multiplexed into a MAC-e PDU in the order of absolute priority until the maximum amount of data allowed by the selected E-TFC size is reached 854. Preferably only the amount of scheduled data allowed by the grant is adjusted to more closely match the selected E-TFC. Non-scheduled MAC-d flow data that is multiplexed maybe restricted to the non-scheduled grant. Padding is then applied to match the selected E-TFC size 856. With this scheme, data can be transmitted exceeding the scheduled and/or non-scheduled grants.

[0046] Figure 9 illustrates an increased size MAC-e PDU 900 that fully utilizes a selected E-TFC size that supports the current grants. A MAC-e PDU header 902 and MAC-d flow data blocks 904a-904c are supported by the current scheduled and non-scheduled grants. Referring to Figures 8A, 8B and 9, the MAC-d flow data blocks 904a-904c are multiplexed into a MAC-e PDU in accordance with an absolute priority until the maximum amount of data allowed by the current scheduled and non-scheduled grants is reached. As shown in Figure 9, three (3) MAC-d flow data blocks 904a-904c are multiplexed as an example, and any number of MAC-d flow data blocks may be multiplexed. The smallest possible E-TFC is selected from a set of supported E-TFCs that is larger than the size of the multiplexed MAC-e PDU. If the selected E-TFC size exceeds the size of the multiplexed MAC-d flow data blocks 904a-904c and the MAC-e header 902 by more than the smallest MAC-d flow multiplexing block size, one or more additional MAC-d flow data blocks 904d are added as shown in Figure 9 in accordance with the absolute priority until no further MAC-d flow data blocks and associated MAC-e header information can fit within the selected E-TFC size. Preferably, only scheduled MAC-d flow data is added exceeding the current grant, but non-scheduled MAC-d flow data may also be added. Padding 906 is then applied to match the selected E-TFC size. With this scheme, MAC-d flow

PDU to match this size if necessary (step 1070). Otherwise, the next lower priority data available for transmission is selected in step 1075. It should be noted that rather ~~then~~ selecting the next lower priority in step 1075, it is also possible just to select the highest priority logical channel that has not been serviced, and continue the multiplexing loop until all logical channels are serviced.

[0057] In another embodiment as illustrated in Figures 11A and 11B taken together, a power offset of the selected MAC-d flow is identified, step 1301. Using the power offset, a maximum supported payload, such as the largest supported E- TFC that can be sent by the WTRU based on the offset and the remaining power allowed for E-DCH data is identified. This can be referred to as the E-TFC restriction procedure, step 1302. A variable, "Remaining Payload", is initially set to the maximum supported payload, step 1303. Based on the scheduled grant, a variable, "Remaining Scheduled Payload", is set to the largest payload that can be transmitted according to the scheduled grant and the power offset, step 1304. For each MAC-d flow with a non-scheduled grant, a variable, "Remaining Non- scheduled Payload", is set to the value of the grant, step 1305. A variable, "Non-scheduled Payload", is the amount of non-scheduled data that can be transmitted and is based on a sum of non-serving grants and the available data on each of these non-scheduled MAC-d flows, step 1306.

[0058] If the "Remaining Payload" is larger than the sum of the amount of available data allowed to be transmitted by the "Remaining Scheduled Payload", "Remaining Non-scheduled Payload" including any MAC header information and control signaling overhead, the next smaller supported E-TFC is selected based on the sum, step 1307. If the "Remaining Payload" is not larger than the sum, the largest supported E-TFC is used to limit the amount of multiplexed data. In the case that

data for that logical channel is filled, step 1311. The bits used to fill the MAC-e/es PDU are subtracted from the "Remaining Payload" and "Remaining Scheduled Payload", taking into account any MAC header information and control signaling overhead, step 1312. The process is repeated for all logical channels, or until the "Remaining Non-scheduled Payload" and "Remaining Scheduled Payload" are both used up, or "Remaining Payload" is used up, or there is no more available data to transmit step 1313. The MAC control signaling overhead such as scheduling information is added to the PDU and the PDU is padded to the selected E-TFC size, step 1314.

[0061] This procedure allows the UE operation to be "deterministic" and the Node-B scheduler can therefore accurately predict how resource grants will be used by the UE. As a result, the Node-B can more efficiently allocate resources. It is desirable to have the amount of multiplexed data adjusted (quantized) so that: first, physical resources are more efficiently utilized and second increased data rates are achieved. In order to accomplish this, it is necessary in the grant limited case that the E-TFC is selected based on the current grants, and this payload size is used to quantize the amount of scheduled data allowed by the grant before multiplexing of the MAC-e/es PDU. Better physical resource utilization and increased data rates ~~is~~ achieved by effecting the E-TFC selection and the multiplexing algorithm.

[0062] Figure 12 is a block diagram illustrating a simplified architecture for EU multiplexing. At the WTRU 1414, MAC-d flows 1403 for various logical channels 1402 are provided to the MAC-e/es 1404 by the MAC-d 1401. An E-TFC selection device 1405 selects an E-TFC for EU transmissions, such as on an enhanced dedicated channel (E-DCH) TTI basis. The E-TFC selection device 1405 receives inputs, such as scheduled grants (SG) 1406, non-scheduled grants (NSG) 1407, power

transmission, the smallest possible E-TFC size that supports the size of the multiplexed data is selected, and padding is added to the MAC-e PDU to match this size if necessary (step 1140). Otherwise, the next lower priority data available for transmission is selected in step 1145. It should be noted that rather ~~then~~ selecting the next lower priority in step 1145, it is also possible just to select the highest priority logical channel that has not been serviced.

[0070] Figure 14 is a flow diagram of a multiplexing procedure 1200 in accordance with another embodiment. In the grant limited case, MAC-d flow data is multiplexed into a MAC-e PDU until the amount of data allowed to be multiplexed by the scheduled or non-scheduled grant associated with each MAC-d flow is reached.

[0071] Before padding the MAC-e PDU to match the selected E-TFC size, more MAC-d flow data is multiplexed if the multiplexing block size, (the MAC-d PDU size), is less than the amount of padding required to match the next larger E-TFC size relative to the amount of data allowed by the scheduled and non- scheduled grants. Preferably for the additional multiplexing, only scheduled data of the highest priority that is available for transmission is used, and non-scheduled multiplexed data remains limited by the non-scheduled grants.

[0072] Alternatively, multiplexed data is reduced to support the next lower E-TFC size relative to the amount of data allowed by the scheduled and non-scheduled grants, if the multiplexing block size, (the MAC-d PDU size), is less than the amount of needed padding to the next higher E-TFC size. Optionally padding thresholds other than the multiplexing block size for reducing the E-TFC size can also be considered, or the required padding to match the next lower E-TFC size being less than the larger E-TFC by some margin could be used as a criteria for reducing the E-TFC size.

Claims

1. A method for multiplexing data for an enhanced dedicated channel (E-DCH), implemented in a wireless transmit/receive unit (WTRU), the method comprising:

receiving at least one serving grant and at least one non-scheduled grant, wherein the at least one serving grant is a grant for scheduled data transmission and the at least one non-scheduled grant is a grant for non-scheduled data transmission;

determining supported enhanced dedicated channel transport format combinations (E-TFCs);

determining an enhanced uplink medium access control (MAC-e) protocol data unit (PDU) payload amount;

for a logical channel, based on priority, multiplexing data from a medium access control for dedicated channel (MAC-d) flow associated with the logical channel into a MAC-e PDU, wherein on a condition that the MAC-e PDU payload amount is not equal to a supported E-TFC size, multiplexing a reduced amount of data from the MAC-d flow into the MAC-e PDU, wherein the reduced amount of data from the MAC-d flow is based on a next smaller E-TFC size relative to the MAC-e PDU payload amount;

selecting an E-TFC for transmission of the MAC-e PDU, wherein the selected E-TFC is a smallest E-TFC that supports the MAC-e PDU; and

transmitting the MAC-e PDU processed in accordance with the selected E-TFC.

2. The method of claim 1 wherein the supported E-TFCs are determined based on a remaining WTRU transmit power.

3. The method of claim 1 wherein the MAC-e PDU payload amount is based on the minimum of:

a largest supported E-TFC; or

a total amount of data allowed to be transmitted based on the at least one serving grant and the at least one non-scheduled grant.

4. The method of claim 3 wherein the largest supported E-TFC is based on a power offset.

5. The method of claim 4 wherein the power offset is the power offset of a MAC-d flow that allows a highest priority data to be transmitted.

6. The method of claim 1 wherein scheduling information is multiplexed into the MAC-e PDU.

7. The method of claim 1, further comprising receiving the MAC-e PDU at a physical layer and formatting the MAC-e PDU for transmission.

8. The method of claim 1 wherein the MAC-e PDU payload amount is reduced each time data of a MAC-d flow is multiplexed into the MAC-e PDU, wherein the MAC-e PDU payload amount is reduced by the amount of data multiplexed.

9. The method of claim 1, further comprising multiplexing a reduced amount of data from the MAC-d flow on a condition that the MAC-d flow is a scheduled MAC-d flow.

10. The method of claim 9 wherein only data from one scheduled MAC-d flow is reduced.

11. The method of claim 1 wherein the multiplexing data from a MAC-d flow is performed for each logical channel up to a minimum of:

a total amount of data allowed to be transmitted based on the at least one scheduled grant and the at least one non-scheduled grant;

data available for transmission; or

the MAC-e PDU payload amount.

12. The method of claim 11 wherein the total amount of data allowed to be transmitted based on the at least one scheduled grant and the at least one non-scheduled grant and the MAC-e PDU payload amount are reduced each time data of a MAC-d flow is multiplexed into the MAC-e PDU, wherein the reduction is based on the amount of data multiplexed.

13. A wireless transmit/receive unit (WTRU) comprising:

circuitry configured to receive at least one serving grant and at least one non-scheduled grant, wherein the at least one serving grant is a grant for scheduled data transmission and the at least one non-scheduled grant is a grant for non-scheduled data transmission;

circuitry configured to determine supported enhanced dedicated channel transport format combinations (E-TFCs);

circuitry configured to determine an enhanced uplink medium access control (MAC-e) protocol data unit (PDU) payload amount;

a multiplexing device configured to, for a logical channel based on priority, multiplex data from a medium access control for dedicated channel (MAC-d) flow associated with the logical channel into a MAC-e PDU, wherein on a condition that the MAC-e PDU payload amount is not equal to a supported E-TFC size, the multiplexing device is configured to multiplex a

reduced amount of data from the MAC-d flow into the MAC-e PDU, wherein the reduced amount of data from the MAC-d flow is based on a next smaller E-TFC size relative to the MAC-e PDU payload amount;

an E-TFC selection device configured to select an E-TFC for transmission of the MAC-e PDU, wherein the selected E-TFC is a smallest E-TFC that supports the MAC-e PDU; and

circuitry configured to transmit the MAC-e PDU processed in accordance with the selected E-TFC.

14. The WTRU of claim 13 wherein the supported E-TFCs are determined based on a remaining WTRU transmit power.

15. The WTRU of claim 13 wherein the MAC-e PDU payload amount is based on the minimum of:

a largest supported E-TFC; or

a total amount of data allowed to be transmitted based on the at least one serving grant and the at least one non-scheduled grant.

16. The WTRU of claim 15 wherein the largest supported E-TFC is based on a power offset.

17. The WTRU of claim 16 wherein the power offset is the power offset of a MAC-d flow that allows a highest priority data to be transmitted.

18. The WTRU of claim 13 wherein the multiplexing device is configured to multiplex scheduling information into the MAC-e PDU.

19. The WTRU of claim 13, further comprising a physical layer configured to receive the MAC-e PDU from the multiplexing device and configured to format the MAC-e PDU for transmission.

20. The WTRU of claim 13 wherein the MAC-e PDU payload amount is reduced each time data of a MAC-d flow is multiplexed into the MAC-e PDU, wherein the MAC-e PDU payload amount is reduced by the amount of data multiplexed.

21. The WTRU of claim 13 wherein the multiplexing device is configured to multiplex a reduced amount of data from the MAC-d flow on a condition that the MAC-d flow is a scheduled MAC-d flow.

22. The WTRU of claim 21 wherein only data from one scheduled MAC-d flow is reduced.

23. The WTRU of claim 13 wherein the multiplexing device is configured to multiplex data for each logical channel up to a minimum of:

a total amount of data allowed to be transmitted based on the at least one scheduled grant and the at least one non-scheduled grant;

data available for transmission; or

the MAC-e PDU payload amount.

24. The WTRU of claim 23 wherein the total amount of data allowed to be transmitted based on the at least one scheduled grant and the at least one non-scheduled grant and the MAC-e PDU payload amount are reduced each time data of a MAC-d flow is multiplexed into the MAC-e PDU, wherein the reduction is based on the amount of data multiplexed.

[0020] This quantization is applied when multiplexing is grant limited, and not limited by the maximum E-TFC size resulting from E-TFC restriction or limited by E-DCH data available for transmission.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] Figure 1 shows a 3G cellular system.

[0022] Figure 2 shows an EU protocol architecture in a WTRU.

[0023] Figure 3 illustrates a MAC-e PDU generation.

[0024] Figure 4 is a flow diagram of a process for generating MAC-e PDUs by quantizing the maximum amount of scheduled and/or non-scheduled data allowed to be transmitted in accordance with a first embodiment.

[0025] Figure 5 is a block diagram of a process for generating MAC-e PDUs by quantizing the maximum amount of non-scheduled data allowed to be multiplexed in accordance with another embodiment.

[0026] Figure 6 is a flow diagram of a process for generating a MAC-e PDU by reducing multiplexed data in accordance with another embodiment.

[0027] Figure 7 illustrates MAC-e PDU generation using the process of Figure 6.

[0028] Figure 8A is a flow diagram of a process for generating a MAC-e PDU by adding additional MAC-d flow data blocks in accordance with yet another embodiment.

[0029] Figure 8B is a flow diagram of a process for generating a MAC-e PDU by adding additional MAC-d flow data blocks in accordance with an alternative to the process of Figure 8A.

[0030] Figure 9 illustrates MAC-e PDU generation using the processes of Figures 8A and 8B.

multiplexed into a MAC-e PDU in the order of absolute priority until the maximum amount of data allowed by the selected E-TFC size is reached 854. Preferably only the amount of scheduled data allowed by the grant is adjusted to more closely match the selected E-TFC. Non-scheduled MAC-d flow data that is multiplexed maybe restricted to the nonscheduled grant. Padding is then applied to match the selected E-TFC size 856. With this scheme, data can be transmitted exceeding the scheduled and/or non-scheduled grants.

[0046] Figure 9 illustrates an increased size MAC-e PDU 900 that fully utilizes a selected E-TFC size that supports the current grants. A MAC-e PDU header 902 and MAC-d flow data blocks 904a-904c are supported by the current scheduled and non-scheduled grants. Referring to Figures 8A, 8B and 9, the MAC-d flow data blocks 904a-904c are multiplexed into a MAC-e PDU in accordance with an absolute priority until the maximum amount of data allowed by the current scheduled and nonscheduled grants is reached. As shown in Figure 9, three (3) MAC-d flow data blocks 904a-904c are multiplexed as an example, and any number of MAC-d flow data blocks may be multiplexed. The smallest possible ETFC is selected from a set of supported E-TFCs that is larger than the size of the multiplexed MAC-e PDU. If the selected E-TFC size exceeds the size of the multiplexed MAC-d flow data blocks 904a-904c and the MAC-e header 902 by more than the smallest MAC-d flow multiplexing block size, one or more additional MAC-d flow data blocks 904d are added as shown in Figure 9 in accordance with the absolute priority until no further MAC-d flow data blocks and associated MAC-e header information can fit within the selected E-TFC size. Preferably, only scheduled MAC-d flow data is added exceeding the current grant, but non-scheduled MAC-d flow data may also be added. Padding 906 is then applied to match the selected E-TFC size. With this scheme, MAC-d flow

PDU to match this size if necessary (step 1070). Otherwise, the next lower priority data available for transmission is selected in step 1075. It should be noted that rather than selecting the next lower priority in step 1075, it is also possible just to select the highest priority logical channel that has not been serviced, and continue the multiplexing loop until all logical channels are serviced.

[0057] In another embodiment as illustrated in Figures 11A and 11B taken together, a power offset of the selected MAC-d flow is identified, step 1301. Using the power offset, a maximum supported payload, such as the largest supported E- TFC that can be sent by the WTRU based on the offset and the remaining power allowed for E-DCH data is identified. This can be referred to as the E-TFC restriction procedure, step 1302. A variable, "Remaining Payload", is initially set to the maximum supported payload, step 1303. Based on the scheduled grant, a variable, "Remaining Scheduled Payload", is set to the largest payload that can be transmitted according to the scheduled grant and the power offset, step 1304. For each MAC-d flow with a non-scheduled grant, a variable, "Remaining Non- scheduled Payload", is set to the value of the grant, step 1305. A variable, "Non-scheduled Payload", is the amount of non-scheduled data that can be transmitted and is based on a sum of non-serving grants and the available data on each of these non-scheduled MAC-d flows, step 1306.

[0058] If the "Remaining Payload" is larger than the sum of the amount of available data allowed to be transmitted by the "Remaining Scheduled Payload", "Remaining Non-scheduled Payload" including any MAC header information and control signaling overhead, the next smaller supported E-TFC is selected based on the sum, step 1307. If the "Remaining Payload" is not larger than the sum, the largest supported E-TFC is used to limit the amount of multiplexed data. In the case that

data for that logical channel is filled, step 1311. The bits used to fill the MAC-e/es PDU are subtracted from the "Remaining Payload" and "Remaining Scheduled Payload", taking into account any MAC header information and control signaling overhead, step 1312. The process is repeated for all logical channels, or until the "Remaining Non-scheduled Payload" and "Remaining Scheduled Payload" are both used up, or "Remaining Payload" is used up, or there is no more available data to transmit step 1313. The MAC control signaling overhead such as scheduling information is added to the PDU and the PDU is padded to the selected E-TFC size, step 1314.

[0061] This procedure allows the UE operation to be "deterministic" and the Node-B scheduler can therefore accurately predict how resource grants will be used by the UE. As a result, the Node-B can more efficiently allocate resources. It is desirable to have the amount of multiplexed data adjusted (quantized) so that: first, physical resources are more efficiently utilized and second increased data rates are achieved. In order to accomplish this, it is necessary in the grant limited case that the E-TFC is selected based on the current grants, and this payload size is used to quantize the amount of scheduled data allowed by the grant before multiplexing of the MAC-e/es PDU. Better physical resource utilization and increased data rates are achieved by effecting the E-TFC selection and the multiplexing algorithm.

[0062] Figure 12 is a block diagram illustrating a simplified architecture for EU multiplexing. At the WTRU 1414, MAC-d flows 1403 for various logical channels 1402 are provided to the MAC-e/es 1404 by the MAC-d 1401. An E-TFC selection device 1405 selects an E-TFC for EU transmissions, such as on an enhanced dedicated channel (E-DCH) TTI basis. The E-TFC selection device 1405 receives inputs, such as scheduled grants (SG) 1406, non-scheduled grants (NSG) 1407, power

transmission, the smallest possible E-TFC size that supports the size of the multiplexed data is selected, and padding is added to the MAC-e PDU to match this size if necessary (step 1140). Otherwise, the next lower priority data available for transmission is selected in step 1145. It should be noted that rather than selecting the next lower priority in step 1145, it is also possible just to select the highest priority logical channel that has not been serviced.

[0070] Figure 14 is a flow diagram of a multiplexing procedure 1200 in accordance with another embodiment. In the grant limited case, MAC-d flow data is multiplexed into a MAC-e PDU until the amount of data allowed to be multiplexed by the scheduled or non-scheduled grant associated with each MAC-d flow is reached.

[0071] Before padding the MAC-e PDU to match the selected E-TFC size, more MAC-d flow data is multiplexed if the multiplexing block size, (the MAC-d PDU size), is less than the amount of padding required to match the next larger E-TFC size relative to the amount of data allowed by the scheduled and non- scheduled grants. Preferably for the additional multiplexing, only scheduled data of the highest priority that is available for transmission is used, and non-scheduled multiplexed data remains limited by the non-scheduled grants.

[0072] Alternatively, multiplexed data is reduced to support the next lower E-TFC size relative to the amount of data allowed by the scheduled and non-scheduled grants, if the multiplexing block size, (the MAC-d PDU size), is less than the amount of needed padding to the next higher E-TFC size. Optionally padding thresholds other than the multiplexing block size for reducing the E-TFC size can also be considered, or the required padding to match the next lower E-TFC size being less than the larger E-TFC by some margin could be used as a criteria for reducing the E-TFC size.

CLAIMS

1. A method for transmitting data over an enhanced dedicated channel (E-DCH), implemented by a wireless transmit/receive unit (WTRU), the method comprising:

receiving a scheduled grant and at least one non-scheduled grant, wherein the scheduled grant is a grant for scheduled data transmission and the at least one non-scheduled grant is a grant for non-scheduled data transmission;

transmitting an enhanced uplink medium access control (MAC-e) protocol data unit (PDU) over an E-DCH;

wherein the MAC-e PDU includes multiplexed data; wherein the multiplexed data includes scheduled data; wherein an amount of the multiplexed data is not greater than a size of a largest supported enhanced uplink transport format combination (E-TFC) size that does not exceed a size based on the received scheduled grant, the received at least one non-scheduled grant, and a power offset; and wherein the MAC-e PDU is transmitted based on a selected E-TFC, wherein the selected E-TFC is a smallest E-TFC that supports the multiplexed data of the MAC-e PDU.

2. The method of claim 1 wherein the supported E-TFCs are determined based on a remaining WTRU transmit power.

3. The method of claim 1 wherein the multiplexed data comprises medium access control for dedicated channel (MAC-d) flow data multiplexed into the MAC-e PDU based on a priority associated with the MAC-d flow data.

4. The method of claim 1 wherein scheduling information is multiplexed into the MAC-e PDU.

5. The method of claim 3 wherein an amount of MAC-d flow data to multiplex into the MAC-e PDU is a minimum of:

an amount based on the received scheduled grant and the received at least one non-scheduled grant;

an amount based on the size of the largest supported E-TFC that does not exceed the size based on the received scheduled grant, the received at least one non-scheduled grant, and the power offset; or

an amount of available MAC-d flow data.

6. A wireless transmit/receive unit (WTRU) comprising:

circuitry configured to receive a scheduled grant and at least one non-scheduled grant, wherein the scheduled grant is a grant for scheduled data

transmission and the at least one non-scheduled grant is a grant for non-scheduled data transmission;

circuitry configured to transmit an enhanced uplink medium access control (MAC-e) protocol data unit (PDU) payload amount over an enhanced dedicated channel (E-DCH);

wherein the MAC-e PDU includes multiplexed data; wherein the multiplexed data includes scheduled data; wherein an amount of the multiplexed data is not greater than a size of a largest supported enhanced uplink transport format combination (E-TFC) size that does not exceed a size based on the received scheduled grant, the received at least one non-scheduled grant, and a power offset; and wherein the MAC-e PDU is transmitted based on a selected E-TFC, wherein the selected E-TFC is a smallest E-TFC that supports the multiplexed data of the MAC-e PDU.

7. The WTRU of claim 6 wherein the supported E-TFCs are determined based on a remaining WTRU transmit power.

8. The WTRU of claim 6 wherein the multiplexed data comprises medium access control for dedicated channel (MAC-d) flow data multiplexed into the MAC-e PDU based on a priority associated with the MAC-d flow data.

9. The WTRU of claim 6 wherein the multiplexing device is configured to multiplex scheduling information into the MAC-e PDU.

10. The WTRU of claim 8 wherein an amount of MAC-d flow data to multiplex into the MAC-e PDU is a minimum of:

an amount based on the received scheduled grant and the received at least one non-scheduled grant;

an amount based on the size of the largest supported E-TFC that does not exceed the size based on the received scheduled grant, the received at least one non-scheduled grant, and the power offset; or

an amount of available MAC-d flow data.

11. The method of claim 1 wherein the scheduled grant originates from a Node-B, and the at least one non-scheduled grant originates from a radio network controller (RNC).

12. The method of claim 1 wherein the MAC-e PDU includes header information and wherein the selected E-TFC is a smallest E-TFC that supports the multiplexed data and header information.

13. The WTRU of claim 6 wherein the scheduled grant originates from a Node-B, and the at least one non-scheduled grant originates from a radio network controller (RNC).

14. The WTRU of claim 6 wherein the MAC-e PDU includes header information and wherein the selected E-TFC is a smallest E-TFC that supports the multiplexed data and header information.

15. A method for transmitting data over an enhanced uplink (EU) channel implemented by a wireless transmit/receive unit (WTRU), the method comprising:

receiving a scheduled grant and at least one non-scheduled grant, wherein the scheduled grant is a grant for scheduled data transmission and the at least one non-scheduled grant is a grant for non-scheduled data transmission;

transmitting a medium access control for EU channel (MAC-e) protocol data unit (PDU) over an EU channel; wherein the MAC-e PDU includes multiplexed data; wherein the MAC-e PDU includes scheduling information; wherein the multiplexed data includes scheduled data; wherein an amount of the multiplexed data is not greater than a size of a largest supported EU transport format combination (E-TFC) size that does not

exceed a size based on the received scheduled grant, the received at least one non-scheduled grant, a power offset, and a size of the scheduling information; and

wherein the MAC-e PDU is transmitted based on a selected E-TFC, wherein the selected E-TFC is a smallest E-TFC that supports the multiplexed data of the MAC-e PDU.

16. The method of claim 15 wherein the scheduled grant originates from a Node-B, and the at least one non-scheduled grant originates from a radio network controller (RNC).

17. The method of claim 15 wherein the multiplexed data comprises medium access control for dedicated channel (MAC-d) flow data multiplexed into the MAC-e PDU based on a priority associated with the MAC-d flow data.

18. The method of claim 17 wherein an amount of MAC-d flow data to multiplex into the MAC-e PDU is a minimum of:

an amount based on the received scheduled grant and the received at least one non-scheduled grant;

an amount based on the size of the largest supported E-TFC that does not exceed the size based on the received scheduled grant, the received at least one non-scheduled grant, and the power offset; or

an amount of available MAC-d flow data.

19. The method of claim 15 wherein the MAC-e PDU includes header information and wherein the selected E-TFC is a smallest E-TFC that supports the multiplexed data and header information.

20. A wireless transmit/receive unit (WTRU) comprising:

a receiver configured to receive a scheduled grant and at least one non-scheduled grant, wherein the scheduled grant is a grant for scheduled data transmission and the at least one non-scheduled grant is a grant for non-scheduled data transmission;

a transmitter configured to transmit a medium access control for enhanced uplink (EU) channel (MAC-e) protocol data unit (PDU) over an EU channel; wherein the MAC-e PDU includes multiplexed data; wherein the MAC-e PDU includes scheduling information; wherein the multiplexed data includes scheduled data; wherein an amount of the multiplexed data is not greater than a size of a largest supported EU transport format combination (E-TFC) size that does not exceed a size based on the received

scheduled grant, the received at least one non-scheduled grant, a power offset, and a size of the scheduling information; and

wherein the MAC-e PDU is transmitted based on a selected E-TFC, wherein the selected E-TFC is a smallest E-TFC that supports the multiplexed data of the-MAC-e PDU.

21. The WTRU of claim 20 wherein the scheduled grant originates from a Node-B, and the at least one non-scheduled grant originates from a radio network controller (RNC).

22. The WTRU of claim 20 wherein the multiplexed data comprises medium access control for dedicated channel (MAC-d) flow data multiplexed into the MAC-e PDU based on a priority associated with the MAC-d flow data.

23. The WTRU of claim 22 wherein an amount of MAC-d flow data to multiplex into the MAC-e PDU is a minimum of:

an amount based on the received scheduled grant and the received at least one non-scheduled grant;

an amount based on the size of the largest supported E-TFC that does not exceed the size based on the received scheduled grant, the received at least one non-scheduled grant, and the power offset; or

an amount of available MAC-d flow data.

24. The WTRU of claim 20 wherein the MAC-e PDU includes header information and wherein the selected E-TFC is a smallest E-TFC that supports the multiplexed data and header information.