SIPP Dynamic Host Address Assignment

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Dynamic Mechanisms

- DHCP (with new options)
- SIPP Router Discovery
- SIPP Router Discovery and DHCP
- SIPP Router Discovery and SIPP DHCP

- All mechanisms assume host has unique identifier

New DHCP Options

- Three options intended to support IPAE hosts:
  - SIPP prefix
  - IPAE IPv4 reachability mask
  - List of address sequences of SIPP routers
- Options encoded as tag octet, length octet and value
- Options support address sequences
- Options support single SIPP prefix

SIPP Router Discovery

- Router advertises local-use and global subnet prefixes
- Solicit RA on startup or when interface enabled
- Host maintains lists of:
  - subnet prefixes, masks and timer
  - local-use addresses
  - global address sequences
- Lists updated on receipt of Router Advertisement
- Lists updated on expiry of timer

SIPP Router Discovery (cont)

- On receipt of Router Advertisement per interface:
  - Add local-use address when get new local prefix
  - Add global addr seq when get new global prefix
  - Add new subnet prefixes to list
  - Update lifetime of existing subnet prefixes
- Choice of subnet prefixes used should be configurable
- Delete address sequences with timed out prefixes

Formation of Address Sequences

- Generally, concatenate subnet prefix and interface ID
- Use local-use prefix to form local-use address
  - Interface ID is IEEE 802/hardware address
  - useful for intra-site communication
  - useful for communicating with SIPP DHCP
- Use global prefix to form global address sequence
  - Identifying address is globally unique local-use
    - address sequence not IPv4-compatible
    - address sequence at least of length two
  - Interface ID is hardware address, if small enough
  - Use (SIPP) DHCP to acquire interface identifier

Using SIPP Router Discovery and IPv4 DHCP

- Learn SIPP prefix of IPv4-compatible subnet prefix
- Use DHCP to acquire IPv4 address
- Concatenate to form IPv4-compatible SIPP address
- Supports only single subnet prefix per interface
- Should check that IPv4 subnet matches that of prefix

Using SIPP Router Discovery and SIPP DHCP

- Use Router Discovery to learn global subnet prefix
- Use SIPP DHCP to acquire SIPP address sequence
- Client specifies subnet explicitly
- Supports multiple subnet prefixes per interface

Why SIPP DHCP?

- DHCP is IPv4-specific, not extensible to SIPP
- Support multiple bindings per interface
- Relay agent functionality not required because:
  - SIPP host can form a local-use address
  - SIPP host learns subnet from Router Discovery

Compatibility with DHCP

- SIPP DHCP server supports IPv4 and SIPP clients
- Distinguish using different opcodes in message
- SIPP clients bypass relay agents
- Allocate addresses out of common database,
  to support IPv4-compatible address assignment

SIPP DHCP

- Maps subnet prefix, client identifier to address sequence, lease time
- Operations:
  - Allocate and bind an addr seq to a client in subnet
  - Look up an existing addr seq in a subnet
  - Renew the lease time of a specified addr seq
  - Delete specified binding and deallocate addr seq
- After lease time expires, server may delete binding and deallocate addr seq

Differences with DHCP

- Only support address assignment
- Operation parameters and certain semantics differ
- New message format
- Message transmission differences

Availability Issues

- Protocol should allow for multiple servers to offer address sequence in same subnet
- But no mechanism to ensure consistency between them
- Thus, servers cannot
  - administer same range of addresses in subnet
  - ensure that a single binding exists per host per subnet in service as whole
- Implications are:
  - Potential two-step allocation procedure (discover and select)
  - Identify single binding when necessary

Address Allocation

- Client multicasts Discover specifying subnet
- Servers make an Offer
- Client chooses one offered address sequence
- Client multicasts Assign specifying offer and server
- Specified server returns an Ack, others retract offer
- Two alternatives:
  - Servers assign address sequence with zero lease
  - Servers return Ack when binding exists

Address Renewal

- Client unicasts Renew specifying binding and server
- Client multicasts Renew when lease time near expiry
- Retransmit at half of remaining lease time
- Specified server extends and returns lease time in Ack

Address Lookup

- Client multicasts Query specifying subnet
- Servers with a binding return address sequence
- More than one addr seq may be returned
- Useful to avoid two-step operation on look up
- Useful to determine whether binding exists
- DHCP equivalent is to verify a specified address

Other Issues

- Client identifier is local-use address
- Multicast optional
- Address assignment when router down
- Hosts without unique identifier, e.g. p-to-p links
- SIPP DHCP supports address assignment only
- Retransmission on Renew operations
- Storing address information over reboots
- Multiple local-use prefixes