

EELINK | CONNECTIVITY GUIDE

GPT12-X Ultra

Connectivity & SIM Planning Guide

How to select the right network technology, SIM strategy and power-saving configuration for GPT12-X Ultra deployments across North America, Europe and global markets — and what to verify before committing to volume.

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1. Purpose of This Guide

GPT12-X Ultra connects exclusively via LTE-M and NB-IoT — the two 3GPP LPWAN technologies designed for low-power, wide-area IoT devices. It has no 2G or 3G fallback. This design choice is deliberate: it enables the PSM + eDRX sleep architecture that delivers multi-year battery life, but it also means that connectivity planning matters more than it does for a multi-mode device.

This guide helps platform buyers and deployment engineers answer four questions before scaling:

1. **LTE-M or NB-IoT?** Which technology fits my deployment, and does my target region support it?
2. **Which SIM strategy?** Plastic nano-SIM, eSIM (eUICC), or multi-IMSI — and what matters for cross-border assets?
3. **How do PSM and eDRX affect my operations?** What can I expect in terms of reachability, wake latency and remote control?
4. **How do I verify coverage before volume?** What to test in a pilot to avoid surprises at scale.

This document is intended for engineering, procurement and connectivity teams evaluating GPT12-X Ultra for standard deployment or OEM/ODM programs.

2. LTE-M vs NB-IoT: Choosing the Right Technology

GPT12-X Ultra supports both LTE-M (LTE Cat-M1) and NB-IoT (NB2) on the same hardware. The device registers on whichever technology the inserted SIM and local network provide.

Understanding the differences helps you choose the right SIM plan and set expectations.

2.1 Technology comparison

Characteristic	LTE-M (Cat-M1)	NB-IoT (NB2)
Bandwidth	1.4 MHz	200 kHz (narrowband)
Typical data rate	300 kbps–1 Mbps	50–150 kbps
Mobility support	Full mobility, cell handover	Limited; best for stationary or slow-moving assets
Voice (VoLTE)	Supported (not used by GPT12-X)	Not supported
Latency	Lower (10–100 ms typical)	Higher (1–10 s typical)
Deep-indoor penetration	Good	Better (extended coverage mode)
PSM + eDRX support	Yes	Yes
SMS support	Yes — used for remote wake and commands	Operator-dependent; some NB-IoT networks restrict SMS
FOTA suitability	Better (higher throughput for firmware images)	Possible but slower and more energy-intensive
N. America availability	Widely deployed (AT&T, T-Mobile, Verizon)	Limited in N. America; primarily Verizon/T-Mobile in select areas
Europe availability	Growing (Vodafone, Deutsche Telekom, Orange)	Broadly deployed (Vodafone, DT, Swisscom, KPN, etc.)

2.2 Eelink recommendation

Default to LTE-M for most GPT12-X Ultra deployments.

LTE-M offers full mobility (cell handover while moving), reliable SMS for remote wake/commands, faster FOTA sessions, and broader North American coverage. Use NB-IoT only when deploying in regions where NB-IoT is the dominant or sole LPWAN technology (e.g., parts of Europe, China) or when deep-indoor penetration is critical and assets are stationary.

For global or multi-region deployments where assets cross borders, a multi-IMSI or eSIM (eUICC) SIM that supports both LTE-M and NB-IoT with automatic fallback between them provides the most robust coverage. See Section 4.

3. Supported Frequency Bands & Regional Coverage

GPT12-X Ultra supports 17 LTE-M / NB-IoT bands, covering the most commonly used IoT spectrum across North America, Europe, Asia-Pacific and other regions:

Supported bands

B1 / B2 / B3 / B4 / B5 / B8 / B12 / B13 / B14 / B17 / B18 / B19 / B20 / B25 / B26 / B28 / B66

3.1 Band-to-region mapping

Region	Key bands	Major operators (LTE-M / NB-IoT)
North America	B2, B4, B5, B12, B13, B14, B25, B26, B66	AT&T (B2/4/12/14/66), T-Mobile (B2/4/12/66/25), Verizon (B4/5/13), FirstNet (B14)
Europe	B1, B3, B8, B20, B28	Vodafone (B8/20), Deutsche Telekom (B8/20), Orange (B3/20), Swisscom (B8/20/28), KPN (B8/20)
UK	B1, B3, B8, B20, B28	Vodafone UK (B8/20), Three (B1/3/20/28), EE (B3/20)
ANZ	B1, B3, B5, B8, B28	Telstra (B3/28), Optus (B1/3/28), Spark NZ (B1/3/28)
Japan / Korea	B1, B3, B5, B8, B18, B19, B26	NTT DoCoMo (B1/19), KDDI (B1/18/26), SoftBank (B1/8)
Southeast Asia	B1, B3, B5, B8, B28	Availability varies by country; confirm with local operator
Latin America	B2, B3, B4, B5, B8, B28	Early-stage LTE-M/NB-IoT in most markets; verify per country

No 2G / 3G fallback

GPT12-X Ultra will not connect in areas served only by 2G or 3G networks. As operators continue to sunset legacy networks, LTE-M/NB-IoT coverage is expanding — but it is not yet universal. Always confirm coverage at your deployment sites with the SIM provider before ordering in volume.

4. SIM Selection & Strategy

Choosing the right SIM determines roaming capability, logistics complexity and long-term cost. Three options apply to GPT12-X Ultra:

4.1 Option comparison

	Plastic Nano-SIM	eSIM (eUICC)	Multi-IMSI SIM
Form factor	Physical card, inserted in SIM tray	Embedded chip, soldered or MFF2 (requires hardware support)	Physical card with multiple network profiles
Provisioning	Manual insertion per unit	Remote profile download (OTA)	Pre-loaded profiles, auto-select best network
Cross-border	Tied to one operator; roaming via operator agreement	Switch profiles OTA per region	Auto-selects local profile; best for roaming assets
Cost model	Per-SIM contract with one operator	Platform fee + per-profile data	Bundled multi-region data plans
Best for	Single-country fleets, price-sensitive deployments	Global programs, OEM pre-integration	Multi-region logistics, trailer/container tracking
Providers (examples)	Local operators (AT&T, Vodafone, etc.)	1NCE, Truphone, KORE, Pelion	1NCE, floLIVE, Eseye, BICS

4.2 Eelink recommendation

- **Single-country, known sites:** A standard plastic nano-SIM from the local LTE-M/NB-IoT operator is simplest and cheapest. Confirm the operator's IoT data plan explicitly supports LTE-M or NB-IoT (not just "4G").
- **Multi-region or cross-border assets:** Use a multi-IMSI SIM or eSIM (eUICC) from a global IoT connectivity provider. Assets that cross borders — trailers, containers, pallets — need a SIM that can attach to local networks without manual swaps.
- **OEM / ODM programs:** Discuss SIM pre-integration with Eelink during the ODM planning phase. GPT12-X Ultra can ship with SIMs pre-inserted, APNs pre-configured and IMEIs pre-registered on your platform, reducing field deployment to physical installation only.

SIM PIN and data plan checklist

Before inserting any SIM into GPT12-X Ultra: (1) Disable the PIN code using a mobile phone. (2) Confirm the data plan is active and credited. (3) Confirm the plan supports LTE-M or NB-IoT, not legacy-only. (4) Note the SIM's ICCID for your deployment log.

5. PSM + eDRX: Power Saving & Reachability

GPT12-X Ultra's multi-year battery life depends on PSM and eDRX — but these mechanisms also affect how quickly you can reach a sleeping device. Understanding the trade-off is essential for operations planning.

5.1 How PSM works

In Power Saving Mode, the device tells the network "I will be unreachable for the next N minutes/hours." During this period, the modem draws microamp-range current — essentially off, but

the network registration remains valid. When the PSM timer expires, the device briefly wakes, checks for queued downlink messages, and either reports or returns to sleep.

Consequence: A device in PSM cannot be reached by SMS or downlink until the next scheduled wake window. For assets reporting once per day, this can mean up to ~24 hours of unreachability.

5.2 How eDRX works

Extended Discontinuous Reception keeps a lightweight, periodic listening window open — even during the PSM period. Every eDRX cycle (configurable from seconds to minutes), the device briefly listens for paging from the network. If an SMS or downlink command is waiting, the device wakes and processes it.

Consequence: eDRX makes a PSM device reachable within one eDRX cycle, at the cost of slightly higher average power. The practical result is a device that sleeps deeply but can be woken remotely in seconds to minutes.

5.3 What this means for your operations

Scenario	Expected behavior
Scheduled position report	The device wakes on its configured interval (e.g., every 24 hours), acquires a GNSS fix, transmits the report, checks for queued commands, and returns to PSM. Fully automatic.
Remote wake via SMS	Send an SMS command (e.g., WHERE#). The command is queued at the network. The device receives it at the next eDRX listening window and responds. Typical delay: seconds to a few minutes, depending on eDRX cycle configuration.
Mode switch (e.g., to Emergency)	Send the mode-switch SMS or platform command. The device receives it at the next eDRX window, switches to Emergency mode and begins high-frequency reporting. Reversion to the previous mode is automatic after the configured window.
FOTA firmware update	The update is queued on the server. At the next device check-in, the update is initiated. The device stays awake during the download — budget this energy cost explicitly in your battery planning (see Battery Life White Paper).
Device completely unreachable	If the device is in PSM without eDRX enabled, or if it is in an area with no LTE-M/NB-IoT coverage, it cannot be reached until it wakes on schedule or moves to a covered area. This is by design, not a fault.

5.4 Configuration guidance

- **The default PSM and eDRX settings shipped with GPT12-X Ultra are calibrated for Long Standby mode** (one report per day, eDRX enabled for remote reachability). These defaults balance battery life and responsiveness for most deployments.
- **For faster remote responsiveness, shorten the eDRX cycle** — but note that shorter cycles mean more frequent wake-listen events and higher average power consumption.
- **For maximum battery life, lengthen or disable eDRX** — but accept that the device becomes unreachable between scheduled reports.

- **PSM and eDRX parameters can be configured remotely** via SMS commands or platform settings. Changes take effect at the next device check-in.

Consult the Eelink engineering team for recommended PSM/eDRX configurations for your specific use case and target operators.

6. APN & Server Configuration

GPT12-X Ultra connects to your tracking platform via APN (Access Point Name) and server address settings. These are typically configured once during provisioning.

6.1 Key parameters

Parameter	Description
APN	The access point name provided by your SIM operator (e.g., "iot.1nce.net", "m2m.att.com", "nb-iot"). Must match the SIM's data plan exactly. Wrong APN = no data connection.
Server address	IP address or hostname of your tracking platform (Keelin or your own server). Example: your.server.com
Server port	TCP or UDP port on which the platform listens for EELINK protocol messages. Default Keelin port is provided by Eelink sales.
Protocol	EELINK binary protocol over TCP or UDP. UDP is slightly more power-efficient; TCP is more reliable in poor-coverage areas.

6.2 Configuration methods

- **SMS commands:** Send APN, SERVER and PORT commands to the device SIM number. See the SMS Command List for exact syntax. Example: APN,iot.1nce.net# and SERVER,1,your.server.com,8001#
- **USB configuration tool:** Connect via USB Type-C and use the Eelink configuration utility to set parameters in bulk before shipping devices to the field.
- **OEM pre-configuration:** For ODM programs, Eelink can flash APN, server and SIM settings at the factory so devices connect to your platform out of the box.

7. Cross-Border & Roaming Considerations

Trailers, containers and pallets regularly cross national boundaries. Connectivity planning must account for this:

- **Roaming agreements:** A domestic SIM typically roams via operator agreements, but IoT roaming is not guaranteed in all markets. Some operators restrict IoT roaming or charge significantly more. Verify roaming terms with your SIM provider for each country in your asset's corridor.
- **Permanent roaming restrictions:** Some countries (notably parts of the EU and Brazil) restrict permanent IoT roaming. Assets that reside in a foreign country for extended periods may need a local SIM profile. Multi-IMSI and eSIM (eUICC) strategies address this by switching to a local profile automatically.

- **Band compatibility:** GPT12-X Ultra's 17 bands cover the major LTE-M/NB-IoT spectrum globally, but coverage depends on which bands local operators have activated for IoT. A band match does not guarantee coverage — check the operator's IoT coverage map for each corridor.
- **SMS availability while roaming:** SMS-based remote wake and command delivery depend on the roaming agreement including SMS. Some IoT-only roaming profiles restrict SMS. Confirm SMS support with your connectivity provider.

Recommendation for cross-border fleets

Use a global IoT connectivity provider (1NCE, Eseye, KORE, floLIVE, BICS) with multi-IMSI or eUICC SIM that auto-selects the best local network in each country. Pre-test each corridor in your pilot (Section 8).

8. Connectivity Verification in a Pilot

Before committing to volume SIM orders and fleet-scale deployment, verify connectivity on a pilot of 50–100 units across your real conditions:

5. **Test in every corridor and site type.** Include urban, suburban, rural, indoor and cross-border scenarios relevant to your fleet.
6. **Measure registration time.** How long from power-on to first platform report? Consistently slow registration suggests marginal coverage.
7. **Log GNSS fix times.** Report payloads include fix duration. Sites where GNSS takes >30 seconds consistently need a mounting position review (see Deployment Guide).
8. **Test SMS reachability.** Send WHERE# to pilot devices at different times of day. Measure response time. If SMS is consistently undelivered, investigate eDRX settings or operator SMS restrictions.
9. **Track data consumption.** Measure per-device monthly data usage across modes. Typical GPT12-X Ultra in Long Standby uses well under 1 MB/month. Excessive data may indicate retry loops from marginal coverage.
10. **Verify roaming transitions.** For cross-border assets, confirm the SIM attaches to the expected local operator in each country and that reports continue uninterrupted across borders.

Document all findings and feed them into your volume SIM contract negotiations and your fleet configuration profile.

9. Connectivity Cost Planning

LTE-M / NB-IoT data costs for asset trackers are typically low, but planning prevents surprises:

Cost factor	Planning guidance
Monthly data per device	GPT12-X Ultra in Long Standby (1 report/day) uses roughly 0.1–0.5 MB/month. Activity and Emergency modes use more. Budget 1 MB/month as a conservative baseline for mixed-mode fleets.
SIM pooling	Many IoT connectivity plans offer data pooling across all SIMs in an account. For large fleets, pooling smooths out per-device variation and

	reduces waste.
Roaming surcharges	IoT roaming rates vary dramatically. Global IoT providers typically offer flat per-MB or per-device-per-month rates that include roaming; domestic operators may charge premium roaming rates.
SMS costs	SMS is used for remote wake, mode switching and configuration. Budget 5–20 SMS per device per month for active management. Some plans include SMS; others charge per message.
Minimum term / commitment	IoT SIM contracts often have 12–36 month minimums. For a device with 3–5 year life, ensure the connectivity contract covers the full deployment horizon, or negotiate renewal terms upfront.

10. Related Resources

Document	Where to find it
GPT12-X Ultra product page	eelinktech.com/gpt12-x-ultra-lte-m-nb-iot-asset-tracker/
Battery Life White Paper + Calculator	eelinktech.com → Resources → White Papers
Deployment & Installation Guide	eelinktech.com → Resources → Guides
SMS Command List	eelinktech.com/command-list/
Protocol & Integration Docs	Request from info@eelinktech.com

11. About Eelink

Shenzhen Eelink Communication Technology Co., Ltd., founded in 2004, is an ODM manufacturer of GPS and IoT tracking hardware serving customers in 100+ countries. R&D is based in Shenzhen, with dual manufacturing sites in Yibin, China and Haiphong, Vietnam providing 500,000+ units/month combined capacity for supply chain resilience, operating under ISO 9001, ISO 14001, IATF 16949 and ISO 45001 quality systems.

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