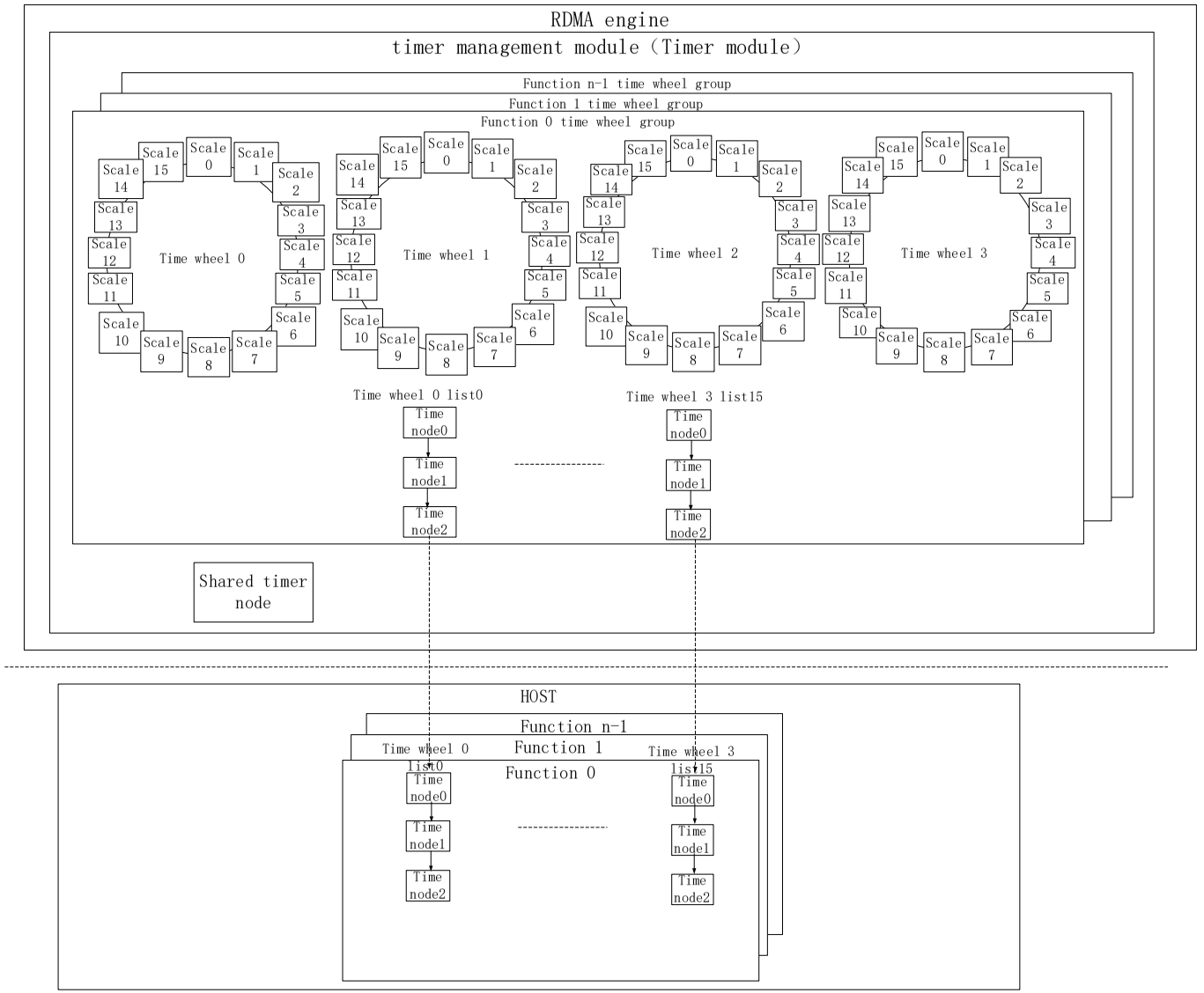
RDMA engine
timer management module (Timer module)
Function n-1 time wheel group
Function 1 time wheel group
Function 0 time wheel group
Time wheel 0
Time wheel 1
Time wheel 2
Time wheel 3
Scale 0
Scale 1
Scale 2
Scale 3
Scale 4
Scale 5
Scale 6
Scale 7
Scale 8
Scale 9
Scale 10
Scale 11
Scale 12
Scale 13
Scale 14
Scale 15
Time wheel 0 list0
Time wheel 3 list15
Time node0
Time node1
Time node2
Shared timer node
HOST
Function n-1
Function 1
Function 0
Time wheel 0 list0
Time wheel 3 list15

FIG.1

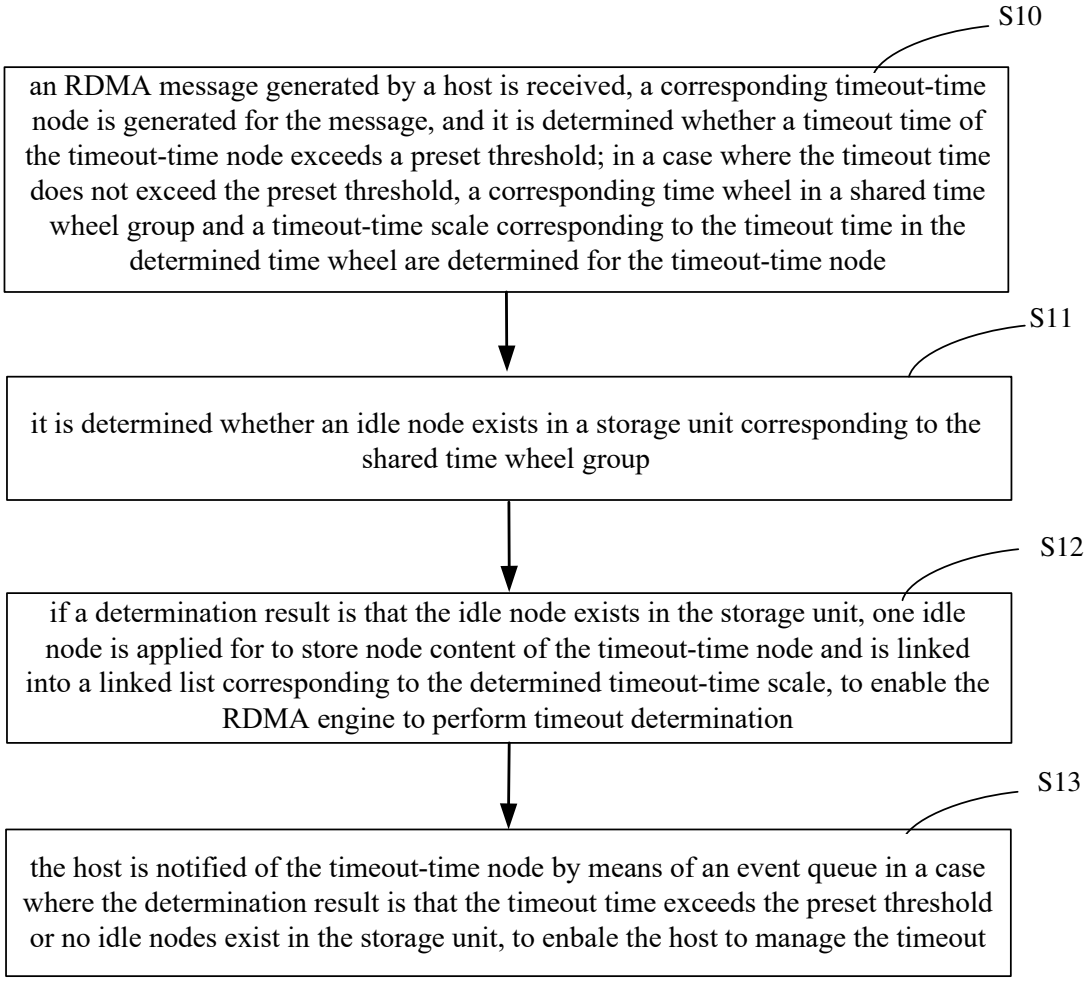
S10
an RDMA message generated by a host is received, a corresponding timeout-time node is generated for the message, and it is determined whether a timeout time of the timeout-time node exceeds a preset threshold; in a case where the timeout time does not exceed the preset threshold, a corresponding time wheel in a shared time wheel group and a timeout-time scale corresponding to the timeout time in the determined time wheel are determined for the timeout-time node
S11
it is determined whether an idle node exists in a storage unit corresponding to the shared time wheel group
S12
if a determination result is that the idle node exists in the storage unit, one idle node is applied for to store node content of the timeout-time node and is linked into a linked list corresponding to the determined timeout-time scale, to enable the RDMA engine to perform timeout determination
S13
the host is notified of the timeout-time node by means of an event queue in a case where the determination result is that the timeout time exceeds the preset threshold or no idle nodes exist in the storage unit, to enbale the host to manage the timeout

FIG. 2

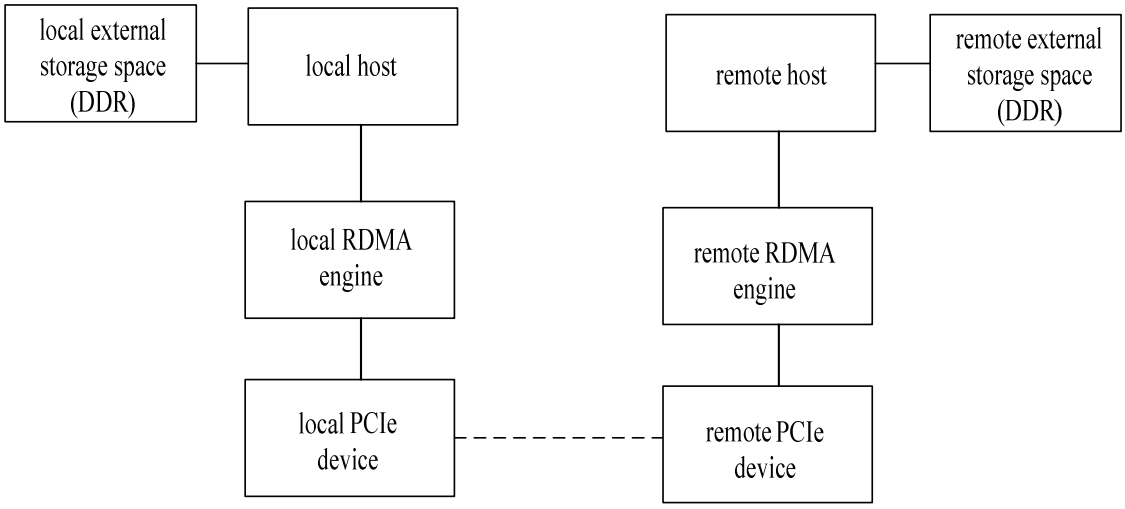
local external storage space (DDR)
local host
remote host
remote external storage space (DDR)
local RDMA engine
remote RDMA engine
local PCIe device
remote PCIe device

FIG. 3

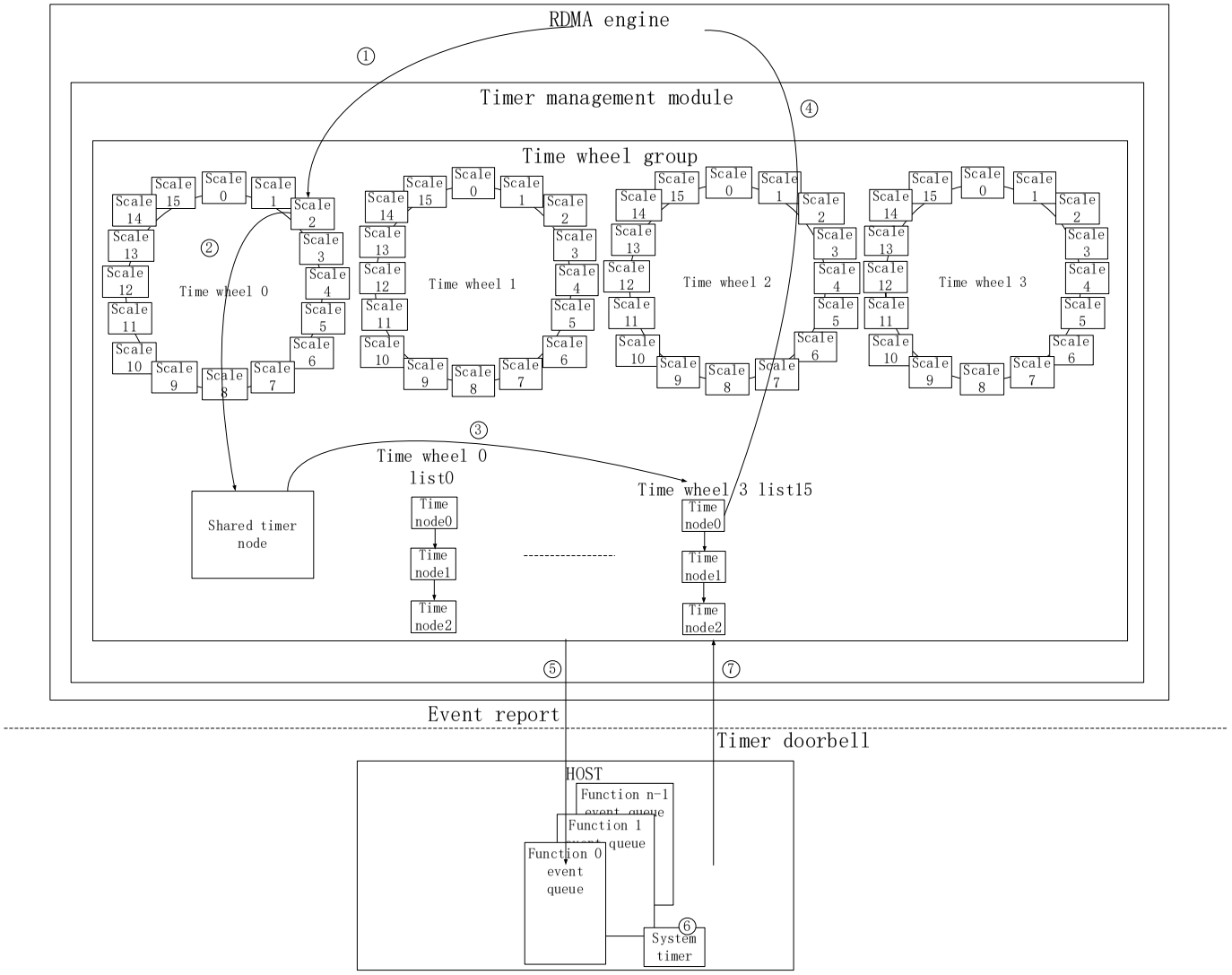
RDMA engine
①
Timer management module
④
Time wheel group
Time wheel 0
Time wheel 1
Time wheel 2
Time wheel 3
②
③
Time wheel 0
list0
Time wheel 3 list15
Shared timer node
Time node0
Time node1
Time node2
⑤
⑦
Event report
Timer doorbell
HOST
Function n-1 event queue
Function 1 event queue
Function 0 event queue
⑥
System timer

FIG.4

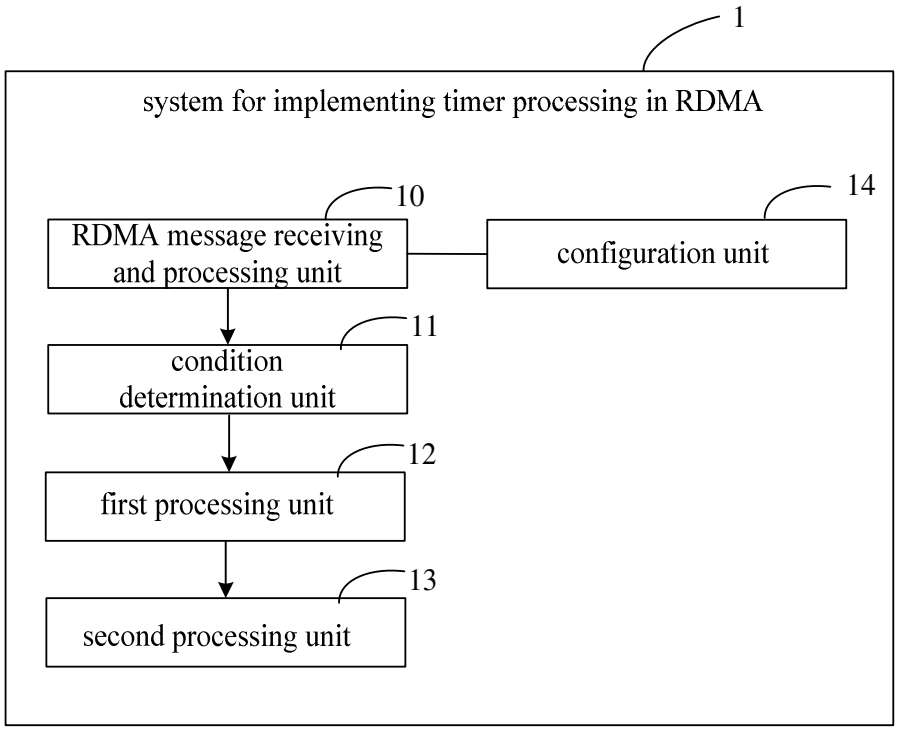
1
system for implementing timer processing in RDMA
10
RDMA message receiving and processing unit
14
configuration unit
11
condition determination unit
12
first processing unit
13
second processing unit

FIG. 5

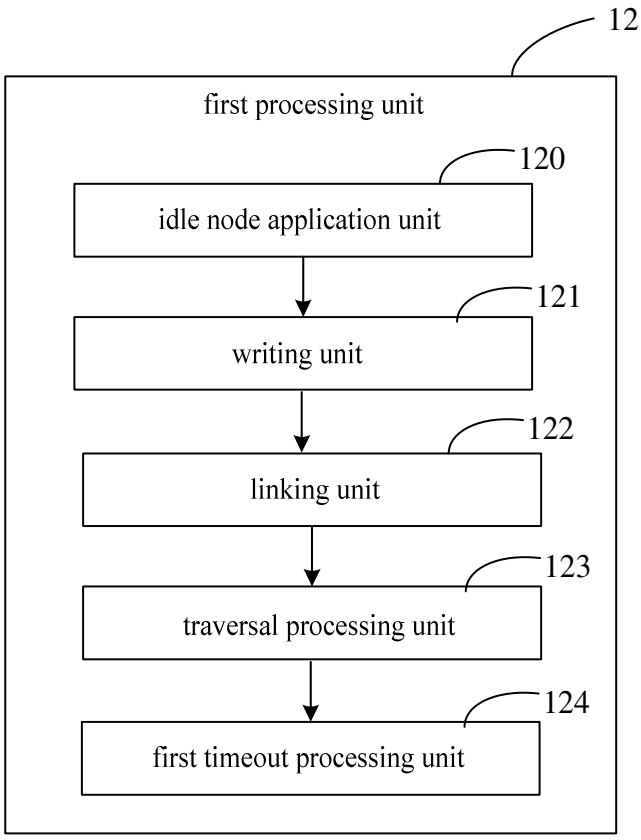
12
first processing unit
120
idle node application unit
121
writing unit
122
linking unit
123
traversal processing unit
124
first timeout processing unit

FIG. 6

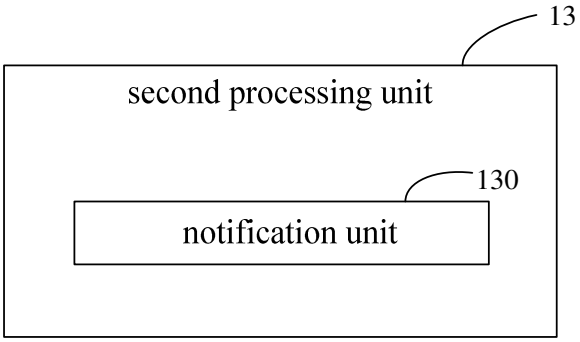
13
second processing unit
130
notification unit

FIG. 7