SUMMARY

According to a first aspect of the present invention, there is provided a method, comprising: transmitting command data from a transmission station to a receiving station via a first communication link, wherein the command data defines one or more commands; transmitting triggering data from the transmission station to the receiving station via a second communication link, wherein the triggering data includes an identifier identifying at least one of the one or more commands; wherein the second communication link transmits the triggering data using electromagnetic waves transmitted via skywave propagation; wherein the first communication link has greater latency than the second communication link; wherein the first communication link has larger data bandwidth than the second communication link; wherein the command data is defined by a first collection of data, wherein the first collection of data has a first overall size, wherein the triggering data is defined by a second collection of data, wherein the second collection of data has a second overall size, and the first overall size is greater than or equal to the second overall size; wherein the one or more commands include trading instructions for one or more financial instruments; wherein the first communication link includes an optical fiber; and wherein there is at least one skip zone between the transmission and receiving stations.

There is also provided a method, comprising: transmitting command data from a transmission station via a first communication link, wherein the command data defines one or more commands; transmitting triggering data from the transmission station via a second communication link, wherein the triggering data includes an identifier identifying at least one of the one or more commands; and wherein the first and second communication links transmit the triggering data using electromagnetic waves transmitted via skywave propagation.

According to a second aspect of the present invention, there is provided a method, comprising: receiving command data at a receiving station from a transmitting station via a first communication link, wherein the command

data defines one or more commands; receiving triggering data at the receiving station from the transmitting station via a second communication link; wherein the triggering data passes over the second communication link to the receiving station using electromagnetic waves received via skywave propagation; and wherein the command data passes over the first communication link to the receiving station without using skywave propagation; wherein the first communication link has larger data bandwidth than the second communication link; wherein the command data is defined by a first collection of data, wherein the first collection of data has a first overall size, wherein the triggering data is defined by a second collection of data, wherein the second collection of data has a second overall size, and the first overall size is greater than or equal to the second overall size; wherein the one or more commands include trading instructions for one or more financial instruments; wherein the first communication link includes an optical fiber; wherein there is at least one skip zone between the transmitting and receiving stations; and executing with a processor at the receiving station at least one of the one or more commands in response to said receiving the triggering data.

According to a third aspect of the present invention, there is provided a system, comprising: a processor coupled to a memory; a first network interface responsive to the processor and coupled to a communication network, wherein the first network interface is configured to send command data defining one or more commands using the communication network via a first communication link to a receiving station; a second network interface responsive to the processor and coupled to a radio-frequency communication interface; an antenna system coupled to the radio-frequency communications interface; wherein the radio-frequency communication interface is configured to send triggering data using electromagnetic waves broadcast from the antenna system via a second communication link to the receiving station; wherein the antenna system and radio-frequency interface are configured to transmit the electromagnetic waves via skywave propagation; and wherein the triggering data includes an identifier identifying at least one of the one or more commands; wherein the first

communication link has larger data bandwidth than the second communication link; wherein the command data is defined by a first collection of data, wherein the first collection of data has a first overall size, wherein the triggering data is defined by a second collection of data, wherein the second collection of data has a second overall size, and the first overall size is greater than or equal to the second overall size; wherein the one or more commands include trading instructions for one or more financial instruments; wherein the first communication link includes an optical fiber; and wherein there is at least one skip zone between the antenna system and the receiving station.

According to a fourth aspect of the present invention, there is provided a system, comprising: a processor coupled to a memory; a first network interface responsive to the processor and coupled to a communication network, wherein the first network interface is configured to receive command data defining one or more commands using the communication network via a first communication link to a receiving station; a second network interface responsive to the processor and coupled to a radio-frequency communication interface; an antenna system coupled to the radio-frequency communications interface; wherein the radio-frequency communication interface is configured to receive triggering data using electromagnetic waves broadcast from the antenna system via a second communication link to the receiving station; wherein the antenna system and radio-frequency interface are configured to receive the electromagnetic waves via skywave propagation; and wherein the triggering data includes an identifier identifying at least one of the one or more commands; wherein the first communication link has larger data bandwidth than the second communication link; wherein the command data is defined by a first collection of data, wherein the first collection of data has a first overall size, wherein the triggering data is defined by a second collection of data, wherein the second collection of data has a second overall size, and the first overall size is greater than or equal to the second overall size; wherein the one or more commands include trading instructions for one or more financial instruments; wherein the first communication link includes an optical fiber; and wherein there is at least one skip zone between the antenna system and the receiving station.

A unique communication system and method has been developed to address the above-mentioned latency issues as well as other issues. In the communication system, command data is transmitted so as to be received at a receiving station before (or at the same time) triggering data is received. The command data includes one or more directives, instructions, algorithms, and/or rules for controlling a machine, such as a computer and/or mechanical device, to take one or more actions. For example, the command data in one form includes a program for buying and/or selling particular options or stocks at certain price levels, ranges, and/or based on other conditions. Command data is typically (but not in all circumstances) larger in size than the triggering data such that the command data takes longer than the triggering data to transmit over communication links having the same data bandwidth. The triggering data includes information identifying one or more commands in the command data to execute. For example, the triggering data can identify one or more particular options in the command data that identifies the particular stock (or multiple stocks) to purchase at a particular price (or prices). In one example, the command data is transmitted over a communication link that has high bandwidth and high latency, such as over a fiber optic cable, and the triggering data is transmitted over a communication link that has low bandwidth and low latency, such as through sky-wave propagation by refracting and/or scattering radio waves from the ionosphere. The relatively small-sized triggering data is then able to be more quickly received at a receiving station than if the triggering data was transmitted over the high bandwidth and high latency communication link provided by fiber optic cable. This communication system and method may dramatically reduce the time to execute complex time-sensitive actions, such as financial transactions, over large distances at remote locations. In one form, this technique is used to remotely perform actions past the radio horizon, such as for transatlantic communications. This technique can be adapted for one-way type communications or even two-way type communications.

This unique communication system and method in one example uses multiple communications links. In one form, the communication links use different communications media. Such a system might be used, for example, to transmit a

CLAIMS

1. A method, comprising:

transmitting command data from a transmission station to a receiving station via a first communication link, wherein the command data defines one or more commands;

transmitting triggering data from the transmission station to the receiving station via a second communication link, wherein the triggering data includes an identifier identifying at least one of the one or more commands;

wherein the second communication link transmits the triggering data using electromagnetic waves transmitted via skywave propagation;

wherein the first communication link has greater latency than the second communication link;

wherein the first communication link has larger data bandwidth than the second communication link;

wherein the command data is defined by a first collection of data, wherein the first collection of data has a first overall size, wherein the triggering data is defined by a second collection of data, wherein the second collection of data has a second overall size, and the first overall size is greater than or equal to the second overall size;

wherein the one or more commands include trading instructions for one or more financial instruments;

wherein the first communication link includes an optical fiber; and

wherein there is at least one skip zone between the transmission and receiving stations.

2. The method of claim 1, further comprising:

determining a maximum usable frequency for skywave propagation over the second communication link; and

transmitting the triggering data over the second communication link at a frequency that is less than or equal to the maximum usable frequency.

3. The method of any preceding claim, further comprising:

determining a minimum usable frequency for skywave propagation over the second communication link; and

transmitting the triggering data over the second communication link at a frequency that is greater than or equal to the minimum usable frequency.

4. The method of any preceding claim, wherein said transmitting the triggering data includes transmitting the electromagnetic waves below the critical angle.

5. The method of any preceding claim, further comprising:

receiving the command data at a receiving station remote from the transmission station; and

receiving the triggering data at the receiving station.

6. The method of claim 5, further comprising:

transmitting the command data on both the first communication link and the second communication link.

7. The method of claim 6, wherein said receiving the command data includes receiving the command data via the first communication link before receiving the command data via the second communication link.

8. The method of claim 6, wherein said receiving the command data includes receiving the command data via the second communication link before receiving the command data via the first communication link.

9. The method of claim 5, further comprising:

transmitting the triggering data on both the first communication link and the second communication link.

10. The method of claim 9, wherein said receiving the triggering data includes receiving the triggering data via the first communication link before receiving the triggering data via the second communication link.

11. The method of claim 9, wherein said receiving the triggering data includes receiving the triggering data via the second communication link before receiving the triggering data via the first communication link.

12. The method of any one of claims 5-11, further comprising:

executing at least one of the one or more commands identified in the triggering data in response to said receiving the triggering data, the at least one command executed using a processor at the receiving station.

13. The method of claim 12, wherein said executing occurs on or after both the command data and triggering data is fully received at the receiving station.

14. The method of any one of preceding claims, further comprising:

retransmitting the electromagnetic waves via one or more repeaters.

15. The method of any one of preceding claims, wherein the second communication link transmits the triggering data using multiple frequencies.

16. The method of claim 15, wherein:

the second communication link transmits on a first frequency for a first period of time, and on a second frequency for the first period of time; and

the first frequency and the second frequency are different frequencies.

17. The method of any one of preceding claims, wherein the skywave propagation includes refracting the electromagnetic waves from the ionosphere.

18. The method of any one of preceding claims, wherein the distance between the transmitting and receiving stations is greater than the radio horizon.

19. The method of any one of preceding claims, wherein the first communication link, and the second communication link are the same communication link.

20. The method of any one of claims 1 to 18, wherein the first communication link, and the second communication link are separate communication links.

21. A method, comprising:

receiving command data at a receiving station from a transmitting station via a first communication link, wherein the command data defines one or more commands;

receiving triggering data at the receiving station from the transmitting station via a second communication link;

wherein the triggering data passes over the second communication link to the receiving station using electromagnetic waves received via skywave propagation; and

wherein the command data passes over the first communication link to the receiving station without using skywave propagation;

wherein the first communication link has larger data bandwidth than the second communication link;

wherein the command data is defined by a first collection of data, wherein the first collection of data has a first overall size, wherein the triggering data is defined by a second collection of data, wherein the second collection of data has a second overall size, and the first overall size is greater than or equal to the second overall size;

wherein the one or more commands include trading instructions for one or more financial instruments;

wherein the first communication link includes an optical fiber;

wherein there is at least one skip zone between the transmitting and receiving stations; and

executing with a processor at the receiving station at least one of the one or more commands in response to said receiving the triggering data.

22. The method of claim 21, wherein said receiving the command data includes receiving the command data on both the first communication link and the second communication link.

23. The method of claim 22, wherein said receiving the command data includes receiving the command data via the first communication link before receiving the command data via the second communication link.

24. The method of claim 22, wherein said receiving the command data includes receiving the command data via the second communication link before receiving the command data via the first communication link.

25. The method of any one of claims 21 to 24, wherein said receiving the triggering data includes receiving the triggering data on both the first communication link and the second communication link.

26. The method of claim 25, wherein said receiving the triggering data includes receiving the triggering data via the first communication link before receiving the triggering data via the second communication link.

27. The method of claim 25, wherein said receiving the triggering data includes receiving the triggering data via the second communication link before receiving the triggering data via the first communication link.

28. The method of any one of claims 21 to 27, wherein said executing occurs on or after both the command data and triggering data is fully received at the receiving station.

29. The method of any one of claims 21 to 28, wherein the receiving station receives the triggering data via multiple frequencies.

30. A system, comprising:

a processor coupled to a memory;

a first network interface responsive to the processor and coupled to a communication network, wherein the first network interface is configured to send command data defining one or more commands using the communication network via a first communication link to a receiving station;

a second network interface responsive to the processor and coupled to a radio-frequency communication interface;

an antenna system coupled to the radio-frequency communications interface;

wherein the radio-frequency communication interface is configured to send triggering data using electromagnetic waves broadcast from the antenna system via a second communication link to the receiving station;

wherein the antenna system and radio-frequency interface are configured to transmit the electromagnetic waves via skywave propagation; and

wherein the triggering data includes an identifier identifying at least one of the one or more commands;

wherein the first communication link has larger data bandwidth than the second communication link;

wherein the command data is defined by a first collection of data, wherein the first collection of data has a first overall size, wherein the triggering data is defined by a second collection of data, wherein the second collection of data has a second overall size, and the first overall size is greater than or equal to the second overall size;

wherein the one or more commands include trading instructions for one or more financial instruments;

wherein the first communication link includes an optical fiber; and

wherein there is at least one skip zone between the antenna system and the receiving station.

31. A system, comprising:

a processor coupled to a memory;

a first network interface responsive to the processor and coupled to a communication network, wherein the first network interface is configured to receive command data defining one or more commands using the communication network via a first communication link to a receiving station;

a second network interface responsive to the processor and coupled to a radio-frequency communication interface;

an antenna system coupled to the radio-frequency communications interface;

wherein the radio-frequency communication interface is configured to receive triggering data using electromagnetic waves broadcast from the antenna system via a second communication link to the receiving station;

wherein the antenna system and radio-frequency interface are configured to receive the electromagnetic waves via skywave propagation; and

wherein the triggering data includes an identifier identifying at least one of the one or more commands;

wherein the first communication link has larger data bandwidth than the second communication link;

wherein the command data is defined by a first collection of data, wherein the first collection of data has a first overall size, wherein the triggering data is defined by a second collection of data, wherein the second collection of data has a second overall size, and the first overall size is greater than or equal to the second overall size;

wherein the one or more commands include trading instructions for one or more financial instruments;

wherein the first communication link includes an optical fiber; and

wherein there is at least one skip zone between the antenna system and the receiving station.