

Wave Glider Management System™

System Administration Guide

Version 1.4

(Through WGMS Release 3.9.4)

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LIQUID ROBOTICS, INC.
1329 MOFFETT PARK DR.
SUNNYVALE, CA 94089
(650) 493-6300

LRI Part Number: 030-00481-02

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TRADEMARKS

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1. Overview

The Liquid Robotics Inc. (LRI) Wave Glider is a platform for long-duration deployment of ocean surface sensor systems. The Wave Glider Management System (WGMS) provides browser and programmatic interfaces to allow users and applications to send commands to the Wave Glider, including its payloads, and to receive data from the Wave Glider and its payloads. WGMS is easily configured to support a variety of deployment scenarios.

This manual describes the configuration and administration of WGMS with specific reference to four common deployment scenarios. Those scenarios are:

- Managing an “Organization” comprised of multiple Wave Gliders and multiple users on a copy of WGMS hosted by LRI.
- Installing and managing a customer-hosted copy of WGMS that controls multiple Wave Gliders and multiple users. Once configured, this scenario is very similar to the scenario where the WGMS instance is hosted by LRI.
- Installing and managing a “mobile to mobile” copy of WGMS. In the most common version of this scenario, a single Wave Glider is managed by a single copy of WGMS on a computer that is disconnected from the Internet and used by a small number of users.
- Configuring and managing Wave Gliders being used for payload development and bench testing. It is very common to combine this scenario with the other three.

Some interesting configuration variants are described briefly. It is recommended that you contact Liquid Robotics technical support for advice on configurations not described here.

1.1 The Wave Glider

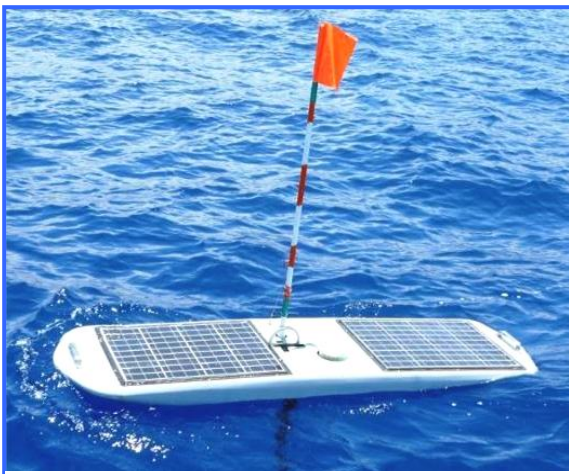


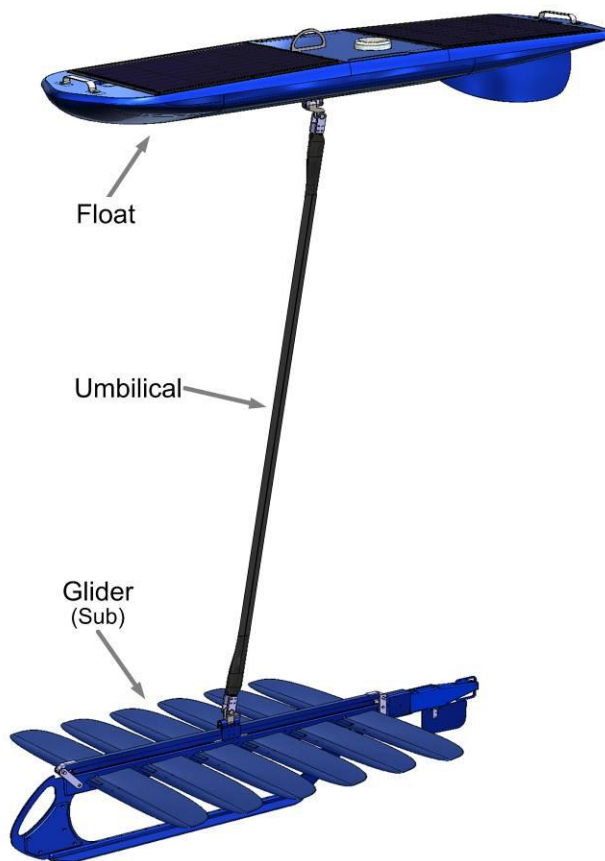
Figure 1-1: Wave Glider on Water

The Wave Glider is composed of two main parts, connected by a flexible umbilical. Figure 1-1 shows what it looks like on the surface. Figure 1-2 shows the basic components and their names.

The float rides on the surface of the water. The middle section of the float contains a command and control (C&C) dry box. That dry box contains the central command and control processor, batteries, power control and antennas for Iridium satellite and XBee communications. In general the C&C dry box contains no customer modifiable components.

The glider provides propulsion by harnessing power from wave action. Steering is provided by an electronically controlled rudder on the glider. The glider is connected to the float via a flexible, high-strength umbilical.

Power and communications interfaces are provided to the fore and aft payload boxes (underneath the solar panels) and to the glider. Additional interfaces are provided through connectors on the top of the C&C dry box.



The payload flexibility, long mission capability and the fact that data and commands may be exchanged with shore-based applications in near real-time makes the Wave Glider suitable for a wide variety of missions. A central consideration for the system administrator is to accommodate that variety of missions.

Figure 1-2: Wave Glider Vehicle Main Components

1.2 Wave Glider Instrumentation and Communications

Figure 1-3 below shows the general configuration of the payload and communications on the Wave Glider. In most cases a system administrator would not need to know the details of this architecture. However, certain administrative tasks refer to some of the illustrated components, so the figure is provided for reference.

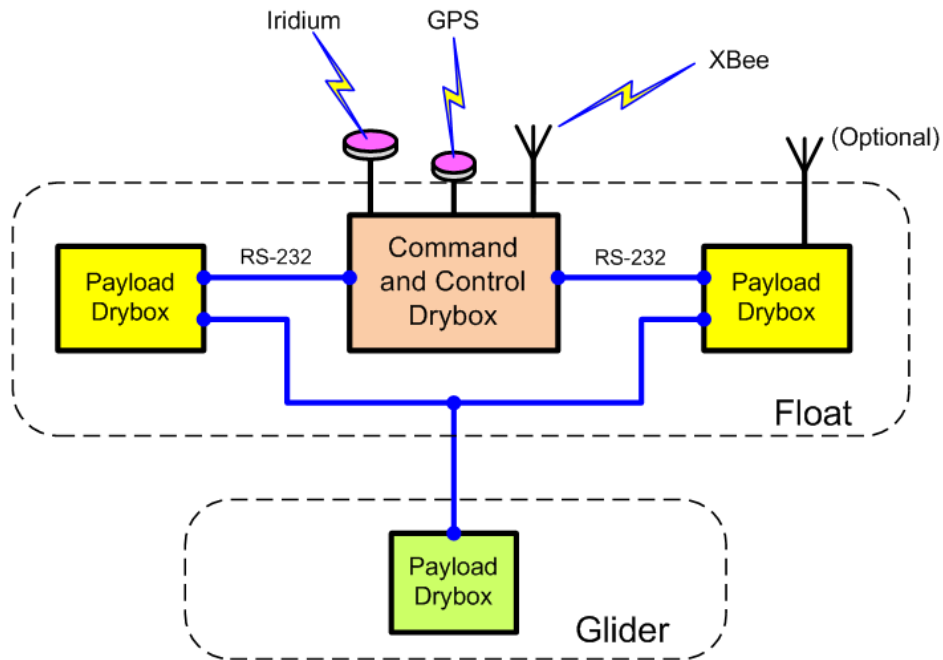


Figure 1-3: Wave Glider Vehicle Components

Note the following in the figure:

- The Command and Control Computer communicates directly with the external world via either Iridium Communications, Inc. satellite or via XBee (IEEE 802.15.4).
- The Command and Control Computer can communicate indirectly through payload-based communications equipment.
- The Command and Control (C&C) Computer communicates with the payloads via RS232 links.

1.3 WGMS Components

Figure 1-4 illustrates the full WGMS configuration, indicating all communications, routing and processing options. Specific deployments, such as payload development or mobile-to-mobile solutions, typically will use a subset of the modules represented by the illustration.

In the figure, circles represent software modules. Blue circles indicate LRI-supplied components which may be customer or user configurable. Crosshatched circles represent user-modifiable or user-generated components. WGMS components communicate with each other via TCP/IP and may or may not be resident on the same computer.

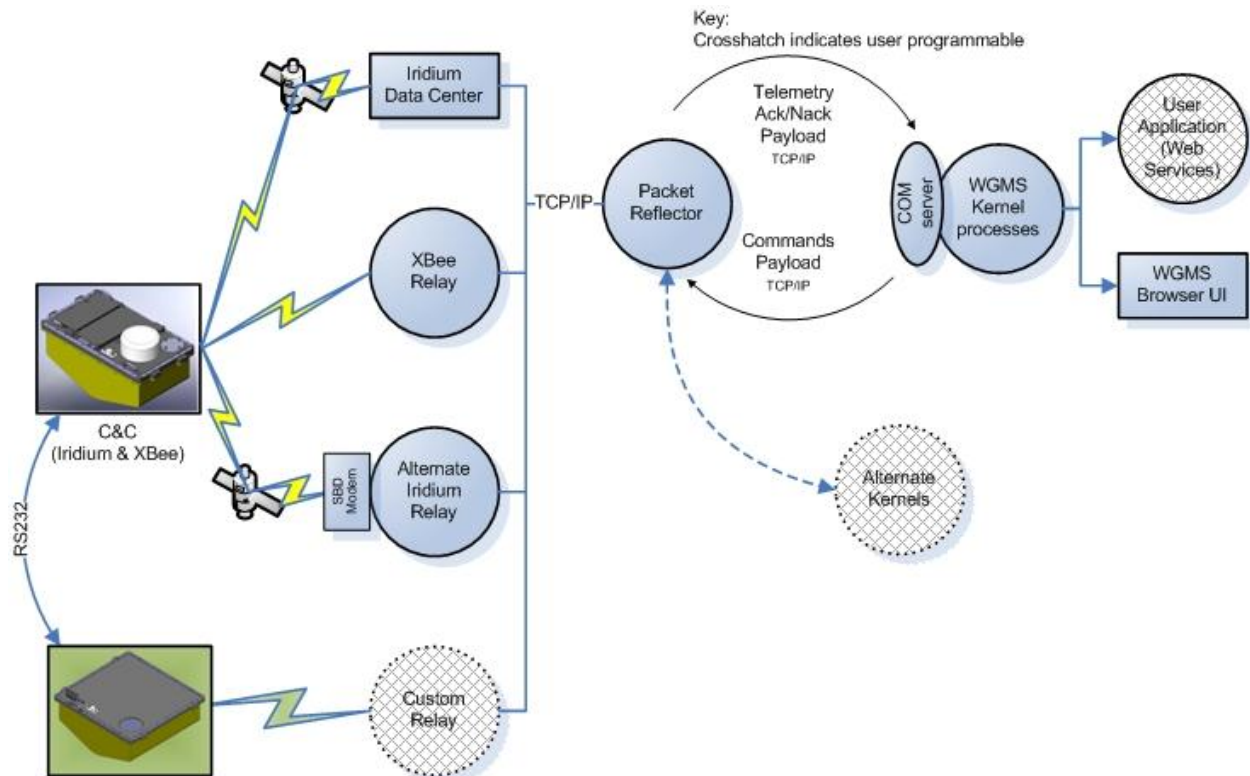


Figure 1-4: Wave Glider Management System Components

For most applications, commands are sent from a browser UI or a customer-provided application to the WGMS Kernel. The Kernel performs authentication, authorization and validation checks on the request. Once approved, it passes the command in an internal format to the Packet Reflector to be forwarded to the Wave Glider. The Packet Reflector forwards the command to the Wave Glider resident Command and Control software (C&C) via the indicated communications channel (relay). The Relay manages the details of the underlying communications technology. Depending on the addressing on the command, the C&C either executes the command locally or forwards it to a payload for processing.

Data such as telemetry is returned from the Wave Glider through a similar mechanism. It is sent to the appropriate Relay (when on mission, typically the Iridium Server) which forwards it to the appropriate Packet Reflector. The Packet Reflector performs validations and some protocol processing and then forwards the data to one or more WGMS Kernels, based on configuration. The WGMS Kernel stores the data in its database for later use.

The Components of the WGMS are as follows:

Iridium Server – For most deployed Wave Gliders the primary mode of communications is through the use of Short Burst Data (SBD) packets sent via the Iridium satellite constellation through the Internet to the Packet Reflector. The Iridium Server is actually a group of servers maintained by Iridium Communications, Inc. The Iridium modem on the Wave Glider must be specifically provisioned to communicate with the Packet Reflector through this communications channel.

Communications Relays (XBee, Alternate Iridium, Custom) – It is sometimes beneficial to communicate with the Wave Glider through means other than the primary Iridium/DirectIP/SBD path. Considerations include bandwidth, cost, latency, privacy, security and distance. For example, in a payload development scenario the Wave Glider's Iridium satellite antenna might be unable to see the sky, necessitating an alternate way of communicating.

Relays mask the variations between the underlying communications technologies from the Packet Reflector. Specific duties may include fragmenting and reassembling packets, managing queues and driving the physical interface. For example, the XBee Relay requires that it have serial access to an XBee dongle, and XBee packets are limited to 100 bytes. Custom Communications Relays may be developed by customers and third parties. They need not reside on the same computer as the Packet Reflector or WGMS kernel.

Packet Reflector – A Packet Reflector routes traffic between one or more Kernels and one or more Relays, including associated protocol processing. The Packet Reflector uses TCP/IP for all communications with other processes.

WGMS COM Server – The COM Server interfaces between the Packet Reflector and the kernel WGMS server application. It communicates with the kernel via Web Services.

WGMS Kernel Processes – These include the WGMS Kernel and the database server. WGMS also uses email for sending alarms to users, so the host system must have the ability to send email. Primary services include filters for access control, data consistency and concurrency management. Communications with application programs is through Web Services technologies. Communications with browsers rely on standard HTML and JavaScript. WGMS relies on Microsoft SQL Server, which may need to be configured for your specific scenario.

Browser UI – This is the dashboard UI for managing the Wave Glider. Communications with browsers use standard HTML and JavaScript over a mix of HTTP and HTTPS. No additional configuration is required for browser access.

User Application – The WGMS Kernel can be accessed by a non-LRI application using Web Services (SOAP 1.1 or SOAP 1.2) calls over HTTPS. Authentication and authorization are the same as for browser-based access. No additional configuration is required for Web Services access.

1.4 Configuring WGMS for Common Scenarios

This section describes the considerations and configuration steps necessary to support the four most common deployment scenarios. Your specific usage may require combining more than one scenario. For example, you might run a private shared copy of WGMS that must support both payload developers and Wave Gliders deployed on a mission. LRI support would be pleased to advise you on configuration options specific to your needs.

1.4.1 LRI-Hosted Shared WGMS

One popular deployment option is to let LRI manage the hosting of WGMS on your behalf. The WGMS software is deployed on redundant, high performance servers in a secure, high availability data center. LRI Operations staff configures the system for you and administers your system and Wave Gliders on a 24x7 basis. Figure 1-5 illustrates that deployment option.

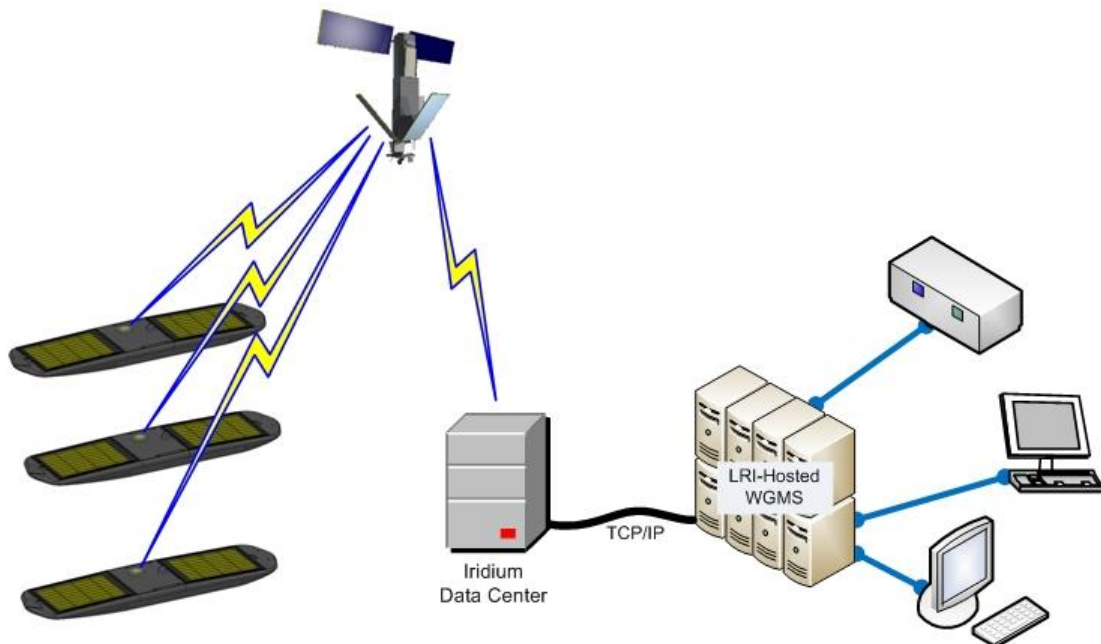


Figure 1-5: LRI-Hosted Shared WGMS

With the hosted service option you are allocated a private domain name, of the form <name>.liquidr.com, to be shared by all of your users and Wave Gliders. Your users log in to this domain to manage the Wave Gliders associated with the domain. The private domain is known in WGMS as an “Organization” or “Org”. Since authentication credentials and permissions are managed on a per-Org basis, you can be confident that you control who has access to your Wave Gliders and what privileges they have been granted.

With the LRI-hosted WGMS deployment scenario, LRI Operations handles all of the configuration details on your behalf. In general, communications are via the commercial Iridium satellite constellation. You continue to have operational control of your Wave Gliders, backed up by LRI's professional operations team. The typical communications flow is illustrated in Figure 1-6.

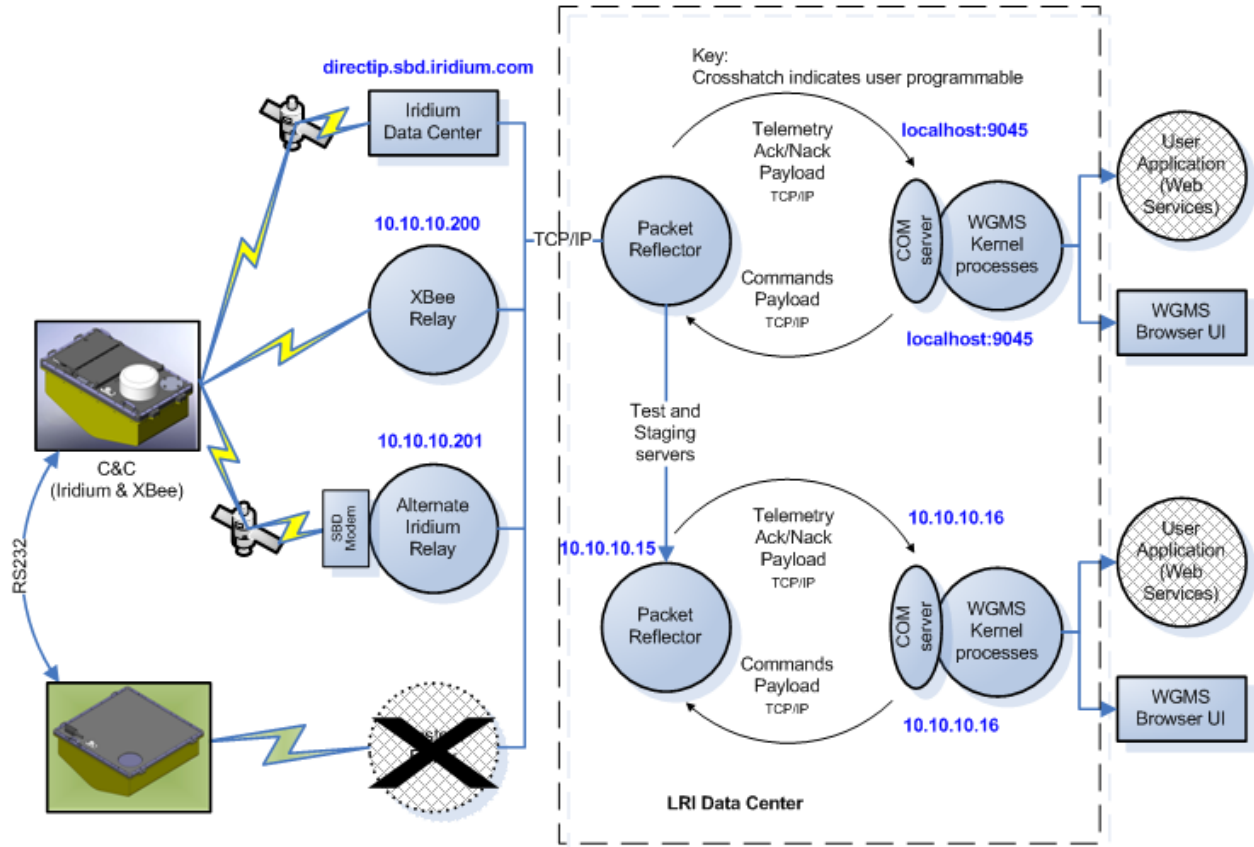


Figure 1-6: Wave Glider Deployed with LRI-hosted WGMS

1.4.2 Customer-hosted (Self-hosted) Shared WGMS

You can license WGMS for hosting on your own servers inside your own network. Common reasons for choosing this option include the gaining the ability to directly control physical security, better control over performance parameters or the need to tightly integrate WGMS services with other aspects of your operation.

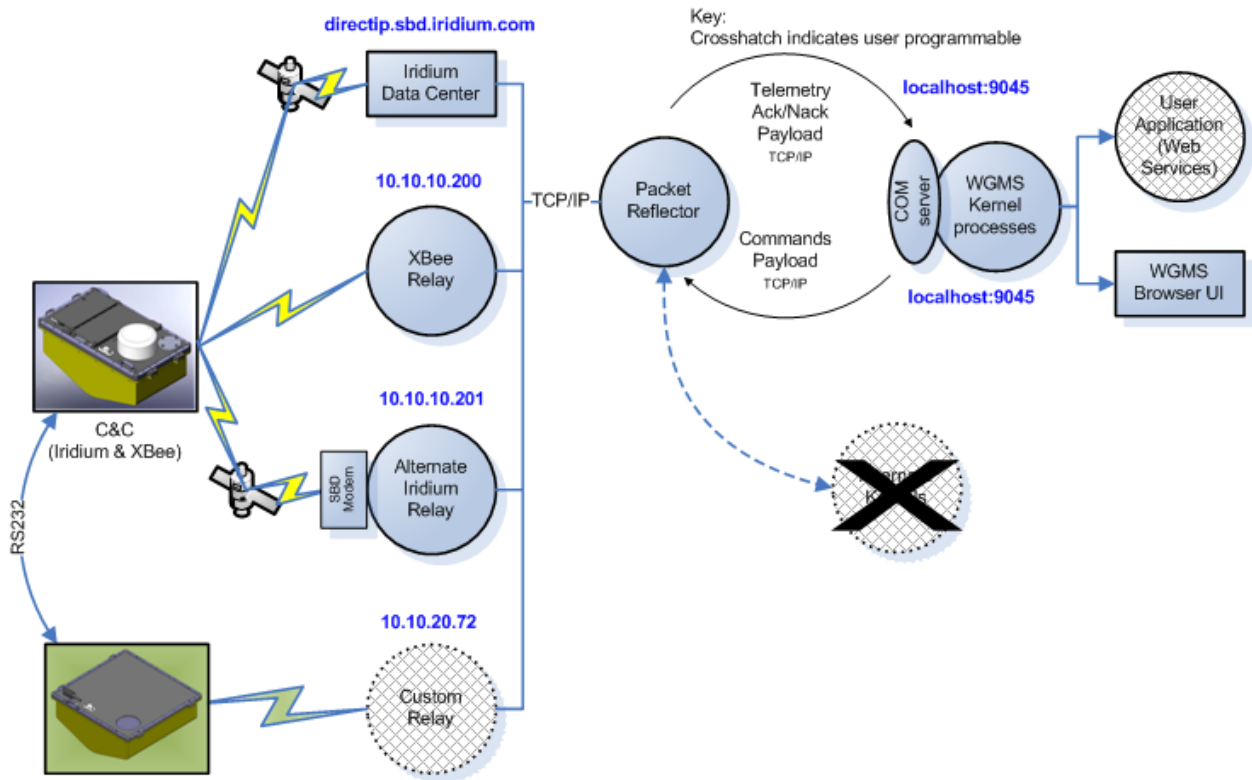


Figure 1-7: Self-Hosted Shared WGMS

The communications flow is very similar to that of the LRI-hosted Shared WGMS, as illustrated in Figure 1-6. However, the configuration steps are more extensive. Key administrative tasks include:

- Arrange for Iridium DirectIP service. Note that US Department of Defense customers may use the EMSS Iridium SBD service, which provides equivalent functionality.
- Configure a computer with the Microsoft technologies appropriate for your use. The operating system may be any of XP, Vista, Windows 7, Server 2003, Server 2008 and Server 2008 R2. You also need an appropriate version of Microsoft SQL Server 2008. The system has been tested with SQL Server 2008 Enterprise and SQL Server 2008 Express. It is likely that other versions of SQL Server will work as well.
- Install WGMS. This step is described in detail in chapter 2, “WGMS Installation Procedure”, including prerequisites, such as obtaining and installing an SSL certificate and a Google API key.
- Configure the Packet Reflector with the appropriate IP addresses and port numbers. This is discussed in chapter 3, “Configuring a Packet Reflector”.
- Provision Wave Gliders. This is discussed in the *User Manual*, LRI part number 030-00025-02.
- Add Users. This is discussed in chapter 6, “Administrative Tasks”.

1.4.3 Mobile-to-Mobile Deployment

The primary application for the Mobile-to-Mobile configuration is to support Wave Glider deployments when Internet access is inconvenient or expensive, such as on board a ship. Although the Iridium satellite network is still used, the messages pass directly between the Iridium modem on the Wave Glider and a paired Iridium modem that is directly connected to a local computer, such as a laptop, known as the “M2M host”. This obviates the need for Internet access. This configuration is illustrated in Figure 1-8.

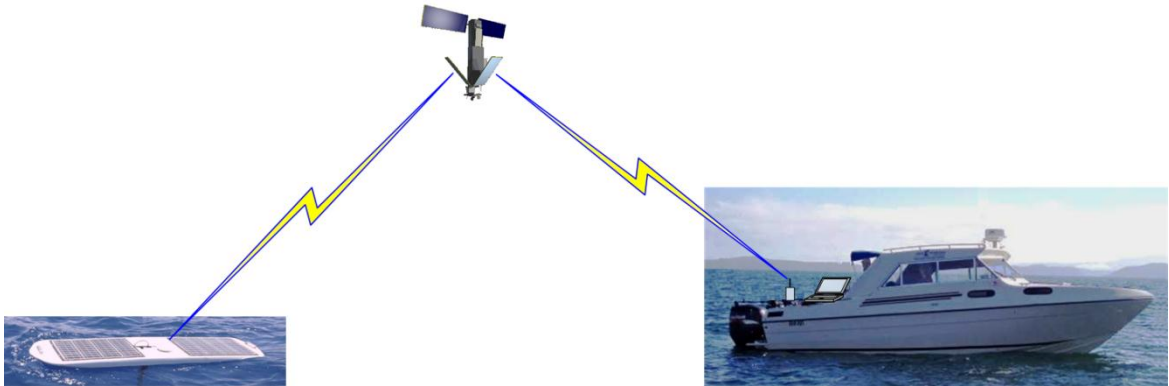


Figure 1-8: Mobile-to-Mobile Deployment

For Mobile-to-Mobile, the entire WGMS stack is present on the M2M host. Communications between WGMS elements are still via TCP/IP, using an internal networking capability. Although elements of the mobile-to-mobile stack can connect over the Internet to other Packet Reflectors and other Internet-based services, it also can run completely independent of the Internet. Note that one consequence of this is that Internet-based services, such as email and Google Maps, may be unavailable.

Iridium communications in the Mobile to Mobile scenario use an Iridium Communications protocol called ISU-ISU, illustrated in Figure 1-9. (ISU is an abbreviation for Iridium Subscriber Unit.)

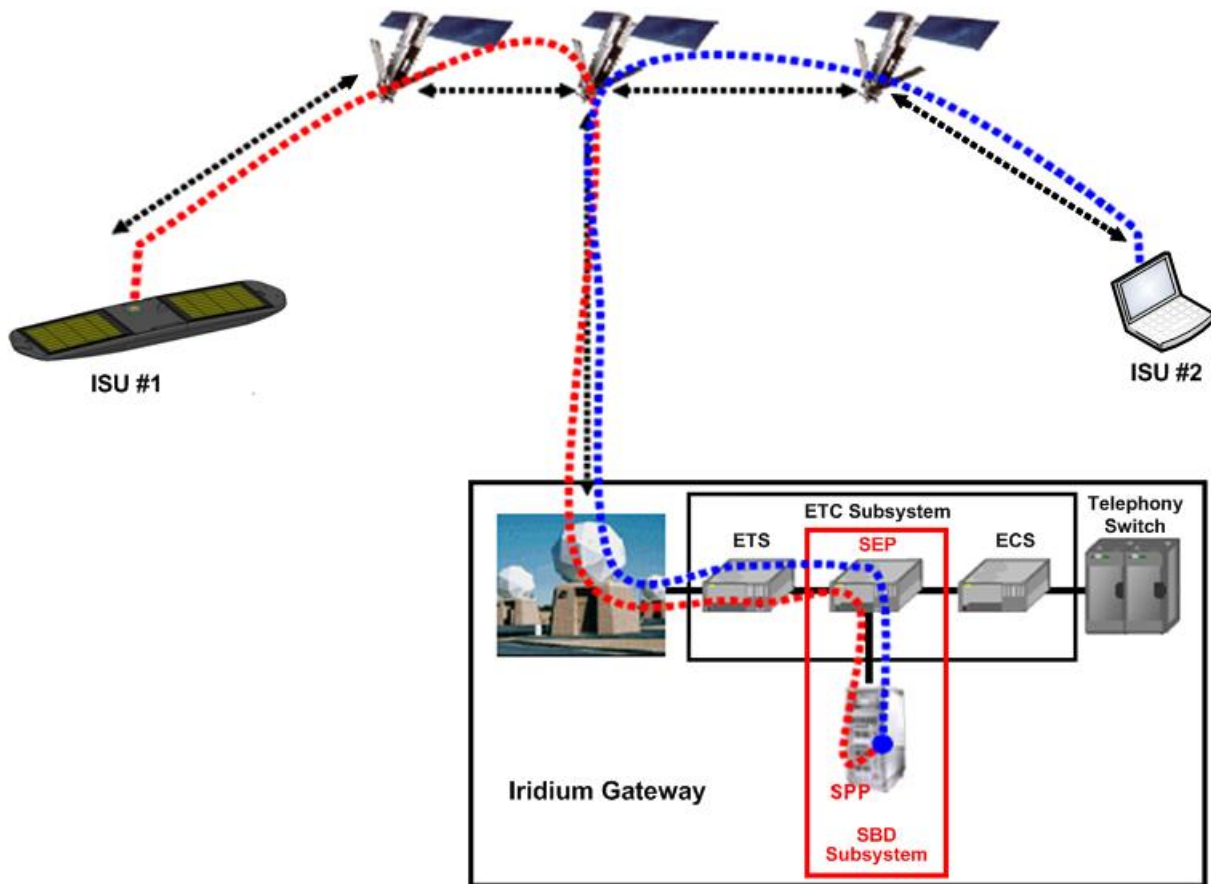


Figure 1-9: Iridium Communications Corp ISU-ISU

As illustrated above, the ISU-ISU protocol is very similar to the DirectIP protocol except that the sent messages are queued in servers in the Iridium data center until the second modem requests them.

In mobile-to-mobile, the paired Iridium modem is connected to the M2M host computer via a serial interface. Messages from the Wave Glider go up to the Iridium satellite, back down to the local Iridium modem, through the serial interface to the Alternate Iridium Relay. This relay reformats the messages before passing them on to the M2M host's Packet Reflector, which then forwards the message to the M2M host's WGMS Kernel and local database. A web server runs on the M2M host and is accessed by a browser on the M2M host. As with other versions of WGMS, application programs can interact with the WGMS Kernel through Web Services interfaces even though they run on the same computer.

The communications architecture is illustrated by Figure 1-10.

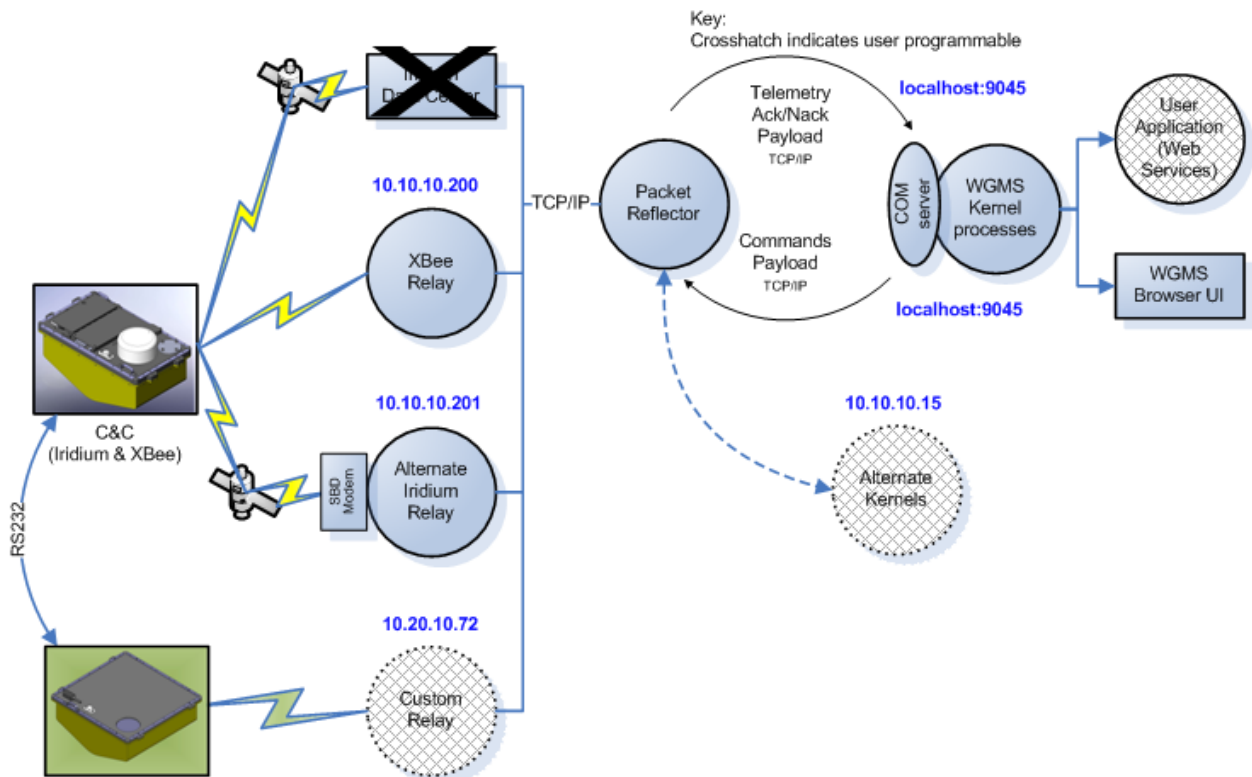


Figure 1-10: Mobile-to-Mobile Communications

Key administrative tasks for Mobile-to-Mobile include:

- Install WGMS. This step is described in detail in chapter 2, “WGMS Installation Procedure”, including prerequisites.
- Configure the Packet Reflector with the appropriate IP addresses and port numbers. This is discussed in chapter 3, “Configuring a Packet Reflector”.
- Arrange for Iridium service. Note that the modems must be specifically provisioned for this deployment scenario and that they must be re-provisioned to be used for the other deployment scenarios.
- Configure the Alternate Iridium Relay, as discussed in chapter 5, “Configuring an Alternate Iridium Relay”.
- Provision Wave Gliders. This is discussed in the *User Manual*, LRI part number 030-00025-02. In the Mobile-to-Mobile use case it is uncommon for the WGMS instance to support more than one Wave Glider, although it is technically feasible. Please contact LRI support if you need help configuring a Mobile-to-Mobile instance to support more than one Wave Glider.
- Add Users. This is discussed in chapter 6, “Administrative Tasks”.

1.4.4 Payload Development and Shore-Side Testing Using XBee

A common workflow is to develop and test a payload in a development lab, then launch the integrated vehicle on its mission. The recommended way to do this is to combine usage of an XBee modem and Iridium services. This use case usually is combined with one of the previous three use cases – LRI hosted, self-hosted and mobile-to-mobile.

For a Wave Glider on an offshore mission, the only practical means of communications is via satellite, typically the Iridium Communications Inc. constellation. This works well due to the unobstructed view of the sky from the surface of the sea. However, during payload development and pre-mission testing the use of satellite communications is inconvenient because the Wave Glider typically is indoors. In addition, satellite bandwidth is expensive and slow in comparison to other technologies.

To meet this need, the Wave Glider C&C is equipped with an XBee modem. XBee is a low power, medium range, medium speed wireless point-to-point networking protocol based on IEEE 802.15.4. A nearby computer can be equipped with an XBee modem which communicates through a serial port with the LRI-provided XBee Relay. That Relay then communicates with a Packet Reflector in the manner described in the introduction to this chapter. This scenario is illustrated by Figure 1-11, XBee for Local Communications.

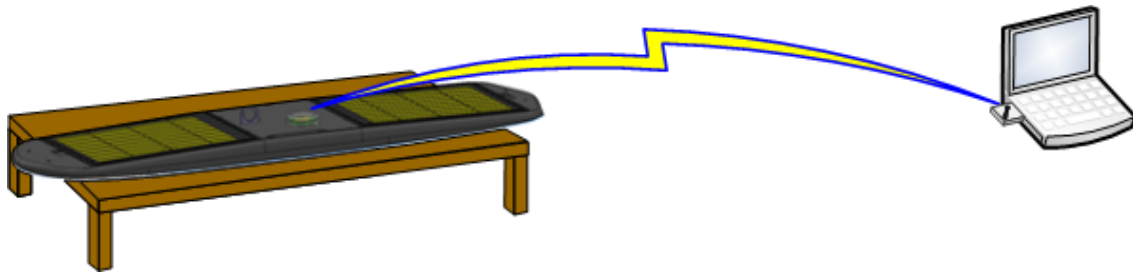


Figure 1-11: XBee for Local Communications

The communications flow is illustrated below by Figure 1-12, XBee Communications.

To use the XBee Relay, you must install the XBee Relay software on a computer with access to an XBee modem that is within range of the XBee modem on the Wave Glider. Depending on conditions, this typically requires that the two modems be within a few hundred meters of each other. Once the software is installed, the Relay must be paired with a Packet Reflector for the host WGMS. That host WGMS may be local, as in the case of Mobile-to-Mobile, or remote, as in the case of a customer or LRI-hosted WGMS service. Pairing consists of setting IP addresses and ports appropriately on both sides. In the case of the LRI-hosted WGMS there are additional administrative tasks to meet security and other operational requirements. Once the relay is configured, a Wave Glider may be managed through either or both the Iridium and XBee communications channels.

A common scenario is the pre-launch checkout of a Wave Glider. LRI provides a suggested checklist (ref. Appendix B), but it is likely that a customer with a custom payload will extend that checklist to confirm the correct operation of the payload. Many of these checks can be performed using the XBee relay, although we recommend that the Iridium channel also be exercised prior to launch.

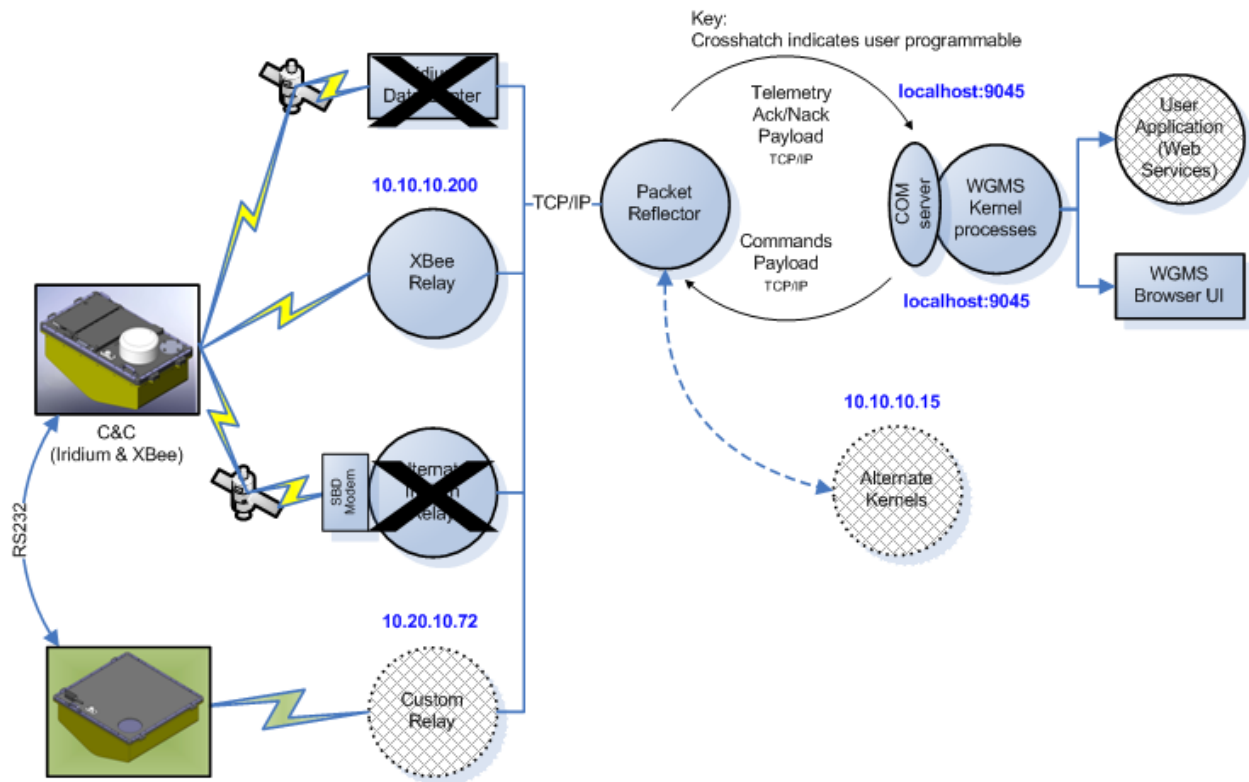


Figure 1-12: XBee Communications

For the XBee Communications scenario, the principal administrative tasks include:

- Obtain an XBee modem (dongle). This is described in section 4.2, “XBee Hardware”.
- Install the XBee Relay on the computer that hosts the XBee modem. This step is described in section 4.4, “XBee Software Configuration”.
- Configure the XBee Relay. This is described in chapter 4, “Configuring an XBee Relay”.
- Configure the target Packet Reflector with the appropriate IP addresses and port numbers. This is discussed in chapter 3, “Configuring a Packet Reflector”. It may also require collaboration with the system administrator for the system that hosts the Packet Reflector.
- Provision Wave Gliders. This is discussed in the *User Manual*, LRI part number 030-00025-02. All Wave Gliders must be configured prior to attempting to use them with WGMS, even if the hardware is not intended to be sent on a mission.
- Add Users. This is discussed in chapter 6, “Administrative Tasks”.

1.4.5 WGMS Variations

The WGMS architecture supports a number of other less common usage scenarios. Two are mentioned briefly here. Please contact LRI Support for advice on configuring your system if you encounter one of these or another that is not mentioned.

1.4.5.1 Customized Relay

It is possible for customers to implement their own Relay to supplement or replace an LRI supplied Relay. There are two circumstances where this might be desirable:

- 1) You wish to support a communications protocol other than XBee or Iridium, such as 802.11 or BGAN. In this case, you will need to implement the hardware and software stack on the Wave Glider side via a Payload Interface Board (PIB) in one of the customer-accessible dry boxes. You also will need to supply the shore-side hardware and software stack and implement a custom Relay to interface between that stack and the Packet Reflector.
- 2) You wish to monitor traffic between the Wave Glider and the Packet Reflector. For example, you could use this to inspect payload-specific packets in near real-time rather than waiting for them to be delivered through WGMS and Web Services.

1.4.5.2 Multiple Copies of WGMS

A Packet Reflector is so named because it can forward a copy of a packet inbound from a Wave Glider to other Packet Reflectors. This allows multiple instances of WGMS to see the same Wave Glider telemetry. This can be useful in large-scale testing environments.

2. WGMS Installation Procedure

2.1 Installation Kit Components

The WGMS Installer is delivered on a single CD. It includes:

- Automated Installations of certain required Microsoft technologies
- Installation of WGMS Communications Services (Packet Reflector and Comm Server)
- Installation of the WGMS Web Application
- Installation of the WGMS Database

2.2 Installation Prerequisites

Operating System: Windows 7 or Server 2008 R2. **Note that Windows XP and Windows Server 2003 are no longer supported by the automated installer. Please contact customer support if you need to install on or update an XP-based system.**

SQL Server: A version of SQL Server 2008 is required. The specific version should be selected based on your specific application needs, such as number of CPUs and concurrent users. The system has been tested on SQL Server Enterprise, Standard, Developer, and Express. Other versions are believed to be software compatible.

Google API Key: Use of Google Maps (ref. 6.3.3) requires a Google Maps API Key. However, use of Google Maps is optional, in which case you may ignore the Google API Key requirement.

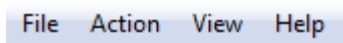
Iridium Short Burst Data Subscription (Optional): A Wave Glider can communicate with shore-based software through a variety of communications protocols. The most common protocol for Wave Gliders on a mission is the Iridium Communications Short Burst Data protocol. The deployment of a self-hosted system that requires this capability will require prior arrangement with Iridium Communications Inc. This is not required if you do not anticipate needing satellite communications.

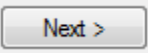
IIS WMI Provider: The IIS WMI Provider is automatically installed as part of IIS on Windows Server 2003. On Windows 7, Windows Server 2008, and Windows Server 2008 R2, it can be installed via the following procedure:

- 1) Open the Control Panel and go to Programs and Features
- 2) Select "Turn Windows features on or off" on the left hand side
- 3) In the Tree view, check IIS 6 WMI Compatibility under Internet Information Services->Web Management Tools->IIS 6 Management Compatibility

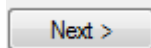
Serial Port: the Comm Server requires that at least one serial port be present on the host system. A virtual serial port can be installed via the following procedure:

- 1) For Windows 7, Windows Server 2008, and Windows Server 2008 R2:
 - a) Open the Control Panel and go to Device Manager
 - b) Open the Action Menu and select "Add Legacy Hardware"



- c) On the opening screen of the Add Hardware Wizard, click .

- d) Select “Install the hardware that I manually select from a list (Advanced)” and then click

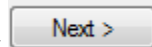


again.

What do you want the wizard to do?

- ☐ Search for and install the hardware automatically (Recommended)
- ☒ Install the hardware that I manually select from a list (Advanced)

- e) In the list of Hardware Devices, select Ports (COM & LPT) and click



- f) For Manufacturer, select (Standard port types) and for Model select Communications

Port and then click

Manufacturer	Model
(Standard port types)	Communications Port
Hewlett Packard	ECP Printer Port
Microsoft	Multipoint Communications Port
	Printer Port

Next >

- g) Click again to start installing the port.
- h) The installer will report that the device is not functioning correctly, due to it not being able to connect to a physical device. This can be ignored. The Comm Server should now work.

2) In Windows Server 2003:

- a) Download com0com (available here: <http://sourceforge.net/projects/com0com/files/com0com/2.2.2.0/com0com-2.2.2.0-i386-fre.zip/download>)

- b) Open the archive and extract it
- c) Open the folder extracted and run setup.exe

- d) Click to start the wizard

- e) Click to accept the license agreement and proceed.

- f) Make sure you have the CNCA0<->CNCB0 feature selected and click .

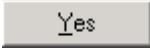
☒	com0com
☒	Start Menu Shortcuts
☒	CNCA0<->CNCB0

- g) Select a destination and click .

- h) The installer will prompt you to accept a test-signed driver. Select yes to accept.

- i) Click and then to complete the installation process.

- j) Now go to the Control Panel and open up Device Manager

- k) There should be two devices listed with an error: Port CNCA0 and Port CNCB0.
- l) Right click on CNCA0 and select Update Driver
- m) Select anything for the Windows update option and click .
- n) Select Install the software automatically and click 
 - ☒ Install the software automatically (Recommended)
 - ☐ Install from a list or specific location (Advanced)
- o) It will prompt you about a signing issue. Select  to install the driver.
- p) Click  to finish the installation.
- q) Repeat this process for CNCB0.
- r) The Comm Server should now be functional.

2.3 High Level Installation Sequence

- 1) Log in as a user with administrator privileges
 - 2) Install SQL Server if necessary. Add the current user as a database administrator.
 - 3) Install IIS if necessary.
 - 5) Run the WGMS installer. This installs the WGMS kernel, initializes the database, installs the COM Server and installs the Packet Reflector.
 - 6) Validate the installation
 - 7) Configure the COM Server
 - 8) Configure the Packet Reflector
- Installation and configuration of the XBee Relay and Alternate Iridium Relay are optional and described in other chapters.

2.4 Install IIS

Install IIS if not already installed on the computer. Navigate to **Control Panel > Add/Remove Software > Add/Remove Windows Components**. Check the box for **Internet Information Services**, click the **Next** button and follow the instructions.

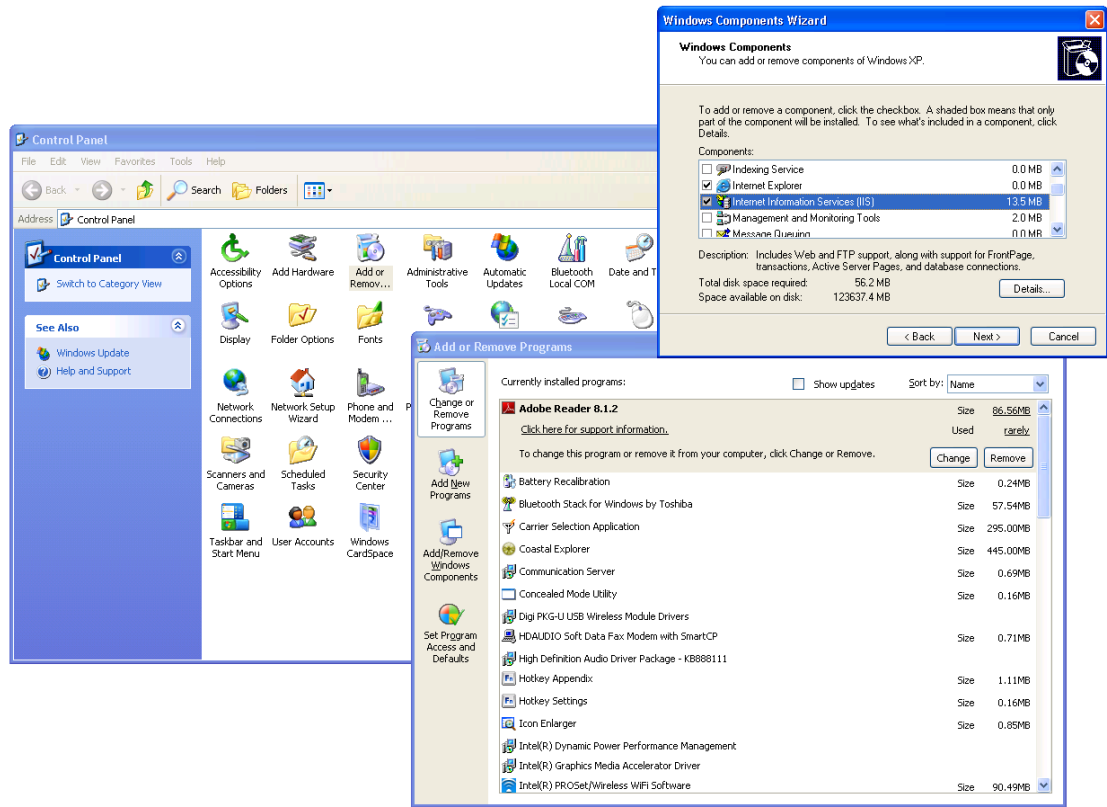


Figure 2-1: Navigating to Internet Information Services

2.5 WGMS Installation Procedure

The Software installation process follows a pattern familiar to all users who have installed software on a Windows system. To launch, insert the CD in the drive.

On the installation CD, execute the setup.exe program by right clicking on it and selecting “Run this program as an Administrator.”

2.5.1 Installation Preparation Dialog

The following dialog is displayed initially when setup.exe is launched.

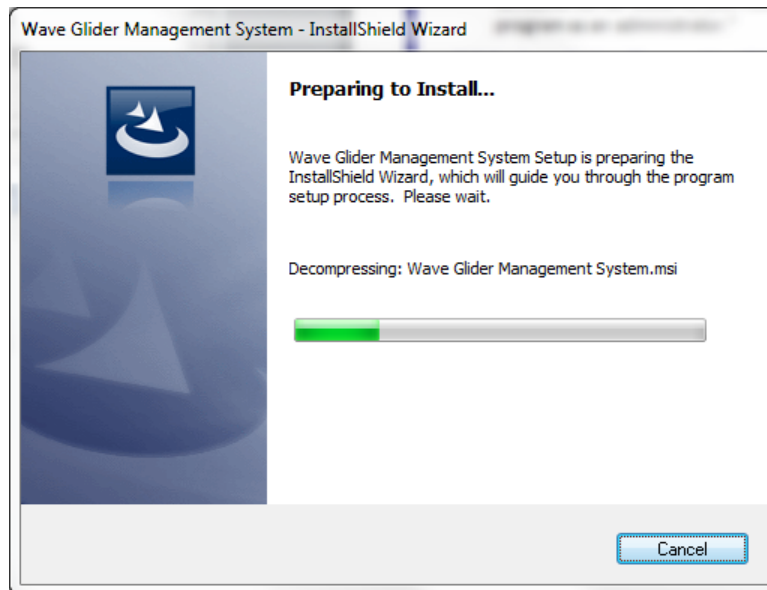


Figure 2-2 - Preparing to Install Dialog

2.5.2 Installation Welcome Dialog

The Install Welcome dialog is the next dialog when setup is launched for the first time.

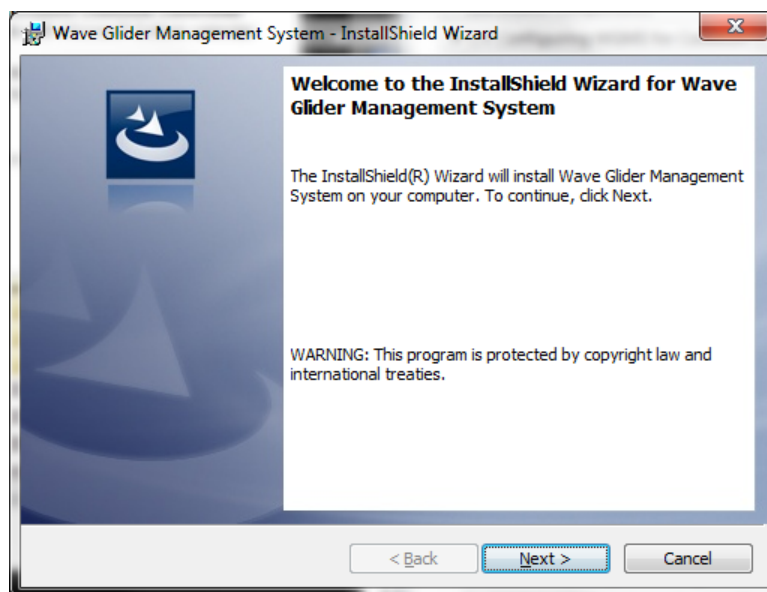


Figure 2-3: Install Welcome Dialog

2.5.3 License Agreement Dialog

The next dialog is the License Agreement Dialog, as shown in Figure 2-4. Read the entire agreement. If you agree, click the “I accept the terms in the license agreement” radio button. Then click the **Next** button.

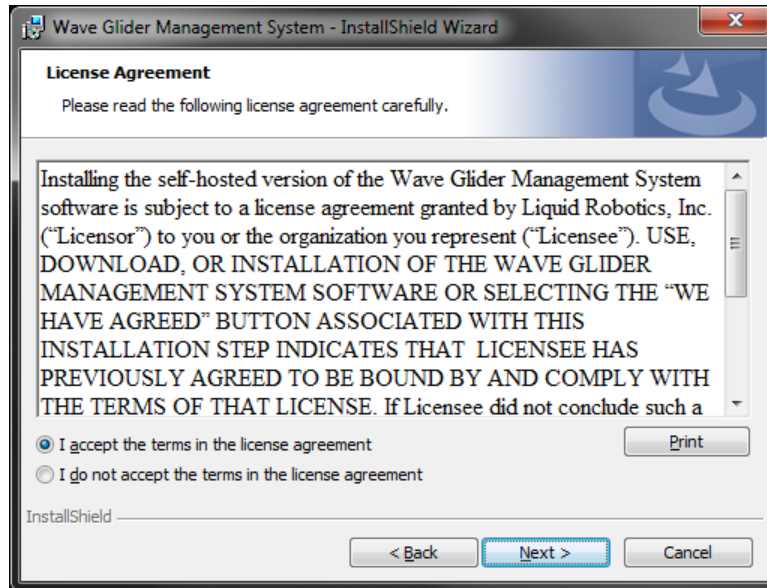


Figure 2-4: WGMS License Agreement Dialog

2.5.4 Customer Information Dialog

After agreeing to the License, enter the name of the user installing WGMS and the name of the installing Organization in the dialog box shown in Figure 2-5. These boxes are typically automatically populated.

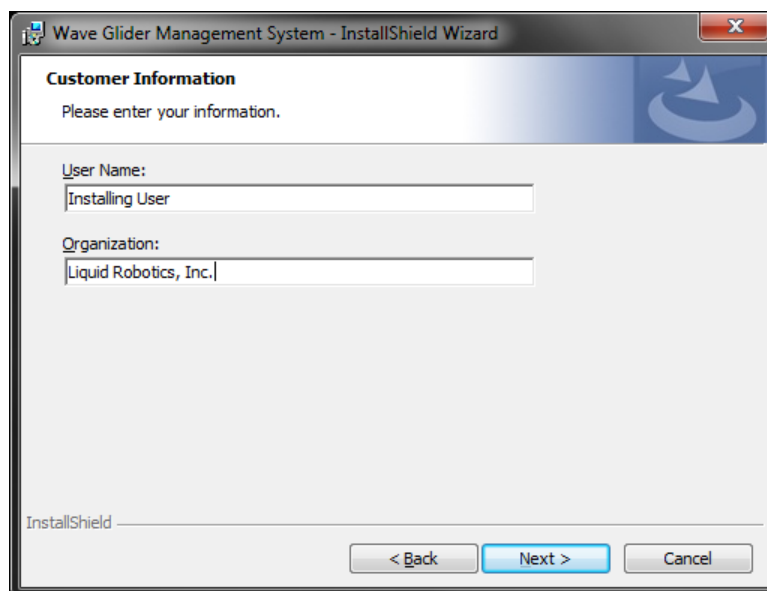


Figure 2-5 - Customer Information Dialog

2.5.5 Select Setup Type

Choose between doing a complete installation or a custom setup in the dialog shown in Figure 2-6. A custom setup lets you choose which features to install.

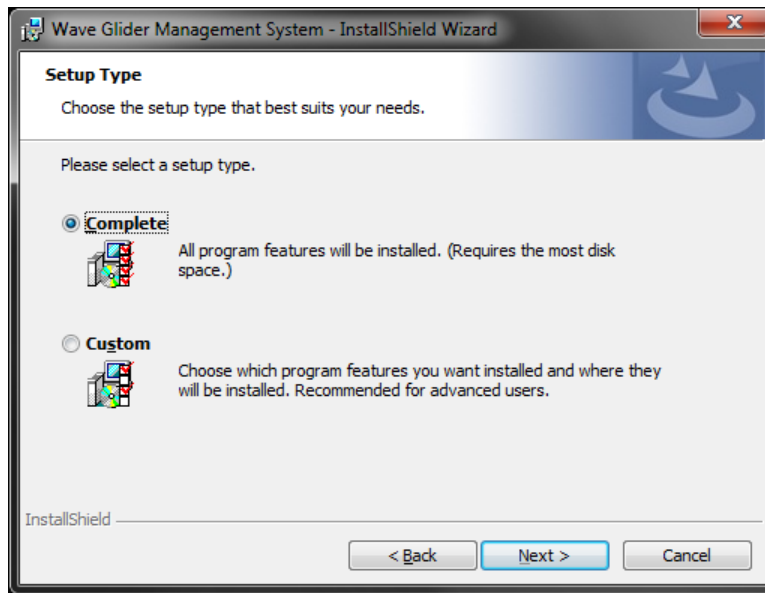


Figure 2-6 - Setup Type Dialog

The Complete setup option installs the Packet Reflector, the Comm Server, the Web Application, and the database. If you select Complete, skip the next step and proceed to Section 2.5.7. Otherwise, continue reading.

2.5.6 Custom Setup

Choose which features you wish to install. The Communications Services feature installs the Packet Reflector and Comm Server. The Web App feature installs the WGMS Web App. The Database feature sets up the WGMS Database on a database server.

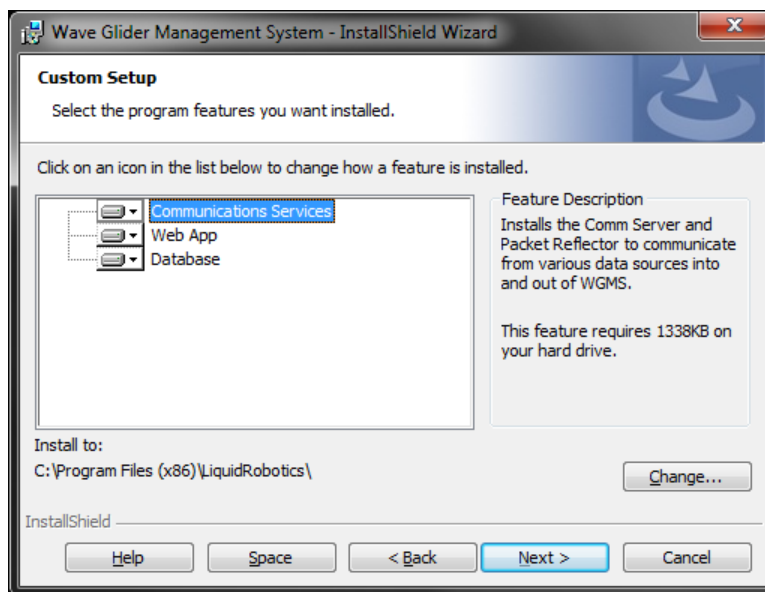


Figure 2-7 - Custom Setup Dialog

2.5.7 Database Server

Enter the connection information for your database server as shown in Figure 2-8. This is required for both the Web App and Database features. Any existing database catalog will work, but do not use liquidrobotics as the catalog name.

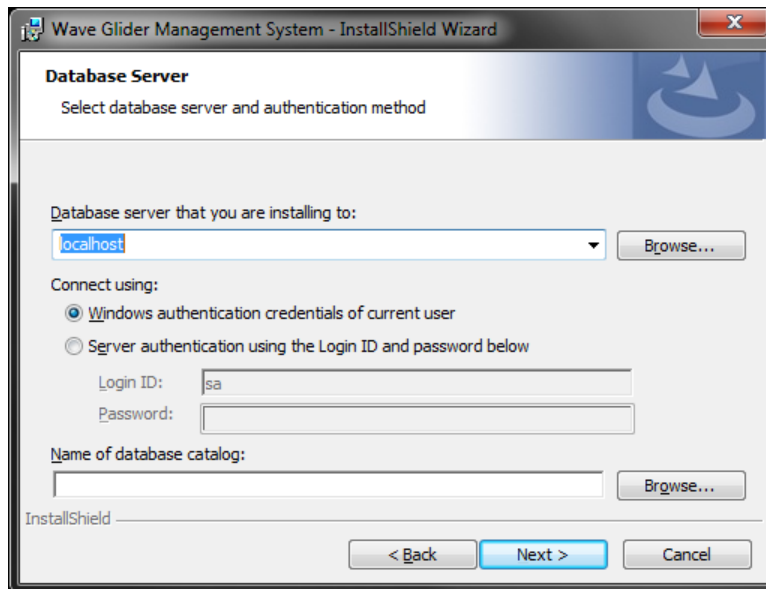


Figure 2-8 - Database Server Dialog

2.5.8 Configure IIS User

If the Web Application is being installed, enter the account information for the user that IIS will impersonate, as shown in Figure 2-9. This information is used to connect to the database. It is currently restricted to local computer accounts only. Entering a domain account here will cause the installer to fail.

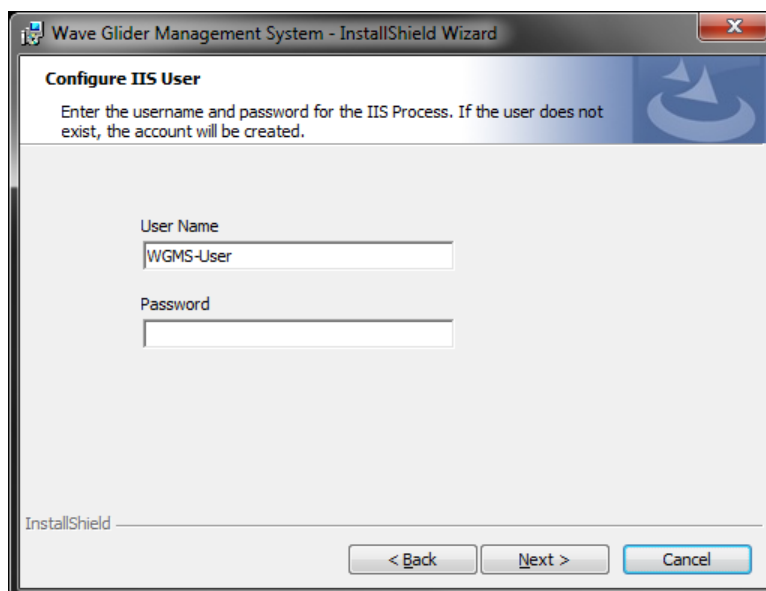


Figure 2-9 - Configure IIS User

2.5.9 Ready to Install the Program

The configuration of the installation has been completed. Click the install button on the dialog box shown in Figure 2-10. The Installer will proceed to install all the features requested.

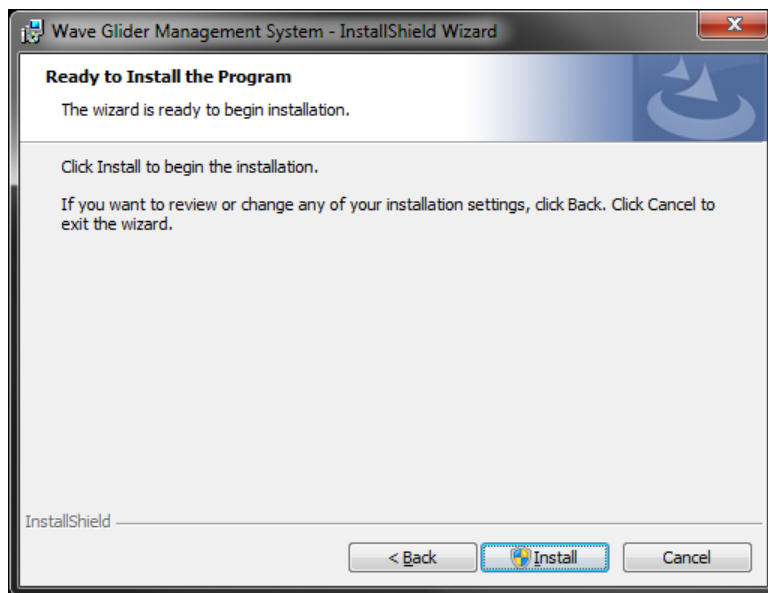


Figure 2-10 - Ready to Install

2.5.10 Installation Progress

The current status of the installation is reflected in the Status box and in the progress bar and will look similar to Figure 2-11.

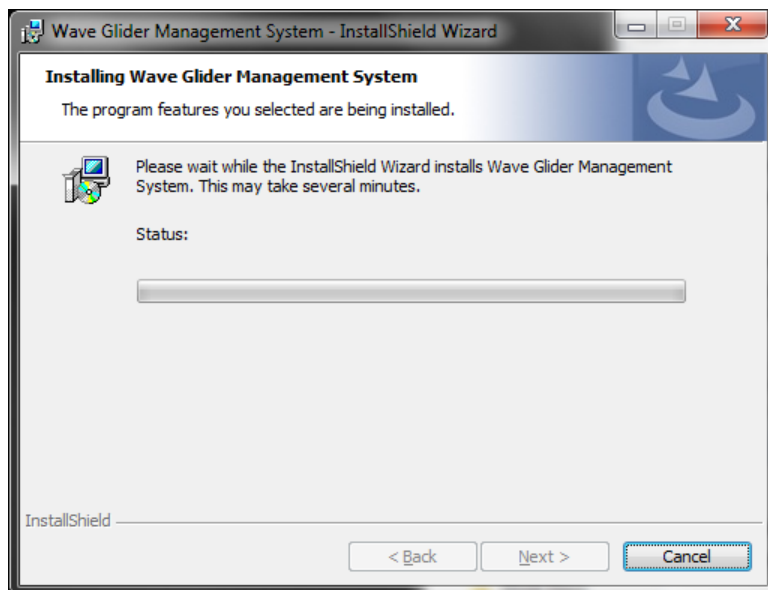


Figure 2-11 - Installation Progress

2.5.11 Installation Complete

When the installation completes successfully, you will be presented with Figure 2-12. Click Finish to close the installer.

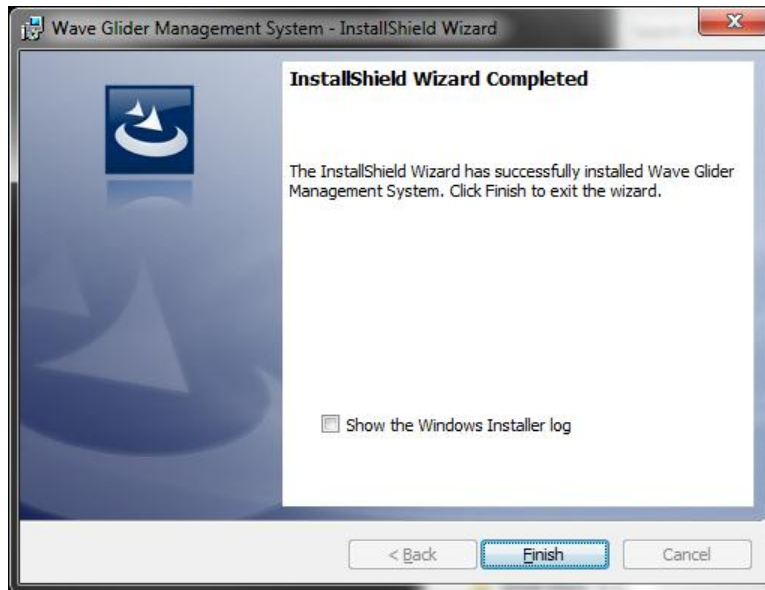


Figure 2-12 - Installation Complete

2.5.12 Installation Problems

If the installer has an issue, it will pop up a message, fail, and then proceed to the dialog box shown in Figure 2-13. For assistance, check the "Show the Windows Installer log" box and click finish. The installer log will open in Notepad. Go to File->Save As, save the log, and attach it in an email to support@liquidr.com.

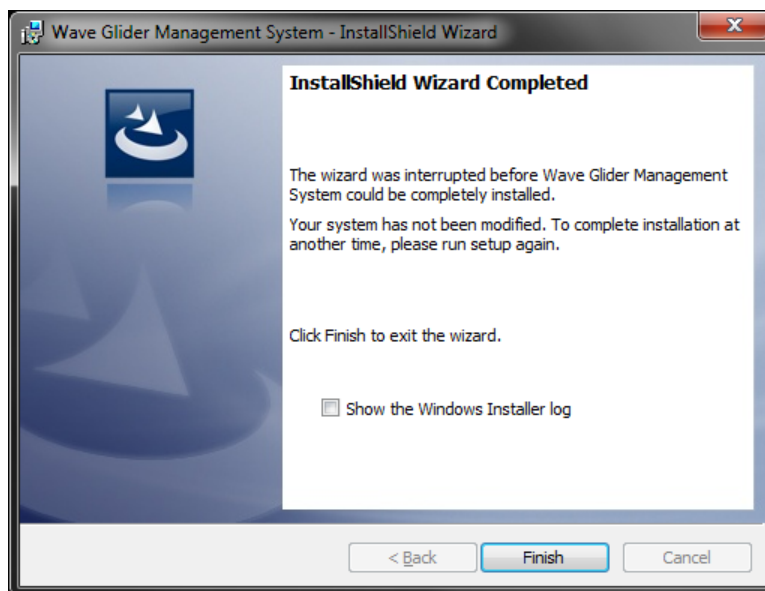


Figure 2-13 - Problem with Installation

2.6 Validate Installation

To verify the installation, navigate to your WGMS login page using a browser:

<http://YourServerDomainName>

This should bring up the WGMS logon dialog similar to that shown in Figure 2-14.

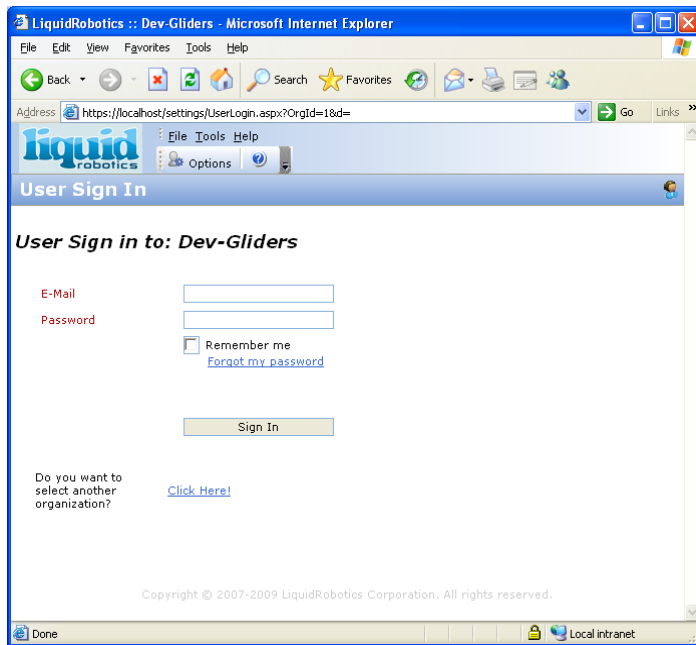


Figure 2-14: Sign-In to WGMS Website

Login to WGMS with the following credentials:

webadmin@liquidr.com

and use the password:

WGMSlog!n

These are predefined in the database. You will have the option to change them later.

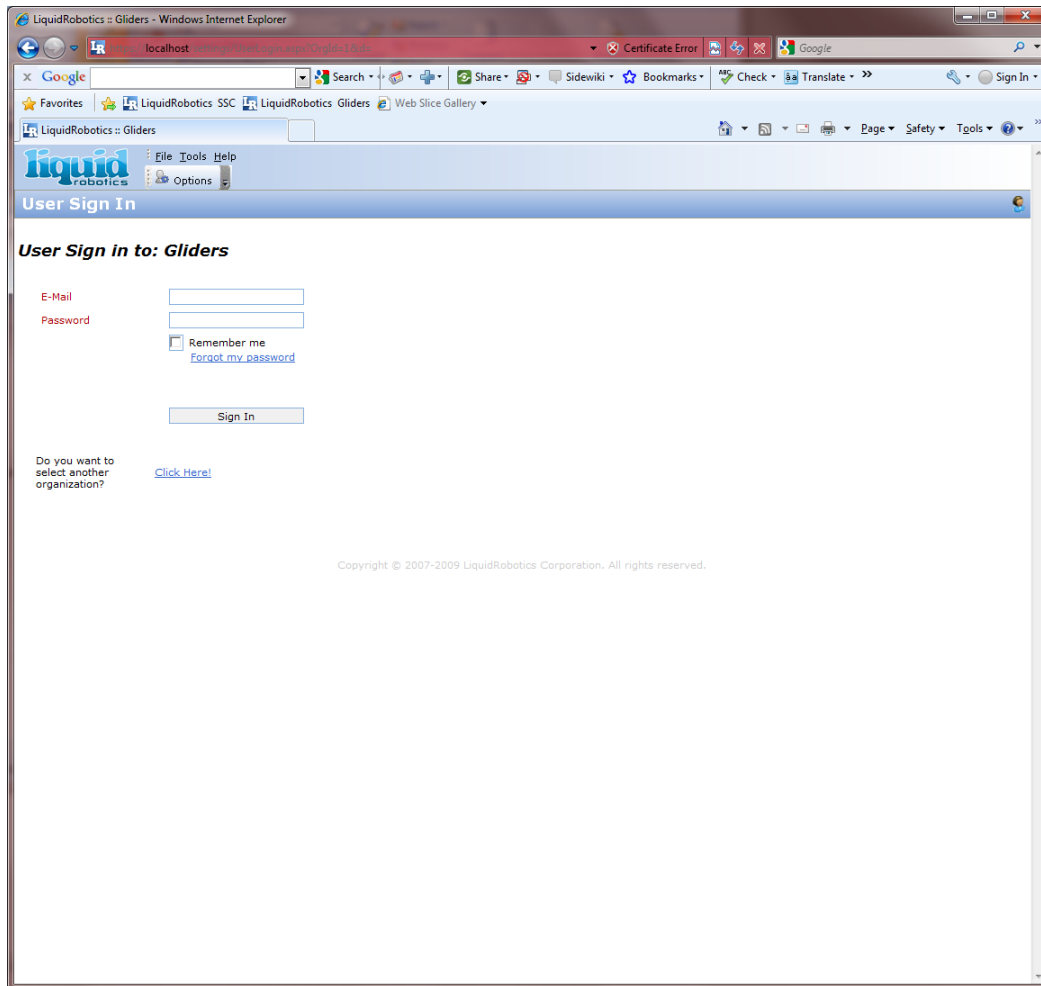


Figure 2-15: WGMS Login Page

You will be asked to change the default user's password on first login.

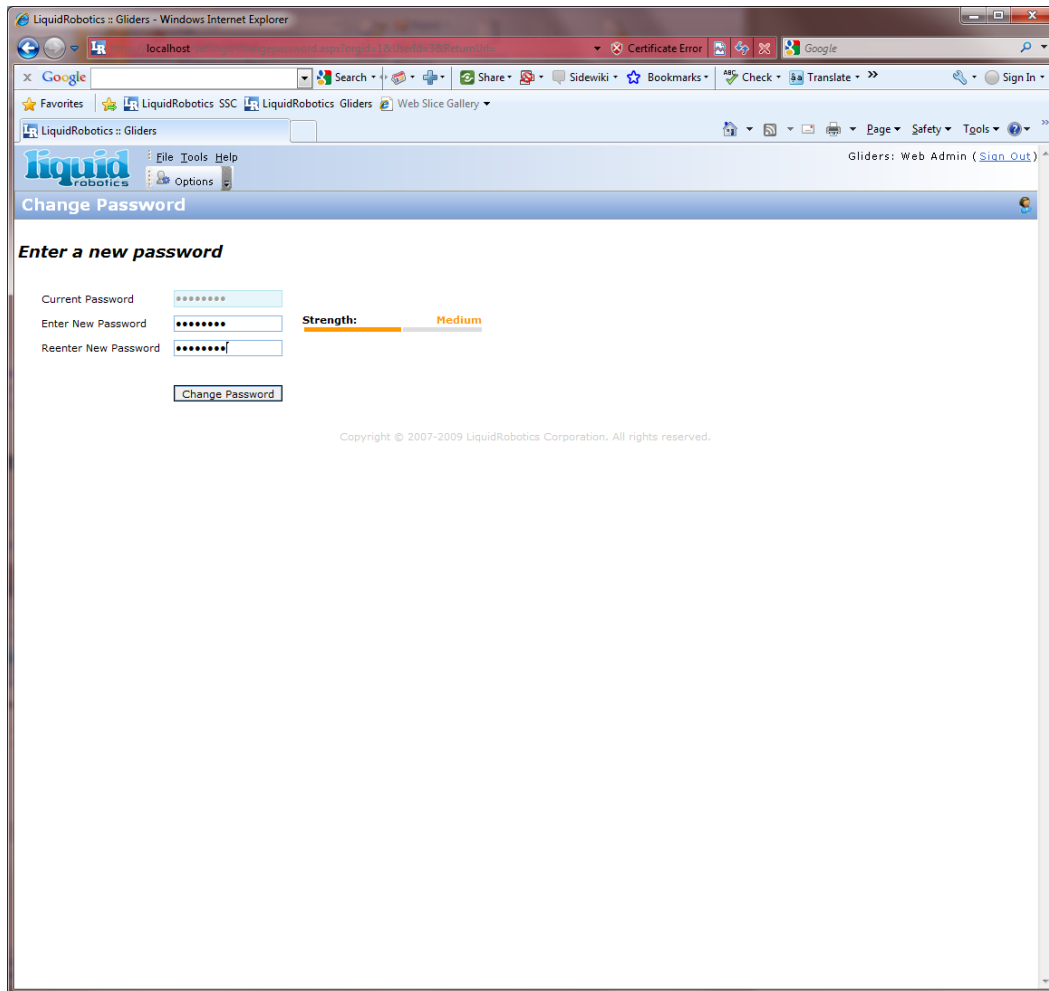


Figure 2-16: Changing the Default Password

Since no vehicles are defined in the initial database, you will see an empty UI display.

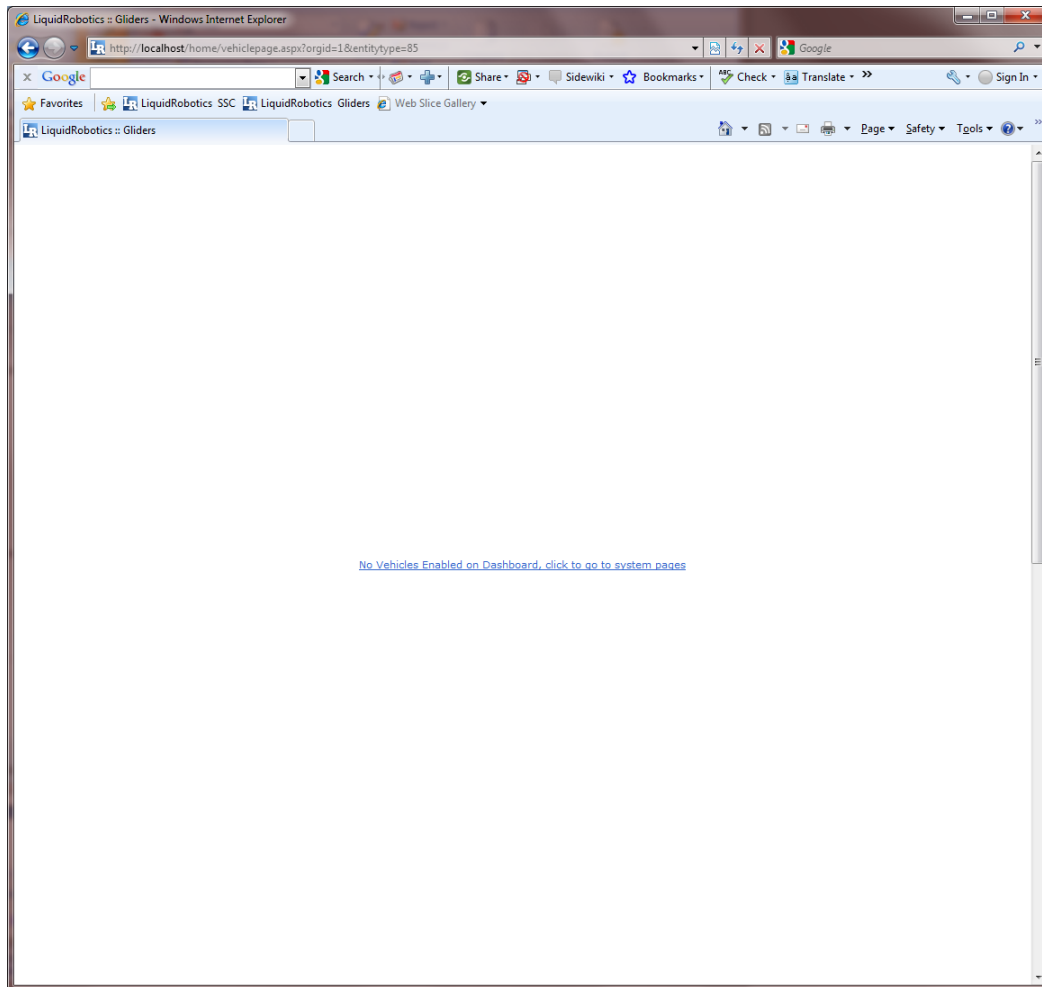


Figure 2-17: Initial UI Display

Click on the link in the middle of the page to see the system menus for administering WGMS. Among other options, this allows you to define vehicles and add users. See the *User Manual* for more information on these operations.

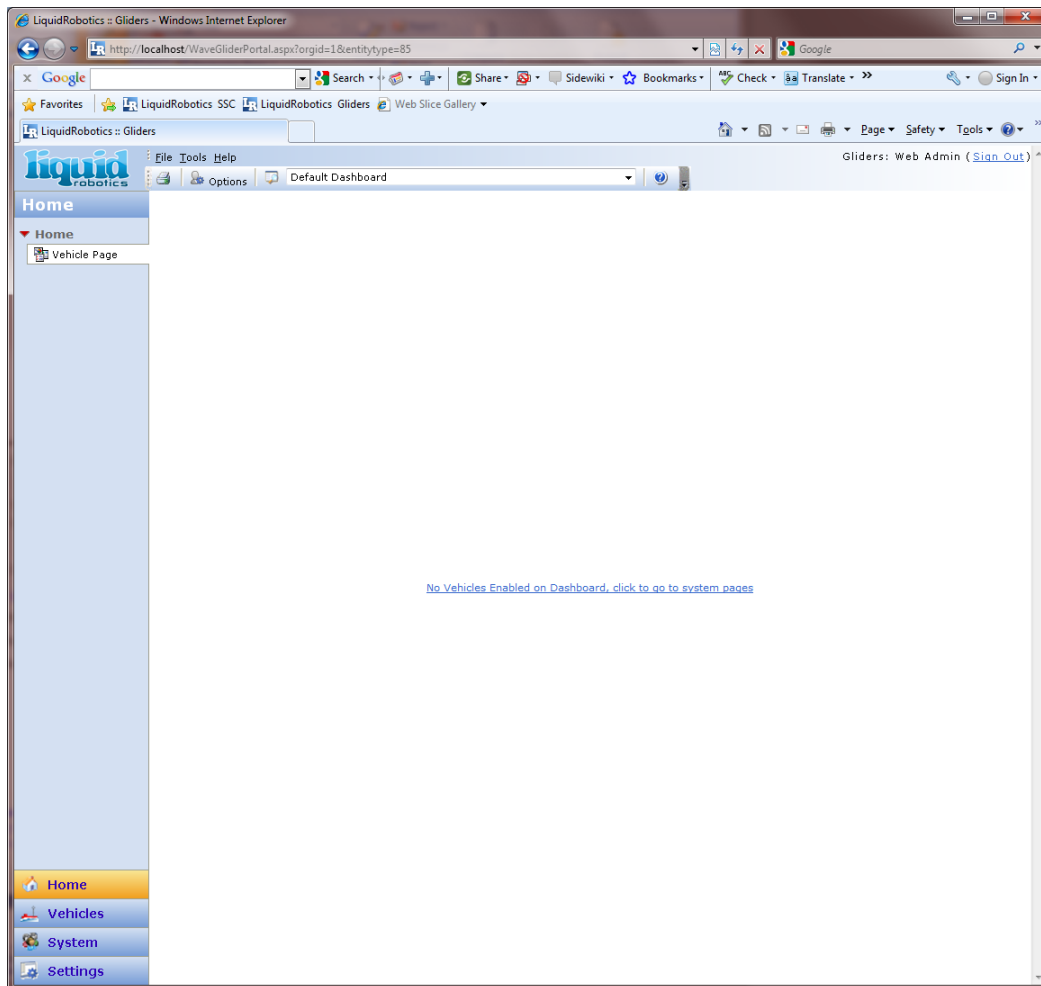


Figure 2-18: UI Display with System Menus

The database is preconfigured with webadmin@liquidr.com as the initial system administrator user. That address is also that user's account name and login ID. You may change it if you wish.

To change the default administrator email for your WGMS deployment, you first change it in the WGMS UI. Log in as webadmin@liquidr.com and click on the options button in the tool bar. That opens the user profile form.

The screenshot shows a web browser window titled "webadmin@liquidr.com: Edit - Windows Internet Explorer". The address bar shows a URL starting with "https://localhost". The page has a "liquid robotics" logo in the top left. The main content area is titled "webadmin@liquidr.com: Edit" and contains a "User Information" section with the following fields:

- E-mail: webadmin@liquidr.com
- Password: [masked] with a "Change" link
- First Name: Web
- Last Name: Admin
- Telephone: [empty]
- Excel Record...: [empty]
- Pager: [empty]
- Alt Email: [empty]
- Time Zone C...: (GMT-08:00) Pacific Time (US & Canada); Tijuana
- Password Ex...: [checkbox]
- Account Lock...: [checkbox]

Below the "User Information" section is a "Related Information" section with the following fields:

- Owner: [empty]
- Parent Org: Gliders
- Created Date: 1/30 12:2
- Updated On: 11/7 7:00
- Created By: System
- Updated By: Web Admin

The bottom of the page shows a copyright notice: "Copyright © 2007-2009 LiquidRobotics Corporation. All rights reserved." and a status bar with "Internet | Protected Mode: Off" and a zoom level of "100%".

Figure 2-19: Initial User Profile Dialog

Change the E-mail field to the appropriate email (for example webadmin@example.com) and then click save and close.

To create a vehicle and its parts, navigate to the Vehicles page and follow the steps outlined in the *User Manual* for provisioning vehicles.

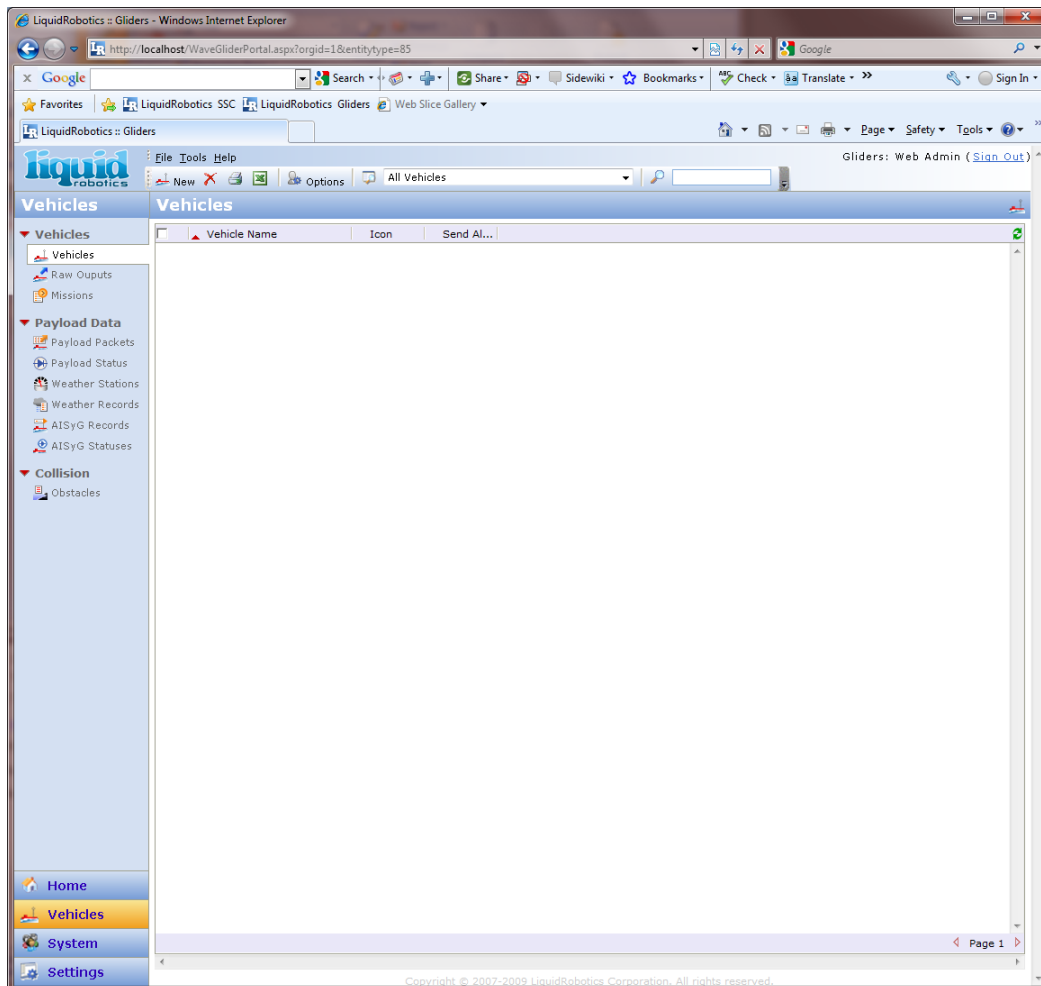


Figure 2-20: Initial Vehicles Page

2.7 Configure the COM Server

The COM Server links between a Packet Reflector and WGMS. Since it communicates with each via TCP/IP, it is possible for each of the applications to run on a separate computer. For convenience, the LRI WGMS installer installs the COM Server on the same system as the WGMS Kernel. The configuration steps that follow assume that default configuration; please contact LRI for guidance if you wish to change that default configuration.

The COM Server code consists of a configuration UI and a separate module that runs as a Windows service. The installer deployed the service but did not start it. In this installation step you will run the configuration UI to initialize the COM Server's settings and start the COM Server service. Note that the COM Server is a WGMS internal application which is distinct from a communications relay. The COM Server sits between a Packet Relay and a WGMS Kernel. A communications relay, such as the XBee Relay, sits between a Wave Glider and a Packet Reflector.

Start the COM Server from the Windows Start menu; click **Start** → **All Programs** → **COM Server**. The following configuration dialog will open.

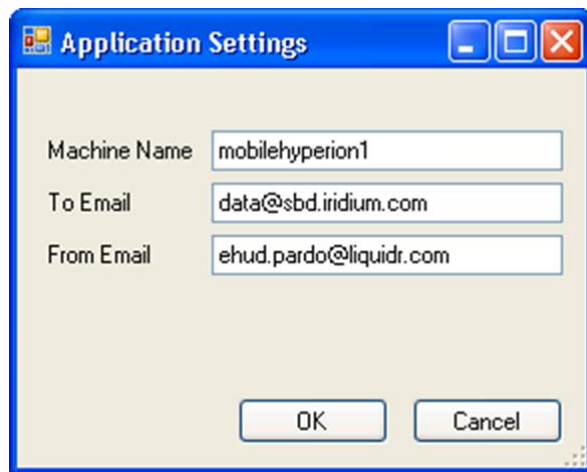


Figure 2-21: COM Server Application Settings

Machine Name – The name of the server hosting the Com Server.

To Email – Should be left unmodified.

From Email – Should be changed to the email address of the administrator for WGMS, such as webadmin@example.com. Remember that you may have changed it from the default in the preceding installation step.

Click **OK** to confirm the settings.

Launching the COM server opens the configuration UI shown below. To configure the COM server, enter:

Server URL – Typically you would replace the domain name (mobilehyperion1 in the example below) with your actual domain name.

Email – Replace “ehud.pardo@liquidr.com” with the administrator’s email address (such as webadmin@example.com), and replace the password field with the administrator’s user password.

Organization – Enter the “Org Internal Name” obtained from the Organization Description Dialog (ref. 6.3.5). Do not use the “public” name displayed on the Dashboard UI.

Figure 2-22: Communication Server Dialog

Click the **Listen** button to start the Com Server. You may close or minimize the configuration window, as you prefer.

2.8 Configure the Packet Reflector

The Packet Reflector provides intelligent routing of messages between multiple Wave Gliders and multiple copies of the WGMS kernel and/or COM Server. Since it communicates with each via TCP/IP, it is possible for each of the applications to run on a separate computer. For convenience, the LRI WGMS installer installs the Packet Reflector on the same system as the WGMS Kernel. The configuration steps that follow assume that default configuration; please contact LRI for guidance if you wish to change that default configuration.

This section configures the Packet Reflector to support the default Iridium Short Burst Data service. Chapter 3, “Configuring a Packet Reflector”, expands on the Packet Reflector configuration to show how to support XBee and other communications models, as required for payload development and mobile to mobile operations. That chapter also includes a more complete description of the operation of the Packet Reflector.

The Packet Reflector code consists of a configuration UI and a separate module that runs as a Windows service. The installer deployed the service but did not start it. In this installation step you will run the configuration UI to initialize the Packet Reflector’s settings and start the Packet Reflector service.

Start the configuration UI from the Windows Start menu; click **Start → All Programs → Packet Reflector**. The following configuration dialog will open.

Machine Name – The name of the server hosting the Packet Reflector.

To Email – Should be left unmodified.

From Email – Should be changed to the email address of the administrator for WGMS, such as webadmin@example.com.

Click OK to confirm the settings. This also launches the Packet Reflector.

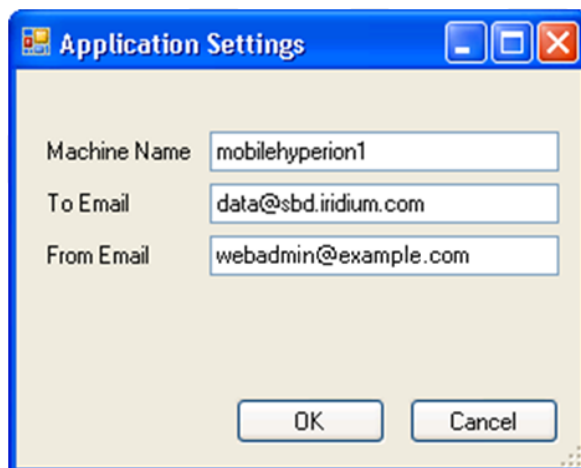


Figure 2-23: UI Start-Up Dialog

The Packet Reflector UI is used both for configuration and for monitoring operations. The first time it runs, the UI will open with no data, as shown in the figure.

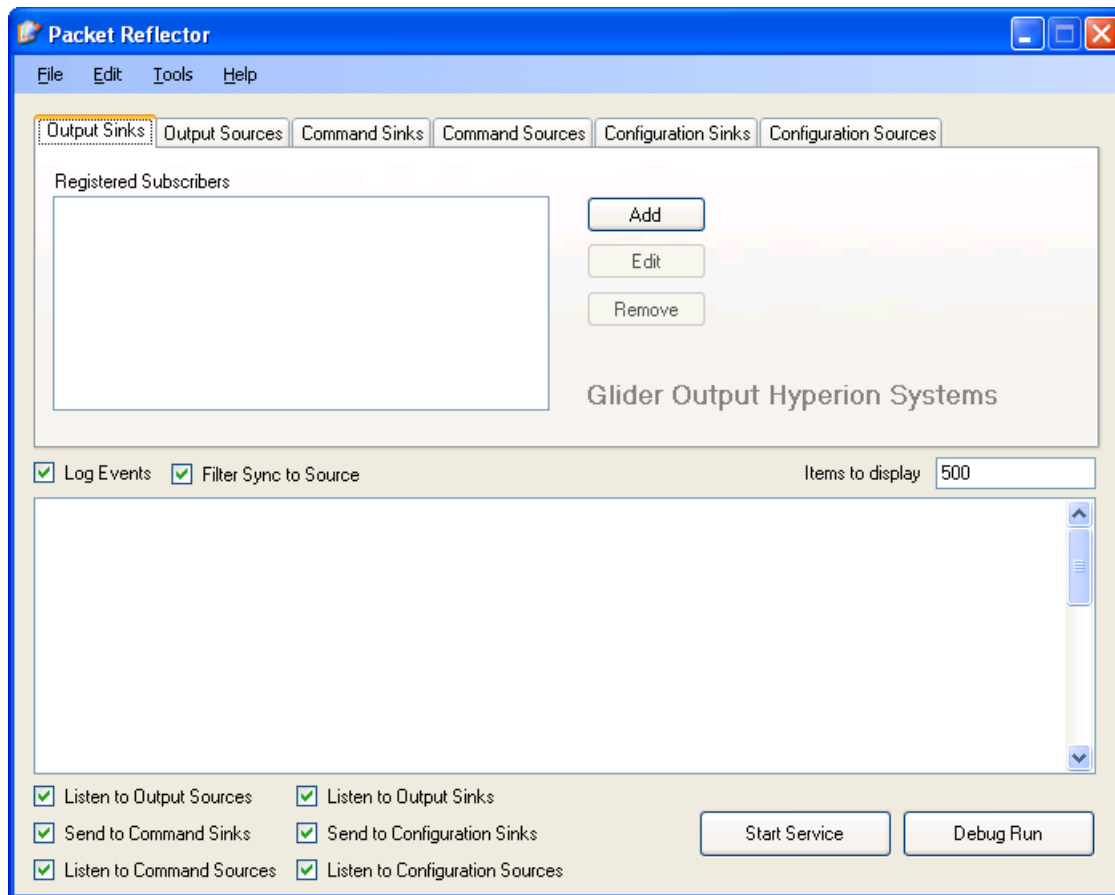


Figure 2-24: Basic Packet Reflector UI

The term “Output” refers to messages from the Wave Glider and “Command” refers to messages from WGMS. “Source” refers to the sender and “Sink” refers to the consumer of those messages. In the simple configuration, the Output Source and Command Sink is the commercial Iridium SBD service. The Command Source and Output Sink is the WGMS COM Server that was configured previously.

Note that the UI is divided into two parts. The upper half (with the tabs) is used to configure the Packet Reflector communications paths; this part of the display will change as different tabs are selected. The lower part is used to start/stop and (optionally) observe the operation of the Packet Reflector.

In the top half, the main features of the UI are:

Selection Tabs – Each tab represents a type of Subscriber.

Note: The obsolete “Configuration” tabs are retained for backwards compatibility only and are not relevant to this discussion.

Registered Subscribers – This box lists currently configured Subscribers of the selected type.

Add/Edit/Remove Buttons – Used to add, edit or delete a Subscriber. These are only enabled when the Packet Reflector is in a stopped state.

In the bottom half, the features are:

Log Events Checkbox – Indicates whether events are to be displayed in the Event Log Display.

Filter Sync to Source – Leave this box checked, as it is only useful to LRI service personnel.

Items to Display – Defines the number of recent events to display in the Event Log panel. Earlier items are not shown.

Event Log Display – This box shows the activity of the Packet Reflector, newest first.

Start/Stop Service Button – Used start the Packet Reflector operation. When the Packet Reflector is running, changes to a “Stop Service” button.

Debug Run/Stop Button – Allows running the Packet Reflector in debug mode. Intended for specialist usage.

Selection Checkboxes – Six checkboxes that allow disabling sending to or listening to different Sinks or Sources. Leave all the boxes checked unless otherwise directed by LRI support personnel.

2.8.1 Adding the Command Source

For this configuration, the Command Source is the originator of messages to be sent to the Wave Glider, which is the WGMS Com Server. To configure that address, click on the Command Source tab and then on Add.

The address information specifies the IP address or domain name of the Command Source Subscriber and the port number to be used on the Packet Reflector system for receiving the messages.

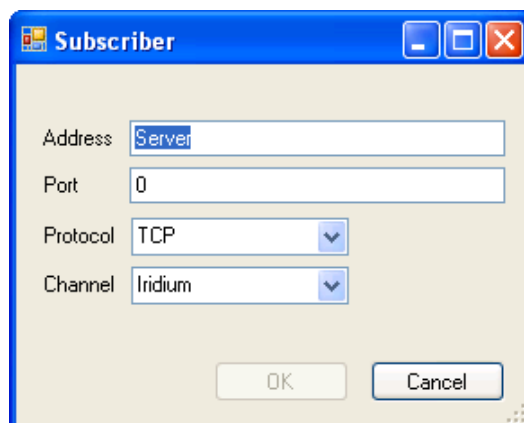


Figure 2-25: Command Source Subscriber Dialog

Address – The DNS address of the COM Server. This can be a fully qualified DNS name, but the easiest is **localhost** if the COM Server is deployed on the same system as the Packet Reflector.

Port – The number of the port on which the Packet Reflector will listen.

Protocol – Communications protocol. Select from the pull-down menu. The options are:

TCP: Transmission Control Protocol. This is recommended.

UDP: User Datagram Protocol.

Channel – The communications channel used by the Source Subscriber. Select **Packet Reflector/COM Server** from the pull-down menu.

An example dialog is shown below.

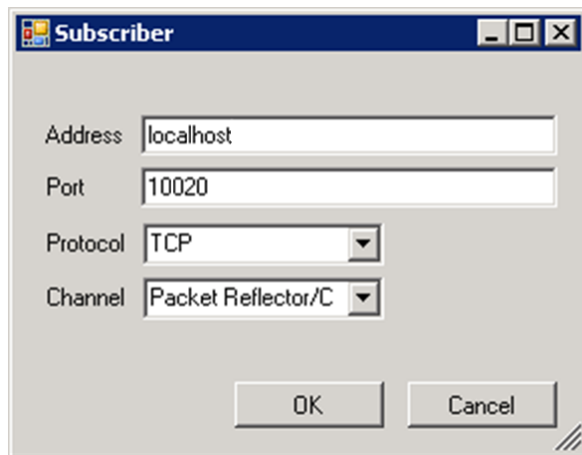


Figure 2-26: Command Source Subscriber Data Entered

Click the **OK** button to register the subscriber for that Subscriber type. Confirm that the entry in the Registered Subscribers pane match what you intended.

2.8.2 Adding the Command Sink

The Command Sink is the next hop for messages to be sent to the Wave Glider. In this example configuration, the Command Sink is the Iridium Short Burst Data service. To configure that address, click on the Command Sink tab and then on Add.

The address information specifies the IP address or domain name of the Command Sink Subscriber (i.e., Iridium's server) and the port number on the Iridium server for receiving the messages. You must obtain that information from Iridium.

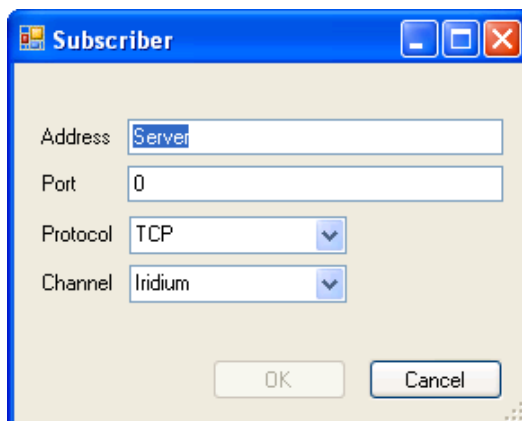


Figure 2-27: Command Sink Subscriber Dialog

Address – The address of the Iridium Service, such as an IP address (e.g., **10.10.5.145**)

Port – The number of the port on Iridium's server to which the Packet Reflector will send.

Protocol – Communications protocol. Select from the pull-down menu. The options are:

TCP: Transmission Control Protocol. This is recommended.

UDP: User Datagram Protocol.

Channel – The communications channel used by the Source Subscriber. Select **Iridium** from the pull-down menu.

An example dialog is shown below.

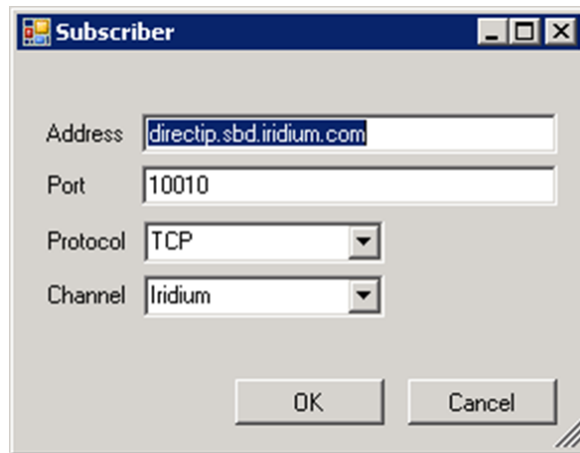


Figure 2-28: Command Sink Subscriber Data Entered

Click the **OK** button to register the subscriber for that Subscriber type. The Subscriber information should then appear in the "Registered Subscriber" box.

2.8.3 Adding the Output Source

The Output Source is the server that feeds messages that originated at the Wave Glider to the Packet Reflector. In this example configuration, the Output Source is the Iridium Short Burst Data service. To configure that address, click on the Output Source tab and then on Add.

The address information specifies the IP address or domain name of the Command Sink Subscriber (i.e., Iridium's server) and the port number on the Packet Reflector server for receiving the messages. That number is negotiated between you and Iridium – WGMS will use whatever number you specify.

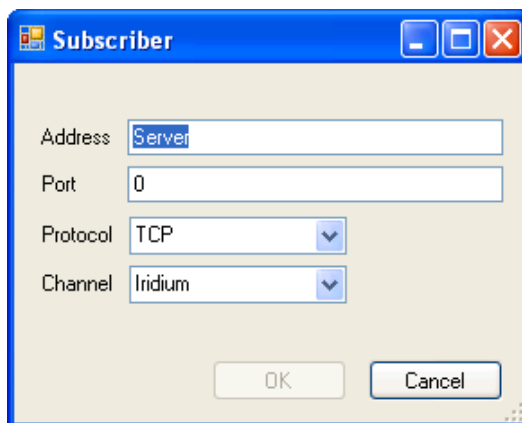


Figure 2-29: Output Source Subscriber Dialog

Address – The address of the Iridium server. This address can be either:

A DNS name (e.g., **someserver.iridium.com**)

An IP number (e.g., **10.10.5.145**)

Port – The number of the port on which the Packet Reflector will listen.

Protocol – Communications protocol. Select from the pull-down menu. The options are:

TCP: Transmission Control Protocol. This is recommended.

UDP: User Datagram Protocol.

Channel – The communications channel used by the Source Subscriber. Select **Iridium** from the pull-down menu.

An example dialog is shown below.

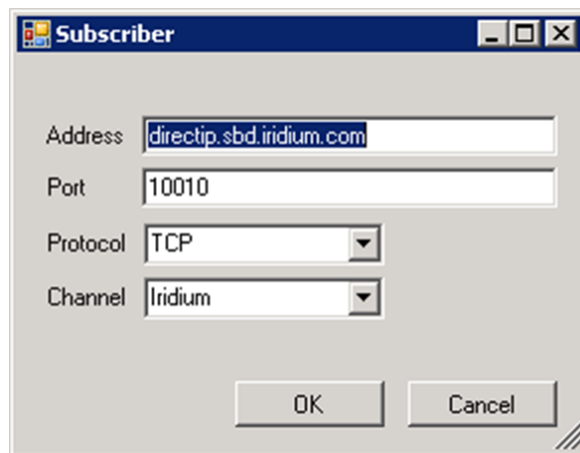


Figure 2-30: Output Source Subscriber Data Entered

Click the **OK** button to register the subscriber for that Subscriber type. The Subscriber information should then appear in the "Registered Subscriber" box.

2.8.4 Adding the Output Sink

The Output Sink is the next hop for messages sent from the Wave Glider. In this example configuration, the Output Sink is the WGMS COM Server. To configure that address, click on the Command Sink tab and then on Add.

The address information specifies the IP address or domain name of the Command Sink Subscriber (i.e., the COM Server) and the port number on the COM server for receiving the messages.

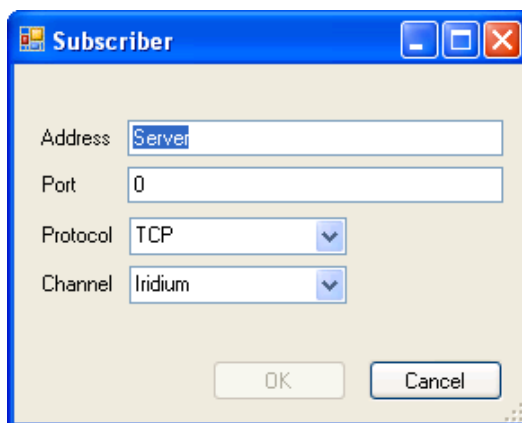


Figure 2-31: Output Sink Subscriber Dialog

Address – The address of the Subscriber. This address can be any valid DNS name, but localhost is the easiest.

Port – The number of the port to which the Packet Reflector will send – 10015.

Protocol – Communications protocol. Select from the pull-down menu. The options are:

TCP: Transmission Control Protocol. This is recommended.

UDP: User Datagram Protocol.

Channel – The communications channel used by the Source Subscriber.

Select **Packet Reflector/Com Server** from the pull-down menu.

An example dialog is shown below.

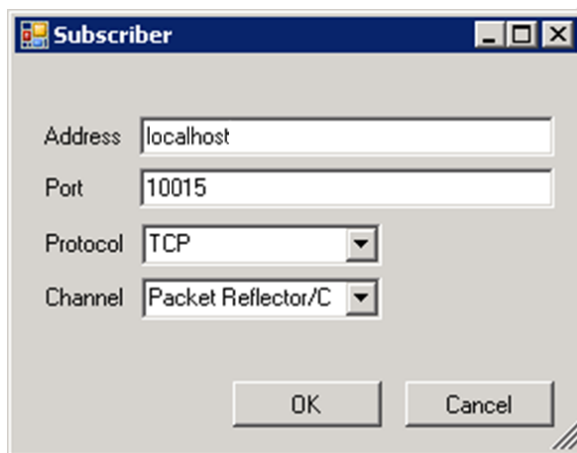


Figure 2-32: Output Sink Subscriber Data Entered

Click the **OK** button to register the subscriber for that Subscriber type. The Subscriber information should then appear in the “Registered Subscriber” box.

You have completed the installation and initial configuration of WGMS and the main constituent parts – the Packet Reflector and the COM Server.

2.8.5 Saving the Packet Reflector Configuration

When you have entered all the values, use the **File→Save** (or **File→Save As**) on the top menu to save the configuration to a file.

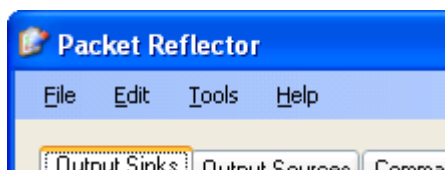


Figure 2-33: Packet Reflector UI Menu

This allows you to recover the configuration if the service or application stops.

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3. Configuring a Packet Reflector

The LRI messaging protocol between Wave Glider and WGMS is designed to be “stateless”. That is, each message and its corresponding ACK/NAK (if any) are independent of any other message. That design allows messages to be delivered to the Wave Glider through multiple independent communications channels. Similarly, that makes it possible for messages from the Wave Glider to be delivered to multiple copies of WGMS.

The Packet Reflector sits at the intersection of these messaging paths. The effect of the Packet Reflector is to isolate the communication transport layer (i.e., one or more Relays) from the application layer (i.e., one or more WGMS Kernels). Different rules are applied to messages coming from a Wave Glider and going to a Wave Glider due to the different usage models for that data.

In the current implementation, a Packet Reflector broadcasts “output” messages from a Wave Glider for delivery to all configured consumers, such as multiple copies of WGMS (i.e., one-to-many). Commands from all command producers such as WGMS are routed to a single Wave Glider (i.e., many to one) based on addressing information in the message. The essential task in configuring a Packet Reflector is to specify the producer/consumer relationships for both command messages and output messages. This is done by “subscribing” a particular TCP/IP or DNS address for a particular use.

3.1 Packet Reflector Operations

All messages exchanged between a Wave Glider and WGMS pass through a Packet Reflector. A Packet Reflector handles two types of messages:

Command Packets – Messages containing commands sent to a Wave Glider. This includes messages that deliver data and commands to a Wave Glider’s payloads, as those are embedded in Wave Glider commands.

Output Packets – Messages sent from a Wave Glider. These include telemetry, ACK/NAK responses and payload-initiated messages back to shore.

A Packet Reflector receives a message from a Command Source Subscriber (typically a copy of WGMS) for delivery to a Command Sink Subscriber (typically a Relay or the Iridium SBD service) based on the routing rules. For example, a WGMS user can specify that a particular message must be routed through a specific relay. Typically a command is delivered through just one path.

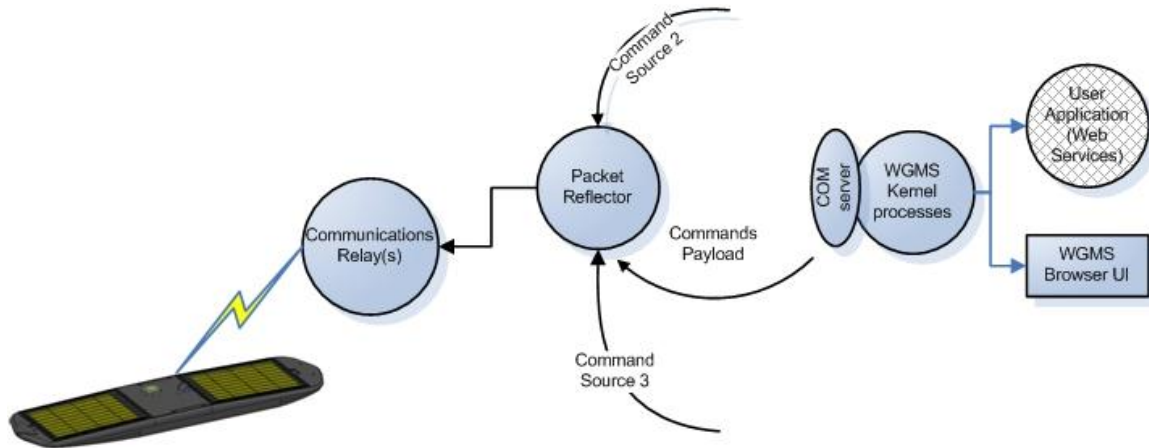


Figure 3-1: Packet Reflector Routing Commands

Similarly, a Packet Reflector receives a packet (message) from an Output Source Subscriber (typically a Relay or the Iridium SBD service) to be delivered to one or more Output Sink Subscribers (typically copies of WGMS). Unlike the Commands direction, each Output message is broadcast to all Output Sink Subscribers. The principal benefit of this is that it allows multiple instances of WGMS to be aware of telemetry and other data sent from the Wave Glider, which is useful in certain testing environments.

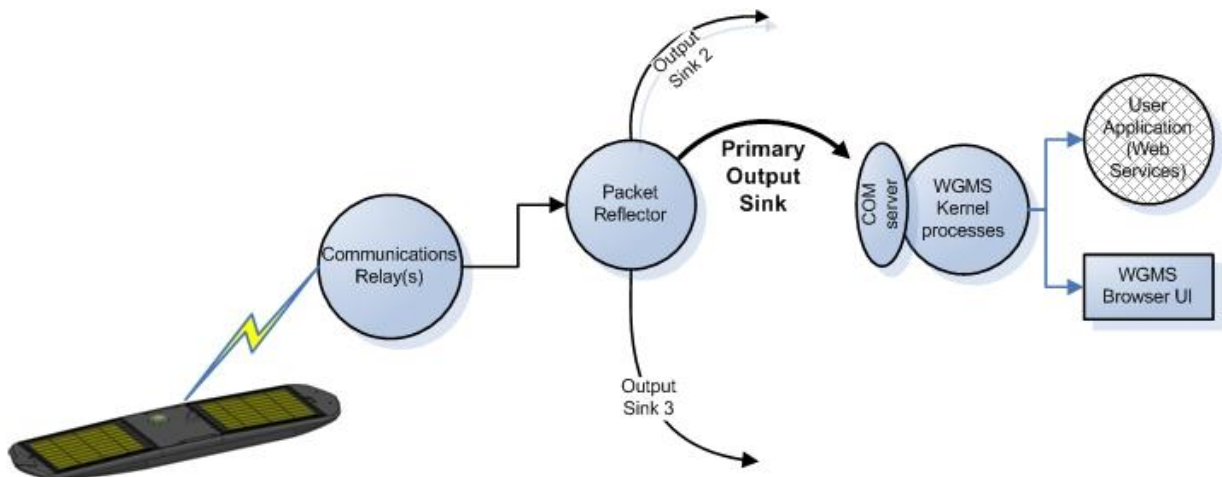


Figure 3-2: Packet Reflector Routing Output Packets

There is a third “Configuration” packet that is specific to the obsolete Model 07 Wave Gliders. The feature is deprecated and not described here.

From the perspective of the operating system, a Packet Reflector is both a Windows service and an application UI that interact with the service. The UI allows an administrator to:

- 1) Configure the service and its Subscribers.
- 2) Start and stop the service.

3) Monitor the service and display an event log.

3.2 Packet Reflector Software

WGMS installation includes installation of the Packet Reflector. Installation should have placed an icon on the main screen, as shown in Figure 3-3. To access the Packet Reflector user interface, double-click on the icon on the Windows desktop.



Figure 3-3: Packet Reflector Icon

If there is no icon, use the Start button; click **Start → All Programs → Packet Reflector**.

Either method should bring up the Packet Reflector User Interface (UI) shown in Figure 3-4.

3.3 Packet Reflector User Interface

The Packet Reflector UI is used both for configuration and for monitoring operations. If no configuration has been done, the UI will open with no data, as shown in the figure.

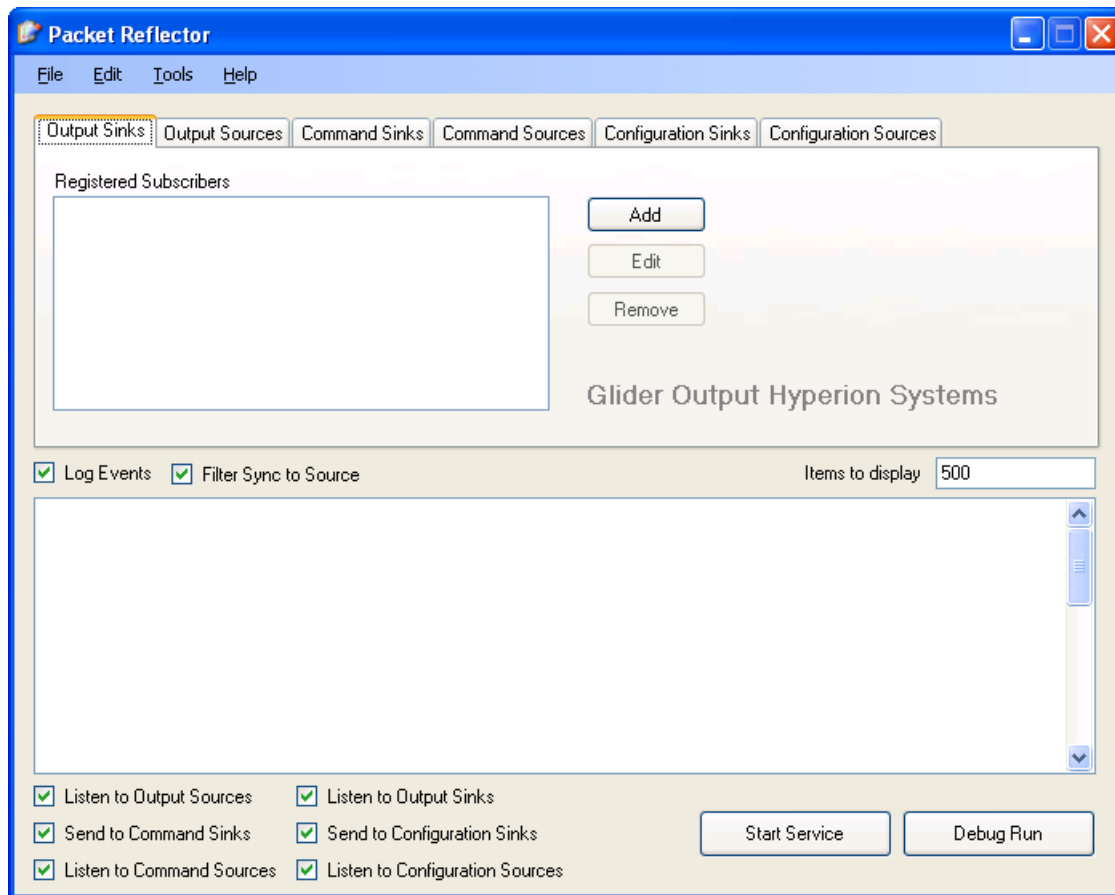


Figure 3-4: Basic Packet Reflector UI

Note that the UI is divided into two parts. The upper half (with the tabs) is used to configure the Packet Reflector; this part of the display will change as different tabs are selected. The lower part is used to start/stop and (optionally) observe the operation of the Packet Reflector.

In the top half, the main features of the UI are:

Selection Tabs – Each tab represents a type of Subscriber.

Note: The obsolete “Configuration” tabs are retained for backwards compatibility only.

Registered Subscribers – This box lists currently configured Subscribers of the selected type.

Add/Edit/Remove Buttons – Used to add, edit or delete a Subscriber. These are only enabled when the Packet Reflector is in a stopped state.

In the bottom half, the features are:

Log Events Checkbox – Indicates whether events are to be displayed in the Event Log Display.

Filter Sync to Source – Leave this box checked, as it is only useful to LRI service personnel.

Items to Display – Defines the number of recent events to display in the Event Log panel. Earlier items are not shown.

Event Log Display – This box shows the activity of the Packet Reflector, newest first.

Start/Stop Service Button – Used start the Packet Reflector operation. When the Packet Reflector is running, changes to a “Stop Service” button.

Debug Run/Stop Button – Allows running the Packet Reflector in debug mode. Intended for specialist usage.

Selection Checkboxes – Six checkboxes that allow disabling sending to or listening to different Sinks or Sources. Leave all the boxes checked unless otherwise directed by LRI support personnel.

3.4 Packet Reflector Configuration

3.4.1 Overview

For each type of Subscriber, such as an Output Sink Subscriber, you need to provide addressing information for that subscriber as well as the communications channel type used by the Subscriber. We recommend drawing yourself a map, such as the one in Figure 1-4: Wave Glider Management System Components, annotated with domain names or IP numbers and ports. You then enter the details using the Add button, which pops up a dialog to assist you. Note that the Packet Reflector must be stopped during configuration.

3.4.2 Adding Source Subscribers

The Packet Reflector receives messages from Output Source and Command Source Subscribers for routing to the corresponding Sinks. The address information specifies the IP address or domain name of the Source Subscriber and the port number to be used on the Packet Reflector system for receiving the messages. Incidentally, that port number will be required when the Subscriber’s communications are configured. See the XBee Relay configuration, section 4.4.2, “Setting Port and Network Configurations”, for an example.

Note: The Port ID specified for any Command Source must not be the same as the Port ID for any Output source. Port IDs for Command and Output Sinks do not have this restriction.

Select the tab corresponding to the Subscriber type of interest. Click on the **Add** button. This will pop up the Subscriber dialog, as shown in Figure 3-5. The same dialog box is used for each of the Subscriber types.

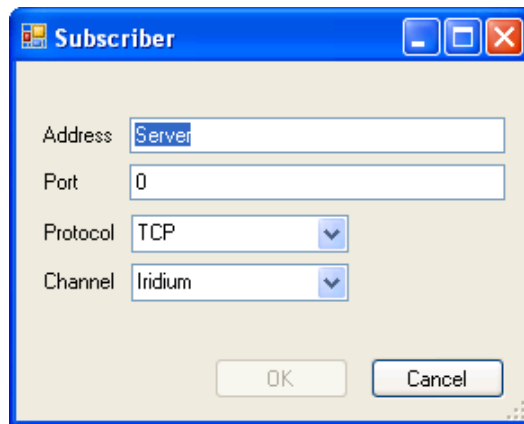


Figure 3-5: Initial Subscriber Dialog

Address – The address of the Subscriber. This address can be either:

A DNS name (e.g., **myhost.example.com**)

An IP number (e.g., **10.10.5.145**)

Port – The number of the port on which the Packet Reflector will listen. The Port ID for any Command Source cannot be the same as any Port ID for any Output source.

Protocol – Communications protocol. Select from the pull-down menu. The options are:

TCP: Transmission Control Protocol. This is recommended.

UDP: User Datagram Protocol.

Channel – The communications channel used by the Source Subscriber. Select from the pull-down menu. The options are:

Packet Reflector/COM Server: A WGMS Kernel or its associated Packet Reflector. This typically would be a Command Source Subscriber.

Iridium: The commercial Iridium Short Burst Data service. Output Source Subscriber.

XBee Relay: An XBee Relay. Often used for development and testing. This is discussed more fully in chapter 4, “Configuring an XBee Relay”.

Alt Iridium Relay: Uses Short Burst Data over the Iridium ISU-ISU protocol. Primarily used for the “mobile to mobile” scenario, discussed in chapter 5, “Configuring an Alternate Iridium Relay”.

Iridium EMSS: This gives US Government customers access to an encrypted and secured version of the Iridium SBD service. Output Source Subscriber.

Relay Type 7 (custom): Used by customers who deploy non-LRI Communications Relays.

Relay Type 8 (custom): Used by customers who deploy non-LRI Communications Relays.

Relay Type 9 (custom): Used by customers who deploy non-LRI Communications Relays.

Relay Type 10 (custom): Used by customers who deploy non-LRI Communications Relays.

An example dialog is shown below.

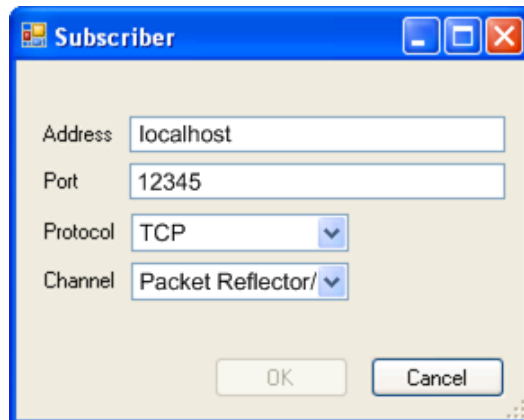


Figure 3-6: Subscriber Data Entered

Click the **OK** button to register the subscriber for that Subscriber type.

The Subscriber information should then appear in the “Registered Subscriber” box as shown below in Figure 3-7. Note that this particular example would usually result in an invalid configuration, since an “Output Sink” would not normally use Iridium as its communications channel. The System Administrator is responsible for entering valid information. However, errors can be corrected, as is shown in section 3.4.4.

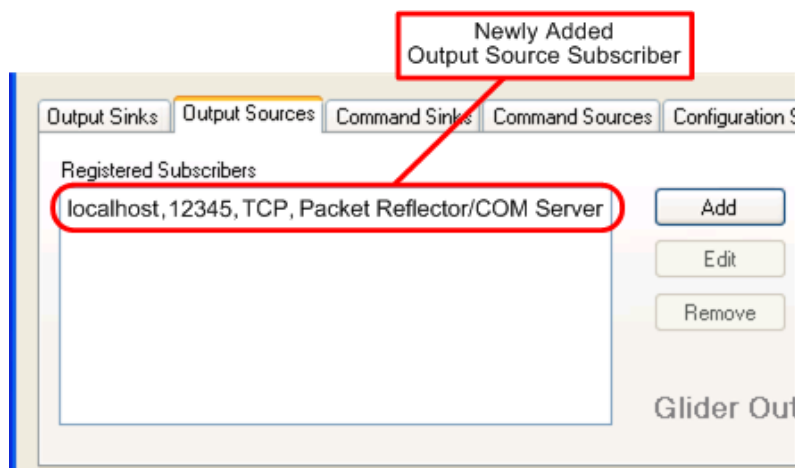


Figure 3-7: Packet Reflector UI Showing Added Output Source

3.4.3 Adding Sink Subscribers

The Packet Reflector routes messages from Sources to Output Sink and Command Sink Subscribers. The address information specifies the IP address or domain name of the Source Subscriber and the port number on the destination Subscriber to which the message should be delivered.

Typically, the port number will be specified initially on the Subscriber system when the Subscriber’s communications are configured and then transferred to the Packet Reflector configuration. See the XBee Relay configuration, section 4.4.2, “Setting Port and Network Configurations”, for an example.

Select the tab corresponding to the Subscriber type of interest. Click on the **Add** button. This will pop up the Subscriber dialog, as shown in Figure 3-8. The same dialog box is used for each of the Subscriber types.

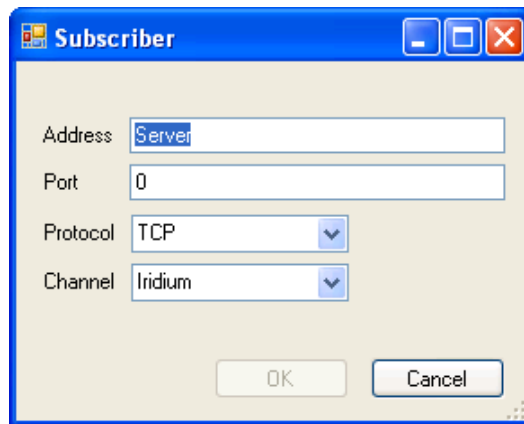


Figure 3-8: Initial Subscriber Dialog

Address – The address of the Subscriber. This address can be either:

A DNS name (e.g., **MyRelay.example.com**)

An IP number (e.g., **10.10.5.145**)

Port – The port number on the Subscriber’s system to which the message should be delivered. A Port ID for a Command Sink can be the same as the Port ID for an Output Sink.

Protocol – Communications protocol. Select from the pull-down menu. The options are:

TCP: Transmission Control Protocol. This is recommended.

UDP: User Datagram Protocol.

Channel – The communications channel used by the Subscriber. Select from the pull-down menu. The options are:

Packet Reflector/COM Server: A WGMS Kernel or its associated Packet Reflector. Output Sink.

Iridium: The commercial Iridium Short Burst Data service. Command Sink.

XBee Relay: An XBee Relay. Often used for development and testing. This is discussed more fully in chapter 4, “Configuring an XBee Relay”.

Alt Iridium Relay: Uses Short Burst Data over the Iridium ISU-ISU protocol. Primarily used for the “mobile to mobile” scenario, discussed in chapter 5, “Configuring an Alternate Iridium Relay”.

Iridium EMSS: This gives US Government customers access to an encrypted and secured version of the Iridium SBD service. Command Sink.

Relay Type 7 (custom): Used by customers who deploy non-LRI Communications Relays.

Relay Type 8 (custom): Used by customers who deploy non-LRI Communications Relays.

Relay Type 9 (custom): Used by customers who deploy non-LRI Communications Relays.

Relay Type 10 (custom): Used by customers who deploy non-LRI Communications Relays.

An example dialog is shown below.

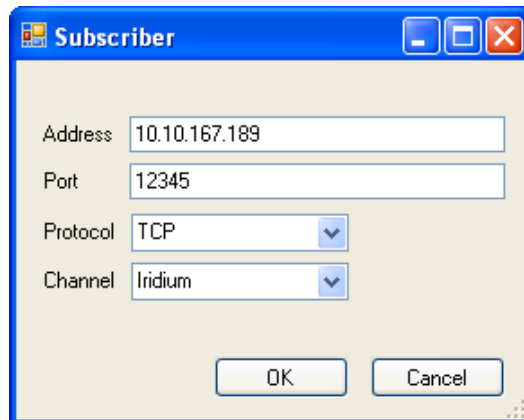


Figure 3-9: Subscriber Data Entered

Click the **OK** button to register the subscriber for that Subscriber type.

The Subscriber information should then appear in the “Registered Subscriber” box as shown below in Figure 3-7. Note that this particular example would usually result in an invalid configuration, since an “Output Sink” would not normally use Iridium as its communications channel. The System Administrator is responsible for entering valid information. However, errors can be corrected, as shown in section 3.4.4.



Figure 3-10: Packet Reflector UI Showing Added Output Sink

3.4.4 Edit Subscribers

To edit the existing Subscriber's data, click on the selected subscriber in the "Registered Subscribers" box. This will activate both the Edit and the Remove buttons, as shown in Figure 3-11.

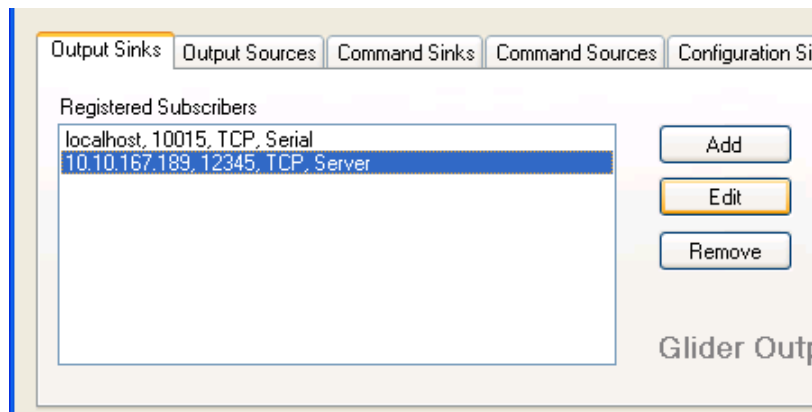


Figure 3-11: Subscriber Data Selected

Click on the **Edit** button.

The "Subscriber" dialog box will pop up showing the data, as shown in Figure 3-12.

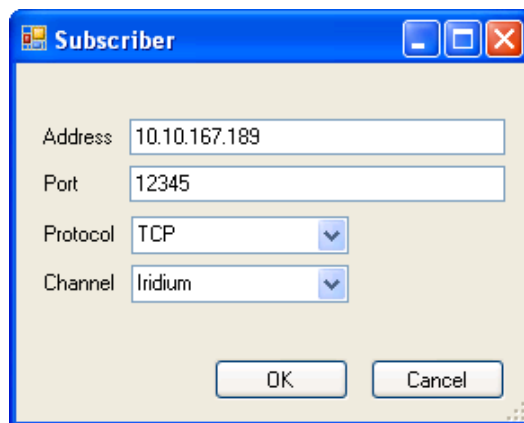


Figure 3-12: Edit Subscriber Dialog

Make the desired change, such as changing the channel or port. Then, click the **OK** button. The changed Subscriber information should then appear in the "Registered Subscriber" box.

3.4.5 Removing Subscribers

Click on the appropriate subscriber in the "Registered Subscribers" box. Click the **Remove** button. The selected Subscriber data will be immediately deleted from the list.

3.5 Packet Reflector Use Cases

Example cases for packet reflector configuration are described below.

3.5.1 Configuring for “Self-Hosted Shared WGMS”

The Packet Reflector for the “Self-Hosted Shared WGMS” is configured to communicate with the Iridium Server and the WGMS Kernel. For the example shown, the Packet Reflector:

- Output Sink: **WGMS** at **localhost:10015**
- Output Source: **Iridium** SBD Server at **directip.sbd.iridium.com:10010**
- Command Sink: **Iridium** SBD Server at **directip.sbd.iridium.com:10800**
- Command Source: **WGMS** at **localhost:10020**

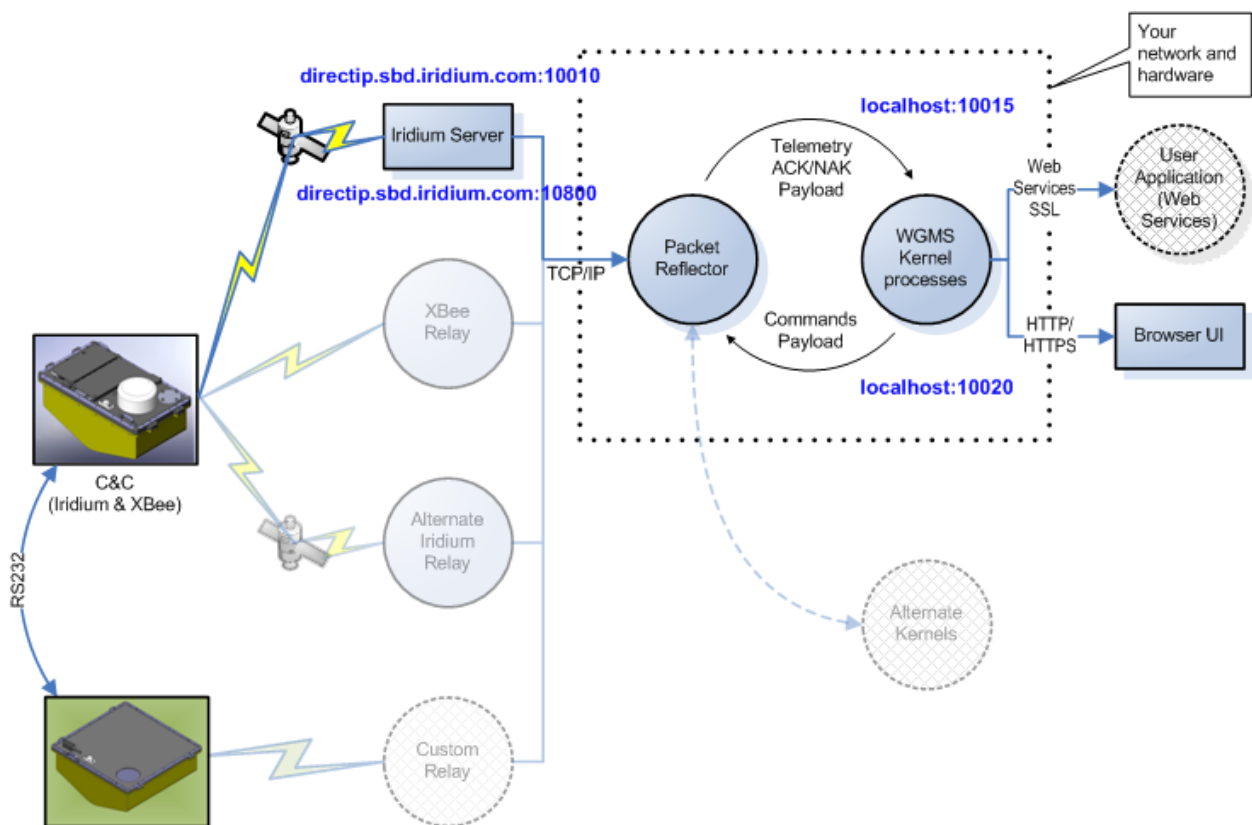


Figure 3-13: Example Self-Hosted WGMS Packet Reflector Configuration

As shown in the figure above, the Packet Reflector port number for a WGMS Output Sink must be **10015**. The port number for a WGMS Command Source must be **10020**.

For the “Self-Hosted Shared WGMS” configuration example described above, the subscriber data selection windows would be set as follows:

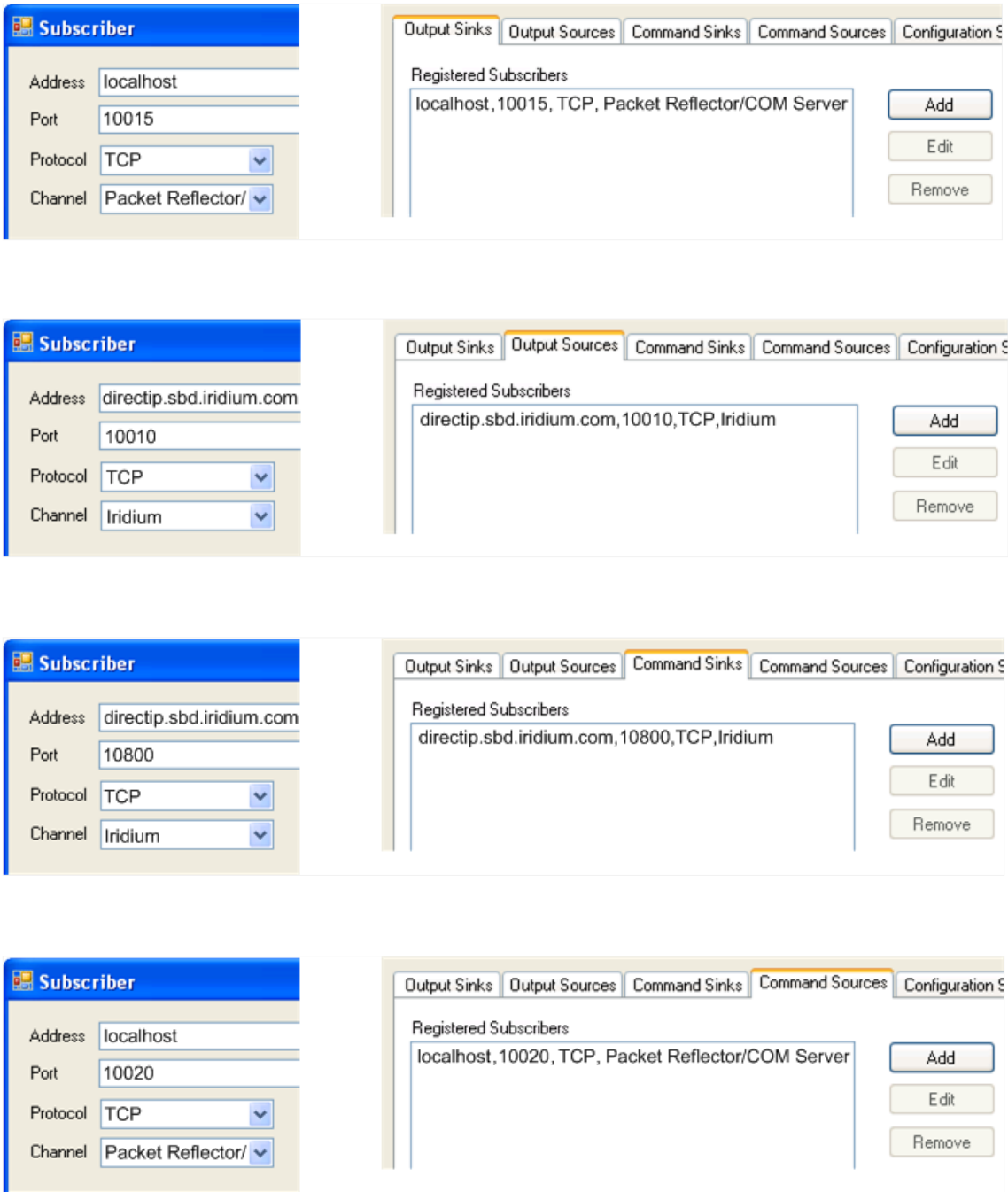


Figure 3-14: Example “Self-Hosted, Shared WGMS” Subscriber Screens

3.5.2 Configuring for “Mobile-to-Mobile”

The Packet Reflector configuration for the “Mobile-to-Mobile” is designed to communicate with the Alternate Iridium Relay and the WGMS Kernel. For the example shown, the Packet Reflector:

- Output Sink: **WGMS** at **localhost:10015**
- Output Sources: **IridiumAlt** at **10.10.167.183:8005** and **XBee** at **10.10.127.172:6051**
- Command Sinks: **IridiumAlt** at **10.10.167.183:8005** and **XBee** at **10.10.127.172:6051**
- Command Source: **WGMS** at **localhost:10020**

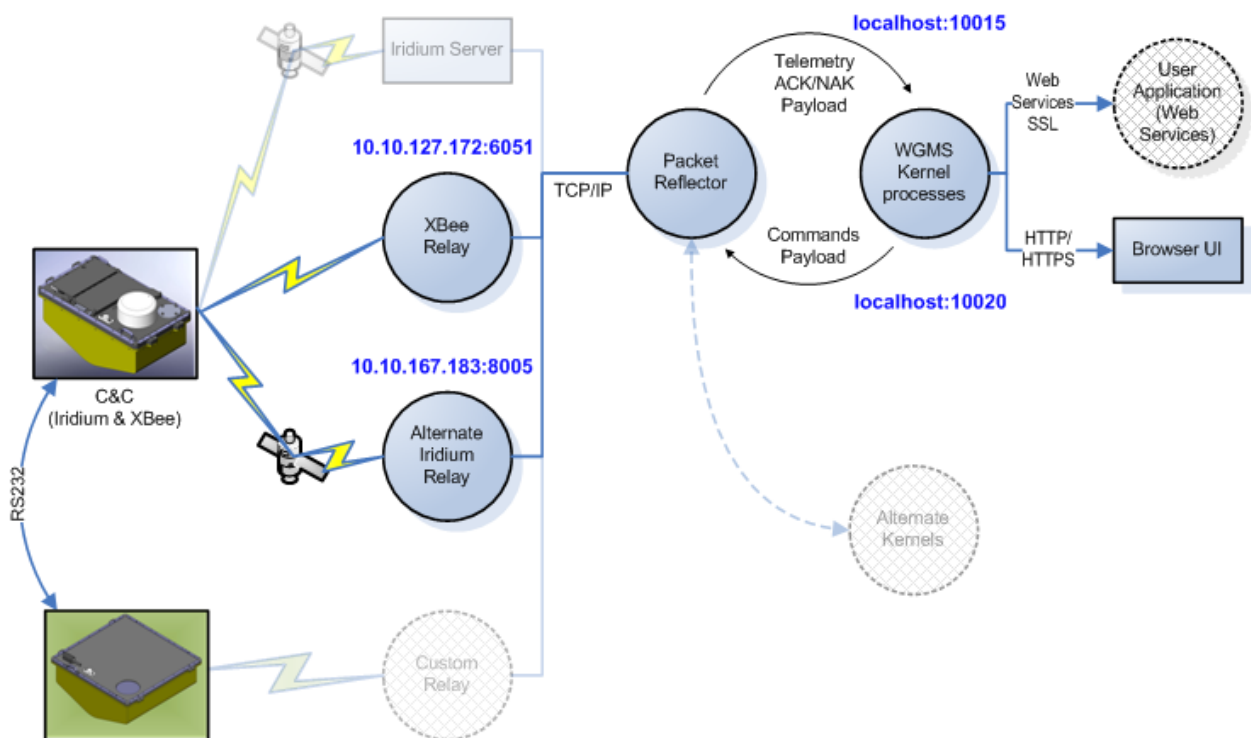
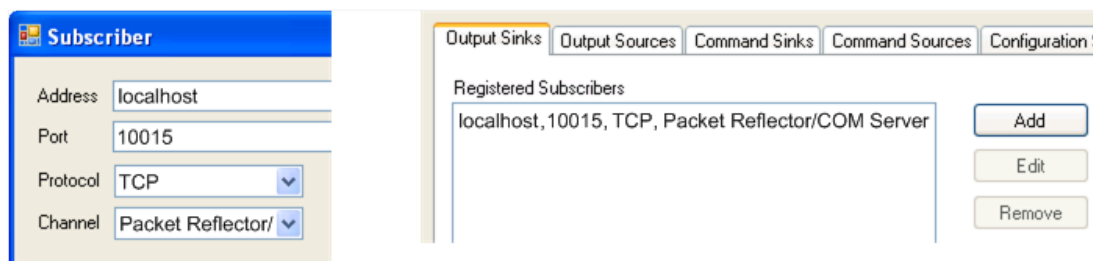


Figure 3-15: Mobile-to-Mobile Packet Reflector Configuration

Note that the Packet Reflector port number for a WGMS Output Sink must be **10015**, and the port number for a WGMS Command Source must be **10020**.

For the “Mobile-to-Mobile” configuration example described above, the subscriber data selection windows would be set as follows:



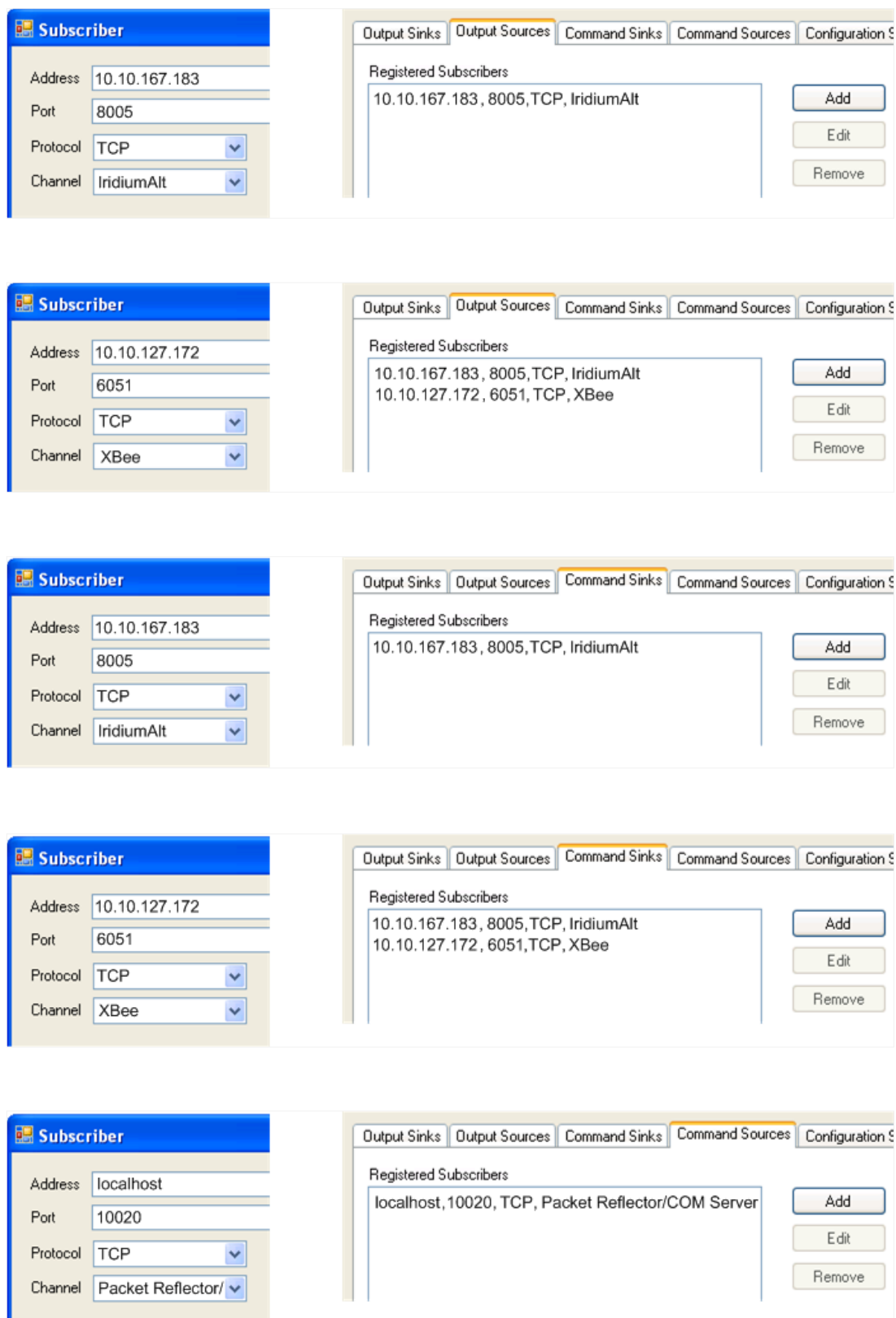


Figure 3-16: Example "Mobile-to-Mobile" Subscriber Screens

3.5.3 Configuring for “Payload Development and Bench Test”

The Packet Reflector configuration for the “Payload Development and Bench Test” is designed to communicate with the XBee and the WGMS Kernel. For the example shown, the Packet Reflector:

- Output Sink: **WGMS** at **localhost:10015**
- Output Source: **XBee** at **localhost:10012**
- Command Sink: **XBee** at **localhost:10012**
- Command Source: **WGMS** at **localhost:10020**

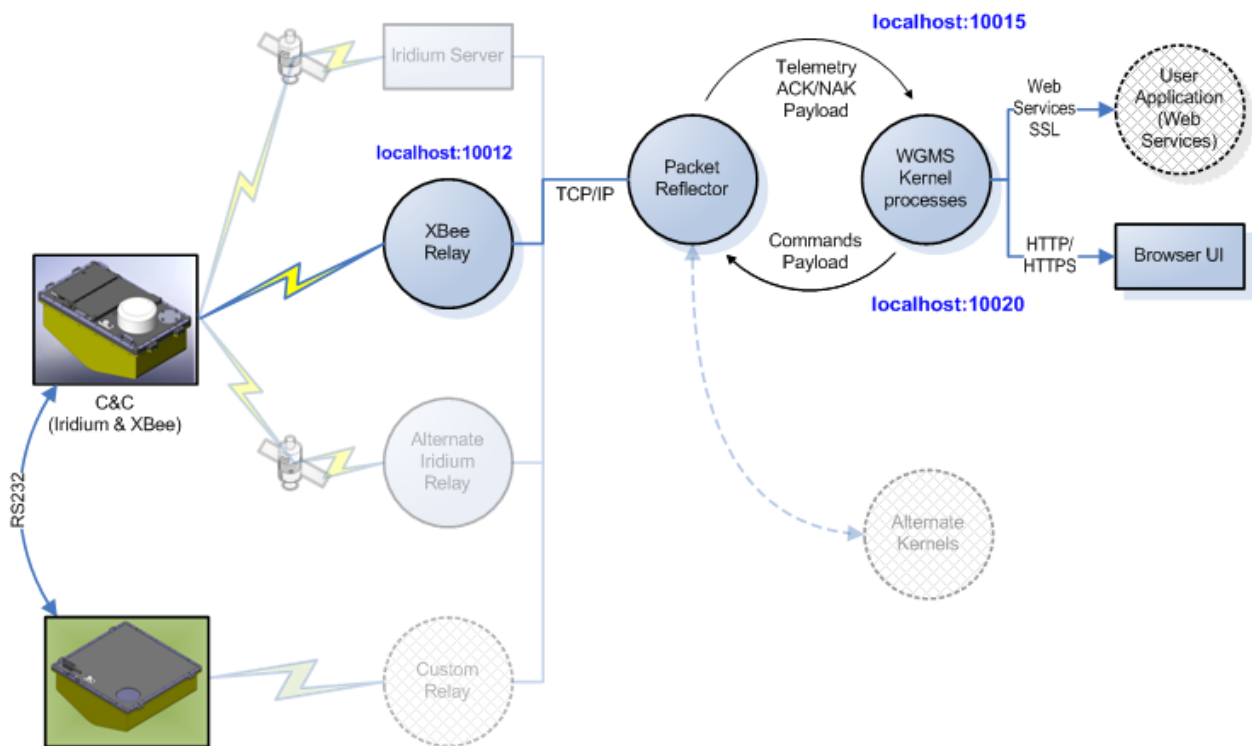


Figure 3-17: Payload Development and Bench Test Configuration

Note that the Packet Reflector port number for a WGMS Output Sink must be **10015**, and the port number for a WGMS Command Source must be **10020**.

For the “Payload Development and Bench Test” configuration example described above, the subscriber data selection windows would be set as follows:

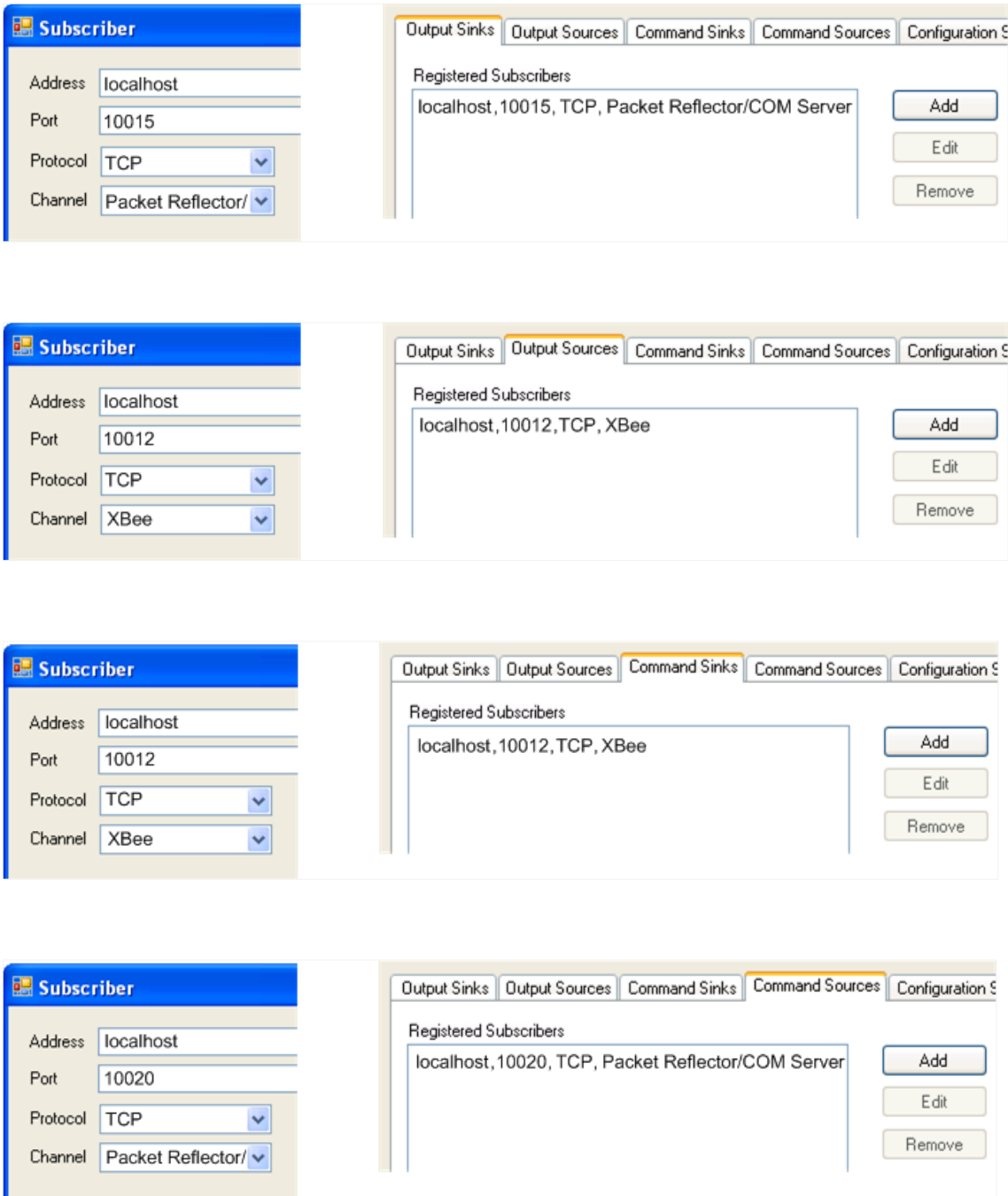


Figure 3-18: Example “Payload Development and Bench Test” Subscriber Screens

3.6 Starting/Stopping the Service

Click the **Start Service** button in the lower-right corner of the dialog box to start the Packet Reflector using the new configuration.

As shown in Figure 3-19, on start all buttons and check boxes will “Gray Out” and the **Start Service** button will change to **Stop Service**.

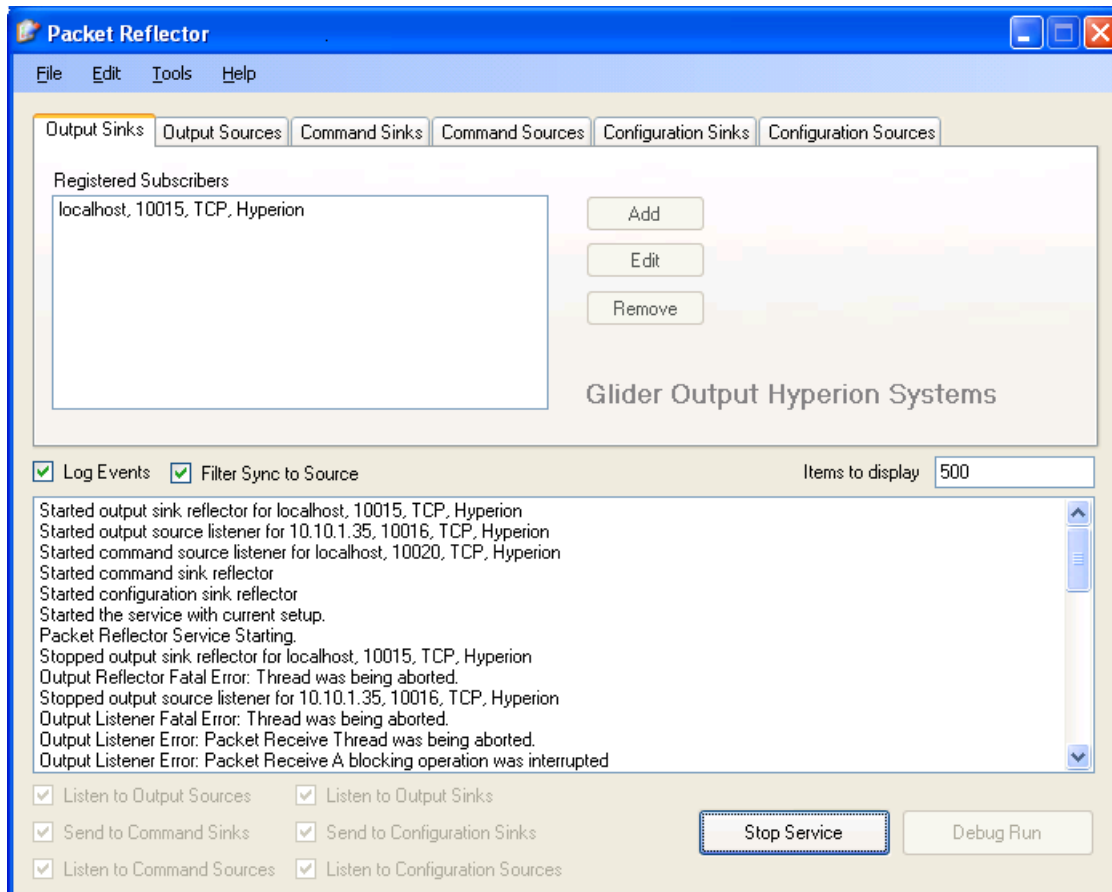


Figure 3-19: Packet Reflector UI During Example Operation

Note in the Event Log of the above Figure 3-19 example that the Packet Reflector failed to make the required Subscriber connections and thus failed.

Refer to section 8.10 "Interpreting Packet Reflector Log Records" for an explanation of how to interpret a log record like that shown above.

3.7 Debug Run Button

The Debug Run button is used for diagnostic purposes. Usage is outside the scope of this document.

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4. Configuring an XBee Relay

4.1 XBee Overview

The XBee radio link is an alternative method of issuing commands to and retrieving data from Wave Gliders. A single XBee Relay can manage multiple active Wave Gliders and masks the details of the XBee communications protocol from the WGMS Packet Reflector. The full set of commands available from WGMS can be used with the XBee interface, with the exception of a few Iridium-specific commands. Similarly, telemetry and other data that are visible in the WGMS UI for Iridium-based communications are also displayed for XBee communications.

Note that the XBee connection is between the Wave Glider and WGMS, not between a particular user and the Wave Glider.

The XBee relay must be installed on the computer to which the XBee transceiver is connected. The Relay communicates with the WGMS Packet Reflector via TCP/IP, which means that the Packet Reflector may run on the same computer or a different computer. A common configuration is to run the XBee Relay on a computer physically near the Wave Glider, with the packets delivered to a shared instance of WGMS via the Internet. The primary configuration task is to set up the connections between the XBee Relay and the Packet Relay.

4.1.1 XBee Operation

The XBee system performs the following operations within the WGMS.

- 1) Interfaces the Digi XBee-PRO modem (USB or serial version) and acts like an XBee Coordinator for the purpose of communicating with Wave Gliders.
- 2) Automatically recruits Wave Gliders with the same PAN ID to the Coordinator's channel.
- 3) Implements an LRI level 3 protocol that can carry WGMS messages in place of the Iridium network.
- 4) Implements the LRI WGMS Communication Channel specification, which enables it to communicate with a Packet Reflector and offer an alternative route for messages between WGMS and the set of Wave Gliders that are detected by the XBee Coordinator.
- 5) Implements communication console messages through the LRI Level 3 protocol and offers the ability to open a console window for each Wave Glider in range.
- 6) Decodes Level 2 messages received from WGMS or from the Wave Glider and displays them in a chat window.
- 7) The configuration of the relay is stored in the Windows registry; editors for the configuration are available through the relay's GUI.

4.1.2 XBee Range

The XBee radio aboard the Vehicle is low power and short-range. The range of XBee is dependent upon weather and terrain, but generally is not dependable at distances greater than 100 meters. It is best suited for launch-ship communications, payload development and land-based testing.

4.2 XBee Hardware and Software

4.2.1 XBee Hardware

To communicate with the Wave Glider XBee system, you will need to attach a transceiver to the computer that hosts the XBee Relay. The recommended hardware, shown below, is:

Digi XBee-PRO 802.15.4 USB Adapter, internal wire antenna

Model # XA-A14-CE1P



Figure 4-1: XBee USB Adapter

This is available from Digi at their website, www.digi.com. It is also available from some electronics distributors. Mobile to Mobile systems supplied by LRI include an XBee Adapter.

Plug the transceiver into a USB port in your computer. Plugging in should power it up, indicated by a blinking green light on the end.

4.2.2 Hardware and Software Requirements

The configuration specified below has been tested with the XBee equipment described above in section 4.2.1. Other configurations may work, but have not been tested.

- PC running Windows XP
- Microsoft .NET 3.5
- 100 MB of free disk space
- 2 GB of RAM
- XBee modem (Digi XBee USB Adapter S1 Pro)
- WGMS XBee Relay setup package
- Privileges to install software on the PC
- An Internet connection may be required

4.2.3 Installing the Device Driver

The device driver software is available for download on the Digi website.

- 1) On the website, click: **Support → Drivers**
- 2) Go down in the list to select: **XBee / XBee Pro 802.15.4 Adapters**,
- 3) Click **Submit**.
This should bring you to a page with download links for different operating systems.
Note that the link for Windows 7 and Vista is at the bottom of the page.
- 4) Download the the ZIP file to your computer. A special directory for the files (e.g., “Digi Driver”) is recommended.
- 5) Extract All from the ZIP file to the directory.
- 6) Open the README.TXT file and follow the instructions for installing the software on your computer.

The key configuration parameters are:

Baud Rate: **115,200 bps**
Data Bits: **8**
Stop Bits: **1 (or 2)**
Parity: **None**

Note: If necessary, use the Digi diagnostics software X-CTU to detect and configure the modem.

4.2.4 Firmware Updates

If there are problems establishing communications, it may be necessary to update the firmware on the XBee modem. The key parameters for updating are:

Modem Type: **XBP24**
Function Set: **XBee PRO 802.15.4**

4.2.5 Establishing Communications

Communications is established by first turning on the Digi transceiver and starting up the XBee Relay. Then turn on the Wave Glider XBee power. A key point to remember is:

Power up the Digi transceiver before starting up XBee on the Wave Glider

The Wave Glider XBee transceiver starts up when the Vehicle is powered up. So the typical procedure would be to connect the Digi, then power up the Wave Glider.

However, the Iridium link can also be used to switch the XBee On or Off. Thus, if the Digi transceiver was turned on after the Wave Glider, use the Dashboard control to first turn Off the XBee, then turn it back On.

You can also cycle power on the Wave Glider Off, then back On. Note that when doing this, wait about 10 seconds after turning Off before turning the Vehicle On again.

4.3 XBee Installation

4.3.1 Installation Instructions

The XBee installation files are on the LRI-supplied DVD. The procedure is as follows:

- 1) Copy the installation files into an accessible directory. The installation files consist of:

SETUP.EXE

XBeeRelayAppSetup.msi

To verify the software revision number, right click on the **XBeeRelayAppSetup.msi** name and select **Properties** from the popup menu, then examine the output on the Summary tab.

The revision number should be indicated in the “Title” box.

Check the “Comments” box for any notes that may be relevant to your revision.

Click **OK** to exit.

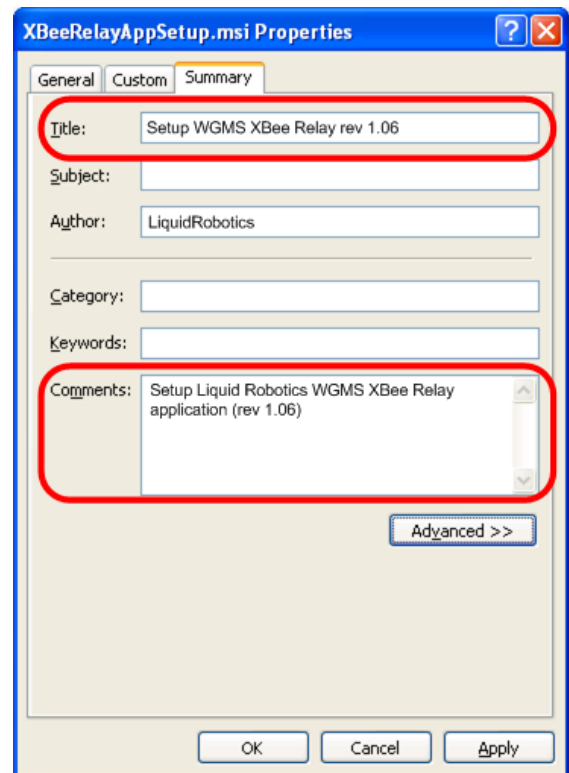


Figure 4-2: XBeeRelayAppSetup.msi Properties

- 2) Run SETUP.EXE from the directory where the file was placed¹.

¹ If another version of the software is already installed, you will be prompted to remove it using the Control Panel → Add or Remove Programs.

Running SETUP.EXE should bring up the “Welcome” dialog shown in Figure 4-3.

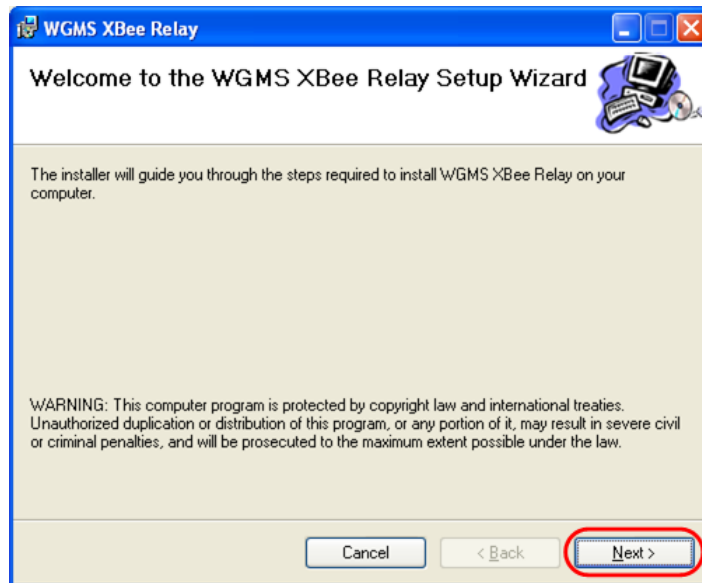


Figure 4-3: XBees Installation Welcome Dialog

3) Click **Next** on the Welcome screen. This should bring up the Installation Folder dialog:

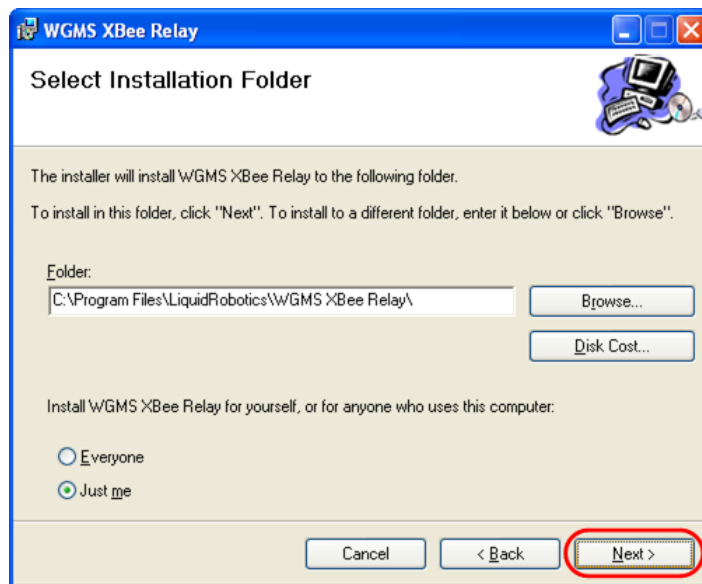


Figure 4-4: XBees Installation Folder Selection

4) Check the installation location and make any changes if necessary. Check the radio button at the bottom. In most cases, leave the “Just me” selected. Then click the **Next** button.

- 5) You should get an installation confirmation dialog. Confirm that you want to install by clicking the **Next** button.

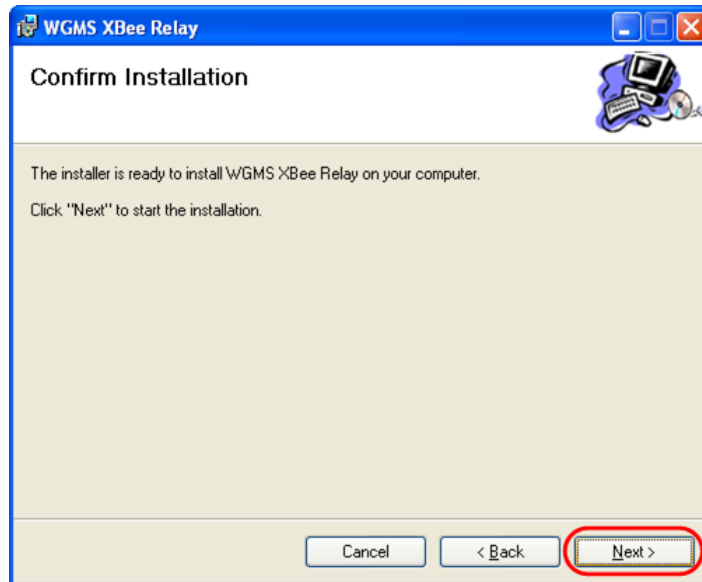


Figure 4-5: XBee Installation Confirmation Dialog

While the program is installing, you will see a progress indicator.

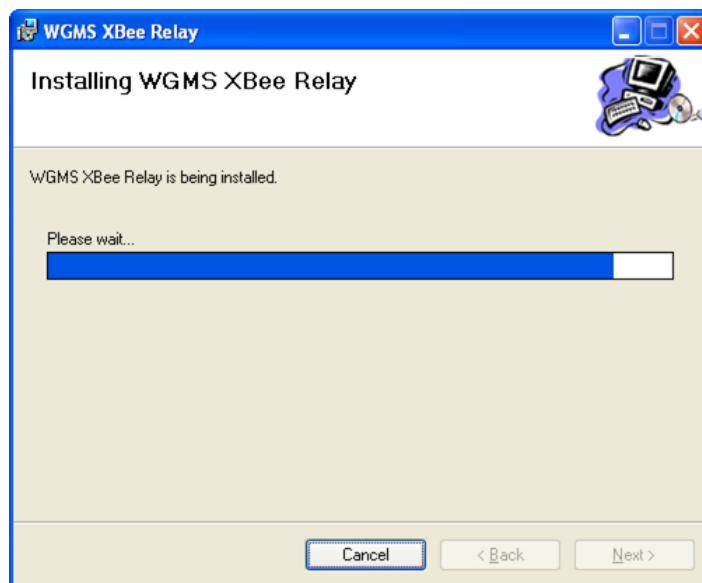


Figure 4-6: XBee Installation Progress Indicator

Note: During installation, you may be prompted to install the Microsoft .NET 3.5 Framework.

- 6) When installation has completed, you should see the following dialog. Click the **Close** button to dismiss the box.

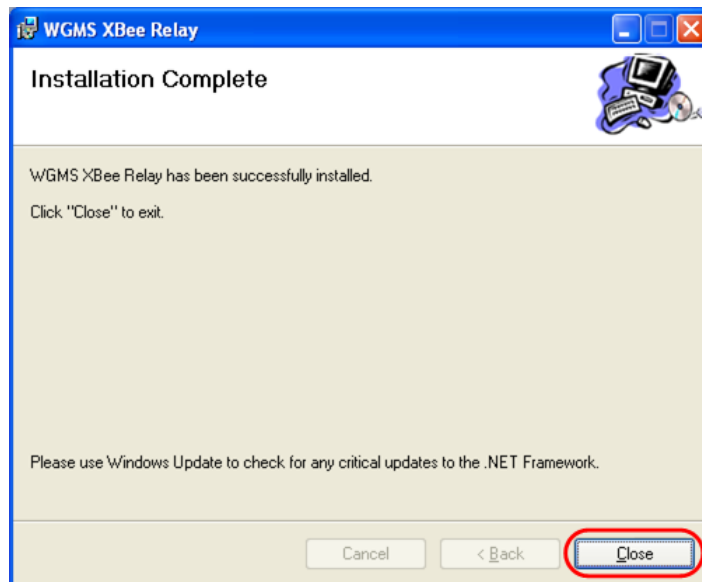


Figure 4-7: XBee Installation Complete Dialog

Once installation is completed, start the XBee Relay by clicking on the XBee Relay icon on the screen:



Figure 4-8: XBee Relay Start Icon

If there is no icon on the screen, you can start by clicking the **Start** button, then using **Programs → WGMS XBee Relay → WGMS XBee Relay**, as shown in Figure 4-9.

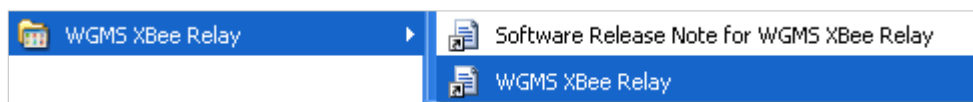


Figure 4-9: XBee Relay Configuration Start

It is a good idea to review the "Software Release Note" prior to configuring the XBee software.

4.4 XBee Software Configuration

4.4.1 XBee Start-Up Screen

- 1) After clicking on the **WGMS XBee Relay** icon or selection, the startup screen shown annotated in Figure 4-10 below should come up:

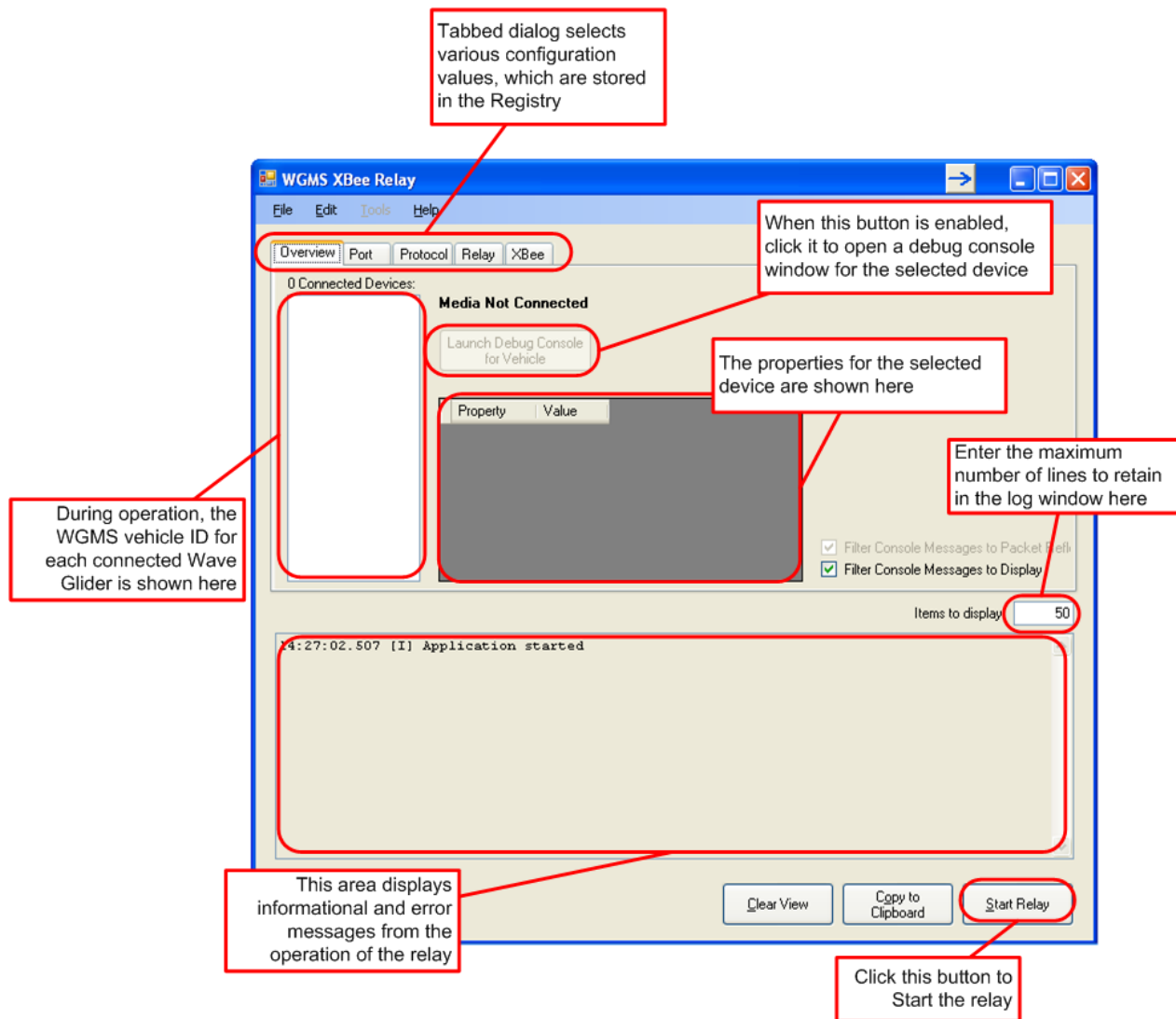


Figure 4-10: XBee Relay Annotated Start-Up Screen

- 2) Ensure that the XBee modem (the Digi XBee USB Adapter) has been connected, and note which serial port is used.

*Note: If necessary, use the Digi diagnostics software **X-CTU** to detect and configure the modem. (This is available from Digi at <http://www.digi.com>)*

4.4.2 Setting Port and Network Configurations

Configure the Relay and XBee network settings before starting the relay:

- 1) Click the **Port** tab and verify that the correct Serial Port is selected (i.e. the one provided by the Digi modem). Only the detected serial ports are listed in the drop-down menu. Click the **Apply** button to save any changes made.

*Note: The **Revert** button causes the settings to go back to the values they had when you clicked to select the Port tab; it does not reset them to the default installation values.*

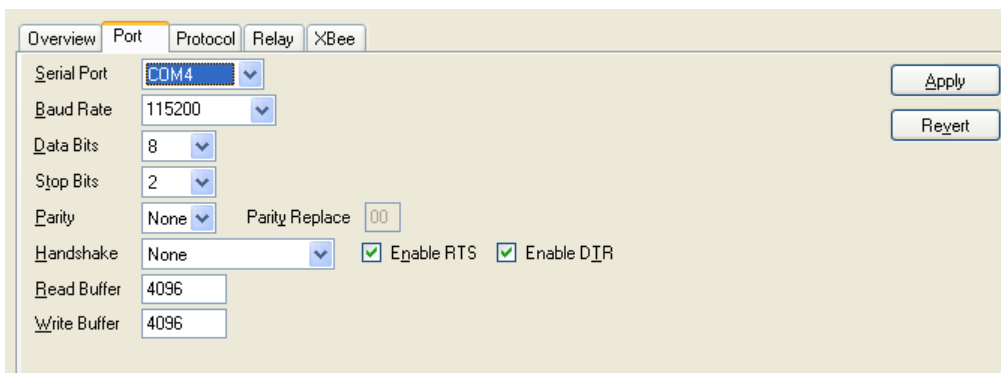


Figure 4-11: Xbee Port Selection Tab

- 2) Click the **XBee** tab (as shown in Figure 4-12) and verify that the PAN ID is correct.

Note: For hexadecimal numbers, be sure to add the "0x" at the beginning of the number. As an example, use 0x5000 to indicate hexadecimal 5000 (20480 decimal).

By default, the modem scans for the clearest channel and uses that. If desired, a specific communication channel can be forced by un-checking the **Scan for Clear Channel** checkbox. Then specify one of the available channels in the **Fixed Channel** box.

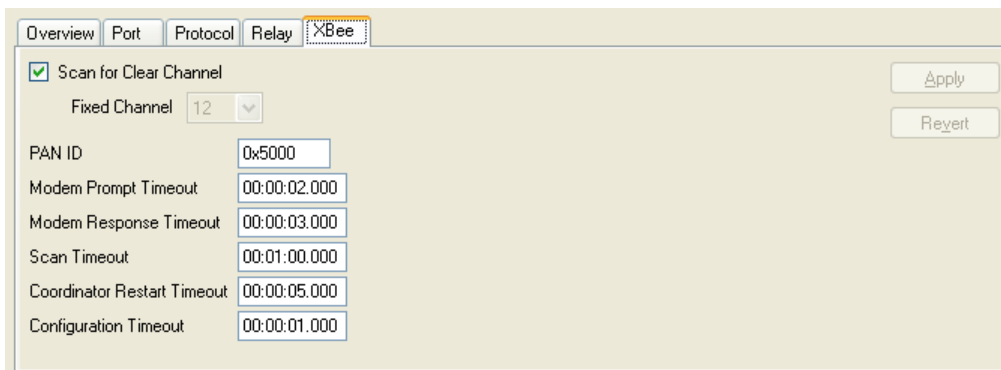


Figure 4-12: Xbee Parameter Selection Tab

- 3) Click the **Apply** button to save any changes made.
- 4) Click the **Relay** tab to enter the address and port values for the Packet Reflector and the Relay.

- For the Relay Address, click **Suggest Relay IP** to show the first IP Address available on the Relay computer.
- For the Packet Reflector Address, use the IP Address and IP Port provided separately by Liquid Robotics or by your IT staff. Note that if the IP Port numbers are the same, the IP Addresses must be different.

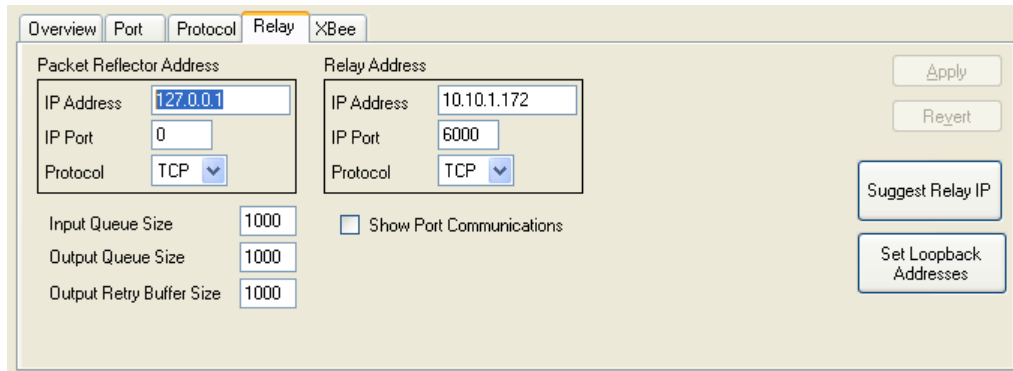


Figure 4-13: Packet Reflector and Relay Address Selection

- 5) Click the **Apply** button to save any changes made.

4.4.3 Starting the Relay

Once the port and network configurations have been set, you can start the Relay.

- 1) Click the **Start Relay** button on the lower right.

Some configuration values are grayed out during execution. The log display (Figure 4-14) shows events as they occur, along with a time stamp.

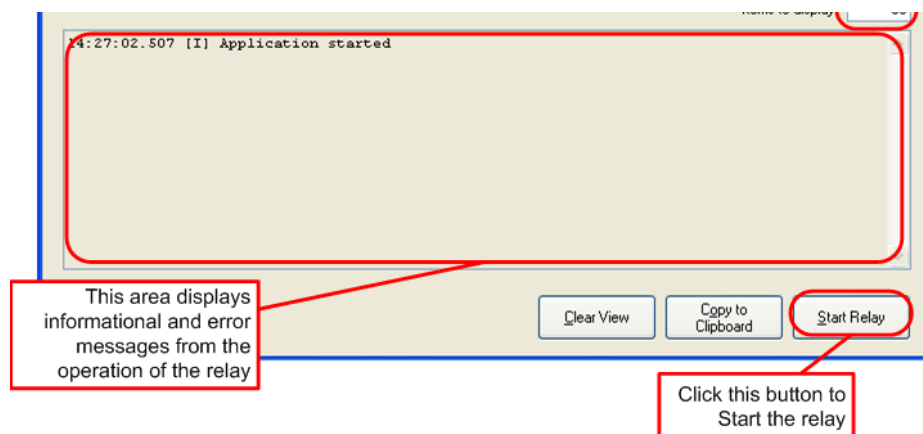


Figure 4-14: Start Relay Button and Log Display

When communication has been established with the modem, the bold indicator field changes to **Media Connected** and the log shows “XBee modem communication established” as shown in Figure 4-15 below.

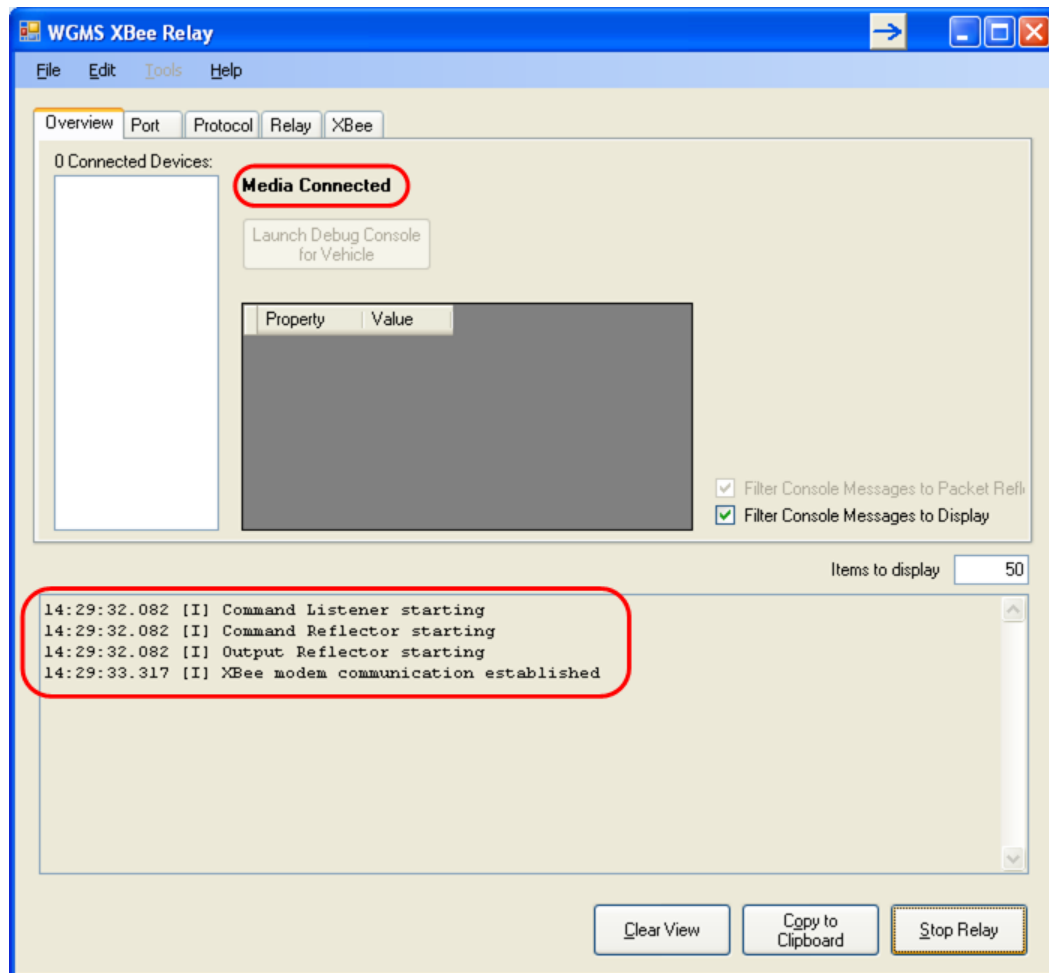


Figure 4-15: XBee Relay Media Connected

Any Vehicles with active XBee modems and that are in range connect automatically. Details of the selected device are shown in the adjacent control box (ref. Figure 4-16).

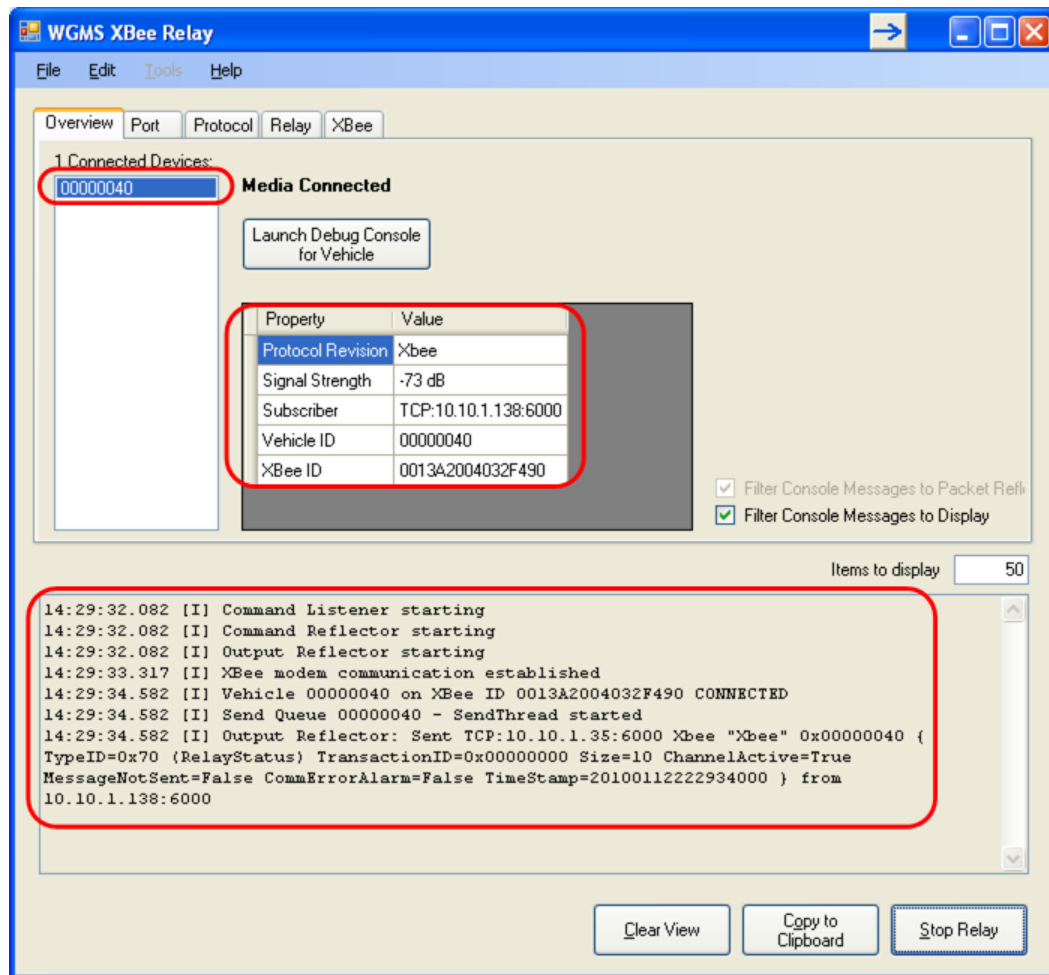


Figure 4-16: XBee Connection Established

The “Output Reflector: Sent ...” line in the log display indicates successful transmission to the Packet Reflector.

If the notification reads “Added” instead of “Sent”, then the relay was not able to send to the Packet Reflector.

Note: Telemetry is not sent via XBee by default. However, you can issue a WGMS command to set XBee as the default communications channel.

- 2) To communicate with the Wave Glider's command line console, select a connected device in the device list and press the **Launch Debug Console for Vehicle** button. This will bring up the small window:

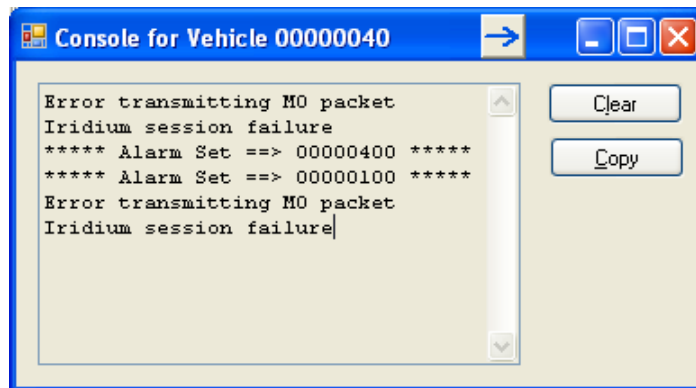


Figure 4-17: Debug Console Window

Right clicking on the window gives access to several useful functions:

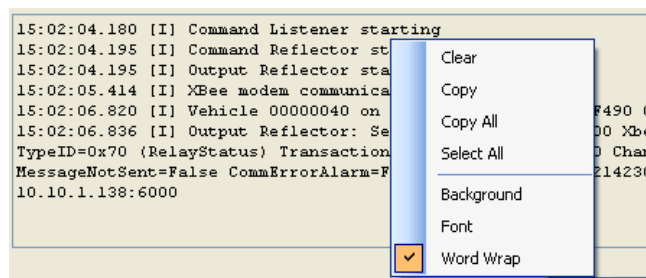


Figure 4-18: Display Window Function Select

Note also that the application window can be resized to take best advantage of the user's screen size:

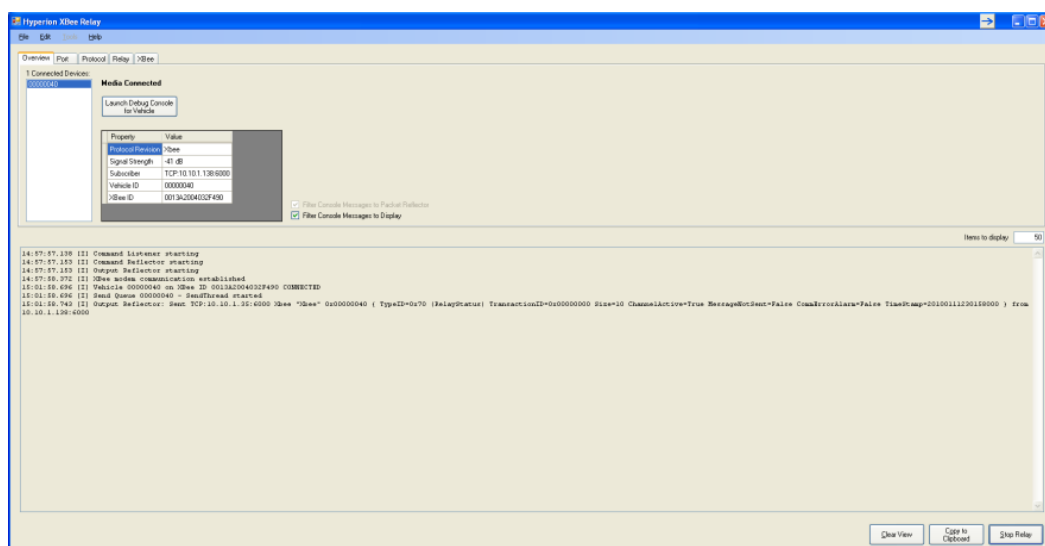


Figure 4-19: Re-Sized Relay Application Form

4.4.4 Saved Events

The events are saved in the system event log under **XBeeRelayLog**, and can be viewed using the Windows Event Viewer applet, which can be accessed from the Administrative Tools folder in the Control Panel:

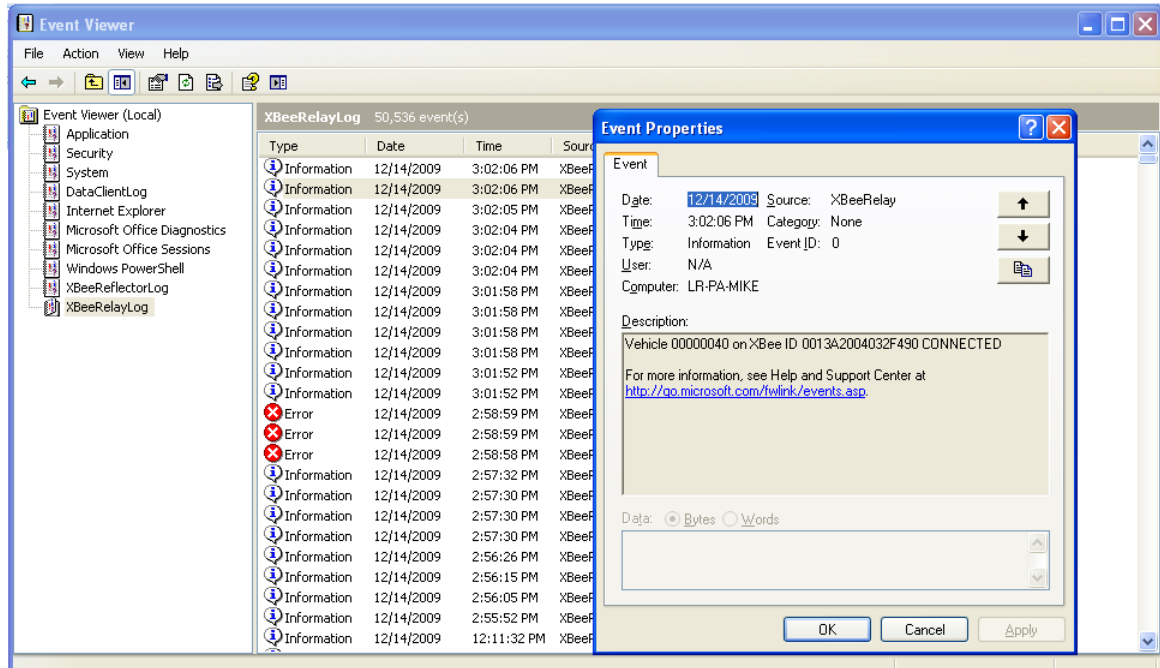


Figure 4-20: Viewing Saved System Events

4.5 Using XBee with Hosted WGMS

This procedure describes how to allow communication between XBee and hosted WGMS via a VPN connection.

4.5.1 Required Materials

- OpenVPN 2.1.4
(Available at <http://swupdate.openvpn.net/community/releases/openvpn-2.1.4-install.exe>)
- Xbee Relay software installed and talking to a vehicle
- Zip file containing your assigned VPN Certificate and config file (from Liquid Robotics)
- VPN account information (from Liquid Robotics)
- IP and port assignments for the Xbee Relay (from Liquid Robotics)
- Liquid Robotics Wave Glider System Administration Manual (from Liquid Robotics)

4.5.2 Configuring OpenVPN

- 1) Download and install OpenVPN.
- 2) Extract the zip file containing the appropriate certificates and config file to the OpenVPN directory. If you used the default directory, it will be in one of two places.
 - 64-bit Windows – C:\Program Files (x86)\OpenVPN\, or
 - 32-bit Windows – C:\Program Files\OpenVPN\
- 3) Open up the Network Connections control panel screen to rename the installed network adapter to TAP-Bridge.
 - Windows XP: Start->Control Panel->Network Connections
 - Windows 7: Start->Control Panel->Network & Sharing Center->Click on “Change Adapter Settings” in the left column
- 4) Locate the connection with the device name “TAP-Win32 Adapter V9.” (If you cannot find this device name or the device name is different, make sure that you have installed the correct version of OpenVPN.)
- 5) Right click on that connection, select Rename, and rename it to TAP-Bridge (case-sensitive).
NOTE: If this adapter has the wrong name, the connection will fail.
(If OpenVPN is being run in Windows Vista or Windows 7, it needs to be run as Administrator in order to update the routing tables when it connects.)
- 6) Go to Start->Programs->OpenVPN->OpenVPN GUI.
- 7) Right click on OpenVPN GUI and select Properties.
- 8) Click on the Compatibility tab in the Properties dialog.
- 9) Check the “Run this program as an Administrator” box.
- 10) Press OK to accept the changes.

4.5.3 Configuring the XBee Relay

1. Open the Xbee Relay and go to the Relay tab.
2. Enter the Packet Reflector Address provided by LRI:

- • IP Address: 10.20.1.41
 - • IP Port: <provided>
3. Enter the Relay Address provided by LRI:
- • IP Address: <IP of the VPN connection, provided>
 - • IP Port: <provided>

4.5.4 Operation & Verification of IP Address

1. Launch OpenVPN GUI (Start->Programs->OpenVPN->OpenVPN GUI).
2. When OpenVPN GUI is running there is an icon in your notification area/systray that looks like two red computer screens. Right click the icon and select Connect.
3. When prompted, enter the username and password provided to you for the Relay VPN.
4. Once connected, the interface will disappear and a notification bubble will pop up and let you know what your IP Address is.
- 5) Verify that this IP address is the same as the one provided to you by Liquid Robotics. If the VPN address is not the same, contact Liquid Robotics customer support for assistance.

5. Configuring an Alternate Iridium Relay

5.1 Alternate Iridium Relay Overview

The Alternate Iridium Relay is primarily intended for Mobile to Mobile (M2M) applications, where WGMS Internet access is inconvenient or expensive. Liquid Robotics offers a pre-configured Mobile to Mobile product that includes all software and hardware required to operate in the Mobile to Mobile mode. That product includes a Panasonic ToughBook laptop, an LRI M2M electronics module and packaging appropriate to a marine environment. It is delivered with the software and Iridium modems pre-configured and tested for operation with a paired Wave Glider. If you purchased that product, no additional configuration of the Alternate Iridium Relay is required.

It is possible to assemble your own M2M system by installing and configuring WGMS and the Alternate Iridium Relay. In the M2M configuration, the standard Iridium service LRI uses for messaging, DirectIP is replaced with one that is not dependent on Internet connectivity. In the M2M use case, LRI uses ISU-ISU messages. In both use cases, the data is sent via Iridium Short Burst Data packets. ISU-ISU relies on the two ends being indirectly connected via modems that are paired in the Iridium Communications provisioning database. Refer to Figure 5-1 below.

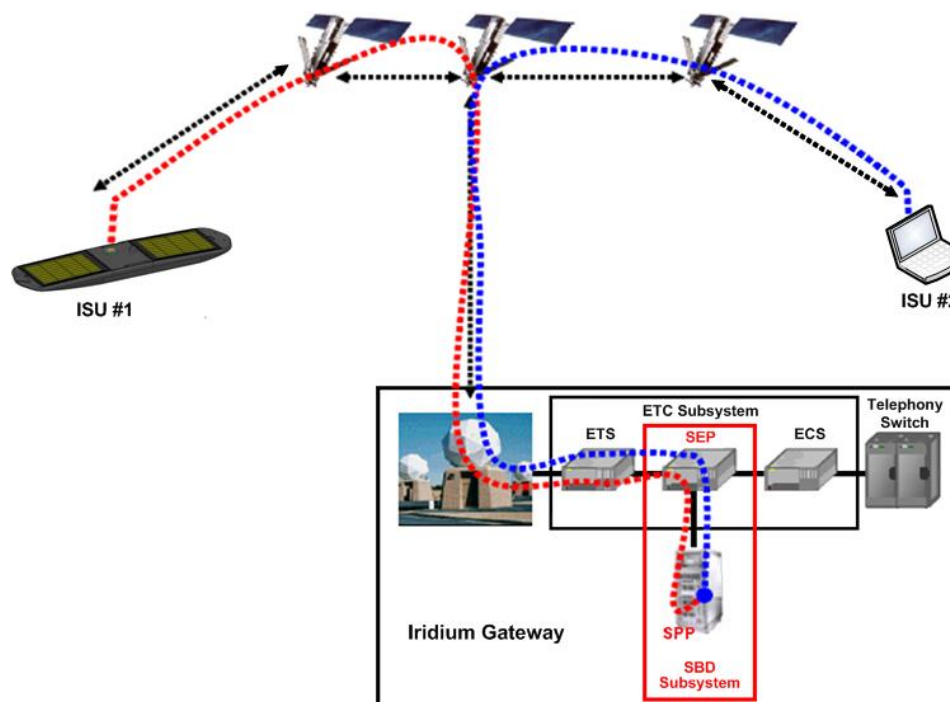


Figure 5-1: Mobile-to-mobile Communications

In the LRI M2M configuration, one Iridium modem is installed in the LRI Wave Glider Command and Control electronics module and the other is installed in a separate Mobile to Mobile electronics module that includes an Iridium modem, a GPS antenna, an XBee transceiver, a Panasonic ToughBook and appropriate cabling and power options. The modem in the M2M electronics module communicates with the ToughBook via a serial connection. The ToughBook is configured with its own copy of WGMS to serve as the M2M Host, including the Alternate Iridium Relay. The LRI M2M electronics package will come pre-configured for communications between the paired Iridium modems.

Creating your own Mobile to Mobile system requires that you provision the modems and install and configure WGMS and the Alternate Iridium Relay. This chapter provides guidance on how to configure and troubleshoot the Alternate Iridium Relay.

It is technically possible to use the Alternate Iridium Relay with a hosted version of WGMS. Please contact LRI technical support if you feel you have an application where this might be useful.

5.2 Installing Iridium Relay Software

5.2.1 Tested Hardware and Software

The configuration specified below has been tested and works on the equipment supplied by LRI. Other configurations may work, but have not been tested.

- PC running Windows XP
- Microsoft .NET 3.5
- 100 MB of free disk space
- 2 GB of RAM
- 1 free serial port
- WGMS Iridium Relay setup package
- Privileges to install software on the PC
- An internet connection may be required
- Modem hardware including:
 - > Iridium 9522B modem provisioned to communicate with the 9601 modem installed on a Wave Glider (ideally, the 9522B's ring indicator has been enabled.)
 - > Power supply and cables as suggested in the 9522B documentation.
 - > Communication cable to serial port.

Note: All modems need to be provisioned to allow for Iridium coordinates in the Header.

5.2.2 Installation Instructions

The Iridium Relay installation files are on the LRI-supplied DVD.

The installation procedure is as follows:

- 1) Copy the installation files into an accessible directory. The installation files consist of:

SETUP.EXE

IridiumRelayAppSetup.msi

To verify the software revision number, right click on the **IridiumRelayAppSetup.msi** name and select **Properties** from the popup menu, then examine the output on the Summary tab.

The revision number should be indicated in the “Title” box.

Check the “Comments” box for any notes that may be relevant to your revision.

Click **OK** to exit.

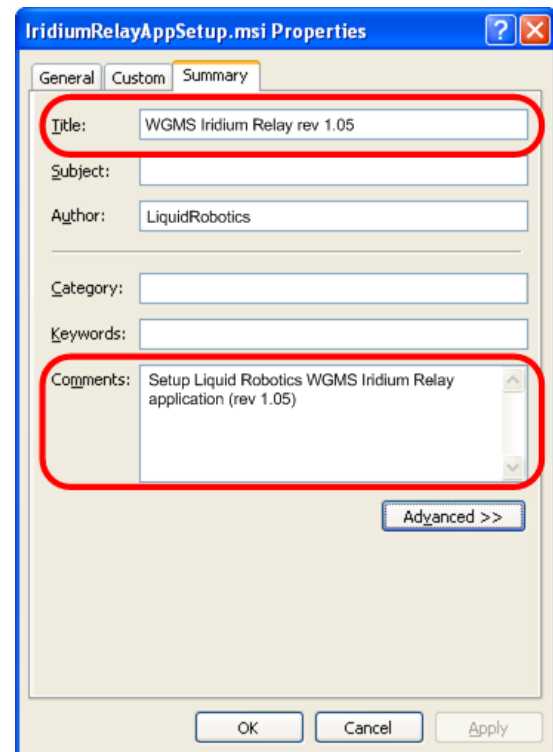


Figure 5-2: Iridium RelayAppSetup.msi Properties

- 2) Run SETUP.EXE from the directory where the file was placed². This should bring up the “Welcome” dialog shown in Figure 5-3.

² If another version of the software is already installed, you will be prompted to remove it using the Control Panel → Add or Remove Programs.

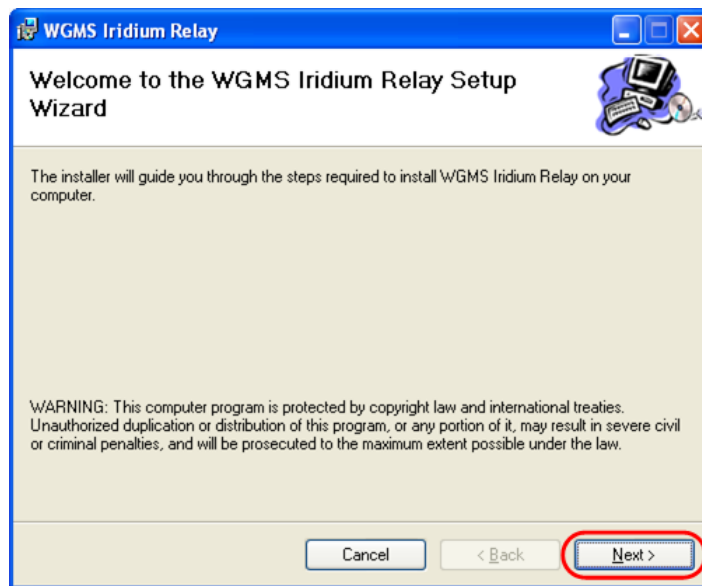


Figure 5-3: Iridium Relay Installation Welcome Dialog

- 3) Review the standard installation location and make any changes necessary; then press **Next**:

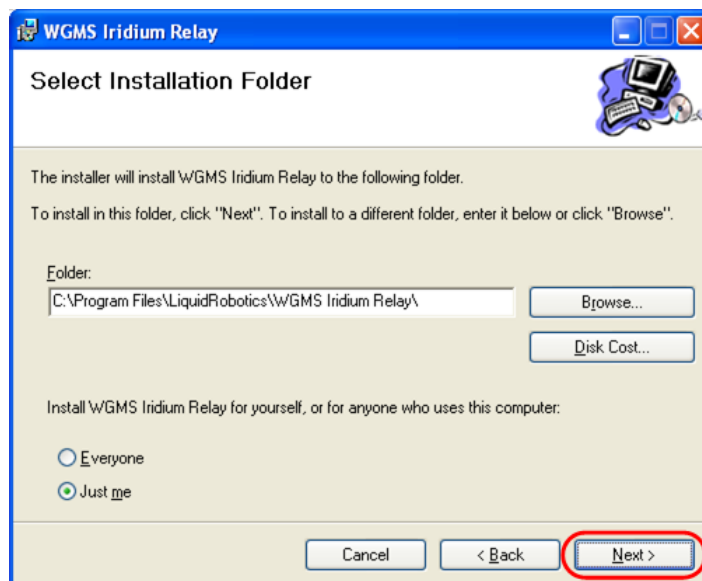


Figure 5-4: Iridium Relay Installation Folder Selection

- 4) Check the installation location and make any changes if necessary. Select the radio button at the bottom. In most cases, leave the “Just me” selected. Then click the **Next** button.

- 5) You will get an installation confirmation dialog. Confirm that you want to install by clicking the **Next** button.

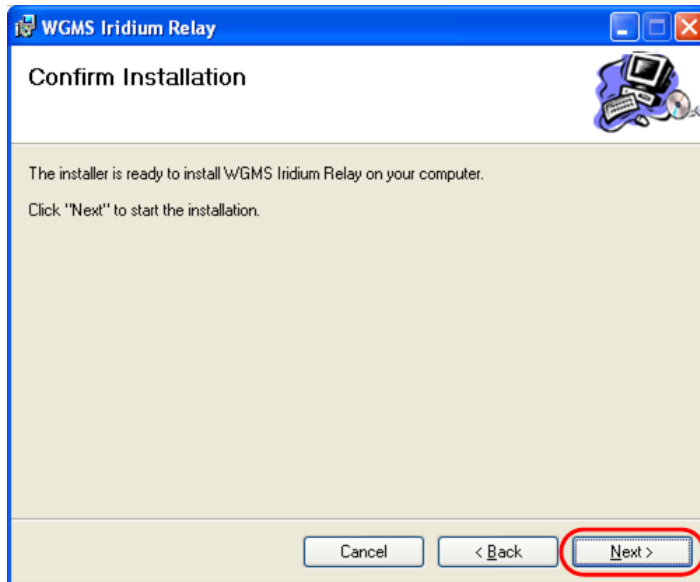


Figure 5-5: Iridium Relay Installation Confirmation Dialog

While the program is installing, you will see a progress indicator.

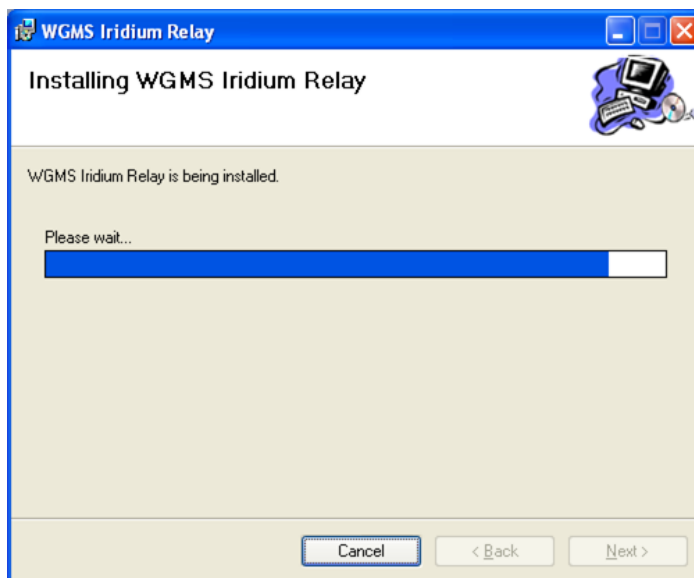


Figure 5-6: Iridium Relay Installation Progress Indicator

Note: During installation, you may be prompted to install the Microsoft .NET 3.5 Framework.

- 6) When installation has completed, you should get the following dialog. Click the **Close** button to dismiss the dialog.

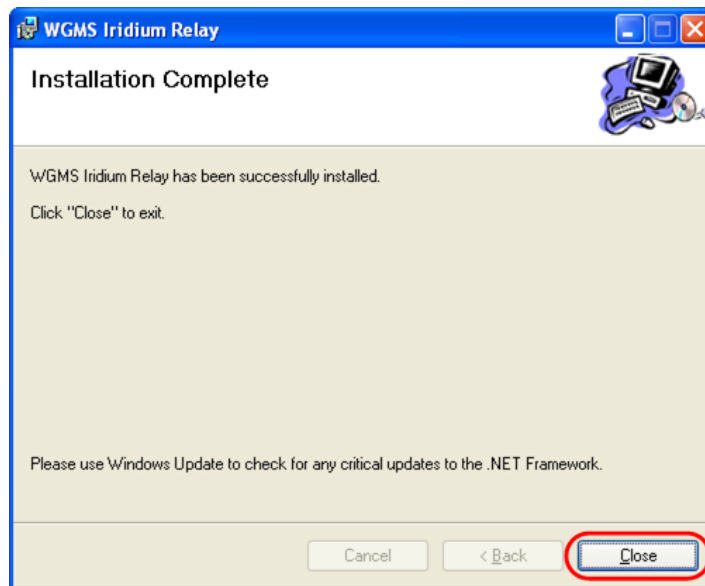


Figure 5-7: Iridium Relay Installation Completion Dialog

If installation completed successfully, the program selection should be on the **Start** menu under **Programs → WGMS Iridium Relay → WGMS Iridium Relay**.

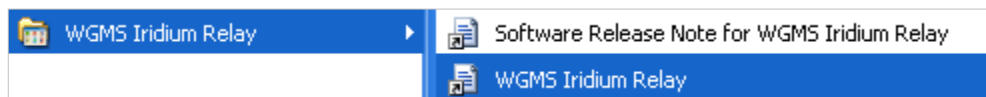


Figure 5-8: Iridium Relay on Start Menu

LRI recommends that you review the "Software Release Note" before configuring the Iridium Relay.

5.3 Iridium Relay Software Configuration

5.3.1 Iridium Relay Start-Up Screen

- 1) Click on the WGMS Iridium Relay shortcut shown in Figure 5-8 to start the relay. The startup screen, shown annotated in Figure 5-9 below, should come up:

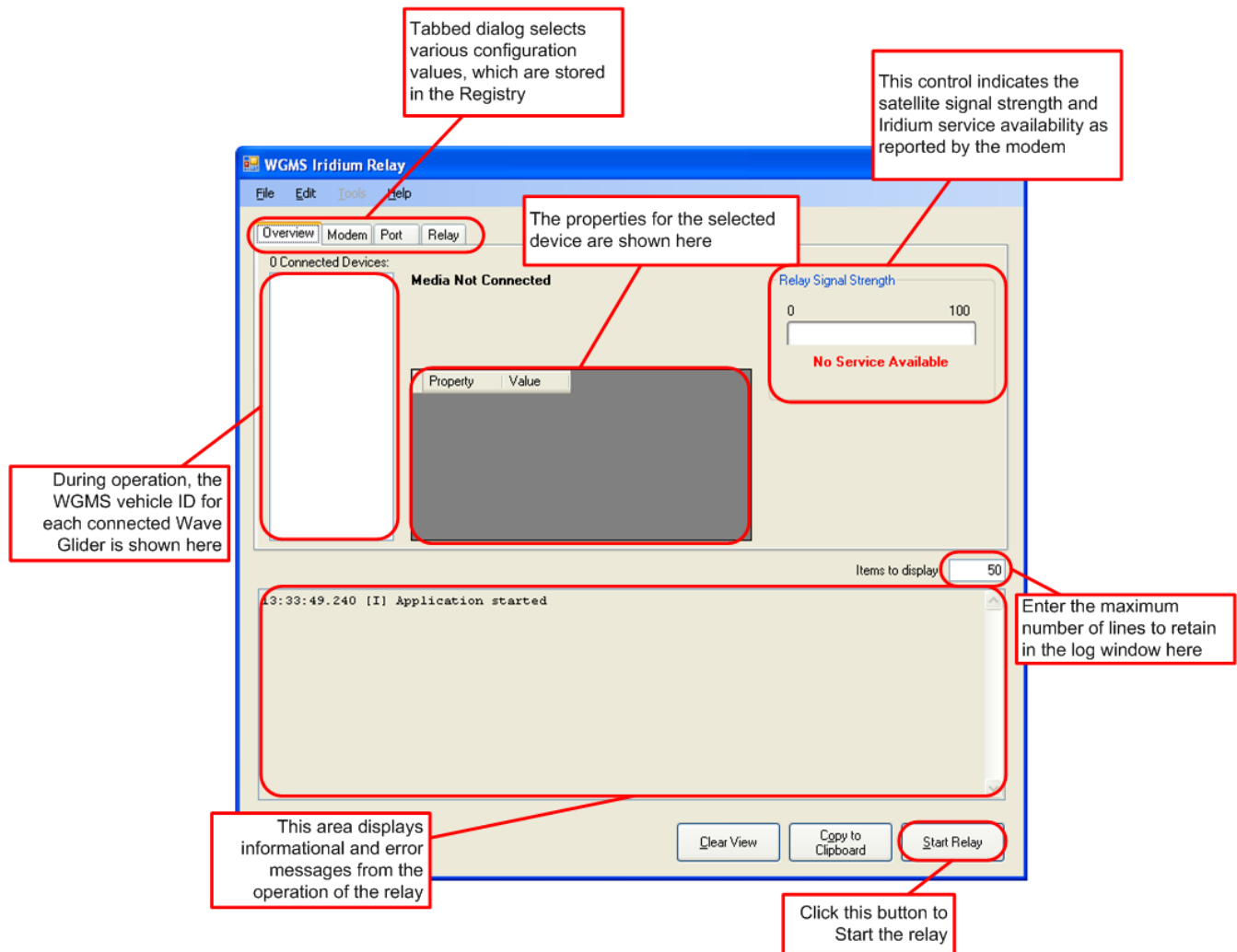


Figure 5-9: Iridium Relay Annotated Start-Up Screen

- 2) Ensure that the Iridium modem has been connected to the WGMS computer, and note which serial port is used.

5.3.2 Setting Iridium Port and Network Configuration

Before starting the Iridium relay, the correct port and network configurations must be set.

- 1) Click on the **Port** tab and verify that the correct Serial Port is selected (i.e., the port to which the Iridium modem is connected). Only the detected serial ports are listed in the drop-down menu.

*Note: The **Revert** button returns the settings to the values they had when you clicked to select the Port tab; it does not reset them to “default” values.*

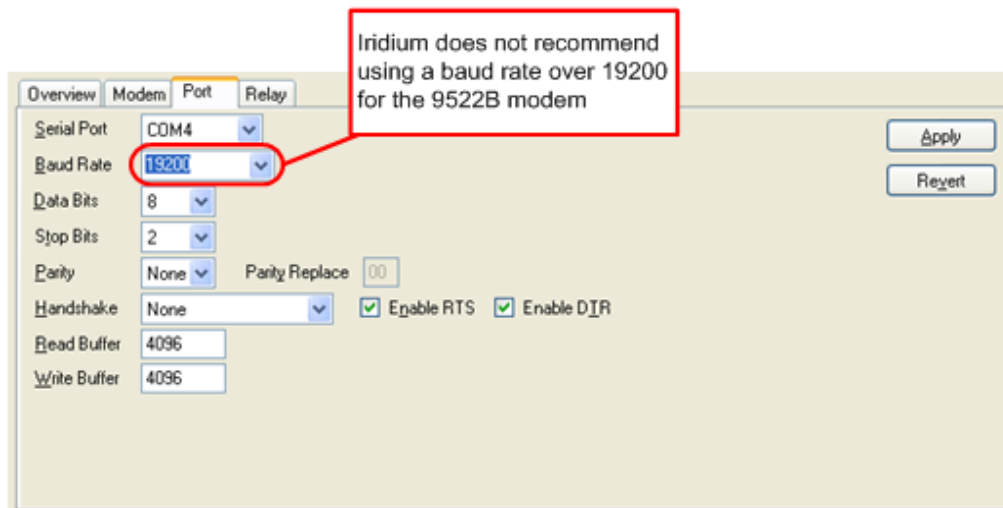


Figure 5-10: Iridium Port Selection Tab

- 2) Click the **Apply** button to save any changes made.
- 3) Click the **Modem** tab to configure various timeout values.

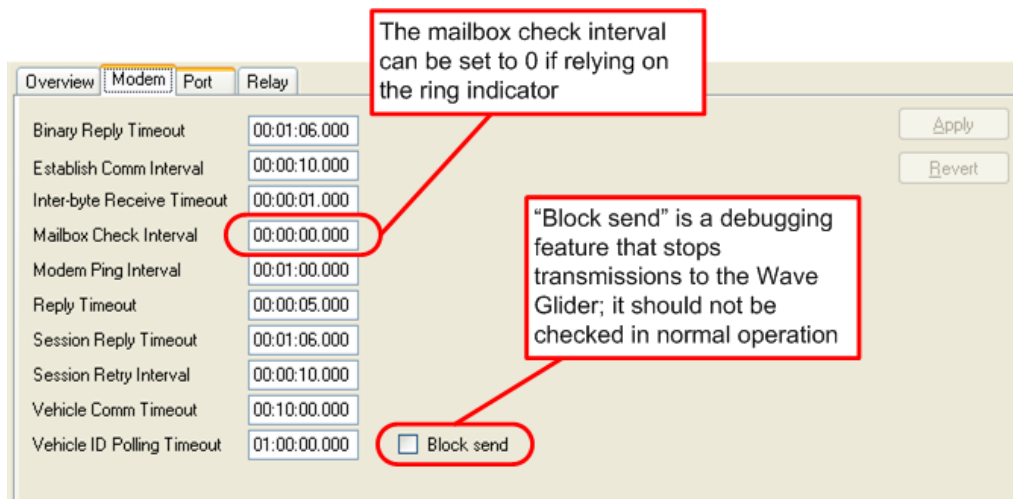


Figure 5-11: Iridium Modem Selection Tab

Most of the Modem selection values should be left at default values, except for the following:

- “Mailbox Check Interval” specifies how often the program should check for messages from the Wave Glider. If you have provisioned the modem connected to the relay computer with the “ring indicator” option, you can set this value to 0 (zero) to disable mailbox checking. If the ring indicator is not used, a 2-minute interval is typical for mailbox checking.³
- “Block send” is used to hold the transmit queue to the Wave Glider (prevent transmission) for diagnostics. It should not be checked in normal operation.

4) Click the **Apply** button to save any changes made in the Modem tab.

5) Click the **Relay** tab to enter the address and port values for the Packet Reflector and the Relay.

- For the Relay Address, click **Suggest Relay IP** to show the first IP Address available on the Relay computer.
- For the Packet Reflector Address, use the IP Address and IP Port provided separately by Liquid Robotics or by your IT staff.

Note: IP Ports with the same number should not have the same IP Address. The Packet Reflector must be configured to accept connections from your computer, and a unique port number should be used for each computer connection and type. Configuration of the Packet Reflector is discussed in chapter 3.

The screenshot shows the 'Relay' tab of the Wave Glider WGMS configuration window. It is divided into two main sections: 'Packet Reflector Address' and 'Relay Address'. The 'Packet Reflector Address' section includes fields for IP Address (127.0.0.1), IP Port (0), and Protocol (TCP). Below these are three input fields for Input Queue Size, Output Queue Size, and Output Retry Buffer Size, all set to 1000. The 'Relay Address' section includes fields for IP Address (10.10.1.172), IP Port (6000), and Protocol (TCP). A checkbox labeled 'Show Port Communications' is checked. On the right side of the window, there are four buttons: 'Apply', 'Revert', 'Suggest Relay IP', and 'Set Loopback Addresses'. The 'Relay' tab is selected in the top navigation bar.

Figure 5-12: Iridium Modem Relay Address Selection

6) Click the **Apply** button to save any changes made.

³ Mailbox checks may have an associated fee: please consult Iridium or your service provider to verify the fee structure. Your service provider or Iridium must configure your modem for Ring Indicator.

5.3.3 Starting the Relay

Once the Port, Modem and Relay configurations have been set, you can start the relay.

- 1) Click the **Start Relay** button on the lower right.

Some configuration values are grayed out during execution. The log display shows events as they occur, along with a time stamp.



Figure 5-13: Start Relay Button

Upon starting, the Relay first establishes connection with the Iridium modem connected to the Relay computer using the parameters from the previous configuration step. It then identifies the Wave Glider on the other side of the connection. Alternate Iridium modems use the Iridium ISU-ISU protocol which requires that the modems be paired by a provisioning service such as Iridium Communications. Since re-provisioning is rare, the Alternate Iridium Relay caches data from previous sessions and only requires you to confirm that you are working with the same Wave Glider as before.

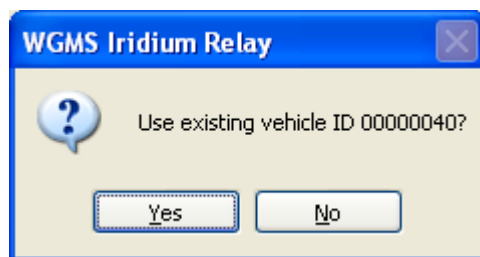


Figure 5-14: Vehicle ID Request

- 2) Click **Yes** if you want to use the same Vehicle ID.

If this is the first use of the relay, you will not get the above message. Instead, the relay will query the Wave Glider for its vehicle ID. Note that it may take several minutes to get a response back from the Wave Glider depending on its communications configuration parameters.

When communication is established with the modem and connection has been made to the Iridium service, the bold indicator field changes to **Media Connected** and the log shows “Iridium modem communication established”.

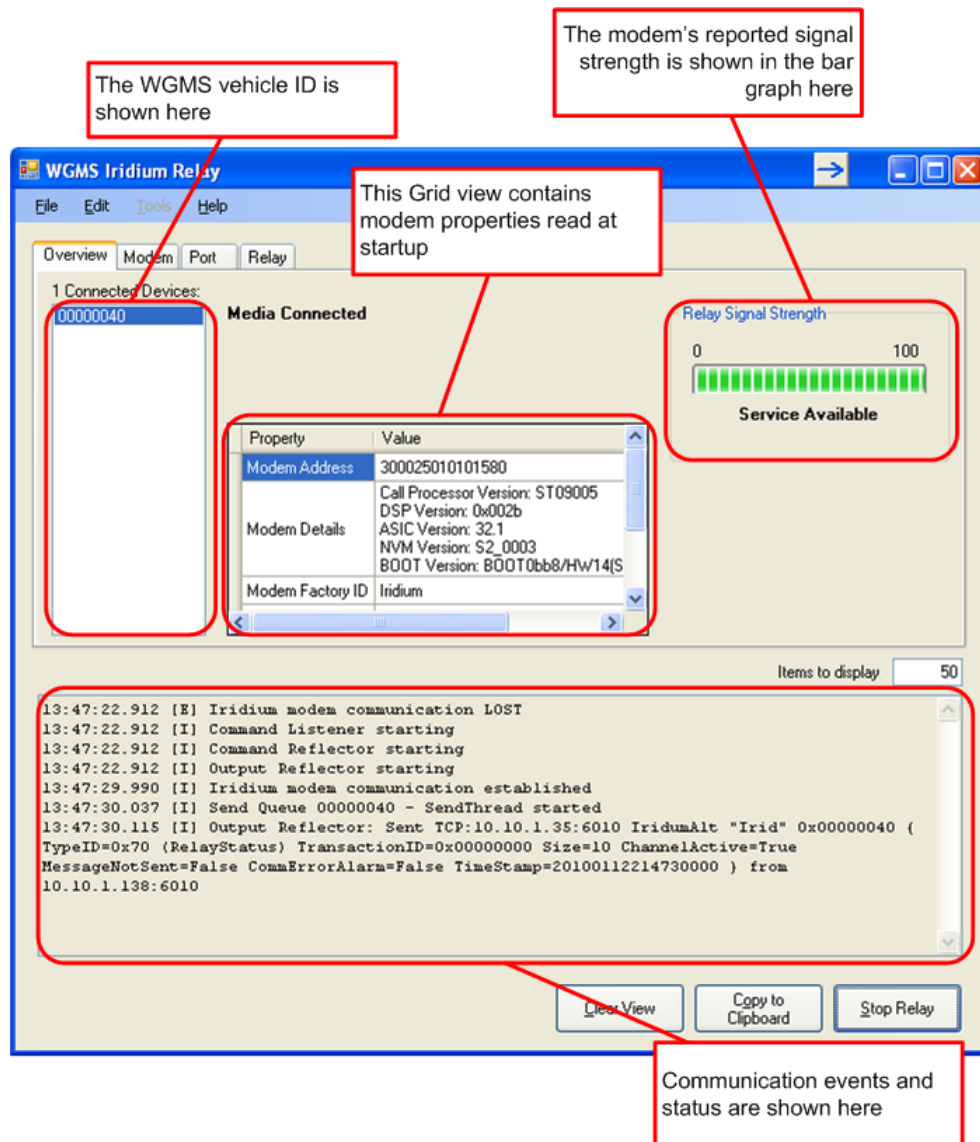


Figure 5-15: Iridium Relay Connected

Note the following in Figure 5-15:

- When the WGMS Vehicle ID is known, it is shown in the “Connected Devices” list.
- The “Output Reflector: Sent” notification indicates transmission to the Packet Reflector. If the notification is “Added” instead of “Sent”, then the relay was not able to successfully send to the Packet Reflector.
- The Wave Glider communicates via Iridium by default, so telemetry packets will be forwarded automatically. Messages can be defaulted to the Alternate Iridium Relay by selecting “Alt Iridium Relay” in the WGMS UI.

5.3.4 User Interface Notes

Right clicking on the window gives access to several useful functions:

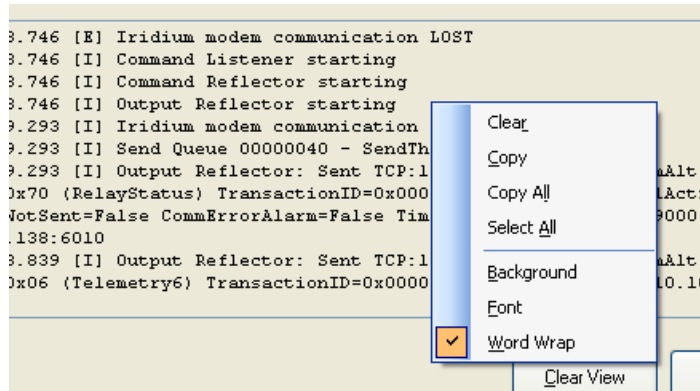


Figure 5-16: Selecting Function in Log Window

The application window can be resized to take advantage of the user's screen size:

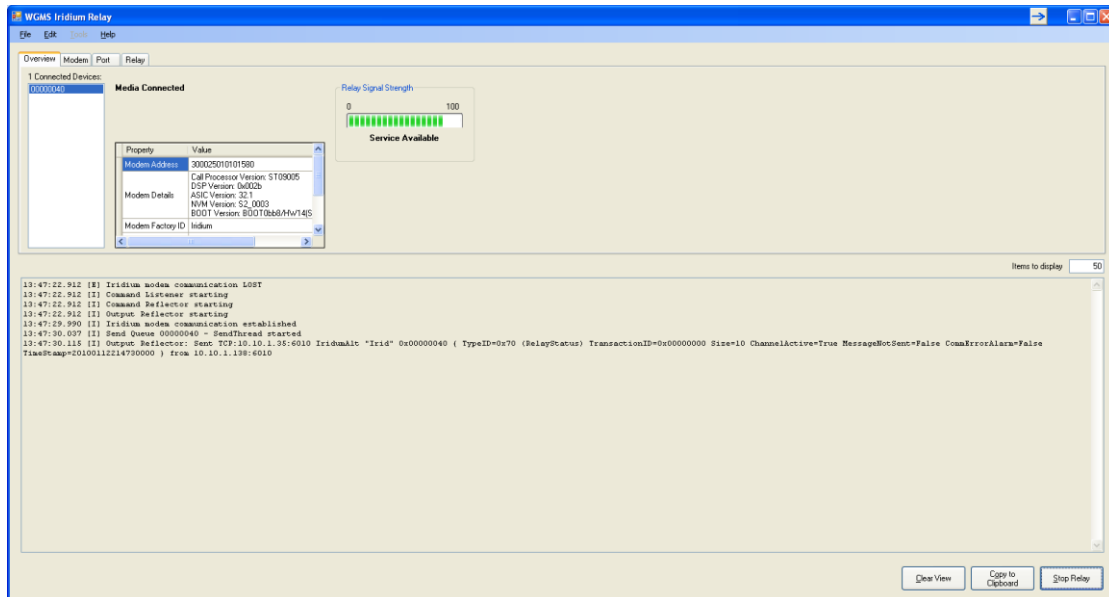


Figure 5-17: Re-Sized Relay Application Form

Alternate Iridium events are saved in the system event log under **IridiumRelayLog**. This log can be viewed using the Event Viewer applet, which can be accessed in **Control Panel → Administrative Tools**.

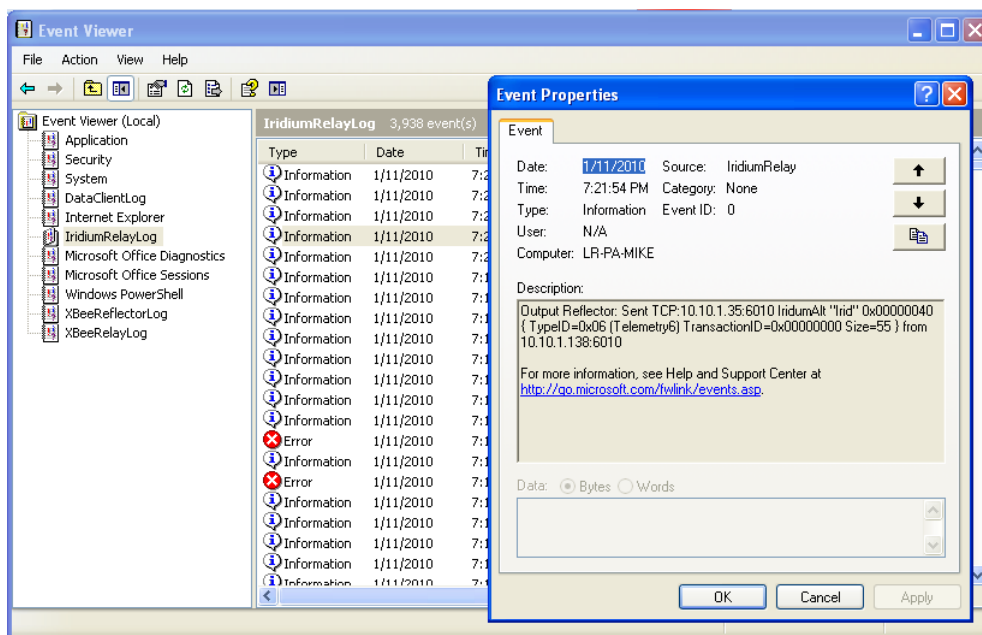


Figure 5-18: Iridium Relay Log Example

Performance counters can be monitored and logged using the Performance applet, which can be accessed from the Administrative Tools folder in Control Panel. The counters are shown in the table below. A counter is provided for each serial port on which an Iridium relay is operating:

Performance object	Counter name	Meaning
IridiumRelay	Bytes Received	A “delta” counter that shows the number of bytes received via Short Burst Data packet during a sample period.
IridiumRelay	Bytes Sent	A “delta” counter that shows the number of bytes sent via Short Burst Data packet during a sample period.
IridiumRelay	Iridium Queue Length	The number of messages queued and waiting to be read from the Iridium service.
IridiumRelay	Messages Received	The number of Short Burst Data messages received during the sample period.
IridiumRelay	Messages Sent	The number of Short Burst Data messages sent during the sample period.
IridiumRelaySession	Avg. Session Time	The average session time taken to exchange Short Burst Data packets during the sample period (shown in Performance Monitor as seconds, reported in ticks.)
IridiumRelaySignalStrength	Service Available	Average sense of whether the Iridium service is available during the sample period. If the service is available, reported as 1; otherwise, reported as 0.
IridiumRelaySignalStrength	Signal Strength	Average signal strength over the sample period, ranging from 0% to 100%

Below is an example graph of logged performance counters showing an Iridium service outage and recovery, followed by reading several messages from the Iridium queue when service was restored.

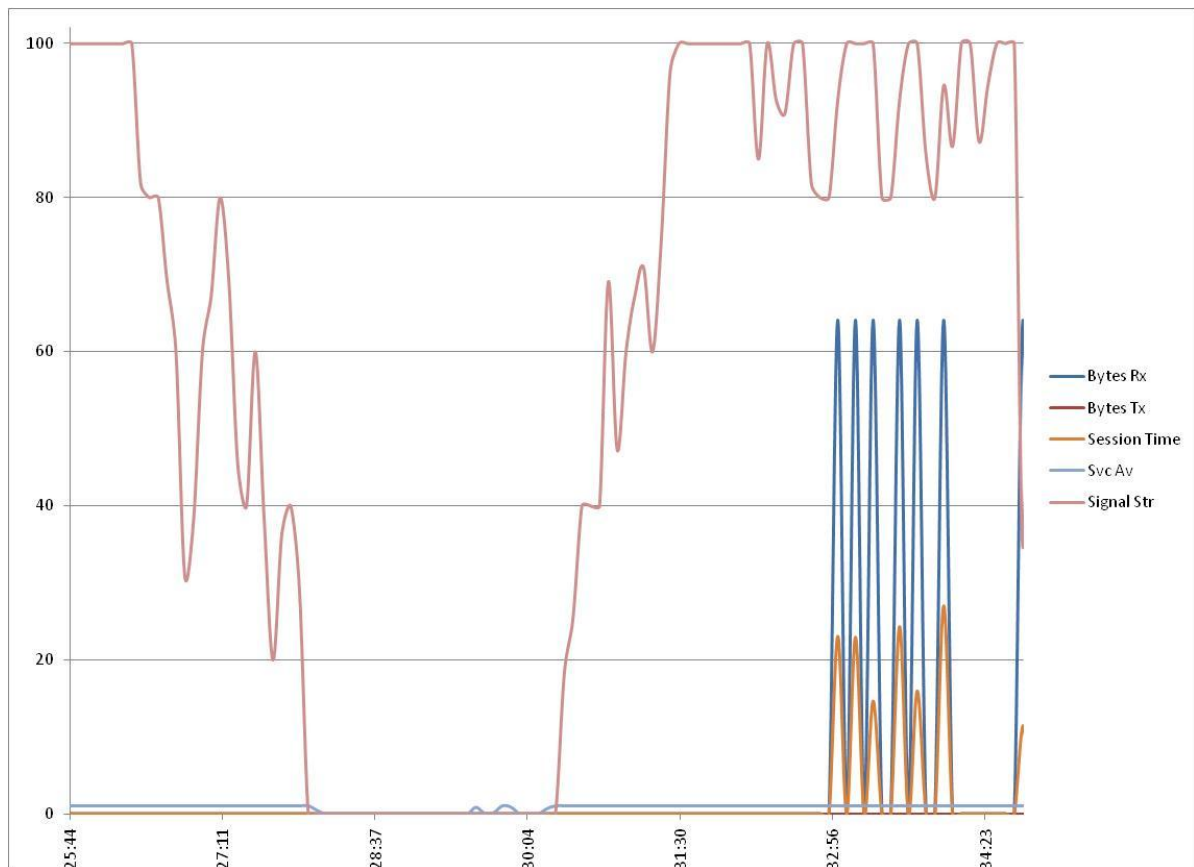


Figure 5-19: Example Iridium Performance Graph

6. Administrative Tasks

This chapter describes tasks that are only accessible to System Administrators. Chapter 7 describes tasks that System Administrators may perform, but which also can be performed by certain other users.

6.1 Organizations, Users and Roles

6.1.1 Organizations

An Organization is a copy of WGMS reserved for a specific group of users and Wave Gliders. It provides a mechanism whereby multiple such groups can share a single physical copy of WGMS, but control access to data and Wave Gliders as if they had their own copy.

- 1) In the LRI-hosted system, LRI uses a single physical copy of WGMS to support multiple Organizations. The Organization serves as a privacy barrier between the groups. Each Organization has a private copy of its data, a private set of authorized users, separate user authentication controls and its own set of Wave Gliders to manage. However, users may be aware of the existence of other Organizations by virtue of login options offered on the LRI-hosted system.
- 2) In a self-hosted environment, including Mobile-to-Mobile, there will be a single Organization per WGMS installation. If a company or agency must support more than one Organization, it will need to have more than one WGMS installation.

An Organization has an alphanumeric “Name”, and that name can be changed. However, there is an LRI-assigned “Org Internal Name” for the Organization that is visible to System Administrators, but should not be changed (ref. 6.3.5).

6.1.2 Users

Users are members of an Organization. They have an email address which serves as their user ID and authentication credentials, such as a password.

Users are created and removed by a System Administrator, who also can reset passwords.

6.1.3 Roles

Users of the WGMS are assigned "Roles", depending upon who they are and what they need to do. The defined Roles are

Guest User: A Guest User can view the status of only those Vehicles that have been marked for display to guests.

Data Analyst: A Data Analyst looks at existing Vehicle and WGMS data and can download database data.

Master: A Master manages Vehicle provisioning, mission planning or operations, as well as payload and web services development.

Admin: A System Administrator has all the permissions required to go through the day-to-day administration of the WGMS, add users, manage customizations, and deal with data.

Root: A Root user has full access to all aspects of the Vehicle and WGMS. This user will be either an LRI developer or a customer under close direction from LRI.

Each Role has differing “Permissions” that restrict what actions a user can take and what commands they can use. The types of Permissions are:

Create Read Update Delete

For example, a Data Analyst can only read Mission data. A Master has permission to create, read or update a mission, but cannot delete it. An Admin can create, read, update and delete mission data.

It is possible for a user to be assigned more than one Role. However, this is rarely necessary.

Refer to 6.5.2 for a more detailed explanation of Roles and Permissions. Appendix A shows a complete table of Roles and their Permissions.

Note: Admin users can assign themselves a Root Role. However, this should not be done unless the Admin is in close contact with an LRI advisor. Incorrect use of Root permissions can result in corruption of the WGMS, loss of data, and failure of Vehicle communication.

6.2 The Settings Menu

6.2.1 Show System Menus

As described in the Wave Glider *User Manual*, clicking the [Show System Menus](#) link on the Home page at the upper-left brings up a display of an extended set of site navigation options at the lower left of the Dashboard.

For a System Administrator, the following buttons are shown.

 Home	The Home Page Dashboard
 Vehicles	Pages for data on all Vehicles
 System	Pages for system-wide settings of all Vehicles
 Settings	Pages for System Administrator tasks

If you do not see the **Settings** button, you have not been assigned an Admin Role and thus cannot perform most system administration tasks.

6.2.2 Settings Privileges

The **Settings** pages and dialogs accessible are typically used to manage User information. They may be used occasionally for other tasks such as modifying Organization contact information.

Other functions available through Settings have very specialized uses related to customizations and should not be used unless guided by LRI support personnel.

6.2.3 Other Privileges

Some System Administrator tasks require use of the **Vehicles** and **System** pages, which also are accessible to users with other Roles.

6.2.4 Menu and Tool Bar

When the System Menu buttons are visible, the Menu and Tool Bar is displayed near the top of the Dashboard window.

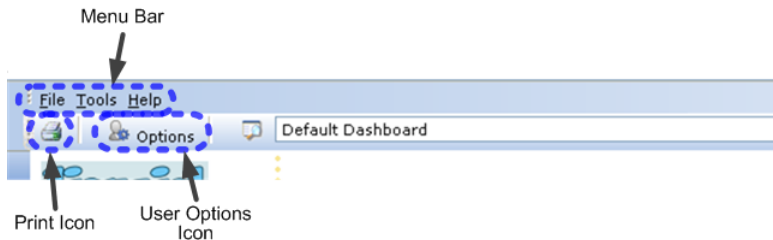


Figure 6-1: Menu and Tool Bar Components

The primary components of the Menu and Tool Bar are:

Menu Bar: The three options in the Menu Bar are:

- File** – Can be used to exit the window.
- Tools** – Can be used to call the User Options dialog.
- Help** – Provides contact information.

Print Icon: Extracts the current window for printing.

User Options: Clicking here brings up the User Options dialog to modify your personal profile.

6.3 Initial Set-Up

6.3.1 Overview

As with the previously-described tasks, the initial set-up will be defined by how the WGMS is hosted:

- 1) For LRI-hosted Organizations, set-up is provided as part of the LRI service.
- 2) For self-hosted WGMS installations, you will need to obtain both Iridium service and a Google Maps API key. The Google Maps key can be for an internally hosted copy of Google Maps, such as those operated by the US Government.
- 3) For Mobile-to-Mobile, the two Iridium modems must be paired prior to first use.

6.3.2 Obtaining Iridium Service

Wave Glider Vehicles are shipped with either an Iridium 9601 modem or an Iridium 9522B modem installed. The IMEI number for a particular Wave Glider should be listed on the Packing Slip accompanying the Vehicle, or else indicated on the top of the C&C drybox. If not, please contact LRI.

For the LRI Mobile-to-Mobile version, LRI will provide a ruggedized laptop with an Iridium modem. The IMEI of the portable modem will be listed on the outside and the modems will have previously been paired in manufacturing.

Note that you cannot set up an Iridium account directly with Iridium Communications Inc.; you must set up the account indirectly through a Value-Added Reseller (VAR).

For commercial customers, the first step is to contact a VAR that handles Iridium accounts. A list of VARs is available on the Iridium website.

For a self-hosted shore-based WGMS, the VAR will need to know the following:

- The IMEI of the modem in the Vehicle.
- The IP address of your WGMS.
- The port being used on your WGMS server's Packet Reflector.

For setting up a Mobile-to-Mobile application, the VAR will need to know:

- The IMEI of the Vehicle modem.
- The IMEI of the laptop modem.

The VAR will then set up your Iridium account.

Note: All modems need to be provisioned to allow for Iridium coordinates in the Header. Be sure to notify your VAR about this.

US Government customers should contact the relevant USG agency, as those modems include firmware that is not included in the commercial product. Note that it may be necessary to open the Command and Control Dry Box to adapt the modems for use in EMSS mode.

6.3.3 Obtaining the Google Maps API Key

The Google Maps API Key is required in order to allow access to Google Maps. Only one API Key is required per Organization. Use of Google Maps is not required, but disabling it will reduce the utility of the WGMS UI. Liquid Robotics will provision the Google Maps API Key on your behalf as part of the setup of your organization in the LRI-hosted version.

It is assumed that Mobile-to-Mobile usage precludes real-time access to the Internet. Since use of Google Maps requires Internet access, the LRI Mobile-to-Mobile version allows you to export the WGMS telemetry as NMEA strings for use in another mapping UI and to disable the Google interface.

Since the map UI is a key part of the WGMS dashboard, self-hosted instances of WGMS should obtain a Google Maps API key. This key may be for the commercial Google service or for a private copy of Google Maps, such as US Government hosted copies of Google Maps. If you are a government customer, contact your IT organization for further assistance, as the details vary by organization.

For a commercial self-hosted instance of WGMS, go to the website:

<http://www.google.com/intl/en/apis/maps/signup.html>

and click on the **Sign up for a Google Maps API** key link.

That should bring up the page with the terms and conditions and the dialog:

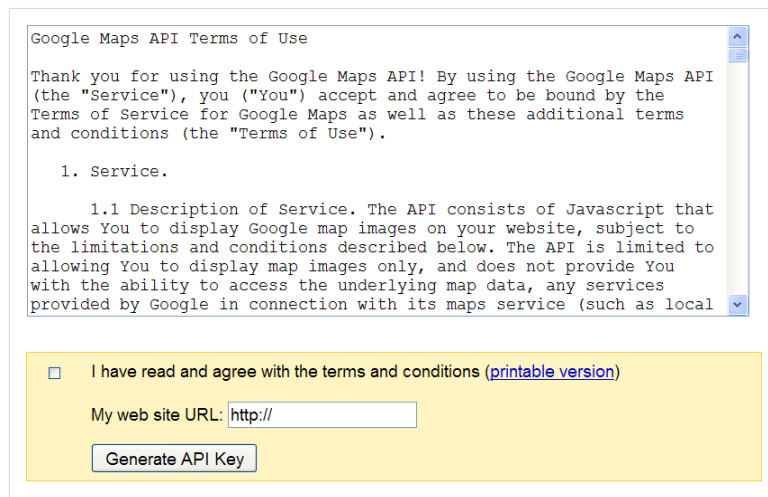


Figure 6-2: Google Maps API Key Request

Read the Terms and Conditions. In the box at the bottom enter the URL for your company or agency.

Note: It is recommended that you enter the main domain name for your company or agency. This way, any sub-domain will also have access.

When you click the “Generate API Key” button, the key will be created. A URL will be returned. Record this URL, as it will be needed for setting up the Organization configuration (ref. 6.3.5).

6.3.4 Accessing the Organization Info

Clicking on the Settings button will bring up a list of organizations configured for your instance of WGMS:

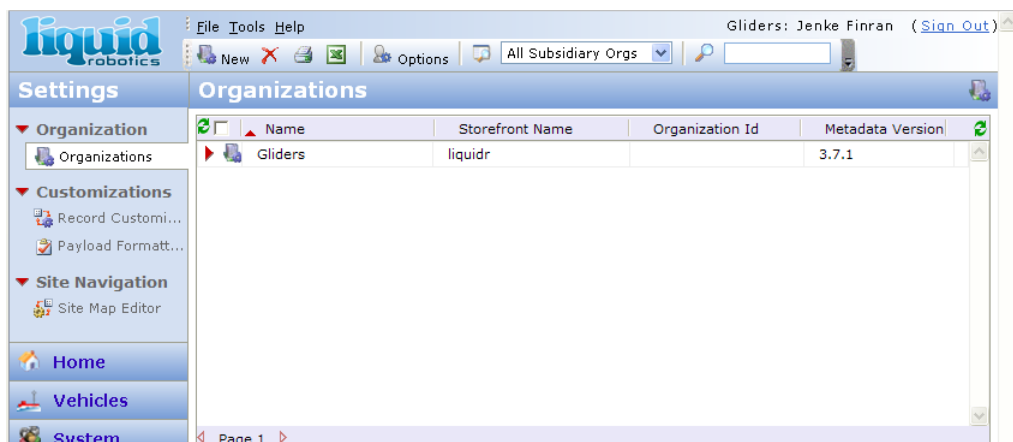


Figure 6-3: New Organization Selection List

Note that there is only one Organization listed, and the Organization name in the “Name” column is a placeholder name that you will change. Double-click on the name, or single-click on the icon to the left of the name. This should bring up the dialog box shown in Figure 6-4.

6.3.5 Setting up the Basic Configuration

This dialog is used to set the basic Organization and GUI configuration data.

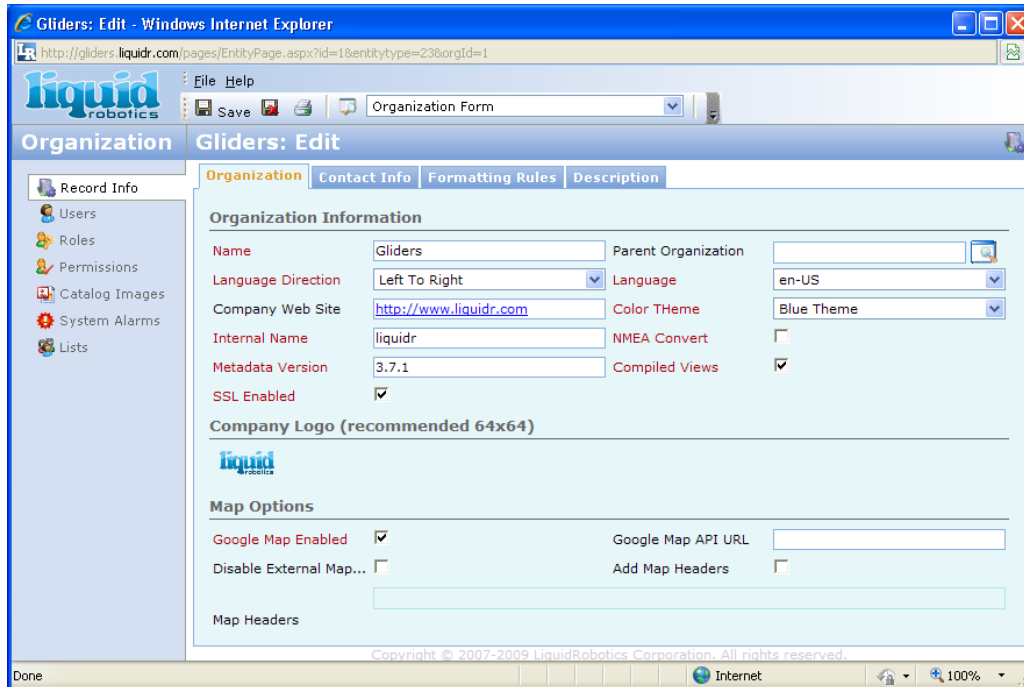


Figure 6-4: Organization Description Dialog

The possible dialog entries are as follows:

Name: The Organization Name used within GUI. This comes initially set with a placeholder name. Enter the name you want to use.

Parent Organization: Leave this blank.

Language Direction: Specifies the placement of the GUI components, including the test positions. Does not change the text itself. The options are:

Left to Right: The default setting.

Right-to-Left: Placement positions are reversed.

Language: Specifies the language used. The options are:

en-US: English, United States. (Default)

en-GB: English, Great Britain

Company Web Site: Optional URL for the Organization's parent company or agency.

Color Theme: Specifies the color scheme for the GUI. Options are:

Gray Theme

Green Theme

Blue Theme

Maroon Theme

Internal Name: A name used only by the WGMS. Do not change this if you are LRI-Hosted. If you are running a Self-Hosted WGMS, contact LRI if you are considering changing this name.

Google Map API URL: Returned URL value from Google (ref. 6.3.3).

Google Map Enabled: Box checked → Use the Google mapping on the Dashboard. If this option is checked, make sure that the “NMEA Convert” box is not checked.

NMEA Convert: Box checked → Convert incoming AIS data to NMEA format and store in the database. The NMEA data will also be immediately output on a previously-designated serial port. This option is typically used when there is no Internet connection to the WGMS.

Metadata Version: Software version number. For reference use when contacting LRI customer support.

Compiled Views: A check in this box indicates to cache the compiled views. This speeds up the response of the GUI. It is recommended that the box always be checked.

SSL Enabled: A check indicates that the Secure Sockets Layer is enabled. It is recommended that the box be checked if an SSL Certificate has been installed.

Note that the logo used in the GUI can be changed to denote your company/agency.



Figure 6-5: Changing Logo

Clicking on the logo image will bring up the dialog:

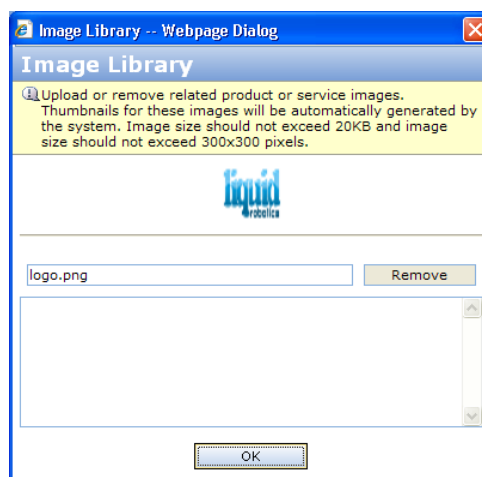


Figure 6-6: Company Logo Specification

Note the restrictions indicated at the top of the box. Enter the name of the file containing the logo image. If you do not want a logo, click “Remove”. Then click the “OK” button.

6.3.6 Setting up the Contact Info

Click on the “Contact Info” tab near the top of the dialog box. This should bring up a dialog for entering the Organization contact information.

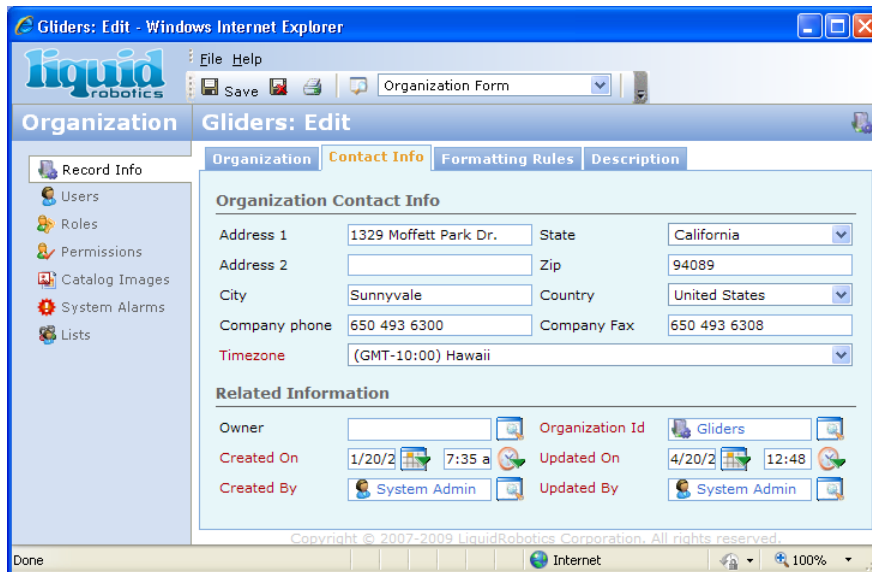


Figure 6-7: Organization Contact Information

The only required field is the “Timezone”. Click the right down-arrow to select the time zone value that will be used for all time-stamped data that is displayed or stored. All other data fields should be entered, but are optional. They can be updated later if necessary.

6.3.7 Setting up the Formatting Rules

Clicking on the “Formatting Rules” tab near the top of the dialog box brings up the following:

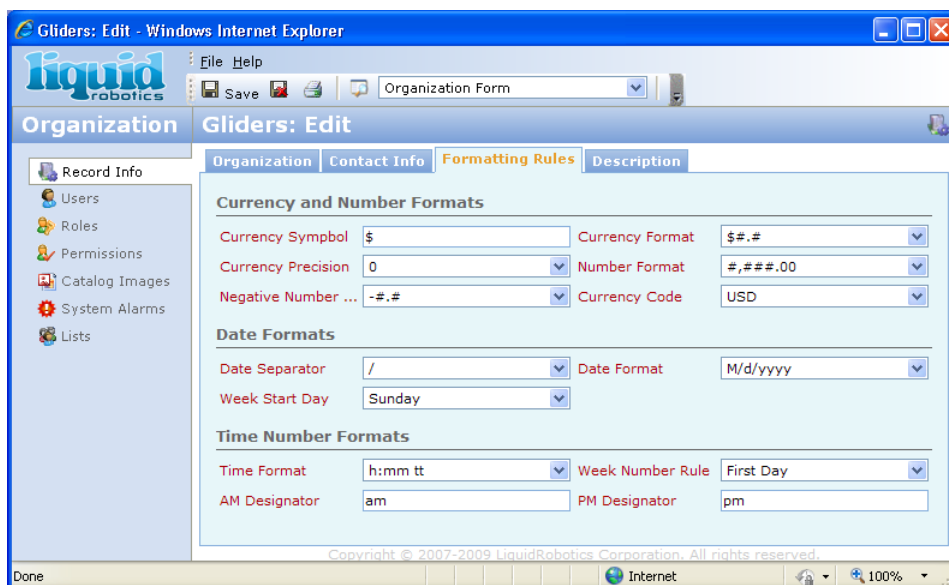


Figure 6-8: Formatting Rules Dialog

Typically, the default values should suffice. However if your company or agency uses different formats for currency, date or time, select the preferred values from the pull-down menus.

6.3.8 Entering a Description

Clicking on the “Description” tab brings up the following:

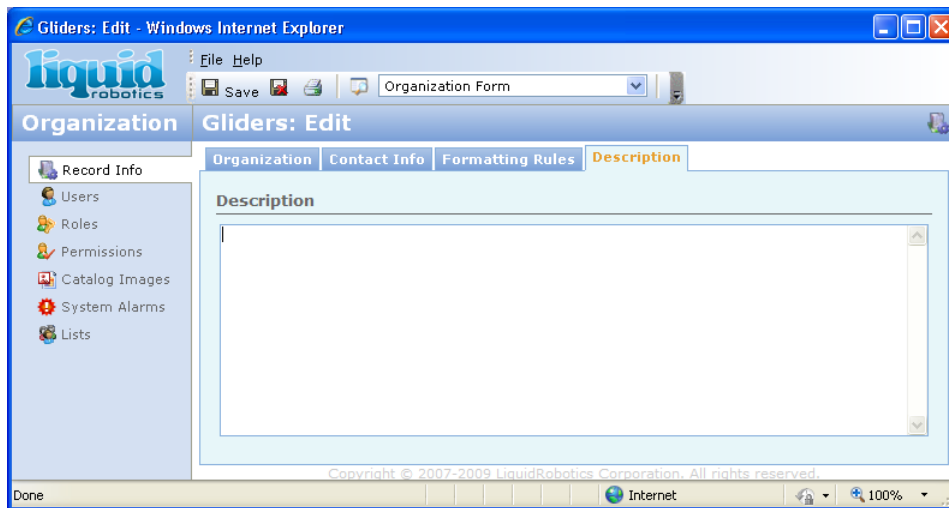


Figure 6-9: Formatting Rules Dialog

You may optionally enter a text description of your company or agency, or any other information you think relevant to the Organization. The text will be saved but otherwise is not used.

6.4 Standard Administrative Tasks

6.4.1 Adding New Users

Clicking on the Settings button will bring up the Organizations list:

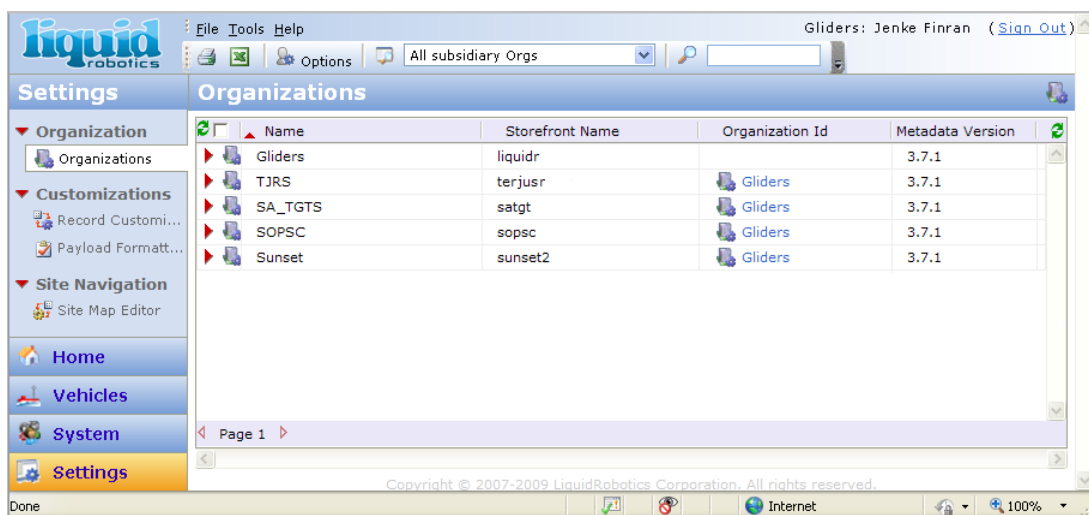


Figure 6-10: Organizations Selection List

Double-click on the name, or single-click on the icon to the left of the name. This should bring up a dialog box similar to Figure 6-11.

The screenshot shows a web browser window titled 'Gliders: Edit - Windows Internet Explorer'. The address bar shows 'http://gliders.liquidr.com/pages/EntityPage.aspx?id=1&entitytype=23&orgid=1'. The page has a 'Liquid robotics' logo and a 'File Help' menu. The main content area is titled 'Gliders: Edit' and has tabs for 'Organization', 'Contact Info', 'Formatting Rules', and 'Description'. The 'Organization' tab is active, showing 'Organization Information'. The form includes fields for 'Name' (Gliders), 'Parent Organization', 'Language Direction' (Left To Right), 'Language' (en-US), 'Company Web Site' (http://www.liquidr.com), 'Color Theme' (Blue Theme), 'Internal Name' (liquidr), 'NMEA Convert' (unchecked), 'Metadata Version' (3.7.1), 'Compiled Views' (checked), and 'SSL Enabled' (checked). There is a 'Company Logo' section with a recommended 64x64 size and a 'Map Options' section with 'Google Map Enabled' (checked) and a 'Google Map API URL' field.

Figure 6-11: Organization Description Dialog

Click on the “Users” tab in the left-side bar. This should bring up a Users List similar to that shown in Figure 6-12, below.

The screenshot shows a web browser window titled 'Gliders: Edit - Windows Internet Explorer'. The address bar shows 'http://gliders.liquidr.com/pages/EntityPage.aspx?id=1&entitytype=23&orgid=1'. The page has a 'Liquid robotics' logo and a 'File Help' menu. The main content area is titled 'Gliders Users' and shows a list of users. The left sidebar has tabs for 'Record Info', 'Users', 'Roles', 'Permissions', 'Catalog Images', 'System Alarms', and 'Lists'. The 'Users' tab is active. The user list has columns for 'First Name', 'Last Name', and 'E-mail'. The list includes users like Scot Willson, Sompy Sayong, System Admin, Tam Thomason, Tanh Dang, Tim Danson, Thanh Ongs, Tom Richards, and Wilson Anders. The page is on 'Page 3' of a list. The footer shows 'Copyright © 2007-2009 LiquidRobotics Corporation. All rights reserved.' and 'Done'.

	First Name	Last Name	E-mail
▶	Scot	Willson	scot.willson@example.com
▶	Sompy	Sayong	sompy.sayong@example.com
▶	System	Admin	j_t_finran@example.com
▶	Tam	Thomason	tthomason@example.com
▶	Tanh	Dang	tanh.dang@example.com
▶	Tim	Danson	tim.danson@example.com
▶	Thanh	Ongs	thanh.ongs@example.com
▶	Tom	Richards	tom.richards@example.com
▶	Wilson	Anders	wil.anders@example.com

Figure 6-12: Example List of Users

Click on the “New” text (or the icon to the left) to bring up the dialog to enter a new User into the system.

Note in the header of Figure 6-13, the form name is “User Admin Form”. This format is only shown to System Administrators. Other Users can only see the “User Form”, which is similar, but does not show the “Password Expired” and “Account Locked” options.

Figure 6-13: New User Dialog

E-mail: The primary email address of the User. This will be used as the user's login ID and for email to the User.

Password: The initial password for the User. All Roles except "Guest User" have the permission to change their own password.

First/Last Name: The User's name.

Telephone: The User's 9-digit telephone number, starting with the Area Code. The number can contain blanks or dashes.

Excel Records Download: The number of Excel records that the User can download at one time from various lists. Typically, the number should be less than the default 65535. The recommended value is 2000 or less.

Pager: This field is not a telephone number. It is an email address link to the User's pager. Alarms are emailed to the pager via this address.

Alt Email: A secondary email address for the User, if available.

Time Zone Code: The preferred time zone of the User. Time stamps will be displayed in this time zone. Pull down to select.

Password Expired: A password can be manually expired using this checkbox. The common use is to create the User data with an administrator-selected password and to check this box. The first time the new User logs in, he will be prompted for the administrator-selected password and then must immediately change the password. If you leave the box unchecked, he can use whatever password you selected for as long as he likes.

Account Locked: For new Users, leave this box unchecked. A check in the box indicates that the User no longer has access to their account.

As an example, a completed User account dialog might look like:

The screenshot shows a web browser window titled 'User: New - Windows Internet Explorer'. The address bar shows 'User Admin Form'. The page has a blue header with the 'Liquid Robotics' logo. The main content area is titled 'User: New' and contains a form for creating a new user. The form is divided into two sections: 'User Information' and 'Related Information'. The 'User Information' section includes fields for E-mail (jt_finran@cglobal.net), Password (masked with dots), First Name (Jenke), Last Name (Finran), Telephone (555.610.3400), Excel Records D... (120), Pager, Alt Email (jt_finran@yahoo.org), Time Zone Code (GMT-08:00 Pacific Time (US & Canada)), Password Expired (unchecked), and Account Locked (unchecked). The 'Related Information' section includes fields for Owner, Parent Org (Gliders), Created Date (1/29/21 10:52), Updated On (1/29/21 10:52), Created By, and Updated By. The 'Roles' tab is active on the left margin.

Figure 6-14: Completed User Account Dialog

Note that the “Roles” tab on the left margin is now active.

6.4.2 Assigning User Roles

Click on the “Roles” tab on the left. This will bring up the dialog:

The screenshot shows a web browser window titled 'admin@liquidr.com: Edit - Windows Internet Explorer'. The address bar shows 'admin@liquidr.com: Edit'. The page has a blue header with the 'Liquid Robotics' logo. The main content area is titled 'User Roles' and contains a table of roles. The table has columns for 'Role Id' and 'Description'. The 'Roles' tab is active on the left margin.

Role Id	Description
Admin	

Page 1

Add User Roles \ / Remove User Roles V

Name	Description
Data Analyst	Analyses data from vehicles and evaluated performance of...
Developer	Allowed to issue a reboot command to gliders
Guest User	Guest can only view specific vehicle dashboards without ab...
Master	This is a general user role. It encompasses actions of miss...
Root	Root-level permissions to change the functionality and par...

Page 1

Figure 6-15: Role Assignment Dialog

The lower box contains all of the possible Roles. The upper box contains the Roles that you wish to assign to the User. Though it is possible to assign more than one Role to a user, it is rarely necessary.

To move a Role from the lower box to the upper, click to select a Role in the lower box. Then click the “Add User Roles” button to move the Role to the upper box.

6.4.3 Deleting a User

To delete a user, call up the list of Users by clicking on the Users tab on the Organization form. Then select the name you want to delete by clicking on it. Figure 6-16 below shows the name “Tim Danson” selected.

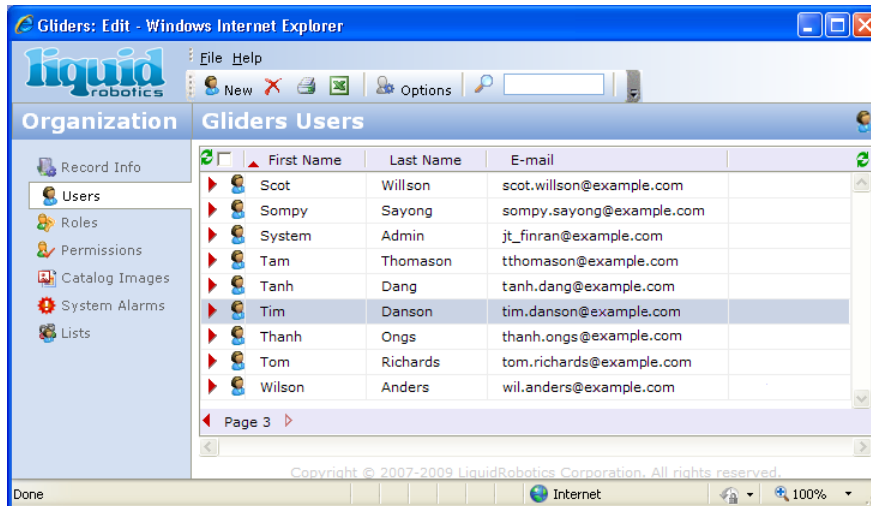


Figure 6-16: Name Selected for Deletion

Click the “X” [Delete User] Icon:

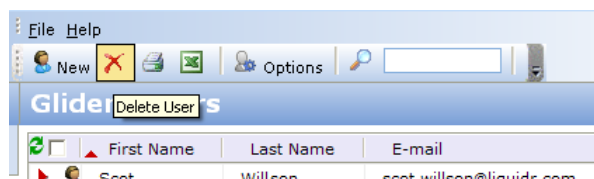


Figure 6-17: Delete User Icon

You will get the confirmation request:

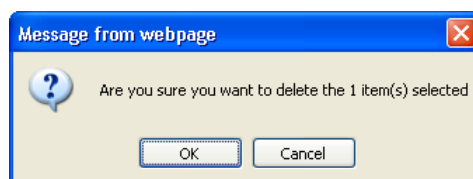


Figure 6-18: User Deletion Confirmation

Clicking OK will permanently delete this user profile from the system.

6.5 Specialized Administrative Tasks

The UI allows a System Administrator to change fundamental features of the system. It is strongly recommended that you contact LRI before doing so, as some changes may have serious side effects. The dialogs are described below for completeness.

6.5.1 Accessing the Organization

Clicking on the Settings button will bring up the Organizations list:

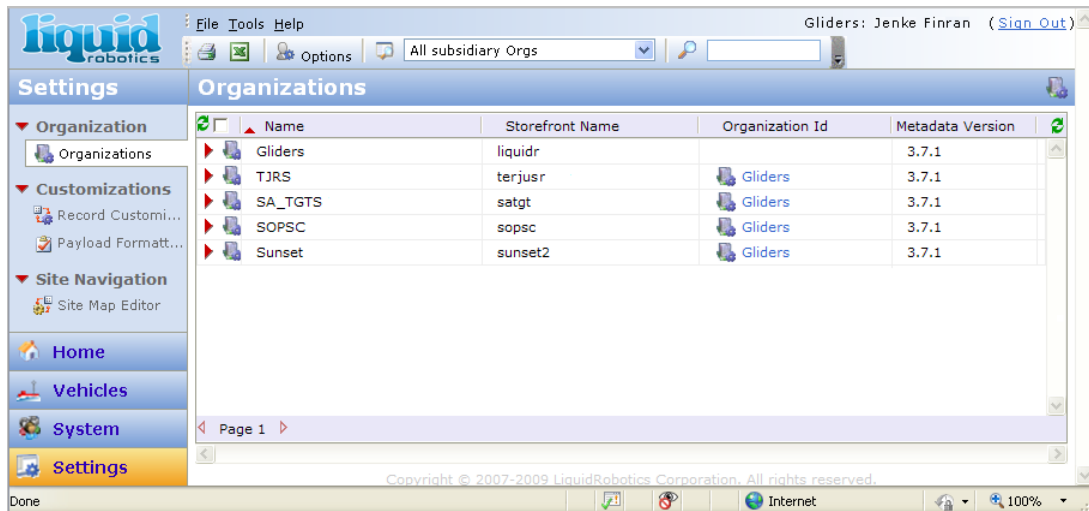


Figure 6-19: Organizations Selection List

6.5.2 Viewing Roles

Double-click on the name, or single-click on the icon to the left of the name. Then click on “Roles” on the left-side bar. This should bring up the dialog in Figure 6-20.

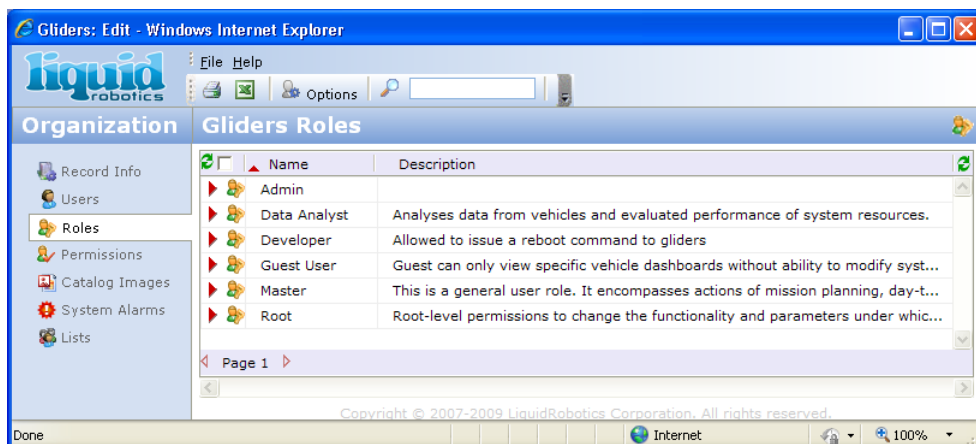


Figure 6-20: Organization Roles Description

This list shows the Role names and their descriptions.

For more information, double-click on a Role name (or single click on the icon to its left). For example, selecting “Master” will bring up the dialogs shown in Figure 6-21 and Figure 6-22.

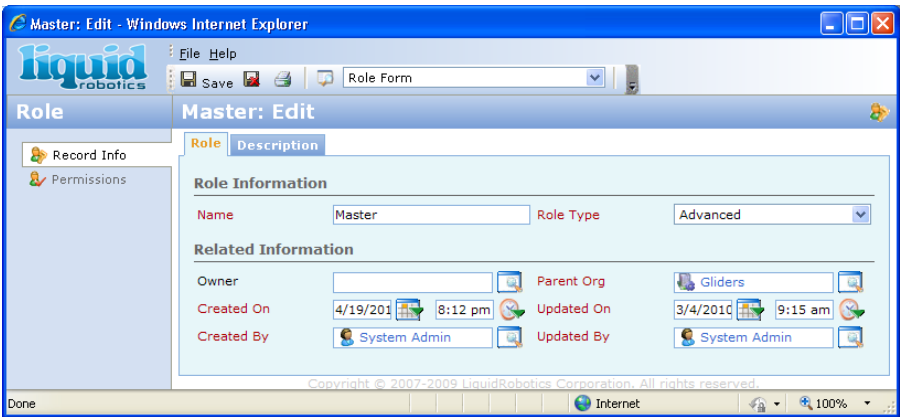


Figure 6-21: Master Role Information

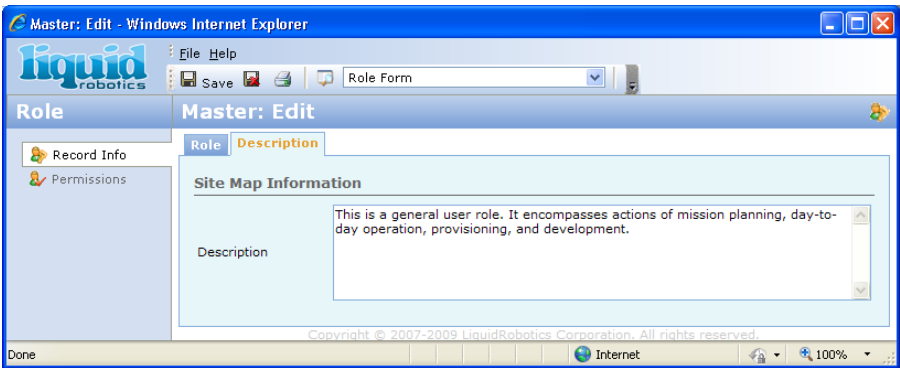


Figure 6-22: Master Role Description

6.5.3 Viewing Permissions

It may be useful to view the Permissions granted for each Role. Clicking on the Permissions tab on the left side of the dialog shown in Figure 6-21 will bring up the dialog that allows changing the Permissions granted to a Master (note the “Master: Edit” in the dialog’s banner).

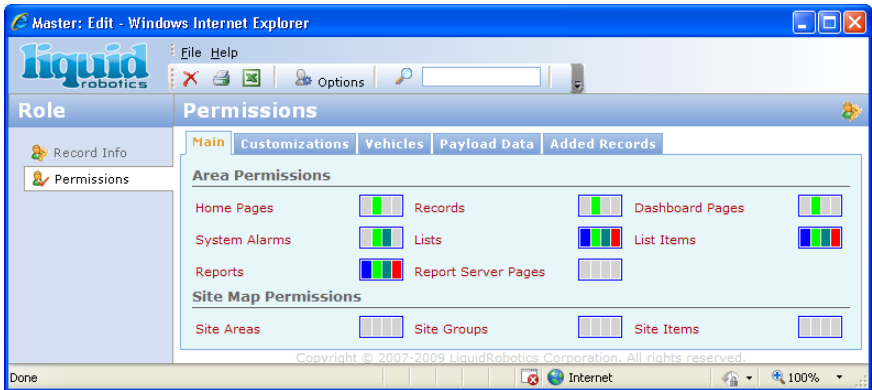


Figure 6-23: Master Role Permissions

Figure 6-24 below shows an annotated section of the above figure:

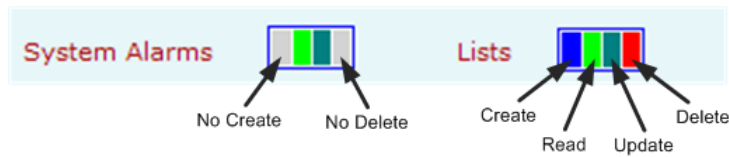


Figure 6-24: Permission Icon Descriptions

As shown, the colored boxes indicate the permissions as follows:

- Gray:** Does not have permission
- Blue:** Create permission
- Light Green:** Read permission
- Dark Green:** Update permission
- Red:** Delete permission

Figure 6-25 shows some of the “Vehicles” Permissions for a Master.

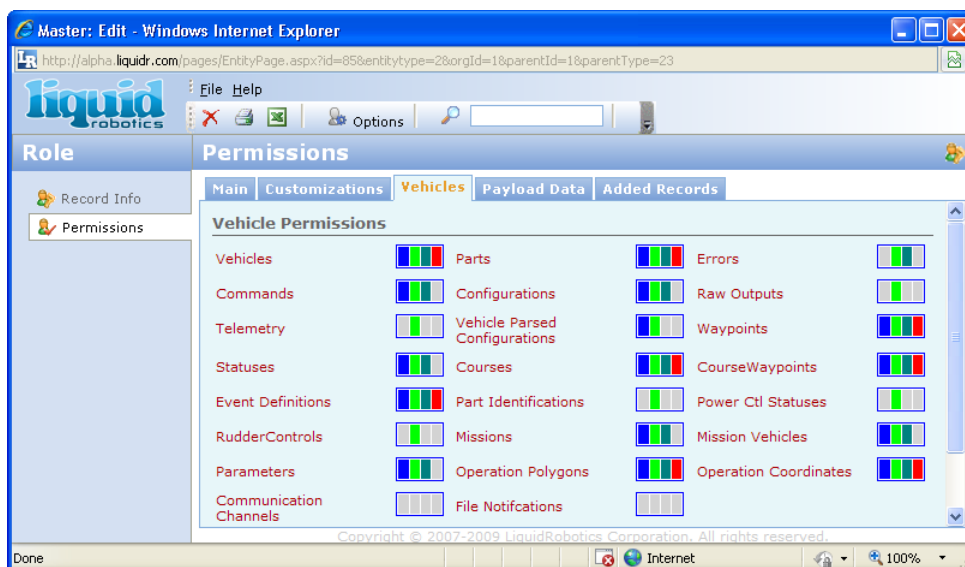


Figure 6-25: Master Vehicles Permissions

Similar dialogs can be displayed for the “Customizations” and “Payload Data” tabs. The “Added Records” tab is not used.

6.5.4 Changing Permissions

Changing the Permissions for a Role requires a Root Role and is strongly discouraged. Keep in mind that changing a Permission for a Role affects all Users that have been assigned that Role.

6.5.5 Changing Catalog Images

Custom images (such as your company/agency logo) must be stored in the WGMS database for use in the GUI. The currently stored images can be viewed by clicking on the left-side “Catalog Images” tab. This brings up a dialog box similar to:

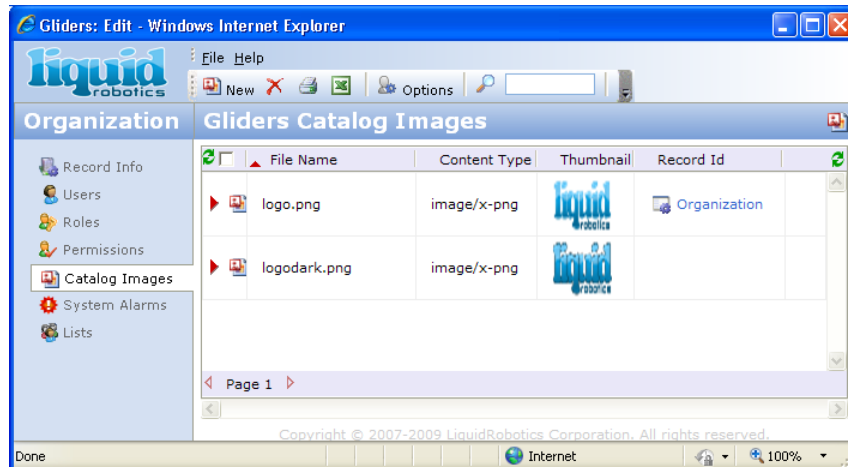


Figure 6-26: Catalog Images Dialog

A new image can be added by clicking on the “New” (New Catalog Image) in the toolbar. This will bring up the dialog:

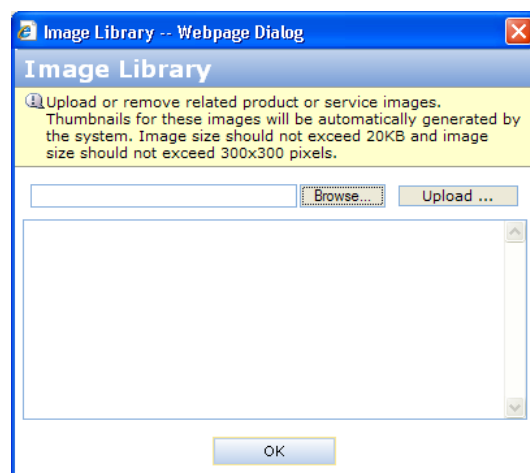


Figure 6-27: Image Upload Dialog

Click the “Browse” button to select the image, then click the “Upload” button. A thumbnail of the uploaded image will show in the box. If you want to keep the image, click the “OK” button.

To remove an image from the catalog, double-click on the name, or single click on the logo to the left of the name. This will bring up a similar dialog box, except it will show the image, and a “Remove” button.

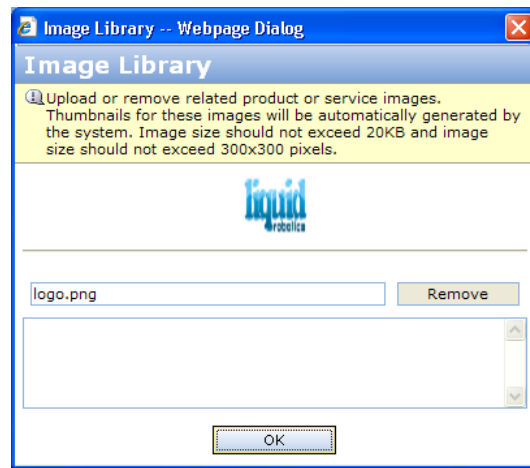


Figure 6-28: Image Removal Dialog

If you want to continue with the deletion, click the “Delete” button and then “OK”.

6.5.6 Advanced Organization Options

The Permissions, System Alarms and Lists tabs on the Organizations dialog panel control basic aspects of the UI and the WGMS database and require a Root Role to change. These options should not be modified without the direct involvement of LRI Customer Support.

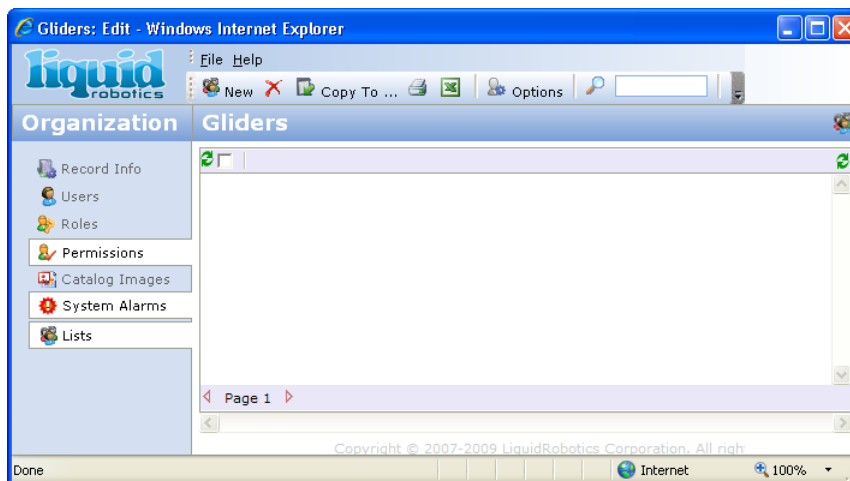


Figure 6-29: Advanced Organization Options

6.5.7 Advanced Settings Options

The Settings pages include links for Record Customization, Payload Formatters and Site Map Editor. These support very specialized use cases and should not be modified without the direct involvement of LRI Customer Support. Incorrectly applied changes can cause very serious damage to your database.

7. Shared Administrative Tasks

This chapter outlines tasks that can be performed by users without Admin Role Permissions, but which may occasionally need to be accessed or used by System Administrators.

7.1 Vehicles Data

Data about specific Vehicles is usually accessed by users assigned a Master Role. A brief outline of the Vehicles data is given below. Refer to the Wave Glider *User Manual* for more detailed information.

7.1.1 Selecting a Vehicle

Clicking the Vehicles button brings up a list of the Vehicles:

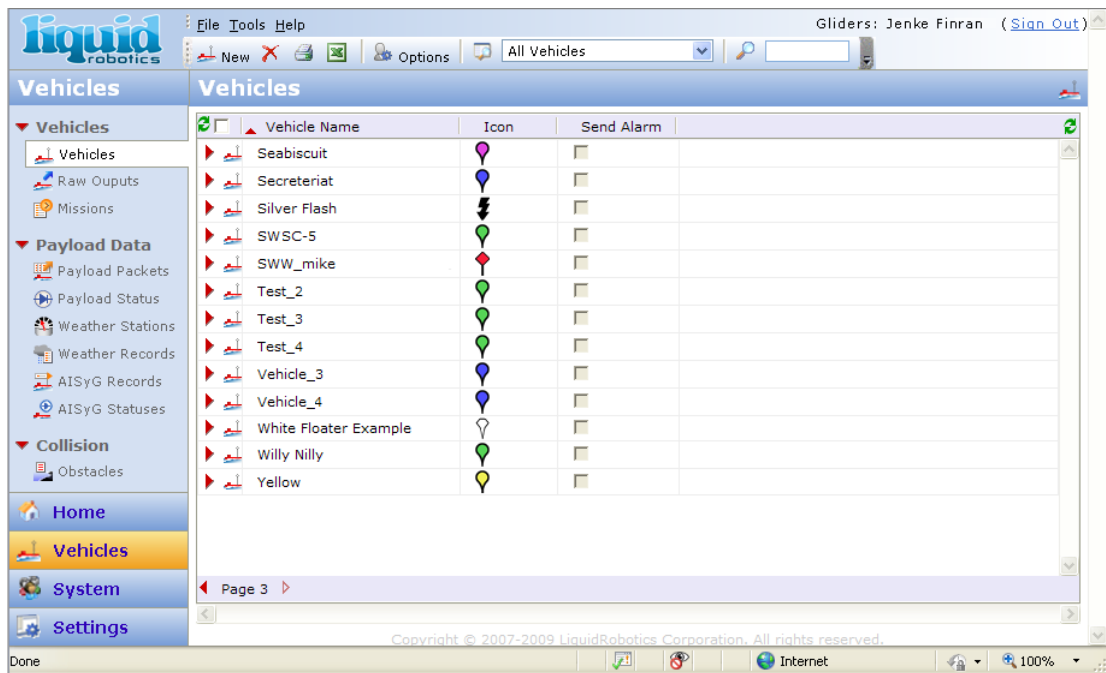


Figure 7-1: Vehicles Listing

The selection tabs on the left show lists for the following:

- Vehicles:** Names of all Vehicles and their map display icon.
- Raw Outputs:** Raw data packets recently received from all Vehicles.
- Missions:** Currently active Missions.
- Payload Packets:** Recently-received payload packets.
- Payload Status:** Recently-received payload status data, if any.
- Weather Stations:** Weather stations for which data is available.
- Weather Records:** Data received from weather stations.
- AISyG Records:** AIS data records.
- AISyG Statuses:** Status of AIS system.
- Obstacles:** Specified Obstacles.

Each option is selected by clicking on the name.

Double-clicking on a Vehicle name, or single-clicking on the icon next to the name, will bring up a dialog about the Vehicle. For example, selecting “White Floater Example” will bring up the following:

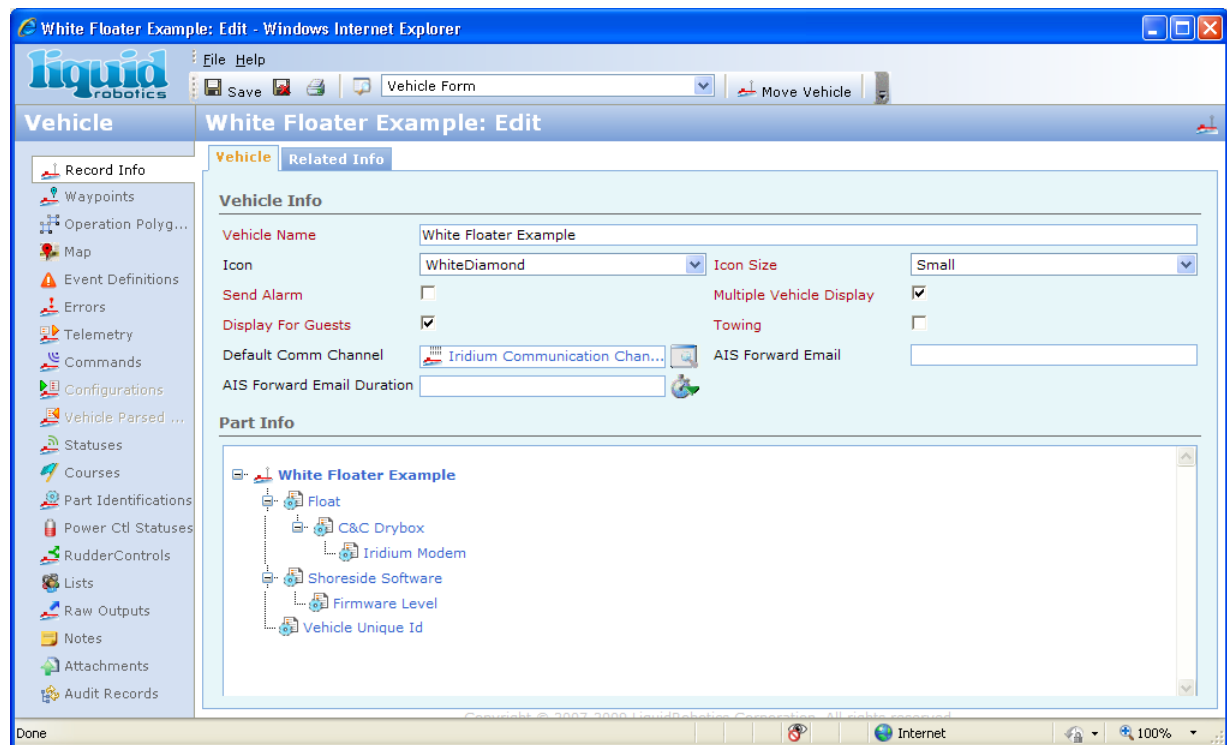


Figure 7-2: Vehicle Main Selection

The tabs in the left-side bar reference the following:

- Record Info:** Basic info on the Vehicle, and the parts definition tree. (Changeable)
- Waypoints:** Lists all the Waypoints assigned to the Vehicle. (Changeable)
- Operation Polygons:** Lists all the Operation Polygons assigned to the Vehicle. (Changeable)
- Map:** Displays a Position Map of the Vehicle location. Identical to the Dashboard map.
- Event Definitions:** Definitions of Alarm types and parameters. (Changeable)
- Errors:** Latest error messages received from the Vehicle.
- Telemetry:** Latest telemetry data received from the Vehicle.
- Commands:** Latest commands sent to the Vehicle.
- Configurations:** Legacy option, pre-Model 08 Wave Gliders.
- Vehicle Parsed Configurations:** Legacy option, pre-Model 08 Wave Gliders.
- Statuses:** Latest Status data received from the Vehicle.
- Courses:** Lists Courses assigned to Vehicle. (Changeable)
- Part Identifications:** Lists Hardware/Software version numbers.
- Power Ctl Statuses:** Latest Power Control Status data received from the Vehicle.
- Rudder Controls:** Latest rudder-control commands sent to the Vehicle.
- Lists:** Alarm Escalation and User Group lists. (Changeable)
- Raw Outputs:** Latest raw data packets received from the Vehicle.

Notes: User-entered text notes for the Vehicle. (Changeable)

Attachments: User-entered links to files associated with the Vehicle. (Changeable)

Audit Records: Changes or updates made to the Vehicle and/or its parts.

7.1.2 Updating a Wave Glider's Configuration Information

A Wave Glider's configuration information is initially entered by someone with a Master Role. However, there may be situations where a System Administrator needs to update this information.

The configuration data is accessed through the "Part Info" box in the main Vehicles page. Figure 7-3 below shows an example of an expanded Part Info box.

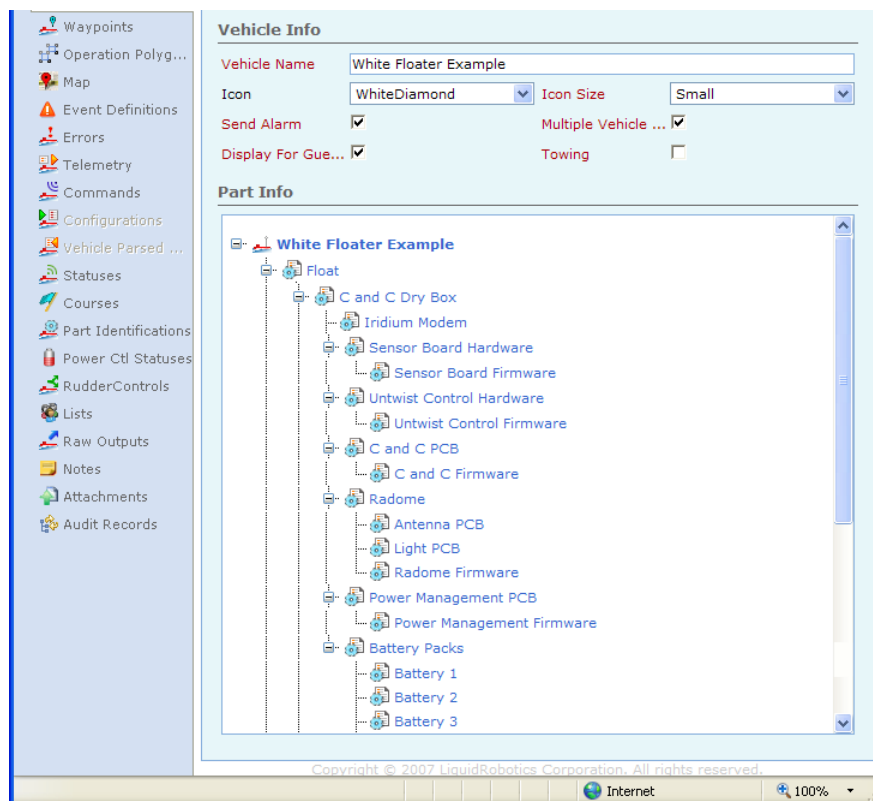


Figure 7-3: Example Expanded Part Info Tree

Data on any of the items in the list can be brought up by single-clicking on the item in the list.

For example, clicking on “Float” will bring up data about the Float, as shown in Figure 7-4 below

Figure 7-4: Example Iridium Modem Dialog

The data in this dialog can now be changed. Click the **Save** button to exit with the changes saved. Note that the update date/time will be recorded in the “Related Information” at the lower part of the dialog.

In a similar manner, data for the remaining parts can be changed if necessary. When making such changes, it is recommended that the Provisioner for the Vehicle be notified.

7.1.3 Adding/Changing Alarm Thresholds

Alarm thresholds are accessed through the **Event Definitions** tab on the left side of the main Vehicles Page. Clicking the tab should bring up a page showing the Alarm Types, similar to:

Alarm Type	Alarm Threshold	Alarm Count
Sub To Float	1	0
Sub Reboot	1	0
GPS Not Functioning	15	0
RF Alarm	5	0
Out Of Bounds	3	0
Communication Timeout	15	5
Empty Packet	5	0
StuckGPS	5	0

Figure 7-5: Event Definition Alarm Types

There is a minimum set of nine Alarm Types that must be specified for each Vehicle. These types and their nominal Alarm Threshold values are:

- 1) Sub To Float [1]
- 2) Sub Reboot [1]
- 3) GPS Not Functioning [15]
- 4) RF Alarm [5]
- 5) Out of Bounds [3]
- 6) Communication Timeout [15]
- 7) Empty Packet [5]
- 8) Stuck GPS [5]
- 9) File Read Timeout [25]

Note that the “File Read Timeout” is not in the list of Figure 7-5, and therefore must be added.

To add a new Alarm Type, click on the New [New Event Definition] icon at the upper left. This will bring up a dialog box:

Figure 7-6: New Event Definition Dialog

Modify the data as follows:

- 1) In the “Alarm Type” box, pull down to select File Read Timeout.
- 2) In the “Alarm Threshold” box, enter the number (nominally 25)
- 3) Verify that the “Self Corrected” box is checked
- 4) Add a check in the “Always Fired” box.

When complete, the upper part of the dialog should look similar to:

Figure 7-7: New Event Entered

Click the [Save and close Event Definition] icon to exit the dialog (ref. Figure 7-8).

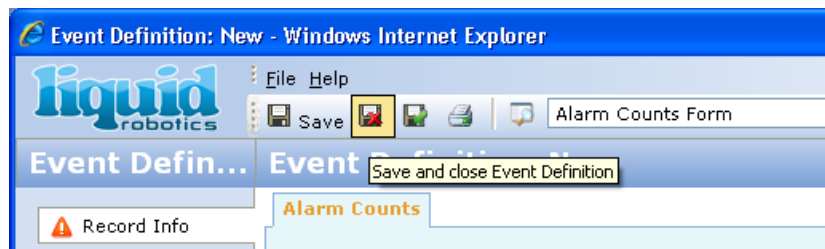


Figure 7-8: Save and Close Event Definition Icon

The Event Definitions page should now show the added “File Read Timeout” entry.

Alarm Type	Alarm Threshold	Alarm Count
Sub To Float	1	0
Sub Reboot	1	0
GPS Not Functioning	15	0
RF Alarm	5	0
Out Of Bounds	3	0
Communication Timeout	15	5
Empty Packet	5	0
StuckGPS	5	0
File Read Timeout	25	0

Figure 7-9: Updated Event Definitions

Event Definitions can be changed by double-clicking on the Alarm Type name, or by single-clicking on the icon next to the name. That will bring up an “Event Definition: Edit” dialog, similar to the dialog shown in Figure 7-7. Update the data value(s) as necessary, then exit.

7.2 System Data

7.2.1 Main System Page

Clicking on the System button will bring up the main system page:

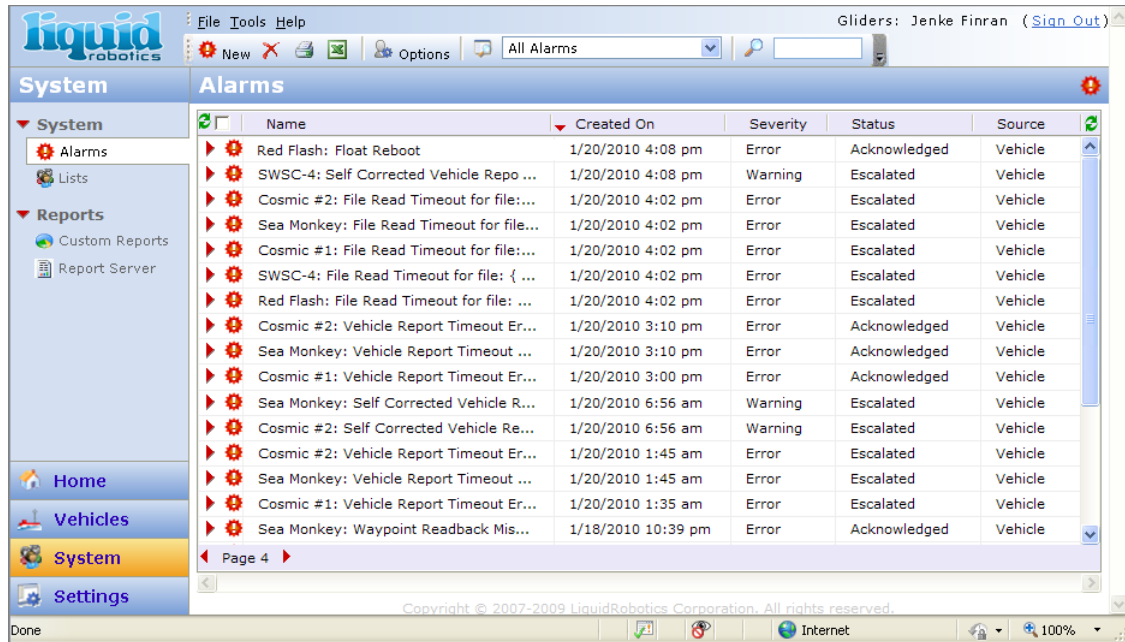


Figure 7-10: Main System Page

The tabs in the left-side bar reference the following:

Alarms: Chronological list of Alarms from all Vehicles.

Lists: Shows and allows changing the Escalation Lists for different Vehicles.

Custom Reports: Used to create, view and archive information related to Vehicle operations.

Report Server: This option is only available to Root users. Contact LRI for more information.

The primary administrative uses for the System Page are updating lists and generating reports. These are described in 7.2.2 and 7.2.3 below.

7.2.2 Updating Lists

Escalation Lists for Alarm notification are the primary type of list that System Administrators may need to modify. Clicking on the “Lists” tab on the left bar of the System Page will show a Lists page, similar to:

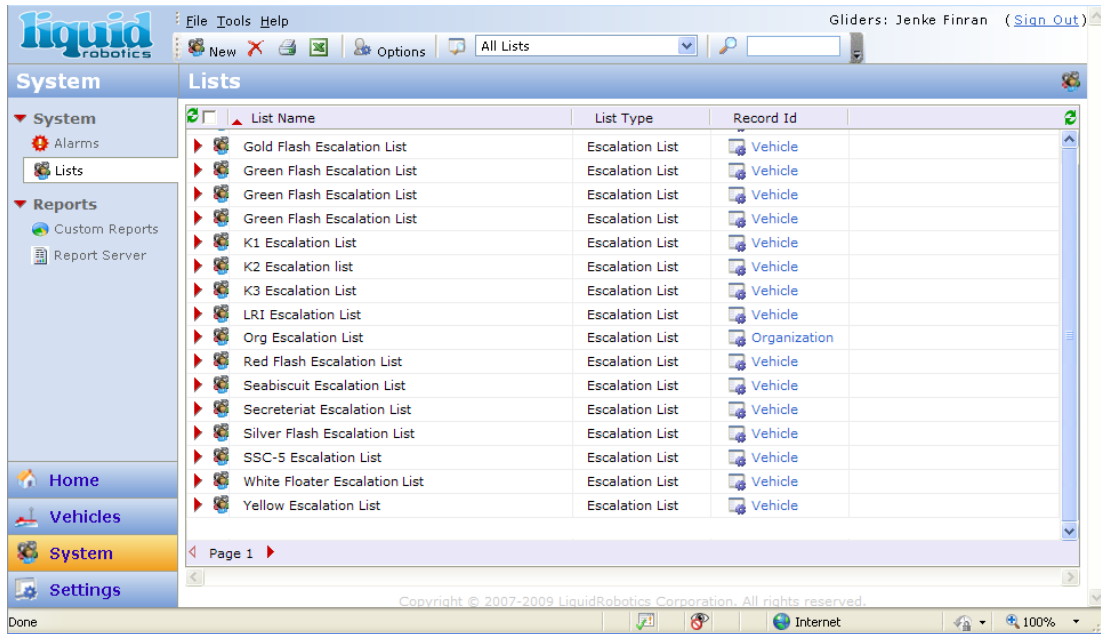


Figure 7-11: Example System-Lists Page

Note that all the List Types are Escalation Lists. To update a list, double-click on the List Name (or single-click on the icon its left). For example, selecting “White Floater Escalation List” would bring up the dialog:

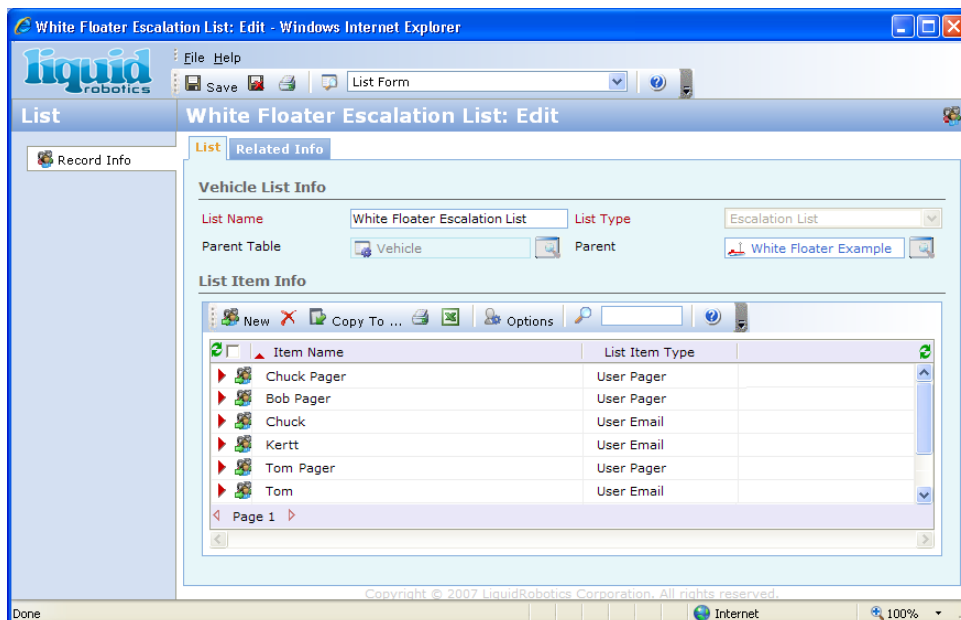


Figure 7-12: Example Escalation List

Typically, you will only be adding or deleting a name from the list, as described below.

To add a name, click on the “New” [New List Item] icon above the list:

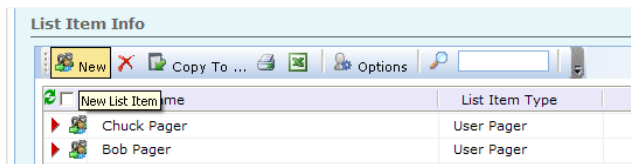


Figure 7-13: New List Item Icon

This will bring up the dialog:

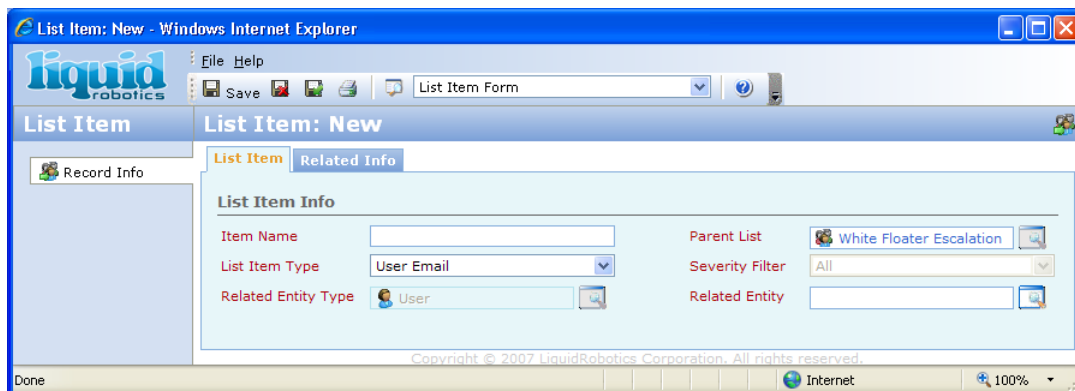


Figure 7-14: New List Item Dialog

Enter the “Item Name” that will appear in the list (e.g., John Email). Also select the “List Item Type”.

Next, click on the icon to the right of the “Related Entry” box. This will bring up a list of names to select from, as shown in Figure 7-15. The name and other information should have already been entered as described in section 6.4.1.

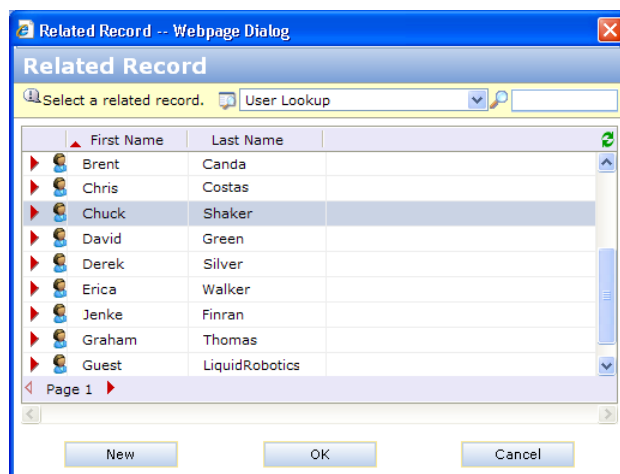


Figure 7-15: Contact List Records

Click on the name to select it, then click the **New** button.

For example, selecting “Chuck Shaker” and clicking New would add the name as a “Related Entity” in the New List Item dialog box:

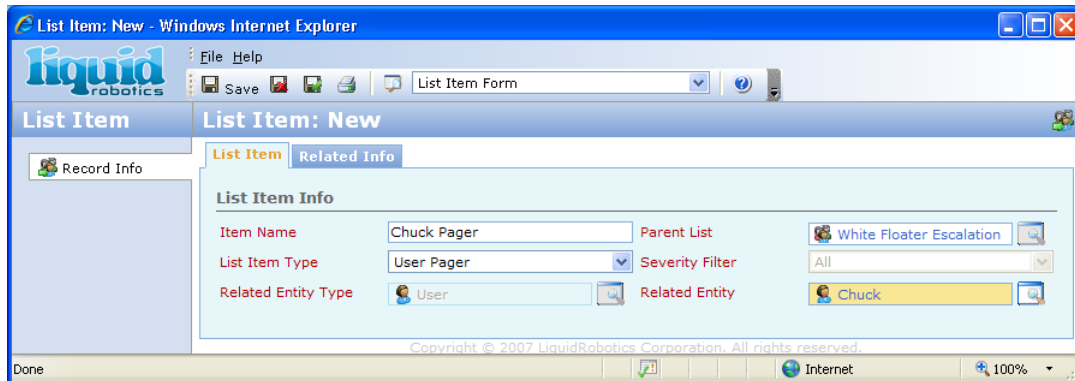


Figure 7-16: Example New List Item

Click the [Save and close List Item] icon to exit back into the Escalation List.

To delete a name from the list, click to select it:

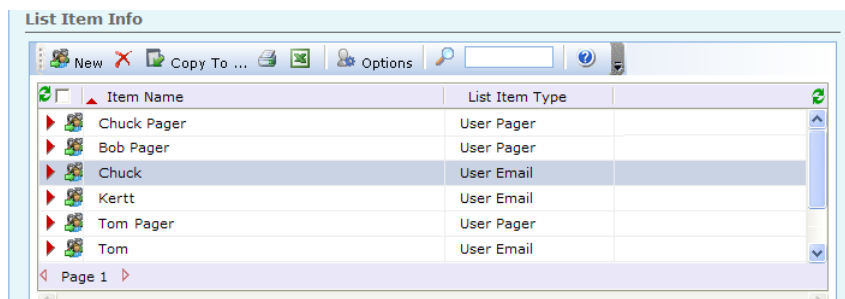


Figure 7-17: Selection in List

Then, click the “Delete” [Delete List Item] icon above the list:

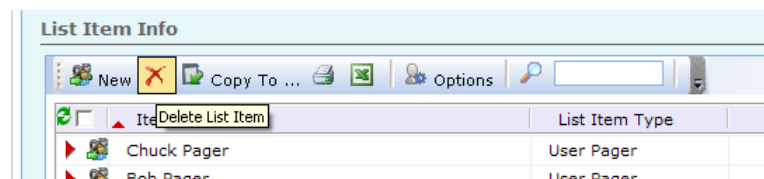


Figure 7-18: Delete List Item Icon

You will be asked to confirm the deletion:

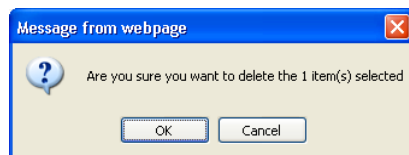


Figure 7-19: List Deletion Confirmation

Note that this will only delete the name from the list; the user’s data will still be in the database.

7.2.3 Generating Reports

Use Custom Reports page to create, view and archive information related to Vehicle operations. There are two types of Reports: Custom and Server. The “Report Server” is only available to Root users.

7.2.3.1 Custom Reports

Custom Reports are pre-defined output types used for graphing or otherwise documenting data trends. Click on the “Custom Reports” tab on the left side.

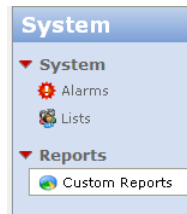


Figure 7-20: Custom Reports Tab

This will bring up the blank form with Telemetry data at the bottom.

 A screenshot of the "Custom Report" page in the Wave Glider WGMS interface. The page has a left-hand navigation bar with the "Liquid Robotics" logo and a "Red Flash" dropdown menu. Below the menu are fields for "Gliders:" (Jenke Finran), "Duration:", "Prior To:", "Report:" (HoldStationAtWaypoi), and "Waypoint:". There are "Show Menu" and "Create Report" buttons. The main area is a large empty space with "No Data" text. At the bottom, there is a "Full Size" link and a table titled "Red Flash Communications". The table has columns for Local Time, Last Speed(kit), Target WP, Desired Heading(°), Sub Heading(°), Path Heading(°), Float Temp(°C), and Battery Total Power. The table contains 6 rows of data.

Local Time	Last Speed(kit)	Target WP	Desired Heading(°)	Sub Heading(°)	Path Heading(°)	Float Temp(°C)	Battery Total Power
4/26/2010 11:20 am	10.542	91	271	26	91	19	550.62
4/26/2010 11:15 am	10.037	91	271	37	90	19	550.32
4/26/2010 11:10 am	7.976	91	273	45	81	19	549.98
4/26/2010 11:05 am	2.708	91	302	23	112	19	549.63
4/26/2010 11:00 am	0.599	91	320	38	132	19	549.11
4/26/2010 10:50 am	0.518	91	91	202	253	19	547.79

Figure 7-21: Custom Report Initial Page

To allow maximum screen space for displaying reports, the left-hand navigation bar is automatically hidden. To restore the navigation buttons, click on the [Show Menus](#) link.

Clicking on the [Full Size](#) link will open a separate window for just the chart. This window can be expanded (pulling on the lower-right) to maximize screen use.

There are currently two “Report” options that can be selected:

Hold Station at Waypoint - Indicates the position, over time, of the Vehicle relative to a specific Waypoint.

Pressure Over Temperature - Indicates the Pressure divided by the Temperature, over time.

Additional Report options may be added in the future, but the general procedure should be similar to that used for the above reports.

Note that to generate a report, you must fill in the necessary data boxes:

Duration: The length of time over which the data is to be plotted. Click on the stopwatch icon to the right of the box to pull down a list (in 1-hour increments).

Prior To: The date and time of the last data point to be plotted. Click on the calendar icon to select the date, then click on the clock icon to select the time.

Report: Use the pull-down arrow to select the report type.

Waypoint: Required only for the “Hold Station at Waypoint”. The Waypoint from which the distance is to be calculated. The value is ignored for the “Pressure Over Temperature” report. Click on the icon to select from a list of Vehicle Waypoints.

Once the data has been entered, click the **Create Report** button. If the data entered above is in the Vehicles Telemetry database, the report will be generated. An example “Hold Station at Waypoint” report is shown in Figure 7-22.

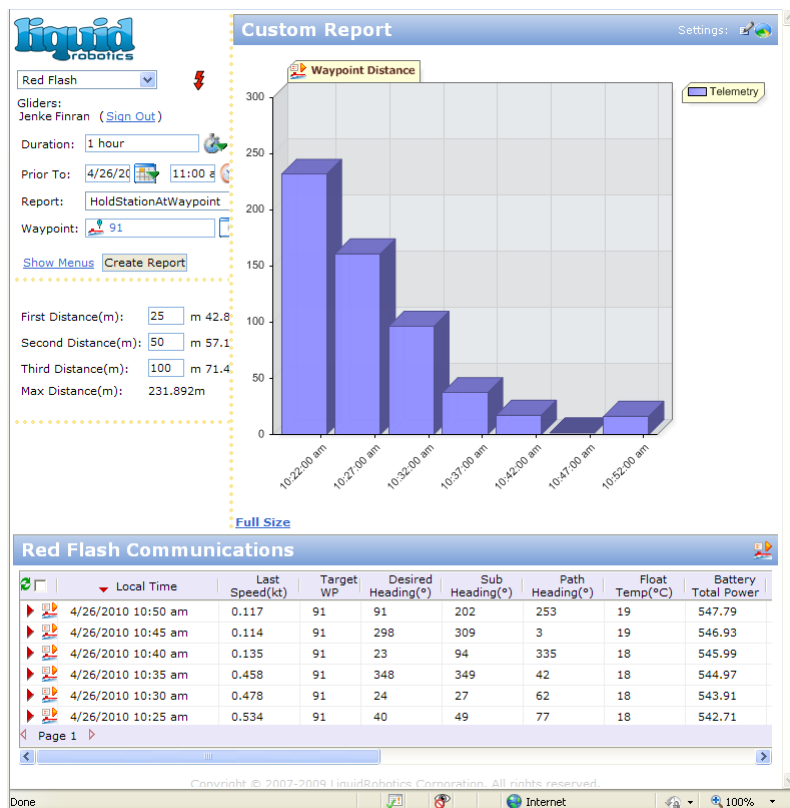


Figure 7-22: Custom Report - Hold Station at Waypoint

An example “Pressure Over Temperature” report is shown in Figure 7-23.

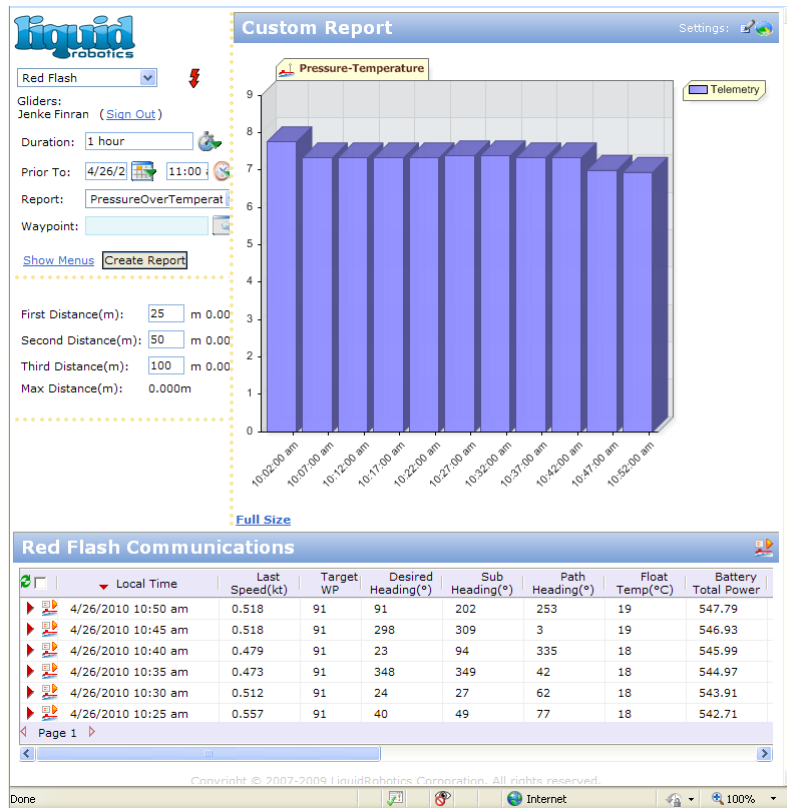


Figure 7-23: Custom Report - Pressure Over Temperature

To save the report image, place the cursor over the image and right-click. Select the option “Save Picture As ...”. Then select the name and the location where it is to be stored.

Note that if all the values selected for the report are not in the database, no report will be generated and the Communications list at the bottom will be blank. Correct the values as necessary and click on the **Create Report** button again.

7.2.3.2 Show/Hide Menus

To recover back to the Reports initial page (Figure 7-21), do the following:

- 1) Click on the [Show Menu](#) link to show the left-side bar.
- 2) Click on the “Custom Reports” tab.

When the left-side tabs and buttons are shown, the link changes to [Hide Menu](#). Clicking this link will remove the left bar to allow more space for the reports display.

7.3 Copying Data to Excel

Several types of data records can be downloaded to an Excel file for analysis using the Excel features.

7.3.1 The Excel Icon and Records

Those lists that can be exported to Excel will have the Green Excel icon [Export Telemetry to Excel] in the menu bar above the list header.

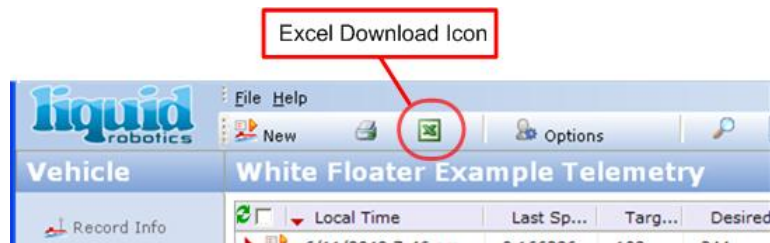


Figure 7-24: Excel Download Icon

Before downloading, verify or set the number of records that you want to save to Excel. The value is set in the User Information Dialog, which can be accessed using the "Options" button to the right of the Excel icon.

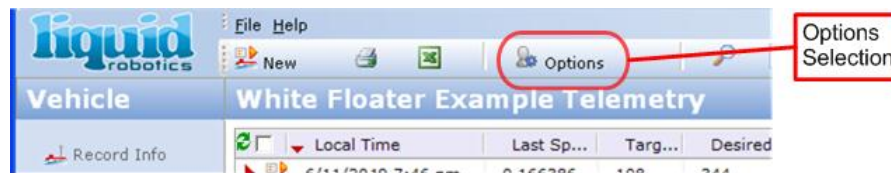


Figure 7-25: Options Selection Icon

Clicking Options will call up the User Options dialog box:

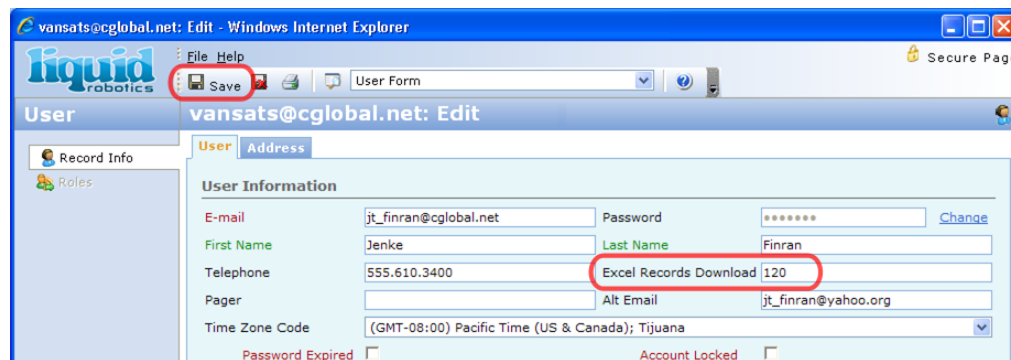


Figure 7-26: Excel Records Download Specification

The "Excel Records Download" box specifies the number of records that will be downloaded into the Excel file (120 in the example). Change the value as desired. Click the "Save" [Save and close User] icon to exit the dialog and save the Excel Records Download value.

To download the records, click on the Green Excel icon [Export Telemetry to Excel].

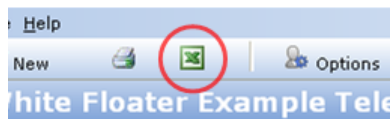


Figure 7-27: Excel Download Icon

You should get a confirmation dialog popup:

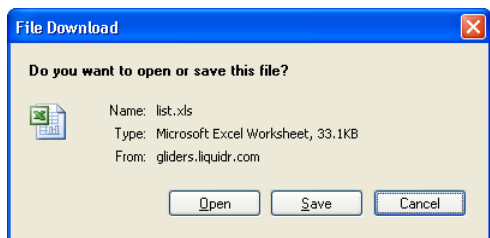


Figure 7-28: Excel File Download Confirmation

Before clicking in this box, check the size of the file indicated (33.1 KB in the example). If this value is large (hundreds of KB), it can take considerable time to download. In such cases, it may be prudent to reduce the number of records to be downloaded.

If you are satisfied with the file size, you can:

- Click "Open" to view the file directly.
- Click "Save" to get the standard request for the name and location to save the .XLS file.

The Excel file will have a format similar to:

A screenshot of a Microsoft Excel spreadsheet titled 'Floater Telemetry Data.xls'. The spreadsheet contains a table with 13 columns: A (Local Time), B (Last Speed), C (Target W/P), D (Desired Heading), E (Sub Heading), F (Path Heading), G (Float Temp), H (ISS), I (User Name), J (Lat), K (Long), L (Distance), and M (Distance). The data rows show various telemetry readings for a floater, including timestamps, speeds, headings, and coordinates. The status bar at the bottom indicates 'Ready'.

Figure 7-29: Excel File Example Output

With this .XLS file, you can convert the format as desired, then do searching, sorting and plotting of the data using Excel features.

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8. Troubleshooting a WGMS Installation

This chapter describes various problem scenarios and suggested responses. There are also sections on interpreting the Packet Reflector and Com Server log error messages.

8.1 I don't see any Vehicles when I start WGMS

The Vehicles page is empty	
Possible Causes	Actions
If not LRI-Hosted, when WGMS is initially installed, there are no Vehicles.	Enter the Vehicles and data.
If LRI-Hosted, someone inadvertently deleted all the Vehicles in the list.	Re-enter the Vehicle data.

8.2 There is no response from the Vehicle

On start-up, there is no response from the Vehicle	
Possible Causes	Actions
There is no Internet connection.	Verify the Internet connection.
Vehicle is not powered On.	On shore: Check Vehicle Power. Off shore: Attempt to contact using XBee.
Relay not configured correctly.	Check connections to Relay hardware.
The Iridium modem was deleted from the parts table.	Check that the Iridium modem is listed in the Parts List.
The wrong IMEI was entered for the Vehicle.	Check the IMEI number in the Parts List against the Vehicle delivery documents.
The Packet Reflector/COM Server is not running	Check Packet Reflector and Com Server Dialog windows.
The Address and/or Port values are incorrect.	Check the Address and Port values. Check Com Server for log for error messages.
The WGMS Unique ID number is not the same as the predefined Vehicle Unique ID number.	Check the Unique IDs as follows: 1) Open a debug window on the Relay 2) Get the WGMS Unique ID 3) Open the WGMS Vehicle form 4) Click on "Unique ID Part" to get the ID 5) If the IDs do not match, follow the procedure described in section Error! Reference source not found.

8.3 Commands are not being ACKed/NAKed

Receiving Telemetry, but no response to Commands	
Possible Causes	Actions
Vehicle is powered off.	Verify that power is on.
Relay is not configured correctly.	Check connections to Relay hardware.
There is no Internet connection.	Verify the Internet connection.
The Iridium modem was deleted from the parts table.	Check that the Iridium modem is listed in the Parts List.
The wrong IMEI was entered for the Vehicle.	Check the IMEI number in the Parts List against the Vehicle delivery documents.
The Packet Reflector or COM Server is not running.	Check the buttons and click if necessary.
The Address and/or Port values are incorrect.	Check the Address and Port values.
Command Timer Box not checked.	Check "Enable Command Timer" box.

8.4 A Vehicle no longer responds to WGMS commands

Vehicle was operating correctly, then stopped responding to commands	
Possible Causes	Actions
Lost Internet connection.	Verify the Internet connection.
Temporary Iridium communications loss.	Wait 10 to 15 minutes to confirm that Iridium loss is not temporary.
Batteries fully discharged.	Check the last telemetry battery level. Check for any previous System alarms.
Vehicle electronics malfunction.	If close to the Vehicle, try communicating via XBee. Check for any previous System alarms.
If still receiving telemetry, Vehicle mechanical failure.	If close to the Vehicle, try communicating via XBee. Notify Mission Operator to prepare for recovery.
Com Server Fatal Error.	Check Com Server Log for error messages. Restart Com Server.

Vehicle was operating correctly, then stopped responding to commands	
Possible Causes	Actions
Packet Reflector Fatal Error.	Check Packet Reflector Log for errors. Restart Packet Reflector.

8.5 Map is not being displayed in the WGMS Dashboard

The Google map is not being displayed on the Dashboard page	
Possible Causes	Actions
No Internet connection – Error Message.	Verify the Internet connection
API Key not specified.	Enter the API key
Wrong API key – Error Message.	Check/update the API key. A pop-up message should advise you on what to do.
No check in the “Display Google Maps” checkbox.	Check the maps checkbox

8.6 XBee doesn’t seem to be working

Cannot communicate via the XBee connection	
Possible Causes	Actions
XBee startup can take up to 1 minute.	Wait at least 1 minute after startup before sending commands.
XBee reception is turned off on Vehicle.	Turn on XBee via Iridium.
Vehicle is too far away.	Move within 100 meters of Vehicle.
Wrong XBee IP address on the Packet Reflector	Check Packet Reflector IP address
Wrong IP address for your computer.	Check computer IP address
Wrong PAN ID number.	Check XBee PAN ID
Multiple XBee connections with same PAN ID.	Go through one Relay to avoid problem

8.7 I'm not getting Iridium messages

Communications with XBee works, but not through Iridium	
Possible Causes	Actions
Lost Internet connection.	Check Internet connection.
Temporary Iridium communications loss.	Wait 10 minutes to verify.
Packet Reflector configuration set to wrong IP address or port number.	Re-check IP address and port number. If "correct" values are set, contact your VAR to verify the IP address and/or port number.
Packet Reflector/COM server not running.	Check the buttons and click if necessary.
System was configured for Mobile-to-Mobile	Confirm that the Wave Glider modem is configured for DirectIP.

8.8 Mobile-to-Mobile is not working

Cannot establish Iridium Mobile-to-Mobile communications	
Possible Causes	Actions
Iridium signal is blocked.	If indoors, move outdoors with a clear view of the sky.
Temporary Iridium communications loss.	Wait 10 minutes to verify.
System was not configured for Mobile-to-Mobile.	Confirm that the Wave Glider modem is configured for ISU-to-ISU.
Incorrect Packet Reflector configuration.	Check the Packet Reflector IP addresses and port numbers.
Incorrect Alternate Iridium Relay configuration.	Check the Alternate Iridium Relay address and port values.

8.9 I changed and then lost the Administrator's password

Cannot remember or find the Administrator's password	
Host	Actions

Cannot remember or find the Administrator's password	
Host	Actions
Hosted by LRI.	If hosted by LRI: Contact LRI to reset the password.
Self-Hosted.	Get another SA to reset your password. Otherwise, re-install WGMS.

8.10 Interpreting Packet Reflector Log Records

This section only applies if your WGMS is Self-Hosted, or you are using Mobile-to-Mobile.

8.10.1 Packet Reflector Dialog

When a Packet Reflector is running, it logs all of the communications that it handles. These are displayed in the log window of the Packet Reflector dialog, as shown below in Figure 8-1.

To access the Packet Reflector dialog, click on the icon (ref. 3.2).

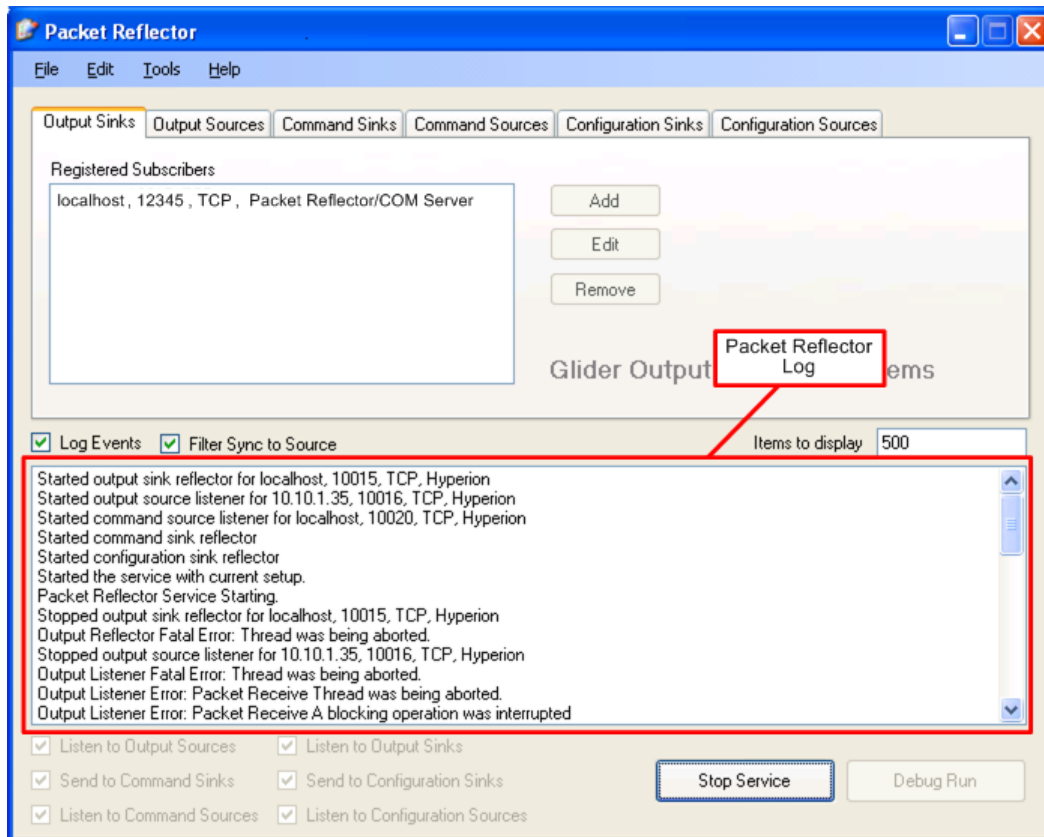


Figure 8-1: Packet Reflector UI During Example Operation

Many of the log records are self-explanatory and indicate normal operation. Certain messages indicate problems. The error messages, their meanings and possible responses are described below.

8.10.2 Packet Reflector Error Messages

Packet Reflector errors can be caused by a failure to specify a valid Command/Output Source/Sink, by corrupted data, by time-outs, or by a device being off-line.

Note that there are two levels of error messages: "Error" and "Fatal Error"

Error: A problem occurred that was handled. If a certain type of error occurs occasionally, it is usually not a problem. If the same error occurs repeatedly, then some action should be taken to fix the problem.

Fatal Error: The problem was so serious that either the Packet Reflector or the Com Server stops. This requires a re-start of the Packet Reflector.

Note: To re-start, click the "Stop Service" button, then click "Start Service".

The table below shows the messages in alphabetic order. Each message is described in more detail in the referenced sections.

Error Message Format	Ref.
"Command Listener [source] Fatal Error: [message] "	8.10.3
"Command Listener [source] Packet Receive Error: [message] "	8.10.4
"Command Reflector: [subscriber], packet echo data mismatch [message] "	8.10.5
"Command Reflector: [subscriber], packet echo length mismatch [message] "	8.10.6
"Command Reflector: [subscriber], Send [message] "	8.10.7
"Output Listener Error: [subscriber], Packet Receive [message] "	8.10.8
"Output Listener Fatal Error: [subscriber], [message] "	8.10.9
"Output Reflector Fatal Error: [subscriber] "	8.10.10
"Output Reflector Error [subscriber], Send: [message] "	8.10.11

8.10.3 "Command Listener [source] Fatal Error: [message] "

Originator: Packet Reflector Command Source

Fields:

[source] – The name of the Source from which the Packet Reflector is receiving the command. This will always be a Com Server.

[message] – A Windows error message indicating the cause of the error.

Explanation:

An unrecoverable error occurred during receipt of a Command from the [source].

The problem is caused by a communications problem between the Packet Reflector and the referenced Com Server.

Responses:

- 1) Re-start the Packet Reflector.

If the problem keeps occurring:

- 2) If the Packet Reflector and the Com server are both running on the same computer, look for a problem with the hardware electronics.
- 3) If the Packet Reflector is not running in the same computer as the referenced Com Server, check for a connection problem between the two computers (e.g., a bad cable).

8.10.4 "Command Listener [source] Packet Receive Error: [message] "

Originator: Packet Reflector Command Source

Fields:

[source] – The name of the Source from which the Packet Reflector is receiving the command. This will always be a Com Server.

[message] – A Windows error message indicating the cause of the error.

Explanation:

An error occurred during receipt of a Command packet from the source.

The error can be caused by:

- a) A problem with the structure of the packet.
- b) Communication overloading of the Packet Server.
- c) A communications problem between the Packet Reflector and the referenced Com Server.

Responses:

If the error occurs continuously:

- 1) If the Packet Reflector and the Com server are both running on the same computer, look for a problem with the electronics in the computer.
- 2) If the Packet Reflector is not running in the same computer as the referenced Com Server, check for a connection problem between the two computers (e.g., a bad cable).

8.10.5 "Command Reflector: [subscriber], packet echo data mismatch [message] "

Originator: Packet Reflector Command Sink

Fields:

[subscriber] – The name of the subscriber to whom the command is being sent. This can be any connection other than the local WGMS.

[message] – A Windows error message indicating the type of error.

Explanation:

When a subscriber receives a command packet, it echoes it back to the Packet Reflector. The Packet Reflector then checks to verify that the data in echoed packet matches the sent packet. If they do not, the error message is sent.

The problem is usually caused by a bad network connection.

Responses:

- 1) Re-check the network connection between the Packet Reflector computer and the hardware where the subscriber resides.
- 2) If the problem persists, contact LRI.

8.10.6 "Command Reflector: *[subscriber]*, packet echo length mismatch *[message]* "

Originator: Packet Reflector Command Sink

Fields:

[subscriber] –The name of the subscriber to whom the command is being sent.
This can be any connection other than the local WGMS.

[message] – A Windows error message indicating the type of error.

Explanation:

When a subscriber receives a command packet, it echoes it back to the Packet Reflector. The Packet Reflector checks that the lengths of the two packets match. If they do not, the error message is sent.

The problem is usually caused by a bad network connection.

Responses:

- 1) Re-start the Packet Reflector.
- 2) If the problem persists, contact LRI.

8.10.7 "Command Reflector: *[subscriber]*, Send *[message]* "

Originator: Packet Reflector Command Sink

Fields:

[subscriber] –The name of the subscriber to whom the command is being sent.
This can be any connection other than the local WGMS.

[message] – A Windows error message indicating the type of error.

Explanation:

The Packet Reflector cannot send a command to the stated subscriber. This can be caused by:

- a) The subscriber hardware is turned off
- b) The subscriber hardware is disconnected from the Packet Reflector hardware.
- c) One or more of the subscriber values (IP Address, Port, Protocol or Channel) is incorrect.

Responses:

- 1) Check that the correct address values have been set.
- 2) Check the connection between the Packet Reflector hardware and the subscriber hardware.

8.10.8 "Output Listener Error: *[subscriber]*, Packet Receive *[message]* "

Originator: Packet Reflector Output Source

Fields:

[subscriber] –The name of the subscriber from whom an output was received.
This will typically be Iridium, Alternate Iridium or XBee.

[message] – A Windows error message indicating the type of error.

Explanation:

An output packet was received by the Packet Reflector, but there is a problem with the packet format. This can be caused by:

- a) The packet type is in a format that the Packet Reflector is not configured to recognize.
- b) The data in the packet was corrupted.
- c) The time allotted to read the packet exceeded the time-out limit.

In general, there was likely an error in the setup of the communications infrastructure, such as a Relay or the Iridium.

Responses:

- 1) If the problem occurs only on a single subscriber, check the connection and configuration of that subscriber.
- 2) If this error seems to be occurring on multiple subscribers, check the Packet Reflector configuration.

8.10.9 "Output Listener Fatal Error: *[subscriber]*, *[message]* "

Originator: Packet Reflector Output Source

Fields:

[subscriber] –The name of the subscriber from whom an output was received.
This will typically be Iridium, Alternate Iridium or XBee.

[message] – A Windows error message indicating the type of error.

Explanation:

This error message indicates that there has been a serious failure of the Packet Server hardware.

Responses:

- 1) Verify that the Packet Reflector Hardware is operating.
- 1) Re-start the Packet Reflector.
- 2) If the problem persists, contact LRI.

8.10.10 "Output Reflector Fatal Error: [subscriber]"

Originator: Packet Reflector Output Sink

Fields:

[subscriber] – The name of the subscriber to whom an output was being sent.
This will usually be a Com Server, another WGMS or another Packet Reflector.

Explanation:

The Packet Reflector could not send an output message to the subscriber.

Responses:

- 1) Re-start the Packet Reflector.
- 2) If the problem persists, contact LRI.

8.10.11 "Output Reflector Error: [subscriber], Send: [message]"

Originator: Packet Reflector Output Sink

Fields:

[subscriber] – The name of the subscriber to whom an output was being sent.
This will usually be a Com Server, another WGMS or another Packet Reflector.

[message] – A Windows error message indicating the type of error.

Explanation:

The Packet Reflector cannot send an output to the stated subscriber. This can be caused by:

- a) The subscriber hardware is turned off
- b) The subscriber hardware is disconnected from the Packet Reflector hardware.
- c) One or more of the subscriber values (IP Address, Port, Protocol or Channel) is incorrect.

Responses:

- 1) Check that the correct address values have been set.
- 2) Check the connection between the Packet Reflector hardware and the subscriber hardware.

8.11 Interpreting Com Server Log Records

This section only applies if your WGMS is Self-Hosted, or you are using Mobile-to-Mobile.

8.11.1 Packet Reflector Dialog

When the Com Server is running, it logs all of the communications that it handles. These are displayed in the log window of the Com Server UI, as shown below.

To access the Com Server log, double-click on the “Com Server” icon on the Windows desktop. If there is no icon, click **Start → All Programs → Com Server**.

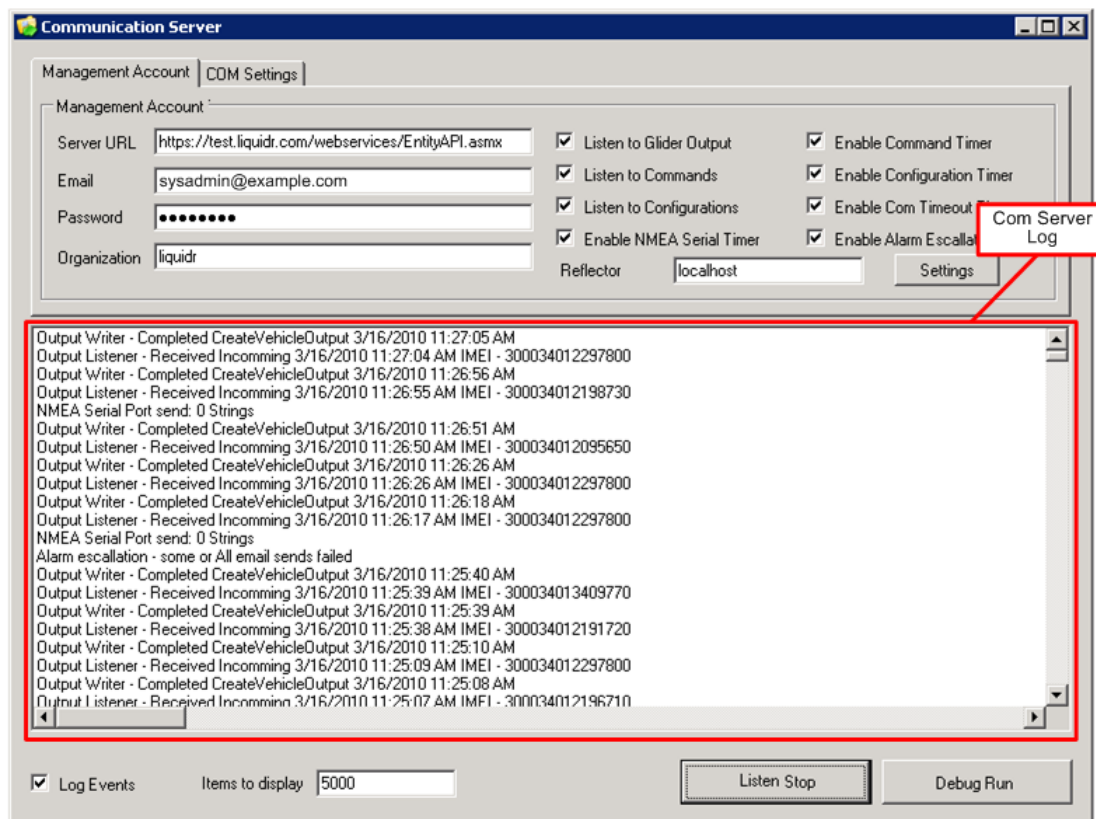


Figure 8-2: Com Server UI During Example Operation

Many of the log records are self-explanatory and indicate normal operation. Certain messages indicate problems. The error messages, their meanings and possible responses are described below.

An important factor in Com Server operation is the Security Certificate. If there is a certificate problem, this can be diagnosed as follows:

- 1) Stop the Com Server operation.
- 2) Copy the URL in the “Reflector” window.
- 3) Paste the URL into the address field of a browser and go to that address.
 - 4a) If the window comes up with an “Entity API” header, the certificate is OK.
 - 4b) If a “Security Alert” dialog comes up, follow the instructions given.

8.11.2 Com Server Error Messages

Com Server errors are typically caused when the system receives data that the system is not prepared to receive.

Note that there are two levels of error messages: “Error” and “Fatal Error”

Error: A problem occurred that was handled.

Fatal Error: The problem was so serious that either the Com Server stops. This requires a re-start of the Com Server.

Note: To re-start, click the “Stop Service” button, then click “Start Service”.

The table below shows the messages in alphabetic order. Each message is described in more detail in the referenced sections.

Error Message Format	Ref.
"Command Listener – ERROR CreateVehicleCommand [date/time] [message] "	8.11.3
"Command Listener – ERROR: [message] "	8.11.4
"Command Listener – FATAL ERROR: [message] "	8.11.5
"Command Queue Failed to set Command Status to Sent: [message] "	8.11.6
"Command Queue Packet Error"	8.11.7
"Command Queue Read Failed"	8.11.8
"Output Listener – ERROR: [message] "	8.11.9
"Output Listener – FATAL ERROR: [message] "	8.11.10
"Output Writer – ERROR CreateVehicleOutput: [date/time], buffer= [hex_buffer], [message] "	8.11.11
"Output Writer – ERROR: [message] "	8.11.12
"Output Writer – FATAL ERROR: [message] "	8.11.13

8.11.3 "Command Listener – ERROR CreateVehicleCommand [date/time] [message] "

Originator: COM Server Command Listener

Fields:

[date/time] – Date and time error was detected.

[message] – A Windows error message indicating the type of error.

Explanation:

The Com Server is trying to write to WGMS, but is not able to. This can be caused by:

- a) The WGMS hardware is disconnected or not operating
- b) The WGMS software is not running
- c) There is a bad security certificate

Responses:

- 1) Check that WGMS hardware is connected and running
- 2) Check that WGMS is operating.
- 3) Check the Security certificate

8.11.4 "Command Listener – ERROR: [message] "

Originator: COM Server Command Listener

Fields:

[message] – A Windows error message indicating the type of error.

Explanation:

A time-out occurred while reading a message from the WGMS. This is most likely due to a connectivity problem between the Com Server and WGMS.

Responses:

Verify connectivity between Com Server and WGMS.

8.11.5 "Command Listener – FATAL ERROR: [message] "

Originator: COM Server Command Listener

Fields:

[message] – A Windows error message indicating the type of error.

Explanation:

There is a major problem with the operation of the Com Server.

Responses:

- 1) Re-start the Com Server.
- 2) If the problem persists, contact LRI.

8.11.6 "Command Queue Failed to set Command Status to Sent: [message] "

Originator: COM Server Command Queue

Fields:

[message] – A Windows error message indicating the type of error.

Explanation:

Incorrect credentials on Com Server or WGMS are bad. Usually, this is the result of the Com Server or WGMS being set-up by someone without System Admin privileges.

Responses:

- 1) In the "Management Account" boxes of the Com Server window, change the email address (and password) to that of a System Administrator.

8.11.7 "Command Queue Packet Error"

Originator: COM Server Command Queue

Explanation:

Com Server couldn't make contact with the Packet Reflector, in order to send a command. This is usually caused by an Incorrect Packet Reflector address. Or, the Packet Reflector hardware may not be operating.

Responses:

If the problem is persistent:

- 1) Check that the Packet Reflector hardware is operating.
- 2) Check that the Packet Reflector address is correct.

8.11.8 "Command Queue Read Failed"

Originator: COM Server Command Queue

Explanation:

The Com server couldn't read commands coming from the WGMS. This can be caused by:

- a) The WGMS hardware is disconnected or not operating
- b) The WGMS software is not running
- c) There is a bad security certificate

Responses:

- 1) Check that WGMS hardware is connected and running
- 2) Check that WGMS is operating.
- 3) Check the Security certificate

8.11.9 "Output Listener – ERROR: [message]"

Originator: COM Server Output Listener

Fields:

[message] – A Windows error message indicating the type of error.

Explanation:

A time-out occurred while reading a message from the Packet Reflector. This is most likely due to a connectivity error between the Com Server and the Packet Reflector.

Responses:

Verify connectivity between Com Server and the Packet Reflector.

8.11.10 "Output Listener – FATAL ERROR: [message] "

Originator: COM Server Output Listener

Fields:

[message] – A Windows error message indicating the type of error.

Explanation:

There is a major problem with the operation of the Com Server. Most likely, there was a hardware crash

Responses:

- 1) Check operation of the Packet Reflector Hardware.
- 2) Re-start the Com Server.
- 3) If the problem persists, contact LRI.

8.11.11 "Output Writer – ERROR CreateVehicleOutput: [date/time], buffer=[hex_buffer], [message] "

Originator: COM Server Output Writer

Fields:

[date/time] – Date and Time of error.

[hex_buffer] – The message sent to WGMS

[message] – A Windows error message indicating the type of error.

Explanation:

The Com Server sent a message to WGMS. WGMS responded, but does not recognize the originator of the packet and cannot process it.

This is most likely caused by a packet being sent from a Vehicle that is not in the database of the WGMS.

Responses:

- 1) Check that the Vehicle is in the database.
- 2) If running multiple WGMS systems, check the Packet Reflector routing.

Note:

This error will cause an email to be automatically generated and sent to the registered System Admin.

8.11.12 "Output Writer – ERROR: [message] "

Originator: COM Server Output Writer

Fields:

[message] – A Windows error message indicating the type of error.

Explanation:

This is a general error indicating a problem between the Com Server and WGMS. This is usually caused by:

- a) The WGMS hardware is not running or is disconnected.
- b) The address of the WGMS has been incorrectly set.
- c) There is a Certificate Error

Responses:

- 1) Check the WGMS hardware connectivity.
- 2) Verify that WGMS is running
- 3) Check the address set in WGMS

8.11.13 "Output Writer – FATAL ERROR: *[message]* "

Originator: COM Server Output Writer

Fields:

[message] – A Windows error message indicating the type of error.

Explanation:

An unrecoverable error occurred when the Com Server was attempting to communicate with the WGMS

Responses:

- 1) Check operation of the WGMS Hardware.
- 2) Re-start the Com Server.
- 3) If the problem persists, contact LRI.

9. Contacting Liquid Robotics Inc.

If you cannot determine or correct the cause of a problem, contact LRI.

To expedite resolving the problem, make a brief list beforehand with the following information.

- 1) Wave Glider Model Number.
- 2) Any special or added payloads on the Vehicle.
- 3) Time/date when problem occurred.
- 4) Location of Vehicle when problem occurred.
- 5) Initial indication of problem.
- 6) Any other indications or unusual readings.
- 7) Attempts at corrective actions and their results.

For time-critical problems, call LRI at:

1 (650) 493-6300

or **(888) 574-4574**

and select the option for Customer Service.

For non-critical problems, send the above information via email to:

support@liquidr.com

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Appendix A: Roles and Permissions

System Administrators are assigned the “Admin” Role.

Permissions are denoted as follows:

C → Create
R → Read
U → Update
D → Delete

Permission Type	Guest User	Data Analyst	Master	Admin	Root	Description
Area Permissions						
Home Pages	• R • •	• R • •	• R • •	• R • •	C R U D	Grids and top levels of the main window.
System Alarms	• R • •	• R • •	• R U •	• R U •	C R U D	Information for alarm escalation
Records	• • • •	• • • •	• R • •	• R U •	C R U D	Top level metadata records. (outputs, vehicles, permissions)
Lists	• • • •	• R • •	C R U D	C R U D	C R U D	Escalation lists, user groups (future)
Dashboard Pages	• R • •	• R • •	• R • •	• R • •	C R U D	Allows user to edit dashboard pages.
List Items	• • • •	• R • •	C R U D	C R U D	C R U D	Items in a list
Report	• • • •	C R U D	C R U D	C R U D	C R U D	Data reports
Users, Roles Permissions						
Users	• • • •	• R U •	• R U •	C R U D	C R U D	User data
Organizations	• • • •	• R • •	• R • •	• R U •	C R U D	Organization parameters
Notes	• • • •	C R U D	C R U D	C R U D	C R U D	Any entity can have a note attached (user, vehicle) (html or text)
Accounts	• • • •	• • • •	• • • •	• • • •	C R U D	(For future use)
Catalog Images	• • • •	• R • •	C R U D	C R U D	C R U D	Logos, images, photographs
Roles	• • • •	• • • •	• • • •	• R U •	C R U D	Editing the roles available in the system
User Roles	• • • •	• • • •	• • • •	C R U D	C R U D	Mapping between users and roles
Audit Records	• • • •	• R • •	• R • •	• R • •	C R U D	Entity change history (parts, vehicle changes)
Vendors	• • • •	• • • •	• • • •	• • • •	C R U D	For future use

Permission Type	Guest User	Data Analyst	Master	Admin	Root	Description
Attachments	• • • • •	• R • • •	C R U D	C R U D	C R U D	Files attached to an entity
Permissions	• • • • •	• • • • •	• • • • •	• R • • •	C R U D	What permissions are allowed in the system
Role Permissions	• • • • •	• • • • •	• • • • •	• R • • •	C R U D	Mapping between roles and permissions
Workflow Events	• • • • •	• • • • •	• • • • •	• • • • •	C R U D	For future use
Inventory Items	• • • • •	• • • • •	• • • • •	• • • • •	C R U D	For future use
Record Customization						
Fields	• • • • •	• R • • •	• R • • •	• R U • •	C R U D	Metadata for each entity field (user name) (change the name of a column)
Data Views	• • • • •	• • • • •	• R • • •	C R U D	C R U D	Metadata defining how entities are displayed (column grids) (change column in a grid)
Relationships	• • • • •	• • • • •	• R • • •	• R • • •	C R U D	Structure that tells how entities are related. (inverse of foreign keys)
Criteria	• • • • •	• • • • •	• R • • •	C R U D	C R U D	Additional conditions on grids (filters)
Selects	• • • • •	• • • • •	• R U • •	C R U D	C R U D	Values for fields with multiple values
Criteria Groups	• • • • •	• • • • •	• R • • •	C R U D	C R U D	Grouping class for criteria
Payload	• • • • •	• • • • •	• • • • •	• • • • •	C R U D	Edit Payload display structures
Vehicle Permissions						
Vehicles	• • • • •	• R • • •	C R U D	C R U D	C R U D	Access to records on vehicles in database (Guests can see vehicles marked "visible for guest")
Commands	• • • • •	• R • • •	C R U •	C R U •	C R U D	Entities representing commands
Telemetry	• R • • •	• R • • •	• R • • •	• R • • •	C R U D	Data coming back from vehicles
Statuses	• • • • •	• R • • •	C R U •	C R U •	C R U D	Statuses coming and going from vehicle
Event Definitions	• • • • •	• R • • •	C R U D	C R U D	C R U D	Alarm definitions
Rudder Controls	• • • • •	• R • • •	• R • • •	C R • • •	C R U D	Parameters for rudder module control loop.
Parameters	• • • • •	• R • • •	C R U •	C R U •	C R U D	Data user can send to vehicle
Communication Channels	• • • • •	• • • • •	• • • • •	• R U • •	C R U D	Automatically created by relays
Parts	• R • • •	• R • • •	C R U D	C R U D	C R U D	Manufacturing track listing of what's on vehicle

Permission Type	Guest User	Data Analyst	Master	Admin	Root	Description
Courses	• • • • •	• R • • •	C R U D	C R U D	C R U D	Vehicle routes
Part Identifications	• • • • •	• R • • •	• R • • •	• R • • •	C R U D	Vehicle-generated list of parts
Missions	• • • • •	• R • • •	C R U •	C R U D	C R U D	Time-delineated vehicle status that states a vehicle is in water.
Operation Polygons	• • • • •	• R • • •	C R U D	C R U D	C R U D	Geographical area for vehicle presence
File Notifications	• • • • •	• • • • •	• • • • •	• • • • •	C R U D	Entities used during file transfers
Errors	• • • • •	• R • • •	• R U •	• R U •	C R U D	Vehicle Events
Raw Outputs	• R • • •	• R • • •	• R • • •	• R • • •	C R U D	Telemetry received from the vehicle
Waypoints	• R • • •	• R • • •	C R U D	C R U D	C R U D	Waypoint data associated with a vehicle.
Course Waypoints	• • • • •	• R • • •	C R U D	C R U D	C R U D	How a course is mapped to a waypoint
Power Ctl Statuses	• • • • •	• R • • •	• R • • •	• R • • •	C R U D	Telemetry
Mission Vehicles	• • • • •	• R • • •	C R U •	C R U •	C R U D	Mapping between missions and vehicles
Operation Coordinates	• • • • •	• R • • •	C R U D	C R U D	C R U D	Coordinates of an operational polygon
Payload Data Permissions						
Payload Packets	• R • • •	• R • • •	• R • • •	• R • • •	C R U D	Generic data from the payloads
Payload Statuses	• R • • •	• R • • •	• R • • •	• R • • •	C R U D	Parsed payload packets
AISyG Locations	• R • • •	• R • • •	• R • • •	• R • • •	C R U D	AIS updates
Weather Stations	• R • • •	• R • • •	• R • • •	• R • • •	C R U D	Weather station telemetry
AISyG Statuses	• R • • •	• R • • •	• R • • •	• R • • •	C R U D	AIS updates
Weather Reports	• R • • •	• R • • •	• R • • •	• R • • •	C R U D	Weather station telemetry
AISyG Records	• R • • •	• R • • •	• R • • •	• R • • •	C R U D	AIS vehicles seen
Site Permissions						
Site Areas	• • • • •	• • • • •	• • • • •	• • • • •	C R U D	Allows different orgs to change page structure (home, vehicles...)
Site Groups	• • • • •	• • • • •	• • • • •	• • • • •	C R U D	Groups of items (Vehicles, Payload data)
Site Items	• • • • •	• • • • •	• • • • •	• • • • •	C R U D	Items that appear within a group

Permission Type	Guest User	Data Analyst	Master	Admin	Root	Description
Custom Entity						
Added Records	• • • • •	• • • • •	• • • • •	• • • • •	C R U D	Ability to add new entities without changing the database
Added Fields	• • • • •	• • • • •	• • • • •	• • • • •	C R U D	
Added Mappings	• • • • •	• • • • •	• • • • •	• • • • •	C R U D	Relationships between added records and existing entities
Collision Avoidance Permissions						
Obstacles	• • • • •	• • • • •	• • • • •	• • • • •	C R U D	Obstacle in the glider's path
Obstacle Locations	• • • • •	• • • • •	• • • • •	• • • • •	C R U D	Obstacle telemetry
Vehicle Obstacles	• • • • •	• • • • •	• • • • •	• • • • •	C R U D	Mapping between obstacles and vehicles

Appendix B: Checklists

Provisioning Checklist

- 1) Enter a Vehicle into the Database
 - a) Determine Vehicle name and icon
 - b) Add name to Vehicles List
- 2) Initialize the Part Info Tree
 - a) Add basic Float info
 - b) Add Shoreside Software info
- 3) Add Event Definitions
 - a) Add 9 Basic Alarm Types
- 4) Add Operation Polygons
 - a) Establish Operational Area
 - a) Operation Inclusion
 - b) Operation Exclusion
- 5) Add Waypoints
 - a) Cross-check with other Vehicles
- 6) Add/Update Escalation List
- 7) Complete the Part Info Tree
 - a) Power-Up Vehicle
 - b) Get/Verify Part Data
- 8) Enter Part Serial Numbers
- 9) Completion
 - a) Generate Provisioning report

Mission Planning Checklist

- 1) Plan the Course
 - a) Operational area
 - b) Weather conditions
 - c) Navigation mode
- 2) Waypoints
 - a) Add or change
 - b) Check/change the Arrival Distance
- 3) Operation Polygons
 - a) Add or modify
- 4) Specify the Course
 - a) Using Waypoints
 - b) Non-Waypoint

Mission Operation Checklist

- 1) Pre-Launch Check
 - a) Telemetry
- 2) Start Mission
 - a) Enter start-Mission data
 - b) Coordinate with launch crew
 - b) Monitor initial Telemetry data
- 3) Running a Mission
 - a) Monitor Telemetry data
 - b) Check Alarms
- 4) Completing a Mission
 - a) Coordinate with recovery crew
 - b) Enter end-Mission comment

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Appendix C: Glossary

ACK – Abbreviation for “Acknowledged” during data transmission. This is response to indicate to the sender that a sent message was received correctly.

Acknowledged (Alarm) – The alarm was reset by a User.

Active (Alarm) – The alarm was issued, but no other action has been taken.

Acoustic Wave and Current Profiler (AWAC) – A sensor that characterizes and records wave motion.

Admin (Role) – A User who has all the permissions required to go through the day-to-day administration of the WGMS, add users, manage customizations, and deal with data.

Alarm – A message either from the Vehicle C&C or from the Shore-based software indicating that a problem has occurred.

Alternate Iridium Relay – A connection to the Iridium system that bypasses the standard Iridium Server.

Arrival Distance – Distance from a Waypoint at which the C&C computer assumes that the Vehicle has “arrived” at the Waypoint.

Audit Records – Record of changes or updates made to a Vehicle and/or its parts.

Automatic Identification System (AIS) – A VHF radio system that automatically broadcasts the type and location of a seaborne vessel.

Broadband Global Area Network (BGAN) – A global satellite Internet network with telephony using portable terminals.

Channel (Packet Reflector) – The type of Subscriber to a Packet Reflector. Types are Command Source, Command Sink, Output Source and Output Sink.

Checkbox – A yes/no selection box in a Dialog Box. Checking one box does not preclude checking another. (ref. Radio Button)

Coastal Explorer – A mapping service that provides a DVD with nautical maps. Used as an alternative to Google Maps.

Command and Control Drybox – The center-mounted Drybox in the Wave Glider Float. Contains the main control computer and communications equipment.

Command Packets – Data packets containing Commands sent to the Vehicle.

Command Sinks (Packet Reflector) – Commands to a Packet Reflector from the WGMS and/or another Packet Reflector.

Command Sources (Packet Reflector) – Commands from a Packet Reflector to the Vehicle.

Commands – Messages sent to the Vehicle for control or to request status.

Commercial, Off-The-Shelf (COTS) – Standard (as opposed to custom-made) components.

Compiled Views – Option to compile different views to speed up the response of the GUI.

Configurations – Legacy Packet Reflector option for pre-Model 08 Wave Gliders.

Course – The path a Vehicle is attempting to follow. (ref. Track)

Create (Permission) – A Role permission that allows creation of a Vehicle-related system parameter.

Custom Relay – Software that provides special communications services between a Vehicle and a Packet Reflector.

Dashboard – The Home Page of the User Interface to the Wave Glider Management System.

Data Analyst (Role) – A User who looks at existing Vehicle and WGMS data and can download database data.

Database (WGMS) – The part of the WGMS that stores configuration and communications data for one or more Vehicles.

Delete (Permission) – A Role permission that allows deletion of a Vehicle-related system parameter.

Dialog Box – An on-screen box that typically requests data to be entered.

Direct IP – An individual computer that is allowed directly communicate to the Internet. Typically used for single-user machines

Drybox – A sealed watertight container on either the Glider or the Float. Typically used for housing electronics.

Errors – Messages sent by the Vehicle or the Shore-based software indicating a problem.

Escalation List – A prioritized list of people to contact in case of an error.

Events – Types of Alarms.

Float – The part of the Wave Glider Vehicle that rides on the surface of the water.

Glider – The submarine portion of the Vehicle, connected by the Umbilical to the Float.

Global Positioning System (GPS) – A satellite-based broadcasting system that allows determination of geographical coordinates.

Global System for Mobile Communications (GSM) – A worldwide standard for mobile telephone communication systems.

Google API Key – A (Google private) registration number that allows access to Google Maps.

Google Maps – A mapping service provided by Google.

Guest User (Role) – Someone who can view the status of Vehicles that have been specifically marked for display to guests.

Home Page – The initial page that comes up on the browser after logging onto the WGMS system.

Hyperion – An alternate name for the WGMS Kernel

Icon – A small pictogram on a GUI. Typically, clicking on the Icon will start some other action.

Internal Name – An alternate reference to the “Org Internal Name”.

International Mobile Equipment Identity (IMEI) – A 15-digit number used by the Iridium system to identify handsets and modems that can connect with the Iridium system.

Iridium – A constellation of satellites that provides world-wide voice and data transmission. Wave Glider Vehicles use the SBD form of transmission.

Iridium Relay – Software/hardware that provides direct communications to the Iridium system, bypassing an Iridium Server.

Iridium Network Server – A server maintained by the Iridium Corporation that provides access to the Iridium system via the Internet.

Iridium Subscriber Unit (ISU) – Describes a stand-alone piece of hardware (phone or modem) that can communicate directly with the Iridium system.

IP Address – Equivalent to IP Number.

IP Number – Internet Protocol Number. A combination of numbers that defines the destination of TCP or UDP data. Of the form xxx.xxx.xxx.xxx, where “xxx” represents a number from 1 to 255 (e.g., 10.10.5.145).

Kernel (WGMS) – That part of the WGMS software that does the primary communications control and database management.

LRI-Hosted WGMS – A deployment option where an Organization uses LRI’s servers and WGMS software to operate their Vehicle.

Master (Role) – A User who manages Vehicle provisioning, mission planning and operations, as well as payload and Web services development.

Menu – Allows selection of one or more items from a list.

Metadata Version – Software version number. For reference use when contacting LRI about a software problem.

Mission – A set of Vehicle operational actions, either by itself, or in cooperation with other Vehicles.

Mobile-to-Mobile – A deployment option where a single computer with its own copy of WGMS communicates directly with a Vehicle, using either XBee or an Alternate Iridium Relay.

NAK – Abbreviation for “Not Acknowledged” for a data transmission. This is response to indicate to the sender that a sent message was received, but cannot be processed.

National Marine Electronics Association (NMEA) – An industry association that creates standards for, and certifies electronics used in marine applications.

NMEA Convert – Option to use the NMEA mapping available from Coastal Explorer. Typically used when there is no Internet connection to the WGMS.

Operation Polygon – A user-defined closed region in the water that defines limits on where a Vehicle should go.

Org – Abbreviation for Organization.

Org Internal Name – The name of the Organization used within the WGMS database. This is not necessarily the same as the “Organization Name” used on the Dashboard UI.

Organization – An entity that operates one or more Wave Glider Vehicles. Each Organization has its own data, and that data cannot be accessed by any other Organization.

Organization Name – The “public” name used on the Dashboard to identify the Organization. This name may be different than the “Org Internal Name”.

Output Packets – Packets sent from the Vehicle. These include telemetry, ACK/NAK responses and (optional) payload-created data.

Output Sinks – Data from the Vehicle to a Packet Reflector.

Output Sources – Data from a Packet Reflector to the WGMS and/or another Packet Reflector.

Packet Reflector – Software that is used to route Commands and Outputs between the Vehicle and the WGMS.

Page – A browser window that displays data, and typically has links to other pages and data.

Parent Organization – A “virtual” Organization definition that includes other Organizations.

Part Identifications – Lists of hardware and software version numbers.

Payload Drybox – A Drybox that is optionally installed on/in a Vehicle. The Float has provision for two internal dryboxes. Payload Dryboxes may also be mounted externally on the Glider.

Permissions – For each Role, the specifications of what system parameters are allowed to be Created, Read, Updated and/or Deleted.

Port (Packet Reflector) – The port number of a Subscriber to a Packet Reflector. A decimal number greater than 5000.

Privileges – Refers to the combined set of Permissions for someone who has been granted multiple Roles.

Protocol (Internet) – Method by which data is sent from one computer to another on the Internet.

Radio Button – One of a set round-icon selection options. Only one option can be selected. (ref. Checkbox).

Raw Outputs – Data packets received from the Vehicle as-is, with no processing.

Read (Permission) – A Role permission that allows read-only viewing of WGMS system parameters.

Roles – A set of Permissions granted to a person that allows them specific types of access to WGMS system parameters. A person can be granted multiple Roles.

Root (Role) – A super-user who has full access to all aspects of the Vehicle and WGMS. This user will be either an LRI developer or a customer under close direction from LRI.

Secure Iridium – A special DoD-only gateway to the Iridium system. (ref. EMSS)

Secure Sockets Layer (SSL) – A protocol for transmitting private documents over the Internet.

Self-Corrected (Alarm) – An Alarm situation corrected itself.

Self-Hosted WGMS – A deployment option where an Organization uses their own independent copy of WGMS to operate their Vehicle(s).

Shore-Side (Software) – Refers to any software that does not reside on the Vehicle. WGMS software in a laptop on a boat is still considered “Shore-Side”.

Short Burst Data (SBD) – An Iridium data communications method that utilizes small data packets.

Sinks (Packet Reflector) – Data (Command or Output) going into a Packet Reflector.

Status Data – Information sent via Telemetry indicating the operational status (position and system health) of the Vehicle.

Storefront Name – Legacy term for “Org Internal Name”.

Sources (Packet Reflector) – Data (Command or Output) sent out by a Packet Reflector.

Structured Query Language (SQL): A language used for retrieval and management of database information. (Pronounced “Sequel”).

Sub – An alternate (and discouraged) term used to refer to the sub-marine Glider part of the Vehicle.

Subscriber (Packet Reflector) – A Source or Sink that communicates with a Packet Reflector.

System Administrator – Someone who handles the day-to-day management of the WGMS and its users.

System Page – An alternate page used to display all System information for an Organization’s Vehicle(s).

Tab – A label in the WGMS GUI. Tabs may be placed near the top of a window, or on the left side. Clicking on a tab selects different data on a Page.

Telemetry – Data sent from the Vehicle on a periodic basis. Typically sent every two minutes.

Tether – An alternate (and incorrect) term for the Umbilical.

Tool Bar – A bar, typically along the top of a window, that contains data entry boxes and icons.

Track – The path a Vehicle actually traverses in the water when it is trying to stay on a Course.

Transmission Control Protocol (TCP) – The standard protocol for transmitting data packets over the Internet (ref. User Datagram Protocol).

User Datagram Protocol (UDP) – An Internet data transfer method that provides higher transmission speed than TCP, but does no handshaking or error checking.

Umbilical – The flexible connecting cord between the Float and the Glider. Contains power and signal conductors, as well as strengthening elements.

Uniform Resource Locator (URL) – A string of names separated by a forward slash. Specifies an address on the Internet (e.g., <http://www.nmea.org>). A URL maps to an IP address.

Update (Permission) – A Role permission that allows updating of a Vehicle-related system parameter.

Value-Added Reseller (VAR) – A company that provides packaged hardware/software products. Can also be used to obtain Iridium services.

Vehicle – An alternate term used to describe the Wave Glider Float + Umbilical + Glider system.

Vehicles Page – An alternate page used to display all Vehicle information for an Organization.

Wave Glider Management System (WGMS) – The combined software package that is used to manage communications to and from a Vehicle.

Waypoint – A geographical point defined by Lat/Long coordinates. Used to define a Vehicle's Course or holding position.

Web Services – Automated information services that are conducted over the Internet, using standardized formats and protocols.

WiFi – A short-range high-bandwidth wireless communications method.

XBee – A short-range low-to-medium bandwidth radio communications method.

Appendix D: Acronyms

ACK	Acknowledged
AIS	Automatic Identification System
ASyG	..Automatic Identification System Gateway
API	 Application Programming Interface
AWAC	..Acoustic Wave and Current Profiler
BGAN	...Broadband Global Area Network
COTS	Commercial, Off-The-Shelf
CRUD	Create-Read-Update-Delete
EMSS	Enhanced Mobile Satellite Service
GPS	Global Positioning System
GSM	 <i>Groupe Spécial Mobile</i> (Global System for Mobile Communications)
GUI	Graphical User Interface
IMEI	International Mobile Equipment Identity
IP	Internet Protocol
ISU	Iridium Subscriber Unit
LRI	Liquid Robotics, Inc.
M2M	Mobile-to-Mobile
MTBF	Mean Time Between Failures
NAK	 Not Acknowledged
NMEA	National Marine Electronics Association