

# TCP Convergence Layer

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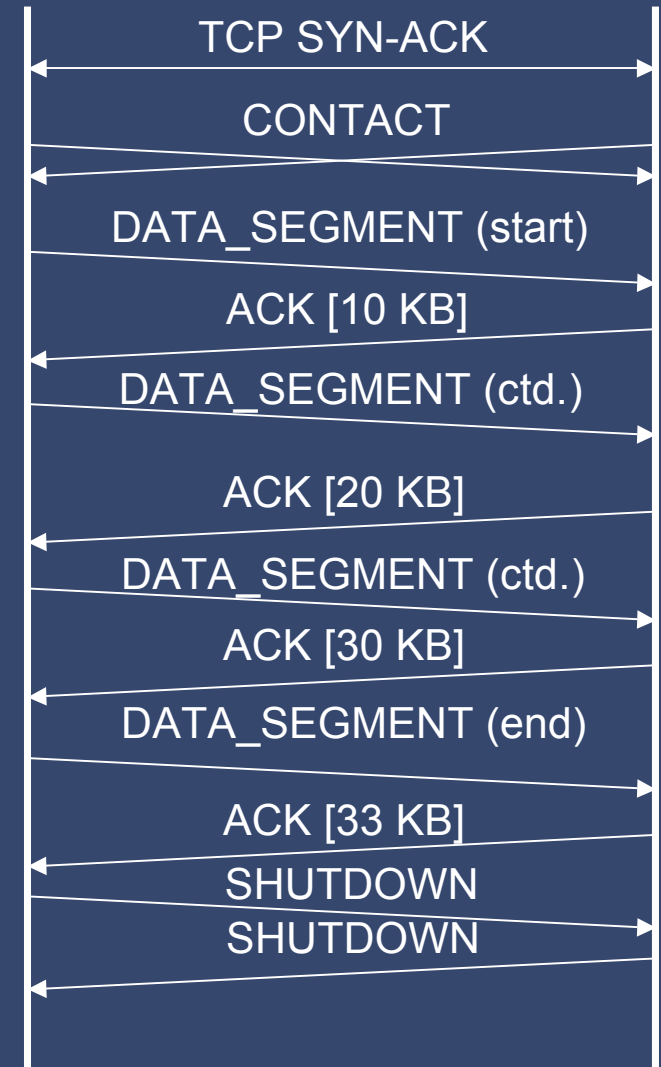
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# Overview

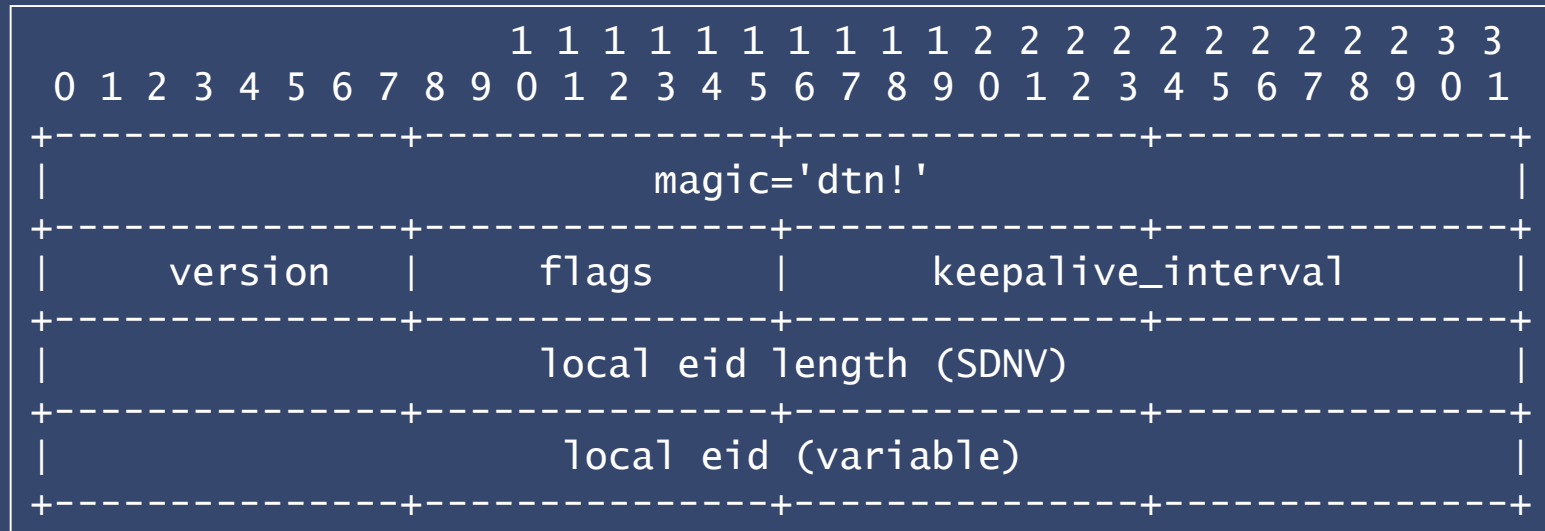
- DTN convergence layer protocol that uses TCP as a transport
- Motivation:
  - message framing, app-level acks, reactive fragmentation
- `draft-demmer-tcp-clayer-00.txt`

# Basic Protocol Operation

- Contact header for session setup
- Data segments / acks exchanged in each direction
- Connection close due to idle timer
- Shutdown msg to convey reason code



# Contact Header



- Magic + version to establish session
- Flags: enable acks, enable reactive fragmentation, enable negative acks
- Keepalive interval
- Local eid for bundle layer identification

# CL Message Format

- Preamble byte with four bit typecode and four bits of flags
- Defined message types:
  - 0x1: DATA\_SEGMENT
  - 0x2: ACK\_SEGMENT
  - 0x3: REFUSE\_BUNDLE
  - 0x4: KEEPALIVE
  - 0x5: SHUTDOWN

# Data / Ack Segments

- Bundle data sent in configurable chunks
  - Minimal overhead: 1 byte + SDNV length
  - First & last data segments marked with corresponding flags
- Cumulative acks returned per-segment
  - E.g. Three 10k segments => ack 10k, 20k, 30k
- Enables reactive fragmentation if the connection unexpectedly breaks

# Keepalive

- Contact header exchange negotiates a keepalive interval
- Enables peering nodes to distinguish idleness from network partition
- Keepalives should not stop a node from closing an idle link

# Refuse Bundle

- In response to a data segment, node may send refuse bundle message
- Enables early duplicate detection (i.e. before payload transmitted)
- Optionally enabled (not implemented by DTN2 reference implementation)



# Shutdown

- App-level shutdown byte to precede TCP FIN
- Optional reason code
  - Idle timeout, version mismatch, busy, others?
- Optional reconnection delay request

# Design Questions

- Protocol version management:
  - Current spec relies on newer version to “downgrade” or disconnect
- Alternative: future extension messages ignored with common way of specifying length