

Horizon Warrior™

Rapid Combat System Application
Development Framework

C2

Highlights

- **100% Java™ compliant.**
- **Robust:** Self-monitoring application framework can detect when part of its application goes rogue.
- **Rapid:** Spend time developing what matters most to the end-user, and you can be sure that the Horizon Warrior framework will take care of the rest.
- **Evolvable:** Add, remove or replace capability thousands of times without degrading the application architecture.



The Horizon Warrior™ Application Framework is a robust, proven platform for rapidly building and deploying complex command and control (C2) software. Used for simulation, experimentation and deployment trials, the framework makes it easy to quickly build applications using specialist functionality from the best vendors, and to seamlessly integrate the technology into a single coherent application for deployment.

Synopsis

Software applications are built using the Horizon Warrior™ framework by developing and integrating plugins into a base set of Horizon Warrior capabilities. The framework manages the display surface, command and control data, shared state information, efficient communications between plugins, the loading and execution of plugins, and overall application stability. Custom capability then provides a layer of software on top of the Horizon Warrior framework to deliver a specialist solution. The standard Horizon Warrior distribution also includes a range of well-tested plugins to help speed development including a map display, time-bearing display, track management, track association and fusion, and scenario stimulation capabilities.

The Horizon Warrior framework allows you to:

- Quickly create robust, modular command and control applications;
- Maximise reuse, including from different vendors;
- Independently integrate capability without access to source code;
- Protect Intellectual Property via plugin boundaries;
- Distribute custom applications with the royalty-free Horizon Warrior run-time; and
- Keep up-to-date using a comprehensive web-based support network (Q3/07)

Application Software Framework

Any new application requires the development of a considerable amount of hidden 'back-end' capability to support the functionality that the user actually sees. When developers are under time pressure, considerably less effort tends to be spent on the back-end, instead directing effort towards the visible functionality. While this may have minimal impact in the short-term, the long-term consequences are dire: Maintainability and the ability to evolve the application become particularly troublesome.

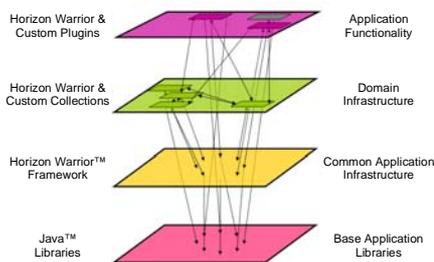
The Horizon Warrior framework adds combat system specific domain capability to the robust and proven Expressj® framework. The Expressj software forms the 'back-end' for various large-scale commercial and defence applications. By exploiting Expressj technology, effort developing Horizon Warrior based applications remains focused on the creation of end-user functionality without compromising long-term maintainability and evolvability.

Central to the Horizon Warrior architecture are the concepts of a *framework*, *collections* and *plugins*. The *framework* is provided by the Horizon Warrior distribution, but any vendor can provide plugins and collections. A default set of collections and plugins are included that can greatly speed the development of custom command and control (C2) application software.

Plugins are small, modular, self-contained granules of closely related functionality. Individual plugins may handle communications with a particular external device, perform background analysis on data as it arrives in the system, or provide an interactive graphical control to the user.



Collections store data that is expected to be shared between plugins. Plugins can register for notification of changes to collection data. The framework ensures notifications are correctly dispatched via events to interested plugins. The default collections shipped with Horizon Warrior provide storage for track, ownership, coalition vessel and annotation data, as well as state information relating to the user's selection of, and interaction with, objects on the screen.



Proven Technology

The predecessor of the Horizon Warrior framework ("Horizon 3") has provided a flexible laboratory-based experimentation platform for defence research organisations in Australia, Canada, the UK and the USA since 2001. Horizon 3's flexibility has also allowed it to be deployed at extremely short-notice on aircraft, submarines and elsewhere in the field to provide a rapid and cost-effective method for interfacing to new third-party sensors, and to provide in-situ visualisation and analysis of real-time data.

The Horizon Warrior framework represents the next generation of Horizon technology. Greater flexibility, robustness and superior configuration management capabilities make Horizon Warrior technology an excellent successor to an already respected solution. Plugins developed for Horizon 3 are easily ported to Horizon Warrior and instantly take advantage of the evolved framework's advanced new features.

Cost Benefit

Horizon Warrior applications dramatically reduce the cost of experimentation. **Savings of 36%** † have been achieved when developing two related applications using the Horizon framework

(compared to developing the same applications using traditional methods of reuse).

Horizon's architecture ensures capability can be introduced and removed without adversely affecting the remainder of the application. Furthermore, capability can be developed by many different vendors and independently integrated into a single, coherent application by the researcher themselves. No programming knowledge is required to perform integration.

Existing Deployments

Researchers have deployed Horizon technologies in countless configurations to:

- Simulate combat system consoles;
- Act as a data gateway between proprietary protocols;
- Evaluate options for augmenting existing naval operating procedures;
- Test data fusion algorithms;
- Provide rapid visualisation and playback of data captured from trials;
- Capture human interaction statistics and assess operator load;
- Interface to new sensors as a way of quickly visualising data without costly changes to deployed combat systems;
- and much more...



Existing Horizon deployments include:

- Submarine C2 simulation consoles;
- Future NCW Concept Displays;
- Maritime Tactical Internet Experimentation;
- Target Motion Analysis;
- Automatic Data Fusion;
- Airborne & Submarine Sensor Data display;
- Command Tactical Picture;
- Network Enabled Undersea Warfare Console;
- Simulated Torpedo Launch Control;

- Naval Gunfire Support Simulation; and
- Remotely Deployed Sonar sensor analysis

Extensive Protocol Integration

Interfacing Horizon Warrior based applications to other combat systems and experimentation environments is easy via the addition of an appropriate "communication" plugin. Any vendor can develop custom communication plugins, which offers exceptional flexibility to integrate Horizon Warrior applications with specialised proprietary protocols and existing equipment. What's more, the proprietary protocol vendor can develop the communication plugin themselves, thereby simplifying issues of third-party access to intellectual property.

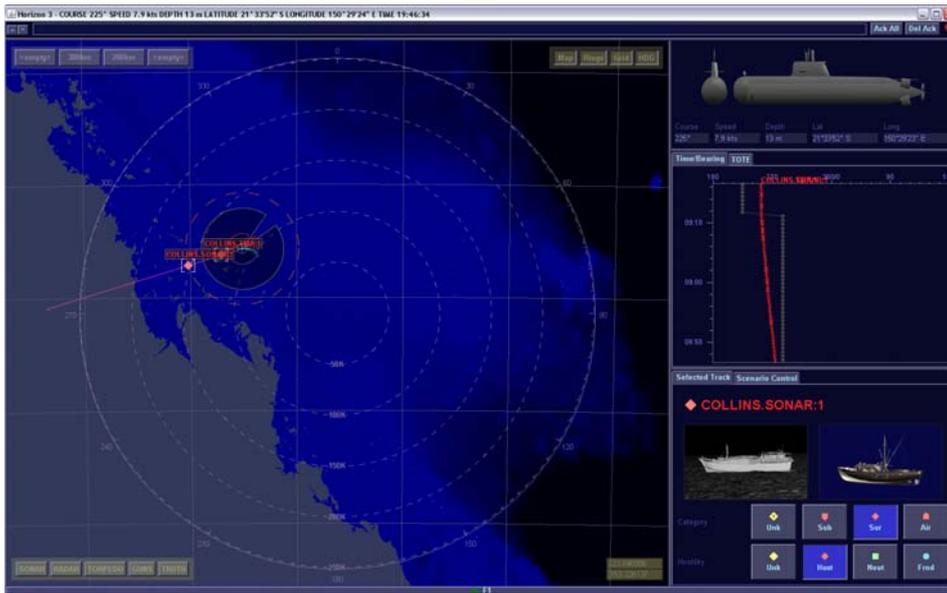
Horizon applications have been deployed to interoperate with a wide range of existing equipment. Numerous communication plugins have therefore already been developed. These existing communication plugins support a multitude of protocols, servicing both proprietary and "open standards"-based interfaces. Some of the more widely used protocols include:

- High Level Architecture (HLA) — specifically Virtual Maritime System Architecture (VMSA)
- Navy 1446 Combat System Augmentation
- CoABS
- MIST
- OCXS
- NMEA

Network Centric Warfare

The Horizon Warrior framework incorporates a range of niche capabilities to enable specialist network centric warfare (NCW) experimentation. Custom data fusion algorithms may be integrated to localise targets using data from multiple sensors. Data can be fused from sensors that are geographically separated or located on the same physical platform. Fusion algorithms range from simple geometric and feature-based fusion, through to sophisticated Particle Filter implementations.

Juggling the quantity and content of coalition data necessary to achieve effective localisation of quiet targets is easily achieved using Horizon Warrior applications. The configurable nature of the software allows additional data sources to be integrated with minimal effort.



Rapid Development

The Horizon Warrior framework provides a base application architecture upon which custom applications are constructed. The architecture forces developers to encapsulate closely related functionality into well-bounded granules (packaged as “plugins”). The framework then manages each plugin as a “black box” within the architecture. The only communication permitted between plugins is via “collections” and the Horizon Warrior event services. This ensures extremely low coupling between plugins and therefore tremendous flexibility when it comes to selecting plugins to be configured and deployed as a single application.

The inherent modularity means that applications can be incrementally developed by dividing functionality into many plugins. Testing can commence the moment the first plugin is completed. As an added benefit, **prototyping** can be achieved in conjunction with production coding as it takes just a few seconds to swap out prototype plugins with production plugins when they become available. The integrity of the application is assured through the monitoring capabilities within the underlying Horizon Warrior framework.

Built entirely on the Java™ J2SE platform, Java developers will find the Horizon Warrior framework requires very little learning curve to be able to quickly develop feature-rich and robust applications.

“I can’t imagine how you could have made it any easier to develop for Horizon”

[Brad Dillman, Software Engineer, DRDC Atlantic]

The Horizon Warrior framework defines an extremely light weight interface that wraps any custom code to convert it into an Horizon Warrior plugin. Developers can then choose how closely they align their plugin with the rest of the framework by choosing whether or not to use optional framework features and services.

Most legacy Java functionality can be ported to Horizon Warrior with minimal effort. Our experience shows that even a programmer with no prior Java experience can develop and integrate a new plugin within a few hours.

Flexible GUI

The Horizon Warrior framework manages the seamless display of multiple graphical plugins through a Graphical User Interface (GUI) configuration file. Each GUI configuration is described using eXtensible Mark-up Language

(XML) offering features such as:

- Multiple display surfaces;
- Multiple frames;
- Absolute and relative positioning of graphical plugins;
- Split-pane and fixed area positioning;
- Opaque and transparent overlay plugins;
- Reusable “named” layouts;
- Slide-out/in, Menu and Tabbed “sockets” to host multiple plugins for run-time visibility selection; and
- Support for custom “sockets”

The GUI services are also linked to the Horizon Warrior framework’s stability monitoring capability. If a graphical plugin is deemed to have misbehaved (based on configurable thresholds or security violations), the GUI can visually indicate its state by overlaying the plugin’s visible area with a semi-transparent veil.

Distributed Infrastructure Support

Distributed processing applications have been developed using Horizon Warrior’s underlying Expressj® technology. The inherent modularity provided by the Collection and Plugin concepts enables Collections to be backed by a wide range of database technologies while Plugins are oblivious to the underlying data storage mechanisms. Plugins can therefore be deployed in flexible ways - including the distribution of processing across multiple computers.

Licensing Plans

The Horizon Warrior framework is available under an annual subscription model. Each annual site-licence subscription includes:

- Access to all major and minor releases of the Horizon Warrior framework during the subscription period;
- Site licence permitting development of Horizon Warrior applications by any number of developers situated at the licensed physical location;
- Royalty-free licence to distribute the binary run-time edition as part of any custom developed Horizon Warrior application;
- Access to developer tools and developer documentation.

Customised licensing options are also available if the standard subscription model doesn’t fit your needs.

About Innovation Science

Innovation Science Pty Ltd is a software and systems engineering company based in Adelaide, South Australia. We provide custom software engineering services and innovative off-the-shelf solutions to defence and commercial clients world-wide. Our clients include the Australian Department of Defence, Canadian Department of National Defense, L3 Communications, Thales Underwater Systems (UK) and QinetiQ (UK and Australia).

Our areas of expertise include:

- Custom application development
- Rapid prototyping
- Prototype commercialisation
- Software Integration
- Simulation and modelling
- iOS & Android mobile app development
- Open and Evolvable systems engineering
- Algorithm implementation and refinement
- Independent technical assessments

Innovation Science is a member of the Australian Information Industry Association (AIIA), an associate member of the RPDE organisation, and has been recognised by the Australian Department of Defence as a supplier of strategic capabilities.



Horizon Warrior™ Framework:

Rapid application development for demanding C2 simulation and experimentation.

‡ Savings derived from metrics gathered during the development of a Target Motion Analysis software application using the Horizon 3 Framework.

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