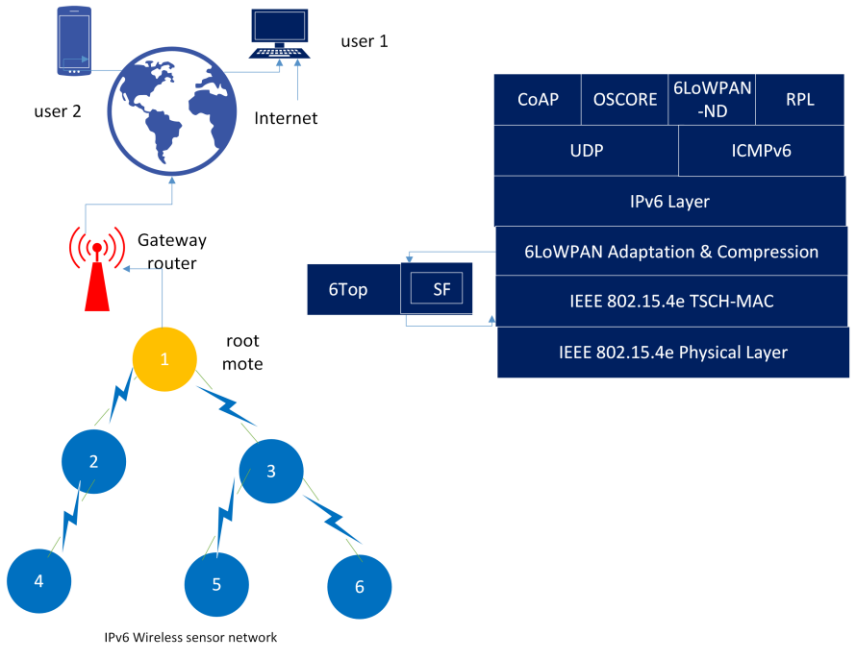
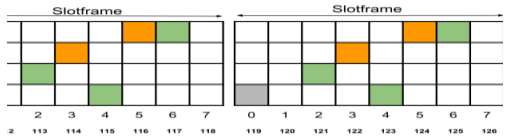


Improving Scalability of the 6TiSCH network using smart scheduling reservation approach

By Kaushal kumar

Why 6TiSCH ?

	ANSI/ISA100.11a	Wireless HART	ZigBee	IETF 6TiSCH
 IP-complaint	✓	✗	✓	✓
 Payload management	✗	✗	✓	✓
 Routing scalability	👎	👎	👍	👍
 TSCH scheduling scalability	👍	👍	👎	👍

Key scheduling inconsistencies hampering scalability and robustness of large-scale 6TiSCH network.

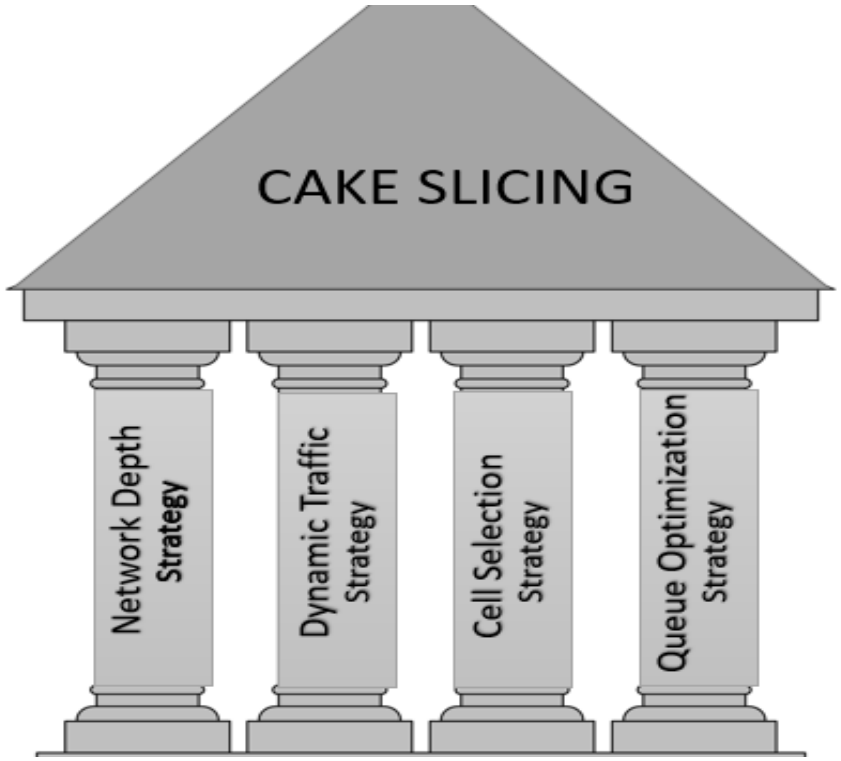
Inefficient traffic adaption

Poor cell selection and collision control

Node’s mobility in the dynamic topology.

Poor queue optimization

Proposed solution



Smart Scheduling Reservation (SSR)

SSR is a contemporary scheduling approach, designed with consideration to improve the scalability of a large-scale 6TiSCH network and unanimously satisfy the diverse needs of Industrial Automation. While doing so, it strictly adheres to the *Quality of Service (QoS)* for 6TiSCH scheduling.

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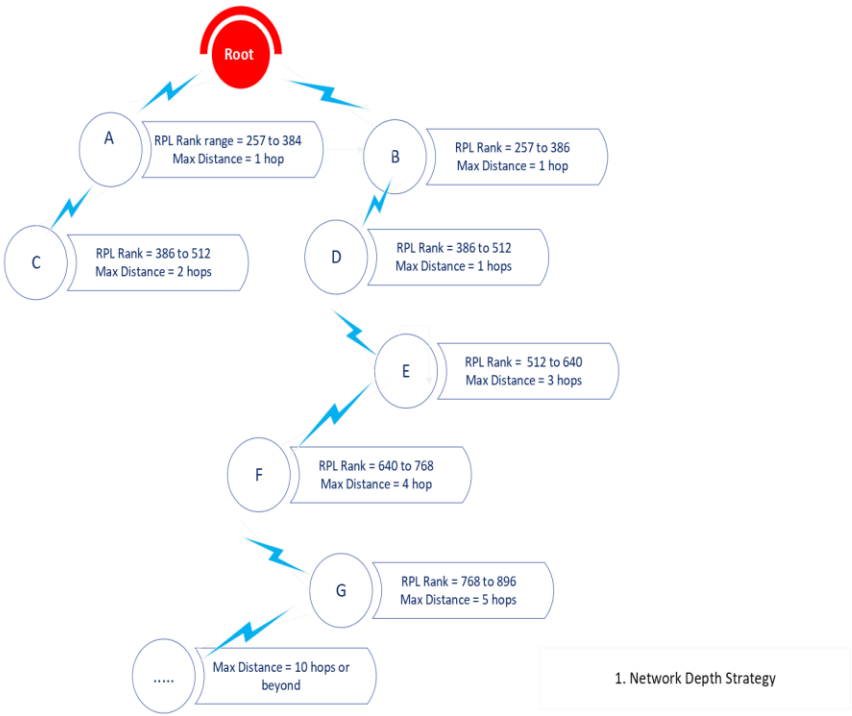
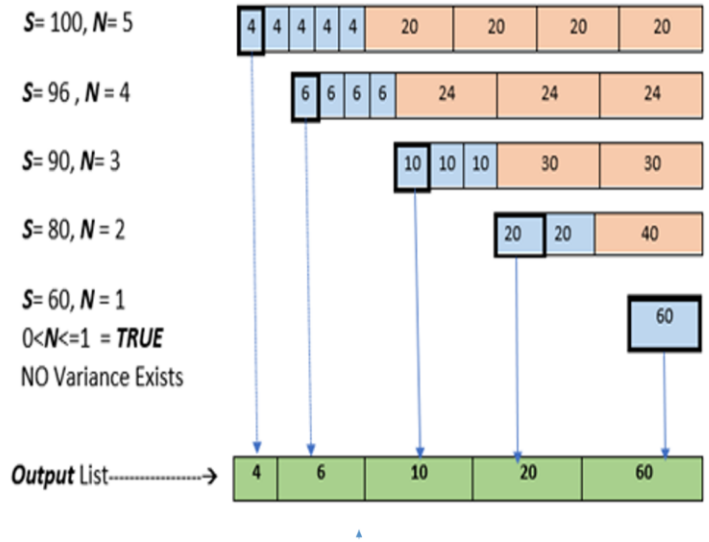
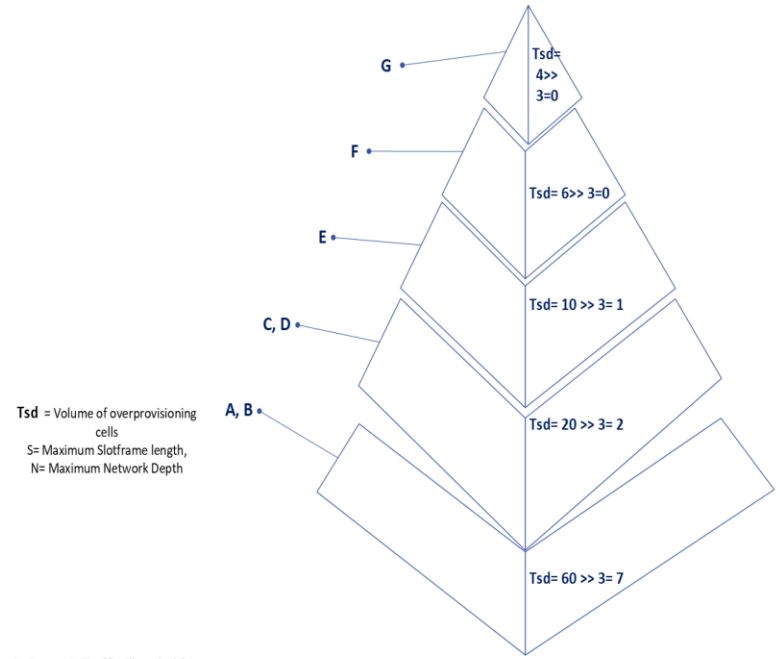
Currently under review



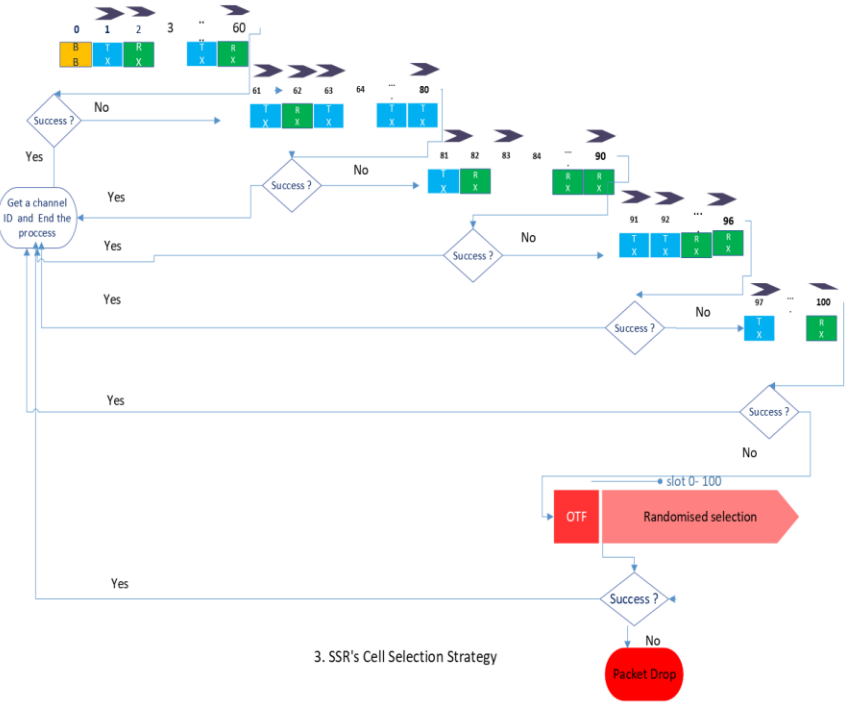
1. Network Depth Strategy



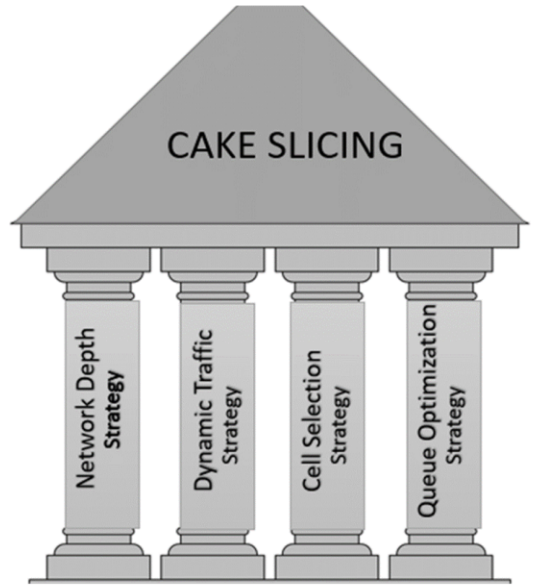
CAKE SLICING EXAMPLE



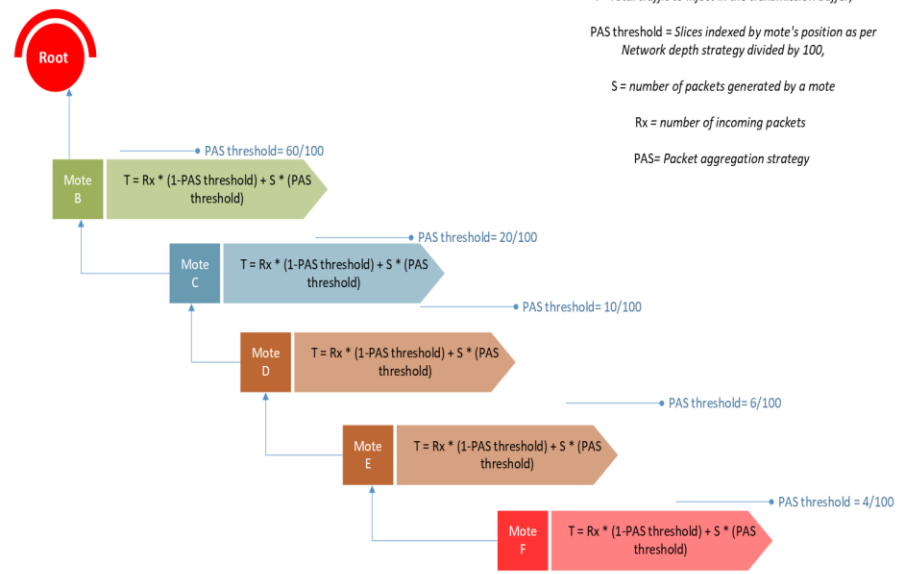
2. Dynamic Traffic Threshold Strategy



3. SSR's Cell Selection Strategy



Smart Scheduling Reservation model



4. SSR's Queue Optimization Strategy

Comparison of SSR with state-of-art “On The Fly” scheduling function using an average traffic rate of 60 packets per minute in a 50mote network

SSR  OTF

Configuration parameters:

Network size= 50,

packet generation interval= 1s,

housekeeping timer = 2min,

*Area= 1*1 sq. km. ,*

queue size = 10,

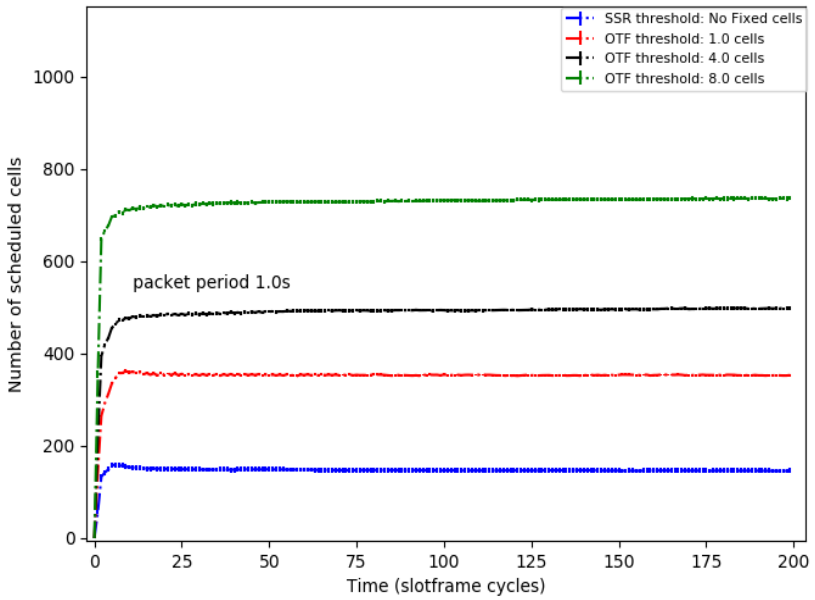
slotframe length= 101 slots,

slot duration = 10ms, no of run= 100, no of cycles= 200,

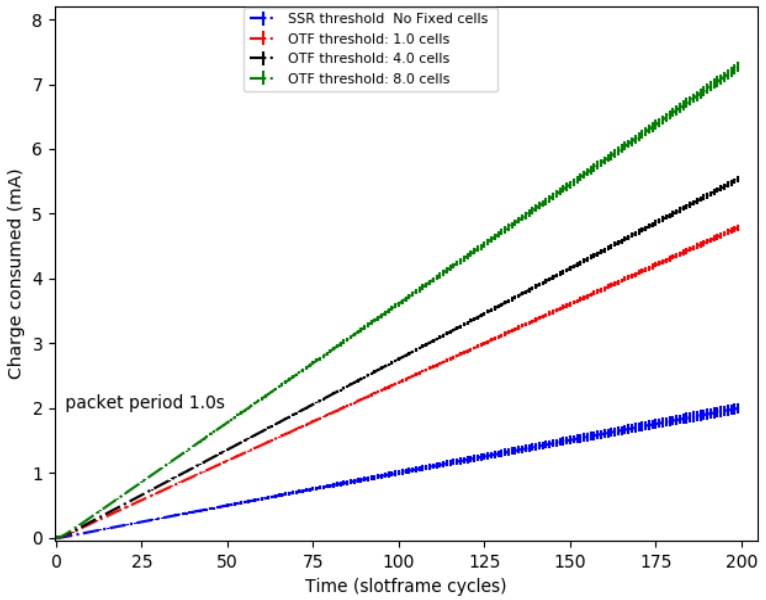
radio-sensitivity= -101.

T. Watteyne, M. R. Palattella, Q. Wang, K. Muraoka, N. Accettura, D. Dujovne, A. I. Grieco and T. Engel, “On-the-fly bandwidth reservation for 6TiSCH wireless industrial network,” IEEE sensor journal, vol. 16, no. 2, pp. 550 - 560, 2016

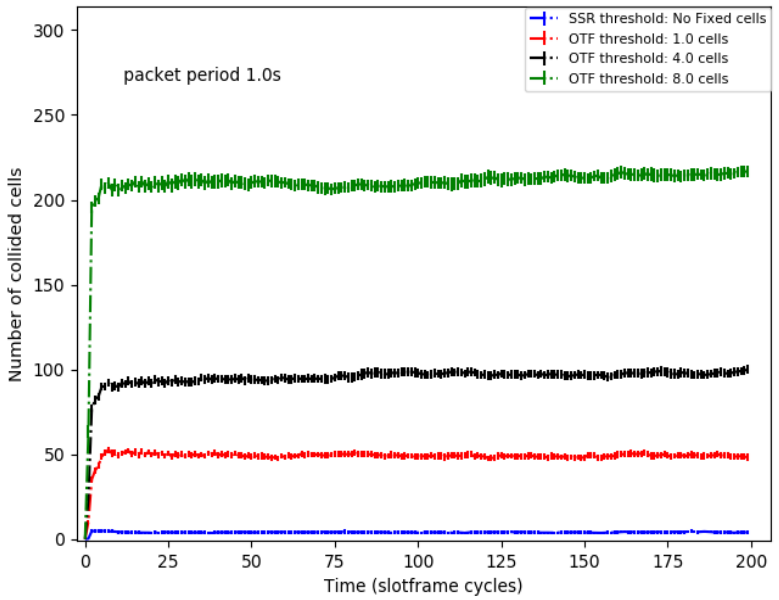
Free from performance Trade-offs: SSR breaks the tie between high consumption and collision



Cell consumption over time

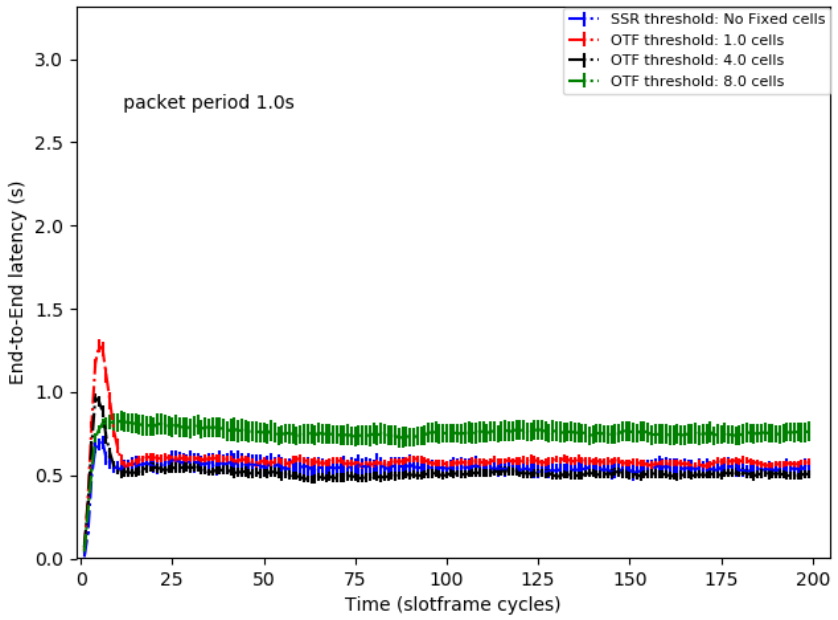


Charge consumption over time

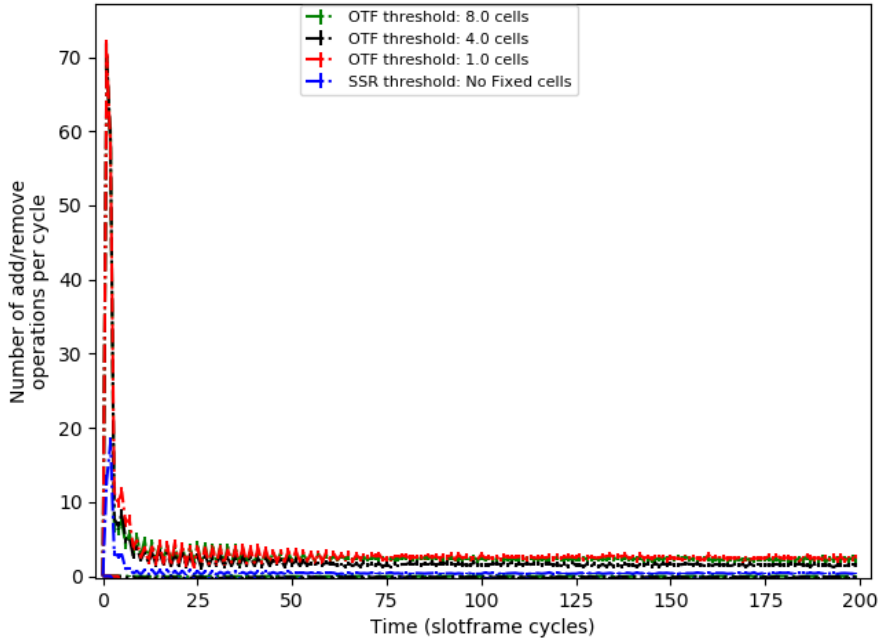


Incurred collided cells over time

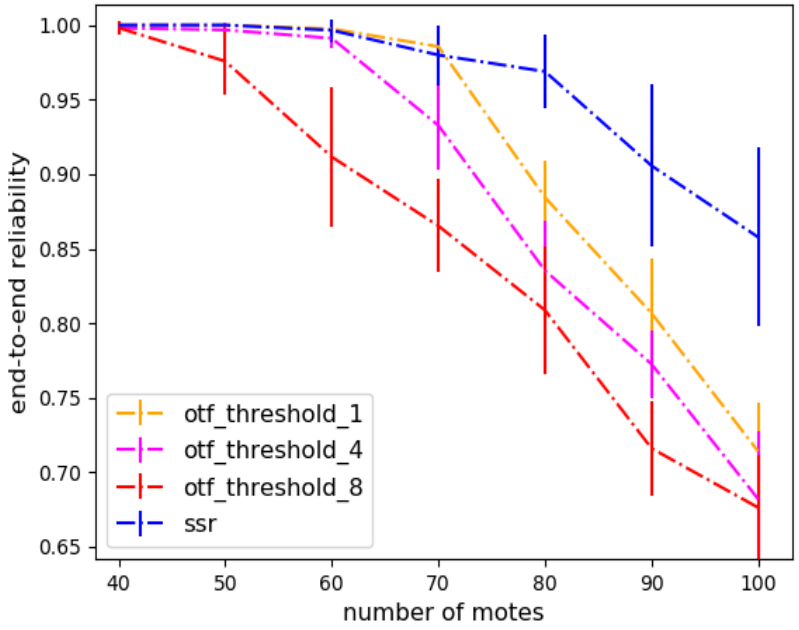
THE SCALABILITY OF SSR UNDER ADVERSE TRAFFIC SCENARIOS



E2E latency (s) over time



6Top overheads over time



E2E reliability over size of network (number of motes)

SUMMARY

What is next

Further improving SSR's scalability using Load balancing scenarios

Journal under review

To be resubmitted soon

Combined scheduling solution

A scalable scheduling solution for IPv6 low power WSN

Thesis writing