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

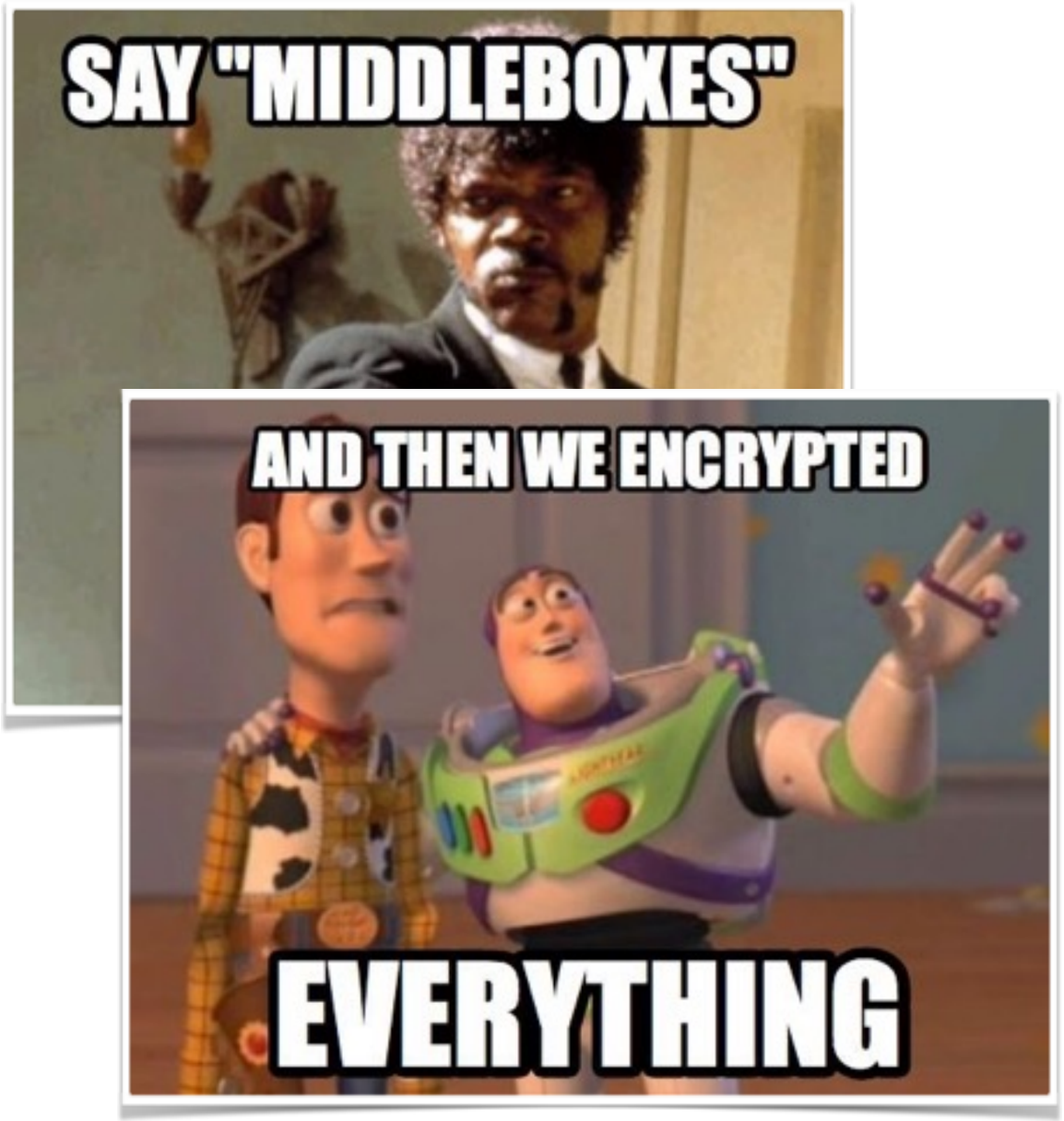
- IAB IP Stack Evolution Program currently focuses on two broad areas:
  - evolution of interfaces to transport and network-layer services beyond `SOCK_STREAM` and `SOCK_DGRAM`
    - Improving path transparency in the presence of firewalls and middleboxes.
- Follows the IAB's interest in general issues 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)

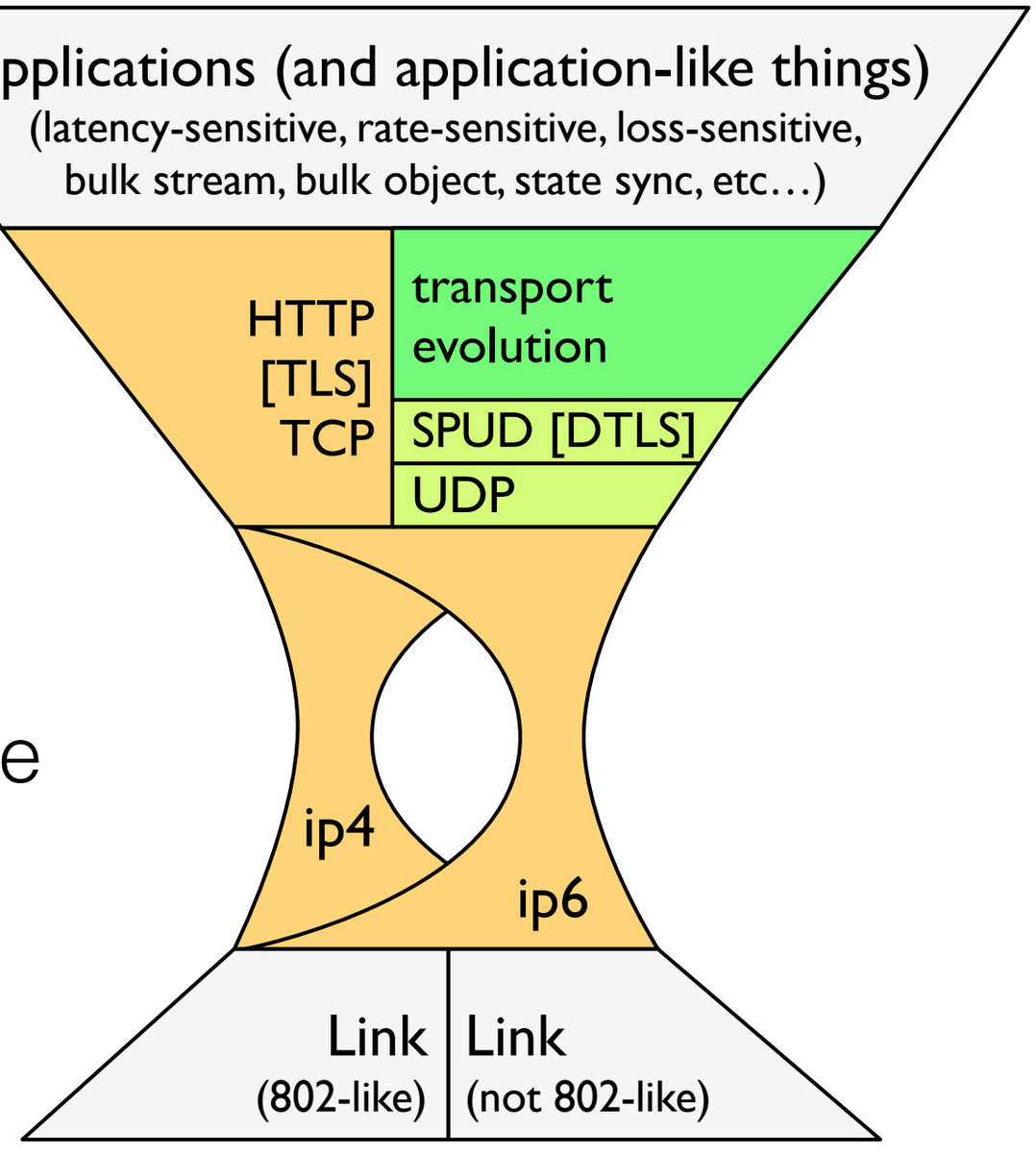
Discussion points on cooperation

- 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.

Cooperation: 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



Cooperation Vocabulary

- Once you have this mechanism, what do you say with it?
  - There need to be incentives to expose information.
  - There need to be incentives not to lie.
- A2P (app to path): problem appears tractable, there is a minimal set of useful information (e.g. session lifetime) which can be exposed, and is anyway useful to the far endpoint.
- P2A (path to app): the way forward is less clear
  - If treated as advisory: problem might be tractable; similar to ICMP, but inband.
  - If treated as authoritative: previously unsolved problem, many trust issues.

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