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Back-off SPF algorithm for link state IGP  
draft-decraene-rtgwg-backoff-algo-00

## Abstract

This document defines a standard algorithm to back-off link-state IGP SPF computations.

This improves interoperability by reducing the probability and/or duration of transient forwarding loops during the IGP convergence in the area/level when the network reacts to multiple consecutive events.

## Requirements Language

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 [RFC 2119](#) [[RFC2119](#)].

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## 1. Introduction

Link state IGP, such as IS-IS [[IS010589-Second-Edition](#)] and OSPF [[RFC2328](#)], performs distributed computation on all nodes of the area/level. In order to have consistent routing tables across the network, such distributed computation requires that all routers have the same vision of the network (Link State DataBase (LSDB)) and perform their computation at the same time.

In general, when the network is stable, there is a desire to compute the new SPF as soon as the failure is known, in order to quickly route around the failure. However, when the network is experiencing multiple consecutive failures over a short period of time, there is a desire to limit the frequency of SPF computations. Indeed, this allow reducing the control plane resources used by IGP and all protocols/sub system reacting on it such as LDP, RSVP-TE, BGP, Fast ReRoute computations, FIB updates..., reduce the churn on nodes and in the network, in particular reduce side effects such as micro-loops which may happen during each IGP convergence.

To allow for this, some back-off algorithm have been implemented. Different implementations choose different algorithms, hence in a multi-vendor network, it's not possible to enforce that all routers triggers their SPF computation after the same waiting delay. This situation increases the average differential delay between routers end of RIB computation. It also increases the probability that different routers compute their RIB based on a different LSDB. Both increases the probability and/or duration of micro-loops.

To allow for multi-vendors networks having all the routers delaying their SPF for the same duration, this document specifies a standardized algorithm. The algorithm is proposed based on its popularity on existing implementations and its large deployed base.

It's not implied that this algorithm is the best. Implementations may offer alternative optional algorithms.

## [2.](#) Exponential back off algorithm

This backoff algorithm introduces a delay between the event triggering a new RIB computation and the start of the computation.

The initial wait time is set to INITIAL\_WAIT.

Subsequent wait times are exponentially delayed by INCREMENTAL\_WAIT, 2\*INCREMENTAL\_WAIT, 4\* INCREMENTAL\_WAIT, 8\* INCREMENTAL\_WAIT... up to reaching the maximum value MAX\_WAIT.

If no new trigger is received for two times MAX\_WAIT\_TIME, the delay is set back to INITIAL\_WAIT.

The back off algorithm makes no difference regarding the type of computation performed to compute the updated RIB. For example no distinction is made between a full SPF, an incremental SPF or a PRC computation.

## [3.](#) Parameters

INITIAL\_WAIT SHOULD be configurable from 0 ms to at least 5 s.

INCREMENTAL\_WAIT SHOULD be configurable from 0 ms to at least 5 s.

MAX\_WAIT SHOULD be configurable from 0 ms to at least 10 s.

In this version of the draft, it's proposed to not define default values because such values are subject to change over time as hardware and software improve and as customers requirements increase. In addition, such timers may be very network dependant.

## [4.](#) Impact on micro-loops

Micro-loops during IGP convergence are due to a non synchronized or non ordered update of the forwarding information tables (FIB) [RFC](#)

[5715](#) [[RFC5715](#)] [RFC 6976](#) [[RFC6976](#)] draft.litkowski-rtgwg-spf-uloop-pb-statement [[I-D.litkowski-rtgwg-spf-uloop-pb-statement](#)]. FIB are installed after multiple steps such as SPF wait time, SPF computation, FIB distribution and FIB update. This document only address the first contribution. This standardized procedure reduces the probability and/or duration of micro-loops when the IGP experience multiple consecutive events. It does not remove all micro-loops. However, it is beneficial and its cost seems limited compared to full solutions such as [RFC 5715](#) [[RFC5715](#)] or [RFC 6976](#) [[RFC6976](#)].

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## [5.](#) IANA Considerations

No IANA actions required.

## [6.](#) Security considerations

This document has no impact on the security of the IGP.

## [7.](#) Acknowledgements

We would like to acknowledge Hannes Gredler and Les Ginsberg for the discussions related to this document.

## [8.](#) References

### [8.1.](#) Normative References

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