PFC round trip timing protocol[1]

Design requirements and goals

Protocol and algorithms

Addressing, identification, and data

State machines

Packet formats, decoding and validation

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1. Idea/suggestions, follow up from Lily Lv's prior work and discussion.

Design requirements and goals

- Determine PFC headroom upper bound
  - Max data octets to be stored after PFC transmission
  - = (Data reception cessation delay * link speed) + max frame size
  - = Measured round trip delay*link speed + max frame size
  - Accuracy ~ max frame size
- Include PFC transmitting system and peer interface stack delays, even when not known to system implementor.[1]
- Not disruptive to network operation if neighbor does not implement without need for management (protocol always confined to single link, not uselessly persistent).
- Not dependent on 802.3 Reserved Address use.
- Operation independent of link delay, w/o need to manage timers.
- Do not constrain local timer/time base/time representation.

1. A real system can comprise multiple component's from different sources, and may be configured in a number of ways. PFC headroom optimization should not depend on complete system knowledge.

Protocol and algorithms

Protocol, a set of rules that communicating participants obey and depend on to exchange information and operate. For this 'Query/Response' round trip measurement protocol:

- Respond promptly (~ PFC recognition and tx cease stop time) to each Query
- Copy peer's time data in Query to Response (not need to understand time)
- If capable of sending Queries will Respond
- Limit Query frequency (minimum interval between Queries)
- Send (some number of, within bounded time) Queries when initialized

Additional algorithms (for this protocol), agreement not required for protocol operation:

- Smoothing of round trip measurement delays.
- Administrative values (initial round trip assumption, acceptable upper and lower bounds as reflected in buffer headroom allocation.

Addressing, identification, and data

- MAC DA : nearest-bridge (TPMR) Reserved Address
  - PFC (and Pause) operates physical link-by-link (scoped by 802.3 MACs)
  - Back-pressure pausing between C-VLAN Bridges connected by TPMRs is concatenated: Bridge to TPMR, TPMR to TPMR, TPMR to Bridge
  - No 802.3 Reserved MAC address - no 802.3 type allocation reqd.
- EtherType: 802.1Q Congestion Isolation (CIM) [Clause 49], followed by 4-bit Version (send >1, ignore on receipt), 4-bit subtype (1, indicates round trip measurement msg, RTM).
- Query Time Stamp (present iff the RTM is a Query, not interpreted by recipient, in some format).
  - + Query Adjustment (optional, not interpreted by recipient)
- Reflected Time Stamp (copy of rcvd Query Time Stamp, present iff the RTM is a Response).
  - + Reflected Adjustment
  - + Responder's Response Delay Adjustment in nanoseconds (?)

State machines (1)

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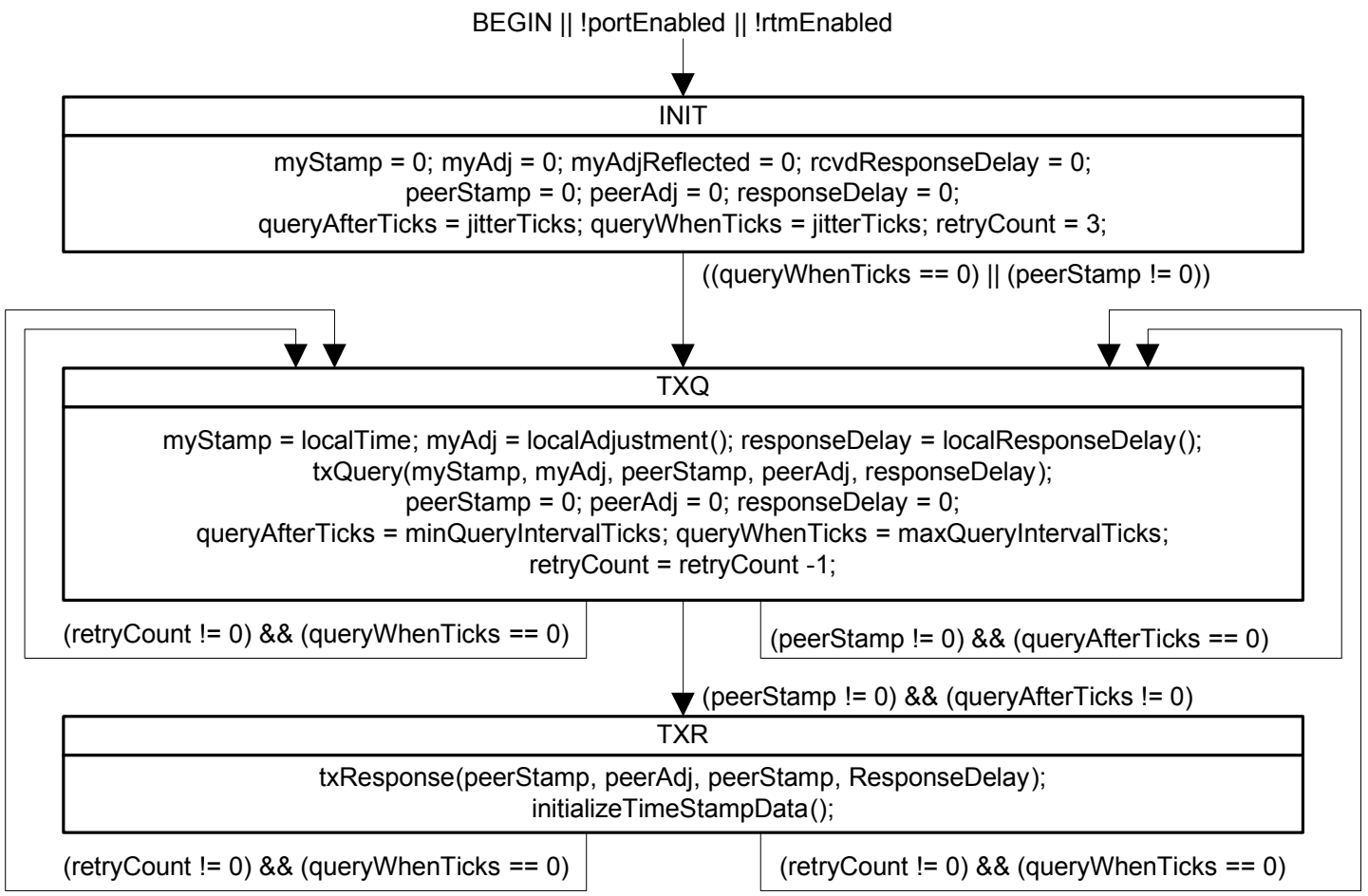

Query Origination and Processing Machine

State machines (2)

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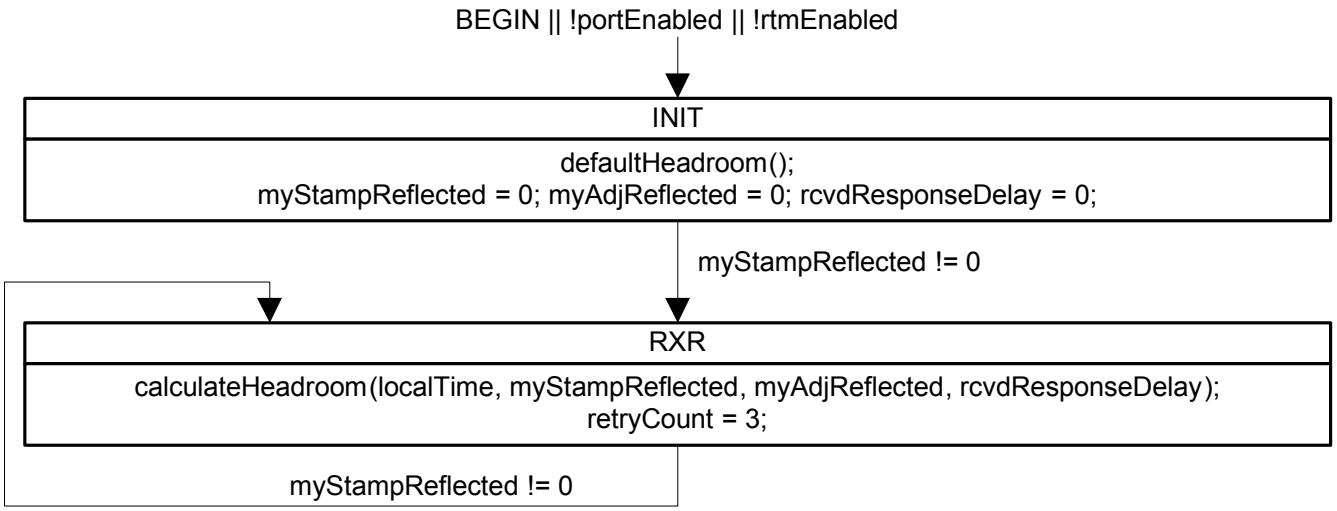

Response Processing Machine