**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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| Application No.: | 18/621,425 |
| Confirmation No.: | 7613 |
| First-Named Inventor: | Manapragada, Sai C. |
| Filing Date: | March 29, 2024 |
| Group Art Unit: | Not Yet Known |
| Examiner: | Not Yet Known |
| Attorney Docket No.: | 020505-000013 |
| 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 12 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 wireless networking device, comprising:

a processing interface that is connected to an application interface, the application interface being associated with a first application, the first application providing, when the wireless networking device is being used, a first data stream and having a first 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 each of the first and second wireless transceivers is suitable for use in a wireless local area network, and the first and second wireless transceivers, respectively, (i) have a first and second bandwidth availability up to first and second actual bandwidths, and (ii) are adapted to emit radio waves in first and second different bands of frequencies;

at least one virtual MAC interface and first and second virtual PHY interfaces formed in the processing interface 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, 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 and (ii) a second association between the recipient and the second actual MAC and PHY interfaces,

(b) identify at least one first and second portions of the first actual bandwidth of the first wireless transceiver, each one of the first and second identified bandwidth portions each having a set of given resources,

(c) evaluate the data transfer characteristics of the given resources of both the first and second identified bandwidth portions,

(d) if the data transfer characteristics of the first identified bandwidth portion are better than those of the second identified bandwidth portion, use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from either or both of the first and second actual MAC and PHY interfaces, using a subset of frequencies corresponding to only the given resources of the first identified bandwidth portion that are available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and

(e) if the data transfer characteristics of the second identified bandwidth portion are better than those of the first identified bandwidth portion, use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from either or both of the first and second actual MAC and PHY interfaces, using a subset of frequencies corresponding to only the given resources of the second identified bandwidth portion that are available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and

wherein, when the wireless networking is being used, the wireless networking device's utilization of the first and second identified bandwidth portions do not prevent any wireless networking device 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 or second identified bandwidth portions are [[is]] being used for data transmission purposes.

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

3. (Original) The wireless networking device of claim 1, wherein the first and second 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 wireless networking device of claim 1, wherein the at least one virtual MAC interface includes a decision block.

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

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

7. (Original) The wireless networking device of claim 1, wherein the first virtual PHY interface includes an RF block.

8. (Original) The wireless networking device of claim 1, wherein the second virtual PHY interface includes an RF block.

9. (Original) The wireless networking device of claim 1, wherein the processing interface comprises multiple virtual MAC interfaces.

10. (Original) The wireless networking device of claim 1, wherein the processing interface includes a bandwidth allocator.

11. (Original) The wireless networking device of claim 1, wherein the first identified actual bandwidth portion is contiguous.

12. (Original) The wireless networking device of claim 1, wherein the second identified actual bandwidth portion is contiguous.

13. (Original) The wireless networking device of claim 1, wherein the first virtual PHY interface is not contiguous with the at least one virtual MAC interface.

14. (Original) The wireless networking device of claim 1, wherein the second virtual PHY interface is not contiguous with the at least one virtual MAC interface.

15. (Original) The wireless networking device of claim 1, wherein the data transfer characteristics are representative of one or more environmental conditions where the wireless networking device is used.

16. (Currently Amended) The wireless networking device of claim 1, wherein the processing interface is configured to, when the wireless networking device is being used, in a manner transparent to any layer of the wireless networking device above the processing interface, aggregate the first and second identified actual bandwidth portions to at least partially simultaneously transmit the first data stream to the first recipient from the first wireless transceiver. ~~wherein the first identified bandwidth portion comprises a set of given resources, wherein the second identified bandwidth portion comprises a set of given resources, and 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,~~

~~(a) evaluate (i) the data transfer characteristics of the first identified bandwidth portion and (ii) the data transfer characteristics of the second identified bandwidth portion,~~

~~(b) if the data transfer characteristics of the first identified bandwidth portion are better than those of the second identified bandwidth portion, use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from either or both of the first and second actual MAC and PHY interfaces, using a subset of frequencies corresponding to only the given resources of the first identified bandwidth portion that are available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and~~

~~(c) if the data transfer characteristics of the second identified bandwidth portion are better than those of the first identified bandwidth portion, use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from either or both of the first and second actual MAC and PHY interfaces, using a subset of frequencies corresponding to only the given resources of the second identified bandwidth portion of the first wireless transceiver that are available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application.~~

17. (Currently Amended) The wireless networking device of claim 1 ~~16~~, 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,

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

(b) evaluate the data transfer characteristics of the ~~identified first bandwidth portion of the first wireless transceiver and the~~ given resources of the first identified ~~first~~ bandwidth portion of the second wireless transceiver,

(c) if the data transfer characteristics of the first identified bandwidth portion of the first wireless transceiver are better than the data transfer characteristics 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 either or both of the first and second 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 available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and

(d) if the data transfer characteristics of the first identified portion of the second wireless transceiver are better than the data transfer characteristics 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 either or both of the first and second 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 available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application; and

wherein, when the wireless networking is being used, the wireless networking device's utilization of the first identified available 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 at the same time that the first identified bandwidth portion is being used.

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

19. (Currently Amended) The wireless networking device of claim 1 ~~2~~, ~~wherein the first identified bandwidth portion of the first wireless transceiver comprises a set of given resources;~~ 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,

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

(b) aggregate the given resources of the first identified bandwidth portion of the first wireless transceiver that are available for communication with the given resources of the first identified bandwidth portion of the second wireless transceiver that are available for communication to at least partially simultaneously transmit the first data stream to the first recipient from both of the first and second wireless transceivers; and

wherein, when the wireless networking device is being used, the wireless networking device's utilization of the first identified available 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 at the same time that the first identified bandwidth portion is being used.

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

21. (Currently Amended) The wireless networking device of claim 16 ~~2~~, ~~wherein the first identified bandwidth portion of the first wireless transceiver comprises a set of given resources;~~ 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,

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

(b) aggregate the given resources of the first identified bandwidth portion of the first wireless transceiver that are available for communication with the given resources of the first identified bandwidth portion of the second wireless transceiver that are available for communication to cause the first and second wireless transceivers to at least partially simultaneously receive a second data stream from the recipient; and

wherein, when the wireless networking is being used, the wireless networking device's utilization of the first identified available 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 at the same time that the first identified bandwidth portion is being used.

22. (Original) The wireless networking device of claim 21, wherein the second data stream is substantially simultaneously received by both of the first and second wireless transceivers.



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23. (Currently Amended) The wireless networking device of claim 1 ~~2~~, ~~wherein the first identified bandwidth portion of the first wireless transceiver comprises a set of given resources;~~ wherein the processing interface is configured to, 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 first portion of the second actual bandwidth of the second wireless transceiver, wherein the first identified bandwidth portion of the second wireless transceiver comprises a set of given resources,

(b) use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of either or both of the first and second associations, using a specific subset of frequencies corresponding to the given resources of the first identified bandwidth portion of the first wireless transceiver that are available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and

(c) 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 either or both of the first and second associations, using a specific subset of frequencies corresponding to only the given resources of the first identified bandwidth portion of the second wireless transceiver that are available for communication to thereby at least partially satisfy a second wireless bandwidth requirement associated with the second data stream; and

wherein, when the wireless networking is being used, the wireless networking device's utilization of the first identified available 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 at the same time that the first identified bandwidth portion is being used.

24. (Original) The wireless networking device of claim 23, 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.



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25. (Original) The wireless networking device of claim 23, 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.

26. (Original) The wireless networking device of claim 23, 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.

27. (Currently Amended) The wireless networking device of claim 23, wherein the processing interface is configured to, when the wireless networking device is being used, in a manner transparent to any layer of the wireless networking device above the processing interface, aggregate at least one first portion of an actual bandwidth of a third wireless transceiver with ~~(i) the given resources of the first identified actual bandwidth portion of the first wireless transceiver that are available for communication and (ii)~~ the given resources of the first identified bandwidth portion of the second wireless transceiver that are available for communication to cause the ~~first and~~ second and third wireless transceivers to at least partially simultaneously receive a second data stream from the recipient.

28. (Original) The wireless networking device of claim 27, wherein the second data stream is substantially simultaneously received by both of the first and second wireless transceivers.

29. (Currently Amended) The wireless networking device of claim 23, wherein the processing interface is configured to, when the wireless networking device is being used, in a manner transparent to any layer of the wireless networking device above the processing interface, aggregate ~~at least one first portion of actual bandwidth of a third wireless transceiver with (i)~~ the given resources of the first and second identified actual bandwidth portions of the first wireless transceiver that are available for communication ~~and (ii) the given resources of the~~



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~~first portion of the second wireless transceiver that are available for communication~~ to at least partially simultaneously transmit the first data stream to the first recipient from ~~both of~~ the first ~~and second~~ wireless [[transceivers]] transceiver.

30. (Currently Amended) The wireless networking device of claim 29, wherein the first data stream is substantially simultaneously transmitted by ~~both of~~ the first ~~and second~~ wireless [[transceivers]] transceiver.



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## REMARKS

Please enter the amendments presented above.

### Status of All of the Claims

Below is the status of the claims in this application.

1. Claim(s) pending: 1-30.
2. Claim(s) canceled: None.
3. Claim(s) added: None.
4. Claim(s) amended: 1, 16-17, 19, 21, 23, 27 and 29-30.
5. Claims withdrawn from consideration but not canceled: None.

Applicant notes that there are still 30 total pending claims, in accordance with the requirements of the Track One program, and fees previously paid.

### 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, terminal disclaimers were filed with this application to obviate any double patenting rejections that might be made with respect to any patents or applications that are related to this application. The Examiner's confirmation that the claims presented herein are not subject to rejection on an obviousness type double patenting basis is respectfully requested.

### Claim Support and Patentability

In an office action for a related application (Ser. No. 17/468,509), the Examiner indicated that a dependent claim, which concerns 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 pending claims as the language "first and second virtual PHY layers … 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" that is recited in independent claim 1.

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.

As an additional matter, please note that claim 1 recites that the "application interface" is "associated with a first application" and that this language is used throughout various other patents and pending applications related to this application. This claim language should not be interpreted to require that an application be loaded onto the wireless networking device. Rather, when this language is properly interpreted, it covers the structure of a wireless networking device (*e.g.*, software and/or hardware) that allows an application to be run on it. Applications that are "associated with the application interface" can be added at any time such as, for example, being added by a manufacturer, wireless network provider, or an end user of the wireless networking device.

**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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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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| Application No.: | 18/621,425 |
| Confirmation No.: | 7613 |
| First-Named Inventor: | Manapragada, Sai C. |
| Filing Date: | March 29, 2024 |
| Group Art Unit: | 2412 |
| Examiner: | Khawar, Saad |
| Attorney Docket No.: | 020505-000013 |
| Title: | METHOD AND APPARATUS FOR PROCESSING BANDWIDTH INTENSIVE DATA STREAMS USING VIRTUAL MEDIA ACCESS CONTROL AND PHYSICAL LAYERS |

**AMENDMENT AFTER ALLOWANCE UNDER RULE 312**

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

a processing interface that is connected to an application interface, the application interface being associated with a first application, the first application providing, when the wireless networking device is being used, a first data stream and having a first 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 each of the first and second wireless transceivers is suitable for use in a wireless local area network, and the first and second wireless transceivers, respectively, (i) have a first and second bandwidth availability up to first and second actual bandwidths, and (ii) are adapted to emit radio waves in first and second different bands of frequencies;

at least one virtual MAC interface and ~~first and second virtual PHY~~ at least one resource monitoring interface[[s]] formed in the processing interface that, during operation of the wireless networking device, feeds 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, 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 and (ii) a second association between the recipient and the second actual MAC and PHY interfaces,

(b) identify at least one first and second portions of the first actual bandwidth of the first wireless transceiver, each one of the first and second identified bandwidth portions each having a set of given resources,

(c) evaluate the data transfer characteristics of the given resources of both the first and second identified bandwidth portions,

(d) if the data transfer characteristics of the first identified bandwidth portion are better than those of the second identified bandwidth portion, use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from either or both of the first and second actual MAC and PHY interfaces, using a subset of frequencies corresponding to only the given resources of the first identified bandwidth portion that are available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and

(e) if the data transfer characteristics of the second identified bandwidth portion are better than those of the first identified bandwidth portion, use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from either or both of the first and second actual MAC and PHY interfaces, using a subset of frequencies corresponding to only the given resources of the second identified bandwidth portion that are available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and

wherein, when the wireless networking is being used, the wireless networking device's utilization of the first and second identified bandwidth portions do not prevent any wireless networking device 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 or second identified bandwidth portions are being used for data transmission purposes.

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



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3. (Original) The wireless networking device of claim 1, wherein the first and second 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 wireless networking device of claim 1, wherein the at least one virtual MAC interface includes a decision block.

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

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

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

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

9. (Original) The wireless networking device of claim 1, wherein the processing interface comprises multiple virtual MAC interfaces.

10. (Original) The wireless networking device of claim 1, wherein the processing interface includes a bandwidth allocator.

11. (Original) The wireless networking device of claim 1, wherein the first identified actual bandwidth portion is contiguous.

12. (Original) The wireless networking device of claim 1, wherein the second identified actual bandwidth portion is contiguous.

13. (Original) The wireless networking device of claim 1, wherein the ~~first virtual PHY~~ resource monitoring interface is not contiguous with the at least one virtual MAC interface.

14. (Canceled.)

15. (Previously Presented) The wireless networking device of claim 1, wherein the data transfer characteristics of at least one of the first and second identified bandwidth portions of the first wireless transceiver are representative of one or more environmental conditions where the wireless networking device is used.

16. (Previously Presented) The wireless networking device of claim 1, wherein the processing interface is configured to, when the wireless networking device is being used, in a manner transparent to any layer of the wireless networking device above the processing interface, aggregate the first and second identified actual bandwidth portions to at least partially simultaneously transmit the first data stream to the first recipient from the first wireless transceiver.

17. (Previously Presented) The wireless networking device of claim 1, 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,

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

(b) evaluate data transfer characteristics of the given resources of the first identified bandwidth portion of the second wireless transceiver,

(c) if the data transfer characteristics of the first identified bandwidth portion of the first wireless transceiver are better than the data transfer characteristics 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 either

or both of the first and second 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 available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and

(d) if the data transfer characteristics of the first identified portion of the second wireless transceiver are better than the data transfer characteristics 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 either or both of the first and second 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 available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application; and

wherein, when the wireless networking is being used, the wireless networking device's utilization of the first identified available 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 at the same time that the first identified bandwidth portion is being used.

18. (Previously Presented) The wireless networking device of claim 17, wherein the data transfer characteristics of at least one of the first identified bandwidth portion of the first wireless transceiver and the first identified bandwidth portion of the second wireless transceiver are representative of one or more environmental conditions where the wireless networking device is used.

19. (Previously Presented) The wireless networking device of claim 1, 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,

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

(b) aggregate the given resources of the first identified bandwidth portion of the first wireless transceiver that are available for communication with the given resources of the first identified bandwidth portion of the second wireless transceiver that are available for communication to at least partially simultaneously transmit the first data stream to the first recipient from both of the first and second wireless transceivers; and

wherein, when the wireless networking device is being used, the wireless networking device's utilization of the first identified available 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 at the same time that the first identified bandwidth portion is being used.

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

21. (Previously Presented) The wireless networking device of claim 16, 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,

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

(b) aggregate the given resources of the first identified bandwidth portion of the first wireless transceiver that are available for communication with the given resources of the first identified bandwidth portion of the second wireless transceiver that are available for communication to cause the first and second wireless transceivers to at least partially simultaneously receive a second data stream from the recipient; and

wherein, when the wireless networking is being used, the wireless networking device's utilization of the first identified available 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 at the same time that the first identified bandwidth portion is being used.

22. (Original) The wireless networking device of claim 21, wherein the second data stream is substantially simultaneously received by both of the first and second wireless transceivers.

23. (Previously Presented) The wireless networking device of claim 1, wherein the processing interface is configured to, 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 first portion of the second actual bandwidth of the second wireless transceiver, wherein the first identified bandwidth portion of the second wireless transceiver comprises a set of given resources,

(b) use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of either or both of the first and second associations, using a specific subset of frequencies corresponding to the given resources of the first identified bandwidth portion of the first wireless transceiver that are available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and

(c) 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 either or both of the first and second associations, using a specific subset of frequencies corresponding to only the given resources of the first identified bandwidth portion of the second wireless transceiver that are available for communication to thereby at least partially satisfy a second wireless bandwidth requirement associated with the second data stream; and

wherein, when the wireless networking is being used, the wireless networking device's utilization of the first identified available 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 at the same time that the first identified bandwidth portion is being used.

24. (Original) The wireless networking device of claim 23, 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.

25. (Original) The wireless networking device of claim 23, 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.

26. (Original) The wireless networking device of claim 23, 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.

27. (Previously Presented) The wireless networking device of claim 23, wherein the processing interface is configured to, when the wireless networking device is being used, in a manner transparent to any layer of the wireless networking device above the processing interface, aggregate at least one first portion of an actual bandwidth of a third wireless transceiver with the given resources of the first identified bandwidth portion of the second wireless transceiver that are available for communication to cause the second and third wireless transceivers to at least partially simultaneously receive a second data stream from the recipient.

28. (Original) The wireless networking device of claim 27, wherein the second data stream is substantially simultaneously received by both of the first and second wireless transceivers.

29. (Previously Presented) The wireless networking device of claim 23, wherein the processing interface is configured to, when the wireless networking device is being used, in a manner transparent to any layer of the wireless networking device above the processing interface, aggregate the given resources of the first and second identified actual bandwidth portions of the first wireless transceiver that are available for communication to at least partially simultaneously transmit the first data stream to the first recipient from the first wireless transceiver.

30. (Previously Presented) The wireless networking device of claim 29, wherein the first data stream is substantially simultaneously transmitted by the first wireless transceiver.

## REMARKS

Applicant respectfully requests entry of the amendments presented herein under Rule 312 (37 C.F.R. § 1.312) and MPEP 714.16. The amended claims do not require additional search or examination and remain patentable for the reasons discussed below as well as in the recent Notice of Allowance and similar allowances in related applications. The amendments are needed to modify the claim language to more fully align with the scope of the disclosure, and were not presented earlier because prior amendments responded to issues raised in examination which were unrelated to the changes addressed herein.

## STATUS OF ALL OF THE CLAIMS

Below is the status of the claims in this application.

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

**Claim Support**

It is believed that the 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 the Examiner feels that any issues remain which must be resolved before the application can be allowed, the Examiner is invited to contact the undersigned representative.

Respectfully submitted,

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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

| | |
|---|---|
| Application No.: | 18/621,425 |
| Confirmation No.: | 7613 |
| First-Named Inventor: | Manapragada, Sai C. |
| Filing Date: | March 29, 2024 |
| Group Art Unit: | 2412 |
| Examiner: | Khawar, Saad |
| Attorney Docket No.: | 020505-000013 |
| Title: | METHOD AND APPARATUS FOR PROCESSING BANDWIDTH INTENSIVE DATA STREAMS USING VIRTUAL MEDIA ACCESS CONTROL AND PHYSICAL LAYERS |

**CORRECTED**
**AMENDMENT AFTER ALLOWANCE UNDER RULE 312**

Please enter the following amendments and remarks in the above-mentioned patent application. This Corrected Amendment After Allowance Under Rule 312 is being submitted to correct minor typographical errors in claim status identifiers (Claims 1 and 13) in the Amendment After Allowance Under Rule 312 filed herein on June 18, 2024. Please disregard the June 18 filing and instead consider this corrected filing.

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 11 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. (Currently Amended) A wireless networking device, comprising:

a processing interface that is connected to an application interface, the application interface being associated with a first application, the first application providing, when the wireless networking device is being used, a first data stream and having a first 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 each of the first and second wireless transceivers is suitable for use in a wireless local area network, and the first and second wireless transceivers, respectively, (i) have a first and second bandwidth availability up to first and second actual bandwidths, and (ii) are adapted to emit radio waves in first and second different bands of frequencies;

at least one virtual MAC interface and ~~first and second virtual PHY~~ at least one resource monitoring interface[[s]] formed in the processing interface that, during operation of the wireless networking device, feeds 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, 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 and (ii) a second association between the recipient and the second actual MAC and PHY interfaces,



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(b) identify at least one first and second portions of the first actual bandwidth of the first wireless transceiver, each one of the first and second identified bandwidth portions each having a set of given resources,

(c) evaluate the data transfer characteristics of the given resources of both the first and second identified bandwidth portions,

(d) if the data transfer characteristics of the first identified bandwidth portion are better than those of the second identified bandwidth portion, use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from either or both of the first and second actual MAC and PHY interfaces, using a subset of frequencies corresponding to only the given resources of the first identified bandwidth portion that are available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and

(e) if the data transfer characteristics of the second identified bandwidth portion are better than those of the first identified bandwidth portion, use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from either or both of the first and second actual MAC and PHY interfaces, using a subset of frequencies corresponding to only the given resources of the second identified bandwidth portion that are available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and

wherein, when the wireless networking is being used, the wireless networking device's utilization of the first and second identified bandwidth portions do not prevent any wireless networking device 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 or second identified bandwidth portions are being used for data transmission purposes.

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



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3. (Original) The wireless networking device of claim 1, wherein the first and second 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 wireless networking device of claim 1, wherein the at least one virtual MAC interface includes a decision block.

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

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

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

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

9. (Original) The wireless networking device of claim 1, wherein the processing interface comprises multiple virtual MAC interfaces.

10. (Original) The wireless networking device of claim 1, wherein the processing interface includes a bandwidth allocator.

11. (Original) The wireless networking device of claim 1, wherein the first identified actual bandwidth portion is contiguous.

12. (Original) The wireless networking device of claim 1, wherein the second identified actual bandwidth portion is contiguous.

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

14. (Canceled.)

15. (Previously Presented) The wireless networking device of claim 1, wherein the data transfer characteristics of at least one of the first and second identified bandwidth portions of the first wireless transceiver are representative of one or more environmental conditions where the wireless networking device is used.

16. (Previously Presented) The wireless networking device of claim 1, wherein the processing interface is configured to, when the wireless networking device is being used, in a manner transparent to any layer of the wireless networking device above the processing interface, aggregate the first and second identified actual bandwidth portions to at least partially simultaneously transmit the first data stream to the first recipient from the first wireless transceiver.

17. (Previously Presented) The wireless networking device of claim 1, 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,

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

(b) evaluate data transfer characteristics of the given resources of the first identified bandwidth portion of the second wireless transceiver,

(c) if the data transfer characteristics of the first identified bandwidth portion of the first wireless transceiver are better than the data transfer characteristics 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 either or both of the first and second 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 available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and

(d) if the data transfer characteristics of the first identified portion of the second wireless transceiver are better than the data transfer characteristics 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 either or both of the first and second 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 available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application; and

wherein, when the wireless networking is being used, the wireless networking device's utilization of the first identified available 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 at the same time that the first identified bandwidth portion is being used.

18. (Previously Presented) The wireless networking device of claim 17, wherein the data transfer characteristics of at least one of the first identified bandwidth portion of the first wireless transceiver and the first identified bandwidth portion of the second wireless transceiver are representative of one or more environmental conditions where the wireless networking device is used.

19. (Previously Presented) The wireless networking device of claim 1, 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,

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

(b) aggregate the given resources of the first identified bandwidth portion of the first wireless transceiver that are available for communication with the given resources of the first identified bandwidth portion of the second wireless transceiver that are available for communication to at least partially simultaneously transmit the first data stream to the first recipient from both of the first and second wireless transceivers; and

wherein, when the wireless networking device is being used, the wireless networking device's utilization of the first identified available 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 at the same time that the first identified bandwidth portion is being used.

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

21. (Previously Presented) The wireless networking device of claim 16, 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,

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

(b) aggregate the given resources of the first identified bandwidth portion of the first wireless transceiver that are available for communication with the given resources of the first identified bandwidth portion of the second wireless transceiver that are available for communication to cause the first and second wireless transceivers to at least partially simultaneously receive a second data stream from the recipient; and

wherein, when the wireless networking is being used, the wireless networking device's utilization of the first identified available 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 at the same time that the first identified bandwidth portion is being used.

22. (Original) The wireless networking device of claim 21, wherein the second data stream is substantially simultaneously received by both of the first and second wireless transceivers.

23. (Previously Presented) The wireless networking device of claim 1, wherein the processing interface is configured to, 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 first portion of the second actual bandwidth of the second wireless transceiver, wherein the first identified bandwidth portion of the second wireless transceiver comprises a set of given resources,

(b) use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of either or both of the first and second associations, using a specific subset of frequencies corresponding to the given resources of the first identified bandwidth portion of the first wireless transceiver that are available for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application, and

(c) 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 either or both of the first and second associations, using a specific subset of frequencies corresponding to only the given resources of the first identified bandwidth portion of the second wireless transceiver that are available for communication to thereby at least partially satisfy a second wireless bandwidth requirement associated with the second data stream; and

wherein, when the wireless networking is being used, the wireless networking device's utilization of the first identified available 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 at the same time that the first identified bandwidth portion is being used.

24. (Original) The wireless networking device of claim 23, 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.

25. (Original) The wireless networking device of claim 23, 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.

26. (Original) The wireless networking device of claim 23, 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.

27. (Previously Presented) The wireless networking device of claim 23, wherein the processing interface is configured to, when the wireless networking device is being used, in a manner transparent to any layer of the wireless networking device above the processing interface, aggregate at least one first portion of an actual bandwidth of a third wireless transceiver with the given resources of the first identified bandwidth portion of the second wireless transceiver that are available for communication to cause the second and third wireless transceivers to at least partially simultaneously receive a second data stream from the recipient.



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28. (Original) The wireless networking device of claim 27, wherein the second data stream is substantially simultaneously received by both of the first and second wireless transceivers.

29. (Previously Presented) The wireless networking device of claim 23, wherein the processing interface is configured to, when the wireless networking device is being used, in a manner transparent to any layer of the wireless networking device above the processing interface, aggregate the given resources of the first and second identified actual bandwidth portions of the first wireless transceiver that are available for communication to at least partially simultaneously transmit the first data stream to the first recipient from the first wireless transceiver.

30. (Previously Presented) The wireless networking device of claim 29, wherein the first data stream is substantially simultaneously transmitted by the first wireless transceiver.

## REMARKS

Applicant respectfully requests entry of the amendments presented herein under Rule 312 (37 C.F.R. § 1.312) and MPEP 714.16. The amended claims do not require additional search or examination and remain patentable for the reasons discussed below as well as in the recent Notice of Allowance and similar allowances in related applications. The amendments are needed to modify the claim language to more fully align with the scope of the disclosure, and were not presented earlier because prior amendments responded to issues raised in examination which were unrelated to the changes addressed herein.

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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.

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**Conclusion**

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