

Intuicom®

Nav-Link Server v4.0

User Guide

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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 a 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.

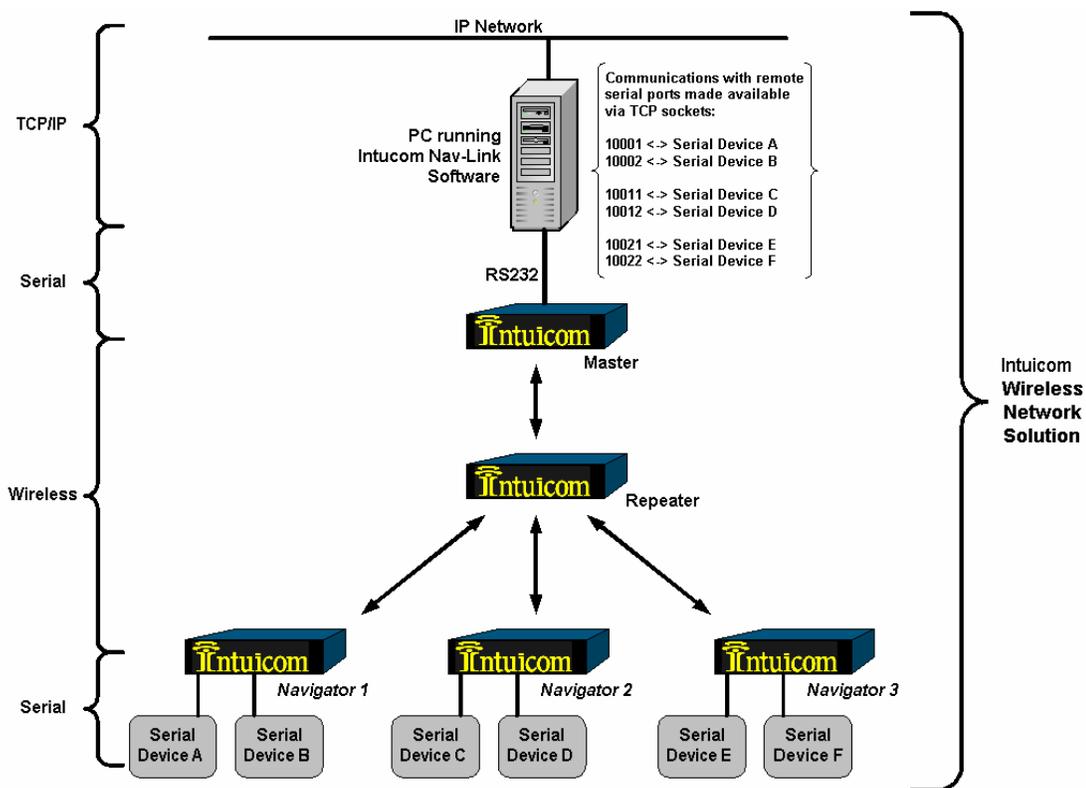


Figure 1-1: Nav-Link for Point-to-MultiPoint Wireless Link

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.

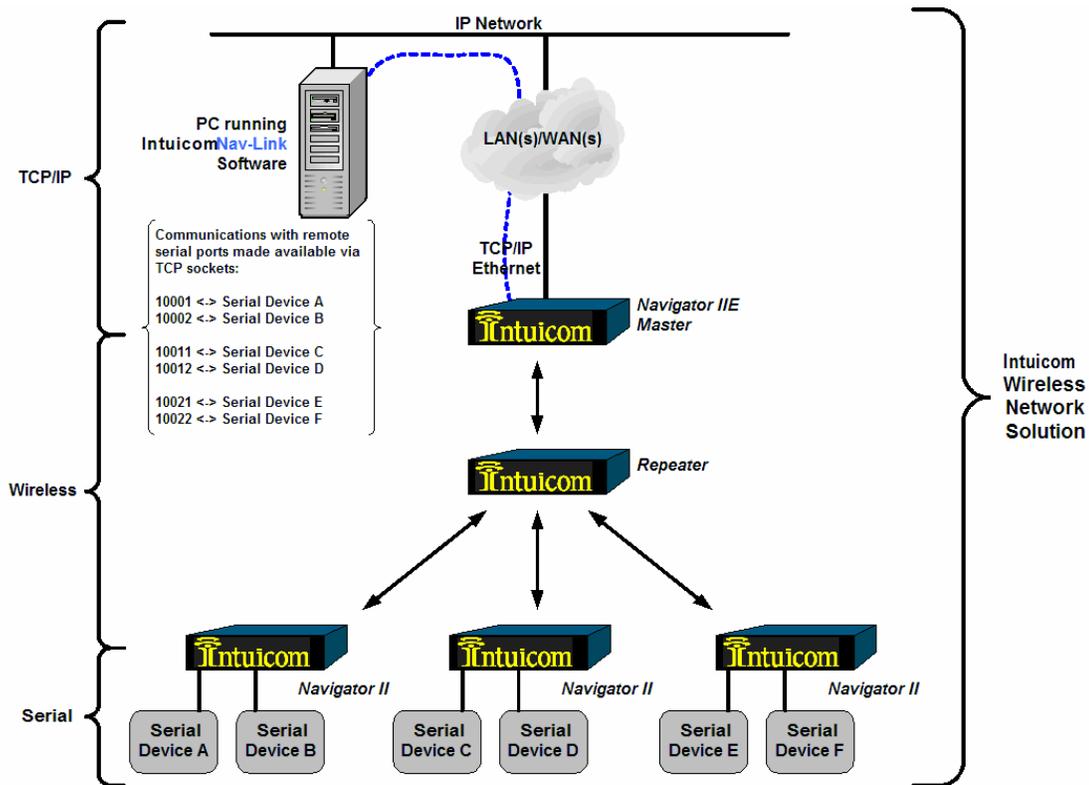


Figure 1-2: TCP/IP Connection between Nav-Link and Master Transceiver

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.

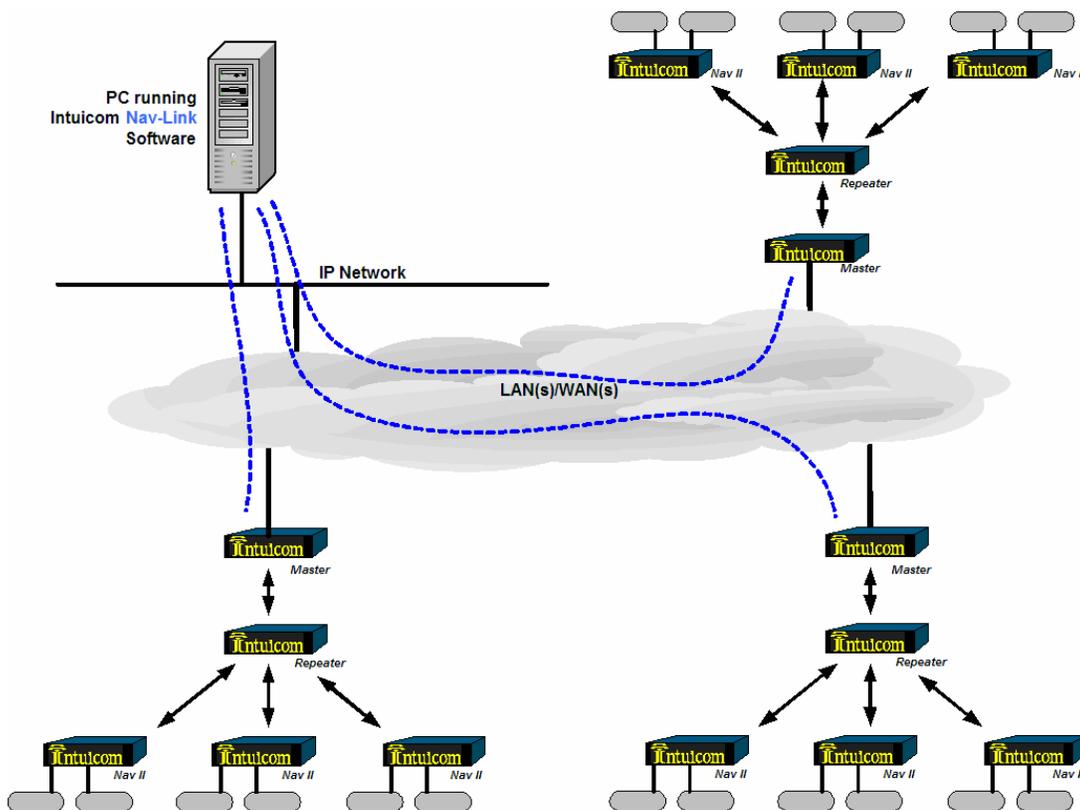


Figure 1-3: Nav-Link connecting to multiple wireless networks via TCP/IP

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.

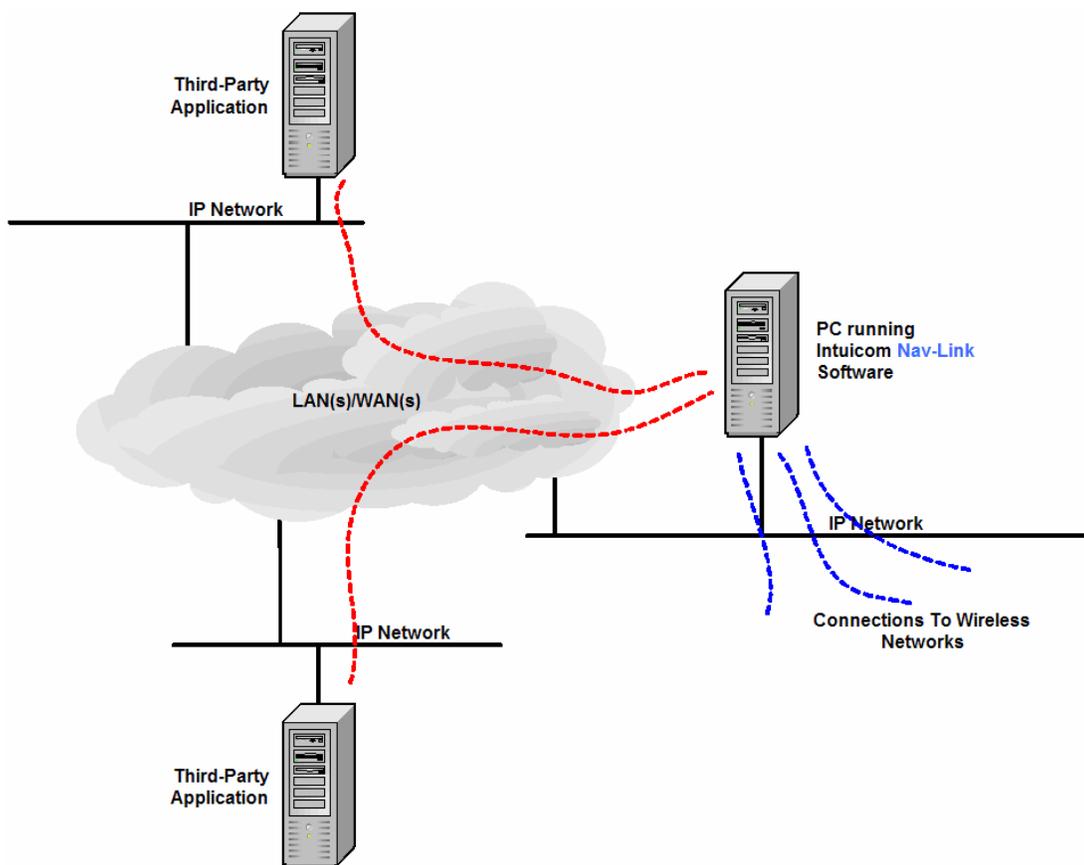


Figure 1-4: Interfacing Third-Party applications with Nav-Link

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:**
 - **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.
 - **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.
 - **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:**
 - **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**.

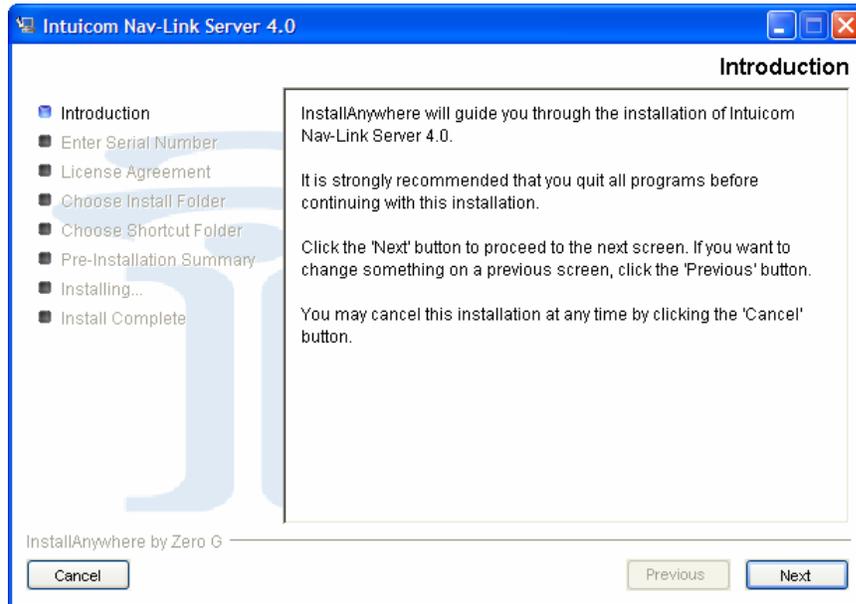


Figure 2-1: Nav-Link Installation Introduction Dialog

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.

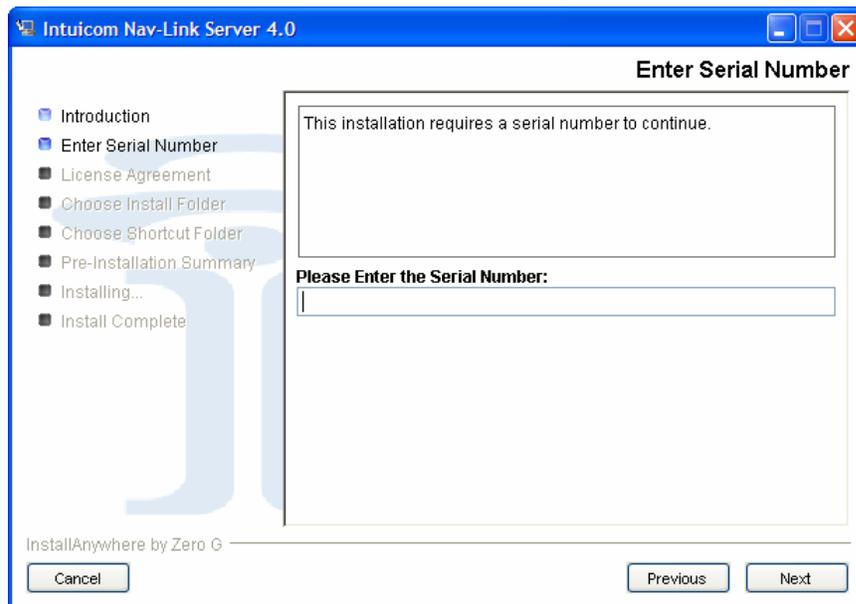


Figure 2-2: Nav-Link Installation Enter Serial Number Dialog

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.

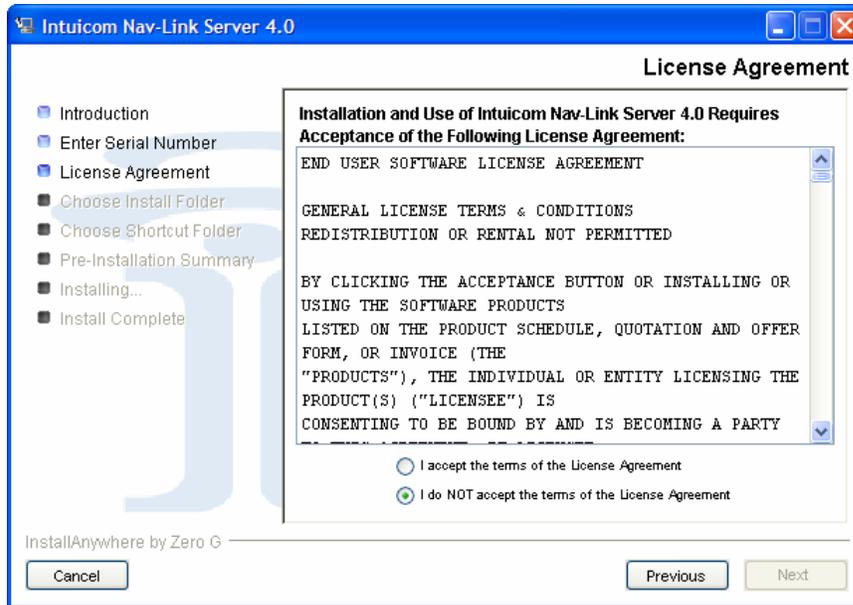


Figure 2-3: Nav-Link Installation License Agreement Dialog

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

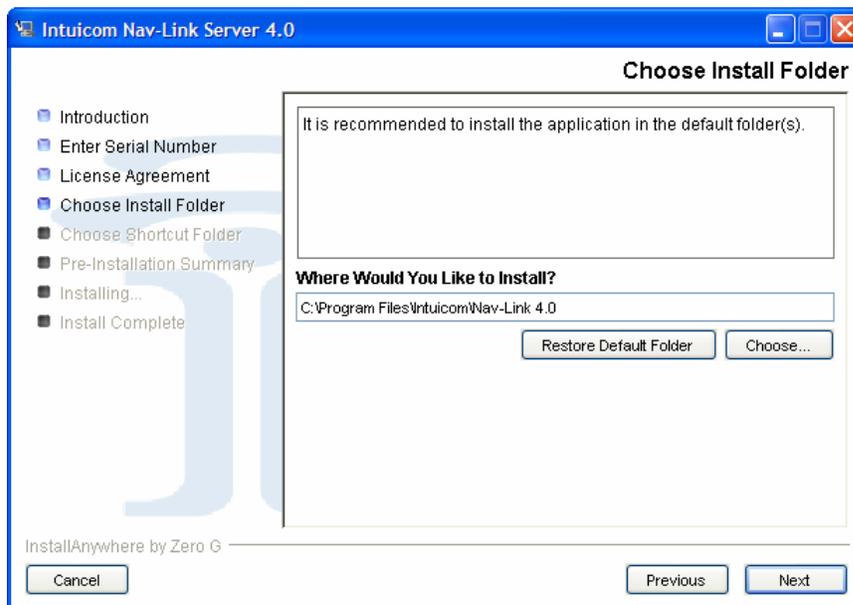


Figure 2-4: Nav-Link Installation Choose Install Folder Dialog

5. If desired, modify the default values for where Shortcuts or Links will be installed. Click “Next” to continue.

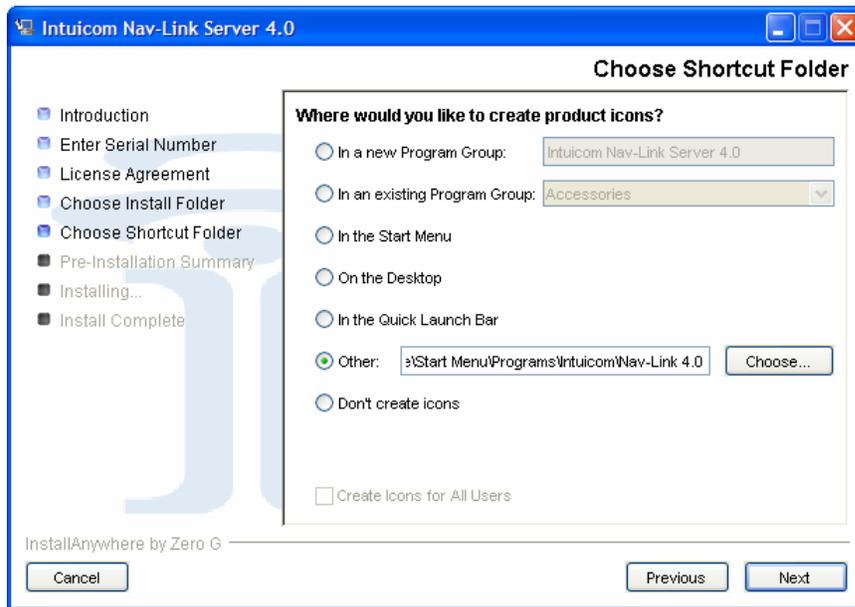


Figure 2-5: Nav-Link Installation Choose Shortcut Folder Dialog

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.

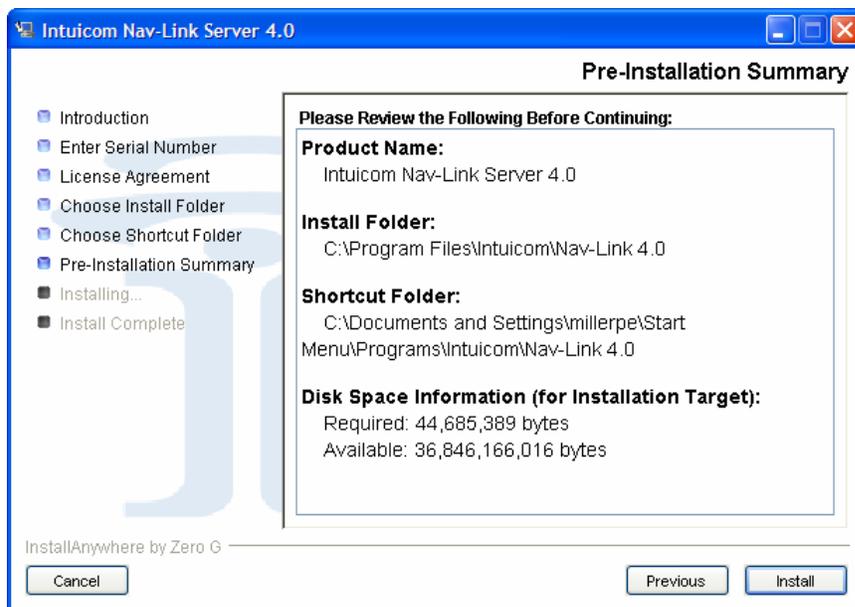


Figure 2-6: Nav-Link Installation Pre-Installation Summary Dialog

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

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

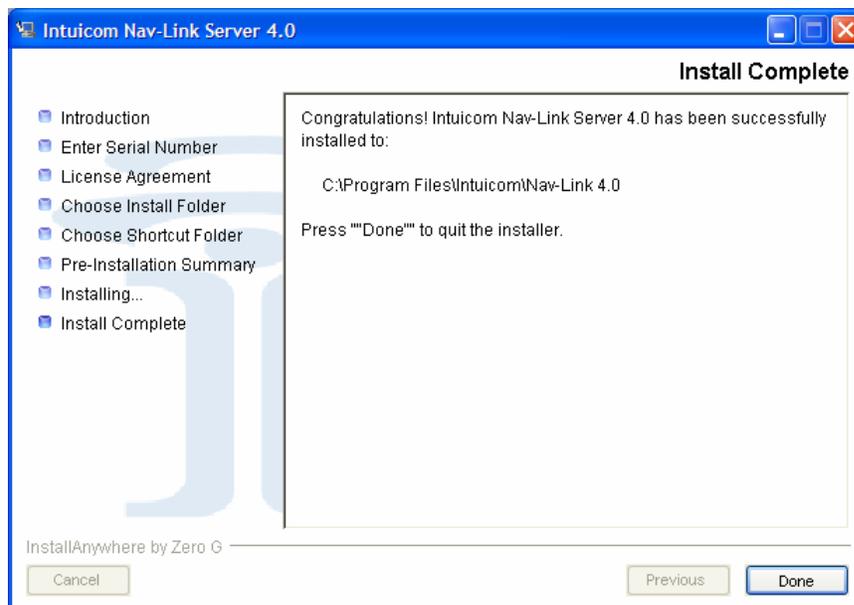


Figure 2-8: Nav-Link Installation Install Complete Dialog

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

- 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.

```

<?xml version = "1.0" encoding = "UTF-8"?>
<configuration xmlns:xsi = "http://www.w3.org/2001/XMLSchema-instance" name = "Example Network" nav_i_support = "false" xsi:noNamespaceSchemaLocation = "config.xsd">
  <debug enabled = "true" level_2 = "false"/>
  <control port = "19000" enabled = "true"/>
  <inputs>
    <input name = "Test TCP/IP Input" input_number = "2">
      <input.ip port = "14000" address = "192.168.0.50"/>
      <network>
        <network.ptmp/>
      </network>
    </input>
    <input name = "Test Serial Input" input_number = "1">
      <input.serial port = "COM1" speed = "115200" parity = "none" databits = "8" stopbits = "1" flowcontrol = "none"/>
      <network>
        <network.ptmp/>
      </network>
    </input>
  </inputs>
  <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 = "9121727" port.c = "10008"/>
        <navigator port.a = "10001" port.b = "10002" port.gps = "10003" id = "9121904" name = "Slave 1904" port.c = "10004" input_number = "1"/>
      </service.navigator>
    </service>
  </services>
</configuration>

```

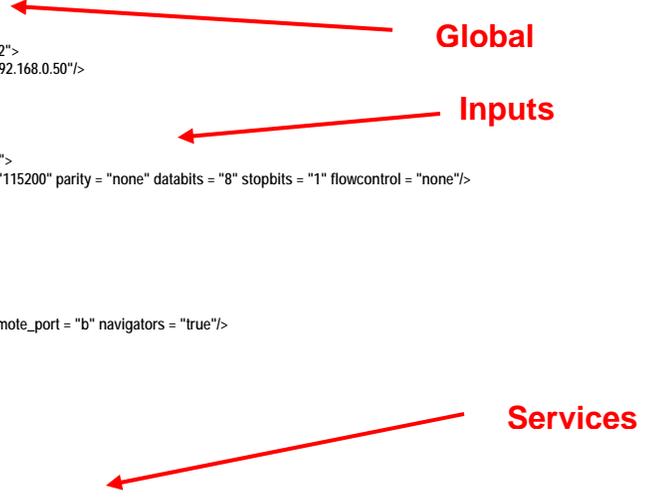


Figure 3-1: The default "config.xml" file - shown as plain text

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.

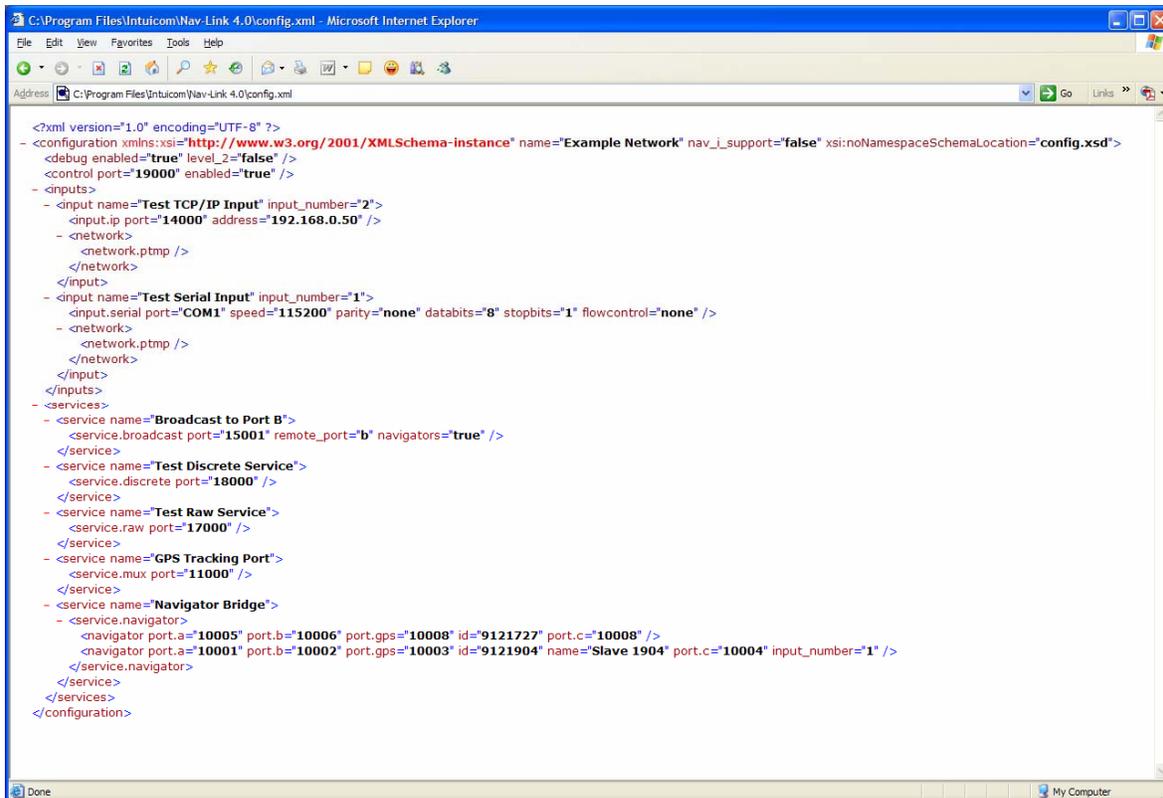


Figure 3-2: The default "config.xml" file viewed using Microsoft Internet Explorer

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>
        <network.ptmp/>
      </network>
    </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>
        <network.ptmp/>
      </network>
    </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:

```
<inputs>
  <input name = "Test Serial Input" input_number = "1">
    <input.serial port = "COM1" speed = "115200" parity = "none" databits = "8" stopbits = "1" flowcontrol = "none"/>
    <network>
      <network.ptmp/>
    </network>
  </input>
  <input name = "Test TCP/IP Input" input_number = "2">
    <input.ip port = "14000" address = "192.168.0.50"/>
    <network>
      <network.ptmp/>
    </network>
  </input>
</inputs>
```

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 = "9121727" port.c = "10008"/>
      <navigator port.a = "10001" port.b = "10002" port.gps = "10003" id = "9121904" name = "Slave 1904" port.c = "10004" input_number = "1"/>
    </service.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.

```
<service name = "Broadcast to Port B">  
  <service.broadcast port = "15001" remote_port = "b" navigators = "true"/>  
</service>
```

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.

```
<service name = "Navigator Bridge">  
  <service.navigator>  
    <navigator port.a = "10005" port.b = "10006" port.gps = "10008" id = "9121727" port.c = "10008"/>  
    <navigator port.a = "10001" port.b = "10002" port.gps = "10003" id = "9121904" name = "Slave 1904" port.c = "10004" input_number = "1"/>  
  </service.navigator>  
</service>
```

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.

```
<service name = "GPS Tracking Port">  
  <service.mux port = "11000"/>  
</service>
```

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 discrettes and the Navigator II has four input discrettes. The application parsing data from this output must know ahead of time whether a given ID belongs to a Navigator I or Navigator II.

```
<service name = "Test Discrete Service">  
  <service.discrete port = "18000"/>  
</service>
```

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.

```
<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.

```
<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.

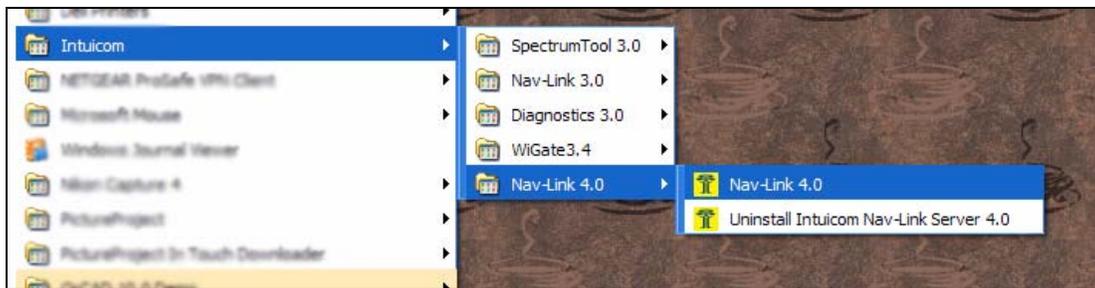


Figure 4-1: Starting Nav-Link on Windows

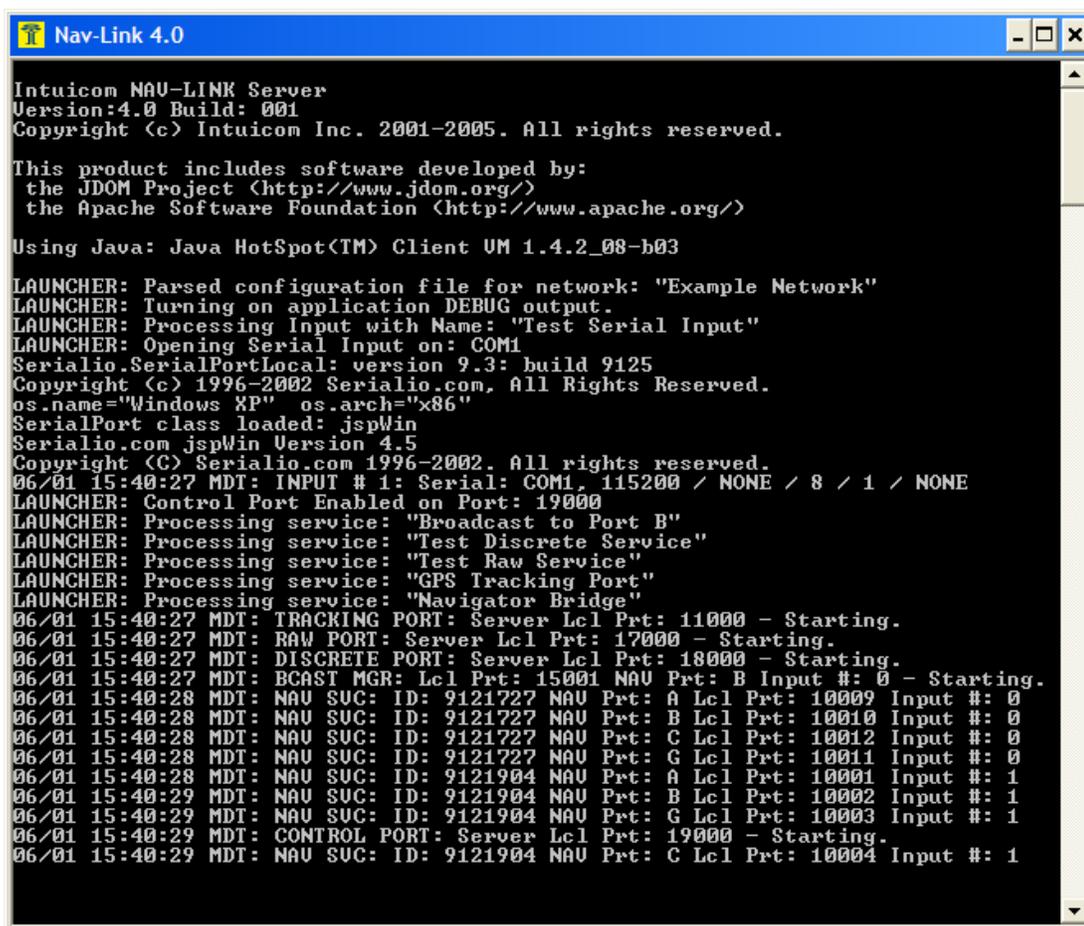
For Unix systems, change to the directory where Nav-Link was installed and execute Nav-Link (startup script), for example:

```
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.



```

Intuicom MAU-LINK Server
Version:4.0 Build: 001
Copyright (c) Intuicom Inc. 2001-2005. All rights reserved.

This product includes software developed by:
the JDOM Project (http://www.jdom.org/)
the Apache Software Foundation (http://www.apache.org/)

Using Java: Java HotSpot(TM) Client UM 1.4.2_08-b03

LAUNCHER: Parsed configuration file for network: "Example Network"
LAUNCHER: Turning on application DEBUG output.
LAUNCHER: Processing Input with Name: "Test Serial Input"
LAUNCHER: Opening Serial Input on: COM1
Serialio.SerialPortLocal: version 9.3: build 9125
Copyright (c) 1996-2002 Serialio.com, All Rights Reserved.
os.name="Windows XP" os.arch="x86"
SerialPort class loaded: jspWin
Serialio.com jspWin Version 4.5
Copyright (C) Serialio.com 1996-2002. All rights reserved.
06/01 15:40:27 MDT: INPUT # 1: Serial: COM1, 115200 / NONE / 8 / 1 / NONE
LAUNCHER: Control Port Enabled on Port: 19000
LAUNCHER: Processing service: "Broadcast to Port B"
LAUNCHER: Processing service: "Test Discrete Service"
LAUNCHER: Processing service: "Test Raw Service"
LAUNCHER: Processing service: "GPS Tracking Port"
LAUNCHER: Processing service: "Navigator Bridge"
06/01 15:40:27 MDT: TRACKING PORT: Server Lcl Prt: 11000 - Starting.
06/01 15:40:27 MDT: RAW PORT: Server Lcl Prt: 17000 - Starting.
06/01 15:40:27 MDT: DISCRETE PORT: Server Lcl Prt: 18000 - Starting.
06/01 15:40:27 MDT: BCAST MGR: Lcl Prt: 15001 NAV Prt: B Input #: 0 - Starting.
06/01 15:40:28 MDT: NAV SUC: ID: 9121727 NAV Prt: A Lcl Prt: 10009 Input #: 0
06/01 15:40:28 MDT: NAV SUC: ID: 9121727 NAV Prt: B Lcl Prt: 10010 Input #: 0
06/01 15:40:28 MDT: NAV SUC: ID: 9121727 NAV Prt: C Lcl Prt: 10012 Input #: 0
06/01 15:40:28 MDT: NAV SUC: ID: 9121727 NAV Prt: G Lcl Prt: 10011 Input #: 0
06/01 15:40:28 MDT: NAV SUC: ID: 9121904 NAV Prt: A Lcl Prt: 10001 Input #: 1
06/01 15:40:29 MDT: NAV SUC: ID: 9121904 NAV Prt: B Lcl Prt: 10002 Input #: 1
06/01 15:40:29 MDT: NAV SUC: ID: 9121904 NAV Prt: G Lcl Prt: 10003 Input #: 1
06/01 15:40:29 MDT: CONTROL PORT: Server Lcl Prt: 19000 - Starting.
06/01 15:40:29 MDT: NAV SUC: ID: 9121904 NAV Prt: C Lcl Prt: 10004 Input #: 1

```

Figure 4-2: Nav-Link Console Screen

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:

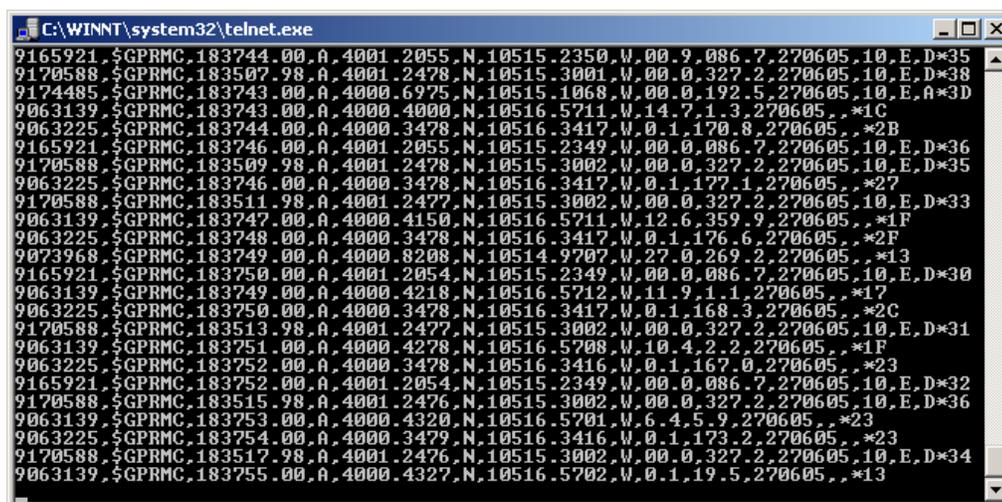
>telnet localhost 10001

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:



```

C:\WINNT\system32\telnet.exe
9165921,$GPRMC,183744.00,A,4001.2055,N,10515.2350,W,00.9,086.7,270605,10,E,D*35
9170588,$GPRMC,183507.98,A,4001.2478,N,10515.3001,W,00.0,327.2,270605,10,E,D*38
9174485,$GPRMC,183743.00,A,4000.6975,N,10515.1068,W,00.0,192.5,270605,10,E,A*3D
9063139,$GPRMC,183743.00,A,4000.4000,N,10516.5711,W,14.7,1.3,270605,,*1C
9063225,$GPRMC,183744.00,A,4000.3478,N,10516.3417,W,0.1,170.8,270605,,*2B
9165921,$GPRMC,183746.00,A,4001.2055,N,10515.2349,W,00.0,086.7,270605,10,E,D*36
9170588,$GPRMC,183509.98,A,4001.2478,N,10515.3002,W,00.0,327.2,270605,10,E,D*35
9063225,$GPRMC,183746.00,A,4000.3478,N,10516.3417,W,0.1,177.1,270605,,*27
9170588,$GPRMC,183511.98,A,4001.2477,N,10515.3002,W,00.0,327.2,270605,10,E,D*33
9063139,$GPRMC,183747.00,A,4000.4150,N,10516.5711,W,12.6,359.9,270605,,*1F
9063225,$GPRMC,183748.00,A,4000.3478,N,10516.3417,W,0.1,176.6,270605,,*2F
9073968,$GPRMC,183749.00,A,4000.8208,N,10514.9707,W,27.0,269.2,270605,,*13
9165921,$GPRMC,183750.00,A,4001.2054,N,10515.2349,W,00.0,086.7,270605,10,E,D*30
9063139,$GPRMC,183749.00,A,4000.4218,N,10516.5712,W,11.9,1.1,270605,,*17
9063225,$GPRMC,183750.00,A,4000.3478,N,10516.3417,W,0.1,168.3,270605,,*2C
9170588,$GPRMC,183513.98,A,4001.2477,N,10515.3002,W,00.0,327.2,270605,10,E,D*31
9063139,$GPRMC,183751.00,A,4000.4278,N,10516.5708,W,10.4,2.2,270605,,*1F
9063225,$GPRMC,183752.00,A,4000.3478,N,10516.3416,W,0.1,167.0,270605,,*23
9165921,$GPRMC,183752.00,A,4001.2054,N,10515.2349,W,00.0,086.7,270605,10,E,D*32
9170588,$GPRMC,183515.98,A,4001.2476,N,10515.3002,W,00.0,327.2,270605,10,E,D*36
9063139,$GPRMC,183753.00,A,4000.4320,N,10516.5701,W,6.4,5.9,270605,,*23
9063225,$GPRMC,183754.00,A,4000.3479,N,10516.3416,W,0.1,173.2,270605,,*23
9170588,$GPRMC,183517.98,A,4001.2476,N,10515.3002,W,00.0,327.2,270605,10,E,D*34
9063139,$GPRMC,183755.00,A,4000.4327,N,10516.5702,W,0.1,19.5,270605,,*13
  
```

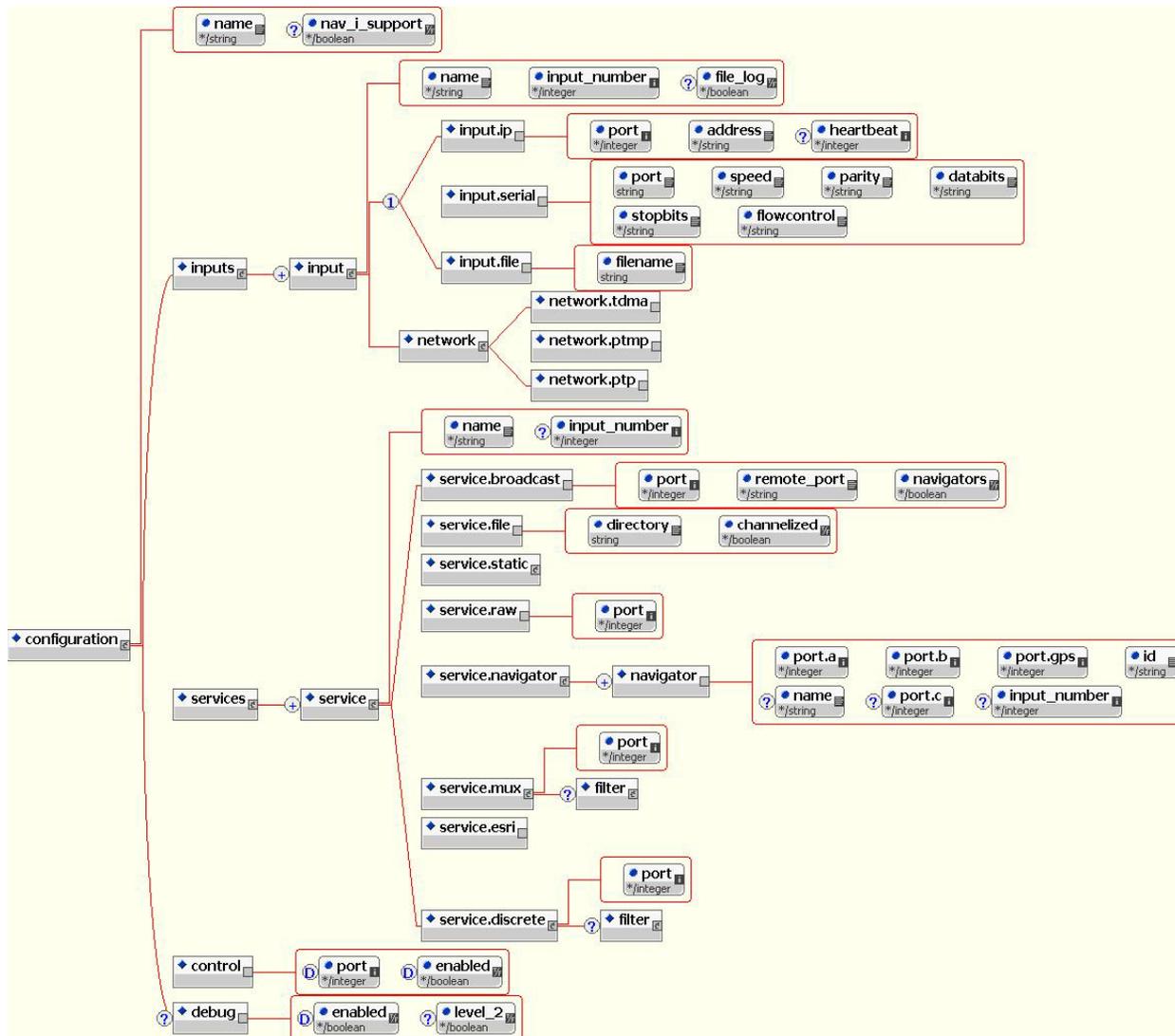
Figure 4-3: Screenshot of Telnet Connection to Tracking (Mux) Service

5 Troubleshooting

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

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

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 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>
        <network.ptmp/>
      </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 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 = "ctsrts"/>
      <network>
        <network.ptmp/>
      </network>
    </input>
  </inputs>
  <services>
    <service name = "Navigators" input_number = "1">
      <service.navigator>
        <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"/>
      </service.navigator>
    </service>
  </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”

```

<?xml version = "1.0" encoding = "UTF-8"?>
<configuration xmlns:xsi = "http://www.w3.org/2001/XMLSchema-instance" name = "inputmapping example" nav_i_support = "false" xsi:noNamespaceSchemaLocation = "config.xsd">
  <control port = "19000" enabled = "true"/>
  <debug enabled = "true" level_2 = "false"/>
  <inputs>
    <input name = "Remote Network 2" input_number = "3">
      <input.ip port = "14000" address = "192.168.5.45" heartbeat = "60"/>
      <network>
        <network.ptmp/>
      </network>
    </input>
    <input name = "Remote Network 1" input_number = "2">
      <input.ip port = "14000" address = "192.168.0.42" heartbeat = "120"/>
      <network>
        <network.ptmp/>
      </network>
    </input>
    <input name = "Serial Input" input_number = "1">
      <input.serial port = "COM1" speed = "115200" parity = "none" databits = "8" stopbits = "1" flowcontrol = "ctsrts"/>
      <network>
        <network.ptmp/>
      </network>
    </input>
  </inputs>
  <services>
    <service name = "Navigators">
      <service.navigator>
        <navigator port.a = "10009" port.b = "10010" port.gps = "10011" id = "9182456" name = "Text Label for 9182456" port.c = "10012"
input_number = "3"/>
        <navigator port.a = "10001" port.b = "10002" port.gps = "10003" id = "9123434" name = "Text Label for 9123434" port.c = "10004"
input_number = "1"/>
        <navigator port.a = "10005" port.b = "10006" port.gps = "10007" id = "9172233" name = "Text Label for 9172233" port.c = "10008"
input_number = "2"/>
      </service.navigator>
    </service>
  </services>
</configuration>

```

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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- 3. License Fees.** Licensee shall pay in full the license fee applicable to the Product(s). Until such license fee is paid in full, no license to use the Product(s) is granted. However, the remaining terms and conditions of this Agreement shall apply and shall bind the Licensee. LICENSEE ACKNOWLEDGES AND AGREES THAT THE AMOUNT OF LICENSE FEE PAYABLE HEREUNDER IS DEPENDENT UPON THE NUMBER OF CPUS UPON WHICH THE PRODUCT MAY BE MAINTAINED AND THE NUMBER OF RADIO TRANCEIVERS THAT THE LICENSEE USES IN CONNECTION WITH THE PRODUCTS AS INDICATED ON THE INVOICE FOR THE LICENSED PRODUCT. PLACEMENT ON ADDITIONAL CPUS AND/OR USE OF ADDITIONAL RADIO TRANCEIVERS IN CONNECTION WITH THE PRODUCT SHALL REQUIRE ADDITIONAL LICENSE FEES TO BE PAID. USE BEYOND THE TOTAL NUMBER OF CPUS AND/OR RADIO TRANCEIVERS APPLICABLE TO THIS LICENSE IS PROHIBITED UNTIL ADDITIONAL LICENSE FEES ARE PAID AT INTUICOM'S THEN-CURRENT FEE SCHEDULE.
- 4. Fees and Taxes.** The license fees due hereunder are exclusive of any applicable taxes. Licensee shall be responsible for and shall reimburse Intuicom for, and promptly pay, all applicable national, state and local taxes, value added or sales taxes, and other taxes pertaining to payments except taxes based on Intuicom's income.
- 5. Reports; Records; Audit.** Licensee shall provide Licensor with quarterly reports containing the number and type of Product copied for license pursuant to this Agreement and the number of radio transceiver units utilized by the Licensee in connection with the Product. Licensee shall maintain accurate records as necessary to verify compliance with this Agreement. Licensor may conduct one or more audits to verify such compliance. Audits will be conducted during normal business hours. All audits shall be conducted at Licensor's expense unless the results establish that Licensee has underpaid Licensor by more than 5% of the amount actually due, in which case Licensee shall pay all amounts due and bear the expense of the audit.
- 6. Proprietary Rights.** Title, ownership rights, and intellectual property rights in the Product(s) shall remain in Intuicom and/or its suppliers. Licensee acknowledges such ownership and intellectual property rights and will not take any action to jeopardize, limit or interfere in any manner with Intuicom's or its suppliers' ownership of or rights with respect to Product(s). The Product(s) are protected by copyright and other intellectual property laws and by international treaties. Title and related rights in the content accessed through the Product(s) are the property of the applicable content owner and are protected by applicable law. The license granted under this Agreement gives Licensee no rights to such content.
- 7. Restrictions.** Except as otherwise expressly permitted in this Agreement, Licensee may not: (i) modify or create any derivative works of any Product or documentation, including translation or localization; (ii) decompile, disassemble, reverse engineer, or otherwise attempt to derive the source code for any Product (except to the extent applicable laws specifically prohibit such restriction); (iii) redistribute, encumber, sell, rent, lease, sublicense, use the Products in a timesharing or service bureau arrangement, or otherwise transfer rights to any Product; (iv) copy any Product (except for a single archival copy which must be stored on media other than a computer hard drive) or documentation (copies shall contain all the notices regarding proprietary rights that were contained in the Product(s) originally delivered by Licensor); (v) remove or alter any trademark; logo, copyright or other proprietary notices, legends, symbols or labels in the Product(s); (vi) modify any header files or class libraries in any Product; (vii) if applicable, create or alter tables or reports relating to any database portion of the Product (except as necessary for operating the Product); (viii) publish any results of benchmark tests run on any Product to a third party without Intuicom's prior written consent; (ix) if applicable, use any database provided for use with any Product except in conjunction with the relevant Product; or (x) use any Product on a system with more CPUs than the number licensed, by more Users than have been licensed, in connection with more radio transmitters than have been licensed, or on more computers than the number licensed, as applicable.

8. Limited Warranty. Provided Licensee has paid the applicable license fees for the Product(s), for 90 days after the date that Intuicom ships the Product(s) to Licensee (the "Warranty Period"), Licensor warrants that (i) the media on which the Product is delivered will be free of defects in material and workmanship under normal use; and (ii) the unmodified Product, when properly installed and used, will substantially achieve the functionality described in the applicable documentation. THE EXPRESS WARRANTY SET FORTH HEREIN CONSTITUTES THE ONLY WARRANTY WITH RESPECT TO THE PRODUCT(S). LICENSOR AND ITS SUPPLIERS DO NOT MAKE, AND HEREBY EXCLUDE, ALL OTHER REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED (EITHER IN FACT OR BY OPERATION OF LAW) WITH RESPECT TO ANY PRODUCT OR DATA INCLUDED IN ANY PRODUCT. LICENSOR AND ITS SUPPLIERS EXPRESSLY DISCLAIM ALL WARRANTIES OF TITLE, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTIES' RIGHTS. LICENSOR AND ITS SUPPLIERS DO NOT WARRANT THAT THE PRODUCT(S) WILL MEET LICENSEE'S REQUIREMENTS OR WILL OPERATE IN THE COMBINATIONS WHICH MAY BE SELECTED BY LICENSEE OR THAT THE OPERATION OF THE PRODUCT(S) WILL BE SECURE, ERROR-FREE OR UNINTERRUPTED AND LICENSOR HEREBY DISCLAIMS ANY AND ALL LIABILITY ON ACCOUNT THEREOF. THE SECURITY MECHANISMS IMPLEMENTED BY THE PRODUCT(S) HAVE INHERENT LIMITATIONS, AND LICENSEE MUST DETERMINE THAT THE PRODUCT(S) SUFFICIENTLY MEET LICENSEE'S REQUIREMENTS. LICENSOR AND ITS SUPPLIERS SHALL HAVE NO OBLIGATIONS UNDER THE WARRANTY PROVISIONS SET FORTH HEREIN IF LICENSEE SUBJECTS THE MEDIA TO ACCIDENT OR ABUSE; ALTERS, MODIFIES OR MISUSES THE PRODUCT(S); USES THE PRODUCT(S) INCORPORATED, ATTACHED OR IN COMBINATION WITH NON-INTUICOM SOFTWARE OR ON ANY COMPUTER SYSTEM OTHER THAN THAT FOR WHICH THE PRODUCT IS INTENDED; OR LICENSEE VIOLATES THE TERMS OF THIS AGREEMENT. THE EXTENT OF LICENSOR'S DUTY UNDER THIS LIMITED WARRANTY SHALL BE THE CORRECTION OR REPLACEMENT ANY PRODUCT WHICH FAILS TO MEET THIS WARRANTY. IN THE EVENT OF A BREACH OF THIS WARRANTY, AND IF LICENSEE PROVIDES LICENSOR WITH A WRITTEN REPORT DURING THE WARRANTY PERIOD, LICENSOR WILL USE REASONABLE EFFORTS TO CORRECT OR REPLACE PROMPTLY, AT NO CHARGE TO LICENSEE, THE ERRORS OR FAILURES. THIS IS LICENSEE'S SOLE AND EXCLUSIVE REMEDY FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTIES HEREUNDER. NOTWITHSTANDING THE FOREGOING, SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF CERTAIN IMPLIED WARRANTIES; HOWEVER, THE EXCLUSIONS OF LICENSOR'S WARRANTY IN THIS LIMITED WARRANTY SECTION SHALL APPLY TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW. THIS AGREEMENT DOES NOT EXCLUDE ANY WARRANTIES THAT MAY NOT BE EXCLUDED BY LAW AND ANY LIABILITY ARISING HEREUNDER SHALL BE LIMITED TO THE CORRECTION OR REPLACEMENT OF THE APPLICABLE PRODUCT, AT LICENSOR'S OPTION.
9. Confidentiality. "Confidential Information" shall mean this Agreement, if the terms have been negotiated, pricing information, and all information a party discloses to the other which has been either (i) characterized in writing as confidential at the time of its disclosure or (ii) orally characterized as confidential at the time of disclosure, except for information which the receiving party can demonstrate: (a) is previously rightfully known to the receiving party without restriction on disclosure; (b) is or becomes, from no act or failure to act on the part of the receiving party, generally known in the relevant industry or public domain; (c) is disclosed to the receiving party by a third party as a matter of right and without restriction on disclosure; or (d) is independently developed by the receiving party without access to the Confidential Information. Each receiving party shall at all times, both during the term hereof and for a period of at least 3 years after termination, keep in confidence all such Confidential Information using a standard of care such party uses with its own information of this nature, but in no event less than reasonable care. The receiving party shall not use any Confidential Information other than in the course of its permitted activities hereunder. Without the prior written consent of the disclosing party, the receiving party shall not disclose any Confidential Information except on a "need to know" basis to an employee or contractor under binding obligations or confidentiality substantially similar to those set forth herein. If a receiving party is legally compelled to disclose any of the disclosing party's Confidential Information, then, prior to such disclosure, the receiving party will (i) assert the privileged and confidential nature of the Confidential Information and (ii) cooperate fully with the disclosing party in protecting against any such disclosure and/or obtaining a protective order narrowing the scope of such disclosure and/or use of the Confidential Information. In the event such protection is not obtained, the receiving party shall disclose the Confidential Information only to the extent necessary to comply with the applicable legal requirements.
10. Limitation of Liability. EXPECT FOR LICENSOR'S OBLIGATIONS AND LIABILITY UNDER SECTION 18 OF THIS AGREEMENT, TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, IN NO EVENT WILL LICENSOR OR ITS SUPPLIERS OR RESELLERS BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF OR INABILITY TO USE THE PRODUCT, INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OR GOODWILL, WORK STOPPAGE, COMPUTER FAILURE OR MALFUNCTION, OR ANY AND ALL OTHER COMMERCIAL DAMAGES OR LOSSES, EVEN IF ADVISED OF THE POSSIBILITY THEREOF, AND REGARDLESS OF THE LEGAL OR EQUITABLE THEORY (CONTRACT, TORT OR OTHERWISE) UPON WHICH THE CLAIM IS BASED. IN ANY CASE, LICENSOR'S ENTIRE LIABILITY UNDER ANY PROVISION OF THIS AGREEMENT SHALL NOT EXCEED IN THE AGGREGATE THE SUM OF THE LICENSE FEES LICENSEE PAID TO LICENSOR FOR THE PRODUCT GIVING RISE TO SUCH DAMAGES, NOTWITHSTANDING ANY FAILURE OF ESSENTIAL PURPOSE OF ANY LIMITED REMEDY. LICENSOR IS NOT RESPONSIBLE FOR ANY LIABILITY ARISING OUT OF CONTENT PROVIDED BY LICENSEE OR A THIRD PARTY THAT IS ACCESSED THROUGH THE PRODUCT AND/OR ANY MATERIAL LINKED THROUGH SUCH CONTENT. ANY DATA INCLUDED IN A PRODUCT UPON SHIPMENT FROM LICENSOR IS FOR TESTING USE ONLY AND LICENSOR HEREBY DISCLAIMS ANY AND ALL LIABILITY ARISING THEREFROM. THE EXTENT OF LICENSOR'S LIABILITY FOR THE LIMITED WARRANTY SECTION SHALL BE AS SET FORTH THEREIN.
11. Export Control. Licensee agrees to comply with all export laws and restrictions and regulations of any United States or foreign agency or authority, and not to export or re-export any Product or any direct product thereof in violation of any such restrictions, laws or regulations, or without all necessary approvals. As applicable, each party shall obtain and bear all expenses relating to any necessary licenses and/or exemptions with respect to its own export of the Product from the U.S. Licensee acknowledges that neither the Product nor the underlying information or technology may be downloaded or otherwise exported or re-exported (i) into Cuba, Iran, Iraq, Libya, North Korea, Sudan, Syria or any other country subject to U.S. trade sanctions covering the Product, to individuals or entities controlled by such countries, or to nationals or residents of such countries other than nationals who are lawfully admitted permanent residents of countries not subject to such sanctions; or (ii) to anyone on the U.S. Treasury Department's list of Specially Designated Nationals and Blocked Persons or the U.S. Commerce Department's Table of Denial Orders. By downloading or using the Product, Licensee represents and warrants that it complies with these conditions.
12. THE PRODUCT(S) AND ANY UNDERLYING ENCRYPTION TECHNOLOGY MAY NOT BE EXPORTED OUTSIDE THE UNITED STATES OR TO ANY FOREIGN ENTITY OR "FOREIGN PERSON" AS DEFINED BY U.S. GOVERNMENT REGULATIONS, INCLUDING WITHOUT LIMITATION, ANYONE WHO IS NOT A CITIZEN, NATIONAL OR LAWFUL PERMANENT RESIDENT OF THE UNITED STATES. BY DOWNLOADING OR USING THE SOFTWARE, LICENSEE AGREES TO THE FOREGOING AND WARRANTS THAT IT IS NOT A "FOREIGN PERSON" OR UNDER THE CONTROL OF A "FOREIGN PERSON."
13. High Risk Activities. The Product(s) are not fault-tolerant and are not designed, manufactured or intended for use or resale as on-line control equipment in hazardous environments requiring fail-safe performance, such as in the operation of nuclear facilities, aircraft navigation or communication systems, air traffic control, direct life support machines, or weapon systems, in which the failure of any Product could lead directly to death, personal injury, or severe physical or environmental damage ("High Risk Activities"). Accordingly, Licensor and its suppliers specifically disclaim any express or implied warranty of fitness for High Risk Activities. Licensee

agrees that Licensor and its suppliers will not be liable for any claims or damages arising from the use of any Product in such applications.

14. U.S. Government End Users. The Product is a "commercial item," as that term is defined in 48 C.F.R. 2.101 (Oct. 1995), consisting of "commercial computer software" and "commercial computer software documentation," as such terms are used in 48 C.F.R. 12.212 (Sept. 1995). Consistent with 48 C.F.R. 12.212 and 48 C.F.R. 227.7202-1 through 227.7202-4 (June 1995), all U.S. Government End Users acquire the Product with only those rights set forth herein.
15. Notices. Any notice required or permitted hereunder shall be in English, in writing and shall be deemed to be properly given upon the earlier of (i) actual receipt by the addressee (including facsimile or e-mail) or (ii) 5 business days after deposit in the mail, postage prepaid, when mailed by registered or certified airmail, return receipt requested, or (iii) 2 business days after being sent via private industry courier to the respective parties at the addresses set forth in the Order Form or to such other person or address as the parties may designate in a writing. Notices to Licensor shall be to the attention of the Legal Department, at Intuicom _____.
16. Miscellaneous. (a) This Agreement constitutes the entire agreement between the parties concerning the subject matter hereof and supersedes all prior and contemporaneous agreements and communications, whether oral or written, between the parties relating to the subject matter hereof, and all past courses of dealing or industry custom. The terms and conditions hereof shall prevail exclusively over any written instrument submitted by Licensee, including purchase order, and Licensee hereby disclaims any terms therein, except for terms therein relating to product description, quantity thereof, pricing therefor, shipment and delivery. (b) This Agreement may be amended only by a writing signed by an executive vice president of Intuicom and a duly authorized representative of Licensee. (c) Except to the extent applicable law, if any, provides otherwise, this Agreement shall be governed by the laws of the State of Colorado, U.S.A., excluding its conflict of law provisions. (d) Any dispute hereunder will be negotiated between the parties commencing upon written notice from one party to the other. Settlement discussions and materials will be confidential and inadmissible in any subsequent proceeding without both parties' written consent. If the dispute is not resolved by negotiation within 45 days following such notice, the parties will refer the dispute to non-binding mediation conducted by a mutually agreeable mediator, with background and experience in the computer and software industries in Boulder, Colorado (the "Venue"). The parties will share the costs of mediation. If the dispute is not resolved after 45 days of mediation, the parties will refer the dispute to binding arbitration by in the Venue. The results of any arbitration will be final and non-appealable, except that either party may petition any court of competent jurisdiction in the Venue to review any decision relating to intellectual property matters (including the scope of license rights) vacating or modifying erroneous conclusions of law or findings of fact not supported by substantial evidence. The arbitrator will render a written decision, which may be entered in and enforced by any court of competent jurisdiction, but which will have no preclusive effect in other matters involving third parties. The losing party will pay the costs of the arbitration and the reasonable legal fees and expenses of the prevailing party, as determined by the arbitrator. The parties will jointly pay arbitration costs pending a final allocation by the arbitrator. At any point in the dispute resolution process, either party may seek injunctive relief preserving the status quo pending the outcome of that process. Except as noted, the parties hereby waive any right to judicial process. The U.S. Arbitration Act rules will govern the arbitration process. Absent fraudulent concealment, neither party may raise a claim more than 3 years after it arises or any shorter period provided by applicable statutes of limitations. Notwithstanding the foregoing, Licensor reserves the right to invoke the jurisdiction of any competent court to remedy or prevent violation of any provision in the Agreement relating to payment, Intuicom Confidential Information or Intuicom intellectual property. (e) If any dispute arises under this Agreement, the prevailing party shall be reimbursed by the other party for any and all legal fees and costs associated therewith. (f) This Agreement shall not be governed by the United Nations Convention on Contracts for the International Sale of Goods. (g) If any provision in this Agreement should be held illegal or unenforceable by a court having jurisdiction, such provision shall be modified to the extent necessary to render it enforceable without losing its intent, or severed from this Agreement if no such modification is possible, and other provisions of this Agreement shall remain in full force and effect. (h) The controlling language of this Agreement is English. If Licensee has received a translation into another language, it has been provided for Licensee's convenience only. (i) A waiver by either party of any term or condition of this Agreement or any breach thereof, in any one instance, shall not waive such term or condition or any subsequent breach thereof. (j) The provisions of this Agreement which require or contemplate performance after the expiration or termination of this Agreement shall be enforceable notwithstanding said expiration or termination. (k) Licensee may not assign or otherwise transfer by operation of law or otherwise this Agreement or any rights or obligations herein without the prior express written consent of Licensor, which will not be unreasonably withheld. (l) This Agreement shall be binding upon and shall inure to the benefit of the parties, their successors and permitted assigns. (m) If applicable, this Agreement may be executed in counterparts or by facsimile, each of which shall be deemed an original, and all of which together shall constitute one and the same agreement. (n) Neither party shall be in default or be liable for any delay, failure in performance (excepting the obligation to pay) or interruption of service resulting directly or indirectly from any cause beyond its reasonable control. (o) The relationship between Licensor and Licensee is that of independent contractors and neither Licensee nor its agents shall have any authority to bind Licensor in any way. (p) Intuicom and its suppliers are direct and intended third party beneficiaries of this Agreement. (q) If any Intuicom professional services are being provided, then such professional services are provided pursuant to the terms of a separate agreement between Intuicom and Licensee. The parties acknowledge that such services are acquired independently of the Products licensed hereunder, and that provision of such services is not essential to the functionality of such Products. (r) The headings of the sections of this Agreement are used for convenience only and shall have no substantive meaning. (s) Licensor may use Licensee's name in any customer reference list or in any press release issued by Licensor regarding the licensing of the Product and/or provide Licensee's name and the names of the Products licensed by Licensee to third parties.
17. Licensee Outside the U.S. If Licensee is located outside the U.S., then the provisions of this Section shall apply. (i) If Licensee is purchasing licenses directly from Intuicom and if Intuicom and Licensee are not located in the same country, then, if any applicable law requires Licensee to withhold amounts from any payments to Intuicom hereunder Licensee shall effect such withholding, remit such amounts to the appropriate taxing authorities and promptly furnish Intuicom with tax receipts evidencing the payments of such amounts, and the sum payable by Licensee upon which the deduction or withholding is based shall be increased to the extent necessary to ensure that, after such deduction or withholding, Intuicom receives and retains, free from liability for such deduction or withholding, a net amount equal to the amount Intuicom would have received and retained absent such required deduction or withholding. (ii) Les parties aux presentes confirment leur volonte que cette convention de meme que tous les documents y compris tout avis qui s'y rattache, soient rediges en langue anglaise. (translation: "The parties confirm that this Agreement and all related documentation is and will be in the English language.") (iii) Licensee is responsible for complying with any local laws in its jurisdiction which might impact its right to import, export or use the Product(s), and Licensee represents that it has complied with any regulations or registration procedures required by applicable law to make this license enforceable.