



DFI

Highly Integrated COM Express Module for Ticketing Machine

Providing Improved Mass Transit Service with DFI's COM Express

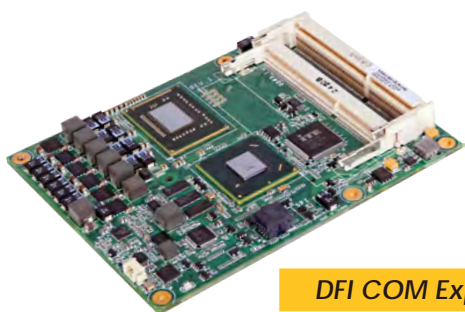
Korea Railroad Corporation (Korail), South Korea's state-run railway operator founded in 1963, sought to deliver better passenger service by upgrading the ticket vending machines at major stations in the country, starting with those stations in Seoul. DFI was introduced to Korail by GIBKorea, a distributor of embedded solutions. Through extensive collaboration with local hardware suppliers, system integrators, and Korail's R&D team, DFI contributed to the successful completion of this initiative.

Company: **KORAIL**
Industrial: Mass Transit
Application: Ticket Vending Machine
Solution: DFI COM Express





“ Through collaboration with other hardware suppliers and system integrators, DFI contributed to the successful upgrade of the TVMs at major subway stations in Seoul. ”



DFI COM Express

Introduction

With increased urbanization in Korea, the vast majority of the population now chooses to travel by rail. As a national operator of railway lines, Korail recognized the need to improve its services due to consumer demands and the modernization of mass transit. One major project that Korail wanted to undertake was to upgrade the ticket vending machines (TVM) at stations across the entire railway network. Studies have shown that ticketing experience plays a vital part in customers' perception of transit service quality. Thus, having fault-proof and easy-to-use TVMs became imperative in the enhancement of customer satisfaction. Since commissioning such a project would require substantial effort and capital investment, Korail had decided to start by replacing the TVMs at stations within the Seoul Metropolitan Subway system, where machine usage was the heaviest, and gradually move towards the completion of the full upgrade. Through collaboration with other hardware suppliers and system integrators, DFI contributed to the successful upgrade of the TVMs at major subway stations in Seoul.

The Challenge

Seoul Metro is one of the world's busiest subway systems with a ridership of more than eight million passengers per day. High volume of travelers means more ticket transactions and heavier loading for the TVMs, causing many incidences of machine breakdown. TVM plays a crucial part in customer service, revenue collection, and operational efficiency; problems such as impeded traffic flow, long queues, missed trains, and extra workload for station staff would occur when the TVMs malfunction. After years of operations, the TVMs at Seoul Metro stations were due for an upgrade. Korail was looking to enhance the performance and transaction speed of TVMs with a more powerful CPU and chipset.

“ Any down time due to component failure would create undesirable operational and financial problems; hence, the selected solution has to function 24/7/365 and be as maintenance-free and failure-proof as possible. ”

Requirements

Korail laid out several requirements for selecting the right solution and partnership prior to commissioning this project:

- **Expansion capabilities**
As various built-in components, such as coin acceptor and ticket dispenser, have to be integrated into the machines, the solution should possess expansion capabilities through multiple interfaces.
- **Hardware reliability**
Any down time due to component failure would create undesirable operational and financial problems; hence, the selected solution has to function 24/7/365 and be as maintenance-free and failure-proof as possible.
- **Technical support and value added services**
Korail was looking for a trusted partner that could provide fully customizable services and seamless technical support throughout every stage of the project development.
- **Cost-effective solution**
Similar to most public agents around the world, Korail had to work with a constrained budget, and that makes cost-effectiveness an essential criterion. The operator also requested that the solution chosen has to support flexibility and ease when upgrading a CPU component to the next generation since this would contribute to saving costs in the long run.



High volume of passenger traffic at Seoul Metro station.



DFI's COM Express board is one of the four boards placed inside Korail's TVM.

The Solution

We were introduced to Korail through a local client of our long-term channel partner, GIBKorea. After conducting a thorough evaluation of our products and services, Korail decided that DFI would be the ideal partner to collaborate with.

Upon learning Korail's requirements, we proposed to redevelop the machines with DFI COM Express. This COM Express, empowered by Intel® Core™ processor and mobile-based Intel® chipset, is packed with high performance capabilities to boost the computing and processing speed of the machine with remarkably low power consumption. As specified by Korail, cost-efficiency and ease to upgrade were important. COM Express is extremely flexible when it comes to catering to the needs of specific applications. By adjusting the carrier-board design, it is possible to create an entirely new product. Furthermore, the machine can be upgraded by simply exchanging the module with a better CPU and chipset, which enables long-term cost-saving. With multiple expansion interfaces, DFI COM Express allows various integral components such as ticket dispenser, printer, cash and coin receivers, LCD monitor, coin hoppers and sorters, and etc. to be incorporated via I/O connectors. DFI COM Express also supports various display interfaces (VGA, LVDS, DDI [HDMI/DVI/DP/SDVO]), allowing flexible implementation of any type of displays capable of delivering rich multimedia experience to the

end-users. To ensure that our products meet the industrial-grade standard, every product undergoes stringent testing. With MTBF of more than 100K hours and an organizational goal to keep the dppm under 200, DFI COM Express is guaranteed to function smoothly.

DFI's RD and field engineers had provided technical consultancy and debugging services from start to finish of the project. We conducted schematic and layout reviews, BIOS customization, as well as offered tools such as design guide and EAPI programming guide to ensure a seamless integration of our product into client's existing system. Korail was pleasantly surprised by our services and flexibility to refine our offering to meet their specific needs.

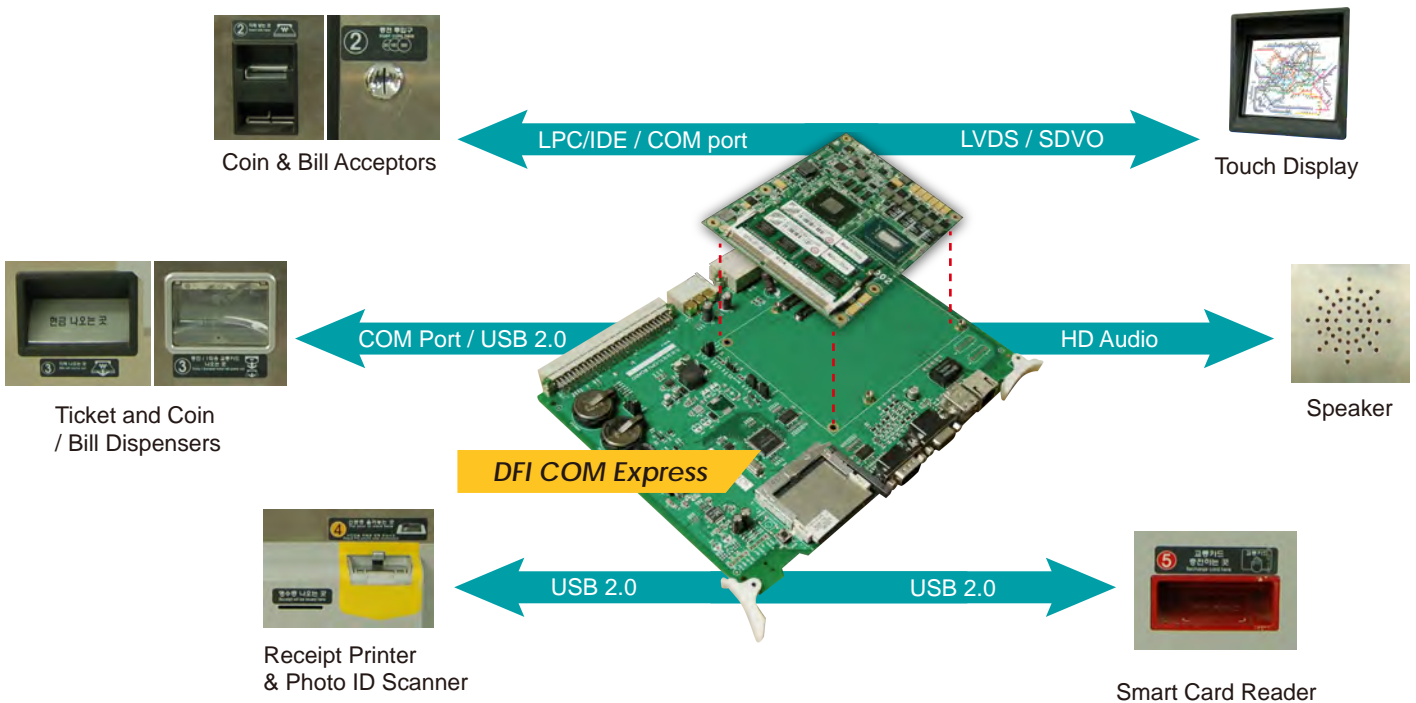
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The Result

The upgraded TVMs are currently active in major stations in Seoul. According to the client's feedback, the result of this initiative has been more than satisfactory. The upgrade has improved the transaction speed of the TVMs by 30%, leading to shorter queues at the stations and more effective allocation of staff resources. "Through DFI COM Express and their wonderful services, we were able to bring more pleasant ticketing experiences to our travelers," says Mr. Kim, Seoul Information Communication Department of Korail.

" Through DFI COM Express and their wonderful services,we were able to bring more pleasant ticketing experiences to our travelers. "

Mr. Kim, Seoul Information Communication Dept., Korail





CR902-QM77

COM Express R2.1 Basic, Type 2
 3rd/2nd Gen. Intel® Core™
 Intel® QM77 Chipset
 2 DDR3/DDR3L SODIMM up to 16GB
 1 VGA, 1 LVDS, 2 DDI
 8 USB



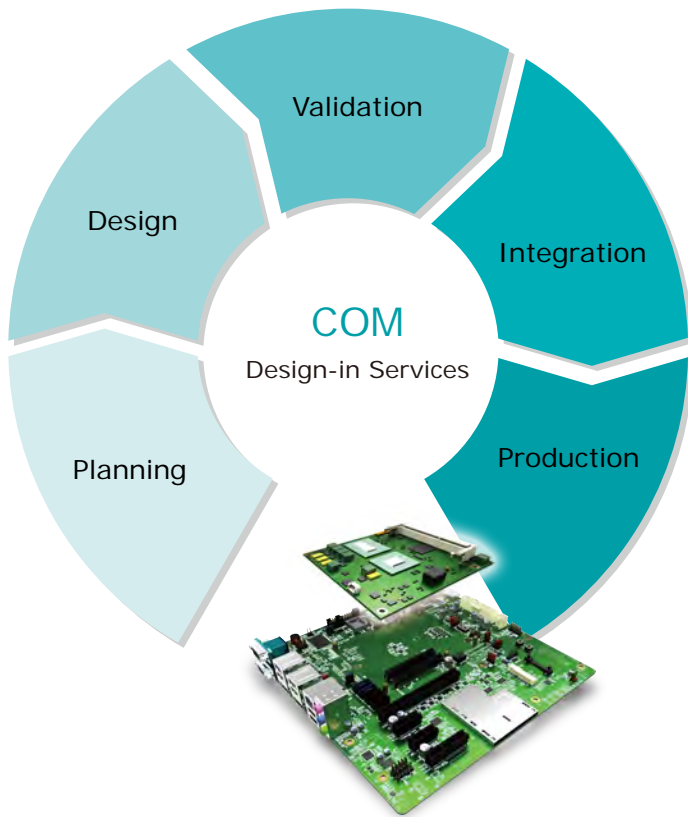
HM961-QM87

COM Express R2.1 Basic, Type 6
 4th Gen. Intel® Core™
 Intel® HM86 Chipset
 2 DDR3L ECC SODIMM up to 16GB
 1 VGA, 1 LVDS, 3 DDI
 12 USB



SH960-QM170

COM Express R2.1 Basic, Type 6
 6th Gen. Intel® Core™
 Intel® QM170 Chipset
 2 DDR4 SODIMM up to 32GB
 3 Independent Displays (Supports 4K x 2K)
 12 USB



DFI's COM Express Basic Combines the Best of Technology and Service

COM Express Basic module is one of the most popular choices for machine manufacturers and system integrators in developing application-specific solutions. The module provides high-level processing performance and high-speed interface to meet a wide variety of computing demands. To reduce our clients' development time and effort, DFI provides standard COM Express as well as OEM/ODM customization services. These services include module design assistance and evaluation during the planning phase, strict validation and testing process for deployments, and customized thermal solution for special requirements. With more than 35 years of expertise in research, design, and manufacturing, DFI has clients covered throughout each development stage so they can stay focused on building their core strength to meet new market challenges.

DFI

Founded in 1981, DFI is a global leading provider of high-performance computing technology across multiple embedded industries. With its innovative design and premium quality management system, DFI's industrial-grade solutions enable customers to optimize their equipment and ensure high reliability, long-term life cycle, and 24/7 durability in a breadth of markets including factory automation, medical, gaming, transportation, smart energy, defense, and intelligent retail.

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