

TN3270E Working Group  
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**Definitions of Managed Objects for TN3270E  
Response Time Collection Using SMIV2  
(TN3270E-RT-MIB)  
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Abstract

The purpose of this memo is to define the protocol and the Management Information Base (MIB) for performing response time data collection on TN3270E sessions by a TN3270E Server. The response time data collected by a TN3270E Server is structured to support both validation of service level agreements as well as performance monitoring of TN3270E Sessions. This MIB has as a prerequisite the TN3270E-MIB reference [[10](#)].

It is the intent of this MIB to fully adhere to all prerequisite MIBs unless explicitly stated. Deviations will be documented in corresponding conformance statements. The specification of this MIB will utilize the Structure of Management Information (SMI) for Version 2 of the Simple Network Management Protocol Version (refer to [RFC1902](#), reference [[1](#)]).

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## **[1.](#) Introduction**

This document is a product of the TN3270E Working Group. Its purpose is to define the protocol and a MIB module for collecting Response Time data by a TN3270E Server. Prerequisites for implementing this MIB are:

- o TN3270E-MIB, Base Definitions of Managed Objects for TN3270E Using SMIV2 [[10](#)].
- o TN3270E RFCs

## **[2.](#) The SNMPv2 Network Management Framework**

The SNMP Network Management Framework presently consists of three major components. They are:

- o the SMI, described in [RFC 1902](#) [[1](#)], - the mechanisms used for describing and naming objects for the purpose of management.
- o the MIB-II, STD 17, [RFC 1213](#) [[5](#)], - the core set of managed objects for the Internet suite of protocols.
- o the protocol, [RFC 1157](#) [[9](#)] and/or [RFC 1905](#) [[7](#)] - the protocol for accessing managed information.

Textual conventions are defined in [RFC 1903](#) [[6](#)], and conformance

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statements are defined in [RFC 1904](#) [8].

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

This memo specifies a MIB module that is compliant to the SNMPv2 SMI. A semantically identical MIB conforming to the SNMPv1 SMI can be produced through the appropriate translation.

### **2.1. 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 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.

## **3. Response Time Collection Methodology**

This section explains the methodology and approach used by the MIB defined by this memo in order to enable response time data collection by a TN3270E Server.

### **3.1. General Response Time Collection**

Two primary methods exists for generating response times in SNA networks:

- o Response Time Monitoring (RTM) function
- o Timestamping using definite response flows

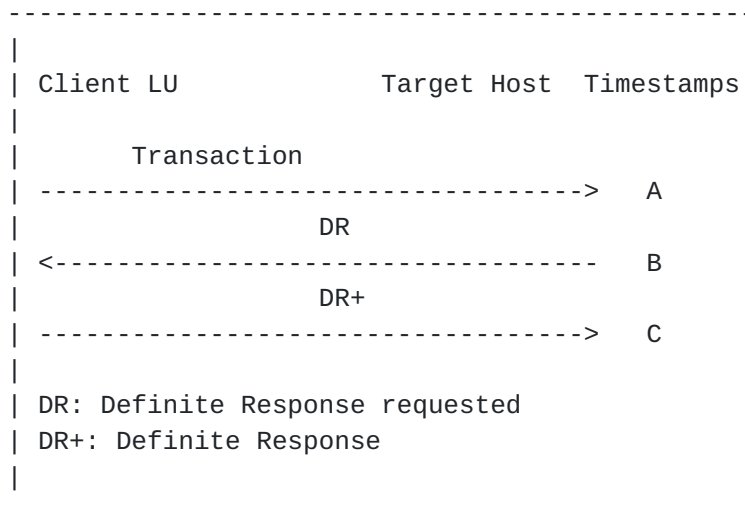
This memo focuses on defining the method and resulting MIB module for collecting response time data by timestamping the flow between a client and its TN3270E Server using definite response requests and responses as oppose to the RTM method. The SNA Request Unit (RU) RTM flow was considered but was deemed unsuitable since not all TN3270E Server implementations have access to the underlying SNA stack to

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access the Physical Unit (PU) in the manner that a outboard control unit like the IBM 3174 can when implementing RTM. The concept in the RTM methodology of keeping response time buckets for service level agreements as well as interval based response time collection for performance monitoring is addressed by the MIB module defined within this memo.

In a SNA network the flow between a client Logical Unit (LU) and the target Host in general looks as follows:



The previous flow is simplistic and is being used only as the basis to illustrate how timestamping the client and target host flows can be used to generate response times. An IBM redbook [\[11\]](#) defines these flows and response time collection in better detail. Two components to response time are typically calculated:

- o Host Transit Time: Timestamp B - A
- o Network Transit Time: Timestamp C - B

Network Transit Time is an approximation for the amount of time that a transaction requires to flow across a network since the definite response flow is used as oppose to timestamping the transaction network flow. Network Transit Time, timestamp C - B, is the amount of time that the definite response request and its response required. Host Time is the actual time that the host required to process the transaction. Experience has indicated that using a definite response flow to generate Network Transit Times is useful and does correlate to actual network transit times.

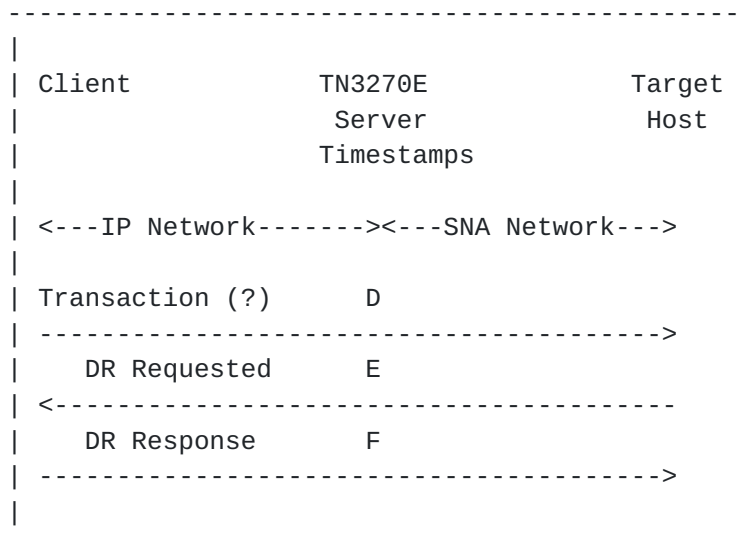
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### 3.2. TN3270E Server Response Time Collection

A TN3270E Server connects a IP Client performing 3270 emulation to a Target Host over both a IP Network (IP Client to TN3270E Server) and a SNA Network (TN3270E Server to Target). A TN3270E Server can use the SNA Definite Response Request Unit (RU) flow and the TN3270 Enhancement ([RFC 1647](#) [11]) RESPONSES function to calculate response times by timestamping when a client sends a request, when the definite response request arrives from the target and is then acknowledged by the client.

The following flow adds a TN3270E Server between the client, in this case a TN3270E Client and the Target Host:



A TN3270E Server can save timestamp D when it receives a client transaction, save timestamp E when the Target Host responds, and save timestamp F when the client response to a definite response request. It doesn't matter whether the Target Host requests the definite response or if the TN3270E Server makes the request on its own in producing timestamp F.

In order to generate timestamp F a TN3270E Server needs to insure that the transaction response has DR selected and that the TN3270E RESPONSES function has been negotiated between the server and the client. Negotiation of the TN3270E RESPONSES function is recommended to occur during the client's TN3270E Session initialization and not during transaction flow. The TN3270E Servers that the authors are aware of requests the RESPONSES function during client session initialization. TN3270E Clients either automatically support the RESPONSES function or can be configured to support it during startup.



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SNA resources can be configured to automatically request definite response or a TN3270E Server can dynamically request it itself. The `tn3270eRtCollCtlType` object in a `tn3270eRtCollCtlEntry` has a BIT setting, `ddr(1)`, defined to inform the TN3270E Server as to whether dynamic definite response is enabled (refer to [section 4.1](#), `tn3270eRtCollCtlTable`) for a particular response time collection policy. Dynamically requesting definite response from a TN3270E Server does increase IP Network traffic which may not be desirable in certain customer environments. In addition, if a customer determines that their IP Network times are not significant then dynamic definite response (DDR) can be disabled.

Using timestamps D, E, and F the following response times can be calculated by a TN3270E Server:

- o Total Response time:  $F - D$
- o IP Network Transit Time:  $F - E$

The MIB defined by this memo is structured to keep response times as a total and as IP Network Transit Time. All of the response times being discussed are approximations. An underlining assumption is that the client can support the TN3270E RESPONSES function in order to flow a definite response request to a client and receive a positive reply. Timestamp F is set equal to timestamp E when the TN3270E Server does not flow a definite response request to the client. This results in a value of zero for IP Network Transit Time. This can occur when either the client doesn't support the TN3270E RESPONSES function or if DDR is not enabled and the TN3270E Server doesn't see DR requested in the transaction response.

The SNA Network Transit Time is approximately the Total Response Time minus the IP Network Transit Time. When a TN3270E Server is in the same host as the target the SNA Network Time will approximate the Host Transit Time described previously. A Host (as opposed to a Gateway) TN3270E Server implementation can typically support the establishment of sessions to remote host targets in which case the SNA Network Transit Time contains the actual SNA Network Transit time as well as essentially two Host Transit Times. For this reason as well as to enable generation of a NOTIFICATION when an average response time was exceeded (refer to `tn3270eRtExceeded` in [section 4.3](#)) it was determined to represent the times kept by a TN3270E Server as a total and as IP Network Transit Times.

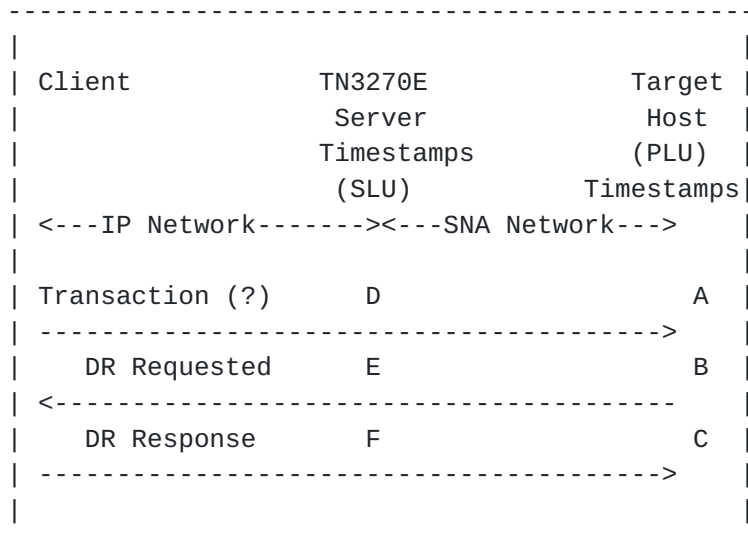
### **3.3. Correlating TN3270E Server and Host Response Times**

It is possible that response time data is collected from TN3270E Servers at the same time as a management application is monitoring the

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session at a host. For example, a management application can be monitoring the Secondary Logical Unit (SLU) while retrieving data from a TN3270E Server. Consider the following:



The following response times would be available:

- o Target Host Transit Time: B - A
- o Target Host Network Transit time: C - B
- o TN3270E Server Total Response Time: F - D
- o TN3270E Server IP Network Time: F - E

The value added by the TN3270E Server in this situation is its IP Network Transit Time approximations. The IP Network Transit Time can be subtracted from the Network Transit Time determined by monitoring the SLU for determine actual SNA versus IP Network Transit Times.

The MIB defined by this memo does not specifically address correlating or enabling collection of Response Time Data by direct SNA resource monitoring, but focuses on response time data collection from a TN3270E Server prospective. The TN3270E-RT-MIB as well as the TN3270E-MIB [[10](#)] have been structured to provide the needed information to make correlation between TN3270E Server provided information and direct SNA resource usage possible.

A management application attempting to correlate SNA Resource usage to IP Client could monitor either the tn3270eResMapTable or the tn3270eTcpConnTable to determine resource to IP Address mappings. Both of these tables are defined by the TN3270E-MIB [[10](#)]. Neither the tn3270eIpGroupTable, tn3270eResPoolTable, nor the tn3270eResMapTable from the TN3270E-MIB can be used to determine this correlation since the mappings defined by these tables can overlap and may not provide

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one to one mappings.

#### **4. Structure of the MIB**

The TN3270E-RT-MIB has the following components:

- o tn3270eRtCollCtlTable
- o tn3270eRtDataTable
- o Notifications

##### **4.1. tn3270eRtCollCtlTable**

The tn3270eRtCollCtlTable is indexed by tn3270eSrvrConfIndex, imported from the TN3270E-MIB, and tn3270eRtCollCtlIpGroupName.

tn3270eSrvrConfIndex identifies within a host which TN3270E Server is the target of the request while tn3270eRtCollCtlIpGroupName defines the collection of IP Clients that response time data should be collected for. This collection of IP Clients must be defined using the tn3270eIpGroupTable defined within the TN3270E-MIB.

tn3270eIpGroupName is not used directly since it causes an inconsistent indexing scheme error by some MIB compilers. To avoid this tn3270eRtCollCtlIpGroupName was defined directly in the tn3270eRtCollCtlEntry.

A tn3270eRtCollCtlEntry contains the following objects:

1st Index	tn3270eSrvrConfIndex	Unsigned32	
2nd Index	tn3270eRtCollCtlIpGroupName	DisplayString	
	tn3270eRtCollCtlType	BITS	
	tn3270eRtCollCtlInterval	Unsigned32	
	tn3270eRtCollCtlThreshHigh	Unsigned32	
	tn3270eRtCollCtlThreshLow	Unsigned32	
	tn3270eRtCollCtlTranCount	Unsigned32	
	tn3270eRtCollCtlBucketBndry1	Unsigned32	
	tn3270eRtCollCtlBucketBndry2	Unsigned32	
	tn3270eRtCollCtlBucketBndry3	Unsigned32	
	tn3270eRtCollCtlBucketBndry4	Unsigned32	
	tn3270eRtCollCtlRowStatus	RowStatus	

The tn3270eRtCollCtlType object controls the type of response time collection that occurs, the granularity of the collection, if dynamic definite response should be initiated, and if notifications should be generated. This object is of BITS SYNTAX and allows multiple option selection. The first option:

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- o aggregate(0) - If specified indicates that data should be collected for the whole IP Group. If not specified then data should be collected for each IP Client specified by the IP Group.

If aggregate(0) is selected then a single entry is created in the tn3270eRtDataTable with the same first two indexes, tn3270eSrvrConfIndex and tn3270eRtCollCtlIpGroupName of the corresponding tn3270eRtCollCtlEntry. A third index is added to the tn3270eRtDataEntry, tn3270eRtDataClientIpAddress, with a value of 0.0.0.0. If the aggregate(0) option is not selected then an entry is created in the tn3270eRtDataTable for each member of the respective IP Group. tn3270eRtDataClientIpAddress would then be the actual IP Address of a IP Group member.

The next two tn3270eRtCollCtlType object settings determine if dynamic definite response should be enabled and which type of response time data is to be collected:

- o ddr(1) - Enable dynamic definite response.
- o average(2) - produce an average based on a collection interval.
- o buckets(3) - increment one of the tn3270eRtDataBucket objects in the corresponding tn3270eRtDataEntry based on the tn3270eRtDataBucketBndry objects.

Any of the prior settings can be selected. Either average(2) or buckets(3) must be selected in order for response time data collection to occur. If average(2) is selected then the following objects have meaning:

- o tn3270eRtCollCtlInterval
- o tn3270eRtCollCtlThreshHigh
- o tn3270eRtCollCtlThreshLow
- o tn3270eRtCollCtlTranCount

If the tn3270eRtCollCtlType setting of buckets(3) is selected then the following objects are used to define a series of 5 counter objects in the associating tn3270eRtDataTable entry(s):

- o tn3270eRtCollCtlBucketBndry1
- o tn3270eRtCollCtlBucketBndry2
- o tn3270eRtCollCtlBucketBndry3
- o tn3270eRtCollCtlBucketBndry4

When the buckets(3) option is selected the response times are



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```
|
|                                     Time Boundaries
|      tn3270eRtCollCtlBucketBndry1..4
|          -----
|          |           |           |           | Maximum
|          |           |           |           | Counter
|    0     1         2         3         4     Value
|    |     |         |         |           |Overflow|
|    |-----|-----|-----|-----|
|    | Bucket1|Bucket2|Bucket3|Bucket4|Bucket5 |
|    |-----|-----|-----|-----|
|
```

The contents of the `tn3270eRtDataTable` depends on the contents of the `tn3270eRtCollCtlTable`. One or more entries in the `tn3270eRtDataTable` can be created for each `tn3270eRtCollCtlEntry` depending on whether the associating `tn3270eRtCollCtlType` has `aggregate(0)` selected as described in the previous section. Selection of the `tn3270eRtCollCtlType` option `average(2)` results in the following objects being maintained:

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- o tn3270eRtDataAverageRt
- o tn3270eRtDataAverageIpRt
- o tn3270eRtDataTransCount
- o tn3270eRtDataDrCount
- o tn3270eRtDataIntTimeStamp
- o tn3270eRtDataCurrTotalRt
- o tn3270eRtDataCurrTotalIpRt
- o tn3270eRtDataCurrTransCount
- o tn3270eRtDataCurrDrCount
- o tn3270eRtDataCurrElapsRndTrpSq
- o tn3270eRtDataCurrElapsIpRtSq

There are basically two sets of similar objects in the prior list. One set of data pertains to the last collection interval timestamped by tn3270eRtDataIntTimeStamp. The second set of objects are running totals of the response time data and transaction counts. The following objects (sum of the squares values) are kept in order to enable variance calculations by a management application:

- o tn3270eRtDataCurrElapsRndTrpSq
- o tn3270eRtDataCurrElapsIpRtSq

Selection of the tn3270eRtCollCtlType option buckets(2) results in the following objects being maintained:

- o tn3270eRtDataBucket1
- o tn3270eRtDataBucket2
- o tn3270eRtDataBucket3
- o tn3270eRtDataBucket4
- o tn3270eRtDataBucket5

A discontinuity object, tn3270eRtDataDiscontinuityTime, can be used by a management application to detect when the values of objects in this table may of been reset due to a TN3270E Server being stopped or restarted.

When tn3270eRtCollCtlType has a setting of aggregate(0) an entry should automatically be created in the tn3270eRtDataTable where tn3270eRtDataClientIpAddress has a value of 0.0.0.0. Entries in the tn3270eRtDataTable should automatically be created for each member of a IP Group when aggregate(0) is not selected when either a IP Client connects to the TN3270E Server or when the TN3270E Server determines that a IP Client is in a IP Group specified by a tn3270eRtCollCtlEntry. All corresponding tn3270eRtDataTable entries should be deleted when its tn3270eRtCollCtlEntry is deleted. When performing data collection on a single IP Group member delete its tn3270eRtDataEntry when its TCP Connection terminates.

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### **4.3. Notifications**

All notifications require that the associating `tn3270eRtCollCtlType` contain a setting of traps. The following notifications are defined by this MIB specification:

- o `tn3270eRtExceeded` - If 'average' response time data is being collected then this notification is generated when an average response time, `tn3270eRtDataAverageRt`, is first detected that exceed a high threshold as defined in the associating `tn3270eRtCollCtlEntry` on a collection interval boundary. In addition, the number of transactions used to calculate the average, `tn3270eRtDataTransCount`, must be greater than or equal to the corresponding `tn3270eRtCollCtlTranCount`. This notification is not regenerated until a `tn3270eRtOkay` notification occurs for the respective `tn3270eRtDataEntry`. The purpose of this notification is to signal that a performance problem has been detected.
- o `tn3270eRtOkay` - If 'average' response time data is being collected then this notification is generated when a average response time, `tn3270eRtDataAverageRt`, for a collection interval is detected to be below the low threshold as defined in the associating `tn3270eRtCollEntry` after a `tn3270eRtExceeded` notification was first generated. The purpose of this notification is to signal that the previously reported performance problem was resolved. The purpose of a low threshold, `tn3270eRtCollCtlThreshLow`, for use in generation of this notification is to enable definition of a small window to prevent spurious trap generation. The intent is that `tn3270eRtCollCtlThreshLow` will be set to a value close to that of `tn3270eRtCollCtlThreshHigh`.
- o `tn3270eRtCollStart` - This notification is generated whenever data collection begins or when a `tn3270eRtDataEntry` becomes active. The primary purpose of this notification is to provide the IP to Resource mapping for a particular session to a management application. This notification is not critical when average data collection is not being performed.
- o `tn3270eRtCollEnd` - This notification is generated whenever a

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data collection ends. This occurs when the corresponding tn3270eRtCollCtlEntry is deleted for either aggregate or individual collections or when the IP Client connection terminates for individual collections. This enables a management application to complete an monitoring function that it is performing since it is unlikely that a collection would end exactly after a tn3270eRtDataTable poll occurred.

## 5. Definitions

```
TN3270E-RT-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
    MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE,  
    experimental, IpAddress, Counter32, BITS, Unsigned32,  
    Gauge32
```

```
        FROM SNMPv2-SMI
```

```
    RowStatus, DateAndTime, DisplayString, TimeStamp
```

```
        FROM SNMPv2-TC
```

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

```
        FROM SNMPv2-CONF
```

```
    tn3270eSrvrConfIndex,
```

```
    tn3270eResMapElementName, tn3270eResMapElementType
```

```
        FROM TN3270E-MIB;
```

```
tn3270eRtMIB    MODULE-IDENTITY
```

```
    LAST-UPDATED "9707280000Z" -- July 28, 1997
```

```
    ORGANIZATION "TN3270E Working Group"
```

```
    CONTACT-INFO
```

```
        "Kenneth White (kennethw@vnet.ibm.com)
```

```
        IBM Corp. - Dept. BRQA/Bldg. 503/C117
```

```
        P.O. Box 12195
```

```
        3039 Cornwallis
```

```
        RTP, NC 27709-2195
```

```
        (919) 254-0102
```

```
  
        Robert Moore (remoore@us.ibm.com)
```

```
        IBM Corp. - Dept. BRQA/Bldg. 501/G114
```

```
        P.O. Box 12195
```

```
        3039 Cornwallis
```

```
        RTP, NC 27709-2195
```

```
        (919) 254-7507"
```

```
    DESCRIPTION
```

```
        "This module defines a portion of the management  
        information base (MIB) for monitoring response
```



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```
time for TN3270E clients."
 ::= { experimental 2002} -- Need IANA assigned OID

-- Top level structure of the MIB

tn3270eRtNotifications    OBJECT IDENTIFIER ::= { tn3270eRtMIB 0 }
tn3270eRtObjects          OBJECT IDENTIFIER ::= { tn3270eRtMIB 1 }
tn3270eRtConformance     OBJECT IDENTIFIER ::= { tn3270eRtMIB 3 }

-- MIB Objects

-- Response Time Control Table

tn3270eRtCollCtlTable  OBJECT-TYPE
    SYNTAX      SEQUENCE OF Tn3270eRtCollCtlEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The response time monitoring control table, which
         enables collection of performance data.

        This table is indexed by tn3270eSrvrConfIndex,
        imported from the TN3270E-MIB, and
        tn3270eRtCollCtlIpGroupName.
        tn3270eSrvrConfIndex indicates within a host which
        TN3270E Server is the target of the request while
        tn3270eRtCollCtlIpGroupName is equivalent to
        tn3270eIpGroupName defined by the TN3270E-MIB and
        defines the collection of IP Clients that response
        time data should be collected for. This collection of
        IP Clients must be defined using the tn3270eIpGroupTable
        defined by the TN3270E-MIB."
    ::= { tn3270eRtObjects 1}

tn3270eRtCollCtlEntry  OBJECT-TYPE
    SYNTAX      Tn3270eRtCollCtlEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Entry in the TN3270 Response Time Monitoring Collection
         Control Table. Note that the first index of
         this table match that of the tn3270eSrvrConfTable
         as defined by the TN3270E-MIB. This was done in order
         for the tables to support multiple TN3270E Servers
         on the same host."
    INDEX {
        tn3270eSrvrConfIndex,          -- Server's index
        tn3270eRtCollCtlIpGroupName } -- What to collect on
```

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```
::= { tn3270eRtCollCtlTable 1 }
```

```
Tn3270eRtCollCtlEntry ::= SEQUENCE {  
    tn3270eRtCollCtlIpGroupName    DisplayString,  
    tn3270eRtCollCtlType           BITS,  
    tn3270eRtCollCtlInterval       Unsigned32,  
    tn3270eRtCollCtlThreshHigh     Unsigned32,  
    tn3270eRtCollCtlThreshLow      Unsigned32,  
    tn3270eRtCollCtlTranCount      Unsigned32,  
    tn3270eRtCollCtlBucketBndry1   Unsigned32,  
    tn3270eRtCollCtlBucketBndry2   Unsigned32,  
    tn3270eRtCollCtlBucketBndry3   Unsigned32,  
    tn3270eRtCollCtlBucketBndry4   Unsigned32,  
    tn3270eRtCollCtlRowStatus      RowStatus  }
```

tn3270eRtCollCtlIpGroupName OBJECT-TYPE

SYNTAX DisplayString (SIZE(1..24))

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The name of a IP Group. A IP Group should be defined via the TN3270E-MIB tn3270eIpGroupTable. tn3270eIpGroupName is equivalent to this object and was not imported since the indexes of the tn3270eIpGroupTable and this table are not equivalent and yield MIB compiler errors when tn3270eIpGroupName is attempted to be used."

```
::= { tn3270eRtCollCtlEntry 1 }
```

tn3270eRtCollCtlType OBJECT-TYPE

SYNTAX BITS {  
 aggregate(0),  
 ddr(1),  
 average(2),  
 buckets(3),  
 traps(4) }

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object controls what type of Response time data is to be collected, if the data being collected should be summarized across the members of a IP Group or collected individually, if dynamic definite response should be initiated and if traps should be generated:

aggregate(0) - If specified represent the results as an aggregate for the whole IP Group. If not selected then collect data for each member

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of an IP Group.

ddr(1) - Enable dynamic definite response.

average(2) - produce an average based on a collection interval.

buckets(3) - increment one of the tn3270eRtDataBucket objects in the corresponding tn3270eRtDataEntry based on the tn3270eRtDataBucketBndry objects.

traps(4) - generate traps. tn3270eRtExceeded and tn3270eRtOkay can be generated only if average(2) is also specified."

::= { tn3270eRtCollCtlEntry 2 }

tn3270eRtCollCtlInterval OBJECT-TYPE

SYNTAX Unsigned32 -- 15 second minimum to 24 hour max

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The number of seconds that defines the collection period.

The value of this object is used only if the corresponding

tn3270eRtCollCtlType has the average(2) setting."

DEFVAL {900}

::= { tn3270eRtCollCtlEntry 3 }

tn3270eRtCollCtlThreshHigh OBJECT-TYPE

SYNTAX Unsigned32

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The threshold to use to generate a tn3270eRtExceeded notification to signal that the monitored total response time has exceeded the specified limit. A value of zero for this object suppresses generation of this notification. The value of this object is used only if the corresponding tn3270eRtCollCtlType has average(2) and traps(4) selected."

::= { tn3270eRtCollCtlEntry 4 }

tn3270eRtCollCtlThreshLow OBJECT-TYPE

SYNTAX Unsigned32

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The threshold to use to generate a tn3270eRtOkay notification to signal that the monitored total response

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time has fallen below the specified limit. A value of zero for this object suppresses generation of this notification. The value of this object is used only if the corresponding tn3270eRtCollCtlType has average(2) and traps(4) selected."

::= { tn3270eRtCollCtlEntry 5 }

tn3270eRtCollCtlTranCount OBJECT-TYPE

SYNTAX Unsigned32

UNITS "transaction count"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The value of this object is used only if the corresponding tn3270eRtCollCtlType has the average(2) and traps(4) selected. Its purpose is to define a minimum number of transactions that must be counted within an interval for generation of a tn3270eRtExceeded NOTIFICATION."

DEFVAL { 1 }

::= { tn3270eRtCollCtlEntry 6 }

tn3270eRtCollCtlBucketBndry1 OBJECT-TYPE

SYNTAX Unsigned32

UNITS "milliseconds"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The value of this object is used to define the first RtDataBucket, 0 to the value of this object if tn3270eRtCollCtlType has buckets(3) set."

::= { tn3270eRtCollCtlEntry 7 }

tn3270eRtCollCtlBucketBndry2 OBJECT-TYPE

SYNTAX Unsigned32

UNITS "milliseconds"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The value of this object is used to define the second RtDataBucket, tn3270eRtCollCtlBucketBndry1 to the value of this object if tn3270eRtCollCtlType has buckets(3) set."

::= { tn3270eRtCollCtlEntry 8 }

tn3270eRtCollCtlBucketBndry3 OBJECT-TYPE

SYNTAX Unsigned32

UNITS "milliseconds"



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```
MAX-ACCESS      read-create
STATUS          current
DESCRIPTION
    "The value of this object is used to define the third
    RtDataBucket, tn3270eRtCollCtrlBucketBndry2 to the
    value of this object if tn3270eRtCollCtlType has
    buckets(3) set."
::= { tn3270eRtCollCtlEntry 9 }

tn3270eRtCollCtlBucketBndry4  OBJECT-TYPE
    SYNTAX      Unsigned32
    UNITS       "milliseconds"
    MAX-ACCESS   read-create
    STATUS      current
    DESCRIPTION
        "The value of this object is used to define the fourth
        RtDataBucket, tn3270eRtCollCtrlBucketBndry3 to the
        value of this object if tn3270eRtCollCtlType has
        buckets(3) set. The fifth bucket is defined to be the
        Response Times that exceed the value of this object."
        ::= { tn3270eRtCollCtlEntry 10 }

tn3270eRtCollCtlRowStatus  OBJECT-TYPE
    SYNTAX      RowStatus
    MAX-ACCESS   read-create
    STATUS      current
    DESCRIPTION
        "This object allows entries to be created and deleted
        in the tn3270eRtCollCtlTable.  An entry in this table
        is deleted by setting this object to destroy(6).
        Deleting an entry in this table has the side-effect
        of removing all entries from the tn3270eRtDataTable
        that are associated with the entry being deleted."
        ::= { tn3270eRtCollCtlEntry 11 }

-- TN3270E Response Time Data Table

tn3270eRtDataTable  OBJECT-TYPE
    SYNTAX      SEQUENCE OF Tn3270eRtDataEntry
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "The response time data table. Entries in this table are
        made based on the tn3270eRtCollCtlTable."
        ::= { tn3270eRtObjects 2 }

tn3270eRtDataEntry  OBJECT-TYPE
```

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SYNTAX Tn3270eRtDataEntry

MAX-ACCESS not-accessible

STATUS current

#### DESCRIPTION

"An entry in this table is created based upon the tn3270eRtCollCtlTable. A single entry is created with a tn3270eRtDataClientIpAddress of 0.0.0.0 when the corresponding tn3270eRtCollCtlType has a value of aggregate(0)."

#### INDEX {

tn3270eSrvrConfIndex, -- Server's local index  
tn3270eRtCollCtlIpGroupName, -- IP Group that data is for  
tn3270eRtDataClientIpAddress }

::= { tn3270eRtDataTable 1 }

Tn3270eRtDataEntry ::= SEQUENCE {

tn3270eRtDataClientIpAddress	IpAddress,
tn3270eRtDataDiscontinuityTime	TimeStamp,
tn3270eRtDataAverageRt	Gauge32,
tn3270eRtDataAverageIpRt	Gauge32,
tn3270eRtDataTransCount	Counter32,
tn3270eRtDataDrCount	Counter32,
tn3270eRtDataIntTimeStamp	DateAndTime,
tn3270eRtDataCurrTotalRt	Unsigned32,
tn3270eRtDataCurrTotalIpRt	Unsigned32,
tn3270eRtDataCurrTransCount	Counter32,
tn3270eRtDataCurrDrCount	Counter32,
tn3270eRtDataCurrElapsRndTrpSq	Unsigned32,
tn3270eRtDataCurrElapsIpRtSq	Unsigned32,
tn3270eRtDataBucket1	Counter32,
tn3270eRtDataBucket2	Counter32,
tn3270eRtDataBucket3	Counter32,
tn3270eRtDataBucket4	Counter32,
tn3270eRtDataBucket5	Counter32

}

tn3270eRtDataClientIpAddress OBJECT-TYPE

SYNTAX IpAddress

MAX-ACCESS not-accessible

STATUS current

#### DESCRIPTION

"Contains the IP address of the TN3270 client being monitored. The value of 0.0 is used if the aggregate of the IP Group is being collected "

::= { tn3270eRtDataEntry 1 }

tn3270eRtDataDiscontinuityTime OBJECT-TYPE

SYNTAX TimeStamp

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MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of sysUpTime on the most recent occasion at which any one or more of this entry's objects suffered a discontinuity. One possibility of this is when a TN3270E Server is stopped and then restarted where local methods are used to setup collection policy (tn3270eRtCollCtlTable entries).

In order to prevent a TN3270E Server from caching this object it is recommended that the TN3270E Server's startup time be used as the objects initial value."

::= { tn3270eRtDataEntry 2 }

tn3270eRtDataAverageRt OBJECT-TYPE

SYNTAX Gauge32

UNITS "milliseconds"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The average total response time measured over the last collection interval."

DEFVAL { 0 }

::= { tn3270eRtDataEntry 3 }

tn3270eRtDataAverageIpRt OBJECT-TYPE

SYNTAX Gauge32

UNITS "milliseconds"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The average IP response time measured over the last collection interval."

DEFVAL { 0 }

::= { tn3270eRtDataEntry 4 }

tn3270eRtDataTransCount OBJECT-TYPE

SYNTAX Counter32

UNITS "transactions"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of transactions excluding Definite Responses that occurred during the last collection interval."

::= { tn3270eRtDataEntry 5 }

tn3270eRtDataDrCount OBJECT-TYPE

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SYNTAX Counter32  
UNITS "transactions"  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
"The number of definite response RUs that occurred during  
the last collection interval."  
::= { tn3270eRtDataEntry 6 }

tn3270eRtDataIntTimeStamp OBJECT-TYPE  
SYNTAX DateAndTime  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
"The date and time of the last interval that  
tn3270eRtDataAverageRt, tn3270eRtDataAverageIpRt,  
tn3270eRtDataTransCount, and tn3270eRtDataDrCount  
was calculated."  
::= { tn3270eRtDataEntry 7 }

tn3270eRtDataCurrTotalRt OBJECT-TYPE  
SYNTAX Unsigned32  
UNITS "milliseconds"  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
"The current total response time collected."  
DEFVAL { 0 }  
::= { tn3270eRtDataEntry 8 }

tn3270eRtDataCurrTotalIpRt OBJECT-TYPE  
SYNTAX Unsigned32  
UNITS "milliseconds"  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
"The current IP response time collected."  
DEFVAL { 0 }  
::= { tn3270eRtDataEntry 9 }

tn3270eRtDataCurrTransCount OBJECT-TYPE  
SYNTAX Counter32  
UNITS "transactions"  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
"The current number of transactions excluding definite  
responses that were detected."



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```
::= { tn3270eRtDataEntry 10 }
```

```
tn3270eRtDataCurrDrCount OBJECT-TYPE
```

```
SYNTAX Counter32
```

```
UNITS "transactions"
```

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

```
STATUS current
```

```
DESCRIPTION
```

```
"The current number of definite responses that where  
seen."
```

```
::= { tn3270eRtDataEntry 11 }
```

```
tn3270eRtDataCurrElapsRndTrpSq OBJECT-TYPE
```

```
SYNTAX Unsigned32
```

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

```
STATUS current
```

```
DESCRIPTION
```

```
"The sum of the elapsed round trip time squared.  
A sum of the squares is keep in order to calculate a  
variance."
```

```
DEFVAL { 0 }
```

```
::= { tn3270eRtDataEntry 12 }
```

```
tn3270eRtDataCurrElapsIpRtSq OBJECT-TYPE
```

```
SYNTAX Unsigned32
```

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

```
STATUS current
```

```
DESCRIPTION
```

```
"The sum of the elapsed IP round trip time squared.  
A sum of the squares is keep in order to calculate a  
variance."
```

```
DEFVAL { 0 }
```

```
::= { tn3270eRtDataEntry 13 }
```

```
tn3270eRtDataBucket1 OBJECT-TYPE
```

```
SYNTAX Counter32
```

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

```
STATUS current
```

```
DESCRIPTION
```

```
"The number of response times falling into bucket 1."
```

```
::= { tn3270eRtDataEntry 14 }
```

```
tn3270eRtDataBucket2 OBJECT-TYPE
```

```
SYNTAX Counter32
```

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

```
STATUS current
```

```
DESCRIPTION
```

```
"The number of response times falling into bucket 2."
```

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```
::= { tn3270eRtDataEntry 15 }
```

```
tn3270eRtDataBucket3 OBJECT-TYPE
```

```
SYNTAX Counter32
```

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

```
STATUS current
```

```
DESCRIPTION
```

```
"The number of response times falling into bucket 3."
```

```
::= { tn3270eRtDataEntry 16 }
```

```
tn3270eRtDataBucket4 OBJECT-TYPE
```

```
SYNTAX Counter32
```

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

```
STATUS current
```

```
DESCRIPTION
```

```
"The number of response times falling into bucket 4."
```

```
::= { tn3270eRtDataEntry 17 }
```

```
tn3270eRtDataBucket5 OBJECT-TYPE
```

```
SYNTAX Counter32
```

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

```
STATUS current
```

```
DESCRIPTION
```

```
"The number of response times falling into bucket 5."
```

```
::= { tn3270eRtDataEntry 18 }
```

```
-- Notifications
```

```
tn3270eRtExceeded NOTIFICATION-TYPE
```

```
OBJECTS {
```

```
tn3270eSrvrConfIndex, -- Server's local index
```

```
tn3270eRtCollCtlIpGroupName, -- IP Group that data is for
```

```
tn3270eRtDataClientIpAddress, -- IP Address or zero
```

```
tn3270eRtDataIntTimeStamp,
```

```
tn3270eRtDataAverageRt,
```

```
tn3270eRtDataAverageIpRt,
```

```
tn3270eRtDataTransCount
```

```
}
```

```
STATUS current
```

```
DESCRIPTION
```

```
"This notification is generated when the average response  
time, tn3270eRtDataAverageRt, exceeds
```

```
tn3270eRtCollCtlThresholdHigh at the end of a collection  
interval specified by tn3270eCollCtlInterval. Note that  
the corresponding tn3270eCollCtlType must have traps(4)  
and average(2) set for this notification to be possible.
```

```
In addition, tn3270eRtDataTransCount must be greater than  
or equal to the value of tn3270eRtCollCtlTranCount
```

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otherwise this NOTIFICATION will be suppressed."  
::= { tn3270eRtNotifications 1 }

tn3270eRtOkay NOTIFICATION-TYPE

OBJECTS {  
    tn3270eSrvrConfIndex,           -- Server's local index  
    tn3270eRtCollCtlIpGroupName, -- IP Group that data is for  
    tn3270eRtDataClientIpAddress, -- IP Address or zero  
    tn3270eRtDataIntTimeStamp,  
    tn3270eRtDataAverageRt,  
    tn3270eRtDataAverageIpRt,  
    tn3270eRtDataTransCount  
}

STATUS current

DESCRIPTION

"This notification is generated when the average response time, tn3270eRtDataAverageRt, falls below tn3270eRtCollCtlThresholdLow at the end of a collection interval specified by tn3270eCollCtlInterval after a tn3270eRtExceeded notification was generated. Note that the corresponding tn3270eCollCtlType must have traps(4) and average(2) set for this notification to be possible."  
::= { tn3270eRtNotifications 2 }

tn3270eRtCollStart NOTIFICATION-TYPE

OBJECTS {  
    tn3270eSrvrConfIndex,           -- Server's local index  
    tn3270eRtCollCtlIpGroupName, -- IP Group that data is for  
    tn3270eRtDataClientIpAddress, -- IP Address or zero  
    tn3270eResMapElementName,       -- IDs LU or Ptr association  
    tn3270eResMapElementType       -- Type of resource  
}

STATUS current

DESCRIPTION

"This notification is generated when response time data collection is enabled for a member of an IP Group. In order for this notification to occur the corresponding tn3270eRtCollCtlType must have traps(4) selected. The objects tn3270eResMapElementName and tn3270eResMapElementType contains valid values only if tn3270eRtDataClientIpAddress contains a valid IP Address (not zero)."  
::= { tn3270eRtNotifications 3 }

tn3270eRtCollEnd NOTIFICATION-TYPE

OBJECTS {  
    tn3270eSrvrConfIndex,           -- Server's local index  
    tn3270eRtCollCtlIpGroupName, -- IP Group that data is for

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```
tn3270eRtDataClientIpAddress,-- IP Address or zero
tn3270eRtDataDiscontinuityTime,
tn3270eRtDataAverageRt,
tn3270eRtDataAverageIpRt,
tn3270eRtDataTransCount,
tn3270eRtDataDrCount,
tn3270eRtDataIntTimeStamp,
tn3270eRtDataCurrTotalRt,
tn3270eRtDataCurrTotalIpRt,
tn3270eRtDataCurrTransCount,
tn3270eRtDataCurrDrCount,
tn3270eRtDataCurrElapsRndTrpSq,
tn3270eRtDataCurrElapsIpRtSq,
tn3270eRtDataBucket1,
tn3270eRtDataBucket2,
tn3270eRtDataBucket3,
tn3270eRtDataBucket4,
tn3270eRtDataBucket5
}
STATUS current
DESCRIPTION
    "This notification is generated when a tn3270eRtDataEntry
    is deleted after being active (actual data collected)
    in order to enable the management application monitoring
    tn3270eRtCollCtlThresholdLow at the end of a collection
    the tn3270eRtDataTable to end its collection interval.
    Note that the corresponding tn3270eCollCtlType must have
    traps(4) set for this notification to be possible."
 ::= { tn3270eRtNotifications 4 }

-- Conformance Statement

tn3270eRtGroups          OBJECT IDENTIFIER ::= { tn3270eRtConformance 1 }
tn3270eRtCompliances    OBJECT IDENTIFIER ::= { tn3270eRtConformance 2 }

-- Compliance statements

tn3270eRtCompliance     MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "The compliance statement for agents that support the
        TN327E-RT-MIB "
    MODULE -- this module
        MANDATORY-GROUPS { tn3270eRtGroup, tn3270eRtNotGroup }
    ::= {tn3270eRtCompliances 1 }

-- Group definitions
```



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## tn3270eRtGroup OBJECT-GROUP

## OBJECTS {

tn3270eRtCollCtlType,  
tn3270eRtCollCtlInterval,  
tn3270eRtCollCtlThreshHigh,  
tn3270eRtCollCtlThreshLow,  
tn3270eRtCollCtlTranCount,  
tn3270eRtCollCtlBucketBndry1,  
tn3270eRtCollCtlBucketBndry2,  
tn3270eRtCollCtlBucketBndry3,  
tn3270eRtCollCtlBucketBndry4,  
tn3270eRtCollCtlRowStatus,  
tn3270eRtDataDiscontinuityTime,  
tn3270eRtDataAverageRt,  
tn3270eRtDataAverageIpRt,  
tn3270eRtDataTransCount,  
tn3270eRtDataDrCount,  
tn3270eRtDataIntTimeStamp,  
tn3270eRtDataCurrTotalRt,  
tn3270eRtDataCurrTotalIpRt,  
tn3270eRtDataCurrTransCount,  
tn3270eRtDataCurrDrCount,  
tn3270eRtDataCurrElapsRndTrpSq,  
tn3270eRtDataCurrElapsIpRtSq,  
tn3270eRtDataBucket1,  
tn3270eRtDataBucket2,  
tn3270eRtDataBucket3,  
tn3270eRtDataBucket4,  
tn3270eRtDataBucket5 }

STATUS current

## DESCRIPTION

"This group is mandatory for all host supporting the  
TN3270E-RT-MIB. "

::= { tn3270eRtGroups 1 }

## tn3270eRtNotGroup NOTIFICATION-GROUP

## NOTIFICATIONS {

tn3270eRtExceeded,  
tn3270eRtOkay,  
tn3270eRtCollStart,  
tn3270eRtCollEnd

}

STATUS current

## DESCRIPTION

"The notifications which must be supported when the  
TN3270E-RT-MIB is implemented. "

::= { tn3270eRtGroups 2 }

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END

## 6. Security Considerations

Certain management information defined in this MIB may be considered sensitive in some network environments. Therefore, authentication of received SNMP requests and controlled access to management information should be employed in such environments. The method for this authentication is a function of the SNMP Administrative Framework, and has not been expanded by this MIB.

Several objects in this MIB allow write access or provide for remote creation. Allowing this support in a non-secure environment can have a negative effect on network operations. It is recommended that implementers seriously consider whether set operations should be allowed without providing, at a minimum, authentication of request origin. It is recommended that without such support that the following objects be implemented as read-only:

- o tn3270eRtCollCtlType
- o tn3270eRtCollCtlInterval
- o tn3270eRtCollCtlThreshHigh
- o tn3270eRtCollCtlThreshLow
- o tn3270eRtCollCtlTranCount
- o tn3270eRtCollCtlBucketBndry1
- o tn3270eRtCollCtlBucketBndry2
- o tn3270eRtCollCtlBucketBndry3
- o tn3270eRtCollCtlBucketBndry4

The following object should either be implemented as read-only or not implemented when security is an issue as previously discussed:

- o tn3270eRtCollCtlRowStatus

The administrative method to use to create and manage the tn3270eRtCollCtlTable when SET support is not allowed is outside of the scope of this memo.

## 7. Acknowledgments

This document is a product of the TN3270E Working Group.

## 8. References

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