IAB Workshop on
Stack Evolution in a Middlebox Internet (SEMI)
26-27 January 2015, Zurich

Transport Area Open Meeting, 23 March 2015, Dallas
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Background

- IAB IP Stack Evolution Program currently focuses on two broad areas:

  - evolution of interfaces to transport and network-layer services beyond `SOCK_STREAM` and `SOCK_DGRAM`

  - Improving path transparency in the presence of firewalls and middleboxes.

- Follows the IAB's interest in general issues of protocol evolution (RFC 5218, ITAT workshop)

- Within the program, the IAB convened a workshop in January to discuss ossification of the transport layer…

  - …and how to fix it for emerging applications (e.g. rtcweb)

Squeezing the Transport Layer

- The problem is one of narrow interfaces as well as narrow paths:

  - `SOCK_STREAM` and `SOCK_DGRAM` not enough for every situation

  - Rolling your own transport can be dangerous

  - Middleboxes won't pass traffic they can't understand (new protocols, protocol extensions, flows with tricky state)

- Increasing deployment of encryption adds another dimension.

Why now?

1. new energy in the IETF:
   - work which requires flexibility we don't appear to have (RTCWEB, TCPINC)
   - work to provide that flexibility at the interface (TAPS)

2. pressure created by increasing deployment of encryption:
   - "Everything over TLS" will brick lots of deployed middleboxes
   - Opportunity to strike a balance between endpoint and midpoint requirements.

Workshop Positions

- 20 position papers accepted, 38 invitations sent.
- Stated goals of participants included:
  - deeper understanding of architecture and incentives,
  - broadening of transport interfaces
  - further research and community education on the issue
  - definition of middlebox cooperation approaches.
- On transport evolution, there were two camps:
  - "TCP is broken, burn it to the ground and start over"
  - "Long live TCP!"

Identified Goals

- Future work (WG/RG) on middlebox cooperation (protocol/functionality/etc.), including:

  - mechanisms for detection of path characteristics

  - measurement for path impairment detection and troubleshooting

- Better understanding of how transport should/must evolve, including applicability of present transports to specific use cases.

- Interface improvement: expose more to applications about transport (in the right way)

- Identify trust issues and deployment incentives in cooperation and evolution approaches (this is hard)
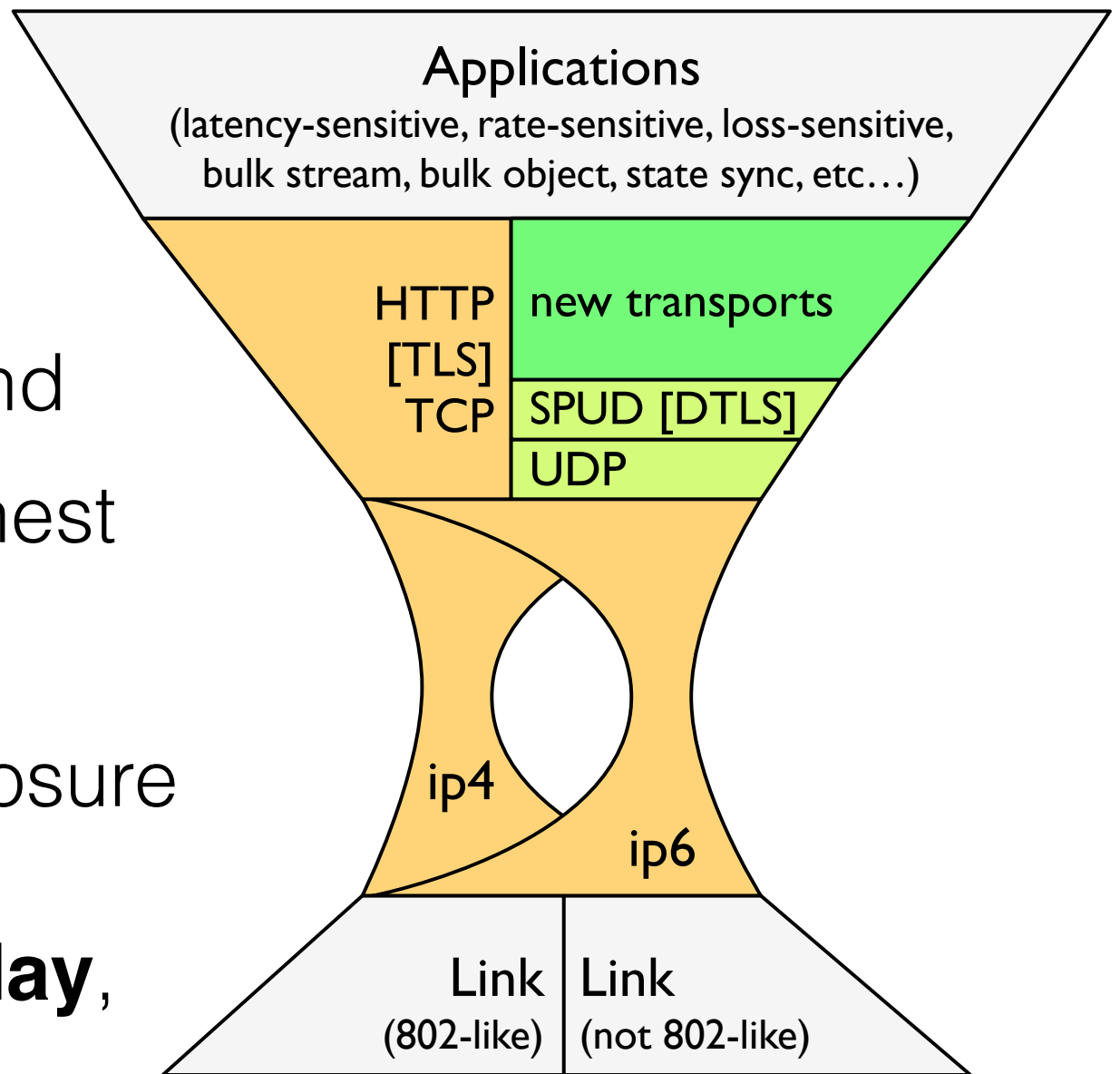
Outcome: Measurement

- We need to make data-driven engineering decisions about transport protocol extension

  - If a protocol works in 99.5% of the Internet, why not use when you can?

  - If a feature breaks in 0.5% of the Internet, how much complexity to work around that is too much?

- Service providers and platform developers have access to a great deal of data which, in aggregate, could better inform these decisions.

- **HOPS BarBoF, 21:30 Sunday** (see Aaron's talk)

Discussion points on cooperation

- We spent a great deal of time talking about endpoint/middlebox cooperation:

  - Contracts about how packets are handled are currently implicit: should these be made explicit?

  - Encryption provides a tool to enforce a balance of power between endpoints and the middle.

  - Incentives to deployment of any new transport protocol or encapsulation are key.

A new view of the two-stemmed Internet martini glass

- Expose what you must to the path

- Everything else is end-to-end

- Crypto keeps everyone honest

- Encapsulation for path exposure in user-space transports: **SPUD BoF: 9:00 Wednesday**, International room

Applications
(latency-sensitive, rate-sensitive, loss-sensitive, bulk stream, bulk object, state sync, etc…)

HTTP [TLS] TCP

new transports

SPUD [DTLS]

UDP

ip4

ip6

Link (802-like)

Link (not 802-like)

TODO

- Initial workshop report: Real Soon Now (mid-April)

  - Until then: transcripts, slides, position papers at https://www.iab.org/activities/workshops/semi/

- Cooperation with ETSI NFV Forum on middlebox issues (in progress)

- Discussions on transport extensibility in area meetings

- UDP encapsulation guidelines

- Statement on architectural assumptions in transport evolution (referred to program)

Further Discussion

- Middlebox measurement issues ("How Ossified is the Protocol Stack"): hops@ietf.org

- Substrate Protocol for User Datagrams spud@ietf.org (and come to the BoF)

- Transport Services WG taps@ietf.org

- Other future work stackevo@iab.org