11. System Management and GDMO Definitions

The operation of the inter-domain routeing functions in a BIS may be monitored and controlled using System Management. This clause contains management specification for IDRP, expressed in the GDMO notation defined in ISO 10165-4.

11.1 Name Binding

idrpConfig-networkEntity NAME BINDING

SUBORDINATE OBJECT CLASS idrpConfig AND SUBCLASSES;
NAMED BY SUPERIOR OBJECT CLASS ″ISO/IEC 10733 : 19xx″: networkEntity;
WITH ATTRIBUTE ″ISO/IEC xxxx″: idrpConfigId;
CREATE WITH-AUTOMATIC-INSTANCE-NAMING;
DELETE ONLY-IF-NO-CONTAINED-OBJECTS;
REGISTERED AS { IDRP.nboi idrpConfig-networkEntity(1) };

adjacentBIS-idrpConfig NAME BINDING

SUBORDINATE OBJECT CLASS adjacentBIS AND SUBCLASSES;
NAMED BY SUPERIOR OBJECT CLASS idrpConfig AND SUBCLASSES;
WITH ATTRIBUTE bisNet;
BEHAVIOUR iDRPConfig-adjacentBIS-idrpConfig-B BEHAVIOUR

DEFINED AS This name binding attribute identifies a BIS to BIS connection information block. One of these blocks of data should exist per remote BIS that this local BIS exchanges BISPDUs with.;;

REGISTERED AS { IDRP.nboi adjacentBIS-idrpConfig(2) };

11.2 Local BIS Managed Objects for IDRP

idrpConfig MANAGED OBJECT CLASS

DERIVED FROM ″Rec. X.721 | ISO/IEC 10165-2 : 1992″: top;
CHARACTERIZED BY idrpConfigPkg PACKAGE
BEHAVIOUR iDRPBasicImportedAlarmNotifications-B

BEHAVIOUR DEFINED AS Imports the communicationsAlarm notification from ISO/IEC 10165-2. It is used to report the following protocol events:

errorBISPDUsent: Generated when a BISPDU is received with an error in its format. The significance sub-parameter of each item of additionalInformation shall be set to the value False′ (i.e., not significant) so that a managing system receiving the event report will be less likely to reject it. The probableCause shall be set to NLM.communicationsProtocolError. The perceivedSeverity shall be set to ′Minor′. A subsequent communicationsAlarm with a perceivedSeverity value of ′Cleared′ shall not be generated. No other fields or parameters shall be used, with the exception of further parameters in the AdditionalInformation field, as follows:

a) RemoteBIS-NET for BIS-BIS connection--using the notificationRemoteBIS-NET parameter
b) BISPDU error code (see 6.4 and 7.20)--this reports the error code that will be sent in the ERROR PDU using the parameter ″notificationBISPDUerrorcode″.
c) BIS error subcode (see 6.4 and 7.20)--this reports the subcode that will be sent using the parameter ″notificationBISerrorsubcode″.
d) BISPDU error information (see 6.4 and 7.20)--this reports the data from the received BISPDU that will be used to diagnose the problem for the Notification. The parameter ″notificationBISpduerrorinfo″ will be used to report this information.

OpenBISpduRDCError: generated when an OPEN BISPDU is received from another BIS in the same routeing domain, and the remote BIS is not a member of identically the same confederations as the local BIS. The significance sub-parameter of each item of additionalInformation shall be set to the value ′False′ (i.e., not significant) so that a managing system receiving the event report will be less likely to reject it. The probableCause shall be set to NLM.communicationsProtocolError. The perceivedSeverity shall be set to ′Minor′. A subsequent communicationsAlarm with a perceivedSeverity value of ′Cleared′ shall not be generated. No other fields or parameters shall be used, with the exception of further parameters in the AdditionalInformation field, as follows:

a) Remote BIS NET for this BIS-BIS connection--using the ″notificationRemoteBIS-NET″ parameter.
b) Remote BIS Routeing Domain Confederation (RDC) information using the ″notificationRemoteRDCconfig″ parameter.
c) Local BIS Routeing Domain Confederation (RDC) information using the ″notificationLocalRDCconfig″ parameter.

errorBISPDUconnectionclose: generated when an ERROR PDU has been received from a remote BIS. The significance sub-parameter of each item of additionalInformation shall be set to the value ′False′ (i.e., not significant) so that a managing system receiving the event report will be less likely to reject it. The probableCause shall be set to NLM.communicationsProtocolError. The perceivedSeverity shall be set to ′Minor′. A subsequent communicationsAlarm with a perceivedSeverity value of ′Cleared′ shall not be generated. No other fields or parameters shall be used, with the exception of further parameters in the AdditionalInformation field, as follows:

a) RemoteBIS-NET for BIS-BIS connection--using the ″notificationREMOTEBIS-NET″ parameter
b) BISPDU error code (see 6.4 and 7.20)--this reports the error code that will be sent in the ERROR PDU using the parameter ″notificationBISpduerrorcode″.
c) BIS error subcode (see 6.4 and 7.20)--this reports the subcode that will be sent using the parameter ″notificationBISerrorsubcode″.
d) BISPDU error information (see 6.4 and 7.20)--this reports the data from the received BISPDU that will be used to diagnose the problem for the Notification. The parameter ″notificatioNBISPUDerrorinfo″ will be used to report this information.

CorruptAdjRIBIn: generated when the local method of checking the Adj-RIB-In has found an error. All Adj-RIBs-In are being purged. The significance sub-parameter of each item of additionalInformation shall be set to the value ′False′ (i.e., not significant) so that a managing system receiving the event report will be less likely to reject it. The probableCause shall be set to NLM.communicationsProtocolError. The perceivedSeverity shall be set to ′Minor′. A subsequent communicationsAlarm with a perceivedSeverity value of ′Cleared′ shall not be generated. No other fields or parameters shall be used, with the exception of further parameters in the AdditionalInformation field, as follows:

a) MaxRIBIntegrityCheck attribute for this BIS
b) The remote BIS associated with this Adjacent RIB in the parameter ″notificationRemoteBIS-NET″.

2 PacketBomb: generated when the local BIS received a BISPDU other than an OPEN PDU, from an
2 unknown BIS. The Source-BIS-NET is reported in the AdditionalInformation field using the
2 ″notificationSourceBIS-NET parameter. The significance sub-parameter of each item of
2 additionalInformation shall be set to the value ′False′ (i.e., not significant) so that a managing system
2 receiving the event report will be less likely to reject it. The probableCause shall be set to
2 NLM.communicationsProtocolError. The perceivedSeverity shall be set to ′Minor′. A subsequent
2 communicationsAlarm with a perceivedSeverity value of ′Cleared′ shall not be generated. No other
2 fields or parameters shall be used, with the exception of further parameters in the
2 AdditionalInformation field, as follows. These parameters are created from the OPEN PDU values:

a) notificationSourceBISNET--NET of remote BIS sending packet bomb
b) notificationSourceBISrdi--RDI of remote BIS sending packet bomb
c) notificationSourceBISrdc--RDC information for remote BIS sending packet bomb

2 connectRequestBISUnknown: generated when the local BIS has received an OPEN BISPDU from an
2 unknown BIS. The significance sub-parameter of each item of additionalInformation shall be set to
2 the value ′False′ (i.e., not significant) so that a managing system receiving the event report will be
2 less likely to reject it. The probableCause shall be set to NLM.communicationsProtocolError. The
2 perceivedSeverity shall be set to ′Minor′. A subsequent communicationsAlarm with a
2 perceivedSeverity value of ′Cleared′ shall not be generated. No other fields or parameters shall be
2 used, with the exception of further parameters in the AdditionalInformation field, as follows. These
2 parameters are created from the OPEN PDU values:

2 a) notificationSourceBISNET--NET of remote BIS sending packet bomb
2 b) notificationSourceBISrdi--RDI of remote BIS sending packet bomb
2 c) notificationSourceBISrdc--RDC information for remote BIS sending packet bomb

EnterFSMStateMachine: generated when the IDRP FSM state machine used to communicate with another BIS is started. The RemoteBis-NET is reported in the additionalInformation field using the ″notificationRemoteBIS-NET″ parameter. The significance sub-parameter of each item of additionalInformation shall be set to the value ′False′ (i.e., not significant) so that a managing system receiving the event report will be less likely to reject it. The probableCause shall be set to NLM.communicationsProtocolError. The perceivedSeverity shall be set to ′Minor′. A subsequent communicationsAlarm with a perceivedSeverity value of ′Cleared′ shall not be generated. No other fields or parameters shall be used, with the exception of further parameters in the AdditionalInformation field, as follows:

iDRPBasicImportedInfoNotifications-B
BEHAVIOUR DEFINED AS Imports the communicationsInformation notification from ISO/IES 10165-2. It is used to report the following protocol events:

EnterFSMState: generated when a BIS starts the IDRP FSM state machine to establish a connection with a remote BIS. The RemoteBis-NET is reported in the AdditionalInformation field using the ″notificationRemoteBIS-NET″ parameter. The significant subparameter of each item of AdditionalInformation shall be set to ″false″ (that is, not significant) so that a managing system receiving the event report will be less likely to reject it.

FSMStateChange: generated when the IDRP FSM used to communicate with another BIS transitions from one state to another. The RemoteBis-NET is reported in the AdditionalInformation field using the ″notificationRemoteBIS-NET″ parameter. The significant sub-parameter of each item ofAdditionalInformation shall be set to ″false″ (that is, not significant) so that a managing system receiving the event report will be less likely to reject it.;;

ATTRIBUTES
authenticationTypeCode GET,
capacity GET,
closeWaitDelayTimer GET
externalBISNeighbor GET-REPLACE,
holdTime GET,
internalBIS GET-REPLACE,
internalSystems GET-REPLACE,
intraIS GET-REPLACE,
keepAliveTimer GET
localRDI GET-REPLACE,
localSNPA GET-REPLACE,
locExpense GET,
maxCPUOverloadTimer GET
maximumPDUSize GET,
maxRIBIntegrityCheck GET;
maxRIBIntegrityTimer GET
minRDOriginationTimer GET
minRouteAdvertisementTimer GET
multiExit GET-REPLACE,
priority GET,
rdcConfig GET-REPLACE,
rdLRE GET,
rdTransitDelay GET,
retransmissionTime GET,
ribAttsSet GET,
routeServer GET-REPLACE,
version GET,
ACTIONS
″GMI″:activate
″GMI″:deactivate
NOTIFICATIONS ″REC X.721 | ISO/IEC 10165-2:1992″: communicationsAlarm
notificationBISerrorssubcode
notificationBISpduerrorcode
notificationBISpduerrorinfo
notificationLocalRDCconfig

```
        notificationMaxAdjRibIntegritycheck
        notificationRemoteBIS-NET
        notificationRemoteRDCconfig
        notificationSourceBISNET
        notificationSourceBISrdc
        notificationSourceBISrdi,
    ″REC X.723 | ISO/IEC 10165-5: 1992″: communicationsInformation notificationRemoteBIS-NET;;;
    REGISTERED AS {IDRP.moi iDRPConfig (1)};
```

11.3 Adjacent BIS Peer Managed Objects

```
adjacentBIS MANAGED OBJECT CLASS

    DERIVED FROM ″Rec. X.721 | ISO/IEC 10165-2 : 1992″: top;

    CHARACTERIZED BY adjacentBISPkg PACKAGE

    ATTRIBUTES

        bisNegotiatedVersion GET,
        bisNet GET,
        bisPeerSNPAs GET,
        bisRDC GET,
         DEFAULT VALUE NULL,
        bisRDI GET,
         DEFAULT VALUE NULL,
        keepAlivesSinceLastUpdate GET;
        lastAckRecv GET
         INITIAL VALUE 0,
        lastAckSent GET
         INITIAL VALUE 0,
        lastSeqNoRecv GET
         INITIAL VALUE 0,
        lastSeqNoSent GET,
         INITIAL VALUE 0
        outstandingPDUs
        state GET,
        totalBISPDUsIn GET,
        totalBISPDUsOut GET,
        updatesIn GET,
        updatesOut GET,

    ATTRIBUTE GROUPS

        ″GMI″:counters
            updatesIn
            updatesOut
            totalBISPDUsIn
            totalBISPDUsOut
            keepAlivesSinceLastUpdate,
        ″DMI″:state
            state

    ACTIONS

        ″GMI″:activate
        ″GMI″:deactivate

    REGISTERED AS { IDRP.moi adjacentBIS(2) };
```

11.4 Attribute Definitions

```
authenticationTypeCode ATTRIBUTE
    WITH ATTRIBUTE SYNTAX IDRP.AuthenticationCode;
    MATCHES FOR EQUALITY, ORDERING;
    BEHAVIOUR authenticationCode-B
        BEHAVIOUR DEFINED AS Indication of which authentication mechanism will be used;;
    REGISTERED AS { IDRP.atoi authenticationCode(1) };

bisNegotiatedVersion ATTRIBUTE
    WITH ATTRIBUTE SYNTAX IDRP.BisNegotiatedVersion;
    MATCHES FOR EQUALITY, ORDERING;
    BEHAVIOUR bisNegotiatedVersion-B
        BEHAVIOUR DEFINED AS The negotiated version of IDRP protocol  this BIS to BIS connection is using.;;
    REGISTERED AS { IDRP.atoi bisNegotiatedVersion(2) };

bisNet ATTRIBUTE
    WITH ATTRIBUTE SYNTAX IDRP.BisNet;
    MATCHES FOR EQUALITY;
    BEHAVIOUR bisNet-B
        BEHAVIOUR DEFINED AS The NET of the remote BIS of this BIS to BIS connection.;;
    REGISTERED AS { IDRP.atoi bisNet(3) };

bisPeerSNPAs ATTRIBUTE
    WITH ATTRIBUTE SYNTAX IDRP.BisPeersSNPAs;
    MATCHES FOR EQUALITY;
    BEHAVIOUR bisPeerSNPAs-B
        BEHAVIOUR DEFINED AS The SNPAs announced by the remote BIS of this BIS to BIS connection.;;
    REGISTERED AS { IDRP.atoi bisPeerSNPAs(4) };

bisRDC ATTRIBUTE
    WITH ATTRIBUTE SYNTAX IDRP.Rdcgroup;
    MATCHES FOR EQUALITY;
    BEHAVIOUR bisRDC-B
        BEHAVIOUR  DEFINED AS "The RDC the remote BIS belongs to in this BIS to BIS connection.";;
    REGISTERED AS { IDRP.atoi bisRDC(5) };

bisRDI ATTRIBUTE
    WITH ATTRIBUTE SYNTAX IDRP.Rdi;
    MATCHES FOR EQUALITY;
    BEHAVIOUR bisRDI-B
        BEHAVIOUR DEFINED AS The RDI of the remote BIS of this BIS to BIS connection.;;
    REGISTERED AS { IDRP.atoi bisRDI(6) };

capacity ATTRIBUTE
    WITH ATTRIBUTE SYNTAX IDRP.Capacity;
    MATCHES FOR EQUALITY, ORDERING;
    BEHAVIOUR capacity-B
        BEHAVIOUR DEFINED AS The traffic carrying capacity of this Routeing Domain.;;
    REGISTERED AS { IDRP.atoi capacity(7) };

closeWaitDelayTimer ATTRIBUTE
    DERIVED FROM "GMI":timer;
    BEHAVIOUR closeWaitDelayTimer-B
        BEHAVIOUR DEFINED AS The timer that measures in seconds the time that has elapsed since the BIS
        FSM entered the CLOSE-WAIT state.  Upon timer expiration, the BIS FSM will enter the CLOSED state;;
```

```
    REGISTERED AS { IDRP.atoi closeWaitDelayTimer(8) };

externalBISNeighbor ATTRIBUTE

    WITH ATTRIBUTE SYNTAX IDRP.BISGroup;
    MATCHES FOR EQUALITY;
    BEHAVIOUR externalBISNeighbor-B
        BEHAVIOUR DEFINED AS The set of NETs which identify the BISs in adjacent routeing domain that are
        reachable via a single subnetwork hop.;;
    REGISTERED AS { IDRP.atoi externalBISNeighbor(9) };

holdTime ATTRIBUTE

    WITH ATTRIBUTE SYNTAX IDRP.Holdtime;
    MATCHES FOR EQUALITY, ORDERING;
    BEHAVIOUR holdTime-B

        BEHAVIOUR DEFINED AS The maximum number of seconds that may elapse between the receipt of two
        successive BISPDUs of any of the following types:  KEEPALIVE, UPDATE, RIB CHECKSUM PDUs or RIB
        REFRESH PDUs;;

    REGISTERED AS { IDRP.atoi holdTime(10) };

internalBIS ATTRIBUTE

    WITH ATTRIBUTE SYNTAX IDRP.BISGroup;
    MATCHES FOR EQUALITY;
    BEHAVIOUR internalBIS-B
        BEHAVIOUR DEFINED AS The set of NETs which identify the BISs in this routeing domain;;
    REGISTERED AS { IDRP.atoi internalBIS(11) };

internalSystems ATTRIBUTE

    WITH ATTRIBUTE SYNTAX IDRP.SystemIdGroup;
    MATCHES FOR EQUALITY;
    BEHAVIOUR internalSystems-B
        BEHAVIOUR DEFINED AS The set of NET and NSAP prefixes that identify the systems in this routeing
        domain for which the BIS constructs this routeing domain from which the BIS constructs network layer
        reachability information;;
    REGISTERED AS { IDRP.atoi internalSystems(12) };

intraIS ATTRIBUTE

    WITH ATTRIBUTE SYNTAX IDRP.BISGroup;
    MATCHES FOR EQUALITY;
    BEHAVIOUR intraIS-B
        BEHAVIOUR DEFINED AS The set of NETs of the ISs to which the local BIS may deliver an inbound NPDU
        whose destination lies within the BIS′s routeing domain.  These ISs must be located on the same
        common subnetwork as this local BIS, and must be capable of delivering NPDUs to destinations that are
        located within the local BIS′s routeing domain.;;
    REGISTERED AS { IDRP.atoi intraIS(13) };

keepAlivesSinceLastUpdate ATTRIBUTE

    DERIVED FROM ″GMI″:nonWrapping64BItCounter;
    BEHAVIOUR keepAlivesSinceLastUpdate-B
        BEHAVIOUR DEFINED AS The number of KEEPALIVE BISPDUS received by this BIS from the remote BIS
        since this last UPDATE BISPDU.;;
    REGISTERED AS { IDRP.atoi keepAlivesSinceLastUpdate(14) };

keepAliveTimer ATTRIBUTE

    DERIVED FROM ″GMI″:timer;
    BEHAVIOUR keepAliveTimer-B
```

BEHAVIOUR DEFINED AS The timer that measures in seconds the time that has elapsed since the previous KEEPALIVE PDU was received by the local BIS. Upon its expiration, the BIS will send a BISPDU to its peer BIS;;
REGISTERED AS { IDRP.atoi keepAliveTimer(15) };

```
lastAckRecv ATTRIBUTE

    WITH ATTRIBUTE SYNTAX INTEGER;
    MATCHES FOR EQUALITY, ORDERING;
    BEHAVIOUR lastAckRecv-B
        BEHAVIOUR DEFINED AS The number of the last ack received from the remote BIS by this local BIS on
        this BIS to BIS connection.;;
    REGISTERED AS { IDRP.atoi lastAckRecv(16) };

lastAckSent ATTRIBUTE

    WITH ATTRIBUTE SYNTAX INTEGER;
    MATCHES FOR EQUALITY, ORDERING;
    BEHAVIOUR lastAckSent-B
        BEHAVIOUR DEFINED AS The number of the last ack sent to the remote BIS from this local BIS on this
        BIS to BIS connection.;;
    REGISTERED AS { IDRP.atoi lastAckSent(17) };

lastSeqNoRecv ATTRIBUTE

    WITH ATTRIBUTE SYNTAX INTEGER;
    MATCHES FOR EQUALITY, ORDERING;
    BEHAVIOUR lastSeqNoRecv-B
        BEHAVIOUR DEFINED AS The last sequence number received from the remote BIS by this local BIS on
        this BIS to BIS connection.;;
    REGISTERED AS { IDRP.atoi lastSeqNoRecv(18) };

lastSeqNoSent ATTRIBUTE

    WITH ATTRIBUTE SYNTAX INTEGER;
    MATCHES FOR EQUALITY, ORDERING;
    BEHAVIOUR lastSeqNoSent-B
        BEHAVIOUR DEFINED AS The last sequence number sent to the remote BIS from this local BIS on this
        BIS to BIS connection.;;
    REGISTERED AS { IDRP.atoi lastSeqNoSent(19) };

localRDI ATTRIBUTE

    WITH ATTRIBUTE SYNTAX IDRP.Rdi;
    MATCHES FOR EQUALITY;
    BEHAVIOUR localRDI-B
        BEHAVIOUR DEFINED AS The Routing Domain Identifier for the routeing domain where this BIS is
        located;;
    REGISTERED AS { IDRP.atoi localRDI(20) };

localSNPA ATTRIBUTE

    WITH ATTRIBUTE SYNTAX IDRP.LocalSNPAs;
    MATCHES FOR EQUALITY;
    BEHAVIOUR localSNPA-B
        BEHAVIOUR DEFINED AS The list of SNPAs of this BIS;;
    REGISTERED AS { IDRP.atoi localSNPA(21) };

locExpense ATTRIBUTE

    WITH ATTRIBUTE SYNTAX IDRP.LocExpense;
    MATCHES FOR EQUALITY, ORDERING;
    BEHAVIOUR locExpense-B
```

```
        BEHAVIOUR DEFINED AS The monetary expense of transiting this Routeing Domain.  The attribute con-
        tains an indication of cost and the units in which it is calculated;;
    REGISTERED AS { IDRP.atoi locExpense(22) };

maxCPUOverloadTimer ATTRIBUTE

    DERIVED FROM ″GMI″:timer;
    BEHAVIOUR maxCPUOverloadTimer-B
        BEHAVIOUR DEFINED AS The timer that measures in seconds the time that has elapsed since the local
        BIS has detected that its CPU has become overloaded.  See Annex H;;
    REGISTERED AS { IDRP.atoi maxCPUOverloadTimer(23) };

maximumPDUSize ATTRIBUTE

    WITH ATTRIBUTE SYNTAX IDRP.MaximumPDUSize;
    MATCHES FOR EQUALITY, ORDERING;
    BEHAVIOUR maximumPDUsize-B

        BEHAVIOUR DEFINED AS The maximum number of octets that this BIS is able to handle in an incoming
        BISPDU;;

    REGISTERED AS { IDRP.atoi maximumPDUsize(24) };

maxRIBIntegrityCheck ATTRIBUTE

    WITH ATTRIBUTE SYNTAX IDRP.MaxRIBIntegrityCheck;
    MATCHES FOR EQUALITY, ORDERING;
    BEHAVIOUR maxRIBIntegrityCheck-B
        BEHAVIOUR DEFINED AS The maximum time in seconds between checking of the Adj-RIBs-In by a local
        mechanism.  If corrupt Adj-RIB-In is detected, the BIS shall purge the offending Adj-RIB-In;;
    REGISTERED AS { IDRP.atoi maxRIBIntegrityCheck(25) };

maxRIBIntegrityTimer ATTRIBUTE

    DERIVED FROM ″GMI″:timer;
    BEHAVIOUR maxRIBIntegrityTimer-B
        BEHAVIOUR DEFINED AS The timer that measures in seconds the time remaining until the Adj-RIBs-In
        must be checked by a local mechanism.  If a corrupt Adj-RIB-In is detected, the BIS shall purge the
        offending Adj-RIB-In;;
    REGISTERED AS { IDRP.atoi maxRIBIntegrityTimer(26) };

minRDOriginationTimer ATTRIBUTE

    DERIVVED FROM ″GMI″:timer;
    BEHAVIOUR minRDOriginationTimer-B
        BEHAVIOUR DEFINED AS The timer that measures in seconds the time that has elapsed since the adver-
        tisement by the local BIS of an UPDATE PDU that reported changes within the local BIS′s routeing
        domain.  See clause 7.16.3.2;;
    REGISTERED AS { IDRP.atoi minRDOriginationTimer(27) };

minRouteAdvertisementTimer ATTRIBUTE

    DERIVED FROM ″GMI″:timer;
    BEHAVIOUR minRouteSelectionTimer-B
        BEHAVIOUR DEFINED AS The timer that measures in seconds the time that has elapsed since the adver-
        tisement by the local BIS of a better route that was received from a BIS located in another routeing
        domain.  See clause 7.16.3.2.  The minimum value is 5 seconds, and the maximum value is 1800
        seconds;;
    REGISTERED AS { IDRP.atoi minRouteSelectionTimer(28) };

multiExit ATTRIBUTE

    WITH ATTRIBUTE SYNTAX IDRP.Boolean;
    MATCHES FOR EQUALITY;
    BEHAVIOUR multiExit-B
```

```
        BEHAVIOUR DEFINED AS The indication whether this BIS will use the MULTI_EXIT_DISC attribute to
        decide between otherwise identical routes.  The multiExit parameter is used as the default value for the
        "multi_exit_disc" function in policy decisions.;;
    REGISTERED AS { IDRP.atoi multiExit(29) };

outstandingPDUs ATTRIBUTE
    WITH ATTRIBUTE SYNTAX IDRP.OutstandingPdus;
    MATCHES FOR EQUALITY, ORDERING;
    BEHAVIOUR outstandingPDUs-B
        BEHAVIOUR DEFINED AS The maximum number of BISPDUs that may be sent to this BIS without
        receiving an acknowledgement;;
    REGISTERED AS { IDRP.atoi outstandingPDUs(30) };

priority ATTRIBUTE
    WITH ATTRIBUTE SYNTAX IDRP.Priority;
    MATCHES FOR EQUALITY, ORDERING;
    BEHAVIOUR priority-B
        BEHAVIOUR DEFINED AS The lowest value of ISO 8473 priority parameter that this RD will provide for-
        warding services for;;
    REGISTERED AS { IDRP.atoi priority(31) };

rdcConfig ATTRIBUTE
    WITH ATTRIBUTE SYNTAX IDRP.Rdcgroup;
    MATCHES FOR EQUALITY;
    BEHAVIOUR rdcConfig-B
        BEHAVIOUR DEFINED AS All of the Routing Confederations to which the RD of this BIS belongs and the
        nesting relationships that are in force between them.  The nesting relationships are described as a
        sequence of sets of RDC Identifiers;;
    REGISTERED AS { IDRP.atoi rdcConfig(32) };

rdLRE ATTRIBUTE
    WITH ATTRIBUTE SYNTAX IDRP.Rdlre;
    MATCHES FOR EQUALITY, ORDERING;
    BEHAVIOUR rdLRE-B
        BEHAVIOUR DEFINED AS A quantity that is proportional to the average error rate of a Routeing Domain
        and is expressed as an an integer in the range from 0 to 2^32 – 1.  The actual error rate is equal to the
        integer value divided by 2^32 – 1.;;
    REGISTERED AS { IDRP.atoi rdLRE(33) };

rdTransitDelay ATTRIBUTE
    WITH ATTRIBUTE SYNTAX IDRP.RDTransitDelay;
    MATCHES FOR EQUALITY, ORDERING;
    BEHAVIOUR rdTransitDelay-B
        BEHAVIOUR DEFINED AS The estimated average delay across a Routeing Domain in units of 2 ms.;;
    REGISTERED AS { IDRP.atoi rdTransitDelay(35) };

retransmissionTime ATTRIBUTE
    WITH ATTRIBUTE SYNTAX IDRP.RetransmissionTime;
    MATCHES FOR EQUALITY, ORDERING;
    BEHAVIOUR retransmissionTime-B
        BEHAVIOUR DEFINED AS The Number of seconds of between KEEPALIVE messages if no other traffic is
        sent;;
    REGISTERED AS { IDRP.atoi retransmissionTime(36) };

ribAttsSet ATTRIBUTE
    WITH ATTRIBUTE SYNTAX IDRP.RibAttsSet;
    MATCHES FOR EQUALITY;
```

```
    BEHAVIOUR ribAttsSet-B
        BEHAVIOUR DEFINED AS The set of Rib Attributes supported by this BIS.;;
    REGISTERED AS { IDRP.atoi ribAttsSet(37) };

routeServer ATTRIBUTE

    WITH ATTRIBUTE SYNTAX IDRP.Boolean;
    MATCHES FOR EQUALITY;
    BEHAVIOUR routeServer-B
        BEHAVIOUR DEFINED AS The indication whether this BIS may set the ″IDRP_Server_Allowed″ field in the
        NEXT_HOP attribute to X″FF″ for BIS to BIS UPDATE BISPDUs.  If this variable is true then in accordance
        with local policy, the IDRP_Server_Allowed field may be set on some UPDATE BISPDUs that this BIS
        sends.  If this attribute is set to false, then no UPDATE BISPDUs will be sent by this BIS with NEXT_HOP
        attributes containing an ″IDRP_Server flag″ equal to X″FF″.;;
    REGISTERED AS { IDRP.atoi routeServer(38) };

state ATTRIBUTE

    WITH ATTRIBUTE SYNTAX IDRP.State;
    MATCHES FOR EQUALITY, ORDERING;
    BEHAVIOUR state-B
        BEHAVIOUR DEFINED AS The current state of BIS to BIS communication in the local BIS.;;
    REGISTERED AS { IDRP.atoi state(39) };

totalBISPDUsIn ATTRIBUTE

    DERIVED FROM ″GMI″:nonWrapping64BItCounter;
    BEHAVIOUR totalBISPDUsIn-B
        BEHAVIOUR DEFINED AS The number of BISPDUS received by this BIS from the remote BIS on this BIS
        to BIS connection.;;
    REGISTERED AS { IDRP.atoi totalBISPDUsIn(40) };

totalBISPDUsOut ATTRIBUTE

    DERIVED FROM ″GMI″:nonWrapping64BItCounter;
    BEHAVIOUR totalBISPDUsOut-B
        BEHAVIOUR DEFINED AS The number of BISPDUS received by this BIS from the remote BIS on this BIS
        to BIS connection.;;
    REGISTERED AS { IDRP.atoi totalBISPDUsOut(41) };

updatesIn ATTRIBUTE

    DERIVED FROM ″GMI″:nonWrapping64BitCounter;
    MATCHES FOR EQUALITY, ORDERING;
    BEHAVIOUR updatesIn-B
        BEHAVIOUR DEFINED AS The number of UPDATE BISPDUs received by this BIS on this BIS to BIS con-
        nection.;;
    REGISTERED AS { IDRP.atoi updatesIn(42) };

updatesOut ATTRIBUTE

    DERIVED FROM ″GMI″:nonWrapping64BItCounter;
    BEHAVIOUR updatesOut-B
        BEHAVIOUR DEFINED AS The number of UPDATE BISPDUs sent by this BIS on this BIS to BIS con-
        nection.;;
    REGISTERED AS { IDRP.atoi updatesOut(43) };

version ATTRIBUTE

    WITH ATTRIBUTE SYNTAX IDRP.Version;
    MATCHES FOR EQUALITY, ORDERING;
    BEHAVIOUR version-B
        BEHAVIOUR DEFINED AS The version of IDRP protocol this machine defaults to using.;;
    REGISTERED AS { IDRP.atoi version(38) };
```

11.5 Action Definitions

startEvent ACTION

```
    BEHAVIOUR startEvent-B
        BEHAVIOUR DEFINED AS The request to start communication with a remote BIS peer;;
    MODE CONFIRMED;
    WITH INFORMATION SYNTAX IDRP.ActionInfo;
    WITH REPLY SYNTAX IDRP.StartEventreply;
    PARAMETERS remoteBISNetEventInfo;;
    REGISTERED AS { IDRP.acoi startEvent(1) };
```

stopEvent ACTION

```
    BEHAVIOUR stopEvent-B
        BEHAVIOUR DEFINED AS The request to stop communication with a remote BIS peer;;
    MODE CONFIRMED;
    WITH INFORMATION SYNTAX IDRP.ActionInfo;
    WITH REPLY SYNTAX IDRP.StopEventreply;
    PARAMETERS remoteBISNetEventInfo;;
    REGISTERED AS { IDRP.acoi stopEvent(2) };
```

11.6 Parameter Definitions

remoteBISNetActionReply PARAMETER

```
    CONTEXT ACTION-REPLY;
    WITH SYNTAX IDRP.RemoteBISNetActionReply;
    BEHAVIOUR remoteBISNetActionReply-B
        BEHAVIOUR DEFINED AS The NET of the Remote BIS that this local BIS is starting IDRP protocol commu-
        nication with.;;
    REGISTERED AS { IDRP.poi remoteBISNetActionReply(1) };
```

remoteBISNetEventInfo PARAMETER

```
    CONTEXT EVENT-INFO;
    WITH SYNTAX IDRP.RemoteBISNetActionReply;
    BEHAVIOUR remoteBISNetEventInfo-B
        BEHAVIOUR DEFINED AS The NET of the Remote BIS that this local BIS is starting IDRP protocol commu-
        nication with.;;
    REGISTERED AS { IDRP.poi remoteBISNetEventInfo(2) };
```

stateEventInfo PARAMETER

```
    CONTEXT EVENT-INFO;
    WITH SYNTAX  IDRP.State;
    BEHAVIOUR stateEventInfo-B
        BEHAVIOUR DEFINED AS The state of the local BIS Finite state machine.;;
    REGISTERED AS { IDRP.poi stateEventInfo(3) };
```

bisPDUErrorCode PARAMETER

```
    CONTEXT EVENT-INFO;
    WITH SYNTAX  IDRP.BispduErrorCode;
    BEHAVIOUR bisPDUErrorCode-B
        BEHAVIOUR DEFINED AS The error code indicating what type of error occurred in the BIS PDU.;;
    REGISTERED AS { IDRP.poi bisPDUErrorCode(4) };
```

bisPDUErrorSubCode PARAMETER

```
    CONTEXT EVENT-INFO;
    WITH SYNTAX  IDRP.BispduErrorSubcode;
    BEHAVIOUR bisPDUErrorSubCode-B
```

```
        BEHAVIOUR DEFINED AS The error code indicating what type of error within the major error type
        occurred in the BIS PDU.;;
    REGISTERED AS { IDRP.poi bisPDUErrorSubCode(5) };

bisPDUErrorInfo PARAMETER
    CONTEXT EVENT-INFO;
    WITH SYNTAX  IDRP.BispduErrorInfo;
    BEHAVIOUR bisPDUErrorInfo-B
        BEHAVIOUR DEFINED AS The additional information from original PDU that indicated an error in the BIS
        PDU.;;
    REGISTERED AS { IDRP.poi bisPDUErrorInfo(6) };

remoteRDCConfig PARAMETER
    CONTEXT EVENT-INFO;
    WITH SYNTAX  IDRP.RemoteRDCConfig;
    BEHAVIOUR remoteRDCConfig-B
        BEHAVIOUR DEFINED AS The Routing Domain Confederation (RDC) information from the remote BIS on
        this BIS to BIS communication.;;
    REGISTERED AS { IDRP.poi remoteRDCConfig(7) };

localRDCConfig PARAMETER
    CONTEXT EVENT-INFO;
    WITH SYNTAX  IDRP.LocalRDCConfig;
    BEHAVIOUR localRDCConfig-B
        BEHAVIOUR DEFINED AS The Routing Domain Confederation (RDC) information from this local BIS on
        this BIS to BIS communcation.;;
    REGISTERED AS { IDRP.poi localRDCConfig(8) };

maxAdjRIBIntegrityCheck PARAMETER
    CONTEXT EVENT-INFO;
    WITH SYNTAX  IDRP.MaxRIBIntegrityCheck;
    BEHAVIOUR maxAdjRIBIntegrityCheck-B
        BEHAVIOUR DEFINED AS The maximum number of integrity checks detected before reporting the event
        to systems management;;
    REGISTERED AS { IDRP.poi maxAdjRIBIntegrityCheck(9) };
```

11.7 ASN.1 Modules

```
  IDRP{joint-iso-ccitt network-layer(13) management(0) iDRP(3)
     asn1Module(2) 0}
  DEFINITIONS::=BEGIN
   -- object identifier definitions
  idrpoi OBJECT IDENTIFIER ::= {NLM.nl iDRP(3)}
  sseoi OBJECT IDENTIFIER ::={idrpoi standSpecificExtensions(0)}
  moi OBJECT IDENTIFIER ::= {idrpoi objectClass (3)}
  poi OBJECT IDENTIFIER ::= {idrpoi package (4)}
  proi OBJECT IDENTIFIER ::={idrpoi parameter(5)}
  nboi OBJECT IDENTIFIER ::={idrpoi nameBinding (6)}
  atoi OBJECT IDENTIFIER ::={idrpoi attribute (7)}
  agoi OBJECT IDENTIFIER ::={idrpoi attributeGroup (8)}
  acoi OBJECT IDENTIFIER ::={idrpoi action (9)}
  noi OBJECT IDENTIFIER ::={idrpoi notification (10)}

  --
  --object identifiers for notification parameters
  --

  se OBJECT IDENTIFIER ::= {sseoi specificProblems(3)}
```

```
errorBISPDUsent OBJECT IDENTIFIER ::= {se errorBISPDU0(0)}
openBISpduRDCerror OBJECT IDENTIFIER ::= {se errorBISPDU1(1)}
errorBISPDUconnectionclose OBJECT IDENTIFIER ::= {se
    errorBISPDU2(2)}
corruptAdjRIBIn OBJECT IDENTIFIER ::= {se errorBISPDU3(3)}
packetBomb OBJECT IDENTIFIER ::= {se errorBISPDU4(4)}
enterFSMstate OBJECT IDENTIFIER ::= {se errorBISPDU5(5)}
fSMStateChange OBJECT IDENTIFIER ::= {se errorBISPDU6(6)}

--
--ASN1 Types and Values
--

ActionInfo ::=SET OF Parameter
ActionReply ::= SEQUENCE {
  responseCode OBJECT IDENTIFIER,
  responseArgs SET OF Parameter OPTIONAL}
AuthenticationCode ::=ENUMERATED{
  integrityOnly(0),
  integrityPlusAuthentication(1)}
Authtype ::=AuthenticationCode
BISGroup ::= SET OF NetworkEntityTitle
BisNet ::= NetworkEntityTitle
BisNegotiatedVersion ::=Version
BispduErrorCode::= ENUMERATED {
  oPENPDUerror (1),
  uPDATEPDUError (2),
  holdtimerExpired (3)}
BispduErrorSubcode ::= CHOICE {
  operr [ ] IMPLICIT Openerrorsubcode,
  uperr [1] IMPLICIT Updateerrorsubcode}

BispduErrorInfo ::=OCTET STRING(SIZE(1..50))
 --50 bytes of original message are saved
BisPeersSNPAs ::= SNPAaddresses
Boolean ::= BOOLEAN
Capacity ::=INTEGER(1..255)
CloseWaitDelayPeriod ::=INTEGER(150)
Destinationspecificqos ::=Ribattsec
Destinationspecificsecurity ::=Ribattsec
EndSystemNSAP ::= OCTET STRING(SIZE(1..20))
1 ESPrefix ::= NSAPprefix
Expensevalue ::=Locexpense
GLOBAL ::= ENUMERATED ( delay(0), expense(1), capacity(3), error(4) }
Holdtime ::=INTEGER(1..65535)
KeepaliveSincelastupdupdate ::=INTEGER(1..4294967295)
Keepalivetimer ::= Timer
Lastseqnosent ::=INTEGER(1..4294967295)
Lastseqnorecv ::=INTEGER(1..4294967295)
Lastacksent ::=INTEGER(1..4294967295)
Lastackrecv ::=INTEGER(1..4294967295)
LocExpense ::= INTEGER(1..65535)
LocalRDCConfig ::=Rdcgroup
LocalSNPAs ::= SNPAaddresses
MaximumPDUSize ::=INTEGER(1..65535)
MaxRIBIntegrityCheck ::=INTEGER(1..65535)
Metriclength ::=INTEGER(1..255)
Metricvalue ::=OCTET STRING(SIZE(1..255))
NSAPprefixLength ::=INTEGER(1..160)
```

```
NSAPprefix ::= BIT STRING(SIZE(1..160))
NetworkEntityTitle ::=OCTET STRING(SIZE(1..20))
1 NETPrefix ::= NSAPprefix
  --0..(2 exp 64)-1
NotificationInfo ::=SET OF Parameter
Openerrorsubcode ::=ENUMERATED {
  unsupportedVersionnumber (1),
  badMaxPDUsize (2),
  badOutstandingPDUs (3),
  badPeerRD (4),
  unsupportedAuthenticationcode (5),
  authenticationFailure (6),
  badRIB-AttrsSet (7),
  rDCmismatch (8)}
OutstandingPdus ::=INTEGER(0..255)
Priority ::= INTEGER(0..14)
QOS ::= CHOICE { global[0] EXPLICIT GLOBAL,
           ssQOS[1] EXPLICIT QOSTV,
           dsQOS[2] EXPLICIT QOSTV }
QOSlength ::= INTEGER(1..255)
QOSTV ::= SEQUENCE { preflgth NSAPorefixLength,
             prefix NSAPpreifx,
             qOSlgth QOSlength,
             qOSval QOSvalue }
QOSvalue ::= OCTET STRING(SIZE(1..255))
Rdi ::=OCTET STRING(SIZE(1..20))
  --assigned from the NSAP address space
Rdcgroup::=SEQUENCE{confed Rdcsetid, members SET OF Rdi}
Rdcsetid ::=INTEGER(1..255)
RDTransitDelay ::=INTEGER(0..65535)
Rdlre ::=INTEGER(0..4294967295)
RetransmissionTime ::= INTEGER(0..65535)
RemoteBIS-NET ::=NetworkEntityTitle
RemoteRDCConfig ::=Rdcgroup
RemoteBISNetActionReply ::=SEQUENCE{
   responseCode OBJECT IDENTIFIER,
   responseArgs SET OF Parameter OPTIONAL}
RibAttsSet ::= SEQUENCE  { confed Ribsetid,
   count Ribsetcount,
   attribs SET OF Ribattributes}
Ribsetid ::=INTEGER(1..255)
Ribsetcount ::=INTEGER(0..255)
Ribattributes ::= SEQUENCE {
            priority [0] EXPLICIT Priority OPTIONAL,
            security [1] EXPLICIT SEC OPTIONAL,
            qosmaint [2] EXPLICIT QOS OPTIONAL }
Ribattribute ::= ENUMERATED {
  tRANSITDELAY (9),
  rESIDUALERROR (10),
  eXPENSE (11),
  sourceSpecificQOS (12),
  destinationSpecificQOS (13),
  sourceSpecificSecurity (17),
  destinationSpecificSecurity(18),
  capacity (19),
  priority (20)}

Ribvalue ::= SEQUENCE {length Ribattlength,
    attr Ribattributes}
Ribattlength ::= INTEGER
```

```
Ribattvalue ::= CHOICE {
   transitdelayvalue [0] IMPLICIT INTEGER,
   residualerrorvalue [1] IMPLICIT INTEGER,
   expensevalue [2] IMPLICIT INTEGER,
   sourcespecificqos [3]IMPLICIT INTEGER,
   destinationspecificqos [4] IMPLICIT INTEGER,
   sourcespecificsecurity [5] IMPLICIT INTEGER,
   destinationspecificsecurity [6] IMPLICIT INTEGER,
   capacityvalue [7] IMPLICIT INTEGER,
   priorityvalue [8] IMPLICIT INTEGER}
Ribattqos ::= SEQUENCE {
   preflgth NSAPprefixLength,
   prefix NSAPprefix,
   qOSlgth QOSlength,
   qOSval QOSvalue,
   metriclgth Metriclength,
   metricval Metricvalue}
Ribattsec ::= SEQUENCE {
   preflgth NSAPprefixLength,
   prefix NSAPprefix,
   seclgth Securitylength,
   secval Securitylevel}
RouteAdvertisementInterval ::=INTEGER(30..900)
 --IS 10589 imposes minimum value of 30 seconds
 --and maximum value of 900 seconds in clause
 --12.2.3.4, part c)
SEC ::= CHOICE { ssSEC[0] EXPLICIT Ribattsec,
            dsSEC[1] EXPLICIT Ribattsec }
Securitylength ::= INTEGER(0..255)
Securitylevel ::= OCTET STRING(SIZE(1..255))

SNPAaddress ::= OCTET STRING
  (FROM (’1’H|’2’H|’3’H|’4’H|’5’H|’6’H|’7’H|’8’H|’9’H|
      ’A’H|’B’H|’C’H|’D’H|’E’H|’F’H))
  --integral number of hexadecimal digits
SNPAaddresses ::= SET OF SNPAaddress
State ::= ENUMERATED {
  closed (0),
  open-recv(1),
  established(2),
  open-sent(3),
  close-wait(4)}
StopEventreply ::= Parameter
StartEventreply::=Parameter
1 SystemIdGroup ::= SEQUENCE  {
1   nETS SET OF NETprefix,
1   nSAPs SET OF ESprefix }
Updateerrorsubcode ::=ENUMERATED {
  malformedAttributelist (1),
  unrecognizedWell-knownAttribute (2),
  missingWell-knownAttribute (3),
  attributeFlagsError (4),
  attributeLengthError (5),
  rDRouteingLoop (6),
  invalidNEXTHOPAttribute (7),
  optionalAttributeerror (8),
  invalidReachabilityInformation (9),
  misconfiguredRDCs (10)}
Updatesin ::=INTEGER(1..4294967295)
Updatesout ::=INTEGER(1..4294967295)
```