CLAIMS

What is claimed is:

1. A token management method, applied to a first token proxy module, comprising:

determining a number of lacked tokens, in response to receiving token demand information sent by a second token proxy module; and

acquiring surplus tokens from at least one node of a preset queue according to the number of lacked tokens, and allocating the acquired surplus tokens to the second token proxy module, such that the second token proxy module uses the allocated tokens to send information;

wherein the preset queue comprises a plurality of nodes, one of the plurality of nodes is used to store a total number of surplus tokens corresponding to a statistical period, and the total number of surplus tokens is a sum of a number of surplus tokens reported by at least one second token proxy module in the corresponding statistical period;

wherein the method further comprises:

in response to receiving the number of surplus tokens reported by the at least one second token proxy module, acquiring a total number of surplus tokens from a node corresponding to a current statistical period, updating the total number of surplus tokens corresponding to the current statistical period according to the at least one received number of surplus tokens, and using the updated total number of surplus tokens to update the total number of surplus tokens stored in the node corresponding to the current statistical period;

wherein respective nodes of the preset queue store respective total numbers of surplus tokens in a chronological order.

2. The method of claim 1, wherein the acquiring the total number of surplus tokens from the node corresponding to the current statistical period, comprises:

acquiring a first position of a first pointer in the preset queue; wherein the first pointer is used for pointing to the node, corresponding to the current statistical period, in the preset queue; and

acquiring, according to the first position, the total number of surplus tokens from the node corresponding to the current statistical period; and

the using the updated total number of surplus tokens to update the total number of surplus tokens stored in the node corresponding to the current statistical period, comprises:

emptying the node corresponding to the current statistical period according to the first position, and storing the updated total number of surplus tokens into the node corresponding to the current statistical period; and

at the end of the current statistical period, pointing, according to a preset direction, the first pointer to a next node of the node corresponding to the current statistical period, and emptying the node currently pointed to by the first pointer; wherein the preset queue comprises a circular queue.

3. The method of claim 1 or 2, wherein the acquiring the surplus tokens from the at least one node of the preset queue according to the number of lacked tokens, comprises:

comparing a total number of surplus tokens stored in a token node of the preset queue with the number of lacked tokens; wherein the token node is a non-empty node with an earliest time in the preset queue;

in a case where the total number of surplus tokens stored in the token node is less than the number of lacked tokens, extracting the surplus tokens from the token node, and updating the number of lacked tokens according to a number of the extracted surplus tokens; and

taking a next node of the token node in the preset queue as a new token node, and returning the step of comparing the total number of surplus tokens stored in the token

node of the preset queue with the number of lacked tokens, until a total number of the extracted surplus tokens is equal to the number of lacked tokens carried in the token demand information.

4. The method of claim 3, wherein the acquiring the surplus tokens from the at least one node of the preset queue according to the number of lacked tokens, further comprises:

in a case where the total number of surplus tokens stored in the token node is larger than the number of lacked tokens, extracting surplus tokens of a same number as the number of lacked tokens from the token node, and updating the total number of surplus tokens stored in the token node; and/or

in a case where the total number of surplus tokens stored in the token node is equal to the number of lacked tokens, extracting the surplus tokens from the token node, emptying the token node, and taking the next node of the token node in the preset queue as the new token node.

5. The method of claim 3, wherein the comparing the total number of surplus tokens stored in the token node of the preset queue with the number of lacked tokens, comprises:

acquiring a second position of a second pointer in the preset queue; wherein the second pointer is used for pointing to the token node in the preset queue;

acquiring, according to the second position, the total number of surplus tokens stored in the token node from the preset queue; and

comparing the acquired total number of surplus tokens with the number of lacked tokens;

the taking the next node of the token node in the preset queue as the new token node, comprises:

pointing the second pointer to the new token node.

6. The method of claim 3, further comprising:

in a case where the next node of the node corresponding to the current statistical period is a same node as the token node, taking the next node of the node corresponding to the current statistical period as a node corresponding to a new current statistical period, emptying the node corresponding to the new current statistical period, and taking the next node of the token node as the new token node.

7. A token management method, applied to a second token proxy module, comprising:

acquiring an allocation number of surplus tokens allocated by a first token proxy module to the second token proxy module in each of recent N allocation periods; wherein N is a positive integer;

updating a maximum basic token number of the second token proxy module according to the allocation numbers;

determining a number of lacked tokens according to the updated maximum basic token number; and

generating token demand information carrying the number of lacked tokens and sending the token demand information to the first token proxy module, such that the first token proxy module determines a number of lacked tokens according to the token demand information, acquires surplus tokens from at least one node of a preset queue according to the number of lacked tokens, and allocates the acquired surplus tokens to the second token proxy module;

wherein the preset queue comprises a plurality of nodes, one of the plurality of nodes is used to store a total number of surplus tokens corresponding to a statistical period, and the total number of surplus tokens is a sum of a number of surplus tokens reported by at least one second token proxy module in the corresponding statistical period;

wherein the method further comprises:

in response to receiving the number of surplus tokens reported by the at least one second token proxy module, acquiring a total number of surplus tokens from a node

corresponding to a current statistical period, updating the total number of surplus tokens corresponding to the current statistical period according to the at least one received number of surplus tokens, and using the updated total number of surplus tokens to update the total number of surplus tokens stored in the node corresponding to the current statistical period;

wherein respective nodes of the preset queue store respective total numbers of surplus tokens in a chronological order.

8. The method of claim 7, wherein the updating the maximum basic token number of the second token proxy module according to the allocation numbers, comprises:

in a case where at least one of the allocation numbers is greater than zero, taking a sum of a maximum allocation number and the maximum basic token number as the updated maximum basic token number; and/or

in a case where all the allocation numbers are zero, updating the maximum basic token number to a preset value.

9. An information sending method, comprising:

determining, by a second token proxy module, a number of lacked tokens according to a current maximum basic token number;

generating, by the second token proxy module, token demand information carrying the number of lacked tokens, and sending, by the second token proxy module, the token demand information to a first token proxy module;

determining, by the first token proxy module, the number of lacked tokens, in response to receiving the token demand information; and

acquiring, by the first token proxy module, surplus tokens from at least one node of a preset queue according to the number of lacked tokens, and allocating, by the first token proxy module, the acquired surplus tokens to the second token proxy module, such that the second token proxy module uses the allocated tokens to send information;

wherein the preset queue comprises a plurality of nodes, one of the plurality of nodes is used to store a total number of surplus tokens corresponding to a statistical period, and the total number of surplus tokens is a sum of a number of surplus tokens reported by at least one second token proxy module in the corresponding statistical period;

wherein the method further comprises:

in response to receiving the number of surplus tokens reported by the at least one second token proxy module, acquiring a total number of surplus tokens from a node corresponding to a current statistical period, updating the total number of surplus tokens corresponding to the current statistical period according to the at least one received number of surplus tokens, and using the updated total number of surplus tokens to update the total number of surplus tokens stored in the node corresponding to the current statistical period;

wherein respective nodes of the preset queue store respective total numbers of surplus tokens in a chronological order.

10. A token management apparatus, applied to a first token proxy module, comprising:

a demand analysis unit, configured for determining a number of lacked tokens, in response to receiving token demand information sent by a second token proxy module; and

a token allocation unit, configured for acquiring surplus tokens from at least one node of a preset queue according to the number of lacked tokens, and allocating the acquired surplus tokens to the second token proxy module, such that the second token proxy module uses the allocated tokens to send information;

wherein the preset queue comprises a plurality of nodes, one of the plurality of nodes is used to store a total number of surplus tokens corresponding to a statistical period, and the total number of surplus tokens is a sum of a number of surplus tokens reported by at least one second token proxy module in the corresponding statistical period;

wherein the token allocation unit is further configured for:

in response to receiving the number of surplus tokens reported by the at least one second token proxy module, acquiring a total number of surplus tokens from a node corresponding to a current statistical period, updating the total number of surplus tokens corresponding to the current statistical period according to the at least one received number of surplus tokens, and using the updated total number of surplus tokens to update the total number of surplus tokens stored in the node corresponding to the current statistical period;

wherein respective nodes of the preset queue store respective total numbers of surplus tokens in a chronological order.

11. A token management apparatus, applied to a second token proxy module, comprising:

a data acquisition unit, configured for acquiring an allocation number of surplus tokens allocated by a first token proxy module to the second token proxy module in each of recent N allocation periods; wherein N is a positive integer;

an update unit, configured for updating a maximum basic token number of the second token proxy module according to the allocation numbers;

a data processing unit, configured for determining a number of lacked tokens according to the updated maximum basic token number; and

a demand generation unit, configured for generating token demand information carrying the number of lacked tokens and sending the token demand information to the first token proxy module, such that the first token proxy module determines a number of lacked tokens according to the token demand information, acquires surplus tokens from at least one node of a preset queue according to the number of lacked tokens, and allocates the acquired surplus tokens to the second token proxy module;

wherein the preset queue comprises a plurality of nodes, one of the plurality of nodes is used to store a total number of surplus tokens corresponding to a statistical period, and the total number of surplus tokens is a sum of a number of surplus tokens

reported by at least one second token proxy module in the corresponding statistical period;

wherein the first token proxy module is configured for:

in response to receiving the number of surplus tokens reported by the at least one second token proxy module, acquiring a total number of surplus tokens from a node corresponding to a current statistical period, updating the total number of surplus tokens corresponding to the current statistical period according to the at least one received number of surplus tokens, and using the updated total number of surplus tokens to update the total number of surplus tokens stored in the node corresponding to the current statistical period;

wherein respective nodes of the preset queue store respective total numbers of surplus tokens in a chronological order.

12. An information sending apparatus, comprising a first token proxy module and at least one second token proxy module; wherein,

the second token proxy module is configured for: determining a number of lacked tokens according to a current maximum basic token number, generating token demand information carrying the number of lacked tokens, and sending the token demand information to the first token proxy module; and

the first token proxy module is configured for: in response to receiving the token demand information, determining the number of lacked tokens, acquiring surplus tokens from at least one node of a preset queue according to the number of lacked tokens, and allocating the acquired surplus tokens to the second token proxy module, such that the second token proxy module uses the allocated tokens to send information;

wherein the preset queue comprises a plurality of nodes, one of the plurality of nodes is used to store a total number of surplus tokens corresponding to a statistical period, and the total number of surplus tokens is a sum of a number of surplus tokens reported by at least one second token proxy module in the corresponding statistical period;

wherein the first token proxy module is further configured for:

in response to receiving the number of surplus tokens reported by the at least one second token proxy module, acquiring a total number of surplus tokens from a node corresponding to a current statistical period, updating the total number of surplus tokens corresponding to the current statistical period according to the at least one received number of surplus tokens, and using the updated total number of surplus tokens to update the total number of surplus tokens stored in the node corresponding to the current statistical period;

wherein respective nodes of the preset queue store respective total numbers of surplus tokens in a chronological order.

13. An electronic device, comprising:

at least one processor; and

a memory communicatively connected to the at least one processor, wherein,

the memory stores instructions that are executable by the at least one processor, and the instructions, when executed by the at least one processor, enable the at least one processor to perform the method of any one of claims 1-9.

14. A non-transitory computer readable storage medium storing computer instructions, wherein the computer instructions are configured for causing a computer to perform the method of any one of claims 1-9.