Adopting and Leveraging Private 5G Network to Support Enterprise-Wide Digital Transformation Program

Overview

The client is an Indian multinational automotive company. As part of the digitalization program, the client was aiming at making their operations more efficient to cater to higher demand in the market, more quickly. TechM helped them by designing and developing a private 5G network solution partnered with a leading telco in India. Implementing 5G network enabled solution in the manufacturing process improved the ECU flashing efficiency and improved the paint quality detect efficiency by 87%.

Client Background and Challenge

Tech Mahindra engaged in a proactive discussion, understood two processes in their operations as key problem areas

Improve the ECU flashing efficiency: As part of their manufacturing process, the client was manually flashing the Electronic Control Units, that used to interface with chipsets in the vehicles. This involved using a Toughbook to connect to each ECU of the vehicle outside the shopfloor, for every vehicle in the yard. The multitude of the process in each yard was about flashing a heterogenous set of ECUs in different models and their variants which had different number of chipsets each, there were 40 such yards! The earlier method was using Wi-Fi to connect the Toughbooks and since the coverage was either limited or had a lot of blind spots, the vehicles had to be moved one lot after the other @ 150 vehicles per day per yard. Any error in the flashing

process meant doing it all over again! Further, since there were 3 different units involved in the flashing activity and the post-delivery checks, the limitations of Wi-Fi were imposing a sequential way of work rather than a parallel activity. The client's existing process was not just complex and prone to high inefficiencies, but also was leading to more recalls of vehicles than anticipated.

Paint quality defect detection: The client used to do manual visual detection of paint quality defects on the exterior surfaces of vehicles Dent, scratch, dust, teardrop, and other defects account for 30% of vehicle defects, and manual inspection misses approximately 1 in 4 defects, especially when the defects are in the micron range.

Our Approach and Solution

Business-technology fit- As part of the proactive propositions that Tech Mahindra made to the client, we suggested adoption of a private 5G network as one of the key levers to support an enterprise-wide digital transformation with an intelligent and scalable backbone, given the scale of manufacturing.

Demonstrating RoI for PoC: Given the potential of a private 5G network-enabled transformation, Tech Mahindra 5G4E (5G for Enterprise) solutions consultants prepared a high-level business case with the below tenets:

ECU use cases such as flashing and pre-delivery checks, defective paint quality. 5 major paint quality defects (dents, dust, craters, and scratches) across 50 vehicles of one model scanned per day using a test rig.

- ▶ To demonstrate the RoI compared to the existing setup, and a 3-year cost-benefit analysis with RoI, using ballpark figures
- ▶ Highlighting the pros and cons of existing and proposed methods (scalability with more use cases from the shopfloor, higher coverage across plants, limitations of Wi-Fi in internally covered areas; constraints on laying more cables to overcome this; blind spots and their impact; etc)
- ▶ Business KPIs (efficiency, ease of flashing, paint defect detection time and accuracy, etc) mapped to network KPIs such as (latency, network coverage, etc)
- ▶ The potential of amortizing the CAPEX with more use cases and the possibility of a subscription-based model

Solution principles and design: We partnered with a leading telecom company in India for a private 5G network function and access networks. We connected the Toughbooks to the 5G network to enable flashing and pre-delivery checks. We enabled the paint quality defect detection with a test rig having 24 cameras to ensure 360-degree coverage of the vehicle. This analyzed the data and generated analytical insights over edge. The solution allowed reading the VIN number of the vehicle and associating the defects enabling better traceability. It enabled edge inferencing to capture real-time insights for operators and a real-time dashboard with defect category by vehicle.

Execution and ecosystem

The installation of the 5G RAN at the client's premises had careful considerations of the location of the tower for greater coverage, better line of sight in the yards and production line, etc. The trilateral partnership succeeded in overcoming the odds, ensuring the infrastructure and placements were taken care of within 3-4 months. Tech Mahindra experts conducted educative sessions for the users for better adoption of the new method of flashing and checking. Thus, we laid out a conducive environment with the best possible options and conducted the PoC.

Business and Community Impact

The average ECU flashing time was reduced from 8 s to 2 s with the private 5G network compared with legacy Wi-Fi.

Identified paint quality defects < 100 microns and improved the detection efficiency to more than 87%

Private 5G RAN is in the client premises and upholds data privacy

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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