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(54) Title: A SYSTEM AND METHOD FOR ROUTING A VEHICLE

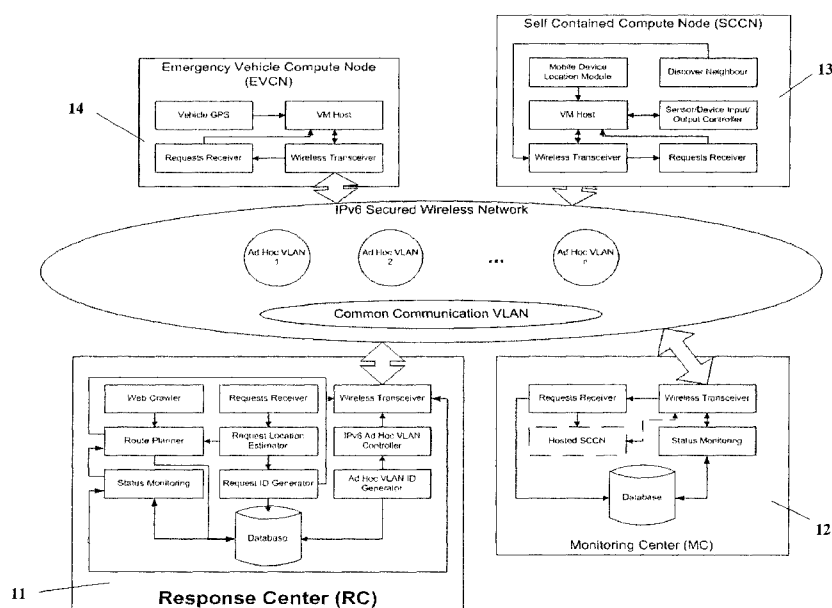


FIGURE 1

(57) Abstract: The present invention generally pertains to a system and method for routing a vehicle (14), more particularly the system for routing a vehicle (14) comprising a response center (11) and at least a monitoring center (12) communicating with the response center (11) for monitoring a plurality of sensors (13), wherein the sensors (13) monitor traffic conditions of a plurality of routes and convey information on the traffic conditions to the response center (11).

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A SYSTEM AND METHOD FOR ROUTING A VEHICLE**FIELD OF THE INVENTION**

- 5 The present invention generally pertains to a system and method for routing a vehicle, more particularly the present invention pertains to a system and method for routing an emergency response vehicle to a destination.

BACKGROUND OF INVENTION

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It has been observed in some cases that emergency vehicles are more often than not delayed by traffic congestions, inconsiderate drivers and at traffic junctions.

Although there are systems and methods for installing monitoring devices such as
15 cameras, and sensors such as inductive loops, as well as remote monitoring centers for addressing the delay issues faced by the emergency vehicles, these elements are however unable to provide a solution for addressing the problem. The situation worsens with the increasing numbers of vehicles on the roads. Also, there has been a situation where the destination is not properly identified or unclearly communicated.

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There are several prior arts disclosed a system and method for providing routing guidance to emergency response vehicles. The prior art WO 2006/088750 discloses a method for aiding emergency vehicle navigation pertaining to emergency vehicle navigation system that aids emergency vehicles in their navigation through non-
25 emergency vehicles. The prior art mainly focuses on providing methods for re-routing of non-emergency vehicle in order to avoid collision with the emergency vehicles travelling at high speed. Problems of the emergency vehicles getting delayed in unforeseen traffic conditions were not addressed in the prior art document.

- 30 The prior art US 7778773 B2 discloses peer to peer information gathering, and transmission of these information to a control center for further analysis and calculation to provide the users of the delivery vehicles with an optimize route recommendation. However, the prior art does not disclose implementation of the

- 2 -

system in an emergency vehicle, whereby emergency vehicles require an immediate response system that can provide real-time with updated route information.

The prior art US 7610151 B2 discloses a system that leverages a database of
5 observations about routes taken by drivers in a region to generate context and/or preference sensitive routes, and provides route planning for users based on the driving profiles and individual preferences and suggests routes accustomed to the users' profiles. However, the prior art fails to provide routing capabilities and a method for re-routing the emergency vehicles under unexpected traffic conditions.

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There is nevertheless a need to provide a system and method for effectively routing an emergency vehicle under unexpected traffic conditions.

SUMMARY OF INVENTION

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The object of the present invention is aimed at providing a system and method that collects real-time data from various optical and mechanical monitoring devices or sensors, as well as data from crowd sourcing mobile applications and social networking applications, and provides an effective route for the emergency response
20 vehicles to attend to the distress or emergency.

Preferably, the preferred embodiment provides a system for routing a response vehicle comprising a response center for receiving and transmitting information on the response vehicle and information on at least a destination, estimating arrival time of
25 the response vehicle and distance between the response vehicle and the destination, and monitoring status of the response vehicle, and the system comprising monitoring center communicating with the response center for monitoring a plurality of sensors.

Preferably, the preferred embodiment provides a system for routing a response vehicle
30 comprising the sensors for monitoring traffic conditions of a plurality of routes and conveying information on the traffic conditions to the response center for further estimating arrival time of the response vehicle and the distance between the response vehicle and the destination.

- 3 -

Preferably, the preferred embodiment provides a system for routing a response vehicle, wherein the response center launches a virtual network and that the monitoring center, the plurality of sensors, and the response vehicle connect to the virtual network provided by the steps according to the preferred embodiment.

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Preferably, the preferred embodiment provides a system for routing a response vehicle, wherein the sensors and the response vehicle establish a virtual machine.

Preferably, the preferred embodiment provides a system for routing a response
10 vehicle, the system comprises an independent device establishing the virtual machine.

The system and method of the present invention therefore provides an effective solution to the issues of delayed response of the emergency vehicles due to unexpected traffic conditions, which will described in detail in the descriptions.

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BRIEF DESCRIPTION OF DRAWINGS

Figure 1 illustrates a schematic representation of a block diagram of the system according to the preferred embodiment.

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Figure 2 illustrates a process flow of launching a virtual network by the response center according to the preferred embodiment.

Figure 3 illustrates a process flow of the monitoring center connecting to a virtual
25 network according to the preferred embodiment.

Figure 4 illustrates a process flow of the plurality of sensors connecting to a virtual network according to the preferred embodiment.

30 Figure 5 illustrates a process flow of the vehicle connecting to a virtual network according to the preferred embodiment.

Figure 6 illustrates a process flow of establishing a virtual machine according to the preferred embodiment.

- 4 -

Figure 7 illustrates a schematic representation of an overview of the system according to the preferred embodiment.

DETAILED DESCRIPTION OF EMBODIMENTS

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Described below are preferred embodiments of the present invention with reference to the accompanying drawings. Each of the following preferred embodiments describes an example not limiting in any aspect.

- 10 Referring to Figure 1, the figure illustrates a schematic representation of a block diagram of the system for routing a vehicle (14), or known as the response vehicle in the preferred embodiment.

The preferred embodiment is a system for routing a vehicle (14) comprising a
15 response center (11) for receiving and transmitting information on the vehicle (14) and information on at least a destination, estimating arrival time of the vehicle (14) and distance between the vehicle (14) and the destination, and monitoring status of the vehicle (14). The preferred embodiment still comprising at least a monitoring center (12) communicating with the response center (11) for monitoring a plurality of
20 sensors (13), wherein the sensors (13) monitor traffic conditions of a plurality of routes and convey information on the traffic conditions to the response center (11) for further estimating arrival time of the vehicle (14) and the distance between the vehicle (14) and the destination.

- 25 The response center (11) launches at least a virtual network with the monitoring center (12) and the sensors (13) by communicating and fetching data from the vehicle (14), monitoring center (12) and the sensors (13), processing the data and transmitting the processed data to the monitoring center (12), the sensors (13) and the vehicle (14) for proving at least a route for the vehicle (14).

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The plurality of sensors (13) and the vehicle (14) preferably comprising a computing node for establishing a virtual machine as it will be discussed later.

- 5 -

As shown in detail in Figure 1, the response center (11) preferably comprising several modules for achieving the effective route planning, namely a database, a status monitoring module, a route planner, a web crawler, a request identification generator, a request location estimator, a requests receiver, an ad hoc virtual area network
5 identification (VLAN ID) generator, an Internet Protocol version 6 (IPv6) ad hoc virtual area network (VLAN) controller, and a wireless transmitter.

Ultimately, the response center (11) receives distress calls from land or mobile phones, then estimates location of distress calls based on information from
10 telecommunication providers, or distress messages using Global Positioning System (GPS) coordinates from mobile applications, or information from various social networking applications (e.g. Twitter, etc.), or from crowd sourcing traffic applications (e.g. Waze, etc.). The response center (11) then collects these information
15 VLAN ID and RID, in which the VLAN ID and RID is used to create an ad hoc VLAN or known as the virtual network according to the preferred embodiment on a per case basis using the unique VLAN ID.

It is also shown in Figure 1, the monitoring center (12) comprising a database, status
20 monitoring module, ad hoc hosted (self-contained computing node) SCCN module, a requests receiver module, and a wireless transceiver for managing a plurality of sensors (13), whereby the plurality of sensors (13) monitor traffic conditions of a plurality of routes where the plurality of sensors (13) are deployed. In the preferred embodiment, the monitoring center (12) hosts at least a virtual machine for the
25 sensors (13) that do not have a computing node, SCCN.

Still referring to Figure 1, the plurality of sensors (13) with SCCNs, each comprising a mobile device location module, a virtual machine host, a neighbour discovery module, a sensor or a device input or output controller module, a requests receiver
30 module, and a wireless transceiver. The plurality of sensors (13) which are deployed as various traffic monitoring devices or sensors, preferably has a computing node known as a SCCN, where each SCCN has specific a virtual machine (VM) image with analytics associated with the device or sensor.

- 6 -

Should however the devices or sensors are not configured with a computing node, the virtual machine will be hosted by the monitoring center (12). SCCN can also reside in smart mobile devices of enforcement personnel that contain a virtual machine or application for such emergency.

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The Figure 1 then shows the vehicle (14), or preferably an emergency vehicle compute node (EVCN) comprising a vehicle GPS, a VM host, a request receiver module, and wireless transceiver. The vehicle (14) according to the preferred embodiment refers to the emergency response vehicle (14) with mobile computing
10 devices or EVCN such as laptops, tablets, or the like.

The preferred embodiment of the Figure 1 preferably implements but not limited to a secured Internet Protocol version 6 (IPv6) as the technology for the wireless network that connects the response center (11), the monitoring center (12), the plurality of
15 sensors (13) and the vehicle (14), using a Common Communication Virtual Local Area Network (VLAN) for basic messaging, that is for initial communication among response center (11), the monitoring center (12), the plurality of sensors (13) and the vehicle (14) and builds a unique ad hoc VLANs, virtual networks for different distresses or emergencies.

20

Also, the preferred embodiment implements the use of different virtual machines with different analytics applications for different sensors or devices within the plurality of sensors (13) that can be either hosted on site within the sensors or devices itself or by the monitoring center (12). The preferred embodiment implements a collaborative
25 nature among the SCCNs and EVCN, where SCCNs provide information to the EVCN for real-time routing calculation and acting on requests sent by the EVCN.

30

Referring to Figure 2, the figure illustrates a process flow of launching a virtual network by the response center (11) for routing a vehicle (14).

The process flow illustrates the response center (11) as described by the description for Figure 1, launching a virtual network by the steps of initially collecting information on traffic conditions from the monitoring center (12) and performing crowdsourcing for obtaining information on the traffic conditions from a plurality of

- 7 -

network sources, determining an initial route and the sensors (13) involved within the initial route, generating at least a request identification message and at least a virtual network identification message, and transmitting the request identification message and the virtual network identification message to the monitoring center (12), the
5 plurality of sensors (13) and the vehicle (14).

Subsequently the response center (11) instructs the monitoring center (12), the plurality of sensors (13) and the vehicle (14) for creating at least virtual network based on the virtual network identification message and linking the response center
10 (11) with the monitoring center (12), the sensors (13) and vehicle (14).

The response center (11) then receives updates from the vehicle (14), and monitors for at least an action request message from the vehicle (14), and waits for an acknowledgement to the action request message if an action type required is
15 determined, else the response center (11) determines whether the vehicle (14) has arrived at the destination according to the initial route.

Then, the response center (11) collects information on the traffic conditions and transmits the information on the traffic conditions to the vehicle (14) if the vehicle
20 (14) has not arrived at the destination. If the response center (11) has received updates on the required acknowledgement to the action request from the vehicle (14), the response center (11) transmits termination message to the vehicle (14) and the plurality of sensors (13) for terminating the virtual network.

25 Finally the response center (11) updates the request identification message; and terminates the virtual network upon receiving the termination message.

As illustrated in Figure 2, the response center (11) of the preferred embodiment estimates the location of the distress or emergency upon receiving a distressed call or
30 message, collects traffic conditions from the various monitoring center (12) or MCs, and performs web crawling for obtaining information from plurality of network sources such as from social networking and crowdsourcing sites, and determines an initial route based on the collected information and determines SCCNs along the determined initial route. After determining the initial route and the SCCNs along the

- 8 -

determined initial route, the response center (11) generates at least a unique RID and at least an ad hoc VLAN ID, which are referred to the request identification message and the virtual network identification message, and sending the RID and VLAN ID to the vehicle (14) known as the EVCN, the plurality of sensors (13) with a computing
5 node known as the SCCNs, and at least the monitoring center (12), MCs.

The process flow of the response center (11) also indicates that the RID and VLAN ID are sent to an Enforcement Personnel Smartphones (EPS), which is preferably at least an independent device in collaboration with the system of an embodiment.

10

It is shown further in the process flow of Figure 2, that the response center (11) further instructs for creating a new ad hoc VLAN which is the virtual network according to the preferred embodiment with the generated VLAN ID and linking the response center (11) with the monitoring center (12), the sensors (13) and vehicle
15 (14), while continuously listening for updates from the EVCN or EPS.

The response center (13) monitors for any action request messages from EVCN or EPS, and if there is a determined action type, the response center (11) waits for acknowledgements to the request, else, the response center (11) determines if the
20 EVCN has completed serving the distress or emergency. Should however the EVCN has not completed serving the distress or emergency, the response center (11) gathers further information on the traffic conditions from the web and sends the information to the EVCN, else the response center (11) sends a terminate virtual machine signal to the EVCN and SCCNs as well as updates the RID, and subsequently performs
25 shutdown action on the ad hoc VLAN.

Referring to Figure 3, the figure illustrates a process flow of a monitoring center (12) connecting to a virtual network for routing a vehicle (14).

30 The process flow in the monitoring center (12) for connecting to the virtual network begins by the steps of first receiving a request identification message. The monitoring center (12) then determines whether the request identification message is from the response center (11) or an action request from the vehicle (14)

- 9 -

If the request identification message is from the response center (11), the monitoring center (12) determines as to whether the request identification message is a new request identification message, and checks on the initial route from the response center (11) and determines the plurality of sensors (13) without a computing node if
5 the request identification message is a new request identification message. The monitoring center (12) then initiates and hosts a virtual machine for each of the plurality of sensors (13) without a computing node.

Else, the monitoring center (12) collects and sends information on the traffic
10 conditions from the plurality of sensors (13) to the response center (11) as well as information on the plurality of sensor (13), and monitoring for acknowledgement to an action request if the request identification message is from the vehicle (14).

Referring to Figure 4, the figure illustrates a process flow of a plurality of sensors
15 connecting to a virtual network for routing a vehicle (14).

The process flow of the plurality of sensors (13) for connecting to the virtual network begins by the steps of each of the sensors (13) first listening to at least a request and determining the type of the received request whether the request is from the response
20 center (11) or monitoring center (12), or neighbouring sensors (13) within the plurality of sensors (13), or whether the request is a termination message.

If the request is a request identification message and a virtual network identification message, preferably the RID and VLAN ID messages from the response center (11) or
25 the monitoring center (12), the sensors (13) initiates a virtual machine and attaches information of the request identification message and a virtual network identification message to the virtual machine, and connects to the virtual network with a virtual network identification, VLAN ID, and discovering associated neighbouring devices non-existing in a determined initial route via IPv6 technology and sending join
30 request message with the relevant VLAN ID and RID to the neighbouring devices.

If the request is a request identification message and a virtual network identification message, preferably the RID and VLAN ID messages from the neighbouring sensors (13), the sensors (13) that received the RID and VLAN ID initiates a virtual machine and attaches information of the request identification message and a virtual network

- 10 -

identification message to the virtual machine, and the sensors (13) connects to the virtual network with the virtual network identification, VLAN ID.

If the plurality of sensors (13) receives a termination message from the response
5 center (11), the monitoring center (12) or from other sensors (13), the plurality of sensors (13) ceases the virtual machine and disconnects from the virtual network.

Referring to Figure 5, the figure illustrates a process flow of a vehicle (14) connecting to a virtual network according for routing the vehicle (14).

10

The process flow of the vehicle (14) for connecting to the virtual network begins by the steps of first receiving a request identification message RID and a virtual network identification message VLAN ID from the response center (11) and the vehicle (14) connects to the virtual network with the VLAN ID.

15

The vehicle (14) then initiates a virtual machine and attaches information of the request identification message RID to the virtual network, initiates communication and continuously communicating with the response center (11), the monitoring center (12), the sensors (12) and the vehicle (14) until arriving at the destination for serving a
20 distress or emergency. In another embodiment, the vehicle (14) communicates with an enforcement personnel smartphone within the virtual network.

The vehicle (14) further waits for a termination message from the response center (11), and then ceases the virtual machine and disconnects the vehicle (14) from the
25 virtual network upon receiving the termination message.

30

Referring to Figure 6, the figure illustrates a process flow of establishing a virtual machine by a plurality of sensors (13) either an optical sensor or a mechanical sensor, a vehicle (14) EVCN, and an emergency personnel smartphone EPS.

As for the plurality of sensors (13) that are optical sensors, the process flow for establishing a virtual machine within each of the plurality of sensors (13) begins by the steps of first initiating a media analytics application on the sensors (13), then continuously providing updated information on the traffic conditions and the

- 11 -

determined initial route to the vehicle (14) until receiving termination message from the response center (11), and terminating the virtual machine upon receiving the termination message from the response center (11).

- 5 As for the plurality of sensors (13) that are mechanical sensors, the process flow for establishing a virtual machine within each of the plurality of sensors (13) begins by the steps of first initiating a sensor analytics application on the sensors (13), then continuously providing updated information on the traffic conditions and the determined initial route to the vehicle (14), executing required action and sending
10 acknowledgement to the vehicle (14), the response center (11) and the monitoring center (12) if action request message is received from the vehicle (14).

- The mechanical sensors repeats steps of continuously providing updated information on the traffic conditions and the determined initial route to the vehicle (14) until
15 receiving termination message from the response center (11), and terminating the virtual machine upon receiving the termination message from the response center (11).

- The vehicle (14) establishes a virtual machine by the steps of receiving information or
20 updates on the traffic conditions and the determined initial route from the response center (11) and the sensors (13), determining whether to adapt to an alternative route upon receiving the updated traffic conditions and the determined initial route, determining whether any one of the plurality of sensors (13) is required for fetching information if an alternative route is required, transmitting a request message to
25 the plurality of sensors (13) if an action request is required and updating the response center (11) and the monitoring center (12) on the action request, waiting for acknowledgement from the sensors (13), providing an alternative route if an acknowledgement is received within a predetermined time, else the initial route is not adapted to the alternative route.

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The vehicle (14) then updates the response center (11) and the monitoring center (12) with the existing status of the vehicle (14), repeats the preceding steps until arriving at the destination, sending acknowledgement to the response center (11), and terminating the virtual machine.

- 12 -

The system further comprising an independent device establishing a virtual machine by the steps of first receiving and determining a request identification message RID and a virtual network identification message VLAN ID from the response center (11), then connecting to the virtual network with the virtual network identification VLAN
5 ID, continuously monitoring proximity of the independent device with the vehicle (14) and sending update to the vehicle (14), response center (11) and the monitoring center (12).

Simultaneously the independent device monitors an action request, sending
10 acknowledgement to the vehicle (14), the response center (11) and the monitoring center (12) if an action request is received and an action response is received, and continuously monitoring proximity of the independent device, and continuously sending acknowledgement to the vehicle (14), the response center (11) and the monitoring center (12) if an action request is received and an action response is
15 received, until a termination message is received, and terminating the virtual network.

The independent device also preferably establishes a voice communication via the virtual network for effective communicating with the response center (11).

20 Referring to Figure 7, the figure illustrates a schematic representation of an overview of the system of the preferred embodiment.

As shown in Figure 7, the general idea is that when a distress or emergency call or message via mobile application is received at the response center (11), an estimated
25 location of the call can be provided by telecommunication companies as well as GPS coordinate from the mobile applications. Using such information with supplemented information from various monitoring center (12) as well as social network or crowd sourcing applications, the response center (11) will calculate an initial route to the destination for the vehicle (14), whilst communicating with the monitoring center (12)
30 as well as other participating plurality of sensors (13) or independent devices.

A unique Ad Hoc Virtual Local Area Networks (VLANs) can be established for different distresses or emergencies such that participants can communicate privately and securely. This wireless network is preferably the IPv6 technology.

- 13 -

As the vehicle (14) or emergency vehicle is travelling, more information would be fed to its compute node (EVCN or Emergency Vehicle Compute Node) by the response center (11) and compute nodes within the plurality of sensors (13) known as the self-contained compute nodes (SCCNs). A SCCN according to the preferred embodiment
5 hosts a virtual machine (VM) that has analytics application related to a particular sensor or device. A virtual machine for a camera for example, may contain analytics application that would estimate congestion level or number of vehicles at a particular junction, while a virtual machine for induction loop may contain analytics that can calculate number vehicles but have additional logic that would allow the virtual
10 machine to control the changing of traffic lights associated to the device.

An enforcement personnel's smart mobile device or known as the independent device in another embodiment can be another SCCN where it can be used to alert the officer to take necessary action and respond to specific requests. Thus as these information
15 and actions are continuously processed and updated, the EVCN can further calculate if a new and more favorable route is available or additional actions are required.

Another function of the SCCN is also to allow the SCCN to discover if any other neighbouring sensors or devices are available and can be asked to join the case.

20

The foregoing description describes the best possible modes for the preferred embodiment that will continue to function until the emergency or distress is served, for example, if an ambulance successfully attended to a victim and arrived to the nearest hospital, etc., then all the virtual machines and the ad hoc virtual networks will
25 shutdown and disconnected from the contributing features.

In as much as the present invention is subject to many variations, modifications and changes in detail, it is intended that all matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in
30 a limiting sense.

- 14 -

CLAIMS

1. A system for routing a vehicle (14) comprising:
 - 5 a response center (11) for receiving and transmitting information on the vehicle (14) and information on at least a destination, estimating arrival time of the vehicle (14) and distance between the vehicle (14) and the destination, and monitoring status of the vehicle (14); and
 - at least a monitoring center (12) communicating with the response center (11) for monitoring a plurality of sensors (13);
 - 10 the plurality of sensors (13) monitor traffic conditions of a plurality of routes and convey information on the traffic conditions to the response center (11) for further estimating arrival time of the vehicle (14) and the distance between the vehicle (14) and the destination;
 - characterized in that the response center (11) launches at least a virtual
 - 15 network with the monitoring center (12) and the sensors (13) by communicating and fetching data from the vehicle (14), monitoring center (12) and the sensors (13), processing the data and transmitting the processed data to the monitoring center (12), the sensors (13) and the vehicle (14) for proving at least a route for the vehicle (14).
 - 20
2. A system for routing a vehicle (14) according to claim 1, wherein the plurality of sensor (13), each comprising a computing node.
3. A method for routing a vehicle (14) through the system of claim 1, the
- 25 method of launching a virtual network by a response center (11) comprising the steps of:
 - collecting information on traffic conditions from the monitoring center (12) and performing crowdsourcing for obtaining information on the traffic conditions from a plurality of network sources;
 - 30 determining an initial route and the plurality of sensors (13) involved within the initial route;
 - generating at least a request identification message and at least a virtual network identification message, and transmitting the request identification

- 15 -

message and the virtual network identification message to the monitoring center (12), the plurality of sensors (13) and the vehicle (14);

instructing the monitoring center (12), the plurality of sensors (13) and the vehicle (14), and creating at least virtual network based on the virtual network identification message and linking the response center (11) with the monitoring center (12), the sensors (13) and vehicle (14);

receiving updates from the vehicle (14), and monitoring for at least an action request message from the vehicle (14);

waiting for an acknowledgement to the action request message if an action type is determined, else determining whether the vehicle (14) has arrived at the destination according to the initial route;

collecting information on the traffic conditions and transmitting the information on the traffic conditions to the vehicle (14) if the vehicle (14) has not arrived at the destination, else transmitting termination message to the vehicle (14) and the plurality of sensors (13);

updating the request identification message; and

terminating the virtual network upon receiving the termination message.

4. A method for routing a vehicle (14) through the system of claim 1, the method of connecting a monitoring center (12) to a virtual network comprising the steps of:

receiving a request identification message;

determining whether the request identification message is from the response center (11) or the vehicle (14);

determining the plurality of sensors (13) whether any one of the sensors (13) comprising a computing node and hosting a virtual machine for each of the sensors (13) not comprising the computing node if the request identification message is from the response center (11), else collecting and reverting information on the traffic conditions from the plurality of sensors (13) to the response center (11); and

monitoring for acknowledgement to an action request if the request identification message is from the vehicle (14).

- 16 -

5. A method for routing a vehicle (14) through the system of claim 1, the method of connecting a plurality of sensors (13) to a virtual network comprising the steps of:

determining type of a received request;

- 5 initiating a virtual machine and attaching information of the request identification message and a virtual network identification message to the virtual machine, connecting the virtual network with a virtual network identification, and discovering associated neighbouring devices non-existing in a determined initial route and sending join request message to the
10 neighbouring devices if the request identification message and a virtual network identification message are received from the response center (11) or the monitoring center (12);

- initiating the virtual machine and attaching information of the request identification message and a virtual network identification message to the
15 virtual machine, and connecting the virtual network with a virtual network identification if the request identification message or a virtual network identification message are received from any one of the sensors (13);

- receiving termination message from the response center (11) or the monitoring center (12) and ceasing the virtual machine and disconnecting
20 from the virtual network.

6. A method for routing a vehicle (14) through the system of claim 1, the method of connecting the vehicle (14) to a virtual network comprising the steps of:

- 25 receiving a request identification message and a virtual network identification message from the response center (11), and connecting to the virtual network with the received virtual network identification;

 initiating a virtual machine and attaching information of the request identification message to the virtual network;

- 30 initiating communication and continuously communicating with the response center (11), the monitoring center (12), the sensors (13) and the vehicle (14) until arriving at the destination;

 waiting for a termination message from the response center (11); then

- 17 -

ceasing the virtual machine and disconnecting from the virtual network upon receiving the termination message.

7. A method for routing a vehicle (14) through the system of claim 1, the method of establishing a virtual machine by each of a plurality of sensors (13) for an optical device comprising the steps of:
- initiating a media analytics application on the sensors (13);
- continuously providing updated information on the traffic conditions and the determined initial route to the vehicle (14) until receiving termination message from the response center (11); and
- terminating upon receiving the termination message.
8. A method for routing a vehicle (14) through the system of claim 1, the method of establishing a virtual machine by each of a plurality of sensors (13) for a mechanical sensor comprising the steps of:
- initiating a sensor analytics application on the sensors (13);
- continuously providing updated information on the traffic conditions and the determined initial route to the vehicle (14);
- executing required action and sending acknowledgement to the vehicle (14), the response center (11) and the monitoring center (12) if action request message is received from the vehicle (14);
- repeating steps of continuously providing updated information on the traffic conditions and the determined initial route to the vehicle (14) until receiving termination message from response center (11); and
- terminating upon receiving the termination message.
9. A method for routing a vehicle (14) through the system of claim 1, the method of establishing a virtual machine by the vehicle (14) comprising the steps of:
- receiving information or updates on the traffic conditions and the determined initial route from the response center (11) and the sensors (13);
- determining whether to adapt to an alternative route upon receiving the updated traffic conditions and the determined initial route;

- 18 -

determining whether any one of the plurality of sensors (13) is required for fetching information if an alternative route is required;

transmitting a request message to the plurality of sensors (13) if an action request is required and updating the response center (11) and the monitoring center (12) on the action request;

waiting for acknowledgement from the sensors (13);

providing an alternative route if an acknowledgement is received within a predetermined time, else the initial route is not adapted to the alternative route, and updating the response center (11) and the monitoring center (12) with the existing status of the vehicle (14);

repeating preceding steps until arriving at the destination;

sending acknowledgement to the response center (11); and

terminating the virtual machine.

10. A method for routing a vehicle (14) through the system of claim 1, the method of establishing a virtual machine by an independent device comprising the steps of:

receiving and determining a request identification message and a virtual network identification message from the response center (11);

connecting the virtual network with the virtual network identification; continuously monitoring proximity of the independent device with the vehicle (14) and sending update to the vehicle (14), response center (11) and the monitoring center (12);

simultaneously monitoring an action request;

sending acknowledgement to the vehicle (14), the response center (11) and the monitoring center (12) if an action request is received and an action response is received;

continuously monitoring proximity of the independent device, and continuously acknowledgement to the vehicle (14), the response center (11) and the monitoring center (12) if an action request is received and an action response is received, until a termination message is received; and

terminating the virtual network.

- 19 -

11. A method for routing a vehicle (14) according to claim 10, wherein the independent device establishes voice communication via the virtual network.

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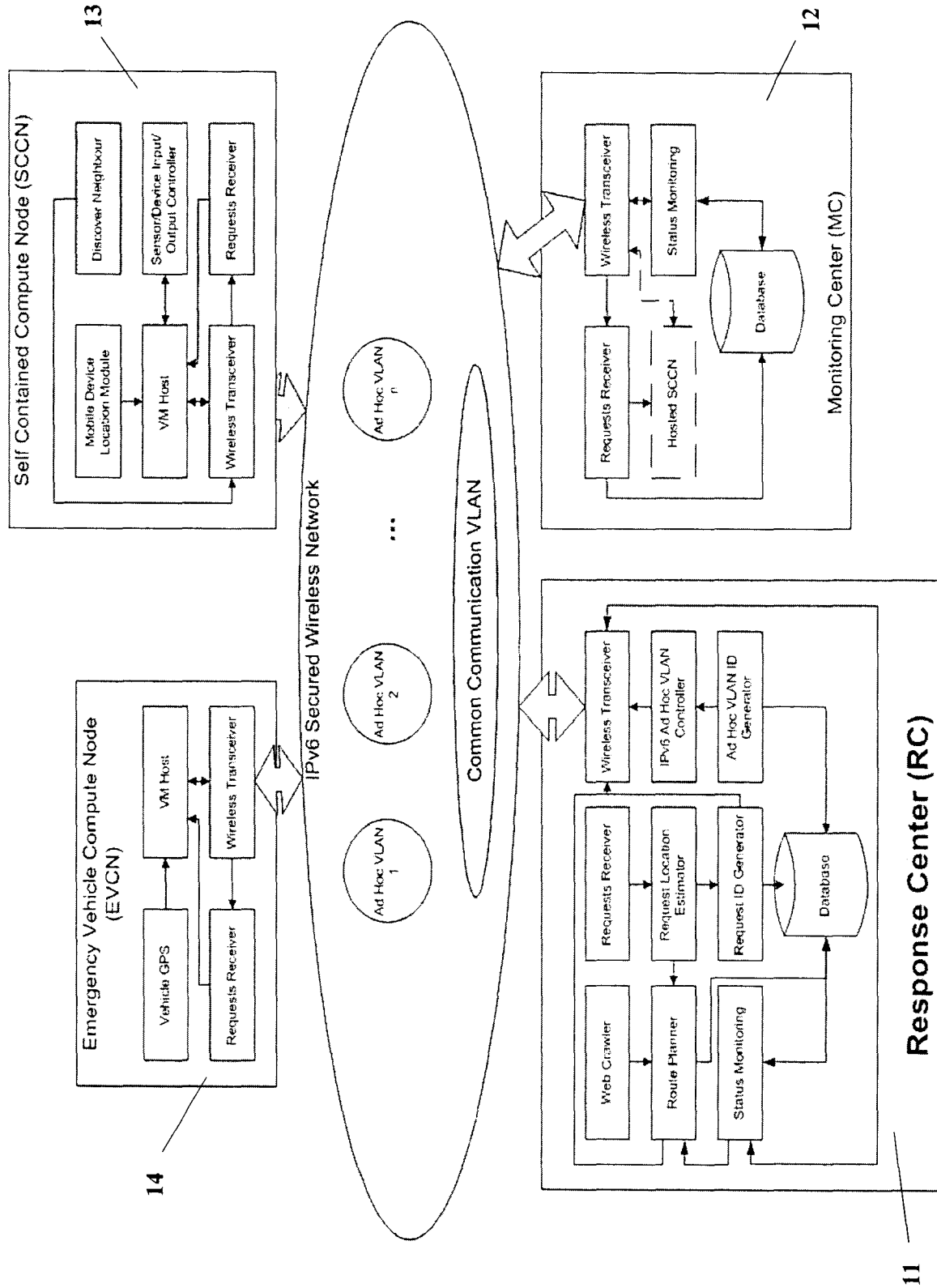


FIGURE 1



FIGURE 2

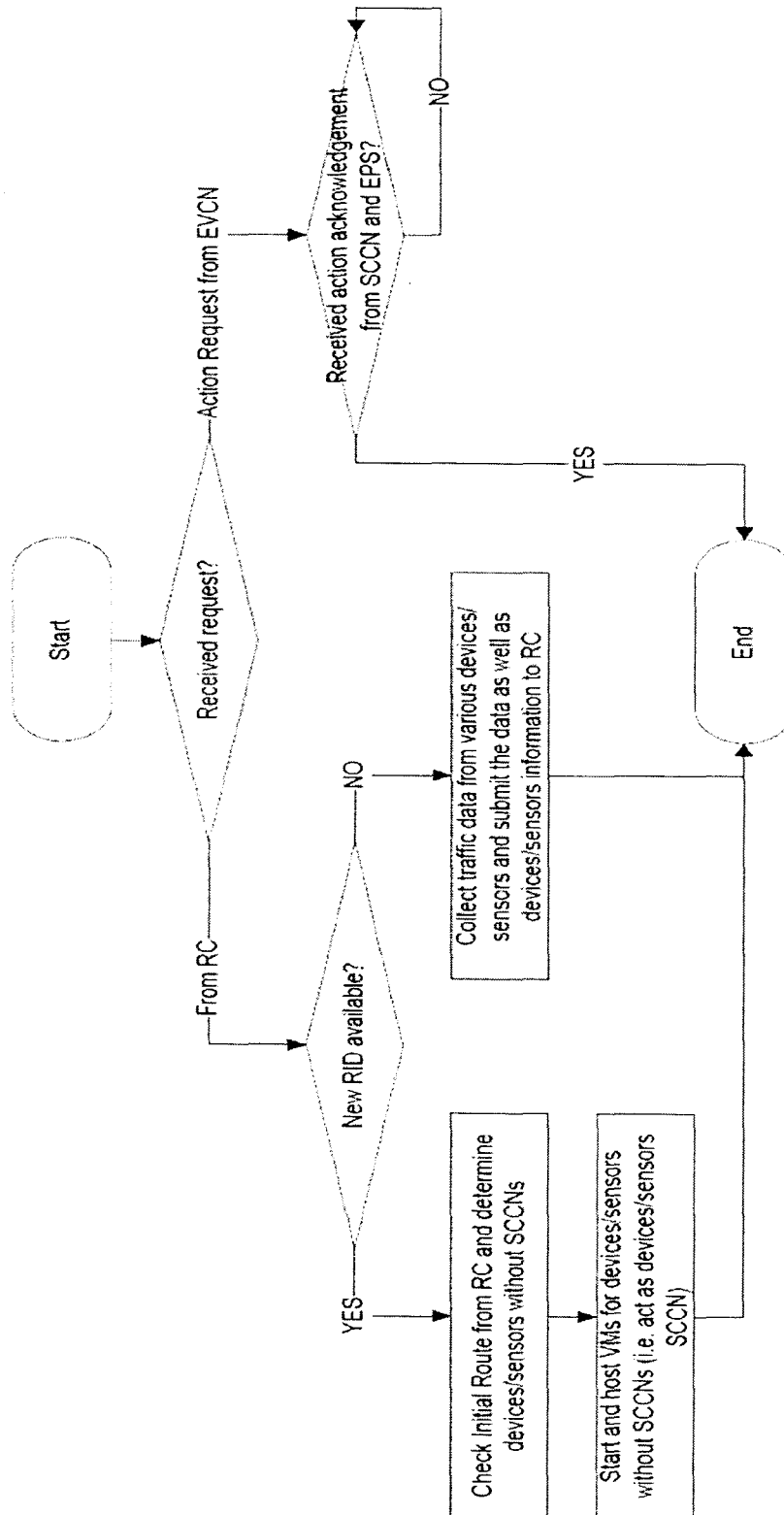


FIGURE 3

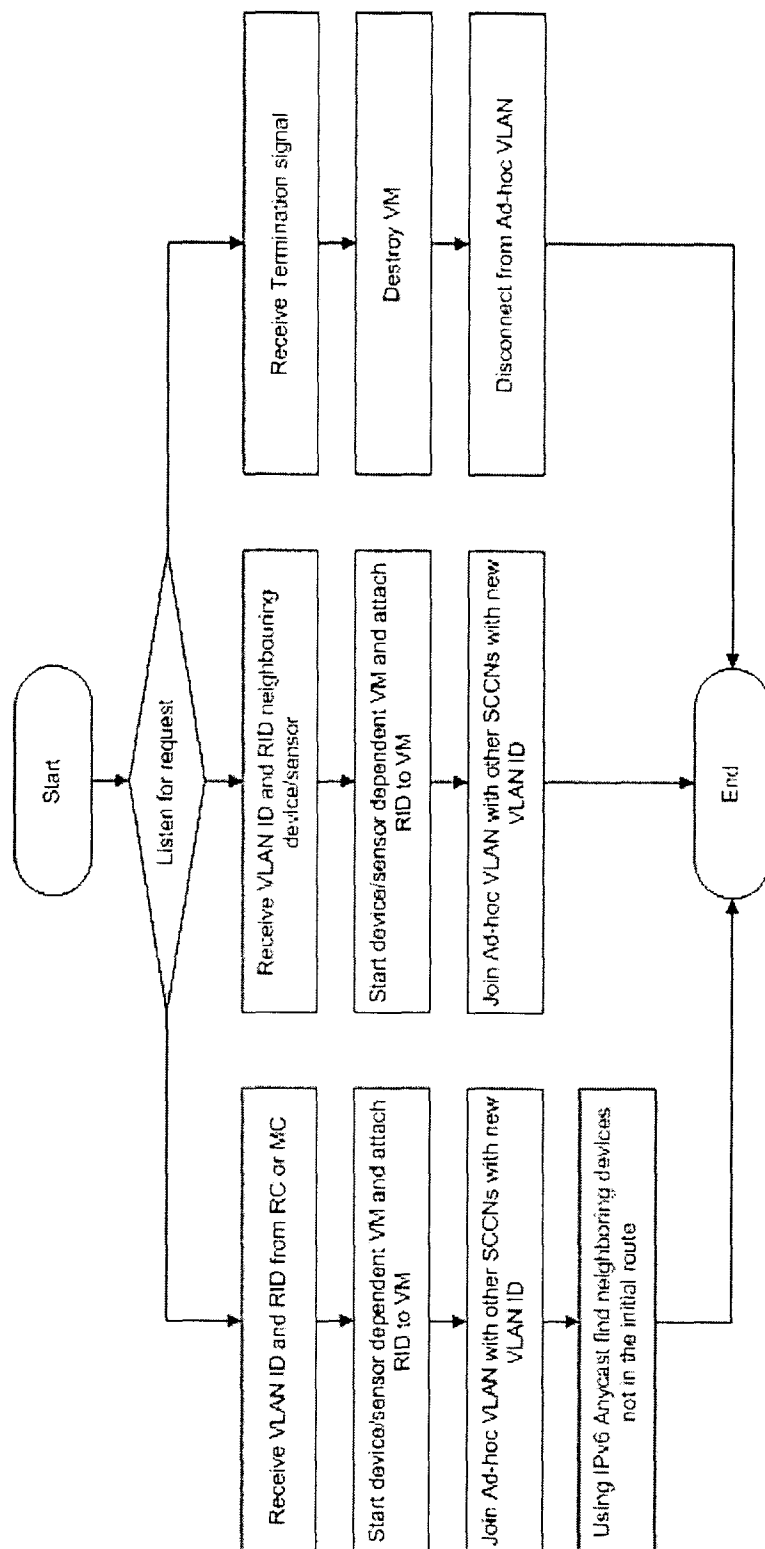


FIGURE 4

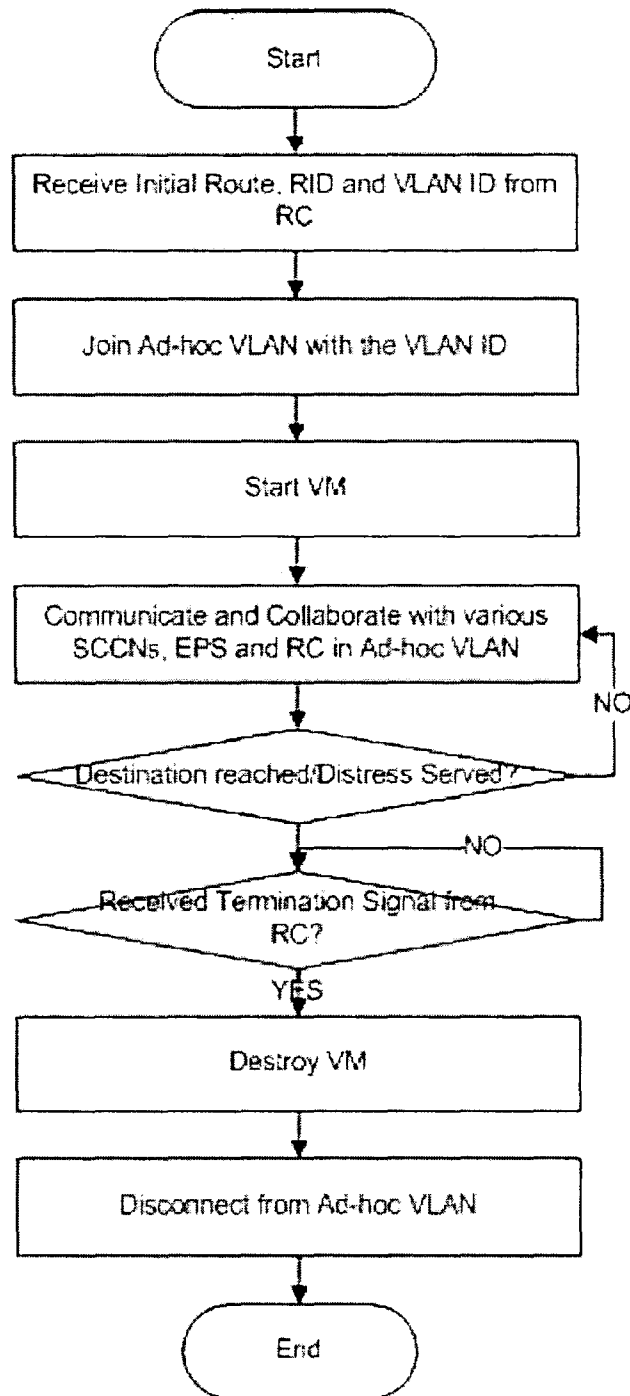


FIGURE 5

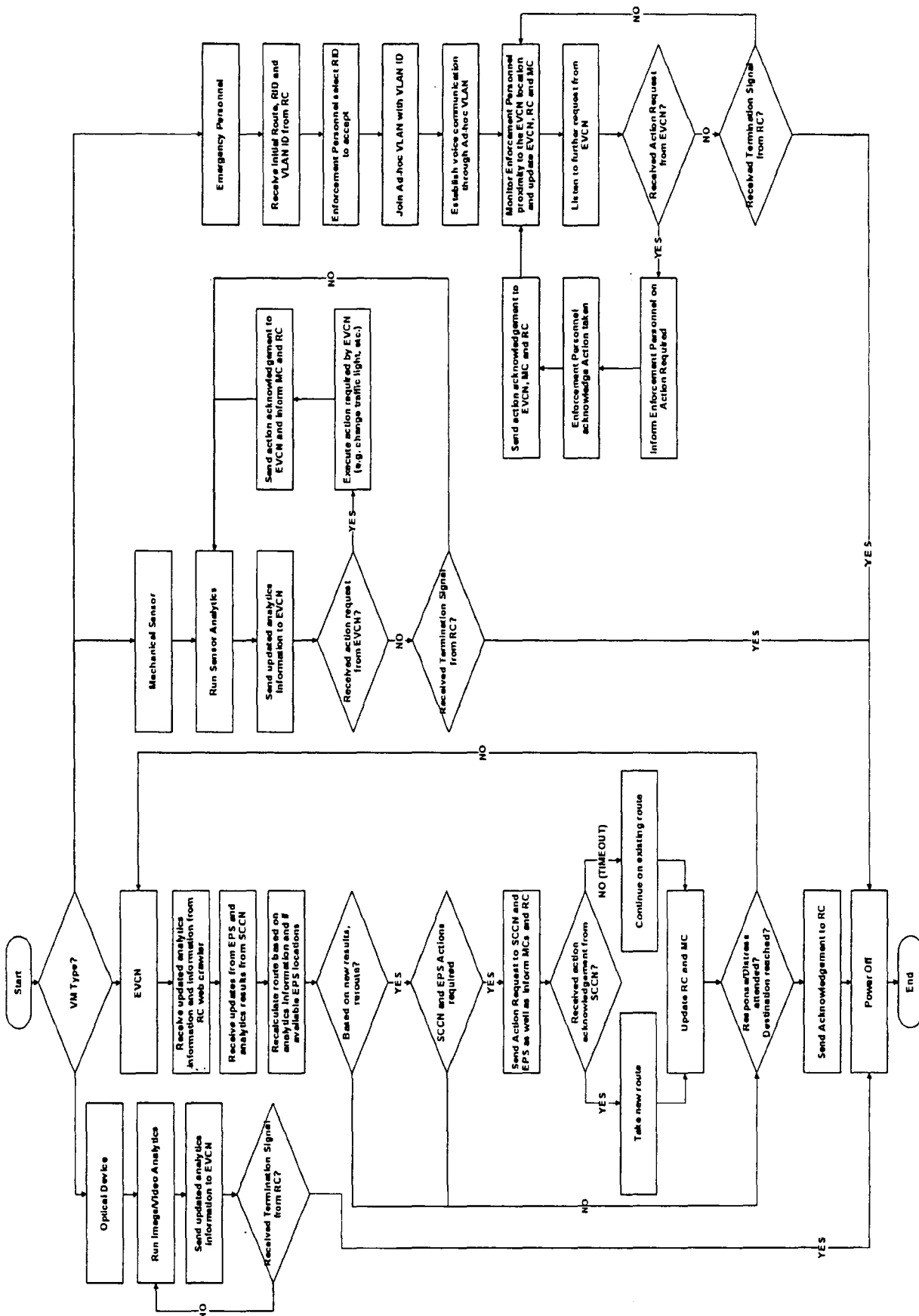


FIGURE 6

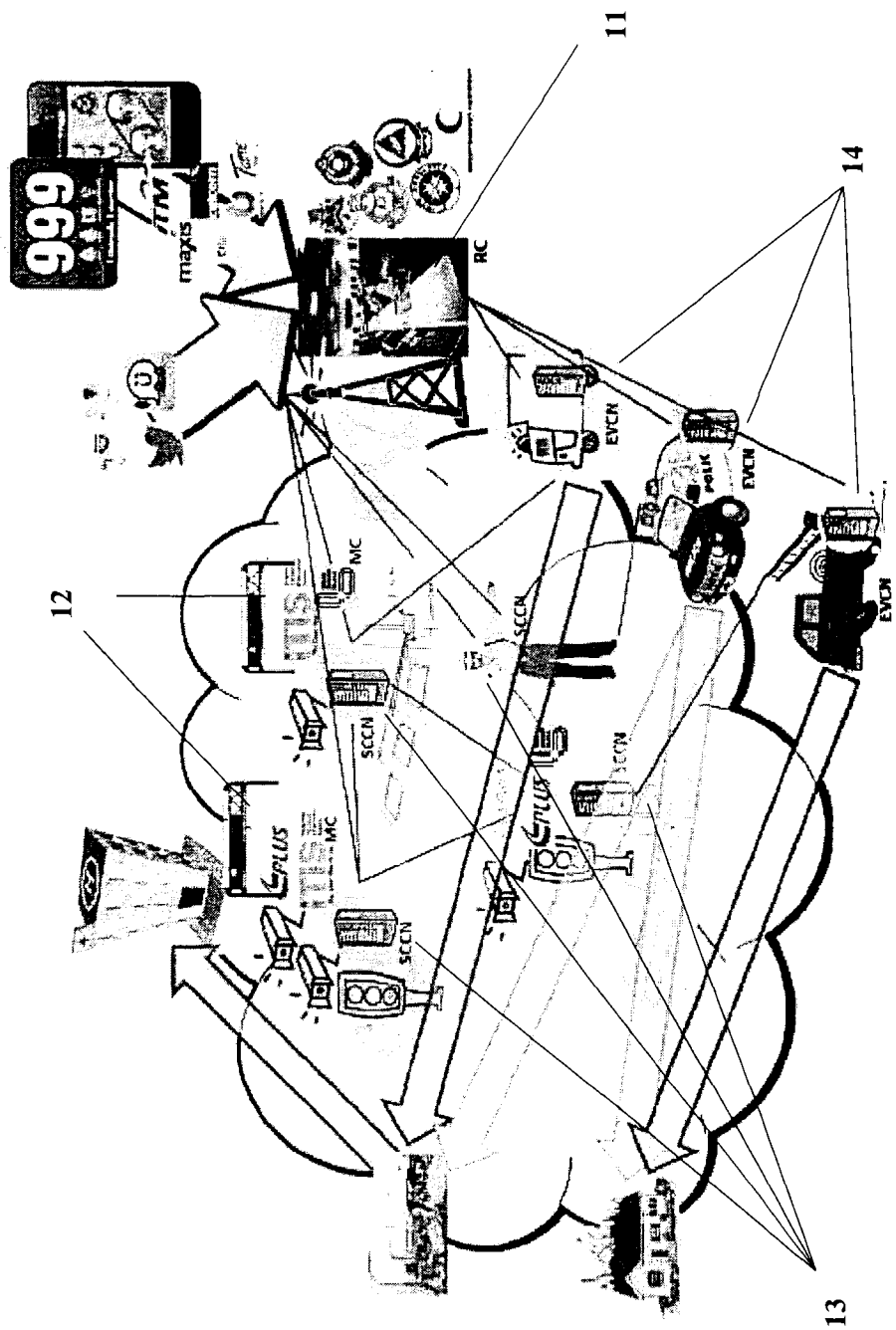


FIGURE 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/MY2014/000116

A. CLASSIFICATION OF SUBJECT MATTER
INV. G08G1/01 G01C21/34 G08G1/02 G08G1/04 G08G1/0968
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G08G G01C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009/271104 A1 (LECHNER JULIA M [US] ET AL) 29 October 2009 (2009-10-29) cited in the application abstract; figures 1, 3 paragraphs [0033], [0041], [0042], [0044]	1,2
X	US 2013/242104 A1 (WANG CHI-CHIH [TW] ET AL) 19 September 2013 (2013-09-19) abstract; figures 1, 2 paragraphs [0009], [0011], [0013] - [0018] ----- -/-	1,2



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

20 November 2014

Date of mailing of the international search report

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Authorized officer

Berland, Joachim

INTERNATIONAL SEARCH REPORT

International application No
PCT/MY2014/000116

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2007/106465 A1 (ADAM THOMAS B W [GB] ET AL) 10 May 2007 (2007-05-10) abstract; figure 1 paragraphs [0015] - [0018], [0025], [0026], [0033] - [0038], [0040], [0049], [0050] -----	1,2
A	US 2005/080606 A1 (AMPUNAN NATHAN D [US] ET AL) 14 April 2005 (2005-04-14) abstract; figure 1 paragraphs [0020], [0021], [0027], [0033] -----	1-11
A	US 2008/177461 A1 (BLACKWOOD ADRIAN KYLE [NL]) 24 July 2008 (2008-07-24) abstract paragraph [0049] -----	1-11
A	US 2006/059024 A1 (BAILEY MAURICE [US] ET AL) 16 March 2006 (2006-03-16) abstract paragraph [0096] - paragraph [0100] -----	1-11
A	US 2003/187573 A1 (AGNEW HUGH JOHN [GB] ET AL) 2 October 2003 (2003-10-02) abstract; figures 1, 4 paragraphs [0016], [0028], [0029] -----	1-11
A	US 2003/083806 A1 (ODINAK GILAD [US] ET AL) 1 May 2003 (2003-05-01) abstract; figures 1, 2 paragraphs [0017], [0018], [0020] -----	1-11

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/MY2014/000116

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009271104 A1	29-10-2009	US 2007299599 A1 US 2009271104 A1	27-12-2007 29-10-2009
US 2013242104 A1	19-09-2013	CN 103310642 A TW 201340048 A US 2013242104 A1	18-09-2013 01-10-2013 19-09-2013
US 2007106465 A1	10-05-2007	AU 2006300938 A1 BR PI0614492 A2 CA 2617388 A1 CN 101253388 A CN 102297700 A EP 1934557 A1 EP 2743898 A2 ES 2495717 T3 GB 2431261 A JP 2009513951 A JP 2014059307 A KR 20080059373 A US 2007106465 A1 US 2014163849 A1 WO 2007042796 A1 ZA 200800895 A	19-04-2007 29-03-2011 19-04-2007 27-08-2008 28-12-2011 25-06-2008 18-06-2014 17-09-2014 18-04-2007 02-04-2009 03-04-2014 27-06-2008 10-05-2007 12-06-2014 19-04-2007 26-08-2009
US 2005080606 A1	14-04-2005	CN 1864164 A CN 101409726 A EP 1671255 A2 KR 20060132816 A US 2005080606 A1 US 2006106584 A1 US 2008071568 A1 US 2009037045 A1 WO 2005039927 A2	15-11-2006 15-04-2009 21-06-2006 22-12-2006 14-04-2005 18-05-2006 20-03-2008 05-02-2009 06-05-2005
US 2008177461 A1	24-07-2008	AR 065543 A1 AR 065835 A1 AR 065836 A1 AR 066996 A1 AU 2008204562 A1 AU 2008204563 A1 AU 2008204564 A1 AU 2008204565 A1 CN 101978283 A EP 2100096 A1 EP 2100159 A1 EP 2102592 A1 EP 2118869 A1 JP 2010515905 A JP 2010515906 A JP 2010515907 A JP 2010516134 A TW 200842322 A TW 200842323 A TW 200844914 A TW 200902941 A US 2008177460 A1 US 2008177461 A1 US 2008177466 A1	17-06-2009 08-07-2009 08-07-2009 30-09-2009 17-07-2008 17-07-2008 17-07-2008 17-07-2008 16-02-2011 16-09-2009 16-09-2009 23-09-2009 18-11-2009 13-05-2010 13-05-2010 13-05-2010 13-05-2010 01-11-2008 01-11-2008 16-11-2008 16-01-2009 24-07-2008 24-07-2008 24-07-2008

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/MY2014/000116

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
		US 2008183380 A1	31-07-2008	
		WO 2008083983 A1	17-07-2008	
		WO 2008083984 A1	17-07-2008	
		WO 2008083985 A1	17-07-2008	
		WO 2008083986 A1	17-07-2008	

US 2006059024	A1	16-03-2006	AU 2003295416 A1	03-06-2004
			EP 1565858 A2	24-08-2005
			US 2006059024 A1	16-03-2006
			WO 2004044694 A2	27-05-2004

US 2003187573	A1	02-10-2003	AT 344917 T	15-11-2006
			AU 6248101 A	26-11-2001
			DE 60124391 T2	30-08-2007
			EP 1285234 A1	26-02-2003
			ES 2275681 T3	16-06-2007
			US 2003187573 A1	02-10-2003
			US 2006031007 A1	09-02-2006
			WO 0188480 A1	22-11-2001

US 2003083806	A1	01-05-2003	AU 2003225809 A1	29-09-2003
			CA 2518915 A1	25-09-2003
			CA 2813529 A1	25-09-2003
			EP 1488399 A2	22-12-2004
			US 2003083806 A1	01-05-2003
			WO 03079310 A2	25-09-2003
