

# Overcoming a major challenge with standard modular solutions

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*This article describes the complete renewal of the Moscow Metro passenger information and security system with standard modular embedded computer solutions.*



■ There were major challenges to overcome: the customer needed to renew the on-board sensors as well as the video surveillance and digital signage devices of the Moscow Metro System at short notice. As a matter of paramount importance, the new devices needed to guarantee over 10 years of operation and more than 30 years of maintainability. The solution to be adopted needed to combine low power consumption and high-performance graphics in a small, modular scale platform. All of this while complying with railway regulations which require modules to be reliable even in the harshest environments, i.e. with a temperature range of  $-40/+85^{\circ}\text{C}$ .

The question was: how best to renovate the Moscow underground in a timely manner while ensuring full compliance with current regulations in terms of safety and long-term reliability of the deployed solutions? This has been the challenge undertaken by SECO since Q3 2016. Global restructuring with regard to IT technology involving not only the onboard sensors but also the video surveillance system, the emergency communication service, the digital signage devices and the data traffic between the wagons and the front section in the Moscow Metro. A leading company in the development, production and integration of electronic systems specializing in Metro systems and railways was instructed to restore

the electronic and digital equipment for the Moscow underground. The customer, located in the Russian Federation, was highly experienced with regard to the railway digital communication system but needed a trustworthy third party with solid expertise in embedded hardware to design, prototype, mass produce and implement a suitable scale solution. The project was extremely complex and entailed a multitude of challenges to overcome.

First and foremost, meeting industrial quality standards while ensuring a rapid time to market. Quality refers to two aspects in this context: performance and power consumption on the one hand, security and longevity on the other. With regard to the former, the envisaged solution needed to achieve an optimal performance/power consumption ratio - in other words, superior capabilities graphically and at the same time low power consumption. Of crucial importance, furthermore, are the durability, maintainability and reliability of the entire system. As an essential condition, the new devices needed to guarantee 10+ years of operation and 30+ years of maintainability. Last but not least, the system needed to work within a broad range of environments as required by the EU regulatory requirements, that is to say, everything needed to be perfectly functioning within a temperature range of  $-40/+85^{\circ}\text{C}$ .

In terms of time to market, with this point being extremely important, it was a critical factor to take into account the fact that the Moscow Metro is a major artery of the city network, serving millions of people every day. Consequently, at no stage could the renewal interfere with the daily activity of its users. Of course, cost effectiveness also played a decisive role as the smallest of increases would result in a significant scale difference. Bottom



Figure 1. The solution needed to achieve superior capabilities graphically and at the same time low power consumption.

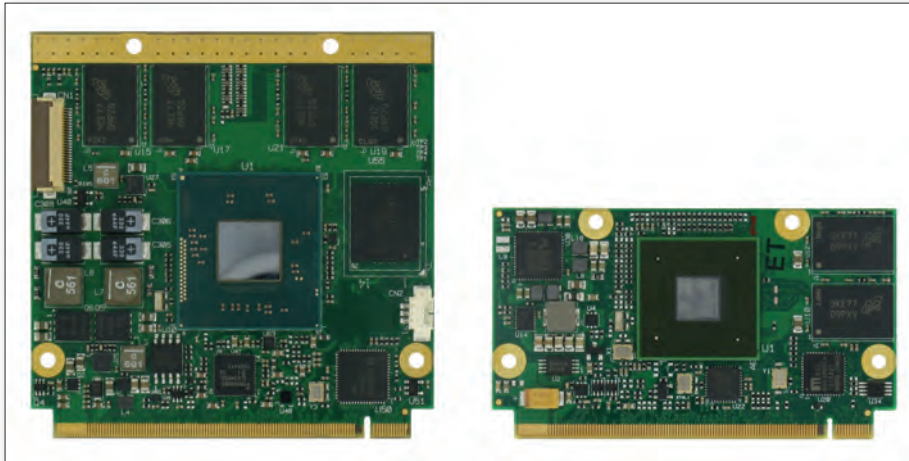


Figure 2. Both the ARM and X86 Qseven modules complying with railway regulations could be delivered immediately in volume.

line: from the initial design to the final implementation the renovation needed to be very rapid yet precise in every detail. To fulfill these requirements SECO worked closely with the customer from the beginning, analyzing the context, assessing all the issues and gathering feedback from the development phase to the fine-tuning. Close collaboration with clients is fundamental in order to succeed. Understanding the framework in which SECO has to operate is essential and it is only by paying the utmost attention to the demands and feedback of the customer that it is possible to achieve the goal. SECO does not come to the table with a pre-planned solution in mind. On the contrary, it places great importance on listening to the customer as well as analyzing the problem and exchanging our know-how with the commissioner. The customer is indeed the most valuable resource.

At the end of the analysis phase SECO had devised an ARM/x86 standard modular solution, the only one ticking all the boxes. Regarding the performance/consumption ratio, such a platform ensures good graphics performance and high energy efficiency, while also being optimal in terms of cost effectiveness. Additionally, a standard module represents the best fit in relation to scalability. Once the platform was defined, SECO, together with the customer, chose the set of modules to be deployed, namely the ARM and x86 Qseven and  $\mu$ Qseven standard modules. Regarding the x86 modules, SECO opted for the Q7-A36, a Qseven based on the Intel Atom E3800 and Celeron

families (SoC) (former code name Bay Trail) as being a cost-effective and mobile-oriented module with eMMC and camera interface as well as featuring industrial-grade components (temperature range  $-40/+85^{\circ}\text{C}$ ). The ARM solution was instead the  $\mu$ Q7-962, a  $\mu$ Qseven module based on the ARM Cortex-A9 i.MX6 SoC, unique given its optimal balance of performance and size. Interestingly, the  $\mu$ Q7-962 is a flexible solution, perfect for high-end, multi-display scenarios, also available in the industrial temperature range, and is available in two versions: the high-performance one, with Quad Core CPU, and the more cost-effective Solo Core solution. Finally, in order to be regulation-compliant, modules were produced with PCB ISOLA PCL370HR and compliant Novec 3M EGC-1700 coating.

SECO was uniquely positioned to address all these mentioned issues. Firstly it was able to quickly supply both the ARM and X86 Qseven modules complying with railway regulations, which means a significantly rapid time to market and ultimately an improved ROI. Not only that: SECO boasts a formidably vast range of modules for different purposes and this, in combination with its customer-first culture, offers a huge choice of options to the client. Most importantly, since 1979 SECO has operated on a global scale in the field of embedded electronics, collaborating with world-class enterprises, institutions and research groups all over the world. It is one of the benchmark companies worldwide in the field of embedded hardware and its reliability is unrivalled. ■