



Greensea Systems, Inc.
Creative Unmanned Technologies

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TO: Mike Risi and Rich Schramm, MBARI

FROM: Ben Kinnaman, Greensea Systems, Inc.

RE: Ventana notes and discussions

Hi Mike and Rich.

I am looking forward to seeing you guys on Thursday. We have been working through the software spec you provided and it is quite complete and thorough. Thank you for that. In the process though, we have generated some questions and discussion topics for Thursday. This is probably not an inclusive list but it will get us started.

- Is there an INS for vehicle navigation or are there currently only disparate sensors? We would use our own navigation core to fuse and manage the independent sensors in a cohesive navigation solution vs as independent sensors as it appears they currently are done.
- Our user interface is quite flexible and offers full simultaneous independent multi-user instances on a LAN or WAN. User preferences can be saved, screen layouts, etc. The UI and control system also provides a comprehensive signal mapping and scaling system to map inputs and outputs to user input and user status devices. It does not however provide a means to dynamically create, configure, or modify on screen user interface graphics such as buttons, sliders, or display functions. The user interface can allow simple modification of static devices such as modifying names, titles, scales, and limits but not full graphical device creation and page placement. If this is a hard requirement, we probably cannot fulfill it.
- We have designed our user interface architecture on much different principles than the user interface shown in the Ventana screen shots. While they convey similar functionality, the work flow is quite different. We do not use a menu-driven format. Our user interface architecture is built on a stacked page and window model. While the information access and utility is similar, the workflow is different.
- Does Ventana currently use a MOXA or other similar serial server to manage serial devices?
- Is the sonar simply pass through? We assume the sonar uses its own interface and display?
- We develop custom control applications, such as the one proposed for Ventana, based on our core software platform openSEA. openSEA, the Open Software and Equipment Architecture, consists of a core library and several stand-alone applications. The stand-alone applications provide discrete capabilities and share data through interapplication communications. Custom applications derive from the openSEA library and share data with the openSEA applications.

Greensea sells licenses to the openSEA library and openSEA applications and provides an Interface Control Document (ICD) for each openSEA application and Application Programming Interface (API) documentation for the openSEA library. This allows developers to develop with the openSEA technology. The openSEA library and applications are provided in Debian-style install packages. While some portions of openSEA and several of the



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openSEA applications have been ported to Windows, openSEA is primarily supported on Linux.

When we develop a custom application based on openSEA, the customer has full rights to the custom application (source included) and receives licenses to the openSEA system for the scope of the stated project including ICDs and API documentation. Greensea commonly develops Graphical User Interfaces for control systems based on the openSEA library. With the appropriate license, Greensea can supply source for the Graphical User Interface code. In all cases, Greensea provides all dependencies, instructions, and installers for customers to configure their own systems and build duplicate systems within the licensed project scope.

For non-competitive customers Greensea sells a Software Development Kit (SDK) for the openSEA system with full source and documentation.

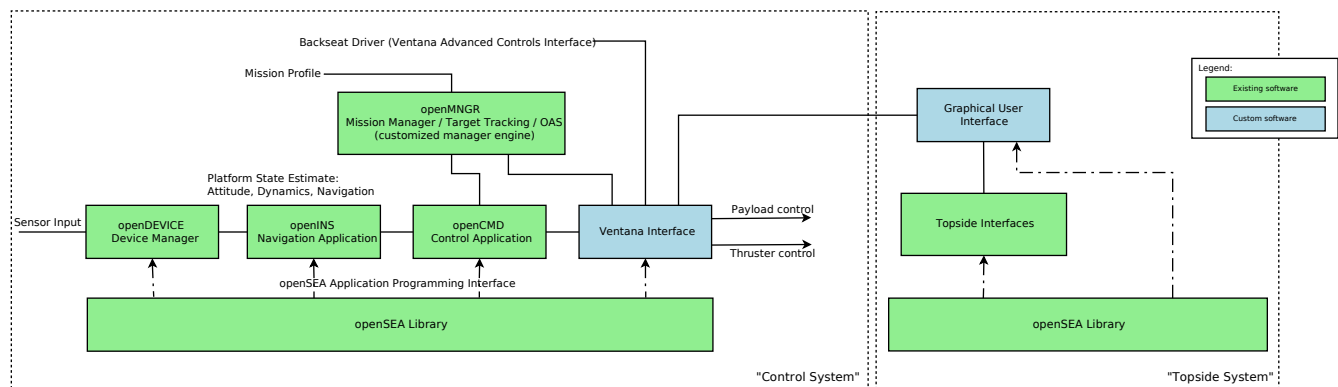


Illustration 1: Typical architecture for an ROV system with requirements similar to Ventana. The Green modules are openSEA products and the blue are custom applications leveraging the openSEA system. Greensea can provide source for the Graphical User Interface with an appropriate license and can provide source for all software with the purchase of an SDK.

- I have provided a Rough Order of Magnitude estimate for this project based on the provided requirements. There are a few factors that drove the cost higher than the "typical" system cost I emailed last fall. We have had to change our engineering rates and I underestimated the size and complexity of the system. Retro-fit systems typically require more NRE and there are several requirements in the Ventana scope that require some additions to our standard system.

Hopefully on Thursday when I am there we can work through these discussion points. I will have a couple of user interfaces with me and some screen shots for reference.

Thank you for the opportunity.

Ben