

Case study

# Automotive Manufacturer Improves Paint Quality Detection by 98% with Smarter, Real Time Manufacturing Operations



## Overview

The client is an Indian multinational automotive company. As part of its digitalization program, the client aimed to improve operational efficiency by leveraging 5G technology and innovative use cases.

Tech Mahindra supported this initiative by designing and implementing a private 5G network solution in partnership with a leading telecommunication provider in India. Two innovative 5G-enabled solutions were deployed, including a manufacturing use case that significantly improved the ECU flashing efficiency and improved the paint quality detect detection efficiency by 98%.

**Tech Mahindra deployed a private 5G network for an Indian automotive major with a leading telecom partner. The solution boosted ECU flashing efficiency and improved paint defect detection accuracy by 98%**



## Client Background and Challenges

The client is an Indian multinational automotive manufacturer with large scale, distributed manufacturing operations. As part of its digitalization program, the organization is focused on improving production efficiency, quality assurance, and responsiveness to increasing market demand through advanced, secure connectivity solutions. Through proactive stakeholder discussion, we identified two critical manufacturing processes as key problem areas:

## ECU Flashing Efficiency

As part of the manufacturing process, the client was manually flashing Electronic Control Units (ECU), which interface with vehicle chipsets. This involved using a Toughbook to connect to each ECU outside the shopfloor for every vehicle in the yard.

The process required flashing a heterogenous set of ECUs across multiple vehicle models and variants, each with a different number of chipsets. Operation were distributed across nearly 40 such yards. The earlier method relied on Wi-Fi connectivity, due to limited coverage and multiple blind spots, vehicles had to be moved in batches of approximately 150 vehicles per day per yard. Any error during the flashing process required the entire activity to be repeated, significantly impacting productivity.

Further three different units were involved across ECU flashing activity and the post-delivery checks. Wi-Fi limitations enforced a sequential mode of operations instead of enabling parallel workflows. The existing process was complex, inefficient, and prone to errors, ultimately contributing to a higher-than-anticipated rate of vehicle recalls.



## Paint Quality Defect Detection

The client relied on manual visual detection of paint quality defects on the exterior surfaces of high end vehicles (XUV category). Defects such as dent, scratches, dust, teardrops, and surface anomalies accounted for nearly 30% of vehicle defects. Manual inspection misses approximately one in four defects, particularly those in the micron range.



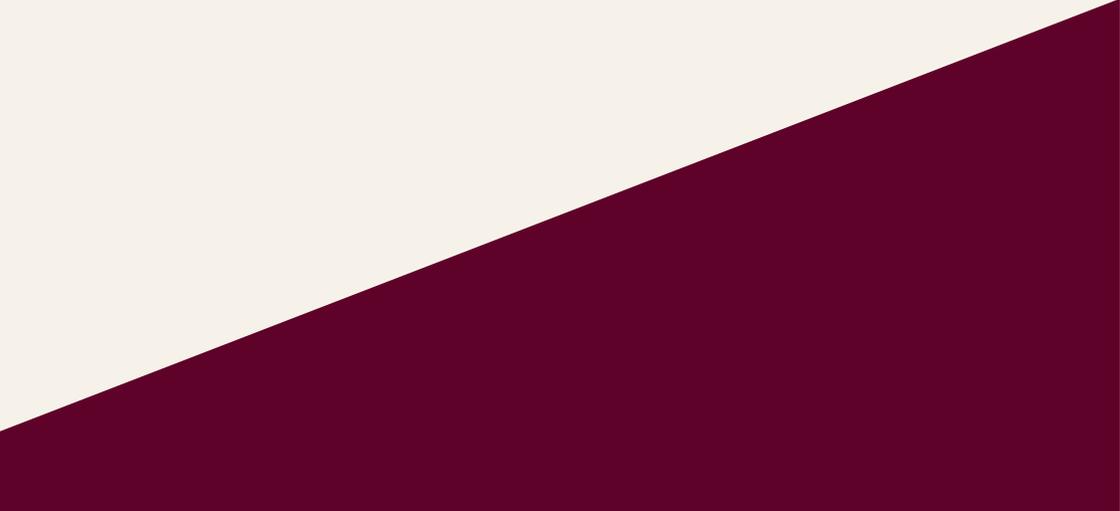
# Our Approach and Solution

## 1) Business-Technology Fit

As part of our proactive propositions, we recommend the adoption of a private 5G network as one of the key levers to support an enterprise-wide digital transformation. The solution provided a scalable and intelligent connectivity and backbone aligned with the scale and complexity of the client's manufacturing operations.

## 2) Demonstrating RoI for PoC

Given the potential of a private 5G network-enabled transformation, our 5G4E (5G for Enterprise) consultants developed a high-level business case on the following tenets:

- ECU-related use cases, including flashing and pre-delivery checks
  - Automated paint quality defect detection, covering five major defect types, dents, dust, craters, scratches, and surface anomalies, across 50 vehicles per day for a single model, using a test rig.
  - RoI comparison against the existing setup, and a 3-year cost-benefit analysis using indicative estimates
  - Evaluation of existing versus proposed approaches, focusing on scalability across shop-floor use cases, wider plant coverage, Wi-Fi limitations in enclosed areas, constraints on laying additional cables, blind spots, and their operational impact
  - Mapping of business KPIs (efficiency, ease of flashing, defect detection time, and accuracy) to network KPIs (latency, coverage, and reliability)
  - Assessment of CAPEX amortization potential through additional use cases and the feasibility of a subscription-based consumption model
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### 3) Solution Principles and Design

We partnered with a leading telecom company in India to deploy a private 5G network function and access networks. Toughbooks were integrated directly 5G network enabling real-time ECU flashing and pre delivery inspections.

For paint quality inspection, we deployed a test rig equipped with 24 high-resolution cameras, ensuring 360-degree coverage of each vehicle. Data was analyzed at the edge, generating near real-time analytical insights.

The solution allowed reading the VIN number of the vehicle and associating the defects enabling better traceability, enabling edge inferencing to capture real-time insights for operators and a real-time dashboard with defect category by vehicle.

### 4) Execution and Ecosystem

The deployment of the 5G RAN at the client's premises involved careful planning of tower placement to ensure optimal coverage and clear line of sight across yards and production line. The trilateral partnership successfully delivered the infrastructure within three to four months.

We conducted structured enablement sessions to drive user adoption of the new flashing and inspection processes. This created a controlled, scalable environment that enabled the successful execution of the proof of concept (PoC).



## Business and Community Impact

- Reduced average ECU flashing time from 8s to 2s with the private 5G network compared with legacy Wi-Fi.
- Detected paint quality defects < 100 microns and improved the detection efficiency to more than 98%.
- Ensured data privacy and security through an on-premises private 5G RAN
- Average reduction of 10 to 20% in ECU flashing, diagnostics and pre-delivery checks in both manual and automatic model
- Higher number of paint quality defects detected (compared to manual visual inspection)



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\*Figures as per Q3, FY 26.



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