CLAIMS

What is claimed is:

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

acquiring token data corresponding to respective autonomous token objects respectively; wherein P autonomous token objects are used for producing tokens and consuming the tokens; and P is a positive integer greater than 1;

analyzing the token data corresponding to the respective autonomous token objects to obtain a comprehensive token supply and demand state, wherein the comprehensive token supply and demand state is used for representing a relationship between an overall token producing speed and an overall token consuming speed of the respective autonomous token objects; and

allocating a reward token for at least one autonomous token object according to the comprehensive token supply and demand state and respective token data, so that the at least one autonomous token object uses tokens after receiving the reward token to forward information.

2. The method of claim 1, wherein the autonomous token object is provided with a token bucket for storing the tokens; and/or;

a speed of producing the tokens by the autonomous token objects producing the tokens is one-Nth of a preset rate; wherein N is a number of the autonomous token objects producing the tokens.

3. The method of claim 1 or 2, wherein the analyzing the token data corresponding to the respective autonomous token objects to obtain the comprehensive token supply and demand state, comprises:

analyzing the token data corresponding to the respective autonomous token objects, to determine token statistical data; and

determining the comprehensive token supply and demand state according to the token statistical data.

4. The method of claim 3, wherein the token data comprises a number of lacked tokens of the autonomous token object; the token data of the autonomous token object for producing the tokens further comprises a number of surplus tokens; the token statistical data comprises a total number of surplus tokens, a total number of lacked tokens, a total number of basic tokens, and a total number of negative tokens;

the analyzing the token data corresponding to the respective autonomous token objects, to determine the token statistical data, comprises:

for each of the autonomous token objects, determining a number of basic tokens and a number of negative tokens of the autonomous token object according to a preset maximum basic token number and a number of lacked tokens corresponding to the autonomous token object;

calculating a sum of numbers of surplus tokens corresponding to at least part of the autonomous token objects, to obtain the total number of surplus tokens; and calculating a sum of numbers of lacked tokens corresponding to at least part of the autonomous token objects, to obtain the total number of lacked tokens; and

calculating a sum of numbers of basic tokens corresponding to at least part of the autonomous token objects, to obtain the total number of basic tokens; and calculating a sum of numbers of negative tokens corresponding to at least part of the autonomous token objects, to obtain the total number of negative tokens.

5. The method of claim 4, wherein the token statistical data comprises the total number of surplus tokens and the total number of lacked tokens;

the determining the comprehensive token supply and demand state according to the token statistical data, comprises:

in a case where the total number of surplus tokens is greater than the total number of lacked tokens, determining the comprehensive token supply and demand state to be a first supply and demand state; wherein the first supply and demand state is used for representing that the overall token producing speed is greater than the overall token consuming speed, and after reward tokens are allocated for the respective autonomous token objects, the number of basic tokens of each of the respective autonomous token objects is the preset maximum basic token number.

6. The method of claim 5, wherein the token data comprises the number of surplus tokens and the number of lacked tokens of the autonomous token object;

the allocating the reward token for the at least one autonomous token object according to the comprehensive token supply and demand state and the respective token data, comprises:

in a case where the comprehensive token supply and demand state is the first supply and demand state, for each first autonomous token object whose number of basic tokens is less than the maximum basic token number, setting a number of reward tokens of the first autonomous token object as a number of lacked tokens of the first autonomous token object.

7. The method of claim 3, wherein the token statistical data comprises a total number of surplus tokens, a total number of basic tokens, and a total number of negative tokens;

the determining the comprehensive token supply and demand state according to the token statistical data, comprises:

in a case where a sum of the total number of surplus tokens and the total number of basic tokens is less than the total number of negative tokens, determining the comprehensive token supply and demand state to be a second supply and demand state; wherein the second supply and demand state is used for representing that the overall token producing speed is less than the overall token consuming speed, and after reward tokens are allocated for the respective autonomous token objects, the number of negative tokens of each of the respective autonomous token objects is greater than zero.

8. The method of claim 7, wherein the allocating the reward token for the at least one autonomous token object according to the comprehensive token supply and demand state and the respective token data, comprises:

in a case where the comprehensive token supply and demand state is the second supply and demand state, calculating a difference value obtained by subtracting the total number of surplus tokens and the total number of basic tokens from the total number of negative tokens;

calculating a quotient obtained by dividing the difference value by the number of the autonomous token objects, to obtain an average number of negative tokens; and

for each of the autonomous token objects, determining a number of reward tokens of the autonomous token object according to the token data of the autonomous token object and the average number of negative tokens.

9. The method of claim 3, wherein the token statistical data comprises a total number of surplus tokens, a total number of basic tokens, and a total number of negative tokens;

the determining the comprehensive token supply and demand state according to the token statistical data, comprises:

in a case where a sum of the total number of surplus tokens and the total number of basic tokens is greater than the total number of negative tokens, and the total number of negative tokens is greater than the total number of surplus tokens, determining the comprehensive token supply and demand state to be a third supply and demand state; wherein the third supply and demand state is used for representing that the overall token producing speed is less than the overall token consuming speed, and after reward tokens are allocated for the respective autonomous token objects, the number of basic tokens of each of the respective autonomous token objects is greater than zero, and is less than or equal to a maximum basic token number.

10. The method of claim 9, wherein the token data comprises a number of surplus tokens and a number of lacked tokens of the autonomous token object; and the token statistical data further comprises a total number of lacked tokens;

the allocating the reward token for the at least one autonomous token object according to the comprehensive token supply and demand state and the respective token data, comprises:

in a case where the comprehensive token supply and demand state is the third supply and demand state, for each second autonomous token object whose number of basic tokens is less than the maximum basic token number, determining a token lacking proportion of the second autonomous token object according to a number of lacked tokens of the second autonomous token object and the total number of lacked tokens; and

determining a number of reward tokens of the second autonomous token object according to the total number of surplus tokens and the token lacking proportion.

11. The method of claim 1, further comprising:

setting a balance horizontal line for a token bucket of the autonomous token object; wherein a value corresponding to the balance horizontal line is a number of tokens in the token bucket when token production of the autonomous token object is balanced with token consumption;

taking tokens in a token area above the balance horizontal line as surplus tokens;

taking tokens in a token area below the balance horizontal line and above a zero line as basic tokens; wherein the zero line represents a positive and negative boundary line of the number of tokens in the token bucket;

in a case where the number of tokens in the token bucket is less than the value corresponding to the balance horizontal line, and the number of tokens in the token bucket is a positive value, taking tokens in an empty token area between the basic tokens and the balance horizontal line as lacked tokens; and

in a case where the number of tokens in the token bucket is a negative value, taking tokens in an empty token area below the zero line as negative tokens, and taking

tokens in an empty token area below the balance horizontal line and below the zero line as lacked tokens.

12. An information forwarding method, comprising:

reporting, by respective autonomous token objects, token data to a token scheduling module respectively; wherein P autonomous token objects are used for producing tokens and consuming the tokens; and P is a positive integer greater than 1; and

receiving, by the token scheduling module, the token data reported by the respective autonomous token objects, determining a comprehensive token supply and demand state based on the received token data, and allocating a reward token for at least one autonomous token object according to the comprehensive token supply and demand state and the token data, so that the at least one autonomous token object uses tokens after receiving the reward token to forward information, wherein the comprehensive token supply and demand state is used for representing a relationship between an overall token producing speed and an overall token consuming speed of the respective autonomous token objects.

13. A token management apparatus, applied to a token scheduling module, comprising:

a data acquisition unit, configured for acquiring token data corresponding to respective autonomous token objects respectively; wherein P autonomous token objects are used for producing tokens and consuming the tokens; and P is a positive integer greater than 1;

a supply and demand analysis unit, configured for analyzing the token data corresponding to the respective autonomous token objects to obtain a comprehensive token supply and demand state, wherein the comprehensive token supply and demand state is used for representing a relationship between an overall token producing speed and an overall token consuming speed of the respective autonomous token objects; and

a token allocation unit, configured for allocating a reward token for at least one autonomous token object according to the comprehensive token supply and demand state and the token data, so that the at least one autonomous token object uses tokens after receiving the reward token to forward information.

14. An information forwarding apparatus, comprising at least one token processing module provided with an autonomous token object and a token scheduling module; wherein,

the token processing module is configured for using respective autonomous token objects to report token data to the token scheduling module respectively; wherein P autonomous token objects are used for producing tokens and consuming the tokens; and P is a positive integer greater than 1; and

the token scheduling module is configured for receiving the token data reported by the respective autonomous token objects, determining a comprehensive token supply and demand state based on the received token data, and allocating a reward token for at least one autonomous token object according to the comprehensive token supply and demand state and the token data, so that the at least one autonomous token object uses tokens after receiving the reward token to forward information, wherein the comprehensive token supply and demand state is used for representing a relationship between an overall token producing speed and an overall token consuming speed of the respective autonomous token objects.

15. 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 are executed by the at least one processor, to enable the at least one processor to perform the method of any one of claims 1 to 12.

16. A non-transitory computer readable storage medium storing computer instructions, wherein the computer instructions are used for causing a computer to perform the method of any one of claims 1 to 12.