

# COSC418 Project: Load balancing in a CTP based network

Henry Jenkins and Regan Gunther

Department of Computer and Electrical Engineering,  
University of Canterbury,  
Christchurch,  
New Zealand

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# Overview

- CTP - Collection Tree Protocol
  - ▶ Address-free
  - ▶ Best effort delivery
  - ▶ Single hop transmissions
  - ▶ Designed for low traffic environments
  - ▶ Expected transmission (ETX)
  - ▶ Each node contains a Link Cost metric.
- CTP LB - Collection Tree Protocol Load Balancing
  - ▶ Add load balancing
  - ▶ Avoid node hotspots
  - ▶ Traffic balancing

# Our Design

- $p^* = \arg \min p \in \{ \text{direct neighbours} \} [\alpha \cdot (ETX_{s,p} + ETX_p) + \beta \cdot L_p^s]$
- Our design is to keep  $L_p^s$  locally
- We increment  $L_p^s$  as:
  - $L_p^s = n_p^s - t_p^s$
  - $n_p^s \geq t_p^s$
- Where  $t_p^s$  is incremented periodically through a timer
- $t_p^s$  is included to stop  $L_p^s$  getting too large.
- **Why do this instead of transmitting link load data**
  - Allows us to use the unmodified CTP routing packet
  - Means we can add load balancing to an existing CTP network
  - No extra data transmission

# Drawbacks

What if  $ETX_p + ETX_{p,s} + L_p^s$  (i.e.  $ETX_s$ ) increases to be  $\geq 2^{16}$ ?

- Bad things...
- This is managed by including the  $t_p^s$  in the loading parameter  $L_p^s$
- (Remember  $L_p^s = n_p^s - t_p^s$ )
- Periodic timer.

# Drawbacks

ETX changing with each packet transmission causes routing updates all the time. All these updates would be inefficient.

- A solution to this is to only update routes when ETX changes by a given threshold

# Drawbacks

## Exponential ETX growth of a node

- In a path of 5 nodes to the root,  $L_p^s$  increases with every packet. The more hops to the root, the more pronounced this effect

# Conclusion

- No results as yet
- Currently implementing and testing code