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FISSURE:

Tactical RF Operations and Situational Awareness with GNU Radio

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github.com/ainfosec/FISSURE

What is FISSURE?

An open-source framework for RF analysis, automation, and distributed operations

- Brings signal processing, targeting, geolocation, and situational awareness into one environment
- Coordinates SDRs, Sensor Nodes, software, and data across local and remote systems
- Uses GNU Radio extensively for RF processing while FISSURE handles the surrounding workflow
- Extensible through plugins, actions, and reusable operations

The Problem I am Trying to Solve

Open, flexible, affordable, and ready for what comes next

- Create an open platform for learning, experimentation, development, and integration
- Offer developers maximum flexibility while keeping operator workflows simple
- Span RF and cyber without locking FISSURE to one protocol, sensor, platform, or use case
- Build around automation, distributed systems, AI/ML, and affordable deployment

How We Got Here

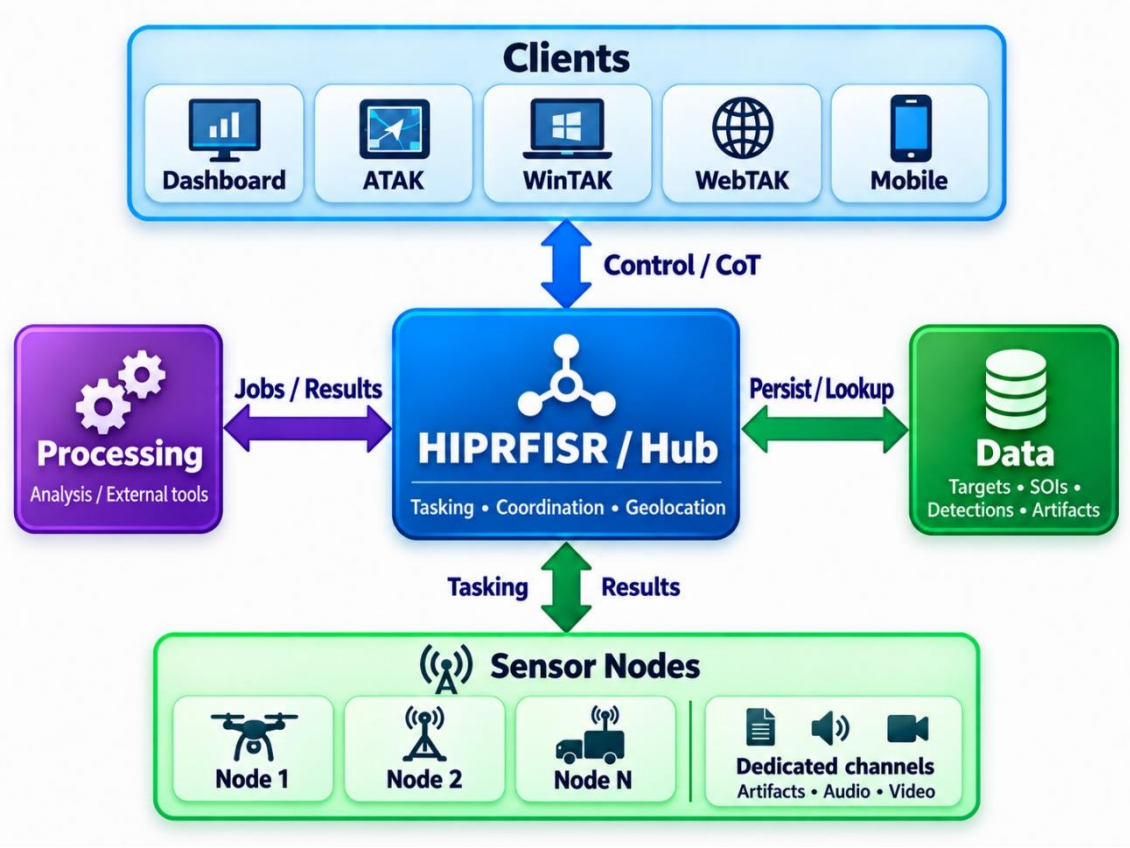
From a collection of RF tools to connected operational workflows

- Started as a broad RF/SDR toolbox with many independent capabilities
- Early development added remote Sensor Nodes, distributed execution, and tactical features
- Recent work has focused on connecting those pieces through clearer workflows, shared records, provenance, and automation
- The goal now is to make FISSURE a stronger bridge between RF hardware, analysis, operators, and emerging AI/ML capabilities

Distributed Architecture

A hub-and-node architecture connecting users, processing, sensors, and data

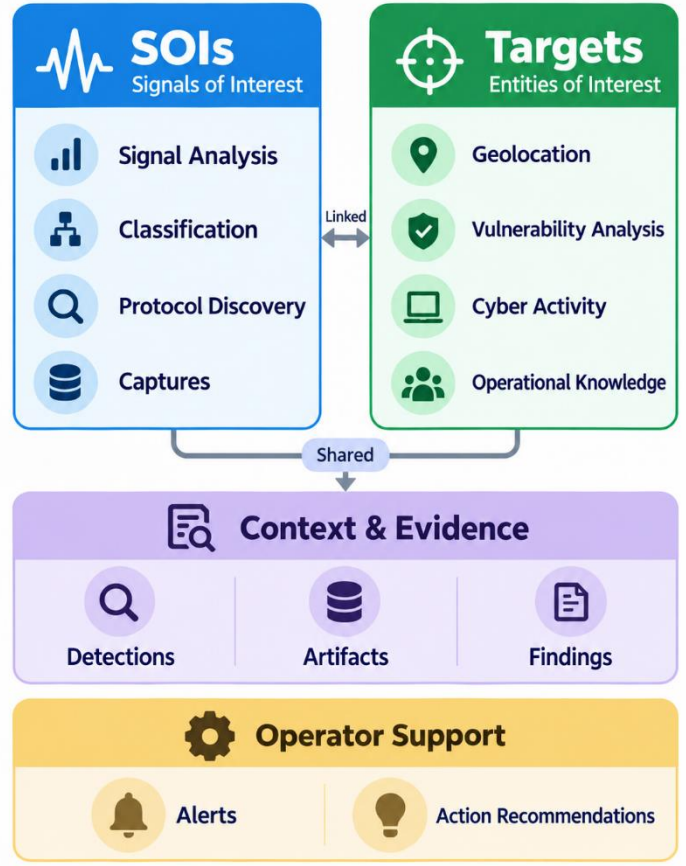
- Clients access FISSURE through the Dashboard or through external systems such as TAK
- HIPRFISR / Hub coordinates tasking, state, multi-node operations, geolocation, and persistent data
- Processing Engines support heavier analysis, network-enabled capabilities, and integration with existing solutions
- Sensor Nodes host SDRs, sensors, plugins, and other tools on distributed or platform-mounted systems



Core Information Model

Organizing signals, targets, and the context built around them

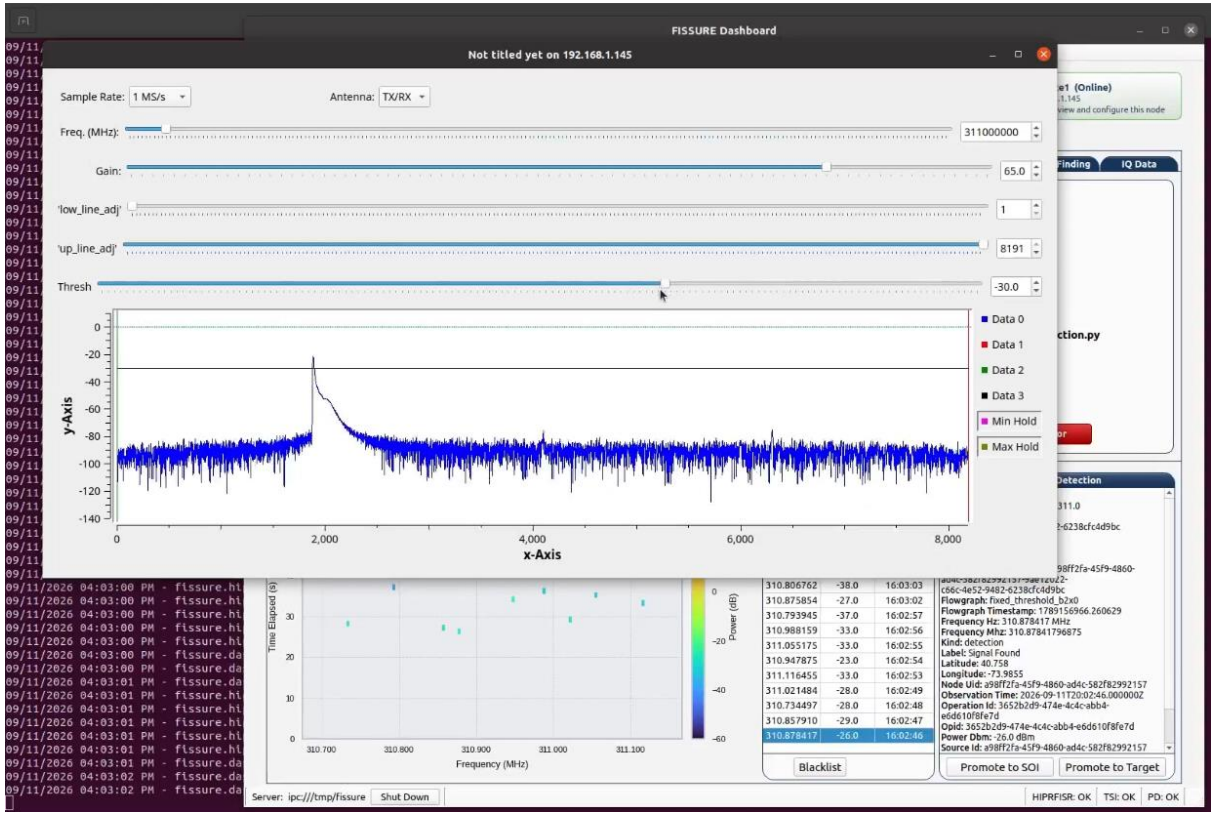
- **SOIs** anchor signal analysis, classification, protocol discovery, and capture
- **Targets** anchor geolocation, vulnerability analysis, cyber activity, and operational knowledge
- Detections provide sensor observations and can drive awareness, geolocation, alerts, and triggers
- Artifacts and Findings preserve evidence and analysis results, while Alerts and Action Recommendations surface what matters and what to do next



GNU Radio in the Workflow

Turning GNU Radio capabilities into local, remote, and automated operations

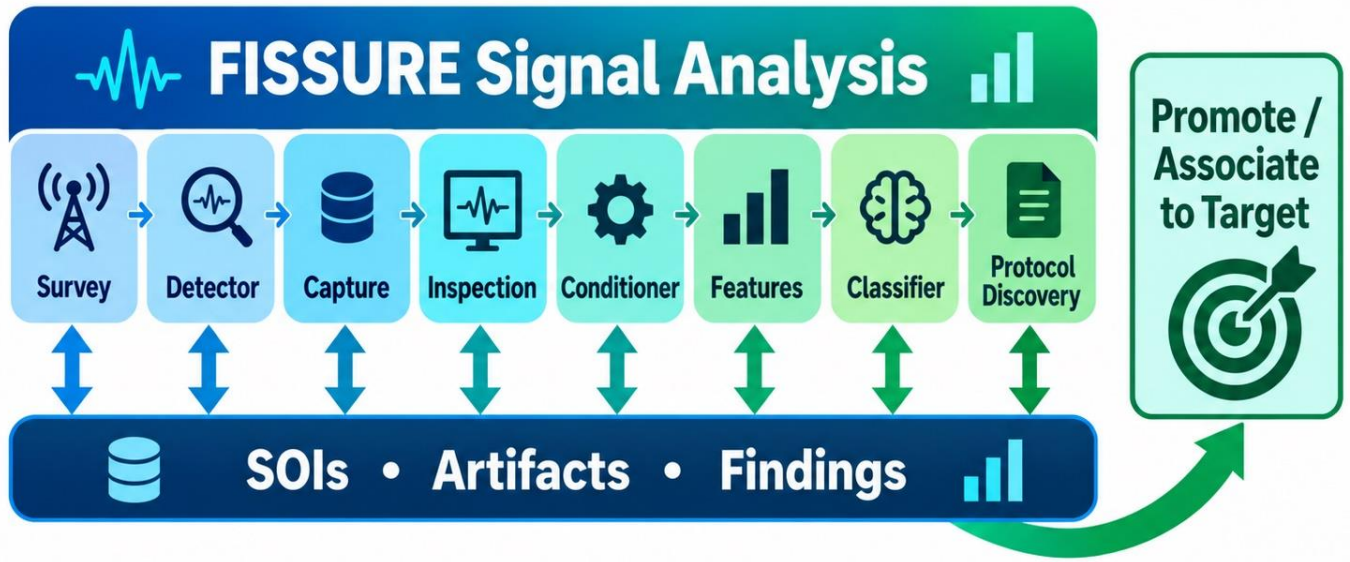
- GNU Radio supports detection, capture, analysis, transmission, and other RF tasks throughout FISSURE
- FISSURE supplies hardware, parameters, context, execution, and status, with values populated from SOIs, Targets, and other records when available
- Capabilities can run locally or on remote Sensor Nodes, with Actions supporting parameterized flow graphs, custom launch logic, and remote GUI streaming through Xpra



Signal Analysis as a Workflow

From discovery to understanding

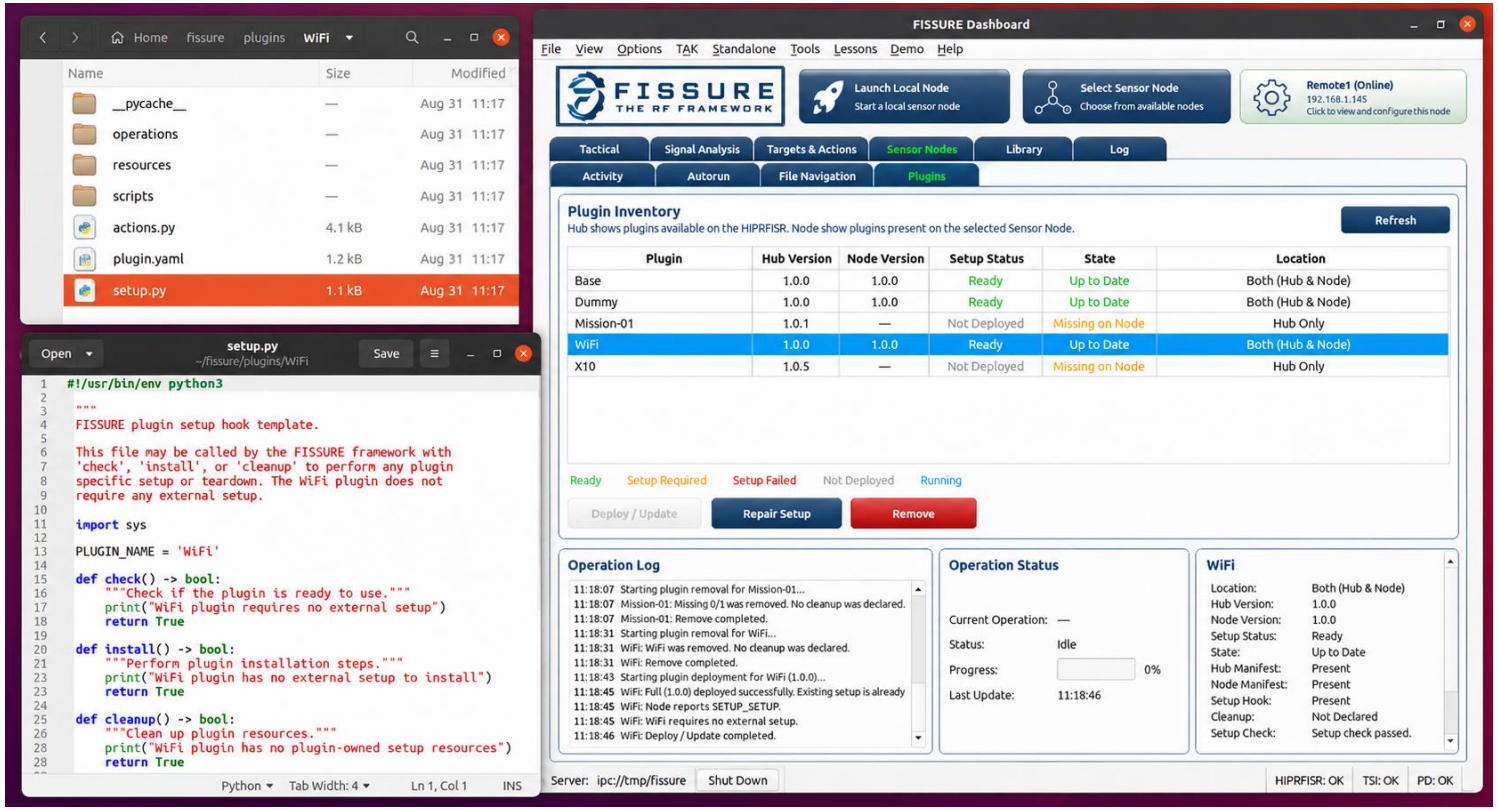
- Survey and detection help identify signals worth investigating
- SOIs carry context through capture, inspection, conditioning, features, classification, and protocol discovery
- Artifacts and findings preserve the data and results generated along the way
- SOIs can be promoted to Targets when a signal becomes operationally relevant



Plugins and Deployable Capabilities

Add and manage capabilities without changing the FISSURE core

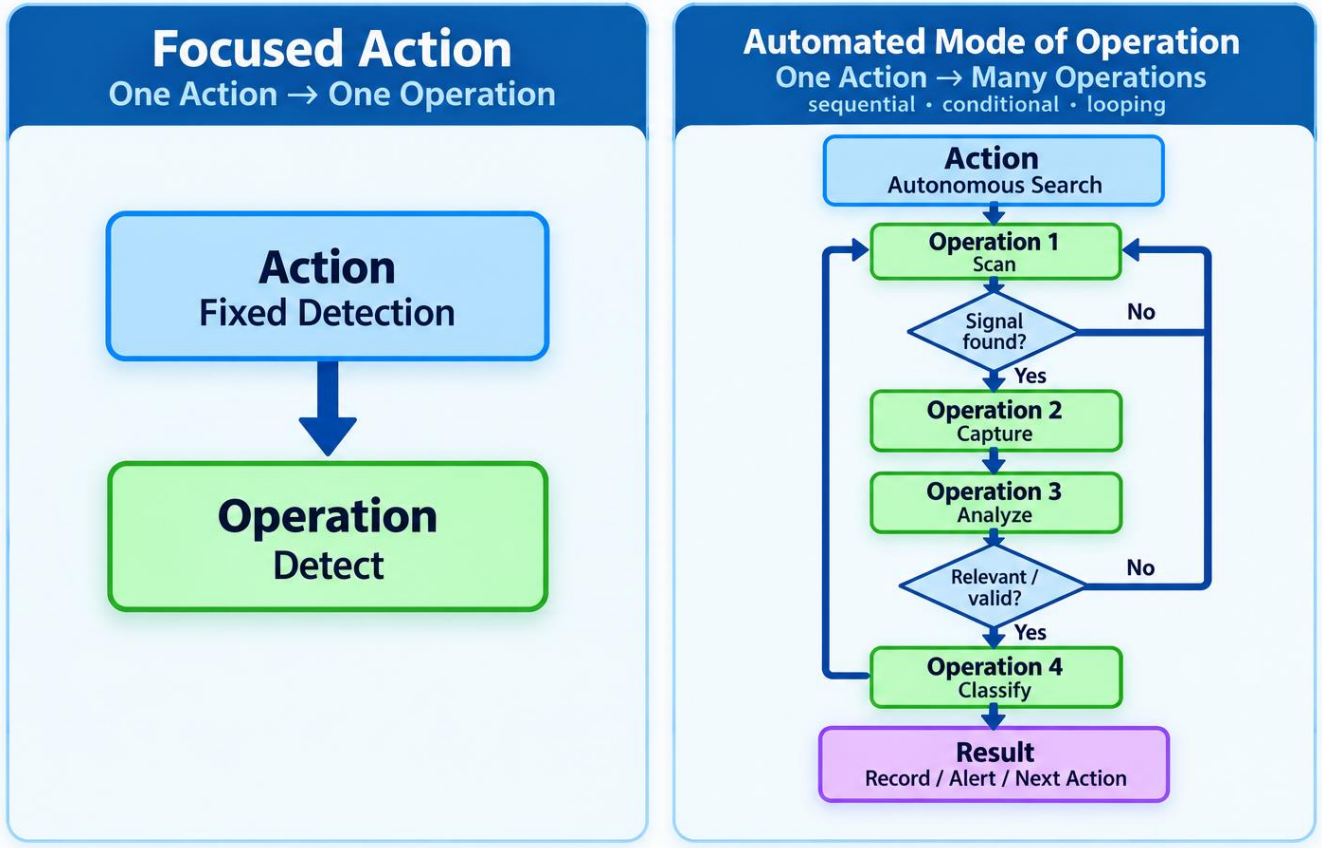
- Plugins can add GNU Radio, hardware, analysis, protocol, and other custom capabilities
- Plugins can manage setup, dependencies, repair, updates, and cleanup
- Capabilities can be deployed locally or to remote Sensor Nodes, while integrating third-party tools
- Mission-specific plugins can reuse Actions and keep proprietary capabilities outside the public FISSURE core



Actions and Operations

From focused one-off tasks to automated modes of operation

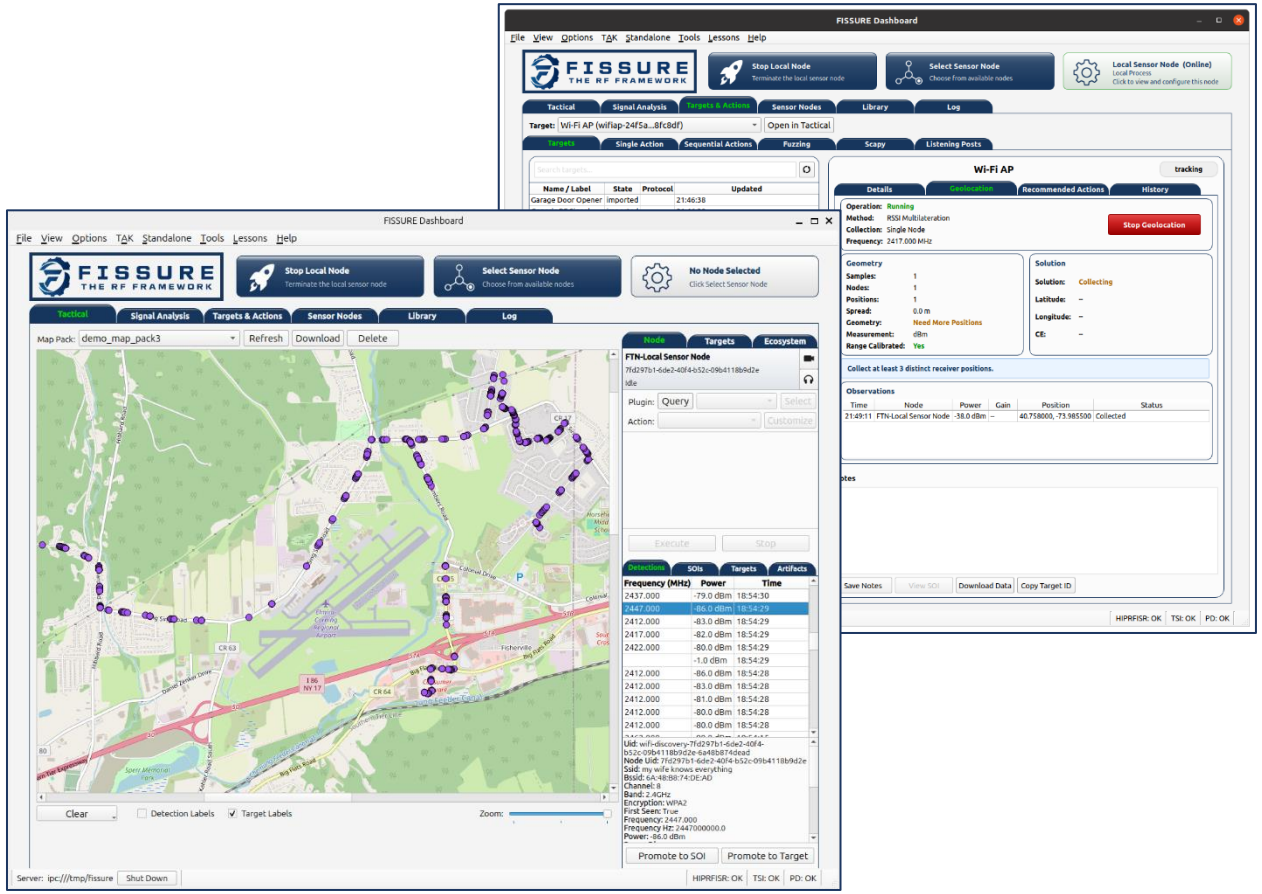
- Operations are the programs that do the work, from GNU Radio and Python to external applications
- Actions expose and configure those Operations for FISSURE, including inputs, parameters, context, and execution
- An Action can call one Operation or orchestrate many sequentially, in parallel, or conditionally, supporting both focused tasks and automated modes of operation



Geolocation and Target Awareness

Turning distributed observations into persistent operational context

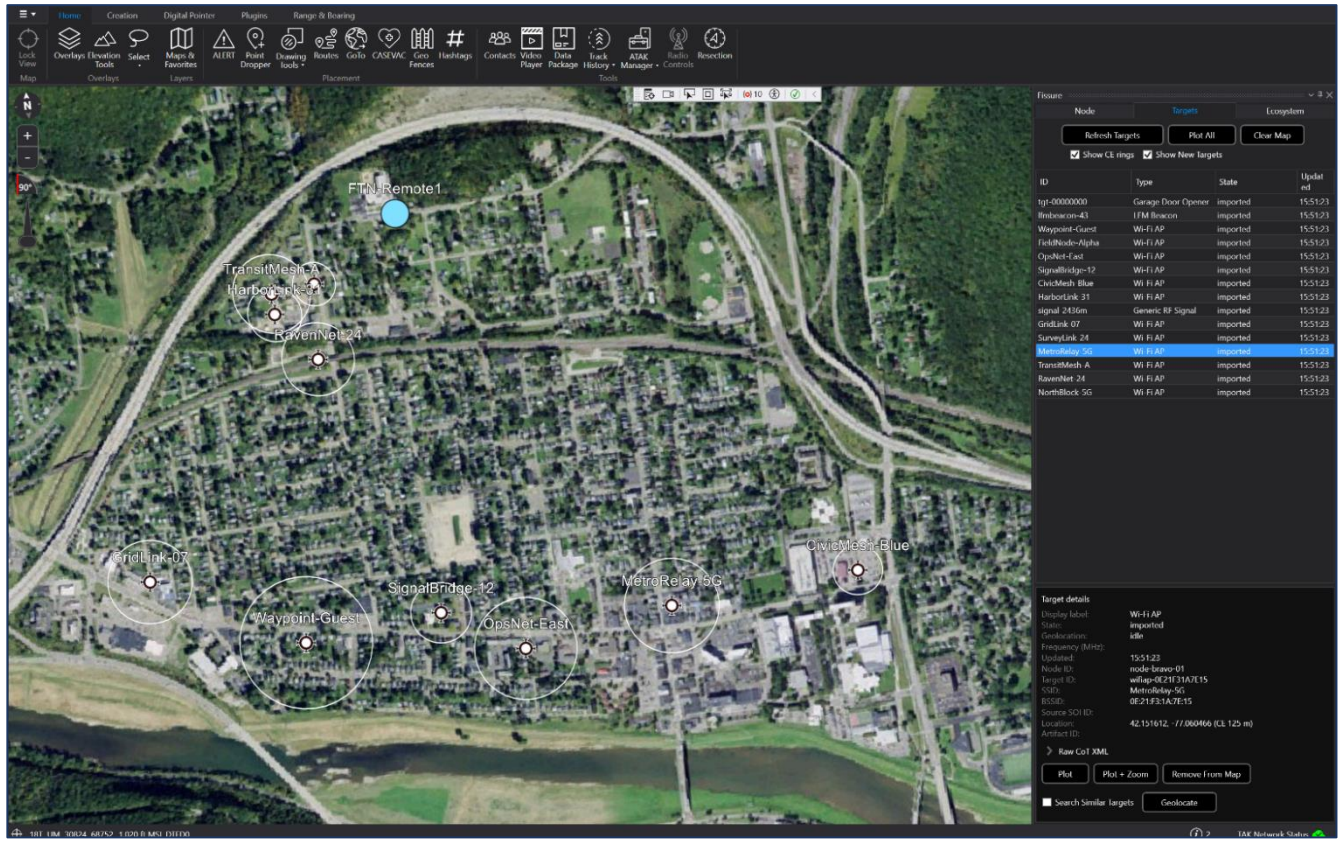
- Targets accumulate signals, locations, observations, and other knowledge about an entity
- Sensor Nodes contribute detections and measurements for geolocation and tracking
- HIPRFISR coordinates multi-node geolocation and feeds results back into Target and mapping workflows
- Target context can recommend or pre-populate relevant Actions, while new observations continue building the record



FISSURE + TAK

Sharing RF awareness through CoT while keeping FISSURE independent

- FISSURE sends and receives CoT for Sensor Nodes, Targets, detections, geolocation, alerts, tracks, and events
- ATAK and WinTAK extend RF-derived awareness to users outside the FISSURE Dashboard, including resources such as remote video
- FISSURE can also provide its own operational map when a TAK client is not needed or available



A Partial FISSURE Workflow (Video)

From tactical context to initial signal analysis

- Tactical View
  - Provides an operator-focused view of Sensor Nodes, detections, SOIs, and targets
  - Connects distributed RF activity with persistent operational context
- Signal Analysis Workflow
  - Moves from RF discovery and detection into capture and analysis
  - Associates collected data, artifacts, and findings back to SOIs
- Distributed Operations
  - Capabilities execute across local and remote Sensor Nodes
  - Collected information can move between operational and analysis workflows

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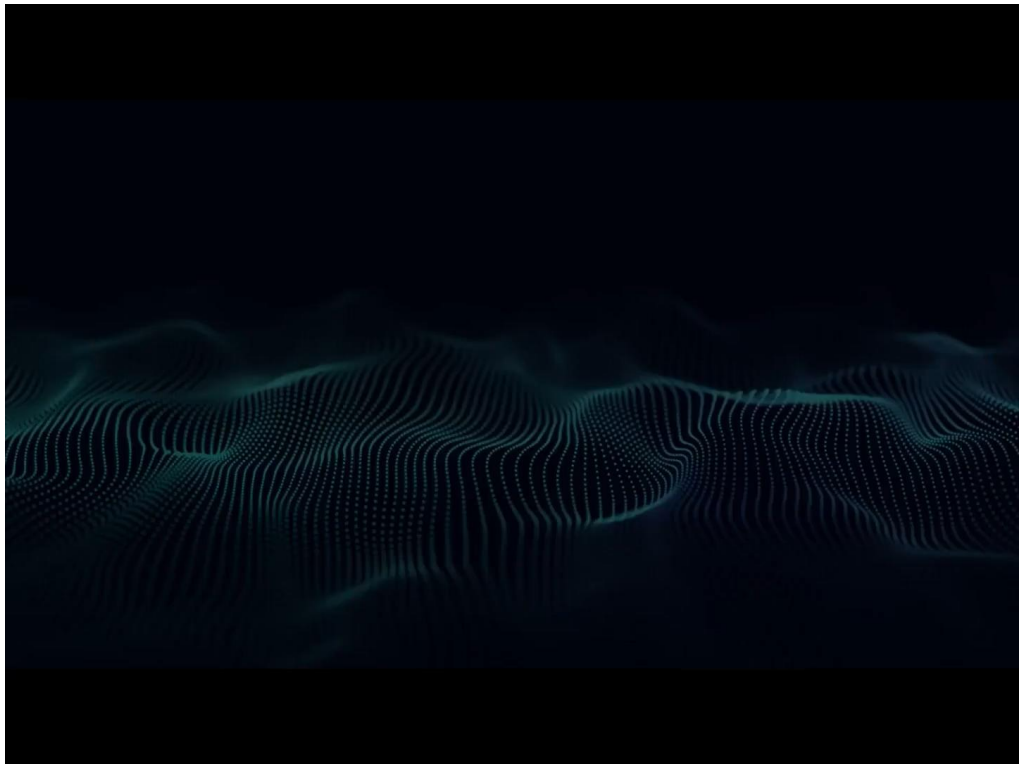
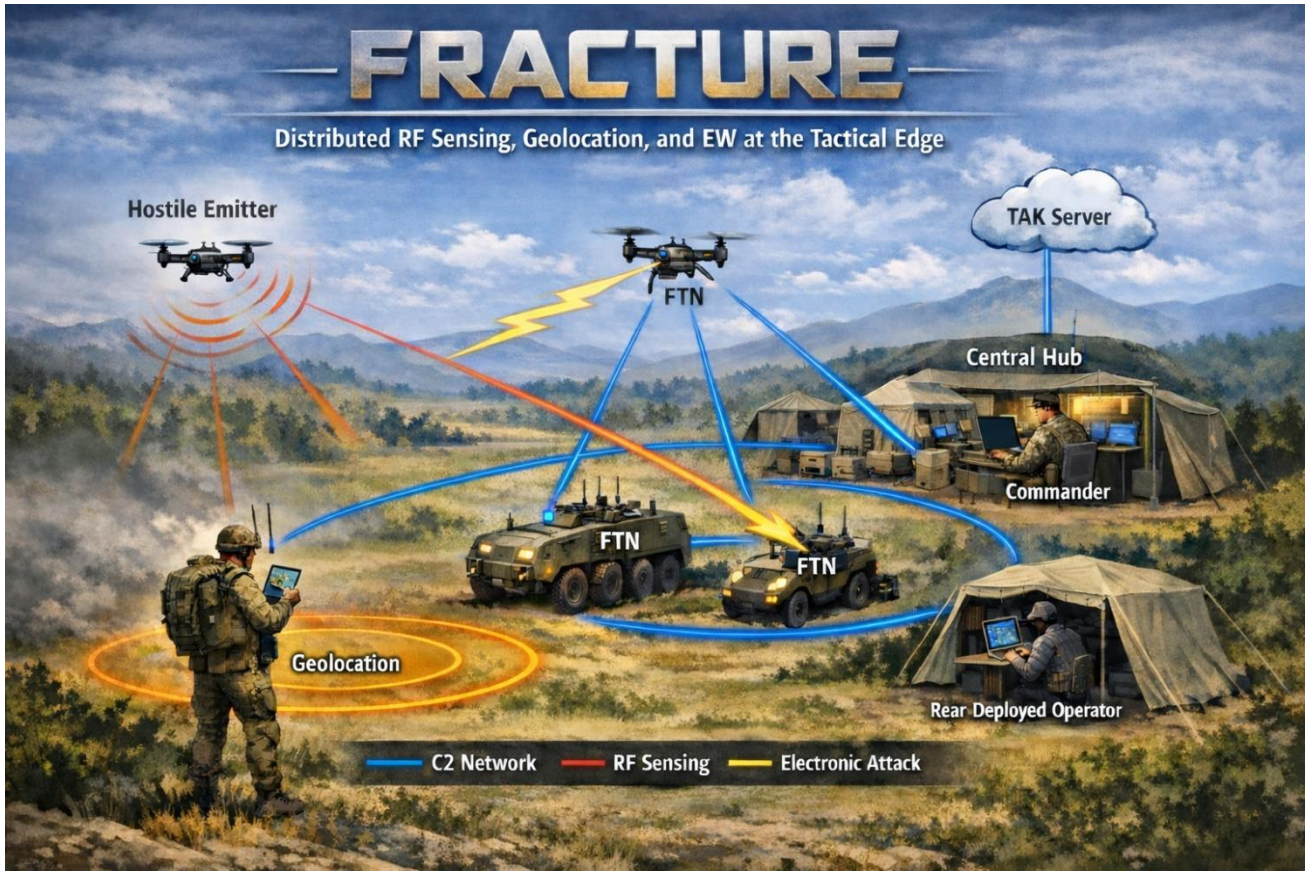
From tactical context to initial signal analysis



Fracture

Turning FISSURE capabilities into deployable systems

- Fracture packages FISSURE into purpose-built hardware and software configurations
- SDRs, compute, networking, plugins, and configuration are combined around a mission or use case
- The goal is easier deployment, integration, support, and sustainment
- Fracture can include deployment-specific integrations, including ATAK and WinTAK plugins not available in the public FISSURE release



Where FISSURE Goes Next

Expanding capability, automation, AI integration, and operational maturity

- Complete end-to-end workflows from discovery through sharing
- Expand the plugin ecosystem across protocols, hardware, sensors, analysis, and integrations
- Strengthen automation and provenance for repeatable, traceable workflows
- Connect RF hardware and structured data more directly to AI/ML while hardening distributed deployment and adoption

How You Can Help

There are plenty of ways to contribute

- **Use it:** Try FISSURE with your own hardware, signals, workflows, and problems
- **Improve it:** Report bugs, rough edges, missing capabilities, and workflow issues
- **Build with it:** Contribute code, plugins, documentation, testing, hardware support, or existing RF/Cyber capabilities
- **Grow it:** Share FISSURE with coworkers, students, professors, labs, and teams, or get involved more deeply in shaping the project

Questions?

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