



Front Desk Sidecar — Technical overview

Independent radio connectivity for field equipment

Out-of-band management over long-range radio

The Sidecar is an attachable radio module that gives Front Desk a second, independent path to a field device. The concept matches out-of-band server management (IPMI or iDRAC): a management controller that still answers when the host operating system or the primary network path has failed. The Sidecar is much simpler than a server BMC, but it does the same job for field equipment. The radio path carries presence, status, alarms, small diagnostics, configuration, commands, results, and recovery actions. Interactive sessions, large files, and software delivery remain on the device's normal Front Desk IP connection.

The module

The radio core is the Texas Instruments CC1312PSIP, an RF-certified Sub-1-GHz system-in-package. It also provides two UARTs, two synchronous serial interfaces, I²C, ADC, and GPIO. These interfaces let one module connect to many kinds of equipment.

Local interfaces

- **USB-C:** the normal Windows or Linux connection. A TI TUSB3410 provides USB; the module appears to the host as a serial device (for example, Front Desk Sidecar on COM17), and the Front Desk agent speaks a compact local protocol over that port
- **RS-232 / RS-485:** for equipment that already exposes serial diagnostics, such as PLCs, vending machines, safe controllers, legacy kiosks, fuel dispenser controllers, and access controllers
- **GPIO, digital inputs, relay outputs:** power-good, host heartbeat, door and tamper inputs, UPS and fault contacts, host reset, and power-cycle control

Surviving host failure

When the Sidecar has independent power and hardware signals, it remains useful after the host fails. If the operating system has crashed, the operator can still ask:

```
RADIO alive?      YES
Host heartbeat?   NO
Power present?    YES
Host current?     2.4 A
> HOST_RESET
```

The operator can then command a hardware-level reset or a power relay. Each installation enables hardware actions under the account's policy.

The radio

- **Band:** Sub-1-GHz operation in 902–928 MHz. The design reuses the CC1312PSIP FCC modular certification per TI's design documentation
- **Protocol:** TI 15.4 with frequency hopping, plus the 5-kbps SimpleLink Long Range PHY for reach at low data rates
- **Security:** AES-128 packet encryption with per-frame authentication. Endpoints accept only authorized Front Desk hubs
- **Bandwidth:** a management path, not broadband. A typical exchange is a few hundred bytes

The hub

The hub uses the same CC1312PSIP radio core with a host processor and an Ethernet, LTE, or Wi-Fi uplink. The hub is mains powered and serves many nearby Sidecars. A typical order is one hub and a dozen Sidecars instead of one cellular subscription per machine. A hub may be fixed, portable, vehicle-mounted, temporarily deployed, or airborne. When the hub has no live uplink, it stores device reports and synchronizes them when connectivity returns. Queued commands travel to devices the next time a hub is in range.

Deployment modes

Normal: device → Internet → Front Desk. Radio: device → Sidecar → hub → Internet → Front Desk. Intermittent: the hub stores and relays. Isolated: a portable, vehicle-mounted, or airborne hub is brought within range, and a technician can read every device on a property before touching any of them. The management model is identical in every mode; only the transport changes.



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Protocol, frame format, and product boundaries

FD-Radio frame format

Sidcars and hubs exchange compact authenticated frames. The layout and message classes below describe the working design. Field sizes and classes are refined with early-access customers.

Frame layout

Version	1 byte
Flags	1 byte
Source ID	8 bytes
Destination ID	8 bytes
Sequence	4 bytes
Message type	2 bytes
Payload length	2 bytes
Payload	0–N bytes
Authentication	per policy
CRC	frame check

Product boundaries

- Not broadband: the radio path does not carry full-motion remote desktop, large downloads, large file transfers, or video. Those operations belong on the normal IP connection
- No universal range number: reach depends on terrain, antennas, installation, interference, enclosures, regulatory limits, and hub elevation. The product claim is continued useful communication
- Not a generic IoT cloud: the radio path is part of the device-management control plane. It carries an operational conversation, not only measurements
- Airborne hubs operate subject to applicable aviation, radio, and authorization requirements

Message classes

0x01–0x04	HELLO · HEARTBEAT · STATUS · ALARM
0x10–0x12	COMMAND · COMMAND_ACK · COMMAND_RESULT
0x20	TELEMETRY (compact)
0x30–0x31	CONFIG_READ · CONFIG_WRITE
0x40–0x41	LOG_REQUEST · LOG_FRAGMENT
0x50	HOST_CONTROL (reset, power relay)
0x60	ROUTE / GATEWAY

Graceful degradation

Over broadband, Front Desk provides the full product: interactive GUI and terminal sessions, files, logs, software delivery, and rich diagnostics. Over the radio path, Front Desk provides the management essentials: presence, health, alarms, small diagnostics, configuration, commands, results, recovery, and compact telemetry. Over a very constrained path, Front Desk still provides a heartbeat, a critical alarm, one small command, and an acknowledgement. The management relationship adapts to the path that remains, and the full experience returns with broadband.

Availability

Sidocar is in early access. First customers shape interfaces, enclosures, mounting, and equipment-specific options as engineering work. Specifications in this document describe the working design and are subject to change. Contact support@front-desk.com to start the conversation.