

IEEE MISENET 2014

Trust Models in Wireless Sensor Networks and Online Social Networks: A Comparative Study

Authors: Wenjun Jiang^a, Jie Wu^b
Presenter: Huanyang Zheng^b

^aHunan University, P. R. China

^bTemple University, USA

Philadelphia, PA, USA. 2014.10.27

Outline



Background

Motivation

Features of WSNS and OSNS

Trust Models in WSNS and OSNS

Validation Approaches

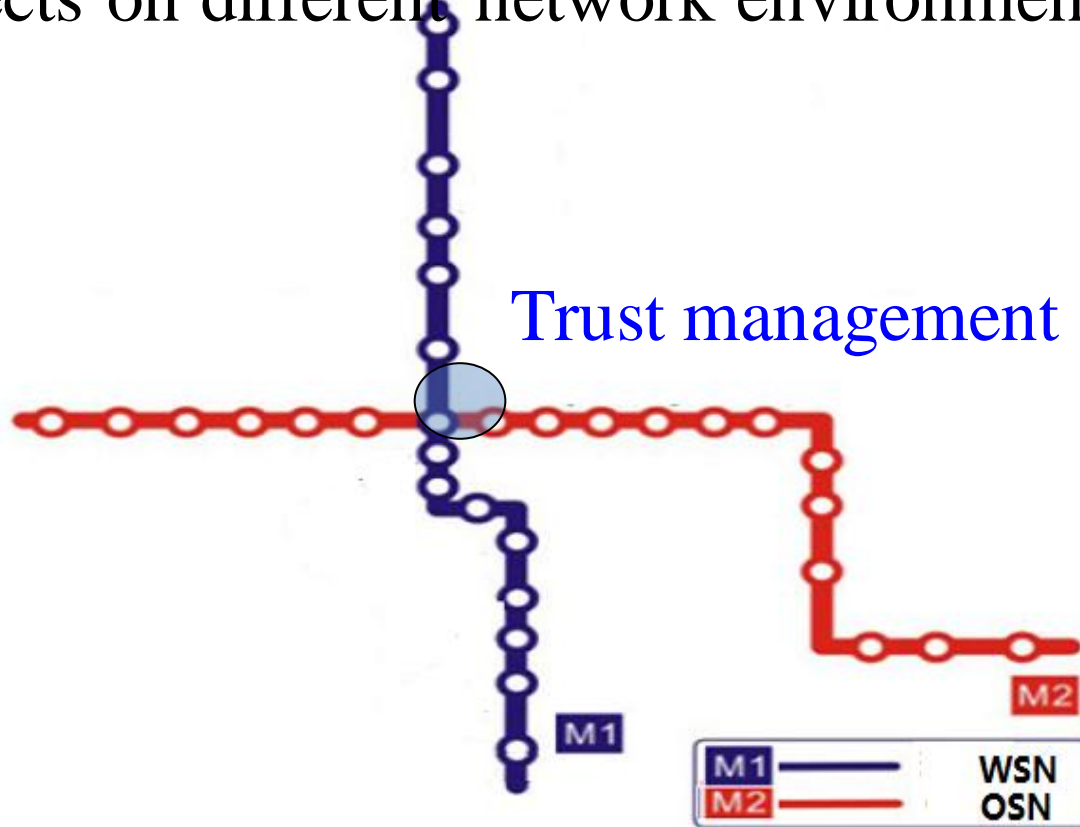
Discussion & Conclusion

Background

- Wireless sensor network (WSN)
 - A new paradigm designing fault-tolerant mission critical systems used to enable varied applications like threat detection, environmental monitoring, etc.
- Online social networks (OSNs)
 - Provide a basis for maintaining social relationships
- Security
 - One of the most important topics in both WSNs and OSNs, for which **trust management** is found to be a necessity

Motivation

- We try to conduct a comparative study
 - As to better understand trust models and their effects on different network environments.



Features of WSNS and OSNS

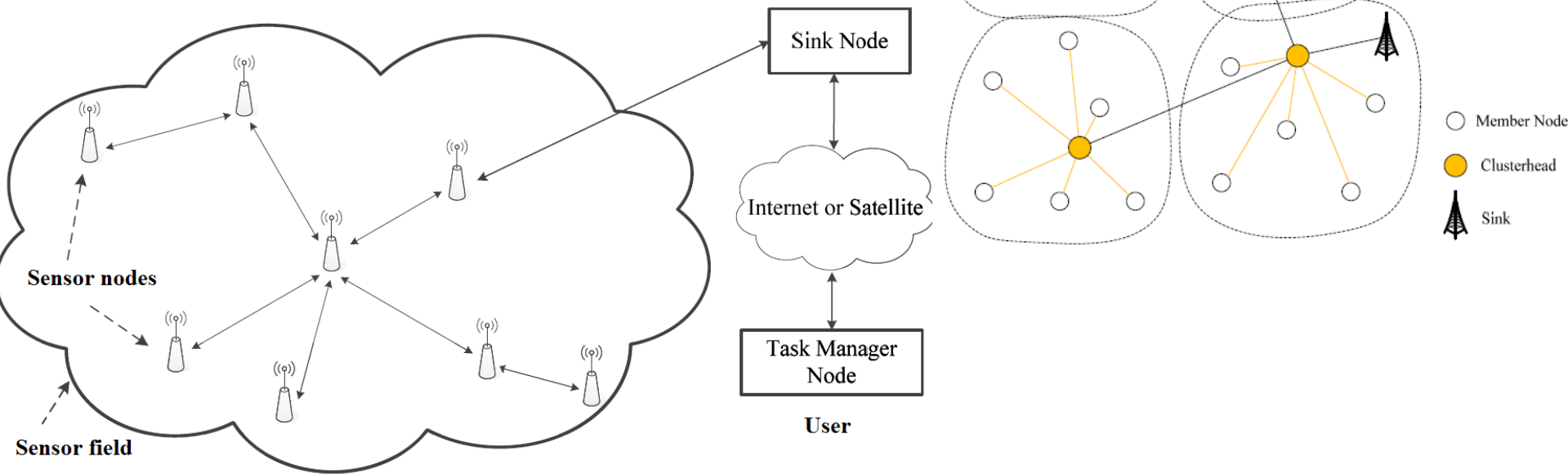
- Construction
 - The components
- Structure
 - Typical network structures
- Trust and trust management
 - The meaning of trust and how to manage trust

Features of WSNS

- Construction
 - Composed with several sensors that are usually small, with low cost and low power
 - The nodes are physically accessible by other people, which leads to the risk of exposure to cryptographic materials.

Features of WSNS

- Structure
 - Sink node, Internet, Task manager node
 - Clustering

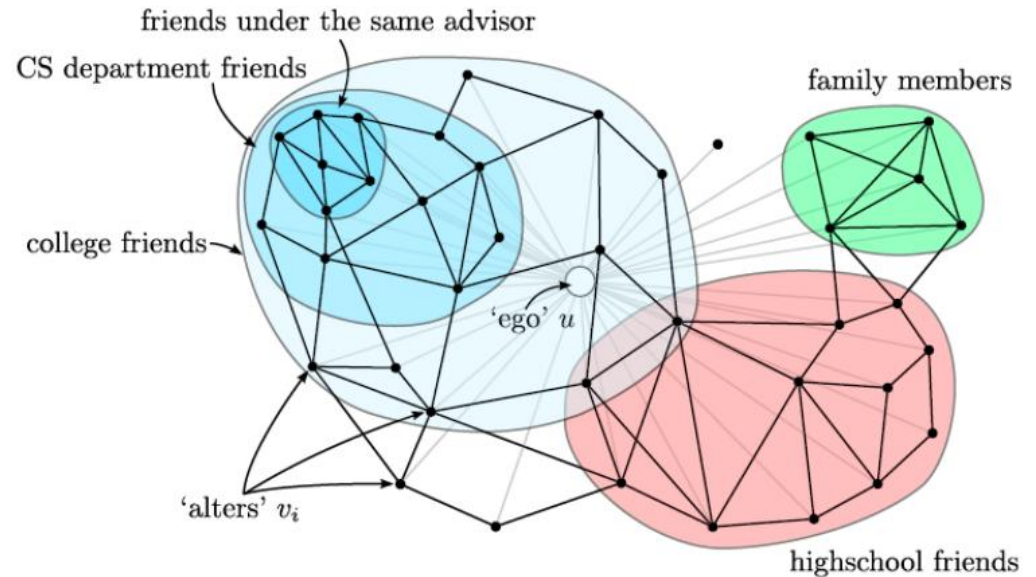


Features of WSNS

- Trust
 - A level of assurance about a key's authenticity that would be provided to the sensor node by some centralized trusted body.
 - A measure of a node's competence in providing a required service
- Trust management
 - More challenging than in OSNs
 - Changes in the topology induced by node mobility or node failure
 - Resource limitations

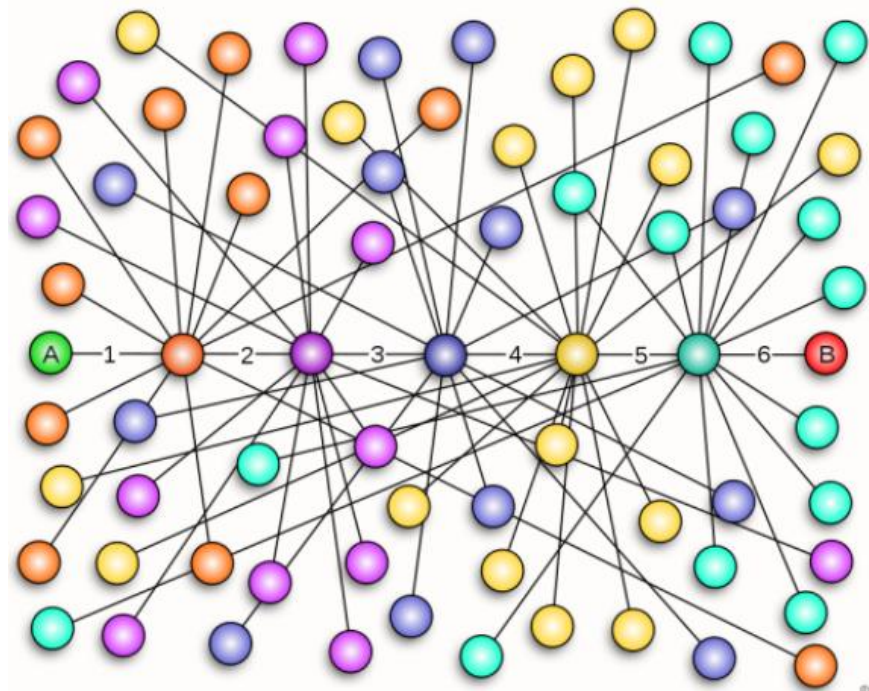
Features of OSNS

- Construction
 - Organized around users.
 - Larger scale



Features of OSNS

- Structure
 - Small world
 - Clustering
 - Short distance



Features of OSNS

- Trust
 - Trust in a person is a commitment to an action, based on a belief that the future actions of that person will lead to a good outcome
- Trust management
 - No resource limitation
 - Focuses more on the accuracy and real effects

Trust Models in WSNs

- RFSN
 - provides a scalable, diverse, and generalized approach for countering all types of misbehavior resulting from malicious and faulty nodes
- ATRM
 - manage trust and reputation locally with minimal overhead in terms of extra messages and time delay.

Trust Models in WSNs (Con't)

- PLUS
 - each sensor node maintains highly abstracted parameters, rates the trustworthiness of its interested neighbors to adopt appropriate cryptographic methods, identifies the malicious nodes, and shares the opinion locally.
- GTMS
 - works on two topologies: intragroup topology and intergroup topology

Trust Models in WSNs (Con't)

- Observation
 - pay special attention to the resource overhead

Trust Models in OSNs

- RN-Trust
 - emulates a trusted graph with a resistive network
- FlowTrust
 - apply network flow theory to trust evaluation
 - use the trust value and confidence level as two trust factors

Trust Models in OSNs (Con't)

- SWTrust
 - Generating small trusted graphs for large OSNs
- TidalTrust
 - Using the shortest, strongest trusted paths
- Observation
 - Focus is mainly on the interpretation of trust itself, including evidence collection and aggregation

Validation Approaches

- WSN
 - Simulation to save costs
 - Several simulators are developed
 - E.g., SENSE, OPNET, TRMSim-WSN, SensorMaker
- OSN
 - Feedback
 - Leave-one-out
 - Real social network data sets
 - E.g., Epinions (www.epinions.com), Advogato (www.advogato.org), etc.

Discussion

- Common features
 - Time sensitivity and dynamic topology
 - Efficiency requirement
 - Validation requirement
- Learn from each other
 - Could we collect some real world data sets for WSNs?
 - Could we develop simulators for OSNs?

Conclusion

- We present a comparative study of trust models in WSNs and OSNs.
 - Provide a comparison of the features of WSNs and OSNs.
 - Review and compare existing trust models in the literature.
 - Analyze the common features of trust models in WSNs and OSNs, and conduct some discussion on how to enhance the trust management in a network by learning from the other type.

Thank you for your attention!

E-mail: wenjj8a@163.com; Jiewu@temple.edu