IEEE P802.11
Wireless LANs

|  |
| --- |
| Proposed Resolution to LB164 CID59 |
| Date: 2010-08-20 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Alex Ashley | NDS Ltd | One London Road, Staines, Middlesex, TW18 4EX, UK | +44 1784 848770 | aashley at nds dot com |
|  |  |  |  |  |

Abstract

CID59 in LB164 states:

*The text assumes that AC\_VO and AC\_VI have admission control mandatory. Couldn't the AP use statistics on the AC\_VI and AC\_VO frames that have passed through the AP, when ACM is not mandatory?*

With the proposed resolution of:

*Add support for calculating traffic self when not using admission control*

This document proposes normative text to accept the above comment resolution.

***Instructions to the TGaa editor are marked in purple italics.***

**Changes to the draft are marked in blue to indicate an addition and ~~blue strikethrough indicates deletion~~.**

Annex D

(normative)

**ASN.1 encoding of the MAC and PHY MIB**

***Add the following to annex D of P802.11aa D1.01***

dot11STAStatisticsAverageMSDUSizeVideo OBJECT-TYPE

SYNTAX Unsigned32 (0.. 7935)

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is a status variable.

It is written by the SME when a measurement report is completed or

by an external management entity. Changes from an external management

entity take effect as soon as practical in the implementation.

If dot11STAStatisticsMeasurementDuration is zero, this attribute

indicates the value of the Average MSDU size for the

Video Access Category returned from the STA in this STA Statistics

Report. If dot11STAStatisticsMeasurementDuration indicates

a non-zero value, this attribute indicates the difference in the

referenced size over the indicated duration.

Changes by an external management entity are ignored when

dot11STAStatisticsMeasurementDuration is non-zero.

"

DEFVAL { 1401 }

::= { dot11STAStatisticsReportEntry aa12 }

dot11STAStatisticsAverageMSDUSizeVoice OBJECT-TYPE

SYNTAX Unsigned32 (0.. 7935)

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is a status variable.

It is written by the SME when a measurement report is completed or

by an external management entity. Changes from an external management

entity take effect as soon as practical in the implementation.

If dot11STAStatisticsMeasurementDuration is zero, this attribute

indicates the value of the Average MSDU size for the

Voice Access Category returned from the STA in this STA Statistics

Report. If dot11STAStatisticsMeasurementDuration indicates

a non-zero value, this attribute indicates the difference in the

referenced size over the indicated duration.

Changes by an external management entity are ignored when

dot11STAStatisticsMeasurementDuration is non-zero.

Changes by an external management entity are ignored when

dot11STAStatisticsMeasurementDuration is non-zero.

"

 DEFVAL { 365 }

::= { dot11STAStatisticsReportEntry aa13 }

dot11STAStatisticsAverageBitrateVideo OBJECT-TYPE

SYNTAX Unsigned32 (0.. 4294967295)

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is a status variable.

It is written by the SME when a measurement report is completed or

by an external management entity. Changes from an external management

entity take effect as soon as practical in the implementation.

If dot11STAStatisticsMeasurementDuration is zero, this attribute

indicates the value of the Average PHY bitrate of MPDUs transmitted and

received using the Video Access Category returned from the STA in

this STA Statistics Report. If dot11STAStatisticsMeasurementDuration

indicates a non-zero value, this attribute indicates the difference

in the referenced size over the indicated duration.

Changes by an external management entity are ignored when

dot11STAStatisticsMeasurementDuration is non-zero.

Changes by an external management entity are ignored when

dot11STAStatisticsMeasurementDuration is non-zero.

"

::= { dot11STAStatisticsReportEntry aa14 }

dot11STAStatisticsAverageBitrateVoice OBJECT-TYPE

SYNTAX Unsigned32 (0.. 4294967295)

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is a status variable.

It is written by the SME when a measurement report is completed or

by an external management entity. Changes from an external management

entity take effect as soon as practical in the implementation.

If dot11STAStatisticsMeasurementDuration is zero, this attribute

indicates the value of the Average PHY bitrate of MPDUs transmitted and

received using the Voice Access Category returned from the STA in

this STA Statistics Report. If dot11STAStatisticsMeasurementDuration

indicates a non-zero value, this attribute indicates the difference

in the referenced size over the indicated duration.

Changes by an external management entity are ignored when

dot11STAStatisticsMeasurementDuration is non-zero.

Changes by an external management entity are ignored when

dot11STAStatisticsMeasurementDuration is non-zero.

"

::= { dot11STAStatisticsReportEntry aa15 }

dot11DefaultSurplusBandwidthAllowance OBJECT-TYPE

SYNTAX Unsigned32 (100 .. 255)

MAX-ACCESS read-write

STATUS current

DESCRIPTION

" This is a control variable.

It is written by an external management entity.

Changes take effect as soon as practical in the implementation.

This is a status variable.

This object specifies the default percentage surplus bandwidth allowance when

calculating medium time.

"

 DEFVAL { 11 }

::= { dot11STAStatisticsReportEntry aa16 }

***Insert the following clause before clause aa.2.1 in P802.11aa D1.0:***

aa.2.1a. Calculating Medium Time

This annex uses the following formula for calculating and estimating medium times in both ACM and non-ACM QoS modes:

mediumTime(s,d,m,p) = s \* pps \* MPDUExchangeTime

where:

pps = ceiling( (d / 8) / m )

MPDUExchangeTime = duration(m,p) + SIFS + duration(14,p)

duration() is the PLME-TXTIME primitive that returns the duration of a packet based on its payload size and the PHY data rate employed.

(also see the definition of MPDUExchangeTime in 9.9.3.1.2 (Procedure at non-AP STAs))

***Modify annex aa.2.1 in P802.11aa D1.01 as shown:***

aa.2.1. Calculating the Values in QLoad

The QLoad value represents the sum of all the streams derived from all the potential QoS traffic. The individual TSPEC elements and QoS Traffic Capability elements provided by the non-AP STAs are used by the AP to calculate mean, maximum and minimum values for:

* Medium Time, in multiples of 32µs, in the case of EDCA Admission Control
* HCCA Medium Time, in the case of HCCA; where HCCA Medium Time is the TXOP time scheduled by the HC converted to multiples of 32µs over a one second period, by multiplying the scheduled TXOP time by the reciprocal of the Service Interval (SI) that the HC has allocated.

TSPECs provide for mean, maximum and minimum values and these allow for statistical multiplexing of streams. The result of summing multiple streams is a composite stream and it is this composite stream that is recommended to be reported in the QLoad field. The summing of streams to produce a composite stream is achieved by using the mean and standard deviation of each stream.

It is recommended that the mean (*MEAN*), maximum (*MAX*) and minimum (*MIN*) values of the Medium or HCCA Medium Times~~,~~ are calculated using the values provided in the individual TSPECs, as follows:

For a TSPEC for stream, i, the mean value, *µ*, is:

 *MINi* = mediumTime(Surplus Bandwidth Allowance, Nominal MSDU Size,

Minimum Data Rate, Minimum PHY Rate)

 *MEANi* = mediumTime(Surplus Bandwidth Allowance, Nominal MSDU Size,

Mean Data Rate, Minimum PHY Rate)

 *MAXi* = mediumTime(Surplus Bandwidth Allowance, Nominal MSDU Size,

Peak Data Rate, Minimum PHY Rate)

*µi* = *MEANi*

~~and the standard deviation~~ If the Minimum Data Rate and Peak Data Rate fields were provided in the TSPEC element σ, is:

*σi* = 0.25 sqrt{(*MAXi* – *MINi*)2}

else if the Peak Data Rate field was provided in the TSPEC element σ is ~~or, if the MIN value is not provided~~

*σi* = (*MAXi* – *MEANi*)/2

otherwise ~~Note that if neither the~~ *~~MAXi~~* ~~nor the~~ *~~MINi~~* ~~values are provided, then~~ *σi* = 0

~~The values reported in the QLoad field represent the composite stream of all the individual streams and it is recommended that this composite stream is calculated as follows:~~

~~QLoad MEAN~~ *~~µ~~~~tot~~* ~~= Σ~~*~~MEANi~~*

~~QLoad STDEV~~ *~~σ~~~~tot~~* ~~= sqrt(Σ~~*~~σ~~~~i~~*~~2~~~~)~~

When the non-AP STA does not have any active TSPECs and has provided a QoS Traffic Capability element in its (Re)Association Request, the potential load information from the QoS Traffic Capability element is used as follows:

For a QoS Traffic Capability the mean value, *µ*, is:

 *µ0* = mediumTime(dot11DefaultSurplusBandwidthAllowance,

dot11STAStatisticsAverageMSDUSizeVideo,

 AC\_VI Peak Bitrate,

dot11STAStatisticsAverageBitrateVideo)

 *µ1* = mediumTime(dot11DefaultSurplusBandwidthAllowance,

dot11STAStatisticsAverageMSDUSizeVoice,

AC\_VO Peak Bitrate,

dot11STAStatisticsAverageBitrateVoice)

and the standard deviation, σ, is:

 *σ0* = 0

 *σ1* = 0

The values reported in the QLoad field represent the composite stream of all the individual streams of all associated STAs and it is recommended that this composite stream is calculated as follows:

QLoad MEAN *µtot* = Σ*MEANi*

QLoad STDEV *σtot* = sqrt(Σ*σi*2)

***Modify annex aa 2.3 in P802.11aa D1.01 as shown:***

aa 2.3. Calculation of Allocated Traffic Self

Allocated Traffic Self represents the total ~~composite~~ BSS load of all streams that the AP has allocated at any one time and the number of AC\_VI and AC\_VO streams that make up that total ~~composite stream~~.

It is recommended that the AP should calculate the mean and standard deviation using the Minimum Data Rate, Mean Data Rate and Peak Data Rate fields of admitted TSPECs and to re-calculate Allocated Traffic Self as each TS is added or deleted. It is recommended that the values of the mean and standard deviation placed in the Allocated Traffic Self field, for *i* allocated streams is calculated using:

 *MINi* = mediumTime(Surplus Bandwidth Allowance, Nominal MSDU Size,

Minimum Data Rate, Minimum PHY Rate)

 *MEANi* = mediumTime(Surplus Bandwidth Allowance, Nominal MSDU Size,

Mean Data Rate, Minimum PHY Rate)

 *MAXi* = mediumTime(Surplus Bandwidth Allowance, Nominal MSDU Size,

Peak Data Rate, Minimum PHY Rate)

If TSPECi has the Minimum Data Rate and Peak Data Rate fields populated:

*σi* = $\sqrt{\left(MAXi-MINi\right)^{2}}$

else if TSPECi has the Mean Data Rate and Peak Data Rate fields populated:

*σi* =$\frac{(MAXi-MEANi)}{2}$

otherwise*:*

*σi* =0

*MEAN* = Σ*MEANi*

*STDEV* = sqrt(Σ*σi*2)

When Admission Control is not used, it is recommended that the AP monitors the mean and maximum frame reception and transmission rates for AC\_VI and AC\_VO (for example by regular sampling of changes to dot11QosMPDUsReceivedCount and dot11QosTransmittedFrameCount of each AC). The MAX, MEAN and STDEV at time t for access category AC is:

*ppst* = $\frac{d}{dt}(dot11QosMPDUsReceivedCount\left[AC\right]+dot11QosTransmittedFrameCount\left[AC\right]-dot11QosFrameDuplicateCount[AC])$

Note ⎯The differentiation above calculates the packets per second for the given AC

*MEANi*  = dot11DefaultSurplusBandwidthAllowance \* (duration(dot11STAStatisticsAverageMSDUSizeVideo, dot11STAStatisticsAverageBitrateVideo) + SIFS + duration(14, dot11STAStatisticsAverageBitrateVideo)) \* ppst

duration() is the PLME-TXTIME primitive that returns the duration of a packet based on its payload size and the PHY data rate employed

*MAXt* is the maximum value of MEANt since MLME-START.confirm

*STDEVt* =$\frac{MAXt-MEANt}{2}$

~~It is recommended that as each stream is added or deleted, the AP should calculate the mean and standard deviation of the resulting composite stream, i.e. µ~~~~tot~~ ~~and~~~~σ~~~~tot~~~~.and note the total number of EDCA streams that are now admitted for this AP.~~

~~It is recommended that the values of the mean and standard deviation placed in the Allocated Traffic Self field, for~~ *~~i~~* ~~allocated streams is calculated using:~~

*~~MEAN~~* ~~= Σ~~*~~MEANi~~*

*~~STDEV~~* ~~= sqrt(Σ~~*~~σ~~~~i~~*~~2~~~~)~~

**References:**