CLAIMS

1. An ad hoc radio base station (100), comprising:

one or more radio transceivers (102) configured to receive and transmit in a Long-Term Evolution, LTE, cellular radio network; and

means (104) for:

setting (302) up an ad hoc LTE cell on a channel number with a Physical Cell ID, PCID, and a Tracking Area Code, TAC;

setting (306) up a radio connection in the ad hoc LTE cell to an LTE user apparatus using a Random Access Channel, RACH, procedure;

setting (308) a Non-Access Stratum, NAS, timer simultaneously with the setting up of the radio connection;

repeating (310) the following three steps until a predetermined period of time remains before an expiry of the NAS timer:

commanding (312) with a Medium Access Control, MAC, control message in the radio connection the LTE user apparatus to use full buffer in all uplink messages of the radio connection;

forcing (314) the LTE user apparatus to send uplink messages in the radio connection by sending to the LTE user apparatus one of a Radio Resource Control User Equipment, RRC UE, capability request message, an NAS identity request message, or an NAS security mode command message; and

receiving (316) a reply message to the one of a Radio Resource Control User Equipment (RRC UE) capability request message, an NAS identity request message, or an NAS security mode command message in the radio connection from the LTE user apparatus;

during (318) the predetermined period of time before the expiry of the NAS timer:

restarting (320) the ad hoc LTE cell on the channel number with a different PCID, and a different TAC than in the previous radio connection; and

continuing performance from the setting (306) up of the radio connection with the different PCID, and the different TAC in the ad hoc LTE cell to the LTE user apparatus using the RACH procedure.

2. The ad hoc radio base station of claim 1, further comprising means (104) for:

after receiving (316) the reply message in the radio connection from the LTE user apparatus, calculating (340) a distance estimate to the LTE user apparatus based on a current uplink timing advance value of the radio connection.

3. The ad hoc radio base station of claim 1, further comprising means (104) for:

after receiving (316) the reply message in the radio connection from the LTE user apparatus, checking (332) whether a predetermined amount of time starting from a previous RACH procedure has passed during the predetermined period of time, and if the predetermined amount of time has passed (332-YES), transmitting (334) a Layer 1 Physical Downlink Control Channel, L1 PDCCH, order message in the radio connection to the LTE user apparatus, and performing (336) a new RACH procedure with the LTE user apparatus to set up the radio connection in the ad hoc LTE cell to the LTE user apparatus.

4. The ad hoc radio base station of claim 3, further comprising means (104) for:

calculating (338) a distance estimate to the LTE user apparatus based on the new RACH procedure setting up the radio connection.

5. The ad hoc radio base station of claim 1, further comprising means (104) for:

during (318) the predetermined period of time before the expiry of the NAS timer:

before restarting (320) the ad hoc LTE cell on the channel number with the different PCID, and the different TAC than in the previous radio connection, transmitting (342) an NAS reject message with a network failure or congestion as the cause in the radio connection to the LTE user apparatus.

6. The ad hoc radio base station of claim 1, wherein the ad hoc LTE cell is set (302) up on the channel number using also a Global Cell ID, GCID, and the ad hoc LTE cell is restarted (320) on the channel number also with a different GCID than in the previous radio connection.

7. A system (130) comprising a first ad hoc radio base station (100A) and a second ad hoc radio base station (100B),

the first ad hoc radio base station (100A) comprising one or more radio transceivers (102A) configured to receive and transmit in a Long-Term Evolution, LTE, cellular radio network, and one or more processors (104A), and

the second ad hoc radio base station (100B) comprising one or more radio transceivers (102B) configured to receive and transmit in the LTE cellular radio network, and one or more processors (104B),

wherein the one or more processors (104A) of the first ad hoc radio base station (100A) are configured to cause performance of at least the following:

setting (402) up a first ad hoc LTE cell on a first channel number with a first Tracking Area Code, TAC;

setting (406) up a first radio connection in the first ad hoc LTE cell to an LTE user apparatus using a first Random Access Channel, RACH, procedure; and

transmitting (410) a Radio Resource Control, RRC, release message with a redirection to a second ad hoc LTE cell in the first radio connection to the LTE user apparatus,

wherein the one or more processors (104B) of the second ad hoc radio base station (100B) are configured to cause performance of at least the following:

setting (412) up a second ad hoc LTE cell on a second channel number with a second TAC;

setting (416) up a second radio connection in the second ad hoc LTE cell to the LTE user apparatus using a second RACH procedure, because the first ad hoc LTE cell transmitted the RRC release message with the redirection to the second ad hoc LTE cell to the LTE user apparatus;

setting (418) a Non-Access Stratum, NAS, timer simultaneously with the setting up of the second radio connection;

repeating (420) the following two steps until a predetermined period of time remains before an expiry of the NAS timer:

forcing (424) the LTE user apparatus to send uplink messages in the second radio connection by sending to the LTE user apparatus one of a Radio Resource Control User Equipment, RRC UE, capability request message, an NAS identity request message, or an NAS security mode command message; and

receiving (426) a reply message to the one of a Radio Resource Control User Equipment, RRC UE, capability request message, an NAS identity request message, or an NAS security mode command message in the second radio connection from the LTE user apparatus;

during (428) the predetermined period of time before the expiry of the

NAS timer:

transmitting (430) an RRC release message with a redirection to the first ad hoc LTE cell in the second radio connection to the LTE user apparatus,

and wherein the one or more processors (104A) of the first ad hoc radio base station (100A) are configured to cause performance of at least the following:

continuing performance from the setting (406) up of the first radio connection in the first ad hoc LTE cell to the LTE user apparatus using the first RACH procedure.

8. The system of claim 7, wherein the one or more processors (104B) of the second ad hoc radio base station (100B) are configured to cause performance of the following:

after receiving (426) the reply message in the second radio connection from the LTE user apparatus, calculating (450) a distance estimate to the LTE user apparatus based on a current uplink timing advance value of the second radio connection.

9. The system of claim 7, wherein the one or more processors (104B) of the second ad hoc radio base station (100B) are configured to cause performance of the following:

after receiving (426) the reply message in the second radio connection from the LTE user apparatus, checking (442) whether a predetermined amount of time starting from a previous RACH procedure in the second ad hoc LTE cell has passed during the predetermined period of time, and if the predetermined amount of time has passed (442-YES), transmitting (444) a Layer 1 Physical Downlink Control Channel, L1 PDCCH, order message in the second radio connection to the LTE user apparatus, and performing (446) a new RACH procedure with the LTE user apparatus to set up the second radio connection in the second ad hoc LTE cell to the LTE user apparatus.

10. The system of claim 9, wherein the one or more processors (104B) of the second ad hoc radio base station (100B) are configured to cause performance of the following:

calculating (448) a distance estimate to the LTE user apparatus based on the new RACH procedure setting up the second radio connection.

11. The system of claim 7, wherein the one or more processors (104B) of the second ad hoc radio base station (100B) are configured to cause performance of the following:

during (428) the predetermined period of time before the expiry of the NAS timer:

before transmitting (410) the RRC release message with the redirection to the first ad hoc LTE cell in the second radio connection to the LTE user apparatus, transmitting (408) an NAS reject message with a network failure or congestion as the cause in the second radio connection to the LTE user apparatus.

12. The system of claim 7, wherein the one or more processors (104B) of the second ad hoc radio base station (100B) are configured to cause performance of the following:

before forcing (424) the LTE user apparatus to send uplink messages in the second radio connection by sending to the LTE user apparatus one of the RRC UE, capability request message, the NAS identity request message, or the NAS security mode command message, commanding (422) with a Medium Access Control, MAC, control message in the second radio connection the LTE user apparatus to use full buffer in all uplink messages of the second radio connection.

13. A method for implementing two successive ad hoc cells, comprising:

setting (302) up, by using one or more radio transceivers configured to receive and transmit in a Long-Term Evolution, LTE, cellular radio network, an ad hoc LTE cell on a channel number with a Physical Cell ID, PCID, and a Tracking Area Code, TAC,

setting (306) up a radio connection in the ad hoc LTE cell to an LTE user apparatus using a Random Access Channel, RACH, procedure;

setting (308) a Non-Access Stratum, NAS, timer simultaneously with the setting up of the radio connection;

repeating (310) the following three steps until a predetermined period of time remains before an expiry of the NAS timer:

commanding (312) with a Medium Access Control, MAC, control message in the radio connection the LTE user apparatus to use full buffer in all uplink messages of the radio connection;

forcing (314) the LTE user apparatus to send uplink messages in the

radio connection by sending to the LTE user apparatus one of a Radio Resource Control User Equipment, RRC UE, capability request message, an NAS identity request message, or an NAS security mode command message; and

receiving (316) a reply message to the one of a Radio Resource Control User Equipment (RRC UE) capability request message, an NAS identity request message, or an NAS security mode command message in the radio connection from the LTE user apparatus;

during (318) the predetermined period of time before the expiry of the NAS timer:

restarting (320) the ad hoc LTE cell on the channel number with a different PCID, and a different TAC than in the previous radio connection; and

continuing performance from the setting (306) up of the radio connection with the different PCID, and the different TAC in the ad hoc LTE cell to the LTE user apparatus using the RACH procedure.

14. A method for implementing two simultaneous ad hoc cells, comprising:

setting (402) up, by using one or more radio transceivers configured to receive and transmit in a Long-Term Evolution, LTE, cellular radio network, a first ad hoc LTE cell on a first channel number with a first Tracking Area Code, TAC;

setting (412) up, by using one or more radio transceivers configured to receive and transmit in the LTE cellular radio network, a second ad hoc LTE cell on a second channel number with a second TAC;

setting (406) up a first radio connection in the first ad hoc LTE cell to an LTE user apparatus using a first Random Access Channel, RACH, procedure; and

transmitting (410) a Radio Resource Control, RRC, release message with a redirection to a second ad hoc LTE cell in the first radio connection to the LTE user apparatus,

setting (416) up a second radio connection in the second ad hoc LTE cell to the LTE user apparatus using a second RACH procedure, because the first ad hoc LTE cell transmitted the RRC release message with the redirection to the second ad hoc LTE cell to the LTE user apparatus;

setting (418) a Non-Access Stratum, NAS, timer simultaneously with the setting up of the second radio connection;

repeating (420) the following two steps until a predetermined period of time remains before an expiry of the NAS timer:

forcing (424) the LTE user apparatus to send uplink messages in the second radio connection by sending to the LTE user apparatus one of a Radio Resource Control User Equipment, RRC UE, capability request message, an NAS identity request message, or an NAS security mode command message; and

receiving (426) a reply message to the one of a Radio Resource Control User Equipment (RRC UE) capability request message, an NAS identity request message, or an NAS security mode command message in the second radio connection from the LTE user apparatus;

during (428) the predetermined period of time before the expiry of the NAS timer:

transmitting (430) an RRC release message with a redirection to the first ad hoc LTE cell in the second radio connection to the LTE user apparatus; and

continuing performance from the setting (406) up of the first radio connection in the first ad hoc LTE cell to the LTE user apparatus using the first RACH procedure.

15. A computer-readable medium (112) comprising computer program code (110), which, when executed by one or more microprocessors (106), causes performance of a method for implementing two successive ad hoc cells, comprising:

setting (302) up, by using one or more radio transceivers configured to receive and transmit in a Long-Term Evolution, LTE, cellular radio network, an ad hoc LTE cell on a channel number with a Physical Cell ID, PCID, and a Tracking Area Code, TAC,

setting (306) up a radio connection in the ad hoc LTE cell to an LTE user apparatus using a Random Access Channel, RACH, procedure;

setting (308) a Non-Access Stratum, NAS, timer simultaneously with the setting up of the radio connection;

repeating (310) the following three steps until a predetermined period of time remains before an expiry of the NAS timer:

commanding (312) with a Medium Access Control, MAC, control message in the radio connection the LTE user apparatus to use full buffer in all uplink messages of the radio connection;

forcing (314) the LTE user apparatus to send uplink messages in the radio connection by sending to the LTE user apparatus one of a Radio Resource Control User Equipment, RRC UE, capability request message, an NAS identity

request message, or an NAS security mode command message; and

receiving (316) a reply message to the one of a Radio Resource Control User Equipment (RRC UE) capability request message, an NAS identity request message, or an NAS security mode command message in the radio connection from the LTE user apparatus;

during (318) the predetermined period of time before the expiry of the NAS timer:

restarting (320) the ad hoc LTE cell on the channel number with a different PCID, and a different TAC than in the previous radio connection; and

continuing performance from the setting (306) up of the radio connection with the different PCID, and the different TAC in the ad hoc LTE cell to the LTE user apparatus using the RACH procedure.