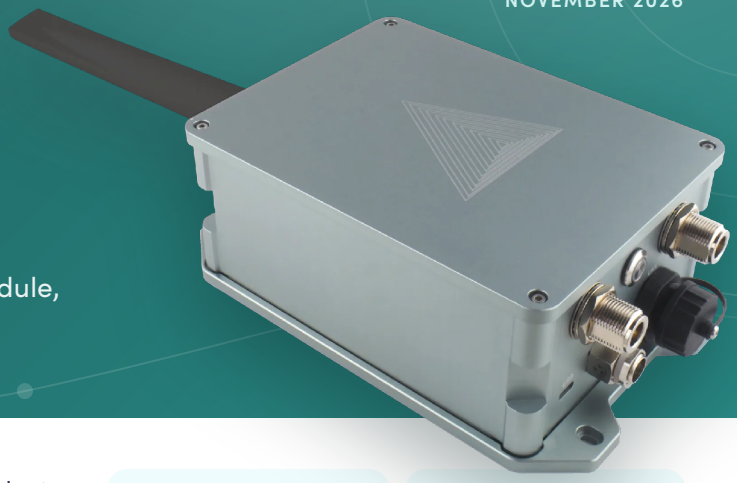
MODULAR EDGE GATEWAY

Quantumlink Gateway

LTE, LoRa, GNSS, UWB, Bluetooth and Zigbee, Thread or Matter as plug-in cards, on a Raspberry Pi compute module, managed from tapdo fleet.



The Quantumlink Gateway puts a Raspberry Pi Compute Module 4 or 5 on a baseboard built for radios. Three Mini PCIe slots take LTE, a LoRa concentrator and one more card; two M.2 slots take NVMe storage or an accelerator. A co-processor controls power, slot resets and SIM selection, so you can restart a hung modem without a site visit. The gateway runs tapdo OS and is managed from tapdo fleet.

3 + 2
Mini PCIe and M.2 slots

3
power inputs: DC, PoE+, USB-C PD

16 GB
RAM at most, with CM5

A/B
OS slots with automatic rollback

KEY FEATURES

Raspberry Pi CM4 or CM5
Quad-core Arm, up to 16 GB RAM and 64 GB eMMC, Wi-Fi 5 and Bluetooth 5.0.

Three ways to power it
8–24 V DC, PoE+ (802.3at) or USB-C PD 5–20 V, with 5 A rails for 3.3 V and 5 V.

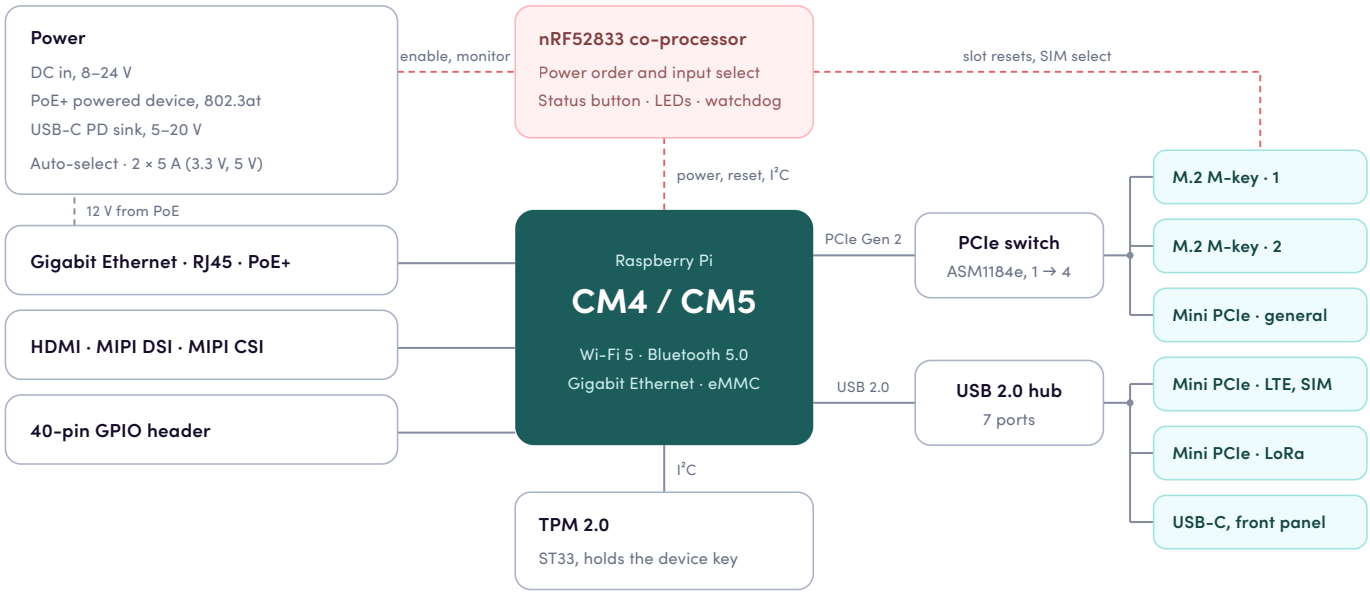
Keys in hardware
Every board has a TPM 2.0. The gateway's key is generated inside it and never leaves it.

Five expansion slots
3 × Mini PCIe for LTE, LoRa and one more radio; 2 × M.2 M-key behind a 4-port PCIe switch.

Recovers on its own
The nRF52833 co-processor resets slots, switches the SIM and power-cycles the module.

Managed from tapdo fleet
Signed A/B OS updates, Docker apps, logs, remote shell and an audit log.

BLOCK DIAGRAM



data ---- control by the co-processor ---- power. Simplified from the Rev. 5.0 schematics; the general Mini PCIe slot also has USB, the LoRa slot adds SPI and GPIO.

SPECIFICATIONS

Compute

Module	Raspberry Pi Compute Module 4 or 5
Processor	CM4: Broadcom BCM2711, 4 × Cortex-A72, 1.5 GHz CM5: Broadcom BCM2712, 4 × Cortex-A76, 2.4 GHz
Memory	CM4: 1–8 GB LPDDR4 CM5: 2–16 GB LPDDR4X
Storage	eMMC on the module: up to 32 GB (CM4), 64 GB (CM5); NVMe in M.2
Clock	CR2032 holder for the CM5 real-time clock

Networking

Ethernet	1 × 10/100/1000BASE-T, RJ45 with sealed cap
Wi-Fi	802.11ac, 2.4 and 5 GHz, from the compute module
Bluetooth	5.0, from the compute module
Cellular	LTE modem in a Mini PCIe slot: Quectel, SIMCom, Fibocom and others
SIM	SIM card slot, eSIM option; selected by the co-processor
LoRa	Dedicated Mini PCIe slot for an SX1302 concentrator with SX1261, PPS line
Antennas	3 × N-type female: LTE and Wi-Fi on the front, LoRa on the rear

Expansion

PCIe switch	ASMedia ASM1184e, 1 upstream to 4 downstream ports, PCIe Gen 2 ×1
M.2	2 × M-key, PCIe ×1 each, for NVMe SSDs or accelerators
Mini PCIe	3 slots General: PCIe, USB · LoRa: SPI, USB, GPIO · LTE: USB, SIM, UART
USB	7-port USB 2.0 hub; front USB-C as host, or to the module for flashing
Display, camera	HDMI; MIPI DSI and CSI on 22-pin FPC connectors
GPIO	40-pin header in the Raspberry Pi layout

Security

TPM	TPM 2.0 (ST33), on every board
Identity	Each gateway signs in to tapdo fleet with its own key, generated in the TPM
OS updates	Signed bundles, A/B root slots, rollback after three failed boots

Power

DC input	8–24 V DC
PoE+	IEEE 802.3at powered device (Silicon Labs Si3404)
USB-C PD	Sink, 5–20 V
Protection	Automatic input selection, reverse polarity and surge protection, 10 A fuse
Rails	2 × 5 A buck converters, 3.3 V and 5 V
Monitoring	Input voltage, current and power (TI INA226), read by the co-processor

Co-processor

Controller	Nordic nRF52833, Arm Cortex-M4F
Tasks	Power-up order and input selection; module power, reset and boot mode; slot resets; SIM selection; LTE wake; status button and LEDs
Radio	SMA connector on the board; Bluetooth LE and 802.15.4 capable

Enclosure and environment

Enclosure	Milled aluminium; flange with four mounting holes
Front panel	LTE, Reset/Status (RGB), Wi-Fi, USB-C, DC gland, LAN with cap
Rear panel	LoRa
Dimensions	124 × 194 × 71 mm
Weight	720 g
Operating temp.	–20 °C to +85 °C
Conformity	CE, Radio Equipment Directive (RED)

Software

Operating system	tapdo OS: Linux built with Buildroot, Docker Engine
OS updates	RAUC A/B, rolled out per feed, pausable
Apps	Docker containers from a compose file, deployed per fleet
Operations	Logs, remote shell, audit log, teams with roles
Hosting	tapdo fleet runs in Frankfurt, Germany

CONNECTORS



Front

LTE N-type female
Reset / Status push button, RGB ring
DC in cable gland
Wi-Fi N-type female
USB USB-C, also PD power in
LAN RJ45, PoE+, sealed cap



Rear

LoRa N-type female

TAPDO EXPANSION CARDS

CARD	WHAT IT ADDS	TYPICAL USE
LTE	Mini PCIe modem: Quectel, SIMCom, Fibocom and others	Backhaul where there is no network on site
LoRa concentrator	LoRaWAN gateway radio for the dedicated LoRa slot	Meters, sensors and trackers over kilometres
RTK GNSS	u-blox F9P or F9R; optional Xsens IMU for dead reckoning	Centimetre positioning, vehicles and machines
UWB	Ultra-wideband transceivers	Indoor positioning and ranging
Bluetooth	One, two or three nRF52 radios on one card	Many tags, beacons and sensors at once
Multi-radio	Zigbee, Thread and Matter; Home Assistant compatible	Building and home automation devices
Industrial I/O	2 relays and 2 MOSFET input detectors	Switch loads, detect contacts and alarms
USB-C hub	4 × USB-C	Serial adapters, sticks and other USB devices
M.2	Standard M-key modules, PCIe ×1	NVMe storage, AI accelerators

EXAMPLE BUILDS

LoRaWAN gateway
A LoRaWAN network that reports over LTE.
LoRa · LTE

Positioning
Centimetre GNSS outdoors, UWB indoors, Bluetooth tags.
RTK GNSS · UWB · LTE

Building
Zigbee, Thread and Bluetooth devices in one place.
Multi-radio · Bluetooth · LTE

Industrial edge
Switch and sense on site, store data locally.
Industrial I/O · LTE · NVMe

MANAGED FROM TAPDO FLEET

- One compose file deploys the Docker apps to every gateway in a fleet.
- Each gateway installs OS updates into its spare slot and falls back if the new image does not come up.
- You read a gateway's logs and open a shell on it from your terminal.
- Teams and customers get separate tenants with their own sign-in and roles, and every change goes into the audit log.

Ordering

We assemble each gateway to order, with the compute module, memory and cards you need. Ask us for a configuration and a quote.

tapdo
Wilhelm-Schickard-Straße 14
48149 Münster, Germany
info@tapdo.io · tapdo.io

Specifications may change without notice. Raspberry Pi is a trademark of Raspberry Pi Ltd.