

### Claims

- 5        1. - A method for transmission of messages from a sender node (12) to multiple destination nodes (14) in a network (10) in which:
  - The same message is sent from the sender node (12) to multiple destination nodes (14),
  - the destination node (14) of a message returns an acknowledgment message to
  - 10    the sender node (12) after receiving the message,
  - characterised in that it comprises a step (114, 122) of the distribution, by the sender node (12), of the destination nodes (14) into at least two groups (G1, G2) of destination nodes according to a predetermined distribution criterion taking into account the to and fro travel time between the sending of the message and the receiving of the
  - 15    acknowledgment message from the destination node, and
  - a step of sending (102, 104) of messages to destination nodes in the same group with a latency period between the sending of two successive messages to the same destination nodes of the same group, the latency periods, each specific to a group and defining the throughput rate of the group being different from one group to another.
- 20        2. - A method according to claim 1, characterised in that the said predetermined distribution criterion involves comparing the to and fro travel time of the message with a characteristic time interval specific to the group considered  $[0, T_{min1-2}] ; [T_{min1-2} - T_{max}]$ .
- 25        3. - A method according to claim 2, characterised in that the latency period for a particular determined group is less than or equal to the upper limit of the characteristic time interval specific to the group.
- 30        4. - A method according of any one of the preceding claims, characterised in that for at least one group, the latency period is equal to the longest to and fro travel time for the previous message of all the destination nodes of the group.
- 35        5. - A method according to any one of the preceding claims, characterised in that the said predetermined distribution criterion is recomputed over time according to the distribution of destination nodes among the groups.

6. - A method according to claim 5, characterised in that the recomputing of the predetermined distribution criteria is performed periodically.

7. - A method according to claim 5 or 6, characterised in that the recomputing of the predetermined distribution criterion is performed in order to maximise the total throughput of the network (10).

8. - A method according to claim 7 taken with claim 2, characterised in that the recomputing of the predetermined distribution criterion is performed in the case of  $M$  groups so as to maximise the function  $\sum_{i=1}^M N_i \frac{K}{T_{\min i-i+1}}$  with  $1 \leq N_i \leq Total - \sum_{j=1}^{i-1} N_j$ ,

where  $M$  is the number of groups,  $N_i$  is the number of destination nodes belonging to the group  $i$ ,  $K$  is the size of messages sent,  $Total$  is the total number of destination nodes, and  $T_{\min i-i+1}$  is the value used for the criterion of distribution between the groups  $i$  and  $i+1$ .

9. - A method according to claim 8, characterised in that the recomputing of the predetermined distribution criterion is performed in the case of two groups so as to maximise the function  $(N.K / T_{\min 1-2}) + L.K / T_{\max}$ , where  $N$  is the number of destination nodes having sent an acknowledgment,  $K$  is a constant,  $T_{\min 1-2}$  is the value used for the criterion of distribution between the two groups,  $L$  is the number of destination nodes that have not sent their acknowledgment,  $T_{\max}$  is a value greater than  $T_{\min 1-2}$ .

10. - A method according any one of the preceding claims, characterised in that it includes a step of reassigning of a destination node from an original group to a destination group by the sender node at the request of the destination node.

11. - A sender node (12) appropriate for the transmission of messages to multiple destination nodes (14) in a network (10), the node consisting of :

- the means for sending the same message to multiple destination nodes (14),
  - the means for receiving from each destination node (14) a message, a message of acknowledgement upon receipt of the message,
- characterised in that it comprises:
- the means for distribution, of destination nodes (14) in at least two groups (G1, G2) of destination nodes according to a predetermined distribution criterion taking into

account the to and fro travel time of the message between the sending of the message and receiving the message of acknowledgment from the destination node,

- the means of sending messages to destination nodes of the same group with a latency period between the sending of two successive messages to the same destination nodes of the same group, these latency periods, each specific to a group and defining the throughput rate of the group being different from one group to another.

12. - A network (10) for transmission of messages comprising at least one sender node (12) and multiple destination nodes (14) wherein each destination node (14) includes the means for returning an acknowledgment message back to the sender node (12) upon receiving a message,

characterised in that the or each sender node (12) is according to claim 11.

13. - A network (10) according to claim 12, characterised in that each destination node (14) includes the means for sending to the sender node (12) a request for changing group and in that the sender node (12) comprises the means for reassigning of the destination node (14) from an original group to a destination group in accordance with the request to change groups.

The invention claimed is:

1. A method for transmission of messages from a sender node to multiple destination nodes in a network in which:
  - a same message is sent from the sender node to multiple destination nodes,
  - the destination node of a message returns an acknowledgment message to the sender node after receiving the message,
  - the method comprising:
    - distributing, by the sender node, the destination nodes into at least two groups of destination nodes according to a predetermined distribution criterion taking into account the to and fro travel time between the sending of the message and the receiving of the acknowledgment message from the destination node, the predetermined distribution criterion involving comparing the to and fro travel time of the message with a characteristic time interval specific to the group considered ( $[0, T_{min\ 1-2}]$ ;  $[T_{min\ 1-2}-T_{max}]$ ); and
    - messages to destination nodes in the same group with a latency period between the sending of two successive messages to the same destination nodes of the same group, the latency periods, each specific to a group and defining the throughput rate of the group being different from one group to another.
2. The method according to claim 1, further comprising the latency period for a particular determined group being less than or equal to the upper limit of the characteristic time interval specific to the group.
3. The method according claim 1, further comprising for at least one group, the latency period being equal to the longest to and fro travel time for the previous message of all the destination nodes of the group.
4. The method according claim 1, wherein the predetermined distribution criterion is recomputed over time according to the distribution of destination nodes among the groups.
5. The method according to claim 4, further comprising the recomputing of the predetermined distribution criteria being performed periodically.
6. The method according to claim 4, further comprising the recomputing of the predetermined distribution criterion being performed in order to maximize the total throughput of the network.

7. The method according to claim 6, and wherein the recomputing of the predetermined distribution criterion is performed in the case of M groups so as to maximize the function

$$\sum_{i=1}^M N_i \frac{K}{T_{\min i-i+1}} \text{ with } 1 \leq N_i \leq \text{Total} - \sum_{j=1}^{i-1} N_j$$

where M is the number of groups,  $N_i$  is the number of destination nodes belonging to the group i, K is the size

of messages sent, Total is the total number of destination nodes, and  $T_{\min i-i+1}$  is the value used for the criterion of distribution between the groups i and i+1.

8. The method according to claim 7, further comprising the recomputing of the predetermined distribution criterion is being performed in the case of two groups so as to maximize the function  $(N.K/T_{\min 1-2}) + L.K/T_{\max}$ , where N is the number of destination nodes having sent an acknowledgment, K is a constant,  $T_{\min 1-2}$  is the value used for the criterion of distribution between the two groups, L is the number of destination nodes that have not sent their acknowledgment,  $T_{\max}$  is a value greater than  $T_{\min 1-2}$ .

9. The method according to claim 1, further comprising reassigning a destination node from an original group to a destination group by the sender node at the request of the destination node.

10. A sender node appropriate for the transmission of messages to multiple destination nodes in a network the node comprising:

means for sending a same message to multiple destination nodes;

means for receiving from each destination node a message of acknowledgement upon receipt of the message;

means for distributing destination nodes in at least two groups, of destination nodes according to a predetermined distribution criterion taking into account the to and fro travel time of the message between the sending

of the message and receiving the message of acknowledgment from the destination node, the predetermined distribution criterion involving comparing the to and fro travel time of the message, with a characteristic time interval specific to the group considered ( $[0, T_{min\ 1-2}]$ ;  $[T_{min\ 1-2}-T_{max}]$ ); and

means for sending messages to destination nodes of the same group with a latency period between the sending of two successive messages to the same destination nodes of the same group, these latency periods, each specific to a group and defining the throughput rate of the group being different from one group to another.

11. A network for transmission of messages comprising at least one sender node and multiple destination nodes wherein each destination node includes means for returning an acknowledgment message back to the sender node upon receiving a message,

wherein at least one of the sender nodes is according to claim 10.

12. The network according to claim 11, wherein each destination node includes means for sending to the sender node a request for changing group and wherein the sender node comprises means for reassigning of the destination node from an original group to a destination group in accordance with the request to change groups.