Shim6 Architecture

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Background

draft-ietf-multi6-architecture-04.txt

(RFC publication queue)

- general description of multi-homing objectives
- consideration of major types of approaches
- consideration of various types of identity choices and their implications
- generic functional decomposition

General Questions

- How is a session/equivalence state established?
    - □ Upper/lower level split
    - □ Initial packet exchange
    - □ Capability negotiation
- Re-Homing Triggers
    - □ Per session?
    - □ Per host?
- Definition of Identity Equivalence State
- Locator Selections
- Session/equivalence state removal
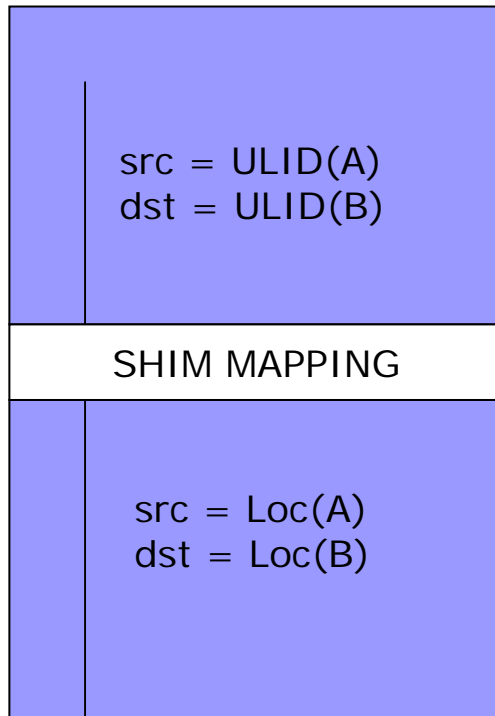
SHIM6 Architecture

draft-ietf-shim6-arch-00.txt

Initial draft – incomplete

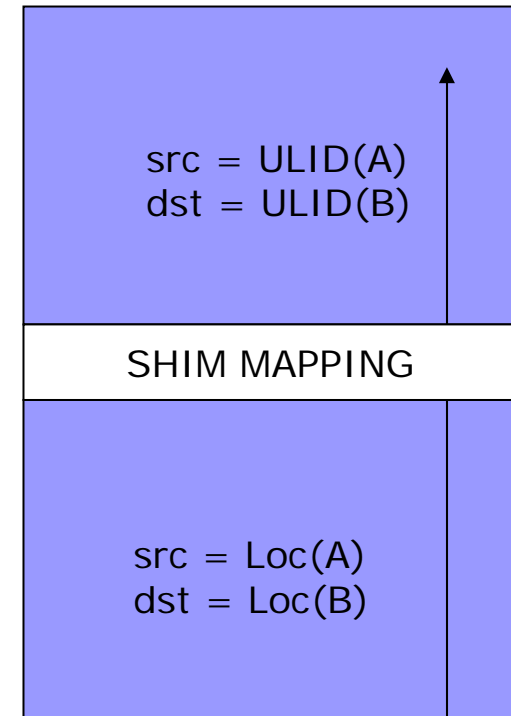- ☐ Endpoint Identity considerations
- ☐ Functional decomposition

- ☐ To Add (?)
  - ◾ Equivalence State definition
  - ◾ Design Trade-offs
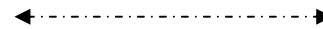
SHIM6 ID / LOC Split - Basic Approach

Sender A

Receiver B

Identity

src = ULID(A)
dst = ULID(B)

src = ULID(A)
dst = ULID(B)

SHIM MAPPING ← – – – – – – → SHIM MAPPING

src = Loc(A)
dst = Loc(B)

Locator

src = Loc(A)
dst = Loc(B)

Where is the SHIM?

Transport Protocols

TCP	UDP	DCCP	...

IP Endpoint Sublayer

AH	ESP	Frag/Reassembly	Destination Options

Multi6 SHIM

IP Routing
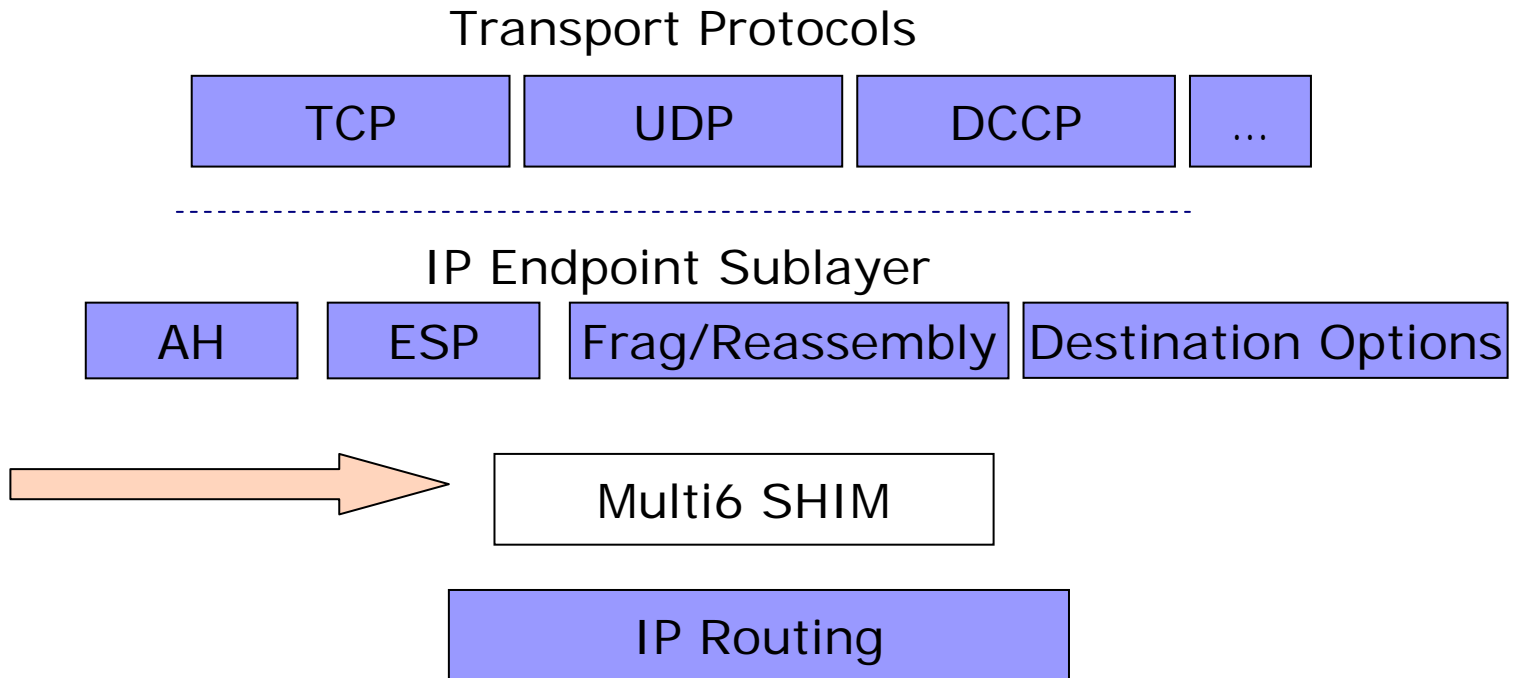
What's a "ULID"?

- **U**pper **L**ayer **ID**entifier
  - A selection from the set of locators associated with an endpoint
    - It's (probably) a viable locator
    - It's drawn from a structured space (reverse mappable)
    - Its better if it were a unique (deterministic) selection for each host *(to be clarified)*
    - Its useable in a referral context within and between hosts
    - Its semi-persistent

Turning on SHIM6

- The initial SHIM6 state for a ULID pair is the null mapping function
    (no shim mapping and no locator equivalence set)

- Subsequent capability negotiation to determine host-paired SHIM6 capability

- Exchange of current Locator Sets

- SHIM mapping installed on each endpoint at the IP layer
    - ULID pair to current Locator pair

Maintaining State

- Detecting network failure

  (How does a host know that its time to use a different source and/or destination locator?)

  (More work needed here)

  - Single per-endpoint state vs per session state
  - Heartbeat within the session
  - Shim heartbeat
  - Modified transport protocol to trigger locator change
  - Host / Router interaction to trigger locator change
  - Application timeframe vs network timeframe
  - Failure during session startup and failure following session establishment

Maintaining State

- Locator Failure Triggers

  - Possible triggers include failure of upper level keepalive signal to the SHIM layer, explicit trigger from upper level, ICMP error, explicit SHIM level reachability failure
    - Any or defined subset?
  - Re-Homing may involve exhaustive pair exploration to establish a new viable locator pair
    - Reactive or Continuous Probe?
  - Signal upper level protocol of path state change
    - "Active" end state change procedure
    - "Passive" end state change procedure

Removing State

- No explicit upper level protocol trigger
  - Use state timeout to remove stale SHIM mapping information

(The entire area of vertical signalling in the host protocol stack requires further consideration)

Some Open Issues

- **Integration of use of HBAs and CGAs with SHIM6**
  - In particular dynamic vs static locator set management

- **SHIM6 capability negotiation and locator set exchange**
  - Protocol analysis required

- **Explicit packet signals for triggering SHIM mapping on incoming packets**
  - How should you tell an incoming SHIM packet vs a non-SHIM packet?

- **Interaction with site exit routers**
  - Not defined as yet

Open Issues (2)

- ULID selection
  - ☐ How deterministic should this be?

- DNS interaction

- Adds and Wdls from locator pool

- Per-transport locator failure triggers
  - ☐ i.e. per transport vs per ULID pair SHIM state?

Common Issues

- **Network layer protocol element**
  - How do you know a session is completed?
    - The concept of session establishment and teardown is a transport concept, not an IP level concept
  - What do you need to do to bootstrap?
    - Are there 'distinguished' locators that you always need to use to get a session up?

Common Issues

- Session Persistence
  - Use one locator as the "home" locator and encapsulate the packet with alternative locators
  - Set up the session with a set of locators and have transport protocol maintain the session across the locator set
    - Optionally delay the locator binding, or allow the peer dynamic change of the locator pool
  - Use a new peering based on an identity protocol element and allow locators to be associated with the session identity

Common Issues

- Identity / Locator Binding domain (Equivalence Set)
  - Is the binding maintained per session?
    - In which case multiple sessions with the same endpoints need to maintain parallel bindings
  - Is the binding shared across sessions?
    - In which case how do you know when to discard a binding set?

Common Issues

- Bilateral peer applications vs multi-party applications

  - What changes for 3 or more parties to a protocol exchange?

- Application hand-over and referral

  - How does the remote party identify the multi-homed party for third party referrals?

Next Steps

- Review SHIM6 contributions
- Solicit explicit answers to open issues from document editors
- Submit -01 draft for WG Review