OVERVIEW

CRFS

APIs

Integrate CRFS' software capabilities with open-source APIs

www.crfs.com

CR-005348-MD

INTRODUCTION

CRFS is an RF technology specialist for defense, national security agencies, militaries, and system integrator partners. We provide advanced capabilities for real-time spectrum monitoring, situational awareness, and electronic warfare support to help customers understand and exploit the electromagnetic environment.

CRFS' engineering approach permits rapid integration processing solutions, a significant reduction in non-recurring engineering costs, and lower risk to schedule. CRFS' RF sensors (RFeye Nodes) are interchangeable across platforms and supported by common open and published application programming interfaces (APIs) to allow third party systems (or sub-systems), to access and exploit processed data, or stream I/Q data in VITA-49, for example.

BENEFITS

Adaptable, high-performance software-defined processing ensures your customers can outpace evolving threats

Open, modular and digital - provides speed, agility and maximum flexibility

Actionable real-time RF intelligence

Proven TRL-9 missions and scenarios

OUR ETHOS

CRFS' processing technology and software is designed for mission-critical applications with the following kept in mind:

Genuinely open – APIs conform to popular open-system standards, with integrators and partners able to plug-and-play or modify and reconfigure hardware and software data results with, or without CRFS co-engineering.

Multi-mission and multi-domain

High performance – The latest superheterodyne technology, microwave components, intelligence and in-built edge processing reduces backhaul data bandwidth, in a small form factor.

Multi-functional – All CRFS solutions are built to support single or dual function missions with absolute precision, and provide customers with a competitive advantage.

Maintainable – CRFS technology is value-aligned within roadmaps and designed with lifecycle and lifetime cost of ownership in mind.

Continuous testing and R&D – CRFS has invested over 640,000 hours across 15+ years in its technology. This can be leveraged by integrators for COTS or co-engineered (custom) program of record requirements.

Software suite – A comprehensive RF software suite allows system providers and end-users to monitor, capture, analyze, geolocate, report, and exploit signals of interest with complementary spectrum visibility tools.

FUNDAMENTALS

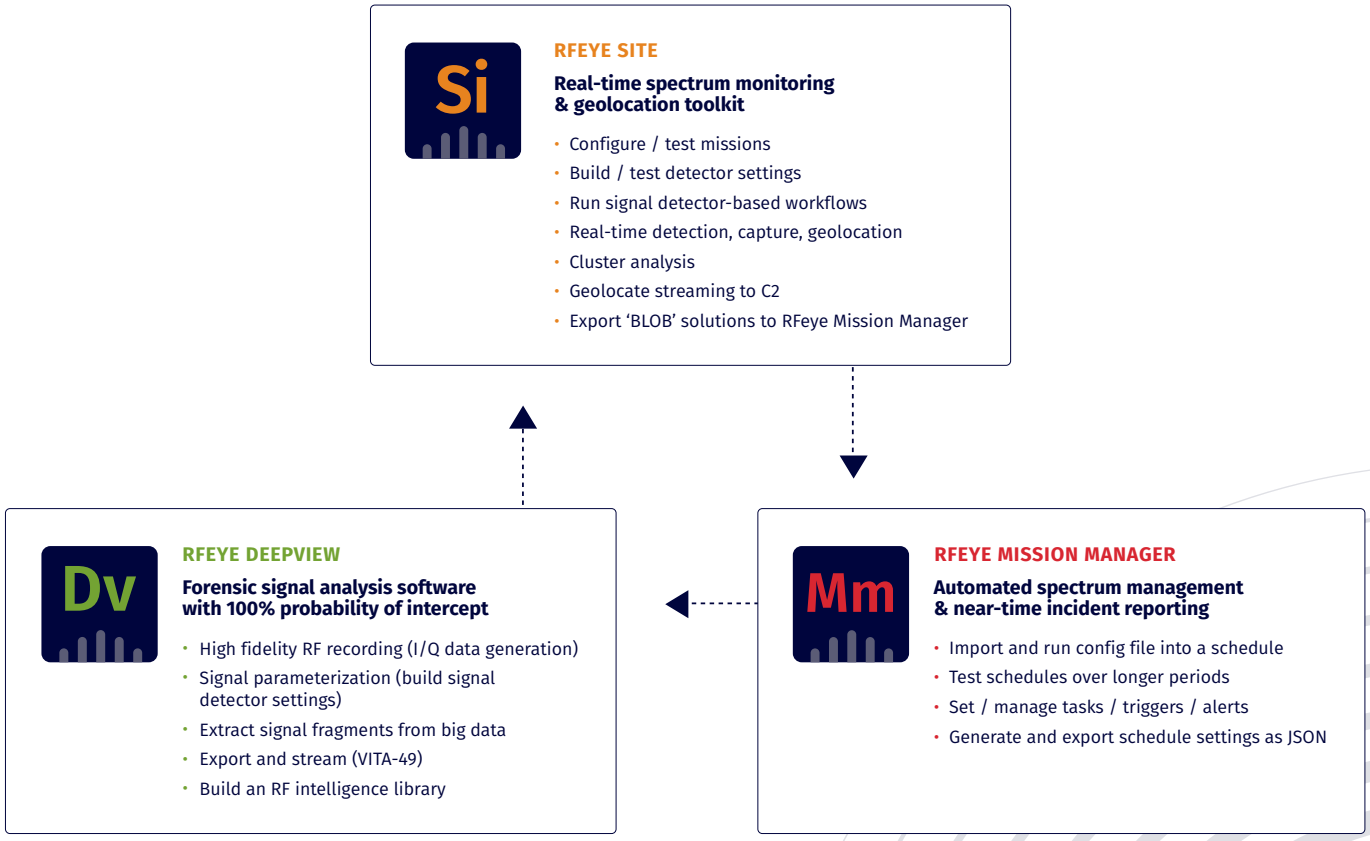
THE RFEYE ECOSYSTEM

CRFS hardware can be used for fixed, mobile, man-portable, unmanned or system-integrated deployments. Our software suite offers a range of functionalities: **RFeye Site** enables users real–time control and intuitive mission planning and execution; **RFeye Mission Manager** facilitates the automation of missions, tasks, intelligence and reporting; and **RFeye DeepView** provides advanced signal analysis and RF intelligence.

The complete RFeye ecosystem allows customers to monitor and geolocate the widest range of signals and transmitters and can be exploited on third-party systems via APIs.

WHAT IS AN APPLICATION PROGRAMMING INTERFACE (API)?

CRFS provides a range of APIs, and by leveraging them customers can seamlessly integrate the capabilities of CRFS software into their proprietary systems, thereby automating tasks, which would otherwise have to be performed manually.



WHAT CONTRIBUTIONS DO APIs MAKE?

Some customers may require RFeye capabilities without wanting to use RFeye applications directly.

For example, a system integrator may want to integrate the detection and geolocation capability of RFeye Site into a larger C2 drone detection system that includes many software solutions for radar, cameras, jammers, etc.

However, developing a solution that involves four or more disparate software components lacking intercommunication is inefficient. APIs solve this problem as they allow each solution's individual piece of software to communicate with the system integrator's proprietary software—so the end user only needs to learn this system.

OUR APIs

CRFS' APIs unlock the value of the CRFS software ecosystem without users having to use the software manually.

CRFS SOFTWARE CAPABILITIES UNLOCKED THROUGH APIs

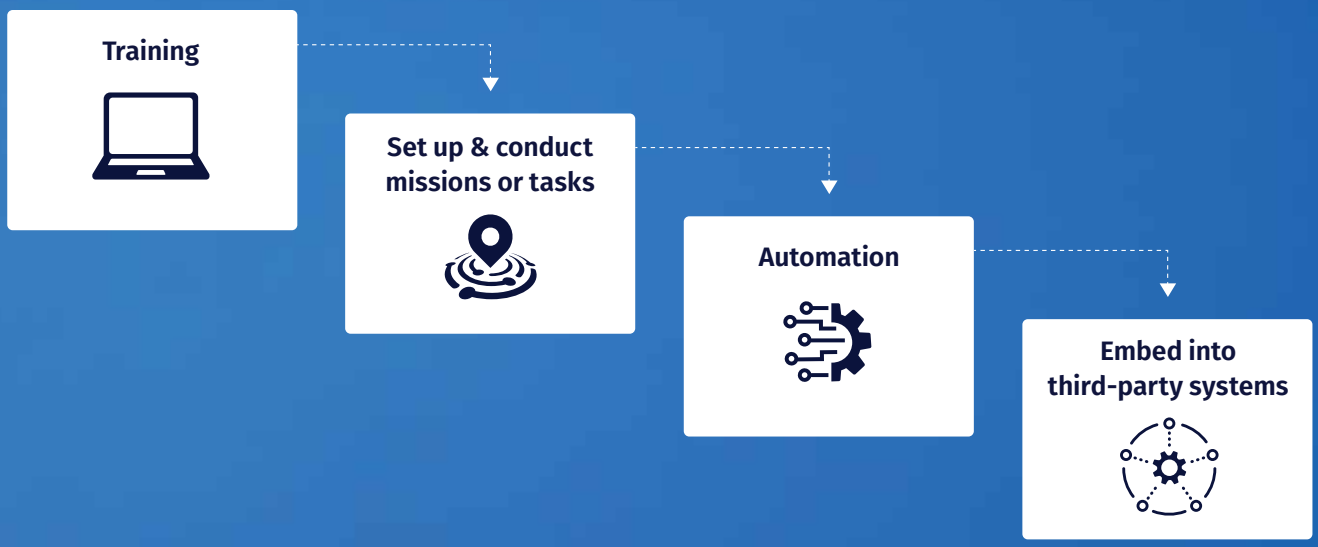
CRFS' RF sensors (RFeye Nodes) receive and process electromagnetic signals, while RFeye software helps users gain actionable intelligence from this RF data.

RFeye Site is a spectrum monitoring and geolocation toolbox. CRFS offers an extensive training program designed to provide a thorough understanding of the software's myriad capabilities.

This training is crucial for enabling users to harness the software's full potential and serves as a foundation on which API use is based. After training, RF experts and mission managers will be able to set up and conduct missions / tasks, which can subsequently be carried out automatically using APIs through system-to-system communication.

Automating tasks and obtaining precise results relies on experts building and tuning their own missions.

BUILD & CUSTOMIZE YOUR OWN MISSIONS



INTEGRATING CRFS SOFTWARE INTO C2 OR THIRD-PARTY SYSTEMS

The battlefield has changed. How we deter, defend, plan and conduct missions needs to change too. Security threats are evolving at machine speed. To keep pace, CRFS is constantly improving data processing and visualization technology to give system integrators and end-users quantum leaps in capability.

API USE CASES AND APPLICATIONS

Which one to use?

NON-SYNCHRONOUS TASKS (ON A SINGLE NODE)	SYNCHRONOUS TASKS (ON A NETWORK OF NODES)
EMP API • Sweeps • Occupancy scans • Detection scans • Bearing scans • VITA-49 streaming	**GMP API** • Sweeps • Sampled TDoA (inc. 3D TDoA) • AoA • PoA • Detector-based TDoA (with 3D)

Geolocation

CRFS is renowned for its geolocation technology, employed by system integrators who need radio direction finding and passive localization capabilities in tandem with other functionalities, such as radar, cameras and jammers. Despite using several systems, the integrator needs a geolocation to be returned automatically into its proprietary system via CRFS' API.

CRFS provides system integrators with training on its software capabilities. By becoming experts, the system integrator's RF operators learn how to achieve optimal outcomes by giving specific instructions to evoke responses. The RF system can then be used seamlessly with larger systems, allowing operators to make geolocations and act upon that information.

Without APIs, no such integration is possible.

Detectors

For time sensitive missions, it is essential to accurately detect specific signals of interest in real time by filtering out thousands of signals. This allows users to instantaneously exploit the spectrum to detect and operate capture and geolocation workflows against a specific signal of interest. This can be done by using real-time signal detectors that are completely configurable and accessible via the APIs.

Spectrum sweeps

To measure and manage channel occupancy, CRFS software takes spectrum measurements across the band.

The input from the software provides information about signals that could indicate problems.

For example, a signal that has disappeared could indicate a hardware failure.

The data is transmitted from the CRFS system to customer's monitoring system, which can then decide on the correct course of action to be taken.

Bearing scans

Customers use a direction-finding RFeye Array to find the line of bearing (LOB) to a specific target signal. By using an API, they can initiate a bearing scan to command the Array to determine the bearing to the signal of interest, using a CRFS proprietary AoA algorithm.

I/Q streaming

CRFS' API will allow customers to configure an I/Q stream, and then stream it to a destination of their choice.

CONFIGURATION FILES

Configuration files are defined files containing the details of mission parameters. Once set up, these files are sent to the targets when the API is called, and the results are returned accordingly. RFeye Mission Manager can automate this for you.

WHY USE CRFS APIs?

CRFS APIs are designed with five key features that collectively enhance the usability, efficiency, and effectiveness of APIs in terms of system integration and communication.

RESTful APIs

Use standard HTTP methods, making them easy to understand, use, and highly flexible for web services and applications. They are stateless, ensuring that each request from a client contains all the information needed by the server, leading to more scalable and flexible interactions.

Well-documented APIs

Clear schemas allow them to be easily integrated into larger systems as developers can understand exactly how to interact with the API, what responses to expect, to handle data correctly.

The JSON open data format

Universally recognized and understood, allowing interoperability between different systems and platforms.

Event streams

Allow for real-time data processing and notifications, enabling applications to respond immediately to changes and events.

Multi-functional

Be able to request multiple tasks at the same time to meet mission objectives.

INTRODUCING
TWO RESTFUL APIs

EMP (EMBEDDED MISSION PROCESSOR)

EMP APIs focus on managing non-synchronous tasks within the RFeye ecosystem. Each API operates individually on a RFeye Node and is tailored for specific functions like sweep scans and occupancy scans.

This allows for a flexible and efficient handling of tasks critical to RF spectrum monitoring and geolocation. The EMP APIs' design emphasizes direct task execution on a RFeye Node without the need for coordination with other Nodes, making it a versatile tool for various operational scenarios within the RFeye framework.

Function: Manages non-synchronous tasks like sweep scans.

Operation: Runs on each RFeye Node individually.

Applications: Sweep scans, occupancy scans, bearing scans, detection scans, remote I/Q recording, and VITA 49 I/Q streaming.

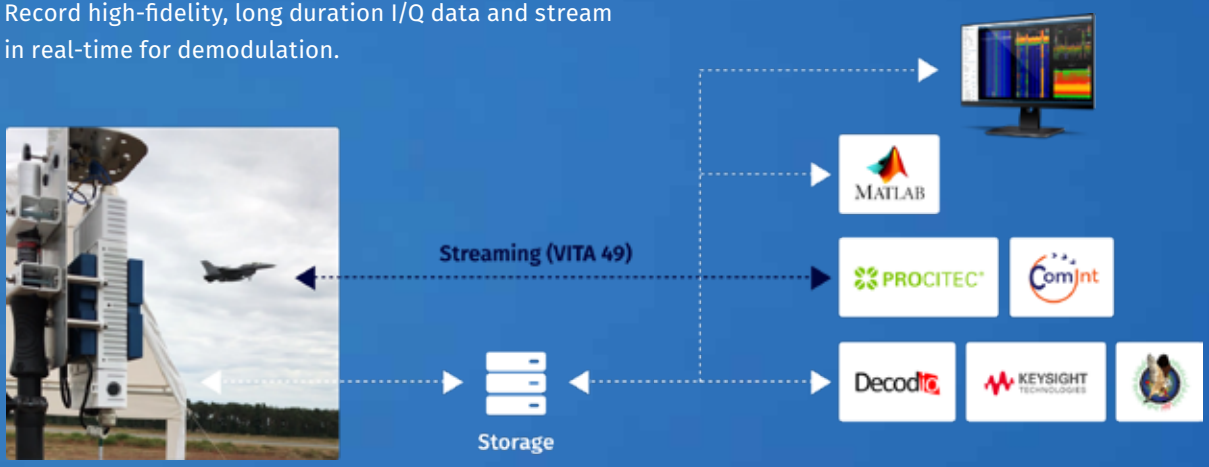
Example: The EMP API can conduct non-synchronous tasks such as triggering, I/Q capture and streaming.

This workflow shows a sequence starting with an RF sensor (receive, record, intelligent in-built processing) connected to RFeye Site (real-time spectrum monitoring and geolocation toolkit).

I/Q data can be recorded and stored on the RF sensor, or larger datasets can be recorded to external storage. Alternatively, operators can record and stream I/Q data (in VITA-49) to RFeye DeepView for analysis, measurement, exploitation and creation of data snippets that can be immediately forwarded for demodulation and decryption.

EMP WORKFLOW EXAMPLE

Record high-fidelity, long duration I/Q data and stream in real-time for demodulation.

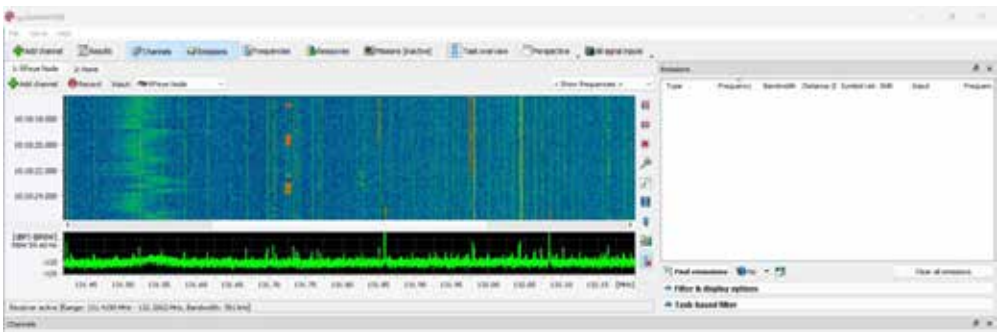


The same data packets can be streamed in VITA-49 to third party software platforms such as Procitec, Decodio among others, for additional processing, demod and decryption.

Here you see RFeye Site. You can stream geolocation results out for use in a third-party system. Here you see detector-based TDoA, where RFeye Site shows a detector event waterfall (after a detection is made, it geolocates where that signal comes from (map) and the geolocation can be streamed out to third party software).

EMP API

Data streaming using the EMP API, requiring a one-time set up allows third-party programs to be sent I/Q data.



In this example, Procitec is receiving CRFS' I/Q data stream for further processing in real-time. Signals are being classified.

GMP (GROUP MISSION PROCESSOR)

GMP APIs are designed to handle synchronous tasks across multiple RFeye Nodes. The GMP APIs play a crucial role in managing complex, coordinated efforts that are vital in advanced spectrum monitoring and geolocation.

Function: Handles all synchronous tasks, such as geolocation requests.

Operation: Runs as an application on Linux and coordinates RFeye Nodes within a timing grid.

Applications: Tasks requiring coordinated effort across multiple RFeye Nodes, such as geolocation scans, sampled TDoA, AoA, PoA, detector-based TDoA, and synchronous sweeps.

Example: The GMP API can conduct a synchronous geolocation scan where multiple RFeye Nodes need to work together, with precise timing & coordination.

This workflow shows a sequence starting with RFeye Site to record I/Q data, which is then analyzed by RFeye DeepView, where I/Q recordings are inspected to determine signal properties necessary for building specific detectors.

Following this analysis, the process loops back to RFeye Site for real-time mission configuration and detector testing, mission performance checks, and exporting the configuration for use with the APIs.

There are then two options: The workflow can branch off to RFeye Mission Manager for mission automation, where these exports can be run as schedules to produce geolocation results.

Or, the exports can be run through GMP integration, and the customer can receive geolocation results directly for use in their own software.

GMP DETECTOR-BASED TDOA WORKFLOW EXAMPLE

RFeye Site

Real-time

Recorded I/Q

RFeye DeepView

Analysis

Inspect I/Q recording to get properties of signals to use to build specific detectors.

RFeye Site

Real-time

Configure and test missions

Build and test detectors in real-time

Check mission performance

Export to config file

RFeye Mission Manager

Automation

Run config file as schedules

Generate JSON API configuration files (optional)

OR

GMP

Integration

Run config file as against RESTful API

Receive results back directly

APIs
GETTING STARTED

Contact your CRFS Account Manager to discuss an integration processing requirement. CRFS provides system integrators with support packages, co-engineering programs and annual support programs (training, demo licenses), as well as use of a VM system for testing.

RFEYE SITE
Real-time spectrum monitoring & geolocation toolkit

RFEYE DEEPVIEW
Forensic signal analysis software with 100% probability of intercept

RFEYE MISSION MANAGER
Automated spectrum management & near-time incident reporting

VISIT OUR DEPLOYMENT LIBRARY
Our online deployment stories library showcases CRFS' expertise across multiple domains and sectors.

CRFS | EXTRAORDINARY **RF TECHNOLOGY**

CRFS is an RF technology specialist for the defense industry, national security agencies, and systems integration partners. We provide advanced capabilities for real-time spectrum monitoring, situational awareness, and electronic warfare support to help our customers understand and exploit the electromagnetic environment.

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