Claims

1. A method for integrating network subscribers into a time-synchronised ad-hoc network (100) with the following method steps:
- formation of individual clusters (30,40,50,70,80) in each case of regionally adjacent network subscribers (1,2…,19,20),
- time synchronisation of the network subscribers (1,2…,19,20) within every cluster (30,40,50,70,80),
- selection of one network subscriber (7) at the periphery of every cluster (70) in order to identify at least one network subscriber (21;21,22,23) to be integrated into the respective cluster (70) and
- time synchronisation of the network subscribers (5,7;7) of the respective cluster (70;70';70'') with every identified network subscriber (21; 21, 22, 23).

2. The method according to claim 1,
characterised in that
the identification of at least one network subscriber (21;21,22,23) to be integrated into the respective cluster (70) is implemented repeatedly, in each case with a different selected network subscriber (7).

3. The method according to claim 1 or 2,
characterised in that
the selected network subscriber (7) is restricted to those network subscribers of a cluster which are positioned within the transmission and/or reception range of a previously specified maximum number of network subscribers each associated with another cluster.

4. The method according to any one of claims 1 to 3,
characterised in that
the selected network subscriber (7) is restricted to those network subscribers of a cluster which are positioned outside the transmission and/or reception range of every network subscriber of all other clusters.

5. The method according to any one of claims 1 to 4,
characterised in that
the time synchronisation of the network subscribers (1,2…,19,20) of a cluster (30,40,50,70,80) is implemented in each case within first time intervals (Z_1) of known, fixed length (ΔZ_1) which are spaced from one another with a statistically fluctuating time spacing (dZ_1).

6. The method according to claim 5,
characterised in that
the time synchronisation of the network subscribers (1,2…,19,20) of a cluster (30,40,50,70,80) is implemented by a network subscriber of the respective cluster which is positioned in the transmission and/or reception range of all other network subscribers of the respective cluster and, in a first time interval (Z_1), transmits an information known to all network subscribers (1,2…,19,20) of the ad-hoc network (100) for the time synchronisation.

7. The method according to claim 5 or 6,
characterised in that
the time synchronisation of the network subscribers (1,2…,19,20) of a cluster (30,40,50,70,80) is omitted if the number of network subscribers in a cluster is not changed.

8. The method according to any one of claims 1 to 7,

characterised in that
the selected network subscriber (7) transmits an information searching for a network subscriber to be integrated in order to identify at least one network subscriber (21;21,22,23) to be integrated into the respective cluster (70;70';70'').

9. The method according to claim 8,
characterised in that
a network subscriber (21) which is disposed in the transmission and/or reception range of the selected network subscriber (7) and intends to integrate itself into the ad-hoc network (100) acknowledges the information searching for a network subscriber to be integrated in order to identify a network subscriber (21;21,22,23) to be integrated into the respective cluster (70;70';70'').

10. The method according to claim 8,
characterised in that
a network subscriber (21) which is disposed in the transmission and/or reception range of the selected network subscriber (7) and belongs to a cluster of network subscribers (21,22,23) synchronised with one another which intend to integrate themselves into the ad-hoc network (100) acknowledges the information searching for a network subscriber to be integrated in order to identify the network subscribers to be integrated into the respective cluster.

11. The method according to any one of claims 1 to 10,
characterised in that
an individual network subscriber (21) or a network subscriber (21) associated with a cluster of mutually synchronised network subscribers (21,22,23) which intend/s

to integrate itself or themselves into the ad-hoc network (100) transmits an information searching for a time-synchronised cluster.

12. The method according to claim 11,
characterised in that
a selected network subscriber (7) of a time-synchronised cluster (70) which is disposed in the transmission and/or reception range of the network subscriber (21) transmitting the information searching for a time-synchronised cluster acknowledges the information searching for a time-synchronised cluster in order to identify the network subscriber or subscribers (21;21,22,23) to be integrated into the respective cluster.

13. The method according to claim 9, 10 or 12,
characterised in that
the transmission of the information searching for a network subscriber to be integrated, the information searching for a time-synchronised cluster and the acknowledgement is implemented within previously specified, second time intervals Z_2.

14. The method according to any one of claims 1 to 13,
characterised in that,
after the identification of at least one network subscriber to be integrated, every cluster is divided as required into several clusters in order to provide clusters in which at least one network subscriber is available in each case within the transmission and/or reception range of all of the other network subscribers of the cluster.

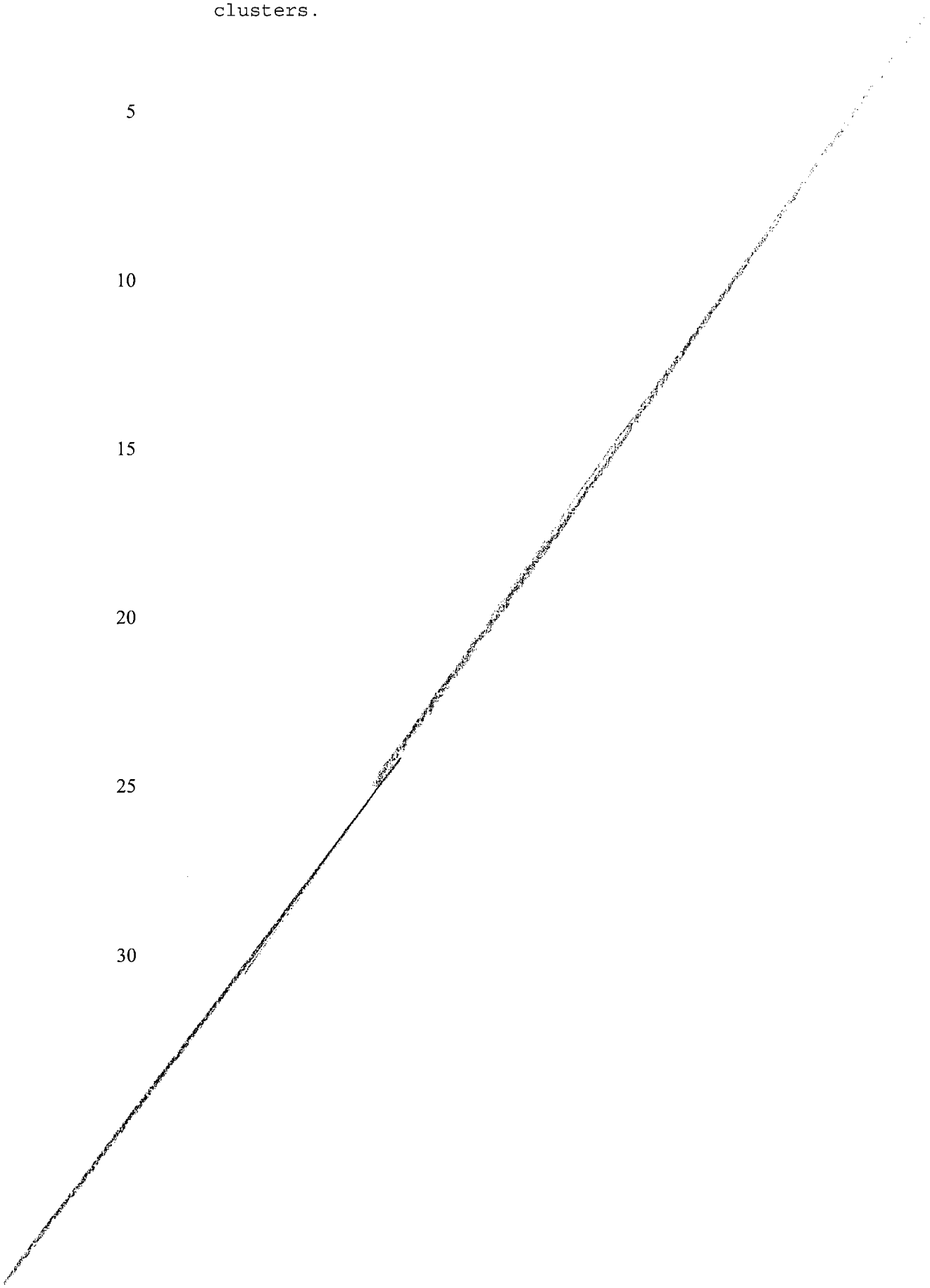
15. The method according to any one of claims 14, **characterised in that** the time synchronisation of the at least one network subscriber identified for integration into the respective cluster with the previous network subscribers of the respective cluster, which is either undivided or divided after the integration of at least one network subscriber, is implemented within a first time interval (Z_1) following respectively after a second time interval (Z_2).

16. An ad-hoc network (100) with at least one time-synchronised cluster (30,40,50,70,80) in each case of regionally adjacent network subscribers (1,2,...,19,20) and at least one selected network subscriber at the periphery of the respective time-synchronised cluster (30,40,50,70,80) for the determination of at least one network subscriber to be integrated into the respective time-synchronised cluster (30,40,50,70,80), especially for the implementation of a method according to any one of claims 1 to 15.

17. The ad-hoc network according to claim 16, **characterised in that** the selected network subscribers are each positioned within the transmission and/or reception range of a previously specified maximum number of network subscribers each associated with another time-synchronised cluster of the ad-hoc network (100).

18. The ad-hoc network according to claim 16 or 17, **characterised in that** the selected network subscribers are each positioned outside the transmission and/or reception range of every

network subscriber of all of the other time-synchronised clusters.



CLAIMS

1. A method for integrating network subscribers into a time-synchronized ad-hoc network, comprising:

forming at least one cluster, each comprising a plurality of regionally adjacent network subscribers;

time synchronizing the network subscribers within each cluster;

selecting at least one network subscriber at a periphery of a respective one of the clusters in order to identify one or more further network subscribers to be integrated into the respective cluster; and

time synchronizing the network subscribers of the respective cluster, to which the one or more further network subscribers are to be integrated, with each of the one or more network subscribers to be integrated in the respective cluster; and

wherein the time synchronization of the network subscribers within each cluster is performed within a first time interval (Z_1) of a fixed length (ΔZ_1), which are spaced from one another with a statistically fluctuating time spacing (dZ_1).

2. The method according to claim 1, wherein the identification of the one or more further network subscribers to be integrated into the respective cluster is performed repeatedly, in each case with a different selected network subscriber.

3. The method according to claim 1, wherein the selected network subscriber is selected from network subscribers of a cluster that are positioned within a transmission and/or reception range of a previously specified maximum number of network subscribers each associated with another cluster.

4. The method according to claim 1, wherein the selected network subscriber is selected from network subscribers of a cluster which are positioned outside of a transmission and/or reception range of each network subscriber of all other clusters.

5. The method according to claim 1, wherein the time synchronization of the network subscribers within each cluster is performed by a network subscriber of the respective cluster that is positioned in a transmission and/or reception range of all other network subscribers of the respective cluster, and wherein, in a first time interval (Z_1), the network subscriber of the respective cluster transmits an information known to all network subscribers of the ad-hoc network for the time synchronization.

6. The method according to claim 1, wherein the time synchronization of the network subscribers within each cluster is omitted if the number of network subscribers in a cluster is not changed.

7. The method according to claim 1, wherein the selected network subscriber transmits an information searching for a network subscriber to be integrated in order to identify at least one network subscriber to be integrated into the respective cluster.

8. The method according to claim 7, wherein a network subscriber that is located in a transmission and/or reception range of the selected network subscriber and intends to integrate itself into the ad-hoc network acknowledges the information searching for a network subscriber to be integrated in order to identify a network subscriber to be integrated into the respective cluster.

9. The method according to claim 7, wherein a network subscriber that is located in a transmission and/or reception range of the selected network subscriber, and belongs to a cluster of network subscribers that are synchronized with one another and intend to integrate themselves into the ad-hoc network, acknowledges the information searching for a network subscriber to be integrated in order to identify the network subscribers to be integrated into the respective cluster.

10. The method according to claim 1, wherein one of an individual network subscriber and a network subscriber associated with a cluster of mutually synchronized network subscribers, which intend/s to integrate itself or themselves into the ad-hoc network, transmits an information searching for a time-synchronized cluster.

11. The method according to claim 10, wherein a selected network subscriber of a time-synchronized cluster, which is disposed in the transmission and/or reception range of the network subscriber transmitting the information searching for a time-synchronized cluster, acknowledges the information searching for a time-synchronized cluster in order to identify the network subscriber or subscribers to be integrated into the respective cluster.

12. The method according to claim 8, wherein the transmission of the information searching for a network subscriber to be integrated, the information searching for a time-synchronized cluster and the acknowledgement is performed within time intervals Z_2.

13. The method according to claim 1, wherein, after the identification of the one or more further network subscribers to be integrated into the respective cluster, each cluster is divided as required into several clusters in order to provide clusters in which at least one network subscriber is available in each case within a transmission and/or reception range of all of the other network subscribers of the cluster.

14. The method according to claim 13, wherein the time synchronization of the network subscribers of each of the at least one cluster, to which the one or more further network subscribers are to be integrated, with each of the one or more network subscribers to be integrated in the respective cluster, which is either undivided or divided, is performed within a first time interval (Z_1) following respectively after a second time interval (Z_2).

15. An ad-hoc network, comprising:

at least one cluster, each comprising a plurality of regionally adjacent network subscribers,

wherein the network subscribers within each cluster are time-synchronized via a

synchronization performed within a first time interval (Z_1) of a fixed length (ΔZ_1), which are spaced from one another with a statistically fluctuating time spacing (dZ_1); and

at least one selected network subscriber located at a periphery of a respective one of the clusters, wherein the at least one selected network subscriber is selected for a determination of one or more further network subscribers to be integrated into the respective cluster; and

wherein the network subscribers of the respective cluster, to which the one or more further network subscribers are to be integrated, are time-synchronized with each of the one or more network subscribers to be integrated in the respective cluster.

16. The ad-hoc network according to claim 15, wherein the selected network subscribers are each positioned within a transmission and/or reception range of a previously specified maximum number of network subscribers each associated with another time-synchronized cluster of the ad-hoc network.

17. The ad-hoc network according to claim 15, wherein the selected network subscribers are each positioned outside of a transmission and/or reception range of each network subscriber of all of the other time-synchronized clusters.