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JP. Vasseur, Ed.
George. Swallow
Cisco Systems, Inc
Adrian. Farrel
Old Dog Consulting

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Node behavior upon originating and receiving Resource ReserVation Protocol (RSVP) Path Error message
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Status of this Memo

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Abstract

The aim of this document is to describe a common practice with regard to the behavior of a node sending a Resource ReserVation Protocol (RSVP) Path Error message and to the behavior of a node receiving an RSVP Path Error message for a particular Multi-Protocol Label Switching - Traffic Engineering (MPLS-TE) Label Switched Path (LSP).

This document does not define any new protocol extensions.

Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119].

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1. Protocol behavior

[RFC2205] defines two RSVP error message types: PathErr and ResvErr that are generated when an error occurs. Path Error Messages (PathErr) are used to report errors and travel upstream toward the head-end of the flow. Resv Error messages (ResvErr) travel downstream toward the tail-end of the flow.

This document describes only PathErr message processing. PathErr messages are routed hop-by-hop using the path state established when a Path message is routed through the network from the head-end to its tail-end.

As stated in [RFC2205], PathErr messages do not modify the state of any node through which they pass; they are only reported to the head-end of the TE LSP (Traffic Engineering Label Switched Path).

The format of the PathErr message as defined in [RFC2205] is as follows:

```
<PathErr message> ::= <Common Header> [ <INTEGRITY> ]
                      <SESSION> <ERROR_SPEC>
                      [ <POLICY_DATA> ...]
                      [ <sender descriptor> ]

<sender descriptor> ::= <SENDER_TEMPLATE> <SENDER_TSPEC>
                           [ <ADSPEC> ]
```

The ERROR_SPEC object includes the IP address of the node that detected the error (Error Node Address), and specifies the error through two fields. The Error Code field encodes the category of the error, for example, Policy Control Failure or Unknown object class. The Error Value field qualifies the error code to indicate the error with more precision. [RFC3209] extends RSVP as defined in [RFC2205] for the management of Multi-Protocol Label Switching (MPLS) Traffic

Engineered Label Switched Paths (TE-LSPs). [RFC3209] specifies several additional conditions that trigger the sending of an RSVP PathErr message for which new error codes and error values have been defined that extend the list defined in [RFC2205]. The exact circumstances under which such PathErr messages are sent are defined in [RFC3209] and will not be repeated here.

Values for the Error Code and Error Value fields defined in [RFC2205], [RFC3209], and other documents are maintained in a registry by the IANA. A full list can be seen at Section 5. The error conditions fall into two categories: - fatal errors represent disruptive conditions for a TE LSP, - non-fatal errors are non-

disruptive conditions which have occurred for this TE LSP. Additionally, PathErr messages may be used in two circumstances: - during TE LSP establishment, - after a TE LSP has been successfully established. Nodal behavior is dependent on which combination of the four cases listed above applies. The following sections describe the expected behavior at nodes that detect (and therefore report using PathErr messages) errors, and at nodes that receive PathErr messages. This text is a clarification and re-statement of the procedures set out in [RFC3209] and does not define any new behavior. Section 2 provides a list of the currently defined PathErr Error Codes and Error Values and indicates for each whether it is fatal or non-fatal.

1.1. Behavior at Detecting Nodes

In the case of fatal errors, the detecting node must send a PathErr message reporting the error condition, and must clear the corresponding Path and Resv (control plane) states. A direct implication is that the data plane resources of such a TE LSP are also released, thus resulting in traffic disruption. It should be noted, however, that in fatal error cases, the LSP has usually already failed in the data plane, and traffic has already been disrupted. When the error arises during LSP establishment, the implications are different to when it arises on an active LSP since no traffic flows until the LSP has been fully established. In the case of non-fatal errors, the detecting node should send a PathErr message, and must not clear control plane or data plane state.

1.2. Behavior at Receiving Nodes

Nodes that receive PathErr messages are all of the nodes along the path of the TE LSP upstream of the node that detected the error. This includes the head-end node. In accordance with [RFC2205] a node receiving a PathErr message takes no action upon it and consequently it must not clear Path or Resv control plane or data plane state. This is true regardless of whether the error condition reported by the PathErr is fatal or non-fatal. RSVP states should only be affected upon receiving a PathTear or ResvTear message, or in the event of a Path or Resv state timeout. Further discussion of the processing of these events is outside the scope of this document. Note that [RFC3473] defines a Path_State_Removed flag in the ERROR_SPEC object carried on a PathErr message. This field may be set to change the behavior of upstream nodes that receive the PathErr message. When set, the flag indicates that the message sender has removed Path state (and any associated Resv and data plane state) for the TE LSP. The message receiver should do likewise before forwarding the message, but may retain state and clear the flag before forwarding the message.

1.3. Data Plane Behavior

Any node clearing either or both the Path or the Resv state of a TE LSP MUST also free up the data plane resources allocated to the corresponding TE LSP.

2. IANA Considerations

IANA maintains a registry of RSVP Error Codes and Error Values at Section 5. The registry is labeled "Resource ReSerVation Protocol (RSVP) Parameters" / "Error Codes and Values" IANA is requested to add a column to this registry to indicate for each Error Code / Error Value combination whether the error reported constitutes a fatal or non-fatal error condition if the error is seen in an MPLS-TE system. It is suggested that the column in headed "MPLS-TE Fatal" and contain one of three values: Yes - The error condition represents a fatal condition as described in this document when applied to an MPLS TE LSP. No - The error condition represents a non-fatal condition as described in this document when applied to an MPLS TE LSP. N/A - The error condition cannot be applied to an MPLS TE LSP. IANA should require that all new assignments from this registry provide

information in this column. In order to update this registry for the creation of this column, the table below supplies the setting of the column for each existing entry in the registry. IANA is requested to transfer this information into the registry. Note that only the Error Code and Error Value numbers are supplied here. No change to any of the other registry fields is implied.

Error code	Error Value	Reference	MPLS-TE Fatal
0	Any	[RFC2205]	N/A
1	Any	[RFC2205]	N/A
2	5	[RFC2750]	Yes
	100	[RFC3476]	N/A
	101	[RFC3476]	N/A
	102	[RFC4495]	N/A
	Any other	[RFC2205]	N/A
3	Any	[RFC2205]	N/A
4	Any	[RFC2205]	N/A
5	Any	[RFC2205]	Yes
6	Any	[RFC2205]	N/A
7	Any	[RFC2205]	N/A
8	Any	[RFC2205]	N/A
9	Any	[RFC2205]	N/A
10	Any	[RFC2205]	N/A
11	Any	[RFC2205]	N/A
12	Any	[RFC2205]	N/A

13	Any	[RFC2205]	
14	Any	[RFC2205]	
15	Any	[RFC2205]	N/A
16	Any	[RFC2205]	N/A
17	Any	[RFC2205]	N/A
18	Any	[RFC2205]	N/A
19	Any	[RFC2205]	N/A
20	Any	[RFC2205]	N/A
21	Any	[RFC2205]	
22	Any	[RFC2205]	
23	Any	[RFC2205]	
24	1	[RFC3209]	Yes
	2	[RFC3209]	Yes
	3	[RFC3209]	Yes
	4	[RFC3209]	Yes

	5	[RFC3209]	Yes
	6	[RFC3209]	Yes
	7	[RFC3209]	Yes
	8	[RFC3209]	Yes
	9	[RFC3209]	Yes
	10	[RFC3209]	Yes
	11	[RFC3473]	Yes
	12	[RFC3473]	Yes
	13	[RFC3473]	Yes
	14	[RFC3473]	Yes
	15	[RFC3473]	Yes
	16	[RFC3473]	Yes
	100	[RFC3476]	N/A
	101	[RFC3476]	N/A
	102	[RFC3476]	N/A
	103	[RFC3474]	N/A
	104	[RFC3474]	N/A
	105	[RFC3474]	N/A
	106	[RFC3474]	N/A
25	1	[RFC3209]	No
	2	[RFC3209]	No
	3	[RFC3209]	No
	4	[RFC3473]	No
	5	[RFC3473]	No
	6	[draft-ietf-ccamp-loose-path-reopt]	No
	7	[draft-ietf-ccamp-loose-path-reopt]	No
	8	[draft-ietf-ccamp-loose-path-reopt]	No
26	Any	[RFC3175]	N/A
27	Any	[RFC3270]	N/A
28	Any	[RFC4124]	Yes
29	Any	[RFC4420]	
30	Any	[RFC4420]	

3. Security Considerations

This document does not define any new procedures, but clarifies those defined in other documents where security considerations are already specified. This document does not raise specific security issues beyond those of existing MPLS-TE. By clarifying the procedures, this document reduces the security risk introduced by non-conformant implementations.

4. Acknowledgements

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5. URLs

[IANA-URL] http://www.iana.org/numbers.html

6. Normative References

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Authors' Addresses

JP Vasseur (editor)
Cisco Systems, Inc
1414 Massachusetts Avenue
Boxborough, MA 01719
USA

Email: jpv@cisco.com

George Swallow
Cisco Systems, Inc
1414 Massachusetts Avenue
Boxborough, MA 01719
USA

Email: swallow@cisco.com

Adrian Farrel
Old Dog Consulting

Email: adrian@olddog.co.uk

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