Working Group Draft for TCPCLv4

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Motivations for Updates to TCPCL

1. During implementation of TCPCLv3, Scott Burleigh found an ambiguity in bundle acknowledgment and refusal.
2. For use in a terrestrial WAN, author has a need for TLS-based authentication and integrity. TCPCLv3 mentions TLS but does not specify its use. IETF strongly in favor of TLS for new general-use protocols.
3. Reduced sequencing variability from TCPCLv3
4. Adding extension capability for TCPCL sessions and transfers.

Goals for TCPCLv4

- Do not change scope or workflow of TCPCL.
  - As much as possible, keep existing requirements and behaviors. The baseline spec was a copy-paste of TCPCLv3.
  - Still using single-phase contact negotiation, re-using existing headers and message type codes.
  - Allow existing implementations to be adapted for TCPCLv4.

Last Draft Edits

- Changes are in draft-ietf-dtn-tcpclv4-11.
- Removed separate XFER_INIT message and moved transfer extension items into first XFER_SEGMENT message (when START bit is set).
  - This avoids overhead of extra message and simplifies message sequencing logic.
  - The transfer Total Length has been moved into an extension item (further discussion in later slides).
- Reduced total extension list length from 64-bit to 32-bit.
  - Strong guidance provided in spec to limit the size of extension items.
  - This still allows “large” extensions (for some relative amount of largeness).
- Clarified default and minimum session timeout behaviors.
  - Restored recommended default from TCPCLv3.
- Added a “reply” marking to SESS_TERM message to avoid trivial feedback loop.
  - Now a termination initiation is distinguishable from its acknowledgement.
- Removed encoding variability in SESS_TERM reason code.
  - An “unknown” code is used where previously there was no encoded value.

Minimal TCPCLv4 Implementation

- In the case where a user wants to achieve least-overhead on a reliable private network:
  - No TLS use, no EID exchange, no extensions
  - Always single-segment transfers
- Sequence:
  - Contact header (each direction): 6 octets
  - SESS_INIT (each direction): 25 octets
  - XFER_SEGMENT out: 22 octets + bundle size
  - XFER_ACK in: 18 octets
  - SESS_TERM (each direction): 2 octets
- Overhead for session: 33 octets
- Overhead for each transfer: 40 octets

Transfer Length Extension

- The total length of a segmented transfer is now included in an extension item.
- Moving this data from (removed) XFER_INIT message to extension item saved 2 octets.
  - XFER_INIT+XFER_SEGMENT overhead was 37 octets, now 35 octets when the Transfer Length extension is used.

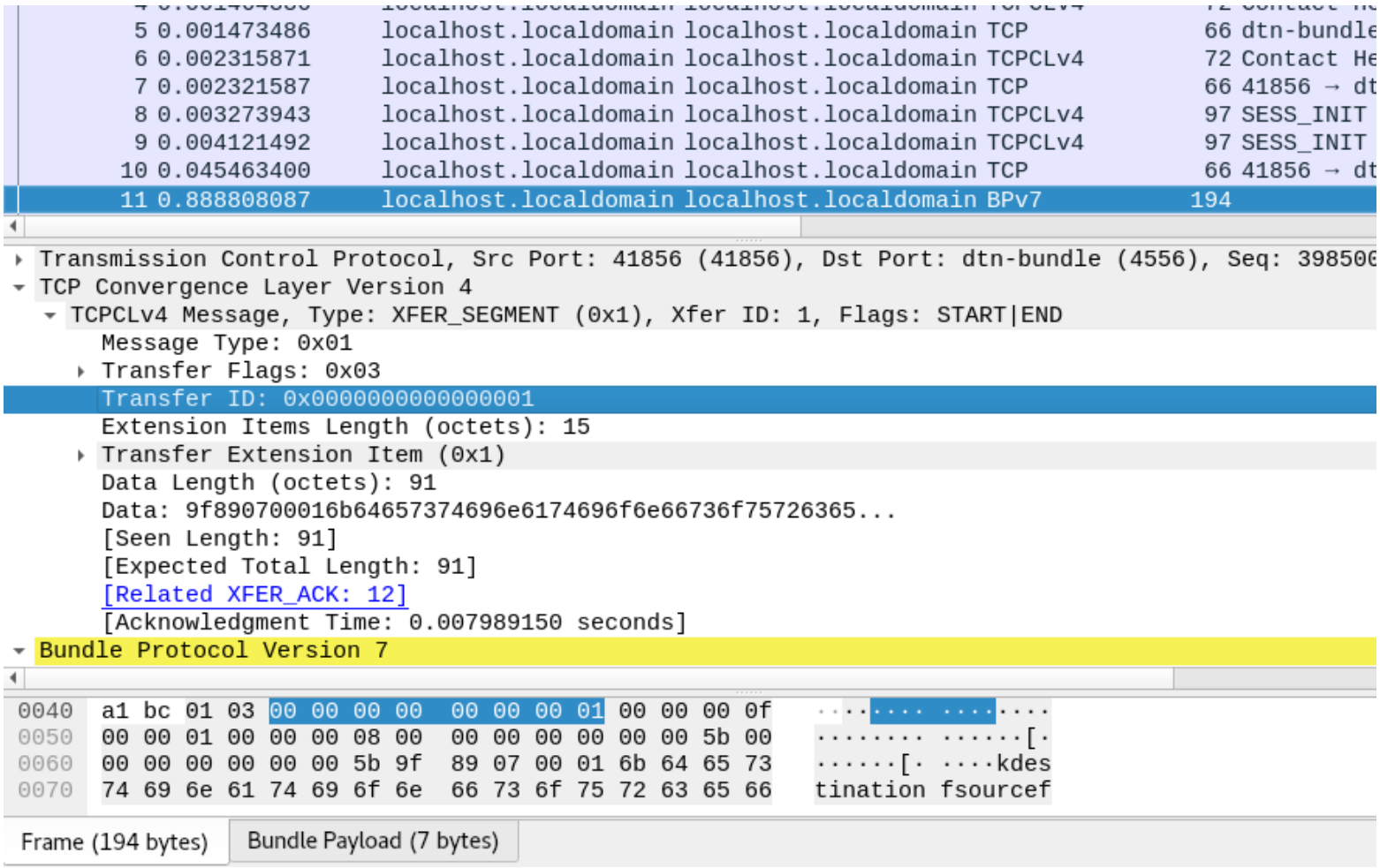
Demo CL Agent Changes

- The python example agent has been updated to follow new -11 message sequencing.
- New behaviors:
  - Agents are not fully bidirectional and D-Bus controlled to allow multiple sessions both incoming and outgoing.
  - Performs graceful SESS_TERM sequencing on `KeyboardInterrupt` (Ctrl+C) or D-Bus command.
  - Implemented segment-scaling algorithm to target a desired time-to-acknowledge as a proof of concept.
- Also implemented random message generator to exercise demo agent and wireshark plugin.

New Wireshark Dissectors

- For TCPCLv4:
  - Decodes Contact Header and all defined Message types.
  - Handles TLS in sessions.
  - Decodes session and transfer extension items.
  - Performs several sequence checks with warnings.
  - Performs SEGMENT--ACK cross-linking and timing.
  - Reassembles segments of a transfer into a single data block.
  - Validates CBOR decoding of the bundle content.
- For BPv7:
  - Verifies proper bundle header/footer.
  - Decodes primary and canonical blocks.
  - Decodes type-specific data defined in the core spec.
  - Ran into issues with CRC use, may need to clarify in BP spec.

Wireshark Screenshot



Open Issues from Feedback

- Concern about allowed extension item encodings.
  - Currently the Extension Item data Length field is 32-bit.
  - This is oversized from minimum expected use.
  - This also avoids any possible issue with large extension items.
  - Is it worth shaving octets to possibly run into size-overflow issues?
    - An Extension Item Length of 16-bits could be used with more complex multiple-item sequencing to implement larger data payloads.
  - Are we concerned with two octets in an optional mechanism?

Way Forward for TCPCLv4

- Further set of editorial changes to fix some typos and to include type/reason codes in the spec body tables (not just in the IANA tables).
- Working implementation is available for interoperability testing
  - Implemented in `scapy/python` for ease of understanding.
  - Handles concurrent sessions and asynchronous socket events.
  - Does not implement BP agent behavior, only CL behavior.
- Working Wireshark protocols for troubleshooting implementations and analyzing traffic.
  - These supersede the “Bundle” protocols in stock Wireshark 2.6