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RESEARCH ARTICLE

EXHAUSTING VERVE BY VAMPIRE'S IN WIRELESS AD HOC SENSOR NETWORKS

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Abstract -Vampire attacks are not specific to any specific protocol, but rather rely on the properties of many popular classes of routing protocols. A single Vampire can increase network-wide energy usage by a factor of O(N), where N in the number of network nodes. This paper will use two attack on stateless protocol in which first Carousel attack is an adversary sends a packet with a route composed as a series of loops, such that the same node appears in the route many times. Second, Stretch attack where a malicious node constructs artificially long source routes, causing packets to traverse a larger than optimal number of nodes. The vampire attack are very difficult to detect and more over very difficult to prevent.

Keywords – Wireless network, carousel attack, stretch attack, routing, Vampire attack, Denial of services, Malicious discovery attack

I. INTRODUCTION

Wireless ad-hoc network is needed to explore in sensing and pervasive computing. The security work till now focuses on denial of communication at the routing or medium access control levels. The "Vampire" attacks are not specific to any specific protocol, but rather rely on the properties of many popular classes of routing protocols. Vampire attack as the composition and transmission of a message that causes more energy to be consumed by the network than if an honest node transmitted a message of identical size to the same destination, although using different packet headers. All the protocols are devastating, difficult to detect and easy to carry out using as few as one malicious insider sending only protocol compliant messages. The proposed system discuss the methods to detect and mitigate these types of attacks, including a new proof-of-concept protocol that provably bounds the damage caused by Vampires during the packet forwarding phase.

I-A. Classification

DOS attacks represents in wired networks are frequently characterized by amplification an adversary can amplify the resources it spends on the attack the cumulative energy of an entire network, amplification attacks are always possible, given that an adversary can compose and send messages which are processed by each node along the message path. Vampire attack as the composition and transmission of a message that causes more energy to be consumed by the network than if an honest node transmitted a message of identical size to the same destination, although using different packet headers.

I-B. Protocols and assumptions

All routing protocols employ at least one topology discovery period, since ad-hoc deployment implies no prior position knowledge. a single Vampire may attack every network node simultaneously, meaning that continuous recharging does not help unless Vampires are more resource-constrained than honest nodes Vampire attacks may be weakened by using groups of nodes with staggered cycles: only active-duty nodes are vulnerable while the Vampire is active; nodes are safe while the Vampire sleeps this defense is only effective when duty cycle groups outnumber Vampires, since it only takes one Vampire per group to carry out the attack.

I-C. Overview

In the first attack that is Carousal attack an adversary composes packets with purposely introduced routing loops It targets source routing protocols by exploiting the limited verification of message headers at forwarding nodes, allowing a single packet to repeatedly traverse the same set of nodes. In the second attack that is stretch attack an adversary constructs artificially long routes, potentially traversing every node in the network. The assumption has been made that only messages originated by adversaries may have maliciously-composed routes.

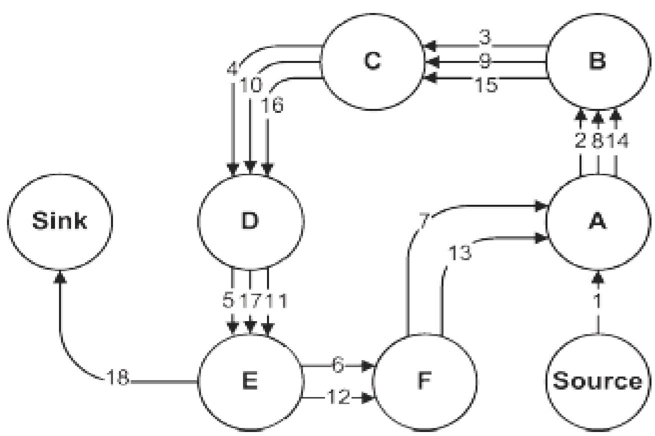


Fig.1 An honest route would exit the loop immediately from node E to Sink but malicious packet makes it twice more before exiting

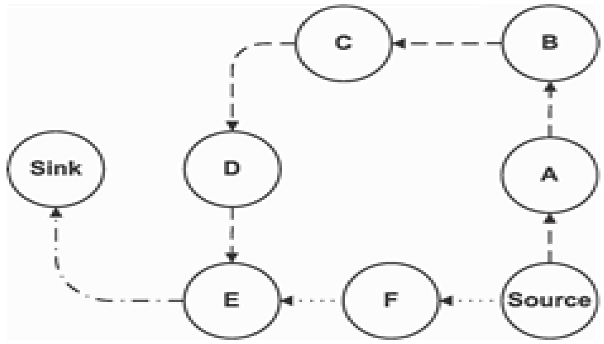


Fig.2 Honest route is dotted while malicious route is dashed. The last link to the sink is shared.

II. RELATED WORK

Existing work on secure routing attempts to ensure that adversaries cannot cause path discovery to return an invalid network path, but Vampires do not disrupt or alter discovered paths, instead using existing valid network paths and protocol compliant messages. Protocols that maximize power efficiency are also inappropriate, since they rely on cooperative node behavior and cannot optimize out malicious action. [1,2,3] the most permanent denial of service attack is to entirely deplete nodes batteries. This is an instance of a resource depletion attack, with battery power as the resource of interest. some of the individual attacks are simple, and power-draining and resource exhaustion attacks have been discussed before [4,5,6], prior work has been mostly confined to other levels of the protocol stack, e.g. medium access control (MAC) or application layers, and there has been a little discussion, and no thorough analysis or mitigation, of routing-layer resource exhaustion attacks. Vampire attacks are not protocol-specific, in that they do not rely on design properties or implementation faults of particular routing protocols, but rather exploit general properties of protocol classes such as link-state, distance-vector, source routing and geographic and beacon routing.

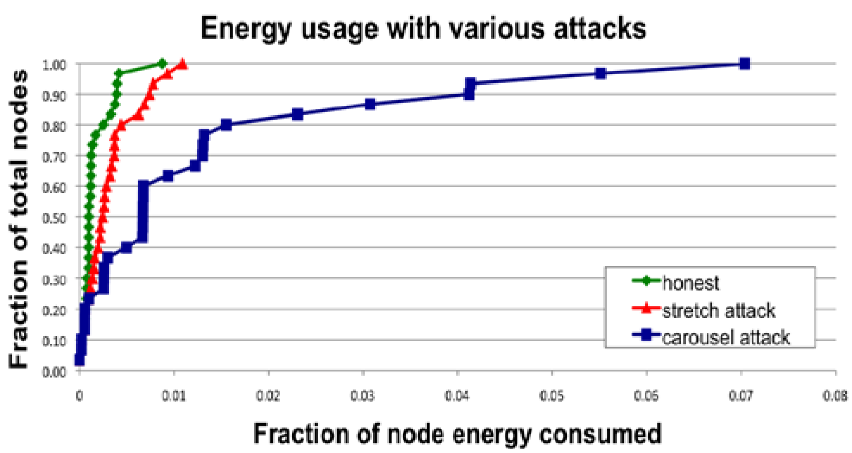
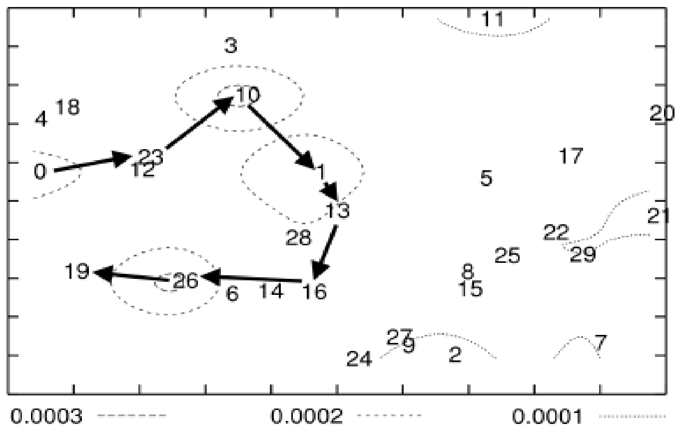


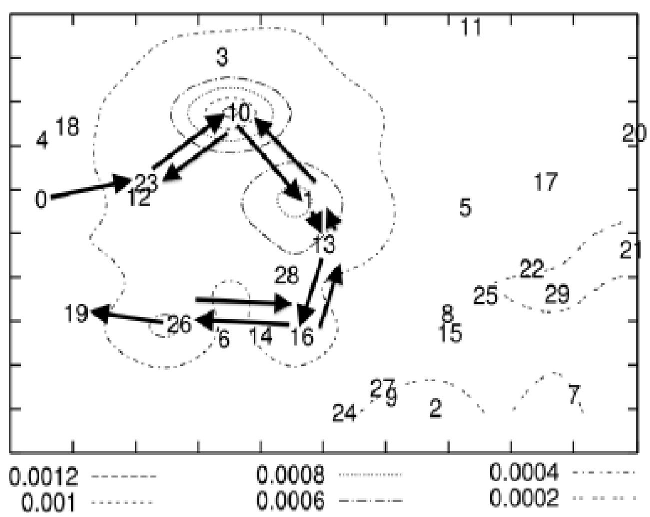
Fig.3 Node energy distribution under various attack scenarios.

III. ATTACKS ON STATELESS PROTOCOL

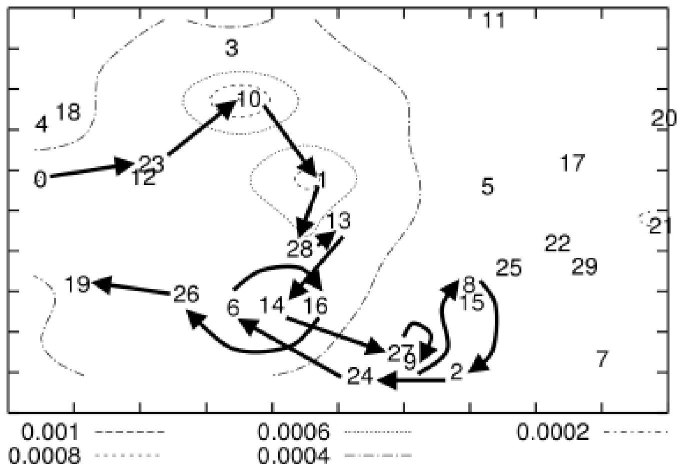
The carousel and stretch attacks (Fig (1) & Fig (2)) in a randomly-generated 30-node topology and a single randomly-selected malicious DSR agent, using the ns-2 network simulator. Malicious nodes are not driving down the cumulative energy of the network purely by their own use of energy.



(a) Honest scenario: node 0 sends a single message to node 19.



(b) Carousel attack (malicious node 0): the nodes traversed by the packet are the same as in (a), but the loop over all forwarding nodes roughly triples the route length (the packet traverses the loop more than once). Note the drastically increased energy consumption among the forwarding nodes.



(c) Stretch attack (malicious node 0): the route diverts from the optimal path between source and destination, roughly doubling in length. Note that while the per-node energy consumption increase is not as drastic as in (b), the region of increased energy consumption is larger. Overall energy consumption is greater than in the carousel attack, but spread more evenly over more network nodes.

III-A. Mitigation methods

The carousel attack can be prevented when a loop is detected, the source route could be corrected and the packet sent on, but one of the attractive features of source routing is that the route can itself be signed by the source.
The stretch attack is more challenging to prevent. Its success rests on the forwarding node not checking for optimality of the route.

IV. ATTACKS ON STATEFUL PROTOCOLS

Routes in link-state and distance-vector networks are built dynamically from many independent forwarding decisions, so adversaries have limited power to affect packet forwarding, making these protocols immune to carousel and stretch attacks. Vampires have little control over packet progress when forwarding decisions are made independently by each node, but they can still waste energy by restarting a packet in various parts of the network.
In Directional antenna attack, Vampires have little control over packet progress when forwarding decisions are made independently by each node, but they can still waste energy by restarting a packet in various parts of the network.
In Malicious discovery attack the attack on all previously-mentioned routing protocols (including stateful and stateless) is spurious route discovery.

V. PROVABLE SECURITY AGAINST VAMPIRE ATTACKS

The “no backtracking property”, satisfied for a given packet if and only routes are provided. This already means the adversary cannot perform carousel or stretch attacks, no node may unilaterally specify a suboptimal path through the network.

VI. CONCLUSION

The first sensor network routing protocol that provably bounds damage from Vampire attacks by verifying that packets consistently make progress toward their destinations Derivation of damage bounds and defenses for topology discovery, as well as handling mobile networks, is left for future work.

ACKNOWLEDGMENT

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