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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.

Revealed several other ambiguities, omissions and inconsistencies. Acknowledged by SHIM6 draft authors. Will be incorporated in new IETF proposal.

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.

UPPAAL
An integrated tool environment for modelling, validation and verification of real-time systems modelled as networks of timed automata, extended with data types.

Properties:
A[] not deadlock
exists(h1:HostType) exists(h2:HostType)
(h1 != h2 and heuristics[h1][h2] --> forall(h3:HostType) forall(h4:HostType)
(h3 != h4 imply Context(h3,h4).established)

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.

Formalization and Verification

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

SHIM6:
Implementations. Add HBA and CGA, Context Forking. INTEROP test.
Traffic engineering issues.

Future Work

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