

X-UTT : a Link Cost Metric for Wireless Mesh Networks

X-UTT is a cross-layer load-independent link cost metric for 802.11-based wireless mesh networks. Its property of load-independence can be exploited in the design of a stable routing algorithm.

Metric definition

Definition:

$$XUTT = \frac{PTT}{d_{u3}}$$

PTT: Packet Transmission Time

Average transmission time of a unicast probe packet. It takes into account the *MAC operations* involved in the transmission.

d_{u3} : Unicast Delivery ratio

Delivery ratio of unicast probe packets

X-UTT Properties

Captures MAC layer impacts on link capacity:

The 802.11 MAC protocol, retransmitting the unacknowledged frames:

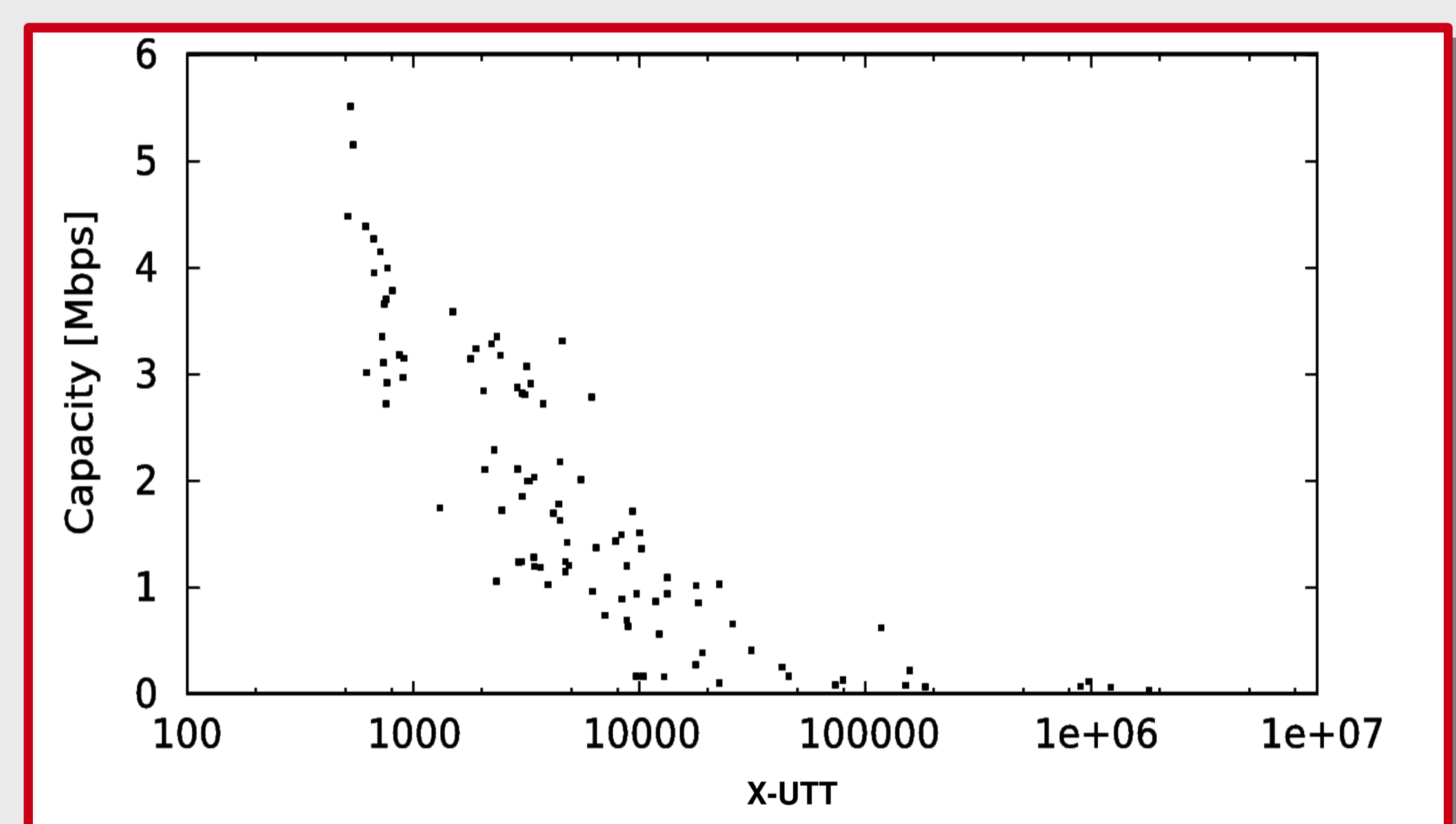
- increases the network layer delivery ratio, **increasing link capacity**
- increases the time to complete the transmission of a network layer unicast packet, **decreasing link capacity**

Load independence

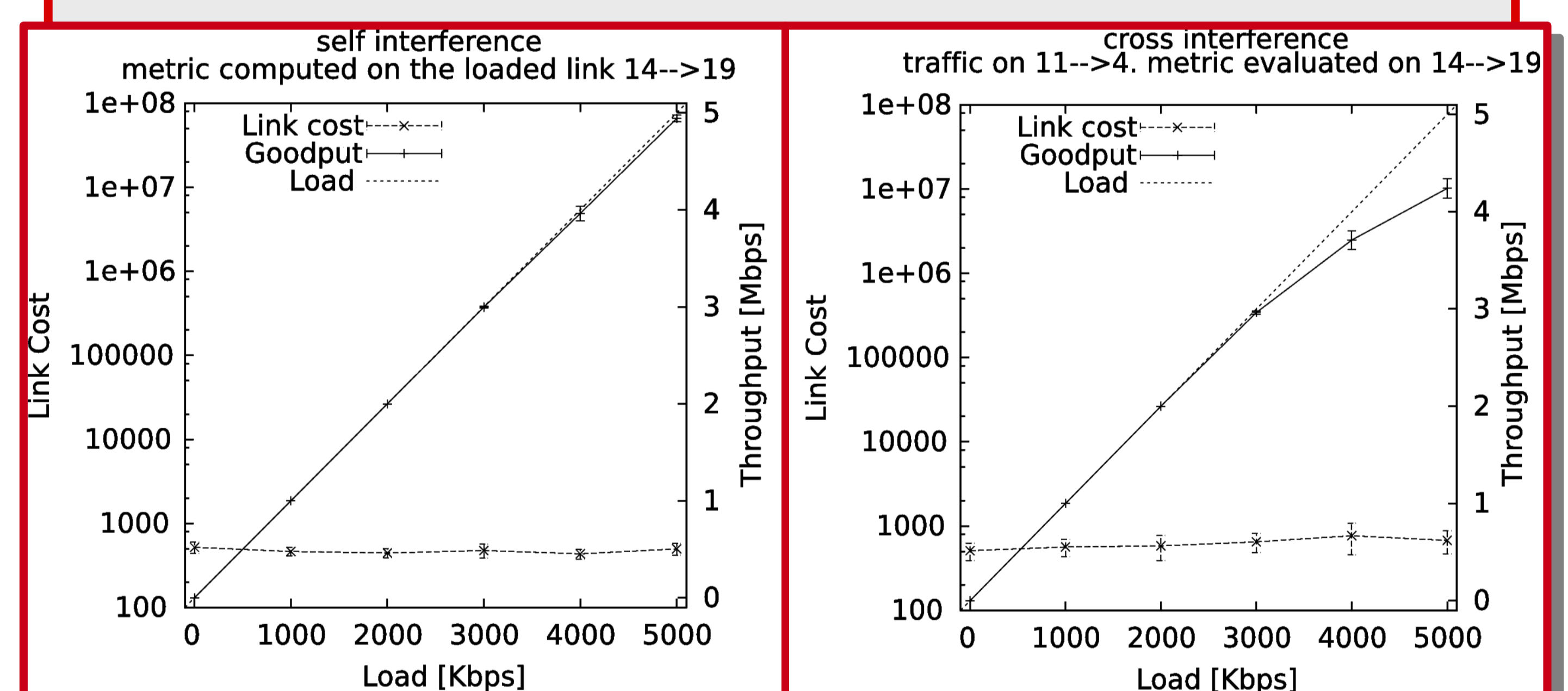
XUTT is designed to capture the "quality of a link" and to have a limited sensitivity to the traffic load on the mesh network. The definition of PTT excludes the time spent by a node for carrier sensing the medium when neighbor nodes transmit.

Experimental Evaluation

X-UTT is inversely proportional to the capacity of the link



Load-independence



X-UTT, evaluated on a **loaded link**, is not sensitive to variation of link-load

X-UTT, evaluated on a **unloaded link, while a neighbor link is loaded**, is not sensitive to variation of link-load

Discussion & Future work

- **Load independence:** desired property or not?
 - a) link capacity is dependent on load
 - b) dependency on load can cause routing instability
- **How to turn it to a path metric?**

- **Next steps:**
 - a) Comparison with ETX, ETT
 - b) Evaluation on the extended testbed
 - c) Definition of a path metric

