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**Packet loss resiliency for Router Solicitations  
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Abstract

When an interface on a host is initialized, the host transmits Router

Solicitations in order to minimize the amount of time it needs to wait until the next unsolicited multicast Router Advertisement is received. In certain scenarios, these router solicitations transmitted by the host might be lost. This document specifies a mechanism for hosts to cope with the loss of the initial Router Solicitations. Furthermore, on some links, unsolicited multicast Router Advertisements are never sent and the mechanism in this document is intended to work even in such scenarios.

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## **1. Introduction**

As specified in [[RFC4861](#)], when an interface on a host is initialized, in order to obtain Router Advertisements quickly, a host

transmits up to MAX\_RTR\_SOLICITATIONS (3) Router Solicitation messages, each separated by at least RTR\_SOLICITATION\_INTERVAL (4) seconds. In certain scenarios, these router solicitations transmitted by the host might be lost.

The generic scenario is that the interface on the host comes up before it gets access to a router. Examples include:

- a. The host is connected to a bridged residential gateway over Ethernet or WiFi. LAN connectivity is achieved at interface initialization, but the upstream WAN connectivity is not active yet. In this case, the host just gives up after the initial RS retransmits.
- b. Access networks/links that turn off periodic RAs and only send RAs in response to RSs. In this case, if the link between the Access Point (AP) and the host comes up before the link between the AP and the Controller/Router, the host will never be able to connect. This technique of turning off periodic RAs is commonly used in several wireless LAN and datacenter networks to reduce the amount of multicast traffic.
- c. Links that are not multicast capable. In this case, sending an RA can only be triggered by an RS (as is the case, for instance, on ISATAP [[RFC5214](#)] links).

Once the initial RSs are lost, the host gives up and assumes that there are no routers on the link as specified in [Section 6.3.7 of \[\[RFC4861\]\(#\)\]](#). The host will not have any form of Internet connectivity until the next unsolicited multicast Router Advertisement is received. These Router Advertisements are transmitted at most MaxRtrAdvInterval seconds apart (maximum value 1800 seconds). Thus in the worst case scenario a host would be without any connectivity for 30 minutes. In general, the delay may be unacceptable in some scenarios.

### **1.1. Conventions used in this document**

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. Proposed algorithm

To achieve resiliency to packet loss, the host needs to continue retransmitting the Router Solicitations until it receives a Router Advertisement, or until it is willing to accept that no router exists. If the host continues retransmitting the RSs at RTR\_SOLICITATION\_INTERVAL second intervals, it may cause excessive network traffic if a large number of such hosts exists. To achieve resiliency while keeping the aggregate network traffic low, the host can use some form of exponential backoff algorithm to retransmit the RSs.

Hosts complying to this specification MUST use the exponential backoff algorithm for retransmits that is described in [Section 14 of \[RFC3315\]](#) in order to continuously retransmit the Router Solicitations until a Router Advertisement is received. The hosts SHOULD use the following variables as input to the retransmission algorithm:

```
IRT  4 seconds
MRT  3600 seconds
MRC  0
MRD  0
```

The initial value IRT was chosen to be in line with the current retransmission interval (RTR\_SOLICITATION\_INTERVAL) that is specified by [\[RFC4861\]](#) and the maximum retransmission time MRT was chosen to be in line with the new value of SOL\_MAX\_RT as specified by [\[SOLMAXRT\]](#). This is to ensure that the short term behavior of the RSs is similar to what is experienced in current networks, and longer term persistent retransmission behavior trends towards being similar to that of DHCPv6 [\[RFC3315\]](#) [\[SOLMAXRT\]](#).

### 2.1. Stopping the retransmissions

On multicast-capable links, the hosts following this specification SHOULD stop retransmitting the RSs when Router Discovery is successful (i.e. an RA with a non-zero Router Lifetime that results in a default route is received). Hosts MAY continue retransmitting the RSs even after router discovery is successful. If the host continues to retransmit RSs, it is RECOMMENDED that such retransmissions be rate-limited to one every MRT. If an RA is received from a router and it does not result in a default route (i.e. Router Lifetime is zero) the host MUST continue retransmitting the RSs.

On non-multicast links, the hosts following this specification MUST continue retransmitting the RSs even after an RA that results in a





default route is received. This is required because, in such links, sending an RA can only be triggered by an RS. Please note that such links have special mechanisms for sending RSeS as well. e.g. The mechanism specified in [Section 8.3.4.](#) of ISATAP [[RFC5214](#)] unicasts the RSeS to specific routers.

### **3. Configuring the use of retransmissions**

Implementations of this specification MAY provide a configuration option to enable or disable the use of such potentially infinite retransmissions. If the implementation provides such a configuration option, it MUST be able to enable/disable retransmissions on a per-interface basis.

### **4. Known Limitations**

When an IPv6-capable host attaches to a network that does not have IPv6 enabled, it transmits 3 (MAX\_RTR\_SOLICITATIONS) Router Solicitations as specified in [[RFC4861](#)]. If it receives no Router Advertisements, it assumes that there are no routers present on the link and it ceases to send further RSs. With the mechanism specified in this document, the host will continue to retransmit RSs indefinitely at the rate of approximately 1 RS per hour. It is unclear how to differentiate between such a network with no IPv6 routers and a link where an IPv6 router is temporarily unreachable but could become reachable in the future.

### **5. IANA Considerations**

This document does not require any IANA actions.

### **6. Security Considerations**

This document does not present any additional security issues beyond those discussed in [[RFC4861](#)].

### **7. Acknowledgements**

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## **8. References**

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### **8.2. Informative References**

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