

Objects of the Invention

Therefore, it is an object of this invention to resolve at least one or more of the problems as set forth in the prior art. Particularly, it is an object of the current invention to provide video surveillance systems using network-based cameras and video stations with easier installation
5 and/or improved security. As a minimum, it is an object of this invention to provide the public with a useful choice.

Summary of the Invention

Accordingly, this invention provides a method of connecting at least one network-based
10 camera to a video station, said video station having at least one socket for connecting said network-based camera. The method of this invention includes the steps of:

- a) sending a camera-advertising signal from the network-based camera to the video station for notifying the presence of the network-based camera, said camera-advertising signal includes a camera-identification tag for identification of
15 the network-based camera;
- b) if the network-based camera is in an unlock state, locking ownership of the network-based camera with the respective connected socket; and
- c) if the network-based camera is in a lock state and is not locked by the respective
20 socket, terminating connection between the network-based camera and the video station
such that at any time, each of the at least one socket
 - can lock ownership of only one network-based camera; and
 - receives video from the only one network-based camera with ownership
locked by the respective socket.

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Preferably, the method of this invention further includes the steps of:

- a1) after receiving the camera-advertising signal, determining whether the camera-identification tag is acceptable to the video station; and
- a2) if the camera identification tag is not acceptable to the video station,
30 terminating connection between the network-based camera and the video station.

Preferably, the steps b) and c) above include the steps of

- __sending an ownership-locking-query signal from the video station to the
35 network-based camera for querying whether ownership of the network-based camera with the respective connected socket can be locked;

- __after the network-based camera receives the ownership-locking-query signal,
 - sending an accept-locking signal from the network-based camera to the video station if the network-based camera is in the unlock state; or
 - sending a reject-locking signal from the network-based camera to the video station if the network-based camera is in the lock state and is not locked by the respective socket;
- __if the accept-locking signal is sent from the network-based camera to the video station, locking ownership of the network-based camera with the respective connected socket and establishing a video connection for sending video from the network-based camera to the video station; and
- __if the reject-locking signal is sent from the network-based camera to the video station or if the camera-identification tag is not acceptable to the video station, terminating connection between the network-based camera and the video station.

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More preferably, the ownership-locking-query signal includes a lock key for decrypting data transmission between the network-based camera and the video station. With the provision of the ownership-locking-query signal, the method of this invention may additionally further include the step of broadcasting a station-discovery signal from the video station before the camera-advertising signal is sent from the network-based camera to the video station, said station-discovery signal including a station-identification tag for the identification of the video station. Even more preferably, the ownership-locking-query signal further includes any one of the camera-identification tag, the station-identification tag, a set of assigned networking settings, or their combinations, and on this basis, the step of locking ownership of the network-based camera by the respective connected socket includes the steps of

- __recording at least one of the following:
 - recording the camera-identification tag at the respective connected socket; and
 - recording the station-identification tag at the network-based camera
- __selecting a set of unique networking settings at the video station as the assigned networking settings in the ownership-locking signal; and optionally, updating the network-based camera with the set of assigned networking settings.

35 Preferably, the camera-advertising signal further includes any one of a set of camera networking settings, camera-locking status, or their combinations.

Optionally, the method of this invention further including the steps of:

- __sending a heart-beat signal from the network-based camera to the respective connected socket for maintaining ownership of the network-based camera with the respective connected socket; and
- __if the heart-beat signal is not received within a predetermined period of time, unlocking ownership of the network-based camera with the respective connected socket and terminating connection between the network-based camera and the respective connected socket.

Preferably, the network-based camera is connected to said at least one socket through a network cable.

It is another aspect of this invention to provide a video surveillance system having at least one network-based camera and a video station incorporating any one of the above methods.

It is yet another aspect of this invention to provide a method of controlling connection between at least one network-based camera to a video station, in which a camera-advertising signal is sent from the network-based camera to the video station for notifying the presence of the network-based camera. The camera-advertising signal includes a camera-identification tag for identification of the network-based camera, said video station having at least one socket for connecting said network-based camera. The method includes the steps of:

- 1) if the network-based camera is in an unlock state, locking ownership of the network-based camera with the respective connected socket; and
 - 2) if the network-based camera is in a lock state and is not locked by the respective socket, terminating connection between the network-based camera and the video station
- such that at any time, each of the at least one socket
- can lock ownership of only one network-based camera; and
 - receives video from the only one network-based camera with ownership locked by the respective socket.

It is a further aspect of this invention to provide a video station for a video surveillance system incorporating the above method.

This invention further provides a method of connecting at least one network-based camera to a video station, said video station:

- ~~__~~having at least one socket for connecting said network-based camera,
- ~~__can~~locking ownership of the network-based camera with the respective
5 connected socket if the network-based camera is in an unlock state, and ~~provide~~
providing the network-based camera with a lock key for decrypting data
transmission between the network-based camera and the video station and
- ~~__can terminate~~terminating connection between the network-based camera and
10 the video station if the network-based camera is in a lock state and is not locked
by the respective socket

and the method includes the steps of:

- a) sending a camera-advertising signal from the network-based camera to the
video station for notifying the presence of the network-based camera, said
camera-advertising signal includes a camera-identification tag for identification
15 of the network-based camera;
- b) recording the lock key at the network-based camera if an
ownership-locking-query signal from the video station is received, and the
network-based camera is in a unlock state

such that at any time, each of the at least one socket

- ~~__~~can lock ownership of only one network-based camera; and
- ~~__~~receives video from the only one network-based camera with ownership locked
20 by the respective socket.

It is another aspect of this invention to provide a network-based camera for a video
25 surveillance system incorporating the above method.

Brief description of the drawings

Preferred embodiments of the present invention will now be explained by way of
example and with reference to the accompanying drawings in which:

30 **Figure 1** shows how fake video images can be sent to a video station by “spoofing”;

Figure 2 shows the general system architecture of the video surveillance system of the
current invention;

Figure 3 shows the flow chart of how a network-based camera is locked by one socket
of the video station of this invention;

35 **Figures 4a to 4d** show the flow charts of the processes involved in the network-based
camera for controlling its connection with the video station; and

CLAIMS:

- 5 1. A method of connecting at least one network-based camera to a video station, said video station having at least one socket for connecting said network-based camera, said method including the steps of:
- 10 a) sending a camera-advertising signal from the network-based camera to the video station for notifying the presence of the network-based camera, said camera-advertising signal includes a camera-identification tag for identification of the network-based camera;
- 15 b) if the network-based camera is in an unlock state, locking ownership of the network-based camera with the respective connected socket; and
- c) if the network-based camera is in a lock state and is not locked by the respective socket, terminating connection between the network-based camera and the video station
- such that at any time, each of the at least one socket
- __can lock ownership of only one network-based camera; and
 - __receives video from the only one network-based camera with ownership locked
- 20 by the respective socket.
2. The method of claim 1 further including the steps of:
- 25 a1) after receiving the camera-advertising signal, determining whether the camera-identification tag is acceptable to the video station; and
- a2) if the camera identification tag is not acceptable to the video station, terminating connection between the network-based camera and the video station.
3. The method of claim 1, wherein the steps b) and c) include the steps of
- 30 • __sending an ownership-locking-query signal from the video station to the network-based camera for querying whether ownership of the network-based camera with the respective connected socket can be locked;
- __after the network-based camera receives the ownership-locking-query signal,
- sending an accept-locking signal from the network-based camera to the video
- 35 station if the network-based camera is in the unlock state; or

- sending a reject-locking signal from the network-based camera to the video station if the network-based camera is in the lock state and is not locked by the respective socket;
 - __if the accept-locking signal is sent from the network-based camera to the video station, locking ownership of the network-based camera with the respective connected socket and establishing a video connection for sending video from the network-based camera to the video station; and
 - __if the reject-locking signal is sent from the network-based camera to the video station or if the camera-identification tag is not acceptable to the video station, terminating connection between the network-based camera and the video station.
4. The method of claim 3, wherein the ownership-locking-query signal includes a lock key for decrypting data transmission between the network-based camera and the video station.
5. The method of claim 4 further including the step of broadcasting a station-discovery signal from the video station before the camera-advertising signal is sent from the network-based camera to the video station, said station-discovery signal including a station-identification tag for the identification of the video station.
6. The method of claim 5, wherein the ownership-locking-query signal further includes any one of the camera-identification tag, the station-identification tag, a set of assigned networking settings, or their combinations.
7. The method of claim 6, wherein the step of locking ownership of the network-based camera by the respective connected socket includes the steps of
- __recording at least one of the following:
 - recording the camera-identification tag at the respective connected socket;
 - and
 - recording the station-identification tag at the network-based camera
 - __selecting a set of unique networking settings at the video station as the assigned networking settings in the ownership-locking signal.
8. The method of claim 7 further including the step of updating the network-based camera with the set of assigned networking settings.

9. The method of claim 1, wherein the camera-advertising signal further includes any one of a set of camera networking settings, camera-locking status, or their combinations.
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10. The method of claim 1 further including the steps of:
- __sending a heart-beat signal from the network-based camera to the respective connected socket for maintaining ownership of the network-based camera with the respective connected socket; and
 - 10 • __if the heart-beat signal is not received within a predetermined period of time, unlocking ownership of the network-based camera with the respective connected socket and terminating connection between the network-based camera and the respective connected socket.
- 15 11. The method of claim 1, wherein the network-based camera is connected to said at least one socket through a network cable.
12. A video surveillance system having at least one network-based camera and a video station incorporating the methods of any one of claims 1 to 11.
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13. A method of controlling connection between at least one network-based camera to a video station, a camera-advertising signal is sent from the network-based camera to the video station for notifying the presence of the network-based camera, said camera-advertising signal includes a camera-identification tag for identification of the network-based camera, said video station having at least one socket for connecting said network-based camera, said method including the steps of:
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- 1) if the network-based camera is in an unlock state, locking ownership of the network-based camera with the respective connected socket; and
 - 2) if the network-based camera is in a lock state and is not locked by the respective socket, terminating connection between the network-based camera and the video station
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- such that at any time, each of the at least one socket
- __can lock ownership of only one network-based camera; and
 - __receives video from the only one network-based camera with ownership locked
- 35 by the respective socket.

14. The method of claim 13 further including the steps of:
- 1a) after receiving the camera-advertising signal, determining whether the camera-identification tag is acceptable to the video station; and
- 1b) if the camera identification tag is not acceptable to the video station, terminating connection between the network-based camera and the video station.
15. The method of claim 13, wherein the steps 1) and 2) includes the steps of:
- __if the camera-identification tag is acceptable to the video station, sending an ownership-locking-query signal from the video station to the network-based camera for querying whether ownership of the network-based camera with the respective connected socket can be locked;
 - __if an accept-locking signal from the network-based camera is received by the video station, locking ownership of the network-based camera with the respective connected socket and establishing a video connection for sending video from the network-based camera to the video station; and
 - __if a reject-locking signal from the network-based camera is received by the video station or if the camera-identification tag is not acceptable to the video station, terminating connection between the network-based camera and the video station.
16. The method of claim 15, wherein the ownership-locking-query signal includes a lock key for decrypting data transmission between the network-based camera and the video station.
17. The method of claim 16 further including the step of broadcasting a station-discovery signal from the video station before the camera-advertising signal is sent from the network-based camera to the video station, said station-discovery signal including a station-identification tag for the identification of the video station.
18. The method of claim 16, wherein the ownership-locking-query signal further includes any one of the camera-identification tag, the station-identification tag, a set of assigned networking settings, or their combinations.
19. The method of claim 18, wherein the step of locking ownership of the network-based camera by the respective connected socket includes the steps of

- __recording the station-identification tag at the network-based camera; and
- __selecting a set of unique networking settings at the video station as the assigned networking settings in the ownership-locking signal.

5 20. The method of claim 12, wherein the network-based camera is connected to said at least one socket through a network cable.

21. A video station for a video surveillance system incorporating the methods of any one of claims 13 to 20.

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22. A method of connecting at least one network-based camera to a video station, said video station:

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- __having at least one socket for connecting said network-based camera,
- ~~__can~~ locking ownership of the network-based camera with the respective connected socket if the network-based camera is in an unlock state, and ~~provide~~ providing the network-based camera with a lock key for decrypting data transmission between the network-based camera and the video station and

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- ~~__can terminate~~ terminating connection between the network-based camera and the video station if the network-based camera is in a lock state and is not locked by the respective socket

said method including the steps of:

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- a) sending a camera-advertising signal from the network-based camera to the video station for notifying the presence of the network-based camera, said camera-advertising signal includes a camera-identification tag for identification of the network-based camera;
- b) recording the lock key at the network-based camera if an ownership-locking-query signal from the video station is received, and the network-based camera is in a unlock state

such that at any time, each of the at least one socket

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- __can lock ownership of only one network-based camera; and
- __receives video from the only one network-based camera with ownership locked by the respective socket.

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23. The method of claim 22, wherein the ownership-locking-query signal is sent from the video station to the network-based camera for querying whether ownership of the

network-based camera with the respective connected socket can be locked, said method further including the steps of:

- __after the network-based camera receives the ownership-locking-query signal,
 - __sending an accept-locking signal from the network-based camera to the video station if the network-based camera is in the unlock state; or
 - __sending a reject-locking signal from the network-based camera to the video station if the network-based camera is in the lock state and is not locked by the respective socket;
- __if the accept-locking signal is sent from the network-based camera to the video station, locking ownership of the network-based camera with the respective connected socket and establishing a video connection for sending video from the network-based camera to the video station; and
- __if the reject-locking signal is sent from the network-based camera to the video station or if the camera-identification tag is not acceptable to the video station, terminating connection between the network-based camera and the video station.

24. The method of claim 23, wherein the ownership-locking-query signal further includes any one of the camera-identification tag, the station-identification tag, a set of assigned networking settings, or their combinations.

25. The method of claim 23, wherein the step of locking ownership of the network-based camera by the respective connected socket includes the step of recording the station-identification tag at the network-based camera.

26. The method of claim 25 further including the step of updating the network-based camera with the set of assigned networking settings.

27. The method of claim 22, wherein the camera-advertising signal further includes any one of a set of camera networking settings, camera-locking status, or their combinations.

28. The method of claim 22 further including the steps of:

- __sending a heart-beat signal from the network-based camera to the respective connected socket for maintaining ownership of the network-based camera with the respective connected socket; and

- __if the heart-beat signal is not received within a predetermined period of time, |
unlocking ownership of the network-based camera with the respective connected
socket and terminating connection between the network-based camera and the
respective connected socket.

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29. The method of claim 22, wherein the network-based camera is connected to said at
least one socket through a network cable.

30. A network-based camera for a video surveillance system incorporating the methods
10 of any one of claims 22 to 29.