



Recursion Software

Next-Generation Computing Tools & Frameworks

Learn how our Voyager technology is transforming communications and collaboration in JFCOMs After Action Review and other DoD programs

Capabilities Overview

Recursion Software, Inc. (RSI) is an expert in distributed computing solutions that bridge the gaps across systems, applications and devices. We solve mobility and performance issues in highly distributed environments by building, selling and supporting software frameworks and Distributed Knowledge Networks. Recursion has multiple patents for communications and mobility of agents in networked distributed computing environments. Currently, Voyager Edge is being used as the agent platform for Joint After Action Review (JAAR) under development at JFCOM. Voyager Edge enables the integration and sharing of After Action Review knowledge from such systems as OneSAF, GCCS, WARSIM, SIMDIS and DDST.

Extensible Operating Environments

RSI provides high-performance software development tools that enable engineers to build mission-critical applications quickly and easily. Tested and commercially hardened, our products represent the leading edge of next-generation communication infrastructure, multi-platform software development, and interoperability. Additionally, we provide training and professional consulting services for organizations that want to leverage our expertise to build entire solutions or for projects that need help getting started.

- **Voyager Edge™:** a sophisticated development platform that enables developers to create Distributed Knowledge Networks, peer-to-peer collaboration, and multiplatform interoperability (Java and .NET, with C++ planned for mid-2008)
- **Cinergi™:** an efficient and reliable translator that exposes software code in various languages (Java, C++, and C#/.NET) for reuse in other applications without compromising performance
- **C++, C# (.NET) and Java Toolkit® Libraries:** Portable and Reusable Libraries and Algorithms that enable organizations to save time and money allowing engineers to focus on higher-level development objectives

Voyager Edge Intelligent Distributed Computing Platform

Voyager Edge is a future-focused platform that provides a distributed systems architecture for interconnecting a heterogeneous collection of data sources and devices into a distributed communications and knowledge network. This will provide the infrastructure for a secure, extensible, scalable, Service Oriented Architecture (SOA) approach to satisfy the goals of a common, modular, integrated training system. Voyager Edge's flexible, layered architecture serves as a software abstraction layer that bridges OSs and messaging protocols into a unified communications infrastructure. Utilizing Voyager technology, it is possible to construct a modular, scalable, multi-agent system to form a **Distributed Knowledge Network (DKN)** that can 'push' and 'pull' actionable knowledge across a heterogeneous environment in near real time.

Voyager Top 10 List of Capabilities

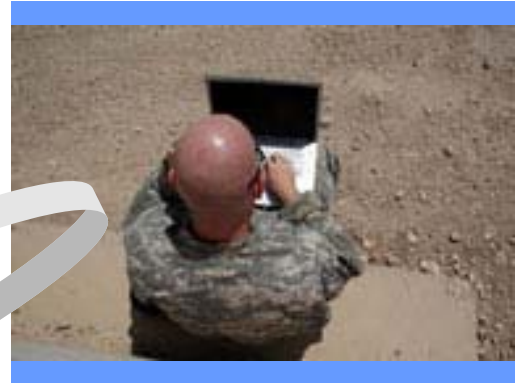
1. Code in Java and any of the .NET languages
2. Communicate with other nodes using SOAP, IIOP, XML-RPC, RMI and our extremely fast, secure, proprietary binary protocol VRMP
3. Exposed as a Remote Component (accessible via protocols above), with just 2 lines of code, for access from any client language - requires no changes to pre-existing classes
4. Publish and subscribe to any combination of enterprise JMS and MSMQ Servers
5. Run on a wide range of wireless/handheld/embedded devices via support for 15 embedded operating systems
6. Register and be discovered via decentralized, federated white and yellow page services
7. Communicate with dynamically created groups of nodes, a.k.a peer-groups using its decentralized messaging service
8. Easily integrated with RETE-based rules and Database engines
9. Managed via any JMX-complaint console (jconsole, mc4j) using an extensive set of JMX-based Components and API's
10. Run on any combination of IPV4 and IPV6 networks

Decentralized Messaging

Next-generation applications must have the ability to communicate to groups of devices/systems without a centralized messaging server. They must support multiple levels of granularity for the intended audience of a given message, and must also support passing messages over standard, centralized messaging servers for integration with external and legacy systems. More specifically, there must be seamless integration with Microsoft's Message Queue (MSMQ) and Java's Message Server (JMS). *Voyager Edge* provides all of these capabilities today, with identical support for TENA's real-time CORBA-based middleware and DDS planned in 2008.

Increased Network Survivability and Reduced Network Requirements

Next-generation applications must process data at the source to minimize network traffic and handle unreliable and/or limited network connections. *Voyager Edge* software agents are autonomous and can continue to operate at a node, regardless of network or enterprise connectivity. This allows the client device to act like a server that retrieves, filters and analyze data at the source, and continues to process data without a wireless connection. As soon as network connectivity is restored. The agents send actionable knowledge onto the desired nodes using a variety of messaging capabilities and avoid data bottleneck and network overload.



Mobile SOA Architecture

Next-generation applications must provide a Service Oriented Architecture (SOA). This SOA environment consists of loosely coupled agents that can communicate with any Web Service client and vice versa. These services must be accessible via a centralized Web Service Container, and also be accessible in a decentralized fashion directly to agents, exposed as Web Services, that are running on edge and wireless devices. The location of intelligent mobile agents and the resulting Mobile Web Services is irrelevant to the Web Service client. Finally, all agents must be accessible by a Service Description, in yellow-pages directories that are UDDI compliant as well as federated and decentralized. *Voyager Edge* provides all of these capabilities today.

Wireless/Embedded Device Support

Next-generation applications must run, in some form, on all devices. To do so, the next-generation platform must be pervasive and supported on these same devices. *Voyager Edge* provides this today with intelligent mobile agents that can run on any device that supports embedded operating systems such as Windows Mobile, Android, Linux, Symbian, VxWorks and LnyxOS with its support of multiple embedded/real time virtual machines. This is, of course, in addition to its current full support for any desktop or server hardware and operating system.

Coordinated Tasks/Transactions at the Edge

Next-generation applications should have the option to extend transactions from centralized systems to include edge devices and allow distributed, coordinated tasks among peers, peer groups, and the enterprise. To do so, support must be provided so that intelligent agents running on the edge can participate in enterprise transaction managers such as those provided in .NET's Microsoft Transaction Service (MTS), Java's Transaction Service (JTS), and OMG's Object Transaction Service (OTS). *Voyager Edge* currently provides coordinated processes through QoS messaging within its peers and peer-groups and transaction-based message integration with JMS and MSMQ and soon TENA and DDS. Seamless integration with C++, which will include CLDC devices and Intelligent Sensor Networks (ISN), is planned for *Voyager Edge* in 2008.

Increased Extensibility/Productivity via Seamless .NET, Java & Legacy Interoperability

Voyager Edge enables application development in your choice of Java and/or .NET, as well as enables high-performance communication between these environments/languages and C++ applications. Pre-existing Java and .NET code can easily be turned into agents that communicate using industry standard, distributed, computing protocols (IIOP, SOAP, XML-RPC, RMI).

Case Study: Voyager Edge in JFCOM's JAAR

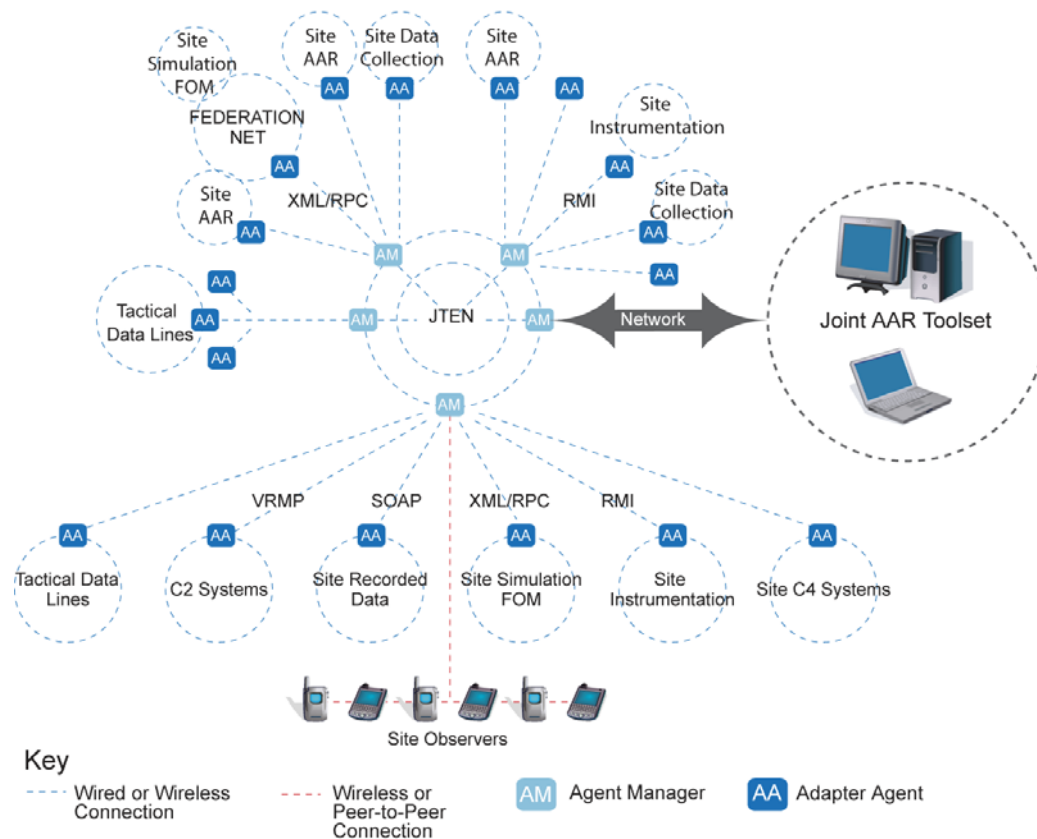
Background/Need

Joint Forces Command (JFCOM) is in need of a non-intrusive distributed mobile communications infrastructure in the Joint After Action Review. The Joint AAR system architecture is required to resolve major issues that now limit the ability to conduct joint training at the COCOM level across many domains. Joint training event conductors and the combatant commander organizations, in order to be able to effectively perform their responsibilities, need to have critical information in a timely fashion.

Agent-based Distributed Knowledge Network

A modular and scalable approach addressing these challenges can be accomplished by building a Joint AAR Distributed Knowledge Network (DKN). A Joint AAR DKN provides some of the key enabling technologies for translating recent advances in automated data acquisition, digital storage, computers and communications into fundamental advances supporting data analysis, collaborative after action reviews and related applications. Voyager Edge's mobile agent technology provides the most attractive framework for the design and implementation of a DKN. Voyager agents provide the framework for interconnecting a heterogeneous collection into a distributed training after action review management system, that provides the mobility infrastructure for code mobility and remote communications. The architectural components are external actors (user client workstations, Software Agents Applied to Simulation-Based Training and Exercise Management, simulations, datasets, and sensors), Adapter Agents (Adapters), the Broker Agent (Broker), and the Mobile Agent.

High-level JAAR System Architecture



Voyager Edge: The Choice for the DoD

Recursion Software's Voyager Edge was identified as an intelligent agent platform that best satisfies the need for the planned JAAR DKN. Recursion is currently using VOYAGER Edge as the communications platform for Joint After Action Review being built at JFCOM, in the DST (Decision Support Tool) for the JDIF Joint Development Integration Facility, and the Navy's TSTS (Total Ship Training System) prototype.

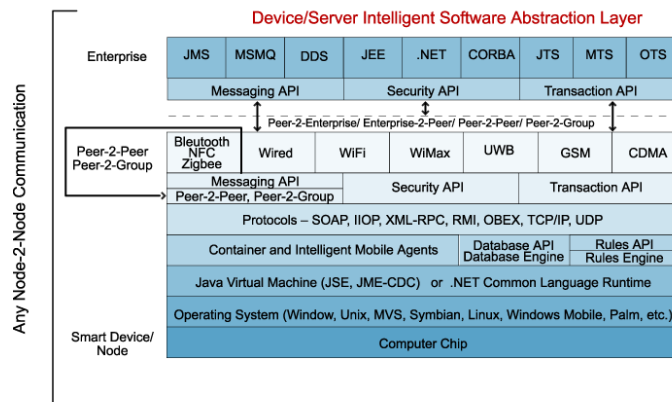
Additional requirements for an agent-based DKN for Joint Forces Training and Test & Evaluation include:

- High Performance
- Unobtrusive and Interoperable
- Multiplatform and Multilanguage
- Easy to Use for Rapid Development
- Available on devices ranging from servers to PDAs and embedded devices (sensors in 2008).

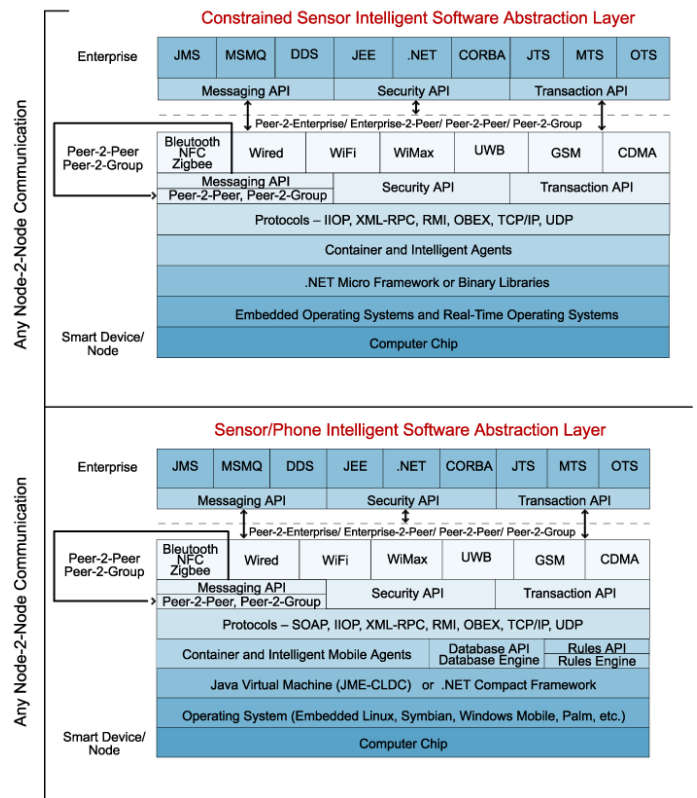
Future Capabilities: Intelligent Sensor Networks

Conducting a Training and/or T&E event requiring multi - service or joint system resources, such as Hardware-in-the-Loop (HWIL) systems distributed across open-air ranges, distributed instrumentation, synthetic battlespace environment simulations (constructive and virtual) with nodes located throughout world-wide DoD network(s), will require new technologies to transform data into information and derive conclusions and knowledge. Currently, the process of recording limitless sets of data from sensors, weapons, and communication and intelligence systems results in enormous unique data sets requiring extensive data analysis to derive conclusions. Over the next few months, RSI will be adding the ability to run Voyager over an Intelligent Sensor Networks (ISN). An ISN will provide the Training and T&E communities with a network centric communications capability leading to the establishment of a test and evaluation knowledge network which can operate with any combination of sensors/nodes/participants at various security and need to know levels of information exchange. The use of intelligent mobile agents can move the conduct of multi-service or joint network centric test events into a new level of capability allowing the conductors to create dynamic logical networks that evolve during the course of any event.

Voyager Current Capabilities



Voyager Roadmap 2008



For More Information

If you are interested in discussing your project or any capabilities Recursion Software has to offer, contact us at our Dallas-Fort Worth headquarters.

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