CLAIMS

1. A method comprising:

~~determining~~ obtaining, by a computing system of the wireless communication service provider, a micro-cell performance parameter associated with a micro-cell of a mobile communication system; ~~and~~

obtaining, by the computing system of the wireless communication service provider, a macro-cell performance parameter associated with a macro-cell of the mobile communication system, the macro-cell including the micro-cell, and the macro-cell performance parameter including one or both of: (i) a number of wireless devices being serviced by a macro-cell access point that corresponds to the macro-cell and (ii) an overall capacity of the macro-cell access point;

determining, by the computing system of the wireless communication service provider, whether performance of mobile data operations by a wireless device connected to the macro-cell improves when performed via the micro-cell instead of the macro-cell, the determining based on a comparison between the micro-cell performance parameter and the macro-cell performance parameter, and the improved performance of the mobile data operations indicates a better quality of service at the wireless device; and

in response to the determining, directing, by the computing system of the wireless communication service provider, the macro-cell access point and a micro-cell access point corresponding to the micro-cell such that the mobile data operations for the wireless device are performed by the macro-cell access point and not offloaded to the micro-cell access point while the wireless device is connected to the micro-cell access point ~~whether to offload mobile data operations to a micro-cell access point that corresponds to the micro-cell based on the micro-cell performance parameter~~.

2. The method of claim 1, wherein the micro-cell is a first micro-cell, the micro-cell access point is a first micro-cell access point, the micro-cell performance parameter is a first micro-cell performance parameter, and the method further comprises offloading the mobile data operations to the first micro-cell access point from a second micro-cell access point of the mobile communications system based on one or more of the first micro-cell performance parameter and a second micro-cell performance parameter associated with a second micro-cell that corresponds to the second micro-cell.

3. The method of claim 1, further comprising:

based on an updated micro-cell performance parameter, offloading the mobile data operations from ~~a~~ the macro-cell access point to the micro-cell access point ~~based on the micro-cell performance parameter~~; and

causing the micro-cell access point to perform the mobile data operations~~, wherein the macro-cell access point corresponds to a macro-cell that includes the micro-cell~~.

4. The method of claim ~~1~~ 3, wherein offloading the mobile data operations from the macro-cell access point to the micro-cell access point is based on the macro-cell performance parameter. ~~further comprising:~~

~~determining a macro-cell service performance parameter associated with a macro-cell of the mobile communication system, the macro-cell including the micro-cell; and~~

~~determining whether to offload the mobile data operations from a macro-cell access point that corresponds to the macro-cell to the micro-cell access point based on one or more of the micro-cell performance parameter and the macro-cell performance parameter.~~

5. The method of claim 4, wherein the macro-cell performance parameter further includes one or more of: a quality of communications between the macro-cell access point and the wireless device ~~one or more wireless devices, a number of wireless devices being serviced by the macro-cell access point, an overall capacity of the macro-cell access point~~, a signal to noise ratio (SNR) of macro-cell communications between the macro-cell access point and the wireless device ~~one or more wireless devices~~, and a latency associated with macro-cell communications between the macro-cell access point and the wireless device ~~one or more wireless devices~~.

~~6. The method of claim 4, further comprising determining whether to offload the mobile data operations based on a comparison between the micro-cell performance parameter and the macro-cell performance parameter.~~

~~7. The method of claim 6, further comprising determining not to offload the mobile data operations from the macro-cell access point to the micro-cell access point based on the comparison between the macro-cell performance parameter and the micro-cell performance parameter indicating a better quality of service in the macro-cell than in the micro-cell.~~

6~~8~~. The method of claim 4, wherein the micro-cell performance parameter includes a micro-cell latency and the macro-cell performance parameter includes a macro-cell latency.

7~~9~~. The method of claim 4, further comprising receiving one or more of the micro-cell performance parameter and the macro-cell performance parameter from one or more of ~~a~~ the wireless device and a performance sensor.

8~~10~~. The method of claim 1, wherein the micro-cell performance parameter includes a micro-cell latency.

9~~11~~. The method of claim ~~10~~ 8, further comprising monitoring one or more of control plane communications and data plane communications to determine the micro-cell latency.

10~~12~~. The method of claim ~~11~~ 9, wherein the control plane communications include Extensible Authentication Protocol (EAP) messages.

11~~13~~. The method of claim ~~11~~ 9, wherein the data plane communications include Address Resolution Protocol (ARP) pinging messages.

12~~14~~. The method of claim ~~10~~ 8, further comprising subtracting a wired latency from the micro-cell latency to determine a wireless latency of the micro-cell latency.

13~~15~~. The method of claim 1, wherein the micro-cell performance parameter includes one or more of: a quality of communications between the micro-cell access point and the wireless device ~~one or more wireless devices~~, a number of wireless devices being serviced by the micro-cell access point, an overall capacity of the micro-cell access point, a signal to noise ratio (SNR) of micro-cell communications between the micro-cell access point and the wireless device ~~one or more wireless devices~~, and a latency associated with micro-cell communications between the micro-cell access point and the wireless device ~~one or more wireless devices~~.

~~16~~14. A system comprising:

a processor; and

a computer-readable storage medium including computer executable instructions configured to cause the processor to perform operations, the operations comprising:

~~determining~~ obtaining, by a computing system of the wireless communication service provider, a micro-cell performance parameter associated with a micro-cell of a mobile communication system; ~~and~~

obtaining, by the computing system of the wireless communication service provider, a macro-cell performance parameter associated with a macro-cell of the mobile communication system, the macro-cell including the micro-cell, and the macro-cell performance parameter including one or both of: (i) a number of wireless devices being serviced by a macro-cell access point that corresponds to the macro-cell and (ii) an overall capacity of the macro-cell access point;

determining, by the computing system of the wireless communication service provider, whether performance of mobile data operations by a wireless device connected to the macro-cell improves when performed via the micro-cell instead of the macro-cell, the determining based on a comparison between the micro-cell performance parameter and the macro-cell performance

parameter, and the improved performance of the mobile data operations indicates a better quality of service at the wireless device; and

in response to the determining, directing, by the computing system of the wireless communication service provider, the macro-cell access point and a micro-cell access point corresponding to the micro-cell such that the mobile data operations for the wireless device are performed by the macro-cell access point and not offloaded to the micro-cell access point while the wireless device is connected to the micro-cell access point ~~whether to offload mobile data operations to a micro-cell access point that corresponds to the micro-cell based on the micro-cell performance parameter~~.

1517. The system of claim ~~16~~ 14, wherein the micro-cell is a first micro-cell, the micro-cell access point is a first micro-cell access point, the micro-cell performance parameter is a first micro-cell performance parameter, and the operations further comprise offloading the mobile data operations to the first micro-cell access point from a second micro-cell access point of the mobile communications system based on one or more of the first micro-cell performance parameter and a second micro-cell performance parameter associated with a second micro-cell that corresponds to the second micro-cell.

1618. The system of claim ~~16~~ 14, wherein the operations further comprise:

based on an updated micro-cell performance parameter, offloading the mobile data operations from ~~a~~ the macro-cell access point to the micro-cell access point based on the micro-cell performance parameter; and

causing the micro-cell access point to perform the mobile data operations~~, wherein the macro-cell access point corresponds to a macro-cell that includes the micro-cell~~.

1719. The system of claim 16, wherein offloading the mobile data operations from the macro-cell access point to the micro-cell access point is based on the macro-cell performance parameter. ~~the operations further comprise:~~

~~determining a macro-cell service performance parameter associated with a macro-cell of the mobile communication system, the macro-cell including the micro-cell; and~~

~~determining whether to offload the mobile data operations from a macro-cell access point that corresponds to the macro-cell to the micro-cell access point based on one or more of the micro-cell performance parameter and the macro-cell performance parameter.~~

1820. The system of claim ~~19~~ 17, wherein the macro-cell performance parameter includes one or more of: a quality of communications between the macro-cell access point and the wireless device ~~one or more wireless devices, a number of wireless devices being serviced by the macro-cell access point, an overall capacity of the macro-cell access point~~, a signal to noise ratio (SNR) of macro-cell

communications between the macro-cell access point and the wireless device ~~one or more wireless devices~~, and a latency associated with macro-cell communications between the macro-cell access point and the wireless device ~~one or more wireless devices~~.

~~21. The system of claim 19, wherein the operations further comprise determining whether to offload the mobile data operations based on a comparison between the micro-cell performance parameter and the macro-cell performance parameter.~~

~~22. The system of claim 21, wherein the operations further comprise determining not to offload the mobile data operations from the macro-cell access point to the micro-cell access point based on the comparison between the macro-cell performance parameter and the micro-cell performance parameter indicating a better quality of service in the macro-cell than in the micro-cell.~~

19~~23~~. The system of claim ~~19~~ 17, wherein the micro-cell performance parameter includes a micro-cell latency and the macro-cell performance parameter includes a macro-cell latency.

20~~24~~. The system of claim ~~19~~ 17, wherein the operations further comprise receiving one or more of the micro-cell performance parameter and the macro-cell performance parameter from one or more of ~~a~~ the wireless device and a performance sensor.

21~~25~~. The system of claim ~~16~~ 14, wherein the micro-cell performance parameter includes a micro-cell latency.

22~~26~~. The system of claim ~~25~~ 21, wherein the operations further comprise monitoring one or more of control plane communications and data plane communications to determine the micro-cell latency.

23~~27~~. The system of claim ~~26~~ 22, wherein the control plane communications include Extensible Authentication Protocol (EAP) messages.

24~~28~~. The system of claim ~~26~~ 22, wherein the data plane communications include Address Resolution Protocol (ARP) pinging messages.

25~~29~~. The system of claim ~~25~~ 21, wherein the operations further comprise subtracting a wired latency from the micro-cell latency to determine a wireless latency of the micro-cell latency.

2630. The system of claim ~~16~~ 14, wherein the micro-cell performance parameter includes one or more of: a quality of communications between the micro-cell access point and the wireless device ~~one or more wireless devices~~, a number of wireless devices being serviced by the micro-cell access point, an overall capacity of the micro-cell access point, a signal to noise ratio (SNR) of micro-cell communications between the micro-cell access point and the wireless device ~~one or more wireless devices~~, and a latency associated with micro-cell communications between the micro-cell access point and the wireless device ~~one or more wireless devices~~.

2731. A computer-readable storage medium including computer executable instructions configured to cause a system to perform operations, the operations comprising:

~~determining~~ obtaining, by a computing system of the wireless communication service provider, a micro-cell performance parameter associated with a micro-cell of a mobile communication system; ~~and~~

obtaining, by the computing system of the wireless communication service provider, a macro-cell performance parameter associated with a macro-cell of the mobile communication system, the macro-cell including the micro-cell, and the macro-cell performance parameter including one or both of: (i) a number of wireless devices being serviced by a macro-cell access point that corresponds to the macro-cell and (ii) an overall capacity of the macro-cell access point;

determining, by the computing system of the wireless communication service provider, whether performance of mobile data operations by a wireless device connected to the macro-cell improves when performed via the micro-cell instead of the micro-cell, the determining based on a comparison between the micro-cell performance parameter and the macro-cell performance parameter, and the improved performance of the mobile data operations indicates a better quality of service at the wireless device; and

in response to the determining, directing, by the computing system of the wireless communication service provider, the macro-cell access point and a micro-cell access point corresponding to the micro-cell such that the mobile data operations for the wireless device are performed by the macro-cell access point and not offloaded to the micro-cell access point while the wireless device is connected to the micro-cell access point ~~whether to offload mobile data operations to a micro-cell access point that corresponds to the micro-cell based on the micro-cell performance parameter~~.

2832. The computer-readable storage medium of claim ~~31~~ 27, wherein the micro-cell is a first micro-cell, the micro-cell access point is a first micro-cell access point, the micro-cell performance parameter is a first micro-cell performance parameter, and the operations further comprise offloading the mobile data operations to the first micro-cell access point from a second micro-cell access point of the mobile communications system based on one or more of the first micro-cell performance parameter and

a second micro-cell performance parameter associated with a second micro-cell that corresponds to the second micro-cell.

2933. The computer-readable storage medium of claim ~~31~~ 27, wherein the operations further comprise:

based on an updated micro-cell performance parameter, offloading the mobile data operations from ~~a~~ the macro-cell access point to the micro-cell access point ~~based on the micro-cell performance parameter~~; and

causing the micro-cell access point to perform the mobile data operations~~, wherein the macro-cell access point corresponds to a macro-cell that includes the micro-cell~~.

3034. The computer-readable storage medium of claim ~~31~~ 29, wherein offloading the mobile data operations from the macro-cell access point to the micro-cell access point is based on the macro-cell performance parameter. ~~the operations further comprise:~~

~~determining a macro-cell service performance parameter associated with a macro-cell of the mobile communication system, the macro-cell including the micro-cell; and~~

~~determining whether to offload the mobile data operations from a macro-cell access point that corresponds to the macro-cell to the micro-cell access point based on one or more of the micro-cell performance parameter and the macro-cell performance parameter.~~

3135. The computer-readable storage medium of claim ~~34~~ 30, wherein the macro-cell performance parameter includes one or more of: a quality of communications between the macro-cell access point and the wireless device ~~one or more wireless devices, a number of wireless devices being serviced by the macro-cell access point, an overall capacity of the macro-cell access point~~, a signal to noise ratio (SNR) of macro-cell communications between the macro-cell access point and the wireless device ~~one or more wireless devices~~, and a latency associated with macro-cell communications between the macro-cell access point and the wireless device ~~one or more wireless devices~~.

~~36. The computer-readable storage medium of claim 34, wherein the operations further comprise determining whether to offload the mobile data operations based on a comparison between the micro-cell performance parameter and the macro-cell performance parameter.~~

~~37. The computer-readable storage medium of claim 36, wherein the operations further comprise determining not to offload the mobile data operations from the macro-cell access point to the micro-cell access point based on the comparison between the macro-cell performance parameter and the micro-cell performance parameter indicating a better quality of service in the macro-cell than in the micro-cell.~~

3238. The computer-readable storage medium of claim ~~34~~ 30, wherein the micro-cell performance parameter includes a micro-cell latency and the macro-cell performance parameter includes a macro-cell latency.

3339. The computer-readable storage medium of claim ~~34~~ 30, wherein the operations further comprise receiving one or more of the micro-cell performance parameter and the macro-cell performance parameter from one or more of ~~a~~ the wireless device and a performance sensor.

3440. The computer-readable storage medium of claim ~~31~~ 27, wherein the micro-cell performance parameter includes a micro-cell latency.

3541. The computer-readable storage medium of claim ~~40~~ 34, wherein the operations further comprise monitoring one or more of control plane communications and data plane communications to determine the micro-cell latency.

3642. The computer-readable storage medium of claim ~~41~~ 35, wherein the control plane communications include Extensible Authentication Protocol (EAP) messages.

3743. The computer-readable storage medium of claim ~~41~~ 35, wherein the data plane communications include Address Resolution Protocol (ARP) pinging messages.

3844. The computer-readable storage medium of claim ~~41~~ 35, wherein the operations further comprise subtracting a wired latency from the micro-cell latency to determine a wireless latency of the micro-cell latency.

3945. The computer-readable storage medium of claim ~~31~~ 27 wherein the micro-cell performance parameter includes one or more of: a quality of communications between the micro-cell access point and the wireless device ~~one or more wireless devices~~, a number of wireless devices being serviced by the micro-cell access point, an overall capacity of the micro-cell access point, a signal to noise ratio (SNR) of micro-cell communications between the micro-cell access point and the wireless device ~~one or more wireless devices~~, and a latency associated with micro-cell communications between the micro-cell access point and the wireless device ~~one or more wireless devices~~.