FUSION TECHNOLOGY

ICAO MID CNS WORKSHOP 2026

Layered GNSS Threat Detection & Integrity Monitoring

StratoCentral and the Case for Cross-Platform Collaboration

Michael Sammueller
Product Owner · Fusion Technology
Doha, Qatar · 12th May 2026

What StratoCentral does

Continuous Monitoring

Ground based, multi-band, multi-constellation monitoring; 24/7.

Real-Time Detection

Detection and classification of spoofing, jamming, RF interference, and other anomalies and threats.

Real-Time Alert

Alerts the user in real-time of any detections and anomalies.

Data & Reports

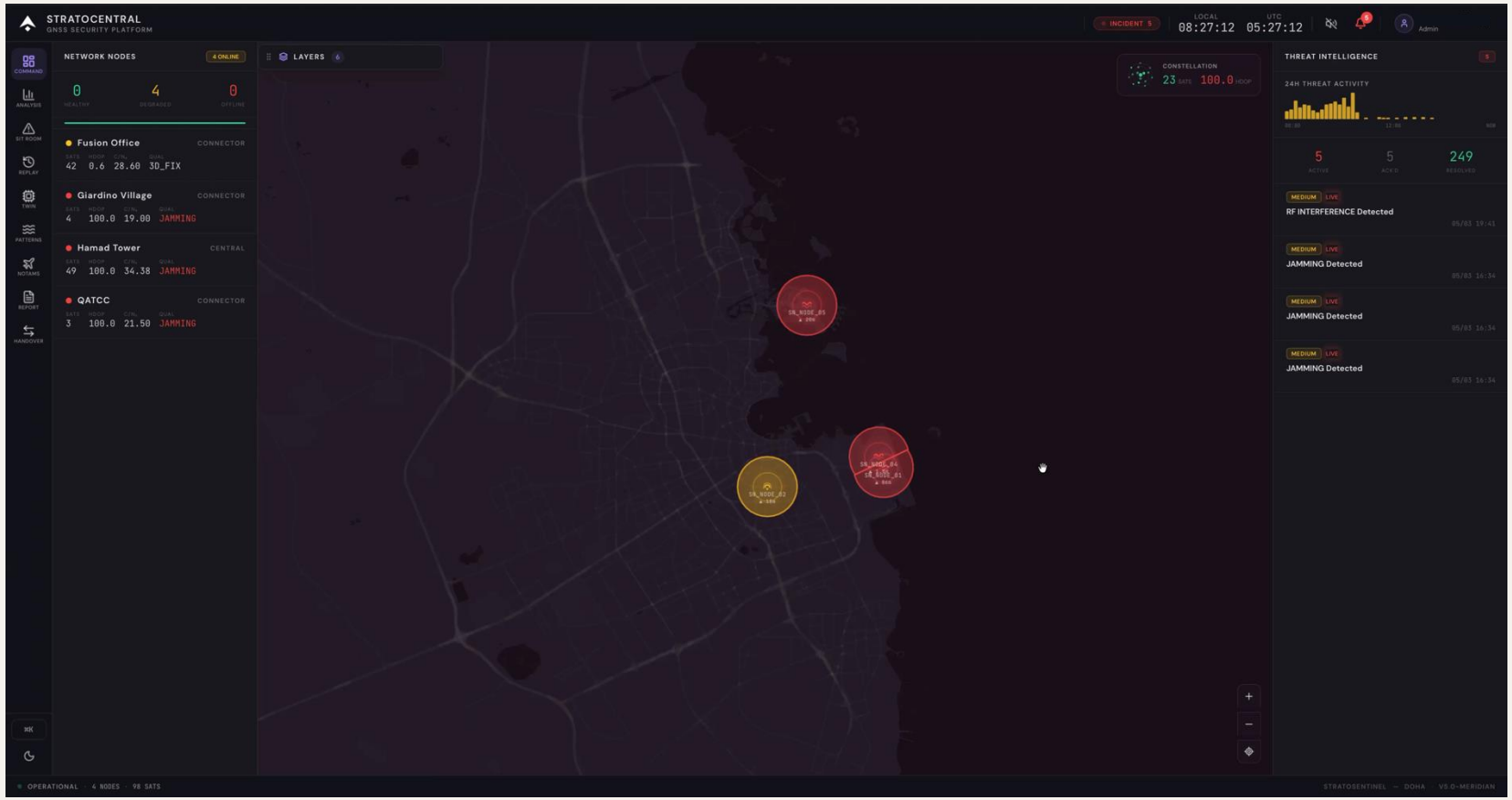
Stores raw and analysis data for min. 90 days. Capable of generating ICAO reports.

Detection is one layer. Resilience is four.

How we think about the problem — and where StratoCentral fits.

STRATOCENTRAL DELIVERS LAYERS 1 AND 4 · LAYERS 2 AND 3 ARE COMPLEMENTARY TECHNOLOGY CATEGORIES · TODAY'S TALK FOCUSES ON LAYER 1

Built for control rooms



1 **Live network map**

Colour-coded node states across the network.

2 **Live telemetry**

Real-time node telemetry visualization.

3 **Area-of-impact estimation**

Where GNSS integrity is compromised vs. nominal.

METHODOLOGY

How detection actually works.

Multi-signal deterministic detection. Augmented by an unsupervised ML layer in shadow mode.

JAMMING

- Satellite visibility loss
- Geometric dilution thresholds
- Receiver gain anomalies
- Constellation collapse

SPOOFING

- Position-deviation signatures
- Drift-pattern analysis
- Linearity tests against noise
- Multi-station consistency checks

RF INTERFERENCE

- Hardware flag + valid fix
- Degraded geometric profile
- Variance-pattern classification
- Multipath signature detection

ML LAYER · SHADOW MODE

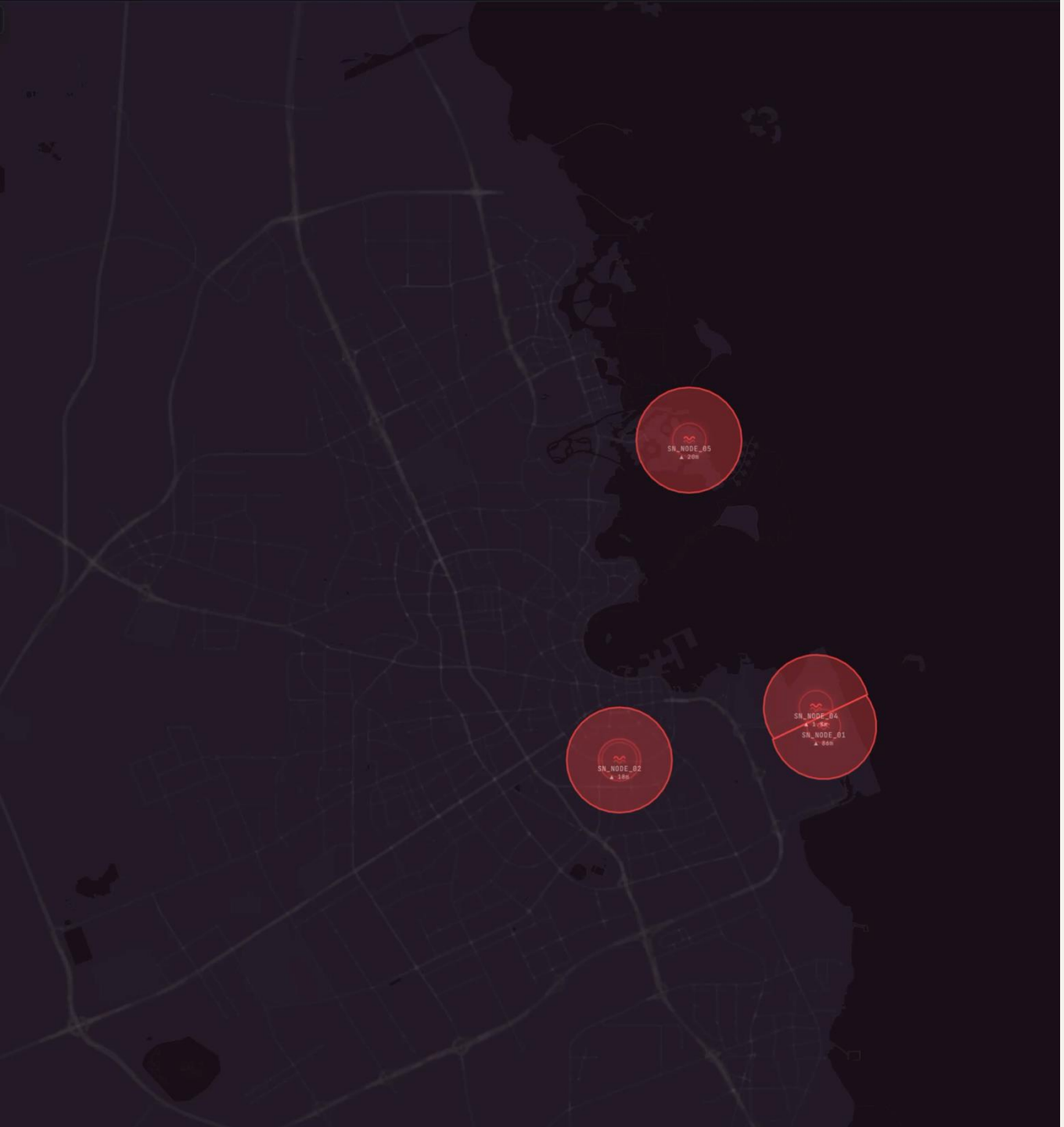
Isolation Forest

- Trained on clean IGS reference data (MATE, WTZR)
- 22 features per observation
- Scored in parallel with algorithms

FUSION TECHNOLOGY

From datasheet and hypothesis

To real-life case studies.



FUSION
TECHNOLOGY

DOHA · LIVE DETECTION

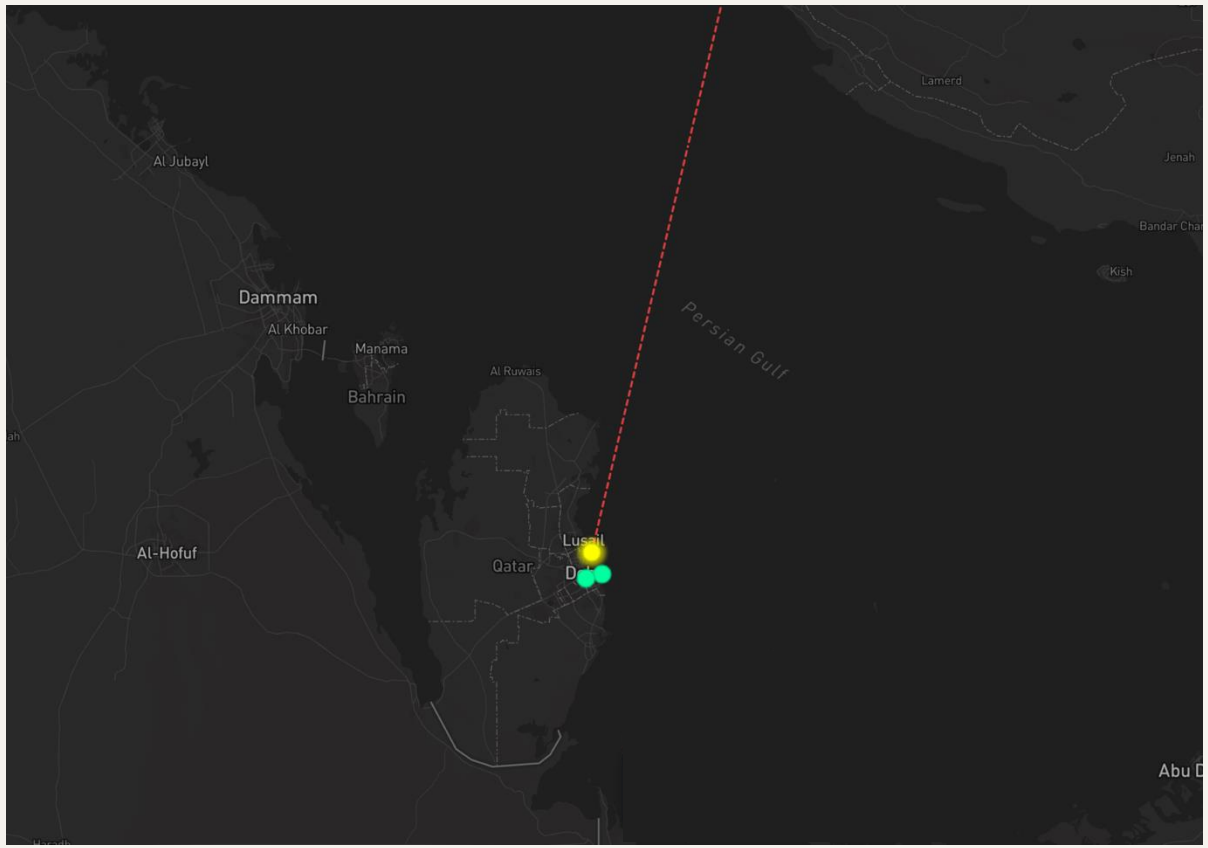
Four sensors.

One jamming event.

0.1 seconds.

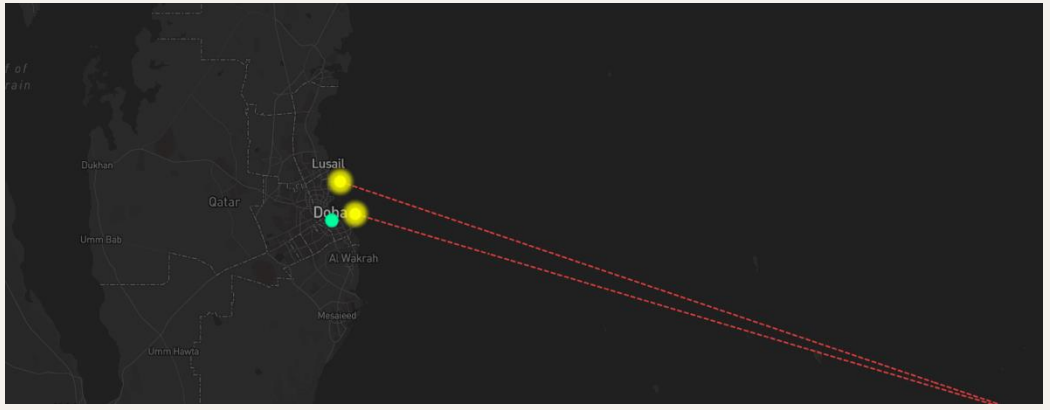
DETECTION LATENCY	0.1 s
AFFECTED NODES	04 / 04
STATUS	CROSS-VALIDATED

What events. Real deviations.



EVENT 01 **DEVIATION → [North]** [2026-02-28]

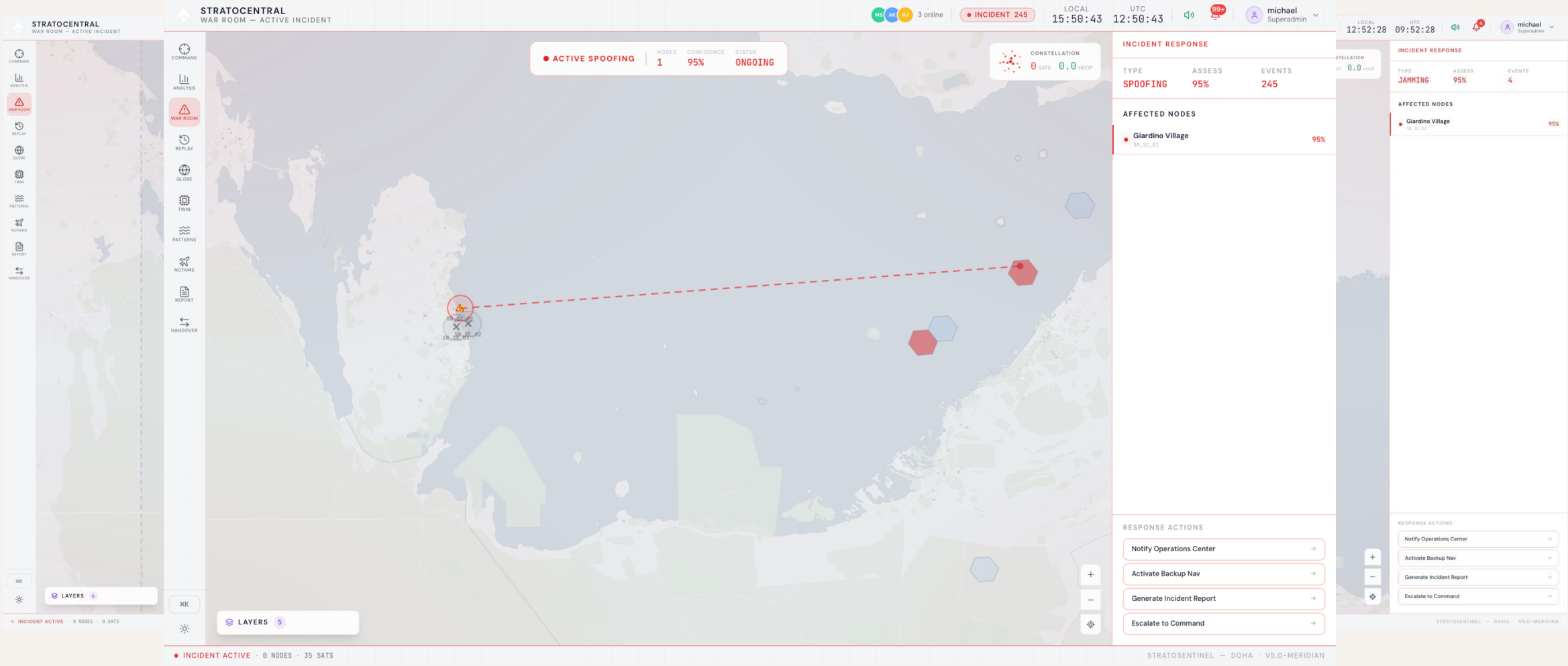
EVENT 02 **DEVIATION → [East]** [2026-03-13]



EVENT 03 **DEVIATION → [South-East]** [2026-03-09]

F I E L D E V I D E N C E · S T R A T O C E N T R A L R E C O R D I N G S

What events. Real deviations.



FUSION TECHNOLOGY

Live Machine Learning on

Operational jammed-network data

M L V A L I D A T I O N

Trained on clean. Tested on jammed.

A methodology for validating ML in adversarial conditions.

T R A I N E D O N

Clean reference data

Global IGS — far from known interference, operationally stable, publicly verifiable.

17,280	3 days	Clean
training samples	training window	operational state

T E S T E D O N

Operational nodes

Four active deployment nodes under sustained jamming. The model never saw this distribution during training.

452,005	4 nodes	15 days
observations	active deployment	test window

R E S U L T

99.69%

agreement with deterministic detection on confirmed jamming events.

T O P D I S C R I M I N A T O R S

Multi-signal variance patterns

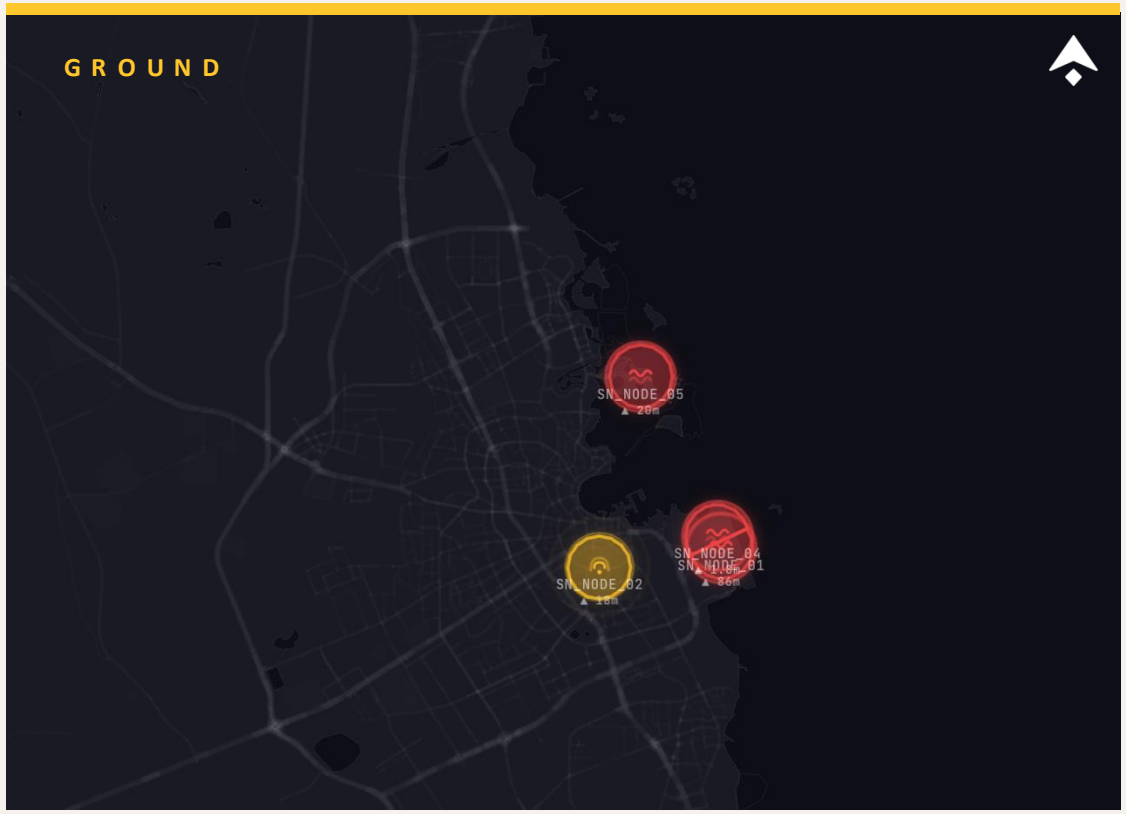
S H A D O W M O D E · N O A L E R T S G A T E D B Y M L · O P E R A T O R F E E D B A C K L O O P I N B E T A

Ground sensing has a horizon —

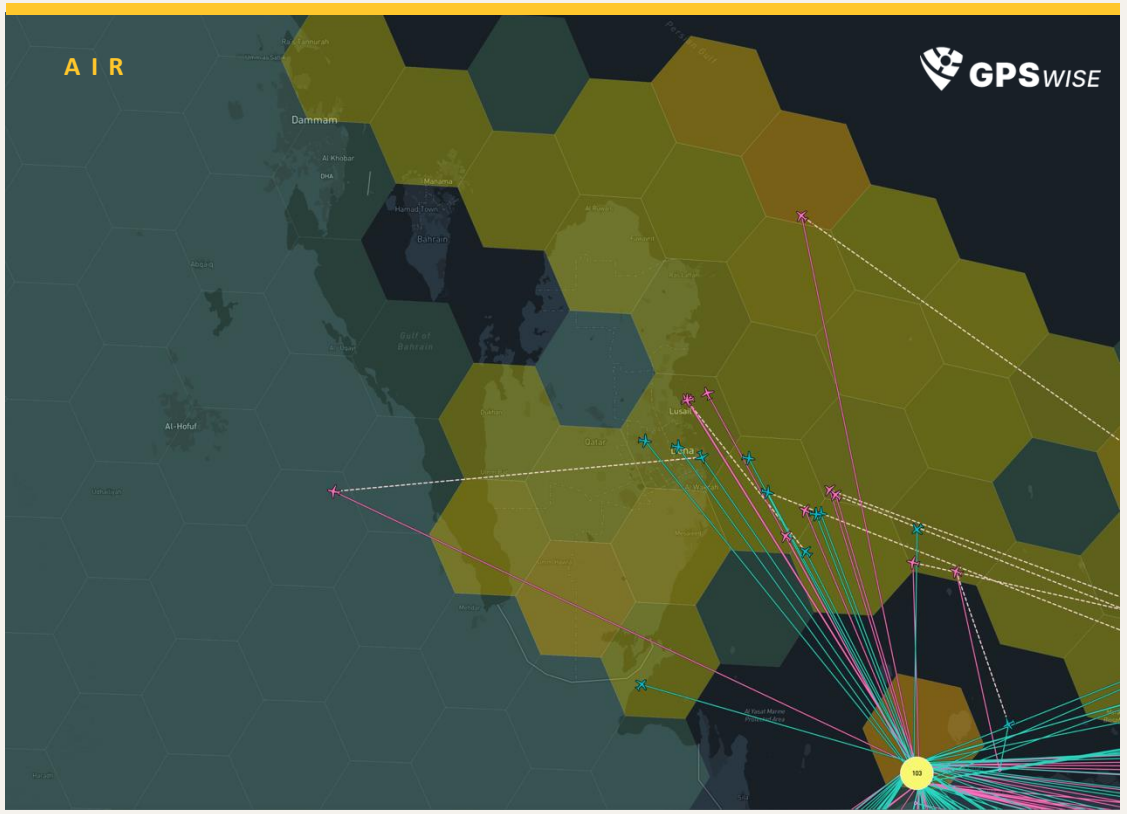
No StratoNode – No Visibility

INTEGRATION

Two views.



Continuous RF monitoring at the receiver level.

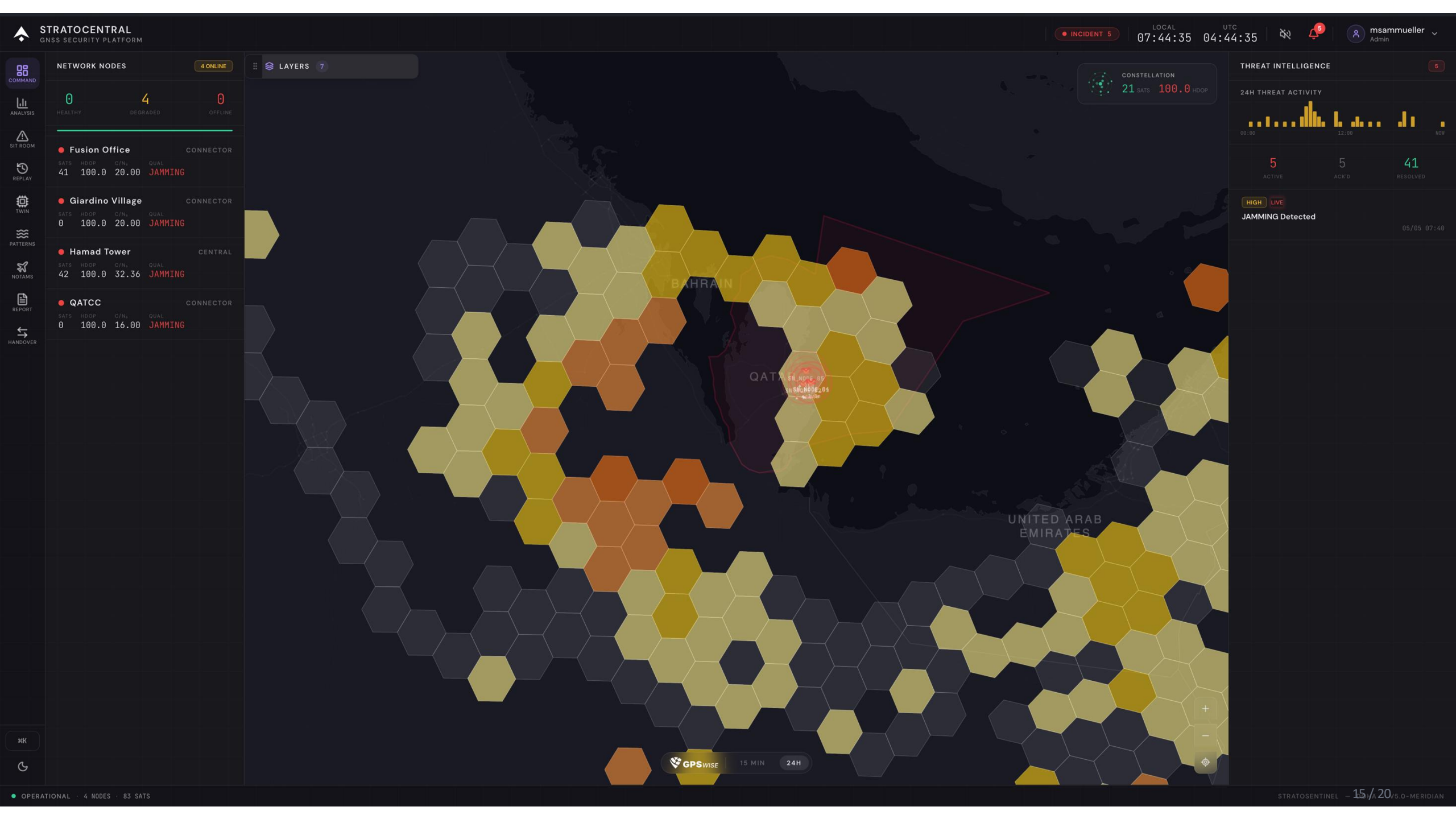


Aircraft ADS-B as a distributed sensor network.

INTEGRATION · PART TWO

One Picture

GPSWise data, integrated directly into StratoCentral. Ground integrity and airborne RFI signatures, cross-validated in a single operations view.


STRATOCENTRAL
GNSS SECURITY PLATFORM
INCIDENT 5
LOCAL 07:44:35
UTC 04:44:35
msammueller
Admin
COMMAND
ANALYSIS
SIT ROOM
REPLAY
TWIN
PATTERNS
NOTAMS
REPORT
HANDOVER
⌘K
NETWORK NODES
4 ONLINE
0 HEALTHY
4 DEGRADED
0 OFFLINE
Fusion Office CONNECTOR
SATS HDOP C/N0 QUAL
41 100.0 20.00 JAMMING
Giardino Village CONNECTOR
SATS HDOP C/N0 QUAL
0 100.0 20.00 JAMMING
Hamad Tower CENTRAL
SATS HDOP C/N0 QUAL
42 100.0 32.36 JAMMING
QATCC CONNECTOR
SATS HDOP C/N0 QUAL
0 100.0 16.00 JAMMING
LAYERS 7
CONSTELLATION
21 SATS 100.0 HDOP
BAHRAIN
QATAR
UNITED ARAB EMIRATES
GPSWISE
15 MIN
24H
THREAT INTELLIGENCE
5
24H THREAT ACTIVITY
00:00
12:00
NOW
5 ACTIVE
5 ACK'D
41 RESOLVED
HIGH LIVE
JAMMING Detected
05/05 07:40
OPERATIONAL · 4 NODES · 83 SATS
STRATOSENTINEL — 15 / 20

From detection to automation -

Current difficulties and outlook

Detection isn't solved.

Three problems we keep working on.

01

Telling environmental from intentional

Multipath, urban RF, weather, and faulty consumer hardware all look like interference at first glance. We separate them by variance pattern, multi-signal fusion, and a state machine requiring sustained signatures.

Variance-pattern logic, multi-signal fusion, ML augmentation in shadow.

02

Catching false positives before operators do

A misconfigured threshold or a single noisy receiver can fire the alert pipeline. We mitigate by requiring cross-receiver agreement and cross-domain correlation against AIS, ADS-B, or neighbouring stations.

Cross-receiver agreement plus cross-domain correlation (AIS, ADS-B).

03

Different receivers, different realities

An aviation-grade GNSS receiver fails under jamming. A consumer phone using cellular and Wi-Fi may not. We monitor a specific receiver class for their vulnerabilities.

Future work depends on multi-vendor data sharing across the sector.

REPORTING

Detection is half the job.

The other half is getting it into State workflows.

WHAT WE DO TODAY

- Real-time visual and audio alerts
- Forensic event logs (replayable)
- Machine-readable API
- Compiled reports — PDF, JSON, ICAO Act of Unlawful Interference

WHAT WE ARE YET TO DO

- Translation into State NOTAM workflows
- Civil-military coordination cell handoff
- Cross-border data sharing
- GNSS Security Layer

Closing the loop.

Detection feeds operations only when integration is built into the workflow.

STATUS

Visual indicators

GNSS integrity surfaced as a unified status inside ATC and operational platforms — not buried in a separate tool.

Green	Amber	Red
nominal	degraded	compromised

ESCALATION

Defined chains

Every state mapped to a controller action. Civil-military coordination handoff, NOTAM issuance, and stakeholder notification — explicit, not improvised.

AUTOMATION

Human-in-the-loop

System proposes the NOTAM. Operator approves. Cross-border data sharing happens automatically. Safety-critical decisions stay with humans — but the busywork doesn't.

CLOSING

Any Questions?

CONTACT

Michael Sammueller

Product Owner · Fusion Technology

s.michael@fusiongroupholding.com · +974 3303 7515