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1 Overview

Intuicom Nav-Link Server software integrates Intuicom Navigator I and Navigator II Wireless Data Transceivers operating in point-to-multipoint or point-to-point modes with third-party applications via TCP/IP, making the Navigators’ remote serial ports and internal GPS receiver available as IP Sockets/Ports. Nav-Link does not place any requirements on third party applications to implement any protocols – it simply transfers data, byte in, byte out, between a user-configured TCP socket and a remote serial port connected to a user device.

Nav-Link Server is very flexible and highly configurable. It can connect to one or more Intuicom wireless networks using serial or TCP/IP or both – providing even more location independence between devices in the field and third party software wanting to communicate with those devices.

Nav-Link Server’s operation is customized by editing a configuration file. Nav-Link reads this configuration file on start-up, connects to the specified inputs (wireless networks) and hosts services (TCP sockets). The configuration file is in XML format. An example configuration file is included with the installation and provides a good starting place for creating a configuration for a specific application.

In addition to generically providing a data interface to remote devices across and Intuicom Wireless Network, Nav-Link Server provides some specialized services, examples include the ability to combine GPS data from all remote devices onto a single TCP port for integration into a tracking or dispatch application, and the ability to dedicate a TCP port to broadcast data to all remote devices.

Although Nav-Link is a Java-based, the installer takes care of all necessary Java requirements and the application launches and operates without any special steps. Being Java-based allows it to run on a variety of platforms including Windows, Linux, and Solaris.
1.1 Key Functionality

- Provides for easy integration by mapping remote serial ports to TCP Ports

- Provides an interface to the Intuicom Navigator I or Navigator II Transceiver by making the multiple remote serial ports individually available (de-multiplexing).

- Identifies and combines all incoming GPS data onto one TCP Port (Mux Port) typically used by third-party applications to integrate real-time positioning information for multiple vehicles/targets.

- Supports “broadcast ports” – data can be sent to Nav-Link on these port and will be broadcast to the configured remote serial port(s)…i.e. broadcast to all Navigator Port Bs (Broadcast Port)

- Supports discrete output port – making the state of the discrete inputs on each remote Navigator I or II available on a single TCP port (Discrete Port)

- Allows for operating the wireless transceivers in a guaranteed delivery mode (Point-to-Multipoint or Point-to-Point).

- Connects to multiple wireless networks simultaneously, via RS232, TCP/IP or combination of both.

- Allows for mapping of services to specific wireless networks – allowing services to listen to one or all inputs and to transmit data to a specific input or to all inputs.

- Monitors and maintains TCP/IP connections to wireless networks (master transceivers).

- Java based platform independence.
1.2 Example Network Architectures

Nav-Link is flexible in how it can be deployed and integrated into user telemetry applications. The example architectures to follow highlight a range of deployments that showcase Nav-Link features.

Figure 1-1 depicts a straightforward Nav-Link 4.0 deployment for point-to-multipoint network. In this example, Nav-Link Server running on a PC connects via an RS232 cable to a “Master” wireless transceiver – an Intuicom Communicator II.
Figure 1-2 shows Nav-Link server connecting to a Master Transceiver (possibly an Intuicom Navigator IIE or a Communicator II with a terminal server device). Nav-Link does not need to be collocated with the wireless network – providing location independence and eliminating the need for a PC in the field.
Figure 1-3 shows Nav-Link connecting to multiple wireless networks via TCP/IP simultaneously. Additionally Nav-Link could connect to wireless network(s) via RS232 serial at the same time. In this example, Nav-Link is consolidating multiple remote or local wireless networks into a single gateway interface.
Figure 1-4 shows third party applications connecting to Nav-Link to access remote serial devices via one or more wireless networks. Note that it is not necessary for the third party application to reside on a separate PC – it could reside on the same PC as Nav-Link and simply make local socket connections.

An example of separate third-party applications connecting to Nav-Link simultaneously might be a seismic data collection application communicating with remote seismometers connected to Port B on remote Navigator II units, while GPS data collection software connects with GPS receivers connected to Port A. Neither application is aware, nor needs to be aware that it is sharing the wireless network(s) to communicate with remote devices.
1.3 Example Applications/Case Studies

The following application summaries demonstrate where Intuicom Nav-Link and Intuicom Navigators I or Navigator IIs deliver key benefits:

- **Two Remote Serial Devices, one Wireless Link:**
  
  o **Weather Monitoring** - This growing area of environmental monitoring is expanding into larger networks of sensors and instruments to gather weather information for the purposes ranging from real-time condition reporting, to event modeling and often serving a role in emergency response applications. Weather data is generally collected into a data logger device where it interfaces with one of the RS 232 ports of the Navigator or Navigator II for real-time communication with a master station where the information is logged, as well as displayed in real-time. In addition to the data logger device, the additional RS-232 port on the Navigator is utilized by other data generating devices including other weather sensors to cameras or an additional data logger.

  o **Seismic Monitoring** - In this application the Navigator I or Navigator II and Nav-Link offer a solution that historically required twice the hardware and additional software for similar wireless communication in the past. Here the sensors generally consist of a seismometer and a dual-frequency GPS receiver that are outputting sizeable files up to 1000 bytes/second. These data received back at a master server where the data is parsed and processed in real-time as well as logged for future use. In many cases the real-time data is a requirement to support the emergency response and preparation activities.

  o **Remote Survey Device Control** – In this application remote Robotic Total Stations are sent instructions from a central software application; the devices take measurements (shots) of fixed prisms and return the results. Users often utilize additional serial ports on the Navigator II to deploy additional devices such as weather sensors at the remote sites. At the central location, a separate application, unrelated to the survey package is able to share the same wireless network to communicate with the weather stations.

- **Automatic Vehicle Location with Two-Way Messaging:**

  o **AVL/Messaging** - In this application, the Navigator or Navigator II serves as the primary in-vehicle component of a vehicle tracking and communication system. In a specific application, the on-board GPS is designed to provide regular position updates every 5 seconds to a central dispatch. A mobile data
terminal (MDT) serves as the data communication interface between the operator and the Navigator I or Navigator II. Through the MDT, the vehicle operator can send and receive text messaging and other data with the central dispatch. The in-vehicle information is sent from the in-vehicle Navigator to an Intuicom-based wireless network infrastructure that covers the designated geographic area of a city or county. This network serves as the backbone for all of the vehicles in the network and provides low-latency communication back to a central server where the position information is used in real-time display for routing and dispatch purposes while the text messaging provided real-time bi-directional data communications providing route activities, modifications, changing road conditions, general reporting activity.

- **Asset tracking and bi-directional communication:**
  - **Buoy tracking and data feedback** - in this application, the Navigator I or Navigator II serves as both a data communication device and an asset tracking mechanism. The Navigator is integrated into a buoy used in mobile applications. The on-board GPS provides a position that is corrected back at the master server location. The RS 232 communication brings sensitive sensor information back for real-time processing.
2 Installation

Nav-Link is a Java 1.4.2 based application and will run on all systems that support a Java 1.4.2 based Virtual Machine. The installation process installs a Java Virtual Machine and creates a Launcher – the fact that the application is Java-based is hidden from the user and does not require any special steps. While the application will run on any Java 1.4.2 platform, the method by which the serial ports are accessed varies from system to system, as does other system specific parameters, such as paths and links or shortcuts (e.g. COM1 vs /dev/tty0). The installation procedures are virtually identical on all platforms and are demonstrated in this section on a Windows XP platform.

2.1 Platforms

Intuicom has tested and supports Nav-Link on the following platforms:

- Windows XP
- Windows 2000
- Linux (Red Hat)
- Solaris

2.2 Installation Procedure

Intuicom Nav-Link Server 4.0 is installed from a CDROM installer. The actual installer runs and functions the same regardless of the platform on which it was launched.

2.2.1 Starting the Installer

1. Insert/Mount the Nav-Link CD into the CDROM drive
2. Navigate to the \NavLink4.0\[platform] directory (in this case windows)
3. Execute install.exe (for Windows, other platforms may require a command such as sh ./install)

2.2.2 Installation Steps

1. Start the installation process by clicking “Next” on the Introduction Dialog.
2. Enter your serial number exactly as assigned in the Enter Serial Number Dialog. Click “Next” to continue. If the serial number is not valid, verify that the serial number was entered correctly. If the serial number is still not valid, contact Intuicom for assistance.
3. Read the license agreement and if you accept the terms, select the “I accept…” radio button on the License Agreement Dialog and click “Next” to continue.

Figure 2-3: Nav-Link Installation License Agreement Dialog

4. In the Choose Install Folder Dialog, select or confirm a location in which to install Nav-Link. Click “Next” to continue.

Figure 2-4: Nav-Link Installation Choose Install Folder Dialog
5. If desired, modify the default values for where Shortcuts or Links will be installed. Click “Next” to continue.

![Choose Shortcut Folder Dialog](image)

**Figure 2-5: Nav-Link Installation Choose Shortcut Folder Dialog**

6. Verify your selection by clicking “Install” on the **Pre-Installation Summary** Dialog. Use the “Previous” button to go back and make any necessary changes.

![Pre-Installation Summary Dialog](image)

**Figure 2-6: Nav-Link Installation Pre-Installation Summary Dialog**
7. Confirm installation progress by viewing the **Installing Intuicom Nav-Link Server 4.0** Dialog.

![Figure 2-7: Nav-Link Installation Installing Nav-Link 3.0 Dialog](image)

8. Installation is confirmed by the **Install Complete** Dialog.

![Figure 2-8: Nav-Link Installation Install Complete Dialog](image)
2.2.3 Installation Completion

At this point the Nav-Link is installed and can be started by locating the launcher and executing it. This will vary by platform, in Windows the launcher is a shortcut accessible from the Start->Programs->Intuicom menu.

While Nav-Link may start at this point, it still needs to be configured. See Section 3 for how to configure Nav-Link for a specific application.
3 Configuration

Intuicom Nav-Link Server’s configuration is specified in a configuration file that is read by Nav-Link when it starts. Nav-Link looks for this configuration file, “config.xml” in its installation directory – and will not start if the file is missing.

The installation process copies a configuration file populated with an example configuration into the installation directory. This example configuration file can and should be used as a basis for creating a customized configuration. The configuration file is structured using XML – the file itself is a basic text file, editable in notepad, MS Word, and other applications. An XML editor may be helpful in creating more complex configuration files, Intuicom recommends Turbo XML from Tibco. Microsoft Internet Explorer can open an XML file in read-only format, and provide a color coded collapsible view of its different elements.

At this point, consider creating a printout, and/or open the installed “config.xml” in an editor to better follow the explanation.

3.1 Configuration File Explained

A Nav-Link configuration file contains three main groups of configuration data:

1. **Global Configuration Parameters:** These parameters control functions like debug and informational messages, control services, and Navigator compatibility.

2. **Inputs:** These represents wireless networks to which Nav-Link will be connected – inputs can be RS232 Serial, TCP/IP or even read from a file.

3. **Services:** These represent TCP socket configurations to allow third-party application to interface to Nav-Link. Services include direct TCP socket to remote serial port mappings, as well as things like a GPS “Tracking” or “MUX” port where remote GPS data is combined into a single stream.

XML provides structure to the configuration file. While this section is not meant to be a tutorial on XML in general – it is worth pointing out a few key aspects of XML to aid in editing the provided default configuration file:

- XML uses “tags” similar to HTML – each tag must have a corresponding close tag, or may be a single tag with and “\” at the end indicating the close. For example:
  
  `<input>  </inputs> ←and open close pair of tags that may enclose other tags
  `<control parameter = “ “ parameter2=” “ /> ←a single tag with implied close
Section 3: Configuration

- While XML is typically structured by indentation for better human readability – whitespace between tags is ignored.

- Nav-Link has a XML schema that it uses to check the validity of the “config.xml” file – Nav-Link will reject a “config.xml” file that contains errors or otherwise violates the rules specified in the schema. See the Nav-Link XML schema diagram in the Appendix - the diagram shows all possible tags, attributes (parameters) and attribute values. In fact, a correct XML file must contain a reference to this schema, a file called “config.xsd”. The Tibco Turbo XML editor can use a schema to create a new “config.xml” instance from scratch and check the resulting file for errors.

- It must start and end with <configuration> tags (root tag)

- It must contain a <control> tag pair.

- It must have at least one completed <input> tag in an <inputs> tag pair and at least one <service> in a <services> tag pair.

Figure 3-1: The default "config.xml" file - shown as plain text

Figure 3-1 shows the default “config.xml” file installed with the application. The “global”, “inputs”, and “services” sections of the file are pointed out. It contains two “inputs”, five
“services”, turns on informational debugging, and turns off support for Navigator I transceivers.

Figure 3-2 shows the same default configuration file as shown in Figure 3-1, but opened for read-only viewing in Microsoft Internet Explorer.

Figure 3-2: The default "config.xml" file viewed using Microsoft Internet Explorer

The default configuration file contains examples of the most common input types, examples of the most common services, and contains the most common set of global parameters (debug, control, Navigator compatibility).

In addition to the default configuration file, other example configuration files are installed providing additional examples, and configuration starting points. Keep in mind that there can be only one file named “config.xml” located in the root of the installation directory and it is this file that Nav-Link will use. See the Appendix for information about the extra example configuration files.
3.2 Configuring Global Parameters

Global configuration includes items such as what type of Navigator packets to support, what level of debug information to output to the screen, and whether or not to host a “control” port for use with Intuicom RemoteCommander application to remotely configure Navigator I and II units in real-time.

First, the configuration file must contain a root element named <configuration>. This element has required and optional attributes. The root element tag (and the ending tag) are shown below. The required attributes are shown in red, with the optional attribute shown in blue.

```
<configuration xmlns:xsi = "http://www.w3.org/2001/XMLSchema-instance" name = "Example Network" nav_i_support = "false" xsi:noNamespaceSchemaLocation = "config.xsd">
    ....[other configuration tags would be enclosed here]
</configuration>
```

If the attribute “nav_i_support” is missing or set to “false”, Nav-Link will support only Navigator II transceivers in the connected network(s)...if set to “true”, Nav-Link can communicate with Navigator I transceivers and Navigator II transceivers, although support for Navigator II Port C will not be available.

The “name” attribute should be set to a string value representing the name of the configuration. The default value is “Example Network”. This string value is printed to the console by Nav-Link during startup as confirmation of which configuration file is being processed.

Two other tags are considered global parameters. They are both contained within the <configuration> ... </configuration> tag pair. They are <debug> and <control>. Both can be entered as a single tag that contains the closing “/” character at the end:

```
<debug enabled="true" level_2="false" />
<control port="19000" enabled="true" />
```

The values for the attributes of the “debug” tag determine the amount of informational and debug messages are printed to the screen as Nav-Link operates. Setting both the “false” is the lowest level, followed by “enabled” set to “true”, and both “enabled” and “level_2” set to “true”.

The values for the attributes of the “control” tag determine whether or not and on what port a TCP socket will be hosted for connection by the Intuicom RemoteCommander application. This application allows for remote configuration and control of Navigator I and II transceivers. The default is enabled on TCP port 19000.


3.3 Configuring Inputs

Inputs are connections to Intuicom Wireless Networks. A connection is to a Master transceiver (typically an Intuicom Communicator II or Intuicom Navigator IIE) and the connection can be via RS232 serial or TCP/IP. Nav-Link supports up to twelve simultaneous inputs of any combination of serial and TCP/IP. A file input type is also supported for playback of previously recorded raw data streams. A file input type operates on only one direction, where serial and TCP/IP input types are bi-directional (data can be received from as well as sent to, a network).

The “inputs” section of the configuration file has open and closing <inputs> tags that enclose one or more <input> open and close tag pairs. For example, an inputs section that contains a single TCP/IP input looks like the following:

```
<inputs>
  <input name = "Test TCP/IP Input" input_number = "2">
    <input.ip port = "14000" address = "192.168.0.50" heartbeat="60">
      <network.ptmp/>
    </input.ip>
  </input>
</inputs>
```

The attributes of the <input> tag includes “name” and “input_number”. The value for the “name” attribute should be a string representing a meaningful name for the input. Each input must have an input number – the value for the attribute “input_number” is arbitrary as long it is unique and between 1 and 99.

For a TCP/IP input, the <input> tag pair must contain a <input.ip> tag. Additionally, the <input> tag pair must contain a <network> tag pair that contains a network type tag. Currently only the <network.ptmp/> network type is supported. The <input.ip> tag has three attributes: “port”, “address”, and “heartbeat”, where “address” is the IP address or hostname of the Intuicom Navigator IIE or terminal server, and “port” is the TCP port number to which Nav-Link will connect. The optional “heartbeat” attribute take a numeric value that represents the number of seconds Nav-Link should wait between sending out heartbeat packets to test the IP connection to the Master.

```
<inputs>
  <input name = "Test Serial Input" input_number = "1">
    <input.serial port = "COM1" speed = "115200" parity = "none" databits = "8" stopbits = "1" flowcontrol = "none">
      <network.ptmp/>
    </input.serial>
  </input>
</inputs>
```

A serial input is virtually identical to an IP input, <input.ip> is replaced with an <input.serial> tag with attributes specifying the details of the serial connection: baud, parity, databits, stopbits, and flowcontrol. One serial and one IP input would look like the following:
Section 3: Configuration

3.4 Configuring Services

Services are how other applications interface with Nav-Link. Nav-Link has six different types of services. Individual Services are enclosed inside the `<services></services>` tag pair. Each service is enclosed inside a `<service></service>` tag pair, which can have “name” and “input_number” attributes. The value for the “name” attribute is a user text string label for the specific service. The optional “input_number” attribute allows the service to be mapped to a specific input. If no “input_number” attribute value is provided, or if a value is provided that does not match a valid input number, the service will listen to and transmit to all inputs.

The following is an example Services section from the default configuration file:

```
<services>
  <service name = "Broadcast to Port B">
    <service.broadcast port = "15001" remote_port = "b" navigators = "true"/>
  </service>
  <service name = "Test Discrete Service">
    <service.discrete port = "18000"/>
  </service>
  <service name = "Test Raw Service">
    <service.raw port = "17000"/>
  </service>
  <service name = "GPS Tracking Port">
    <service.mux port = "11000"/>
  </service>
  <service name = "Navigator Bridge">
    <service.navigator>
      <navigator port.a = "10005" port.b = "10006" port.gps = "10008" id = "8121727" port.c = "10008"/>
      <navigator port.a = "10001" port.b = "10002" port.gps = "10003" id = "9121904" name = "Slave 1904" port.c = "10004" input_number = "1"/>
    </navigator>
  </service>
</services>
```

3.4.1 Broadcast Service

The Broadcast Service allows for a mapping between a TCP port and a Navigator I or II remote serial port. The Broadcast port operates in one direction – a third-party application makes a TCP socket connection to the Broadcast port, data sent to the port by the application will be transmitted to the specified port (A, B or C) on remote Navigator I or II units. Any number of Broadcast Services are allowed – they must have unique port numbers, but can have the same remote ports. Below is an example of a complete Broadcast service which would be enclosed inside the `<services> </service>` tag pair.
3.4.2 Navigator Service

The Navigator Service allows for individual mappings between TCP ports and specific remote serial ports. Remote Navigator I or II units are identified by their ID and TCP port numbers are supplied for mappings to each Navigator’s Ports A, B, C, and GPS.

If an input number attribute and value are supplied, that Navigator will be mapped to the specified input number, overriding the input number supplied on the service tag.

Navigator Service mappings are specified on individual `<navigator>` tags, enclosed inside the `<service.navigator>` tag pair. Attributes and values for “port.a”, “port.b”, “port.gps”, and “id” are required, while “name”, “port.c”, and “input_number” are optional.

3.4.3 MUX (Tracking) Service

The Mux service is a one directional output that combines data from remote Navigator I or II internal GPS receivers onto a single TCP port. A third party application would connect to this port and parse the incoming data. Each NMEA string from a remote Navigator is pre-pended with the Navigator’s ID.

A unique TCP port number must be supplied as the value for the “port” tag. More than one Mux port is allowed.

3.4.4 Discrete Service

The Discrete service is a one-directional service that outputs the current state of all remote Navigator I and II’s discrete IO inputs. It outputs a single byte from each Navigator pre-pended by the unit’s ID. A Navigator I has two input discretes and the Navigator II has four input discretes. The application parsing data from this output must know ahead of time whether a given ID belongs to a Navigator I or Navigator II.
3.4.5 Raw Service
The Raw Service defines a bi-directional TCP port that outputs unparsed Navigator packets, and accepts Navigator packets to be transmitted to remote Navigators. This Service is a pass-through for applications wishing to parse Navigator packet data themselves. Note that Control packets are not included in this data stream.

```xml
<service name = "Test Raw Service">
  <service.raw port = "17000"/>
</service>
```

3.4.6 File Logging Service
The File Logging Service writes data from remote Navigators to flat file(s). The service can be configured to record raw Navigator Packets or to create separate files for each Navigator ID and each port from a given ID.

This service requires values for two attributes “directory” and “channelized”. The “directory” attribute requires a string value for a valid path in which to store the file(s). The “channelized” attribute takes a “true” or “false” value indicating whether or not to break the data into individual files by ID and port.

```xml
<service name = "File Logging Service">
  <service.file directory = "." channelized="true"/>
</service>
```
4 Operation

When properly configured and running, Nav-Link has no direct interaction with the user - no GUI. Nav-Link is designed to be run in the background similar to a service. Nav-Link does, however, output messages and error information to the console where it was started. On Unix systems, Nav-Link output can be piped to a file.

4.1 Starting Nav-Link

On Windows a system, start Nav-Link by double clicking the Nav-Link icon installed in Start->Programs->Intuicom->Nav-Link4.0 or the appropriate program group path as specified during installation.

![Figure 4-1: Starting Nav-Link on Windows](image)

For Unix systems, change to the directory where Nav-Link was installed and execute Nav-Link (startup script), for example:

Server>./Nav-Link

Nav-Link will start and display startup messages to the console indicating the results of processing the configuration file (config.xml). Examine this output closely to confirm all configuration settings are correct.

At this point Nav-Link will run, accept TCP connections, etc. as configured. Any error or informational messages will be written to the console.

Figure 4-2 shows an example of the Nav-Link console screen after startup.
Be sure that for serial inputs, the specified COM/Serial port(s) are available and cabled to the appropriate master transceiver. Additionally, confirm that the master transceiver’s baud rate and the baud rate configured in Nav-Link match, along with the other serial parameters.

For IP inputs, confirm that the remote terminal server or Navigator IIE is configured, and available via IP.
4.2 Testing Nav-Link Operation

Confirm a properly configured Nav-Link Server by accessing configured TCP ports and viewing data streaming from the wireless network. If your network is designed to automatically return data via the wireless network (i.e, not in response to a command sent to a remote device), you will be able to use TELNET to connect to the configured port(s) on the Nav-Link server.

For example, if Nav-Link is configured to map a remote Navigator’s serial Port A to TCP port 10001, use the following command to connect to the port and view any data received on Port A of the remote unit:

```
telnet localhost 10001
```

Use TELNET to connect to the Tracking port to view all GPS data. Similarly, use TELNET to connect to a broadcast port, and test the broadcast function by transmitting text and confirming that the same text is received on every remote unit. Use a terminal application such as Windows Hyperterminal to connect to the corresponding serial port on the remote unit to send and/or receive data.

In a network where the remote units are transmitting GPS NMEA strings from their embedded GPS receivers, Tracking Port (mux) operation can be tested by using TELNET to connect to the configured TCP port (default 11000):

```
telnet localhost 11000
```

Below in an example of output from the Tracking Port accessed by TELNET:

![Figure 4-3: Screenshot of Telnet Connection to Tracking (Mux) Service](image)
# 5 Troubleshooting

Use the following table to aid in troubleshooting Nav-Link operation.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Possible Cause(s)</th>
<th>Possible Fix(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nav-Link will not start</td>
<td>Java VM not installed with Nav-Link</td>
<td>Install Nav-Link with its own Java VM when prompted during install.</td>
</tr>
<tr>
<td></td>
<td>Path to existing Java VM incorrect</td>
<td>Note that Nav-Link outputs the JVM version/name in use on the startup screen.</td>
</tr>
<tr>
<td></td>
<td>Existing Java VM version too old</td>
<td></td>
</tr>
<tr>
<td>Nav-Link will not read config.xml file</td>
<td>Config file not in same directory as Nav-Link application</td>
<td>Place config.xml in same directory as Nav-Link</td>
</tr>
<tr>
<td></td>
<td>Config file corrupt or not readable from disk</td>
<td>Create a new config.xml file from scratch.</td>
</tr>
<tr>
<td>Nav-Link reports and error in parsing the config.xml file, a schema or config rule violation</td>
<td>The config.xml file does not adhere to the config.xsd schema.</td>
<td>Closely examine the error message to identify the offending tag in the config file then modify the config file to adhere to the schema definition.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use the example in this manual as a starting point and build on it.</td>
</tr>
<tr>
<td>Nav-Link reports error connecting to serial port</td>
<td>Serial port specified incorrectly in properties file</td>
<td>Confirm correct serial port configuration in properties file</td>
</tr>
<tr>
<td></td>
<td>Serial port specified in properties file not available</td>
<td>Choose an available serial port</td>
</tr>
<tr>
<td>Nav-Link maps ports but no data available when connect to port</td>
<td>Remote device not sending data</td>
<td>Confirm remote device operational and sending data</td>
</tr>
<tr>
<td></td>
<td>Wireless network configuration issue</td>
<td>Check wireless Point-to-Point or Point-to-Multipoint configuration</td>
</tr>
<tr>
<td>Can receive data from but not send data to Navigator I units</td>
<td>nav_i_support not set in configuration file</td>
<td>Set nav_i_support=&quot;true&quot; in &lt;configuration&gt; tag in config.xml file.</td>
</tr>
<tr>
<td>Nav-Link cannot connect to a IP Input</td>
<td>The IP address or hostname is incorrect</td>
<td>Check the input.ip configuration in the config.xml file.</td>
</tr>
<tr>
<td></td>
<td>The TCP port number is incorrect</td>
<td>Confirm the remote host is correctly configured – confirm with a ping test, and a manual telnet to the TCP port.</td>
</tr>
<tr>
<td></td>
<td>The Navigator IIE or terminal server is incorrectly configured, unavailable, powered down, etc.</td>
<td></td>
</tr>
<tr>
<td>Cannot transfer data to or from a Navigator configured as a Navigator Service.</td>
<td>The ID of the Navigator is incorrect in the config.xml file</td>
<td>Confirm ID for Navigator in Navigator service matched ID of remote Navigator</td>
</tr>
<tr>
<td></td>
<td>The remote Navigator is not linked with the wireless network</td>
<td>Test remote Navigator when linked</td>
</tr>
</tbody>
</table>
APPENDIX A - Configuration XML Schema
APPENDIX B - Example configuration files

Three different example configuration files are presented showing a range of different tags and attributes. Electronic versions of these example configuration files can be found in the Nav-Link installation directory.

“simple_example_config.xml”

```xml
<?xml version = "1.0" encoding = "UTF-8"?>
<configuration xmlns:xsi = "http://www.w3.org/2001/XMLSchema-instance" name = "simple example" nav_i_support = "false" xsi:noNamespaceSchemaLocation = "config.xsd">
  <debug enabled = "true" level_2 = "false"/>
  <control port = "19000" enabled = "false"/>
  <inputs>
    <input name = "IP Input" input_number = "1">
      <input.ip port = "14000" address = "192.168.0.42"/>
      <network />
    </input>
  </inputs>
  <services>
    <service name = "Tracking Port">
      <service.mux port = "11000"/>
    </service>
  </services>
</configuration>
```

This example highlights a very simple configuration with a single “input” or connection to an Intuicom wireless network (in this case an TCP/IP connection to the network master transceiver) and a single service – the “raw” or Tracking Port service.

Note that Navigator I support is disabled by setting the “nav_i_support” attribute of the “configuration” tag to false.
“navIdebug_example_config.xml”

```xml
<?xml version = "1.0" encoding = "UTF-8"?>
<configuration xmlns:xsi = "http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation = "config.xsd" name = "navIdebug example"
 nav_i_support = "true">
  <control port = "19000" enabled = "true"/>
  <debug enabled = "true" level_2 = "true"/>
  <inputs>
    <input name = "" input_number = "1">
      <input.serial port = "COM1" speed = "115200" parity = "none" databits = "8" stopbits = "1" flowcontrol = "ctsrs"/>
      <network ptmp/>
    </input>
  </inputs>
  <services>
    <service name = "Navigators" input_number = "1">
      <navigator port.a = "10001" port.b = "10002" port.gps = "10003" id = "9084455" name = "Text Label for 9084455"/>
      <navigator port.a = "10004" port.b = "10005" port.gps = "10006" id = "9072345" name = "Text Label for 9072345"/>
    </navigator>
  </services>
</configuration>
```

This example enables support for Navigator I transceivers (enabling Navigator I support is mutually exclusive with Navigator II Port C support).

This example has a single “input” or connection to an Intuicom wireless network (in this case a serial connection to the Master transceiver).

A single service is configured – the Navigator Service, with two Navigator mappings.
“inputmapping_example_config.xml”

This example configuration has three different connections to wireless networks or “inputs”. Two of the inputs are TCP/IP and one is serial. Note the “heartbeat” attribute for the IP inputs – the heartbeat attribute specifies an interval for Nav-Link to test the TCP socket connection to the Navigator IIe or remote terminal server – if the connection is stalled, Nav-Link attempts to re-connect.

Note in this example that each of the Navigators in the Navigator Service specify different input numbers. When an input number is specified as an attribute for a given Navigator, any input number specified as an attribute in the “service” tag is overridden. In this example each Navigator will only listen to, or transmit packets to the input number specified. This is important for example, when polling devices attached to remote Navigator transceivers – with an input number specified for each Navigator, outbound data will only be transmitted to the input specified. If not input number is specified for a service (and in this case for either the service or a Navigator) then outbound data will be sent to all inputs.
APPENDIX C – EULA

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