

PLUS and QUIC: Deploying the MCP

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measurement and architecture for a middleboxed internet

measurement

architecture

experimentation

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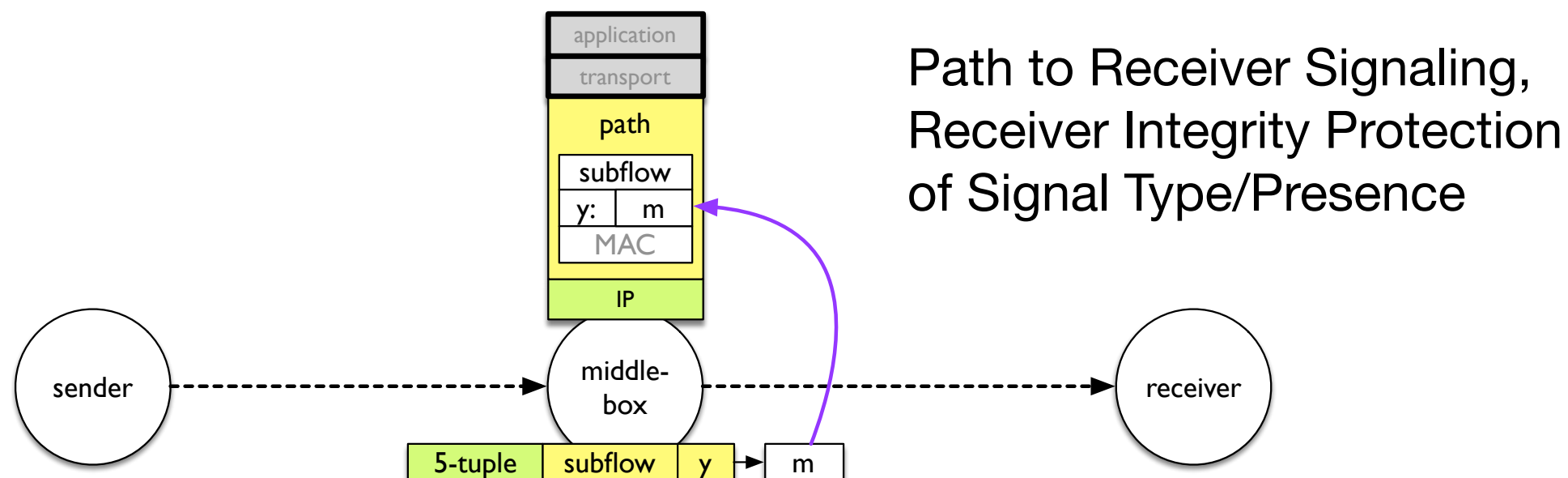
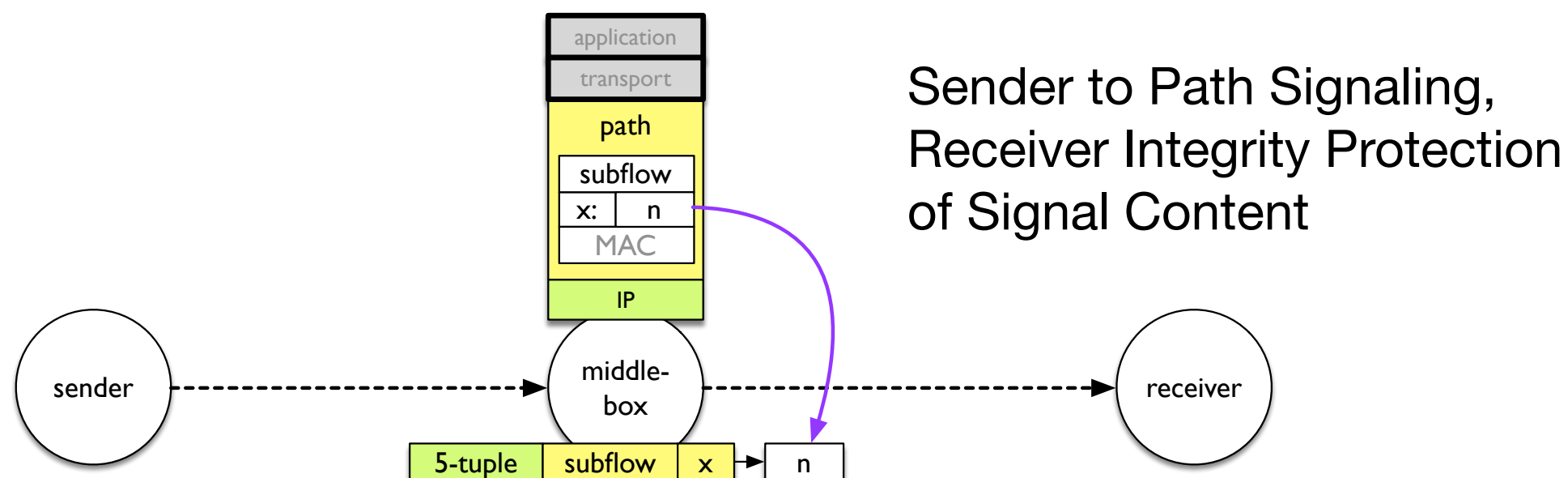


Overview Internet-drafts and preprints

- SPUD (expired)
 - draft-kuehlewind-spud-use-cases-00: Use Cases for a Substrate Protocol for User Datagrams (SPUD)
 - draft-trammell-spud-req-04: Requirements for the design of a Substrate Protocol for User Datagrams (SPUD)
- **PLUS**
 - **draft-trammell-plus-statefulness-02**: Transport-Independent Path Layer State Management
 - **draft-trammell-plus-abstract-mech-00**: Abstract Mechanisms for a Cooperative Path Layer under Endpoint Control
 - **draft-trammell-plus-spec-00**: Path Layer UDP Substrate Specification
- **QUIC**
 - **draft-kuehlewind-quic-appman-00**: Applicability and Management of the QUIC Transport Protocol
- **IPIM**
 - **Principles for Measurability in Protocol Design**: describes an abstract In-Protocol Internet Measurement (IPIM) facility to be implemented in PLUS/MCP, <https://arxiv.org/pdf/1612.02902v1.pdf>



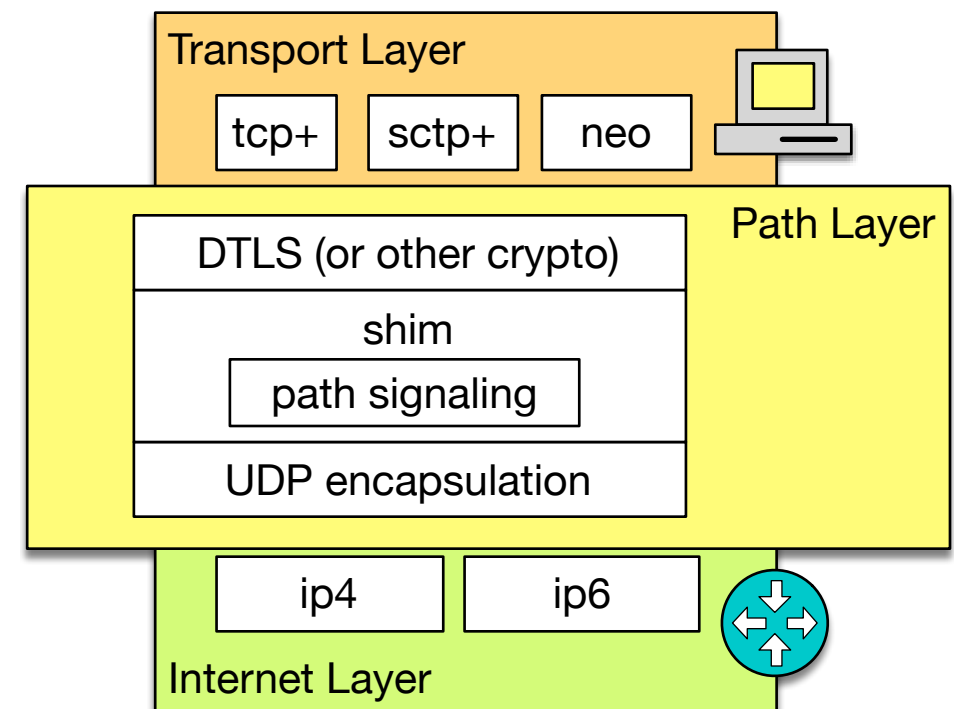
Abstract Mechanisms for the Path Layer (PLUS BoF, Berlin, “-abstract-mech”)





Anatomy of the Path Layer (PLUS BoF, Berlin)

- UDP encapsulation
 - userspace implementation
 - ports for NAT
 - ~95% deployable today
- encoding for abstract signaling mechanisms
- crypto (unspecified) to protect transport headers and above
- Unable to achieve IETF consensus due to concerns about privacy and operator abuse of path signaling.



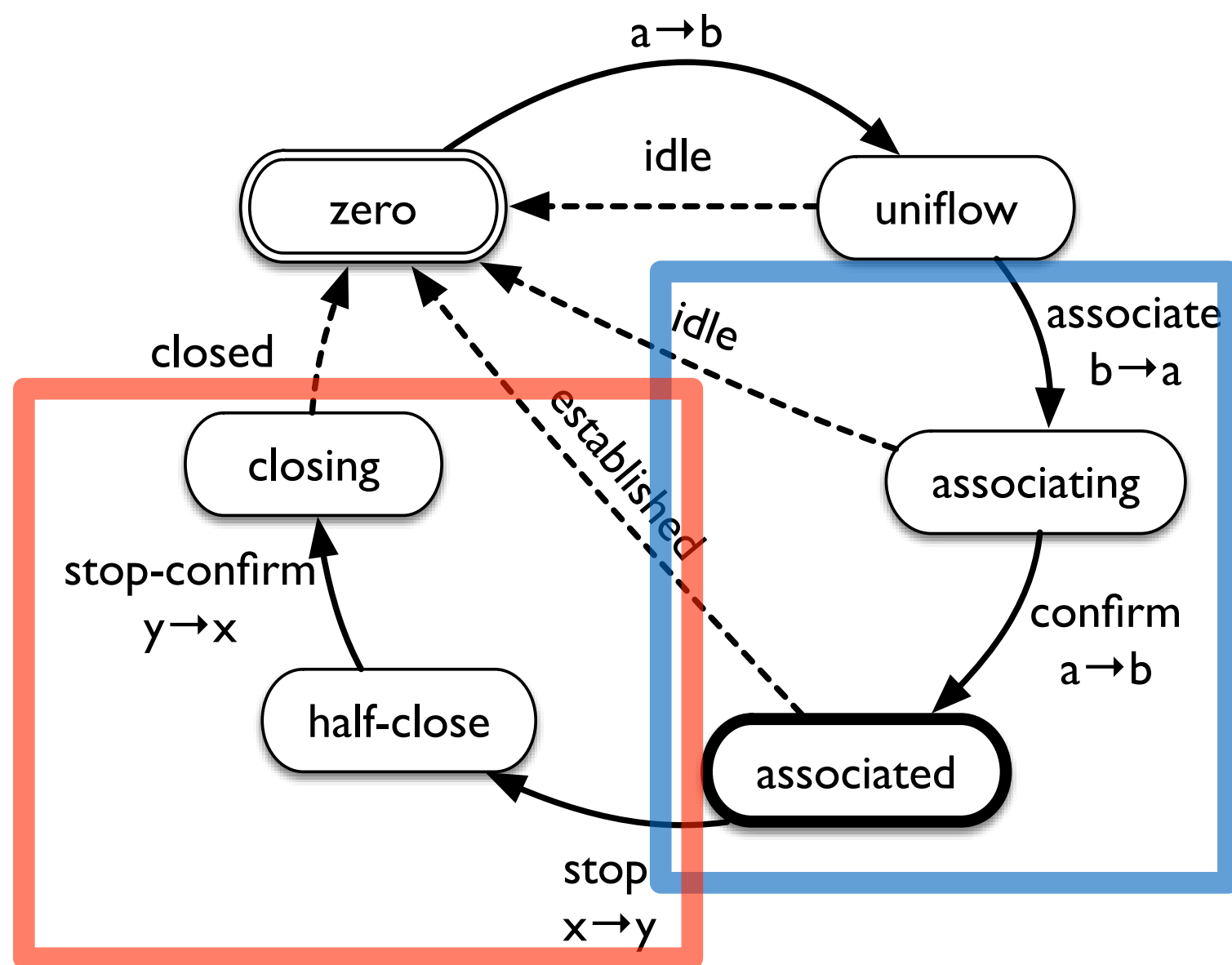


Reframing the MCP problem

- We really want three different sets of features:
 - TCP wire image replacement for encrypted transport protocols — state exposure and basic measurement
 - Sender to path signaling for one-bit signals (e.g. LoLa)
 - Additional sender-to-path and path-to-receiver signals for future troubleshooting, management, provisioning network functions.
- So let's define a wire image with these features in mind.



Transport-Independent Exposure of Transport State (“-statefulness”)

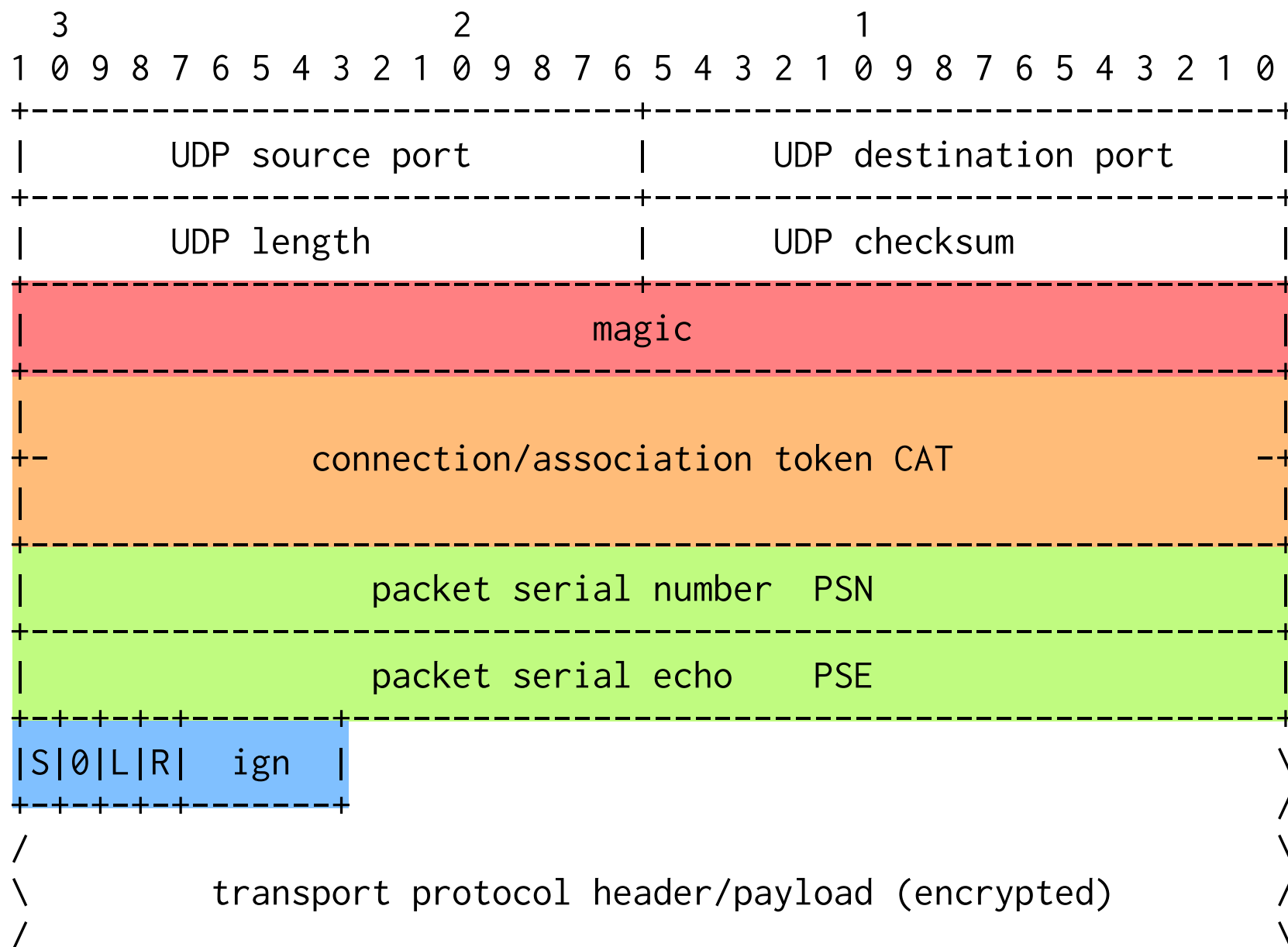


Require closing signals in both directions to prevent injection

Force three-way handshake to prove return routability



PLUS Basic Header (“-spec”)



identifies packet as PLUS

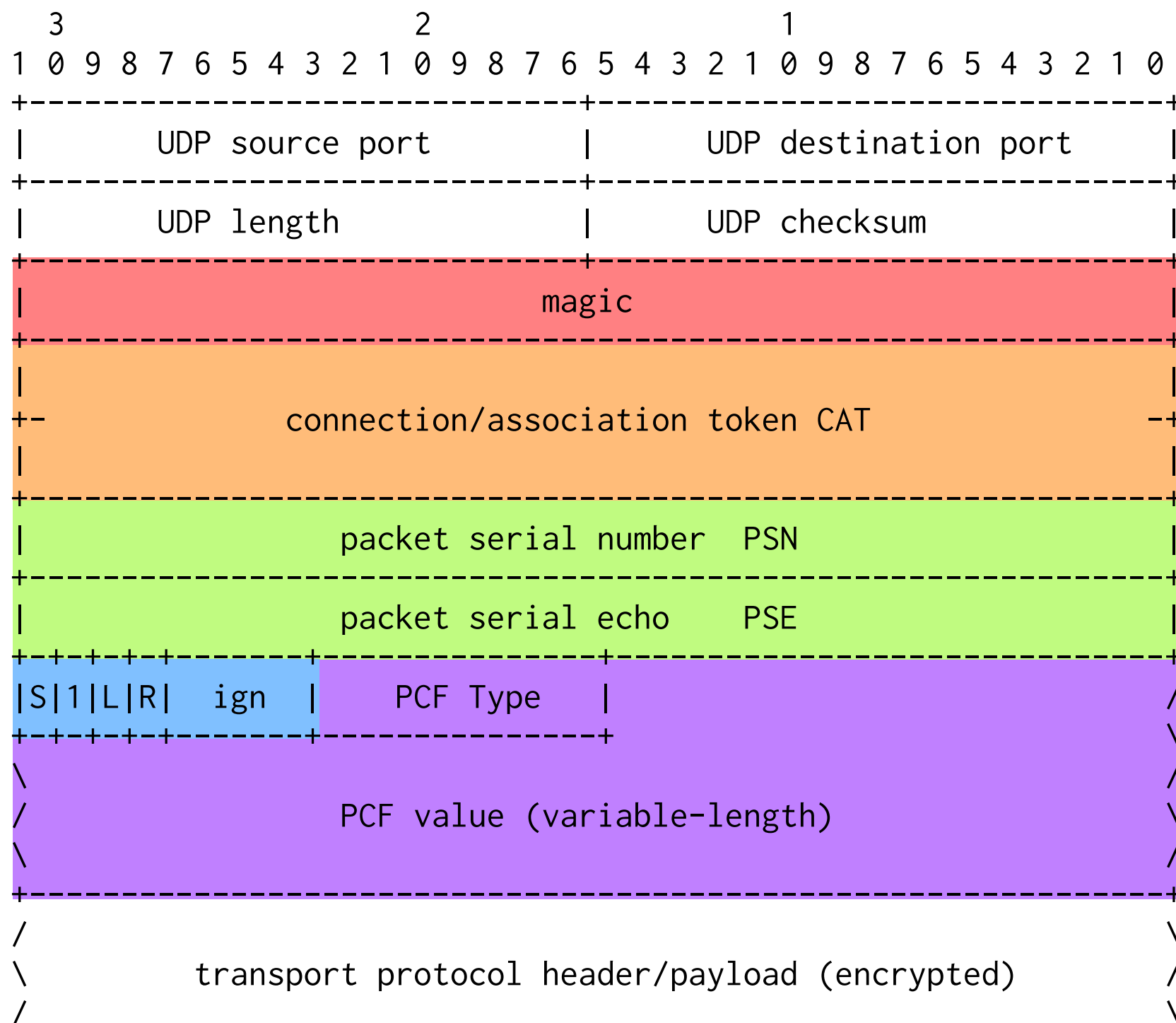
token for load balancing,
NAT rebinding, association
and confirmation signals

for loss and RTT measurement,
and stop signal confirmation

stop, extended header,
latency sensitivity, and
reordering OK flags



PLUS Extended Header (“-spec”)



sender-to-path and
path-to-receiver signals
(length/behavior specified
by PCF type)



PLUS Path Communication Field vocabulary

- Sender to path:
 - Timestamp/Timestamp Echo (less useful with PSN/PSE)
 - Relative priority (*not in -00*)
 - Congestion exposure (*not in -00*)
- Path to receiver:
 - MTU accumulator
 - State timeout accumulator
 - Rate limit accumulator
 - Path delay accumulator
 - Path element trace (IPIM §4.3)



QUIC (Interim WG Mtg. Tokyo, Jan 2017)

- QUIC will deploy before PLUS — getting some MCP concepts into it is worth the effort.
- Primary focus: PSN/PSE, two-way stop.
- Secondary focus: make sure QUIC can layer on PLUS for experimentation.
 - Align PSN/PSE, CAT semantics.
- Applicability and manageability document(s) for QUIC:
 - Description of in-network functions supported by QUIC's design



QUIC+ implementation plan

- Fork <https://github.com/lucas-clemente/quic-go>
 - first step: update implementation to match current spec (with or without crypto)
 - H2 implementation out of the box
 - Basic server, test client
 - Measure PLUS connectivity towards target test servers at DigitalOcean, ETH, etc.
- Reference PLUS middlebox: <https://fd.io/>
 - focusing on NAT and traffic diagnostics
- Experimental PLUS passive measurements based on <https://github.com/britram/mokumokuren> (new PathSpider observer)
 - potential experimentation with extended header to increase measurement accuracy