Implementation of ASRAN algorithm in NS3

An adaptive TCP Transmission Adjustment for flying Ad Hoc Netwok (UAV)

Flying Ad Hoc Networks

Possible reasons for segment loss:

- Congested Network
  - Normally Assumed by TCP
  - Reduce transmission speed
- Transient Link instability
  - Frequent node mobility
  - Routing update
  - **Reduction in transmission speed is not desired**

Adaptive Ssthresh Reviser for flying Ad hoc Network (ASRAN)

Aim

quickly recovers unnecessarily reduced throughput in a UAV Network

Target

Identify the cause of segment loss:

- Congested Network - congestion avoidance algorithm (linear increase)
- Transient Link Instability - continue with slow start (exponential increase)

Congestion Control - TCP NewReno

- Slow Start Threshold value - ssthresh
- Slow start - Exponential increase of cwnd
- Segment loss
  - ssthresh = cwnd size = cwnd/2
  - Congestion Avoidance phase starts
  - Linear increase of cwnd

ASRAN Algorithm

Last_max_cwnd = cwnd size of successful transmission until the previous segment loss

Original ssthresh = cwnd / 2

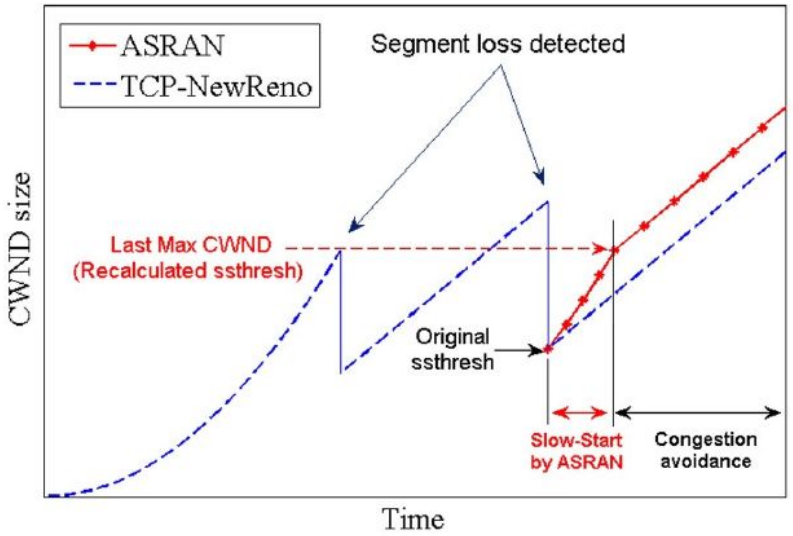
SSthresh = max(last_max_cwnd, original_ssthresh)

ASRAN Algorithm

Last_max_cwnd > original_ssthresh :

transient link instability

- Ssthresh = last_max_cwnd
- exponential increase



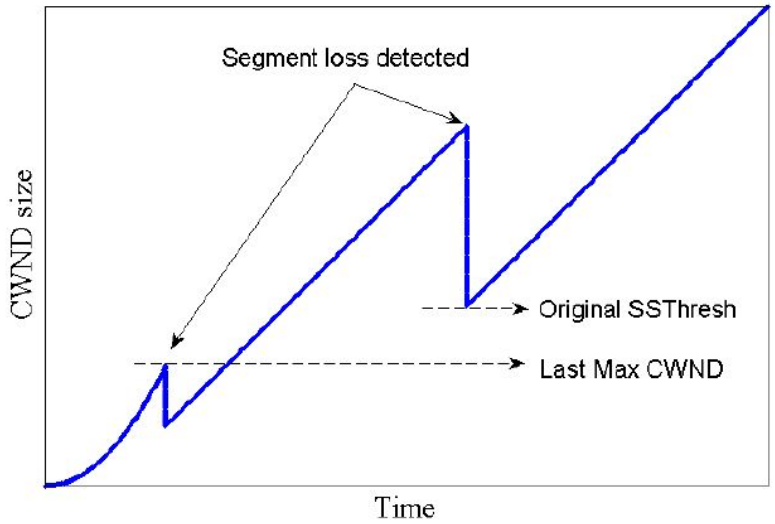
(a) CWND fluctuation in *ASRAN* activated scenario

ASRAN Algorithm

Last_max_cwnd < original_ssthresh :

Buffer overflow

- Ssthresh = original_ssthresh
- Linear Increase



(**b**) CWND fluctuation in buffer overflow scenario with *ASRAN*

Works better than TCP Cubic Algo

Gain of ASRAN = ASRAN Throughput / Cubic Throughput = 1.622

Reference :

Lee, J.Y.; Lee, W.; Kim, H.; Kim, H. Adaptive TCP Transmission Adjustment for UAV Network Infrastructure. *Appl. Sci.* **2020**, *10*, 1161. https://doi.org/10.3390/app10031161