<table>
<thead>
<tr>
<th>Release 2.0.2</th>
<th>Release 3.0.2</th>
<th>Release 3.0.3</th>
<th>Release 4.0</th>
<th>Release 5.0.1</th>
<th>Release 6.0</th>
<th>Master 2019-02-24</th>
<th>Release 7.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>FRR</td>
<td>FRR</td>
<td>FRR</td>
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<td>FRR</td>
<td>FRR</td>
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</tr>
<tr>
<td><strong>Commit ID</strong></td>
<td>36a7e78</td>
<td>30283fd</td>
<td>5df44c</td>
<td>7a377a1</td>
<td>8525d8</td>
<td>c8c2427</td>
<td>5a80b8c</td>
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<tr>
<td><strong>Commit Date</strong></td>
<td>2017-11-08</td>
<td>2017-11-08</td>
<td>2018-01-09</td>
<td>2018-03-12</td>
<td>2018-07-05</td>
<td>2018-10-08</td>
<td>2019-02-24</td>
</tr>
</tbody>
</table>

**ANVL-OSPF-1.1**

**MUST**

Test Setup Validation Test

Validate OSPF Hello packet from DUT.

<table>
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<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: untested</th>
<th>FreeBSD 10.3: untested</th>
</tr>
</thead>
</table>

**ANVL-OSPF-1.6**

**RFC 2328 Section 12**

Test Setup

The collection of LSAs forms the link-state database. Each separate type of LSA has a separate function. Router-LSAs and network-LSAs describe how an area's routers and networks are interconnected. Summary-LSAs provide a way of condensing an area's routing information. AS-external-LSAs provide a way of transparently advertising externally-derived routing information throughout the Autonomous System.

Note: ANVL Setup Validation Test

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
</table>

**ANVL-OSPF-2.1**

**RFC 1583, s13.3 p132** Next step in the flooding procedure (see also sA.3.5 p179)

**RFC 2328, s13.3 p148** Next step in the flooding procedure (see also sA.3.5 p199)

**MUST**

OSPF Flooding

Validate Link State Update packet format.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
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<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
</table>

<p>| FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass |</p>
<table>
<thead>
<tr>
<th>ANVL-OSPF-2.2</th>
<th>RFC 1583, s13.3 p131</th>
<th>Next step in the flooding procedure (see also s4.2 p35 and s12.1.3 p103)</th>
<th>RFC 2328, s13.3 p148</th>
<th>Next step in the flooding procedure (see also s4.2 p41 and s12.1.3 p117)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUST</td>
<td>RFC Compliance Test Report</td>
<td>OSPF Flooding</td>
<td>AS external link advertisements are not flooded into/throughout stub areas.</td>
<td></td>
</tr>
<tr>
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<td>FreeBSD 10.3: pass</td>
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<td>FreeBSD 10.3: pass</td>
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<tr>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>ANVL-OSPF-2.3</th>
<th>RFC 1583, s13.3 p132</th>
<th>Next step in the flooding procedure</th>
<th>RFC 2328, s13.3 p149</th>
<th>Next step in the flooding procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUST</td>
<td>RFC Compliance Test Report</td>
<td>OSPF Flooding</td>
<td>If a neighbor is in a lesser state than Exchange, it does not participate in flooding.</td>
<td></td>
</tr>
<tr>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
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<th>ANVL-OSPF-2.4</th>
<th>RFC 1583, s13.3 p132</th>
<th>Next step in the flooding procedure</th>
<th>RFC 2328, s13.3 p149</th>
<th>Next step in the flooding procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUST</td>
<td>RFC Compliance Test Report</td>
<td>OSPF Flooding</td>
<td>Verify that advertisements for neighbors in state Exchange who appear on the Link State Request list are processed correctly</td>
<td></td>
</tr>
<tr>
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</table>
### ANVL-OSPF-2.5

**MUST**

RFC 1583, s13 p127 The Flooding Procedure
RFC 2328, s13 p144 The Flooding Procedure

OSPF Flooding

If a new advertisement was received from a neighbor such that the receiving interface is DR and sender is not BDR, then the advertisement must be flooded back out the receiving interface.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
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</table>

### ANVL-OSPF-2.6

**MUST**

RFC 1583, s13.3 p133 The Flooding Procedure
RFC 2328, s13.3 p150 The Flooding Procedure

OSPF Flooding

Do not flood a new advertisement back to an interface if it was received from the Designated Router or the Backup Designated Router.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
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<th>FreeBSD 10.3: untested</th>
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</thead>
</table>

### ANVL-OSPF-2.7

**MUST**

RFC 1583, s13.3 p133 Next step in the flooding procedure
RFC 2328, s13.3 p150 Next step in the flooding procedure

OSPF Flooding

Do not flood a new advertisement back onto the receiving interface if that interface is in state Backup.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
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<table>
<thead>
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<th>FreeBSD 12.0: untested</th>
<th>FreeBSD 12.0: untested</th>
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<th>FreeBSD 12.0: untested</th>
</tr>
</thead>
</table>
### ANVL-OSPF-2.8
**MUST**

RFC 1583, s13.3 p133 Next step in the flooding procedure
(see also s12.1.1 p101 and s14 p139)

**RFC 2328, s13.3 p150** Next step in the flooding procedure
(see also s12.1.1 p116 and s14 p156)

OSPF Flooding

The LS age field must be incremented by InfTransDelay on every hop of the flooding procedure.

<table>
<thead>
<tr>
<th></th>
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</table>

### ANVL-OSPF-2.9
**MUST**

RFC 1583, s13.3 p133-134 Next step in the flooding procedure
(see also s7.3 p47 and s8.1 p51)

**RFC 2328, s13.3 p151** Next step in the flooding procedure
(see also s7.3 p54 and s8.1 p58)

OSPF Flooding

The Designated Router and its Backup send Link State Update packets to the multicast address AllSPFRouters.

<table>
<thead>
<tr>
<th></th>
<th></th>
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</table>

### ANVL-OSPF-2.10
**MUST**

RFC 1583, s13.3 p134 Next step in the flooding procedure
(see also s8.1 p51)

**RFC 2328, s13.3 p151** Next step in the flooding procedure
(see also s8.1 p58)

OSPF Flooding

All routers other than the Designated Router and its Backup send their Link State Update packets to the multicast address AllDRouters.

<table>
<thead>
<tr>
<th></th>
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<td>Release 5.0.1</td>
<td>Release 6.0</td>
<td>Master 2019-02-24</td>
<td>Release 7.0</td>
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<tr>
<td><strong>ANVL-OSPF-2.11</strong></td>
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<tr>
<td>SHOULD</td>
<td>NEGATIVE: RFC 1583, s13.3 p133 Next step in the flooding procedure</td>
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<td>NEGATIVE: RFC 2328, s13.3 p150 Next step in the flooding procedure</td>
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</tr>
<tr>
<td><strong>OSPF Flooding</strong></td>
<td>DUT should ignore unexpected Link State Ack during adjacency establishment.</td>
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<tr>
<td>MUST</td>
<td>RFC 2328, s13 p145 The flooding procedure</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>OSPF Flooding</strong></td>
<td>When a received LSA instance is less recent than a router's current database copy, the router will respond by flooding back its DB copy.</td>
<td></td>
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<tr>
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</tr>
<tr>
<td>MUST</td>
<td>RFC 2328, s10.6 p100 Receiving Database Description Packets</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OSPF Flooding</strong></td>
<td>Duplicate Database Description packets are discarded by the master.</td>
<td></td>
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<tr>
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<td><strong>ANVL-OSPF-2.14</strong></td>
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<tr>
<td>MUST</td>
<td>RFC 2328, s10.6 p100 Receiving Database Description Packets</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>OSPF Flooding</strong></td>
<td>Duplicate Database Description packets cause the slave to retransmit the last Database Description packet that it had sent.</td>
<td></td>
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<tr>
<td>ANVL-OSPF-2.15</td>
<td>RFC 2328, s10.8 p99 Receiving Database Description Packets</td>
<td>MUST</td>
<td>OSPF Flooding</td>
<td>If the Interface MTU field in a Database Description packet is larger than the router can accept without fragmentation, then it is rejected.</td>
<td></td>
<td></td>
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</tr>
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</tr>
<tr>
<td>ANVL-OSPF-3.1</td>
<td>RFC 1583, s11.1 p96 Routing table lookup RFC 2328, s11.1 p111 Routing table lookup</td>
<td>MUST</td>
<td>OSPF Routing Table Lookups</td>
<td>This routing table entry then provides the outgoing interface and next hop router to use in forwarding the packet. (NOTE: Here we are testing the DUT forwards IP packet to the correct interface and next hop based on an entry in the OSPF routing table.)</td>
<td></td>
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</tr>
<tr>
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<td>RFC 1583, s11.1 p96 Routing table lookup RFC 2328, s11.1 p111 Routing table lookup</td>
<td>MUST</td>
<td>OSPF Routing Table Lookups</td>
<td>In this case, the packet's IP destination is considered unreachable. Instead of being forwarded, the packet should be dropped and an ICMP destination unreachable message should be returned to the packet's source. (NOTE: Here we are testing the DUT sends an ICMP destination unreachable if there is no route to the destination.)</td>
<td></td>
<td></td>
<td></td>
</tr>
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</tr>
<tr>
<td>ANVL-OSPF-3.3</td>
<td>RFC 1583, s11.1 p96 Routing table lookup</td>
<td>RFC 2328, s11.1 p111 Routing table lookup</td>
<td>SHOULD</td>
<td>OSPF Routing Table Lookups</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>If there is no matching routing table entry then the packet&quot;s IP destination is considered unreachable. Instead of being forwarded, the packet should then be discarded and an ICMP destination unreachable message should be returned to the packet&quot;s source. (NOTE: Here we are testing DUT sends an ICMP destination unreachable if there is no intra-area route for a packet destined for the router&quot;s configured area.)</td>
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</tr>
<tr>
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<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

| ANVL-OSPF-3.4 | RFC 1583, s11.1 p96 Routing table lookup | RFC 2328, s11.1 p96 Routing table lookup | MUST | OSPF Routing Table Lookups | DUT forwards IP packets based on the most preferential path type. | | |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: pass |

<p>| ANVL-OSPF-3.5 | RFC 1583, s11.1 p96 Routing table lookup | RFC 2328, s11.1 p111 Routing table lookup | MUST | OSPF Routing Table Lookups | In this case, the &quot;best match&quot; is the routing table entry that provides the most specific (longest) match. (NOTE: here we are testing DUT forwards IP packets based on the most specific address/mask match.) | | |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: pass |</p>
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<tr>
<td>RFC 2328, s16.2 p169 Calculating the Inter-area routes</td>
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<tr>
<td></td>
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<tr>
<td></td>
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<tr>
<td>2.0.2</td>
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<td>5.0.1</td>
<td>6.0</td>
<td>2019-02-24</td>
<td>7.0</td>
</tr>
</tbody>
</table>

**ANVL-OSPF-4.1**

**MAY**

RFC 1583, s16.7 p157 Events generated as a result of routing table changes

RFC 2328, s16.7 p177 Events generated as a result of routing table changes

**OSPF Routing Table Changes**

New summary link advertisements are generated when the cost or path type of a routing entry changes.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
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<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: FAIL</td>
</tr>
</tbody>
</table>

**ANVL-OSPF-4.2**

**MUST**

RFC 1583, s16.7 p157 Events generated as a result of routing table changes

(see also s12.4.3 p120)

RFC 2328, s16.7 p177 Events generated as a result of routing table changes

(see also s12.4.3 p135)

**OSPF Routing Table Changes**

New summary link advertisements are reflooded with LS Age = MaxAge when routing table entries are deleted or are no longer advertiseable.

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
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<td>FreeBSD 12.0: untested</td>
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<td>FreeBSD 12.0: pass</td>
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</tbody>
</table>

**ANVL-OSPF-4.3**

**MUST**

RFC 1583, s16.7 p158 Events generated as a result of routing table changes

(see also s15 p141)

RFC 2328, s16.7 p178 Events generated as a result of routing table changes

(see also s15 p159)

**OSPF Routing Table Changes**

If the entry indicates that the area border router is newly reachable, the corresponding virtual link is now operational. An InterfaceUp event should be generated for the virtual link, which will cause a virtual adjacency to begin to form.

(NOTE: Here we are testing DUT attempts to bring up a virtual link when a changed routing table entry indicates that the endpoint of the virtual link is reachable.)

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
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<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: FAIL</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>
### ANVL-OSPF-4.4

**MUST**

**OSPF Routing Table Changes**

If the entry indicates that the area border router is no longer reachable, the virtual link and its associated adjacency should be destroyed. This means an InterfaceDown event should be generated for the associated virtual link.  
*(NOTE: Here we are testing the DUT brings down a virtual link when a changed routing table entry indicates that the virtual link endpoint is no longer reachable.)*

<table>
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<tr>
<th>FreeBSD 10.3: pass</th>
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<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
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<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-4.5

**MUST**

**OSPF Routing Table Changes**

If the cost of the entry has changed, and there is a fully established virtual adjacency, a new router-LSA for the backbone must be originated.  
*(NOTE: Here we are testing DUT generates new summary link advertisements when the cost of a path to a virtual link endpoint changes in the routing table.)*

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
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</tr>
</thead>
<tbody>
<tr>
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<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-5.1

**SHOULD**

**Intra-Area Shortest Path Calculation**

DUT should use the shortest of two or more paths (according to OSPF route distance metric) when forwarding packets.

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<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
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</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
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</tbody>
</table>
**OSPF Results**

<table>
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<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>2.0.2</td>
<td>3.0.2</td>
<td>3.0.3</td>
<td>4.0</td>
<td>5.0.1</td>
<td>6.0</td>
<td>2019-02-24</td>
<td>7.0</td>
</tr>
</tbody>
</table>

**ANVL-OSPF-5.2**
RFC 1583, s16.1 p145 Calculating the shortest-path tree for an area
RFC 2328, s16.1 p163 Calculating the shortest-path tree for an area

**MUST**

Intra-Area Shortest Path Calculation
If the LSA LS age is equal to MaxAge, examine the next link in V's LSA.
(NOTE: Here we are testing router links or network links advertisements
with LS age = MaxAge are not used when building the shortest-path tree
for an area.)

<table>
<thead>
<tr>
<th></th>
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</table>

**ANVL-OSPF-5.3**
RFC 1583, s16.1 p145 Calculating the shortest-path tree for an area
RFC 2328, s16.1 p163 Calculating the shortest-path tree for an area

**MUST**

Intra-Area Shortest Path Calculation
If the LSA does not have a link back to vertex V, examine the
next link in V's LSA.
(NOTE: Here we are testing DUT does not calculate routes from an
entry in the link state database if that entry has no path back
to the DUT.)

<table>
<thead>
<tr>
<th></th>
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**ANVL-OSPF-5.4**
RFC 1583, s16.1 p146 Calculating the shortest-path tree for an area
RFC 2328, s16.1 p164 Calculating the shortest-path tree for an area

**MUST**

Intra-Area Shortest Path Calculation
Multiple sets of next hop values are calculated for intra-area routes
when multiple equal-cost destinations to a network exist.

<table>
<thead>
<tr>
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<td>FreeBSD 12.0: FAIL</td>
</tr>
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</table>
### ANVL-OSPF-5.5

**MUST**

Intra-Area Shortest Path Calculation

If intra-area routes exist to an AS boundary router in more than one area, the area providing the shortest path is always chosen.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
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<tbody>
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</tr>
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</table>

### ANVL-OSPF-5.6

**MUST**

Intra-Area Shortest Path Calculation

If equal-cost intra-area routes exist to an AS boundary router in different areas, the area with largest OSPF Area ID is chosen.

<table>
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<tr>
<th>FreeBSD 10.3: pass</th>
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<th>FreeBSD 10.3: pass</th>
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</thead>
<tbody>
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<td>FreeBSD 12.0: untested</td>
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<td>FreeBSD 12.0: pass</td>
</tr>
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</table>

### ANVL-OSPF-5.7

**SHOULD**

Intra-Area Shortest Path Calculation

In this case, the current routing table entry should be overwritten if and only if the newly found path is just as short and the current routing table entry's Link State Origin has a smaller Link State ID than the newly added vertex' LSA.

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<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>
## ANVL-OSPF-5.8
**MUST**

Intra-Area Shortest Path Calculation
Multiple sets of next hop values are calculated for intra-area routes to stub networks when multiple equal-cost paths exist.

<table>
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<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
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<th>FreeBSD 10.3: untested</th>
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</thead>
<tbody>
<tr>
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<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: FAIL</td>
<td>FreeBSD 12.0: FAIL</td>
</tr>
</tbody>
</table>

## ANVL-OSPF-5.9
**MUST**

Intra-Area Shortest Path Calculation
Otherwise D is smaller than the routing table cost. Overwrite the current routing table entry by setting the routing table entry's cost to D, and by setting the entry's list of next hops to the newly calculated set.

(Note: Here we are testing stub network routing table entries are updated when a new path with smaller distance is calculated due to received routing information.)

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</thead>
<tbody>
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<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

## ANVL-OSPF-6.1
**MUST**

Use of Summaries
For each summary-LSA: If the cost specified by the LSA is LSInfinity then examine the next LSA.

(Note: Here we are testing summary link advertisements with cost LSInfinity are not used when calculating inter-area routes.)

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
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<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>
## ANVL-OSPF-6.2

RFC 1583, s16.2 p150 Calculating the inter-area routes
RFC 2328, s16.2 p169 Calculating the inter-area routes

**MUST**

Use of Summaries
For each summary-LSA: if the LSA's LS age is equal to MaxAge, then examine the next LSA.
(NOTE: here we are testing summary link advertisements with LS age of MaxAge are not used when calculating inter-area routes.)

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
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<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

## ANVL-OSPF-6.3

RFC 1583, s16.2 p150 Calculating the inter-area routes
RFC 2328, s16.2 p169 Calculating the inter-area routes

**MUST**

Use of Summaries
For each summary-LSA: if the LSA was originated by the calculating router itself, examine the next LSA.
(NOTE: Here we are testing if a summary link advertisement was originated by the router itself, it is not used when calculating inter-area routes.)

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

## ANVL-OSPF-6.4

RFC 1583, s16.2 p151 Calculating the inter-area routes
RFC 2328, s16.2 p169 Calculating the inter-area routes

**MUST**

Use of Summaries
If it is a Type 3 summary-LSA, and the collection of destinations described by the summary-LSA equals one of the router's configured area address ranges, and the particular area address range is active, then the summary-LSA should be ignored.
(NOTE: Here we are testing a summary link advertisement is ignored if its destinations fall into one of the router's active configured address ranges.)

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>
### ANVL-OSPF-6.5

**MUST**

RFC 1583, s16.2 p151 Calculating the inter-area routes
RFC 2328, s16.2 p169 Calculating the inter-area routes

Use of Summaries
Ignore summary links advertisements originated by an area border router if there is no entry for that ABR in the routing table.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-6.6

**SHOULD**

RFC 1583, s16.2 p151 Calculating the inter-area routes
RFC 2328, s16.2 p169 Calculating the inter-area routes

Use of Summaries
Summary (inter-area) routes should be installed into the routing table in preference to existing external type 1 or type 2 routes.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-6.7

**MUST**

RFC 1583, s16.3 p152 Examining transit areas” summary links
RFC 2328, s16.3 p170 Examining transit areas” summary links

Use of Summaries
The purpose of the calculation below is to examine the transit areas to see whether they provide any better (shorter) paths than the paths previously calculated in Sections 16.1 and 16.2. Any paths found that are better than or equal to previously discovered paths are installed in the routing table.

(Note: Here we are testing the DUT uses a summary link advertisement in a transit area if it has a better cost route to a backbone area network than the virtual link.)

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>ANVL-OSPF-7.1</td>
<td>RFC 1583, s16.4 p155 Calculating AS external routes</td>
<td>RFC 2328, s16.4 p173 Calculating AS external routes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>--------------------------------------------------</td>
<td>--------------------------------------------------</td>
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<tr>
<td>MUST</td>
<td>MUST</td>
<td>MUST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OSFP AS External Route Calculation</td>
<td>OSFP AS External Route Calculation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>If the cost specified by the LSA is LSInfinity, or if the LSA&quot;s LS age is equal to MaxAge, then examine the next LSA. (NOTE: Here we are testing the DUT does not use AS external link advertisements with either a metric of LSInfinity or an LS age of MaxAge.)</td>
<td>If the LSA was originated by the calculating router itself, examine the next LSA. (NOTE: He we are testing the DUT does not use AS external link advertisements originated by the device itself.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 12.0: pass</th>
<th>FreeBSD 12.0: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ANVL-OSPF-7.2</th>
<th>RFC 1583, s16.4 p155 Calculating AS external routes</th>
<th>RFC 2328, s16.4 p173 Calculating AS external routes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUST</td>
<td>MUST</td>
<td>MUST</td>
</tr>
<tr>
<td></td>
<td>OSFP AS External Route Calculation</td>
<td>OSFP AS External Route Calculation</td>
</tr>
<tr>
<td></td>
<td>If no entries exist for router ASBR (i.e., ASBR is unreachable), do nothing with this LSA and consider the next in the list. (NOTE: Here we are testing the DUT does not use an AS external link advertisement if there is no routing table entry for the AS boundary router originating the advertisement.)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 12.0: pass</th>
<th>FreeBSD 12.0: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>
### ANVL-OSPF-7.4

**MUST**

OSPF AS External Route Calculation

If the forwarding address is non-zero, look up the forwarding address in
the routing table. The matching routing table entry must specify an
intra-area or inter-area path; if no such path exists, do nothing with
the LSA and consider the next in the list.

(NOTE: Here we are testing DUT ignores an AS external link advertisement
if there is no intra-area or inter-area routing table entry for the
forwarding address.)

<table>
<thead>
<tr>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
</tr>
<tr>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-7.5

**MUST**

OSPF AS External Route Calculation

Type 1 external paths are always preferred over type 2 external paths.

(NOTE: Here we are testing DUT always treats Type 1 external paths as
shorter than type 2 external paths.)

<table>
<thead>
<tr>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.3: pass</td>
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<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
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<tr>
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<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-7.6

**MUST**

OSPF AS External Route Calculation

If the external metric type is 1, then the path-type is set to type 1
external and the cost is equal to X+Y.

(NOTE: Here we are testing DUT compares Type 1 external paths by looking
at the sum of the distance to the forwarding address and the advertised
type 1 metric.)

<table>
<thead>
<tr>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
</tr>
<tr>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.0: pass</td>
<td>12.0: pass</td>
<td>12.0: pass</td>
<td>12.0: pass</td>
<td>12.0: pass</td>
<td>12.0: pass</td>
</tr>
</tbody>
</table>
### ANVL-OSPF-7.7
**MUST**

OSPF AS External Route Calculation
If the external metric type is 2, the path-type is set to type 2 external, the link state component of the route's cost is X, and the type 2 cost is Y.

*(NOTE: Here we are testing DUT compares type 2 external paths by advertised type 2 metrics or by distance to the forwarding addresses if type 2 metrics are equal.)*

|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|

### ANVL-OSPF-11.1
**MUST**

External Routing Information Use
External routing information is flooded unaltered throughout the AS.

|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|

### ANVL-OSPF-12.1
**MUST**

OSPF Operations
The router sends Hello packets to its neighbors, and in turn receives their Hello packets.

|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|

Test Report created at 2019-03-05 16:43:40 UTC
### OSPF Results

#### ANVL-OSPF-12.2

**RFC 2328, s40 Functional Summary**

**MUST**

OSPF Operations

On broadcast networks, the router dynamically detects its neighboring routers by sending its Hello packets to the multicast address AllSPFRouters.

<table>
<thead>
<tr>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>

#### ANVL-OSPF-12.4

**RFC 2328, s40 Functional Summary**

**MUST**

OSPF Operations

A router periodically advertises its state, which is also called link state.

<table>
<thead>
<tr>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>

#### ANVL-OSPF-12.5

**RFC 2328, s40 Functional Summary**

**MUST**

OSPF Operations

Link state is also advertised when a router’s state changes.

<table>
<thead>
<tr>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>

#### ANVL-OSPF-12.6

**RFC 2328, s4.3 p42 Routing protocol packets**

**MUST**

OSPF Operations

The OSPF protocol runs directly over IP, using IP protocol 89.

<table>
<thead>
<tr>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>
**Anvil-OSPF-12.7**

**SHOULD**

RFC 2328, s4.3 p42 Routing protocol packets

Routing protocol packets should always be sent with the IP TOS field set to 0.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 12.0: tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
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</tr>
</tbody>
</table>

**Anvil-OSPF-12.8**

**SHOULD**

RFC 2328, s4.3 p42 Routing protocol packets

OSPF protocol packets should have their IP precedence field set to the value Internetwork Control.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 12.0: tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

**Anvil-OSPF-12.9**

**MUST**

RFC 2328, s4.3 p43 Routing protocol packets

Each LSA is tagged with the ID of the originating router and a checksum of its link state contents. This test is for Router-LSA.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 12.0: tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
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<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

**Anvil-OSPF-12.10**

**MUST**

RFC 2328, s4.3 p43 Routing protocol packets

Each LSA is tagged with the ID of the originating router and a checksum of its link state contents. This test is for Network-LSA.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 12.0: tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>RFC Compliance Test Report</td>
<td>OSPF Results</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
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<th>ANVL-OSPF-12.11</th>
<th>RFC 2328, s4.3 p43 Routing protocol packets</th>
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<tr>
<td>MUST</td>
<td>OSPF Operations</td>
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<tr>
<td>Each LSA is tagged with the ID of the originating router and a checksum of its link state contents. This test is for a Type-3 Summary LSA.</td>
<td></td>
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<th>ANVL-OSPF-13.1</th>
<th>RFC 2328, s7.1 p52 The Hello Protocol</th>
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</thead>
<tbody>
<tr>
<td>MUST</td>
<td>Bringing up Adjacencies</td>
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<tr>
<td>Bidirectional communication is indicated when the router sees itself listed in the neighbor's Hello Packet.</td>
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<td>MUST</td>
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<tr>
<td>On broadcast networks, each router advertises itself by multicasting Hello Packets.</td>
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<th>RFC 2328, s7.1 p52 The Hello Protocol</th>
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<tbody>
<tr>
<td>MUST</td>
<td>Bringing up Adjacencies</td>
</tr>
<tr>
<td>On broadcast networks, each router advertises itself by periodically multicasting Hello Packets.</td>
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<td>RFC Compliance Test Report</td>
<td>OSPF Results</td>
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<td>RFC 2328, s7.2 p53 The Synchronization of Databases</td>
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<td><strong>MUST</strong></td>
<td>Bringing up Adjacencies</td>
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<tr>
<td></td>
<td>Each router describes its database by sending a sequence of Database Description packets to its neighbor. This is an indirect test which verifies that the DUT recognizes the LSA headers contained in the Database Description packets received from ANVL.</td>
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</table>

| RFC 2328, s7.2 p53 The Synchronization of Databases | |
| **SHOULD** | Bringing up Adjacencies |
| | When the neighbor sees an LSA that is more recent than its own database copy, it makes a note that this newer LSA should be requested. |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: untested | FreeBSD 10.3: untested |
| Ubuntu 16.04: pass | Ubuntu 16.04: pass |
| Ubuntu 16.04: pass | Ubuntu 16.04: pass |
| Ubuntu 16.04: pass | Ubuntu 16.04: pass |
| Ubuntu 16.04: pass | Ubuntu 16.04: pass |
| Ubuntu 16.04: pass | Ubuntu 16.04: pass |
| Ubuntu 16.04: pass | Ubuntu 16.04: pass |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested |
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| FreeBSD 12.0: untested | FreeBSD 12.0: untested |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested |
| FreeBSD 12.0: pass | FreeBSD 12.0: pass |

| RFC 2328, s7.2 p53 The Synchronization of Databases | |
| **SHOULD** | Bringing up Adjacencies |
| | When the neighbor sees an LSA that is not more recent than its own database copy, it does not make a note that this LSA (which is not newer) should be requested. |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: untested | FreeBSD 10.3: untested |
| Ubuntu 16.04: pass | Ubuntu 16.04: pass |
| Ubuntu 16.04: pass | Ubuntu 16.04: pass |
| Ubuntu 16.04: pass | Ubuntu 16.04: pass |
| Ubuntu 16.04: pass | Ubuntu 16.04: pass |
| Ubuntu 16.04: pass | Ubuntu 16.04: pass |
| Ubuntu 16.04: pass | Ubuntu 16.04: pass |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested |
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| FreeBSD 12.0: untested | FreeBSD 12.0: untested |
| FreeBSD 12.0: pass | FreeBSD 12.0: pass |

<p>| RFC 2328, s7.2 p53 The Synchronization of Databases | |
| <strong>MUST</strong> | Bringing up Adjacencies |
| | Database Description Packets sent by the master (polls) are acknowledged by the slave through echoing of the sequence number. |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: untested | FreeBSD 10.3: untested |
| Ubuntu 16.04: pass | Ubuntu 16.04: pass |
| Ubuntu 16.04: pass | Ubuntu 16.04: pass |
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| Ubuntu 16.04: pass | Ubuntu 16.04: pass |
| Ubuntu 16.04: pass | Ubuntu 16.04: pass |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested |
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| FreeBSD 12.0: pass | FreeBSD 12.0: pass |</p>
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<tr>
<td><strong>MUST</strong></td>
<td>Bringing up Adjacencies The master is the only one allowed to retransmit Database Description Packets.</td>
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<td><strong>MUST</strong></td>
<td>Bringing up Adjacencies The slave is not allowed to retransmit Database Description packets.</td>
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<tr>
<td><strong>MUST</strong></td>
<td>Bringing up Adjacencies Each Database Description contains an indication that there are more packets to follow --- the M-bit.</td>
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<td><strong>MUST</strong></td>
<td>Bringing up Adjacencies Database Exchange Process is over when a router has received and sent Database Description Packets with the M-bit off.</td>
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**ANVL-OSPF-13.12**
MUST
RFC 2328, s7.3 p54 The Designated Router

Bringing up Adjacencies
The Designated Router originates a network-LSA on behalf of the network.

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</table>

**ANVL-OSPF-13.13**
MUST
RFC 2328, s7.3 p54 The Designated Router

Bringing up Adjacencies
If a router is not the DR, it does not generate a network-LSA for the network. This test is with DUT as BDR.

<table>
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**ANVL-OSPF-13.14**
MUST
RFC 2328, s7.3 p54 The Designated Router

Bringing up Adjacencies
If a router is not the DR, it does not generate a network-LSA for the network. This test is with DUT as DR-Other.

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**ANVL-OSPF-13.15**
MUST
RFC 2328, s7.3 p54 The Designated Router

Bringing up Adjacencies
The Link State ID for network-LSA is the IP interface address of the Designated Router.

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<tbody>
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## RFC Compliance Test Report

### OSPF Results

### ANVL-OSPF-13.16

**MUST**

<table>
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<tr>
<th>Release 2.0.2</th>
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<th>Release 3.0.3</th>
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<th>Release 5.0.1</th>
<th>Release 6.0</th>
<th>Master 2019-02-24</th>
<th>Release 7.0</th>
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<tbody>
<tr>
<td>ANVL-OSPF-13.16</td>
<td>RFC 2328, s7.4 p56 The Backup Designated Router</td>
<td>Bringing up Adjacencies</td>
<td>Backup Designated Router becomes Designated Router when the previous Designated Router fails.</td>
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### ANVL-OSPF-13.17

**MUST**

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### ANVL-OSPF-14.1

**MUST**

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**Page 25 of 87**
<table>
<thead>
<tr>
<th>ANVL-OSPF-14.3</th>
<th>RFC 2328, s8.1 p59 Sending protocol packets</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUST</td>
<td>Protocol Packet Processing</td>
</tr>
<tr>
<td></td>
<td>Area ID in the OSPF packet header must be set to the ID of the area that the packet is being sent into. (This test checks Hello packet)</td>
</tr>
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<tr>
<td>MUST</td>
<td>Protocol Packet Processing</td>
</tr>
<tr>
<td></td>
<td>The IP checksum of any OSPF packet is the standard IP 16-bit one's complement checksum of the entire OSPF packet, excluding the 64-bit authentication field. (This test checks the case of sending a Hello packet)</td>
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<th>RFC 2328, s8.1 p59 Sending protocol packets</th>
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<tr>
<td>MUST</td>
<td>Protocol Packet Processing</td>
</tr>
<tr>
<td></td>
<td>A router discards any received Hello packet with an invalid IP checksum i.e. which is not the standard IP 16-bit one's complement checksum of the entire OSPF packet, excluding the 64-bit authentication field.</td>
</tr>
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<th>RFC 2328, s8.1 p60 Sending protocol packets</th>
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<td>MUST</td>
<td>Protocol Packet Processing</td>
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<tr>
<td></td>
<td>Retransmissions of Link State Update packets are ALWAYS sent directly to the neighbor.</td>
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<td>ANVL-OSPF-14.8</td>
<td>Protocol Packet Processing</td>
<td>The Received packet’s IP source address is required to be on the same network as the receiving interface.</td>
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<tr>
<th>ANVL-OSPF-14.9</th>
<th>Protocol Packet Processing</th>
<th>The Received packet’s IP source address is required to be on the same network as the receiving interface.</th>
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<th>ANVL-OSPF-14.10</th>
<th>Protocol Packet Processing</th>
<th>The AuType specified in the packet must match the AuType specified for the associated area.</th>
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<th>ANVL-OSPF-15.1</th>
<th>Sending Hello packets</th>
<th>Interface Data Structure</th>
<th>The Hello Packet also indicates how often a neighbor must be heard from to remain active (RouterDeadInterval).</th>
</tr>
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<tr>
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</tbody>
</table>

**ANVL-OSPF-15.2**

**MUST**

RFC 2328, s9 p66 The Interface Data Structure

Interface Data Structure

The Designated Router is initialized to 0.0.0.0, which indicates the lack of a Designated Router.

<table>
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**ANVL-OSPF-15.3**

**MUST**

RFC 2328, s9 p66 The Interface Data Structure

Interface Data Structure

The Backup Designated Router is initialized to 0.0.0.0, indicating the lack of a Backup Designated Router.

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<th>FreeBSD 10.3: pass</th>
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</table>

**ANVL-OSPF-15.4**

**MUST**

RFC 2328, s9 p66 The Interface Data Structure

Interface Data Structure

RxmtInterval is the number of seconds between Database Description packet retransmissions. This tests for Database Description packet retransmission in ExStart state.

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</table>

**ANVL-OSPF-15.5**

**MUST**

RFC 2328, s9 p66 The Interface Data Structure

Interface Data Structure

RxmtInterval is the number of seconds between Link State Request packet retransmissions. This tests for Database Description packet retransmission in Loading state.

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### Interface Data Structure

**RxmtInterval** is the number of seconds between LSA retransmissions, for adjacencies belonging to this interface.

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### Interface Data Structure

No protocol traffic at all will be sent or received on a down interface.

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### Interface Data Structure

In DR Other state, the router itself has not been selected Backup Designated Router either. The router forms adjacencies to both the Designated Router and the Backup Designated Router (if they exist).

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<th>FreeBSD 10.3: tested</th>
<th>FreeBSD 10.3: tested</th>
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### Interface Data Structure

In Backup state the router establishes adjacencies to all other routers attached to the network.

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### ANVL-OSPF-15.10
**MUST**
RFC 2328, s9.1 p69 Interface states

Interface Data Structure
In DR state Adjacencies are established to all other routers attached to the network.

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### ANVL-OSPF-15.11
**MUST**
RFC 2328, s9.3 p73 The Interface state machine

Interface Data Structure
When router is in Waiting state, if BackupSeen event occurs then router calculates the attached network"s Backup Designated Router and Designated Router.

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<th>FreeBSD 10.3: pass</th>
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### ANVL-OSPF-15.12
**MUST**
RFC 2328, s9.3 p73 The Interface state machine

Interface Data Structure
When router is in Waiting state, if WaitTimer event fires then router calculates the attached network"s Backup Designated Router and Designated Router.

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<td>FreeBSD 12.0: untested</td>
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<td>FreeBSD 12.0: untested</td>
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</tr>
</tbody>
</table>

### ANVL-OSPF-15.13
**MUST**
RFC 2328, s9.3 p74 The Interface state machine

Interface Data Structure
When NbrChange event fires then router recalculates the attached network"s Backup Designated Router and Designated Router.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
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<tr>
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</tbody>
</table>

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<tr>
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</thead>
<tbody>
<tr>
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<th>FreeBSD 10.3: pass</th>
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<tbody>
<tr>
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<td>FreeBSD 12.0: untested</td>
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</thead>
<tbody>
<tr>
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<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
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</tr>
</tbody>
</table>
### Interface Data Structure

**RFC 2328, s9.4 p75 Electing the Designated Router**

If more than one routers have declared themselves as Backup designated but not as Designated Router, the one having the highest Router Priority is declared to be Backup Designated Router.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
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<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
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<td>FreeBSD 12.0: untested</td>
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<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

### Interface Data Structure

When selecting a Backup Designated Router among more than one Routers declaring themselves as Backup Designated Router, if there is a tie in the Router Priority, the one having highest Router ID is chosen.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
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</tr>
</thead>
<tbody>
<tr>
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<td>FreeBSD 12.0: untested</td>
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<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

### Interface Data Structure

If no routers have declared themselves Backup Designated Router, choose the router having highest Router Priority as Backup Designated Router.

<table>
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<th>FreeBSD 10.3: pass</th>
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<tbody>
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<td>FreeBSD 12.0: untested</td>
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<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

### Interface Data Structure

If no routers have declared themselves Backup Designated Router, choose the router having highest Router Priority, again use the Router ID to break ties.

<table>
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<th>FreeBSD 10.3: pass</th>
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<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
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<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>Release 2.0.2</td>
<td>Release 3.0.2</td>
<td>Release 3.0.3</td>
<td>Release 4.0</td>
<td>Release 5.0.1</td>
<td>Release 6.0</td>
</tr>
<tr>
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<td>-------------</td>
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<td>-------------</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-15.18

**MUST**

RFC 2328, s9.4 p76 Electing the Designated Router

**Interface Data Structure**

If one or more of the routers have declared themselves Designated Router, the one having highest Router Priority is declared to be Designated Router.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</tr>
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<td>FreeBSD 12.0: untested</td>
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</table>

### ANVL-OSPF-15.19

**MUST**

RFC 2328, s9.4 p76 Electing the Designated Router

**Interface Data Structure**

In case of a tie in the router priority among routers declaring themselves Designated Router, the one having the highest Router ID is chosen.

<table>
<thead>
<tr>
<th></th>
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</table>

### ANVL-OSPF-15.20

**MUST**

RFC 2328, s9.4 p76 Electing the Designated Router

**Interface Data Structure**

If no routers have declared themselves Designated Router, assign the Designated Router to be the same as the newly elected Backup Designated Router.

<table>
<thead>
<tr>
<th></th>
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### ANVL-OSPF-15.21

**SHOULD**

RFC 2328, s9.5 p78 Sending Hello packets

**Interface Data Structure**

While sending a Hello packet into a stub area the E-bit of the Options field should be clear.

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<tr>
<th></th>
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<tr>
<td>ANVL-OSPF-15.22 SHOULD</td>
<td>RFC 2328, s9.5 p78 Sending Hello packets</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interface Data Structure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>While sending a Hello packet into a non-stub area the E-bit of the Options field should be set.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<th>ANVL-OSPF-15.23 MUST</th>
<th>RFC 2328, s9.5 p78 Sending Hello packets</th>
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</thead>
<tbody>
<tr>
<td>Interface Data Structure</td>
<td></td>
</tr>
<tr>
<td>In order to ensure two-way communication between adjacent routers, the Hello packet contains the list of all routers on the network from which Hello Packets have been seen recently.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
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<table>
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<tr>
<th>ANVL-OSPF-15.24 MUST</th>
<th>RFC 2328, s9.5 p78 Sending Hello packets</th>
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<tbody>
<tr>
<td>Interface Data Structure</td>
<td></td>
</tr>
<tr>
<td>Hello packet also contains the router's current choice for Designated Router and Backup Designated Router.</td>
<td></td>
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<tr>
<th>ANVL-OSPF-15.25 MUST</th>
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</thead>
<tbody>
<tr>
<td>Interface Data Structure</td>
<td></td>
</tr>
<tr>
<td>On broadcast networks, Hello packets are sent to the IP multicast address AllSPFRouters.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
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<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
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<tr>
<td>Release 2.0.2</td>
<td>Release 3.0.2</td>
<td>Release 3.0.3</td>
<td>Release 4.0</td>
<td>Release 5.0.1</td>
<td>Release 6.0</td>
<td>Master 2019-02-24</td>
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<tr>
<td>ANVL-OSPF-15.26 MUST</td>
<td>RFC 2328, s9.5 p78 Sending Hello packets</td>
<td>Interface Data Structure</td>
<td>On broadcast networks, Hello packets are sent every HelloInterval seconds.</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
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<td>FreeBSD 12.0: untested</td>
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<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
<tr>
<td>ANVL-OSPF-15.29 MUST</td>
<td>RFC 2328, s9.5 p78 Sending Hello packets</td>
<td>Interface Data Structure</td>
<td>On virtual links, Hello packets are sent as unicasts (addressed directly) to the other end of the virtual link)</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
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<tr>
<td>FreeBSD 12.0: untested</td>
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<td>FreeBSD 12.0: untested</td>
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</tr>
<tr>
<td>ANVL-OSPF-15.30 MUST</td>
<td>RFC 2328, s9.5 p78 Sending Hello packets</td>
<td>Interface Data Structure</td>
<td>On virtual links, Hello packets are sent every HelloInterval seconds.</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
</tr>
<tr>
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<tr>
<td>ANVL-OSPF-16.1 MUST</td>
<td>RFC 2328, s10 p80 The neighbor Data Structure</td>
<td>Neighbor Data Structure</td>
<td>The Database Description Packet sent by slave is not allowed to retransmit.</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
</tr>
<tr>
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<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>
### ANVL-OSPF-16.2

**MUST**

RFC 2328, s10 p81 The neighbor Data Structure

The `initialize(I)`, `more (M)` and `master (MS)` bits, `Options` field, and `DD` sequence number contained in the last Database Description packet received from the neighbor are used to determine whether the next Database Description packet received from the neighbor is a duplicate.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: fail</th>
<th>FreeBSD 10.3: fail</th>
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<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-17.1

**MUST**

RFC 2328, s10.1 p83 neighbor states

After the two routers discover their master/slave status, the state transitions to Exchange.

(This test checks the case when DUT eventually becomes master)

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
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<th>FreeBSD 10.3: pass</th>
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</thead>
<tbody>
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<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
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</table>

### ANVL-OSPF-17.2

**MUST**

RFC 2328, s10.1 p83 neighbor states

After the two routers discover their master/slave status, the state transitions to Exchange.

(This test checks the case when DUT eventually becomes slave)

<table>
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<tr>
<th>FreeBSD 10.3: pass</th>
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<th>FreeBSD 10.3: pass</th>
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<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
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</table>
### ANVL-OSPF-17.3

**MUST**

<table>
<thead>
<tr>
<th>Release 2.0.2</th>
<th>Release 3.0.2</th>
<th>Release 3.0.3</th>
<th>Release 4.0</th>
<th>Release 5.0.1</th>
<th>Release 6.0</th>
<th>Master 2019-02-24</th>
<th>Release 7.0</th>
</tr>
</thead>
</table>

RFC 2328, s10.1 p86 neighbor states

**Neighbor States**

Only one Database Description Packet is allowed outstanding at any one time. So when a router is slave it will always send a Database Description packet with the DD sequence number same as that of the Database Description packet received from master.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: tested</th>
<th>FreeBSD 10.3: tested</th>
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</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: tested</td>
<td>FreeBSD 12.0: tested</td>
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</tbody>
</table>

### ANVL-OSPF-17.4

**MUST**

<table>
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<tr>
<th>Release 2.0.2</th>
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<th>Release 3.0.3</th>
<th>Release 4.0</th>
<th>Release 5.0.1</th>
<th>Release 6.0</th>
<th>Master 2019-02-24</th>
<th>Release 7.0</th>
</tr>
</thead>
</table>

RFC 2328, s10.1 p86 neighbor states

**Neighbor States**

Only one Database Description Packet is allowed outstanding at any one time. So when a router is master it will retransmit a Database Description packet unless slave sends a Database Description packet echoing the DD sequence number of the last sent Database Description packet.

<table>
<thead>
<tr>
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<tbody>
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</table>

### ANVL-OSPF-17.5

**MAY**

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<th>Release 4.0</th>
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<th>Master 2019-02-24</th>
<th>Release 7.0</th>
</tr>
</thead>
</table>

RFC 2328, s10.1 p86 neighbor states

**Neighbor States**

In Exchange state Link State Request Packets may also be sent asking for the neighbor's more recent LSAs.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
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<tbody>
<tr>
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</tr>
</tbody>
</table>
### Neighbor State Machine

**ANVL-OSPF-18.1**

**SHOULD**

RFC 2328, s10.3 p90-91 The neighbor state machine

In Init state if the neighbor event 2-WayReceived is triggered and if it is determined that adjacency should be established with the neighbor, the neighbor state transitions to ExStart. Upon entering this state, the router increments the DD sequence number in the neighbor data structure.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
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<tbody>
<tr>
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</tr>
</tbody>
</table>

### Neighbor State Machine

**ANVL-OSPF-18.2**

**MUST**

RFC 2328, s10.3 p91 The neighbor state machine

The area link state database consists of the router-LSAs, network-LSAs and summary-LSAs contained in the area structure, along with the AS-external-LSAs contained in the global structure.

<table>
<thead>
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<tbody>
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</tr>
</tbody>
</table>

### Neighbor State Machine

**ANVL-OSPF-18.3**

**MUST**

RFC 2328, s10.3 p91 The neighbor state machine

AS-external-LSAs are omitted from the Database summary list if the area has been configured as a stub area.

<table>
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<th>FreeBSD 10.3: pass</th>
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</tr>
</thead>
<tbody>
<tr>
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<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
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<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>
## RFC 2328, s10.3 p92 The neighbor state machine

### Neighbor State Machine

When in Exchange state if ExchangeDone event has fired then if the neighbor Link state request list is not empty, router transitions to Loading state and starts (or continues) sending Link State Request packets to the neighbor.

|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-----------------------|-----------------------|

### ANVL-OSPF-18.5

#### MUST

If the router is in Exchange or greater state and the neighbor event SeqNumberMismatch has occurred then the router increments the DD sequence number in the neighbor data structure. This test is for Exchange State.

|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-----------------------|-----------------------|

### ANVL-OSPF-18.6

#### MUST

If the router is in Exchange or greater state and the neighbor event SeqNumberMismatch has occurred then the router increments the DD sequence number in the neighbor data structure. This test is for Loading State.

|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-----------------------|-----------------------|

Test Report created at 2019-03-05 16:43:40 UTC
<table>
<thead>
<tr>
<th>Release</th>
<th>RFC Compliance Test Report</th>
<th>OSPF Results</th>
</tr>
</thead>
</table>

### ANVL-OSPF-18.7

**MUST**

RFC 2328, s10.3 p94 The neighbor state machine

**Neighbor State Machine**

The action for event BadLSReq is exactly the same as for the neighbor event SeqNumberMismatch. The (possibly partially formed) adjacency is torn down, and then an attempt is made at reestablishment. This test is for Exchange State.

<table>
<thead>
<tr>
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<th>FreeBSD 10.3: pass</th>
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<tbody>
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</tr>
</tbody>
</table>

### ANVL-OSPF-18.8

**MUST**

RFC 2328, s10.3 p94 The neighbor state machine

**Neighbor State Machine**

The action for event BadLSReq is exactly the same as for the neighbor event SeqNumberMismatch. The (possibly partially formed) adjacency is torn down, and then an attempt is made at reestablishment. This test is for Loading State.

<table>
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</table>

### ANVL-OSPF-19.1

**MUST**

RFC 2328, s10.4 p95 Whether to become adjacent

**Adjacency Decision**

On broadcast, all routers become adjacent to both the Designated Router and the Backup Designated Router.

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</table>

### ANVL-OSPF-20.1

**MUST**

RFC 2328, s10.5 p96 Receiving Hello Packets

**Receiving Hello Packets**

The values of the Network Mask field in the received Hello packet must be checked against the values configured for the receiving interface. Any mismatch causes processing to stop and the packet to be dropped.

<table>
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<tr>
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</table>
### ANVL-OSPF-20.2

**MUST**

RFC 2328, s10.5 p96 Receiving Hello Packets

The values of the HelloInterval field in the received Hello packet must be checked against the values configured for the receiving interface. Any mismatch causes processing to stop and the packet to be dropped.

<table>
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</table>

### ANVL-OSPF-20.3

**MUST**

RFC 2328, s10.5 p96 Receiving Hello Packets

The values of the RouterDeadInterval fields in the received Hello packet must be checked against the values configured for the receiving interface. Any mismatch causes processing to stop and the packet to be dropped.

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</table>

### ANVL-OSPF-20.4

**MUST**

RFC 2328, s10.5 p96 Receiving Hello Packets

Receiving Hello Packets

If the receiving interface is attached to a stub area the E-bit must be clear in received Hello Packets and a mismatch causes processing to stop and the packet to be dropped.

<table>
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</tr>
</tbody>
</table>

### ANVL-OSPF-20.5

**MUST**

RFC 2328, s10.5 p96 Receiving Hello Packets

Receiving Hello Packets

If the receiving interface is attached to a non-stub area the E-bit must be set in received Hello Packets and a mismatch causes processing to stop and the packet to be dropped.

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</tbody>
</table>
### ANVL-OSPF-21.1

**RFC 2328, s10.6 p100 Receiving Database Description Packets**

**MUST**

Receiving DB Description Packets

In ExStart state if the received Database Description packet has the I, M and MS bits set, the packet is empty, and the neighbor's Router ID is larger than the router's own then the router is slave, and it sets the neighbor data structure's DD sequence number to that specified by master.

<table>
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<tr>
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</table>

### ANVL-OSPF-21.2

**RFC 2328, s10.6 p100 Receiving Database Description Packets**

**MUST**

Receiving DB Description Packets

In ExStart state if the received Database Description packet has the I and MS bits off, the packet's DD sequence number equals the neighbor data structure's DD sequence number and the neighbor's Router ID is smaller than the router's own then the router is Master.

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</table>

### ANVL-OSPF-21.3

**RFC 2328, s10.6 p102 Receiving Database Description Packets**

**SHOULD**

Receiving DB Description Packets

When the router accepts a received Database Description Packet as the next in sequence, if the router is master and the accepted packet has more bit (M) set to 1, it should send a new Database Description to the slave.

<table>
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<th>FreeBSD 10.3: pass</th>
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<tbody>
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</table>
### ANVL-OSPF-21.4

**SHOULD**  
RFC 2328, s10.6 p102 Receiving Database Description Packets  
Receiving DB Description Packets  
When the router accepts a received Database Description Packet as the next in sequence, if the router is master and the router has not sent its entire sequence of Database Description packets, it should send a new Database Description to the slave.

<table>
<thead>
<tr>
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<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
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<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
</table>

### ANVL-OSPF-21.5

**MUST**  
RFC 2328, s10.6 p102 Receiving Database Description Packets  
Receiving DB Description Packets  
When the router accepts a received Database Description Packet as the next in sequence, if the router is master it increments the DD sequence number in the neighbor data structure.

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<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
</table>

### ANVL-OSPF-21.6

**MUST**  
RFC 2328, s10.6 p102 Receiving Database Description Packets  
Receiving DB Description Packets  
When the router accepts a received Database Description Packet as the next in sequence, if the router is slave, it sets the DD sequence number in the neighbor data structure to the DD sequence number appearing in the received packet and also it must send a Database Description packet in response.

<table>
<thead>
<tr>
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<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
</table>
# RFC Compliance Test Report

## OSPF Results

<table>
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<th>Release 2.0.2</th>
<th>Release 3.0.2</th>
<th>Release 3.0.3</th>
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<th>Release 7.0</th>
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</thead>
</table>
### ANVL-OSPF-22.1

**SHOULD**

RFC 2328, s10.7 p102 Receiving Link State Request Packets

Link State Request Packets should be accepted when the neighbor is in state Exchange.

<table>
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<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-22.2

**SHOULD**

RFC 2328, s10.7 p102 Receiving Link State Request Packets

Link State Request Packets should be accepted when the neighbor is in state Loading.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-22.3

**SHOULD**

RFC 2328, s10.7 p102 Receiving Link State Request Packets

Link State Request Packets should be accepted when the neighbor is in state Full.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-22.4

**SHOULD**

RFC 2328, s10.7 p102 Receiving Link State Request Packets

Link State Request Packets should be ignored when neighbor is in ExStart state.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
<td><strong>Ubuntu 16.04:</strong> pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
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</tr>
</tbody>
</table>
### ANVL-OSPF-22.5

**SHOULD**

RFC 2328, s10.7 p102 Receiving Link State Request Packets

Link State Request Packets should be ignored when neighbor is in Init state.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-22.6

**SHOULD**

RFC 2328, s10.7 p102 Receiving Link State Request Packets

Link State Request Packets should be ignored when neighbor is in Down state.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-22.7

**SHOULD**

RFC 2328, s10.7 p103 Receiving Link State Request Packets

If an LSA specified in the Link State Request packet cannot be found in the database, something has gone wrong with the Database Exchange process, and neighbor event BadLSReq should be generated.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-23.1

**SHOULD**

RFC 2328, s10.8 p103 Sending Database Description Packets

Interface MTU should be set to 0 in Database Description packets sent over virtual links.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>
### RFC Compliance Test Report

#### OSPF Results

<table>
<thead>
<tr>
<th>Test Case</th>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
</table>
| ANVL-OSPF-23.2 | RFC 2328, s10.8 p103 Sending Database Description Packets | SHOULD  
Sending DB Description Packets  
In Database Description packet the unrecognized bits in the Options field should be set to zero.  
(Note: we are only checking the option-bit 1 since it is currently reserved and not recognized)  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
FreeBSD 12.0: untested  
FreeBSD 12.0: untested  
FreeBSD 12.0: untested  
FreeBSD 12.0: untested  
FreeBSD 12.0: untested  
FreeBSD 12.0: pass  
FreeBSD 12.0: pass  
FreeBSD 12.0: pass  
FreeBSD 12.0: pass  
FreeBSD 12.0: pass  
FreeBSD 12.0: pass  |
| ANVL-OSPF-23.3 | RFC 2328, s10.8 p103 Sending Database Description Packets | MUST  
Sending DB Description Packets  
In state ExStart the router sends empty Database Description packets, with the initialize (I), more (M) and master (MS) bits set.  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
FreeBSD 12.0: untested  
FreeBSD 12.0: untested  
FreeBSD 12.0: untested  
FreeBSD 12.0: untested  
FreeBSD 12.0: untested  
FreeBSD 12.0: pass  
FreeBSD 12.0: pass  
FreeBSD 12.0: pass  
FreeBSD 12.0: pass  
FreeBSD 12.0: pass  
FreeBSD 12.0: pass  |
| ANVL-OSPF-23.4 | RFC 2328, s10.8 p103 Sending Database Description Packets | MUST  
Sending DB Description Packets  
In state ExStart Database Description packets are retransmitted every RxmtInterval seconds.  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
FreeBSD 12.0: untested  
FreeBSD 12.0: untested  
FreeBSD 12.0: untested  
FreeBSD 12.0: untested  
FreeBSD 12.0: untested  
FreeBSD 12.0: pass  
FreeBSD 12.0: pass  
FreeBSD 12.0: pass  
FreeBSD 12.0: pass  
FreeBSD 12.0: pass  
FreeBSD 12.0: pass  |
| ANVL-OSPF-23.5 | RFC 2328, s10.8 p104 Sending Database Description Packets | MUST  
Sending DB Description Packets  
In state Exchange, if the router is master, Database Description packets are sent when slave acknowledges the previous Database Description packet by echoing the DD sequence number.  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
FreeBSD 10.3: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
Ubuntu 16.04: pass  
FreeBSD 12.0: untested  
FreeBSD 12.0: untested  
FreeBSD 12.0: untested  
FreeBSD 12.0: untested  
FreeBSD 12.0: untested  
FreeBSD 12.0: pass  
FreeBSD 12.0: pass  
FreeBSD 12.0: pass  
FreeBSD 12.0: pass  
FreeBSD 12.0: pass  
FreeBSD 12.0: pass  |
### ANVL-OSPF-23.6

**MUST**

RFC 2328, s10.8 p104 Sending Database Description Packets

Sending DB Description Packets

In state Exchange, if the router is slave, Database Description packets are sent only in response to Database Description packets received from the master.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-23.7

**MUST**

RFC 2328, s10.8 p104 Sending Database Description Packets

Sending DB Description Packets

In state Exchange, if the router is slave, if the Database Description packet received from the master is new, a new Database Description packet is sent, otherwise the previous Database Description packet is resent.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-23.8

**MUST**

RFC 2328, s10.8 p104 Sending Database Description Packets

Sending DB Description Packets

In state Loading the slave must resend its last Database Description packet in response to duplicate Database Description packets received from the master.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-23.9

**MUST**

RFC 2328, s10.8 p104 Sending Database Description Packets

Sending DB Description Packets

In state Full the slave must resend its last Database Description packet in response to duplicate Database Description packets received from the master.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>--------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>2.0.2</td>
<td>3.0.2</td>
<td>3.0.3</td>
<td>4.0</td>
<td>5.0.1</td>
<td>6.0</td>
<td>2019-02-24</td>
<td>7.0</td>
<td></td>
</tr>
</tbody>
</table>

**ANVL-OSPF-23.10**

RFC 2328, s10.8 p104 Sending Database Description Packets

**MUST**

Sending DB Description Packets

In state Loading, reception of a Database Description packet from the master after this interval (RouterDeadInterval) will generate a SeqNumberMismatch neighbor event.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: test</th>
<th>FreeBSD 10.3: test</th>
</tr>
</thead>
</table>

**ANVL-OSPF-23.11**

RFC 2328, s10.8 p104 Sending Database Description Packets

**MUST**

Sending DB Description Packets

In state Full, reception of a Database Description packet from the master after this interval (RouterDeadInterval) will generate a SeqNumberMismatch neighbor event.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: test</th>
<th>FreeBSD 10.3: test</th>
</tr>
</thead>
</table>

**ANVL-OSPF-24.1**

RFC 2328, s10.9 p105 Sending Link State Request Packets

**MUST**

Sending LS Request Packets

When the neighbor responds to these requests (Link State Request) with the proper Link State Update packet(s), the Link state request list is truncated and a new Link State Request packet is sent. This process continues until the Link state request list becomes empty.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: test</th>
<th>FreeBSD 10.3: test</th>
</tr>
</thead>
</table>

**ANVL-OSPF-24.2**

RFC 2328, s10.9 p105 Sending Link State Request Packets

**MUST**

Sending LS Request Packets

Link state request list that have been requested, but not yet received, are packaged into Link State Request packets for retransmission at intervals of RxmtInterval.
### RFC Compliance Test Report

#### OSPF Results

**ANVL-OSPF-24.3**

**MUST**

<table>
<thead>
<tr>
<th>Release 2.0.2</th>
<th>Release 3.0.2</th>
<th>Release 3.0.3</th>
<th>Release 4.0</th>
<th>Release 5.0.1</th>
<th>Release 6.0</th>
<th>Master 2019-02-24</th>
<th>Release 7.0</th>
</tr>
</thead>
</table>

- RFC 2328, s12.1.1 p116 LS age
  - Sending LS Request Packets
  - LSAs are also aged as they are held in each router's database.

```
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0:</td>
<td>FreeBSD 12.0:</td>
<td>FreeBSD 12.0:</td>
<td>FreeBSD 12.0:</td>
<td>FreeBSD 12.0:</td>
<td>FreeBSD 12.0:</td>
<td>FreeBSD 12.0:</td>
<td>FreeBSD 12.0:</td>
<td>FreeBSD 12.0:</td>
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</tr>
</tbody>
</table>
```

**ANVL-OSPF-24.4**

**MUST**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
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<td>FreeBSD 12.0:</td>
<td>FreeBSD 12.0:</td>
<td>FreeBSD 12.0:</td>
<td>FreeBSD 12.0:</td>
<td>FreeBSD 12.0:</td>
<td>FreeBSD 12.0:</td>
<td>FreeBSD 12.0:</td>
<td>FreeBSD 12.0:</td>
</tr>
<tr>
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<td>FreeBSD 12.0:</td>
<td>FreeBSD 12.0:</td>
<td>FreeBSD 12.0:</td>
<td>FreeBSD 12.0:</td>
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<td>FreeBSD 12.0:</td>
<td>FreeBSD 12.0:</td>
</tr>
<tr>
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**ANVL-OSPF-24.5**

**MUST**

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**ANVL-OSPF-24.6**

**MUST**

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</tbody>
</table>

- RFC 2328, s12.1.1 p116 LS age
  - Sending LS Request Packets
  - When an LSA's age first reaches MaxAge, it is reflooded.

- RFC 2328, s12.1.1 p116 LS age
  - Sending LS Request Packets
  - The age of an LSA is never incremented past MaxAge.

- RFC 2328, s12.1.1 p116 LS age
  - Sending LS Request Packets
  - When an LSA's age first reaches MaxAge, it is reflooded.

- RFC 2328, s12.1.1 p116 LS age
  - Sending LS Request Packets
  - LSA of age MaxAge is finally flushed from the database when it is no longer needed to ensure database synchronization.
### ANVL-OSPF-24.7

**MUST**

RFC 2328, s12.1.1 p117 LS age

Sending LS Request Packets
If the two instances of a LSA have identical LS sequence number and LS
checksum, an instance of age MaxAge is then always accepted as most
recent.

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<tr>
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</tr>
</thead>
</table>

### ANVL-OSPF-24.8

**MUST**

RFC 2328, s12.1.1 p117 LS age

Sending LS Request Packets
If the two instances of a LSA have identical LS sequence number and LS
Checksum and none of them is of age MaxAge then if their ages differ by
more than MaxAgeDiff, the instance having the smaller age is accepted
as most recent.

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</table>

### ANVL-OSPF-25.1

**SHOULD**

RFC 2328, s12.1.2 p117 Options

LSA Header
The E-bit represents OSPF's ExternalRoutingCapability. This bit should
be set in all LSAs associated with the backbone.

<table>
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<th>FreeBSD 10.3: pass</th>
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</table>

### ANVL-OSPF-25.2

**SHOULD**

RFC 2328, s12.1.2 p117 Options

LSA Header
The E-bit represents OSPF's ExternalRoutingCapability. This bit should
be set in all LSAs associated with (non-backbone) non-stub areas.
(This test checks for Router-LSA)

<table>
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<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
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<tbody>
<tr>
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<td>Release 3.0.2</td>
<td>Release 3.0.3</td>
<td>Release 4.0</td>
<td>Release 5.0.1</td>
<td>Release 6.0</td>
<td>Master 2019-02-24</td>
<td>Release 7.0</td>
</tr>
<tr>
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### ANVL-OSPF-25.3

**SHOULD**

RFC 2328, s12.1.2 p117 Options

**LSA Header**

The E-bit represents OSPF's ExternalRoutingCapability. This bit should be set in all LSAs associated with (non-backbone) non-stub areas. (This test checks for Network-LSA)

|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------------------|------------------------|

### ANVL-OSPF-25.4

**SHOULD**

RFC 2328, s12.1.2 p117 Options

**LSA Header**

The E-bit represents OSPF's ExternalRoutingCapability. This bit should be set in all LSAs associated with (non-backbone) non-stub areas. (This test checks for Type-3 Summary-LSA)

|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------------------|------------------------|

### ANVL-OSPF-25.5

**SHOULD**

RFC 2328, s12.1.2 p117 Options

**LSA Header**

The E-bit represents OSPF's ExternalRoutingCapability. This bit should be set in all LSAs associated with (non-backbone) non-stub areas. (This test checks for Type-4 Summary-LSA)

|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------------------|------------------------|

### ANVL-OSPF-25.6

**SHOULD**

RFC 2328, s12.1.2 p117 Options

**LSA Header**

E-bit should be reset (set to 0) in all router-LSAs associated with a stub area.

|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------------------|------------------------|

Test Report created at 2019-03-05 16:43:40 UTC
<table>
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<tr>
<th>Release 2.0.2</th>
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<th>Release 3.0.3</th>
<th>Release 4.0</th>
<th>Release 5.0.1</th>
<th>Release 6.0</th>
<th>Master 2019-02-24</th>
<th>Release 7.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ANVL-OSPF-25.7</strong></td>
<td>RFC 2328, s12.1.2 p117 Options</td>
<td>LSA Header</td>
<td>E-bit should be reset (set to 0) in all network-LSAs associated with a stub area.</td>
<td></td>
<td></td>
<td></td>
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</tr>
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<tr>
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</tbody>
</table>

| **ANVL-OSPF-25.8** | RFC 2328, s12.1.2 p117 Options | LSA Header | E-bit should be reset (set to 0) in all summary-LSAs associated with a stub area. |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: pass |

| **ANVL-OSPF-25.9** | RFC 2328, s12.1.3 p117 LS type | LSA Header | All LSA types defined by this memo, except the AS-external-LSAs (LS type = 5), are flooded throughout a single area only. |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: pass |

| **ANVL-OSPF-25.10** | RFC 2328, s12.1.4 p119 Link State ID | LSA Header | When the LSA is describing a router (LS type = 1 or 4), the Link State ID is always the described router's OSPF Router ID. |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: pass |
### ANVL-OSPF-25.11

**MUST**

RFC 2328, s12.1.5 p119 Advertising Router

The Advertising Router field specifies the OSPF Router ID of the LSA's originator.

<table>
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### ANVL-OSPF-25.12

**MUST**

RFC 2328, s12.1.5 p119 Advertising Router

For router-LSAs, the Advertising Router field is identical to the Link State ID field.

<table>
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### ANVL-OSPF-25.13

**MUST**

RFC 2328, s12.1.5 p120 Advertising Router

Summary-LSAs are originated by area border routers.

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### ANVL-OSPF-25.14

**MUST**

RFC 2328, s12.1.6 p120 LS sequence number

A router uses InitialSequenceNumber the first time it originates any LSA.

(This test checks for Router-LSAs)

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Test Report created at 2019-03-05 16:43:40 UTC  Page 52 of 87
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<tr>
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<th>Release 3.0.3</th>
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<th>Release 7.0</th>
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<td><strong>ANVL-OSPF-25.15</strong></td>
<td>RFC 2328, s12.1.6 p120 LS sequence number</td>
<td>MUST</td>
<td>LSA Header A router uses InitialSequenceNumber the first time it originates any LSA. (This test checks for Network-LSAs)</td>
<td></td>
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<td><strong>ANVL-OSPF-25.16</strong></td>
<td>RFC 2328, s12.1.6 p120 LS sequence number</td>
<td>MUST</td>
<td>LSA Header A router uses InitialSequenceNumber the first time it originates any LSA. (This test checks for Type-3 Summary-LSAs)</td>
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<td><strong>ANVL-OSPF-25.17</strong></td>
<td>RFC 2328, s12.1.6 p120 LS sequence number</td>
<td>MUST</td>
<td>LSA Header A router uses InitialSequenceNumber the first time it originates any LSA. (This test checks for Type-4 Summary-LSAs)</td>
<td></td>
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<tr>
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<tr>
<td><strong>ANVL-OSPF-25.18</strong></td>
<td>RFC 2328, s12.1.6 p120 LS sequence number</td>
<td>MUST</td>
<td>LSA Header A router uses InitialSequenceNumber the first time it originates any LSA. Afterwards, the LSA's sequence number is incremented each time the router originates a new instance of the LSA. (This test checks for Router-LSA)</td>
<td></td>
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**ANVL-OSPF-25.19**

**MUST**

RFC 2328, s12.1.6 p120 LS sequence number

LSA Header

A router uses InitialSequenceNumber the first time it originates any LSA. Afterwards, the LSA's sequence number is incremented each time the router originates a new instance of the LSA.

(This test checks for Network-LSA)

<table>
<thead>
<tr>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: FAIL</td>
</tr>
</tbody>
</table>

**ANVL-OSPF-25.20**

**MUST**

RFC 2328, s12.1.6 p120 LS sequence number

LSA Header

A router uses InitialSequenceNumber the first time it originates any LSA. Afterwards, the LSA's sequence number is incremented each time the router originates a new instance of the LSA.

(This test checks for Type-3 Summary-LSA)

<table>
<thead>
<tr>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

**ANVL-OSPF-25.21**

**MUST**

RFC 2328, s12.1.6 p120 LS sequence number

LSA Header

A router uses InitialSequenceNumber the first time it originates any LSA. Afterwards, the LSA's sequence number is incremented each time the router originates a new instance of the LSA.

(This test checks for Type-4 Summary-LSA)

<table>
<thead>
<tr>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>--------</td>
<td>---------</td>
</tr>
<tr>
<td>2.0.2</td>
<td>3.0.2</td>
<td>3.0.3</td>
<td>4.0</td>
<td>5.0.1</td>
<td>6.0</td>
<td>2019-02-24</td>
<td>7.0</td>
</tr>
</tbody>
</table>

**ANVL-OSPF-25.22**

RFC 2328, s12.1.6 p120 LS sequence number

**MUST**

LSA Header

When an attempt is made to increment the sequence number past the maximum value of N - 1 (0x7fffffff; also referred to as MaxSequenceNumber), the current instance of the LSA must first be flushed from the routing domain.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: untested</th>
<th>FreeBSD 10.3: untested</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: FAIL</td>
<td>FreeBSD 12.0: FAIL</td>
</tr>
</tbody>
</table>

**ANVL-OSPF-25.23**

RFC 2328, s12.1.6 p120 LS sequence number

**MUST**

LSA Header

As soon as this flooding of a LSA with LS sequence number MaxSequenceNumber has been acknowledged by all adjacent neighbors, a new instance can be originated with sequence number of InitialSequenceNumber.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: FAIL</td>
<td>FreeBSD 12.0: FAIL</td>
</tr>
</tbody>
</table>

**ANVL-OSPF-25.24**

RFC 2328, s12.1.7 p121 LS checksum

**MUST**

LSA Header

The LSA header also contains the length of the LSA in bytes; subtracting the size of the LS age field (two bytes) yields the amount of data to checksum. (This test checks for Router-LSA)

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
<tr>
<td>Release 2.0.2</td>
<td>Release 3.0.2</td>
<td>Release 3.0.3</td>
<td>Release 4.0</td>
<td>Release 5.0.1</td>
<td>Release 6.0</td>
<td>Master 2019-02-24</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------</td>
<td>--------------</td>
<td>------------</td>
<td>--------------</td>
<td>------------</td>
<td>------------------</td>
</tr>
<tr>
<td><strong>ANVL-OSPF-25.25</strong></td>
<td><strong>RFC 2328, s12.1.7 p121 LS checksum</strong></td>
<td><strong>MUST</strong></td>
<td>LSA Header</td>
<td>The LSA header also contains the length of the LSA in bytes; subtracting the size of the LS age field (two bytes) yields the amount of data to checksum. <strong>(This test checks for Network-LSA)</strong></td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
<tr>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

| **ANVL-OSPF-25.26** | **RFC 2328, s12.1.7 p121 LS checksum** | **MUST** | LSA Header | The LSA header also contains the length of the LSA in bytes; subtracting the size of the LS age field (two bytes) yields the amount of data to checksum. **(This test checks for Type-3 Summary-LSA)** | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: untested | FreeBSD 10.3: untested |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested |
| FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass |
| FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass |
| FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass |

| **ANVL-OSPF-25.27** | **RFC 2328, s12.1.7 p121 LS checksum** | **MUST** | LSA Header | The LSA header also contains the length of the LSA in bytes; subtracting the size of the LS age field (two bytes) yields the amount of data to checksum. **(This test checks for Type-4 Summary-LSA)** | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: untested | FreeBSD 10.3: untested |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested |
| FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass |
| FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass |
| FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass |
## ANVL-OSPF-25.28

**SHOULD**

RFC 2328, s12.1.7 p121 LS checksum

**LSA Header**

The LS checksum field cannot take on the value of zero; the occurrence of such a value should be considered a checksum failure.

<table>
<thead>
<tr>
<th></th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ubuntu 16.04</strong></td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
</tr>
<tr>
<td><strong>FreeBSD 12.0</strong></td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
</tr>
</tbody>
</table>

## ANVL-OSPF-26.1

**MUST**

RFC 2328, s12.2 p122 The link state database

**LS Database**

An LSA is deleted from a router's database when it has been overwritten by a newer instance during the flooding process.

(This test checks for Router-LSA)

<table>
<thead>
<tr>
<th></th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ubuntu 16.04</strong></td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
</tr>
<tr>
<td><strong>FreeBSD 12.0</strong></td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
</tr>
</tbody>
</table>

## ANVL-OSPF-26.2

**MUST**

RFC 2328, s12.2 p122 The link state database

**LS Database**

An LSA is deleted from a router's database when it has been overwritten by a newer instance during the flooding process.

(This test checks for Network-LSA)

<table>
<thead>
<tr>
<th></th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ubuntu 16.04</strong></td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
</tr>
<tr>
<td><strong>FreeBSD 12.0</strong></td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
</tr>
</tbody>
</table>

## ANVL-OSPF-26.3

**MUST**

RFC 2328, s12.2 p122 The link state database

**LS Database**

An LSA is deleted from a router's database when it has been overwritten by a newer instance during the flooding process.

(This test checks for Type-3 Summary-LSA)

<table>
<thead>
<tr>
<th></th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ubuntu 16.04</strong></td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
</tr>
<tr>
<td><strong>FreeBSD 12.0</strong></td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
</tr>
</tbody>
</table>

---

Test Report created at 2019-03-05 16:43:40 UTC

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### ANVL-OSPF-26.4

**MUST**

RFC 2328, s12.2 p122 The link state database

An LSA is deleted from a router's database when it has been overwritten by a newer instance during the flooding process. (This test checks for Type-4 Summary-LSA)

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-26.5

**MUST**

RFC 2328, s12.2 p122 The link state database

An LSA is deleted from a router's database when it has been overwritten by a newer instance during the flooding process. (This test checks for Type-5 AS-External-LSA)

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-26.6

**MUST**

RFC 2328, s12.2 p122 The link state database

An LSA is deleted from a router's database when the router originates a newer instance of one of its self-originated LSAs. (This test checks for Router-LSA)

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-26.7

**MUST**

RFC 2328, s12.2 p122 The link state database

An LSA is deleted from a router's database when the router originates a newer instance of one of its self-originated LSAs. (This test checks for Network-LSA)

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>Release 2.0.2</td>
<td>Release 3.0.2</td>
<td>Release 3.0.3</td>
<td>Release 4.0</td>
<td>Release 5.0.1</td>
<td>Release 6.0</td>
<td>Master 2019-02-24</td>
<td>Release 7.0</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
<td>------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>ANVL-OSPF-26.8</td>
<td>RFC 2328, s12.2 p122</td>
<td>The link state database</td>
<td>MUST</td>
<td>LS Database</td>
<td>An LSA is deleted from a router's database when the router originates a newer instance of one of its self-originated LSAs.</td>
<td>(This test checks for Type-3 Summary-LSA)</td>
<td></td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>ANVL-OSPF-26.9</td>
<td>RFC 2328, s12.2 p122</td>
<td>The link state database</td>
<td>MUST</td>
<td>LS Database</td>
<td>An LSA is deleted from a router's database when the router originates a newer instance of one of its self-originated LSAs.</td>
<td>(This test checks for Type-4 Summary-LSA)</td>
<td></td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
<tr>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>ANVL-OSPF-26.10</td>
<td>RFC 2328, s12.2 p122</td>
<td>The link state database</td>
<td>MUST</td>
<td>LS Database</td>
<td>An LSA is deleted from a router's database when the LSA ages out and is flushed from the routing domain.</td>
<td>(This test is for Router-LSA)</td>
<td></td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
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<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
<tr>
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<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
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<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>ANVL-OSPF-26.11</td>
<td>RFC 2328, s12.2 p122</td>
<td>The link state database</td>
<td>MUST</td>
<td>LS Database</td>
<td>An LSA is deleted from a router's database when the LSA ages out and is flushed from the routing domain.</td>
<td>(This test is for Network-LSA)</td>
<td></td>
</tr>
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<td>Release 5.0.1</td>
<td>Release 6.0</td>
<td>Master 2019-02-24</td>
<td>Release 7.0</td>
</tr>
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<td>------------------</td>
<td>-----------</td>
</tr>
</tbody>
</table>

**ANVL-OSPF-26.12**

RFC 2328, s12.2 p122 The link state database

**MUST**

LS Database
An LSA is deleted from a router's database when the LSA ages out and is flushed from the routing domain.
(This test is for Type-3 Summary-LSA)

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
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<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
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<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
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</tr>
</tbody>
</table>

**ANVL-OSPF-26.13**

RFC 2328, s12.2 p122 The link state database

**MUST**

LS Database
An LSA is deleted from a router's database when the LSA ages out and is flushed from the routing domain.
(This test is for Type-4 Summary-LSA)

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</tr>
</tbody>
</table>

**ANVL-OSPF-26.14**

RFC 2328, s12.2 p122 The link state database

**MUST**

LS Database
An LSA is deleted from a router's database when the LSA ages out and is flushed from the routing domain.
(This test is for Type-5 AS External-LSA)

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<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
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</tr>
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</table>

**ANVL-OSPF-27.1**

RFC 2328, s12.4 p123 Originating LSAs

**MUST**

LSA Origination
Destinations are advertised one at a time so that the change in any single route can be flooded without reflooding the entire collection of routes.
This test is for Type-3 Summary-LSA.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
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<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
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<th>FreeBSD 10.3: tested</th>
<th>FreeBSD 10.3: tested</th>
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<tbody>
<tr>
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<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
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<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>
### RFC 2328, s12.4 p123 Originating LSAs

**LSA Origination**
During the flooding procedure, many LSAs can be carried by a single Link State Update packet.
This test verifies whether the DUT recognizes multiple LSAs residing in a single Link State Update packet.

<table>
<thead>
<tr>
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<tbody>
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<td><strong>MUST</strong></td>
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<td><strong>MUST</strong></td>
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<td><strong>MUST</strong></td>
</tr>
</tbody>
</table>

### RFC 2328, s12.4 p124 Originating LSAs

**LSA Origination**
Whenever a new instance of an LSA is originated, its LS sequence number is incremented, its LS age is set to 0.

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</tbody>
</table>

### RFC 2328, s12.4 p125 Originating LSAs

**LSA Origination**
A change in an interface's state may mean that it is necessary to produce a new instance of the router-LSA.

<table>
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<th>FreeBSD 10.3: pass</th>
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<th>FreeBSD 10.3: pass</th>
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<td><strong>MAY</strong></td>
<td><strong>MAY</strong></td>
<td><strong>MAY</strong></td>
<td><strong>MAY</strong></td>
<td><strong>MAY</strong></td>
</tr>
</tbody>
</table>

### RFC 2328, s12.4 p125 Originating LSAs

**LSA Origination**
If an attached network's Designated Router gets changed a new router-LSA should be originated.

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<th>FreeBSD 10.3: pass</th>
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<td><strong>SHOULD</strong></td>
<td><strong>SHOULD</strong></td>
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</tr>
<tr>
<td>Release 2.0.2</td>
<td>Release 3.0.2</td>
<td>Release 3.0.3</td>
<td>Release 4.0</td>
<td>Release 5.0.1</td>
<td>Release 6.0</td>
</tr>
<tr>
<td>--------------</td>
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<td><strong>ANVL-OSPF-27.6</strong></td>
<td>RFC 2328, s12.4 p125 Originating LSAs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHOULD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LSA Origination</td>
<td>When Designated Router changes and if the router itself is now the Designated Router, a new network-LSA should be produced.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>

| **ANVL-OSPF-27.7** | RFC 2328, s12.4 p125 Originating LSAs | | | | | | |
| SHOULD | | | | | | | |
| LSA Origination | If the router itself is no longer the Designated Router, any network-LSA that it might have originated for the network should be flushed from the routing domain. | | | | | | |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: pass | FreeBSD 12.0: pass |

| **ANVL-OSPF-27.8** | RFC 2328, s12.4 p125 Originating LSAs | | | | | | |
| MAY | | | | | | | |
| LSA Origination | If one of the neighboring routers changes to the FULL state then this may mean that it is necessary to produce a new instance of the router-LSA. | | | | | | |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: pass | FreeBSD 12.0: pass |

<p>| <strong>ANVL-OSPF-27.9</strong> | RFC 2328, s12.4 p125 Originating LSAs | | | | | | |
| MAY | | | | | | | |
| LSA Origination | If one of the neighboring routers changes from the FULL state then this may mean that it is necessary to produce a new instance of the router-LSA. | | | | | | |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: pass | FreeBSD 12.0: pass |</p>
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<td>2.0.2</td>
<td>MAY</td>
<td>LSA Origination</td>
</tr>
<tr>
<td>3.0.2</td>
<td>An intra-area route has been added in the routing table. This may cause a new instance of a summary-LSA (for this route) to be originated in each attached area.</td>
<td></td>
</tr>
<tr>
<td>3.0.3</td>
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<td>FreeBSD 10.3: pass</td>
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<tr>
<td>4.0</td>
<td>FreeBSD 10.3: pass</td>
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<td>5.0.1</td>
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<td>FreeBSD 10.3: pass</td>
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<td>Release 7.0</td>
<td>FreeBSD 10.3: pass</td>
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</tbody>
</table>

| ANVL-OSPF-27.11 | RFC 2328, s12.4 p125 Originating LSAs |
|---|---|---|
| MAY | LSA Origination |
| An intra-area route has been modified in the routing table. This may cause a new instance of a summary-LSA (for this route) to be originated in each attached area. |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |

| ANVL-OSPF-27.12 | RFC 2328, s12.4 p125 Originating LSAs |
|---|---|---|
| MAY | LSA Origination |
| An intra-area route has been deleted in the routing table. This may cause a new instance of a summary-LSA (for this route) to be originated in each attached area. |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |

<p>| ANVL-OSPF-27.13 | RFC 2328, s12.4 p125 Originating LSAs |
|---|---|---|
| MAY | LSA Origination |
| In case of an area border router an inter-area route has been added in the routing table. This may cause a new instance of a summary-LSA (for this route) to be originated in each attached non-backbone area. |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
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| FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 10.3: pass | FreeBSD 10.3: pass |</p>
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<td></td>
<td>In case of an area border router an inter-area route has been modified in the routing table. This may cause a new instance of a summary-LSA (for this route) to be originated in each attached non-backbone area.</td>
</tr>
</tbody>
</table>

<table>
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<th>FreeBSD 10.3: pass</th>
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<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: untested</th>
<th>FreeBSD 10.3: untested</th>
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<td>FreeBSD 12.0: untested</td>
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<tr>
<td>MAY</td>
<td>LSA Origination</td>
</tr>
<tr>
<td></td>
<td>In case of an area border router an inter-area route has been deleted in the routing table. This may cause a new instance of a summary-LSA (for this route) to be originated in each attached non-backbone area.</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
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<th>FreeBSD 10.3: untested</th>
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</tr>
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<tbody>
<tr>
<td>MUST</td>
<td>LSA Origination</td>
</tr>
<tr>
<td></td>
<td>In case of an area border router an inter-area route has been added in the routing table. This never causes a new instance of a summary-LSA (for this route) to be originated in the attached backbone area.</td>
</tr>
</tbody>
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</table>

**ANVL-OSPF-27.17**

MUST

RFC 2328, s12.4 p125 Originating LSAs

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**ANVL-OSPF-27.18**

MUST

RFC 2328, s12.4 p125 Originating LSAs

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**ANVL-OSPF-27.19**

MUST

RFC 2328, s12.4 p126 Originating LSAs,

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</thead>
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<td>FreeBSD 12.0: untested</td>
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<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>Release 2.0.2</td>
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<td>Release 4.0</td>
<td>Release 5.0.1</td>
<td>Release 6.0</td>
<td>Master 2019-02-24</td>
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<td><strong>ANVL-OSPF-27.20</strong></td>
<td>RFC 2328, s12.4 p126 Originating LSAs</td>
<td>MAY</td>
<td>LSA Origination</td>
<td>When the state of one of the router's configured virtual links changes, it may be necessary to originate a new router-LSA into the virtual link's Transit area, as well as originating a new router-LSA into the backbone. This test is for DUT which is ABR between backbone and non-backbone areas.</td>
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<td><strong>ANVL-OSPF-27.21</strong></td>
<td>RFC 2328, s12.4.1 p127 Router-LSAs</td>
<td>MUST</td>
<td>LSA Origination</td>
<td>A router also indicates whether it is an area border router, by setting the appropriate bits (bit B, respectively) in its router-LSAs.</td>
<td>FreeBSD 10.3: pass</td>
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<td><strong>ANVL-OSPF-27.22</strong></td>
<td>RFC 2328, s12.4.1 p127 Router-LSAs</td>
<td>SHOULD</td>
<td>LSA Origination</td>
<td>Bit B should be set whenever the router is actively attached to two or more areas, even if the router is not currently attached to the OSPF backbone area.</td>
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### ANVL-OSPF-27.23

**MUST**

RFC 2328, s12.4.1 p128 Router-LSAs

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### ANVL-OSPF-27.24

**MUST**

RFC 2328, s12.4.1 p129 Router-LSAs,

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### ANVL-OSPF-27.25

**MUST**

RFC 2328, s12.4.1.3 p131 Describing virtual links

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### ANVL-OSPF-27.26

**SHOULD**

RFC 2328, s12.4.2 p134 Network-LSAs

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<td>Release 7.0</td>
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<td>ANVL-OSPF-27.28</td>
<td>RFC 2328, s12.4.3. p136 Summary-LSAs</td>
<td>LSA Origination</td>
<td>If for a route the area associated with this set of paths is the Area A itself, do not generate a summary-LSA for the route for advertising into Area A.</td>
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<td>ANVL-OSPF-27.29</td>
<td>RFC 2328, s12.4.3. p136 Summary-LSAs</td>
<td>LSA Origination</td>
<td>If for a route the area associated with the set of paths is not Area A but the next hops associated with this set of paths belong to Area A itself, do not generate a summary-LSA for the route for advertising into Area A.</td>
<td>FreeBSD 10.3: pass</td>
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<td>ANVL-OSPF-27.30</td>
<td>RFC 2328, s12.4.3. p136 Summary-LSAs</td>
<td>LSA Origination</td>
<td>If the destination of a route is an AS boundary router, a summary-LSA should be originated if and only if the routing table entry describes the preferred path to the AS boundary router. If so, a Type 4 summary-LSA is originated for the destination.</td>
<td>FreeBSD 10.3: pass</td>
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<td>ANVL-OSPF-27.31</td>
<td>RFC 2328, s12.4.3. p136 Summary-LSAs</td>
<td>MUST</td>
<td>LSA Origination</td>
<td>While originating summary-LSAs for networks reachable by inter-area routes at most a single Type 3 summary-LSA is originated for each area address range.</td>
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<td>ANVL-OSPF-27.32</td>
<td>RFC 2328, s12.4.4 p139 AS-external-LSAs</td>
<td>MUST</td>
<td>LSA Origination</td>
<td>A default route for the Autonomous System can be described in an AS-external-LSA by setting the LSA's Link State ID to DefaultDestination (0.0.0.0).</td>
<td>FreeBSD 10.3: pass</td>
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<td>ANVL-OSPF-28.1</td>
<td>RFC 2328, s13 p143 The Flooding Procedure</td>
<td>MUST</td>
<td>Flooding Procedure</td>
<td>To make the flooding procedure reliable, each LSA must be acknowledged separately. Acknowledgments are transmitted in Link State Acknowledgment packets.</td>
<td>FreeBSD 10.3: pass</td>
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<td>ANVL-OSPF-28.2</td>
<td>RFC 2328, s13 p143 The Flooding Procedure</td>
<td>MUST</td>
<td>Flooding Procedure</td>
<td>For each LSA contained in a Link State Update packet, validate the LSA's LS checksum. If the checksum turns out to be invalid, discard the LSA.</td>
<td>FreeBSD 10.3: pass</td>
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</table>
### ANVL-OSPF-28.3

**MUST**

RFC 2328, s13 p143 The Flooding Procedure

For each LSA contained in a Link State Update packet, examine the LSA's LS type. If the LS type is unknown, discard the LSA.

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</table>

### ANVL-OSPF-28.4

**MUST**

RFC 2328, s13 p143 The Flooding Procedure

For each LSA contained in a Link State Update packet, if this is an AS-external-LSA (LS type = 5) and the area has been configured as a stub area discard the LSA.

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### ANVL-OSPF-28.5

**MUST**

RFC 2328, s13 p144 The Flooding Procedure,

If the LSA's LS age is equal to MaxAge, and there is currently no instance of the LSA in router's link state database, and none of router's neighbors are in state Exchange or Loading send direct Acknowledgement packet to the sending neighbor and discard the LSA.

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### ANVL-OSPF-28.6

**MUST**

RFC 2328, s13 p144 The Flooding Procedure,

If there is already a database copy, and if the database copy was received via flooding and installed less than MinLSArrival seconds ago, discard the new LSA (without acknowledging it).

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<td>If there is no database copy or the received LSA is more recent than the database copy and the database copy was installed more than MinLSArrival seconds ago, immediately flood the new LSA out some subset of the router's interfaces.</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

Test Report created at 2019-03-05 16:43:40 UTC
## Flooding Procedure

### SHOULD

*RFC 2328, s13 p145 The Flooding Procedure*

If the received LSA is the same instance as the database copy and is listed in the Link state retransmission list for the receiving adjacency, the router itself is expecting an acknowledgment for this LSA. The router should remove the LSA from the Link state retransmission list.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>

### MUST

*RFC 2328, s13 p145 The Flooding Procedure*

If the database copy has LS age equal to MaxAge and LS sequence number equal to MaxSequenceNumber, simply discard the received LSA without acknowledging it.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>

### RFC Compliance Test Report

**OSPF Results**

Test Report created at 2019-03-05 16:43:40 UTC

<table>
<thead>
<tr>
<th>Release 2.0.2</th>
<th>Release 3.0.2</th>
<th>Release 3.0.3</th>
<th>Release 4.0</th>
<th>Release 5.0.1</th>
<th>Release 6.0</th>
<th>Master 2019-02-24</th>
<th>Release 7.0</th>
</tr>
</thead>
</table>

**ANVL-OSPF-28.10**

*RFC 2328, s13 p145 The Flooding Procedure*

Flooding Procedure

If the received LSA is the same instance as the database copy and is listed in the Link state retransmission list for the receiving adjacency, the router itself is expecting an acknowledgment for this LSA. The router should remove the LSA from the Link state retransmission list.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>

**ANVL-OSPF-28.11**

*RFC 2328, s13 p145 The Flooding Procedure*

Flooding Procedure

If the database copy has LS age equal to MaxAge and LS sequence number equal to MaxSequenceNumber, simply discard the received LSA without acknowledging it.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>

**ANVL-OSPF-29.1**

*RFC 2328, s13.1 p145 Determining which LSA is newer*

**Newer LSA Determination**

The LSA having the newer LS sequence number is more recent.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>

**ANVL-OSPF-30.1**

*RFC 2328, s13.3 p149 Next step in the Flooding Procedure*

Flooding Procedure Next Step

If the adjacency is not yet full and there is an instance of new LSA in Link State request list and if the new LSA is more recent delete the LSA from the Link state request list.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
<tr>
<td>Release 2.0.2</td>
<td>Release 3.0.2</td>
<td>Release 3.0.3</td>
<td>Release 4.0</td>
<td>Release 5.0.1</td>
<td>Release 6.0</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>RFC 2328, s13.3 p150 Sending protocol packets</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flooding Procedure Next Step</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On broadcast network, the Link State Update packets are multicast but Link State Update packets carrying retransmissions are always sent directly to the neighbor.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: untested</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>Ubuntu 16.04: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>

| ANVL-OSPF-31.1 | MUST |
| RFC 2328, s13.4 p151 Receiving self-originated LSAs |
| Self-Originated LSA Receipt |
| A self-originated LSA is detected when the LSA's Advertising Router is equal to the router's own Router ID and in most cases (when the LS sequence number of the received LSA is greater than that of the current instance), the router must then advance the LSA's LS sequence number one past the received LS sequence number, and originate a new instance of the LSA. |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: pass |
| FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass |
| Ubuntu 16.04: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested |

| ANVL-OSPF-31.2 | MUST |
| RFC 2328, s13.4 p151 Receiving self-originated LSAs |
| Self-Originated LSA Receipt |
| A self-originated LSA is detected when the LSA is a network-LSA and its Link State ID is equal to one of the router's own IP interface addresses. In this case the LSA is flushed from the routing domain. |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested |
| FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass |
| Ubuntu 16.04: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested |
### ANVL-OSPF-31.3

**SHOULD**

RFC 2328, s13.4 p151 Receiving self-originated LSAs

Self-Originated LSA Receipt

If the received self-originated LSA is a summary-LSA and the router no longer has an (advertisable) route to the destination instead of updating the LSA, the LSA should be flushed from the routing domain by incrementing the received LSA's LS age to MaxAge and reflooding.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-31.4

**SHOULD**

RFC 2328, s13.4 p151 Receiving self-originated LSAs

Self-Originated LSA Receipt

If the received self-originated LSA is an AS-external-LSA and the router no longer has an (advertisable) route to the destination instead of updating the LSA, the LSA should be flushed from the routing domain by incrementing the received LSA's LS age to MaxAge and reflooding.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-31.5

**SHOULD**

RFC 2328, s13.4 p151 Receiving self-originated LSAs

Self-Originated LSA Receipt

If the received self-originated LSA is a network-LSA but the router is no longer Designated Router for the network, instead of updating the LSA, the LSA should be flushed from the routing domain by incrementing the received LSA's LS age to MaxAge and reflooding.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>

FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass | FreeBSD 12.0: pass |
<table>
<thead>
<tr>
<th>Release 2.0.2</th>
<th>Release 3.0.2</th>
<th>Release 3.0.3</th>
<th>Release 4.0</th>
<th>Release 5.0.1</th>
<th>Release 6.0</th>
<th>Master 2019-02-24</th>
<th>Release 7.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANVL-OSPF-32.1</td>
<td>RFC 2328, s13.5 p152-153 Sending Link State Acknowledgment packets</td>
<td>MUST</td>
<td>Sending LSA Packets If the new LSA has been flooded back out receiving interface no acknowledgement is sent.</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

| ANVL-OSPF-32.2 | RFC 2328, s13.5 p152-153 Sending Link State Acknowledgment packets | MUST | Sending LSA Packets If the new LSA is more recent than database copy, but was not flooded back out receiving interface and if the router is in state Backup then delayed acknowledgement is sent if advertisement is received from Designated Router, otherwise nothing is done. | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: pass | FreeBSD 12.0: pass |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: pass | FreeBSD 12.0: pass |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: pass | FreeBSD 12.0: pass |

<p>| ANVL-OSPF-32.3 | RFC 2328, s13.5 p152-153 Sending Link State Acknowledgment packets | MUST | Sending LSA Packets If the new LSA is more recent than database copy, but was not flooded back out receiving interface and if the receiving router is not in state Backup then delayed acknowledgement is sent. (This test checks the case when router state is DR Other) | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: pass | FreeBSD 12.0: pass |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: pass | FreeBSD 12.0: pass |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: pass | FreeBSD 12.0: pass |</p>
<table>
<thead>
<tr>
<th>ANVL-OSPF-32.4</th>
<th>RFC 2328, s13.5 p152-153 Sending Link State Acknowledgment packets</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MUST</strong></td>
<td>Sending LSA Packets</td>
</tr>
<tr>
<td></td>
<td>If the new LSA is more recent than database copy, but was not flooded</td>
</tr>
<tr>
<td></td>
<td>back out receiving interface and if the receiving router is not in</td>
</tr>
<tr>
<td></td>
<td>state Backup then delayed acknowledgement is sent.</td>
</tr>
<tr>
<td>(This test checks the case when router state is DR)</td>
<td></td>
</tr>
<tr>
<td>FreeBSD 10.3:</td>
<td>pass</td>
</tr>
<tr>
<td>FreeBSD 10.3:</td>
<td>pass</td>
</tr>
<tr>
<td>FreeBSD 10.3:</td>
<td>pass</td>
</tr>
<tr>
<td>FreeBSD 10.3:</td>
<td>pass</td>
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<td>FreeBSD 10.3:</td>
<td>pass</td>
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<tr>
<td>FreeBSD 10.3:</td>
<td>pass</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>ANVL-OSPF-32.5</th>
<th>RFC 2328, s13.5 p152-153 Sending Link State Acknowledgment packets</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MUST</strong></td>
<td>Sending LSA Packets</td>
</tr>
<tr>
<td></td>
<td>If the new LSA is a duplicate, and was treated as implied</td>
</tr>
<tr>
<td></td>
<td>acknowledgement and if the receiving router is in state Backup</td>
</tr>
<tr>
<td></td>
<td>then delayed acknowledgement is sent if advertisement is received</td>
</tr>
<tr>
<td></td>
<td>from Designated Router, otherwise nothing is done.</td>
</tr>
<tr>
<td>FreeBSD 10.3:</td>
<td>pass</td>
</tr>
<tr>
<td>FreeBSD 10.3:</td>
<td>pass</td>
</tr>
<tr>
<td>FreeBSD 10.3:</td>
<td>pass</td>
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<td>FreeBSD 10.3:</td>
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<td>FreeBSD 10.3:</td>
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<td>FreeBSD 10.3:</td>
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</tr>
<tr>
<td>FreeBSD 10.3:</td>
<td>pass</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ANVL-OSPF-32.6</th>
<th>RFC 2328, s13.5 p152-153 Sending Link State Acknowledgment packets</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MUST</strong></td>
<td>Sending LSA Packets</td>
</tr>
<tr>
<td></td>
<td>If the new LSA is a duplicate, and was treated as implied</td>
</tr>
<tr>
<td></td>
<td>acknowledgement and if the receiving router is not in state</td>
</tr>
<tr>
<td></td>
<td>Backup then no acknowledgement is sent.</td>
</tr>
<tr>
<td>(This test checks the case when router state is DR Other)</td>
<td></td>
</tr>
</tbody>
</table>
### RFC Compliance Test Report

#### OSPF Results

<table>
<thead>
<tr>
<th>Release 2.0.2</th>
<th>Release 3.0.2</th>
<th>Release 3.0.3</th>
<th>Release 4.0</th>
<th>Release 5.0.1</th>
<th>Release 6.0</th>
<th>Master 2019-02-24</th>
<th>Release 7.0</th>
</tr>
</thead>
</table>

### ANVL-OSPF-32.7

**MUST**

RFC 2328, s13.5.152-153 Sending Link State Acknowledgment packets

Sending LSA Packets

If the new LSA is a duplicate, and was treated as implied acknowledgement and if the receiving router is not in state Backup then no acknowledgement is sent.

(This test checks the case when router state is DR)

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td></td>
</tr>
</tbody>
</table>

### ANVL-OSPF-32.8

**MUST**

RFC 2328, s13.5.152-153 Sending Link State Acknowledgment packets

Sending LSA Packets

If the new LSA is a duplicate, and was not treated as implied acknowledgement and if the receiving router is in state Backup then direct acknowledgement is sent.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td></td>
</tr>
</tbody>
</table>

### ANVL-OSPF-32.9

**MUST**

RFC 2328, s13.5.152-153 Sending Link State Acknowledgment packets

Sending LSA Packets

If the new LSA is a duplicate, and was not treated as implied acknowledgement and if the receiving router is not in state Backup then direct acknowledgement is sent.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td></td>
</tr>
</tbody>
</table>

### ANVL-OSPF-33.1

**MUST**

RFC 2328, s13.7.156 Receiving link state acknowledgments

LSA Receipt

If the acknowledgment is for the same instance that is contained on the Link state retransmission list, remove the item from the list.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td></td>
</tr>
</tbody>
</table>

---

Test Report created at 2019-03-05 16:43:40 UTC
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0.2</td>
<td>3.0.2</td>
<td>3.0.3</td>
<td>4.0</td>
<td>5.0.1</td>
<td>6.0</td>
<td>2019-02-24</td>
<td>7.0</td>
</tr>
</tbody>
</table>

**ANVL-OSPF-34.1**

**RFC 2328, s15 p158 Virtual Links**

**Virtual Links**

When an adjacency is established over a virtual link, the virtual link will be included in backbone router-LSAs.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

**ANVL-OSPF-34.2**

**RFC 2328, s15 p158 Virtual Links**

**Virtual Links**

When an adjacency is established over a virtual link, then OSPF packets pertaining to the backbone area will flow over the adjacency.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
</tr>
<tr>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

**ANVL-OSPF-34.3**

**RFC 2328, s15 p158 Virtual Links**

**Virtual Links**

AS-external-LSAs are NEVER flooded over virtual adjacencies.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
</tr>
<tr>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

**ANVL-OSPF-34.4**

**RFC 2328, s15 p159 Virtual Links**

**Virtual Links**

The cost of a virtual link is NOT configured. It is defined to be the cost of the intra-area path between the two defining area border routers.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
</tr>
<tr>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>
### ANVL-OSPF-34.5
#### SHOULD

Virtual Links
When the cost of a virtual link changes, a new router-LSA should be originated for the backbone area.

<table>
<thead>
<tr>
<th>System</th>
<th>Release 2.0.2</th>
<th>Release 3.0.2</th>
<th>Release 3.0.3</th>
<th>Release 4.0</th>
<th>Release 5.0.1</th>
<th>Release 6.0</th>
<th>Master</th>
<th>Release 7.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 10.3:</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td></td>
<td>pass</td>
</tr>
<tr>
<td>Ubuntu 16.04:</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td></td>
<td>pass</td>
</tr>
<tr>
<td>FreeBSD 12.0:</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td></td>
<td>untested</td>
</tr>
<tr>
<td>FreeBSD 12.0:</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td></td>
<td>untested</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-34.6
#### MUST

Virtual Links
In each endpoint’s router-LSA for the backbone, the virtual link is represented as a Type 4 link whose Link ID is set to the virtual neighbor’s OSPF Router ID and whose Link Data is set to the virtual interface’s IP address. (This test checks the case of router between backbone area and a non-backbone area)

<table>
<thead>
<tr>
<th>System</th>
<th>Release 2.0.2</th>
<th>Release 3.0.2</th>
<th>Release 3.0.3</th>
<th>Release 4.0</th>
<th>Release 5.0.1</th>
<th>Release 6.0</th>
<th>Master</th>
<th>Release 7.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 10.3:</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td></td>
<td>pass</td>
</tr>
<tr>
<td>Ubuntu 16.04:</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td></td>
<td>pass</td>
</tr>
<tr>
<td>FreeBSD 12.0:</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td></td>
<td>untested</td>
</tr>
<tr>
<td>FreeBSD 12.0:</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td></td>
<td>untested</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-34.7
#### MUST

Virtual Links
In each endpoint’s router-LSA for the backbone, the virtual link is represented as a Type 4 link whose Link ID is set to the virtual neighbor’s OSPF Router ID and whose Link Data is set to the virtual interface’s IP address. (This test checks the case of router between two non-backbone areas)

<table>
<thead>
<tr>
<th>System</th>
<th>Release 2.0.2</th>
<th>Release 3.0.2</th>
<th>Release 3.0.3</th>
<th>Release 4.0</th>
<th>Release 5.0.1</th>
<th>Release 6.0</th>
<th>Master</th>
<th>Release 7.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 10.3:</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td></td>
<td>pass</td>
</tr>
<tr>
<td>Ubuntu 16.04:</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td></td>
<td>pass</td>
</tr>
<tr>
<td>FreeBSD 12.0:</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td></td>
<td>untested</td>
</tr>
<tr>
<td>FreeBSD 12.0:</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td></td>
<td>untested</td>
</tr>
<tr>
<td>RFC Compliance Test Report</td>
<td>OSPF Results</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### ANVL-OSPF-34.8

**MUST**

**RFC 2328, s15 p159 Virtual Links**

Virtual Links

The time between link state retransmissions, `RxmtInterval`, is configured for a virtual link.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
<th>FreeBSD 10.3: FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 10.3: FAIL</td>
<td>FreeBSD 10.3: FAIL</td>
<td>FreeBSD 10.3: FAIL</td>
<td>FreeBSD 10.3: FAIL</td>
<td>FreeBSD 10.3: FAIL</td>
<td>FreeBSD 10.3: FAIL</td>
<td>FreeBSD 10.3: FAIL</td>
<td>FreeBSD 10.3: FAIL</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-35.1

**MUST**

**RFC 2328, s16.2 p168 Calculating the inter-area routes**

Interarea Route Calculation

If the router has active attachments to multiple areas, only backbone summary-LSAs are examined.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
<tr>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-36.1

**MUST**

**RFC 2328, sA.1 p185 Encapsulation of OSPF packets**

OSPF Packet Encapsulation

To ensure that the OSPF packets sent to multicast addresses will not travel multiple hops, their IP TTL must be set to 1.

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
<tr>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-36.2

**SHOULD**

**RFC 2328, sA.1 p186 Encapsulation of OSPF packets**

OSPF Packet Encapsulation

All routers running OSPF should be prepared to receive packets sent to the address 224.0.0.5. Hello packets are always sent to this destination.

(This test checks the case when router is in state DR Other)

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
</tr>
<tr>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>
### ANVL-OSPF-36.3

**Should**

RFC 2328, sA.1 p186 Encapsulation of OSPF packets

**OSPF Packet Encapsulation**

All routers running OSPF should be prepared to receive packets sent to the address 224.0.0.5. Hello packets are always sent to this destination.

(This test checks the case when router is in state DR)

<table>
<thead>
<tr>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>untested</td>
</tr>
<tr>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-36.4

**Should**

RFC 2328, sA.1 p186 Encapsulation of OSPF packets

**OSPF Packet Encapsulation**

All routers running OSPF should be prepared to receive packets sent to the address 224.0.0.5. Hello packets are always sent to this destination.

(This test checks the case when router is in state Backup)

<table>
<thead>
<tr>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>untested</td>
</tr>
<tr>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-36.5

**MUST**

RFC 2328, sA.1 p186 Encapsulation of OSPF packets

**OSPF Packet Encapsulation**

The Designated Router must be prepared to receive packets destined to the multicast address 224.0.0.6.

<table>
<thead>
<tr>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>untested</td>
</tr>
<tr>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
</tr>
</tbody>
</table>

### ANVL-OSPF-36.6

**MUST**

RFC 2328, sA.1 p186 Encapsulation of OSPF packets

**OSPF Packet Encapsulation**

The Backup Designated Router must be prepared to receive packets destined to the multicast address 224.0.0.6.

<table>
<thead>
<tr>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
<th>FreeBSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>10.3: pass</td>
<td>untested</td>
</tr>
<tr>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
<td>Ubuntu</td>
</tr>
</tbody>
</table>
**RFC Compliance Test Report**

**OSPF Results**

<table>
<thead>
<tr>
<th>Release 2.0.2</th>
<th>Release 3.0.2</th>
<th>Release 3.0.3</th>
<th>Release 4.0</th>
<th>Release 5.0.1</th>
<th>Release 6.0</th>
<th>Master 2019-02-24</th>
<th>Release 7.0</th>
</tr>
</thead>
</table>

**ANVL-OSPF-36.7**

RFC 2328, sA.3.2 p194 The Hello packet

**MUST**

OSPF Packet Encapsulation
If Router Priority set to 0, the router will be ineligible to become Backup Designated Router.
(This test checks the case when router itself has Router Priority 0)

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
</table>

**ANVL-OSPF-36.8**

RFC 2328, sA.3.2 p194 The Hello packet

**MUST**

OSPF Packet Encapsulation
If Router Priority set to 0, the router will be ineligible to become Backup Designated Router.
(This test checks the case when a neighbor has Router Priority 0)

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
</table>

**ANVL-OSPF-36.9**

RFC 2328, sA.3.2 p194 The Hello packet

**MUST**

OSPF Packet Encapsulation
If Router Priority set to 0, the router will be ineligible to become Designated Router.
(This test checks the case when router itself has Router Priority 0)

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
</table>

**ANVL-OSPF-36.10**

RFC 2328, sA.3.2 p194 The Hello packet

**MUST**

OSPF Packet Encapsulation
If Router Priority set to 0, the router will be ineligible to become Designated Router.
(This test checks the case when a neighbor has Router Priority 0)

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
</tr>
</thead>
</table>

Test Report created at 2019-03-05 16:43:40 UTC

Page 82 of 87
OSPF Packet Encapsulation

A Link State Acknowledgment packet is sent either to the multicast address AllSPFRouters, to the multicast address AllDRouters, or as a unicast.

<table>
<thead>
<tr>
<th>Release 2.0.2</th>
<th>Release 3.0.2</th>
<th>Release 3.0.3</th>
<th>Release 4.0</th>
<th>Release 5.0.1</th>
<th>Release 6.0</th>
<th>Master 2019-02-24</th>
<th>Release 7.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANVL-OSPF-36.11</td>
<td>RFC 2328, sa.3.6 p201 The Link State Acknowledgment packet</td>
<td>MUST</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

ANVL-OSPF-36.12 | RFC 2328, sa.4.2 p206-207 Router-LSAs | MUST | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: pass | FreeBSD 12.0: pass |

ANVL-OSPF-36.13 | RFC 2328, sa.4.2 p208 Router-LSAs | MUST | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass |
| FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: pass | FreeBSD 12.0: pass |

ANVL-OSPF-36.14 | RFC 2328, sa.4.2 p208 Router-LSAs | MUST | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass | FreeBSD 10.3: pass |
<p>| FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: untested | FreeBSD 12.0: pass | FreeBSD 12.0: pass |</p>
<table>
<thead>
<tr>
<th>Release 2.0.2</th>
<th>Release 3.0.2</th>
<th>Release 3.0.3</th>
<th>Release 4.0</th>
<th>Release 5.0.1</th>
<th>Release 6.0</th>
<th>Master 2019-02-24</th>
<th>Release 7.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANVL-OSPF-36.16</td>
<td>RFC 2328, sA.4.2 p208 Router-LSAs</td>
<td>OSPF Packet Encapsulation</td>
<td>For connections to transit network Link Data specifies the router interface's IP address.</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>ANVL-OSPF-36.17</td>
<td>RFC 2328, sA.4.4 p212 Summary-LSAs</td>
<td>OSPF Packet Encapsulation</td>
<td>Type 3 summary-LSAs are used when the destination is an IP network.</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>ANVL-OSPF-36.18</td>
<td>RFC 2328, sA.4.4 p212 Summary-LSAs</td>
<td>OSPF Packet Encapsulation</td>
<td>When the destination is an AS boundary router, a Type 4 summary-LSA is used.</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>ANVL-OSPF-37.1</td>
<td>RFC 2328, sB p217 Architectural Constants</td>
<td>Architectural Restraints</td>
<td>MinLSInterval is the minimum time between distinct originations of any particular LSA. The value of MinLSInterval is set to 5 seconds.</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
<td>FreeBSD 10.3: pass</td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td>Release 2.0.2</td>
<td>Release 3.0.2</td>
<td>Release 3.0.3</td>
<td>Release 4.0</td>
<td>Release 5.0.1</td>
<td>Release 6.0</td>
<td>Master 2019-02-24</td>
<td>Release 7.0</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
<td>------------------</td>
<td>------------</td>
</tr>
<tr>
<td><strong>ANVL-OSPF-37.2</strong></td>
<td>RFC 2328, sB p218 Architectural Constants</td>
<td>Architectural Restraints</td>
<td>LSInfinity is the metric value indicating that the destination described by an LSA is unreachable. Used in summary-LSAs as an alternative to premature aging. It is defined to be the 24-bit binary value of all ones: 0xffffff.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td><strong>ANVL-OSPF-37.3</strong></td>
<td>RFC 2328, sB p218 Architectural Constants</td>
<td>Architectural Restraints</td>
<td>LSInfinity is the metric value indicating that the destination described by an LSA is unreachable. Used in AS-external-LSAs as an alternative to premature aging. It is defined to be the 24-bit binary value of all ones: 0xffffff.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
<tr>
<td><strong>ANVL-OSPF-37.4</strong></td>
<td>RFC 2328, sB p218 Architectural Constants</td>
<td>Architectural Restraints</td>
<td>InitialSequenceNumber is the value used for LS Sequence Number when originating the first instance of any LSA. Its value is the signed 32-bit integer 0x80000001.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: FAIL</td>
<td>FreeBSD 12.0: FAIL</td>
</tr>
</tbody>
</table>
### RFC 2328, sD.3 p229 Cryptographic Authentication

**MUST**

Cryptographic Authentication

When cryptographic authentication is used, the 64-bit Authentication field in the standard OSPF packet header is redefined as:

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1</td>
<td>KeyID</td>
<td>Auth Data Len</td>
<td></td>
</tr>
</tbody>
</table>

Cryptographic sequence number

---

<table>
<thead>
<tr>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: pass</th>
<th>FreeBSD 10.3: untested</th>
<th>FreeBSD 10.3: untested</th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>

### RFC 2328, sD.3 p229 Cryptographic Authentication

**MUST**

(6) The message digest is then calculated and appended to the OSPF packet. The authentication algorithm to be used in calculating the digest is indicated by the key itself. Input to the authentication algorithm consists of the OSPF packet and the secret key. When using MD5 as the authentication algorithm, the message digest calculation proceeds as follows:

(a) The 16 byte MD5 key is appended to the OSPF packet.

(b) Trailing pad and length fields are added, as specified in [Ref17].

(c) The MD5 authentication algorithm is run over the concatenation of the OSPF packet, secret key, pad and length fields, producing a 16 byte message digest (see [Ref17]).

(d) The MD5 digest is written over the OSPF key (i.e., appended to the original OSPF packet). The digest is not counted in the OSPF packet's length field, but is included in the packet's IP length field. Any trailing pad or length fields beyond the digest are not counted or transmitted.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: untested</td>
<td>FreeBSD 12.0: pass</td>
<td>FreeBSD 12.0: pass</td>
</tr>
</tbody>
</table>
RFC Compliance Test Report

OSPF Results

<table>
<thead>
<tr>
<th>Release 2.0.2</th>
<th>Release 3.0.2</th>
<th>Release 3.0.3</th>
<th>Release 4.0</th>
<th>Release 5.0.1</th>
<th>Release 6.0</th>
<th>Master</th>
<th>Release 7.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ANVL-OSPF-38.3</strong></td>
<td>RFC 2328, sD4.3 p233 Generating Cryptographic authentication</td>
<td><strong>MUST</strong></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FreeBSD 10.3:</strong></td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Ubuntu 16.04:</strong></td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td>pass</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FreeBSD 12.0:</strong></td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td>untested</td>
<td></td>
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