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OSPFv2 Multi-Instance Extensions
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Abstract

OSPFv3 includes a mechanism to support multiple instances of the protocol running on the same interface. OSPFv2 can utilize such a mechanism in order to support multiple routing domains on the same subnet.

This document defines the OSPFv2 instance ID to enable separate OSPFv2 protocol instances on the same interface. Unlike OSPFv3 where the instance ID can be used for multiple purposes, such as putting the same interface in multiple areas, the OSPFv2 instance ID is reserved for identifying protocol instances.

This document updates RFC 2328.

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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This Internet-Draft will expire on July 22, 2012.

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1. Introduction

OSPFv3 [OSPFV3] includes a mechanism to support multiple instances of the protocol running on the same interface. OSPFv2 [OSPFV2] can utilize such a mechanism in order to support multiple routing domains on the same subnet.

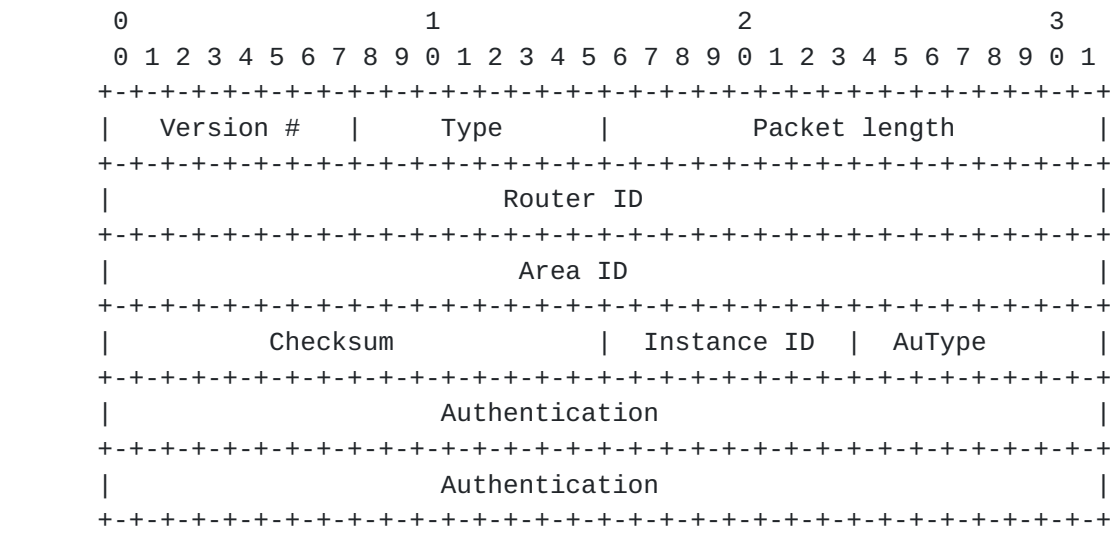
This document defines the OSPFv2 instance ID to enable separate OSPFv2 protocol instances on the same interface. Unlike OSPFv3 where the instance ID can be used for multiple purposes, such as putting the same interface in multiple areas, the OSPFv2 instance ID is reserved for identifying protocol instances.

1.1. Requirements notation

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-KEYWORDS].

2. OSPFv2 Instance Packet Encoding

This document extends OSPFv2 with a mechanism to differentiate packets for different instances sent and received on the same interface. In support of this capability, a modified packet header format with the Authentication Type field split into an Instance ID and AuType.



The OSPFv2 Packet Header

All fields are as defined in [OSPFV2] except that the Instance ID field is new, and the AuType field is reduced to 8 bits from 16 bits without any change in meaning. The Instance ID field is defined as follows:

Instance ID
: Enables multiple instances of OSPFv2 to be used on a single interface. Each protocol instance would be assigned a separate Instance ID; the Instance ID has local subnet significance only. Received packets with an Instance ID not equal to one of the Instance IDs corresponding to one of the configured OSPFv2 Instances for the receiving interface MUST be discarded.

3. OSPFv2 Interface Instance ID

[OSPFV2] describes the conceptual interface data structure in section 9. The OSPFv2 Interface Instance ID is added to this structure. The OSPFv2 Interface Instance ID has a default value of 0. Its setting to a non-zero value may be accomplished through configuration.

3.1. Sending and Receiving OSPFv2 packets

When sending OSPFv2 packets, the OSPFv2 Interface Instance ID is set in the OSPFv2 packet header. When receiving OSPFv2 packets, the OSPFv2 Header Instance ID is used to aid in demultiplexing the packet and routing it to the correct OSPFv2 instance. Received packets with an Instance ID not equal to one of the configured OSPFv2 Instance IDs on the receiving interface MUST be discarded.

3.2. Interface Instance ID Values

The following OSPFv2 Instance IDs have been defined:

0
: Base IPv4 Instance - This is the default IPv4 routing instance corresponding to default IPv4 unicast routing and the attendant IPv4 routing table. Use of this instance ID provides backward compatibility with the base OSPF specification [OSPFV2].

1
: Base IPv4 Multicast Instance - This IPv4 instance corresponds to the separate IPv4 routing table used for the Reverse Path Forwarding (RPF) checking performed on IPv4 multicast traffic.

2
: Base IPv4 In-band Management Instance - This IPv4 instance corresponds to a separate IPv4 routing table used for network management applications.

3-127
: Private Use - These Instance IDs are reserved for definition and semantics defined by the local network administrator. For example, separate Interface Instance IDs and their corresponding OSPFv2 instances could be used to support independent non-congruent topologies for different classes of IPv4 unicast traffic. The details of such deployments are beyond the scope of this document.

The first three Interface Instance IDs are analogous to the topology IDs defined in [RFC4915].

4. State Sharing Optimizations between OSPFv2 instances

This is beyond the scope of this draft and is an area for further study.

5. OSPFv2 Authentication Impacts

Now that the AuType OSPFv2 header field has been reduced from 2 octets to 1 octet, OSPFv2 routers not supporting this specification will fail packet authentication for any instance other than the default (i.e., the Base IPv4 Unicast Instance). This is solely due to the difference in field definition as opposed to any explicit change to OSPFv2 authentication as described in Appendix D of RFC 2328 [OSPFV2] and RFC 5709 [RFC5709]. However, this is exactly what is desired since OSPFv2 routers not supporting this specification should only support the default instance (Refer to Section 6).

6. Backward Compatibility and Deployment Considerations

When there are OSPFv2 routers that support OSPFv2 Multi-Instance extensions on the same broadcast capable interface as OSPFv2 routers that do not, packets with non-zero OSPFv2 header Instance IDs are received by those legacy OSPFv2 routers. Since the non-zero Instance ID is included in the AuType by these legacy OSPFv2 routers, it is misinterpreted as a mismatched authentication type and the packet is dropped. This is exactly what is expected and desired.

Previously, there was concern that certain implementations would log every single authentication type mismatch. However, discussions with implementers have led us to the conclusion that this is not as severe a problem as we'd first thought and it will be even less of a problem by the time the mechanism in this draft is standardized, implemented, and deployed. Most implementations will dampen the logging of errors. Hence, the more drastic mechanisms to avoid legacy OSPFv2 routers from receiving multicast OSPFv2 packets with non-zero Instance IDs have been removed.

If the OSPF MIB as specified in [OSPF-MIB] is implemented, even the damped generation of the ospfIfAuthFailure or ospfVirtIfAuthFailure SNMP notifications would be undesirable in situations where legacy OSPFv2 routers are deployed on the same subnet as OSPFv2 routers supporting this specification. Consequently, it is recommended that implementations that implement this specification and the OSPF MIB also implement SNMP Notification filtering as specified in section 6 of [RFC3413].

7. Security Considerations

The enhancement described herein doesn't add any additional security considerations to OSPFv2. Security considerations for OSPFv2 are described in [OSPFV2].

Given that only three OSPFv2 authentication types have been standardized, it seems reasonable to reduce the OSPFv2 packet header field to 8 bits.

8. IANA Considerations

The size of the AuType field is reduced from 16 octets to 8 octets. This changes the OSPF Authentication Codes registry in that the values 256-65535 are no longer defined. There is no backward compatibility issue since this range of values was previously defined as "Reserved and should not be assigned".

A new registry is added for OSPFv2 Instance IDs. The allocation of OSPFv2 Instance IDs is described below. Refer to Section 3.2 for more information.

Value/Range	Designation	Assignment Policy
0	Base IPv4 Unicast Instance	Assigned
1	Base IPv4 Multicast Instance	Assigned
2	Base IPv4 In-band Management Instance	Assigned
3-127	Private Use	Reserved for local policy assignment
128-255	Unassigned	Standards Action

OSPFv2 Instance ID

9. References

9.1. Normative References

[OSPFV2] Moy, J., "OSPF Version 2", RFC 2328, April 1998.

[OSPFV3] Coltun, R., Ferguson, D., Moy, J., and A. Lindem, "OSPF for IPv6", RFC 5340, July 2008.

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

9.2. Informative References

[OSPF-MIB] Joyal, D., Galecki, P., Giacalone, S., Baker, F., and R. Coltun, "OSPF Version 2 Management Information Base", RFC 4750, December 2006.

[RFC3413] Levi, D., Meyer, P., and B. Stewart, "Simple Network Management Protocol (SNMP) Applications", STD 62, RFC 3413, December 2002.

[RFC4915] Psenak, P., Mirtorabi, S., Roy, A., Nguyen, L., and P. Pillay-Esnault, "Multi-Topology (MT) Routing in OSPF", RFC 4915, June 2007.

[RFC5709] Bhatia, M., Manral, V., Fanto, M., White, R., Barnes, M., Li, T., and R. Atkinson, "OSPFv2 HMAC-SHA Cryptographic Authentication", RFC 5709, October 2009.

Appendix A. Acknowledgments

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