

# Train Measurements with TWAMP

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# Initial Observations

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- › TWAMP Burst Rate attempts to provide unidirectional line-rate measurements (?) by changing the fundamentals of the TWAMP round-trip measurement architecture
  - OWAMP is a better solution for this purpose without requiring any changes
- › TWAMP Value-Added octets provides bidirectional variable-rate measurements needed for capacity estimates while aligning with the TWAMP round-trip measurement architecture

# General Observations

	TWAMP Burst Rate Modes	TWAMP Value-Added Mode
Performance Metrics	Purpose is unclear	Capacity Metrics (RFC5136) IP packet transfer (ITU-T Y.1540) Can be used for other PM metrics
Compatibility	Break many core TWAMP rules Re-define the Session-Reflector has Session-Receiver and Session-Sender Redefine test packets as “control packets” Incomplete	Align with the core TWAMP spec It is still a Session-Reflector Work with any capacity/rate estimation methods
Scalability	Requires two sessions to measure the “rate” over a bidirectional path	A single session is sufficient to measure the “capacity” over a bidirectional path
Complexity	Many changes to control protocol with overlapping definitions with core specs Not compatible with all modes Fields are questionable Changes to TWAMP test packet header	Minimal changes to control protocol Compatible with all other modes Simple extension to TWAMP test packet
Precision	Unknown Intrusive	Proven Non-intrusive

# New Proposal

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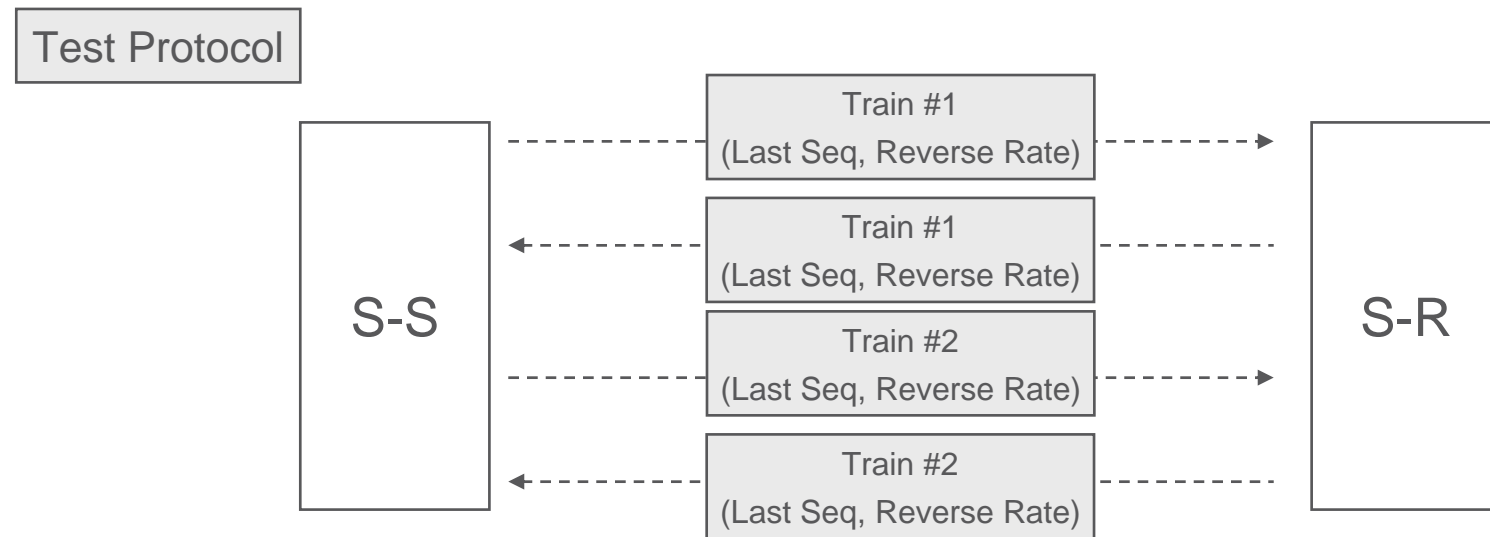
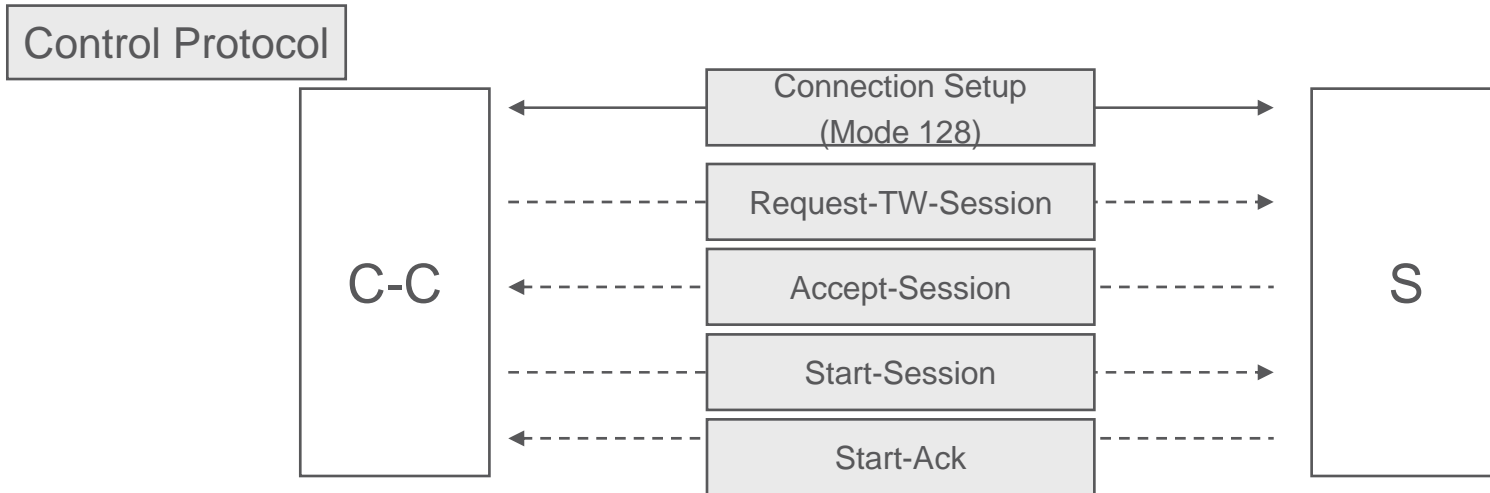
- › Create a separate TWAMP mode for each train measurement type with clear separation between control (out-of-band) and test packets (in-band)
  - 1) Two-way train measurements (mode 128)
  - 2) Forward train measurements (mode 256)
  - 3) Reverse train measurements (mode 512)
- › Independent modes
  - Mode 128 is also compatible with Symmetrical Size mode
- › Flexible choice for the implementers/users
  - All three modes are optional
  - All have pros and cons (?)
- › Should interwork with any capacity estimation methods
  - Fixe and variable rate (inter-packet interval)
  - Fixe and variable train size
- › Consistent design approach across all three modes
  - Easier to implement
  - Easier to operate and manage at both endpoints
- › Applicable to other metrics
  - Killer app for OWAMP, not really (?)

# Two-way train measurements (mode 128)

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- › Align with core TWAMP round-trip measurement architecture
- › draft-baillargeon-ippm-twamp-value-added-octets-01
- › 1 FWD test packet, 1 REV test packet
- › 1 FWD test octet, 1 REV test octet
- › 1 FWD train, 1 REV train

# Two-Way Train Measurements

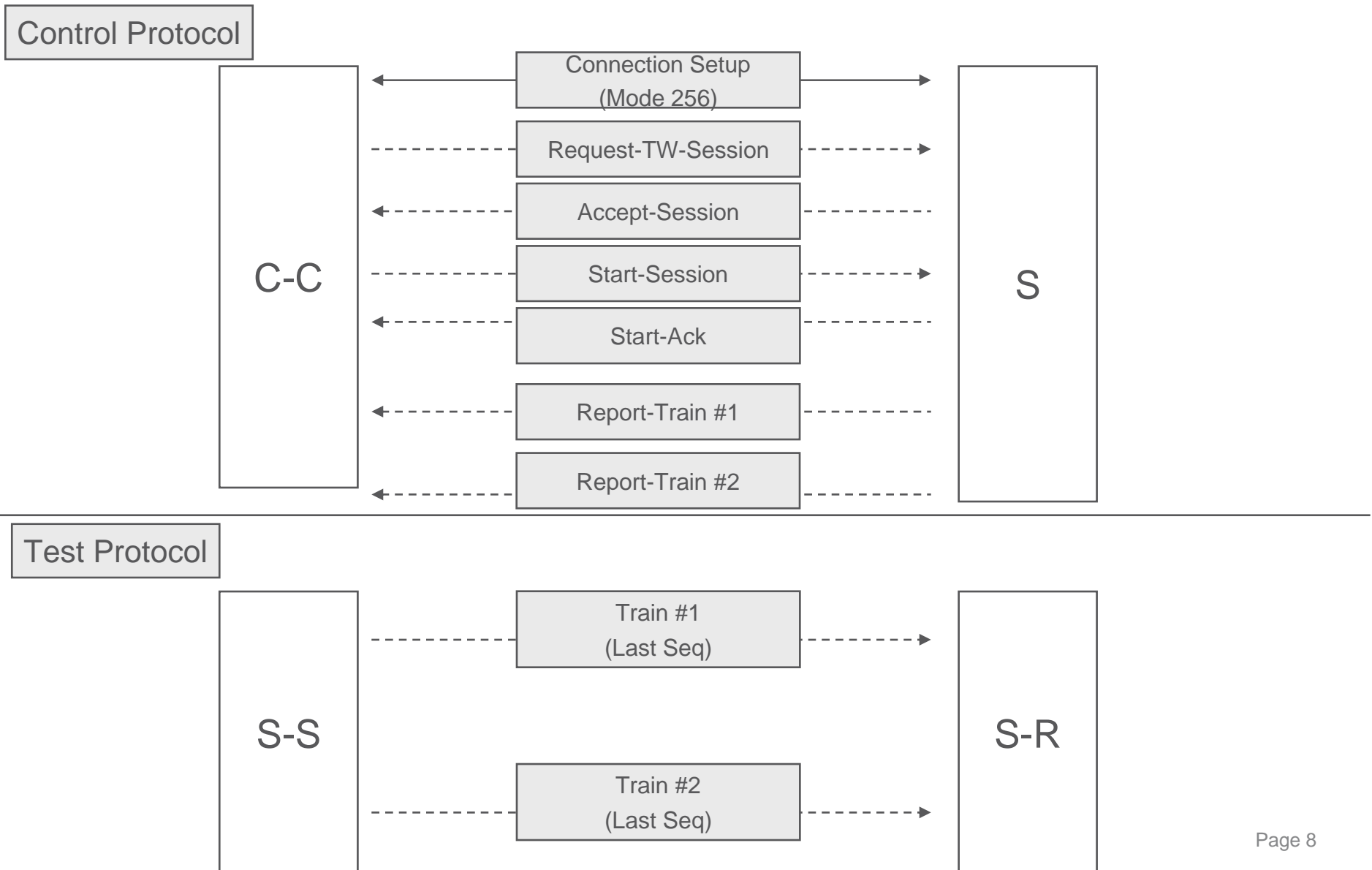


# Forward train measurements (mode 256)

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- › Transfer of test packets in FWD direction only
  - One-way measurements only
- › Use the “same” S-S test packet format as in mode 128
- › X FWD test packets, 0 REV test packet
- › Y FWD test octets, 0 REV test octet
- › Z FWD trains, 0 REV train
- › Small addition to TWAMP control
  - New unack control packet originating from Server
  - Example: Report-Train

# Forward Train Measurements



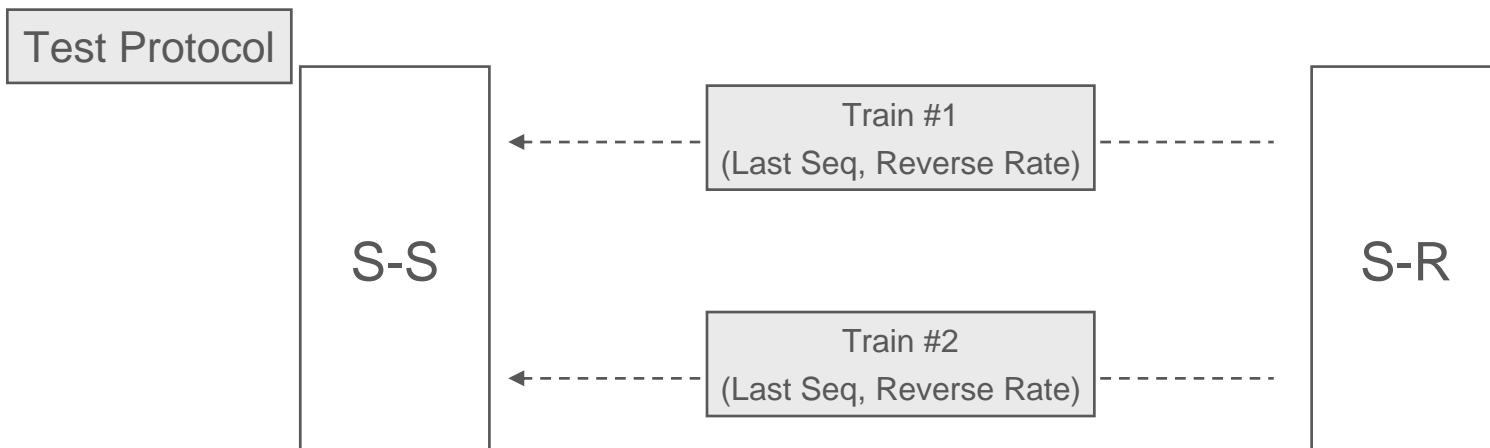
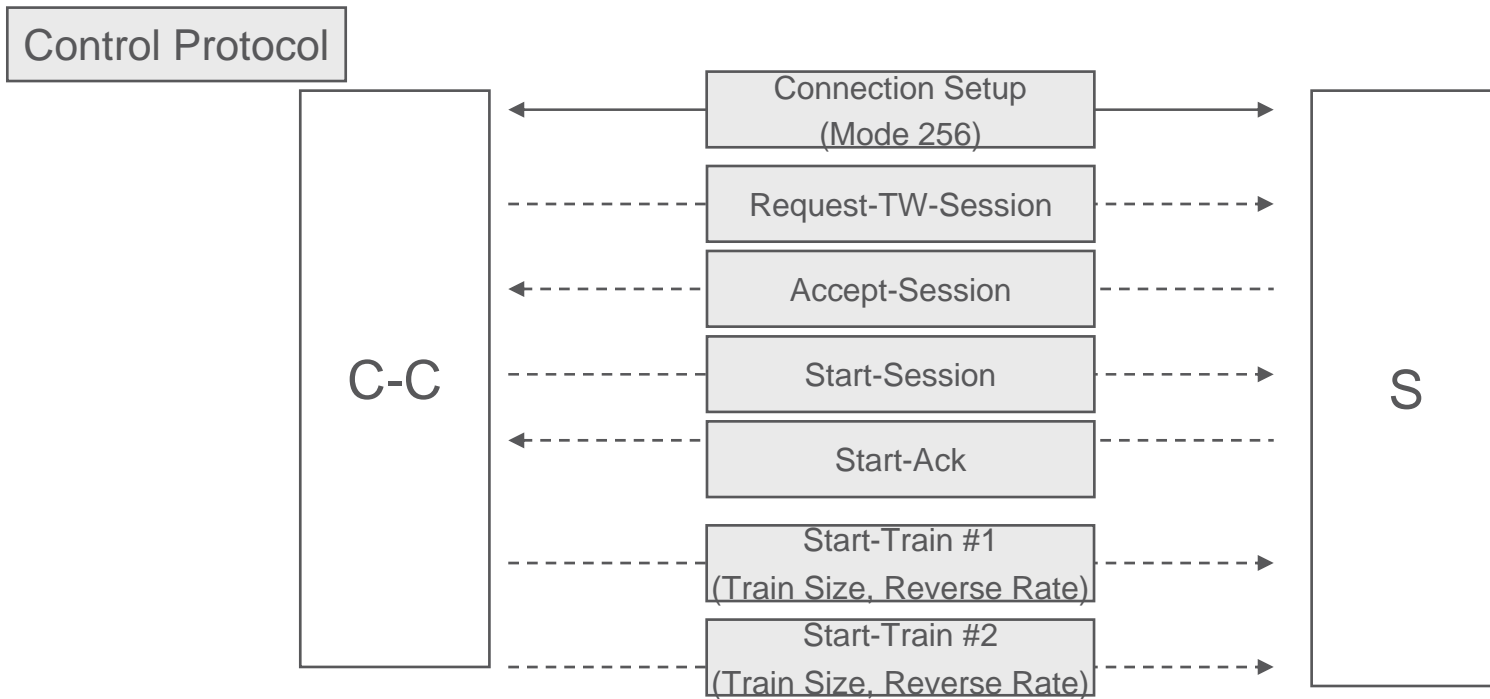


# Reverse train Measurements (mode 512)

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- › Transfer of test packets in REV direction only
  - One-way measurements only
- › Use the “same” S-R test packet format as in mode 128
- › 0 FWD test packets, X REV test packets
- › 0 FWD test octets, Y REV test octets
- › 0 FWD trains, Z REV trains
- › Small addition to TWAMP control
  - New unack control packet originating from Control-Client
  - Example: Start-Train

# Reverse Train Measurements





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