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Diameter Congestion and Filter Attributes
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Abstract

This document defines optional ECN and filter related attributes that can be used for improved traffic identification, support of ECN and minimized filter administration within Diameter.

RFC 5777 defines a Filter-Rule AVP that accommodates extensions for classification, conditions and actions. It does not support traffic identification for packets using Explicit Congestion Notification as defined in RFC 3168 and does not provide specific actions when the flow(s) described by the Filter-Rule are congested.

A Filter-Rule can describe multiple flows but not the exact number of flows. Flow count and other associated data (e.g. packets) is not captured in Accounting applications, leaving administrators without useful information regarding the effectiveness or understanding of the filter definition.

These optional attributes are forward and backwards compatible with RFC 5777.

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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This Internet-Draft will expire on February 14, 2014.

Table of Contents

1. Introduction

Two optional Explicit Congestion Notification (ECN) [RFC3168] related AVPs are specified in the document. The first AVP provides direct support for ECN [RFC3168] in the IP header and the second AVP provides the ability to define alternate traffic treatment when congestion is experienced.

This document also defines two optional AVPs, Flow-Count and Packet-Count, used for conveying flow information within the Diameter protocol [RFC6733]. These AVPs were found to be useful for a wide range of applications. The AVPs provide a way to convey information of the group of flows described by the Filter-Rule, IPFilterRule or other Diameter traffic filters.

The semantics and encoding of all AVPs can be found in Section 3.

Such AVPs are, for example, needed by some ECN applications to determine the number of flows congested or used by administrators to determine the impact of filter definitions.

Additional parameters may be defined in future documents as the need arises. All parameters are defined as Diameter-encoded Attribute Value Pairs (AVPs), which are described using a modified version of the Augmented Backus-Naur Form (ABNF), see [RFC6733]. The data types are also taken from [RFC6733].

2. Terminology and Abbreviations

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 [RFC2119].

3. ECN-IP-Codepoint, Congestion-Treatment and Filter Attributes

3.1. ECN-IP-Codepoint AVP

The ECN-IP-Codepoint AVP (AVP Code TBD) is of type Enumerated and specifies the Explicit Congestion Notification codepoint values to match in the IP header.

Value	Binary	Keyword	References
0	00	Non-ECT (Not ECN-Capable Transport)	[RFC3168]
1	01	ECT(1) (ECN-Capable Transport)	[RFC3168]
2	10	ECT(0) (ECN-Capable Transport)	[RFC3168]
3	11	CE (Congestion Experienced)	[RFC3168]

When this AVP is used for classification in the Filter-Rule it MUST be part of Classifier Grouped AVP as defined in RFC5777.

3.2. Congestion-Treatment AVP

The Congestion-Treatment AVP (AVP Code TBD) is of type Grouped and indicates how congested traffic, i.e., traffic that has Explicit Congestion Notification Congestion Experienced marking set or some other administratively defined criteria, is treated. In case the Congestion-Treatment AVP is absent the treatment of the congested traffic is left to the discretion of the node performing QoS treatment.

```
Congestion-Treatment ::= < AVP Header: TBD >
                         { Treatment-Action }
                         [ QoS-Profile-Template ]
                         [ QoS-Parameters ]
                       * [ AVP ]
```

Treatment-Action, QoS-Profile-Template and QoS-Parameters are defined in [RFC5777]. The Congestion-Treatment AVP is an action and MUST be an attribute of the Filter-Rule Grouped AVP as defined in RFC5777.

3.3. Flow-Count AVP

The Flow-Count AVP (AVP Code TBD) is of type Unsigned64.

It indicates the number of protocol specific flows. The protocol is determined by the filter (e.g. IPFilterRule, Filter-Id, etc.).

3.4. Packet-Count AVP

The Packet-Count AVP (AVP Code TBD) is of type Unsigned64.

It indicates the number of protocol specific packets. The protocol is determined by the filter (e.g. IPFilterRule, Filter-Id, etc.).

4. IANA Considerations

4.1. AVP Codes

IANA allocated AVP codes in the IANA-controlled namespace registry specified in Section 11.1.1 of [RFC6733] for the following AVPs that are defined in this document.

AVP	AVP Code	Section Defined	Data Type
ECN-IP-Codepoint	TBD	3.1	Enumerated
Congestion-Treatment	TBD	3.2	Grouped
Flow-Count	TBD	3.3	Unsigned64
Packet-Count	TBD	3.4	Unsinged64

5. Examples

The following examples illustrate the use of the AVPs defined in this draft.

5.1. Classifier Example

The Classifier AVP (AVP Code 511) specified in RFC 5777 is a grouped AVP that consists of a set of attributes that specify how to match a packet. The addition of the ECN-IP-Codepoint is shown here.

```
   Classifier ::= < AVP Header: 511 >
                  { Classifier-ID }
                  [ Protocol ]
                  [ Direction ]
                  [ ECP-IP-Codepoint ]
                * [ From-Spec ]
                * [ To-Spec ]
                * [ Diffserv-Code-Point ]
                  [ Fragmentation-Flag ]
                * [ IP-Option ]
                * [ TCP-Option ]
                  [ TCP-Flags ]
                * [ ICMP-Type ]
                * [ ETH-Option ]
                * [ AVP ]
```

Setting the ECP-IP-Codepoint value to 'CE' would permit the capture of CE flags in the Flow.

Another Classifier with the ECP-IP-Codepoint value of 'ECT' could be specified and, when coupled with the Flow-Count AVP, reports the number of ECT capable flows.

5.2. Diameter Credit Control (CC) with Congestion Information

Diameter nodes using Charge Control can use the Congestion-Treatment AVP to trigger specific actions when congestion occurs. This is similar to the Excess-Treatment Action. The ability to detect when congestion occurs is specific to the AVPs in the Filter-Rule and Diameter Client and is no different than how 'Excess' can be determined for Excess-Treatment. If Excess-Treatment or Congestion-Treatment has occurred Diameter Clients may autonomously send CCRs during the Service Delivery session as interim events. This is shown in Figure 1.

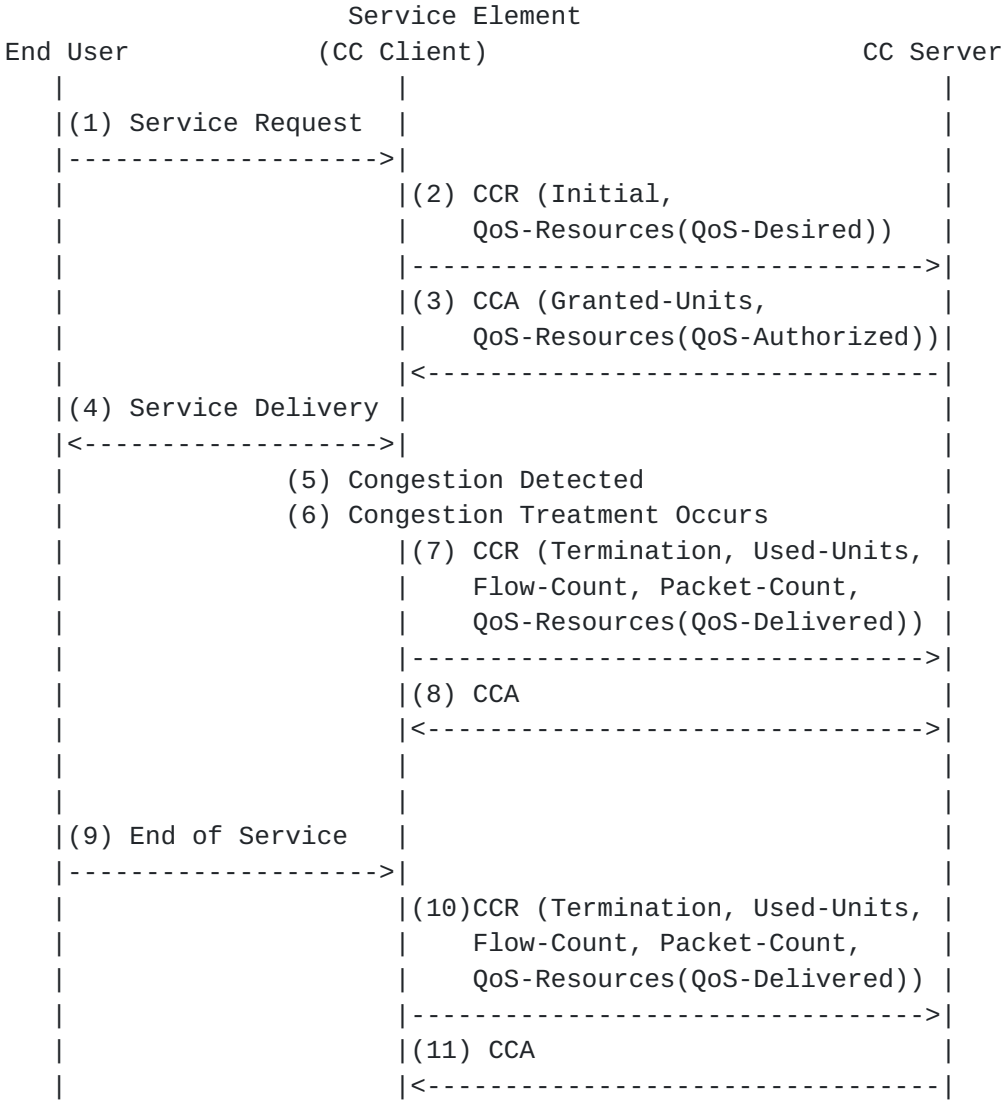

Figure 1: Example of a Diameter Credit Control with Congestion Information

The 'Used-Service-Units' described in RFC5777 examples is customarily a Service-Units, Time-Units or Byte-Count AVP. This is insufficient to represent network state and does not differentiate between throughput and good-put (good or quality throughput) even though the filters may imply good or poor throughput.

Flow-Count and Packet-Count AVPs defined in this document could be sent with a CCR when the triggering event is related to Congestion-Treatment. This provides the CC Server with a better view of the type of congested traffic for improved decision making and Charging. Sending such AVPs under any condition permits rudimentary traffic profiling regardless of network conditions. For instance, low byte per packet counts is indicative of web traffic and high byte counts per packet with a small number of flows may be indicative of video traffic. Enriched reporting described here provides relief from Deep Packet Inspection load and loss of information as traffic becomes increasingly encrypted.

Some services, e.g. Streaming Services, limit the number of flows, Flow-Count, as opposed to other Units, i.e. Byte-Count. In such a case the Flow-Count AVP may be used in place of Service-Units.

6. Security Considerations

The document does not raise any new security concerns. This document describes an extension of RFC5777 that introduces a new filter parameter applied to ECN as defined by [RFC3168]. It also defines a new Grouped AVP that expresses what action to take should congestion be detected. The Grouped AVP reuses attributes defined in RFC5777.

The security considerations of the Diameter protocol itself have been discussed in RFC 6733 [RFC6733]. Use of the AVPs defined in this document MUST take into consideration the security issues and requirements of the Diameter base protocol.

7. Acknowledgements

We would like to thank Avi Lior for his guidance and feedback during the development of this specification.

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.

[RFC3168] Black, D., Floyd, S., and K. Ramakrishnan, "The Addition of Explicit Congestion Notification (ECN) to IP", RFC 3168, September 2001.

[RFC6733] Fajardo, V., Arkko, J., Loughney, J., and G. Zorn, "Diameter Base Protocol", RFC 6733, October 2012.

[RFC5777] Korhonen, J., Tschofenig, H., Arumaithurai, M., Lior, A. and Jones, M. Ed., "Traffic Classification and Quality of Service (QoS) Attributes for Diameter", RFC 5777, February 2010.

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