

Building Scalable EV Electronics Platforms for a Software-Defined Future



As electric mobility and software-defined vehicles (SDVs) reshape the automotive landscape, engineering depth, platform scalability, and IP-led innovation are becoming decisive differentiators. From power electronics and vehicle control systems to embedded software and ADAS, EV architectures now demand tightly integrated, safety-critical, and regulation-compliant solutions.

To understand how engineering service providers are navigating this transition, **Nikita Kumari**, Sub-Editor at **BIS InfoTech**, interacted with **Sharath Bharati**, Founder and Managing Director of **Embitel Technologies**. In this interaction, Bharati discusses Embitel's GCC-plus model, its role in EV electronics and embedded engineering, deep collaboration with Volkswagen Group, and the company's roadmap for future-ready mobility platforms.

Embitel follows a unique GCC-plus engineering model. Could you explain this approach and how it differentiates the company?

Traditional Global Capability Centers are typically structured as cost centers, focused on execution efficiency rather than innovation ownership. Embitel's GCC-plus model deliberately moves away from this construct. While we benefit from the scale, stability, and long-term strategic alignment of the Volkswagen Group, we operate as an independent profit center with full accountability for what we build and deliver. Nearly 30 percent of our revenue is generated from customers beyond the Volkswagen ecosystem. This ensures we remain outward-looking, continuously benchmark ourselves against global peers, and invest in innovation based on market demand rather than internal mandates. The GCC-plus model gives us the best of both worlds—deep integration with a global OEM and the entrepreneurial agility of an independent engineering company.

How does Embitel balance deep engineering ownership for Volkswagen Group while delivering scalable solutions for other global automotive clients?

Confidentiality and IP protection are non-negotiable when working at the core engineering level with a global OEM like Volkswagen. To address this, we maintain strict physical, operational, and network-level separation between Volkswagen programs

and projects for other OEMs. Dedicated teams operate in isolated environments, ensuring that solutions developed for Volkswagen remain exclusive.

At the same time, our engagement with multiple global OEMs exposes us to diverse regulatory requirements, vehicle architectures, and design philosophies across regions. This breadth of experience strengthens our engineering judgement and allows us to design more adaptable, scalable, and future-ready platforms—without compromising client-specific ownership or trust.

Where does Embitel create maximum value within the EV electronics stack?

Our value creation spans both what we build and how we build it. On the product side, we develop core EV subsystems such as vehicle control units (VCUs), motor control units (MCUs), battery management systems (BMS), onboard chargers, and power electronics platforms—each designed as reusable IP blocks. Equally important is our design-first methodology. We begin by carefully selecting compute architectures, power electronics topologies, and communication frameworks that align with performance targets while minimising cost and complexity. Safety and cybersecurity are embedded from the architecture stage itself. This approach enables us to deliver robust, cost-optimised platforms that can reduce development timelines by up to 50 percent while remaining scalable across vehicle categories.

As EV architectures move toward domain and zonal control with compact multi-in-one units, how does Embitel ensure performance and safety are not compromised?

The shift toward integrated architectures demands a fundamentally modular design philosophy. At Embitel, we focus on reusable hardware building blocks classified by voltage, power, and performance levels. These are paired with platform-independent software abstractions that separate application logic from hardware dependencies.

This combination allows us to design integrated systems such as 3-in-1 or 5-in-1 units without reengineering the core architecture each time. Performance scaling, redundancy, or feature expansion can be achieved through configuration and software updates rather



**Sharath Bharati,
Founder and Managing Director,
Embitel Technologies**

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than hardware redesign—ensuring both safety and efficiency remain intact.

EV platforms must scale across two-wheelers, three-wheelers, passenger vehicles, and commercial vehicles. How does Embitel ensure this scalability?

Scalability is anchored in voltage architecture and compliance planning. Our motor control platforms span 48V to 128V, VCUs operate across 12V and 24V systems, and our BMS solutions support high-voltage architectures ranging from 300V to 800V.

By designing platforms that are inherently flexible in voltage, performance, and compliance, we enable OEMs to reuse core architectures across multiple vehicle segments. This reduces engineering effort, accelerates product rollout, and ensures consistency across vehicle portfolios.

How does Embitel address compliance with diverse international EV regulations and standards?

Regulatory compliance is not treated as an afterthought. Functional safety, cybersecurity, and EV-specific standards are integrated at the concept and architecture stages of development. This includes alignment with global safety norms, cybersecurity frameworks, and region-specific EV regulations.

Our experience working with OEMs across multiple geographies gives us a practical understanding of how regulations are interpreted and enforced worldwide. This enables us to design solutions that are compliant by design and readily deployable across international markets without extensive rework.

Safety and cybersecurity are critical in software-defined vehicles. How does Embitel address these challenges?

We have a dedicated team of approximately 150 engineers focused exclusively on functional safety and cybersecurity. Standards such as ISO 26262 and ISO 21434 are embedded throughout the development lifecycle—from concept definition and architecture to implementation and validation.

Key measures include secure boot mechanisms, threat analysis and risk assessment, fault-

tolerant architectures, secure communication frameworks, and clearly defined safety goals. By integrating these elements early, we ensure resilience, regulatory compliance, and long-term system integrity.

How do partnerships with semiconductor vendors and ecosystem players strengthen Embitel's EV and ADAS roadmap?

Semiconductors form the backbone of EV and ADAS platforms. While OEMs often define chipset strategies based on long-term partnerships and supply chain considerations, we work closely with leading semiconductor vendors globally to optimise system performance.

This collaboration ensures our platforms are tightly aligned with chosen silicon architectures while remaining flexible enough to adapt to OEM-specific constraints. It also allows us to stay ahead of technology roadmaps in compute, power electronics, and connectivity.

How important is IP-led engineering to Embitel's EV and ADAS programmes?

IP-led engineering is central to Embitel's value proposition. Our platforms are built on over a decade of hands-on experience working with global OEMs across EV and automotive domains.

By capturing this experience in reusable IPs, we enable customers to significantly reduce development cost and time-to-market while benefiting from optimised performance, safety, and scalability. This IP foundation allows us to move faster without compromising engineering quality.

How has working with Volkswagen Group strengthened Embitel's position in the EV market?

Our engagement with Volkswagen extends well beyond EV powertrains. We are actively involved in ADAS, power electronics, energy systems, cloud connectivity, and software-defined platform development.

Volkswagen's diverse brand portfolio—from mass-market vehicles to premium marques—allows our solutions to scale across segments and performance classes. Our talent-first approach, focused on product mindset rather

than cost arbitrage, ensures that innovation remains central to everything we deliver.

What are Embitel's key technology and market focus areas going forward?

In EV technologies, our focus includes integrated systems such as 3-in-1 and 5-in-1 units, AI-driven battery management systems, advanced vehicle control platforms, wireless charging, and bidirectional charging solutions. Beyond EVs, ADAS is a major strategic priority. We are actively working on Level 2+, Level 3, and higher autonomous capabilities. Cloud connectivity, AI-driven analytics, digital twins, and personalised vehicle experiences are also key areas where we see strong future growth.