Network Working Group
Internet-Draft
Expires: February 17, 2004

C. Lonvick
Cisco Systems
August 19, 2003

# RADIUS Attributes for soBGP Support
# draft-lonvick-sobgp-radius-03.txt

## Status of this Memo



## Copyright Notice



## Abstract

This document defines a set of RADIUS attributes designed to support the provisioning of the soBGP protocol. A router will encapsulate the components of an AuthCert or PolicyCert into TLVs and transport them to a centralized server capable of verifying the associated signature.

This draft goes along with other IDs submitted for Secure Origin BGP (soBGP) both of which are edited by James Ng and Russ White. draft-white-sobgp-bgp-deployment-00.txt [1], draft-ng-sobgp-bgp-extensions-00.txt [2] Mostly this work relates to "Extensions to BGP to Support Secure Origin BGP (soBGP)" and is explained in additional detail in "Deployment Considerations for Secure Origin BGP (soBGP)". The purpose of this draft is to explain

the concept of offloading the Authcert validation steps, and the Entitycert storage, from the router. RADIUS may not be the best way to do this but it's the best that I know of at this moment. Once the concepts of soBGP are discussed, the transport to support offload should be reviewed and a proper mechanism should be chosen.

Table of Contents

## 1. Introduction

A router participating in soBGP will need to validate received Authcerts. The best way to do this is by having their associated Entitycerts contained on the router and using the information stored in them to perform the necessary validation steps. Unfortunately, this would entail the storage and consistent maintenance of Entitycerts on all participating routers in the AS. One way to centralize this would be for a device to store all of the Entitycerts and then have each of the participating routers submit the pertinent information from each received Authcert to it for the computationally intensive validation steps. This centralized device, henceforth to be known as the sob-server in this document, could then transmit a pass/fail message back to the router. This would reduce the amount of administration of the Entitycert database to one device - with appropriate backup. This document defines a set of RADIUS attributes designed to support the provision of the soBGP protocol. The participating routers are expected to form and transmit a RADIUS RFC 2865 [4] Access-Request message with the appropriate pieces of information from a received Authcert. This Access-Request will go to the sob-server which will perform the steps necessary to validate the Authcert information. It will then form and transmit an Access-Accept or Access-Reject response to the router.

This draft is still rather drafty. It does not discuss validation of Policycerts yet, but that's still a subject of discussion anyway.

Discussion of this draft may be directed to the author, or to the mailing list discussing soBGP. sobgp@external.cisco.com

More information about soBGP may be found on the web page. ftp://ftp-eng.cisco.com/sobgp/index.html

## 2. Attributes

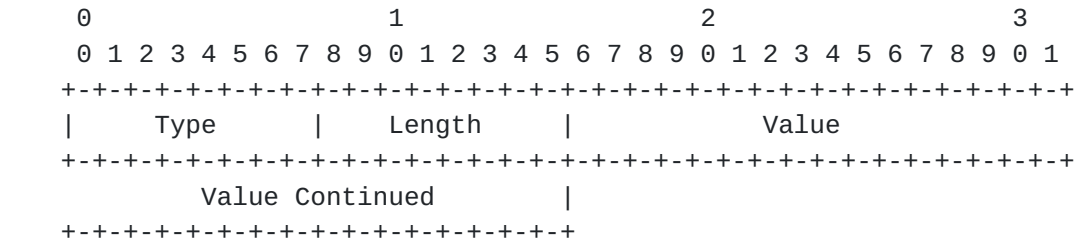
The Attributes are listed in this section. In all cases, each RADIUS message may only include Attributes pertaining to a single AS. There are useage notes later in this document which should answer any questions outstanding from the Attribute section.

### 2.1 Stored-Policy

This set of Attributes requests any policy information stored on the sob-server in an Access-Request message, and delivers the policies through Access-Challenge messages using the Prefix set of of Attributes described below. Each Access-Challenge message will describe a policy associated with a single AS. The router will continue requesting more policies through additional Access-Requests. When there are no additional policies stored on the sob-server, or if there were no policies stored there to begin with, then an Access-Accept message with an appropriate attribute will be sent to the router.

#### 2.1.1 Stored-Policy-Request

A summary of the Stored-Policy-Request Attribute format is shown below. This format will only be used in the Access-Request message The fields are transmitted from left to right.




Type - [SPR] for Stored-Policy-Request

Length - The length of the Attribute; 6 octets.

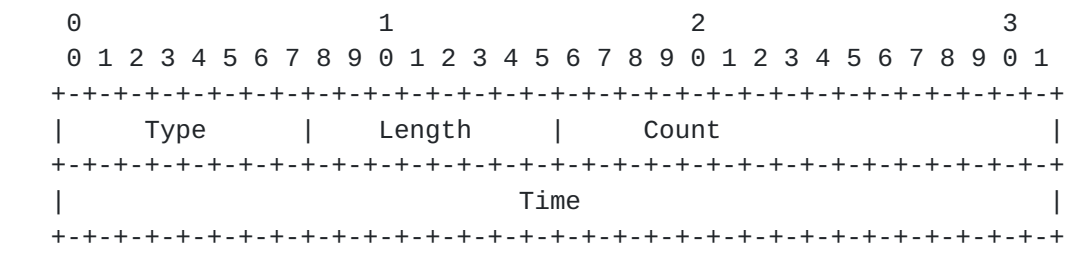
Value - The Value field is four octets. In an Access-Request message, it contains the request number for the available policies stored on the sob-server. The first value will be 0x00000001. If the sob-server responds with a policy (described next), then the router will send a request with a value of 0x00000002. This will continue until the sob-server has no more policies to send. At that point, the sob-server will respond with an Access-Accept message described below.

This Attribute is also used in Access-Challenge messages. In that

case, the Value is the AS number of the Authorized Originator. This is the autonomous system number of an entity authorized to advertise the associated IPv4 and IPv6 prefixes.

### 2.1.2 Stored-Policy-End

A summary of the Stored-Policy-End Attribute format is shown below. This format will only be used in the Access-Accept message. The fields are transmitted from left to right.




Type - [SPE] for Stored-Policy-End

Length - The length of the Attribute; 8 octets.

Count - The Count field is two octets and contains the number of policies that have been transmitted to the router. The router should verify that the value returned in this message is the same value that was most recently transmitted in the associated request message.

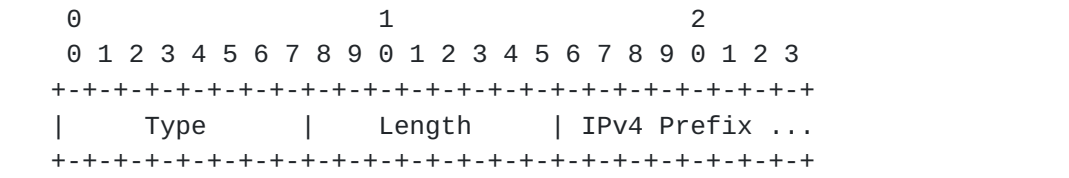
Time - The Time field is the number of seconds for which the downloaded policies should be considered valid. The receiver is not obligated to honor this timer. A value of 0 is not valid and MUST NOT be used.

## 2.2 Prefixes

Multiple instances of each of the attributes defined in this section may be included in a single RADIUS packet. In all cases, each RADIUS message may only include these Attributes pertaining to a single AS.

### 2.2.1 IPv4-Prefix

A summary of the IPv4-Prefix Attribute format is shown below. The fields are transmitted from left to right.



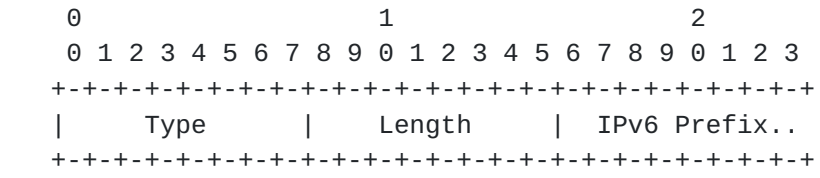
Type - [IP4] for IPv4-Prefix

Length - The entire length of this message in octets; >=3 octets.

IPv4 Prefix - The non-zero octets of the IPv4 Prefix. A special value of 0x00 is reserved when the Length is 0x03. When that value is used in an Access-Accept message in response to a Stored-Policy-Request message, this will denote that no IPv4 address bock announcements should be received from that originating AS.

### 2.2.2 IPv6-Prefix

A summary of the IPv6-Prefix Attribute is shown below. The fields are transmitted from left to right.




Type - [IP6] for IPv6-Prefix

Length - The entire length of this message in octets; >=3

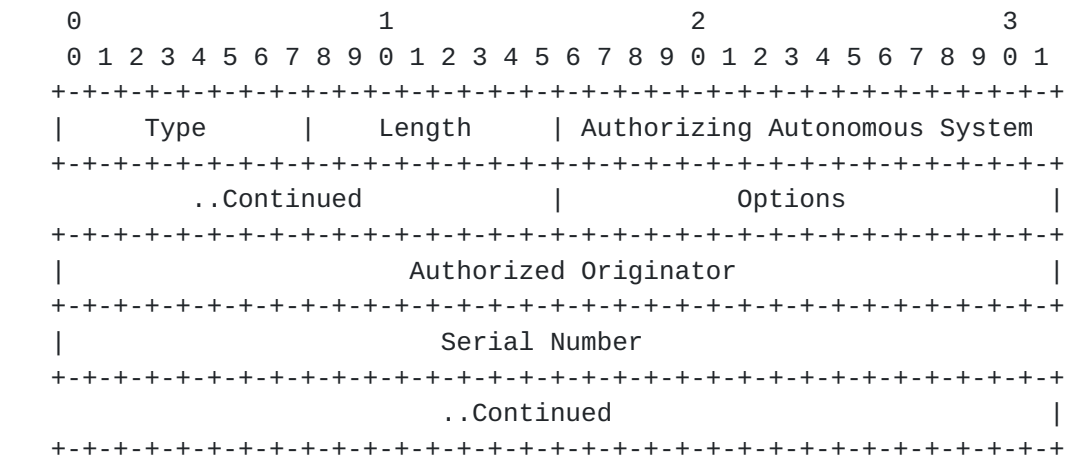
IPv6 Prefix - The IPv6 Address Block represented as a prefix. A special value of 0x00 is reserved when the Prefix Length is 0x01. This will denote that no IPv6 address bock announcements should be received from that originating AS.

## 2.3 Authcert Validation Request

This Attribute validates an Authcert received by a router through soBGP. This will first be requested in an Access-Request message with the pertinent information. The sob-server will respond with either an Access-Accept or an Access-Reject message with specific information as described below.

### 2.3.1 Authcert-Header

A summary of the Authcert-Header Attribute format is given below. The fields are transmitted left to right.




Type - [HDR] for Authcert-Header

Length - The entire length of this message in octets; 20.

Authorizing Autonomous System - The autonomous system authorizing other entities to advertise prefixes within this block.

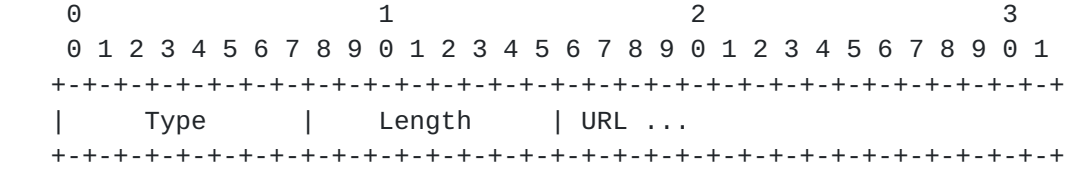
Options - The Options associated with this Authcert.

Authorized Originator - The autonomous system number of an entity authorized to advertise the associated IPv4 and IPv6 prefixes.

Serial Number - A eight octet unsigned integer indicating the serial number of this Authorization certificate.

### 2.3.2 Authcert-URL

A summary of the Authcert-URL Attribute format is given below. The fields are transmitted left to right.



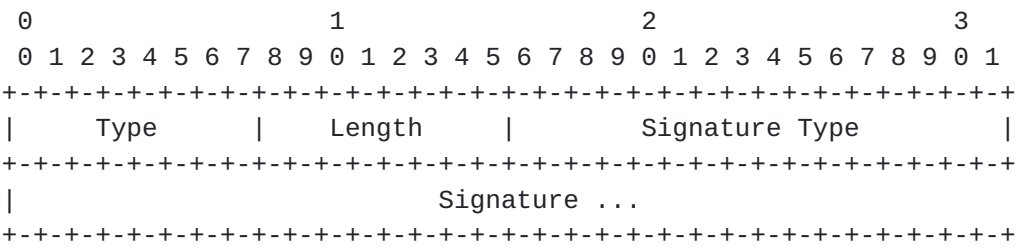

Type - [URL] for Authcert-URL

Length - The entire length of this message in octets.

URL - A uniform resource locater indicating a location where the public key of the entity which signed this certificate can be found along with any certificate revocation information.

### 2.3.3 Authcert-Signature

A summary of the Authcert-Signature Attribute format is given below. The fields are transmitted left to right.




Type - [Sig] for Authcert-Signature

Length - The entire length of this message in octets.

Signature Type - A two byte unsigned integer denoting the type of signature (the algorithm used to build this signature). Each possible signing algorithm is assigned an integer from this field.

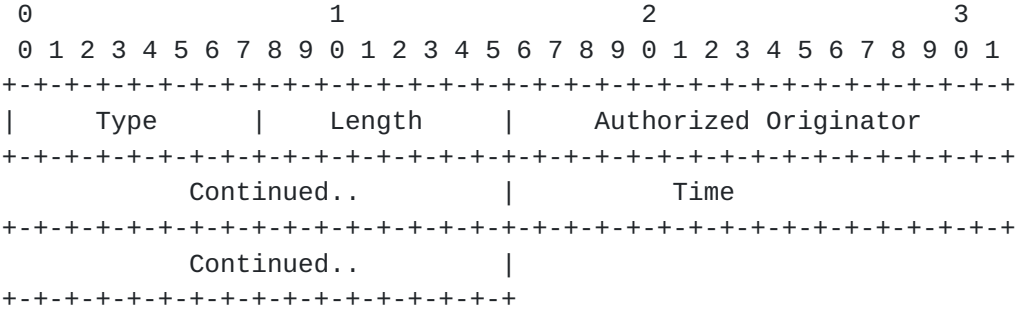
Signature - The signature will be as taken from draft-ng-sobgp-extensions-01.txt [2]

## 2.4 Authcert Validation Responses

The following Attributes will be sent in response to a group of Authcert Validation Request Attributes. The Authcert-Accept Attribute will be sent in an Access-Accept message while the Authcert-Reject Attribute will be sent in an Access-Reject message.

### 2.4.1 Authcert-Accept

A summary of the Authcert-Accept Attribute format is shown below. This format will only be used in the Access-Accept message. The fields are transmitted from left to right.




Type - [ACA] for Authcert-Accept

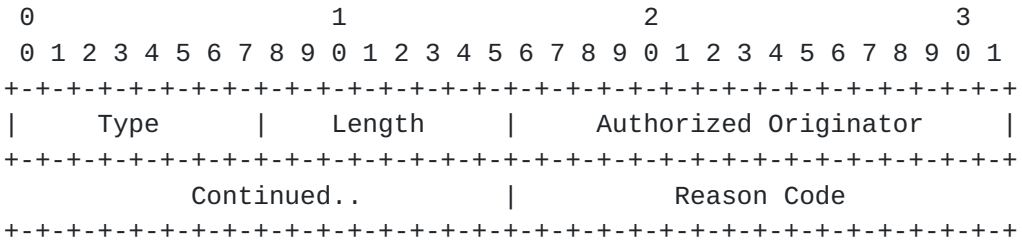
Length - The length of the attribute; 10 octets.

Authorized Originator - The autonomous system number of an entity authorized to advertise the associated IPv4 and IPv6 prefixes.

Time - The Time field is the number of seconds for which the downloaded policies should be considered valid. The receiver is not obligated to honor this timer. A value of 0 is not valid and MUST NOT be used.

### 2.4.2 Authcert-Reject

A summary of the Authcert-Reject Attribute format is shown below. This format will only be used in the Access-Reject message. The fields are transmitted from left to right.




Type - [ACR] for Authcert-Reject

Length - The length of the attribute; >=7 octets.

Authorized Originator - The autonomous system number of an entity authorized to advertise the associated IPv4 and IPv6 prefixes.

Reason Code - The reason for the rejection. It may be a local policy decision on the router to accept the information contained in the received Authcert even if it is rejected by the sob-server. As an example of that, if the URL is not found but the Authcert is validated otherwise, the router may choose to accept the information in the Authcert but at a lower trust level than if the signature is valid and the URL is found and properly processed. The table below gives the Reason Codes and their explanations.

| Reason Code | Explanation |
|---|---|
| 0-filled | Invalid Code - This value MUST NOT be used. |
| 0b10000000 | No Entitycert found matching this Authorized Originator. |
| 0b01000000 | Entitycert found for this Authorized Originator but the Serial Number in the Authcert is out of range. |
| 0b00100000 | The Signature in the Authcert doesn't match the calculated signature. |
| 0b000100000 | The Entitycert found on the sob-server has expired. |
| 0b000010000 | The URL could not be found. |
| 0b00000nnnn | Reserved for future use. |

0x00nn and beyond are also reserved for future use.

## 3. Table of Attributes

The following table provides a guide to which of the above attributes may be found in which kinds of packets, and in what quantity.

| Request | Accept | Reject | Challenge | Acct-Request | # | Attribute |
|---|---|---|---|---|---|---|
| 0-1 | 0 | 0 | 0-1 | 0 | SPR | Stored-Policy-Request |
| 0 | 0-1 | 0 | 0 | 0 | SPE | Stored-Policy-End |
| 0+ | 0+ | 0 | 0 | 0 | IP4 | IPv4-Prefix |
| 0+ | 0+ | 0 | 0 | 0 | IP6 | IPv6-Prefix |
| 0-1 | 0 | 0 | 0 | 0 | HDR | AC-Header |
| 0-1 | 0 | 0 | 0 | 0 | URL | |
| 0-1 | 0 | 0 | 0 | 0 | SIG | AC-Signature |
| 0-1 | 0 | 0 | 0 | 0 | ACA | AC-Accept |
| 0 | 0 | 0-1 | 0 | 0 | ACR | AC-Reject |

The following table defines the meaning of the above table entries.

| | |
|---|---|
| 0 | This attribute MUST NOT be present in packet. |
| 0+ | Zero or more instances of this attribute MAY be present in packet. |
| 0-1 | Zero or one instance of this attribute MAY be present in packet. |

## 4. Useage Notes and Examples

This section describes the expected implementation of the ideas presented in this document.

### 4.1 Certificate Validation

Any device receiving an Entitycert can verify it by separating its components into appropriate segments and sending them to the sob-server. The sob-server will return either an accept or reject message.

Likewise a router may submit a signed AuthCert or PolicyCert so an sob-server for validation.

Note: I need to review Brian's work to ensure that the components of each of these certificates or signed information has an associated RADIUS attribute in this document.

### 4.2 Usernames and Passwords

Some latitude is given in this area so that different policies may be enforced on different routers. In the most expected case, all routers will be configured with identical Usernames and Passwords which will be sent in the Access-Request Attributes as described in [1].

While it is not currently expected to be needed, a differentiated policy may be applied through the use of different Usernames on different routers when they initiate the policy download in the Access-Request Attribute. For example, southern-facing routers could be configured with a Username of "South" and northern-facing routers could be given a Username of "North". When the sob-server receives a policy download request from a router using a Username of "North", it will deliver a policy for the northern-facing routers. Similarly for "South" and southern-facing routers.

### 4.3 Stored Policy

A router SHOULD attempt to gather the stored policy from the sob-server when it first awakes. It should be a local policy decision of how to proceed if the router cannot obtain the stored policy.

If the router can gather policies, then these MAY be enforced above information received in the Authcerts since this will be locally defined and administered policy. If the sob-server replies that it has no policies to deliver then the router should accept routing

updates in the manner described in draft-white-sobgp-bgp-deployment-01.txt [1].

### 4.4 Time

Policies - The router should associate a countdown timer with a received policy. Before the timer has reached 0, the router should request a new set of policies. (Note: It may be a problem to associate all of the downloaded policies with a single timer.)

Authcert - The router should associate a countdown timer with a validated Authcert. Before that timer reches 0, the router should reaffirm the validity of the Authcert but only if the associated AS is still advertising routes.

### 4.5 Authcert Verification

An Authcert will contain all of the policies which must be sent to the sob-server in the order they are placed within the Authcert. It is very important that the elements be kept in order as the signature is calculated over them in that order. (Note: Perhaps XML signing would be better?)

### 4.6 Redundancy

As with all RADIUS solutions, it is usually important that the client devices be able to access an authoritative RADIUS server at all times. For this reason, it should be stressed that soBGP devices utilizing the procedure described in this document should have redundant sob-servers in their network with consistent databases of stored policies and certificates.

## 5. Security Considerations

The security concerns of the mechanisms described in this document may be separated into two parts: concerns with the transport, and concerns with the content.

The security concerns dealing with the transport of this mechanism are described in RFCs 2865 [4] and 2865 [6]. No further discussion is warranted in this document.

The security concerns with the contents are identical to the security concerns of the contens of the Authcerts, Entitycerts and Policycerts in the other soBGP IDs.

## 6. IANA Considerations

Need stuff here.

## 7. Acknowledgments

Glen Zorn suggested using Access-Challenge to convey Stored Policy. This seems to be much better than trying to use a stream of Access-Requests and a finale of an Access-Reject.

## 8. Changes from Prior Drafts

-00 : Contained the basics but had poor formatting.

-01 : The content was transferred to XML to be used with RFC 2629 formatting using "xml2rfc". (Thanks Marshall Rose.)

-02 : Restructured the Stored Policy section to utilize Access-Challenges. Added things to the tail-end sections.

-03 : tried to harmonize with draft-weis-sobgp-certificates-00.txt This includes a change to the length of the Serial Number. And I fixed some spelling errors. Not many of course.

## References

[1] White, R., "Deployment Considerations for Secure Origin BGP (soBGP)", draft-white-sobgp-bgp-extensions-01.txt (work in progress), October 2002.

[2] Ng, J., "Extensions to BGP to Support Secure Origin BGP (soBGP)", draft-ng-sobgp-bgp-extensions-01.txt (work in progress), October 2002.

[3] Weis, J., "Extensions to BGP to Support Secure Origin BGP (soBGP)", draft-weis-sobgp-certificates-00.txt (work in progress), June 2003.

[4] Rigney, C., Willens, S., Rubens, A. and W. Simpson, "Remote Authentication Dial in User Service (RADIUS)", RFC 2865, June 2000.

[5] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", RFC 2119, STD 14, March 1997.

[6] Rigney, C., Willats, W. and P. Calhoun, "RADIUS Extensions", RFC 2869, June 2000.

[7] Narten, T. and H. Alvestrand, "Guidelines for writing an IANA Considerations Section in RFCs", RFC 2869, BCP 26, October 1998.

[8] Hinden, R. and S. Deering, "IP Version 6 Addressing Architecture", RFC 2373, July 1998.

## Author's Address

Chris Lonvick
Cisco Systems
12515 Research Blvd.
Austin, TX 78759
US

Phone: +1 512 378 1182
EMail: clonvick@cisco.com

## Intellectual Property Statement



## Full Copyright Statement

## Acknowledgement

Funding for the RFC Editor function is currently provided by the Internet Society.