

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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.

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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) 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

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(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).

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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 ~~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.

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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

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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.

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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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