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IS-IS Traffic Engineering Extensions For Microburst
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Abstract

This document defines a new IS-IS sub-TLV to advertise microburst-related statistics on links, serving as a supplement to RFC 8570(IS-IS Traffic Engineering (TE) Metric Extensions). RFC 8570 specifies steady-state TE performance metrics (e.g., latency, jitter, packet loss) but does not cover microburst-related information, which this document intends to address. Microbursts are short-duration, high-intensity traffic bursts that can cause transient congestion, increased latency, jitter, and packet loss, which are critical issues for latency-sensitive services. The proposed sub-TLV carries aggregated microburst statistics on a per-traffic-class basis, including total burst count, burst-induced drop metrics, and a configurable measurement interval, along with an Anomalous (A) bit to indicate abnormal microburst conditions. This extension enhances IS-IS Traffic Engineering capabilities by advertising link microburst statistics,enabling improved traffic engineering and path selection decisions for traffic.

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1. Introduction

1.1. Background

Latency-sensitive applications (e.g., 5G bearer networks, financial market data transmission, industrial control systems) have rapidly evolved, imposing increasingly stringent requirements on network performance. Unlike traditional best-effort services, these applications are highly sensitive to transient network anomalies—even short-duration congestion or packet loss can severely degrade service quality.

RFC 8570 defines steady-state Traffic Engineering (TE) metrics (e.g., latency, jitter, packet loss) for IS-IS, which effectively characterize long-term link performance but fail to address microbursts. Microbursts are short-duration, high-intensity traffic bursts that cause transient congestion, latency spikes, jitter, and packet loss—even when average link utilization remains low. This gap

in RFC 8570 means network operators lack visibility into microburst-related issues when making TE path selection decisions, which can hinder performance optimization for latency-sensitive services.

To fill this gap, this document extends RFC 8570 by adding microburst visibility to the IS-IS TE framework, while adhering to RFC 8570's core design principles for backward compatibility and interoperability.

Modern network devices now include hardware-level capabilities to monitor microbursts with high precision: millisecond (ms)-level sampling of port/queue traffic enables accurate detection of microbursts, without the need for active probe packets (e.g., ICMP/ TWAMP) that introduce extra bandwidth overhead or probe-induced interference. This native hardware support makes it feasible to collect aggregated microburst statistics and advertise them via a new IS-IS sub-TLV— enabling data-driven TE path selection for latency-sensitive services.

1.2. Requirements Analysis

The primary motivation for this extension is to address the limitations of existing IS-IS TE metrics by providing microburst visibility, enabling two key use cases that are critical for modern network operations.

First, for latency and jitter-sensitive services (e.g., financial data feeds, 5G real-time services, and industrial control signals), path selection must prioritize links with minimal microburst activity. Microbursts can cause transient spikes in latency and jitter, which are unacceptable for these services. By advertising microburst statistics via IS-IS, Node or controller can prune links with frequent or severe microbursts from path calculations, ensuring that latency-sensitive traffic is routed over stable, low-burst links.

Second, for non-urgent, best-effort (BE) traffic (e.g., system updates, massive file transfers, and non-critical background tasks), network operators need the ability to throttle or pause such traffic when microbursts on a link increase.

To address these requirements, the proposed extension must meet the following key criteria:

a.Carry aggregated microburst statistics to avoid excessive IS-IS flooding (microbursts are real-time events but must not be advertised per-event).

b.Be compatible with existing IS-IS TE extensions and non-supporting nodes (which should ignore the new sub-TLV), in accordance with IS-IS processing rules.

c.Provide actionable metrics that are engineering-feasible to measure and useful for path selection and traffic management.

1.3. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

2. Unidirectional Microburst Statistics Sub-TLV Definition

A microburst is defined as a transient, high-intensity traffic burst that causes instantaneous queue occupancy for a specific traffic class to exceed a locally configured threshold. Microbursts can have significant negative impacts on network performance, including transient congestion, unexpected packet loss, latency spikes, and increased jitter-even when average link utilization remains low, which can severely degrade the quality of latency-sensitive services such as 5G real-time services and financial data transmission.

This document defines a new IS-IS sub-TLV, the Microburst Statistics Sub-TLV, which is advertised within IS-IS TLVs 22 (Extended IS Reachability), 222 (Extended IS Reachability for IPv6), 23 (IS Neighbor Reachability), 223 (IS Neighbor Reachability for IPv6), 141 (AS Level Reachability), and 25 (Protocols Supported). For each link, multiple Microburst Statistics Sub-TLVs may be included (one per traffic class, as microbursts are class-isolated)

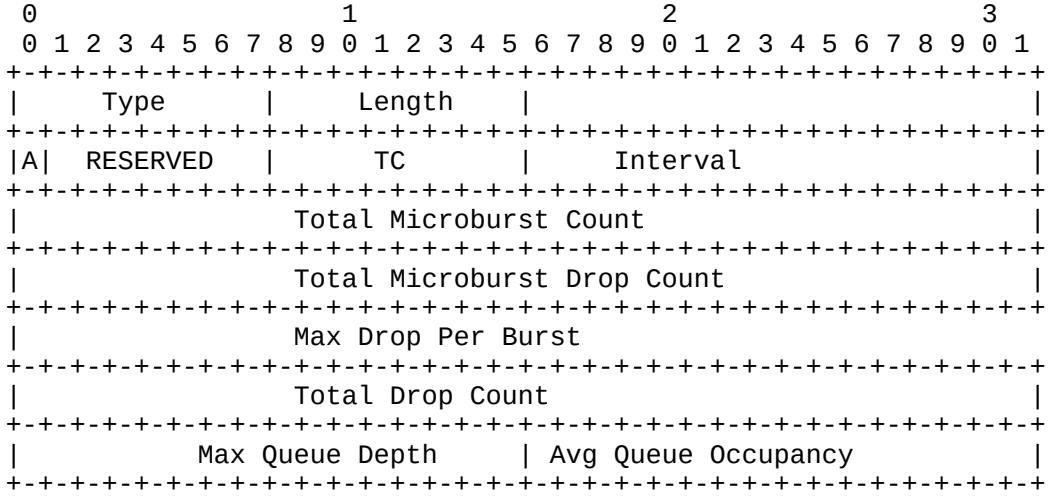

Figure 1: Microburst Statistics Sub-TLV Format

The Microburst Statistics Sub-TLV is structured as an IS-IS TE sub-TLV, with the following fields defined below:

Type : To Be Determined (TBD) by IANA.

A bit: This field represents the Anomalous (A) bit. The A bit is set when the measured total microburst count value parameter exceeds its configured maximum threshold. The A bit is cleared when the measured value falls below its configured reuse threshold. If the A bit is cleared, the sub-TLV represents steady-state link performance.

Reserved : This field is reserved for future use. It MUST be set to 0 when sent and MUST be ignored when received.

Length : 24.

TC : Traffic Class. Indicates the traffic class to which the microburst statistics apply (0-255), commonly 0-255.

Interval : Measurement interval (in seconds), during which microburst statistics are sampled and aggregated. The interval is configurable per node/link.

Total Microburst Count : Total number of microbursts detected on the link for the specified TC during the measurement interval.

Total Microburst Drop Count : Number of microbursts that caused packet loss on the link for the specified TC during the measurement interval.

Max Drop Per Burst : Maximum number of packets lost during a single microburst event for the specified TC during the measurement interval. This metric is useful for quantifying the severity of individual microburst events.

Total Drop Count : Total number of packets lost due to all microburst events for the specified TC during the measurement interval. This metric provides a cumulative measure of microburst impact.

Max Queue Depth : Maximum queue depth (in bytes) observed on the link for the specified TC at the time microburst-induced packet loss occurred. This metric directly reflects the queue accumulation level that triggered drop events during microbursts.

Avg Queue Occupancy : Average queue occupancy in bytes for the TC during the measurement interval.

3. Measurement and Advertisement Rules

3.1. Measurement Rules

a. Microburst statistics MUST be sampled and aggregated over the configured interval.Microbursts MUST NOT be advertised on a per-event basis, as this would cause excessive IS-IS LSP flooding and network instability.

b. Microburst detection and measurement can be performed per-traffic-class, as different traffic classes are isolated in separate queues and experience microbursts independently.

c. The queue occupancy threshold for microburst detection is configurable per node/link, but SHOULD be consistent across the network to ensure consistent statistics interpretation.

d. Packet loss attributed to microbursts MUST be distinguished from loss due to other causes (e.g., link errors) to ensure accurate measurement of microburst impact.

3.2. Advertisement Rules

a. For each link, burst detection can be configured on demand for different TC, and the detection results are transmitted independently.

b. Under normal conditions, the sub-TLV MUST be advertised once per measurement interval,regardless of the number of microbursts detected.However, if microburst statistics change abruptly,the node MUST advertise the updated sub-TLV immediatelywithout waiting for the end of the interval.

c. If a node receives multiple Microburst Statistics Sub-TLVs for the same link, same TC, and same measurement Interval, it SHOULD select the first advertisement in the lowest-numbered LSP.

d. Nodes that do not recognize the Microburst Statistics Sub-TLV MUST ignore it, in accordance with IS-IS processing rules (RFC 8918), ensuring backward compatibility with existing networks.

4. Security Considerations

The Microburst Statistics Sub-TLV does not introduce new security risks beyond those already present in IS-IS TE extensions (RFC 5305, RFC 8570). False or malicious advertisement of microburst statistics could lead to incorrect path selection or traffic management decisions. To mitigate this risk, IS-IS authentication (RFC 5304) SHOULD be enabled to ensure the integrity and authenticity of LSPs containing the Microburst Statistics Sub-TLV, consistent with IETF security best practices for IS-IS extensions.

5. IANA Considerations

IANA is requested to assign a Type value for the Microburst Statistics Sub-TLV in the IS-IS Traffic Engineering Sub-TLVs registry (under the "IS-IS Sub-TLVs" heading). The recommended Type value is TBD (to be assigned by IANA), following the registration process defined in RFC 5305 for IS-IS TE sub-TLVs.

Type	Description
TBD	Unidirectional Microburst statistics

Figure 2: IS-IS TE Sub-TLV Type Assignment for Microburst Statistics

6. References

6.1. Normative References

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