

Integrated AVL, Incident Dispatch & SatNav

The effectiveness of an Emergency Service Incident Dispatch system can be improved by the addition of Automatic Vehicle Location, electronic directed incident dispatch to vehicles and satellite navigation. Now all of these features are available in a cost effective integrated package, using the capabilities of in-vehicle Garmin Satellite Navigation (SatNav) devices integrated with APD INCA units.

INCA™ is APD's market leading GPS-enabled vehicle tracking and telematics unit, allowing organisations to centrally manage and optimise their geographically dispersed field resource. The INCA unit is fitted to vehicles such as police cars, fire engines and ambulances. These are tracked in real-time, with the INCA unit continuously recording and transmitting GPS information via a range of bearers including GSM, GPRS, TETRA, Paknet or Mobitex. **Co-Ordinator**, APD's fleet location management application, is installed at a central control centre or depot and processes the location reports received from the INCA units.

INCA's telematics capability extends beyond simply sensing on/off type conditions on vehicle equipment – it has the capability to be used as a data protocol convertor and message router between electronic devices fitted in a vehicle and the central Co-Ordinator system. APD has now exploited this capability to offer integration with the market leading Garmin range of in-vehicle Satellite Navigation (SatNav) devices. For emergency service customers, the combination of INCA and a Garmin SatNav in a vehicle installation, results in a powerful and cost effective Incident Dispatch solution which supplements the capabilities of the separate INCA tracking and Garmin unit navigation units with the ability to:



- Dispatch the details and location of a number of low priority incidents/visits to be stored in the in-vehicle Garmin unit.
- Allow the user to select an incident/visit from the list and initiate navigation to the location.
- Dispatch a high priority incident to the Garmin unit with pre-emptive automatic initiation of navigation to the incident.
- Allow the user to mark incidents/visits sent to the Garmin as "done", or delete them.



In-Vehicle Configuration

INCA uses the standard Garmin Fleet Management Interface (FMI) to transfer data to and from the Garmin unit. There are a range of Garmin SatNav devices that support the FMI (see <http://www8.garmin.com/solutions/commercial/supportedproducts.jsp>). Any Garmin device that supports the FMI may be used in the INCA/Garmin Incident Dispatch solution.

INCA's serial data port connects to the Garmin control interface and, in association with a Co-Ordinator SatNav Gateway, incident destinations can be sent automatically to a Garmin SatNav in a vehicle.

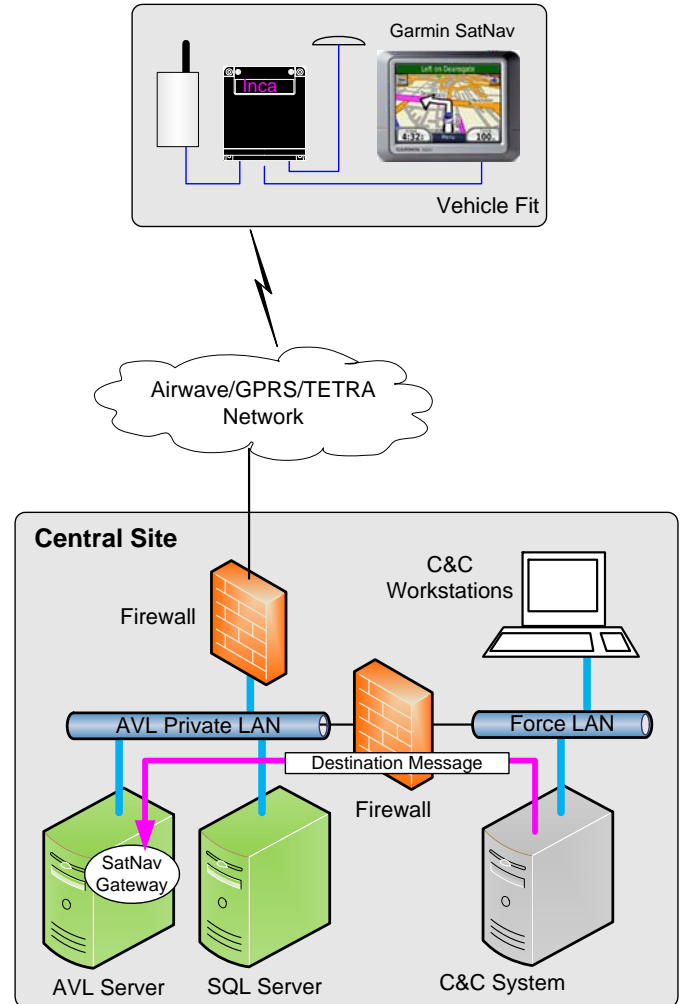
The solution uses the Data Transport capability of the INCA/Co-Ordinator system to transfer data to and from INCA and the central Gateway. The Garmin SatNav is connected in vehicle to INCA using a specialised cable and INCA contains firmware to support the protocol required by the Garmin unit.

At the host end, a SatNav Gateway provides a TCP/IP server connection for 3rd Party applications such as Command & Control (C&C) systems to exchange XML formatted messages.

These XML messages instruct the Garmin Unit to navigate to a specific destination. In response, the SatNav Gateway will forward status messages to the C&C system indicating the user has either selected the destination, marked the destination as "done" or deleted the destination.

Solution Architecture

The physical arrangement of key elements of the solution is shown in the diagram below.



Note that it is also possible to have APD map clients connected to the AVL server; however, these do not support the Incident dispatch messaging features.

Low Priority Dispatch Operation

The C&C system can send a structured XML message to the SatNav gateway which will contain the following elements. This message, subject to being correctly formatted, will be delivered to the Garmin support module within the INCA. The message contains:

- The Alias of the INCA as defined in the Co-Ordinator database.
- The latitude and longitude expressed as decimal degrees using the WGS84 coordinate system.
- Up to 80 bytes of text, which are displayed to the user as an explanation of the destination.
- A 32bit Unique Identifier (UID) for the destination.

For low grade incidents/visits, the UID of the message will be set to any value but 1; the destination message will be appended to the list of destinations currently held in the in the Garmin Unit and the user will be alerted to the arrival of the message. The limit to the number of destination messages is a minimum of 10 messages.

When the message is delivered to the Garmin SatNav, the user will be notified, and will be given the opportunity to select the destination to which they want the SatNav to navigate. It will be possible to send more than one destination to a unit



High Priority Dispatch Operation

For Grade A incidents, the UID of the message will be set to the value 1, and the Garmin Module in the INCA will take specific action as follows:

- It will command the Garmin to stop navigating to its current destination.
- It will delete any existing destination with a UID of 1 from the Garmin Unit.
- It will download the new destination to the unit.
- It will command the unit to start navigating to the new destination.

User Interactions with Messages

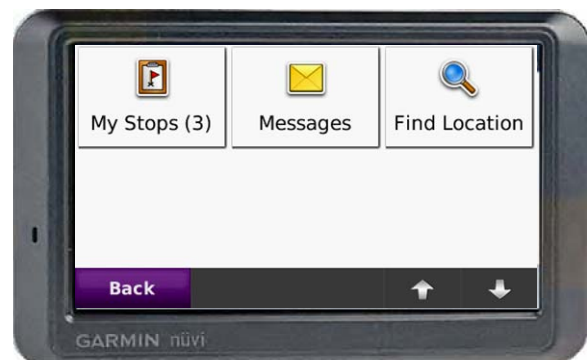
For both the low and high priority messages, the user has the ability to interact with the destination messages as follows:

- To select a destination message and navigate to the destination.
- To mark a destination message as “done”.
- To delete a destination message.

Each of the above events will cause a “status” message to be delivered to the C&C system as a structured XML message. The C&C system will be able to determine the originally sent message to which the status response message relates, from the INCA Alias and the UID provided in the message.

Additional system messages are provided for the following communication events:

- Destination message delivered to the Garmin Unit.
- Delivered to the INCA, but the Garmin unit not responding.
- Failed to deliver to the INCA unit.
- Error detected by the SatNav Gateway, i.e. link to AVLS down or XML message formatting error.



Interface with Command & Control System

The C&C system will establish a “client” connection to the APD Co-Ordinator SatNav Gateway i.e. The C&C will make and maintain a TCP/IP connection to the SatNav Gateway. Note that in two server configurations (i.e. the Co-Ordinator AVLS and SQL database run on separate servers), the SatNav Gateway runs on the AVLS server. All messages between the Gateway and server must conform to the XML standard. The details of the interface are described in the APD Co-Ordinator SatNat Gateway Interface specification and a copy of this is available to third party C&C suppliers on completion of a non-disclosure agreement.

Implementation

A number of implementation permutations are available depending upon an individual customer's situation and requirements and these are described below. Note that in all cases the following will be required:

- INCA Incident Dispatch server and vehicle software licences.
- APD engineering services to install and validate the operation of the software.

Option 1 - New or existing APD customer:

- The system can be delivered to new customers as an integrated AVL and Incident Dispatch solution.
- Existing APD AVL customers can upgrade their system.

Option 2 - Equipment Supply:

- APD can supply all necessary equipment and software.
- The customer can supply (or utilise existing compatible) Garmin units.

Option 3 - Installation:

- APD can provide a complete "turnkey" supply/install of all equipment.
- APD can supply some, or all, of the vehicle equipment and the customer can install it.

For existing APD AVL customers who choose to upgrade their systems, the INCA units must be re-programmed with the latest software version that supports the Garmin FMI, and the Co-Ordinator software must be upgraded to the latest version that supports the SatNav Gateway.

Glossary

SatNav – Satellite (i.e. GPS) Navigation.

C&C – Command & Control.

AVL – Automatic Vehicle Location.

FMI – (Garmin) Fleet Management Interface.

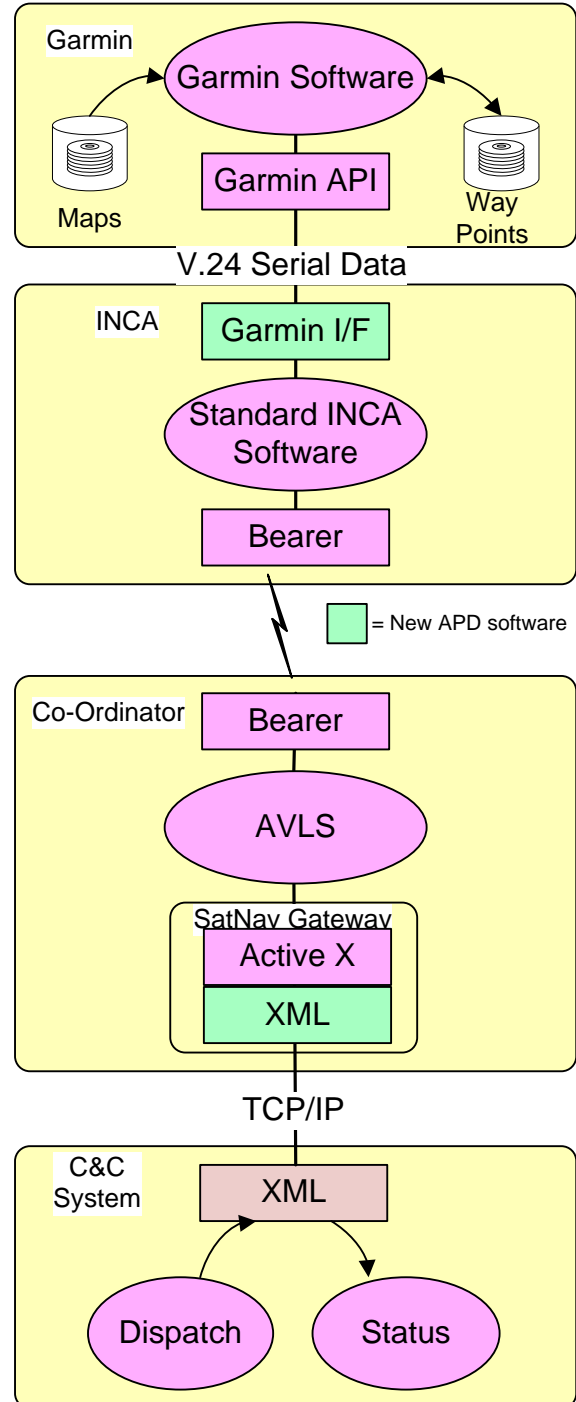
API – Application Programming Interface.

XML – eXtensible Markup Language

UID – Unique Identifier (for an incident/visit).

Solution Key Processes

The key processes in the solution are shown in the diagram below.



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APD Communications Ltd

Head Office Newlands Centre, Inglemire Lane, Hull, HU6 7TQ, United Kingdom

Sales and Marketing 16 Shenley Pavilions, Chalkdell Drive, Milton Keynes, MK5 6LB, United Kingdom

Tel: +44 (0) 1482 808300 Fax: +44 (0) 1482 803901 Email: info@apdcomms.com www.apdcomms.com