SIMPLE INTERNET TRANSITION (SIT)

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OVERVIEW

- Philosophy and Goals
- Transition Model
- Examples
- Mechanisms
- Further Information

PHILOSOPHY

- Make IPv6 Compatible with IPv4
- Make it Easy to Deploy IPv6
  - Users, System Administrators, and Network Operators
- Get Experience Running IPv6 Early in the Transition
- Don't Wait for Someone Else to Do Something
  - Don't Design in Deployment Dependencies

GOALS

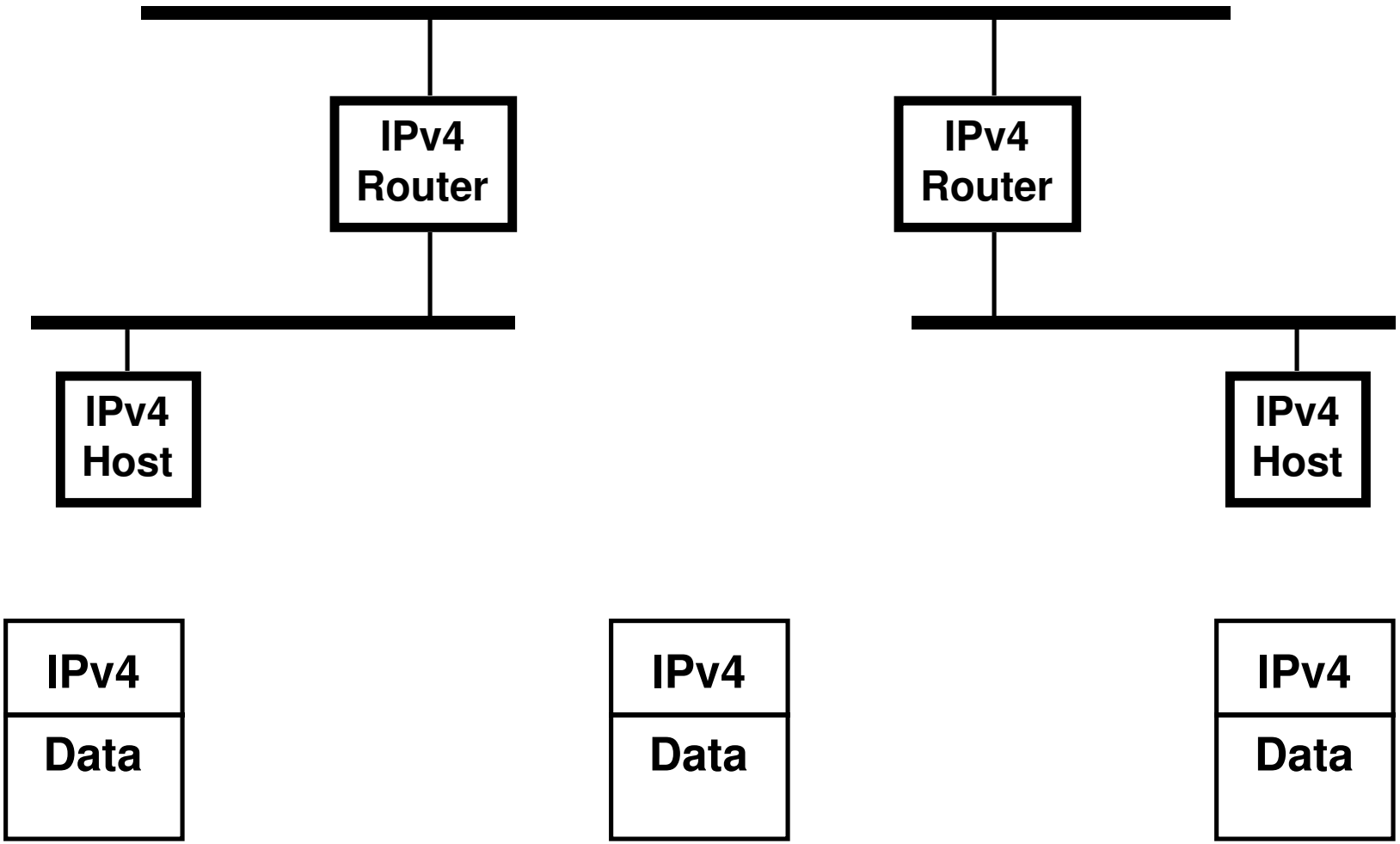
- Allow incremental upgrade of IPv4 hosts and routers to IPv6
  - Allow upgrade to happen “one at a time”
- Few or no “upgrade dependencies”
  - Avoid “step X before step Y”
- No Switches to Turn IPv6 On
- Complete Transition before IPv4 Addresses Run Out
- Non-Goal: Fixing IPv4 Routing

GENERAL TRANSITION MODEL

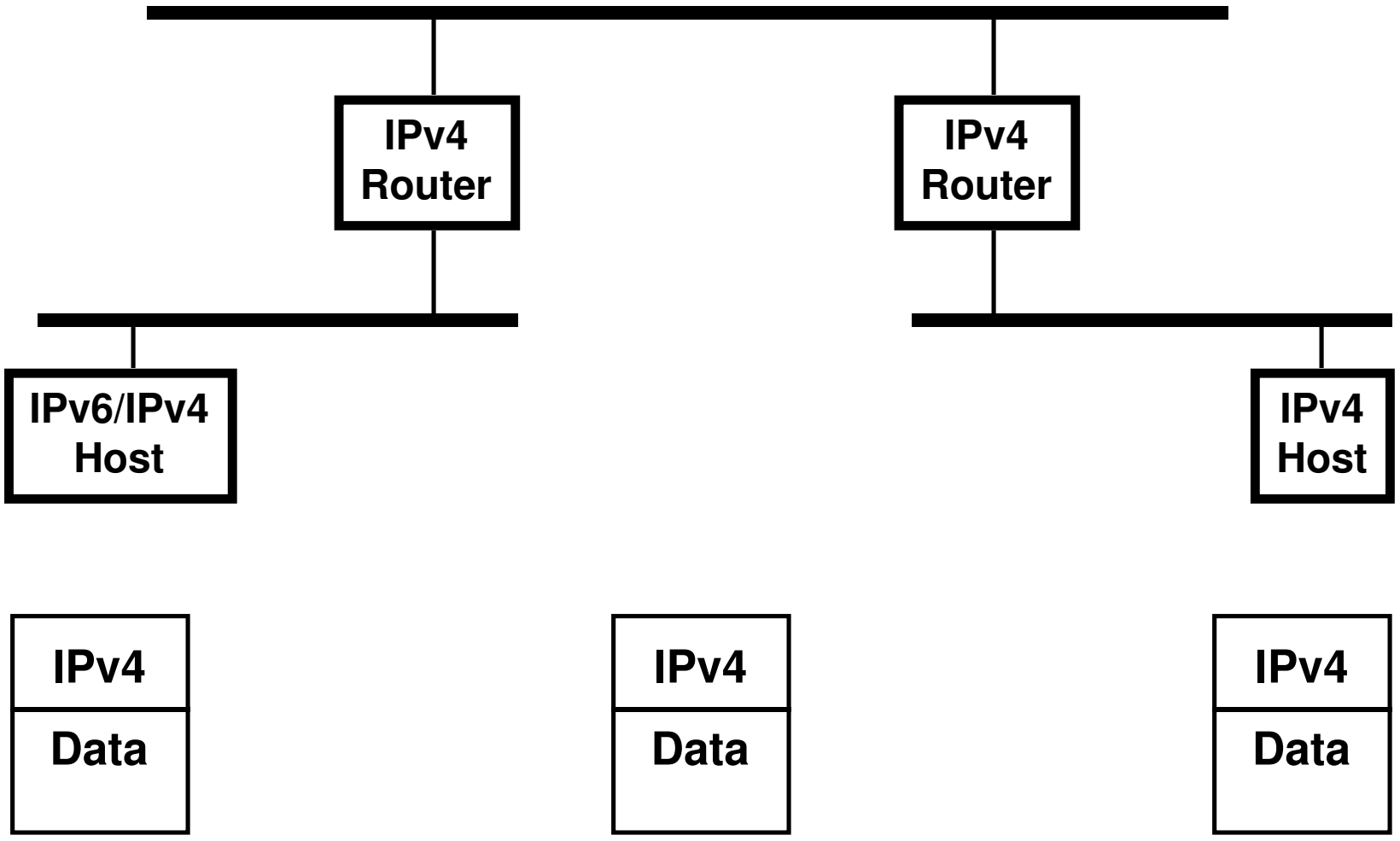
TRANSITION TECHNIQUES

- Dual IP Layer
  - Nodes Support IPv4 and IPv6
- IPv4-Compatibility Addresses
  - IPv4 Address Embedded within IPv6 Address
- IPv6-in-IPv4 Encapsulation
  - Tunnel IPv6 Datagrams across IPv4 Topologies
- IPv6/IPv4 Header Translation (Optional)
  - Support Interoperation between IPv4-Only and IPv6-Only Hosts

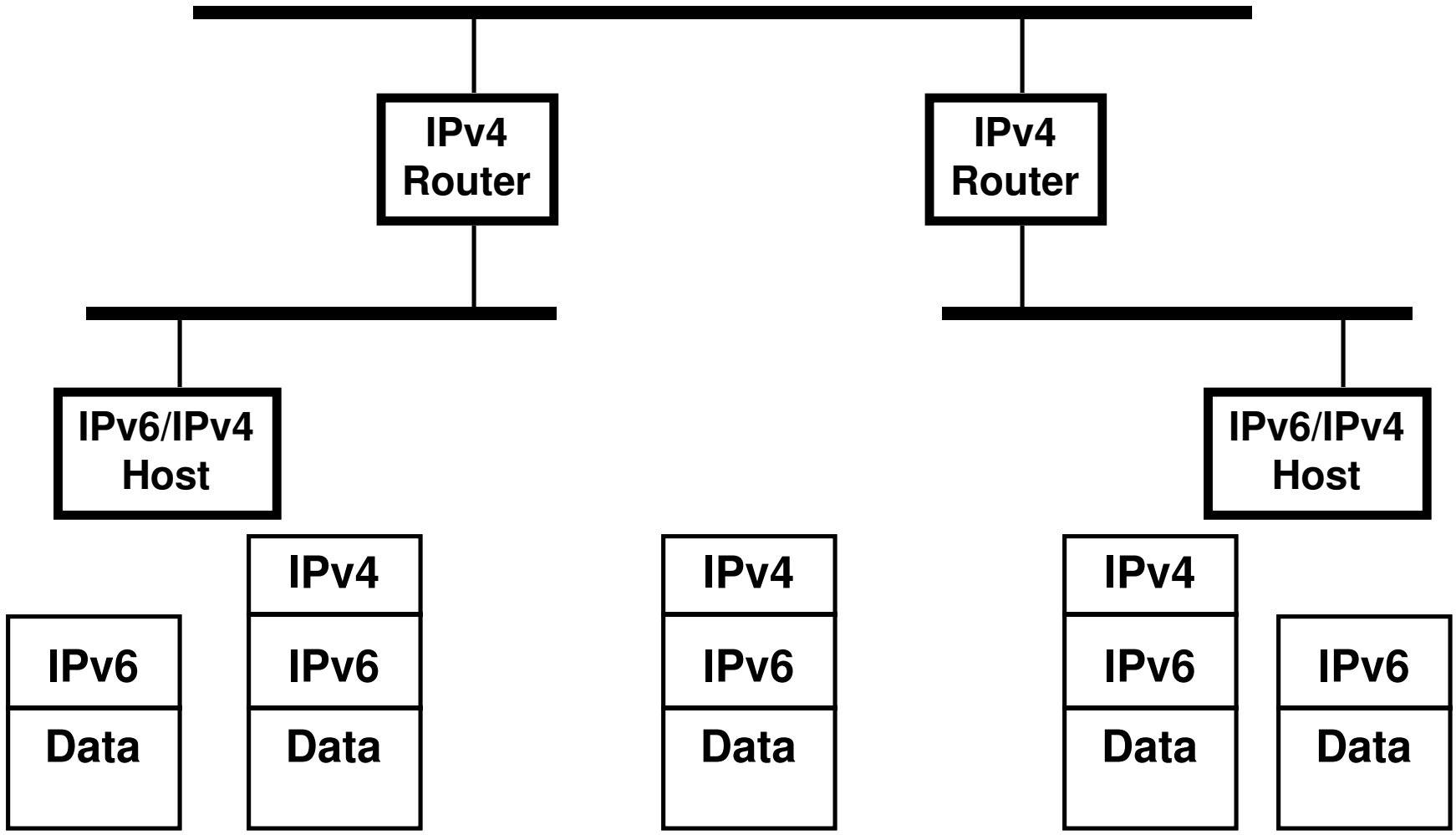
EXAMPLE: IPv4 TODAY



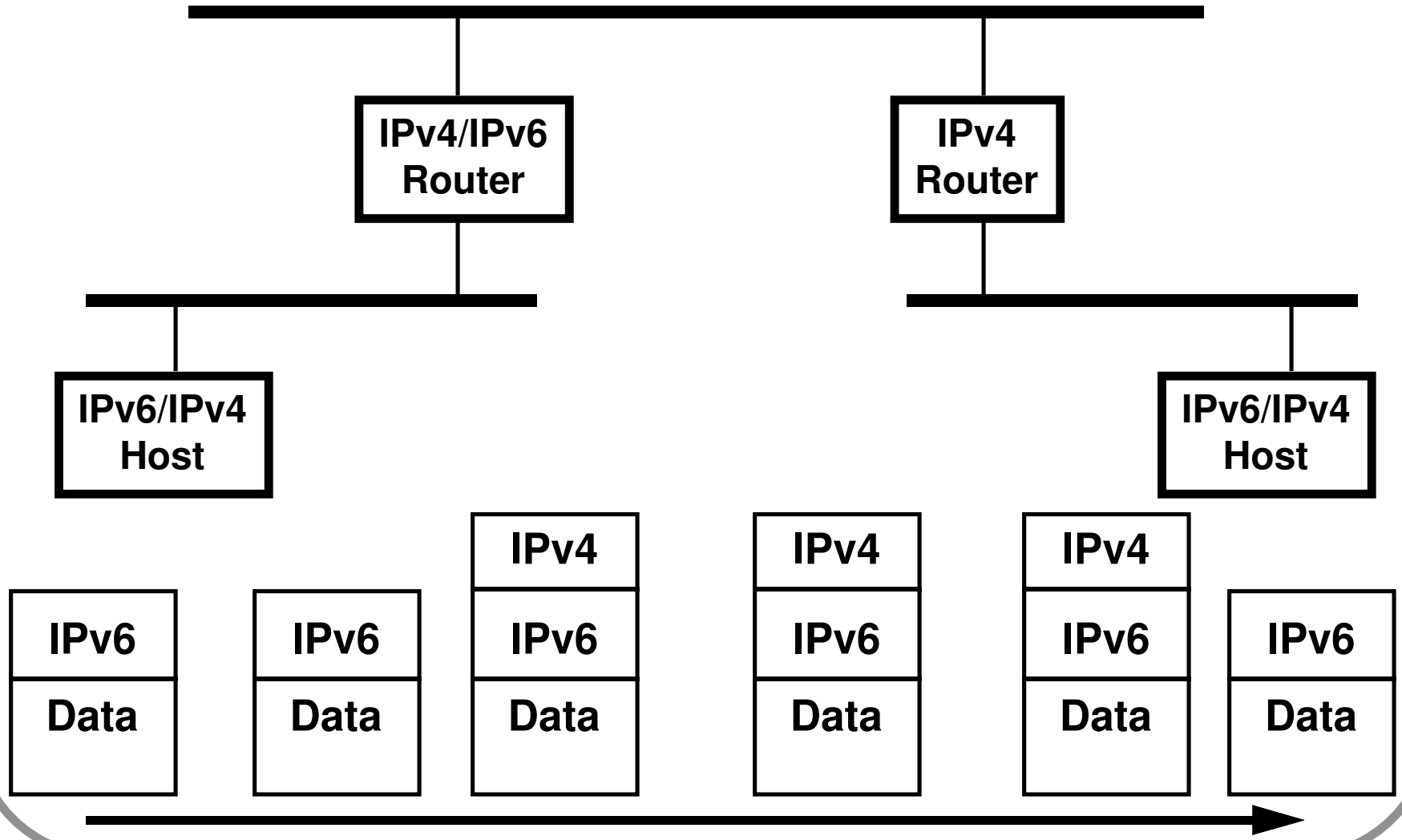
INTEROPERATION WITH IPv4



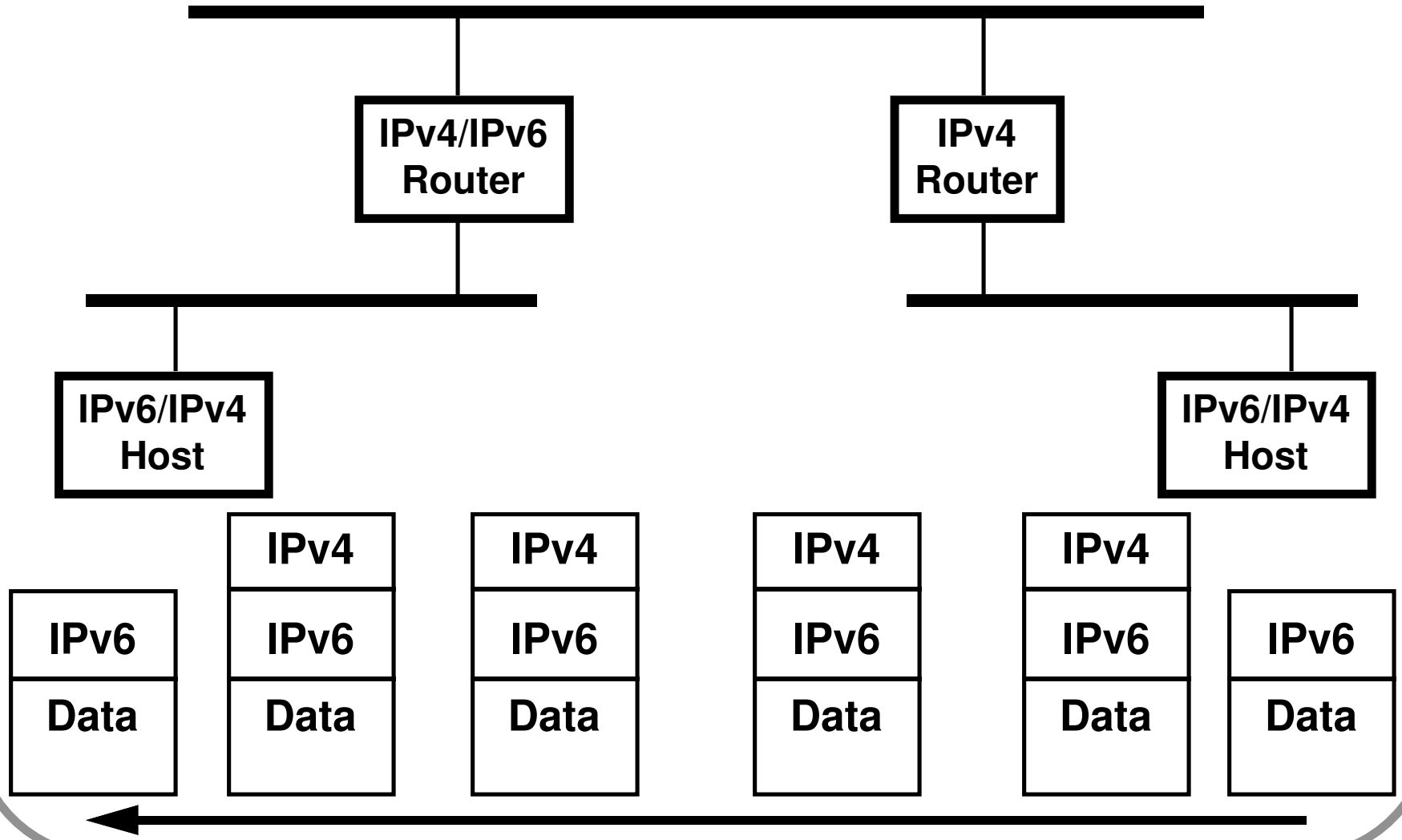
TUNNELING OVER IPv4



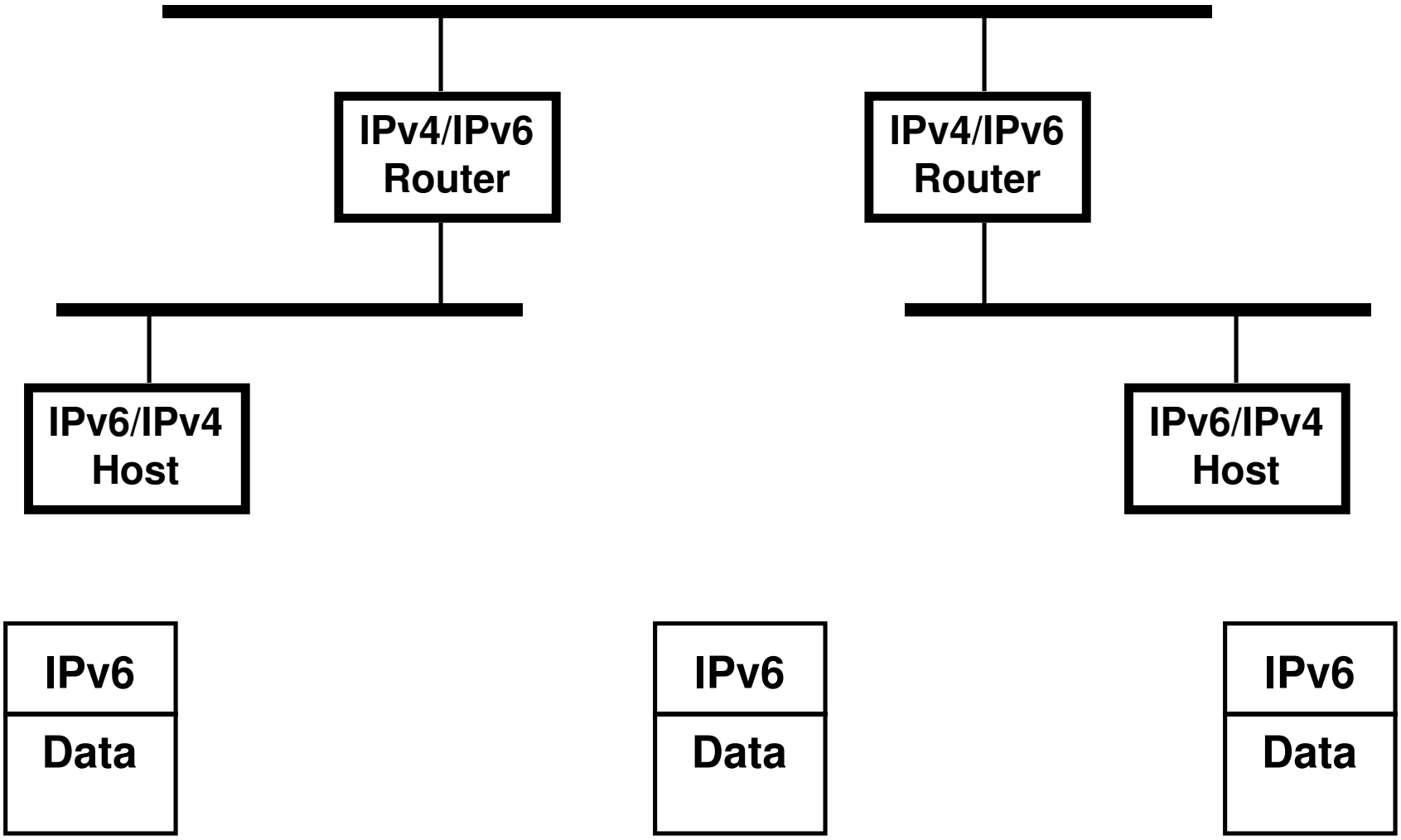
IPv6 AND TUNNELING



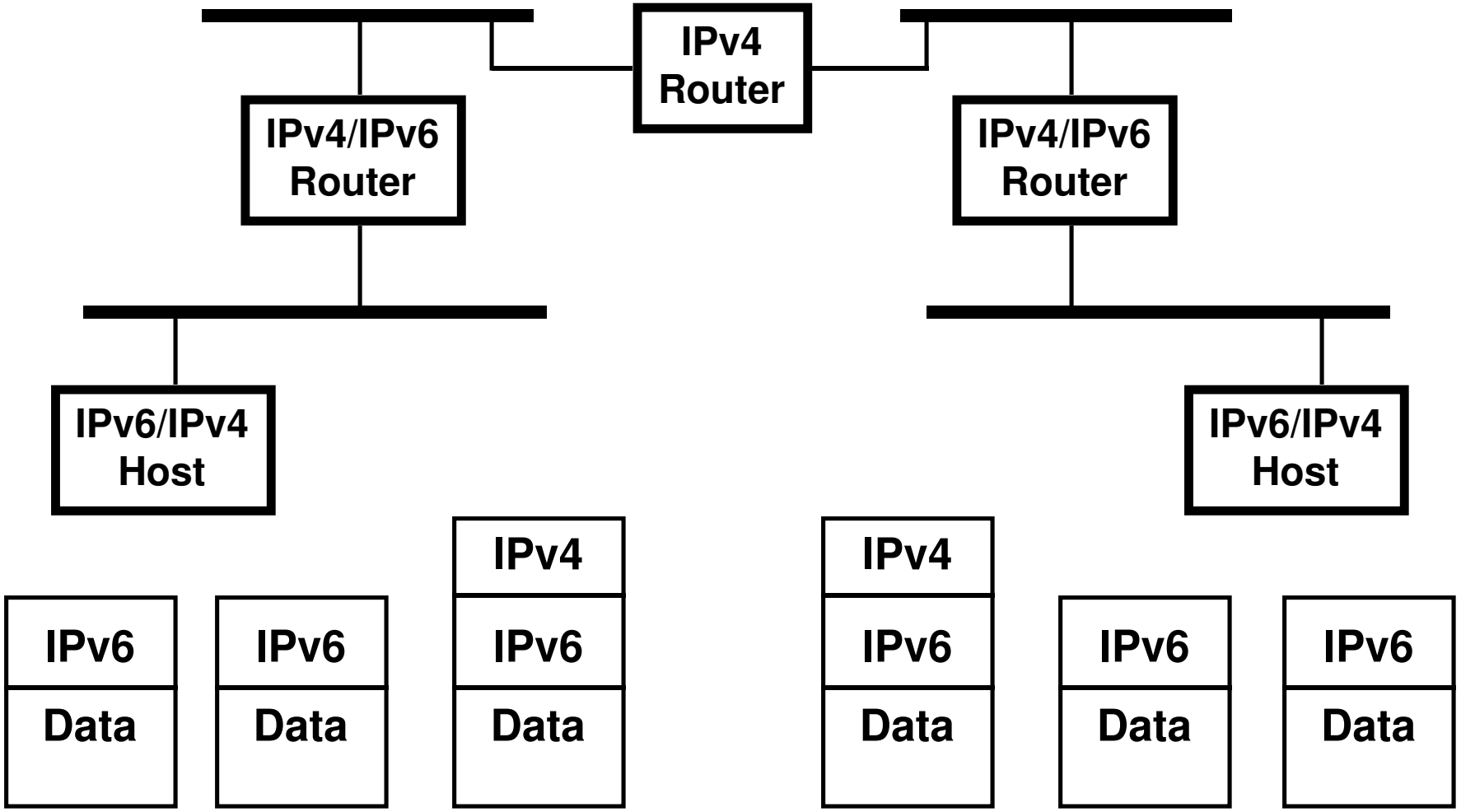
TUNNELING AND IPv6



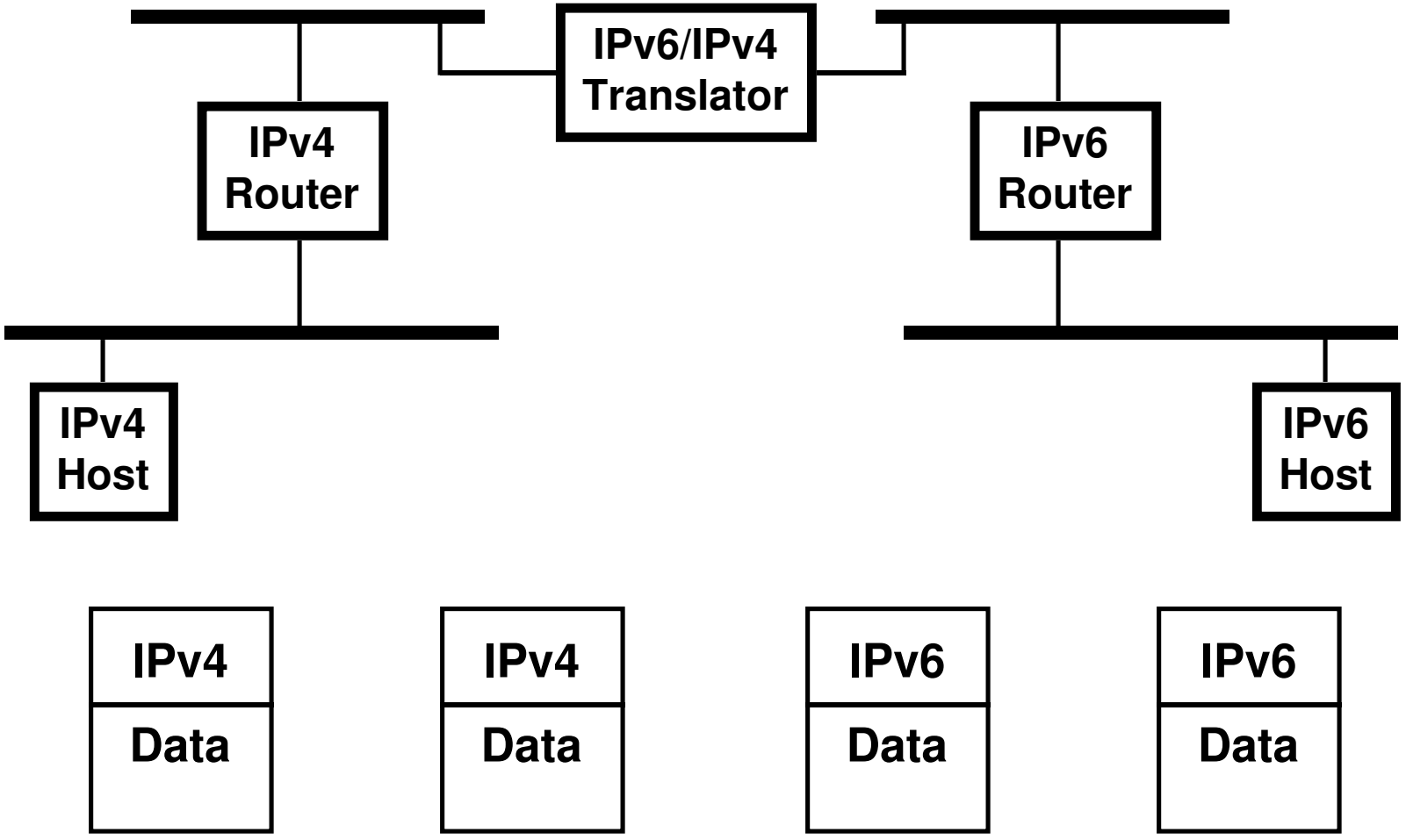
IPv6 OPERATION



ROUTER TUNNELING



TRANSLATION BETWEEN IPv6 and IPv4



MECHANISMS

- Terminology
- Constraints and Dependencies
- IPv4 Compatibility Addresses
- IPv6 in IPv4 Encapsulation
- IPv6/IPv4 Header Translation

NEW TERMINOLOGY

- **IPv4-Only Node**
  - **Host or Router that speaks *Only* IPv4**
- **IPv6-Only Node**
  - **Host or Router that speaks *Only* IPv6**
- **IPv6/IPv4 Node**
  - **Host or Router that speaks *both* IPv6 and IPv4 *plus* Implements IPv6-in-IPv4 Tunneling**
- **IPv6/IPv4 Translator**
  - **IPv6/IPv4 Router *plus* Implements Header Translation**

ASSUMPTIONS / CONSTRAINTS

- **IPv6 hosts need an IPv4 address to Interoperate with IPv4-Only hosts**
- **Interoperability between IPv4-Only and IPv6-Only Hosts requires Header Translation**

UPGRADE DEPENDENCIES

Transition Step	Depends On
Upgrade IPv4 Host or Router to IPv6/IPv4	Upgrade DNS to support AAAA records
Upgrade IPv6/IPv4 Host or Router to IPv6-Only	Upgrade all routers in Area to IPv6/IPv4 (Optional: Install Translating Router at Area Border)

IPv4 COMPATIBILITY ADDRESSES

- **IPv4-Mapped IPv6 Address**
  - **0:0:0:0:0:0:<IPv4-address>**
  - **Addresses of IPv4-Only Hosts mapped into IPv6 Address Space**
  - **Listed in DNS with *Only* "A" Records**
- **IPv4-Compatible IPv6 Address**
  - **0:0:0:0:0:FFFF:<IPv4-address>**
  - **Assigned to IPv6 Hosts that wish to Interoperate with IPv4-Only Hosts**
  - **Listed in DNS with *Both* "A" and "AAAA" Records**
- **IPv6-Only Address**
  - **0:0:0:0:1:0 through ffff:ffff:ffff:ffff:ffff:ffff**
  - **Assigned to IPv6 Hosts that *do not* wish to interoperate with IPv4-Only hosts**
  - **Listed in DNS with *Only* "AAAA" Records**

IPv6-in-IPv4 ENCAPSULATION

- Allows IPv6 Hosts to Exchange IPv6 Packets over IPv4 Infrastructure
- "Sending Rules" tell Hosts and Routers when to Encapsulate
- Mostly used "Host-to-Host" and "Router-to-Host"
  - "Host-to-Router" and "Router-to-Router" Allowed, but Requires Manual Configuration
- Embedded IPv4 Address allows "Automatic Configuration" of IPv4 "Tunnel End Point"
- IPv4 Source Address is Encapsulating Node
  - IPv4 ICMP Errors Return to the Right Place

IPv6/IPv4 HEADER TRANSLATION

- "Translating IPv6/IPv4 routers" Translate:
  - Packets between IPv6-Only and IPv4-Only Hosts
  - IPv4 Datagrams Transiting IPv6-Only area
- IPv4-Only and IPv6-Only Hosts speak their "Native" Protocol
- Address Mapping Completely Algorithmic
  - 0:0:0:0:0:0:<IPv4-addr> ==> <IPv4-addr>
  - <IPv4-addr> ==> 0:0:0:0:0:0:<IPv4-addr>
    OR
    <IPv4-addr> ==> 0:0:0:0:0:FFFF:<IPv4-addr>
- Translating Routers Must be Positioned Between IPv6-Only Areas and IPv6/IPv4 Areas

FOR MORE INFORMATION ON "NGTRANS" WORKING GROUP

- SIT Overview
  - Basic Overview / Introduction
  - Current draft: draft-gilligan-ipv6-sit-overview-00.txt
- Document Archive
  - playground.sun.com in pub/ngtrans/
- To Join Working Group Mailing List Send message to:
  majordomo@sunroof.eng.sun.com
  with
  subscribe ngtrans
  in the body of the message