Dual Stack Transition Mechanism

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Outline

- DSTM Overview
- DSTM Architecture
- Operation of DSTM components
- Worked example
- Advantages
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DSTM Overview

- Described in <draft-ietf-ngtrans-dstm-06>
- Designed to connect native IPv6 clouds to IPv4-only remote nodes
- IPv4 traffic is tunnelled in IPv6 datagrams
DSTM Architecture

- **DSTM Server**
  - IPv4 address allocation within IPv6 network

- **DSTM Client**
  - Process running on the client which request IPv4 addresses to the DSTM server

- **Gateway (a.k.a Tunnel End Point – TEP)**
  - Performs all the encapsulations/decapsulations

- **DSTM Hosts**
  - They are dual-stacked
  - Request & autoconfigure IPv4 addresses
  - Establish 4over6 tunnels towards the TEP
DSTM Architecture (2)
Operation of DSTM nodes

- How to detect when an IPv4 address is needed?
  - IPv4 address as a result of a DNS Query
  - An application opening an IPv4 socket, etc

- How to configure the IPv4 stack?
  - Request an IPv4/port address from DTSM server (if it is not one already available)
  - Configure 4over6 interface with the received values
  - Address all IPv4 traffic to the 4over6 interface
Operation of DSTM nodes (2)

- How does the node know the TEP address?
  - Statically configured (not recommended)
  - Learned from the answer of the DSTM server

- How is the packet built?
  - Source should be the IPv6 address of the physical interface on which the packet will be sent
  - Destination address is set to TEP
  - Next header type = 4 (IPv4 packet)
Operation of the DSTM TEP

How is it configured?
- Manually (not recommended)
- Via the DSTM Server
- Dynamically

What is configured?
- Mappings between IPv6, IPv4, [port]

When the 4over6 packet arrives
- It is decapsulated
- Forwarded according to IPv4 routing table
- Eventually it would need to announce routes towards IPv4 addresses assigned by DSTM Server into the IPv4 cloud.
Operation of the DSTM Server

- The protocol for addr allocation is left open
- What to do after receiving a request?
  - Answer with (IPv4, [port], TEP, duration)
  - Store the mappings between IPv6 and IPv4
  - Optionally it can auto-configure the TEP mappings
- Client authentication should be available
Worked Example (1)

A initiates the communication with B

IPv6

DNS Query B?

DNS answer B=155.54.1.10

IPv4

A

B

DNS

TEP

DSTM domain

DSTM server
IPv4 DNS record triggers DHCP request

IPv6

DHCPv6 Response
IP=1.1.1.120
6541 [optional]
TEP=2002:100::1
Time=180 s
Now IPv4 packets are sent using 4over6 towards TEP.
Worked Example (4)

TEP extracts IPv4 packet and sends it as usual

IPv4

IPv6

DSTM domain

DSTM server

A

B

TEP

DNS

S=1.1.1.120
D=155.54.1.10
Payload
Worked Example (5)

As TEP stored the mapping there is no problem for routing the answer.

IPv6

IPv4

TEP

DSTM domain

DSTM server

Payload

Payload

S=2002:100::1
D=2002:100::120
S=155.54.1.10
D=1.1.1.120

S=155.54.1.10
D=1.1.1.120

DNS

A

B
Worked Example (6): Extension IPv4 Query to IPv6 address

B initiates the communication with A. Extension needed so that B can Resolve on DTSM server.
As B has not allocated IPv4 addr a new address is allocated and added to the DNS. A is informed.
Now B can address IPv4 datagrams to the new allocated IPv4 address for A.
Worked Example (9)

A can answer because it knows the TEP IPv6 address.
Advantages

- Transparent to the network
  - As IPv4 messages are encapsulated, no IPv4 routing needs to be maintained
- Transparent to the application
  - No changes are needed for the applications to work in the dual-stack host
- DHCPv6 allows the dynamic allocation of IPv4 addresses.
- Based on standard protocols
- Easy to manage (no IPv4 routes needed)
Weaknesses

- Asymmetric paths are not supported
  - Return IPv4 packets must enter the IPv6 cloud through the same DSTM TEP who maintains the association

- Initial delay may be excessive for real-time traffic.
References

