CLAIMS

~~What is claimed is:~~

1. A method for wireless communication, comprising:

communicating in a wireless mesh network that includes a plurality of mesh nodes; and

establishing at least a first multi-user (MU) association group that includes a first mesh node and one or more peer mesh nodes of the plurality of mesh nodes, the first MU association group enabling the first mesh node as an MU group head to allocate wireless channel resources for MU communication between the first mesh node and at least a subset of the one or more peer mesh nodes that form the first MU association group.

2. The method of claim 1, wherein establishing ~~the~~ at least the first MU association group ~~includes~~ comprises:

transmitting an indication to the one or more peer mesh nodes regarding their roles as members of the first MU association group.

3. The method of ~~any one of claims~~claim 1~~–2~~, wherein establishing ~~the~~ at least the first MU association group ~~includes~~ comprises:

selecting the first mesh node as the MU group head of the first MU association group based, at least in part, on a routing topology of the wireless mesh network.

4. The method of claim 3, wherein establishing ~~the~~ at least the first MU association group further ~~includes~~comprises:

selecting the first mesh node as the MU group head to manage the first MU association group based, at least in part, on the routing topology and traffic flow information; and

selecting the one or more peer mesh nodes as members of the first MU association group based on their respective peer relationship with the first mesh node.

5. The method of claim 4, wherein establishing ~~the~~ at least the first MU association group further ~~includes~~comprises:

obtaining the routing topology of the wireless mesh network based, at least in part, on path selection protocol messages; and

obtaining traffic flow information regarding traffic between the first mesh node and the one or more peer mesh nodes.

6. The method of claim 5, wherein obtaining the traffic flow information includes:

sending a request for a traffic report message to each of the one or more peer mesh nodes; and

receiving the traffic report message from each of the one or more peer mesh nodes in response to the request, the traffic report message including the traffic flow information measured by each of the one or more peer mesh nodes.

~~7. The method of any one of claims 3–6, wherein selecting the first mesh node as the MU group head includes:~~

~~selecting the first mesh node as the MU group head of the first MU association group based on at least one condition from a group consisting of:~~

~~a determination that the first mesh node has a highest traffic load from among the plurality of mesh nodes not already assigned as an MU group head,~~

~~a determination that the first mesh node produces a highest capacity bottleneck in the wireless mesh network from among the plurality of mesh nodes not already assigned as an MU group head,~~

~~a determination that the first mesh node receives traffic from a highest quantity of source mesh nodes from among the plurality of mesh nodes not already assigned as an MU group head,~~

~~a determination that the first mesh node has a highest weighting value among weighting values for the plurality of mesh nodes, and~~

~~any combination thereof.~~

~~8. The method of any one of claims 3–6, wherein selecting the first mesh node as the MU group head includes:~~

selecting the first mesh node as the MU group head of the first MU association group based on at least one condition from a group consisting of:

the first mesh node having a lowest quantity of hops to a mesh portal as compared to quantities of hops between each of the plurality of mesh nodes and the mesh portal,

the first mesh node having a highest quantity of inbound or outbound routes as compared to quantities of inbound or output routes for each of the plurality of mesh nodes in a routing table for the wireless mesh network, and

a weighted combination thereof.

9. The method of any one of claims 1–8, further comprising:

receiving, from various mesh nodes of the wireless mesh network, candidate MU association groups determined by the various mesh nodes; and

selecting the first mesh node as the MU group head of the first MU association group based, at least in part, on the candidate MU association groups.

10. The method of any one of claims 1–9, further comprising:

determining a plurality of MU association groups based on traffic flow information and a routing topology of the wireless mesh network, each MU association group having a respective MU group head and one or more respective member mesh nodes.

11. The method of any one of claims 1–10, further comprising:

determining MU participation constraints for each of the plurality of mesh nodes, the MU participation constraints limiting a quantity of mesh nodes that the mesh node can manage as an MU group head or limiting a quantity of MU association groups in which the mesh node can participate as a member; and

selecting the plurality of MU association groups based, at least in part, on the MU participation constraints for each of the plurality of mesh nodes.

12. The method of any one of claims 1–11, wherein the first mesh node operates as, or is collocated with, a network management unit of the wireless mesh network.

13. A method for wireless communication by a first mesh node of a wireless mesh network, comprising:

operating as a multi-user (MU) group head of a first MU association group that includes the first mesh node and one or more peer mesh nodes in the wireless mesh network; and

allocating, by the first mesh node, wireless channel resources for an MU group communication between the first mesh node and at least a subset of the one or more peer mesh nodes that form the first MU association group.

14. The method of claim 13, wherein managing the wireless channel resources includes allocating the wireless channel resources based on a multi-user communication technology that is different from a wireless mesh network protocol.

15. The method of any one of claims 13-14, wherein managing the wireless channel resources includes:

transmitting the MU group communication from the first mesh node to the at least the subset of the one or more peer mesh nodes, the MU group communication including concurrent downlink transmission of distinct data for each of the at least the subset of the one or more peer mesh nodes.

16. The method of any one of claims 13-15, wherein managing the wireless channel resources includes:

allocating the wireless channel resources to the at least the subset of the one or more peer mesh nodes in which to concurrently receive uplink transmissions of distinct data from each of the at least the subset of the one or more peer mesh nodes; and

receiving the MU group communication having the distinct data via the allocated wireless channel resources corresponding to each of the at least the subset of the one or more peer mesh nodes.

17. The method of any one of claims 13-16, further comprising:

formatting the MU group communication between the first mesh node and the subset of the one or more peer mesh nodes as a MU multiple-input-multiple-output (MU-MIMO) transmission or an orthogonal frequency division multiple access (OFDMA) transmission.

~~18. The method of claim 17, wherein the MU group communication is the MU-MIMO transmission when a traffic type of the first MU association group is capacity sensitive, and wherein the MU group communication is the OFDMA transmission when the traffic type of the first MU association group is latency sensitive.~~

~~19~~7. A method performed by a first mesh node of a wireless mesh network, comprising:

communicating in the wireless mesh network with a plurality of mesh nodes;

receiving a configuration for at least a first multi-user (MU) association group that includes a second mesh node as an MU group head and at least the first mesh node; and

transmitting part of a first MU group communication to the second mesh node using wireless channel resources managed by the second mesh node, the first MU group communication including transmissions from one or more mesh nodes.

~~20~~8. The method of claim ~~19~~7, further comprising:

receiving, from a network management unit, a request for a traffic report message; and

sending the traffic report message to the network management unit in response to the request, the traffic report message including ~~the~~ traffic flow information measured by the first mesh node and usable by the network management unit to assign the first mesh node to the first MU association group.

~~21~~9. The method of ~~any one of claims 19–20~~claim 7, further comprising:

sending, from the first mesh node to a network management unit, one or more candidate MU association groups based on traffic flow information and a routing topology of the wireless mesh network,

wherein the configuration for the first MU association group is based, at least in part, on the one or more candidate MU association groups.

~~22~~10. The method of ~~any one of claims 19–21~~claim 7, further comprising:

receiving a configuration for a second MU association group that includes the first mesh node;

communicating traffic associated the first MU association group via the first MU group communication using wireless channel resources managed by the second mesh node; and

communicating traffic associated with the second MU association group via a second MU group communication using wireless channel resources managed by an MU group head for the second MU association group.

~~23~~11. The method of claim ~~22~~10, wherein the first mesh node is the MU group head for the second MU association group, the method further comprising:

managing, by the first mesh node as the MU group head of the second MU association group, wireless channel resources associated with the second MU group communication between the first mesh node and one or more peer mesh nodes in the second MU association group.

~~24~~12. A first mesh node, comprising:

at least one modem configured to communicate in a wireless mesh network that includes a plurality of mesh nodes; and

a processing system configured to establish at least a first multi-user (MU) association group that includes the first mesh node and one or more peer mesh nodes of the plurality of mesh nodes, the first MU association group enabling the first mesh node as an MU group head to allocate wireless channel resources for MU communication between the first mesh node and at least a subset of the one or more peer mesh nodes that form the first MU association group.

~~25~~13. The first mesh node of claim ~~24~~12, wherein the at least one modem is configured to output an indication for transmission to the one or more peer mesh nodes regarding their roles as members of the first MU association group.

~~26~~14. The first mesh node of ~~any one of claims 24–25~~claim 12, wherein the processing system is configured to select the first mesh node as the MU group head of the first MU association group based, at least in part, on a routing topology of the wireless mesh network.

~~27~~15. The first mesh node of claim ~~26~~14, wherein the processing system is further configured to:

select the first mesh node as the MU group head to manage the first MU association group based, at least in part, on the routing topology and ~~the~~ traffic flow information; and

select the one or more peer mesh nodes as members of the first MU association group based on their respective peer relationship with the first mesh node.

~~28~~16. The first mesh node of claim ~~27~~15, wherein the processing system is further configured to:

obtain the routing topology of the wireless mesh network based, at least in part, on path selection protocol messages obtained by the at least one modem; and

obtain traffic flow information regarding traffic between the first mesh node and the one or more peer mesh nodes.

~~29~~17. The first mesh node of claim ~~28~~16, wherein the at least one modem is configured to:

output a request for a traffic report message to each of the one or more peer mesh nodes; and

obtain the traffic report message from each of the one or more peer mesh nodes in response to the request, the traffic report message including the traffic flow information measured by each of the one or more peer mesh nodes.

~~30~~18. The first mesh node of ~~any one of claims 26–29~~claim 14, wherein the processing system is configured to select the first mesh node as the MU group head of the first MU association group based on at least one condition from a group consisting of:

a determination that the first mesh node has a highest traffic load from among the plurality of mesh nodes not already assigned as an MU group head,

a determination that the first mesh node produces a highest capacity bottleneck in the wireless mesh network from among the plurality of mesh nodes not already assigned as an MU group head,

a determination that the first mesh node receives traffic from a highest quantity of source mesh nodes from among the plurality of mesh nodes not already assigned as an MU group head,

a determination that the first mesh node has a highest weighting value among weighting values for the plurality of mesh nodes, and

any combination thereof.

~~31~~19. The first mesh node of ~~claims 26-29~~claim 14, wherein the processing system is configured to select the first mesh node as the MU group head of the first MU association group based on at least one condition from a group consisting of:

the first mesh node having a lowest quantity of hops to a mesh portal as compared to quantities of hops between each of the plurality of mesh nodes and the mesh portal,

the first mesh node having a highest quantity of inbound or outbound routes as compared to quantities of inbound or output routes for each of the plurality of mesh nodes in a routing table for the wireless mesh network, and

a weighted combination thereof.

~~32~~20. The first mesh node of ~~any one of claims 24-31,~~ claim 12,

wherein the at least one modem is configured to obtain, from various mesh nodes of the wireless mesh network, candidate MU association groups determined by the various mesh nodes~~;~~, and

wherein the processing system is configured to select the first mesh node as the MU group head of the first MU association group based, at least in part, on the candidate MU association groups.

~~33~~21. The first mesh node of ~~any one of claims 24-32~~claim 12, wherein the processing system is configured to determine a plurality of MU association groups based on traffic flow information and a routing topology of the wireless mesh network, each MU association group having a respective MU group head and one or more respective member mesh nodes.

~~34~~22. The first mesh node of ~~any one of claims 24–33~~claim 21, wherein the processing system is configured to:

determine MU participation constraints for each of the plurality of mesh nodes, the MU participation constraints limiting a quantity of mesh nodes that ~~the~~a mesh node can manage as an MU group head or limiting a quantity of MU association groups in which the mesh node can participate as a member; and

select the plurality of MU association groups based, at least in part, on the MU participation constraints for each of the plurality of mesh nodes.

~~35~~23. The first mesh node of ~~any one of claims 24–34~~claim 12, wherein the first mesh node operates as, or is collocated with, a network management unit of the wireless mesh network.

~~36~~24. The first mesh node of ~~any one of claims 24–35~~claim 12, further comprising:

at least one transceiver coupled to the at least one modem;

at least one antenna coupled to the at least one transceiver to wirelessly transmit signals output from the at least one transceiver and to wirelessly receive signals for input into the at least one transceiver; and

a housing that encompasses at least the processing system, the at least one modem, the at least one transceiver, and at least a portion of the at least one antenna.

~~37. A first mesh node, comprising:~~

~~at least one modem configured to operate as a multi-user (MU) group head of a first MU association group that includes the first mesh node and one or more peer mesh nodes in the wireless mesh network; and~~

~~a processing system configured to allocate wireless channel resources for an MU group communication between the first mesh node and at least a subset of the one or more peer mesh nodes that form the first MU association group.~~

38. The method of claim 37, wherein the processing system is configured to allocate the wireless channel resources based on a multi-user communication technology that is different from a wireless mesh network protocol.

39. The first mesh node of any one of claims 37-38, wherein the at least one modem is configured to output the MU group communication from the first mesh node to the at least the subset of the one or more peer mesh nodes, the MU group communication including concurrent downlink transmission of distinct data for each of the at least the subset of the one or more peer mesh nodes.

40. The first mesh node of any one of claims 37-39,

wherein the processing system is configured to allocate the wireless channel resources to the at least the subset of the one or more peer mesh nodes in which to concurrently receive uplink transmissions of distinct data from each of the at least the subset of the one or more peer mesh nodes; and

wherein the at least one modem is configured to obtain the MU group communication having the distinct data via the allocated wireless channel resources corresponding to each of the at least the subset of the one or more peer mesh nodes.

41. The first mesh node of any one of claims 37-40, wherein the at least one modem is configured to format the MU group communication between the first mesh node and the subset of the one or more peer mesh nodes as a MU multiple-input multiple-output (MU-MIMO) transmission or an orthogonal frequency division multiple access (OFDMA) transmission.

42. The first mesh node of claim 41, wherein the MU group communication is the MU-MIMO transmission when a traffic type of the first MU association group is capacity sensitive, and wherein the MU group communication is the OFDMA transmission when the traffic type of the first MU association group is latency sensitive.

43. The first mesh node of any one of claims 37-42, further comprising:

at least one transceiver coupled to the at least one modem;

~~at least one antenna coupled to the at least one transceiver to wirelessly transmit signals output from the at least one transceiver and to wirelessly receive signals for input into the at least one transceiver; and~~

~~a housing that encompasses at least the processing system, the at least one modem, the at least one transceiver, and at least a portion of the at least one antenna.~~

~~44~~25. A first mesh node, comprising:

at least one modem configured to:

communicate in ~~the~~a wireless mesh network with a plurality of mesh nodes, and

obtain a configuration for at least a first multi-user (MU) association group that includes a second mesh node as an MU group head and at least the first mesh node;

a processing system configured to manage a first MU group communication by the at least one modem in accordance with the configuration; and

the at least one modem configured to output part of the first MU group communication for transmission to the second mesh node using wireless channel resources managed by the second mesh node, the first MU group communication including transmissions from one or more mesh nodes.

~~45~~26. The first mesh node of claim ~~44~~25, wherein the at least one modem is configured to:

obtain, from a network management unit, a request for a traffic report message; and

output the traffic report message for transmission to the network management unit in response to the request, the traffic report message including ~~the~~ traffic flow information measured by the first mesh node and usable by the network management unit to assign the first mesh node to the first MU association group.

~~46~~27. The first mesh node of ~~any one of claims 44-45~~claim 25,

wherein the at least one modem is configured to output, to a network management unit, one or more candidate MU association groups based on traffic flow information and a routing topology of the wireless mesh network, and

wherein the configuration for the first MU association group is based, at least in part, on the one or more candidate MU association groups.

~~47~~28. The first mesh node of ~~any one of claims 44-46~~claim 25, further comprising:

the at least one modem configured to obtain a configuration for a second MU association group that includes the first mesh node; and

the processing system configured to:

cause the at least one modem to communicate traffic associated the first MU association group via the first MU group communication using wireless channel resources managed by the second mesh node operating as the MU group head for the first MU association group; and

cause the at least one modem to communicate traffic associated with the second MU association group via a second MU group communication using wireless channel resources managed by an MU group head for the second MU association group.

~~48~~29. The first mesh node of claim ~~47~~28,

wherein the first mesh node is the MU group head for the second MU association group, and

wherein the processing system is configured to manage, as the MU group head of the second MU association group, wireless channel resources associated with the second MU group communication between the first mesh node and one or more peer mesh nodes in the second MU association group.

~~49~~30. The first mesh node of ~~any one of claims 44-48~~claim 25, further comprising:

at least one transceiver coupled to the at least one modem;

at least one antenna coupled to the at least one transceiver to wirelessly transmit signals output from the at least one transceiver and to wirelessly receive signals for input into the at least one transceiver; and

a housing that encompasses at least the processing system, the at least one modem, the at least one transceiver, and at least a portion of the at least one antenna.