relaying the traffic of the other Base Stations/Relays to the core segment or to other Base Stations/Relays in a higher layer, which is connected to the core segment.

Multi-layer hierarchical dynamic cellular networks pose difficulties for routing, traffic flow and management (e.g. the multi protocol-layers handling). These difficulties may occur since the base LTE architecture, protocols and core elements do not support this type of network topology.

The disclosures of all publications and patent documents mentioned in the specification, and of the publications and patent documents cited therein directly or indirectly, are hereby incorporated by reference.

SUMMARY

Certain embodiments of the presently disclosed subject matter seek to provide a moving cellular communication system operative in an emergency mode.

According to a first aspect, there is provided a moving cellular communication system forming part of a cellular communication network having a core element, the system comprising: at least one emergency moving relay including: at least one base station functionality serving at least one mobile station; at least one mobile station functionality providing at least one backhauling link toward the core element; and a relay resource manager operative to manage at least one resource pertaining to at least one of the base station functionality and mobile station functionality, all co-located, wherein the relay resource manager includes a core functionality operative, selectably, to take over at least one core function performed by said core element, for said at least one mobile station served by said base station functionality.

In accordance with an embodiment~~aspect~~ of the presently disclosed subject matter, there is provided a moving cellular communication system comprising at least one moving relay including at least one base station functionality and at least one mobile station functionality and a radio manager, all co-located, at least one emergency moving relay from among the moving relays further including a simulated stationary network that includes a

simulated IP connectivity gateway operative to communicate with a simulated mobility management entity; the simulated stationary network simulates the operation of a stationary network; the emergency moving relay being a root of a sub tree that includes at least one moving relay and at least one mobile station, and is configured to utilize its mobile station functionality, base station functionality and radio manager for operating in at least the following modes of operations:

(i) normal mode of operation wherein the emergency moving relay communicates with other relays in the network and with the stationary network;

(ii) in response to an emergency event, operating in an emergency mode of operation, including

a. communicating to a designated mobile station in the sub-tree each message that was received from a moving relay or a

Embodiment 40. The system according to Embodiment 1 wherein the core functionality's take-over of the at least one core function from the core element includes taking over at least one gateway function of the core element's functioning.

Embodiment 41. The system according to Embodiment 40 wherein said gateway function comprises at least one of an LTE PDN-GW function and a Serving-GW function.

Embodiment 42. The system according to any of embodiments 1 – 3 or 31where said at least one mobile station functionality is not connected to another relay base station functionality and is is not connected to a static base station.

The subject matter of the invention further contemplates a counterpart method and corresponding embodiments, *mutatis mutandis*.

According to a second aspect, there is provided a moving cellular communication system comprising: at least one moving relay including at least one base station functionality and at least one mobile station functionality and a relay resource manager, all co-located, at least one emergency moving relay from among said moving relays further including a simulated stationary network that includes a simulated IP connectivity gateway operative to communicate with a simulated mobility management entity; said simulated stationary network simulates the operation of a stationary network; said emergency moving relay being a root of a sub tree that includes at least one moving relay and at least one mobile station, and is configured to utilize its mobile station functionality, base station functionality and relay resource manager for operating in at least the following modes of operations: (i) normal mode of operation wherein the emergency moving relay communicates with other relays in the network and with the stationary network; (ii) in response to an emergency event, operating in an emergency mode of operation, including: a. communicating to a designated mobile station in the sub-tree each message that was received from a moving relay or a mobile station in said sub-tree and said message having an IP address of the designated mobile station; or b. communicating to said simulated stationary network each message that was received from a moving relay or a mobile station in said sub-tree and having an IP address that does not match any mobile station in the sub-tree.

According to a third aspect, there is provided a system according to the first aspect wherein said cellular communication network has at least one inter-node interface operable

according to at least one of the following standards: 2G, GSM, CDMA, 3G, UMTS, WCDMA, HSPA, LTE, WiMAX, WiFi.

The following terms may be construed either in accordance with any definition thereof appearing in the prior art literature or in accordance with the specification, or as follows:

access link: a bi-directional link between a relay node (RN) base station functionality and a mobile station (MS) served thereby or between a base station and a mobile station served thereby. It typically has an uplink portion and a downlink portion, both uni-directional.

Backhaul data: data being transferred, typically bi-directionally, over at least one backhauling link.

Backhauling link: bi-directional link other than an access link e.g. link between relays in adjacent levels or link between relay and static base station or link between relays and relay proxy or link between base station functionality or static base station or relay proxy and core. More generally, a backhauling link bi-directionally links distributed sites to each other or links access points e.g. base stations and a more centralized point e.g. a core. Typically a backhauling link has an uplink portion and a downlink portion, both uni-directional.

base station: one of a plurality of stationary or mobile nodes in a cellular communication network which are sufficiently densely distributed over a served area such that almost all mobile communication devices served by the network can almost always communicate with one another or with a terrestrial network through those

CLAIMS

1. A moving cellular communication system forming part of a cellular communication network having a core element, the system comprising:

at least one emergency moving relay including:

at least one base station functionality serving at least one mobile station;

at least one mobile station functionality providing at least one backhauling link toward the core element; and

a relay resource manager operative to manage at least one resource pertaining to at least one of the base station functionality and mobile station functionality,

all co-located,

wherein the relay resource manager includes a core functionality operative, selectably, to take over at least one core function performed by said core element, for said at least one mobile station served by said base station functionality.

2. The system according to Claim 1 wherein the core functionality takes over said functionality in real time and without disrupting ongoing communication over the network.

3. The system according to Claim 1 wherein the core functionality is also operative, selectably, to hand back said at least one functionality taken over from said core element.

4. The system according to Claim 1 wherein said core functionality comprises connecting between at least a pair of mobile stations characterized in that at least one core function pertaining to said pair which was previously performed at the core element is now performed by the core functionality of the relay resource manager.

5. The system according to Claim 1 wherein said core functionality comprises connecting between:

at least one mobile station characterized in that the core element previously performed at last one core function for the mobile station whereas the core functionality of the relay resource manager now performs said core function for the mobile station; and

at least one additional mobile station characterized in that the core element still performs said at last one core function for the additional mobile station's core.

6. The system according to Claim 1 wherein said at least one core function comprises connecting between at least one mobile station characterized in that the core element previously served as the mobile station's core whereas the core functionality of the relay resource manager now serves as the mobile station's at least one core function and an application service server.

7. The system according to Claim 6 wherein said server includes one of the following types of servers: internet server, internet gateway, terrestrial communication network server, terrestrial communication network gateway, video broadcasting server, video conference server, gaming server, voice calls server, SIP server, mapping server, messaging server, data services server.

8. The system according to Claim 3 wherein the core functionality hands back said at least one core function without disrupting ongoing communication over the network.

9. The system according to Claim 1 wherein the core functionality's take-over of the at least one core function from the core element includes taking over at least one mobility-management function in the core element's functioning.

10. The system according to Claim 1 wherein the core functionality's take-over of the at least one core function from the core element includes taking over at least one policy- management and control function in the core element's functioning.

11. The system according to Claim 1 wherein the core functionality's take-over of the at least one core function from the core element includes taking over at least one QoS-management function of the core element's functioning.

12. The system according to Claim 1 wherein the core functionality's take-over of the at least one core function from the core element includes taking over at least one load-management function of the core element's functioning.

13. The system according to Claim 1 wherein the core functionality's take-over of the at least one core function from the core element includes taking over at least one billing-management function of the core element's functioning.

14. The system according to Claim 3 or 8 wherein the core functionality's hand-back of the at least one core function from the core element includes handing back at least one mobility-management function of the core element's functioning.

15. The system according to Claim 3 or 8 wherein the core functionality's hand-back of the at least one core function from the core element includes handing back at least one policy-management and control function of the core element's functioning.

16. The system according to Claim 3 or 8 wherein the core functionality's hand-back of the at least one core function from the core element includes handing back at least one QoS-management function of the core element's functioning.

17. The system according to Claim 3 or 8 wherein the core functionality's hand-back of the at least one core function from the core element includes handing back at least one load-management function of the core element's functioning.

18. The system according to Claim 3 or 8 wherein the core functionality's hand-back of the at least one core function from the core element includes handing back at least one billing-management function of the core element's functioning.

19. The system according to Claim 1 wherein the core functionality includes a simulated stationary network having a simulated IP connectivity gateway operative to communicate with a simulated mobility management entity and said simulated stationary network simulates the operation of a stationary network.

20. The system according to Claim 1 wherein said emergency moving relay is a root of a sub tree that includes at least one moving relay and at least one mobile station, and is configured for utilizing its mobile station functionality, base station functionality and radio manager for operating in at least the following modes of operations:

i. normal mode of operation wherein the emergency moving relay communicating with other relays in the network and with the stationary network;

ii. in response to an emergency event, operating in an emergency mode of operation, including

a. communicating to a designated mobile station in the sub-tree each message that was received from a moving relay or a mobile station in said sub-tree and said message having an IP address of the designated mobile station; or

b. communicating to said core functionality each message that was received from a moving relay or a mobile station in said sub-tree and having an IP address that does not match any mobile station in the sub-tree.

21. The system according to Claim 1 and also comprising at least one moving relay other than said emergency moving relay.

22. The system according to Claim 20, wherein said core functionality is further operative for simulating at least one application service having at least one respective

application IP address, and wherein said operating in an emergency mode of operation, further includes communicating, to a designated application service in said core functionality, each message, received from a moving relay or mobile station in said sub-tree, and having an IP address of the designated application service.

23. The system according to Claim 20, wherein said emergency event includes a detected disconnection of the emergency relay from another relay.

24. The system according to Claim 1, wherein said core functionality further includes a router service application.

25. The system according to Claim 20, wherein said emergency event includes a detected disconnection of the emergency relay from a stationary network.

26. The system according to Claim 20, wherein said emergency relay is configured to revert to operate in accordance with said normal mode, upon termination of an emergency event.

27. The system according to Claim 1 wherein said at least one emergency moving relay comprises a plurality of at least one emergency moving relays to accommodate for a situation of separation of a subset of moving relays from a larger group of moving relays necessitating each of the two separate groups is having one of its core element or its core functionality.

28. An emergency communication method for a moving cellular communication system forming part of a cellular communication network having a core element, the method comprising:

providing at least one emergency moving relay including: at least one base station functionality serving at least one mobile station; at least one mobile station functionality providing at least one backhauling link toward the core element; and a relay resource manager operative to manage at least one resource pertaining to at least one of the base station functionality and mobile station functionality, all co-located; and

providing the relay resource manager with a core functionality operative, selectably, to take over at least one core function performed by said core element, for said at least one mobile station served by said base station functionality.

29. The method according to Claim 28 wherein the core element serves a core of a static cellular communication network.

30. The method according to Claim 28 wherein the core element serves a core of a moving cellular communication network.

31. The system according to Claim 1 wherein said mobile station comprises a mobile station functionality of another relay.

32. The system according to claim 1 wherein the core functionality takes over said functionality while backhauling link is active.

33. The system according to claim 1 wherein the core functionality takes over said functionality while said at least one mobile station functionality is connected to one of: another relay base station functionality; and a static base station.

34. The system according to Claim 32 wherein said taking over is activated responsive to measurements collected by one of said at least one mobile station functionality and said at least one base station functionality.

35. The system according to Claim 34 wherein said measurements includes link quality parameters.

36. The system according to Claim 34 wherein said measurements includes at least one of: SNR, SNIR, SIR, BER, BLER, PER, Eb/No, Ec/No, Ec/Io, RSSI, RSRP, RSRQ.

37. The system according to any of claims 1 – 3 or 31, wherein the core functionality takes over said functionality while backhauling link is not active.

38. The system according to Claim 8 wherein said handing back is done in response to mobile station functionality connected to one of: other relay base station functionality or static base station.

39. The system according to Claim 9 wherein the at least one mobility-management function comprises at least one of: LTE MME, 3G RNC and WiMAX ASN.

40. The system according to Claim 1 wherein the core functionality's take-over of the at least one core function from the core element includes taking over at least one gateway function of the core element's functioning.

41. The system according to Claim 40 wherein said gateway function comprises at least one of LTE PDN-GW function, and LTE Serving-GW function, and 3G GGSN, and 3G SGSN, and WiMAX CSN.

42. The system according to any of claims 1 – 3 or 31 where said at least one mobile station functionality is not connected to another relay base station functionality and it is not connected to a static base station.

43. A moving cellular communication system comprising:

at least one moving relay including at least one base station functionality and at least one mobile station functionality and a relay resource manager, all co-located,

at least one emergency moving relay from among said moving relays further including

a simulated stationary network that includes a simulated IP connectivity gateway operative to communicate with a simulated mobility management entity; said simulated stationary network simulates the operation of a stationary network;

said emergency moving relay being a root of a sub tree that includes at least one moving relay and at least one mobile station, and is configured to utilize its mobile station functionality, base station functionality and relay resource manager for operating in at least the following modes of operations:

(i) normal mode of operation wherein the emergency moving relay communicates with other relays in the network and with the stationary network;

(ii) in response to an emergency event, operating in an emergency mode of operation, including:

a. communicating to a designated mobile station in the sub-tree each message that was received from a moving relay or a mobile station in said sub-tree and said message having an IP address of the designated mobile station; or

b. communicating to said simulated stationary network each message that was received from a moving relay or a mobile station in said sub-tree and having an IP address that does not match any mobile station in the sub-tree.

44. The system according to Claim 43, wherein said simulated stationary network further includes simulating at least one application service having a respective application IP address, and wherein said operating in an emergency mode of operation, further includes:

communicating to a designated application service in said simulated network each message that was received from a moving relay or a mobile station in said sub-tree and said message having an IP address of the designated application service.

45. The system according to Claim 43, wherein at least one of said moving relays being an upgraded moving relay.

46. The system according to Claim 43, wherein said relay resource manager further includes a router service application.

47. The system according to Claim 43, wherein said emergency event includes detecting disconnection of the emergency relay from the stationary network.

48. The system according to Claim 43, further comprising, in response to undo emergency event, said emergency relay is configured to revert to operate in accordance with said normal mode.

49. The system according to Claim 2 wherein said core functionality's taking over is performed by at least one of: manual operation and autonomous operation.

50. The system according to Claim 49 wherein said autonomous operation is performed by a command originated by at least one of: an internal element of said emergency moving relay, an internal element of a relay other than said emergency moving relay, an element of said cellular communication network and an element external to said cellular communication network.

51. The system according to Claim 3 wherein said core functionality's handing back is performed by at least one of: manual operation and autonomous operation.

52. The system according to Claim 51 wherein said autonomous operation is performed by a command originated by at least one of: an internal element of said emergency moving relay, an internal element of a relay other than said emergency moving relay, an element of said cellular communication network and an element external to said cellular communication network.

53. The system according to Claim 1 wherein the core functionality's take-over of the at least one core function from the core element includes taking over at least one IP-connectivity gateway function of the core element's functioning.

54. The system according to Claim 1 wherein the core functionality's take-over of the at least one core function from the core element includes taking over at least one security management function of the core element's functioning.

55. The system according to Claim 3 or 8 wherein the core functionality's hand-back of the at least one core function from the core element includes handing back at least one connectivity gateway function of the core element's functioning.

56. The system according to Claim 3 or 8 wherein the core functionality's hand-back of the at least one core function from the core element includes handing back at least one security management function of the core element's functioning.

57. The system according to Claim 20, wherein said core functionality is further operative for simulating at least one application having at least one respective application IP address, and wherein said operating in an emergency mode of operation, further includes communicating, to a designated mobile station in the sub-tree, each message, received from said application having an IP address of the designated application.

58. The system according to Claim 1 wherein the core functionality comprises an IP connectivity gateway and a mobility management functionality.

59. The system according to Claim 1 or claim 58 wherein the core functionality also comprise identification user data information storage and authentication functionality.

60. The system according to Claim 59 wherein the identification user data information storage and authentication functionality stores and shares with the mobility management entity subscriber's information.

61. The system according to Claim 59 employing a home subscriber server which comprises an LTE HSS.

62. The system according to Claim 58 wherein the IP connectivity gateway comprises an LTE P/S-GW entity at the core and the mobility management functionality comprises an LTE MME.

63. The system according to Claim 1 wherein a tunnel that was connecting the static network core P/S-GW to the relay's base station functionality and was originally to be terminated at the core network P/S-GW, whose tunnel header destination address was

said P/S-GW, is terminated in a local simulated P/S-GW by setting said tunnel's tunnel header destination address to the local simulated P/S-GW.

64. The system according to Claim 1 wherein communication in an emergency mode in a multi-hop scenario is effected by terminating a tunnel that was originally to be terminated at the core network P/S-GW by the root of a disconnected moving relay sub-tree that simulates the core network and wherein a second moving relay and mobile stations anchored thereto are unaware of the emergency event.

65. The system according to Claim 1 wherein communication is based on GPRS tunneling, and wherein the relay resource manager alters at least one tunnel, so that it can enable to communicate with the source and destination of said tunnel.

66. The system according to Claim 65 and wherein, when an undo emergency event is received, the relay resource manager is operative to alter local (emergency-mode) tunnels to the original tunnels (normal-mode).

67. The system according to Claim 66 wherein the resource manager alters local (emergency-mode) tunnels to the original tunnels (normal-mode) by creating an alternative using a GTP-C standard tunnel by sending a create packet data protocol context.

68. The system according to Claim 65 wherein said relay resource manager alters said at least one tunnel e.g. by creating an alternative using a GTP-C standard tunnel by sending a create packet data protocol context, Create Bearer Request to its collocated core.

69. The system according to Claim 67 or claim 68 wherein said GTP-C standard tunnel comprises a 3GPP TS 29.274 tunnel.

70. The system according to Claim 1 wherein User and control plane data goes through the mobile station functionality and Base station functionality and wherein, when there is an emergency event, all relays in a relevant topology tree change to emergency mode.

71. The system according to Claim 70 and wherein connections are made between the relays in the topology tree in order to form one unified tree.

72. The system according to Claim 1 wherein a Network event listener sniffs standard interfaces (e.g. S1) and notifies of at least one change in the network to the Network event listener's subscribers.

73. The system according to Claim 72 wherein a Network Event Handler which is a Network event listener's subscriber is responsible for synchronization of a local EPC core to a last known state of the core element in case of an emergency event.

74. The system according to Claim 72 wherein a Network Event Handler which is a Network event listener's subscriber is responsible for synchronization of the stationary core state to the state of the local EPC core (Stand-Alone Subsystem) in case of an undo emergency event.

75. The system according to Claim 73 wherein the Network Event Handler synchronizes the local EPC core to the last known state of the core element, in case of emergency, by:

a. sending, for each disconnected nodes a "create packet data protocol (PDP)" context request to a local simulated mobility management entity; and

b. enabling an alternate tunnel by sending a modify bearer request for each disconnected bearer to a local simulated P/S-GW in case of emergency.

76. The system according to Claim 74 wherein the Network Event Handler synchronizes the stationary core state to the state of the local EPC core (Stand-Alone Subsystem) in case of an undo emergency event by:

sending, for each reconnected node, a create context request to the stationary or remote-simulated network mobility management entity; and

sending a modify bearer request for each reconnected tunnel to the stationary or remote-simulated network P/S-GW.

77. The system according to Claim 72 wherein said change comprises a disconnection from the core.

78. The system according to Claim 72 wherein said change comprises attachment of a user.

79. The system according to Claim 72 wherein said change comprises creation of a bearer.

80. The system according to Claim 72 wherein the Network event listener's subscribers include the Relay Resource Manager.

81. The system according to Claim 72 or claim 80 wherein the Network event listener's subscribers include a Network Event Handler.

82. The method according to Claim 28 and also comprising informing idle mode mobile stations (MSs) of a disconnection caused by an emergency event.

83. The method according to Claim 82 wherein said informing comprises:

changing a public land mobile network (PLMN) ID to another public land mobile network (PLMN); and

broadcasting said public land mobile network (PLMN) ID to all Base station functionalities (TeNb) in a cluster.

84. The method according to Claim 82 or 83 wherein the public land mobile network (PLMN) is operative to inform at least one mobile station of the identity of a head relay of a cluster.

85. The method according to Claim 82 or 83 wherein the public land mobile network (PLMN) is operative to inform at least one mobile station of the number of relays in a cluster.

86. The system according to Claim 1 wherein if handoff occurs in which a relay disconnects from its core, at least one virtual core subsystem, having an encapsulation manager, recreates all relevant PDP contexts and bearers according to information stored on said encapsulation manager and switches packet data to a local stand-alone subsystem.

87. The system according to Claim 1 wherein one mobile station is connected to a core functionality of the relay resource manager and another mobile station is connected to the core element of the network, and there is a link between said core functionality and said core element of the network.

88. A system according to any of claims 1-13, 31 – 41, 43 - 54, 58 – 60, 63 – 81, 86 – 87 wherein said cellular communication network has at least one inter-node interface operable according to at least one of the following standards: 2G, GSM, CDMA, 3G, UMTS, WCDMA, HSPA, LTE, WiMAX, WiFi.

Claims:

1. A moving cellular communication system forming part of a cellular communication network having a core element, the system comprising:

at least one emergency moving relay including:

at least one base station functionality serving at least one mobile station;

at least one mobile station functionality providing at least one backhauling link toward the core element; and

a relay resource manager operative to manage at least one resource pertaining to at least one of the base station functionality and mobile station functionality,

all co-located,

wherein the relay resource manager includes a core functionality operative, selectably, to take over at least one core function performed by said core element, for said at least one mobile station served by said base station functionality.

2. The system according to Claim 1 wherein the core functionality takes over said functionality in real time and without disrupting ongoing communication over the network.

3. The system according to Claim 1 wherein the core functionality is also operative, selectably, to hand back said at least one functionality taken over from said core element.

4. The system according to Claim 1 wherein said core functionality comprises connecting between at least a pair of mobile stations characterized in that at least one core function pertaining to said pair which was previously performed at the core element is now performed by the core functionality of the relay resource manager.

5. The system according to Claim 1 wherein said core functionality comprises connecting between:

at least one mobile station characterized in that the core element previously performed at last one core function for the mobile station whereas the core functionality of the relay resource manager now performs said core function for the mobile station; and

at least one additional mobile station characterized in that the core element still performs said at last one core function for the additional mobile station's core.

6. The system according to Claim 1 wherein said at least one core function comprises connecting between at least one mobile station characterized in that the core element previously served as the mobile station's core whereas the core functionality of the relay resource manager now serves as the mobile station's at least one core function and an application service server.

7. The system according to Claim 6 wherein said server includes one of the following types of servers: internet server, internet gateway, terrestrial communication network server, terrestrial communication network gateway, video broadcasting server, video conference server, gaming server, voice calls server, SIP server, mapping server, messaging server, data services server.

8. The system according to Claim 3 wherein the core functionality hands back said at least one core function without disrupting ongoing communication over the network.

9. The system according to Claim 1 wherein the core functionality's take-over of the at least one core function from the core element includes taking over at least one mobility-management function in the core element's functioning.

10. The system according to Claim 1 wherein the core functionality's take-over of the at least one core function from the core element includes taking over at least one policy- management and control function in the core element's functioning.

11. The system according to Claim 1 wherein the core functionality's take-over of the at least one core function from the core element includes taking over at least one QoS-management function of the core element's functioning.

12. The system according to Claim 1 wherein the core functionality's take-over of the at least one core function from the core element includes taking over at least one load-management function of the core element's functioning.

13. The system according to Claim 1 wherein the core functionality's take-over of the at least one core function from the core element includes taking over at least one billing-management function of the core element's functioning.

14. The system according to Claim 3 wherein the core functionality's hand-back of the at least one core function from the core element includes handing back at least one mobility-management function of the core element's functioning.

15. The system according to Claim 3 wherein the core functionality's hand-back of the at least one core function from the core element includes handing back at least one policy-management and control function of the core element's functioning.

16. The system according to Claim 3 wherein the core functionality's hand-back of the at least one core function from the core element includes handing back at least one QoS-management function of the core element's functioning.

17. The system according to Claim 3 wherein the core functionality's hand-back of the at least one core function from the core element includes handing back at least one load-management function of the core element's functioning.

18. The system according to Claim 3 wherein the core functionality's hand-back of the at least one core function from the core element includes handing back at least one billing-management function of the core element's functioning.

19. The system according to Claim 1 wherein the core functionality includes a simulated stationary network having a simulated IP connectivity gateway operative to communicate with a simulated mobility management entity and said simulated stationary network simulates the operation of a stationary network.

20. The system according to Claim 1 wherein said emergency moving relay is a root of a sub tree that includes at least one moving relay and at least one mobile station,

and is configured for utilizing its mobile station functionality, base station functionality and radio manager for operating in at least the following modes of operations:

i. normal mode of operation wherein the emergency moving relay communicating with other relays in the network and with the stationary network;

ii. in response to an emergency event, operating in an emergency mode of operation, including

a. communicating to a designated mobile station in the sub-tree each message that was received from a moving relay or a mobile station in said sub-tree and said message having an IP address of the designated mobile station; or

b. communicating to said core functionality each message that was received from a moving relay or a mobile station in said sub-tree and having an IP address that does not match any mobile station in the sub-tree.

21. The system according to Claim 1 and also comprising at least one moving relay other than said emergency moving relay.

22. The system according to Claim 20, wherein said core functionality is further operative for simulating at least one application service having at least one respective application IP address, and wherein said operating in an emergency mode of operation, further includes communicating, to a designated application service in said core functionality, each message, received from a moving relay or mobile station in said sub-tree, and having an IP address of the designated application service.

23. The system according to Claim 20, wherein said emergency event includes a detected disconnection of the emergency relay from another relay.

24. The system according to Claim 1, wherein said core functionality further includes a router service application.

25. The system according to Claim 20, wherein said emergency event includes a detected disconnection of the emergency relay from a stationary network.

26. The system according to Claim 20, wherein said emergency relay is configured to revert to operate in accordance with said normal mode, upon termination of an emergency event.

27. The system according to Claim 1 wherein said at least one emergency moving relay comprises a plurality of at least one emergency moving relays to accommodate for a situation of separation of a subset of moving relays from a larger group of moving relays necessitating each of the two separate groups is having one of its core element or its core functionality.

28. An emergency communication method for a moving cellular communication system forming part of a cellular communication network having a core element, the method comprising:

providing at least one emergency moving relay including: at least one base station functionality serving at least one mobile station; at least one mobile station functionality providing at least one backhauling link toward the core element; and a relay resource manager operative to manage at least one resource pertaining to at least one of the base station functionality and mobile station functionality, all co-located; and

providing the relay resource manager with a core functionality operative, selectably, to take over at least one core function performed by said core element, for said at least one mobile station served by said base station functionality.

29. The method according to Claim 28 wherein the core element serves a core of a static cellular communication network.

30. The method according to Claim 28 wherein the core element serves a core of a moving cellular communication network.

31. The system according to Claim 1 wherein said mobile station comprises a mobile station functionality of another relay.

32. The system according to claim 1 wherein the core functionality takes over said functionality while backhauling link is active.

33. The system according to claim 1 wherein the core functionality takes over said functionality while said at least one mobile station functionality is connected to one of: another relay base station functionality; and a static base station.

34. The system according to Claim 32 wherein said taking over is activated responsive to measurements collected by one of said at least one mobile station functionality and said at least one base station functionality.

35. The system according to Claim 34 wherein said measurements includes link quality parameters.

36. The system according to Claim 34 wherein said measurements includes at least one of: SNR, SNIR, SIR, BER, BLER, PER, Eb/No, Ec/No, Ec/Io, RSSI, RSRP, RSRQ.

37. The system according to Claim 1, wherein the core functionality takes over said functionality while backhauling link is not active.

38. The system according to Claim 8 wherein said handing back is done in response to mobile station functionality connected to one of: other relay base station functionality or static base station.

39. The system according to Claim 9 wherein the at least one mobility-management function comprises at least one of: LTE MME, 3G RNC and WiMAX ASN.

40. The system according to Claim 1 wherein the core functionality's take-over of the at least one core function from the core element includes taking over at least one gateway function of the core element's functioning.

41. The system according to Claim 40 wherein said gateway function comprises at least one of LTE PDN-GW function, and LTE Serving-GW function, and 3G GGSN, and 3G SGSN, and WiMAX CSN.

42. The system according to Claim 1 where said at least one mobile station functionality is not connected to another relay base station functionality and it is not connected to a static base station.

43. A moving cellular communication system comprising:

at least one moving relay including at least one base station functionality and at least one mobile station functionality and a relay resource manager, all co-located,

at least one emergency moving relay from among said moving relays further including

a simulated stationary network that includes a simulated IP connectivity gateway operative to communicate with a simulated mobility management entity; said simulated stationary network simulates the operation of a stationary network;

said emergency moving relay being a root of a sub tree that includes at least one moving relay and at least one mobile station, and is configured to utilize its mobile station functionality, base station functionality and relay resource manager for operating in at least the following modes of operations:

(i) normal mode of operation wherein the emergency moving relay communicates with other relays in the network and with the stationary network;

(ii) in response to an emergency event, operating in an emergency mode of operation, including:

a. communicating to a designated mobile station in the sub-tree each message that was received from a moving relay or a mobile station in said sub-tree and said message having an IP address of the designated mobile station; or

b. communicating to said simulated stationary network each message that was received from a moving relay or a mobile station in said sub-tree and having an IP address that does not match any mobile station in the sub-tree.

44. The system according to Claim 43, wherein said simulated stationary network further includes simulating at least one application service having a respective application IP address, and wherein said operating in an emergency mode of operation, further includes:

communicating to a designated application service in said simulated network each message that was received from a moving relay or a mobile station in said sub-tree and said message having an IP address of the designated application service.

45. The system according to Claim 43, wherein at least one of said moving relays being an upgraded moving relay.

46. The system according to Claim 43, wherein said relay resource manager further includes a router service application.

47. The system according to Claim 43, wherein said emergency event includes detecting disconnection of the emergency relay from the stationary network.

48. The system according to Claim 43, further comprising, in response to undo emergency event, said emergency relay is configured to revert to operate in accordance with said normal mode.

49. The system according to Claim 2 wherein said core functionality's taking over is performed by at least one of: manual operation and autonomous operation.

50. The system according to Claim 49 wherein said autonomous operation is performed by a command originated by at least one of: an internal element of said emergency moving relay, an internal element of a relay other than said emergency moving relay, an element of said cellular communication network and an element external to said cellular communication network.

51. The system according to Claim 3 wherein said core functionality's handing back is performed by at least one of: manual operation and autonomous operation.

52. The system according to Claim 51 wherein said autonomous operation is performed by a command originated by at least one of: an internal element of said emergency moving relay, an internal element of a relay other than said emergency moving relay, an element of said cellular communication network and an element external to said cellular communication network.

53. The system according to Claim 1 wherein the core functionality's take-over of the at least one core function from the core element includes taking over at least one IP-connectivity gateway function of the core element's functioning.

54. The system according to Claim 1 wherein the core functionality's take-over of the at least one core function from the core element includes taking over at least one security management function of the core element's functioning.

55. The system according to Claim 3 wherein the core functionality's hand-back of the at least one core function from the core element includes handing back at least one connectivity gateway function of the core element's functioning.

56. The system according to Claim 3 wherein the core functionality's hand-back of the at least one core function from the core element includes handing back at least one security management function of the core element's functioning.

57. The system according to Claim 20, wherein said core functionality is further operative for simulating at least one application having at least one respective application IP address, and wherein said operating in an emergency mode of operation, further includes communicating, to a designated mobile station in the sub-tree, each message, received from said application having an IP address of the designated application.

58. The system according to Claim 1 wherein the core functionality comprises an IP connectivity gateway and a mobility management functionality.

59. The system according to Claim 1 wherein the core functionality also comprise identification user data information storage and authentication functionality.

60. The system according to Claim 59 wherein the identification user data information storage and authentication functionality stores and shares with the mobility management entity subscriber's information.

61. The system according to Claim 59 employing a home subscriber server which comprises an LTE HSS.

62. The system according to Claim 58 wherein the IP connectivity gateway comprises an LTE P/S-GW entity at the core and the mobility management functionality comprises an LTE MME.

63. The system according to Claim 1 wherein a tunnel that was connecting the static network core P/S-GW to the relay's base station functionality and was originally to be terminated at the core network P/S-GW, whose tunnel header destination address was said P/S-GW, is terminated in a local simulated P/S-GW by setting said tunnel's tunnel header destination address to the local simulated P/S-GW.

64. The system according to Claim 1 wherein communication in an emergency mode in a multi-hop scenario is effected by terminating a tunnel that was originally to be terminated at the core network P/S-GW by the root of a disconnected moving relay sub-tree that simulates the core network and wherein a second moving relay and mobile stations anchored thereto are unaware of the emergency event.

65. The system according to Claim 1 wherein communication is based on GPRS tunneling, and wherein the relay resource manager alters at least one tunnel, so that it can enable to communicate with the source and destination of said tunnel.

66. The system according to Claim 65 and wherein, when an undo emergency event is received, the relay resource manager is operative to alter local (emergency-mode) tunnels to the original tunnels (normal-mode).

67. The system according to Claim 66 wherein the resource manager alters local (emergency-mode) tunnels to the original tunnels (normal-mode) by creating an alternative using a GTP-C standard tunnel by sending a create packet data protocol context.

68. The system according to Claim 65 wherein said relay resource manager alters said at least one tunnel e.g. by creating an alternative using a GTP-C standard tunnel by sending a create packet data protocol context, Create Bearer Request to its collocated core.

69. The system according to Claim 67 wherein said GTP-C standard tunnel comprises a 3GPP TS 29.274 tunnel.

70. The system according to Claim 1 wherein User and control plane data goes through the mobile station functionality and Base station functionality and wherein, when there is an emergency event, all relays in a relevant topology tree change to emergency mode.

71. The system according to Claim 70 and wherein connections are made between the relays in the topology tree in order to form one unified tree.

72. The system according to Claim 1 wherein a Network event listener sniffs standard interfaces and notifies of at least one change in the network to the Network event listener's subscribers.

73. The system according to Claim 72 wherein a Network Event Handler which is a Network event listener's subscriber is responsible for synchronization of a local EPC core to a last known state of the core element in case of an emergency event.

74. The system according to Claim 72 wherein a Network Event Handler which is a Network event listener's subscriber is responsible for synchronization of the stationary core state to the state of the local EPC core (Stand-Alone Subsystem) in case of an undo emergency event.

75. The system according to Claim 73 wherein the Network Event Handler synchronizes the local EPC core to the last known state of the core element, in case of emergency, by:

a. sending, for each disconnected nodes a "create packet data protocol (PDP)" context request to a local simulated mobility management entity; and

b. enabling an alternate tunnel by sending a modify bearer request for each disconnected bearer to a local simulated P/S-GW in case of emergency.

76. The system according to Claim 74 wherein the Network Event Handler synchronizes the stationary core state to the state of the local EPC core (Stand-Alone Subsystem) in case of an undo emergency event by:

sending, for each reconnected node, a create context request to the stationary or remote-simulated network mobility management entity; and

sending a modify bearer request for each reconnected tunnel to the stationary or remote-simulated network P/S-GW.

77. The system according to Claim 72 wherein said change comprises a disconnection from the core.

78. The system according to Claim 72 wherein said change comprises attachment of a user.

79. The system according to Claim 72 wherein said change comprises creation of a bearer.

80. The system according to Claim 72 wherein the Network event listener's subscribers include the Relay Resource Manager.

81. The system according to Claim 72 wherein the Network event listener's subscribers include a Network Event Handler.

82. The method according to Claim 28 and also comprising informing idle mode mobile stations (MSs) of a disconnection caused by an emergency event.

83. The method according to Claim 82 wherein said informing comprises:

changing a public land mobile network (PLMN) ID to another public land mobile network (PLMN); and

broadcasting said public land mobile network (PLMN) ID to all Base station functionalities (TeNb) in a cluster.

84. The method according to Claim 82 wherein the public land mobile network (PLMN) is operative to inform at least one mobile station of the identity of a head relay of a cluster.

85. The method according to Claim 82 wherein the public land mobile network (PLMN) is operative to inform at least one mobile station of the number of relays in a cluster.

86. The system according to Claim 1 wherein if handoff occurs in which a relay disconnects from its core, at least one virtual core subsystem, having an encapsulation manager, recreates all relevant PDP contexts and bearers according to information stored on said encapsulation manager and switches packet data to a local stand-alone subsystem.

87. The system according to Claim 1 wherein one mobile station is connected to a core functionality of the relay resource manager and another mobile station is connected to the core element of the network, and there is a link between said core functionality and said core element of the network.

88. A system according to Claim 1 wherein said cellular communication network has at least one inter-node interface operable according to at least one of the following standards: 2G, GSM, CDMA, 3G, UMTS, WCDMA, HSPA, LTE, WiMAX, WiFi.

89. The system according to Claim 1 wherein the relay resource manager includes a Network event listener operative to notify of changes in the network including at least a disconnection from the core, to a network Event Handler operative for synchronization of said core functionality to a last known state of the stationary core element in case of an emergency event, and synchronization of the stationary core element's state to a current state of said core functionality in case of an undo emergency event.