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M. Richardson
Sandelman Software Works

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Enabling secure network enrollment in RPL networks draft-richardson-6tisch-roll-enrollment-priority-01

Abstract

[I-D.richardson-6tisch-enrollment-enhanced-beacon] defines a method by which a potential [I-D.ietf-6tisch-minimal-security] can announce itself as a available for new Pledges to Join a network. The announcement includes a priority for join. This document provides a mechanism by which a RPL DODAG root can disable join announcements, or adjust the base priority for join operation.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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1. Introduction

[RFC7554] describes the use of the time-slotted channel hopping (TSCH) mode of [ieee802154]. [I-D.ietf-6tisch-minimal-security] and [I-D.ietf-6tisch-dtsecurity-secure-join] describe mechanisms by which a new node (the "pledge)" can use a friendly router as a Join Proxy. [I-D.richardson-6tisch-enrollment-enhanced-beacon] describes an extension to the 802.15.4 Enhanced Beacon that is used by a Join Proxy to announce its existence such that Pledges can find them.

It has become clear that not every routing member of the mesh ought to announce itself as a Join Proxy. There are a variety of local reasons by which a 6LR might not want to provide the Join Proxy function. They include available battery power, already committed network bandwidth, and also total available memory available for Join proxy neighbor cache slots.

There are other situations where the operator of the network would like to selective enable or disable the join process in a particular DODAG.

As the join process involves permitting unencrypted traffic into the best effort part of a (TSCH) network, it would be better to have the join process off when no new nodes are expected.

A network operator might also be able to recognize when certain parts of the network are overloaded and can not accomodate additional join traffic, and it would like to adjust the join priority among all nodes in the subtree of a congested link.

This document describes an RPL DIO option that can be used to announce a minimum join priority. Each potential Join Proxy would this value as a base on which to add (decreasing likely hood of attracting traffic) values relating to local conditions.

A network operator can set this value to the maximum value allowed, effectively disable all new join traffic.

1.1. Terminology

In this document, the key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" are to be interpreted as described in BCP 14, RFC 2119 [RFC2119] and indicate requirement levels for compliant STuPiD implementations.

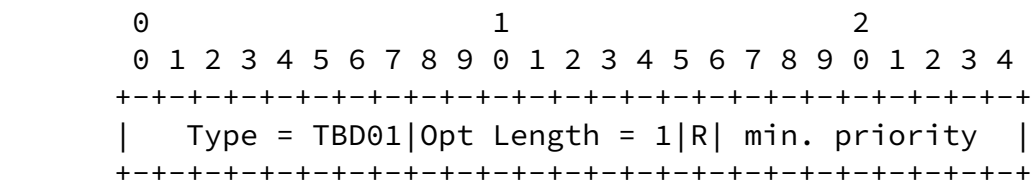
In addition, the terminology of [I-D.ietf-6tisch-terminology] and from [I-D.ietf-anima-voucher] are used.

2. Protocol Definition

The following option is defined to transmission in the DIO issued by the DODAG root. It may also be added by a router on part of the sub-tree as a result of some (out of scope for this document) management function.

6LRs that see this DIO Option SHOULD increment the minimum priority if they observe congestion on the channel used for join traffic. (TODO: how much? Do we need to standardize this?)

A 6LR which would otherwise be willing to act as a Join Proxy, will examine the minimum priority field, and to that number, add any additional local consideration (such as upstream congestion). The resulting priority, if less than 0x7f should enable the Join Proxy function.



min.priority a 7 bit field which provides a base value for the Enhanced Beacon Join priority. A value of 0x7f (127) disables the Join Proxy function entirely.

R a reserved bit that SHOULD be set to 0 by senders, and MUST be ignored by receivers. The reserved bit SHOULD be copied to options created.

3. Security Considerations

As per [RFC7416], RPL control frames either run over a secured layer 2, or use the [RFC6550] Secure DIO methods. This option can be placed into either a "clear" (layer-2 secured) DIO, or a layer-3 Secure DIO. As such this option will have both integrity and confidentiality mechanisms applied to it.

A malicious node (that was part of the RPL control plane) could see these options and could, based upon the observed minimal join priority signal a confederate that it was a good time to send malicious join traffic.

A malicious node (that was part of the RPL control plane) could also send DIOs with a different minimal join priority which would cause downstream mesh routers to change their Join Proxy behaviour. Lower minimal priorities would cause downstream nodes to accept more pledges than the network was expecting, and higher minimal priorities cause the join process to stall.

The use of layer-2 or layer-3 security for RPL control messages prevents the above two attacks.

4. Privacy Considerations

There are no new privacy issues caused by this extension.

5. IANA Considerations

Allocate a new number TBD01 from Registry RPL Control Message Options. This entry should be called Minimum Join Priority.

6. Acknowledgements

This has been reviewed by Pascal Thubert and Thomas Wattenye.

7. References

7.1. Normative References

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7.2. Informative References

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Appendix A. Change history

version 00.

Author's Address

Michael Richardson
Sandelman Software Works

Email: mcr+ietf@sandelman.ca