IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.:	18/787,267
Confirmation No.:	5460
First-Named Inventor:	Manapragada, Sai C.
Filing Date:	July 29, 2024
Group Art Unit:	Not Yet Known
Examiner:	Not Yet Known
Attorney Docket No.:	020505-000014
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 7 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. (Cancelled)

2. (New) A wireless networking device, comprising:

a processing interface configured to, during use of the wireless networking device, interact with an application providing a data stream and having a wireless bandwidth requirement;

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

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

first and second wireless transceivers respectively associated with the first and second actual PHY interfaces, wherein the first and second wireless transceivers (i) are suitable for use in a wireless local area network, (ii) respectively have first and second bandwidth availabilities up to first and second actual bandwidths, and (iii) are adapted to respectively emit radio waves in first and second different bands of frequencies; and

wherein the processing interface comprises,

at least one virtual MAC interface,

at least one resource monitoring interface that, during operation of the wireless networking device, provides information regarding the first and second bandwidth availabilities to the virtual MAC interface, and

the virtual MAC interface being configured to, during use of the wireless networking device and in a manner transparent to any layer of the wireless networking device above the processing interface,

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

(ii) use the information provided to it by the resource monitoring interface to make allocation decisions with respect to first and second bandwidth availabilities to at least partially satisfy the bandwidth requirement of the data stream.

3. (New) The wireless networking device of claim 2, wherein the first frequency band is specified in at least one member of the family of IEEE 802.11 standards that was in existence as of October 30, 2013.

4. (New) The wireless networking device of claim 2, wherein the second frequency band is specified in at least one member of the family of IEEE 802.11 standards that was in existence as of October 30, 2013.

5. (New) The wireless networking device of claim 2, wherein the at least one virtual MAC interface includes a decision block.

6. (New) The wireless networking device of claim 2, wherein the at least one virtual MAC interface includes a processing block.

7. (New) The wireless networking device of claim 2, wherein the at least one virtual MAC interface includes an ultra-streaming block.

8. (New) The wireless networking device of claim 2, wherein the resource monitoring interface comprises at least one RF block.

9. (New) The wireless networking device of claim 2, wherein the resource monitoring interface comprises multiple RF blocks.

10. (New) The wireless networking device of claim 2, wherein the resource monitoring interface is configured to, during use of the wireless networking device, process the data stream before it is sent to any actual MAC interface.

11. (New) The wireless networking device of claim 2, wherein the processing interface comprises multiple resource monitoring interfaces.

12. (New) The wireless networking device of claim 2, wherein the processing interface comprises multiple virtual MAC interfaces.

13. (New) The wireless networking device of claim 2, wherein the processing interface comprises a bandwidth allocator.

14. (New) The wireless networking device of claim 2, wherein the resource monitoring interface is not contiguous with the virtual MAC interface.

15. (New) The wireless networking device of claim 2, wherein the wireless networking device comprises a wireless access point.

16. (New) The wireless networking device of claim 2, wherein the information provided by the resource monitoring interface to the virtual MAC interface is received by the resource monitoring interface directly from at least one of the first and second actual PHY interfaces.

17. (New) The wireless networking device of claim 2, wherein the information provided by the resource monitoring interface to the virtual MAC interface is received by the resource monitoring interface directly from at least one of the first and second actual MAC interfaces.

18. (New) The wireless networking device of claim 2, wherein the allocation decisions involve use of at least some of the first and second bandwidth availabilities.

19. (New) The wireless networking device of claim 2, wherein the processing interface is configured to, 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, (i)

identify at least one portion of the actual bandwidth of one of the first and second wireless transceivers, the identified bandwidth portion comprising a set of given resources, and (ii) transmit the data stream to the recipient using only the given resources of the identified bandwidth portion that are not unavailable to thereby at least partially satisfy the bandwidth requirement.

20. (New) The wireless networking device of claim 19, wherein the processing interface is configured to, 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, (i) evaluate at least one data transfer characteristic of a first identified bandwidth portion of each of the first and second wireless transceivers, and (ii) transmit the data stream to the recipient using the first identified bandwidth portion of either the first or second wireless transceiver based upon a comparison of the evaluated data transfer characteristics.

21. (New) The wireless networking device of claim 20, wherein the evaluation of the at least one data transfer characteristic comprises evaluation of bandwidth unavailability.

22. (New) The wireless networking device of claim 21, wherein the evaluation of the at least one data transfer characteristic comprises evaluation of bandwidth unavailability and received signal strength of at least one communication from the recipient.

23. (New) The wireless networking device of claim 19, wherein the first identified bandwidth portion of the first wireless transceiver comprises two non-contiguous portions of the bandwidth of the first wireless transceiver.

24. (New) The wireless networking device of claim 23, wherein the first identified bandwidth portion of the second wireless transceiver comprises two non-contiguous portions of the bandwidth of the second wireless transceiver.

25. (New) The wireless networking device of claim 19, wherein the allocation decisions are based at least upon the type of information carried by the data stream.

26. (New) The wireless networking device of claim 19, wherein the processing interface is configured to, 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 a first identified bandwidth portion of the first wireless transceiver with a first identified bandwidth portion of the second wireless transceiver to at least partially satisfy the bandwidth requirement of the application.

27. (New) The wireless networking device of claim 19, wherein the processing interface is configured to, 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, transmit the data stream to the recipient using the first wireless transceiver and to receive a second data stream that is transmitted from the recipient using the second transceiver.

28. (New) The wireless networking device of claim 27, wherein the transmission of the data stream from the first wireless transceiver is at least partially simultaneous with the reception of the second data stream by the second wireless transceiver.

29. (New) The wireless networking device of claim 28, wherein the transmission of the data stream from the first wireless transceiver is simultaneous with the reception of the second data stream by the second wireless transceiver.

30. (New) The wireless networking device of claim 28, wherein a first identified portion of a bandwidth availability of a third wireless transceiver is aggregated with the first identified portion of the bandwidth of the first wireless transceiver to transmit the data stream to the recipient.

31. (New) The wireless networking device of claim 28, wherein a first identified portion of a bandwidth availability of a third wireless transceiver is aggregated with the first identified portion of the bandwidth of the second wireless transceiver to receive the second data stream from the recipient.

REMARKS

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

Status of All of the Claims

Below is the status of the claims in this application.

1. Claim(s) pending: 2-31.
2. Claim(s) canceled: 1.
3. Claim(s) added: 2-31.
4. Claims withdrawn from consideration but not canceled: none.

Claim and Specification Amendments

It is believed that the new claims are supported by the application as originally filed including, for example, the '216 and '219 provisional applications that were filed on October 30, 2013 and for which priority is claimed. See, for example, at least Figures 1-8 of the instant application that include all of the drawings of both provisional applications. The Examiner's confirmation of this is earnestly solicited.

New independent claim 2 recites that a virtual MAC interface uses information provided to it by the resource monitoring interface to make "allocation decisions" with respect to the bandwidth availabilities of the first and second wireless transceivers. It is respectfully submitted that, when the claim language is properly interpreted, the "allocation decisions" read on, for example, decisions covered by claims of applications related hereto. Within the scope of the claimed "allocation decisions" are, for example, the band selection feature claimed in USP 11849337, the band aggregation feature claimed in USP 11856414, the simultaneous transmit and receive feature claimed in USP 11974143 and the bandwidth portion selection feature claimed in pending application SN 18/621,425. This limitation is supported by at least paragraphs [0017]–[0018], [0027]–[0033] of the present application as filed.

Please note that new claims 16-17 recite that the information provided by the resource monitoring interface to the virtual MAC interface is received by the resource monitoring interface either directly from at least one of the first and second actual PHY interfaces or directly from at least one of the first and second actual MAC interfaces. Exemplary support for these

claims is illustrated, for example, in Figures 1-2 of the '216 provisional application which are included as Figures 1 and 3 of the instant application where:

1) The dashed line box surrounding two boxes labelled "MAC" 114 and "PHY" 116 in Figure 1 are schematic representations of the actual MAC and PHY layers of a wireless networking device that includes at least two wireless transceivers. A two-way arrow connects the dashed box with a "process layer" 104. This discloses that each actual MAC and each actual PHY in a particular wireless networking device communicates directly with the processing layer to allow it to receive information regarding bandwidth availabilities from the wireless transceiver associated with each MAC/PHY pair.
2) Figure 3 shows a virtual physical layer 304 that is connected to four actual MAC/PHY pairs each of which is associated with a wireless transceiver. The virtual physical layer 304 is shown in schematic form indicating that it contains an RF block for each one of the four actual MAC/PHY pairs shown in Figure 3. There the two arrows shown in Figure 3 illustrating communication from the virtual physical layer 304 to the virtual MAC layer 302 which indicates that each RF block provides the virtual MAC layer 302 with information regarding the bandwidth availabilities of the wireless transceivers associated with the four actual MAC/PHY pairs.

Note that new claim 10 recites that the resource monitoring interface is configured to, during use of the wireless networking device, process the data stream before it is sent to any actual MAC interface. Exemplary structure corresponding to this claim limitation is found, for example, in Figure 2 of the '216 provisional that is equivalent to Figure 3 of the instant application which shows a downward arrow from the virtual MAC layer 302 ending at each RF block in the virtual physical layer 304. This indicates that each RF block processes any data stream passed to it during use from the virtual MAC layer before it is processed by any actual MAC layer.

It is respectfully submitted that, when properly interpreted, new independent claim 2 does not include any of the limitations of any of the dependent claims such as, for example, dependent claims 10 and 16-17. The Examiner's confirmation of this is earnestly solicited.

Applicant also notes that the present amendments provide for 30 total claims pending, in

accordance with the requirements of the Track One program. Excess claims fees for ten claims (22-31) are submitted herewith.

Patentability

It is respectfully submitted that the new claims are patentable over all of the prior art of record either taken alone or in any purported combination with each other for a number of different reasons. First, no prior art reference includes at least one virtual MAC interface as claimed. Second, no prior art includes a processing interface having at least one resource monitoring interface that provides information to the virtual MAC interface about the bandwidth availabilities of the wireless transceivers in the wireless networking device. Third, the "allocation decisions" regarding the bandwidth availabilities of the wireless transceivers that may be disclosed in the prior art are done at a layer above the processing interface and, therefore, are not transparent to the processing interface as claimed in the new claims. The Examiner's confirmation of the patentability of the new claims is earnestly solicited.

Additionally, Applicant has previously submitted terminal disclaimers relative to all other issued and pending cases of Applicant related to this application, thus eliminating any potential basis for obviousness-type double patenting. Accordingly, Applicant respectfully submits that the case is in condition for allowance.

Conclusion

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

Respectfully submitted

By *<u>/Blake R. Hartz, Reg. No. 73453/</u>*

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.:	18/787,267
Confirmation No.:	5460
First-Named Inventor:	Manapragada, Sai C.
Filing Date:	July 29, 2024
Group Art Unit:	2412
Examiner:	Khawar, Saad
Attorney Docket No.:	020505-000014
Title:	METHOD AND APPARATUS FOR PROCESSING BANDWIDTH INTENSIVE DATA STREAMS USING VIRTUAL MEDIA ACCESS CONTROL AND PHYSICAL LAYERS

RESPONSE TO NON-FINAL OFFICE ACTION

In response to the Office Action dated September 26, 2024, 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 8 of this paper.

AMENDMENTS TO THE CLAIMS

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

Listing of Claims

1. (Cancelled)

2. (Previously Presented) A wireless networking device, comprising:

a processing interface configured to, during use of the wireless networking device, interact with an application providing a data stream and having a wireless bandwidth requirement;

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

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

first and second wireless transceivers respectively associated with the first and second actual PHY interfaces, wherein the first and second wireless transceivers (i) are suitable for use in a wireless local area network, (ii) respectively have first and second bandwidth availabilities up to first and second actual bandwidths, and (iii) are adapted to respectively emit radio waves in first and second different bands of frequencies; and

wherein the processing interface comprises,

at least one virtual MAC interface,

at least one resource monitoring interface that, during operation of the wireless networking device, provides information regarding the first and second bandwidth availabilities to the virtual MAC interface, and

the virtual MAC interface being configured to, during use of the wireless networking device and in a manner transparent to any layer of the wireless networking device above the processing interface,

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

(ii) use the information provided to it by the resource monitoring interface to make allocation decisions with respect to first and second bandwidth availabilities to at least partially satisfy the bandwidth requirement of the data stream.

3. (Previously Presented) The wireless networking device of claim 2, wherein the first frequency band is specified in at least one member of the family of IEEE 802.11 standards that was in existence as of October 30, 2013.

4. (Previously Presented) The wireless networking device of claim 2, wherein the second frequency band is specified in at least one member of the family of IEEE 802.11 standards that was in existence as of October 30, 2013.

5. (Previously Presented) The wireless networking device of claim 2, wherein the at least one virtual MAC interface includes a decision block.

6. (Previously Presented) The wireless networking device of claim 2, wherein the at least one virtual MAC interface includes a processing block.

7. (Previously Presented) The wireless networking device of claim 2, wherein the at least one virtual MAC interface includes an ultra-streaming block.

8. (Previously Presented) The wireless networking device of claim 2, wherein the resource monitoring interface comprises at least one RF block.

9. (Previously Presented) The wireless networking device of claim 2, wherein the resource monitoring interface comprises multiple RF blocks.

10. (Previously Presented) The wireless networking device of claim 2, wherein the resource monitoring interface is configured to, during use of the wireless networking device, process the data stream before it is sent to any actual MAC interface.

11. (Previously Presented) The wireless networking device of claim 2, wherein the processing interface comprises multiple resource monitoring interfaces.

12. (Previously Presented) The wireless networking device of claim 2, wherein the processing interface comprises multiple virtual MAC interfaces.

13. (Previously Presented) The wireless networking device of claim 2, wherein the processing interface comprises a bandwidth allocator.

14. (Previously Presented) The wireless networking device of claim 2, wherein the resource monitoring interface is not contiguous with the virtual MAC interface.

15. (Previously Presented) The wireless networking device of claim 2, wherein the wireless networking device comprises a wireless access point.

16. (Previously Presented) The wireless networking device of claim 2, wherein the information provided by the resource monitoring interface to the virtual MAC interface is received by the resource monitoring interface directly from at least one of the first and second actual PHY interfaces.

17. (Previously Presented) The wireless networking device of claim 2, wherein the information provided by the resource monitoring interface to the virtual MAC interface is received by the resource monitoring interface directly from at least one of the first and second actual MAC interfaces.

18. (Previously Presented) The wireless networking device of claim 2, wherein the allocation decisions involve use of at least some of the first and second bandwidth availabilities.

19. (Previously Presented) The wireless networking device of claim 2, wherein the processing interface is configured to, 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, (i) identify at least one portion of the actual bandwidth of one of the first and second wireless transceivers, the identified bandwidth portion comprising a set of given resources, and (ii) transmit the data stream to the recipient using only the given resources of the identified bandwidth portion that are not unavailable to thereby at least partially satisfy the bandwidth requirement.

20. (Previously Presented) The wireless networking device of claim 19, wherein the processing interface is configured to, 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, (i) evaluate at least one data transfer characteristic of a first identified bandwidth portion of each of the first and second wireless transceivers, and (ii) transmit the data stream to the recipient using the first identified bandwidth portion of either the first or second wireless transceiver based upon a comparison of the evaluated data transfer characteristics.

21. (Previously Presented) The wireless networking device of claim 20, wherein the evaluation of the at least one data transfer characteristic comprises evaluation of bandwidth unavailability.

22. (Previously Presented) The wireless networking device of claim 21, wherein the evaluation of the at least one data transfer characteristic comprises evaluation of bandwidth unavailability and received signal strength of at least one communication from the recipient.

23. (Previously Presented) The wireless networking device of claim 19, wherein the first identified bandwidth portion of the first wireless transceiver comprises two non-contiguous portions of the bandwidth of the first wireless transceiver.

24. (Previously Presented) The wireless networking device of claim 23, wherein the first identified bandwidth portion of the second wireless transceiver comprises two non-contiguous portions of the bandwidth of the second wireless transceiver.

25. (Currently Amended) The wireless networking device of claim 19, wherein the allocation decisions are based at least upon a signal type associated with ~~the type of information carried by~~ the data stream.

26. (Previously Presented) The wireless networking device of claim 19, wherein the processing interface is configured to, 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 a first identified bandwidth portion of the first wireless transceiver with a first identified bandwidth portion of the second wireless transceiver to at least partially satisfy the bandwidth requirement of the application.

27. (Previously Presented) The wireless networking device of claim 19, wherein the processing interface is configured to, 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, transmit the data stream to the recipient using the first wireless transceiver and to receive a second data stream that is transmitted from the recipient using the second transceiver.

28. (Previously Presented) The wireless networking device of claim 27, wherein the transmission of the data stream from the first wireless transceiver is at least partially simultaneous with the reception of the second data stream by the second wireless transceiver.

29. (Previously Presented) The wireless networking device of claim 28, wherein the transmission of the data stream from the first wireless transceiver is simultaneous with the reception of the second data stream by the second wireless transceiver.

30. (Previously Presented) The wireless networking device of claim 28, wherein a first identified portion of a bandwidth availability of a third wireless transceiver is aggregated with the first identified portion of the bandwidth of the first wireless transceiver to transmit the data stream to the recipient.

31. (Previously Presented) The wireless networking device of claim 28, wherein a first identified portion of a bandwidth availability of a third wireless transceiver is aggregated with the first identified portion of the bandwidth of the second wireless transceiver to receive the second data stream from the recipient.

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: 2-31.
2. Claim(s) canceled: 1.
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. For example, support for these amendments can be found at least at paragraphs [0020]–[0033] of the as-filed application.

Allowed/Allowable Claims; Section 112 Rejection

The Applicant wishes to thank the examiner for the indication in items 6-7 ("Allowable Subject Matter") on page 2 of the Office Action that claims 2-24 and 26-31 are allowable and that claim 25 would be allowable if the § 112 issue is overcome. Claim 25 has been amended to overcome the antecedent noted by the Examiner. Accordingly, Applicant respectfully requests withdrawal of the rejection and allowance of all claims.

Information Disclosure and Patentability

For purposes of completeness, an IDS is being filed herewith to cite additional references that are believed to be cumulative of references previously considered by the Examiner. See, for example, U.S. Patent No. 9,560,656, as well as the provisional application that resulted in U.S. Patent No. 9,516,540.

None of the cited references, either taken alone or in any purported combination with each other, disclose, teach, or suggest, for example, a virtual MAC layer and at least one resource monitoring interface that provides information regarding wireless transceiver bandwidth

availabilities to the virtual MAC layer. For this reason, for example, and unlike the inventions claimed in the instant application, the cited references require that routing decisions be made at a layer above the processing interface. As a result of this, those decisions are not made in a manner transparent to the layers above the processing interface, such as a data link layer, as required by the claims of the instant application. The Examiner's confirmation that the amended claims are patentable over the cumulative art submitted herewith is respectfully requested.

Examples of the references are discussed in the following paragraphs to help the Examiner more easily understand their irrelevancy:

1) While Figure 3 of U.S. Patent No. 8,078,208 shows a "virtual MAC 311" that is described at col. 6, l. 32 of the patent as a "single virtual MAC interface," the multi-radio communication protocol virtual layer 215 (which includes the virtual MAC 311) is located in the architecture as a part of the data link layer 211 shown in Figure 2. As such, all of the routing decisions made by the '208 patent are not transparent to all layers of the device above the processing interface as required by the claimed invention.
2) U.S. Patent No. 9,204,489 states that a multi-band mechanism (also referred to as "fast session transfer" (FST)) "may significantly improve user experience, for example, by offering real-time integration at the data link level between radios of different technologies, e.g., WGA-based and IEEE 802.11-based technologies." Col. 7, ll. 17-20. However, the circuity and logic of the '489 patent (which does not include a virtual MAC interface nor at least one resource monitoring interface) is at or above the data link layer, and thus does not operate in a manner transparent to any layer above a processing interface, as required by the claims of the instant application.
3) U.S. Patent No. 10,027,452 states that a transparent mode "may enable wireless communication unit 108 to transfer, for example, a session . . . between the first and second wireless communication frequency bands without interrupting, restarting and/or disrupting the session at an application-level" because an Internet-Protocol (IP) layer "may keep using the same MAC address after the transfer of the session." Col. 6, ll. 45-52. However, the circuity and logic of the '452 patent (which does not include a virtual MAC interface nor at least one resource monitoring interface) is at

the data link layer, and thus does not operate in a manner transparent to any layer above a processing interface, as required by the claims of the instant application.

CONCLUSION

Applicant submits that all issues are resolved and the application is in condition for allowance and requests notice thereof in due course. If the Examiner feels that any issues remain, the Examiner is invited to contact the undersigned representative.

Respectfully submitted,

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