

CLAIMS

What is claimed is:

1. A method for wireless communication at a user equipment (UE), comprising:

- _transmitting a capability message to a base station indicating a multi-connectivity capability of the UE to support more than two concurrent active cell group connections;
- _transmitting, to the base station, one or more measurement reports that provide measurement information for cells in proximity to the UE;
- _receiving, responsive to the capability message and the one or more measurement reports, a multi-connectivity configuration, the multi-connectivity configuration comprising a cell group set that includes a plurality of cell groups with which the UE is configured for multi-connectivity communications, the cell group set including more than two active cell groups to which the UE is connected for concurrent connected mode operations between the UE and the base station; ~~and~~
- ~~communicating with the base station via the more than two active cell groups in accordance with the multi-connectivity configuration.~~

~~2. The method of claim 1, further comprising:~~

receiving an indication of which cell groups of the more than two active cell groups are to be configured for packet data convergence protocol (PDCP) aggregation such that data associated with a first data radio bearer (DRB) having a throughput requirement ~~above~~satisfying at least one threshold is distributed across ~~the indicated~~ cell groups in the received indication having an aggregate throughput that satisfies the throughput requirement of the ~~DRB~~first DRB; and communicating with the base station via the more than two active cell groups in accordance with the multi-connectivity configuration and the indication.

~~3. The method of claim 2,~~ 2. The method of claim 2, wherein the at least one threshold is a plurality of predetermined thresholds, with each of the plurality of predetermined thresholds corresponding to one of the indicated cell groups, and wherein the data associated with the first DRB is distributed across the indicated cell groups in accordance with the plurality of predetermined thresholds.

4.—3. The method of claim ~~2~~1, wherein the at least one threshold is one or more conditional thresholds, with each of the one or more conditional thresholds corresponding to a predetermined quality of a link connection associated with the indicated cell groups.

5.—4. The method of claim 1, further comprising:
 _receiving an indication of which cell groups of the more than two active cell groups are to be configured for ~~packet data convergence protocol (PDCP)~~ replication such that data associated with a ~~data radio bearer (second DRB)~~ having a latency or reliability requirement above a threshold is replicated across the indicated cell groups.

6.—5. The method of claim ~~5~~4, wherein the indication includes one or more replication flags corresponding to each of the indicated cell groups.

7.—6. The method of claim 1, further comprising:
 _receiving a conditional indication of which cell groups of the more than two active cell groups are to be configured for ~~data radio bearer (DRB) packet data convergence protocol (PDCP)~~DRB PDCP aggregation and of which cell groups of the more than two active cell groups are to be configured for DRB PDCP replication; and
 _updating the multi-connectivity configuration for DRB PDCP aggregation or DRB PDCP replication based on a trigger of the conditional indication and without prior receipt of an updated multi-connectivity configuration.

8.—7. The method of claim 1, wherein a number of the plurality of cell groups included in the cell group set for which the UE is configured is based at least in part on the multi-connectivity capability of the UE, service requirements of ~~data radio bearers (DRBs)~~ configured for the UE, throughput or reliability requirements of DRBs configured for the UE, a location of the UE, channel conditions affecting communications with the UE, battery resources of the UE, other device resource conditions having an effect on capabilities of the UE, or combinations thereof.

9.—8. The method of claim 1, wherein the plurality of cell groups included in the cell group set include cell groups for both New Radio (NR) and Long Term Evolution (LTE) radio access technologies (RATs).

~~10.~~—9. The method of claim 1, wherein the plurality of cell groups included in the cell group set include cell groups for a same type of radio access technology (RAT).

~~11.~~—10. The method of claim 1, wherein each of the plurality of cell groups of the cell group set includes a set of cells configured for a same distributed unit (DU) of the base station and managed by a single medium access control (MAC) entity, and wherein all of the plurality of cell groups of the cell group set are associated with a same central unit (CU) of the base station.

~~12.~~—11. The method of claim 1, further comprising:

_identifying that two or more of the more than two of active cell groups are controlling cell groups.

~~13.~~—12. The method of claim ~~12~~,11, wherein identifying that two or more of the more than two active cell groups are controlling cell groups comprises:

_receiving, via a radio resource control (RRC) message, an indicator that the two or more of the more than two active cell groups are controlling cell groups.

~~14.~~—13. The method of claim 12, wherein identifying that two or more of the more than two active cell groups are controlling cell groups comprises:

_receiving an allocation of signaling radio bearer (SRB) resources for each of the controlling cell groups; and

_identifying the controlling cell groups based at least in part on receipt of the allocation of SRB resources for the controlling cell groups.

~~15.~~—14. The method of claim ~~12~~,11, further comprising:

_measuring one or more attributes of the controlling cell groups;

_identifying, based at least in part on the measuring, one or more of the controlling cell groups as one or more selected controlling cell groups;

_reporting the one or more selected controlling cell groups to the base station;

and

_receiving at least one of system information (SI) notifications, public warning system (PWS) notifications, core network (CN) registration area notifications, or radio area network (RAN) notifications via the one or more selected controlling cell groups.

~~16.~~—~~15.~~ The method of claim ~~12~~,~~11~~, further comprising:

_declaring radio link failure (RLF) only if RLF is identified on each of the controlling cell groups.

~~17.~~—~~16.~~ The method of claim 1, further comprising:

_identifying, from the multi-connectivity configuration, that the cell group set includes one or more inactive cell groups to which the UE is connected but for which the UE lacks an allocation of uplink and downlink physical resources.

~~18.~~—~~17.~~ The method of claim 1, further comprising:

_receiving an update to the multi-connectivity configuration indicating that an additional cell group is to be added to the cell group set.

~~19.~~—~~18.~~ The method of claim 1, further comprising:

_receiving an update to the multi-connectivity configuration indicating that at least one of an active cell group or an inactive cell group has been released and is no longer a part of the cell group set.

~~20.~~—~~19.~~ A method for wireless communication at a base station, comprising:

_receiving a capability message from a user equipment (UE) indicating a multi-connectivity capability of the UE to support more than two concurrent active cell group connections;

_receiving, from the UE, one or more measurement reports that provide measurement information for cells in proximity to the UE;

_determining, based at least in part on the one or more measurement reports, a cell group set that includes a plurality of cell groups with which the UE is to be configured for multi-connectivity communications, the cell group set including of more than two active cell groups to which the UE is to be connected for concurrent connected mode operations between the UE and the base station;

_transmitting to the UE, responsive to the capability message and the one or more measurement reports, a multi-connectivity configuration that includes the cell group set; and

~~communicating with the UE via the more than two active cell groups in accordance with the multi-connectivity configuration.~~

21.—~~The method of claim 20, further comprising:~~

transmitting an indication of which cell groups of the more than two active cell groups are to be configured for packet data convergence protocol (PDCP) aggregation such that data associated with a first data radio bearer (DRB) having a throughput requirement above at least one threshold is distributed across the indicated cell groups having an aggregate throughput that satisfies the throughput requirement of the ~~DRB~~first DRB; and communicating with the UE via the more than two active cell groups in accordance with the multi-connectivity configuration and the indication.

22.—~~20.~~ 20. The method of claim ~~21,19~~, wherein the at least one threshold is a plurality of predetermined thresholds, with each of the plurality of predetermined thresholds corresponding to one of the indicated cell groups, and wherein the data associated with the first DRB is distributed across the indicated cell groups in accordance with the plurality of predetermined thresholds.

23.—~~21.~~ 21. The method of claim ~~21,19~~, wherein the at least one threshold is one or more conditional thresholds, with each of the one or more conditional thresholds corresponding to a predetermined quality of a link connection associated with the indicated cell groups.

24.—~~22.~~ 22. The method of claim ~~20,19~~, further comprising:

_transmitting an indication of which cell groups of the more than two active cell groups are to be configured for ~~packet data convergence protocol (PDCP)~~ replication such that data associated with a ~~data radio bearer (second~~ second DRB) having a latency or reliability requirement above a threshold is replicated across the indicated cell groups.

25.—~~23.~~ 23. The method of claim ~~20,19~~, further comprising:

_determining a number of the plurality of cell groups to be included in the cell group set based at least in part on the multi-connectivity capability of the UE, service

requirements of ~~data radio bearers (DRBs)~~ configured for the UE, throughput or reliability requirements of DRBs configured for the UE, a location of the UE, channel conditions affecting communications with the UE, battery resources of the UE, other device resource conditions having an effect on capabilities of the UE, or combinations thereof.

~~26.~~—24. The method of claim ~~20,~~19, wherein the plurality of cell groups included in the cell group set include cell groups for both New Radio (NR) and Long Term Evolution (LTE) radio access technologies (RATs).

~~27.~~—25. The method of claim ~~20,~~19, wherein the plurality of cell groups included in the cell group set include cell groups for a same type of radio access technology (RAT).

~~28.~~—26. The method of claim ~~20,~~19, wherein each of the plurality of cell groups of the cell group set includes a set of cells configured for a same distributed unit (DU) of the base station and managed by a single medium access control (MAC) entity, and wherein all of the plurality of cell groups of the cell group set are associated with a same central unit (CU) of the base station.

~~29.~~—27. The method of claim ~~20,~~19, further comprising:
 _determining that two or more of the more than two active cell groups are controlling cell groups.

~~30.~~—28. The method of claim ~~29,~~27, further comprising:
 _transmitting, via a radio resource control (RRC) message, an indicator that the two or more of the more than two active cell groups are controlling cell groups.

~~31.~~—29. The method of claim ~~29,~~27, further comprising:
 _transmitting an allocation of signaling radio bearer (SRB) resources for each of the controlling cell groups without also transmitting an indicator that the two or more of the more than two active cell groups are controlling cell groups.

~~32.~~—30. The method of claim ~~29,~~27, further comprising:
 _receiving a report from the UE indicating one or more selected controlling cell groups from controlling cell groups; and

_transmitting at least one of system information (SI) notifications, public warning system (PWS) notifications, core network (CN) registration area notifications, or radio area network (RAN) notifications via the one or more selected controlling cell groups.

~~33.~~—31. The method of claim ~~20,19~~, further comprising:

_determining, based at least in part on the one or more measurement reports, that the cell group set is to further include one or more inactive cell groups to which the UE is connected but for which the UE lacks an allocation of uplink or downlink physical resources; and

_including an identification of the one or more inactive cell groups in the multi-connectivity configuration.

~~34.~~—32. The method of claim ~~33,31~~, further comprising:

_receiving, from the UE, one or more additional measurement reports identifying channel conditions associated with at least the more than two active cell groups and the one or more inactive cell groups; and

_transmitting an update to the multi-connectivity configuration based at least in part on the one or more additional measurement reports.

~~35.~~—33. The method of claim ~~34,32~~, further comprising:

_determining that the update to the multi-connectivity configuration is associated with adding an additional cell group to the cell group set;

_configuring a distributed unit (DU) of the base station and associated with the additional cell group with a UE context of the UE; and

_wherein transmitting the update to the multi-connectivity configuration comprises transmitting a radio resource control (RRC) signal indicating that the additional cell group is to be added to the cell group set.

~~36.~~—34. The method of claim ~~34,32~~, further comprising:

_determining that the update to the multi-connectivity configuration is associated with activating an inactive cell group to an active cell group;

_indicating the activating to a distributed unit (DU) of the base station and associated with the cell group to be activated via an flag; and

_wherein transmitting the update to the multi-connectivity configuration comprises transmitting a medium access control (MAC) control element (CE) or radio resource control (RRC) signal indicating that the inactive cell group has been changed to be an active cell group.

37.—~~35.~~ The method of claim ~~34,32,~~ further comprising:

_determining that the update to the multi-connectivity configuration is associated with deactivating an active cell group to an inactive cell group;

_indicating the deactivating to a distributed unit (DU) of the base station and associated with the cell group to be deactivated via a flag; and

_wherein transmitting the update to the multi-connectivity configuration comprises transmitting a medium access control (MAC) control element (CE) or radio resource control (RRC) signal indicating that the active cell group has been changed to be an inactive cell group.

38.—~~36.~~ The method of claim ~~34,32,~~ further comprising:

_determining that the update to the multi-connectivity configuration is associated with releasing a cell group from the cell group set;

_releasing a UE context of the UE from a distributed unit (DU) of the base station and associated with the cell group to be released; and

_wherein transmitting the update to the multi-connectivity configuration comprises transmitting a radio resource control (RRC) signal indicating that either an active cell group or an inactive cell group has been released and is no longer a part of the cell group set.

39.—~~37.~~ The method of claim ~~20,19,~~ further comprising:

_determining, at a central unit (CU) of the base station and based at least in part on information received from the UE and associated distributed units (DUs) of the base station, which ~~data radio bearers (DRBs)~~ are to be enabled for ~~packet data convergence protocol (PDCP)~~ aggregation and which DRBs are to be enabled for PDCP replication.

40.—~~38.~~ The method of claim ~~20,19,~~ further comprising:

_determining, at a distributed unit (DU) of the base station, which ~~data radio bearers (DRBs)~~ are to be enabled for ~~packet data convergence protocol (PDCP)~~ aggregation and which DRBs are to be enabled for PDCP replication; and

signaling the determination to a central unit (CU) of the base station.

41.—~~39.~~ The method of claim ~~20,19~~, further comprising:

transmitting a conditional indication of which cell groups of the more than two active cell groups are to be configured for ~~data radio bearer (DRB) packet data convergence protocol (PDCP)~~ DRB PDCP aggregation and of which cell groups of the more than two active cell groups are to be configured for DRB PDCP replication.

42.—~~40.~~ The method of claim ~~20,19~~, wherein the determining the cell group set is performed by a central unit (CU) of the base station.

43.—~~41.~~ The method of claim ~~42,40~~, wherein the CU of the base station communicates with distributed units (DUs) of the base station corresponding to each cell group of the cell group set via an ~~F1~~ interface or a ~~W1~~ interface.

44.—~~An apparatus for wireless communication at a user equipment (UE), comprising:~~

42. An apparatus for wireless communication at a user equipment (UE), comprising: a processor, memory coupled with the processor; and instructions stored in the memory and executable by the processor to cause the apparatus to: transmit a capability message to a base station indicating a multi-connectivity capability of the UE to support more than two concurrent active cell group connections; transmit, to the base station, one or more measurement reports that provide measurement information for cells in proximity to the UE; receive, responsive to the capability message and the one or more measurement reports, a multi-connectivity configuration, the multi-connectivity configuration comprising a cell group set that includes a plurality of cell groups with which the UE is configured for multi-connectivity communications, the cell group set including more than two active cell groups to which the UE is connected for concurrent connected mode operations between the UE and the base station; receive an indication of which cell groups of the more than two active cell groups are to be configured for packet data convergence protocol (PDCP) aggregation such that data associated with a first data radio bearer (DRB) having a throughput requirement satisfying a threshold is distributed across cell groups in the received indication having an aggregate throughput that satisfies the throughput requirement of the first DRB; and

communicate with the base station via the more than two active cell groups in accordance with the multi-connectivity configuration and the indication.

43. An apparatus for wireless communication at a base station, comprising: a processor, memory coupled with the processor; and instructions stored in the memory and executable by the processor to cause the apparatus to: receive a capability message from a user equipment (UE) indicating a multi-connectivity capability of the UE to support more than two concurrent active cell group connections; receive, from the UE, one or more measurement reports that provide measurement information for cells in proximity to the UE; determine, based at least in part on the one or more measurement reports, a cell group set that includes a plurality of cell groups with which the UE is to be configured for multi-connectivity communications, the cell group set including more than two active cell groups to which the UE is to be connected for concurrent connected mode operations between the UE and the base station; transmit to the UE, responsive to the capability message and the one or more measurement reports, a multi-connectivity configuration that includes the cell group set; transmit an indication of which cell groups of the more than two active cell groups are to be configured for packet data convergence protocol (PDCP) aggregation such that data associated with a first data radio bearer (DRB) having a throughput requirement above at least one threshold is distributed across the indicated cell groups having an aggregate throughput that satisfies the throughput requirement of the first DRB; and communicate with the UE via the more than two active cell groups in accordance with the multi-connectivity configuration and the indication.

44. An apparatus for wireless communication at a user equipment (UE), comprising: means for transmitting a capability message to a base station indicating a multi-connectivity capability of the UE to support more than two concurrent active cell group connections;

_means for transmitting, to the base station, one or more measurement reports that provide measurement information for cells in proximity to the UE;

_means for receiving, responsive to the capability message and the one or more measurement reports, a multi-connectivity configuration, the multi-connectivity configuration comprising a cell group set that includes a plurality of cell groups with which the UE is configured for multi-connectivity communications, the cell group set including more than

two active cell groups to which the UE is connected for concurrent connected mode operations between the UE and the base station; ~~and~~

~~means for communicating with the base station via the more than two active cell groups in accordance with the multi-connectivity configuration.~~

45.—~~The apparatus of claim 44, further comprising:~~

~~means for receiving an indication of which cell groups of the more than two active cell groups are to be configured for packet data convergence protocol (PDCP) aggregation such that data associated with a first data radio bearer (DRB) having a throughput requirement above at least one satisfying a threshold is distributed across ~~the indicated~~ cell groups in the received indication having an aggregate throughput that satisfies the throughput requirement of the ~~DRB~~ first DRB; and means for communicating with the base station via the more than two active cell groups in accordance with the multi-connectivity configuration and the indication.~~

46.—~~45.~~ An apparatus for wireless communication at a base station, comprising:

~~_~~means for receiving a capability message from a user equipment (UE) indicating a multi-connectivity capability of the UE to support more than two concurrent active cell group connections;

~~_~~means for receiving, from the UE, one or more measurement reports that provide measurement information for cells in proximity to the UE;

~~_~~means for determining, based at least in part on the one or more measurement reports, a cell group set that includes a plurality of cell groups with which the UE is to be configured for multi-connectivity communications, the cell group set including more than two active cell groups to which the UE is to be connected for concurrent connected mode operations between the UE and the base station;

~~_~~means for transmitting to the UE, responsive to the capability message and the one or more measurement reports, a multi-connectivity configuration that includes the cell group set; ~~and~~

means for transmitting an indication of which cell groups of the more than two active cell groups are to be configured for packet data convergence protocol (PDCP) aggregation such that data associated with a first data radio bearer (DRB) having a throughput requirement above at least one threshold is distributed across the indicated cell

groups having an aggregate throughput that satisfies the throughput requirement of the first DRB; and means for communicating with the UE via the more than two active cell groups in accordance with the multi-connectivity configuration and the indication.

47.—~~The apparatus of claim 46, further comprising:~~

~~means for transmitting an indication of which cell groups of the more than two active cell groups are to be configured for packet data convergence protocol (PDCP) aggregation such that data associated with a data radio bearer (DRB) having a throughput requirement above at least one threshold is distributed across the indicated cell groups having an aggregate throughput that satisfies the throughput requirement of the DRB.~~

48.—~~An apparatus for wireless communication at a user equipment (UE), comprising:~~

~~a processor;~~

~~memory coupled with the processor; and~~

~~instructions stored in the memory and executable by the processor to cause the apparatus to:~~

~~transmit a capability message to a base station indicating a multi-connectivity capability of the UE to support more than two concurrent active cell group connections;~~

~~transmit, to the base station, one or more measurement reports that provide measurement information for cells in proximity to the UE;~~

~~receive, responsive to the capability message and the one or more measurement reports, a multi-connectivity configuration, the multi-connectivity configuration comprising a cell group set that includes a plurality of cell groups with which the UE is configured for multi-connectivity communications, the cell group set including more than two active cell groups to which the UE is connected for concurrent connected mode operations between the UE and the base station; and~~

~~communicate with the base station via the more than two active cell groups in accordance with the multi-connectivity configuration.~~

49.—~~An apparatus for wireless communication at a base station, comprising:~~

~~a processor;~~

~~memory coupled with the processor; and~~

instructions stored in the memory and executable by the processor to cause the apparatus to:

~~receive a capability message from a user equipment (UE) indicating a multi-connectivity capability of the UE to support more than two concurrent active cell group connections;~~

~~receive, from the UE, one or more measurement reports that provide measurement information for cells in proximity to the UE;~~

~~determine, based at least in part on the one or more measurement reports, a cell group set that includes a plurality of cell groups with which the UE is to be configured for multi-connectivity communications, the cell group set including more than two active cell groups to which the UE is to be connected for concurrent connected mode operations between the UE and the base station;~~

~~transmit to the UE, responsive to the capability message and the one or more measurement reports, a multi-connectivity configuration that includes the cell group set; and~~

~~communicate with the UE via the more than two active cell groups in accordance with the multi-connectivity configuration.~~

50.—46. A non-transitory computer-readable medium storing code for wireless communication at a user equipment (UE), the code comprising instructions executable by a processor to:

transmit a capability message to a base station indicating a multi-connectivity capability of the UE to support more than two concurrent active cell group connections;

transmit, to the base station, one or more measurement reports that provide measurement information for cells in proximity to the UE;

receive, responsive to the capability message and the one or more measurement reports, a multi-connectivity configuration, the multi-connectivity configuration comprising a cell group set that includes a plurality of cell groups with which the UE is configured for multi-connectivity communications, the cell group set including more than two active cell groups to which the UE is connected for concurrent connected mode operations between the UE and the base station; and

receive an indication of which cell groups of the more than two active cell groups are to be configured for packet data convergence protocol (PDCP) aggregation such that data associated with a first data radio bearer (DRB) having a throughput requirement

satisfying a threshold is distributed across cell groups in the received indication having an aggregate throughput that satisfies the throughput requirement of the first DRB; and
communicate with the base station via the more than two active cell groups in accordance with the multi-connectivity configuration and the indication.

51.—47. A non-transitory computer-readable medium storing code for wireless communication at a base station, the code comprising instructions executable by a processor to:

_receive a capability message from a user equipment (UE) indicating a multi-connectivity capability of the UE to support more than two concurrent active cell group connections;

_receive, from the UE, one or more measurement reports that provide measurement information for cells in proximity to the UE;

_determine, based at least in part on the one or more measurement reports, a cell group set that includes a plurality of cell groups with which the UE is to be configured for multi-connectivity communications, the cell group set including more than two active cell groups to which the UE is to be connected for concurrent connected mode operations between the UE and the base station;

_transmit to the UE, responsive to the capability message and the one or more measurement reports, a multi-connectivity configuration that includes the cell group set; ~~and~~

transmit an indication of which cell groups of the more than two active cell groups are to be configured for packet data convergence protocol (PDCP) aggregation such that data associated with a first data radio bearer (DRB) having a throughput requirement above at least one threshold is distributed across the indicated cell groups having an aggregate throughput that satisfies the throughput requirement of the first DRB; and
communicate with the UE via the more than two active cell groups in accordance with the multi-connectivity configuration— and the indication.