Detection of Mobile Replica Node Attacks in Mobile Computing Environment using GUIDE Technique

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Abstract—**Mobile computing is a term used to refer to a variety of devices that allow accessing data and information from anytime, anyplace, anywhere. The mobile networks are often deployed in complex environments in which to provide a secure transmission and also to detect the hackers. An adversary can capture and compromise mobile nodes, generate replicas of those nodes, and mount a variety of attacks with the replicas injects into the network. These attacks are dangerous because they allow the attacker to leverage and compromise of a few nodes to exert control over much of the network. Thus adversaries can capture some nodes, replicate them and deploy those replicas back into the strategic positions in the network to launch a variety of attacks. These are referred to as node replication attacks. Some methods of defending against node replication attacks have been proposed only in static networks. This paper proposes the work for mobile networks for detecting replica node attack. In this scenario, one of the dangerous attack is the replica attack, in which the adversary takes the secret keying materials from a compromised node, generates a large number of attacker-controlled replicas that share the node's keying materials and ID, and then spreads these replicas throughout the network. To prevent and avoid such replica nodes, each and every node has its own spread value generated by pseudo random number which is registered in base station including IP address along with their secret keying materials. Whenever mobile node sends packet through base station by transmission channel, at the time detection and verification of nodes were performed by applying GUIDE technique. Then the base station allows broadcasting the packets and reaching destination IP address. Thereby we can avoid the replica node attacks and also provide information of intruders in efficient manner to achieve effective and robust replica detection capability with reasonable overheads.**

Index Terms— **Replica node reduction, Mobile Node, Pseudo random number, GUIDE (Greedy User IDEntification) technique**

I. Introduction

Mobile computing is a generic term used to refer to a variety of devices that allow people to access data and information from everywhere. The definition of "replica" has emerged that defines one as a copy of an original object. Replica is the process of compromising the original mobile node. There are many issues in mobile computing like insufficient bandwidth, security standards, power consumption, Transmission Interferences and Potential health hazards. As oppose to the benefits of being able to access information from any location through wireless transmission, there is it faults with the need for security protection. In a wireless mobile communication environment, the messages transmitted over the wireless medium are more susceptible to eavesdropping than in a wired network. Also, it is possible for any user to access the mobile communication system using false identity. Advances in robotics have mad e it possible to develop a variety of new architectures for autonomous wireless networks. Mobile computing network architectures could be used for a variety of applications including intruder detection, border monitoring, and military patrols in a wireless network. In potentially hostile environments, the security of unattended mobile nodes is extremely critical. The attacker may be able to capture and compromise mobile nodes, and then use them to inject fake data, disrupt network operations, and eavesdrop on network communications. In this scenario, a particularly dangerous attack is the replica node attack, in which the adversary takes the secret keying materials from a compromised node, generates a large number of attacker-controlled replicas that share the compromised node's keying materials and ID [1].By the extraction of key material from the benign node, the attacker can create replica node and allow them to seem like authorized participants in the network. The adversary can then leverage this insider position in many ways. For example, he can simply monitor a significant fraction of the network traffic that would pass through these nodes. Alternately, he could jam legitimate signals from benign nodes or inject falsified data to corrupt the monitoring operation.

II. Related Work

Several software-based replica node detection schemes have been proposed for static networks [5], [9], [13]. The primary method used by these schemes is to have location report of the nodes and identify their positions. The drawback of this approach may cause of generating the conflict reports whose signal of one node from multiple locations. However, this approach requires fixed node locations; it cannot be used when

nodes are expected to move. Thus, our challenge is to design an effective, fast, and robust replica detection scheme specifically for mobile networks. In the randomized multicast scheme, every node is required to multicast a signed *location claim* [12] to randomly chosen witness nodes. A witness node that receives two conflicting location claims for a node concludes that the node has been replicated and initiates a process to revoke the node. The line-selected multicast scheme, on the other hand, reduces communication overhead of the randomized multicast scheme by having every claim-relaying node participate in the replica detection and revocation process.

III. SIGNIFICANCE OF WORK

We propose this paper to overcome the drawback from replica node attack in mobile computing environment. Mobile computing has many advantages like improved decision making, increased productivity and reduced costs. By taking advantage, the proposed schemes perform replica detection in a distributed, efficient, and secure manner. Through analysis experiments that our scheme will achieve effective and robust replica detection capability with substantially lower communication, computational, and storage overheads than prior work in the literature. The replica nodes are controlled by the adversary, but have keying materials that allow them to seem like authorized participants in the network. Protocols for secure network communication would allow replica nodes to create pair wise shared keys with other nodes and the base station, thus enabling the nodes to encrypt and authenticate all of their communications as if they were the original captured node.
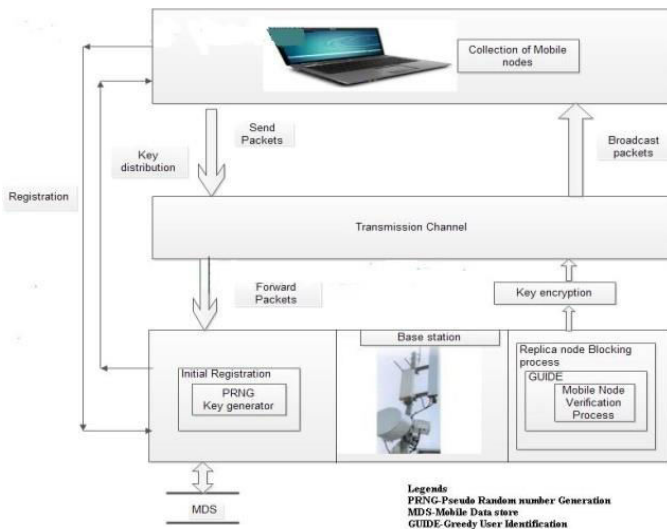
A. System Architecture

Fig.1 Architecture of Detection of Mobile Replica Nodes using GUIDE Technique

In mobile computing, collection of mobile nodes is connected at same access point. Initially all mobile nodes are registered and gets spread value called pseudo random number

from base station. Mobile node broadcasting the packets through transmission channel and forward the packets to the base station. Then the base station verifies the spread value of certain mobile node along with user information which is retrieved from mobile data storage. The verification process is taken by GUIDE [17] algorithm .The base station blocks the packet if there is any mismatch between all the keying materials and detected as a replica node. Otherwise the base station identified that mobile node has the valid key materials. Then it encrypts the spread value before transferring the packets to transmission channel. Finally the transmission channel broadcast the packet.

B. Guide Process

We proposed and evaluated metrics for resilience and delay which quantify the availability of control messages under control channel jamming attacks and demonstrated that the use of random key assignment provides graceful degradation in availability as the number of compromised user increases. We formulated the identification of compromised users in the system as a maximum likelihood estimation problem and proposed the GUIDE algorithms using greedy heuristics for jammer identification and user identification. We provided an analytical approximation to evaluate the false alarm and miss rates in the identification of compromised users resulting from the GUIDE algorithms. We will investigate modifications to the adversary's jamming strategy and the effect on the availability of control messages and the ability to identify compromised users. Due to the complexity of the resulting identification problem, we propose technique, referred to as GUIDE (Greedy User IDEntification). This Technique has following methods to detect the replica node attack in mobile computing environment.

C. Pseudo Random Number Generation

A pseudo-random number generator, or PRNG [18], is a random number generator that produces a sequence of values based on a seed and a current state. Random Number Generators (RNGs) used for cryptographic applications typically produce a sequence of zero and one bits that may be combined into sub-sequences or blocks of random numbers. *Seed key* is a secret value used to initialize a cryptographic function or operation.

- CC, a 32-bit counter stored in thread-safe memory
- D, a 64-bit representation of the current date and time
- K, a 192-bit triple DES key
- L, a 64-bit value stored in thread-safe memory used to store the last value of X0
- P, a 64-bit value stored in thread-safe memory used to store the previously-generated block X
- S, a 64-bit generated seed value
- SD, a 64-bit value stored in thread-safe memory
- U, an optional user-supplied seed consisting of an arbitrary number of bytes

    X, X0, X f, 64-bit generated values

The Secure Hash Algorithm is a one of cryptographic hash function SHA-1 is a 160 bit hash function which resembles the

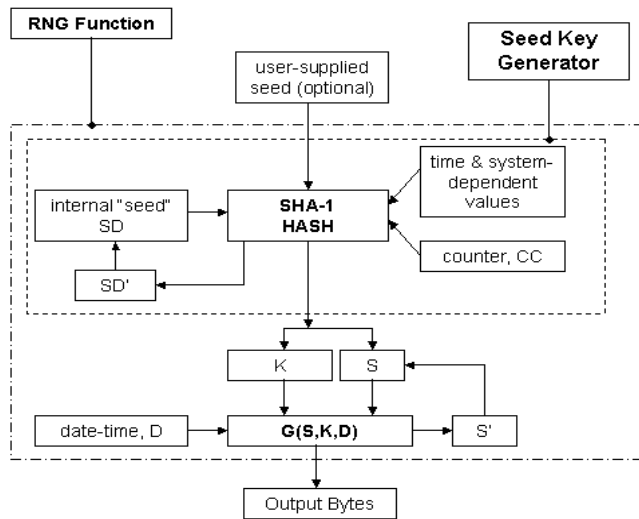earlier MD5 algorithm.SHA-1 is employed in several widely used security application and protocols.

Fig. 2 Generation of Pseudo-random Number

IV. EXPERIMENTAL RESULTS

In the mobile replica cases, the mobile nodes IP address and its secret keying materials with the registered information in the base station are defined. Thus the results of replica node means the base station verified it as replica and block sending files. And also block its action, along with alarm information. If the mobile node has valid user information and key means, the base station allows broadcasting the packets in mobile computing environment. After verification of the specified mobile node, it will encrypt the key while forward it to the transmission channel. The following graph shows the relationship between the processing times of the mobile node and the PRNG key.
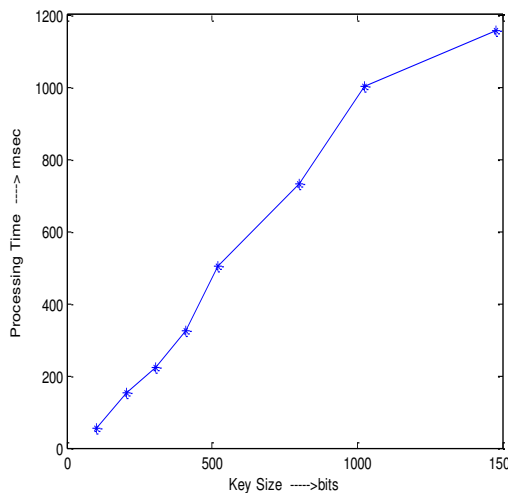

Fig. 3. PRNG key

V. CONCLUSION

We have proposed a replica detection scheme for mobile networks based on the GUIDE (Greedy User IDEntification).

We also generated random number to detect mobile replicas by using the basic idea that a mobile node should never replicate anymore. Furthermore, we have presented two types of attacks that might be launched by the attacker and discussed the defence strategies against those attacks.

VI. FUTURE ENHANCEMENT

Through the continuing investigation, that the architecture for better replica detection in mobile computing environment should be distributed and cooperative. For future work, we would like to thoroughly explore how localization and time synchronization errors affect the detection accuracy of our scheme. We would like to evaluate our scheme against various types of attacker models. In particular, we are interested in exploring how a variety of attacker models impact on the security of the scheme and also create one virtual memory to reduce the overload of base station.

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