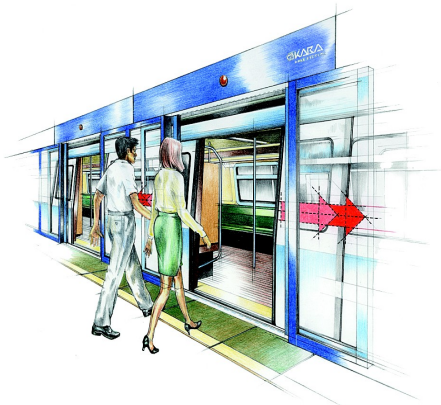
Case Study:

Emenda Software Ltd

Based throughout Europe, Emenda provide software development and software testing consultancy and tools to customers worldwide. With a strong background in safety- and mission-critical software testing, Emenda has core competence and expertise in the verification and validation of software to external software standards.



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Kaba Gilgen AG

With over 550 employees, Kaba Gilgen AG have been manufacturing, installing and providing services for automatic doors and gate systems since 1961. In 1990 Kaba Gilgen AG brought their expertise and experience to automatic doors for public transport. They are now a leading provider of of both full- and half-height Platform Screen Door (PSD) systems. The Swiss-based company have wide experience as a supplier of PSD systems for various metro lines worldwide, including cities such as New York (USA), Toulouse and Lille (France), Hong Kong, Kaohsiung (Taiwan), Taipei (Taiwan) and Shanghai (P.R.C.). Kaba Gilgen AG is part of the Kaba Group.

In March 2007 Kaba Gilgen AG won the contract to upgrade metro stations in Paris with half-height Platform Screen Door (PSD) systems from the metro operator, RATP (Régie Autonome des Transports Parisiens). During a first stage from March 2008 to 2011, the project will see the development, production and installation of more than 10 kilometres of platform screens, featuring up to 2000 fully automatic half-height PSD systems. Once installed, the PSD systems will deliver improvements in passenger safety as well as in the transport capacity and efficiency of the metro.

Despite previous experience with similar projects in Europe and Asia, the Paris metro project presented unique challenges for Kaba's in-house team of software developers. The half-height PSD system chosen by RATP is mechanically more complex than the full-height model, which creates a need for a more complex controlling software. The scale of the Paris metro also placed high demands on the software, with some platforms having the capacity for up to 18 PSD units. Crucially, RATP also required that the software and hardware meet the standards EN50128 and EN50129 for SIL2.

The CENELEC standards EN50128 and EN50129 relate specifically to operational safety-critical systems in the rail industry. The standards require evidence to be produced proving that a system reaches the specified System Integrity Level (SIL), which involves module tests, software integration tests, hardware/software integration tests and simulated system-level tests. Though Kaba already had embedded SIL2 software developed for the control of PSD systems, that software had not undergone the same level of unit testing required by the metro project. With the extra demands the size of the project placed on the software and the time pressures involved, Kaba's team of developers looked for external help with software testing and design.

With the volume and complexity of high-level testing to complete, Kaba chose Emenda Software Ltd to provide them with software testing and design solutions as well as consultancy. Kaba chose Cantata++ to help them develop their existing software to meet the required standards. With the capacity to run detailed unit tests on all source files, Cantata++ provided the scope for ensuring the 100% code coverage required to meet the standards. "**We considered other products, but Cantata++ was the right solution for the project**," explains Application Engineer Denis Battaglia. "**A high level of programming knowledge is needed to adapt Cantata++, but we chose the solution because it is highly customizable. We were**

able to tailor the functionality of Cantata++ exactly to our needs and this greatly helped in meeting the customer specification for the project", he said. Emenda provided the initial training for Cantata++ and helped integrate the tool into Kaba's existing set-up, which includes a Fujitsu cross compiler running on an embOS operating system.

As well as Cantata++, Kaba also benefited from two Emenda workshops where they ran the static analysis tool Klocwork on their code, which is exclusively written in C. The tool was not integrated into Kaba's system but Klocwork was used in the early stages of development to visualise the architecture of the software. By displaying the dependencies between modules visually, Klocwork enabled to Kaba to ensure their architecture was ordered and clean, thus increasing the stability of their software and reducing the risk of unreachable code.

In summary of the collaboration between Kaba and Emenda, Denis Battaglia said: "**It was essential for us to meet the strict safety standards that the customer required. Cantata++ enabled us to ensure that the software we developed could meet those standards. Emenda initially helped us implement Cantata++ into our set-up but they also provided us with consulting services as the project progressed. They carried out around 60% of the required testing and greatly increased our capacity to complete the project. Emenda's expertise in Cantata++ and software testing in general meant this was a logical step for us. This project was not easy and there were significant time constraints. Emenda's flexibility and integrity were important to us. We were very happy with the service Emenda provided."**

Emenda were also positive about working on the project. As Emenda's Steve Howard says, "With Kaba's expertise and commitment to high-quality design, coding and documentation, working with them to produce unit tests was both straightforward and rewarding. We soon built up an excellent working relationship between the two companies in which everyone knew what their tasks were and how to achieve them. It was probably the smoothest and most efficient operation I have ever had the pleasure of being involved with."

Overall, the software development team at Kaba have been able to adapt their existing software to meet the strict safety requirements of the Paris metro project through their own knowledge and by investing in Cantata++, Klocwork workshops and the expertise of the Emenda team. Having successfully engineered the software for the Paris metro project, Kaba now have the tools and expertise to implement high-level safety software on future projects.

Work began on installing the PSD systems in May 2008. The software controlling the doors has been externally validated and reaches the CENELEC SIL2 level. At present (June 2008), Kaba's PSD systems are installed at Châtillon-Montrouge on Line 13 of the Paris metro. Further stations will follow from November 2008.

Emenda would like to thank Kaba Gilgen AG for their assistance with this case study, the contents of which was approved before publication.

Further Information

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For further information on the products and services we offer, as well as the locations of our offices, please visit our website at:

www.emenda.eu