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Title:	METHOD AND APPARATUS FOR PROCESSING BANDWIDTH INTENSIVE DATA STREAMS USING VIRTUAL MEDIA ACCESS CONTROL AND PHYSICAL LAYERS

PRELIMINARY AMENDMENT

Please enter the following amendments and remarks in the above-mentioned patent application.

The Commissioner is authorized to charge any extensions of time as well as any additional fees or credit any overcharges to Deposit Account No. 23-3030, but not to include any payment of issue fees.

Amendments to the Claims begin on page 2 of this paper.

Remarks/Arguments begin on page 10 of this paper.

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Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method of improving the performance of circuitry, comprising the steps of:

providing a processing interface that is adapted to be connected to an application interface of a wireless networking device, the application interface being associated with a first application, the first application providing, after the circuitry has been connected to the application interface and when the wireless networking device is being used, a first data stream and having a first wireless bandwidth requirement;

connecting first, second and third actual MAC interfaces to the processing interface;

connecting first, second and third actual PHY interfaces respectively to the first, second and third actual MAC interfaces;

respectively associating first, second and third wireless transceivers with the first, ~~and~~ second and third actual PHY interfaces, wherein each of the first, second and third wireless transceivers is suitable for use in a wireless local area network, and the first, second and third wireless transceivers, respectively, (i) have a first, second and third bandwidth availability up to first, second and third actual bandwidths, and (ii) are adapted to emit radio signals in first, second and third bands of frequencies, at least two of the first, second and third bands of frequencies being different;

forming in the processing interface (i) at least one virtual MAC interface and (ii) ~~first, second and third virtual PHY~~ at least one resource monitoring interface[[s]] that, after the circuitry has been connected to the application interface and during operation of the wireless networking device, feeds information regarding the bandwidth availabilities of the first, second and third wireless transceivers back to the at least one virtual MAC interface;

wherein the processing interface is configured to, after the circuitry has been connected to the application interface and when the wireless networking device is being used, and in a manner transparent to any layer of the wireless networking device above the processing interface,

(a) request or create (i) a first association between a recipient and the first actual MAC and PHY interfaces, (ii) a second association between the recipient and the second actual MAC and PHY interfaces, and (iii) a third association between the recipient and the third actual MAC and PHY interfaces,

(b) identify at least one first portion of the first actual bandwidth of the first wireless transceiver, the identified at least one first portion comprising a set of given resources,

(c) evaluate whether any of the given resources of the first identified actual bandwidth portion are unavailable for communication, and

(d) use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from any of the first, second and third actual MAC and PHY interfaces, using a subset of frequencies corresponding to only the given resources of the first bandwidth portion that are not unavailable for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application; and

wherein, after the circuitry has been connected to the application interface and when the wireless networking is being used, the wireless networking device's utilization of the first available bandwidth portion of the first wireless transceiver does not prevent any wireless networking device ~~devices~~ from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availability of the first wireless transceiver for data transmission or reception purposes at the same time that the first bandwidth portion is being used for data transmission purposes.

2. (Original) The method of claim 1, wherein the processing interface is adapted to be connected to an application interface of a wireless access point.

3. (Original) The method of claim 1, wherein at least two of the first, second and third frequency bands are specified in at least one member of the family of IEEE 802.11 standards that was in existence as of October 30, 2013.

4. (Original) The method of claim 1, wherein the at least one virtual MAC interface includes a decision block.

5. (Original) The method of claim 1, wherein the at least one virtual MAC interface includes a processing block.

6. (Original) The method of claim 1, wherein the at least one virtual MAC interface includes an ultra-streaming block.

7. (Currently Amended) The method of claim 1, wherein the ~~first virtual PHY~~ resource monitoring interface includes an RF block.

8. (Currently Amended) The method of claim 1, wherein the ~~second virtual PHY~~ processing interface comprises multiple resource monitoring interfaces ~~includes an RF block~~.

9. (Cancelled).

10. (Original) The method of claim 1, wherein the processing interface comprises multiple virtual MAC interfaces.

11. (Original) The method of claim 1, wherein the processing interface includes a bandwidth allocator.

12. (Original) The method of claim 1, wherein the first identified actual bandwidth portion is contiguous.

13. (Currently Amended) The method of claim 1, wherein the ~~first virtual PHY~~ resource monitoring interface is not contiguous with the at least one virtual MAC interface.

14. (Cancelled).

15. (Cancelled).

16. (Original) The method of claim 1,

wherein the processing interface is configured to, after the circuitry has been connected to the application interface and when the wireless networking device is being used, and in a manner transparent to any layer of the wireless networking device above the processing interface,

(a) identify at least one first portion of the second actual bandwidth of the second wireless transceiver, the first identified portion of the second wireless transceiver comprising a set of given resources,

(b) evaluate whether any of the given resources of the first identified actual bandwidth portion of the second wireless transceiver are unavailable for communication, and

(c) if none of the given resources of the first identified bandwidth portion of the first wireless transceiver are available for communication and if the first identified bandwidth portion of the second wireless transceiver is available for communication, use the second wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from any of the first, second and third actual MAC and PHY interfaces, using a subset of frequencies corresponding only to the given resources of the first identified actual bandwidth portion of the second wireless transceiver that are not unavailable for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application,

(d) if both the first identified actual bandwidth portions of the first and second wireless transceivers are available for communication,

(i) evaluate the data transfer characteristics of both,

(ii) if the data transfer characteristics of the first identified bandwidth portion of the first wireless transceiver are better than those of the first identified bandwidth portion of the second wireless transceiver, use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from any of the first, second and third actual MAC and PHY interfaces, using a subset of frequencies corresponding to only the given resources of the first identified bandwidth portion of the first wireless transceiver that are not unavailable for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and

(iii) if the data transfer characteristics of the first identified portion of the second wireless transceiver are better than those of the first identified bandwidth portion of the first wireless transceiver, use the second wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from any of the first, second and third actual MAC and PHY interfaces, using a subset of frequencies corresponding to only the given resources of the first identified bandwidth portion of the second wireless transceiver that are not unavailable for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application; and

wherein, after the circuitry has been connected to the application interface and when the wireless networking device is being used, the wireless networking device's utilization of the first identified actual bandwidth portion of the second wireless transceiver does not prevent any wireless networking device from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availability of the second wireless transceiver for data transmission or reception purposes.

17. (Original) The method of claim 16, wherein the data transfer characteristics are representative of one or more environmental conditions where the wireless networking device is used.

18. (Original) The method of claim 1, wherein the processing interface is configured to, after the circuitry has been connected to the application interface and when the wireless networking device is being used, and in a manner transparent to any layer of the wireless networking device above the processing interface, aggregate the first identified actual bandwidth portion of the first wireless transceiver with an identified first portion of an available bandwidth of the second wireless transceiver to at least partially simultaneously (i) transmit the first data stream to the first recipient from both of the first and second wireless transceivers or (ii) receive a second data stream from the recipient from both of the first and second wireless transceivers.

19. (Original) The method of claim 18, wherein the first data stream is substantially simultaneously transmitted to the recipient from both of the first and second wireless transceivers.

20. (Original) The method of claim 18, wherein the second data stream is simultaneously received by the wireless networking device from all of the first, second and third wireless transceivers.

21. (Original) The method of claim 18, wherein the identified first portion of the available bandwidth of the second wireless transceiver is contiguous.

22. (Original) The method of claim 18, wherein the processing interface is configured to, after the circuitry has been connected to the application interface and when the wireless networking device is being used, and in a manner transparent to any layer of the wireless networking device above the processing interface, aggregate the first identified actual bandwidth portion of the first wireless transceiver with the identified first portion of an available bandwidth of the second wireless transceiver and an identified first portion of an available bandwidth of the third wireless transceiver to at least partially simultaneously (i) transmit the first data stream to the first recipient from all of the first, second and third wireless transceivers or (ii) receive a second data stream from the recipient from all of the first, second and third wireless transceivers.

23. (Original) The method of claim 22, wherein the first data stream is substantially simultaneously transmitted to the recipient from all of the first, second and third wireless transceivers.

24. (Original) The method of claim 22, wherein the second data stream is simultaneously received by the wireless networking device from all of the first, second and third wireless transceivers.

25. (Original) The method of claim 22, wherein the identified first portion of the available bandwidth of the third wireless transceiver is contiguous.

26. (Original) The method of claim 1, wherein the processing interface is configured to, after the circuitry has been connected to the application interface and when the wireless

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networking device is being used, in a manner transparent to any layer of the wireless networking device above the processing interface,

(a) identify at least one first portion of bandwidth available for communication of the second wireless transceiver, the identified at least one first portion of the second wireless transceiver comprising a set of given resources,

(b) evaluate whether any of the given resources of the first identified portions of the first and second wireless transceivers are not unavailable for communication,

(c) use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of any of the first, second and third associations, using a specific subset of frequencies corresponding to the given resources of the identified first bandwidth portion of the first wireless transceiver that are not unavailable for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and

(d) use the second wireless transceiver to receive a second data stream from the recipient at least partially simultaneously with the first data stream being transmitted to the recipient from the first wireless transceiver, without requiring disassociation of any of the first, second and third associations, using a specific subset of frequencies corresponding to only the given resources of the identified first bandwidth portion of the second wireless transceiver that are not unavailable for communication to thereby at least partially satisfy a second wireless bandwidth requirement associated with the second data stream; and

wherein, after the circuitry has been connected to the application interface and when the wireless networking device is being used, the wireless networking device's utilization of the first bandwidth portions of the first and second wireless transceivers does not prevent any wireless networking device from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availabilities of the first and second wireless transceivers for data transmission or reception purposes at the same time that data is being transmitted from or received by the first and second wireless transceivers.

27. (Original) The method of claim 26, wherein the second data stream is received by the second wireless transceiver substantially simultaneously with the transmission of the first data stream from the first wireless transceiver.

28. (Original) The method of claim 26, wherein the start of the reception of the second data stream by the second wireless transceiver is substantially simultaneous with the start of the transmission of the first data stream from the first wireless transceiver.

29. (Original) The method of claim 26, wherein the end of the reception of the second data stream by the second wireless transceiver is substantially simultaneous with the end of the transmission of the first data stream from the first wireless transceiver.

30. (Original) The method of claim 26, wherein the processing interface is configured to, after the circuitry has been connected to the application interface and when the wireless networking device is being used, in a manner transparent to any layer of the wireless networking device above the processing interface,

(a) identify at least one second portion of bandwidth available for communication of the first wireless transceiver, the identified at least one second portion comprising a set of given resources,

(b) evaluate whether any of the given resources of the first and second identified portions of the first wireless transceiver are not unavailable for communication, and

(c) use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of any of the first, second and third associations, using a specific subset of frequencies corresponding to the given resources of the identified first and second bandwidth portion of the first wireless transceiver that are not unavailable for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application.

REMARKS

In view of the above amendments and the following remarks, reconsideration and further examination are respectfully requested.

Status of All of the Claims

Below is the status of the claims in this application.

1. Claim(s) pending: 1-8, 10-13 and 16-30.
2. Claim(s) canceled: 9 and 14-15.
3. Claim(s) added: none.
4. Claims withdrawn from consideration but not canceled: none.

Claim Support

It is believed that the above-identified amended claims are supported by the application as originally filed, such as at least ¶¶ [0017], [0021]–[0024], including priority to two provisional applications that were filed on October 30, 2013. See, for example, Figure 1 of the application as filed which is included in the 10/30/2013 provisional, Ser. No. 61/897,216. See also, for example, the priority charts that were included in a response filed in application Ser. No. 17/468,509 on 8/8/2023.

Patentability

The amended claims recite a "virtual MAC interface" formed in the "processing interface" that receives information regarding the "bandwidth availabilities" of the first, second and third transceivers that is provided by a "resource monitoring interface." The "resource monitoring interface" operates in a processing layer below the logical link layer and provides information about the bandwidth availability of the transceivers associated with the actual PHY interfaces. The bandwidth availability information the "resource monitoring interface" provides to the "virtual MAC interface" allows the "virtual MAC interface" to allocate portions of the actual bandwidth of each transceiver to satisfy application bandwidth needs.

The amended claims presented herein are valid over the prior art of record for several reasons. First, no prior art reference includes a virtual MAC interface as claimed. Second, no

prior art includes a resource monitoring interface that provides feedback to the virtual MAC interface about the bandwidth availabilities of any of the links available to it. Third, the routing decisions and link selection that may be disclosed in the prior art is done at a layer well above the MAC/PHY interface and, therefore, are not transparent to those interfaces as required by the amended claims.

The Examiner is respectfully requested to enter the amendments presented herein and allow this application to issue as a patent.

Conclusion

If after reviewing this amendment the Examiner feels that any issues remain which must be resolved before the application can be passed to issue, the Examiner is invited to contact the undersigned representative by telephone to resolve such issues.

Respectfully submitted

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