CLAIMS

What is claimed is:

1. A memory refresh method, wherein the method is applied to a computer system comprising a memory controller and a dynamic random access memory, DRAM, and the method comprises:

receiving (301), by the memory controller, access requests for accessing the DRAM, wherein the access requests for accessing the DRAM includes access requests for accessing a first rank of the DRAM;

determining (302), by the memory controller, whether a quantity of the received access requests for accessing the DRAM is greater than a first threshold;

if the quantity of the received access requests for accessing the DRAM is greater than the first threshold, determining (304), by the memory controller, whether a quantity of the access requests for accessing the first rank is greater than a second threshold; and

refreshing (310), by the memory controller, the first rank when a quantity of access requests for accessing the first rank is greater than 0 and less than the second threshold in one case at a standard average refresh interval, in another case, based on the quantity of the access requests, at a T/N interval, wherein T is the standard average refresh interval, and N is an integer greater than 1.

2. The memory refresh method according to claim 1, wherein the refreshing, by the memory controller, the first rank comprises:

refreshing, by the memory controller, the first rank at the T/N interval when a quantity of target ranks of the received access requests is less than a specified fourth threshold and a proportion of read requests or write requests in the access requests is greater than a specified fifth threshold, wherein the target ranks are ranks to be accessed by using the received access requests for accessing the DRAM.

3. The method according to claim 1 or 2, further comprising:

in a process in which the memory controller refreshes the first rank, receiving, by the memory controller, a first access request for accessing the first rank; and

buffering, by the memory controller, the first access request in a configured buffer queue, wherein the memory controller comprises at least the buffer queue and a scheduling queue, the

buffer queue is used to buffer an access request for a rank on which a refresh operation is being performed, and the scheduling queue is used to buffer an access request to be sent to a rank on which a refresh operation is not being performed.

4. The method according to claim 3, further comprising:

receiving, by the memory controller, a second access request for accessing a second rank in the DRAM; and

buffering, by the memory controller, the second access request in the scheduling queue when the second rank is not being refreshed.

5. The method according to any one of claims 1 to 4, further comprising:

refreshing, by the memory controller, the second rank when a quantity of access requests for accessing the second rank in the DRAM that are in the received access requests is not less than the second threshold and a quantity of postponed refreshes on the second rank is greater than a specified third threshold, wherein the third threshold is not less than 1 and is less than a specified warning value, and the warning value is used to indicate a need to immediately perform a refresh operation on the second rank.

6. The method according to any one of claims 1 to 5, further comprising:

skipping, by the memory controller, performing a refresh operation on a third rank when a quantity of access requests for accessing the third rank in the DRAM that are in the received access requests is not less than the second threshold and a quantity of postponed refreshes on the third rank is not greater than the specified third threshold, wherein the third threshold is not less than 1 and is less than the specified warning value, and the warning value is used to indicate a need to immediately perform a refresh operation on the third rank.

7. The memory refresh method according to claim 1, wherein the refreshing, by the memory controller, the first rank comprises:

refreshing, by the memory controller, the first rank at a T interval when a quantity of target ranks of the received access requests is not less than a specified fourth threshold and a proportion of read requests or write requests in the access requests is not greater than a specified fifth threshold, wherein T is used to indicate a standard average refresh interval.

8. A computer system (100), comprising a memory controller (106) and a dynamic random access memory (108), DRAM, connected to the memory controller (106), wherein the memory controller (106) is configured to perform the method according to any one of claims 1-7.

9. A memory refresh apparatus (400), wherein the memory refresh apparatus (400) is configured to refresh a dynamic random access memory (108), DRAM, in a computer system (100), and comprises:

a receiving module (402), configured to receive access requests for accessing the DRAM, wherein the access requests for accessing the DRAM includes access requests for accessing a first rank of the DRAM;

a statistical module (404), configured to: determine whether a quantity of the received access requests for accessing the DRAM is greater than a first threshold, and if the quantity of the received access requests for accessing the DRAM is greater than the first threshold, determines whether a quantity of the access requests for accessing the first rank is greater than a second threshold; and

a refresh module (408), configured to refresh the first rank when a quantity of access requests for accessing the first rank in the DRAM that are in the received access requests is greater than 0 and less than the second threshold in one case at a standard average refresh interval, in another case, based on the quantity of the access requests, at a T/N interval, wherein T is the standard average refresh interval, and N is an integer greater than 1.

10. The memory refresh apparatus according to claim 9, wherein

the refresh module (408) is configured to refresh the first rank at the T/N interval when a quantity of target ranks of the received access requests is less than a specified fourth threshold and a proportion of read requests or write requests in the access requests is greater than a specified fifth threshold, wherein the target ranks are ranks to be accessed by using the received access requests for accessing the DRAM.

11. The memory refresh apparatus according to claim 9, wherein

the receiving module (402) is further configured to: in a process of refreshing the first rank, receive a first access request for accessing the first rank; and

the memory refresh apparatus (400) further comprises:

a buffer module (410), configured to buffer the first access request in a configured buffer queue, wherein the buffer module comprises at least the buffer queue and a scheduling queue,

the buffer queue is used to buffer an access request for a rank on which a refresh operation is being performed, and the scheduling queue is used to buffer an access request to be sent to a rank on which a refresh operation is not being performed.

12. The memory refresh apparatus according to claim 11, wherein

the receiving module (402) is further configured to receive a second access request for accessing a second rank in the DRAM; and

the buffer module (410) is further configured to buffer the second access request in the scheduling queue when the second rank is not being refreshed.

13. The memory refresh apparatus according to any one of claims 9 to12, wherein

the refresh module (408) is further configured to refresh the second rank when a quantity of access requests for accessing the second rank in the DRAM that are in the received access requests is not less than the second threshold and a quantity of postponed refreshes on the second rank is greater than a specified third threshold, wherein the third threshold is not less than 1 and is less than a specified warning value, and the warning value is used to indicate a need to immediately perform a refresh operation on the second rank.

14. The memory refresh apparatus according to any one of claims 9 to 13, wherein

the refresh module (408) is further configured to skip refreshing a third rank when a quantity of access requests for accessing the third rank in the DRAM that are in the received access requests is not less than the second threshold and a quantity of postponed refreshes on the third rank is not greater than the specified third threshold, wherein the third threshold is not less than 1 and is less than the specified warning value, and the warning value is used to indicate a need to immediately perform a refresh operation on the third rank.

15. The memory refresh apparatus according to claim 9, wherein

the refresh module (408) is configured to refresh the first rank at a T interval when a quantity of target ranks of the received access requests is not less than a specified fourth threshold and a proportion of read requests or write requests in the access requests is not greater than a specified fifth threshold, wherein T is used to indicate a standard average refresh interval.

16. A computer readable storage medium, comprising one or more computer executable instructions, wherein when the one or more computer executable instructions are executed by a computer, the computer performs the method according to any one of claims 1-7.