

Network Working Group  
Internet Draft  
Updates: [RFC4204](#)  
Category: Standards Track

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Expires: April 2011

October 11, 2010

## Behavior Negotiation in The Link Management Protocol

[draft-ietf-ccamp-lmp-behavior-negotiation-01.txt](#)

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Abstract

The Link Management Protocol (LMP) is used to coordinate the properties, use, and faults of data links in Generalized Multiprotocol Label Switching (GMPLS) networks. Various proposals have been advanced to provide extensions to the base LMP specification. This document defines an extension to negotiated capabilities and provides a generic procedure for LMP implementations that do not recognize or do not support any one of these extensions.

Conventions used in this document

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 [[RFC2119](#)].

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[1](#). Introduction

The Link Management Protocol (LMP) [[RFC4204](#)] is being successfully deployed in Generalized Multiprotocol Label Switching (GMPLS)-

controlled networks. New LMP behaviors and protocol extensions are being introduced in a number of IETF documents.

In the network, if one GMPLS Label Switch Router (LSR) supports a new behavior or protocol extension, but its peer LSR does not, it is necessary to have a protocol mechanism for resolving issues that may

arise. It is also beneficial to have a protocol mechanism to discover the capabilities of peer LSRs. There is no such procedure defined in the base LMP specification [[RFC4204](#)], so this document defines how to handle LMP extensions both at legacy LSRs and at upgraded LSRs that would communicate with legacy LSRs.

In [[RFC4204](#)], the basic behaviors have been defined around the use of the standard LMP messages, which include Config, Hello, Verify, Test, LinkSummary, and ChannelStatus. Per [[RFC4204](#)], these behaviors MUST be supported when LMP is implemented, and the message types from 1 to 20 have been assigned by IANA for these messages.

In [[RFC4207](#)], the SONET/SDH technology-specific behavior and information for LMP is defined. The TRACE behavior is added to LMP, and the message types from 21 to 31 were assigned by IANA for the messages that provide the TRACE function. The TRACE function has been extended for the support of OTNs (Optical Transport Networks) in [LMP TEST].

In [[RFC4209](#)], extensions to LMP are defined to allow it to be used between a peer node and an adjacent Optical Line System (OLS). The LMP object class type and sub-object class name have been extended to support DWDM behavior.

In [[RFC5818](#)], the data channel consistency check behavior is defined, and the message types from 32 to 34 have been assigned by IANA for messages that provide this behavior.

It is likely that future extensions to LMP for other functions or technologies will require the definition of further LMP messages.

This document describes the behavior negotiation procedure to make sure both LSRs at the ends of each link understand the LMP messages that they exchange.

## 2. LMP Behavior Negotiation Procedure

The Config message is used in the control channel negotiation phase of LMP [RFC4204]. The LMP behavior negotiation procedure is defined in this document as an addition to this phase.

The Config message is defined in [Section 12.3.1 of \[RFC4204\]](#) and carries the <CONFIG> object (class name 6) as defined in [Section 13.6 of \[RFC4204\]](#).

Two class types have been defined:

- C-Type = 1, HelloConfig, defined in [\[RFC4204\]](#)
- C-Type = 2, LMP\_WDM\_CONFIG, defined in [\[RFC4209\]](#)

This document defines a third C-Type with value 3 (TBD by IANA) to report and negotiate currently defined LMP mechanisms and behaviors, and to allow future LMP extensions to be reported and negotiated.

- C-Type = 3, BEHAVIOR\_CONFIG

The format of the new type of CONFIG Class is defined as follows:

0								1								2								3							
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
Length								B S D C O								Reserved															

Length: 8 bits

This field indicates the total length of the objects expressed in multiples of 4 bytes.

Flags:

B: 1 bit

This bit indicates support for the basic behaviors defined in

[[RFC4204](#)].

S: 1 bit

This bit indicates support for the Trace behavior of SONET/SDH technology-specific defined in [[RFC4207](#)].

D: 1 bit

This bit indicates support for the DWDM behavior defined in [[RFC4209](#)].

C: 1 bit

This bit indicates support for the data channel consistency check behavior defined in [[RFC5818](#)].

O: 1 bit

This bit indicates support for the TEST behavior of OTN technology-specific defined in [LMP TEST].

Further bits may be defined in future documents.

The Reserved field MUST be sent as zero and MUST NOT be ignored on receipt. This allows the detection of unsupported or unknown LMP behaviors when new bits are allocated to indicate further capabilities and are sent as one.

Upon receiving a bit set related to an unsupported or unknown behavior, a ConfigNack message MUST be sent with a <CONFIG> object, the BEHAVIOR\_CONFIG C-Type representing the supported LMP behaviors. An LSR receiving such a ConfigNack SHOULD select a supported set of capabilities and send a further Config message, or MAY raise an alert to the management system (or log an error) and stop trying to perform LMP communications with its neighbor.

### 3. Backwards Compatibility

An LSR that receives a Config message containing a <CONFIG> object with a C-Type that it does not recognize MUST respond with a

ConfigNack message as described in [[RFC4204](#)]. Thus, legacy LMP nodes that do not support the BEHAVIOR\_CONFIG C-Type defined in this document will respond with a ConfigNack message.

It's not explicitly stated in [[RFC4204](#)] that a Config Message could include multiple <CONFIG> objects. But with new CONFIG C-Types are defined, multiple <CONFIG> objects (each with a different Class Type) MAY be present on a Config message in which case all of the objects MUST be processed.

#### [4. Security Considerations](#)

[RFC4204] describes how LMP messages between peers can be secured, and these measures are equally applicable to messages carrying the new <CONFIG> object defined in this document.

The operation of the procedures described in this document does not of itself constitute a security risk since they do not cause any change in network state. It would be possible, if the messages were

intercepted or spoofed to cause bogus alerts in the management plane, or to cause LMP peers to consider that they could or could not operate protocol extensions, and so the use of the LMP security measures are RECOMMENDED.

#### [5. IANA Considerations](#)

##### [5.1. New LMP Class Type](#)

IANA maintains the "Link Management Protocol (LMP)" registry which has a subregistry called "LMP Object Class name space and Class type (C-Type)".

IANA is requested to make an assignment from this registry as follows:

6 CONFIG

[[RFC4204](#)]

CONFIG Object Class type name space:

C-Type	Description	Reference
3	BEHAVIOR_CONFIG	[This.I-D]

## 5.2. New Capabilities Registry

IANA is requested to create a new subregistry of the "Link Management Protocol (LMP)" registry to track the Behaviour Configuration bits defined in [Section 2](#) of this document. It is suggested that this registry be called "LMP Behaviour Configuration Flags".

Allocations from this registry are by Standards Action.

Bits in this registry are numbered from zero as the most significant bit (transmitted first). The number of bits that can be present is limited by the length field of the <CONFIG> object which gives rise to  $(255 \times 32) - 8 = 8152$ . IANA is strongly recommended to allocate new bits with the lowest available unused number.

The registry is initially populated as follows:

Bit Number	Bit Name	Meaning	Reference
0	B	Basic LMP behavior support	[This.ID]
1	S	SONET/SDH Test support	[This.ID]
2	D	DWDM support	[This.ID]
3	C	Data Channel consistency check support	[This.ID]
4	O	OTN TEST behavior	[This.ID]

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## 7. Acknowledgments

Thanks to Adrian Farrel and Lou Berger for their useful comments.

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