We have 2 datasets which are logs from access control system (unlocking doors).

1) rpc data from device

2)Metadata from device

It is a database export formatted as a text table with | separators. We converted both files to .csv format.

1a) First set of data:

\_id – unique identifier (event, unlock swipe)

\_uuid – device identifier, door lock

\_timestamp – event time

rpc – the type of action/event (always “unlock” )

\_ack\_timestamp – acknowledgement time (when the system confirmed the event).

\_ack\_status – acknowledgement result (0 means success, empty means not acknowledged).

2a) Second dataset is a diagnostic telemetry from a Nordic nRF91 cellular IoT device (LTE-M/NB-IoT).

It’s recording resets, uptime, firmware versions, and network signal strength.

\_id – unique row identifier (event, unlock swipe).

\_uuid – device identifier (same one as in a first file: 359404230082423)

timestamp – when the record was captured.

just\_booted – t means the device had just restarted when the log was recorded.

reset\_reason – numeric code for why the device reset (e.g., 0, 2, 16 … probably mapped to watchdog, power cycle, etc.).

uptime – how many seconds the device had been running before the log.

fw\_version – firmware version running on the device.

modem\_fw\_version – modem firmware version (mfw\_nrf91x1\_2.0.1).

rsrp – signal strength (Reference Signal Received Power, typical for LTE/5G modules).

Here’s a quick analysis of your combined dataset 📊

General

Total rows: 90

Contains both unlock events (from test\_data1.cs) and device telemetry (from test\_data2.cs).

Unlock Events (44 events)

Acknowledged: ~81.8% (\_ack\_status = 0)

Average acknowledgment delay: ~1.1 seconds

Device Resets (44 events)

Reset reasons:

0 → 35 times (normal reset / power cycle)

2 → 8 times (likely watchdog or fault)

16 → 1 time (special condition)

Uptime

Average uptime: ~3,343 seconds (~55 minutes)

Max uptime: ~39,824 seconds (~11 hours)

Signal Strength (RSRP)

Mean: ~-97 dBm

Range: -112 dBm (worst) to -85 dBm (best)

⚡ So the picture is:

The device is rebooting often (many just-booted logs).

Network signal is quite weak (around -97 dBm, borderline LTE-M quality).

Unlock commands are acknowledged fairly quickly, usually within a second.

👉 Do you want me to plot charts (unlock event timings, reset reasons distribution, signal strength trends)?

You said:

yes

ChatGPT said:

Unlock Events Over Time

Reset Reasons Distribution

Device Uptime Over Time

Signal Strength (RSRP) Over Time

Here are the charts 📊

Unlock Events Over Time → shows when unlock actions happened.

Reset Reasons Distribution → most resets are code 0, some 2, one 16.

Device Uptime Trend → uptime varies a lot, sometimes very short, sometimes long.

Signal Strength (RSRP) Trend → signal is usually weak (around -95 to -100 dBm).

Would you like me to also correlate resets with poor signal strength (e.g., check if resets happen more often when RSRP is very low)?

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Here’s the summary report from your merged dataset 📊

General

Total rows: 88

Columns: \_id, \_uuid, \_timestamp, rpc, \_ack\_timestamp, \_ack\_status, timestamp, just\_booted, reset\_reason, uptime, fw\_version, modem\_fw\_version, rsrp

Unlock Events

Count: 44

Acknowledged: ~81.8%

Average acknowledgment delay: ~1.1 seconds

Device Resets

Count: 44

Reset reasons:

0 → 35 times (normal / power cycle)

2 → 8 times (fault/watchdog-like)

16 → 1 time (special condition)

Uptime

Average uptime: ~3,343 seconds (~55 minutes)

Max uptime: ~39,824 seconds (~11 hours)

Signal Strength (RSRP)

Mean: ~-97 dBm (weak)

Min: -112 dBm (very poor)

Max: -85 dBm (okay)

⚡ Insight: The device frequently reboots (short uptimes) and often operates in weak LTE signal conditions. Unlock events are usually acknowledged within a second, but not always.

Here’s the summary report from your merged dataset 📊

General

Total rows: 88

Columns: \_id, \_uuid, \_timestamp, rpc, \_ack\_timestamp, \_ack\_status, timestamp, just\_booted, reset\_reason, uptime, fw\_version, modem\_fw\_version, rsrp

Unlock Events

Count: 44

Acknowledged: ~81.8%

Average acknowledgment delay: ~1.1 seconds

Device Resets

Count: 44

Reset reasons:

0 → 35 times (normal / power cycle)

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Max uptime: ~39,824 seconds (~11 hours)

Signal Strength (RSRP)

Mean: ~-97 dBm (weak)

Min: -112 dBm (very poor)

Max: -85 dBm (okay)

⚡ Insight: The device frequently reboots (short uptimes) and often operates in weak LTE signal conditions. Unlock events are usually acknowledged within a second, but not always.

Would you like me to create visual charts (unlock activity timeline, reset reasons bar chart, uptime trend, signal strength trend) for this merged dataset as well?

Here are the visual charts from your merged dataset ✅

Unlock Events Over Time → shows when unlock actions occurred

.

Reset Reasons Distribution → majority are reason 0, with some 2, and one 16.

Device Uptime Trend → uptime is often short, with occasional long runs.

Signal Strength (RSRP) Trend → signal mostly weak (around -95 to -100 dBm), with some very poor dips below -110 dBm.

Here’s the correlation between reset reasons and signal strength (RSRP) 📊

Reason 0 (normal/power cycle): avg RSRP ≈ -96 dBm

Reason 16 (special condition): avg RSRP ≈ -92 dBm (better signal)

Reason 2 (fault/watchdog-like): avg RSRP ≈ -101 dBm (weaker signal)

🔎 Insight: Resets with code 2 tend to happen when the device has worse network signal.

Would you like me to also calculate the uptime differences by reset reason (e.g., does weak signal correlate with shorter runtimes)?

Here’s the uptime distribution by reset reason ⏱️

Reason 0 (normal reset/power cycle):

Avg uptime ≈ 3,020 sec (~50 min)

Max uptime ≈ 39,824 sec (~11 hours)

Reason 16 (special condition):

Avg uptime ≈ 161 sec (~2.5 min)

Max uptime = 161 sec

Reason 2 (fault/watchdog-like):

Avg uptime ≈ 5,155 sec (~1.4 hours)

Max uptime ≈ 33,585 sec (~9.3 hours)

🔎 Insight:

Reason 16 resets happen very quickly after boot (device only runs for a couple of minutes).

Reason 2 resets often occur with weaker signal (as we saw earlier) but can still run for hours before failing.

Reason 0 resets are the most common, with the longest uptimes.

Would you like me to also create a timeline plot showing both uptime and RSRP before resets, so you can visually see if weak signal leads to earlier resets?

Here’s the timeline plot 📈 showing:

Green (left axis): device uptime at each reset.

Red (right axis): signal strength (RSRP) at the time of reset.

🔎 You can see that:

Very short uptimes (like reason 16) occur regardless of signal, but are rare.

Resets with poor signal (RSRP below -100 dBm) tend to correlate with shorter uptimes.

Longer uptimes are usually when the device has moderate signal (-90 to -95 dBm).

Would you like me to also separate the timeline by reset reason (different colors per reason) to make the patterns clearer?

Here’s the timeline split by reset reason 🎨:

Each reset reason now has its own uptime curve (solid, circles) and signal strength curve (dashed, crosses).

You can clearly see that:

Reason 0 (normal resets): happen across a wide range of uptimes, usually with mid-level signal (~-95 dBm).

Reason 2 (fault/watchdog): cluster more around weaker signal (-100 dBm and below) and often shorter uptimes.

Reason 16 (special): very short uptime, one-off case.

Would you like me to also generate a statistical correlation coefficient (like Pearson correlation between uptime and RSRP) to quantify the relationship?

Yes 👍 we can calculate device response time from your combined dataset using the unlock events (rpc = unlock).

In your data we have:

\_timestamp → when the unlock request was issued.

\_ack\_timestamp → when the device acknowledged the unlock.

The difference between them = response time.

Earlier, I computed the average response time ≈ 1.1 seconds.

But we can go further and calculate:

Min, max, average response time.

Distribution of response times (are there outliers?).

👉 Do you want me to run a calculation now and give you a summary + chart of response times from the combined data?

Here’s the response time analysis for unlock events 🔑

Statistics (in seconds)

Count (valid samples): 36

Average (mean): ~ 1.09 s

Median (50%): ~ 0.24 s

Min: ~ 0.13 s (very fast)

Max: ~ 2.97 s

75% percentile: ~ 2.20 s

Insights

Most responses are well under 1 second.

A few events take 2–3 seconds, which pulls up the average.

Median shows typical response is actually much faster (~0.2s).

📊 The histogram shows this distribution: many quick responses with some slower outliers.

👉 Would you like me to also correlate response time with signal strength (RSRP) to see if weak network leads to slower acknowledgments?

I plotted Response Time vs Signal Strength (RSRP) ✅

But the correlation coefficient came out as NaN. This happens because in your combined dataset, the rsrp field is only logged in the reset/telemetry entries, not in the unlock event rows — meaning most unlock events don’t have rsrp values recorded alongside them.

⚡ So:

We can’t directly correlate unlock response times with signal strength, since those data points aren’t logged together.

What we could do is align events by timestamp (e.g., match each unlock event with the closest reset/telemetry entry’s RSRP).

👉 Do you want me to try that matching approach, so we can approximate the signal strength at the time of each unlock?

I matched each unlock event with the closest telemetry record’s RSRP (signal strength).

Result:

Correlation coefficient: ≈ -0.014 (essentially zero).

The scatter plot shows no clear trend — response time stays ~0.2–3s regardless of signal quality.

🔎 Insight:

In your dataset, signal strength (RSRP) does not significantly affect unlock response time. Delays seem more related to other factors (e.g., network latency, device load) than radio conditions.

Here’s the timeline plot 🔑📶

Blue (left axis): unlock response time in seconds.

Red (right axis): estimated signal strength (RSRP) at the closest telemetry point.

🔎 From this view:

Response times vary between ~0.1–3 seconds, but don’t track strongly with signal changes.

Even when RSRP is poor (< -100 dBm), response times can still be quick.

The outliers (~3s) appear sporadic and not tied to weak signal.