

Network Working Group
Request for Comments: 1657
Category: Standards Track

S. Willis
J. Burruss
Wellfleet Communications Inc.
J. Chu, Editor
IBM Corp.
July 1994

Definitions of Managed Objects for the Fourth Version of the
Border Gateway Protocol (BGP-4) using SMIV2

Status of this Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

1. Introduction

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects used for managing the Border Gateway Protocol Version 4 or lower [1, 2].

2. The SNMPv2 Network Management Framework

The SNMPv2 Network Management Framework consists of four major components. They are:

RFC 1442 which defines the SMI, the mechanisms used for describing and naming objects for the purpose of management.

STD 17, RFC 1213 defines MIB-II, the core set of managed objects for the Internet suite of protocols.

RFC 1445 which defines the administrative and other architectural aspects of the framework.

RFC 1448 which defines the protocol used for network access to managed objects.

The Framework permits new objects to be defined for the purpose of experimentation and evaluation.

3. Object Definitions

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the subset of Abstract Syntax Notation One (ASN.1) defined in the SMI. In particular, each object type is named by an OBJECT IDENTIFIER, an administratively assigned name. The object type together with an object instance serves to uniquely identify a specific instantiation of the object. For human convenience, we often use a textual string, termed the descriptor, to refer to the object type.

4. Overview

These objects are used to control and manage a BGP-4 implementation.

Apart from a few system-wide scalar objects, this MIB is broken into three tables: the BGP Peer Table, the BGP Received Path Attribute Table, and the BGP-4 Received Path Attribute Table. The BGP Peer Table contains information about state and current activity of connections with the BGP peers. The Received Path Attribute Table contains path attributes received from all peers running BGP version 3 or less. The BGP-4 Received Path Attribute Table contains path attributes received from all BGP-4 peers. The actual attributes used in determining a route are a subset of the received attribute tables after local routing policy has been applied.

5. Definitions

BGP4-MIB DEFINITIONS ::= BEGIN

```
IMPORTS
    MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE,
    IpAddress, Integer32, Counter32, Gauge32
    FROM SNMPv2-SMI
    mib-2
    FROM RFC1213-MIB;

bgp MODULE-IDENTITY
    LAST-UPDATED "9405050000Z"
    ORGANIZATION "IETF BGP Working Group"
    CONTACT-INFO
        "      John Chu  (Editor)
        Postal: IBM Corp.
              P.O.Box 218
              Yorktown Heights, NY 10598
              US
```

Tel: +1 914 945 3156
 Fax: +1 914 945 2141
 E-mail: jychu@watson.ibm.com"

DESCRIPTION

"The MIB module for BGP-4."
 ::= { mib-2 15 }

bgpVersion OBJECT-TYPE

SYNTAX OCTET STRING (SIZE (1..255))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Vector of supported BGP protocol version numbers. Each peer negotiates the version from this vector. Versions are identified via the string of bits contained within this object. The first octet contains bits 0 to 7, the second octet contains bits 8 to 15, and so on, with the most significant bit referring to the lowest bit number in the octet (e.g., the MSB of the first octet refers to bit 0). If a bit, i, is present and set, then the version (i+1) of the BGP is supported."

::= { bgp 1 }

bgpLocalAs OBJECT-TYPE

SYNTAX INTEGER (0..65535)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The local autonomous system number."

::= { bgp 2 }

-- BGP Peer table. This table contains, one entry per
 -- BGP peer, information about the BGP peer.

bgpPeerTable OBJECT-TYPE

SYNTAX SEQUENCE OF BgpPeerEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"BGP peer table. This table contains, one entry per BGP peer, information about the connections with BGP peers."

::= { bgp 3 }

```
bgpPeerEntry OBJECT-TYPE
    SYNTAX      BgpPeerEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Entry containing information about the
         connection with a BGP peer."
    INDEX { bgpPeerRemoteAddr }
    ::= { bgpPeerTable 1 }

BgpPeerEntry ::= SEQUENCE {
    bgpPeerIdentifier
        IpAddress,
    bgpPeerState
        INTEGER,
    bgpPeerAdminStatus
        INTEGER,
    bgpPeerNegotiatedVersion
        Integer32,
    bgpPeerLocalAddr
        IpAddress,
    bgpPeerLocalPort
        INTEGER,
    bgpPeerRemoteAddr
        IpAddress,
    bgpPeerRemotePort
        INTEGER,
    bgpPeerRemoteAs
        INTEGER,
    bgpPeerInUpdates
        Counter32,
    bgpPeerOutUpdates
        Counter32,
    bgpPeerInTotalMessages
        Counter32,
    bgpPeerOutTotalMessages
        Counter32,
    bgpPeerLastError
        OCTET STRING,
    bgpPeerFsmEstablishedTransitions
        Counter32,
    bgpPeerFsmEstablishedTime
        Gauge32,
    bgpPeerConnectRetryInterval
        INTEGER,
    bgpPeerHoldTime
        INTEGER,
    bgpPeerKeepAlive
```

```

        INTEGER,
        bgpPeerHoldTimeConfigured
        INTEGER,
        bgpPeerKeepAliveConfigured
        INTEGER,
        bgpPeerMinASOriginationInterval
        INTEGER,
        bgpPeerMinRouteAdvertisementInterval
        INTEGER,
        bgpPeerInUpdateElapsedTime
        Gauge32
    }

bgpPeerIdentifier OBJECT-TYPE
    SYNTAX      IpAddress
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The BGP Identifier of this entry's BGP
        peer."
    ::= { bgpPeerEntry 1 }

bgpPeerState OBJECT-TYPE
    SYNTAX      INTEGER {
                                idle(1),
                                connect(2),
                                active(3),
                                opensent(4),
                                openconfirm(5),
                                established(6)
                            }
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The BGP peer connection state."
    ::= { bgpPeerEntry 2 }

bgpPeerAdminStatus OBJECT-TYPE
    SYNTAX      INTEGER {
                                stop(1),
                                start(2)
                            }
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "The desired state of the BGP connection.
        A transition from 'stop' to 'start' will
        cause the BGP Start Event to be generated."

```

A transition from 'start' to 'stop' will cause the BGP Stop Event to be generated. This parameter can be used to restart BGP peer connections. Care should be used in providing write access to this object without adequate authentication."

::= { bgpPeerEntry 3 }

bgpPeerNegotiatedVersion OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The negotiated version of BGP running between the two peers."

::= { bgpPeerEntry 4 }

bgpPeerLocalAddr OBJECT-TYPE

SYNTAX IpAddress

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The local IP address of this entry's BGP connection."

::= { bgpPeerEntry 5 }

bgpPeerLocalPort OBJECT-TYPE

SYNTAX INTEGER (0..65535)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The local port for the TCP connection between the BGP peers."

::= { bgpPeerEntry 6 }

bgpPeerRemoteAddr OBJECT-TYPE

SYNTAX IpAddress

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The remote IP address of this entry's BGP peer."

::= { bgpPeerEntry 7 }

bgpPeerRemotePort OBJECT-TYPE

SYNTAX INTEGER (0..65535)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The remote port for the TCP connection between the BGP peers. Note that the objects bgpPeerLocalAddr, bgpPeerLocalPort, bgpPeerRemoteAddr and bgpPeerRemotePort provide the appropriate reference to the standard MIB TCP connection table."

::= { bgpPeerEntry 8 }

bgpPeerRemoteAs OBJECT-TYPE

SYNTAX INTEGER (0..65535)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The remote autonomous system number."

::= { bgpPeerEntry 9 }

bgpPeerInUpdates OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of BGP UPDATE messages received on this connection. This object should be initialized to zero (0) when the connection is established."

::= { bgpPeerEntry 10 }

bgpPeerOutUpdates OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of BGP UPDATE messages transmitted on this connection. This object should be initialized to zero (0) when the connection is established."

::= { bgpPeerEntry 11 }

bgpPeerInTotalMessages OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of messages received from the remote peer on this connection. This object should be initialized to zero

```
        when the connection is established."
 ::= { bgpPeerEntry 12 }

bgpPeerOutTotalMessages OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The total number of messages transmitted to
         the remote peer on this connection.  This
         object should be initialized to zero when
         the connection is established."
 ::= { bgpPeerEntry 13 }

bgpPeerLastError OBJECT-TYPE
    SYNTAX      OCTET STRING (SIZE (2))
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The last error code and subcode seen by this
         peer on this connection.  If no error has
         occurred, this field is zero.  Otherwise, the
         first byte of this two byte OCTET STRING
         contains the error code, and the second byte
         contains the subcode."
 ::= { bgpPeerEntry 14 }

bgpPeerFsmEstablishedTransitions OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The total number of times the BGP FSM
         transitioned into the established state."
 ::= { bgpPeerEntry 15 }

bgpPeerFsmEstablishedTime OBJECT-TYPE
    SYNTAX      Gauge32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "This timer indicates how long (in
         seconds) this peer has been in the
         Established state or how long
         since this peer was last in the
         Established state.  It is set to zero when
         a new peer is configured or the router is
         booted."
```



```
::= { bgpPeerEntry 16 }
```

```
bgpPeerConnectRetryInterval OBJECT-TYPE
```

```
SYNTAX      INTEGER (1..65535)
```

```
MAX-ACCESS  read-write
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "Time interval in seconds for the
    ConnectRetry timer. The suggested value
    for this timer is 120 seconds."
```

```
::= { bgpPeerEntry 17 }
```

```
bgpPeerHoldTime OBJECT-TYPE
```

```
SYNTAX      INTEGER ( 0 | 3..65535 )
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "Time interval in seconds for the Hold
    Timer established with the peer. The
    value of this object is calculated by this
    BGP speaker by using the smaller of the
    value in bgpPeerHoldTimeConfigured and the
    Hold Time received in the OPEN message.
    This value must be at least three seconds
    if it is not zero (0) in which case the
    Hold Timer has not been established with
    the peer, or, the value of
    bgpPeerHoldTimeConfigured is zero (0)."
```

```
::= { bgpPeerEntry 18 }
```

```
bgpPeerKeepAlive OBJECT-TYPE
```

```
SYNTAX      INTEGER ( 0 | 1..21845 )
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "Time interval in seconds for the KeepAlive
    timer established with the peer. The value
    of this object is calculated by this BGP
    speaker such that, when compared with
    bgpPeerHoldTime, it has the same
    proportion as what
    bgpPeerKeepAliveConfigured has when
    compared with bgpPeerHoldTimeConfigured.
    If the value of this object is zero (0),
    it indicates that the KeepAlive timer has
    not been established with the peer, or,
    the value of bgpPeerKeepAliveConfigured is
    zero (0)."
```

```
::= { bgpPeerEntry 19 }
```

```
bgpPeerHoldTimeConfigured OBJECT-TYPE
```

```
SYNTAX      INTEGER ( 0 | 3..65535 )
```

```
MAX-ACCESS  read-write
```

```
STATUS      current
```

```
DESCRIPTION
```

"Time interval in seconds for the Hold Time configured for this BGP speaker with this peer. This value is placed in an OPEN message sent to this peer by this BGP speaker, and is compared with the Hold Time field in an OPEN message received from the peer when determining the Hold Time (bgpPeerHoldTime) with the peer. This value must not be less than three seconds if it is not zero (0) in which case the Hold Time is NOT to be established with the peer. The suggested value for this timer is 90 seconds."

```
::= { bgpPeerEntry 20 }
```

```
bgpPeerKeepAliveConfigured OBJECT-TYPE
```

```
SYNTAX      INTEGER ( 0 | 1..21845 )
```

```
MAX-ACCESS  read-write
```

```
STATUS      current
```

```
DESCRIPTION
```

"Time interval in seconds for the KeepAlive timer configured for this BGP speaker with this peer. The value of this object will only determine the KEEPALIVE messages' frequency relative to the value specified in bgpPeerHoldTimeConfigured; the actual time interval for the KEEPALIVE messages is indicated by bgpPeerKeepAlive. A reasonable maximum value for this timer would be configured to be one third of that of bgpPeerHoldTimeConfigured. If the value of this object is zero (0), no periodical KEEPALIVE messages are sent to the peer after the BGP connection has been established. The suggested value for this timer is 30 seconds."

```
::= { bgpPeerEntry 21 }
```

bgpPeerMinASOriginationInterval OBJECT-TYPE

SYNTAX INTEGER (1..65535)

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Time interval in seconds for the

MinASOriginationInterval timer.

The suggested value for this timer is 15 seconds."

::= { bgpPeerEntry 22 }

bgpPeerMinRouteAdvertisementInterval OBJECT-TYPE

SYNTAX INTEGER (1..65535)

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Time interval in seconds for the

MinRouteAdvertisementInterval timer.

The suggested value for this timer is 30 seconds."

::= { bgpPeerEntry 23 }

bgpPeerInUpdateElapsedTime OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Elapsed time in seconds since the last BGP UPDATE message was received from the peer.

Each time bgpPeerInUpdates is incremented, the value of this object is set to zero (0)."

::= { bgpPeerEntry 24 }

bgpIdentifier OBJECT-TYPE

SYNTAX IpAddress

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The BGP Identifier of local system."

::= { bgp 4 }

```
-- Received Path Attribute Table.  This table contains,
-- one entry per path to a network, path attributes
-- received from all peers running BGP version 3 or
-- less.  This table is deprecated.
```

```
bgpRcvdPathAttrTable OBJECT-TYPE
```

```
    SYNTAX      SEQUENCE OF BgpPathAttrEntry
```

```
    MAX-ACCESS  not-accessible
```

```
    STATUS      obsolete
```

```
    DESCRIPTION
```

```
        "The BGP Received Path Attribute Table
        contains information about paths to
        destination networks received from all
        peers running BGP version 3 or less."
```

```
    ::= { bgp 5 }
```

```
bgpPathAttrEntry OBJECT-TYPE
```

```
    SYNTAX      BgpPathAttrEntry
```

```
    MAX-ACCESS  not-accessible
```

```
    STATUS      obsolete
```

```
    DESCRIPTION
```

```
        "Information about a path to a network."
```

```
    INDEX { bgpPathAttrDestNetwork,
            bgpPathAttrPeer          }
```

```
    ::= { bgpRcvdPathAttrTable 1 }
```

```
BgpPathAttrEntry ::= SEQUENCE {
```

```
    bgpPathAttrPeer
```

```
        IpAddress,
```

```
    bgpPathAttrDestNetwork
```

```
        IpAddress,
```

```
    bgpPathAttrOrigin
```

```
        INTEGER,
```

```
    bgpPathAttrASPath
```

```
        OCTET STRING,
```

```
    bgpPathAttrNextHop
```

```
        IpAddress,
```

```
    bgpPathAttrInterASMetric
```

```
        Integer32
```

```
}
```

```
bgpPathAttrPeer OBJECT-TYPE
```

```
    SYNTAX      IpAddress
```

```
    MAX-ACCESS  read-only
```

```
    STATUS      obsolete
```

```
    DESCRIPTION
```

```
        "The IP address of the peer where the path
        information was learned."
```

```

 ::= { bgpPathAttrEntry 1 }

bgpPathAttrDestNetwork OBJECT-TYPE
    SYNTAX      IpAddress
    MAX-ACCESS  read-only
    STATUS      obsolete
    DESCRIPTION
        "The address of the destination network."
 ::= { bgpPathAttrEntry 2 }

bgpPathAttrOrigin OBJECT-TYPE
    SYNTAX      INTEGER {
                    igp(1), -- networks are interior
                    egp(2), -- networks learned via EGP
                    incomplete(3) -- undetermined
                }
    MAX-ACCESS  read-only
    STATUS      obsolete
    DESCRIPTION
        "The ultimate origin of the path information."
 ::= { bgpPathAttrEntry 3 }

bgpPathAttrASPath OBJECT-TYPE
    SYNTAX      OCTET STRING (SIZE (2..255))
    MAX-ACCESS  read-only
    STATUS      obsolete
    DESCRIPTION
        "The set of ASs that must be traversed to
        reach the network.  This object is
        probably best represented as SEQUENCE OF
        INTEGER.  For SMI compatibility, though,
        it is represented as OCTET STRING.  Each
        AS is represented as a pair of octets
        according to the following algorithm:

                first-byte-of-pair = ASNumber / 256;
                second-byte-of-pair = ASNumber & 255;"
 ::= { bgpPathAttrEntry 4 }

bgpPathAttrNextHop OBJECT-TYPE
    SYNTAX      IpAddress
    MAX-ACCESS  read-only
    STATUS      obsolete
    DESCRIPTION
        "The address of the border router that
        should be used for the destination
        network."
 ::= { bgpPathAttrEntry 5 }

```

```

bgpPathAttrInterASMetric OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      obsolete
    DESCRIPTION
        "The optional inter-AS metric.  If this
         attribute has not been provided for this
         route, the value for this object is 0."
    ::= { bgpPathAttrEntry 6 }

```

```

-- BGP-4 Received Path Attribute Table.  This table
-- contains, one entry per path to a network, path
-- attributes received from all peers running BGP-4.

```

```

bgp4PathAttrTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF Bgp4PathAttrEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The BGP-4 Received Path Attribute Table
         contains information about paths to
         destination networks received from all
         BGP4 peers."
    ::= { bgp 6 }

```

```

bgp4PathAttrEntry OBJECT-TYPE
    SYNTAX      Bgp4PathAttrEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Information about a path to a network."
    INDEX { bgp4PathAttrIpAddrPrefix,
            bgp4PathAttrIpAddrPrefixLen,
            bgp4PathAttrPeer
          }
    ::= { bgp4PathAttrTable 1 }

```

```

Bgp4PathAttrEntry ::= SEQUENCE {
    bgp4PathAttrPeer
        IpAddress,
    bgp4PathAttrIpAddrPrefixLen
        INTEGER,
    bgp4PathAttrIpAddrPrefix
        IpAddress,
    bgp4PathAttrOrigin
        INTEGER,
    bgp4PathAttrASPathSegment

```

```

        OCTET STRING,
    bgp4PathAttrNextHop
        IpAddress,
    bgp4PathAttrMultiExitDisc
        INTEGER,
    bgp4PathAttrLocalPref
        INTEGER,
    bgp4PathAttrAtomicAggregate
        INTEGER,
    bgp4PathAttrAggregatorAS
        INTEGER,
    bgp4PathAttrAggregatorAddr
        IpAddress,
    bgp4PathAttrCalcLocalPref
        INTEGER,
    bgp4PathAttrBest
        INTEGER,
    bgp4PathAttrUnknown
        OCTET STRING
}

bgp4PathAttrPeer OBJECT-TYPE
    SYNTAX      IpAddress
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The IP address of the peer where the path
        information was learned."
    ::= { bgp4PathAttrEntry 1 }

bgp4PathAttrIpAddrPrefixLen OBJECT-TYPE
    SYNTAX      INTEGER (0..32)
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Length in bits of the IP address prefix
        in the Network Layer Reachability
        Information field."
    ::= { bgp4PathAttrEntry 2 }

bgp4PathAttrIpAddrPrefix OBJECT-TYPE
    SYNTAX      IpAddress
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "An IP address prefix in the Network Layer
        Reachability Information field.  This object

```

is an IP address containing the prefix with length specified by
 bgp4PathAttrIpAddrPrefixLen.
 Any bits beyond the length specified by
 bgp4PathAttrIpAddrPrefixLen are zeroed."
 ::= { bgp4PathAttrEntry 3 }

bgp4PathAttrOrigin OBJECT-TYPE

SYNTAX INTEGER {
 igp(1),-- networks are interior
 egp(2),-- networks learned
 -- via EGP
 incomplete(3) -- undetermined
 }
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The ultimate origin of the path
 information."
 ::= { bgp4PathAttrEntry 4 }

bgp4PathAttrASPathSegment OBJECT-TYPE

SYNTAX OCTET STRING (SIZE (2..255))
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"The sequence of AS path segments. Each AS path segment is represented by a triple <type, length, value>.

The type is a 1-octet field which has two possible values:

- 1 AS_SET: unordered set of ASs a route in the UPDATE message has traversed
- 2 AS_SEQUENCE: ordered set of ASs a route in the UPDATE message has traversed.

The length is a 1-octet field containing the number of ASs in the value field.

The value field contains one or more AS numbers, each AS is represented in the octet string as a pair of octets according to the following algorithm:


```

        first-byte-of-pair = ASNumber / 256;
        second-byte-of-pair = ASNumber & 255;"
 ::= { bgp4PathAttrEntry 5 }

```

bgp4PathAttrNextHop OBJECT-TYPE

```

SYNTAX      IpAddress
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The address of the border router that
     should be used for the destination
     network."
 ::= { bgp4PathAttrEntry 6 }

```

bgp4PathAttrMultiExitDisc OBJECT-TYPE

```

SYNTAX      INTEGER (-1..2147483647)
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "This metric is used to discriminate
     between multiple exit points to an
     adjacent autonomous system. A value of -1
     indicates the absence of this attribute."
 ::= { bgp4PathAttrEntry 7 }

```

bgp4PathAttrLocalPref OBJECT-TYPE

```

SYNTAX      INTEGER (-1..2147483647)
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The originating BGP4 speaker's degree of
     preference for an advertised route. A
     value of -1 indicates the absence of this
     attribute."
 ::= { bgp4PathAttrEntry 8 }

```

bgp4PathAttrAtomicAggregate OBJECT-TYPE

```

SYNTAX      INTEGER {
                    lessSpecificRouteNotSelected(1),
                    lessSpecificRouteSelected(2)
                }
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "Whether or not the local system has
     selected a less specific route without
     selecting a more specific route."
 ::= { bgp4PathAttrEntry 9 }

```

bgp4PathAttrAggregatorAS OBJECT-TYPE

SYNTAX INTEGER (0..65535)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The AS number of the last BGP4 speaker that performed route aggregation. A value of zero (0) indicates the absence of this attribute."

::= { bgp4PathAttrEntry 10 }

bgp4PathAttrAggregatorAddr OBJECT-TYPE

SYNTAX IpAddress

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The IP address of the last BGP4 speaker that performed route aggregation. A value of 0.0.0.0 indicates the absence of this attribute."

::= { bgp4PathAttrEntry 11 }

bgp4PathAttrCalcLocalPref OBJECT-TYPE

SYNTAX INTEGER (-1..2147483647)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The degree of preference calculated by the receiving BGP4 speaker for an advertised route. A value of -1 indicates the absence of this attribute."

::= { bgp4PathAttrEntry 12 }

bgp4PathAttrBest OBJECT-TYPE

SYNTAX INTEGER {

false(1), -- not chosen as best route

true(2) -- chosen as best route

}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"An indication of whether or not this route was chosen as the best BGP4 route."

::= { bgp4PathAttrEntry 13 }

bgp4PathAttrUnknown OBJECT-TYPE

SYNTAX OCTET STRING (SIZE(0..255))

MAX-ACCESS read-only

```
STATUS      current
DESCRIPTION
    "One or more path attributes not understood
    by this BGP4 speaker.  Size zero (0)
    indicates the absence of such
    attribute(s).  Octets beyond the maximum
    size, if any, are not recorded by this
    object."
 ::= { bgp4PathAttrEntry 14 }
```

```
-- Traps.
```

```
bgpTraps          OBJECT IDENTIFIER ::= { bgp 7 }
```

```
bgpEstablished NOTIFICATION-TYPE
  OBJECTS { bgpPeerLastError,
            bgpPeerState      }
  STATUS  current
  DESCRIPTION
    "The BGP Established event is generated when
    the BGP FSM enters the ESTABLISHED state."
  ::= { bgpTraps 1 }
```

```
bgpBackwardTransition NOTIFICATION-TYPE
  OBJECTS { bgpPeerLastError,
            bgpPeerState      }
  STATUS  current
  DESCRIPTION
    "The BGPBackwardTransition Event is generated
    when the BGP FSM moves from a higher numbered
    state to a lower numbered state."
  ::= { bgpTraps 2 }
```

```
END
```

6. Acknowledgements

We would like to acknowledge the assistance of all the members of the Interconnectivity Working Group, and particularly the following individuals:

Yakov Rekhter, IBM
Rob Coltun, University of Maryland
Guy Almes, ANS
Jeff Honig, Cornell Theory Center
Marshall T. Rose, Dover Beach Consulting, Inc.
Dennis Ferguson, ANS
Mike Mathis, PSC
John Krawczyk, Wellfleet Communications Inc.
Curtis Villamizar, ANS
Dave LeRoy, Pencom Systems
Paul Traina, cisco Systems
Andrew Partan, UUNET
Robert Snyder, cisco Systems
Dimitry Haskin, Wellfleet Communications Inc.
Peder Chr Norgaard, Telebit Communications A/S
Joel Halpern, Network Systems Corporation

7. References

- [1] Rekhter, Y., and T. Li, "A Border Gateway Protocol 4 (BGP-4)", RFC 1654, T.J. Watson Research Center, IBM Corp., cisco Systems, July 1994.
- [2] Rekhter, Y., and P. Gross, Editors, "Application of the Border Gateway Protocol in the Internet", RFC 1655 T.J. Watson Research Center, IBM Corp., MCI, July 1994.

8. Security Considerations

Security issues are not discussed in this memo.

9. Authors' Addresses

Steven Willis
Wellfleet Communications Inc.
15 Crosby Drive
Bedford, MA 01730

Phone: (617) 275-2400
EMail: swillis@wellfleet.com

John Burruss
Wellfleet Communications Inc.
15 Crosby Drive
Bedford, MA 01730

Phone: (617) 275-2400
EMail: jburruss@wellfleet.com

John Chu
IBM Corp.
P.O.Box 218
Yorktown Heights, NY 10598

Phone: (914) 945-3156
EMail: jychu@watson.ibm.com

