RTO considerations in LPWAN
draft-gomez-lpwan-rto-considerations-01

Authors:

Carles Gomez <carlesgo@entel.upc.edu>

Universitat Politècnica de Catalunya (Spain)

Jon Crowcroft <jon.crowcroft@cl.cam.ac.uk>

University of Cambridge (UK)

105th IETF, Montreal, July 26th, 2019

1. Introduction

- Long or very long RTTs in many LPWANs:
  - In ideal scenarios: in the order of seconds or tens of seconds
  - Higher order RTTs: up to several minutes or even more
- RTT (and its variance) in LPWAN, much greater than typical one on the Internet
  - Default RTO in TCP, currently: 1 second
  - Default RTO in CoAP: between 2 and 3 seconds
- In LPWAN, RTOs:
  - When using CoAP, for CON messages
  - In SCHC fragmentation (ACK-Always, ACK-on-Error)

How do we deal with LPWAN RTTs ?

2. Status

- Version -00 presented in Prague (IETF 104)
  - Uplink-RTT (U-RTT) analysis
  - Proposal of an algorithm for the RTO
- New version: -01
  - Added terminology: U-RTT, Downlink-RTT (D-RTT)
  - Added D-RTT analysis
- Additionally
  - Preliminary evaluation results of proposed algorithm

3. D-RTT analysis

- Components
  - Wait time until next uplink transmission
    - Depends on app, might be minutes, hours…
    - May be zero for ideal, scheduled uplink transmissions
  - Time since uplink completed until D-RTT completed
    - Basic D-RTT (BD-RTT)

	BD-RTT	
DR	Min	Max
0	3.52	3.81
1	1.99	2.15
2	0.92	1.00
3	0.73	0.82
4	0.66	0.78
5	0.37	0.44
6	0.19	0.22
7	0.01	0.05

LoRaWAN

	BD-RTT	
UL BR	Min	Max
100	23.6	48.1
600	22.1	46.7

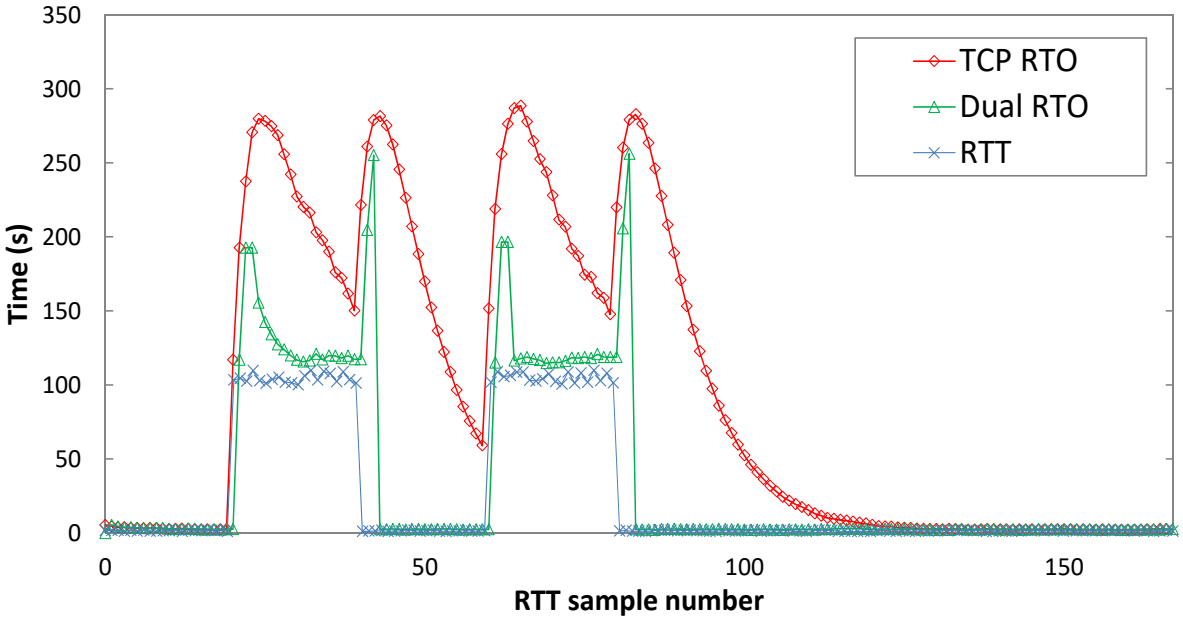
Sigfox

4. Approaches for the RTO

- If delay is not relevant, set the (default) RTO to the highest expected RTT
- If delay is relevant, and higher order RTTs expected:
  - Dual-RTO algorithm

5. Simulation results

- Dual RTO using the TCP RTO in each state
- Scenario with high RTT intervals
- High RTT value known a priori: time between uplink messages
- Improvement depends on the duration of high and low RTT intervals



6. Questions

- Interest in this work?

- Way forward?
  - Different kinds of contributions:
    - Guidance for RTO settings
    - Proposal of an algorithm