

Portable Subway Telltale

Github link: <https://github.com/Daidai1031/Portable-Subway-Telltale>

The Portable Subway Telltale is a small, keychain-sized ambient display designed to provide calm, glanceable information about real-time subway arrivals at the Roosevelt Island station in New York City. Rather than replacing a smartphone transit app, the device exists as a lightweight companion that supports everyday departure decisions. It is meant to live on a key ring, in a bag, or near a door—precisely at the threshold between staying and leaving. Because most people already carry their keys when heading out, the keychain format leverages an existing habit instead of introducing a new device that must be remembered.

The telltale focuses specifically on the F and M lines at Roosevelt Island (station ID B06). It displays the next arrival times in both directions—toward Manhattan and toward Queens—while allowing the user to select which direction determines the current “status” of the device. Two physical buttons (D1 and D2) switch between directions. Both directions are always visible on screen, but the selected direction drives the primary visual feedback state.

Rather than presenting raw numerical data alone, the device interprets arrival times into three meaningful states:

- **WAIT** (more than 7 minutes remaining)
- **GO NOW** (between 2 and 7 minutes remaining)
- **ARRIVAL** (0–2 minutes remaining)

Each state is expressed through a coordinated visual language using color, motion, and animation. WAIT is rendered in a calm grey palette and accompanied by a gently steaming coffee animation. GO NOW switches to MTA blue (#3236A6) and shows a walking pixel character, suggesting movement without urgency. ARRIVAL uses MTA orange (#FF6319), triggers blinking text, and displays a running subway animation to indicate immediate departure. In addition, a clockwise “edge flow” of pixel blocks moves along the border of the screen, with speed increasing as urgency increases. This layered feedback transforms abstract time data into embodied, intuitive cues.

The information displayed on the device is retrieved via Wi-Fi connectivity. The ESP32-S2 Feather connects to a wireless network and queries an online subway API endpoint: https://subwayinfo.nyc/api/arrivals?station_id=B06

The API returns JSON data containing predicted arrival times for upcoming trains. The device does not use physical sensors to determine train status; instead, it relies on real-time GTFS-based transit feeds accessed over HTTPS. Using the `adafruit_requests` library, the device fetches updated data at regular intervals (every 15 seconds).

Once received, the JSON payload is parsed to extract relevant fields: train line, direction, and minutesAway. The code filters the results to select the active line (F or M) and determines the soonest arrival time for each direction. Because the F and M trains do not always run simultaneously at Roosevelt Island (for example, the M often runs alone on weekends), the system dynamically detects which line is active and adjusts accordingly. The raw arrival minutes are then processed through a simple state machine. Threshold

constants define the boundaries between WAIT, GO NOW, and ARRIVAL. The selected direction's minutes determine the current state, which in turn drives:

- Text content ("WAIT~", "GO NOW!", "ARRIVE!")
- Title and icon color
- Pixel animation (coffee, walk, or metro run)
- Border edge flow speed
- Blinking behavior in ARRIVAL state

This additional processing abstracts numerical time into an actionable interpretation. Instead of asking the user to cognitively calculate whether "4 minutes" means hurry or relax, the device performs that reasoning and expresses it visually.

Physically, the device is housed in a 3D-printed enclosure modeled in Fusion 360 and printed on a Bambu X1C using PLA. The final enclosure measures approximately $5.6 \times 4.2 \times 1.6$ cm. Multiple iterations refined the internal layout of the ESP32 board and battery, print tolerances, and typography. The final version emphasizes simplicity and legibility, reinforcing the device's role as a calm computing artifact.

Overall, the Portable Subway Telltale transforms real-time transit data into a compact, expressive object that supports everyday mobility decisions. By existing as a keychain rather than a screen competing for attention, it demonstrates how small embedded devices can deliver meaningful, context-specific information without requiring continuous interaction.