

Wednesday, August 19

1:10 PM - 1:30 PM

Scalable, Agile, Modular Edge Services: C2 That Survives Disconnection

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Abstract:

"At the tactical edge, the network is the first thing the adversary takes away. Algorithms and databases that depend on a clean link to the enterprise fail exactly when the fight begins. The requirement is an edge that keeps computing - and keeps its data coherent - through disconnection, low bandwidth, and degraded power.

ECS has built and tested a modular edge C2 platform that runs the same way on one node or many. On a single ruggedized, fanless gateway it hosts a full mission stack - tactical awareness, messaging, sensor pipelines, search, and GPU-accelerated AI inference - entirely on-device, with no reachback. The same architecture scales out to a multi-node, high-availability cluster - from a small team's minimal footprint to a command post's replicated configuration with no single point of failure. Tactical databases replicate synchronously across nodes and reconcile across sites by store-and-forward when a link returns, so no event is lost.

Connectivity and compute are treated as mission variables. Multiple transports are bonded behind automated PACE failover, and mission profiles add or shed services as power and bandwidth change. On-board AI summarizes and prioritizes data so only what matters crosses a thin link, while local inference keeps decision support alive when the cloud is gone. Modular and standards-based, the platform accepts new capability - a better model, a new sensor, another radio - per mission, and an emergency cryptographic destruct protects data if hardware is compromised.

The result is high-performance algorithmic execution and tactical database replication that scale from a single node to an entire unit - and survive the disconnected edge rather than assuming it away. ECS engineers this resilience end to end for the Army. "