

IEEE P802.11  
Wireless Access Method and Physical Layer Specifications

**Title: Proposed Changes to Draft Standard in order to support MultiRate PHYs**

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**Abstract:**

This submission contains the required changes to the Draft Standard (DOC: IEEE P802-11-93/020b0) in order to support Multiple BitRate PHYs.

**Related Documents:**

IEEE DOC P802.11-94/119: Gear Shifting Proposal  
IEEE DOC P802.11-93/20b0: Preliminary Draft Standard  
IEEE DOC P802.11-94/115: MAC Issues for supporting a dual rate PHY

## Changes Overview

The basic idea was presented in submission IEEE Doc P802.11-94/119.

The proposal is based on the following principles:

1. All ESSs have a set of Basic Rates at which all stations must be able to receive.
2. Each station has a single Default Rate selected from the Basic Rates at which all control, multicast and broadcast messages will be transmitted.
3. Rates outside the Basic Rates set will be included within an Extended Rates set. Communications at these rates will take place via rate negotiation using RTS/CTS:
  - A new field is added to **RTS messages: Requested\_Rate**, which indicates the maximum speed that the sender wants to transmit the data.
  - A new field is added to the **CTS messages: Granted\_Rate**, which indicates the acceptable bit rate at which the data transmission should take place and it is less or equal than the minimum between the Requested-Rate of the corresponding RTS and the maximum supported rate at the receiving station.
  - **Data Messages** belonging to an RTS/CTS MPDU are sent at the **Granted\_Rate**, or if the Granted\_Rate is not supported by the transmitting station, at the **BASIC\_RATE**.

The NAV vector will be updated as following:

When an RTS is seen, the NAV will be updated according to the Requested\_Rate.

When a CTS is seen, the NAV will be updated according to the Granted\_Rate.

Note that in order to speed up the time-critical transitions on the MAC State Machine, the semantics of the "duration" field in the RTS/CTS are changed to indicate "Data Length", this allows to keep the CTS unchanged, without any need for calculations. The overhead is passed to the NAV calculation which is not time-critical.

## Changes Description

### 1. Change Duration Field Semantics.

#### Text Location in Draft Standard:

Paragraph 4.1 Frame Formats, Page 4-4

#### Change Description:

Change Duration Element description to define data frame length in Bits instead of time in microseconds. The rationale behind this change is that the CTS will return exactly the same value regardless of the Requested/Granted Speed, hence reducing the required operations in this Time-critical part of the protocol. The calculation of the real duration will be performed by the stations receiving the RTS/CTS to calculate the NAV.

#### Is:

Duration: Time in microseconds of frame's transmission

#### Should be:

Data Length: Data Length in Bits

**2. Add Rate Field**

**Text Location in Draft Standard:**

Paragraph 4.1 Frame Formats, Page 4-4

**Change Description:**

Add a Type-Dependent field to be used on RTS/CTS Messages

**Text to be Added:**

Rate: This field describes the Requested Rate for the Transaction on the RTS frame, or the Granted Rate for the Transaction on the CTS frame.

**3. Change frame types figures**

**Text Location in Draft Standard:**

Paragraph 4.1 Frame Formats, Page 4-4

**Change Description:**

Change the figure to reflect the above mentioned changes.

**Was:**

RTS	Fixed Header	NID	Dest	Duration	CRC8
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CTS	Fixed Header	Duration	CRC8
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**Should Be:**

RTS	Fixed Header	NID	Dest	Rate	Data length	CRC8
-----	--------------	-----	------	------	-------------	------

CTS	Fixed Header	Rate	Data length	CRC8
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#### 4. Change/Add MAC Data Service Pseudo-Code

Text Location in Draft Standard:

Paragraph 5.1.4, Page 5-5

Add a Signal Indication: Rate = { Default-Rate if ((destination\_address == (broadcast | multicast)) or (requested\_service\_class <> async))  
else Granted\_Rate)

#### 5. Change/Add MAC Management Service Pseudo\_Code

Text Location in Draft Standard:

Paragraph 5.1.5, Page 5-6

Add a Signal Indication: Speed = { Basic\_Speed if ((destination\_address == (broadcast | multicast)) or (requested\_service\_class <> async))  
else Granted\_Speed)

#### 6. Change NAV Setting Procedure

Text Location in Draft Standard:

Paragraph 5.2.6.4. Page 5-11

The second paragraph says: "RTS and CTS frames contain a Duration Field ...."

Should be changed to: "RTS and CTS frames contain a Rate Field and a Data Length Field" that will be used to calculate what will be the medium occupancy from this MPDU until the End of the ACK frame...."

#### 7. Describe how a CTS frame is built based on a received RTS

(Author's note: I didn't find such description on the Draft)

Text Location in Draft Standard:

Probably Paragraph 5.2.7. Page 5-11

A station receiving an RTS addressed to its unicast address and with the TO\_AP bit reset, must respond with a CTS frame built as follows:

Fixed header:

The same but CTS type instead of RTS type

Rate:

The same as the Rate in RTS if this speed is supported by the receiving station, and the PMD\_Management indicates that the rate is acceptable, otherwise, this parameter will be set to Default\_Rate

Data\_Length: the same as the RTS's Data\_Length field

**8. Receive State Machine Changes**

Text Location in Draft Standard:  
Paragraph 5.5.2.2. Page 5-28

**Transition R20a Description:**

Was:

R20a, Other\_RTS: This transition shall be taken when the RTS receipt actions are complete and My\_addr is not set. The NAV shall be updated with the value in the Length field of the frame plus the value of RTS\_Time\_offset.....

Should be:

R20a, Other\_RTS: This transition shall be taken when the RTS receipt actions are complete and My\_addr is not set. The NAV shall be updated with the value in the Data\_Length field of the frame divided by the Speed field of the frame, plus the value of RTS\_Time\_offset.....

**Transition R30a Description:**

Was:

R30a, Other\_CTS: This transition shall be taken when the CTS receipt actions are complete and the MPDU\_ID is not equal to the Original\_ID. The NAV shall be updated with the value in the Length field of the frame plus the value of CTS\_Time\_offset.....

Should be:

R30a, Other\_CTS: This transition shall be taken when the CTS receipt actions are complete and the MPDU\_ID is not equal to the Original\_ID. The NAV shall be updated with the value in the Data\_Length field of the frame divided by the Speed field of the frame, plus the value of CTS\_Time\_offset.....

**Transition R12 Description:**

Was:

R12, Received\_RTS: When the frame is valid and the frame type is RTS, this transition shall be taken. Original\_ID shall be set to MPDU\_ID.

Add:

Requested\_Rate shall be set to the Rate field value.

**Transition R13 Description:**

Was:

R13, Received\_CTS: When the frame is valid and the frame type is CTS, this transition shall be taken.

Add:

Granted\_Rate shall be set to the Rate field value.

**9. Control State Machine Changes/Additions**

Text Location in Draft Standard:  
Paragraph 5.5.2.3. Page 5-31

**State C1, Transmit RTS:**

Add:

When building the RTS, always set Rate to MAX\_BITRATE.

**State C5, Transmit CTS:**

Add:

When building the CTS, set Rate = Requested\_Rate if the Requested\_Rate is acceptable for the Phy.

**State C3, Transmit Data:**

Add:

Set TX\_BIT\_RATE in PLME\_PARLIST (for the PHY\_DATA.request) to Granted\_Rate.