Reducing energy consumption of Router Advertisements
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Abstract

   Frequent Router Advertisement messages can severely impact host power
   consumption. This document recommends operational practices to avoid
   such impact.

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   provisions of BCP 78 and BCP 79.

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   This Internet-Draft will expire on March 10, 2016.

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1. Introduction

   Routing information is communicated to IPv6 hosts by Router
   Advertisement (RA) messages [RFC4861]. If these messages are too
   frequent, they can severely impact power consumption on battery-
   powered hosts.

   The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT",
   "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this
   document are to be interpreted as described in [RFC2119].

2. Problem scenarios

2.1. Solicited multicast RAs on large networks

   On links with a large number of battery-powered devices, sending
   solicited Router Advertisements multicast can severely impact host
   power consumption. This is because every time a device joins the
   network, all devices on the network receive a multicast Router
   Advertisement. In the worst case, if devices are continually joining
   and leaving the network, and the network is large enough, then all
   devices on the network will receive solicited Router Advertisements
   at the maximum rate specified by section 6.2.6 of [RFC4861], which is
   one every 3 seconds.

2.2. Frequent periodic Router Advertisements

   Some networks send periodic multicast Router Advertisements very
   frequently (e.g., once every few seconds). This may be due to a

desire to ensure that hosts always have access to up-to-date router
information. This has severe impact on battery life.

3. Consequences

Observed reactions to frequent Router Advertisement messages by
battery-powered devices include:

o Some hosts simply experience bad battery life on these networks
   and otherwise operate normally. This is frustrating for users of
   these networks.

o Some hosts react by dropping all Router Advertisement messages
   when in power saving mode on any network, e.g., [1]. This causes
   devices to lose connectivity when in power-saving mode,
   potentially disrupting background network communications, because
   the device is no longer able to send packets or acknowledge
   received traffic.

o Some hosts react by dropping *all* IPv6 packets when in power
   saving mode, [2]. This disrupts network communications.

Compounding the problem, when dealing with devices that drop Router
Advertisements when in power saving mode, some network administrators
work around the problem by sending RAs even more frequently. This
causes devices to engage in even more aggressive filtering.

4. Recommendations

4.1. Network-side recommendations

1. Router manufacturers SHOULD allow network administrators to
    configure the routers to respond to Router Solicitations with
    unicast Router Advertisements if:

    * The Router Solicitation's source address is not the
       unspecified address, and:

    * The solicitation contains a valid Source Link-Layer Address
       option.

2. Administrators of networks that serve large numbers (tens or
    hundreds) of battery-powered devices SHOULD enable this
    behaviour.

3. Networks that serve battery-powered devices SHOULD NOT send
    multicast RAs too frequently (e.g., more than one every 5-10
    minutes for current battery-powered devices) unless the

information in the RA packet has substantially changed. If there is a desire to ensure that hosts pick up configuration changes quickly, those networks MAY send frequent Router Advertisements for a limited period of time (e.g., not more than one minute) immediately after a configuration change.

No protocol changes are required. Responding to Router Solicitations with unicast Router Advertisements is already allowed by section 6.2.6 of [RFC4861], and Router Advertisement intervals are already configurable by the administrator to a wide range of values.

4.2. Device-side recommendations

1. Mobile devices that intend to maintain IPv6 connectivity while asleep MUST NOT ignore RAs while asleep.

2. Mobile devices that do not intend to maintain IPv6 connectivity while asleep SHOULD disconnect from the IPv6 network and SHOULD reconnect to the network (including performing any DNAv6 procedures [RFC6059], sending Router Solicitations and performing Duplicate Address Detection) when waking up.

5. Acknowledgements

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6. IANA Considerations

None.

7. Security Considerations

None.

8. References

8.1. Normative References

[RFC2119]   Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC4861]   Narten, T., Nordmark, E., Simpson, W., and H. Soliman, "Neighbor Discovery for IP version 6 (IPv6)", RFC 4861, September 2007.

   [RFC6059]   Krishnan, S. and G. Daley, "Simple Procedures for
               Detecting Network Attachment in IPv6", RFC 6059, DOI 10
               .17487/RFC6059, November 2010,
               <http://www.rfc-editor.org/info/rfc6059>.

8.2. URIs

   [1] https://code.google.com/p/android/issues/detail?id=32662

   [2] http://www.gossamer-threads.com/lists/nsp/ipv6/54641

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