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AN ENVIRONMENTAL MONITORING SYSTEM USING TASK MANAGEMENT AND DATA ADVERTISEMENT PROTOCOL IN WIRELESS SENSOR NETWORK

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Abstract:

The star topology sensor networks compliant 802.15.4k standard in which sensors could fail to report sensing information to the access point (AP) due to temporary obstructions that clutter the link with the AP.The contribution of this work is twofold. First, we study general connectivity requirements in relay networks. Second, to restore connectivity and to recover from information loss, we propose the neighbor-assisted connectivity recovery protocol (NACRP), which automatically selects a subset of sensor nodes to act as relays for those which lack connectivity with the AP.We rely on the tool of stochastic geometry and in particular, on Poisson point processes to seek the tradeoff, which arises from the selection of a subset of relay nodes and the necessary transmitted power that relays need to use to restore network connectivity.

Keyterms: Neighbor-assisted connectivity recovery protocol (NACRP),CAP,CFP,Guranteed Time Slot.

I. INTRODUCTION

A wireless network is any type of computer network that uses wireless data connections for connecting network nodes. Wireless networking is a method by which homes, telecommunications networks and enterprise (business) installations avoid the Costly process of introducing cables into a building, or as a connection between various equipment locations. Wireless telecommunications networks are generally implemented and administered using radio communication. This implementation takes place at the physical level (layer) of the OSI model network structure. Examples of wireless networks include cell phone networks, Wireless local networks, wireless sensor networks, satellite communication networks, and terrestrial microwave networks. During past decades WSNs have witnessed a relentless research activity to leverage the deployment of low cost, easy to maintain and energy efficient solutions to monitor natural phenomena and men-made activities. Recently, the surge of packet data traffic over the cellular network has leveraged IoT and Machine-Type Communications, thus making sensors part of an omnipresent communication network. Standardization bodies started several activities on WSN technology and its subsequent amendments at both PHY and Medium Access Control (MAC) layers is one exemplary case of such ongoing effort We consider in this work the latest for professionally installed star topology WSNs (STP-WSN).In STP-WSNs temporary obstructions might clutter the LOS connection between sensors deployed over a wide survey area and the central coordination point or AP. When this occurs, sensors will be unable to report sensed data

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although they function properly. Depending on the particular monitored phenomena, faulty sensors might trigger unnecessary human intervention or safety alarms. Network connectivity is an important topic, by the critical transmission radius of a node The NACRP developed for the first time in this work tackles the same general context of but it provides a completely different solution since NACRP is a new protocol solving lack of connectivity under the centralized control of the AP.

II.EXISTING SYSTEM

The IEEE 802.15.4k standard defines PHY and MAC layers specifications to support Low Energy Critical Infrastructure Monitoring networks. Channel time is organized in super frames, with each divided in several sub-beacon intervals (BIs) plus an optional inactive period delimited by the transmission of beacon frames transmitted by the AP.

Beacons carry out general network information, as well as time synchronization for networked devices. The transmission of a beacon is followed by a Contention Access Period (CAP) and a Contention Free Period (CFP). During the CAP, carrier sense multiple access with collision avoidance (CSMA-CA) is used to transmit command frames for association and resource reservations inside the CFP. The CFP is TDMA based and is divided into guaranteed time slots (GTSs). During one GTS, only one sensor is allowed to communicate with the AP.

III.PROPOSED SYSTEM

3.1 OBJECTIVE

The aim to study whether a tradeoff exists between the fraction of the maximum transmitted power which is necessary to cover the cluttered region with s-beacons and the topological change the NACRP.NACRP, a new protocol to automatically restore connectivity in an STP-WSN when obstructions clutter the communication link between sensors and the AP. The contribution of our work is twofold: i) we detail NACRP that, to the best of our knowledge, provides a clean slate solution to the problem of connectivity and ii) we investigate connectivity and the tradeoffs that arise from the adoption of the NACRP in the STP-WSN, relying on stochastic geometry and in particular on Poisson Point Processes (PPPs).

3.2 METHODOLOGY

- Network Formation
- Low Energy Critical Infrastructure Monitoring (LECIM)
- Neighbour-assisted connectivity recovery protocol (NACRP)

3.2.1 Network Formation

Star topology WSNs (STP-WSN). In STP-WSNs temporary obstructions might clut-ter the LOS connection between sensors deployed over a wide survey area and the central coordination point or AP. When this occurs, sensors will be unable to report sensed data although they function properly. Depending on the particular monitored phenomena, faulty sensors might trigger unnecessary human intervention or safety alarms.

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3.2.2 Low Energy Critical Infrastructure Monitoring (LECIM)

Channel time is organized in super frames, with each divided in several sub-beacon intervals plus an optional inactive period delimited by the transmission of beacon frames transmitted by the AP. Beacons carry out general network information, as well as time synchronization for networked devices. The transmission of a beacon is followed by a Contention Access Period and a Contention Free Period. During the CAP, carrier sense multiple access with collision avoidance is used to transmit command frames for association and resource reservations inside the CFP. The CFP is TDMA based and is divided into guaranteed time slots. During one GTS, only one sensor is allowed to communicate with the AP**.**

3.2.3 Neighbour-assisted connectivity recovery protocol (NACRP)

Start transmitting local beacons in order to create sub networks. The AP shall inform the selected sensors whereby a new Information Element embedded in its beacon referred to as Sub Net Information Element. The SN-IE will carry the identification of the selected sensor(s) and the time offset required to schedule the transmission of sub beacon frames to avoid collisions between multiple s-beacon transmissions. An s-beacon shall provide synchronization locally and carry the ID of the parent AP, the ID of the transmitter and a bit field denoting whether the device is an AP or not. For a sensor coordinating a sub-network such a bit shall be set to zero.Thus, each sub-network should take place during the inactive period within the superframe of the AP. When sensors located inside the cluttered region start receiving s-beacons, they have to select the sub-networks they receive with the strongest power, carry out association and reserve resources during the CFP using CSMA-CA within the CA+P period. After collecting data from the associated cluttered sensors, each beaconing sensor will do the relay to the AP using the reserved GTS.

3.3 Architectural Diagram

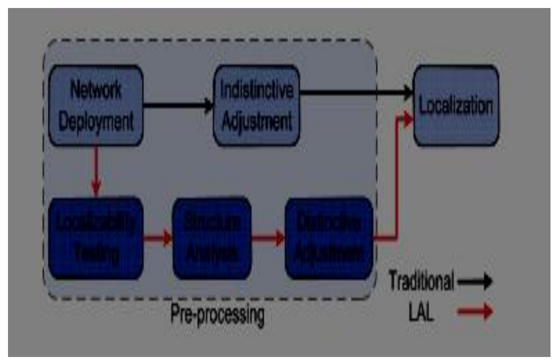

Fig 1:Architecture

IV. EXPRIMENTAL RESULTS AND DISCUSSION

4.1 NETWORK SIMULATION 2

NS (Version 2) is an open source network simulation tool. It is an object oriented, discrete event driven simulator written in C++ and Otcl. The primary use of NS is in network researches to simulate various types of wired/wireless local and wide area networks; to implement network protocols such as TCP and UPD, traffic source behavior such as FTP, Telnet, Web, CBR and VBR, router queue management

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mechanism such as Drop Tail, RED and CBQ, routing algorithms such as Dijkstra, and many more.

Ns2 is written in C++ and Otcl to separate the control and data path implementations. The simulator supports a class hierarchy in C++ (the compiled hierarchy) and a corresponding hierarchy within the Otcl interpreter (interpreted hierarchy).

The reason why ns2 uses two languages is that different tasks have different requirements: For example simulation of protocols requires efficient manipulation of bytes and packet headers making the run-time speed very important. On the other hand, in network studies where the aim is to vary some parameters and to quickly examine a number of scenarios the time to change the model and run it again is more important.

In ns2, C++ is used for detailed protocol implementation and in general for such cases where every packet of a flow has to be processed. For instance, if you want to implement a new queuing discipline, then C++ is the language of choice.

Otcl, on the other hand, is suitable for configuration and setup.Otcl runs quite slowly, but it can be changed very quickly making the construction of simulations easier. In ns2, the compiled C++ objects can be made available to the Otcl interpreter. In this way, the ready-made C++ objects can be controlled from the OTcl level.

An extensive simulation model having scenario of n (user defined) mobile nodes and n UDP/TCP connections is used to study inter-layer interactions and their performance implications. The performance differentials are analyzed using packet delivery ratio.

4.2 SAMPLE SCREENSOTS

The data is send from source to destination due to some data loss the nodes are diverted. The following screenshots explains the concept.

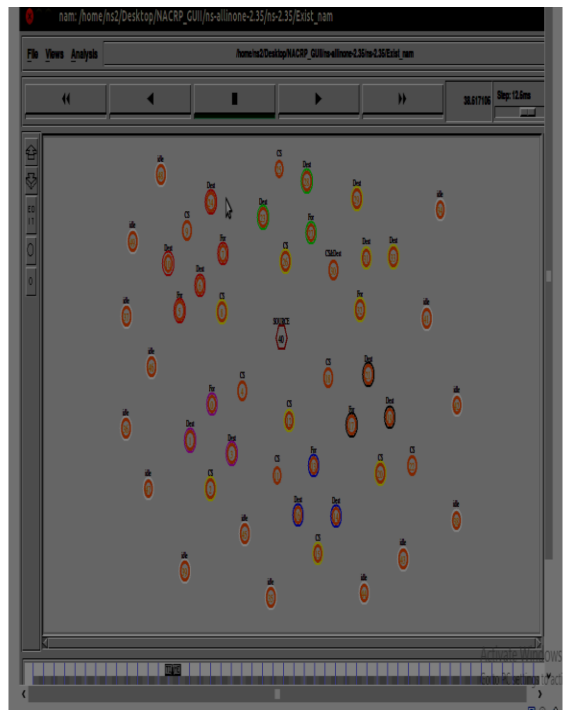

Fig 2:CS, Des and Forwarder nodes are assigned

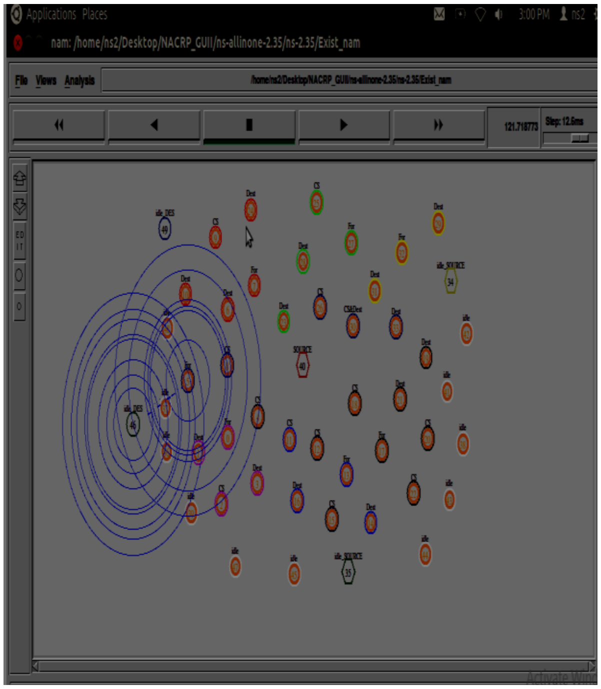

Fig 3: Data send from source to destination while nodes move dynamically

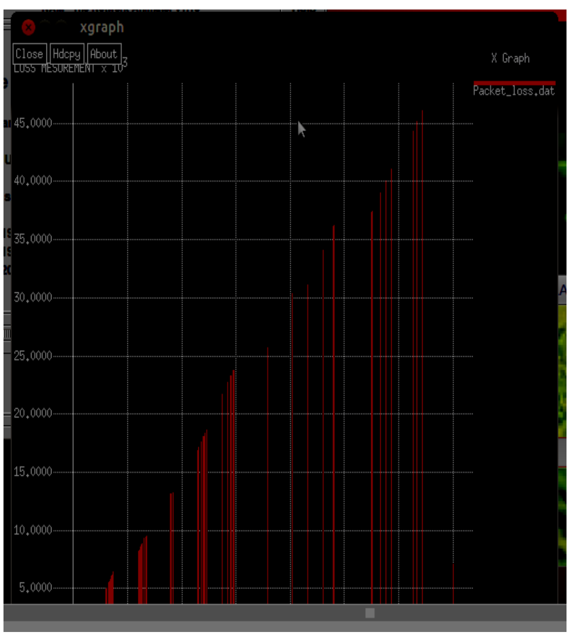

Fig 4:Result Graph

V. CONCLUSION AND FUTURE WORK

We have presented the NACRP, a novel protocol to recover from connectivity loss when the direct link between one or more sensors and the AP is cluttered by the sudden appearance of temporary obstructions. We have analyzed the protocol resorting to the tool of stochastic geometry to characterize the spatial process of sensors scattered over a survey area. Whereby our analysis we managed to identify the set of tradeoff points between the power that sensors have to spend to transmit s- beacon frames and the topological change due to the fact that the star topology morphs into local mesh networks.

REFERENCES

[1] C. Buratti , A. Conti, D. Dardari, and R. Verdone, “An overview on wire- less sensor networks technology and evolution,” J. Sens., vol. 9, no. 9, pp. 6869–6896, Jul. 2009.

[2] IEEE Draft Standard for Local and Metropolitan Area Networks—Part 15.4: Low-rate Wireless Personal Area Networks (LR-WPAN), IEEE P802.15.4REVi/D09, April 2011 (Revision of IEEE Std 802.15.4-2006), Apr. 2013, pp. 1 311.

[3] IEEE Draft Standard for Local and Metropolitan Area Networks— Part 15.4: Low-Rate Wireless Personal Area Networks (LR-WPAN) Amendment 5: Physical Layer (PHY) Specifications for Low Energy, Critical Infrastructure Monitoring Networks IEEE Std 802.15.4k-2013, Aug. 2013, pp. 1 149.

[4] P.-J. Wan, C.-W. Yi, and W. Lixin, "Asymptotic critical transmission radius for k-connectivity in wireless ad hoc networks," IEEE Trans. Inf. Theory, vol. 56, no. 6, pp. 2867–2874, Jun. 2010.

[5] F. Baccelli and B. Laszczyszyn, "Stochastic gometry and wireless net- works, Vol. I—Theory," Found. Trends Netw., vol. 3, no. 4, pp. 249–449, Jul. 2009.

[6] M. Khanafer, M. Guennoun, and H. T. Mouftah, "A survey of beacon- enabled IEEE 802.15.4 MAC protocols in wireless sensor networks," IEEE Commun. Surveys Tuts., vol. 16, no. 2, pp. 856–876, May 2014.

[7] L. Goratti, J. Haapola, and S. Kato, "Highly reliable star and sub-mesh hybrid sensor network for smart grid monitoring," in Proc. GC Workshop Globecom, Dec. 2013, pp. 1480–1485.

[8] T. Baykas, L. Goratti, T. Rasheed, and S. Kato, "On the spectrum effi- ciency of mesh and star topology wide area wireless sensor networks," in Proc. IEEE Int. Symp.Pers. Indoors Mobile Radio Commun. (PIMRC), 2014, pp. 1819–1823.

[9] D. Stoyan, W. S. Kendall, and J. Mecke, Stochastic Geometry and Its Applications, 2nd ed. Hoboken, NJ, USA: Wiley, 1995.