



IMPROVING SCALABILITY OF 6TISCH NETWORK USING SMART SCHEDULING RESERVATION(SSR)

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AGENDA

INTRODUCTION OF 6TiSCH

CHALLENGES

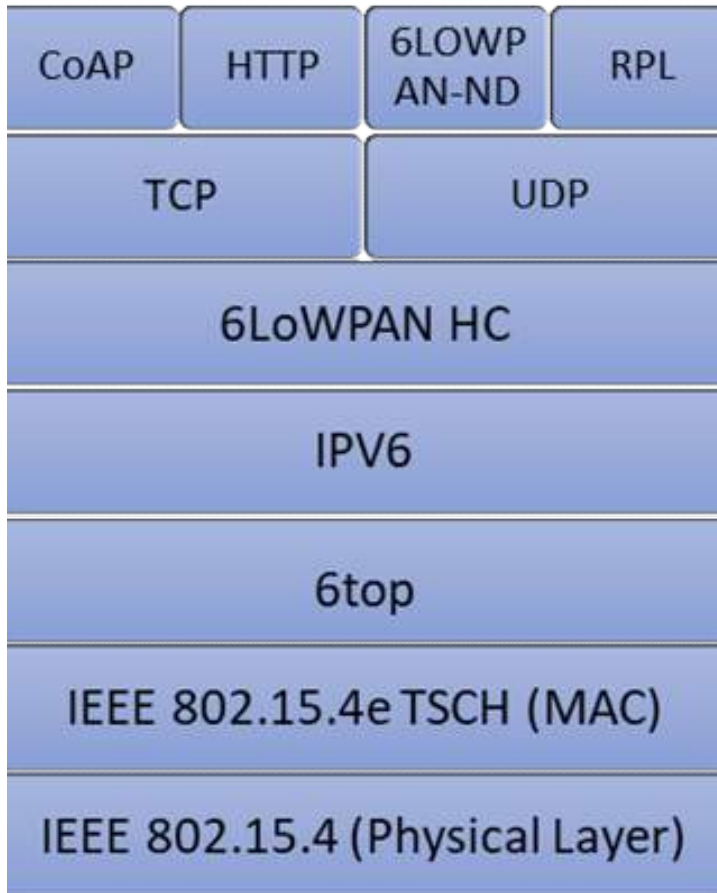
REVIEW OF 6TiSCH SCHEDULING

WHAT CAN BE DO ABOUT IT

KEY RESULTS

NEXT AGENDA





WHAT IS 6TISCH?

IoT_s->WSN->LLNS->IETF 6TISCH

Is a communication standard introduced by IETF WG for providing reliable service to low power wireless sensing network.

Employs TSCH – MAC protocol over IEEE 802.15.4e

TSCH significantly reduce contention and path fading and improve reliability in low power and lossy network where devices are severely constrained.



CHALLENGES!

- POOR SCALABILITY DUE TO INEFFICIENT SCHEDULING & ROUTING.
- LACK OF CONSENSUS DUE TO PERFORMANCE TRADE-OFFs
- POOR OPTIMIZATION OF RESOURCES.





REVIEW OF 6TISCH SCHEDULING

LET'S DIVE IN

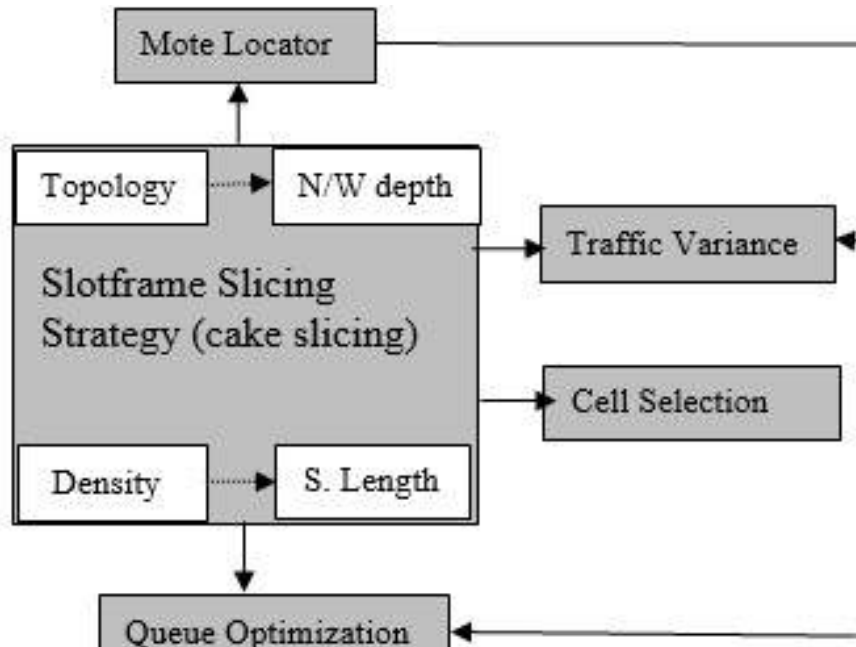
REVIEW BY CATEGORY

	SCALABILITY	COMMUNICATION OVERHEADS	ENERGY CONSUMPTION	SUITABILITY
CENTRALIZED	POOR	<ul style="list-style-type: none"> • HIGH CONFIGURATION & SIGNALLING OVERHEADS • BUFFER OVERFLOW LIKELY 	HIGH	STABLE STATIC
DISTRIBUTED	HIGH	<ul style="list-style-type: none"> • HIGH 6P TRANSACTIONS • BUFFER OVERFLOW UNLIKELY 	MODERATE	DYNAMIC
HYBRID	POOR	<ul style="list-style-type: none"> • EXCESS MONITORING COST • INFLATED PACKET HEADER • BUFFER OVERFLOW LIKELY 	MODERATE	DYNAMIC

WHAT CAN BE DO ABOUT IT ?

We propose a novel scheduling solution called '*smart scheduling reservation (SSR)*' embracing negotiation-led reactive scheduling with some intelligence about network topology to generate overprovisioning dynamically, avoid schedule wastage and optimize buffer as well as energy consumption.

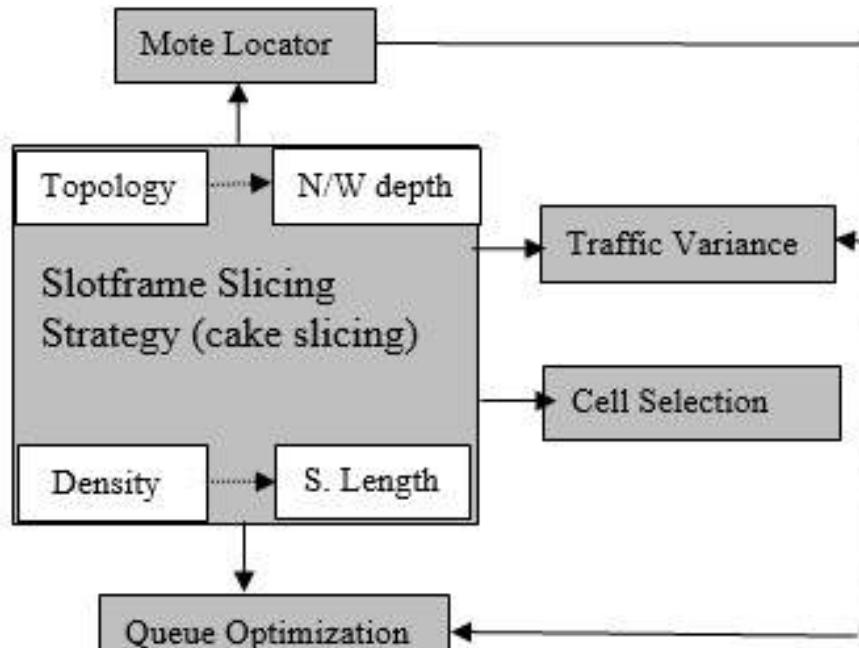
CAKE SLICING



Cake slicing module is foundation to the proposed solution, rendering a list of disproportionate slices in robust and scalable manner. The proposed slicing method is novel and have no adverse impact on the network performance.



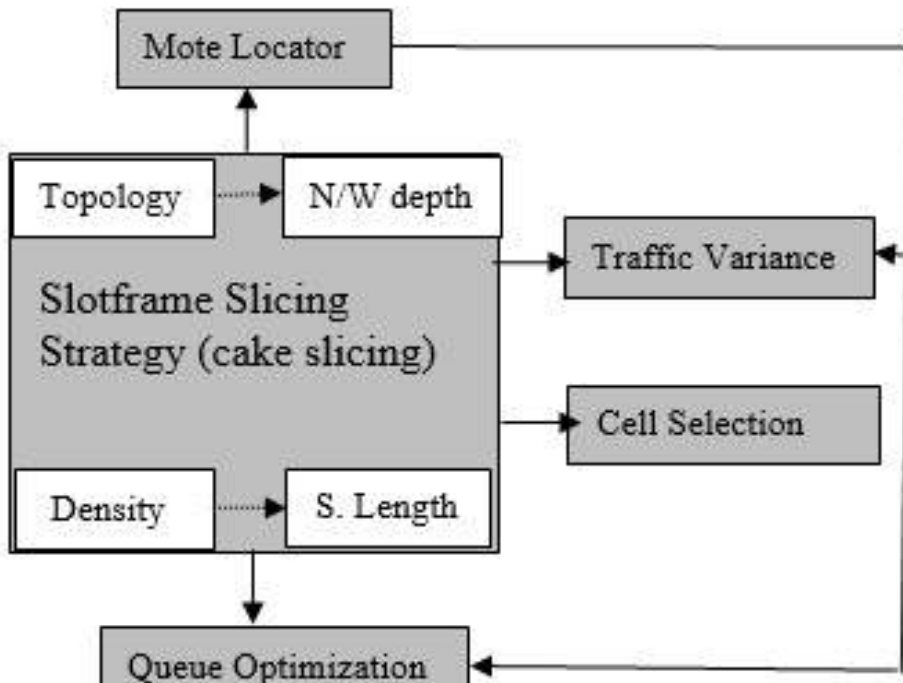
MOTE LOCATOR



Mote locator module calculates the position of the mote in the network in the form of hop distance which is then used to calculate dynamic traffic variance and packet aggregation.



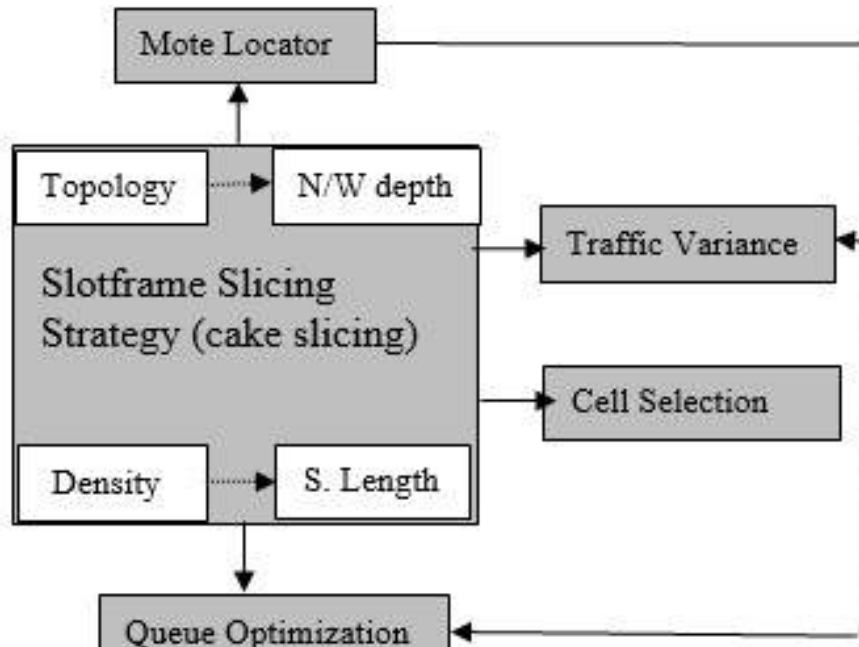
TRAFFIC VARIANCE



Traffic variance is the variance between actual traffic and the predicted traffic on the mote during upstream transmission. SSR calculates a single digit to add/remove with the help of discrete slicing and mote locator module.



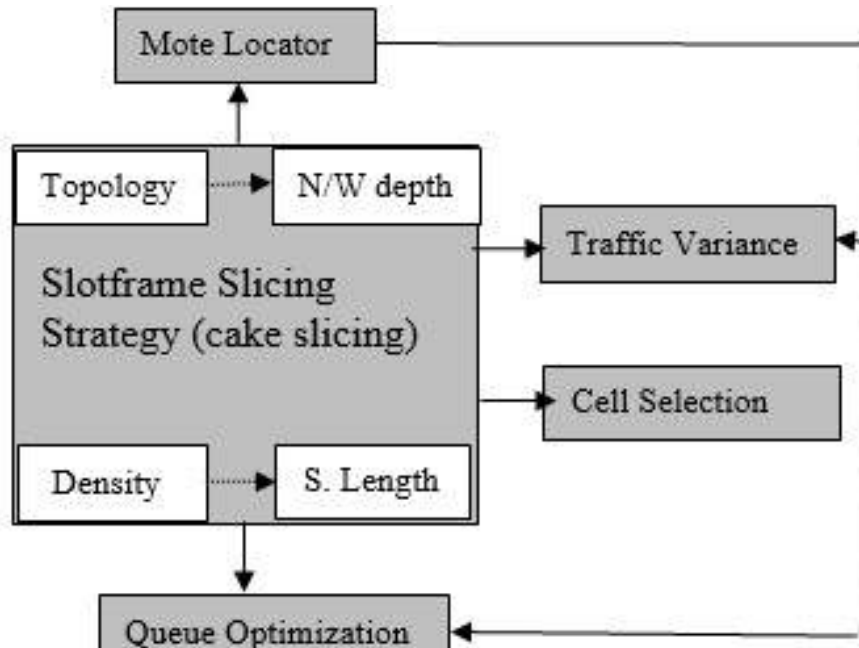
CELL SELECTION



Cell selection follows hybrid techniques combining random and criterion-based slot filtering. This is key technique to optimize battery life and manage queue buffer effectively.



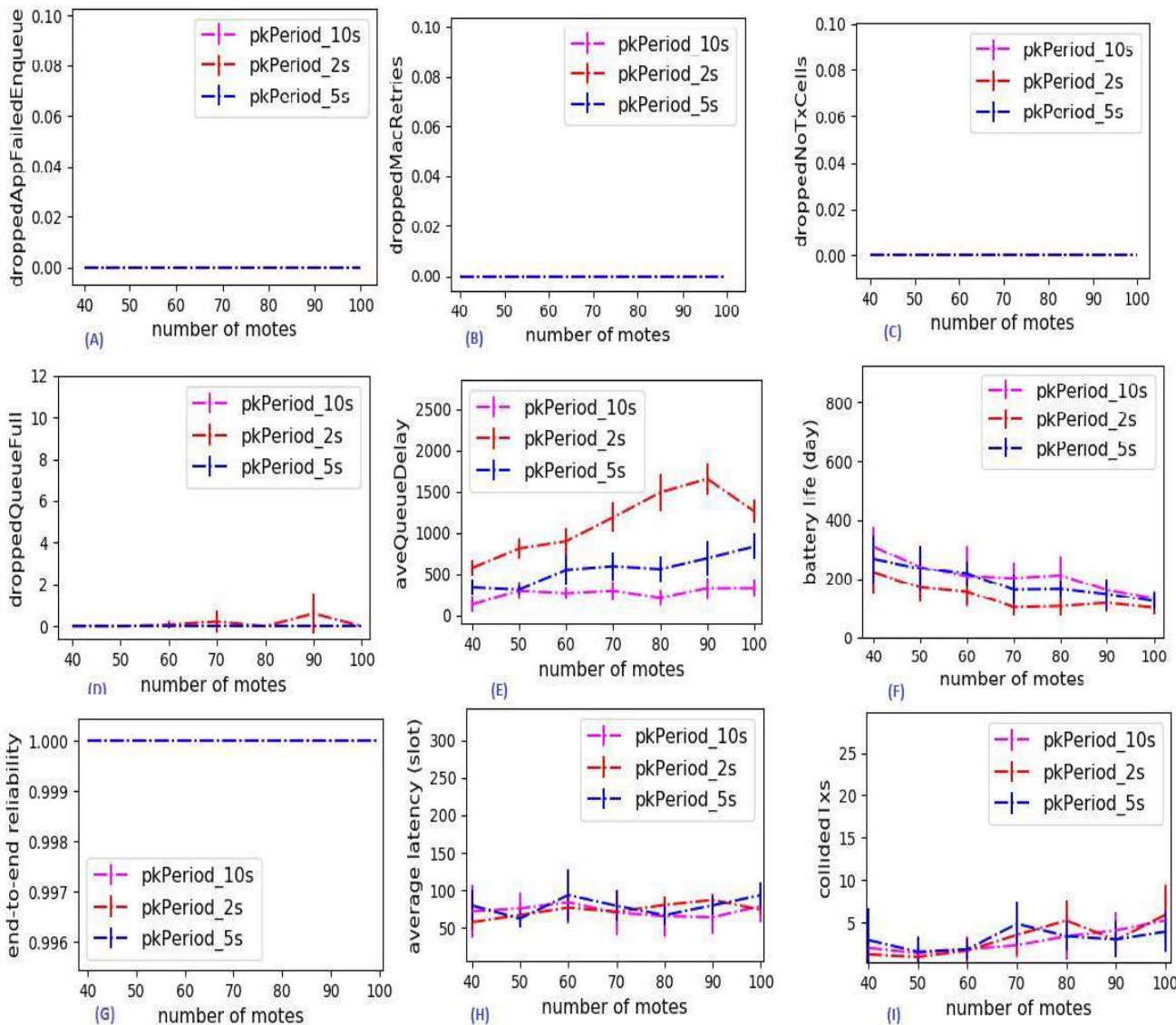
PACKET AGGREGATION



Packet aggregation follows dynamic selection of packets from the buffer as some motes generate less and forward more or vice versa.



RESULTS



- (A) pkts can enter in no time
- (B) Successful retransmission
- (C) No shortage of TSCH cells
- (D) Negligible queue overflow
- (E) Controlled queue delay
- (F) High battery performance
- (G) High reliability
- (H) Lowest latency: no trade-offs
- (I) Low collision: just under 5





WHAT'S NEXT

LOOKING AHEAD

NEXT AGENDA



Publishing journal

- SSR can unanimously satisfy diverse needs of 6tiSCH network in scalable manner.
- It is a flexible approach to be adapted in multi-hop 6tisch network.
- Flexible to adapt to multicast, unicast, and broadcast scheduling.



Improve scalability using novel routing solution

- Improve link metrics performance
- Stay a head with path formation
- Overhead management
- To improve convergence



Integration of scheduling and routing solutions

- Implement routing solution in 6tisch stack
- Test results
- Record overall performance
- Publish the findings

THANK YOU



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