

CLAIMS:

1. A method for use in a user equipment (UE), the method comprising:  
receiving (812), from a network node, a plurality of weights for assigning paging  
5 physical resource blocks (PRBs) to a plurality of UEs, each weight of the plurality of  
weights associated with a respective paging PRB;  
determining (814) a paging PRB for the UE using at least one weight of the  
plurality of weights; and  
receiving (816) paging on the determined paging PRB, wherein determining  
10 (814) the paging PRB for the UE comprises:  
assigning the UE to an artificial paging PRB of a set of artificial paging PRBs;  
and  
mapping the artificial paging PRB to an actual paging PRB of a set of actual  
paging PRBs using at least one weight of the plurality of weights, the set of actual paging  
15 PRBs including a smaller number of paging PRBs than the set of artificial paging PRBs,  
wherein the UE is associated with a unique identifier;  
wherein assigning the UE to the artificial paging PRB comprises using an even  
distribution function to select the artificial paging PRB, the even distribution function  
comprising dividing the unique identifier by a total number of paging PRBs in the set of  
20 artificial paging PRBs; and  
wherein mapping the artificial paging PRB to the actual paging PRB comprises  
using an uneven distribution function to select the actual paging PRB, the uneven  
distribution function comprising assigning a number of paging PRBs of the set of  
artificial paging PRBs to the paging PRBs of the set of actual paging PRBs according to  
25 the weights.
2. The method of Claim 1, wherein the total number of paging PRBs in the  
set of artificial paging PRBs is equal to a sum of the plurality of weights.
3. The method of any of Claims 1-2, wherein receiving (812) the plurality  
30 of weights comprises receiving broadcast system information.

4. The method of any of Claims 1-3, wherein the weights are based on at least one of the following:

- whether a PRB is an anchor PRB;
- a paging load or paging blocking probability;
- 5 downlink traffic load;
- a number of anchor PRBs;
- a discontinuous reception (DRX) parameter; and
- a distribution of UEs according to their long term evolution (LTE) release version.

10

5. A user equipment (UE) (210) comprising a memory (930) coupled to processing circuitry (920), the processing circuitry operable to:

- receive, from a network node (200), a plurality of weights for assigning paging physical resource blocks (PRBs) to a plurality of UEs, each weight of the plurality of weights associated with a respective paging PRB;

15

- determine a paging PRB for the UE using at least one weight of the plurality of weights; and

- receive paging on the determined paging PRB, wherein the processing circuitry operable to determine the paging PRB for the UE is operable to:

20

- assign the UE to an artificial paging PRB of a set of artificial paging PRBs; and
- map the artificial paging PRB to an actual paging PRB of a set of actual paging PRBs using at least one weight of the plurality of weights, the set of actual paging PRBs including a smaller number of paging PRBs than the set of artificial paging PRBs, wherein the UE is associated with a unique identifier;

25

- wherein the processing circuitry is operable to assign the UE to the artificial paging PRB by using an even distribution function to select the artificial paging PRB, the even distribution function comprising dividing the unique identifier by a total number of paging PRBs in the set of artificial paging PRBs; and

30

- wherein the processing circuitry is operable to map the artificial paging PRB to the actual paging PRB by using an uneven distribution function to select the actual paging PRB, the uneven distribution function comprising assigning a number of paging PRBs

of the set of artificial paging PRBs to the paging PRBs of the set of actual paging PRBs according to the weights.

6. The UE of Claim 5, wherein the total number of paging PRBs in the set  
5 of artificial paging PRBs is equal to a sum of the plurality of weights.

7. The UE of any of Claims 5-6, wherein the processing circuitry is operable to receive the plurality of weights by receiving broadcast system information.

10 8. The UE of any of Claims 5-7, wherein the weights are based on at least one of the following:

whether a PRB is an anchor PRB;

a paging load or paging blocking probability;

downlink traffic load;

15 a number of anchor PRBs;

a discontinuous reception (DRX) parameter; and

a distribution of UEs according to their long term evolution (LTE) release version.

20 9. A method for use in a network node of assigning paging physical resource blocks (PRBs) to a plurality of user equipment (UEs) to unevenly distribute a paging load to balance an existing paging load in a wireless network, the method comprising:

obtaining (952) a plurality of weights for assigning paging PRBs to a plurality of UEs, wherein each weight of the plurality of weights is associated with a respective  
25 paging PRB and the plurality of weights unevenly assign UEs to paging PRBs to unevenly distribute a paging load;

transmitting (954) the plurality of weights to one or more UEs,

the method further comprising:

30 assigning (956) a paging PRB for a UE of the plurality of UEs using at least one weight of the plurality of weights; and

paging (958) the UE using the assigned paging PRB,

wherein assigning the paging PRB for the UE comprises:

assigning the UE to an artificial paging PRB of a set of artificial paging PRBs;  
and

mapping the artificial paging PRB to an actual paging PRB of a set of actual  
paging PRBs using at least one weight of the plurality of weights, the set of actual paging  
5 PRBs including a smaller number of paging PRBs than the set of artificial paging PRBs,  
wherein the UE is associated with a unique identifier;

wherein assigning the UE to the artificial paging PRB comprises using an even  
distribution function to select the artificial paging PRB, the even distribution function  
comprising dividing the unique identifier by a total number of paging PRBs in the set of  
10 artificial paging PRBs; and

wherein mapping the artificial paging PRB to the actual paging PRB comprises  
using an uneven distribution function to select the paging PRB, the uneven distribution  
function comprising assigning a number of paging PRBs of the set of artificial paging  
PRBs to the paging PRBs of the set of actual paging PRBs according to the weights.

15

10. The method of Claim 9, wherein obtaining (952) the plurality of weights  
comprises the network node determining the weights.

11. The method of any of Claims 9-10, wherein the weights are based on at  
20 least one of the following:

whether a PRB is an anchor PRB;

a paging load or paging blocking probability;

downlink traffic load;

a number of anchor PRBs;

25 a discontinuous reception (DRX) parameter; and

a distribution of UEs according to their long term evolution (LTE) release  
version.

12. The method of any of Claims 9-11, wherein transmitting (954) the  
30 plurality of weights comprises broadcasting system information.

13. The method of Claim 9, wherein the total number of paging PRBs in the set of artificial paging PRBs is equal to a sum of the plurality of weights.

5 14. A network node (200) comprising a memory (1030) coupled to processing circuitry (1020), the network node capable of assigning paging physical resource blocks (PRBs) to a plurality of user equipment (UEs) to unevenly distribute a paging load to balance an existing paging load in a wireless network, the processing circuitry operable to:

10 obtain a plurality of weights for assigning paging PRBs to a plurality of UEs (210), wherein each weight of the plurality of weights is associated with a respective paging PRB and the plurality of weights unevenly assign UEs to paging PRBs to unevenly distribute a paging load;

transmit the plurality of weights to one or more UEs;

15 wherein the processing circuitry is further operable to:

assign a paging PRB for a UE of the plurality of UEs using at least one weight of the plurality of weights; and

page the UE using the assigned paging PRB,

wherein the processing circuitry is operable to assign the paging PRB for the UE

20 by:

assigning the UE to an artificial paging PRB of a set of artificial paging PRBs;

and

mapping the artificial paging PRB to an actual paging PRB of a set of actual paging PRBs using at least one weight of the plurality of weights, the set of actual paging PRBs including a smaller number of paging PRBs than the set of artificial paging PRBs, wherein the UE is associated with a unique identifier;

25 wherein the processing circuitry is operable to assign the UE to the artificial paging PRB by using an even distribution function to select the artificial paging PRB, the even distribution function comprising dividing the unique identifier by a total number of paging PRBs in the set of artificial PRBs; and

30 the processing circuitry is operable to map the artificial paging PRB to the actual paging PRB by using an uneven distribution function to select the actual paging PRB,

the uneven distribution function comprising assigning a number of paging PRBs of the set of artificial paging PRBs to the paging PRBs of the set of actual paging PRBs according to the weights.

5           15.     The network node of Claim 14, wherein the processing circuitry is operable to obtain the plurality of weights by determining the weights.

16.     The network node of any of Claims 14-15, wherein the weights are based on at least one of the following:

10           whether a PRB is an anchor PRB;  
            a paging load or paging blocking probability;  
            downlink traffic load;  
            a number of anchor PRBs;  
            a discontinuous reception (DRX) parameter; and  
15           a distribution of UEs according to their long term evolution (LTE) release version.

17.     The network node of any of Claims 14-16, wherein the processing circuitry is operable to transmit the plurality of weights by broadcasting system  
20     information.

          assign a paging PRB for a UE of the plurality of UEs using at least one weight of the plurality of weights; and  
          page the UE using the assigned paging PRB.

25

18.     The network node of Claim 14, wherein the total number of paging PRBs in the set of artificial paging PRBs is equal to a sum of the plurality of weights.

19.     A user equipment (UE) (210) comprising a receiving module (942) and a  
30     determining module (944):

          the receiving module operable to receive, from a network node (200), a plurality of weights for assigning paging physical resource blocks (PRBs) to a plurality of UEs,

each weight of the plurality of weights associated with a respective paging PRB;

the determining module operable to determine a paging PRB for the UE using at least one weight of the plurality of weights; and

the receiving module further operable to receive paging on the determined paging PRB, wherein the determining module is further operable to:

assign the UE to an artificial paging PRB of a set of artificial paging PRBs; and

map the artificial paging PRB to an actual paging PRB of a set of actual paging PRBs using at least one weight of the plurality of weights, the set of actual paging PRBs including a smaller number of paging PRBs than the set of artificial paging PRBs, wherein the UE is associated with a unique identifier;

wherein the determining module is operable to assign the UE to the artificial paging PRB by using an even distribution function to select the artificial paging PRB, the even distribution function comprising dividing the unique identifier by a total number of paging PRBs in the set of artificial paging PRBs; and

wherein the determining module is operable to map the artificial paging PRB to the actual paging PRB by using an uneven distribution function to select the actual paging PRB, the uneven distribution function comprising assigning a number of paging PRBs of the set of artificial paging PRBs to the paging PRBs of the set of actual paging PRBs according to the weights.

20

20. A network node (200) comprising an obtaining module (1060), a transmitting module (1062) and a determining module (1064):

the obtaining module operable to obtain a plurality of weights for assigning paging PRBs to a plurality of UEs (210), wherein each weight of the plurality of weights is associated with a respective paging PRB and the plurality of weights unevenly assign UEs to paging PRBs to unevenly distribute a paging load;

the transmitting module operable to transmit the plurality of weights to one or more UEs; and

the determining module operable to assign a paging PRB for a UE of the plurality of UEs using at least one weight of the plurality of weights, and page the UE using the assigned paging PRB,

30

wherein the determining module is operable to assign the paging PRB for the UE  
by:

assigning the UE to an artificial paging PRB of a set of artificial paging PRBs;

and

- 5           mapping the artificial paging PRB to an actual paging PRB of a set of actual  
paging PRBs using at least one weight of the plurality of weights, the set of actual paging  
PRBs including a smaller number of paging PRBs than the set of artificial paging PRBs,  
wherein the UE is associated with a unique identifier;

- wherein the determining module is operable to assign the UE to the artificial  
10   paging PRB by using an even distribution function to select the artificial paging PRB,  
the even distribution function comprising dividing the unique identifier by a total number  
of paging PRBs in the set of artificial PRBs; and

- the determining module is operable to map the artificial paging PRB to the actual  
paging PRB by using an uneven distribution function to select the actual paging PRB,  
15   the uneven distribution function comprising assigning a number of paging PRBs of the  
set of artificial paging PRBs to the paging PRBs of the set of actual paging PRBs  
according to the weights.