

PREFACE

Technology Development in CASE Era

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Competition in technology development is intensifying due to the participation of GAF A (Google/Apple/Facebook/Amazon) and IT-related companies in the automotive industry. “Fast” and “Reliable” development progress in building cars is a matter of course, but this progress has never been more needed. Technology development in “a big transition for the mobility business once in 100 years” requires speed at all, which is likely to falter.

As symbolized by the term “Software Defined Car,” software has had a major impact on the function and performance of cars.

The source code for software of luxury cars has also reached one hundred million lines, which is said to be several times the latest passenger aircraft.

The more speed is required, the more agile software development which performs short iterations is touted. Needless to say, it is suitable for POC (Proof of Concept) of service-related application as well as mass production. However, the project management shall be carried out properly and the specifications (paper/model) shall also be created properly. Review cannot be performed without the specifications and also it is extremely difficult to deal with defects, leading to quality degradation. Large-scale software development requires architecture optimization, elaboration of detailed specifications, and strict project management.

Although the car society is about to change drastically, the car architecture itself will also change greatly. To put it simply, it is the conversion of a car to a smartphone. Applications are added to the car to increase function, just like the smartphone. In other words, the more applications are upgraded, the more functionality and security are improved like the smartphone.

If entertainment software which is called IVI (In Vehicle Infotainment) is stuck, users are furious because of their valuable beloved cars, though, no one dies. Applying a power reset usually recovers it. Therefore, there are some suppliers who are practical about the same level of quality as the smartphone.

That’s not the case with control system software. It’s easy to imagine that the software under driving control (especially during autonomous driving) can’t be operated wrongly. The quality which goes far beyond home appliances and

smartphones is required with the growing significance of functional safety. As an example, large voltage fluctuations and electrical noise, which are impossible to occur in home appliances, exist in a car. An engineer who knows the car must carefully develop that point.

OTA (Over the Air) is used for the smartphone to update software and install applications, which is widely used for updating navigation maps. I've heard that Tesla rolled out a software update including control system in 2012. Careful development, which uses functional safety and redundancy as collateral, is required to update the control system software with OTA.

The other day, my iPad OS was automatically updated at midnight. Although I tried to start it up on the next morning, it wouldn't work. When I called an apple store, they kindly guided me through the operation. As a result, they answered "The software has been crashed." In the case of the car, you can't commute to work by car on that day and don't even want to think about updates while driving.

Security must be strengthened for the expansion of "connected." TCU (Telematics Control Unit) has created an invasion pathway of a virus from the outside. Although many layers of security measures are definitely provided, it is troublesome that some virus is sure to break it open. Due to that, SOC (Security Operation Center) is needed to monitor and deal with it.

A convenient tool which is called AI has begun to be put into practical use. Although it is possible to improve the recognition performance, relying solely on AI is difficult for quality assurance at present because there are parts that cannot be explained by logic. Learning with correct data, understanding of weaknesses, and thorough establishment and evaluation of the system for which fail-safe is taken into consideration are indispensable.

The CASE (Connected/Autonomous/Shared/Electric) era is the time when we can't survive unless we speed up development in any case. However, the fact remains that quality risk is increasing due to its software-defined structure, large-scale software development, "connected," and adoption of the AI.

As DENSO TEN specializing in the automotive industry, while grasping environment (How it is used) and complying with the principles, we would like to develop a comfortable, safe, and secure car even in the CASE era, without neglecting the evaluation as a precaution.

A handwritten signature in black ink, appearing to be 'J. G.' with a long horizontal stroke extending to the right.