CLAIMS

1. A system for monitoring loading of cargo onto a transport vehicle, comprising:

a wireless tracking tag attached to a logistic container containing the cargo, the wireless tracking tag associated with a tracking identifier that uniquely identifies the wireless tracking tag; and

a wireless monitoring device positioned to monitor a cargo hold of the transport vehicle, the wireless monitoring device comprising:

a wireless communications interface;

a processor; and

a memory communicatively coupled with the processor and storing:

a device identifier that uniquely identifies the wireless monitoring device;

a manifest including tracking identifiers corresponding to wireless tracking tags attached to logistic containers expected to be loaded onto the transport vehicle; and

firmware having machine-readable instructions that, when executed by the processor, cause the processor to:

receive, using the wireless communication interface, the tracking identifier from the wireless tracking tag; and

identify a discrepancy when the tracking identifier is not listed in the manifest.

2. The system of claim 1, the wireless monitoring device further comprising machine-readable instructions stored in the memory that, when executed by the processor, cause the processor to:

monitor strength of wireless signals received from the wireless tracking tag as the logistic container is conveyed to the cargo hold of the transport vehicle; and

determine that the logistic container is being conveyed into the cargo hold.

3. The system of claim 2, the wireless monitoring device further comprising machine-readable instructions stored in the memory that, when executed by the processor, cause the processor to initiate an alert when strength of any one of the wireless signals abruptly decreases or increases.

4. The system of claim 1, the wireless monitoring device further comprising machine-readable instructions stored in the memory that, when executed by the processor, cause the processor to transmit a location of the wireless monitoring device to a server, and to receive, in response, an identifier of the transport vehicle nearest to the wireless monitoring device.

5. The system of claim 1, wherein the wireless monitoring device is affixed to a stationary portion of a cargo loader that conveys the logistic container into the cargo hold.

6. The system of claim 1, wherein the wireless monitoring device is affixed to a stationary portion of the cargo hold.

7. The system of claim 1, the wireless monitoring device further comprising machine-readable instructions stored in the memory that, when executed by the processor, cause the processor to receive the manifest is from a server prior to loading of the logistic container into the cargo hold.

8. The system of claim 1, the wireless monitoring device further comprising machine-readable instructions stored in the memory that, when executed by the processor, cause the processor to:

determine, at a scheduled time, whether all identifiers listed in the manifest have been received as tracking identifiers from corresponding logistic containers loaded into the cargo hold; and

generate an alert when one or more identifiers listed in the manifest have not been received as tracking identifiers from corresponding wireless tracking tags.

9. A wireless tracking tag, comprising:

a battery;

an Automatic Dependent Surveillance - Broadcast (ADS-B) out receiver implementing a first wireless communication protocol;

a processor; and

memory storing machine-readable instructions that, when executed by the processor, cause the processor to:

control the ADS-B out receiver to (a) receive a first ADS-B out signal transmitted by a first transport vehicle, (b) receive a second ADS-B out signal transmitted by a second transport vehicle, different from the first transport vehicle, and (c) receive a third ADS-B out signal transmitted by a third transport vehicle, different from both the first transport vehicle and the second transport vehicle; and

estimate a current location of the wireless tracking tag based on locations defined in at least one of the first ADS-B out signal, the second ADS-B out signal, and the third ADS-B out signal.

10. The wireless tracking tag of claim 9, the memory further comprising machine-readable instructions that, when executed by the processor, cause the processor to:

control the ADS-B out receiver to determine respective signal strengths of each of the first ADS-B out signal, the second ADS-B out signal, and the third ADS-B out signal; and

triangulate the current location based on the respective signal strengths and the locations defined in each of the at least one of the first ADS-B out signal, the second ADS-B out signal, and the third ADS-B out signal.

11. The wireless tracking tag of claim 10, the memory further comprising machine-readable instructions that, when executed by the processor, cause the processor to:

associate, with the wireless tracking tag, a transport vehicle identifier received in one of the first ADS-B out signal, the second ADS-B out signal, and the third ADS-B out signal having the greatest signal strength; and

determine a current location of the wireless tracking tag based on an updated location contained in each subsequently received ADS-B out signal containing the same transport vehicle identifier.

12. The wireless tracking tag of claim 11, the memory further comprising machine-readable instructions that, when executed by the processor, cause the processor to wirelessly transmit the transport vehicle identifier to a network service.

13. The wireless tracking tag of claim 9, further comprising an adhesive for adhering the wireless tracking tag to a logistic unit.

14. The wireless tracking tag of claim 13, the logistic unit comprising one or more of a parcel, a pallet, a container, and a unit load device (ULD).

15. The wireless tracking tag of claim 9, wherein each of the first transport vehicle, the second transport vehicle, and the third transport vehicle being selected from the group including an aircraft, a ground vehicle, and a water vehicle.

16. The wireless tracking tag of claim 9, the memory further comprising machine-readable instructions that, when executed by the processor, cause the processor to:

receive a beacon signal including a first universally unique identifier (UUID) that identifies the transport vehicle from a wireless monitoring device positioned in a cargo hold of the transport vehicle; and

generating an alert when the UUID is different from a second UUID previously stored in the memory.

17. The wireless tracking tag of claim 9, further comprising an RF transceiver implementing a second wireless communication protocol, different form the first wireless communication protocol, the memory further comprising machine-readable instructions that, when executed by the processor, cause the processor to control the RF transceiver to communicate with one or more of another wireless tracking tag and a wireless monitoring device.

18. The wireless tracking tag of claim 17, the memory further comprising machine-readable instructions that, when executed by the processor, cause the processor to:

broadcast advertisement packets in accordance with the second wireless communication protocol;

receive a scan link request from at least one other wireless tracking tag; and

establish a communications link with the other wireless tracking tag.

19. The wireless tracking tag of claim 17, wherein the wireless tracking tag is a flexible tape node formed as a segment of a flexible adhesive tape platform, the wireless tracking tag further comprising:

a flexible circuit having one or more electrical wiring layers for electrically coupling the battery, the ADS-B out receiver, the processor, and the memory;

an adhesive layer for attaching the wireless tracking tag to a logistic unit; and

a flexible cover.

20. The wireless tracking tag of claim 17, the memory further comprising machine-readable instructions that, when executed by the processor, cause the processor to:

receive, from at least one other wireless tracking tag located in a cargo hold of a transport vehicle containing the wireless tracking tag, at least one other tracking identifier that uniquely identifies the at least one other wireless tracking tag;

determine a count of the at least one other wireless tracking tags within the cargo hold based on the at least one other tracking identifier;

generating an alert when the count is less than a target threshold number; and

wherein the memory stores the target threshold number corresponding to a number of logistic units being transported by the transport vehicle.

21. A monitoring device, comprising:

an RF transceiver implementing a first wireless communication protocol;

a processor; and

memory storing machine-readable instructions that, when executed by the processor, cause the processor to:

receive a wireless signal containing a tracking identifier from a wireless tracking tag attached to a logistic container being conveyed into a cargo hold of a transport vehicle;

determine a signal strength of the wireless signal; and

transmit an alert to a network service when the signal strength indicates that the wireless tracking tag was not loaded into the cargo hold of the transport vehicle.

22. The wireless tracking tag of claim 21, further comprising machine-readable instructions that, when executed by the processor, cause the processor to:

transmit a beacon signal comprising a first universally unique identifier (UUID) that identifies the transport vehicle.