APN003 – Dual-Mode GPS Application

APN003 - 21 April, 2009

1. Introduction

Ctek's Dual-Mode GPS application is a general purpose GPS application that can be installed on any Series SkyRouter. When installed the application is administered from SkyRouter's Application environment using a web browser. The Dual-Mode GPS application operates with an external GPS unit on all SkyRouters and in addition can be configured to operate with the internal GPS capabilities of the Series 4200 and Series 4400 routers in both M and Z packaging.

The Dual-Mode GPS application takes its name from its ability to simultaneously update a remote AVL type application and a local or remote desk top style mapping application such as Microsoft's Streets and Trips. Figure 1 shows the architecture of a Series 4200 using the full set of capabilities available in the Dual-Mode GPS application.

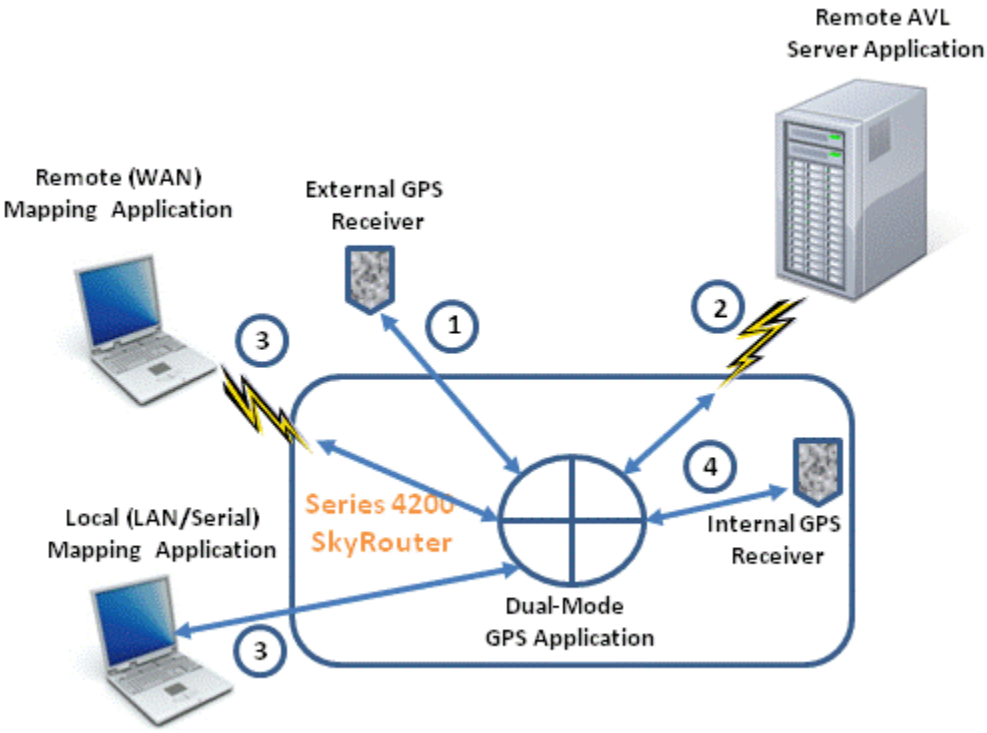

Figure 1

In Figure 1 the external communications interfaces are numbered 1 – 4. A brief description of each interface follows:

APN003 – Dual-Mode GPS Application

APN003 - 21 April, 2009

1. **External GPS Interface** – An external GPS unit may be connected to the SkyRouter resident Dual-Mode GPS application using the serial application interface (RS-232) provided by the SkyRouter. The reference GPS unit for this interface is the Garmin model 18 OEM unit. Ctek can offer integration services for any selected GPS module that produces NMEA sentences.
2. **External AVL Client Application Interface** – The transport for this interface is UDP/IP over the wireless IP data connection provided by the SkyRouter. The Dual-Mode application maps NMEA sentence information onto the proprietary interfaces of applications. The reference application for this integration point is the DataNet application from Datalink Systems Inc. Integration with other AVL like applications can easily be accommodated.

   NOTE - The message set and description for the reference implementation is found in Appendix A.

3. **Mapping Server Interface** – This interface provides a pass through of the NMEA sentence information read from either the internal or external GPS. Through the application administration screen three transports are available for this connection; either TCP/IP on the WAN (wireless), TCP/IP through the LAN, or through the SkyRouter's serial port. To use the TCP/IP transport a port redirector utility may be required.
4. **Internal GPS Interface** – This programmatic interface connects to the internal GPS resources of the Series 4200 and Series 4400 SkyRouter. The selection of either an external GPS or the internal GPS resources is made through the application administration screen.

   Note – The internal GPS capability of the Series 4200/4400 models does not depend on the wireless network for positioning although network connectivity is required to transmit to remote server based AVL applications.

2. Dual-Mode GPS Application Administration

When installed the Dual-Mode GPS application is found under the Applications category on a SkyRouter. Selecting the Dual-Mode application brings up the screen shown in figure 2 which provides access to all required administrative

APN003 – Dual-Mode GPS Application

APN003 - 21 April, 2009

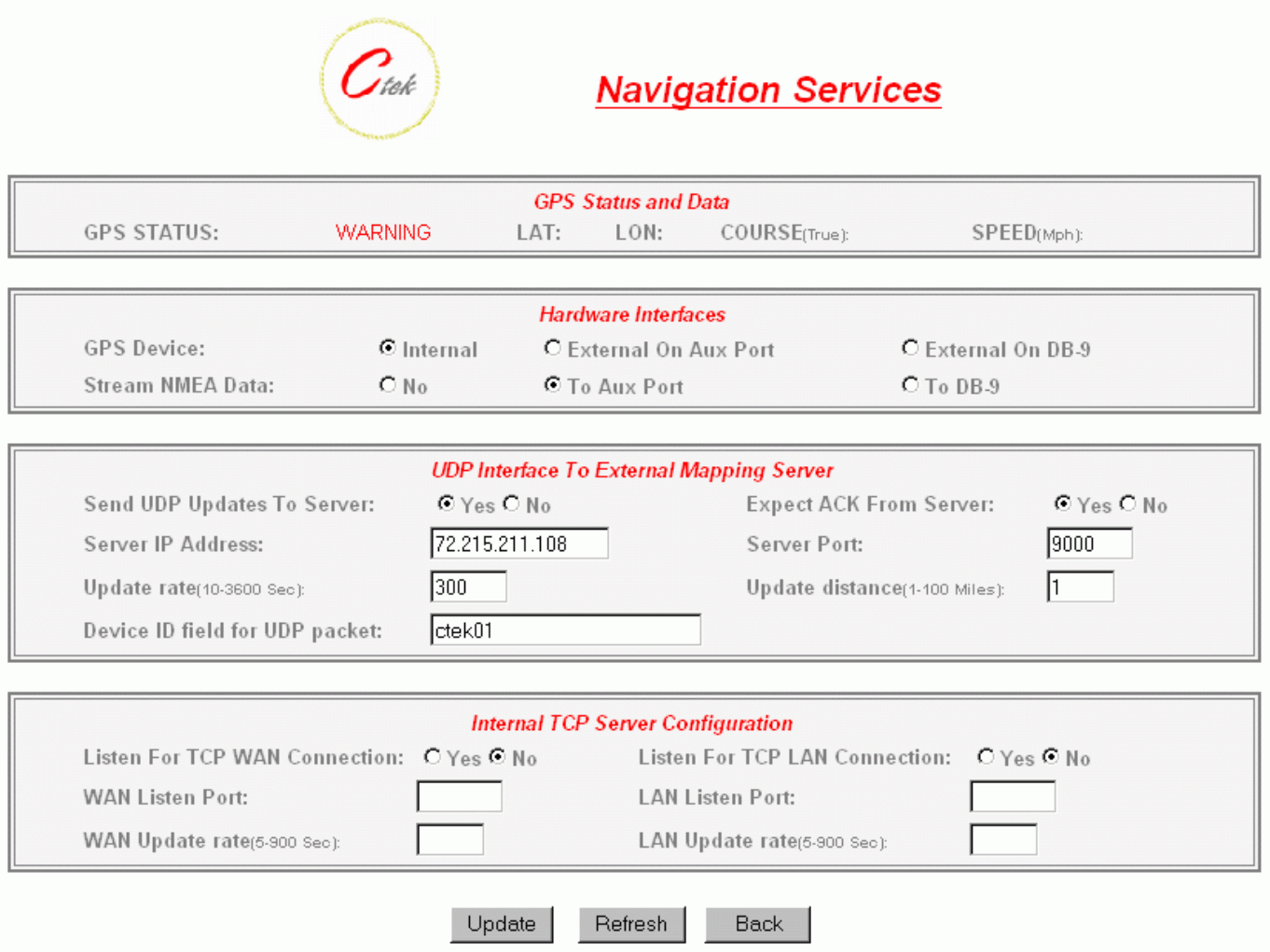

Figure 2

The administrative interface screen is divided into four panels. The first shows the status of the GPS and reports some basic positioning and tracking information.

The second panel controls the hardware interfaces for the GPS source and the output of the internal TCP server.

APN003 – Dual-Mode GPS Application

APN003 - 21 April, 2009

GPS Device – Select either the internal GPS capabilities of the model 4200 and 4400 or an external GPS on one of two possible serial connections.
NOTE: - The DB9 port is not available of E (4XXXE) versions
NOTE – Bit rate and parity selections for the serial connections are made on the RS232 Interface screen.

Stream NMEA Data – Select a serial connection to be used for streaming NMEA data. This feature simulates a directly connected GPS module. Ctek recommends a bit rate of at least 4800 baud on this connection.

The third panel controls the behavior of the remote UDP interface. The following settings are provided.

Send UDP Updates To Server – A yes/no setting that enables the UDP interface.

Expect ACK From Server – A yes/no setting based on the server applications behavior.

Server IP Address – The network address of the application server.

Server Port – Selects the UDP port that will be used for application messaging.

Update Rate – The frequency at which the application will but updated with new positioning data.

Update Distance – Specifies a distance traveled at which the server application will be updated.

NOTE: - If either the Update Rate or Update Distance field is left blank it will not be used. If values are entered in both fields the server application will be updated whenever the first value is reached. At least one of the fields must be populated.

Device ID Field For UDP Packets – A unique identifier for each SkyRouter

The fourth (bottom) panel controls the behavior of the internal TCP server interface. The mapping interface can be set to use TCP/IP on the WAN (wireless) connection, TCP/IP on the LAN (Ethernet) connection. The TCP server can also be directed to the Aux serial port, or transmit through the serial port on SkyRouters having a serial (RS-232) connection. The following settings are provided.

Listen For TCP WAN Connection - A yes/no setting that enables the TCP WAN interface.

WAN Listen Port – The TCP port that will be used by the application

APN003 – Dual-Mode GPS Application

APN003 - 21 April, 2009

WAN Update Rate - The frequency at which the application will but updated with new positioning data.

Listen For TCP LAN Connection - A yes/no setting that enables the TCP LAN interface.

LAN Listen Port – The TCP port that will be used by the application

LAN Update Rate - The frequency at which the application will but updated with new positioning data.

APN003 - 21 April, 2009

Appendix A
Reference Implementation Message Set

Ctek SkyRouter UDP Packet Definition
For Delivery and Receipt of Navigation Related Data

1. INTRODUCTION

The SkyRouter provides a facility for sending and receiving navigation related data via UDP packets. The navigation facility is configured through HTML screens provided by the SkyRouter. The user may configure:

- Server IP address
- Server port number
- Server ACK support (on/off)
- Maximum time between transmission of positioning data
- Position change threshold for transmission of positioning data
- Speed and time definition for vehicle start reporting
- Speed and time definition for vehicle stop reporting

2. NAVIGATION DATA FROM SKYROUTER

This section defines the form of a general position packet from the SkyRouter. This type of packet will always be sent:

- During unit power up
- If the SkyRouter moves further than the distance defined in the position change parameter
- If the SkyRouter detects that it has not sent navigation data for a period longer than the defined maximum.
- If a ping request is received from the server

The form of a general position packet from the SkyRouter is as follows:

$PADDR,<address data><CR><LF>
$GPRMC,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>,<10>,<11>,<12><CR><LF>

Where address data is an ASCII alphanumeric identifier of 25 characters or less.

Where parameters 1 - 12 are as defined in NEMA sentence $GPRMC (Recommended minimum specific GPS/Transit data)

3. START NOTIFICATION FROM SKYROUTER

If the SkyRouter detects that it has met the speed and time definition of start, it will send the following message:

```
$PADDR,<address                                                    data><CR><LF>
$GPRMC,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>,<10>,<11>,<12><CR><LF>
$START<CR><LF>
```

4. STOP NOTIFICATION FROM SKYROUTER

If the SkyRouter detects that it has met the speed and time definition of start, it will send the following message:

$PADDR,<address data><CR><LF>
$GPRMC,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>,<10>,<11>,<12><CR><LF>
$STOP<CR><LF>

5. ACK FROM SERVER

If ACK support is enabled, the SkyRouter will expect an ACK packet from the server in response to the packets defined in section 2, 3 and 4. If an ACK is not received, retransmission will occur until an ACK is received or until the retry limit has been exceed. If the retry limit is exceeded, the data will be discarded. Retry limit and retry transmission rate may be configured. The expected ACK format is as follows:

$ACK<CR><LF>

6. PING REQUEST FROM SERVER

APN003 – Dual-Mode GPS Application

APN003 - 21 April, 2009

If the SkyRouter receives a ping packet from the server, it will send a general position packet. The form of a ping message is as follows:

$PING<CR><LF>