Success Story: Journey with LG AUTOSAR Adaptive for SOP Project

by **Yeongkyu Lim & Seongwook Min**

Starting of LG AUTOSAR Project

LG Electronics joined AUTOSAR as a Premium Partner in 2017 and took a major contributor role in the demonstrator integration team. Based on its capabilities and experience in automotive as well as information technology, LG started developing the LG AUTOSAR Adaptive Platform in 2018. Just in time, some OEMs in Europe had demand for the application of the AUTOSAR Adaptive Platform to cluster products and telematics products, so we named the project **LARA** (**L**G **A**UTOSA**R** **A**daptive) and started developing it with the aim of launching the LG AUTOSAR Adaptive Platform in these products.

Many hurdles for LG AUTOSAR development and how to overcome it?

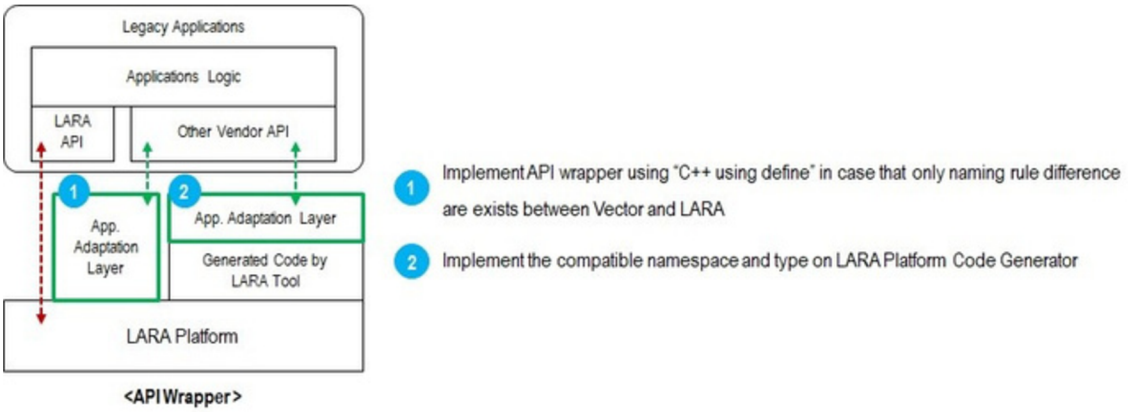
The first version of the AUTOSAR Adaptive standard was released in March 2017, and it has been upgraded every year. However, the community's reference code, called the "Demonstrator," had very low specification coverage and could not keep up with the speed of standard evolution, so it can be regarded as being for reference only. Therefore, development of the LG AUTOSAR Adaptive Platform was decided to start from scratch, and the first module to begin development was SOME/IP. This was because one of the core automotive technologies was the in-vehicle network, and we thought that the importance of the SOME/IP protocol would be high as the communication structure changed from CAN to Ethernet. Even though open-source implementations exist, we analyzed them and concluded that they have limitations. In addition to SOME/IP, local IPC, which is one of the popular communication methods between AUTOSAR Adaptive applications, was also developed. The local IPC mechanism is enhanced with a zero-copy technique to avoid performance degradation in cases of high payload size. This is one of the advantages of the LARA platform. We also contributed DDS network-binding code to the AUTOSAR community to validate the specification. It is regarded as a good example.

The elemental technologies required for mass production were secured and applied to actual mass-production products, and many unexpected difficulties were encountered during the work. Among them, the biggest challenges were performance, non-AUTOSAR Adaptive interworking, and API compatibility. In a single ECU, Adaptive AUTOSAR, the legacy software platform, and Classic AUTOSAR are co-located. Since there are no standards for heterogeneous communication, AUTOSAR needs to create and implement the necessary methods on its own. Therefore, we developed several interworking modules, such as the "Diagnostic Handler" for exchanging diagnostic information with Classic AUTOSAR and the "NM Handler" for exchanging network state information. In addition, we suggested the "ARA Proxy" module for bridging different IPC communication methods, enabling modules to communicate with Binder IPC and ara::com.

Success Story: Journey with LG AUTOSAR Adaptive for SOP Project

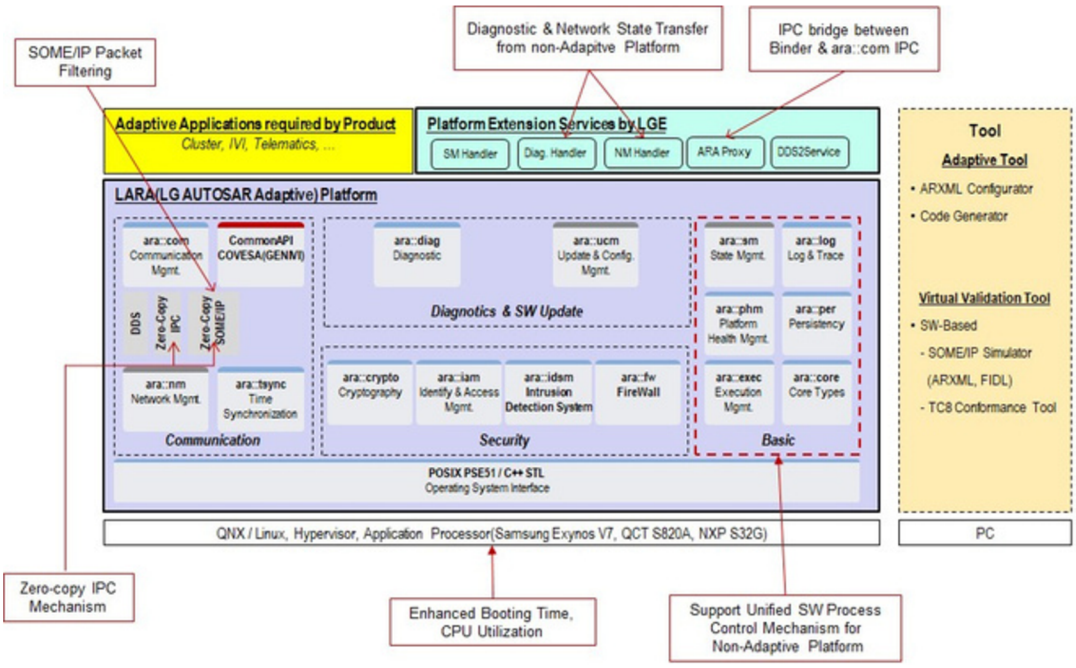
by **Yeongkyu Lim & Seongwook Min**

The second challenge is performance. As the number of SOME/IP packets that the ECU has to handle increased, performance degradation occurred. To solve this problem, SOME/IP packet filtering technology was developed, and it is capable of receiving packets only within each set period. The third challenge is API compatibility. API mapping was required to interwork with LARA without modification for applications using older versions of the AUTOSAR stack. As shown in Figure 1, the "App Adaptation Layer" was created to automatically convert parts that differ from LARA in terms of APIs and types, allowing applications to run on the LARA platform without deteriorating the performance of existing applications.



<Figure 1. API Wrapper>

Figure 2 schematically shows the major technologies included in the LARA platform mentioned above. Some of them are not explained in this document, but they are also required for mass production using AUTOSAR Adaptive.



< Figure 2. LARA Introduction>

Success Story: Journey with LG AUTOSAR Adaptive for SOP Project

by **Yeongkyu Lim & Seongwook Min**

Key Takeaways

The AUTOSAR Adaptive Platform alone is not enough for developing ECUs that customers want, and it should coexist with AUTOSAR Classic and other Linux- or RTOS-based legacy software platforms. It is always important to keep in mind that interworking with other software platforms is essential and requires special modules responsible for various bridging functionalities. In addition, performance aspects that are not included in the AUTOSAR specification are also important in production.

The experience of developing the AUTOSAR standard has been very helpful in overcoming these difficulties, and it is necessary to participate in the AUTOSAR Community to develop standards that the market and customers need. In the community, many experts sit together to create better solutions. This is a great strength of the AUTOSAR Partnership.