ZEROVAEGA TECHNOLOGIES

Bluetooth Machine Connectivity (BMC)

Smart EV Charging Platform | Business Case



DOMAIN	PLATFORM	DATE
Electric Vehicles · Bluetooth Connectivity · Smart Charging	Android (Flutter)	31 July 2026

9 Functional Modules

4 Tier Architecture

BLE Real-Time Connectivity

100% Digital Billing Accuracy

01 EXECUTIVE SUMMARY

Rapid EV adoption has outpaced charging infrastructure that is easy to find, monitor, and pay for. Zerovaega Technologies designed and delivered the Bluetooth Machine Connectivity (BMC) application — an Android platform that pairs smartphones with Bluetooth-enabled charging machines, giving two- and four-wheeler EV users a secure, real-time, and accurately billed charging experience. The solution replaces fragmented, manual charging workflows with a unified digital ecosystem spanning a mobile app, backend services, and an admin portal.

02 BUSINESS CHALLENGE & SOLUTION

THE CHALLENGE

- Complex onboarding: friction-heavy registration and login slowed user adoption.
- Compatibility gaps: several EV models could not reliably pair with charging machines.
- Billing inaccuracies: manual data capture caused inconsistent charging records.
- No live visibility: users could not track charging progress or plan around completion.
- Limited site connectivity: machines were largely installed in basement parking areas of large residential societies, where internet access is patchy or unavailable.
- Hardware & protocol complexity: integrating with diverse charging-machine hardware, communication protocols, and middleware required significant, ongoing engineering effort.

THE SOLUTION

- Simplified authentication: streamlined, secure registration and login workflow.
- Offline-capable BLE connectivity: Bluetooth Low Energy pairing works without internet, purpose-built for basement and low-connectivity installations.
- Wallet-based payments: users pre-load their wallet; balance is verified before a BLE-triggered session starts, and usage is deducted in real time.
- Automated, accurate billing: session data captured directly for precise charge records.
- Real-time monitoring: live charging status, duration, and completion alerts.
- Deep hardware integration: custom engineering across machine protocols and middleware, upgraded iteratively for cross-model compatibility.

03 KEY FUNCTIONAL CAPABILITIES

Registration & Auth
Secure sign-up, login, and profile management.

Bluetooth Connectivity
Offline-capable BLE discovery, pairing & session initiation — built for internet-poor basements.

Session Management
Start, stop, track, and review charging sessions.

Real-Time Monitoring
Live charging progress, battery status & duration.

Billing & Payments
Wallet-based payments, real-time deduction, billing summary & history.

Station Discovery
Nearby stations plus community-driven expansion.

Vehicle Compatibility
Multi-vehicle support with firmware updates.

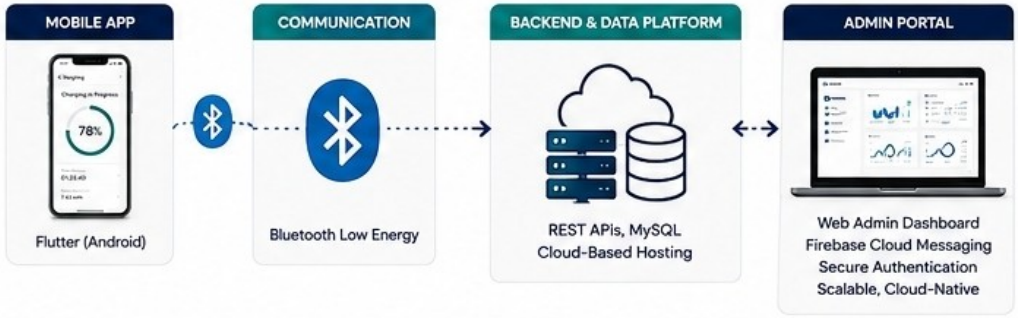
Notifications
Start, completion & interruption alerts.

Admin Panel
Role-based web portal: company-wide oversight plus site-level earnings access.

BUILT FOR RELIABILITY.
Offline-capable BLE connectivity, accurate digital billing, real-time visibility and remote management — all in one smart EV charging ecosystem.

04 ARCHITECTURE & TECHNOLOGY STACK

BMC is built on a three-tier architecture — a Flutter-based Android mobile app, cloud-hosted backend services, and a web-based admin portal — connected to charging machines via Bluetooth Low Energy for low-latency, offline-capable device communication. BLE was deliberately chosen over an internet-dependent model: client charging machines are largely installed in basement parking areas of large residential societies, where connectivity is limited, so pairing and session control needed to work reliably without relying on the internet. Delivering this required deep integration with diverse hardware and machine communication protocols, with middleware upgraded iteratively to maintain compatibility across machine models.



05 VALUE DELIVERED & BUSINESS IMPACT

KEY VALUE DELIVERED

- Simplified, offline-capable BLE charging process
- Improved charging accessibility in low-connectivity basements
- Enhanced, friction-free user onboarding
- Real-time, wallet-based payment integration
- Accurate charging session & billing records
- Real-time charging visibility
- Remote machine management via admin panel
- Site-level earnings & electricity-usage visibility for machine host owners
- Higher customer satisfaction

BUSINESS IMPACT

BMC transformed traditional EV charging through seamless, offline-capable Bluetooth communication, real-time wallet-based payments, and remote machine oversight — improving reliability, reducing billing discrepancies, and streamlining operations for all stakeholders.

TRADITIONAL CHARGING EXPERIENCE	WITH BMC PLATFORM
Manual tracking & billing	Automated, accurate digital billing
Connectivity dependent	Offline-capable BLE connectivity
No real-time monitoring	Real-time status & completion alerts
No wallet integration	Prepaid wallet with real-time deductions
No remote management	Remote monitoring & management
Poor user experience	Seamless, reliable user experience

RESULTS ACHIEVED

- Accurate digital billing & records
- Real-time visibility & control
- Seamless user experience
- Secure & reliable offline operations
- Greater efficiency & transparency

FUTURE-READY SOLUTION
Built to scale with evolving EV adoption, diverse hardware, and smart community charging needs.