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Quality of Service Attributes for Diameter
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Abstract

This document extends the functionality of the Diameter Base protocol and Diameter NASREQ with respect to their ability to convey Quality of Service information as part of the QoSFilterRule Attribute Value Pair (AVP).

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1. Introduction

This document extends the functionality of the Diameter Base protocol, Diameter Credit Control and Diameter NASREQ with respect to their ability to convey Quality of Service information as part of the QoS-Resources Attribute Value Pair (AVP) defined in [I-D.ietf-dime-diameter-qos]. It extends the functionality of the above-mentioned Diameter applications to enable it to have basic QoS support for environments where the usage of the Diameter QoS application is not applicable.

2. Terminology

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].

3. Commands, AVPs and Advertising Application Support

3.1. Command Codes

This document re-uses the Diameter Base protocol [RFC3588], NASREQ [RFC4072] and Diameter EAP commands [RFC4005]. The following commands are used to carry QoS related AVPs:

Command-Name	Abbrev.	Code	Reference	Application
Diameter-EAP-Request	DER	268	RFC 4072	QoS
Diameter-EAP-Answer	DEA	268	RFC 4072	QoS
Credit-Control-Request	CCR	272	RFC 4006	QoS
Credit-Control-Answer	CCA	272	RFC 4006	QoS
AA-Request	AAR	265	RFC 4005	QoS
AA-Answer	AAA	265	RFC 4005	QoS

Figure 1: QoS Integrated Application Command Codes

When the Re-Auth-Request (RAR), Re-Auth-Answer (RAA), Session-Termination-Request (STR), Session-Termination-Answer (STA), Abort-Session-Request (ASR), Abort-Session-Answer (ASA), Accounting-Request (ACR), and Accounting-Answer (ACA) commands are used together with the Diameter QoS Integrated application, they follow the rules in

NASREQ [RFC4005], EAP [RFC4072], Credit-Control [RFC4006] and BASE [RFC3588]. The accounting commands use Application Identifier value of 3 (Diameter Base Accounting); the others use 0 (Diameter Common Messages).

3.2. Diameter-EAP-Request (DER)

The Diameter-EAP-Request (DER) command [RFC4072], indicated by the Command-Code field set to 268 and the 'R' bit set in the Command Flags field, may be sent by the NAS to the Diameter server providing network access authentication and authorization services. At the same time with the network access authentication and authorization the NAS MAY request the Diameter QoS server, to authorize for provision of QoS resources. In that case the DER command MAY also carry the QoS-Resources AVPs.

The message format is the same as defined in [RFC4072] with an addition of Diameter QoS specific AVPs. Figure 2 shows the DER message used with the Diameter QoS AVPs:

```
<Diameter-EAP-Request> ::= < Diameter Header: 268, REQ, PXY >
                           < Session-Id >
                           { Auth-Application-Id }
                           { Origin-Host }
                           { Origin-Realm }
                           { Destination-Realm }
                           { Auth-Request-Type }

                           [ Destination-Host ]
                           [ User-Name ]

                         * [ QoS-Resources ]

                           ...
                         * [ AVP ]
```

Figure 2: Diameter EAP Request Command

3.3. Diameter-EAP-Answer (DEA)

The Diameter-EAP-Answer (DEA) message defined in [RFC4072], indicated by the Command- Code field set to 268 and 'R' bit cleared in the Command Flags field is sent in response to the Diameter-EAP-Request message (DER). If the QoS service is successfully authorized and the Diameter server was able to fulfill the QoS Authorization request (if needed) then the response MAY include the QoS-Resources AVPs.

The message format is the same as defined in [RFC4072] with an addition of Diameter QoS specific AVPs. Figure 3 shows the DEA message used with the Diameter QoS AVPs:

```
<Diameter-EAP-Answer> ::= < Diameter Header: 268, PXY >
                          < Session-Id >
                          { Auth-Application-Id }
                          { Auth-Request-Type }
                          { Result-Code }
                          { Origin-Host }
                          { Origin-Realm }

                        * [ QoS-Resources ]


                          [ Session-Timeout ]
                          [ Authz-Session-Lifetime ]
                          [ Authz-Grace-Period ]
                          [ User-Name ]
                          ...
                        * [ AVP ]
```

Figure 3: Diameter EAP Answer Command

3.4. Credit-Control-Request (CCR)

The Credit-Control-Request (CCR) command [RFC4006], indicated by the Command-Code field set to 272 and the 'R' bit set in the Command Flags field, may be sent by the NAS to the Diameter-QoS server to request QoS credit authorization for a given QoS provisioning request. In that case the CCR command MAY also carry the QoS-Resources AVPs.

The message format is the same as defined in [RFC4006] with an addition of Diameter QoS specific AVPs. Figure 4 shows the CCR message used with the Diameter QoS AVPs:

```
<Credit-Control-Request> ::= < Diameter Header: 272, REQ, PXY >
                             < Session-Id >
                             { Auth-Application-Id }
                             { Origin-Host }
                             { Origin-Realm }
                             { Destination-Realm }
                             { Auth-Request-Type }
                             { Service-Context-Id }
                             { CC-Request-Type }
                             { CC-Request-Number }
                             [ Destination-Host ]
                             [ User-Name ]

                           * [ QoS-Resources ]

                             ...
                           * [ AVP ]
```

Figure 4: Credit Control Request Command

3.5. Credit-Control-Answer (CCA)

The Credit-Control-Answer (CCA) command [RFC4006], indicated by the Command-Code field set to 272 and the 'R' bit set in the Command Flags field is sent in response to the CC-Request (CCR) message to acknowledge a CC-Request command. If the Diameter QoS server was able to fulfill the QoS request (if needed) then the response MAY include the QoS-Resources AVPs.

The message format is the same as defined in [RFC4006] with an addition of Diameter QoS specific AVPs. Figure 5 shows the CCA message used with the Diameter QoS AVPs:

```
<Credit-Control-Answer> ::= < Diameter Header: 272, PXY >
                            < Session-Id >
                            { Result-Code }
                            { Origin-Host }
                            { Origin-Realm }
                            { Auth-Application-Id }
                            { CC-Request-Type }
                            { CC-Request-Number }
                            [ User-Name ]
                            [ CC-Session-Failover ]
                            [ CC-Sub-Session-Id ]
                            [ Acct-Multi-Session-Id ]
                            [ Origin-State-Id ]
                            [ Event-Timestamp ]


                          * [ QoS-Resources ]

                            ...
                          * [ AVP ]
```

Figure 5: Credit Control Answer Command

3.6. AA-Request (AAR)

The AA-Request (AAR) message, indicated by the Command-Code field set to 265 and 'R' bit set in the Command Flags field, may be sent by the NAS to the Diameter server providing network access configuration services. At the same time with the network access configuration the NAS MAY request QoS Resources Authorization, to authorize for the provision of QoS. In that case the AAR command MAY also carry the QoS-Resources AVPs.

The message format is the same as defined in [RFC4005] with an addition of Diameter QoS specific AVPs. Figure 6 shows the AAR message used with the Diameter QoS AVPs:

```
<AA-Request> ::= < Diameter Header: 265, REQ, PXY >
                 < Session-Id >
                 { Auth-Application-Id }
                 { Origin-Host }
                 { Origin-Realm }
                 { Destination-Realm }
                 { Auth-Request-Type }

               * [ QoS-Resources ]

                 [ Destination-Host ]
                 ...
               * [ AVP ]
```

Figure 6: AA Request Command

3.7. AA-Answer (AAA)

The AA-Answer (AAA) message, indicated by the Command-Code field set to 265 and 'R' bit cleared in the Command Flags field is sent in response to the AA-Request (AAR) message for confirmation of the result of QoS provisioning. If the QoS service is successfully authorized and the Diameter server was able to fulfill the QoS provisioning request (if needed) then the response MAY include the QoS-Resources AVPs.

The message format is the same as defined in [RFC4005] with an addition of Diameter QoS specific AVPs. Figure 7 shows the AAA message used with the Diameter QoS AVPs:

```
<AA-Answer> ::= < Diameter Header: 265, PXY >
                < Session-Id >
                { Auth-Application-Id }
                { Auth-Request-Type }
                { Result-Code }
                { Origin-Host }
                { Origin-Realm }

              * [ QoS-Resources ]

                [ Authz-Session-Lifetime ]
                [ Authz-Grace-Period ]

                [ User-Name ]
                [ Session-Timeout ]
                ...
              * [ AVP ]
```

Figure 7: AA Answer Command

4. Diameter QoS Defined AVPs

The following table lists the Diameter AVPs used by this document, their AVP code values, types, possible flag values, and whether the AVP may be encrypted.

Attribute Name	AVP Code	Section Defined	Data Type	AVP Flag rules: MUST	MAY	SHLD NOT	MUST NOT
QoS-Flow-State	TBD	7.4	Enumerated		P		V
QSPEC	TBD	7.4	OctetSTring		P		V
QoS-ID	TBD	7.4	Unsigned32		P		V
ExtendedQoSFilterRule	TBD	7.4	OctetString		P		V
QoS-Resources	TBD	7.4	Grouped		P		V

M - Mandatory bit. An AVP with "M" bit set and its value MUST be supported and recognized by a Diameter entity in order the message, which carries this AVP, to be accepted.
P - Indicates the need for encryption for end-to-end security.
V - Vendor specific bit that indicates whether the AVP belongs to a address space.

The above-mentioned attributes are defined in [I-D.ietf-dime-diameter-qos].

5. Examples

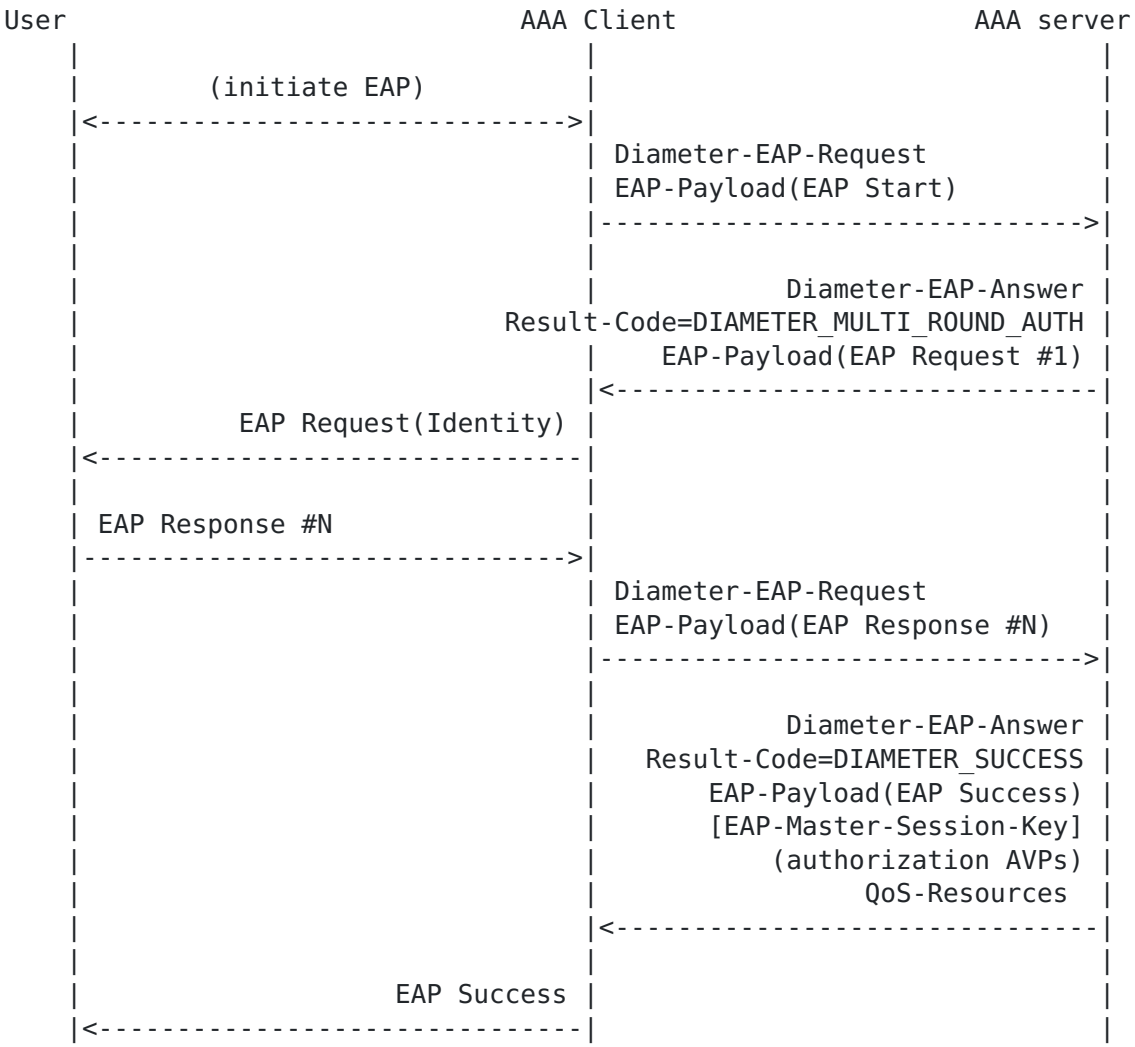

Figure 9: Example of AAA Server providing QoS Information to AAA Client

6. AVP Occurrence Tables

6.1. DER and DEA Commands AVP Table

The following table lists the additional Diameter QoS specific AVPs that may be present in the DER and DEA Commands, as defined in this document and in [RFC4072].

Attribute Name	Command-Code	
	DER	DEA
QoS-Resources	0+	0+

Figure 10: DER and DEA Commands AVP table

6.2. CCR and CCA Commands AVP Table

The following table lists the additional Diameter QoS specific AVPs that may be present in the CCR and CCA Commands, as defined in this document and in [RFC4006].

Attribute Name	Command-Code	
	CCR	CCA
QoS-Resources	0+	0+

Figure 11: CCR and CCA Commands AVP table

6.3. AAR and AAA Commands AVP Table

The following table lists the additional Diameter QoS specific AVPs that may be present in the AAR and AAA Commands, as defined in this document and in [RFC4005].

Attribute Name	Command-Code AAR	Command-Code AAA
QoS-Resources	0+	0+

Figure 12: AAR and AAA Commands AVP table

7. IANA Considerations

This document does not require actions by IANA.

8. Security Considerations

TBD

9. References

9.1. Normative References

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9.2. Informative References

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