

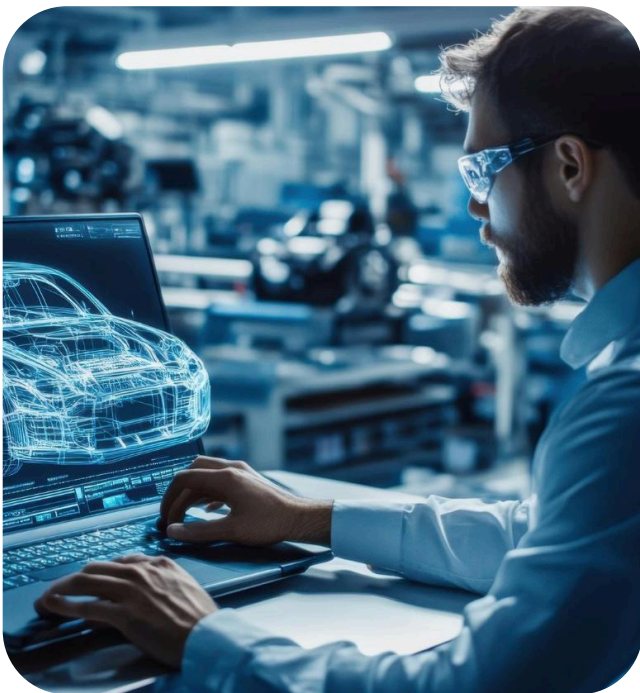
# Real-Time Breathing Pattern Analyzer

A high-performance Android tablet application that syncs with medical hardware via Bluetooth to monitor and visualize patient vital signs.

## Overview

We developed a custom Android tablet application to monitor respiratory health. The app establishes a seamless Bluetooth connection to the medical device, providing real-time data visualization and critical health alerts.

- **Rapid Two-Week Development:** Successfully delivered a production-ready application in just 14 days for a high-profile trade show demonstration.
- **Real-Time Visualization:** Transformed raw sensor data into actionable insights through continuous graphical plotting and animated breathing guides.



## Client Profile

Based in Singapore, the client is a prestigious medical research organization focused on advancing information and communications technologies. They specialize in developing holistic healthcare solutions, leveraging media and data to improve patient monitoring and clinical outcomes.

## Challenges: Hardware Integration and Real-Time Feedback

The client's hardware—a cushion-like apparatus fitted with sensors—required a mobile display unit that could interpret and visualize complex vital signs without latency.

- The absence of a user-friendly display made it difficult for patients and researchers to monitor breathing patterns in real-time while using the Microcontroller Unit (MCU).

- Critical alerts, such as detecting apnea (cessation of breathing), needed to be communicated instantly from the hardware to the screen to ensure patient safety.
- The application required a robust wireless connection to the MCU that could handle continuous data streaming for graphical plotting.
- The project had a tight deadline, requiring the complete design and implementation of the app within two weeks for an upcoming medical exhibition.

## QBurst Solution: Bluetooth-Enabled Medical Display Unit

We engineered an Android application tailored for the Samsung Galaxy Tab 10.1 that interfaces directly with the client's MCU. Communication is facilitated via Bluetooth, enabling the tablet to function as a sophisticated display for the hardware's vital sign sensors.

- **Interactive Breathing Guidance:** Integrated an animated visual of lungs that provides biofeedback, directing the user to increase or decrease their breathing rate for therapeutic purposes.
- **Continuous Waveform Graphing:** Leveraged the AChartEngine library to plot the current breathing rate as a continuous graph against time, providing a clear visual history of respiratory activity.
- **MCU State Monitoring:** Developed a status indicator to show real-time device states, including "Idling" and "User Detected," ensuring researchers know the exact operational phase of the hardware.
- **Safety Alert System:** Implemented a prioritized "Apnea Alert" feature that triggers an immediate visual warning if the hardware detects that a patient has stopped breathing.

## Technical Highlights

The application was built to ensure high performance and reliable connectivity, specifically optimized for medical research environments where data accuracy and display responsiveness are paramount.

- **Bluetooth Connectivity:** Facilitates the automatic scaling and transmission of the breathing pattern display from the MCU to the tablet.
- **Android SDK & Java:** Utilized the core Android framework and Java programming to build a stable, exhibition-ready interface.
- **AChartEngine Integration:** Enables the rendering of complex, real-time graphical data points into a smooth, readable respiratory waveform.
- **Biofeedback Animation:** Programmed reactive animations to serve as an intuitive guide for patient breathing exercises.

## Impact

The resulting application provided a professional, reliable interface that successfully bridged the gap between medical hardware and user experience.

- **Exhibition Success:** The rapid two-week delivery enabled the client to showcase their innovative hardware at major trade shows and exhibitions on schedule.
- **Enhanced Data Interpretation:** Transformed raw microcontroller data into a clinical-grade graphical display, allowing for easier assessment of physical conditions.
- **Critical Safety Monitoring:** Provided an effective platform for apnea detection, significantly increasing the utility of the MCU hardware as a diagnostic tool.
- **Improved User Engagement:** The inclusion of animated guides and real-time feedback made the complex medical device accessible and interactive for patients.