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

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| Application No.: | 18/532,175 |
| Confirmation No.: | 1075 |
| First-Named Inventor: | Manapragada, Sai C. |
| Group Art Unit: | Not Yet Known |
| Examiner: | Not Yet Known |
| Attorney Docket No.: | 020505-000009 |
| 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 9 of this paper.



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**Amendments to the Claims**

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

Listing of Claims:

1. (Currently Amended) A method of improving the performance of a wireless networking device, comprising the steps of:

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

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

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

respectively associating first and second wireless transceivers with the first and second actual PHY interfaces, wherein each 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) ~~(iii)~~ are adapted to emit radio waves in first and second different bands of frequencies;

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

wherein the processing interface is configured to, when the wireless networking device is being used, 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) respectively identify at least first and second portions of the first and second actual bandwidths of the first and second wireless transceivers, and



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(c) evaluate the data transmission characteristics of the first and second actual bandwidth portions;

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, if only one of the first and second actual bandwidth portions is available for communication, use the wireless transceiver having that only one bandwidth portion to transmit the first data stream to the recipient, without requiring the disassociation of the recipient from either or both of the first and second actual MAC and PHY interfaces, using a ~~specific~~ subset of frequencies corresponding to the only one of the first and second bandwidth portions to thereby at least partially satisfy the first wireless bandwidth requirement of the first application;

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, if both of the first and second actual bandwidth portions are available for communication, use ~~transmit the first data stream to the recipient from~~ the wireless transceiver having an available bandwidth portion with superior data transfer characteristics to transmit the first data stream to the recipient, without requiring the disassociation of the recipient from either or both of the first and second actual MAC and PHY interfaces, using a ~~specific~~ subset of frequencies corresponding to the available bandwidth portion with superior data transfer characteristics to thereby at least partially satisfy the first wireless bandwidth requirement of the first application; and

wherein the wireless networking device's utilization of the first or second available bandwidth portions does not prevent the wireless networking device from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availabilities of the first and second wireless transceivers for data transmission or reception purposes at the same time that the first or second bandwidth portions are being used for data transmission purposes.

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

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

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

5. (Currently Amended) The method of claim 1, wherein the first and second bands of frequencies are both different than ~~above~~ a 2.4 GHz band.

6. (Original) The method of claim 5, wherein each one of the first and second frequency bands are specified in at least one member of the family of IEEE 802.11 standards.

7. (Currently Amended) The method of claim 6, wherein ~~the~~ at least one of the first and second frequency bands is specified in at least one member of the family of IEEE 802.11 standards that was in existence as of October 30, 2013.

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

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

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

11. (Original) The method of claim 1, wherein the first virtual PHY interface includes an RF block.

12. (Original) The method of claim 1, wherein the second virtual PHY interface includes an RF block.

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

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

15. (Original) The method of claim 1, wherein the first actual bandwidth portion comprises a single portion.

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

17. (Original) The method of claim 1, wherein the second actual bandwidth portion comprises a single portion.

18. (Original) The method of claim 1, wherein the second actual bandwidth portion is contiguous.

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

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

21. (Currently Amended) The method 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, if both of the first and second actual bandwidth portions are available for communication during use but the data transmission characteristics of the first and second actual bandwidth portions change to make the first one have superior data transfer characteristics, transmit the first data stream from the first wireless transceiver, without requiring

the disassociation of the recipient from either or both of the first and second actual MAC and PHY interfaces, using a ~~specific~~ subset of frequencies corresponding to the first available bandwidth portion to thereby continue to at least partially satisfy the first wireless bandwidth requirement of the first application.

22. (Currently Amended) The method of claim 21, wherein the application interface is associated with a second application, the second application providing, when the wireless networking device is being used, a second data stream and having a second wireless bandwidth requirement;

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, cause the first and second data streams to be simultaneously transmitted to the recipient based upon the availability and data transfer characteristics of the first and second actual bandwidth portions.

23. (Original) The method of claim 22,

wherein, if the first or second actual bandwidth portions becomes unavailable during use of the wireless networking device, the processing interface is configured to, as a result of the unavailability and in a manner transparent to any layer of the wireless networking device above the processing interface, identify at least one new portion of the bandwidth of the first or second wireless transceiver that is available for communication and use that at least one new bandwidth portion in place of the unavailable one of the first and second actual bandwidth portions.

24. (Currently Amended) The method of claim 23, further comprising the steps of:

connecting a third actual MAC interface to the processing interface;

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

associating a third wireless transceiver with the third actual PHY interface,

wherein the third wireless transceiver (i) is suitable for use in a wireless local area network, (ii) has a third bandwidth availability up to a third actual bandwidth, and (iii) is adapted to emit radio

waves in a third band of frequencies that is different from at least one of the first and second frequency bands;

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

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, request or create a third association between a first recipient and the third actual MAC and PHY interfaces.

25. (Original) The method of claim 24, 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, use the third wireless transceiver to receive a data stream transmitted to the wireless networking device from the first recipient at least partially simultaneously with the transmission of the first data stream to the recipient using the first and second wireless transceivers.

26. (Original) The method of claim 25, wherein the transmission of the first data stream to the recipient occurs simultaneously with reception of the data stream transmitted from the first recipient.

27. (Cancelled).

28. (Cancelled).

29. (Cancelled).

30. (Currently Amended) The method of claim 25~~24~~, wherein the third wireless transceiver is configured to receive a data stream at the same time as when the third wireless transceiver is configured to transmit a data stream.

31. (New) The method of claim 24, wherein, during use of the wireless networking device, at least one portion of the available bandwidth of the third wireless transceiver is aggregated with a portion of the available bandwidth of the first or second wireless transceiver to transmit the first data stream to the recipient.

32. (New) The method of claim 1, wherein the data transfer characteristics of the first and second actual bandwidth portions are representative of one or more environmental conditions where the wireless networking device is used.

33. (New) The method of claim 1, wherein the data transfer characteristics of the first and second actual bandwidth portions are consistent with their size.

## 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: 1-26 and 30-33.
2. Claim(s) canceled: 27-29.
3. Claims(s) amended: 1, 5, 7, 21-22, 24 and 30.
4. Claim(s) added: 31-33.
5. Claims withdrawn from consideration but not canceled: None.

Applicant notes that the present amendments include 30 total claims, in accordance with the requirements of the Track One program.

### Claim Support

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

### Double Patenting

In an effort to expedite the prosecution of this application, 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.

### 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. The claims presented herein also include a "band selection" feature that allows, for each transmission opportunity, a single transceiver to be used that has at least one available bandwidth portion having superior data transfer characteristics without requiring disassociation of the wireless networking device from any recipient.

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

**Conclusion**

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

Respectfully submitted

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

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| Application No.: | 18/532,175 |
| Confirmation No.: | 1075 |
| First-Named Inventor: | Manapragada, Sai C. |
| Group Art Unit: | Not Yet Known |
| Examiner: | Not Yet Known |
| Attorney Docket No.: | 020505-000009 |
| Title: | METHOD AND APPARATUS FOR PROCESSING BANDWIDTH INTENSIVE DATA STREAMS USING VIRTUAL MEDIA ACCESS CONTROL AND PHYSICAL LAYERS |

## SECOND PRELIMINARY AMENDMENT

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

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

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

**Remarks/Arguments** begin on page 10 of this paper.

**Amendments to the Claims**

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

Listing of Claims:

1. (Currently Amended) A method of improving the performance of a wireless networking device, comprising the steps of:

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

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

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

respectively associating first and second wireless transceivers with the first and second actual PHY interfaces, wherein each 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;

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

wherein the processing interface is configured to, when the wireless networking device is being used, 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) respectively identify at least first and second portions of the first ~~and second~~ actual bandwidth[[s]] of the first and second wireless transceiver[[s]], and

(c) evaluate the data transmission characteristics of the first and second identified actual bandwidth portions;

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, if only one of the first and second actual bandwidth portions is available for communication, use the first wireless transceiver ~~having that only one bandwidth portion~~ to transmit the first data stream to the recipient, without requiring the 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 the only one of the first and second bandwidth portions to thereby at least partially satisfy the first wireless bandwidth requirement of the first application;

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, if both of the first and second actual bandwidth portions are available for communication, use the first wireless transceiver ~~having an available bandwidth portion with superior data transfer characteristics~~ to transmit the first data stream to the recipient, without requiring the 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 the first and second available bandwidth portions of the first wireless transceiver ~~with superior data transfer characteristics~~ to thereby at least partially satisfy the first wireless bandwidth requirement of the first application; and

wherein the wireless networking device's utilization of the first or second available bandwidth portions of the first wireless transceiver do[[es]] not prevent any ~~the~~ wireless networking device from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availabilities of the first ~~and second~~ wireless transceiver[[s]] for data transmission or reception purposes at the same time that the first or second bandwidth portions are being used for data transmission purposes.

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

3. (Cancelled).

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

5-6. (Cancelled).

7. (Currently Amended) The method of claim ~~6~~1, wherein ~~at least one of~~ the first and second frequency bands are [[is]] specified in at least one member of the family of IEEE 802.11 standards that was in existence as of October 30, 2013.

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

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

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

11. (Original) The method of claim 1, wherein the first virtual PHY interface includes an RF block.

12. (Original) The method of claim 1, wherein the second virtual PHY interface includes an RF block.

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

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

15. (Currently Amended) The method of claim 1, wherein the first identified actual bandwidth portion comprises a single portion.

16. (Currently Amended) The method of claim 1, wherein the first identified actual bandwidth portion is contiguous.

17. (Currently Amended) The method of claim 1, wherein the second identified actual bandwidth portion comprises a single portion.

18. (Currently Amended) The method of claim 1, wherein the second identified actual bandwidth portion is contiguous.

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

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

21-33. (Cancelled).

34. (New) The method 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 and (b) evaluate the data transfer characteristics of the identified first bandwidth portion of the second wireless transceiver;

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, if neither of the first and second bandwidth portions of the first wireless transceiver are available for communication and if the identified first bandwidth portion of the second wireless transceiver is available for communication, use the second wireless

transceiver to transmit the first data stream to the recipient, without requiring the 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 the identified first actual bandwidth portion of the second wireless transceiver to thereby at least partially satisfy the first wireless bandwidth requirement of the first application; and

wherein the wireless networking device's utilization of the first identified actual bandwidth portion of the second wireless transceiver does not prevent any wireless networking device from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availabilities of the second wireless transceiver for data transmission or reception purposes.

35. (New) The method of claim 34, 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, if both of the first and second identified actual bandwidth portions of the first wireless transceiver as well as the first identified actual bandwidth portion of the second wireless transceiver are available for communication, and if the first identified actual bandwidth portion of the second wireless transceiver has superior data transfer characteristics as compared to the data transfer characteristics of at least the first identified actual bandwidth portion of the first wireless transceiver, transmit the first data stream to the recipient from the second wireless transceiver, without requiring the 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 the first identified actual bandwidth portion of the second wireless transceiver to thereby at least partially satisfy the first wireless bandwidth requirement of the first application.

36. (New) The method of claim 35, wherein the data transfer characteristics of the first and second actual bandwidth portions are representative of one or more environmental conditions where the wireless networking device is used.

37. (New) The method of claim 35, 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, if at least the first identified actual bandwidth portion of the first wireless transceiver as well as the first identified actual bandwidth portion of the second wireless transceiver are available for communication, and if their data transfer characteristics change during use to make the at least one first identified actual bandwidth portion of the first wireless transceiver have superior data transfer characteristics as compared to those of the first identified actual bandwidth portion of the second wireless transceiver, transmit the first data stream to the recipient from the first wireless transceiver, without requiring the 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 the first identified actual bandwidth portion of the first wireless transceiver to thereby at least partially satisfy the first wireless bandwidth requirement of the first application.

38. (New) The method of claim 37, wherein, if the first or second identified actual bandwidth portions of the first wireless transceiver become unavailable during use of the wireless networking device, the processing interface is configured to, as a result of the unavailability and in a manner transparent to any layer of the wireless networking device above the processing interface, identify at least one new portion of the bandwidth of the first or second wireless transceiver that is available for communication and use that at least one new bandwidth portion in place of the unavailable one of the first and second actual bandwidth portions of the first wireless transceiver.

39. (New) The method of claim 38, wherein, if the first identified actual bandwidth portion of the second wireless transceiver becomes unavailable during use of the wireless networking device, the processing interface is configured to, as a result of the unavailability and in a manner transparent to any layer of the wireless networking device above the processing interface, identify at least one new portion of the bandwidth of the second wireless transceiver that is available for communication and use that at least one new bandwidth portion in place of the unavailable one of the first identified actual bandwidth portion of the second wireless transceiver.

40. (New) The method of claim 39, wherein, during use of the wireless networking device, at least the first identified actual bandwidth portion of the first wireless transceiver is aggregated with the identified first portion of the available bandwidth of the second wireless transceiver to simultaneously transmit the first data stream to the first recipient from both of the first and second wireless transceivers.

41. (New) The method of claim 40, wherein, during use of the wireless networking device, wherein, during use of the wireless networking device, both of the first and second identified actual bandwidth portions of the first wireless transceiver are aggregated with the identified first portion of the available bandwidth of the second wireless transceiver to simultaneously transmit the first data stream to the first recipient from both of the first and second wireless transceivers.

42. (New) The method of claim 40, further comprising the steps of:

connecting a third actual MAC interface to the processing interface;

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

associating a third wireless transceiver with the third actual PHY interface, wherein the third wireless transceiver (i) is suitable for use in a wireless local area network, (ii) has a third bandwidth availability up to a third actual bandwidth, and (iii) is adapted to emit radio waves in a third band of frequencies that is different from at least one of the first and second frequency bands;

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

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, request or create a third association between a first recipient and the third actual MAC and PHY interfaces.

43. (New) The method of claim 42, wherein, during use of the wireless networking device, at least the first identified actual bandwidth portion of the first wireless transceiver, the

identified first portion of the available bandwidth of the second wireless transceiver and the identified first actual bandwidth portion of the third wireless transceiver are aggregated together to simultaneously transmit the first data stream to the first recipient from all three of the first, second and third wireless transceivers.

44. (New) The method of claim 43, wherein, during use of the wireless networking device, the first and second identified actual bandwidth portions of the first wireless transceiver, the first identified actual bandwidth portion of the second wireless transceiver and the identified first actual bandwidth portion of the third wireless transceiver are aggregated together to simultaneously transmit the first data stream to the first recipient from all three of the first, second and third wireless transceivers.

45. (New) The method of claim 42, 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, use the third wireless transceiver to receive a data stream transmitted to the wireless networking device from the recipient at least partially simultaneously with the transmission of the first data stream to the recipient using the first and second wireless transceivers.

46. (New) The method of claim 45, wherein the transmission of the first data stream to the recipient occurs simultaneously with reception of the data stream transmitted from the first recipient.

## 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: 1-2, 4, 7-20, 34-46.
2. Claim(s) canceled: 3, 5-6, 21-33.
3. Claims(s) amended: 1, 7, 15-18.
4. Claim(s) added: 34-46.
5. Claims withdrawn from consideration but not canceled: None.

Applicant notes that the present amendments include 30 total claims, in accordance with the requirements of the Track One program.

### Claim Support

It is believed that the above-identified new and 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.

### Information Disclosure and Patentability

The amended claims presented herewith generally relate to a method of improving the performance of a wireless networking device (*e.g.*, an access point or a smartphone or a tablet) that is provided with the ability to aggregate two portions of bandwidth (*e.g.*, channels) of a particular communication band when the device is manufactured. It is respectfully submitted that the claims presented herein are patentable for at least the same reasons that the previously pending claims are patentable stated in the last preliminary amendment and related cases. These reasons include, for example, the inclusion of a processing interface having at least one virtual MAC interface and a virtual PHY interface for each band providing feedback to the at least one virtual MAC during operation about bandwidth availabilities for each band, as well as a

requirement that all bandwidth allocation decisions be made in a manner transparent to the layers above the MAC/PHY interfaces.

An IDS was recently filed to cite additional prior art that is believed to be cumulative of prior art previously submitted and previously considered by the Examiner in related cases. For example, the provisional application that resulted in U.S. Patent No. 9516540 was filed sixteen days before the 10/20/2013 priority filings of the instant application. The '540 patent and its provisional operate in a manner substantially similar to U.S. Patent No. 9560656 that already is of record and was considered by the Examiner during prosecution of other related applications which were allowed or have recently issued. A short analysis in support of this conclusion follows.

Just like the '656 patent, the '540 patent and its provisional do not disclose, teach, or suggest, for example, a virtual MAC layer and a virtual PHY layer for each band providing feedback to the virtual MAC regarding bandwidth availabilities at each PHY layer. For this reason, for example, and unlike the inventions claimed in the instant application, both the '540 patent, its provisional, and the '656 patent require that bandwidth allocation decisions be made at a layer above the MAC/PHY layers. As a result of this, those decisions are not made in a manner transparent to the layers above the MAC/PHY interfaces as required by the claims of the instant application. The Examiner's confirmation that the amended claims are patentable over the additional art submitted herewith is respectfully requested.

The term "Upper MAC" is used in the newly cited art such as, for example, in Figures 5A-5B of the '540 patent. It should be noted that none of these "upper MACs" are a "virtual MAC" as claimed herein. A person of ordinary skill in the art would understand that one reason for this is that, for example, the claimed "virtual MAC" utilizes a virtual MAC address and allows for bandwidth allocation decisions to be made in a manner transparent to the layers above the MAC/PHY layers. On the other hand, the "upper MAC" in the '540 patent and the other newly cited references is not capable of this as all the allocations decisions are made by upper layers and, therefore, are not transparent to those upper layers as required by the pending claims. Making bandwidth allocation decisions at higher layers necessarily introduces significant latency and lowers throughput as compared to the inventions claimed in this application and its related family of patents.

Significantly, please note that the '540 patent utilizes the word "latency" only once at col. 12, line 24 to describe a requirement of "gaming devices." The '540 patent does not discuss "latency" or a decrease thereof in connection with utilizing the wireless communication methods described therein. This is additional confirmation that the newly cited art and, especially the '540 patent, is, at worst, cumulative of the art the Examiner already considered.

It is respectfully submitted that no prior art reference of record, either taken alone or in combination with any other reference(s) of record, renders the pending claims obvious. As such, it is respectfully submitted that the pending claims are in condition for allowance.

As an additional matter, please note that amended claim 1 in the instant application, as well as all of the related applications filed or issued in 2023, recite an application interface "being associated with" one or more applications. It is understood that these claim elements cover applications regardless of their installation source or history, and regardless of the device on which such applications are run. For example, applications may be loaded onto a wireless networking device when it is manufactured, as well as being added later by a user or process such as, for example, firmware updates, interaction with an application store, downloadable applications, or installation from media sources.

**Conclusion**

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

Respectfully submitted,

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

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| Application No.: | 18/532,175 |
| Confirmation No.: | 1075 |
| First-Named Inventor: | Manapragada, Sai C. |
| Group Art Unit: | 2412 |
| Examiner: | SAAD KHAWAR |
| Attorney Docket No.: | 020505-000009 |
| Title: | METHOD AND APPARATUS FOR PROCESSING BANDWIDTH INTENSIVE DATA STREAMS USING VIRTUAL MEDIA ACCESS CONTROL AND PHYSICAL LAYERS |

**THIRD 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 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:

1-46. (Cancelled).

47. (New) A method of improving the performance of a wireless networking device, comprising the steps of:

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

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

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

respectively associating first and second wireless transceivers with the first and second actual PHY interfaces, wherein each 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;

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

wherein the processing interface is configured to, when the wireless networking device is being used, 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 portion of the first actual bandwidth of the first wireless transceiver, the identified at least one first portion comprising a set of given resources,

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

(d) use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from 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 bandwidth portion that are not unavailable for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application; and

wherein the wireless networking device's utilization of the first available bandwidth portion of the first wireless transceiver does not prevent any wireless networking device devices from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availability of the first wireless transceiver for data transmission or reception purposes at the same time that the first bandwidth portion is being used for data transmission purposes.

48. (New) The method of claim 47, wherein the wireless networking device comprises a wireless access point.

49. (New) The method of claim 47, 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.

50. (New) The method of claim 47, wherein the at least one virtual MAC interface includes a decision block.

51. (New) The method of claim 47, wherein the at least one virtual MAC interface includes a processing block.

52. (New) The method of claim 47, wherein the at least one virtual MAC interface includes an ultra-streaming block.

53. (New) The method of claim 47, wherein the first virtual PHY interface includes an RF block.

54. (New) The method of claim 47, wherein the second virtual PHY interface includes an RF block.

55. (New) The method of claim 47, wherein the processing interface comprises multiple virtual MAC interfaces.

56. (New) The method of claim 47, wherein the processing interface includes a bandwidth allocator.

57. (New) The method of claim 47, wherein the first identified actual bandwidth portion is contiguous.

58. (New) The method of claim 47, wherein the first virtual PHY interface is not contiguous with the at least one virtual MAC interface.

59. (New) The method of claim 47, wherein the second virtual PHY interface is not contiguous with the at least one virtual MAC interface.

60. (New) The method of claim 47,

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 second portion of the first actual bandwidth of the first wireless transceiver, the identified second bandwidth portion comprising a set of given resources, the first and second identified actual bandwidth portions not being contiguous with each other,

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

(c) 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 and second bandwidth portions that are not unavailable for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application.

61. (New) The method of claim 60, wherein the second identified actual bandwidth portion is contiguous.

62. (New) The method of claim 60, 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) if all of the given resources of the first identified bandwidth portion are unavailable, identify at least one third portion of the first actual bandwidth of the first wireless transceiver, the third identified bandwidth portion comprising a set of given resources,

(b) evaluate whether any of the given resources of the third identified bandwidth portion are unavailable for communication, and

(c) 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 third identified bandwidth portion that are not unavailable for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application.

63. (New) The method of claim 62, 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) if all of the given resources of the second actual bandwidth portion are unavailable, identify at least one fourth portion of the actual bandwidth of the first wireless transceiver, the fourth identified bandwidth portion comprising a set of given resources,

(b) evaluate whether any of the given resources of the fourth identified bandwidth portion are unavailable for communication, and

(c) 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 fourth identified bandwidth portion that are not unavailable for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application.

64. (New) The method of claim 47,

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 portion of the second wireless transceiver comprising a set of given resources,

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

(c) if none of the given resources of the first identified bandwidth portion of the first wireless transceiver are available for communication and if the first identified bandwidth portion of the second wireless transceiver is available for communication, use the second wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from either or both of the first and second actual MAC and PHY interfaces, using a subset of frequencies corresponding only to the given resources of the first

identified actual bandwidth portion of the second wireless transceiver that are not unavailable for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application; and

wherein the wireless networking device's utilization of the first identified actual bandwidth portion of the second wireless transceiver does not prevent any other 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.

65. (New) The method of claim 64, 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) if both the first identified actual bandwidth portions of the first and second wireless transceivers are available for communication, evaluate the data transfer characteristics of both,

(b) if the data transfer characteristics of the first identified bandwidth portion of the first wireless transceiver are better than those of the first identified bandwidth portion of the second wireless transceiver, use the first wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from 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 not unavailable 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 first identified portion of the second wireless transceiver are better than those of the first identified bandwidth portion of the first wireless transceiver, use the second wireless transceiver to transmit the first data stream to the recipient, without requiring disassociation of the recipient from 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 not unavailable for communication to thereby at least partially satisfy the first wireless bandwidth requirement of the first application.

66. (New) The method of claim 65, wherein the data transfer characteristics are representative of one or more environmental conditions where the wireless networking device is used.

67. (New) The method of claim 47, 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 the first identified actual bandwidth portion of the first wireless transceiver with an identified first portion of an available bandwidth of the second wireless transceiver to at least partially simultaneously transmit the first data stream to the first recipient from both of the first and second wireless transceivers.

68. (New) The method of claim 47, wherein the first data stream is substantially simultaneously transmitted to the recipient from both of the first and second wireless transceivers.

69. (New) The method of claim 67, 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 the first identified actual bandwidth portion of the first wireless transceiver with an identified first portion of an available bandwidth of the second wireless transceiver to cause the first and second wireless transceivers to at least partially simultaneously receive a second data stream from the recipient.

70. (New) The method of claim 69, wherein the second data stream is substantially simultaneously received by both of the first and second wireless transceivers.

71. (New) The method of claim 69, further comprising the steps of

connecting a third actual MAC interface to the processing interface;

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

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

forming in the processing interface a third virtual PHY interface that, during operation of the wireless networking device, feeds information regarding the bandwidth availabilities of the third wireless transceiver back to the at least one virtual MAC interface; 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, aggregate a first identified actual bandwidth portion of the third wireless transceiver with the identified first portions of available bandwidth of the first and second wireless transceivers to simultaneously transmit the first data stream to the first recipient from the first, second and third wireless transceivers.

72. (New) The method of claim 71, wherein the third 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.

73. (New) The method of claim 71, wherein the third identified actual bandwidth portion is contiguous.

74. (New) The method of claim 71, wherein the third virtual PHY interface is not contiguous with the at least one virtual MAC interface.

75. (New) The method of claim 71, 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 the first identified actual bandwidth portions of the first, second and third wireless transceivers to cause the first, second and third wireless transceivers to at least partially simultaneously receive the second data stream from the recipient.

76. (New) The method of claim 75, 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, if the first identified actual bandwidth portions of the first, second and third wireless transceivers become unavailable during use of the wireless networking device, identify a replacement at least one portion of the actual bandwidth of one of the first, second and third wireless transceivers to use either for transmission of the first data stream to the recipient or for reception of the second data stream by the wireless networking device.

## 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: 47-76.
2. Claim(s) canceled: 1-46.
3. Claims(s) amended: none.
4. Claim(s) added: 47-76.
5. Claims withdrawn from consideration but not canceled: None.

Applicant notes that the present amendments include 30 total claims, in accordance with the requirements of the Track One program.

### Claim Support

It is believed that the above-identified new 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.

### Patentability

The amended claims presented herewith generally relate to a method of improving the performance of a wireless networking device (*e.g.*, an access point or a smartphone or a tablet) that is provided, when it is manufactured, with the ability to transmit a data stream to a recipient only using the given resources of at least one bandwidth portion that are not unavailable for communication. This allows, for example, the transmission to avoid the use of any given resources of the bandwidth portion that, for example, have interference from other sources.

It is respectfully submitted that the claims presented herein are patentable for at least the same reasons that the previously pending claims are patentable as stated in the last preliminary amendment and related cases. These reasons include, for example, the inclusion of a processing interface having at least one virtual MAC interface and a virtual PHY interface for each band

providing feedback to the at least one virtual MAC during operation about bandwidth availabilities for each band, as well as a requirement that all of the claimed operations of the wireless networking device take place in a manner transparent to the layers of the wireless networking device above its MAC/PHY interfaces. The Examiner's confirmation of this and cooperation in connection with issuing a Notice of Allowance are respectfully requested.

**Conclusion**

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

Respectfully submitted,

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