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**Management Information Base for Load Balancers**  
**draft-li-opsawg-loadbalance-mib-03**

**Abstract**

Load balancer is deployed widely in datacenter nowadays. There is a requirement to build a unique LB network management system where two or more vendors' LB devices are used. We propose the standard MIBs for unique NMS.

Load balancer description is introduced at  
"[http://en.wikipedia.org/wiki/Load\\_balancing\\_\(computing\)](http://en.wikipedia.org/wiki/Load_balancing_(computing))".

This memo defines an portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes a MIB module for load balance device.

**Status of this Memo**

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## **1. Introduction**

Load balancer is deployed widely in datacenter nowadays. There is a requirement to build a unique LB network management system where two or more vendors' LB devices are used. We propose the standard MIBs for unique NMS.

This document defines 5 MIB Modules which together support the configuration and monitoring of Load Balance device.

## **2. The Internet-Standard Management Framework**

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to [section 7 of RFC 3410](#) [[RFC3410](#)].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIV2, which is described in STD 58, [[RFC2578](#)] STD 58, [RFC 2579](#) [[RFC2579](#)] and STD 58, [RFC 2580](#) [[RFC2580](#)].

## **3. Conventions**

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](#)].

## **4. Structure of Load-Balance MIB objects**

The following subsections describe the purpose of each of the objects contained in the loadbalance-MIB.

### **4.1. Load balance Virtual Service Table**

Services provided by LB devices are virtual services. Configured on an LB device, a virtual service is uniquely identified by virtual service IP address, service protocol, service mode, and service port number. Access requests of users are sent to the LB device through a public or private network. If matching the virtual service, the requests are distributed to real services by the LB device.

### **4.2. Load balance Real Service Table**



Services provided by real servers are real services. A real service can be a traditional FTP or HTTP service, and can also be a forwarding service in a generic sense. For example, a real service in firewall load balancing is the packet forwarding path.

#### 4.3. Load balance Real Service Group Table

Server group----a real service group is a logical concept. Servers can be classified into different groups according to the common attributes of these servers. For example, servers can be classified into static storage server group and dynamic switching server group according to their functions; or they can be classified into music server group, video server group and picture server group according to the services they provide.

#### 4.4. Load balance health checking Table

Health monitoring allows an LB device to check the statuses of real servers or links, collect the corresponding information, and quarantine the servers or links that work abnormally. Health monitoring can not only mark whether servers or links can work normally, but also can collect statistics of the response time of the servers or links for selecting servers or links.

#### 4.5. Load balance Statistic Table

The statistic for Virtual Service or Real Service session, transmission rate.

## 5. Loadbalance-MIB Module Definitions

```
LOAD-BALANCER-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
    MODULE-IDENTITY, OBJECT-TYPE, mib-2,  
    Unsigned32, Integer32
```

```
    FROM SNMPv2-SMI
```

```
-- RFC2578
```

```
    MODULE-COMPLIANCE, OBJECT-GROUP
```

```
    FROM SNMPv2-CONF
```

```
-- RFC2580
```

```
;
```

```
lbMIB MODULE-IDENTITY
```

```
    LAST-UPDATED "201111310000Z"
```

```
    ORGANIZATION
```

```
        "IETF Operations and Management Area Working Group
```

```
        http://datatracker.ietf.org/wg/opsawg/"
```

```
    CONTACT-INFO
```



"email: Li Chen (lichenyj@chinamobile.com) China Mobile"  
DESCRIPTION

"MIB objects for load-balancing devices.

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Provisions Relating to IETF Documents  
(<http://trustee.ietf.org/license-info>)."

REVISION "201111310000Z"

::= { mib-2 XXX }

lbMIBNotifications OBJECT IDENTIFIER ::= { lbMIB 0 }

lbMIBObjects OBJECT IDENTIFIER ::= { lbMIB 1 }

lbMIBConformance OBJECT IDENTIFIER ::= { lbMIB 2 }

lbMIBCompliances OBJECT IDENTIFIER ::= { lbMIBConformance 1 }

lbMIBGroups OBJECT IDENTIFIER ::= { lbMIBConformance 2 }

--

-- Load-balancer Virtual Service table

--

lbVSTable OBJECT-TYPE

SYNTAX SEQUENCE OF LbVSEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Configured on an LB device, a virtual service is uniquely  
identified by virtual service IP address, service protocol,  
service mode , and service port number. Access requests of users  
are sent to the LB device through a public or private network.  
If matching the virtual service, the requests are distributed  
to real services by the LB device."

::= { lbMIBObjects 1 }

lbVSEntry OBJECT-TYPE

SYNTAX LbVSEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION





"A row describing LB virtual service."  
INDEX { lbVSId }  
::= { lbVSTable 1 }

LbVSEntry ::= SEQUENCE {  
    lbVSId            Unsigned32,  
    lbVSAddr          IpAddress,  
    lbVSPort          INTEGER,  
    lbVSmode          INTEGER,  
    lbVSproto         INTEGER,  
}

LbVSId            OBJECT-TYPE  
    SYNTAX          Unsigned32 (1..'ffffffff'H)  
    MAX-ACCESS      read-write  
    STATUS          current  
    DESCRIPTION  
        "LB virtual service identifier."  
    ::= { LbVSEntry 1 }

LbVSAddr          OBJECT-TYPE  
    SYNTAX          IpAddress  
    MAX-ACCESS      read-write  
    STATUS          current  
    DESCRIPTION  
        "Virtual service IP address of cluster/LB, used for users  
        to request services."  
    ::= { LbVSEntry 2 }

LbVSPort          OBJECT-TYPE  
    SYNTAX          INTEGER (0..65535)  
    MAX-ACCESS      read-write  
    STATUS          current  
    DESCRIPTION  
        "The LB distributes the requests with the same source IP  
        address and source port  
        to a specific server."  
    ::= { LbVSEntry 3 }

LbVSmode          OBJECT-TYPE  
    SYNTAX          INTEGER (NAT(0),DR(1))  
    MAX-ACCESS      read-write  
    STATUS          current  
    DESCRIPTION  
        "Layer 4 server load balancing can be classified into  
        Network Address Translation (NAT)-mode server load



```

        balancing and Direct routing (DR)-mode server
        load balancing."
 ::= { lbVSEntry 4 }

```

```

lbVSproto      OBJECT-TYPE
    SYNTAX      INTEGER (TCP(0),UDP(1))
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION
        "LB can support protocol for user."
 ::= { lbVSEntry 5 }

```

```

--
-- Load-balancer Real Service table
--

```

```

lbRSTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF LbRSEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "Services provided by real servers are real services.
        A real service can be a traditional FTP or HTTP service,
        and can also be a forwarding service in a generic sense.
        For example, a real service in firewall load balancing
        is the packet forwarding path."
 ::= { lbMIBObjects 2 }

```

```

lbRSEntry OBJECT-TYPE
    SYNTAX      LbRSEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "A row describing LB real service."
    INDEX       { lbRSId }
 ::= { lbRSTable 1 }

```

```

LbRSEntry ::= SEQUENCE {
    lbRSId      Unsigned32,
    lbRSGId     Unsigned32
    lbRSAddr    IpAddress,
    lbRSPort    INTEGER,
}

```

```

lbRSId      OBJECT-TYPE
    SYNTAX      Unsigned32 (1..'ffffffff'H)
    MAX-ACCESS   read-write
    STATUS       current

```



## DESCRIPTION

"LB real service identifier."

::= { lbRSEntry 1 }

lbRSGId OBJECT-TYPE

SYNTAX Unsigned32 (1..'ffffffff'H)

MAX-ACCESS read-only

STATUS current

## DESCRIPTION

"a real service group is a logical concept. Servers can be classified into different groups according to the common attributes of these servers."

::= { lbRSEntry 2 }

lbRSAddr OBJECT-TYPE

SYNTAX IPAddress

MAX-ACCESS read-write

STATUS current

## DESCRIPTION

"IP address of a server, used by the LB device to distribute requests."

::= { lbRSEntry 3 }

lbRSPort OBJECT-TYPE

SYNTAX INTEGER (0..65535)

MAX-ACCESS read-write

STATUS current

## DESCRIPTION

"The LB uses the port for communication with server."

::= { lbRSEntry 4 }

--

-- Load-balancer Real Service Group table

--

lbRSGTable OBJECT-TYPE

SYNTAX SEQUENCE OF LbRSGEntry

MAX-ACCESS not-accessible

STATUS current

## DESCRIPTION

"Real Server group is a logical concept. Servers can be classified into different groups according to the common attributes of these servers."

::= { lbMIBObjects 3 }

lbRSGEntry OBJECT-TYPE

SYNTAX LbRSGEntry

MAX-ACCESS not-accessible



```

STATUS      current
DESCRIPTION
    "A row describing LB real service group."
INDEX      { lbRSGId }
 ::= { lbRSGTable 1 }

```

```

LbRSGEntry ::= SEQUENCE {

```

```

    lbRSGId      Unsigned32,
    lbRSID       Unsigned32,
    lbRSGschdalgorithm  INTEGER,
    lbRSGhealth  INTEGER

```

```

}

```

```

lbRSGId      OBJECT-TYPE
    SYNTAX      Unsigned32 (1..'ffffffff'H)
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "LB real service group identifier."
    ::= { lbRSGEntry 1 }

```

```

lbRSID       OBJECT-TYPE
    SYNTAX      Unsigned32 (1..'ffffffff'H)
    MAX-ACCESS  read only
    STATUS      current
    DESCRIPTION
        "LB real service identifier."
    ::= { lbRSGEntry 2 }

```

```

lbRSGschdalgorithm  OBJECT-TYPE
    SYNTAX      INTEGER(
        Round Robin(0),
        Weighted Round Robin(1),
        Random(2),
        Weighted Random(3),
        Source IP Hashing(4),
        Source IP and Source Port Hashing(5),
        Destination IP Hashing(6),
        UDP Packet Load Hashing(7),
        Least Connection(8),
        Weighted Least Connection(9),
        Bandwidth(10)
    )
    MAX-ACCESS  read only
    STATUS      current
    DESCRIPTION
        "An LB needs to distribute service traffic to different

```





```

        real services according to a load balancing scheduling
        algorithm."
 ::= { lbRSGEntry 3 }

```

```

lbRSGhealth      OBJECT-TYPE
    SYNTAX        INTEGER(
                        DNS(0),
                        ICMP(1),
                        HTTP(2)
                    )
    MAX-ACCESS     read-write
    STATUS         current
    DESCRIPTION
        "The health monitoring method of RSG. It allows an LB device
        to detect whether real servers can provide services. The
        common method includes DNS\ICMP\HTTP, etc."
 ::= { lbRSGEntry 4 }

```

```

--
-- Load-balancer health monitoring table
--

```

```

lbHealthchkTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF LbHealthchkEntry
    MAX-ACCESS       not-accessible
    STATUS           current
    DESCRIPTION
        "This table contains information about the health check
        parameters, which include IP address,prot,health check type
        ,health check interval,
        retry times."
 ::= { lbMIBObjects 4 }

```

```

LbHealthchkEntry OBJECT-TYPE
    SYNTAX          LbHealthchkEntry
    MAX-ACCESS       not-accessible
    STATUS           current
    DESCRIPTION
        "A row describing LB health check."
    INDEX           { lbHealthchkId }
 ::= { lbHealthchkTable 1 }

```

```

LbHealthchkEntry ::= SEQUENCE {
    lbHealthchkId      Unsigned32,
    lbHealthchkAddr     IPAddress,
    lbHealthchkPort     INTEGER,
    lbHealthchktype     INTEGER,
    lbHealthchkintvl    Integer32,

```



```
    lbHealthchkretrytimes      Integer32
}

lbHealthchkId OBJECT-TYPE
    SYNTAX      Unsigned32 (1..'ffffffff'H)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "LB health check identifier."
    ::= { lbHealthchkEntry 1 }

lbHealthchkAddr      OBJECT-TYPE
    SYNTAX      IpAddress
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "The remote IP address of server."
    ::= { lbHealthchkEntry 2 }

lbHealthchkPort      OBJECT-TYPE
    SYNTAX      INTEGER (0..65535)
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "The remote port of server supporting service."
    ::= { lbHealthchkEntry 3 }

lbHealthchktype      OBJECT-TYPE
    SYNTAX      INTEGER(ICMP(0),DNS(1),HTTP(2))
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "The set of health check method that include ICMP\DNS\HTTP,
        etc."
    ::= { lbHealthchkEntry 4 }

lbHealthchkintvl      OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "The definite length of between two packets. the packet can be
        ICMP\DNS\HTTP message."
    ::= { lbHealthchkEntry 5 }

lbHealthchkretrytimes OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-write
```



```

STATUS      current
DESCRIPTION
    "the LB will retry the defined times when server doesn't reply
    health check packet in time. "
 ::= { lbHealthchkEntry 6 }

```

```

--
-- Statistic table
--

```

```

lbStaTable    OBJECT-TYPE
    SYNTAX      SEQUENCE OF LbStaEntry
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "The statistic for Virtual Service or Real Service session,
        transmission rate."
    ::= { lbMIBObjects 5 }

```

```

lbStaEntry OBJECT-TYPE
    SYNTAX      LbStaEntry
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "A row describing LB Statistic."
    INDEX       { lbStaId }
    ::= { lbStaTable 1 }

```

```

LbStaEntry ::= SEQUENCE {

    lbStaId          Unsigned32,
    lbStasession      INTEGER,
    lbStarate         INTEGER
}

```

```

lbStaId        OBJECT-TYPE
    SYNTAX      Unsigned32 (1..'ffffffff'H)
    MAX-ACCESS   read-write
    STATUS      current
    DESCRIPTION
        "LB statistic table identifier."
    ::= { lbStaEntry 1 }

```

```

lbStasession    OBJECT-TYPE
    SYNTAX      INTEGER32
    MAX-ACCESS   read only

```



```

    STATUS      current
    DESCRIPTION
        "the max or min session number of a RS or RSG."
    ::= { lbStaEntry 2 }

lbStarate      OBJECT-TYPE
    SYNTAX      INTEGER32
    MAX-ACCESS  read only
    STATUS      current
    DESCRIPTION
        "the max or min flow rate of a RS or RSG."
    ::= { lbStaEntry 3 }

--
-- Conformance statements
--

lbMIBCompliance MODULE-COMPLIANCE
    STATUS      current
    DESCRIPTION "The compliance statement for SNMP engines that support
                the LOAD-BALANCER-MIB."
    MODULE
        MANDATORY-GROUPS { lbMIBGroup }
    ::= { lbMIBCompliances 1 }

lbMIBGroup OBJECT-GROUP
    OBJECTS {
        lbVSmode,
        lbRSGschdalgorithm,
        lbHealthchktype,
        lbStasession,
    }
    STATUS      current
    DESCRIPTION
        "A collection of objects for managing load-balancer."
    ::= { lbMIBGroups 1 }

END
```

## 6. Security Considerations

[TBD]





## **7. IANA Considerations**

IANA is requested to assign a value for "XXX" under the 'mib-2' subtree and to record the assignment in the SMI Numbers registry. When the assignment has been made, the RFC Editor is asked to replace "XXX" (here and in the MIB module) with the assigned value and to remove this note.

## **8. Normative References**

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC2578] McCloghrie, K., Ed., Perkins, D., Ed., and J. Schoenwaelder, Ed., "Structure of Management Information Version 2 (SMIv2)", STD 58, [RFC 2578](#), April 1999.
- [RFC2579] McCloghrie, K., Ed., Perkins, D., Ed., and J. Schoenwaelder, Ed., "Textual Conventions for SMIv2", STD 58, [RFC 2579](#), April 1999.
- [RFC2580] McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Conformance Statements for SMIv2", STD 58, [RFC 2580](#), April 1999.
- [RFC3410] Case, J., Mundy, R., Partain, D., and B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework", [RFC 3410](#), December 2002.

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