

db4o | The Open Source Object Database | Java and .NET

BOSCH: db4o Controls Complex, High-Speed Packaging Robots

By Amy Tenderich

Sigpack Systems AG, a BOSCH Packaging Technology company (www.sigpack.com), is a worldwide leader in fully automated packaging technology. Its new robot Delta XR31 defines the state-of-the-art in high-speed, reliable “pick-and-place” robotic systems used for packaging food products, cosmetics, pharmaceuticals, and consumer electronics.

Fitted with the latest material and drive technology, the lightweight Delta structure features unique rigidity and few moving parts, resulting in ultra-precise movements and extremely low maintenance. The data model controlling this automation system is highly complex, managing some 39,000 objects in use between the database and memory at any given time. db4o is at the heart of the Delta XR31 automation system.

A native object database was a clear choice for powering the Delta automation server due to the system’s complexity. BOSCH Sigpack Systems AG turned to db4objects because it offered the only object database capable of meeting the strict requirements of robotic systems, including the critical ability to quickly reconfigure the packaging line to handle production changes.

“We found that db4o was the only native object database that would allow us to quickly accomplish our goal: adding a PC-based server to the system in order to simplify configuration and shorten commissioning time both in-house and at the customers’ sites. We believe that going with db4o reduces our time to market, which is a critical factor,” said the project manager with BOSCH Sigpack Systems AG in Beringen, Switzerland.

Evaluating Tools

Previously, BOSCH Sigpack Systems AG engineers had to manually configure each individual robot in a packaging line. The existing PLC (Programmable Logic Controller) is limited to controlling conveyors and central operational functions, including start/stop, maintenance mode, and some basic statistics.

To streamline operations, BOSCH Sigpack first modeled a new centralized system in UML (Unified Modeling Language) that would provide an overview of the entire system and all connections between real-world objects. The next step was identifying a database that



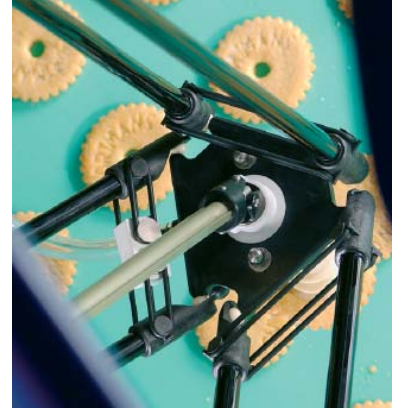
With nearly 4’300 employees and annual sales of approx. 600 million EUR, the Bosch Packaging Technology Group is No. 1 in the worldwide market for packaging technology.

Sigpack Systems of Beringen is the “System and integration house“ at Bosch Packaging Technology Group. Fully-automated packaging solutions combining ultra-high performance with maximum availability are the core competencies of Sigpack Systems. Ongoing innovations guarantee the company’s technological leadership.



could handle such a system. The team had to decide between a traditional relational database coupled with an object-relational mapper – that “wraps” relational databases to store objects directly – or a “native” object-oriented database (OODBMS).

“We determined that using an OR-Mapper wouldn't save us any time, so we did some research in the OODBMS sector and evaluated different products. Every one we looked at had at least one catch, involving an error-prone and complicated 'after-compile' process, or needing a proprietary script language to manipulate objects, which was too expensive... Until I got my hands on db4o. At first sight I was impressed with how easy things can be,” said Sebastian Hubrich, a BOSCH Sigpack Systems AG quality engineer who helped manage the implementation.



He found db4o to be a lightweight and fast OODBMS needing little, if any, administrative overhead. BOSCH Sigpack Systems AG was able to produce satisfactory results immediately.

Achieving the “Configurator”

BOSCH Sigpack Systems AG used a phased approach to create an optimal method for managing robot components. In Phase One, the company used db4o to implement a central configuration and log database to enable distributed configuration settings, machine formats, vision parameters and HMI settings to the connected robots. This allowed BOSCH Sigpack Systems AG to manage robot components in a distributed manner, and helped build the foundation for the new management tool.

In Phase Two, the company designed a db4o-based “Configurator Tool” to reconfigure packaging lines centrally, controlling robot drivers, vision, HMI, central control unit, and central line control station through a single system.

“This is revolutionary for us because it drastically lowers the time spent for the configuration of a robot line. As you can imagine, every day a packaging line is standing still and not producing costs a lot of money. Now the possibilities for misconfiguration – and time wasted in error tracking – are reduced due to automated tasks and performed checks. Support for our engineers at the customer’s site becomes significantly easier, as they can just send the .YAP (db4o data) files and we can analyze the whole line,” Hubrich explains.

«This project is highly demanding and had a tough time schedule - db4o was the ideal choice on both counts»

The ability to make configuration changes on the fly allows production lines to become much more flexible and adaptable to production changes, but also increases the complexity of the data model – a key reason for the selection of db4o, proven to excel in managing complex data models.



Conquering Complexity

The new system consists of approximately 30 robot objects, each connected to an array of feeder objects, and each feeder further linked to an array of sensor objects, and so on. All together there are 39,000 objects in memory simultaneously.



“This project is highly demanding and had a tough time schedule,” Hubrich said. “db4o was the ideal choice on both counts.”

Key selection criteria for BOSCH Sigpack Systems AG were:

- db4o’s high performance, allowing management of a huge number of objects
- db4o’s proven reliability
- accelerated time to market through db4o’s ease of use and straightforward implementation

Beyond offering speed and reliability, db4o is also optimized to run in a minimal footprint and requires zero administration. Additionally, db4o is native to both Java and .NET programming frameworks, allowing developers to store objects directly.

Results and ROI

The advent of the db4o-enabled Configurator Tool makes life a lot easier for the project manager and his team of developers to implement the advanced Delta XR31 system. Now instead of spending hours configuring one robot after another, they can centrally configure an entire robot line for a significant productivity jump. “The use of db4o on the data-backend has helped us to achieve a time-saving effect of at least 10% on each project”, Hubrich says.

For BOSCH Sigpack Systems AG, the most important benefits of using db4o technology are reduced development time, ease of use via enhanced performance, i.e. more time for engineers to concentrate the core system, and the very satisfactory support received from the db4o support team. Overall, Hubrich says, db4o offers excellent ROI in terms of the price compared to capabilities delivered.

“Our biggest concern is shortening our commissioning time, and db4o gives us the ability to do that.”

Sebastian Hubrich, BOSCH Sigpack Systems

About db4objects

db4objects develops, commercially licenses and supports db4o, the leading open source object database. With more than 100,000 deployments, db4o offers Java and .NET developers one of the easiest and fastest ways to store objects natively. Development managers rely on db4o to cut development costs and deliver new products to market faster.

db4o is used by some of the world’s largest companies, including BMW, Hertz, and Indra Sistemas. db4objects is a privately-held company based in San Mateo, California and backed by noted Silicon Valley investors including Mark Leslie, founding CEO of Veritas, who also acts as the chairman of the company.

db4o Benefits:

- Faster time to market
- Ease of use
- Enhanced performance

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