

CLAIMS

1. A method (P100) implemented by a processing unit (11) of a first communicating electronic device (10) further including a data memory (12), first communication means (13) providing nearby wireless communication with any other communicating electronic device (10i) situated within communication range within a cluster (C1, C2) comprising a plurality of communicating electronic devices (10, 10i, a1, ..., a8, b1, ..., b8, ..., j1, ..., j5), said memory (12) and said communication means (13) cooperating with said processing unit (11), the data memory (12) storing the value of an identifier (ID, IDm, IDa) dedicated to the first communicating electronic device (10) and a register (RH) arranged to include the current value (IDHc) of an identifier (IDH) of a communicating electronic device (d2, h3) acting as a cluster head (C1, C2), said method (P100) including a step for sending a service message (MS) to the device acting as cluster head, and being characterized in that it includes:
 - a step (125) prior to the sending of the service message (MS) for generating and sending, via the first communication means (13), a verification message (MAS) for belonging to the cluster, said message encoding:
 - i. the value (MAS-1) of the identifier of a second communicating electronic device as identifier of the communicating electronic device recipient of said verification message (MAS) for belonging to the cluster;
 - ii. the value (MAS-2) of the identifier of the first device as identifier of the communicating electronic device that is the source of said verification message (MAS) for belonging to said cluster;
 - a step (126), carried out if and only if a message (MAA) acknowledging receipt of said message verifying belonging to the cluster is received before the expiration of a maximum waiting time determined from the sending of the message (MAS) verifying belonging to the cluster, to decode said message (MAA) acknowledging receipt and deduce therefrom:
 - i. the value (MAA-2) of the identifier of the device recipient of said message (MAA) acknowledging receipt of the message (MAS) verifying belonging to the cluster;
 - ii. the value (MAA-1) of the identifier of the source device of said message (MAA) acknowledging receipt of the message (MAS) verifying belonging to the cluster;
 - the steps for generating (123a) and initiating (123) the sending of a service message (MS) only being carried out if (126-y):

- the deduced value (MAA-2) of the identifier of the device receiving the message (MAA) acknowledging receipt of the message (MAS) verifying belonging to the cluster is equal to that of the identifier of the first communicating electronic device;
 - the deduced value (MAA-1) of the identifier of the source device of said message (MAA) acknowledging receipt of the message (MAS) verifying belonging to the cluster is equal to that of the identifier of the second communicating electronic device.
2. The method according to the preceding claim, wherein the step prior to sending the service message (MS) for generating and sending, via the first communication means (13), a message (MAS) verifying belonging to the cluster is only carried out (124-y) if a test step (124) shows that the device is affiliated with the cluster (C1, C2).
3. The method (P100) according to one of the preceding claims, including:
- a step (201) for receiving a message (MAR) requesting affiliation generated and sent by a third communicating electronic device (c5, i5) requesting an affiliation with a cluster (C1, C2), said affiliation request message (MAR) including the value of the identifier (IDa) of said third device (c5, i5) requesting an affiliation;
 - a step (202) for decoding said affiliation request message (MAR) and deducing the value therefrom of said identifier (IDa) of said third device requesting affiliation;
 - a step (204) for generating a message (MAA) acknowledging receipt of the affiliation request consisting of encoding (MAA-1, MAA-2, MAA-3), within said message (MAA):
 - i. the value of the identifier (ID) of the first device as identifier of the source device of said message (MAA) acknowledging receipt of the affiliation request,
 - ii. the value of the identifier (IDa) of the third device requesting affiliation as identifier of the device recipient of said message (MAA) acknowledging receipt of the affiliation request,
 - iii. the current value (IDHc) of the identifier (IDH) of a fourth communicating electronic device acting as a cluster head, said value (IDHc) being read in the register (RH),
 - a step (205) for triggering the sending, by the first communication means (13), of the message (MAA) acknowledging receipt of the affiliation request.

4. The method (P100) according to the preceding claim, wherein the step (204) for generating a message (MAA) acknowledging receipt of the affiliation request further consists of encoding (MAA-6, MAA-7) a value (CHc1, CHc2) describing a capacity (CH1, CH2) of the fourth communicating electronic device (d2, h3) acting as cluster head (C1, C2) to perform a service, said value being recorded in the register (RH) further storing the current value (IDHc) of the identifier (IDH) of said fourth communicating electronic device (d2, h3) acting as cluster head (C1, C2).
5. The method (P100) according to any one of the preceding claims, wherein the step (205) for triggering the transmission, by the first communication means (13), of the message (MAA) acknowledging receipt of the affiliation request is only performed if (203-a) the data memory (12) stores a register (RH) including a current value (IDHc) of an identifier (IDH) of a communicating electronic device (d2, h3) acting as cluster head (C1, C2).
6. The method (P100) according to any one of the preceding claims, including:
 - a step for generating (211) an affiliation request message (MAR) consisting of encoding (MAR-1) the value of the identifier (ID, IDa) of the first device (c5, i5) as identifier of a device requesting affiliation with a cluster;
 - a step (212) for initiating the sending, by the first communication means (13), of said affiliation request message (MAR);
 - a step (213) for receiving, by the communication means (13), a message (MAA) generated and sent by a fifth device (10i) acknowledging receipt of the affiliation request message (MAR);
 - a step (214), carried out if and only if (213, 213-y) said message (MAA), acknowledging receipt of the affiliation request message (MAR), is received before the expiration of a maximum waiting time determined from the sending of said affiliation request message (MAR), to decode said message (MAA) acknowledging receipt of the affiliation request message and to deduce therefrom:
 - i. the value of the identifier (MAA-2, IDa) of the device recipient of said message (MAA) acknowledging receipt of an affiliation request;
 - ii. the value of the identifier (MAA-3, IDH) of a sixth communicating electronic device acting as cluster head to which the fifth source device of said message (MAA) acknowledging receipt of an affiliation request belongs;

- a step (215), carried out if and only if said deduced value (MAA-2) of the identifier of the receiving device is equal to that of the value of the identifier (ID) of the first device requesting affiliation, to record, in the register (RH), the deduced value of the identifier (IDH) of the sixth communicating electronic device acting as cluster head, as current value (IDHc) of the identifier of the device acting as cluster head.
7. The method (P100) according to the preceding claim, wherein:
- the step (214) for decoding the message (MAA) acknowledging receipt of the affiliation request message further consists of deducing (MAA-1), from said message (MAA), the value of the identifier (IDm) of the fifth communicating electronic device that is the source of said message (MAA);
 - the step (215) for updating the register (RH) further consists of recording said deduced identifier value therein as identifier of the communicating electronic device and an uplink route (Ru) separating the first communicating electronic device requesting affiliation from the sixth communicating electronic device acting as cluster head.
8. The method (P100) according to any one of the preceding claims, including a step prior to the step for sending a service message (MS) intended for device acting as cluster head to generate (123a) and initiate (123), via the first communication means (13), the sending of the service message (MS) intended for the communicating electronic device whose identifier value (IDH) is stored, as current identifier value (IDHc) of the communicating electronic device acting as cluster head, by the register (RH).
9. A computer program (P) including a plurality of program instructions, which, when they are:
- stored beforehand in a program memory (14) of such an electronic device (10) further including a processing unit (11), first communication means (13) ensuring wireless nearby communication with any other electronic device (10i) situated within the communication range, a data memory (12) saving the value of an identifier (ID) dedicated to the device and a register (RH) to include the current value of an identifier of a device acting as cluster head, said memories (12, 14) and said first communication means (13) cooperating with said processing unit (11);
 - executed or interpreted by said processing means (11),

causes the implementation of an affiliation method (P100) according to any one of the preceding claims.

10. An electronic device (10) including a processing unit (11), a data memory (12), a program memory (14), first communication means (13) providing wireless nearby communication with any other electronic device (10i) situated within the communication range, said memories (12, 14) and said first communication means (13) cooperating with said processing unit (11), the data memory (12) including the value of an identifier (ID) dedicated to the device and a register (RH) to include the current value of an identifier of a device acting as cluster head, said device (10) being characterized in that it includes, in the program memory (14), the instructions of a program (P) according to the preceding claim.
11. A system including a plurality of such communicating electronic devices (10, 10i) according to the preceding claim.
12. The system according to the preceding claim, including a plurality of containers of goods, solid, fluid or liquid merchandise, said containers respectively cooperating with the communicating electronic devices (10, 10i), the latter each including a sensor (15) cooperating with the processing unit (11) to measure and collect a property related to the internal and/or external environment of said containers.