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# Diameter Priority Attribute-Value Pairs

## Abstract

This document defines Attribute-Value Pair (AVP) containers for various priority parameters for use with Diameter and the Authentication, Authorization, and Accounting (AAA) framework. The parameters themselves are defined in several different protocols that operate at either the network or application layer.

## Status of This Memo



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# 1. Introduction

This document defines a number of Attribute-Value Pairs (AVP) that can be used within the Diameter protocol [RFC6733] to convey a specific set of priority parameters. These parameters are specified in other documents, but are briefly described below. The corresponding AVPs defined in Section 3 are extensions to those defined in [RFC5866]. We note that all the priority fields associated with the AVPs defined in this document are extensible and allow for additional values beyond what may have already been defined or registered with IANA.

Priority influences the distribution of resources and, in turn, the QoS associated with that resource. This influence may be probabilistic, ranging between (but not including) 0% and 100%, or it may be in the form of a guarantee to either receive or not receive the resource.

Another example of how prioritization can be realized is articulated in Appendix A.3 (the Priority Bypass Model) of [RFC6401]. In this case, prioritized flows may gain access to resources that are never shared with non-prioritized flows.

## 1.1. Other Priority-Related AVPs

The 3rd Generation Partnership Project (3GPP) has defined several Diameter AVPs that support prioritization of sessions. The following AVPs are intended to be used for priority services (e.g., Multimedia Priority Service):

- Reservation-Priority AVP as defined in [ETSI]
- MPS-Identifier AVP as defined in [3GPPa]
- Priority-Level AVP (as part of the Allocation Retention Priority AVP) as defined in [3GPPb]
- Session-Priority AVP as defined in [3GPPc] and [3GPPd]

Both the Reservation-Priority AVP and the Priority-Level AVP can carry priority levels associated with a session initiated by a user. We note that these AVPs are defined from the allotment set aside for 3GPP for Diameter-based interfaces, and they are particularly aimed at IP Multimedia Subsystem (IMS) deployment environments. The above AVPs defined by 3GPP are to be viewed as private implementations operating within a walled garden. In contrast, the priority-related AVPs defined below in Section 3 are not constrained to IMS environments. The potential applicability or use-case scenarios that involve coexistence between the above 3GPP-defined priority-related AVPs and those defined below in Section 3 is for further study.

## 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 RFC 2119 [RFC2119].

## 3. Priority Parameter Encoding

This section defines a set of AVPs that correlates to priority fields defined in other protocols. This set of priority-related AVPs is for use with the Diameter QoS application [RFC5866] and represents a continuation of the list of AVPs defined in [RFC5624]. The syntax notation used is that of [RFC6733]. We note that the following subsections describe the prioritization field of a given protocol as well as the structure of the AVP corresponding to that field.

We stress that neither the priority-related AVPs, nor the Diameter protocol, perform or realize the QoS for a session or flow of packets. Rather, these AVPs are part of a mechanism to determine validation of the priority value.

### 3.1. Dual-Priority AVP

The Dual-Priority AVP (AVP Code 608) is a grouped AVP consisting of two AVPs, the Preemption-Priority and the Defending-Priority AVP. These AVPs are derived from the corresponding priority fields specified in the "Signaled Preemption Priority Policy Element" [RFC3181] of RSVP [RFC2205].

In [RFC3181], the Defending-Priority value is set when the reservation has been admitted by the RSVP protocol. The Preemption-Priority field (described in [RFC3181]) of a newly requested reservation is compared with the Defending-Priority value of a previously admitted flow. The actions taken based upon the result of this comparison are a function of local policy.

```
Dual-Priority  ::= < AVP Header: 608 >
            { Preemption-Priority }
            { Defending-Priority }
```

#### 3.1.1. Preemption-Priority AVP

The Preemption-Priority AVP (AVP Code 609) is of type Unsigned16. Higher values represent higher priority. The value encoded in this AVP is the same as the preemption-priority value that would be encoded in the signaled preemption priority policy element.

#### 3.1.2. Defending-Priority AVP

The Defending-Priority AVP (AVP Code 610) is of type Unsigned16. Higher values represent higher priority. The value encoded in this AVP is the same as the defending-priority value that would be encoded in the signaled preemption priority policy element.

### 3.2. Admission-Priority AVP

The Admission-Priority AVP (AVP Code 611) is of type Unsigned8. The admission priority associated with an RSVP flow is used to increase the probability of session establishment for selected RSVP flows. Higher values represent higher priority. A given admission priority is encoded in this information element using the same value as when encoded in the admission-priority parameter defined in Section 5.1 of [RFC6401].

### 3.3. SIP-Resource-Priority AVP

The SIP-Resource-Priority AVP (AVP Code 612) is a grouped AVP consisting of two AVPs, the SIP-Resource-Priority-Namespace and the SIP-Resource-Priority-Value AVP, which are derived from the corresponding optional header fields in [RFC4412].

```
SIP-Resource-Priority ::= < AVP Header: 612 >
               { SIP-Resource-Priority-Namespace }
               { SIP-Resource-Priority-Value }
```

#### 3.3.1. SIP-Resource-Priority-Namespace AVP

The SIP-Resource-Priority-Namespace AVP (AVP Code 613) is of type UTF8String. This AVP contains a string that identifies a unique ordered set of priority values as described in [RFC4412].

### 3.3.2. SIP-Resource-Priority-Value AVP

The SIP-Resource-Priority-Value AVP (AVP Code 614) is of type UTF8String. This AVP contains a string (i.e., a namespace entry) that identifies a member of a set of priority values unique to the namespace. Examples of namespaces and corresponding sets of priority values are found in [RFC4412].

## 3.4. Application-Level-Resource-Priority AVP

The Application-Level-Resource-Priority (ALRP) AVP (AVP Code 615) is a grouped AVP consisting of two AVPs, the ALRP-Namespace AVP and the ALRP-Value AVP.

```
Application-Level-Resource-Priority  ::= < AVP Header: 615 >
                                { ALRP-Namespace }
                                { ALRP-Value }
```

A description of the semantics of the parameter values can be found in [RFC4412] and in [RFC6401]. The registry set up by [RFC4412] provides string values for both the priority namespace and the priority values associated with that namespace. [RFC6401] modifies that registry to assign numerical values to both the namespace identifiers and the priority values within them. Consequently, SIP-Resource-Priority and Application-Level-Resource-Priority AVPs convey the same priority semantics, but with differing syntax. In the former case, an alpha-numeric encoding is used, while the latter case is constrained to a numeric-only value.

### 3.4.1. ALRP-Namespace AVP

The ALRP-Namespace AVP (AVP Code 616) is of type Unsigned16. This AVP contains a numerical value identifying the namespace of the application-level resource priority as described in [RFC6401].

### 3.4.2. ALRP-Value AVP

The ALRP-Value AVP (AVP Code 617) is of type Unsigned8. This AVP contains the priority value within the ALRP-Namespace, as described in [RFC6401].

# 4. Examples of Usage

Usage of the Dual-Priority, Admission-Priority, and Application-Level-Resource-Priority AVPs can all be illustrated by the same simple network scenario, although they would not all typically be used in the same network. The scenario is as follows:

A user with special authorization is authenticated by a Network Access Server (NAS), which acts as a client to a Diameter Server supporting the user's desired application. Once the user has authenticated, the Diameter Server provides the NAS with information on the user's authorized QoS, including instances of the Dual-Priority, Admission-Priority, and/or Application-Level-Resource-Priority AVPs.

Local policy governs the usage of the values conveyed by these AVPs at the NAS to decide whether the flow associated with the user's application can be admitted. If the decision is positive, the NAS forwards the authorized QoS values as objects in RSVP signaling. In particular, the values in the Dual-Priority AVP would be carried in the "Signaled Preemption Priority Policy Element" defined in [RFC3181], and the values contained in the Admission-Priority and Application-Level-Resource-Priority AVPs would be carried in the corresponding policy objects defined in [RFC6401]. Each subsequent node would make its own decision taking account of the authorized QoS objects including the priority-related objects, again governed by local policy. The example assumes that the user session terminates on a host or server in the same administrative domain as the NAS to avoid complications due to the restricted applicability of [RFC3181] and [RFC6401].

Local policy might for example indicate:

- which value to take if both Admission-Priority and Application-Level-Resource-Priority are present;

- which namespace or namespaces are recognized for use in Application-Level-Resource-Priority;

- which resources are subject to preemption if the values in Dual-Priority are high enough to allow it.

A scenario for the use of the SIP-Resource-Priority AVP will differ slightly from the previous one, in that the initial decision point would typically be a SIP proxy receiving a session initiation request containing a Resource-Priority header field and deciding whether to admit the session to the domain. Like the NAS, the SIP proxy would serve as client to a Diameter Server during the process of user authentication, and upon successful authentication would receive back from the Diameter Server AVPs indicating authorized QoS. Among these might be the SIP-Resource-Priority AVP, the contents of which would be compared with the contents of the Resource-Priority header field. Again, local policy would determine which namespaces to accept and the effect of a given priority level on the admission decision.

For the sake of our example, suppose now that the SIP proxy signals using RSVP to the border router that will be admitting the media flows associated with the session. (This, of course, makes a few assumptions on routing and knowledge of that routing at the proxy.) The SIP proxy can indicate authorized QoS using various objects. In particular, it can map the values from the Resource-Priority header field to the corresponding numeric values as defined by [RFC6401] and send it using the Application-Level Resource Priority Policy Element.

# 5. IANA Considerations

## 5.1. AVP Codes

IANA has allocated AVP codes for the following AVPs that are defined in this document.

| AVP Name | AVP Code | Section Defined | Data Type |
|---|---|---|---|
| Dual-Priority | 608 | 3.1 | Grouped |
| Preemption-Priority | 609 | 3.1.1 | Unsigned16 |
| Defending-Priority | 610 | 3.1.2 | Unsigned16 |
| Admission-Priority | 611 | 3.2 | Unsigned8 |
| SIP-Resource-Priority | 612 | 3.3 | Grouped |
| SIP-Resource-Priority-Namespace | 613 | 3.3.1 | UTF8String |
| SIP-Resource-Priority-Value | 614 | 3.3.2 | UTF8String |
| Application-Level-Resource-Priority | 615 | 3.4 | Grouped |
| ALRP-Namespace | 616 | 3.4.1 | Unsigned32 |
| ALRP-Value | 617 | 3.4.2 | Unsigned32 |

## 5.2. QoS Profile

IANA has allocated a new value from the "QoS Profiles" subregistry of the "Authentication, Authorization, and Accounting (AAA) Parameters" defined in [RFC5624] for the QoS profile defined in this document. The name of the profile is "Resource priority parameters" (1).

# 6. Security Considerations

This document describes an extension for conveying quality-of-service information, and therefore follows the same security considerations of the Diameter QoS Application [RFC5866]. The values placed in the AVPs are not changed by this document, nor are they changed in the Diameter QoS application. We recommend the use of mechanisms to ensure integrity when exchanging information from one protocol to an associated DIAMETER AVP. Examples of these integrity mechanisms would be use of S/MIME with the SIP Resource Priority Header (RPH), or an INTEGRITY object within a POLICY_DATA object within the context of RSVP. The consequences of changing values in the Priority AVPs may result in an allocation of additional or less resources.

Changes in integrity-protected values SHOULD NOT be ignored, and appropriate protocol-specific error messages SHOULD be sent back upstream. Note that we do not use the term "MUST NOT be ignored" because the local policy of an administrative domain associated with other protocols acts as the final arbiter. In addition, some protocols associated with the AVPs defined in this document may be deployed within a single administrative domain or "walled garden"; thus, possible changes in values would reflect policies of that administrative domain.

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

The authors also recommend that readers familiarize themselves with the security considerations of the various protocols listed in the Normative References. This is because values placed in the AVPs defined in this document are set/changed by other protocols.

## 7. Acknowledgements

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[3GPPb] "TS 29.212: Policy and charging control over Gx reference point", 3GPP, October, 2010

[3GPPc] "TS 29.229: Cx and Dx interfaces based on the Diameter protocol; Protocol details", 3GPP, September, 2010

[3GPPd] "TS 29.329: Sh interface based on the Diameter protocol; Protocol details", 3GPP, September, 2010

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