

PhD Application for The PhD Thesis "Decentralized Fog Computing Infrastructure Control"

Ali J. Fahs

Supervised by Professor Guillaume Pierre

Audition, 8th of June, 2017

Outline

- 1 Personal Presentation
- 2 Master Thesis
- 3 State-of-the-Art for Edge Clouding
- 4 PhD Topic
- 5 Project Perspective

- A double diploma student.
 - Engineering diploma in telecommunication and computer science - Lebanese University, Faculty of engineering (ULFG).
 - Master's degree in Informatics Grenoble (MoSIG) Parallel, Distributed Systems Track - Grenoble INP (Institut national polytechnique), Ensimag (École nationale supérieure d'informatique et de mathématiques appliquées de Grenoble) jointly with UGA (université grenoble alpes), IMAG (Informatique, mathématiques, mathématiques appliquées de Grenoble).
- Research interest: Distributed systems, Networking.
- Master's thesis "Distributed Approach for Cross-Layer Resource Allocation in Wireless Sensor Networks" Jointly between LIG (Laboratoire d'Informatique de Grenoble) and VERIMAG.

Overview

- IEEE802.15.4: Wireless sensor network standard.

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- Time-slotted channel hopping (TSCH), The Medium access layer control.

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Channel Offset	0	Shared Slot				B>A
	1		C>A			
	2		B>D		D>B E>C	
	3					

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- Time-slotted channel hopping (TSCH), The Medium access layer control.
- 6TiSCH: IPv6 over IEEE802.15.4e TSCH.

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Internship Challenges

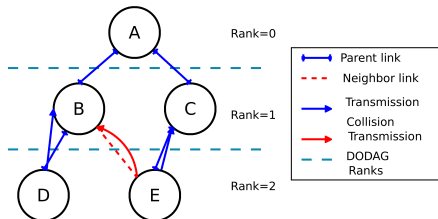
- Improvement in the distributed 6TiSCH networks

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- Improvement in the distributed 6TiSCH networks
- Reduction of collision in TSCH Dedicated cells.

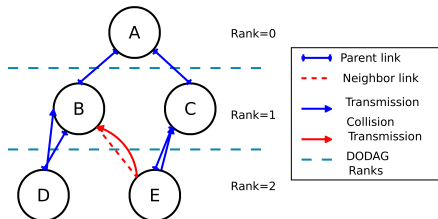
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- The distributed approach causing the problem.

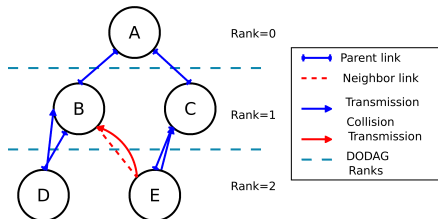
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Internship Challenges

- Improvement in the distributed 6TiSCH networks
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- The distributed approach causing the problem.
- Lack of central entity.

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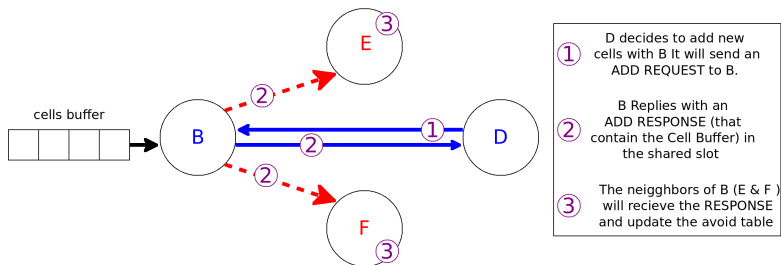


Proposed Mechanism

- Local Mutual exclusion.

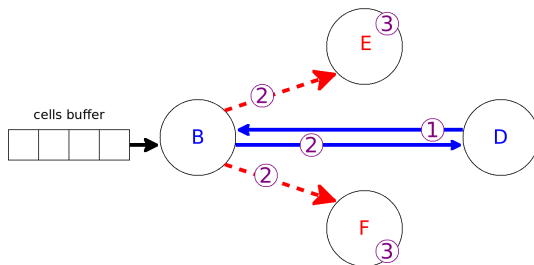
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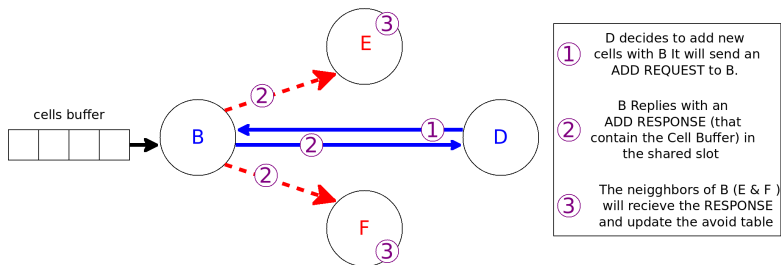
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- ① D decides to add new cells with B It will send an ADD REQUEST to B.
- ② B Replies with an ADD RESPONSE (that contain the Cell Buffer) in the shared slot
- ③ The neighbors of B (E & F) will receive the RESPONSE and update the avoid table

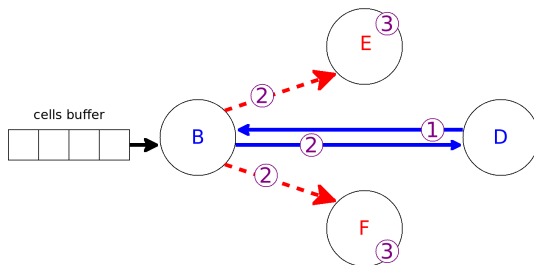
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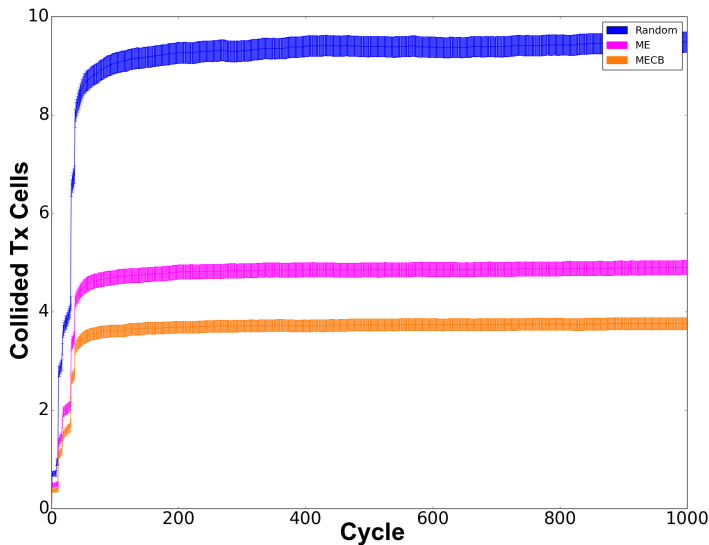
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- Local Mutual exclusion.
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- Achieved 70% reduction in the colliding Tx cells.



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Internship Results



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State-of-the-Art for Edge Clouding

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State-of-the-Art for Edge Clouding

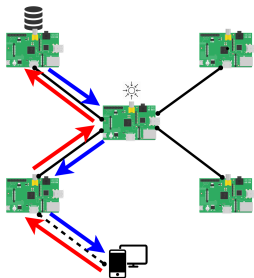
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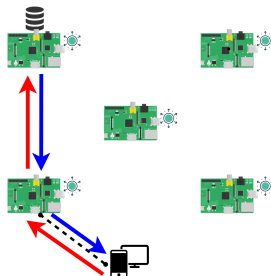
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- Improvement of end to end latency, and application interactivity.

Challenges of Fog Computing

- Centralized control over a distributed compute/storage resources.



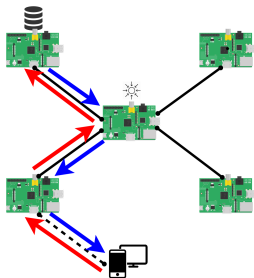
Centerlized Control



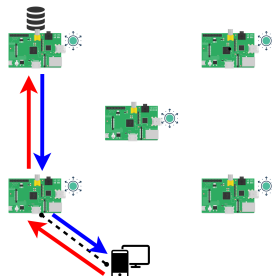
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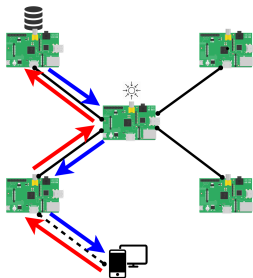
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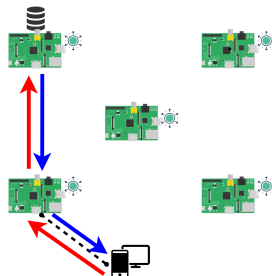
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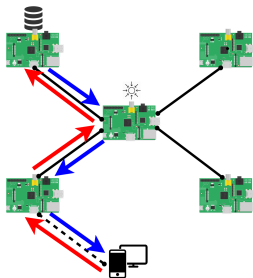
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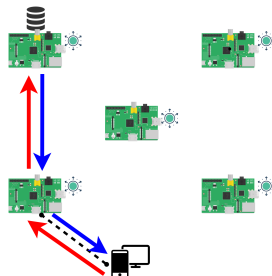
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Challenges of Fog Computing

- Centralized control over a distributed compute/storage resources.
- Drawbacks of the centralized: Unnecessary traffic, latency, fragile.
- Implementing very large number of potentially unreliable servers.
- Application developers should not handle the complexity of application deployment, fault tolerance, reconfiguration, or elasticity.



Centerlized Control



Distributed Control

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- Applying a distributed mechanism to manage the resources.
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- Executing cloud resource scheduling algorithms.
- One interesting direction: gossip-based algorithms for the coordination of multiple schedulers.

Project Perspective

- The Importance of the research field of fog computing.

Personal Perspective

- PhD Thesis and my research interests

Project Perspective

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- Advancing the State-of-the-art of edge clouding.

Personal Perspective

- PhD Thesis and my research interests
- IRISA and MYRAIDS.

Project Perspective

- The Importance of the research field of fog computing.
- Advancing the State-of-the-art of edge clouding.
- Implementing on the already existing testbed in IRISA.

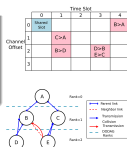
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Master Thesis

Internship objectives

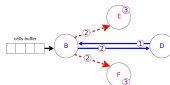
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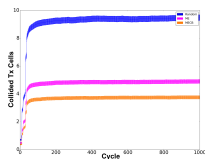
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State-of-the-Art for Edge Clouding

- Clouding disadvantages: latency, mobility, etc...
- Application-Network wall.
- Edge Clouding: Deploying Cloudlets in the immediate end user proximity.
- Using single board computers as Cloudlets
- Improvement of end to end latency, and application interactivity.
- Current fog computing platforms remains centralized.

PhD Topic

Objectives

- Applying a distributed mechanism to manage the resources.
- Comparing the performance of Distributed mechanisms to centralized ones.
- executing cloud resource scheduling algorithms.
- executing gossip-based algorithms.

Project Perspective

- The importance of the topic.
- Solutions using Gossip algorithms.
- Advancing state-of-the-art to this hot topic.

Thanks for your attention!
Questions?