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Extended Optional Parameters Length for BGP OPEN Message
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Abstract

The Optional Parameters in the BGP OPEN message as defined in the base BGP specification are limited to 255 octets due to a one-octet length field. BGP Capabilities are carried in this field and may foreseeably exceed 255 octets in the future, leading to concern about this limitation.

In this document we update RFC 4271 by extending the BGP OPEN length field in a backward-compatible manner. The Parameter Length field of individual Optional Parameters is similarly extended.

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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1. Introduction

The Optional Parameters Length field in the BGP OPEN message is defined in the base BGP specification [RFC4271] as one octet, thus limiting the Optional Parameters field in the OPEN message to 255 octets. As BGP Capabilities [RFC5492] are carried in the Optional Parameters field, and new BGP capabilities continue to be introduced, the limitation is becoming a concern for BGP development.

In this document we update [RFC4271] by extending the BGP OPEN length field in a backward-compatible manner. The Parameter Length field of individual Optional Parameters is similarly extended. This is done by using Optional Parameters Length of 255 combined with Optional Parameter Type 255 as a distinguished value pair, which indicates that an extended Optional Parameters Length field follows. In this case the Parameter Length field of the Optional Parameters in the BGP OPEN message is also extended.

1.1. Requirements Language

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].

2. Protocol Extensions

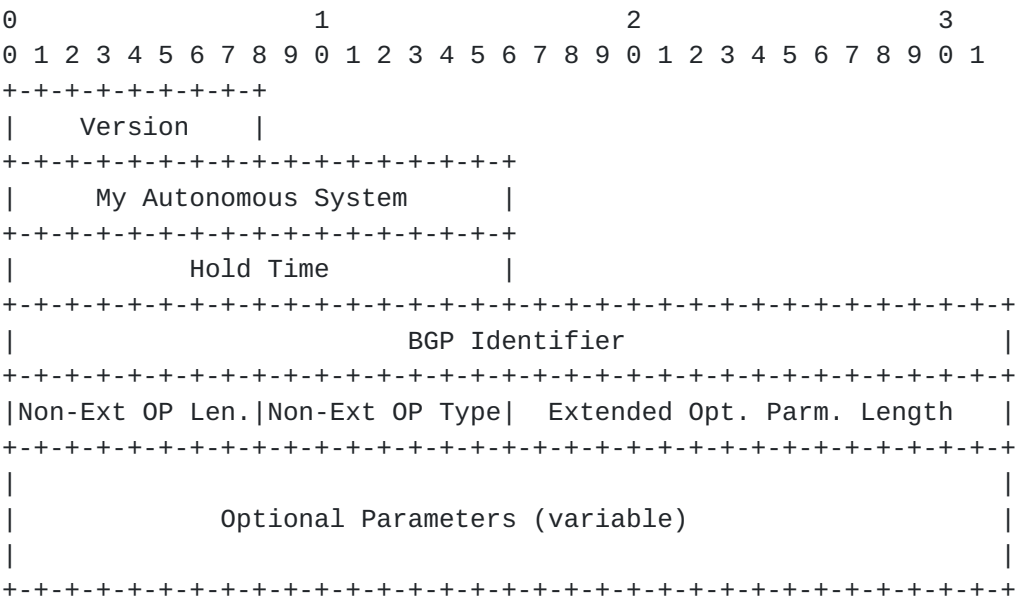
This document reserves Optional Parameter Type code 255 as the "Extended Length" type code.

In the event that the length of Optional Parameters in the BGP OPEN message does not exceed 255, the encodings of the base BGP specification [RFC4271] MUST be used without alteration.

However, if the length of Optional Parameters is greater than 255, an extended encoding is used. The (non-extended) length field is set to 255, as is the subsequent octet that in the non-extended format would be the first Optional Parameter Type. The subsequent two octets carry the actual length. In addition, the "Parameter Length" field of each Optional Parameter is enlarged to two octets. Other than the larger sizes of the given fields, there is no change to the BGP OPEN message defined in [RFC4271].

When receiving an OPEN, a BGP speaker determines the extended encoding is in use if the first Optional Parameter Type field is 255. In this case, the BGP speaker MUST ignore the non-extended Optional Parameters Length field, and must instead rely on the Extended Optional Parameters Length field.

Accordingly, when the length of Optional Parameters in the BGP OPEN message is greater than 255, the OPEN message format is modified as follows, repurposing the Optional Parameters Length field as well as the first Optional Parameter Type field to indicate the use of the extended format:

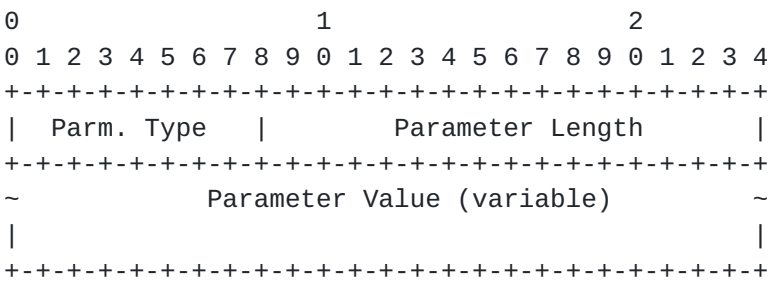


The non-extended Optional Parameters Length field MUST be set to 255 on transmission, and MUST be ignored on receipt once the use of the extended format is determined.

The subsequent one-octet field, that in the non-extended format would be the first Optional Parameter Type field, MUST be set to 255 on transmission. On receipt, a value of 255 for this field is the indication that the extended format is in use.

In this extended encoding, the subsequent two-octet field, termed the Extended Optional Parameters Length field, is an unsigned integer indicating the total length of the Optional Parameters field in octets. If the value of this field is zero, no Optional Parameters are present (this would never be expected to happen with the extended encoding, however).

Likewise, in that situation the Optional Parameters encoding is modified to be the following:



The rules for encoding Optional Parameters are unchanged with respect to those given in [RFC4271] other than the extension of the Parameter Length field to be a two-octet unsigned integer.

In parsing an OPEN message, a BGP speaker MUST use the value of the one-octet "Optional Parameters Length" field and the value of the octet following it to determine the encoding of the Optional Parameters length, as well as the size of the "Parameter Length" field of the Optional Parameters. If both values are 255, then the four-octet encoding described above is used for the Optional Parameters length. Otherwise the encoding defined in [RFC4271] is used.

This encoding is chosen for backward compatibility reasons -- a BGP speaker which has not been upgraded to support this specification may legitimately send Optional Parameters whose length equals exactly 255, thus the Optional Parameters Length field alone is insufficient as an indicator. However, such a speaker would never legitimately send an Optional Parameter whose type code is 255, since that value has been reserved by this specification.

3. Errors

If a BGP speaker supporting this specification (a "new speaker") is peering with one which does not (an "old speaker") no interoperability issues arise unless the new speaker needs to encode Optional Parameters whose length exceeds 255. In that case, it will transmit an OPEN message which the old speaker will interpret as containing an Optional Parameter with type code 255. Since by definition the old speaker will not recognize that type code, the old speaker may be expected to close the connection with a NOTIFICATION with an Error Code of OPEN Message Error and an Error Subcode of Unsupported Optional Parameters, according to Section 6.2 of [RFC4271].

Although the above is the most likely error to be sent, it is not impossible that the old speaker might detect some other error first, such as a length error, depending on the details of the implementation. In no case would the peering be expected to

establish successfully; the only question is which NOTIFICATION would be generated.

We note that in any case, such a peering could not succeed, since by definition the extended length encoding would not be used by the new speaker unless the basic encoding was insufficient.

Although the Optional Parameter Type code 255 is used in this specification as the indication that the extended encoding is in use, it is not a bonafide Optional Parameter Type in the usual sense, and MUST NOT be used other than as described above. If encountered as an actual Optional Parameter Type code, it MUST be treated as an unrecognized Optional Parameter and handled according to [RFC4271] Section 6.2.

4. IANA Considerations

IANA is requested to designate BGP OPEN Optional Parameter Type code 255 as the Extended Length type code.

5. Security Considerations

This extension to BGP does not change the underlying security issues inherent in the existing BGP [RFC4272].

6. Acknowledgements

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7. References

7.1. Normative References

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7.2. Informative References

[RFC4272] Murphy, S., "BGP Security Vulnerabilities Analysis", RFC 4272, DOI 10.17487/RFC4272, January 2006, <https://www.rfc-editor.org/info/rfc4272>.

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