1.0  Abstract

OSPF [1] is an event driven routing protocol, where an event can be a change in an OSPF interface’s link-level status, the expiration of an OSPF timer or the reception of an OSPF protocol packet. Many of the actions that OSPF takes as a result of these events will result in a change of the routing topology. As routing topologies become large and complex it is often difficult to locate the source of a topology change or unpredicted routing path by polling a large number or routers. Another approach is to notify a network manager of potentially critical OSPF events with SNMP traps.

This draft document defines a set of traps, objects and mechanisms to enhance the ability to manage IP internetworks which use OSPF as its IGP. It is meant as an extension to the OSPF MIB [2].

2.0  Approach

The SNMP trap mechanism is defined in RFC1155 [3]; the convention for defining traps is described in RFC1215 [4]. The mechanism is straightforward. When an exception event occurs, the application will notify the local agent who will send a trap to the appropriate SNMP management stations. The message will include the trap type and may include a list of trap specific variables. A new object is defined in section 3.2 that will allow a network
administrator to enable or disable particular OSPF traps. Section 3.3 gives the trap definitions which includes the variable lists. The router ID of the originator of the trap is included in the variable list so that the network manager may easily determine the source of the trap.

To limit the frequency of OSPF traps, the following additional mechanisms are suggested.

2.1 Ignoring Initial Activity

The majority of critical events occur when OSPF is enabled on a router, at which time the designated router is elected and neighbor adjacencies are formed. During this initial period a potential flood of traps is unnecessary since the events are expected. To avoid unnecessary generation of traps, a router should wait at least two dead timer intervals before it enables its OSPF traps, where the dead timer is equal to the router’s largest configured dead timer.

2.2 Throttling Traps

The mechanism for throttling the traps is similar to the mechanism explained in RFC 1224 [5] section 5. The basic idea is that there is a sliding window in seconds and an upper bound on the number of traps that may be generated within this window. Unlike RFC 1224, traps are not sent to inform the network manager that the throttling mechanism has kicked in.

A single window should be used to throttle all OSPF traps types. For example, if the window time is 3, the upper bound is 3 and the events that would cause trap types 1, 3, 5 and 7 occur within a 3 second period, the type 7 trap should not be generated.

Appropriate values are 7 traps with a window time of 10 seconds.

2.3 One Trap Per OSPF Packet

Several of the traps defined in section 3.3 are generated as the result of finding an unusual condition while parsing an OSPF packet or a timer event which results in sending an OSPF packet. However, there may be several events per packet. For example, a link-state update packet may contain several new link-state advertisements, or a retransmitted database description packet may contain several database description entries. To limit the number of traps and variables, OSPF should generate at most one trap per OSPF packet. Only the variables associated with the first entry should be included with the trap. Similarly, if more than one type of unusual event is encountered while parsing the packet, only the first event will generate a trap.

2.4 Polling Event Counters

Many of the tables in the OSPF MIB contain generalized event
counters. By enabling the traps defined in this document a network manager can obtain more specific information about these events. A network manager may want to poll these event counters and enable specific OSPF traps when a particular counter starts increasing abnormally.

The following table shows the relationship between the event counters defined in the OSPF MIB and the trap types defined in section 3.3.

<table>
<thead>
<tr>
<th>Counter</th>
<th>Trap Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>ospfOriginateNewLsa</td>
<td>ospfOriginateLSA</td>
</tr>
<tr>
<td>ospfIfEvents</td>
<td>ospfIfStateChange</td>
</tr>
<tr>
<td>ospfDrChange</td>
<td>ospfDrChange</td>
</tr>
<tr>
<td>ospfConfigError</td>
<td>ospfConfigError</td>
</tr>
<tr>
<td>ospfRxBadPacket</td>
<td>ospfRxBadPacket</td>
</tr>
<tr>
<td>ospfTxRetransmit</td>
<td>ospfTxRetransmit</td>
</tr>
<tr>
<td>ospfVirtIfEvents</td>
<td>ospfVirtIfStateChange</td>
</tr>
<tr>
<td>ospfVirtIfConfigError</td>
<td>ospfVirtIfConfigError</td>
</tr>
<tr>
<td>ospfVirtIfRxBadPacket</td>
<td>ospfVirtIfRxBadPacket</td>
</tr>
<tr>
<td>ospfVirtIfTxRetransmit</td>
<td>ospfVirtIfTxRetransmit</td>
</tr>
<tr>
<td>ospfNbrEvents</td>
<td>ospfNbrStateChange</td>
</tr>
<tr>
<td>ospfVirtNbrEvents</td>
<td>ospfVirtNbrStateChange</td>
</tr>
</tbody>
</table>

3.0 OSPF Trap Definitions

3.1 Imports

RFCxxxx-MIB DEFINITIONS ::= BEGIN
IMPORTS
   IpAddress
FROM RFC1155-SMI
OBJECT-TYPE
FROM RFC1212
TRAP-TYPE
FROM RFC1215
   ospfRouterId, ospfIfIpAddress, ospfAddressLessIf,
   ospfAreaID, ospfIfType, ospfIfState, ospfVirtAreaID,
   ospfVirtIfNeighbor, ospfVirtIfState, ospfNbrIpAddress,
   ospfNbrAddressLessIndex, ospfNbrRtrId, ospfNbrState,
   ospfVirtNbrArea, ospfVirtNbrRtrId, ospfLsdbAreaId,
   ospfLsdbType, ospfLsdbLSID, ospfLsdbRouterId
FROM RFCxxxx-OSPF MIB
3.2 Trap Support Objects

ospfTrapGroup OBJECT IDENTIFIER ::= { ospf 12 }

ospfSetTrap OBJECT-TYPE
SYNTAX OCTET STRING
ACCESS read-write
STATUS mandatory
DESCRIPTION "A four-octet string serving as a bit map for the
trap events defined by the OSPF traps. This object
is used to enable and disable specific OSPF traps
where a 1 in the bit field represents enabled.
The right-most bit (least significant) represents
trap 0."
::= { ospfTrapGroup 1 }

ospfConfigErrorType OBJECT-TYPE
SYNTAX INTEGER {
badVersion (1),
areaMismatch (2),
unknownNbmaNbr (3), -- Initiator of trap is Dr
eligible
unknownVirtualNbr (4),
authTypeMismatch (5),
authFailure (6),
etMaskMismatch (7),
helloIntervalMismatch (8),
deadIntervalMismatch (9),
eBitMismatch (10) }
ACCESS read-only
STATUS mandatory
DESCRIPTION "Potential types of configuration conflicts. Used
by the ospfConfigError and ospfConfigVirtError
traps."
::= { ospfTrapGroup 2 }

ospfPacketType OBJECT-TYPE
SYNTAX INTEGER {
hello (1),
dbDescript (2),
lsReq (3),
lsUpdate (4),
lsAck (5) }
ACCESS read-only
STATUS mandatory
DESCRIPTION "OSPF packet types."
::= { ospfTrapGroup 3 }
3.3 Traps

ospfIfStateChange TRAP-TYPE
ENTERPRISE ospf
VARIABLES {
    ospfRouterId, -- The originator of the trap
    ospfIfIpAddress,
    ospfAddressLessIf,
    ospfIfState } -- The new state
DESCRIPTION
"An ospfIfStateChange trap signifies that there has been a change in the state of a non-virtual OSPF interface."
::= 0

ospfVirtIfStateChange TRAP-TYPE
ENTERPRISE ospf
VARIABLES {
    ospfRouterId, -- The originator of the trap
    ospfVirtAreaID,
    ospfVirtIfNeighbor,
    ospfVirtIfState } -- The new state
DESCRIPTION
"An ospfIfStateChange trap signifies that there has been a change in the state of an OSPF virtual interface."
::= 1

ospfNbrStateChange TRAP-TYPE
ENTERPRISE ospf
VARIABLES {
    ospfRouterId, -- The originator of the trap
    ospfNbrIpAddress,
    ospfNbrAddressLessIndex,
    ospfNbrRtrId,
    ospfNbrState } -- The new state
DESCRIPTION
"An ospfIfStateChange trap signifies that there has been a change in the state of a non-virtual OSPF neighbor."
::= 2

ospfVirtNbrStateChange TRAP-TYPE
ENTERPRISE ospf
VARIABLES {
    ospfRouterId, -- The originator of the trap
    ospfVirtNbrArea,
    ospfVirtNbrRtrId,
    ospfVirtNbrState } -- The new state
DESCRIPTION
"An ospfIfStateChange trap signifies that there has
been a change in the state of an OSPF virtual neighbor."
::= 3

ospfDrChange TRAP-TYPE
ENTERPRISE ospf
VARIABLES {
ospfRouterId, -- The originator of the trap
ospfIfIpAddress,
ospfIpAddress, -- The new Dr or (0 if none)
ospfIpAddress } -- The new Backup Dr (0 if none)
DESCRIPTION
"An ospfDrChange trap signifies that there has been a change in the Dr or backup Dr on one of the router’s directly connected multi-access networks."
::= 4

ospfConfigError TRAP-TYPE
ENTERPRISE ospf
VARIABLES {
ospfRouterId, -- The originator of the trap
ospfIfIpAddress,
ospfAddressLessIf,
IpAddress, -- The source IP address
ospfConfigErrorType, -- Type of error
ospfPacketType }
DESCRIPTION
"An ospfConfigError trap signifies that a packet has been received on a non-virtual interface from a router whose configuration parameters conflict with this router’s configuration parameters."
::= 5

ospfVirtIfConfigError TRAP-TYPE
ENTERPRISE ospf
VARIABLES {
ospfRouterId, -- The originator of the trap
ospfVirtAreaID,
ospfVirtIfNeighbor,
ospfConfigErrorType, -- Type of error
ospfPacketType }
DESCRIPTION
"An ospfConfigError trap signifies that a packet has been received on a virtual interface from a router whose configuration parameters conflict with this router’s configuration parameters."
::= 6

ospfRxBadPacket TRAP-TYPE
ENTERPRISE ospf
VARIABLES {
    ospfRouterId, -- The originator of the trap
    ospfIfIpAddress,
    ospfAddressLessIf,
    IpAddress, -- The source IP address
    ospfPacketType }

DESCRIPTION
    "An ospfRxBadPacket trap signifies that an OSPF packet
    has been received on a non-virtual interface that cannot
    be parsed."

::= 7

ospfVirtIfRxBadPacket  TRAP-TYPE
ENTERPRISE      ospf
VARIABLES {
    ospfRouterId, -- The originator of the trap
    ospfVirtAreaId,
    ospfVirtIfNeighbor,
    ospfPacketType }

DESCRIPTION
    "An ospfRxBadPacket trap signifies that an OSPF packet
    has been received on a virtual interface that cannot be
    parsed."

::= 8

ospfTxRetransmit        TRAP-TYPE
ENTERPRISE      ospf
VARIABLES {
    ospfRouterId, -- The originator of the trap
    ospfIfIpAddress,
    ospfAddressLessIf,
    ospfNbrRtrId, -- Who the packet is being retransmitted to
    ospfPacketType }

DESCRIPTION
    "An ospfTxRetransmit trap signifies than an OSPF packet
    has been retransmitted on a non-virtual interface."

::= 9

ospfVirtIfTxRetransmit  TRAP-TYPE
ENTERPRISE      ospf
VARIABLES {
    ospfRouterId, -- The originator of the trap
    ospfVirtAreaId,
    ospfVirtIfNeighbor,
    ospfPacketType }

DESCRIPTION
    "An ospfTxRetransmit trap signifies than an OSPF packet
    has been retransmitted on a virtual interface."

::= 10
ospfOriginateLSA   TRAP-TYPE
ENTERPRISE      ospf
VARIABLES {
    ospfRouterId, -- The originator of the trap
    ospfLsdbAreaId,  -- 0.0.0.0 for AS Externals
    ospfLsdbType,
    ospfLsdbLSID,
    ospfLsdbRouterId }
DESCRIPTION
"An ospfOriginateLSA trap signifies that a new link-state advertisement of has been originated by this router."
::= 11

ospfMaxAgeLSA    TRAP-TYPE
ENTERPRISE      ospf
VARIABLES {
    ospfRouterId, -- The originator of the trap
    ospfLsdbAreaId,  -- 0.0.0.0 for AS Externals
    ospfLsdbType,
    ospfLsdbLSID,
    ospfLsdbRouterId }
DESCRIPTION
"An ospfMaxAgeLSA trap signifies that one of the link-state advertisements in the router’s link-state database has aged to MaxAge."
::= 12

ospfFreeLSA      TRAP-TYPE
ENTERPRISE      ospf
VARIABLES {
    ospfRouterId, -- The originator of the trap
    ospfLsdbAreaId,  -- 0.0.0.0 for AS Externals
    ospfLsdbType,
    ospfLsdbLSID,
    ospfLsdbRouterId }
DESCRIPTION
"An ospfFreeLSA trap signifies that one of the link-state advertisements in the router’s link-state database has been freed."
::= 13
4.0 Acknowledgements

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5.0 References


