Performance Analysis of Internet of Underground Things Network in Smart and Greenhouse Agriculture

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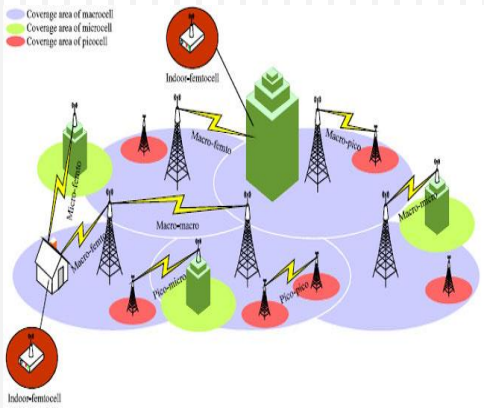

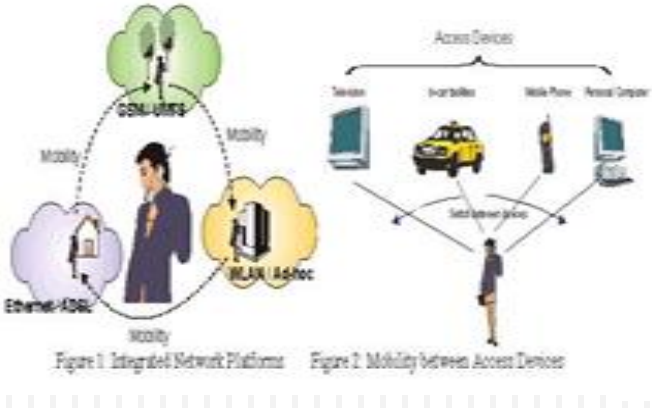

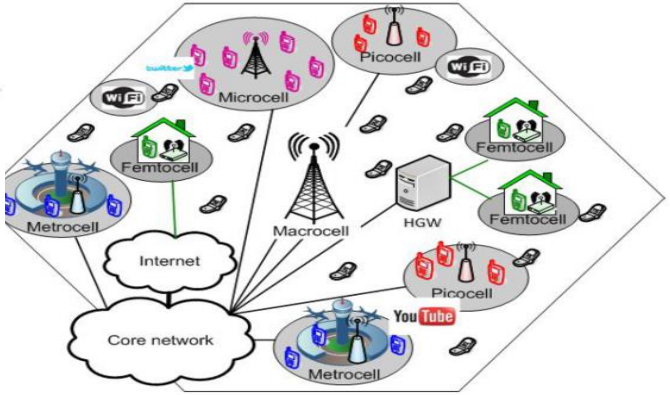

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Presentation Outline

- Objective
- Introduction
- Data Model
- Network Model
- Performance Model
- Simulation Analysis
- Conclusion

Objective

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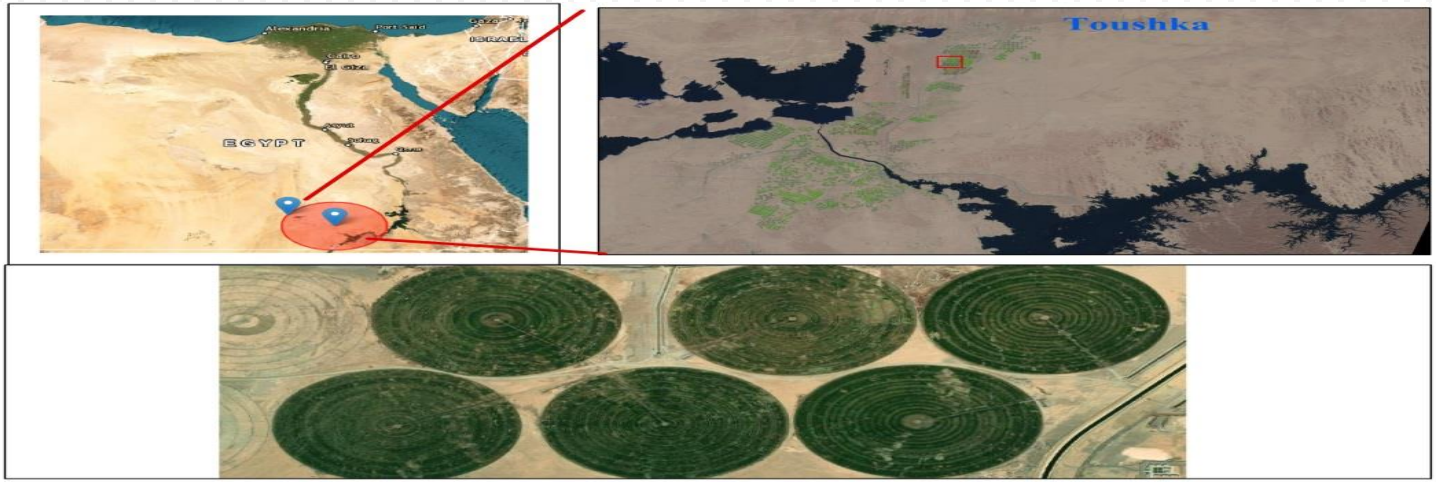
- Accurately modeling the information generated by each sensor device is essential for designing a smart system for precision agriculture.
- Model and measure the performance of precision agriculture communication networks
- The impact of burst traffic on the performance is investigated analytically and by simulation

Introduction

Introduction

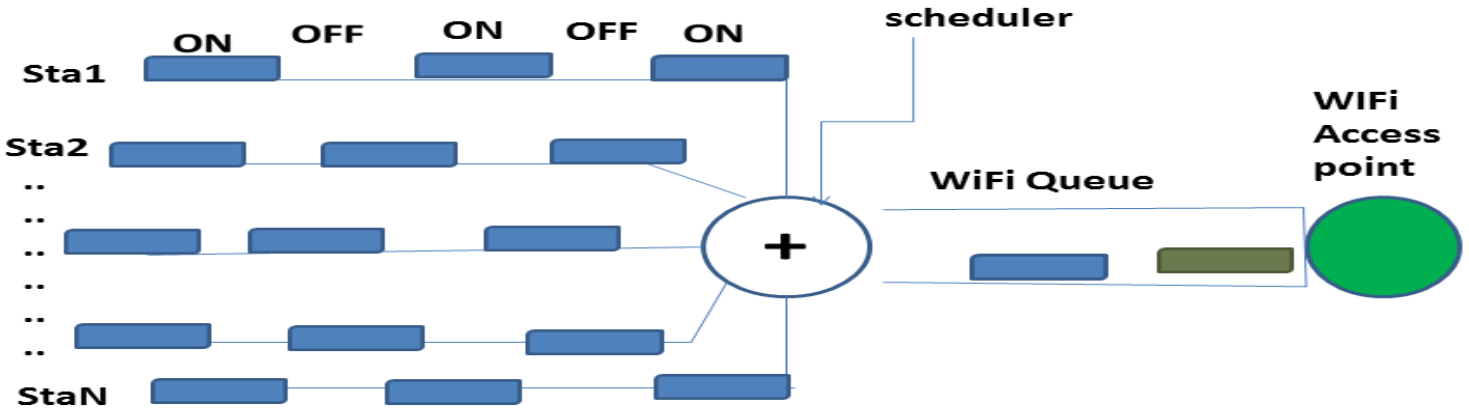
An example of smart farming system is the Pivot system which is used in Toushka farms, upper Egypt as clear from the map each pivot has a circle of approximately 360-meter radius to irrigate and fertilize



Data Model

Data Modeling

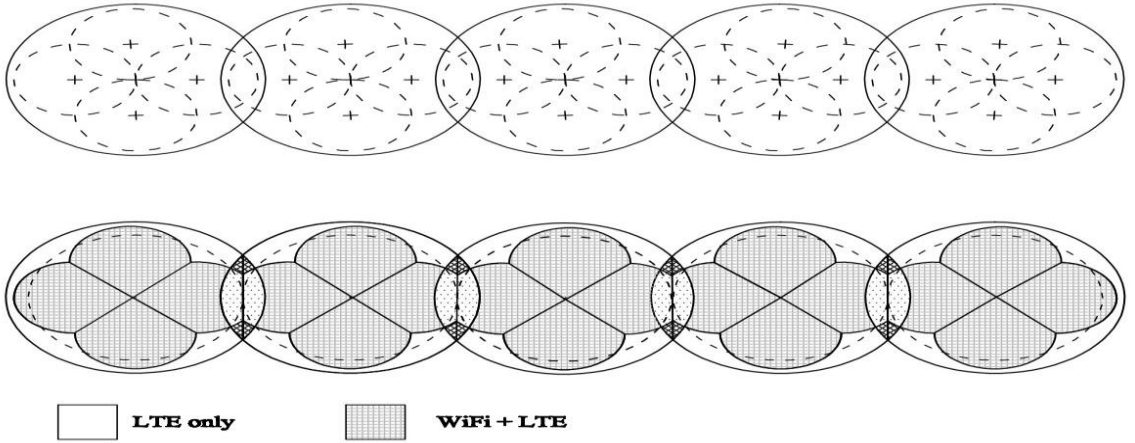
The underground wireless sensor network model consists of numbers of sensors and actuators, each one has information to send over the sink node or receive information from the focal point. We model that using N-burst traffic model.



Architecture of Precision agriculture Networks

Network Model

We consider that each farm area has a sufficient number of LTE antennae. Each part of the farm has WiFi coverage through access points to provide communication between sink nodes, farmers, and the cloud. The sink nodes can connect to the Internet through various technologies(WiFi and LTE)



Analytical Performance Model

Performance model

The traffic can be divided into two categories :

Continuous traffic

assume that the sensors and actuators are continuously sent information.

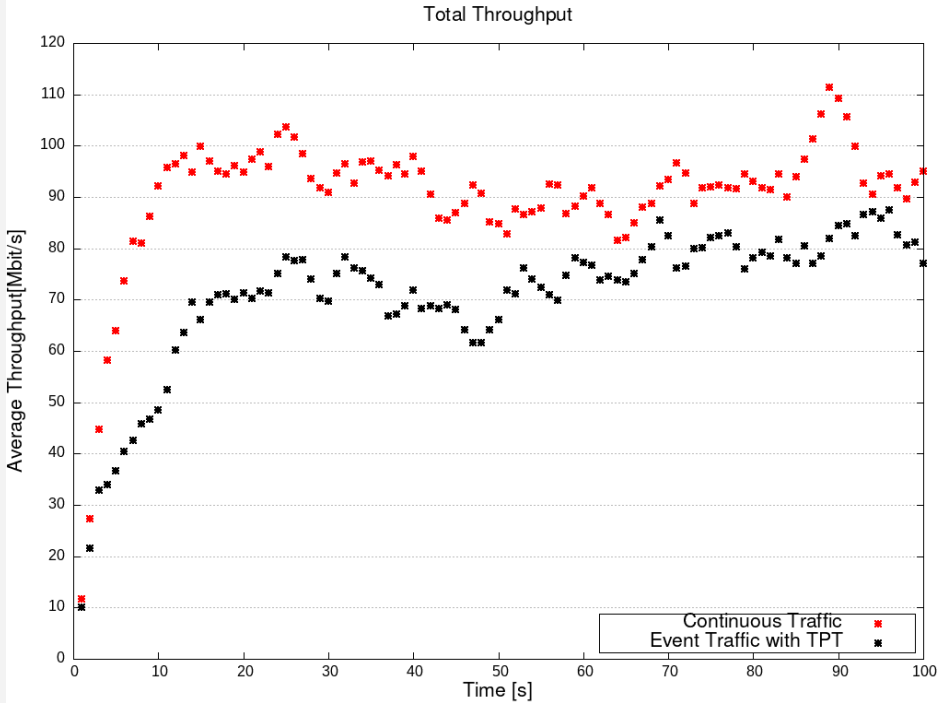
Event Based Traffic

event-based traffic where sensor nodes monitor events and send data based the events.

Simulation analysis

Simulation analysis

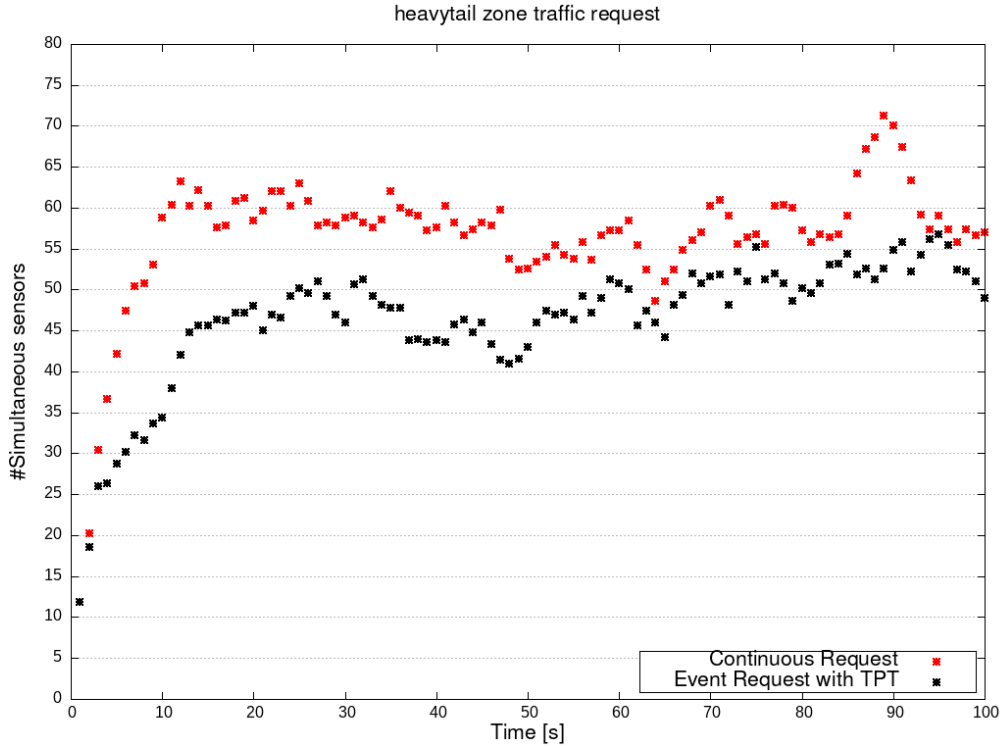
The total data successfully received by the focal point from sensors for two various types continuous and event



Simulation analysis

Simulation analysis

the instantaneous number of sensors data request



Conclusion

Conclusion

- Studies the performance of a smart communication system for precision agriculture analytically by modeling data of the sensors and sink nodes
- We investigated the performance of the communication network under bursty traffic with different metrics.
- the model was validated using NS3 simulation to study the effect of various traffic types
- The system can be applied to the Toushka province farms, in Aswan Egypt

THANK YOU