



D2C pLEO:

Reshaping Military SATCOM



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Direct-to-cell Is becoming the tactical control plane for mobility

Proliferated low Earth orbit (pLEO) is already reshaping military SATCOM—mostly through broadband user terminals that look a lot like the consumer internet, just in a harder place. The next shift is quieter: 4G/5G Direct-to-Cell (D2C), also called direct-to-device (D2D), where satellites behave like cell towers and standard cellular waveforms reach handhelds and embedded modems without a dish.

That matters because modern operations are increasingly defined by things that move: small teams, ground vehicles, and uncrewed systems (UxV—UAV, USV, UGV). Mobility breaks comms first. A D2C/NTN layer won't replace MANET radios or high-throughput BLOS links; it fills a different role: persistent, low-friction, low-rate connectivity that keeps command, control, position, and short messages flowing when everything else degrades.

What “D2C via pLEO” actually is (and why “NTN” is the more useful word)

D2C is the commercial label. The engineering reality is Non-Terrestrial Networks (NTN): extending 3GPP cellular standards so user equipment (UE)—phones, tablets, and modems—can attach to space-based radio access networks. 3GPP Release 17 explicitly includes NTN work items (NR over NTN and IoT over NTN), and even calls out support for uncrewed aerial systems, which is a telling indicator of where cellular standards bodies think “mainstream mobility” is going.

The hard part of NTN is not marketing. It's physics and protocol: long and variable propagation delays, Doppler shifts from fast-moving satellites, and service continuity as cells sweep across the user. That's why standards matter; they force the ecosystem (chips, OS, apps, operators, satellites) to converge on predictable behaviors instead of one-off hacks.

In practice, today's D2C services cluster into two buckets:

- Messaging-first D2C (often LTE/4G-ish in user experience): good for SMS/MMS-class traffic, emergency alerts, and low-rate telemetry.
- Broadband-intent D2C (moving toward 5G NR-NTN): trying to deliver more general IP data and higher duty cycles, but constrained by spectrum, link budgets, and capacity per beam.

The critical point for defense users is not whether a constellation markets itself as “4G” or “5G.” The critical point is whether the service is standards-based, scalable across devices, and policy-controllable (priority, roaming, authentication, logging, and survivability under interference).

Commercial momentum is no longer theoretical

Several programs have moved from “slideware” to operational pilots and early service. In the U.S., T-Mobile’s Starlink-powered T-Satellite launched with satellite texting and expanded toward data-light application support through app optimization and OS-level frameworks.

In Europe, Vodafone and AST SpaceMobile’s SatCo joint venture has publicly targeted commercial direct-to-device services beginning in 2026, framed as an integrated satellite extension of terrestrial networks.

There’s also visible progress on the “real 5G” path: GSMA has highlighted recent testing of 5G-Advanced NR-NTN via a LEO constellation (including handover behaviors) with ESA, Airbus, Eutelsat OneWeb, and partners—exactly the kind of integration step required before anyone should promise seamless “space-to-phone broadband.”

And on the “show me it works while moving” front, Airbus and OQ Technology demonstrated a LEO 5G NTN connection to terminals mounted on a flying drone—an important milestone because mobility, orientation, and Doppler are where NTN stops being a lab experiment.

D2C for tactical users: the value is not bandwidth, it’s continuity

If you treat D2C as “cheap Starlink,” you will be disappointed. If you treat it as a resilient control and coordination layer—especially for SBU-E (Sensitive But Unclassified, Encrypted) traffic—it becomes strategically useful.

D2C’s near-term sweet spot is what tactical operators already rely on when networks are stressed

D2C’s near-term sweet spot is what tactical operators already rely on when networks are stressed: short messages, location, intent, acknowledgements, health/status, and lightweight tasking. Those are the dataflows that keep humans and machines coordinated while higher-rate payload links come and go.

Three use cases emerge immediately.

1) **Dismounted connectivity without “radio-shaped radios”**

Dismounted troops already carry phones, ruggedized handhelds, and small Android-based compute. D2C makes those devices viable as tactical endpoints in dead zones—without towers, without specialized terminals, and with radically lower training overhead than traditional radios.

For defense, the practical architecture is a “gray zone” comms layer: SBU-E traffic on commercial bearers, with end-to-end encryption, strong identity, and strict data-flow control at the edge. That layer is not a replacement for classified networks; it is a way to keep mission-relevant data moving when classified bearers are absent, overloaded, or politically constrained.

The uncomfortable truth is that most tactical comms failures are not caused by encryption strength. They’re caused by physical reality: the network isn’t there, the radio is misconfigured, or a component is damaged. D2C changes that availability equation.

2) **Ground vehicle connectivity: a new baseline for “always reachable”**

Ground vehicles are simultaneously more connected and more fragile. They need BLOS reachback for logistics, maintenance, sensor reporting, navigation updates, and C2—and they are prime targets for interference and detection.

Vehicle-mounted broadband (including LEO user terminals) solves the “big pipe” problem, but it doesn’t solve the “always reachable” problem. D2C can provide a thin but persistent channel for:

- Convoy and fleet status,
- Blue force location bursts,
- Short tasking,
- Maintenance/health telemetry, and
- Emergency fallbacks for voice/text.

That thin channel is often the difference between a degraded force and a disconnected force.

3) **UxV control: D2C as an enabling link for UAV/USV/UGV operations**

UxV operations are connectivity-hungry and failure-intolerant. Lose the link, lose the platform—or at least lose the ability to keep a human in the loop. The US and allies are pushing autonomy and swarming concepts, but operational reality still demands positive control, abort authority, and periodic human validation.

The Airbus/OQ Technology flight demo matters here because it shows a standards-based NTN link to a moving aerial platform, not a static terminal. The industry implication is straightforward: cellular NTN can become an additional command-and-control (C2) path for UAS, especially for low-rate control, health telemetry, and “return-to-safe-state” triggers.

The same logic extends to USVs and UGVs, where terrain, sea state, and clutter routinely break line-of-sight control links. D2C becomes a second (or third) control path—one that is physically decoupled from the local RF geometry.

This is also where “weapons and UxV” converge in real planning: modern precision effects (including weaponized drones) increasingly depend on networked control, mission updates, and positive deconfliction. A thin NTN control path is not about streaming video; it’s about keeping authority, safety constraints, and mission state synchronized when the primary link is contested.

The architecture layer that turns D2C into military utility

D2C by itself is just a bearer. The military value comes from what you attach to it at the edge:

- A gateway node that enforces identity and policy (who can talk, to whom, under what conditions),
- End-to-end encryption suited to the mission (including CSfC-style layered approaches where appropriate),
- Data-flow controls that prevent accidental cross-domain leakage, and
- Application behavior that degrades gracefully (text-first, metadata-first, store-and-forward).

In other words: D2C enables transport. Tactical advantage comes from transport plus controlled edge compute.

How D2C compares to MANET (Silvus-class) and broadband BLOS (Starlink-class)

Tactical networks work when they are layered. Each layer has a job. D2C is not “better than” MANET or LEO broadband; it is different, and that difference is exactly why it is valuable.

MANET (Silvus and peers): local dominance, limited reach

Mobile ad hoc networks (MANETs) like Silvus StreamCaster create self-forming, self-healing mesh bubbles that can move with the force and carry high-rate video, voice, and data among nearby nodes. They are purpose-built for mobility and contested environments, and vendors emphasize throughput, range, and resiliency using MIMO and mesh waveforms.

Their constraint is geometry: MANET still needs RF paths between nodes. In urban canyons, mountains, forests, or dispersed maritime operations, the mesh fractures unless you can keep enough relays in view. MANET is excellent inside the tactical bubble; it is not, by itself, global reachback.

Starlink/Starshield-class broadband BLOS: the big pipe with a big signature

LEO broadband terminals deliver transformative throughput and acceptable latency for many mission applications. They are also physically and electromagnetically loud: they need power, sky view, and a terminal that can be detected, targeted, and in some cases geofenced or regulated.

For many missions, the big pipe is necessary. For many others, it is excessive—and it can be a liability.

D2C/NTN: the thin, ubiquitous layer

D2C’s advantage is that it collapses the terminal problem. The endpoint is the device you already have (or a small, embedded modem), and the network is increasingly standards-driven rather than bespoke. The trade is capacity: a D2C service cannot offer “a Starlink link for every soldier” in the near term. It can offer “a viable message/control channel for many endpoints,” which is a different kind of scaling.

It also offers meaningful band diversity. LEO broadband user terminals typically operate in Ku/Ka bands. D2C services are usually in sub-6 GHz cellular bands (often paired with licensed mobile operator spectrum). From an interference and equipment standpoint, that forces an adversary to solve a different problem set to deny the backup link.

A practical comparison

Capability focus	MANET (Silvus-class)	LEO broadband (Starlink-class)	pLEO D2C/NTN
Primary role	local mesh inside the force	high-throughput reachback	ubiquitous control/messaging layer
Terminal	dedicated radios + antennas	dedicated user terminal	standard phone/small modem
Throughput	high (local)	very high	low to moderate (near-term)
Best at	video/voice/data across mobile teams	ISR backhaul, collaboration, large file transfer	C2 continuity, status, safety, SBU-E messaging
Key constraint	needs RF paths and density	signature, power, terminal logistics	capacity, spectrum/regulatory access

The winning architecture is not a choice between these. It is combining them: MANET for local maneuver and sensor sharing, LEO broadband for payload backhaul, and D2C as the always-there coordination layer that binds humans and machines when the other layers get punched in the face.

Iran and the reality of contested commercial SATCOM: link diversity is not optional

January 2026 delivered a blunt reminder that LEO broadband is not magically immune to state pressure. Forbes framed Iran’s Starlink disruption as a kind of “kill switch,” and other reporting described a major communications blackout amid unrest, with Starlink connectivity becoming patchy and degraded in some areas—attributed to interference/ jamming and GPS disruption effects that can impact user terminals.

This is not an Iran-specific lesson. It is the general rule: commercial SATCOM is a battlefield system the moment it matters. If a force depends on one link, the adversary only has to solve one problem.

Commercial SATCOM is a battlefield system the moment it matters

This is where a cheap, out-of-band D2C path becomes strategically interesting even for Starlink/Starshield users. D2C can serve as:

- An alternate command channel for dispersed teams when broadband links are jammed or politically throttled,
- A low-rate management plane for terminals and edge nodes (status, rekey, fallback instructions),
- A path for minimal mission-essential traffic when the big pipe is denied, and
- A redundancy layer that complicates adversary targeting and timing.

Treat D2C as link diversity, not as a replacement for broadband. The goal is graceful degradation: when you lose the big pipe, you do not lose command, control, and coordination.

Security, sovereignty, and the global connectivity problem

D2C pushes defense users into a reality that is technical, legal, and political at the same time:

- **Spectrum:** D2C often rides terrestrial operator spectrum. Access depends on agreements, licensing, and host-nation policy.
- **Control:** A commercial operator can prioritize, throttle, geofence, or shut down service under legal pressure.

- **Attribution:** Traffic that crosses commercial infrastructure needs strong identity and auditability, especially for coalition operations.
- **Data protection:** Even if the bearer is “black,” the payload must be protected end-to-end.

This is where the defense conversation needs to mature. Global connectivity is not a constellation count; it is a planning discipline:

- 1) **Multi-path by design:** Assume every bearer will fail. Build operational plans that use two or three independent paths (MANET + broadband + D2C, or D2C + other resilient bearers).
- 2) **Policy-defined roaming:** Pre-negotiate access across multiple mobile network operators and satellite network operators, including coalition and expeditionary contexts.
- 3) **Crypto with a roadmap:** Call the tipping point “Q Day” or just inevitable cryptographic transition—“harvest now, decrypt later” is already a real threat, and post-quantum migration timelines are measured in program cycles, not research cycles.
- 4) **Edge enforcement:** Keep data governance close to the user—classification tagging, data loss prevention, and mission-role-based access—because once traffic hits a commercial bearer, you have forfeited physical control.

None of this requires classified magic. It requires engineering rigor and procurement seriousness.

Why the U.S. should accelerate NTN experimentation now

The U.S. does not lack SATCOM. It lacks a broad, repeatable, standards-aligned practice of integrating commercial NTN into tactical architectures at scale—especially for SBU-E and coalition operations where speed and ubiquity matter.

NTN experimentation should be treated like an integration campaign, not a science fair

- **Test in motion:** UAS, USV, UGV, convoys, and dismounted movement in representative terrain.
- **Measure what matters:** attach time, latency distributions, message completion under load, handover behavior, and power draw on real devices.
- **Stress interference:** not to teach people how to jam, but to learn how networks fail and how quickly they recover under realistic RF congestion and benign interference.
- **Exercise governance:** priority policies, identity management, logging, and the ability to revoke/restore access quickly.
- **Validate thin-channel concepts:** build playbooks for operating on minimal bandwidth (text-first C2, map tiles, small metadata, compressed imagery bursts).

A D2C/NTN layer is most valuable when the environment is messy and adversarial. That is exactly why peacetime is the right time to test it: you cannot improvise interoperability, roaming rights, and security controls during a crisis.

Bottom line

pLEO D2C is emerging as a new connective tissue between tactical mobility and global networks. It is not the next Starlink, and it is not a replacement for MANET radios. It is the missing control plane: the thin, persistent, standards-based layer that keeps people and uncrewed systems connected when high-rate links drop, local meshes fracture, or politics turns off the lights.

pLEO D2C is the missing control plane: the thin, persistent, standards-based layer that keeps people and uncrewed systems connected

The force that treats D2C/NTN as a layered component—alongside MANET and broadband BLOS—gets resilience. The force that treats it as a single “next network” gets surprise and disappointment.

About Fuse Integration

Fuse is a warfighter-focused, non-traditional engineering firm providing innovative communications, networking and computing solutions for defense customers. The company’s virtualized network systems, tactical edge network and airborne networking gateway products improve the sharing of information, video, text and voice among warfighters throughout airborne, maritime and ground environments. Founded in 2010, Fuse is a service-disabled veteran-owned small business with headquarters in San Diego and a corporate office in Washington, D.C.

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