~~WHAT IS CLAIMED IS:~~

CLAIMS

1.____ A method of wireless communication performed by a ~~base station~~network entity, comprising:

detecting a preamble of a random access message associated with a two-step random access procedure,

wherein the random access message is received from a user equipment (UE);

processing a payload of the random access message, wherein an outcome of processing the payload is either successfully decoding the payload or failing to decode the payload; and

transmitting, based at least in part on detecting the preamble and the outcome of processing the payload, a random access response associated with the two-step random access procedure,

wherein the random access response includes an uplink group grant, a status of the uplink group grant, and an indication of a type of the uplink group grant, for a plurality of UEs including the UE,

wherein the status includes information that identifies a number of uplink group grants included in the random access response,

wherein the indication of the type of the uplink group grant is capable of indicating that that the uplink group grant is for one of a fallback random access response, a success random access response, or a shared uplink group grant,

wherein preamble transmissions of the plurality of UEs share a time and frequency occasion~~.~~, and

wherein the uplink group grant is transmitted in a set of resources shared by the fallback random access response and the success random access response.

2.____ The method of claim 1, wherein, when the outcome of processing the payload of the random access message is failing to decode the payload, the uplink group grant is included in the random access response based at least in part on failing to decode the payload.

3.____ The method of claim 2, wherein the uplink group grant is included in ~~a~~the fallback random access response.

4.____ The method of claim 2, wherein the UE is included in the plurality of UEs based at least in part on a timing offset associated with the UE or a UE status of the UE.

5.____ The method of claim 1, wherein the uplink group grant indicates a common set of time-frequency resources, a modulation and coding scheme (MCS), common information for power control or beam management, and a physical uplink shared channel (PUSCH) hopping flag to be used by the plurality of UEs for transmitting other random access messages.

6.____ The method of claim 1, wherein a demodulation reference signal (DMRS) resource configuration for the plurality of UEs is explicitly indicated in the uplink group grant.

7.____ The method of claim 1, wherein a demodulation reference signal (DMRS) resource configuration for the plurality of UEs is implicitly indicated by a mapping rule associated with preamble resource indices and DMRS resource indices configured for the plurality of UEs by the ~~base station.~~network entity.

8.____ The method of claim 1, wherein a timing advance (TA) command, associated with the UE, and a temporary cell radio network temporary identifier (TC-RNTI), associated with the UE, are transmitted separately from the uplink group grant.

9.____ The method of claim 1, wherein the uplink group grant is an only uplink group grant included in the random access response.

10.___ The method of claim 1, wherein the uplink group grant is one of a plurality of uplink group grants included in the random access response.

11.___ The method of claim 1, wherein the random access response further includes a single-UE uplink grant for another UE.

12.___ The method of claim 1, wherein the outcome of processing the payload of the random access message is successfully decoding the payload, wherein the method further comprises:

determining, based at least in part on ~~an~~a payload indication in the payload, that the UE needs to transmit additional uplink data,

wherein the uplink group grant is included in the random access response based at least in part on the indication of the type of the uplink group grant.

13. The method of claim 12, wherein the uplink group grant is included in ~~a~~the success random access response.

14. The method of claim 12, wherein the indication of the type of the uplink group grant is provided via a buffer status report (BSR).

15. The method of claim 12, wherein the indication of the type of the uplink group grant is provided via a scheduling request (SR).

16. The method of claim 12, wherein the UE is grouped into the plurality of UEs based at least in part on at least one of:

a reference signal received power (RSRP) measurement,

a channel state information (CSI) report,

beam management,

quality of service (QoS) handling, or

a positioning-related measurement.

17. ~~The method of claim 1, wherein the uplink group grant is transmitted in a resource independent from resources corresponding to a fallback random access response and resources corresponding to a success random access response.~~

~~18. The method of claim 1, wherein the uplink group grant is transmitted in a set of resources shared by a fallback random access response and a success random access response.~~

~~19.~~ The method of claim 1, wherein the indication of the type of the uplink group grant is transmitted in a downlink control information (DCI) field of a random access response physical downlink control channel (PDCCH).

~~20.~~18. The method of claim ~~19~~17, wherein the indication of the type of the uplink group grant is based at least in part on a bitmap.

~~21.~~19. The method of claim ~~19~~17, wherein the DCI is associated with a cyclic redundancy check (CRC), wherein the CRC is masked by a group radio network temporary identifier (RNTI).

~~22.~~20. The method of claim ~~19~~17, wherein the random access response PDCCH is transmitted in a common search space.

~~23.~~21. The method of claim 1, further comprising constructing the uplink group grant for the plurality of UEs performing a two-step random access procedure.

~~24. The method of claim 1, wherein the random access response includes a status of the uplink group grant, the status including at least one of:~~
~~information that identifies a number of uplink group grants included in the random access response, or~~
~~the indication of the type of the uplink group grant.~~

~~25.~~22. A method of wireless communication performed by a user equipment (UE), comprising:

transmitting a preamble and a payload of a random access message associated with a two-step random access procedure;

receiving a random access response, associated with the two-step random access procedure, including an uplink group grant, a status of the uplink group grant, and an indication of a type of the uplink group grant for a plurality of UEs including the UE,

wherein the status includes information that identifies a number of uplink group grants included in the random access response,

wherein the indication of the type of the uplink group grant is capable of indicating that that the uplink group grant is for one of a fallback random access response, a success random access response, or a shared uplink group grant, and

wherein the uplink group grant is transmitted in a set of resources shared by the fallback random access response and the success random access response; and

transmitting an uplink communication on a set of shared time-frequency resources based at least in part on the uplink group grant.

~~26.~~23. The method of claim ~~25~~22, wherein the uplink group grant included in the random access response indicates a ~~base station~~network entity failing to decode the payload.

~~27.~~24. The method of claim ~~26~~23, wherein the uplink group grant is included in ~~a~~the fallback random access response.

~~28.~~25. The method of claim ~~26~~23, wherein the UE is included in the plurality of UEs based at least in part on a timing offset associated with the UE or a UE status of the UE.

~~29.~~26. The method of claim ~~25~~22, wherein the uplink group grant indicates a common set of time-frequency resources, a modulation and coding scheme (MCS), common information for power control or beam management, and a physical uplink shared channel (PUSCH) hopping flag to be used by the plurality of UEs for transmitting other random access messages.

~~30.~~27. The method of claim ~~25~~22, wherein a demodulation reference signal (DMRS) resource configuration for the plurality of UEs is explicitly indicated in the uplink group grant.

~~31.~~28. The method of claim ~~25~~22, wherein a demodulation reference signal (DMRS) resource configuration for the plurality of UEs is implicitly indicated by a mapping rule associated with preamble resource indices and DMRS resource indices configured for the plurality of UEs by a ~~base station.~~network entity.

~~32.~~29. The method of claim ~~25~~22, wherein a timing advance (TA) command, associated with the UE, and a temporary cell radio network temporary identifier (TC-RNTI), associated with the UE, are received separately from the uplink group grant.

~~33.~~30. The method of claim ~~25~~22, wherein the uplink group grant is an only uplink group grant included in the random access response.

~~34.~~31. The method of claim ~~25~~22, wherein the uplink group grant is one of a plurality of uplink group grants included in the random access response.

~~35.~~32. The method of claim ~~25~~22, wherein the random access response further includes a single-UE uplink grant for another UE.

~~36.~~33. The method of claim ~~25~~22, wherein an indication that the UE needs to transmit additional uplink data is included in the payload of the random access message.

~~37.~~34. The method of claim ~~36~~33, wherein the uplink group grant is included in ~~a~~the success random access response.

~~38.~~35. The method of claim ~~36~~33, wherein the indication of the type of the uplink group grant is provided via a buffer status report (BSR).

~~39.~~36. The method of claim ~~36~~33, wherein the indication of the type of the uplink group grant is provided via a scheduling request (SR).

~~40.~~37. The method of claim ~~36~~33, wherein the UE is grouped into the plurality of UEs based at least in part on at least one of:

a reference signal received power (RSRP) measurement,
a channel state information (CSI) report,
beam management,
quality of service (QoS) handling, or
a positioning-related measurement.

~~41.~~38. The method of claim ~~25, wherein the uplink group grant is received in a resource independent from resources corresponding to a fallback random access response and resources corresponding to a success random access response.~~

~~42. The method of claim 25, wherein the uplink group grant is received in a set of resources shared by a fallback random access response and a success random access response.~~

~~43. The method of claim 25~~22, wherein the indication of the type of the uplink group grant is received in a downlink control information (DCI) field of a random access response physical downlink control channel (PDCCH) based at least in part on monitoring the random access response PDCCH.

~~44.~~39. The method of claim ~~43~~38, wherein the DCI is associated with a cyclic redundancy check (CRC), wherein the CRC is de-masked with a group radio network temporary identifier (RNTI).

~~45.~~40. The method of claim ~~43~~38, wherein the DCI is decoded to determine a resource assignment of a random access response physical downlink shared channel (PDSCH), wherein the indication of the type of the uplink group grant is carried in the random access response PDSCH.

~~46.~~41. The method of claim ~~25~~22, wherein the random access response and the uplink group grant are decoded.

~~47.~~42. The method of claim ~~25~~22, wherein a timing advance (TA), a modulation and coding scheme (MCS), power control, beam management, and time-frequency resource allocation ~~is~~are applied in association with transmitting the uplink communication.

~~48.~~43. The method of claim ~~25~~22, wherein the ~~random access response~~status further includes~~a status of the uplink group grant, the status including at least one of~~:

~~information that identifies a number of uplink group grants included in the random access response, or~~

the indication of the type of the uplink group grant.

~~49.~~44. A ~~base station~~network entity for wireless communication, comprising:

a memory; and

one or more processors coupled to the memory, the ~~memory and the~~ one or more processors configured to:

detect a preamble of a random access message associated with a two-step random access procedure,

wherein the random access message is received from a user equipment (UE);

process a payload of the random access message, wherein an outcome of processing the payload is either successfully decoding the payload or failing to decode the payload; and

transmit, based at least in part on detecting the preamble and the outcome of processing the payload, a random access response associated with the two-step random access procedure,

wherein the random access response includes an uplink group grant, a status of the uplink group grant, and an indication of a type of the uplink group grant, for a plurality of UEs including the UE,

wherein the status includes information that identifies a number of uplink group grants included in the random access response,

wherein the indication of the type of the uplink group grant is capable of indicating that that the uplink group grant is for one of a fallback random access response, a success random access response, or a shared uplink group grant,

wherein preamble transmissions of the plurality of UEs share a time and frequency occasion~~.~~, and

wherein the uplink group grant is transmitted in a set of resources shared by the fallback random access response and the success random access response.

45. The network entity of claim 44, wherein the uplink group grant is one of a plurality of uplink group grants included in the random access response.

46. The network entity of claim 44, wherein an indication that the UE needs to transmit additional uplink data is included in the payload of the random access message.

~~50.~~47. A user equipment (UE) for wireless communication, comprising:

a memory; and

one or more processors coupled to the memory, the ~~memory and the~~ one or more processors configured to:

transmit a preamble and a payload of a random access message associated with a two-step random access procedure;

receive a random access response, associated with the two-step random access procedure, including an uplink group grant, a status of the uplink group grant, and an indication of a type of the uplink group grant for a plurality of UEs including the UE~~; and~~,

wherein the status includes information that identifies a number of uplink group grants included in the random access response,

wherein the indication of the type of the uplink group grant is capable of indicating that that the uplink group grant is for one of a fallback random access response, a success random access response, or a shared uplink group grant, and

wherein the uplink group grant is transmitted in a set of resources shared by the fallback random access response and the success random access response; and

transmit an uplink communication on a set of shared time-frequency resources based at least in part on the uplink group grant.

48. The UE of claim 47, wherein the uplink group grant is one of a plurality of uplink group grants included in the random access response.

49. The UE of claim 47, wherein an indication that the UE needs to transmit additional uplink data is included in the payload of the random access message.