FORMALIZING SHIM6
AN IETF PROPOSED INTERNET STANDARD IN UPPAAL
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Revealed incorrectness upon receiving payload in I2-SENT or I2BIS-SENT.
Revealed possible deadlock with optional retransmitting I2 / I2bis messages.
Clarified confusion about responder nonce.

Aim: improve the quality of the specification by applying formal methods.

How SHIM6 works

IP roles SHIM6 splits the two semantics of an IP address (end point identifier and locator role).

Initial contact Normal data communication between end point identifiers, no SHIM6 needed.
Context Establishment Communication to exchange multihoming information.

Data communication remains normal.

Failure detection Messages are transmitted to detect a link failure.
Locator pair exploration In case of a link failure, a new locator needs to be selected.
Locators are mapped back at the host to the end point identifier. Transport session remains stable. Communication resumes with SHIM6 data packets that provide mapping information.

Figure 1: shim6 architecture

Formalization and Verification

Multihoming

• A technique to increase the reliability of a network connection.
• Features redundancy, load sharing, performance, and policy.
• Current multihoming practices (IPv4) impose a threat on address and routing scalability.
• SHIM6 is a proposal by the IETF to provide multihoming that solve these issues.
• No formal methods have been applied to the draft specification.

Future Work

UPPAAL: Improve model to verify on scale.
Add failure detection and exploration. Extend UPPAAL verifier language. Indicate model state space.

SHIM6:

Results

• Revealed incorrectness upon receiving payload in I2-SENT or I2BIS-SENT.
• Revealed possible deadlock with optional retransmitting I2 / I2bis messages.
• Clarified confusion about responder nonce.

Further Information

SHIM6:
http://www.shim6.org
http://tools.ietf.org/wg/shim6/
http://www.ietf.org/html.charters/shim6-charter.html

UPPAAL:
http://www.uppaal.com