

SECURE DATA AGGREGATION SCHEME
FOR MULTI-ROOTED TREE TOPOLOGY

A Dissertation

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This is the dedication.

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This is the acknowledgments.

PREFACE

This is the preface.

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SYMBOLS

m mass

v velocity

ABBREVIATIONS

abbr	abbreviation
bcf	billion cubic feet
BMOC	big man on campus

NOMENCLATURE

Alanine	2-Aminopropanoic acid
Valine	2-Amino-3-methylbutanoic acid

GLOSSARY

chick female, usually young

dude male, usually young

ABSTRACT

Shah, Kavit Master, Purdue University, December 2014. Secure data aggregation scheme for multi-rooted tree topology. Major Professor: Dr. Brian King.

This is the abstract.

1. INTRODUCTION

Advancements in compute, storage, networks and sensors technologies have led to many new promising applications.

1.1 Sensor Networks

The sensor networks of the near future are envisioned to consist of hundreds to thousands of inexpensive wireless sensor nodes, each with some computational power and sensing capability, operating in an unattended mode. They are intended for a broad range of environmental sensing applications from vehicle tracking to habitat monitoring. Give an example and talk about energy, security constraints.

1.2 Internet Of Things

In the world of mass connectivity people need to get information all the time on an array of devices. Everything from your refrigerator to your thermostat is connected to wireless networks and joining the “internet of things”. Write about bandwidth constraints.

1.3 Big Data

All the large internet companies process massive amounts of data also know as “Big Data” in real time applications. These include batch-oriented jobs such as data mining, building search indices, log collection, log analysis, real time stream processing, web search and advertisement selection on big data. To achieve high scalability, these applications distributes large input data set over many servers. Each server process its share of the data, and generates local intermediate. The set of

intermediate results contained on all the servers is then aggregated to generate the final result. Often the intermediate data is large so it is divided across multiple servers which perform aggregation on a subset of the data to generate the final result. If there are N servers in the cluster, then using all N servers to perform the aggregation provides the highest parallelism. Talk about compute constraints. [?]

Airplanes are also a great example of “big data”. In a new Boeing Co.747, almost every part of the plane is connected to the Internet, recording and sometimes sending continuous streams of data about its status. According to General Electric Co. in a single flight one of its jet engines generates half a tera bytes of data. This shows that we have too much of data and we are just getting started.

1.4 Data Aggregation

Data aggregation is an important technique used in many system architectures. The key idea is to combine the data coming from different sources eliminating the data redundancy, minimizing the number of packet transmissions thus saving energy, bandwidth and memory usage. This technique allows us to focus more on data centric approaches for networking rather than address centric approaches. [1]

1.5 Cloud Computing

1.6 Fog Computing

2. SECURE DATA AGGREGATION SCHEME

The goal of this thesis is to examine secure data aggregation schemes for various distributed systems.

Many modern world system designs are distributed in nature. The system design includes small, individual components doing their tasks precisely and lots of these components synchronize with all other components to complete the bigger task.

Many applications of sensor network are inherently distributed in nature. For example, scientific data collection, building health monitoring, building safety monitoring systems are distributed systems. Write an example how data aggregation happens in one particular application. [2]

The application design architecture for the internet of things is distributed as well. Write an example how data aggregation happens in one particular application. [?]

2.1 Network topology

Write about how all these distributed systems can be classified into general tree structure.

2.1.1 Related work

Talk about existing aggregation schemes.

Subsubsection heading

This is a sentence. This is a sentence.

3. PERFORMANCE-ANALYSIS

3.1 A Notations

We are enhancing the analysis done in [3]. We consider the case in which intermediate nodes are sensors as well as aggregators, which makes network homogeneous. According to us these scenario is more practical as it allows any node to be an intermediate node according to the current state of the network and also allows dynamism in the network. We keep the same notations used in [3] to be consistent.

3.2 B Number of transmitted bits

First, we start analyzing the case in which no aggregation and no security are used. Suppose all nodes in the network sends raw or encrypted data(x bits), sensor node ID(y bits) and overhead data(oh bits) towards its parents which are $x + y + oh$ bits long.

4. SUMMARY

This is the summary chapter.

5. RECOMMENDATIONS

Buy low. Sell high.

LIST OF REFERENCES

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- [2] D. Wagner, “Resilient aggregation in sensor networks,” in *Proceedings of the 2nd ACM workshop on Security of ad hoc and sensor networks.* ACM, 2004, pp. 78–87.
- [3] H. Alzaid, E. Foo, and J. G. Nieto, “Secure data aggregation in wireless sensor network: a survey,” in *Proceedings of the sixth Australasian conference on Information security-Volume 81.* Australian Computer Society, Inc., 2008, pp. 93–105.