

How to prevent Routing Table Overload attacks in RPL-based IoT Networks?

STIR prevents this attack by improving the memory efficiency of the RPL protocol.

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1

The **Internet of Things (IoT)** is the network connecting "smart" objects or sensors.

Routing Protocol for Low Power and Lossy Networks (RPL)

- Routing protocol for "**constrained nodes**"
 - limited memory, processing power, or energy consumption [1]

STIR is a **protocol modification to RPL** and is the name of the proposed contribution.

Objective

- Modify the RPL protocol to **prevent** the Routing Table Overload attack

Method

- Understanding the RPL protocol in details
- Identifying RPL-specific attacks and mitigations
- Designing a solution to an RPL-specific attack

Sources:

1. A. Brandt, J. Hui, R. Kelsey, P. Levis, K. Pister, R. Struik, and R. Alexander, *RPL: IPv6 Routing Protocol for Low-Power and Lossy Networks*. IETF, Mar 2012. [Online]. Available: <http://dx.doi.org/10.17487/RFC6550>

2

The Routing Table Overload Attack

Malicious Node (N3) sends fake messages

The router creates **new routing table entries** for nonexistent nodes

Constrained nodes have a **limited number of routing entries**.

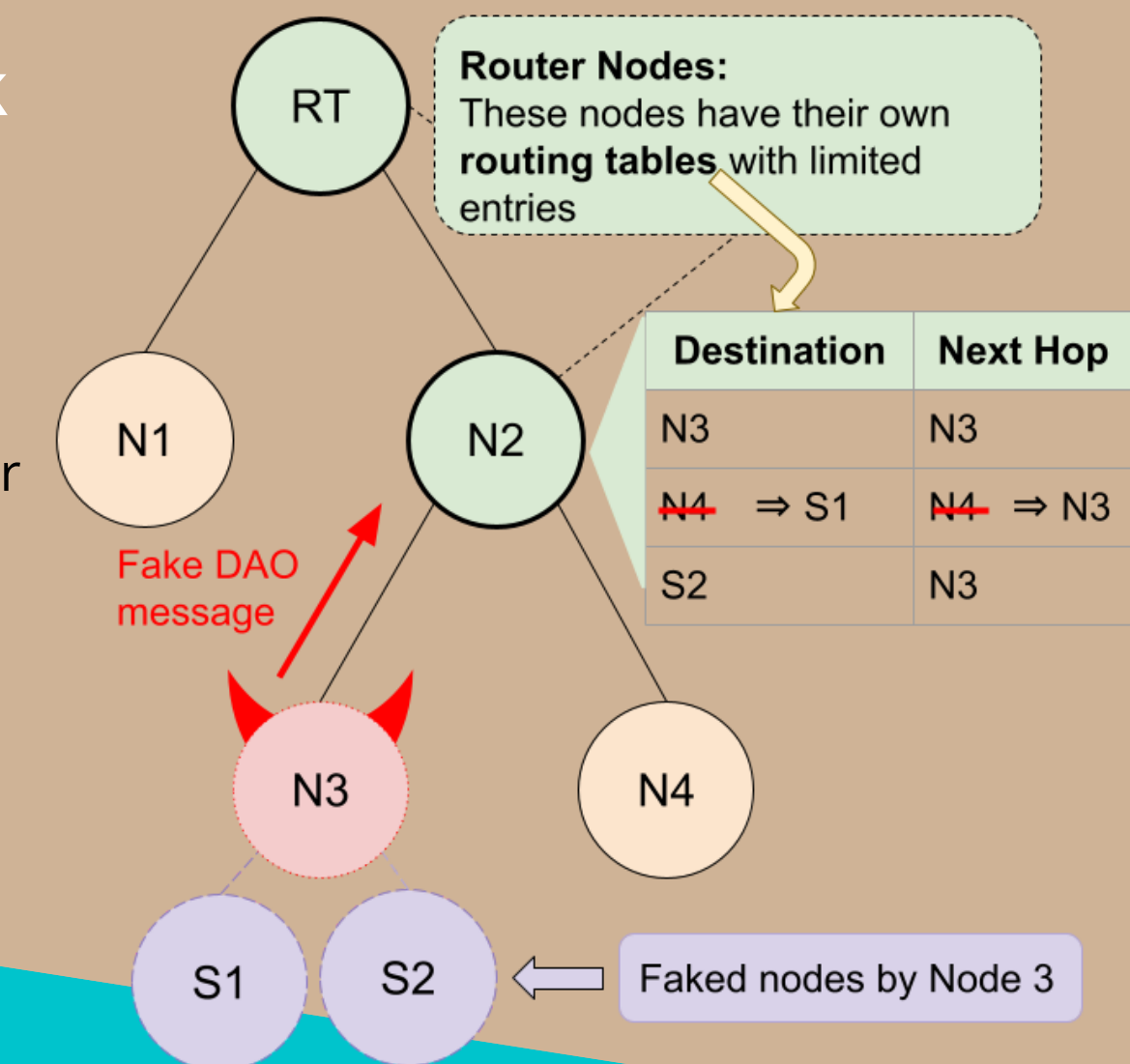


Figure 1: A malicious node (N3) performing a Routing Table Overload attack

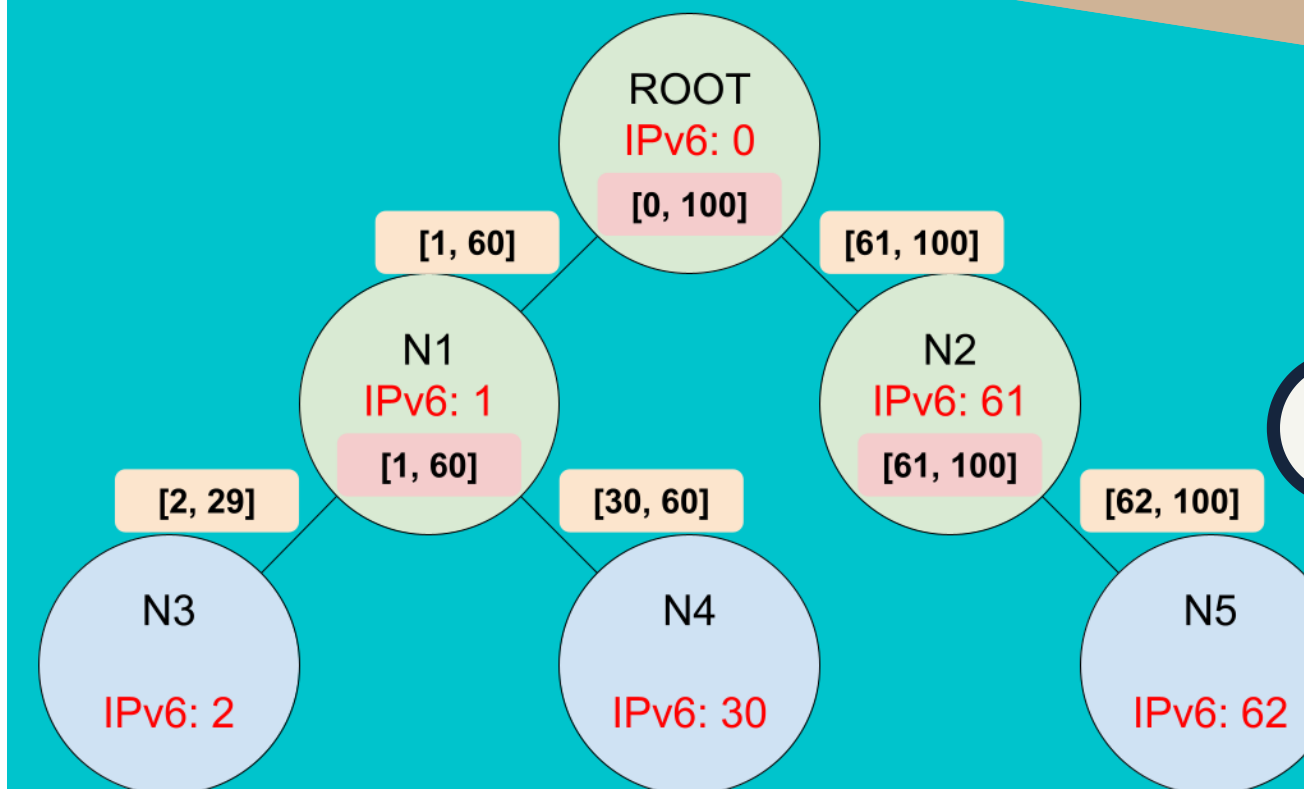


Figure 2: An RPL network with routing addresses in interval format

Using interval routing there are **fewer routing table entries** to store

3

Prevention using Interval Routing

Efficient routing table entries

Less routing table entries

4

Paper's Contribution

STIR prevents the routing table overload attack by **coalescing IPv6 addresses**.

STIR **modifies the protocol** into two steps:

- **initializing the network** with specific IPv6 addresses per nodes
- **routing based on stored intervals** in routing table entries

STIR's Performance (based on RFC 6687):

- **Improves** routing table size
- **Slightly increases** control packet overhead

5

Conclusion

Nodes store routing table entries **proportional to the number of sub-DODAGs**.

STIR is a **minimal protocol modification** to RPL ameliorating the memory efficiency of the protocol.