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Capabilities Advertisement with BGP-4
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Abstract

This document defines an Optional Parameter, called Capabilities, that is expected to facilitate the introduction of new capabilities in the Border Gateway Protocol (BGP) by providing graceful capability advertisement without requiring that BGP peering be terminated. This document obsoletes [RFC 3392](#).

1. Introduction

The base BGP-4 specification [[RFC4271](#)] requires that when a BGP speaker receives an OPEN message with one or more unrecognized

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Optional Parameters, the speaker must terminate BGP peering. This complicates introduction of new capabilities in BGP.

2. 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](#)].

3. Overview of Operations

When a BGP speaker [[RFC4271](#)] that supports capabilities advertisement sends an OPEN message to its BGP peer, the message MAY include an Optional Parameter, called Capabilities. The parameter lists the capabilities supported by the speaker.

A BGP speaker determines the capabilities supported by its peer by examining the list of capabilities present in the Capabilities Optional Parameter carried by the OPEN message that the speaker receives from the peer.

A BGP speaker that supports a particular capability may use this capability with its peer after the speaker determines (as described above) that the peer supports this capability. Simply put, a given capability can be used on a peering if that capability has been advertised by both peers. If either peer has not advertised it, the capability cannot be used.

A BGP speaker determines that its peer doesn't support capabilities advertisement, if in response to an OPEN message that carries the Capabilities Optional Parameter, the speaker receives a NOTIFICATION message with the Error Subcode set to Unsupported Optional Parameter. (This is a consequence of the base BGP-4 specification [[RFC4271](#)] and not a new requirement.) In this case the speaker SHOULD attempt to re-establish a BGP connection with the peer without sending to the peer the Capabilities Optional Parameter.

If a BGP speaker that supports a certain capability requires that this capability be used on a peering but determines that its peer doesn't support this capability, the speaker MAY send a NOTIFICATION message to the peer, and terminate peering (see Section "Extensions

to Error Handling" for more details). The Error Subcode in the message is set to Unsupported Capability. The message SHOULD contain the capability (capabilities) that causes the speaker to send the message. The decision to send the message and terminate peering is local to the speaker. If terminated, such peering SHOULD NOT be re-

established automatically. An example of when this procedure might be followed is if a BGP speaker is attempting to establish an IPv6 peering but determines that its peer does not support Multiprotocol Extensions for BGP-4 [[RFC4760](#)].

If a BGP speaker receives from its peer a capability which it does not itself support, it SHOULD ignore that capability. In particular, the Unsupported Capability NOTIFICATION message MUST NOT be generated in response to reception of a capability which is not supported by the local speaker.

[4.](#) Capabilities Optional Parameter (Parameter Type 2):

This is an Optional Parameter that is used by a BGP speaker to convey to its BGP peer the list of capabilities supported by the speaker.

The parameter contains one or more triples <Capability Code, Capability Length, Capability Value>, where each triple is encoded as shown below:

```
+-----+
| Capability Code (1 octet)   |
+-----+
| Capability Length (1 octet) |
+-----+
| Capability Value (variable) |
+-----+
```

Figure 1

The use and meaning of these fields are as follows:

Capability Code:

Capability Code is a one octet field that unambiguously

identifies individual capabilities.

Capability Length:

Capability Length is a one octet field that contains the length of the Capability Value field in octets.

Capability Value:

Capability Value is a variable length field that is interpreted according to the value of the Capability Code field.

BGP speakers SHOULD NOT include more than one instance of a capability with the same Capability Code, Capability Length, and Capability Value. Note however, that processing of multiple instances of such capability does not require special handling, as additional instances do not change the meaning of the announced capability.

BGP speakers MAY include more than one instance of a capability (as identified by the Capability Code) with non-zero Capability Length field, but with different Capability Value, and either the same or different Capability Length. Processing of these capability instances is specific to the Capability Code and MUST be described in the document introducing the new capability.

[5.](#) Extensions to Error Handling

This document defines new Error Subcode - Unsupported Capability. The value of this Subcode is 7. The Data field in the NOTIFICATION message SHOULD list the set of capabilities that cause the speaker to send the message. Each such capability is encoded the same way as it would be encoded in the OPEN message.

As the Overview of Operations section notes, the Unsupported Capability NOTIFICATION is a way for a BGP speaker to complain that its peer does not support a required capability, without which the peering cannot proceed. It MUST NOT be used when a BGP speaker receives a capability which it does not understand; such capabilities SHOULD be ignored.

[6.](#) IANA Considerations

This document defines a Capability Optional Parameter along with a Capability Code field. IANA maintains the registry for Capability Code values. Capability Code value 0 is reserved. Capability Code values 1 through 63 are to be assigned by IANA using the "IETF Consensus" policy defined in [[RFC2434](#)]. Capability Code values 64 through 127 are to be assigned by IANA, using the "First Come First Served" policy defined in [[RFC2434](#)]. Capability Code values 128 through 255 are for "Private Use" as defined in [[RFC2434](#)].

[7.](#) Security Considerations

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

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[8.](#) Acknowledgements

The authors would like to thank members of the IDR Working Group for their review and comments.

[9.](#) References

[9.1.](#) Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC2434] Narten, T. and H. Alvestrand, "Guidelines for Writing an IANA Considerations Section in RFCs", [BCP 26](#), [RFC 2434](#), October 1998.
- [RFC4271] Rekhter, Y., Li, T., and S. Hares, "A Border Gateway Protocol 4 (BGP-4)", [RFC 4271](#), January 2006.

[9.2.](#) Informative References

- [RFC4272] Murphy, S., "BGP Security Vulnerabilities Analysis", [RFC 4272](#), January 2006.
- [RFC4760] Bates, T., Chandra, R., Katz, D., and Y. Rekhter, "Multiprotocol Extensions for BGP-4", [RFC 4760](#), January 2007.

[Appendix A](#). Comparison with [RFC 2842](#)

In addition to several minor editorial changes, this document also clarifies how to handle multiple instances of the same capability.

[Appendix B](#). Comparison with [RFC 3392](#)

In addition to minor editorial changes, this document also clarifies the use of the Unsupported Optional Parameter NOTIFICATION message, and updates references to the base BGP-4 specification [[RFC4271](#)] and security analysis [[RFC4272](#)].

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