

Hands-on Evaluation of Kinéis Satellite IoT Technology

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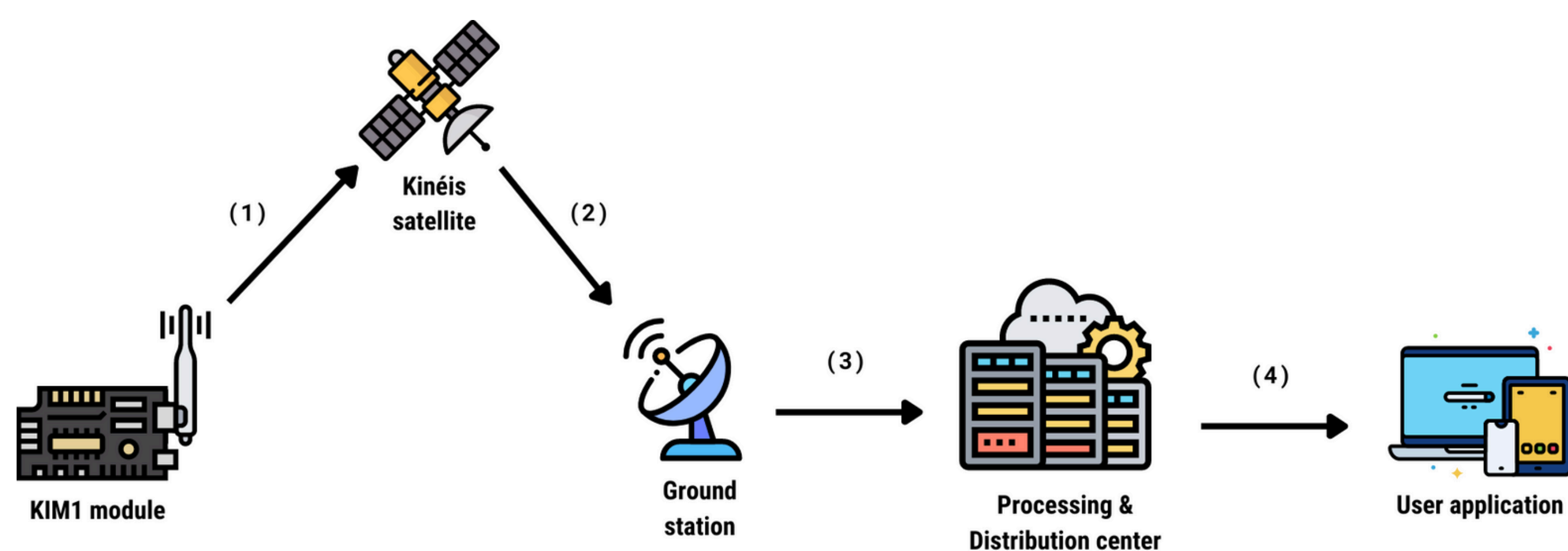
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Abstract

This poster highlights the potential of satellite technology for IoT applications, using Kinéis - a leading operator - as an example. Results show a **45-minute end-to-end latency**, **1,000 packet battery lifetime** with AA batteries, and **23%/54%/99% end-to-end reliability** with 1/10/18 repetitions.

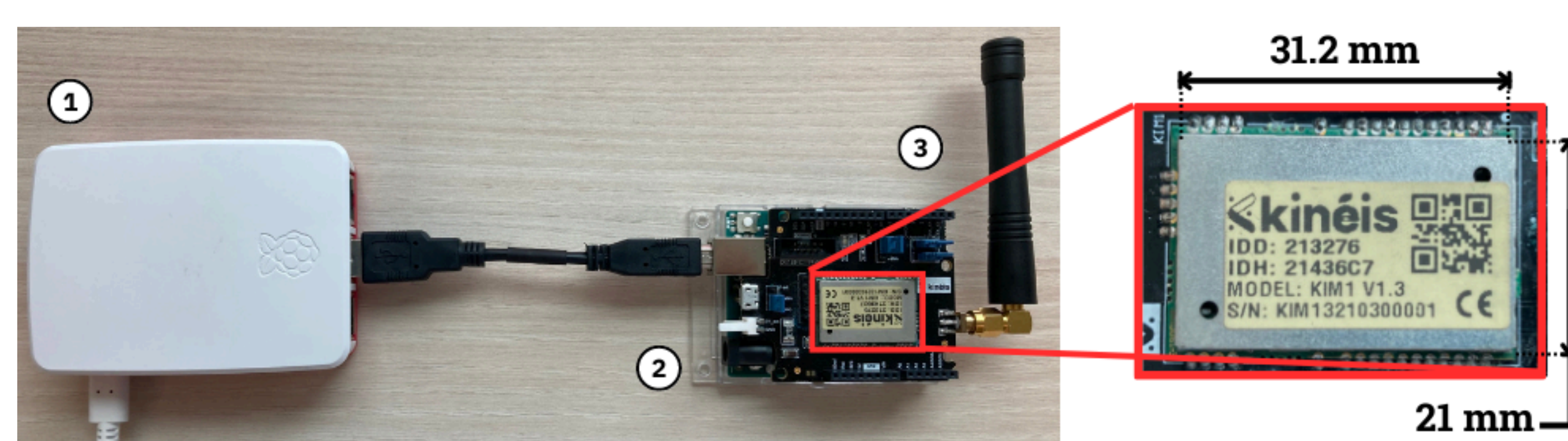
Satellite for IoT

The general architecture for sensor-to-satellite solutions is shown below. IoT devices are deployed on Earth and rely on **LEO satellites** that **orbit the planet every 128 minutes**, with devices typically in **radio range for 10-12 minutes**. In the general case, a device transmits data only when a satellite passes overhead. The satellite sends the data to a ground station for processing, and the processed data is sent to a distribution center that delivers it to the end user.



Experiment

The experimental setup consists of an **Arduino board** (2) enhanced with satellite connectivity by **Kinéis' KIM1 module** (3). Computing when a satellite is passing overhead is handled by a **Raspberry Pi** (1).



Performance Evaluation

We set up the module to **transmit a 13-byte data frame every 90 seconds for a week** during satellite passes.

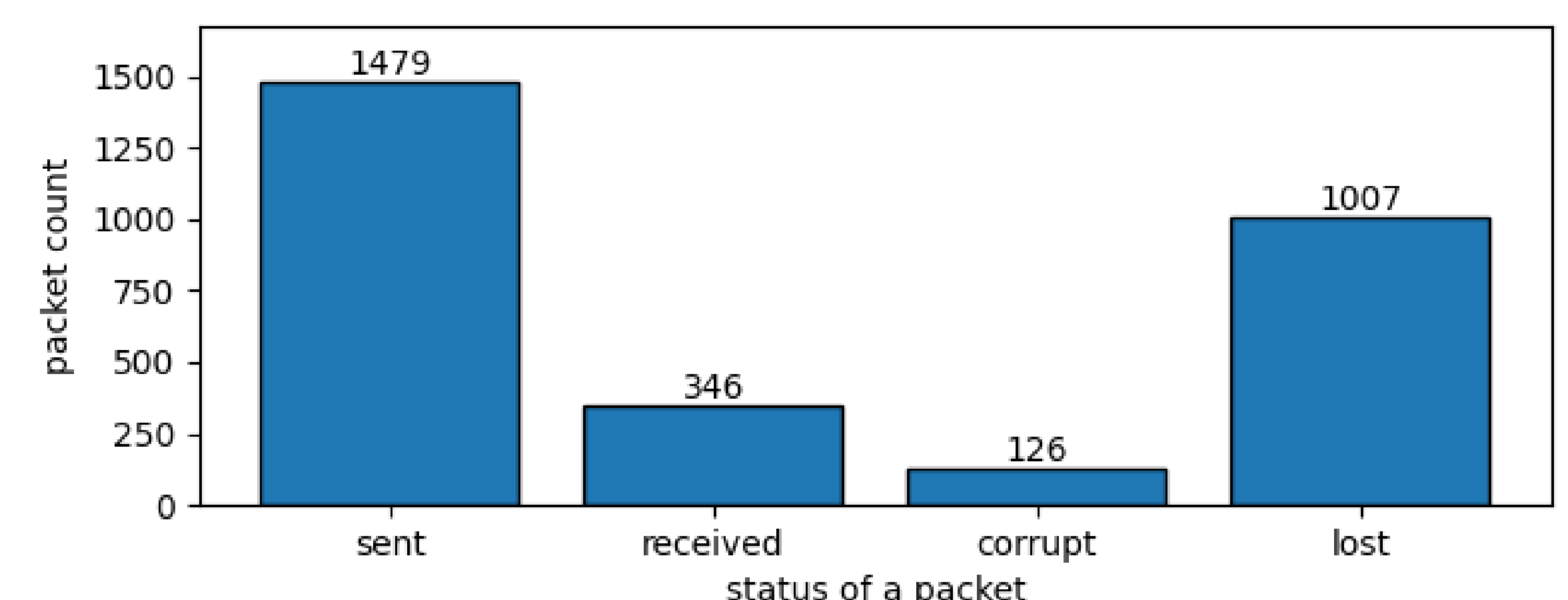
End-to-end Latency

Kineis notifications enable the following end-to-end latency breakdown in a typical scenario.

Waiting for a satellite to pass over	35 min
Sending frame to satellite	5.103 s
Satellite travels and sends to ground station	9 min 23 s
Send data over the internet from the ground station to the application	31 ms
Total	45 min

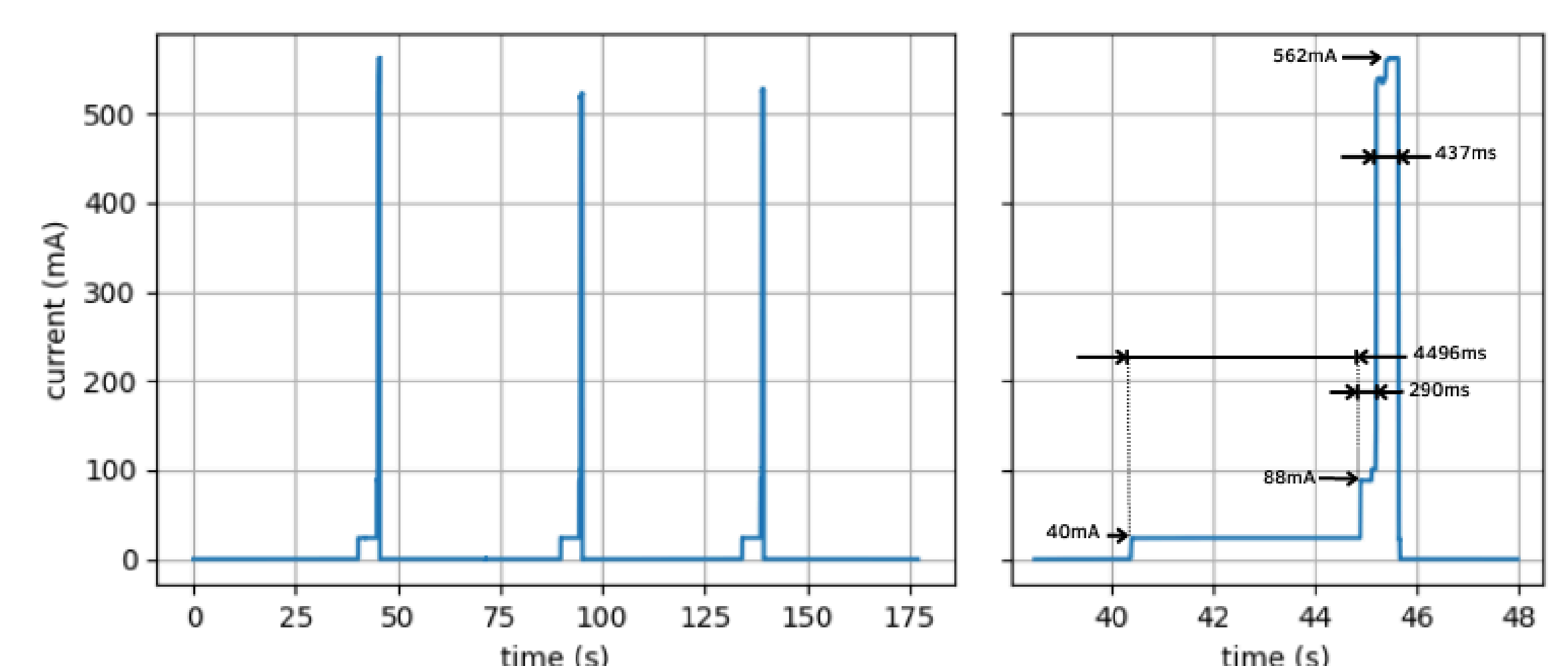
End-to-end Reliability

We cross-referenced sent frames with received ones from Kinéis site and employed CRC checks for detecting corruption.



Battery Lifetime

One transmission draws a charge of $40 \cdot 4496 + 88 \cdot 290 + 562 \cdot 437 = 451 \mu\text{C}$ (or 2.25 J). With a pair of **AA batteries** holding 2,500 J, the module can transmit approximately **1,000 packets**.



Conclusions

Satellite IoT technology offers **new opportunities**, but it is not intended to replace existing technologies. It fills a gap for nodes deployed in remote areas without infrastructure.