed is contained in SIPP packet being translated**
  - Doesn’t use mapping table

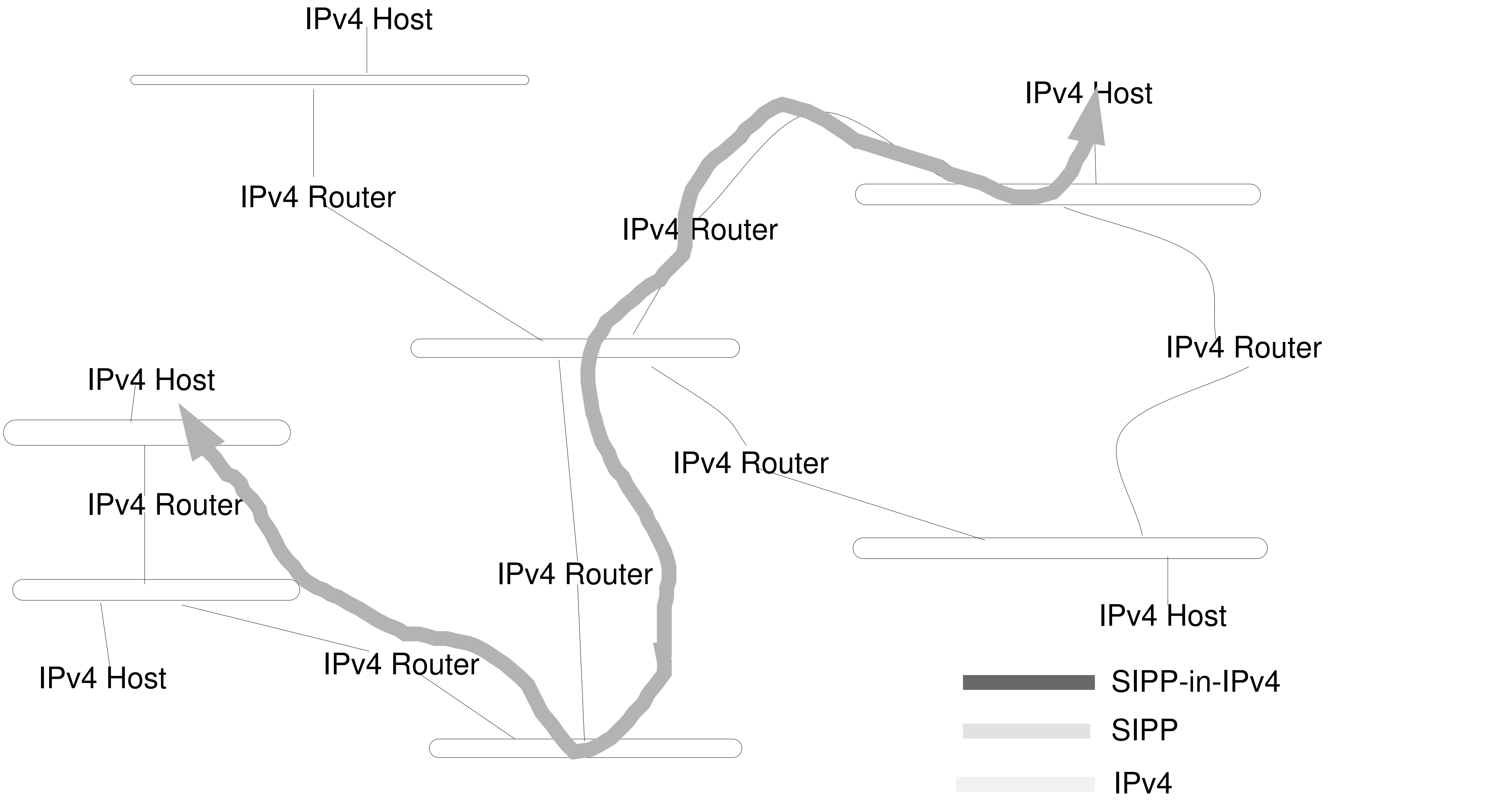
DNS Algorithms

- **SIPP address records in DNS**
  - SIPP records MAY be added for both IPv4 and SIPP hosts
  - SIPP records are optional, but desired
  - IPv4 records MUST exist for all hosts
- **Hostname lookup algorithm**
  - Lookup SIPP records first, IPv4 records second
  - Traffic is SIPP if SIPP record is found
  - Traffic is IPv4 if IPv4 record is found

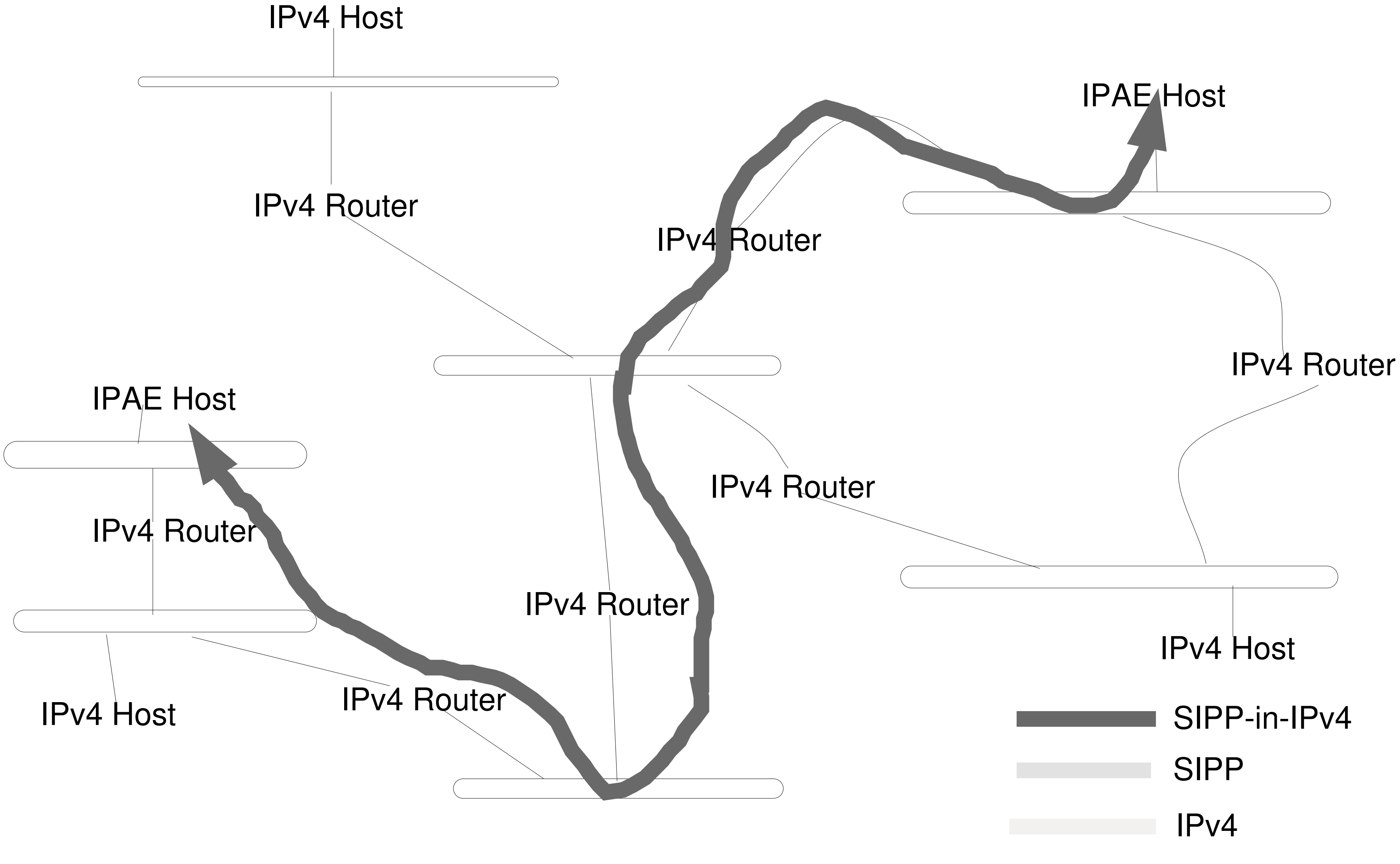
IPv4-to-SIPP Translation

- **Used to link IPv4 islands with SIPP**
- **Special translators are set up**
  - At least one translator per IPv4 island
- **IPv4 traffic addressed to other islands is translated to SIPP**
- **IPv4-to-SIPP address mapping**
  - Additional address bits needed
  - Mapping table supplies address prefix
  - Default fixed prefix mapping table entry
- **Is an optional mechansm**
  - Not needed if IPv4 is routed globally

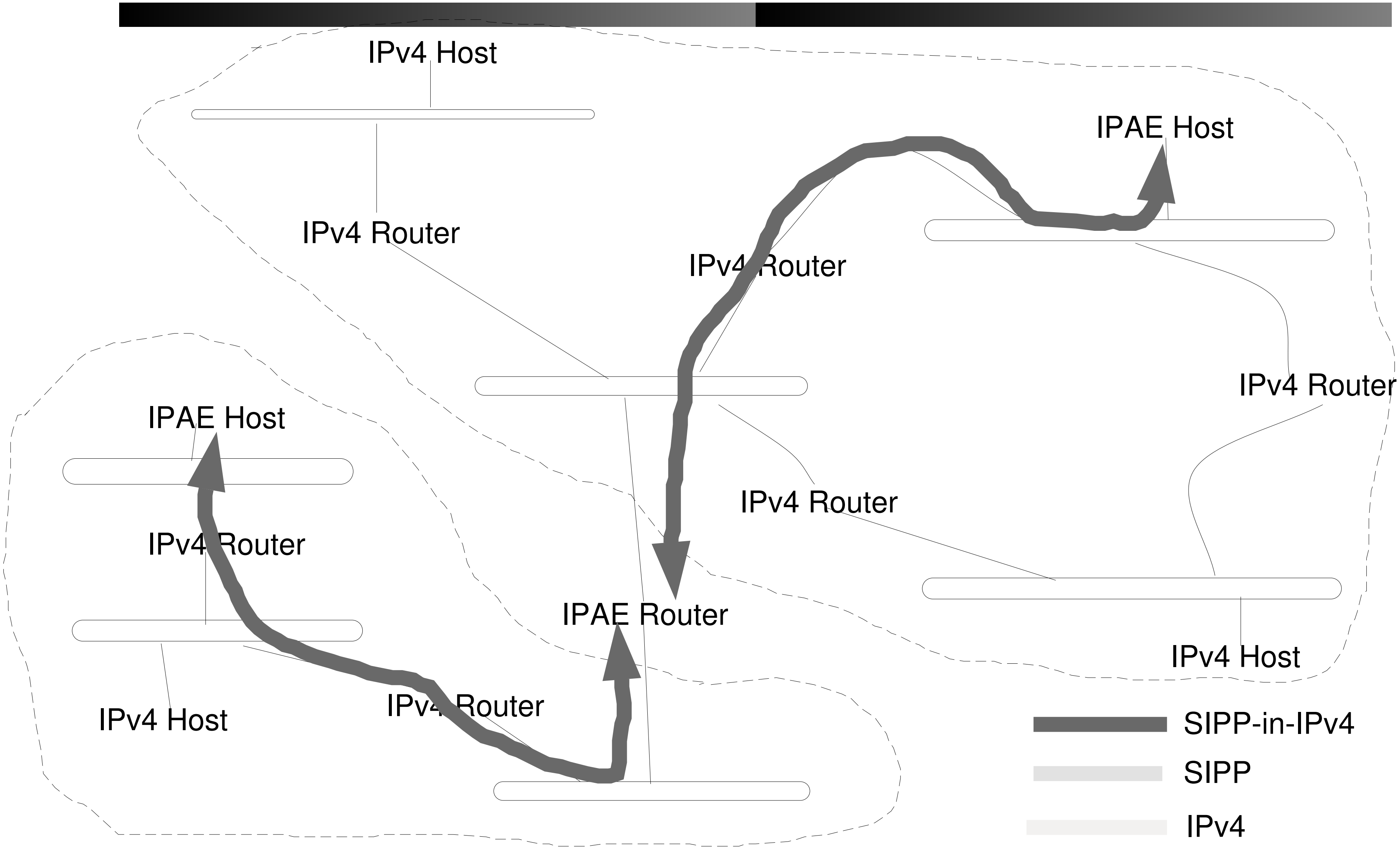
End-to-End IPv4



End-to-End SIP-in-IPv4



IPAE Router



IPv4 Host
IPAE Host
IPv4 Router
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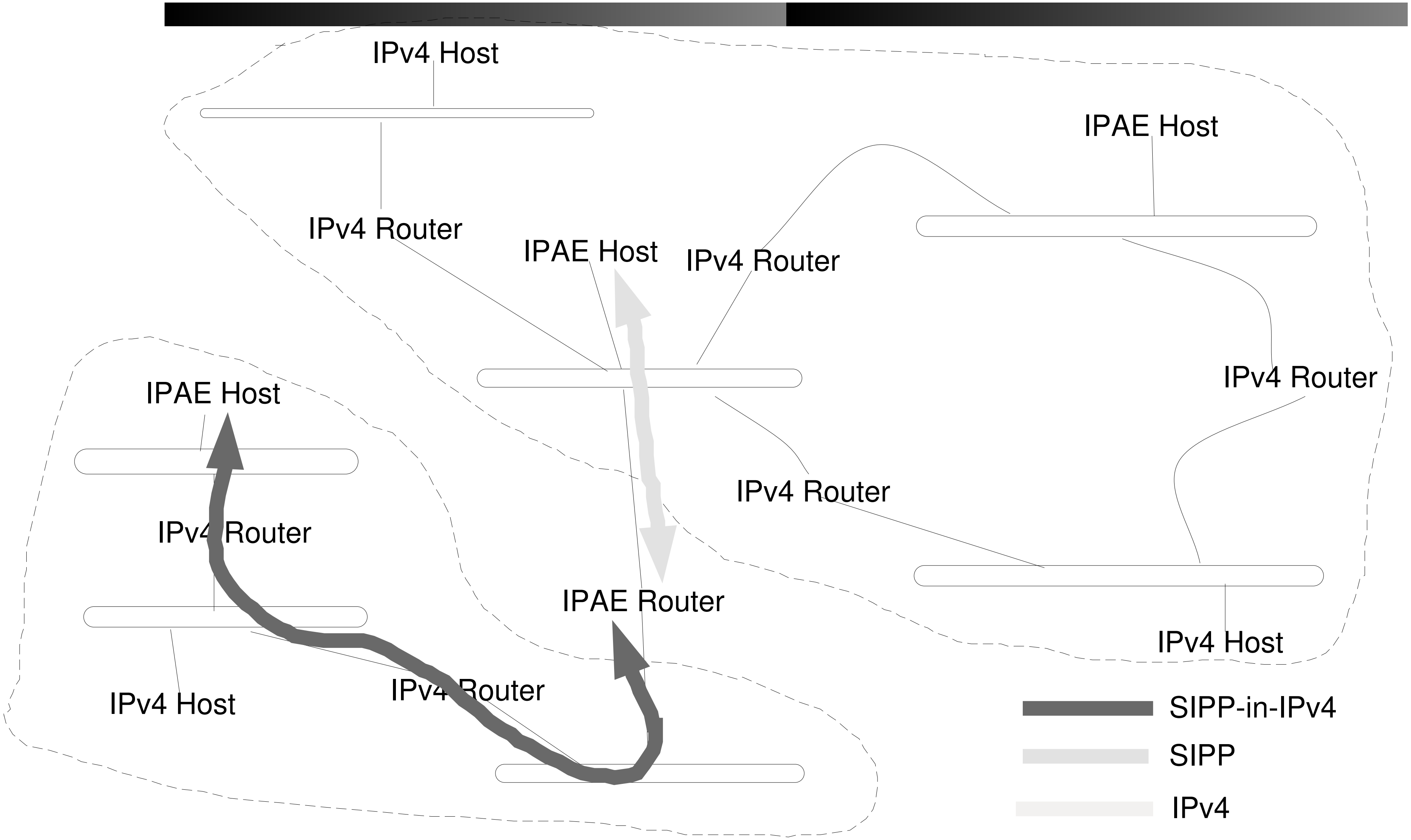
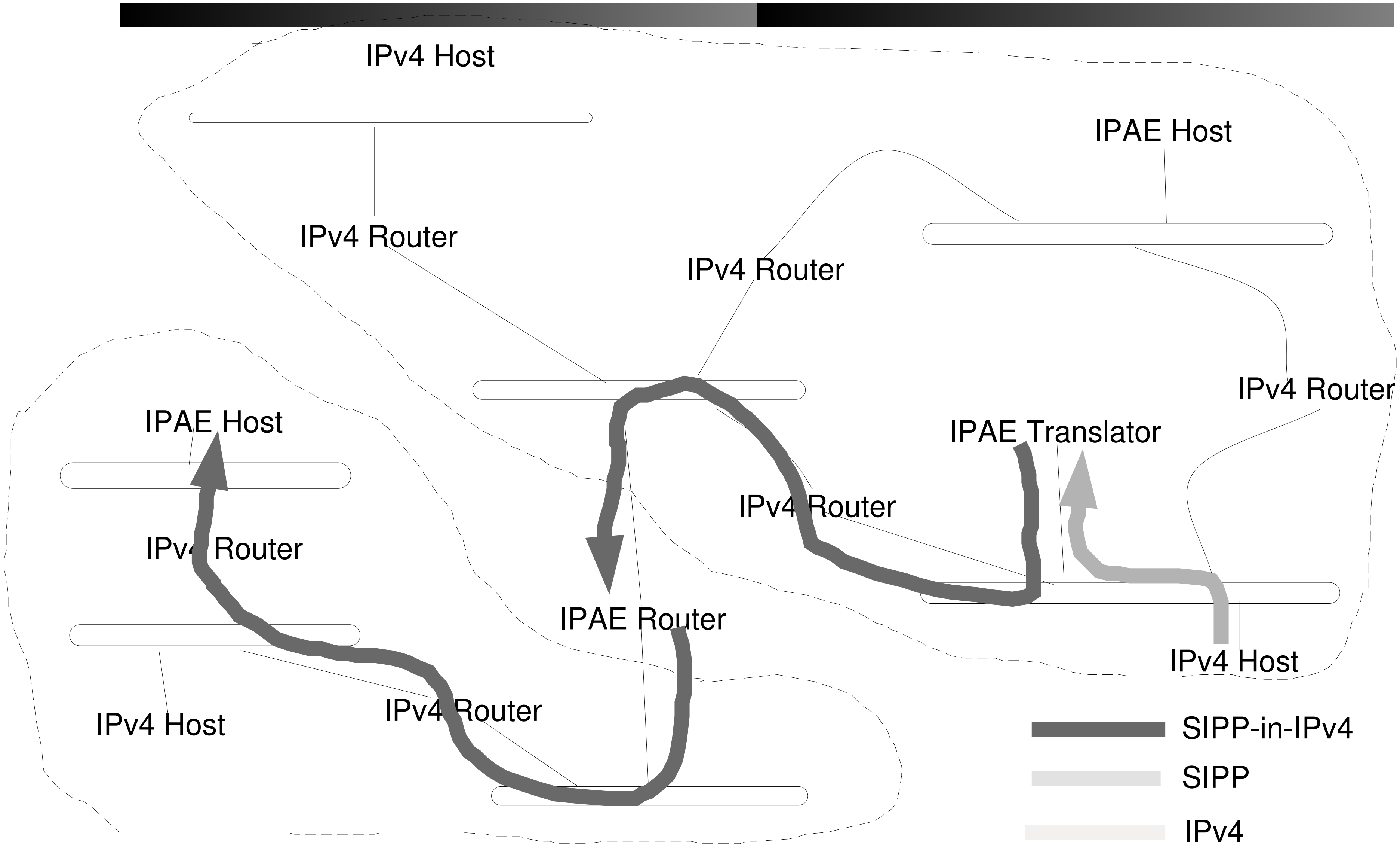
IPv4 Host
IPv4 Host
IPv4 Router
SIPP-in-IPv4
SIPP
IPv4

Raw SIPP Form



IPv4-to-SIPP Translation



SIPP-to-IPv4 Translation