IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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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.

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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 a wireless networking device, comprising the steps of:

connecting an application interface to a processing interface, the application interface being associated with a first application ~~that~~, the first application providing, when the wireless networking device is being used, ~~provides~~ a first data stream and ~~that~~ havings a first wireless bandwidth requirement;

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

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

respectively associating first and second wireless transceivers with the first and second actual PHY interfaces, wherein each one of the first and second wireless transceivers (i) is ~~are~~ suitable for use in a wireless local area network, (ii) has~~ve~~ a first and second bandwidth availability up to a first and second actual bandwidth, and (iii) is ~~are~~ adapted to emit radio waves in first and second different bands of frequencies;

forming in the processing interface (i) at least one virtual MAC interface and (ii) first and second virtual PHY interfaces that, during operation of the wireless networking device, feed information regarding the bandwidth availabilities of the first and second wireless transceivers back to the at least one virtual MAC interface;

wherein the processing interface is configured to, when the wireless networking device is being used, ~~to,~~ 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 and (ii) a second association between the recipient and the second actual MAC and PHY interfaces, and

(b) (i) identify at least one portion of each one of the first and second bandwidth availabilities of the first and second wireless transceivers, and (ii) evaluate ~~compare the magnitude of the first bandwidth requirement of the first application to~~ the identified bandwidth availabilities of the first and second wireless transceivers with respect to the first bandwidth requirement of the first application;

wherein, if the first bandwidth requirement is at least partially satisfied by the bandwidth availabilities of the first and second wireless transceivers, ~~then~~ preparing the first data stream for simultaneous transmission to the recipient from both of the first and second wireless transceivers using a specific subset of frequencies corresponding to the identified at least one portions of their available bandwidth and ~~then~~ causing the prepared first data stream to be transmitted from the first and second wireless transceivers to thereby at least partially satisfy the first wireless bandwidth requirement of the first application; and

wherein the wireless networking device's utilization of the available bandwidth of the first and second wireless transceivers does not prevent ~~any~~ other wireless networking devices from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availability of the first and second wireless transceivers for data transmission purposes at the same time that processed data is being sent from the first and second wireless transceivers.

2. (Currently Amended) The method of claim 1,

wherein the application interface is associated with a second application, the second application providing ~~that~~, when the wireless networking device is being used, ~~provides~~ a second data stream and having~~s~~ a second wireless bandwidth requirement;

wherein the processing interface is configured to, when the wireless networking device is being used, ~~to,~~ in a manner transparent to any layer of the wireless networking device above the processing interface, (i) prepare the first and second data streams for simultaneous transmission to the recipient from both of the first and second wireless transceivers using a specific subset of frequencies corresponding to the identified at least one portions of their available bandwidth, and (ii) cause the prepared first and second data streams to be simultaneously transmitted from the first and second wireless transceivers to thereby at least partially satisfy the first and second wireless bandwidth requirements of the first and second applications.

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3. (Currently Amended) The method of claim 2,

wherein, if the identified at least one portion of the bandwidth of the first wireless transceiver becomes unavailable during use of the wireless networking device or if it has an unidentified portion of bandwidth availability that is greater than its identified at least one portion of bandwidth availability during use of the wireless networking device, ~~then~~ the processing interface is adapted to, as a result of the unavailability or the increased bandwidth availability and in a manner transparent to any layer of the wireless networking device above the processing interface,

(i) identify at least one new portion of the bandwidth of the first wireless transceiver that is available for communication and then select that wireless transceiver,

(ii) prepare the first and second data streams, without requiring the disassociation of the recipient from the actual MAC and PHY interfaces associated with any wireless transceiver, for transmission to the recipient from the first and second wireless transceivers using a specific subset of frequencies corresponding to the newly ~~its un~~identified at least one portion of available bandwidth of the first wireless transceiver as well as the identified at least one portion of available bandwidth of the second wireless transceiver, and

(iii) cause the first and second prepared data streams to be transmitted to the recipient from the first and second wireless transceivers, without requiring the disassociation of the recipient from the actual MAC and PHY interfaces of any wireless transceiver, to thereby continue to at least partially satisfy the first and second wireless bandwidth requirements of the first and second applications.

4. (Currently Amended) The method of claim 3,

wherein, if the identified at least one portion of the bandwidth of the second wireless transceiver becomes unavailable during use of the wireless networking device or if it has an unidentified portion of bandwidth availability that is greater than its identified at least one portion of bandwidth availability during use of the wireless networking device, ~~then~~ the processing interface is adapted to, as a result of the unavailability or the increased bandwidth availability and in a manner transparent to any layer of the wireless networking device above the processing interface,

(i) identify at least one new portion of the bandwidth of the second wireless transceiver that is available for communication and then select that wireless transceiver,

(ii) prepare the first and second data streams, without requiring the disassociation of the recipient from the actual MAC and PHY interfaces associated with any wireless transceiver, for transmission to the recipient from the first and second wireless transceivers using a specific subset of frequencies corresponding to the identified at least one portion of the bandwidth availability of the first wireless transceiver and the newly identified ~~its unidentified~~ at least one portion of available bandwidth of the second wireless transceiver, and

(iii) cause the first and second prepared data streams to be transmitted to the recipient from the first and second wireless transceivers, without requiring the disassociation of the recipient from the actual MAC and PHY interfaces of any wireless transceiver, to thereby continue to at least partially satisfy the first and second wireless bandwidth requirements of the first and second applications.

5. (Currently Amended) The method of claim 4, further comprising the steps of:

connecting a third actual MAC interface to the processing interface;

connecting a third actual PHY interface to the third actual MAC interface;

associating a third wireless transceiver with the third actual PHY interface, wherein the third wireless transceiver (i) is suitable for use in a wireless local area network, (ii) has a third bandwidth availability up to a third actual bandwidth, and (iii) is adapted to emit radio waves in a third band of frequencies;

forming in the processing interface a third virtual PHY interface that, during operation of the wireless networking device, feeds information regarding the bandwidth availability of the third wireless transceiver back to the at least one virtual MAC interface;

wherein the processing interface is configured to, when the wireless networking device is being used, ~~to,~~ in a manner transparent to any layer of the wireless networking device above the processing interface, request or create a third association between the recipient and the third actual MAC and PHY interfaces;

wherein, if the first and second bandwidth requirements are not at least partially satisfied by the bandwidth availabilities of the first and second wireless transceivers, ~~then~~ (i) identifying at least one portion of the bandwidth availability of the third wireless transceiver, (ii)

preparing the first and second data streams for simultaneous transmission to the recipient from all of the identified at least one portions of the bandwidths of the first, second and third wireless transceivers using a specific subset of frequencies corresponding to the identified at least one portions of their available bandwidth and ~~then~~ (iii) causing the prepared first and second prepared data streams to be transmitted from the first, second and third wireless transceivers to thereby at least partially satisfy the first and second wireless bandwidth requirements of the first and second applications; and

wherein the wireless networking device's utilization of the available bandwidth of the first, second and third wireless transceivers does not prevent ~~any~~ other wireless networking device<u>s</u> from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availability of the first, second and third wireless transceivers for data transmission purposes at the same time that processed data is being sent from the first, second and third wireless transceivers.

6. (Currently Amended) The method of claim 5, wherein the at least one portion of the third bandwidth of the <u>third</u> ~~first~~ transceiver comprises a single portion.

7. (Currently Amended) The method of claim 5, wherein the at least one portion <u>of</u> the third bandwidth of the third transceiver is contiguous.

8. (Original) The method of claim 5, wherein the third virtual PHY layer is not contiguous with the virtual MAC interface.

9. (Currently Amended) The method of claim 5, wherein at least one of the first, second and third wireless transceivers are adapted to communicate with a recipient via a variable duplex link <u>that exhibits an asymmetric transmit and receive profile that is programmable</u>.

10. (Canceled)

11. (Canceled)

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12. (Currently Amended) The method of claim 5~~11~~, wherein the wireless networking device comprises a first wireless access point that provides access to the internet within a first coverage area, the processing interface of the first wireless access point being configured to, during operation of the first wireless access point, establish a wireless link to a second wireless access point that has a second coverage area and a processing interface, the processing interfaces of the first and second wireless access points being configured, during their operation, to communicate with each other regarding at least one aspect of operation of the first wireless access point.

13. (Original) The method of claim 12, wherein the processing interface of the first wireless access point cooperates with the processing interface of the second wireless access point to define a distributed processing logic.

14. (Currently Amended) The method of claim 12, wherein the aspect of operation of the first wireless access point comprise~~s~~ aggregation of the bandwidth availabilities of the first, second and third wireless transceivers of the first wireless access point in a virtual link.

15. (Original) The method of claim 1, wherein the wireless networking device comprises a wireless access point.

16. (Original) The method of claim 1, wherein the wireless networking device comprises a handheld computing device.

17. (Original) The method of claim 16, wherein the handheld computing device comprises a tablet.

18. (Currently Amended) The method of claim 1, wherein each one of the first and second frequency bands is ~~are~~ specified in at least one member of the family of IEEE 802.11 standards.

19. (Original) The method of claim 18, wherein the at least one member of the family of IEEE 802.11 standards was in existence as of October 30, 2013.

20. (Original) The method of claim 1, wherein the virtual MAC interface includes a decision block.

21. (Original) The method of claim 1, wherein the virtual MAC interface includes a processing block.

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

23. (Original) The method of claim 1, wherein each one of the virtual PHY interface includes an RF block.

24. (Original) The method of claim 1, wherein the wireless networking device comprises a telephone.

25. (Currently Amended) The method of claim 1, wherein the at least one portion of the first bandwidth of the first transceiver comprises a single portion.

26. (Currently Amended) The method of claim 1, wherein the at least one portion of the first bandwidth of the first transceiver is contiguous.

27. (Currently Amended) The method of claim 1, wherein the at least one portion of the second bandwidth of the second transceiver comprises a single portion.

28. (Currently Amended) The method of claim 1, wherein the at least one portion of the second bandwidth of the second transceiver is contiguous.

29. (Original) The method of claim 1, wherein the first virtual PHY layer is not contiguous with the virtual MAC interface.

30. (Original) The method of claim 1, wherein the second virtual PHY layer is not contiguous with the virtual MAC interface.

31. (New) The method of claim 1, wherein multiple virtual MAC interfaces are formed in the processing interface.

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

REMARKS

Status of All of the Claims

Below is the status of the claims in this application.

1. Claim(s) pending: 1-9 and 12-32.
2. Claim(s) canceled: 10-11.
3. Claim(s) added: 31-32.
4. Claims withdrawn from consideration but not canceled: None.

Applicant notes that under the amendments presented herein there are still 30 total claims pending in accordance with the requirements of the Track One program.

Claim Support

It is believed that the above-identified amended claims are supported by the application as originally filed 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.

Double Patenting

In an effort to expedite the prosecution of this application, a terminal disclaimer was submitted upon filing to obviate any double patenting rejections that might be made with respect to any patents or applications that are related to this application. In particular, a terminal disclaimer was submitted relative to Ser. No. 17/468,509. That '509 Application has, in turn, terminal disclaimers granted relative to all patents and pending applications relating to this application, including the present application and co-pending Ser. No. 18/448,281. The Examiner's confirmation that the claims presented herein are not subject to rejection on a double patenting basis is respectfully requested.

Patentability of the Claims

In the last office action for a related application (Ser. No. 17/468,509), the Examiner indicated that (now-) cancelled claim 5, concerning feeding back to processing circuitry

information regarding the bandwidth availability of multiple transceivers, would be allowable if rewritten in independent form. Please note that this feature is included in all of the new claims as "wherein… during operation of the wireless networking device, feed information regarding the bandwidth availabilities of the first and second wireless transceivers back to the at least one virtual MAC interface" in independent claim 1. The claims presented herein also include a limitation regarding "band aggregation" whereby, for each transmission opportunity, the feedback provided to the at least one virtual MAC regarding bandwidth availabilities allows the networking device to transmit a data stream over portions of the bandwidth availability of multiple transceivers without requiring disassociation of the networking device from any recipient.

It is respectfully submitted that no prior art reference of record either taken alone or in combination with any other reference(s) of record render the above-described claims anticipated or obvious. For at least these reasons, it is respectfully submitted that the claims are in condition for allowance.

Conclusion

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

Respectfully submitted,

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