



Networks Without Boundaries



CoCo Communications Corp.

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CoCo Commercial Products

Mobile Mesh Networking

CoCo® Node (Networking Software)

- Windows, Windows Mobile, Linux
- Any point-to-any point VPN

CoCo® Tactical Mesh Router

- Battery powered
- Handheld
- Deploys with one button



CoCo® Indoor Mesh Router

- Wireless
- Forwarding device for a camera



CoCo® Outdoor Mesh Router

- Wireless
- Forwarding device for a camera
- Weatherproof design



Voice and Radio Interoperability

CoCo® Tactical Radio Gateway

- 4 radio interfaces (E&M)
- Secure Wi-Fi, Ethernet, and PTT handset
- VoIP gateway via Ethernet



CoCo® Communicator

- Voice/data/video
- Works on PCs, phones and handheld devices



CoCo® Conferencing

- Joins radio gateways, phone lines, CoCo Communicators
- Create and control conferences, and talk groups



Self Forming Networking (MANET)

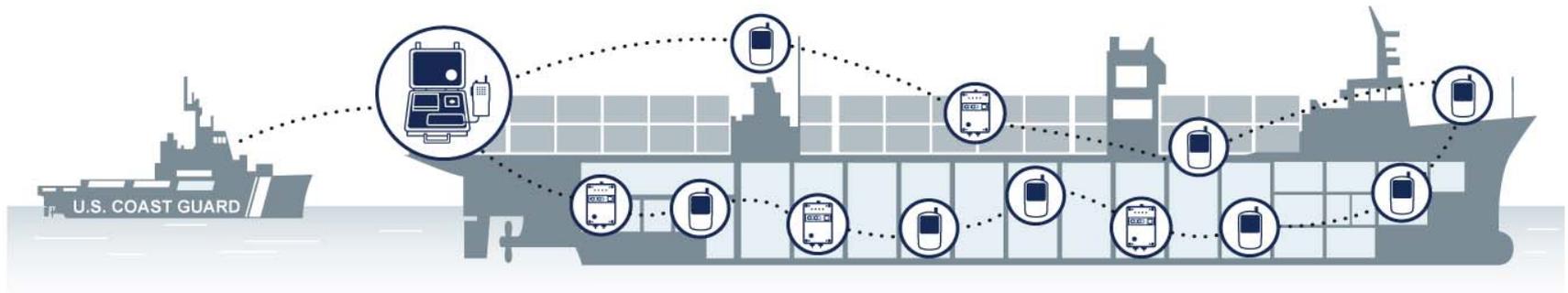
Customer Example: Coast Guard Boarding Team Communications

Their Problem:

- Lack of connectivity below decks on steel hull ships
- Decreased safety for boarding teams
- Lack of real time knowledge at HQ for decision making
- A single solution for voice, streaming video and data

Competitive Advantage:

CoCo has true MANET, it doesn't require an umbilical cord. **Other network solutions dictate predefined network boundaries interfaces, and configurations.** CoCo moves with you at the tactical edge and automatically reconfigures, so you are always connected.



Outdoor Network Extension

Customer Example: Port Security

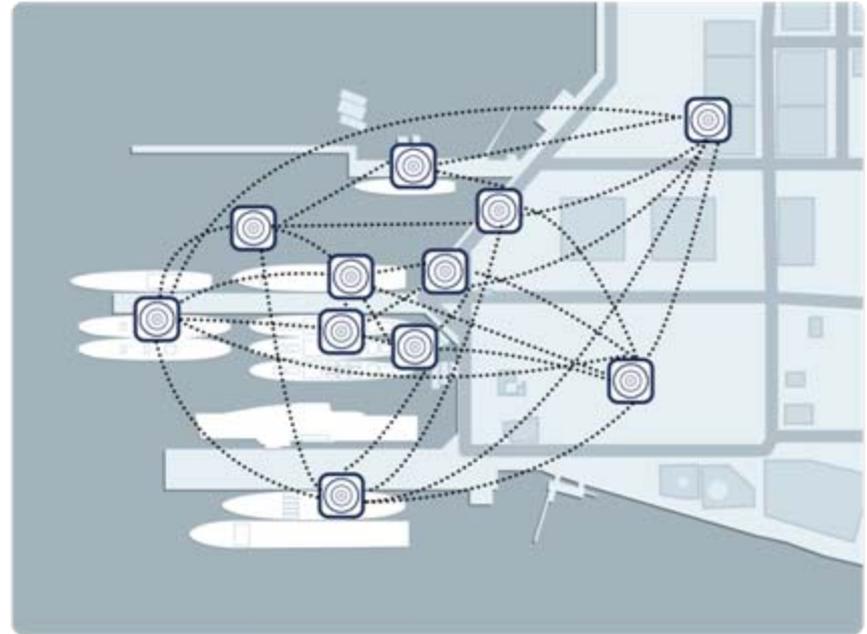
Indoor and outdoor network coverage across the entire port property.

Their Problem:

- Network works seamlessly indoors and outdoors
- Connectivity reaches the furthest edge of the port

Competitive Advantage:

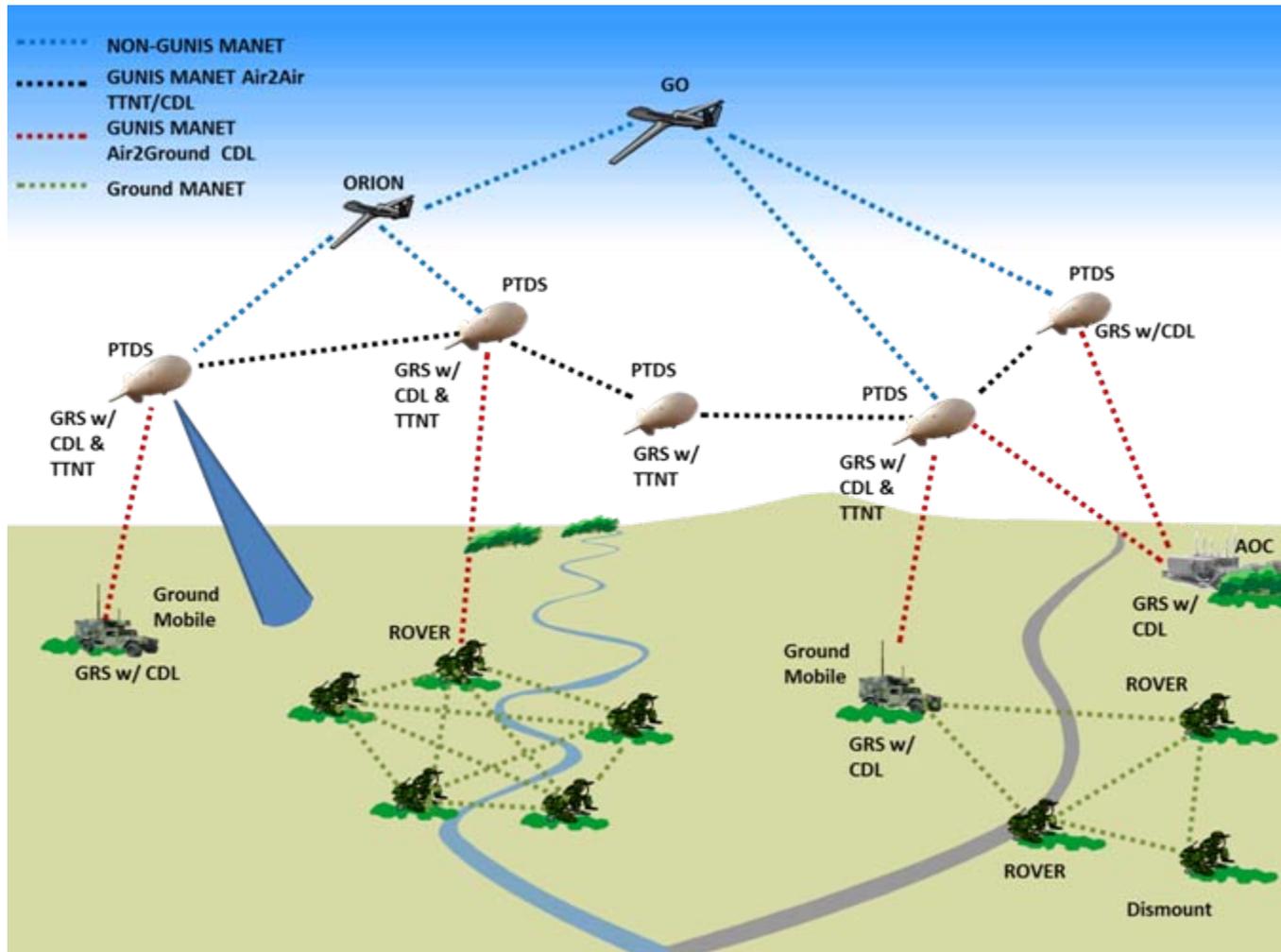
CoCo overlays existing networks to provide a **single, secure network anywhere on the property**, regardless of line of sight obstructions and also extends the boundaries of the network tactical edge as needed.



USAF Aerial Networking

- Global UAS Networking and Interoperability System (GUNIS)
- Mission: Deliver an aerial router
 - Routing in fixed networks with just 1 type of connection (Ethernet) and human operators can be difficult
 - Routing in autonomous mobile networks with multiple types of wireless connections is extremely difficult
 - Mass market routers do not meet aerial routing requirements
 - GUNIS is tasked with delivering a pre-packaged router suited for autonomous aerial networking
- Goals: GUNIS Router System (GRS)
 - Help warfighters move data using aerial assets
 - Deliver self-forming, reduced congestion networks
 - Make the router small, flexible, secure, and easy to use

GUNIS Operational View



GUNIS Router System (GRS)



COTS HW

Low SWAP requirements

5.4" x 2.2" x 6.9", ~3 lbs, 50 watts

COTS OS: Linux

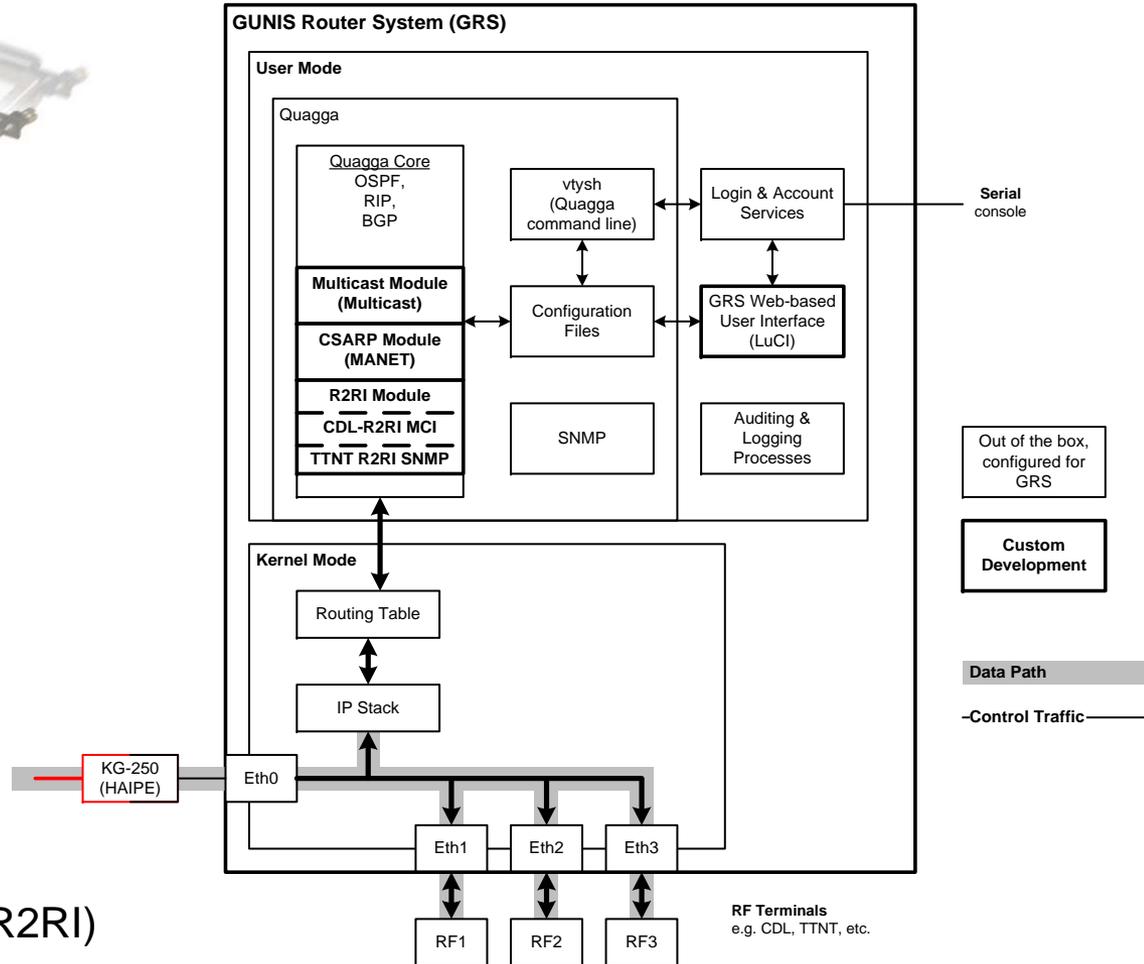
COTS routing software

Quagga routing engine

CoCo Communications MANET

GOTS Radio to Router Interfaces (R2RI)

RF link-specific



GUNIS Requirements

Performance Category	Performance Parameters
1 – Link & R2RI: IP Routing Decision	Link Establishment Time, (RF) Link Efficiency, Multicast Forwarding
2 - MANET: Radio Traffic Routing Management (RF Link Failover)	Link Failure Recovery Time, Routing Restore Time (Link technology-specific)
3 - MANET: Uninterrupted Data Flows/Network Stability (Non-disruptive Join)	Packet Loss—at merge, Packet Loss---at split, Time to Join Multicast from diff. segment
4 - Network Interoperability	Send Unicast Traffic, Send Multicast Traffic, Call Setup Time after First Connection
5- Efficiency: Traffic Control Overhead	Max Network Size w/o exceeding Overhead Limit, Traffic overhead with 30 Nodes
6- Efficiency: Loop Avoidance	End-to-End Unicast Traffic Loop Count, End-to-End Multicast Traffic Loop Count
7- Efficiency: Latency (Low Induced Latency)	TTNT Link-Induced Latency, GUNIS-Induced Latency, CDL Link-Induced Latency
8- Efficiency: Multicast Traffic	Time-to-Join first listener (Multicast), Non-Group Members Receiving Multicast Traffic
9- Efficiency: Congestion Management	Total Throughput divided by Max Link Throughput
10- Efficiency: QoS Prioritization	Jitter of Voice Packet Delivery
11-Network Management: Improved Simplicity	# of devices to configure per node, # of config setting per node, pre-mission setup time per node

DACA Focus Issues

1. What are the most appropriate SATCOM and Airborne relays and frequencies to use and why?
2. Please identify and comment on avoiding interference (I.e. coordination, etc.) from the elevated relays (DACA systems) to existing and still operational ground infrastructure so that their operation is preserved with no additional harm or disturbance.
3. Please comment on multi-protocol considerations to enable optimal relaying and interoperation to accommodate the wide varieties of communication on the ground.
4. Please comment on Ad-hoc and/or peer-to-peer mesh networking between relay craft to extend the reach of the DACA system.
5. Please comment on any Standards that are currently in place or need to be developed.

DACA – CoCo Perspectives

1. Appropriate SATCOM and Airborne relays and frequencies
 - All techs have strengths/weaknesses – cost is key independent variable
 - Consider “Exposed Node” problem
 - Consider “Disadvantaged User” size, weight, and power (SWaP) issues
2. Interference
 - Manifests as reduced signal to noise ratio (SNR) in channel
 - Is one of many SNR issues
 - Mitigation: policy, manual, autonomous, or by higher layer software
3. Multi-protocol considerations for optimal relaying and interoperation
 - Hard problem even if given dedicated spectrum, technology, budget
 - High-performance solutions tend to require cross-layering approaches
 - Moving target: military using evolutionary R&D with continuous testing
4. Ad-hoc and/or peer-to-peer mesh networking between relay craft
 - Adds substantial complexity, currently DoD cutting edge
 - Very hard to optimize without dedicated antennas, radios, routers
5. Standards
 - Consider defining “killer app”, limiting initial capability, then evolving

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