

CASE STUDY: TECHNOLOGY / INNOVATION

Shattering the ARQ Barrier with SafecomLink Pactor Clusters

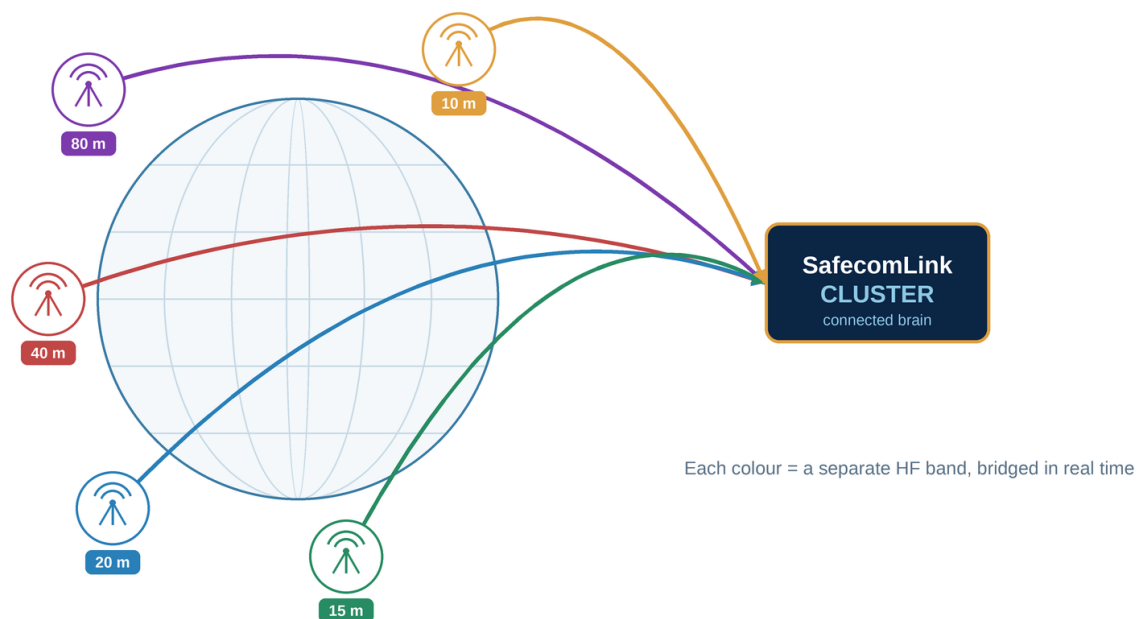
Pioneering Real-Time, Cross-Band Multi-Station Chat/Data-Exchange on HF

For decades, HF data communication over ARQ modes like Pactor has been bound by two hard limits: it is point-to-point, and both stations must share propagation on a single frequency. The SafecomLink Cluster feature breaks both, enabling real-time, cross-band ARQ data exchange and the world's first multi-party ARQ-based live chat.

FEATURE	MODE	CAPABILITY	FIRST
SafecomLink Cluster	Pactor ARQ over HF	Cross-band bridging	Multi-party ARQ chat

One Cluster. Every Band. One Connected Brain.

Cross-band ARQ data converging on a single SafecomLink Cluster



A single SafecomLink Cluster fuses independent radio nodes on different HF bands into one connected brain, bridging disparate RF paths into a unified real-time data stream.

EXECUTIVE SUMMARY

Breaking two limits that have bound HF data for decades

In critical off-grid communication, ARQ protocols are the gold standard for error-free delivery, but their traditional use has always carried two structural constraints. SafecomLink disrupts both with the Cluster feature, deploying a unified, multi-node “connected brain” architecture that enables real-time, cross-band ARQ data exchange and introduces the first multi-party ARQ-based live data-exchange/chat on HF radio.

THE CHALLENGE

The rigid nature of traditional ARQ

ARQ modes deliver data without errors, but the traditional application of these modes presents two significant operational bottlenecks:

1 • The single-band dependency

Station A and Station B can only communicate if they share an open propagation path on the exact same frequency band (e.g. 20 m). If the band closes on one side of the globe, the link drops.

2 • The point-to-point constraint

ARQ is inherently a 1-to-1 handshake protocol. Creating a unified, real-time tactical chat involving three or more stations using ARQ has historically been impossible over HF radio.

THE INNOVATION

The SafecomLink “connected brain” architecture

The SafecomLink Cluster feature transforms a single physical station into a highly intelligent, multi-band routing hub. Rather than running isolated instances of modem software, a Cluster uses a synchronized backend. An operator can deploy multiple nodes: for example, Node 1 connected to a transceiver and Pactor modem on the 20 m band, and Node 2 on a separate transceiver and modem for the 40 m band.

These nodes share a single connected brain. They are fully aware of each other’s traffic and state, which is what makes seamless cross-band routing possible.

How the cross-band repeater works

Inbound connection 1

Station A connects to the SafecomLink Cluster on the 40 m band.

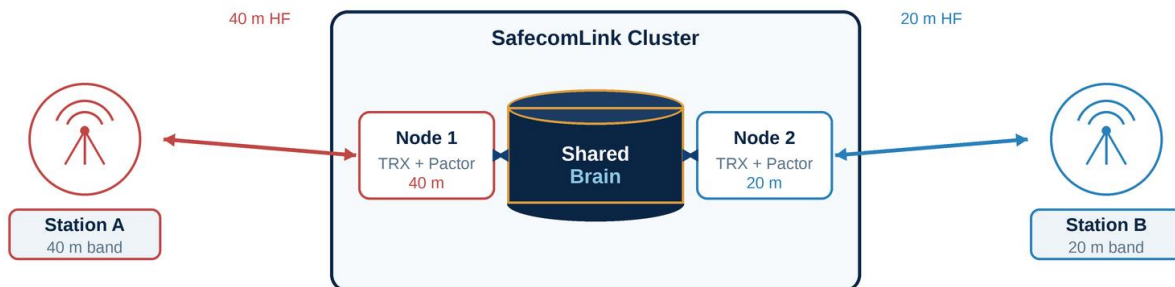
Inbound connection 2

Station B connects to the same SafecomLink Cluster on the 20 m band.

Real-time exchange

Because the cluster nodes share an integrated data layer, data entered by Station A on 40 m is instantly bridged and routed out through Node 2 on 20 m to Station B.

How the Cross-Band Repeater Works



Data entered by Station A on 40 m is instantly bridged through the shared brain and routed out on 20 m to Station B.

Cross-band repeater flow: Station A (40 m) → Node 1 ↔ Shared Brain ↔ Node 2 → Station B (20 m).

1 → ∞

Nodes per cluster — no software limit

Cross-Band

Error-free ARQ data, bridged live

3-Way (or more)

Multi-party ARQ chat — a world first

BREAKING HISTORY

The 3-way (or more) ARQ chat

A remarkable byproduct of this unified backend is multi-party ARQ communication. Because the Cluster sits in the middle, monitoring and bridging the active links, the human operator at the Cluster station can interact with both remote parties simultaneously.

For the first time in HF radio history, multiple stations can engage in an error-free, ARQ-based live chat, shattering the two-station limitation of ARQ modes and opening the door to dynamic tactical nets and group coordination over strictly off-grid HF links.

USE CASES & REAL-WORLD APPLICATIONS

Where the cluster changes the game

1 Transcontinental propagation bridging

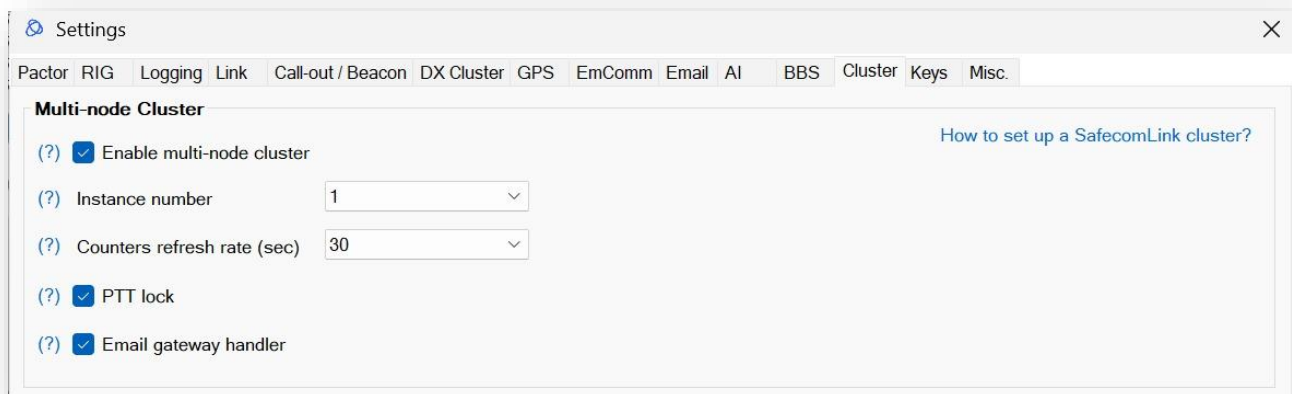
HF propagation is highly localized. A station in Europe may have excellent 20 m propagation to the Middle East, while a station in North America has a path only on 40 m. A Cluster stationed in between bridges the two seamlessly, even though Station A and Station B share no direct RF path, they converse in real time through the centrally located cluster.

2 Multi-agency emergency coordination hubs

When cellular and satellite grids fail, an Emergency Operations Center can run a Cluster across multiple bands (e.g. 80 m for local NVIS traffic, 40 m for regional). Field operators with different antenna capabilities all connect into the central EOC and exchange data with one another, regardless of which band they used to connect.

3 Maritime-to-land relays

Vessels at sea face rapidly changing propagation due to movement and atmospheric shifts. A maritime operator working a higher band (15 m or 10 m) connects to a coastal Cluster, which instantly bridges their messages to inland logistics teams operating on lower bands (40 m or 80 m).



SafecomLink Cluster Settings - Simple and Easy to Configure

INFINITE SCALABILITY

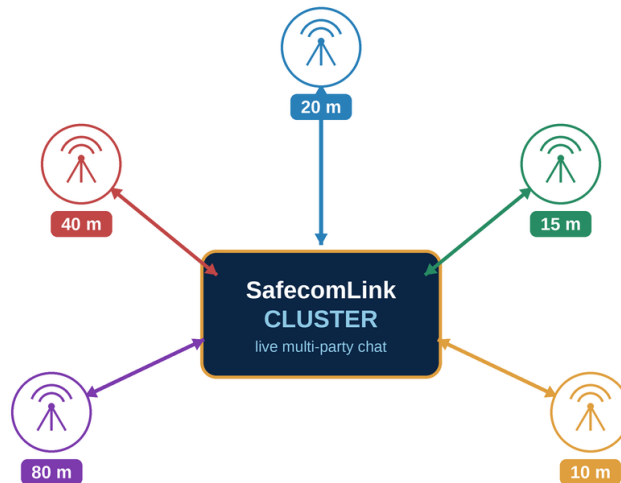
Bridging the entire HF spectrum

The Cluster design is not limited to two nodes, the software imposes no artificial limit on node quantity. A well-equipped station with the requisite transceivers, Pactor modems, and antenna separation can spin up a node for every amateur or commercial HF band.

This creates a true omni-band bridge: an operator on 80 m can instantly live-chat with operators on 40 m, 20 m, 15 m, and 10 m simultaneously, funneling all disparate RF paths into one unified, real-time data stream.

A True Omni-Band Bridge

One operator. Every HF band. A single, unified real-time data stream.



One operator at the center of every band — disparate RF paths funneled into a single real-time data stream.

SUMMARY

A paradigm shift for digital HF operations

By introducing a shared-state architecture between independent radio nodes, the SafecomLink Pactor Cluster bypasses the historical limitations of ARQ propagation dependency. Whether providing vital relays across shifting ionospheric conditions or hosting the world's first multi-station ARQ live chats, SafecomLink has redefined what is possible in grid-independent data communication.

SafecomLink

Grid-independent radio data — reliable long-range messaging, file transfer, email gateway, and AI-powered information access when traditional networks fail.

<https://www.safecomlink.com/>

