Post Sockets

a way to think about the world after sockets

draft-trammell-post-sockets-00

TAPS WG, IETF 97 서울, Wednesday 16 November 2016

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(with thanks to Jason Lee and Laurent Chuat, and acknowledgments to the authors of TCP Minion and of SCTP and its extensions, from whence many of these ideas came)
A few insights

- **Applications deal in objects** (messages) of arbitrary size
  - Files, assets, media frames, etc. may depend on each other, but usually don’t require a strict ordering.
  - Streams exist too, but only when the underlying source of data is of unknown length and not easily divisible into objects.

- The network of the future is *explicitly multipath*.
  - Applications must have access to the properties of these paths.
  - (And may be able to communicate with the path about these properties)

- Future transports must *guarantee security properties*.
  - Path elements must not be able to see transport-layer metadata.

- Message reception is *inherently asynchronous*.
  - Present scalable programming models enable (and require!) async IO.
Abstract Programming Interface
Classes and Entry Points

Listener
- creates associations
- restores paths

- Local
  - interfaces, private keys

- Path
  - ephemeral state, per-address-pair parameters

- Remote
  - names, addresses, public keys and certificates

Association
- long-term state, end-to-end cryptographic parameters

- Object
  - send()

- Event Handler
  - dormant() receive()
  - path_down() ack()
  - path_up() expired()

- Stream
  - platform-specific read/write API

- open_stream()
Abstract Programming Interface
Object and Stream properties

• Objects and streams have a **niceness**
  • Nicer **send()**s/**write()**s yield to less nice

• Objects have a **deadline**
  • An object will be cancelled if it cannot be realistically received before this deadline
  • Infinite-deadline objects are fully reliable

• Objects may have **antecedents**
  • other objects which should be sent before
Transport Independence

• Only two requirements for transport on the wire:
  • Framing for objects
  • Some (non-address) way to identify associations

• Assumption that the transport protocol provides encryption for payload confidentiality and public header integrity protection.

• Can make use of other transport features on demand:
  • Multipath load balancing and migration
  • Multistreaming for objects and streams
  • PLUS for path property exposure

• Object properties (niceness, deadline, dependencies) are sender-side only; path properties can be derived locally too.
Post and TAPS

- What we asking for: input and indication of interest in further development.

- POST as the TAPS API? probably not, or at least not yet:
  - Post places some requirements on the transport:
    - Won’t run over TCP/MPTCP without a framing/association identification shim.
    - Not the generic API TAPS envisions, if TAPS must work with unmodified transport protocols.
  - Could be modified for application-layer failover:
    - exception to say “transport supports only open_stream().”
Work to do

- Solicit feedback and design review ← *we are here*
  What are we missing? What can we remove?
- Define path properties beyond “up/down”
  - Defined properties: interface cost/preference
  - Measurable properties: RTT/loss rate
  - Exposed properties: Lo/La, etc. via PLUS
- Pilot implementation and experimentation
  - Within auspices of MAMI project, by mid-2018.
  - Post for QUIC/TLS over PLUS?
  - Post with framing/ID shim over TCP?